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DEVELOPMENT OF A NEW PROCEDURE TO ASSESS THE FLAMMABILITY OF MATERIALS USED IN MOTOR VEHICLES

FINAL REPORT

SwRI® Project 18.03614

Prepared by

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San Antonio, Texas

Prepared for

General Motors Corporation
Warren, MI

February 2004

SOUTHWEST RESEARCH INSTITUTE®
SAN ANTONIO HOUSTON WASHINGTON, DC

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APPROVED:

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Mechanical and Materials Engineering Division

EXECUTIVE SUMMARY

This study was completed in response to the March 7, 1995, Settlement Agreement between General Motors and the U.S. Department of Transportation (DOT). That agreement established a five-year, multi-million dollar research program to gain a better understanding of how vehicle fires start and spread, and to determine what might be done from an engineering and materials perspective to mitigate such fires. Under the agreement, the National Highway Traffic Safety Administration (NHTSA), in collaboration with GM, has defined 14 separate research projects that intend to address various factors concerning vehicle fires, from initiation scenarios to material behavior. The B.10(b) section of that agreement, entitled "Development of a Method to Assess the Flammability of Materials Used in Motor Vehicles" is the topic of the work described in this report.

The principal objective of this research project was to identify or develop a test methodology to determine an automotive material fire rating which best correlates to actual fire performance of the material in actual vehicle fires.

It is generally accepted in the fire science and fire protection engineering communities that heat release rate is the single most important variable used to characterize the fire performance of materials. The Cone Calorimeter is the most commonly used laboratory-scale test apparatus to measure heat release rate from materials. Based on this experience, the Cone Calorimeter was selected in the present study to serve as the basis for a procedure to assess the fire performance of materials used in motor vehicles.

The approach to this research study consisted of six tasks as follows. In the first task, an extensive literature survey was conducted and publications on motor vehicle fire safety were reviewed to obtain some guidance for the selection of appropriate test conditions. Based on that information, the second task involved the selection of a total of 24 parts from four different compact cars for testing: seven interior and three exterior parts of the Chevrolet Cavalier; and four to six interior and one or two exterior parts each of the Dodge Neon, Ford Focus, and Honda Civic. The interior parts accounted for most of the exposed area and quantity of combustible materials inside the passenger compartment. Exterior parts were selected that are most likely to be involved in a fire originating outside the passenger compartment. The third task was aimed at linking the composition and thermodynamic characteristics of selected types of vehicle materials (interior and exterior) with their flammability behavior. Each material selected for the comparative evaluation was analyzed to determine or verify its base polymeric composition, and to determine the molecular and morphological changes that might occur, including first- and second-order endothermic phase transitions or exothermic reactions, or both. The corresponding thermodynamic characteristics of the same materials were evaluated by modulated differential scanning calorimetry (MDSC). In the fourth task, the selected materials were tested according to Federal Motor Vehicle Safety Standard 302 (FMVSS 302) to verify compliance and obtain some baseline flammability data. Moreover, an extensive series of tests were conducted in the Cone Calorimeter on each material: full tests at three irradiance levels to obtain ignition, heat release, and smoke production data; and an additional series of partial tests to experimentally determine the minimum heat flux for piloted ignition. Given that the main challenge of using Cone Calorimeter data to predict performance of materials in real fires is addressing the scaling effect, a series of intermediate-scale tests were performed in the fifth task on some larger

specimens and components. These intermediate-scale tests were performed in the Intermediate-scale CALorimeter, or ICAL. Finally, the sixth task entailed critical analysis of small-scale tests (FMVSS 302 and Cone Calorimeter) and the intermediate-scale tests to develop a procedure to assess the fire performance of materials used in motor vehicles. This analysis identified the test conditions in the Cone Calorimeter and parameters that need to be obtained as a measure of the fire performance of the material. Correlations were also established between the microscopic thermodynamic behavior obtained from MDSC measurements and the macroscopic flammability data obtained from small- and intermediate-scale fire tests.

An extensive review of published literature and unpublished reports indicated that the most suitable heat flux ranges for evaluating the fire performance of motor vehicle components and materials were as follows: 10-61 kW/m^2 for components in the engine compartment; 20-40 kW/m^2 for components in the passenger compartment; and, 10-180 kW/m^2 for exterior components exposed to a fuel spill fire. Since interior parts account for most of the exposed area and quantity of combustible materials inside the passenger compartment, approximately two-thirds of all parts tested in the present study were selected from inside the passenger compartment. This selection criterion proved to be appropriate for validating the scaling laws of component and system behavior.

Analysis of the microscopic thermal properties of component materials indicated that most materials subjected to MDSC analysis exhibited crystalline polymer morphologies with well-defined first-order melt transitions. At a molecular level, polyurethane seat foam materials exhibited the most change as a function of temperature (≤ 300 °C), principally due to the thermal degradation of the amide-ester linkage and the reaction of residual isocyanate species. This microscopic thermal behavior was in contrast to the good thermo-molecular stability demonstrated by carpet and fabric fibers of the aromatic polyester type, such as polyethylene terephthalate (PET).

Overall, the Cone Calorimeter test method was shown to be scalable down to the microscopic thermal behavior of most materials. This "downward scalability" was demonstrated as a result of a positive correlation in the relationship between the microscopic enthalpies of component materials and the time to ignition determined macroscopically by the small-scale Cone Calorimeter measurements.

At a macroscopic level, the Fire Propagation Index (FPI) determined by the Cone Calorimeter methods provided a reasonably accurate indication for full-scale fire behavior for materials that stay in place and do not melt and drip. Materials with an FPI of 20 $m^{5/3}/kW^{2/3}$-$s^{1/2}$ as defined in this study are expected to have decelerating fire propagation. Of all materials tested in this study carpets and fabrics had the lowest FPI values.

It was inferred that the peak heat release rate of automobile parts in a real fire may be higher than expected on the basis of the FPI of the materials involved if these melt when exposed to heat. The heat release rate of these types of components appears to be relatively independent of incident heat flux and can be estimated more accurately on the basis of a pool fire analysis. The pool fire size in the ICAL experiments conducted as part of this study was determined by the size of the catch pan at the bottom of the specimen holder. More work is needed to develop a methodology for estimating the pool fire size in actual vehicle fires.

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1.0 INTRODUCTION

This report presents the results of a research program to develop a new procedure for assessing the fire performance of materials used in motor vehicles. It is generally accepted in the fire science and fire protection engineering communities that heat release rate is the single most important variable used to characterize the fire performance of materials [1]. The Cone Calorimeter[1] is the most commonly used laboratory-scale test apparatus to measure heat release rate from materials. In recent years, procedures have been developed for several types of products to predict fire performance in end-use conditions on the basis of Cone Calorimeter data. For example, a two-year research program was conducted in Europe in the early 1990's that resulted in a procedure to evaluate the fire performance of upholstered furniture on the basis of Cone Calorimeter data [2]. More recently, a similar approach was developed for electrical cables [3]. Several engineering analyses and correlations have been developed to predict fire growth over wall and ceiling finishes in a room/corner test [4-6]. Based on this experience, the Cone Calorimeter was selected in the present study to serve as the basis for a procedure to assess the fire hazard of materials used in motor vehicles.

2.0 APPROACH

The research study consisted of the following tasks:

Task 1: Literature Survey.

The Cone Calorimeter can be operated under a wide range of conditions (heat flux levels), simulating the various phases of fire growth. The most appropriate conditions to evaluate the fire performance of a material are a function of the fire scenarios that are being addressed. To obtain some guidance for the selection of appropriate test conditions, an extensive literature survey was conducted and publications on motor vehicle fire safety were reviewed.

Task 2: Selection of Materials

A total of 24 parts were selected from four different compact cars for testing: seven interior and three exterior parts of the Chevrolet Cavalier; and four to six interior and one or two exterior parts each of the Dodge Neon, Ford Focus, and Honda Civic. The interior parts account for most of the exposed area and quantity of combustible materials inside the passenger compartment. Exterior parts were selected that are most likely to be involved in a fire originating outside the passenger compartment.

Task 3: Materials Characterization

The goal of this task was to link the composition and thermodynamic characteristics of selected types of vehicle materials (interior and exterior) with their flammability behavior. Each material selected for the comparative evaluation was analyzed to determine or verify its base polymeric composition using Raman spectroscopy where appropriate. Raman analysis was also

[1] A brief description of the Cone Calorimeter is provided in Appendix A

used in conjunction with precise thermal control to determine the molecular and morphological changes that occur in automotive polymeric materials, spanning a sufficiently broad temperature range to capture first- and second-order endothermic phase transitions or exothermic reactions, or both. The corresponding thermodynamic characteristics of the same materials were evaluated by modulated differential scanning calorimetry (MDSC)[2].

Task 4: Small-Scale Fire Tests

Federal regulations require that materials used inside the passenger compartment of cars, trucks, and buses be tested according to Federal Motor Vehicle Safety Standard 302 (FMVSS 302). The materials selected in Task 2 were tested according to this standard to obtain some baseline flammability data. In addition, an extensive series of tests were conducted in the Cone Calorimeter on each material: full tests at three irradiance levels to obtain ignition, heat release, and smoke production data; and an additional series of partial tests to experimentally determine the minimum heat flux for piloted ignition.

Task 5: Intermediate-Scale Fire Tests

The main challenge of using Cone Calorimeter data to predict performance of materials in real fires is addressing the scaling effect. Higher heat fluxes are typically associated with larger fires, and those can be simulated in the Cone Calorimeter by using appropriate settings for the radiant heater. However, it is difficult to test representative samples of products with joints, or layered materials with a thickness of the same order as the Cone Calorimeter specimen size. Moreover, the geometry of the end-use of a product may also affect its performance. To address these issues, a series of intermediate-scale tests were performed on some larger specimens and components. These intermediate-scale tests were performed at Omega Point Laboratories, Inc. (Elmendorf, TX) in the Intermediate-scale CALorimeter, or ICAL[3].

Task 6: Data Analysis

The data from the small-scale tests (Task 4) and intermediate-scale tests (Task 5) were analyzed to develop a procedure to assess the fire performance of representative materials used in motor vehicles. This analysis identifies the test conditions in the Cone Calorimeter and parameters that need to be obtained as a measure of the fire performance of the material. Correlations were also established between the physical and chemical properties obtained in Task 3 and the flammability data obtained in Task 4.

The results of the six tasks are described in detail in the sections that follow.

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[2] MDSC original thermograms are attached in Appendix C

[3] A brief description of the ICAL method is provided in Appendix A

3.0 LITERATURE SURVEY

A literature survey was conducted to obtain guidance for the selection of the small-scale and intermediate-scale test conditions. Three sources of information were consulted for this survey. The majority of publications were found and obtained through the Fire Research Information Service (FRIS) of the Building and Fire Research Laboratory (BFRL) at the National Institute of Standards and Technology (NIST). The FRIS database can be accessed via the Internet at http://www.bfrl.nist.gov/fris/. Additional publications were found in a searchable transportation fire safety bibliography compiled by General Motors [7], and the National Highway Traffic Safety Administration (NHTSA) docket management system (http://dms.dot.gov). The survey was last updated through December 31, 2001. Five distinct categories of information were obtained in the survey:

1. *Automobile Fire Statistics.* Statistics may provide information on likely ignition scenarios and potential paths of fire propagation, and their importance in terms of passenger safety.
2. *Full-Scale Car Burn Test Reports.* Many full-scale car burn tests have been conducted. The purpose of most of these tests was to obtain data for fire engineering design of car ferries, parking structures, road tunnels, *etc.* Older tests were instrumented with thermocouples, but more recent experiments may include heat flux and energy release rate data that are of interest for this study.
3. *Reports on Small-Scale Flammability Tests on Materials Used in Automobiles.* Numerous reports have been published on the flammability of materials used in automobiles. Most of these studies focus on performance of materials tested according to FMVSS 302. However, a few recent publications present ignition, heat release, and smoke production data that are pertinent to this study.
4. *Other Publications on Fires in Automobiles.* Accident reports, publications on computer modeling and investigation of motor vehicle fires, and legislative documents concerning automobile fire safety may contain useful information for the present study.
5. *Similar Studies for Other Modes of Transportation.* Several studies have been performed to relate small-scale flammability data with performance in real fires for materials used in passenger cabins of commercial aircraft, rail transportation vehicles, and ships. There are analogies between these investigations and the present study. A survey of these investigations might reveal some valuable information for the present study.

A summary of the results of the literature survey for each of these categories follows.

3.1 Automobile Fire Statistics

A recent study examined various U.S. motor vehicle fire databases [8]. The study focused on databases maintained by Federal and State highway safety organizations. It was concluded that all databases have deficiencies in terms of the information needed by fire

researchers. Recommendations were made to improve the level of detail and consistency for motor vehicle fires reported in the Federal Analysis Reporting System (FARS) of NHTSA.

Shields et al., developed a methodology for collecting detailed information from motor vehicle fires [9]. Data have been obtained for 50 fires and preliminary results have been presented for 13 incidents. The following conclusions were drawn from the analysis of the data for these 13 fires:

1. There are large variations in times to ignition (immediate to 10 min) and propagation to the passenger compartment (immediate to 11 min);
2. Ignition is possible from varied sources such as hot surfaces, mechanical sparks, electric sparks, etc.;
3. Upper engine impact may increase intrusive damage to the engine compartment with subsequent fluid release; and
4. Most incidents did not involve burn injuries.

Given the low number of fires investigated, these conclusions cannot be generalized.

The FRIS search identified 18 publications on fire statistics of passenger motor vehicles. Since FMVSS 302 first went into effect in 1972, it was decided to restrict the survey to reports that were published in the 1980's and beyond. The reports of the National Fire Protection Association (NFPA) turned out to provide the most complete and useful information [10-14]. The study by Lavelle et al. [8], points out that the NFPA surveys are based on random samples of U.S. fire department reports with a sampling error of approximately 10%. Any conclusions from these surveys, therefore, have to be treated with some caution.

NFPA began tracking vehicle fires and losses in 1980, and has published annual reports on U.S. vehicle fire trends and patterns based on these data since 1996. The reports published to-date each cover a five-year period ending in 1994, 1995, 1996, 1997, and 1998 respectively. Table 3-1 gives some statistics for passenger road transport vehicle fires presented in the NFPA reports.

The statistics indicate that the number of passenger road transport vehicle fires, fire deaths, and fire injuries have continuously declined since the late 1980's. The direct property losses have increased slightly above inflation.

Table 3-2 shows the same data as a percentage of the overall U.S. fire statistics published by NFPA. This puts the motor vehicle fire issue in perspective. Approximately 15% of all fires that are reported in the United States involve passenger motor vehicles. Passenger motor vehicle fires account for approximately 8% of the total number of fire deaths.

Tables 3-3, 3-4, and 3-5 show a subset of the statistical data presented in the aforementioned NFPA reports. Table 3-3 gives the percentage of fires by ignition factor, area of origin, and form of material first ignited. In a similar manner, Tables 3-4 and 3-5 show the

percentage of fire deaths and the percentage of direct property loss respectively. Only the top three contributing ignition factors, areas of origin and forms of material first ignited are listed.

Table 3-3 indicates that more than 70% of passenger motor vehicle fires originate outside the passenger compartment, and that almost 20% originate inside the passenger area. Table 3-4 indicates that fires following collision, overturn or knockdown account for the majority of fire deaths.

Finally, The U.S. Fire Administration (USFA) recently published some findings concerning highway vehicle fires [15]. These findings were based on analyses of motor vehicle fire reports in the National Fire Incident Reporting System (NFIRS) and are consistent with those of the NFPA. This is not surprising since both organizations base their analysis on the same type of data. An interesting statistic reported in the USFA publication is that one in four fire department responses is to a vehicle fire. The aforementioned study by Lavelle et al., pointed out that not all States and not all fire departments participate in the NFIRS [8]. Hence the USFA findings may not be representative for the entire nation.

Table 3-1. Sliding Average Annual NFPA Statistics for Passenger Road Transport Vehicle Fires in The U.S.

Period	Fires	Deaths	Injuries	Direct Loss (Millions)
1989-1993	321,570	416	2,130	$600.0
1990-1994	313,560	406	2,021	$606.2
1991-1995	308,760	368	1,830	$607.3
1992-1996	298,570	369	1,658	$603.8
1993-1997	302,210	343	1,570	$645.6
1994-1998	295,170	330	1,403	$692.6

Table 3-2. Passenger Motor Vehicle Fire Statistics as a Percentage of Overall U.S. Fire Statistics

Period	Fires	Deaths	Injuries	Direct Loss
1989-1993	15.9%	8.5%	7.3%	7.0%
1990-1994	15.6%	8.7%	7.0%	7.2%
1991-1995	15.5%	8.1%	6.5%	7.0%
1992-1996	15.1%	7.9%	6.0%	7.0%
1993-1997	15.5%	7.6%	5.9%	7.4%
1994-1998	15.5%	7.5%	5.6%	7.9%

Table 3-3. Ignition Factors, Areas of Origin, and Forms of Material First Ignited Accounting for The Majority of Fires+

		1989-1993	1990-1994	1991-1995	1992-1996	1993-1997	1994-1998
Ignition Factor	Part failure, leak or break	21.9%	21.4%	19.4%	19.9%	20.6%	20.5%
	Short circuit or ground fault	16.4%	16.9%	18.3%	18.0%	17.6%	17.3%
	Incendiary or suspicious	16.8%	16.8%	16.6%	16.7%	16.7%	12.5%
	Total	55.1%	55.1%	54.3%	54.6%	54.9%	50.3%
Area of Origin	Engine area, running gear or wheel area	67.4%	67.8%	68.5%	68.5%	68.2%	60.7%
	Passenger area	19.1%	18.7%	17.7%	17.9%	18.2%	13.9%
	Exterior exposed surface	2.6%	2.6%	2.7%	2.7%	2.7%	4.2%
	Total	89.1%	89.1%	88.9%	89.1%	89.1%	78.8%
Form of Material First Ignited	Fuel	34.5%	33.3%	28.6%	30.1%	31.8%	26.6%
	Electrical wire or cable insulation	23.4%	24.0%	26.4%	25.6%	24.9%	23.1%
	Upholstered seat	8.5%	8.1%	7.4%	7.5%	7.7%	4.5%
	Total	66.4%	65.4%	62.4%	63.2%	64.4%	54.2%

+ References 10-14.

Table 3-4. Ignition Factors, Areas of Origin, and Forms of Material First Ignited Accounting for The Majority of Fire+ Deaths

		1989-1993	1990-1994	1991-1995	1992-1996	1993-1997	1994-1998
Ignition Factor	Collision, overturn or knockdown	61.9%	62.0%	59.1%	61.9%	60.9%	64.4%
	Incendiary or suspicious	7.2%	6.7%	10.4%	9.1%	8.6%	2.9%
	Part failure, leak or break	4.1%	4.4%	4.9%	4.8%	4.5%	3.2%
	Total	73.2%	73.1%	74.4%	75.8%	74.0%	70.5%
Area of Origin	Engine area, running gear or wheel area	39.4%	40.8%	38.4%	39.5%	40.2%	26.0%
	Passenger area	22.2%	21.8%	21.0%	20.9%	21.4%	15.4%
	Fuel tank or fuel line area	19.4%	19.2%	19.6%	20.7%	19.4%	27.6%
	Total	81.0%	81.8%	79.0%	81.1%	81.0%	69.0%
Form of Material First Ignited	Fuel	61.6%	60.0%	57.1%	56.5%	58.8%	54.0%
	Gas or liquid from a pipe or container	7.7%	7.3%	7.7%	7.6%	0.8%	9.9%
	Upholstered seat	5.1%	4.5%	3.2%	3.7%	4.3%	3.1%
	Total	74.4%	71.8%	68.0%	67.8%	63.9%	67.0%

+ References 10-14.

Table 3-5. Ignition Factors, Areas of Origin, and Forms of Material First Ignited Accounting for The Majority of Property[+] Loss

		1989-1993	1990-1994	1991-1995	1992-1996	1993-1997	1994-1998
Ignition Factor	Incendiary or suspicious	29.0%	28.4%	27.4%	27.3%	27.7%	16.3%
	Part failure, leak or break	17.9%	17.7%	16.4%	16.9%	17.3%	17.0%
	Short circuit or ground fault	13.5%	13.9%	14.9%	14.9%	14.6%	14.9%
	Total	60.4%	60.0%	58.7%	59.1%	59.6%	48.2%
Area of Origin	Engine area, running gear or wheel area	55.9%	57.9%	58.9%	59.0%	58.4%	46.9%
	Passenger area	26.4%	25.5%	24.6%	24.5%	24.9%	16.5%
	Exterior exposed surface	2.4%	2.2%	2.3%	2.3%	2.2%	5.3%
	Total	84.7%	85.6%	85.8%	85.8%	85.5%	68.7%
Form of Material First Ignited	Fuel	30.9%	30.0%	26.4%	27.1%	28.8%	28.7%
	Electrical wire or cable insulation	18.3%	19.0%	21.8%	20.7%	20.1%	17.2%
	Upholstered seat	11.6%	10.9%	10.3%	9.9%	10.4%	4.5%
	Total	60.8%	59.9%	58.5%	57.7%	59.3%	50.4%

+ References 10-14.

3.2 Full-Scale Car Burn Test Reports

3.2.1 Tests to Provide Data for Fire Protection of Parking Garages

Full-scale car burn tests were conducted in several countries in the 1960's and 1970's [16-21]. These tests were performed inside parking garages with the objective to assess the effect of such fires on the structure, and, in some cases, to evaluate the adequacy of proposed building fire protection measures. Typically only temperatures were measured on the surface of structural elements and in the air surrounding the fire. There was no instrumentation inside the test cars, and fire growth assessment was limited to visual observations. The general conclusion from these tests was that open-air parking structures present a very low fire hazard, and that exposed steel framing provides an adequate degree of safety against structural collapse. The test results provided the basis for modifications to building regulations for open-deck parking garages in the United Kingdom, Japan, the United States, and Australia.

The time to full involvement in these tests ranged from 3 to 10 min depending on the ignition scenario. This is quite consistent with fire growth rates estimated from field investigations and measured in more recent experiments (see below), in spite of the fact that the types and quantities of combustible materials used in the passenger compartment of motor vehicles have changed considerably. In addition, the following important findings from these tests are probably still valid:

1. Window must be (partially) open for sustained flaming combustion in the passenger area;
2. A motor vehicle fire is unlikely to spread to adjacent cars in a parking garage; and
3. It is unlikely that the gasoline tank will explode in the event of a motor vehicle fire.

More recently, fire scientists in Finland re-examined the fire hazard of open-deck parking garages. A computer model was developed at the Technical University of Helsinki to simulate a fire in a parking garage and evaluate the effects on the structure [22]. The calculations were consistent with the experimental data from the tests conducted in the 1960's and 1970's. In these calculations it was assumed that a single car represents a fire load[4] of 3221 MJ uniformly distributed over an area of 2×4 m and that the fire grows at a rate of 1 m per min. The latter was estimated on the basis of observed fire spread rates in German railcar fires, and resulted in a conservative estimate of 2 min for the time to full involvement. To obtain a more realistic fire growth curve, three full-scale car burn tests were conducted in an oxygen consumption calorimeter at the Technical Research Center of Finland (VTT) a few years later [23]. The results of these tests are summarized in Table 3-6. The fire was initiated inside the passenger compartment in the first test. The ignition source was located in the engine for the remaining two tests. The decision to obtain more data for fires that originate in the engine compartment

[4] The fire load was calculated on the basis of the "m factor" method described in DIN standard 18230. The mass of each type of material is multiplied by the net heat of combustion of the material and a factor that accounts primarily for the efficiency of combustion of the material (the "m factor"). The fire load is given by the sum of the resulting energy values for all materials. A typical composition of a car was obtained from an inventory published in the United States (Gewain 1973). The fire load calculated according to this method was 54% of the value obtained without adjustments for the efficiency of combustion.

was motivated by US motor vehicle fire statistics. Windows and/or doors were (partially) open for all tests, so that the fire would not be affected by oxygen starvation in the passenger compartment.

Table 3-6. Test Results of Full-Scale Car Burn Tests at VTT

Test	Ignition scenario	Peak HRR	Total HR	Flashover[a]	Spread Rate
1	1.5 L heptane in 0.3×0.3 m open tray under front seat	1500 kW	3300 MJ	4 min	11-12 min[b]
2	3 L heptane in 0.33×0.33 m open tray under engine	1900 kW	3000 MJ	4-5 min	4-5 min[c]
3		2000 kW	3900 MJ		

[a] in passenger compartment due to collapsing windshield
[b] from passenger compartment to engine area
[c] from engine area to passenger compartment

3.2.2 Tests to Provide Data for Fire Protection of Tunnels

In October of 1994 the National Testing and Research Institute in Borås, Sweden organized a major conference on fires in tunnels. Eleven papers covered various aspects of the EUREKA fire tests. The remaining 12 presentations dealt with other tunnel fire experiments and fire protection of tunnels in general. The EUREKA EU-499 FIRETUN project consisted of 20 full-scale fire tests of road and rail transportation vehicles, wood cribs, and heptane pools [24]. The tests were conducted between July 1990 and November 1992 in the abandoned Repparfjord tunnel in Norway. Extensive instrumentation was used to measure gas temperature and velocity profiles, tunnel surface temperatures, heat fluxes, smoke obscuration, and gas composition at various distances in both directions from the location of the fire [25]. Temperatures and mass loss of the burning object were also measured. Several approaches were used to determine the heat release rate of the burning object based on the available temperature, velocity, and gas composition data [26-30]. The difficulty was that there was no single extraction point where flow rate and oxygen concentration could be measured as in an oxygen consumption calorimeter, and that the distribution of temperature, velocity, and oxygen concentration across the section of the tunnel had to be accounted for.

Heat release curves for the design of fire protection of tunnels were later developed on the basis of the results of the EUREKA project [31]. The curve for a typical passenger motor vehicle is given by the following formulas:

$$\begin{aligned}
&0 \le t < t_1 &&: \dot{Q}(t) = \alpha t^2 \\
&t_1 \le t < t_2 &&: \dot{Q}(t) = \dot{Q}_{\max} \\
&t_2 \le t &&: \dot{Q}(t) = \dot{Q}_{\max} \exp[-\beta(t - t_2)] \text{ with } t_2 = \frac{\chi Q_{tot}}{\dot{Q}_{\max}} + \frac{2}{3} t_1 - \frac{1}{\beta}
\end{aligned} \tag{3.1}$$

where

t	=	time from ignition (s)
t_1	=	time to reach maximum heat release rate (632 s)

α	=	t-squared growth factor (0.01 kW/s^2)
$\dot{Q}$	=	heat release rate (kW)
$\dot{Q}_{max}$	=	maximum heat release rate (4000 kW)
t_2	=	time when the heat release rate starts to decay (s)
β	=	exponential decay factor (1/s)
χ	=	combustion efficiency
Q_{tot}	=	total calorific content (4000-7000 MJ)

The maximum heat release rate is an average based on the values measured or used by various investigators, ranging from 1.5 MW measured at VTT [23] to 6 MW obtained in the EUREKA project [30]. The total calorific content is the sum of the mass of each type of combustible multiplied by its net heat of combustion. It varies as a function of the size of the car and the amount of polymeric materials. The total calorific content of the cars tested at VTT was approximately 4000 MJ [23]. The total calorific content of the plastic car tested in the EUREKA project was 7000 MJ [30].

Extensive testing was also conducted in support of the fire safety engineering analysis for the railway tunnel under the English Channel (the "Chunnel"). Service through the 50 km long Chunnel connecting France and England started in 1994. Three types of trains travel through the Chunnel: high-speed passenger trains; shuttle trains that transport cars, buses, and trucks; and freight trains. Four full-scale car burn tests were conducted in support of the fire hazard assessment of car-carrying wagons at INERIS in France [32]. The results from these tests are not useful for this study because the primary objective was to evaluate the proposed Halon 1301 suppression systems. However, it is interesting to note that the following ignition scenarios were used for these tests:

- Test No. 1: fire started by igniting a No. 7 crib of BS 5852 Part 2 placed on a front seat with the covering cut to expose the foam;
- Test No. 2: fire started in typical luggage contained in the enclosed trunk;
- Test No. 3: fire started in the engine compartment by remote ignition of one liter of gasoline placed in small containers to simulate leakage from the carburetor pipe; and
- Test No. 4: remote ignition of gasoline leaking at a rate of 10 L/h into a tray placed below the car in the drain.

Malhotra [32] stated that it is difficult to visualize how a fire might start accidentally, except for an electrical fault, but that a complete fire hazard assessment needs to address these scenarios.

Of more interest are the results of two full-scale car burn tests conducted at the Fire Research Station [33]. The primary objective of these tests was to provide data for an assessment of the fire resistance requirements of Chunnel car-carrying shuttle wagons. The tests were conducted with the test car located in a shuttle wagon mock-up. Both test cars had a ¾ full steel fuel tank and open front windows. The ignition source for the first test was a BS 5852 Part 2 No. 7 wood crib placed on a front seat. It was estimated that the heat release rate from this

crib peaks at 10 kW. It took 6 min to full involvement of the passenger compartment. The heat release rate at that time was approximately 3.5 MW. The fire spread to the rest of the car at 11 min. A maximum heat release rate of 8.5 MW was recorded at 17 min, partly due to the contribution of the fuel. The first test had to be terminated at this point. The total heat released was 4008 MJ. The second test was initiated with 300 mL of gasoline placed in the engine. Smoke was first observed in the passenger area at 4 min, followed by flames under the dashboard one min later. A maximum heat release rate of 4.5 MW was reached at approximately 15 min. The second car burned for 57 min and the total heat released was 4957 MJ. The fact that the peak heat release rate and total heat released were higher than in previous experiments was attributed to the materials used in the manufacture of the vehicles and the burning conditions.

3.2.3 Other Pertinent Large-Scale Tests

Volvo Car Corporation has conducted full-scale car burn tests since the early 1970's. Results of a typical test are reported in a paper that was published in 1990 [34]. The purpose of the test was to simulate a fire in the engine compartment and evaluate the effects in the passenger area. Two small pans with gasoline were located against the firewall on the engine side. Thermocouples were placed on the opposite side of the firewall and gas-sampling probes were located in the passenger compartment. The gasoline burned for approximately 5 min. Temperatures in the areas of flame impingement rose to 700-800°C on the passenger side. However, temperatures were much lower in other areas and even remained close to ambient at a sufficient distance from the heated areas. The data are useful to determine where to locate penetrations through the firewall, and how to design plugs and connectors so that rapid propagation through these penetrations can be avoided. The author noted that it is relatively easy to treat materials with fire retardants so that ignition and flaming combustion can be delayed or eliminated, but that it is very difficult to prevent pyrolysis and the release of toxic gases inside the passenger compartment. He therefore suggested more work be done on smoke suppressants to address this problem.

Many full and intermediate scale fire tests have been conducted as outlined in the March 7, 1995 Settlement Agreement between General Motors Corporation (GM) and the Department of Transportation (DOT). These tests were performed on four different types of motor vehicles representing more than 50% of the sales in the U.S [35]. The vehicles were subjected to a crash test by GM prior to the fire tests at Factory Mutual Research Corporation (FM). A detailed discussion of the objectives and experimental design of these crash and fire tests is provided in [35]. At the time this survey was concluded, the report for only one of the eight full-scale tests conducted at FM had been released [36]. The vehicle in this test was a 1996 Dodge Caravan Sport, which had been crash tested earlier in a front collision with a moving barrier at 106 km/h. An electric igniter was used to artificially ignite the battery and power distribution center housing in the fire test. The fire was allowed to burn for approximately 11 min until flames spread into the passenger compartment and along the headliner toward the rear of the passenger compartment. Flames spread from the engine to the passenger compartment via three pathways: 1) through the windshield (first at 4½ min); 2) through bulkhead penetrations for (dislodged) AC evaporator and condenser lines; and 3) dislodged HVAC air intake. Peak heat flux to transducers in the dash panel facing the engine

compartment varied between 10 and 50 kW/m^2. Directional flame thermometers located above the front passenger and driver seats facing forward registered maximum heat fluxes of 40 kW/m^2. The heat release rate of the vehicle was steadily increasing during the test, and peaked at approximately 1.5 MW at the time of extinguishment. Approximately 50% of the heat was released in the form of convection, and 50% in the form of thermal radiation.

In addition to the FM data, five reports are now available of work performed at the National Institute of Standards and Technology (NIST). These tests and some important conclusions pertinent to this study are summarized below.

1. In the first series of tests selected functional parts from a minivan were subjected to a gas flame ignition source and burned in a manner that allowed measurement of the resulting total heat release rate, mass loss, and heat fluxes to the surroundings [37]. The test specimens comprised parts of the passenger compartment, the engine, and the fuel tank. Most parts exhibited a wide variety of behavior influenced not only by their constituent polymer resins, but also by their shapes, sizes, and internal structures. Heat fluxes recorded by a gauge located 51 mm above the top of the object were typically in the range of 80 kW/m^2. Heat fluxes recorded by gauges at a horizontal distance of 51 mm from the object were generally between 20 and 40 kW/m^2.
2. The second report examined a number of factors that pertain to fire initiation in motor vehicles subsequent to a fuel spill [38]. The incident heat flux to a steel plate located 0.3 m above a pool fire of 100 mL n-heptane is reported to be 70 kW/m^2 in the area of flame impingement. The heat flux drops to 22 kW/m^2 at 0.3 m from the vertical centerline of the pool fire. The heat flux for a gasoline pool fire of the same size peaks at 100 kW/m^2, but the duration of exposure at this level is only a few seconds (as opposed to approximately 20 s for the n-heptane fire).
3. The objective of the third series of tests was to evaluate the effect of intumescent body panel coatings on flame penetration, heat transfer, and transport of toxic gases to the passenger compartment in a post-collision vehicle fire [39]. It was concluded that such coatings considerably reduce heat transfer through non-damaged body panels, but that they fail to close and prevent flames from penetrating holes in post-collision vehicle body panels. Peak heat fluxes to vertical and horizontal steel surfaces from pool fires ranged from 30 to 150 kW/m^2, depending on the configuration and fuel burned.
4. In the fourth study parts from a sports coupe were evaluated in a similar manner as in the previous minivan study [40]. In addition, samples of the windscreen were evaluated in the Cone Calorimeter at heat fluxes ranging from 14 to 50 kW/m^2. Measured heat fluxes generally ranged from 10 to 60 kW/m^2, except for the rear bumper fascia (a peak heat flux of 180 kW/m^2 was recorded toward the rear hatch) and the instrument panel assembly (a brief peak heat flux of 105 kW/m^2 before fire extinguisher activation).
5. The fifth study examined different suppression strategies for two motor vehicle fire scenarios, i.e., fires initiated in the engine compartment and underbody fires due to spills of fuel and other liquids [41]. The suppression strategies were only partly successful. Use of a solid propellant generator was the most effective strategy in suppressing engine compartment fires. ABC and BC powders worked best to extinguish underbody fires of limited size. No heat flux measurements were reported in this study.

3.3 Reports of Small-Scale Flammability Tests on Materials Used in Automobiles

There was a significant amount of small-scale flammability testing and research on interior automotive materials in the years prior to and following the release of FMVSS 302 in September of 1972. Eleven publications were found in the NIST FRIS database, spanning a period from 1969 to 1977. These publications deal primarily with the performance of various polymeric materials in the test and re-formulation of products to meet the test requirements. These studies provide little information concerning initiation and propagation of automobile fires and the thermal exposure conditions that various components might experience.

Extensive flammability testing has been conducted as part of the Settlement Agreement between DOT and GM. Two types of investigations have been performed. The first type involved thermal gravimetric analysis (TGA), differential scanning calorimetry (DSC), and measurement of thermal conductivity of automotive polymers [42-45]. This work also resulted in the development of a new small-scale flammability test to evaluate automotive polymers [46]. The second type was performed at FM [47]. Twenty plastic materials from components of a 1996 Dodge Caravan were evaluated in the FM Fire Propagation Apparatus. This apparatus is similar to the Cone Calorimeter, and is used to obtain the same type of flammability data. The time to ignition was measured at different heat flux levels ranging from 20 to 60 kW/m^2. The ignition data were used to determine the *Critical Heat Flux* (CHF) and to calculate the *Thermal Response Parameter* (TRP). Experimental and extrapolated values of the CHF were consistent for all materials. The TRP values were approximately 28% higher than calculated values based on the measured thermal properties and TGA decomposition temperatures [48, 49]. Combustibility tests were conducted at a heat flux of 50 kW/m^2, and the resulting data were used to calculate the *Fire Propagation Index* (FPI). The TRP and FPI are used in a procedure to assess the fire performance of materials. FM developed this procedure and uses it to qualify a variety of materials for specific applications [50].

An extensive compilation of Cone Calorimeter data for 50 automotive materials was recently published [51]. Most of the tests were performed at 25 and 40 kW/m^2, but a small number was performed at 20 and/or 35 kW/m^2.

3.4 Other Publications on Fires in Automobiles

The survey of the NIST FRIS database identified 15 publications concerning ignition scenarios outside the passenger compartment, and design changes to address the fire hazard associated with these scenarios. The subjects covered by these publications include fire suppression systems and fires involving catalytic converters, electrical systems, exhaust systems, hoses, natural gas vehicles, and plastic fuel tanks. Nine additional publications were found on the subject of arson, including a comprehensive book on investigation of motor vehicle fires [52]. The 24 publications are not discussed here in detail because the amount of information pertinent to this study is very limited.

Michigan State University (MSU) conducted a theoretical and experimental study of thermal barriers separating automobile engine and passenger compartments [53]. This study was

funded by GM as part of the DOT settlement agreement. The experimental part of the study consisted of two sets of heat transfer measurements on a sample of a steel bulkhead with various types of insulation materials on the engine and passenger sides. MSU conducted small-scale tests to obtain thermal properties of the insulation materials based on parameter estimation and inverse heat transfer calculations. GM exposed 0.9 × 0.9-m bulkhead panels to the heat flux from a 0.32 × 0.32-m radiant panel. The temperature measurements from the intermediate-scale experiments were used to validate the heat transfer model developed at MSU. GM conducted seven experiments in total, with incident heat fluxes on the simulated engine side ranging from 14.1 to 67.1 kW/m^2.

A year after completion of the MSU study, an M.S. thesis was published at Worcester Polytechnic Institute (WPI) describing a computer model to predict fire spread from the engine to the passenger compartment through the windshield [54, 55]. The model is based on the TASCflow Computational Fluid Dynamics (CFD) code. The heat release rate of the simulated engine fire was based on a curve for fire design of structural steel developed by ARBED on the basis of nine full-scale car burn experiments [56]. The ARBED curve rises to 1.4 MW in 4 min, remains at 4 MW for the next 12 min, then increases to a maximum of 8.3 MW at 25 min, and finally rapidly decreases to 4.5 MW two min later, to 1 MW at 38 min, and to 0 MW at 70 min. The model simulates a fire occurring at the vehicle's hood. No heat flux data are presented in the thesis.

Another study conducted under the GM-DOT settlement agreement explored the use of a Computational Fluid Dynamics (CFD) code to predict the response of human skin to the radiative and convective heat transfer from a vehicle fire [57]. Results were presented of simulations that predicted the response of a human-like figure in the front bucket seat of a minivan to the radiant heat of a 75 kW/m^2 panel, representing a 800°C diffusion flame of the expected size and at the expected distance in front of the windshield. The corresponding heat flux at the surface of a manikin was approximately 20 kW/m^2.

3.5 Similar Studies for Other Modes of Transportation

3.5.1 Commercial Aircraft

In 1978 the Federal Aviation Administration (FAA) established a committee to examine the factors affecting the ability of aircraft cabin occupants to survive in a post-crash environment. The committee recommended research to evaluate the fire performance of cabin materials, and development of a method using radiant heat for testing of cabin materials. As a result, the FAA conducted an extensive series of full-scale fire tests and evaluated numerous bench-scale tests for their capability to provide results that correlate well with full-scale performance. The Ohio State University (OSU) apparatus, standardized as ASTM E-906, was found to be the most suitable for material qualification. Improved flammability standards and requirements for airplane cabin interior materials based on ASTM E-906 first went into effect in 1986 [58]. The limits for acceptance were based on heat release rate measured at an irradiance level of 35 kW/m^2. Peak heat release rate could not exceed 100 kW/m^2, and average heat release rate over the first two minutes following ignition had to be 50 kW/m^2 or less. Originally, the test method used by the FAA was identical to ASTM E-906. Since then, modifications have been

made [59]. The FAA method now uses a thermopile of five thermocouples, a lighter sample holder, and a modified test procedure to minimize problems associated with thermal lag. The FAA criteria for acceptance were revised in 1990 to 65 kW/m^2 for peak heat release rate during the 5-minute test, and to 32.5 kW/m^2 for average heat release rate over the first two minutes following ignition.

For many years the FAA has also expended considerable effort to relate laboratory thermal analysis to flammability. This effort resulted in the definition of a physical quantity that is a good predictor of heat release rate of pure polymers in a fire [60]. This quantity is referred to as the "heat capacity". Its units are J/g·K. The heat capacity is equal to the ratio of the specific heat release rate (W/g) to the rate of temperature rise (K/s) of a small specimen that is heated at a particular rate. The FAA also developed the so-called "Pyrolysis Combustion Flow Calorimeter" (PCFC), which is a laboratory-scale test apparatus to measure heat capacity. It has been demonstrated for more than a dozen pure polymers that heat capacity correlates well with the average heat release rate measured in the Cone Calorimeter at 50 kW/m^2. Since heat capacity is measured under conditions of dynamic equilibrium, it is not capable of predicting transient fire behavior.

3.5.2 Passenger Trains

The Federal Railroad Administration (FRA) issued a new rule on Passenger Equipment Safety Standards on May 12, 1999. Part 238.103(d) of this rule requires that passenger railroads conduct a preliminary Fire Safety Assessment (FSA) for each category of existing rail equipment and current rail service by July 10, 2000. The deadline for the preliminary analysis was later moved to January 10, 2001. A final analysis had to be conducted on those categories of equipment and service that are found on the basis of the preliminary analysis to present an unacceptable fire risk. This final analysis had to be completed by July 10, 2001. A complete analysis also has to be conducted on the deadline for this analysis is July 10, 2003. The rule is a direct result from a research program that was conducted for the FRA by NIST [61]. This program consisted of three phases. The first phase involved Cone Calorimeter testing of 30 selected passenger train materials taken from various AMTRAK railcars. The Cone Calorimeter tests were performed at a heat flux of 50 kW/m^2. The second phase involved intermediate-scale tests of chairs, beds, and wall sections in combination with a computer fire hazard assessment based on the Cone Calorimeter and intermediate-scale heat release rate data. The accuracy of the hazard assessment was verified in the third phase, which consisted of full-scale tests in a furnished passenger railcar.

An extensive study of the fire performance of materials used in passenger railcars is currently being performed in Europe [62]. The Cone Calorimeter tests in this study are performed at 25 and 50 kW/m^2.

3.5.3 Passenger Ships

On 1 January 1996, the High Speed Craft Code (HSC) entered into force as part of the Safety of Life at Sea (SOLAS) convention. This code deals with all aspects of the construction and operation of high speed craft. The most common type of ships that are regulated by the code are passenger and vehicle ferries that operate within 4 hours from shore. The code permits that a high speed craft be constructed of combustible materials, provided certain fire performance criteria are met. Materials that meet these criteria are referred to as "fire restricting materials." The determination of fire restricting materials is based primarily on one of two tests. Bulkhead lining, and ceiling materials are tested using the ISO 9705 room corner test. Acceptance criteria for ISO 9705 were published by the International Maritime Organization (IMO) several years ago. Furniture components (other than fabrics, upholstery, or bedding) and other components are tested using the ISO 5660 Cone Calorimeter. A research program funded by the United States Coast Guard (USCG) was conducted at Southwest Research Institute between August 1997 and July 1998 to establish suitable Cone Calorimeter acceptance criteria [63]. The USCG is the government agency responsible for enforcing IMO regulations in the U.S. Eight glassfiber-reinforced composite materials and one textile wallcovering were tested in different configurations in a room and in various small-scale tests. The proposed Cone Calorimeter acceptance criteria that resulted from this work are consistent with full-scale fire behavior, and are based on ignition time and heat and smoke release rate measured at a heat flux level of 50 kW/m^2. These acceptance criteria have now been approved and implemented by IMO.

3.6 Conclusions

Propagation times to the passenger compartment for fires originating in the engine area are summarized in Table 3-7. Propagation times measured in experiments are within the range of estimates from field investigations, although this range is rather wide and based on a very small sample. Whether or not the vehicle has crashed prior to fire initiation in the engine compartment does not seem to make much difference.

Heat flux data from various sources are summarized in Table 3-8. These data indicate that the following heat flux ranges may be suitable to evaluate the fire performance of motor vehicle components and materials:

1. Components in the engine compartment: 10-61 kW/m^2
2. Exterior components exposed to a fuel spill fire: 10-180 kW/m^2
3. Components in the passenger compartment: 20-40 kW/m^2

Heat fluxes inside the passenger compartment may rise above 40 kW/m^2 after full involvement (flashover).

Table 3-9 lists heat fluxes that are or have been used in small-scale experiments to determine the heat release rate (HRR) of interior materials used in various types of transportation vehicles. These heat fluxes range from 20 to 50 kW/m^2, which, based on the data presented in Table 3-8, appears to be a suitable range for components inside the passenger and engine compartments. Higher heat fluxes may be required to evaluate the fire performance of exterior

components in a fuel spill pool fire. However, the performance at high heat fluxes can also be obtained by extrapolation from data measured at multiple lower heat flux levels. The maximum heat flux that can be obtained in the ICAL apparatus is not much higher than 50 kW/m^2. Since test data at multiple heat fluxes are needed to obtain material properties and allow extrapolation to more severe thermal exposure levels, it is concluded that heat release tests in this study will be performed at 20, 35, and 50 kW/m^2.

Table 3-7. Comparison of Propagation Times from The Engine to The Passenger Compartment

Reference	Data Source	Propagation Times (min)
[9]	Field investigations	0-11
[23]	Full-scale test for parking garage design	4-5
[33]	Full-scale test for tunnel design	4
[36]	Fire initiation and propagation test	4½

Table 3-8. Heat Fluxes in Motor Vehicle Fires

Engine Fire to Bulkhead		
Reference	**Data Source**	**Heat Flux (kW/m^2)**
[36]	Fire initiation and propagation test	10-50
[53]	Intermediate-scale panel experiments	14-61
Underbody Pool Fire to Exterior Parts		
Reference	**Data Source**	**Heat Flux (kW/m^2)**
[37]	Gas burner flame simulation tests	80
[38]	Fuel spill pool fire tests	70-100
[39]	Fuel spill pool fire tests	30-150
[40]	Gas burner flame simulation tests	10-180
Engine Fire to Interior of Passenger Compartment		
Reference	**Data Source**	**Heat Flux (kW/m^2)**
[36]	Fire initiation and propagation test	40
[57]	Burn simulations	20

Table 3-9. Heat Fluxes in HRR Tests of Interior Materials in Passenger Transportation Vehicles

Reference	Type of vehicle	Heat fluxes
[40]	Automobile	14-50
[47]	Automobile	50
[51]	Automobile	20-40
[59]	Passenger aircraft	35
[61]	Passenger railcar	50
[62]	Passenger railcar	25-50
[63]	Fast passenger ferry	50

4.0 MATERIALS SELECTION

At total of 24 parts were selected from four different compact sedans for testing as shown in Tables 4-1 and 4-2. Approximately two-thirds of the parts were selected from inside the passenger compartment. These "interior parts" account for most of the exposed area and quantity of combustible materials inside the passenger compartment based on the findings of earlier work by Abu-Isa et al. [42-45], which are summarized in Table 4-3. The remaining parts were selected from the engine compartment and the trunk and fuel tank area. "Exterior" parts were selected that are most likely to be involved in a fire originating outside the passenger compartment. A larger number of interior parts were chosen because this study focuses on the hazard assessment of materials inside the passenger compartment, i.e., those that currently need to be tested according to FMVSS 302. However, some exterior materials were included to explore whether the fire hazard assessment procedure that results from this study can be applied outside the passenger compartment.

A popular GM compact car model, the Chevrolet Cavalier (2001 model year), was chosen to provide five interior and three exterior parts. A smaller number of functionally identical parts were obtained from three comparable compact sedans of the same 2001 model year made by other manufacturers: the Dodge Neon, the Ford Focus, and the Honda Civic. Two additional parts were selected from the Dodge Neon: a kick panel and a plastic fuel tank. The test matrix was set up so that, with the exception of the Neon kick panel and fuel tank, each type of part was obtained from at least two different manufacturers. Thus, it is believed that the parts that were selected are representative of the principal combustible materials that are found inside and outside the passenger compartment of compact automobiles currently available for sale in the U.S.

Some parts had different components that were tested separately. For example, the composition of the headrest was usually different from the seat back and bottom and additional small-scale tests were therefore conducted on the headrest. Table 4-1 provides an overview of the different parts and components that were obtained for testing. A description and photographs of all parts can be found in Appendix B.

Table 4-1. Summary of Component Materials by Part Number Selected from Four Vehicle Brands (2001 Model Year for All Brands)

Chevrolet Cavalier		*Dodge Neon*		*Ford Focus*		*Honda Civic*	
Part No.	**Description**	**Part No.**	**Description**	**Part No.**	**Description**	**Part No.**	**Description**
22589249	Seat Back Cover w/pad	SL491AZZA	Lt Frt Upper Seat Cushion Cover	YS4Z5462900BAB	Seat Cover	81521-S5A-A01ZA	Seat Cover
12532840	Seat Cushion cover w/pad	PZ15WL5AK	Lt Frt Door Panel	YS4Z5464810AB	Seat Pad	81522-55A-A01	Seat Pad
12457891	Headrest	TN47XDVAA	Carpet	YS4Z54611AO8BBB	Headrest	81140-55A-A01ZA	Headrest
22619703	Headliner	PV77WL5AB	Kick Panel	YS4Z5423942AAB	Door Panel	83583-S5A-A01ZC	Door Panel
22587440	Glove Box door	50172094A	Fuel Tank	YS4Z5413000BAF	Carpet	83801-S5A-A01ZB	Carpet
22618443	Door panel			YS4Z545191 6AAB	Headliner	T1500-S5A-A01ZA	Glove Box Door
22628609	Carpeting			YS4Z9600NA	Air Cleaner Assembly	77400-S5A-A01	Duct Assembly
52460744	HVAC Parts					32200-S5A-A00	Wire Harness
10488727	Engine Cover						
22621025	Wiring Harness						

Table 4-2. Matrix of Parts and Components That Were Obtained for Testing

		Chevrolet Cavalier	Dodge Neon	Ford Focus	Honda Civic
Interior	Seat				
	Headrest	X		X	X
	Back	X			X
	Bottom	X	X	X	
	Head liner	X		X	
	Glove box (cover)	X			X
	Door panel	X	X	X	X
	Carpet	X	X	X	X
	Kick panel		X		
Exterior	HVAC components	X			X
	Air filter assembly	X		X	
	Wiring harness	X			X
	Plastic fuel tank		X		

Table 4-3. Average Usage by Mass of Polymeric Materials in Passenger Cars and Light Trucks

Material[1]	Average Usage (lb/vehicle)[2]	Vehicle Component
Polyurethane	44	Headliner, seats, upholstery
Polypropylene	40	HVAC, air duct, instrument panel, shelf, fan & shroud
Polyvinyl Chloride	21	Steering wheel, seat cover, wire insulation, kick panel insulation
Polyethylene	20	Wire insulation, fuel tank, reservoir, filler pipe
Polyamide (Nylon)	18	Fuel system, fuel lines, engine cover, manifold, canister
Poly(acrylonitrile-butadiene-styrene)	16	Cowl vent, console, engine cover, fascia, head liner, duct
Polycarbonate	9	Instrument panel, console, electrical
Polyester (thermoplastic)	8	HVAC components, fuel rail, fuse junction
Leather	?	Upholstery

1 Abu-Isa, I. A., et al., NHTSA paper number 98-S4-P-17
2 Most used in cars and light trucks

5.0 MATERIALS CHARACTERIZATION

The analytical objective of this element of the study was to correlate the microscopic properties of the selected component materials, as determined by thermal analysis and spectroscopic techniques, with the measured flammability behavior of the selected materials as determined by laboratory- and component-scale comparative methods, i.e., Cone Calorimeter and ICAL tests as described in subsequent sections. Of particular interest was the correlative relationship between the microscopic thermal behavior of the selected polymeric materials, including the morphological and molecular changes that may occur, and the time to ignition that transpired under radiant heat flux for macroscopic quantities of the same material. In this context, the latent heats of endothermic phase transitions and exothermic heats of reaction of the material measured microscopically provided a bridge to the pre-ignition behavior of material flammability tests.

5.1 MDSC Thermal Analysis

Differential scanning calorimetry (DSC) is a technique in which the difference in energy input into a material and a reference material is measured as a function of temperature. In this study, a modulated differential scanning calorimetry (MDSC) procedure was used for the analysis. In the MDSC technique, the specimen is exposed to a steady rising temperature modulated by small-amplitude, sinusoidal temperature oscillations. In addition to providing a determination of the total heat flow into or from the specimen, such as in conventional DSC, the MDSC technique allows for the mathematical separation of the total heat flow into reversing and non-reversing components (as determined from the complex Fourier components of the sinusoidal thermal perturbations). Reversible heat flow is associated with reversible thermal phenomena that occur within a specimen regardless of its thermal history, such as the first- or second-order transitions and heat capacity of the material. Non-reversible heat flow is associated with thermal phenomena in which the state of matter is kinetically controlled and present in a quasi-stable state, as opposed to the thermodynamically most favorable state.

In the present study, the separation between reversible and non-reversible heat flow was used predominantly to resolve the actual temperatures at which complex phase transitions (first- and second-order) occurred within the polymeric components. However, the total heat-flow thermograms were used to determine the endothermic enthalpies for first-order phase transitions (i.e., melt transition for the crystalline fraction of the polymeric component) as well as any exothermic enthalpies of reaction. This was done to account for the total endothermic heat-flow history, such as latent heats of fusion, or exothermic heat-flow history, such as reactive exotherms, that occur in polymeric components of this kind under conditions of radiant heat flux prior to the time of ignition of the material. In this way, the microscopic scalability of cone calorimetric measurements could be assessed. This microscopic scalability will be discussed in the context of what will be termed the "downward scalability" of cone calorimetric measurements in the analysis section of this report.

Specimens for MDSC analysis (5 to 15 mg in mass) were heated from room temperature to 300°C at a constant rate of 3°C/min with a superimposed thermal modulation of approximately 1 °C/min. For each component material, duplicate specimens were excised from

the component and analyzed under a nitrogen gas environment at a flow rate of 30 mL/min. Between each analysis, the sample compartment of the MDSC instrument was allowed to cool to room temperature while purging with copious amounts of nitrogen for not less than five minutes. Thermograms of the total, reversible, and non-reversible heat flows were recorded as a function of the ramp temperature, the originals of which are attached in Appendix C.

The results of MDSC measurements are summarized in Tables 5-1 through 5-4, which show for each vehicle group and component material tested the temperature at which endothermic and, if applicable, exothermic phenomena occur, along with the corresponding enthalpy for each thermal event. As indicated in these tables, no attempt was made to elucidate second-order phase transitions - either the amorphous fraction of the polymeric material or a substantially amorphous polymer component - that occurred below room temperature. Only in one case was there a substantially amorphous polymer with a glass transition above room temperature represented in the vehicle component selection. This component was the interior segment of the glove box door from the Chevrolet Cavalier, whose base polymer consisted of acrylonitrile-butadiene-styrene (ABS). With the exception of polyurethane foam materials, all remaining materials subjected to MDSC analysis exhibited crystalline polymer morphologies with well-defined first-order melt transitions.

5.2 Raman Spectroscopic Analysis

Raman spectroscopy is a mature light-scattering technique used to analyze the molecular composition and morphological features of many materials. Over the past decade, the development of laser Raman spectroscopic micro-analysis has provided considerable insight into many problems in materials chemistry. The information obtained from Raman spectroscopy is complementary to that obtained from infrared absorbance spectroscopy, such as FTIR, in that both techniques probe the vibrational internal degrees of freedom of free molecules and solids, including polymers and many other forms solid-state matter. However, the instrumental arrangement and the rules that govern the spectroscopic activity of the matter being interrogated are distinct. These distinctions lead to the practical experimental advantage that Raman spectroscopy has over infrared absorption spectroscopy in specific applications, particularly those applications related to microanalysis of opaque and tortuous materials and *in situ* analysis of such materials at elevated temperatures.

A Renishaw Model 2000 Raman microscopic system (Gloucestershire, UK, 1993) was used in this study. This system is capable of acquiring the Raman spectrum of matter within microscopic dimensions by directing a narrow (1 μm diameter) laser beam through the objective of a microscope attachment onto the point of interest, and collecting the light backscattered 180° from that point through the same objective. A 30-mW near infrared (780 nm) diode laser was used as the excitation source. The Rayleigh component of the collected scattered light was removed with a holographic notch filter, followed by spectral dispersion with a grating onto a thermoelectrically-cooled charged coupled device (CCD) detector. The system achieved a spectral resolution of 1 cm^{-1}. In conjunction with this system, a specially designed sample stage was used to heat a small mass aliquot of the component material at a pre-programmed rate (room temperature to 350 °C at 1 °C/min) in a similar manner and for a similar purpose as the thermal

cycle used for MDSC analysis. Raman spectra were then acquired at pre-selected intervals of the thermal program.

In the present study, Raman spectroscopic analysis was used to analyze select types of component materials represented in Tables 5-1 through 5-4. The objective of the analysis was twofold. In some instances it was used to determine or verify the base polymer of selected polymeric materials to the extent possible as permitted by the inherent luminescence and absorption properties of the material. Where applicable, the analysis provided the necessary evidence for properly identifying the base polymers shown in the said tables. However, it is important to recognize that for many engineered plastics that contain certain dyes and fillers, spectroscopic determination of the base polymer type can be illusive or even intractable as the characteristic spectral fingerprint can be obscured by sample fluorescence (or luminescence), strong absorption of the source illumination, or spectral interferences from the additives or fillers. A second object of the Raman analysis was to determine the thermal stability (thermochemical) and extent to which molecular and morphological changes occur in the selected component materials. Morphological changes in this context refer to the amorphous and microcrystalline nature of the plastic at a molecular level below the melt transition.

The results of Raman analyses are presented in Figures 5-1 through 5-10. Each spectrum shown in these figures was subjected to a polynomial algorithm to correct for baseline skew and offset. The corrected spectra were then organized as overlay plots by material and vehicle type to illustrate how certain spectral features are affected by the thermal conditions of the sample. The molecular functional groups pertinent to the discussion that follows are annotated in each figure.

In the case of polyurethane seat foam materials (Figures 5-1 to 5-4), monotonic changes to the spectral features of the foam were detected as a consequence of the thermal ramp. With the exception of the Honda Civic polyurethane seat foam (Figure 5-4), these changes were consistent across the remaining vehicle brands. A noteworthy phenomenon was the initial presence and subsequent consumption of unreacted isocyanate species, appearing in the Raman spectrum as C-N=C=O stretching vibrations near 2238 cm^{-1}. Residual isocyanate species are often found in commodity polyurethane foams of this kind. In the present case, the residual isocyanate species represented by the 2238 cm^{-1} vibrational mode in the Raman spectra appear to complete their reaction with the polyurethane network above 175 °C. In addition to this latent reaction, the analyses also provide evidence for thermal degradation of the polyurethane network. The specific form of thermal degradation appears to occur via chain scission of the amide-ester linkages of the urethane network, which is consistently reflected in the decay of the carbonyl (C=O) stretching vibrations near 1710 cm^{-1} relative to other vibrational modes representing the polymer network (*e.g.*, relative to those modes that arise at 1621, 1456, and 1326 cm^{-1}).

As expected the thermal stability of carpet and fabric fibers of the aromatic polyester type, polyethylene terephthalate (PET), was consistent with the MDSC results (Tables 5-1 to 5-4), which indicated that carpet and fabric fibers of this kind exhibit a single first-order melt transition near 256°C, regardless of vehicle brand. This observation was true for all vehicle brands with the exception of the Ford Focus, which utilized carpet fibers whose molecular origin

and composition remains illusive due to background interferences from additives. The Raman thermal analyses further corroborate the molecular stability of the PET fibers below and above the melt transition (Figures 5-5 to 5-8). For example, in contrast to the decay of the amide-ester carbonyl vibrations of polyurethane foam (1710 cm^{-1}), the ester linkage of PET fibers represented by the carbonyl (C=O) stretching vibrations near 1720 cm^{-1} did not change through the melt transition up to the highest temperature recorded (280°C). Above the melt transition the total scattering intensity decayed for the fluid-state polymer, but the ratio of the aromatic stretching vibrations (1613 cm^{-1}) to that of the carbonyl band (1720 cm^{-1}) remained unchanged. Hence, molecular degradation was not indicated within the said temperature range (< 300 °C).

Component materials consisting of polyolefin thermoplastics, polypropylene and polyethylene, also exhibited thermal stability to the extent that molecular degradation was not observed in the Raman thermal analyses within the said temperature range (Figures 5-9 and 5-10). Cross-linking reactions via scission of weak links in the polymer chains have been shown to initiate in virgin polyethylene at approximately 200°C. Decomposition follows cross-linking at approximately 300 °C, leading to decomposition products in the melt consisting of a mixture of alkanes and alkenes. A similar mechanism is observed in polypropylene except that tertiary carbons present in the polymer chains in regular order are more susceptible to attack than unbranched polyethylene. In light of such mechanisms, therefore, a suitable marker for monitoring molecular degradation in the Raman spectrum is the appearance of carbon-carbon double bonding stretching vibrations near 1600 cm^{-1}. These modes, however, were not observed in either of the polypropylene (interior door panel) or polyethylene (fuel tank) components studied. This indicates that the additives present in these components improve the thermal stability of these components, relative to what is known about virgin polyolefins.

Table 5-1. Results of MDSC Thermal Measurements Showing Endothermic and Exothermic Microscopic Behavior of Component Materials from the Chevrolet Cavalier

Chevrolet Cavalier Part No.	Description	Base Polymer Composition	Endothermic Melt Transition 1 (°C)	Endothermic Heat of Fusion 1 (J/g)	Endothermic Melt Transition 2 (°C)	Endothermic Heat of Fusion 2 (J/g)	Endothermic Melt Transition 3 (°C)	Endothermic Heat of Fusion 3 (J/g)	Exotherm (°C)	Exothermic Heat of Reaction (J/g)
22589249	Seat Back, Cover	Polyester	249	37	NA	NA	NA	NA	NA	NA
22589249	Seat Back, Foam	Polyurethane	99	37	NA	NA	NA	NA	NA	NA
12457891	Headrest, Cover	Undetermined	NA	NA	NA	NA	NA	NA	236	39
12457891	Headrest, Foam	Polyurethane	92	20	NA	NA	NA	NA	NA	NA
22619703	Headliner, Center Foam	Polyurethane	112	39	NA	NA	NA	NA	NA	NA
22587440	Glove Box Door, Outside	Polypropylene	167	63	NA	NA	NA	NA	NA	NA
22587440	Glove Box Door, Inside	Acrylonitrile-Butadiene-Styrene	[redacted]	[redacted]	NA	NA	NA	NA	NA	NA
22618443	Door Panel, Black Plastic	Polypropylene	168	69	NA	NA	NA	NA	NA	NA
22618443	Door Panel, Backing w/o Foam	Polypropylene	165	133	NA	NA	NA	NA	NA	NA
22618443	Door Panel, Cloth	Polyurethane/Polyester	98	10	247	31	NA	NA	NA	NA
22618443	Door Panel, Foam	Polyurethane	106	32	NA	NA	NA	NA	263	43
22628609	Carpet, Backing	Undetermined	81	9	98	6	256	2	NA	NA
22628609	Carpet, Nap	Polyethylene Terephthalate	257	57	NA	NA	NA	NA	NA	NA
52460744	HVAC, Duct	Polypropylene	165	80	NA	NA	NA	NA	NA	NA
22621025	Wiring Harness, Conduit	Polypropylene Blend	76	1	124	0.6	163	32	NA	NA
22621025	Wiring Harness, Module	Polyethylene	128	147	NA	NA	NA	NA	NA	NA
10488727	Air Filter Assembly	Polypropylene	166	101	NA	NA	NA	NA	NA	NA

Second-order (amorphous) glass transition, Tg

Table 5-2. Results of MDSC Thermal Measurements Showing Endothermic and Exothermic Microscopic Behavior of Component Materials from the Dodge Neon

Dodge Neon Part No.	Description	Base Polymer Composition	Endothermic Melt Transition 1 (°C)	Endothermic Heat of Fusion 1 (J/g)	Endothermic Melt Transition 2 (°C)	Endothermic Heat of Fusion 2 (J/g)	Endothermic Melt Transition 3 (°C)	Endothermic Heat of Fusion 3 (J/g)	Exotherm (°C)	Exothermic Heat of Reaction (J/g)
SL491AZZA	Front Upper Seat, Foam	Polyurethane	102	38	NA	NA	NA	NA	NA	NA
SL491AZZA	Front Upper Seat, Foam Backing	Polyproplylene	167	61	NA	NA	NA	NA	NA	NA
SL491AZZA	Front Upper Seat, Fabric	Polyethylene Terephthalate	256	53	NA	NA	NA	NA	NA	NA
PZ15WL5AK	Front Door Panel, Plastic	Polyethylene/Polypropylene	128	20	167	59	NA	NA	NA	NA
PZ15WL5AK	Front Door Panel, Fabric	Polyethylene Terephthalate	256	57	NA	NA	NA	NA	NA	NA
TN47XDVAA	Carpet, Fiber wt. Backing	Mixed Fiber/PET	111	45	222	11	257	3	NA	NA
PV77WL5AB	Kick Panel	Polyproplylene	167	78	NA	NA	NA	NA	NA	NA
50172094A	Fuel Tank, Flange	Polyethylene	131	197	NA	NA	NA	NA	NA	NA
50172094A	Fuel Tank	Polyethylene	128	178	NA	NA	NA	NA	NA	NA

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Table 5-3. Results of MDSC Thermal Measurements Showing Endothermic and Exothermic Microscopic Behavior of Component Materials from the Ford Focus

Ford Focus			Endothermic	Endothermic	Endothermic	Endothermic	Endothermic	Endothermic		Exothermic
			Melt Transition 1	Heat of Fusion 1	Melt Transition 2	Heat of Fusion 2	Melt Transition 3	Heat of Fusion 3	Exotherm	Heat of Reaction
Part No.	Description	Base Polymer Composition	(°C)	(J/g)	(°C)	(J/g)	(°C)	(J/g)	(°C)	(J/g)
YS4Z5462900BAB	Seat Cover, Foam	Polyurethane	102	19	NA	NA	NA	NA	NA	NA
YS4Z5462900BAB	Seat Cover, Batting	Polyurethane/Fiber blend	101	33	NA	NA	NA	NA	254	49
YS4Z5423942AAB	Door Panel, Beige Plastic	Polypropylene	166	65	NA	NA	NA	NA	NA	NA
YS4Z5423942AAB	Door Panel, Two-Layer Backing	Polyethylene/Polypropylene	121	1	136	2	252	2	249	28
YS4Z5413000BAF	Carpet	Undetermined	252	4	NA	NA	NA	NA	NA	NA
YS4Z5451916AAB	Headliner, Gray Liner	Undetermined	252	41	NA	NA	NA	NA	NA	NA
YS4Z5451916AAB	Headliner, Foam wt, Brown Backing	Polyurethane/Other	104	3	188	5	NA	NA	NA	NA
YS4Z9600NA	Air Cleaner Assembly	Polypropylene	166	67	NA	NA	NA	NA	NA	NA

Table 5-4. Results of MDSC Thermal Measurements Showing Endothermic and Exothermic Microscopic Behavior of Component Materials from the Honda Civic

Honda Civic			Endothermic	Endothermic	Endothermic	Endothermic	Endothermic	Endothermic		Exothermic
			Melt Transition 1	Heat of Fusion 1	Melt Transition 2	Heat of Fusion 2	Melt Transition 3	Heat of Fusion 3	Exotherm	Heat of Reaction
Part No.	Description	Base Polymer Composition	(°C)	(J/g)	(°C)	(J/g)	(°C)	(J/g)	(°C)	(J/g)
81521-S5A-A01ZA	Seat Cover, Green Foam	Undetermined	211	9	NA	NA	NA	NA	NA	NA
81521-S5A-A01ZA	Seat Cover, Gray Backing	Polyethylene Terephthalate	254	51	NA	NA	NA	NA	NA	NA
83583-S5A-A01ZC	Door Panel, Gray Plastic	Polypropylene	168	105	NA	NA	NA	NA	NA	NA
83583-S5A-A01ZC	Door Panel, Fabric	Undetermined	256	60	NA	NA	NA	NA	NA	NA
83583-S5A-A01ZC	Door Panel, Black Plastic	Polypropylene	167	77	NA	NA	NA	NA	NA	NA
83801-S5A-A01ZB	Carpet, Light Color Nap	Polyethylene Terephthalate	256	46	NA	NA	NA	NA	NA	NA
83801-S5A-A01ZB	Carpet, Middle Reinforcement	Mixed Fiber/PET	106	60	254	5	NA	NA	NA	NA
83801-S5A-A01ZB	Carpet, Gray Backing	Polyethylene Terephthalate	258	54	NA	NA	NA	NA	NA	NA
77400-S5A-A01	HVAC Duct Assembly	Polyethylene	131	188	NA	NA	NA	NA	NA	NA
32200-S5A-A00	Wiring Harness	Polypropylene	168	105	NA	NA	NA	NA	NA	NA

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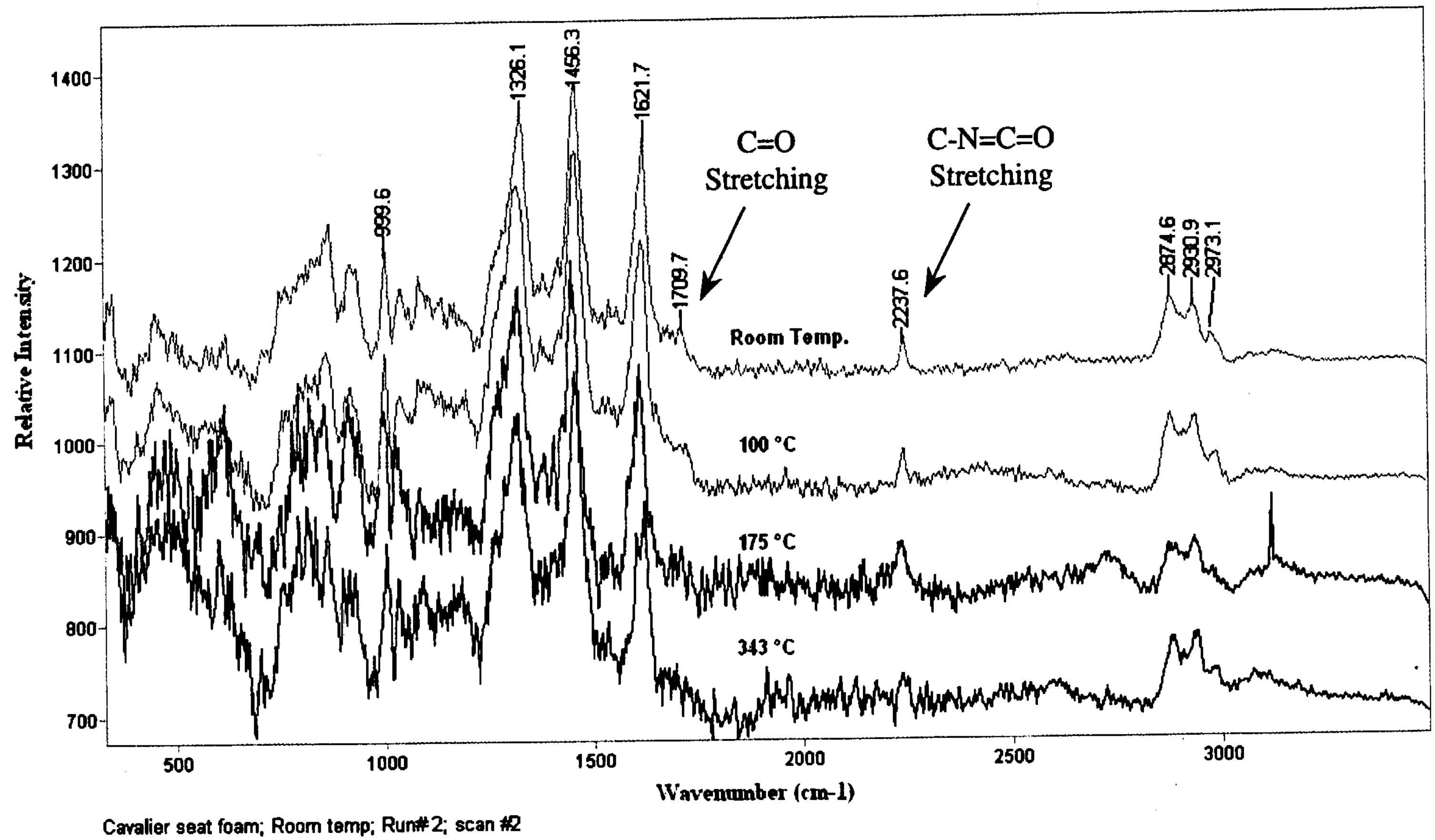

Figure 5-1. Raman thermal analysis of polyurethane seat foam obtained from the Chevrolet Cavalier. Overlay shows the spectral response as a function of temperature, indicating thermal degradation of the amide-ester linkage as shown by a reduction in the peak amplitude of carbonyl stretching vibrations (1710 cm^{-1}) relative to other vibrational modes that represent the polymer network (*e.g.*, 1621, 1456, and 1326 cm^{-1}). Initial presence and subsequent consumption of residual isocyanate species is also indicated by the vibrational mode near 2238 cm^{-1}.

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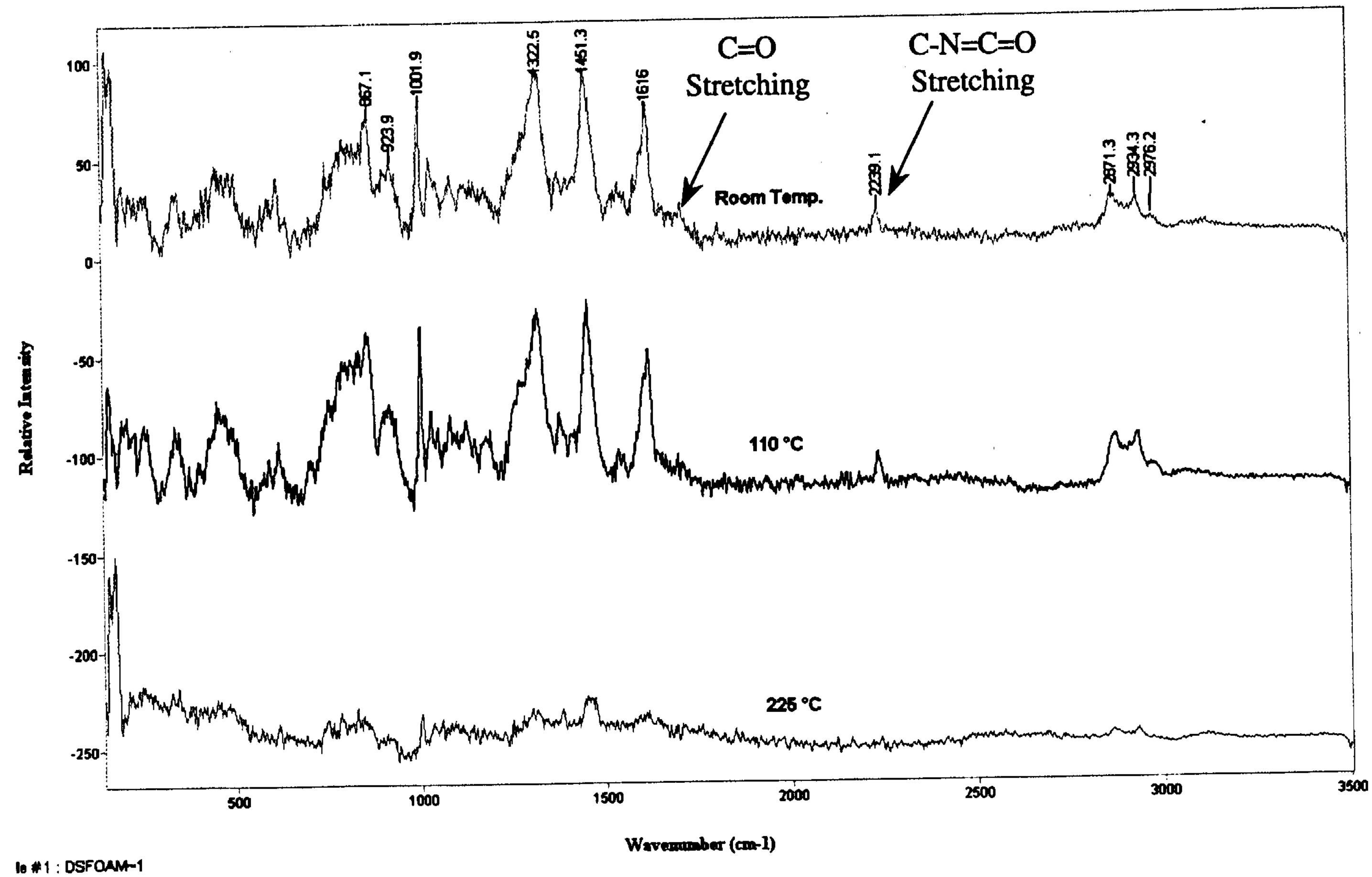

Figure 5-2. Raman thermal analysis of polyurethane seat foam obtained from the Dodge Neon. Overlay shows the spectral response as a function of temperature, indicating thermal degradation of the amide-ester linkage and consumption of residual isocyanate species similar to that shown in Figure 5-1.

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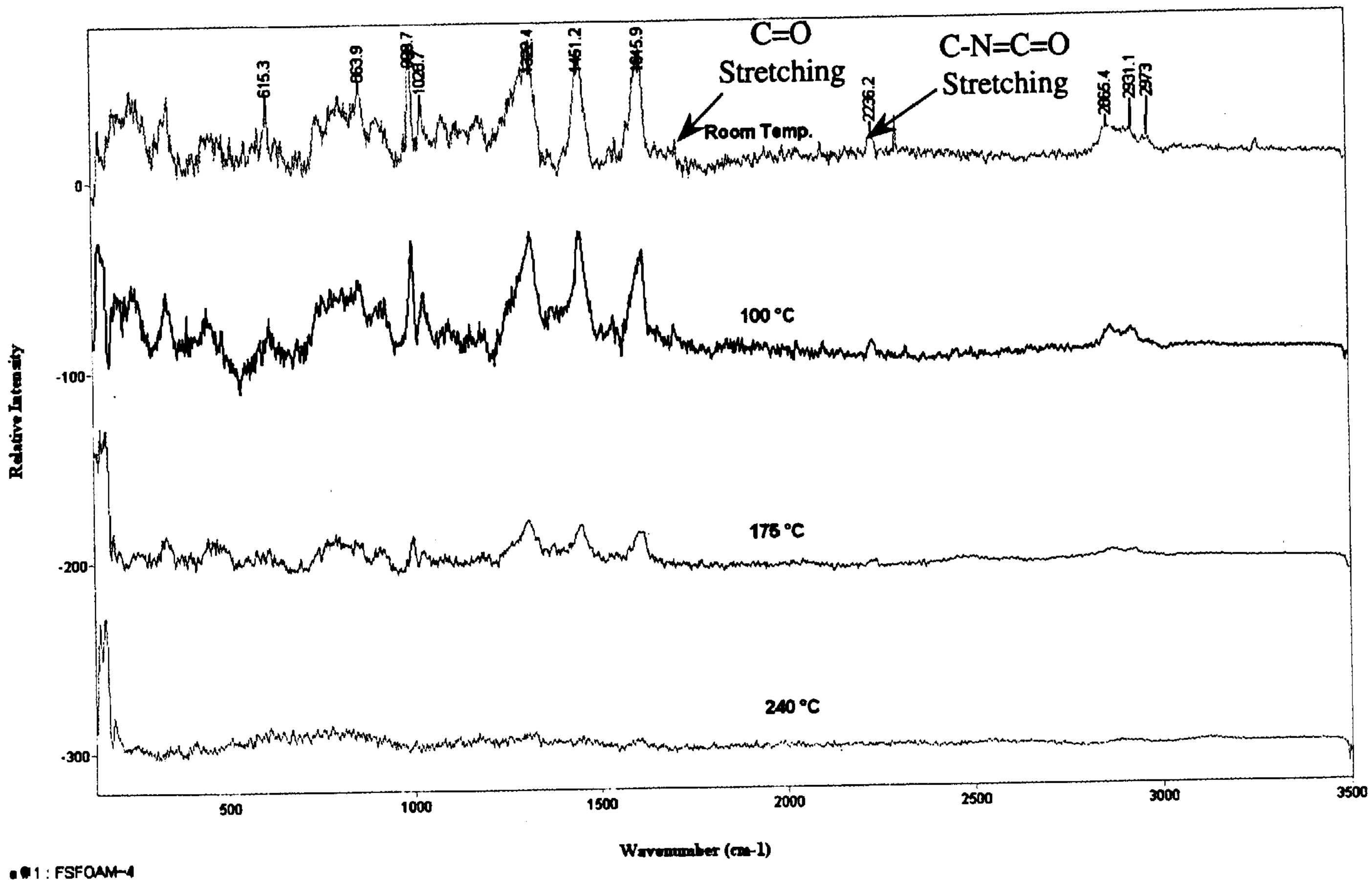

Figure 5-3. Raman thermal analysis of polyurethane seat foam obtained from the Ford Focus. Overlay shows the spectral response as a function of temperature, indicating thermal degradation of the amide-ester linkage and consumption of residual isocyanate species similar to that shown in Figure 5-1.

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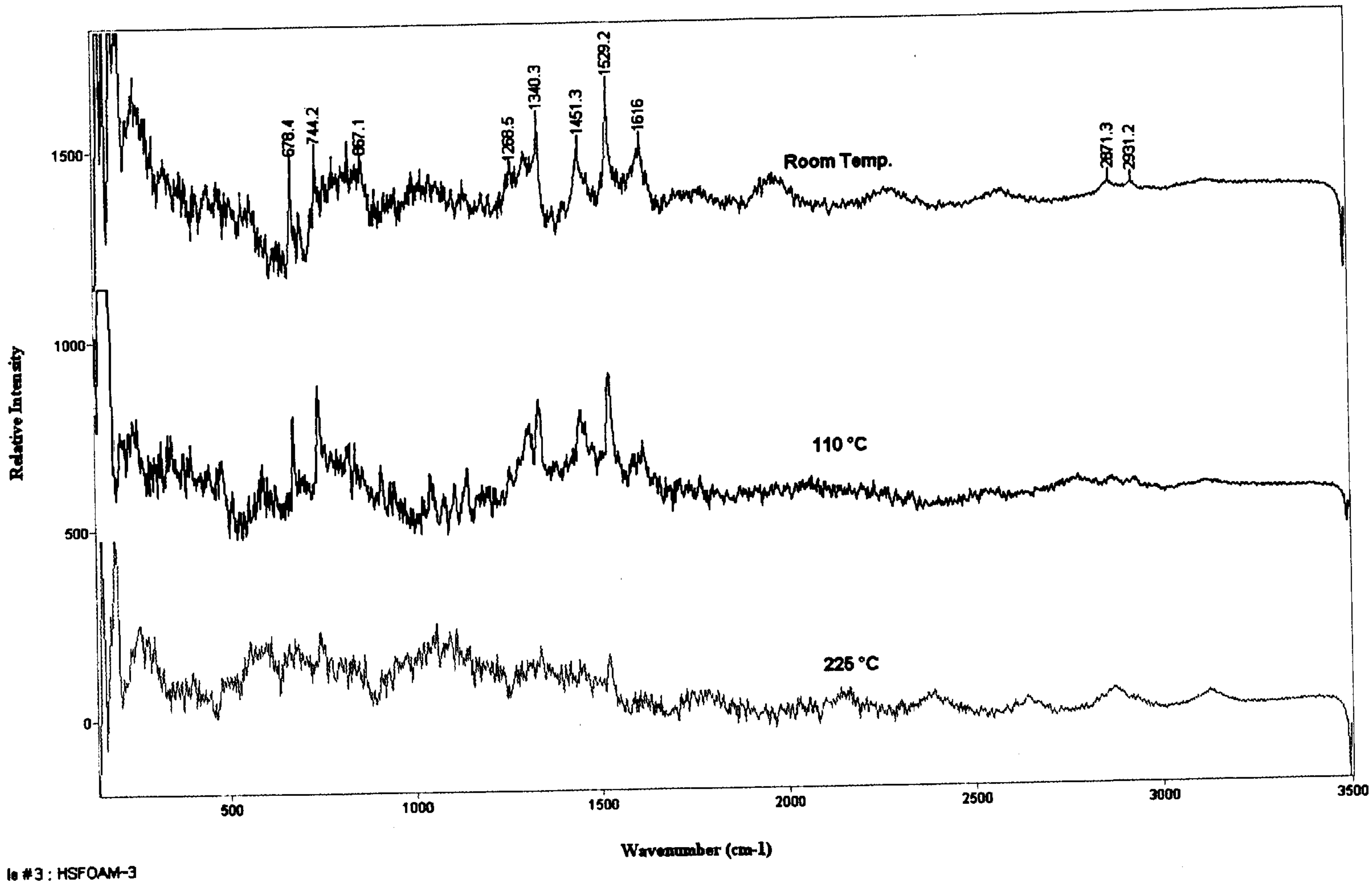

Figure 5-4. Raman thermal analysis of polyurethane seat foam obtained from the Honda Civic. Overlay shows the spectral response as a function of temperature. Carbonyl stretching vibrations originating from the amide-ester linkages were difficult to detect as compared with similar foams from other vehicle brands. Residual isocyanate species were not detected.

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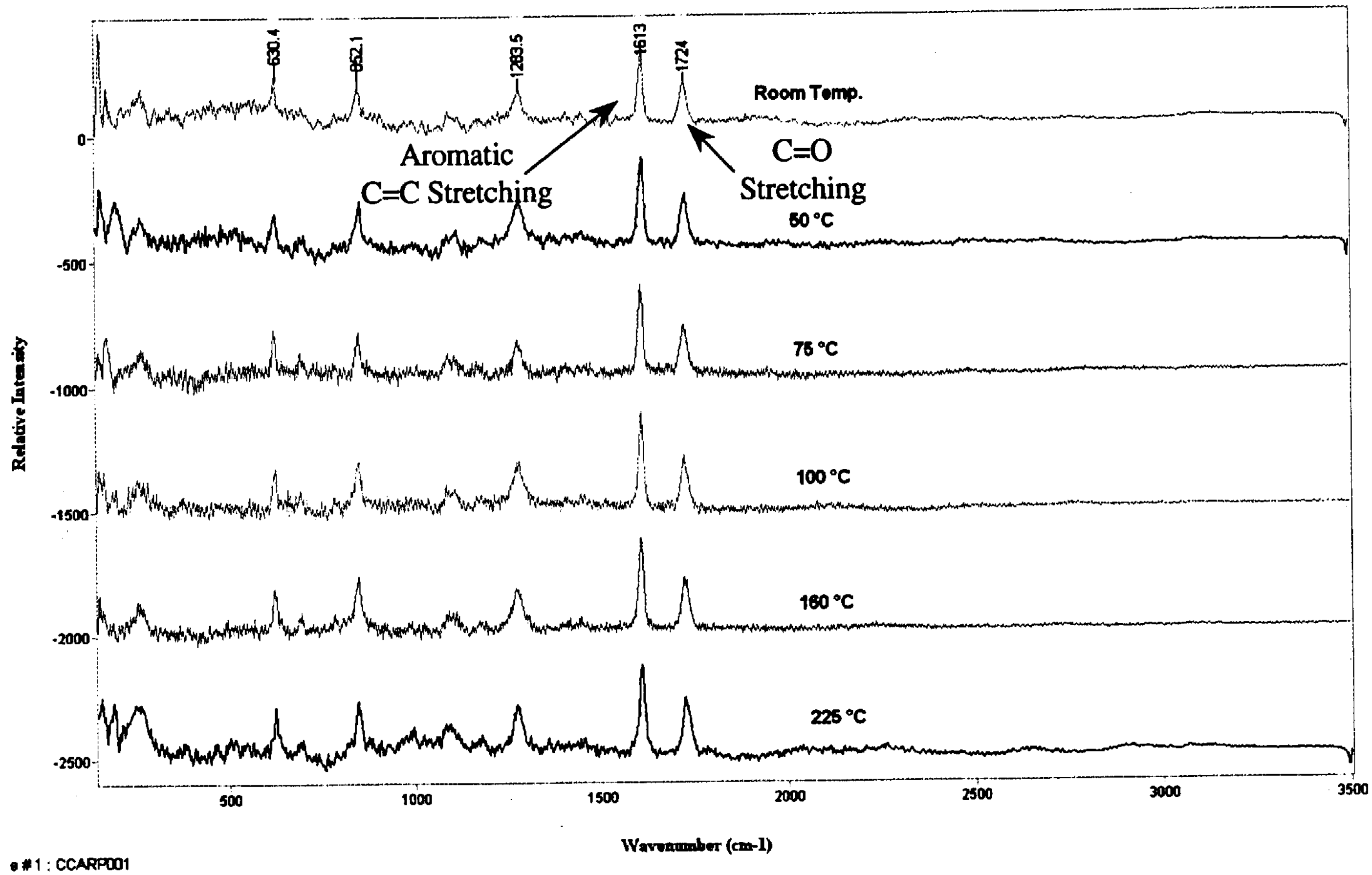

Figure 5-5. Raman thermal analysis of aromatic polyester carpet obtained from the Chevrolet Cavalier. Overlay shows the spectral response as a function of temperature, indicating good thermal stability of the polymer network over the temperature range measured.

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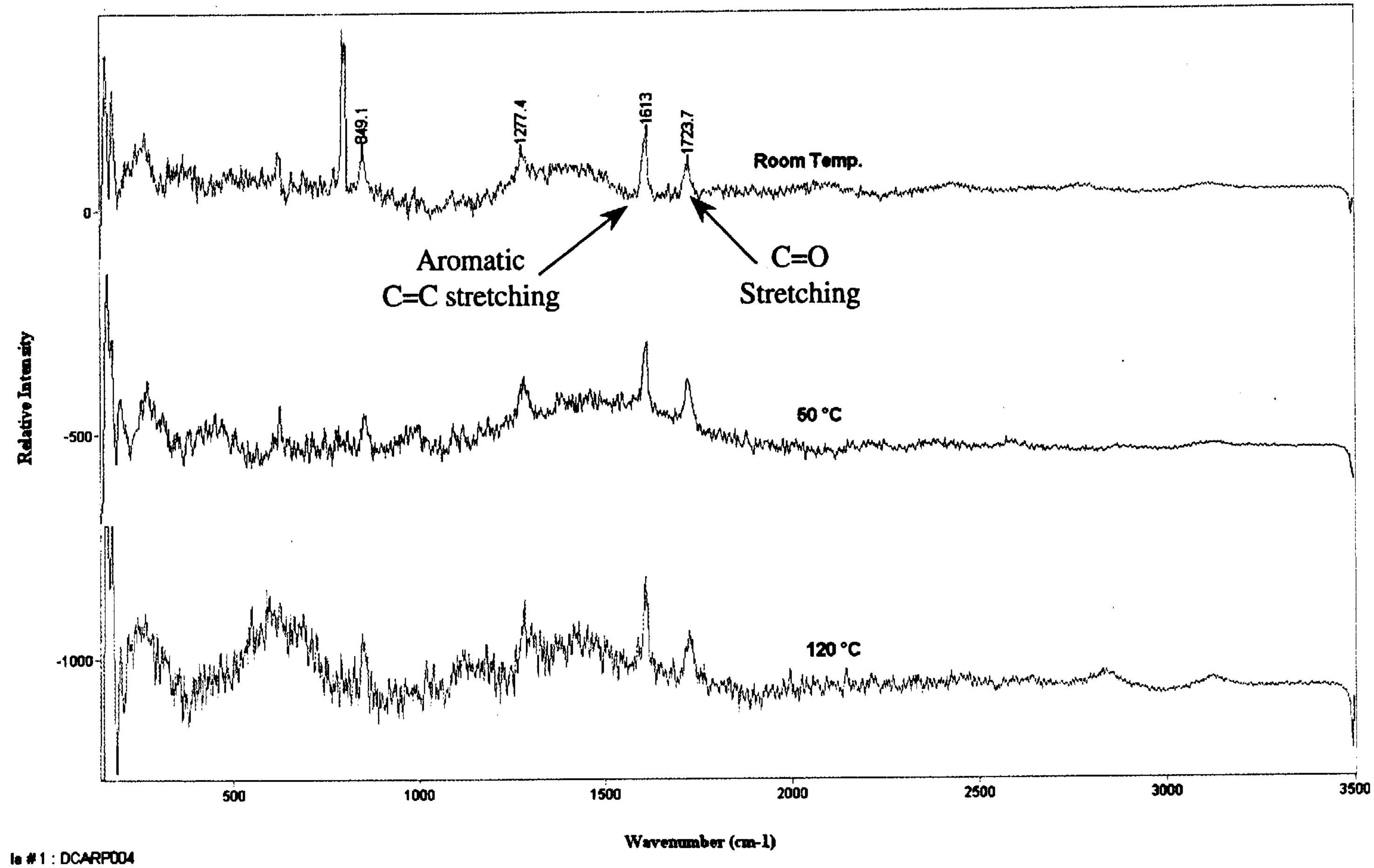

Figure 5-6. Raman thermal analysis of aromatic polyester carpet obtained from the Dodge Neon. Overlay shows the spectral response as a function of temperature, indicating good thermal stability of the polymer network over the temperature range measured.

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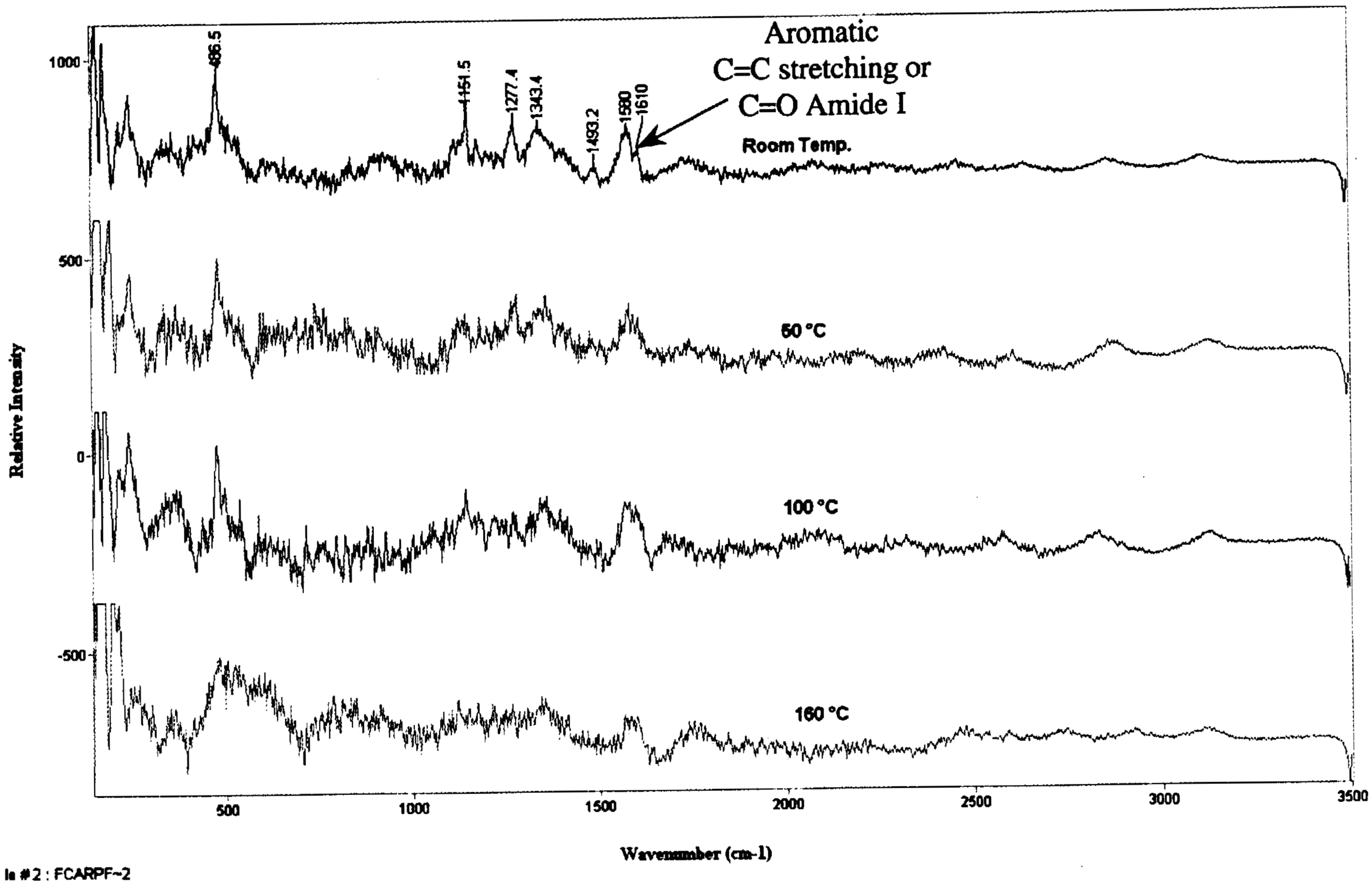

Figure 5-7. Raman thermal analysis of carpet obtained from the Ford Focus. Overlay shows the spectral response as a function of temperature. Proper identification of fiber type and tracking of spectral changes was problematic due to background fluorescence as a consequence of additives.

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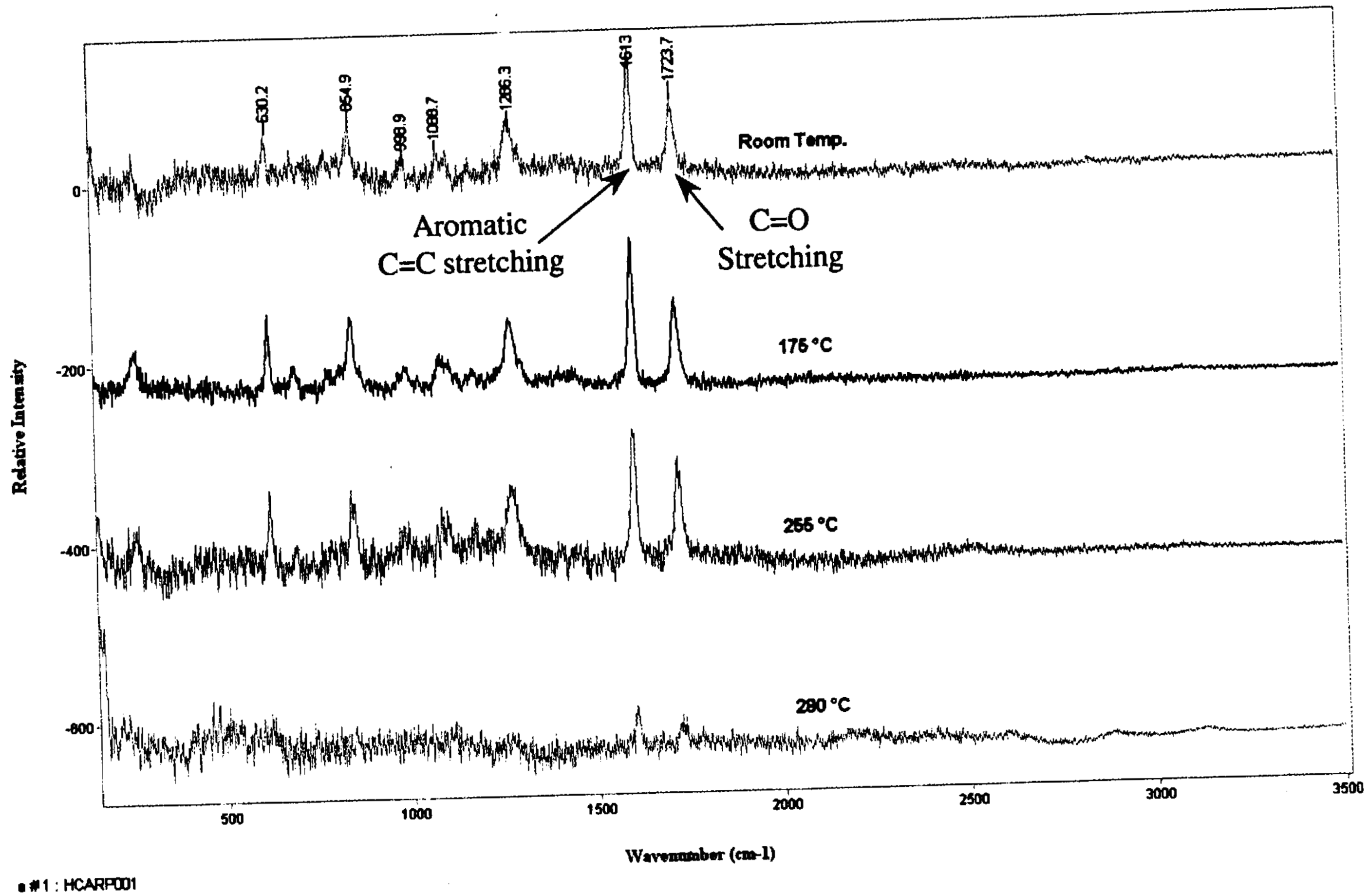

Figure 5-8. Raman thermal analysis of aromatic polyester carpet obtained from the Honda Civic. Overlay shows the spectral response as a function of temperature, indicating good thermal stability of the polymer network over the temperature range measured.

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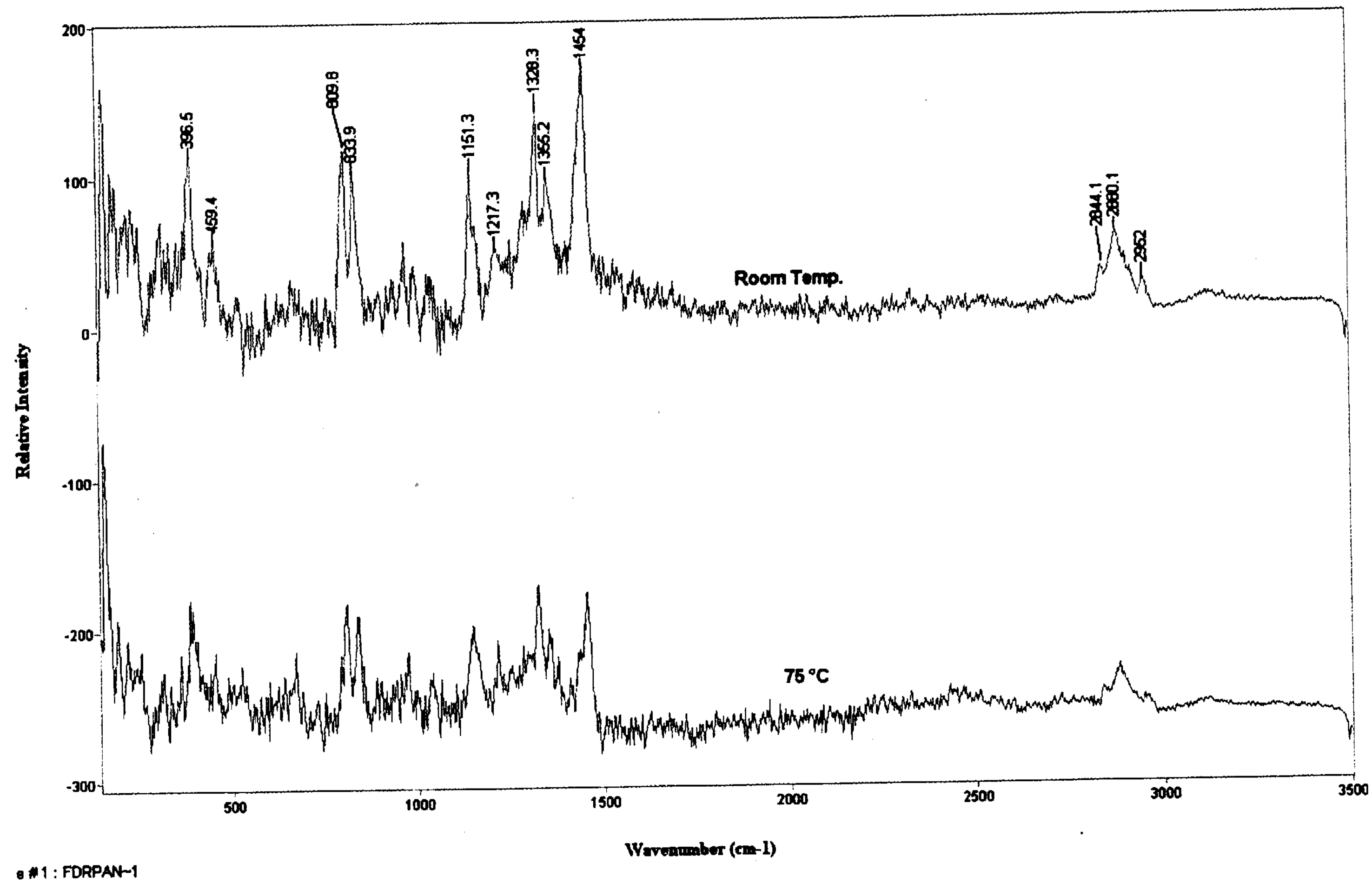

Figure 5-9. Raman thermal analysis of polypropylene door panel material obtained from the Ford Focus. Overlay shows the spectral response as a function of temperature, indicating spectral peak broadening (i.e., amorphism) at elevated temperatures as the polymer softens and eventually melts. Spectra at or above the melt transition could not be acquired due to strong sample fluorescence caused by colorants and other additives.

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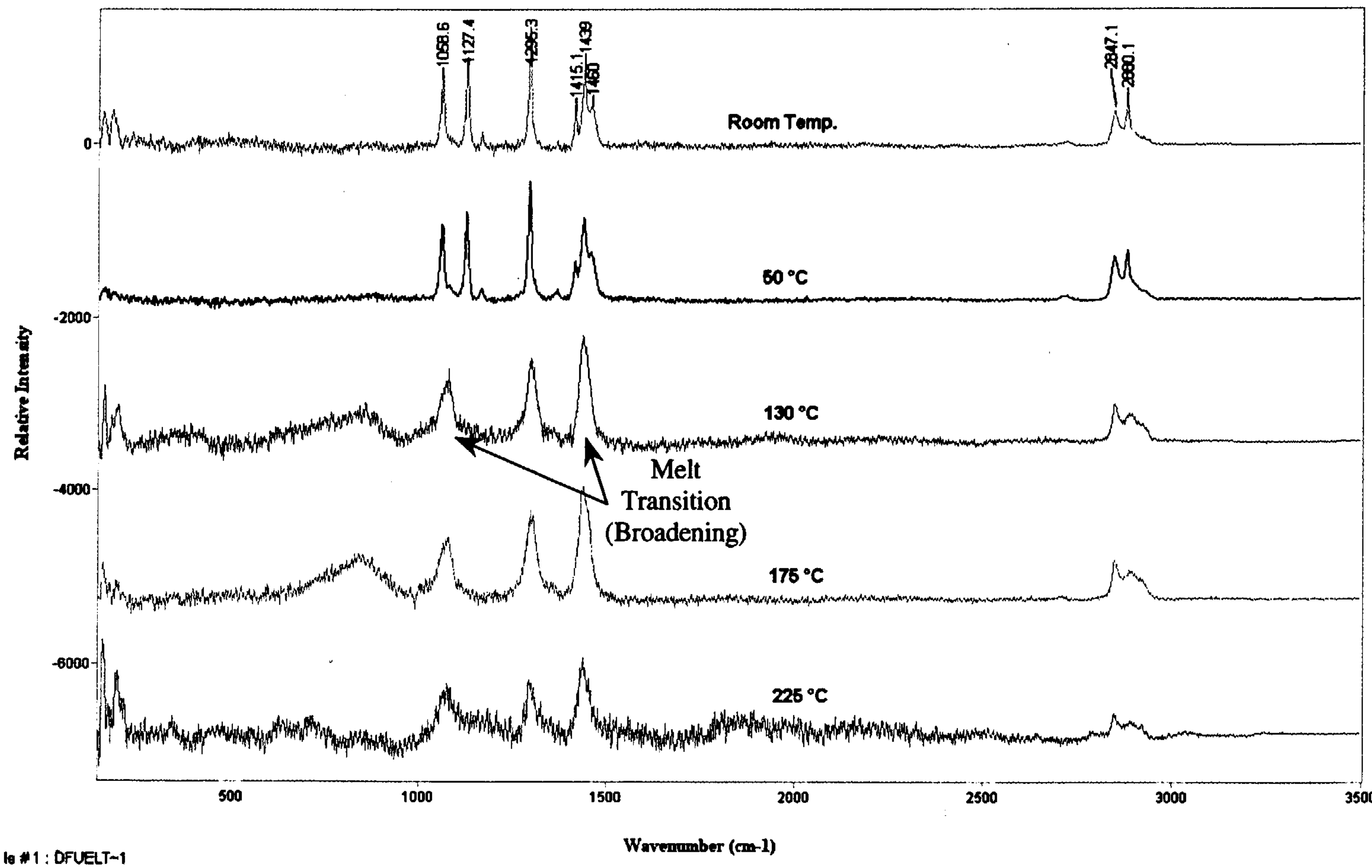

Figure 5-10. Raman thermal analysis of polyethylene fuel tank material obtained from the Dodge Neon. Overlay shows the spectral response as a function of temperature, indicating spectral peak broadening (i.e., amorphism) at elevated temperatures as the polymer softens and eventually melts. Thermal molecular decomposition through chain scissions leading to the formation of alkenes was not indicated above the melt transition of this material.

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6.0 SMALL-SCALE FIRE TESTS

6.1 Introduction

An extensive series of small-scale fire tests were conducted on samples prepared from the parts that were obtained as described in Section 4.0. Two test procedures were used: FMVSS 302 and ASTM E 1354 (Cone Calorimeter). The FMVSS 302 tests were conducted primarily to provide baseline data in accordance with a conventionally practiced test method. A much larger number of Cone Calorimeter tests were performed to obtain engineering data for performance assessment of the materials. Details and results for the small-scale tests are provided below.

6.2 FMVSS 302 Verification Tests

6.2.1 Test Procedure

A full description of the test procedure contained within FMVSS 302 and ASTM D 5132-94 is presented in Appendix A.

6.2.2 Test Matrix

A detailed test matrix for the FMVSS 302 testing is provided below in Table 6-1. Some of the materials are not normally tested as a part of the standard. Exterior materials such as the air cleaner assembly and the plastic fuel tank are exempt from the FMVSS 302 test requirements. Tests were performed for these materials to provide a base line performance measure for all materials, and a reference point for both exterior and interior materials to the current requirements for automotive component flammability.

Table 6-1. FMVSS 302 Test Matrix

	Chevrolet Cavalier	**Dodge Neon**	**Honda Civic**	**Ford Focus**
Head Rest	X			
Seat (Cover)	X	X	X	
Seat (Foam)	X	X	X	X
Door Panel (Plastic)	X	X	X	X
Door Panel (Fabric)	X	X	X	
Door Panel (Foam)			X	
Headliner	X			X
Glove Box (Exterior)	X			
Glove Box (Interior)	X			
Carpeting	X	X	X	X
HVAC Parts	X		X	
Kick Panel		X		
Air Cleaner Assembly	X			
Fuel Tank		X		

6.2.3 Specimen Preparation

The test specimens were prepared as specified in ASTM D 5132-93 and FMVSS 302. For many of the materials, it was not possible to obtain a 4 × 14-in long specimen. For these materials the test specimen was constructed by placing together flat pieces of material such that ridges and joinings were minimized on the sample surface. The side nearest the passenger compartment was placed face down in the sample holder, and test specimens were held in place by the retainer frame.

6.2.4 FMVSS 302 Test Results

FMVSS 302 test results for the four vehicles tested under this program are presented in the following tables (Tables 6-2 to 6-5), along with observations noted during each test. A material meets the test requirements if its burn rate, calculated as described in Appendix A, does not exceed 4 in./min. Each of the components tested met the FMVSS 302 requirements for interior automotive materials.

Table 6-2. 2001 Chevrolet Cavalier FMVSS 302 Test Results

Part ID	Material Thickness	Observations/Comments	Time to first 1.5-in. mark (sec)	Time to second 1.5-in. mark (sec)	Time to flame out (sec)	Distance at which flaming stopped (in)	Burn Rate (in/min)	Pass/Fail
Head Rest	0.623-1.000 in	Heavy gray smoke, dripping and flaming droplets @ 2:09	40	590	550	10.0	1.09	Pass
Seat (Cover)	0.059 in	Burning droplets, flame did not reach first 1.5-in mark	N/A	N/A	N/A	0.0	0.00	Pass
Seat (Foam)	0.469-0.625 in	Flame did not reach first 1.5-in mark	N/A	N/A	N/A	0.0	0.00	Pass
Headliner	0.375 in	Light gray smoke, no dripping or flaming	62	513	451	10.0	1.33	Pass
Glove Box (Exterior)	0.119-0.484 in	Heavy black smoke/soot, falling flaming pieces @ 3:05	23	530	507	10.0	1.18	Pass
Glove Box (Interior)	0.098-0.373 in	Light gray smoke, flaming drops @ 3:48	144	607	463	10.0	1.30	Pass
Door Panel (Plastic)	0.125 in	Light gray smoke, flaming drops @ 0:52	139	715	576	10.0	1.04	Pass
Door Panel (Fabric)	0.245-0.640 in	No dripping	N/A	N/A	8	0.0	0.00	Pass
Carpeting	0.790 in	No dripping	181	N/A	256	0.3	0.06	Pass
HVAC Parts	0.074 in	Flaming drops at 47 seconds, light gray smoke	122	887	765	10.0	0.78	Pass
Air Cleaner Assembly	0.104-0.225 in	Light black smoke, flaming drops at 1:27	142	450	308	10.0	1.80	Pass

Table 6-3. 2001 Dodge Neon FMVSS 302 Test Results

Part ID	Material Thickness	Observations/Comments	Time to first 1.5-in. mark (sec)	Time to second 1.5-in. mark (sec)	Time to flame out (sec)	Distance at which flaming stopped (in)	Burn Rate (in/min)	Pass/Fail
Seat (Cover)	0.260 in	Flame did not reach first 1.5-in mark	N/A	N/A	N/A	0.0	0.00	Pass
Seat (Foam)	0.500 in	Flame did not reach first 1.5-in mark	N/A	N/A	6	0.0	0.00	Pass
Door Panel (Plastic)	0.116-0.302 in	Light gray smoke, flaming drops at 1:42	151	933	782	10.0	0.77	Pass
Door Panel (Fabric)	0.375 in	Light black smoke, flaming drops at 1:48	197	540	343	10.0	1.75	Pass
Carpeting	0.490 in	Light gray smoke, flaming drops at 2:12	213	852	639	10.0	0.94	Pass
Kick Panel	0.108 in	Light gray smoke, flaming drops at 0:43	136	N/A	507	6.5	0.77	Pass
Fuel Tank	0.28	Flame did not reach first 1.5-in mark	N/A	N/A	N/A	0.0	0.00	Pass

Table 6-4. 2001 Ford Focus FMVSS 302 Test Results

Part ID	Material Thickness	Observations/Comments	Time to first 1.5-in. mark (sec)	Time to second 1.5-in. mark (sec)	Time to flame out (sec)	Distance at which flaming stopped (in)	Burn Rate (in/min)	Pass/Fail
Seat (Foam)	0.500 in	Flame did not reach first 1.5-in mark	N/A	N/A	N/A	0.0	0.00	Pass
Headliner	0.257 in	Light gray smoke, no dripping observed	57	N/A	50	1.5	1.80	Pass
Door Panel	0.148 in	Flame did not reach first 1.5-in mark	N/A	N/A	N/A	0.0	0.00	Pass
Carpeting	0.420 in	Light gray smoke, flaming droplets @ 1:11	198	1392	1194	10.0	0.50	Pass

Table 6-5. 2001 Honda Civic FMVSS 302 Test Results

Part ID	Material Thickness	Observations/Comments	Time to first 1.5-in. mark (sec)	Time to second 1.5-in. mark (sec)	Time to flame out (sec)	Distance at which flaming stopped (in)	Burn Rate (in/min)	Pass/Fail
Seat (Cover)	0.200 in	Flame did not reach first 1.5-in mark	N/A	N/A	N/A	0.0	0.00	Pass
Seat (Foam)	0.500 in	Flame did not reach first 1.5-in mark	N/A	N/A	N/A	0.0	0.00	Pass
Glove Box (Exterior)	0.101-0.293 in	Light gray smoke, flaming droplets @ 0:52	155	945	790	10.0	0.76	Pass
Glove Box (Interior)	0.082-0.273 in	Light gray smoke, flaming droplets at 0:32	108	487	379	10.0	1.58	Pass
Door Panel (Gray Plastic)	0.098-0.318 in	Light gray smoke, flaming droplets @ 0:36	106	658	552	10.0	1.09	Pass
Door Panel (Black	0.085-0.093 in	Light gray smoke, flaming droplets @ 0:44	116	468	352	10.0	1.70	Pass
Door Panel (Fabric)	0.158 in	Light gray smoke, flaming droplets a@ 0:50	128	733	605	10.0	0.99	Pass
Door Panel (Foam)	0.250-0.500 in	Flame did not reach first 1.5-in mark	N/A	N/A	N/A	0.0	0.00	Pass
Carpeting	0.500 in	Light gray smoke, flaming droplets @ 0:43	83	475	392	10.0	1.53	Pass
HVAC Parts	0.076 in	Light gray smoke, flaming droplets @ 0:40	82	412	330	10.0	1.82	Pass

6.3 ASTM E 1354 Cone Calorimeter Test

6.3.1 Test Procedure

All tests were conducted in general accordance with ASTM E 1354, in the horizontal orientation, with the edge frame and spark ignitor. Two types of tests were performed: full Cone Calorimeter tests and ignition tests. The full tests were terminated after flameout and data were recorded as specified in ASTM E 1354. The ignition tests were terminated when sustained flaming occurred and only the time to ignition was recorded. Components of certain parts were tested separately. For example, the seat foam and fabric was tested as a combination and the foam was also tested separately.

Full Cone Calorimeter tests were generally conducted in duplicate at three heat flux levels: 20, 35, and 50 kW/m^2. The rationale for the choice of heat flux levels is discussed in Section 3.0. If there was a major discrepancy between the two results, a third test was performed. Single tests were conducted on materials that were not available in sufficient quantity for the complete series. In a few cases only a single test at 35 kW/m^2 could be performed.

Up to four additional ignition tests were performed at heat flux levels below 20 kW/m^2. The objective was to bracket the minimum heat flux for ignition within ± 1 kW/m^2. "No Ignition" was recorded if sustained flaming did not occur in 10 min.

6.3.2 Test Matrix

The parts and components of the Chevrolet Cavalier tested in the Cone Calorimeter are listed in Table 6-6. The number of replicate tests at each heat flux level, the number of additional ignition tests, and the page numbers in Appendix D, where concise reports of the full tests can be found, are also given in this table. Similar information for the Dodge Neon, Ford Focus, and Honda Civic is presented in Tables 6-7, 6-8, and 6-9 respectively.

Full Cone Calorimeter tests were usually conducted in duplicate. If only a small quantity of material was available, a single test was conducted at 35 kW/m^2 first. If possible, full tests were also conducted at 20 and 50 kW/m^2. Additional ignition tests were performed if excess material was left over after a complete set of full tests.

A total of 203 full Cone Calorimeter tests and 79 additional ignition tests were performed.

6.3.3 Specimen preparation

Test specimens were generally prepared according to the procedure in ASTM E 1354 for products that are at least 6 mm (1/4 in.) in thickness, i.e., without a substrate. In most cases parts were large enough so that complete 100 × 100 mm specimens could be cut (see Figure 6-1). In some cases specimens had to be pieced together (see Figure 6-2). Seat specimens were prepared from the bottom as specified in ASTM E 1474 (see Figure 6-3). Wire and conduit specimens were prepared according to the procedure described in ASTM D 5485 (see Figure 6-4).

Table 6-6. Cone Calorimeter Test Matrix for Parts of the Chevrolet Cavalier

		Full Cone Calorimeter Tests			Ignition	Appendix D
		20 kW/m²	35 kW/m²	50 kW/m²	Tests	Pages
Interior	Seat					
	Headrest	2	2	2	4	1-6
	Cover & Foam	3	2	2	2	7-12
	Foam	2	2	2	4	13-18
	Headliner	2	2	2	1	19-24
	Glove Box Cover					
	Exterior	2	2	2	3	25-30
	Interior	2	2	2	2	31-36
	Door Panel					
	Plastic	2	2	2	4	37-42
	Fabric		1			43-44
	Carpet	2	2	2	2	45-50
Exterior	HVAC Parts	3	3	3	3	51-56
	Air Fiter Assembly	2	2	2	3	57-62
	Wiring Harness					
	Large Conduit	1	1	1		63-68
	Small Conduit	1	1	1		69-74
	Flat Section		1			75-76

Table 6-7. Cone Calorimeter Test Matrix for Parts of the Dodge Neon

		Full Cone Calorimeter Tests			Ignition	Appendix D
		20 kW/m²	35 kW/m²	50 kW/m²	Tests	Pages
Interior	Seat					
	Cover & Foam	1	1	1	1	77-82
	Foam	2	2	2	4	83-88
	Door Panel					
	Plastic	2	2	2	3	89-94
	Cloth	1	1	1	3	95-100
	Armrest		1			101-102
	Carpet	3	2	2	4	103-108
	Kick Panel	3	2	3	4	109-114
Ext.	Fuel Tank	2	2	2	2	115-120

Table 6-8. Cone Calorimeter Test Matrix for Parts of the Ford Focus

		Full Cone Calorimeter Tests			Ignition	Appendix D
		20 kW/m²	35 kW/m²	50 kW/m²	Tests	Pages
Interior	Seat					
	Headrest	1	1	1		121-126
	Cover & Foam	1	1	1		127-132
	Foam	2	2	2	4	133-138
	Headliner	3	2	2	2	139-144
	Door Panel	2	2	2	4	145-150
	Carpet	2	2	2	3	151-156
Ext.	Air Filter Assembly	2	2	2	3	157-162

Table 6-9. Cone Calorimeter Test Matrix for Parts of the Honda Civic

		Full Cone Calorimeter Tests			Ignition	Appendix D
		20 kW/m²	35 kW/m²	50 kW/m²	Tests	Pages
Interior	Seat					
	Headrest	1	1	1		163-168
	Cover & Foam	1	1	1		169-174
	Foam	2	2	2	3	175-180
	Glove Box					
	Exterior	2	2	2	3	181-186
	Interior	2	2	2		187-192
	Door Panel					
	Grey Plastic	2	2	2	4	193-198
	Black Plastic	1	1	1		199-204
	Fabric	1	1	1		205-210
	Carpet	2	2	2	2	211-216
Ext.	HVAC Parts	3	3	3	2	217-222
	Wiring Harness	1	1	1		223-228

6.3.4 Test Results

Complete results and graphs as required by the ASTM E1354 and ISO 5660 Cone Calorimeter standards are compiled in Appendix D. Both standards require that tests be conducted in triplicate. To reduce costs, materials were conducted in duplicate if enough specimens were available. The heat release rate graphs in Appendix D indicate that repeatability was generally very good. A third test was conducted only if there was a major discrepancy between the two results. Usually, this occurred with specimens that had to be pieced together, such as specimens of the HVAC parts.

Time to ignition measurements from the full and addition ignition tests are compiled in Tables 6-10 through 6-13.

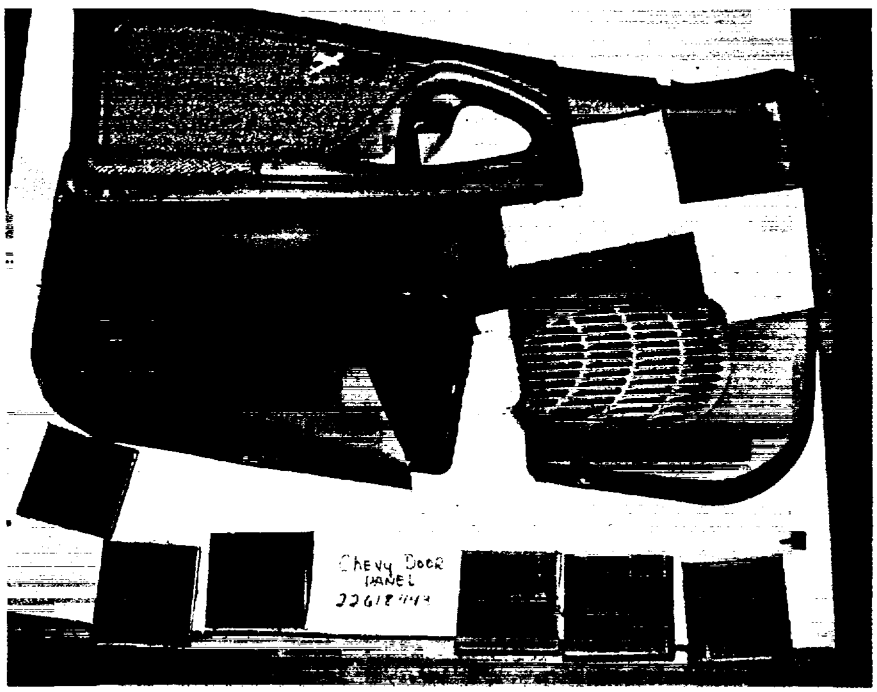


Figure 6-1. Chevrolet Cavalier door panel Cone Calorimeter specimens.

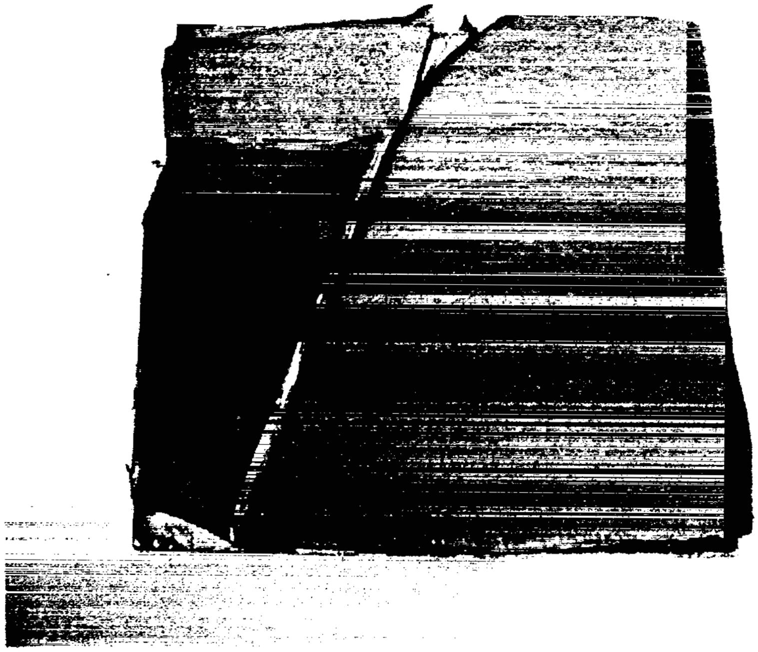
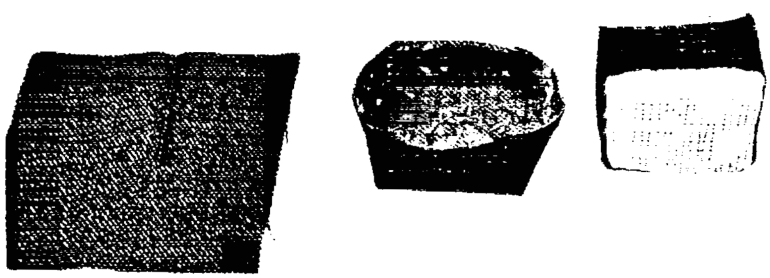


Figure 6-2. Dodge Neon kick panel Cone Calorimeter specimen.



CHEVY SEAT
E-1474
METHOD

Figure 6-3. Chevrolet Cavalier seat Cone Calorimeter specimen.

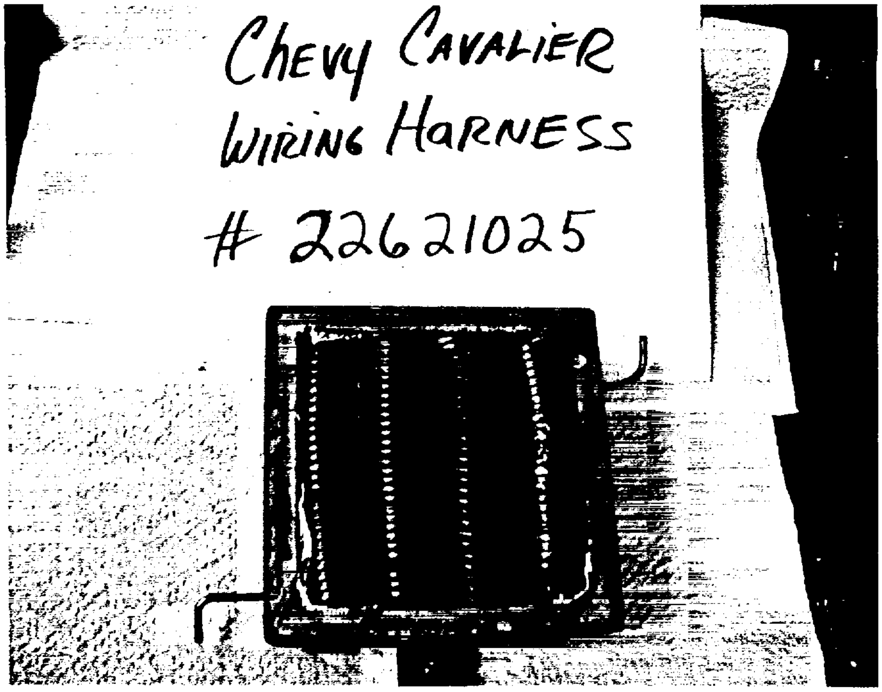


Figure 6-4. Chevrolet Cavalier wiring harness Cone Calorimeter specimen.

Table 6-10. Ignition Data for Parts and Components of the Chevrolet Cavalier

Headrest		Seat (Foam & Cover)		Seat (Foam)		Headliner	
Flux (kW/m^2)	t_{ig} (s)	Flux (kW/m^2)	t_{ig} (s)	Flux (kW/m^2)	t_{ig} (s)	Flux (kW/m^2)	t_{ig} (s)
50	11	50	8	50	2	50	7
50	11	50	9	50	2	50	7
35	24	35	16	35	2	35	12
35	30	35	21	35	3	35	13
20	49	20	34	20	10	20	124
20	51	20	39	20	12	20	153
15	77	18	298	15	20		
10	121	16	NI	10	68		
7	184			9	92		
5	NI			7	NI		

Table 6-10. Ignition Data for Parts and Components of the Chevrolet Cavalier (Continued)

Glove Box (Exterior)		Glove Box (Interior)		Door Panel (Plastic)		Carpet	
Flux (kW/m^2)	t_{ig} (s)	Flux (kW/m^2)	t_{ig} (s)	Flux (kW/m^2)	t_{ig} (s)	Flux (kW/m^2)	t_{ig} (s)
50	22	50	23	50	21	50	34
50	23	50	23	50	21	50	35
35	43	35	61	35	42	35	58
35	45	35	73	35	44	35	65
20	123	20	152	20	130	20	171
20	124	20	154	20	134	20	173
15	183	15	427	15	173	15	375
13	599	13	NI	12	320	12	NI
12	NI			10	448		
				8	NI		

HVAC Parts		Air Filter Assembly		Wiring Harness (Thick)		Wiring Harness (Thick)	
Flux (kW/m^2)	t_{ig} (s)	Flux (kW/m^2)	t_{ig} (s)	Flux (kW/m^2)	t_{ig} (s)	Flux (kW/m^2)	t_{ig} (s)
50	19	50	17	50	10	50	10
50	20	50	18	35	26	35	25
50	20	35	35	20	301	20	203
35	41	35	35				
35	43	20	127				
35	43	20	135				
20	93	15	243				
20	101	12	270				
20	101	10	NI				
15	204						
10	451						
8	NI						

Table 6-11. Ignition Data for Parts and Components of the Dodge Neon

Seat (Foam & Cover)		Seat (Foam)		Door Panel (Plastic)		Door Panel (Fabric)	
Flux (kW/m^2)	t_{ig} (s)	Flux (kW/m^2)	t_{ig} (s)	Flux (kW/m^2)	t_{ig} (s)	Flux (kW/m^2)	t_{ig} (s)
50	8	50	2	50	23	50	27
35	21	50	3	50	24	35	54
20	641	35	3	35	48	20	351
18	NI	35	3	35	50		
		20	9	20	142		
		20	11	20	158		
		15	16	15	213		
		10	53	10	320		
		8	249	8	NI		
		7	NI				

Carpet		Kick Panel		Kick Panel		Fuel Tank	
Flux (kW/m^2)	t_{ig} (s)	Flux (kW/m^2)	t_{ig} (s)	Flux (kW/m^2)	t_{ig} (s)	Flux (kW/m^2)	t_{ig} (s)
50	25	50	25	15	170	50	39
50	28	50	26	10	360	50	40
35	53	50	29	8	515	35	88
35	54	35	46	6	NI	35	90
20	122	35	47			20	295
20	136	20	118			20	342
15	147	20	131			18	431
10	280	20	145			17	NI
8	NI						

Table 6-12. Ignition data for parts and components of the Ford Focus

Headrest		Seat (Cover & Foam)		Seat (Foam)		Headliner	
Flux (kW/m^2)	t_{ig} (s)	Flux (kW/m^2)	t_{ig} (s)	Flux (kW/m^2)	t_{ig} (s)	Flux (kW/m^2)	t_{ig} (s)
50	5	50	23	50	2	50	9
35	23	35	43	50	2	50	9
20	49	20	30	35	4	35	15
				35	4	35	16
				20	8	20	165
				20	9	20	254
				15	18	17	203
				10	68	15	NI
				7	478		
				5	NI		

Door Panel		Carpet		Air Filter Assembly			
Flux (kW/m^2)	t_{ig} (s)	Flux (kW/m^2)	t_{ig} (s)	Flux (kW/m^2)	t_{ig} (s)		
50	7	50	27	50	19		
50	7	50	28	50	20		
35	11	35	42	35	36		
35	13	35	42	35	36		
20	23	20	102	20	119		
20	26	20	102	20	125		
15	39	15	151	15	223		
10	91	12	286	10	360		
7	541	10	NI	8	NI		
5	NI						

Table 6-13. Ignition data for parts and components of the Honda Civic

Headrest	
Flux (kW/m^2)	t_{ig} (s)
50	17
35	24
20	60

Seat (Cover & Foam)	
Flux (kW/m^2)	t_{ig} (s)
50	11
35	17
20	531

Seat (Foam)	
Flux (kW/m^2)	t_{ig} (s)
50	2
50	2
35	8
35	9
20	15
20	21
15	185
12	565
10	NI

Glove Box (Exterior)	
Flux (kW/m^2)	t_{ig} (s)
50	29
50	29
35	50
35	51
20	129
20	134
15	212
12	375
10	NI

Glove Box (Interior)	
Flux (kW/m^2)	t_{ig} (s)
50	23
35	42
20	116

Wiring Harness	
Flux (kW/m^2)	t_{ig} (s)
50	6
35	11
20	210

Door (Grey Plastic)	
Flux (kW/m^2)	t_{ig} (s)
50	23
50	24
35	42
35	44
20	98
20	112
15	118
10	289
8	387
6	NI

Door (Black Plastic)	
Flux (kW/m^2)	t_{ig} (s)
50	23
35	40
20	128

Door (Fabric)	
Flux (kW/m^2)	t_{ig} (s)
50	35
35	58
20	190

Carpet	
Flux (kW/m^2)	t_{ig} (s)
50	25
50	29
35	52
35	55
20	98
20	101
17	187
15	NI

HVAC Parts	
Flux (kW/m^2)	t_{ig} (s)
50	20
50	24
50	26
35	41
35	46
35	50
20	99
20	102
20	109
10	372
8	NI

7.0 INTERMEDIATE-SCALE FIRE TESTS

7.1 Introduction

A series of intermediate-scale fire tests was conducted on five Chevrolet Cavalier parts, as described in Section 4.0. The test matrix for this testing is given in detail in Section 7.3. The testing was conducted in general accordance with ASTM E 1623-02b, *Standard Test Method for Determination of Fire and Thermal Parameters of Materials, Products, and Systems Using an Intermediate-Scale Calorimeter (ICAL).* Details and results for the intermediate-scale tests are provided below.

7.2 Test Procedure

All tests were conducted in general accordance with ASTM E 1623, in the vertical orientation, with the edge frame (customized for various samples) and a pilot flame. The tests were terminated after flameout and data were recorded as specified in ASTM E 1623. Figure 7-1 shows the apparatus and Figure 7-2 shows the apparatus with the calibration board in place. There were three major deviations from the test standard, and they are as follows:

1. *Pilot Flame*: the pilot used to ignite the pyrolysis gases was a small open flame (propane flowing through tubing) rather than a hot wire at the surface of the test specimen.
2. *Pilot Flame Insertion Time*: the flame was inserted in the stream of pyrolysis gases at a time that was calculated from the Cone Calorimeter ignition data. This was done to minimize heat release rate variations due to random ignition time fluctuations.
3. *Irregular Shaped Test Specimens*: test specimens were tested as whole components whenever possible and this made it necessary to design and construct adequate test fixtures to support the specimens.

ICAL tests were generally conducted in duplicate at three heat flux levels: 20, 35, and 50 kW/m^2. The rationale for the choice of heat flux levels is discussed in Section 3.0. Also, it was necessary to perform the ICAL tests at the same irradiance as the Cone Calorimeter tests in order to solidify the data analysis. Single tests at three heat flux levels were conducted on materials that were not available in sufficient quantity for the complete series.

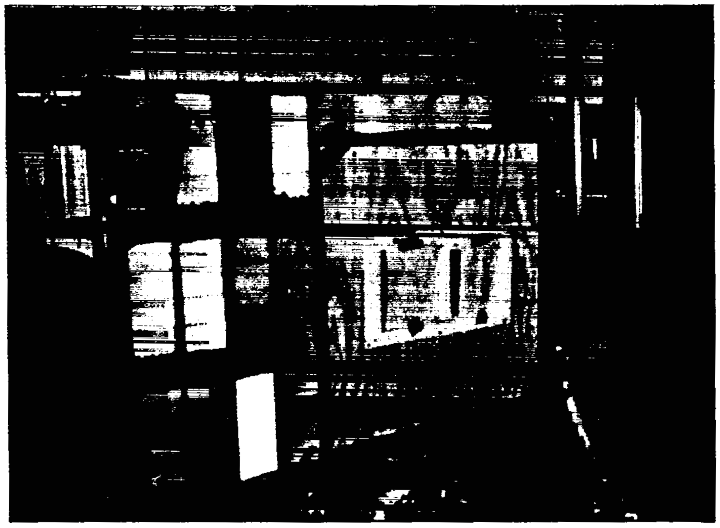


Figure 7-1. ICAL apparatus.

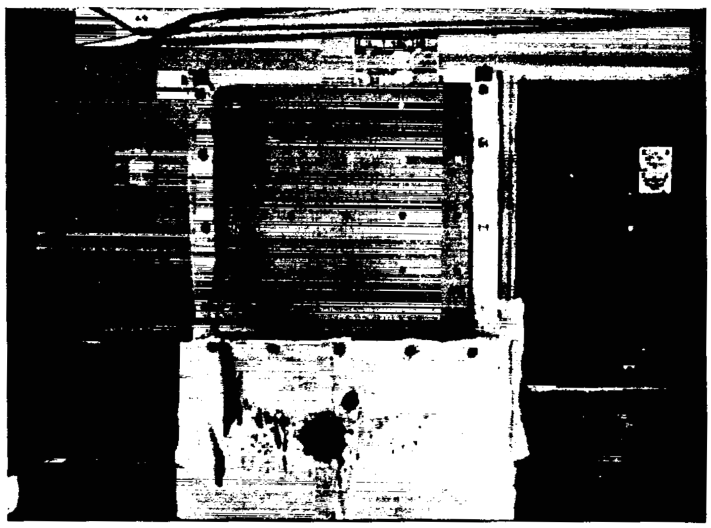


Figure 7-2. Calibration board in place on ICAL apparatus.

7.3 Test Matrix

The parts and components of the Chevrolet Cavalier tested in the ICAL are listed in Table 7.1. The number of replicate tests at each heat flux level, and the page numbers in Appendix F, where concise reports of the full tests can be found, are also given in this table. A total of 24 full ICAL tests were performed on five different component parts.

Table 7-1. ICAL Test Matrix

		Full ICAL Tests			Appendix E Pages
		20 kW/m^2	35 kW/m^2	50 kW/m^2	
Interior & Exterior (Air Filter Box)	Seat				
	Back w/Headrest	1	1	1	1-9
	Seat Foam	1	1	1	10-18
	Door Panel (Plastic)	2	2	2	19-27
	Carpet	2	2	2	28-36
	Air Filter Box	2	2	2	37-45

7.4 Specimen Preparation

Nearly all of the test specimens were irregular in shape and size. The ICAL was developed for testing of planar specimens, so special sample holders were constructed to accommodate these odd-shaped automotive components. When possible, samples were prepared according to the procedure in ASTM E 1623. In most cases, however, parts were tested as whole components supported by a custom frame or fixture. Due to this fact, drip pans were used to catch burning pieces that fell during testing to maintain the mass loss rate measurement. Table 7-2 shows a photograph of each specimen in its sample holder prior to testing and of each test specimen's initially exposed area.

Table 7-2. ICAL Sample Preparation Details

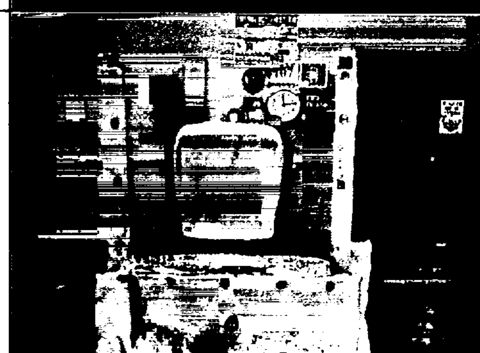
Automotive Component	Photograph of Prepared Specimens in Sample Holders	Initially Exposed Area (m^2)
Seat Back w/Headrest		0.428
Seat Foam Cushion		0.312
Door Panel (Plastic)		0.465

Table 7-2. ICAL Sample Preparation Details (Continued)

Automotive Component	Photograph of Prepared Specimens in Sample Holders	Initially Exposed Area (m^2)
Carpet		0.525
Air Filter Assembly		0.121

7.5 Results

Complete results and graphs for ASTM E 1623 tests are compiled in Appendix E. In general, materials were conducted in duplicate if enough specimens were available. The heat release rate graphs in Appendix E indicate that repeatability was generally very good.

Table 7-3 gives logistic information about the ICAL testing such as test number, material identification, incident heat flux and data file name. Table 7-4 summarizes the ICAL data, including peak heat release rate, total heat released, peak smoke production rate, total smoke produced, total mass loss, peak carbon monoxide (CO) generation rate and total amount of CO produced.

Figures 7-3 to 7-7 show test photographs for the seat back with a headrest, the seat bottom, the door panel, the carpet and the air filter box, respectively.

Table 7-3. ICAL Test Information

Test No.	Material Identification	Data File No.	Date Tested	Incident Heat Flux (kW/m^2)	Ignition Time (s)
1	Seat Foam Cushion	001279	3/16/2001	50	3
2	Seat Foam Cushion	003279	3/16/2001	35	5
3	Seat Foam Cushion	004279	3/16/2001	20	15
4	Air Filter Box	005279	3/19/2001	20	171
5	Air Filter Box	006279	3/19/2001	20	171
6	Air Filter Box	007279	3/19/2001	35	51
7	Air Filter Box	008279	3/20/2001	35	51
8	Air Filter Box	009279	3/20/2001	50	24
9	Air Filter Box	010279	3/20/2001	50	24
10	Door Panel (Plastic)	011279	3/22/2001	50	29
11	Door Panel (Plastic)	012279	3/22/2001	50	29
12	Door Panel (Plastic)	013279	3/22/2001	35	59
13	Door Panel (Plastic)	014279	3/22/2001	35	59
14	Door Panel (Plastic)	015279	3/22/2001	20	170
15	Door Panel (Plastic)	016279	3/26/2001	20	170
16	Seat Back w/Headrest	018279	3/26/2001	35	23
17	Seat Back w/Headrest	019279	3/26/2001	50	12
18	Seat Back w/Headrest	020279	3/27/2001	20	55
19	Carpet	021279	3/29/2001	20	249
20	Carpet	022279	3/29/2001	20	249
21	Carpet	023279	3/29/2001	35	91
22	Carpet	024279	3/29/2001	35	91
23	Carpet	025279	3/29/2001	50	46
24	Carpet	026279	3/29/2001	50	46

Table 7-4. ICAL Test Results Summary

Test No.	Peak Heat Release Rate (HRR) (kW)	Time of Peak HRR (s)	Total Heat Released (MJ)	Peak Smoke Production Rate (m^2/s)	Total Smoke Produced (m^2)
1	288.4	42	18.4	0.75	57.2
2	250.3	54	29.1	0.60	56.9
3	258.4	78	27.2	0.55	50.8
4	114.6	300	41.1	0.65	741.7
5	148.4	294	59.7	0.37	366.2
6	119.5	168	50.3	0.43	410.6
7	129.6	192	48.4	0.64	637.6
8	144.3	282	67.8	0.48	385.1
9	114.0	198	51.3	0.30	199.7
10	382.5	138	91.1	1.11	304.7
11	421.5	138	96.6	1.59	331.24
12	351.8	168	77.6	1.10	278.1
13	422.7	186	104.3	1.09	338.8
14	346.6	342	90.4	1.36	277.2
15	371.1	324	94.2	1.48	389.6
16	386.4	96	51.5	1.79	158.2
17	374.0	114	55.3	3.03	168.9
18	350.3	120	44.1	1.28	118.1
19	83.8	366	22.6	0.28	124.2
20	93.6	384	23.0	0.30	129.9
21	157.4	186	29.7	0.30	122.8
22	152.8	174	38.1	0.23	85.7
23	150.1	155	50.0	0.27	91.1
24	201.0	180	54.6	0.24	49.3

Table 7-4. ICAL Test Results Summary (Continued)

Test No.	Peak CO Generation Rate (g/s)	Total CO Produced (g)	Peak Mass Loss Rate (g/s)	Average Heat of Combustion (kJ/g)	Total Mass Loss (g)
1	1.07	97.5	13	30	613
2	0.98	108.2	27	33	893
3	1.05	101.6	13	44	611
4	0.54	383.8	6	37	1108
5	0.61	454.8	14	54	1109
6	0.42	210.5	18	37	1348
7	0.44	165.6	15	43	1125
8	0.46	208.9	21	61	1118
9	0.37	79.8	14	52	981
10	1.33	288.9	14	43	2136
11	2.21	433.5	35	44	2207
12	2.04	357.1	44	38	2018
13	1.62	207.8	23	49	2112
14	1.90	330.8	12	45	1989
15	1.57	337.0	15	44	2148
16	4.01	307.9	25	32	1624
17	3.15	184.4	45	33	1664
18	2.92	301.8	65	27	1631
19	0.65	207.3	10	32	702
20	0.45	100.6	9	28	833
21	0.63	205.9	8	28	1066
22	0.86	323.3	27	29	1318
23	0.89	348.4	13	40	1254
24	0.32	26.5	13	34	1597

Figure 7-3. Seat back with headrest – test in progress.

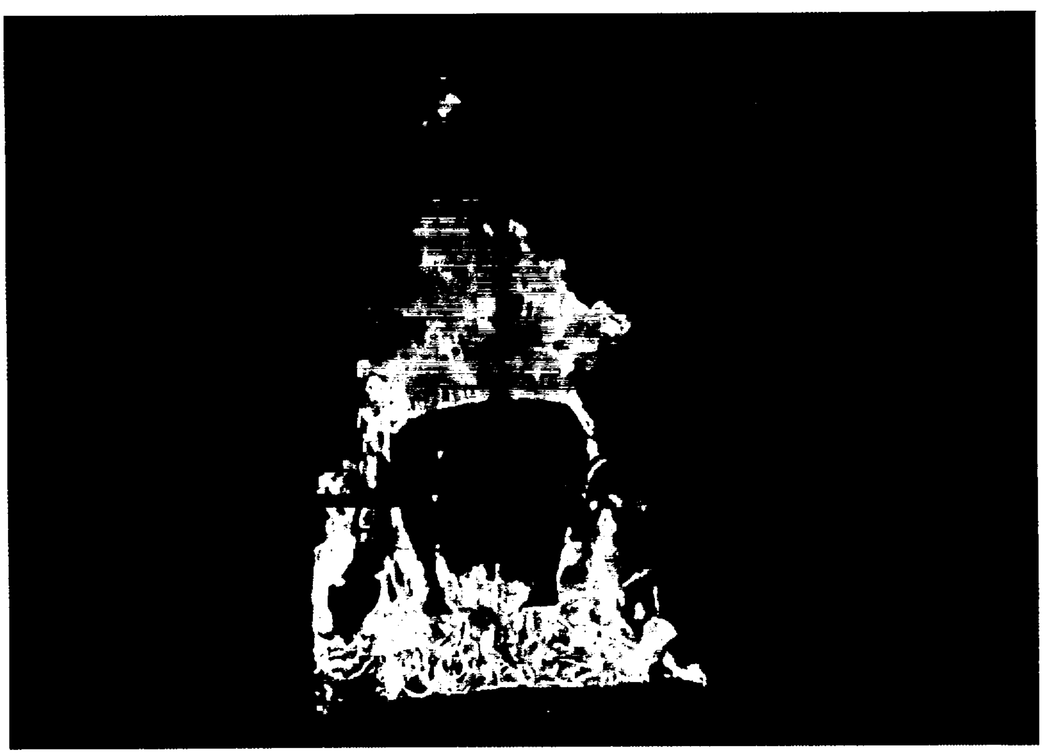


Figure 7-4. Seat foam cushion – test in progress.

Figure 7-5. Door panel (plastic) – test in progress.

Figure 7-6. Carpet.

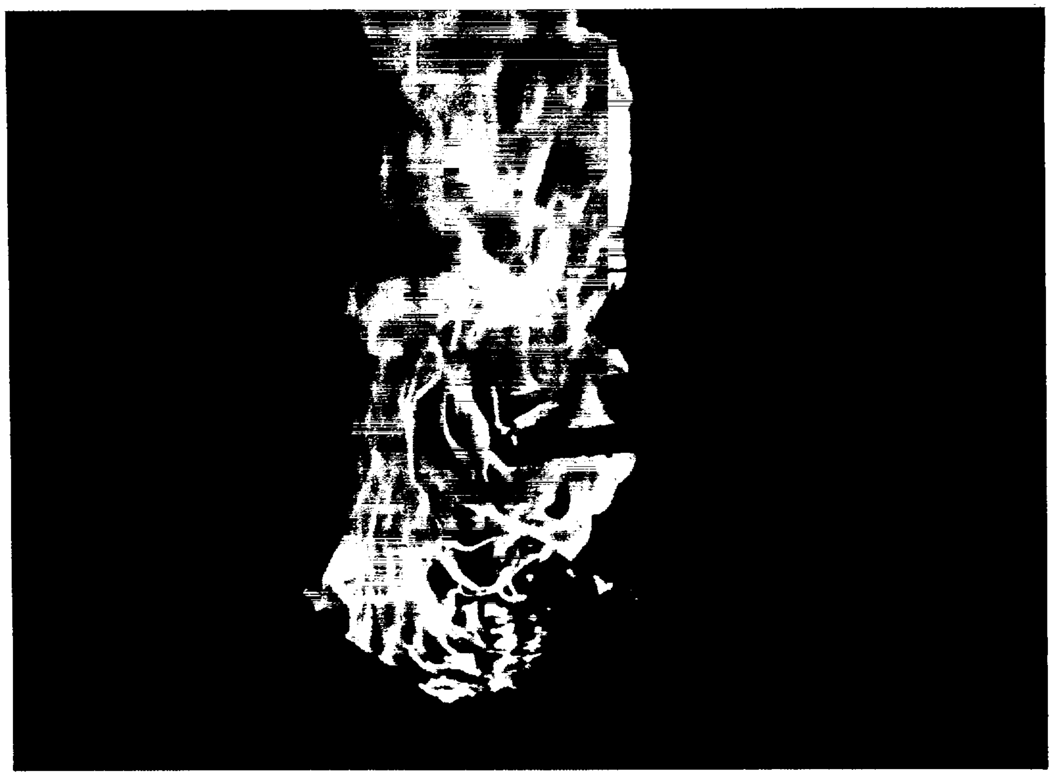


Figure 7-7. Air filter assembly – test in progress.

8.0 DATA ANALYSIS

8.1 Introduction

The main objective of the analysis is to establish a correlation between small-scale flammability test data of materials used in motor vehicles and the fire performance of components that are made of these materials. A secondary objective is to relate more fundamental physical and chemical material properties to the flammability data. Two approaches are explored to accomplish the main objective.

The first approach is the simplest and consists of one-on-one correlations between parameters measured in the small-scale flammability tests and in the component tests. As a minimum, this requires that at least one set of small-scale and intermediate-scale tests be conducted under comparable conditions. The primary variable of these conditions is the heat flux at which the tests are performed. For this first approach to be meaningful, it is important that a heat flux be selected which is representative of the exposure conditions in real fires involving the component being evaluated. The representative heat flux may vary as a function of the location of the component, i.e., whether it is inside or outside the passenger compartment and whether it is in the path of fire propagation or not.

The second approach is much more complex. It involves the development of one or more fire hazard or fire performance indices from the small-scale data, and uses the intermediate-scale

results to verify their validity. These indices are typically based on fairly simple theoretical or empirical expressions that explain the relationship between flammability properties of materials and some aspect of their performance in real fires. To obtain the properties, small-scale test data are required over a range of exposure conditions, i.e., at several heat flux levels. To ensure that the results of the approach are meaningful, the range of heat fluxes has to be representative of those observed in real fires. It is particularly important that the test conditions cover the high end of heat fluxes.

The scalability of the approach and test-method can be postulated in the following way. First it is important to establish some definitions for the scaling laws employed in the present analysis. The relationship between microscopic, macroscopic, component, and system behavior, consistent with the scaling laws of the approach, is simplified by way of illustration in Figure 8-1, which will be used here to aid in the present discussion.

Near the center of this illustration lies the Cone Calorimeter data (i.e., small-scale test data) from which macroscopic flammability behavior – both pre- and post-ignition – is determined, and from which component and system behavior may be predicted. The downward scalability of the Cone Calorimeter data pertains to the linkage between microscopic and macroscopic behavior. This linkage, however, is relevant only within the pre-ignition phase of the material because the thermal-physical properties measured at this level only involve phase transitions and exothermic processes not associated with combustion. The MDSC data, which has been corroborated to a limited extent with spectroscopic analysis, will be used to represent the microscopic behavior of the material, and to establish the downward scalability of the Cone Calorimeter technique.

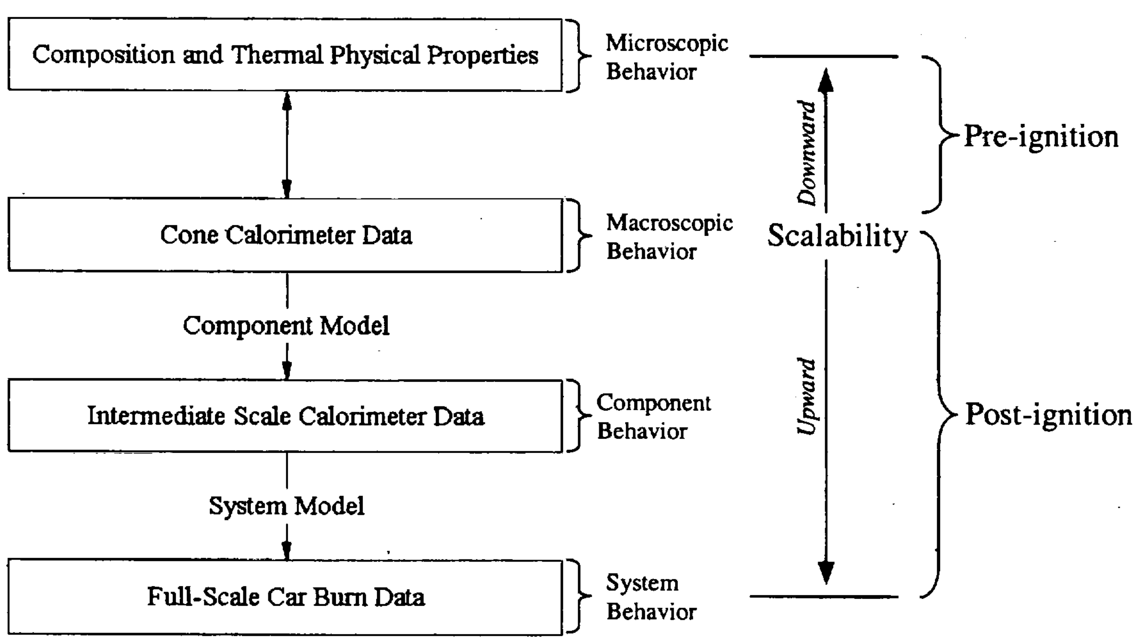


Figure 8-1. A scheme illustrating the scalability laws postulated for the test-method.

Under this scheme, upward scalability, therefore, pertains to the predictive value of data derived from small-scale Cone Calorimeter measurements for estimating flammability behavior at the component and system level. Naturally, the thermodynamic factors that are pertinent at this level are manifested in the post-ignition behavior of the material. As described earlier, these factors include the time to ignition (t_{ig}), the peak rate of heat release (HRR_{peak}), and the total heat release (THR).

8.2 Downward Scaling

The analysis begins here with an assessment of the downward scalability of the small-scale Cone Calorimeter measurements for all component materials tested; the upward scalability will be addressed later. In this assessment, the microscopic parameter of importance derived from the MDSC measurements (Tables 5-1 to 5-4) is for each component material the sum of the enthalpies for endothermic and exothermic events in the range of 0 to 300°C. Since this sum for an individual material is dominated by the heats of fusion for first-order phase transitions, it will be designated heretofore as *Total* $-\Delta H_{fus}$ (0 – 300°C), recognizing that in some instances an exothermic event may also contribute to the net value (such is the case for polyurethane foams). Recalling from the argument above that the microscopic or downward scalability of the Cone Calorimeter data pertains to pre-ignition phenomena, the only appropriate parameter to consider is the time to ignition (t_{ig}) subject to the incident heat flux of the measurement.

Tables 8-1 to 8-4 summarize the combined set of microscopic and macroscopic parameters derived from MDSC and Cone Calorimeter measurements, respectively. From these tables, the correlation between the microscopic parameter of importance, *Total* $-\Delta H_{fus}$ (0 – 300°C), and the time to ignition (t_{ig}) as determined from the Cone Calorimeter was assessed at each heat flux for all materials combined. The results of these correlations are illustrated in Figures 8-2 to 8-4. In each case a linear regression algorithm was used to fit the data and to determine the corresponding confidence interval (95% CI) as shown.

As indicated in the plots, a positive correlation can be derived from the relationship between the microscopic enthalpies of the material and the time to ignition determined macroscopically by the small-scale Cone Calorimeter. While these correlations are not statistically strong ($0.4 \leq r^2 \leq 0.5$), they are intuitively consistent from a thermodynamics viewpoint in that large endothermic latent heats as a consequence of first-order phase transitions would be expected to delay the ignition of the material under the influence of constant heat flux. Notably too, the correlation improves slightly as the heat flux is increased (Figure 8-4).

The most obvious outliers to the said correlations are annotated in each plot to illustrate some important trends. From these annotations, it is shown that carpet and fabric fibers (PET) deviate most from the downward scalability of the Cone Calorimeter measurements. However, such component materials exhibit first-order melt transitions that occur at relatively high temperatures (256°C) in comparison with most other component materials, such as the polyolefin or polyurethane components. Additionally, the decomposition temperature as reported by others [42] (approximately 300°C) quickly follows the melt temperature, which would indicate that the melt transition is also close to the temperature of ignition.

As a test for the relevance of these correlations, the downward scalability of the FMVSS 302 standard method was assessed in the same manner as the Cone Calorimeter method. In this case, the measured burn rate of each component material was employed. The result of the correlation is shown in Figure 8-5, which expectedly shows no microscopic scalability.

Table 8-1. Summary of MDSC Microscopic Thermal Measurements Compared with Pre- and Post-Ignition Macroscopic Behavior as Measured by the Cone Calorimeter Test-Method for Component Materials Obtained from the Chevrolet Cavalier

Chevrolet Cavalier			MDSC	MDSC	Heat Flux: 20 (kW/m^2)						Heat Flux: 35 (kW/m^2)						Heat Flux: 50 (kW/m^2)					
Part No.	Description	Base Polymer Composition	Total Heat (J/g) (0-300 °C)	Component Total (J/g) (0-300 °C)	Mass (g)	tig (s)	Peak HRR (kW/m^2)	THR (MJ/m^2)	Peak MWHRR (W/g)	MWTHR (kJ/g)	Mass (g)	tig (s)	Peak HRR (kW/m^2)	THR (MJ/m^2)	Peak MWHRR (W/g)	MWTHR (kJ/g)	Mass (g)	tig (s)	Peak HRR (kW/m^2)	THR (MJ/m^2)	Peak MWHRR (W/g)	MWTHR (kJ/g)
22589249	Seat Back, Cover	Polyester	-37																			
22589249	Seat Back, Foam	Polyurethane	-37		15.3	11	404	40.6	233.42	23.46	17.6	2	404	46.4	202.92	23.31	19.3	2	475	42.1	217.56	19.28
[redacted]																						
12457891	Headrest, Cover	Undetermined	39		47.3	50	269	88.7	50.27	16.58	49	27	306	79.4	55.20	14.32	48.8	11	412	103	74.63	18.66
12457891	Headrest, Foam	Polyurethane	-20																			
22619703	Headliner, Center Foam	Polyurethane	-39		7.7	138	186	5	213.54	5.74	7.8	12	198	8.4	224.40	9.52	7.6	7	271	9.8	315.22	11.40
22587440	Glove Box Door, Outside	Polypropylene	-63		26.8	124	493	91.7	162.62	30.25	28.4	44	598	107.5	186.14	33.46	26.3	22	708	99.8	237.97	33.54
22587440	Glove Box Door, Inside	Acrylonitrile-Butadiene-Styrene	-0.0078		32.5	153	647	108.9	175.98	29.62	33	67	620	105.7	166.08	28.31	33.1	23	916	108.2	244.64	28.90
22618443	Door Panel, Black Plastic	Polypropylene	-69		28.9	132	429	66.4	131.22	20.31	29.8	43	545	73.7	161.67	21.86	30.3	21	757	68.5	220.85	19.98
22618443	Door Panel, Backing w/o Foam	Polypropylene	-133								52.3	43	571	214	96.51	36.17						
22618443	Door Panel, Cloth	Polyurethane/Polyester	-41																			
22618443	Door Panel, Foam	Polyurethane	11																			
22628609	Carpet, Backing	Undetermined	-17																			
22628609	Carpet, Nap	Polyethylene Terephthalate	-57																			
[redacted]																						
52460744	HVAC, Duct	Polypropylene	-80		21.4	98	533	70.3	220.17	29.04	22.8	43	669	84	255.51	32.57	21	20	924	76.6	388.96	32.24
22621025	Wiring Harness, Conduit	Polypropylene Blend	-34		120.5	301	198	138.8	14.53	10.18	121.1	26	260	143.5	18.98	10.48	121.3	10	333	138.4	24.27	10.09
22621025	Wiring Harness, Module	Polyethylene	-147								186.4	48	334	256.8	15.84	12.18						
10488727	Air Filter Assembly	Polypropylene	-101		31.3	131	412	93.8	116.36	26.49	32.8	35	454	98.2	122.36	26.47	28.8	18	585	86.2	179.56	26.46
Component/Sum																						

Table 8-2. Summary of MDSC Microscopic Thermal Measurements Compared with Pre- and Post-Ignition Macroscopic Behavior as Measured by the Cone Calorimeter Test-Method for Component Materials Obtained from the Dodge Neon

Dodge Neon			MDSC	MDSC	Heat Flux: 20						Heat Flux: 35						Heat Flux: 50					
Part No.	Description	Base Polymer Composition	Total Heat (J/g) (0-300 °C)	Component Total (J/g) (0-300 °C)	Mass (g)	tig (s)	Peak HRR (kW/m^2)	THR (MJ/m^2)	147.33	24.45	Mass (g)	tig (s)	Peak HRR (kW/m^2)	THR (MJ/m^2)	148.47	26.76	Mass (g)	tig (s)	Peak HRR (kW/m^2)	THR (MJ/m^2)	182.57	26.64
SL491AZZA	Front Upper Seat, Foam	Polyurethane																				
SL491AZZA	Front Upper Seat, Foam Backing	Polyproplylene	-61																			
SL491AZZA	Front Upper Seat, Fabric	Polyethylene Terephthalate	-53																			
[redacted]																						
PZ15WL5AK	Front Door Panel, Plastic	Polyethylene/Polypropylene	-79		27.5	150	310	50.5	99.65	16.23	24.1	49	483	54.6	177.17	20.03	24.4	24	709	80.5	256.87	29.16
PZ15WL5AK	Front Door Panel, Fabric	Polyethylene Terephthalate	-57		54.5	351	428	182.2	69.42	29.55	54.3	54	714	200.8	116.24	32.69	55.5	27	885	208.1	140.96	33.15
TN47XDVAA	Carpet, Fiber wt. Backing	Mixed Fiber/PET	-59		57.3	129	323	112.4	49.83	17.34	34.8	54	442	69	112.28	17.53	35.3	26	554	64.7	138.74	16.20
PV77WL5AB	Kick Panel	Polyproplylene	-78		23.2	138	215	37.2	81.92	14.17							25.1	27	605	75	213.08	26.41
50172094A	Fuel Tank, Flange	Polyethylene	-197																			
50172094A	Fuel Tank	Polyethylene	-178		67.8	318	492	196.4	64.15	25.61	73.4	89	586	230.4	70.58	27.75	72.2	40	1200	305.8	146.93	37.44
Component/Sum																						

Table 8-3. Summary of MDSC Microscopic Thermal Measurements Compared with Pre- and Post-Ignition Macroscopic Behavior as Measured by the Cone Calorimeter Test-Method for Component Materials Obtained from the Ford Focus

Ford Focus			MDSC	MDSC	Heat Flux: 20						Heat Flux: 35						Heat Flux: 50					
			Total	Component			Peak						Peak						Peak			
			Heat (J/g)	Total (J/g)	Mass	tig	HRR	THR			Mass	tig	HRR	THR			Mass	tig	HRR	THR		
Part No.	Description	Base Polymer Composition	@300 °C	@300 °C	(g)	(s)	(kW/m^2)	(MJ/m^2)	122.83	26.19	(g)	(s)	(kW/m^2)	(MJ/m^2)	221.80	25.88	(g)	(s)	(kW/m^2)	(MJ/m^2)	361.74	26.87
YS4Z5462900BAB	Seat Cover, Foam	Polyurethane																				
YS4Z5462900BAB	Seat Cover, Batting	Polyurethane/Fiber blend	16																			
YS4Z5423942AAB	Door Panel, Beige Plastic	Polypropylene	-65																			
YS4Z5423942AAB	Door Panel, Two-Layer Backing	Polyethylene/Polypropylene	23																			
	Door Panel, Plastic + Backing	[illegible]	[illegible]	[illegible]	[illegible]	24	[illegible]	118.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	135.6	[illegible]	[illegible]	[illegible]	7	[illegible]	141.3	[illegible]	[illegible]
YS4Z5413000BAF	Carpet	Undetermined			31.9	102	345	63.6	95.61	17.62	31.9	42	502	65.6	139.11	18.18	30.4	28	590	63	171.57	18.32
YS4Z5451916AAB	Headliner, Gray Liner	Undetermined	-41																			
YS4Z5451916AAB	Headliner, Foam wt. Brown Backing	Polyurethane/Other	-8																			
	Headliner, Liner + Foam + Backing	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
YS4Z9600NA	Air Cleaner Assembly	Polypropylene	-67	-67	27.7	122	428	91.3	136.59	29.14	30.8	36	511	100.5	146.66	28.84	35.4	20	554	116	138.34	28.97
Component Sum																						

Table 8-4. Summary of MDSC Microscopic Thermal Measurements Compared with Pre- and Post-Ignition Macroscopic Behavior as Measured by the Cone Calorimeter Test-Method for Component Materials Obtained from the Honda Civic

Honda Civic			MDSC	MDSC	Heat Flux: 20						Heat Flux: 35						Heat Flux: 50					
			Total	Component			Peak						Peak						Peak			
			Heat (J/g)	Total (J/g)	Mass	tig	HRR	THR			Mass	tig	HRR	THR			Mass	tig	HRR	THR		
Part No.	Description	Base Polymer Composition	@300 °C	@300 °C	(g)	(s)	(kW/m^2)	(MJ/m^2)	150.72	25.46	(g)	(s)	(kW/m^2)	(MJ/m^2)	189.04	26.61	(g)	(s)	(kW/m^2)	(MJ/m^2)	116.16	24.65
81521-S5A-A01ZA	Seat Cover, Green Foam	Undetermined																				
81521-S5A-A01ZA	Seat Cover, Gray Backing	Polyethylene Terephthalate	-51																			
	Seat Cover, Cover + Foam + Backing	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
83583-S5A-A01ZC	Door Panel, Gray Plastic	Polypropylene	-105		19.8	105	263	31.9	117.42	14.24	20.8	43	417	40.9	177.23	17.38	19.3	24	547	51.7	250.54	23.68
83583-S5A-A01ZC	Door Panel, Fabric	Undetermined	-60		31.5	190	295	80.4	82.79	22.56	33	58	450	126.1	120.55	33.78	28.7	35	856	116.4	263.66	35.85
83583-S5A-A01ZC	Door Panel, Black Plastic	Polypropylene	-77		29.3	128	629	90.2	189.77	27.21	24.5	40	914	97.2	329.79	35.07	23.8	23	924	101.8	343.20	37.81
83801-S5A-A01ZB	Carpet, Light Color Nap	Polyethylene Terephthalate	-46																			
83801-S5A-A01ZB	Carpet, Middle Reinforcement	Mixed Fiber/PET	-65																			
83801-S5A-A01ZB	Carpet, Gray Backing	Polyethylene Terephthalate	-54																			
	Carpet, Nap + Reinforcement + Backing	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
77400-S5A-A01	HVAC Duct Assembly	Polyethylene	-188		18	103	444	54.2	218.05	26.62	17.6	46	595	68.9	298.86	34.61	20.7	22	716	68.2	305.77	29.13
32200-S5A-A00	Wiring Harness	Polypropylene	-105		98.8	210	322	84.9	28.81	7.60	93.3	11	524	87.1	49.65	8.25	91.9	6	663	84.1	63.77	8.09
Component Sum																						

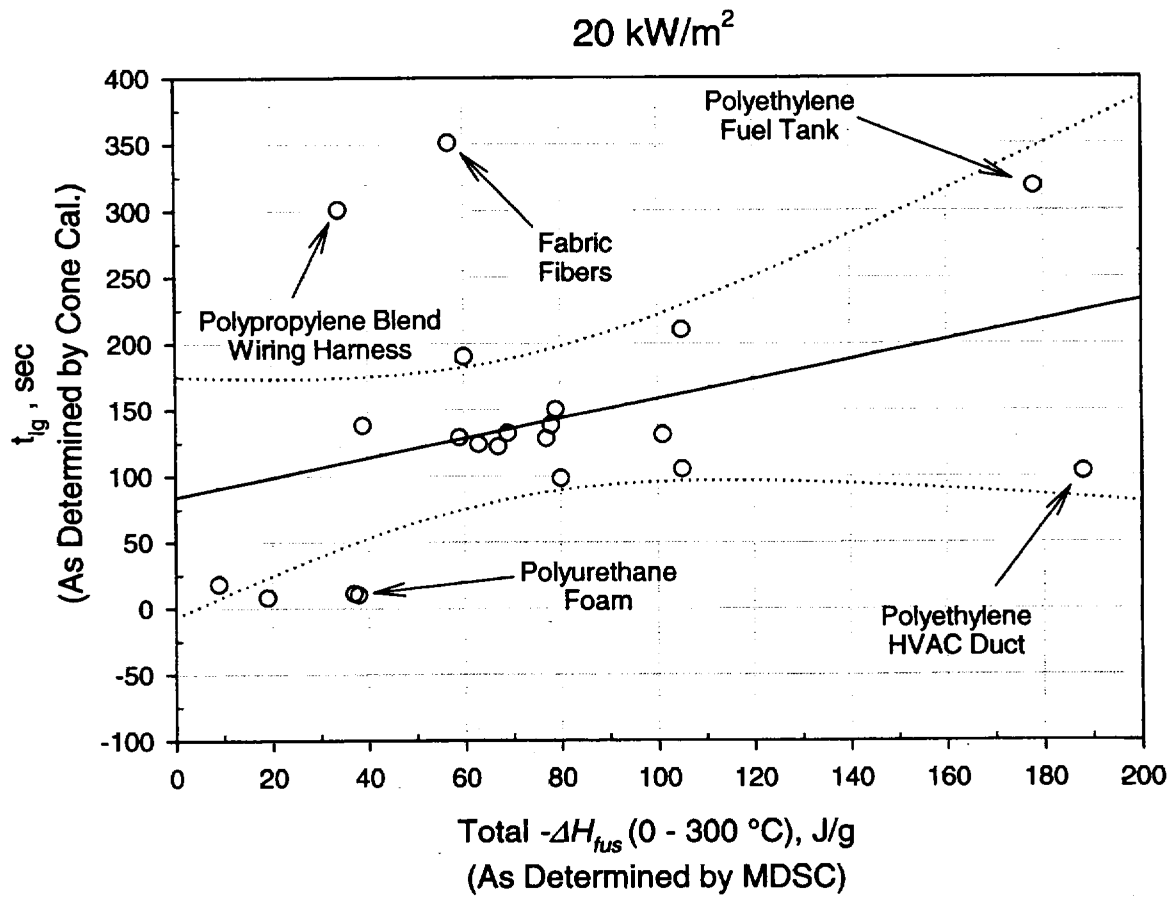


Figure 8-2. Correlation between the total microscopic enthalpy prior to ignition in the range 0 – 300°C, as determined by MDSC measurements, and the time to ignition as determined by the Cone Calorimeter test method at a constant heat flux of 20 kw/m^2. Plot shows cross-section of all vehicle materials tested regardless of vehicle brand, along with the linear best-fit (solid line) and the corresponding 95% confidence interval (dotted line). Regression line parameters are: $r^2 = 0.4236$; $t_{ig} = 0.74(-\Delta H_{fus}) + 83.9$.

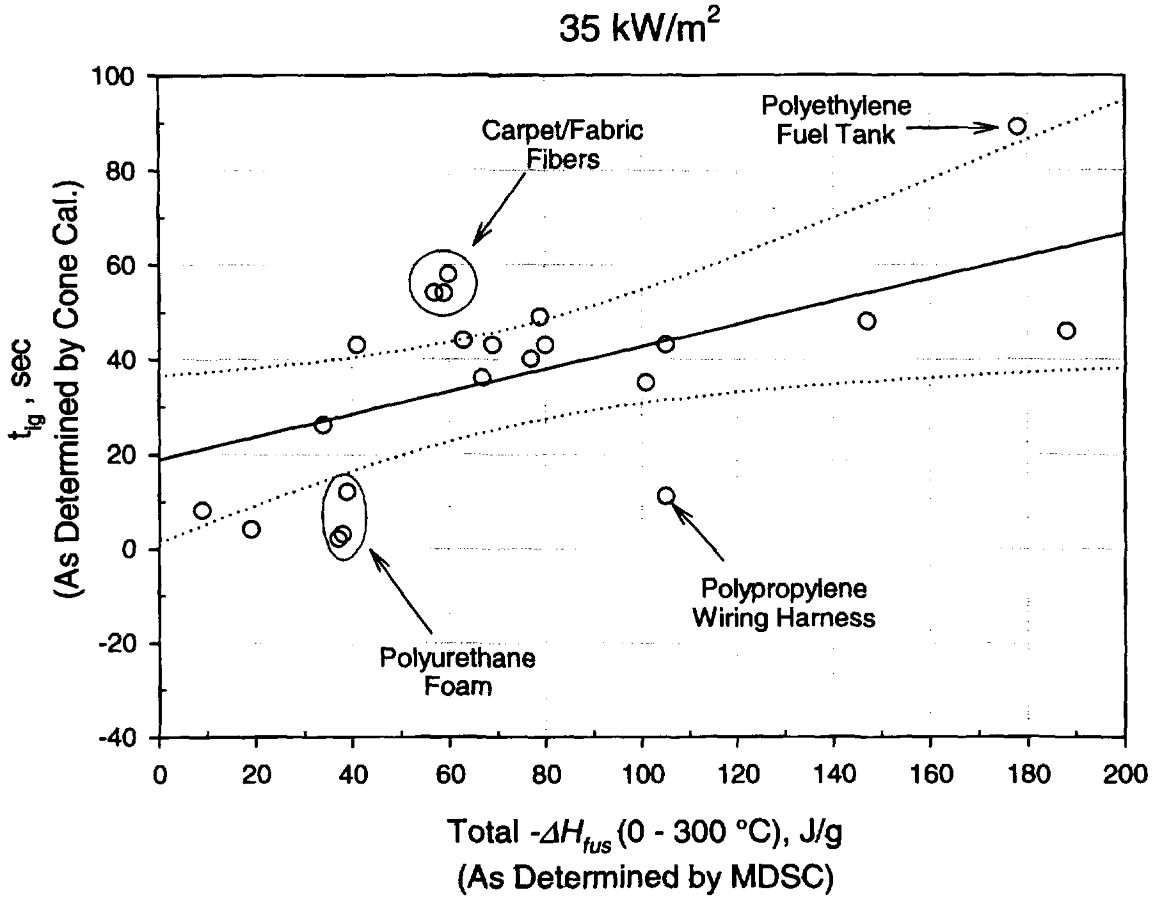


Figure 8-3. Correlation between the total microscopic enthalpy prior to ignition in the range 0 – 300°C, as determined by MDSC measurements, and the time to ignition as determined by the Cone Calorimeter test method at a constant heat flux of 35 kw/m^2. Plot shows cross-section of all vehicle materials tested regardless of vehicle brand, along with the linear best-fit (solid line) and the corresponding 95% confidence interval (dotted line). Regression line parameters are: $r^2 = 0.4447$; $t_g = 0.24(-\Delta H_{fus}) + 18.8$.

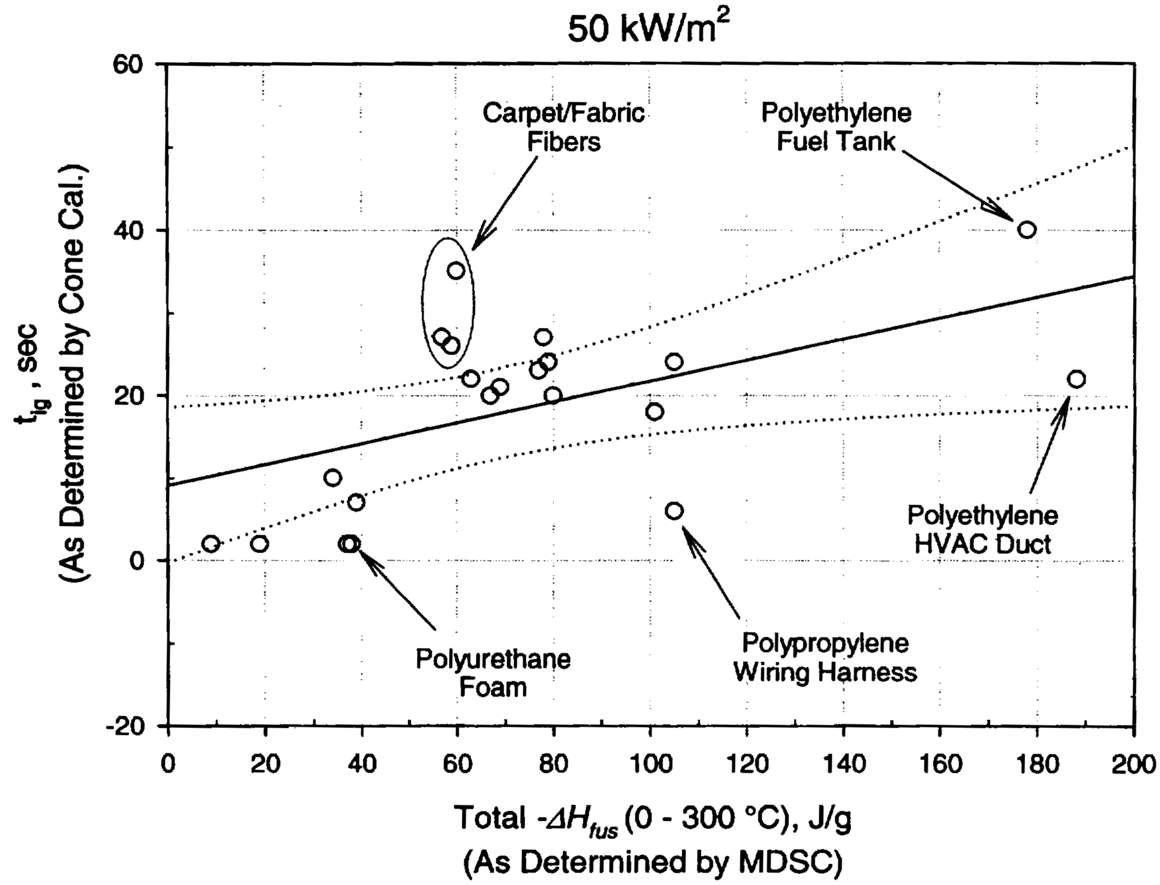


Figure 8-4. Correlation between the total microscopic enthalpy prior to ignition in the range 0 – 300°C, as determined by MDSC measurements, and the time to ignition as determined by the Cone Calorimeter test method at a constant heat flux of 50 kW/m^2. Plot shows cross-section of all vehicle materials tested regardless of vehicle brand, along with the linear best-fit (solid line) and the corresponding 95% confidence interval (dotted line). Regression line parameters are: $r^2 = 0.4825$; $t_{ig} = 0.13(-\Delta H_{fus}) + 9.11$.

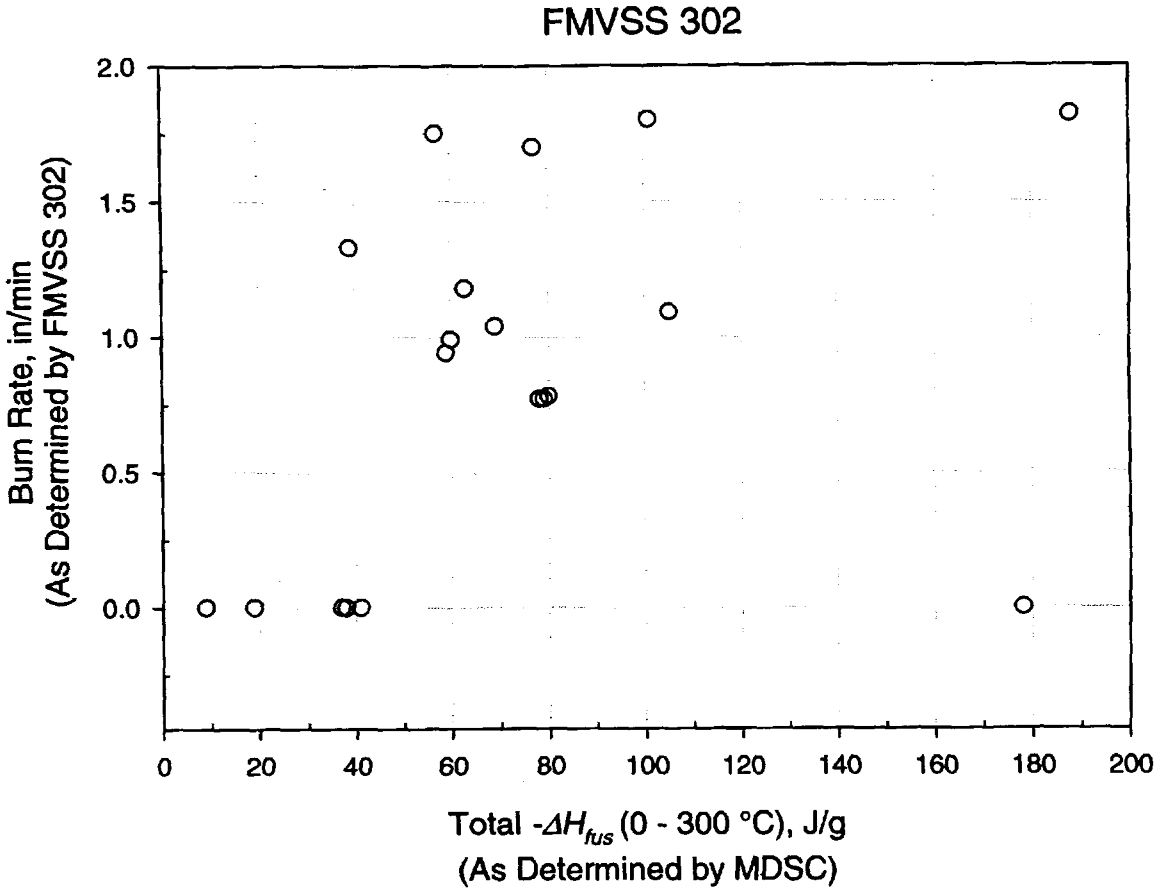


Figure 8-5. Correlation between the total microscopic enthalpy prior to ignition in the range 0 – 300°C, as determined by MDSC measurements, and the burn rate as determined by the FMVSS 302 test standard. Plot shows cross-section of all vehicle materials tested regardless of vehicle brand.

8.3 Upward Scaling

8.3.1 Simple Approach

Figure 8-6 compares peak heat release rates measured in the ICAL apparatus to those measured for the same materials in the Cone Calorimeter at the three heat flux levels. In both cases the heat release rate is expressed per unit initially exposed area. In case of the ICAL, the values were obtained by dividing the peak heat release rates in Table 7-4 by the initially exposed area in Table 7-2. Heat release rates measured in the Cone Calorimeter are already expressed on a per unit initially exposed area.

Ideally one would expect a one-on-one relationship as shown by the straight line in Figure 8-6. The three symbols below the line are for the carpet, which stayed in place during the ICAL tests. The peak heat release rates for this material are slightly lower in the ICAL because peak burning does not occur over the entire surface at the same time. Because of this convolution effect, the peak heat release rate measured in the Cone Calorimeter is a conservative estimate for the peak heat release rate in full-scale for a material that does not melt and drip.

For the other four components, however, peak heat release rates are much higher in the ICAL and relatively independent of incident heat flux. The fact that heat release rates are much higher is primarily due to the fact that the burning area at peak release rate is significantly greater than the initially exposed area due to melting. The melted material is captured in a pan at the bottom of the specimen holder and forms a liquid pool fire that enhances the heat release rate from the burning surface. The burning rate of the pool fire is driven primarily by the heat transfer from the flame, which explains why the heat release rate is relatively independent of incident heat flux.

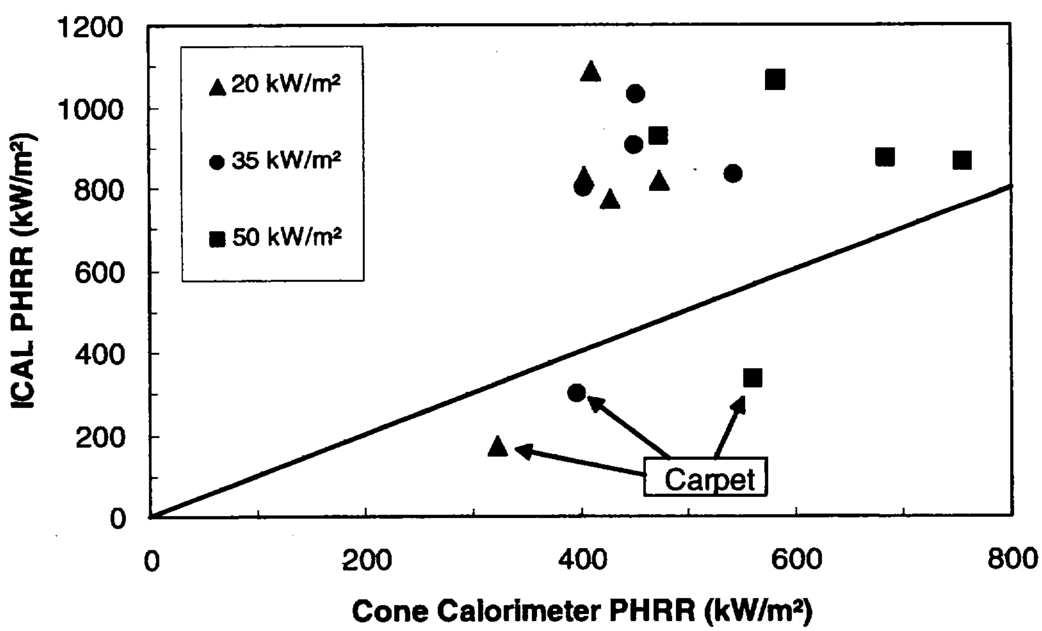


Figure 8-6. Comparison of Cone Calorimeter and ICAL peak heat release rates.

8.3.2 Complex Approach

Tables 8-5 through 8-8 give some commonly used material fire hazard indices for the components of the Chevrolet Cavalier, Dodge Neon, Ford Focus, and Honda Civic respectively. These indices are defined in reference [47].

In most cases the Critical Heat Flux (CHF) was measured within ±1 kW/m² by bracketing, but in some cases the CHF had to be determined by extrapolation. In a few cases available data were insufficient to determine the CHF.

The Thermal Response Parameter (TRP) is equal to the inverse of the slope of a linear fit through data points in a graph of $(1/t_{ig})^{1/2}$ versus incident heat flux. Only data points in the thermally thick regime, i.e., ignition times at 35 and 50 kW/m² were considered.

The ranges of fire hazard index values in the following tables is similar to those reported by Tewarson [47], except that the range of Fire Propagation Index (FPI) values appears to be higher in this study. This is probably due to the fact that peak heat release rates at 50 kW/m² were used, while Tewarson probably used (lower) average heat release rates. Tewarson [47] states that materials with an FPI of 10 $m^{5/3}/kW^{2/3}$-$s^{1/2}$ are expected to have a decelerating fire propagation. The critical value as calculated in this study is probably closer to 20 $m^{5/3}/kW^{2/3}$-$s^{1/2}$.

Table 8-5. Fire Hazard Indices for Parts of the Chevy Cavalier

		CHF (kW/m²)	TRP (kW-$s^{1/2}$/m²)	FPI ($m^{5/3}/kW^{2/3}$-$s^{1/2}$)
Interior	Seat			
	Headrest	6	138	41
	Cover & Foam	17	127	52
	Foam	8	45	129
	Headliner	19	149	33
	Glove Box Cover			
	Exterior	12	240	23
	Interior	14	174	29
	Door Panel			
	Plastic	9	228	26
	Carpet	14	337	16
Exterior	HVAC Parts	9	216	25
	Air Fiter Assembly	11	214	29
	Wiring Harness			
	Large Conduit	13	125	42
	Small Conduit	11	129	48

Table 8-6. Fire Hazard Indices for Parts of the Dodge Neon

		CHF (kW/m²)	TRP (kW-s$^{1/2}$/m²)	FPI (m$^{5/3}$/kW$^{2/3}$-s$^{1/2}$)
Interior	Seat			
	Cover & Foam	19	111	62
	Foam	7	57	102
	Door Panel			
	Plastic	9	237	28
	Fabric	10*	366	20
	Carpet	9	261	24
	Kick Panel	7	327	19
Ext.	Fuel Tank	17	282	28

* Determined from extrapolation

Table 8-7. Fire Hazard Indices for Parts of the Ford Focus

		CHF (kW/m²)	TRP (kW-s$^{1/2}$/m²)	FPI (m$^{5/3}$/kW$^{2/3}$-s$^{1/2}$)
Interior	Seat			
	Headrest	9*	63	87
	Cover & Foam	NA	268	24
	Foam	6	96	67
	Headliner	16	189	25
	Door Panel	6	168	40
	Carpet	11	412	15
Ext.	Air Filter Assembly	9	251	25

* Determined from extrapolation
NA Could not be determined

Table 8-8. Fire Hazard Indices for Parts of the Honda Civic

		CHF (kW/m^2)	TRP ($kW\text{-}s^{1/2}/m^2$)	FPI ($m^{5/3}/kW^{2/3}\text{-}s^{1/2}$)
Interior	Seat			
	Headrest	NA	390	15
	Cover & Foam	12*	254	27
	Foam	11	41	132
	Glove Box Cover			
	Exterior	11	334	23
	Interior	NA	277	28
	Door Panel			
	Grey Plastic	7	277	22
	Black Plastic	NA	298	25
	Fabric	NA	398	18
	Carpet	16	269	20
Ext.	HVAC Parts	9	255	26
	Wiring Harness	12*	141	46

NA Could not be determined
* Determined from extrapolation

Figure 8-7 shows that the peak heat release rate in the ICAL at 40 kW/m^2 appears to be nearly independent of the FPI, which implies that the FPI may not be a reliable indicator of performance in full-scale. This poor correlation can be explained by the fact that all materials except the carpet melt when tested in the ICAL. For melting materials, the additional heat release rate from the pool fire at the bottom of the sample holder needs to be considered.

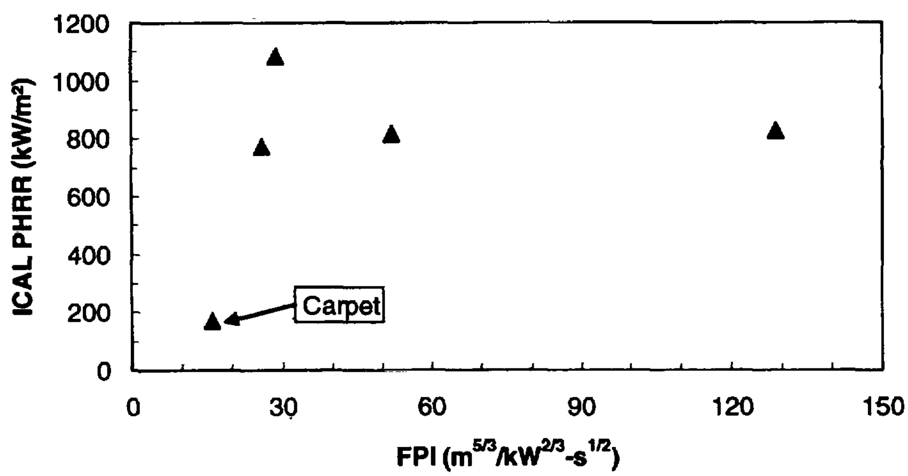


Figure 8-7. Comparison of FPI and ICAL peak heat release rates.

9.0 CONCLUSIONS AND RECOMMENDATIONS

In summary, this study has assessed whether or not a small-scale test based on the Cone Calorimeter method could be used to gauge the flammability behavior of materials used in motor vehicles. The present study has shown that, with the appropriate range of heat flux values, small-scale Cone Calorimeter measurements enable an accurate and representative prediction of the flammability behavior of materials used in motor vehicles. They have also shown that the replacement method conforms to thermodynamic scaling laws – both in terms of microscopic scalability as well as macroscopic component and system scalability. Along the critical path toward the empirical validation of the replacement test method, the most salient results of this study can be summarized as follows.

1. An extensive review of published literature and unpublished reports indicated that propagation times of vehicle fires measured in full-scale fire burns are within the range of estimates from field investigations, although this range is rather wide and based on a very small sample. Whether or not the vehicle has crashed prior to fire initiation in the engine compartment does not seem to make much difference. These data indicated that the most suitable heat flux ranges for evaluating the fire performance of motor vehicle components and materials were as follows: 0-61 kW/m^2 for components in the engine compartment; 20-40 kW/m^2 for components in the passenger compartment; and, 10-180 kW/m^2 for exterior components exposed to a fuel spill fire.

2. Interior parts account for most of the exposed area and quantity of combustible materials inside the passenger compartment based on the findings of earlier work by Abu-Isa et al. [42-45]. Approximately two-thirds of all parts tested in the present study were, therefore, selected from inside the passenger compartment. This selection criterion proved to be appropriate for validating the scaling laws of component and system behavior as determined by the present study.

3. Analysis of the microscopic thermal properties of component materials indicated that, with the exception of polyurethane foam materials, all other materials subjected to MDSC analysis exhibited crystalline polymer morphologies with well-defined first-order melt transitions.

4. At a molecular level, polyurethane seat foam materials exhibited the most change as a function of temperature (≤ 300 °C). These changes were consistent across most vehicle brands, and provided evidence for thermal degradation of the polyurethane network. The specific form of thermal degradation appears to occur via chain scission of the amide-ester linkages of the urethane network. A noteworthy phenomenon too was the initial presence and subsequent consumption of unreacted isocyanate species.

5. The thermo-molecular stability of carpet and fabric fibers of the aromatic polyester type, such as polyethylene terephthalate (PET), was the best among all component materials tested.

6. Component materials consisting of polyolefin thermoplastics, polypropylene and polyethylene, also exhibited thermal stability to the extent that molecular degradation was not observed within the said temperature range (≤ 300 °C).

7. A positive correlation was derived from the relationship between the microscopic enthalpies of component materials and the time to ignition determined macroscopically by the small-scale Cone Calorimeter measurements, independent of vehicle brand. Notably, the correlation improved slightly as the heat flux was increased. It was shown that carpet and fabric fibers (PET) deviate most from the downward scalability of the Cone Calorimeter measurements.

8. Overall, the Cone Calorimeter test method was shown to be scalable down to the microscopic thermal behavior of most materials. By contrast, no such scalability laws could be derived from the FMVSS 302 test standard.

9. At a macroscopic level, the Fire Propagation Index (FPI) determined by the Cone Calorimeter methods can provide a reasonably accurate indication for full-scale fire behavior as long as the materials stay in place and do not melt and drip. Materials with an FPI of 20 $m^{5/3}/kW^{2/3}\text{-}s^{1/2}$ as defined in this study, i.e., based on the peak heat release rate at 50 kW/m^2 measured in the Cone Calorimeter are expected to have a decelerating fire propagation. Of all materials tested in this study carpets and fabrics had the lowest FPI values and are expected to have the best performance in an actual automobile fire.

10. Peak heat release rate of automobile parts in a real fire will be higher than expected on the basis of the FPI of the materials involved if these melt when exposed to heat. The heat release rate of these types of components appears to be relatively independent of incident heat flux and can be estimated more accurately on the basis of a pool fire analysis. The pool fire size in the ICAL experiments conducted as part of this study was determined by the size of the catch pan at the bottom of the specimen holder. More work is needed to develop a methodology for estimating the pool fire size in actual vehicle fires.

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APPENDIX A

FIRE TEST PROCEDURES

(Contains 4 Pages)

A.1 THE CONE CALORIMETER

For organic solids, liquids, and gases, a nearly constant net amount of heat is released per unit mass of oxygen consumed for complete combustion. An average value for this constant of 13.1 MJ/kg of O_2 can be used for practical applications and is accurate with very few exceptions to within ± 5%. Therefore, measurements of the oxygen consumed in a combustion system can be used to determine the net heat released. This technique, generally referred to as the "oxygen consumption technique," is now the most widely used and accurate method for measuring heat release rate in experimental fires.

The Cone Calorimeter is a sophisticated small-scale test apparatus, which measures the rate of heat release of materials and products under a wide range of conditions using the oxygen consumption technique. A schematic of the instrument is shown in Figure A-1. Other useful information obtained from Cone Calorimeter tests includes time to ignition, mass loss rate, smoke production rate, and effective heat of combustion.

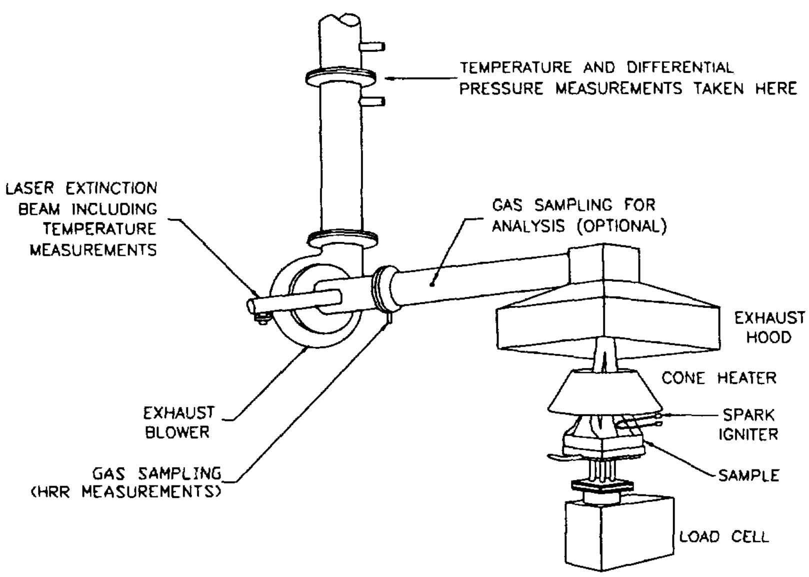

Figure A-1. Schematic of the Cone Calorimeter apparatus.

In the Cone Calorimeter, a square sample of 100 x 100 mm (4 x 4 in.) is exposed to the radiant flux of an electric heater. The heater is in the shape of a truncated cone and is capable of providing heat fluxes to the specimen in the range of 10 to 110 kW/m². An electric spark ignition source is used for piloted ignition of the pyrolysis gases produced by the radiant heater.

Test specimens are to be representative of the product's end use and can have a maximum thickness of 50 mm (2 in.). Specimens with a thickness of less than 6 mm are to be tested using a substrate that is representative of end-use conditions. Prior to testing, the test specimen is wrapped in aluminum foil, backed with a layer of low-density refractory fiber blanket, and placed in a standard specimen holder. An optional edge frame can be used to retain the sample within the specimen holder during testing. A load cell is used to measure the mass loss of the specimen throughout the duration of the test.

At the start of a test, the specimen (in the appropriate holder) is placed on the load cell, which is located below the heater. The top edge of the specimen is typically positioned 25 mm below the base plate of the heater. An electric spark ignitor is located 13 mm above the center of the specimen. Ten sec after the pyrolysis gases released by the specimen ignite, the electric spark ignitor is removed.

The products of combustion and entrained air are collected in a hood and extracted through a duct by a fan. A gas sample is drawn from the exhaust duct and analyzed for oxygen concentration. Smoke production is determined on the basis of the measured light obscuration in the duct using a laser photometer located close to the gas sampling point. The gas temperature and differential pressure across an orifice plate are used for calculating the mass flow rate of the exhaust gases.

The Cone Calorimeter apparatus, calibration procedure, and test protocol are standardized in the United States as ASTM E 1354-99 and NFPA 271: 1998, "Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter" and internationally as ISO 5660-1:1993, "Fire tests—Reaction to fire—Part 1: Rate of heat release from building products—(Cone Calorimeter method)." ASTM E 1354 and NFPA 271 are functionally identical to ISO 5660 except that the ISO standard does not address smoke production. SwRI's Cone Calorimeter is capable of performing tests in accordance with the ASTM, NFPA, and ISO standards.

A.2 INTERMEDIATE-SCALE CALORIMETER

The Intermediate-scale CALorimeter (ICAL) forms the subject of ASTM Standard E 1623. A schematic of the ICAL apparatus is shown in Figure A-2. The apparatus consists of an array of gas heaters, forming a vertical radiant panel with a height of approximately 1.33 m and width of approximately 1.54 m. A standard test specimen measures 1 m x 1 m, and is positioned parallel to the radiant panel. Irradiance to the specimen is preset to a maximum of 50 kW/m^2 by adjusting the distance to the panel. Gas flow to the panel is controlled to maintain the temperature to the panel, and consequently the irradiance to the specimen. The products of pyrolysis from the specimen are ignited with hot wires located close to, but not in contact with the specimen at its top and bottom. The specimen is placed in a holder that is put on a load cell to measure mass loss during testing. Panel and specimen are positioned beneath the hood of the standard room test, ISO 9705. All products of combustion are collected in the hood and continuously extracted through the exhaust duct. Instrumentation is provided in the duct for measuring heat release rate on the basis of oxygen consumption. A smoke photometer is also included for measuring smoke obscuration in the duct. The ICAL has also been used to test non-planar specimens exposed from one side to a uniform radiant heat flux.

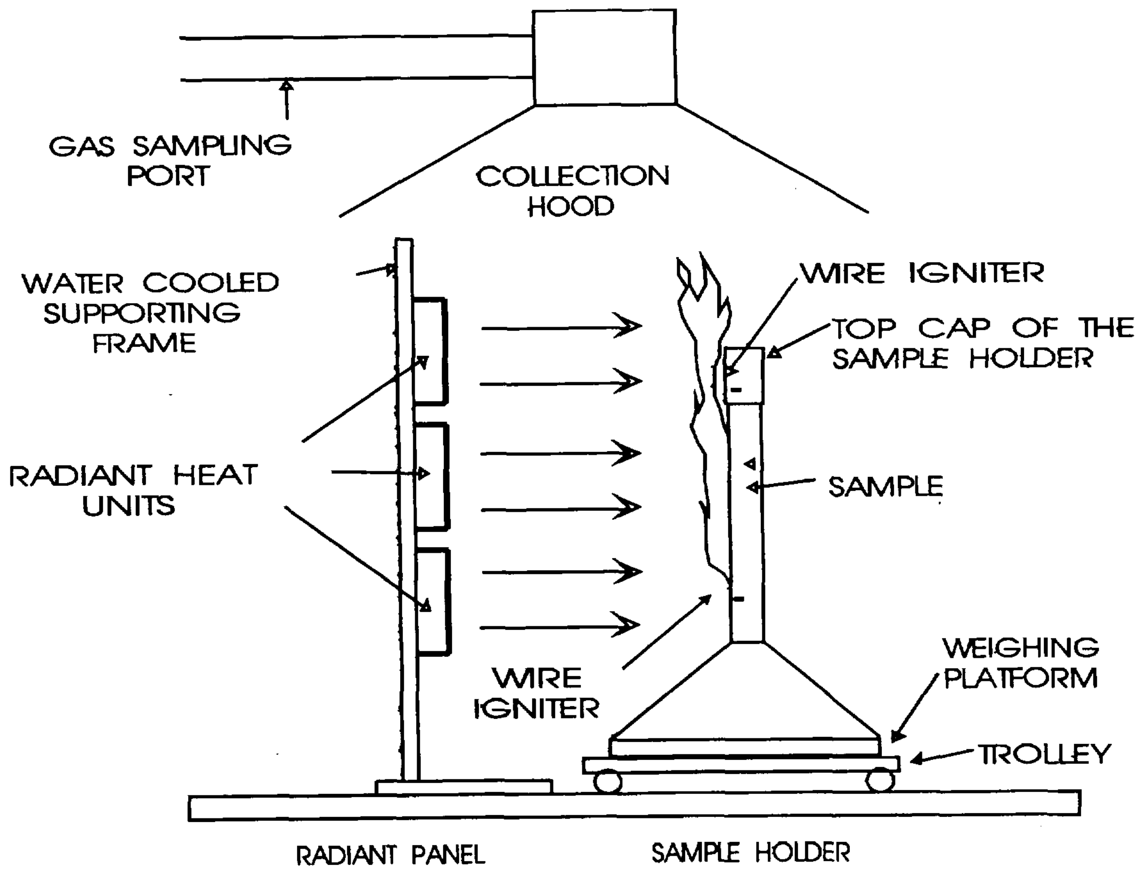

Figure A-2. Schematic of the ICAL apparatus.

A.3 FEDERAL MOTOR VEHICLE SAFETY STANDARD (FMVSS) 302

FMVSS 302 addresses flammability for materials used in the occupant compartments of motor vehicles (passenger cars, multipurpose passenger vehicles, trucks and buses). The primary purpose for the development of this standard was to reduce deaths and injuries to passengers caused by fires originating in the passenger compartment. Typical materials that are tested are as follows:

- Seat cushions
- Seat belts
- Convertible tops
- Trim panels
- Head restraints
- Sun visors
- Shades
- Engine compartment covers
- Instrument panel padding
- Seat backs
- Headlining
- Arm rests
- Compartment shelves
- Floor coverings
- Curtains
- Wheel housing covers
- Mattress covers
- Other material designed to absorb crash energy

These materials are tested if any portion of the material is within ½ in (13 mm) of the occupant compartment air space. All materials that do not adhere to other materials at every point of contact are required to meet a requirement for the rate of flamespread. Materials that are adhered at every point of contact are tested together, to a thickness of ½ in. If it is not possible to prepare a flat specimen because of surface curvature, the test specimen is prepared so that the thickness does not exceed ½ in at any point. Materials are prepared to dimensions of 4 x 14 in, with a maximum thickness of ½ in, and are prepared with the surface material in the direction that provides the most adverse test results. Materials with napped or tufted surfaces are combed twice against the nap prior to testing.

Test specimens are mounted in a U-shaped frame face down. Specimens that are less than 2-in wide are supported in a special frame with wire supports. The frame is placed into a ventilated 8 × 15 × 14-in (200 × 380 × 355-mm) tall chamber (shown below) to protect against drafts. The gas flow to a Bunsen burner is adjusted to provide a 1.5 in. (38 mm) flame, and the burner is placed ¾ in below the center of the open end of the frame. The underside is exposed to the flame for 15 sec, and timing is recorded when the flame front reaches a point 1.5 in from the exposed end. The time for the flame to travel along the underside of the specimen, from a point 1.5 in from the exposed end of the frame to a point 1.5 in from the clamped end of the specimen, is recorded. The rate of flamespread is then calculated.

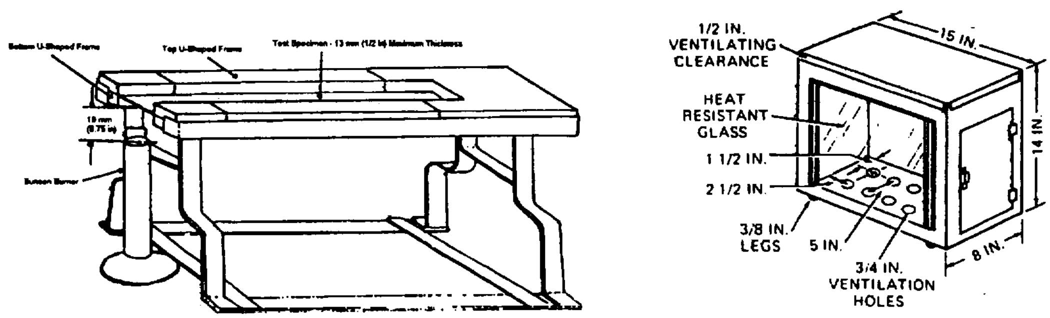

Figure A-3. Left – specimen holder; right – test chamber.

If the material burns for not more than 1 min, and progresses no farther than 2 in from the point where timing began, it is considered to meet the burn-rate requirements. If the flame front self extinguishes before it reaches the end point, the time is recorded to the point where flaming stops.

FMVSS 302 does not specify the number of specimens that are tested. Other test methods, such as ASTM D 5132-93, "Standard Test Method for Horizontal Burning Rate of Flexible Cellular and Rubber Materials Used in Occupant Compartments of Motor Vehicles," specify that five specimens be burned in each direction if the material has a coating or covering that is considered to be directional. The FMV standard states that materials with directional coatings are to be tested in the direction that produces the "worst case" performance.

APPENDIX B

DESCRIPTION OF VEHICLE COMPONENTS

Model: Chevrolet Cavalier	Mass: 820 g 1.8 lb
Part: Headrest	Color: Gray fabric
Part No.: 12457891	Dimensions: 191 × 267 × 102 mm 7.5 × 10.5 × 4 in.
Description: Two mm gray vinyl cover exterior, polyurethane foam interior. Two 9.5-mm (3/8-in.) diameter steel rods protruding from the bottom of the headrest, 140-mm (5.5-in.) long.	

Model: Chevrolet Cavalier	Mass: 1500 g, 520 g (fabric), 980 g (foam) 3.3 lb, 1.1 lb (fabric), 2.2 lb (foam)
Part: Seat back (cover and pad)	Color: Gray fabric, yellow foam
Part No.: 22589249	Dimensions: 559 × 508 × 102 mm 22 × 20 × 4 in.
Description: Gray fabric adhered to yellow foam with 102-mm (4-in.) wings.	

Model: Chevrolet Cavalier	Mass: 1380 g, 420 g (fabric), 960 g (foam) 3.0 lb, 0.9 lb (fabric), 2.1 lb (foam)
Part: Seat bottom (cover and pad)	Color: Gray fabric, yellow foam
Part No.: 12532840	Dimensions: 559 × 508 × 102 mm 22 × 20 × 4 in.
Description: Gray fabric adhered to yellow foam.	

Model: Chevrolet Cavalier	Mass: 8360 g 3.8 lb
Part: Headliner	Color: Tan/gray
Part No.: 22619703	Dimensions: 889 × 1321 × 7 mm 35 × 52 × 9/32 in.
Description: One whole piece.	

Model: Chevrolet Cavalier	Mass: 1990 g 4.38 lb
Part: Glove box cover	Color: Gray exterior, black interior
Part No.: 22587440	Dimensions: 254 × 381 × 25 mm 10 × 15 × 1 in.
Description: Three-layered construction. Dark gray plastic exterior, steel middle portion, and black plastic inside.	

Model: Chevrolet Cavalier	Mass: 1400 g 3.1 lb
Part: Door panel	Color: Black/gray plastic
Part No.: 22618443	Dimensions: 864 × 533 × 3.2 mm 34 × 21 × 1/8 in.
Description: Plastic, with 152 × 229 mm (6 × 9 in.) area covered in fabric similar to seat cover fabric.	

Model: Chevrolet Cavalier	Mass: 10400 g 22.9 lb
Part: Carpet	Color: Dark gray carpet with multi-colored foam backing
Part No.: 22628609	Dimensions: 1422 × 1727 × 20 mm 56 × 68 × 25/32 in.
Description: Dark gray carpet with 13 mm (1/2 in.) foam backing. Foam covers ~75% of the area of the carpet.	

Model: Chevrolet Cavalier	Mass: 196 g 0.43 lb
Part: HVAC vents	Color: Black
Part No.: 52460744	Dimensions: 241 × 279 × 4 mm 9.5 × 11 × 5/32 in.
Description: Irregularly shaped black plastic. Material is homogenous.	

Model: Chevrolet Cavalier	Mass:
Part: Air filter assembly	Color: Black/gray plastic
Part No.:	Dimensions:
Description:	

Model: Chevrolet Cavalier	Mass: 1400 g 3.1 lb
Part: Wiring Harness	Color: Black conduit, multi-colored wire
Part No.: 22621025	Dimensions: Main trunk, 1067 mm (42 in.) long × 32 mm (1.25 in.) dia. Branch, 305 mm (12 in.) long × 13 mm (0.5 in.) dia. Plastic box, 254 × 64 × 51-mm (10 × 2.5 × 2-in.)
Description: Three plastic box containers, conduits containing wires. Conduits of varying diameter and thickness.	

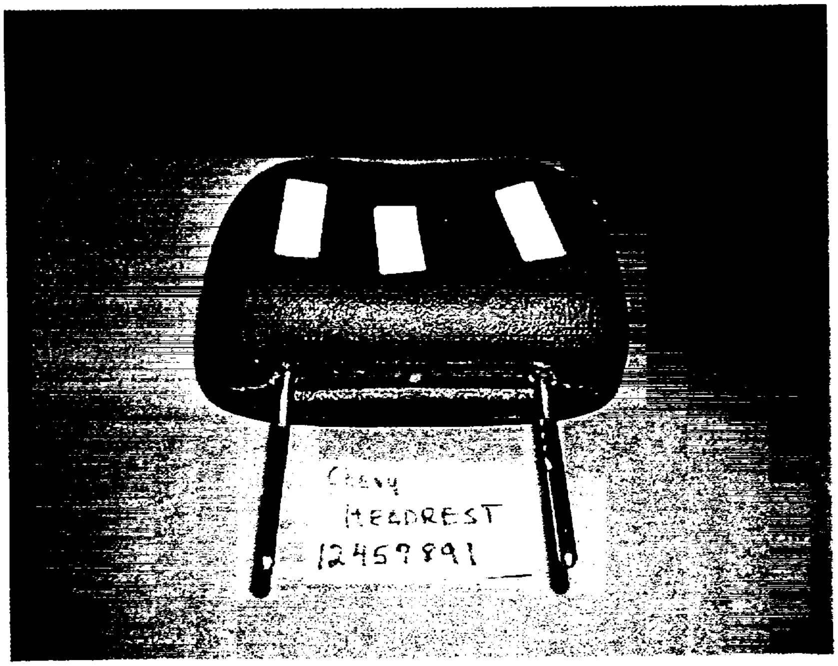

Figure B-1. Chevy Cavalier Headrest

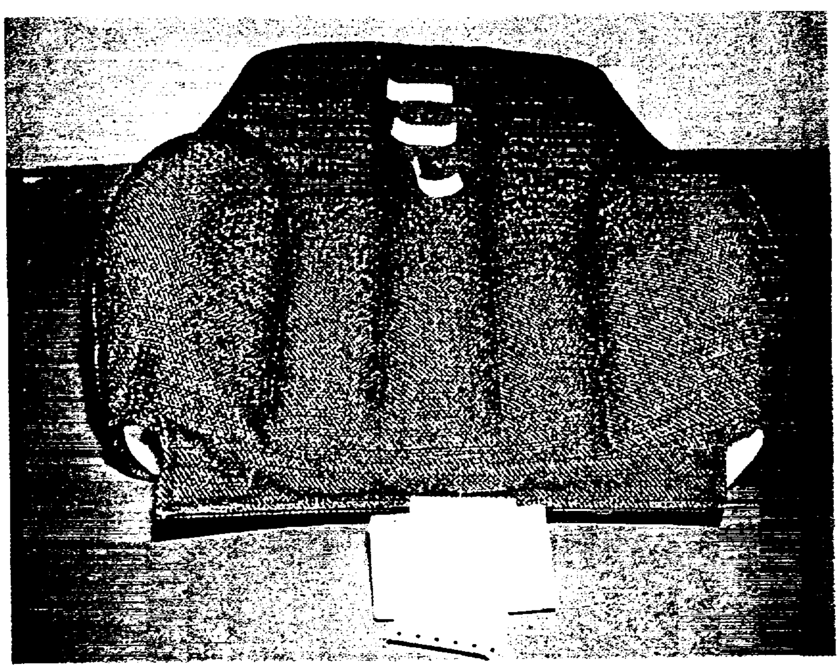

Figure B-2. Chevy Cavalier Seat Back

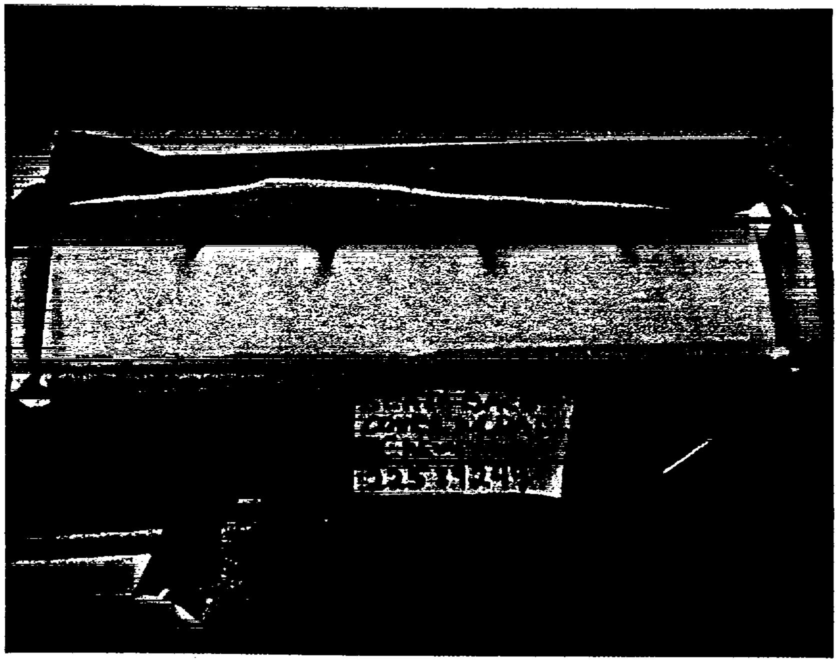

Figure B-3. Chevy Cavalier Seat Back Foam

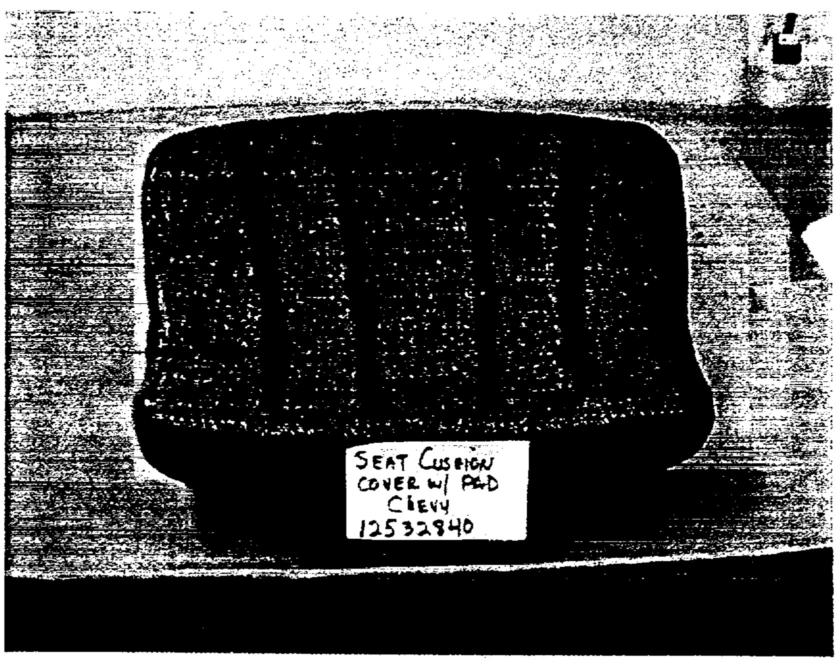

Figure B-4. Chevy Cavalier Seat Bottom

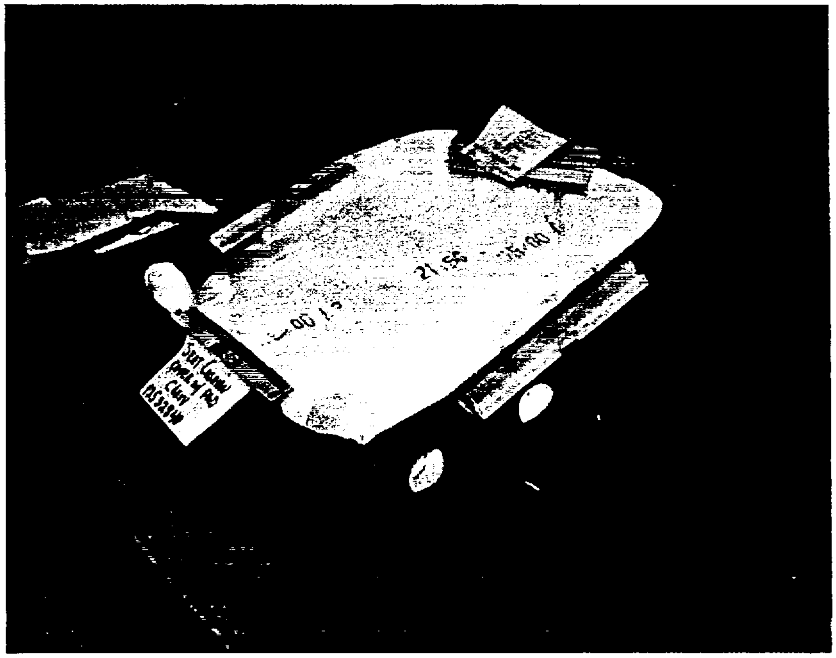

Figure B-5. Cavalier Seat Bottom Foam

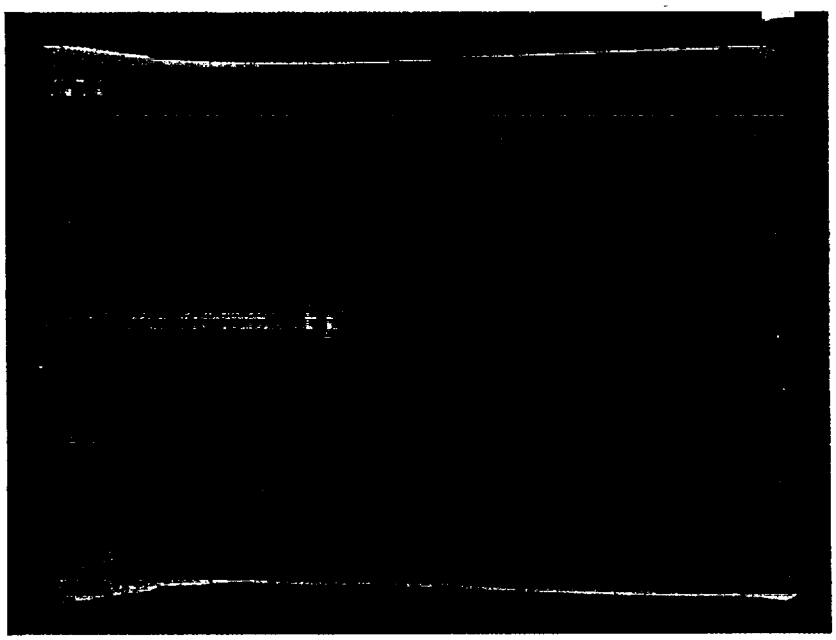

Figure B-6. Chevy Cavalier Headliner

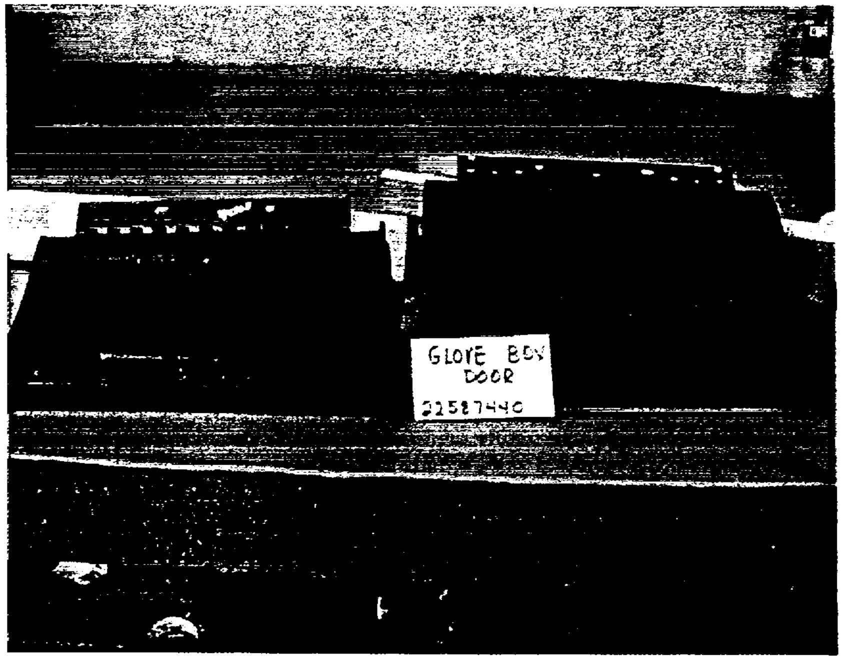

Figure B-7. Chevy Cavalier Glove Box Covers

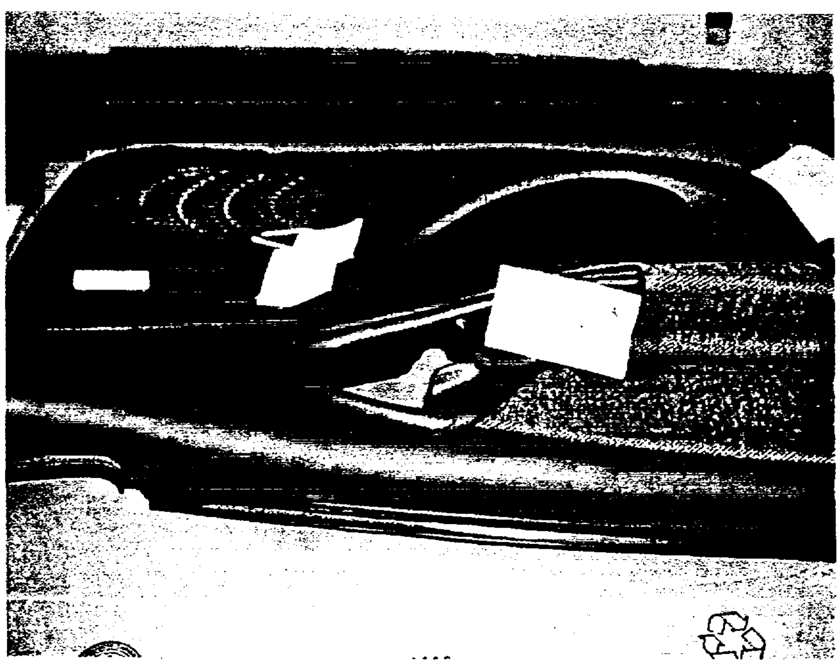

Figure B-8. Chevy Cavalier Door Panel

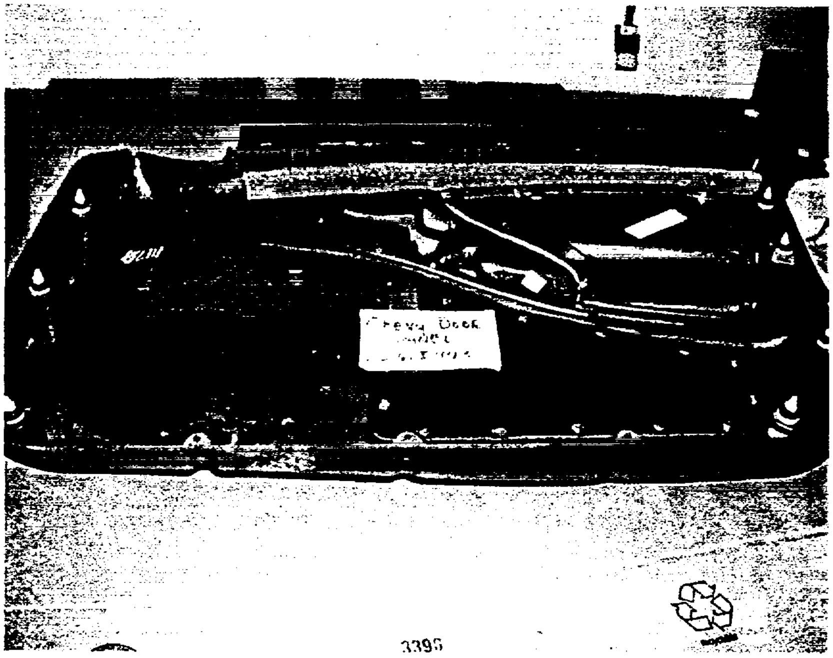

Figure B-9. Chevy Cavalier Door Panel (Inside)

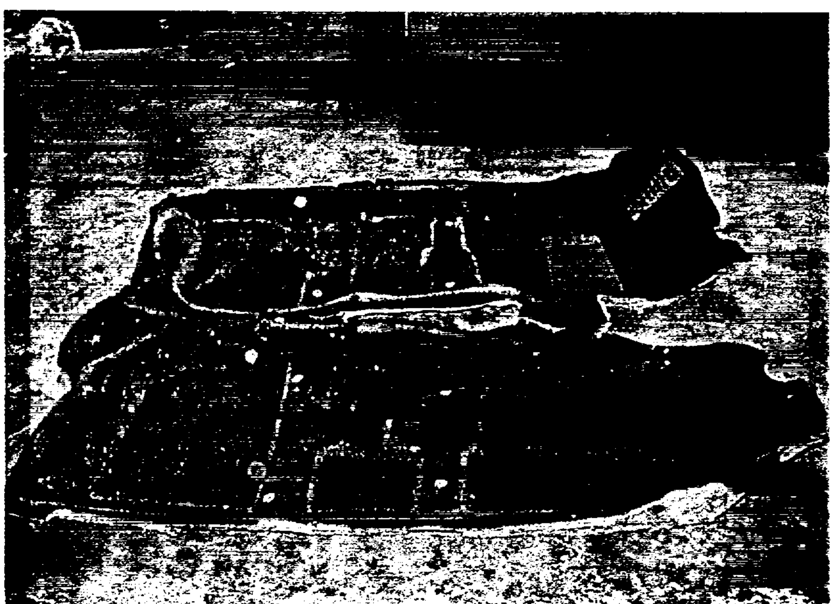

Figure B-10. Chevy Cavalier Carpet

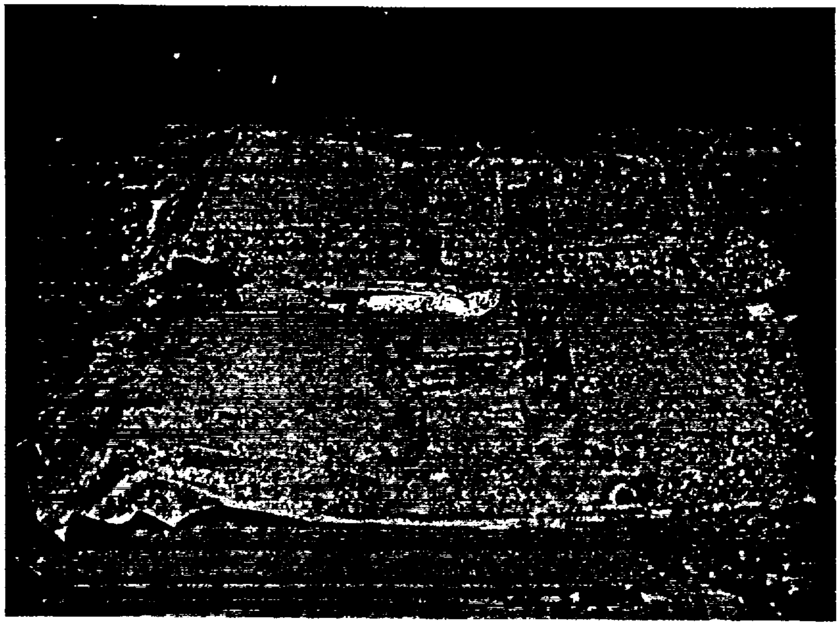

Figure B-11. Chevy Cavalier Carpet Backing

Figure B-12. HVAC Vents

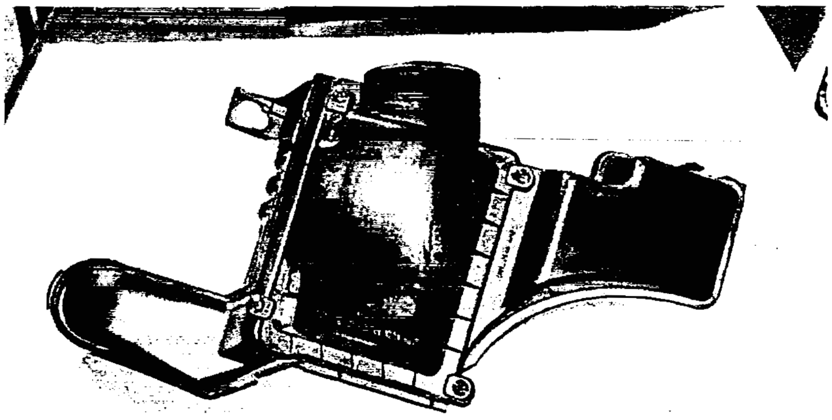

Figure B-13. Chevy Cavalier Air Filter Assembly

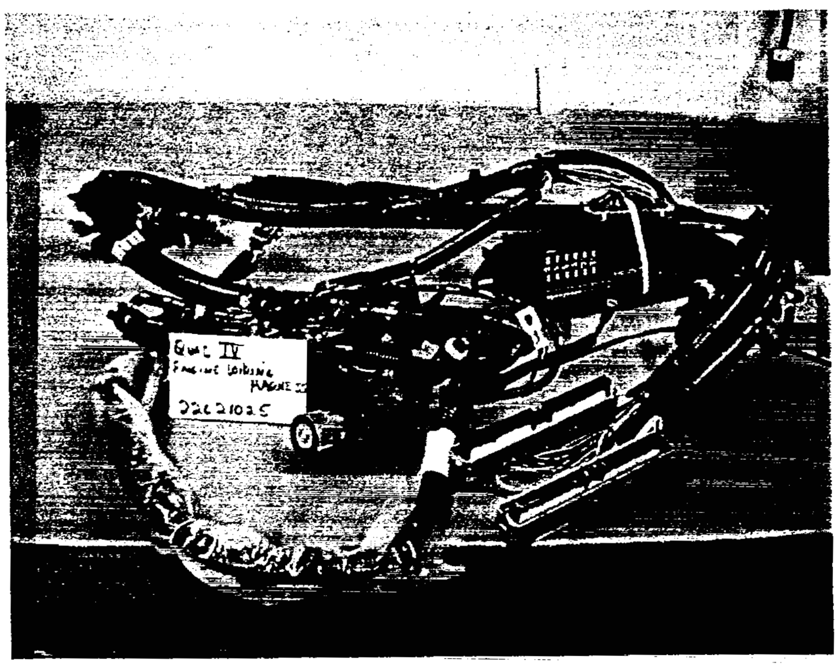

Figure B-14. Chevy Cavalier Wiring Harness

Model: Dodge Neon	Mass: 3550 g, 1860 g (frame), 340 g (cover), 1340 g (foam) 7.8 lb, 4.1 lb (frame), 0.8 lb (cover), 2.9 lb (foam)
Part: Seat bottom	Color: Gray/black
Part No.: SL491AZZAA	Dimensions: 508 × 483 × 102 mm 20 × 19 × 4 in.
Description: Seat cushion complete with spring bars on metal frame bottom. Two fabrics make up approximately 50% each of coverage. Back of cover contains pink and yellow foam, each 50%.	

Model: Dodge Neon	Mass: 2270 g 5.0 lb
Part: Door panel	Color: Tan (grayish)
Part No.: PZ15WL5AK	Dimensions: 914-813 × 533 × 3 mm (36-32 × 21 × 1/8 in.), fabric is 165 × 406 mm (6.5 × 16 in.), circular speaker is 152 mm (6 in.) dia., and the padded armrest is 305 × 76 × 25 mm (12 × 3 × 1 in.)
Description: Tan plastic is 90% of front. Seat contains door handle mechanism, and a fabric area about the padded armrest. Also contains storage compartment and 25-mm (1 in.) dia. hole, which is surrounded on reverse side by 76-mm (3-in.) square by 44 mm (1.75 in.) deep foam. On reverse side is the door handle mechanism, white padding 394 × 254 mm (15.5 × 10 in.), and a clear plastic cup under the armrest.	

Model: Dodge Neon	Mass: 9730 g 21.4 lb
Part: Carpet	Color: Black carpet, gray vinyl backing
Part No.: TN47XDVAA	Dimensions: 1397 × 1829 × 3 mm (55 × 72 × 1/8 in.), cutout in center is 838 × 191 mm (33 × 7.5 in.) Padding: two 508 × 508 × 13 mm (20 × 20 × 0.5 in) + one 1143 × 254 × 13 mm (45 × 10 × 0.5 in.) + two 508 × 178 × 13 mm (20 × 7 × 0.5 in.)
Description: Black carpet with gray vinyl backing over entire surface.	

Model: Dodge Neon	Mass: 126 g 0.3 lb
Part: Kick panel	Color: Tan
Part No.: PV77WL5AB	Dimensions: 152 × 3 mm (6 × 1/8 in.) and 102 × 152 mm (4 × 6 in.) triangle
Description: Textured tan plastic.	

Model: Dodge Neon	Mass: Shield: 840 g or 1.8 lb
Part: Fuel tank	Color: Black w/ metallic shield
Part No.: 50172094A	Dimensions: 813 × 533 × 216 mm. 32 × 21 × 8.5 in.
Description: Plastic fuel tank, 1 only. Fuel cap is 152 mm (6 in.) dia. red plastic w/ white rim. Metal shield is on opposite end from the fuel inlet. Depression on tank measures 140 × 89 mm (5.5 × 3.5 in.) on the bottom side of the tank. Several gauge and instrumentation holes are present in tank.	

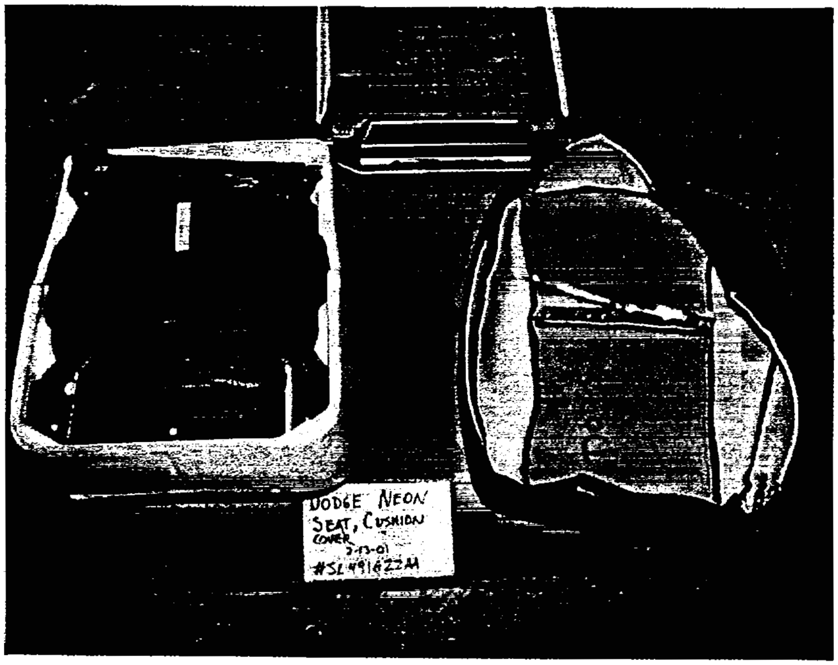

Figure B-15. Dodge Neon Seat Bottom

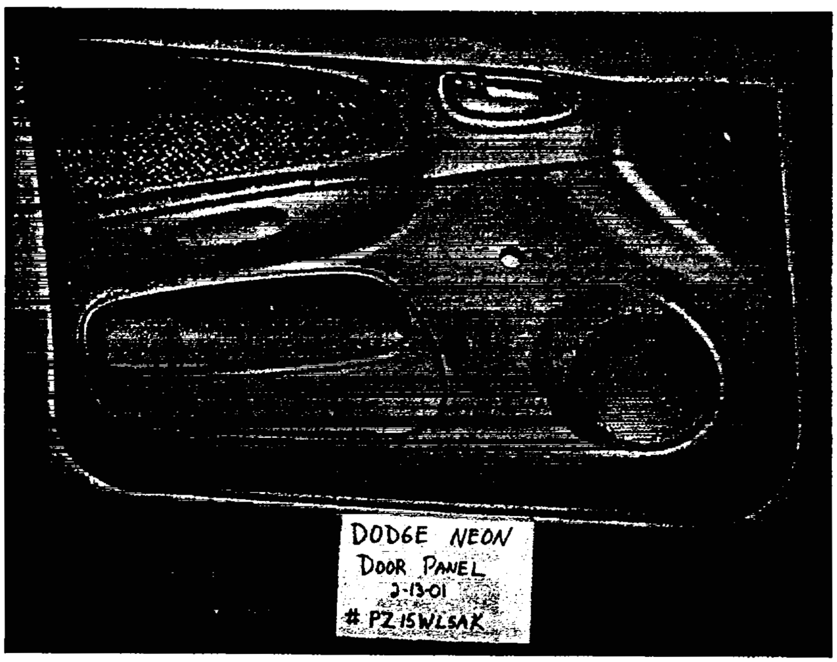

Figure B-16. Dodge Neon Door Panel

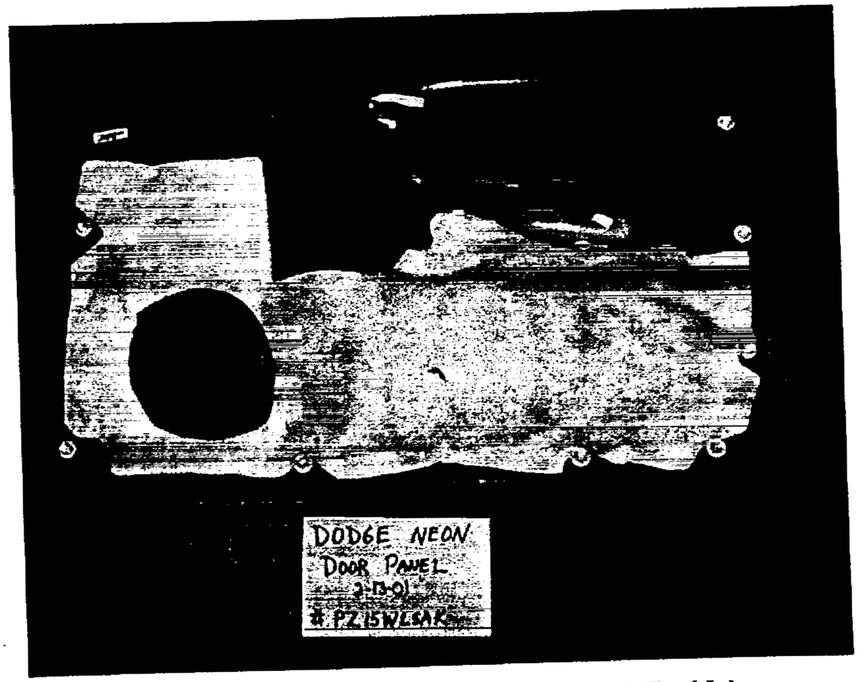

Figure B-17. Dodge Neon Door Panel (Inside)

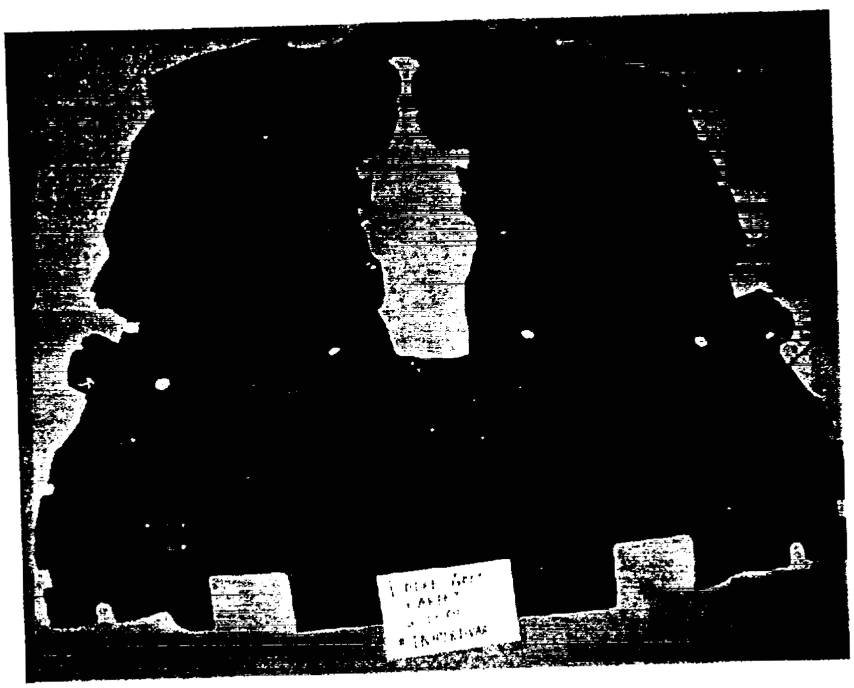

Figure B-18. Dodge Neon Carpet

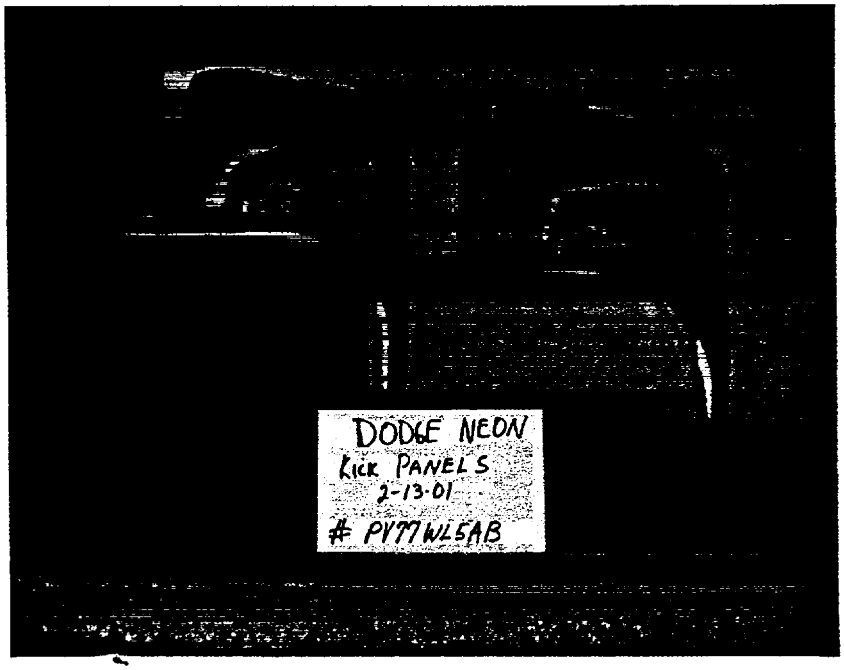

Figure B-19. Dodge Neon Kick Panel

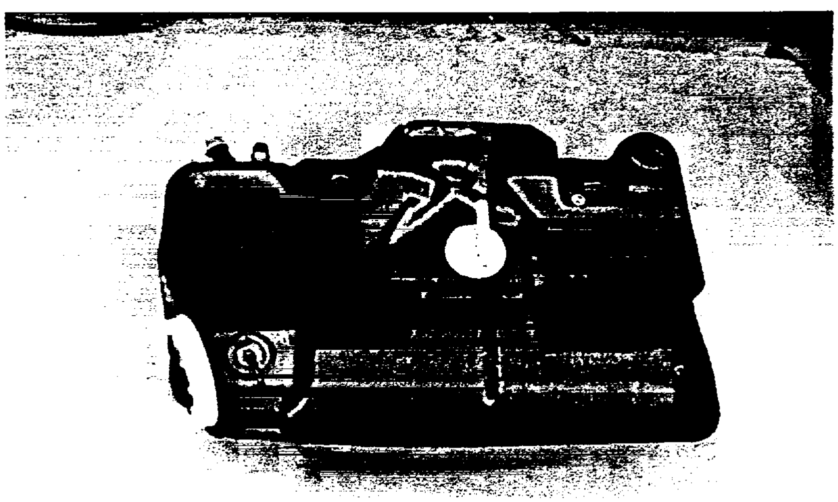

Figure B-20. Dodge Neon Fuel Tank

Model: Ford Focus	Mass: 1280 g 2.8 lb
Part: Headrest	Color: Gray
Part No.: YS4254611A08BBB	Dimensions: 254 × 203 ×102 mm (10 × 8 × 4 in.) with 2 10 mm (3/8 in.) rods, 165 mm (6.5 in.) long.
Description: Gray vinyl fabric over foam.	

Model: Ford Focus	Mass: 940 g 2.1 lb
Part: Seat foam	Color: Yellow
Part No.: YS4Z5464810AB	Dimensions: 660 × 483 × 152 mm 26 × 19 × 6 in.
Description: Extruded polyurethane foam, wings are 102 mm (4 in.) high.	

Model: Ford Focus	Mass: 710 g 1.6 lb
Part: Seat cover	Color: Gray
Part No.: YS4Z462900BAB	Dimensions: 584 × 508 × 165 mm (23 × 20 × 6.5 in.) wide on the side. "Carpet" fabric is 102 × 660 mm (4 × 26 in.)
Description: Semi-rounded cover w/ foam and cloth backing. Two types of fabrics, "carpet" and vinyl with plastic seams 3 mm (1/8 in.) in dia. Fabric is backed with a pink foam (75%) and a white foam (25%).	

Model: Ford Focus	Mass: 1680 g 3.7 lb
Part: Headliner	Color: Gray/tan
Part No.: YS4Z5451916AAB	Dimensions: 1499 × 991 × 3 mm (59 × 39 × 1/8 in.), 51 × 127 mm (2 × 5 in.) cutout
Description:	

Model: Ford Focus	Mass: 2590 g 5.7 lb
Part: Door panel	Color: Gray/tan
Part No.: YS425423942AAB	Dimensions: 559 × 762 × 3 mm (22 × 30 × 1/8 in.) plastic, one block of foam, 76 × 254 32 mm (3 × 10 × 1.25 in.) thick on back. 127 × 305 mm (5 × 12 in.) cutout for door handle, padded armrest panel 89 × 432 mm (3.5 × 17 in.) above armrest, and 25 × 711 mm (1 × 28 in.) weather strip.
Description:	

Model: Ford Focus	Mass: 8180 g 18.0 lb
Part: Carpet	Color: Gray/green back
Part No.: YSAZ5413000BAF	Dimensions: 1321 × 2032 × 6 mm 52 × 80 × ¼ in.
Description: Molded carpet with green foam (80% coverage) adhered to back	

Model: Ford Focus	Mass:
Part: Air filter assembly	Color: Black plastic
Part No.: YS429600NA	Dimensions: Main box, 267 × 127 × 152-203 mm (10.5 × 5 × 6-8 in.) Small box was 152 × 76 × 89 mm (6 × 3 × 3.5 in.)
Description:	

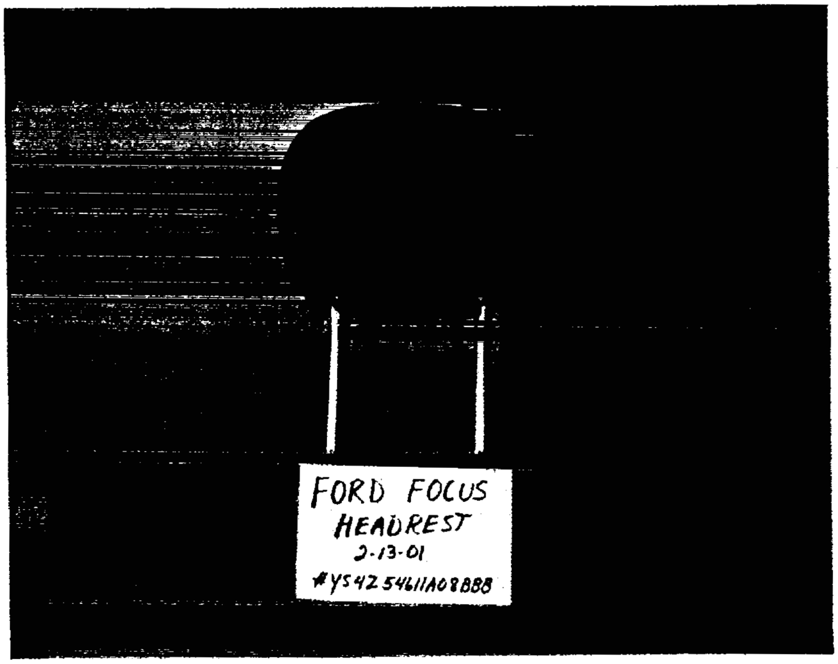

Figure B-21. Ford Focus Headrest

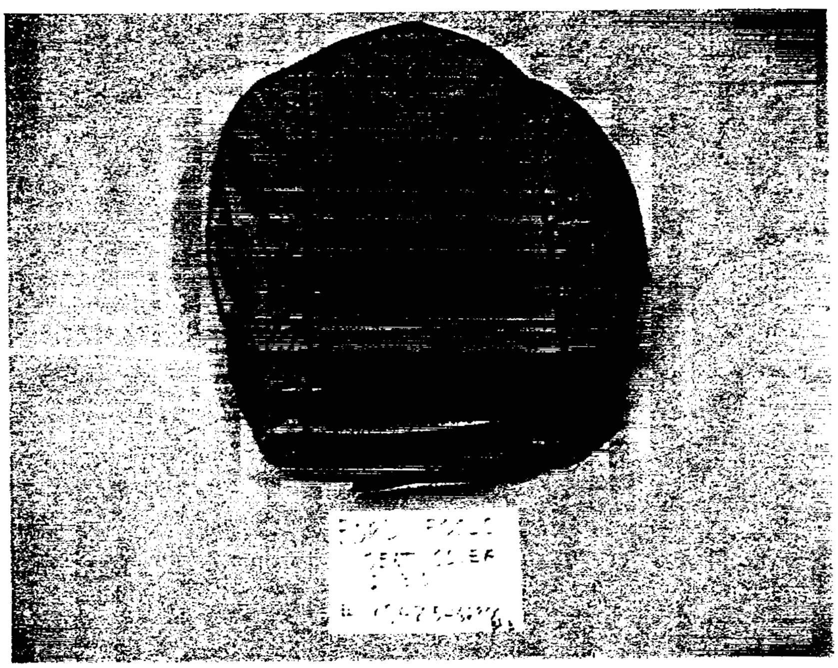

Figure B-22. Ford Focus Seat Bottom Cover

Figure B-23. Ford Focus Seat Bottom Foam

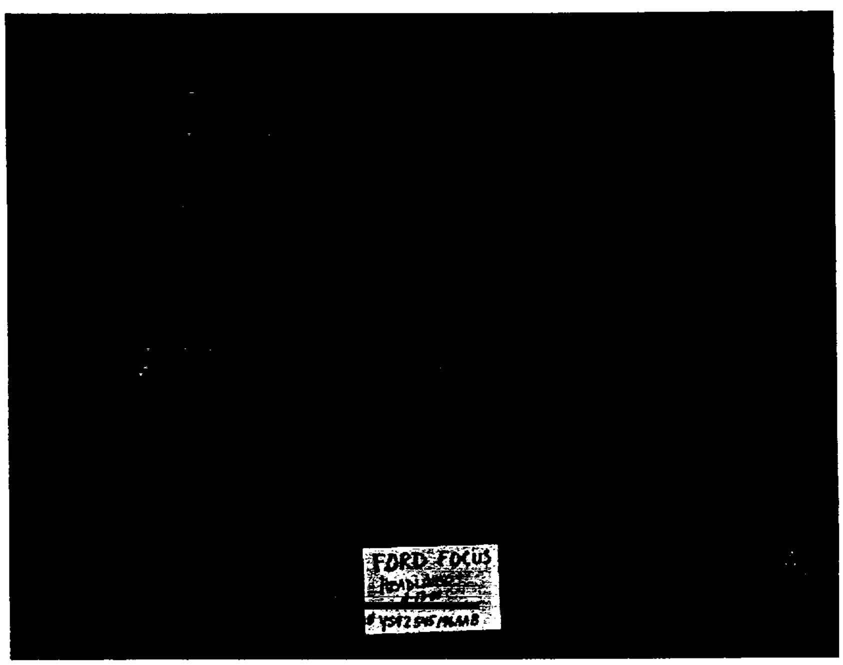

Figure B-24. Ford Focus Headliner

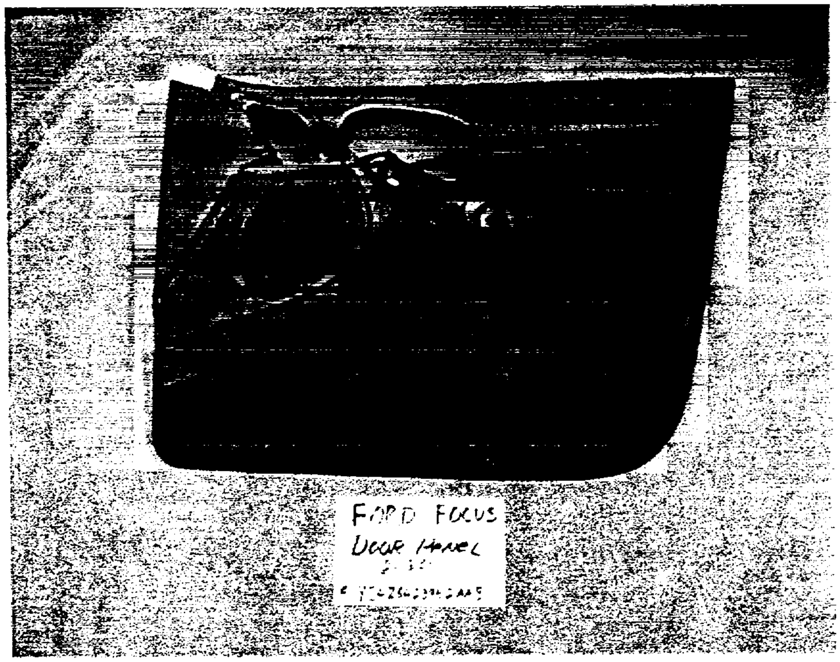

Figure B-25. Ford Focus Door Panel

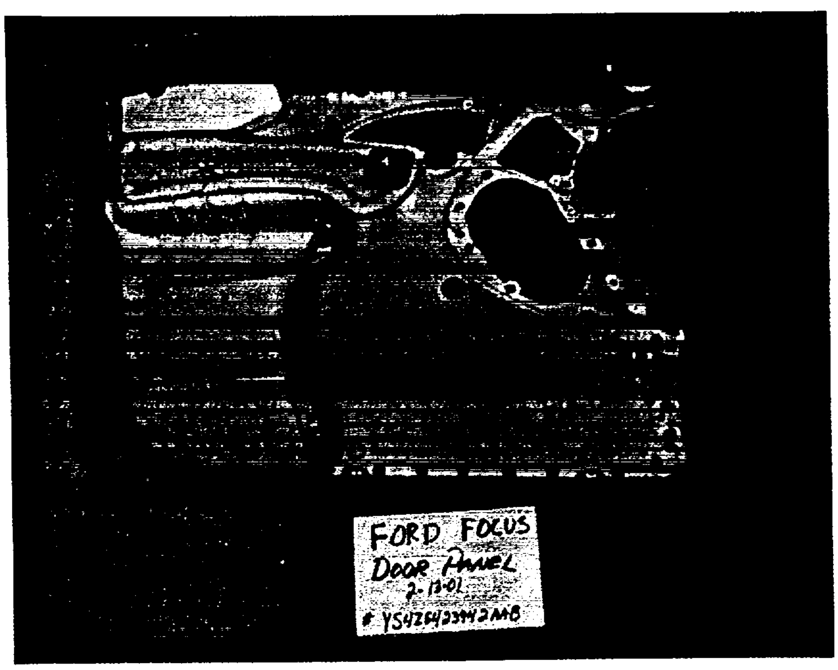

Figure B-26. Ford Focus Door Panel (Inside)

Sampre: Door Panel-Cloth
Size: 11.7300 mg
Method: MDSC Method
Comment: Chevy Cavalier: cloth portion #22618443

DSC

File: C:...\DSC\03614-103.005
Operator: WJM
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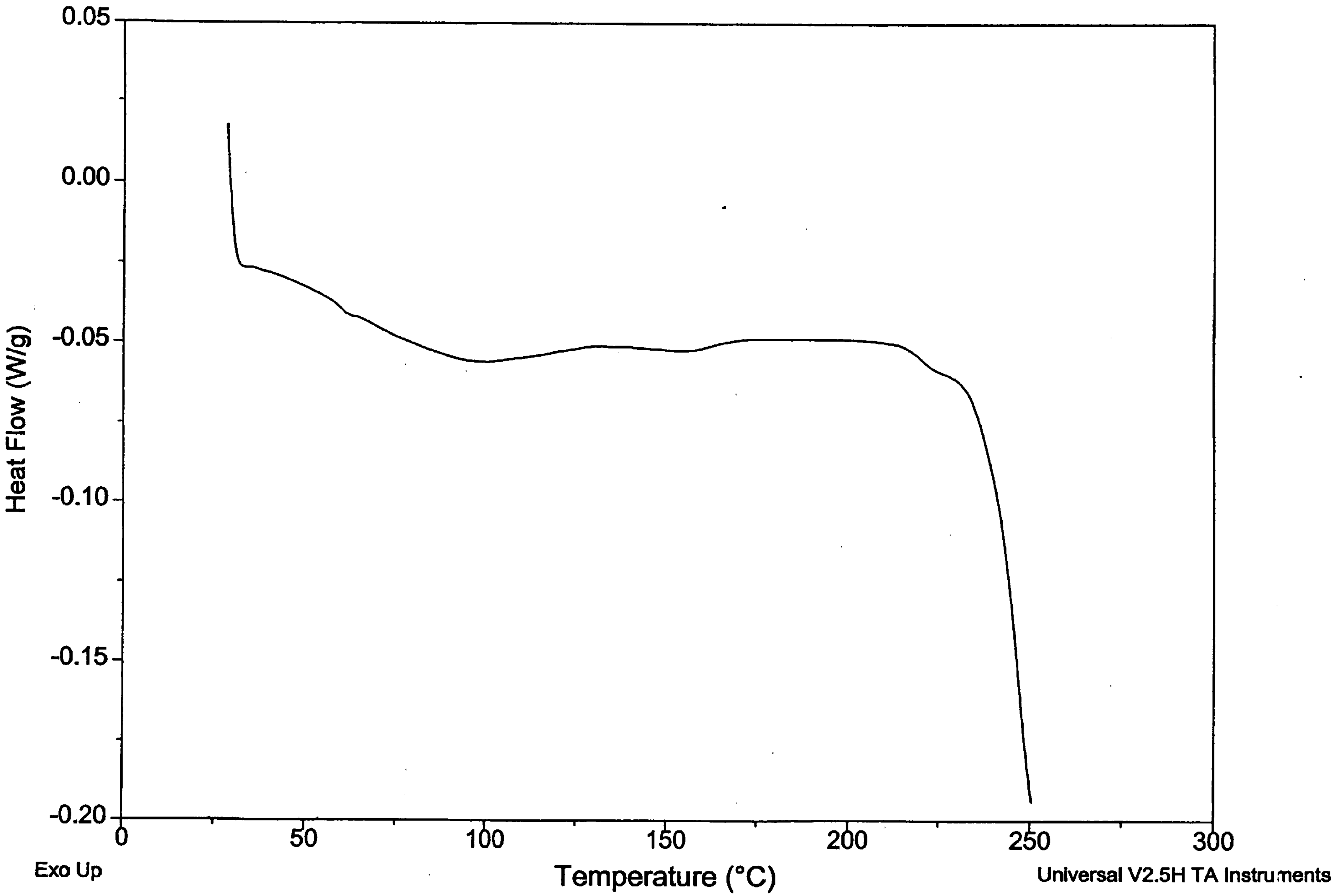

Sample: Door Panel-Backing (2nd run)
Size: 11.2900 mg
Method: MDSC Method
Comment: Chevy Cavalier: Door panel - backing w/o foam #22618443

DSC

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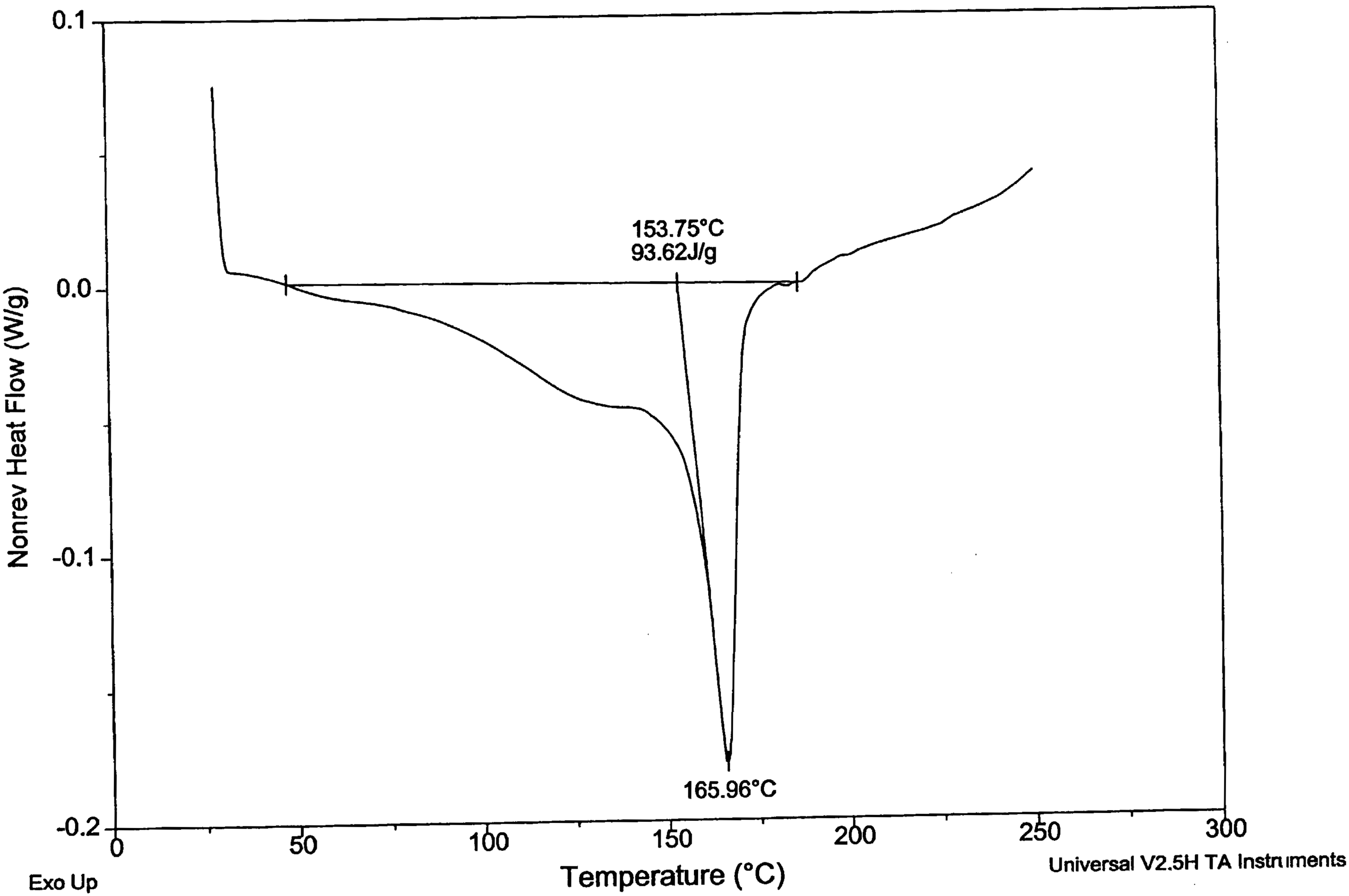
Operator: WJM
Run Date: 10-May-01 14:28



Sample: Door Panel-Backing (2nd run)
Size: 11.2900 mg
Method: MDSC Method
Comment: Chevy Cavalier: Door panel - backing w/o foam #22618443

DSC

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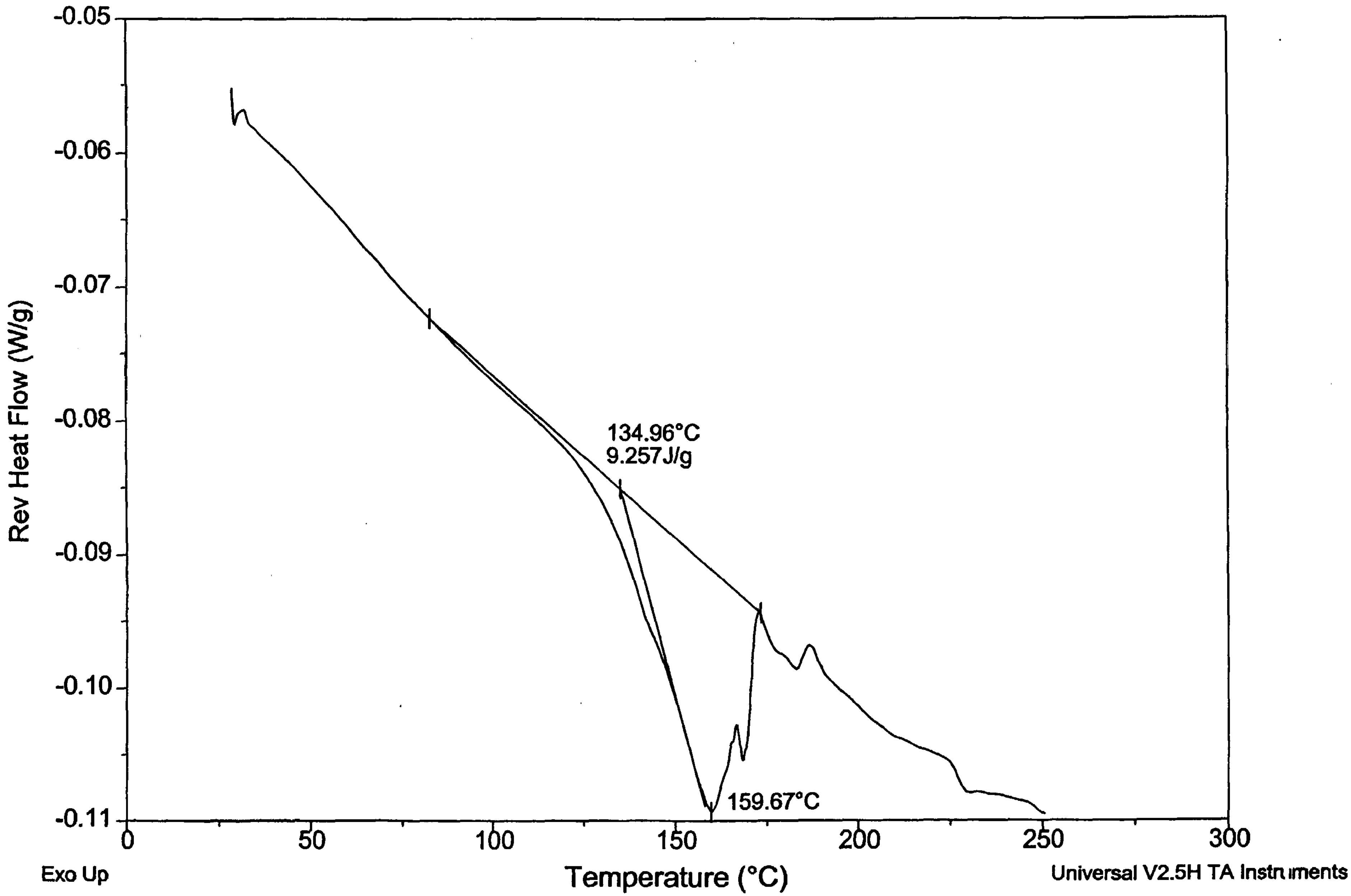
Operator: WJM
Run Date: 10-May-01 14:28



Sample: Door Panel-Backing (2nd run)
Size: 11.2900 mg
Method: MDSC Method
Comment: Chevy Cavalier: Door panel - backing w/o foam #22618443

DSC

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Operator: WJM
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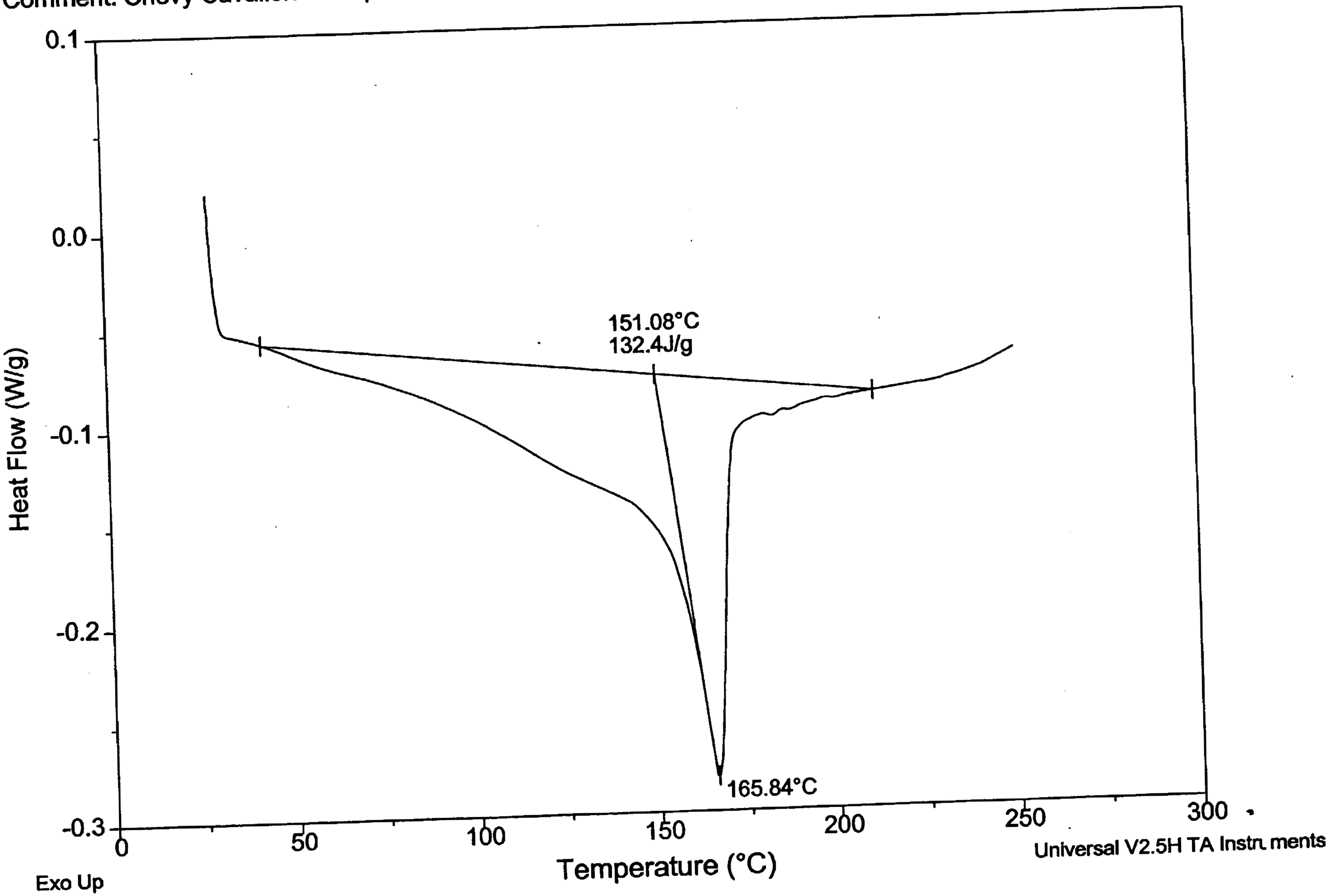

Sampre: Door Panel-Backing
Size: 6.8000 mg
Method: MDSC Method
Comment: Chevy Cavalier: Door panel - backing w/o foam #22618443

DSC

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Operator: WJM
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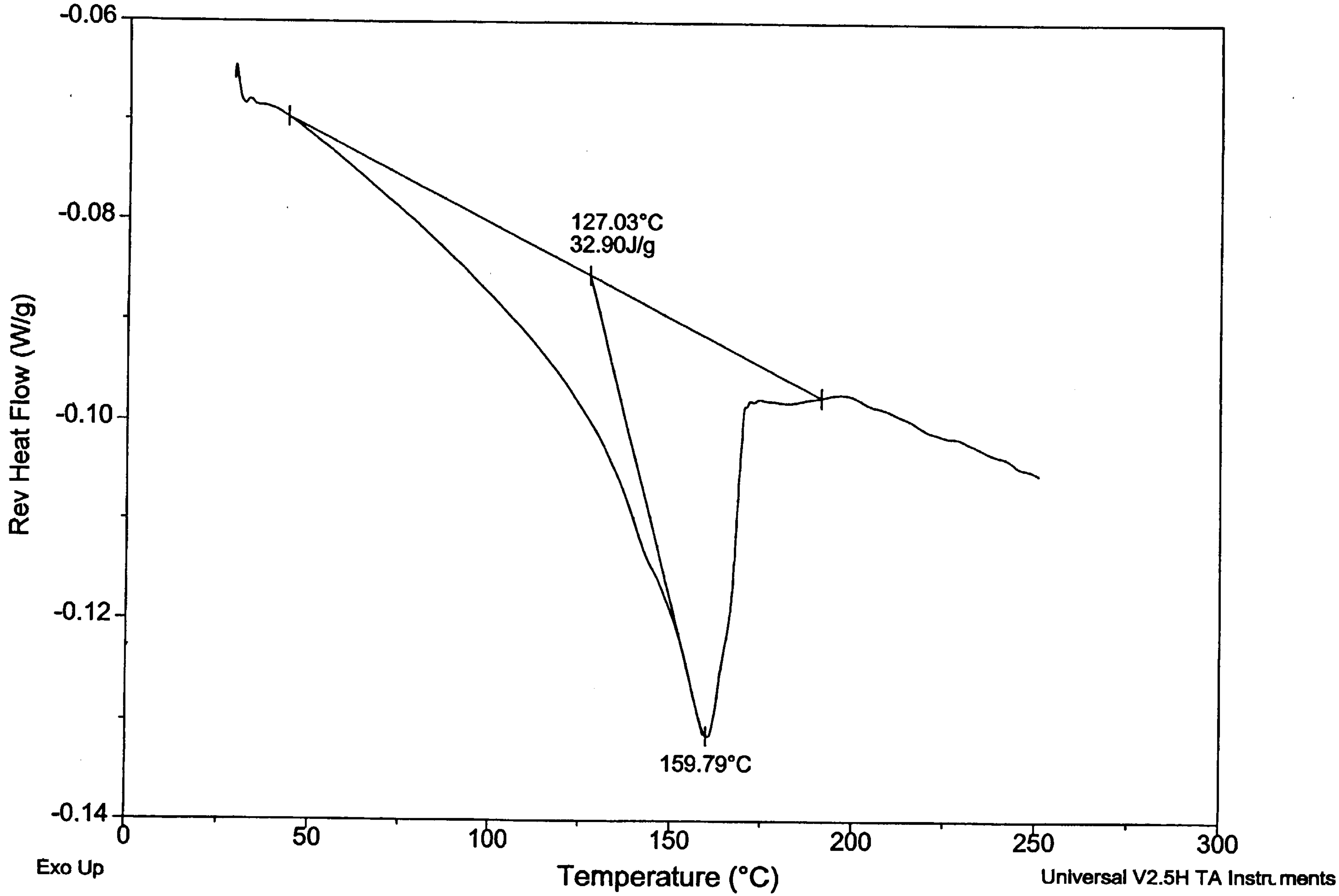

Sampre: Door Panel-Backing
Size: 6.8000 mg
Method: MDSC Method
Comment: Chevy Cavalier: Door panel - backing w/o foam #22618443

DSC

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Operator: WJM
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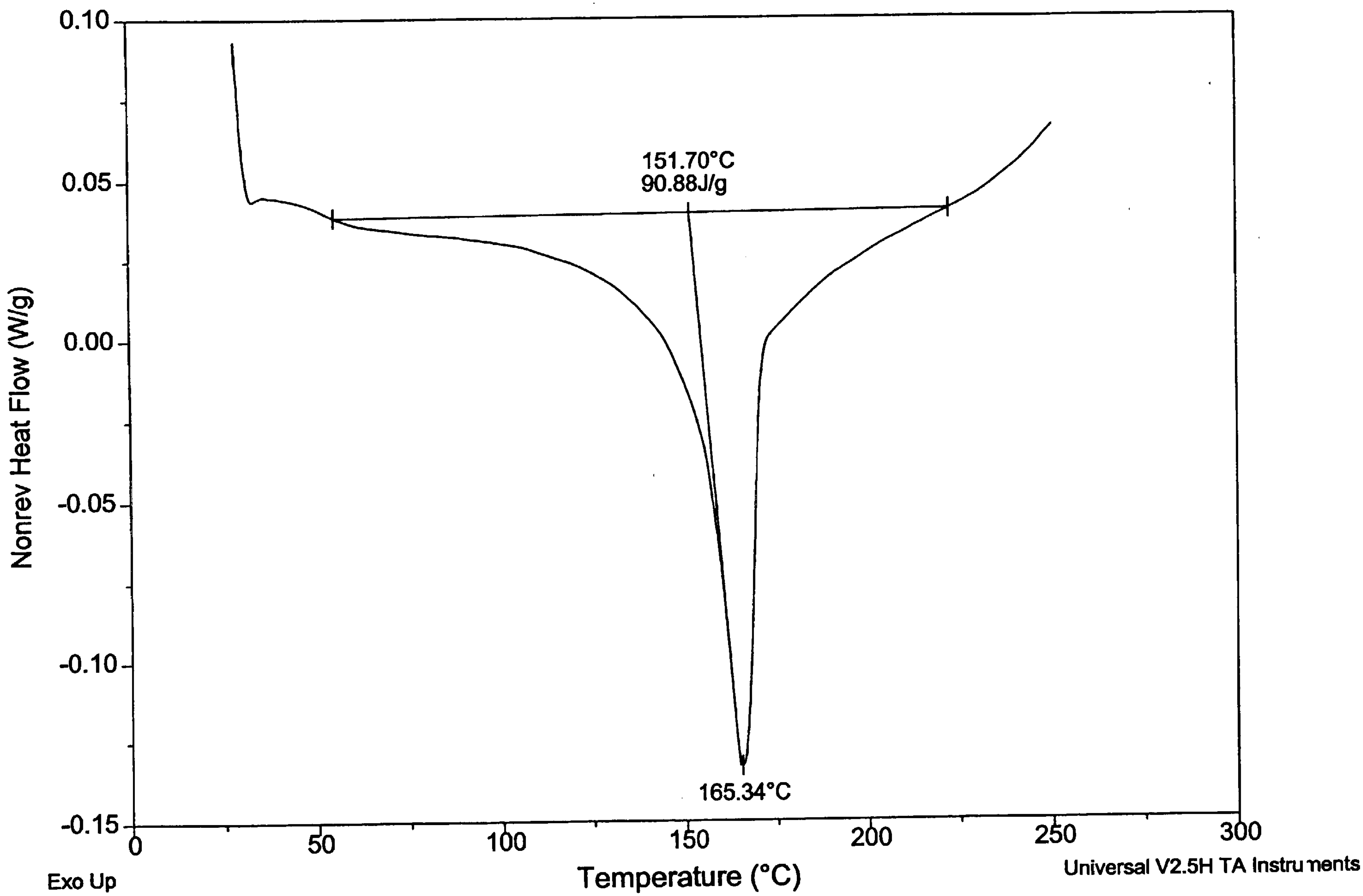

Sample: Door Panel-Backing
Size: 6.8000 mg
Method: MDSC Method
Comment: Chevy Cavalier: Door panel - backing w/o foam #22618443

DSC

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Operator: WJM
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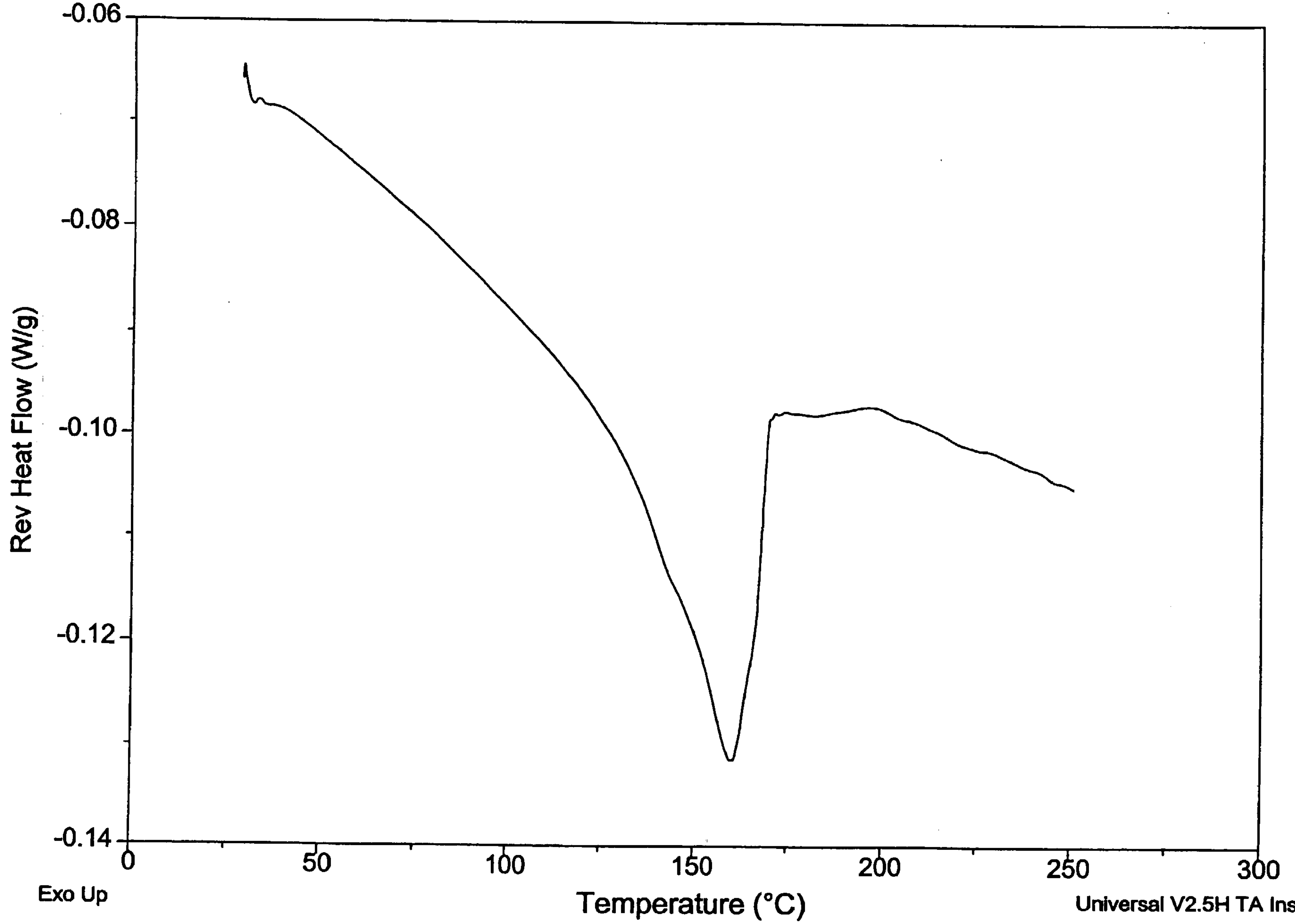

Sample: Door Panel-Backing
Size: 6.8000 mg
Method: MDSC Method
Comment: Chevy Cavalier: Door panel - backing w/o foam #22618443

DSC

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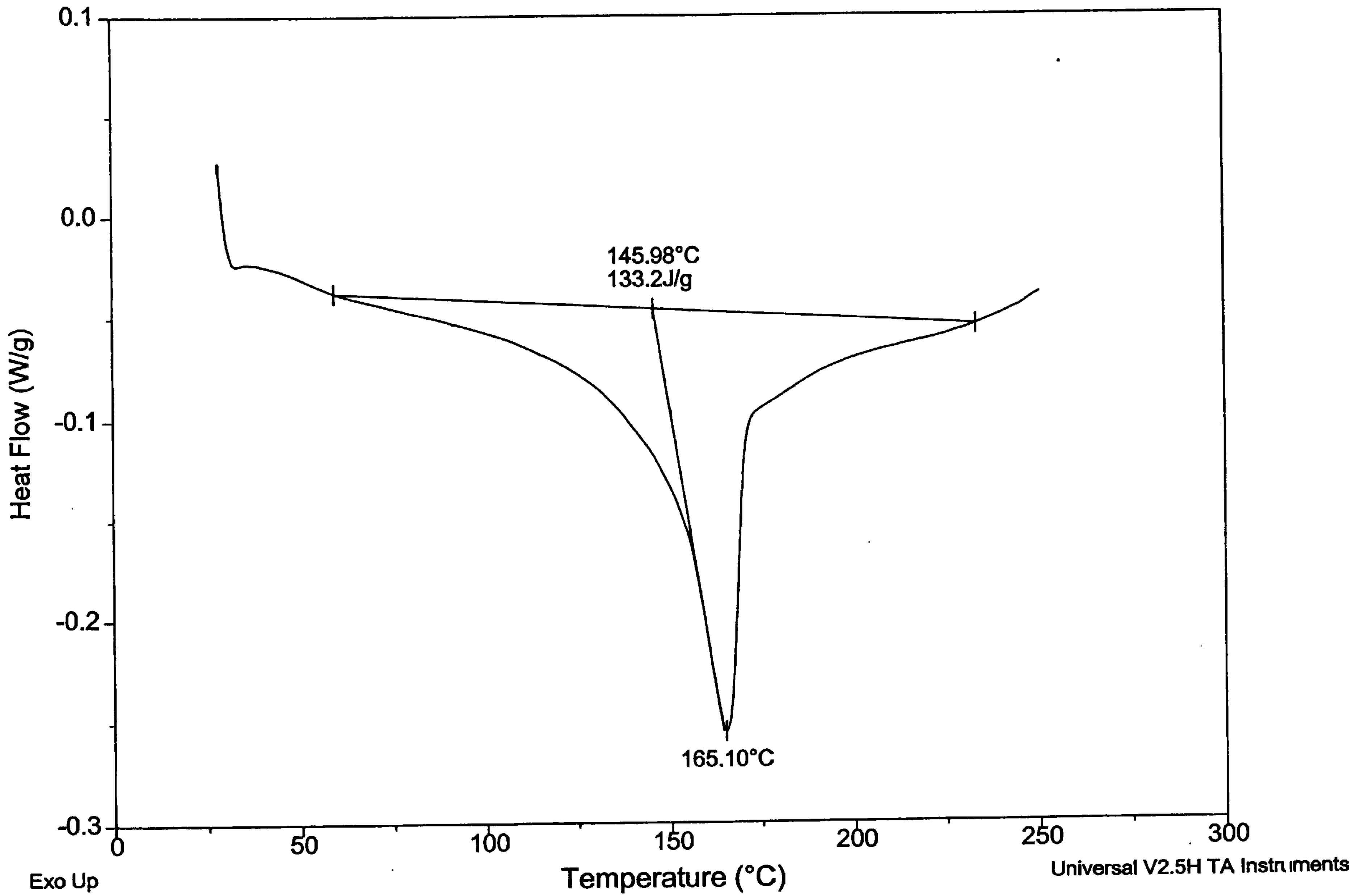
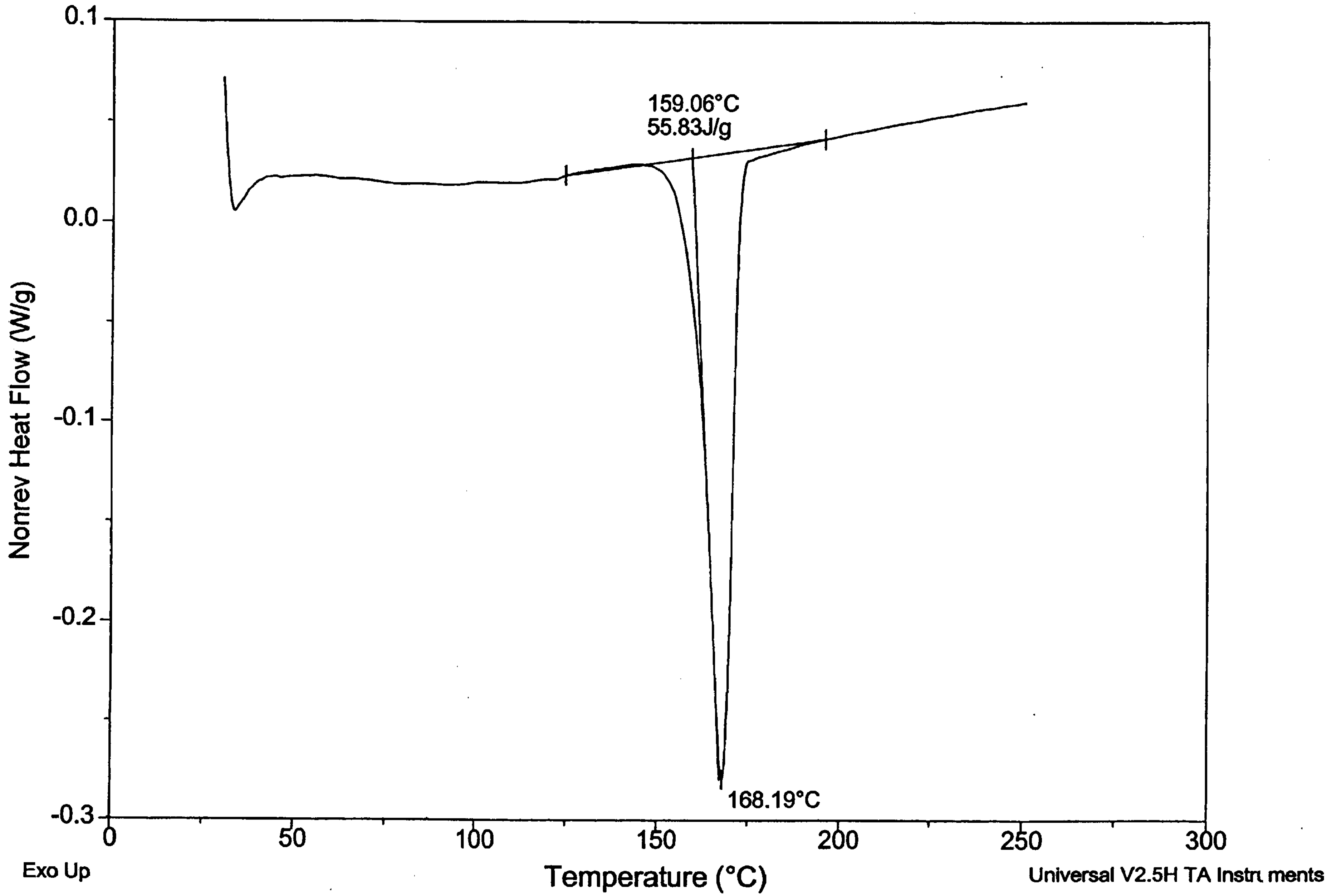
Operator: WJM
Run Date: 10-May-01 12:23



Sample: Door Panel-Black Plastic
Size: 6.8500 mg
Method: MDSC Method
Comment: Chevy Cavalier: Door panel - black plastic portion

DSC

File: C:\TA\Data\DSC\mike.001
Operator: WJM
Run Date: 10-May-01 08:33



Sampıe: Door Panel-Black Plastic
Size: 6.8500 mg
Method: MDSC Method
Comment: Chevy Cavalier: Door panel - black plastic portion

DSC

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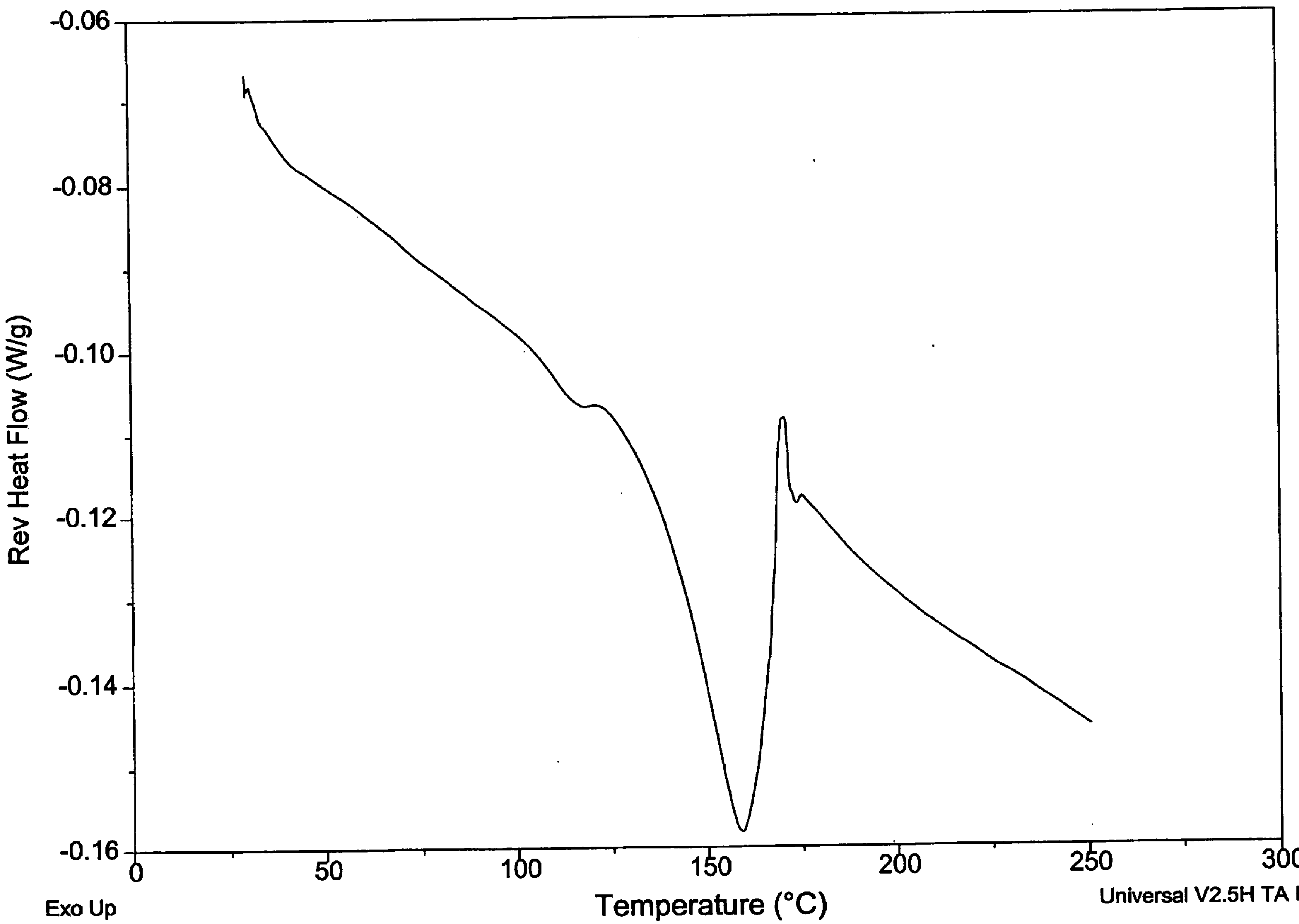
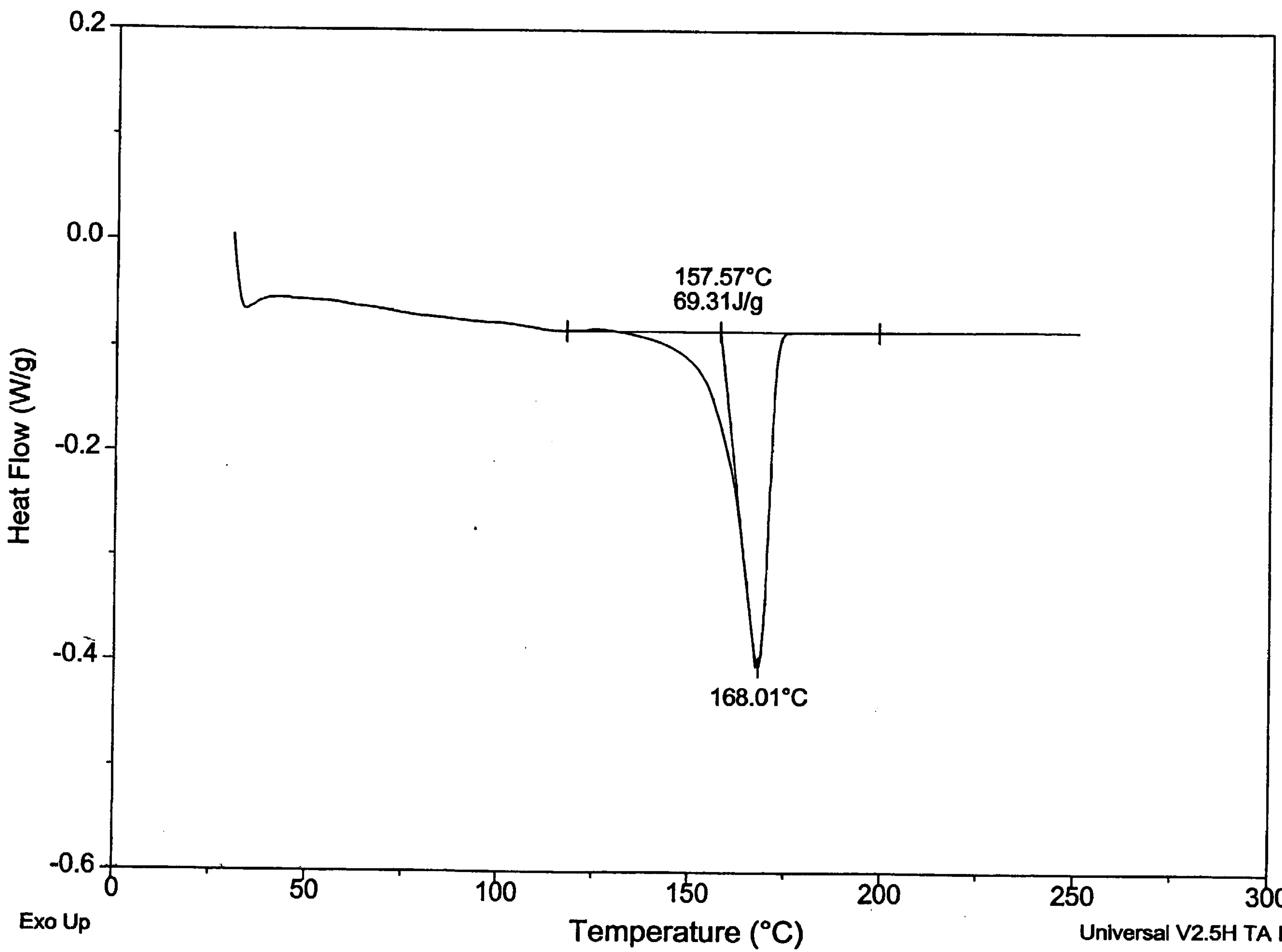


Universal V2.5H TA Instruments

Sample: Door Panel-Black Plastic
Size: 6.8500 mg
Method: MDSC Method
Comment: Chevy Cavalier: Door panel - black plastic portion

DSC

File: C:\TA\Data\DSC\mike.001
Operator: WJM
Run Date: 10-May-01 08:33



Universal V2.5H TA Instruments

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Index cont'd

Index cont'd

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2.	**Chevy Cavalier:** door panel; backing w/o foam	03614-103.003
3.	**Chevy Cavalier:** door panel; backing w/o foam;re-run	03614-103.004
4.	**Chevy Cavalier:** door panel; cloth	03614-103.005
5.	**Chevy Cavalier:** door panel; foam	03614-103.006
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21.	**Chevy Cavalier:** seat foam #22589249	03614-103.022
22.	**Chevy Cavalier:** seat foam; re-run	03614-103.023
23.	**Chevy Cavalier:** headliner center foam #22619703	03614-103.024
24.	**Chevy Cavalier:** headliner center foam; re-run	03614-103.025

APPENDIX C

ORIGINAL MDSC THERMOGRAMS

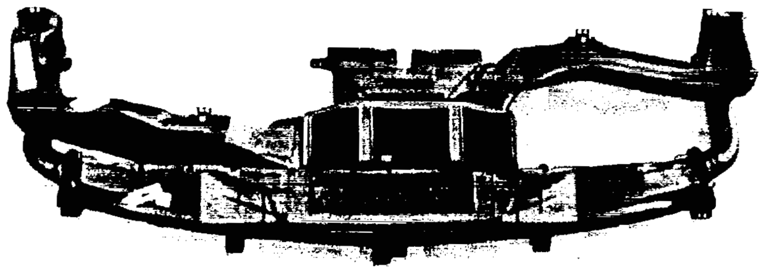


Figure B-38. Honda Civic HVAC Ductwork

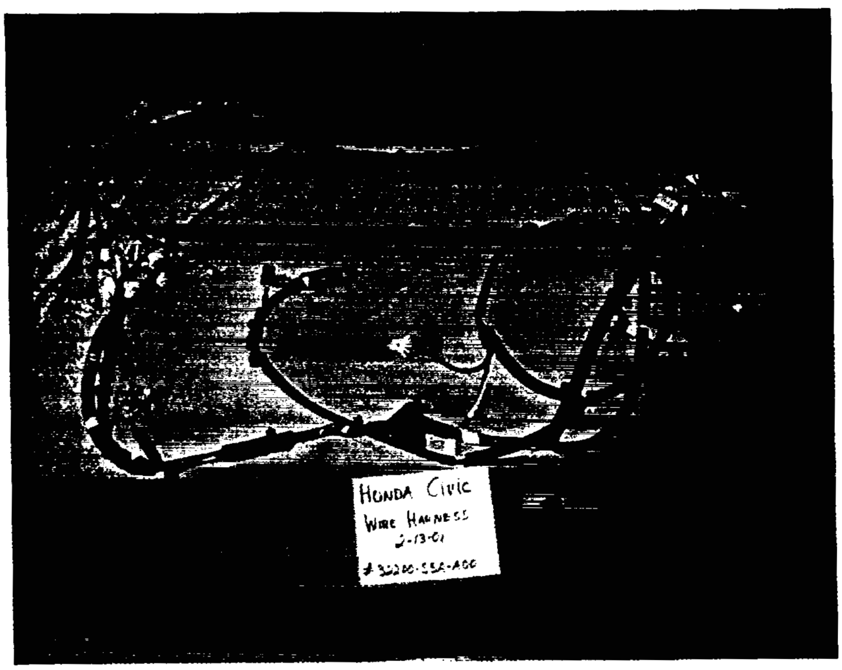


Figure B-39. Honda Civic Wiring Harness

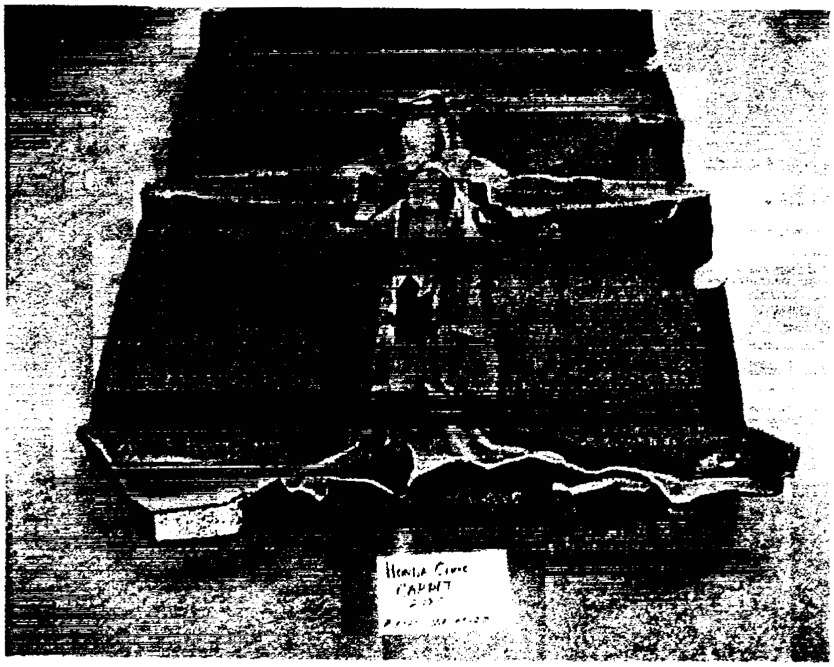


Figure B-36. Honda Civic Carpet

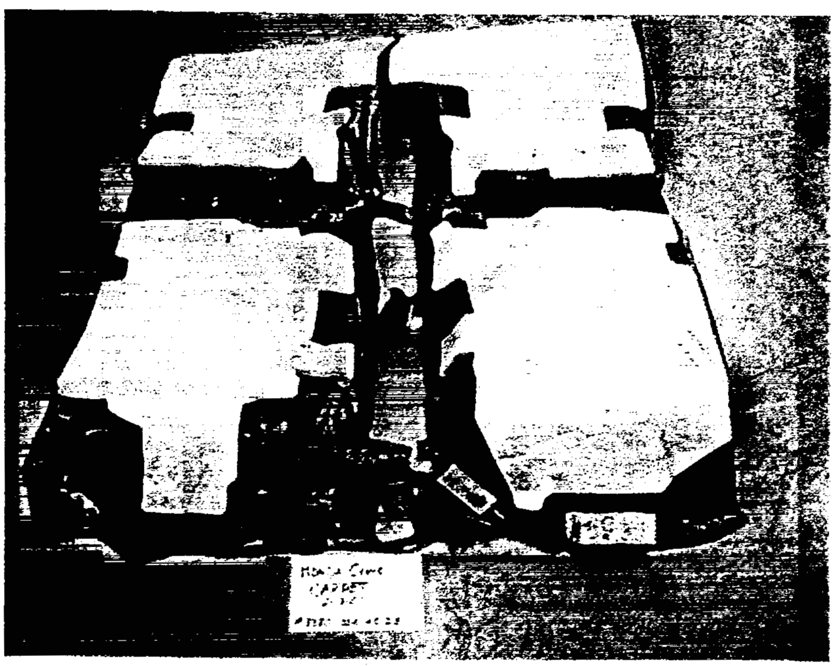


Figure B-37. Honda Civic Carpet Backing

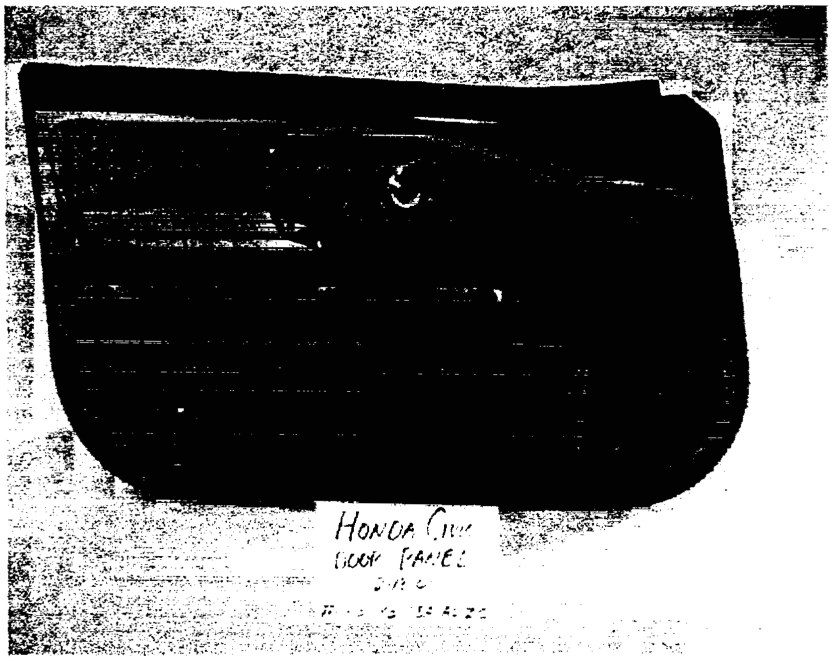


Figure B-34. Honda Civic Door Panel

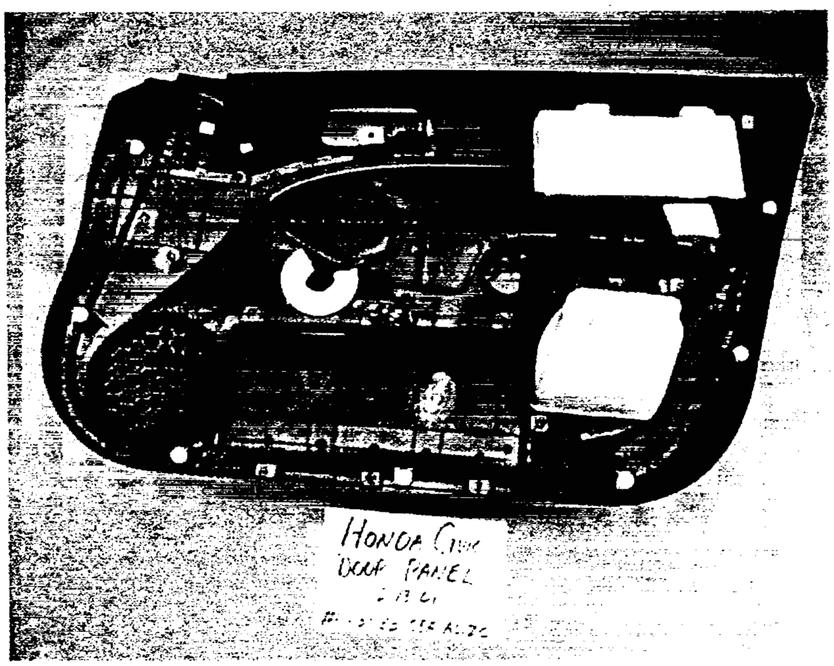


Figure B-35. Honda Civic Door Panel (Inside)

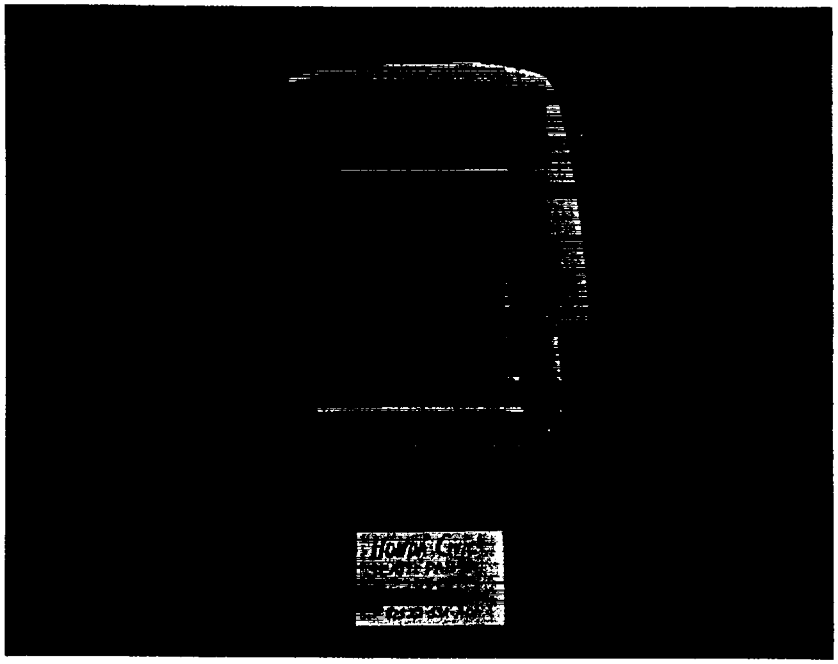


Figure B-32. Honda Civic Seat Bottom Foam

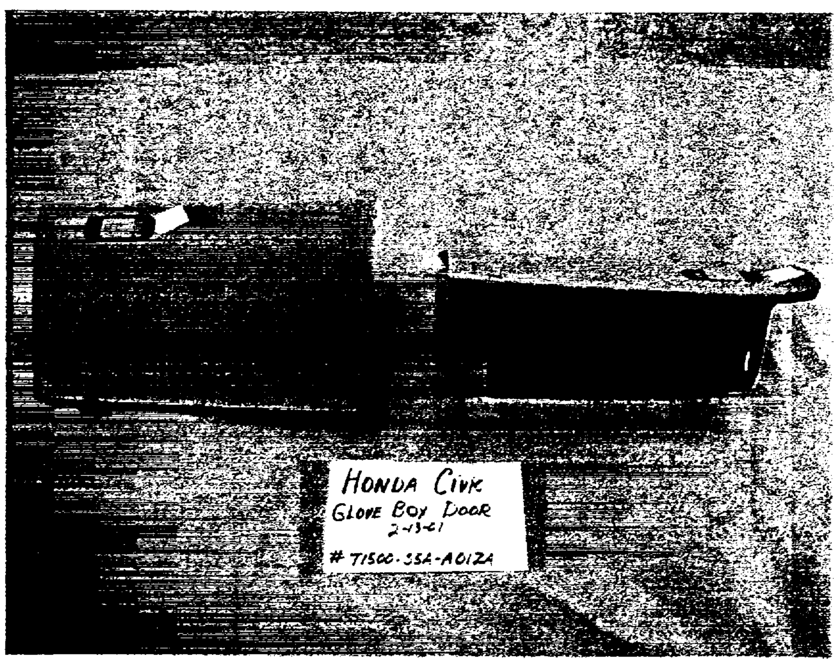


Figure B-33. Honda Civic Glove Box

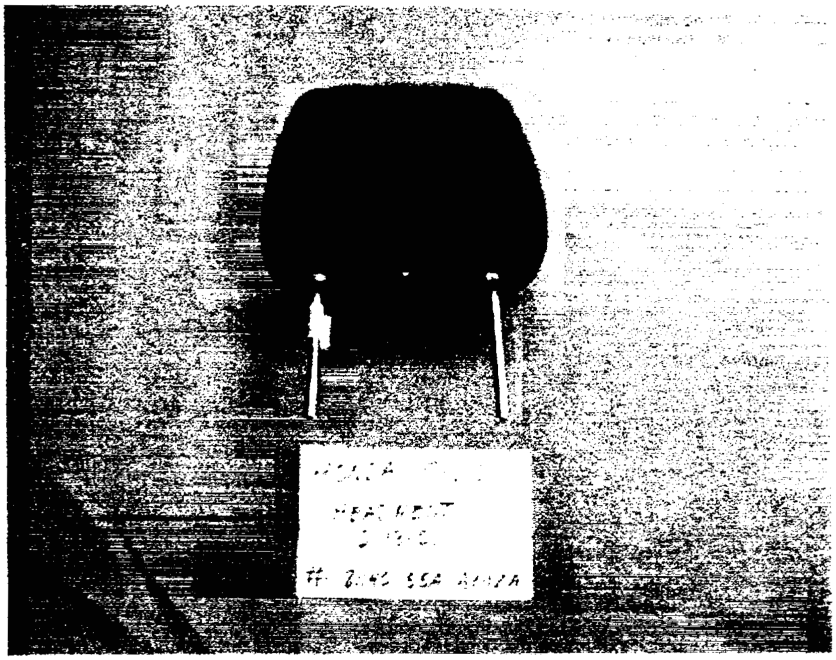


Figure B-30. Honda Civic Headrest

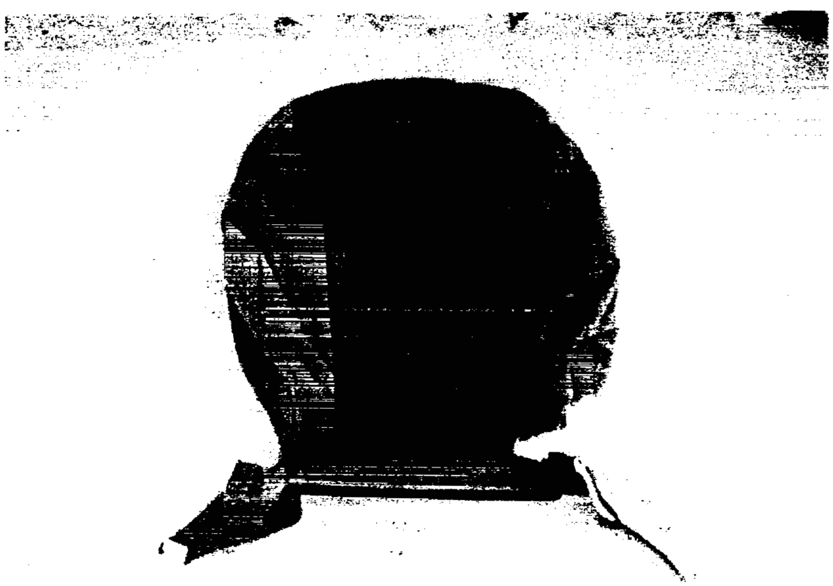


Figure B-31. Honda Civic Seat Back Cover

Model: Honda Civic	Mass: 2140 g 4.7 lb
Part: Door panel	Color: Gray plastic, black plastic trim
Part No.: 83583-S5A-A01ZC	Dimensions: 559 × 940-838 × 3 mm (22 × 37-33 × 1/8 in.), fabric is 203 × 305 mm (8 × 12 in.) + 127 × 330 mm (5 × 13 in.) Top trim is 102 × 940 mm (4 × 37 in.). Hole is 127 × 64 mm (5 × 2.5 in.), speaker is 178 × 152 mm (7 × 6 in.), foam is 127 × 114 × 102 mm (5 × 4.5 x 4 in.), and 267 × 127 × 25 mm (10.5 × 5 × 1 in.) for second piece.
Description: Front contains gray plastic, black plastic trim, speaker and irregularities (arm rest, map storage compartment, etc). Back contains two foam pads of the above dimensions.	

Model: Honda Civic	Mass: 5360 g 11.8 lbs
Part: Carpet	Color: Dark gray, black plastic backing, gray foam
Part No.: 83801-SFA-A012B	Dimensions: 1270 × 1930 × 5 mm 50 × 76 in × 3/16 in.
Description: Pad covers 70-80% of back surface. Carpet has black vinyl backing. A small piece of 51 mm (2 in.) thick foam is present on the driver side front corner, and two small pieces of 19 mm (3/4 in.) foam are present at the rear corners.	

Model: Honda Civic	Mass: 2200 g 4.8 lb
Part: Wiring harness	Color: Black plastic conduit, multi-colored wires
Part No.: 3220-S5A-A00	Dimensions: Twenty-three pieces of varying length and diameter. Longest piece is 1727 × 19 mm (68 × ¾ in.)
Description: Wire in conduits of varying thickness. No plastic box connectors.	

Model: Honda Civic	Mass: 730 g 1.6 lb
Part: Headrest	Color: Dark gray
Part No.: 811040-55A-A012A	Dimensions: 254 × 216 × 114 mm (10 × 8.5 × 4.5 in.), steel bars are 140 mm (5.5 in.) long and 10 mm (3/8 in.) in dia.
Description: Fabric is the same as the front fabric on the seat.	

Model: Honda Civic	Mass: 480 g 1.1 lb
Part: Seat Cover (for back)	Color: Dark Gray
Part No.: 81521-S5A-A01ZA	Dimensions: 711 × 559 × 178 mm 28 × 22 × 7 in.
Description: Top panel is 305 × 178 mm (12 × 7 in.), side panels are 178 × 432 mm (7 × 17 in.), and the exposed front panel is 470 × 356 mm (18.5 × 14 in.) Four different fabrics: 1. Seat front (30%) 2. Seat Side (30%) 3. Seatback (30%) 4. Seat felt trim (10%). A small plastic sill is present along the bottom approximately 25 × 394 mm (1 × 15.5 in.) Note: Seat bottom was not purchased for testing. Cover backing is foam material.	

Model: Honda Civic	Mass: 1250 g 2.8 lb
Part: Seat Foam (from seat back)	Color: Yellow
Part No.: 81522-55A-A01	Dimensions: 711 × 451 × 38 mm 28 × 17.75 × 1.5 in.
Description: PUR foam for the seat back. Irregularly shaped, wings on sides.	

Model: Honda Civic	Mass: 1520 g 3.3 lb
Part: Glove compartment	Color: Tan exterior, black interior
Part No.: T1500-S5A-A01ZA	Dimensions: 432 × 267 × 22 mm (17 × 10.5 × 7/8 in.), plastic holder inside is 305 × 191 mm × 152-25 mm (12 × 7.5 × 6-1 in.) in triangular dimensions
Description: Slightly curved exterior, black plastic interior. Compartment inside is triangular. Compartment is 100% plastic materials, 3 mm (1/8 in.) thick.	

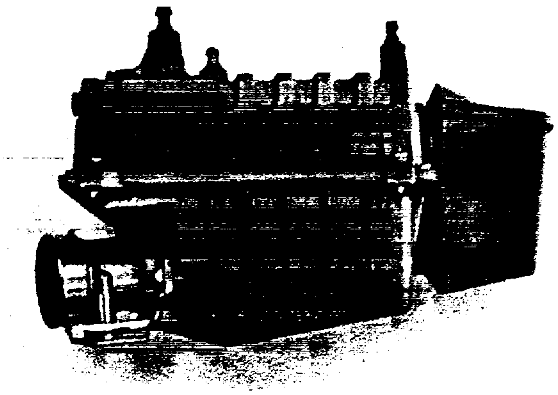


Figure B-29. Ford Focus Air Filter Assembly

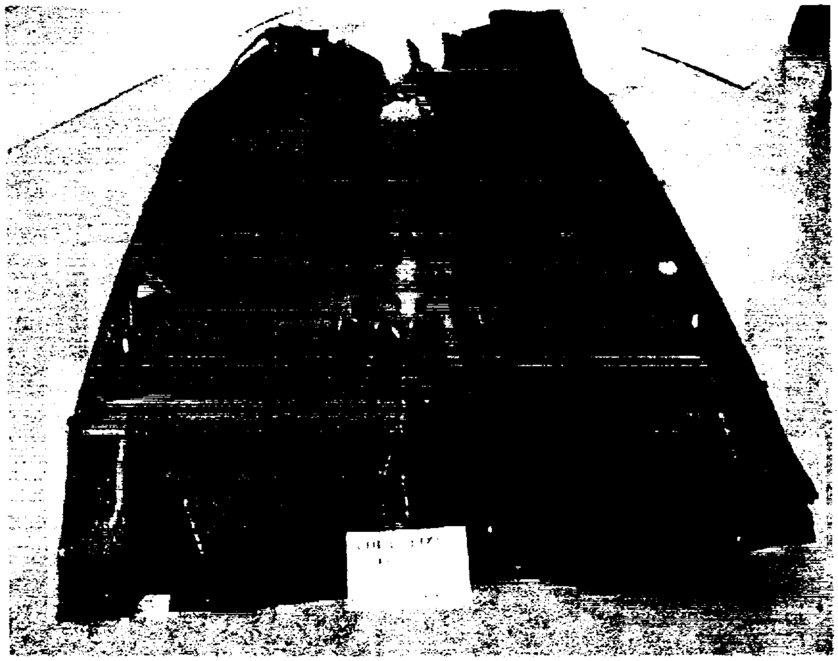


Figure B-27. Ford Focus Carpet

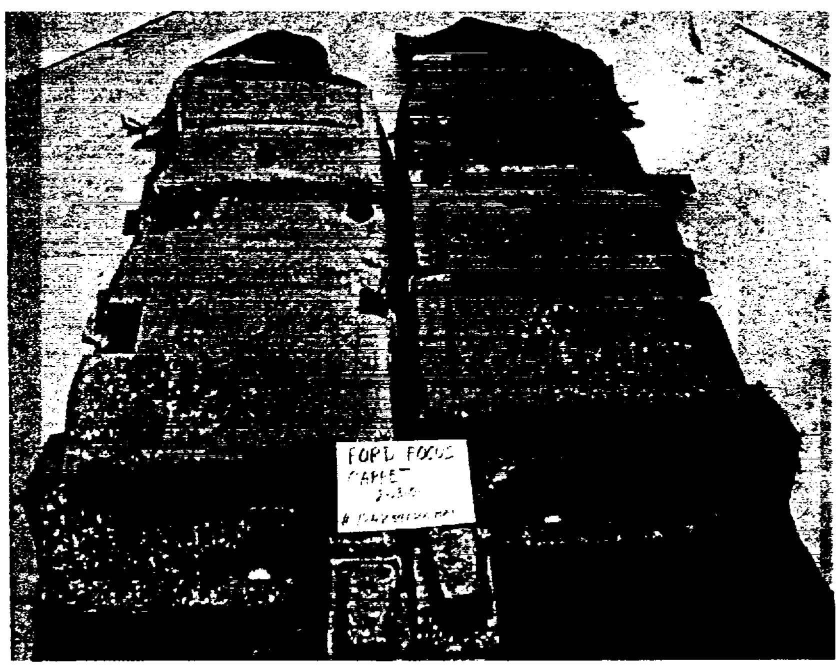
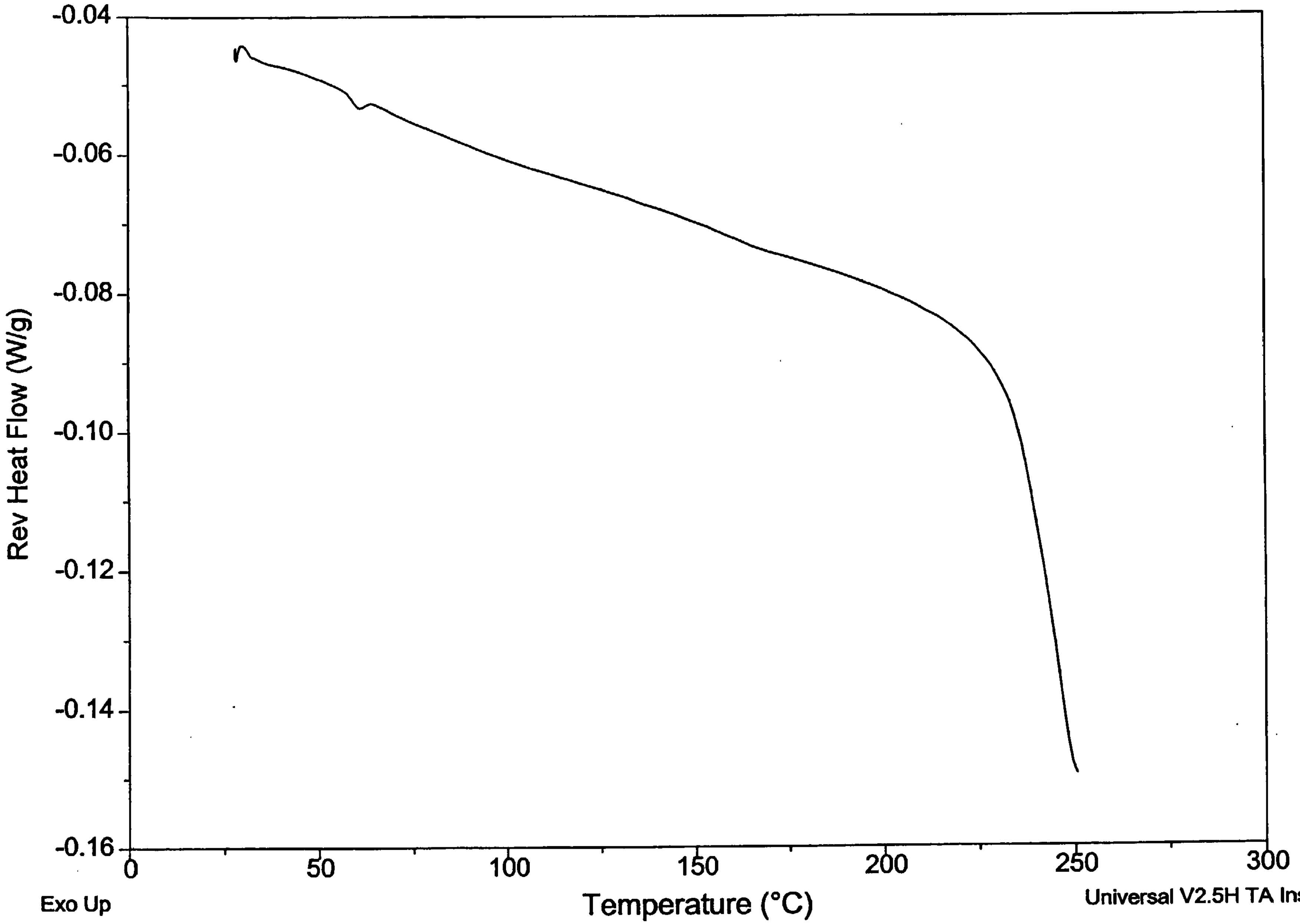


Figure B-28. Ford Focus Carpet Backing

Sample: Door Panel-Cloth
Size: 11.7300 mg
Method: MDSC Method
Comment: Chevy Cavalier: cloth portion #22618443

DSC

File: C:...\DSC\03614-103.005
Operator: WJM
Run Date: 10-May-01 16:26

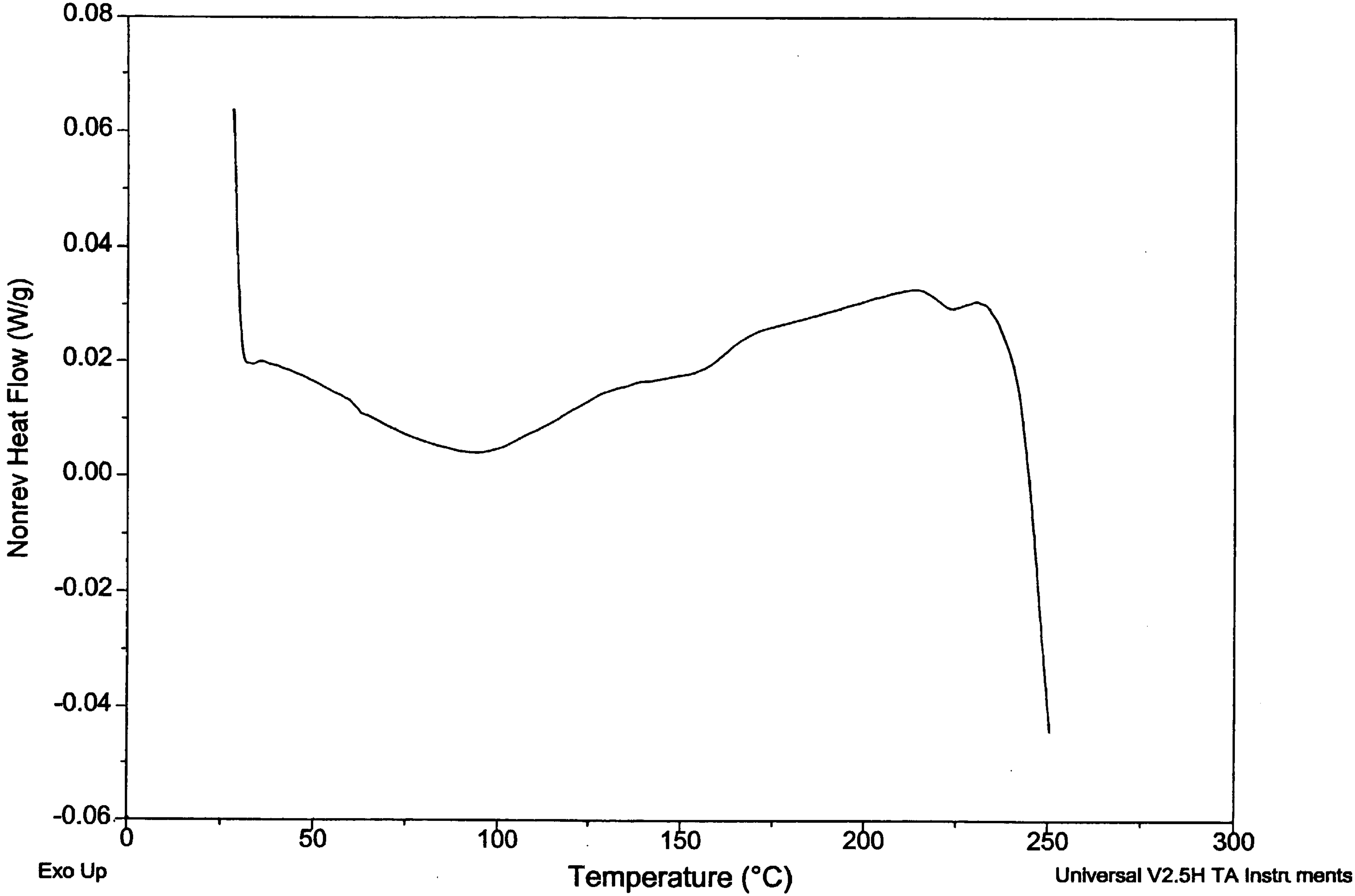


Universal V2.5H TA Instruments

Sample: Door Panel-Cloth
Size: 11.7300 mg
Method: MDSC Method
Comment: Chevy Cavalier: cloth portion #22618443

DSC

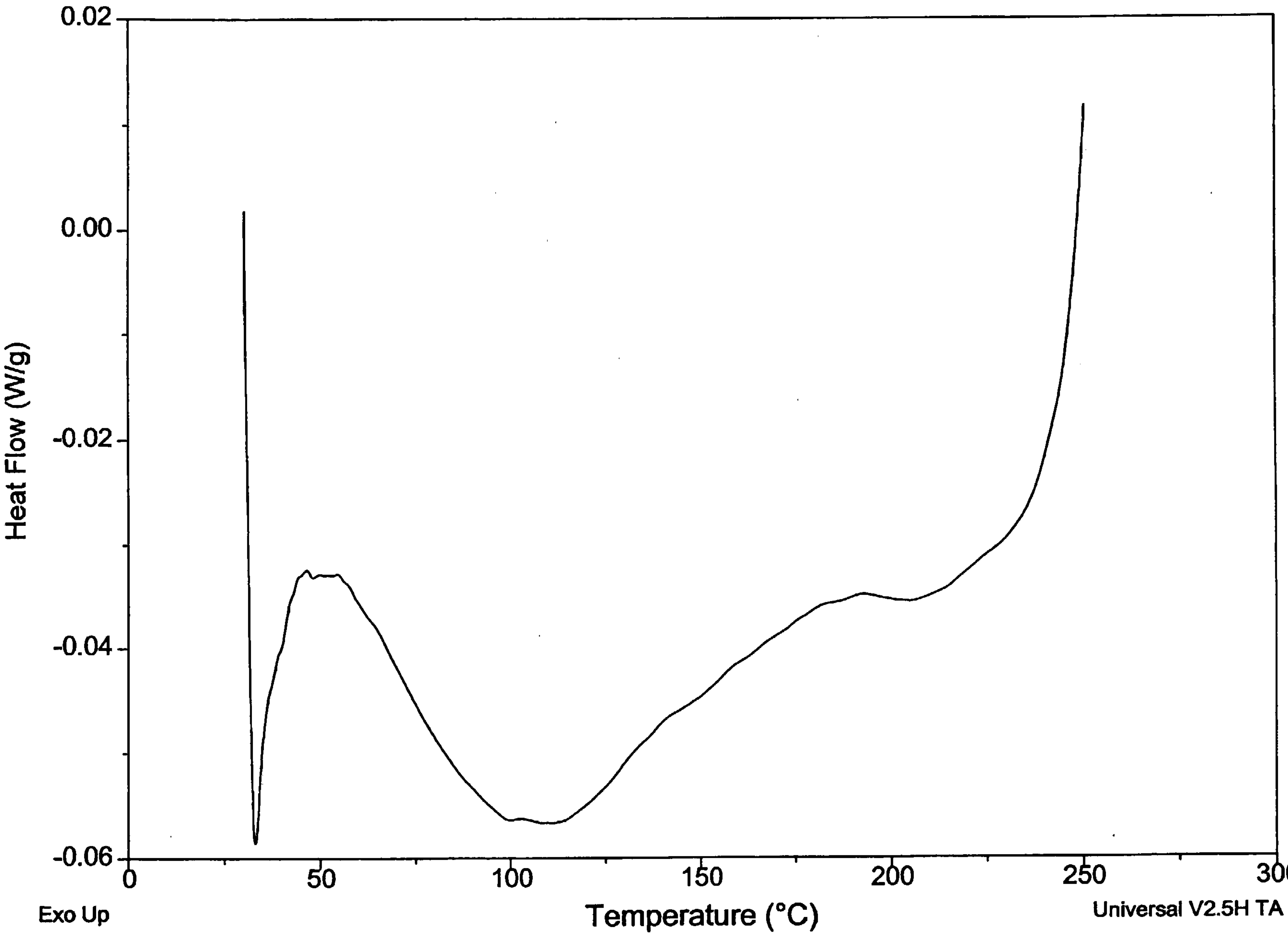
File: C:...\DSC\03614-103.005
Operator: WJM
Run Date: 10-May-01 16:26



Sample: Door Panel-Foam
Size: 4.6800 mg
Method: MDSC Method
Comment: Chevy Cavalier: foam #22618443

DSC

File: C:...\DSC\03614-103.006
Operator: WJM
Run Date: 11-May-01 09:12



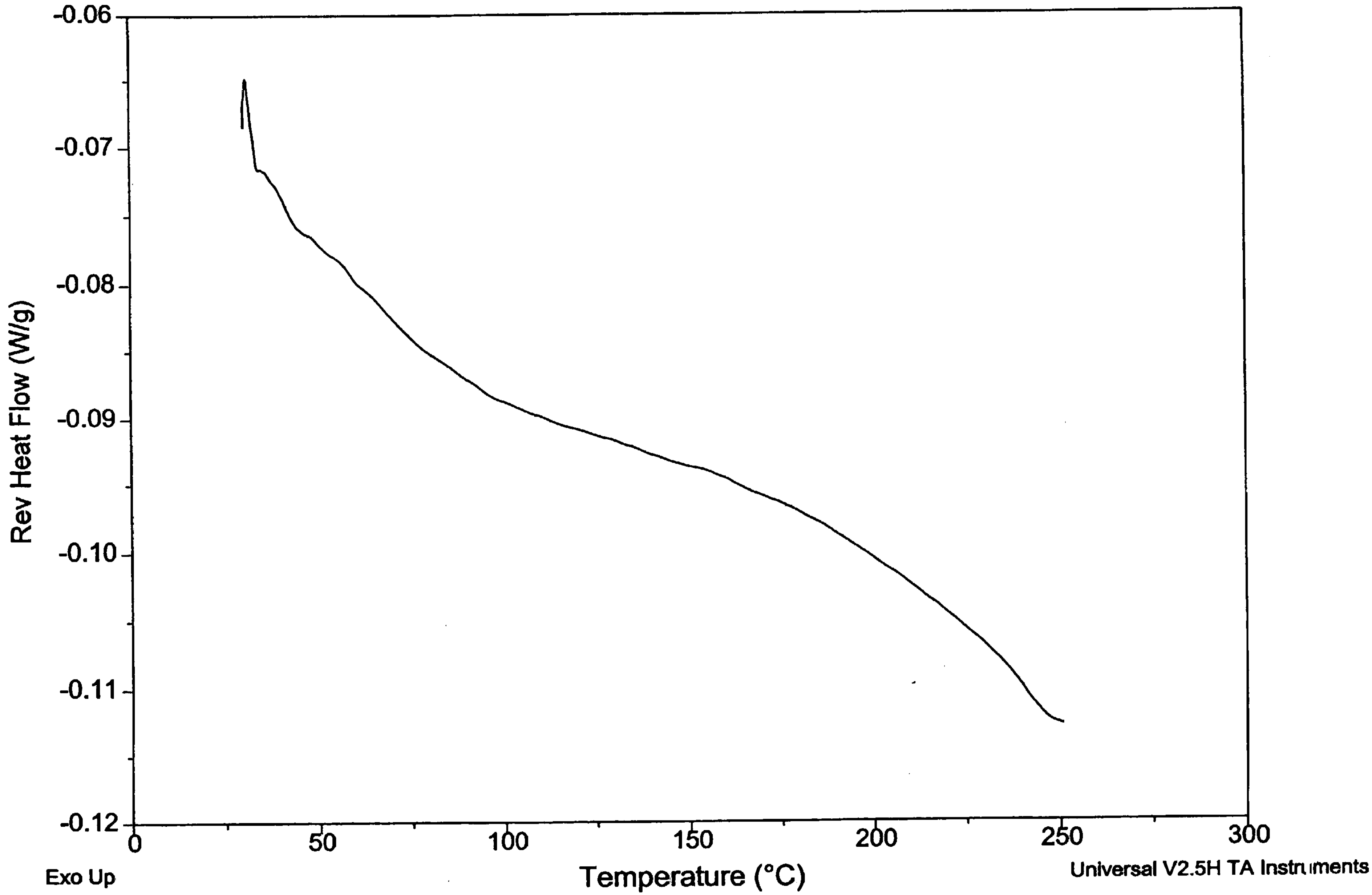
Exo Up

Universal V2.5H TA Instruments

Sample: Door Panel-Foam
Size: 4.6800 mg
Method: MDSC Method
Comment: Chevy Cavalier: foam #22618443

DSC

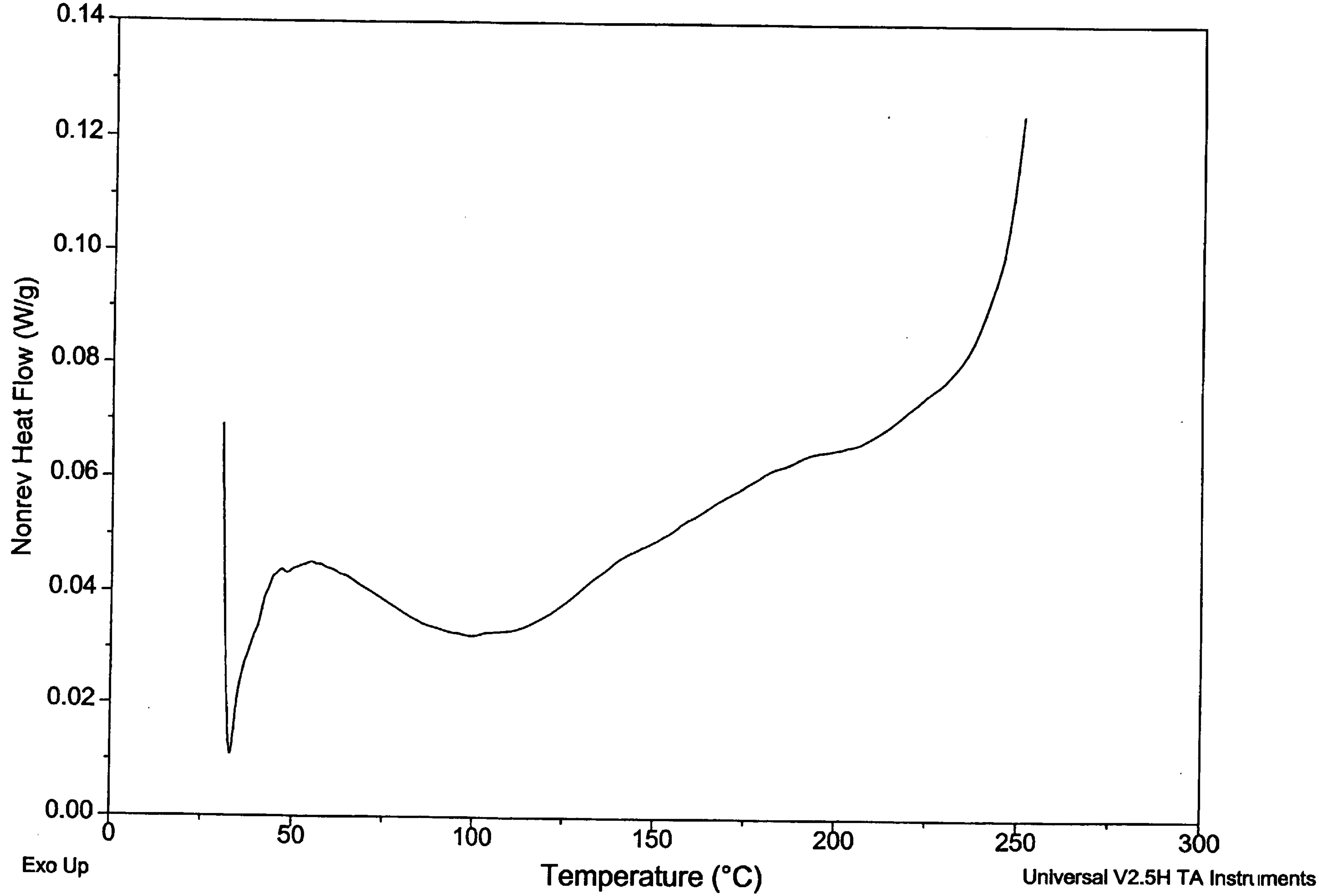
File: C:...\DSC\03614-103.006
Operator: WJM
Run Date: 11-May-01 09:12



Sample: Door Panel-Foam
Size: 4.6800 mg
Method: MDSC Method
Comment: Chevy Cavalier: foam #22618443

DSC

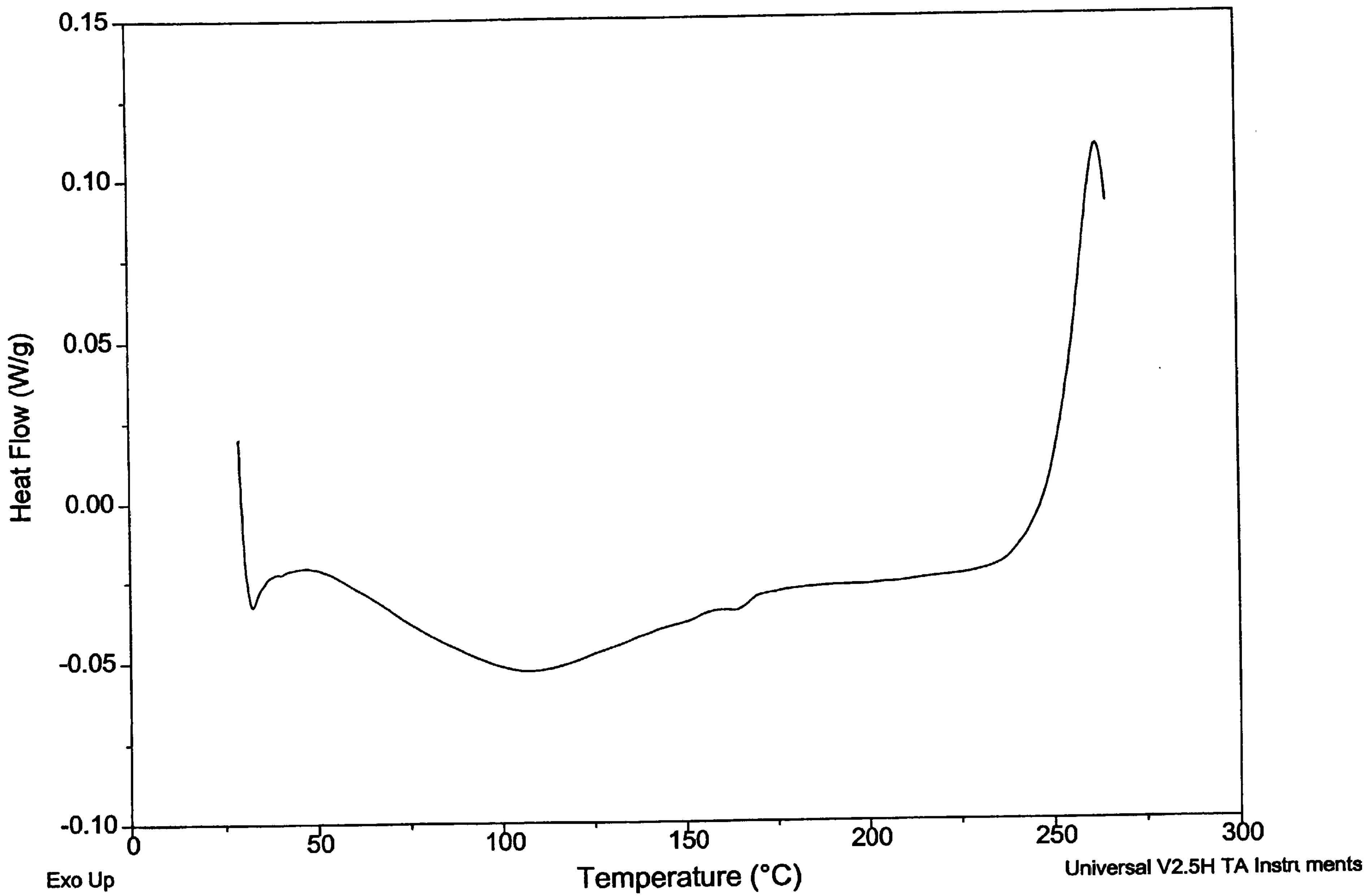
File: C:...\DSC\03614-103.006
Operator: WJM
Run Date: 11-May-01 09:12



Sample: Door Panel-Foam (2nd run)
Size: 5.4800 mg
Method: MDSC Method
Comment: Chevy Cavalier: foam #22618443

DSC

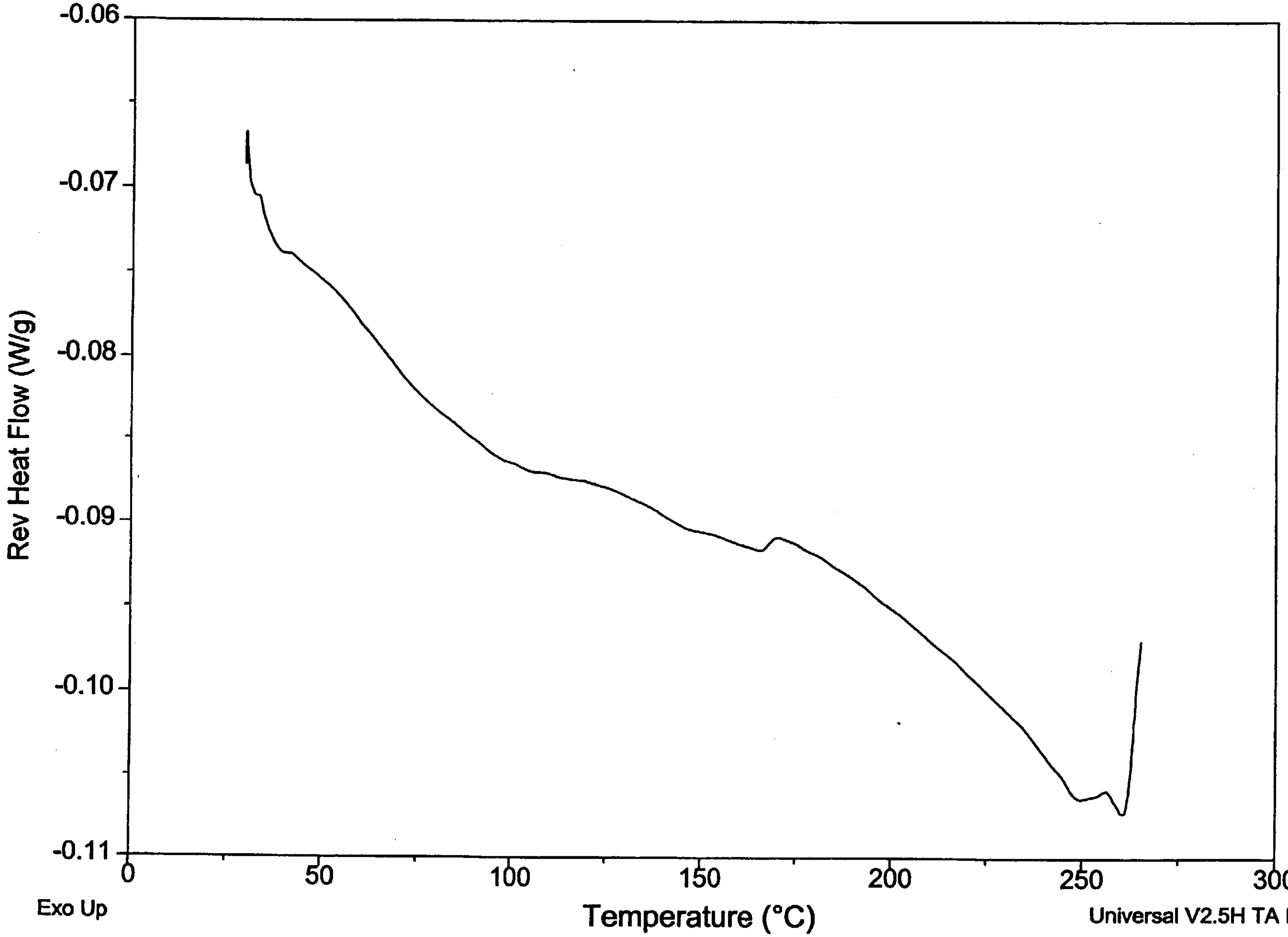
File: C:...\DSC\03614-103.007
Operator: WJM
Run Date: 11-May-01 11:46



Sampie: Door Panel-Foam (2nd run)
Size: 5.4800 mg
Method: MDSC Method
Comment: Chevy Cavalier: foam #22618443

DSC

File: C:...\DSC\03614-103.007
Operator: WJM
Run Date: 11-May-01 11:46

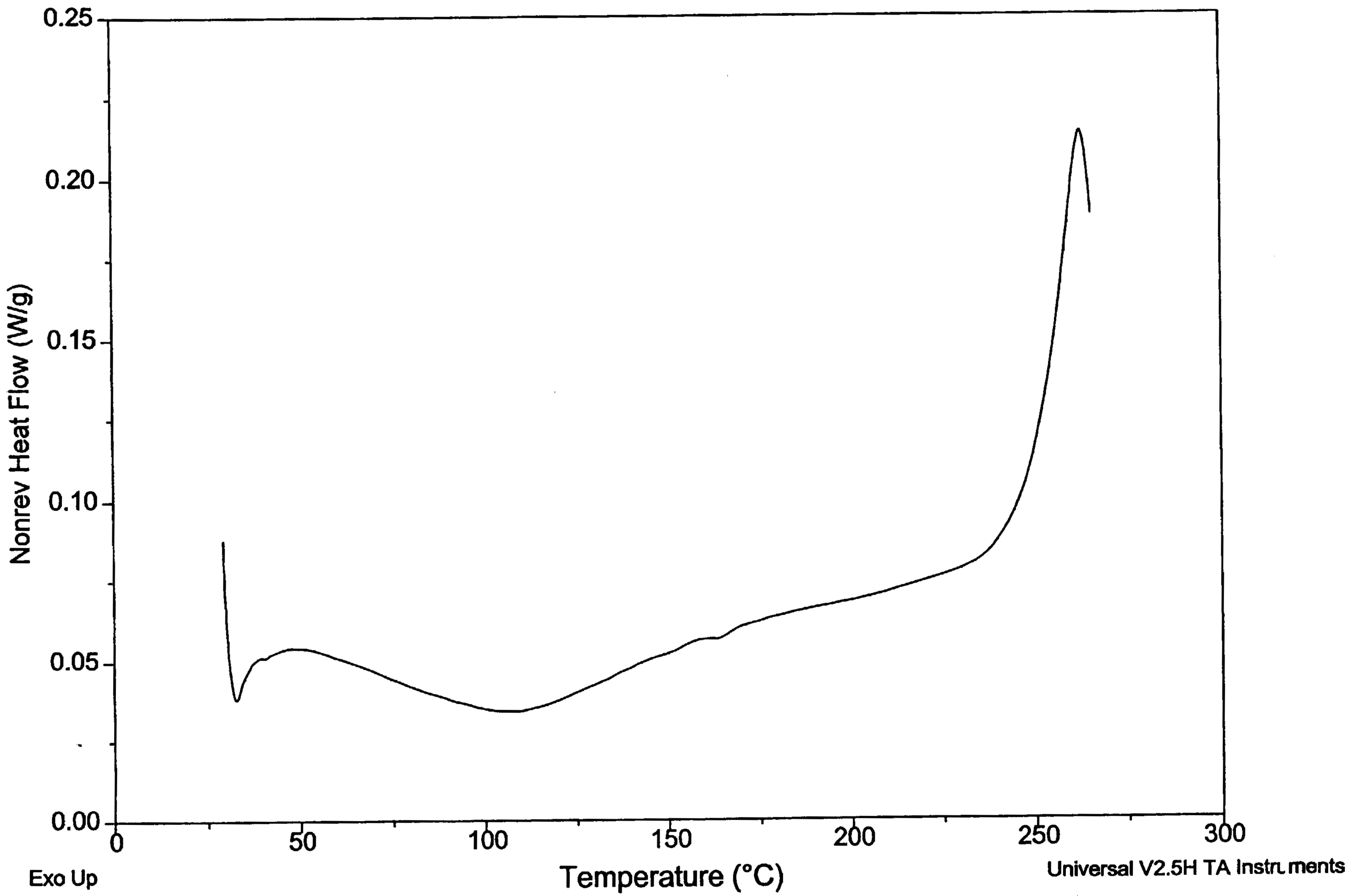


Universal V2.5H TA Instrι ments

Sample: Door Panel-Foam (2nd run)
Size: 5.4800 mg
Method: MDSC Method
Comment: Chevy Cavalier: foam #22618443

DSC

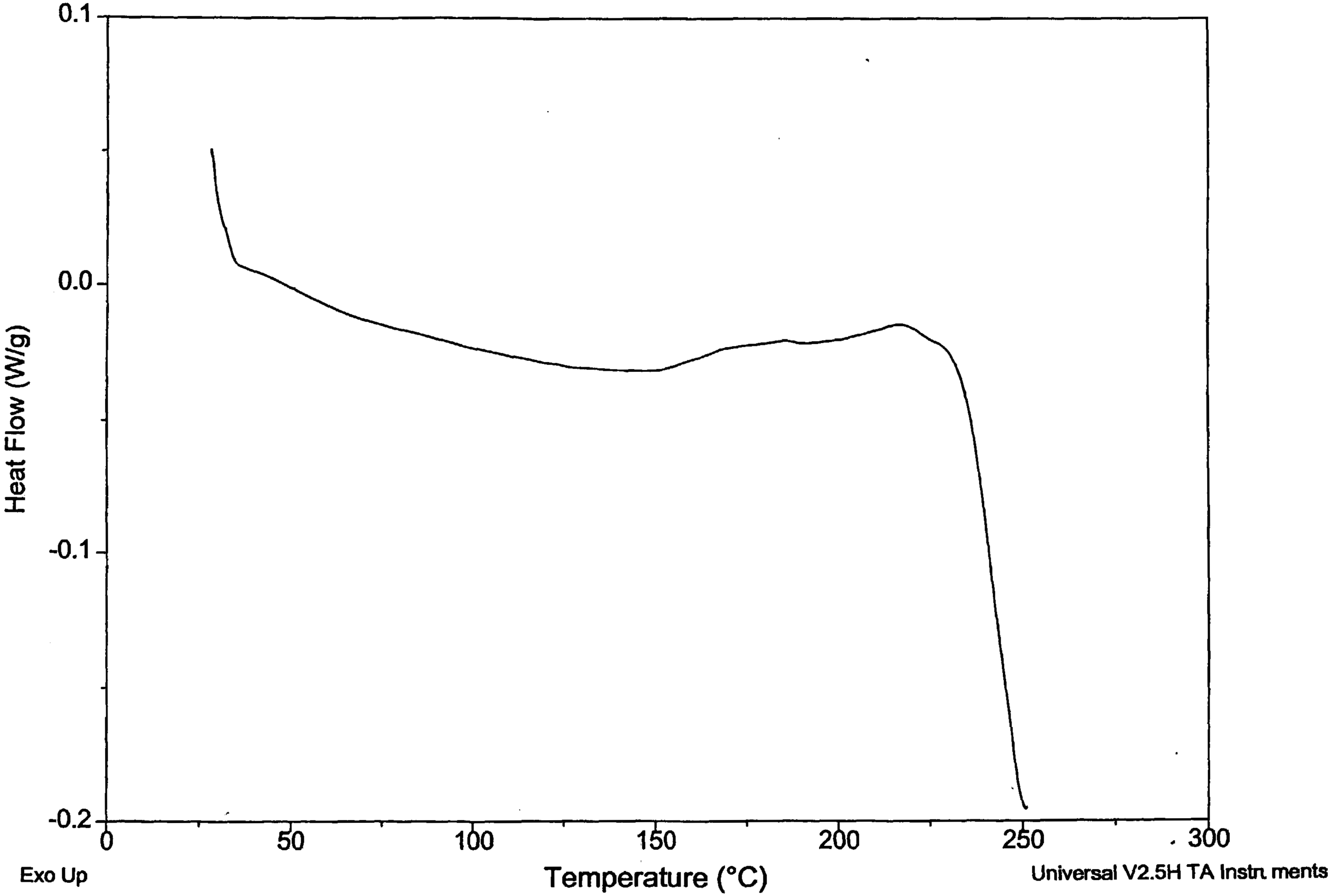
File: C:...\DSC\03614-103.007
Operator: WJM
Run Date: 11-May-01 11:46



Sample: Door Panel-Cloth (2nd run)
Size: 6.0500 mg
Method: MDSC Method
Comment: Chevy Cavalier: cloth #22618443

DSC

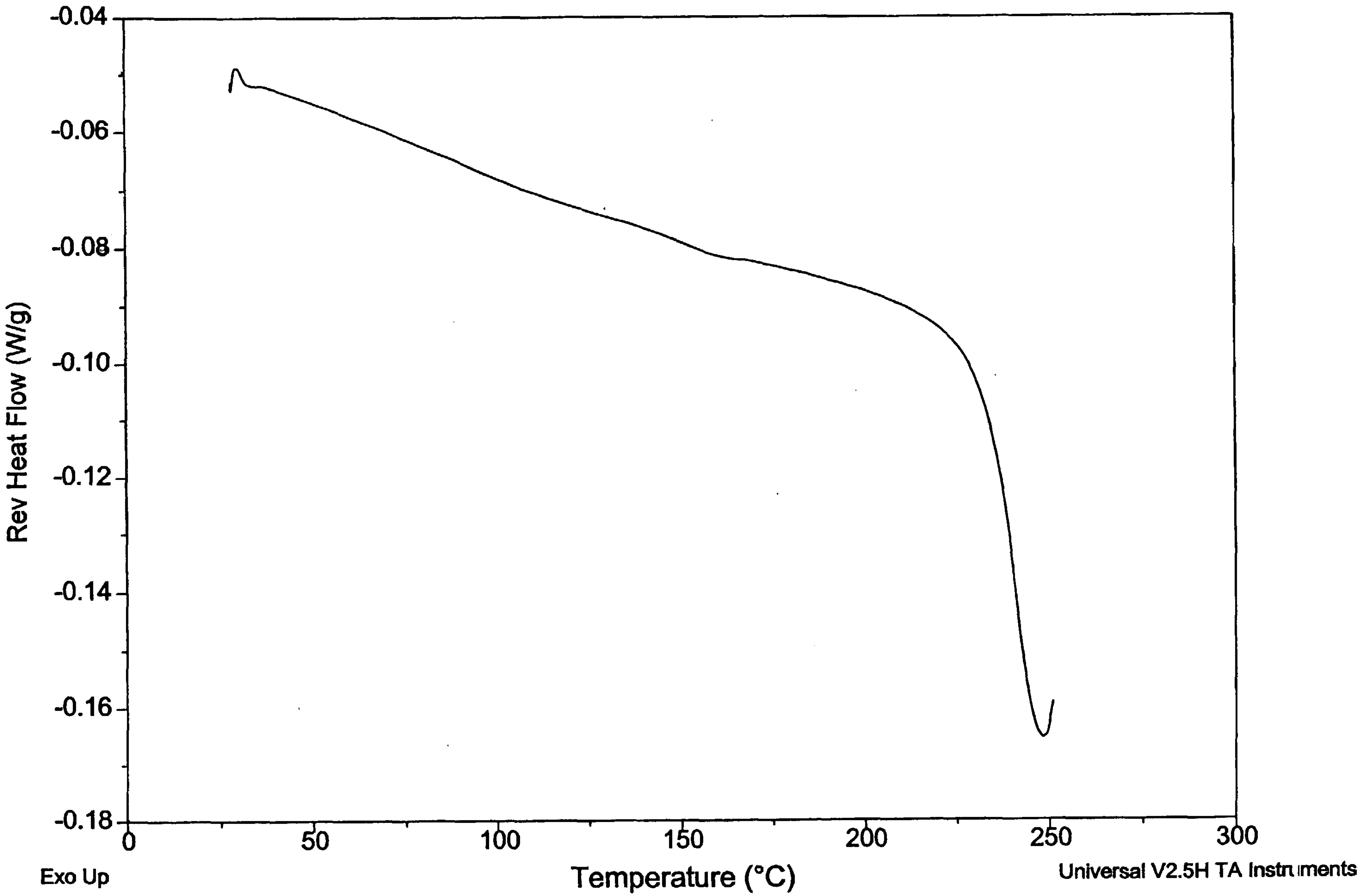
File: C:...\DSC\03614-103.008
Operator: WJM
Run Date: 11-May-01 13:50



Sample: Door Panel-Cloth (2nd run)
Size: 6.0500 mg
Method: MDSC Method
Comment: Chevy Cavalier: cloth #22618443

DSC

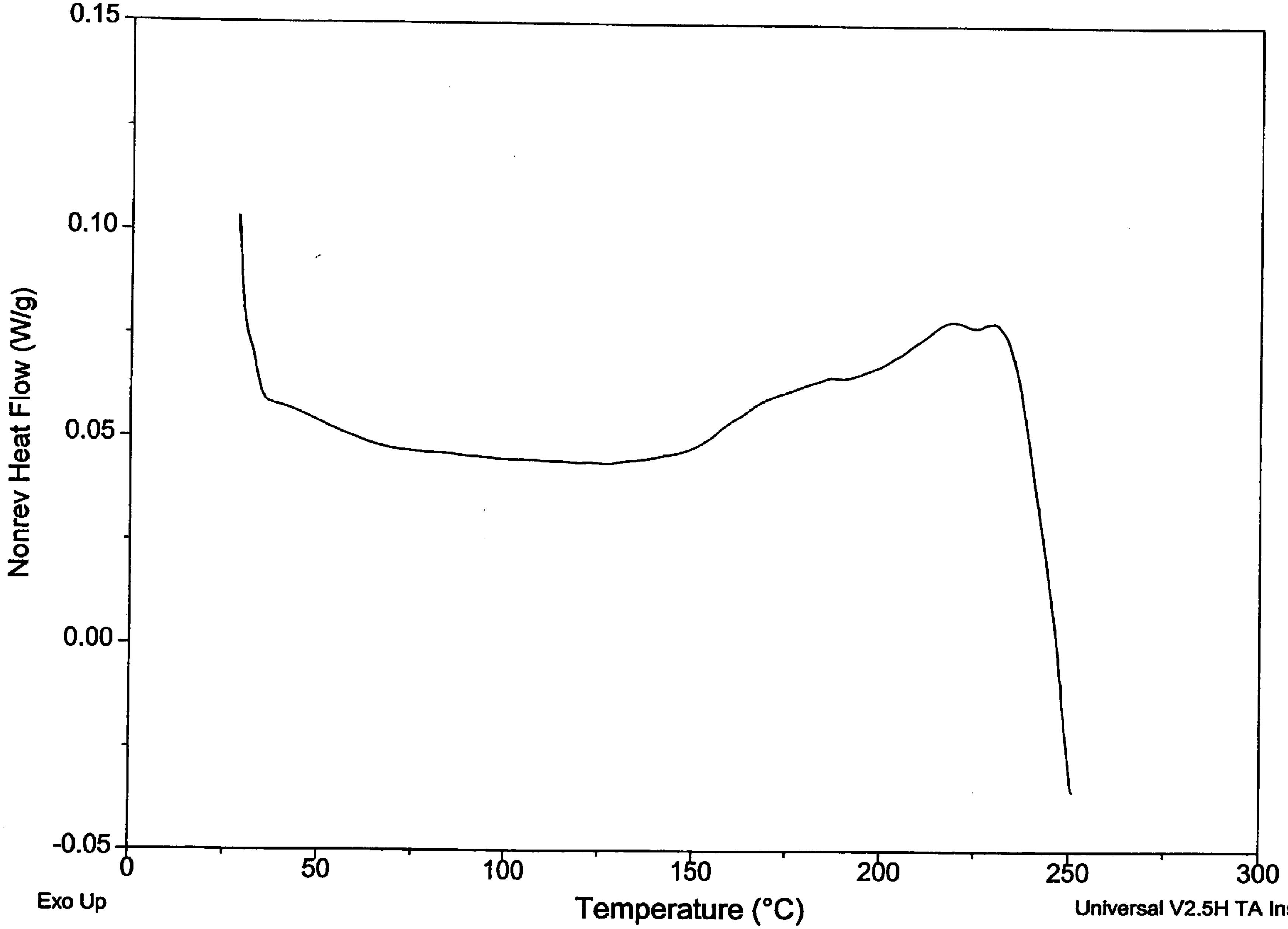
File: C:...\DSC\03614-103.008
Operator: WJM
Run Date: 11-May-01 13:50



Sample: Door Panel-Cloth (2nd run)
Size: 6.0500 mg
Method: MDSC Method
Comment: Chevy Cavalier: cloth #22618443

DSC

File: C:...\DSC\03614-103.008
Operator: WJM
Run Date: 11-May-01 13:50

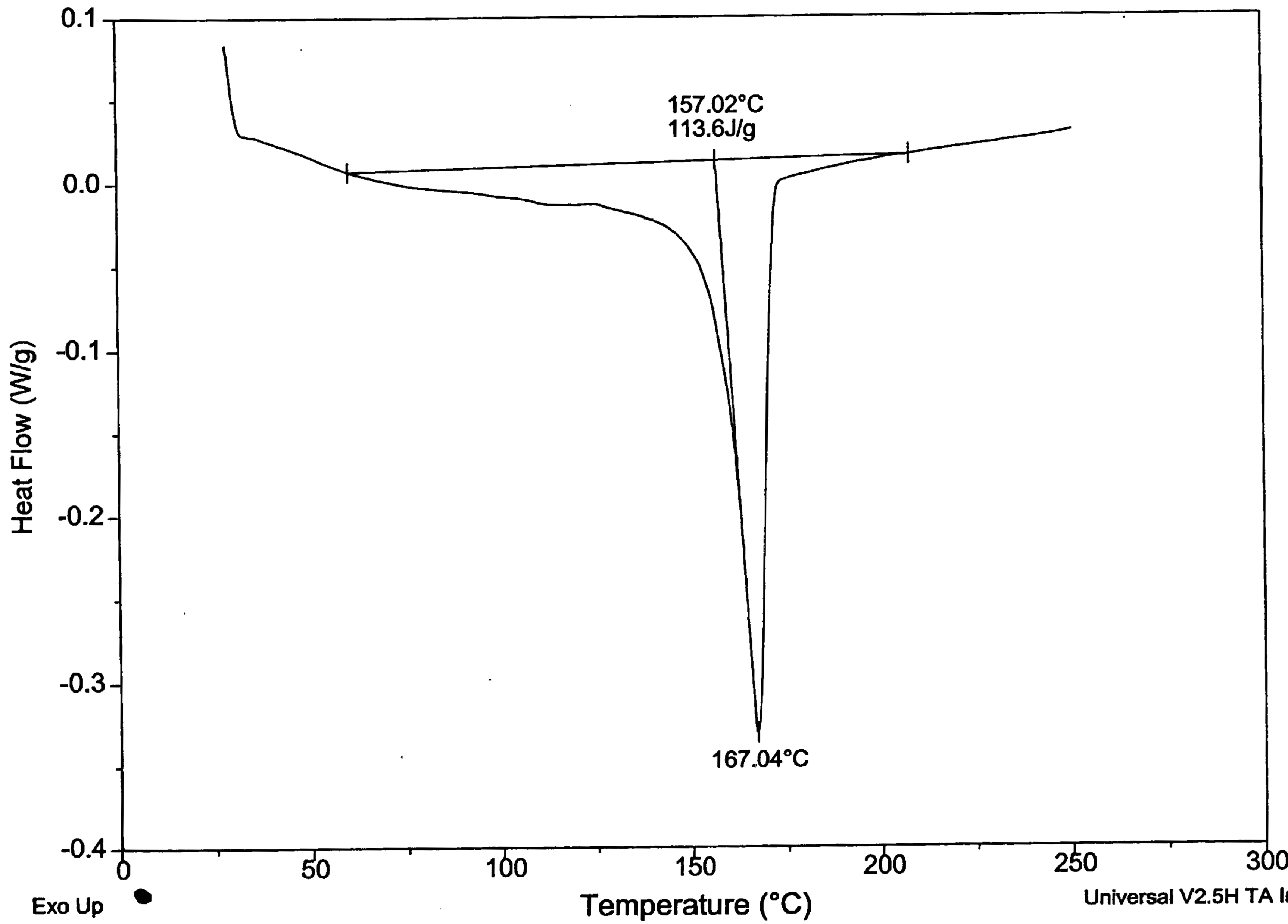


Universal V2.5H TA Instruments

Sample: Door Panel-Blk Plastic (2nd run)
Size: 4.7400 mg
Method: MDSC Method
Comment: Chevy Cavalier: Black Plastic #22618443

DSC

File: C:...\DSC\03614-103.009
Operator: WJM
Run Date: 11-May-01 15:28

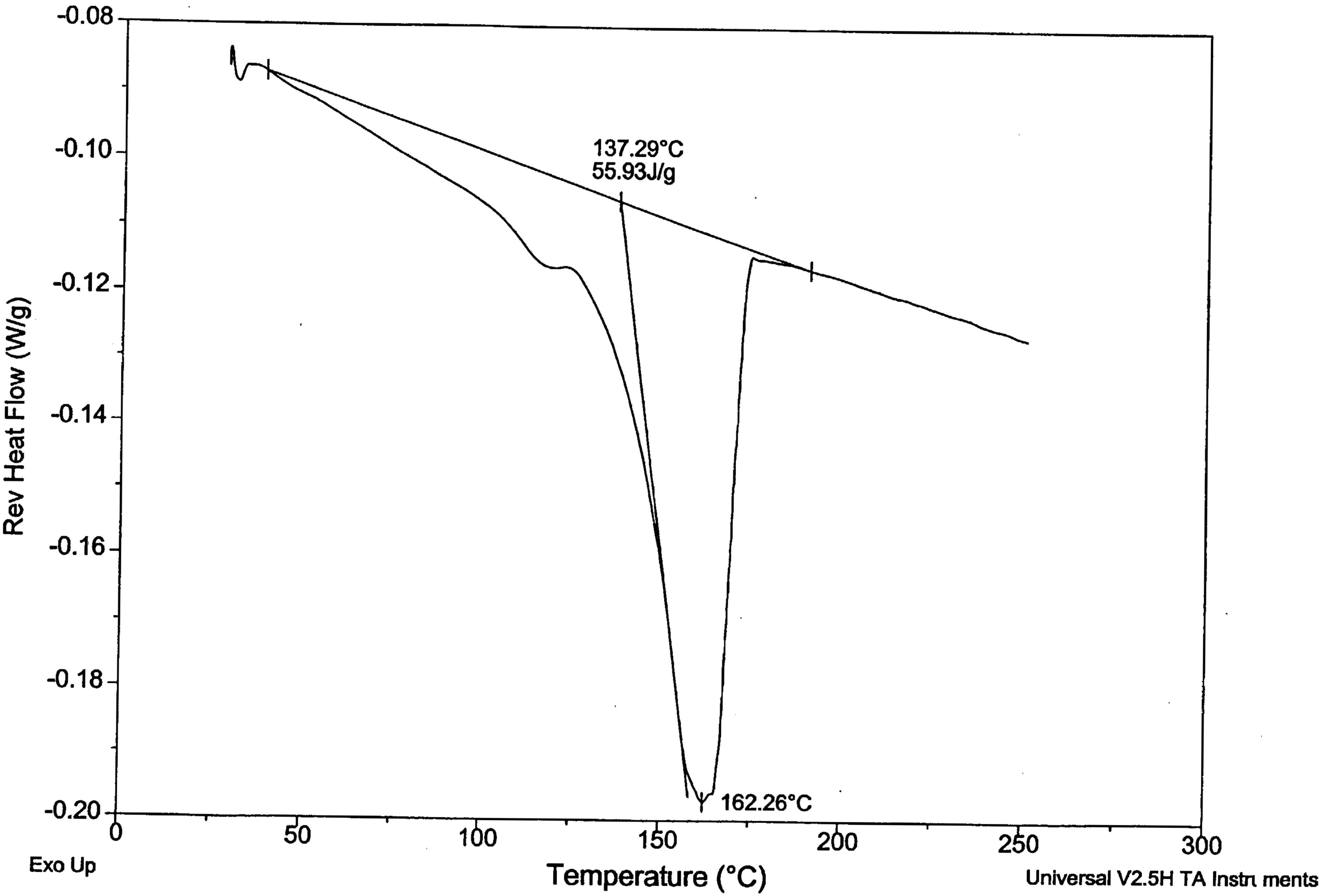


Universal V2.5H TA Instruments

Sampie: Door Panel-Blk Plastic (2nd run)
Size: 4.7400 mg
Method: MDSC Method
Comment: Chevy Cavalier: Black Plastic #22618443

DSC

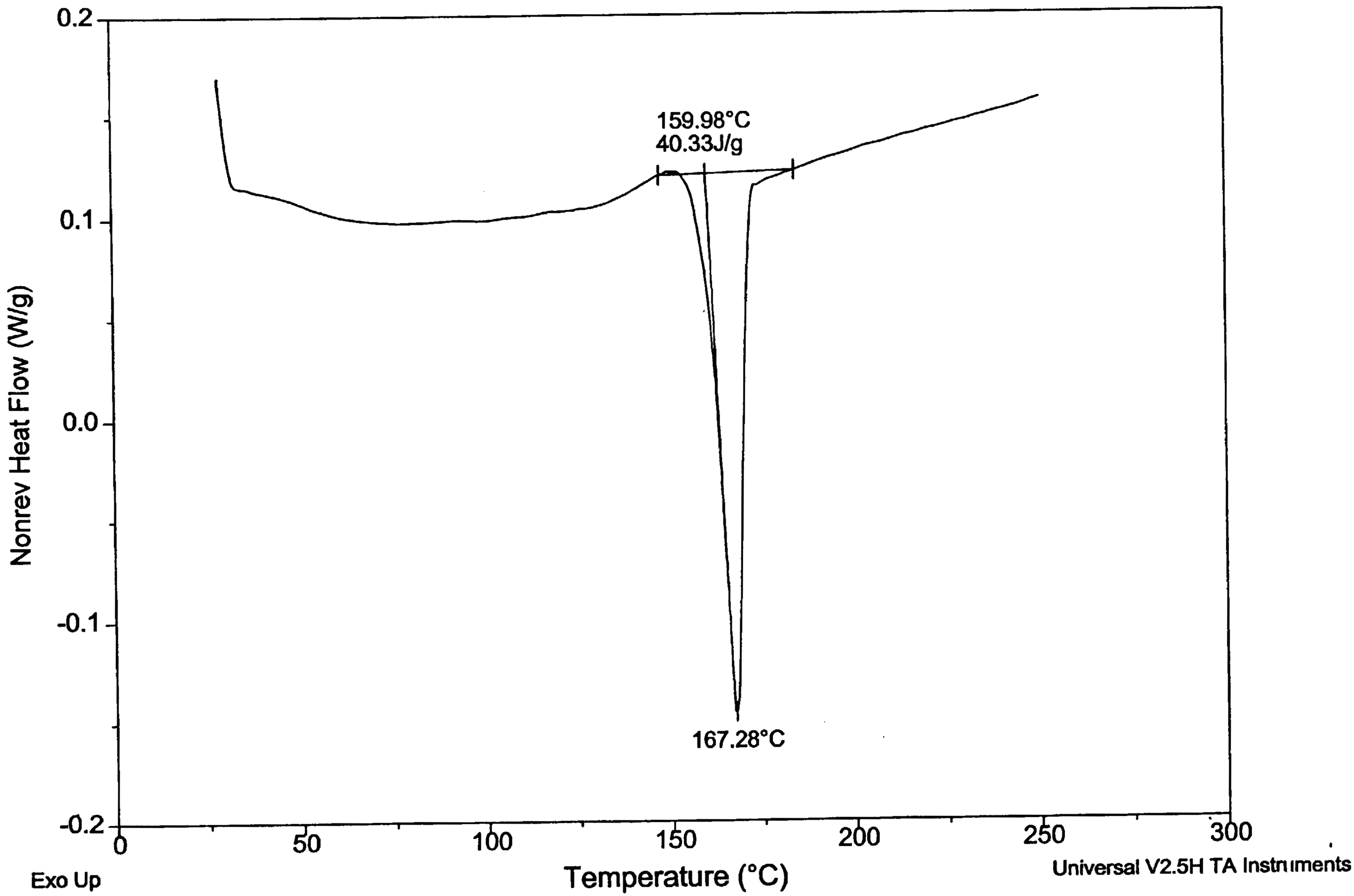
File: C:...\DSC\03614-103.009
Operator: WJM
Run Date: 11-May-01 15:28



Sample: Door Panel-Blk Plastic (2nd run)
Size: 4.7400 mg
Method: MDSC Method
Comment: Chevy Cavalier: Black Plastic #22618443

DSC

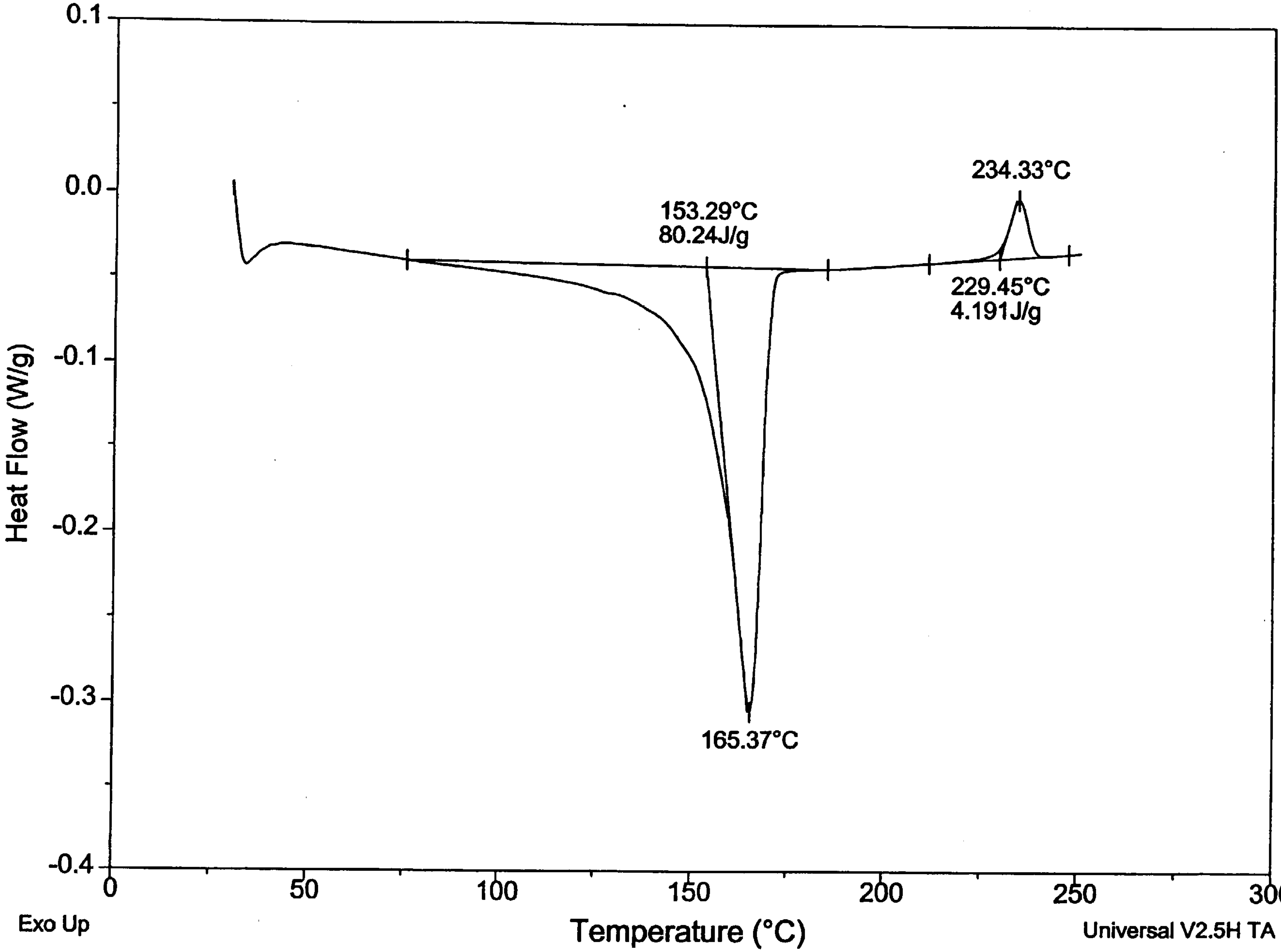
File: C:...\DSC\03614-103.009
Operator: WJM
Run Date: 11-May-01 15:28



Sample: ~~Door Panel~~-HVAC Ducts
Size: 6.5900 mg
Method: MDSC Method
Comment: Chevy Cavalier: HVAC Ducts

DSC

File: C:...\DSC\03614-103.010
Operator: WJM
Run Date: 14-May-01 08:42

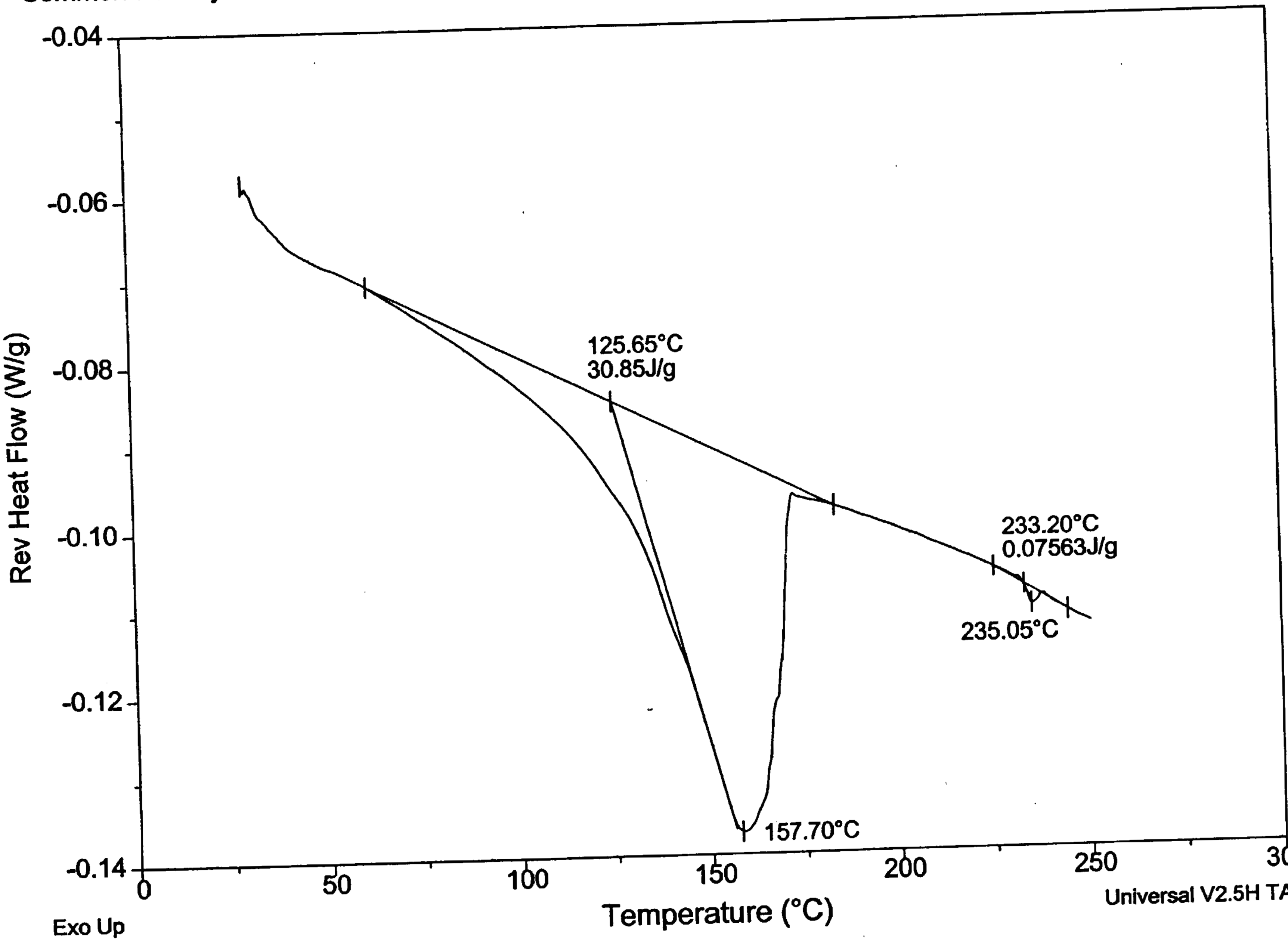


Universal V2.5H TA Instruments

Sample: Door Panel-HVAC Ducts
Size: 6.5900 mg
Method: MDSC Method
Comment: Chevy Cavalier: HVAC Ducts

DSC

File: C:...\DSC\03614-103.010
Operator: WJM
Run Date: 14-May-01 08:42

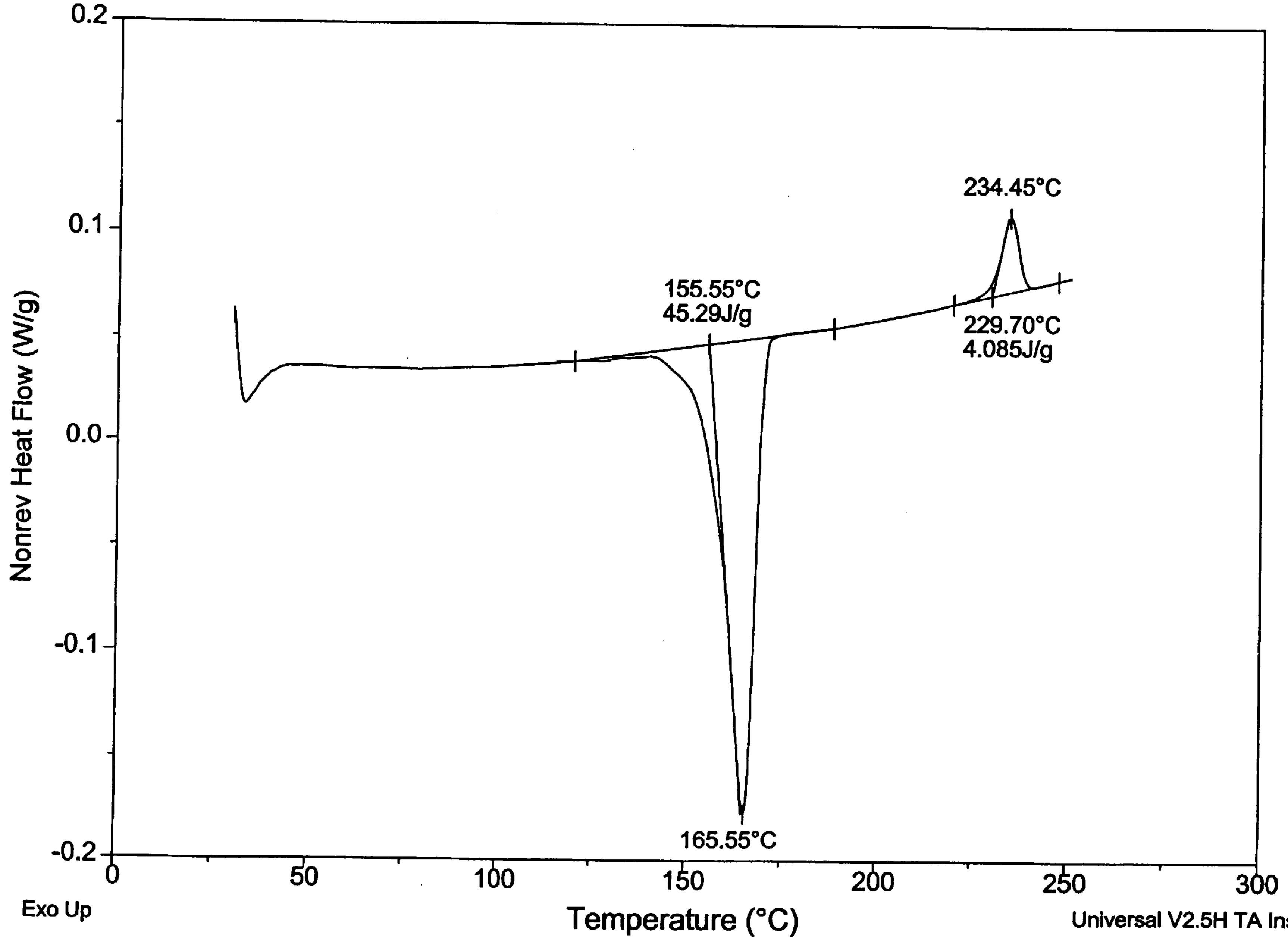


Universal V2.5H TA Instruments

Sample: Door Panel-HVAC Ducts
Size: 6.5900 mg
Method: MDSC Method
Comment: Chevy Cavalier: HVAC Ducts

DSC

File: C:...\DSC\03614-103.010
Operator: WJM
Run Date: 14-May-01 08:42

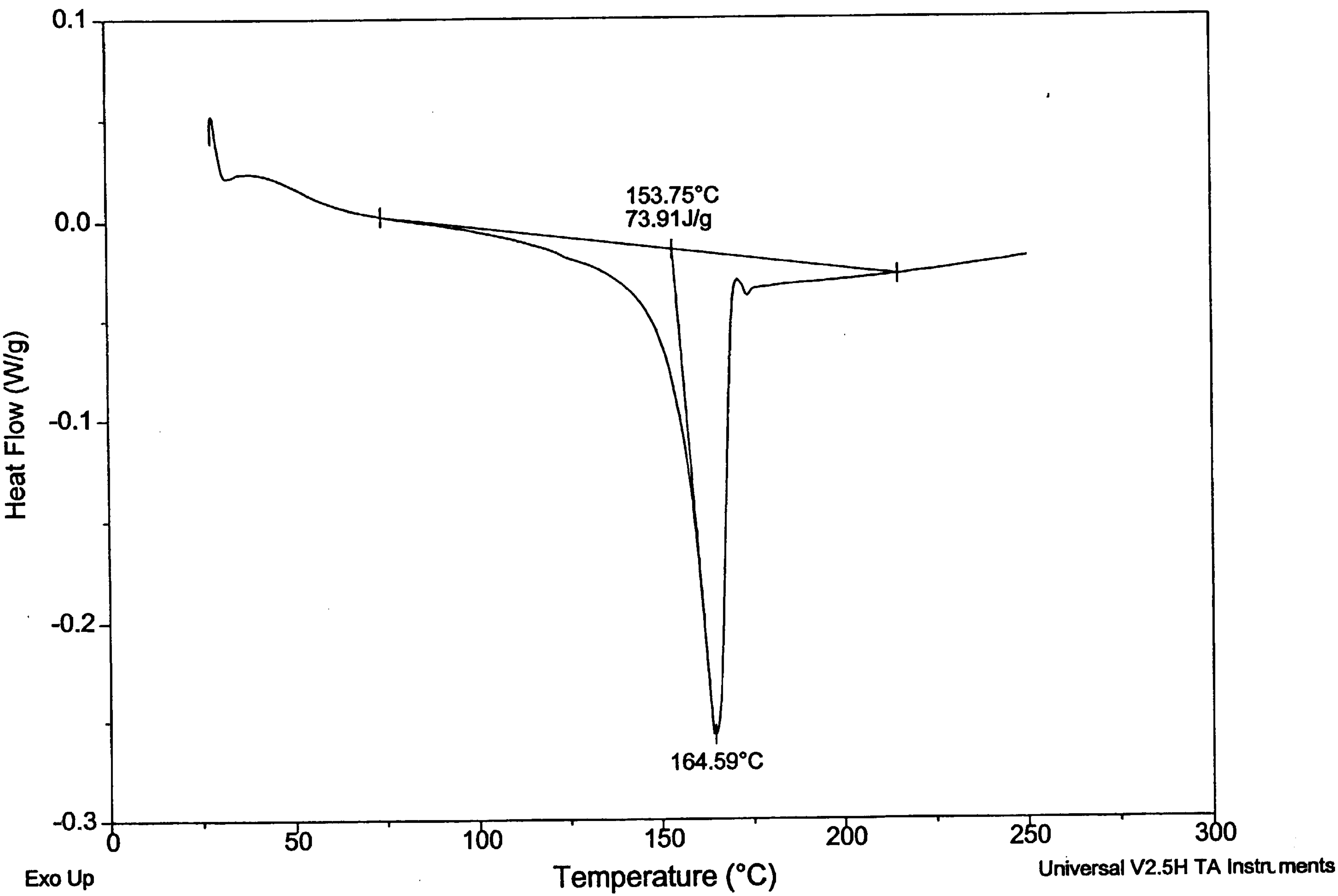


Universal V2.5H TA Instrı ments

Sample: ~~Door Panel-~~HVAC Ducts (run 2)
Size: 5.3200 mg
Method: MDSC Method
Comment: Chevy Cavalier: HVAC Ducts

DSC

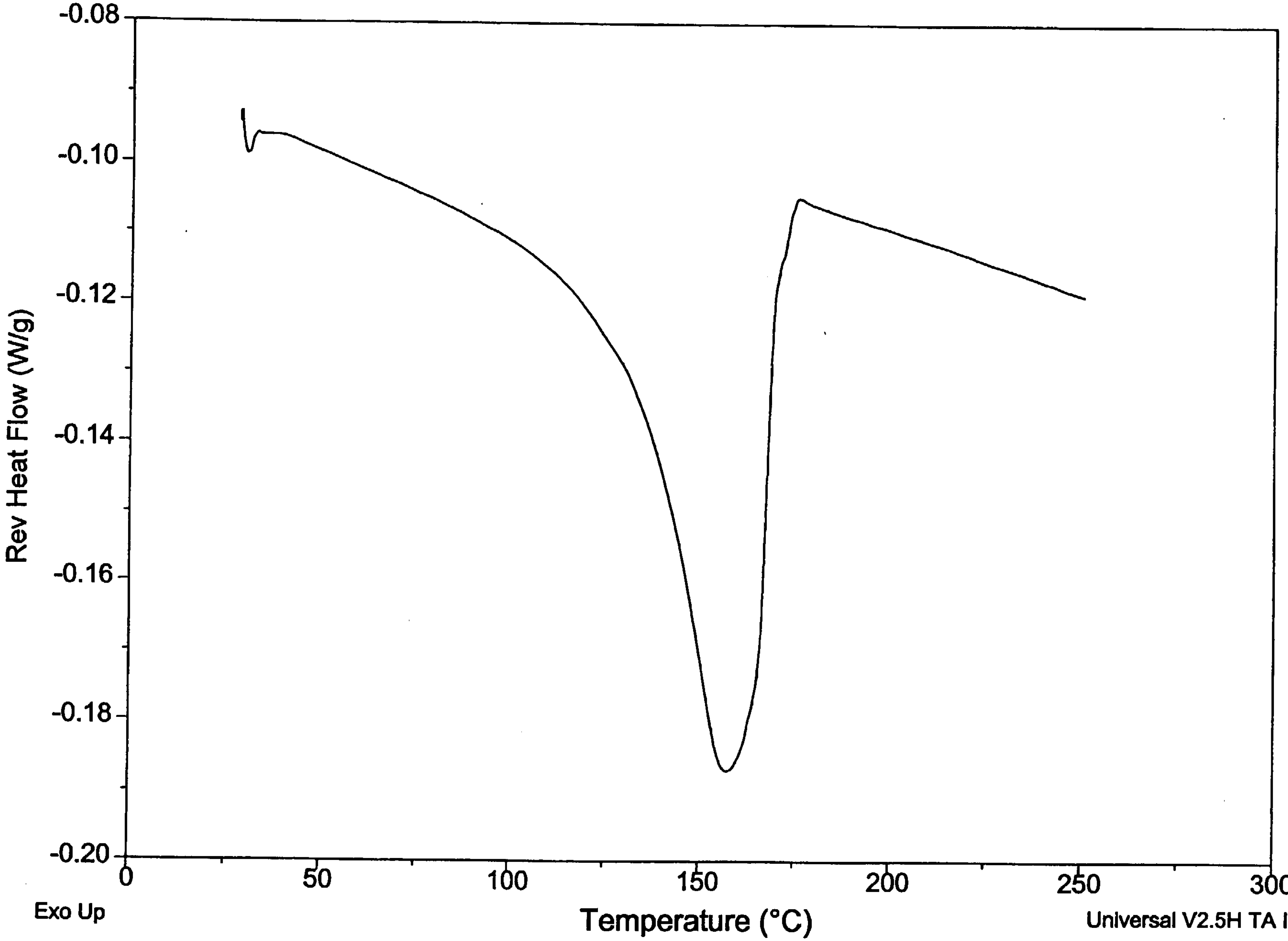
File: C:...\DSC\03614-103.011
Operator: WJM
Run Date: 14-May-01 10:45



Sample: Door Panel-HVAC Ducts (run 2)
Size: 5.3200 mg
Method: MDSC Method
Comment: Chevy Cavalier: HVAC Ducts

DSC

File: C:...\DSC\03614-103.011
Operator: WJM
Run Date: 14-May-01 10:45

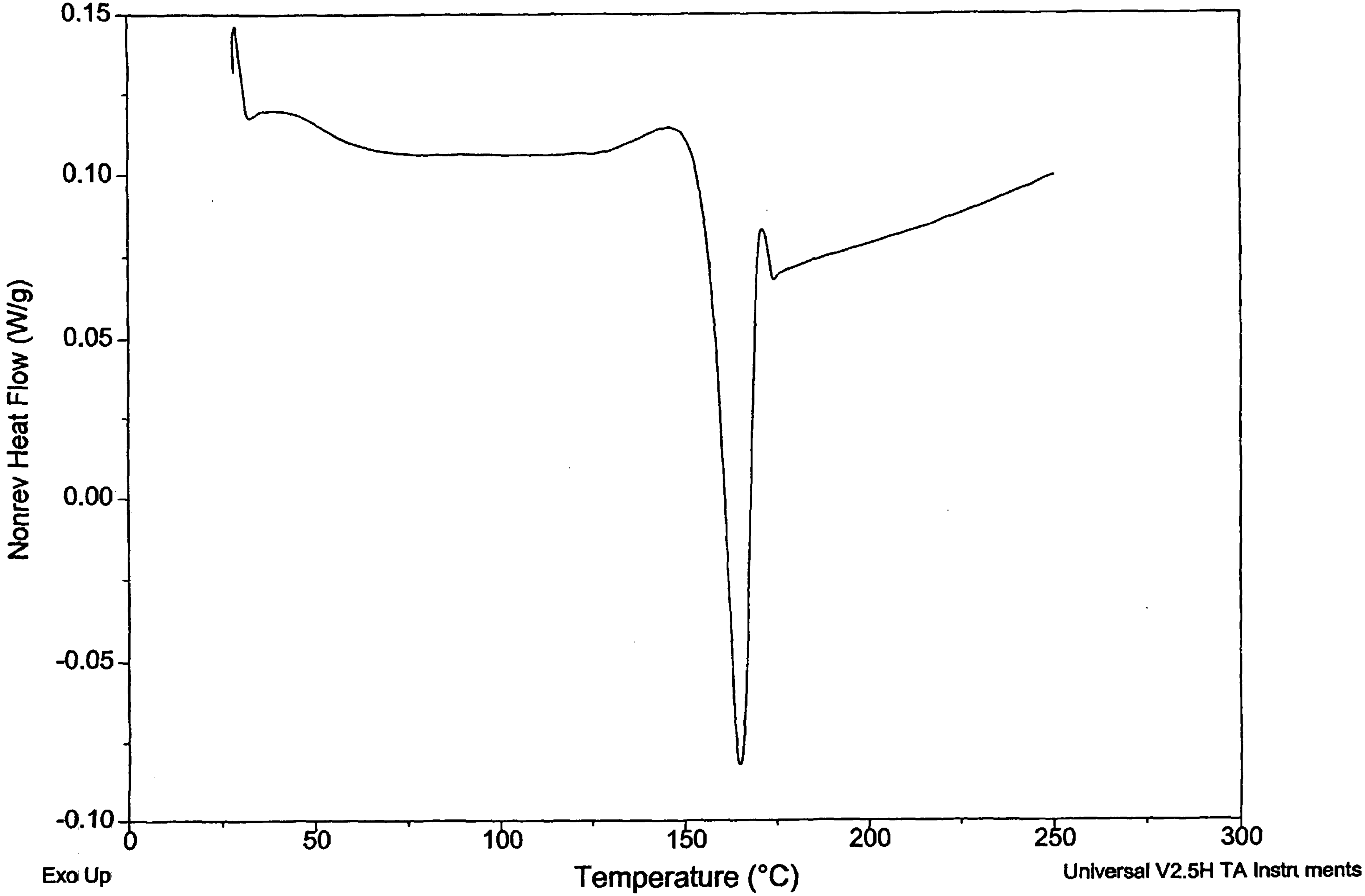


Universal V2.5H TA Instruments

Sampre: Door Panel-HVAC Ducts (run 2)
Size: 5.3200 mg
Method: MDSC Method
Comment: Chevy Cavalier: HVAC Ducts

DSC

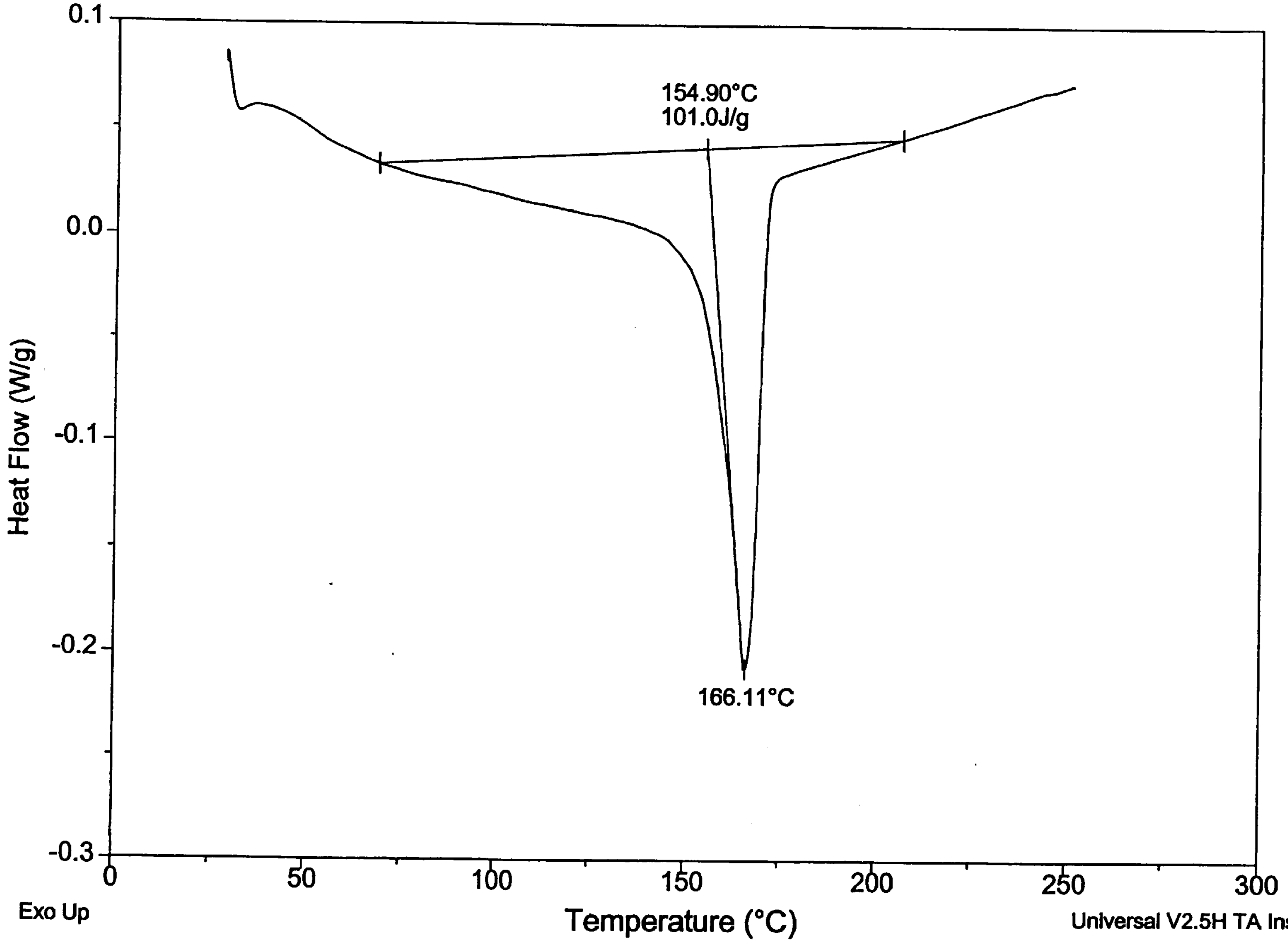
File: C:...\DSC\03614-103.011
Operator: WJM
Run Date: 14-May-01 10:45



Sample: Air Cleaner
Size: 3.6500 mg
Method: MDSC Method
Comment: Chevy Cavalier: Air Cleaner

DSC

File: C:...\DSC\03614-103.012
Operator: WJM
Run Date: 14-May-01 12:37

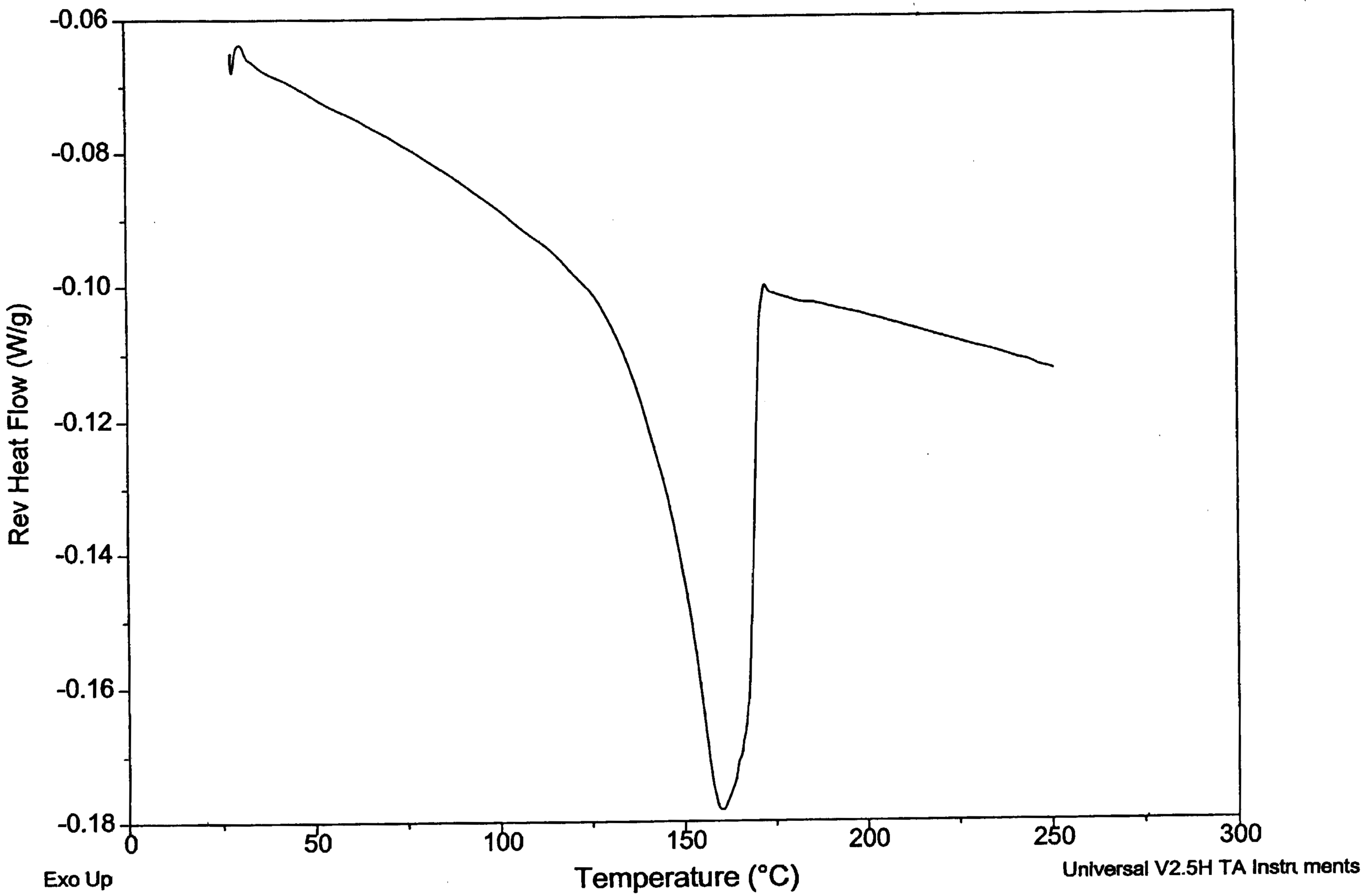


Universal V2.5H TA Instruments

Sample: Air Cleaner
Size: 3.6500 mg
Method: MDSC Method
Comment: Chevy Cavalier: Air Cleaner

DSC

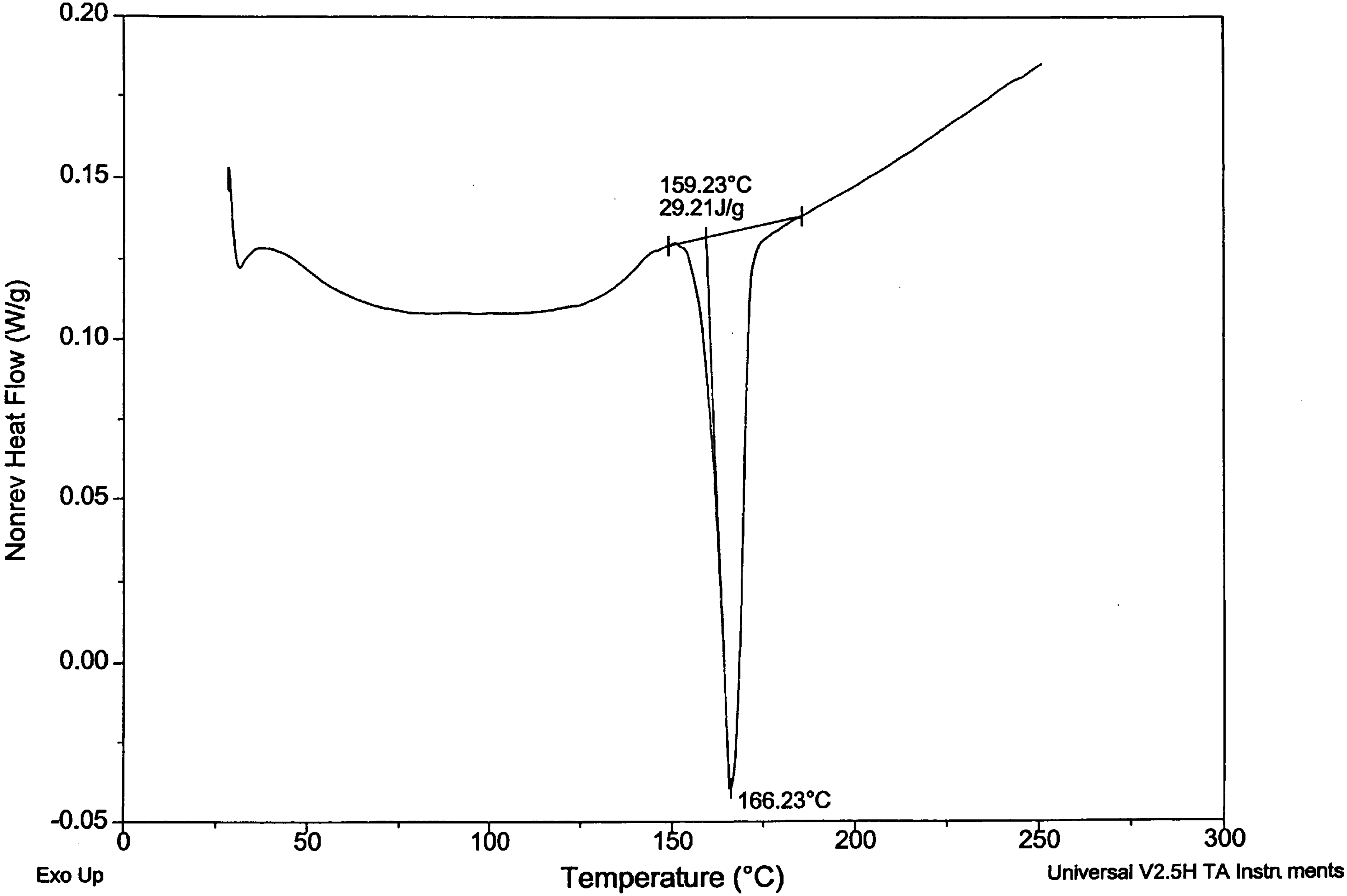
File: C:...\DSC\03614-103.012
Operator: WJM
Run Date: 14-May-01 12:37

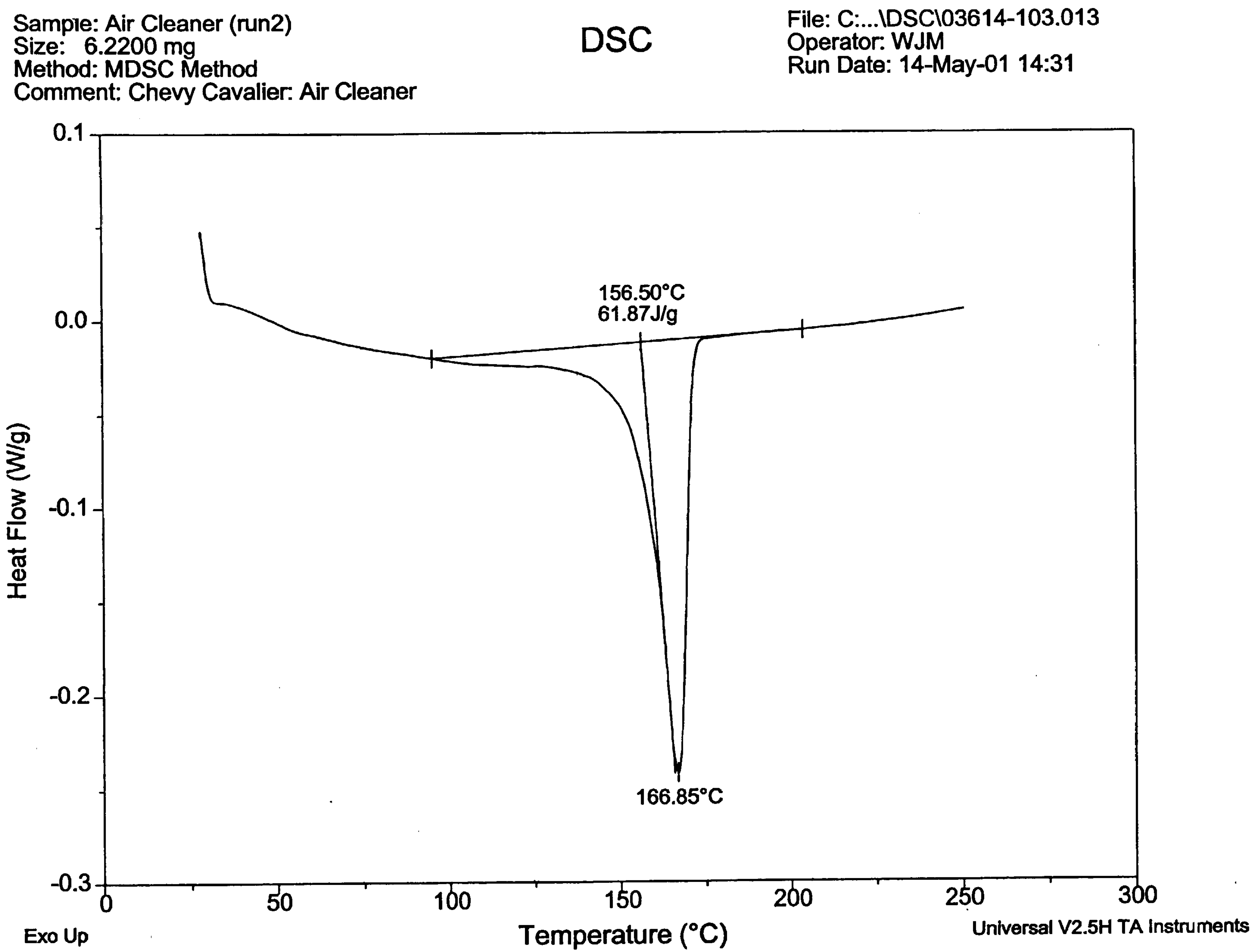


Sample: Air Cleaner
Size: 3.6500 mg
Method: MDSC Method
Comment: Chevy Cavalier: Air Cleaner

DSC

File: C:...\DSC\03614-103.012
Operator: WJM
Run Date: 14-May-01 12:37



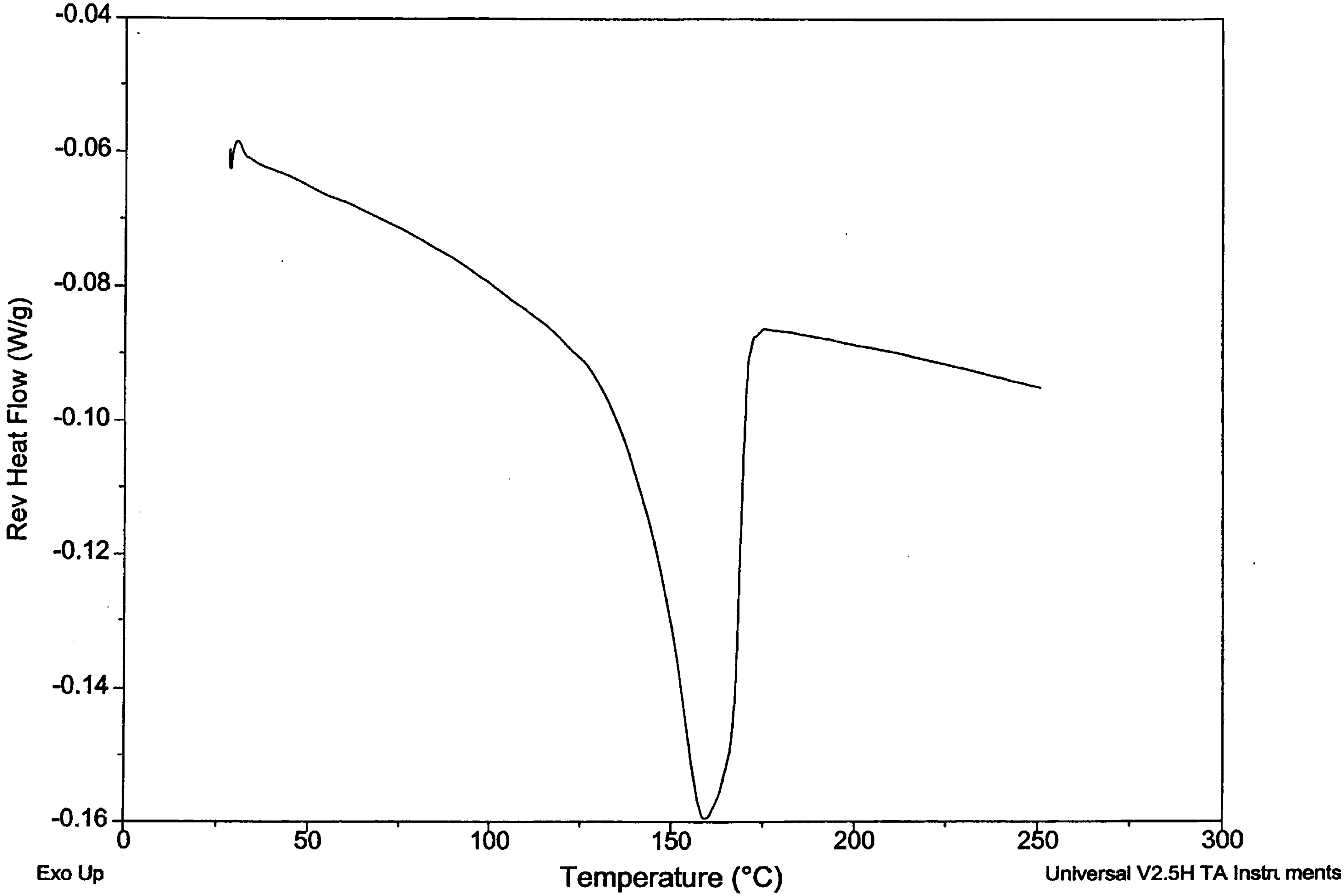


Sample: Air Cleaner (run2)
Size: 6.2200 mg
Method: MDSC Method
Comment: Chevy Cavalier: Air Cleaner
DSC
File: C:...\DSC\03614-103.013
Operator: WJM
Run Date: 14-May-01 14:31
0.1
0.0
-0.1
-0.2
-0.3
Heat Flow (W/g)
156.50°C
61.87J/g
166.85°C
0
50
100
150
200
250
300
Temperature (°C)
Exo Up
Universal V2.5H TA Instruments

Sample: Air Cleaner (run2)
Size: 6.2200 mg
Method: MDSC Method
Comment: Chevy Cavalier: Air Cleaner

DSC

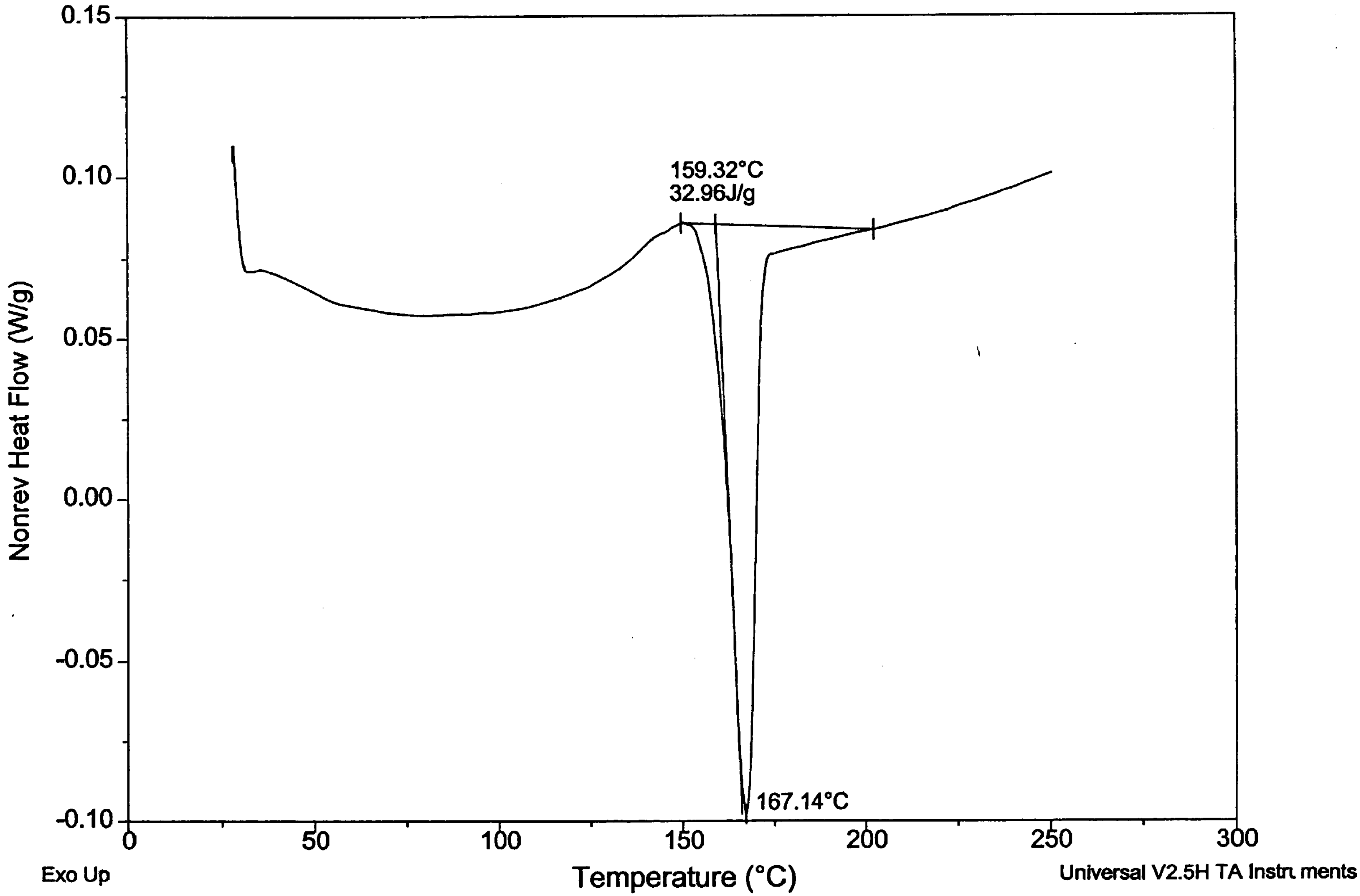
File: C:...\DSC\03614-103.013
Operator: WJM
Run Date: 14-May-01 14:31



Sample: Air Cleaner (run2)
Size: 6.2200 mg
Method: MDSC Method
Comment: Chevy Cavalier: Air Cleaner

DSC

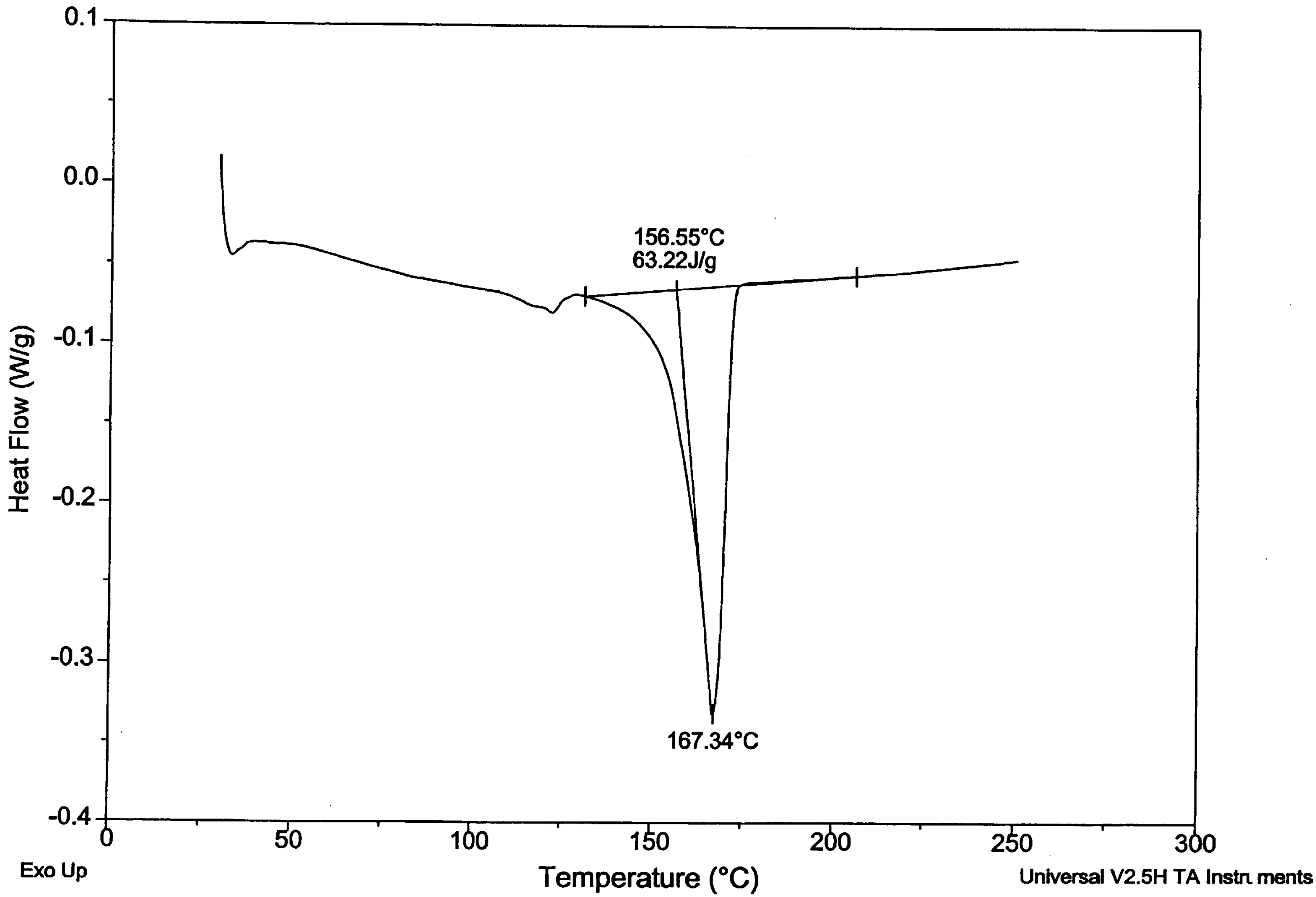
File: C:...\DSC\03614-103.013
Operator: WJM
Run Date: 14-May-01 14:31



Sample: Glove Box Outside
Size: 5.4500 mg
Method: MDSC Method
Comment: Chevy Cavalier: Glove Box outside # 22587440

DSC

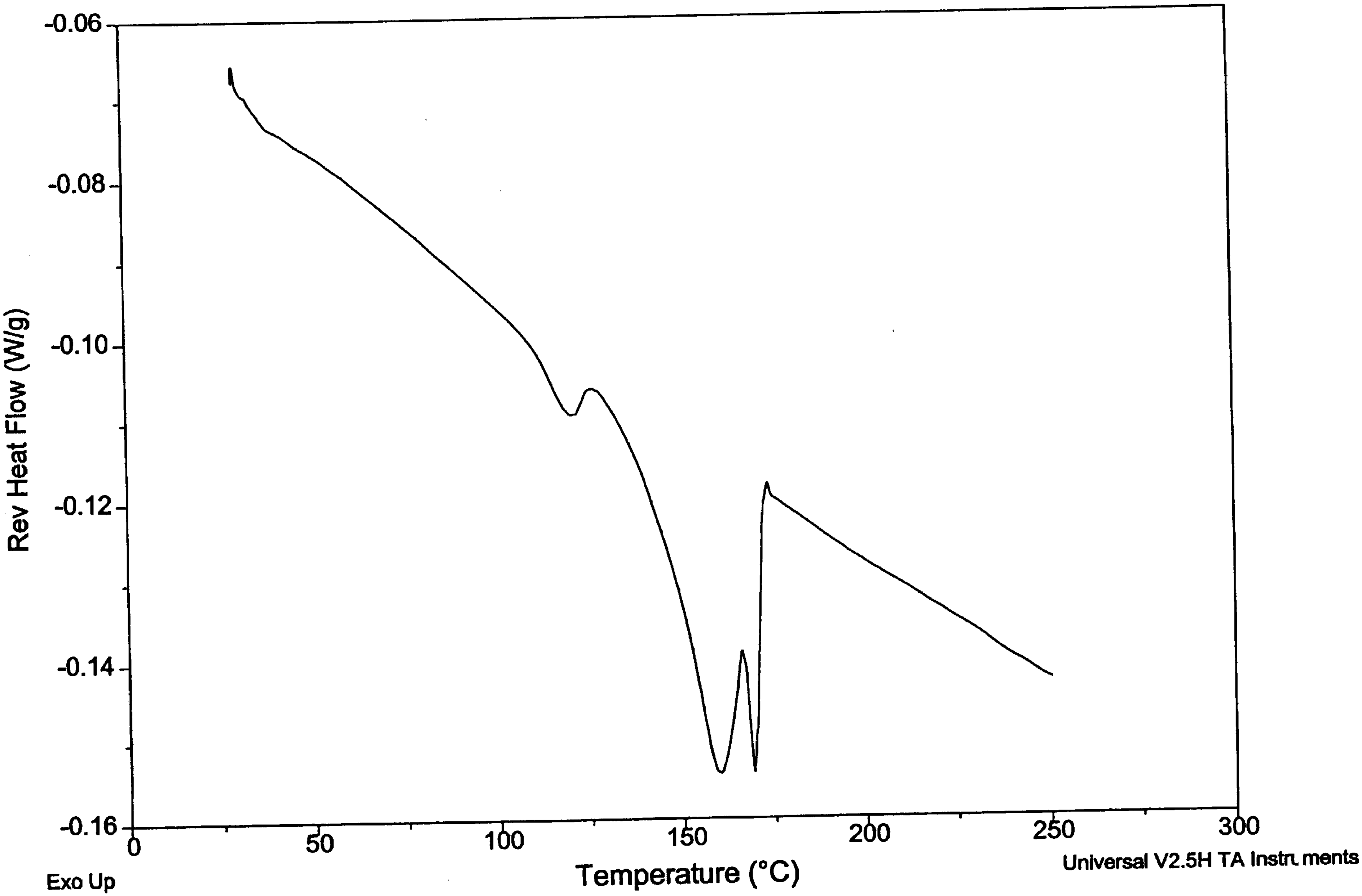
File: C:...\DSC\03614-103.014
Operator: WJM
Run Date: 15-May-01 09:27



Sample: Glove Box Outside
Size: 5.4500 mg
Method: MDSC Method
Comment: Chevy Cavalier: Glove Box outside # 22587440

DSC

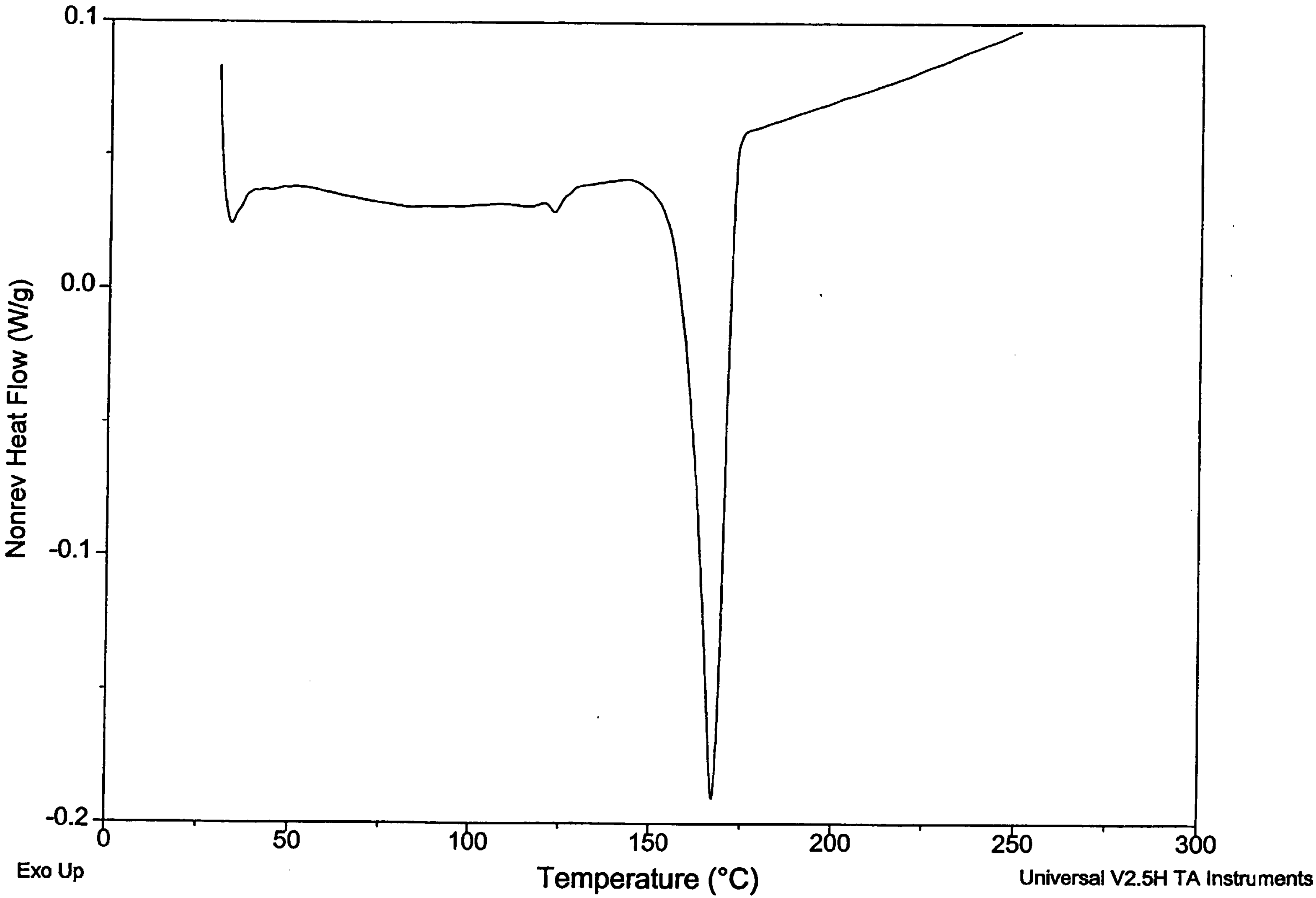
File: C:...\DSC\03614-103.014
Operator: WJM
Run Date: 15-May-01 09:27



Sample: Glove Box Outside
Size: 5.4500 mg
Method: MDSC Method
Comment: Chevy Cavalier: Glove Box outside # 22587440

DSC

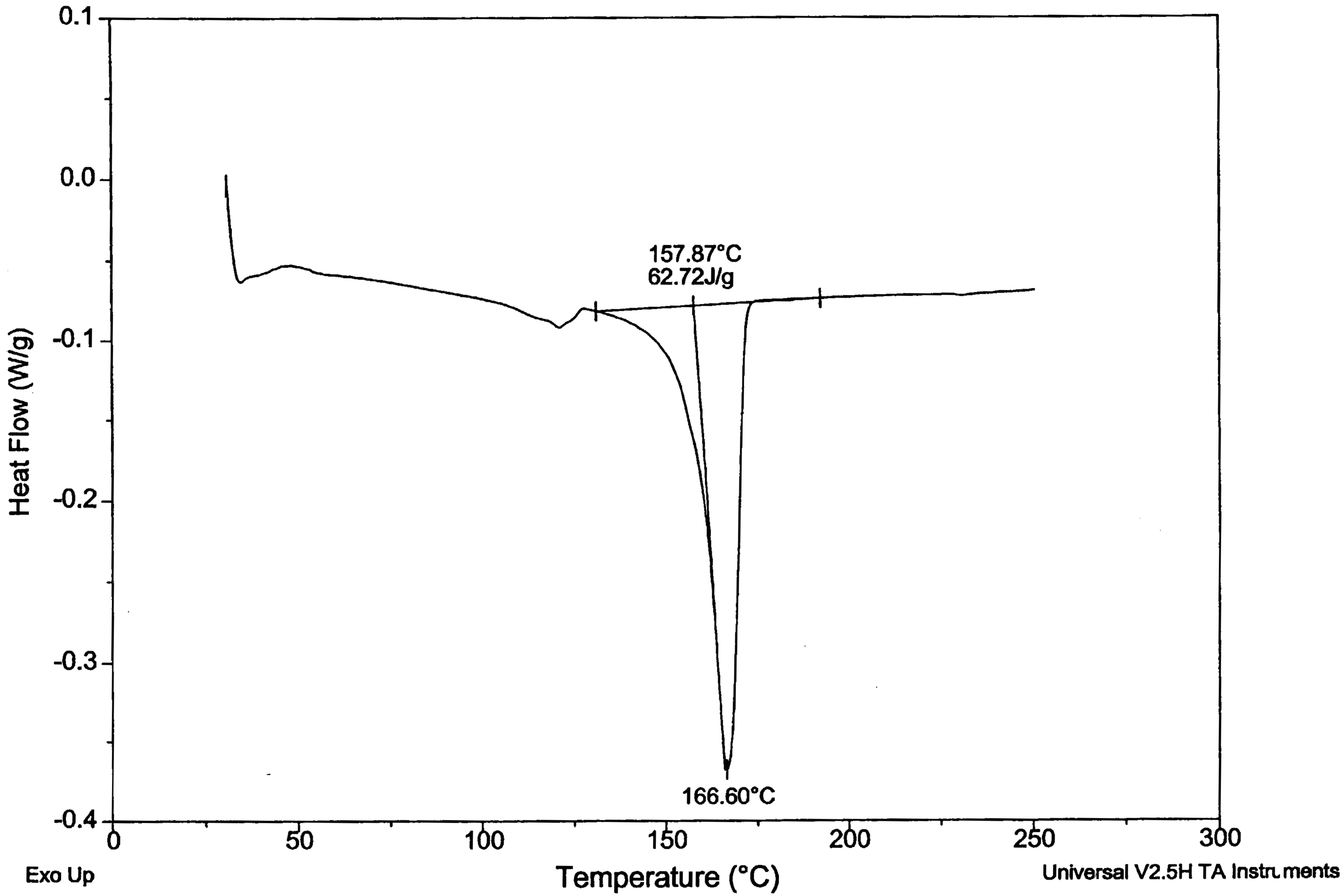
File: C:...\DSC\03614-103.014
Operator: WJM
Run Date: 15-May-01 09:27



Sampre: Glove Box Outside (run 2)
Size: 7.7400 mg
Method: MDSC Method
Comment: Chevy Cavalier: Glove Box outside # 22587440

DSC

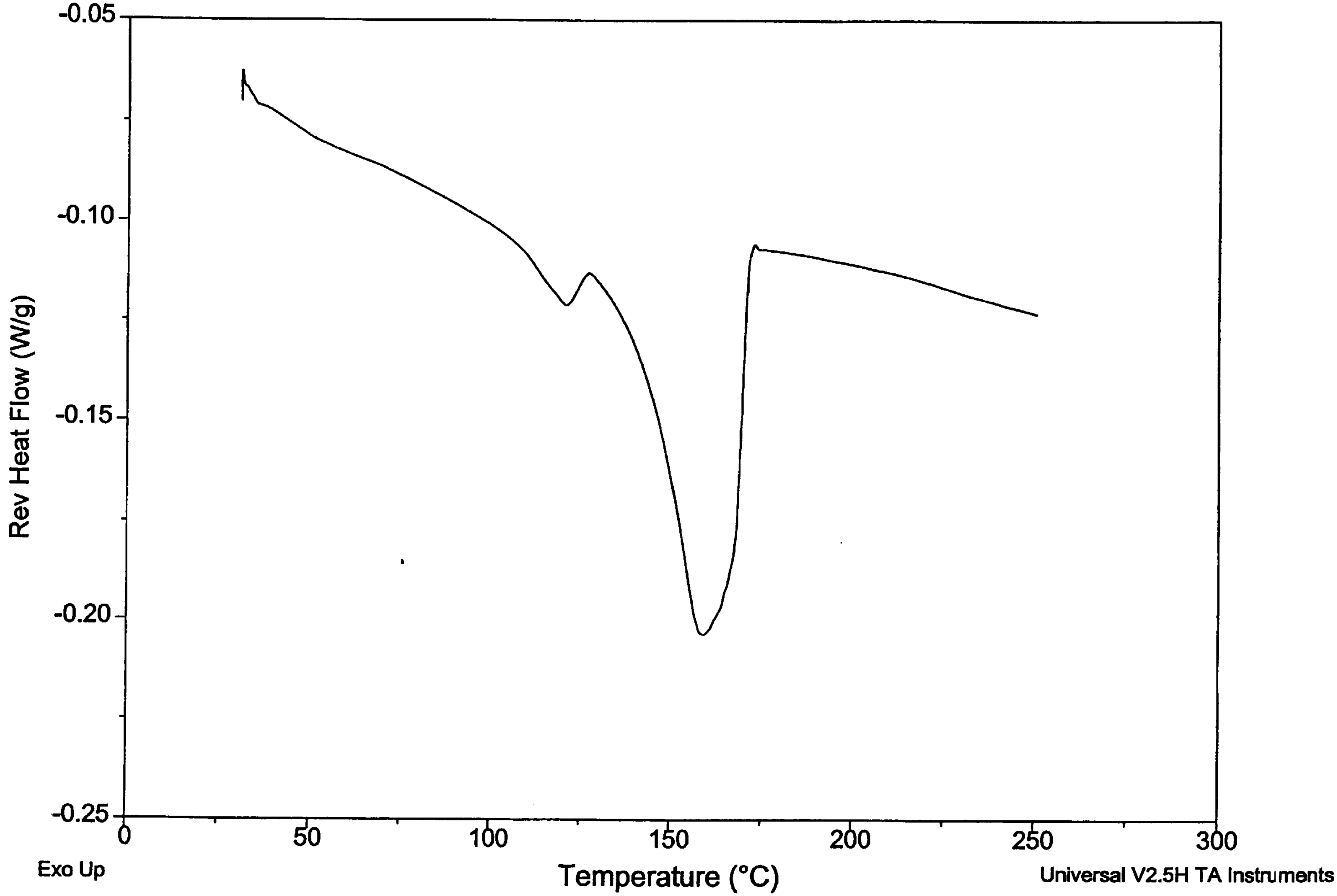
File: C:...\DSC\03614-103.015
Operator: WJM
Run Date: 15-May-01 12:23



Sample: Glove Box Outside (run 2)
Size: 7.7400 mg
Method: MDSC Method
Comment: Chevy Cavalier: Glove Box outside # 22587440

DSC

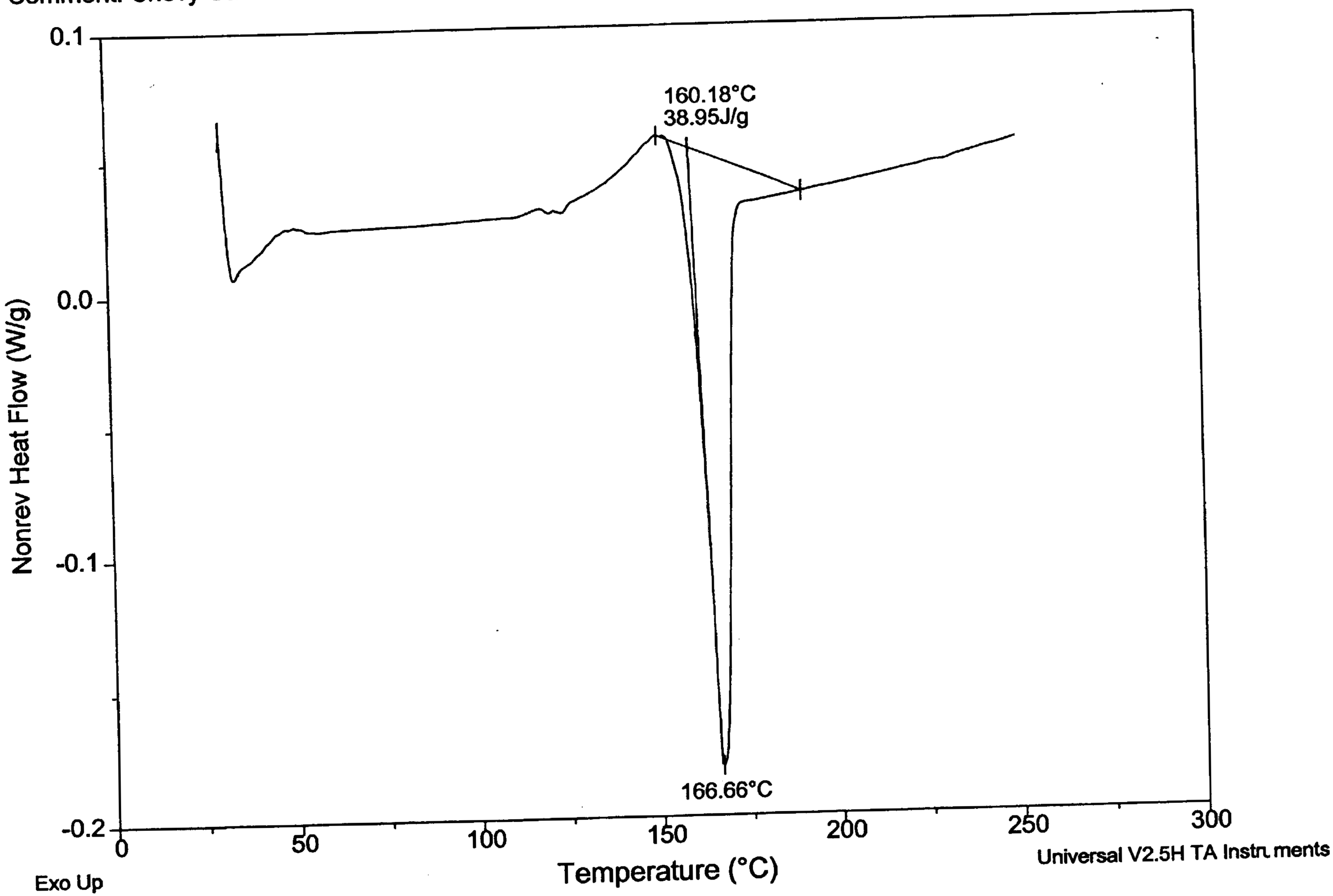
File: C:...\DSC\03614-103.015
Operator: WJM
Run Date: 15-May-01 12:23



Sample: Glove Box Outside (run 2)
Size: 7.7400 mg
Method: MDSC Method
Comment: Chevy Cavalier: Glove Box outside # 22587440

DSC

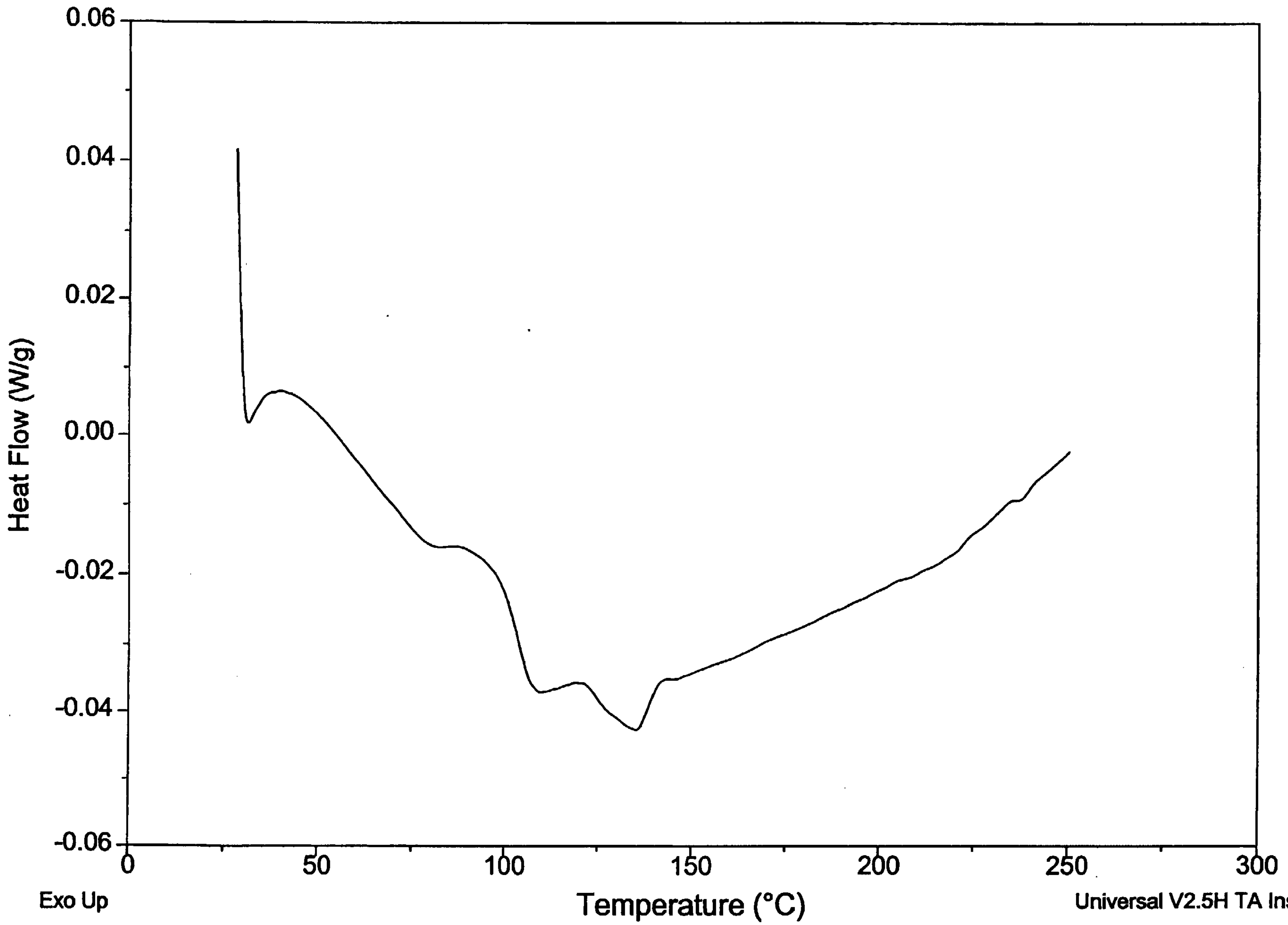
File: C:...\DSC\03614-103.015
Operator: WJM
Run Date: 15-May-01 12:23



Sampie: Glove Box Inside
Size: 5.5700 mg
Method: MDSC Method
Comment: Chevy Cavalier: Glove Box Inside

DSC

File: C:...\DSC\03614-103.016
Operator: WJM
Run Date: 15-May-01 14:25

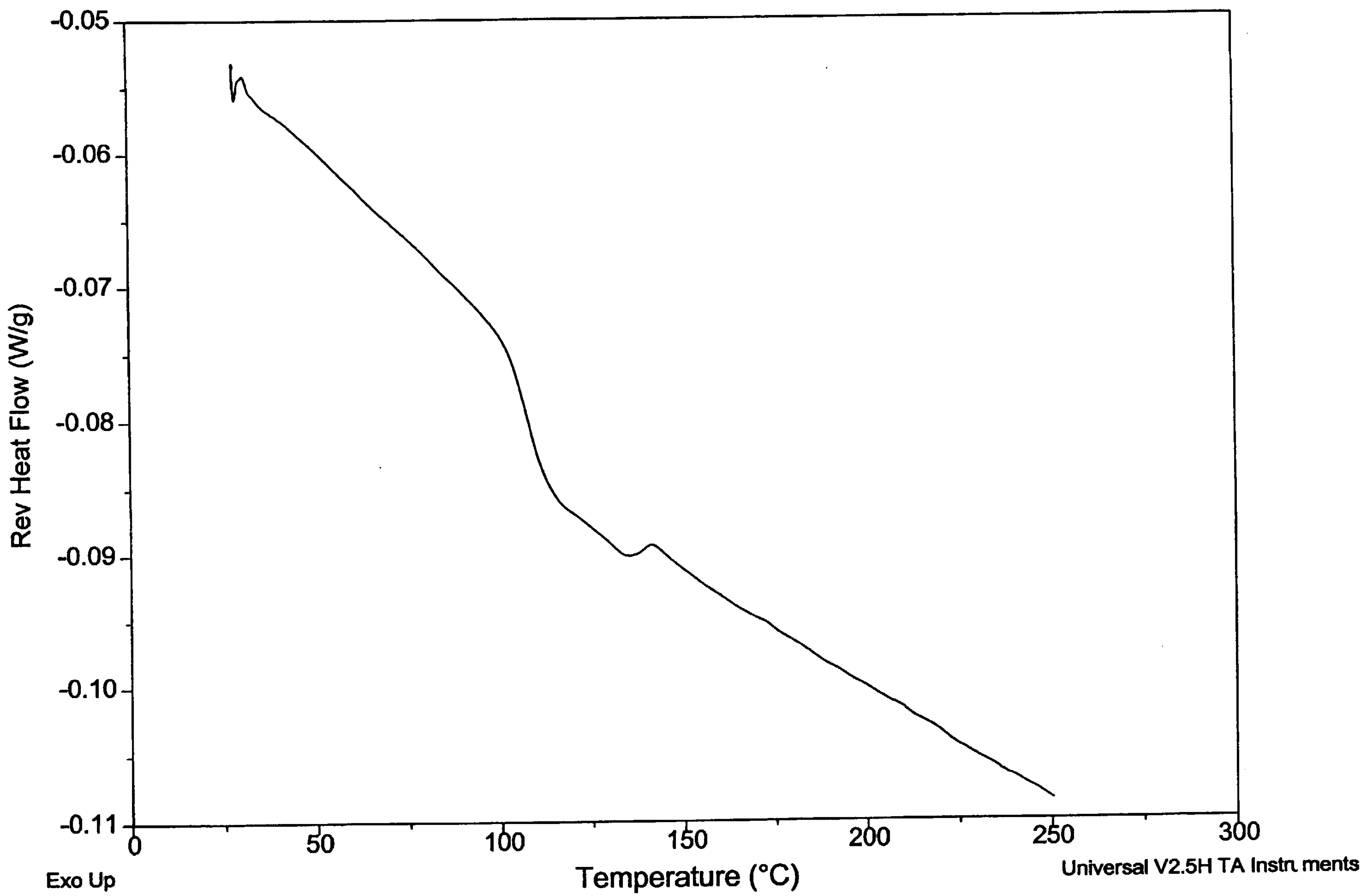


Universal V2.5H TA Instru ments

Sample: Glove Box Inside
Size: 5.5700 mg
Method: MDSC Method
Comment: Chevy Cavalier: Glove Box Inside

DSC

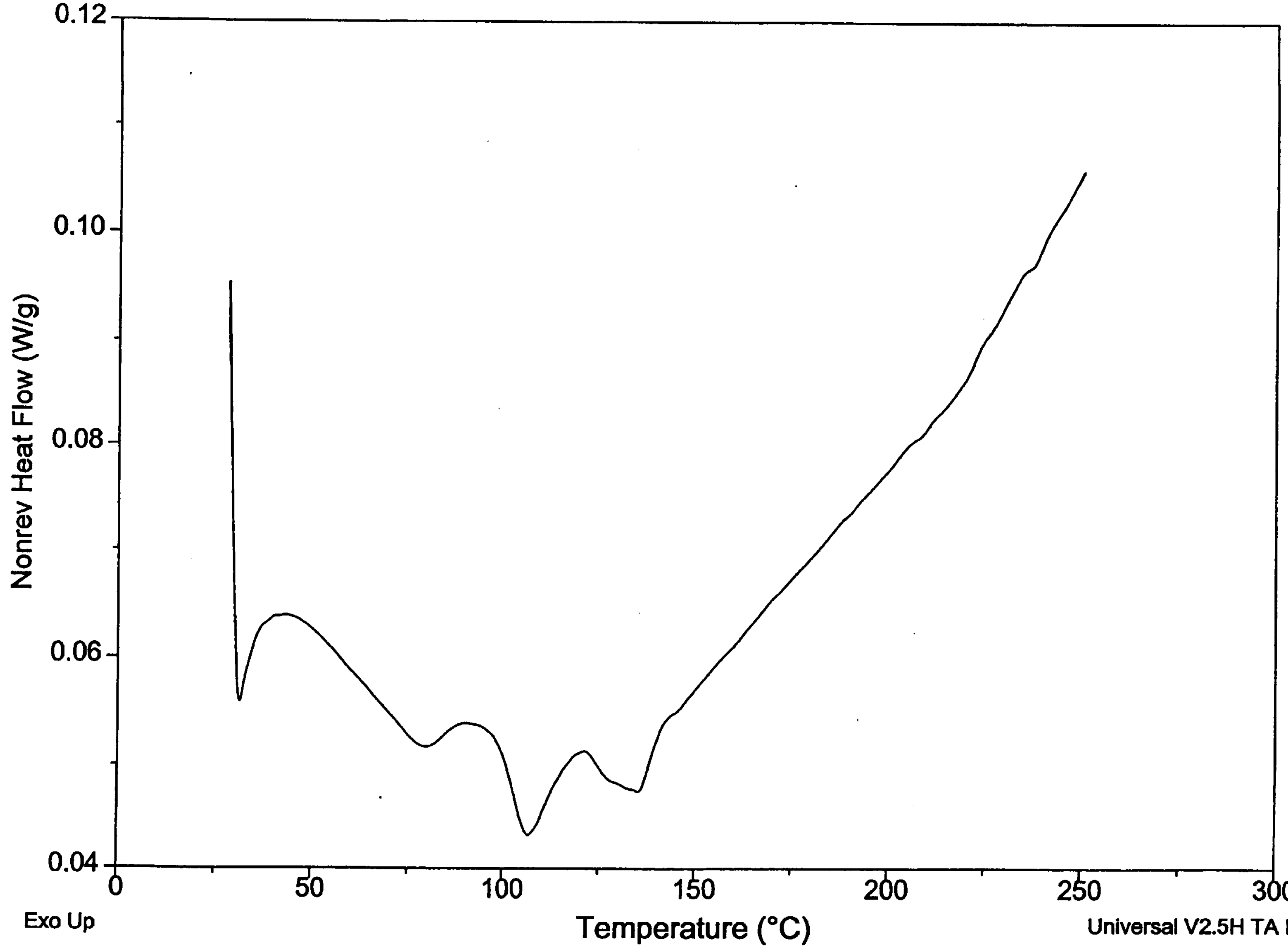
File: C:...\DSC\03614-103.016
Operator: WJM
Run Date: 15-May-01 14:25



Sample: Glove Box Inside
Size: 5.5700 mg
Method: MDSC Method
Comment: Chevy Cavalier: Glove Box Inside

DSC

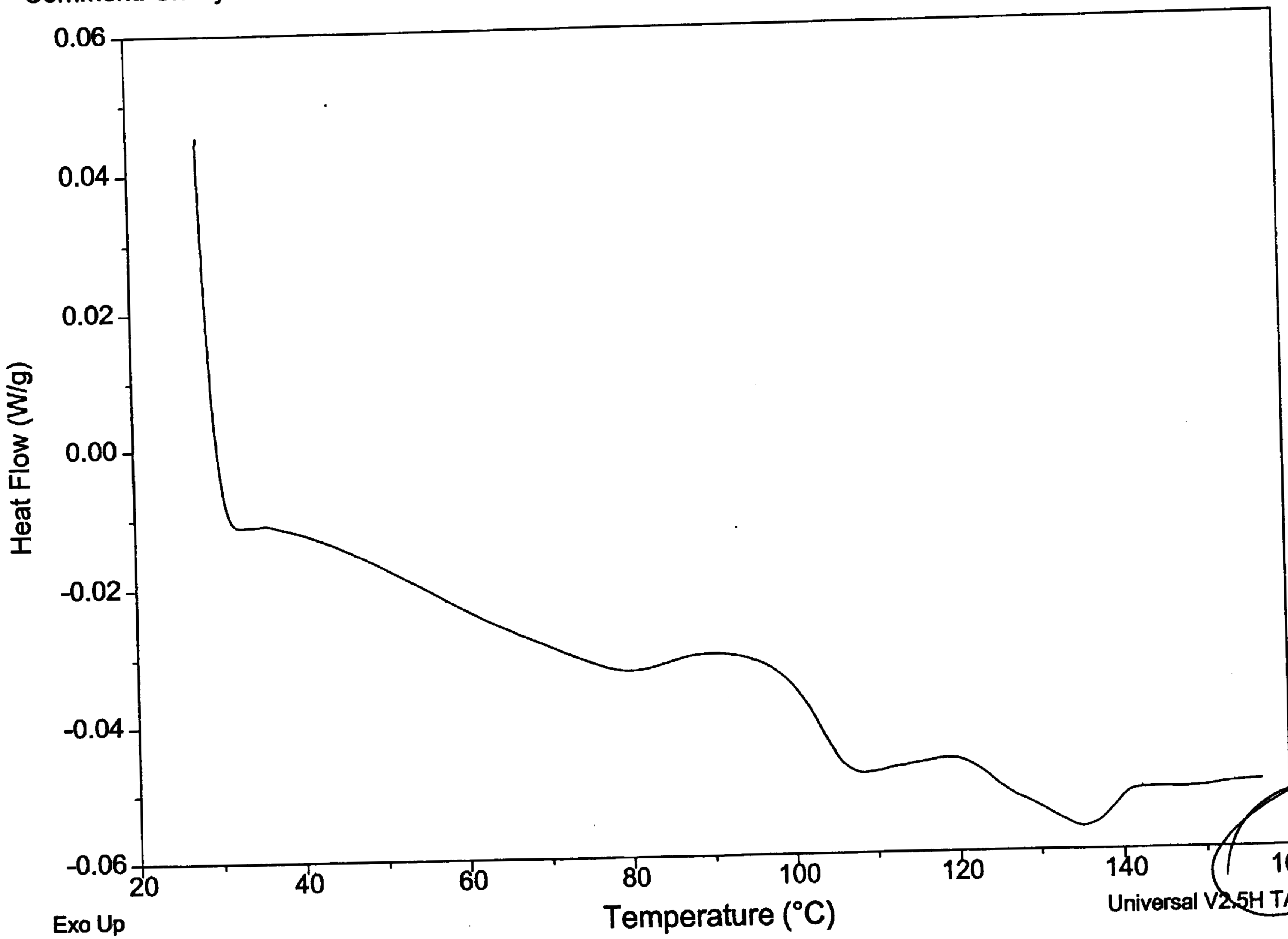
File: C:...\DSC\03614-103.016
Operator: WJM
Run Date: 15-May-01 14:25



Sample: Glove Box Inside (run 2)
Size: 6.8600 mg
Method: MDSC Method
Comment: Chevy Cavalier: Glove Box Inside

DSC

File: C:...\DSC\03614-103.017
Operator: WJM
Run Date: 15-May-01 16:03

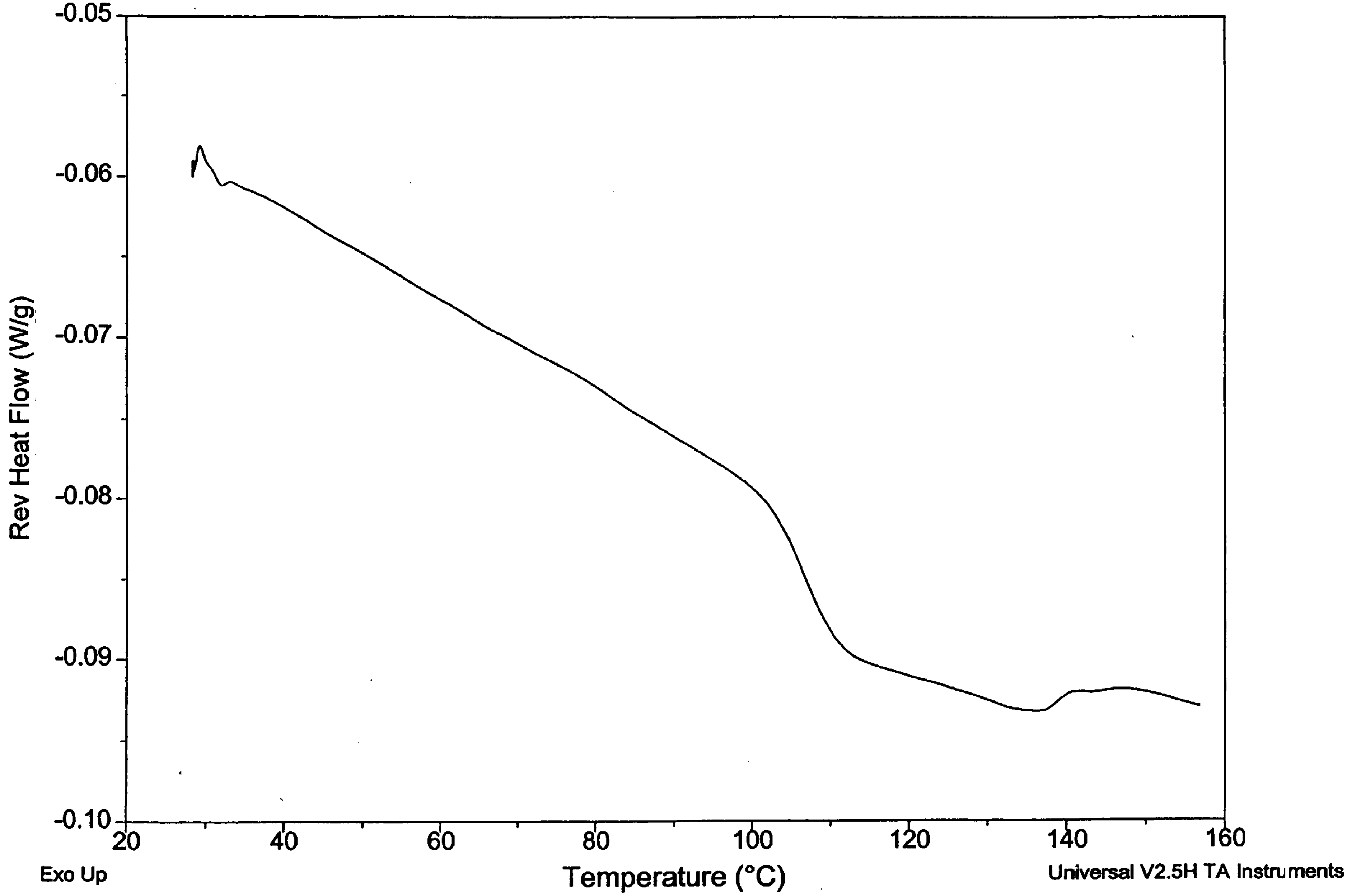


Universal V2.5H TA Instruments

Sample: Glove Box Inside (run 2)
Size: 6.8600 mg
Method: MDSC Method
Comment: Chevy Cavalier: Glove Box Inside

DSC

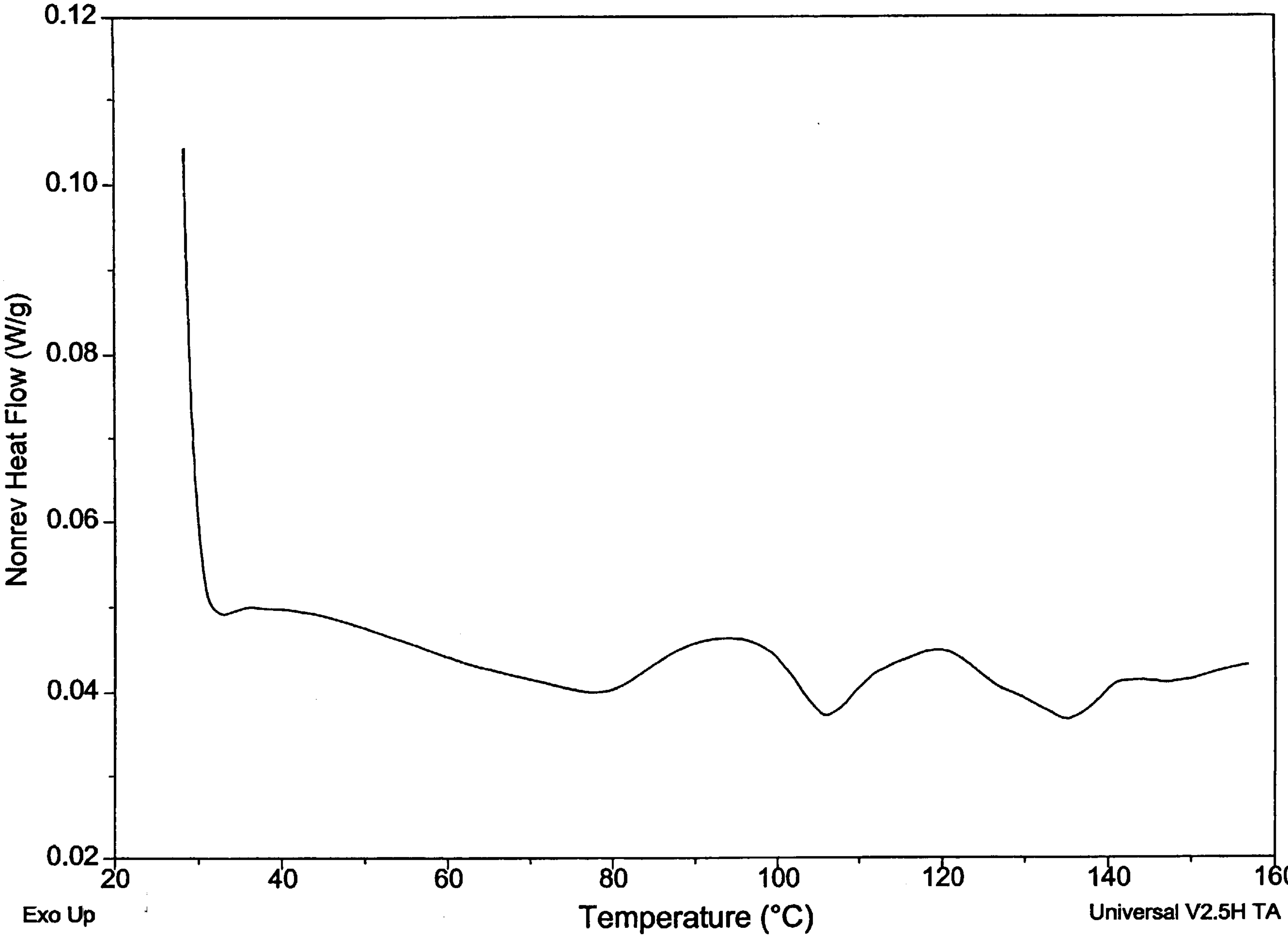
File: C:...\DSC\03614-103.017
Operator: WJM
Run Date: 15-May-01 16:03



Sample: Glove Box Inside (run 2)
Size: 6.8600 mg
Method: MDSC Method
Comment: Chevy Cavalier: Glove Box Inside

DSC

File: C:...\DSC\03614-103.017
Operator: WJM
Run Date: 15-May-01 16:03

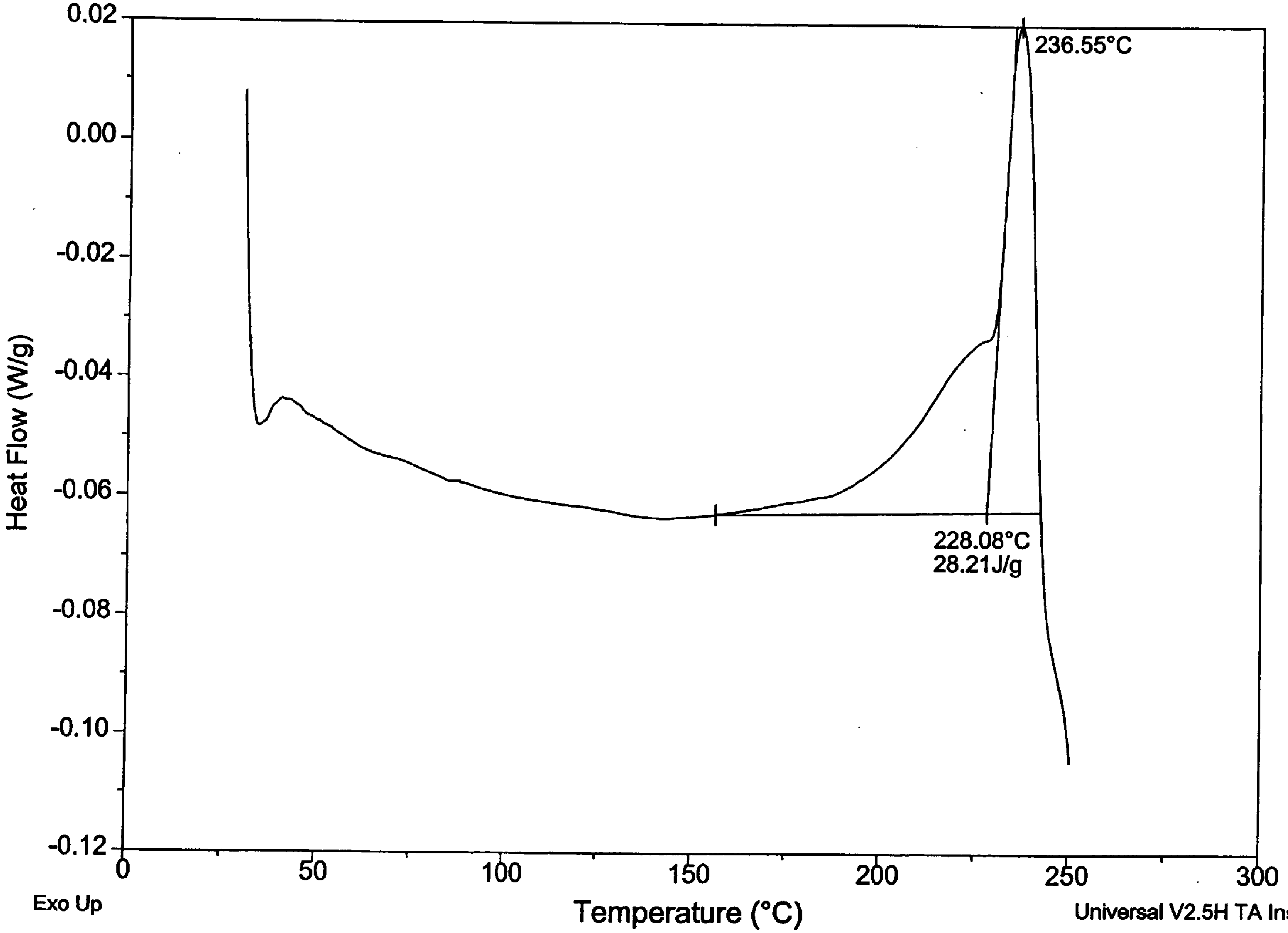


Universal V2.5H TA Instruments

Sample: Headrest Black part
Size: 9.8500 mg
Method: MDSC Method
Comment: Chevy Cavalier: Headrest # 1245789

DSC

File: C:...\DSC\03614-103.018
Operator: WJM
Run Date: 16-May-01 08:30

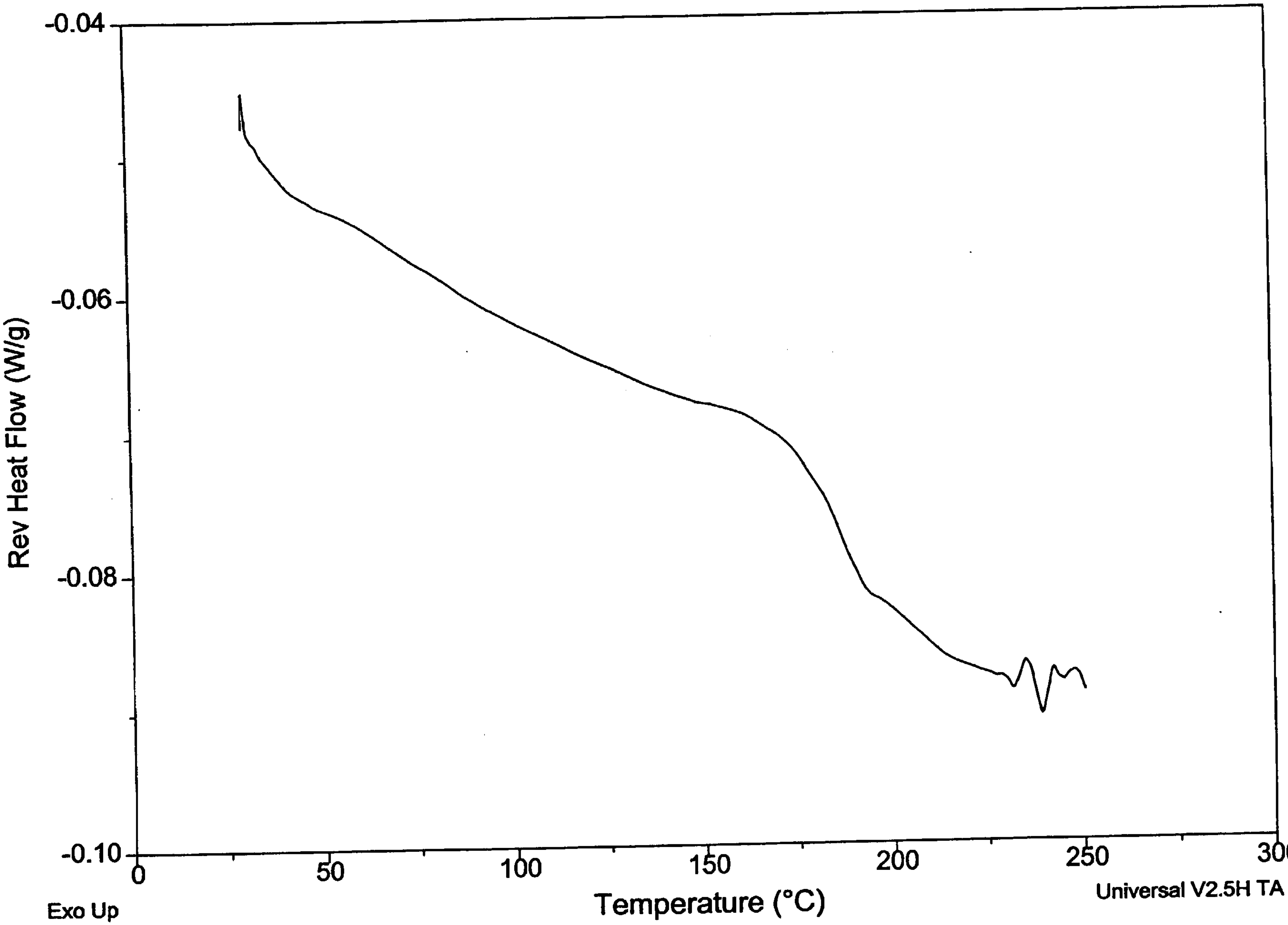


Universal V2.5H TA Instruments

Sample: Headrest Black part
Size: 9.8500 mg
Method: MDSC Method
Comment: Chevy Cavalier: Headrest # 1245789

DSC

File: C:...\DSC\03614-103.018
Operator: WJM
Run Date: 16-May-01 08:30

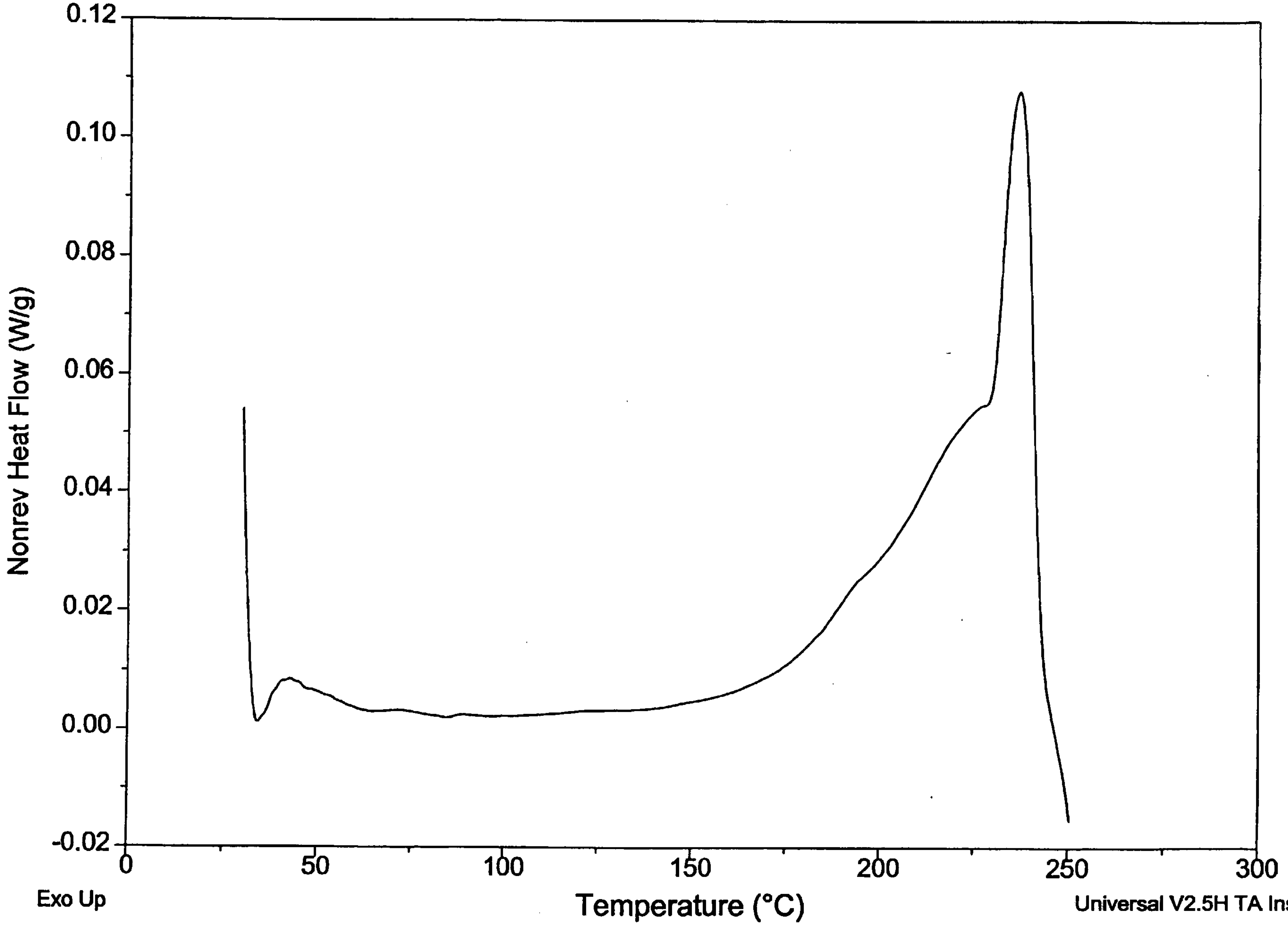


Universal V2.5H TA Instruments

Sample: Headrest Black part
Size: 9.8500 mg
Method: MDSC Method
Comment: Chevy Cavalier: Headrest # 1245789

DSC

File: C:...\DSC\03614-103.018
Operator: WJM
Run Date: 16-May-01 08:30

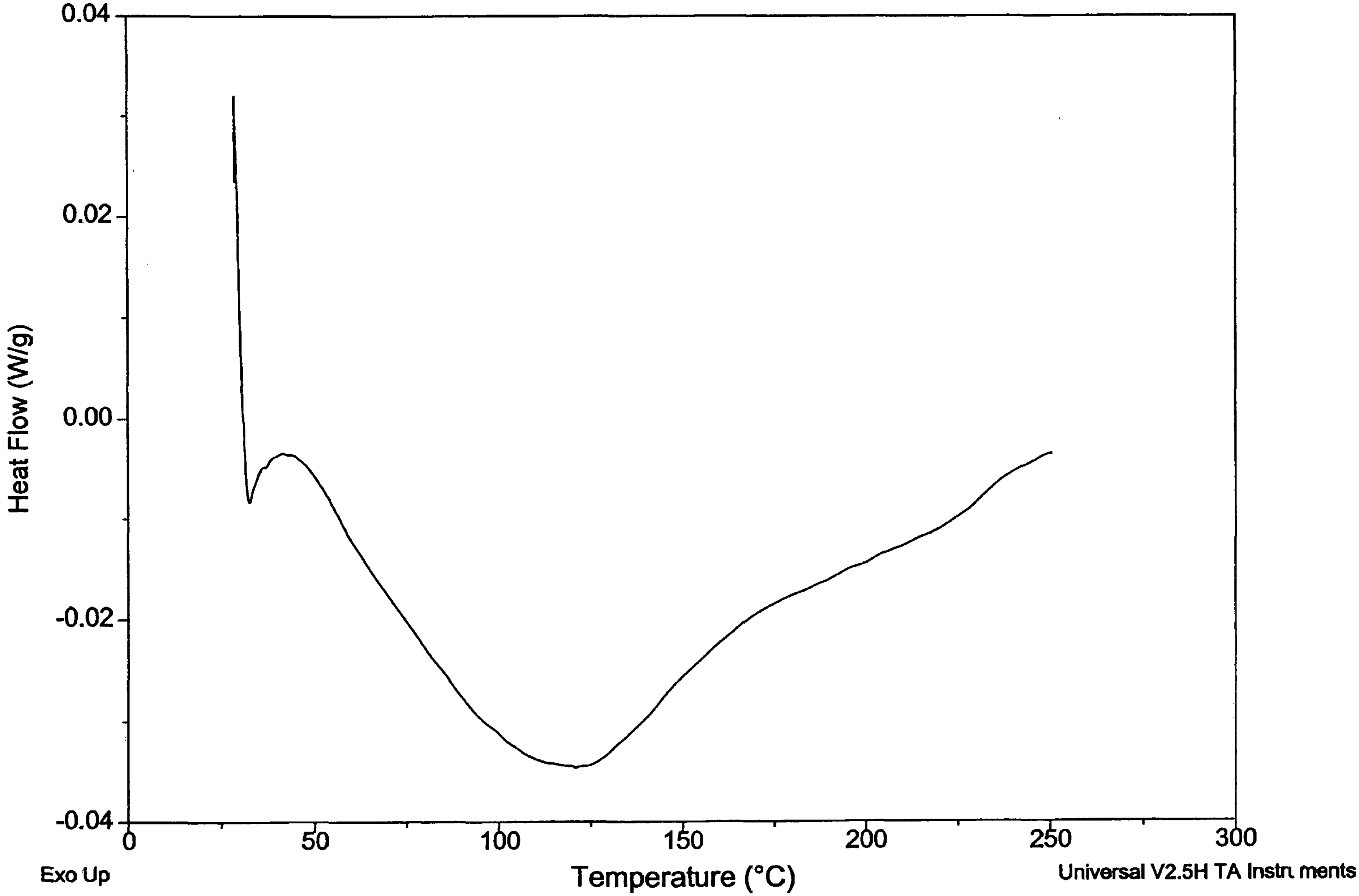


Universal V2.5H TA Instruments

Sample: Headrest Foam
Size: 5.2200 mg
Method: MDSC Method
Comment: Chevy Cavalier: Headrest - Foam # 1245789

DSC

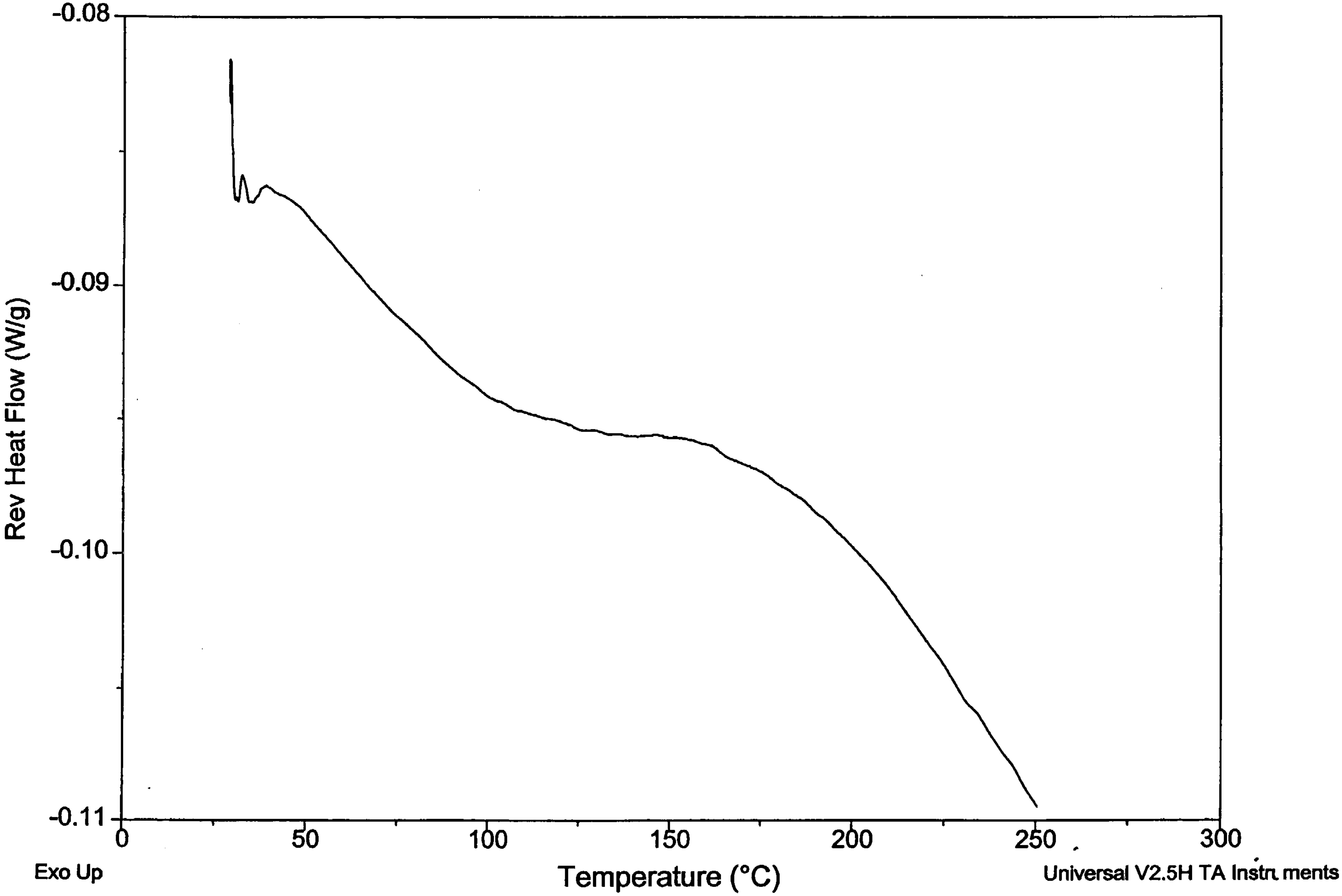
File: C:...\DSC\03614-103.019
Operator: WJM
Run Date: 16-May-01 10:50



Sample: Headrest Foam
Size: 5.2200 mg
Method: MDSC Method
Comment: Chevy Cavalier: Headrest - Foam # 1245789

DSC

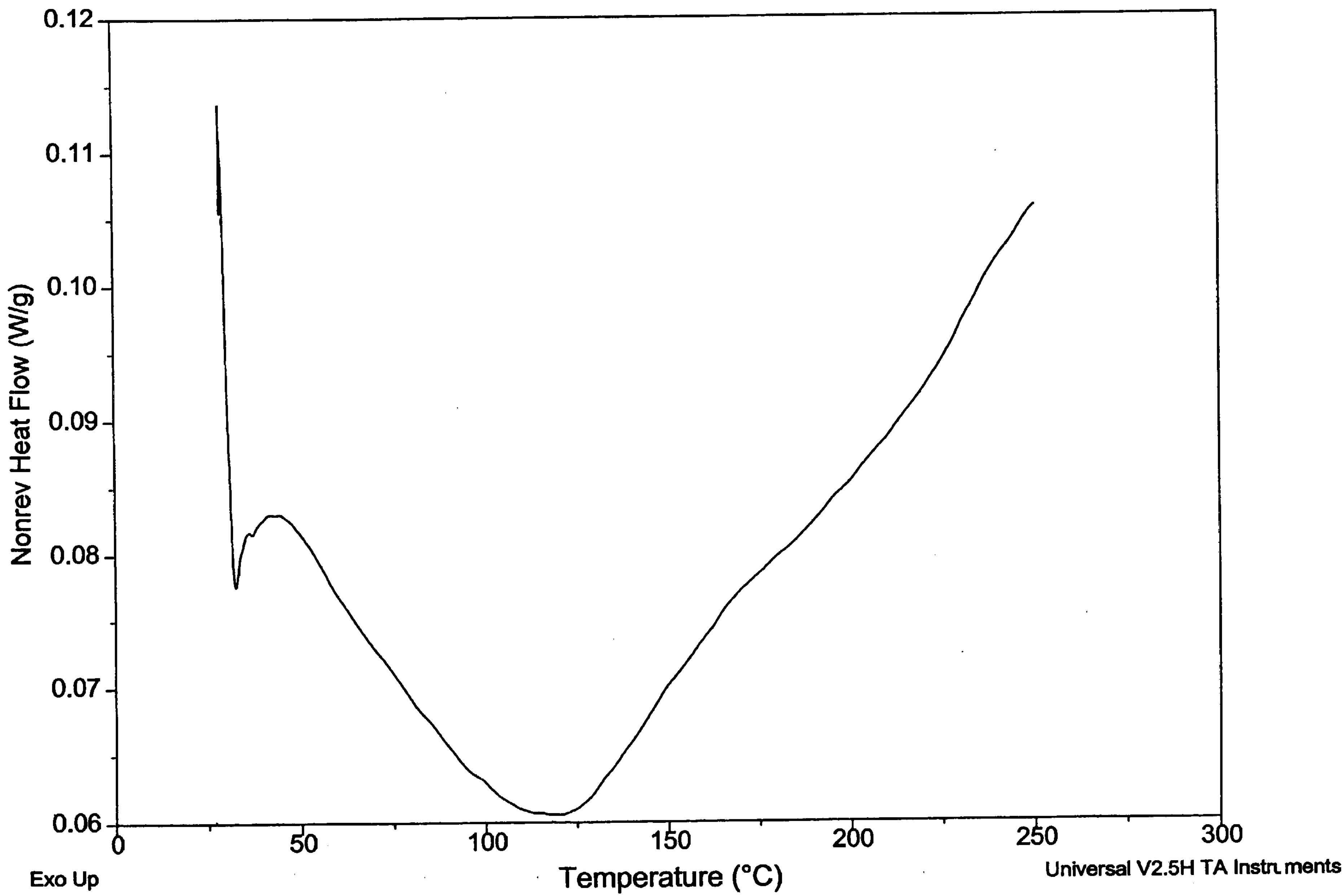
File: C:...\DSC\03614-103.019
Operator: WJM
Run Date: 16-May-01 10:50



Sample: Headrest Foam
Size: 5.2200 mg
Method: MDSC Method
Comment: Chevy Cavalier: Headrest - Foam # 1245789

DSC

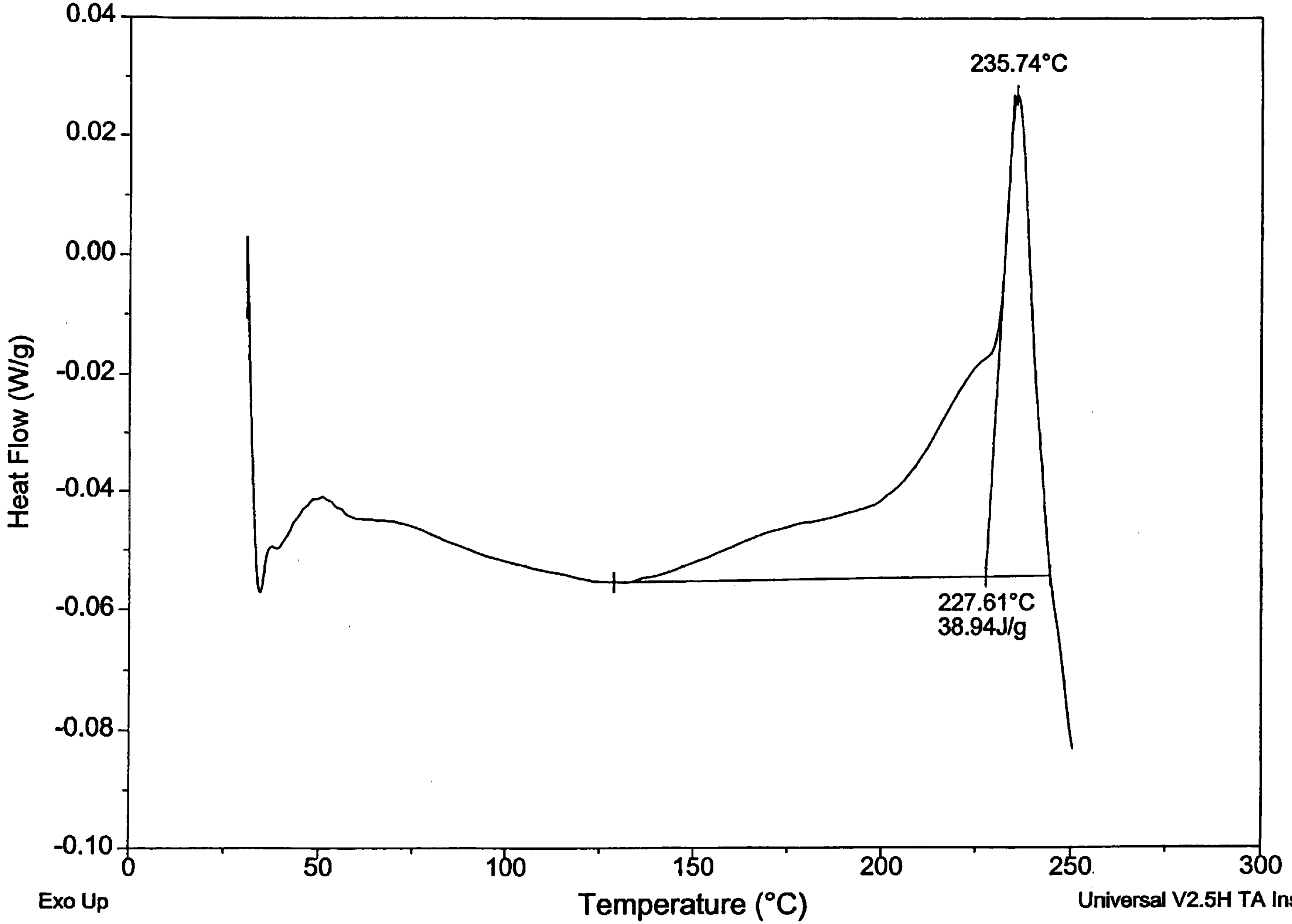
File: C:...\DSC\03614-103.019
Operator: WJM
Run Date: 16-May-01 10:50



Sample: Headrest   Black part
Size: 8.5000 mg
Method: MDSC Method
Comment: Chevy Cavalier: Headrest - Black part # 1245789

DSC

File: C:...\DSC\03614-103.020
Operator: WJM
Run Date: 16-May-01 13:44



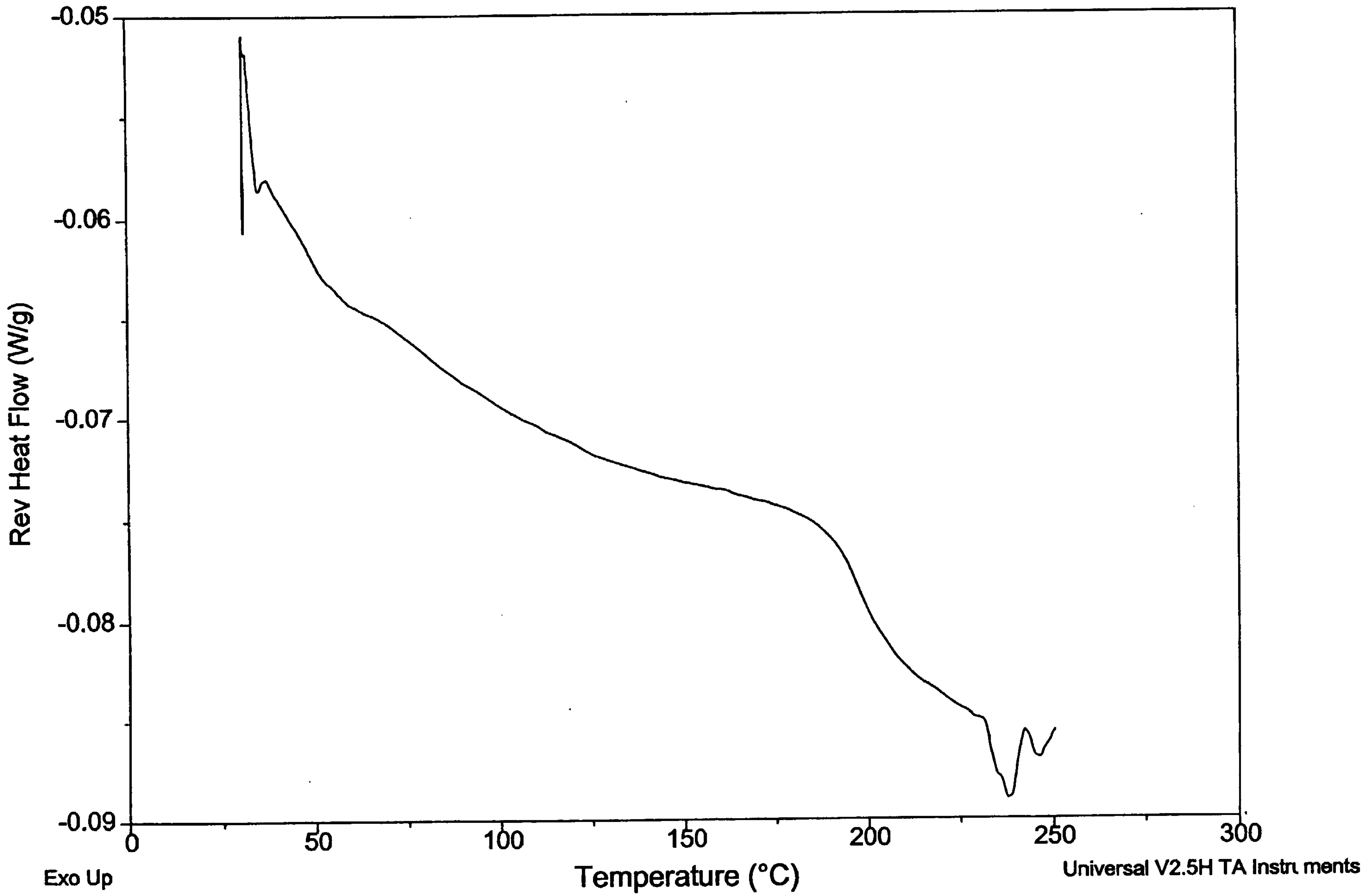
Exo Up

Universal V2.5H TA Instruments

Sample: Headrest Black part
Size: 8.5000 mg
Method: MDSC Method
Comment: Chevy Cavalier: Headrest - Black part # 1245789

DSC

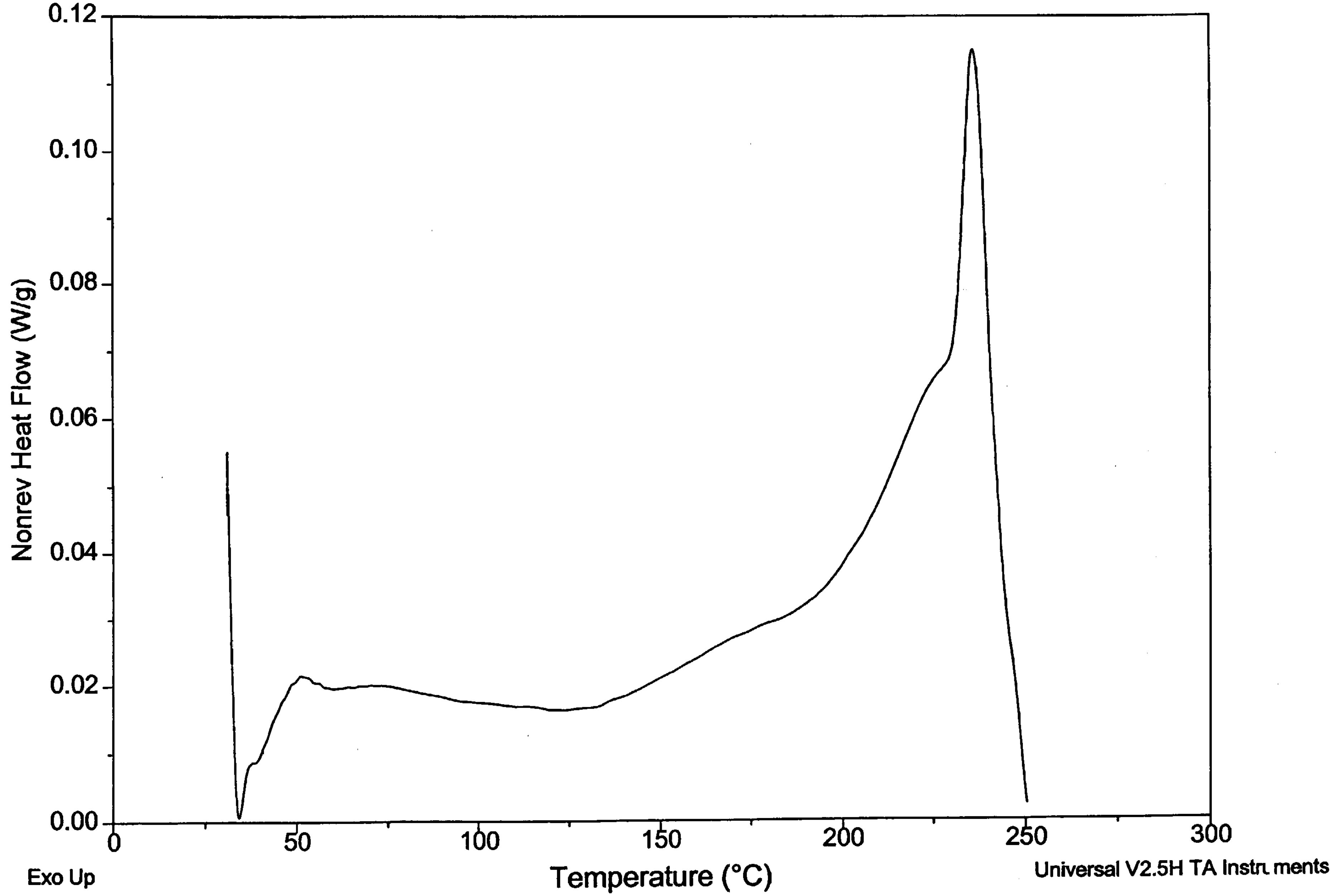
File: C:...\DSC\03614-103.020
Operator: WJM
Run Date: 16-May-01 13:44



Sample: Headrest   Black part
Size: 8.5000 mg
Method: MDSC Method
Comment: Chevy Cavalier: Headrest - Black part # 1245789

DSC

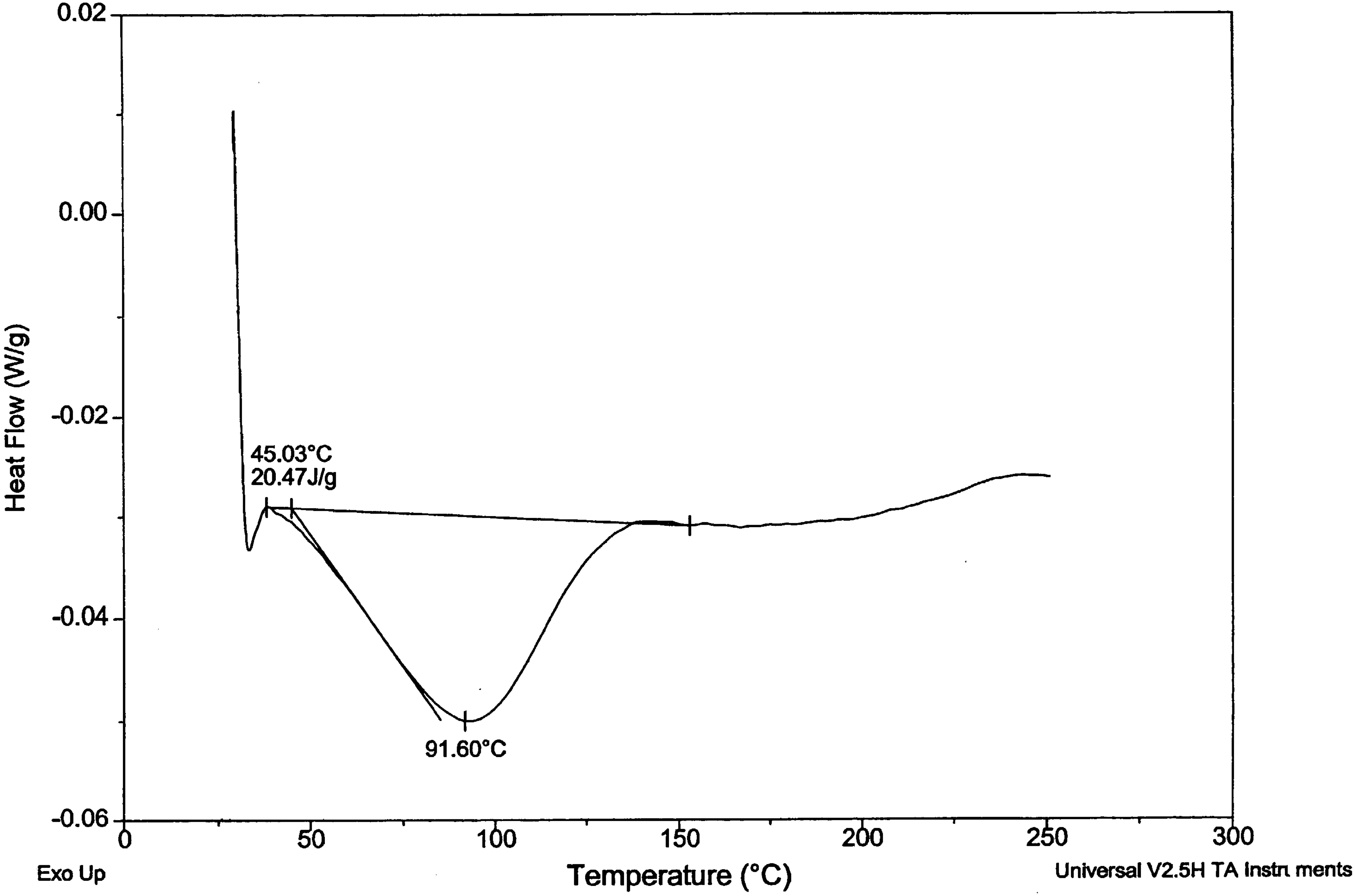
File: C:...\DSC\03614-103.020
Operator: WJM
Run Date: 16-May-01 13:44



Sample: Headrest   Foam Part (run2)
Size: 8.5000 mg
Method: MDSC Method
Comment: Chevy Cavalier: Headrest - Foam part # 1245789

DSC

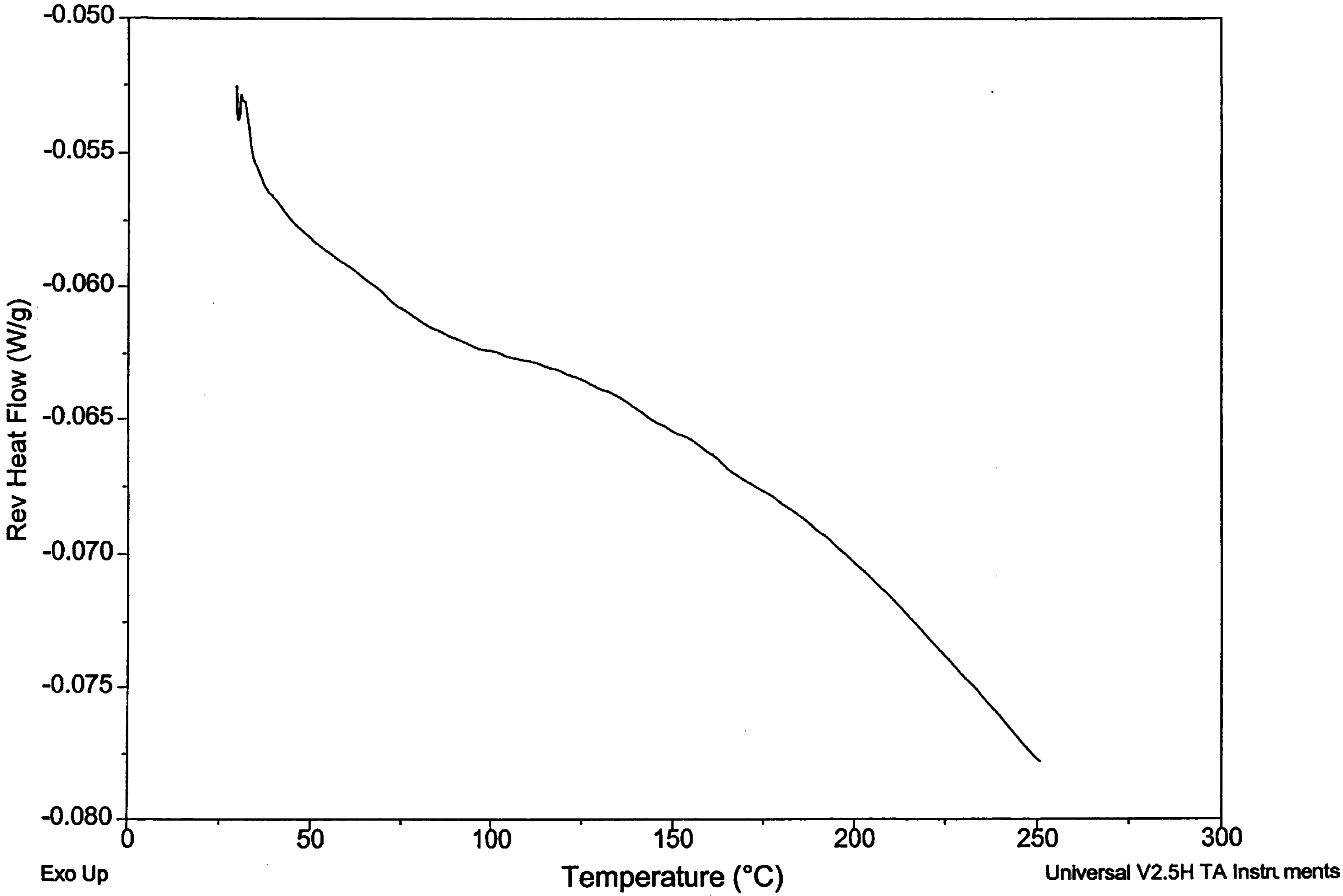
File: C:...\DSC\03614-103.021
Operator: WJM
Run Date: 16-May-01 16:07



Sample: Headrest   Foam Part (run2)
Size: 8.5000 mg
Method: MDSC Method
Comment: Chevy Cavalier: Headrest - Foam part # 1245789

DSC

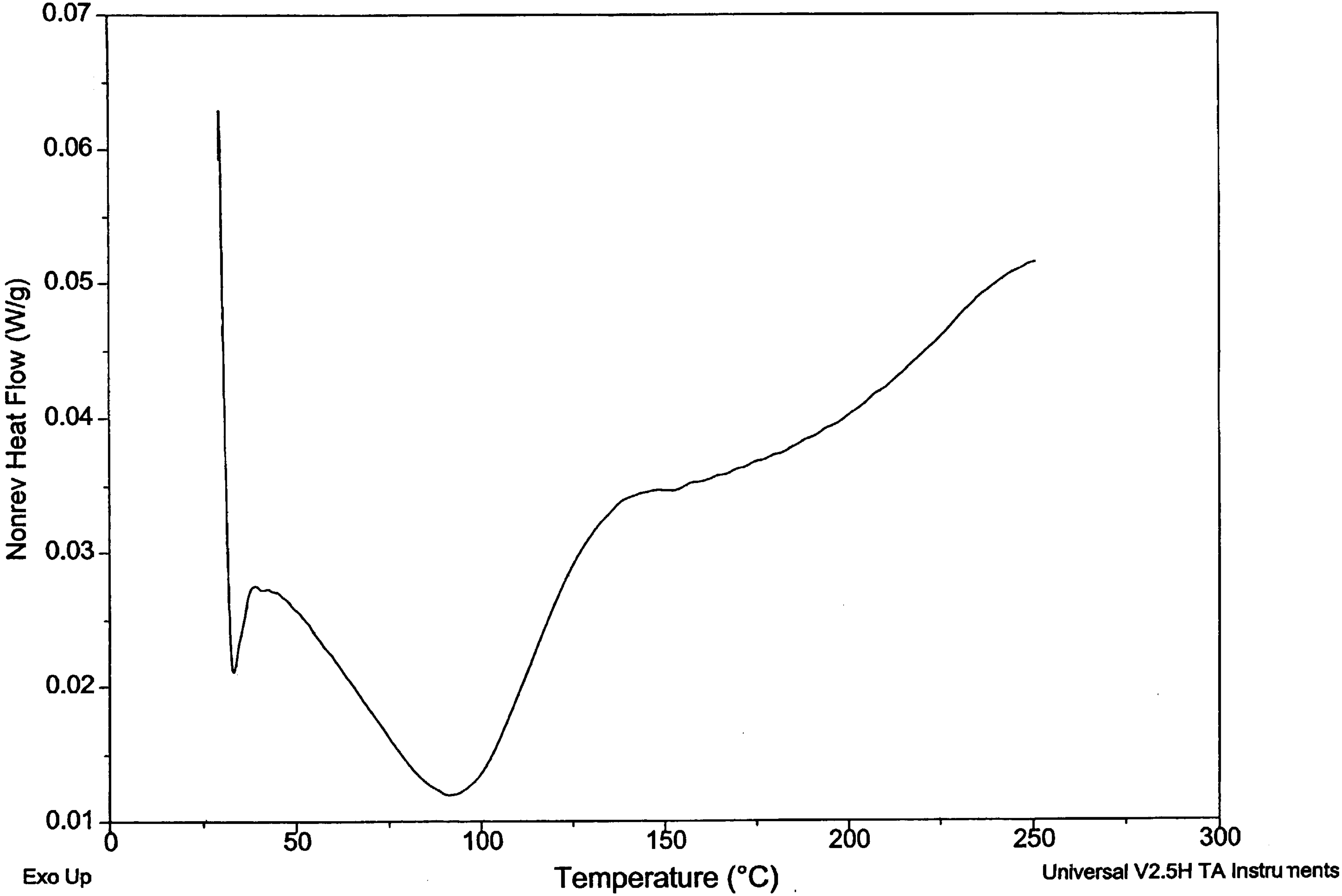
File: C:...\DSC\03614-103.021
Operator: WJM
Run Date: 16-May-01 16:07



Sample: Headrest Foam Part (run2)
Size: 8.5000 mg
Method: MDSC Method
Comment: Chevy Cavalier: Headrest - Foam part # 1245789

DSC

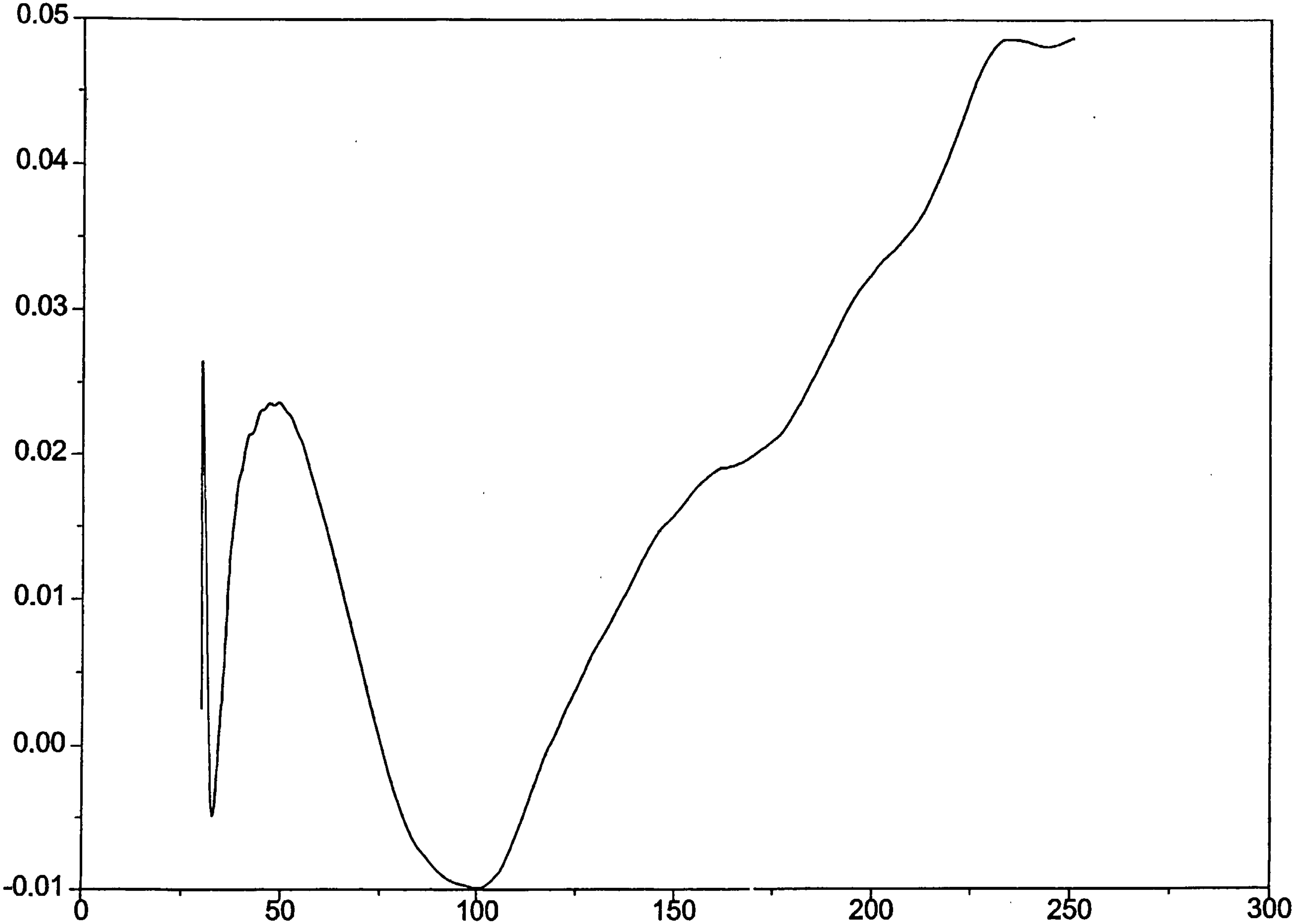
File: C:...\DSC\03614-103.021
Operator: WJM
Run Date: 16-May-01 16:07



Sample: Seat Foam
Size: 3.5800 mg
Method: MDSC Method
Comment: Chevy Cavalier: Seat Foam # 22589249

DSC

File: C:...\DSC\03614-103.022
Operator: WJM
Run Date: 17-May-01 08:23



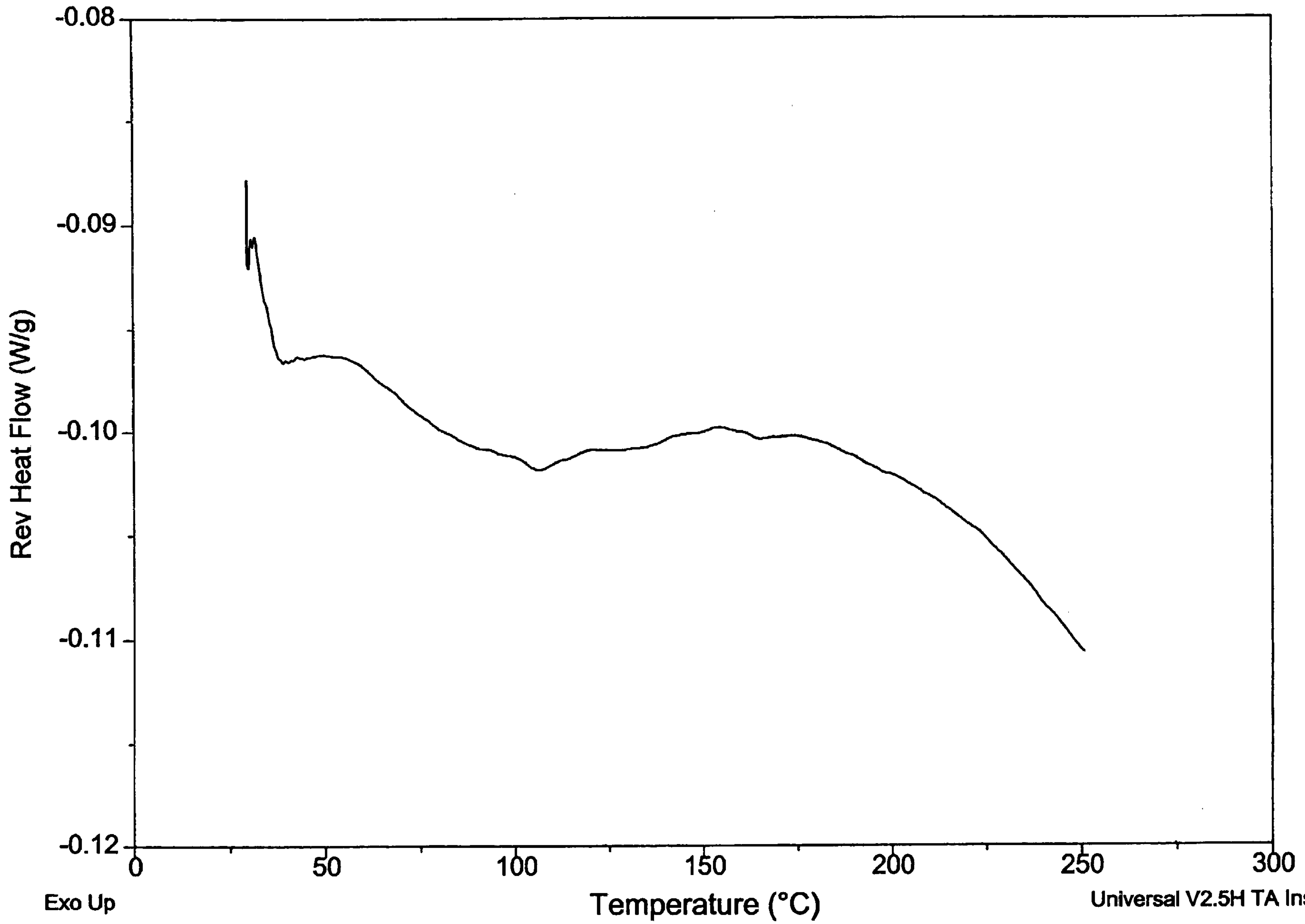
Exo Up

Universal V2.5H TA Instruments

Sample: Seat Foam
Size: 3.5800 mg
Method: MDSC Method
Comment: Chevy Cavalier: Seat Foam # 22589249

DSC

File: C:...\DSC\03614-103.022
Operator: WJM
Run Date: 17-May-01 08:23

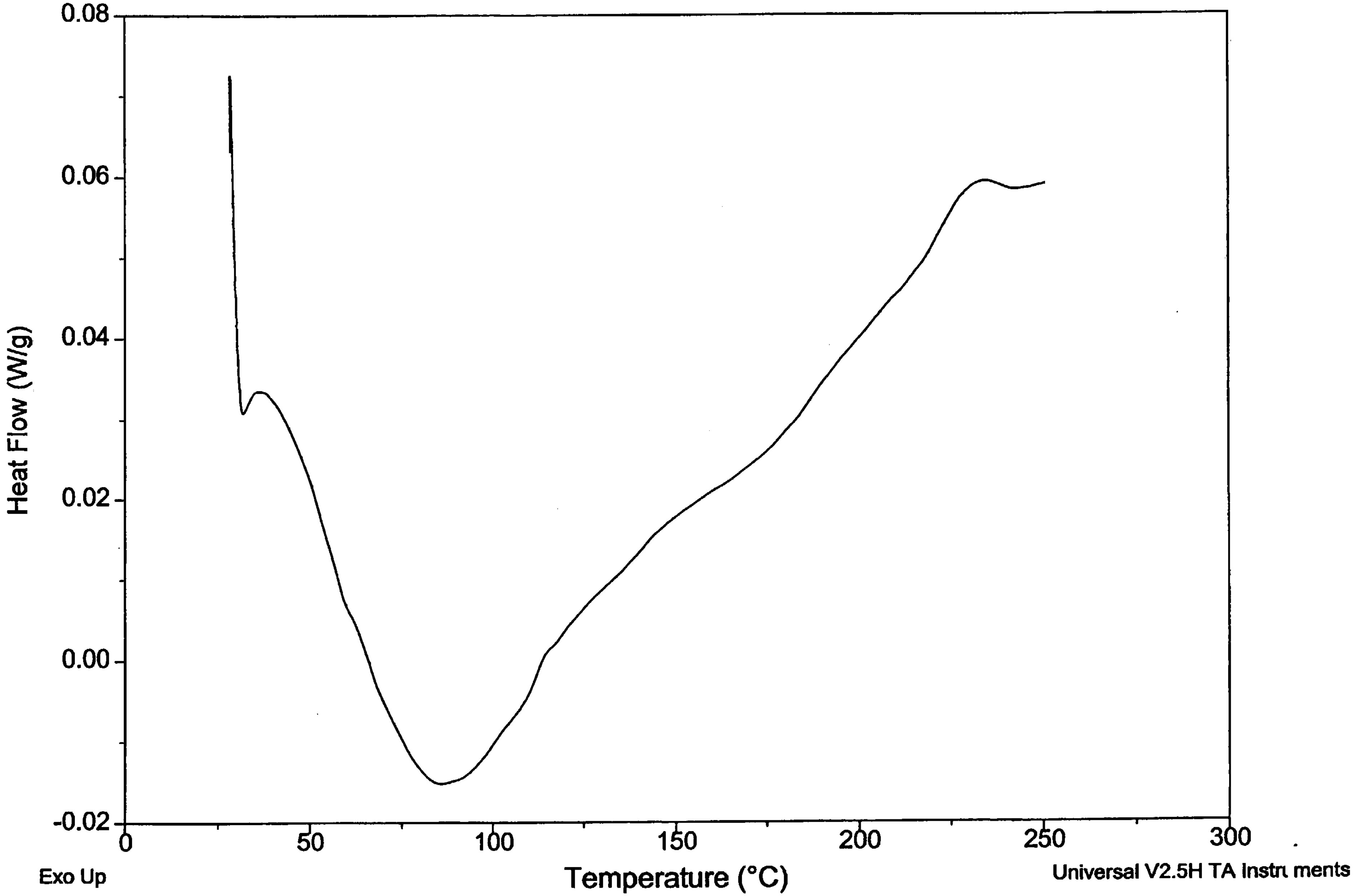


Universal V2.5H TA Instruments

Sample: Seat Foam (2nd run)
Size: 3.6600 mg
Method: MDSC Method
Comment: Chevy Cavalier: Seat Foam # 22589249

DSC

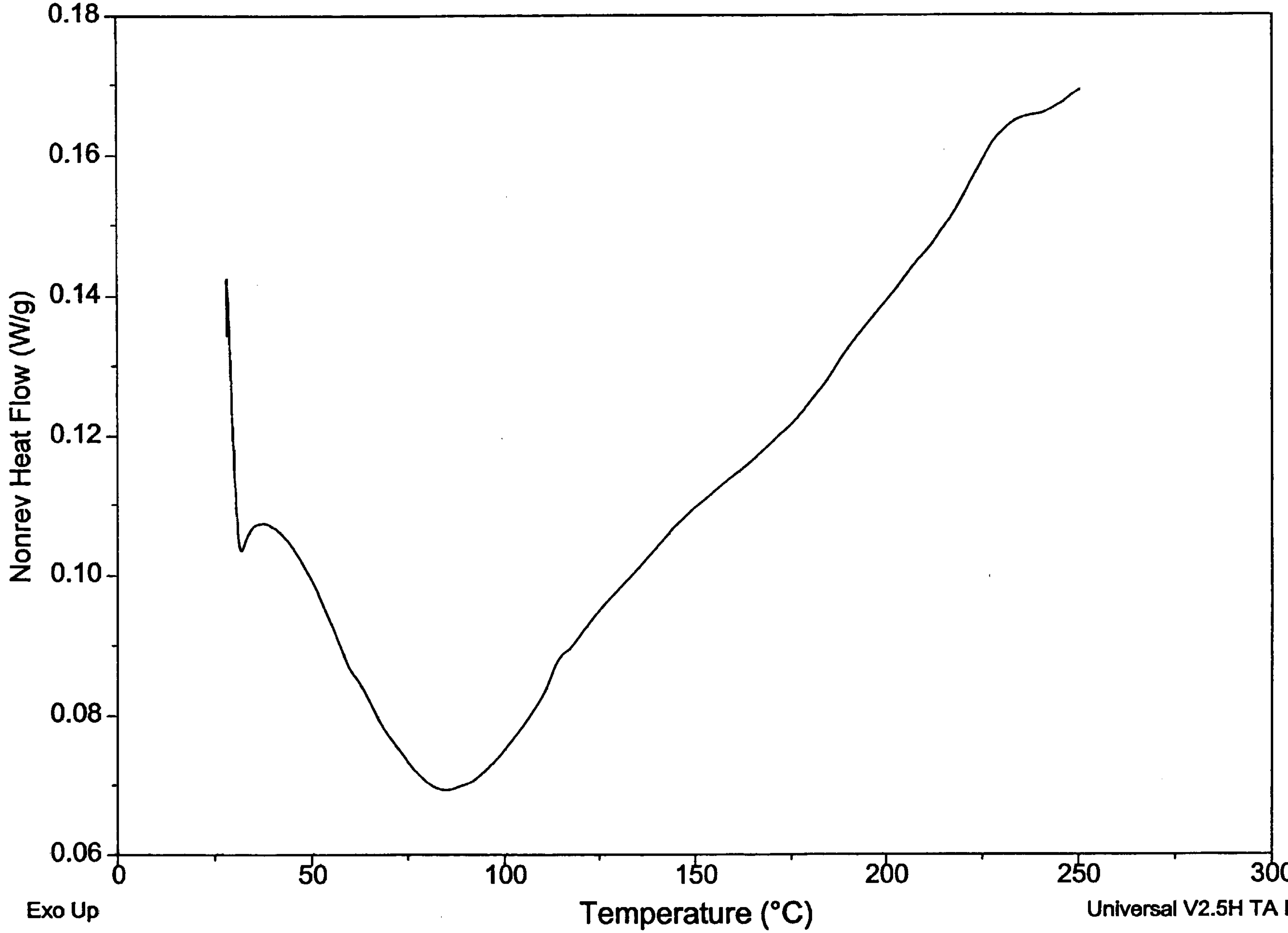
File: C:...\DSC\03614-103.023
Operator: WJM
Run Date: 17-May-01 10:21



Sample: Seat Foam (2nd run)
Size: 3.6600 mg
Method: MDSC Method
Comment: Chevy Cavalier: Seat Foam # 22589249

DSC

File: C:...\DSC\03614-103.023
Operator: WJM
Run Date: 17-May-01 10:21

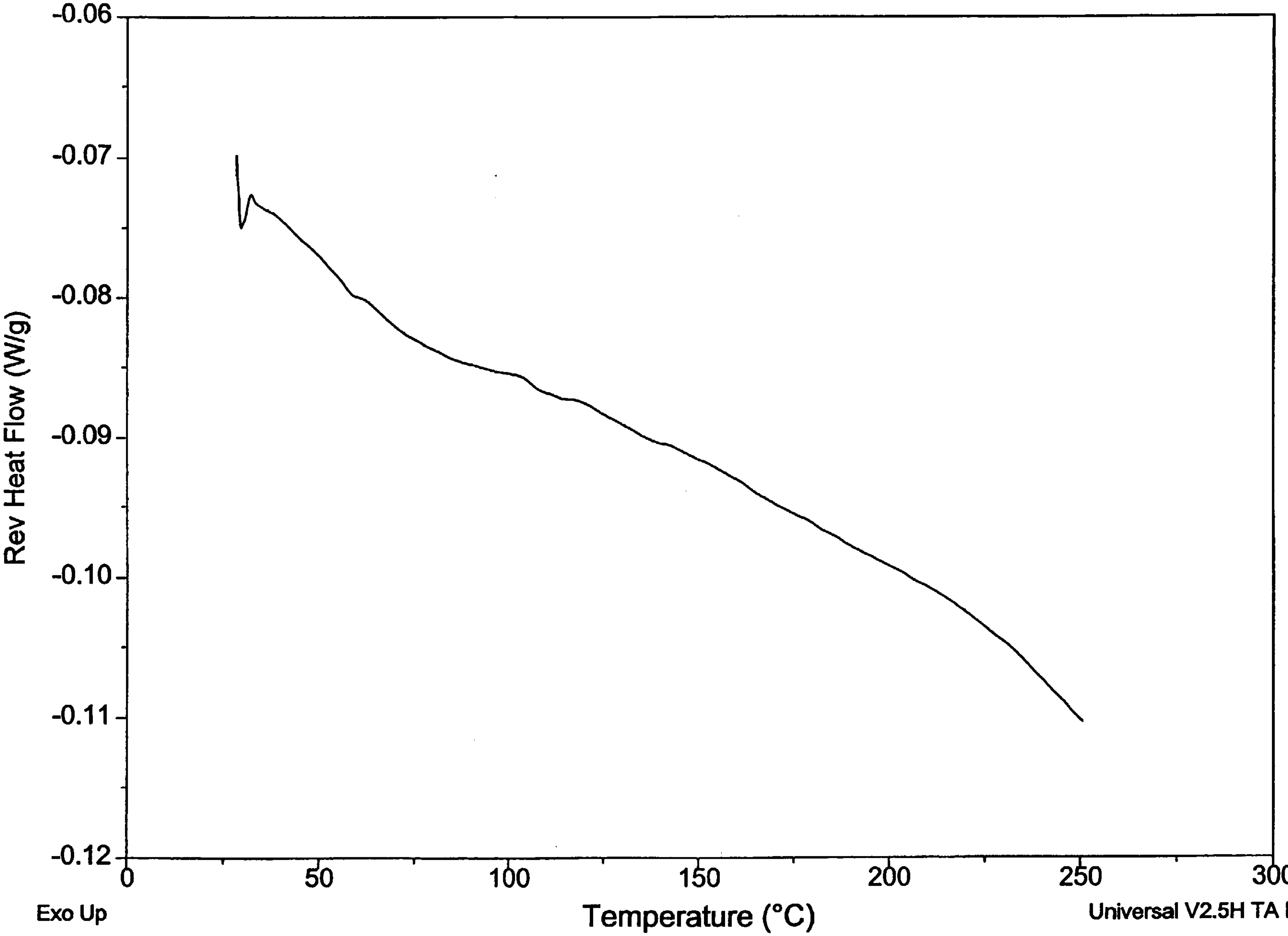


Universal V2.5H TA Instruments

Sample: Seat Foam (2nd run)
Size: 3.6600 mg
Method: MDSC Method
Comment: Chevy Cavalier: Seat Foam # 22589249

DSC

File: C:...\DSC\03614-103.023
Operator: WJM
Run Date: 17-May-01 10:21

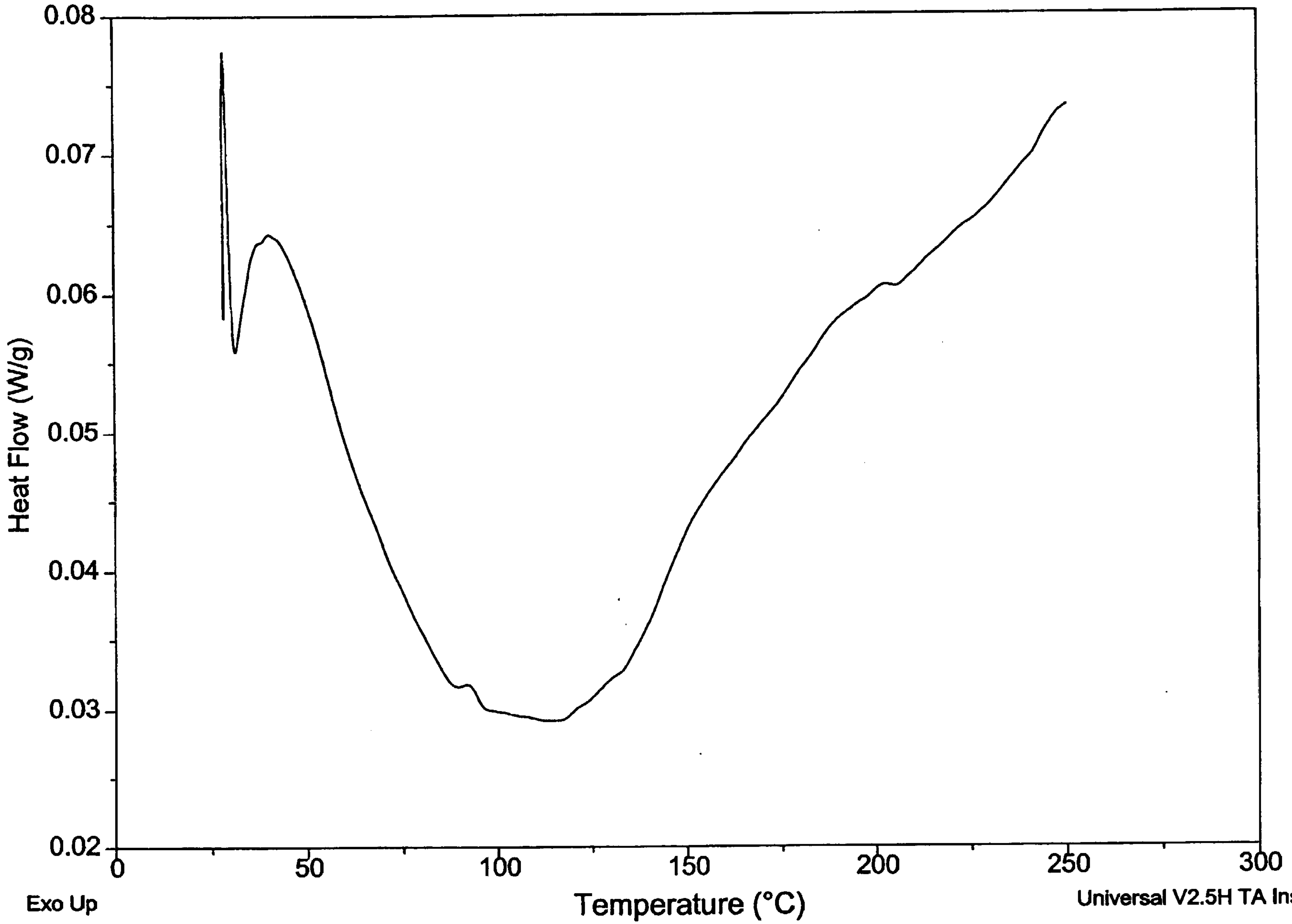


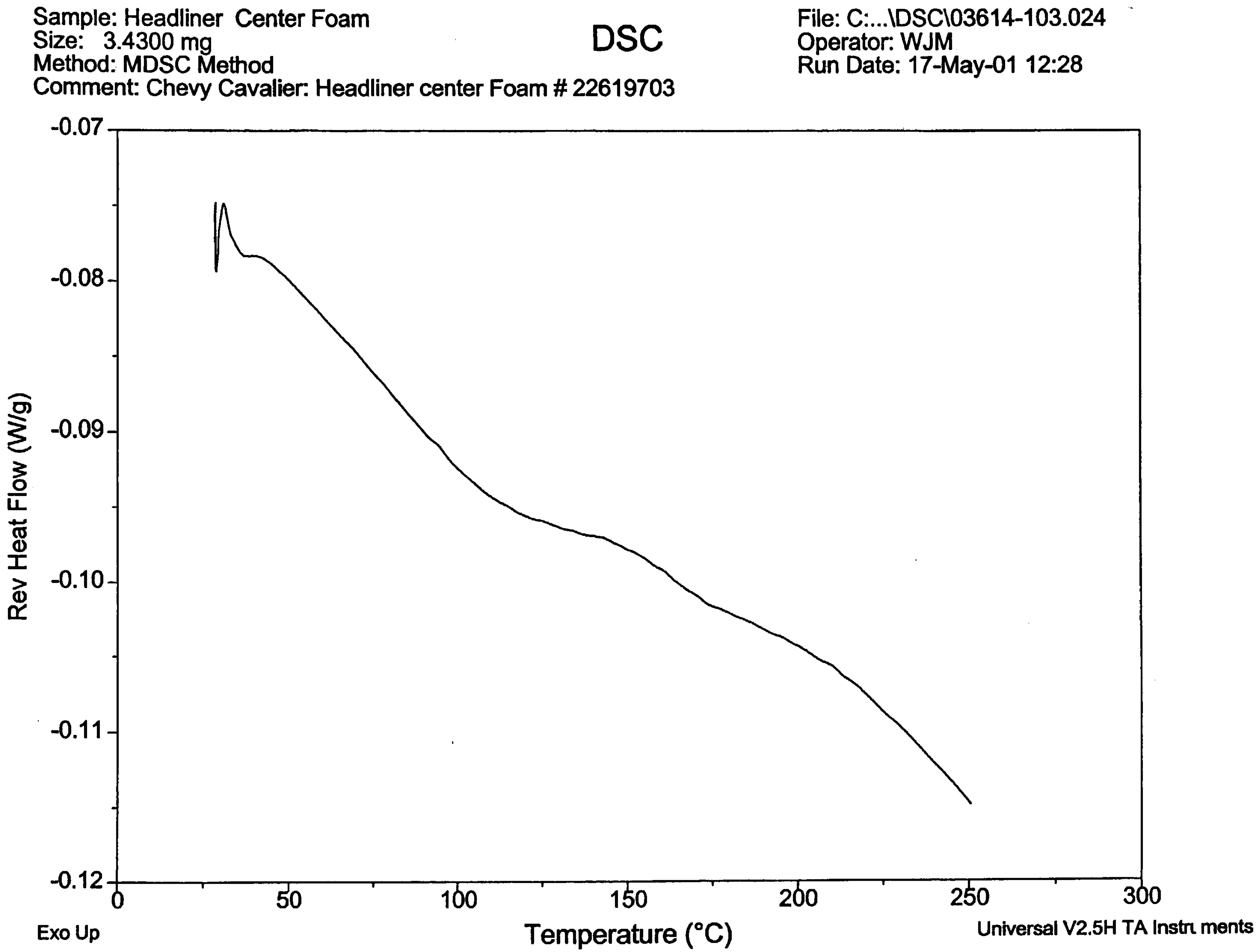
Universal V2.5H TA Instruments

Sample: Headliner Center Foam
Size: 3.4300 mg
Method: MDSC Method
Comment: Chevy Cavalier: Headliner center Foam # 22619703

DSC

File: C:...\DSC\03614-103.024
Operator: WJM
Run Date: 17-May-01 12:28

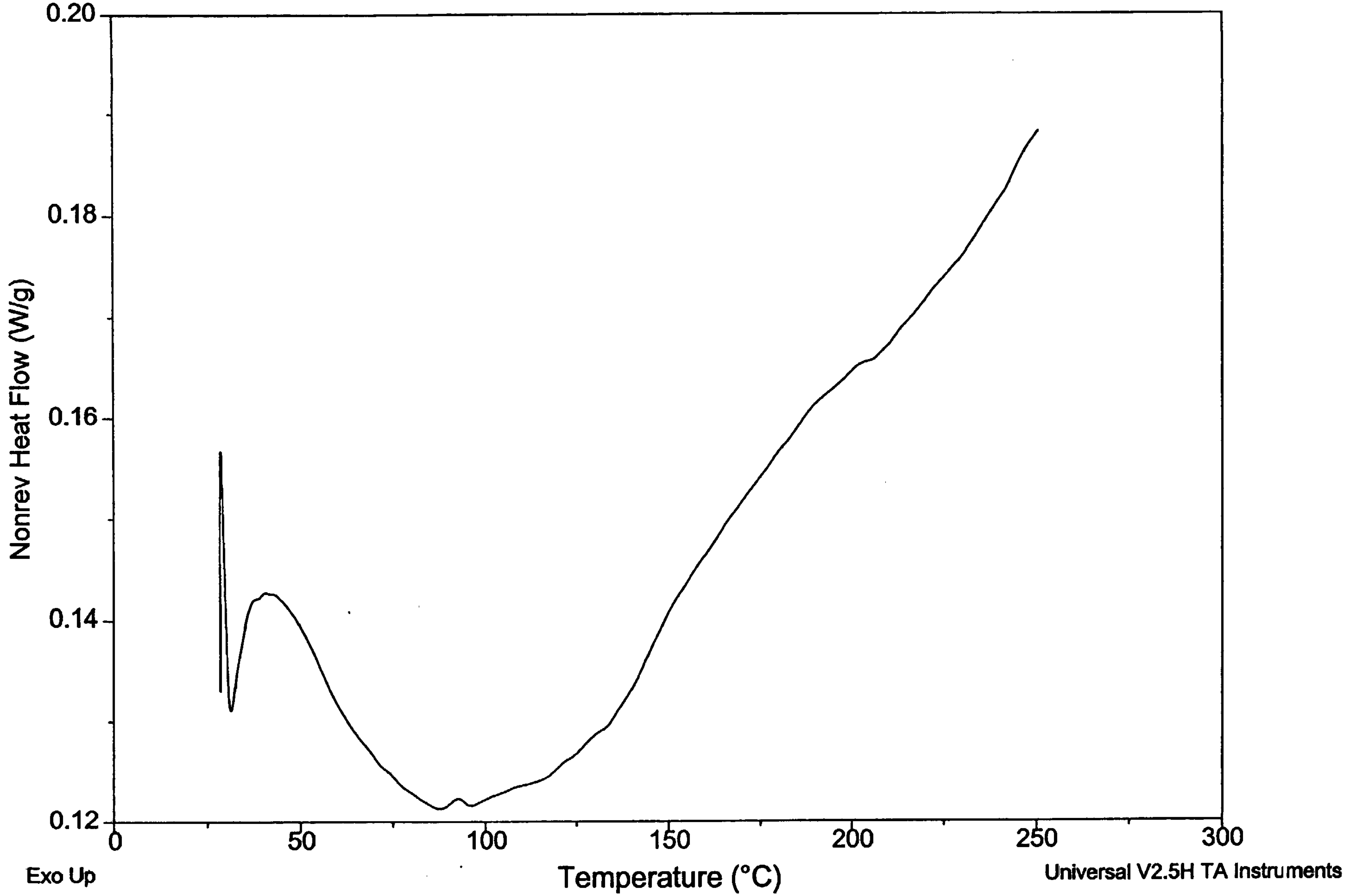



Sample: Headliner Center Foam
Size: 3.4300 mg
Method: MDSC Method
Comment: Chevy Cavalier: Headliner center Foam # 22619703
DSC
File: C:...\DSC\03614-103.024
Operator: WJM
Run Date: 17-May-01 12:28
Rev Heat Flow (W/g)
-0.07
-0.08
-0.09
-0.10
-0.11
-0.12
0
50
100
150
200
250
300
Exo Up
Temperature (°C)
Universal V2.5H TA Instruments

Sample: Headliner Center Foam
Size: 3.4300 mg
Method: MDSC Method
Comment: Chevy Cavalier: Headliner center Foam # 22619703

DSC

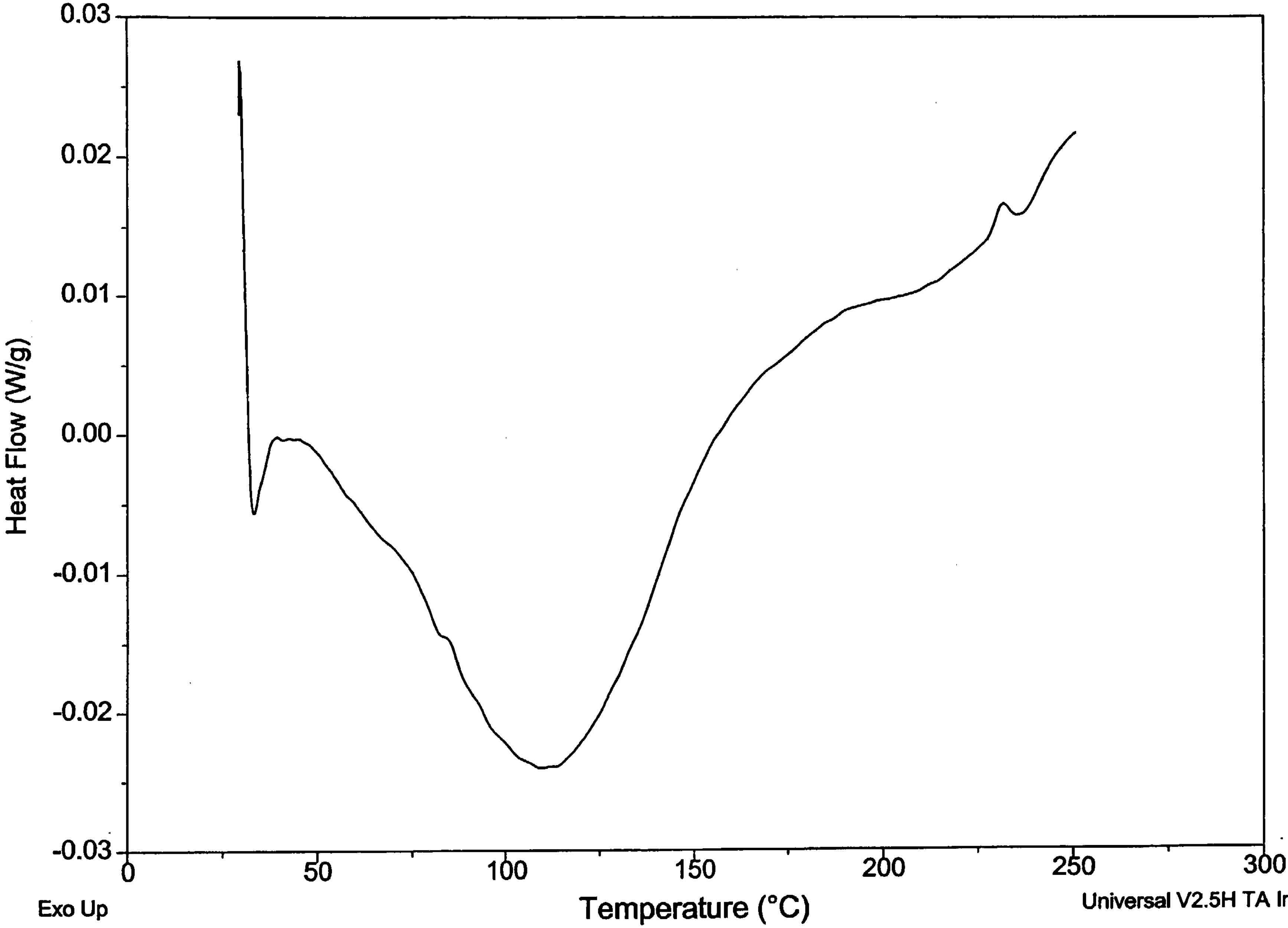
File: C:...\DSC\03614-103.024
Operator: WJM
Run Date: 17-May-01 12:28



Sample: Headliner Center Foam (run 2)
Size: 4.1900 mg
Method: MDSC Method
Comment: Chevy Cavalier: Headliner center Foam # 22619703

DSC

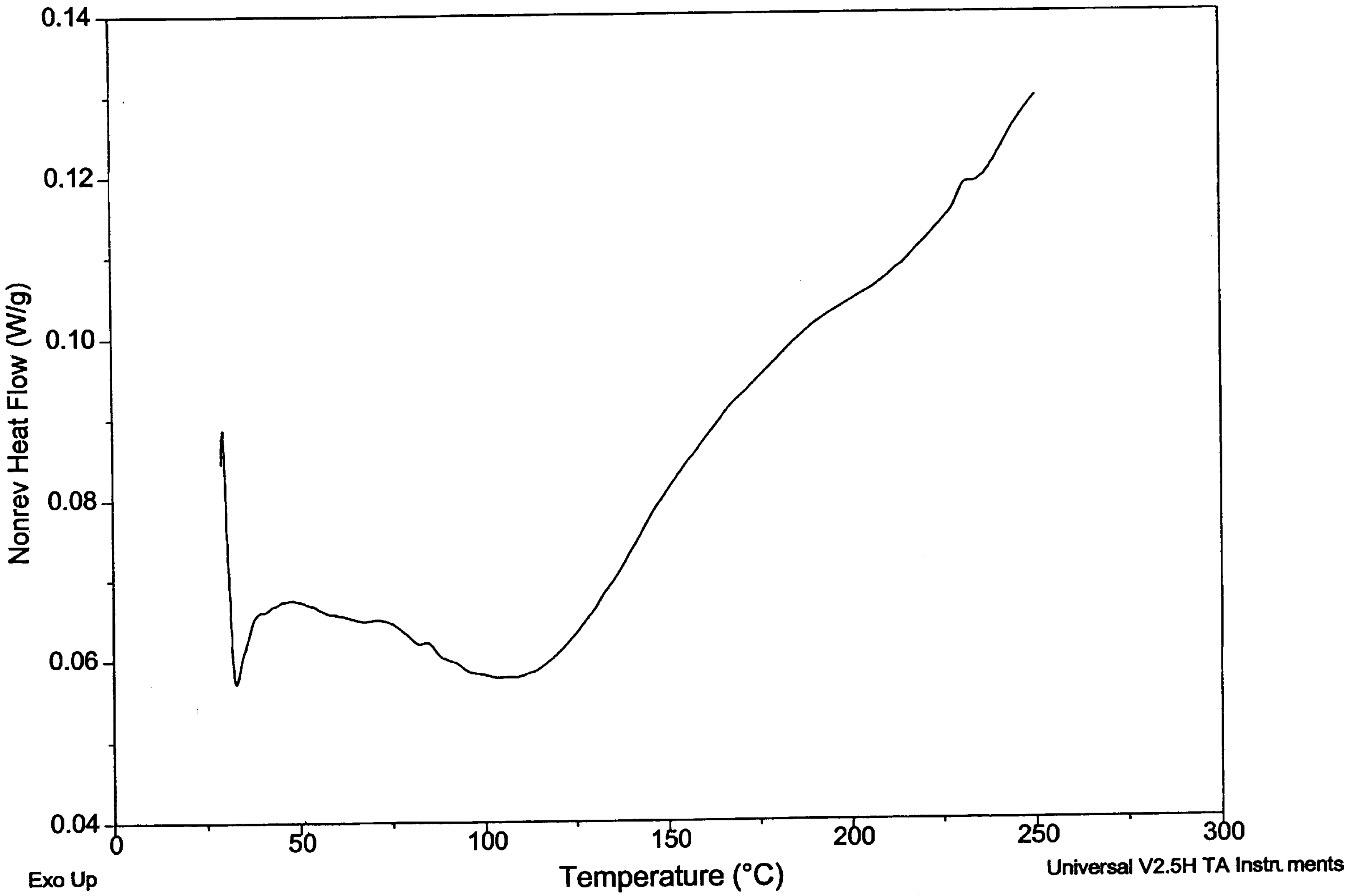
File: C:...\DSC\03614-103.025
Operator: WJM
Run Date: 17-May-01 14:21



Sample: Headliner Center Foam (run 2)
Size: 4.1900 mg
Method: MDSC Method
Comment: Chevy Cavalier: Headliner center Foam # 22619703

DSC

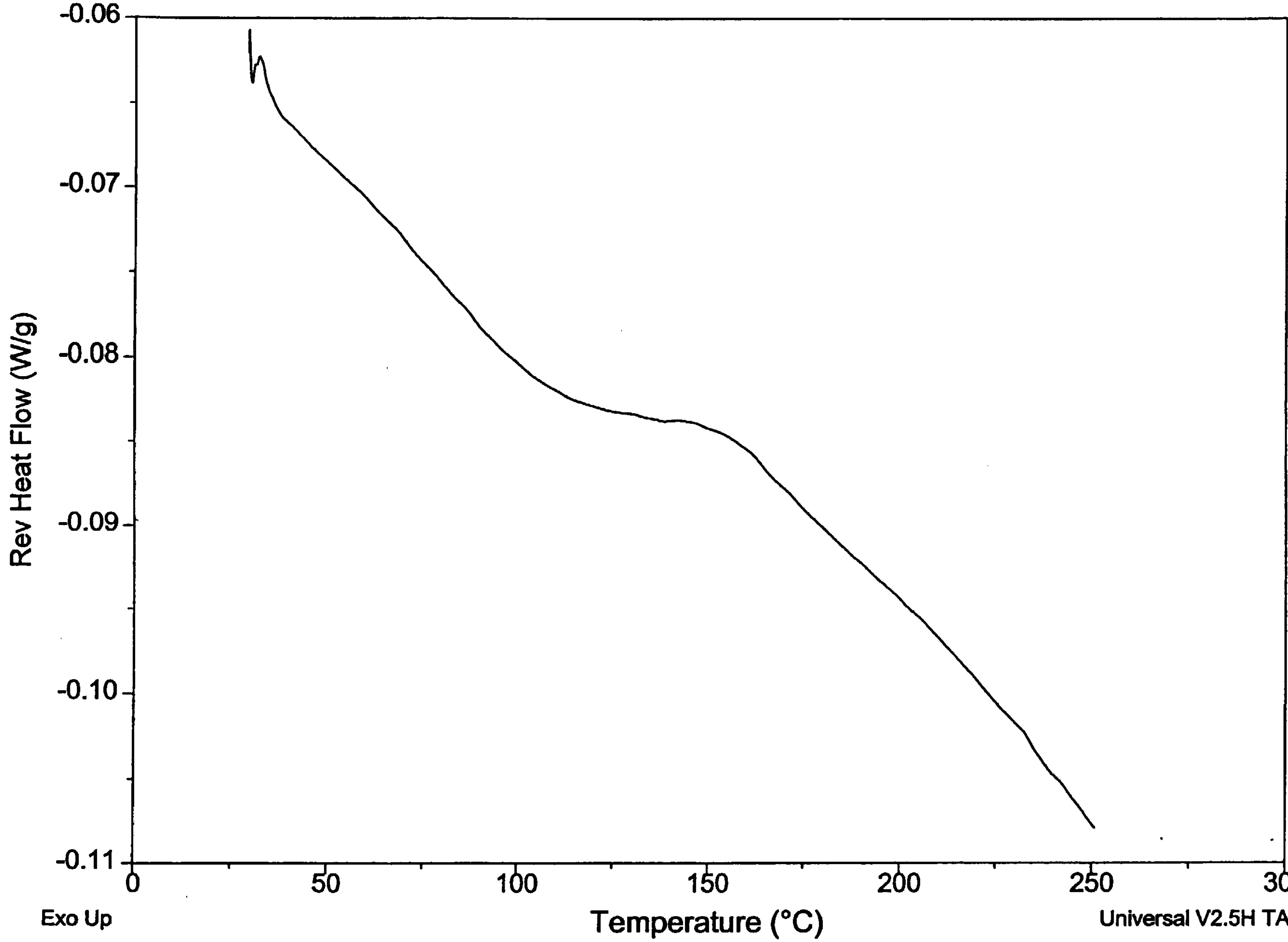
File: C:...\DSC\03614-103.025
Operator: WJM
Run Date: 17-May-01 14:21



Sample: Headliner Center Foam (run 2)
Size: 4.1900 mg
Method: MDSC Method
Comment: Chevy Cavalier: Headliner center Foam # 22619703

DSC

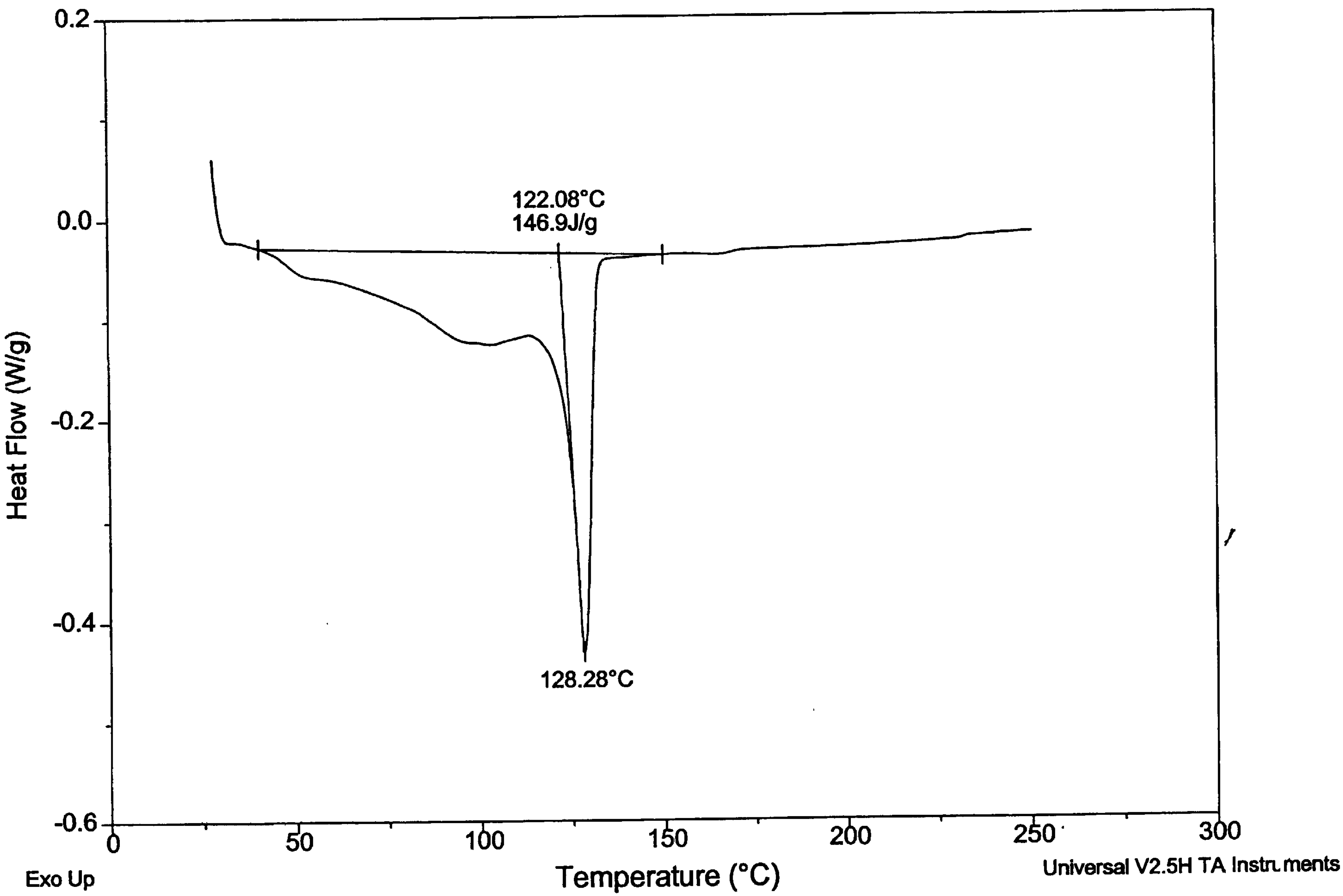
File: C:...\DSC\03614-103.025
Operator: WJM
Run Date: 17-May-01 14:21



Sample: Wiring Harness (rect)
Size: 5.2800 mg
Method: MDSC Method
Comment: Chevy Cavalier: wire harness, blk rectangular: #22621025

DSC

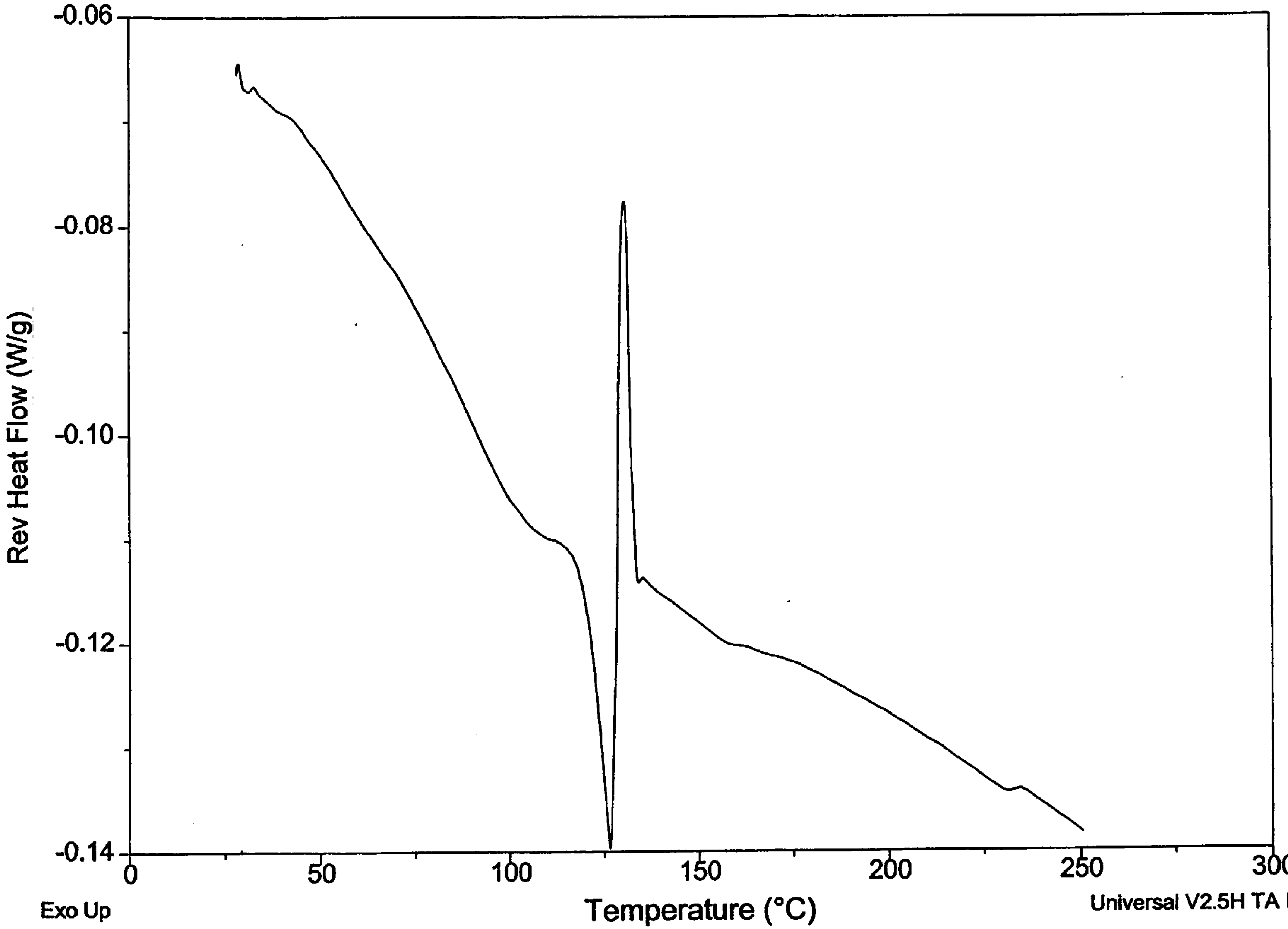
File: C:...\DSC\03614-103.026
Operator: WJM
Run Date: 24-May-01 14:33



Sample: Wiring Harness (rect)
Size: 5.2800 mg
Method: MDSC Method
Comment: Chevy Cavalier: wire harness, blk rectangular: #22621025

DSC

File: C:...\DSC\03614-103.026
Operator: WJM
Run Date: 24-May-01 14:33

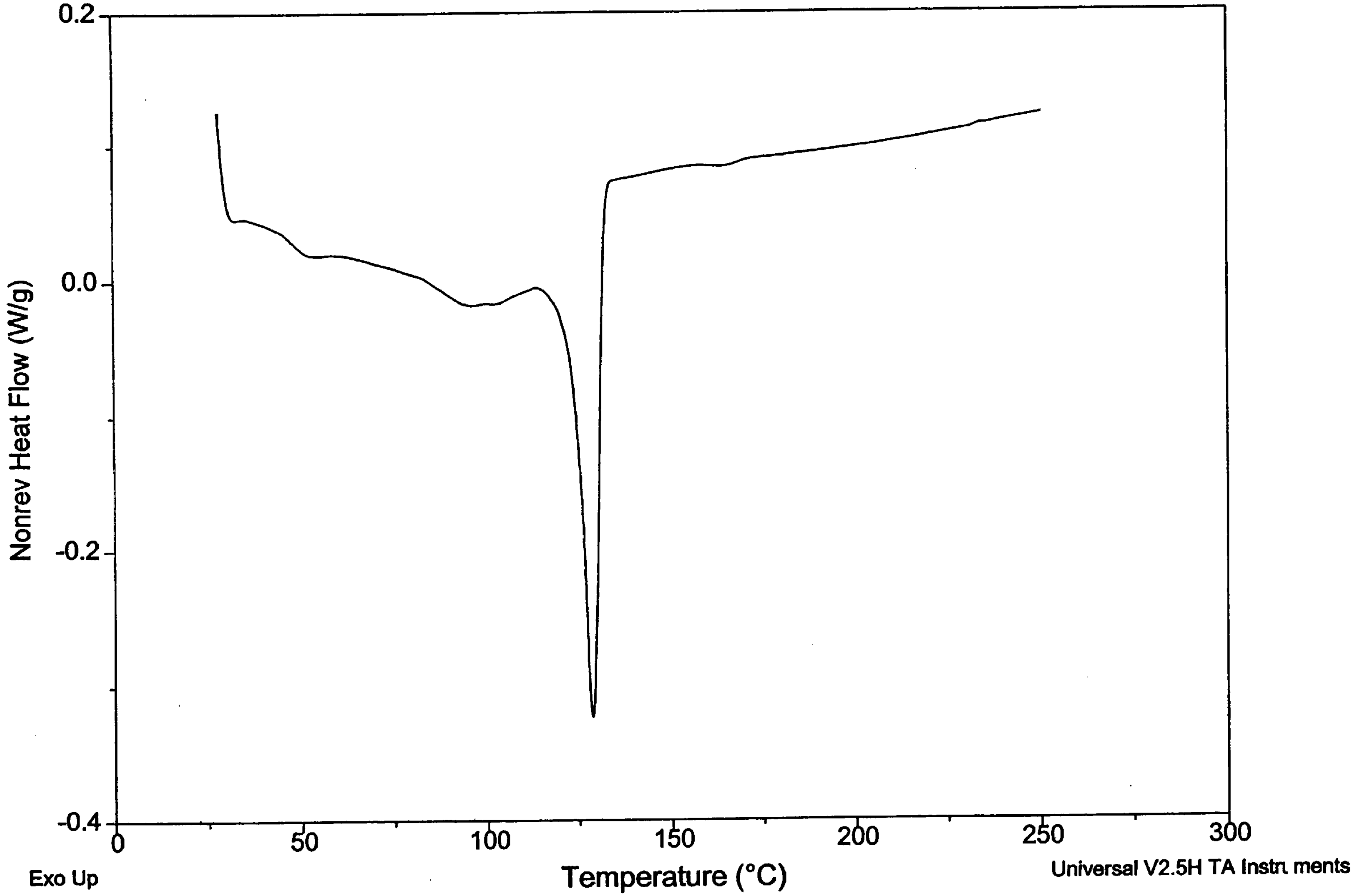


Universal V2.5H TA Instruments

Sample: Wiring Harness (rect)
Size: 5.2800 mg
Method: MDSC Method
Comment: Chevy Cavalier: wire harness, blk rectangular: #22621025

DSC

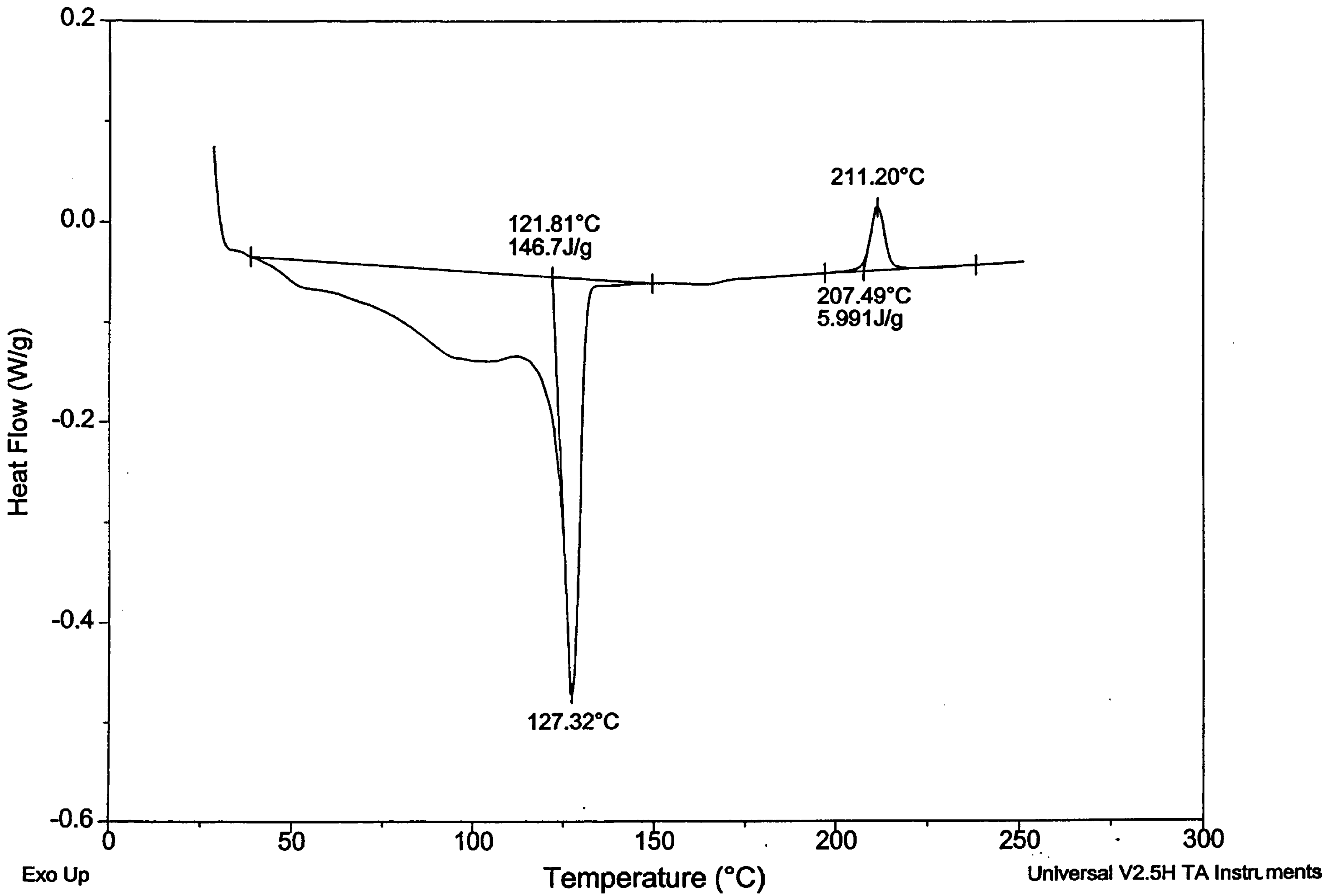
File: C:...\DSC\03614-103.026
Operator: WJM
Run Date: 24-May-01 14:33



Sample: Wiring Harness (rect) run 2
Size: 5.1700 mg
Method: MDSC Method
Comment: Chevy Cavalier: wire harness, blk rectangular: #22621025

DSC

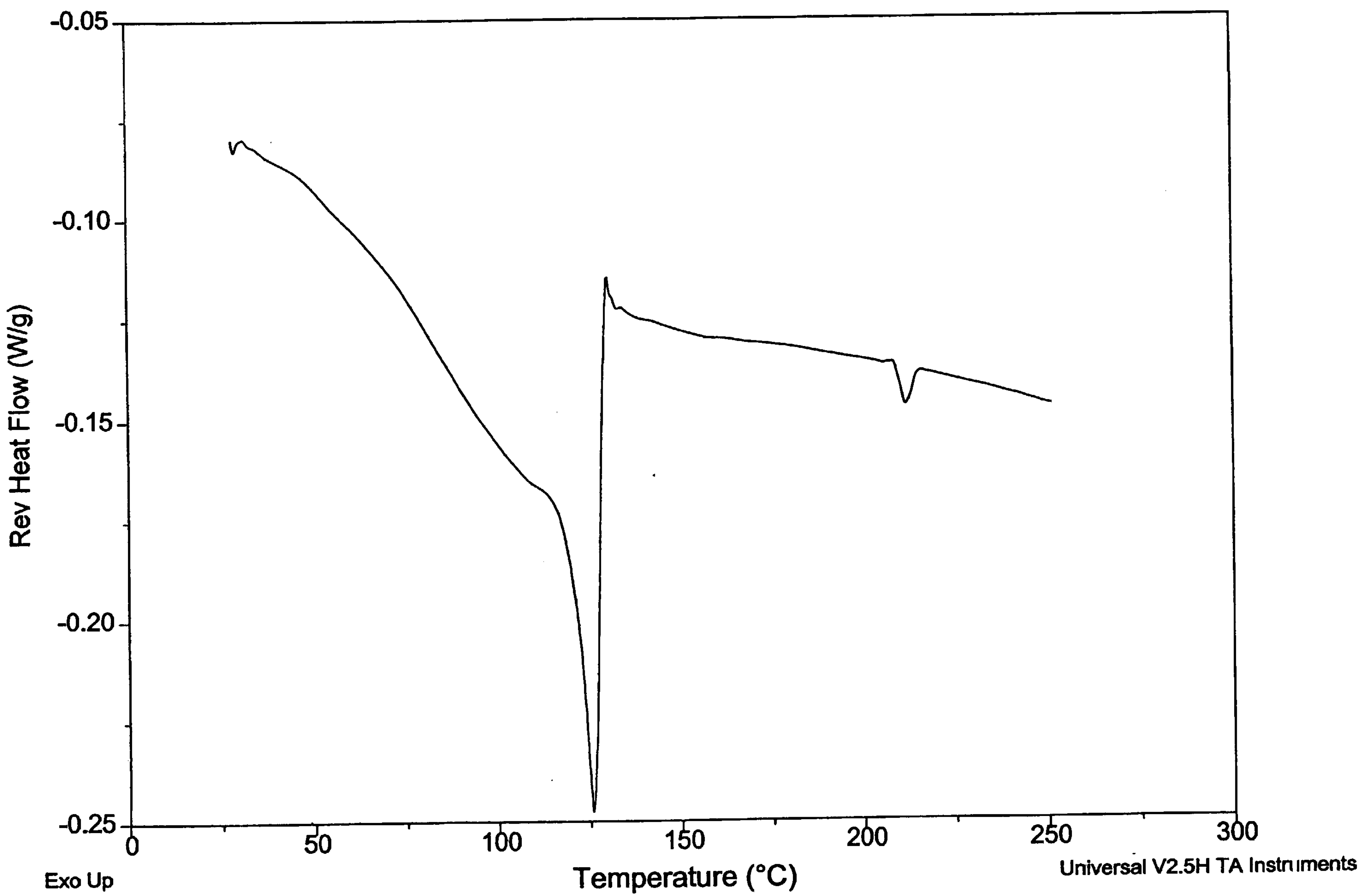
File: C:...\DSC\03614-103.027
Operator: WJM
Run Date: 24-May-01 16:12



Sample: Wiring Harness (rect) run 2
Size: 5.1700 mg
Method: MDSC Method
Comment: Chevy Cavalier: wire harness, blk rectangular: #22621025

DSC

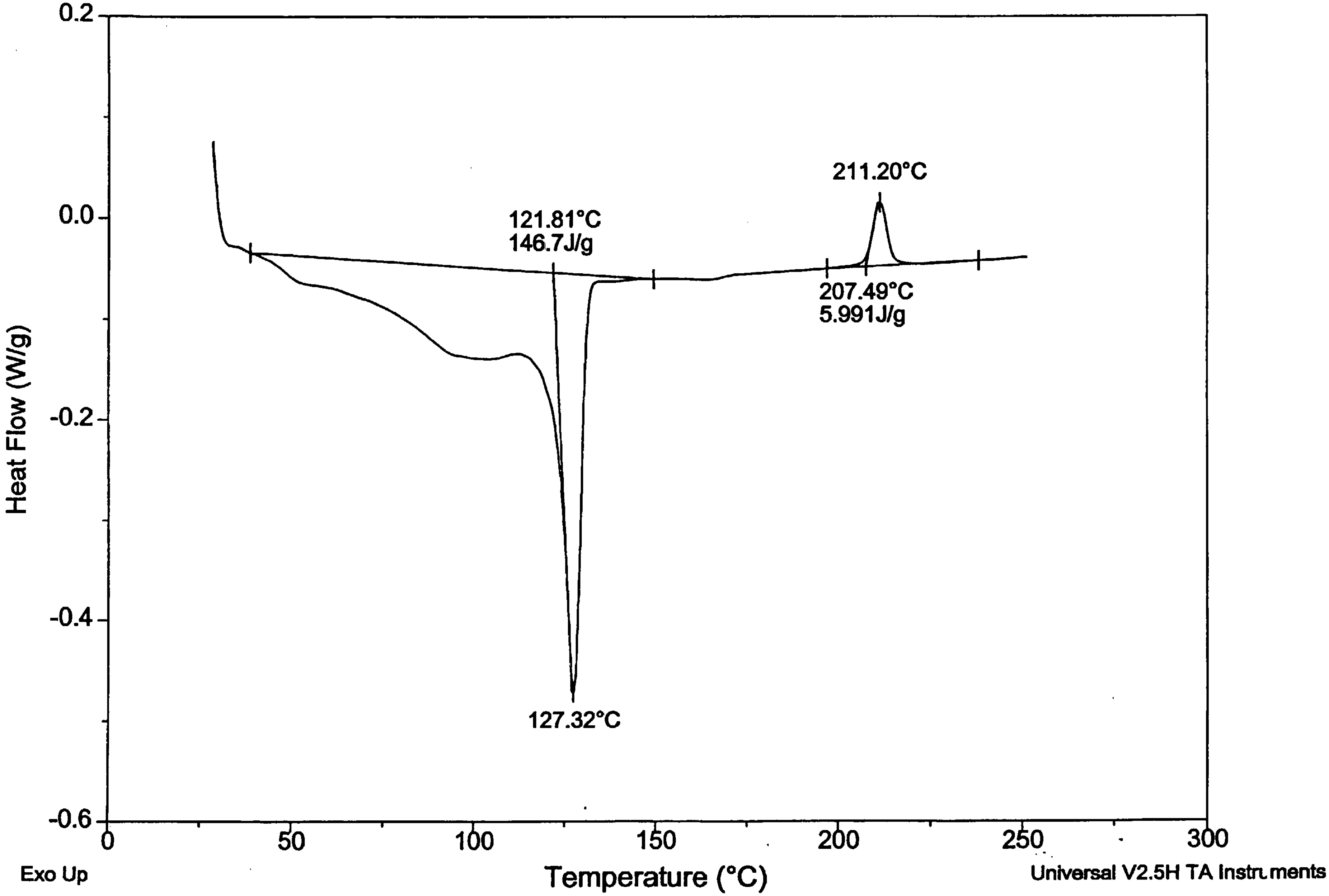
File: C:...\DSC\03614-103.027
Operator: WJM
Run Date: 24-May-01 16:12



Sample: Wiring Harness (rect) run 2
Size: 5.1700 mg
Method: MDSC Method
Comment: Chevy Cavalier: wire harness, blk rectangular: #22621025

DSC

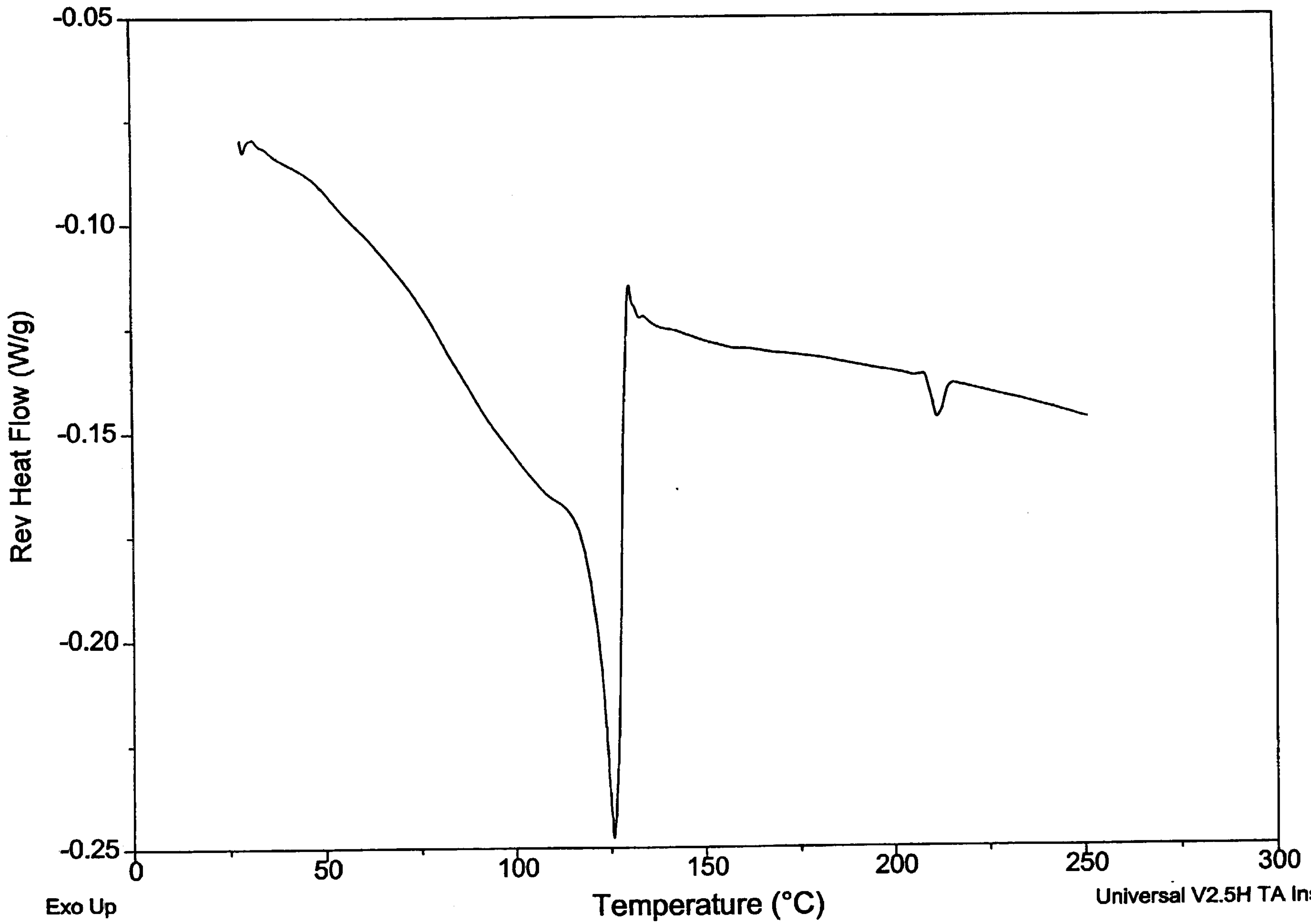
File: C:...\DSC\03614-103.027
Operator: WJM
Run Date: 24-May-01 16:12



Sample: Wiring Harness (rect) run 2
Size: 5.1700 mg
Method: MDSC Method
Comment: Chevy Cavalier: wire harness, blk rectangular: #22621025

DSC

File: C:...\DSC\03614-103.027
Operator: WJM
Run Date: 24-May-01 16:12

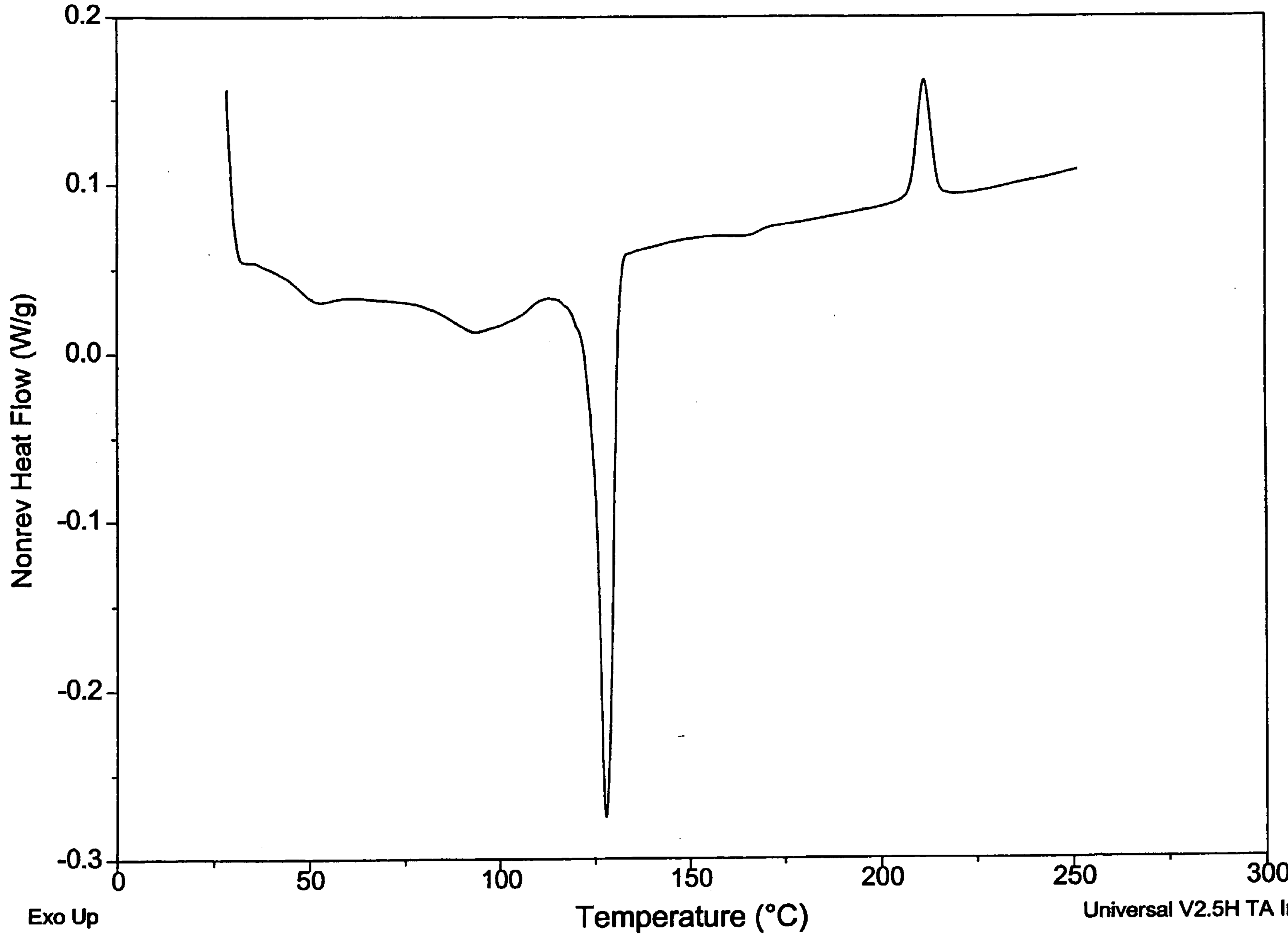


Universal V2.5H TA Instruments

Sample: Wiring Harness (rect) run 2
Size: 5.1700 mg
Method: MDSC Method
Comment: Chevy Cavalier: wire harness, blk rectangular: #22621025

DSC

File: C:...\DSC\03614-103.027
Operator: WJM
Run Date: 24-May-01 16:12

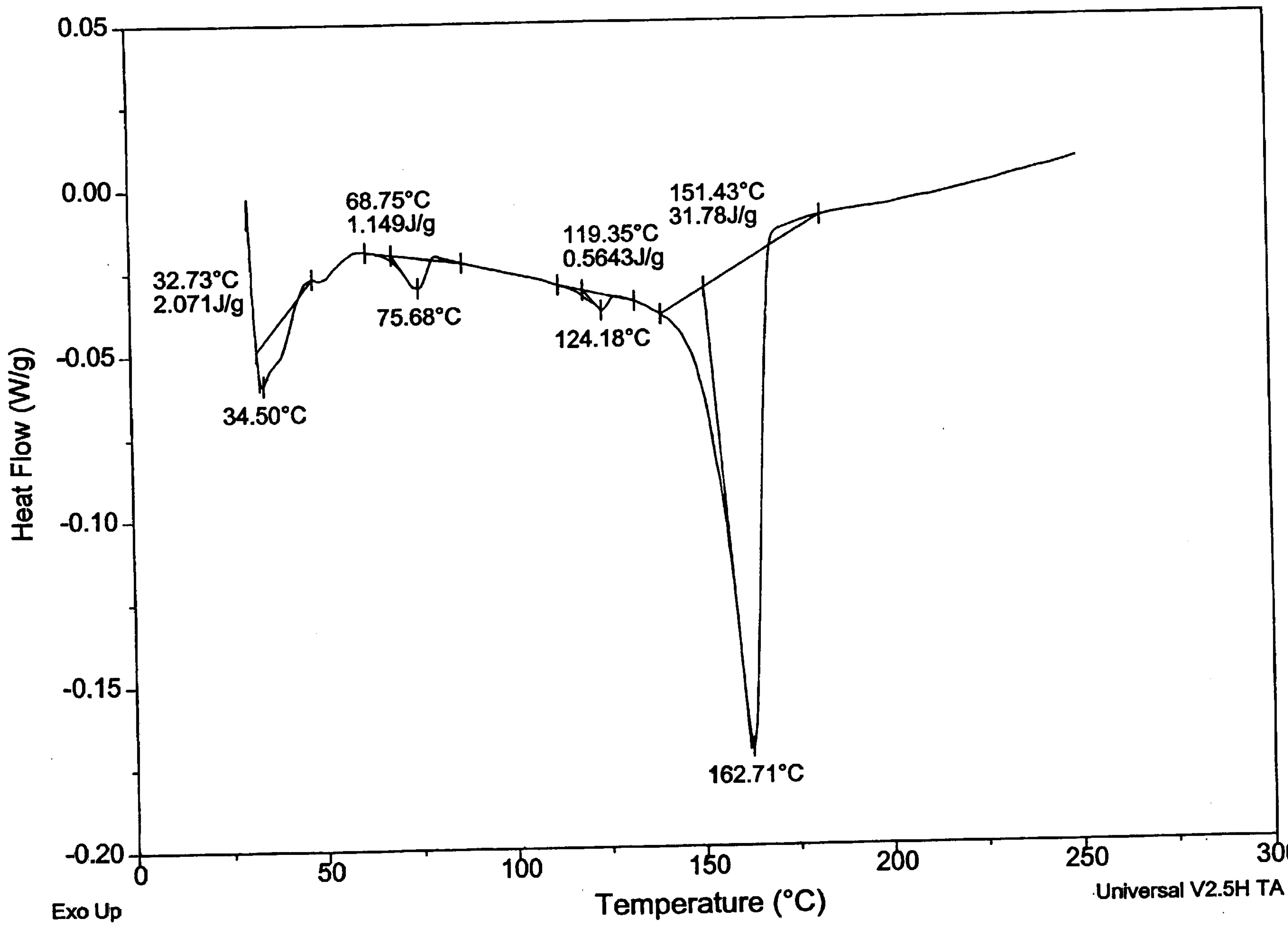


Universal V2.5H TA Instruments

Sample: Wiring Harness (spiral) run 2
Size: 4.8000 mg
Method: MDSC Method
Comment: Chevy Cavalier: wire harness, blk spiral: #22621025

DSC

File: C:...\DSC\03614-103.028
Operator: WJM
Run Date: 25-May-01 07:50

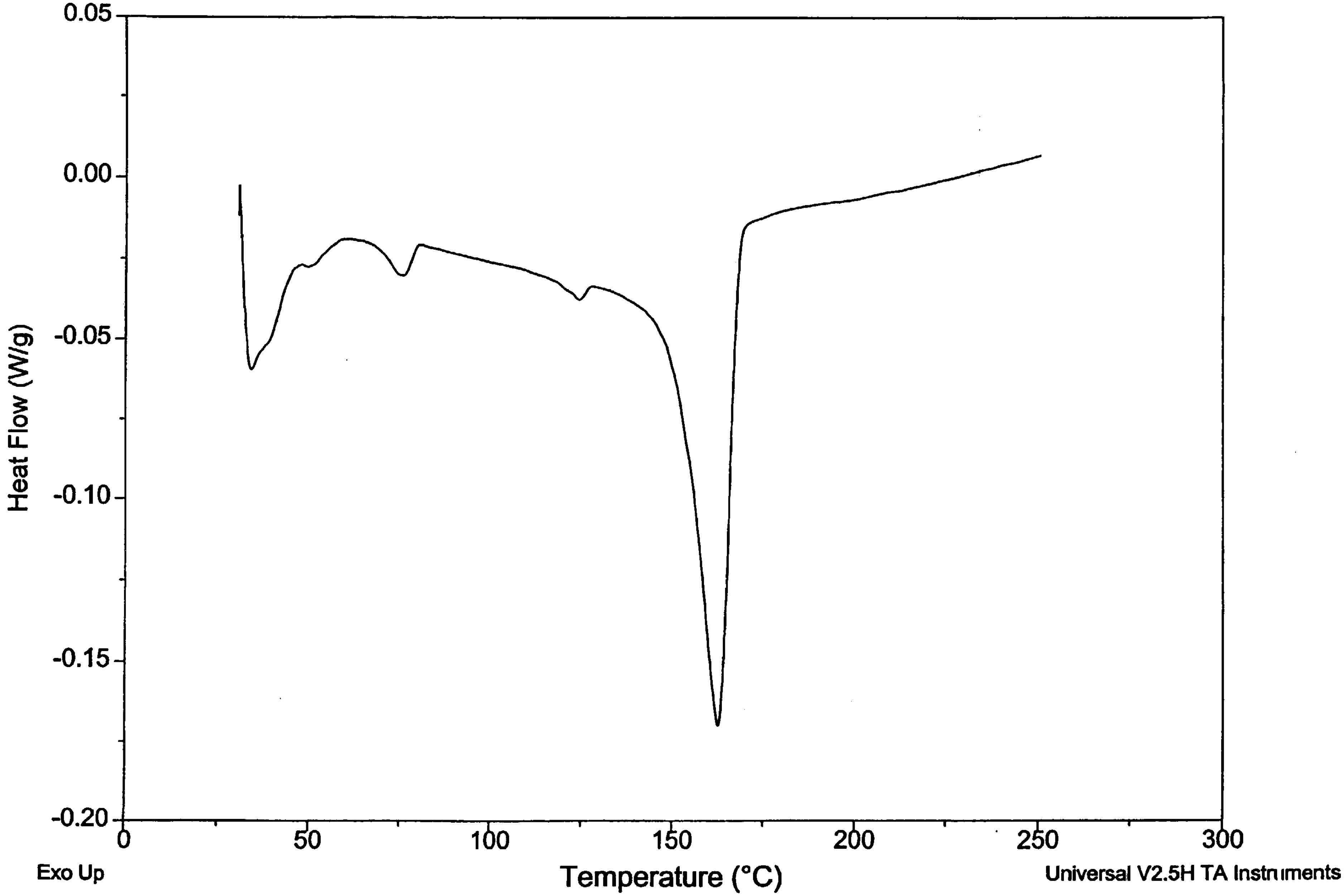


Universal V2.5H TA Instruments

Sample: Wiring Harness (spiral) run 2
Size: 4.8000 mg
Method: MDSC Method
Comment: Chevy Cavalier: wire harness, blk spiral: #22621025

DSC

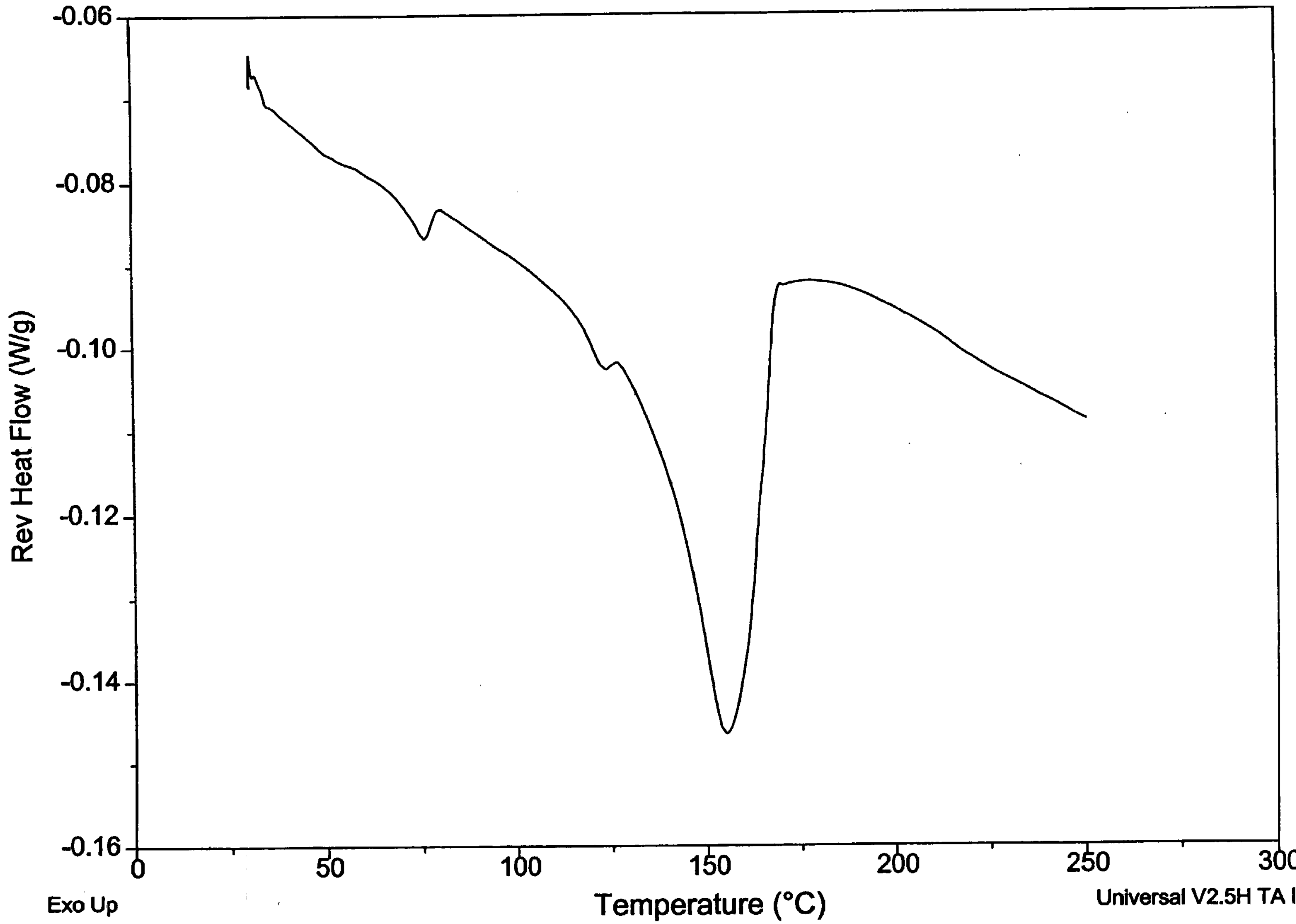
File: C:...\DSC\03614-103.028
Operator: WJM
Run Date: 25-May-01 07:50



Sample: Wiring Harness (spiral) run 2
Size: 4.8000 mg
Method: MDSC Method
Comment: Chevy Cavalier: wire harness, blk spiral: #22621025

DSC

File: C:...\DSC\03614-103.028
Operator: WJM
Run Date: 25-May-01 07:50

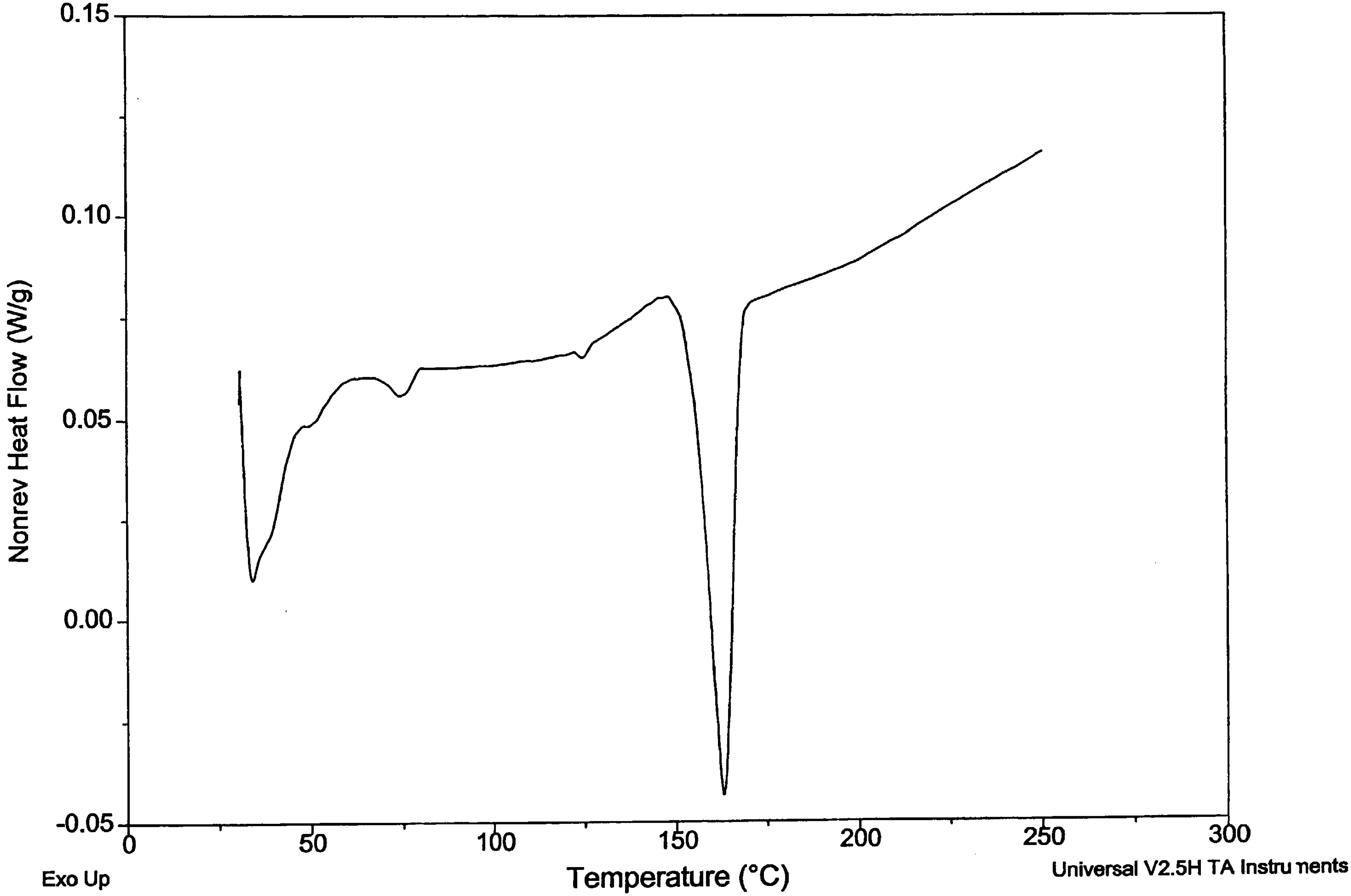


Universal V2.5H TA Instruments

Sample: Wiring Harness (spiral) run 2
Size: 4.8000 mg
Method: MDSC Method
Comment: Chevy Cavalier: wire harness, blk spiral: #22621025

DSC

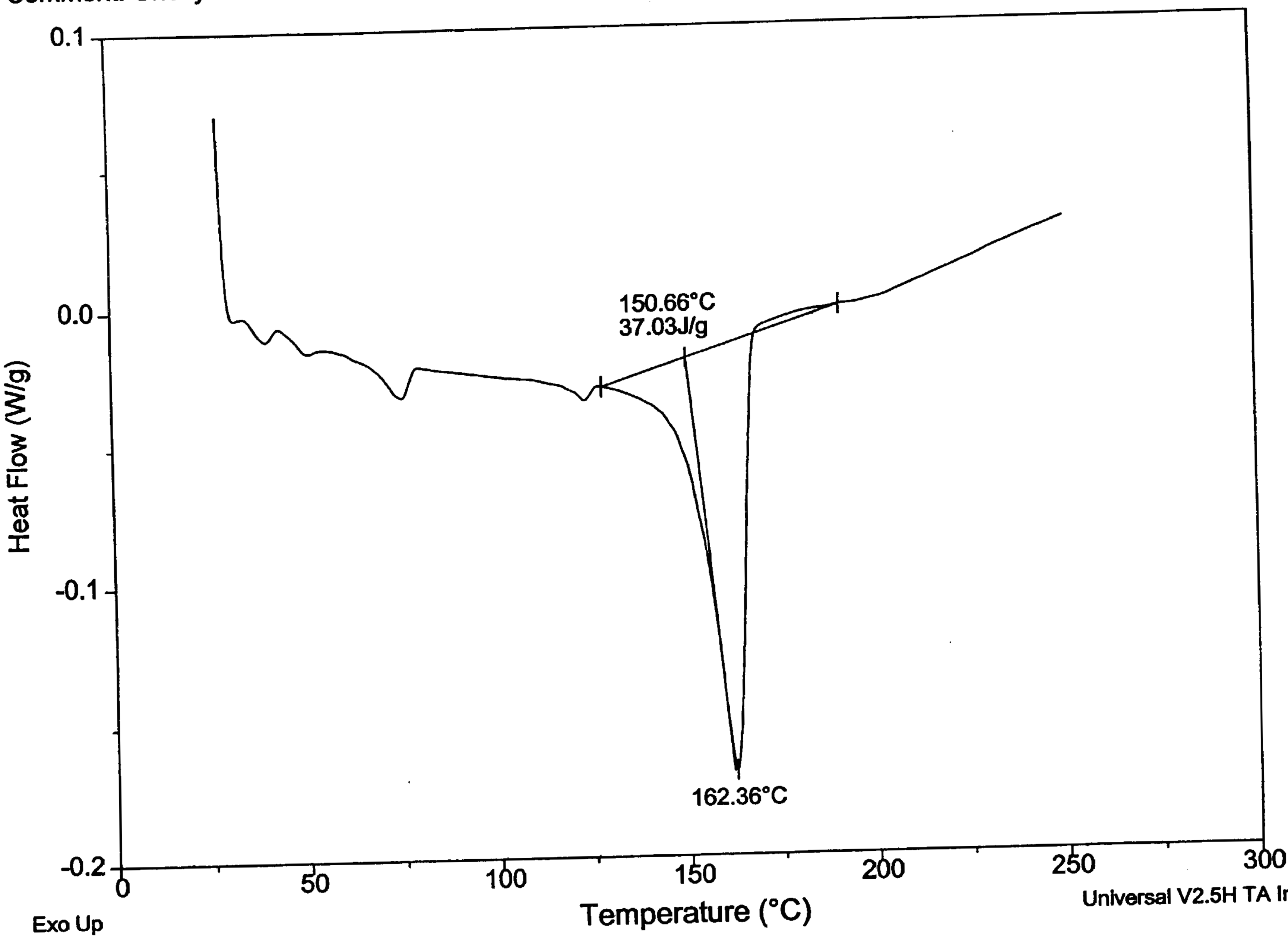
File: C:...\DSC\03614-103.028
Operator: WJM
Run Date: 25-May-01 07:50



Sample: Wiring Harness (spiral)
Size: 4.4000 mg
Method: MDSC Method
Comment: Chevy Cavalier: wire harness, blk spiral: #22621025

DSC

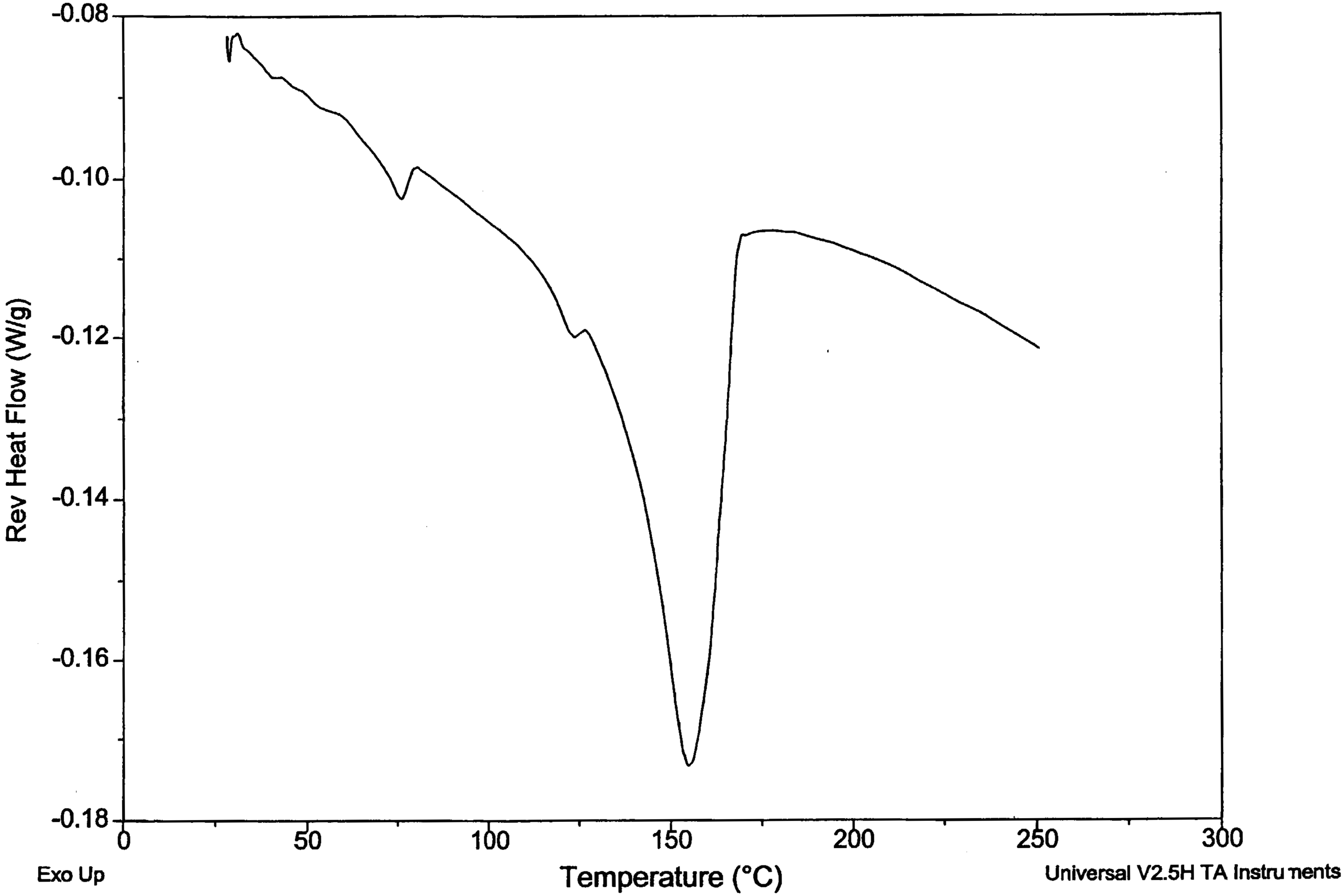
File: C:...\DSC\03614-103.029
Operator: WJM
Run Date: 25-May-01 09:43



Sample: Wiring Harness (spiral)
Size: 4.4000 mg
Method: MDSC Method
Comment: Chevy Cavalier: wire harness, blk spiral: #22621025

DSC

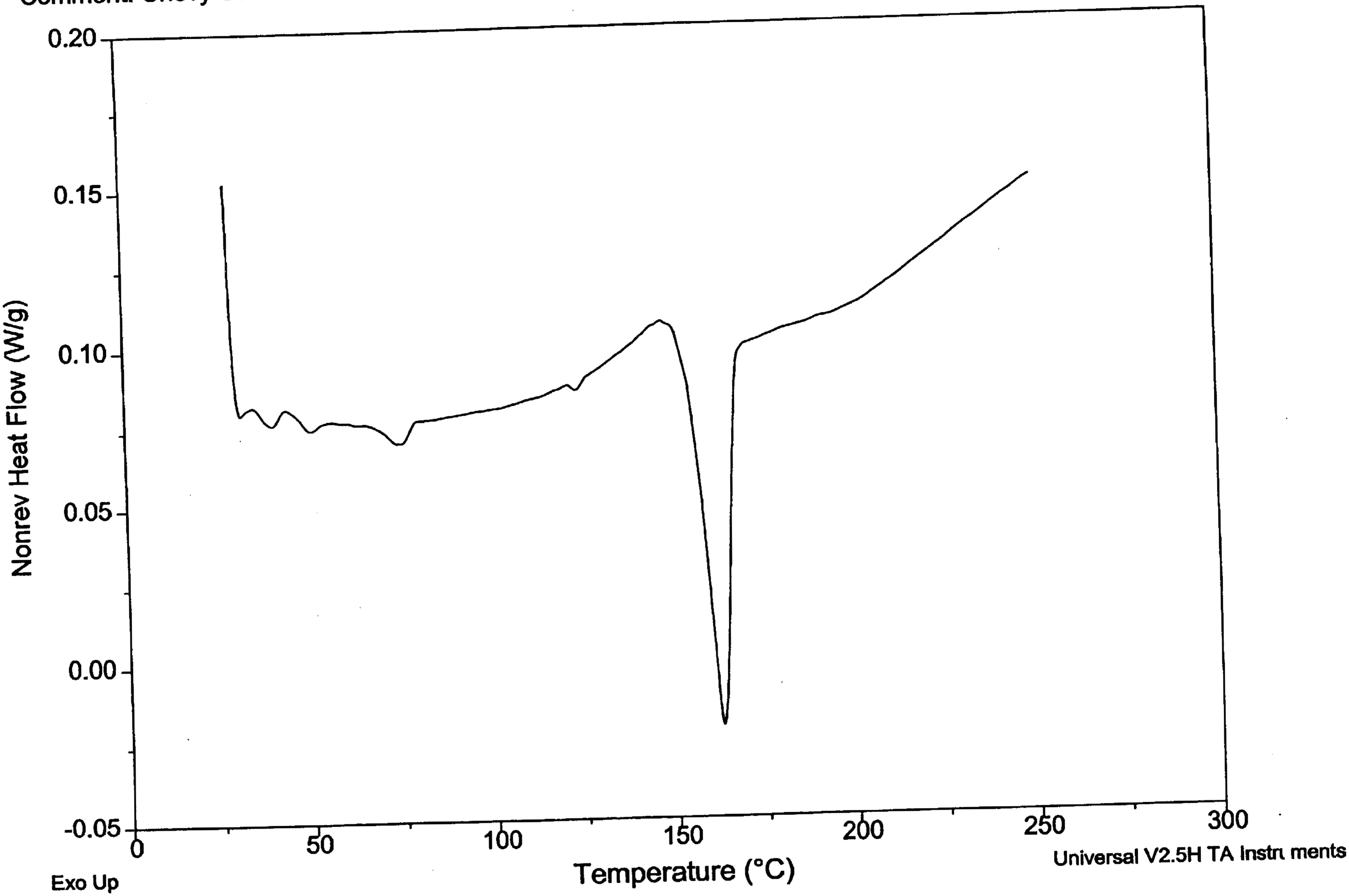
File: C:...\DSC\03614-103.029
Operator: WJM
Run Date: 25-May-01 09:43



Sample: Wiring Harness (spiral)
Size: 4.4000 mg
Method: MDSC Method
Comment: Chevy Cavalier: wire harness, blk spiral: #22621025

DSC

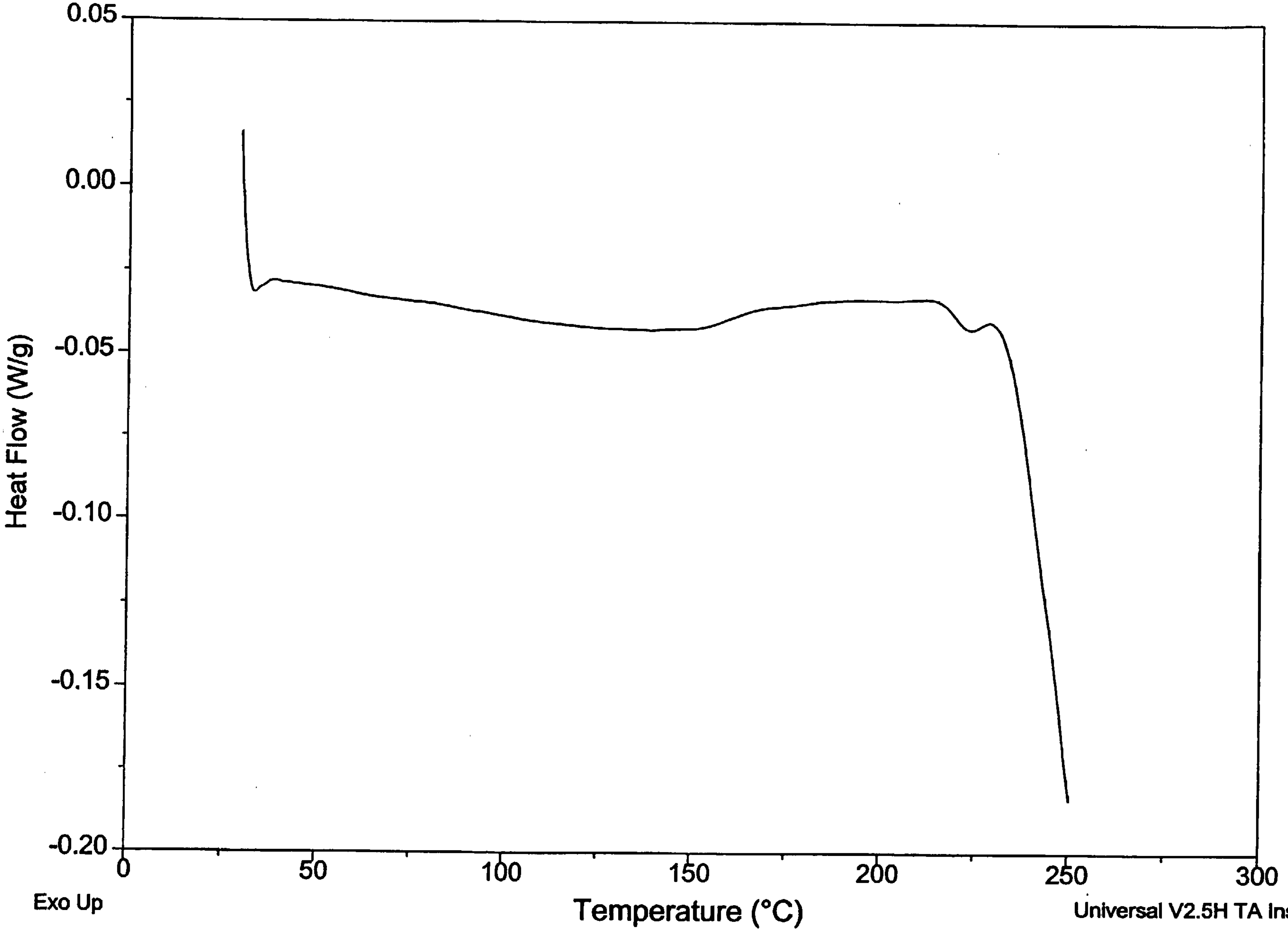
File: C:...\DSC\03614-103.029
Operator: WJM
Run Date: 25-May-01 09:43



Sample: Seat Cover
Size: 8.8300 mg
Method: MDSC Method
Comment: Chevy Cavalier: Seat Cover # 22589249

DSC

File: C:...\DSC\03614-103.030
Operator: WJM
Run Date: 25-May-01 12:32

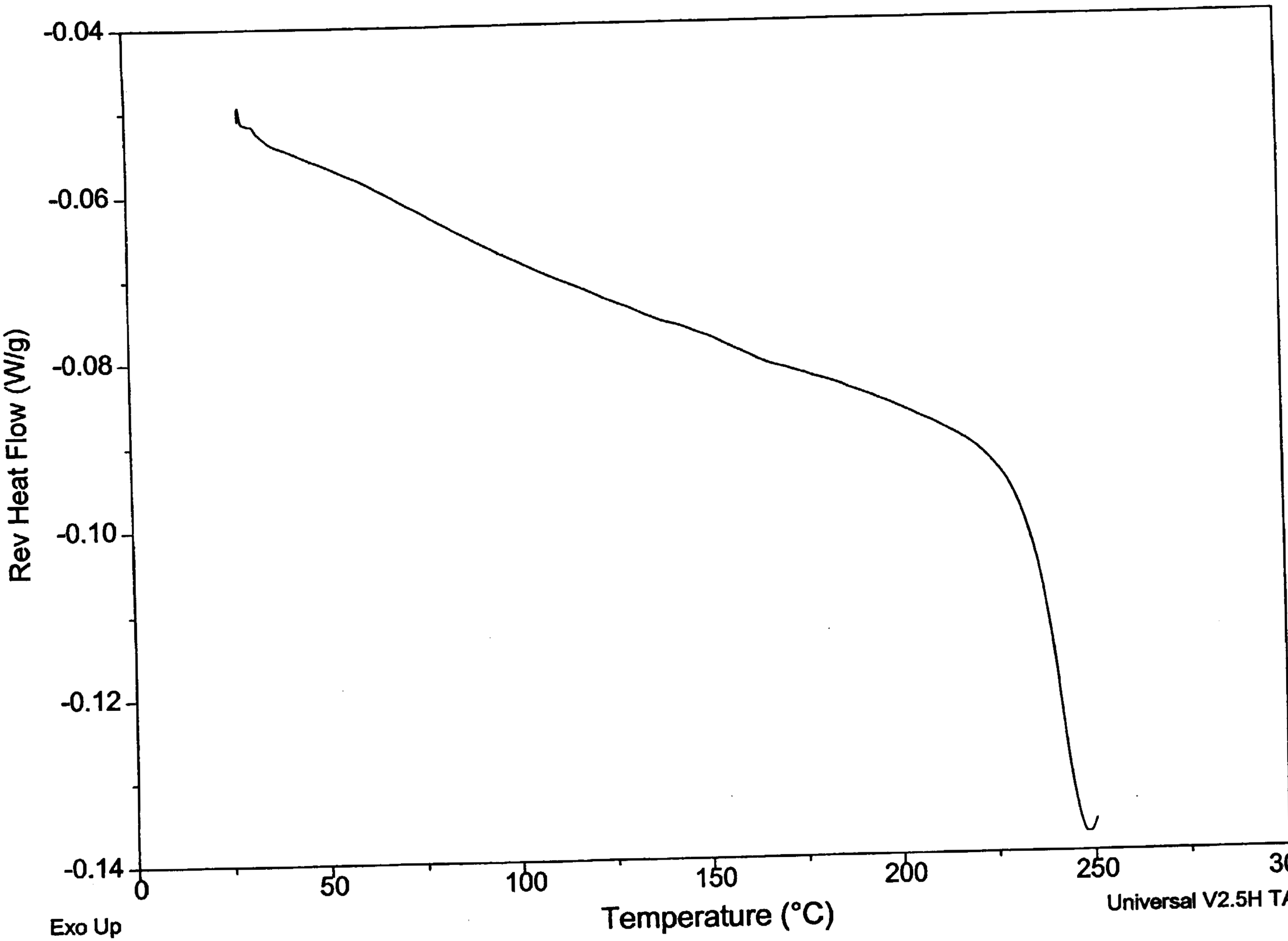


Universal V2.5H TA Instruments

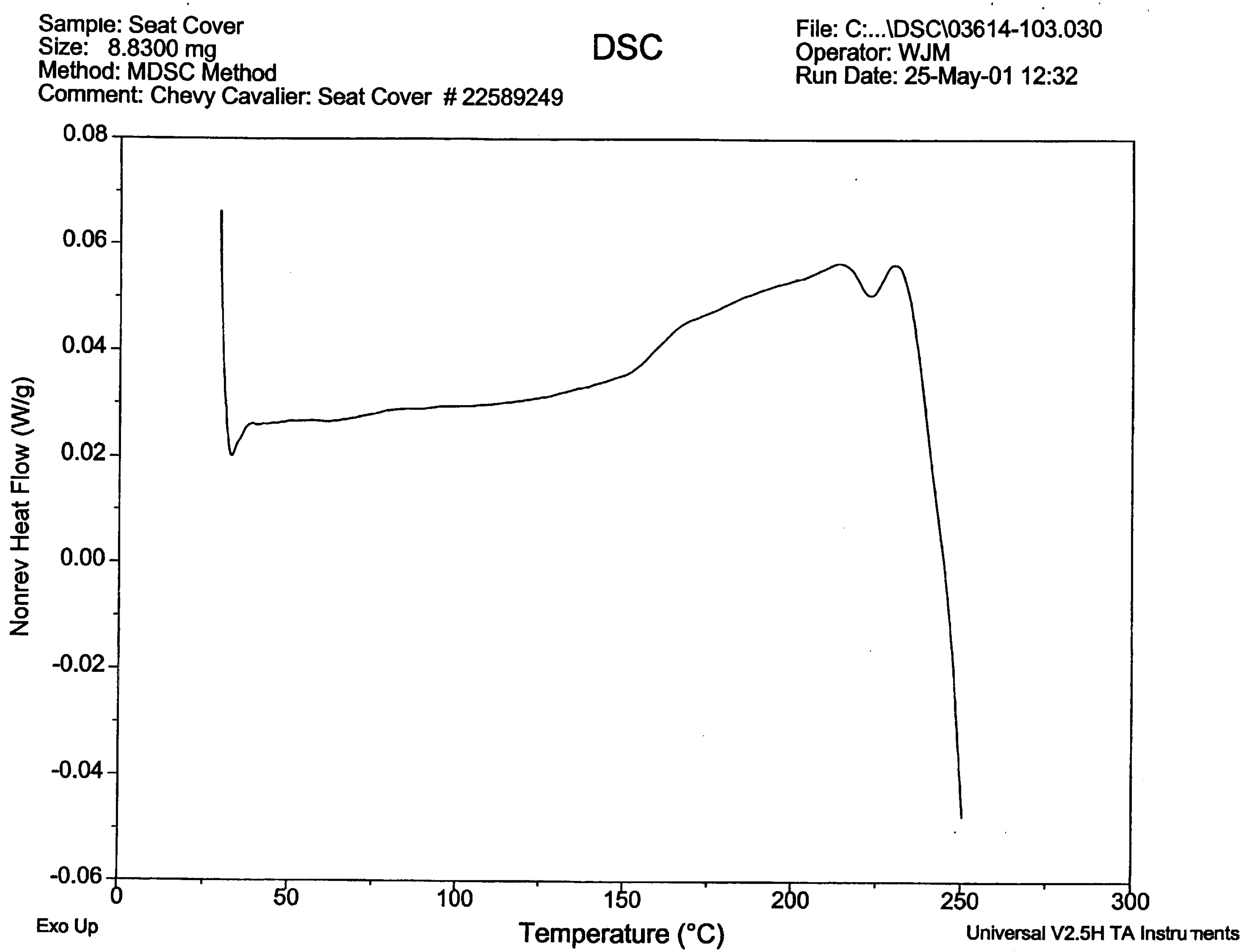
Sample: Seat Cover
Size: 8.8300 mg
Method: MDSC Method
Comment: Chevy Cavalier: Seat Cover # 22589249

DSC

File: C:...\DSC\03614-103.030
Operator: WJM
Run Date: 25-May-01 12:32



Universal V2.5H TA Instruments

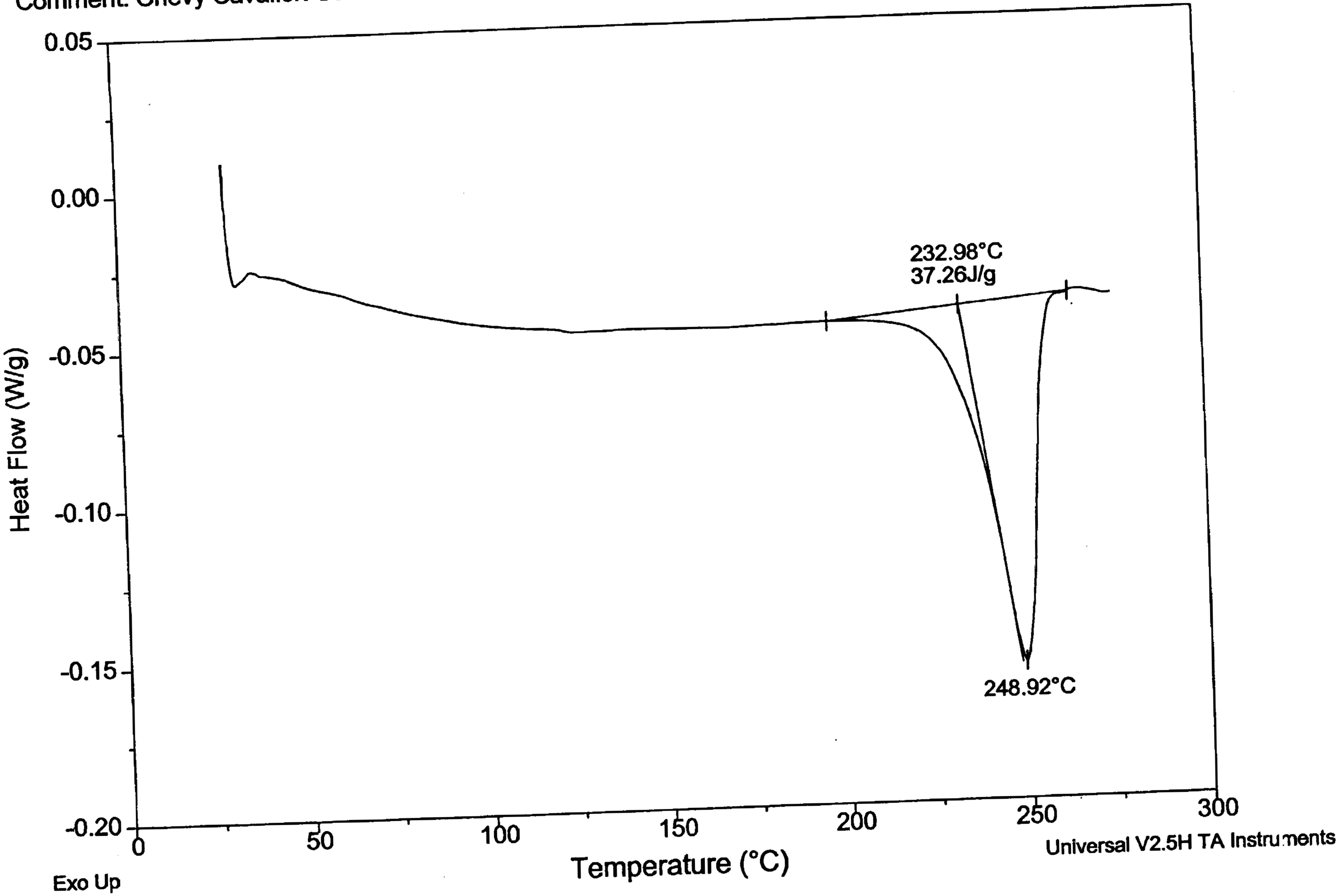


Sample: Seat Cover
Size: 8.8300 mg
Method: MDSC Method
Comment: Chevy Cavalier: Seat Cover # 22589249
DSC
File: C:...\DSC\03614-103.030
Operator: WJM
Run Date: 25-May-01 12:32
Nonrev Heat Flow (W/g)
0.08
0.06
0.04
0.02
0.00
-0.02
-0.04
-0.06
0
50
100
150
200
250
300
Exo Up
Temperature (°C)
Universal V2.5H TA Instruments

Sample: Seat Cover run 2
Size: 10.1600 mg
Method: MDSC Method
Comment: Chevy Cavalier: Seat Cover # 22589249

DSC

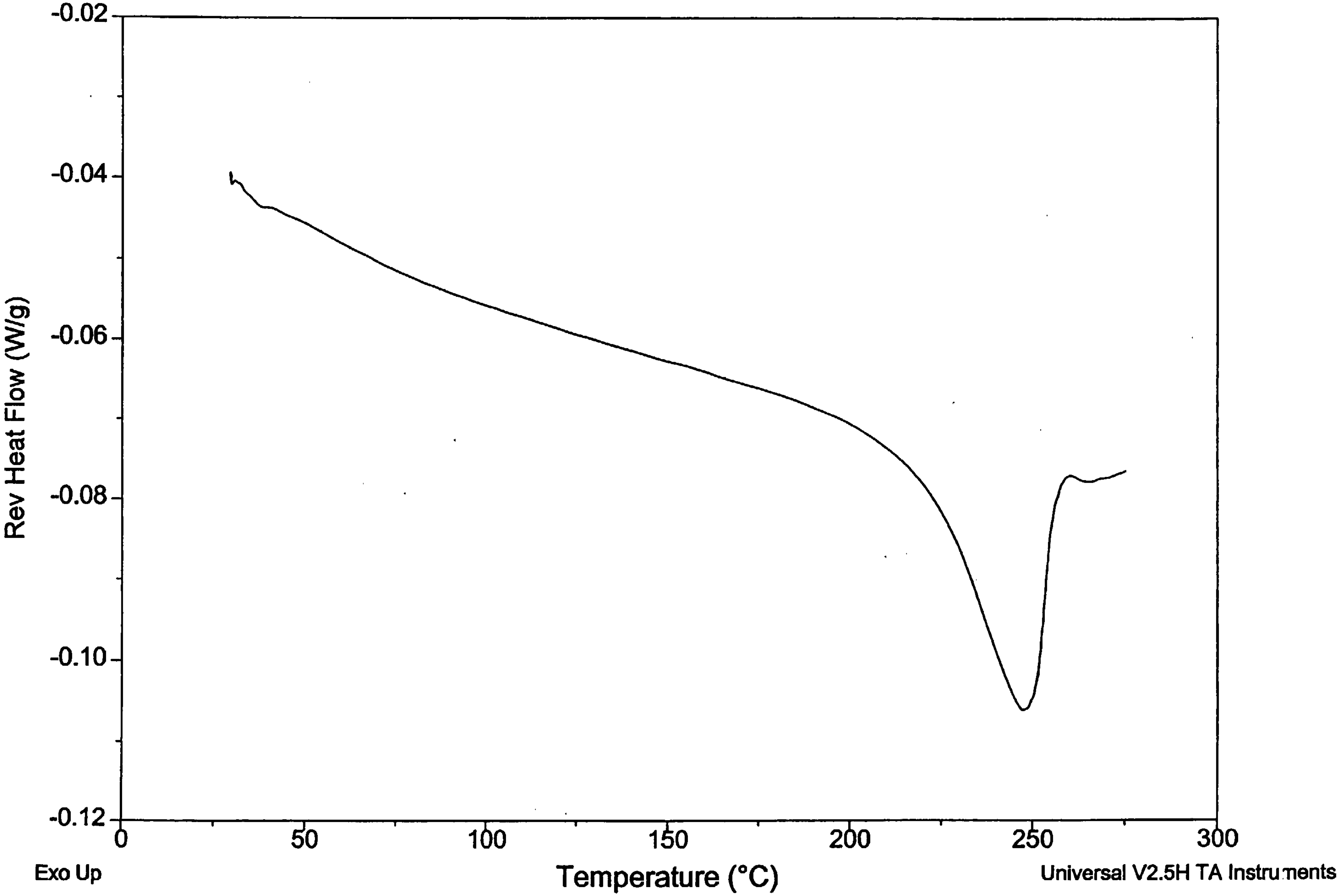
File: C:...\DSC\03614-103.031
Operator: WJM
Run Date: 31-May-01 08:26



Sample: Seat Cover run 2
Size: 10.1600 mg
Method: MDSC Method
Comment: Chevy Cavalier: Seat Cover # 22589249

DSC

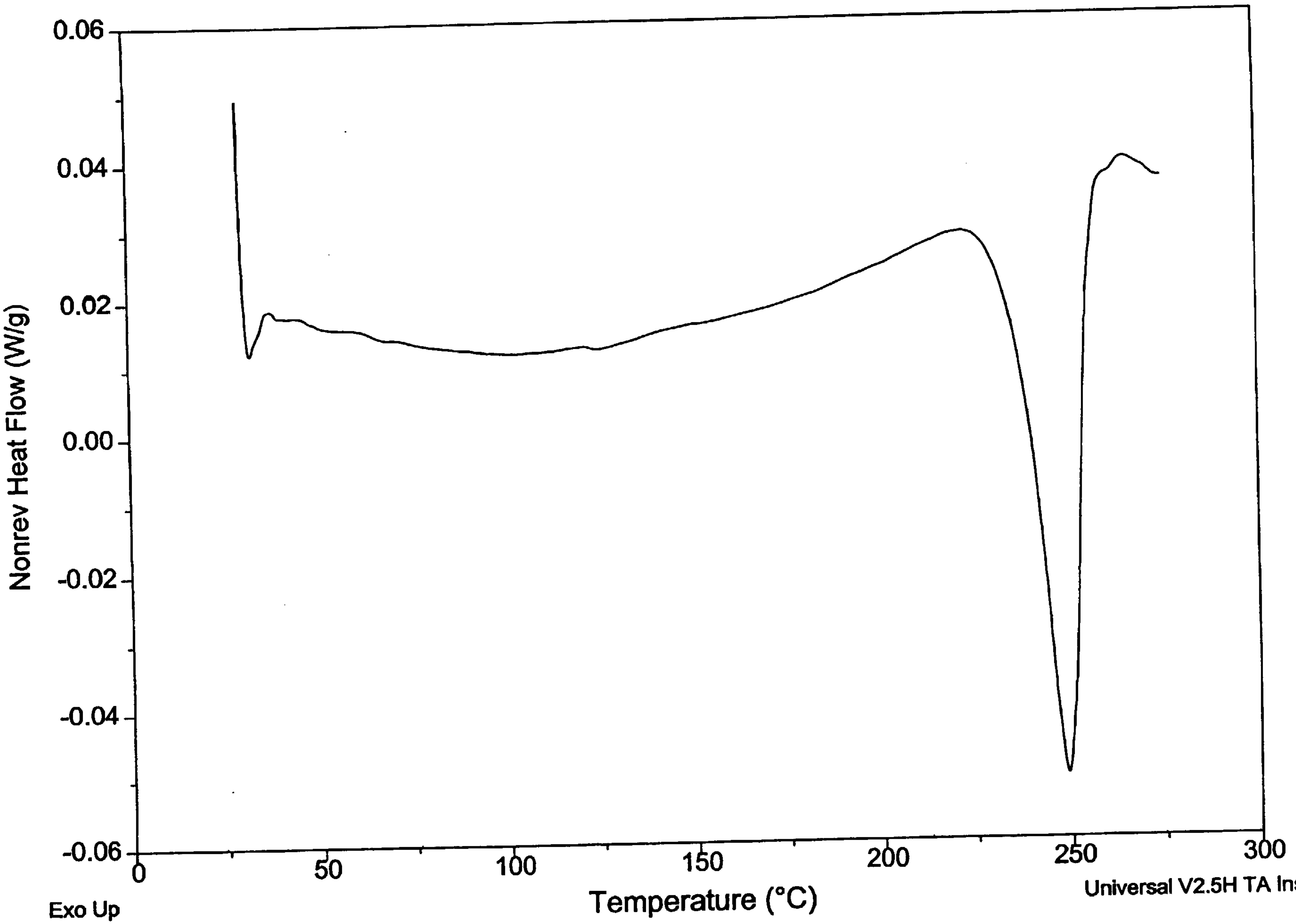
File: C:...\DSC\03614-103.031
Operator: WJM
Run Date: 31-May-01 08:26



Sample: Seat Cover run 2
Size: 10.1600 mg
Method: MDSC Method
Comment: Chevy Cavalier: Seat Cover # 22589249

DSC

File: C:...\DSC\03614-103.031
Operator: WJM
Run Date: 31-May-01 08:26

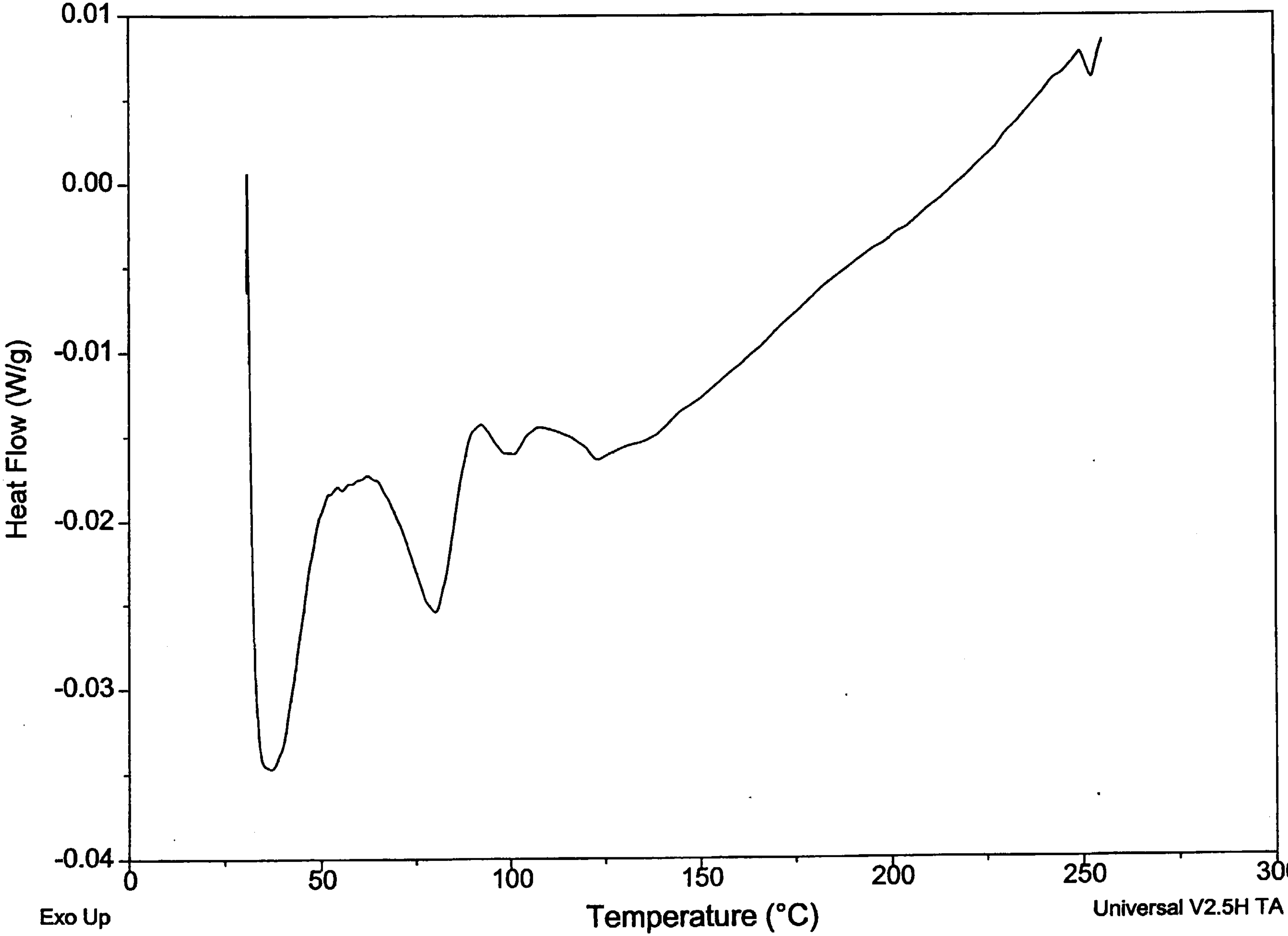


Universal V2.5H TA Instruments

Sample: Carpet
Size: 8.2400 mg
Method: MDSC Method
Comment: Chevy Cavalier: Carpet (backing)

DSC

File: C:...\DSC\03614-103.032
Operator: WJM
Run Date: 31-May-01 11:34

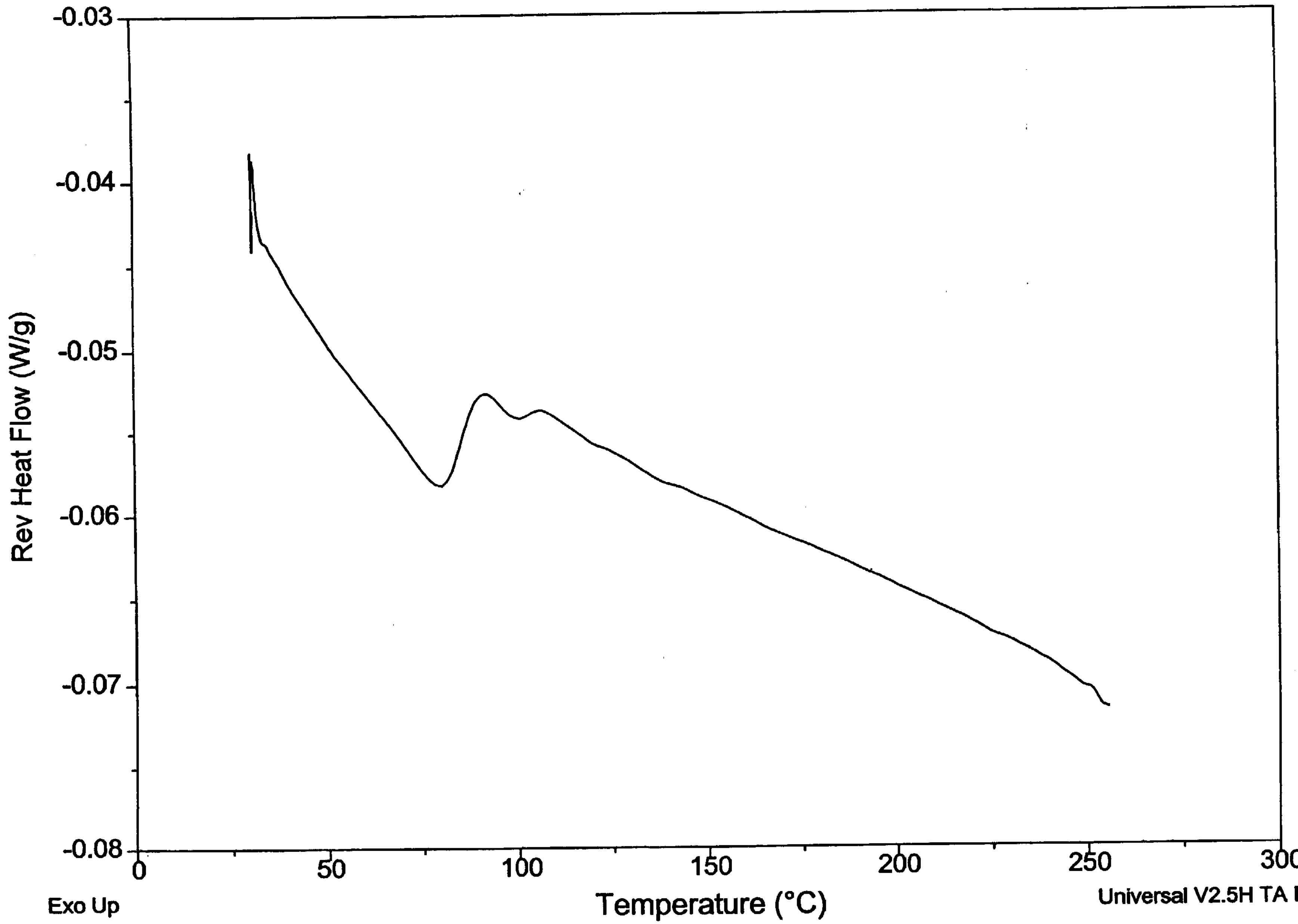


Universal V2.5H TA Instruments

Sample: Carpet
Size: 8.2400 mg
Method: MDSC Method
Comment: Chevy Cavalier: Carpet (backing)

DSC

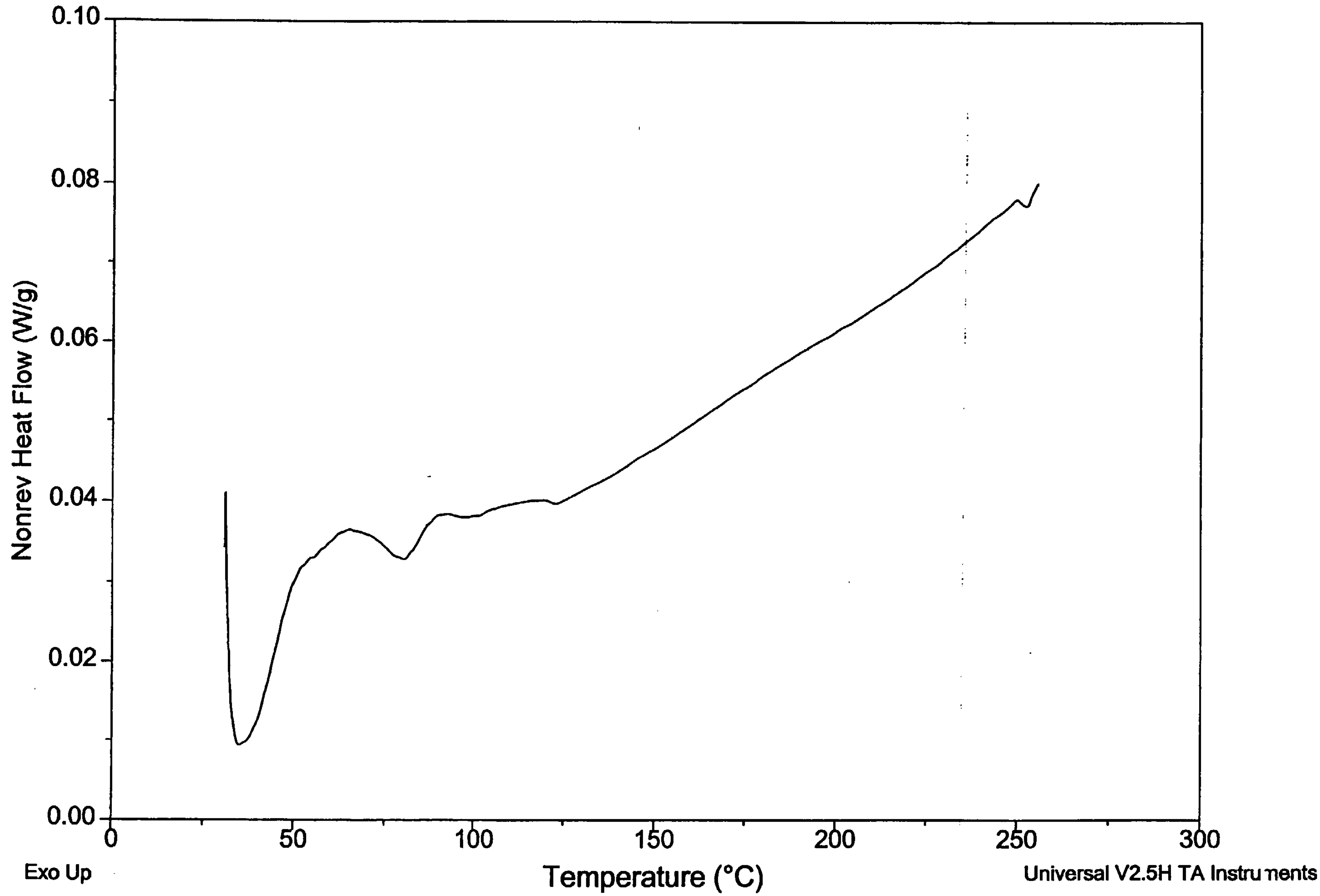
File: C:...\DSC\03614-103.032
Operator: WJM
Run Date: 31-May-01 11:34



Sample: Carpet
Size: 8.2400 mg
Method: MDSC Method
Comment: Chevy Cavalier: Carpet (backing)

DSC

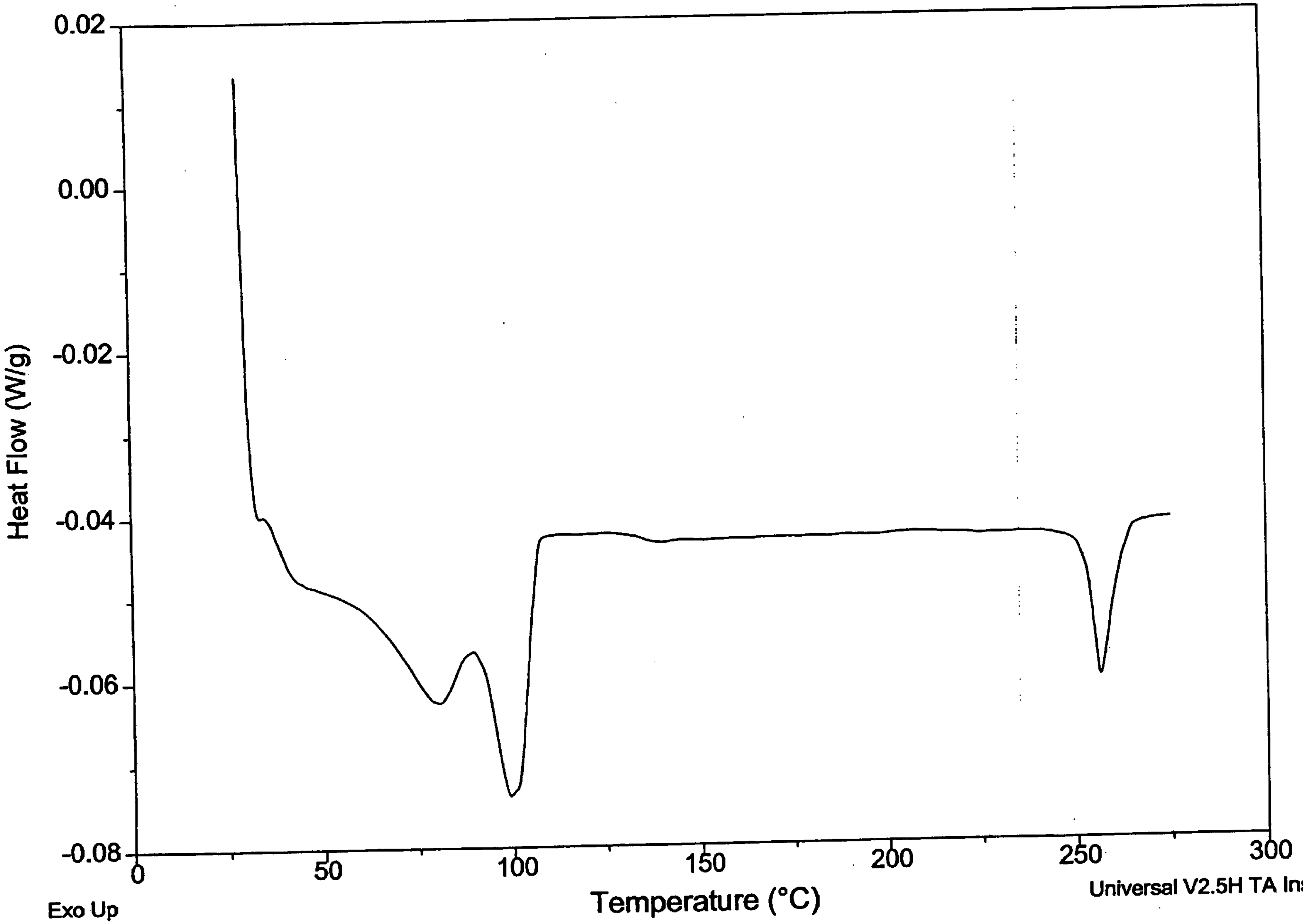
File: C:...\DSC\03614-103.032
Operator: WJM
Run Date: 31-May-01 11:34



Sample: Carpet (run 2)
Size: 12.3700 mg
Method: MDSC Method
Comment: Chevy Cavalier: Carpet (backing)

DSC

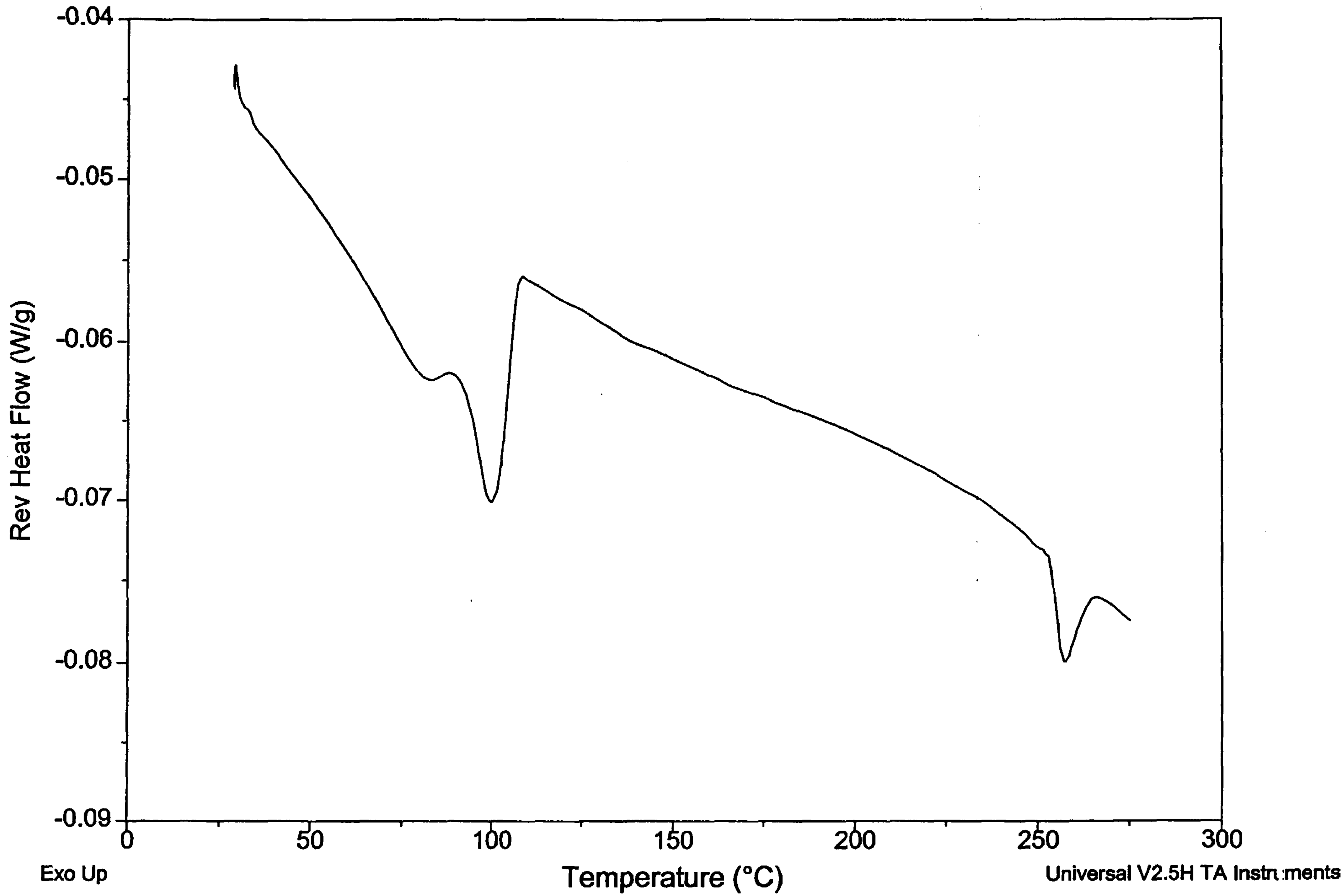
File: C:...\D$C\03614-103.033
Operator: WJM
Run Date: 31-May-01 14:03



Sample: Carpet (run 2)
Size: 12.3700 mg
Method: MDSC Method
Comment: Chevy Cavalier: Carpet (backing)

DSC

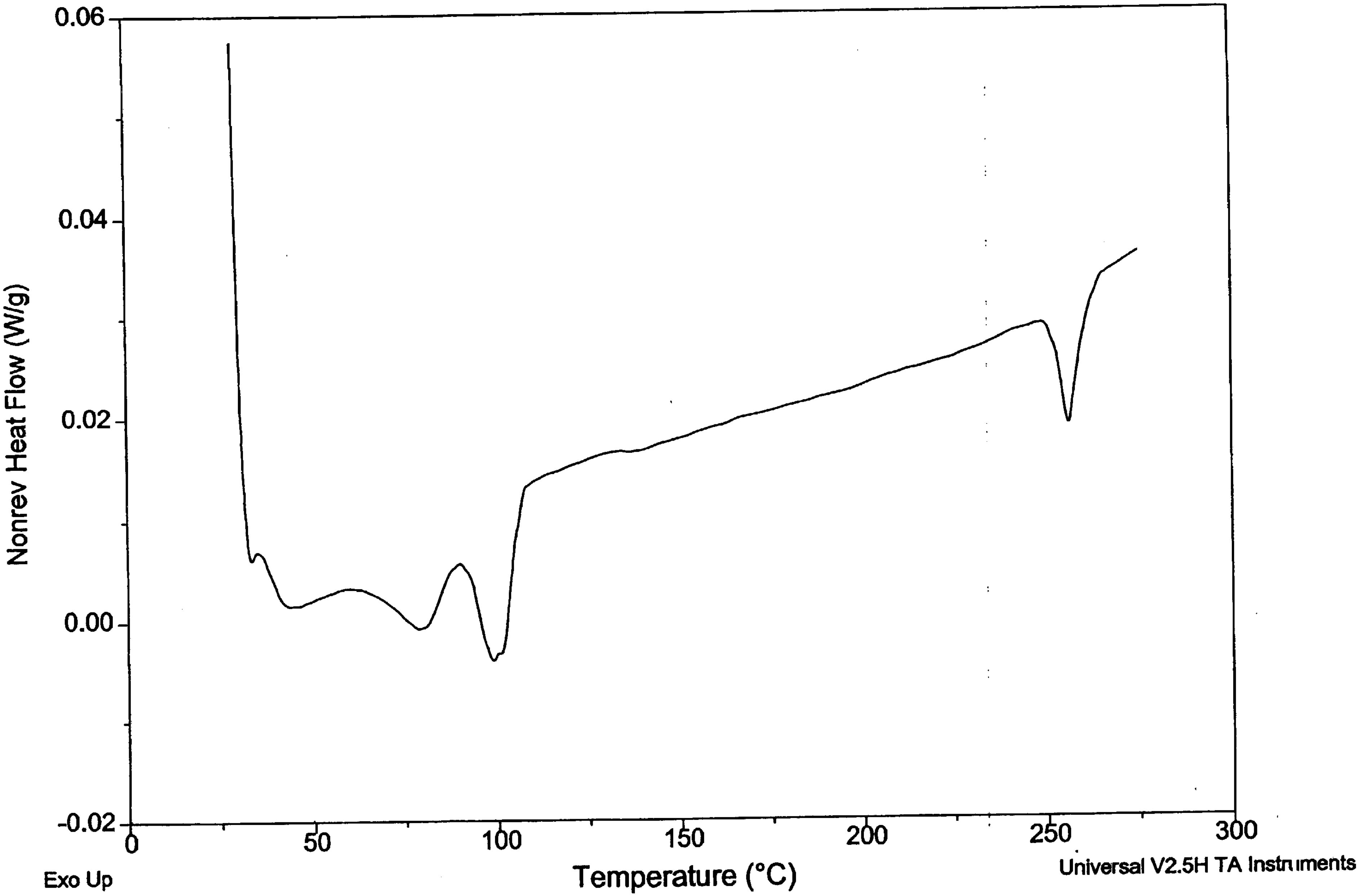
File: C:...\DSC\03614-103.033
Operator: WJM
Run Date: 31-May-01 14:03



Sample: Carpet (run 2)
Size: 12.3700 mg
Method: MDSC Method
Comment: Chevy Cavalier: Carpet (backing)

DSC

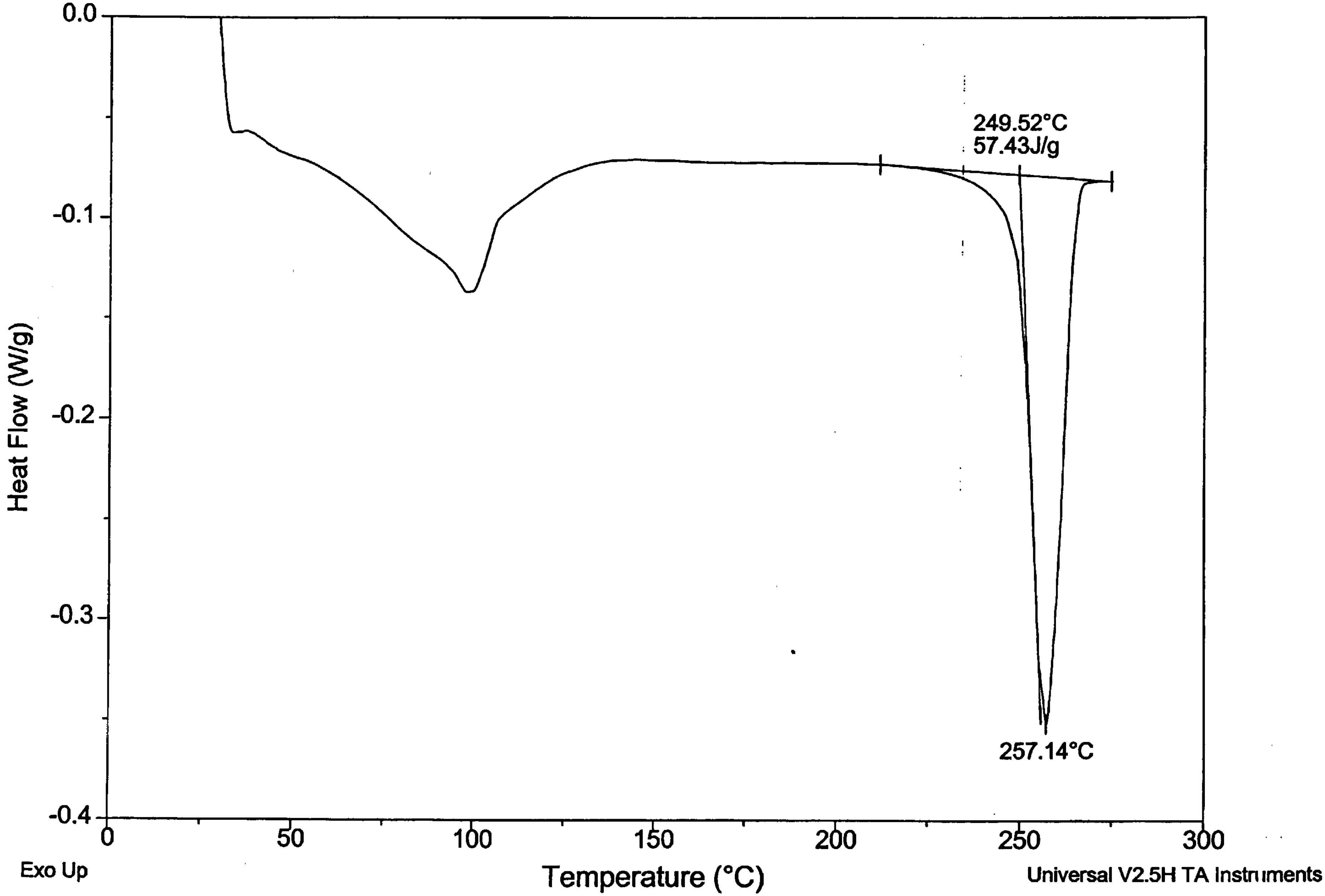
File: C:...\DSC\03614-103.033
Operator: WJM
Run Date: 31-May-01 14:03



Sample: Carpet
Size: 8.2200 mg
Method: MDSC Method
Comment: Chevy Cavalier: Carpet (nap)

DSC

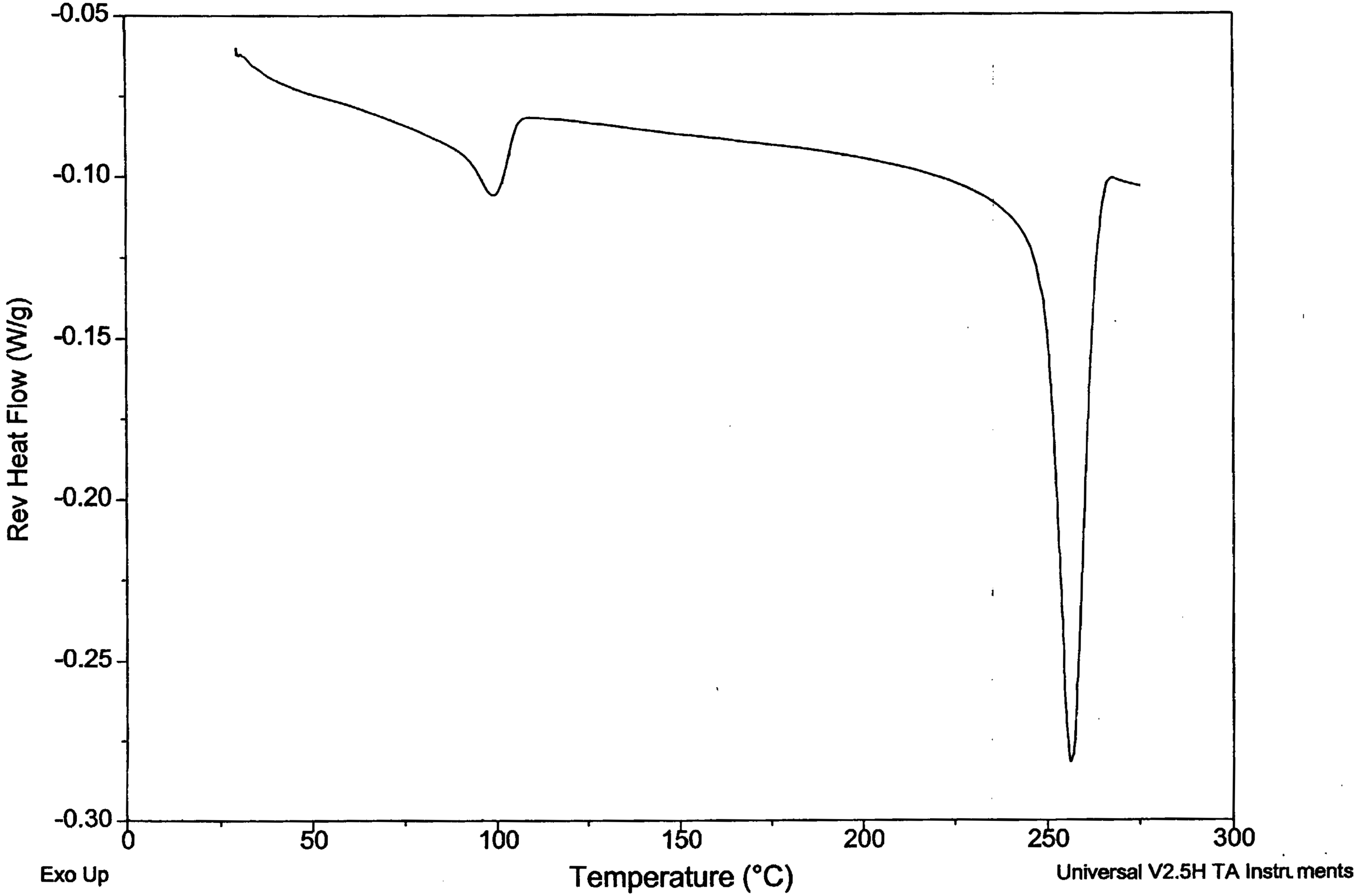
File: C:...\DSC\03614-103.034
Operator: WJM
Run Date: 4-Jun-01 08:11



Sample: Carpet
Size: 8.2200 mg
Method: MDSC Method
Comment: Chevy Cavalier: Carpet (nap)

DSC

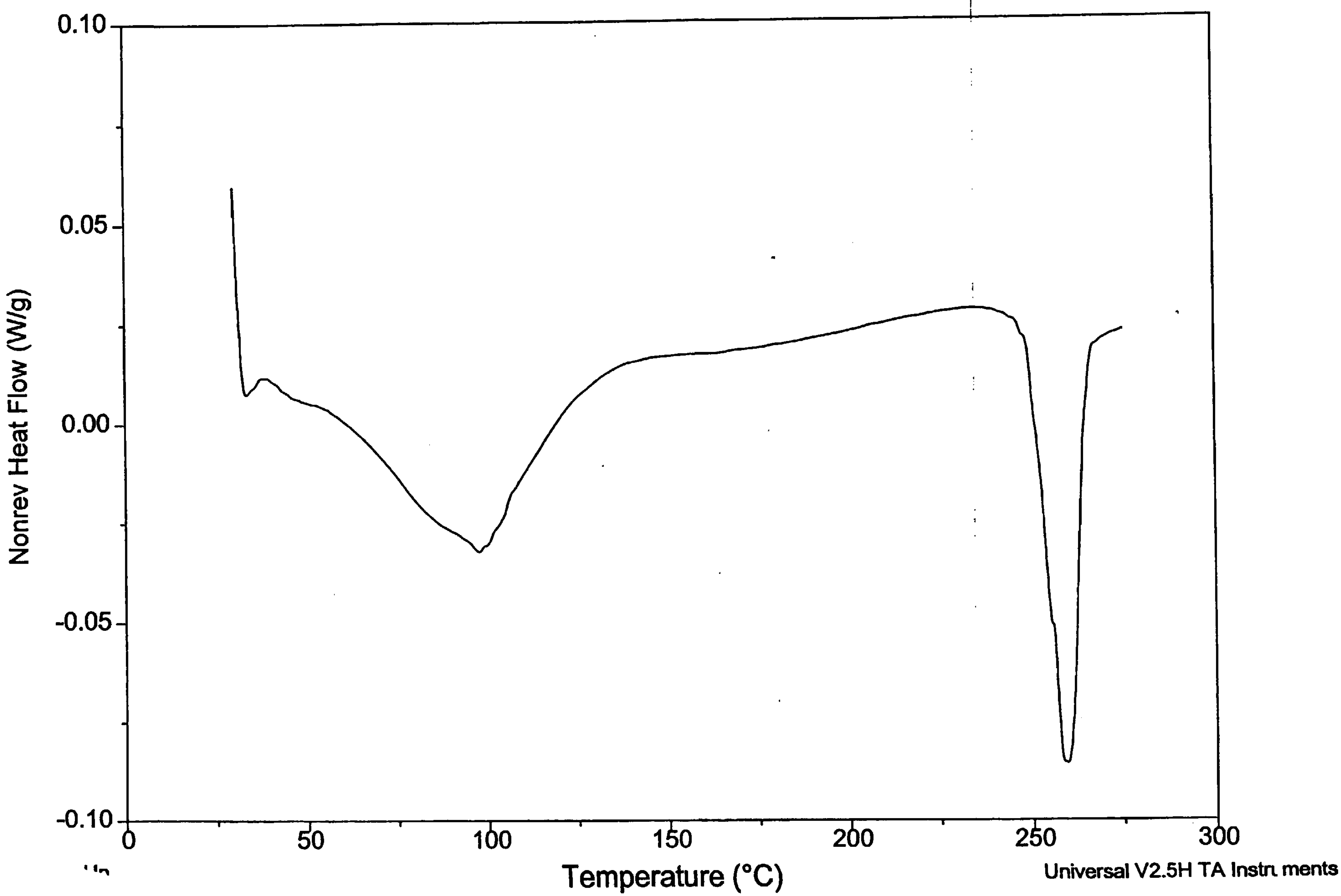
File: C:...\D$C\03614-103.034
Operator: WJM
Run Date: 4-Jun-01 08:11



Sample: Carpet
Size: 8.2200 mg
Method: MDSC Method
Comment: Chevy Cavalier: Carpet (nap)

DSC

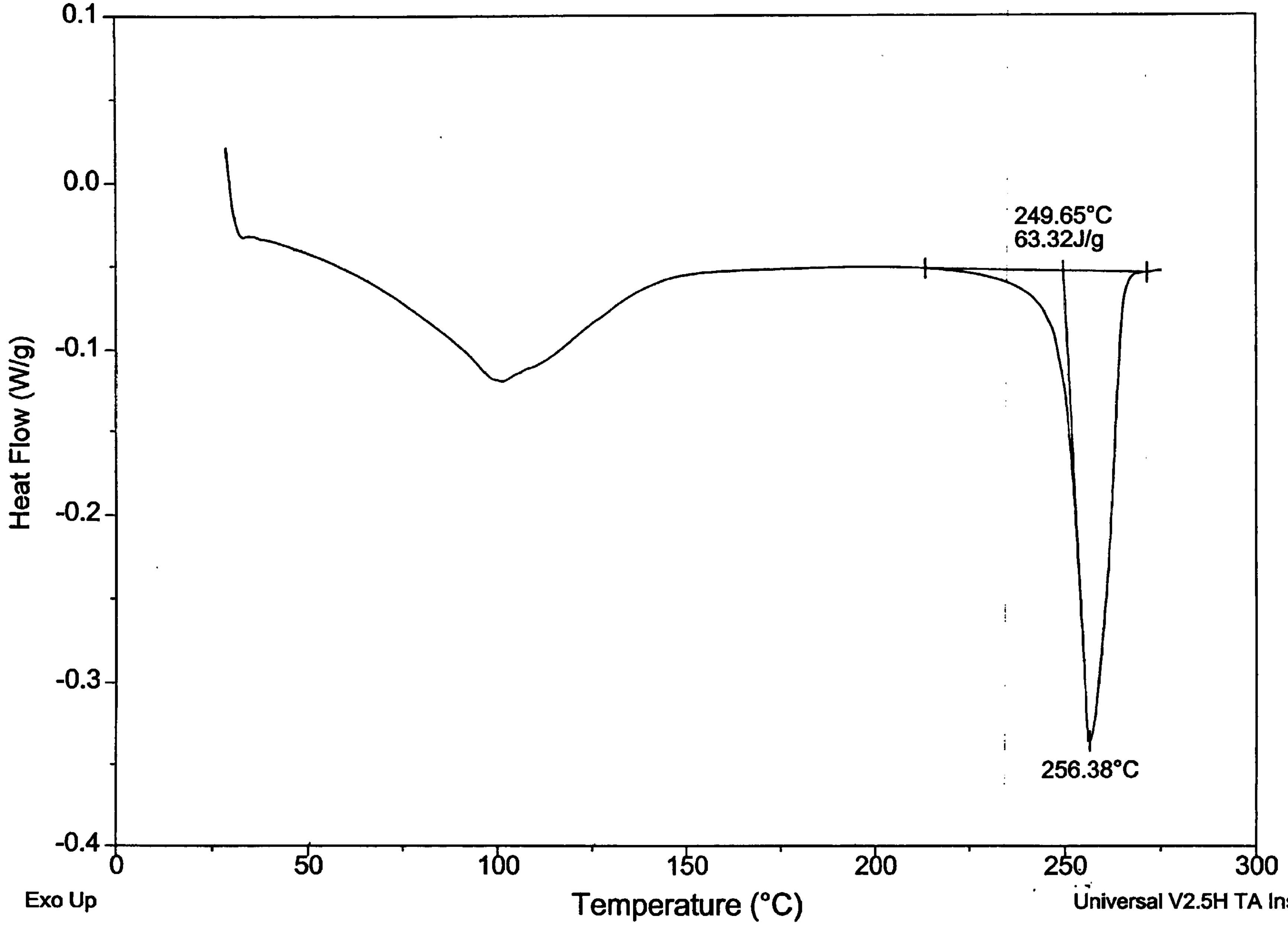
File: C:...\DSC\03614-103.034
Operator: WJM
Run Date: 4-Jun-01 08:11



Sample: Carpet (run 2)
Size: 7.6200 mg
Method: MDSC Method
Comment: Chevy Cavalier: Carpet (nap)

DSC

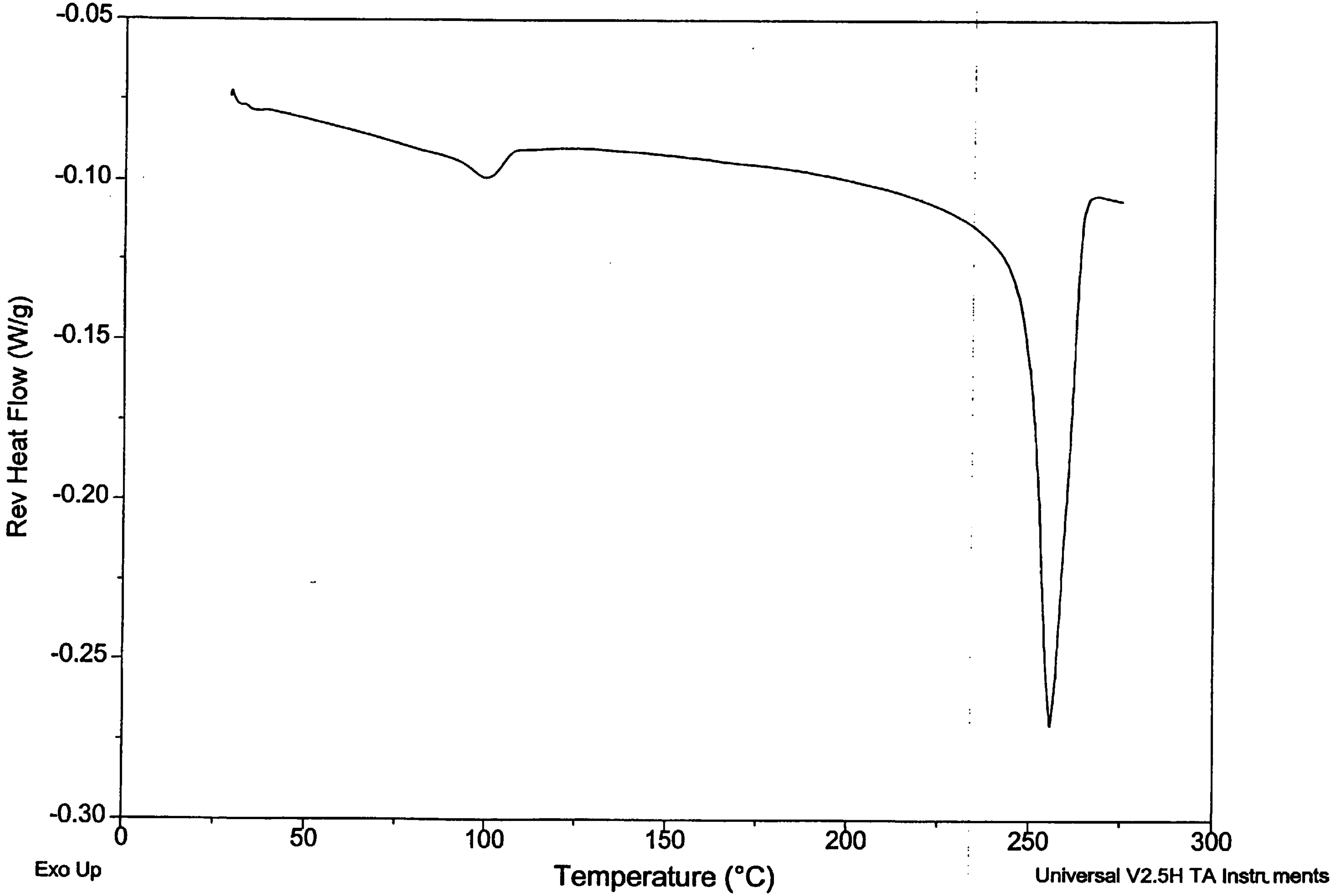
File: C:...\DSC\03614-103.035
Operator: WJM
Run Date: 4-Jun-01 10:50

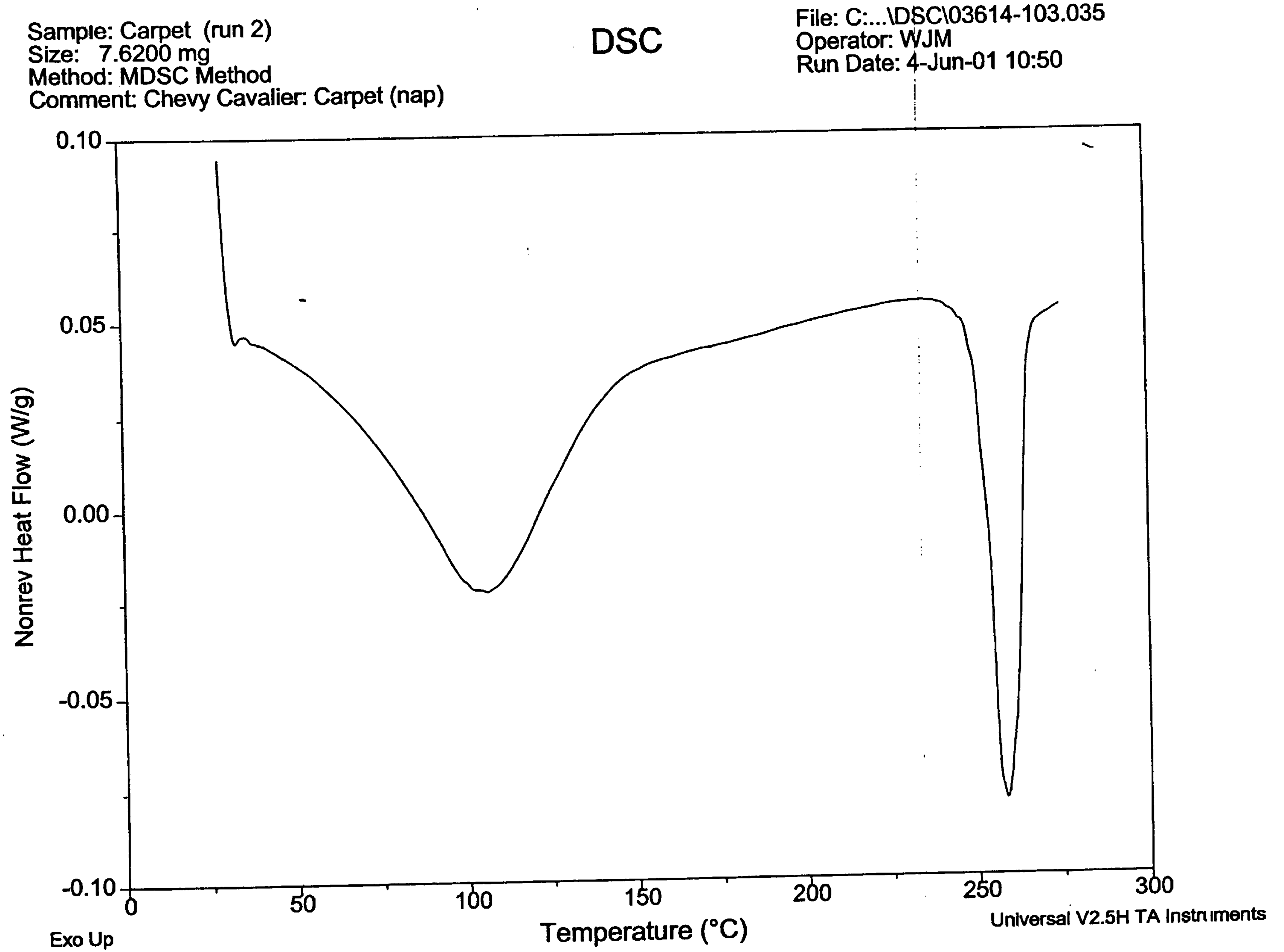


Sample: Carpet (run 2)
Size: 7.6200 mg
Method: MDSC Method
Comment: Chevy Cavalier: Carpet (nap)

DSC

File: C:...\DSC\03614-103.035
Operator: WJM
Run Date: 4-Jun-01 10:50



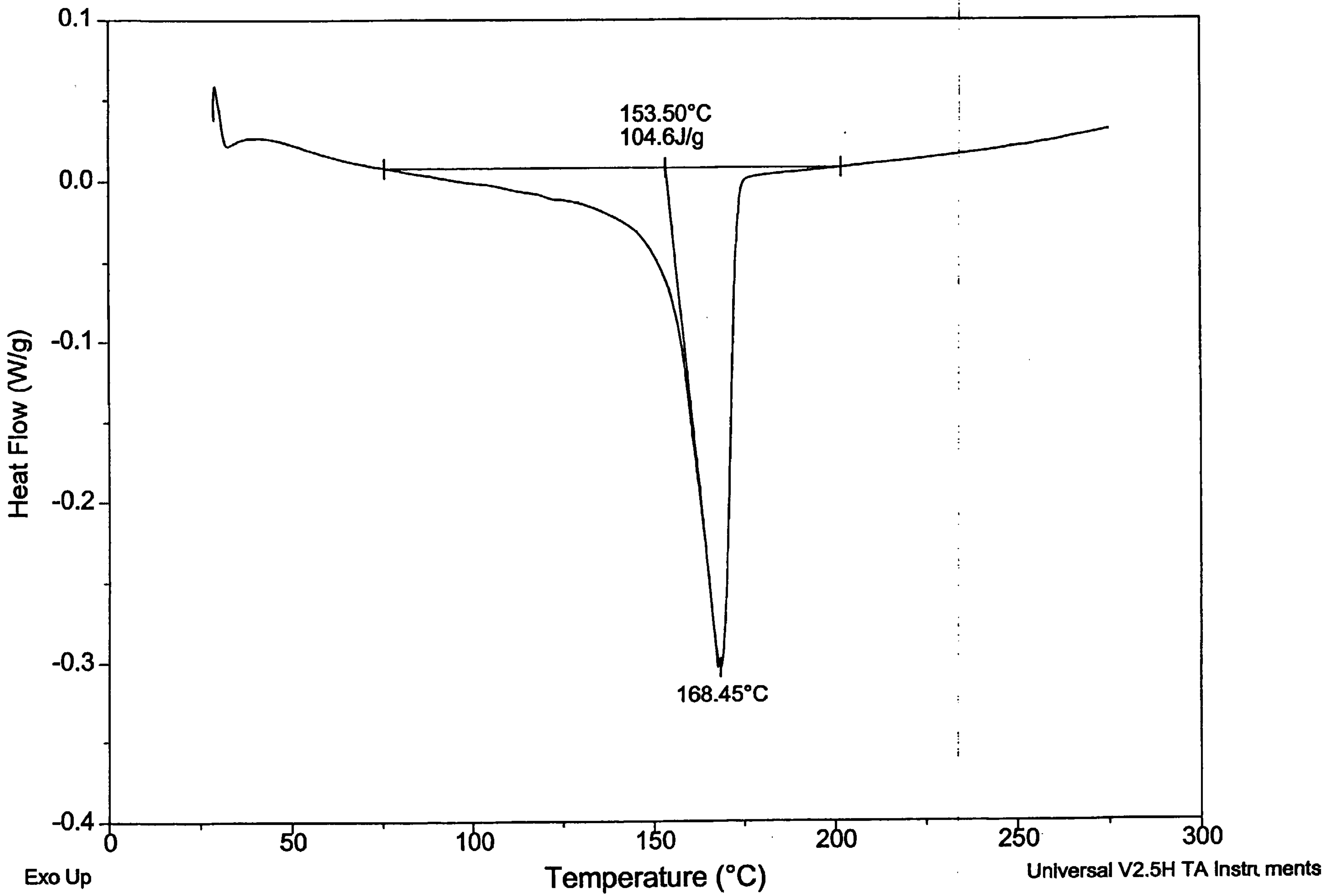


Sample: Carpet (run 2)
Size: 7.6200 mg
Method: MDSC Method
Comment: Chevy Cavalier: Carpet (nap)
DSC
File: C:...\DSC\03614-103.035
Operator: WJM
Run Date: 4-Jun-01 10:50
0.10
0.05
0.00
-0.05
-0.10
Nonrev Heat Flow (W/g)
0
50
100
150
200
250
300
Temperature (°C)
Exo Up
Universal V2.5H TA Instruments

Sample: Door Panel Gray Plastic
Size: 5.4000 mg
Method: MDSC Method
Comment: Honda Civic

DSC

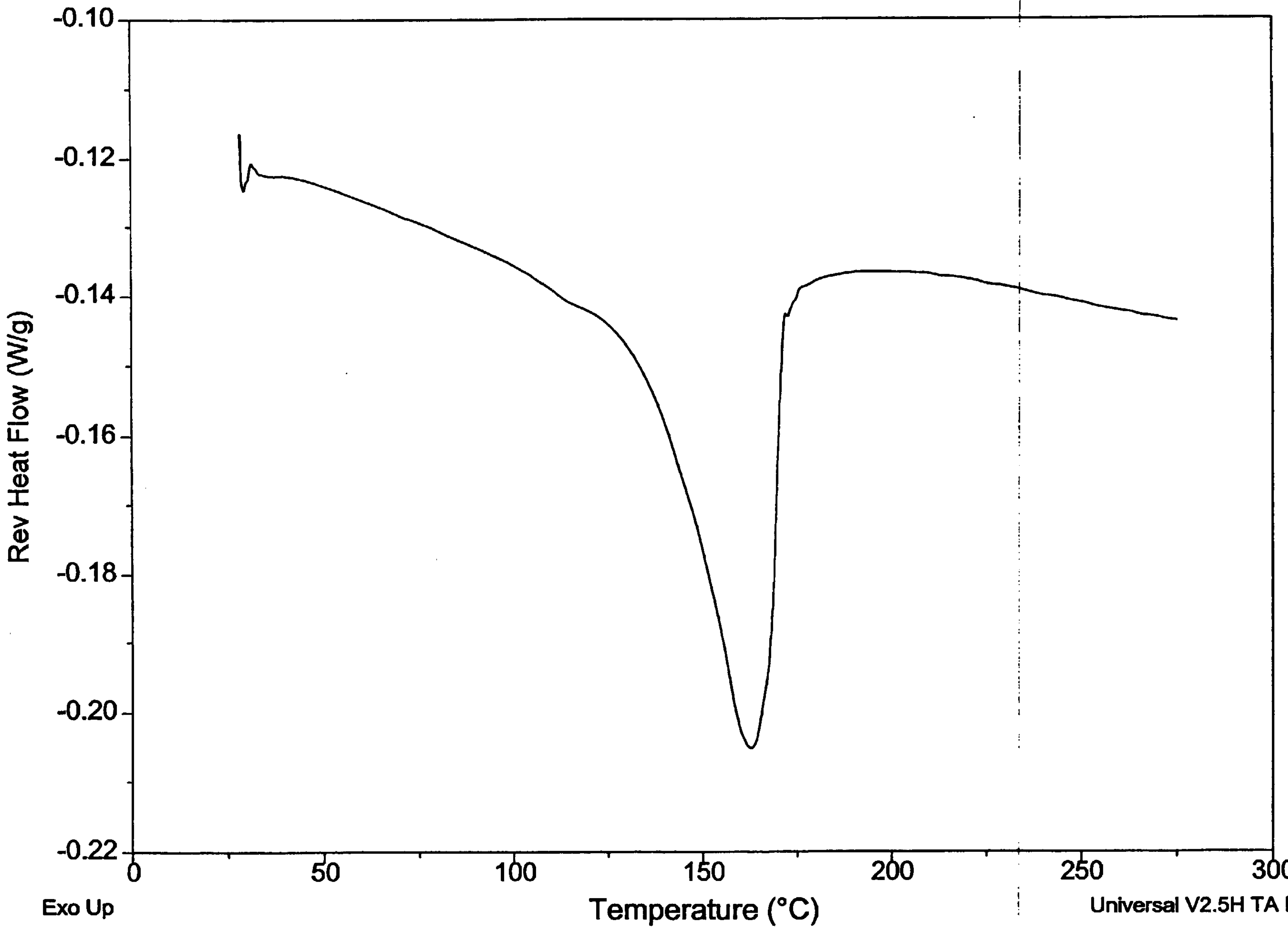
File: C:...\DSC\03614-103.036
Operator: WJM
Run Date: 4-Jun-01 13:19



Sample: Door Panel Gray Plastic
Size: 5.4000 mg
Method: MDSC Method
Comment: Honda Civic

DSC

File: C:...\DSC\03614-103.036
Operator: WJM
Run Date: 4-Jun-01 13:19

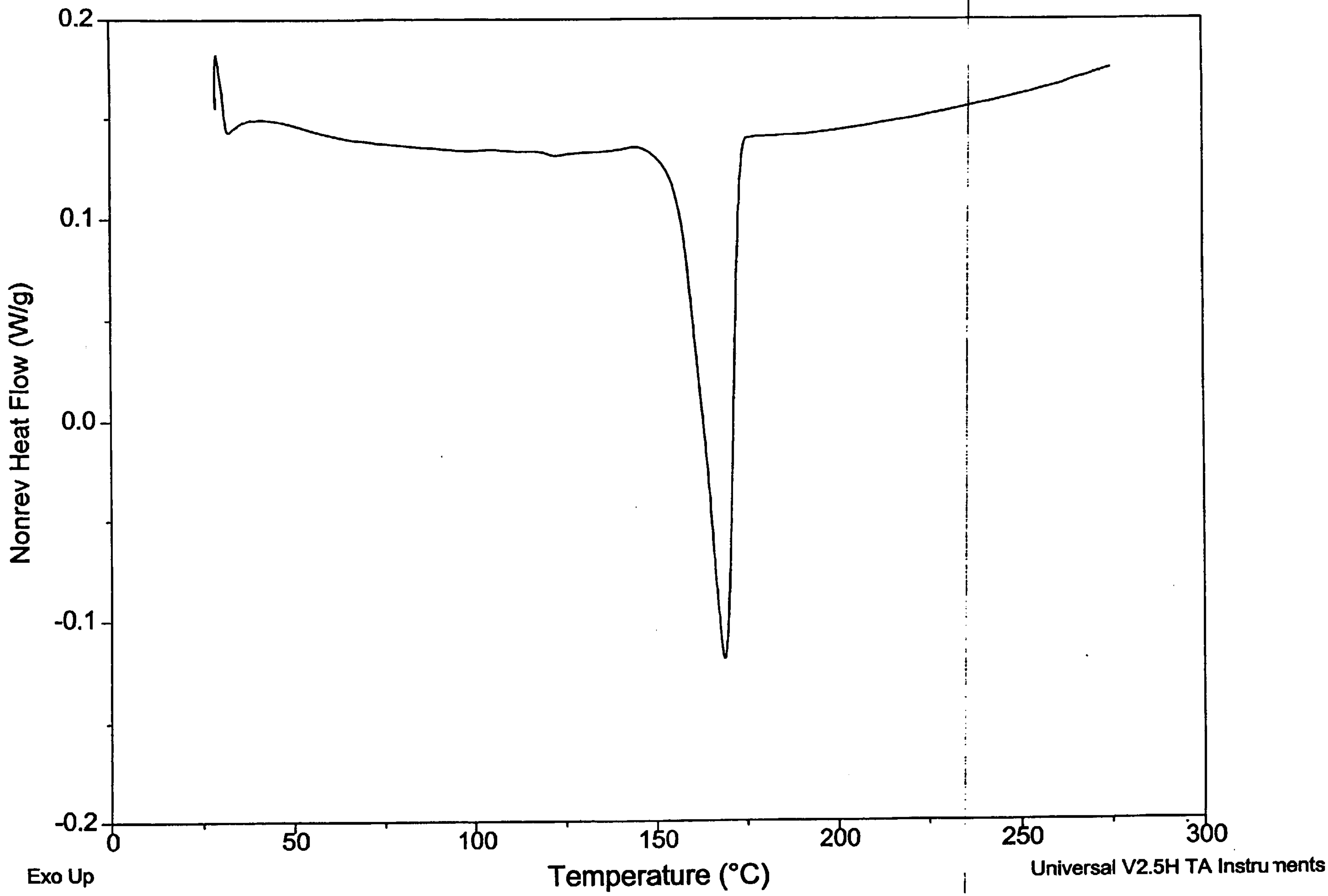


Universal V2.5H TA Instruments

Sample: Door Panel Gray Plastic
Size: 5.4000 mg
Method: MDSC Method
Comment: Honda Civic

DSC

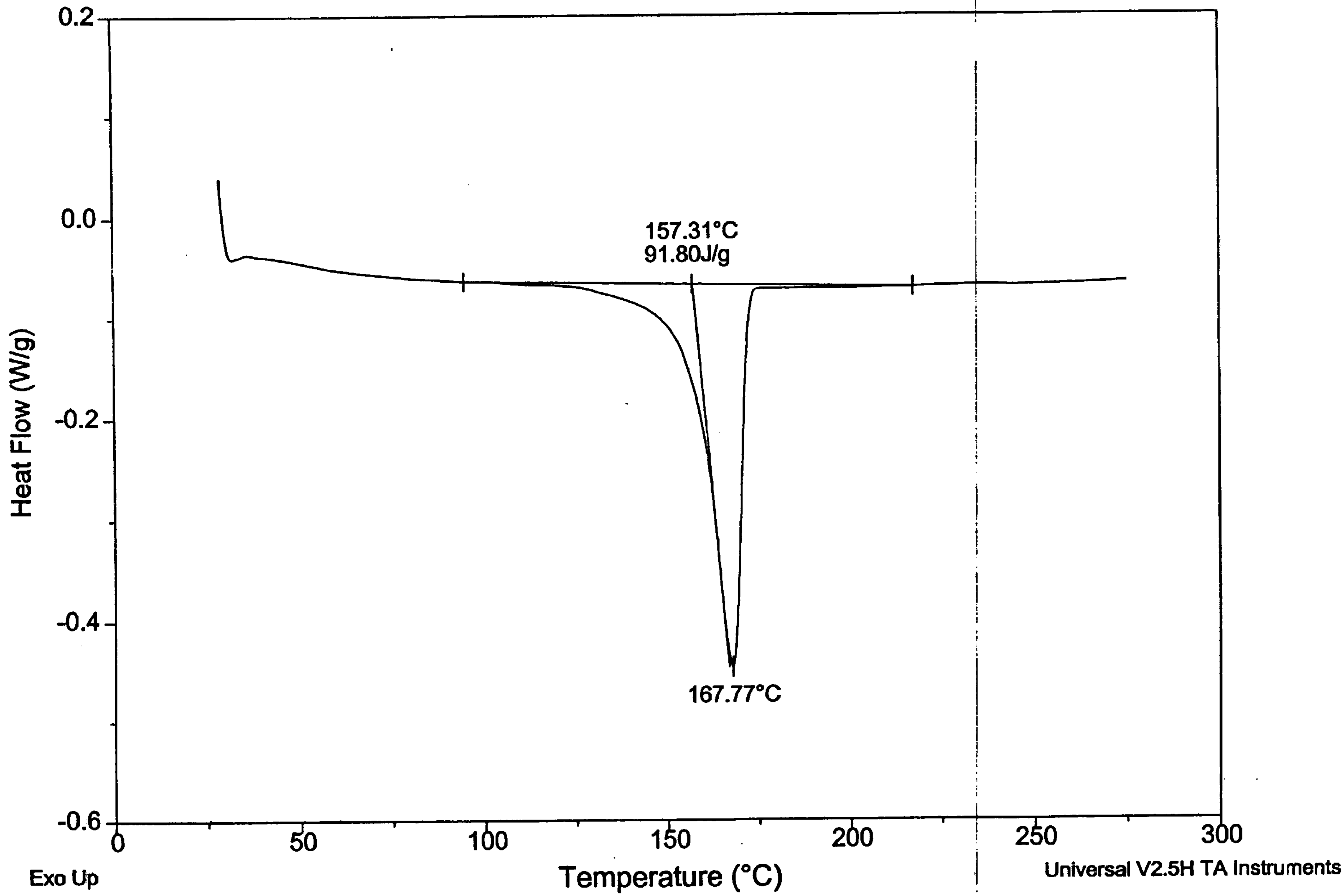
File: C:...\DSC\03614-103.036
Operator: WJM
Run Date: 4-Jun-01 13:19



Sample: Door Panel Gray Plastic (run 2)
Size: 4.9600 mg
Method: MDSC Method
Comment: Honda Civic

DSC

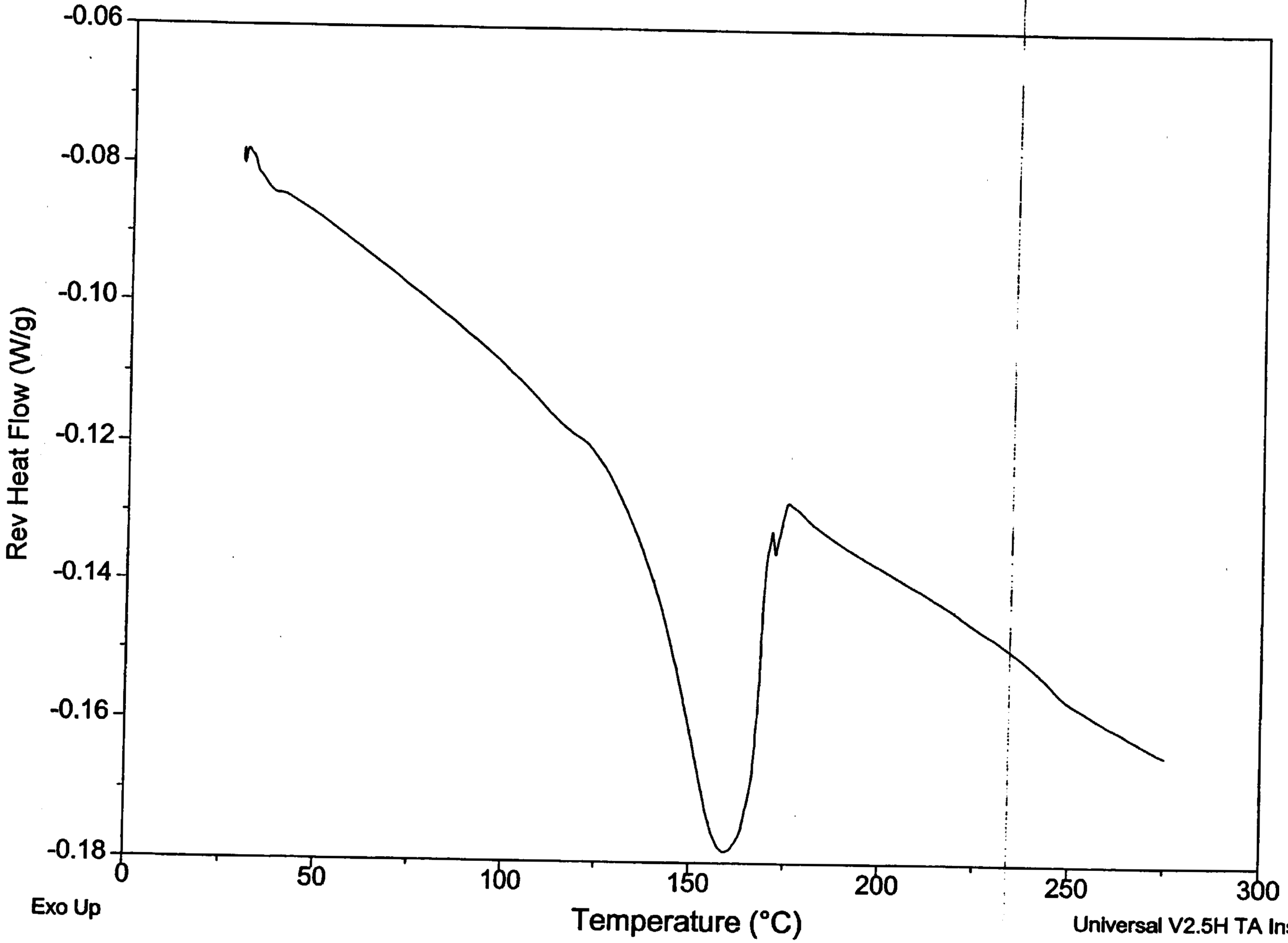
File: C:...\DSC\03614-103.037
Operator: WJM
Run Date: 4-Jun-01 15:59



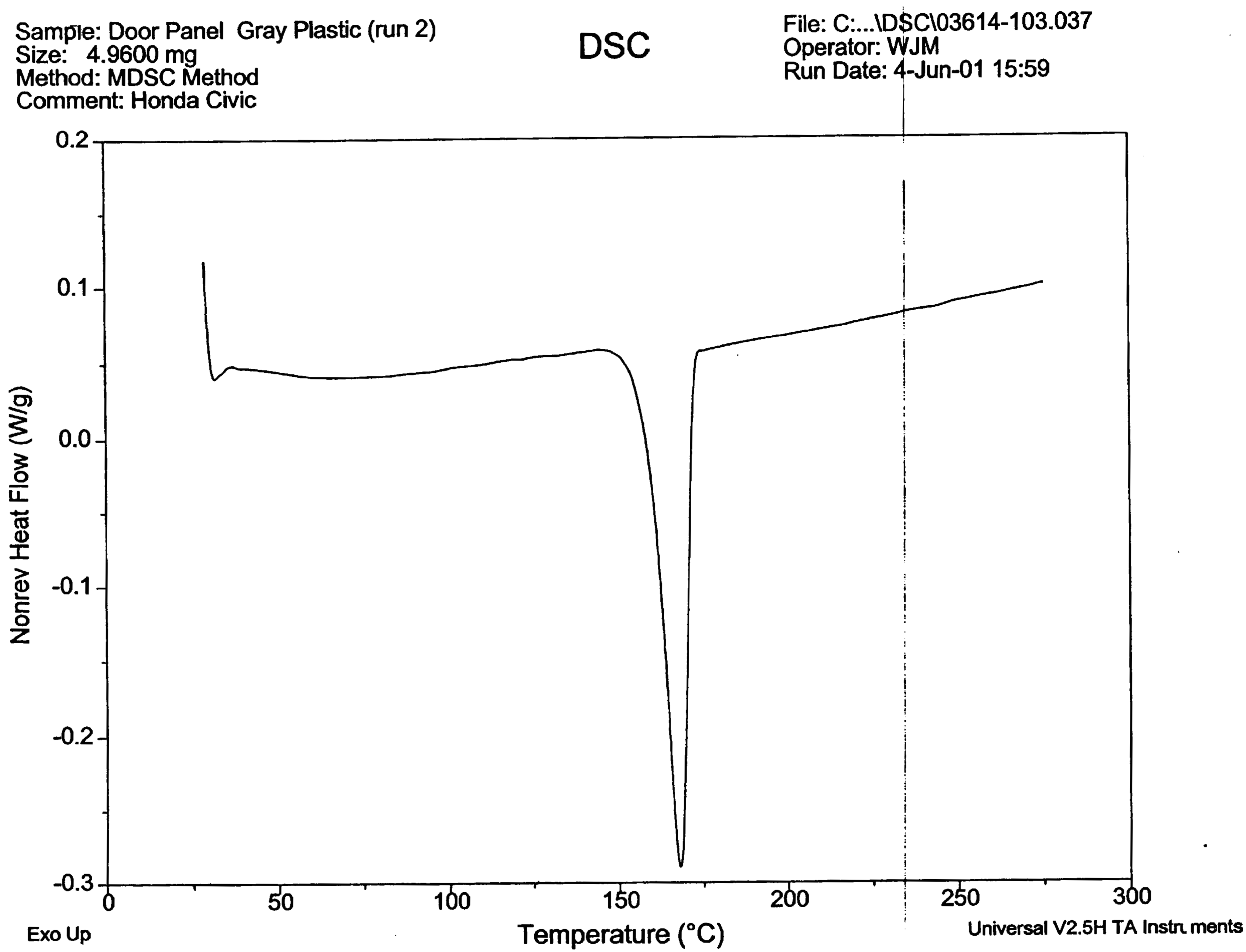
Sample: Door Panel Gray Plastic (run 2)
Size: 4.9600 mg
Method: MDSC Method
Comment: Honda Civic

DSC

File: C:...\DSC\03614-103.037
Operator: WJM
Run Date: 4-Jun-01 15:59



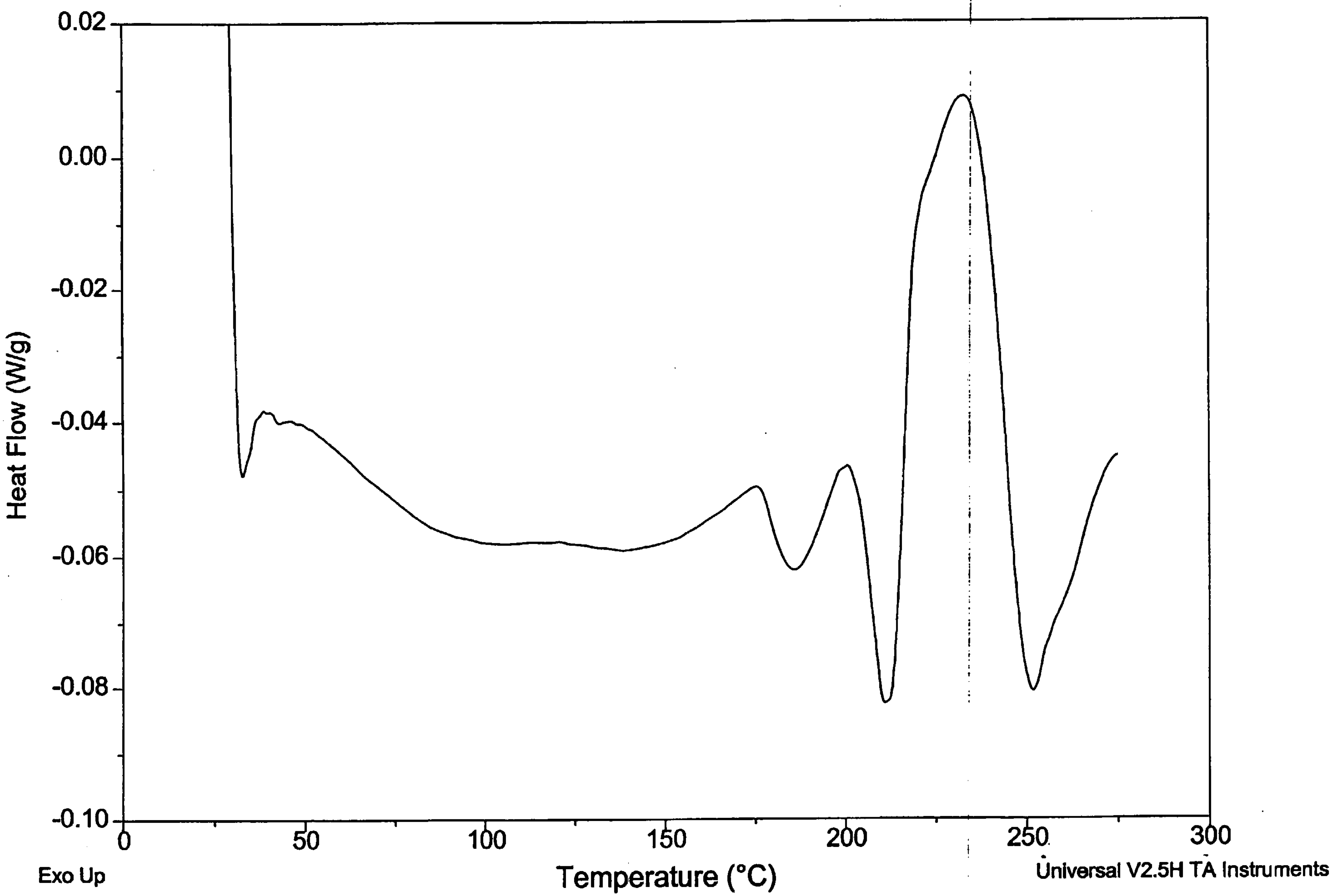
Universal V2.5H TA Instrıments


Sample: Door Panel Gray Plastic (run 2)
Size: 4.9600 mg
Method: MDSC Method
Comment: Honda Civic
DSC
File: C:...\DSC\03614-103.037
Operator: WJM
Run Date: 4-Jun-01 15:59
0.2
0.1
0.0
-0.1
-0.2
-0.3
Nonrev Heat Flow (W/g)
0
50
100
150
200
250
300
Exo Up
Temperature (°C)
Universal V2.5H TA Instruments

Sample: Seat Back Cover - foam part
Size: 7.4400 mg
Method: MDSC Method
Comment: Honda Civic seat back cover; green foam part

DSC

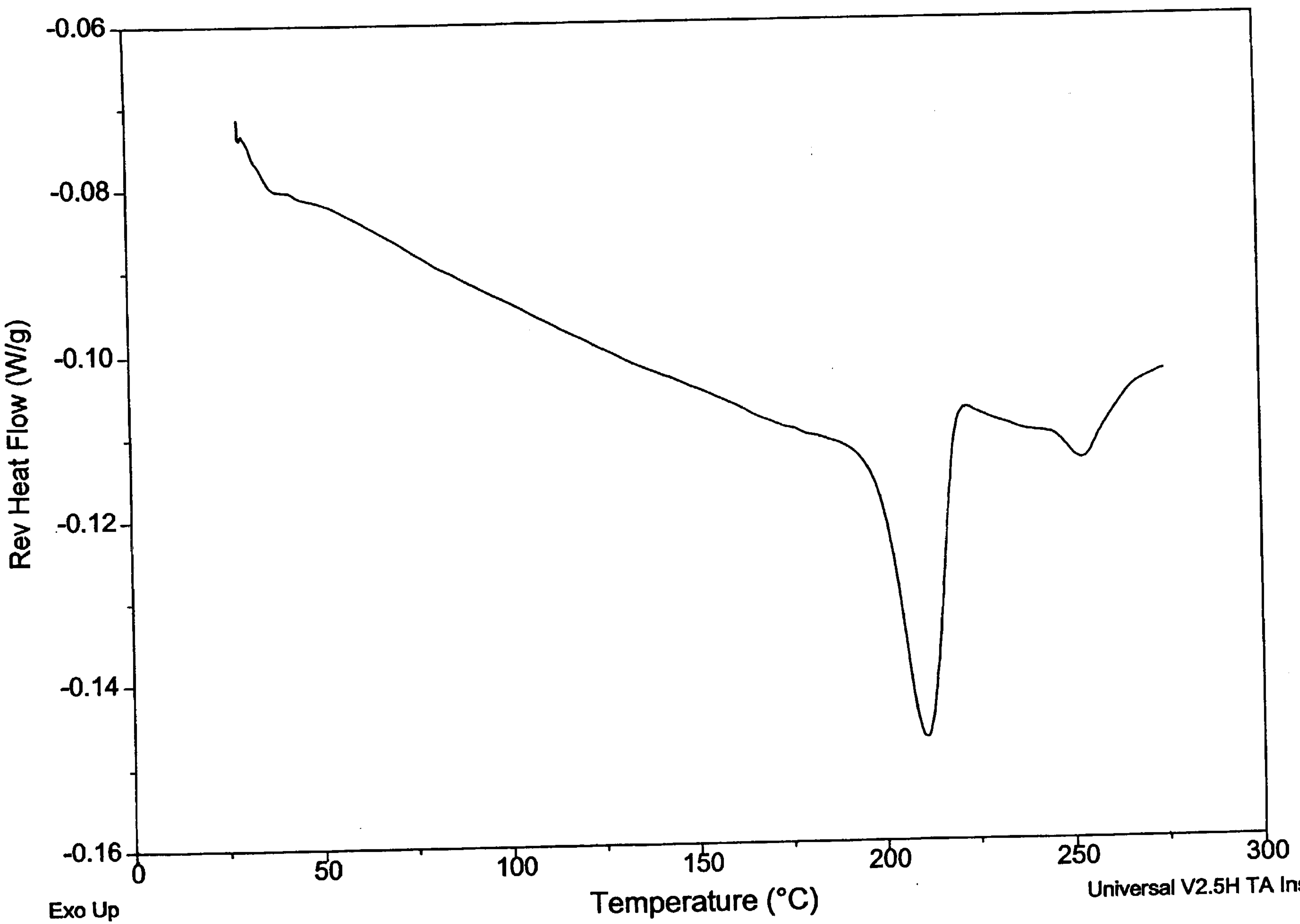
File: C:...\DSC\03614-103.038
Operator: WJM
Run Date: 5-Jun-01 08:08



Sample: Seat Back Cover - foam part
Size: 7.4400 mg
Method: MDSC Method
Comment: Honda Civic seat back cover; green foam part

DSC

File: C:...\DSC\03614-103.038
Operator: WJM
Run Date: 5-Jun-01 08:08

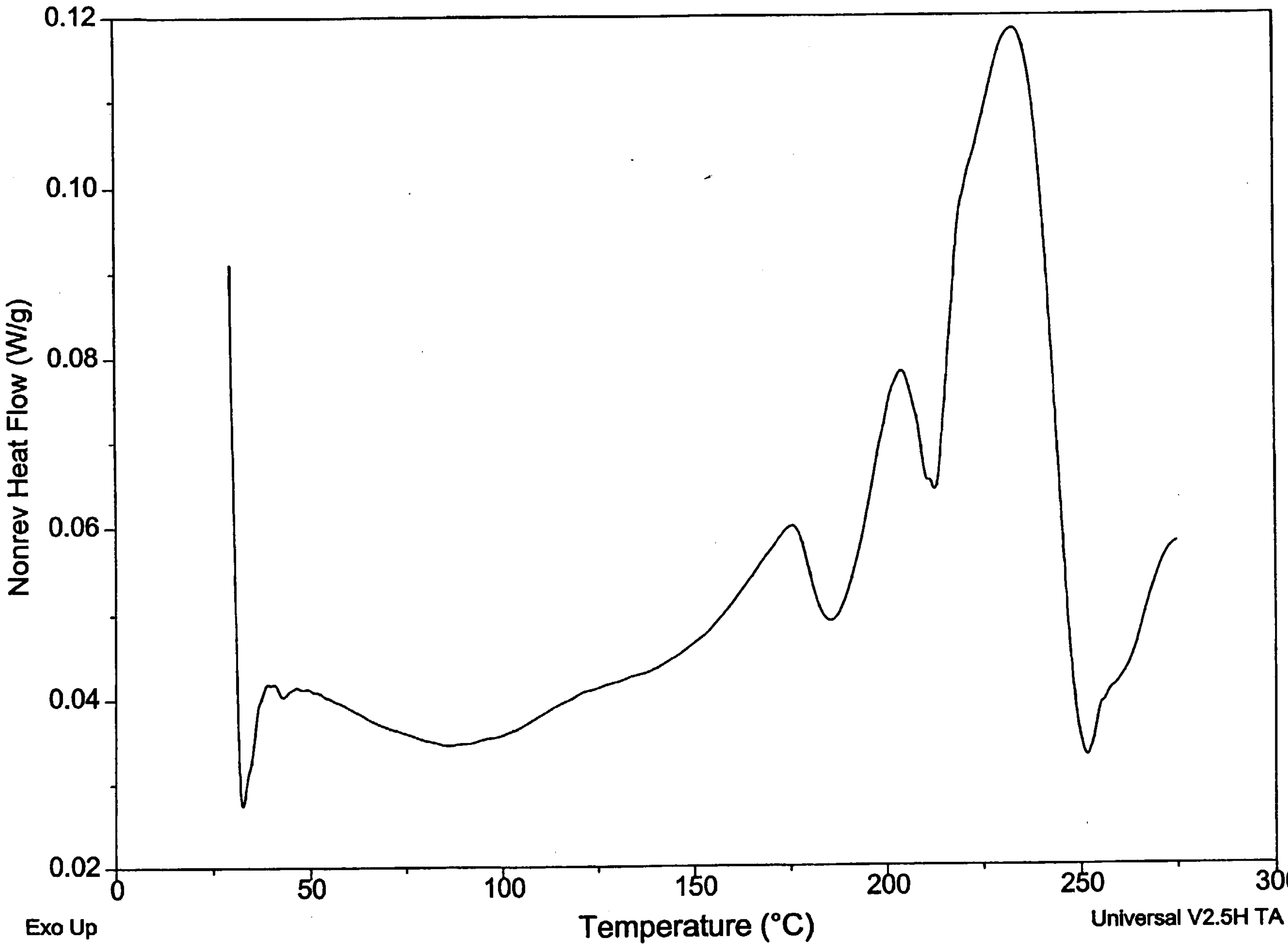


Universal V2.5H TA Instruments

Sample: Seat Back Cover - foam part
Size: 7.4400 mg
Method: MDSC Method
Comment: Honda Civic seat back cover; green foam part

DSC

File: C:...\DSC\03614-103.038
Operator: WJM
Run Date: 5-Jun-01 08:08

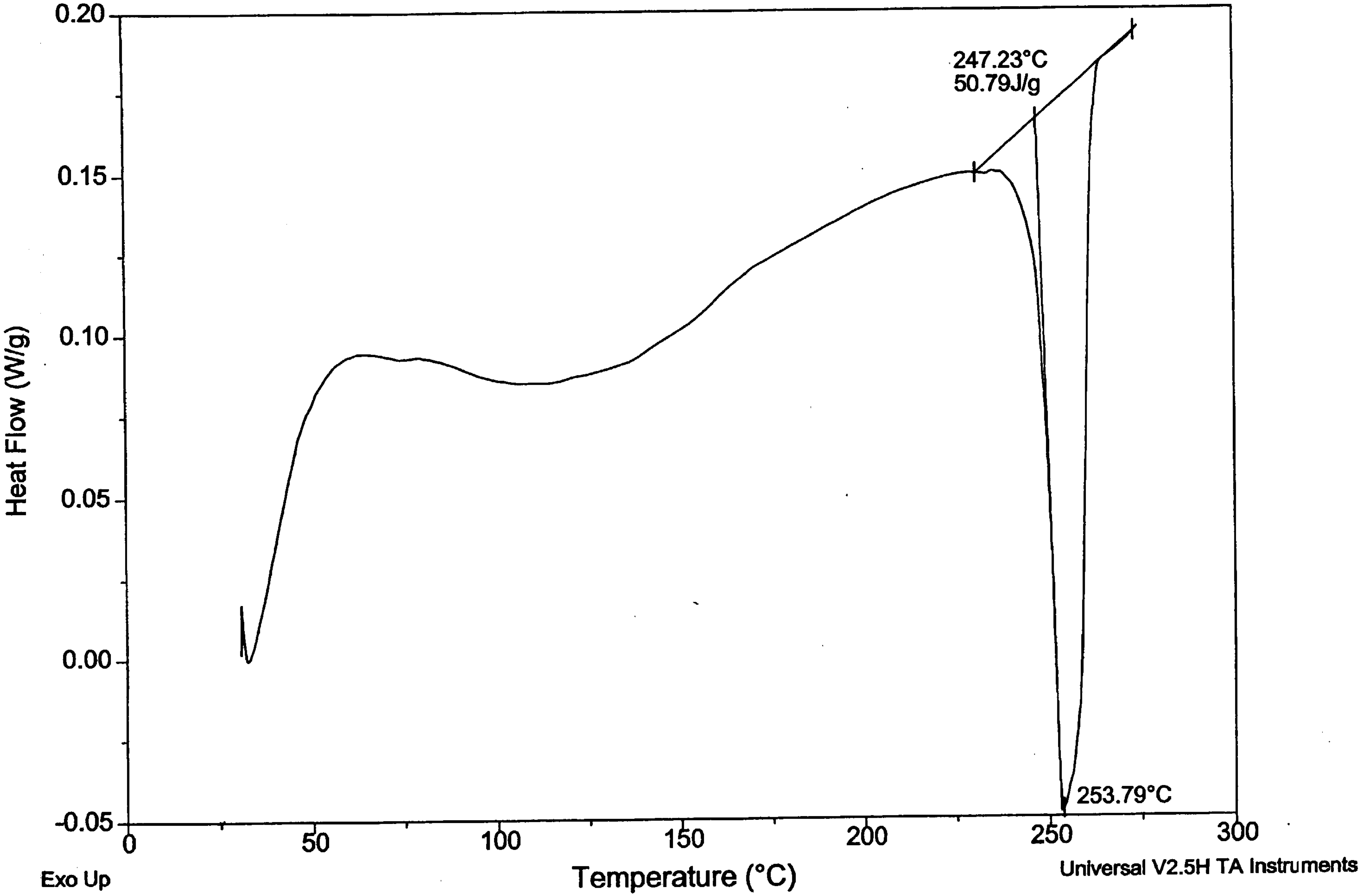


Universal V2.5H TA Instruments

Sample: Seat Back Cover - backing
Size: 2.4000 mg
Method: MDSC Method
Comment: Honda Civic: seat back cover; gray backing part

DSC

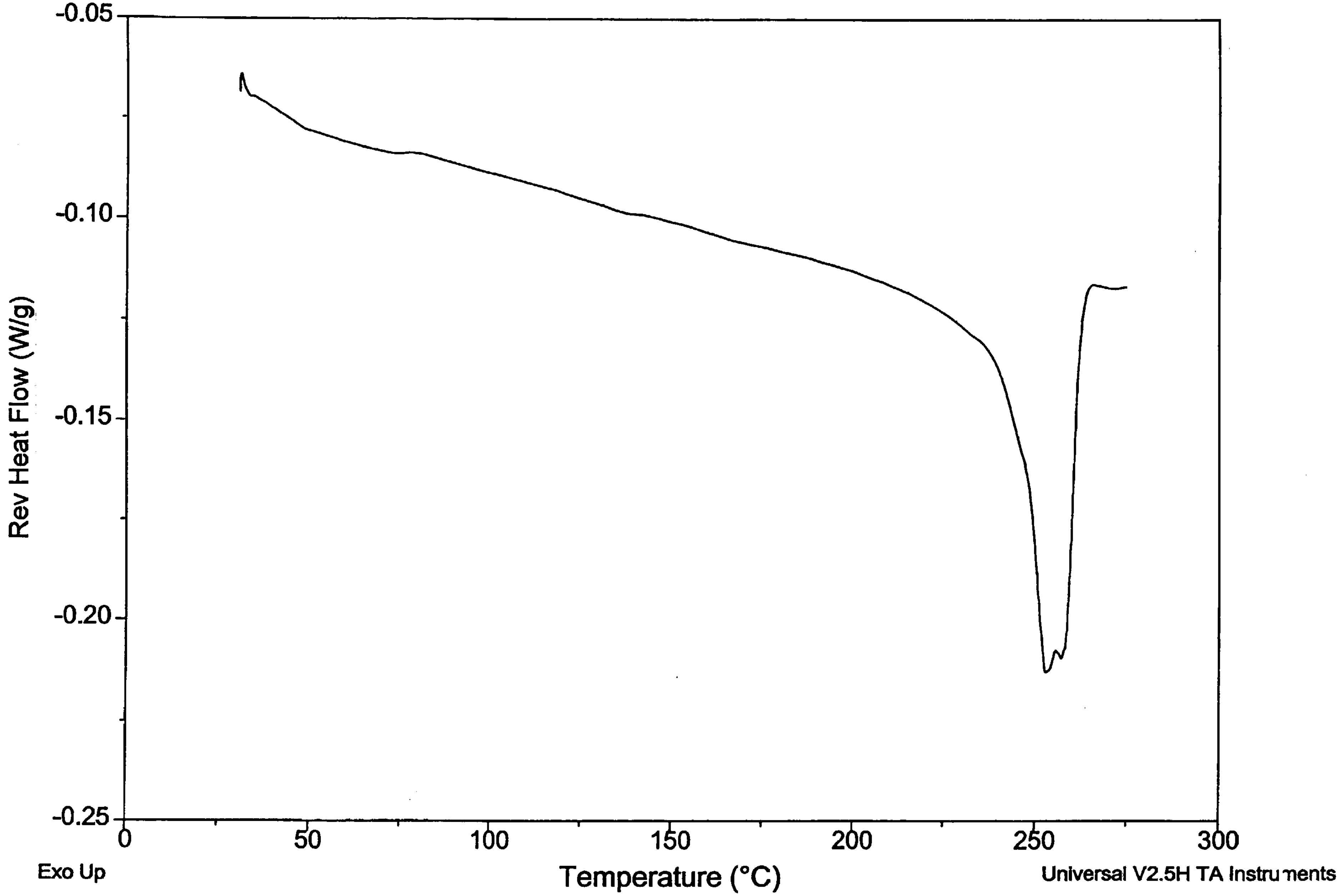
File: C:...\DSC\03614-103.039
Operator: WJM
Run Date: 5-Jun-01 12:05



Sample: Seat Back Cover - backing
Size: 2.4000 mg
Method: MDSC Method
Comment: Honda Civic: seat back cover; gray backing part

DSC

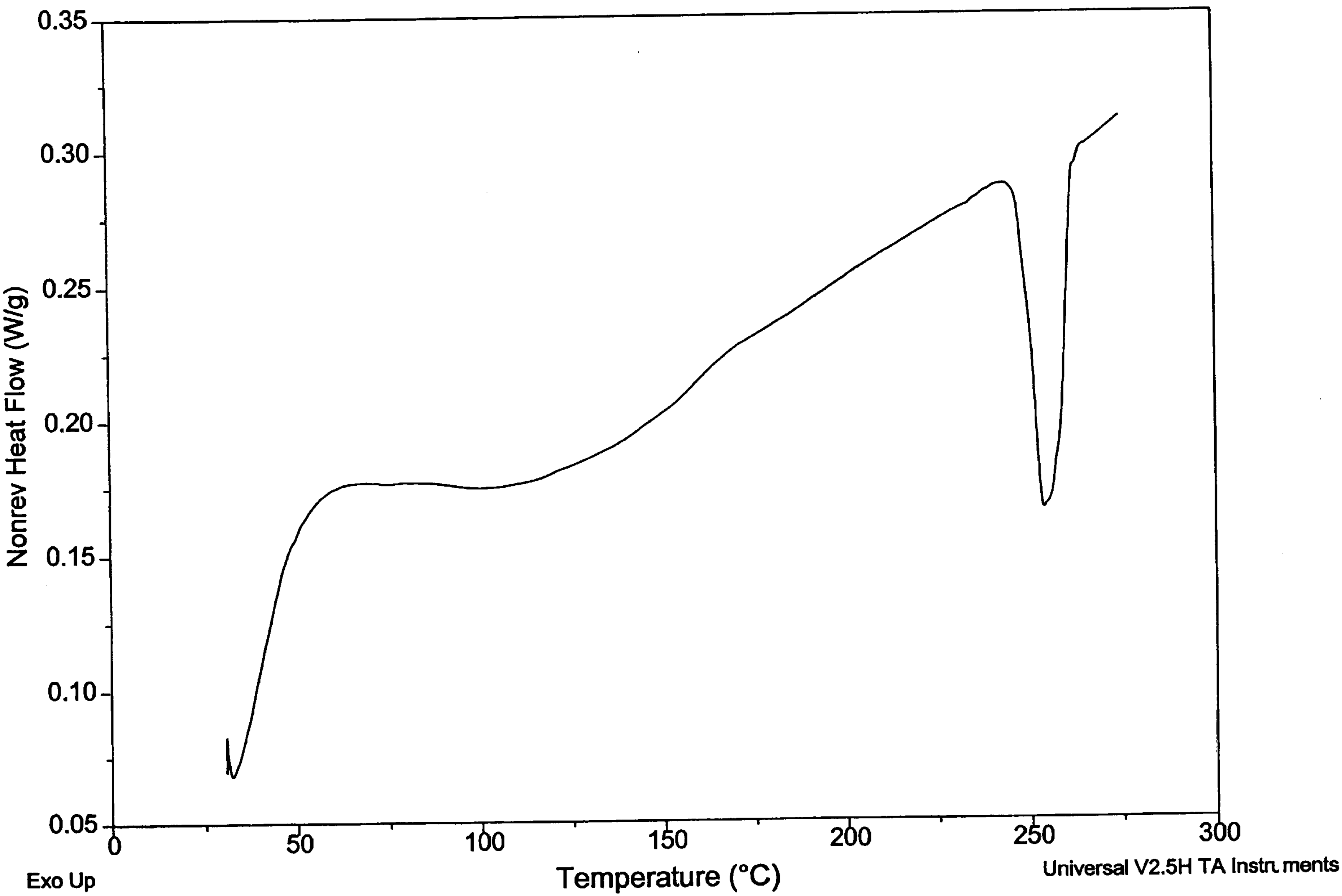
File: C:...\DSC\03614-103.039
Operator: WJM
Run Date: 5-Jun-01 12:05



Sample: Seat Back Cover - backing
Size: 2.4000 mg
Method: MDSC Method
Comment: Honda Civic: seat back cover; gray backing part

DSC

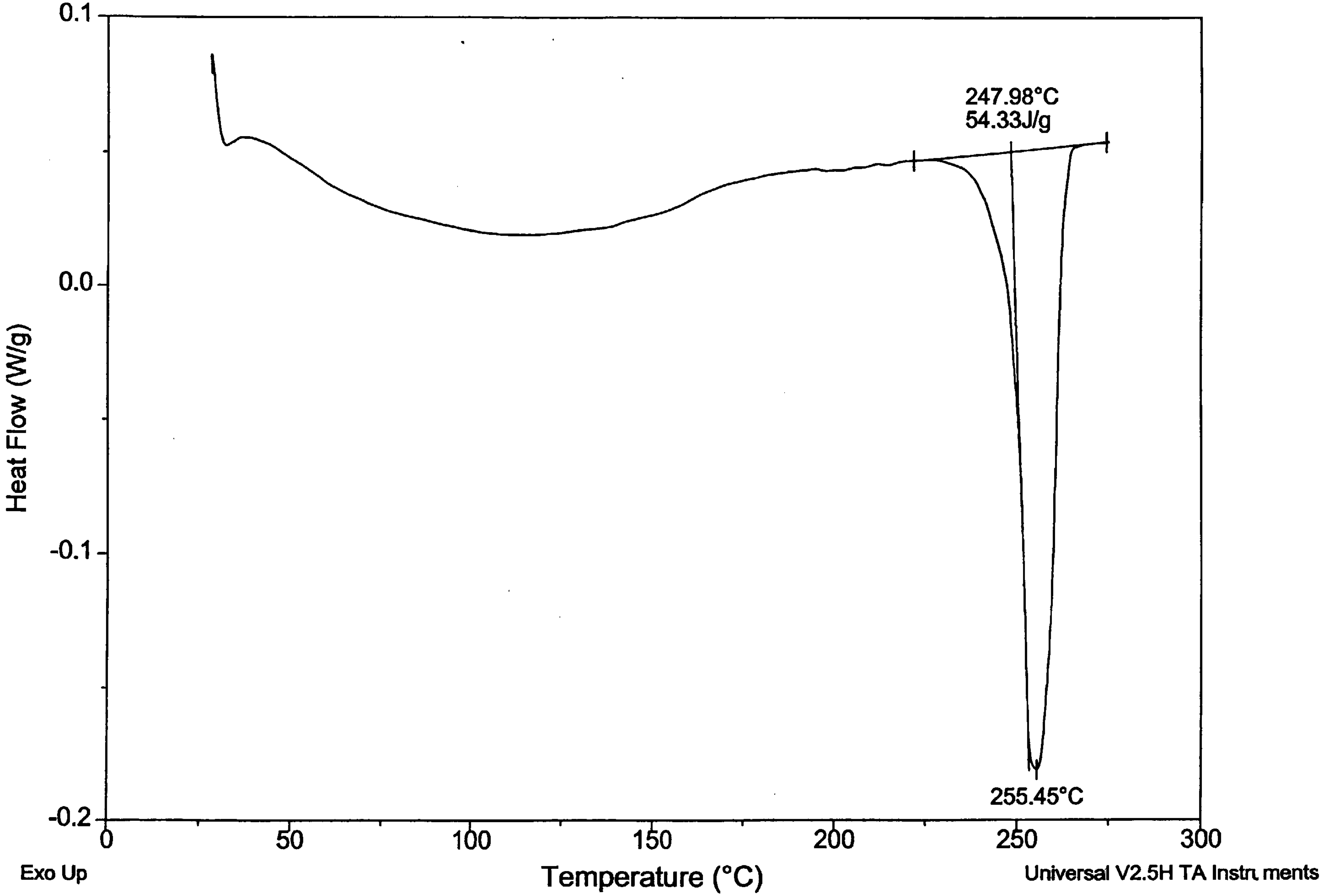
File: C:...\DSC\03614-103.039
Operator: WJM
Run Date: 5-Jun-01 12:05



Sample: Seat Back Cover - ~~foam (run 2)~~ gray back (run 2)
Size: 3.4200 mg
Method: MDSC Method
Comment: Honda Civic: seat back cover; ~~green foam~~ gray back part

DSC

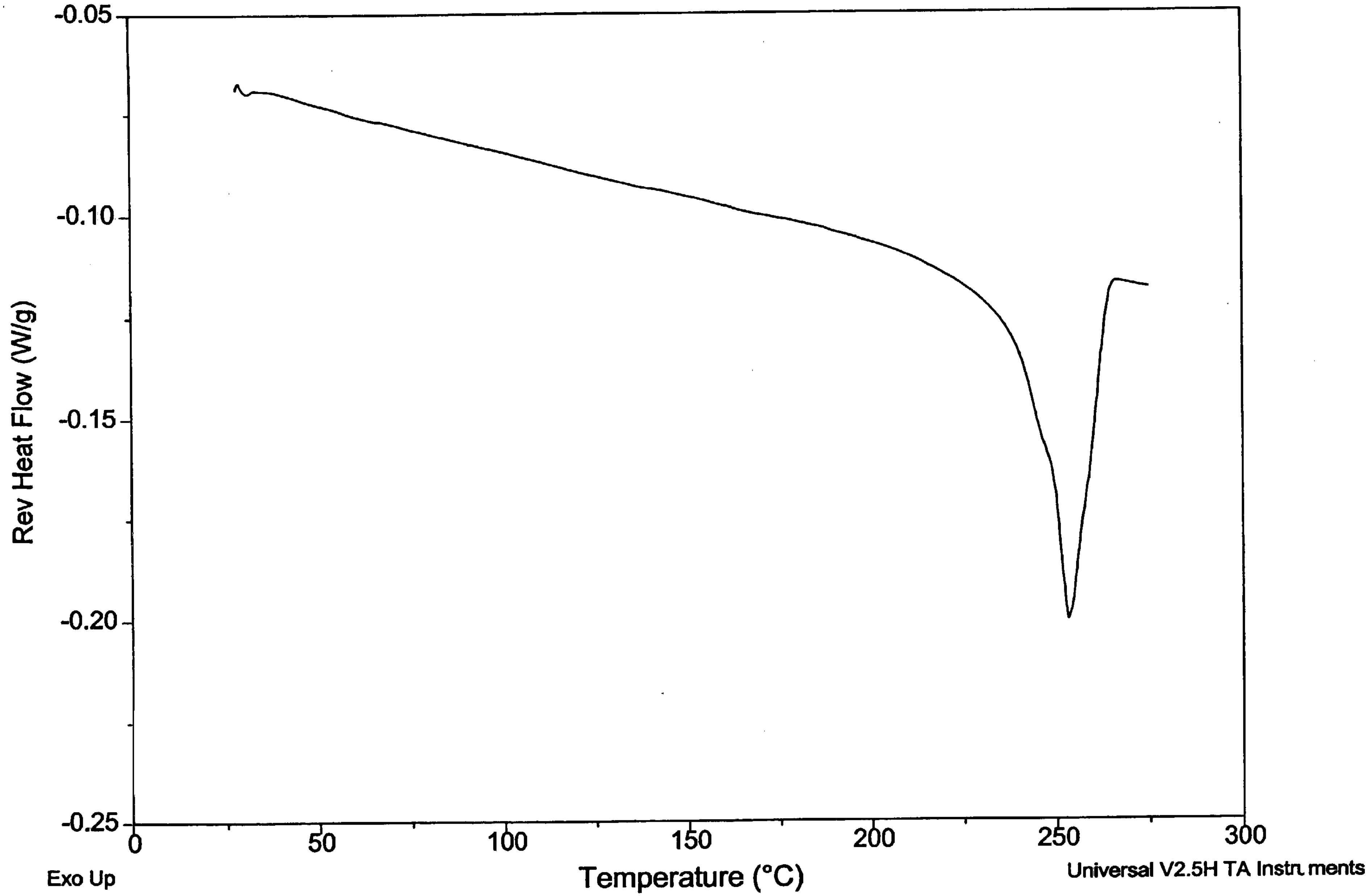
File: C:...\DSC\03614-103.040
Operator: WJM
Run Date: 5-Jun-01 14:10



Sample: Seat Back Cover ~~foam (run 2)~~ gray back (run 2)
Size: 3.4200 mg
Method: MDSC Method
Comment: Honda Civic: seat back cover; ~~green foam~~ gray back part

DSC

File: C:...\DSC\03614-103.040
Operator: WJM
Run Date: 5-Jun-01 14:10

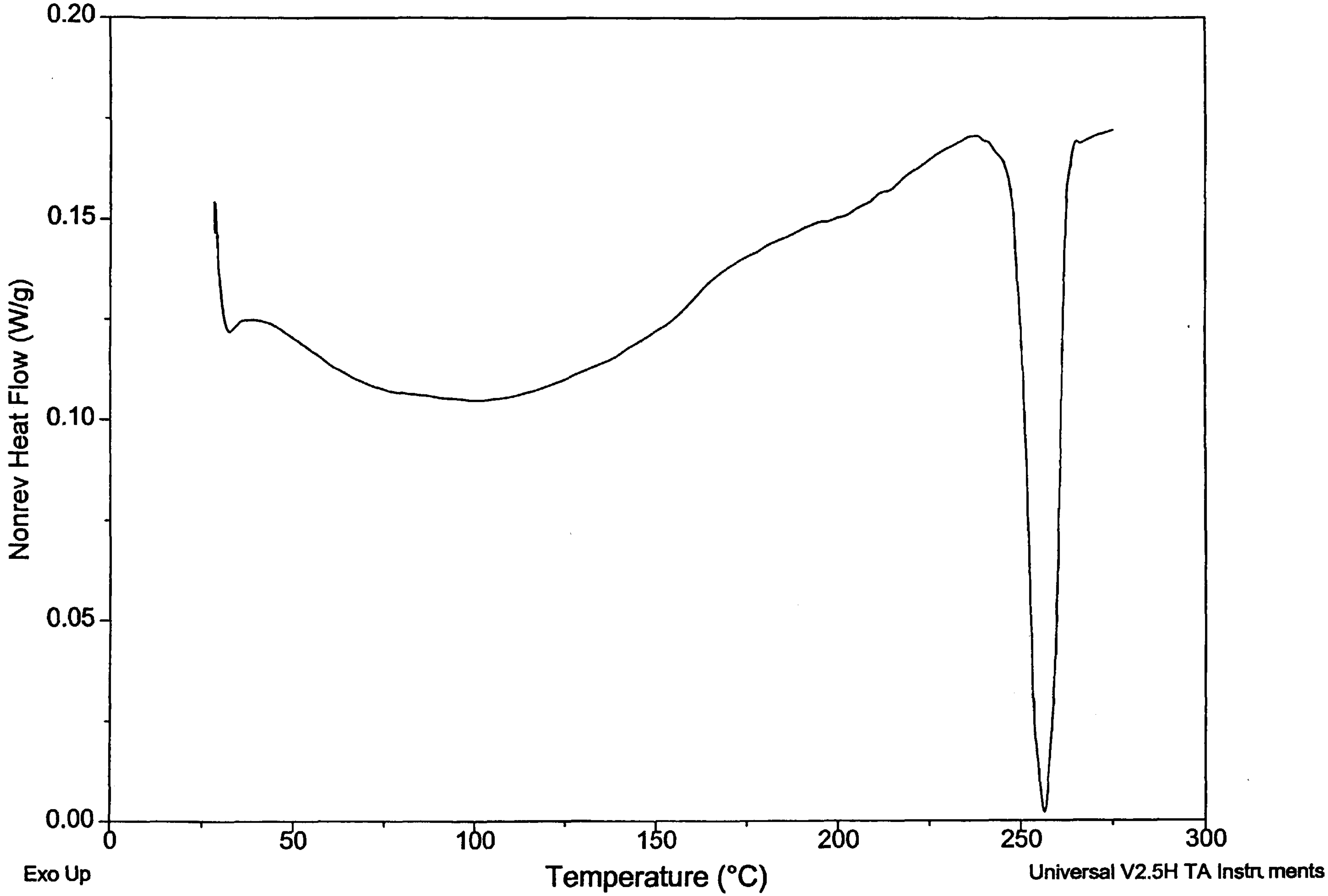


gray back (run 2)

Sample: Seat Back Cover ~~foam (run 2)~~
Size: 3.4200 mg
Method: MDSC Method
Comment: Honda Civic: seat back cover; ~~green foam~~ gray back part

DSC

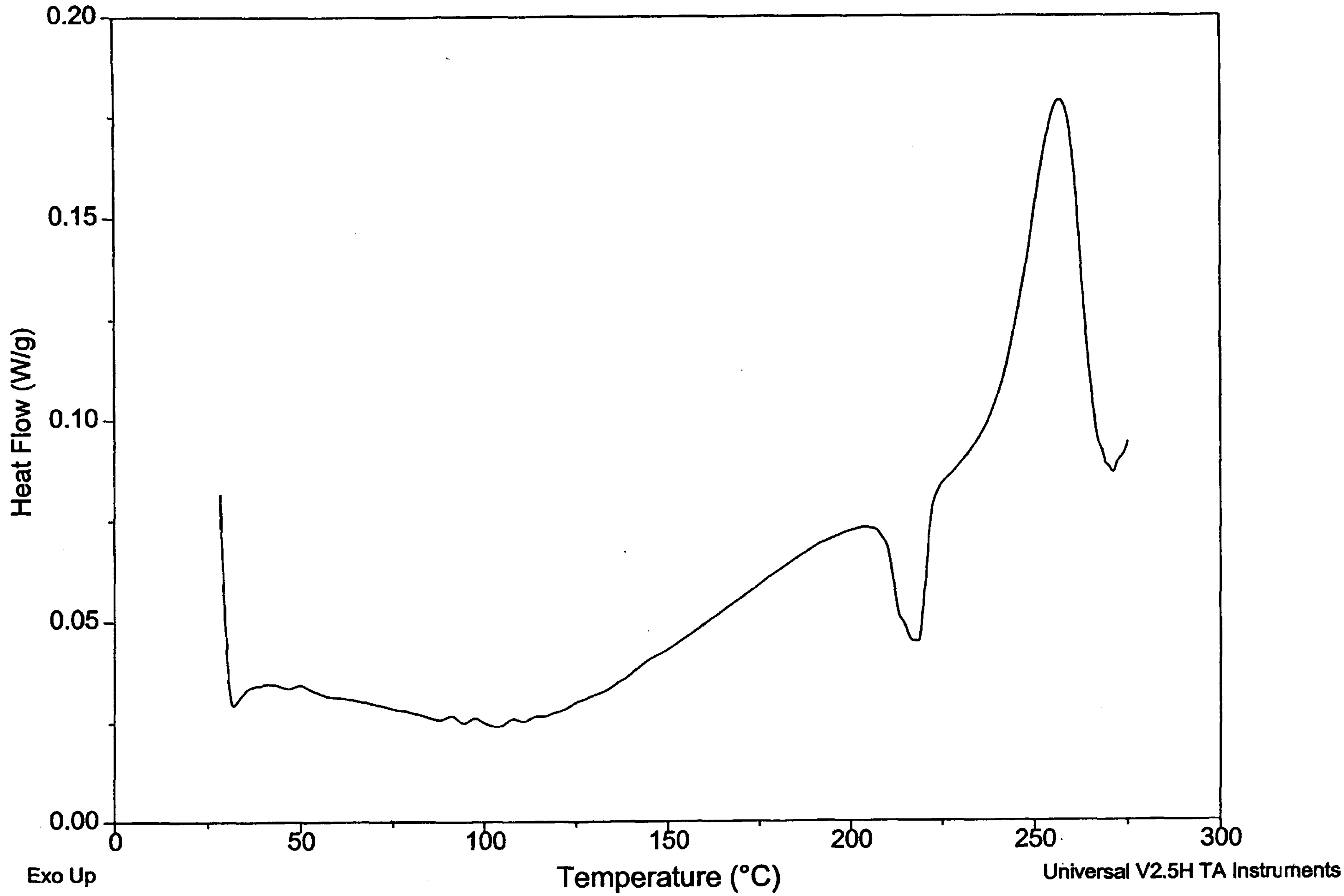
File: C:...\DSC\03614-103.040
Operator: WJM
Run Date: 5-Jun-01 14:10



Sample: Seat Back Cover - foam (run 2)
Size: 2.9400 mg
Method: MDSC Method
Comment: Honda Civic: seat back cover; green foam part

DSC

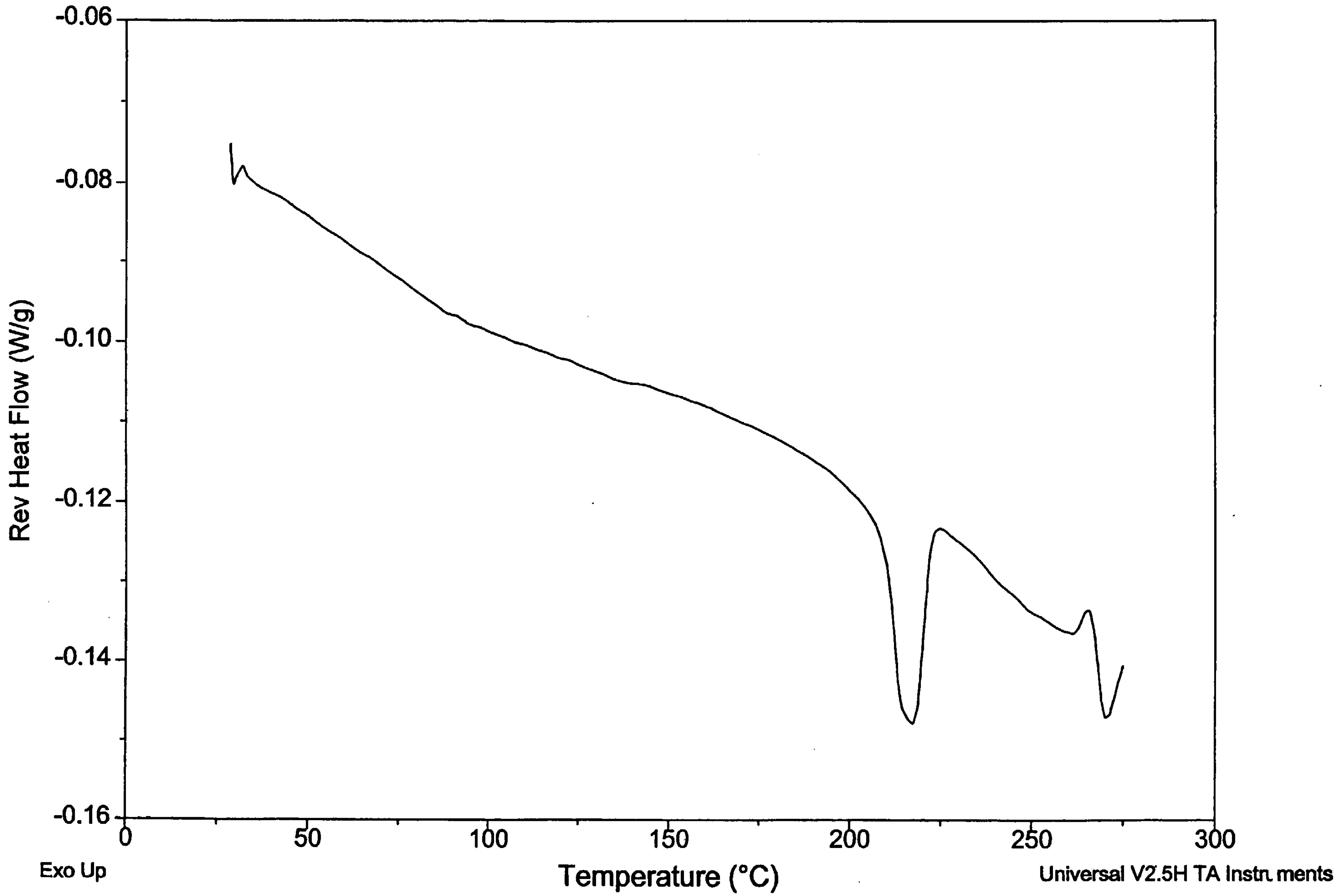
File: C:...\DSC\03614-103.041
Operator: WJM
Run Date: 5-Jun-01 16:14



Sample: Seat Back Cover - foam (run 2)
Size: 2.9400 mg
Method: MDSC Method
Comment: Honda Civic: seat back cover; green foam part

DSC

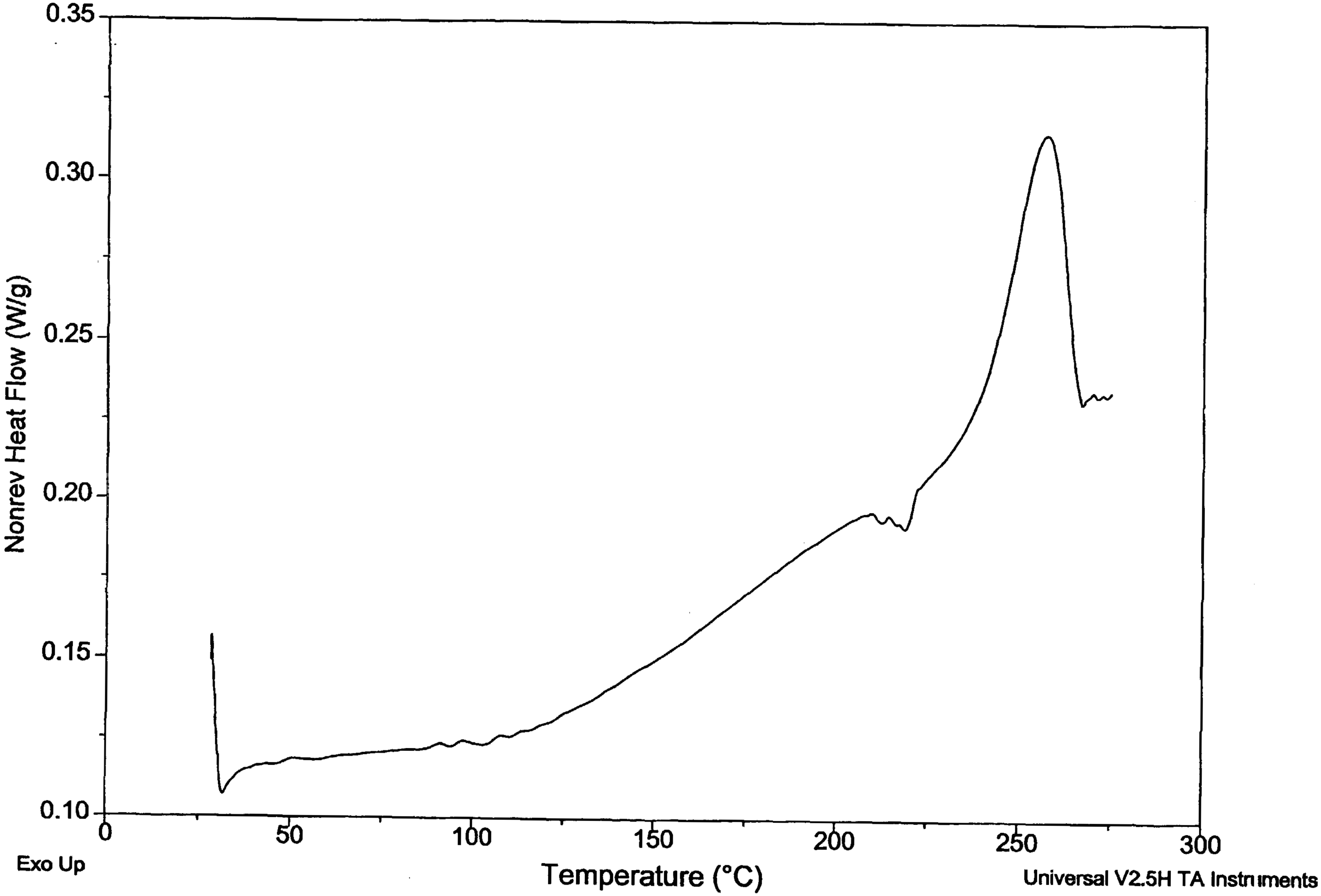
File: C:...\DSC\03614-103.041
Operator: WJM
Run Date: 5-Jun-01 16:14



Sample: Seat Back Cover - foam (run 2)
Size: 2.9400 mg
Method: MDSC Method
Comment: Honda Civic: seat back cover; green foam part

DSC

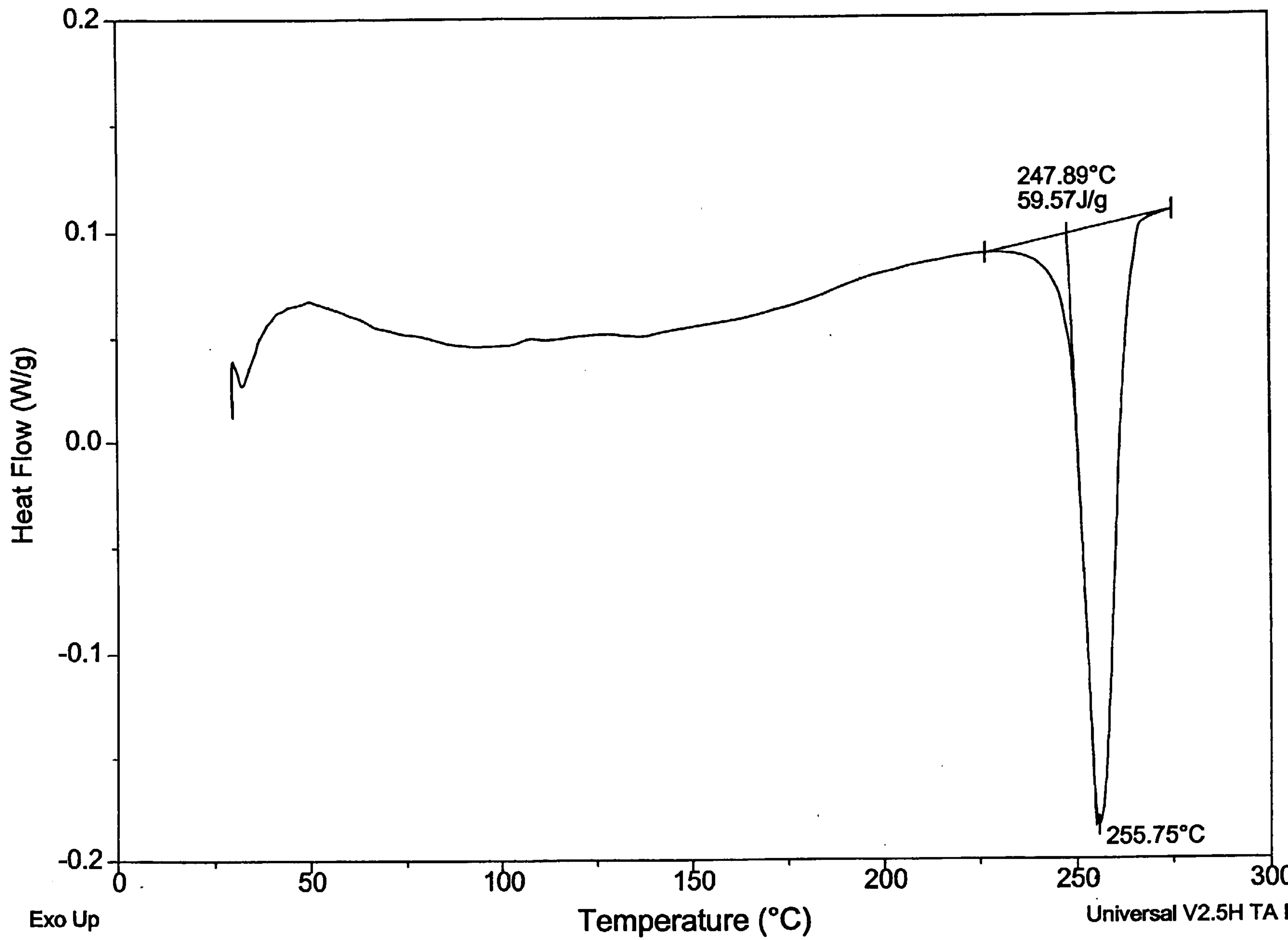
File: C:...\DSC\03614-103.041
Operator: WJM
Run Date: 5-Jun-01 16:14



Sample: Door Panel - Fabric
Size: 3.4500 mg
Method: MDSC Method
Comment: Honda Civic: door panel fabric

DSC

File: C:...\DSC\03614-103.042
Operator: WJM
Run Date: 6-Jun-01 08:20

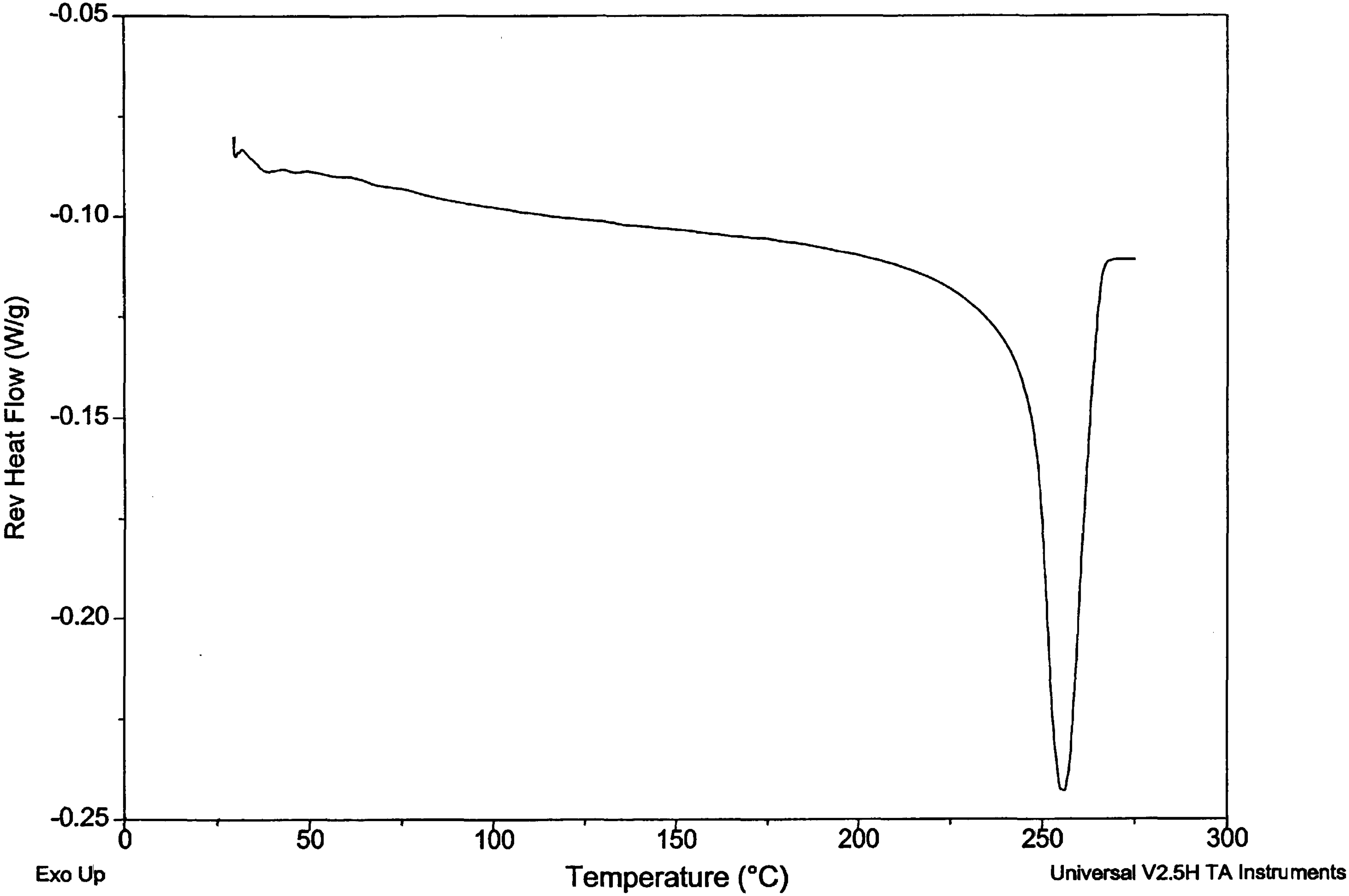


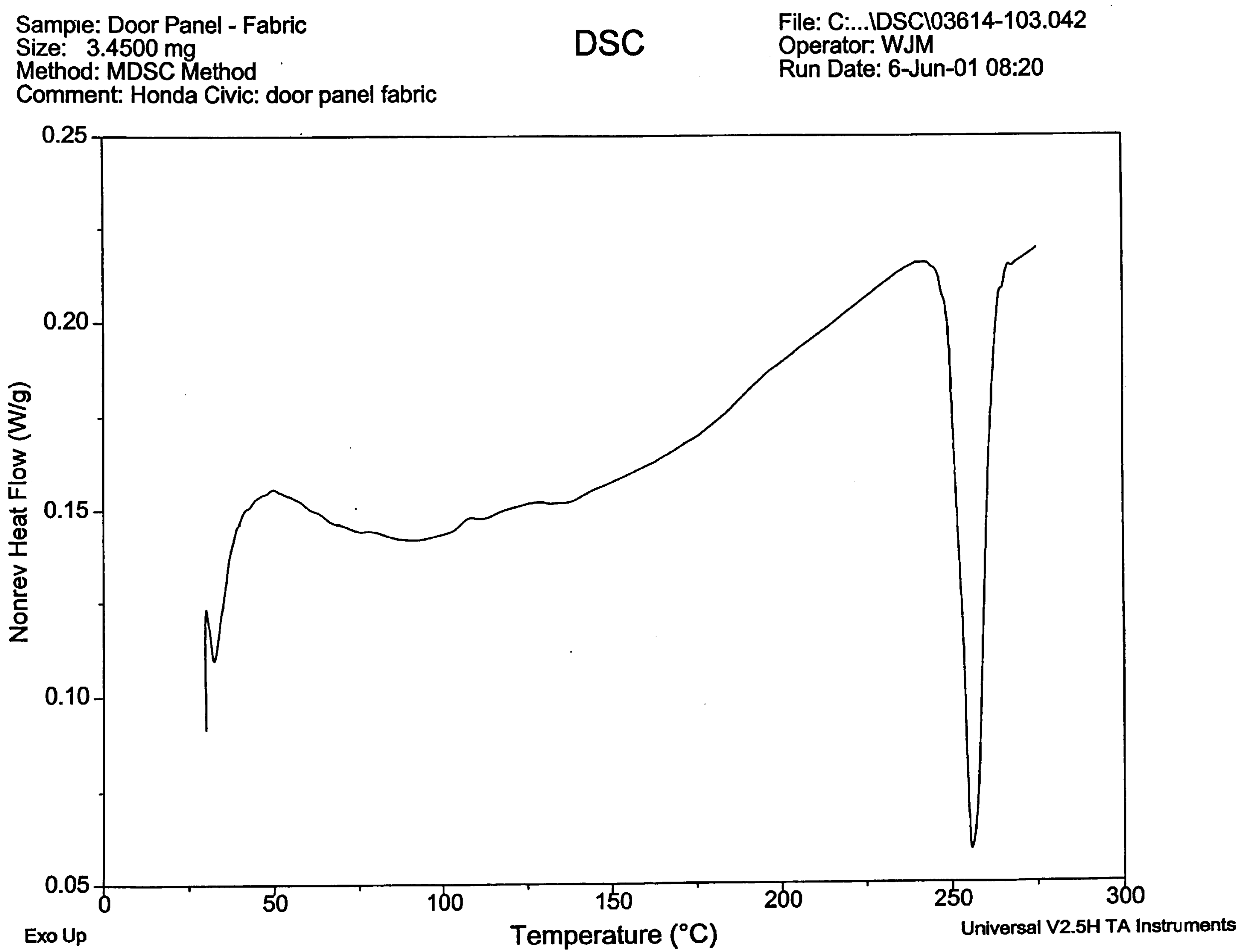
Universal V2.5H TA Instruments

Sample: Door Panel - Fabric
Size: 3.4500 mg
Method: MDSC Method
Comment: Honda Civic: door panel fabric

DSC

File: C:...\DSC\03614-103.042
Operator: WJM
Run Date: 6-Jun-01 08:20

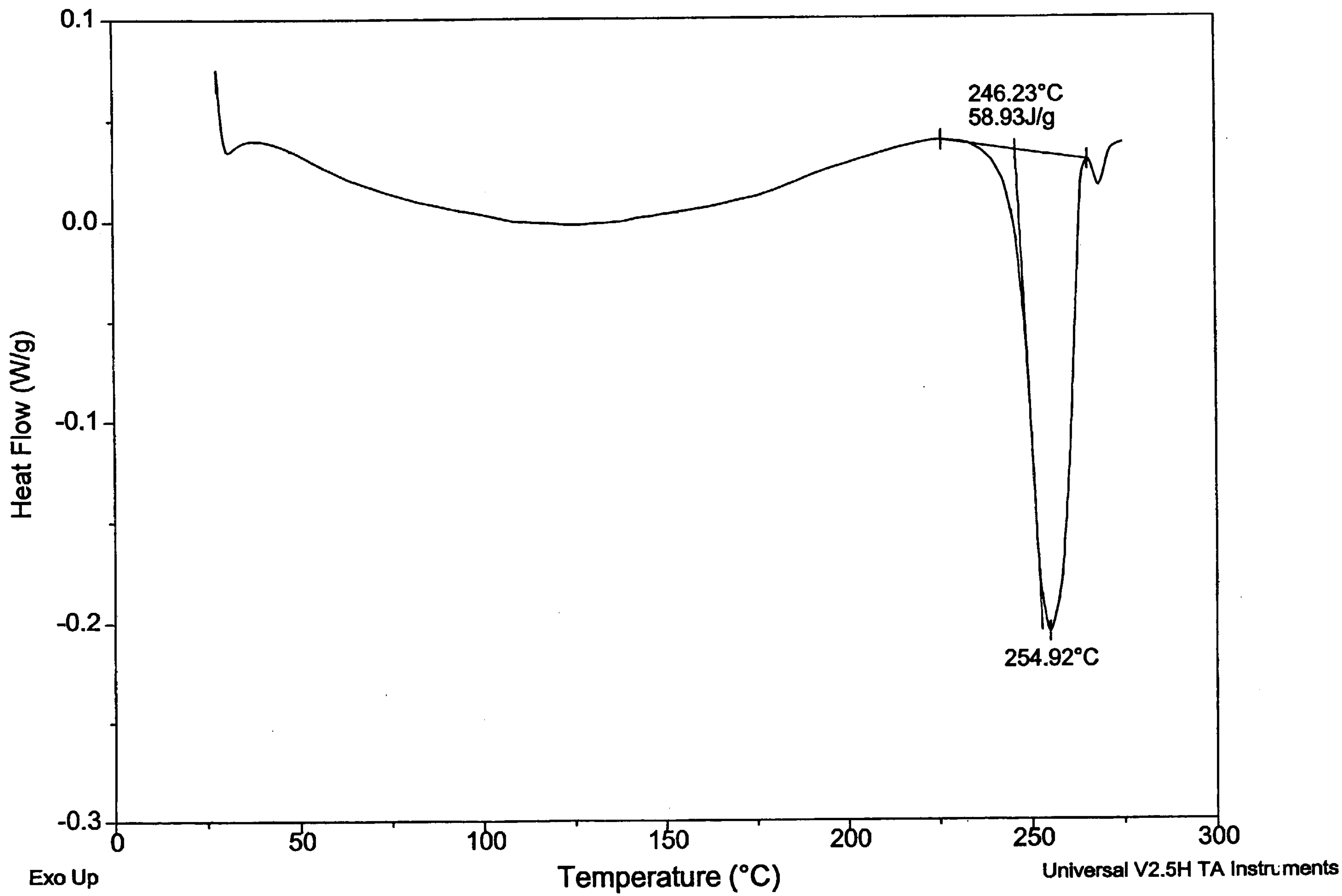



Sampie: Door Panel - Fabric
Size: 3.4500 mg
Method: MDSC Method
Comment: Honda Civic: door panel fabric
DSC
File: C:...\DSC\03614-103.042
Operator: WJM
Run Date: 6-Jun-01 08:20
Nonrev Heat Flow (W/g)
0.25
0.20
0.15
0.10
0.05
0
50
100
150
200
250
300
Exo Up
Temperature (°C)
Universal V2.5H TA Instruments

Sample: Door Panel - Fabric (run 2)
Size: 3.4000 mg
Method: MDSC Method
Comment: Honda Civic: door panel fabric

DSC

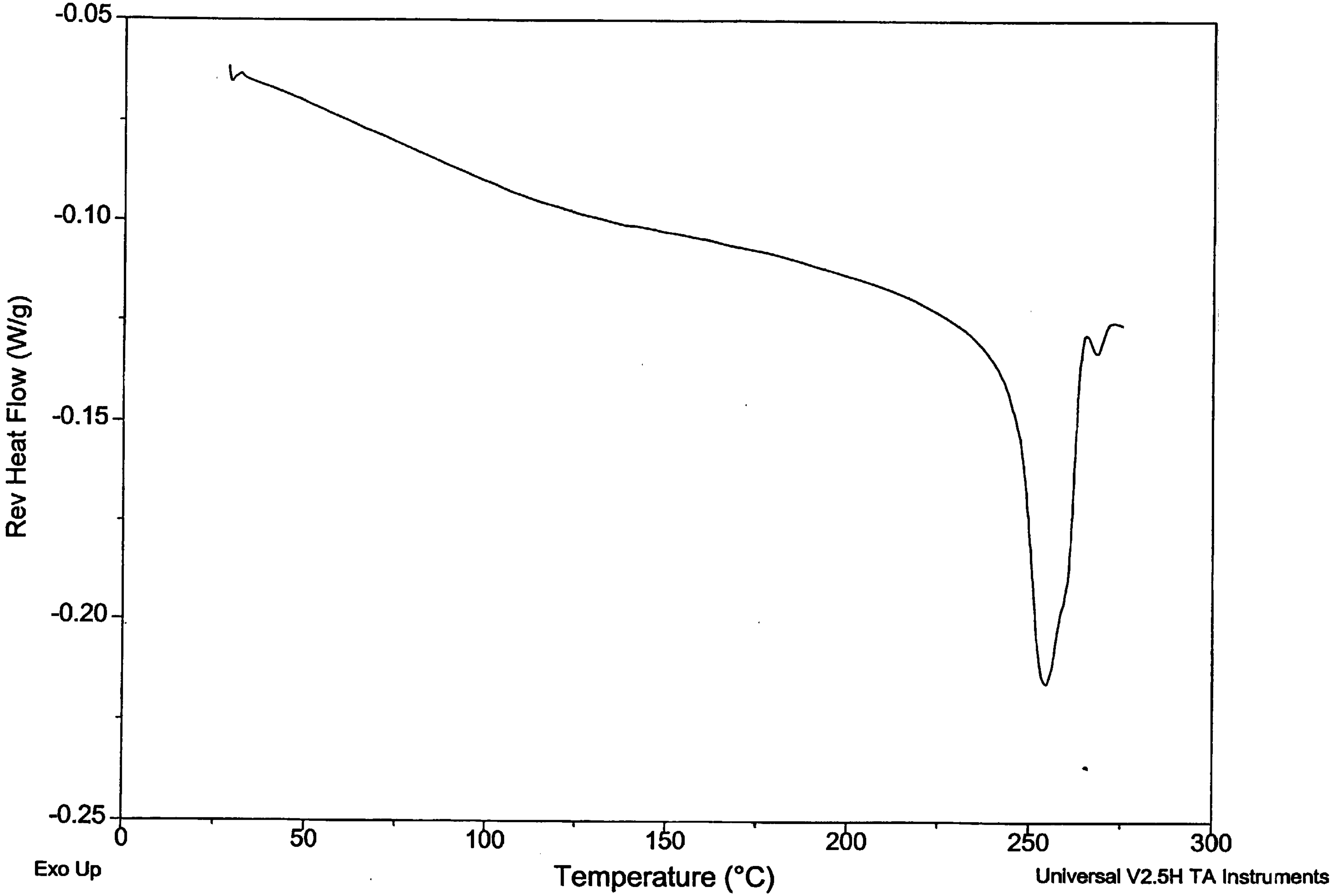
File: C:...\DSC\03614-103.043
Operator: WJM
Run Date: 6-Jun-01 10:41



Sample: Door Panel - Fabric (run 2)
Size: 3.4000 mg
Method: MDSC Method
Comment: Honda Civic: door panel fabric

DSC

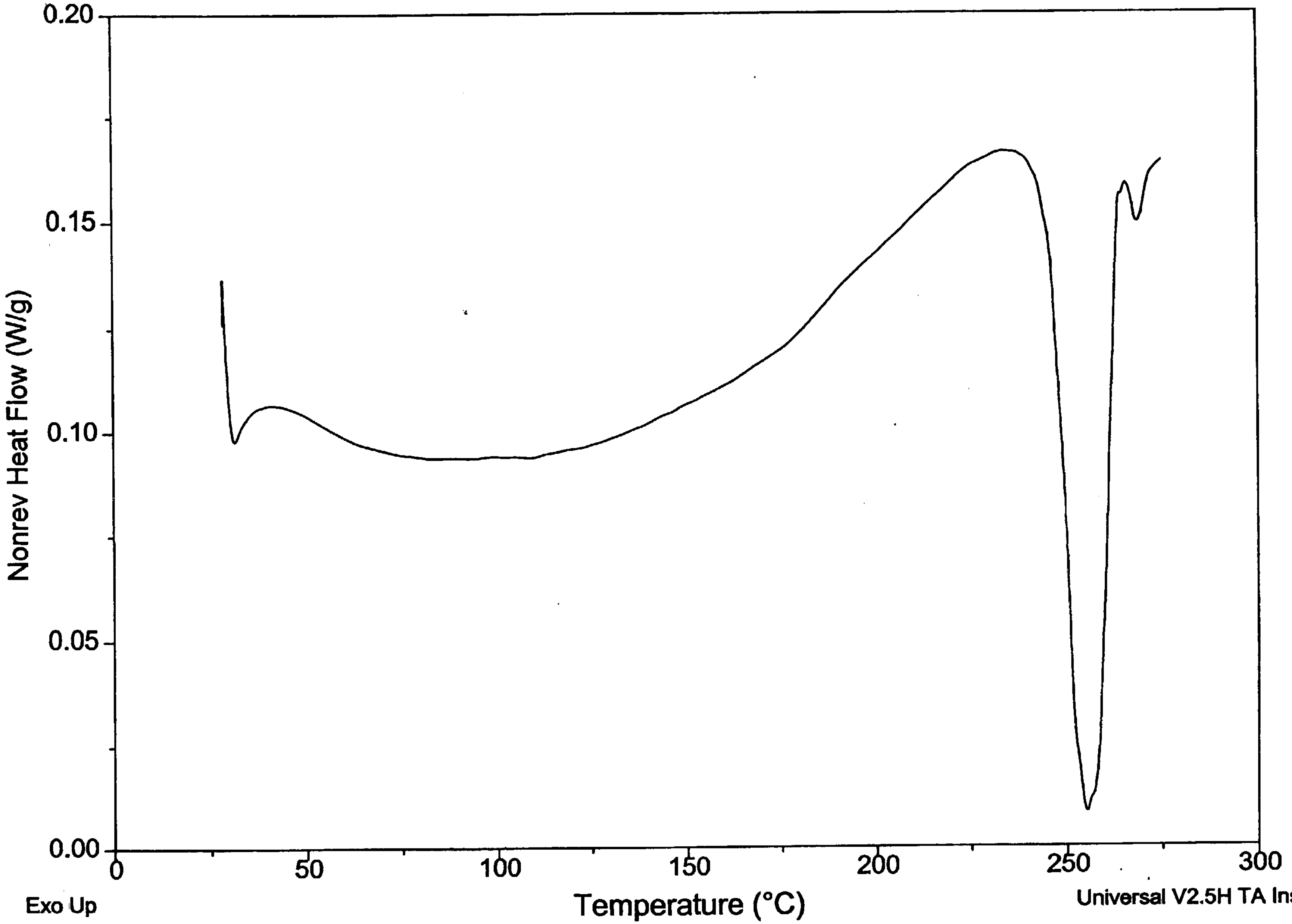
File: C:...\DSC\03614-103.043
Operator: WJM
Run Date: 6-Jun-01 10:41



Sample: Door Panel - Fabric (run 2)
Size: 3.4000 mg
Method: MDSC Method
Comment: Honda Civic: door panel fabric

DSC

File: C:...\DSC\03614-103.043
Operator: WJM
Run Date: 6-Jun-01 10:41

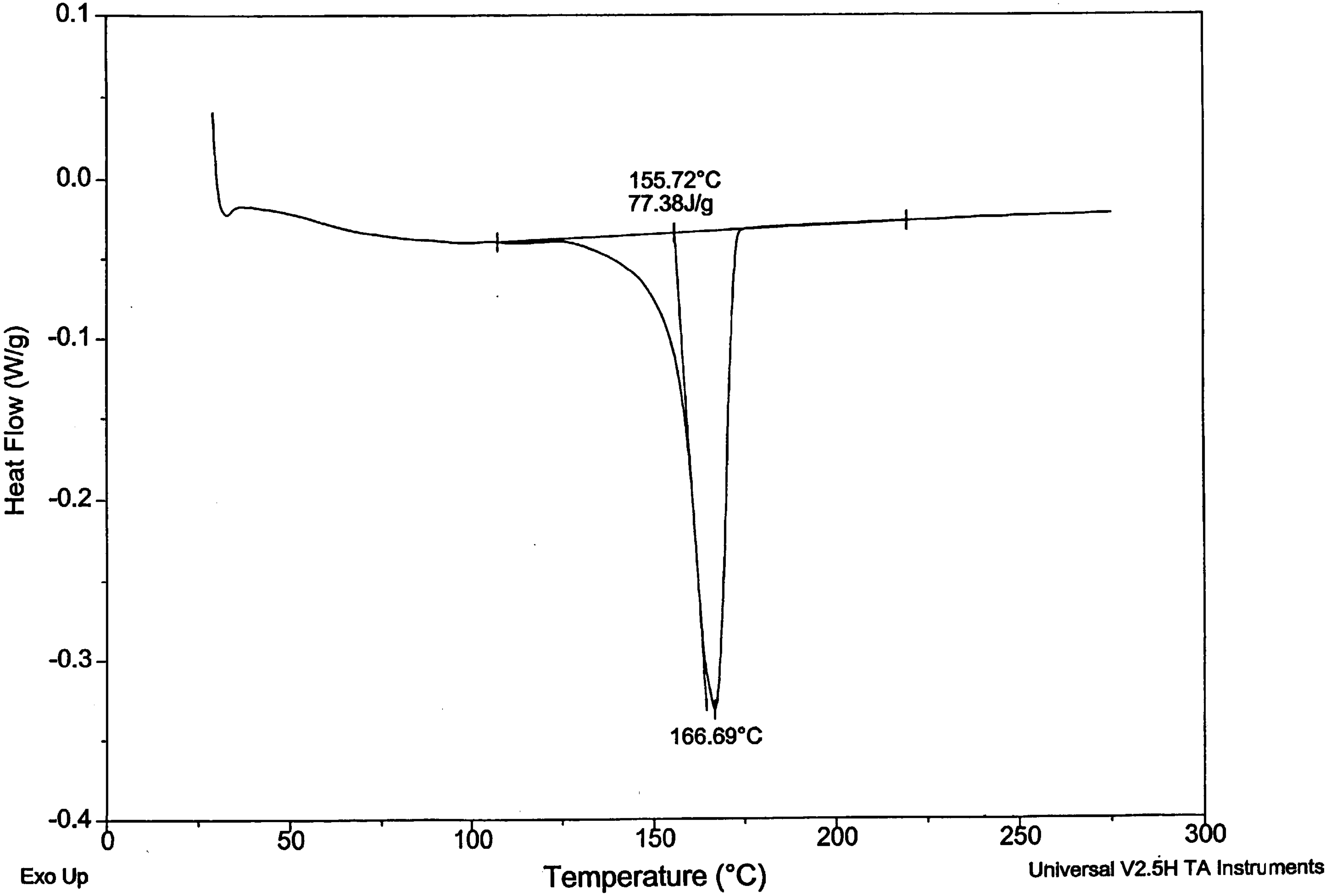


Universal V2.5H TA Instruments

Sample: Door Panel - Black Plastic
Size: 4.6100 mg
Method: MDSC Method
Comment: Honda Civic: door panel black plastic

DSC

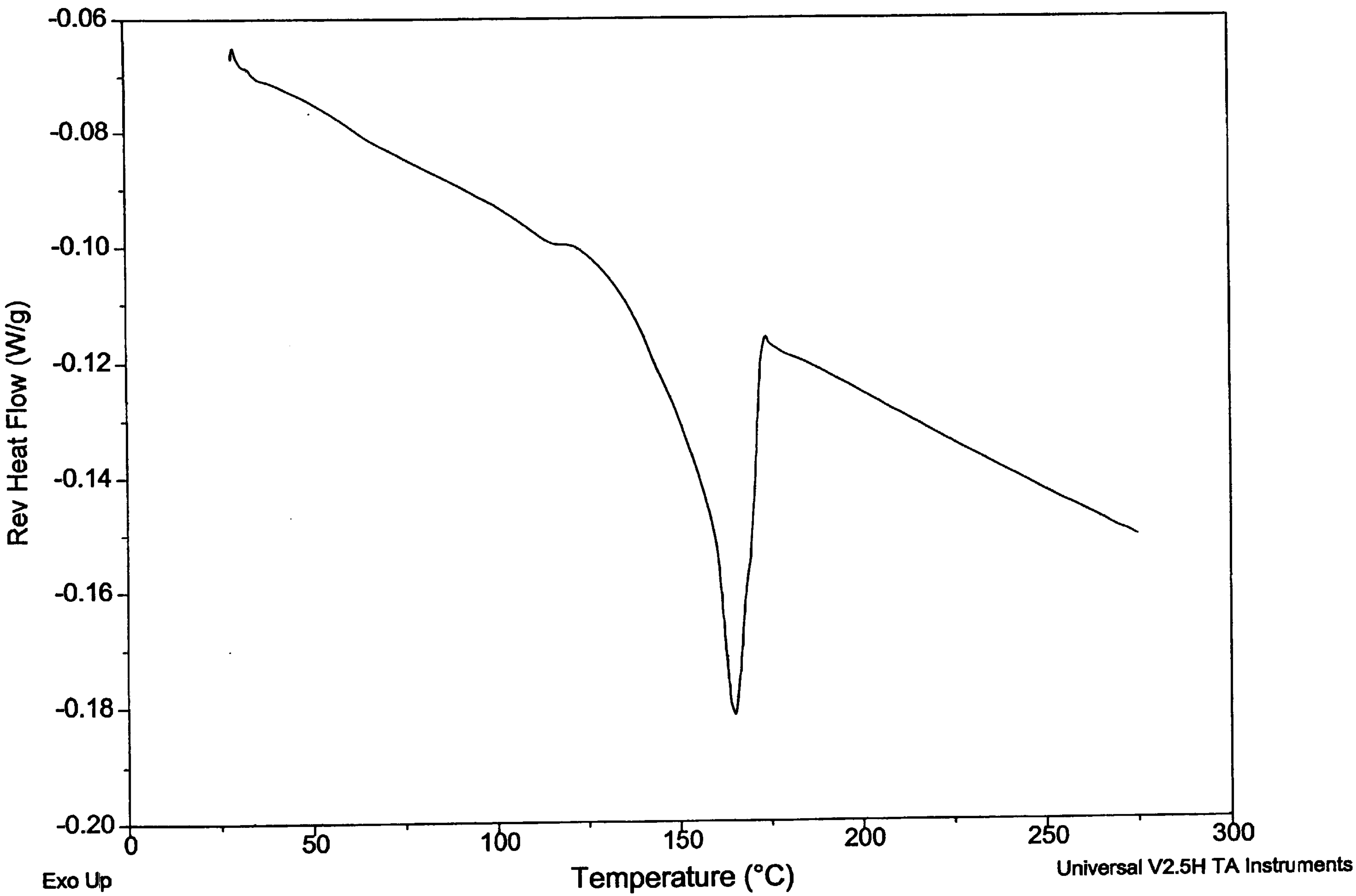
File: C:...\DSC\03614-103.044
Operator: WJM
Run Date: 6-Jun-01 13:29



Sample: Door Panel - Black Plastic
Size: 4.6100 mg
Method: MDSC Method
Comment: Honda Civic: door panel black plastic

DSC

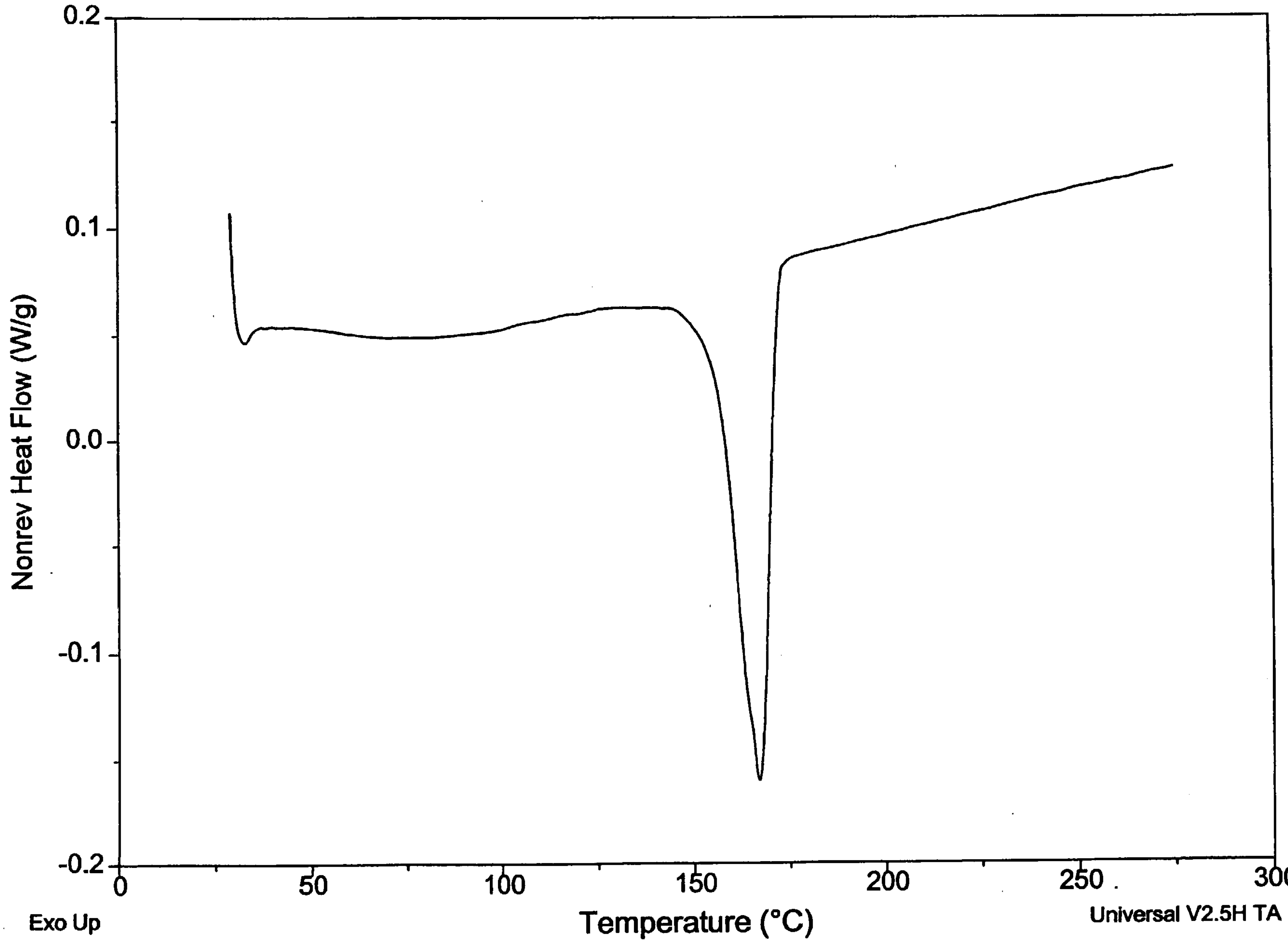
File: C:...\DSC\03614-103.044
Operator: WJM
Run Date: 6-Jun-01 13:29



Sample: Door Panel - Black Plastic
Size: 4.6100 mg
Method: MDSC Method
Comment: Honda Civic: door panel black plastic

DSC

File: C:...\DSC\03614-103.044
Operator: WJM
Run Date: 6-Jun-01 13:29

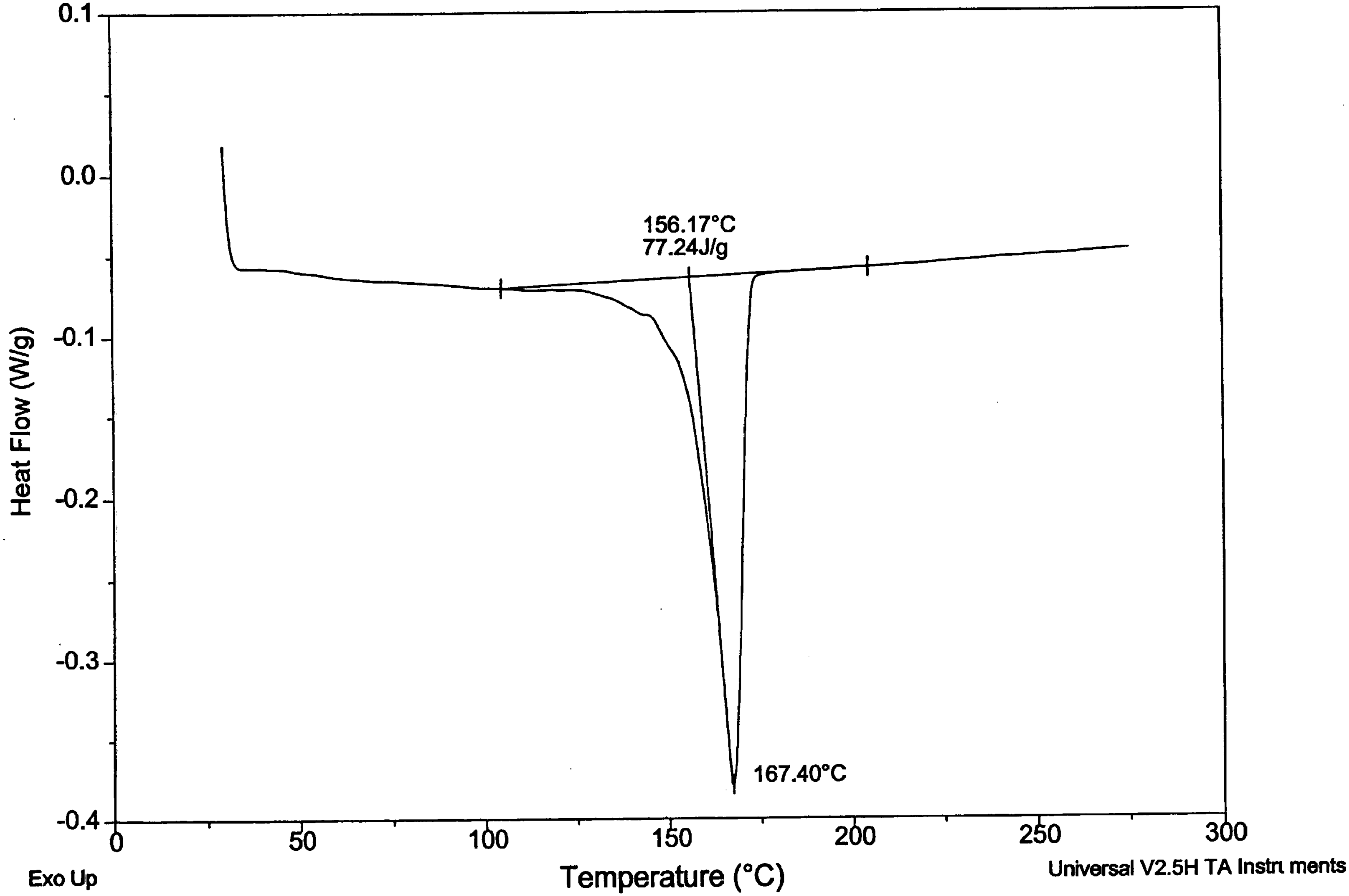


Universal V2.5H TA Instruments

Sample: Door Panel - Black Plastic run 2
Size: 6.6400 mg
Method: MDSC Method
Comment: Honda Civic: door panel black plastic

DSC

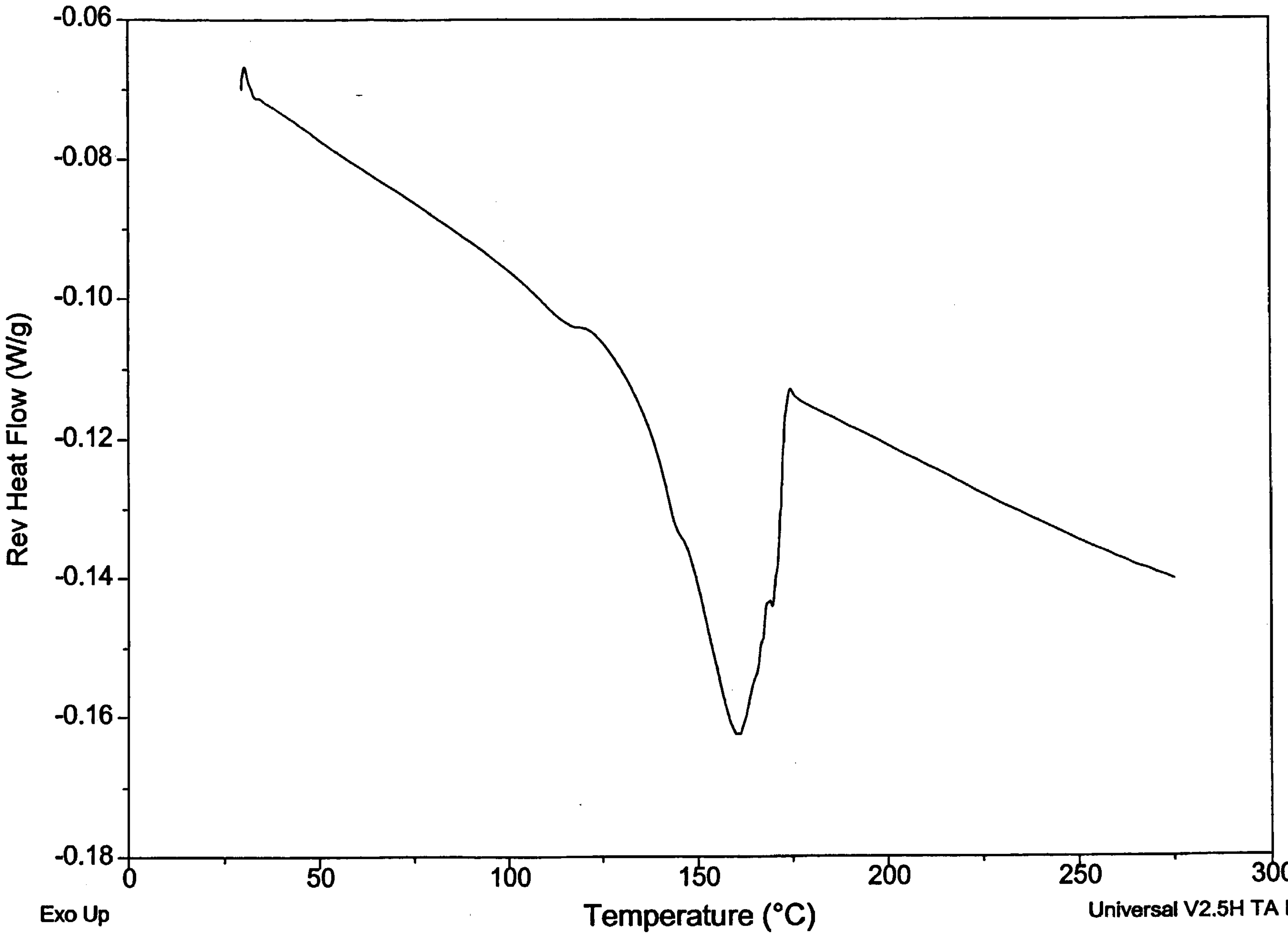
File: C:...\DSC\03614-103.045
Operator: WJM
Run Date: 6-Jun-01 15:40



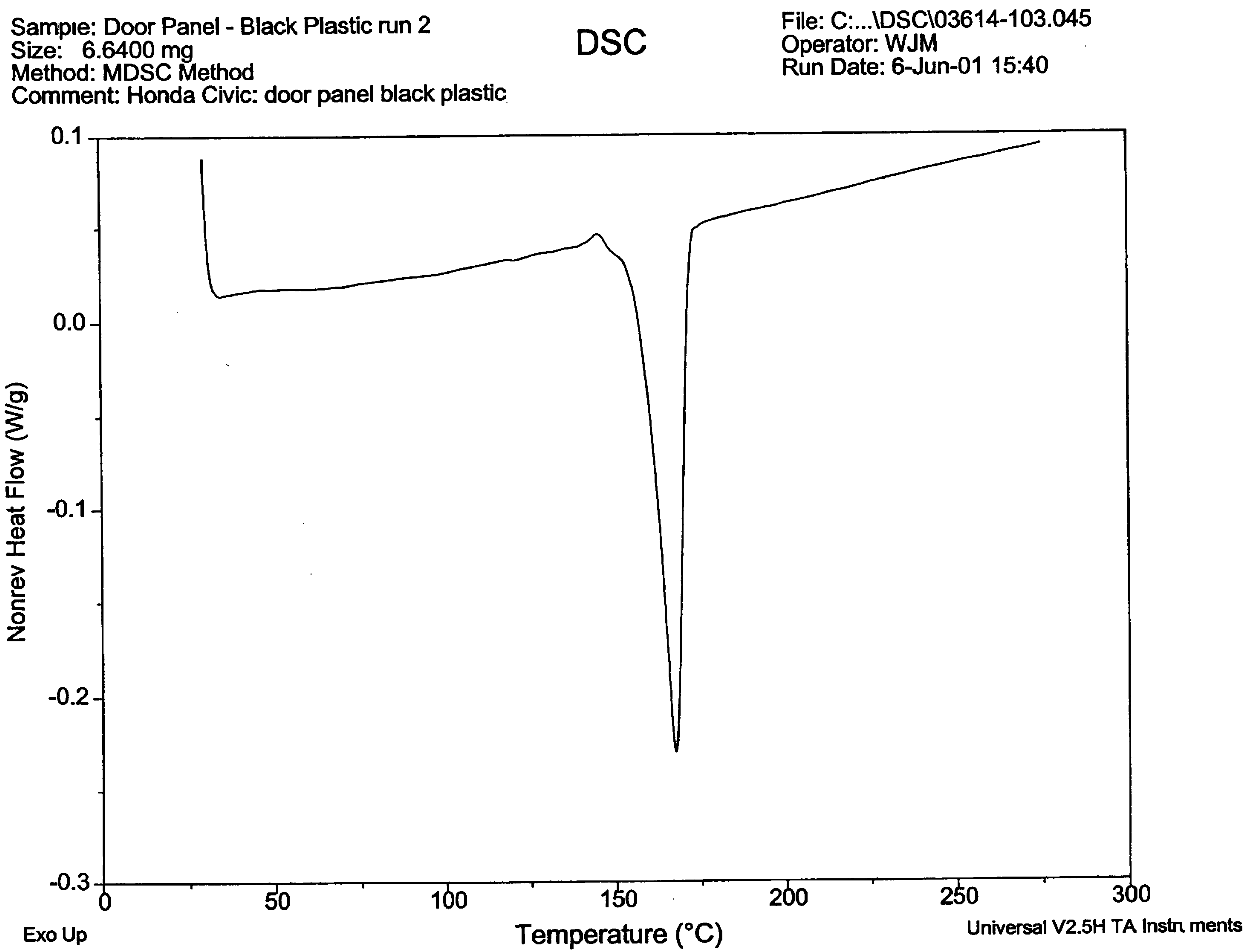
Sample: Door Panel - Black Plastic run 2
Size: 6.6400 mg
Method: MDSC Method
Comment: Honda Civic: door panel black plastic

DSC

File: C:...\DSC\03614-103.045
Operator: WJM
Run Date: 6-Jun-01 15:40



Universal V2.5H TA Instruments

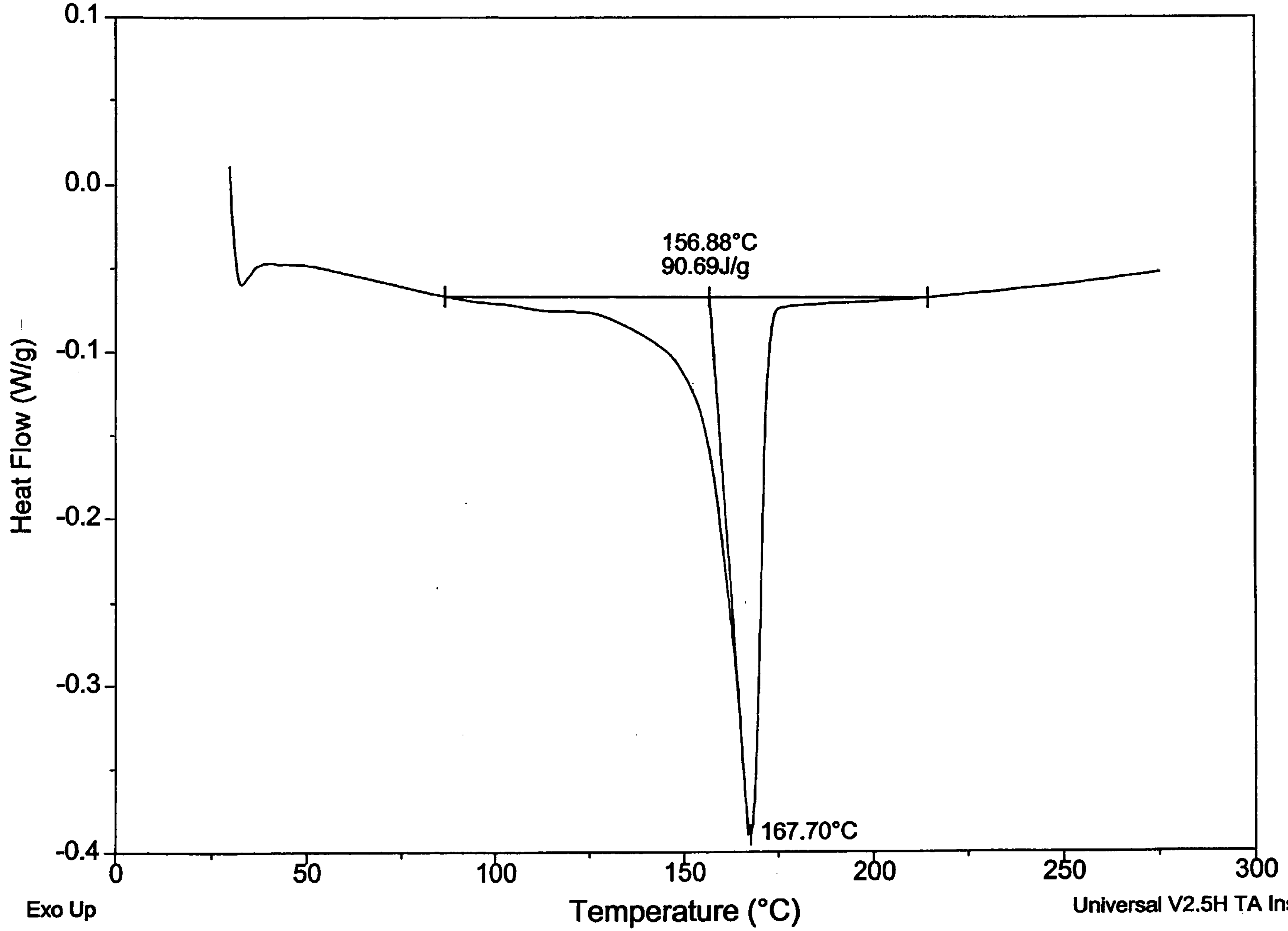


Sample: Door Panel - Black Plastic run 2
Size: 6.6400 mg
Method: MDSC Method
Comment: Honda Civic: door panel black plastic
DSC
File: C:...\DSC\03614-103.045
Operator: WJM
Run Date: 6-Jun-01 15:40
0.1
0.0
-0.1
-0.2
-0.3
Nonrev Heat Flow (W/g)
0
50
100
150
200
250
300
Temperature (°C)
Exo Up
Universal V2.5H TA Instruments

Sample: Exterior Glove Box
Size: 5.5400 mg
Method: MDSC Method
Comment: Honda Civic: exterior glove box

DSC

File: C:...\DSC\03614-103.046
Operator: WJM
Run Date: 7-Jun-01 08:00

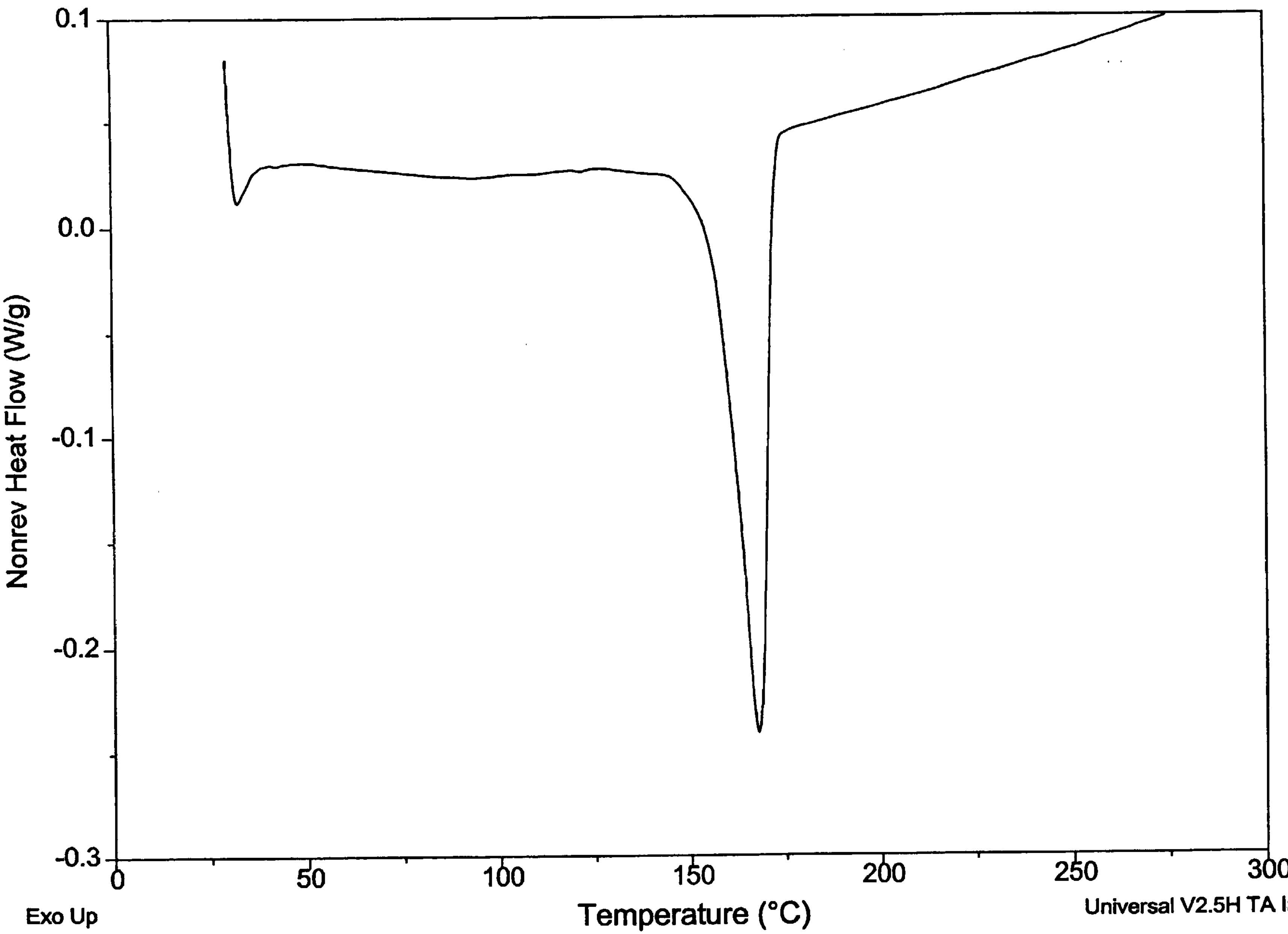


Universal V2.5H TA Instruments

Sample: Exterior Glove Box
Size: 5.5400 mg
Method: MDSC Method
Comment: Honda Civic: exterior glove box

DSC

File: C:...\DSC\03614-103.046
Operator: WJM
Run Date: 7-Jun-01 08:00

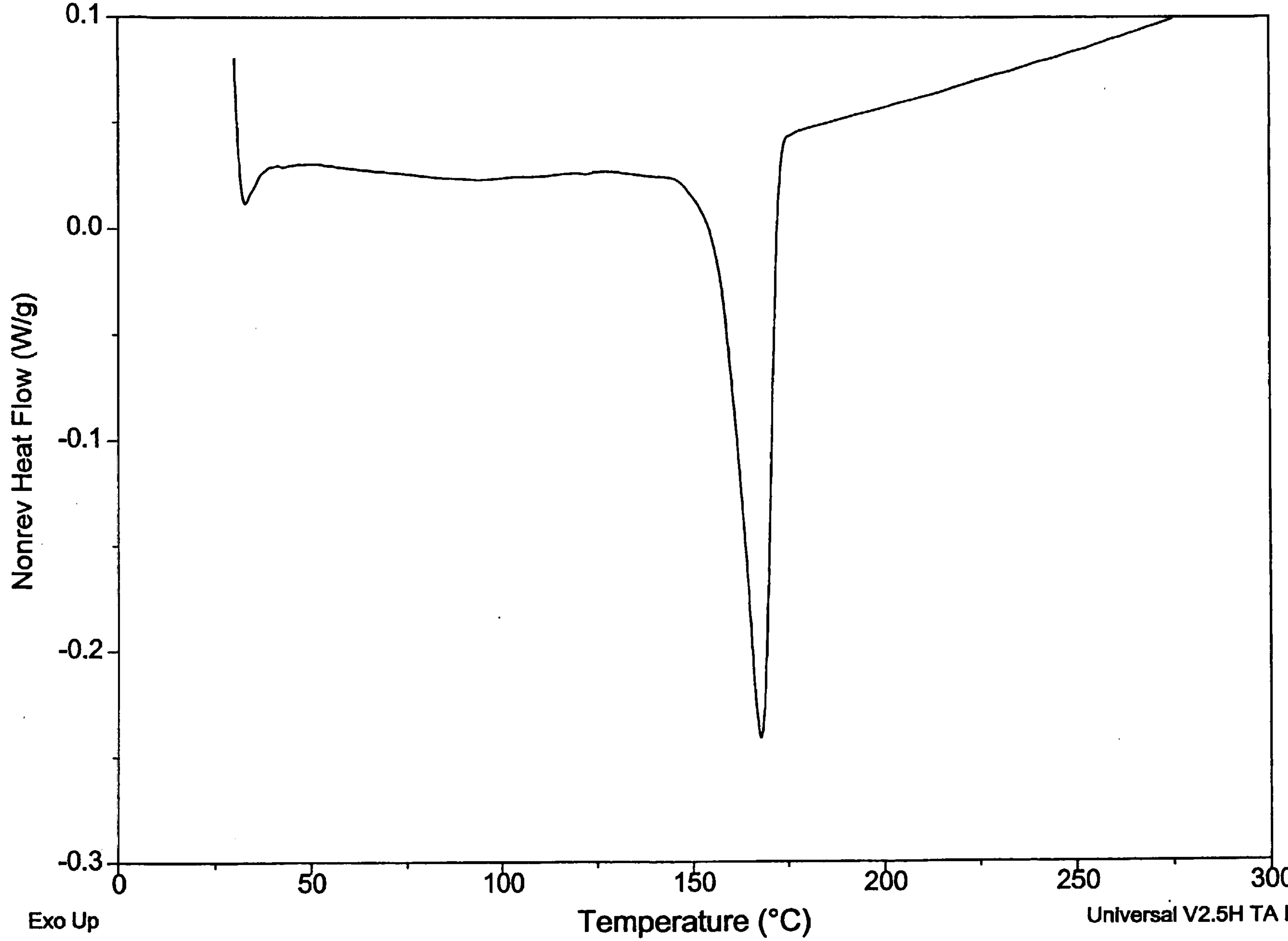


Universal V2.5H TA Instruments

Sample: Exterior Glove Box
Size: 5.5400 mg
Method: MDSC Method
Comment: Honda Civic: exterior glove box

DSC

File: C:...\DSC\03614-103.046
Operator: WJM
Run Date: 7-Jun-01 08:00

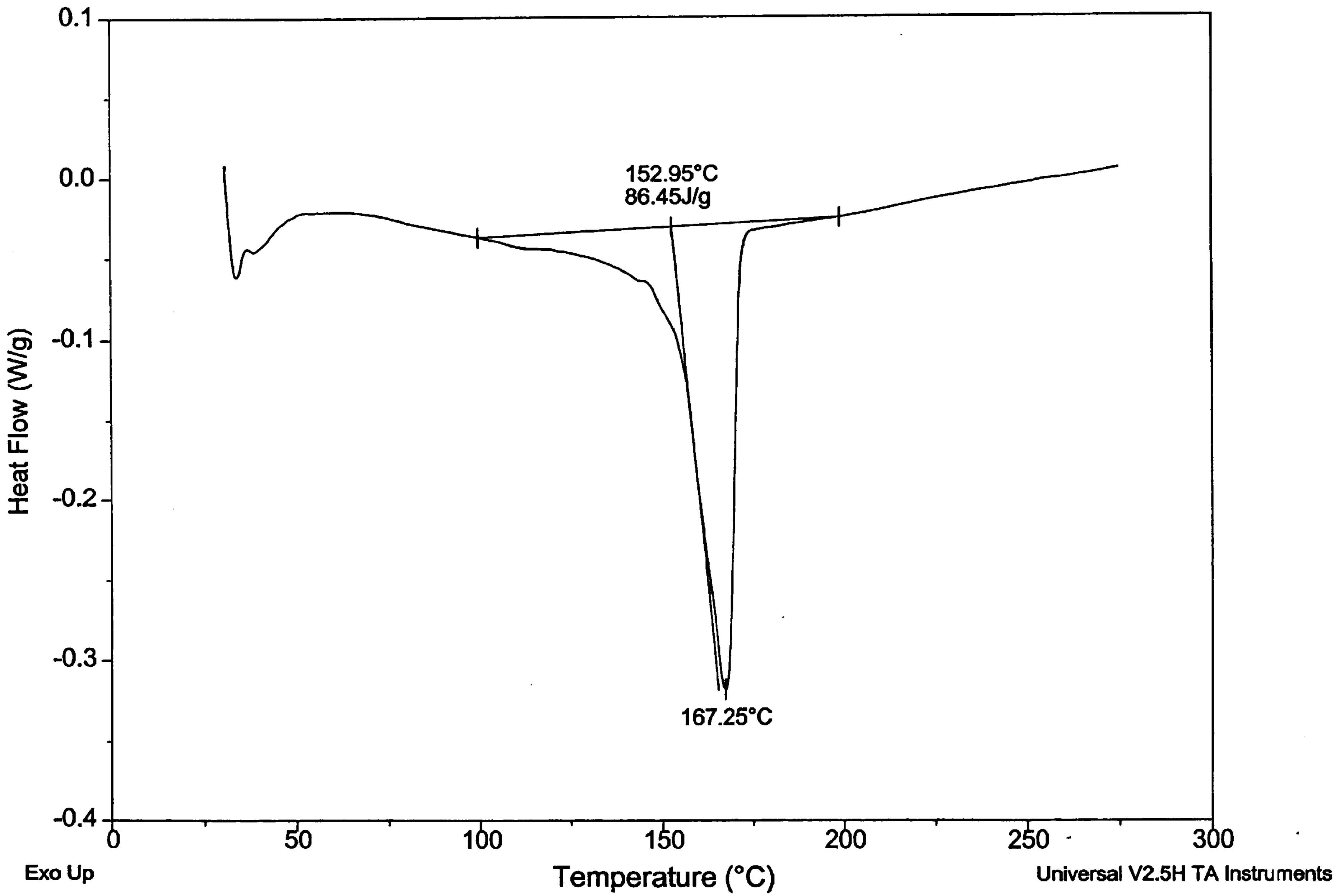


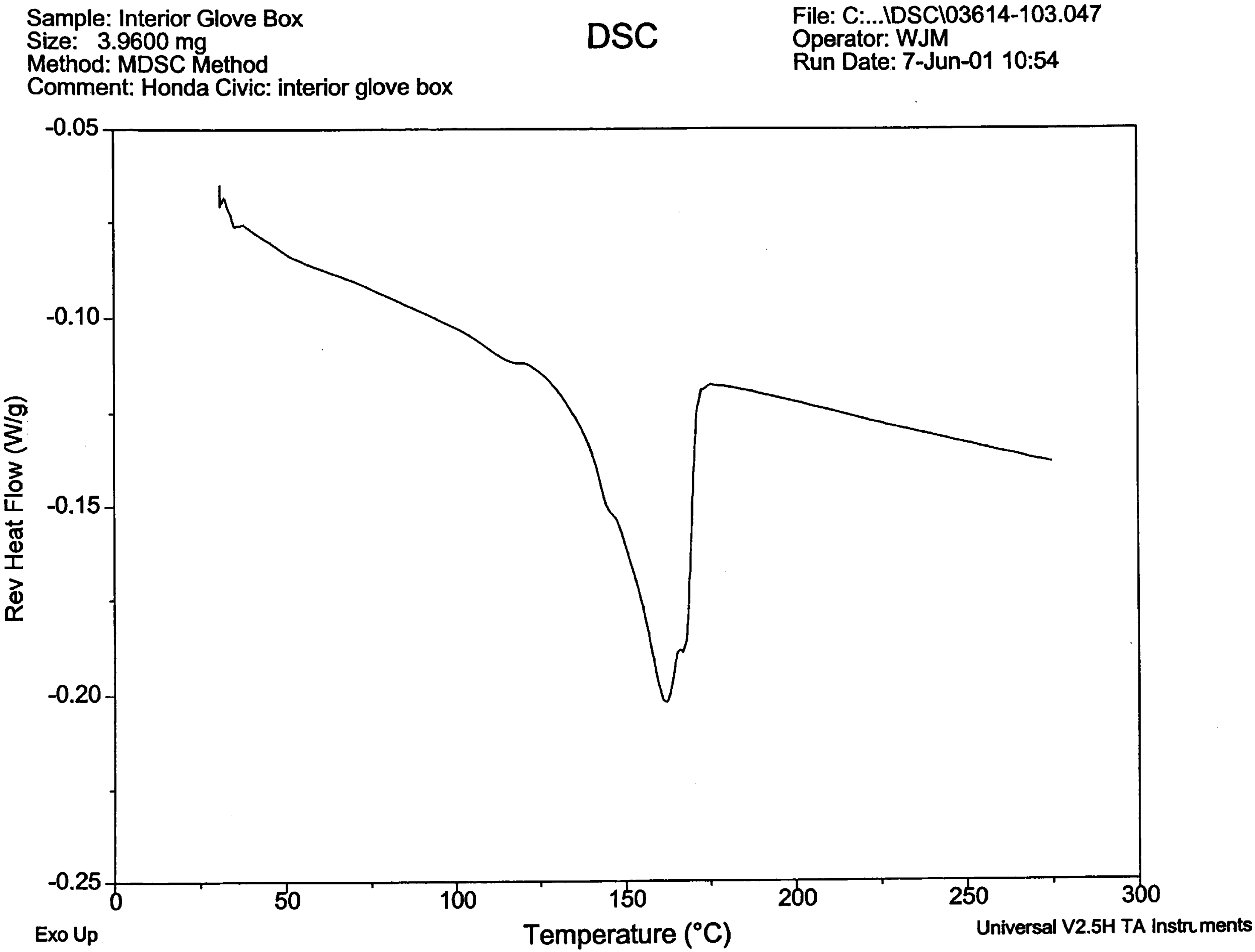
Universal V2.5H TA Instruments

Sample: Interior Glove Box
Size: 3.9600 mg
Method: MDSC Method
Comment: Honda Civic: interior glove box

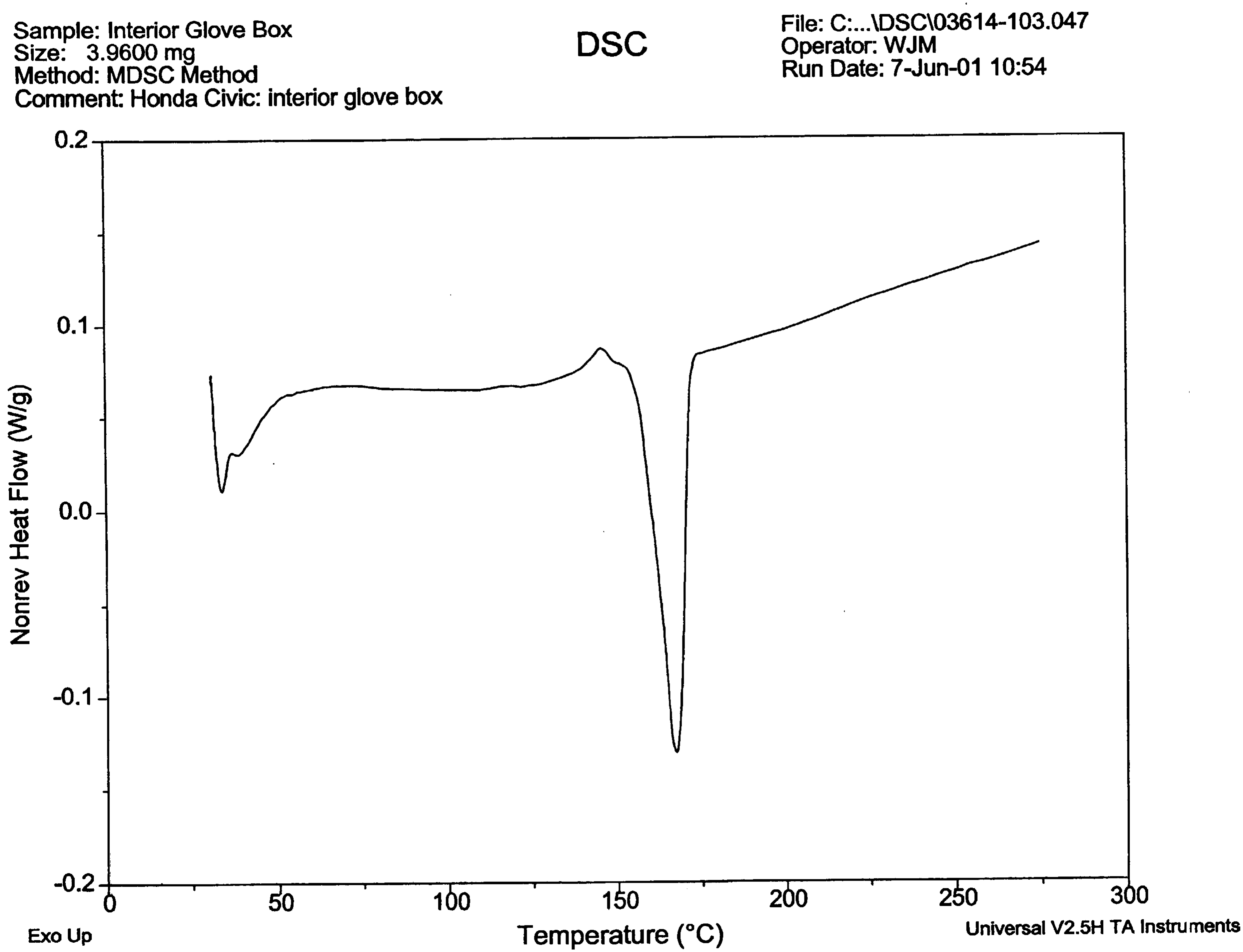
DSC

File: C:...\DSC\03614-103.047
Operator: WJM
Run Date: 7-Jun-01 10:54





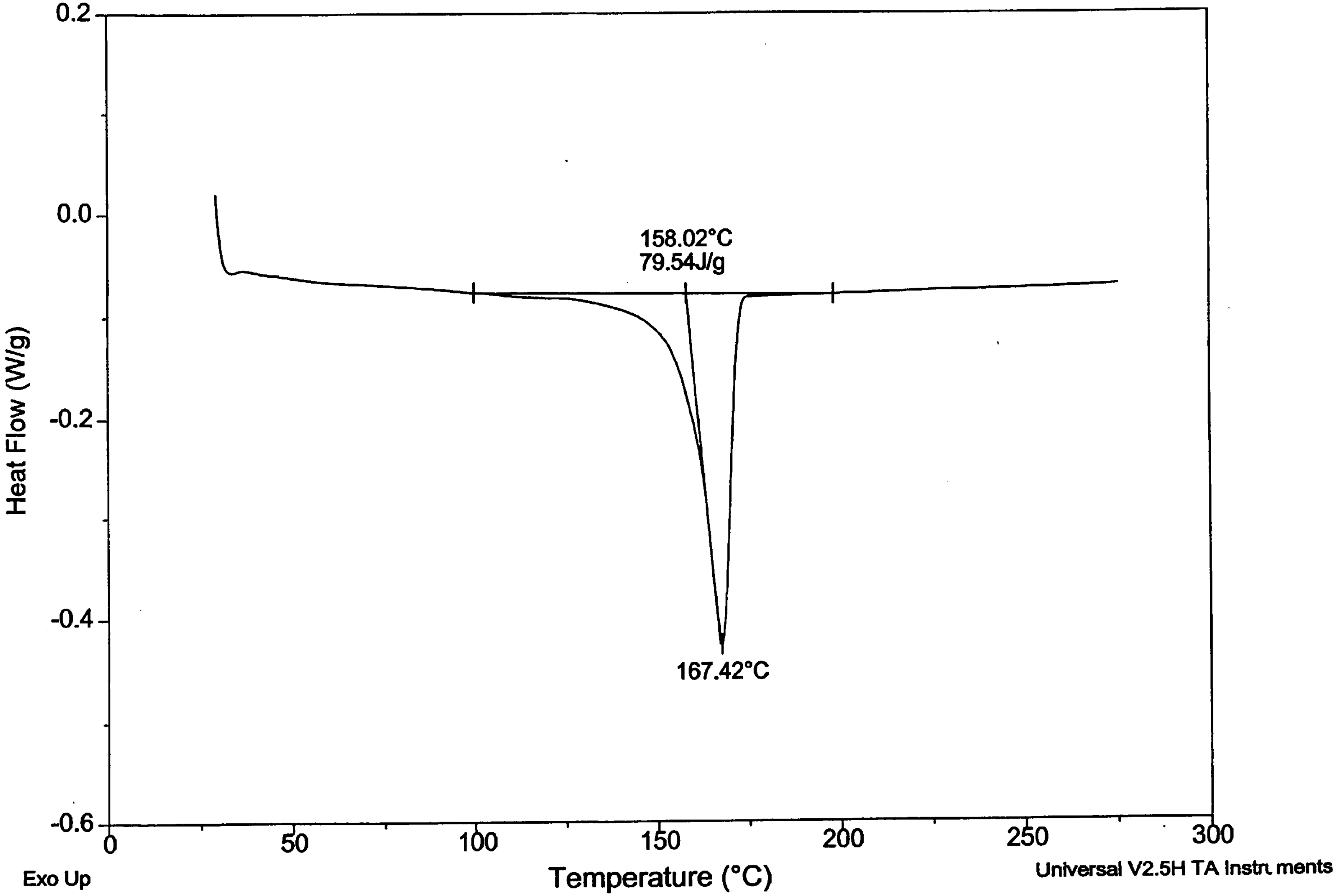
Sample: Interior Glove Box
Size: 3.9600 mg
Method: MDSC Method
Comment: Honda Civic: interior glove box
DSC
File: C:...\DSC\03614-103.047
Operator: WJM
Run Date: 7-Jun-01 10:54
-0.05
-0.10
-0.15
-0.20
-0.25
Rev Heat Flow (W/g)
0
50
100
150
200
250
300
Exo Up
Temperature (°C)
Universal V2.5H TA Instruments


Sample: Interior Glove Box
Size: 3.9600 mg
Method: MDSC Method
Comment: Honda Civic: interior glove box
DSC
File: C:...\DSC\03614-103.047
Operator: WJM
Run Date: 7-Jun-01 10:54
Nonrev Heat Flow (W/g)
0.2
0.1
0.0
-0.1
-0.2
0
50
100
150
200
250
300
Exo Up
Temperature (°C)
Universal V2.5H TA Instruments

Sample: Exterior Glove Box (run 2)
Size: 5.7800 mg
Method: MDSC Method
Comment: Honda Civic: exterior glove box

DSC

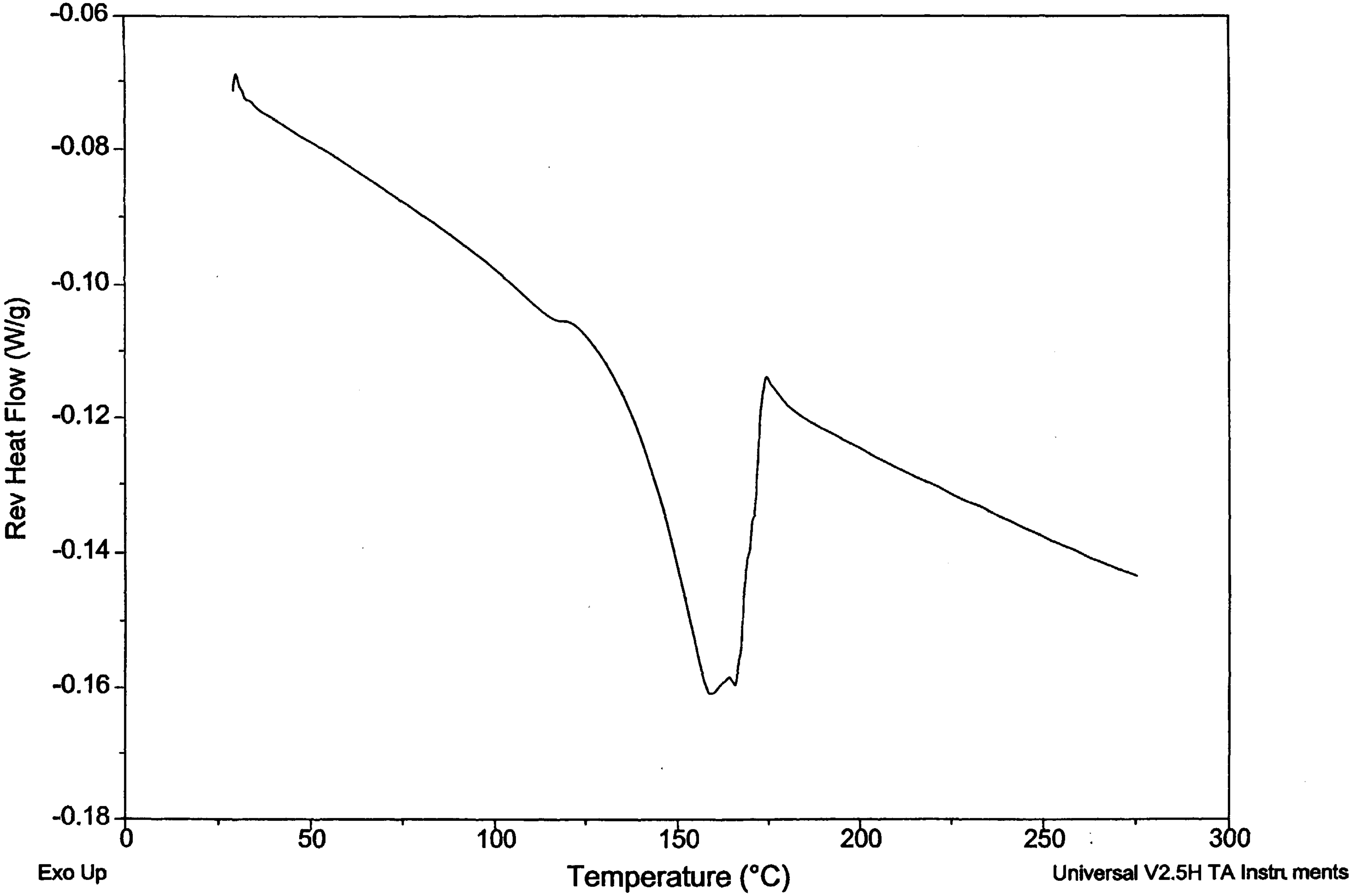
File: C:...\DSC\03614-103.048
Operator: WJM
Run Date: 7-Jun-01 13:25



Sample: Exterior Glove Box (run 2)
Size: 5.7800 mg
Method: MDSC Method
Comment: Honda Civic: exterior glove box

DSC

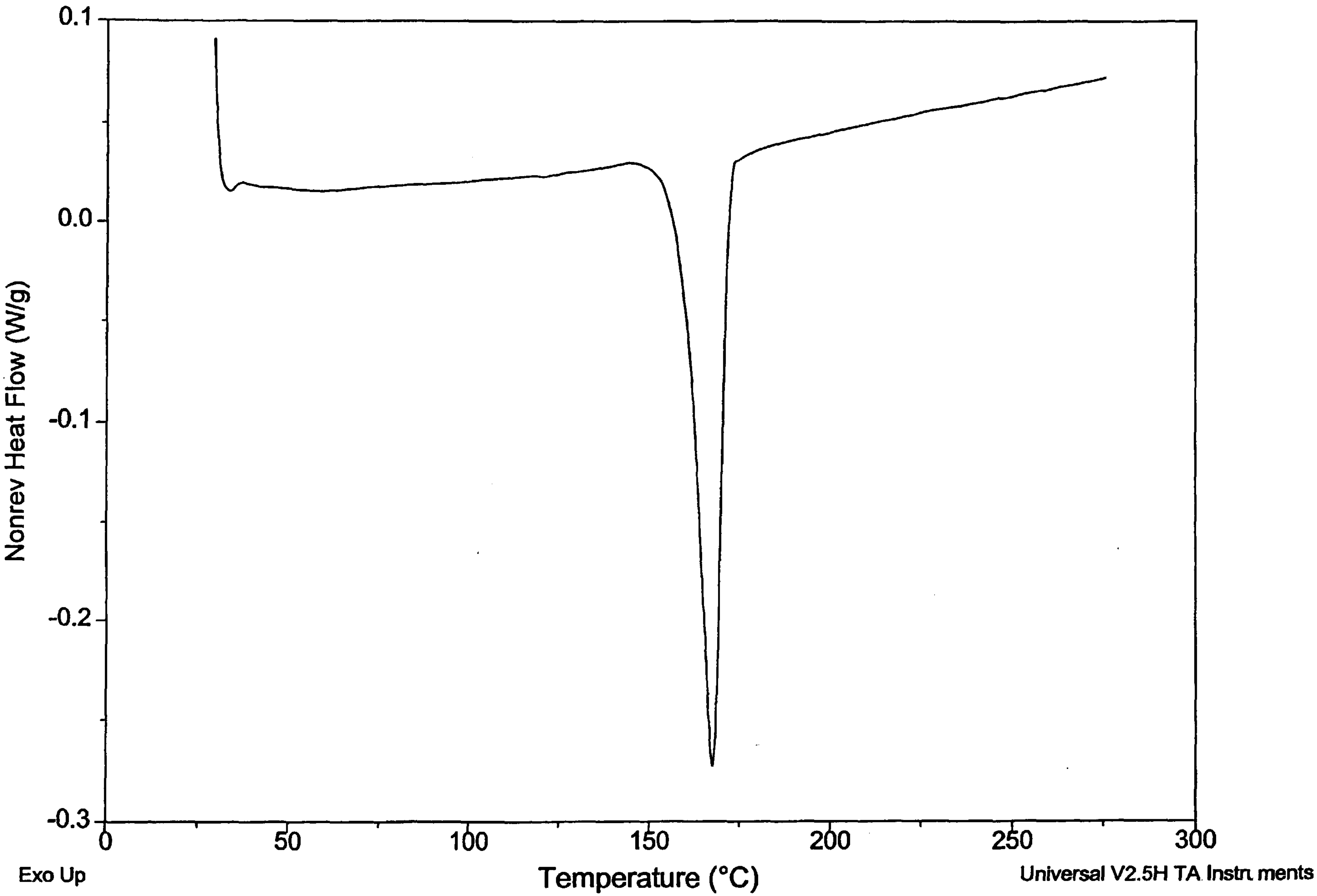
File: C:...\DSC\03614-103.048
Operator: WJM
Run Date: 7-Jun-01 13:25



Sample: Exterior Glove Box (run 2)
Size: 5.7800 mg
Method: MDSC Method
Comment: Honda Civic: exterior glove box

DSC

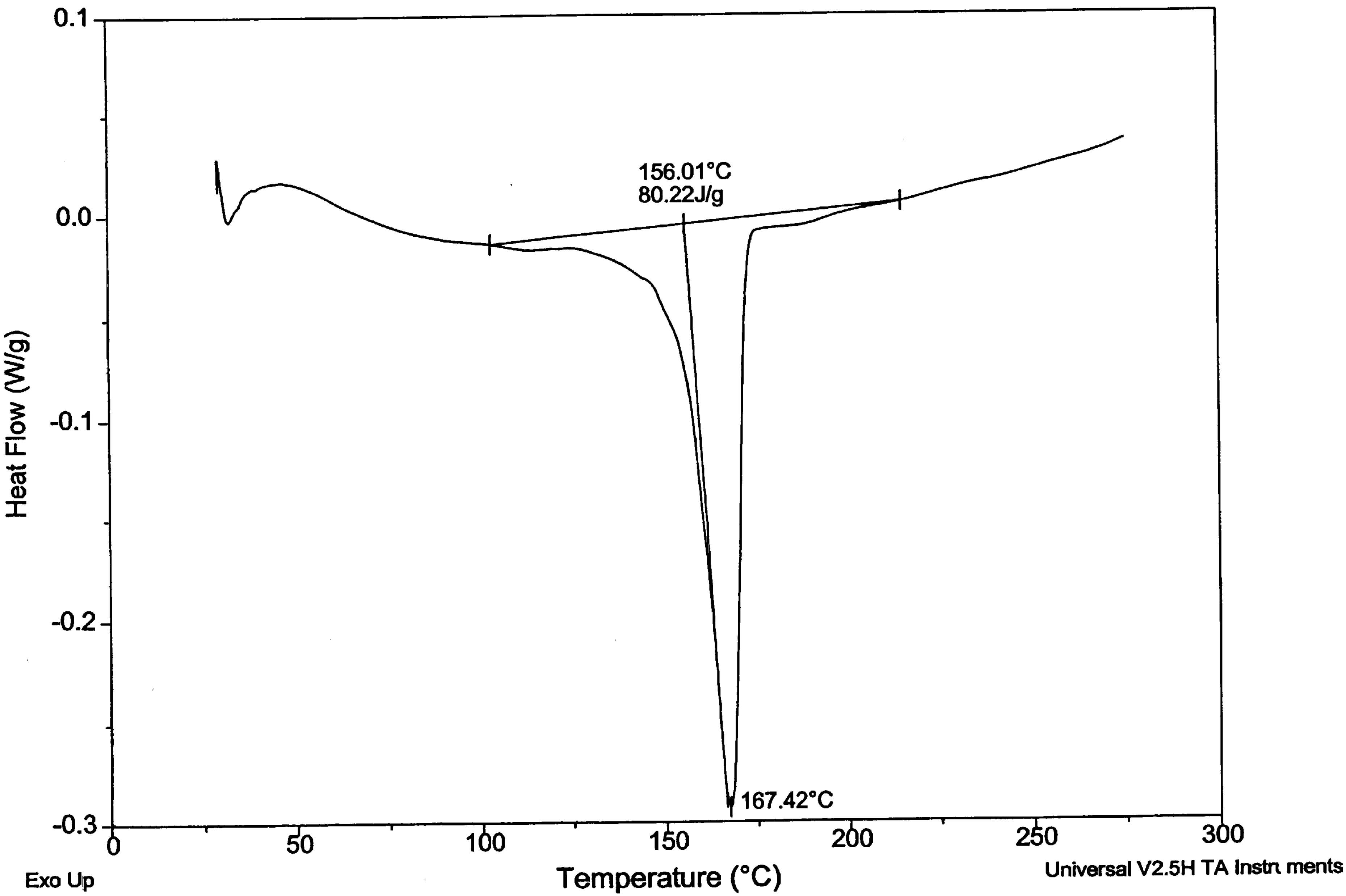
File: C:...\DSC\03614-103.048
Operator: WJM
Run Date: 7-Jun-01 13:25



Sample: Interior Glove Box (run 2)
Size: 4.8900 mg
Method: MDSC Method
Comment: Honda Civic: interior glove box

DSC

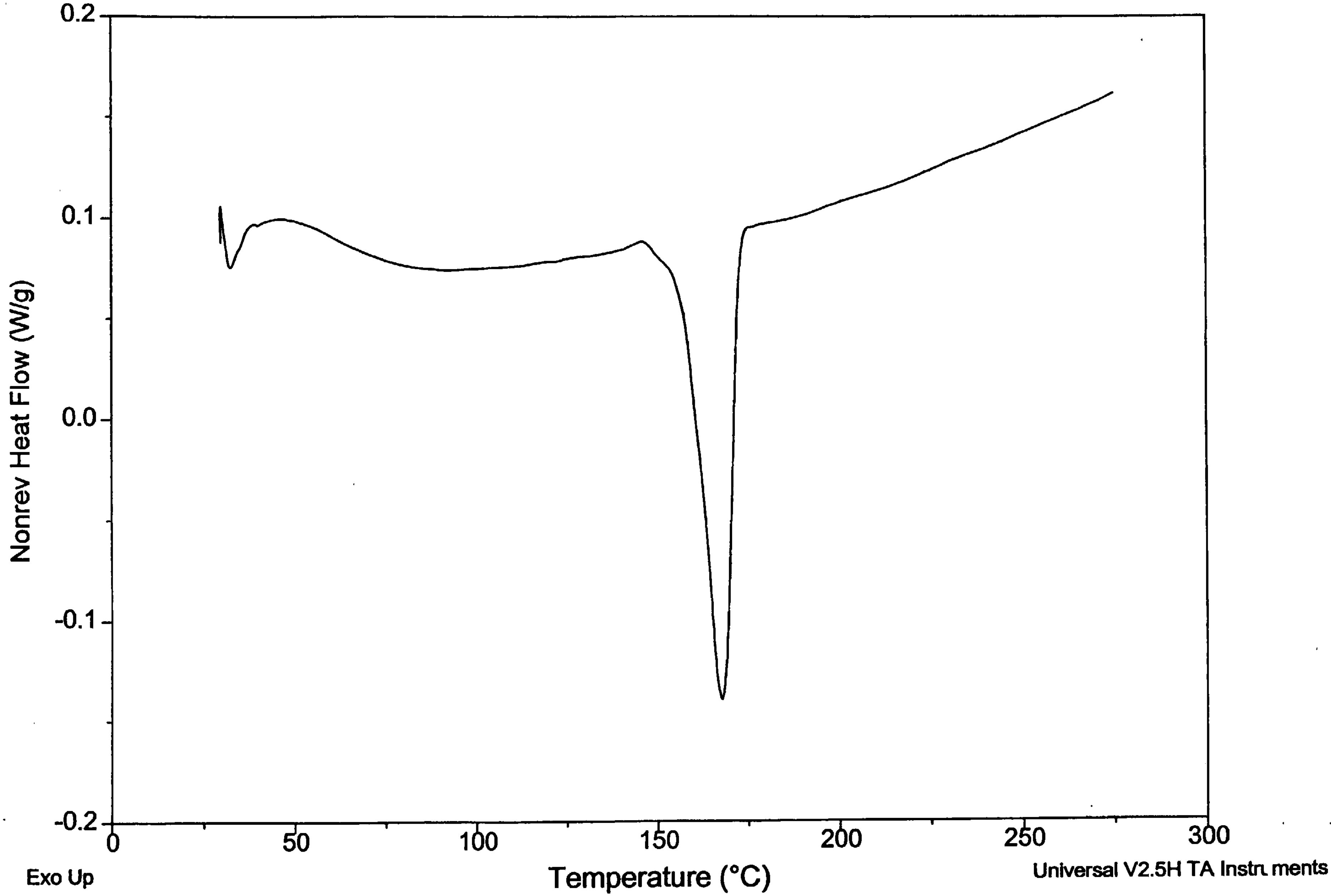
File: C:...\DSC\03614-103.049
Operator: WJM
Run Date: 8-Jun-01 08:02



Sample: Interior Glove Box (run 2)
Size: 4.8900 mg
Method: MDSC Method
Comment: Honda Civic: interior glove box

DSC

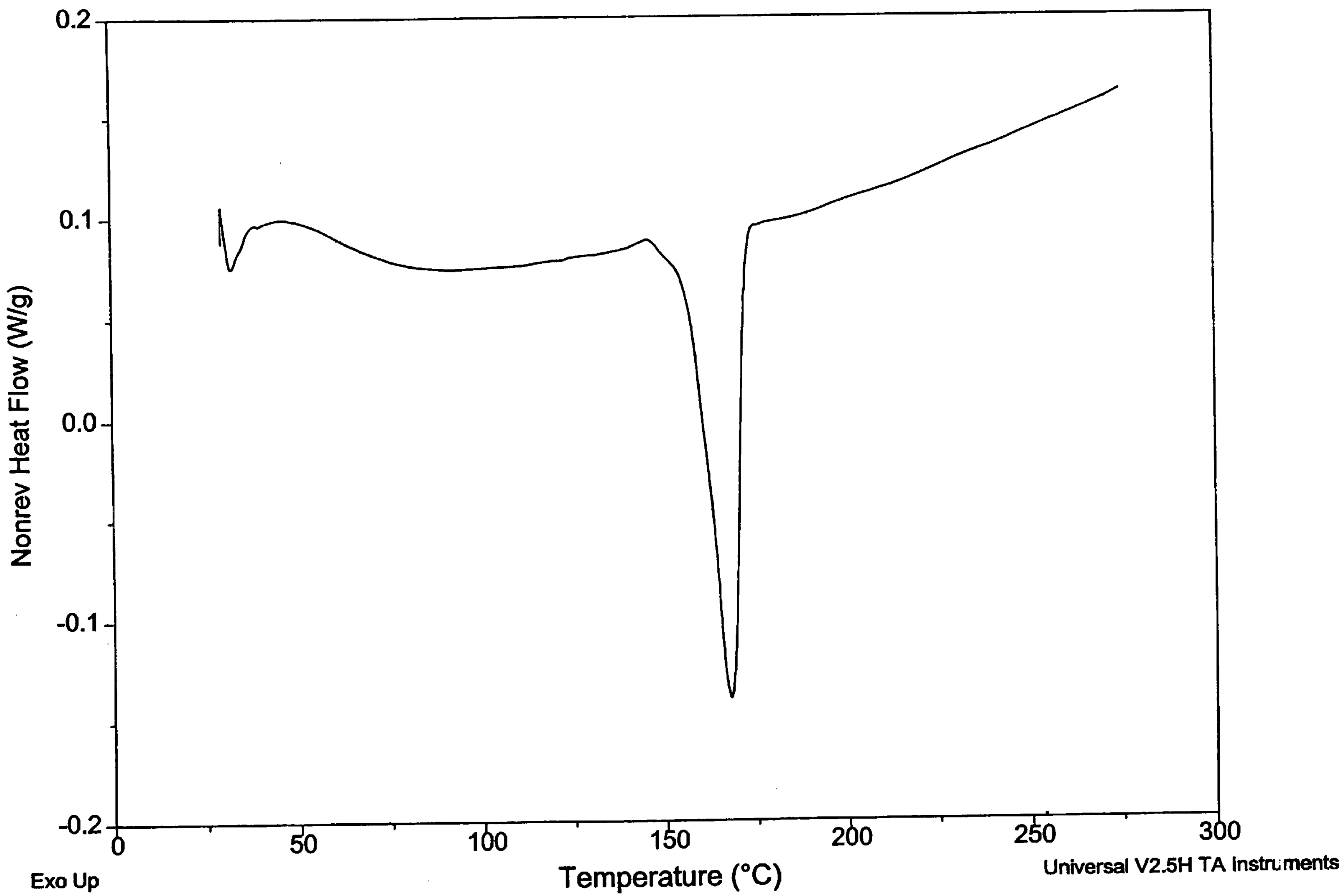
File: C:...\DSC\03614-103.049
Operator: WJM
Run Date: 8-Jun-01 08:02

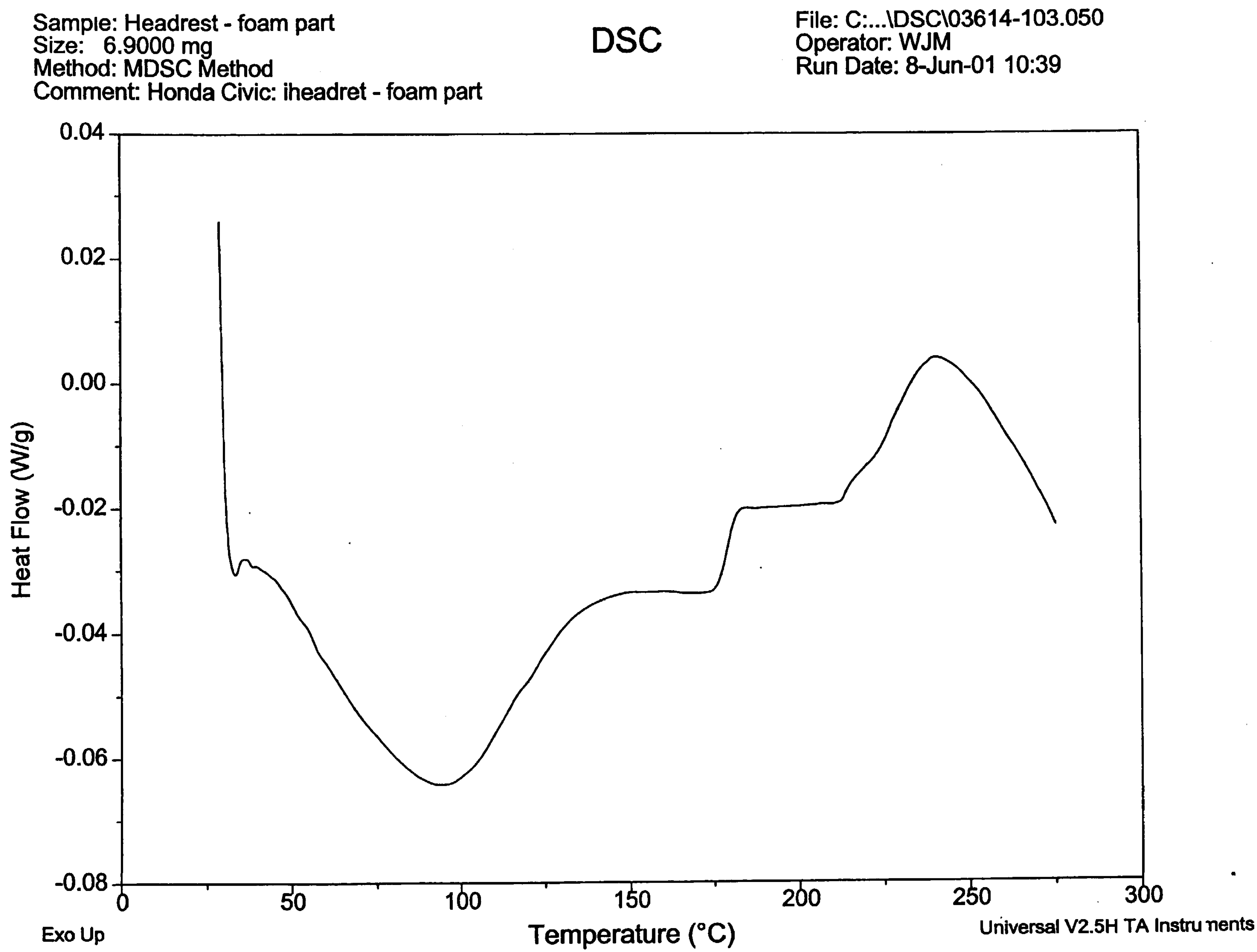


Sample: Interior Glove Box (run 2)
Size: 4.8900 mg
Method: MDSC Method
Comment: Honda Civic: interior glove box

DSC

File: C:...\DSC\03614-103.049
Operator: WJM
Run Date: 8-Jun-01 08:02

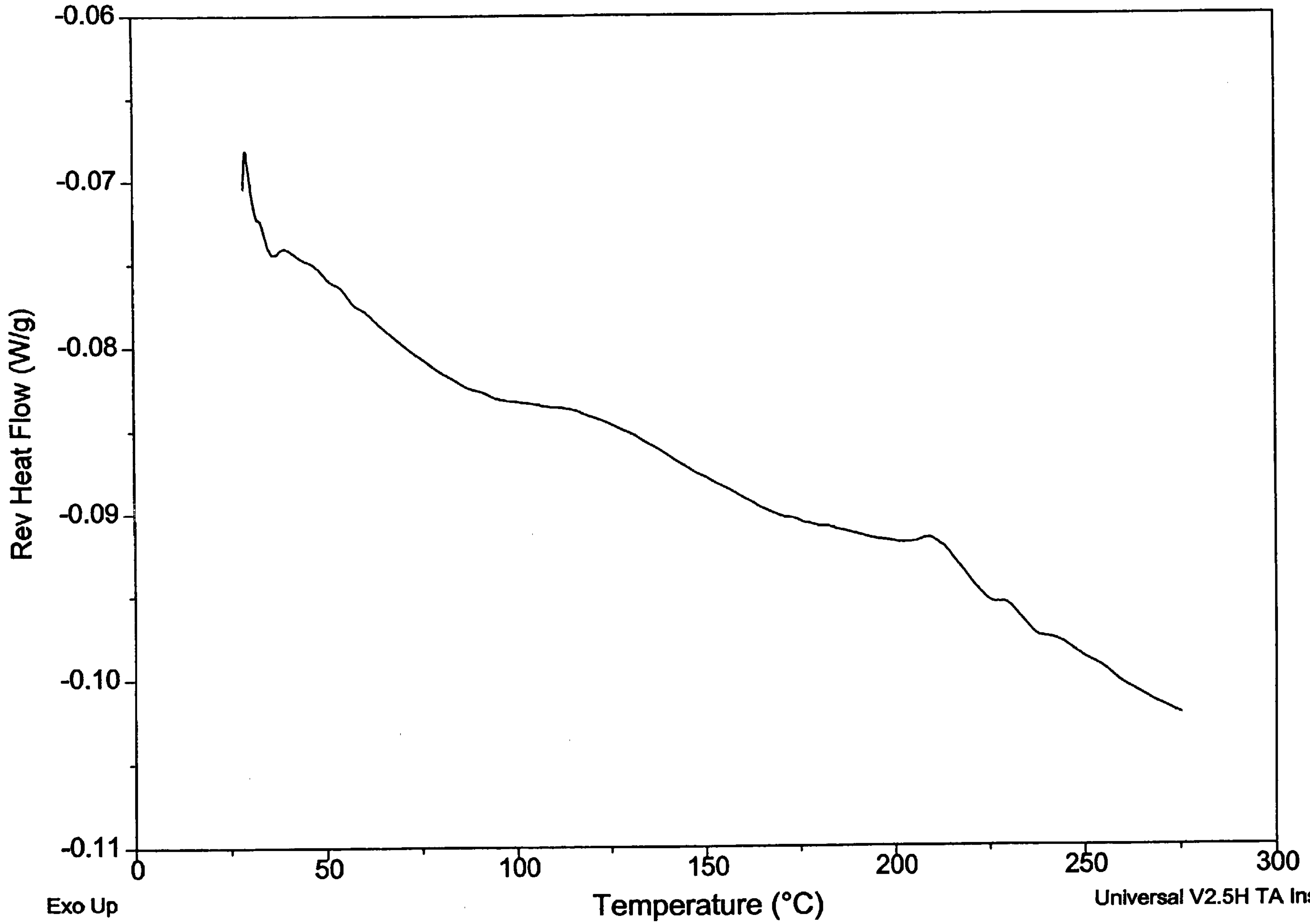



Sample: Headrest - foam part
Size: 6.9000 mg
Method: MDSC Method
Comment: Honda Civic: iheadret - foam part
DSC
File: C:...\DSC\03614-103.050
Operator: WJM
Run Date: 8-Jun-01 10:39
0.04
0.02
0.00
-0.02
-0.04
-0.06
-0.08
Heat Flow (W/g)
0
50
100
150
200
250
300
Temperature (°C)
Exo Up
Universal V2.5H TA Instruments

Sample: Headrest - foam part
Size: 6.9000 mg
Method: MDSC Method
Comment: Honda Civic: iheadret - foam part

DSC

File: C:...\DSC\03614-103.050
Operator: WJM
Run Date: 8-Jun-01 10:39

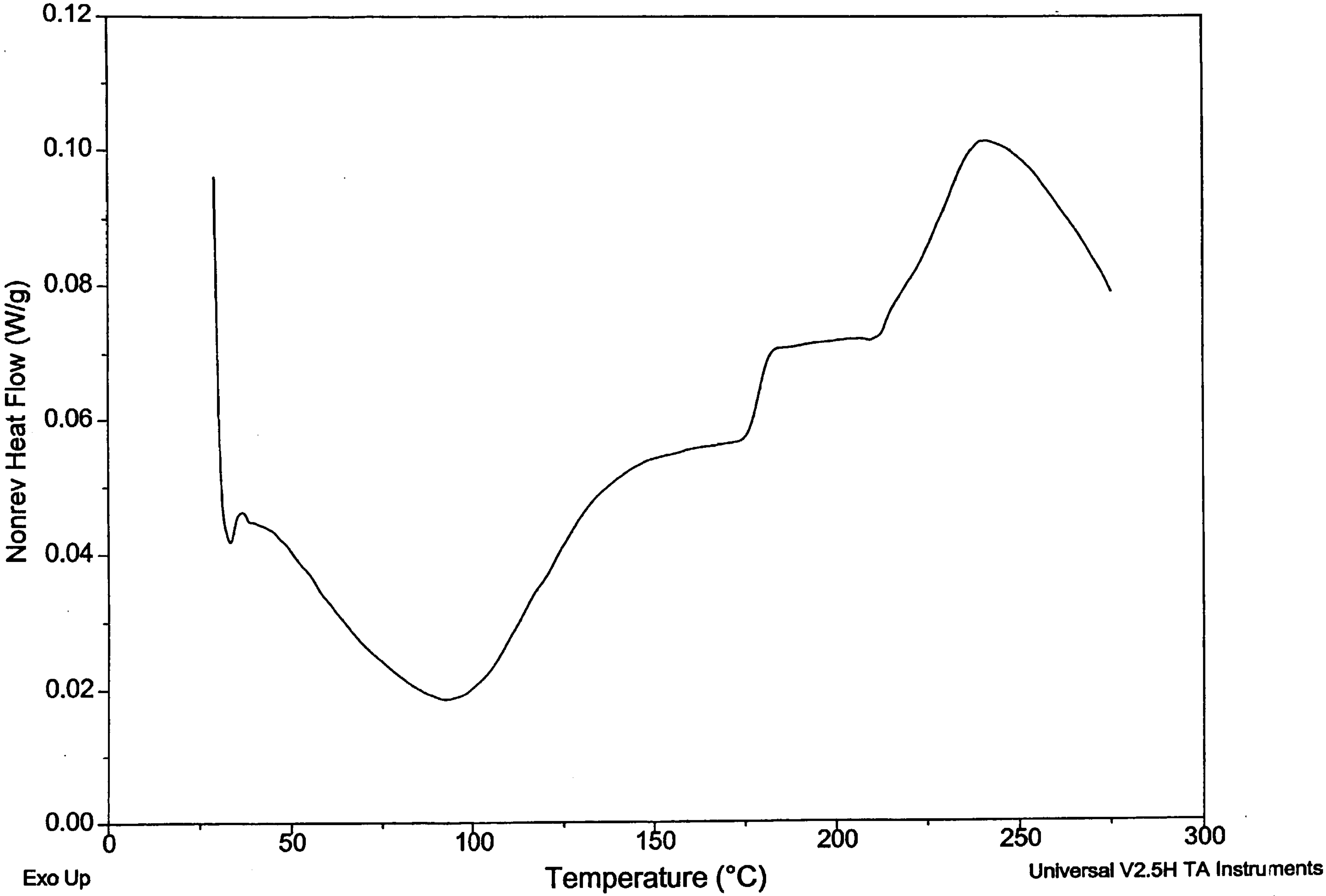


Universal V2.5H TA Instruments

Sample: Headrest - foam part
Size: 6.9000 mg
Method: MDSC Method
Comment: Honda Civic: iheadret - foam part

DSC

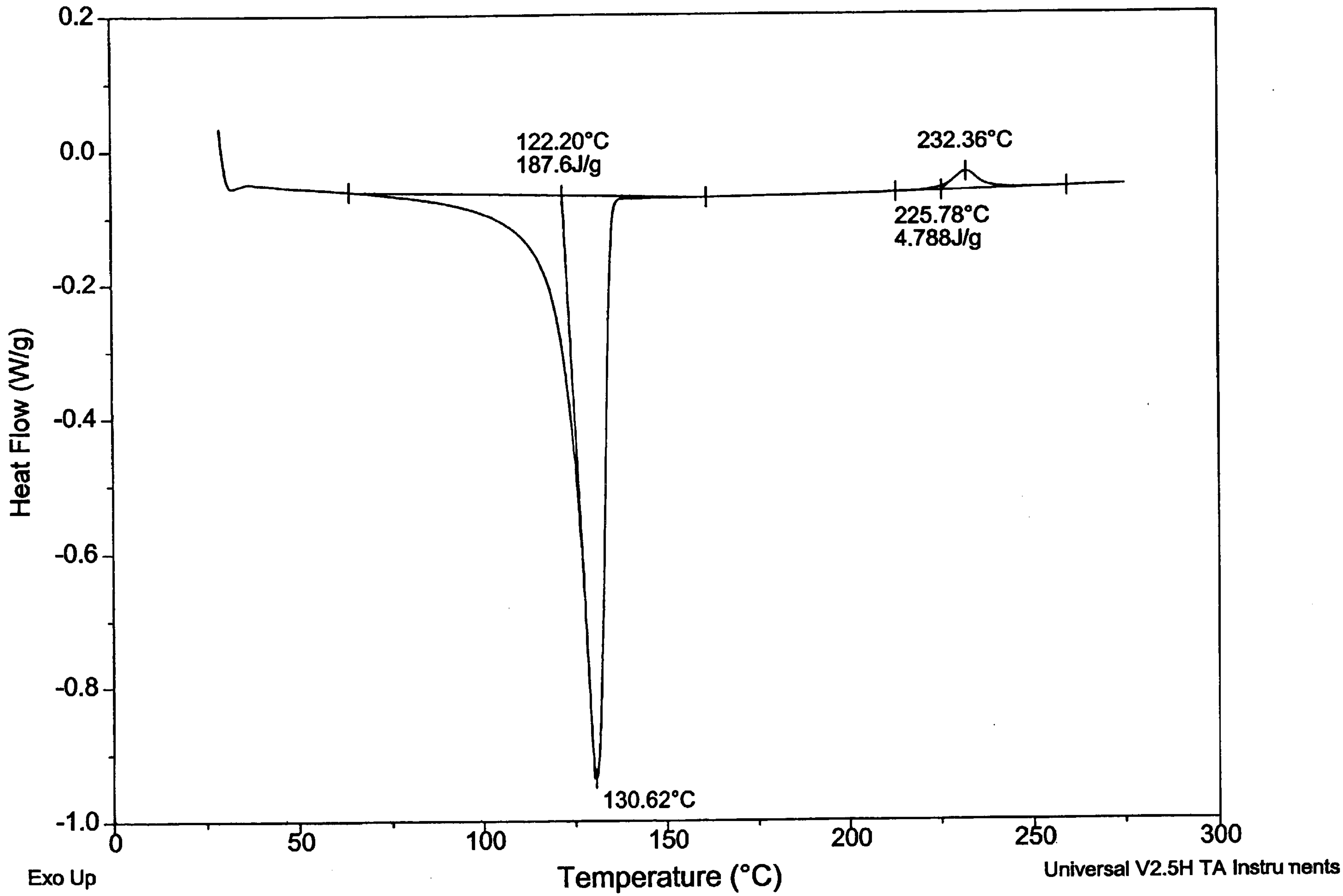
File: C:...\DSC\03614-103.050
Operator: WJM
Run Date: 8-Jun-01 10:39



Sample: HVAC Ducts
Size: 5.0000 mg
Method: MDSC Method
Comment: Honda Civic: HVAC Ducts

DSC

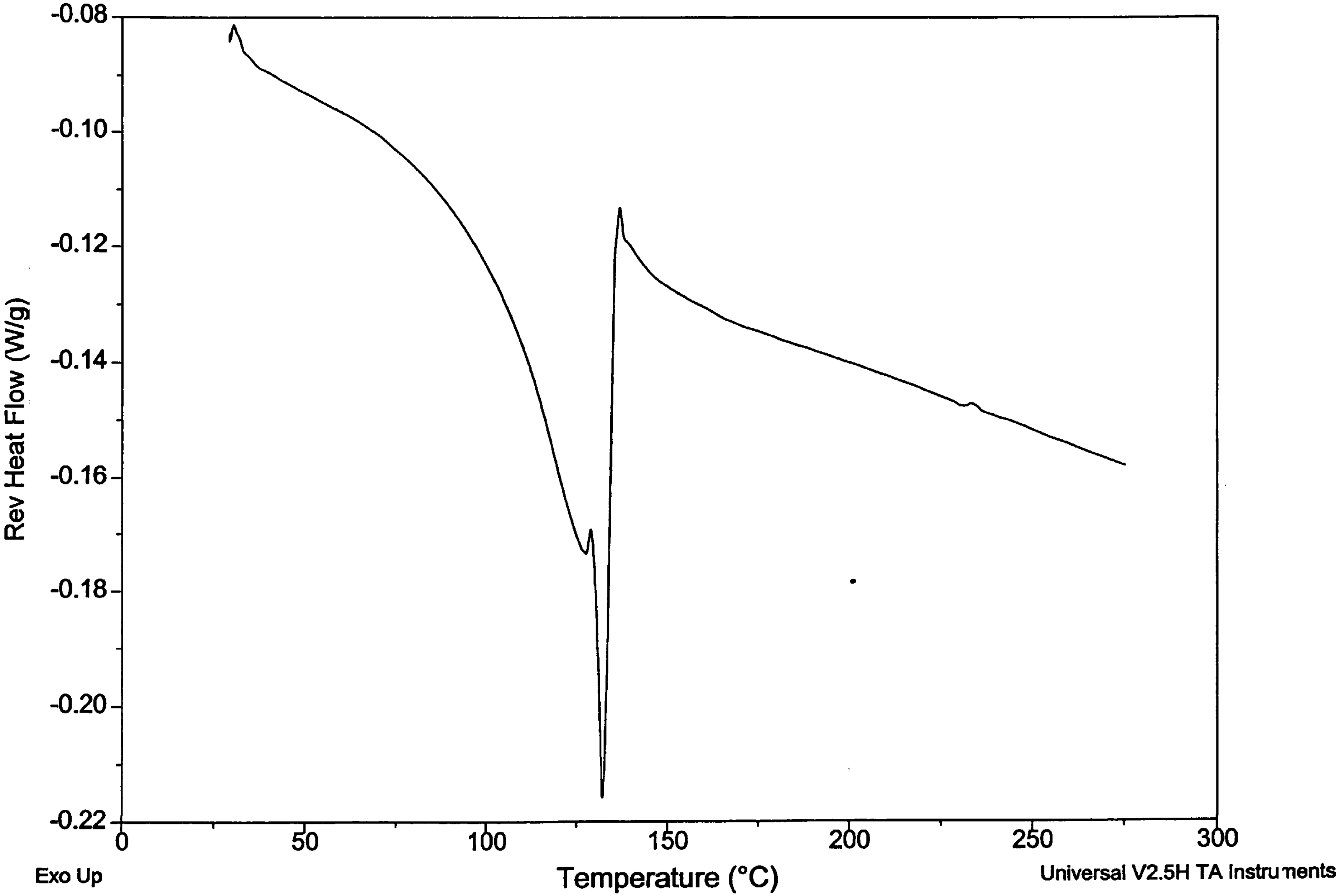
File: C:...\DSC\03614-103.052
Operator: WJM
Run Date: 8-Jun-01 16:10



Sample: HVAC Ducts
Size: 5.0000 mg
Method: MDSC Method
Comment: Honda Civic: HVAC Ducts

DSC

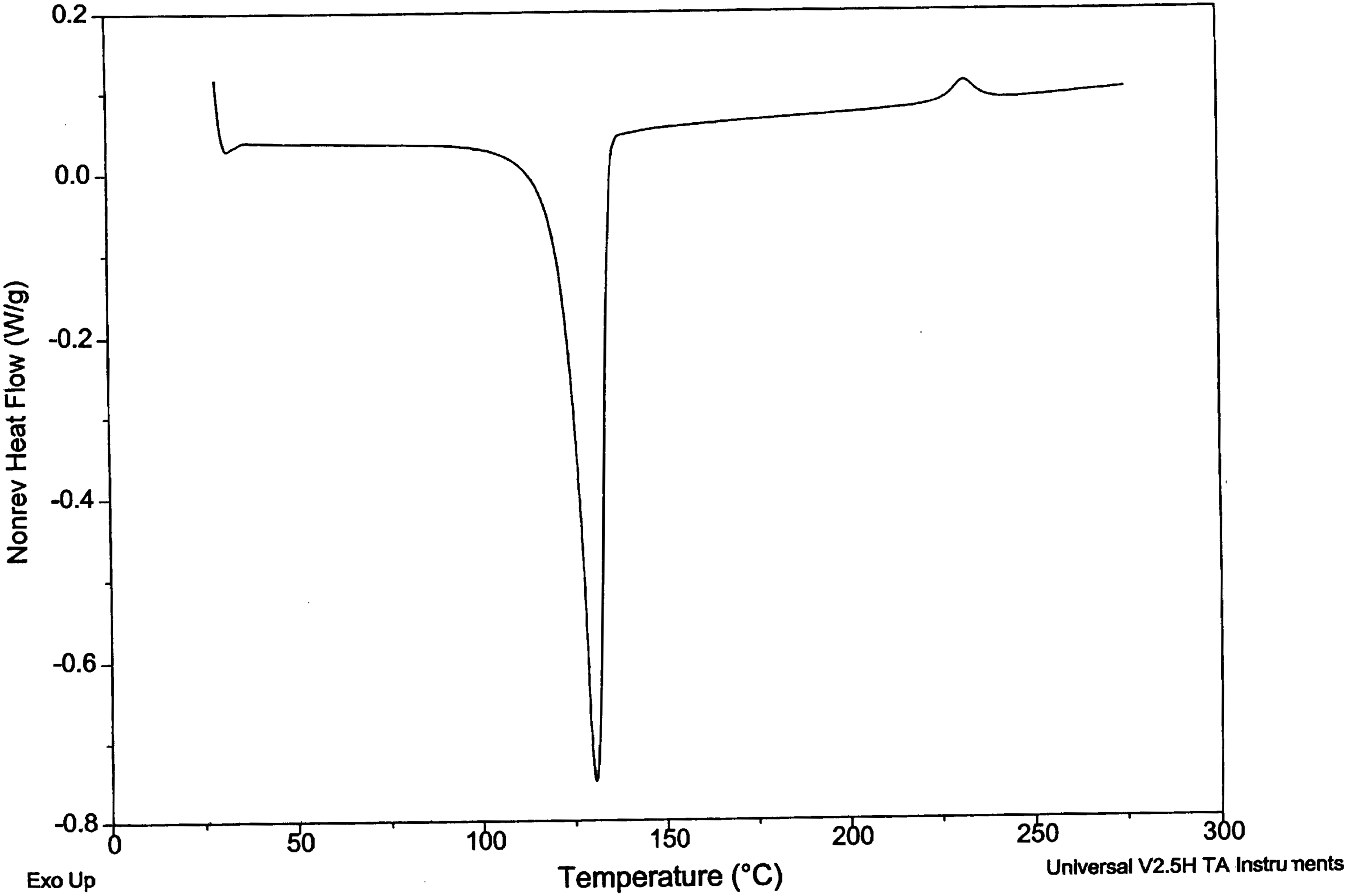
File: C:...\DSC\03614-103.052
Operator: WJM
Run Date: 8-Jun-01 16:10



Sample: HVAC Ducts
Size: 5.0000 mg
Method: MDSC Method
Comment: Honda Civic: HVAC Ducts

DSC

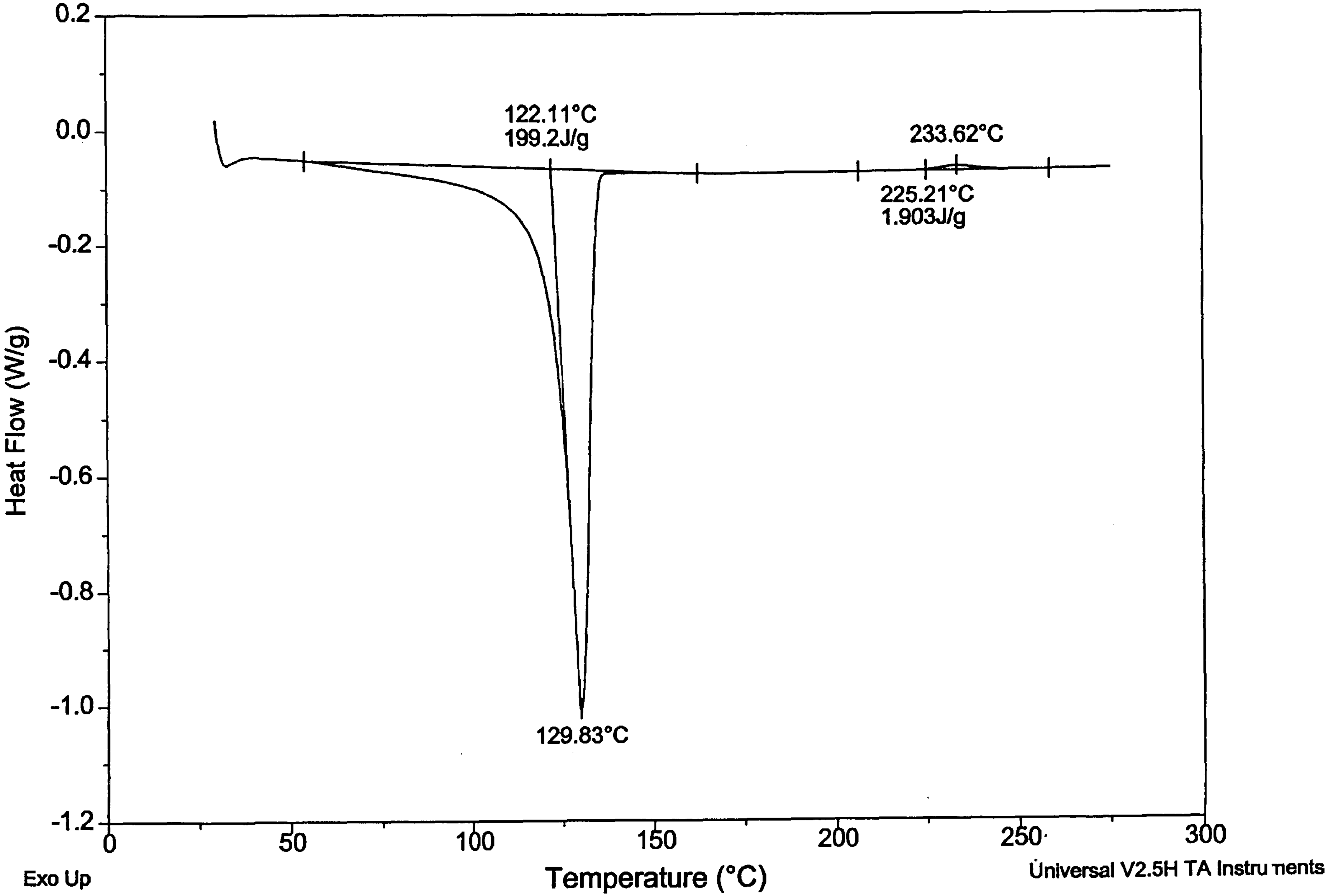
File: C:...\DSC\03614-103.052
Operator: WJM
Run Date: 8-Jun-01 16:10



Sample: HVAC Ducts (run 2)
Size: 4.6700 mg
Method: MDSC Method
Comment: Honda Civic: HVAC Ducts

DSC

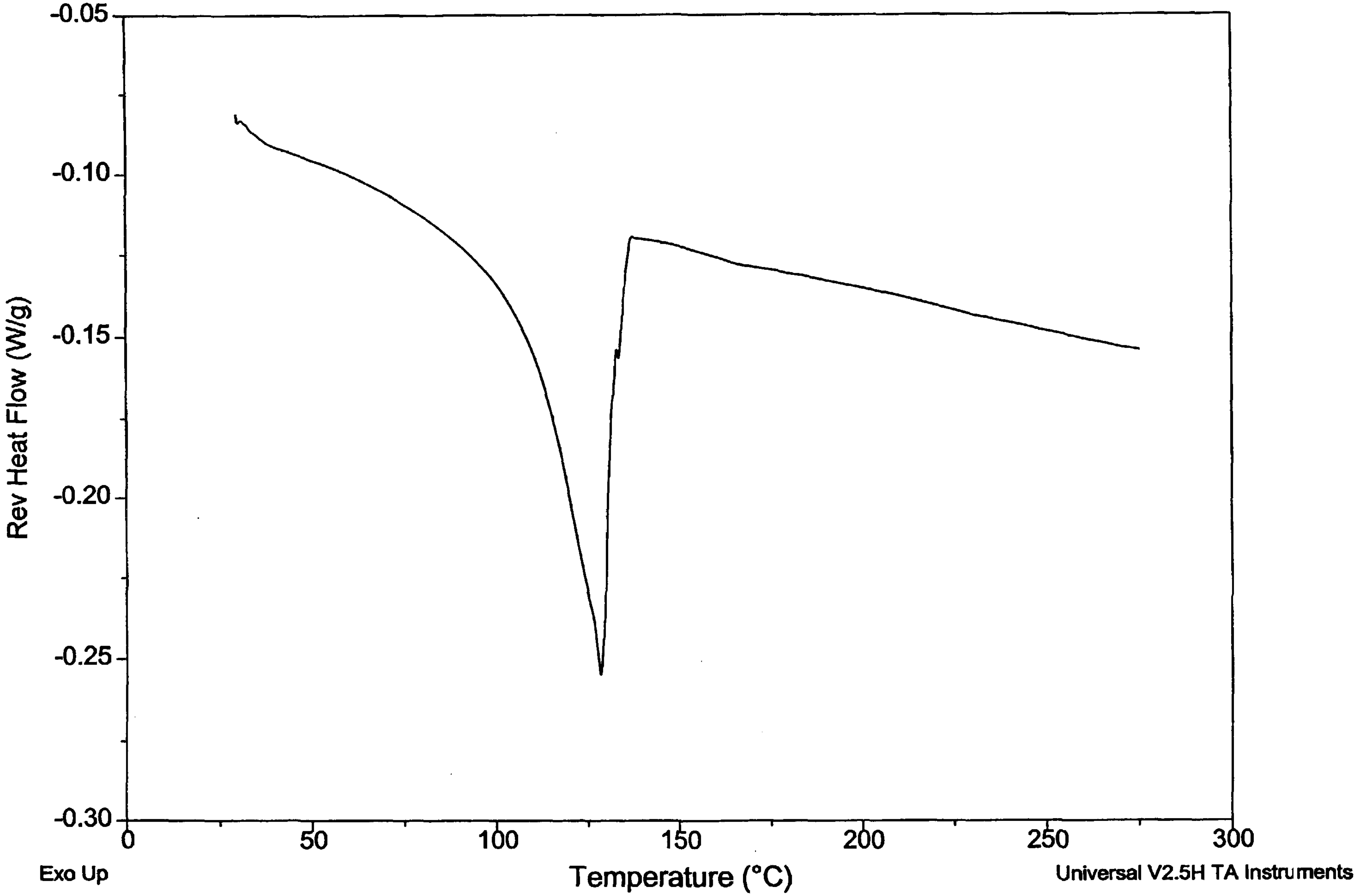
File: C:...\DSC\03614-103.053
Operator: WJM
Run Date: 11-Jun-01 08:03



Sample: HVAC Ducts (run 2)
Size: 4.6700 mg
Method: MDSC Method
Comment: Honda Civic: HVAC Ducts

DSC

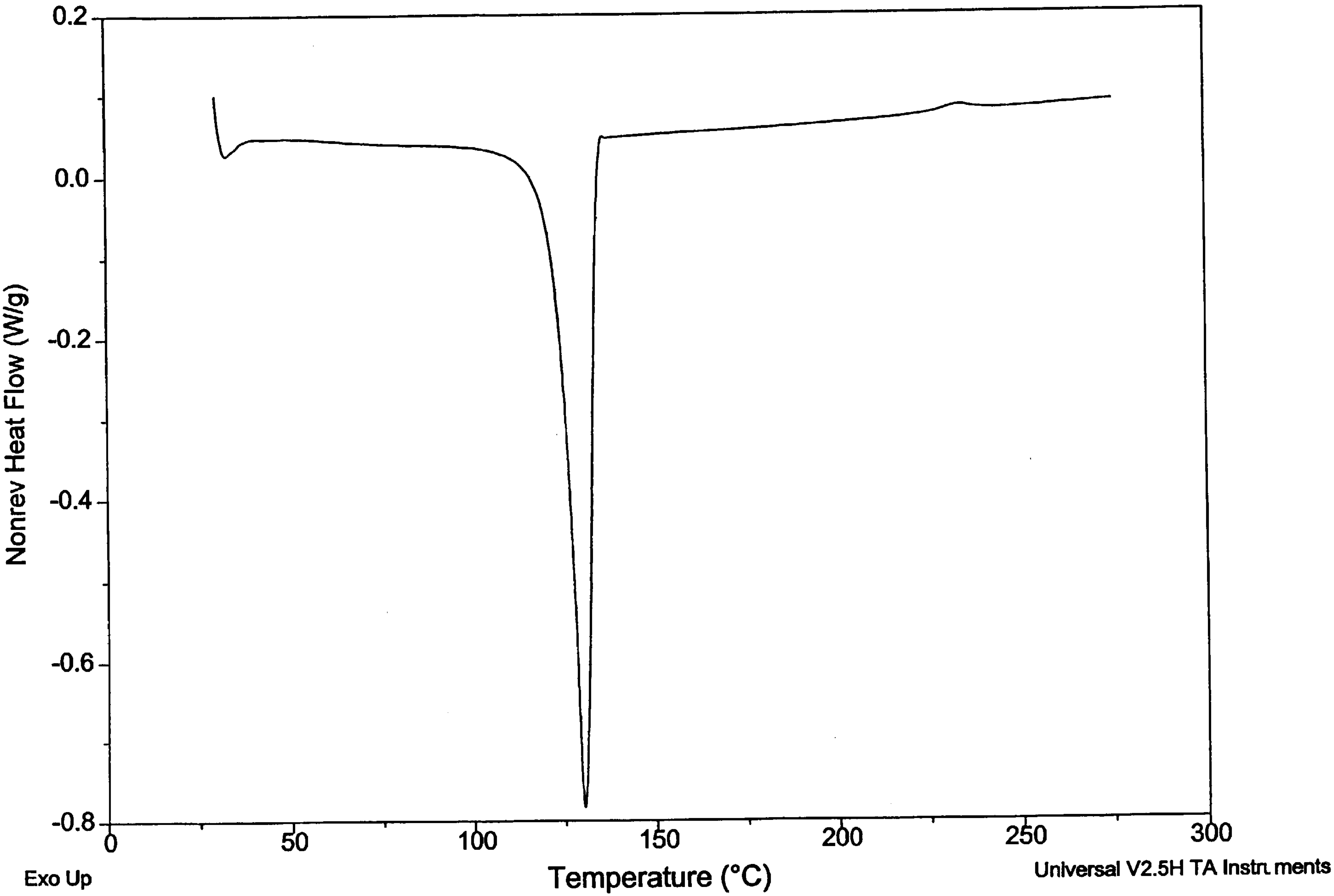
File: C:...\DSC\03614-103.053
Operator: WJM
Run Date: 11-Jun-01 08:03



Sample: HVAC Ducts (run 2)
Size: 4.6700 mg
Method: MDSC Method
Comment: Honda Civic; HVAC Ducts

DSC

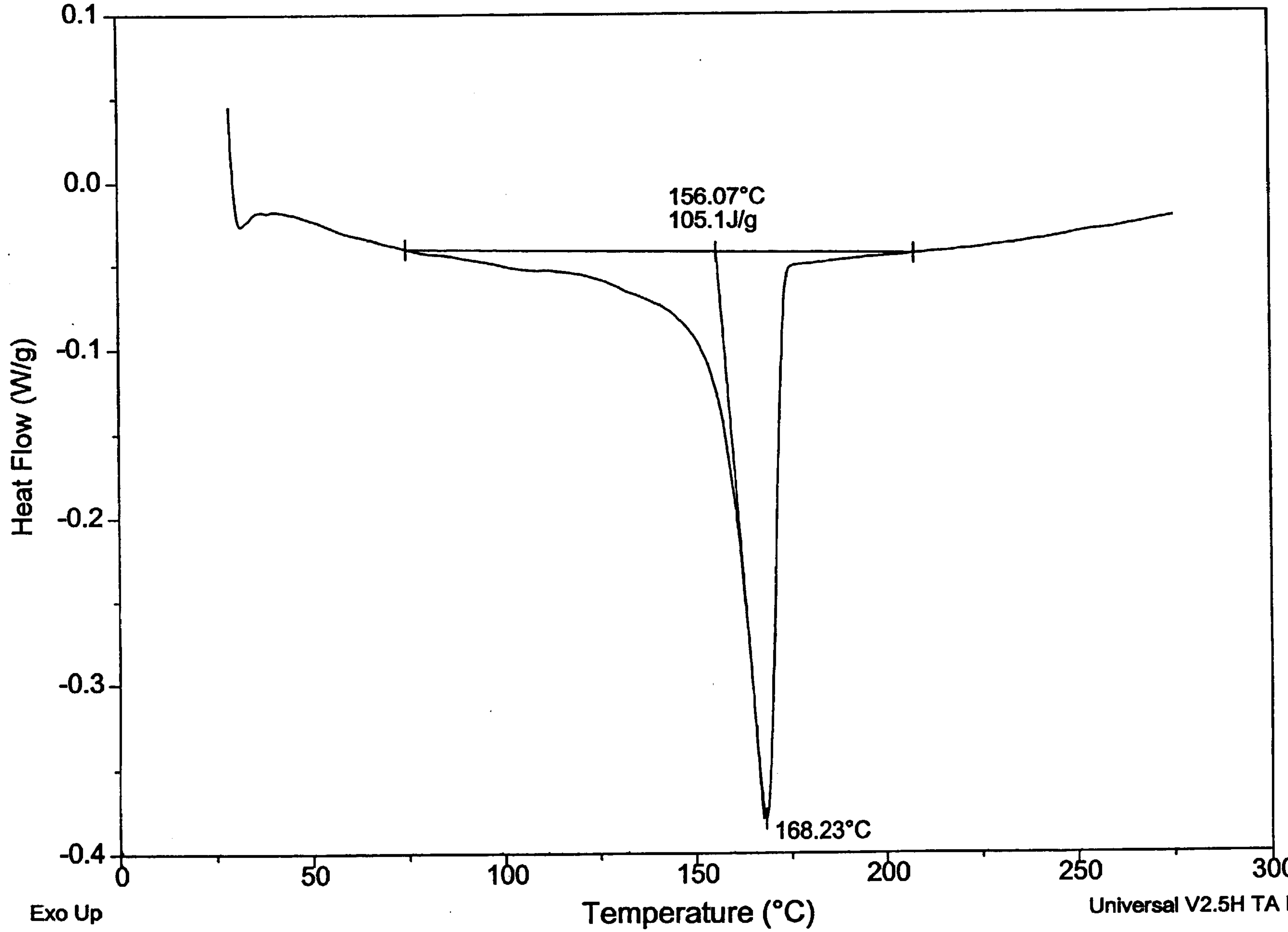
File: C:...\DSC\03614-103.053
Operator: WJM
Run Date: 11-Jun-01 08:03



Sample: Wiring Harness
Size: 3.5000 mg
Method: MDSC Method
Comment: Honda Civic: Wiring Harness

DSC

File: C:...\DSC\03614-103.054
Operator: WJM
Run Date: 11-Jun-01 10:37

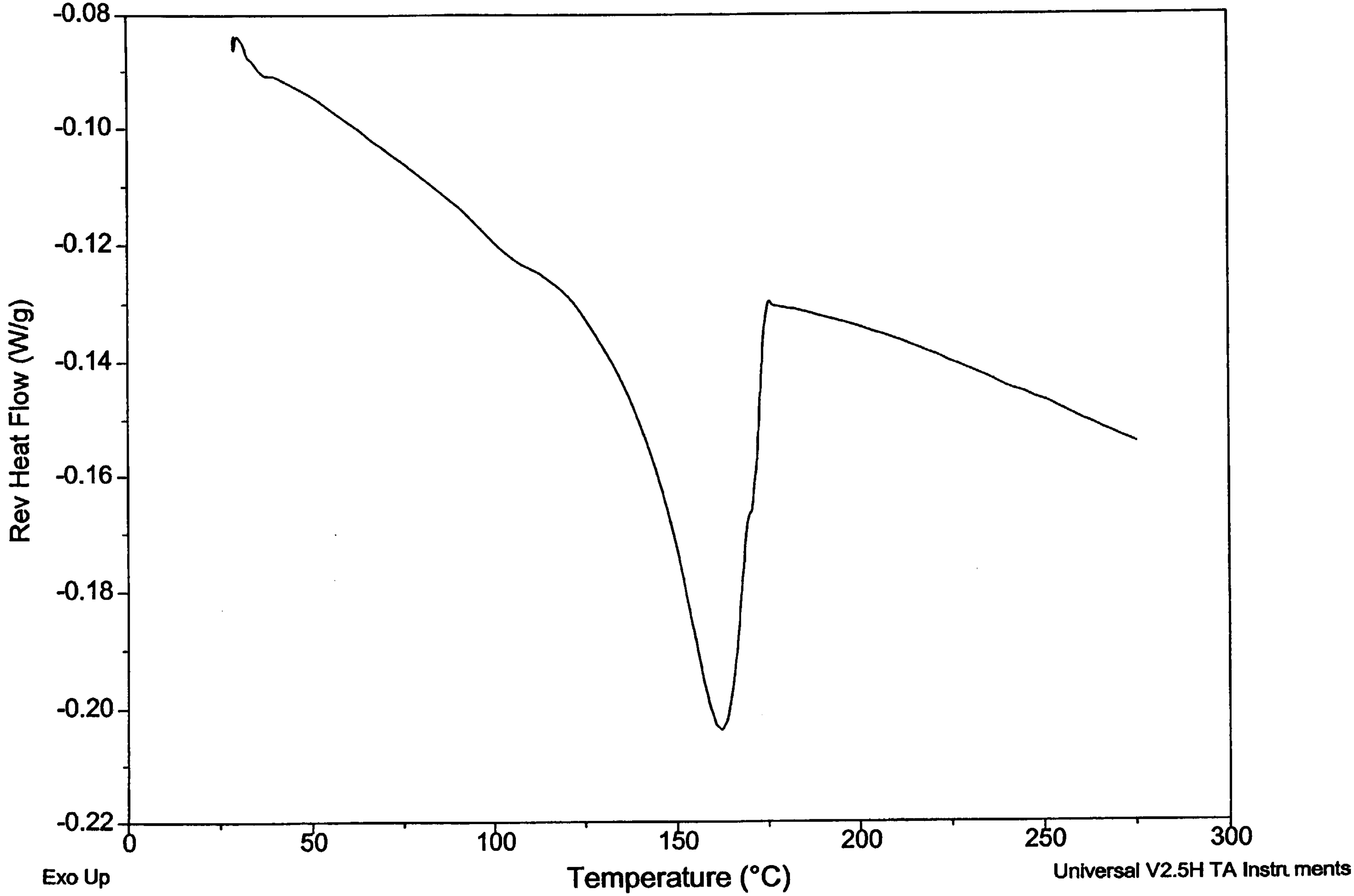


Universal V2.5H TA Instruments

Sampie: Wiring Harness
Size: 3.5000 mg
Method: MDSC Method
Comment: Honda Civic: Wiring Harness

DSC

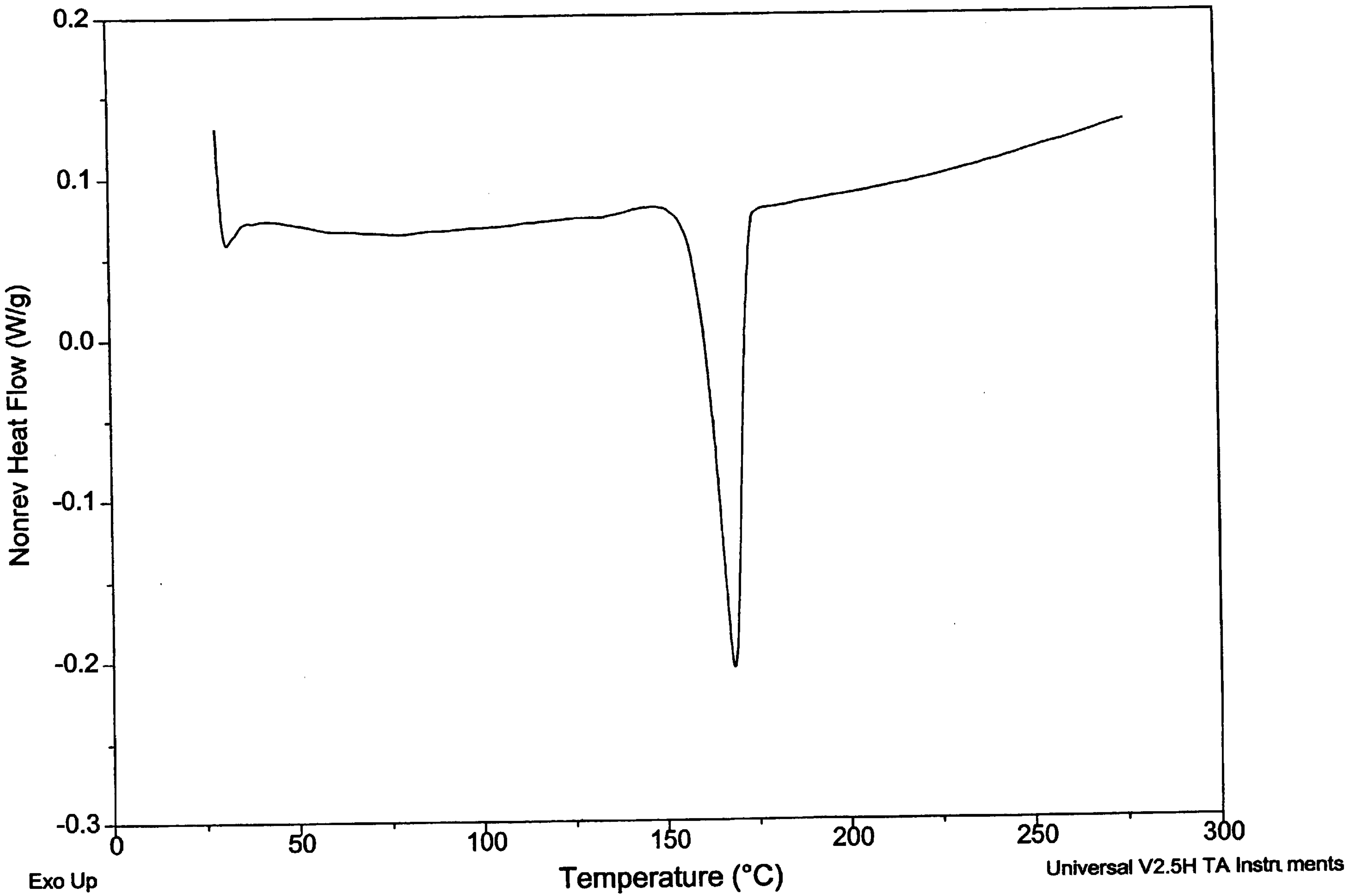
File: C:...\DSC\03614-103.054
Operator: WJM
Run Date: 11-Jun-01 10:37



Sample: Wiring Harness
Size: 3.5000 mg
Method: MDSC Method
Comment: Honda Civic: Wiring Harness

DSC

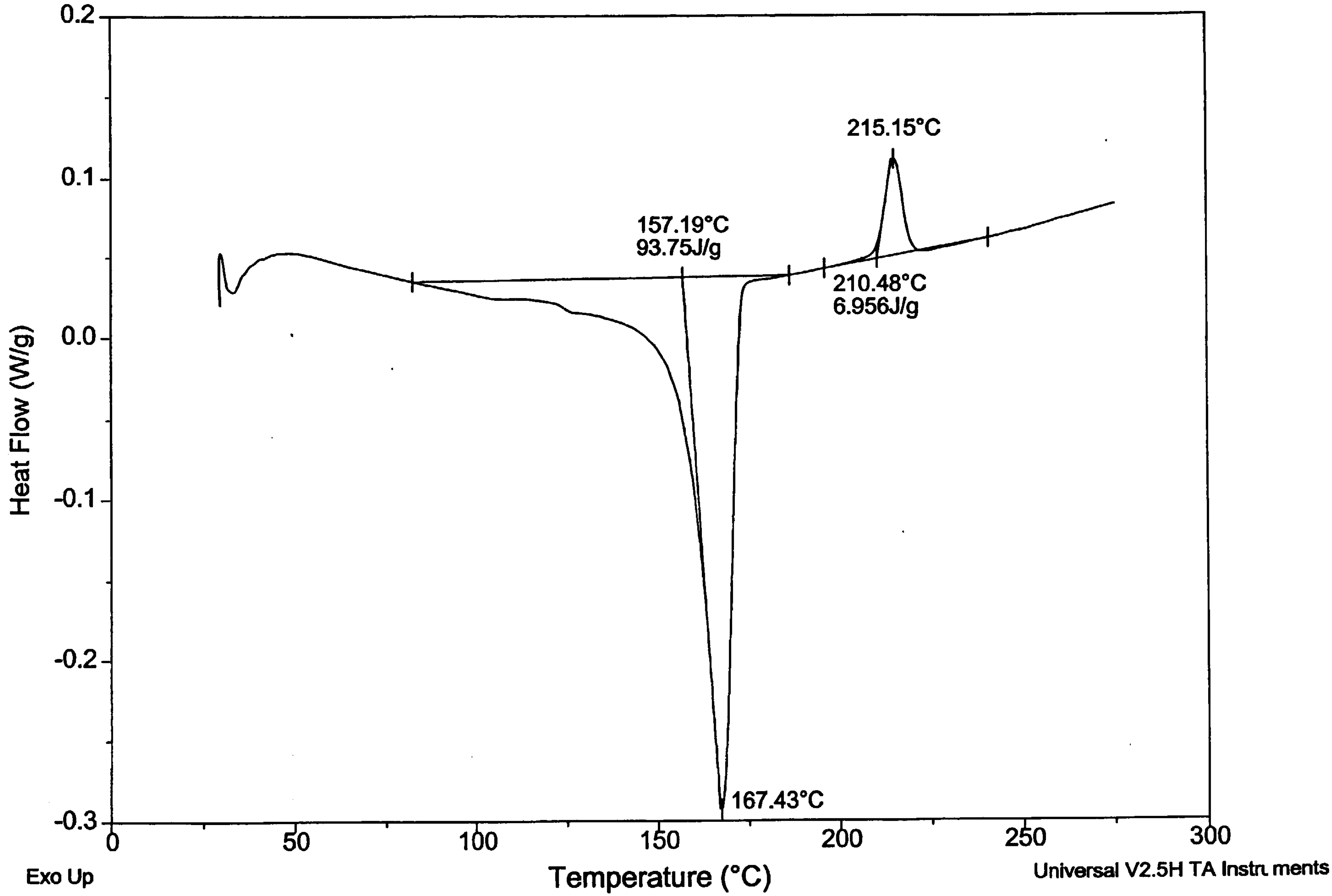
File: C:...\DSC\03614-103.054
Operator: WJM
Run Date: 11-Jun-01 10:37



Sample: Wiring Harness (run 2)
Size: 2.5000 mg
Method: MDSC Method
Comment: Honda Civic: Wiring Harness

DSC

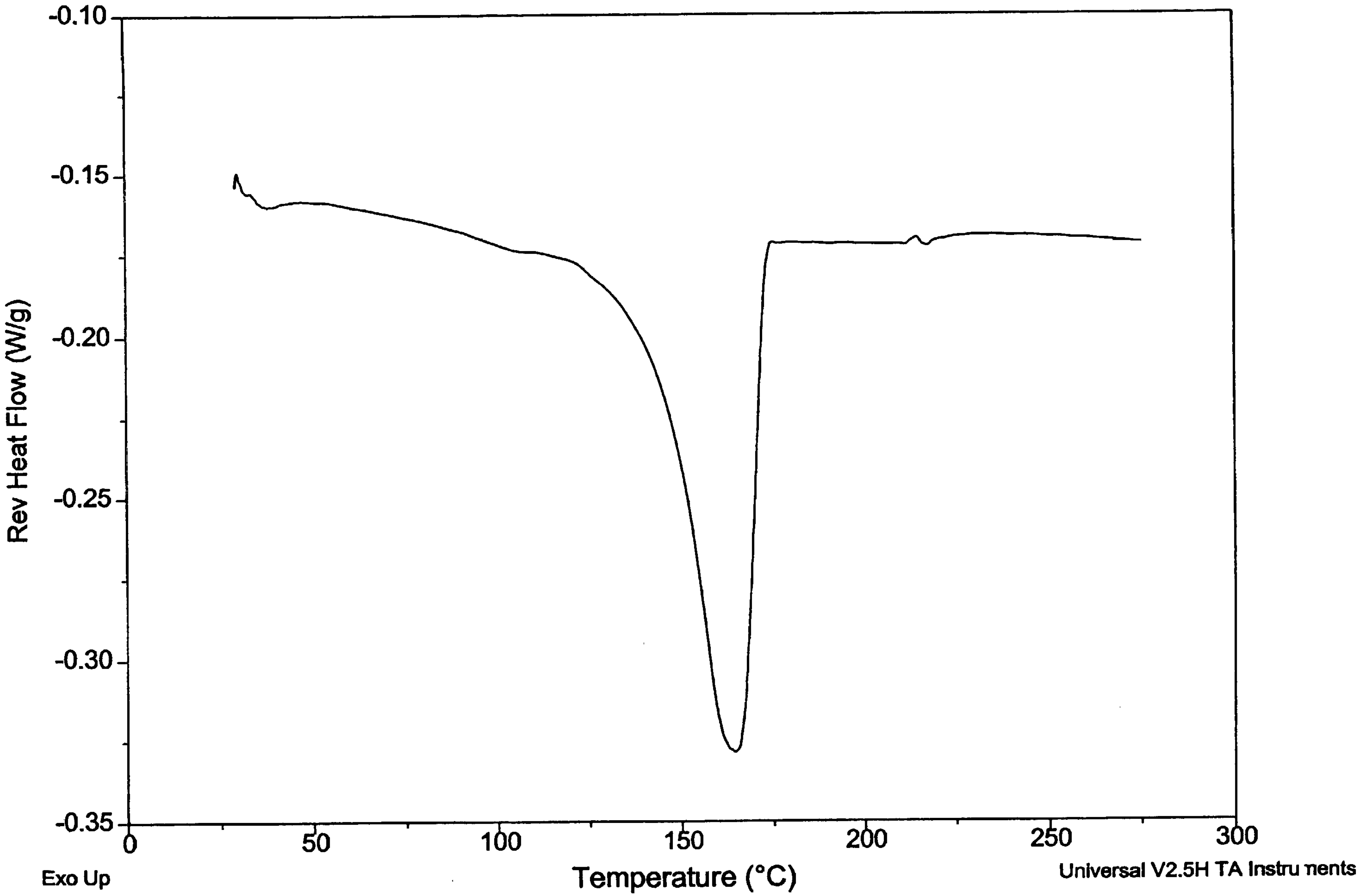
File: C:...\DSC\03614-103.055
Operator: WJM
Run Date: 11-Jun-01 13:33



Sample: Wiring Harness (run 2)
Size: 2.5000 mg
Method: MDSC Method
Comment: Honda Civic: Wiring Harness

DSC

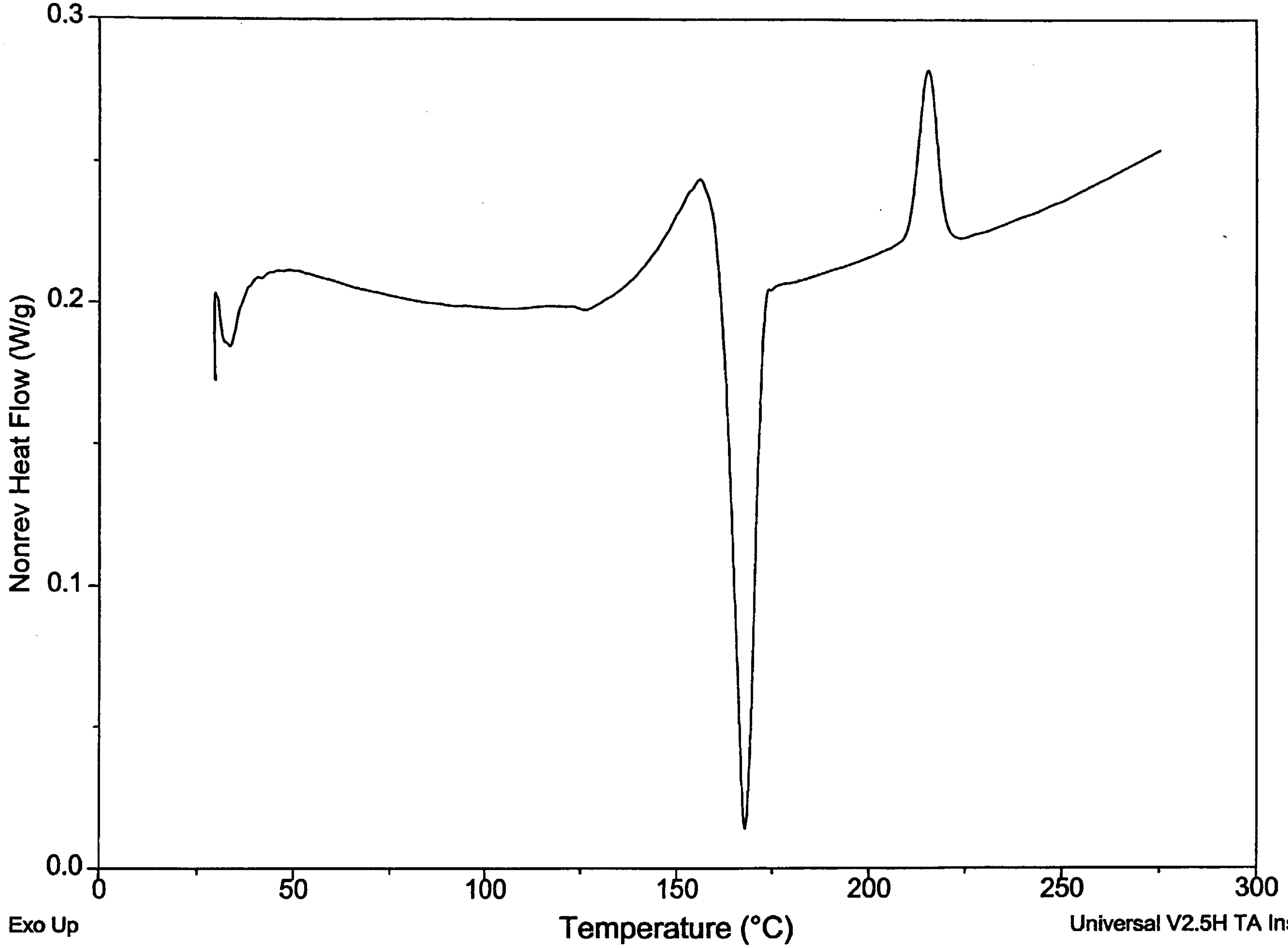
File: C:...\DSC\03614-103.055
Operator: WJM
Run Date: 11-Jun-01 13:33



Sampie: Wiring Harness (run 2)
Size: 2.5000 mg
Method: MDSC Method
Comment: Honda Civic: Wiring Harness

DSC

File: C:...\DSC\03614-103.055
Operator: WJM
Run Date: 11-Jun-01 13:33

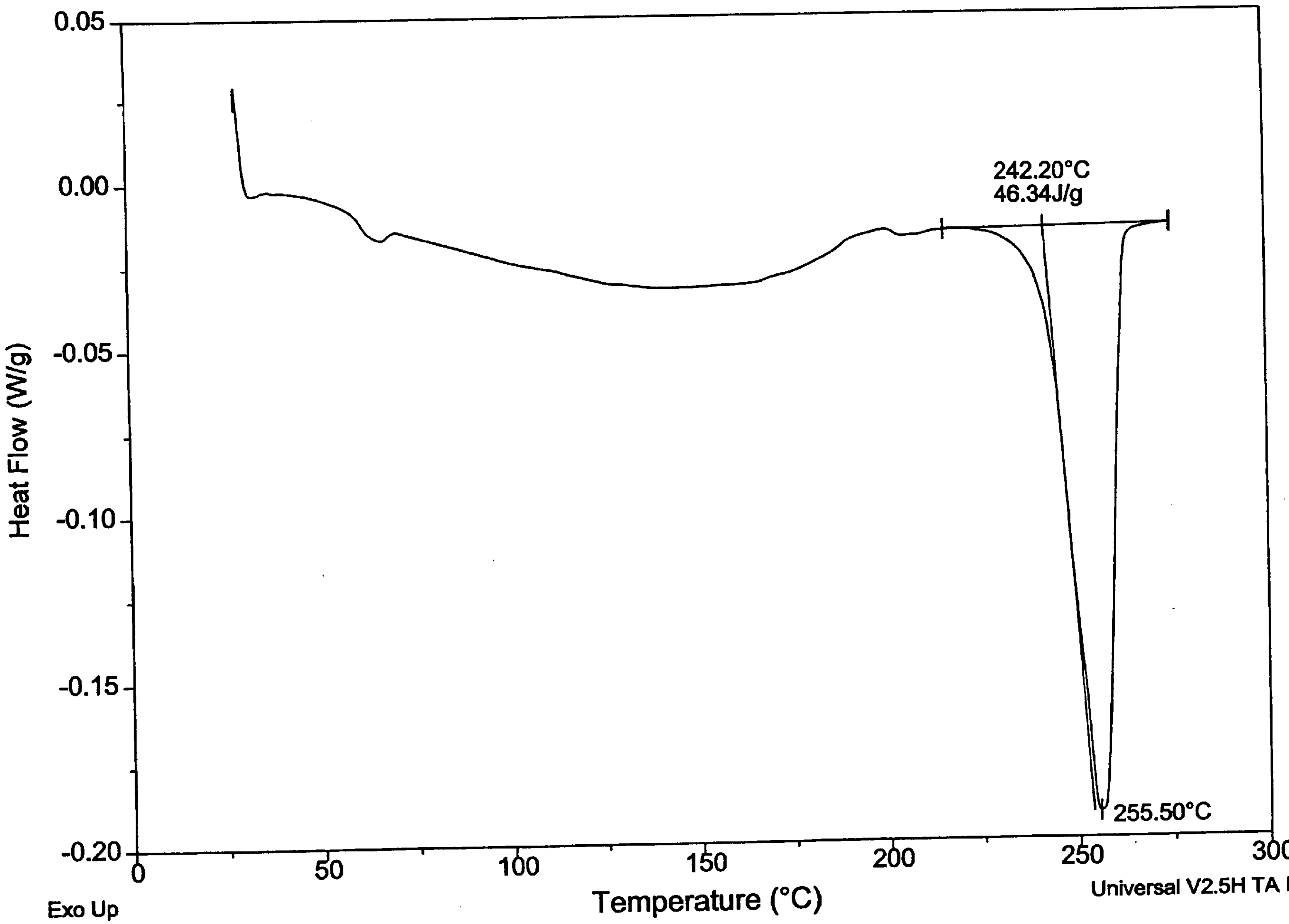


Universal V2.5H TA Instruments

Sample: Carpet - light colored part
Size: 8.2400 mg
Method: MDSC Method
Comment: Honda Civic: Carpet - Light colored part

DSC

File: C:...\DSC\03614-103.056
Operator: WJM
Run Date: 11-Jun-01 15:47

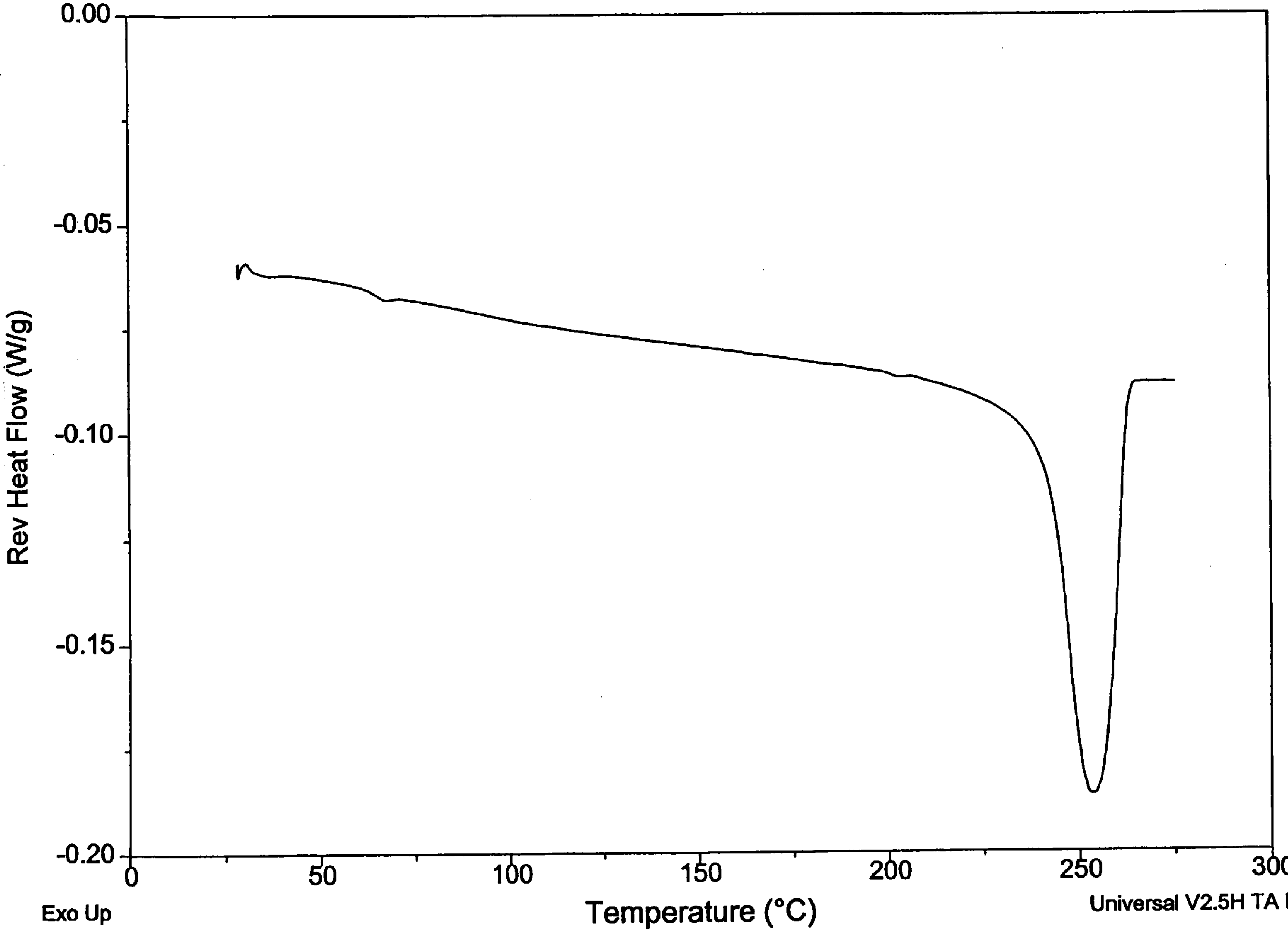


Universal V2.5H TA Instruments

Sample: Carpet - light colored part
Size: 8.2400 mg
Method: MDSC Method
Comment: Honda Civic: Carpet - Light colored part

DSC

File: C:...\DSC\03614-103.056
Operator: WJM
Run Date: 11-Jun-01 15:47

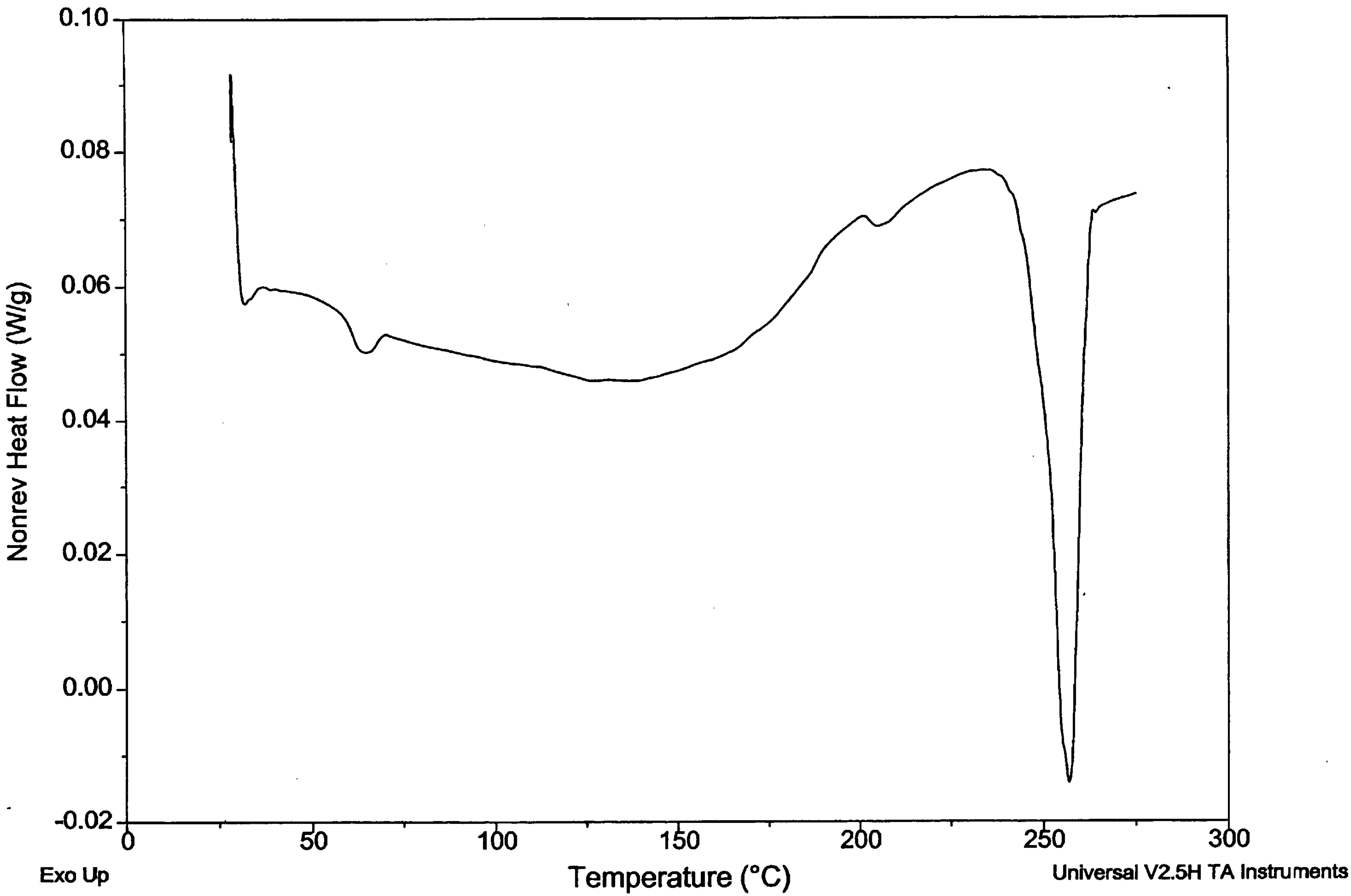


Universal V2.5H TA Instruments

Sample: Carpet - light colored part
Size: 8.2400 mg
Method: MDSC Method
Comment: Honda Civic: Carpet - Light colored part

DSC

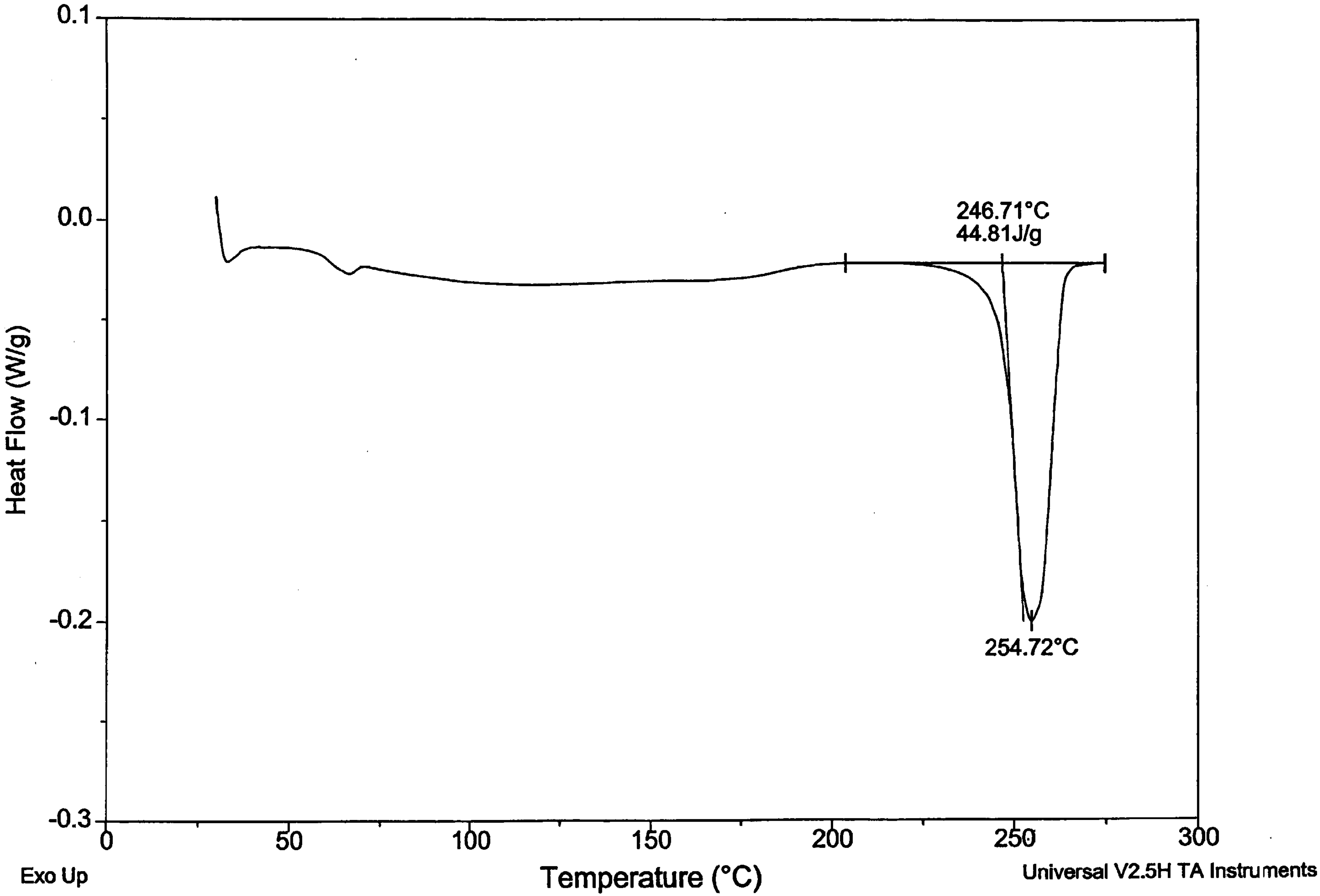
File: C:...\DSC\03614-103.056
Operator: WJM
Run Date: 11-Jun-01 15:47



Sample: Carpet - light colored (run 2)
Size: 10.6100 mg
Method: MDSC Method
Comment: Honda Civic: Carpet - Light colored part

DSC

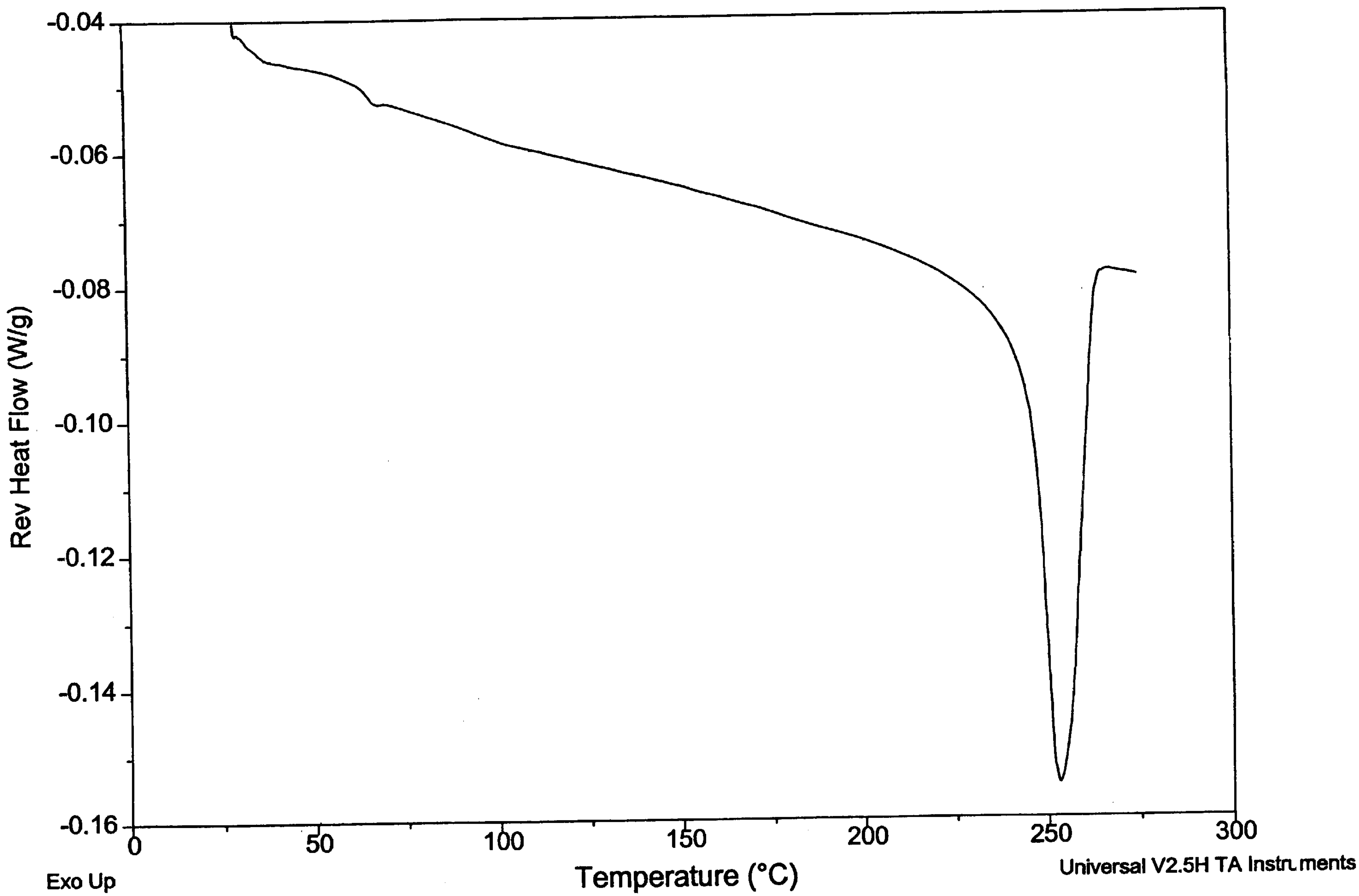
File: C:...\DSC\03614-103.057
Operator: WJM
Run Date: 12-Jun-01 08:13



Sample: Carpet - light colored (run 2)
Size: 10.6100 mg
Method: MDSC Method
Comment: Honda Civic: Carpet - Light colored part

DSC

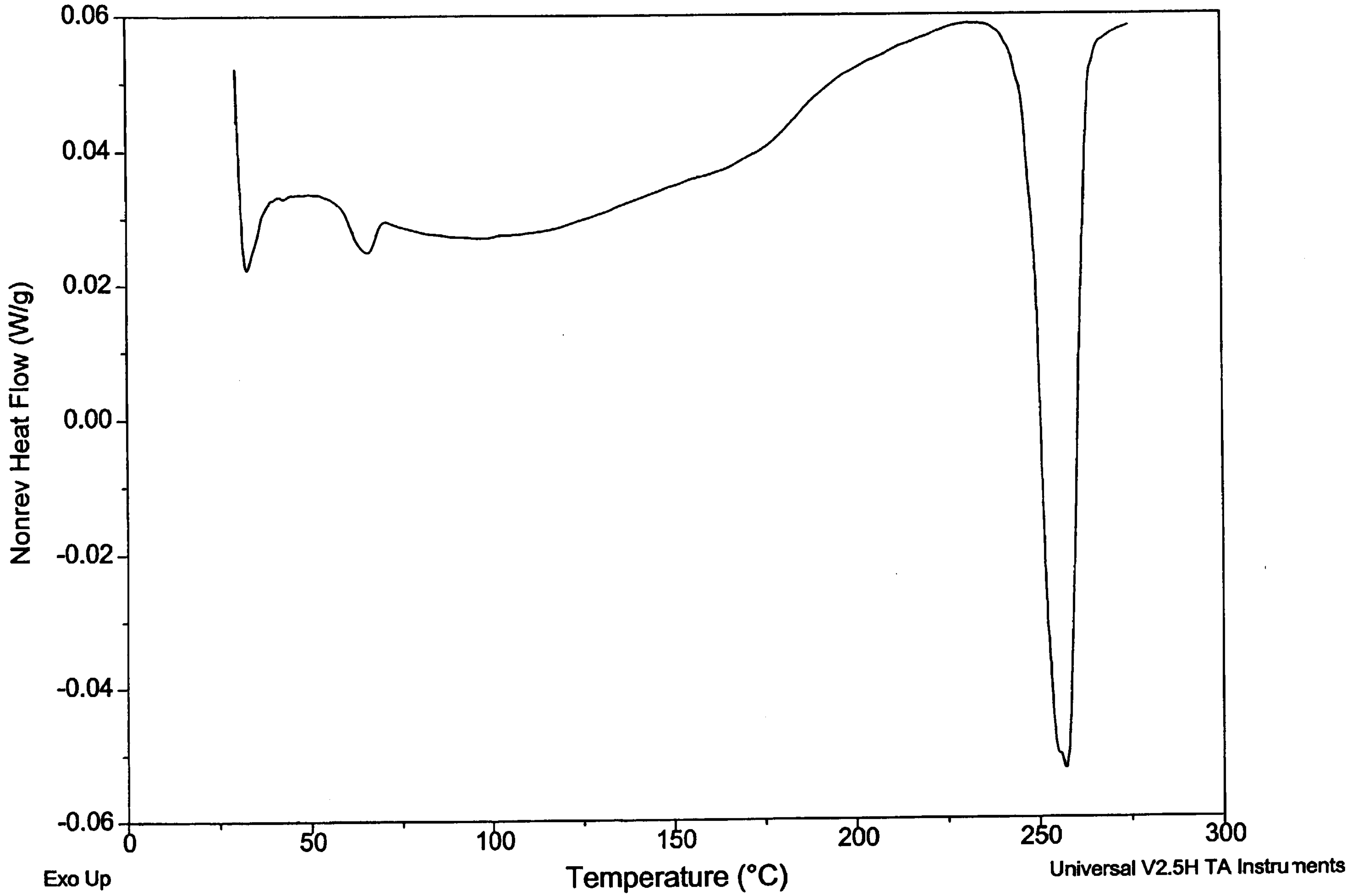
File: C:...\DSC\03614-103.057
Operator: WJM
Run Date: 12-Jun-01 08:13



Sample: Carpet - light colored (run 2)
Size: 10.6100 mg
Method: MDSC Method
Comment: Honda Civic: Carpet - Light colored part

DSC

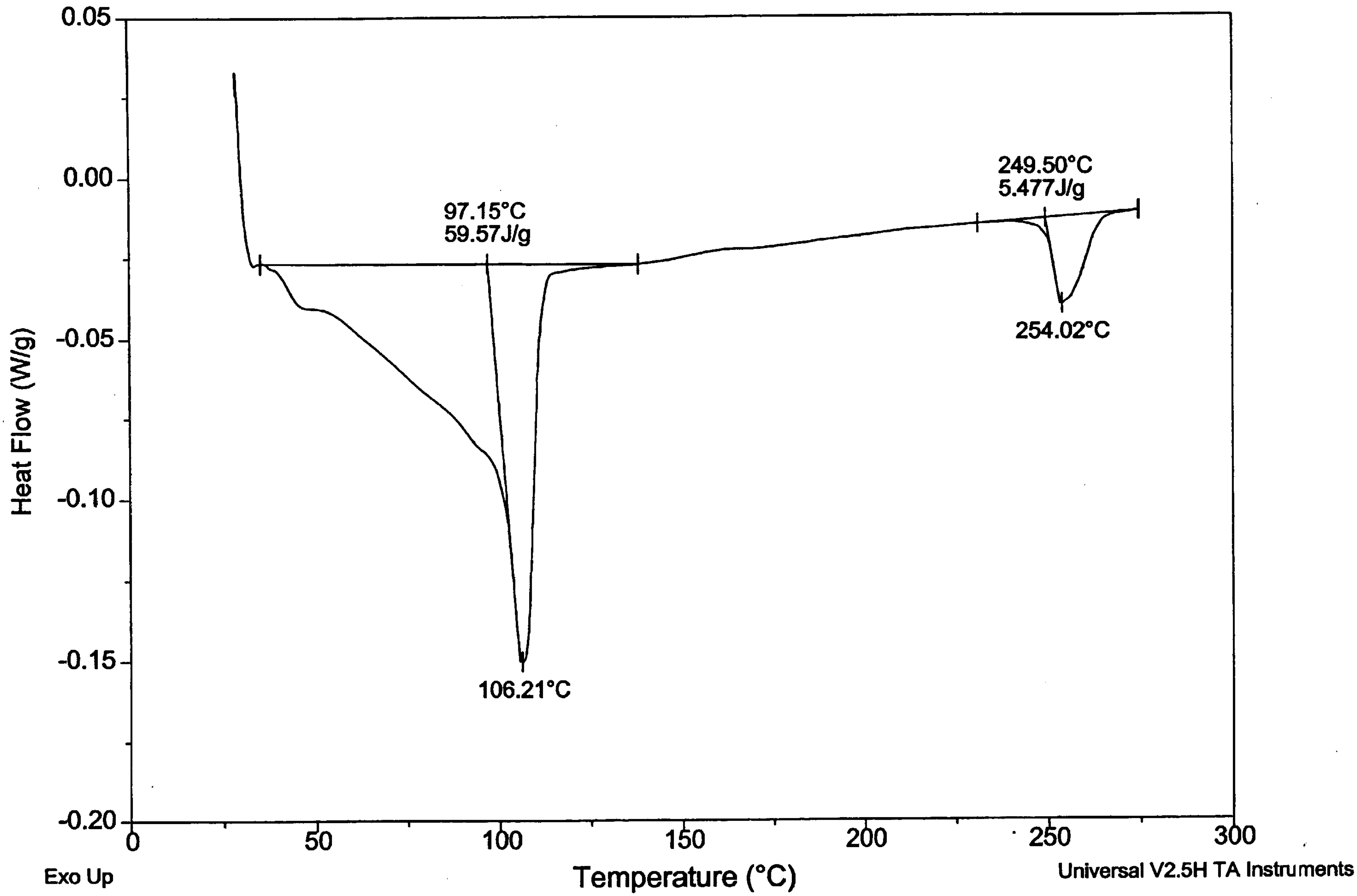
File: C:...\DSC\03614-103.057
Operator: WJM
Run Date: 12-Jun-01 08:13

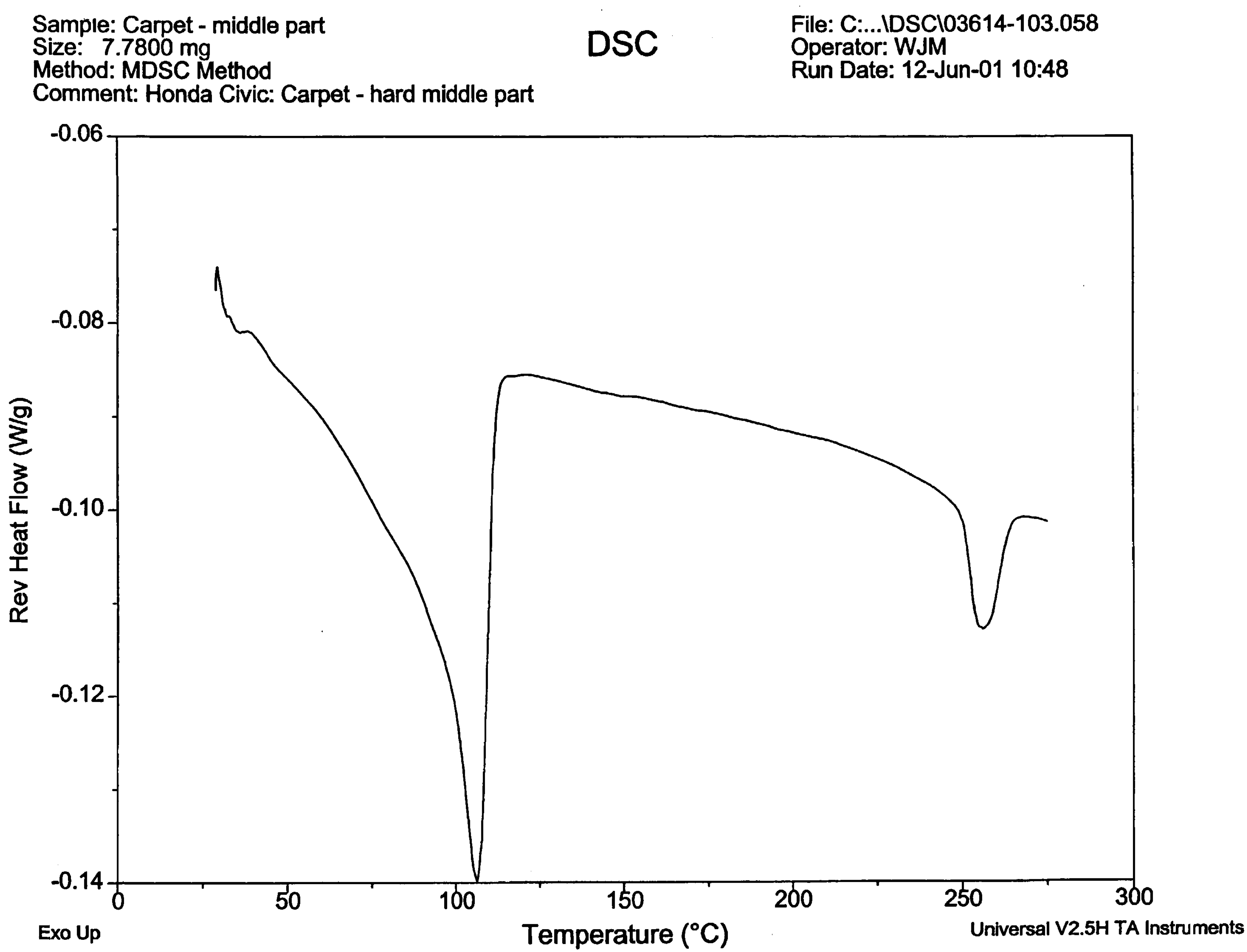


Sample: Carpet - middle part
Size: 7.7800 mg
Method: MDSC Method
Comment: Honda Civic: Carpet - hard middle part

DSC

File: C:...\DSC\03614-103.058
Operator: WJM
Run Date: 12-Jun-01 10:48

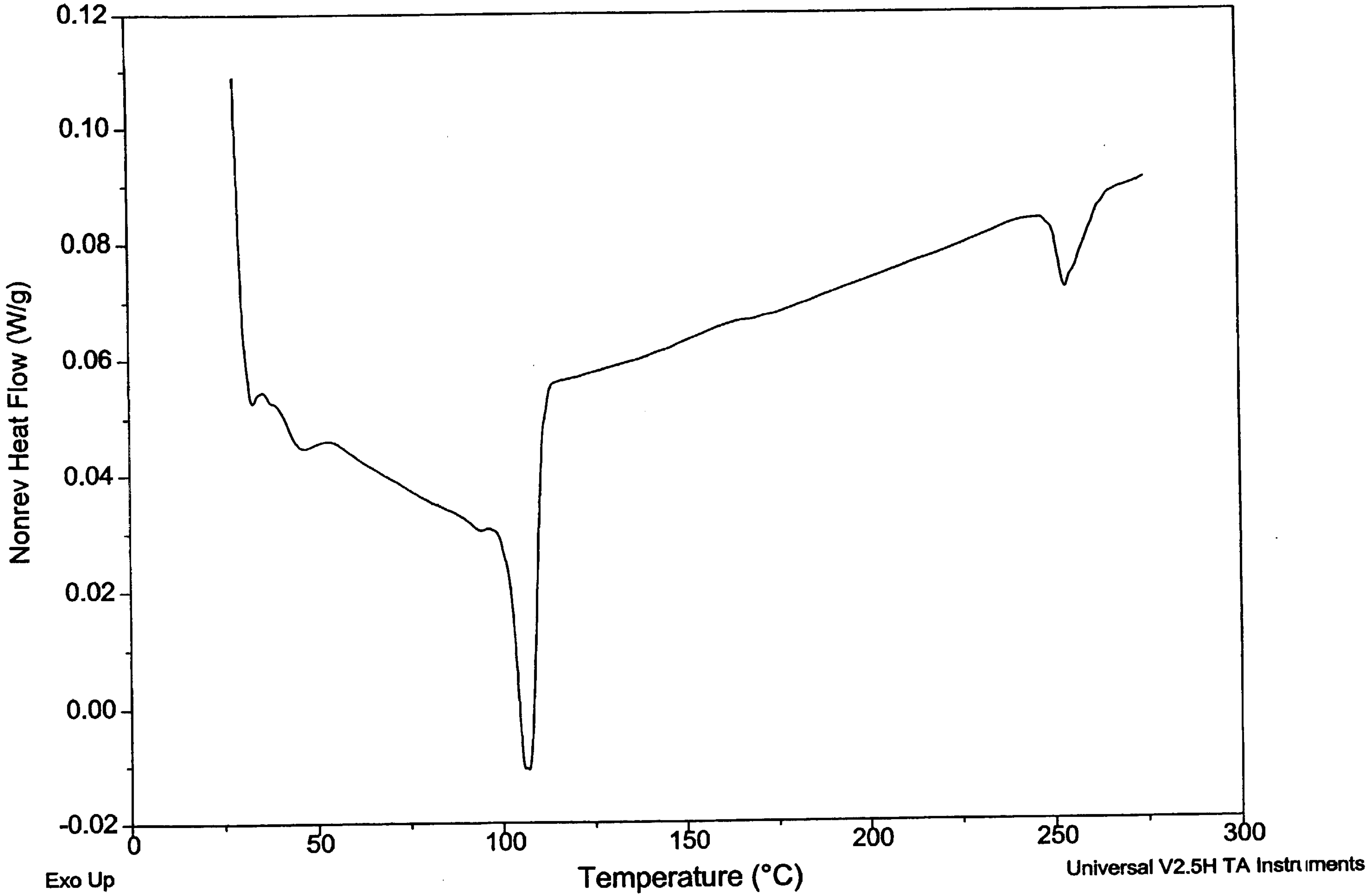



Sample: Carpet - middle part
Size: 7.7800 mg
Method: MDSC Method
Comment: Honda Civic: Carpet - hard middle part
DSC
File: C:...\DSC\03614-103.058
Operator: WJM
Run Date: 12-Jun-01 10:48
-0.06
-0.08
-0.10
-0.12
-0.14
Rev Heat Flow (W/g)
0
50
100
150
200
250
300
Exo Up
Temperature (°C)
Universal V2.5H TA Instruments

Sample: Carpet - middle part
Size: 7.7800 mg
Method: MDSC Method
Comment: Honda Civic: Carpet - hard middle part

DSC

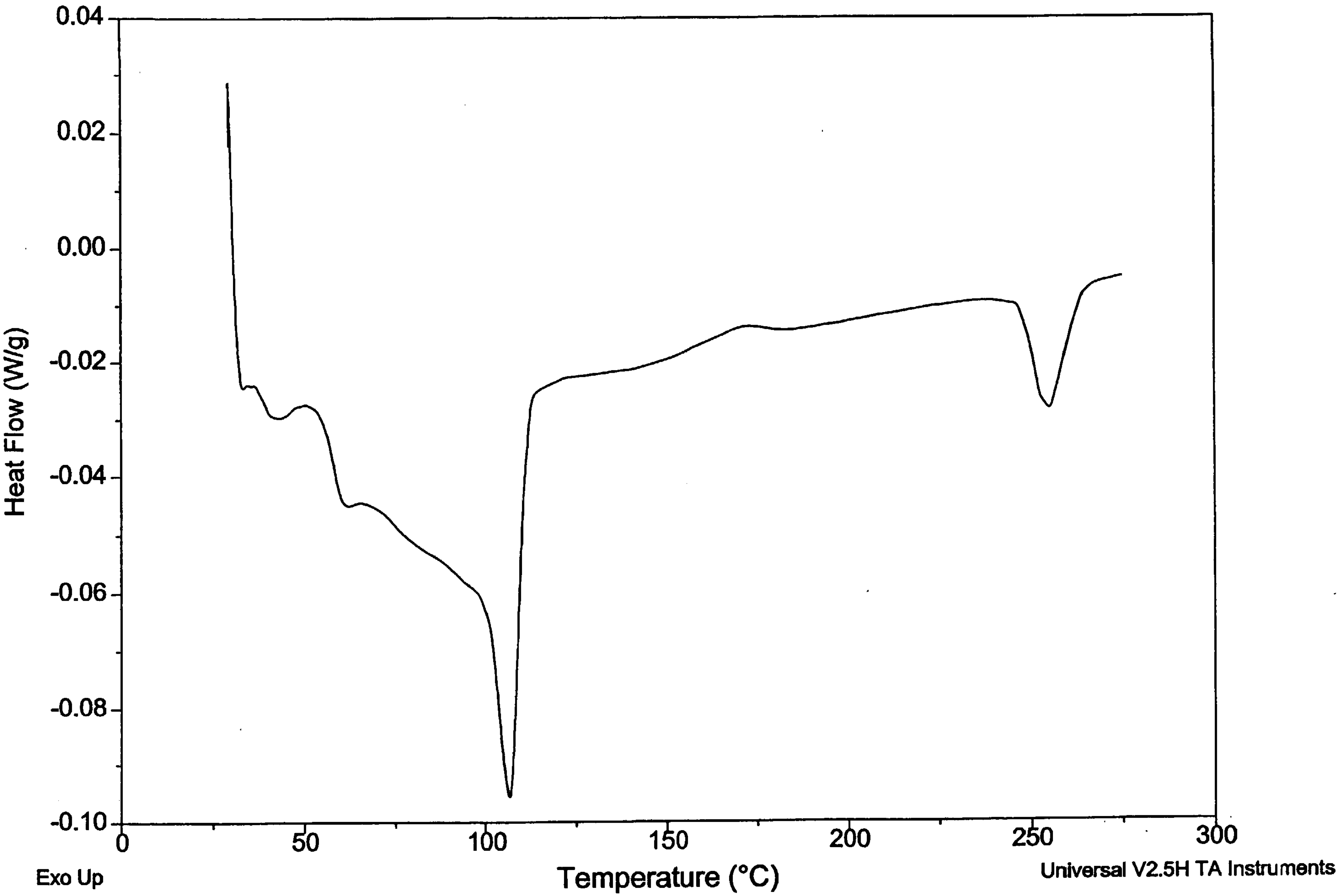
File: C:...\DSC\03614-103.058
Operator: WJM
Run Date: 12-Jun-01 10:48



Sample: Carpet - middle part (run 2)
Size: 7.5800 mg
Method: MDSC Method
Comment: Honda Civic: Carpet - hard middle part

DSC

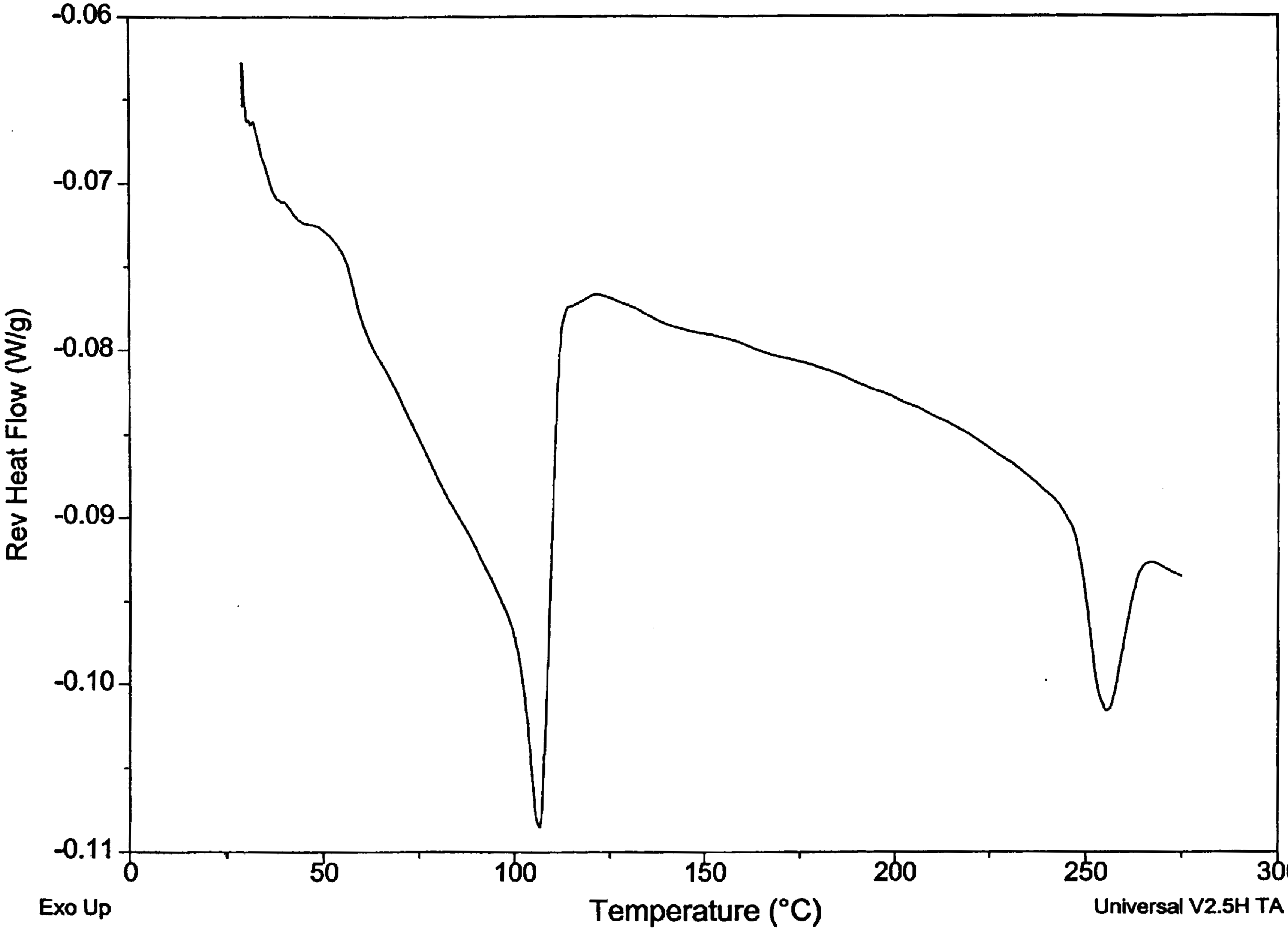
File: C:...\DSC\03614-103.059
Operator: WJM
Run Date: 12-Jun-01 13:45



Sample: Carpet - middle part (run 2)
Size: 7.5800 mg
Method: MDSC Method
Comment: Honda Civic: Carpet - hard middle part

DSC

File: C:...\DSC\03614-103.059
Operator: WJM
Run Date: 12-Jun-01 13:45

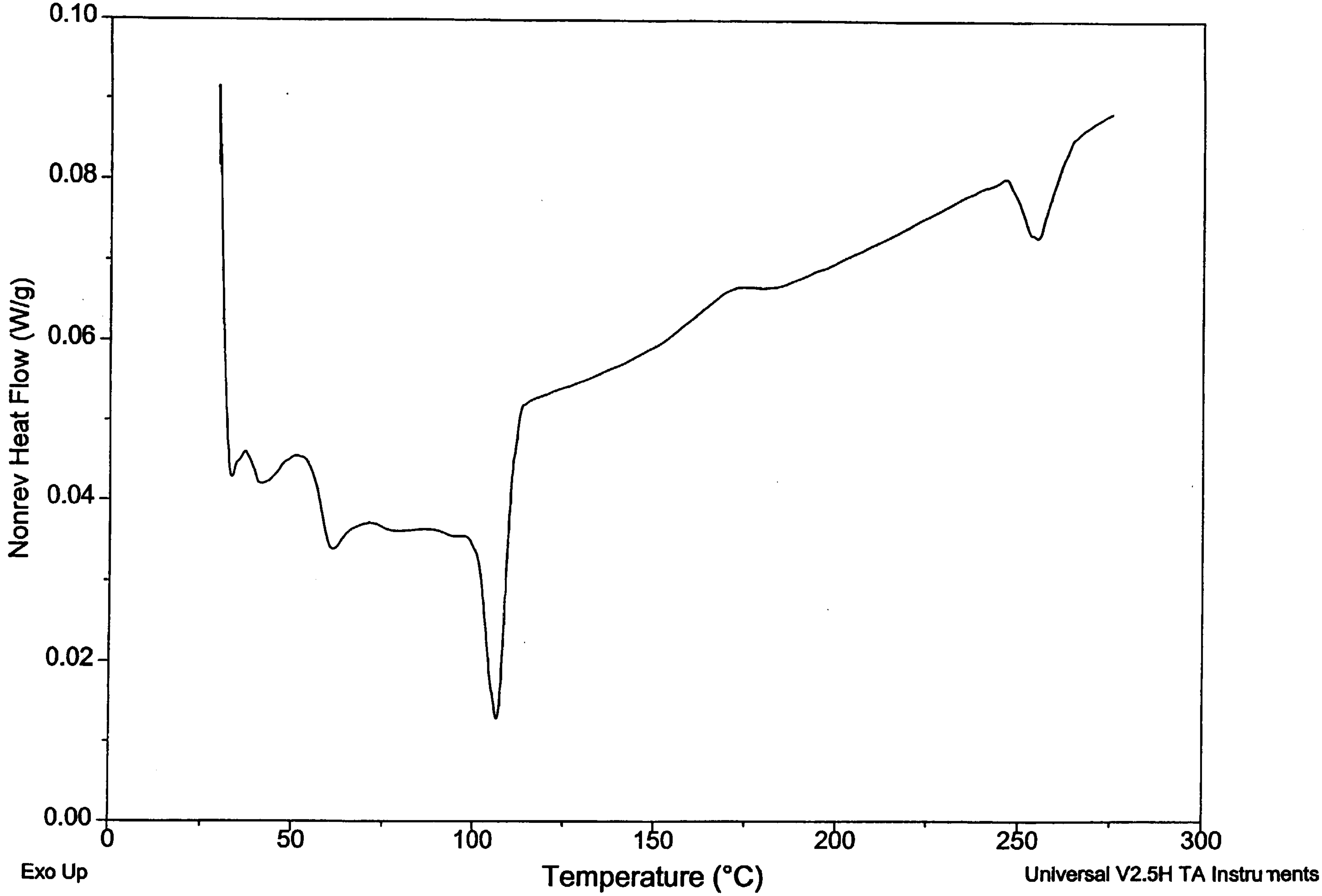


Universal V2.5H TA Instruments

Sample: Carpet - middle part (run 2)
Size: 7.5800 mg
Method: MDSC Method
Comment: Honda Civic: Carpet - hard middle part

DSC

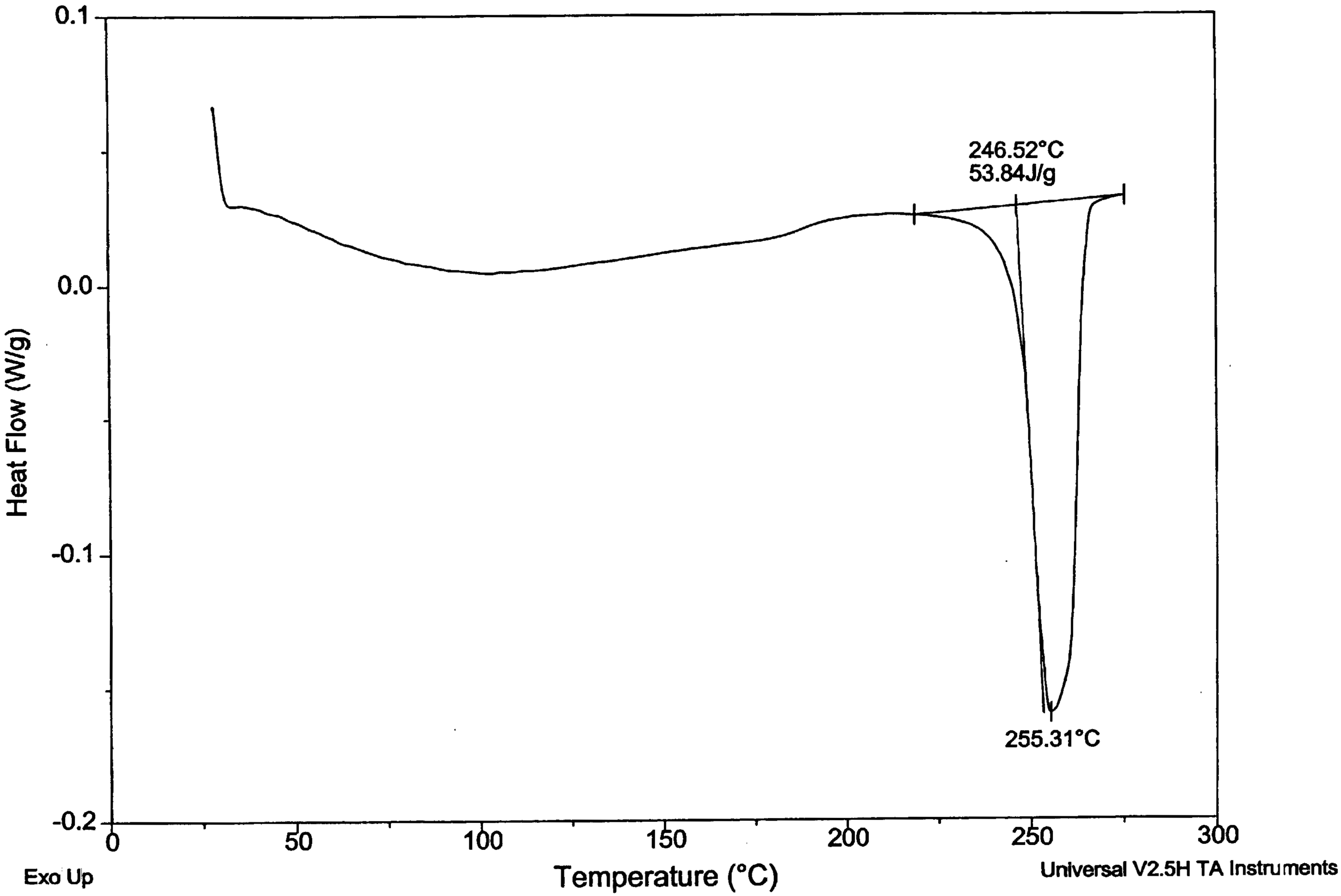
File: C:...\DSC\03614-103.059
Operator: WJM
Run Date: 12-Jun-01 13:45



Sample: Carpet - gray part
Size: 6.0800 mg
Method: MDSC Method
Comment: Honda Civic: Carpet - gray fiber part

DSC

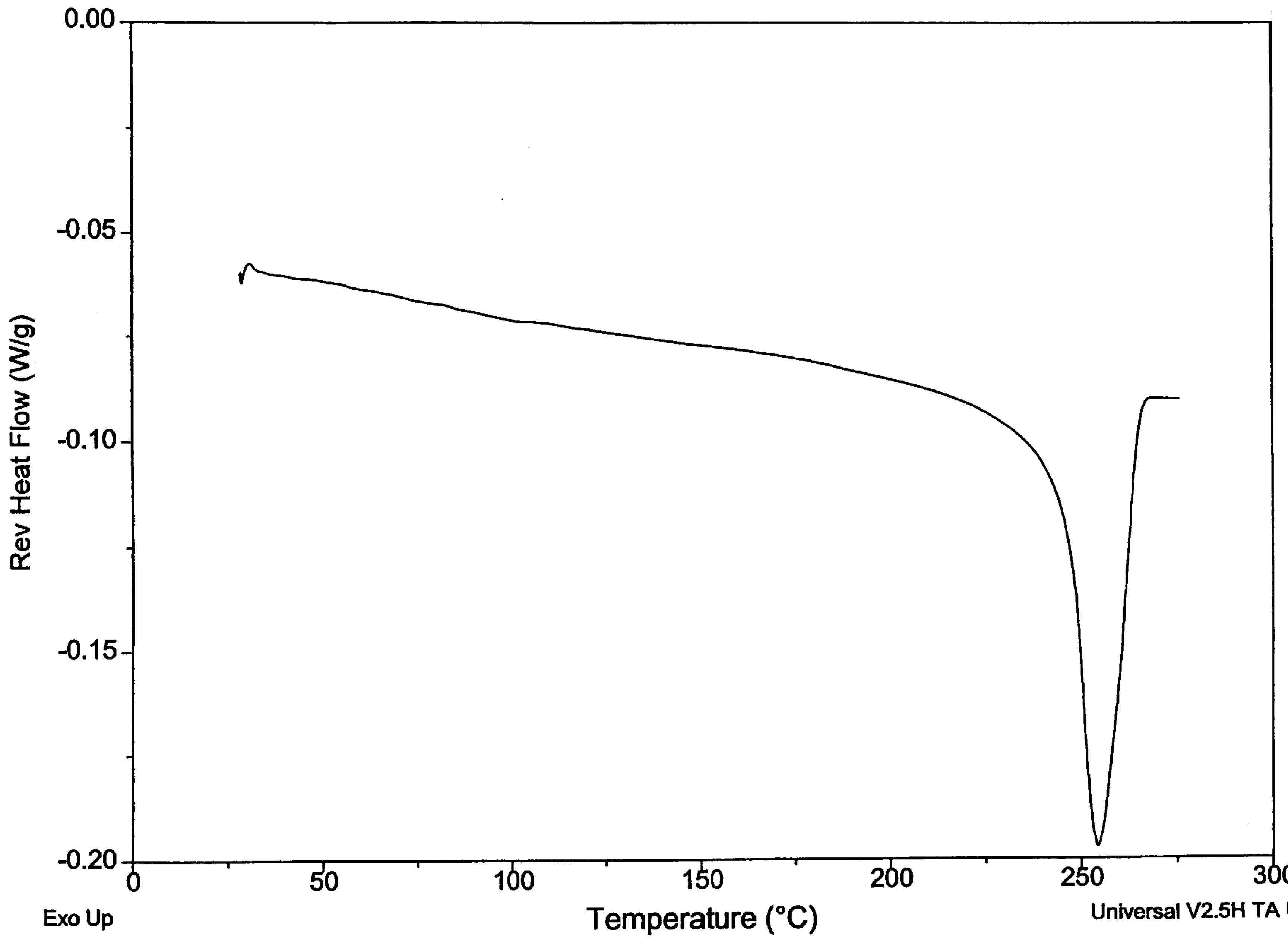
File: C:...\DSC\03614-103.060
Operator: WJM
Run Date: 12-Jun-01 15:33



Sample: Carpet - gray part
Size: 6.0800 mg
Method: MDSC Method
Comment: Honda Civic: Carpet - gray fiber part

DSC

File: C:...\DSC\03614-103.060
Operator: WJM
Run Date: 12-Jun-01 15:33

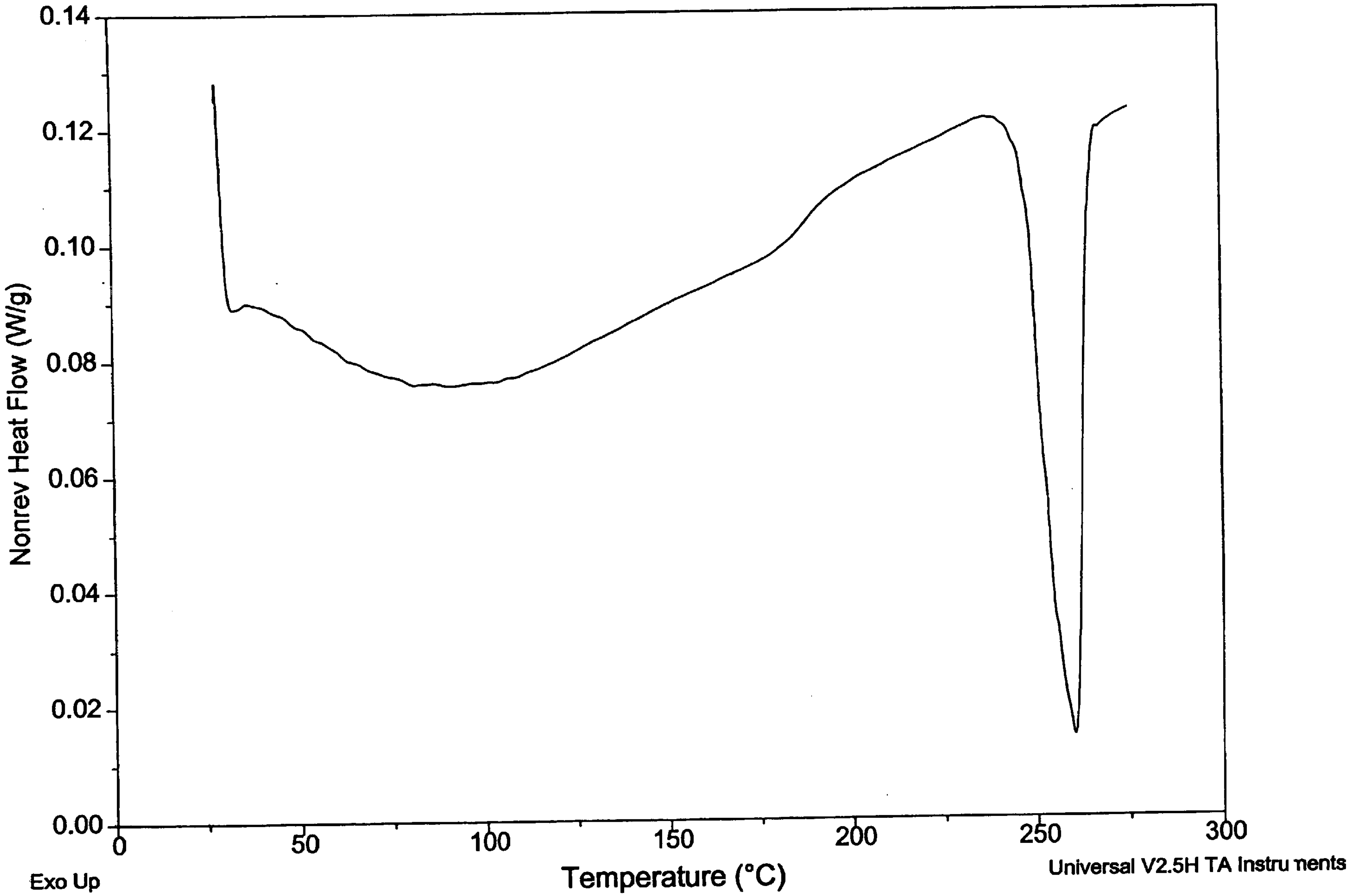


Universal V2.5H TA Instruments

Sample: Carpet - gray part
Size: 6.0800 mg
Method: MDSC Method
Comment: Honda Civic: Carpet - gray fiber part

DSC

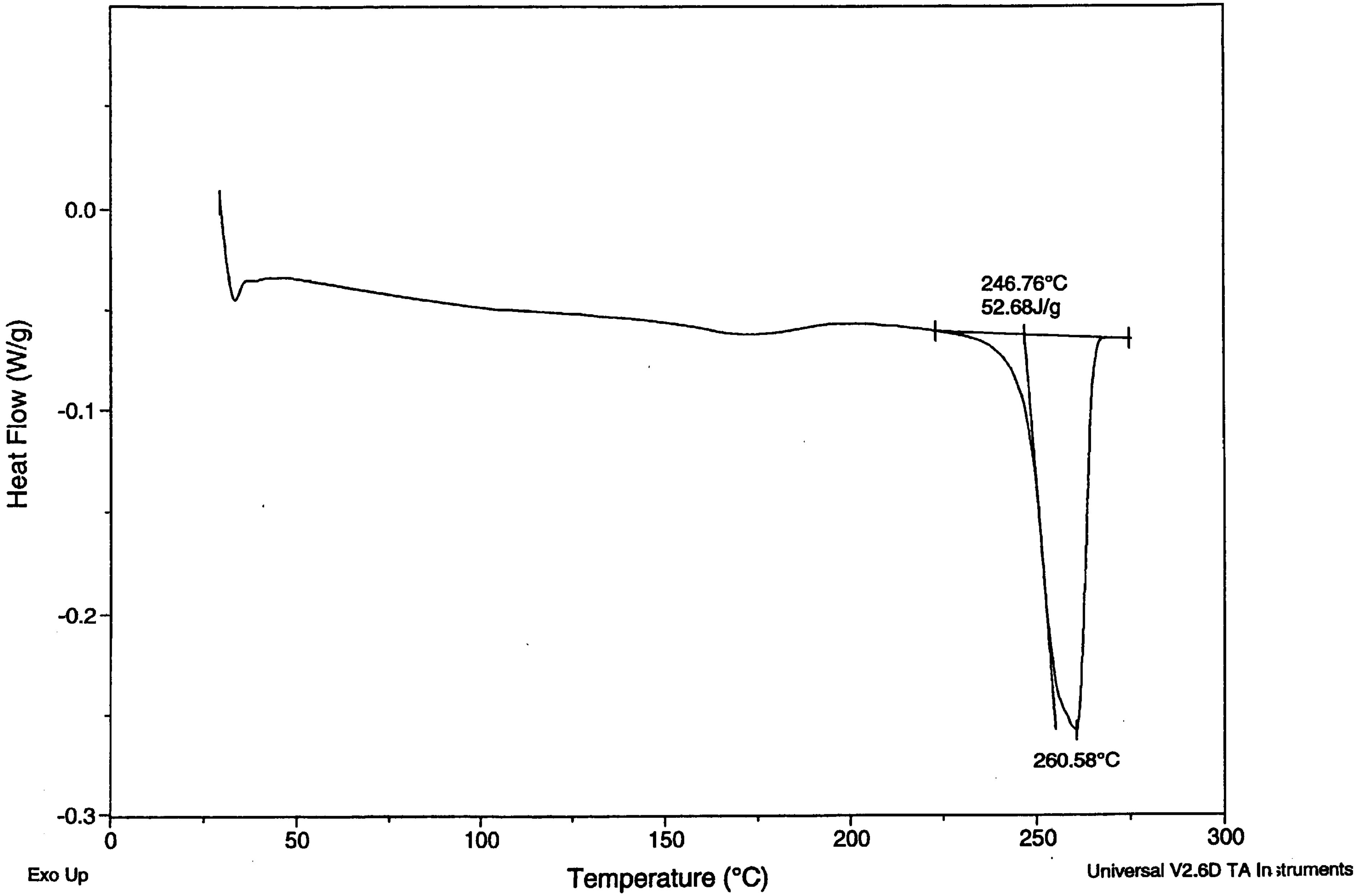
File: C:...\DSC\03614-103.060
Operator: WJM
Run Date: 12-Jun-01 15:33



Sample: Carpet-gray part (run 2)
Size: 8.8900 mg
Method: MDSC Method
Comment: Honda Civic: carpet - gray part

DSC

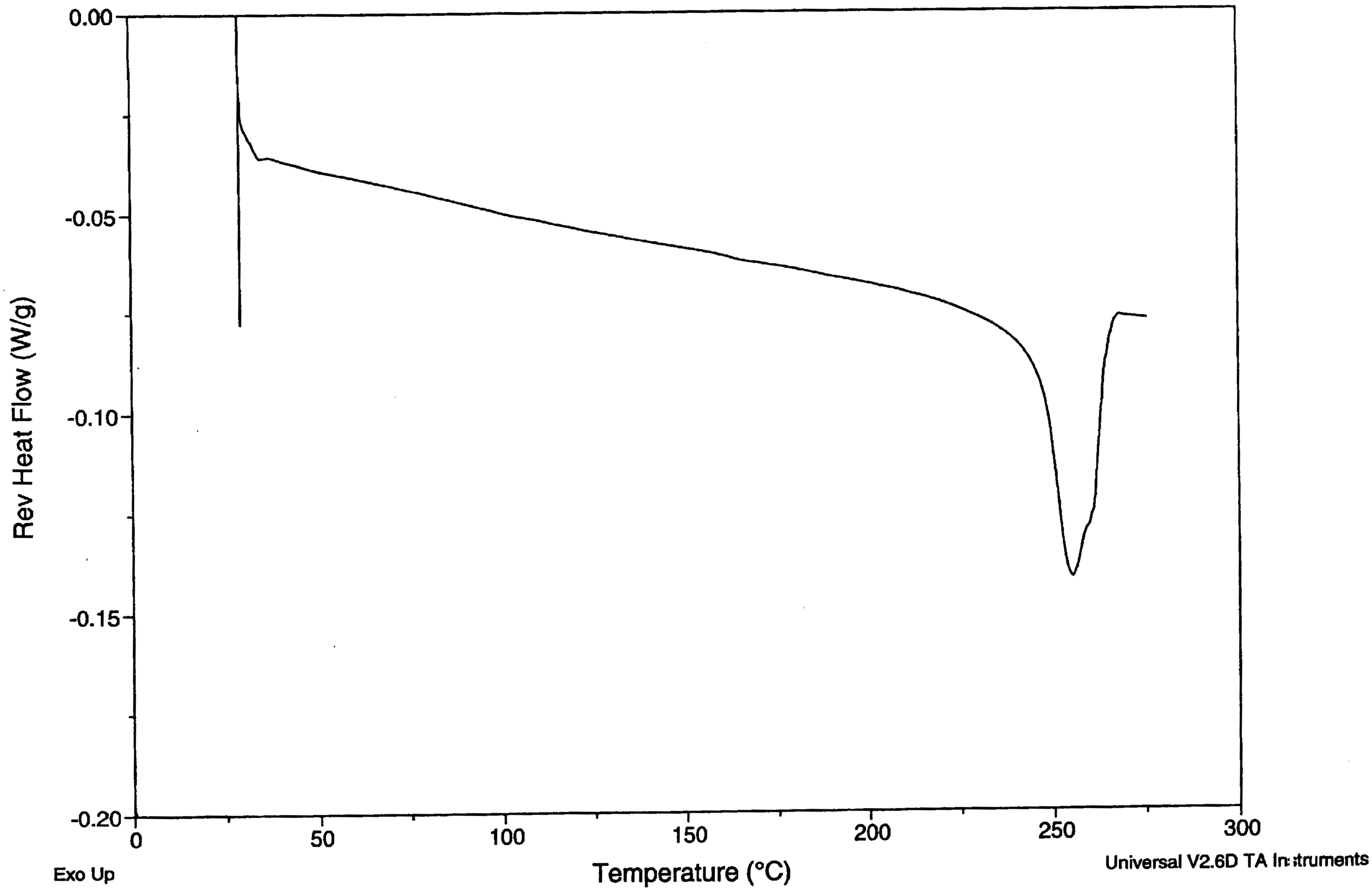
File: C:...\DSC\03614-103.061
Operator: WJM
Run Date: 25-Jun-01 15:15



Sample: Carpet-gray part (run 2)
Size: 8.8900 mg
Method: MDSC Method
Comment: Honda Civic: carpet - gray part

DSC

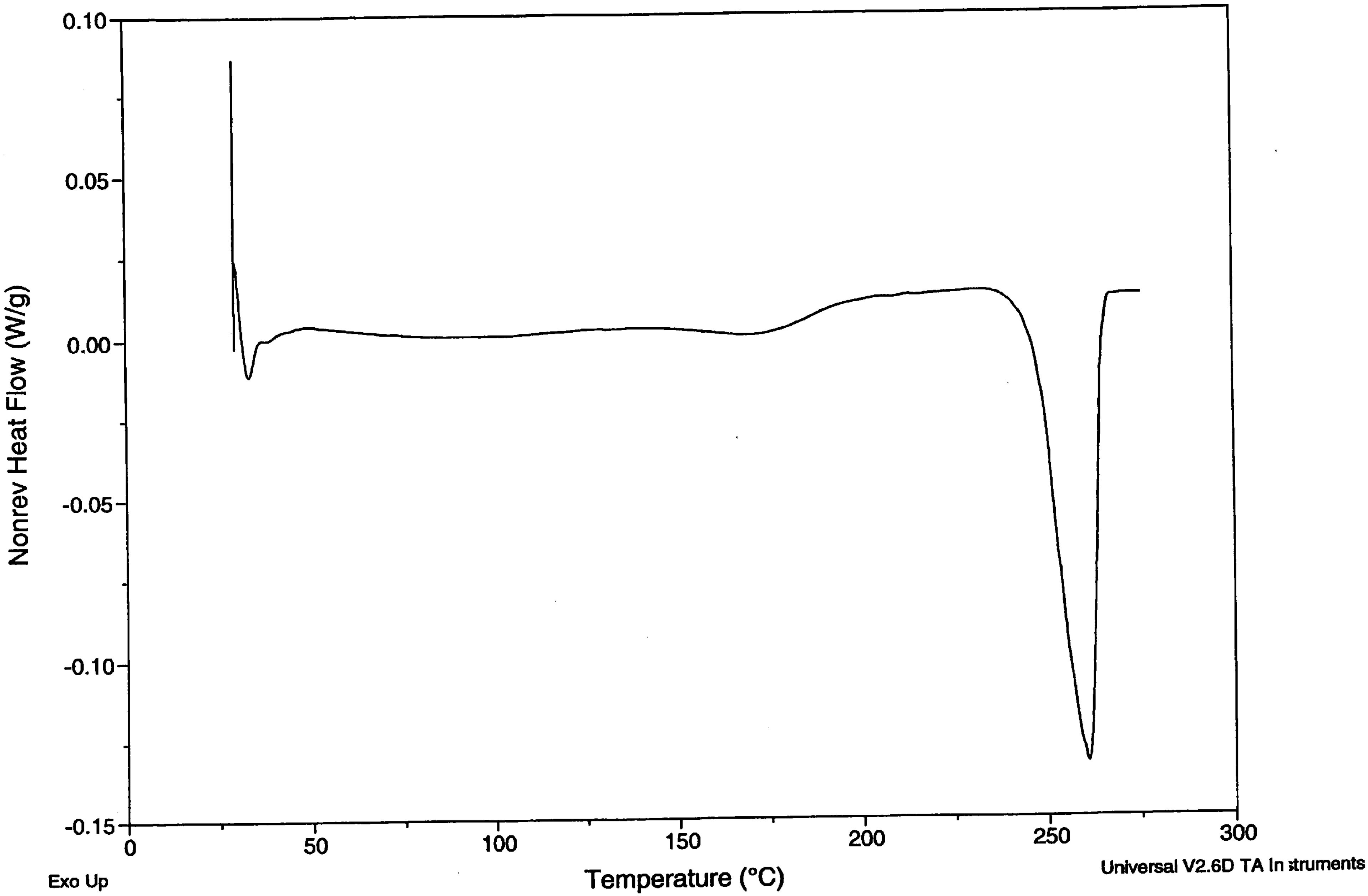
File: C:...\DSC\03614-103.061
Operator: WJM
Run Date: 25-Jun-01 15:15



Sample: Carpet-gray part (run 2)
Size: 8.8900 mg
Method: MDSC Method
Comment: Honda Civic: carpet - gray part

DSC

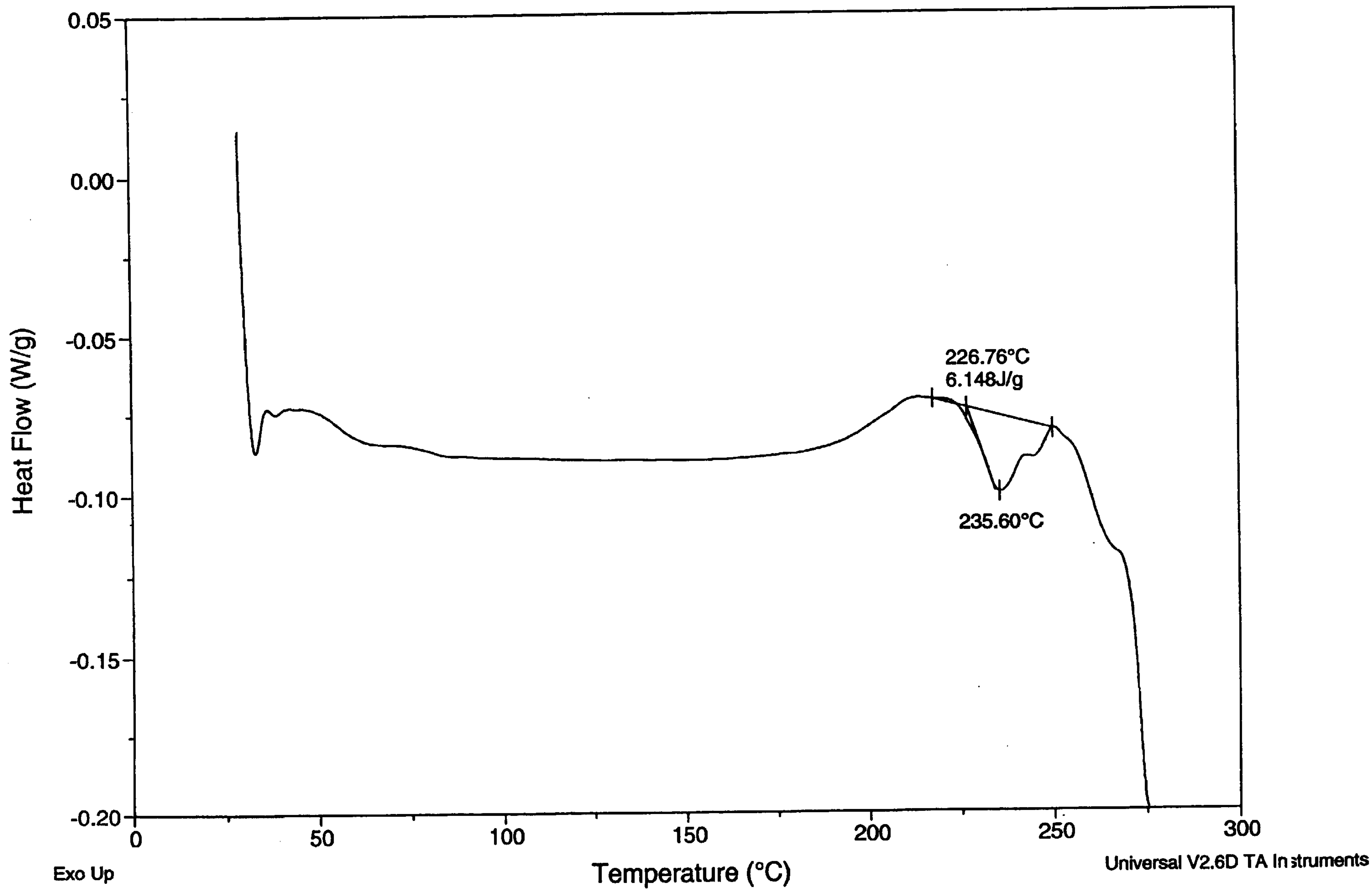
File: C:...\DSC\03614-103.061
Operator: WJM
Run Date: 25-Jun-01 15:15



Sample: Armrest - soft gray part
Size: 10.3900 mg
Method: MDSC Method
Comment: Dodge Neon-Armrest; soft gray part

DSC

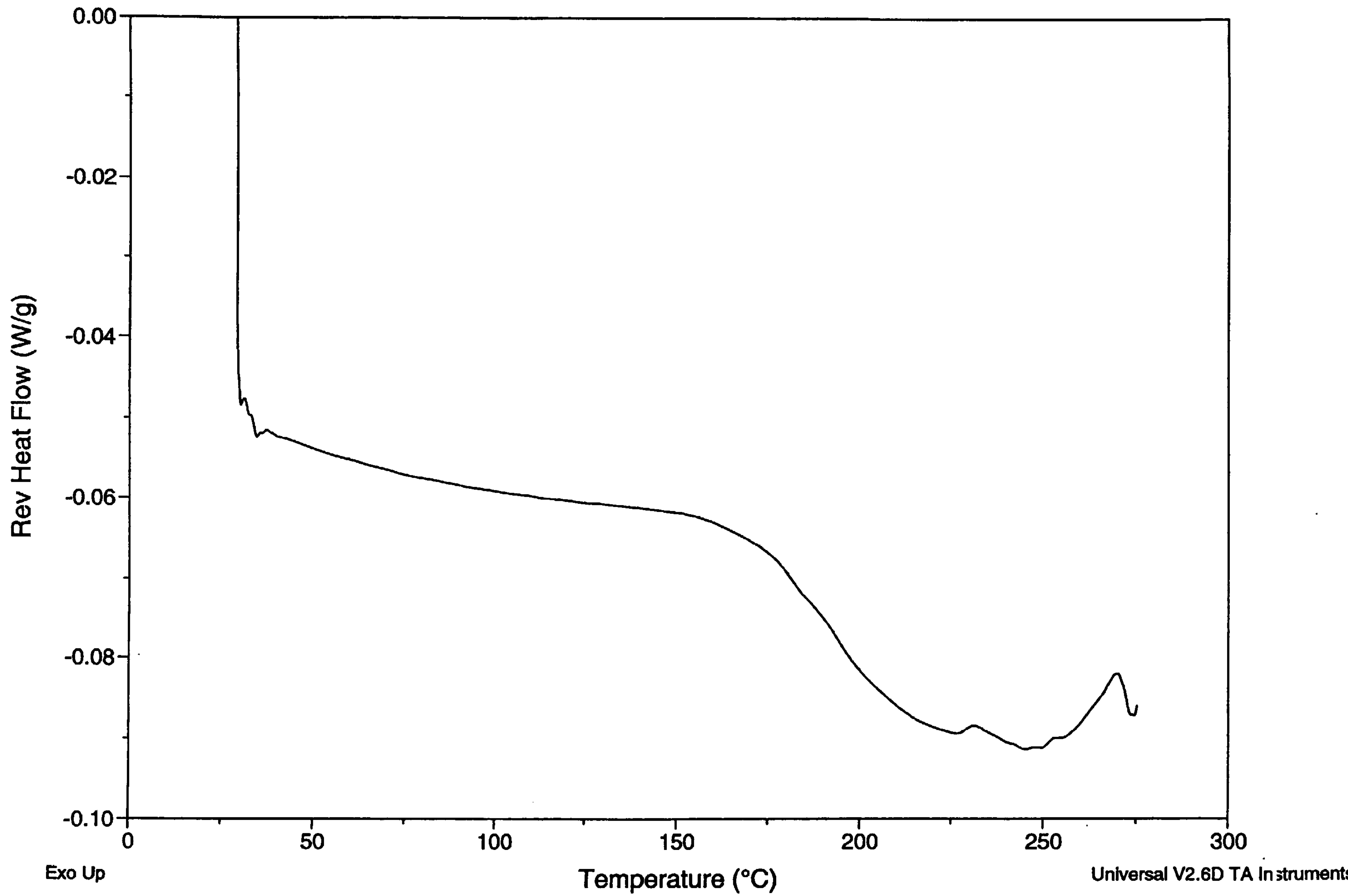
File: C:...\DSC\03614-103.062
Operator: WJM
Run Date: 26-Jun-01 07:47



Sample: Armrest - soft gray part
Size: 10.3900 mg
Method: MDSC Method
Comment: Dodge Neon-Armrest; soft gray part

DSC

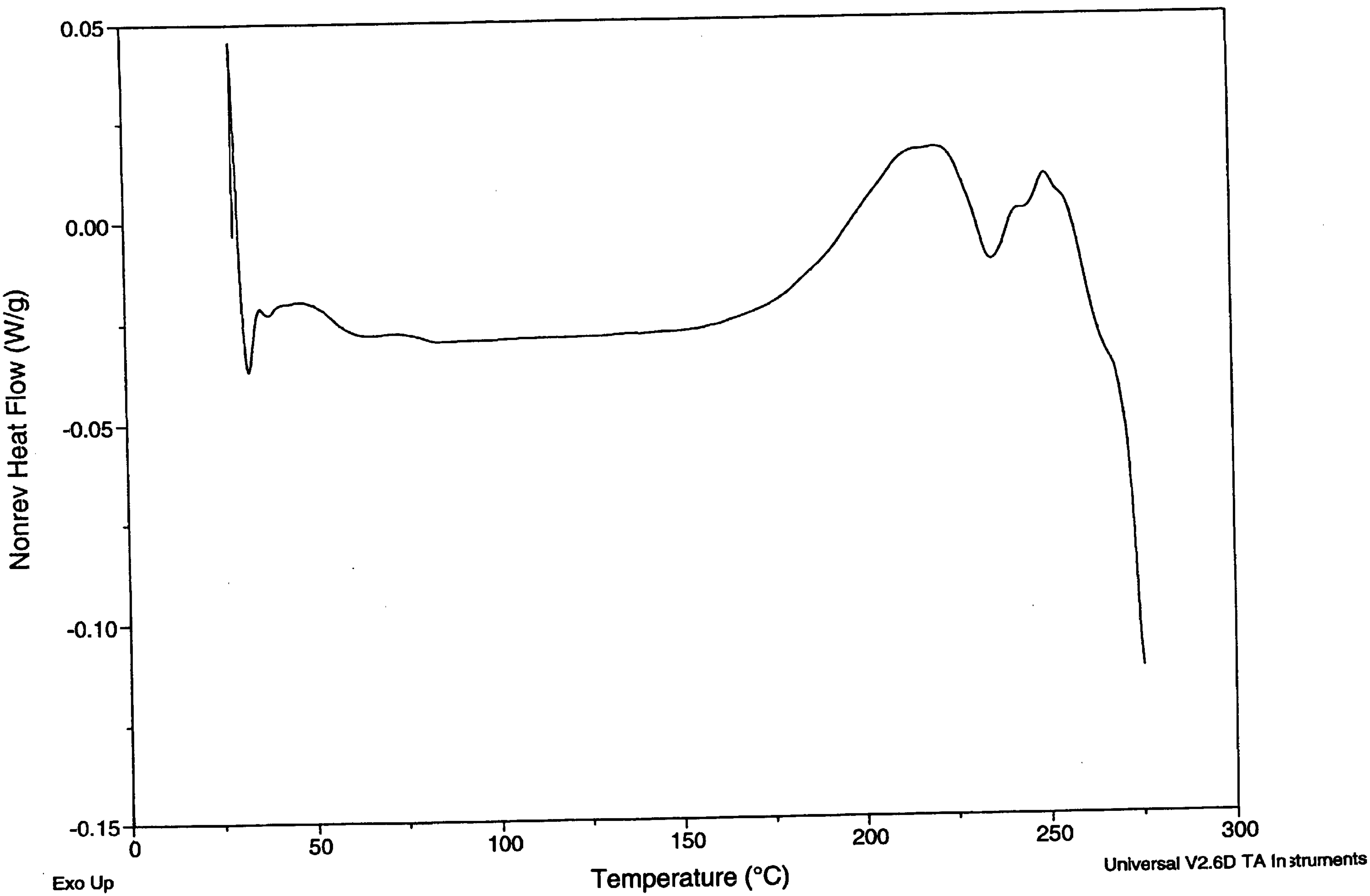
File: C:...\DSC\03614-103.062
Operator: WJM
Run Date: 26-Jun-01 07:47



Sample: Armrest - soft gray part
Size: 10.3900 mg
Method: MDSC Method
Comment: Dodge Neon-Armrest; soft gray part

DSC

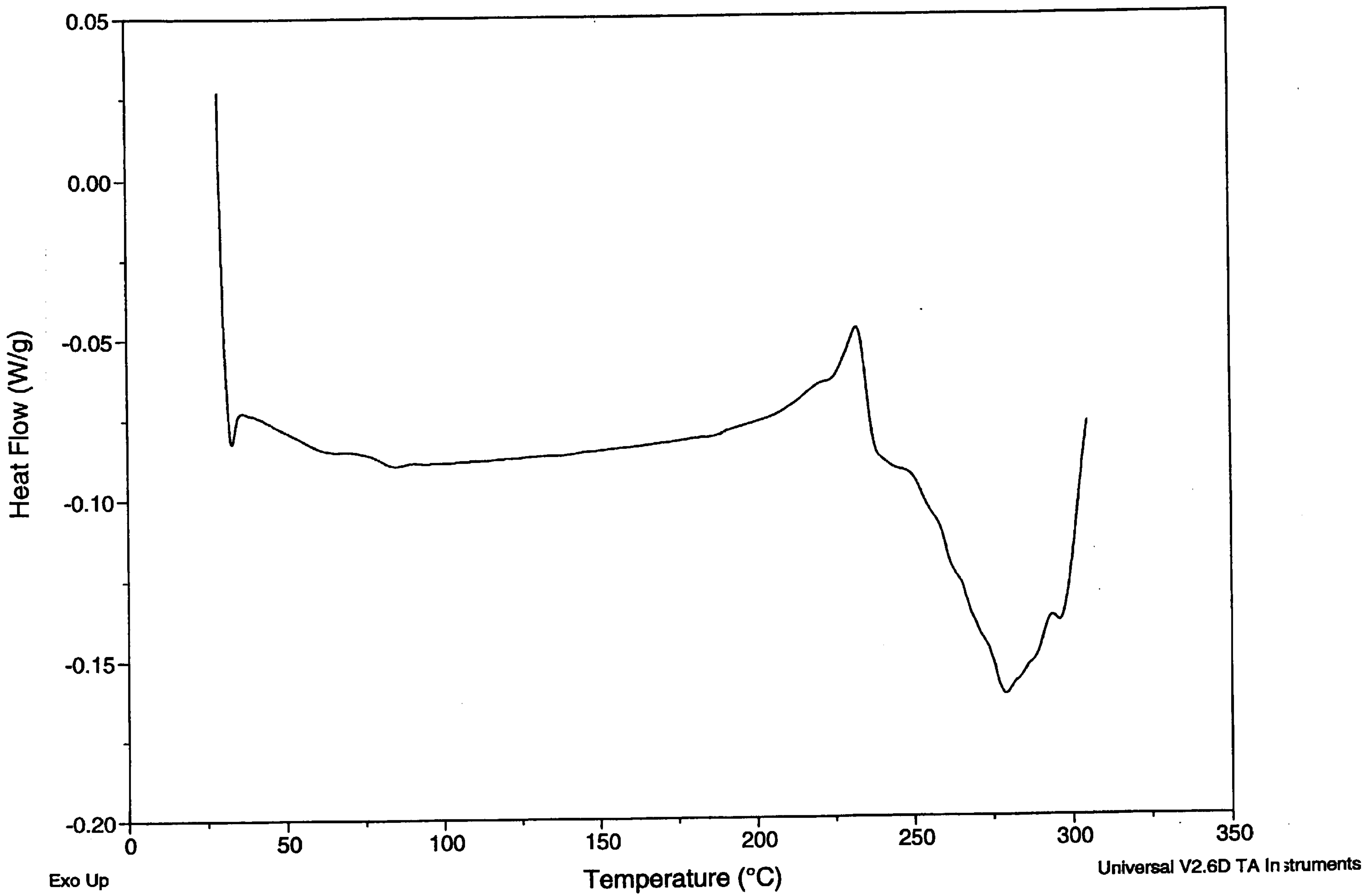
File: C:...\DSC\03614-103.062
Operator: WJM
Run Date: 26-Jun-01 07:47



Sample: Armrest - soft gray part run 2
Size: 6.1500 mg
Method: MDSC Method
Comment: Dodge Neon : Armrest; soft gray part

DSC

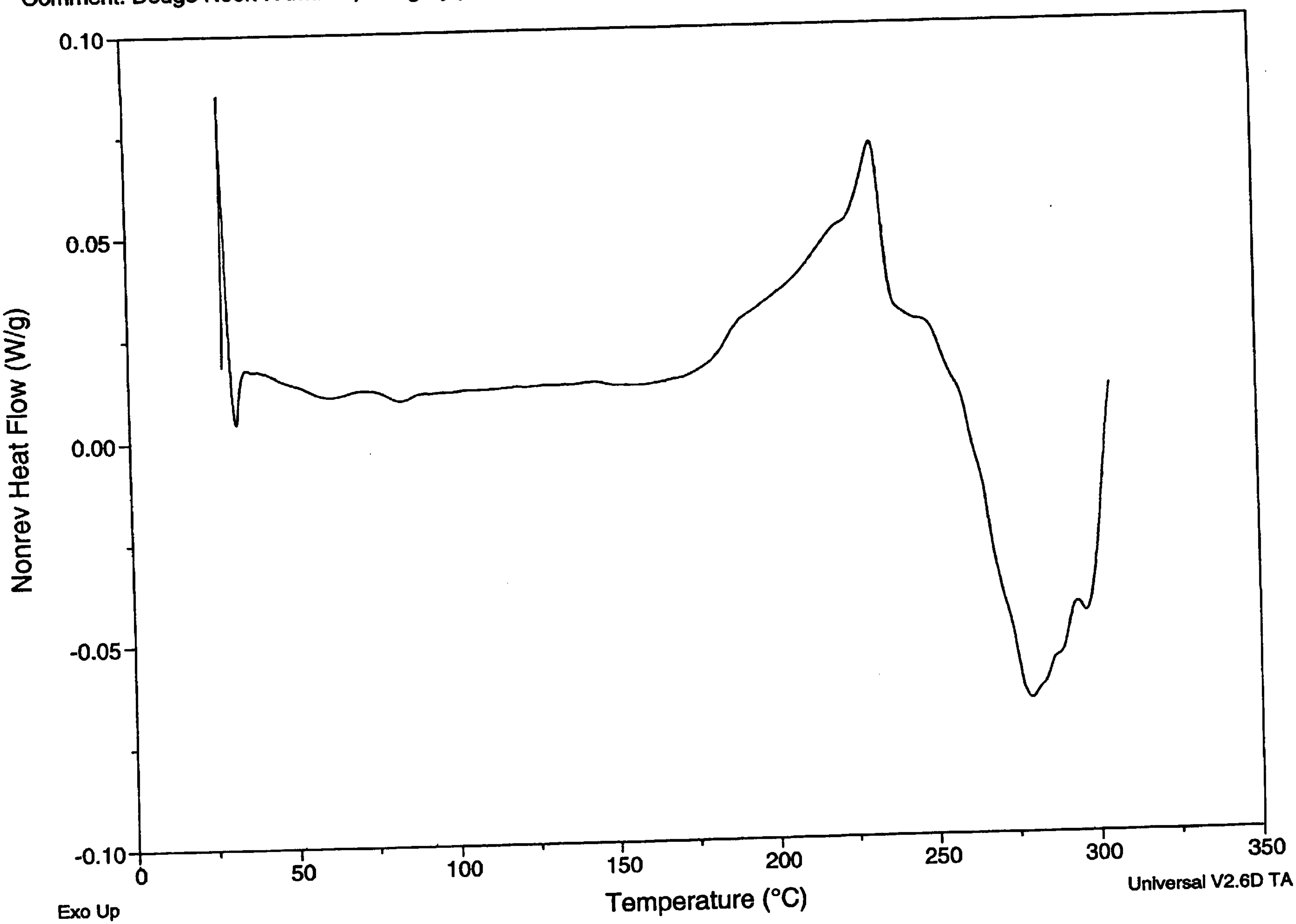
File: C:...\DSC\03614-103.063
Operator: WJM
Run Date: 26-Jun-01 10:28



Sample: Armrest - soft gray part run 2
Size: 6.1500 mg
Method: MDSC Method
Comment: Dodge Neon : Armrest; soft gray part

DSC

File: C:...\DSC\03614-103.063
Operator: WJM
Run Date: 26-Jun-01 10:28

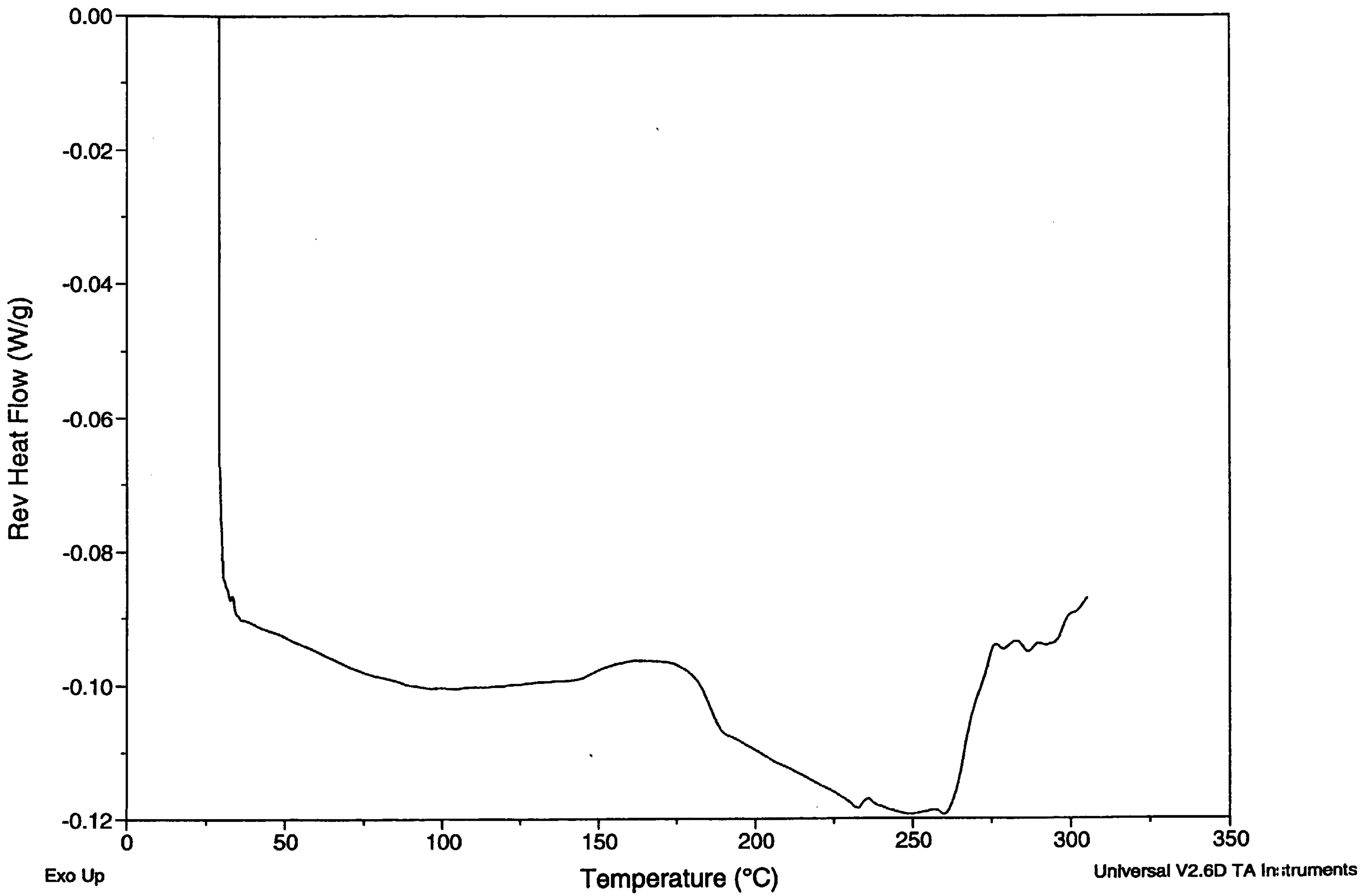


Universal V2.6D TA Instruments

Sample: Armrest - soft gray part run 2
Size: 6.1500 mg
Method: MDSC Method
Comment: Dodge Neon : Armrest; soft gray part

DSC

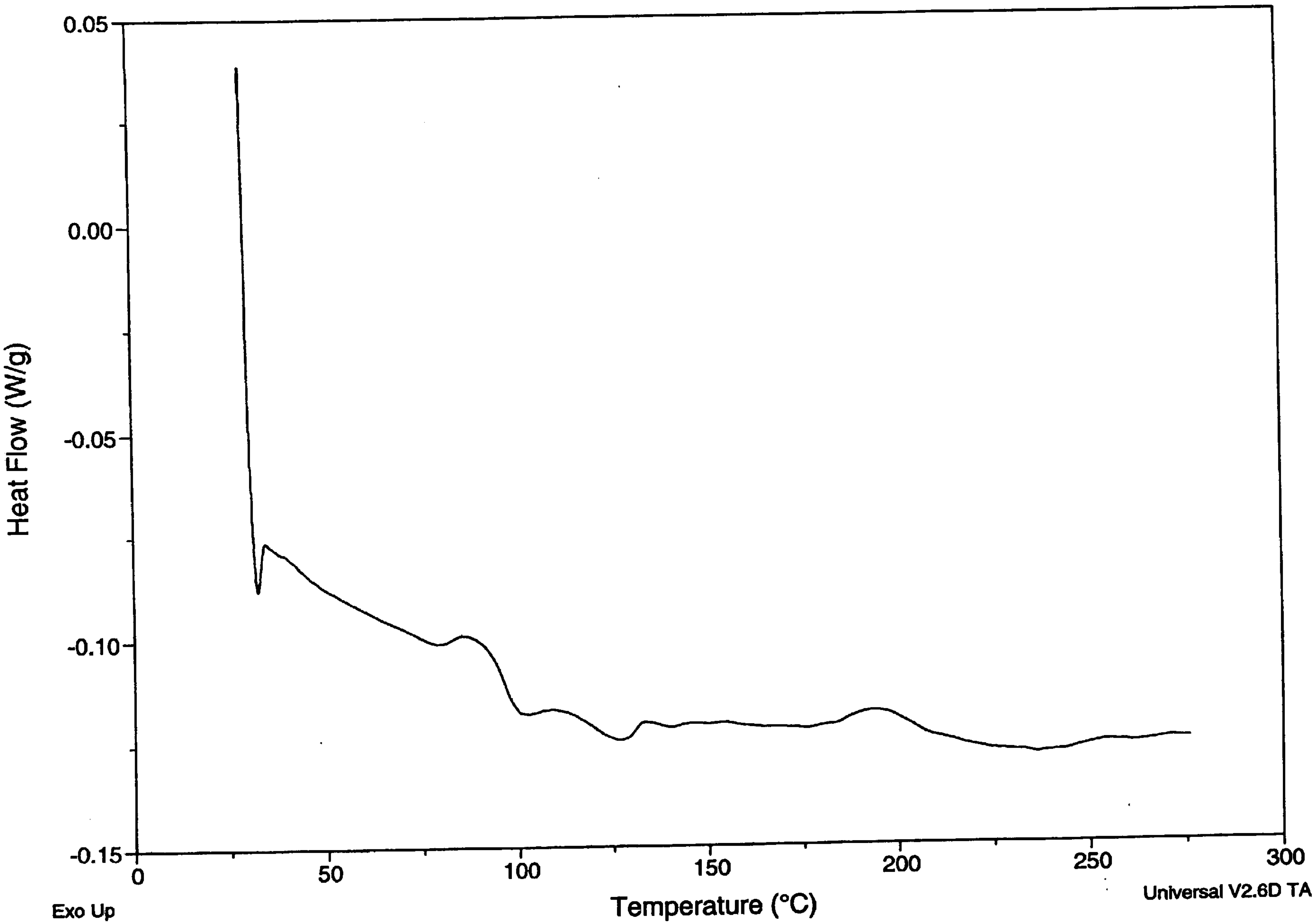
File: C:...\DSC\03614-103.063
Operator: WJM
Run Date: 26-Jun-01 10:28



Sample: Armrest - hard plastic part
Size: 3.7900 mg
Method: MDSC Method
Comment: Dodge Neon : Armrest; hard plastic part

DSC

File: C:...\DSC\03614-103.064
Operator: WJM
Run Date: 26-Jun-01 13:33

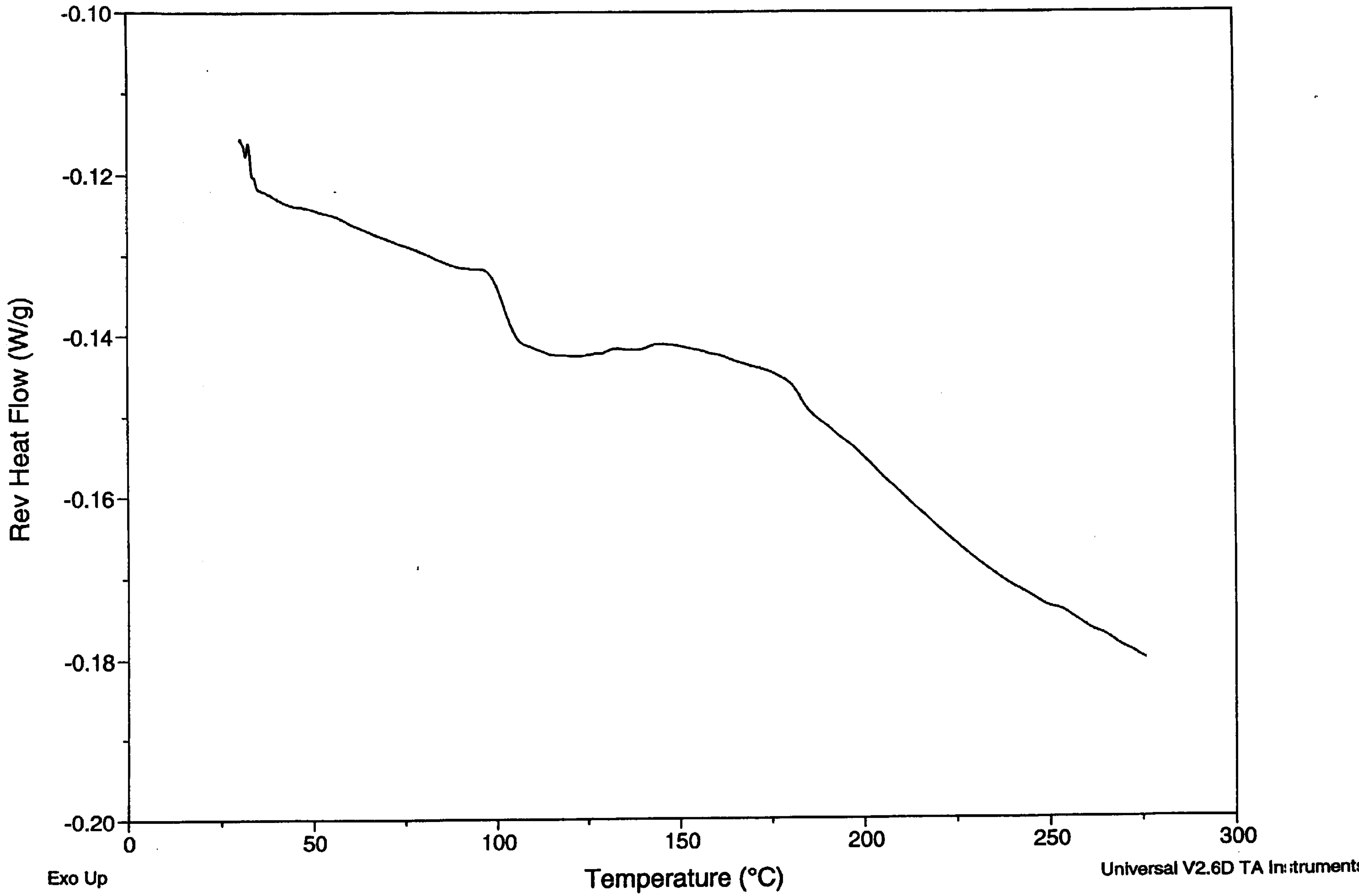


Universal V2.6D TA Instruments

Sample: Armrest - hard plastic part
Size: 3.7900 mg
Method: MDSC Method
Comment: Dodge Neon : Armrest; hard plastic part

DSC

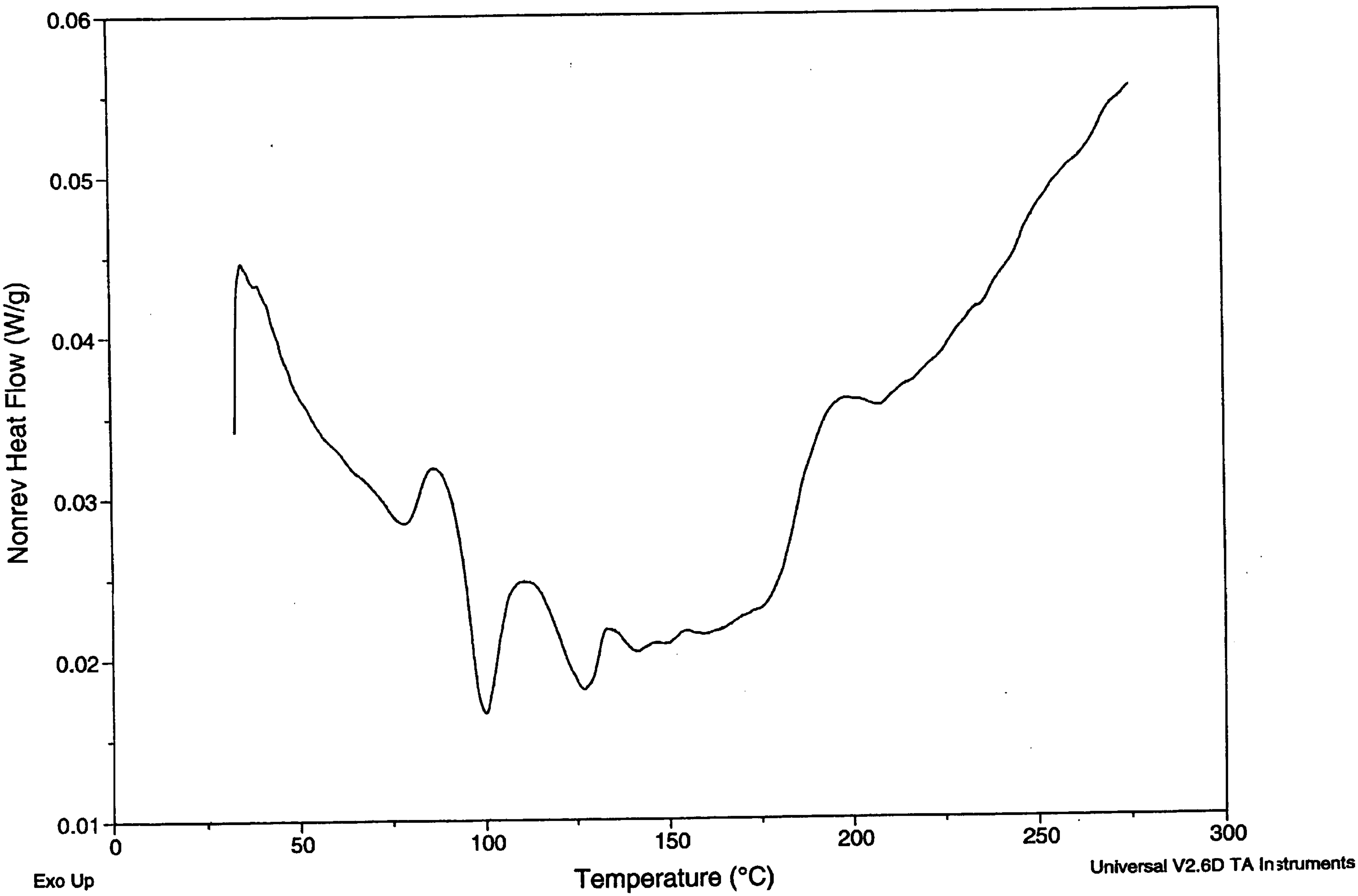
File: C:...\DSC\03614-103.064
Operator: WJM
Run Date: 26-Jun-01 13:33



Sample: Armrest - hard plastic part
Size: 3.7900 mg
Method: MDSC Method
Comment: Dodge Neon : Armrest; hard plastic part

DSC

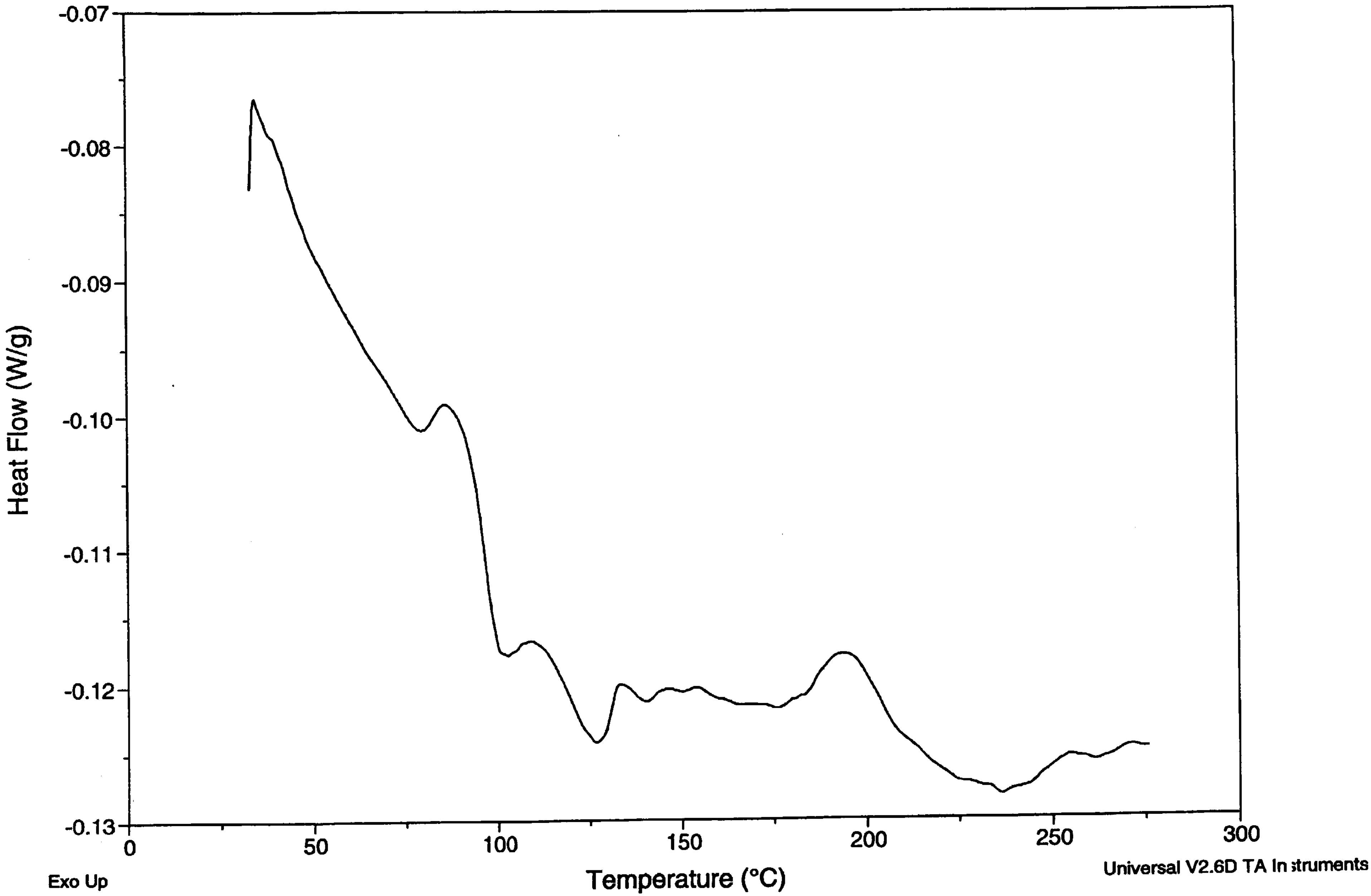
File: C:...\DSC\03614-103.064
Operator: WJM
Run Date: 26-Jun-01 13:33



Sample: Armrest - hard plastic part
Size: 3.7900 mg
Method: MDSC Method
Comment: Dodge Neon : Armrest; hard plastic part

DSC

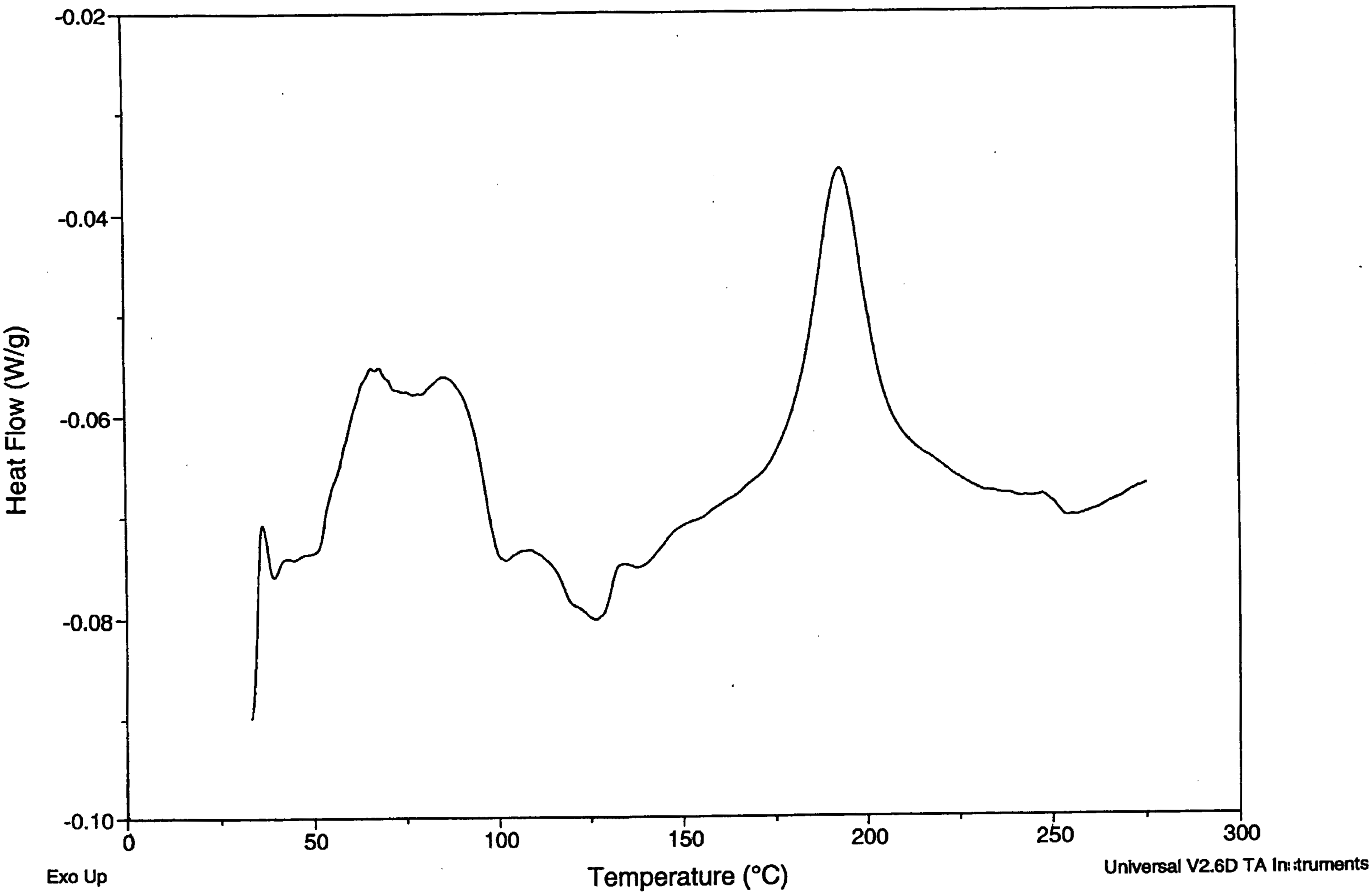
File: C:...\DSC\03614-103.064
Operator: WJM
Run Date: 26-Jun-01 13:33



Sample: Armrest- hard plastic part run 2
Size: 4.3800 mg
Method: MDSC Method
Comment: Dodge Neon : Armrest; hard plastic part

DSC

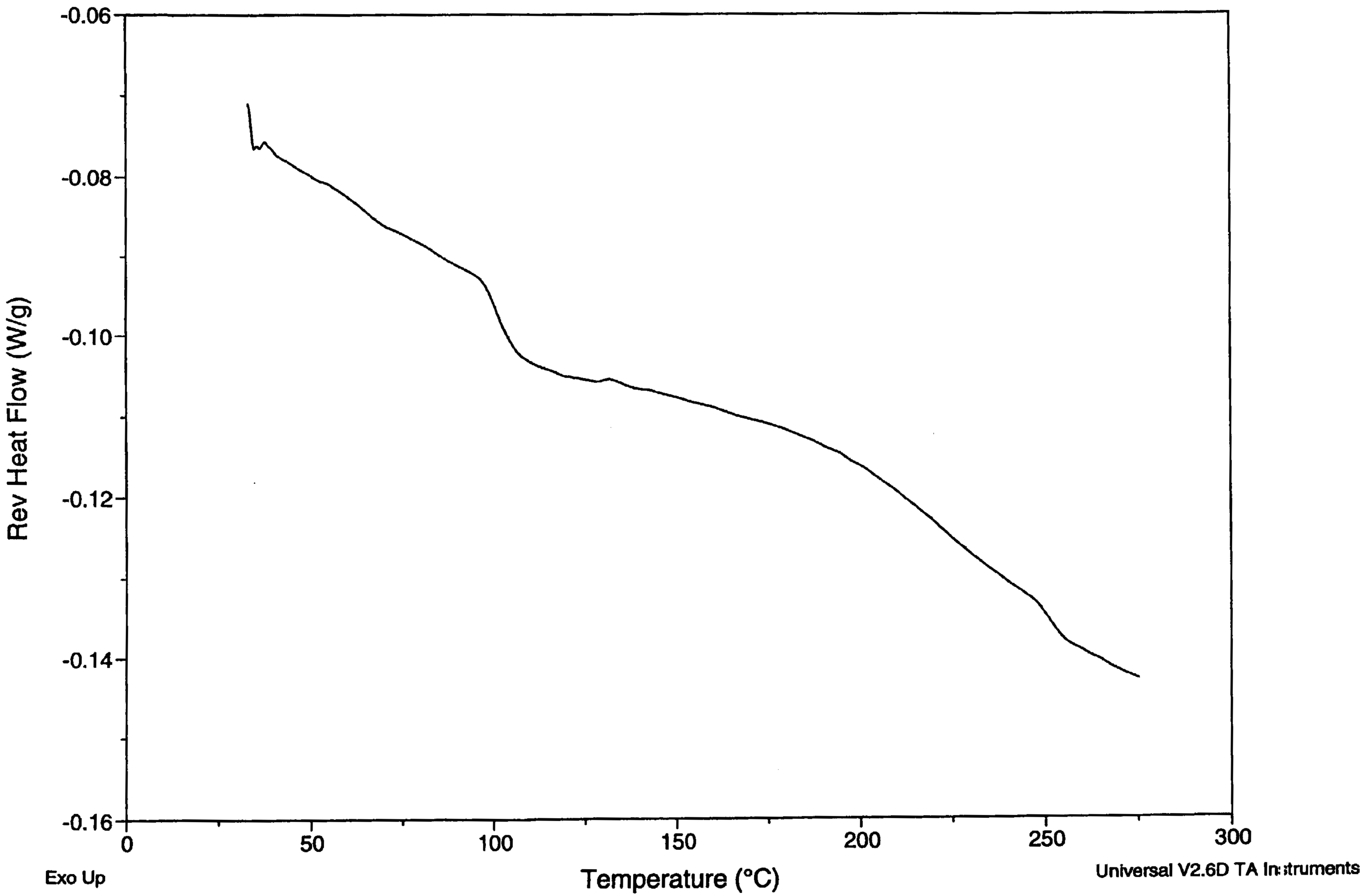
File: C:...\DSC\03614-103.065
Operator: WJM
Run Date: 27-Jun-01 08:31



Sample: Armrest- hard plastic part run 2
Size: 4.3800 mg
Method: MDSC Method
Comment: Dodge Neon : Armrest; hard plastic part

DSC

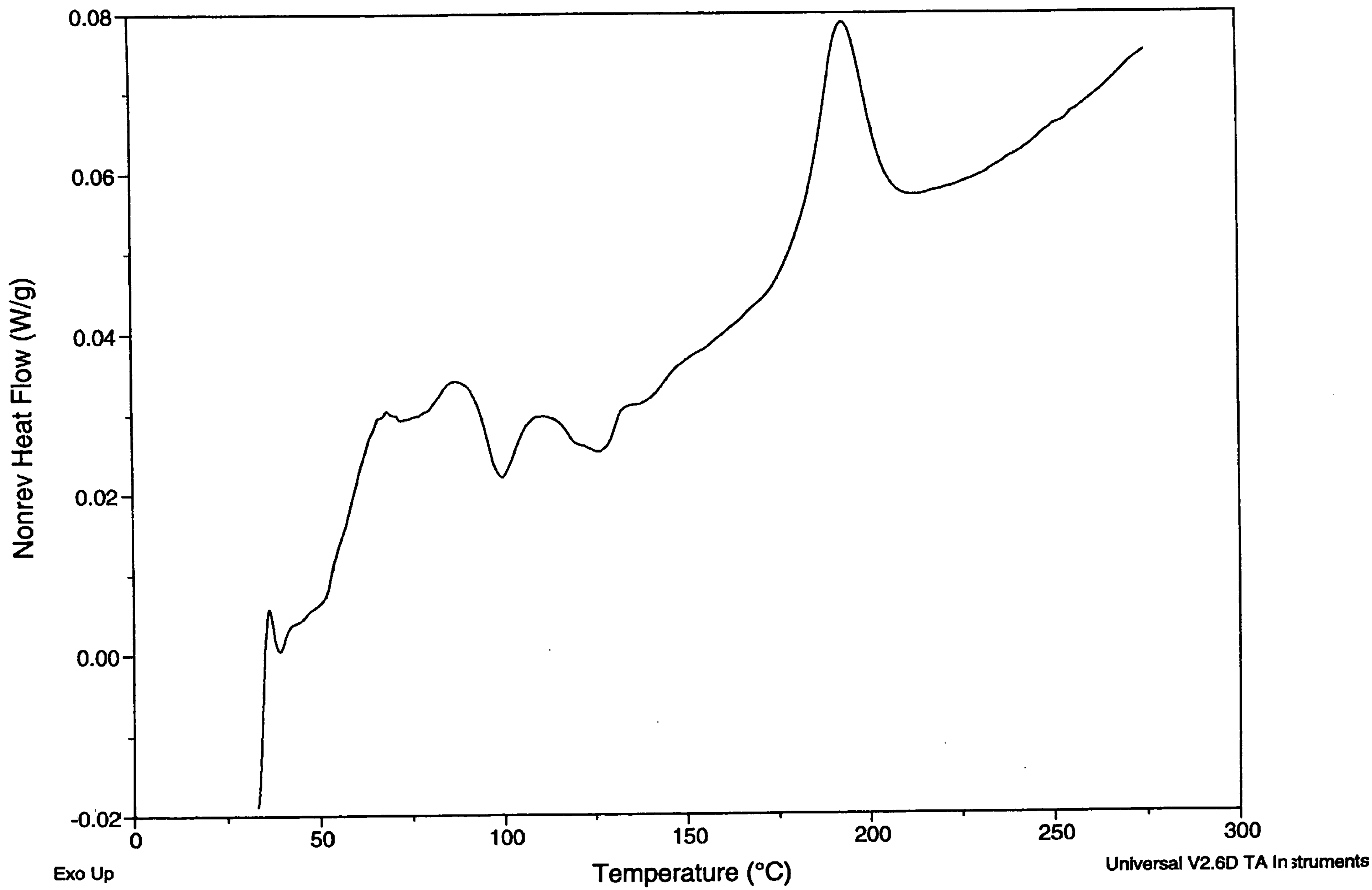
File: C:...\DSC\03614-103.065
Operator: WJM
Run Date: 27-Jun-01 08:31



Sample: Armrest- hard plastic part run 2
Size: 4.3800 mg
Method: MDSC Method
Comment: Dodge Neon : Armrest; hard plastic part

DSC

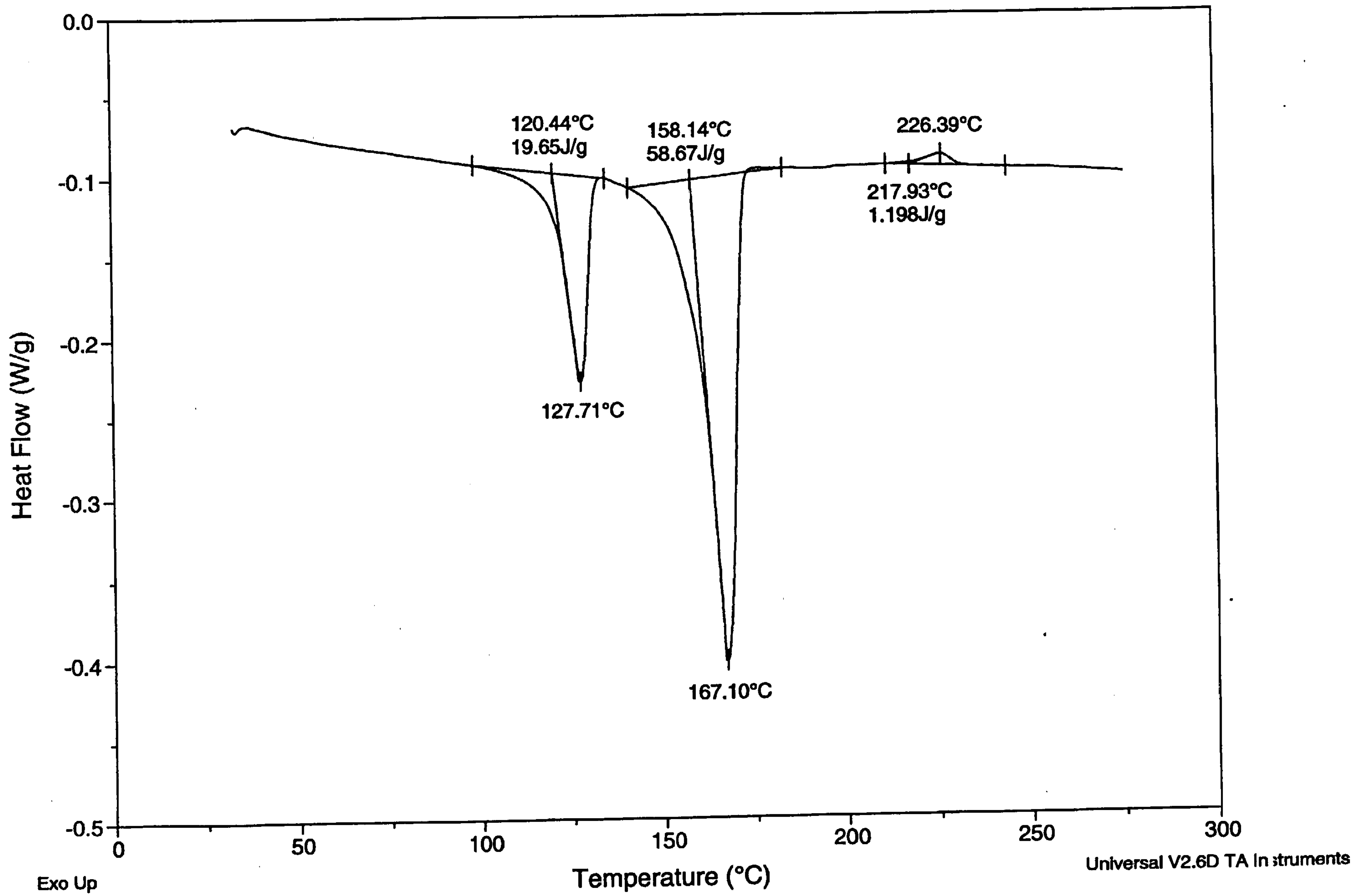
File: C:...\DSC\03614-103.065
Operator: WJM
Run Date: 27-Jun-01 08:31



Sample: Door Panel Plastic
Size: 7.6100 mg
Method: MDSC Method
Comment: Dodge Neon : Door Panel Plastic

DSC

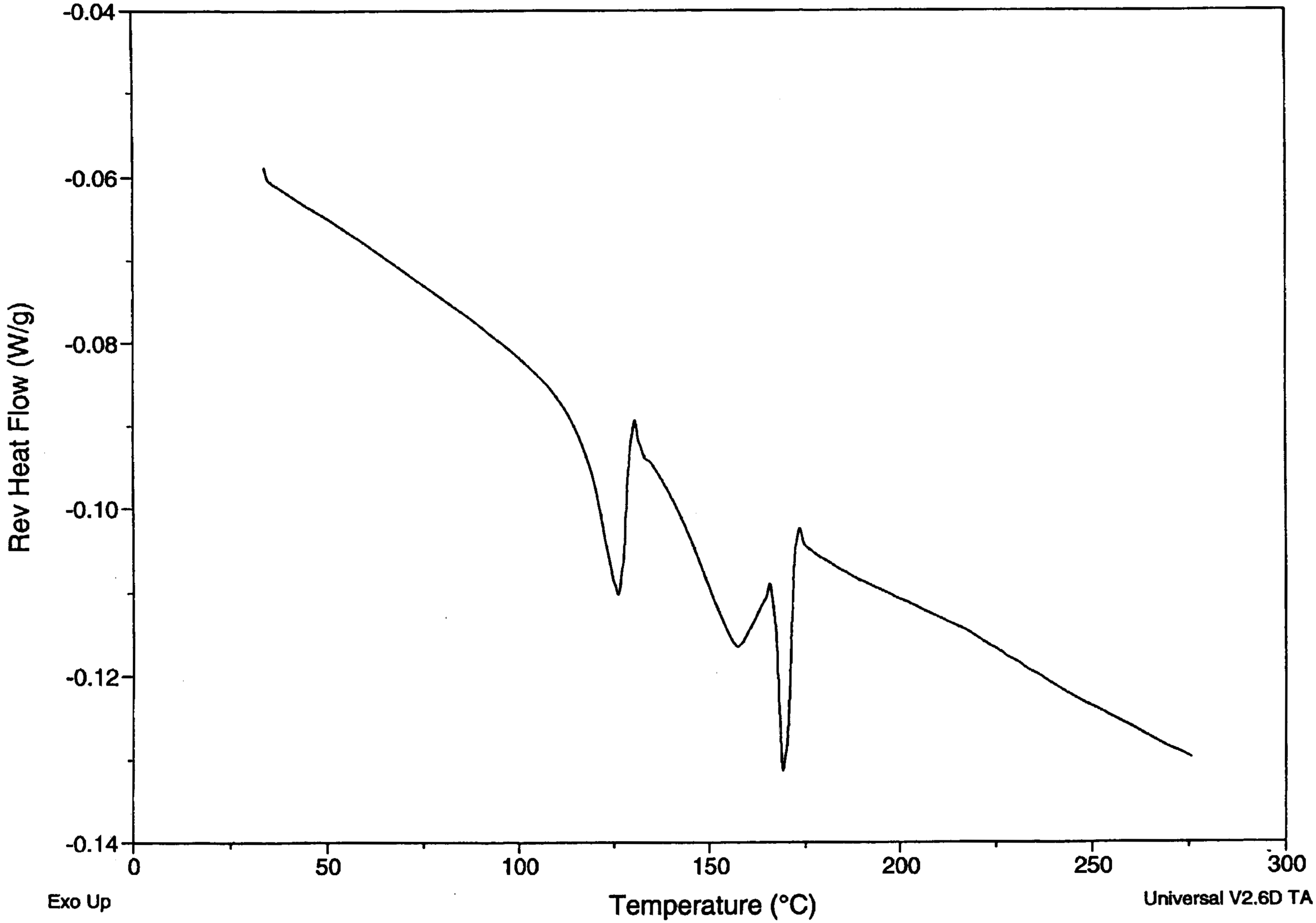
File: C:...\DSC\03614-103.066
Operator: WJM
Run Date: 27-Jun-01 10:58



Sample: Door Panel Plastic
Size: 7.6100 mg
Method: MDSC Method
Comment: Dodge Neon : Door Panel Plastic

DSC

File: C:...\DSC\03614-103.066
Operator: WJM
Run Date: 27-Jun-01 10:58

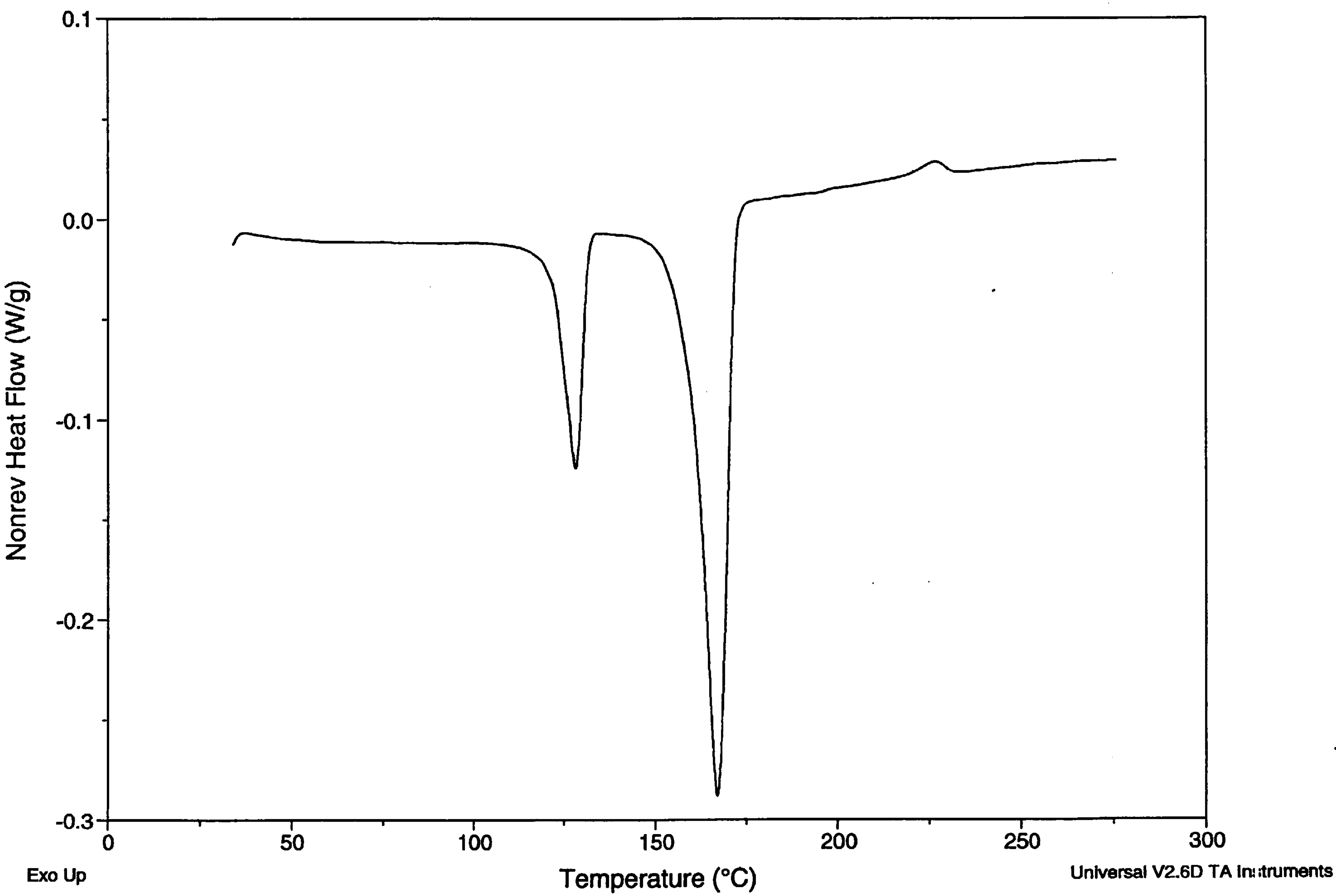


Universal V2.6D TA Instruments

Sample: Door Panel Plastic
Size: 7.6100 mg
Method: MDSC Method
Comment: Dodge Neon : Door Panel Plastic

DSC

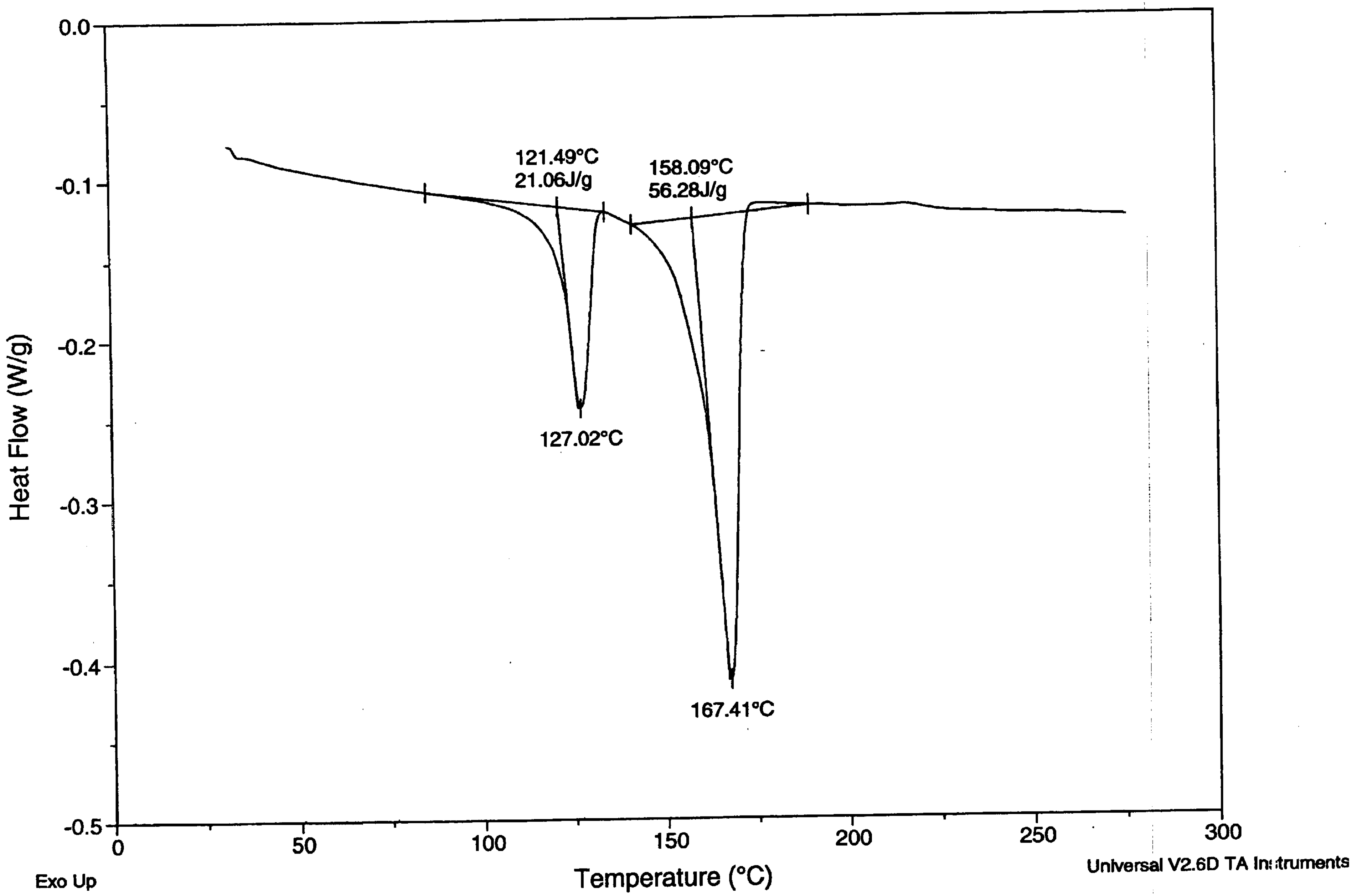
File: C:...\DSC\03614-103.066
Operator: WJM
Run Date: 27-Jun-01 10:58



Sample: Door Panel Plastic run 2
Size: 7.4500 mg
Method: MDSC Method
Comment: Dodge Neon : Door Panel Plastic

DSC

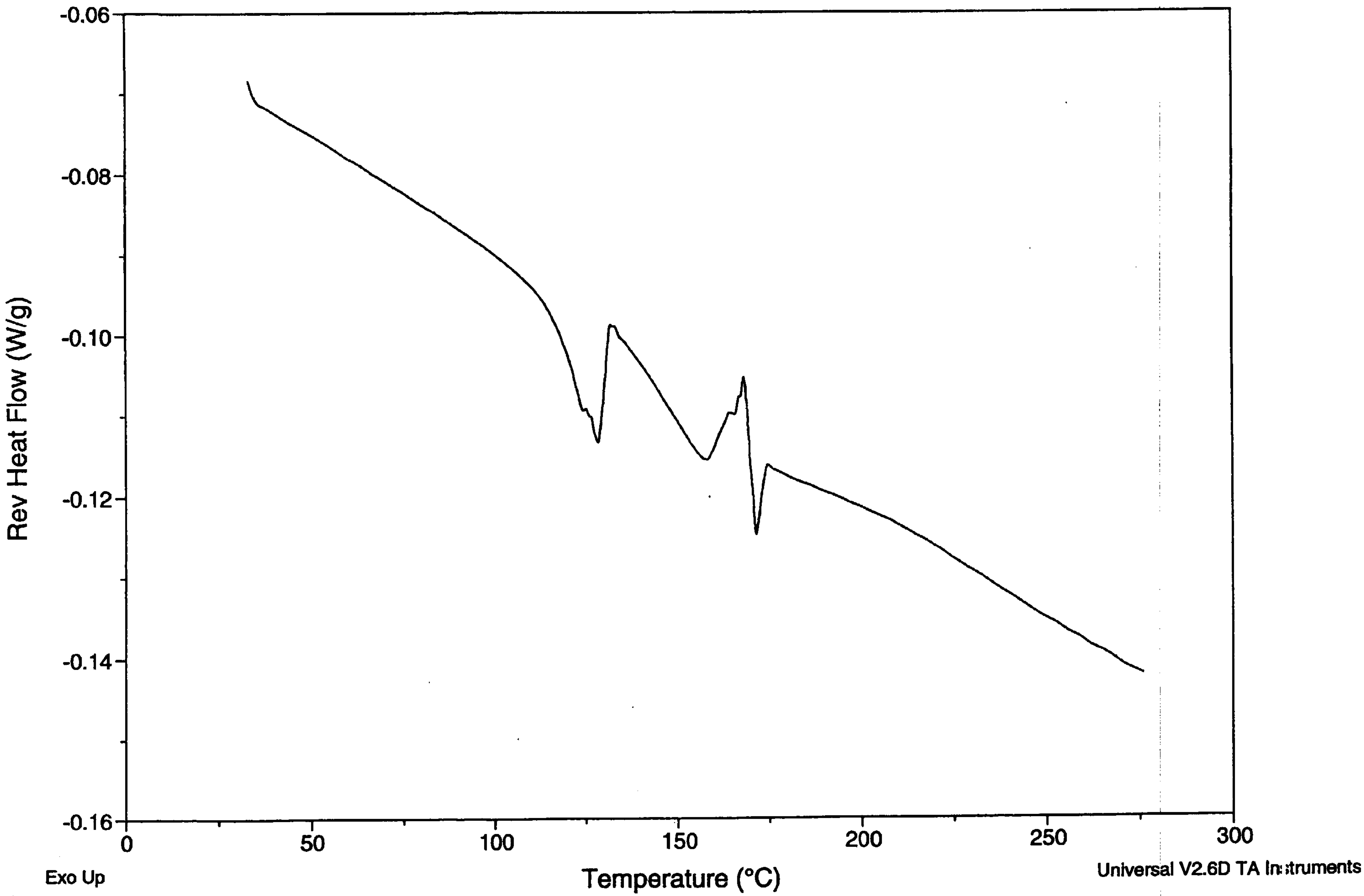
File: C:...\DSC\03614-103.067
Operator: WJM
Run Date: 27-Jun-01 13:11



Sample: Door Panel Plastic run 2
Size: 7.4500 mg
Method: MDSC Method
Comment: Dodge Neon : Door Panel Plastic

DSC

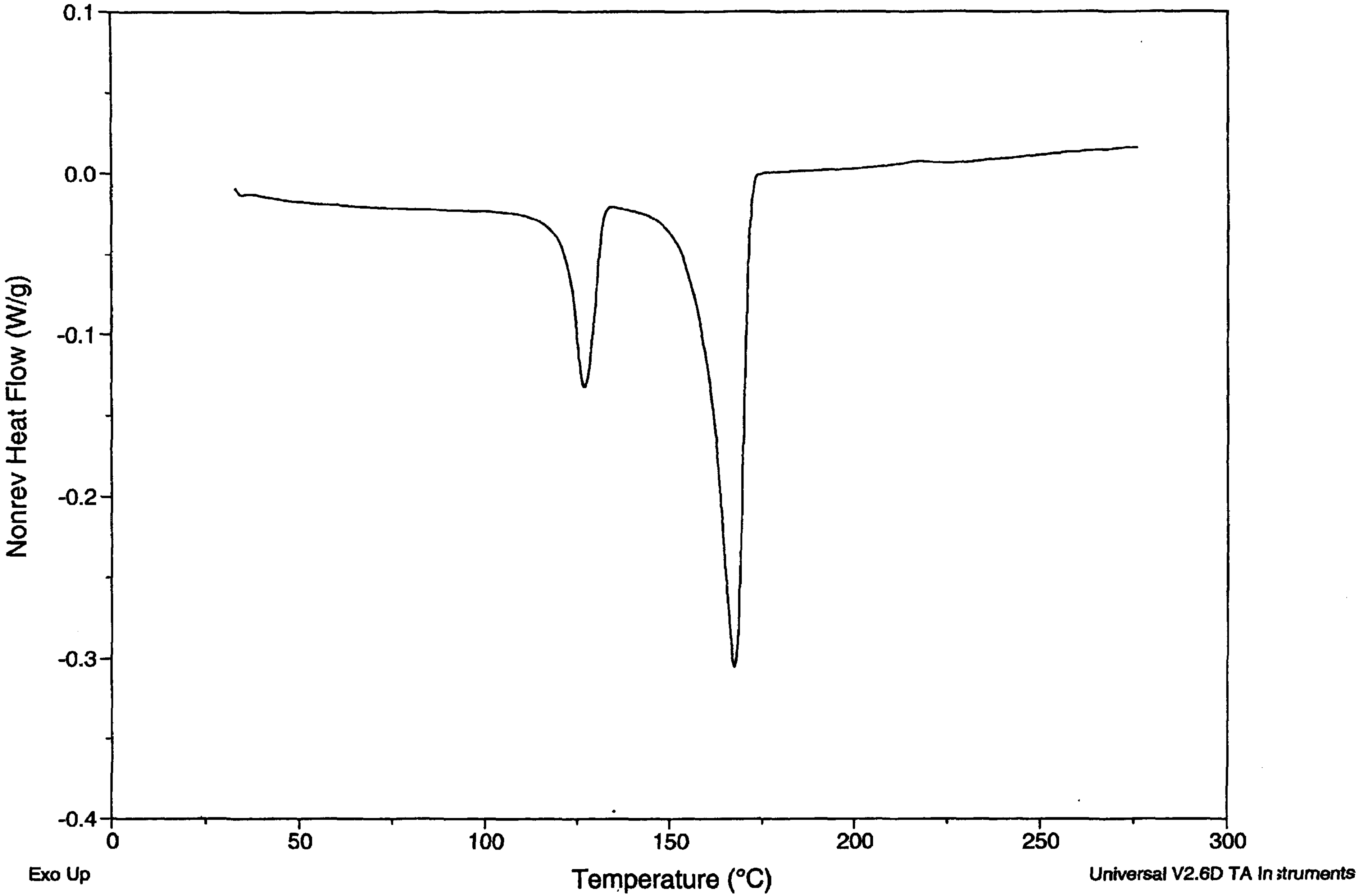
File: C:...\DSC\03614-103.067
Operator: WJM
Run Date: 27-Jun-01 13:11



Sample: Door Panel Plastic run 2
Size: 7.4500 mg
Method: MDSC Method
Comment: Dodge Neon : Door Panel Plastic

DSC

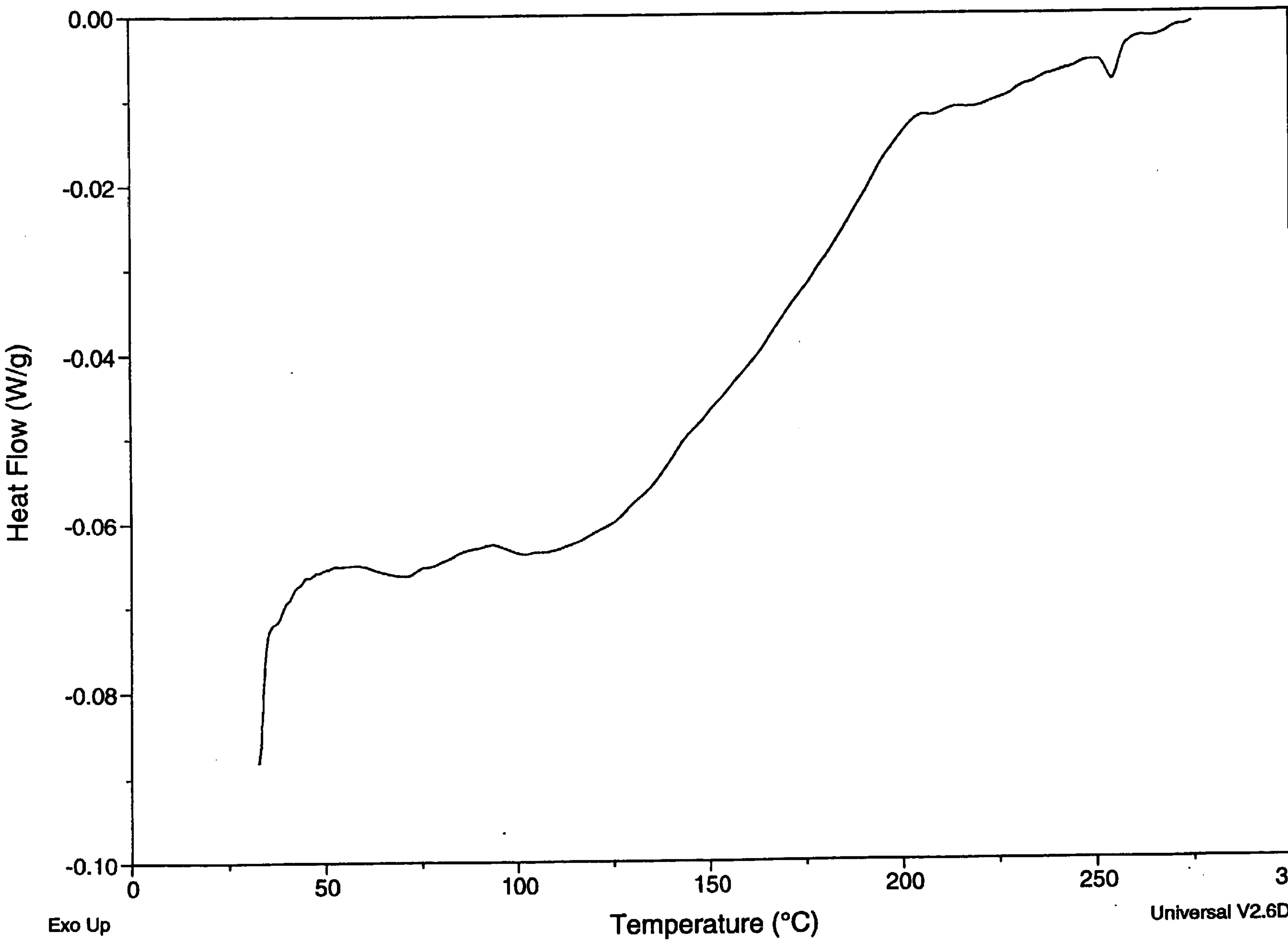
File: C:...\DSC\03614-103.067
Operator: WJM
Run Date: 27-Jun-01 13:11



Sample: Seat Foam
Size: 3.9700 mg
Method: MDSC Method
Comment: Dodge Neon : Seat Foam

DSC

File: C:...\DSC\03614-103.068
Operator: WJM
Run Date: 28-Jun-01 08:50

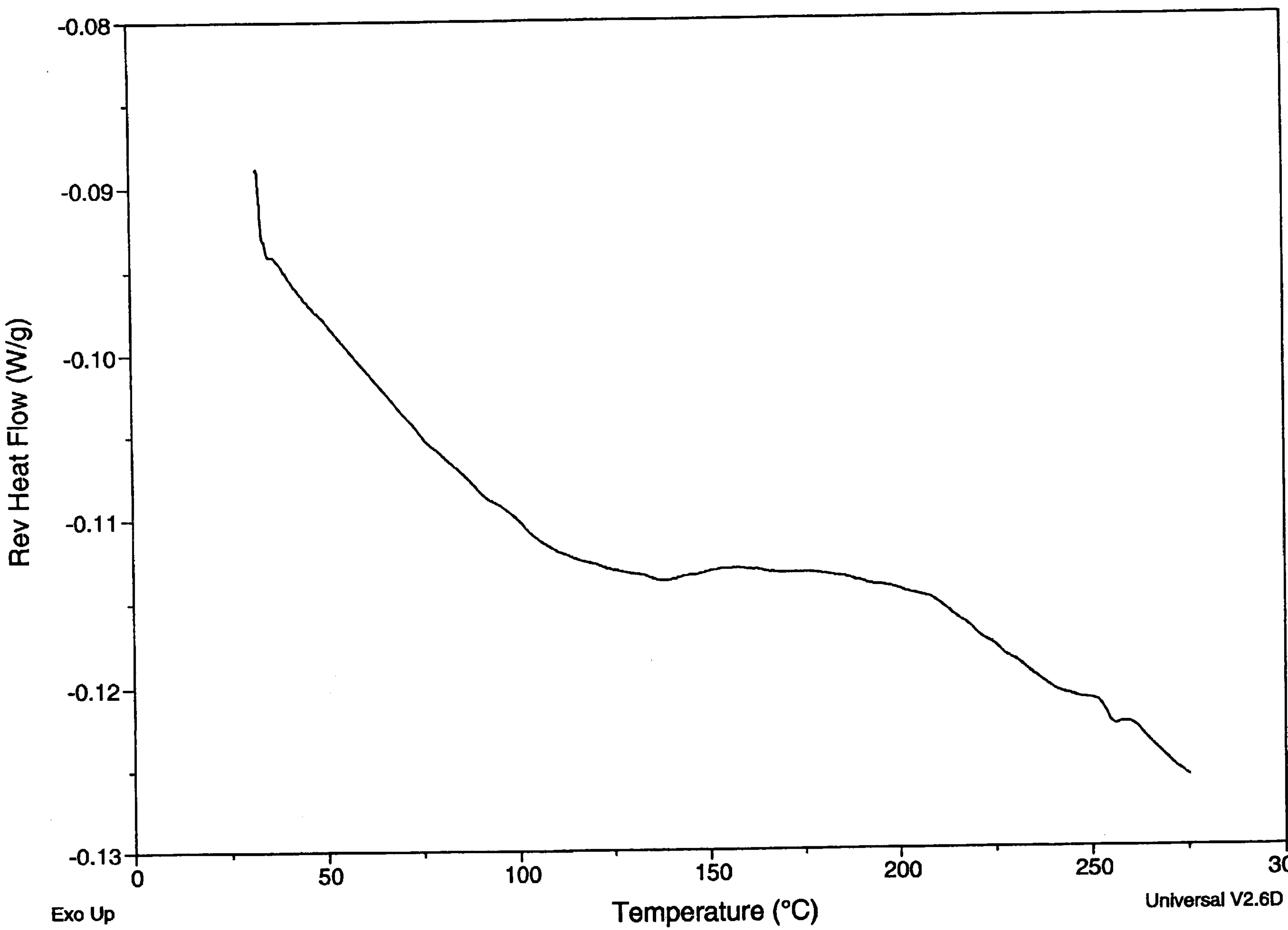


Universal V2.6D TA Instruments

Sample: Seat Foam
Size: 3.9700 mg
Method: MDSC Method
Comment: Dodge Neon : Seat Foam

DSC

File: C:...\DSC\03614-103.068
Operator: WJM
Run Date: 28-Jun-01 08:50

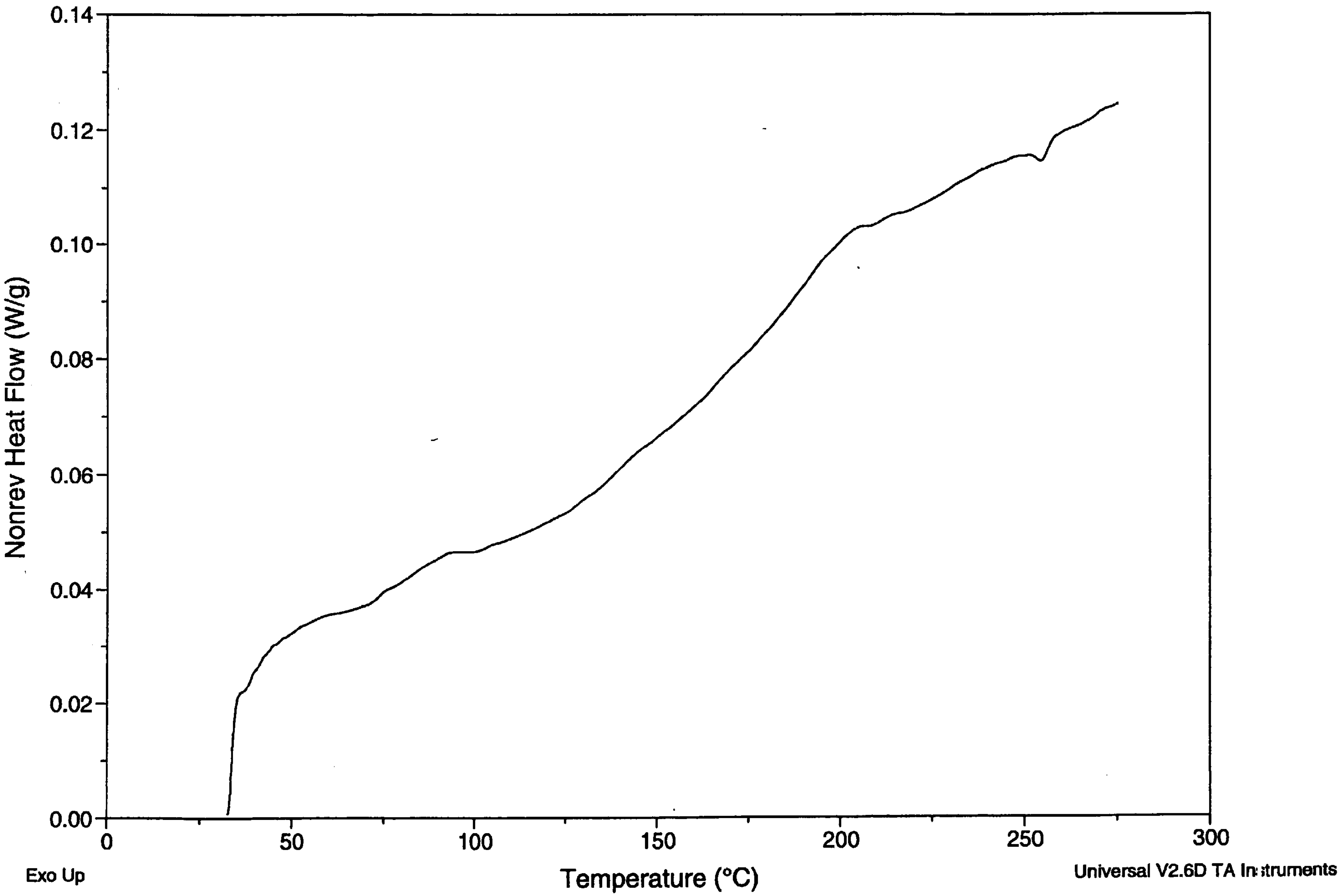


Universal V2.6D TA Instruments

Sample: Seat Foam
Size: 3.9700 mg
Method: MDSC Method
Comment: Dodge Neon : Seat Foam

DSC

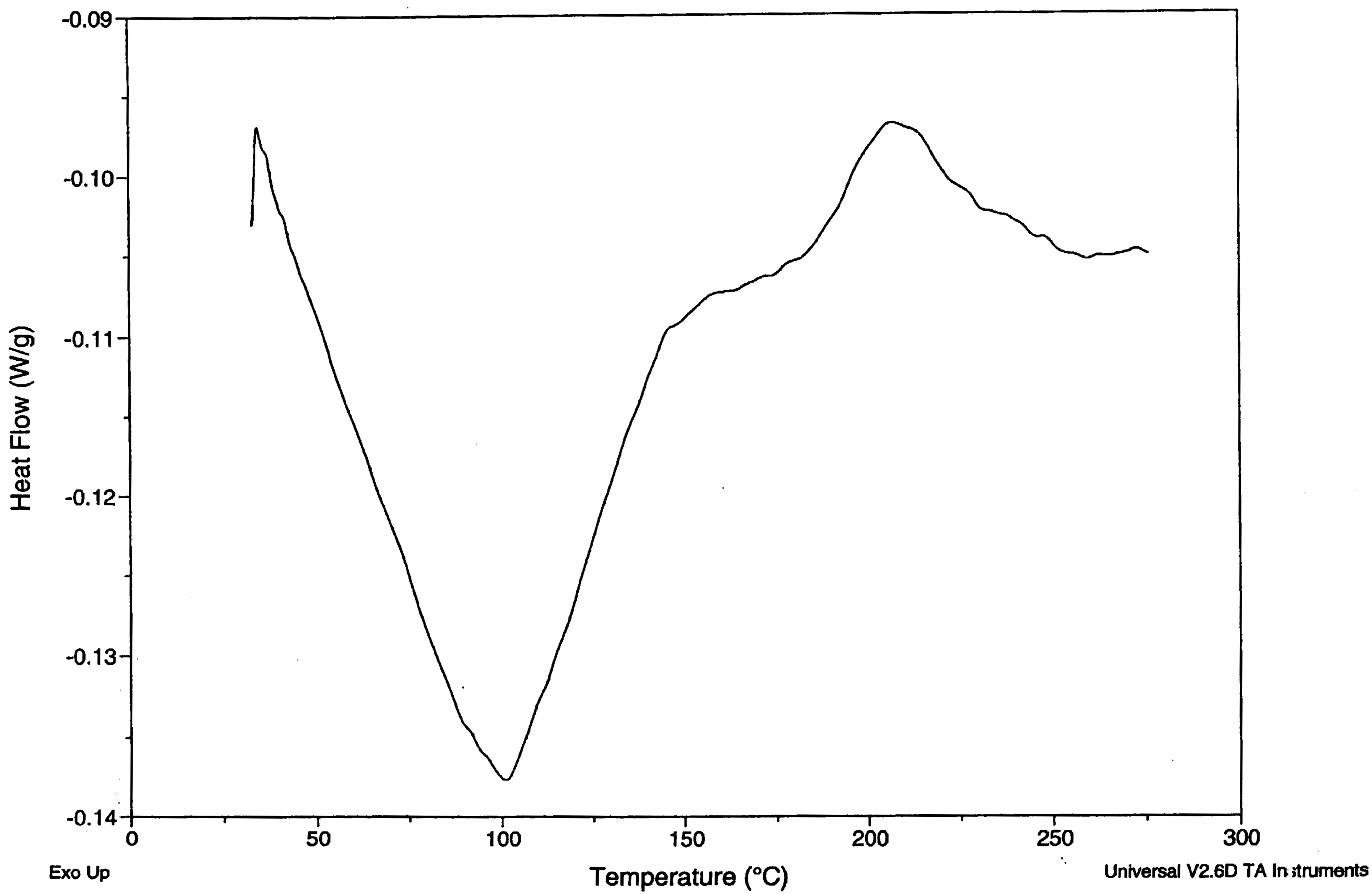
File: C:...\DSC\03614-103.068
Operator: WJM
Run Date: 28-Jun-01 08:50



Sample: Seat Foam run 2
Size: 4.6700 mg
Method: MDSC Method
Comment: Dodge Neon : Seat Foam

DSC

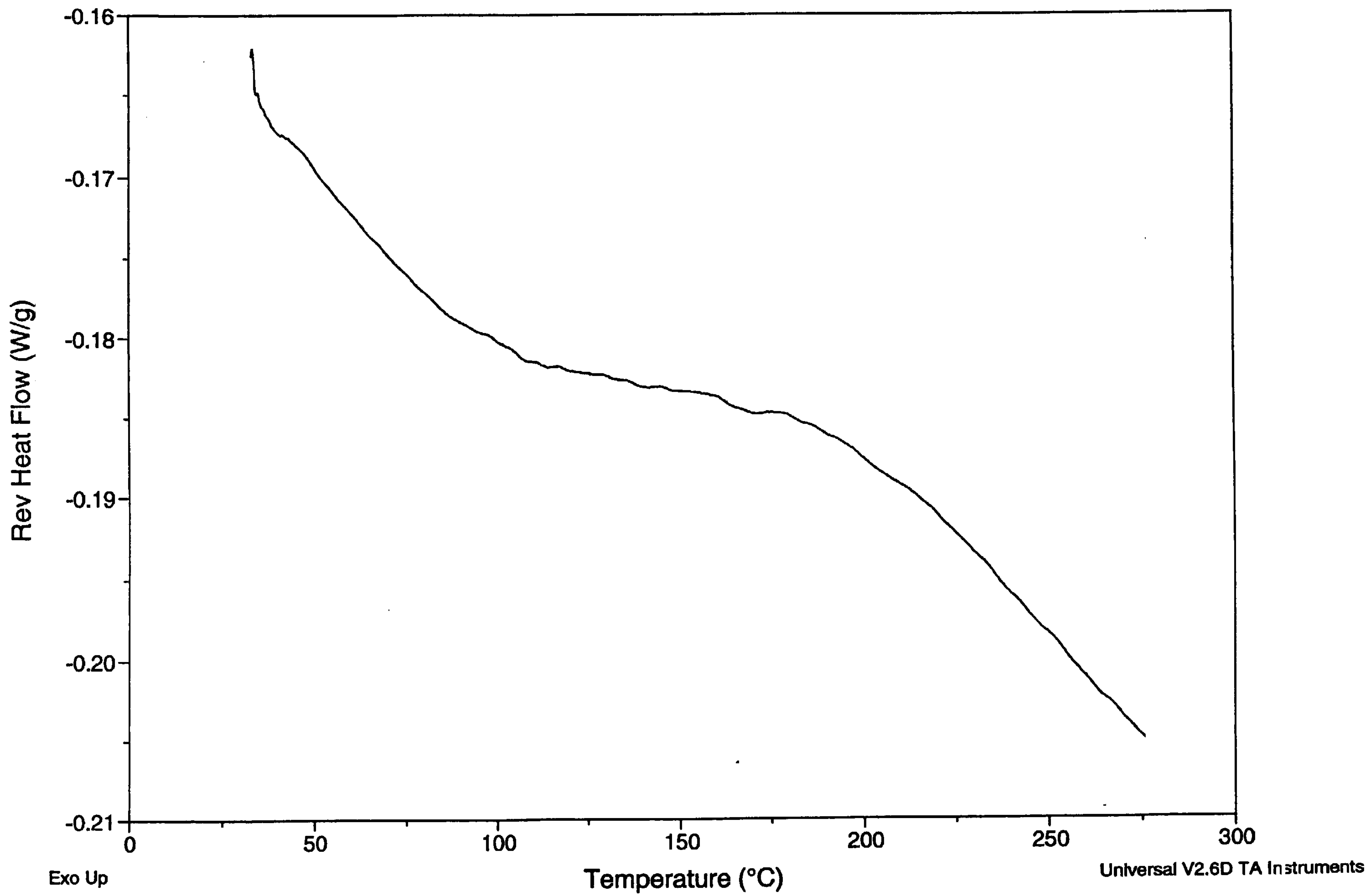
File: C:...\DSC\03614-103.069
Operator: WJM
Run Date: 28-Jun-01 14:23



Sample: Seat Foam run 2
Size: 4.6700 mg
Method: MDSC Method
Comment: Dodge Neon : Seat Foam

DSC

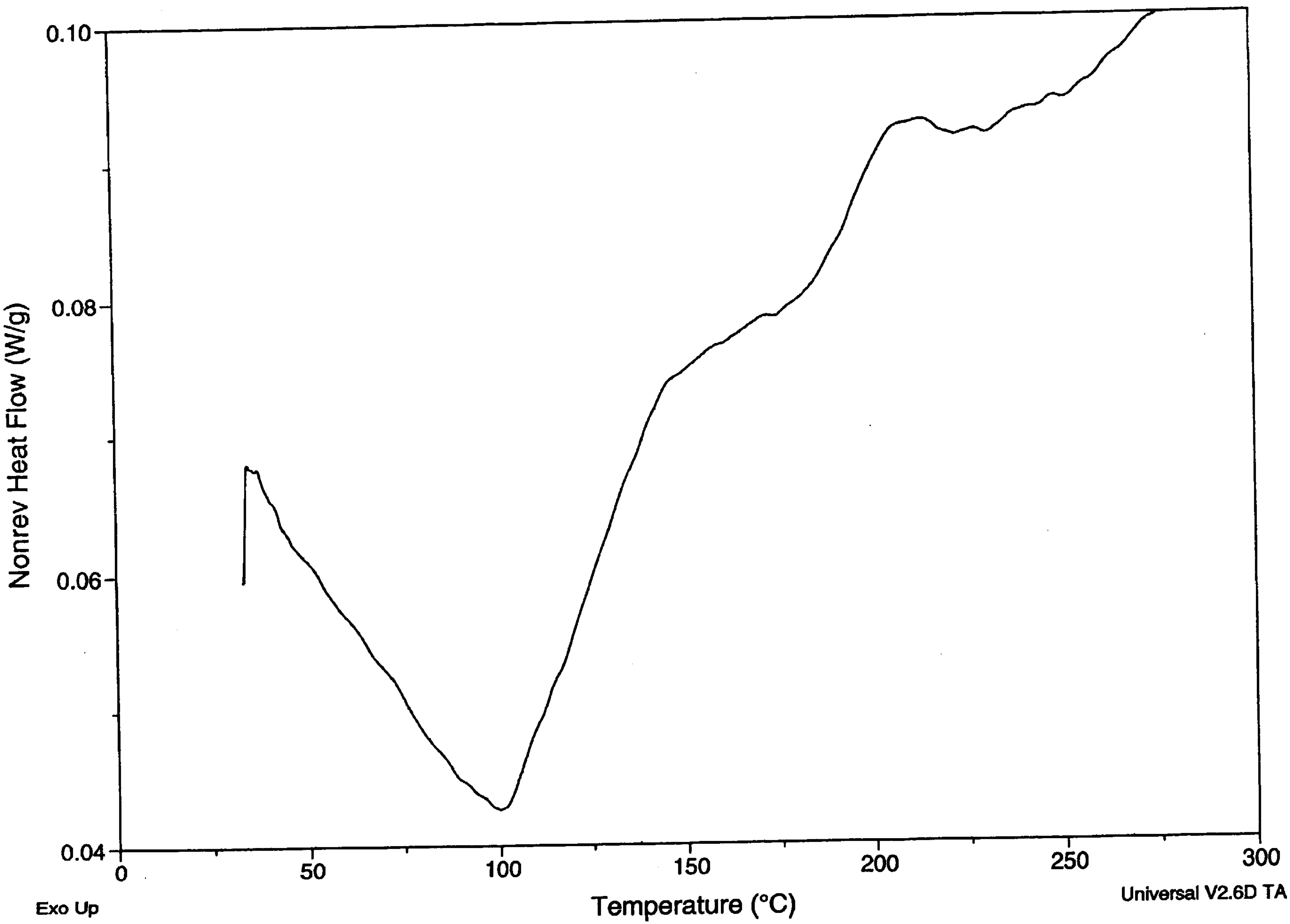
File: C:...\DSC\03614-103.069
Operator: WJM
Run Date: 28-Jun-01 14:23



Sample: Seat Foam run 2
Size: 4.6700 mg
Method: MDSC Method
Comment: Dodge Neon : Seat Foam

DSC

File: C:...\DSC\03614-103.069
Operator: WJM
Run Date: 28-Jun-01 14:23

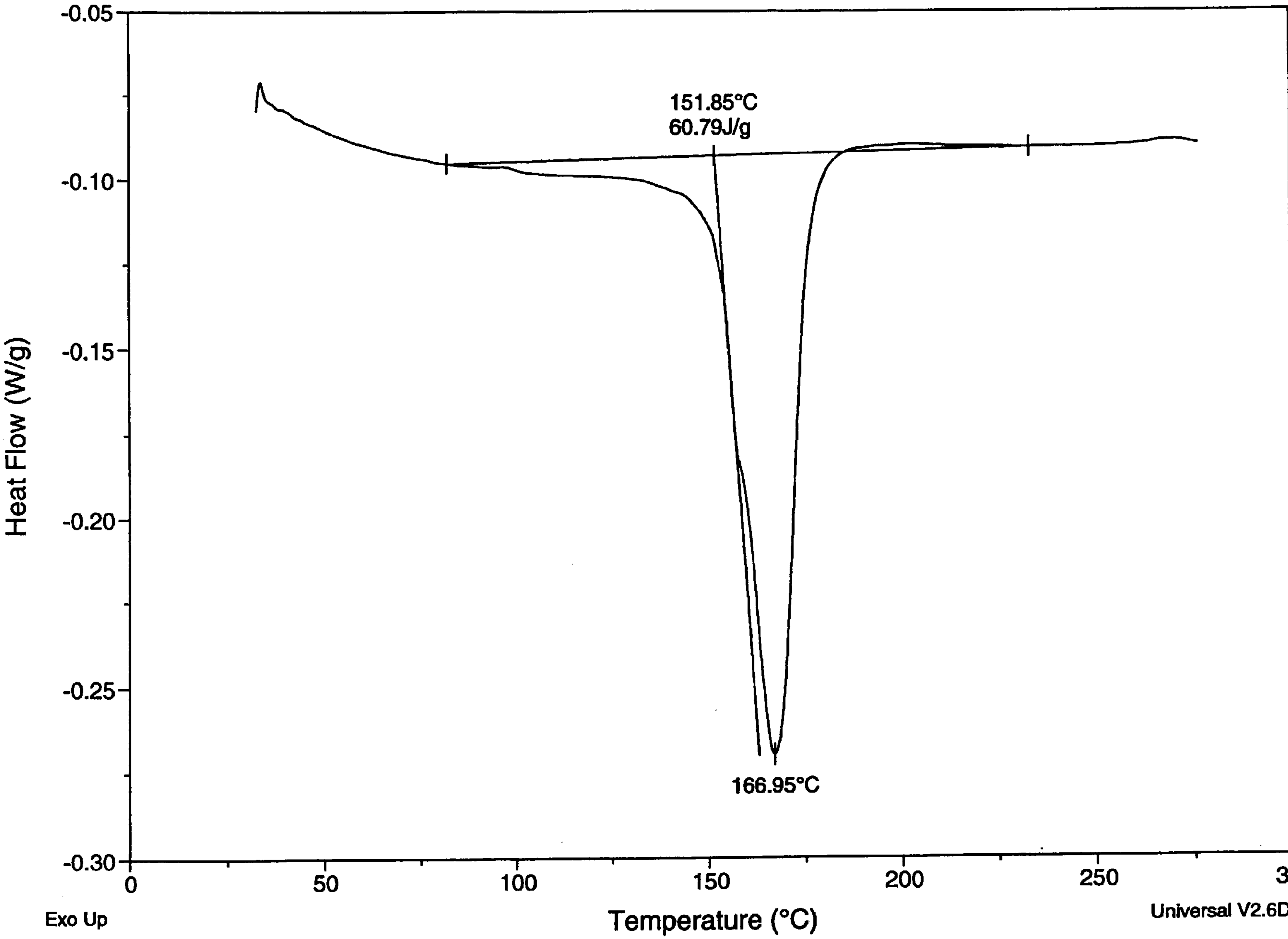


Universal V2.6D TA Instruments

Sample: Seat Foam Backing
Size: 4.6100 mg
Method: MDSC Method
Comment: Dodge Neon : Seat Foam Backing

DSC

File: C:...\DSC\03614-103.070
Operator: WJM
Run Date: 28-Jun-01 16:14

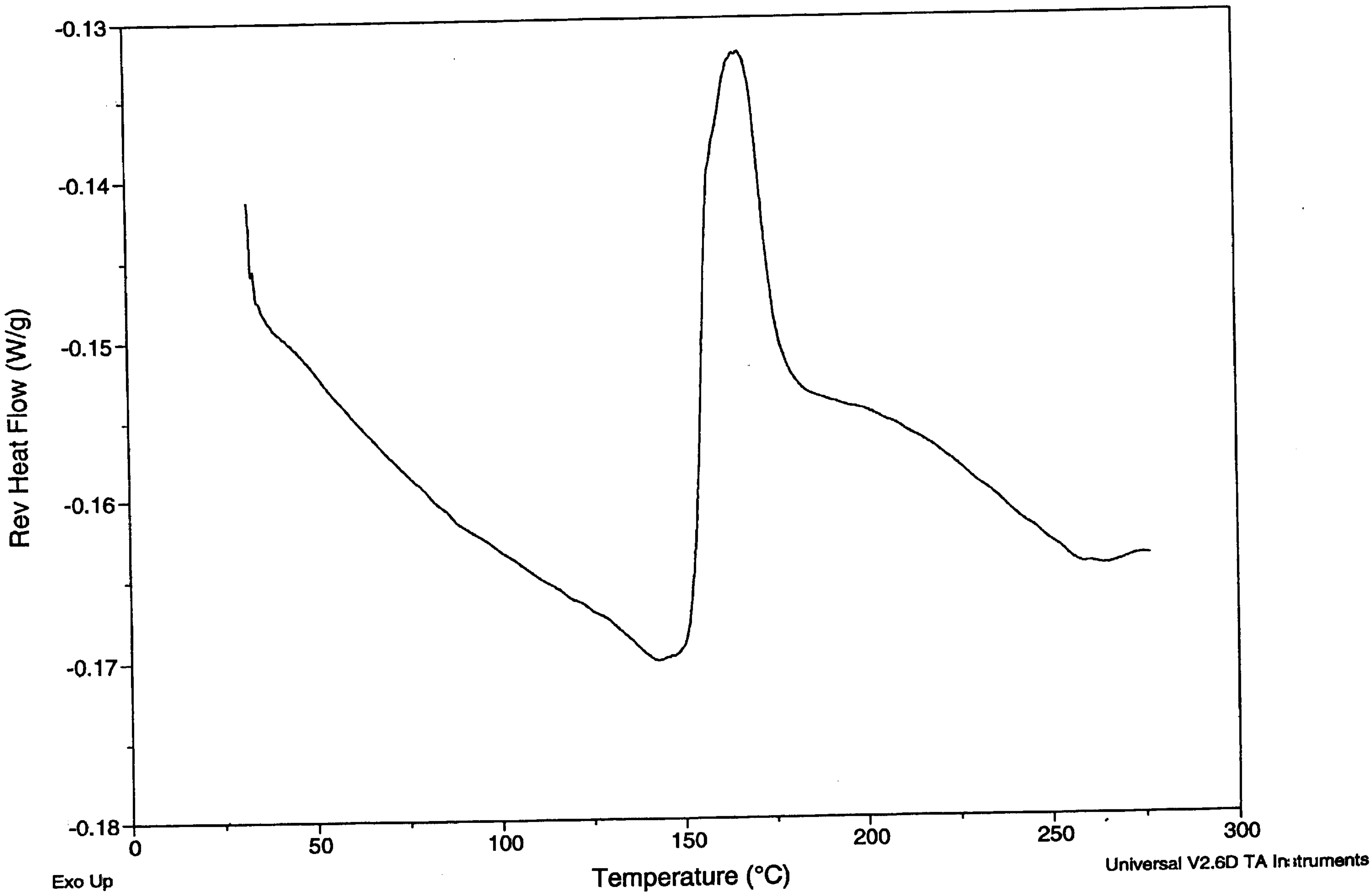


Universal V2.6D TA Instruments

Sample: Seat Foam Backing
Size: 4.6100 mg
Method: MDSC Method
Comment: Dodge Neon : Seat Foam Backing

DSC

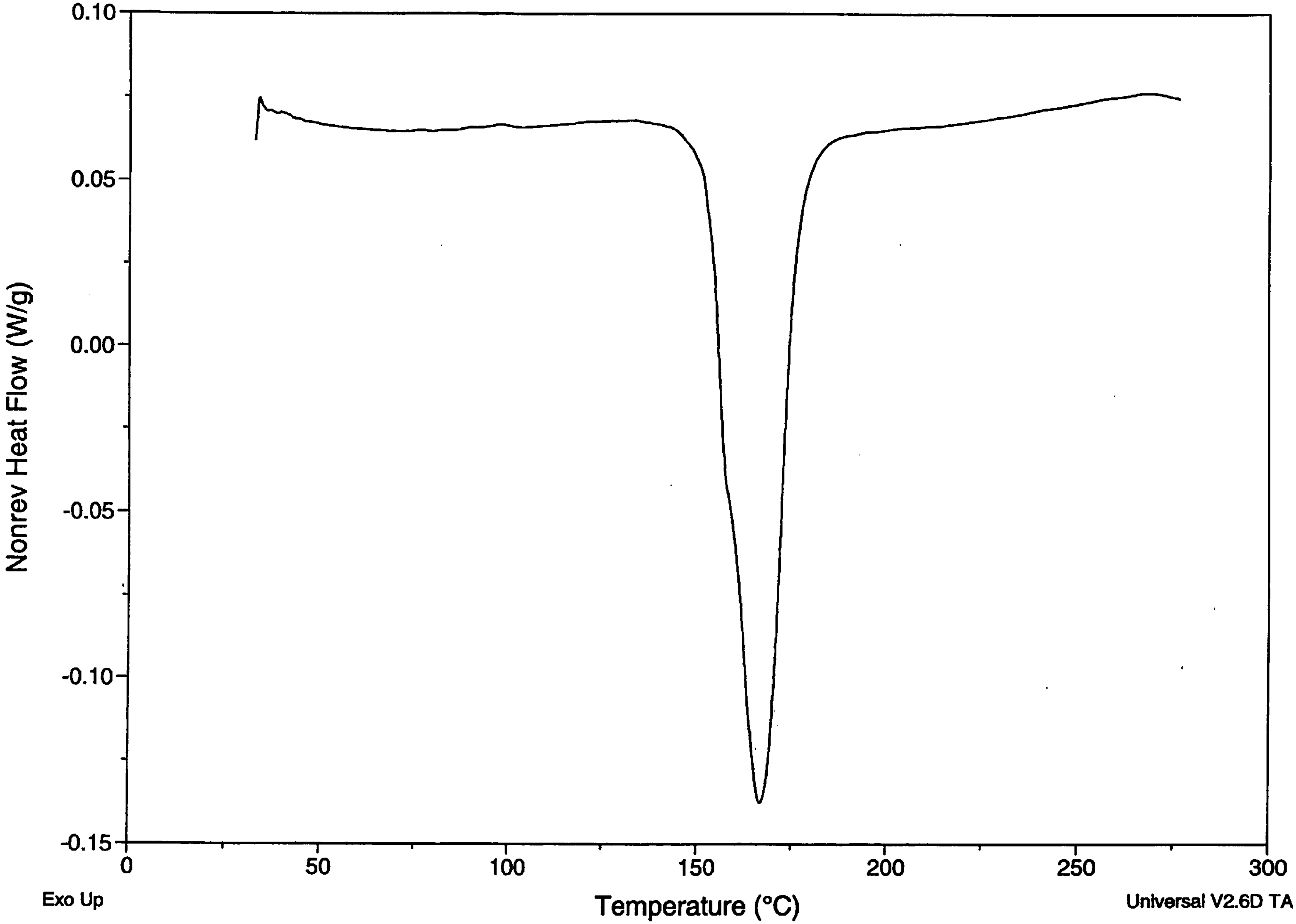
File: C:...\DSC\03614-103.070
Operator: WJM
Run Date: 28-Jun-01 16:14



Sample: Seat Foam Backing
Size: 4.6100 mg
Method: MDSC Method
Comment: Dodge Neon : Seat Foam Backing

DSC

File: C:...\DSC\03614-103.070
Operator: WJM
Run Date: 28-Jun-01 16:14

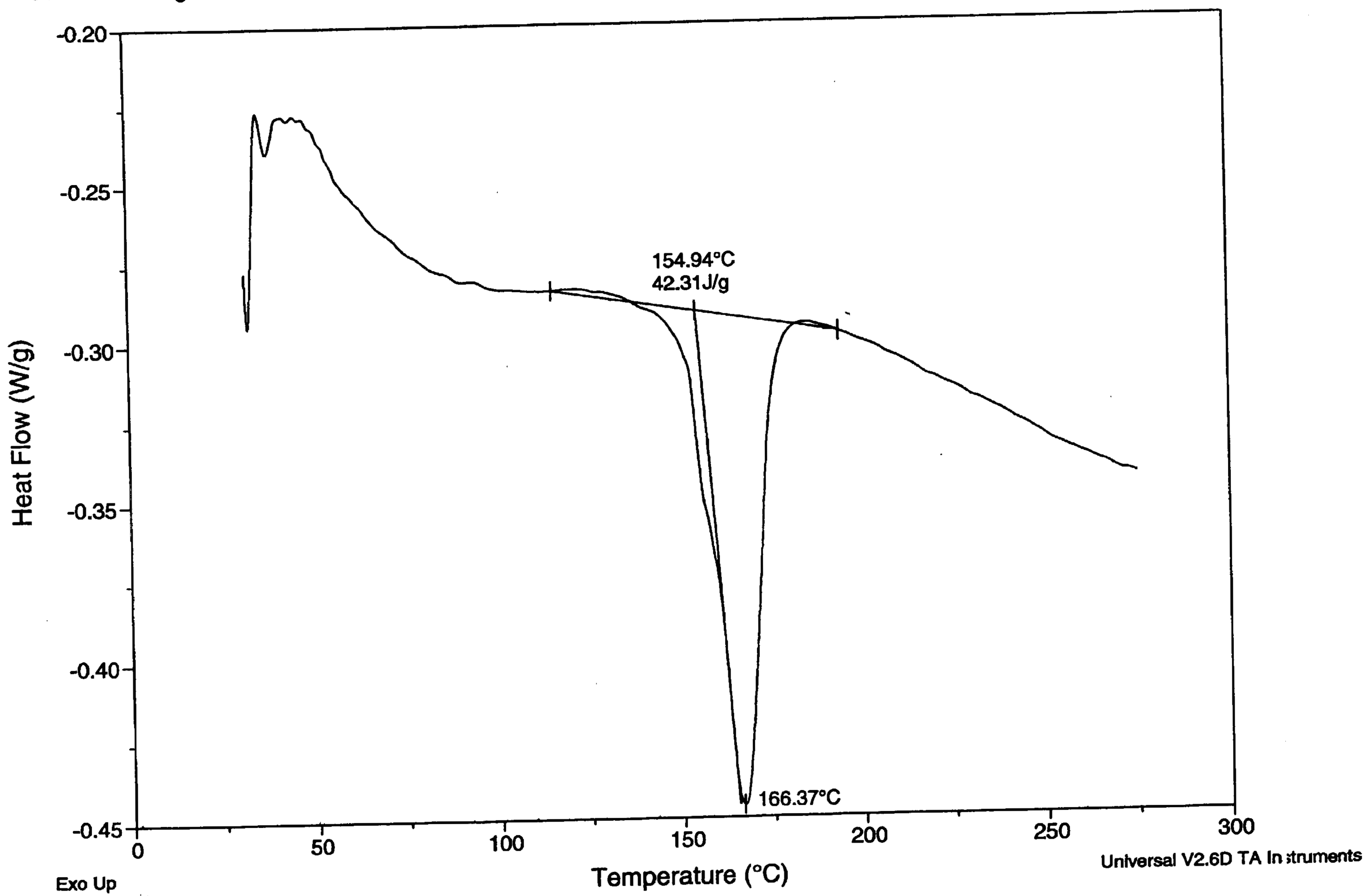


Universal V2.6D TA Instruments

Sample: Seat Foam Backing run 2
Size: 3.8000 mg
Method: MDSC Method
Comment: Dodge Neon : Seat Foam Backing

DSC

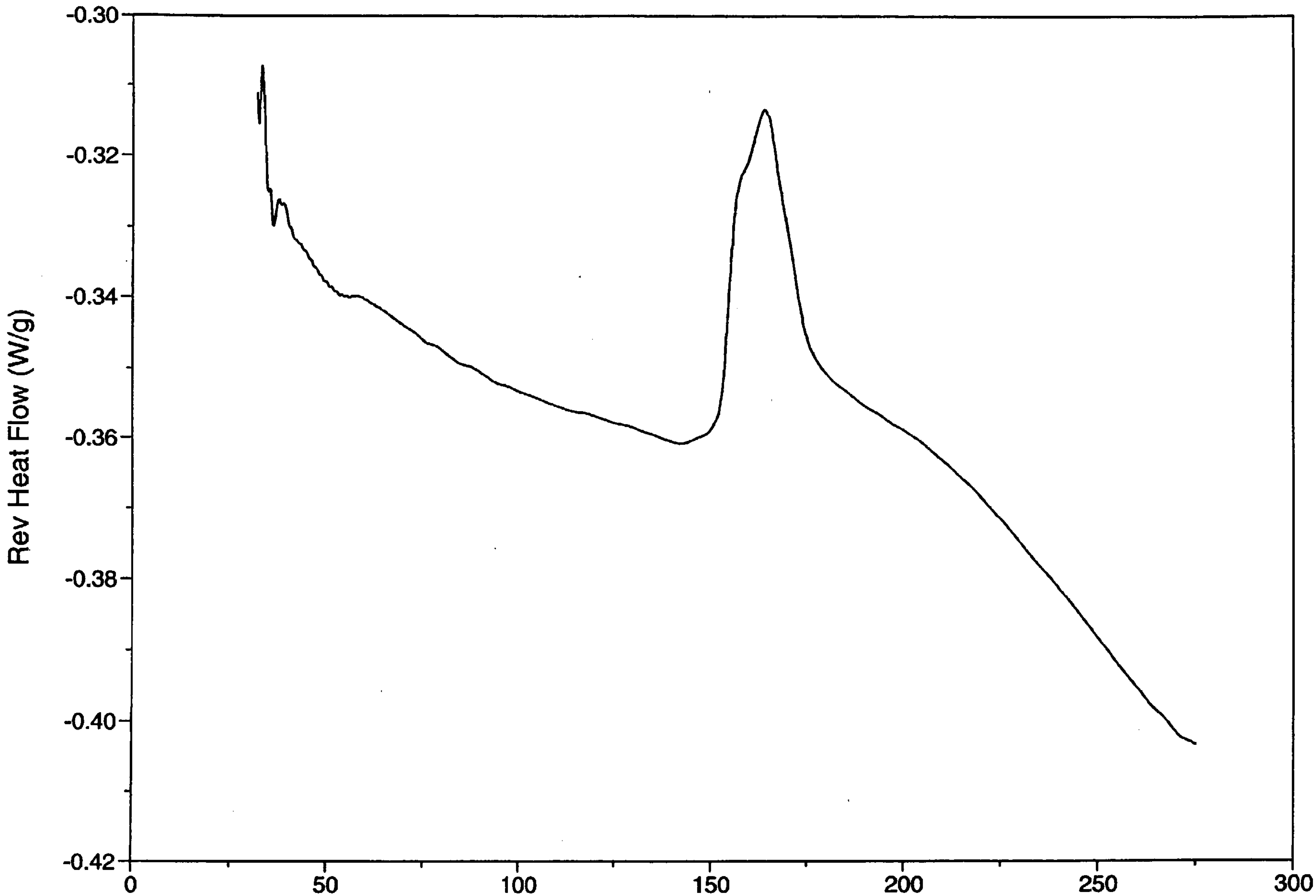
File: C:...\DSC\03614-103.071
Operator: WJM
Run Date: 29-Jun-01 08:02



Sample: Seat Foam Backing run 2
Size: 3.8000 mg
Method: MDSC Method
Comment: Dodge Neon : Seat Foam Backing

DSC

File: C:...\DSC\03614-103.071
Operator: WJM
Run Date: 29-Jun-01 08:02



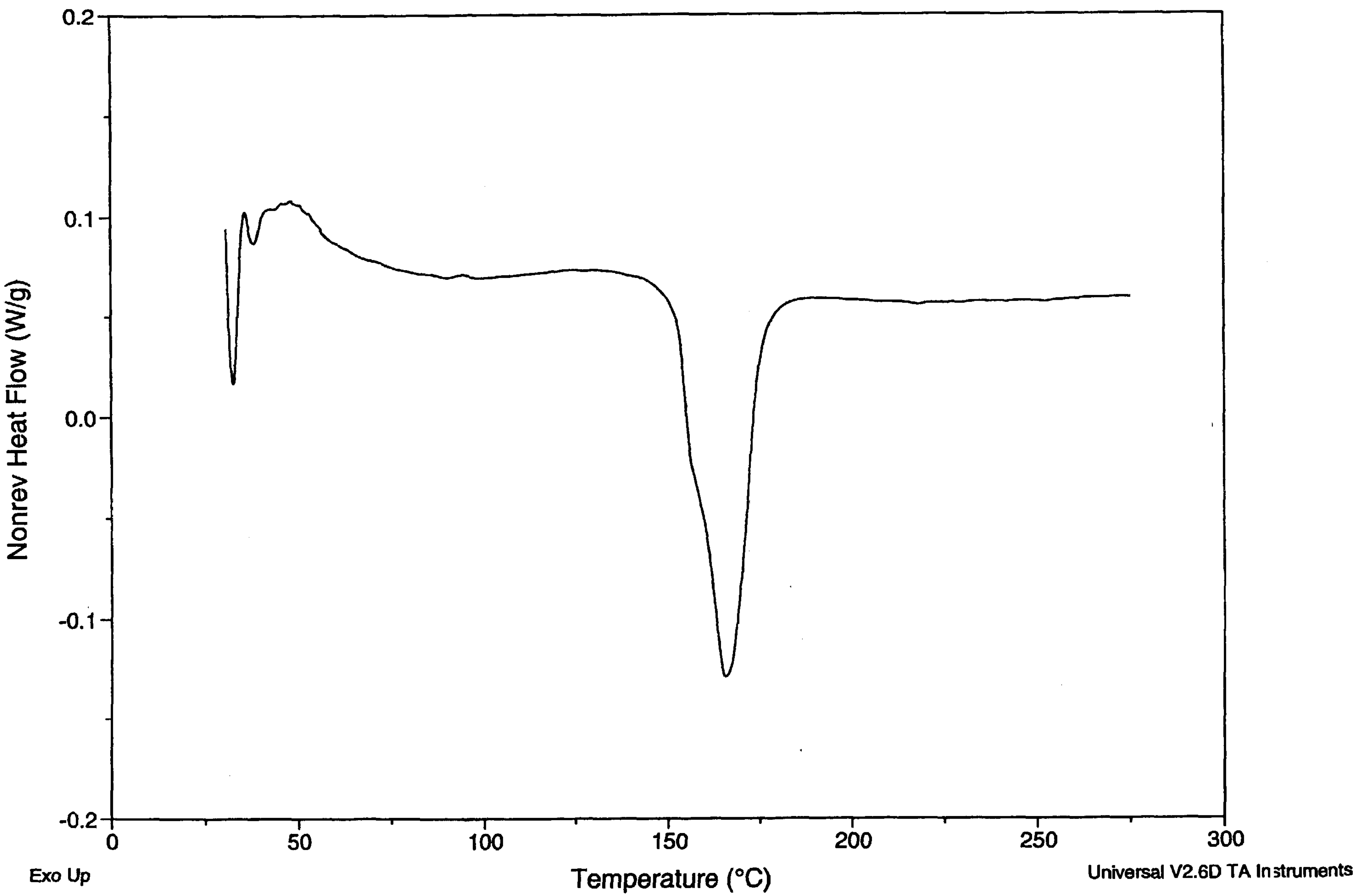
Exo Up

Universal V2.6D TA Instruments

Sample: Seat Foam Backing run 2
Size: 3.8000 mg
Method: MDSC Method
Comment: Dodge Neon : Seat Foam Backing

DSC

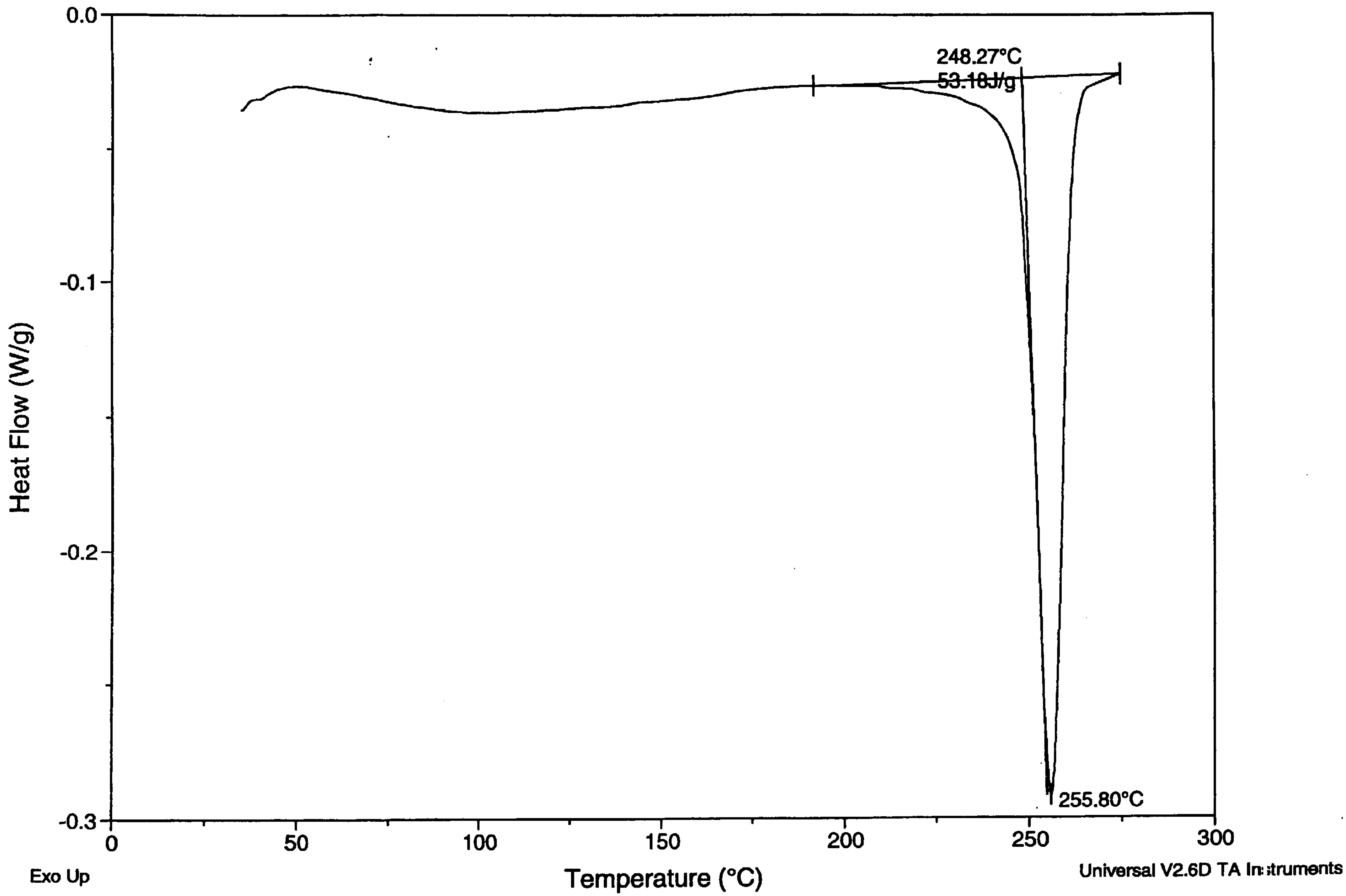
File: C:...\DSC\03614-103.071
Operator: WJM
Run Date: 29-Jun-01 08:02

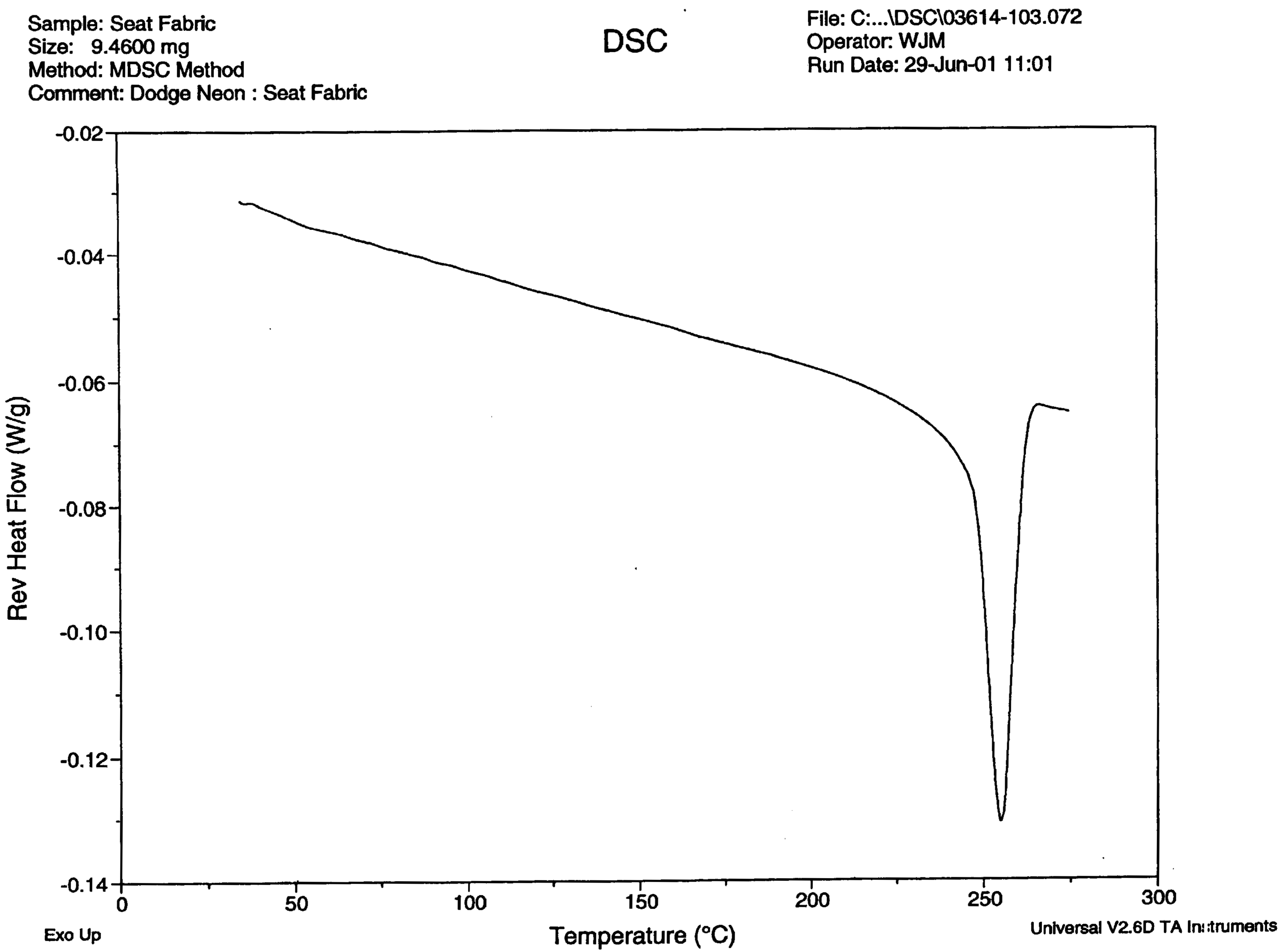


Sample: Seat Fabric
Size: 9.4600 mg
Method: MDSC Method
Comment: Dodge Neon : Seat Fabric

DSC

File: C:...\DSC\03614-103.072
Operator: WJM
Run Date: 29-Jun-01 11:01



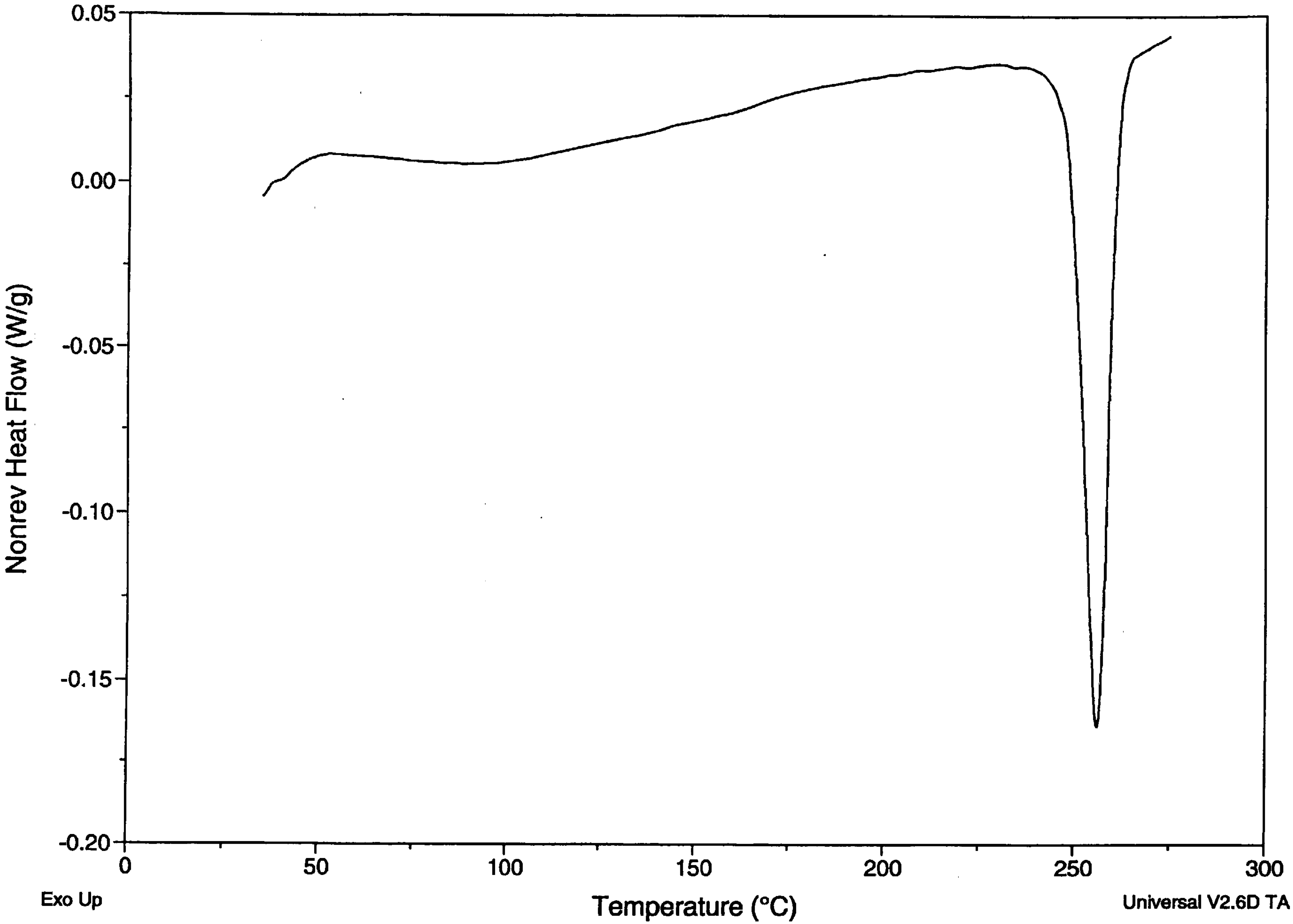


Sample: Seat Fabric
Size: 9.4600 mg
Method: MDSC Method
Comment: Dodge Neon : Seat Fabric
DSC
File: C:...\DSC\03614-103.072
Operator: WJM
Run Date: 29-Jun-01 11:01
Rev Heat Flow (W/g)
-0.02
-0.04
-0.06
-0.08
-0.10
-0.12
-0.14
0
50
100
150
200
250
300
Exo Up
Temperature (°C)
Universal V2.6D TA Instruments

Sample: Seat Fabric
Size: 9.4600 mg
Method: MDSC Method
Comment: Dodge Neon : Seat Fabric

DSC

File: C:...\DSC\03614-103.072
Operator: WJM
Run Date: 29-Jun-01 11:01

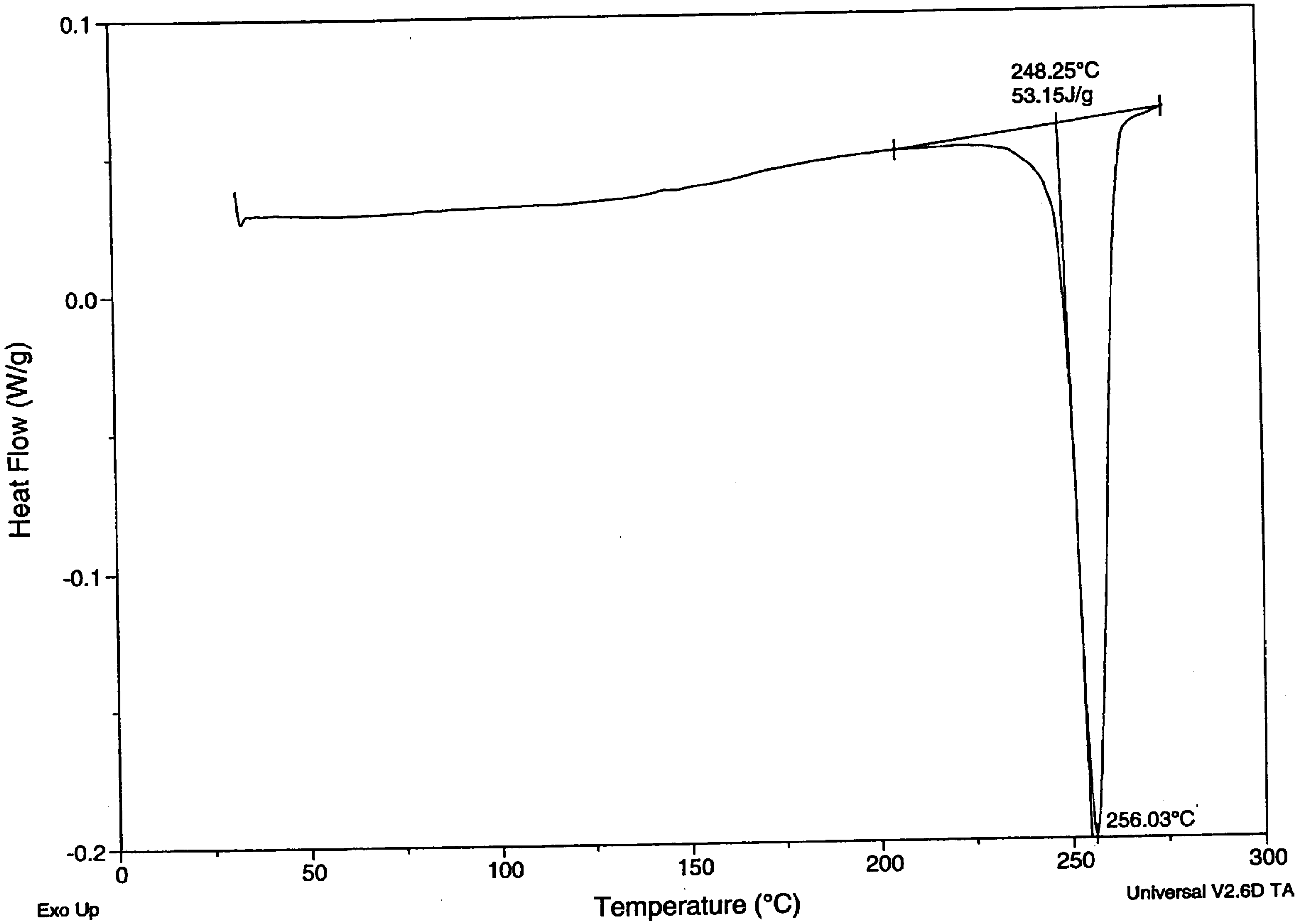


Universal V2.6D TA Instruments

Sample: Seat Fabric run 2
Size: 5.7200 mg
Method: MDSC Method
Comment: Dodge Neon : Seat Fabric

DSC

File: C:...\DSC\03614-103.073
Operator: WJM
Run Date: 29-Jun-01 13:05

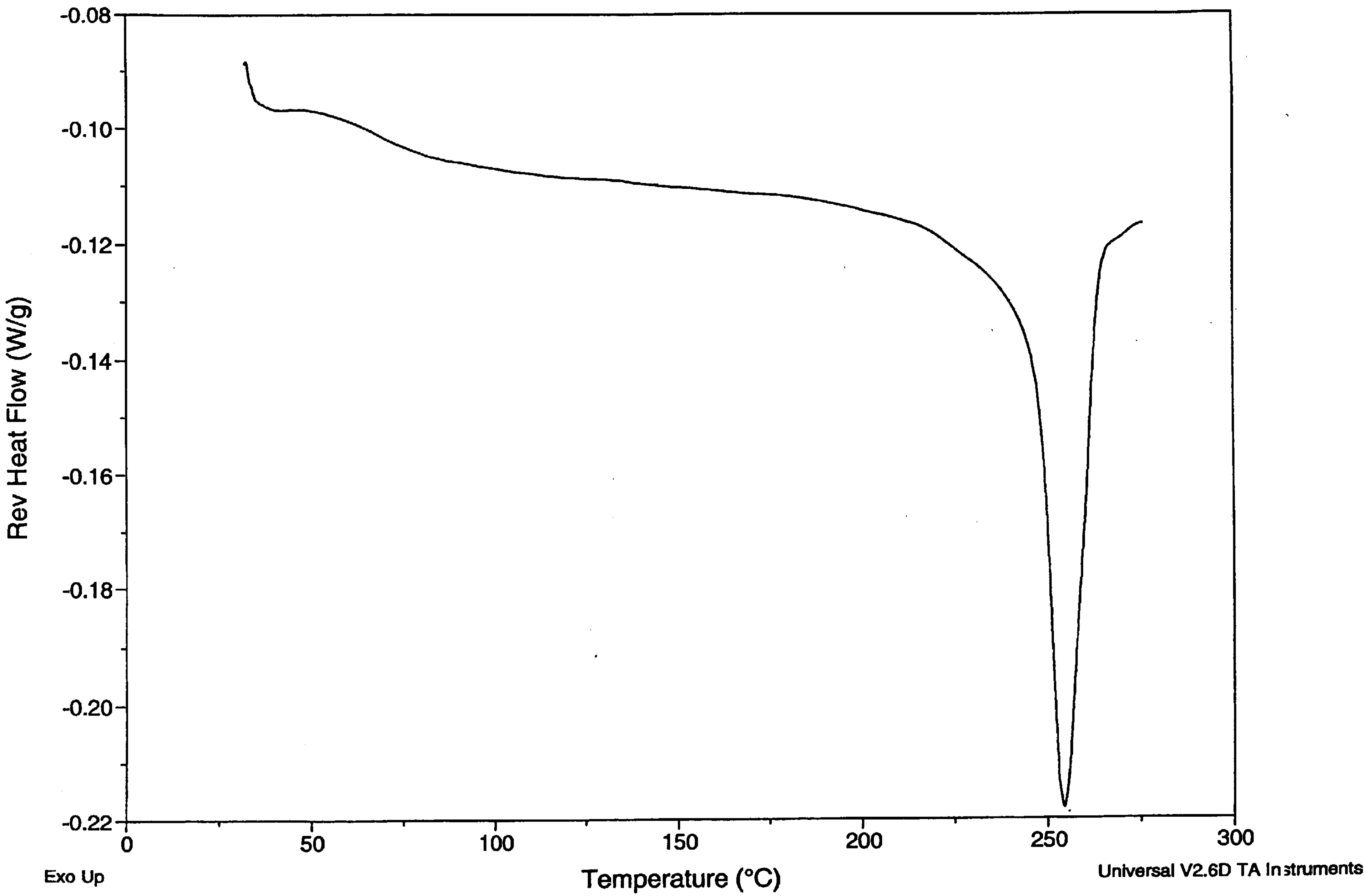


Universal V2.6D TA Instruments

Sample: Seat Fabric run 2
Size: 5.7200 mg
Method: MDSC Method
Comment: Dodge Neon : Seat Fabric

DSC

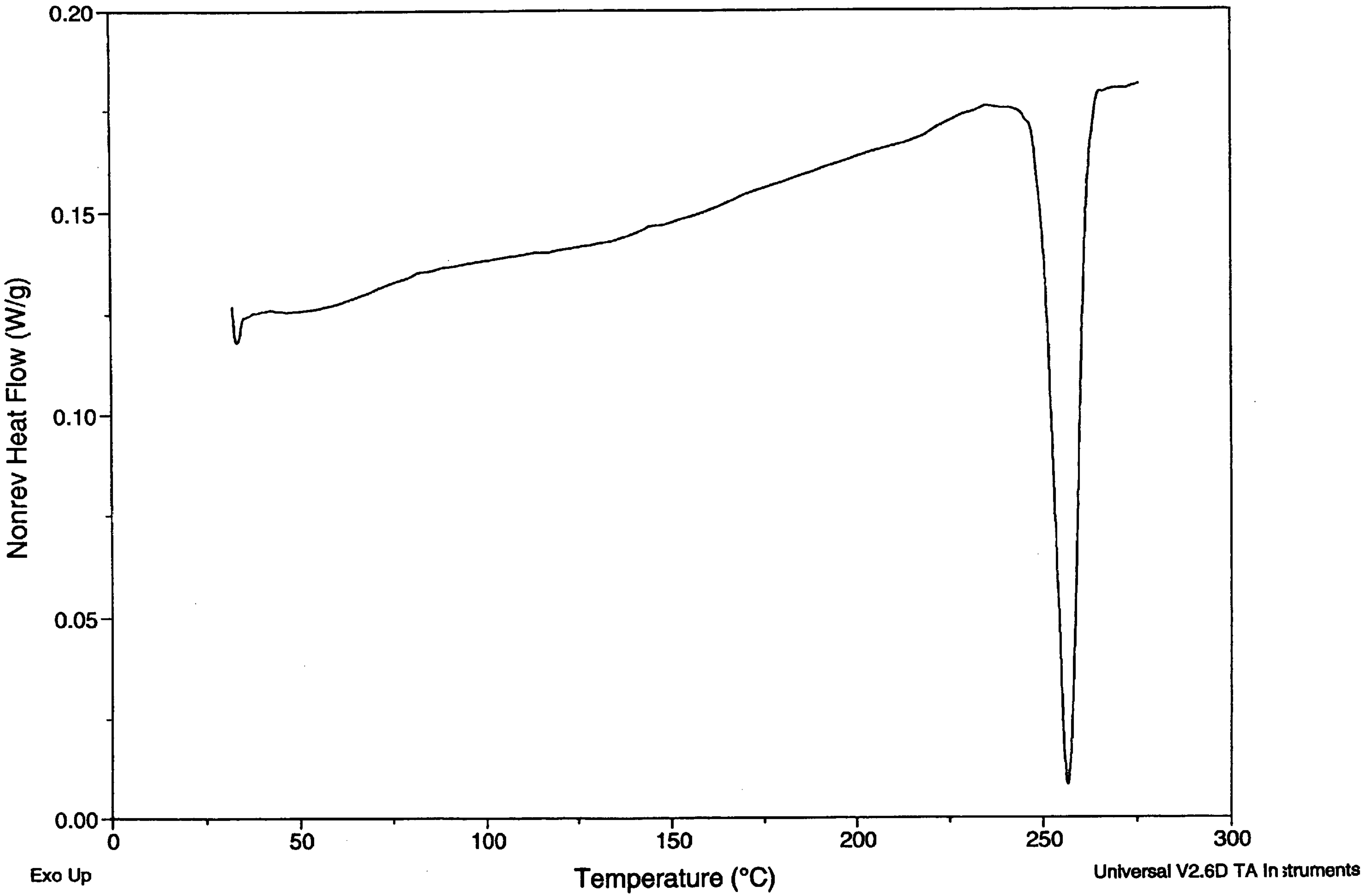
File: C:...\DSC\03614-103.073
Operator: WJM
Run Date: 29-Jun-01 13:05



Sample: Seat Fabric run 2
Size: 5.7200 mg
Method: MDSC Method
Comment: Dodge Neon : Seat Fabric

DSC

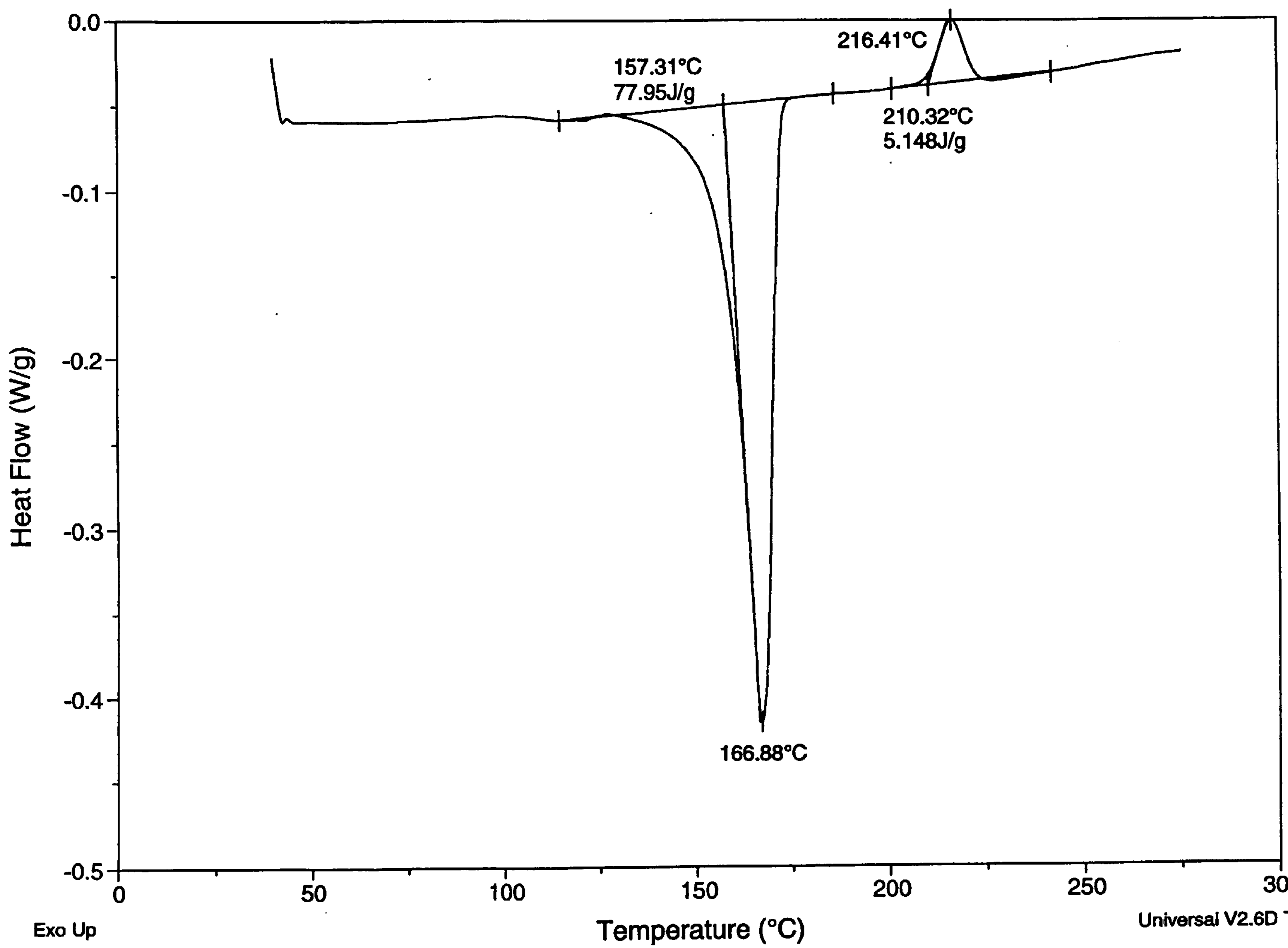
File: C:...\DSC\03614-103.073
Operator: WJM
Run Date: 29-Jun-01 13:05



Sample: Kick Panel Run 2
Size: 4.6800 mg
Method: MDSC Method
Comment: Dodgr Neon: Kick Panel

DSC

File: C:...\DSC\03614-103.075
Operator: WJM
Run Date: 5-Jul-01 16:15

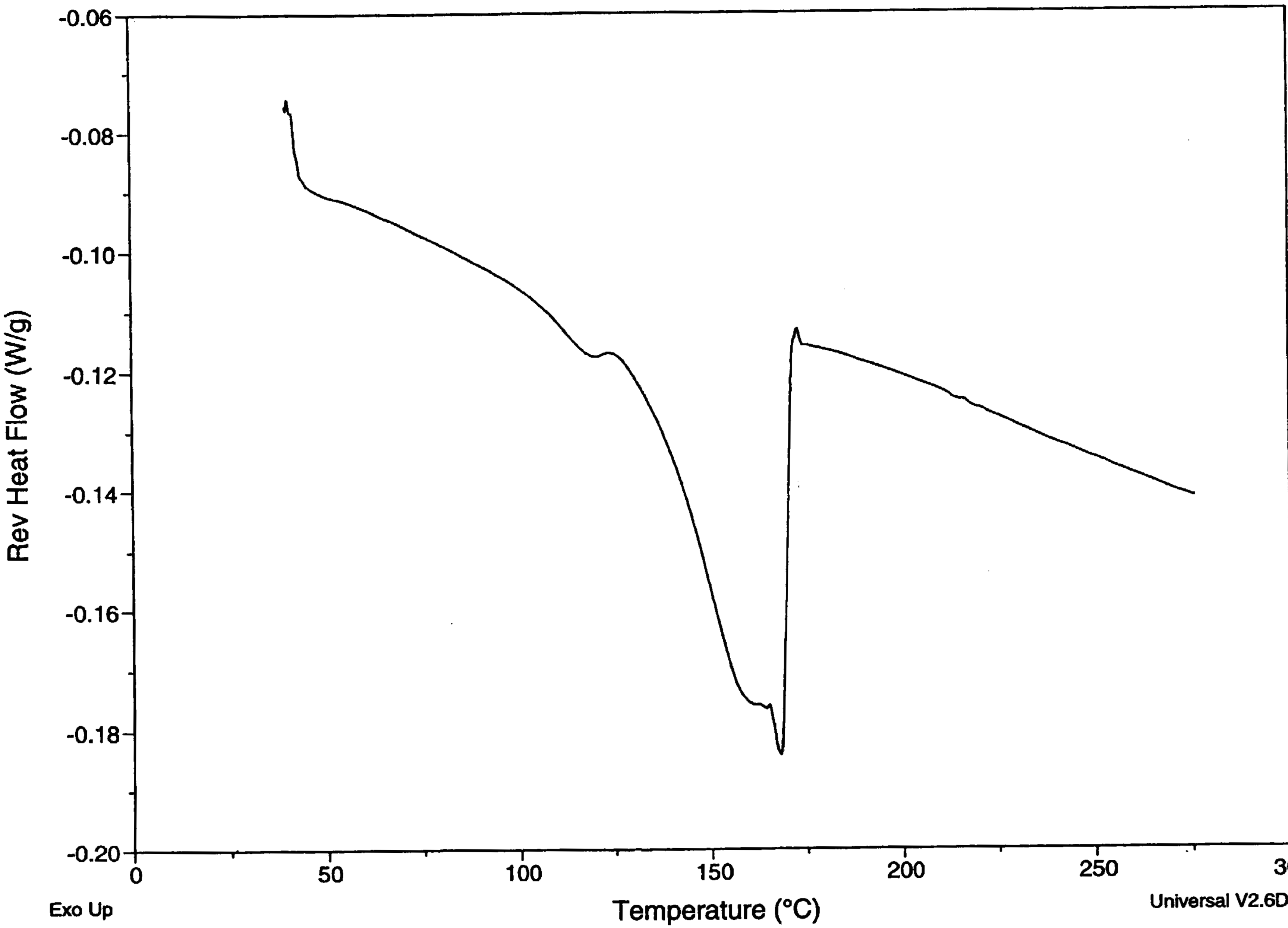


Universal V2.6D TA Instruments

Sample: Kick Panel Run 2
Size: 4.6800 mg
Method: MDSC Method
Comment: Dodgr Neon: Kick Panel

DSC

File: C:...\DSC\03614-103.075
Operator: WJM
Run Date: 5-Jul-01 16:15

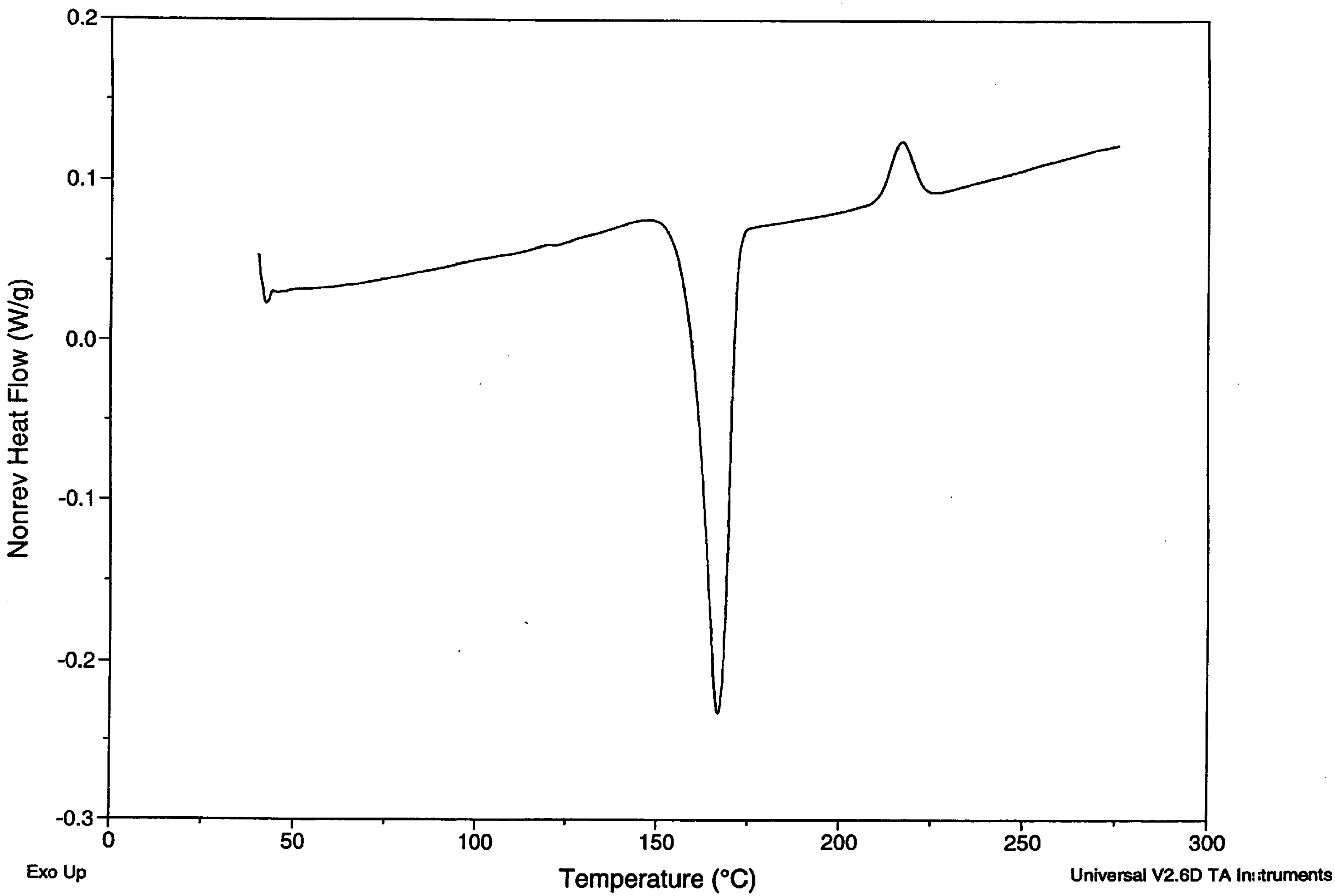


Universal V2.6D TA Instruments

Sample: Kick Panel Run 2
Size: 4.6800 mg
Method: MDSC Method
Comment: Dodgr Neon: Kick Panel

DSC

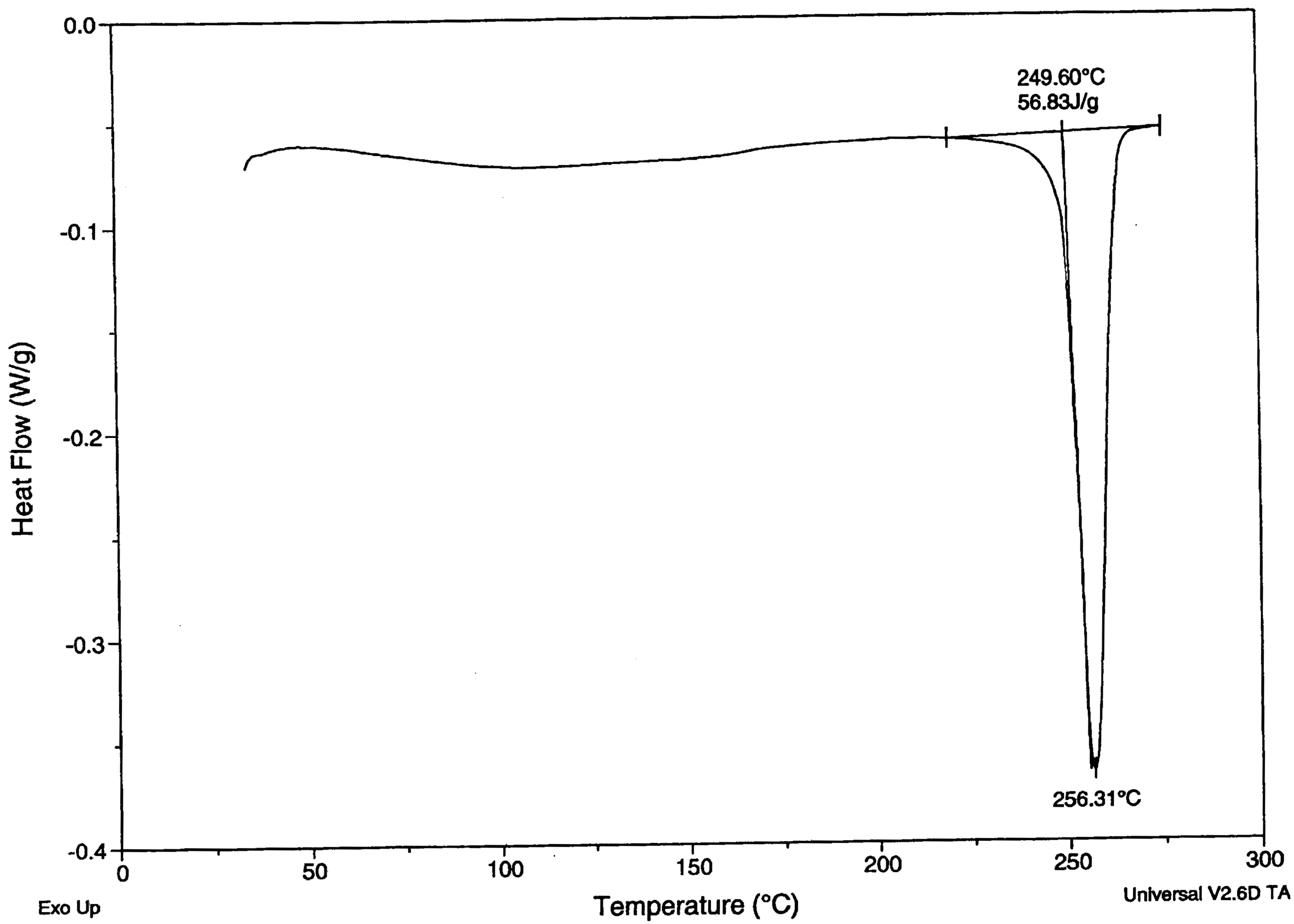
File: C:...\DSC\03614-103.075
Operator: WJM
Run Date: 5-Jul-01 16:15



Sample: Door Panel Fabric
Size: 7.3200 mg
Method: MDSC Method
Comment: Dodgr Neon: Door Panel Fabric

DSC

File: C:...\DSC\03614-103.076
Operator: WJM
Run Date: 6-Jul-01 08:49

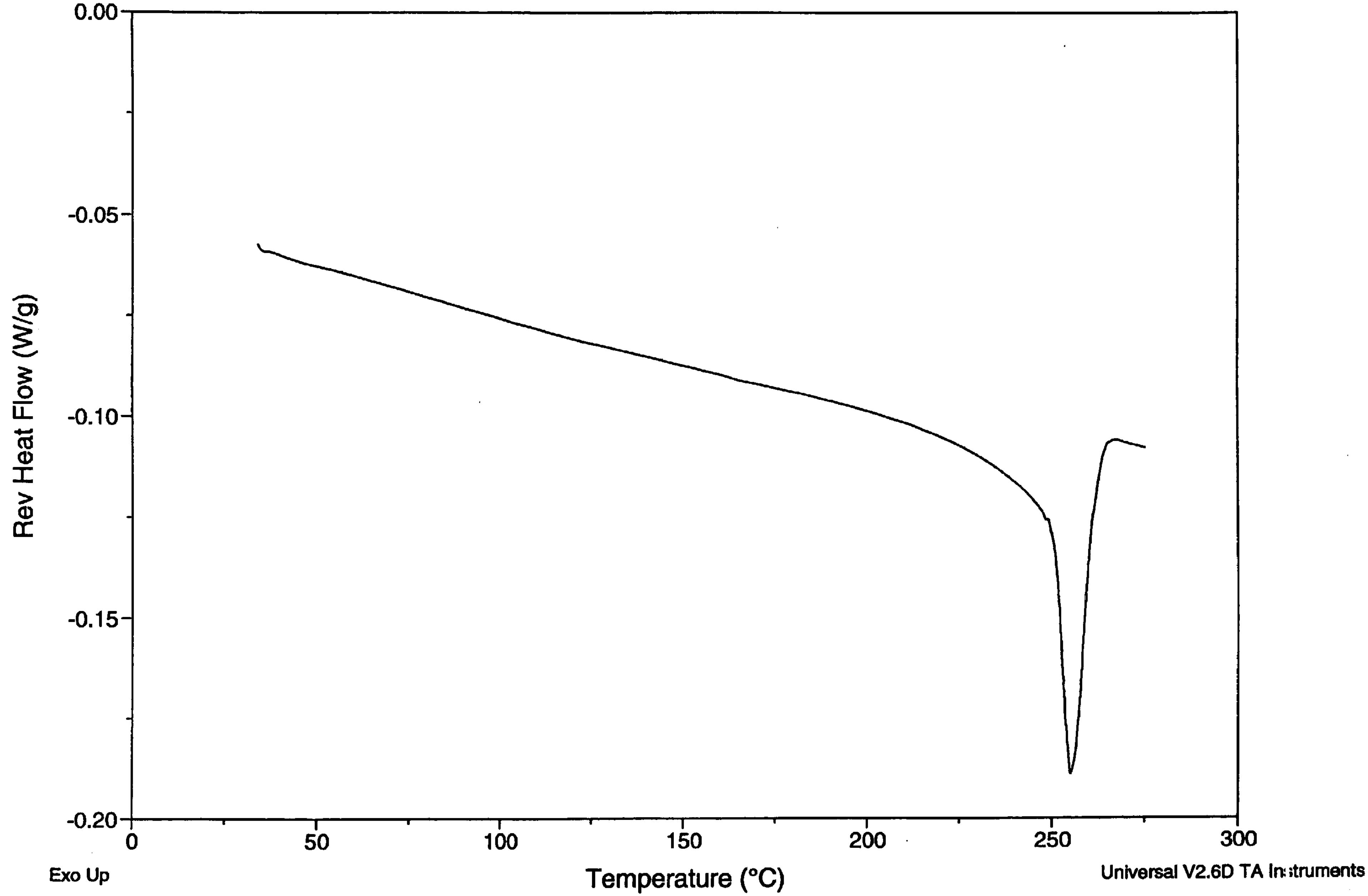


Universal V2.6D TA Instruments

Sample: Door Panel Fabric
Size: 7.3200 mg
Method: MDSC Method
Comment: Dodgr Neon: Door Panel Fabric

DSC

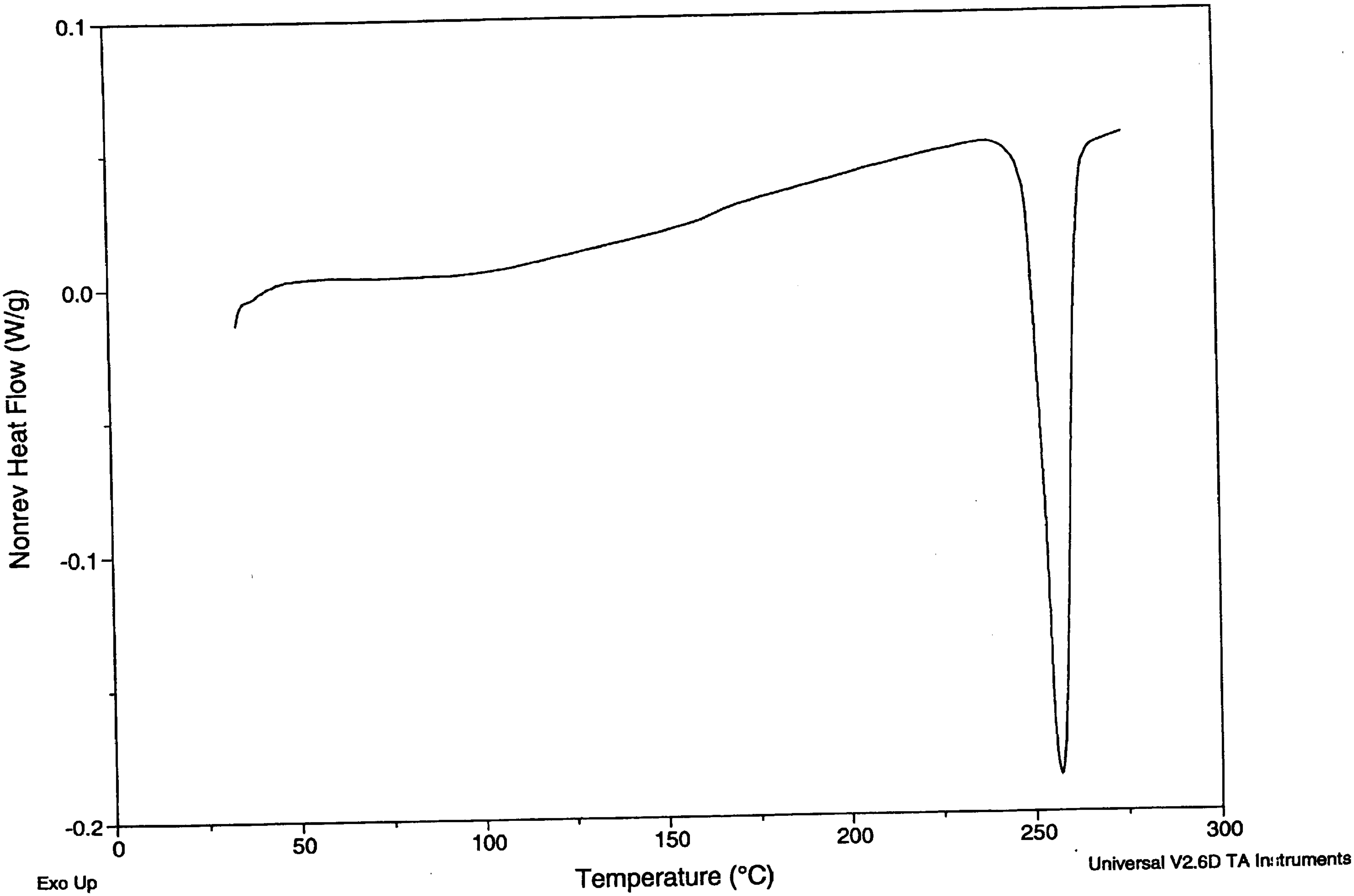
File: C:...\DSC\03614-103.076
Operator: WJM
Run Date: 6-Jul-01 08:49



Sample: Door Panel Fabric
Size: 7.3200 mg
Method: MDSC Method
Comment: Dodgr Neon: Door Panel Fabric

DSC

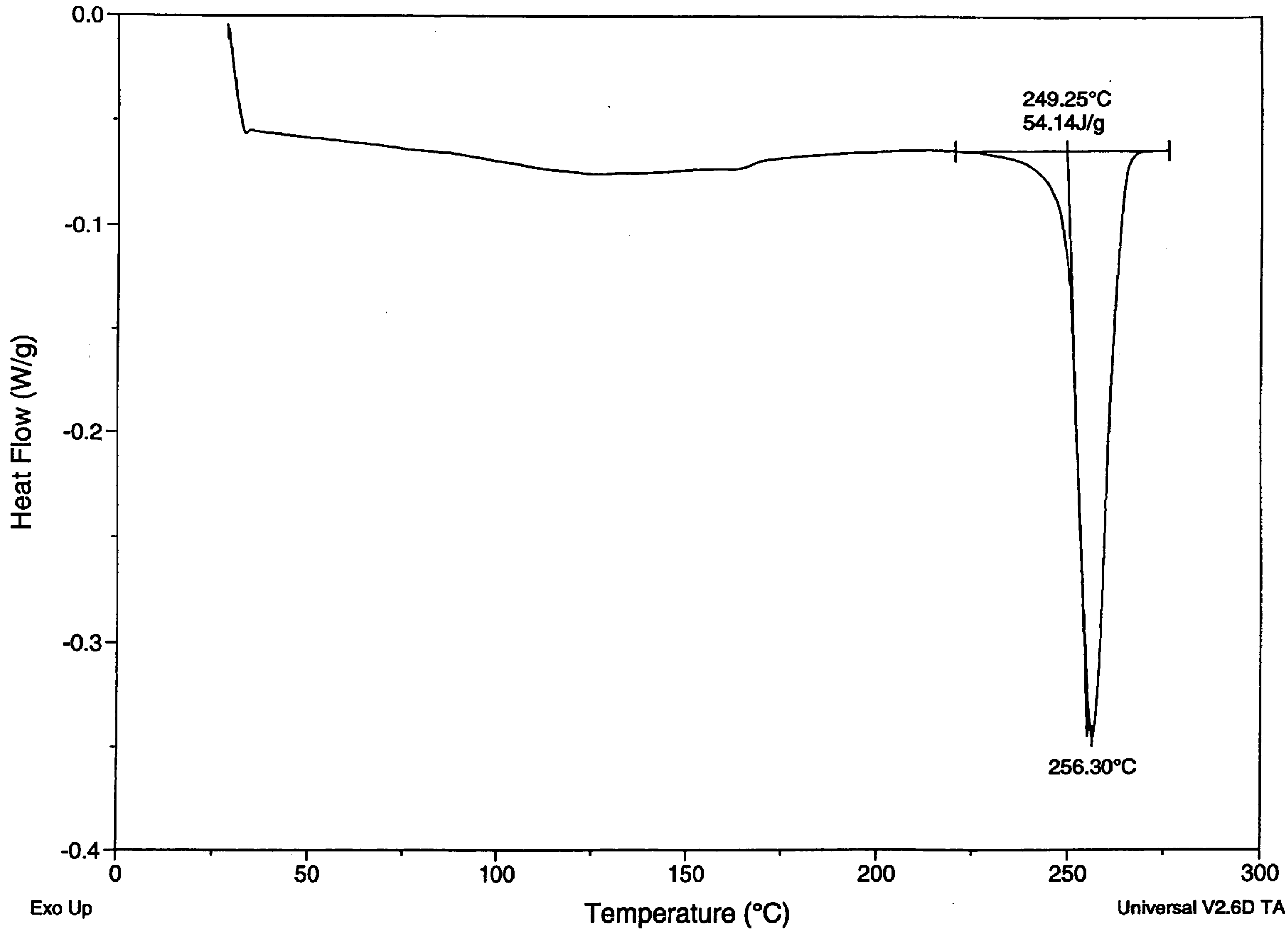
File: C:...\DSC\03614-103.076
Operator: WJM
Run Date: 6-Jul-01 08:49



Sample: Door Panel Fabric Run 2
Size: 8.7500 mg
Method: MDSC Method
Comment: Dodgr Neon: Door Panel Fabric

DSC

File: C:...\DSC\03614-103.077
Operator: WJM
Run Date: 6-Jul-01 10:55

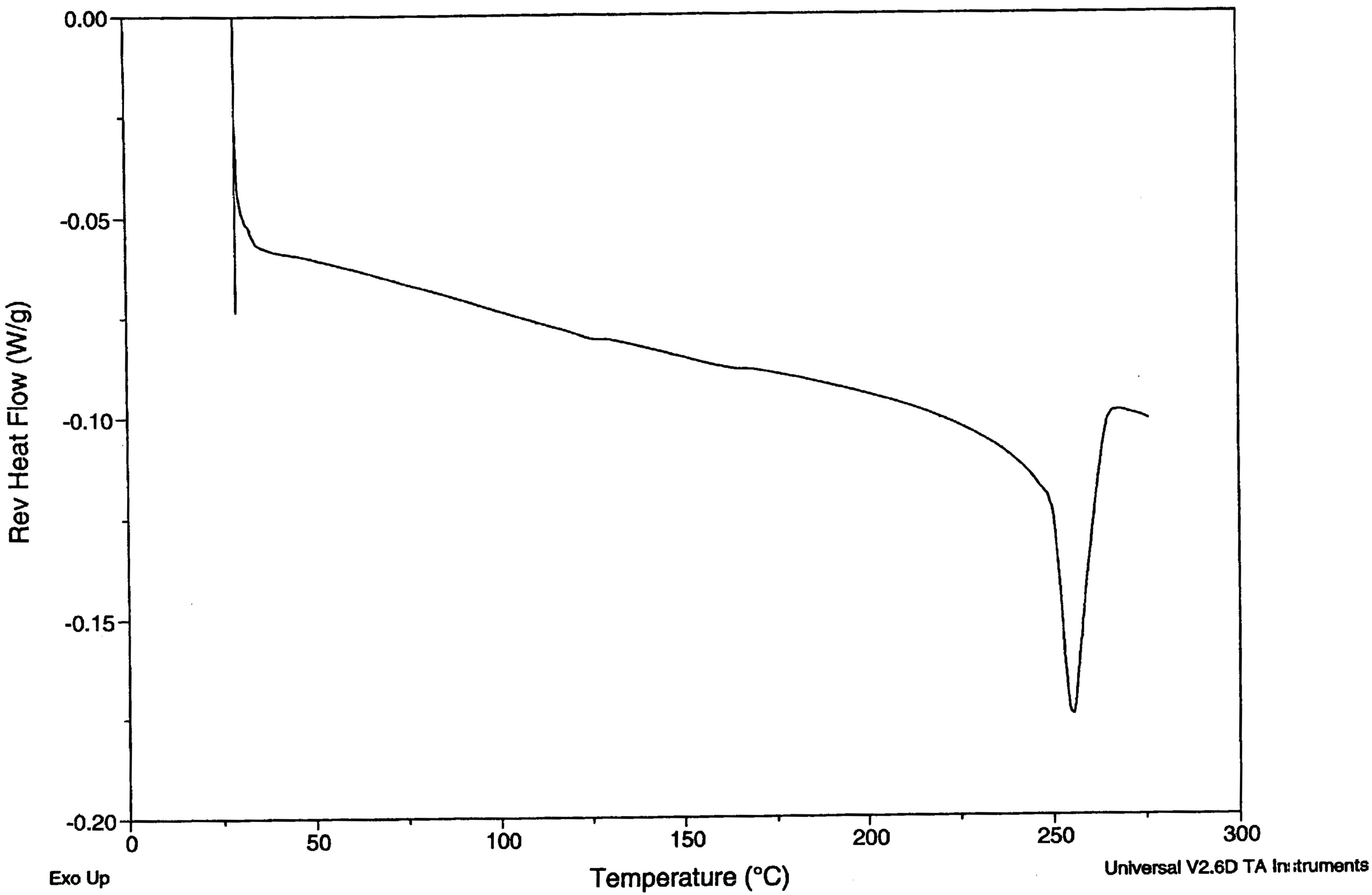


Universal V2.6D TA Instruments

Sample: Door Panel Fabric Run 2
Size: 8.7500 mg
Method: MDSC Method
Comment: Dodgr Neon: Door Panel Fabric

DSC

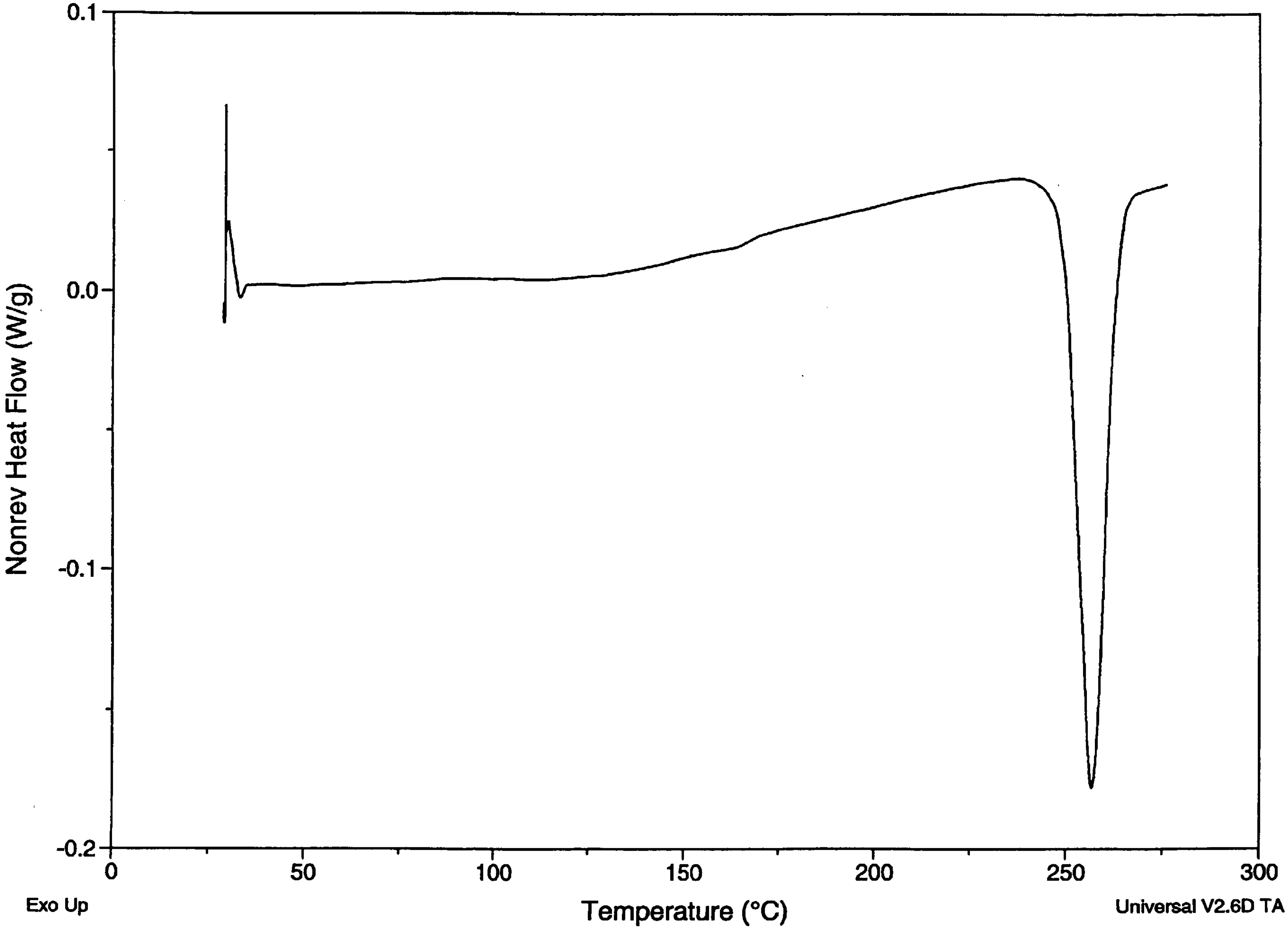
File: C:...\DSC\03614-103.077
Operator: WJM
Run Date: 6-Jul-01 10:55



Sample: Door Panel Fabric Run 2
Size: 8.7500 mg
Method: MDSC Method
Comment: Dodgr Neon: Door Panel Fabric

DSC

File: C:...\DSC\03614-103.077
Operator: WJM
Run Date: 6-Jul-01 10:55

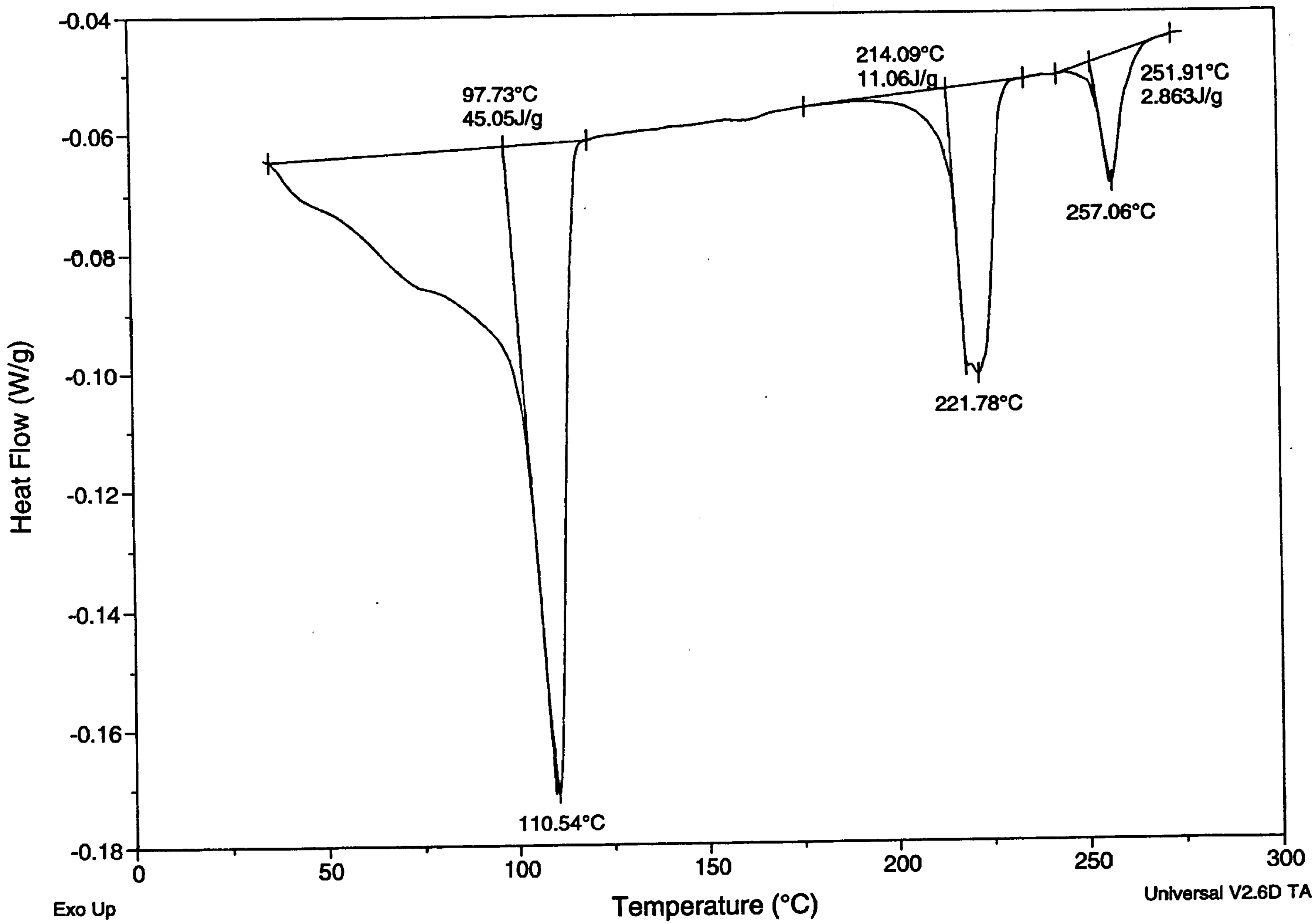


Universal V2.6D TA Instruments

Sample: Carpet
Size: 7.6000 mg
Method: MDSC Method
Comment: Dodgr Neon: Carpet (fiber w/backing)

DSC

File: C:...\DSC\03614-103.078
Operator: WJM
Run Date: 6-Jul-01 13:18

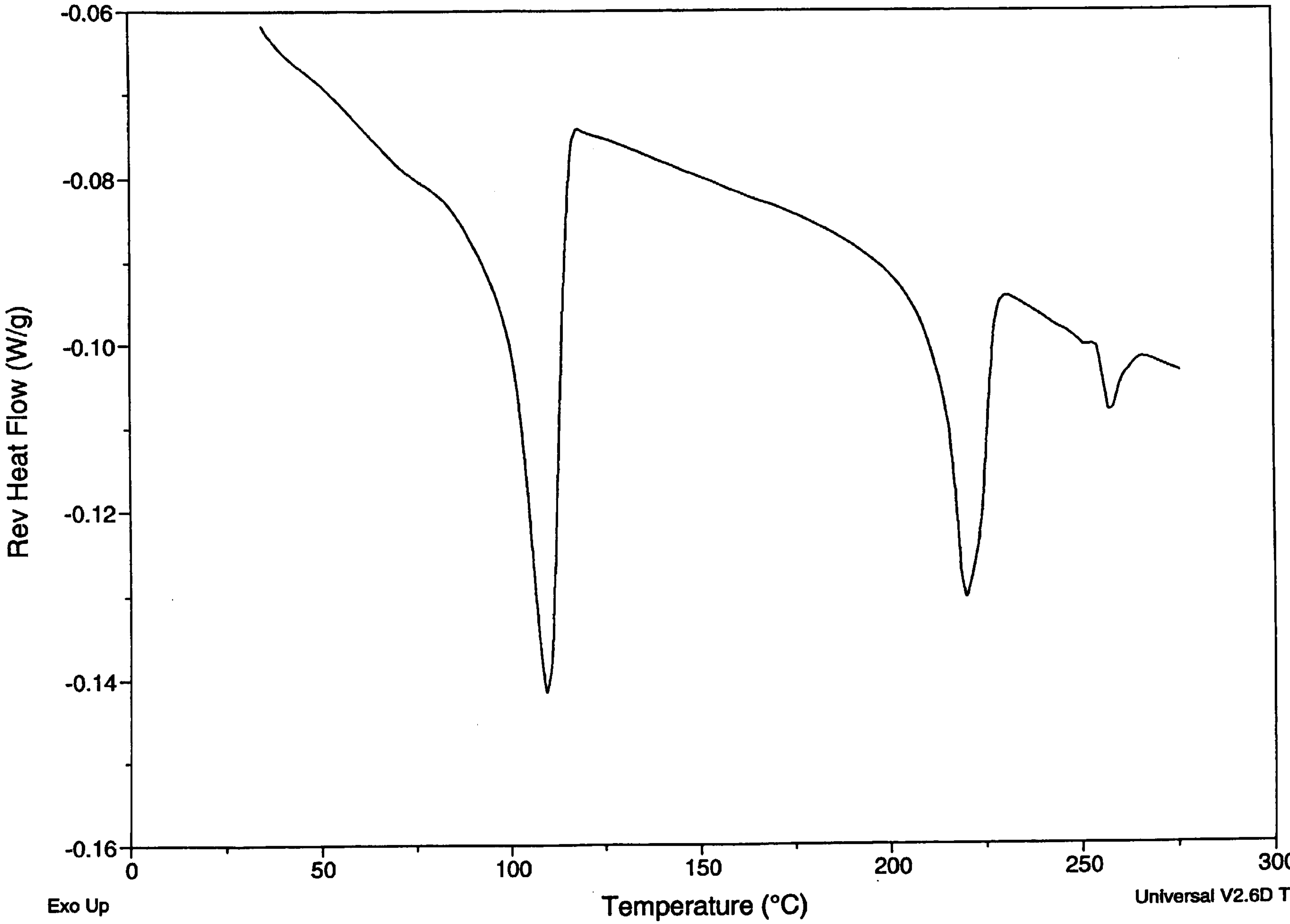


Universal V2.6D TA Instruments

Sample: Carpet
Size: 7.6000 mg
Method: MDSC Method
Comment: Dodgr Neon: Carpet (fiber w/backing)

DSC

File: C:...\DSC\03614-103.078
Operator: WJM
Run Date: 6-Jul-01 13:18

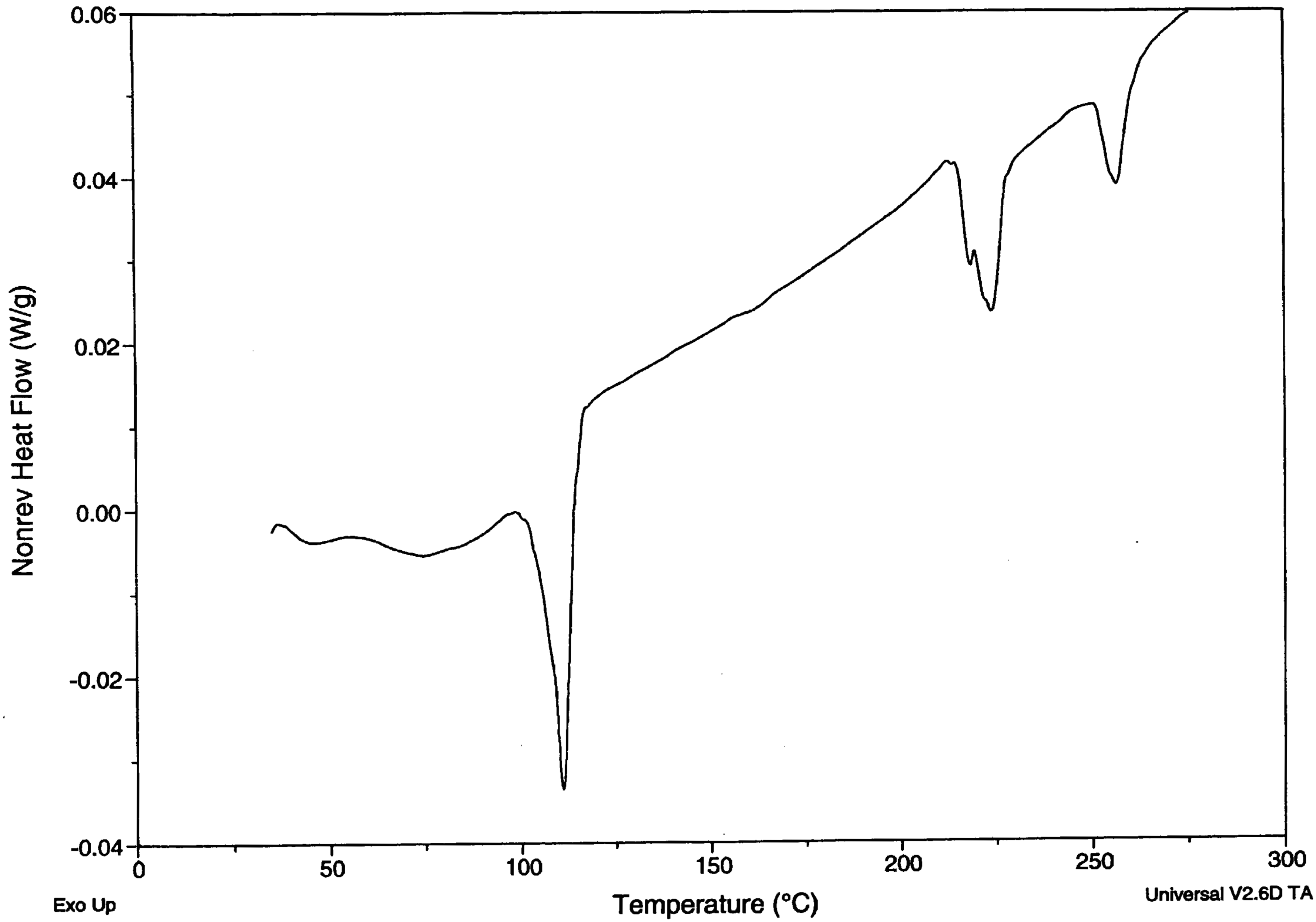


Universal V2.6D TA Instruments

Sample: Carpet
Size: 7.6000 mg
Method: MDSC Method
Comment: Dodgr Neon: Carpet (fiber w/backing)

DSC

File: C:...\DSC\03614-103.078
Operator: WJM
Run Date: 6-Jul-01 13:18

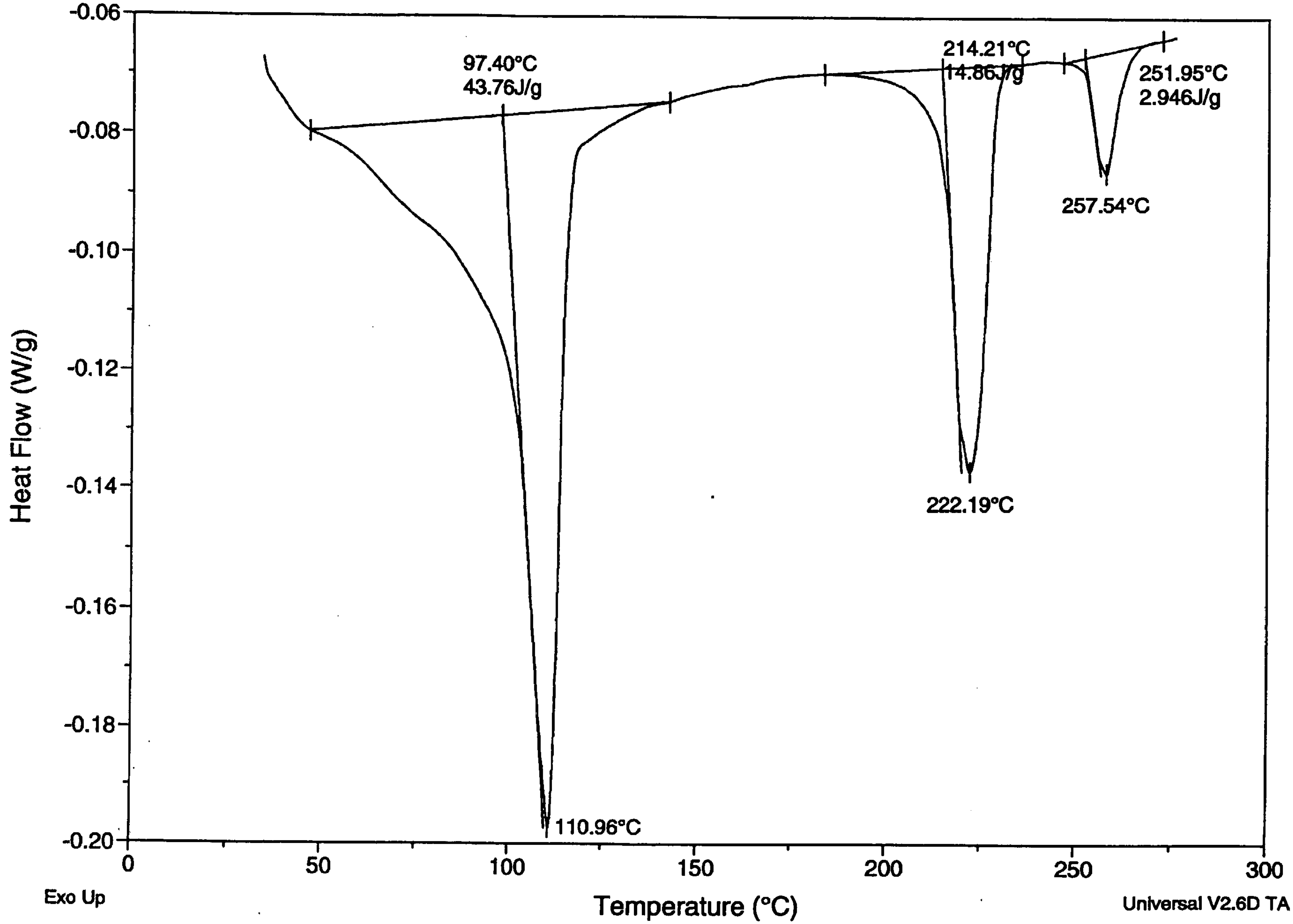


Universal V2.6D TA Instruments

Sample: Carpet Run 2
Size: 10.4500 mg
Method: MDSC Method
Comment: Dodgr Neon: Carpet (fiber w/backing)

DSC

File: C:...\DSC\03614-103.079
Operator: WJM
Run Date: 6-Jul-01 15:28

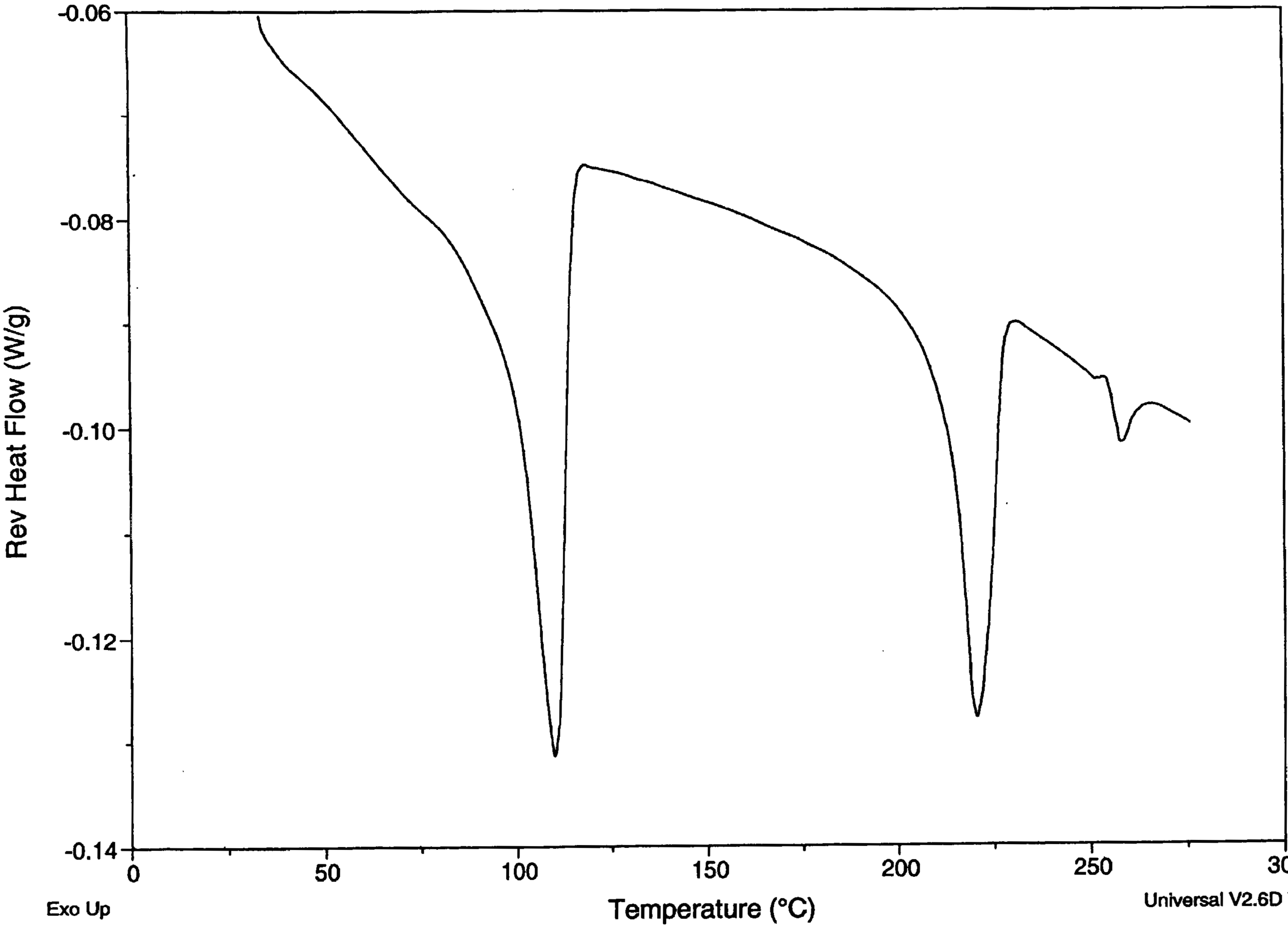


Universal V2.6D TA Instruments

Sample: Carpet Run 2
Size: 10.4500 mg
Method: MDSC Method
Comment: Dodgr Neon: Carpet (fiber w/backing)

DSC

File: C:...\DSC\03614-103.079
Operator: WJM
Run Date: 6-Jul-01 15:28

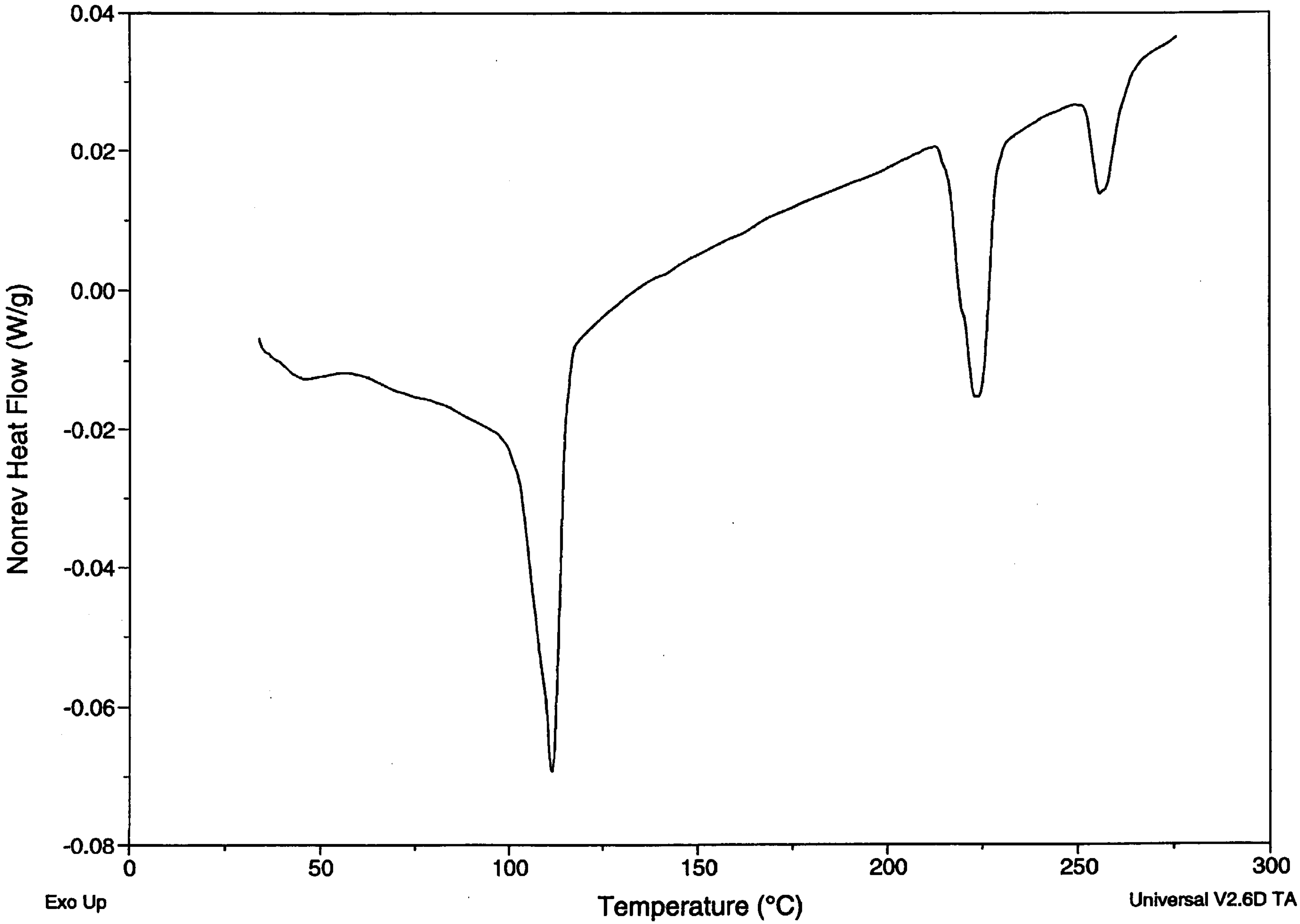


Universal V2.6D TA Instruments

Sample: Carpet Run 2
Size: 10.4500 mg
Method: MDSC Method
Comment: Dodgr Neon: Carpet (fiber w/backing)

DSC

File: C:...\DSC\03614-103.079
Operator: WJM
Run Date: 6-Jul-01 15:28

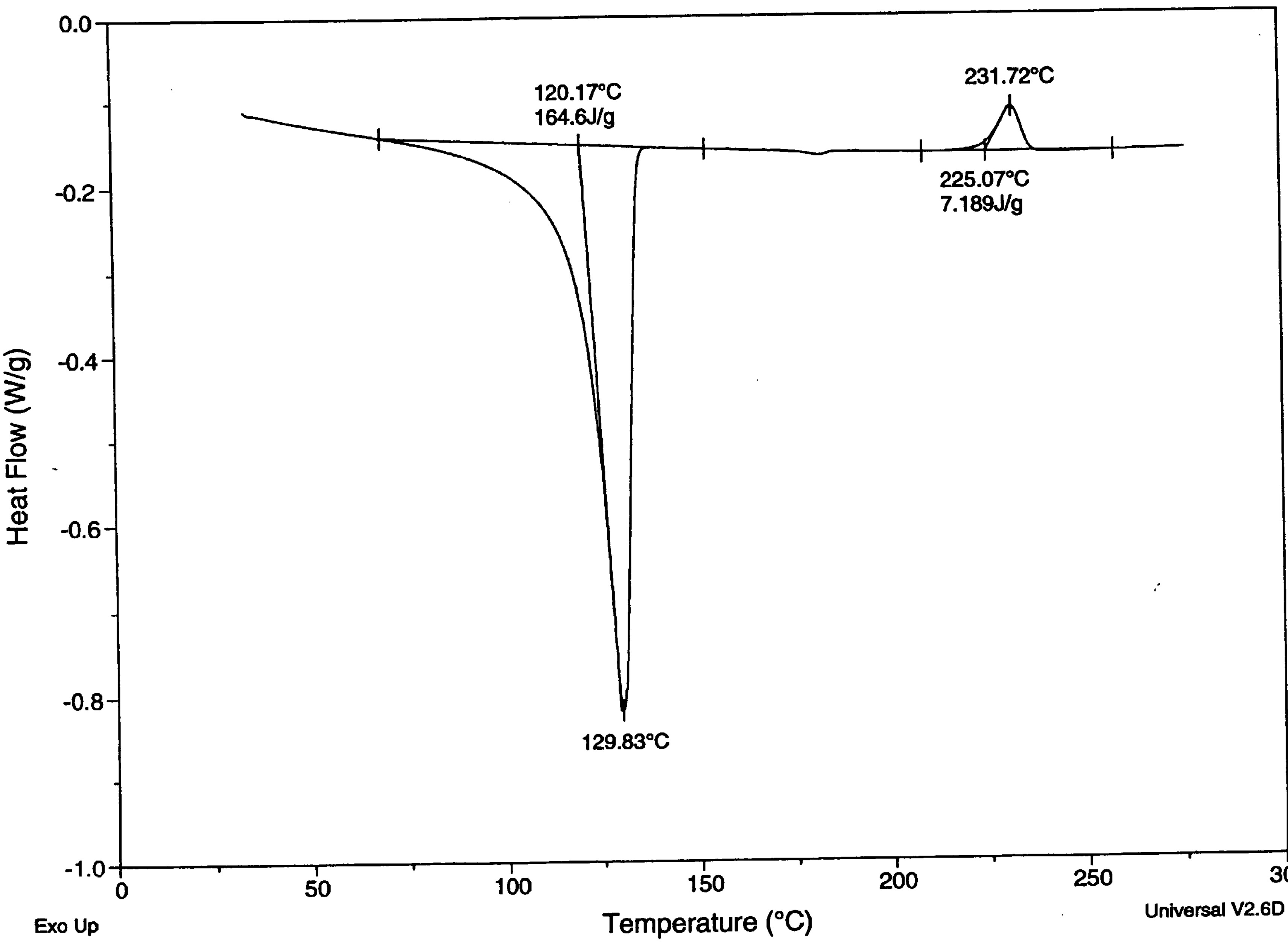


Universal V2.6D TA Instruments

Sample: Fuel Tank- Gray part
Size: 5.6000 mg
Method: MDSC Method
Comment: Dodge Neon: Fuel Tank Gray part

DSC

File: C:...\DSC\03614-103.080
Operator: WJM
Run Date: 9-Jul-01 09:47

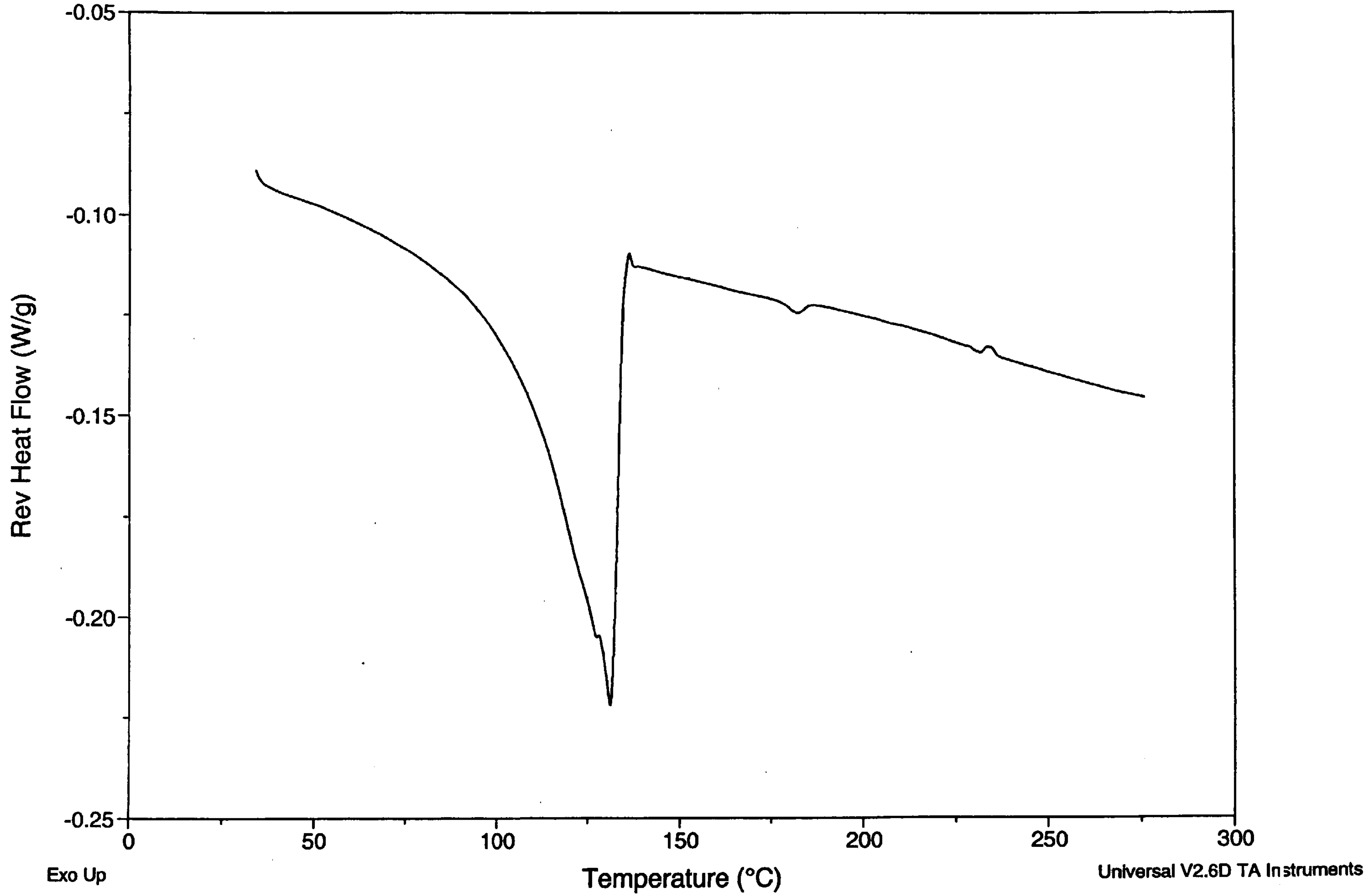


Universal V2.6D TA Instruments

Sample: Fuel Tank- Gray part
Size: 5.6000 mg
Method: MDSC Method
Comment: Dodge Neon: Fuel Tank Gray part

DSC

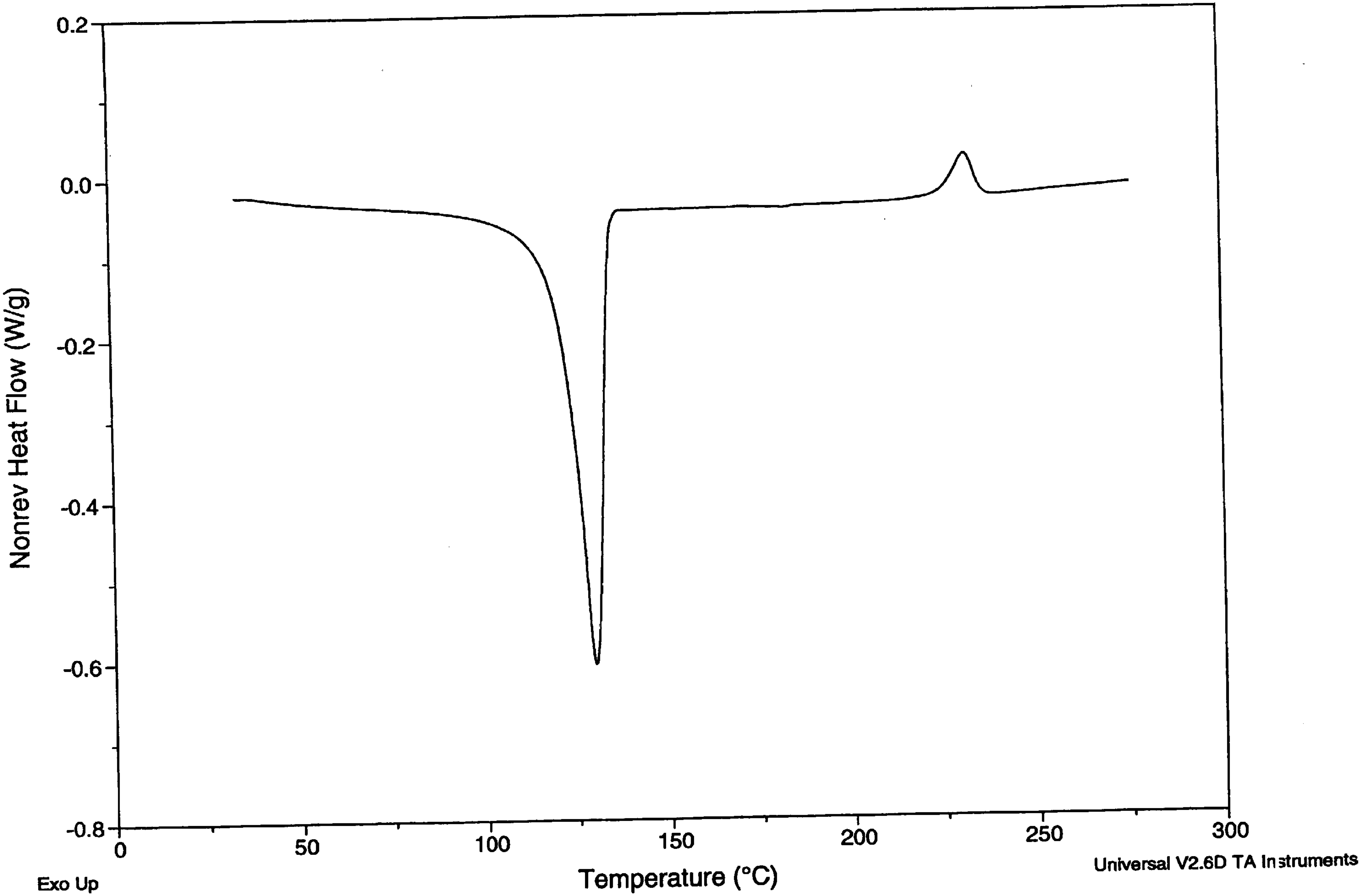
File: C:...\DSC\03614-103.080
Operator: WJM
Run Date: 9-Jul-01 09:47



Sample: Fuel Tank- Gray part
Size: 5.6000 mg
Method: MDSC Method
Comment: Dodge Neon: Fuel Tank Gray part

DSC

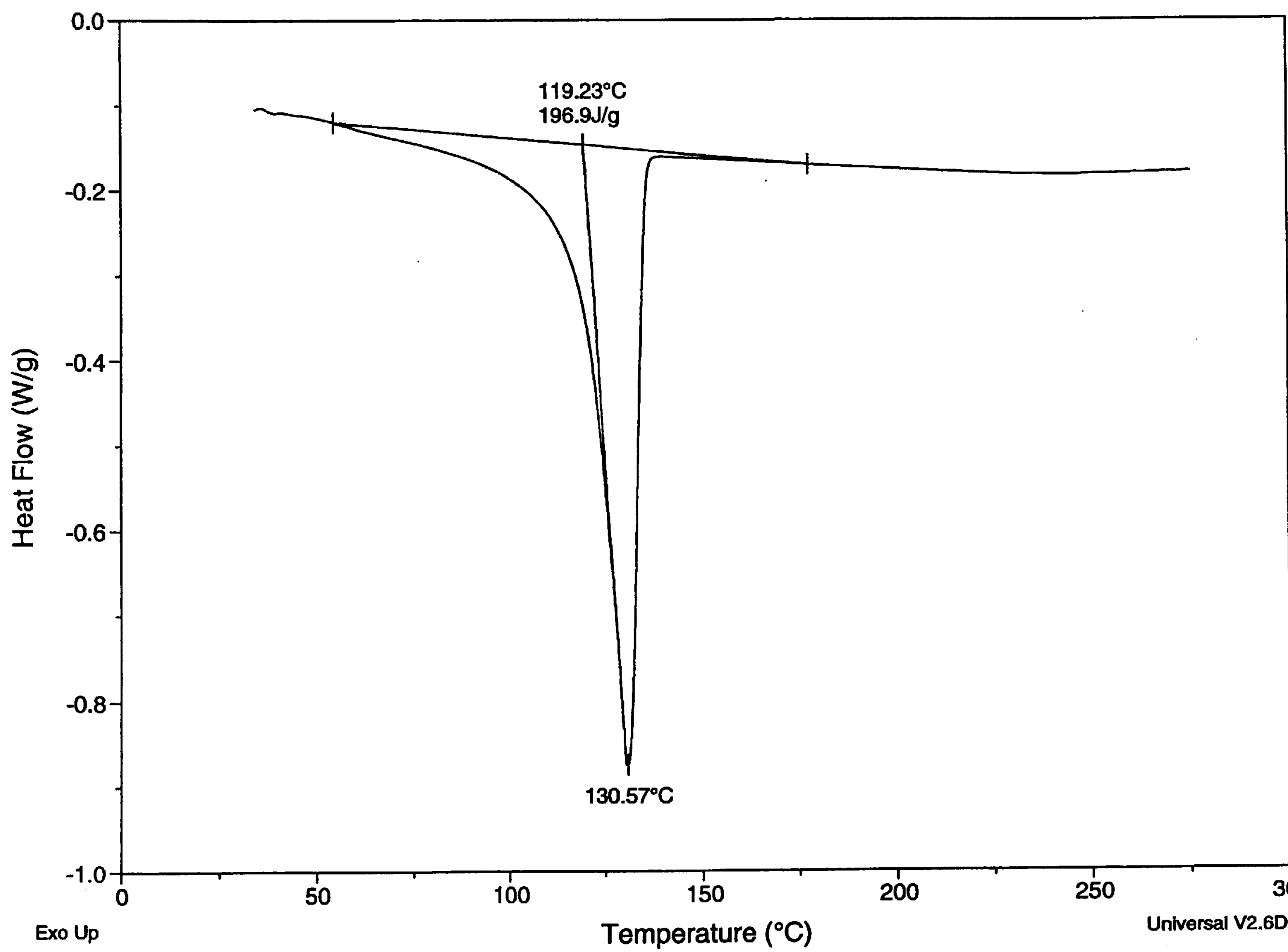
File: C:...\DSC\03614-103.080
Operator: WJM
Run Date: 9-Jul-01 09:47



Sample: Fuel Tank- Gray part Run 2
Size: 5.2100 mg
Method: MDSC Method
Comment: Dodge Neon: Fuel Tank Gray part

DSC

File: C:...\DSC\03614-103.081
Operator: WJM
Run Date: 9-Jul-01 12:43

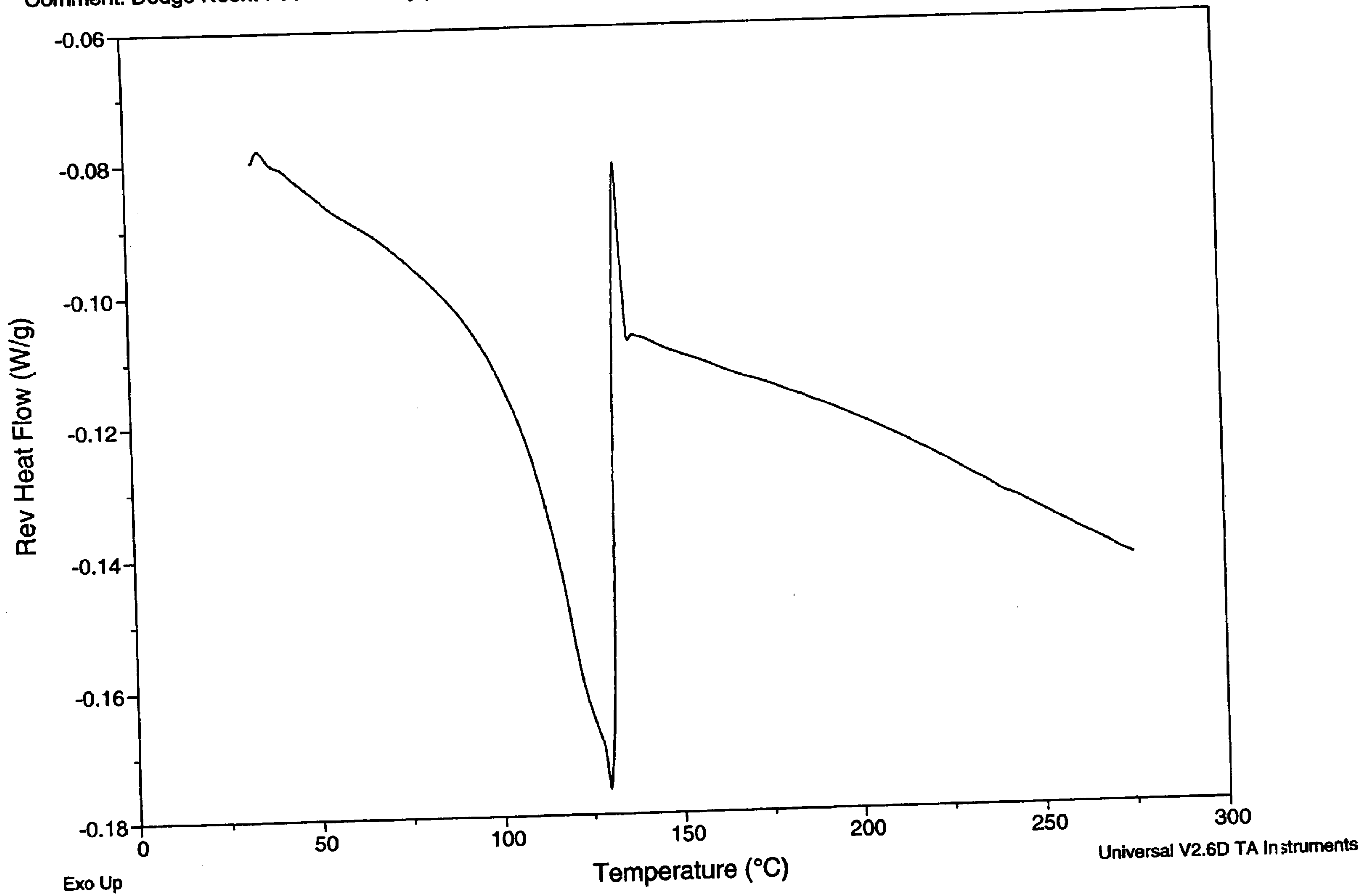


Universal V2.6D TA Instruments

Sample: Fuel Tank- Gray part Run 2
Size: 5.2100 mg
Method: MDSC Method
Comment: Dodge Neon: Fuel Tank Gray part

DSC

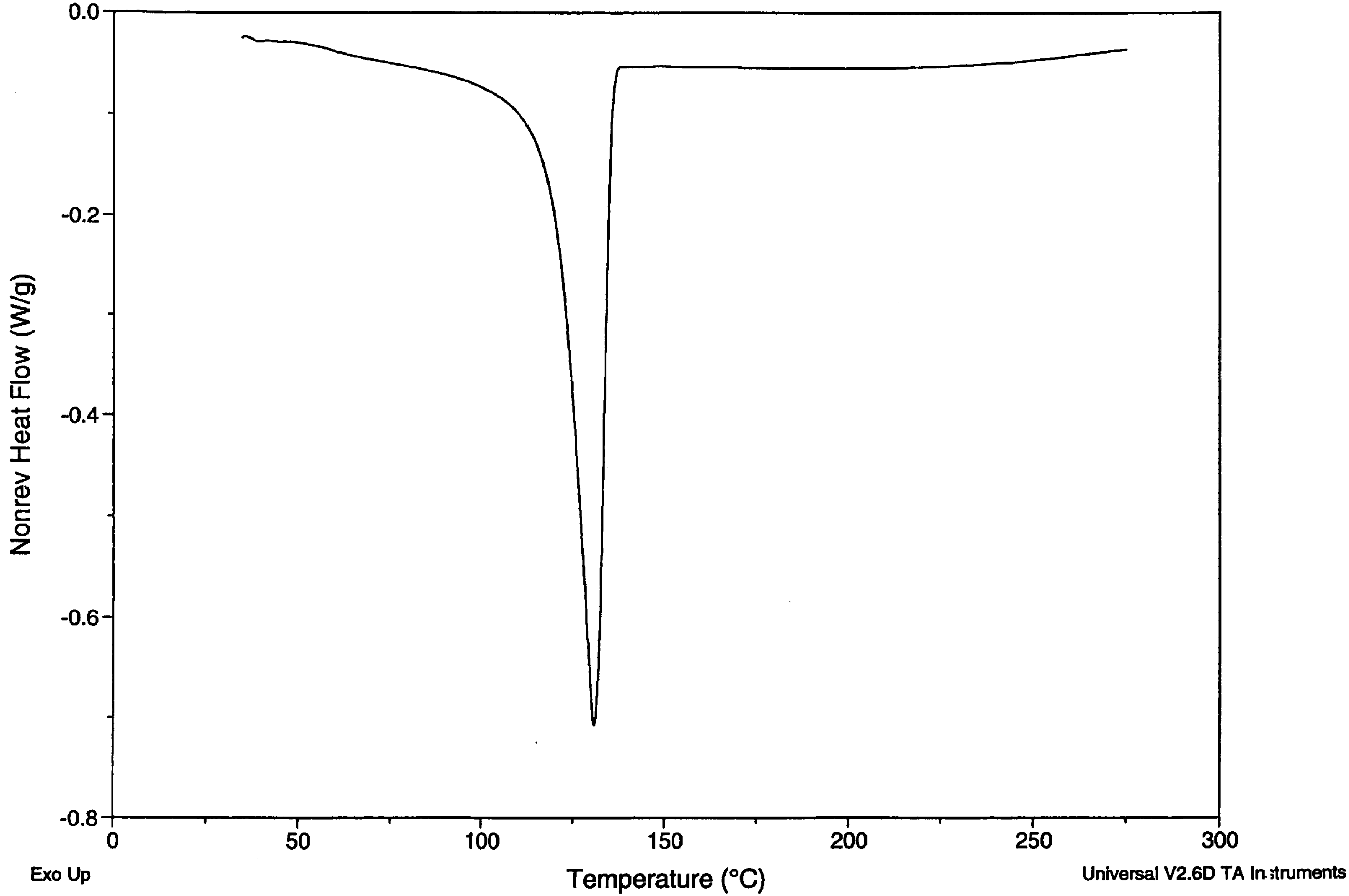
File: C:...\DSC\03614-103.081
Operator: WJM
Run Date: 9-Jul-01 12:43



Sample: Fuel Tank- Gray part Run 2
Size: 5.2100 mg
Method: MDSC Method
Comment: Dodge Neon: Fuel Tank Gray part

DSC

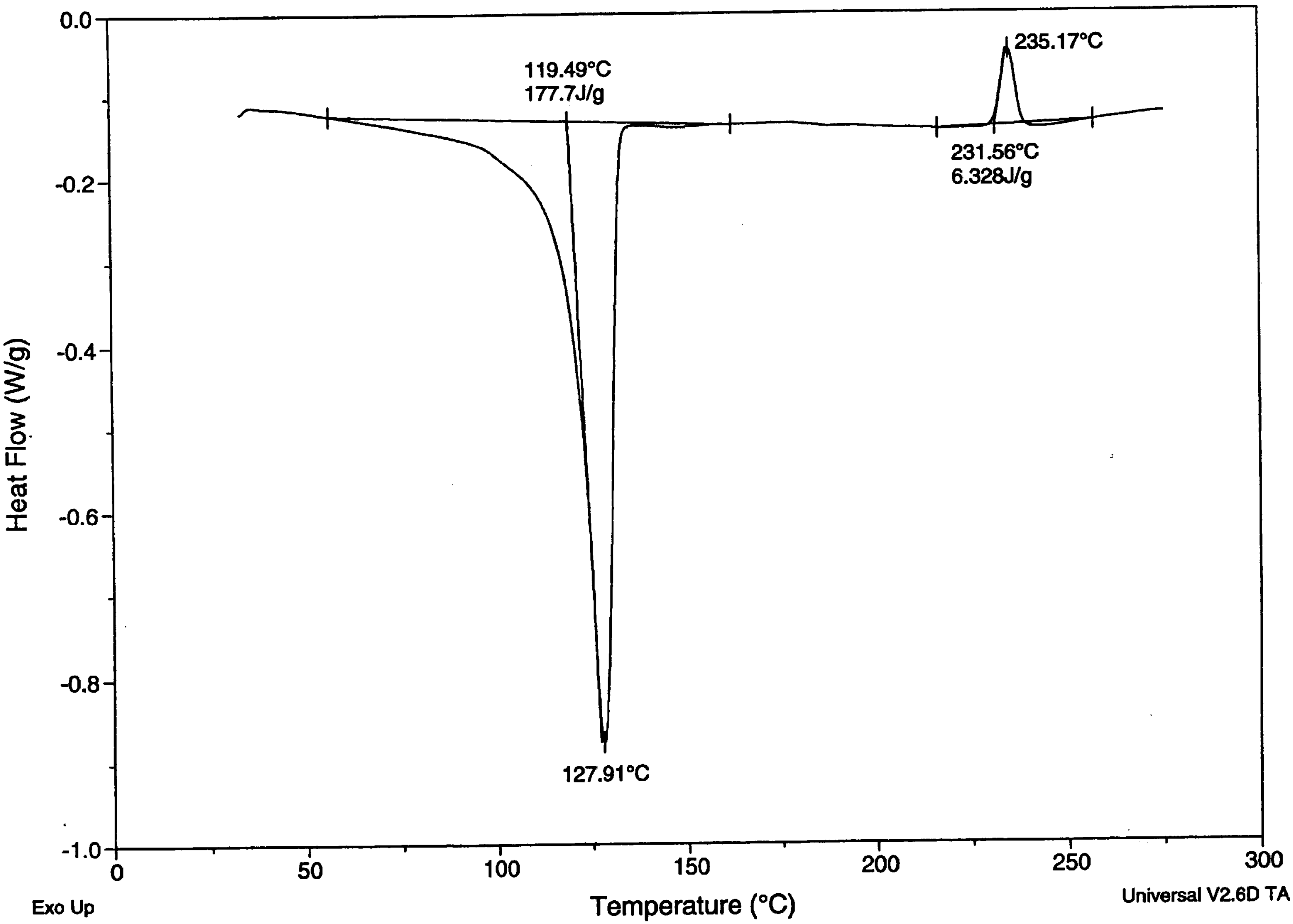
File: C:...\DSC\03614-103.081
Operator: WJM
Run Date: 9-Jul-01 12:43



Sample: Fuel Tank - Black Part
Size: 4.2600 mg
Method: MDSC Method
Comment: Dodge Neon: Fuel Tank - Black Part

DSC

File: C:...\DSC\03614-103.082
Operator: WJM
Run Date: 10-Jul-01 08:16

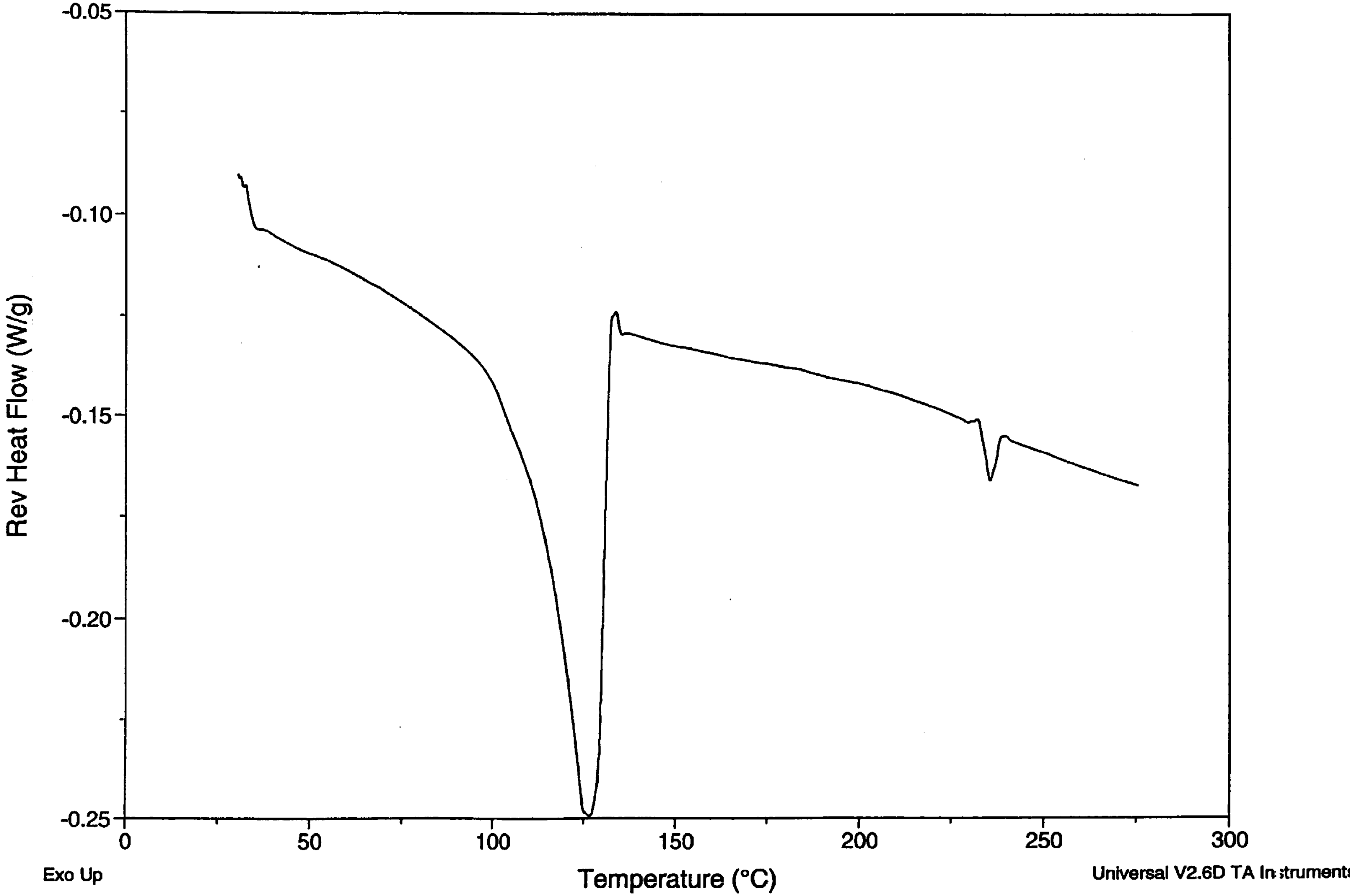


Universal V2.6D TA Instruments

Sample: Fuel Tank - Black Part
Size: 4.2600 mg
Method: MDSC Method
Comment: Dodge Neon: Fuel Tank - Black Part

DSC

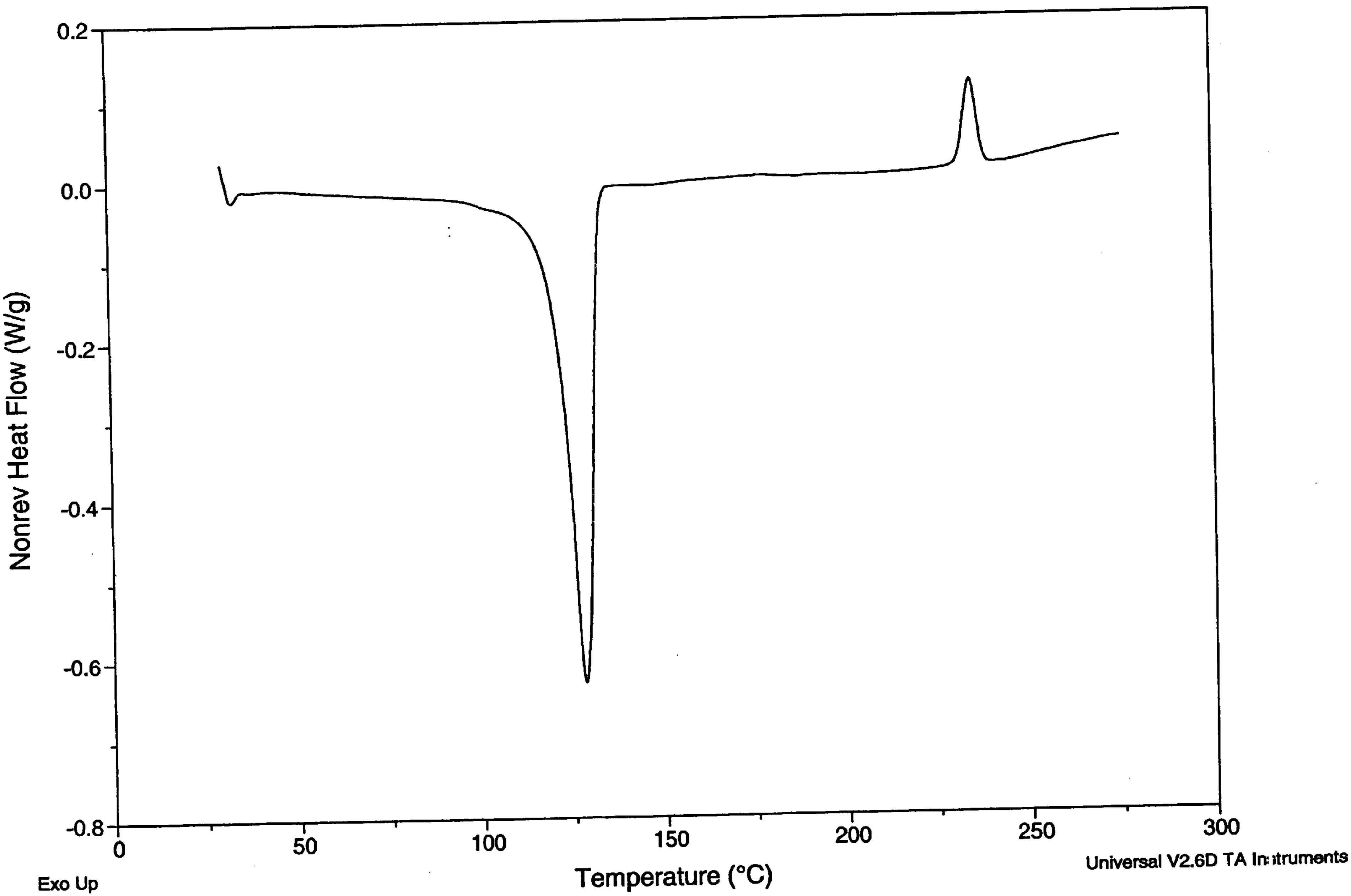
File: C:...\DSC\03614-103.082
Operator: WJM
Run Date: 10-Jul-01 08:16



Sample: Fuel Tank - Black Part
Size: 4.2600 mg
Method: MDSC Method
Comment: Dodge Neon: Fuel Tank - Black Part

DSC

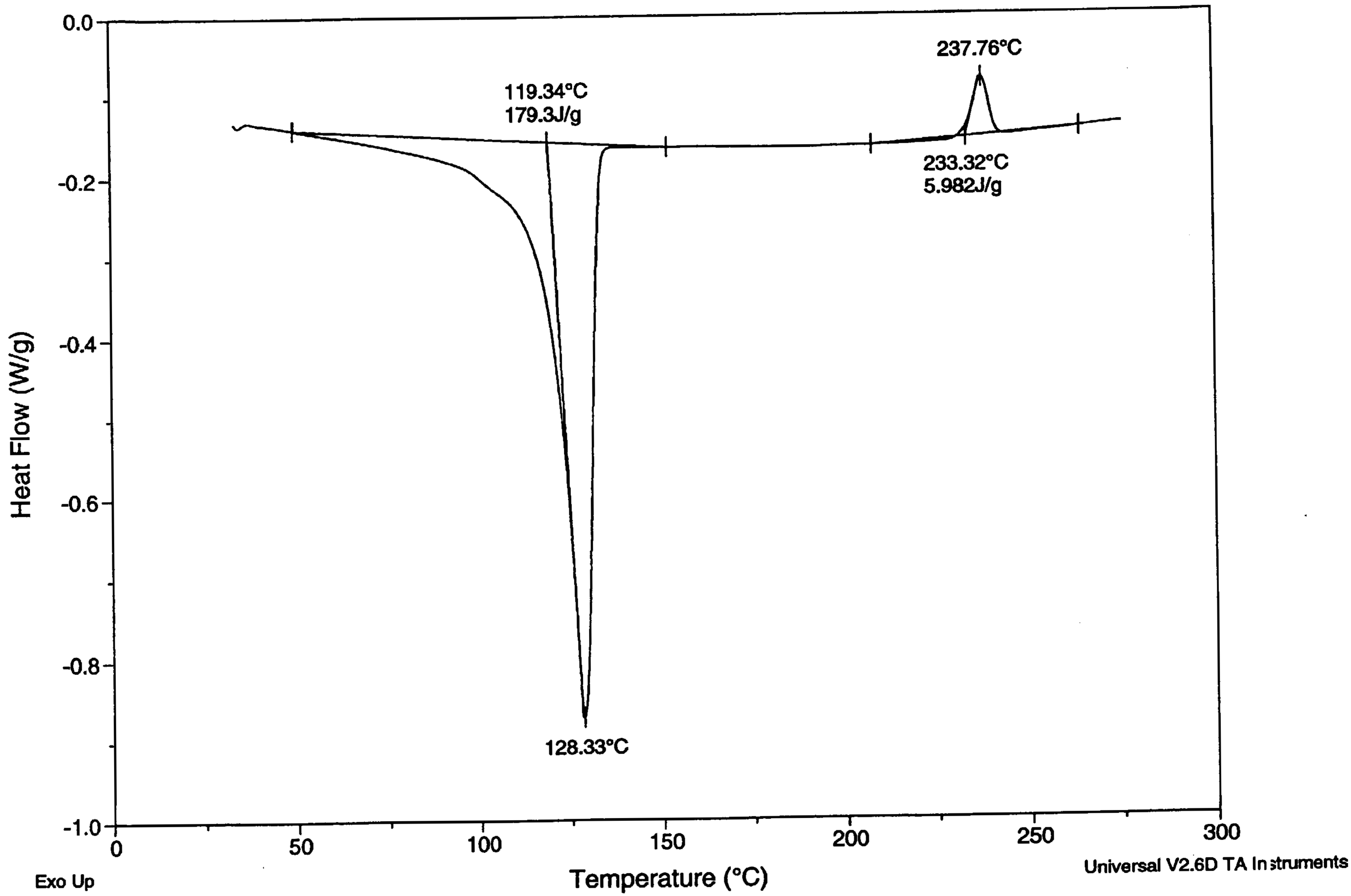
File: C:...\DSC\03614-103.082
Operator: WJM
Run Date: 10-Jul-01 08:16



Sample: Fuel Tank - Black Part Run 2
Size: 4.5000 mg
Method: MDSC Method
Comment: Dodge Neon: Fuel Tank - Black Part

DSC

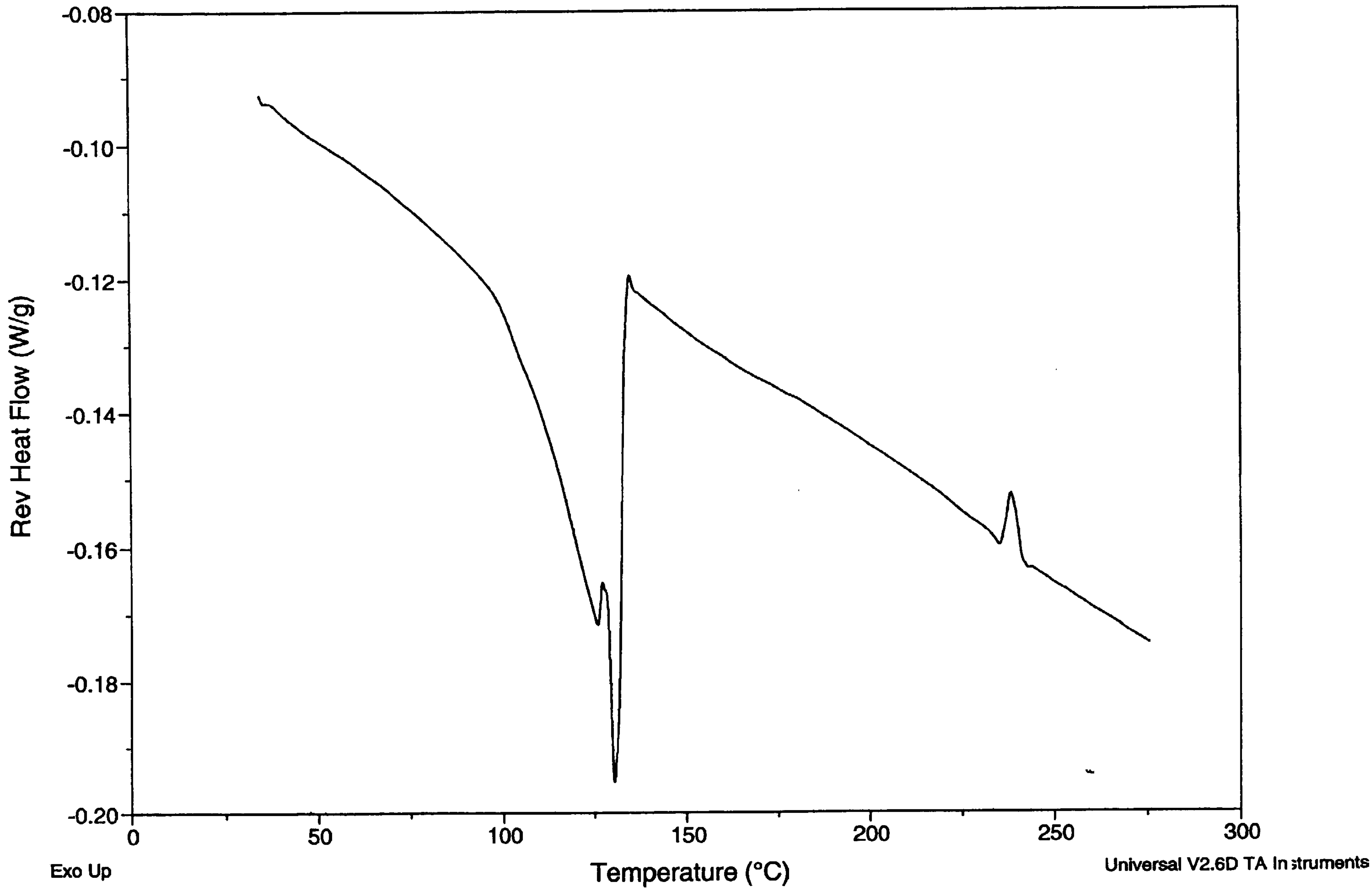
File: C:...\DSC\03614-103.083
Operator: WJM
Run Date: 10-Jul-01 11:04



Sample: Fuel Tank - Black Part Run 2
Size: 4.5000 mg
Method: MDSC Method
Comment: Dodge Neon: Fuel Tank - Black Part

DSC

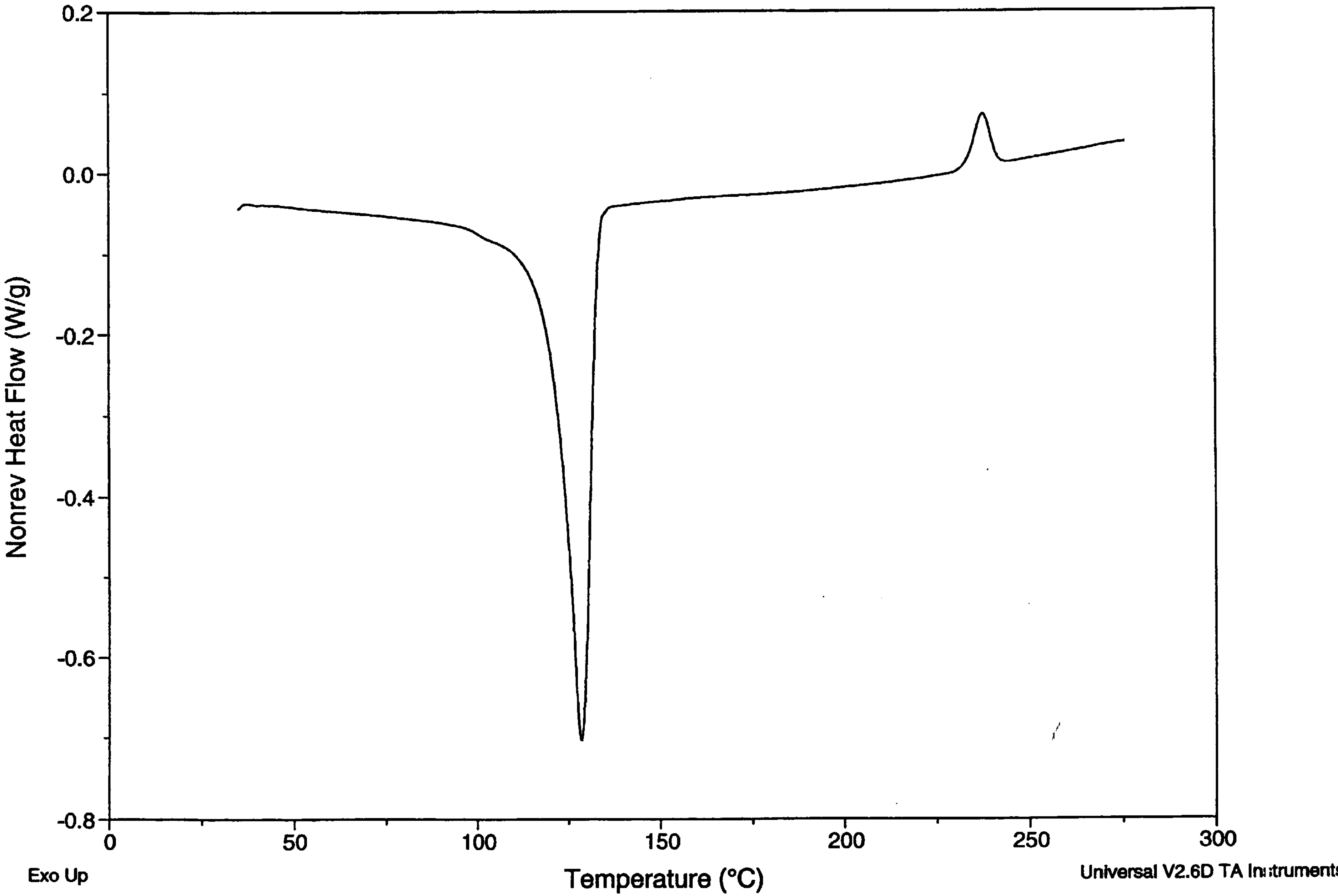
File: C:...\DSC\03614-103.083
Operator: WJM
Run Date: 10-Jul-01 11:04



Sample: Fuel Tank - Black Part Run 2
Size: 4.5000 mg
Method: MDSC Method
Comment: Dodge Neon: Fuel Tank - Black Part

DSC

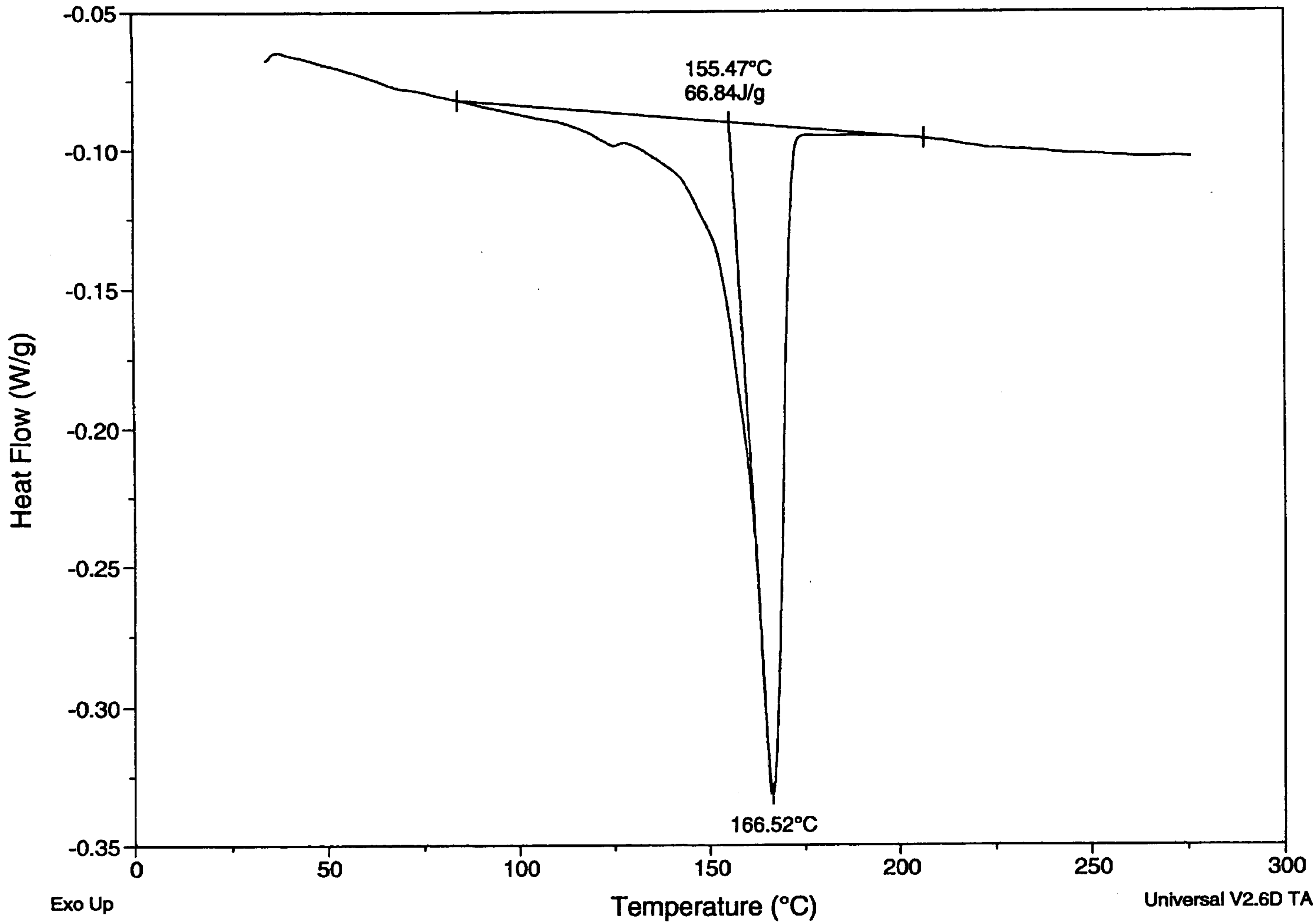
File: C:...\DSC\03614-103.083
Operator: WJM
Run Date: 10-Jul-01 11:04



Sample: Air Cleaner Run 2
Size: 7.0000 mg
Method: MDSC Method
Comment: Ford Focus: Air Cleaner

DSC

File: C:...\DSC\03614-103.085
Operator: WJM
Run Date: 10-Jul-01 15:51

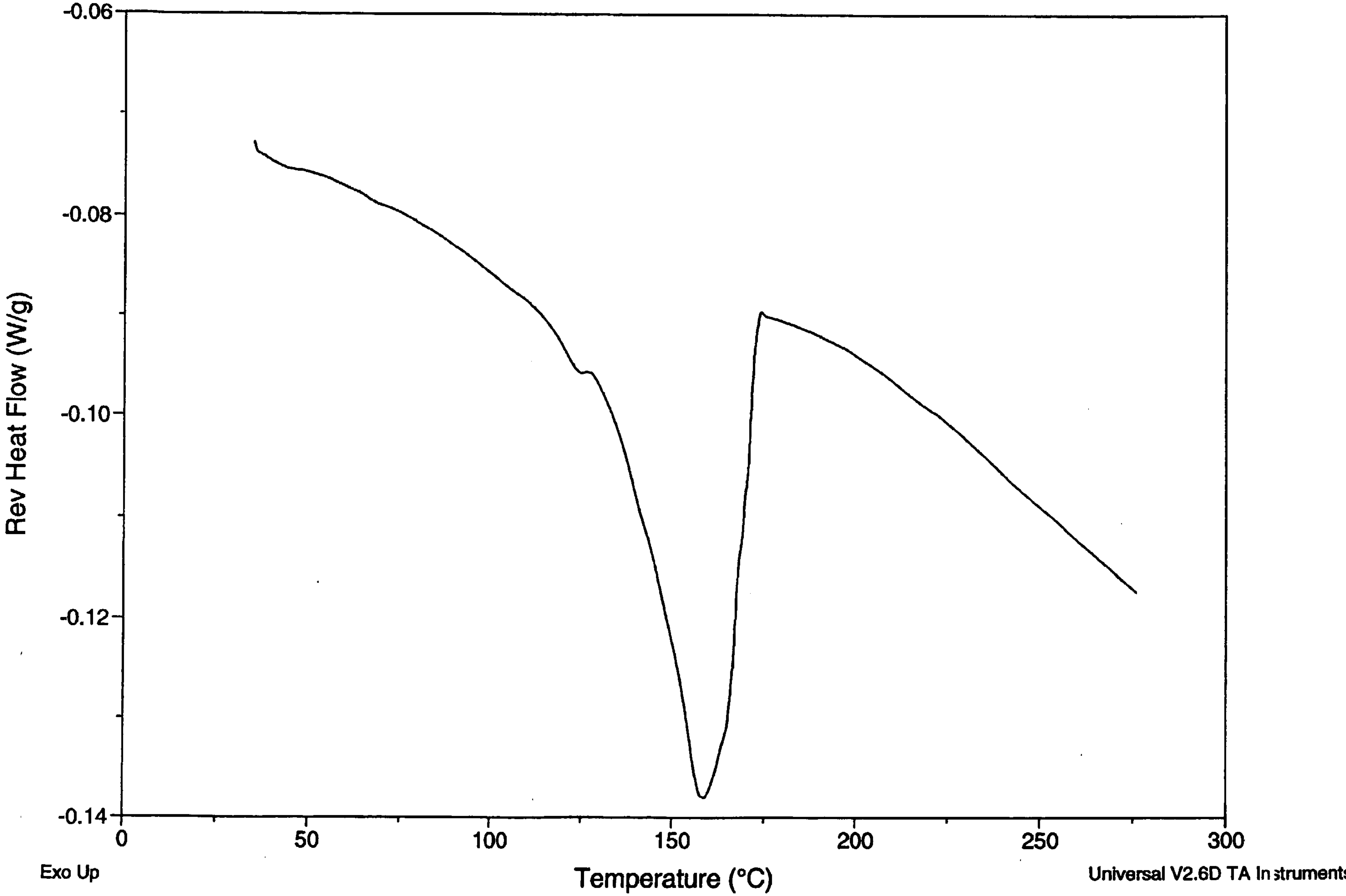


Universal V2.6D TA Instruments

Sample: Air Cleaner Run 2
Size: 7.0000 mg
Method: MDSC Method
Comment: Ford Focus: Air Cleaner

DSC

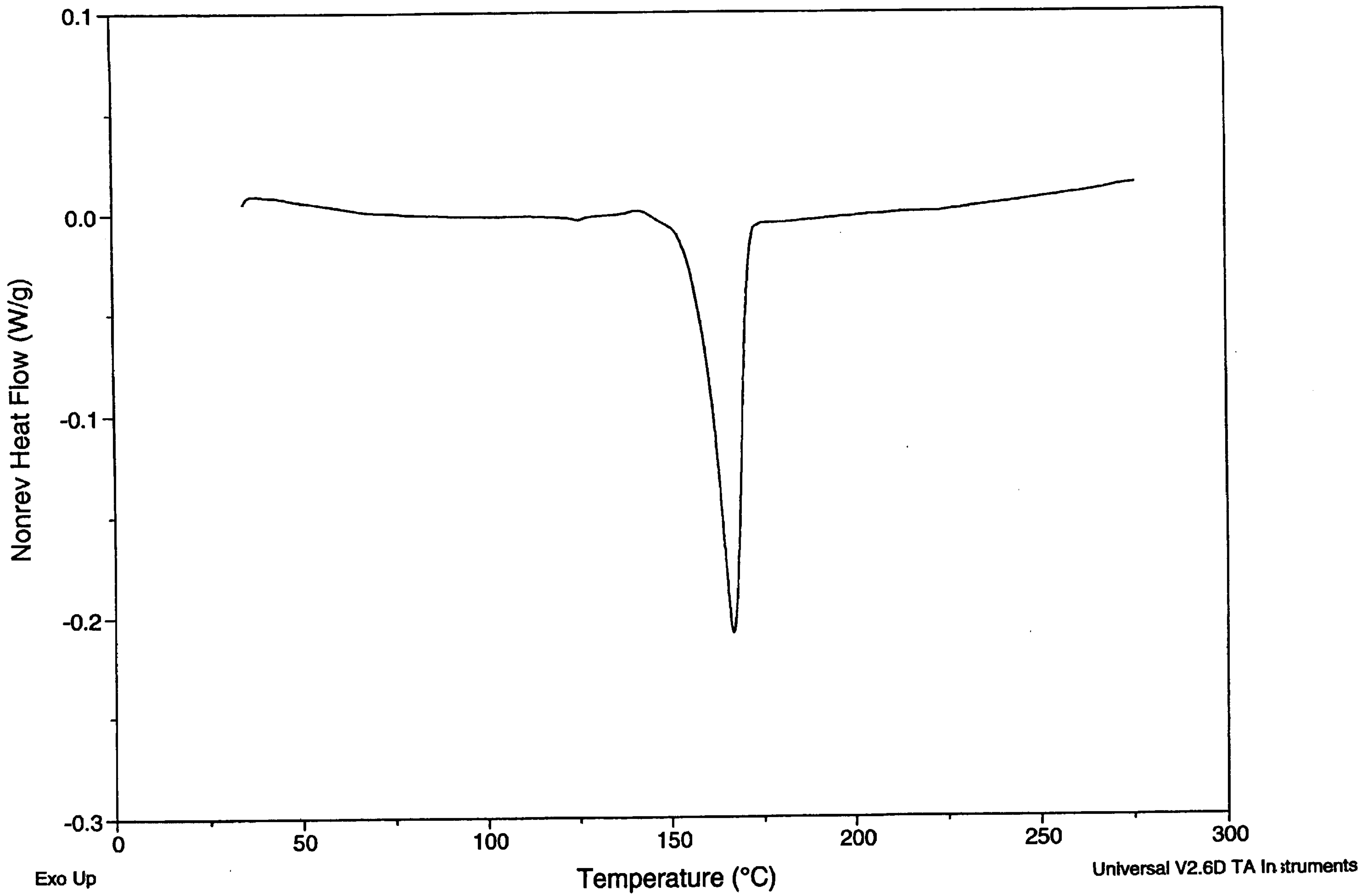
File: C:...\DSC\03614-103.085
Operator: WJM
Run Date: 10-Jul-01 15:51



Sample: Air Cleaner Run 2
Size: 7.0000 mg
Method: MDSC Method
Comment: Ford Focus: Air Cleaner

DSC

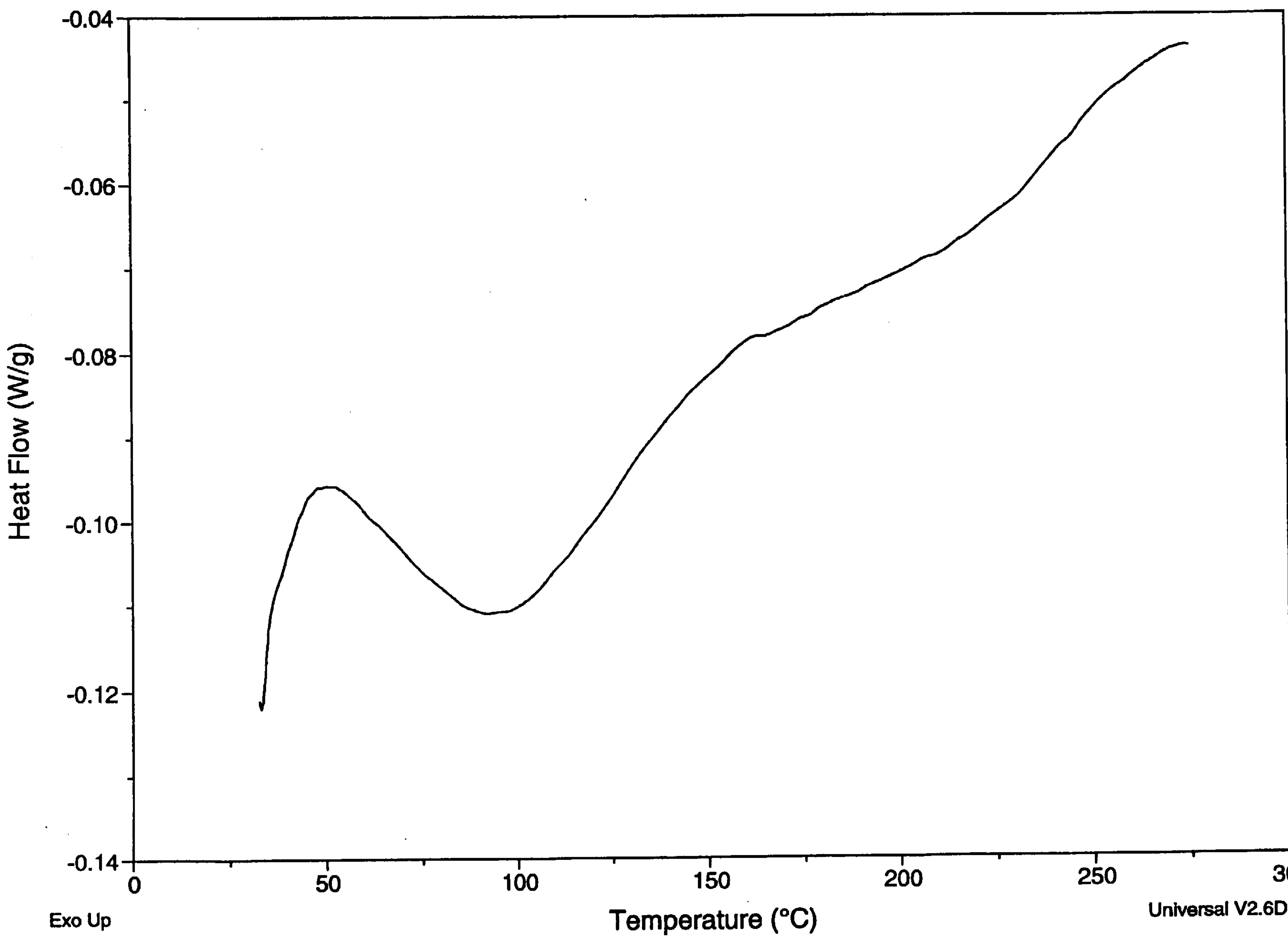
File: C:...\DSC\03614-103.085
Operator: WJM
Run Date: 10-Jul-01 15:51



Sample: Headrest - White Foam
Size: 2.6300 mg
Method: MDSC Method
Comment: Ford Focus: Headrest - White Foam

DSC

File: C:...\DSC\03614-103.086
Operator: WJM
Run Date: 11-Jul-01 08:36

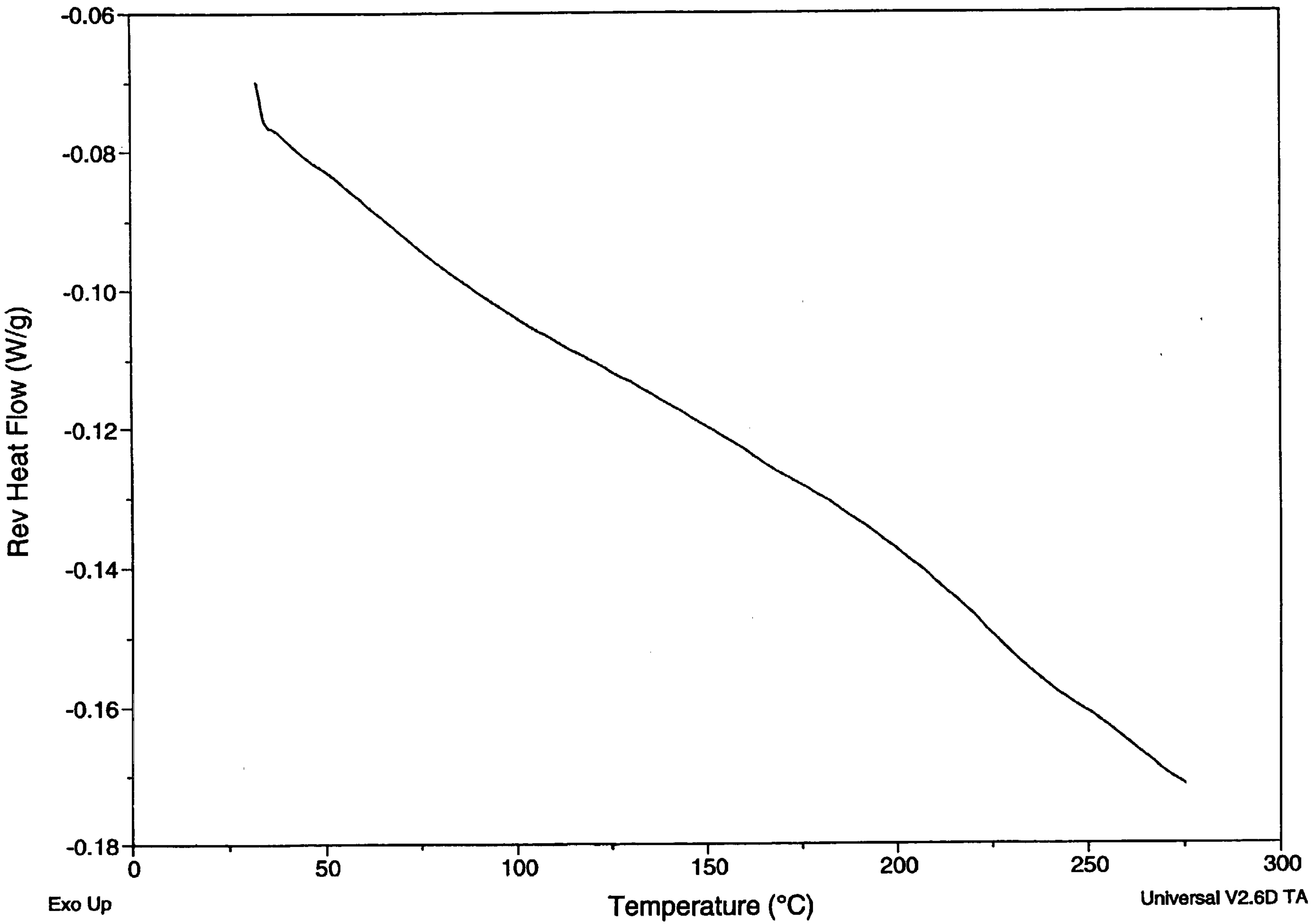


Universal V2.6D TA Instruments

Sample: Headrest - White Foam
Size: 2.6300 mg
Method: MDSC Method
Comment: Ford Focus: Headrest - White Foam

DSC

File: C:...\DSC\03614-103.086
Operator: WJM
Run Date: 11-Jul-01 08:36

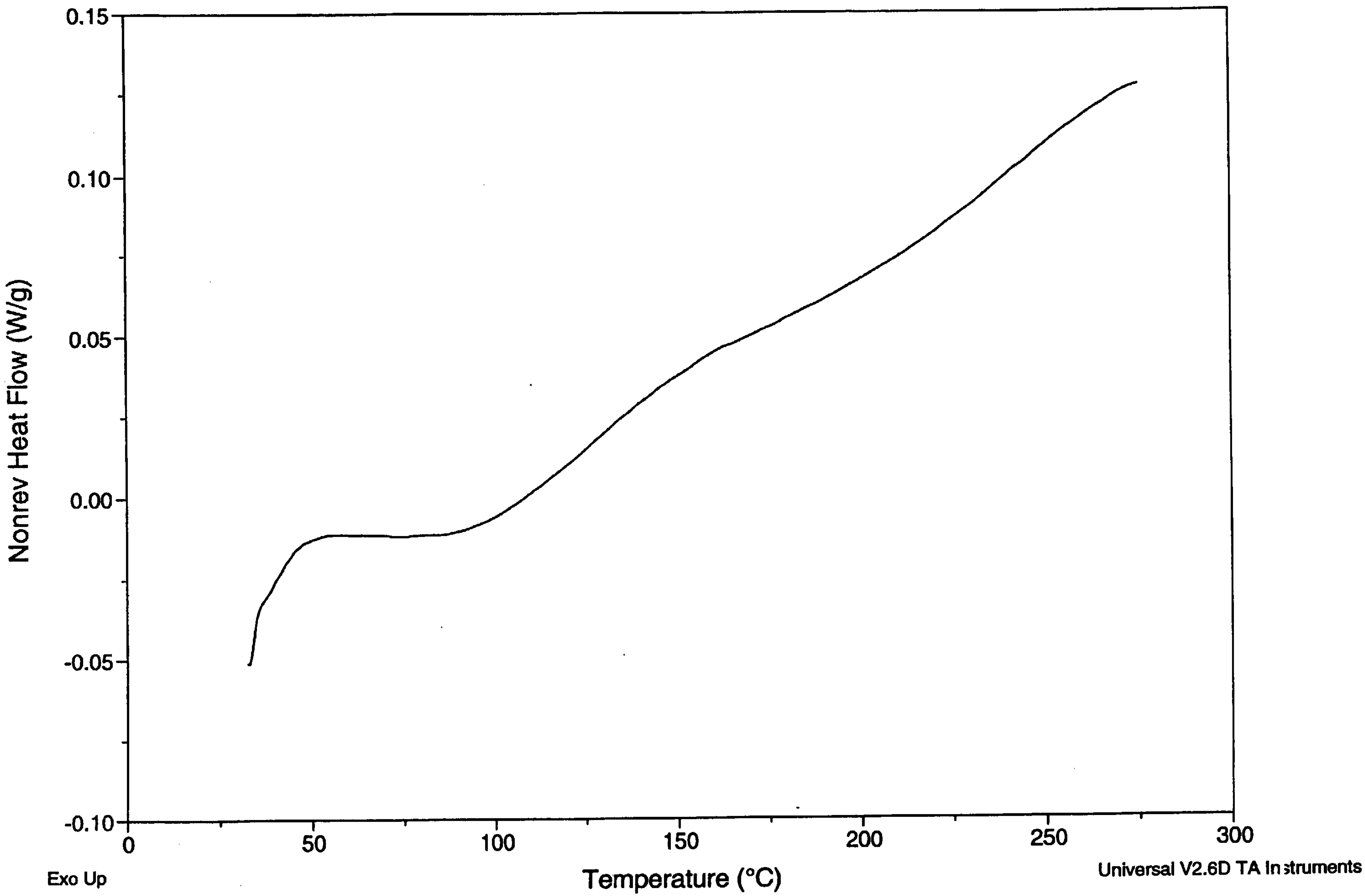


Universal V2.6D TA Instruments

Sample: Headrest - White Foam
Size: 2.6300 mg
Method: MDSC Method
Comment: Ford Focus: Headrest - White Foam

DSC

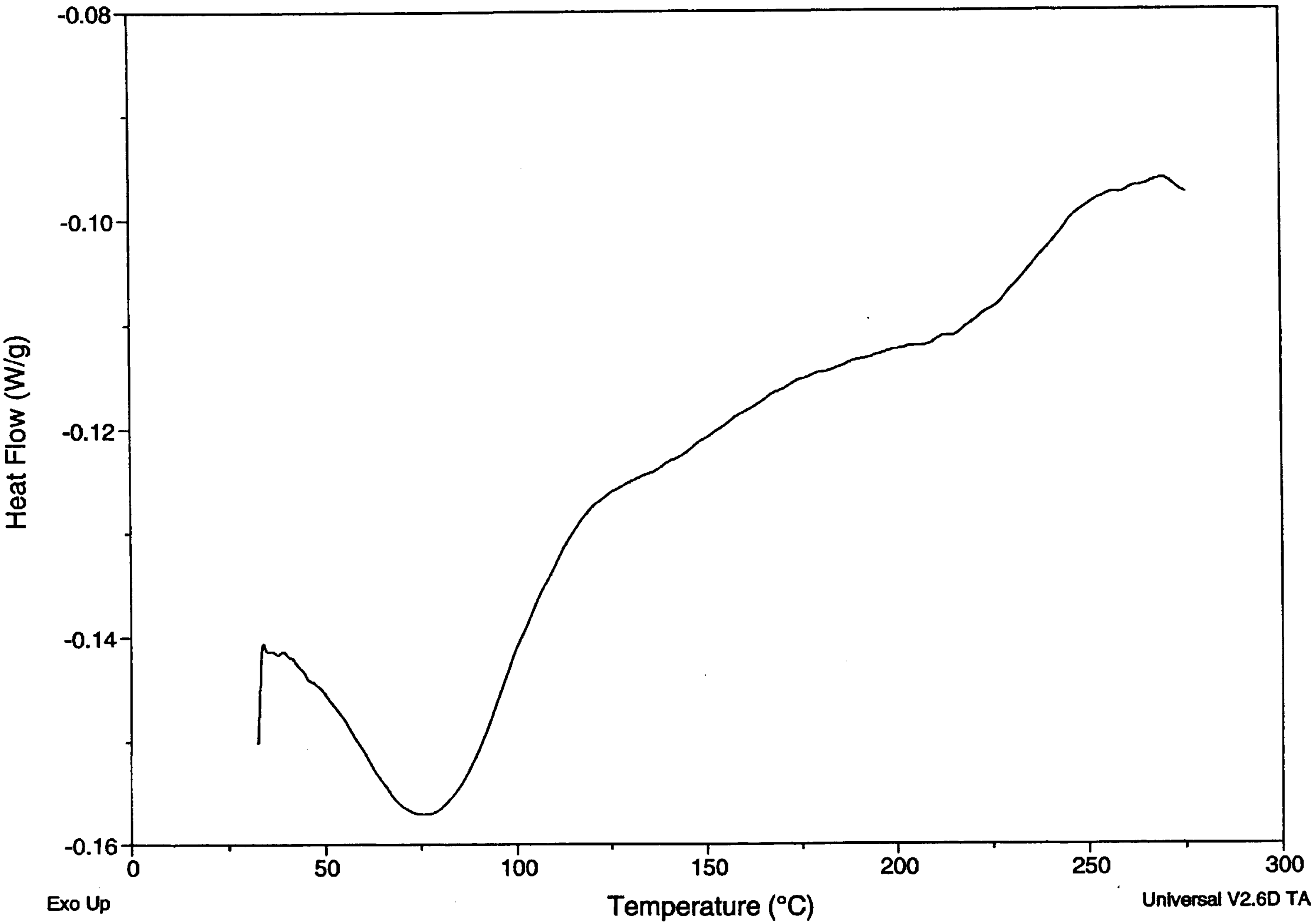
File: C:...\DSC\03614-103.086
Operator: WJM
Run Date: 11-Jul-01 08:36



Sample: Headrest - White Foam Run 2
Size: 2.7000 mg
Method: MDSC Method
Comment: Ford Focus: Headrest - White Foam

DSC

File: C:...\DSC\03614-103.087
Operator: WJM
Run Date: 11-Jul-01 11:13

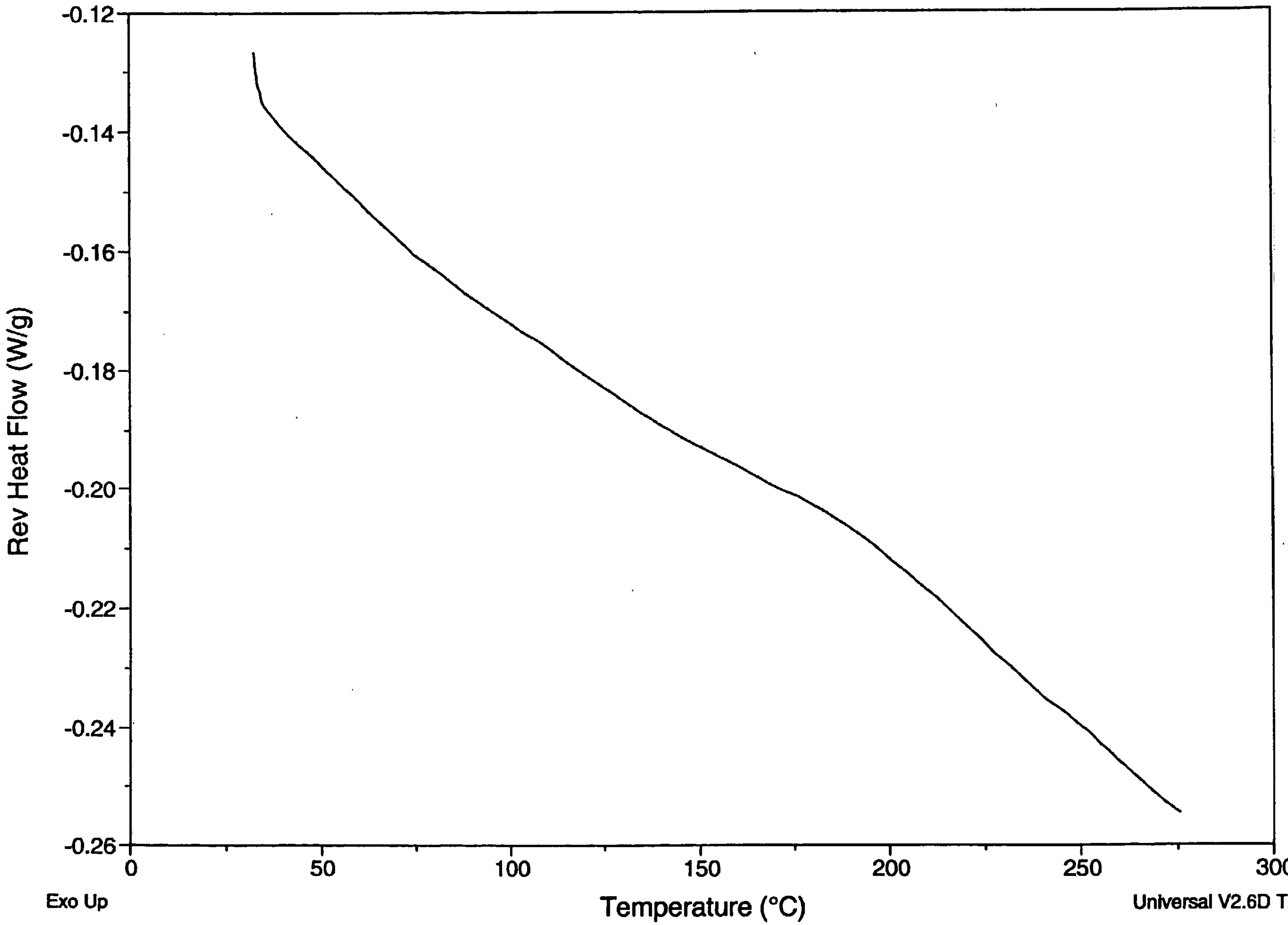


Universal V2.6D TA Instruments

Sample: Headrest - White Foam Run 2
Size: 2.7000 mg
Method: MDSC Method
Comment: Ford Focus: Headrest - White Foam

DSC

File: C:...\DSC\03614-103.087
Operator: WJM
Run Date: 11-Jul-01 11:13



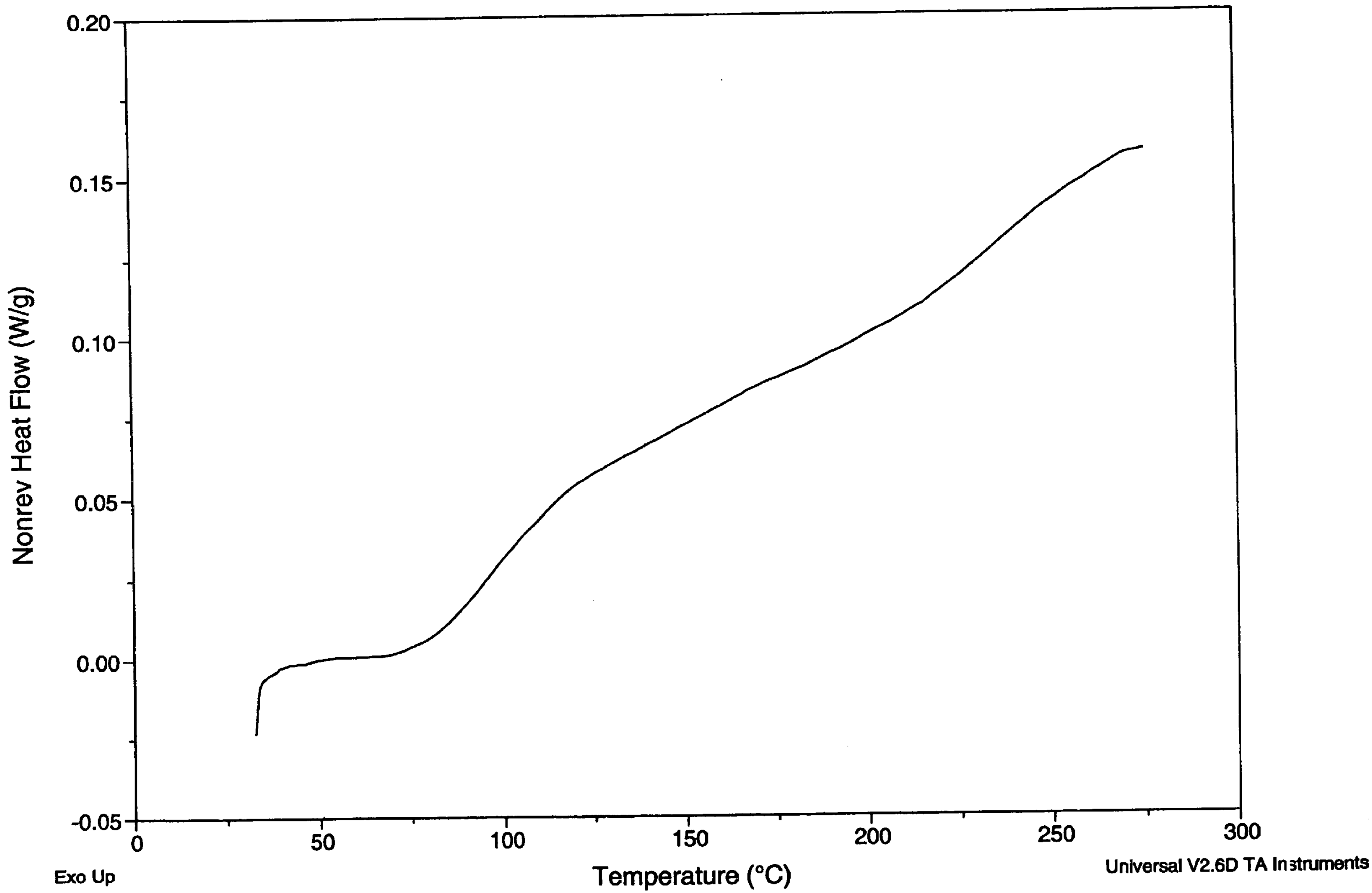
Exo Up

Universal V2.6D TA Instruments

Sample: Headrest - White Foam Run 2
Size: 2.7000 mg
Method: MDSC Method
Comment: Ford Focus: Headrest - White Foam

DSC

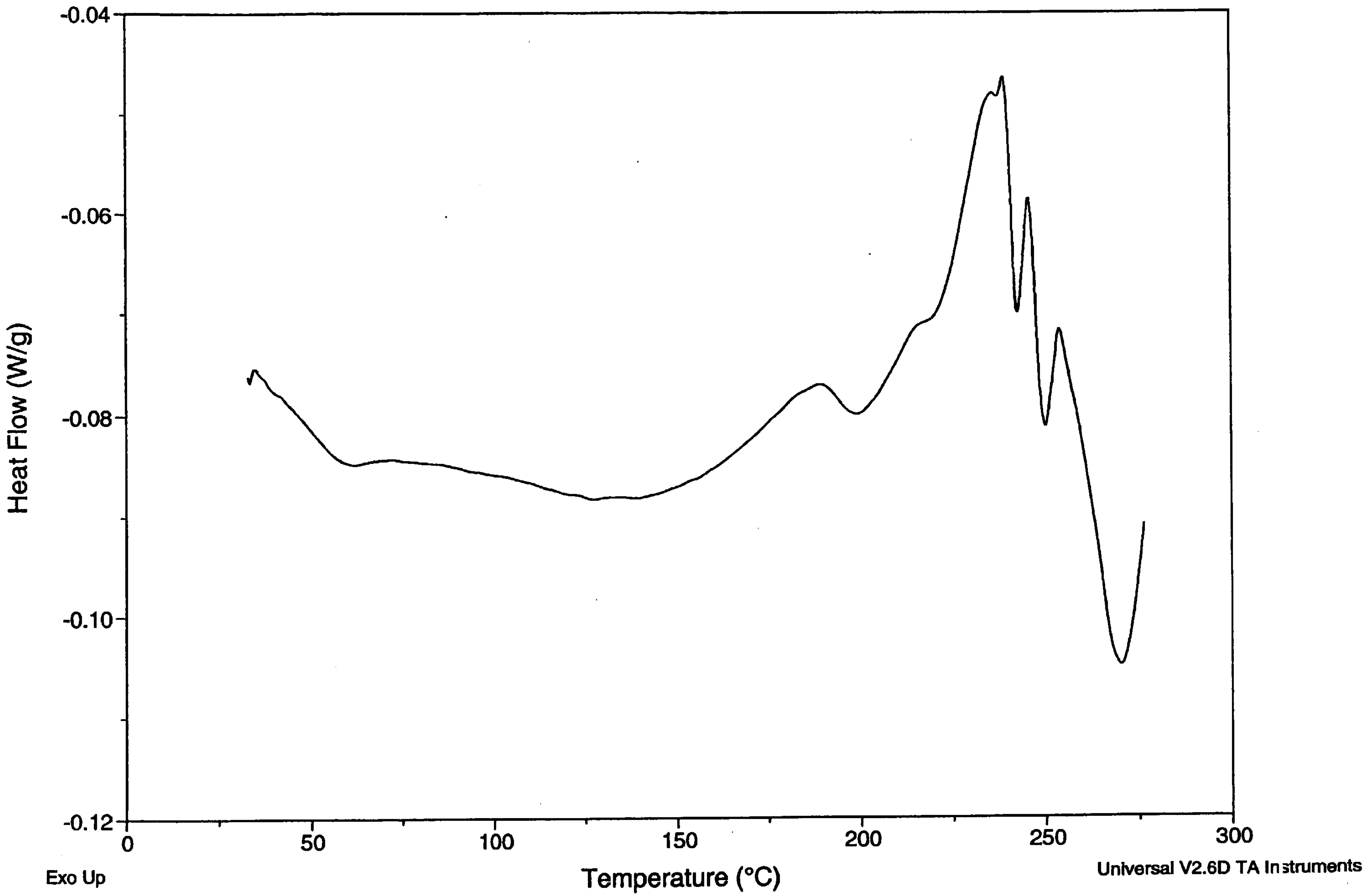
File: C:...\DSC\03614-103.087
Operator: WJM
Run Date: 11-Jul-01 11:13



Sample: Headrest - Backing
Size: 6.9800 mg
Method: MDSC Method
Comment: Ford Focus: Headrest - Backing

DSC

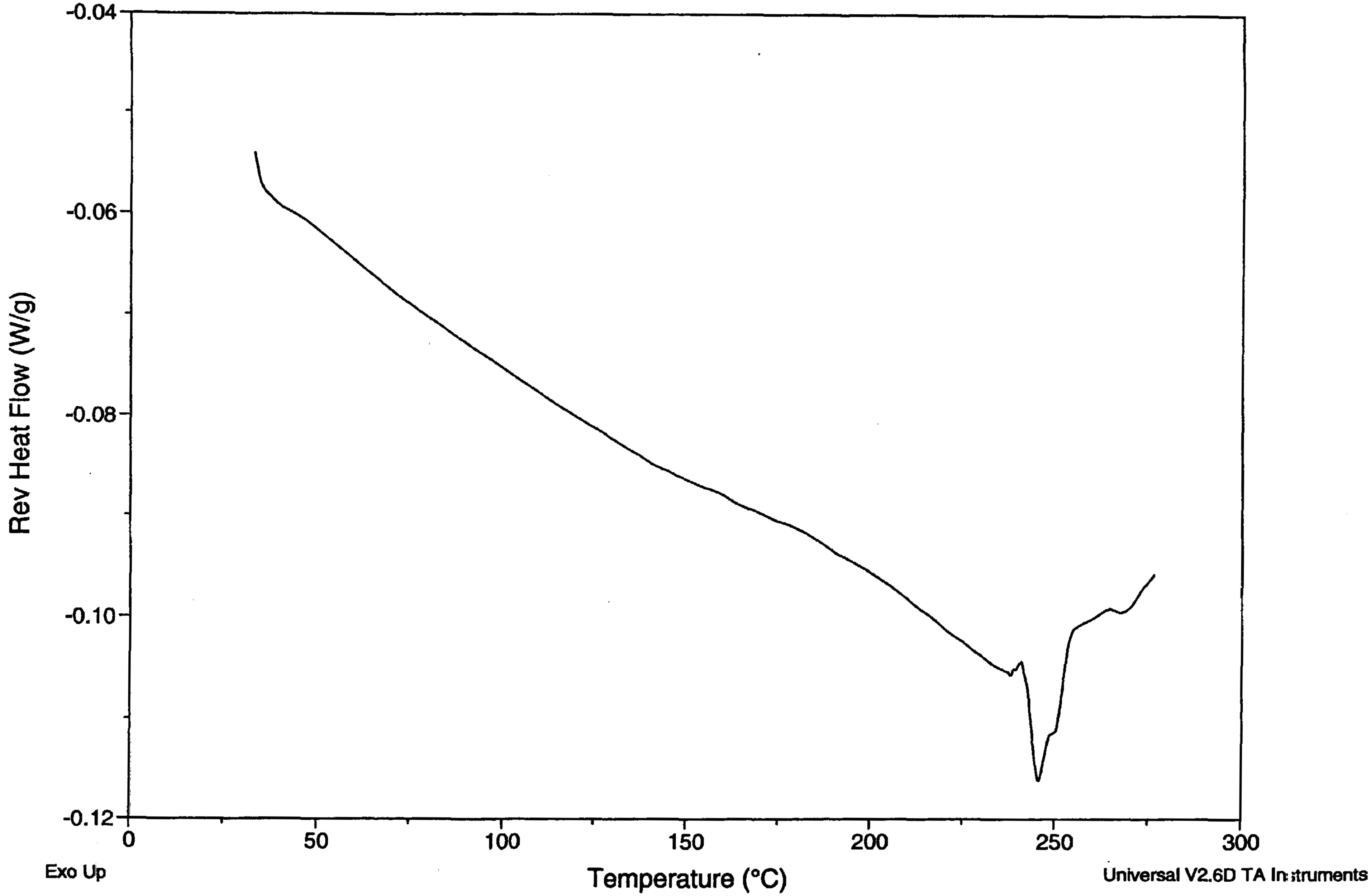
File: C:...\DSC\03614-103.088
Operator: WJM
Run Date: 11-Jul-01 13:04



Sample: Headrest - Backing
Size: 6.9800 mg
Method: MDSC Method
Comment: Ford Focus: Headrest - Backing

DSC

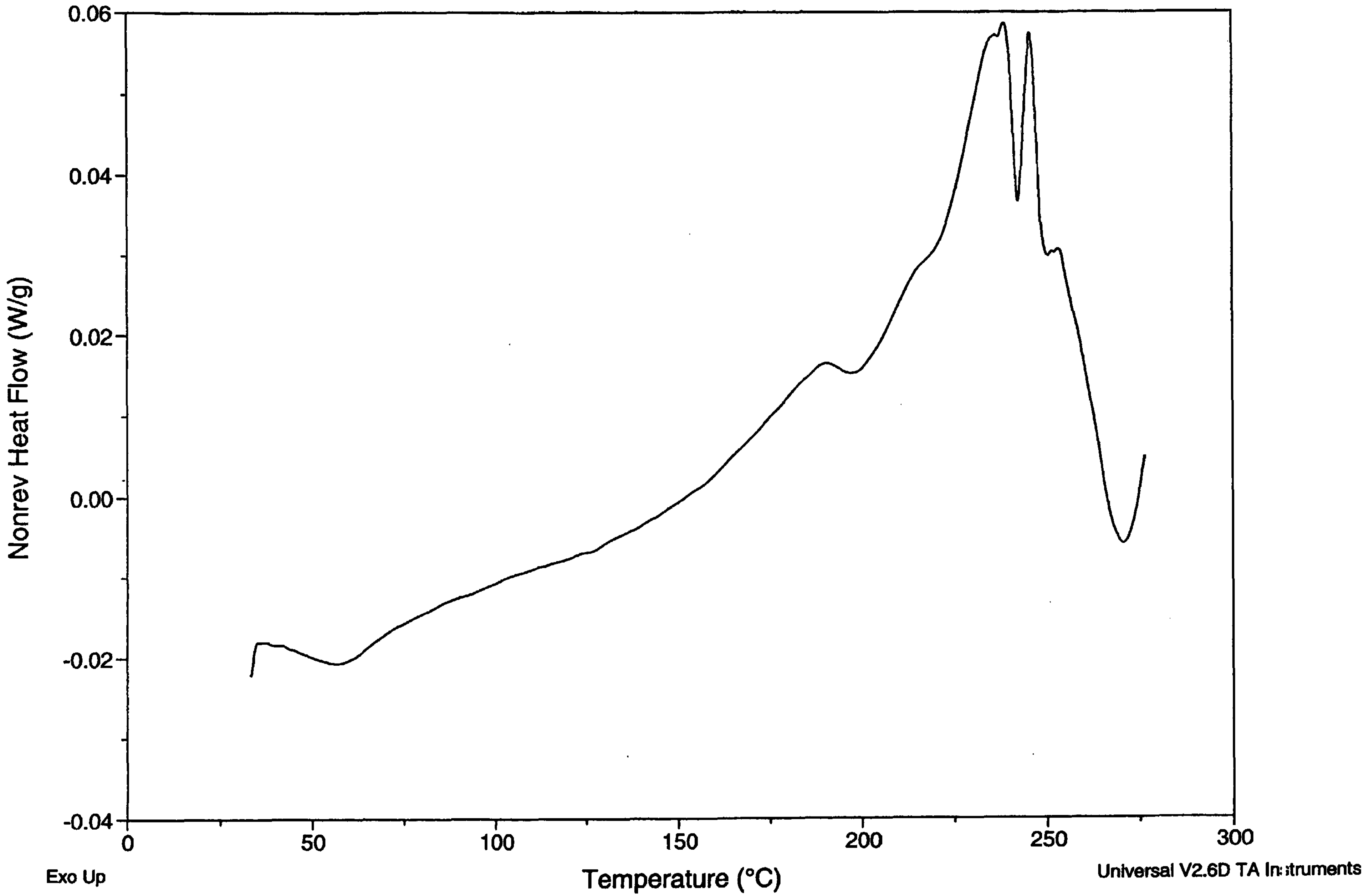
File: C:...\DSC\03614-103.088
Operator: WJM
Run Date: 11-Jul-01 13:04



Sample: Headrest - Backing
Size: 6.9800 mg
Method: MDSC Method
Comment: Ford Focus: Headrest - Backing

DSC

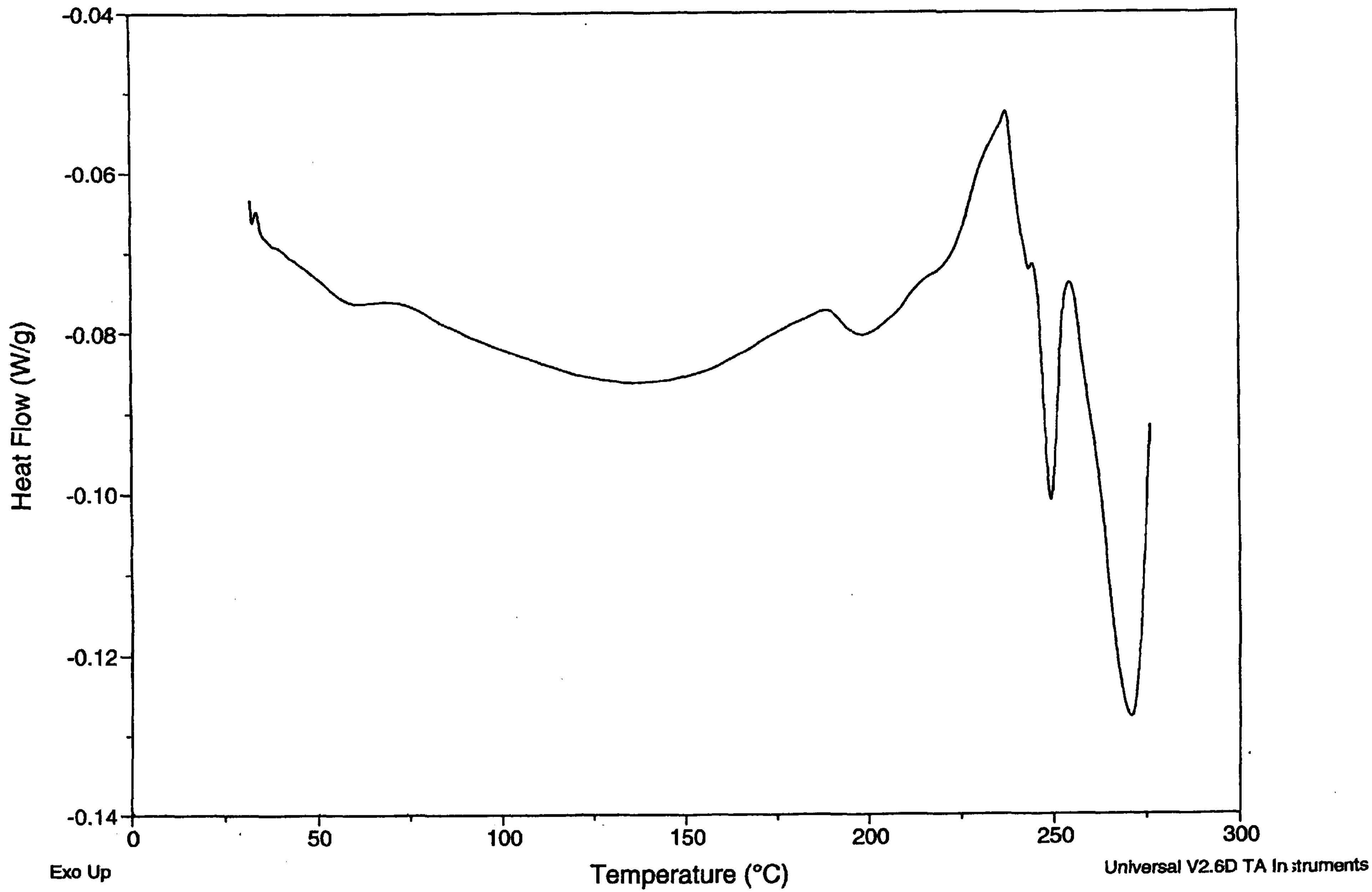
File: C:...\DSC\03614-103.088
Operator: WJM
Run Date: 11-Jul-01 13:04



Sample: Headrest - Backing Run 2
Size: 7.4000 mg
Method: MDSC Method
Comment: Ford Focus: Headrest - Backing

DSC

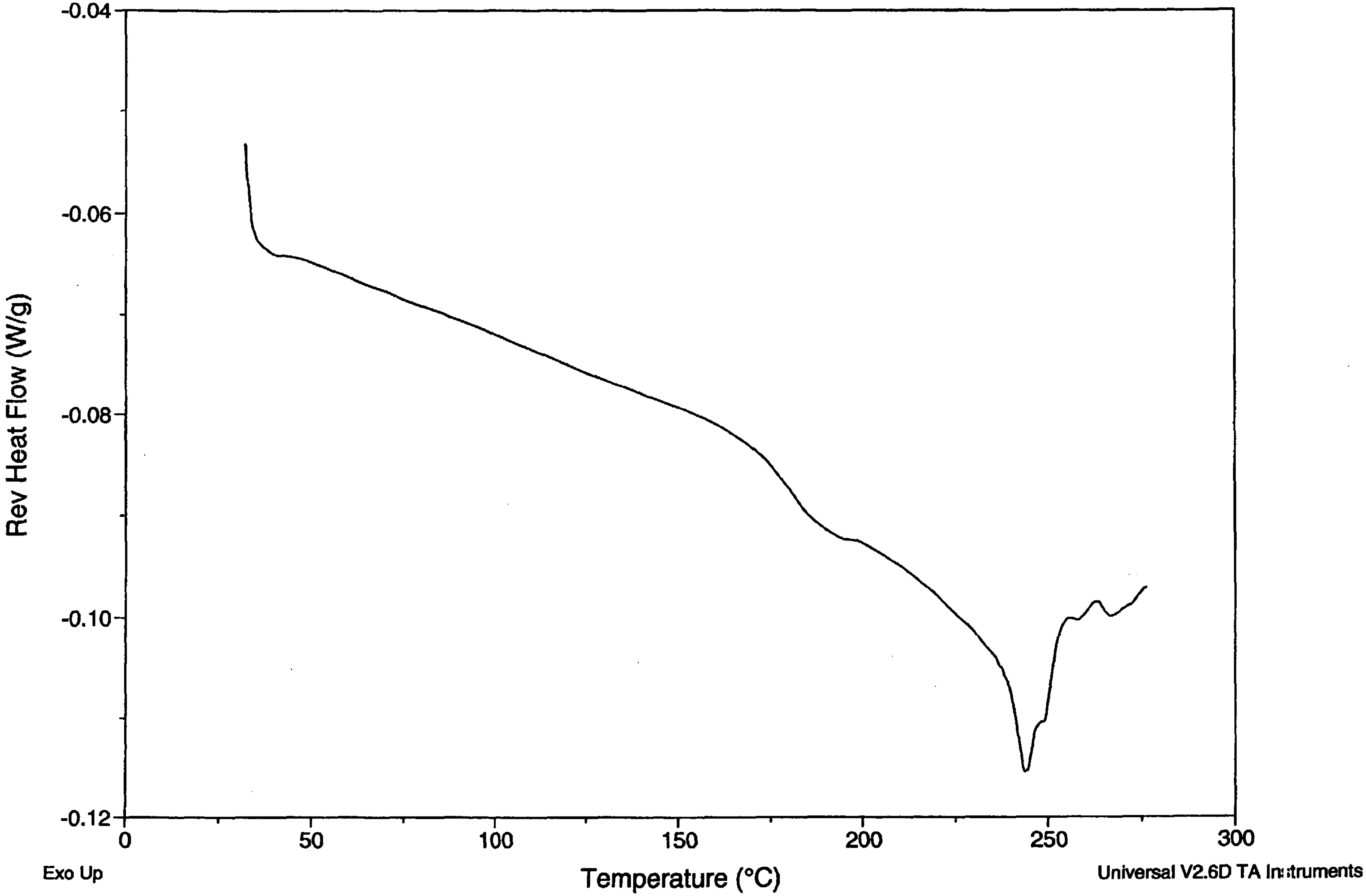
File: C:...\DSC\03614-103.089
Operator: WJM
Run Date: 11-Jul-01 15:09



Sample: Headrest - Backing Run 2
Size: 7.4000 mg
Method: MDSC Method
Comment: Ford Focus: Headrest - Backing

DSC

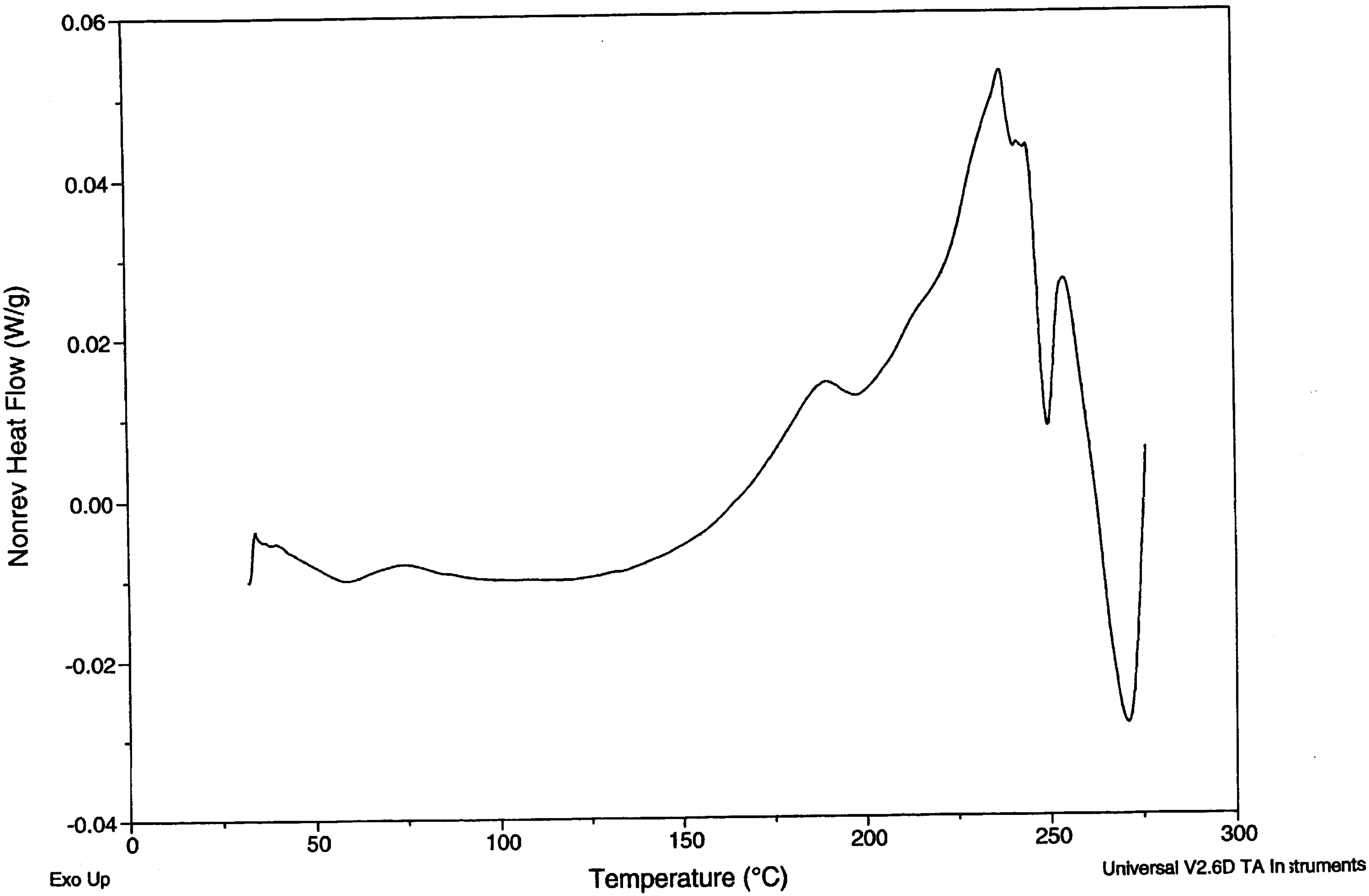
File: C:...\DSC\03614-103.089
Operator: WJM
Run Date: 11-Jul-01 15:09



Sample: Headrest - Backing Run 2
Size: 7.4000 mg
Method: MDSC Method
Comment: Ford Focus: Headrest - Backing

DSC

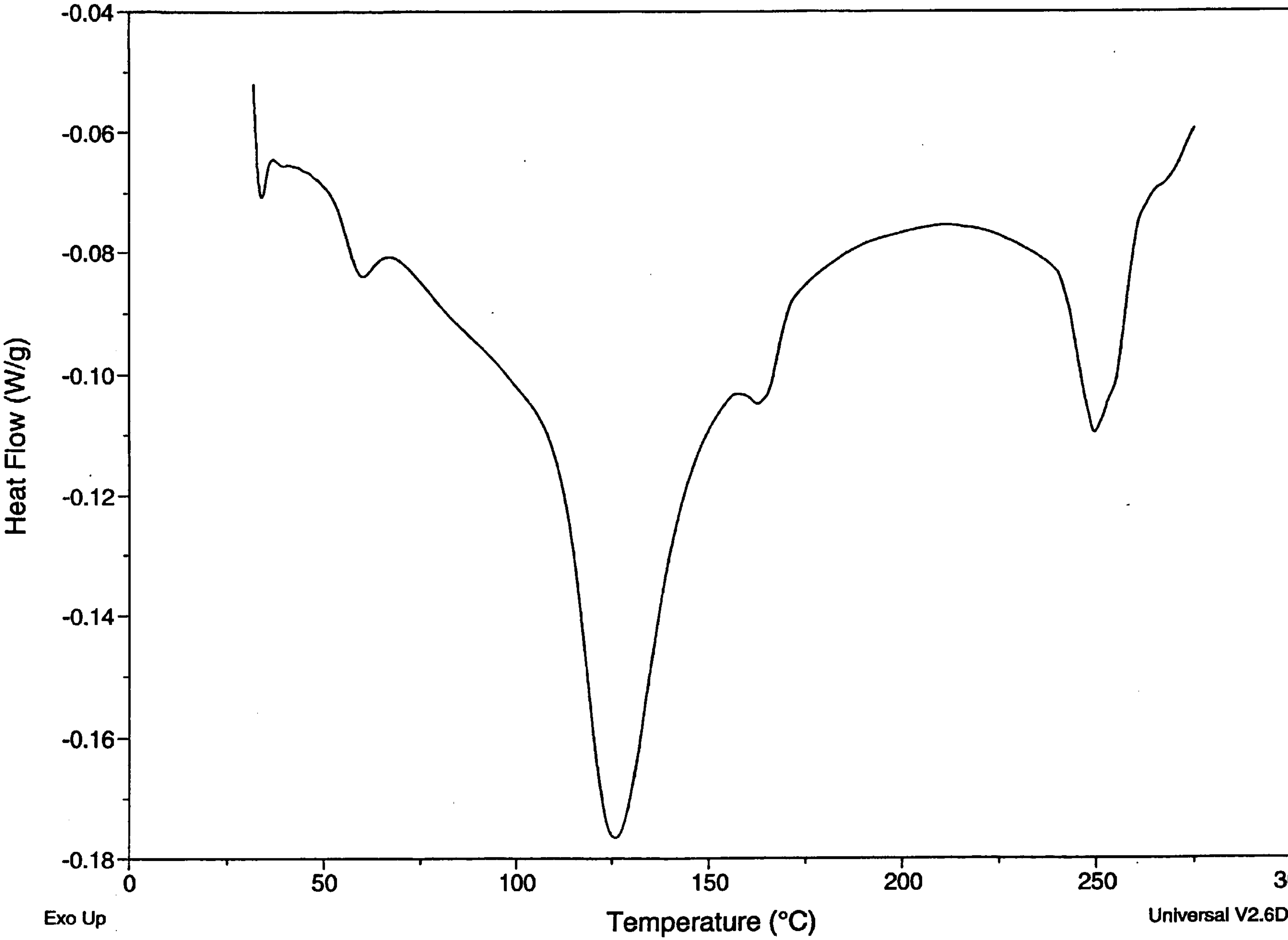
File: C:...\DSC\03614-103.089
Operator: WJM
Run Date: 11-Jul-01 15:09



Sample: Carpet
Size: 11.8900 mg
Method: MDSC Method
Comment: Ford Focus: Carpet - fibers

DSC

File: C:...\DSC\03614-103.090
Operator: WJM
Run Date: 16-Jul-01 10:04

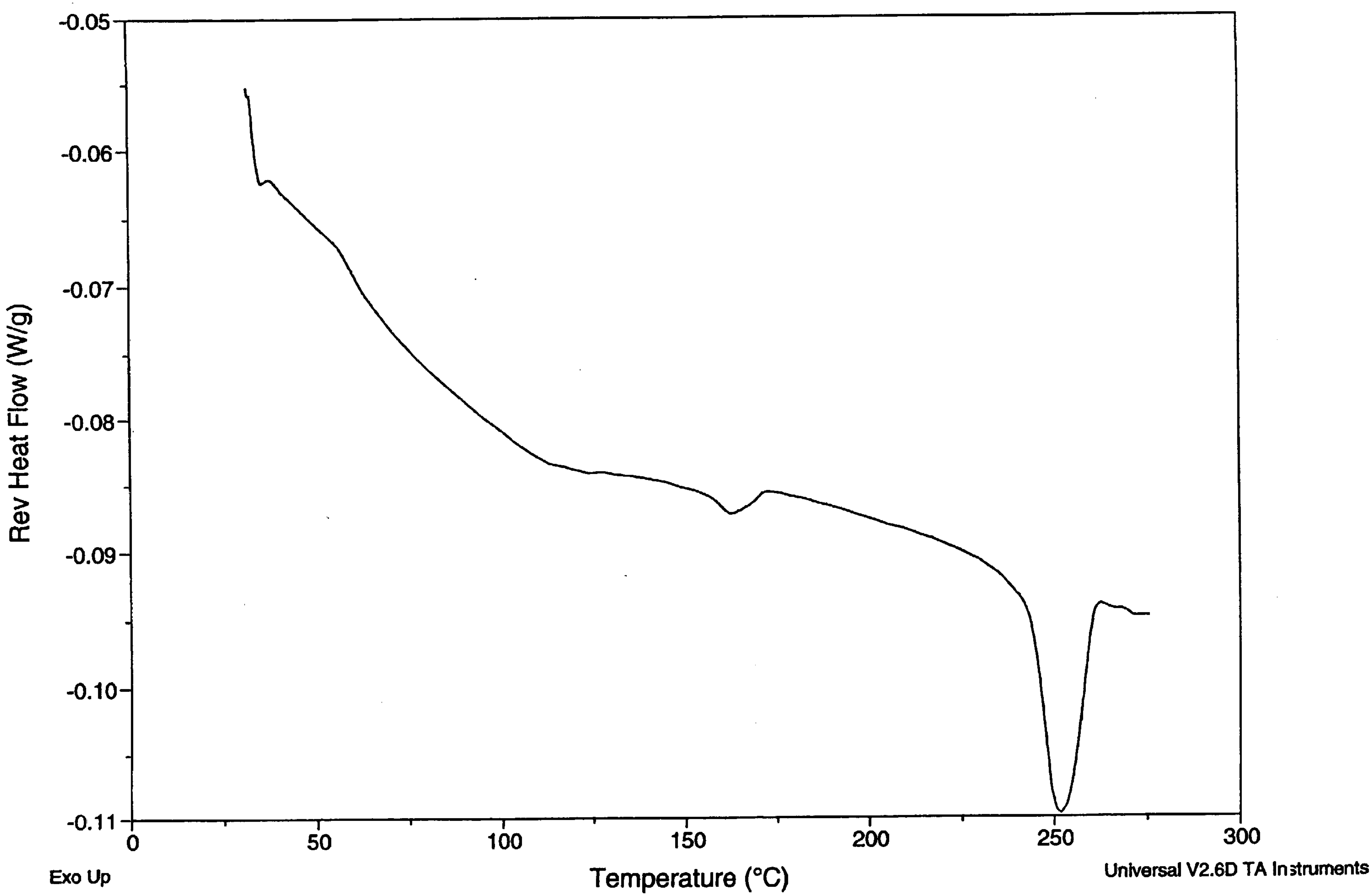


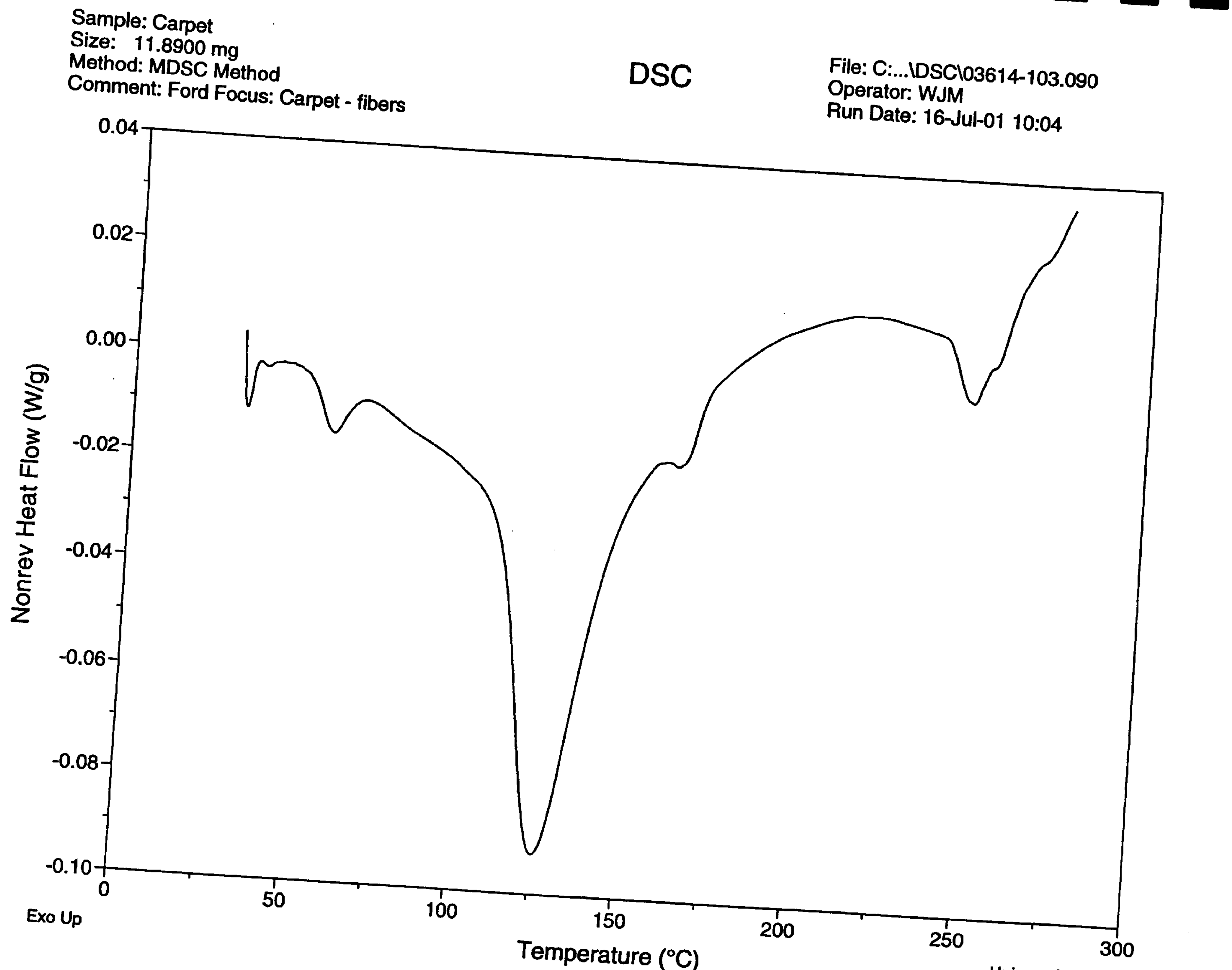
Universal V2.6D TA Instruments

Sample: Carpet
Size: 11.8900 mg
Method: MDSC Method
Comment: Ford Focus: Carpet - fibers

DSC

File: C:...\DSC\03614-103.090
Operator: WJM
Run Date: 16-Jul-01 10:04

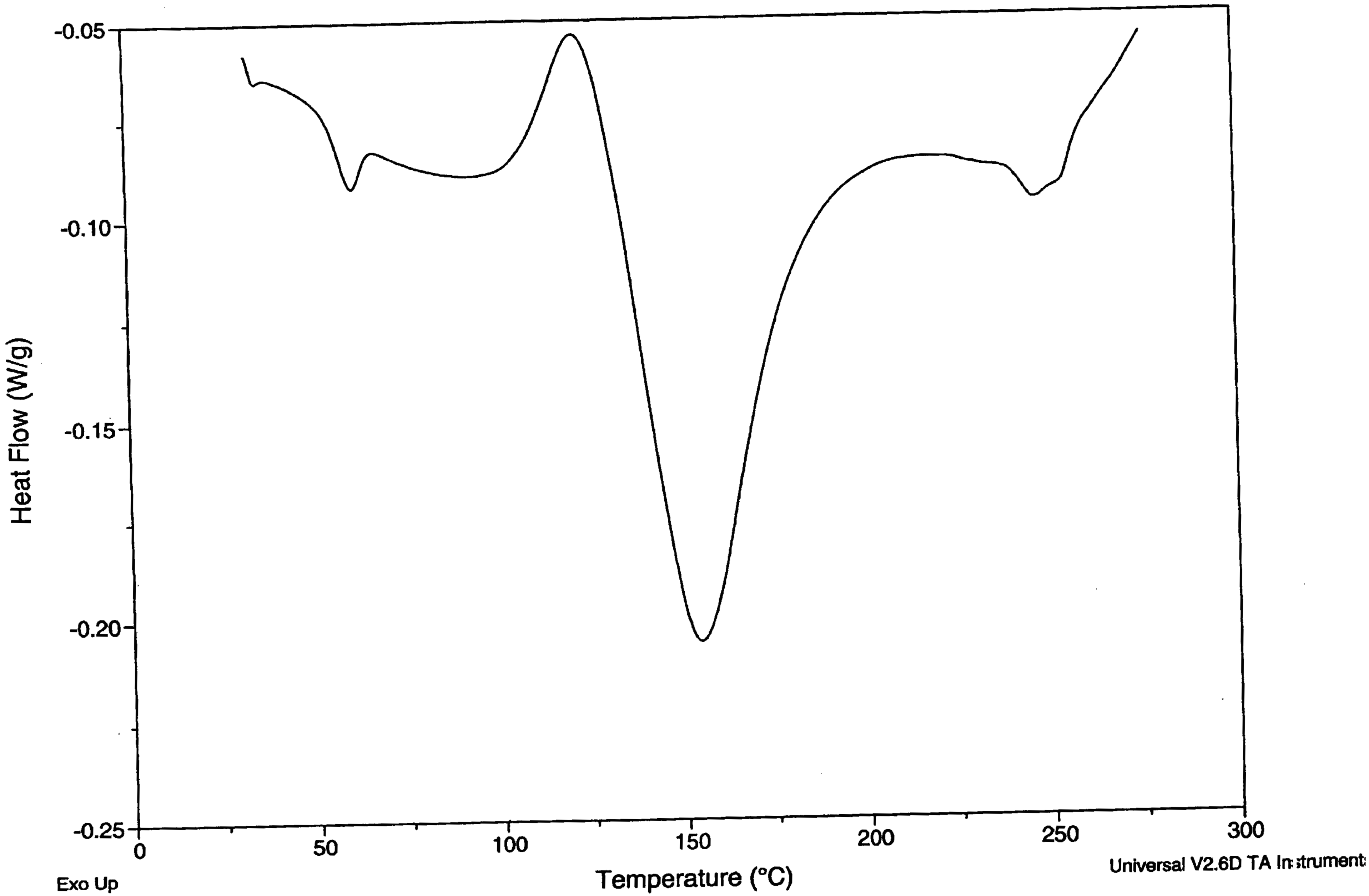



Sample: Carpet
Size: 11.8900 mg
Method: MDSC Method
Comment: Ford Focus: Carpet - fibers
DSC
File: C:...\DSC\03614-103.090
Operator: WJM
Run Date: 16-Jul-01 10:04
Nonrev Heat Flow (W/g)
0.04
0.02
0.00
-0.02
-0.04
-0.06
-0.08
-0.10
0
50
100
150
200
250
300
Exo Up
Temperature (°C)
Universal V2.6D TA Instruments

Sample: Carpet Run 2
Size: 11.3200 mg
Method: MDSC Method
Comment: Ford Focus: Carpet - fibers

DSC

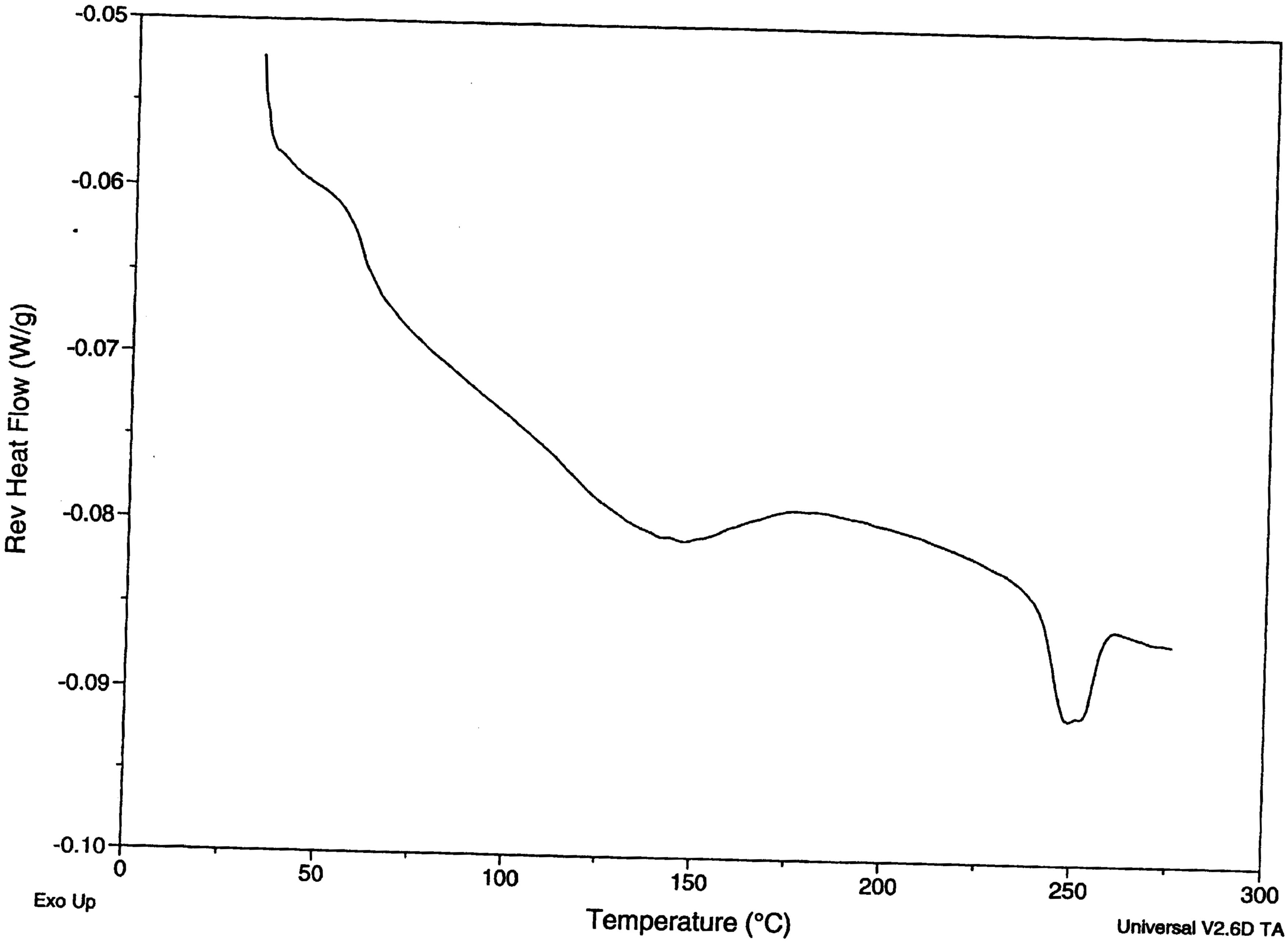
File: C:...\DSC\03614-103.091
Operator: WJM
Run Date: 16-Jul-01 12:41



Sample: Carpet Run 2
Size: 11.3200 mg
Method: MDSC Method
Comment: Ford Focus: Carpet - fibers

DSC

File: C:...\DSC\03614-103.091
Operator: WJM
Run Date: 16-Jul-01 12:41

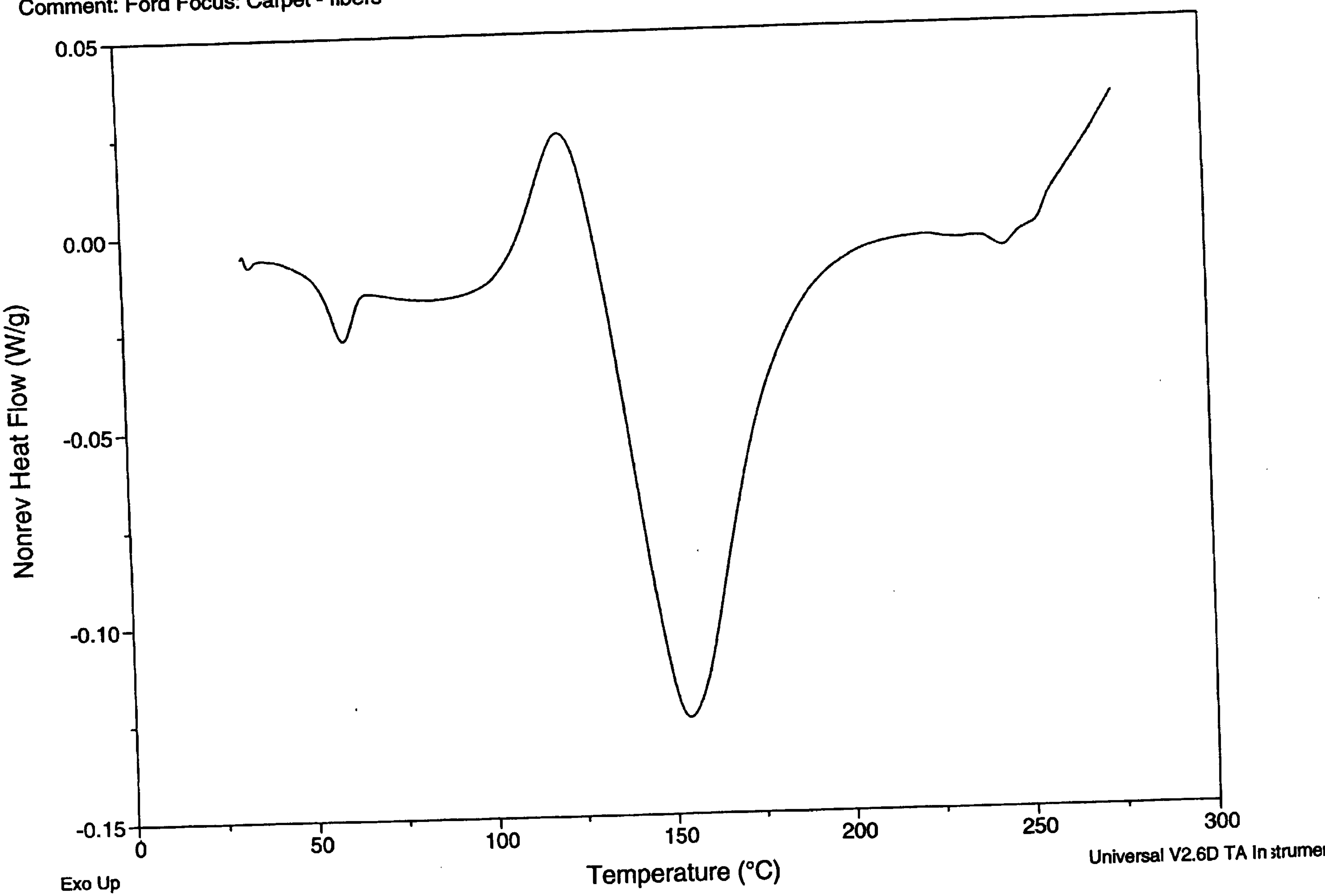


Universal V2.6D TA Instruments

Sample: Carpet Run 2
Size: 11.3200 mg
Method: MDSC Method
Comment: Ford Focus: Carpet - fibers

DSC

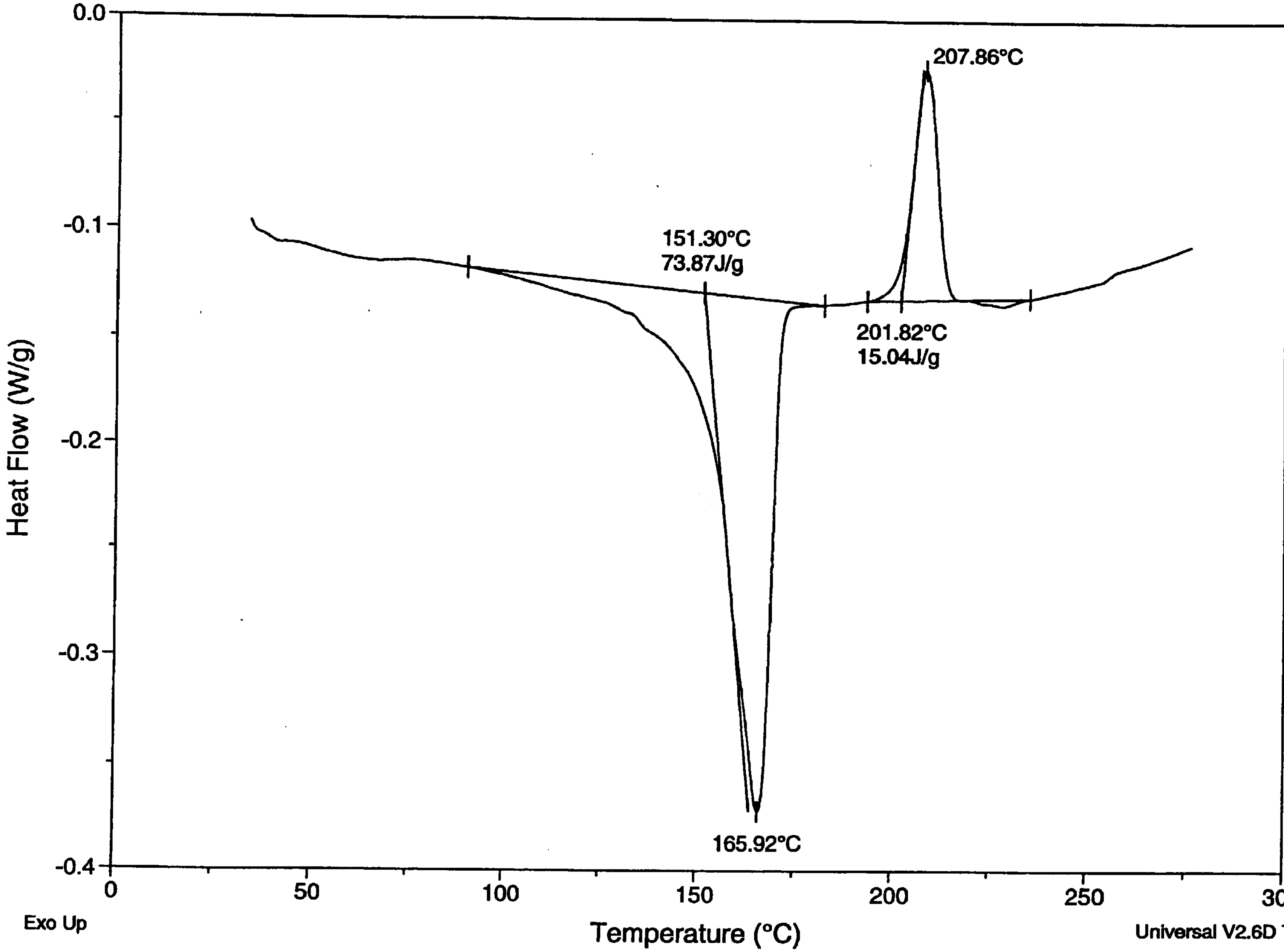
File: C:...\DSC\03614-103.091
Operator: WJM
Run Date: 16-Jul-01 12:41



Sample: Door Panel
Size: 4.0000 mg
Method: MDSC Method
Comment: Ford Focus: Door Panel - beige plastic part

DSC

File: C:...\DSC\03614-103.092
Operator: WJM
Run Date: 16-Jul-01 14:40

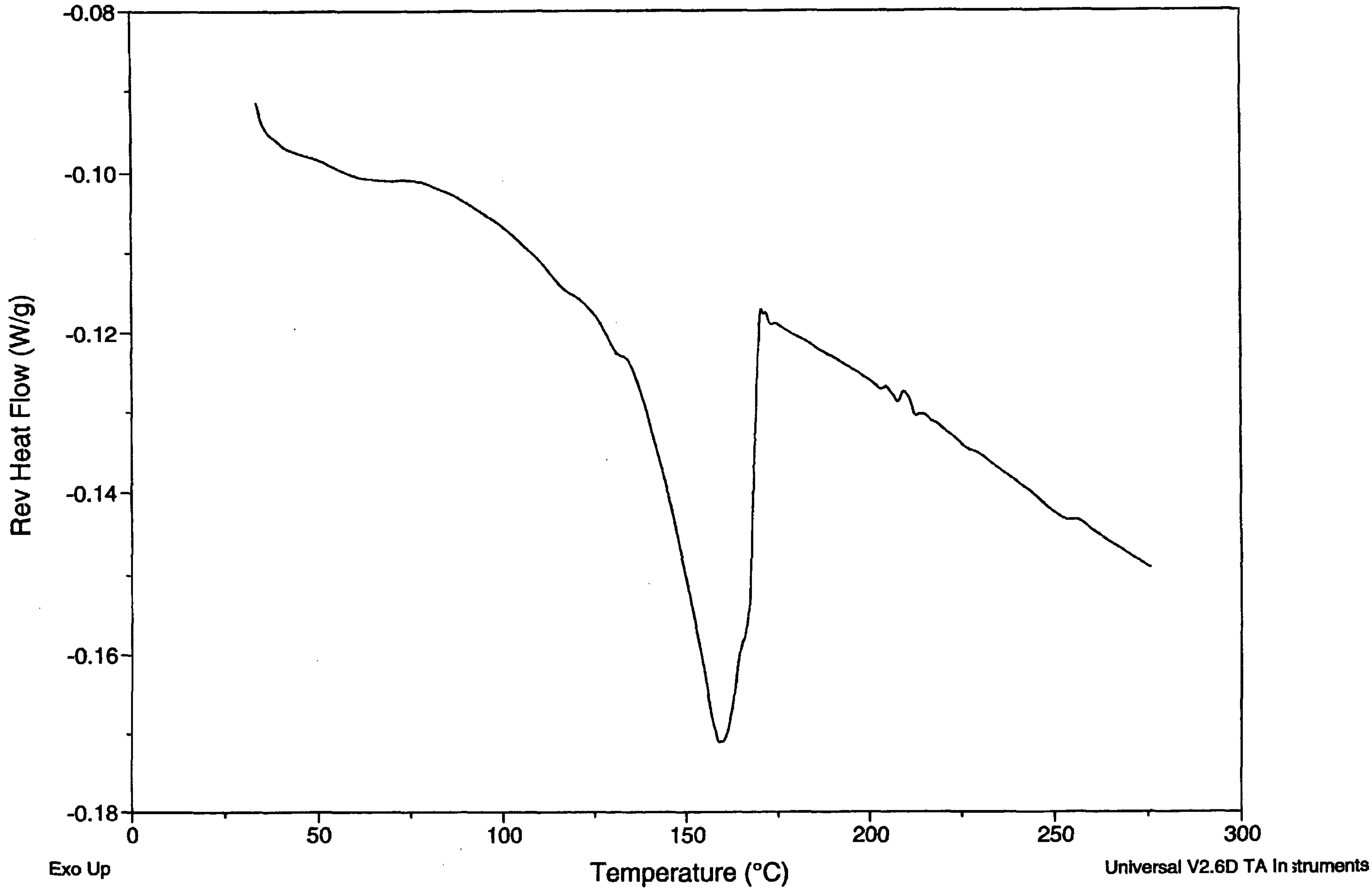


Universal V2.6D TA Instruments

Sample: Door Panel
Size: 4.0000 mg
Method: MDSC Method
Comment: Ford Focus: Door Panel - beige plastic part

DSC

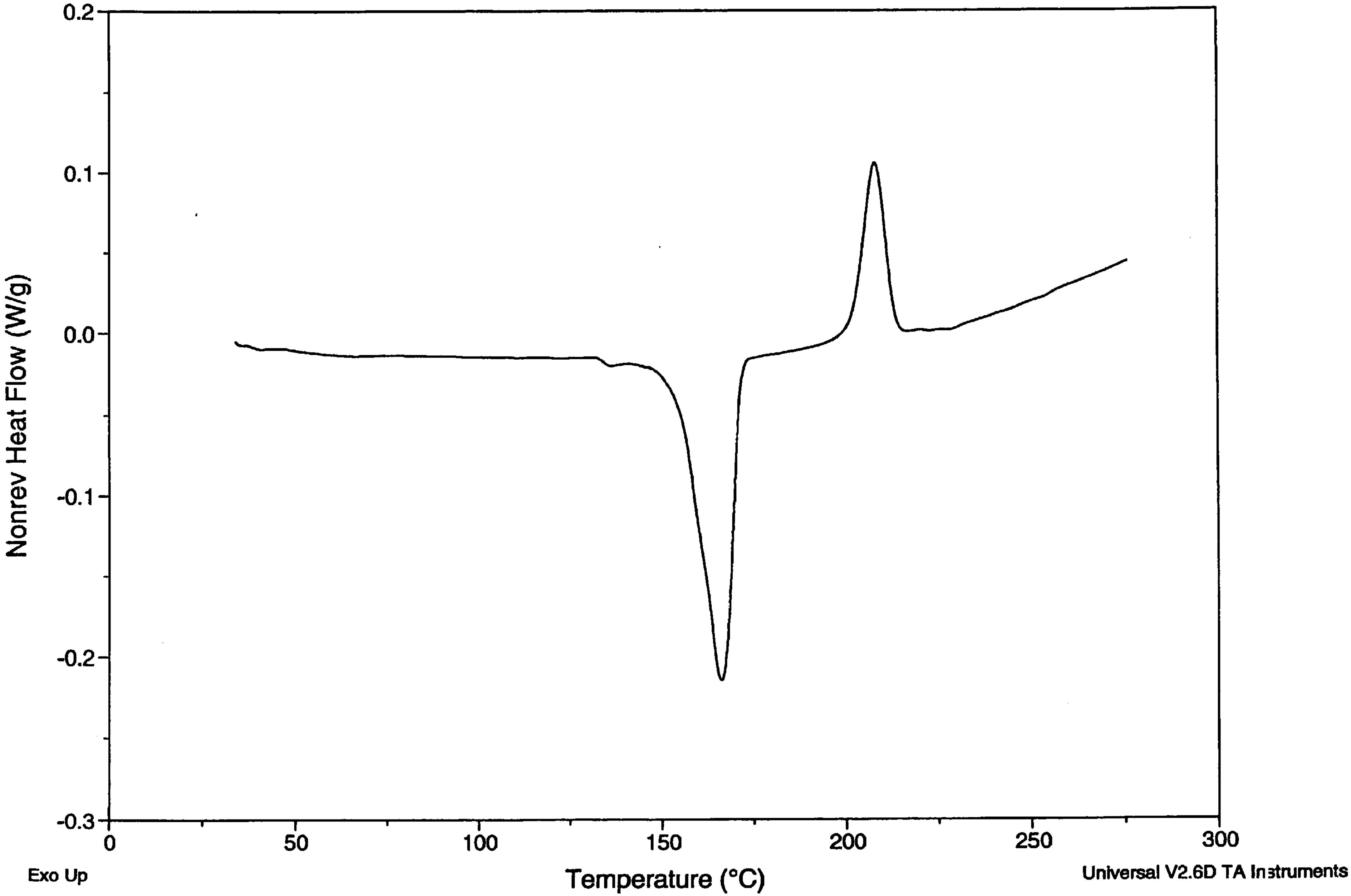
File: C:...\DSC\03614-103.092
Operator: WJM
Run Date: 16-Jul-01 14:40



Sample: Door Panel
Size: 4.0000 mg
Method: MDSC Method
Comment: Ford Focus: Door Panel - beige plastic part

DSC

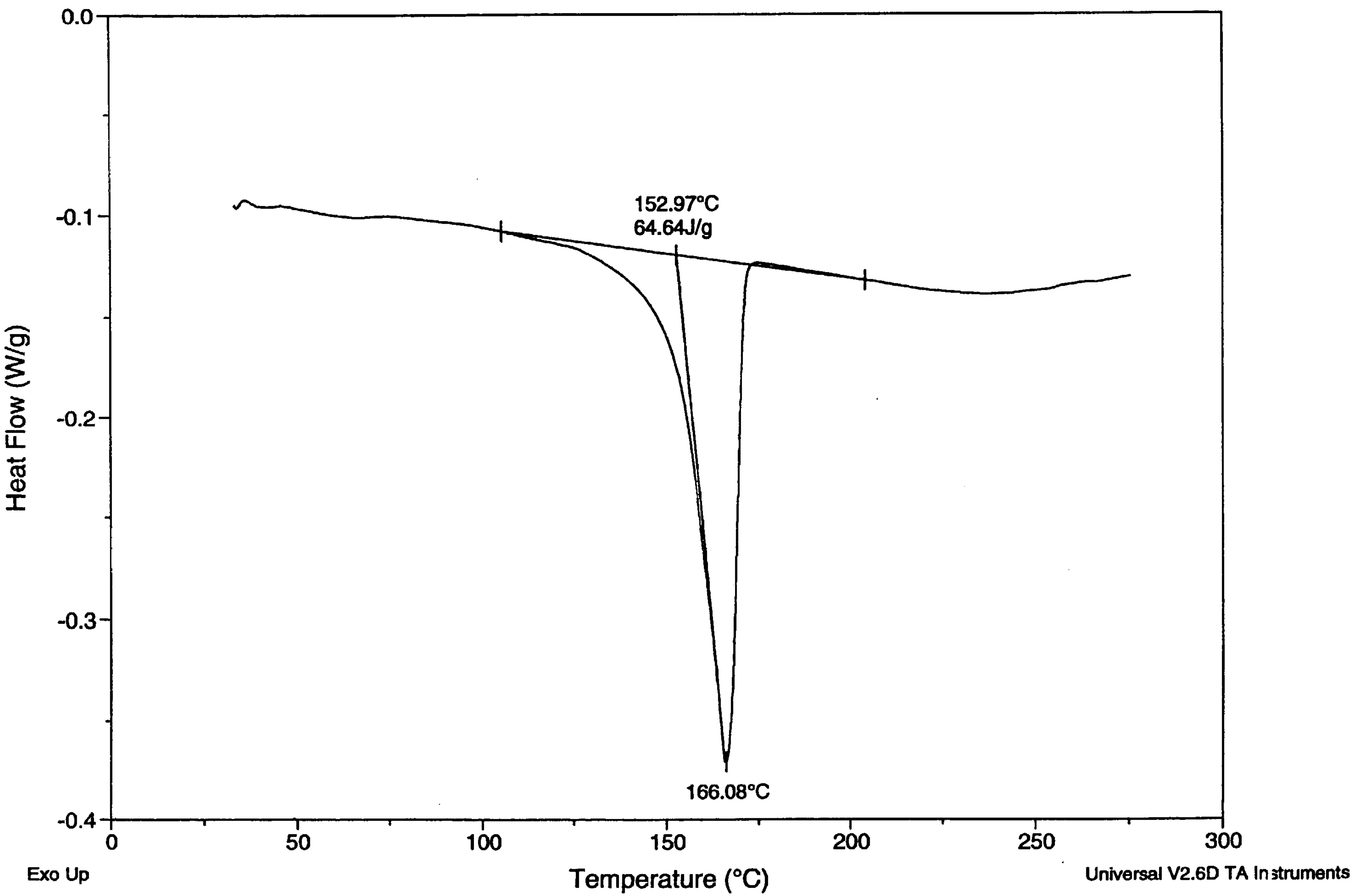
File: C:...\DSC\03614-103.092
Operator: WJM
Run Date: 16-Jul-01 14:40



Sample: Door Panel Run 2
Size: 5.2100 mg
Method: MDSC Method
Comment: Ford Focus: Door Panel - beige plastic part

DSC

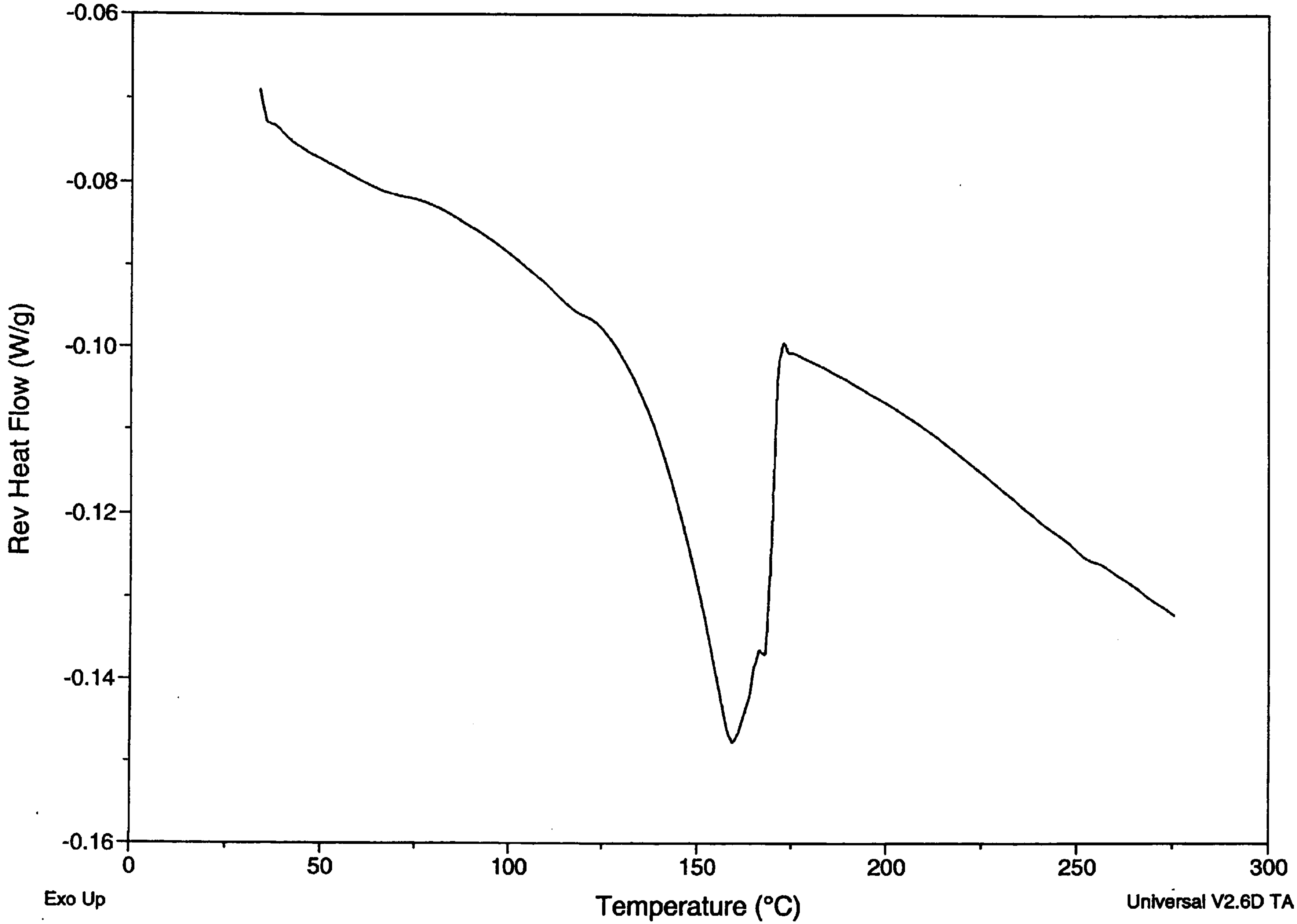
File: C:...\DSC\03614-103.093
Operator: WJM
Run Date: 17-Jul-01 08:43



Sample: Door Panel Run 2
Size: 5.2100 mg
Method: MDSC Method
Comment: Ford Focus: Door Panel - beige plastic part

DSC

File: C:...\DSC\03614-103.093
Operator: WJM
Run Date: 17-Jul-01 08:43

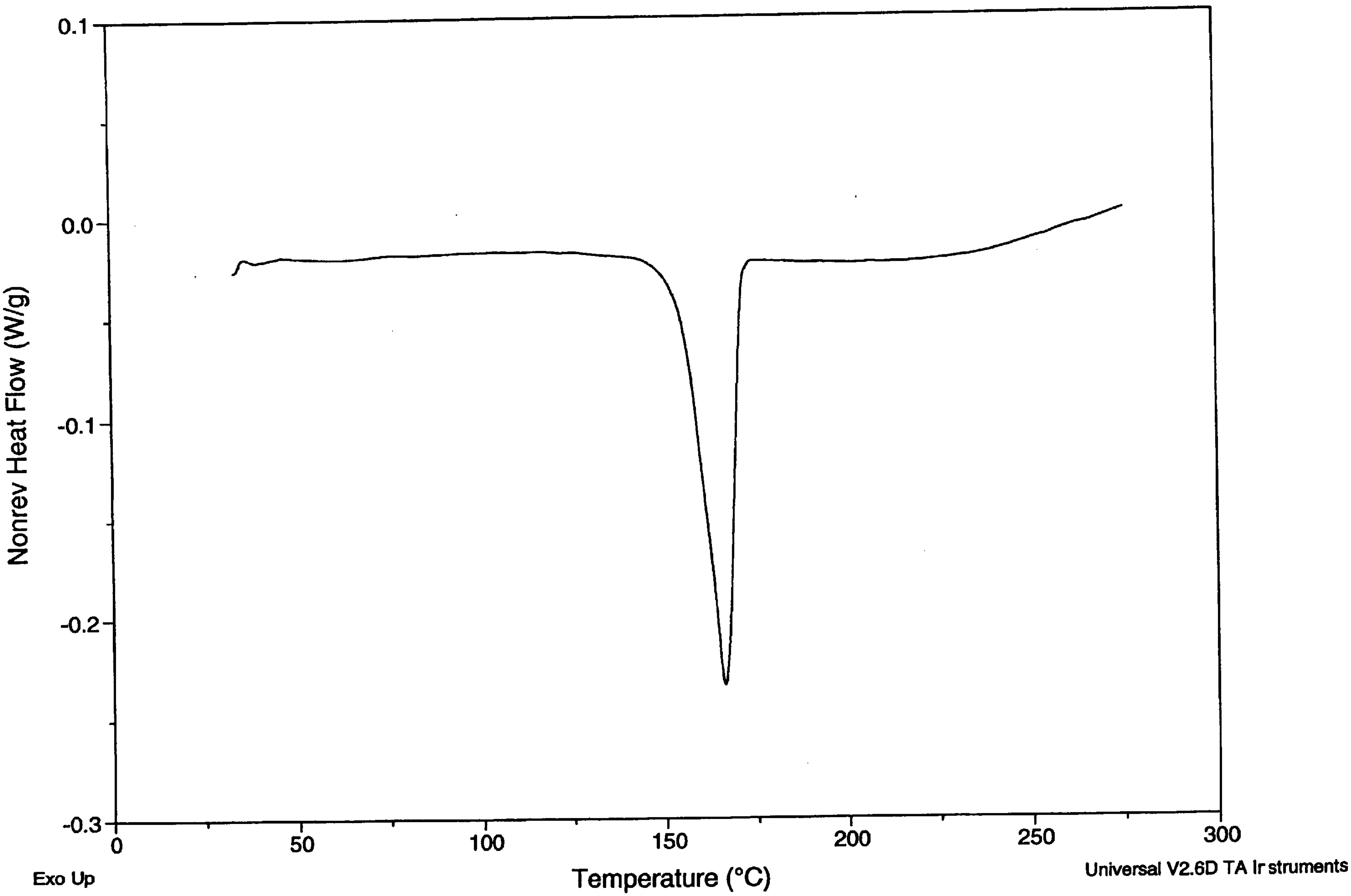


Universal V2.6D TA Instruments

Sample: Door Panel Run 2
Size: 5.2100 mg
Method: MDSC Method
Comment: Ford Focus: Door Panel - beige plastic part

DSC

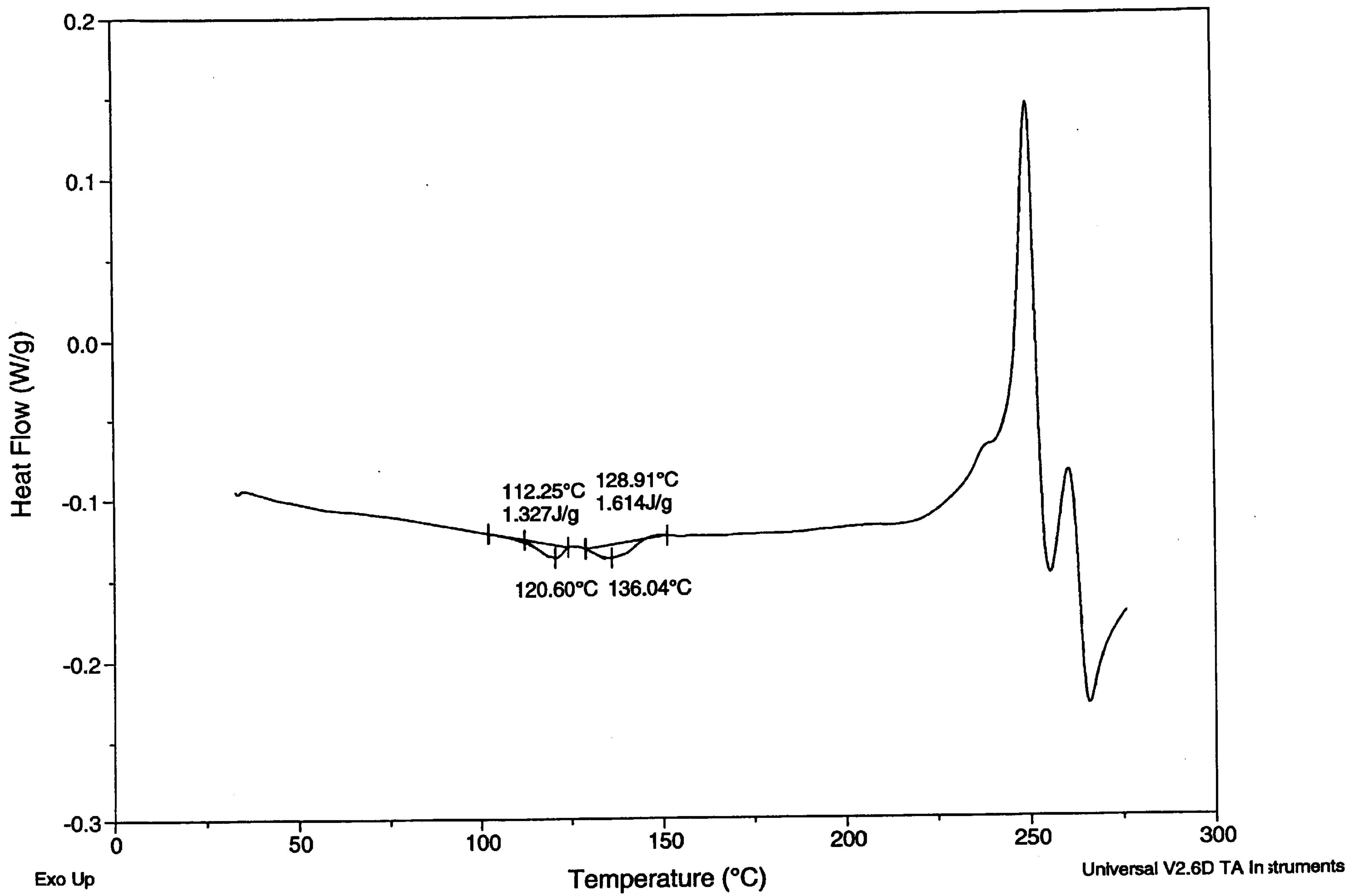
File: C:...\DSC\03614-103.093
Operator: WJM
Run Date: 17-Jul-01 08:43



Sample: Door Panel - Back two layers
Size: 4.7300 mg
Method: MDSC Method
Comment: Ford Focus: Door Panel - back two layers

DSC

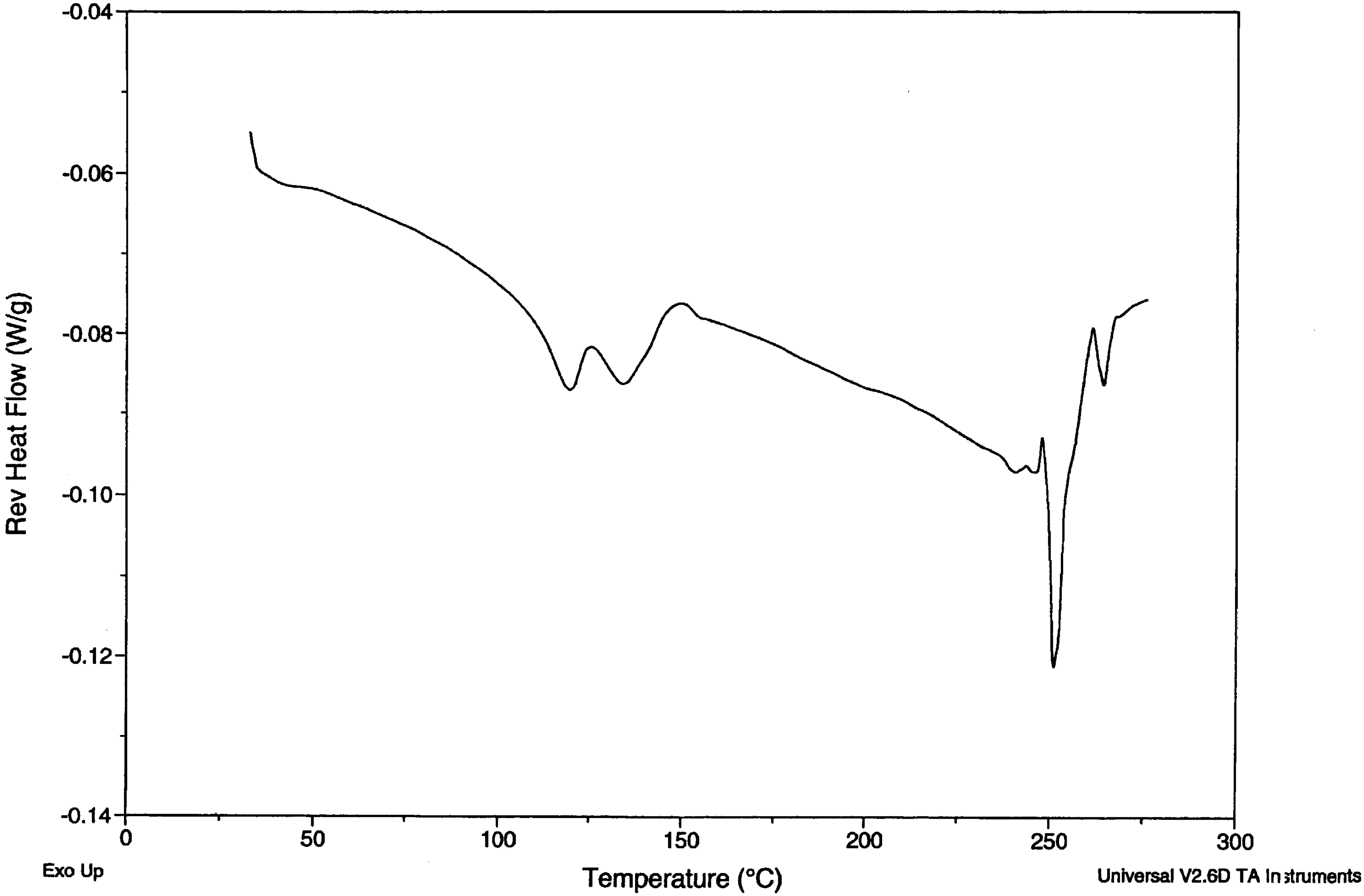
File: C:...\DSC\03614-103.094
Operator: WJM
Run Date: 17-Jul-01 11:02



Sample: Door Panel - Back two layers
Size: 4.7300 mg
Method: MDSC Method
Comment: Ford Focus: Door Panel - back two layers

DSC

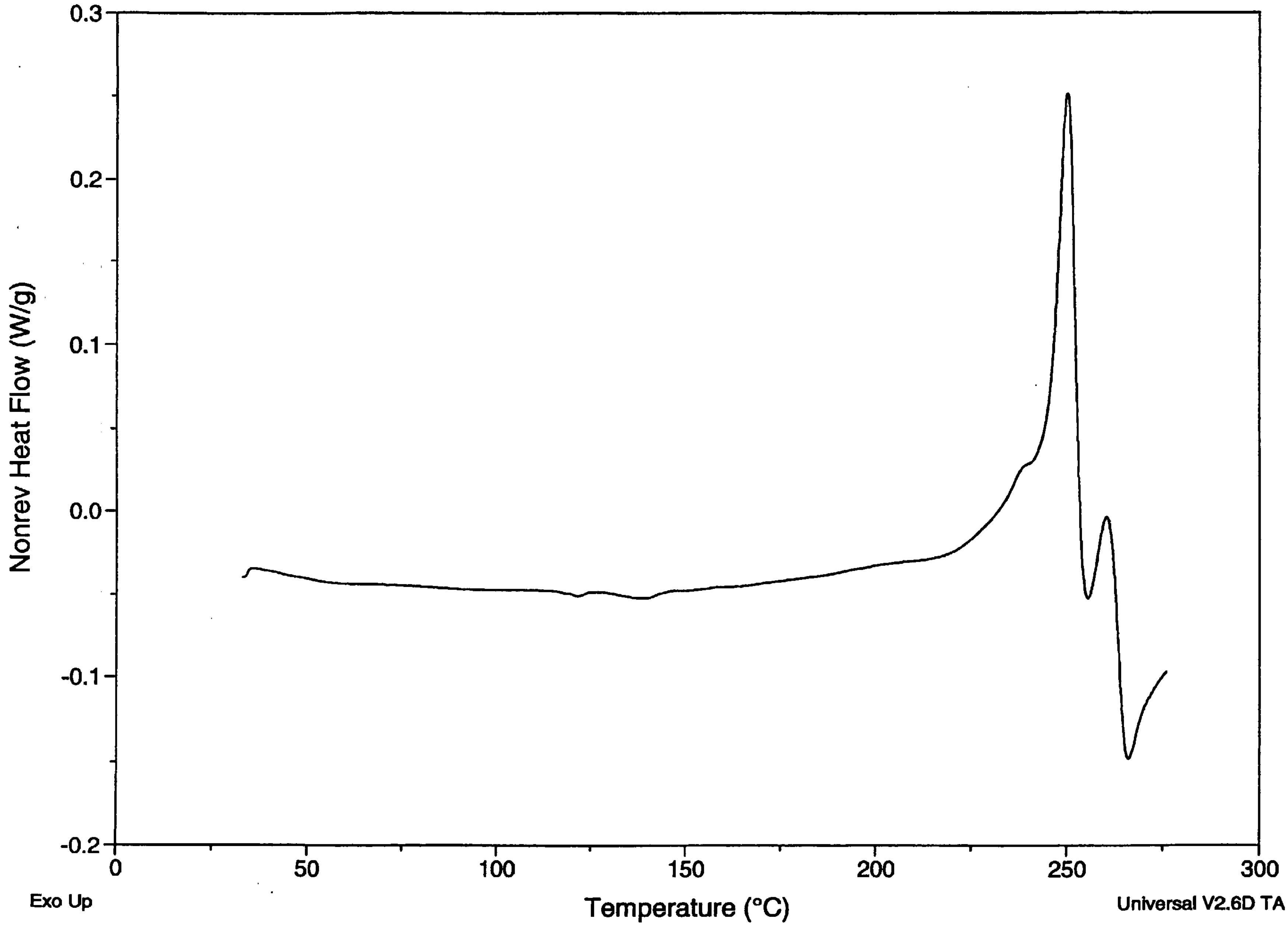
File: C:...\DSC\03614-103.094
Operator: WJM
Run Date: 17-Jul-01 11:02



Sample: Door Panel - Back two layers
Size: 4.7300 mg
Method: MDSC Method
Comment: Ford Focus: Door Panel - back two layers

DSC

File: C:...\DSC\03614-103.094
Operator: WJM
Run Date: 17-Jul-01 11:02

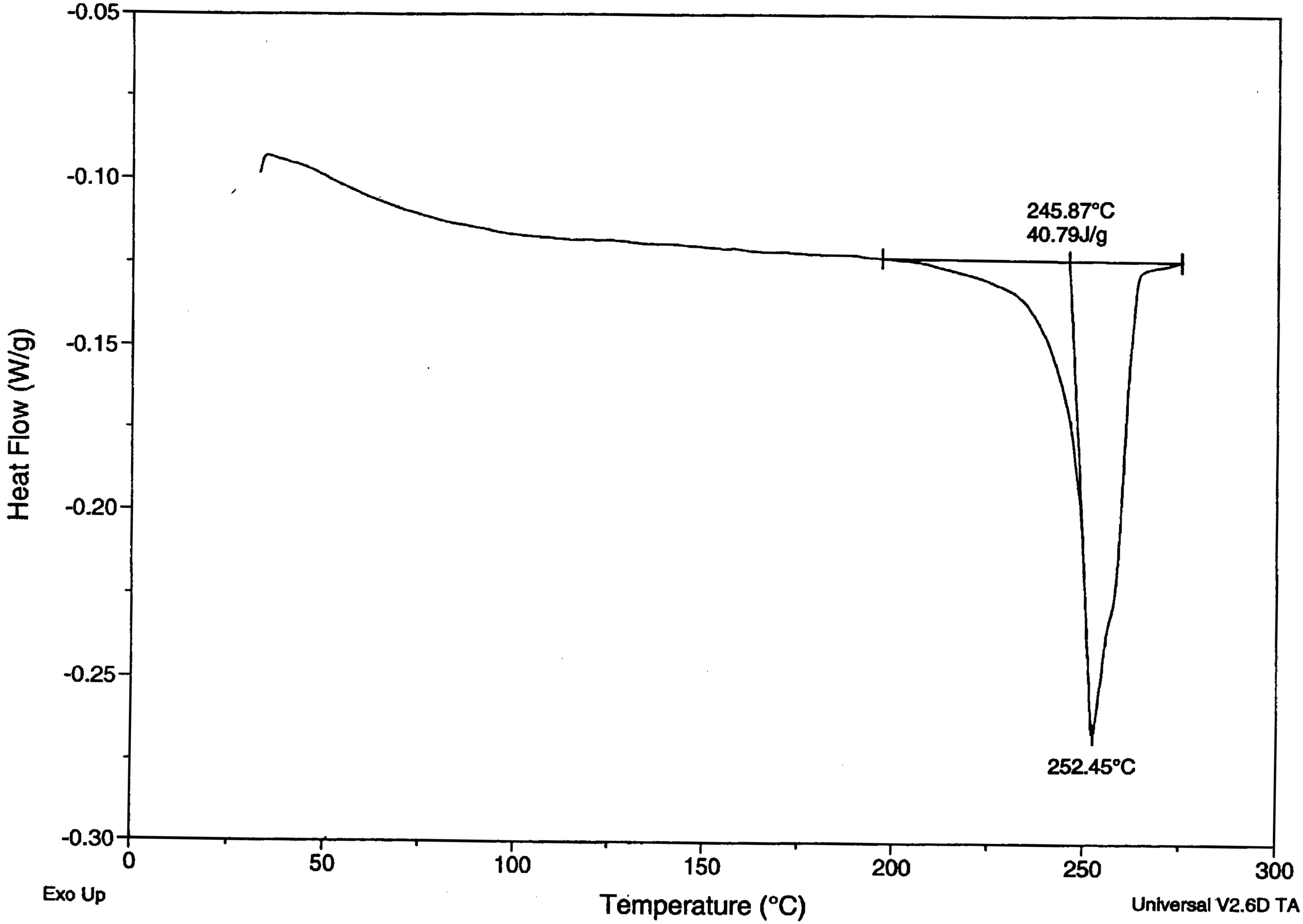


Universal V2.6D TA Instruments

Sample: Headliner - gray outer part
Size: 4.7300 mg
Method: MDSC Method
Comment: Ford Focus: Headliner - gray outer part

DSC

File: C:...\DSC\03614-103.095
Operator: WJM
Run Date: 17-Jul-01 13:54

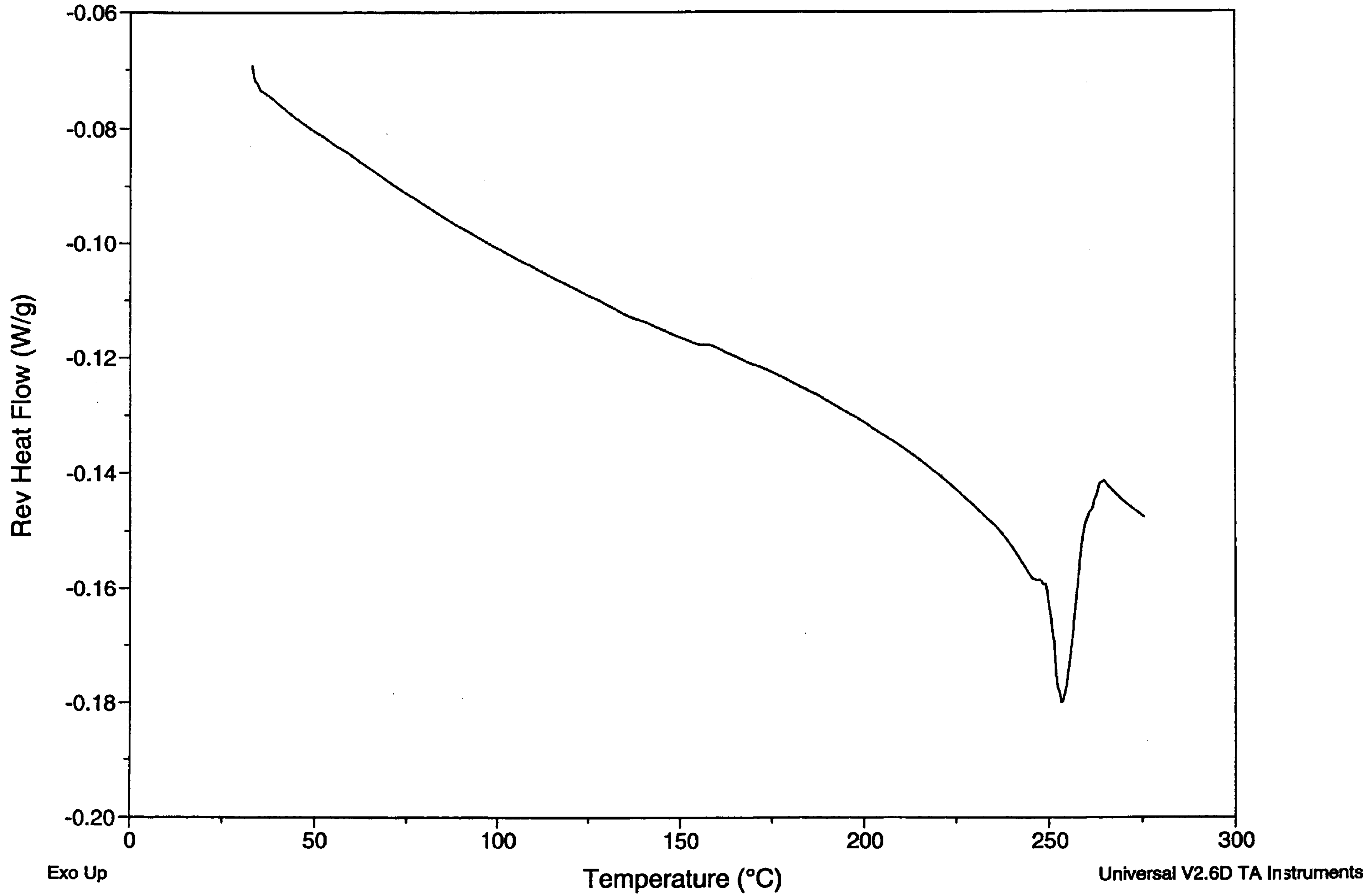


Universal V2.6D TA Instruments

Sample: Headliner - gray outer part
Size: 4.7300 mg
Method: MDSC Method
Comment: Ford Focus: Headliner - gray outer part

DSC

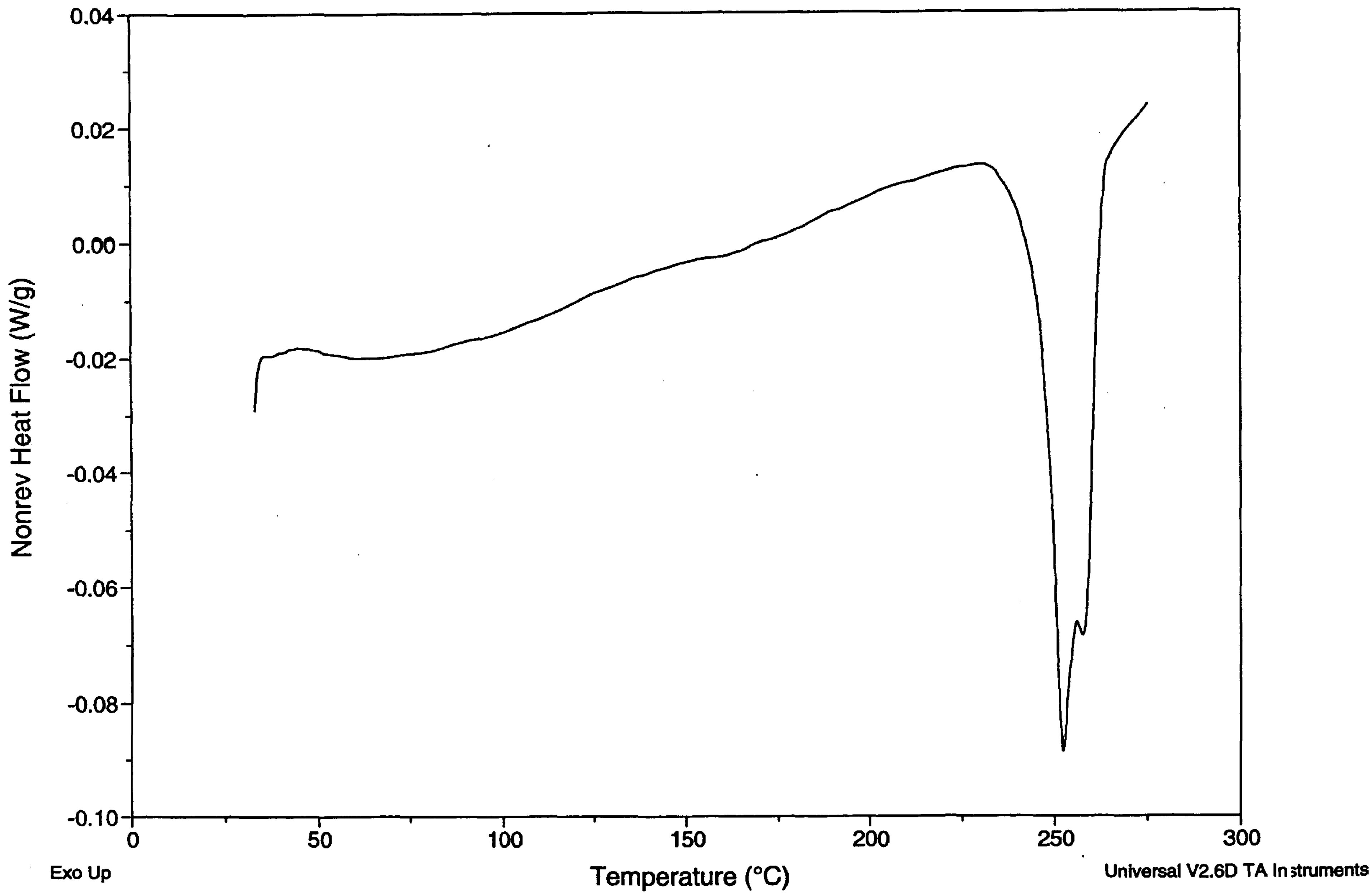
File: C:...\DSC\03614-103.095
Operator: WJM
Run Date: 17-Jul-01 13:54



Sample: Headliner - gray outer part
Size: 4.7300 mg
Method: MDSC Method
Comment: Ford Focus: Headliner - gray outer part

DSC

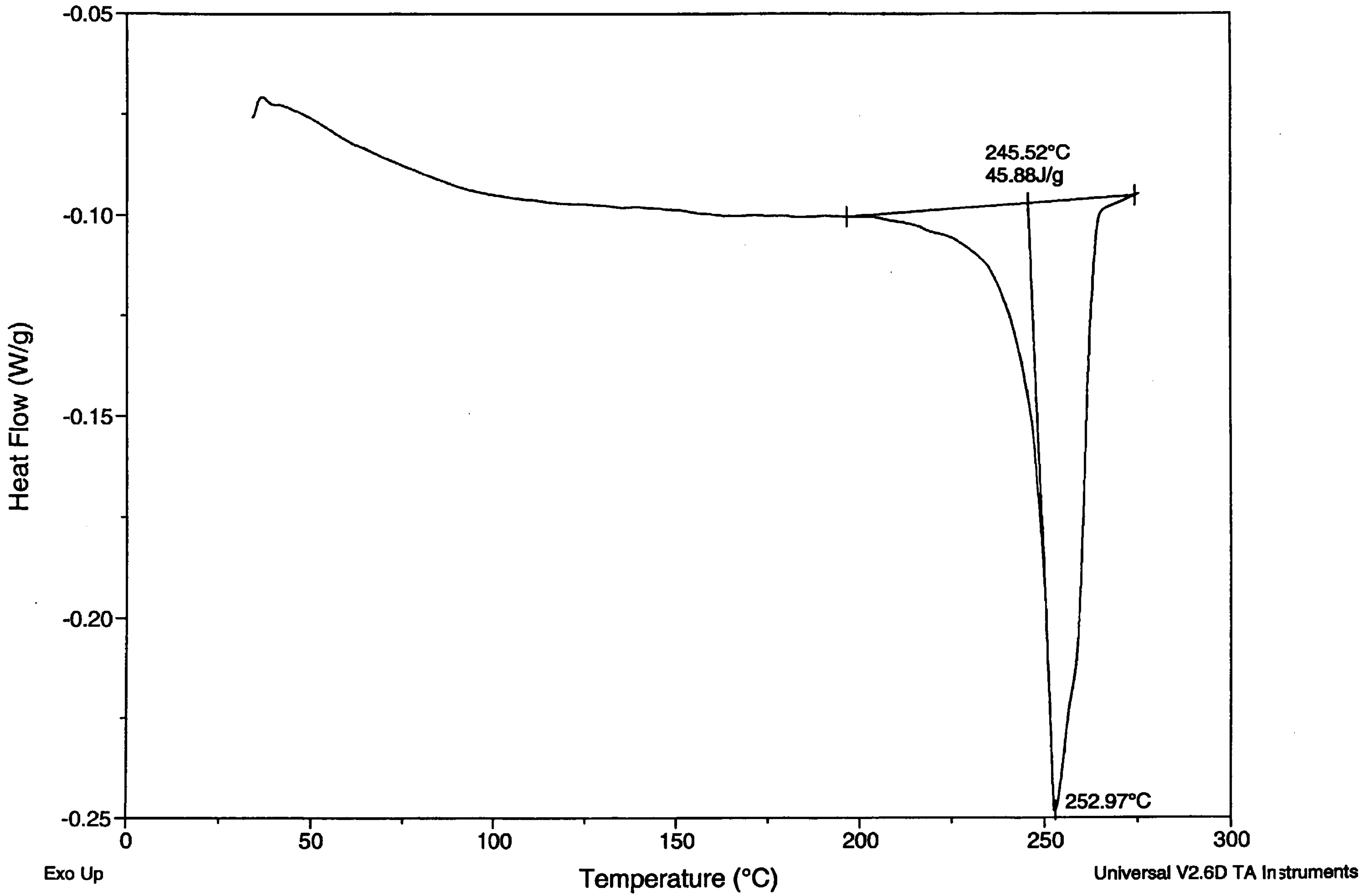
File: C:...\DSC\03614-103.095
Operator: WJM
Run Date: 17-Jul-01 13:54



Sample: Headliner - gray outer part #2
Size: 4.3600 mg
Method: MDSC Method
Comment: Ford Focus: Headliner - gray outer part

DSC

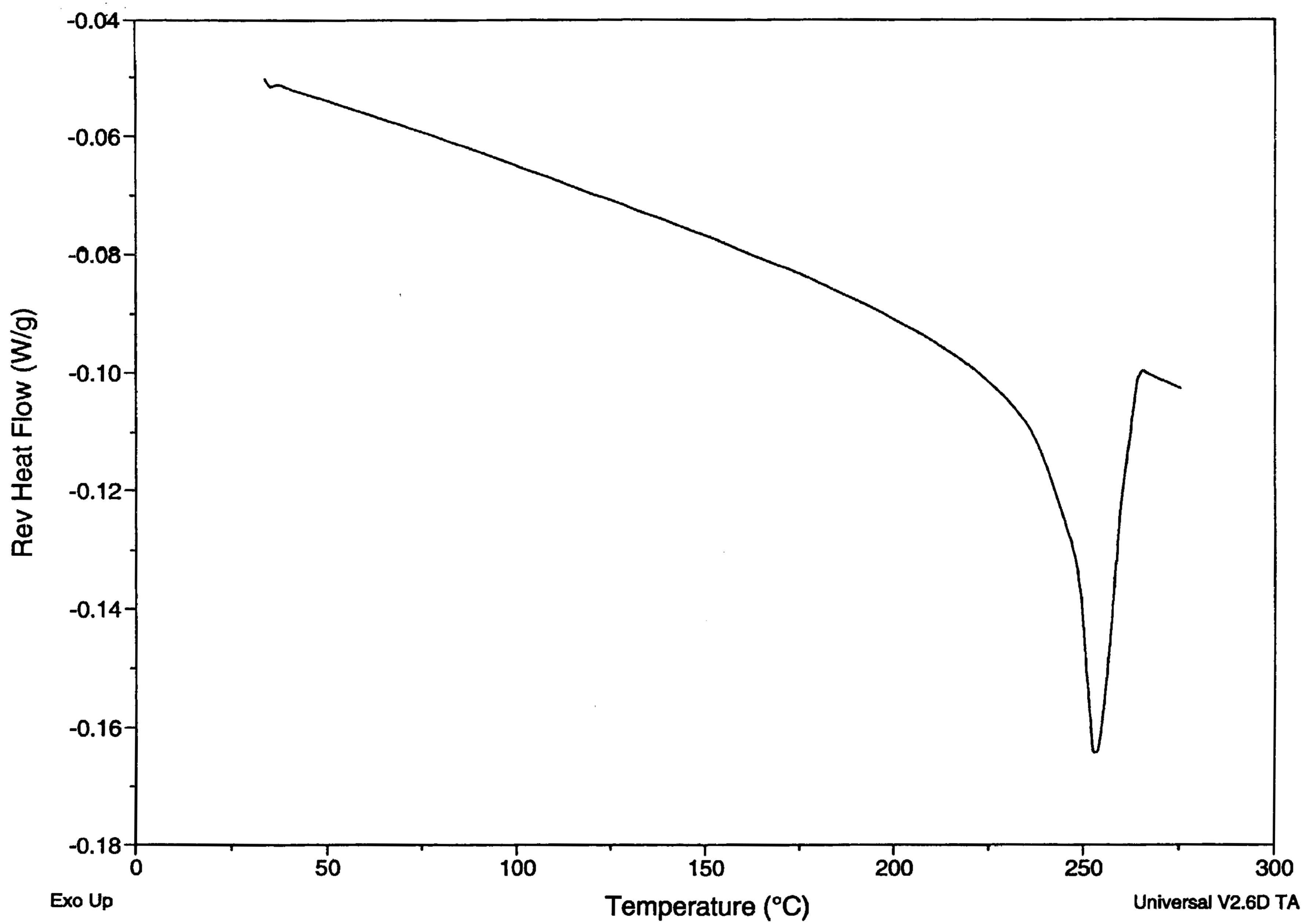
File: C:...\DSC\03614-103.096
Operator: WJM
Run Date: 17-Jul-01 16:31



Sample: Headliner - gray outer part #2
Size: 4.3600 mg
Method: MDSC Method
Comment: Ford Focus: Headliner - gray outer part

DSC

File: C:...\DSC\03614-103.096
Operator: WJM
Run Date: 17-Jul-01 16:31

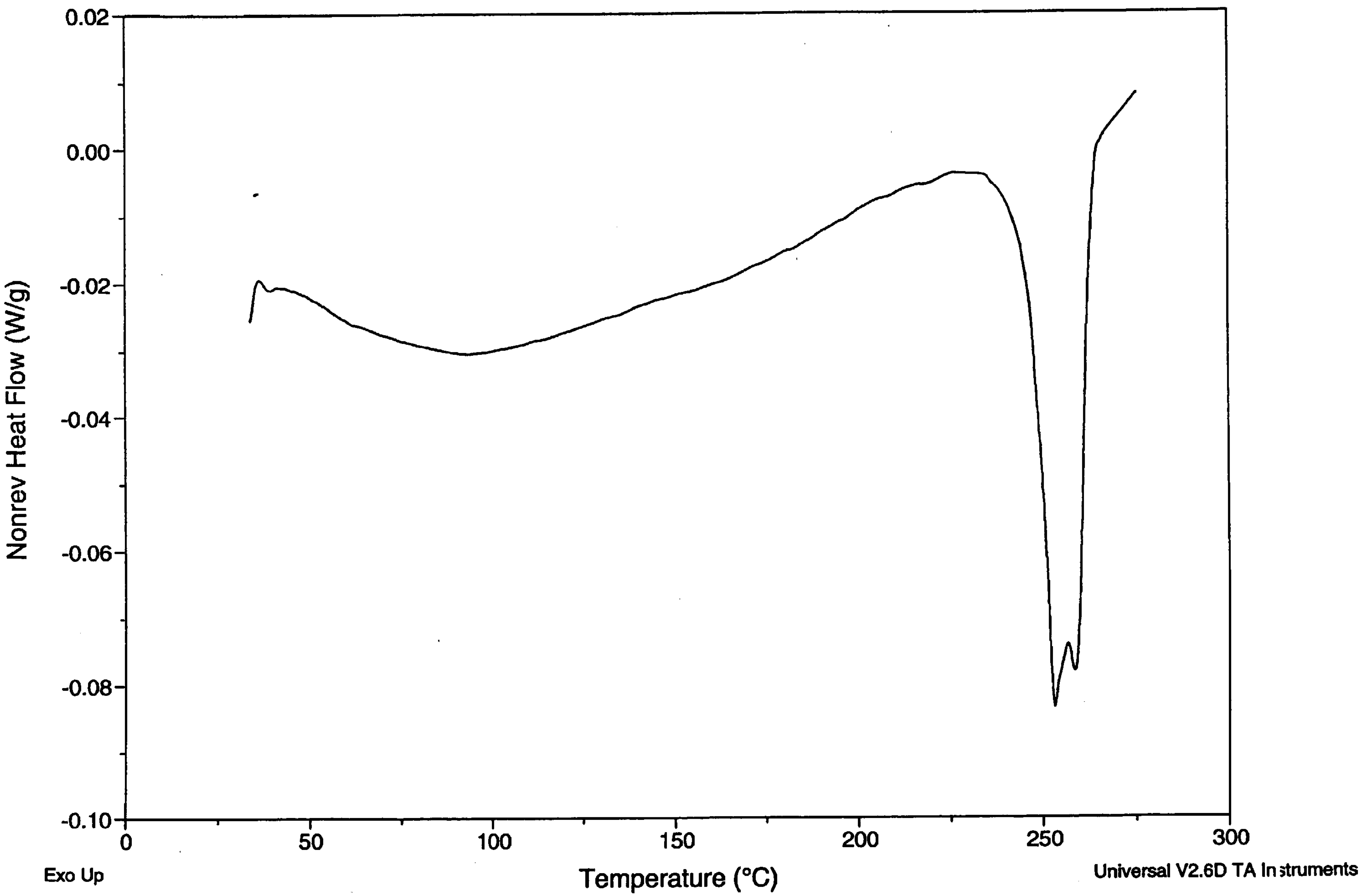


Universal V2.6D TA Instruments

Sample: Headliner - gray outer part #2
Size: 4.3600 mg
Method: MDSC Method
Comment: Ford Focus: Headliner - gray outer part

DSC

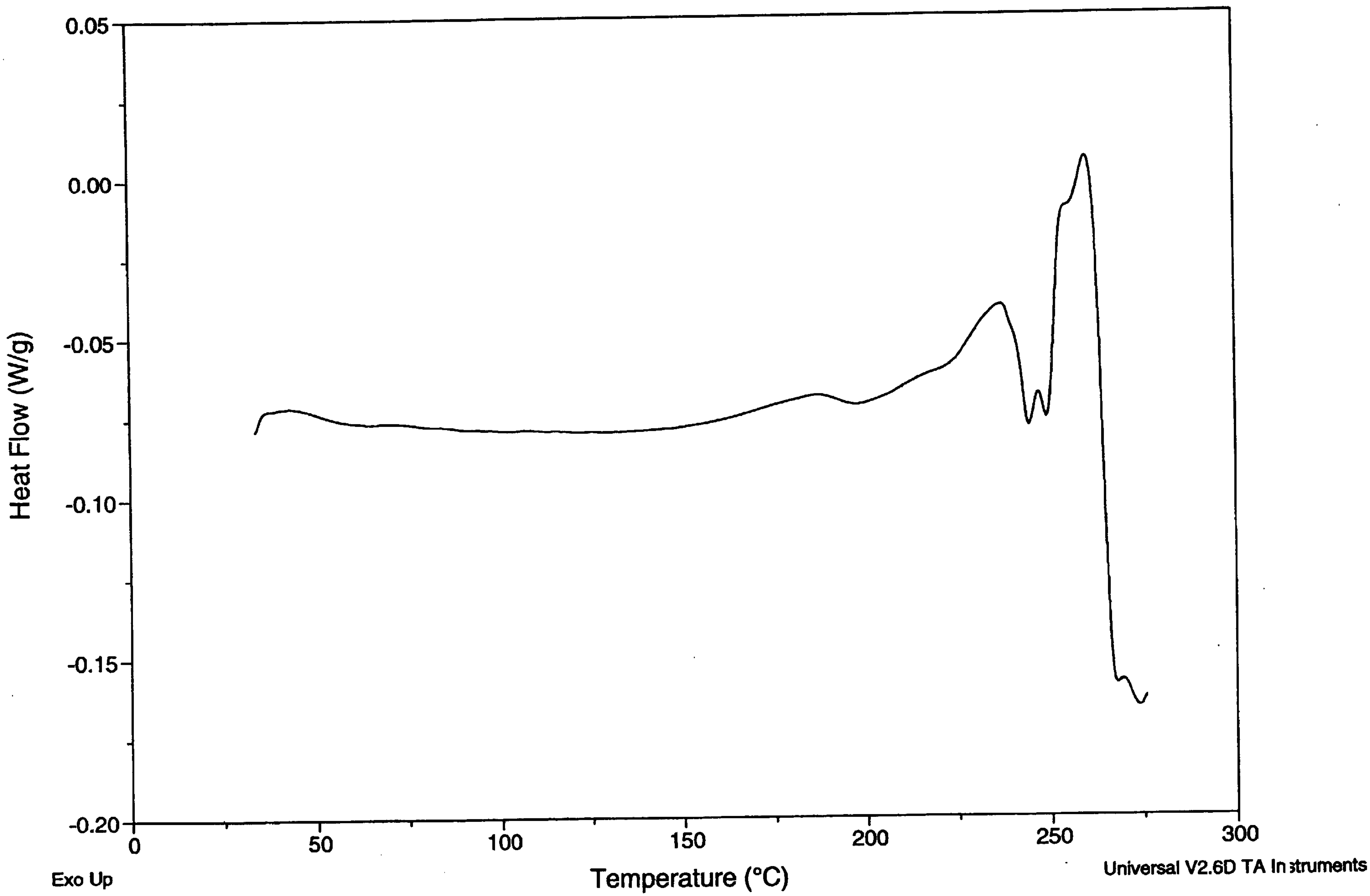
File: C:...\DSC\03614-103.096
Operator: WJM
Run Date: 17-Jul-01 16:31



Sample: Seatcover - covering
Size: 7.5600 mg
Method: MDSC Method
Comment: Ford Focus: Seatcover - covering

DSC

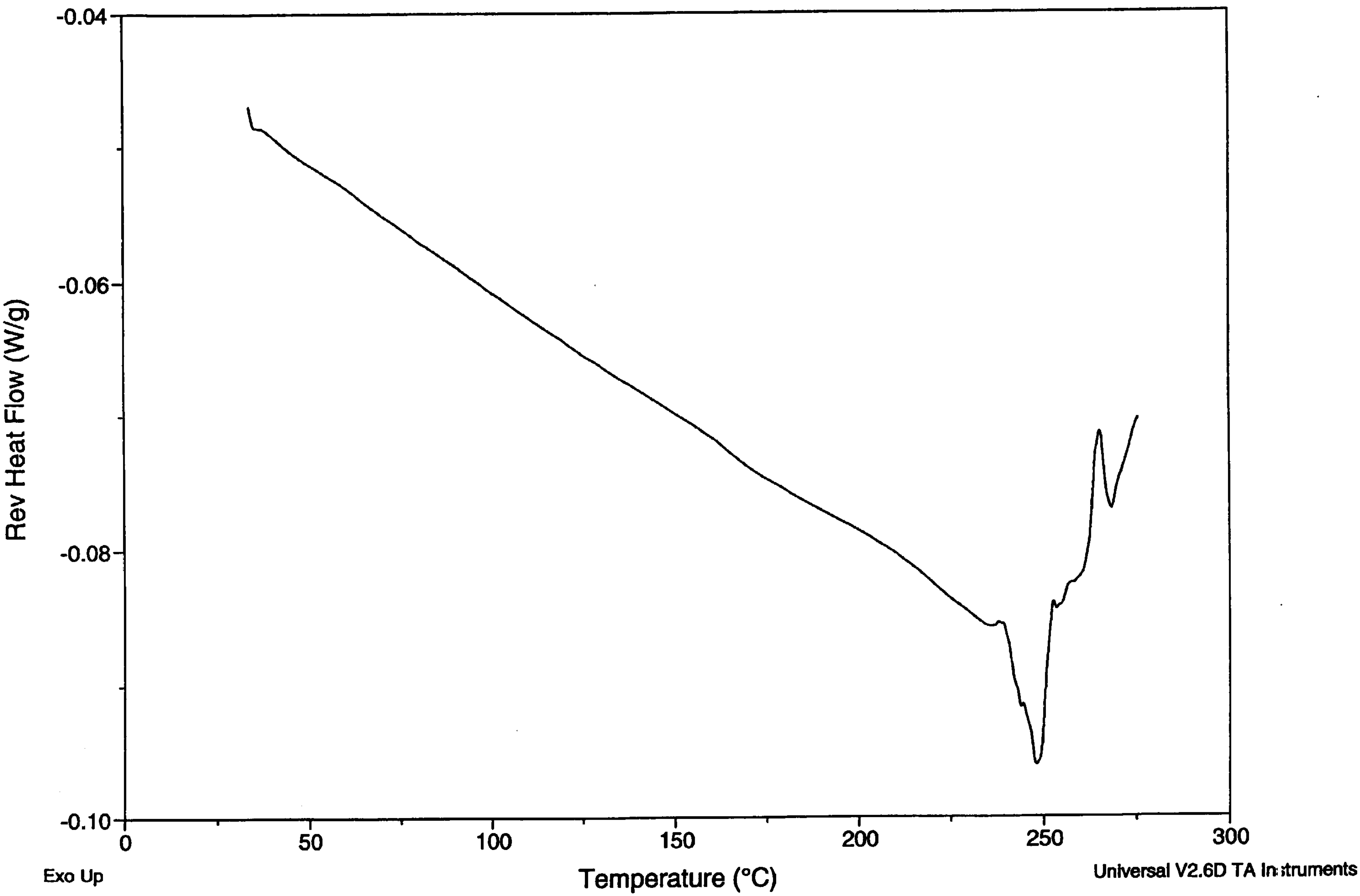
File: C:...\DSC\03614-103.097
Operator: WJM
Run Date: 18-Jul-01 08:36



Sample: Seatcover - covering
Size: 7.5600 mg
Method: MDSC Method
Comment: Ford Focus: Seatcover - covering

DSC

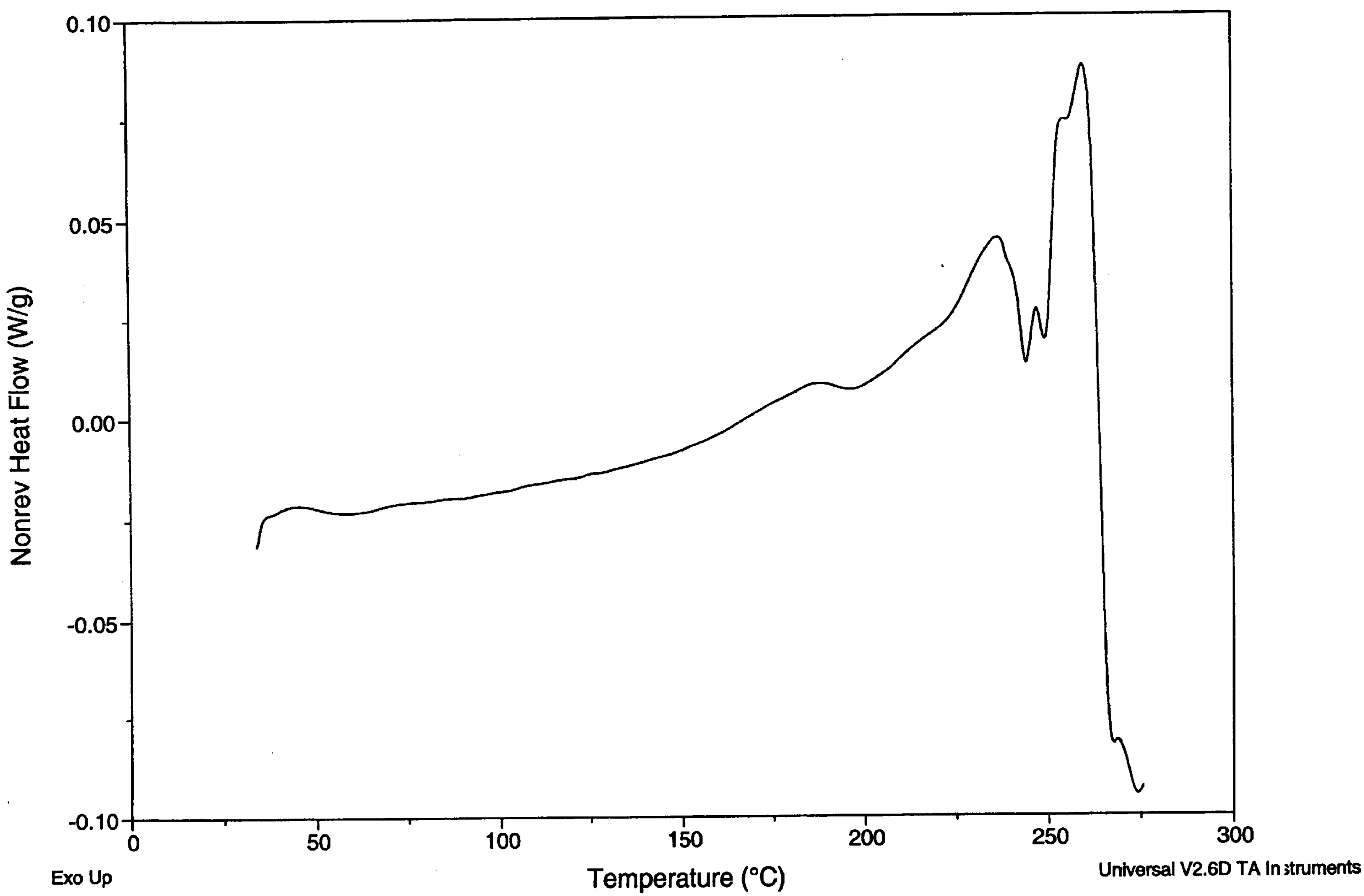
File: C:...\DSC\03614-103.097
Operator: WJM
Run Date: 18-Jul-01 08:36



Sample: Seatcover - covering
Size: 7.5600 mg
Method: MDSC Method
Comment: Ford Focus: Seatcover - covering

DSC

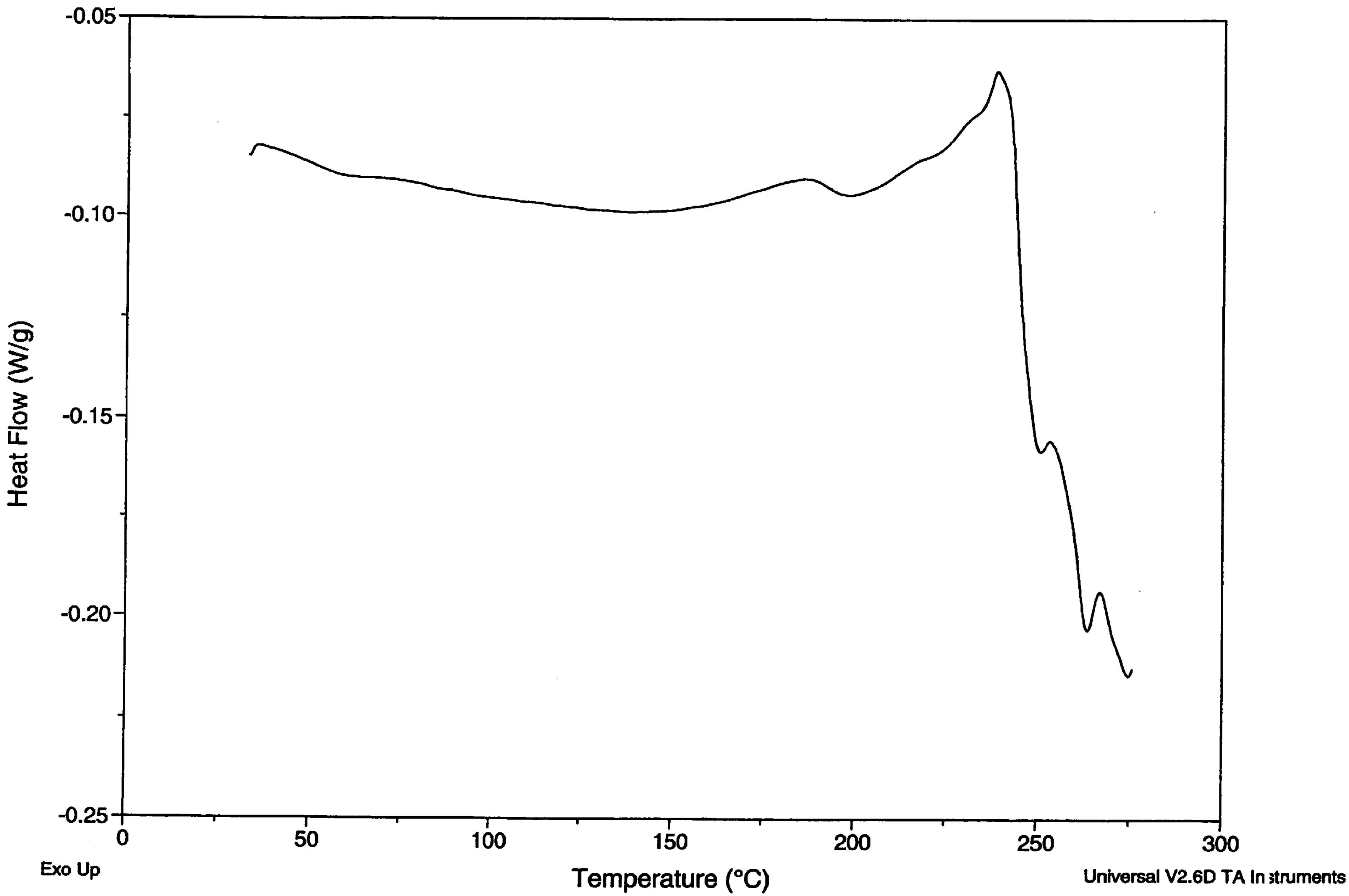
File: C:...\DSC\03614-103.097
Operator: WJM
Run Date: 18-Jul-01 08:36



Sample: Seatcover - covering #2
Size: 12.0000 mg
Method: MDSC Method
Comment: Ford Focus: Seatcover - covering

DSC

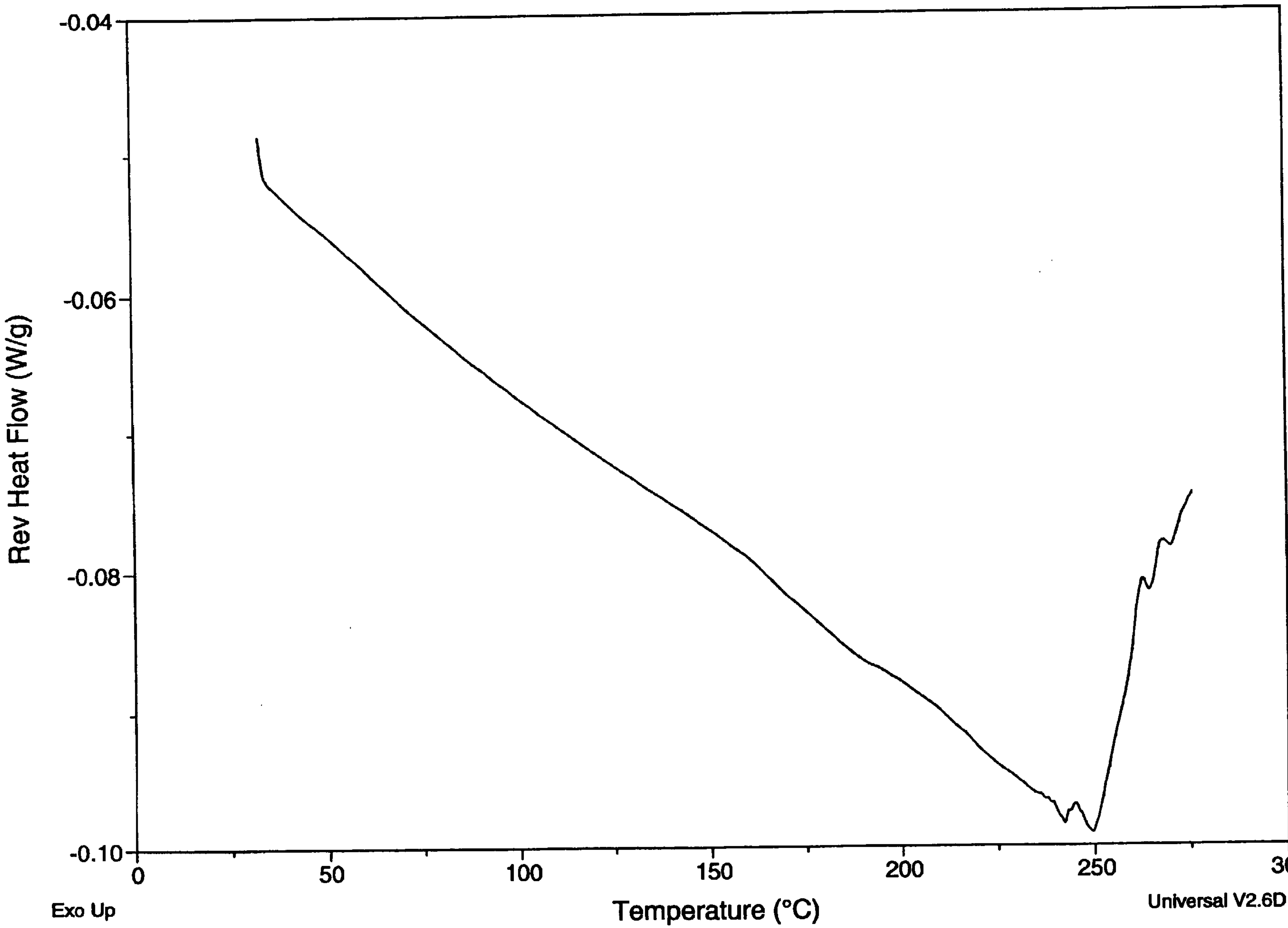
File: C:...\DSC\03614-103.098
Operator: WJM
Run Date: 18-Jul-01 10:57



Sample: Seatcover - covering #2
Size: 12.0000 mg
Method: MDSC Method
Comment: Ford Focus: Seatcover - covering

DSC

File: C:...\DSC\03614-103.098
Operator: WJM
Run Date: 18-Jul-01 10:57

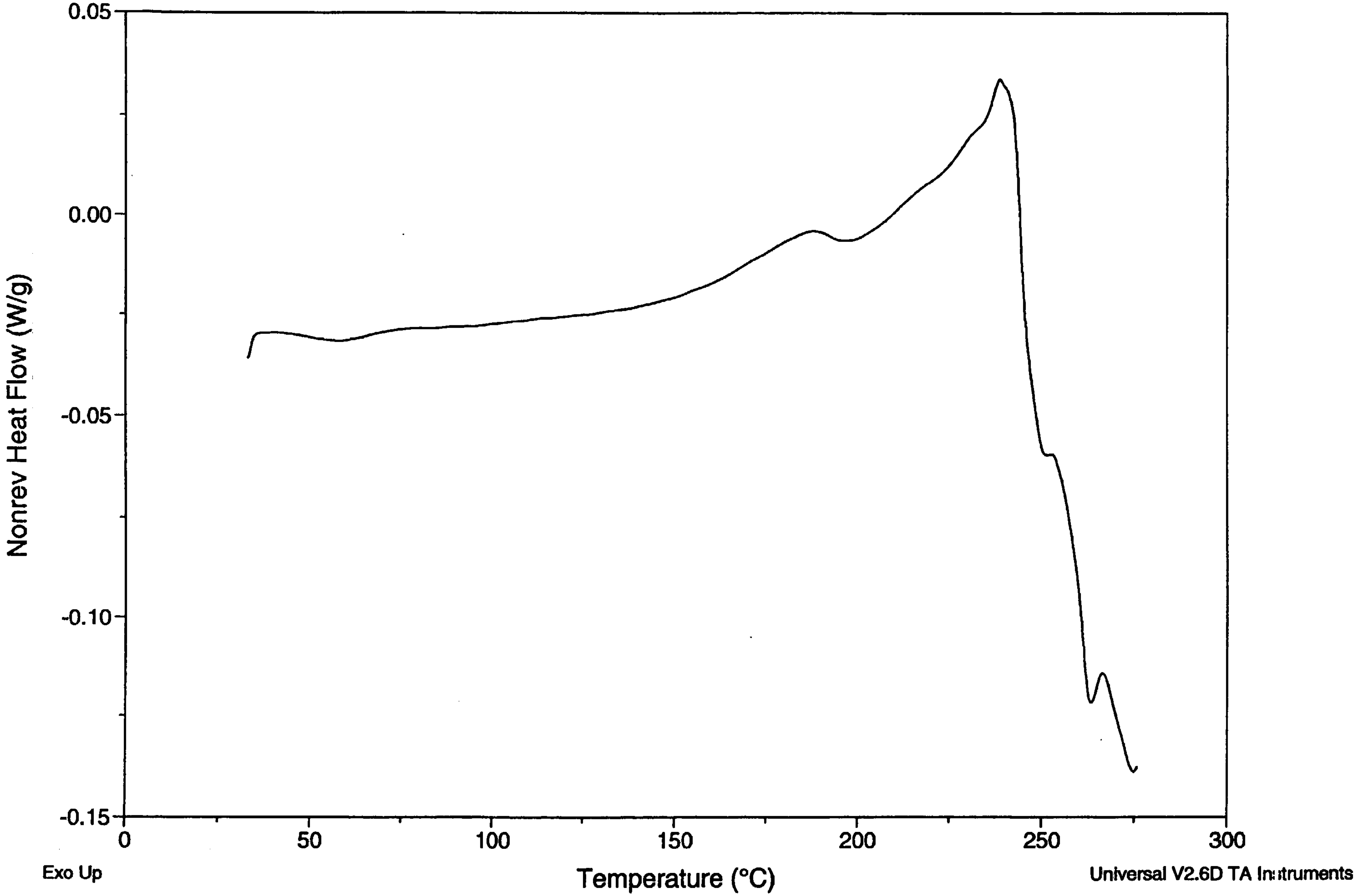


Universal V2.6D TA Instruments

Sample: Seatcover - covering #2
Size: 12.0000 mg
Method: MDSC Method
Comment: Ford Focus: Seatcover - covering

DSC

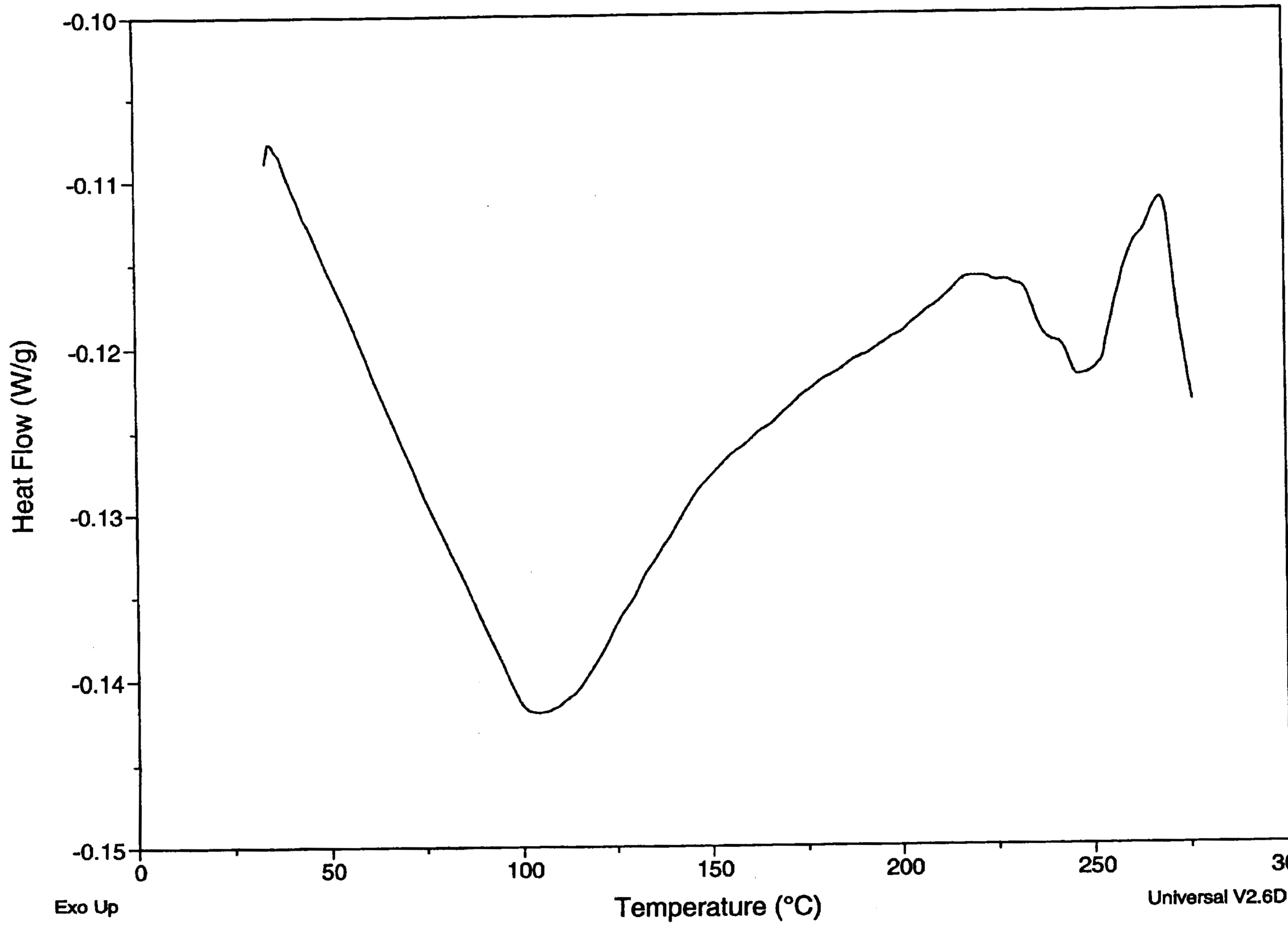
File: C:...\DSC\03614-103.098
Operator: WJM
Run Date: 18-Jul-01 10:57



Sample: Seatcover - Foam
Size: 5.2600 mg
Method: MDSC Method
Comment: Ford Focus: Seatcover - foam

DSC

File: C:...\DSC\03614-103.099
Operator: WJM
Run Date: 18-Jul-01 13:02

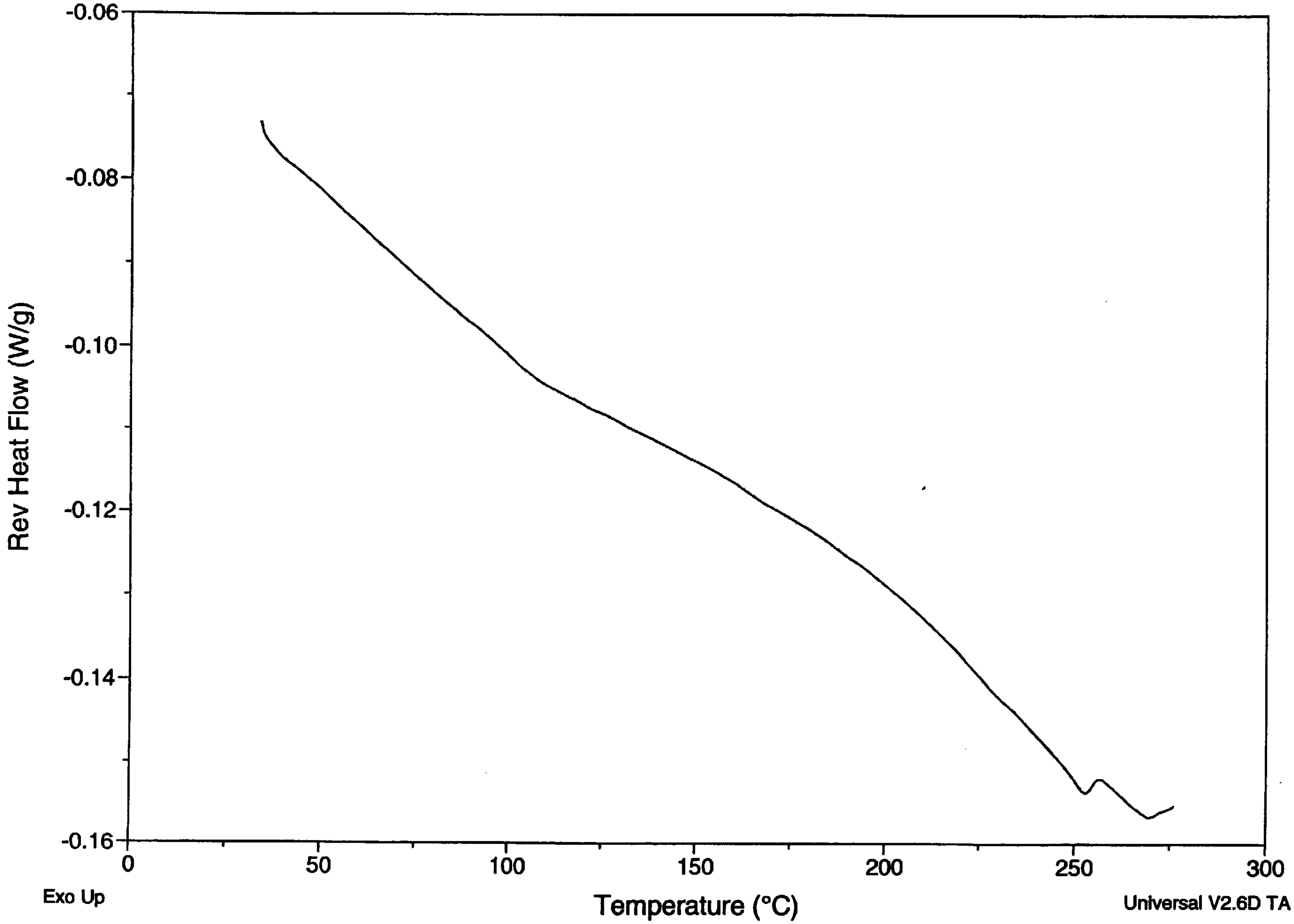


Universal V2.6D TA Ir struments

Sample: Seatcover - Foam
Size: 5.2600 mg
Method: MDSC Method
Comment: Ford Focus: Seatcover - foam

DSC

File: C:...\DSC\03614-103.099
Operator: WJM
Run Date: 18-Jul-01 13:02

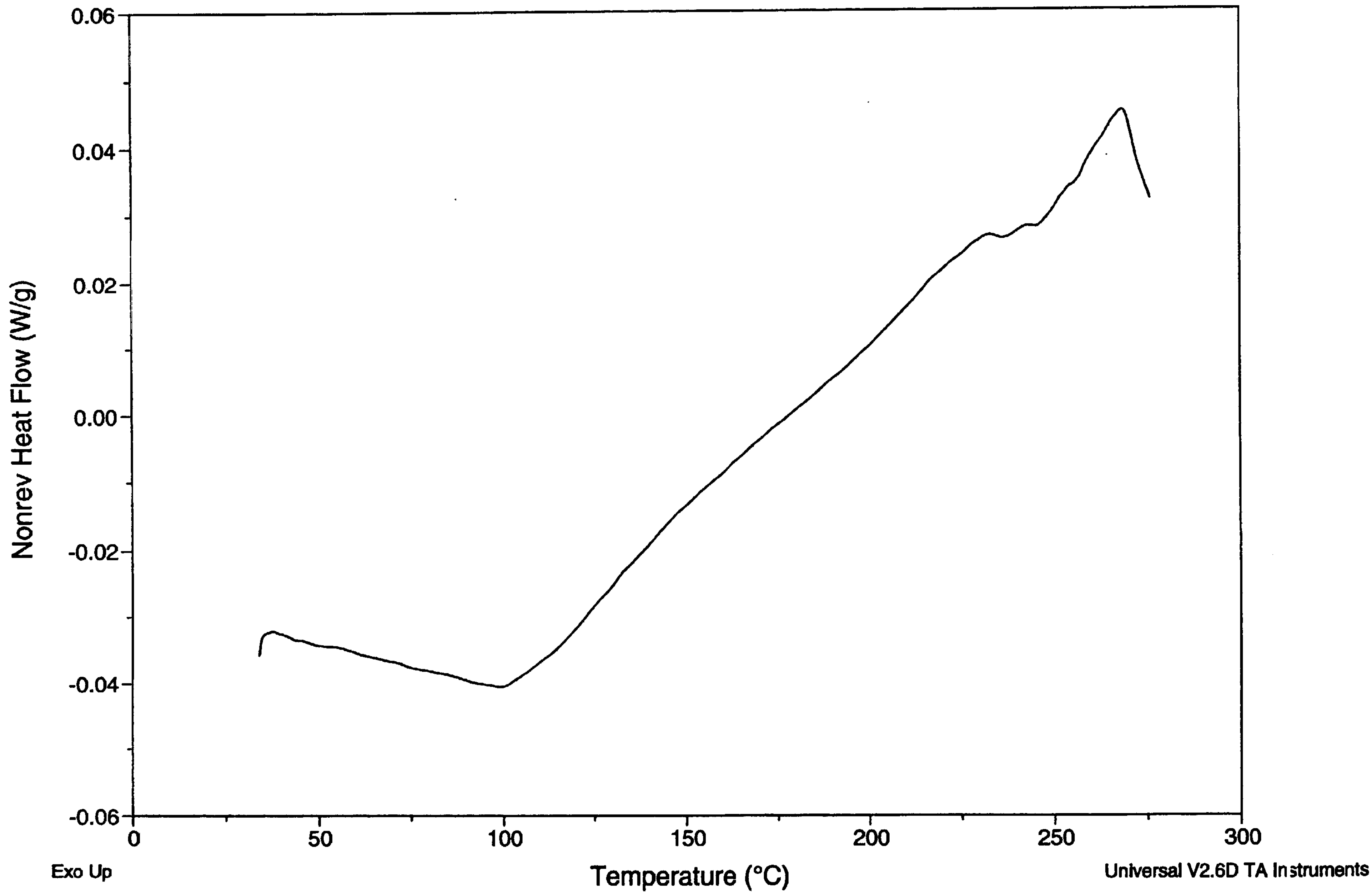


Universal V2.6D TA Instruments

Sample: Seatcover - Foam
Size: 5.2600 mg
Method: MDSC Method
Comment: Ford Focus: Seatcover - foam

DSC

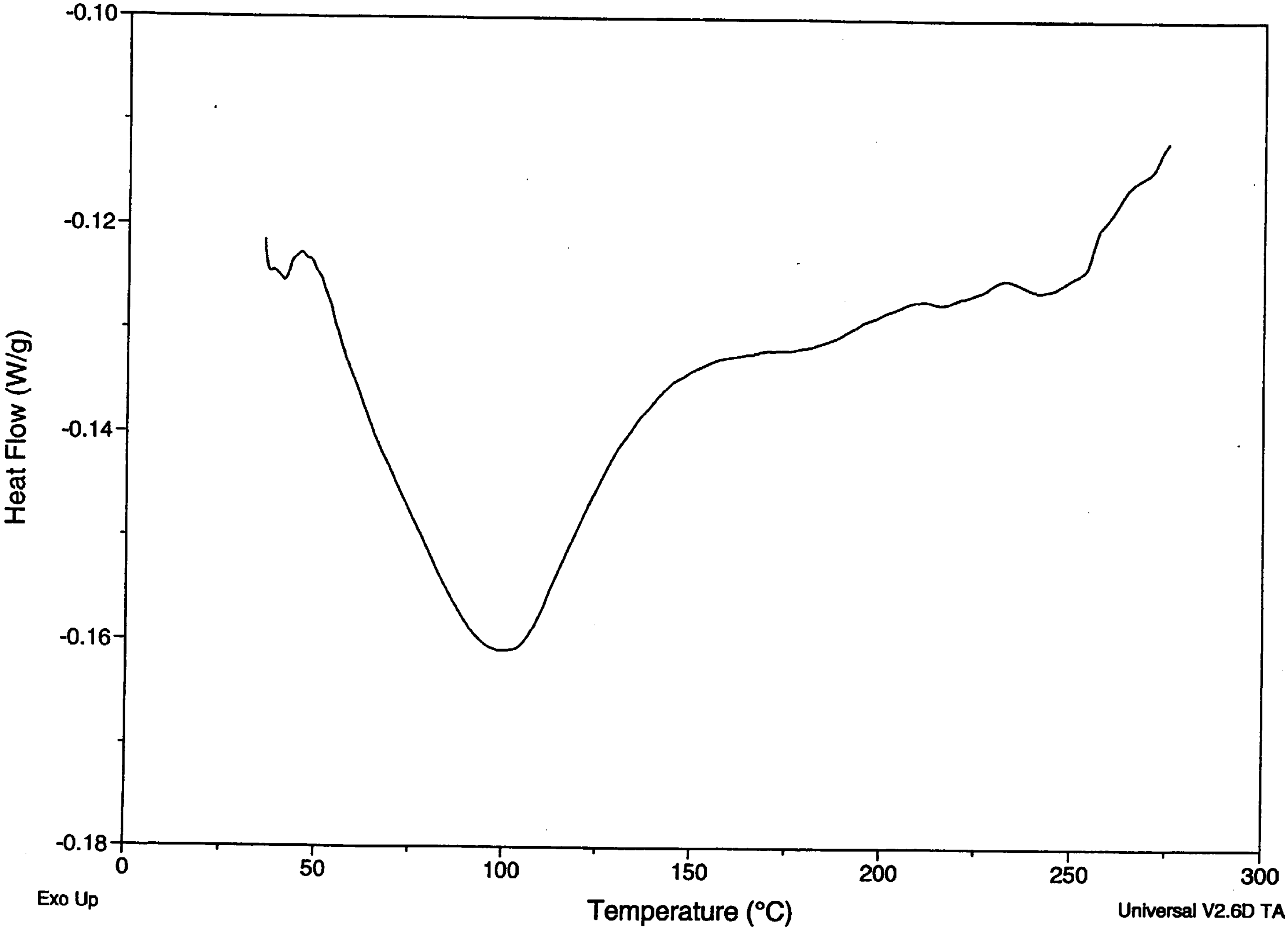
File: C:...\DSC\03614-103.099
Operator: WJM
Run Date: 18-Jul-01 13:02



Sample: Seatcover - Foam run 2
Size: 5.1300 mg
Method: MDSC Method
Comment: Ford Focus: Seatcover - foam

DSC

File: C:...\DSC\03614-103.100
Operator: WJM
Run Date: 18-Jul-01 15:44

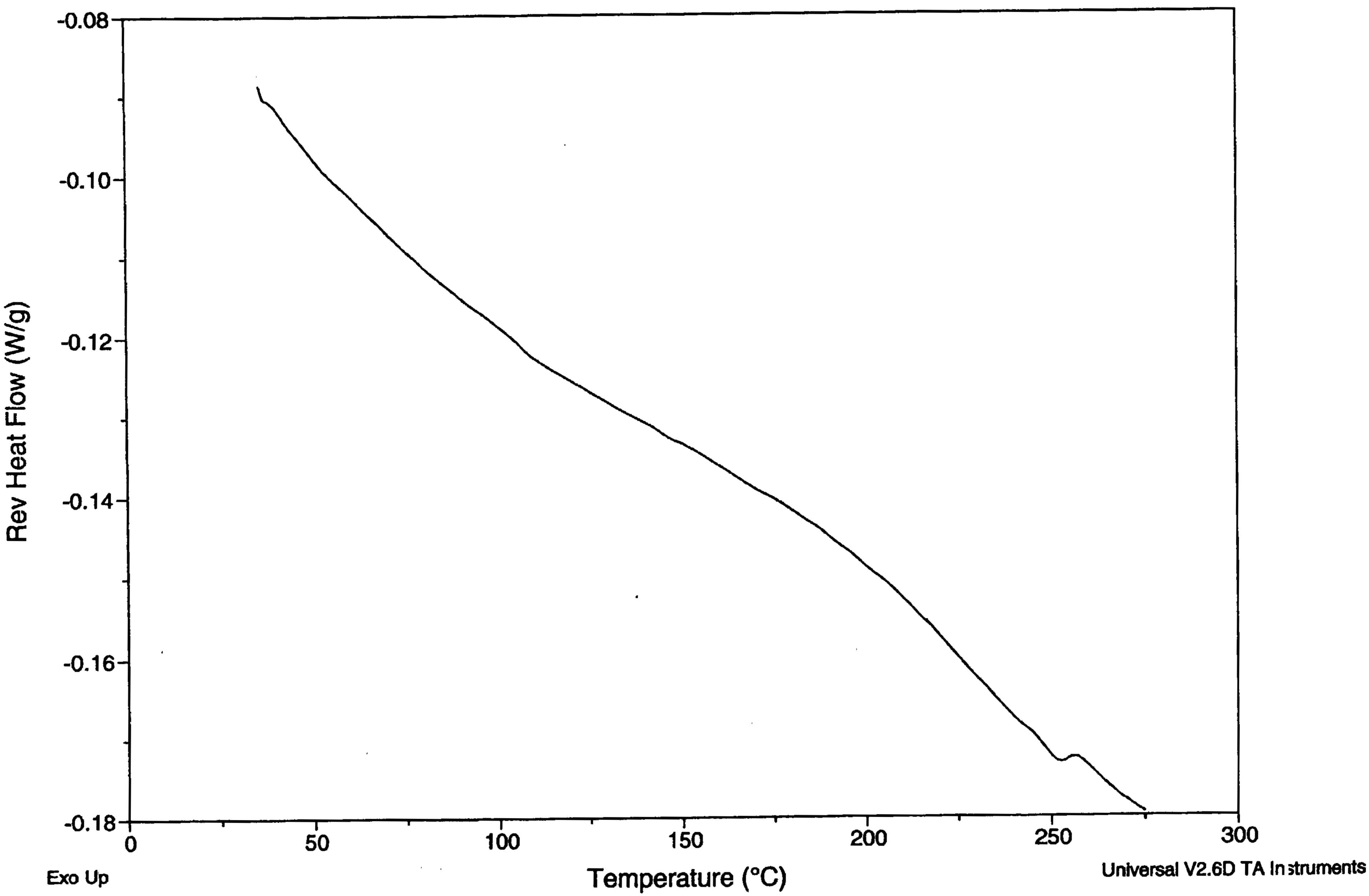


Universal V2.6D TA Instruments

Sample: Seatcover - Foam run 2
Size: 5.1300 mg
Method: MDSC Method
Comment: Ford Focus: Seatcover - foam

DSC

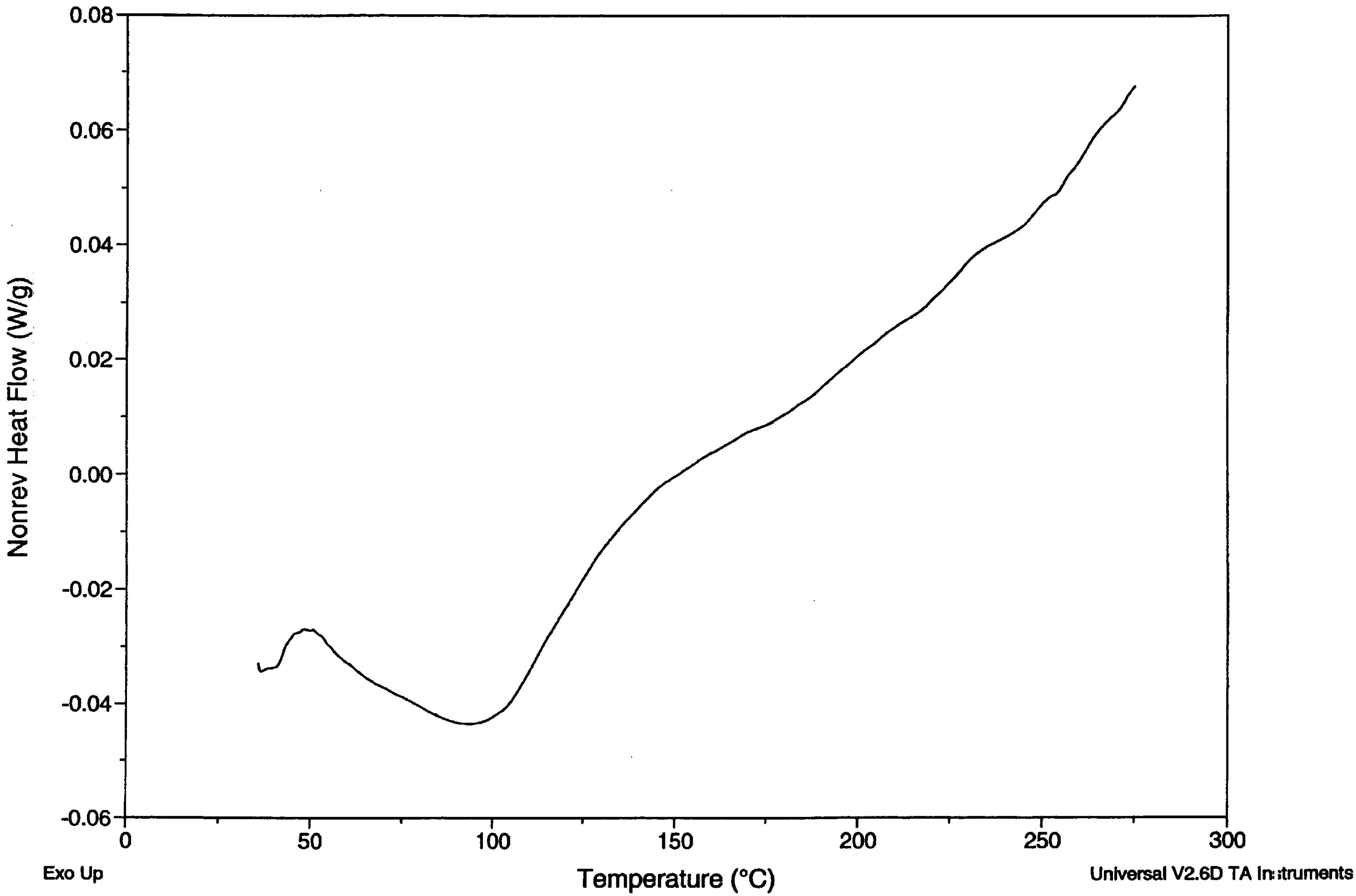
File: C:...\DSC\03614-103.100
Operator: WJM
Run Date: 18-Jul-01 15:44



Sample: Seatcover - Foam run 2
Size: 5.1300 mg
Method: MDSC Method
Comment: Ford Focus: Seatcover - foam

DSC

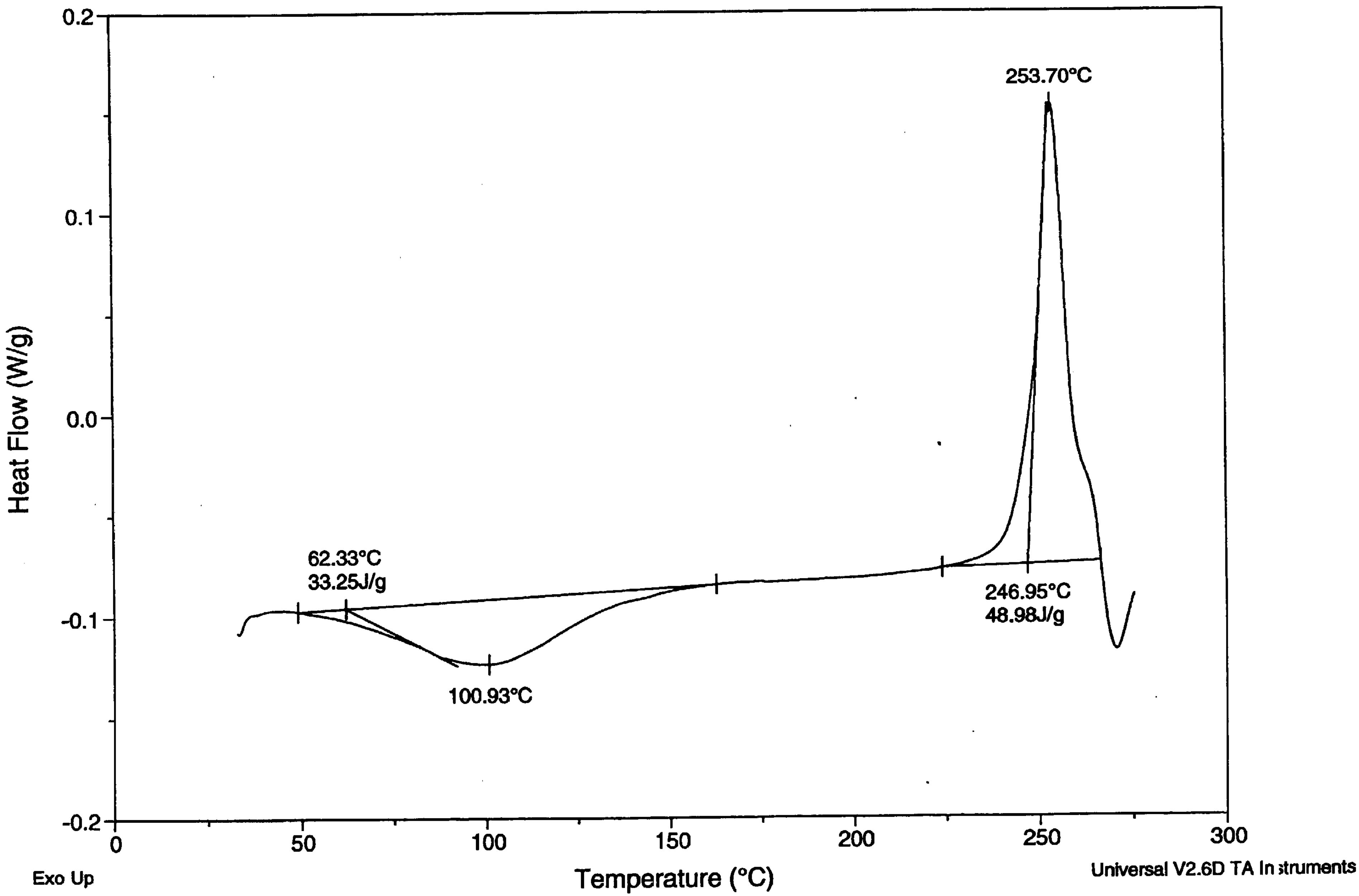
File: C:...\DSC\03614-103.100
Operator: WJM
Run Date: 18-Jul-01 15:44



Sample: Seatcover- batting
Size: 8.9200 mg
Method: MDSC Method
Comment: Ford Focus: Seatcover - batting

DSC

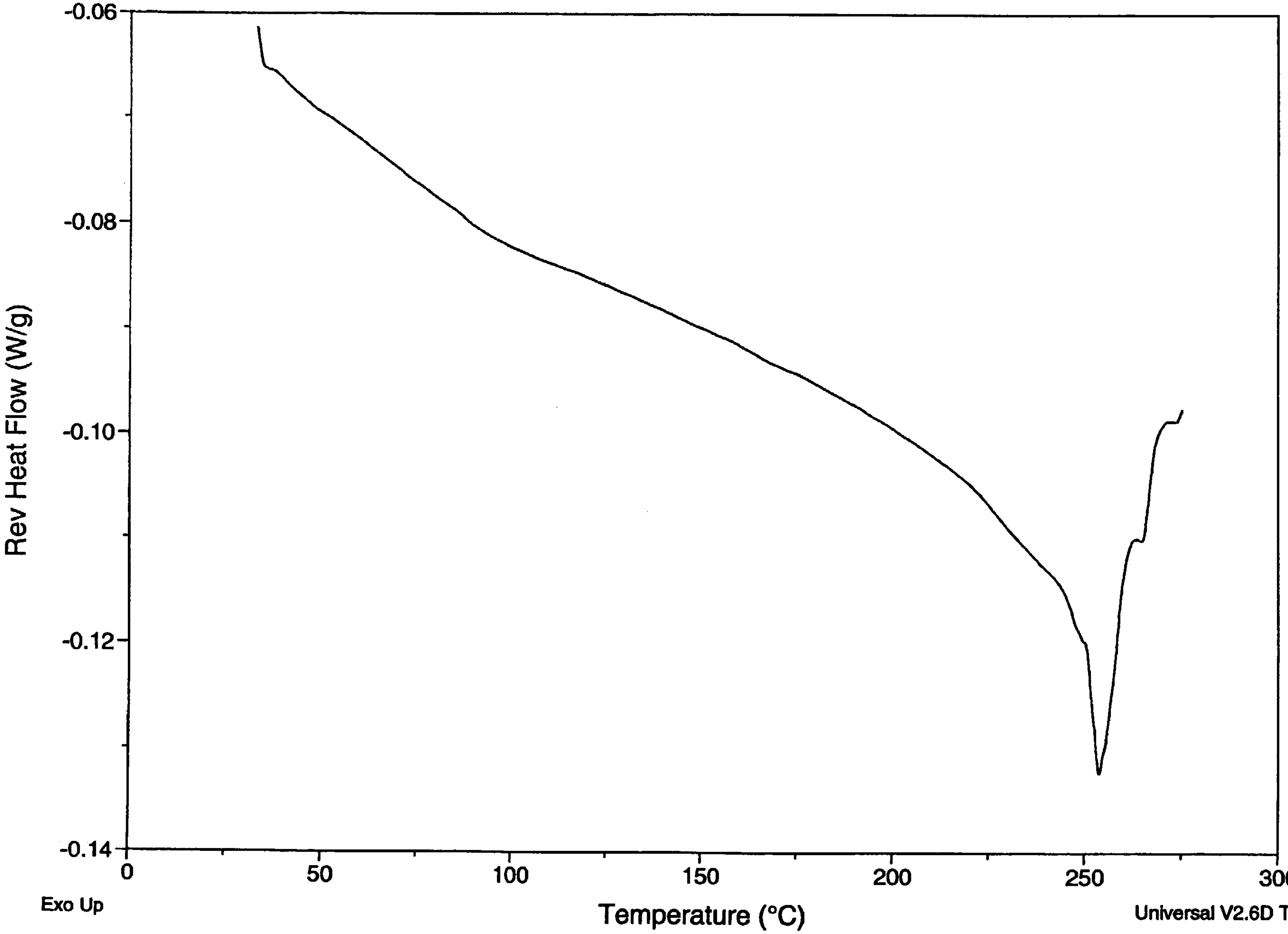
File: C:...\DSC\03614-103.101
Operator: WJM
Run Date: 19-Jul-01 08:43



Sample: Seatcover- batting
Size: 8.9200 mg
Method: MDSC Method
Comment: Ford Focus: Seatcover - batting

DSC

File: C:...\DSC\03614-103.101
Operator: WJM
Run Date: 19-Jul-01 08:43

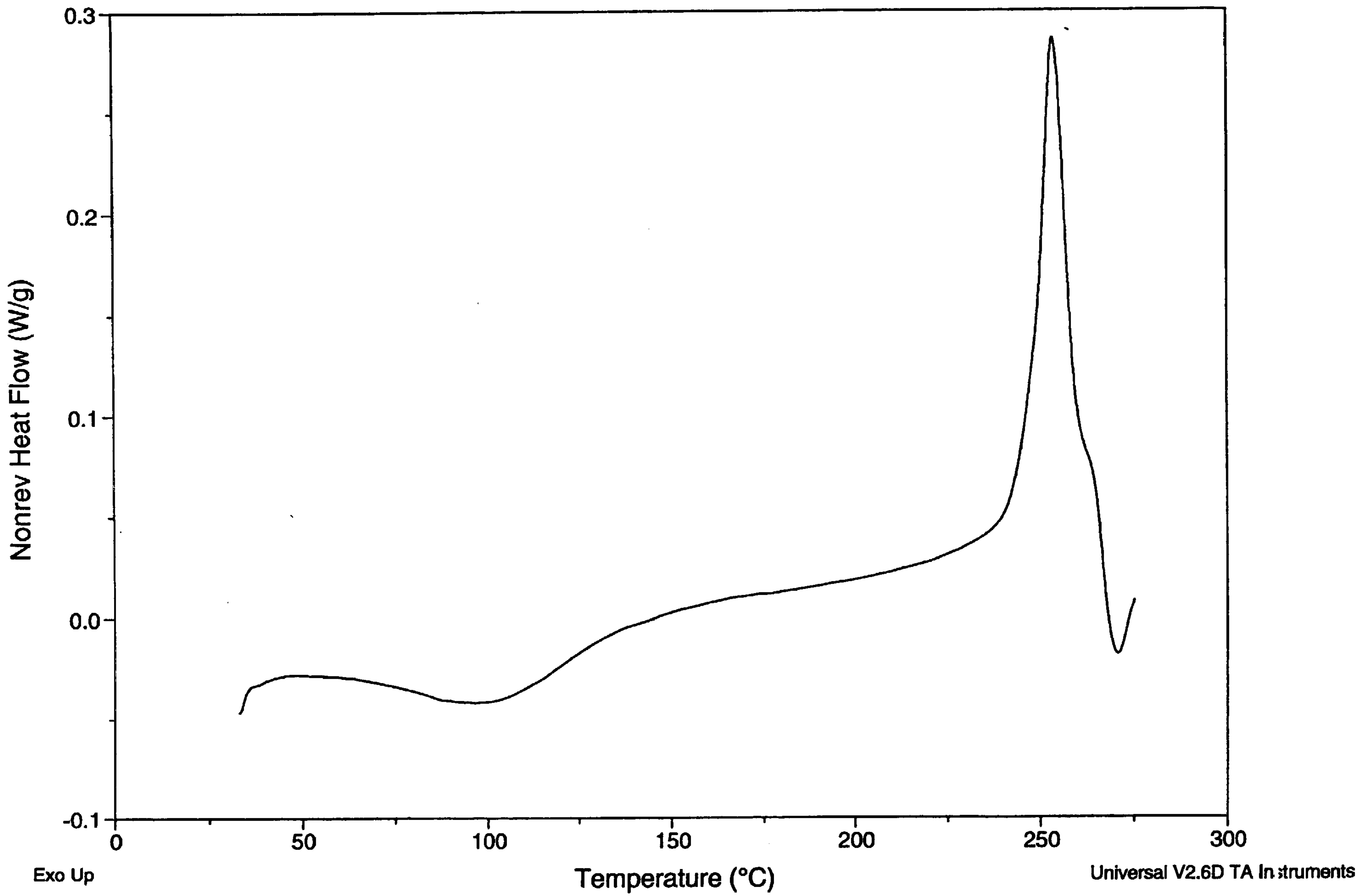


Universal V2.6D TA Instruments

Sample: Seatcover- batting
Size: 8.9200 mg
Method: MDSC Method
Comment: Ford Focus: Seatcover - batting

DSC

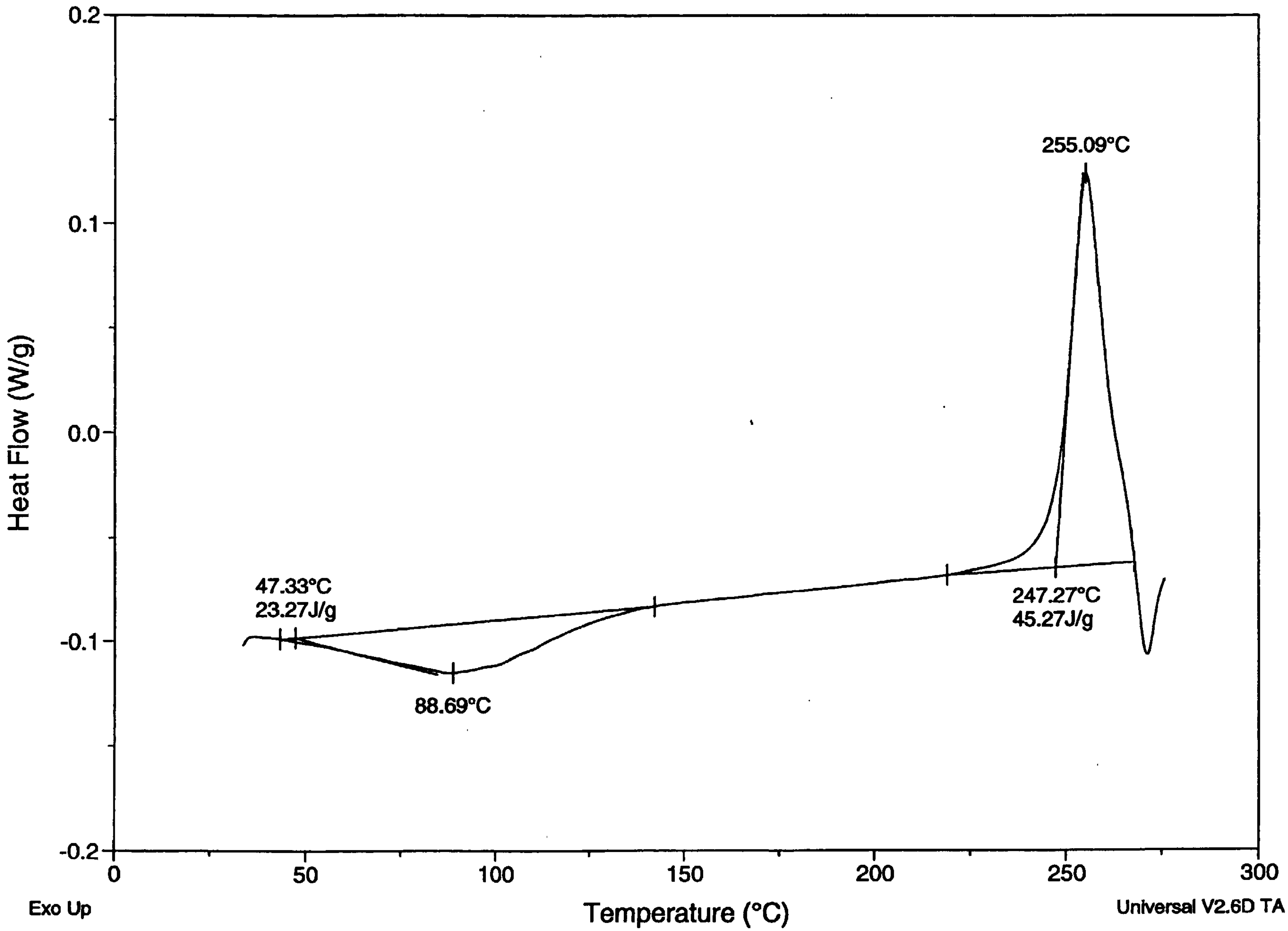
File: C:...\DSC\03614-103.101
Operator: WJM
Run Date: 19-Jul-01 08:43



Sample: Seatcover- batting run 2
Size: 4.6400 mg
Method: MDSC Method
Comment: Ford Focus: Seatcover - batting

DSC

File: C:...\DSC\03614-103.102
Operator: WJM
Run Date: 19-Jul-01 11:09



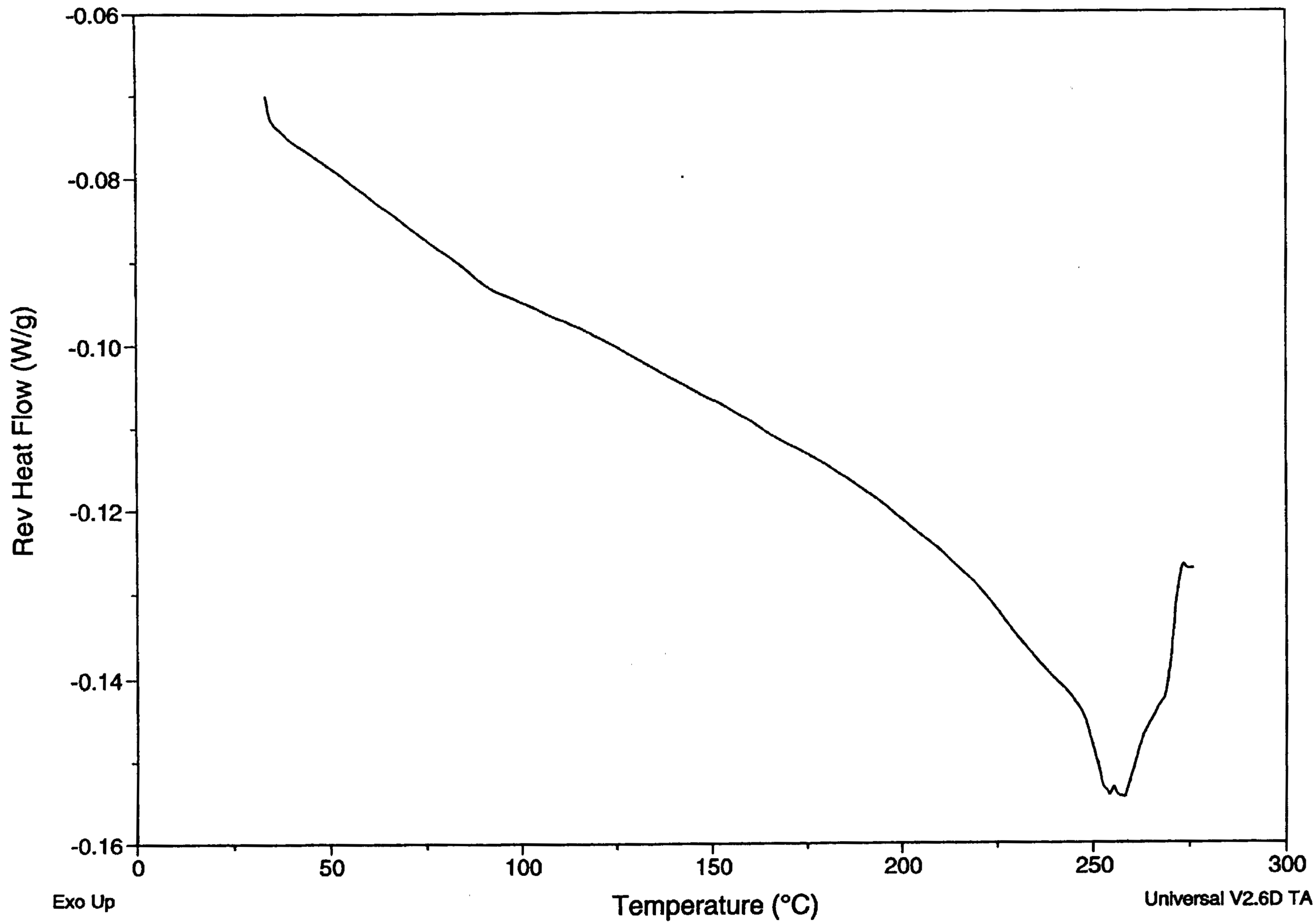
Exo Up

Universal V2.6D TA Instruments

Sample: Seatcover- batting run 2
Size: 4.6400 mg
Method: MDSC Method
Comment: Ford Focus: Seatcover - batting

DSC

File: C:...\DSC\03614-103.102
Operator: WJM
Run Date: 19-Jul-01 11:09

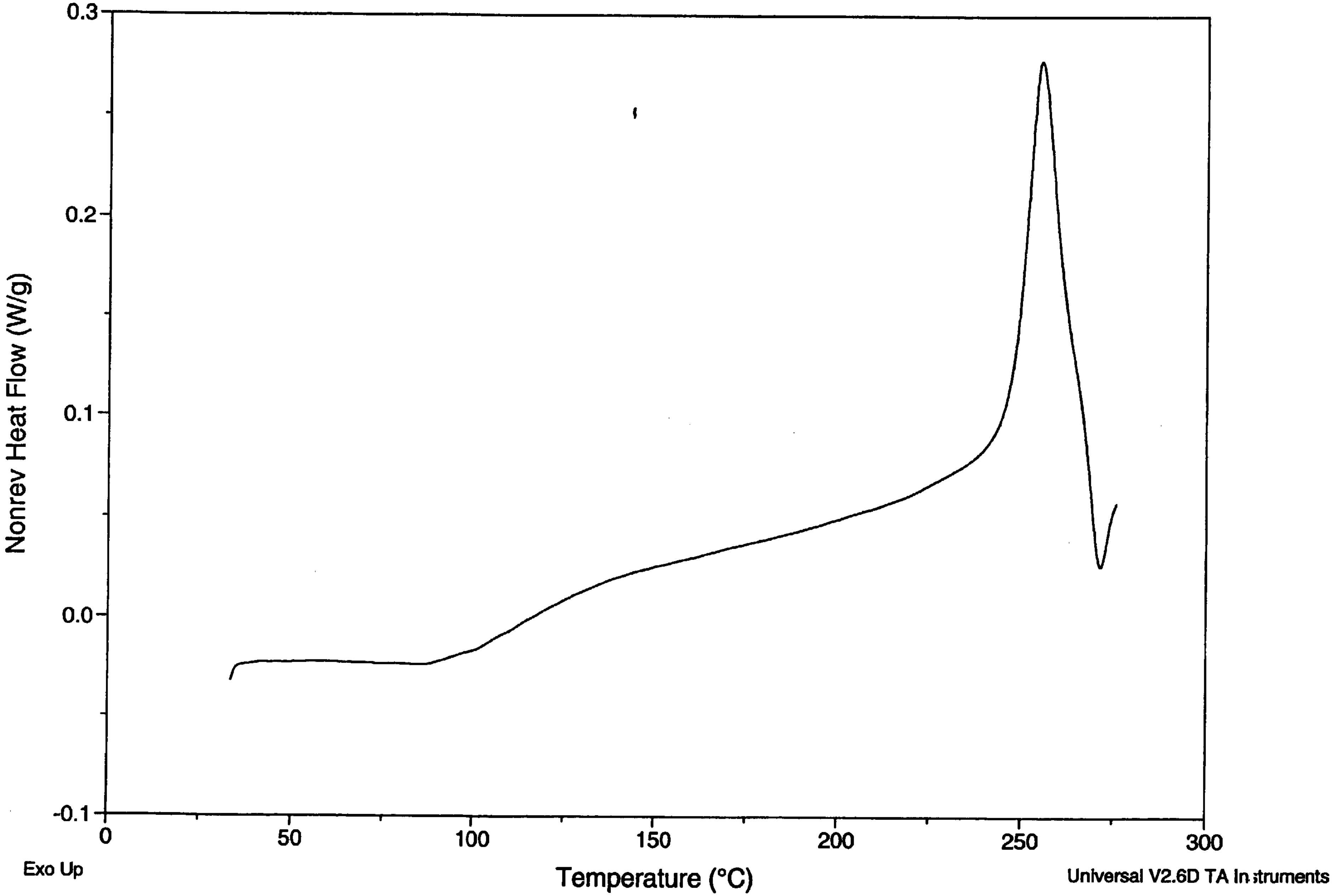


Universal V2.6D TA Instruments

Sample: Seatcover- batting run 2
Size: 4.6400 mg
Method: MDSC Method
Comment: Ford Focus: Seatcover - batting

DSC

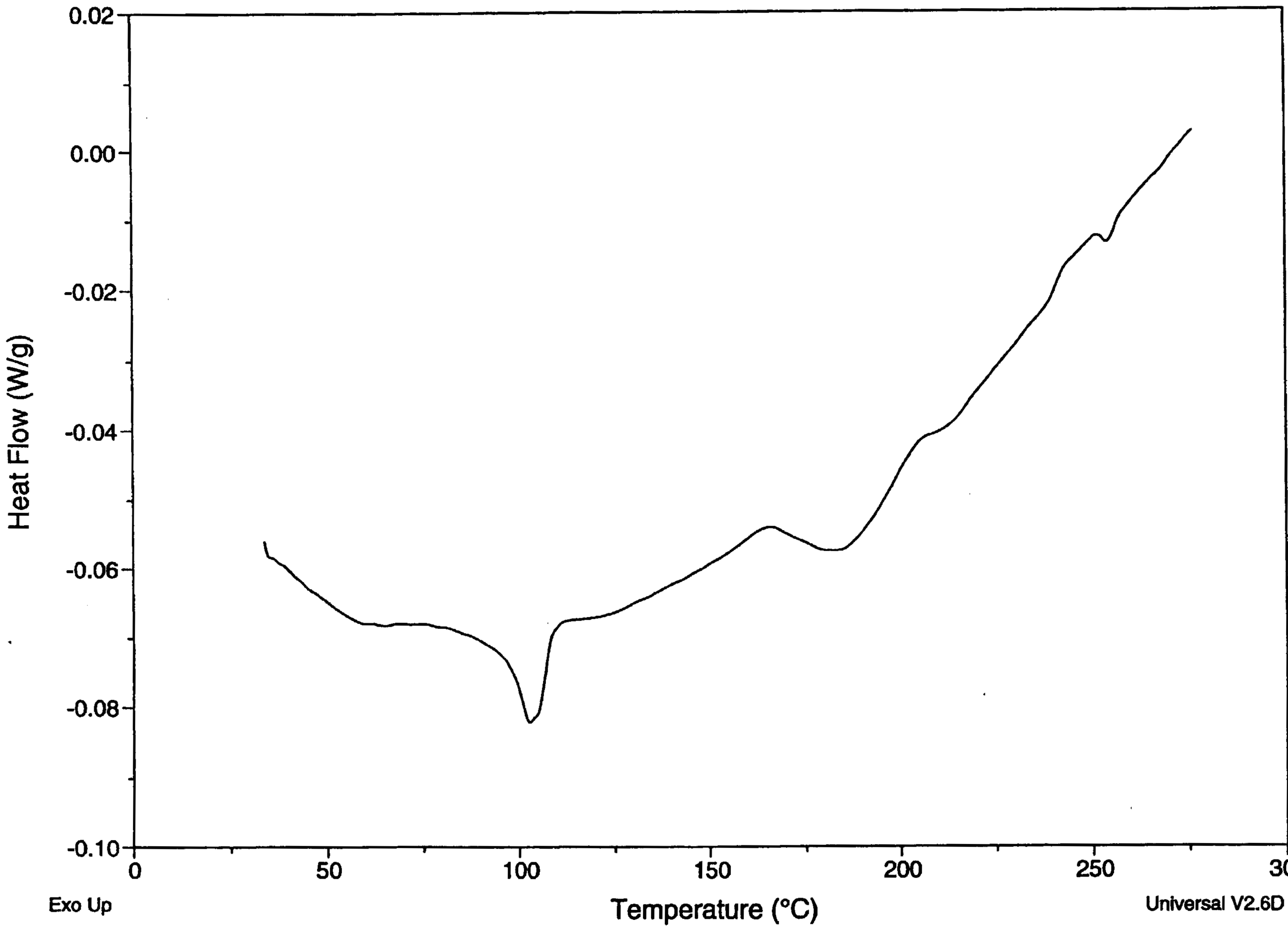
File: C:...\DSC\03614-103.102
Operator: WJM
Run Date: 19-Jul-01 11:09



Sample: Headliner - foam w/brown back'g
Size: 4.4300 mg
Method: MDSC Method
Comment: Ford Focus: Headliner - foam w/brown backing

DSC

File: C:...\DSC\03614-103.103
Operator: WJM
Run Date: 19-Jul-01 13:11



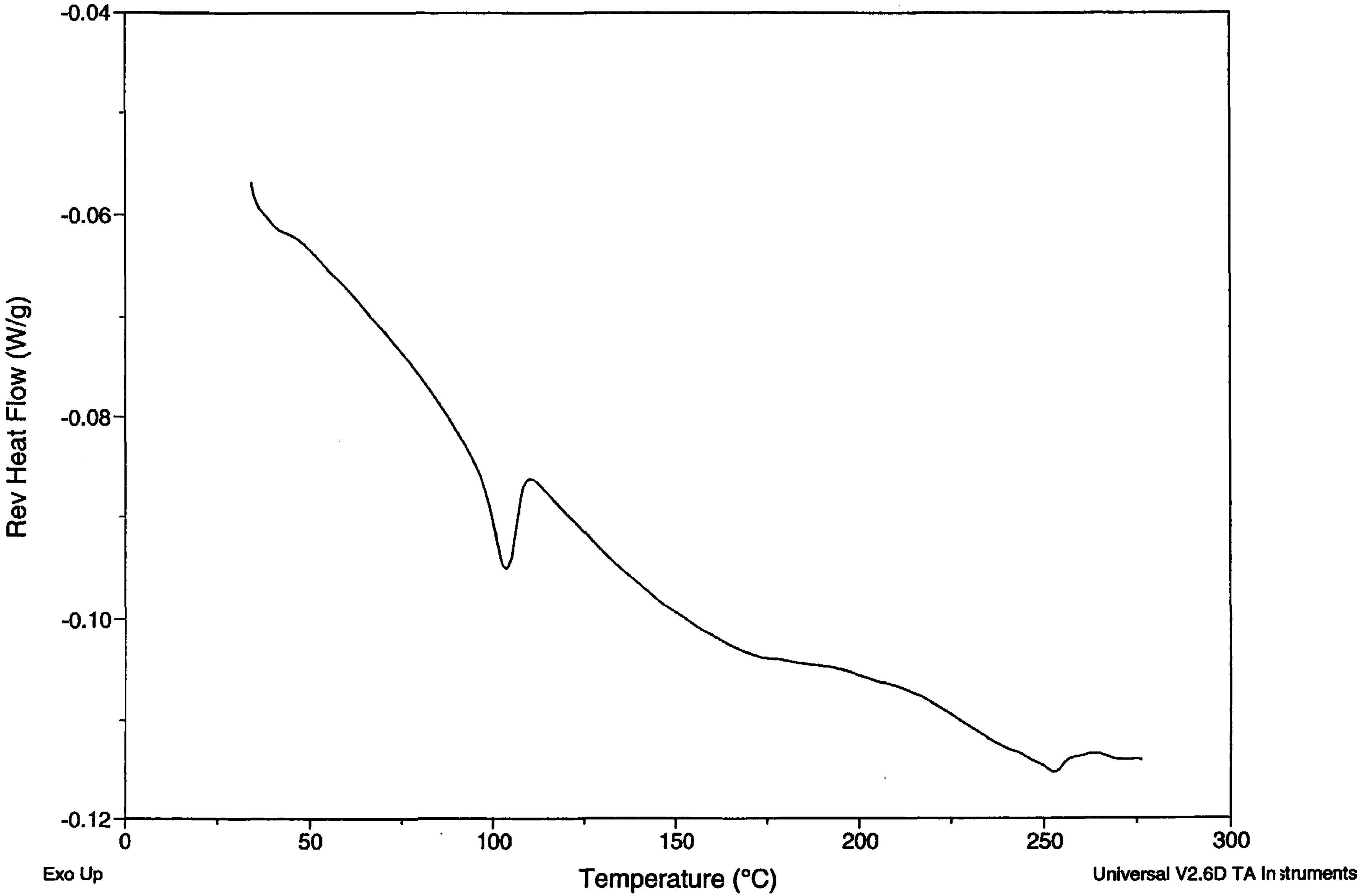
Exo Up

Universal V2.6D TA Instruments

Sample: Headliner - foam w/brown back'g
Size: 4.4300 mg
Method: MDSC Method
Comment: Ford Focus: Headliner - foam w/brown backing

DSC

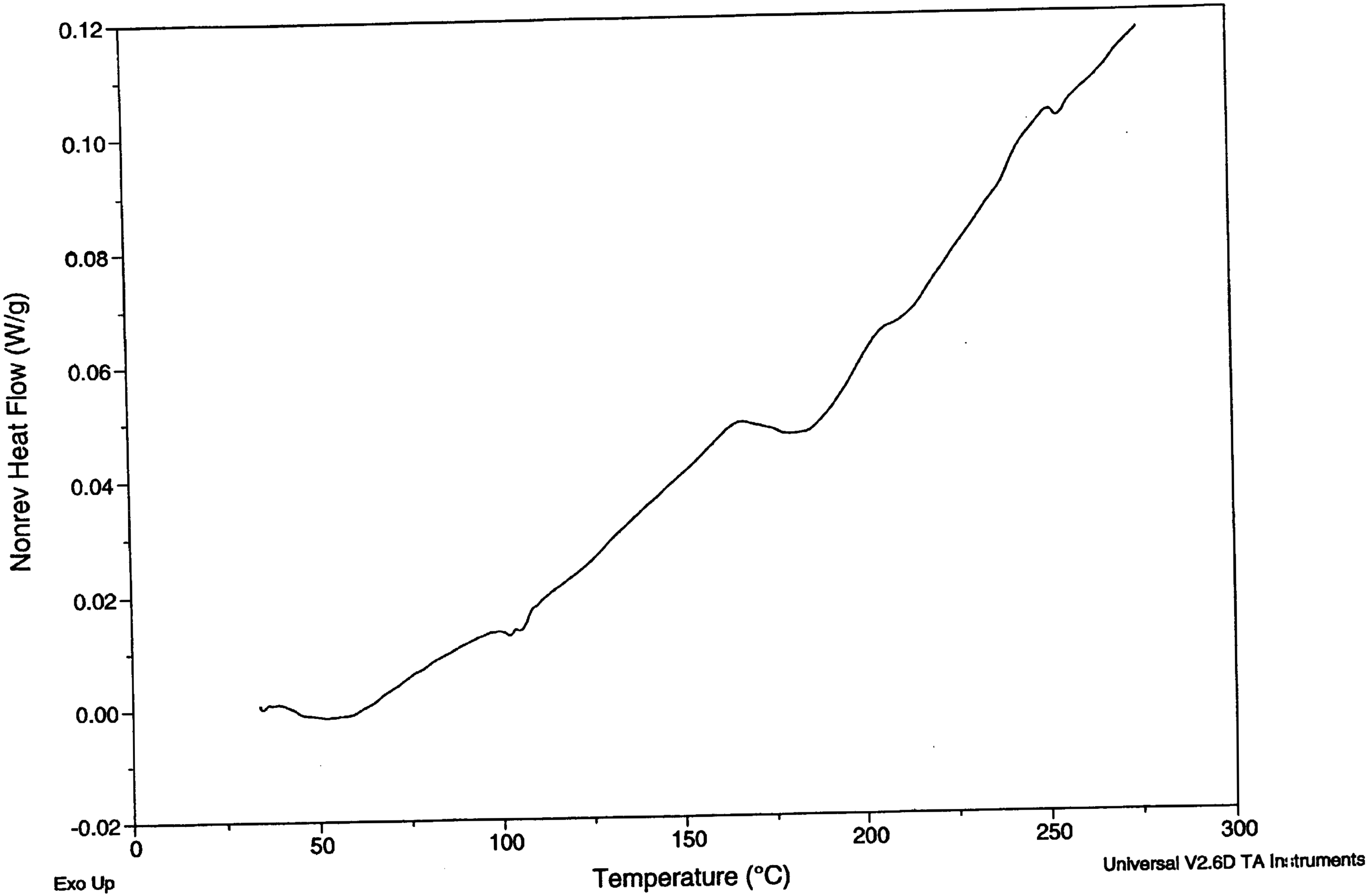
File: C:...\DSC\03614-103.103
Operator: WJM
Run Date: 19-Jul-01 13:11



Sample: Headliner - foam w/brown back'g
Size: 4.4300 mg
Method: MDSC Method
Comment: Ford Focus: Headliner - foam w/brown backing

DSC

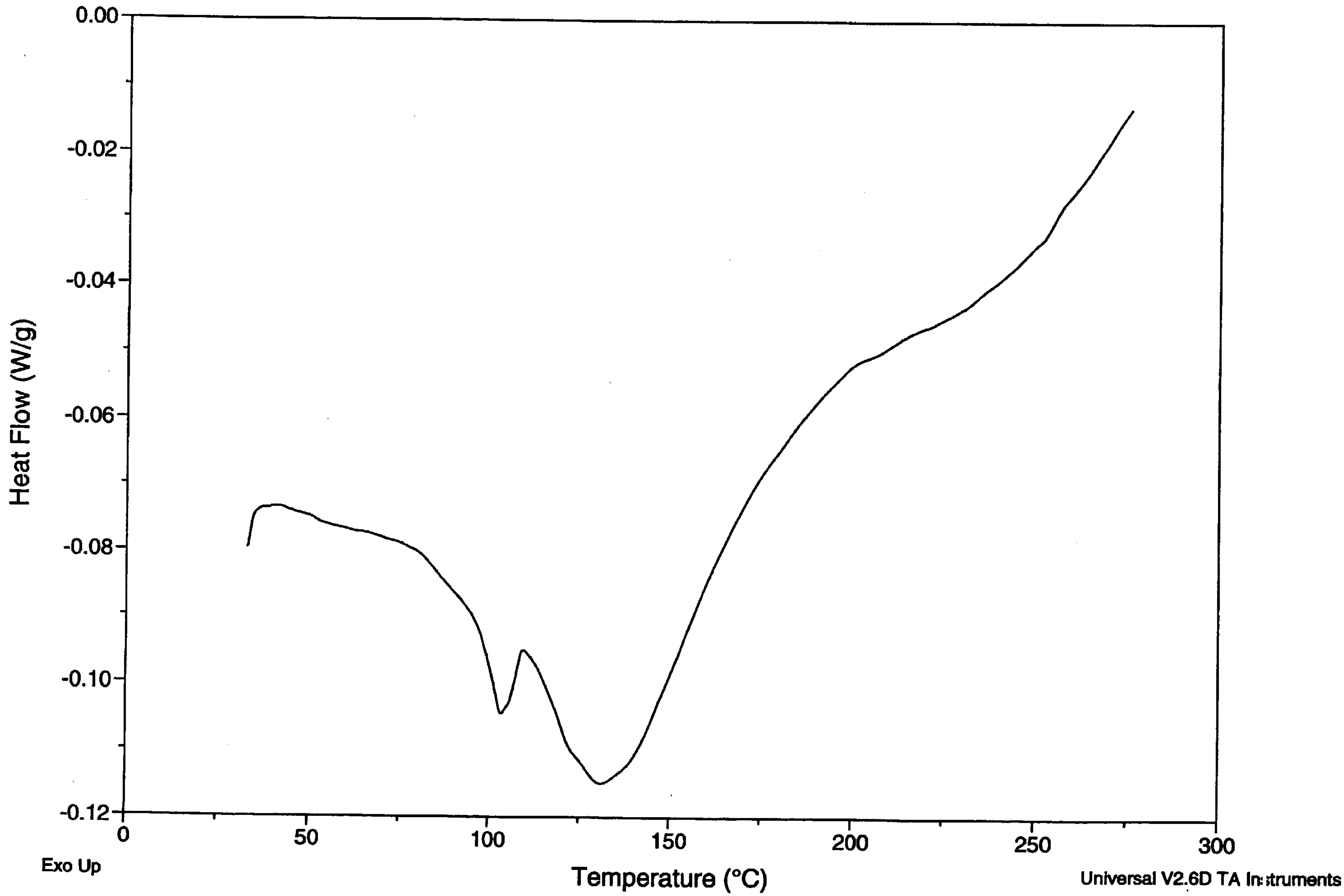
File: C:...\DSC\03614-103.103
Operator: WJM
Run Date: 19-Jul-01 13:11



Sample: Headliner - foam w/bak'g #2
Size: 4.9100 mg
Method: MDSC Method
Comment: Ford Focus: Headliner - foam w/brown backing

DSC

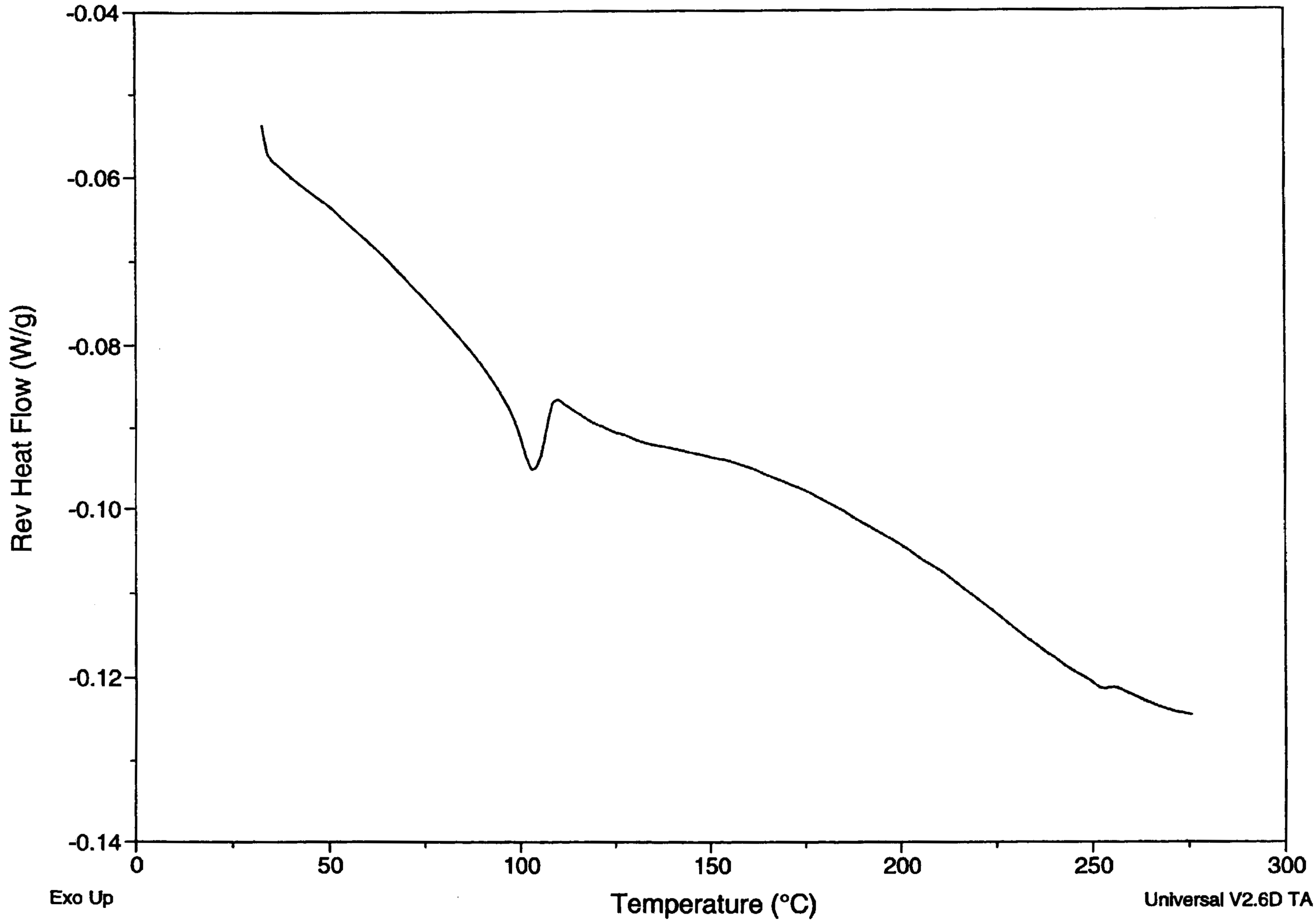
File: C:...\DSC\03614-103.104
Operator: WJM
Run Date: 19-Jul-01 15:49



Sample: Headliner - foam w/bak'g #2
Size: 4.9100 mg
Method: MDSC Method
Comment: Ford Focus: Headliner - foam w/brown backing

DSC

File: C:...\DSC\03614-103.104
Operator: WJM
Run Date: 19-Jul-01 15:49

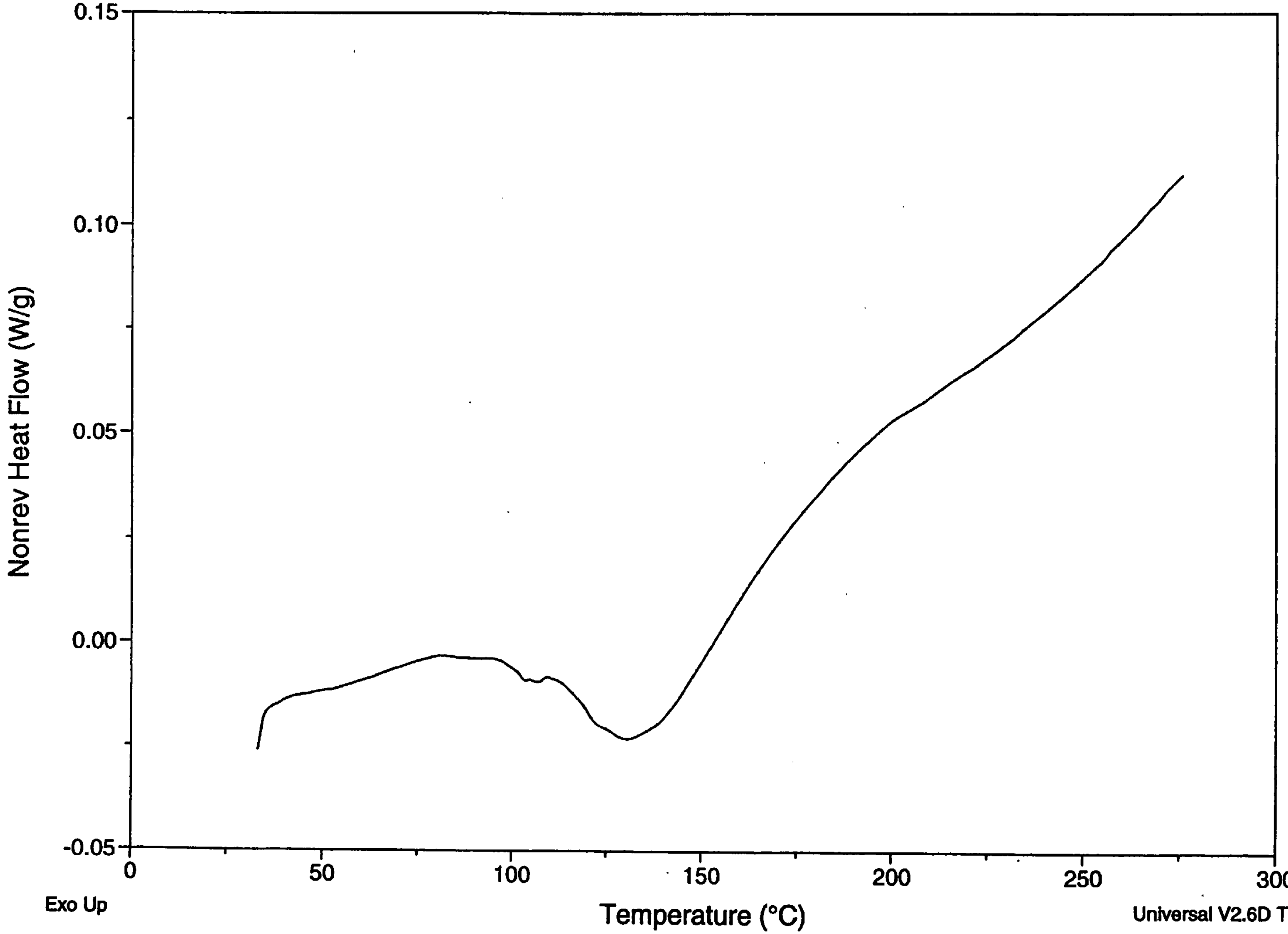


Universal V2.6D TA Instruments

Sample: Headliner - foam w/bak'g #2
Size: 4.9100 mg
Method: MDSC Method
Comment: Ford Focus: Headliner - foam w/brown backing

DSC

File: C:...\DSC\03614-103.104
Operator: WJM
Run Date: 19-Jul-01 15:49



Universal V2.6D TA Instruments

APPENDIX D

CONE CALORIMETER TEST REPORTS

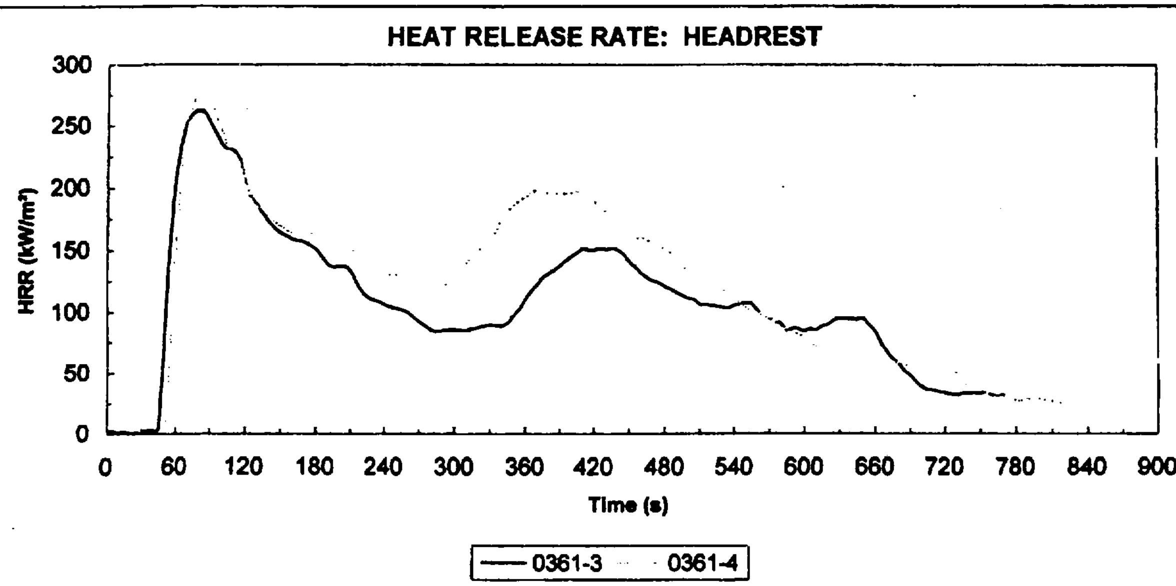
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614	*Material ID:*	Headrest
Part No.:	12457891	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0361-3	02/05/01	49	640	262	80	81.2	230	182	146	255
0361-4	02/05/01	51	699	275	80	96.1	220	186	167	265
Average		50	670	269	80	88.7	225	184	157	260

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
51.2	19.7	31.6	61.8	6.1	22.7	2.70	16	1858	1874	519
43.3	7.4	36.1	83.4	7.0	23.5	2.76	0	2082	2082	510
47.3	13.5	33.9	72.6	6.6	23.1	2.73	8	1970	1978	514



SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Headrest
SwRI Project No:	18.03614	*Heat Flux:*	20 kW/m²

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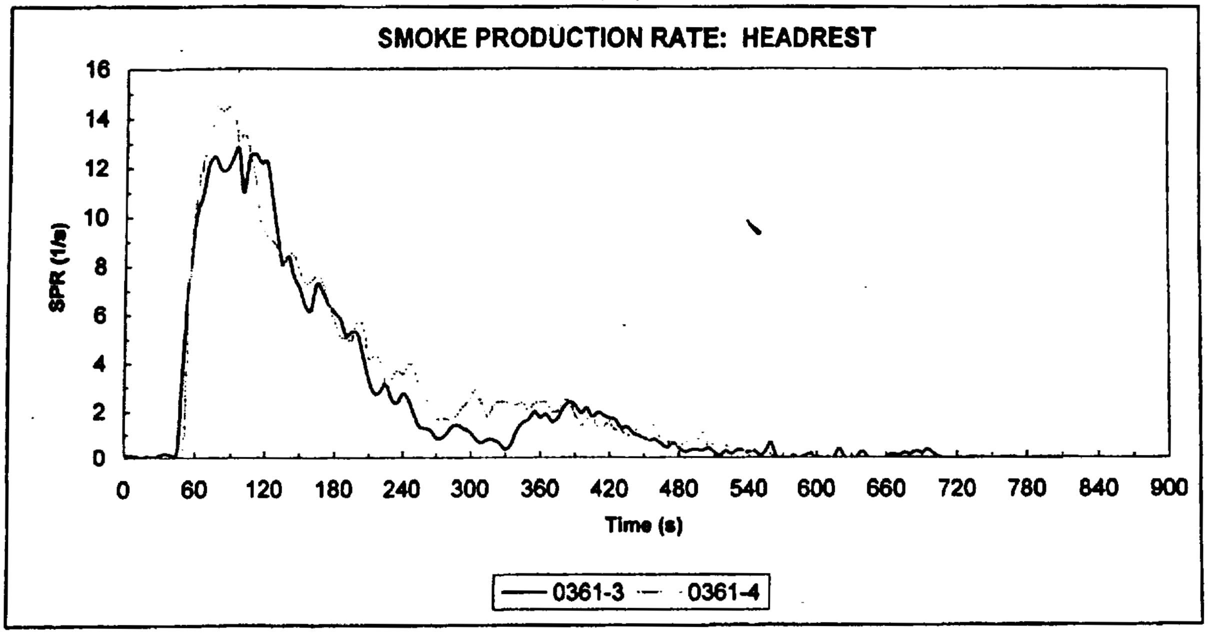
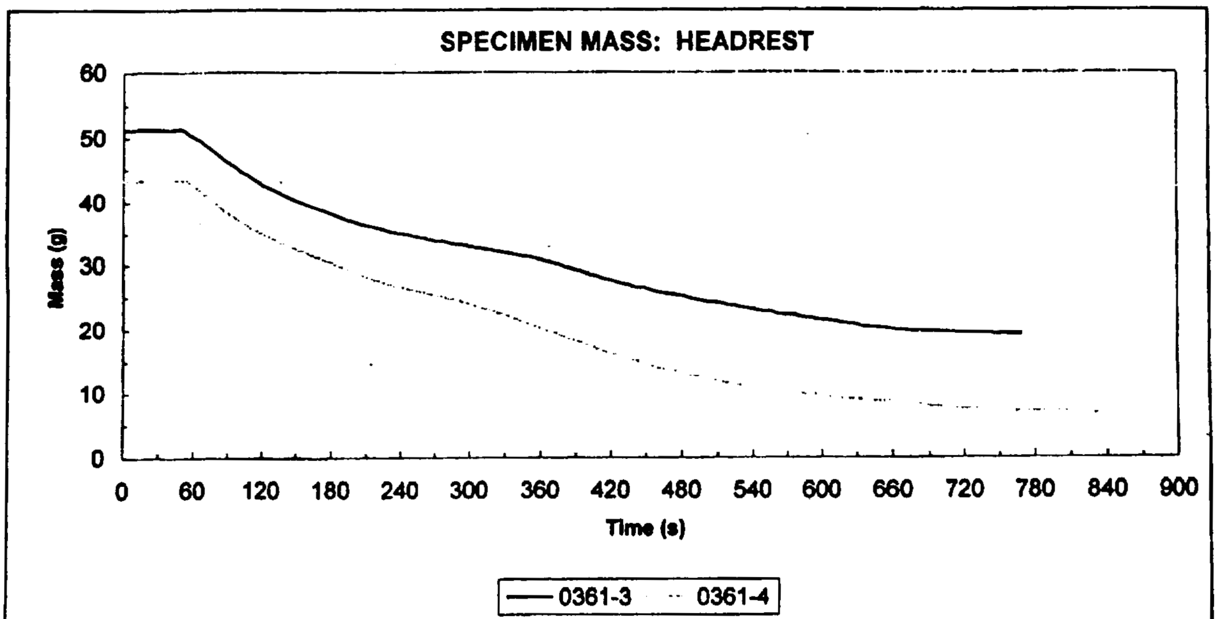




Notes & Observations:
Samples were 45 mm in thickness.

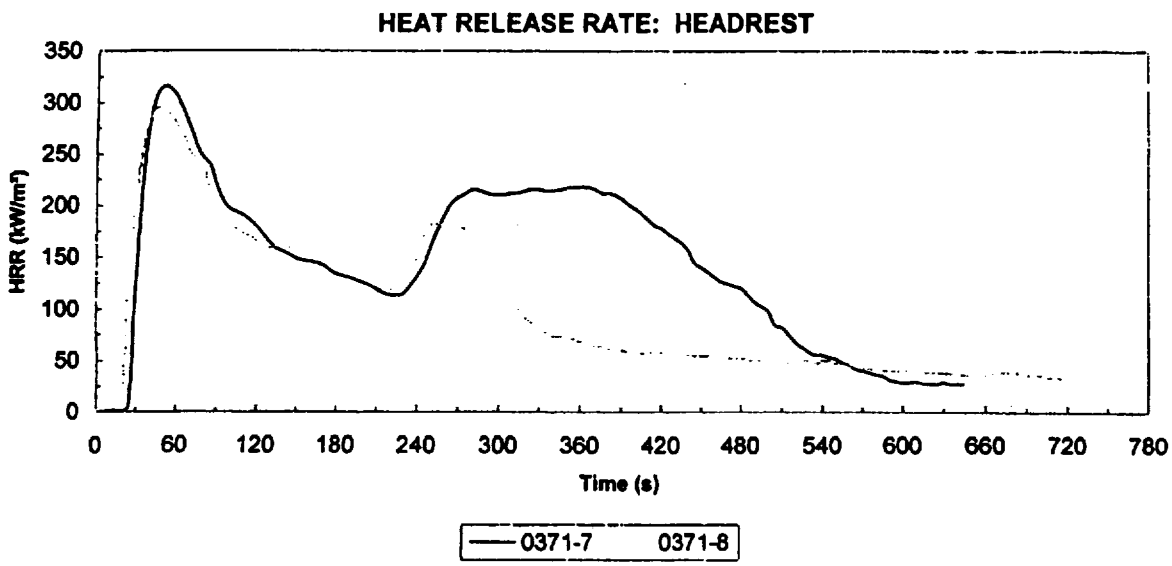
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Headrest
Part No.:	1245789	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0371-7	02/06/01	30	533	316	50	90.1	268	194	188	302
0371-8	02/06/01	24	622	295	45	68.7	256	191	172	284
Average		27	578	306	48	79.4	262	192	180	293

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
49.5	13.4	36.0	72.7	8.6	22.1	4.23	8	2403	2411	590
48.5	19.5	28.6	58.9	6.6	21.2	3.25	22	2093	2114	647
49.0	16.5	32.3	65.8	7.6	21.7	3.74	15	2248	2263	619



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Headrest
SwRI Project No:	18.03614.01	*Heat Flux:*	35 kW/m²

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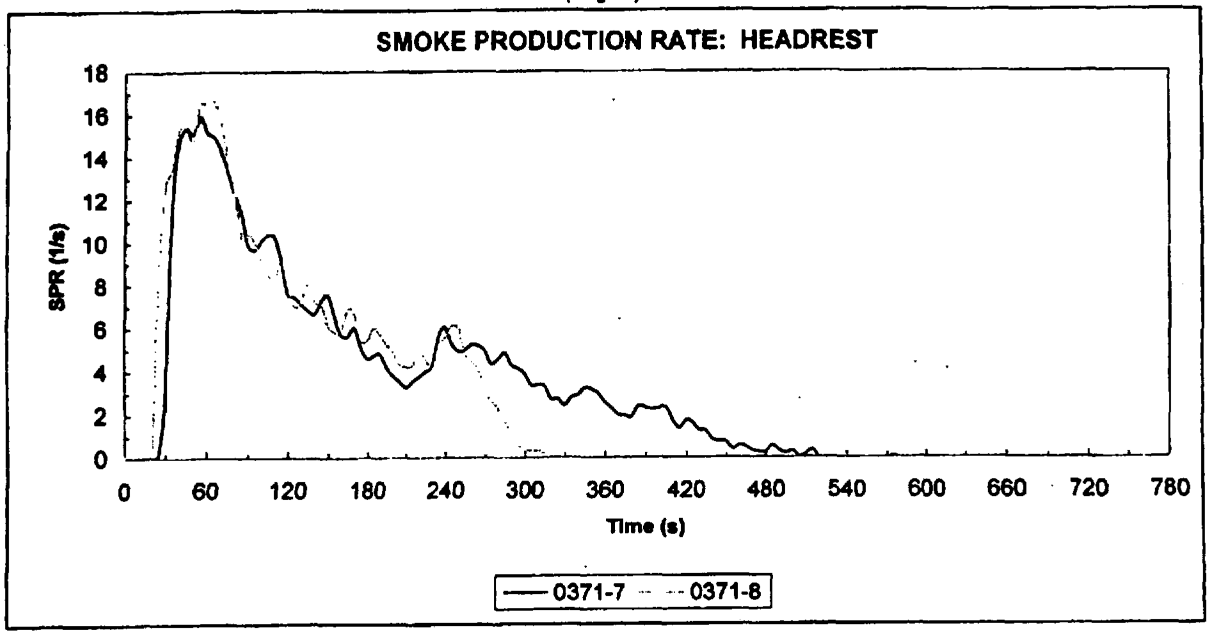
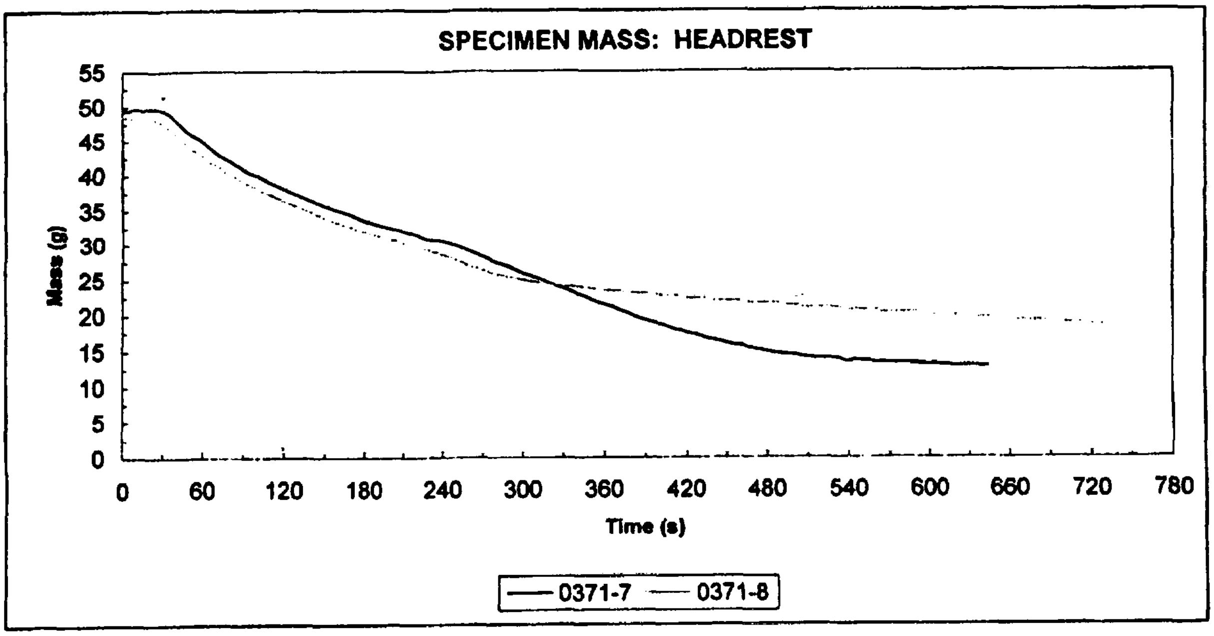




Notes & Observations:

Sample was 45 mm in thickness.

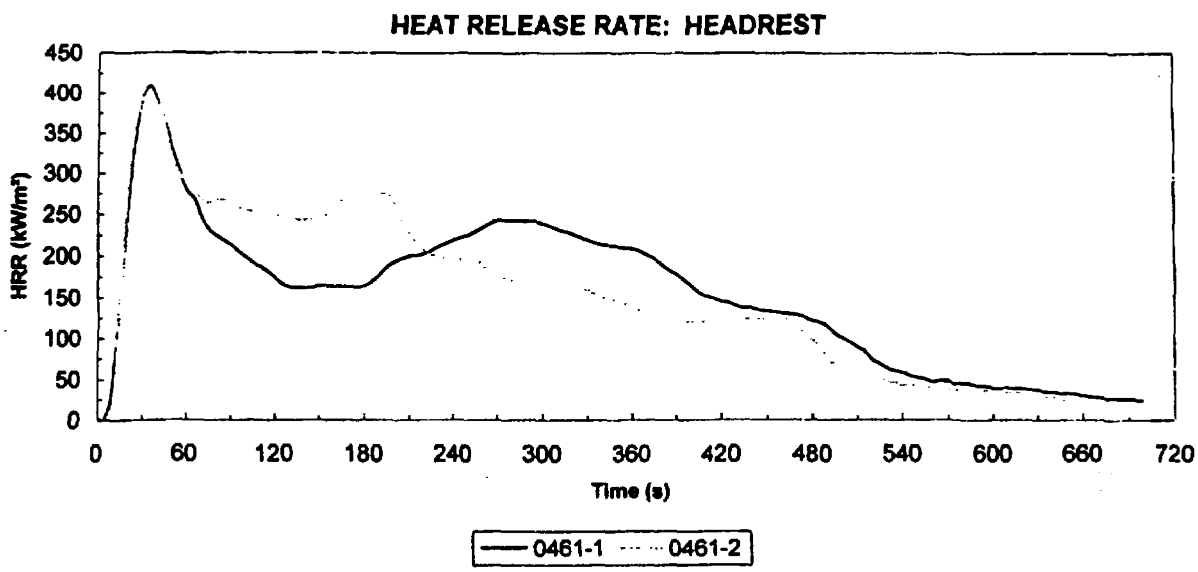
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Headrest
Part Number:	12457891	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0461-1	02/15/01	11	609	409	35	105.4	301	222	222	368
0461-2	02/15/01	11	559	416	35	100.7	304	274	244	369
Average		11	584	412	35	103.0	303	248	233	369

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
49.6	8.6	41.0	82.6	9.3	22.7	4.43	2	2763	2766	596
47.9	8.9	39.0	81.5	9.5	22.8	4.15	0	2385	2386	540
48.8	8.7	40.0	82.1	9.4	22.8	4.29	1	2574	2576	568



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Headrest
SwRI Project No:	18.03614.01	*Heat Flux:*	50 kW/m²

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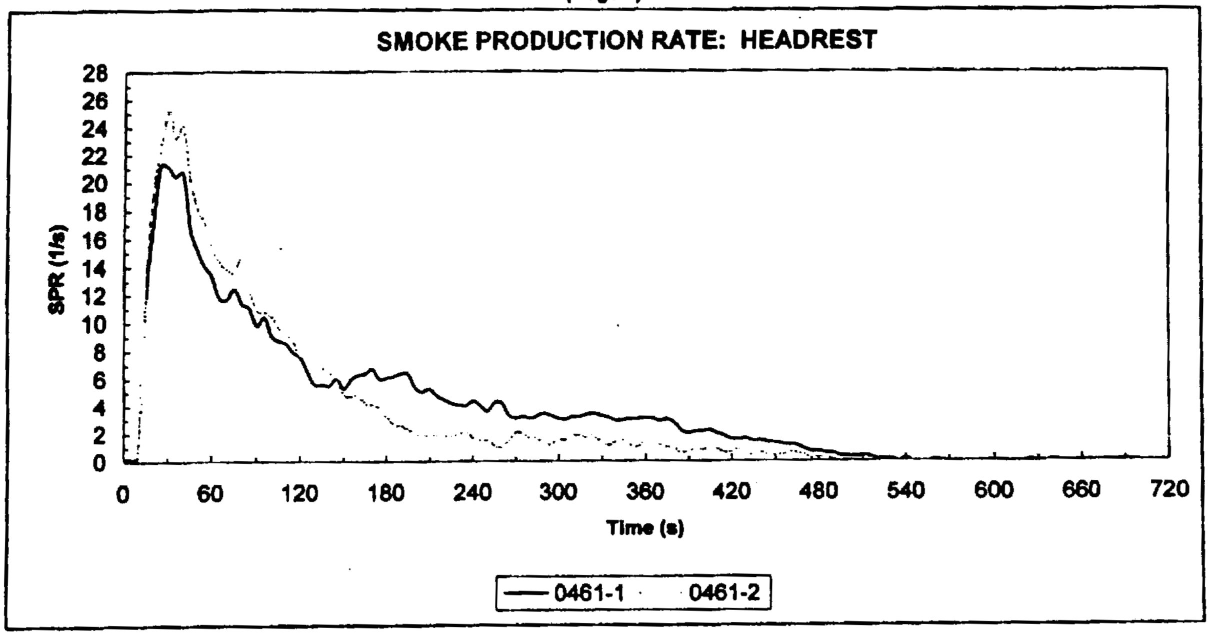

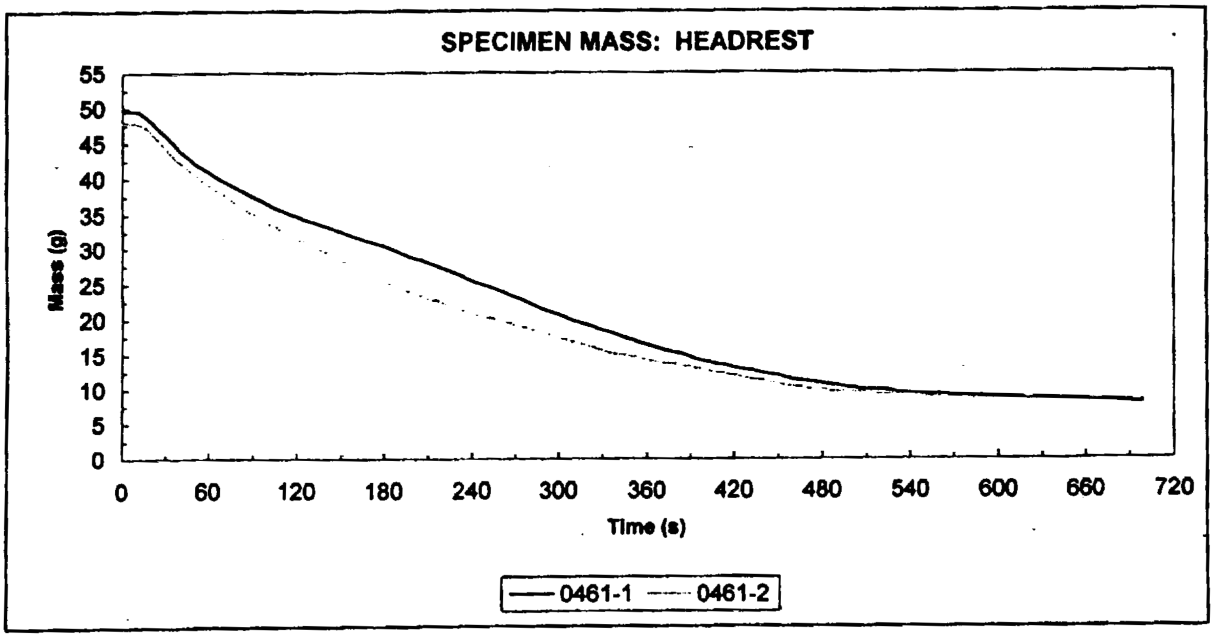

Notes & Observations:

Samples were 48 mm in thickness.

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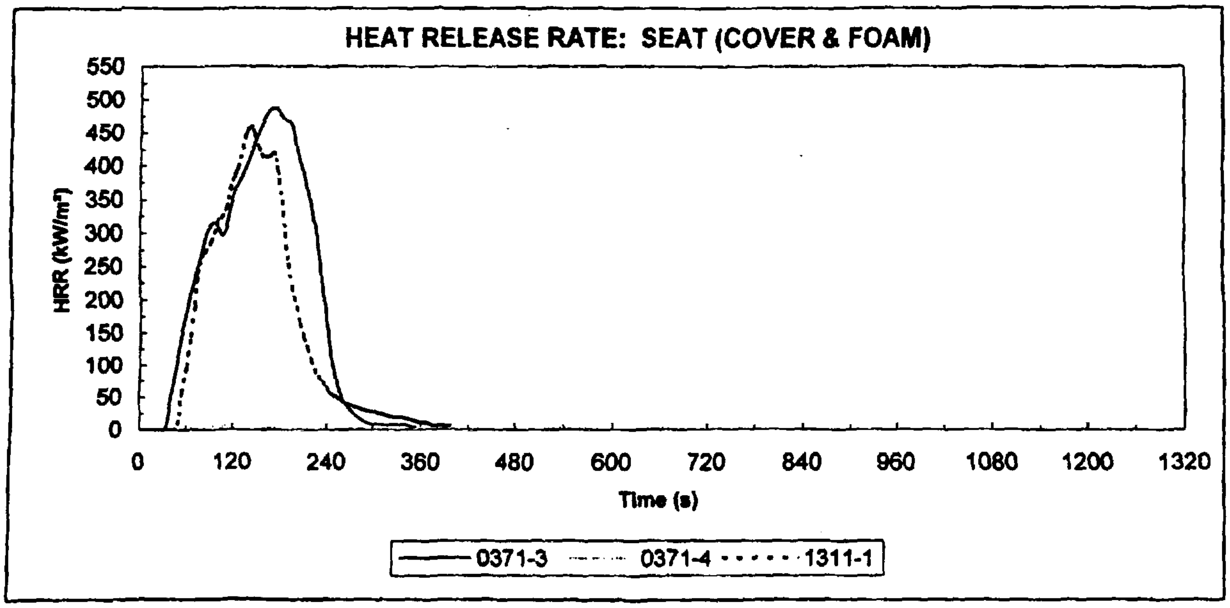
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Seat (Cover & Foam)
Part No.:	12532840	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0371-3	2/6/01	34	237	488	170	70.0	193	339	234	479
0371-4	2/6/01	No Ignition		7	115	1.1	2	3	2	6
1311-1	5/11/01	39	273	460	140	54.7	169	279	182	437
*Average**		36	255	474	155	62.3	181	309	208	458

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
37.3	5.2	31.9	85.6	20.6	19.4	6.00	7	1643	1651	455
40.7	25.0	15.7	38.6	1.5	0.6	0.96	1227	N/A	1227	690
32.6	4.9	27.4	83.9	23.6	17.7	4.15	21	1285	1307	415
35.0	5.1	29.7	84.8	22.1	18.5	5.08	14	1464	1479	435



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Seat (Cover & Foam)
SwRI Project No:	18.03614.01	*Heat Flux:*	20 kW/m²

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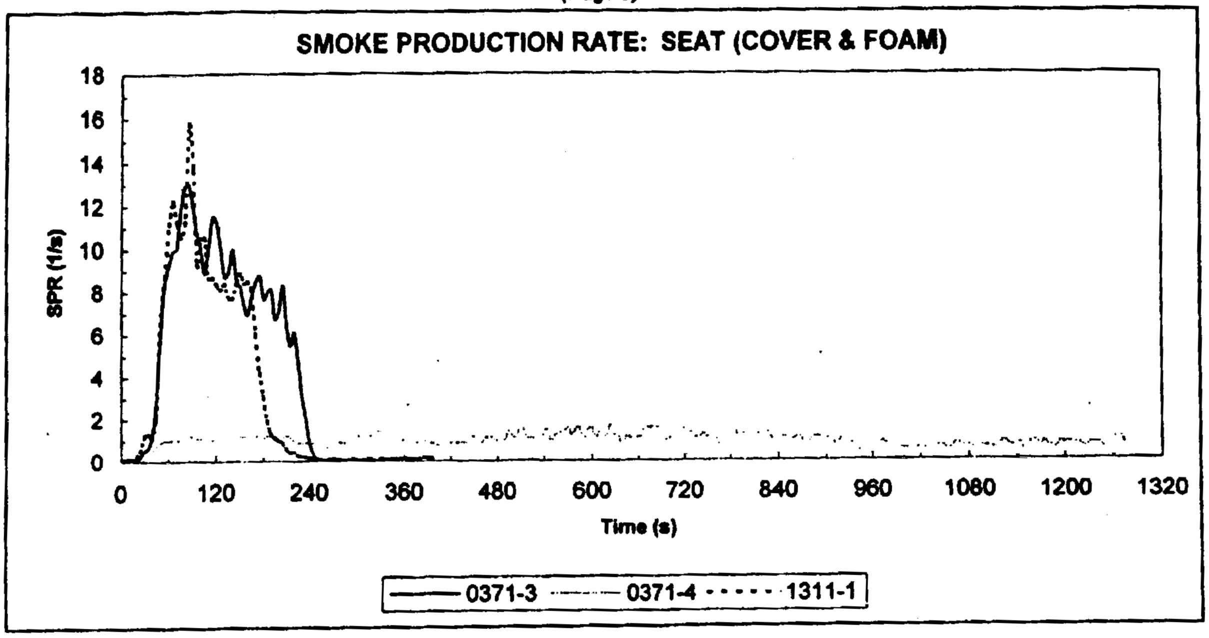

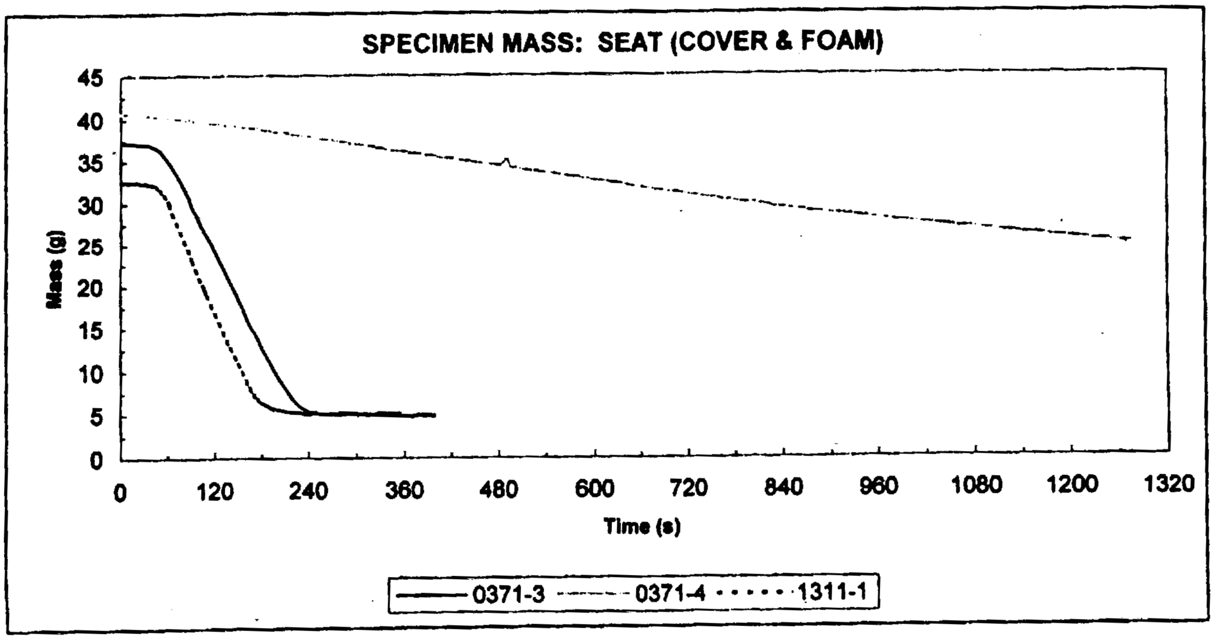

*Notes & Observations: * Averages of test 0371-1 and 1311-1*

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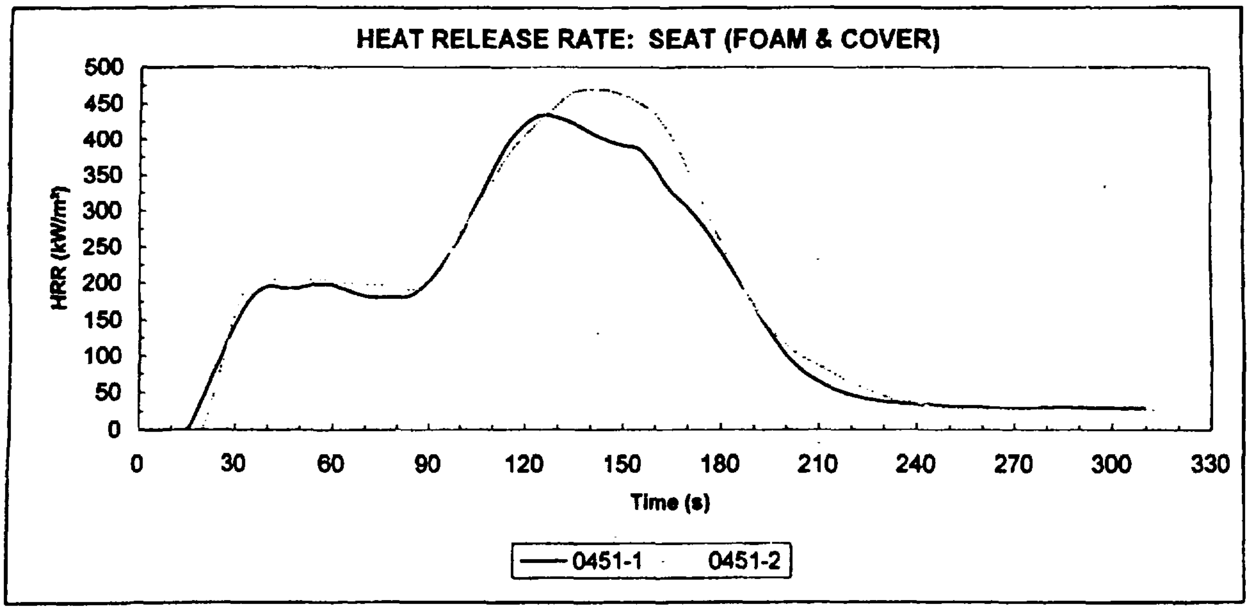
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Seat (Foam & Cover)
Part Number:	22589249	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0451-1	02/14/01	16	210	434	125	49.1	158	261	164	420
0451-2	02/14/01	21	211	470	140	52.9	179	281	177	460
Average		18	210	452	133	51.0	169	271	170	440

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
35.7	5.0	30.6	85.6	21.3	14.2	8.17	1	1879	1880	544
34.7	4.6	29.9	86.2	20.1	15.6	7.05	6	1651	1657	488
35.2	4.8	30.2	85.9	20.7	14.9	7.61	4	1765	1768	516



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Seat (Foam & Cover)
SwRI Project No:	18.03614.01	*Heat Flux:*	35 kW/m²

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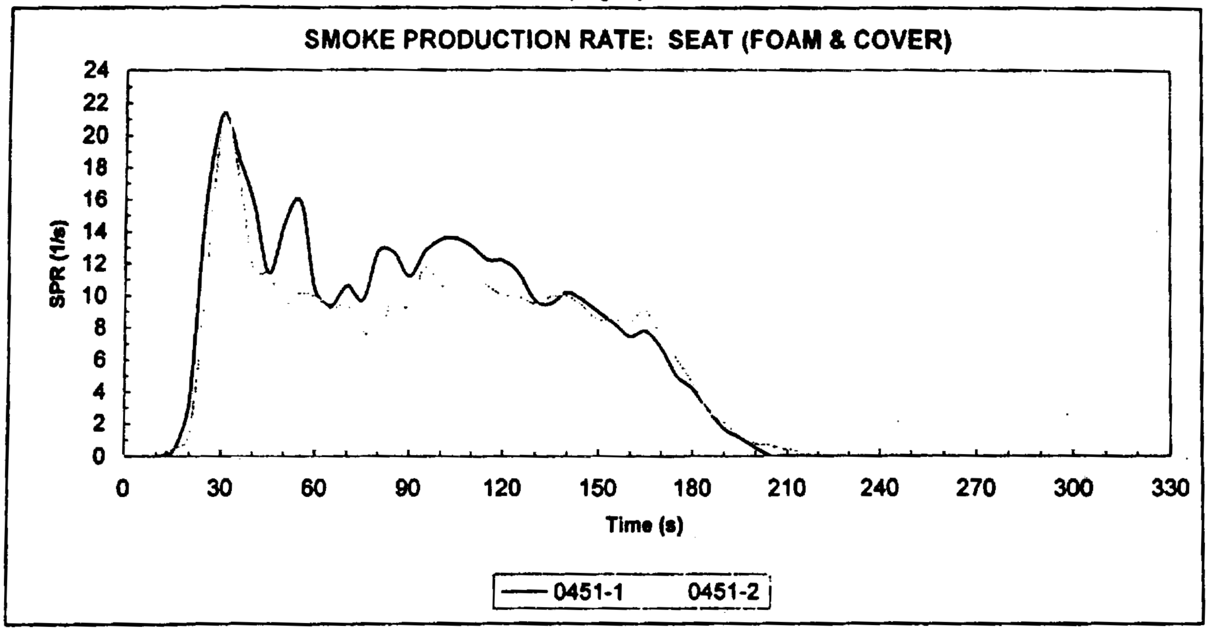

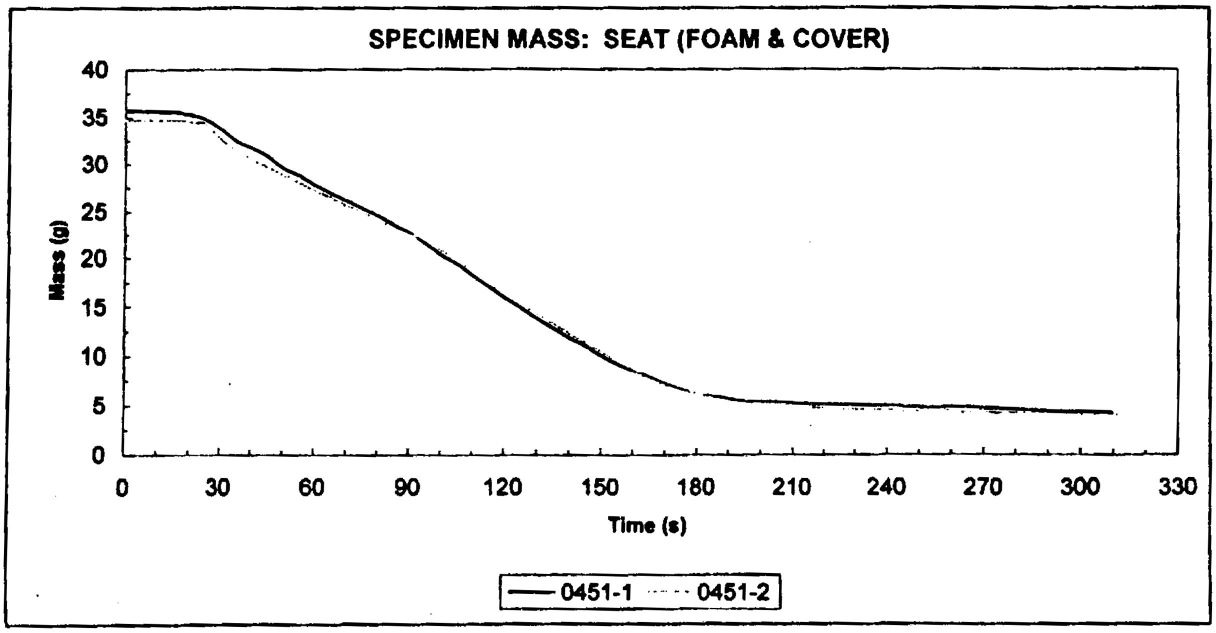

Notes & Observations:

0451-1: Cover peeled back at 14 secs and exposed the foam padding.

0451-2: Cover did not peel back, but did melt and ignite in place.

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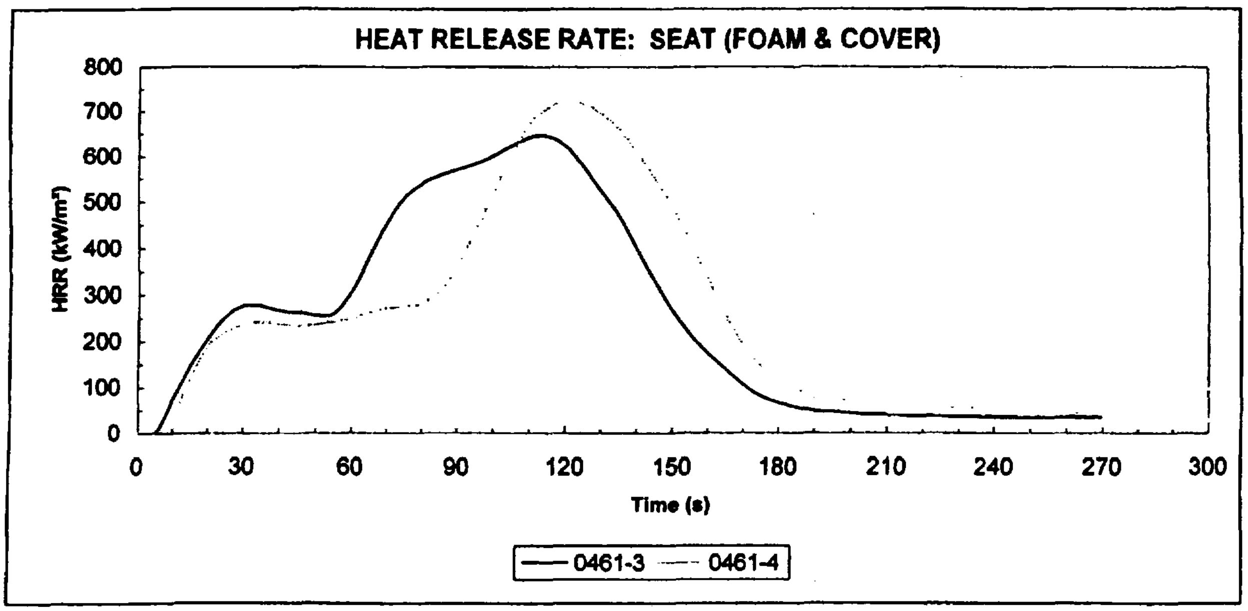
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Seat (Foam & Cover)
Part Number:	22589249	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0461-3	02/15/01	8	175	646	115	63.4	263	353	212	621
0461-4	02/15/01	9	179	725	120	65.1	218	361	218	693
Average		8	177	685	118	64.2	241	357	215	657

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
34.9	4.4	30.4	87.0	26.2	18.5	9.50	5	1799	1804	524
43.1	5.5	37.4	86.9	29.5	15.4	11.47	3	2232	2235	527
39.0	5.0	33.9	86.9	27.8	16.9	10.48	4	2016	2020	526



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Seat (Foam & Cover)
SwRI Project No:	18.03614.01	*Heat Flux:*	50 kW/m²

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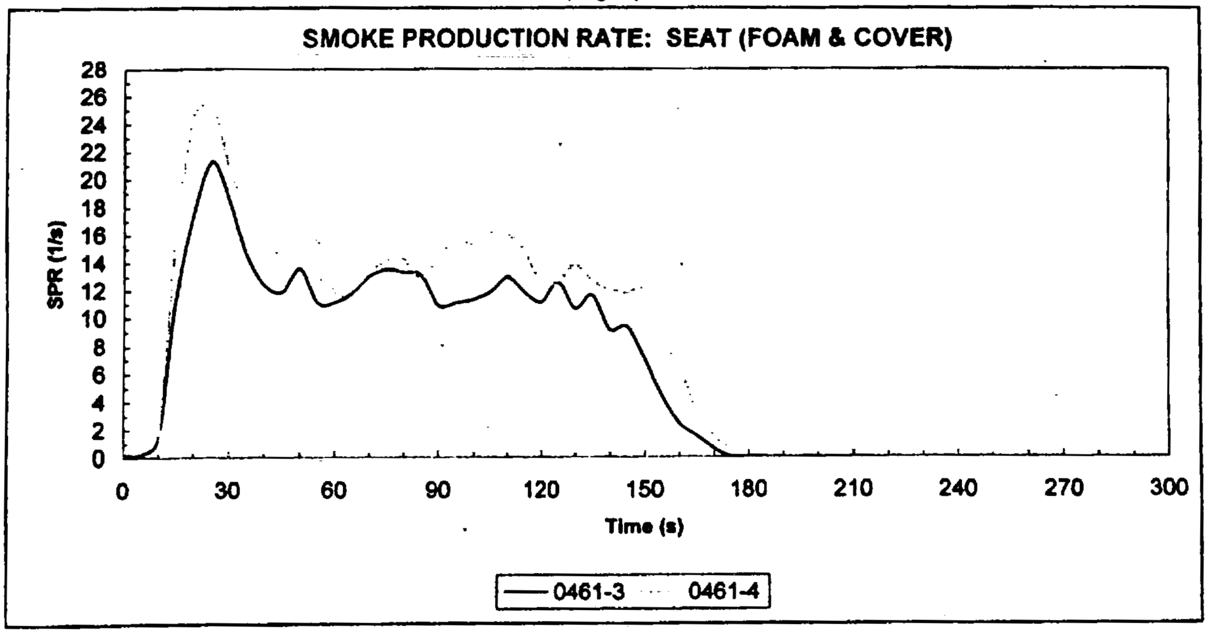

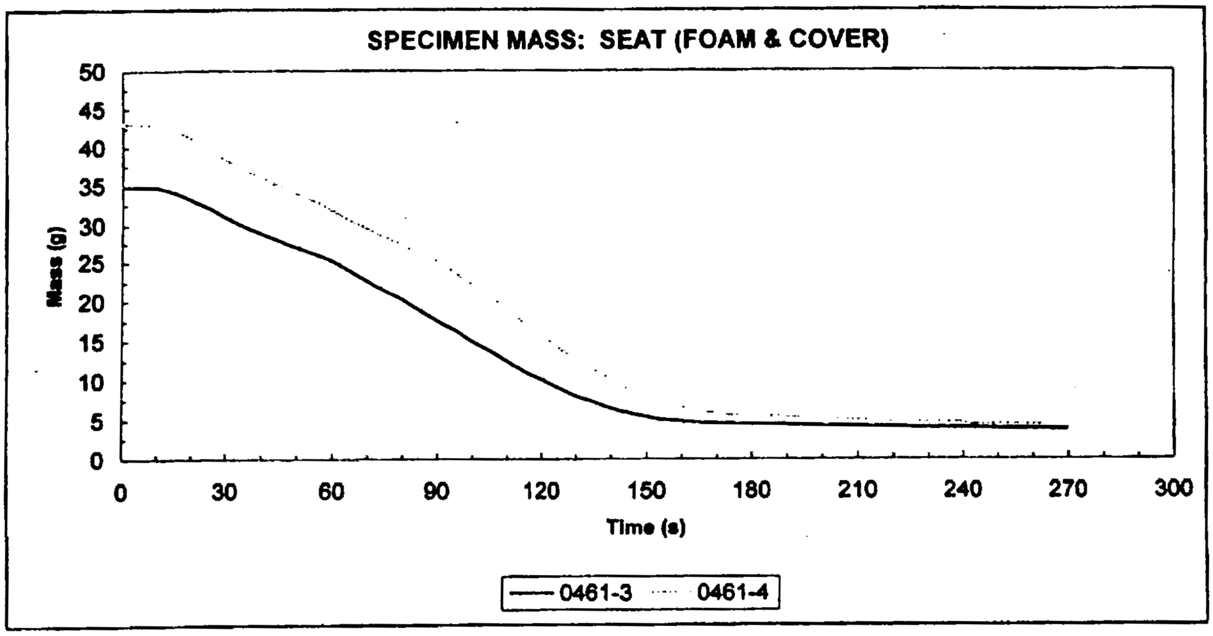

Notes & Observations:
Samples peeled away and shrank at 6 secs.

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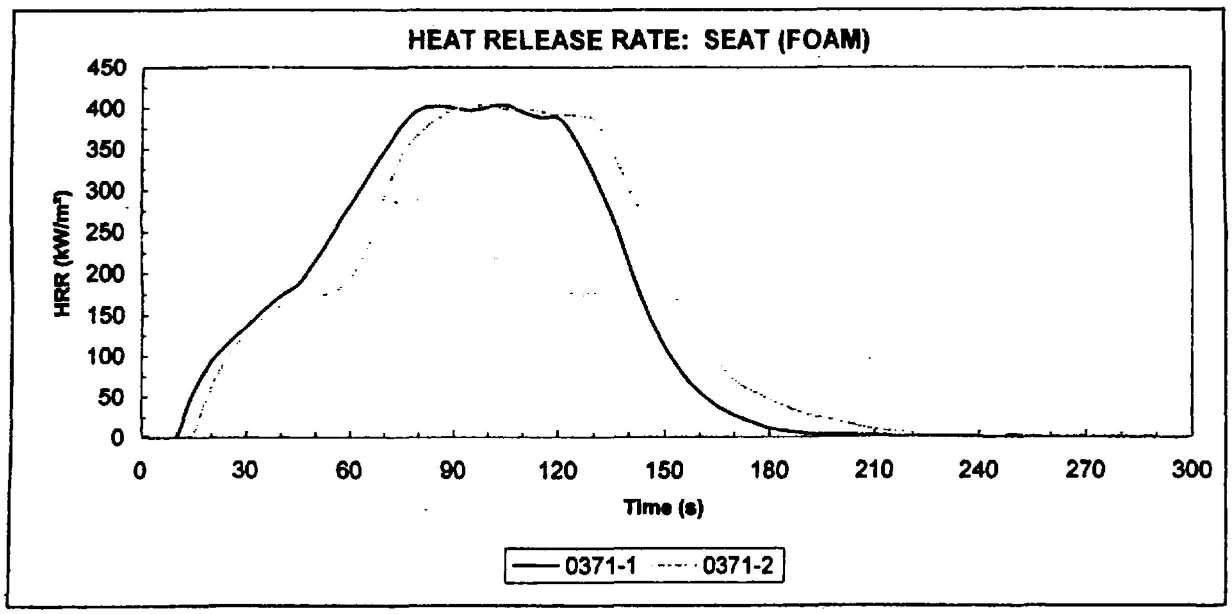
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Seat (Foam)
Part No.:	12532840	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\ max}$ (kW/m²)
0371-1	02/06/01	10	164	404	105	39.7	180	221	133	401
0371-2	02/06/01	12	190	404	95	41.5	142	229	138	400
Average		11	177	404	100	40.6	161	225	136	401

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
14.9	1.2	13.7	91.8	13.0	25.7	2.30	2	412	414	267
15.7	0.8	14.9	95.0	13.5	24.6	2.58	2	527	529	312
15.3	1.0	14.3	93.4	13.3	25.1	2.44	2	470	471	289



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Seat (Foam)
SwRI Project No:	18.03614.01	*Heat Flux:*	20 kW/m²

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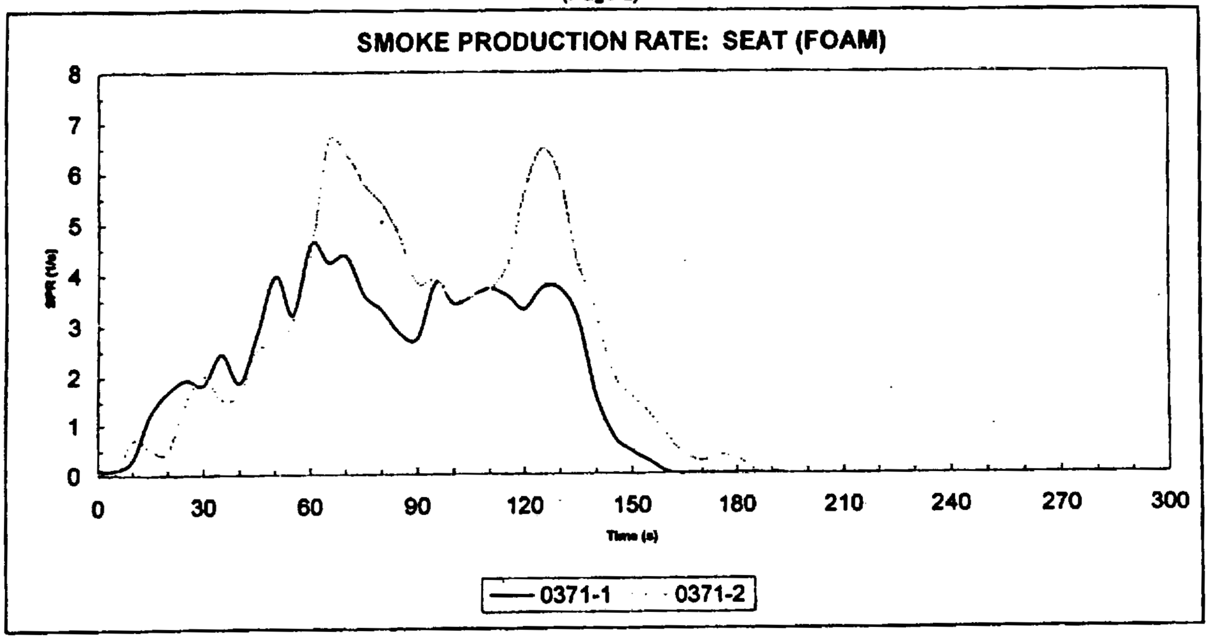
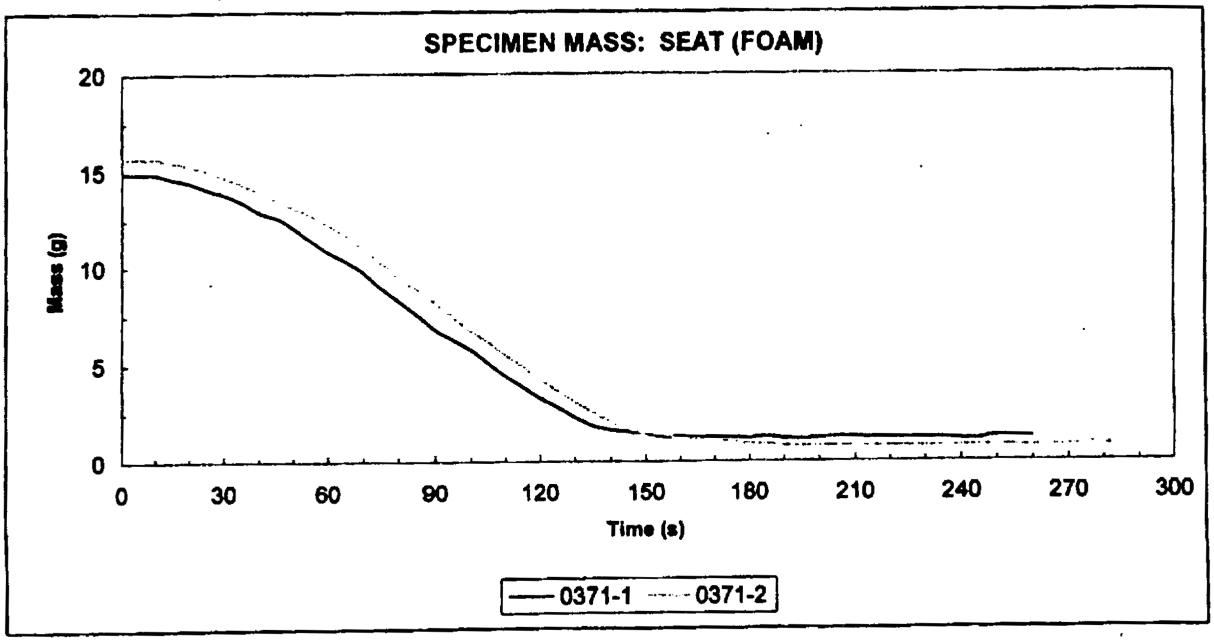




Notes & Observations:
Samples were 35 mm in thickness.

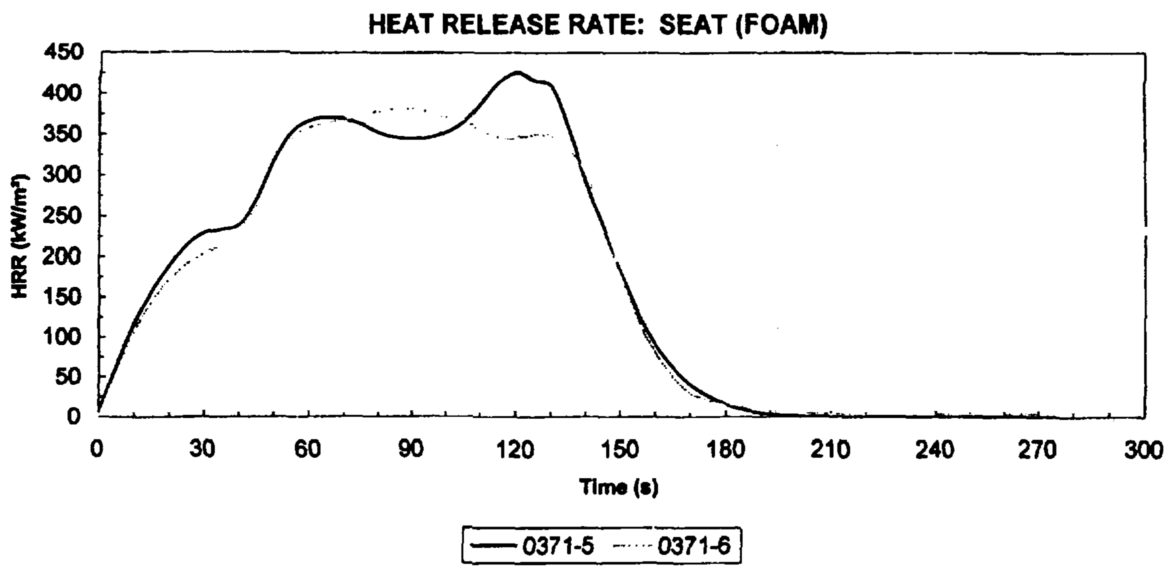
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Seat (Foam)
Part No.:	12532840	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0371-5	02/06/01	2	190	426	120	47.4	215	263	158	403
0371-6	02/06/01	3	180	382	85	45.4	230	252	151	377
Average		2	185	404	103	46.4	222	257	155	390

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
17.8	0.8	17.0	95.7	14.7	24.6	3.30	0	640	640	332
17.4	0.9	16.5	95.1	13.6	24.3	3.67	3	693	695	370
17.6	0.8	16.8	95.4	14.1	24.4	3.48	1	667	668	351



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Seat (Foam)
SwRI Project No:	18.03614.01	*Heat Flux:*	35 kW/m²

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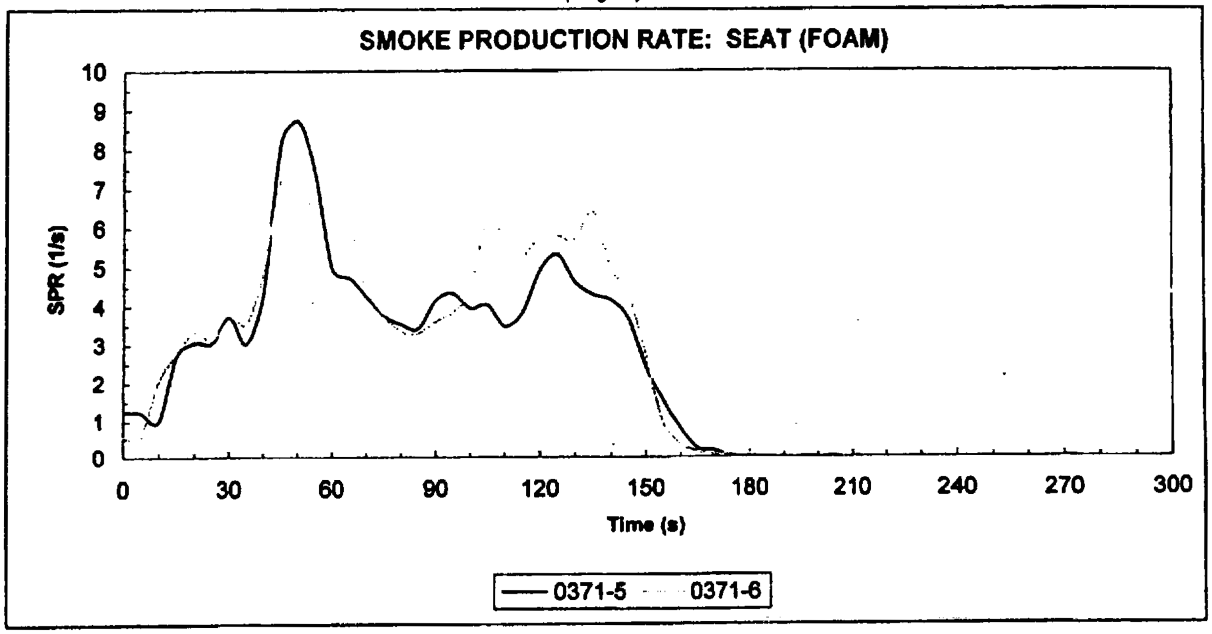
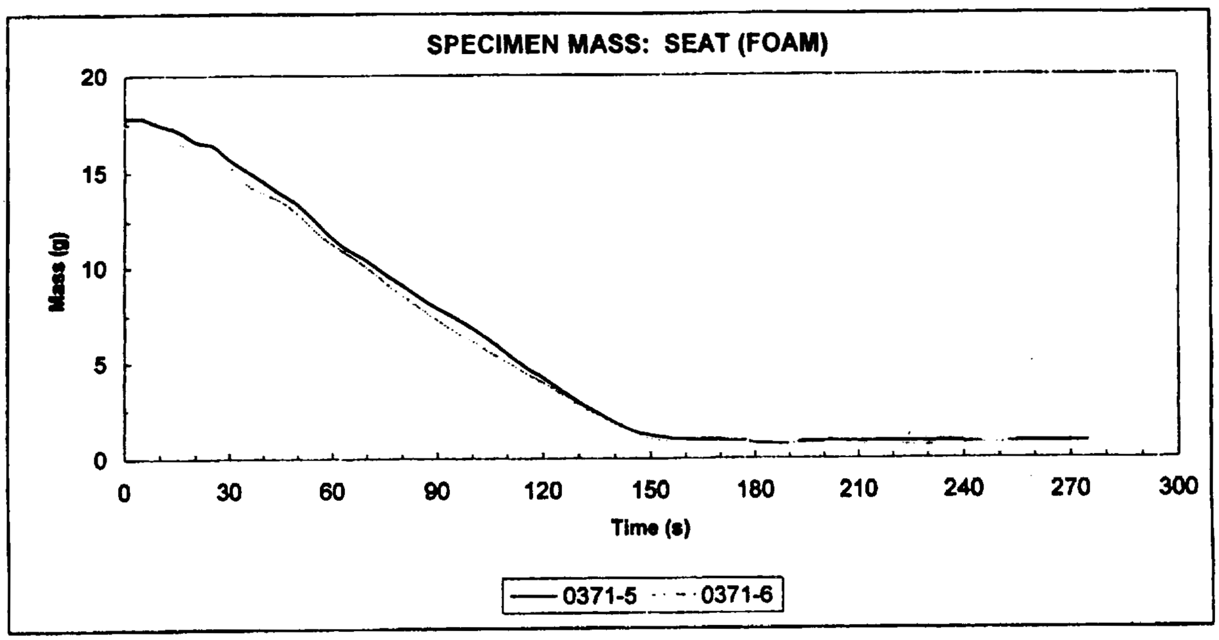




Notes & Observations:
Samples were 35 mm in thickness.

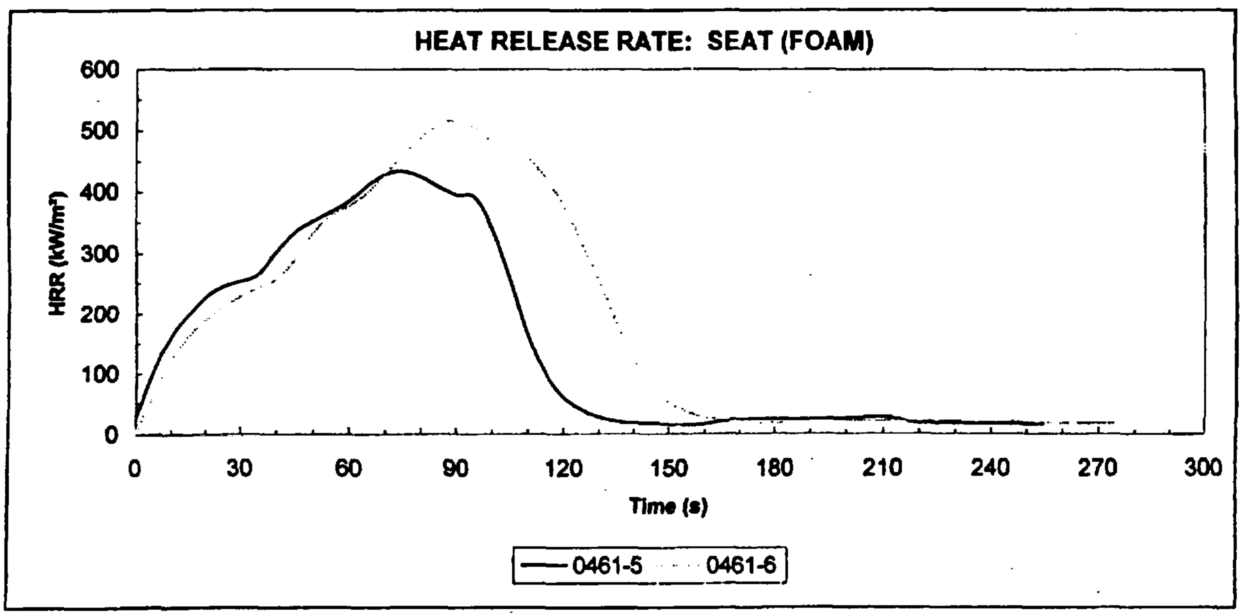
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Seat (Foam)
Part Number:	22589249	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\,max}$ (kW/m²)
0461-5	02/15/01	2	167	434	75	36.2	252	202	121	416
0461-6	02/15/01	2	191	516	90	47.9	221	264	160	494
Average		2	179	475	83	42.1	237	233	140	455

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
19.2	6.0	13.2	68.7	14.9	24.3	3.46	0	591	591	396
19.3	2.6	16.7	86.4	15.9	25.4	3.15	0	624	624	331
19.3	4.3	14.9	77.5	15.4	24.8	3.31	0	608	607	363



SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Seat (Foam)
SwRI Project No:	18.03614.01	*Heat Flux:*	50 kW/m²

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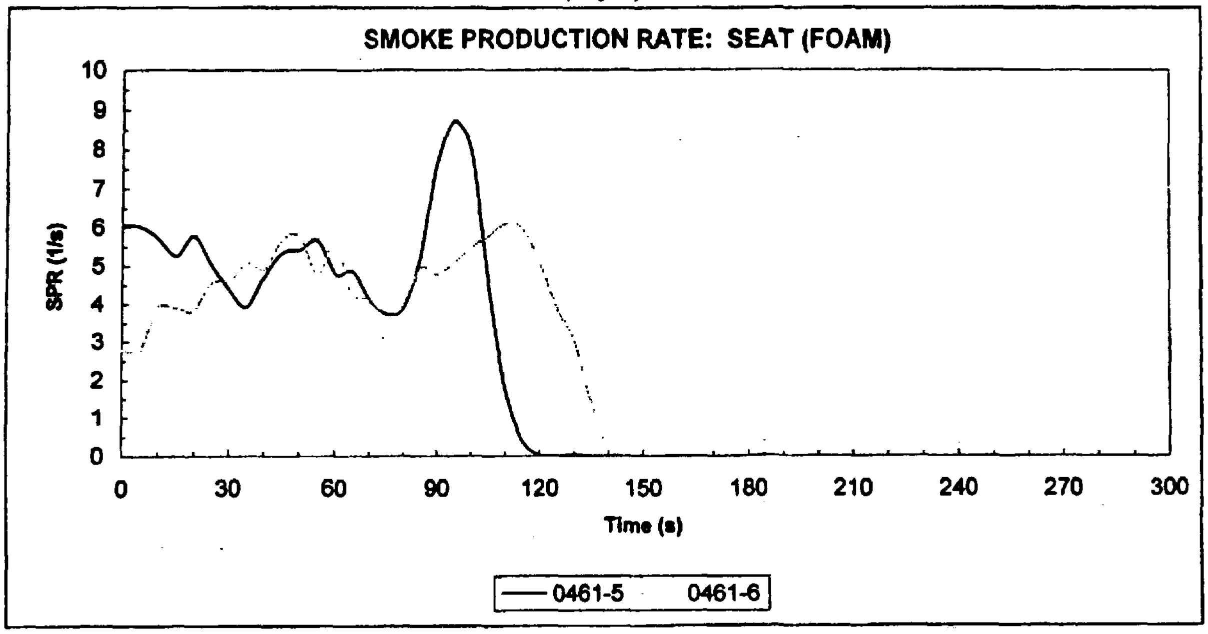
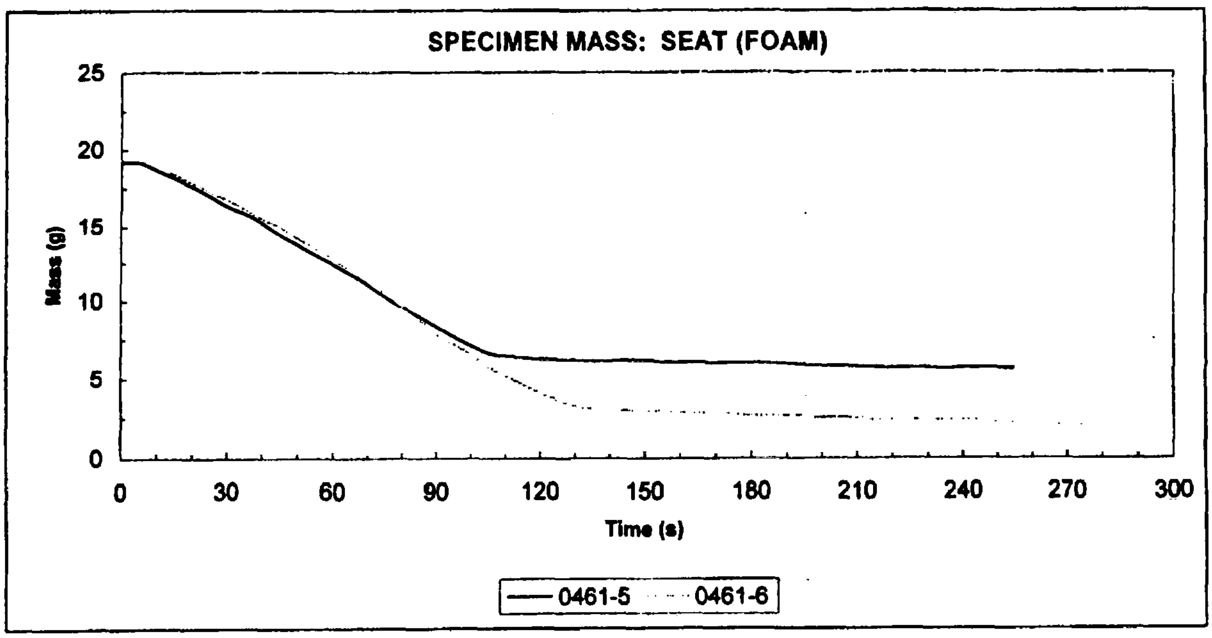




Notes & Observations:

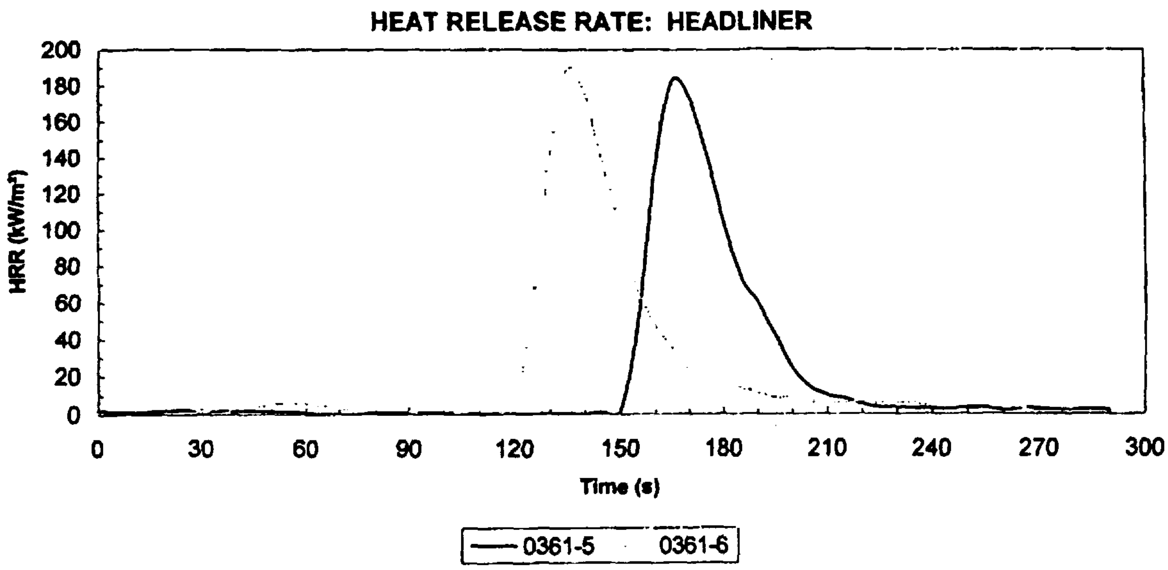
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Headliner
Part No.:	22619703	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\,max}$ (kW/m²)
0361-5	02/05/01	153	53	183	165	4.9	82	27	16	134
0361-6	02/05/01	124	80	190	135	5.1	83	29	17	135
Average		138	66	186	150	5.0	82	28	17	134

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
7.7	4.4	2.3	29.5	8.2	19.0	0.86	73	108	181	420
7.7	4.5	2.6	34.0	7.9	17.4	0.76	59	99	159	334
7.7	4.5	2.4	31.8	8.1	18.2	0.81	66	104	170	377



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Headliner
SwRI Project No:	18.03614.01	*Heat Flux:*	20 kW/m²

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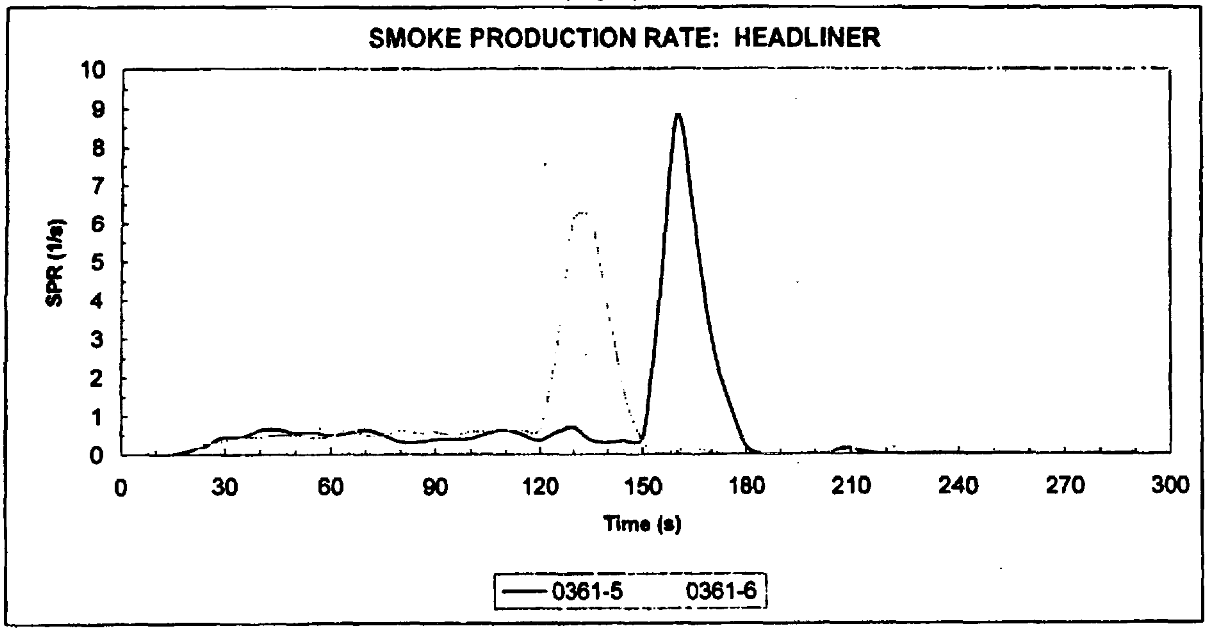
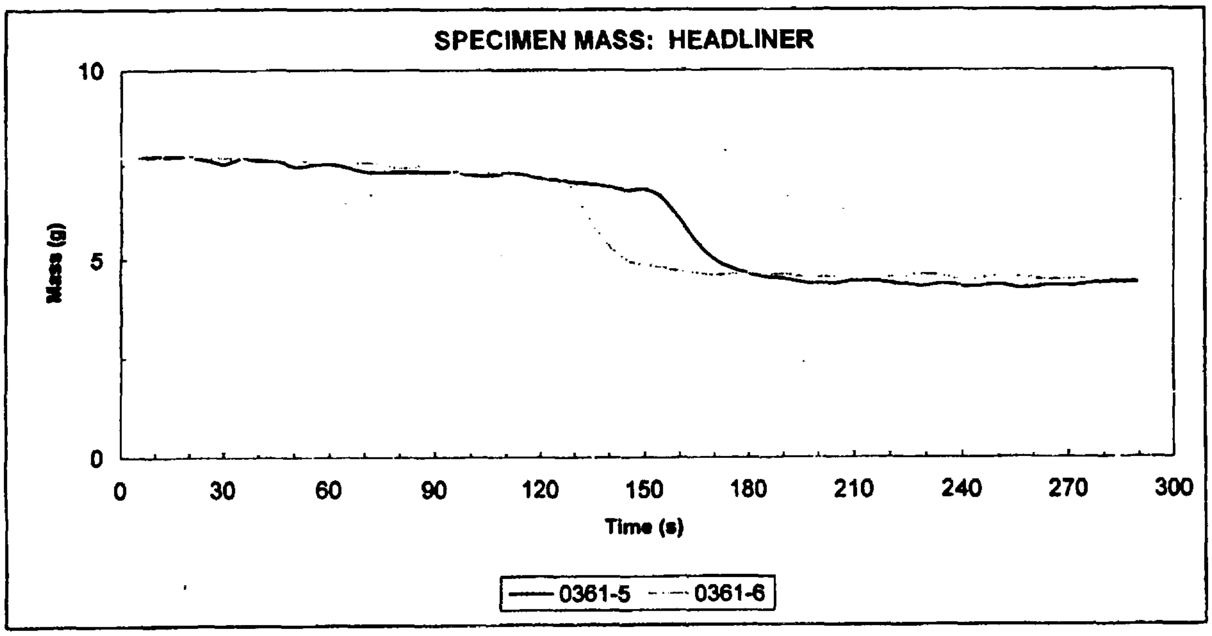




Notes & Observations:

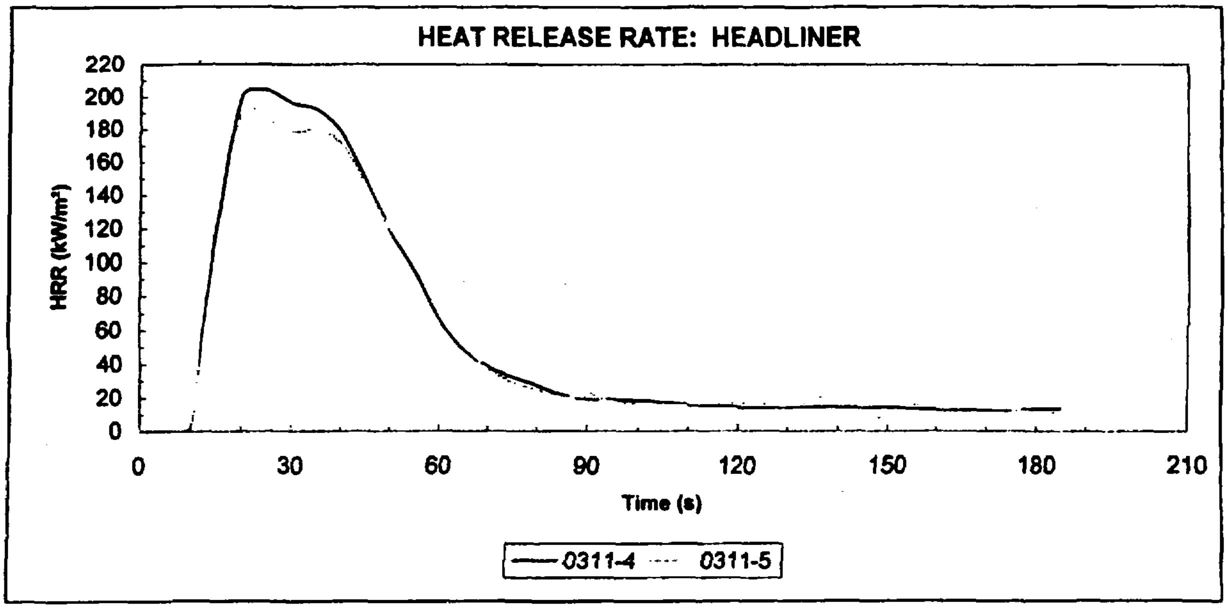
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Headliner
Part No.:	22619703	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\ max}$ (kW/m²)
0311-4	01/31/01	13	88	204	25	8.4	130	47	28	184
0311-5	01/31/01	12	89	191	20	8.3	127	46	28	173
Average		12	88	198	23	8.4	129	47	28	178

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
7.6	3.5	4.1	53.5	9.2	18.3	2.01	5	206	211	448
7.9	4.0	3.9	49.0	8.8	19.0	1.94	1	203	204	464
7.8	3.8	4.0	51.2	9.0	18.6	1.97	3	205	207	456



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Headliner
SwRI Project No:	18.03614.01	*Heat Flux:*	35 kW/m²

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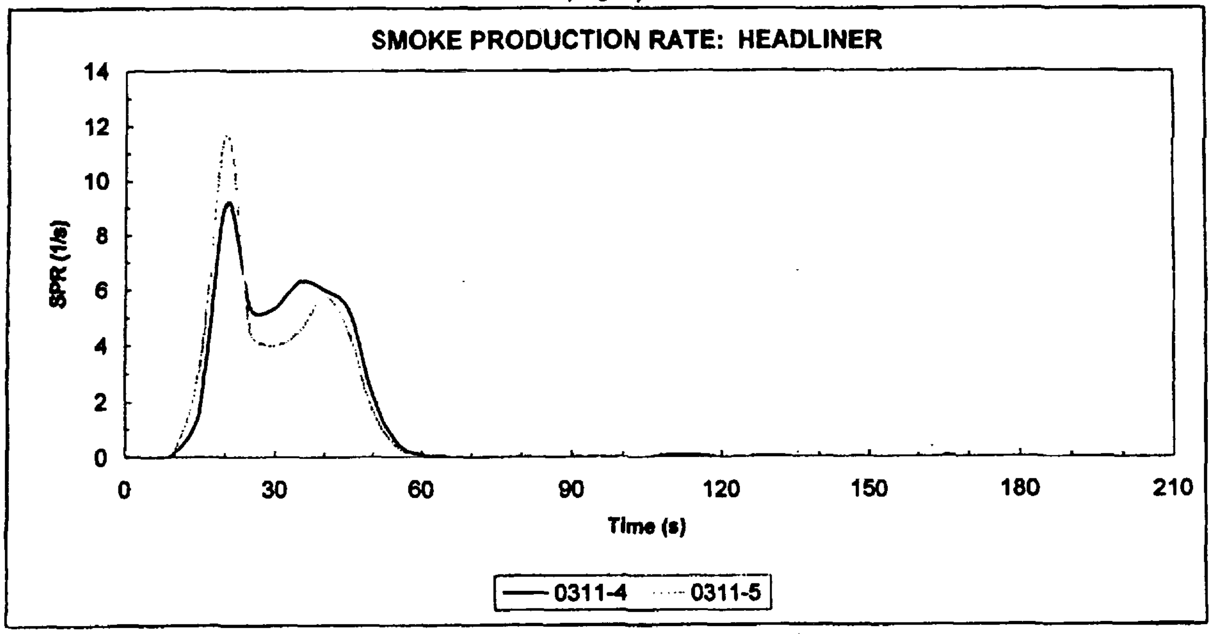
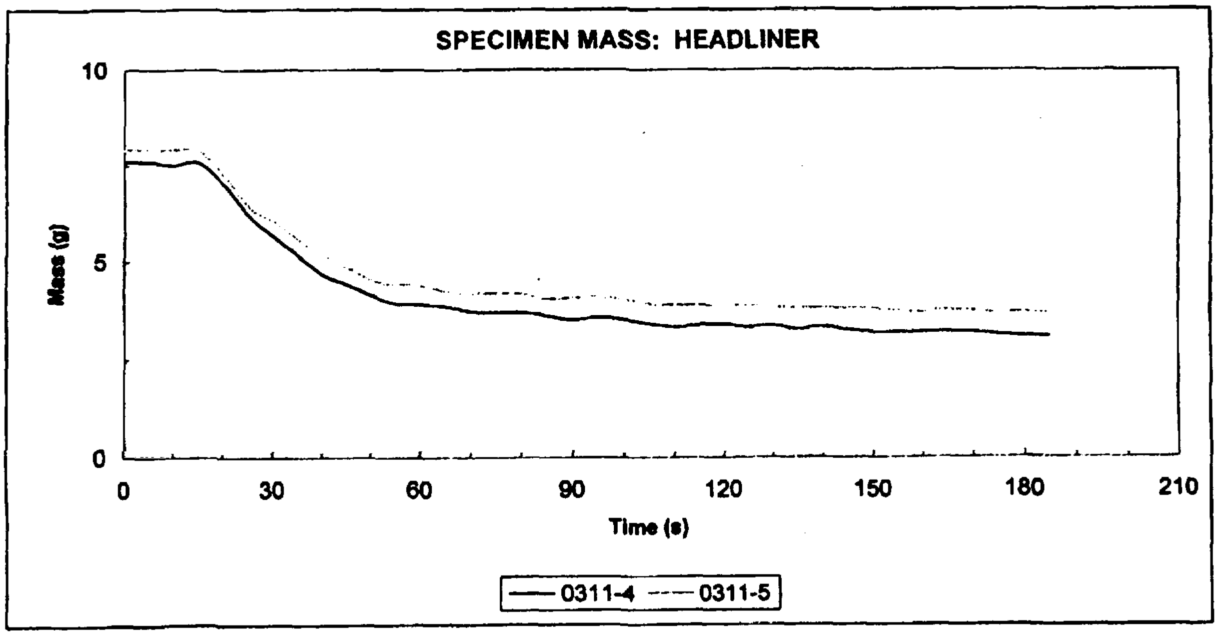




Notes & Observations:

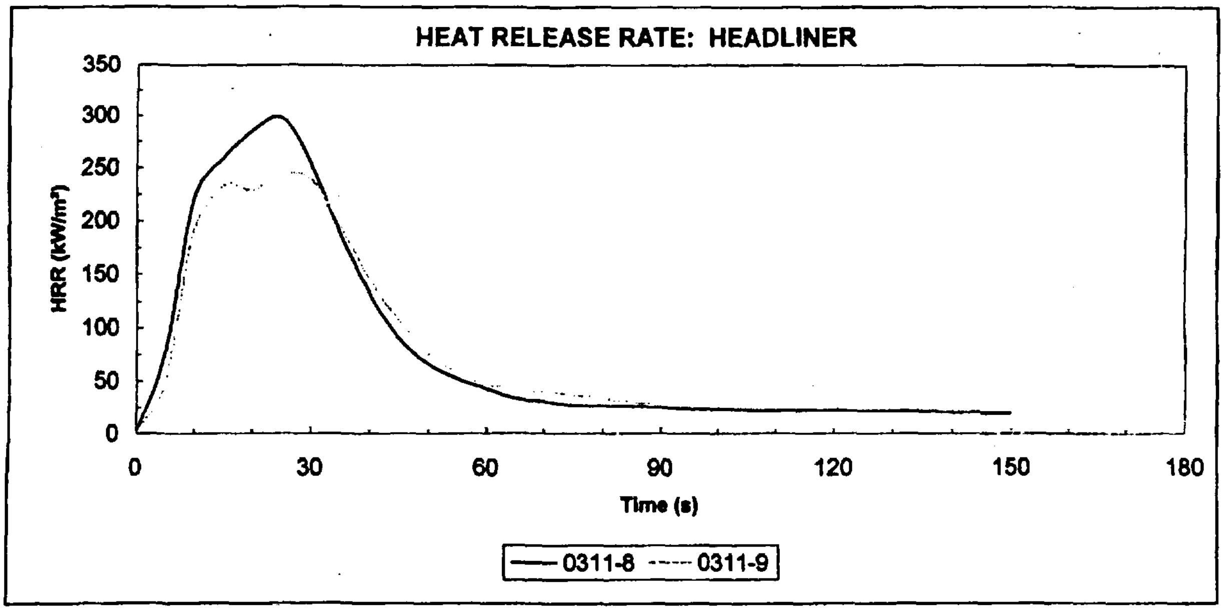
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Headliner
Part No.:	22619703	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0311-8	01/31/01	7	60	298	25	9.7	162	55	33	244
0311-9	01/31/01	7	78	245	25	9.8	151	55	33	218
Average		7	69	271	25	9.8	157	55	33	231

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
7.6	3.2	4.4	58.2	16.0	19.5	4.14	1	288	289	577
7.6	3.1	4.5	59.1	10.2	19.3	2.82	0	254	254	499
7.6	3.1	4.5	58.6	13.1	19.4	3.48	1	271	272	538



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client: General Motors
SwRI Project No: 18.03614.01
Material ID: Headliner
Heat Flux: 50 kW/m²

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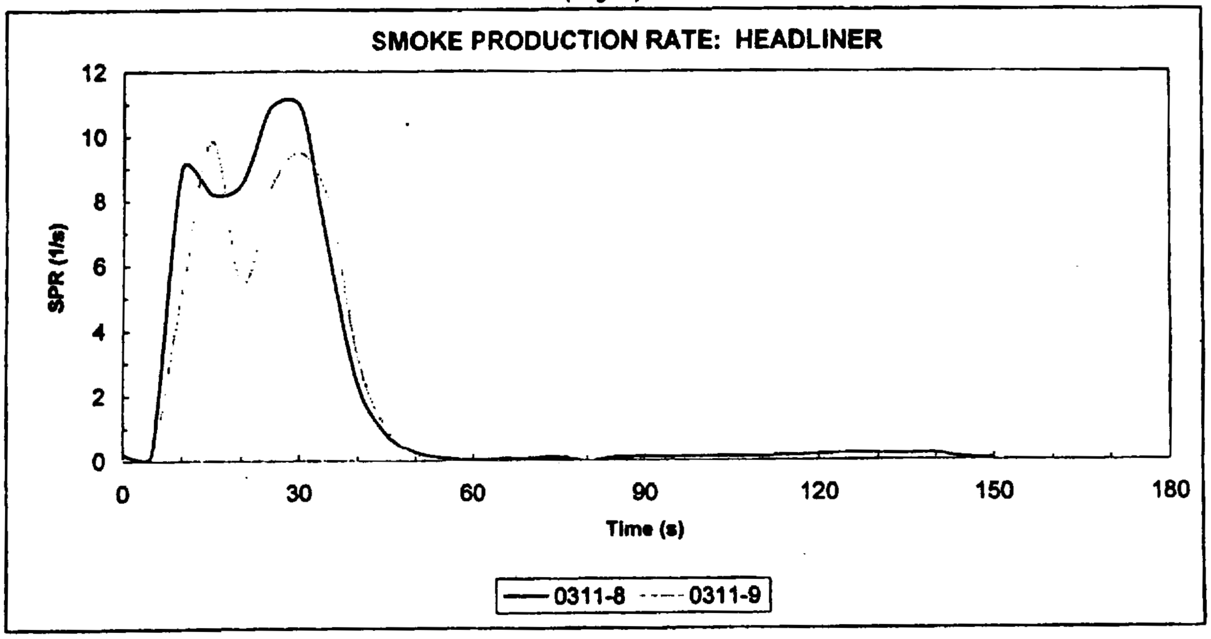
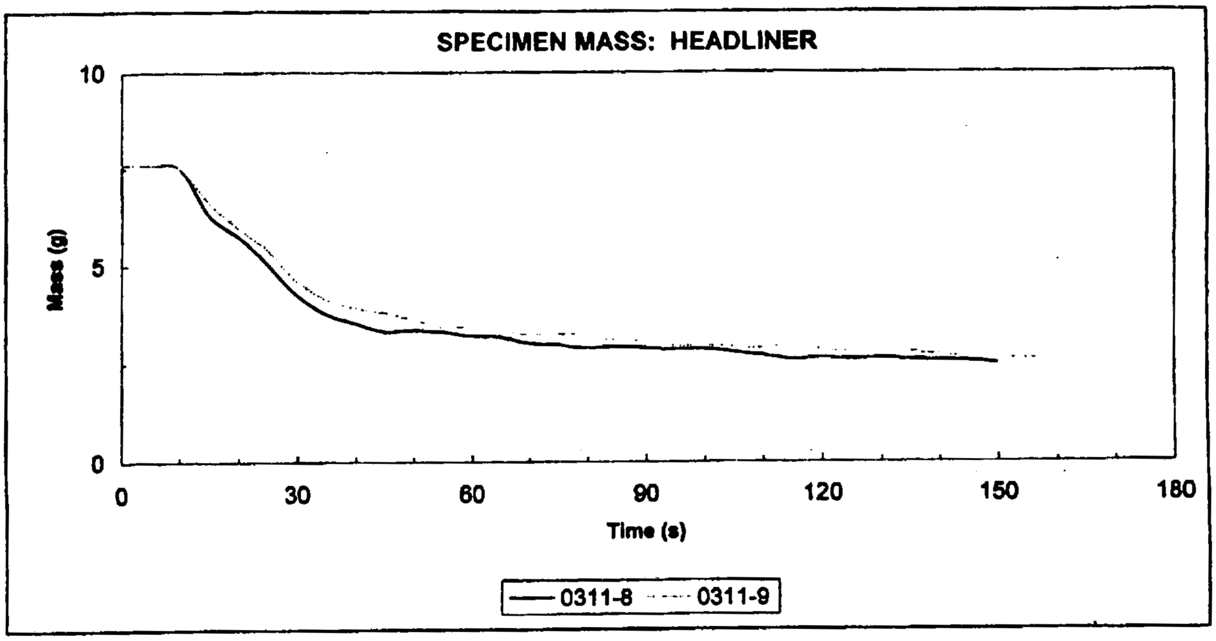




Notes & Observations:

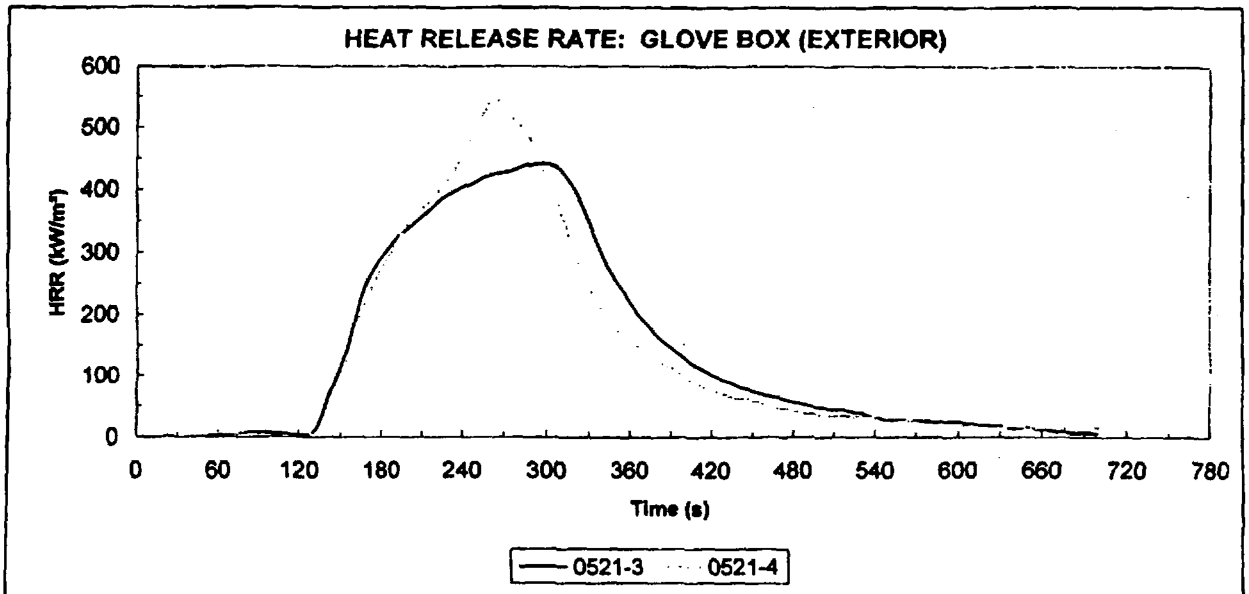
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Glove Box (Exterior)
Part Number:	22587440	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\,max}$ (kW/m²)
0521-3	02/21/01	124	493	443	295	94.1	155	318	284	440
0521-4	02/21/01	123	499	543	260	89.3	139	340	274	528
Average		124	496	493	278	91.7	147	329	279	484

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
28.5	8.5	20.1	70.4	8.1	41.5	1.01	6	619	625	273
25.0	6.1	18.8	75.1	8.7	42.0	1.26	26	765	790	360
26.8	7.3	19.4	72.8	8.4	41.7	1.14	16	692	708	316



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Glove Box (Exterior)
SwRI Project No:	18.03614.01	*Heat Flux:*	20 kW/m²

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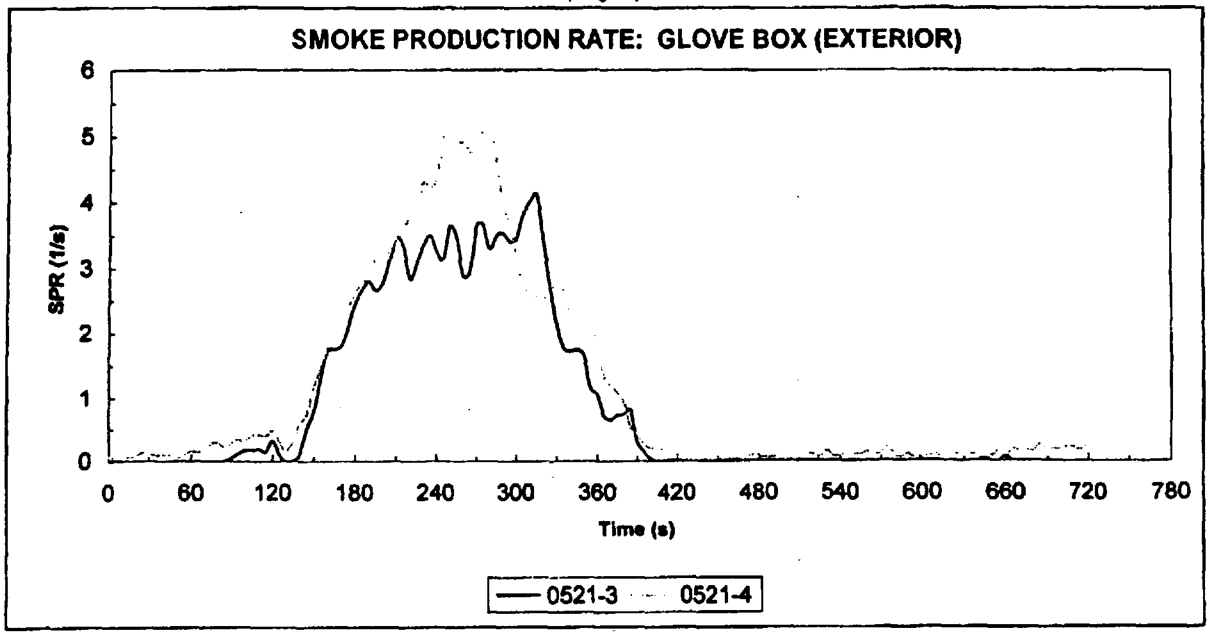
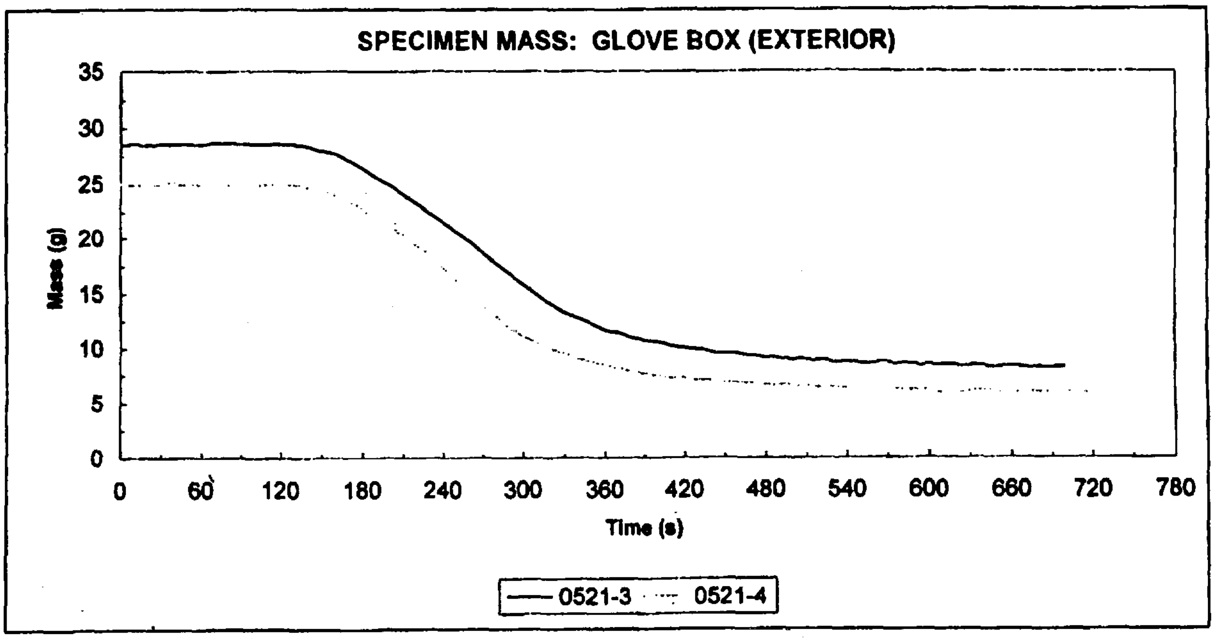




Notes & Observations:

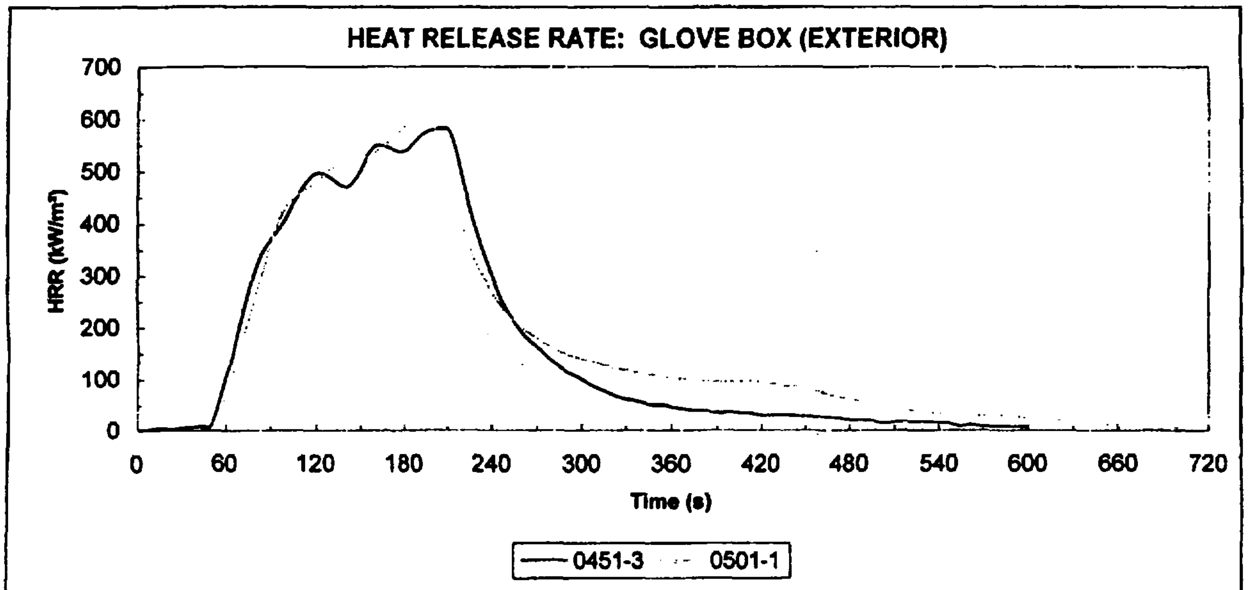
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Glove Box (Exterior)
Part Number:	22587440	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\ max}$ (kW/m²)
0451-3	02/14/01	43	473	584	205	101.2	237	427	319	573
0501-1	02/19/01	45	563	613	190	113.8	212	418	322	594
Average		44	518	598	198	107.5	225	423	321	583

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
27.4	6.2	21.2	77.2	10.6	42.3	1.92	4	997	1000	416
29.4	5.7	23.6	80.2	7.8	42.7	2.03	6	1240	1246	465
28.4	6.0	22.4	78.7	9.2	42.5	1.98	5	1119	1123	441



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Glove Box (Exterior)
SwRI Project No:	18.03614.01	*Heat Flux:*	35 kW/m²

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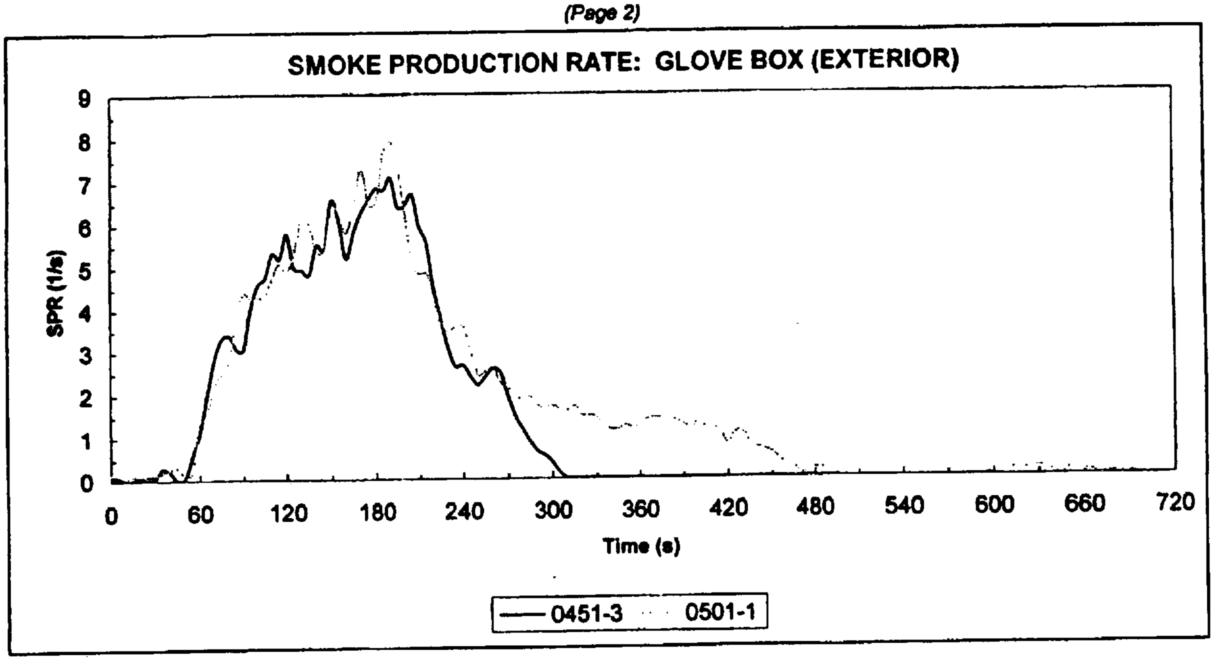
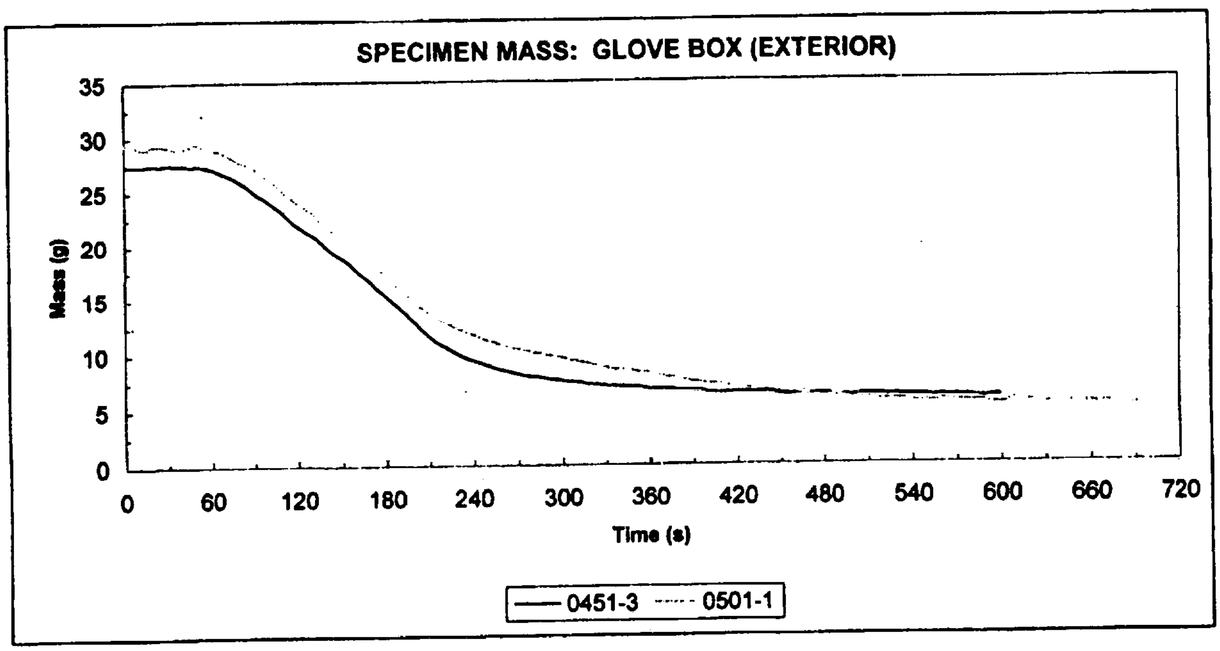




Notes & Observations:

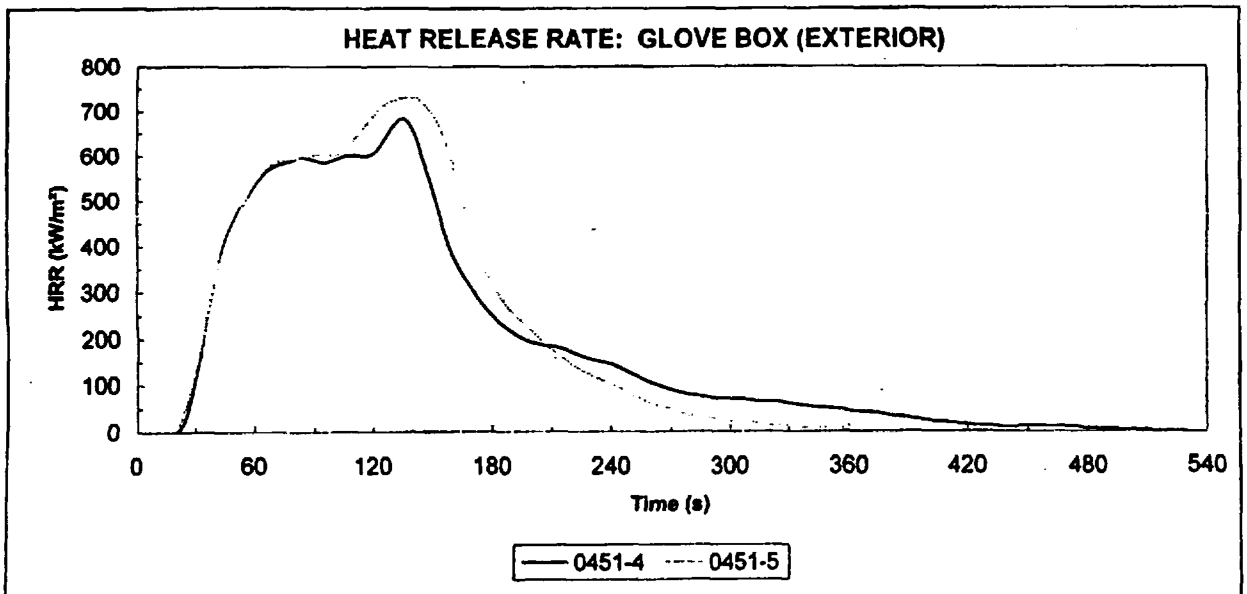
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Glove Box (Exterior)
Part Number:	22587440	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\ max}$ (kW/m²)
0451-4	02/14/01	23	423	684	135	99.4	433	455	318	641
0451-5	02/14/01	22	344	731	140	100.2	389	500	333	719
Average		22	384	708	138	99.8	411	478	325	680

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
27.1	5.4	21.7	80.2	10.1	40.4	2.85	2	1283	1285	522
25.5	4.1	21.5	84.3	13.9	41.2	3.59	1	1327	1328	546
26.3	4.8	21.6	82.3	12.0	40.8	3.22	1	1305	1306	534



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Glove Box (Exterior)
SwRI Project No:	18.03614.01	*Heat Flux:*	50 kW/m²

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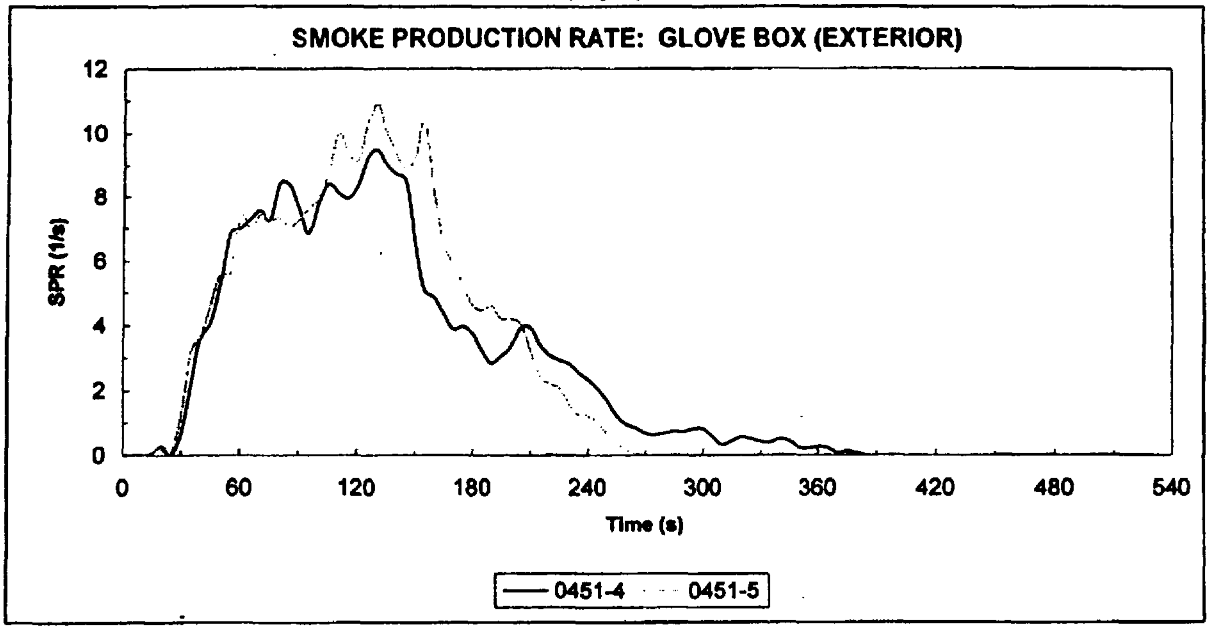
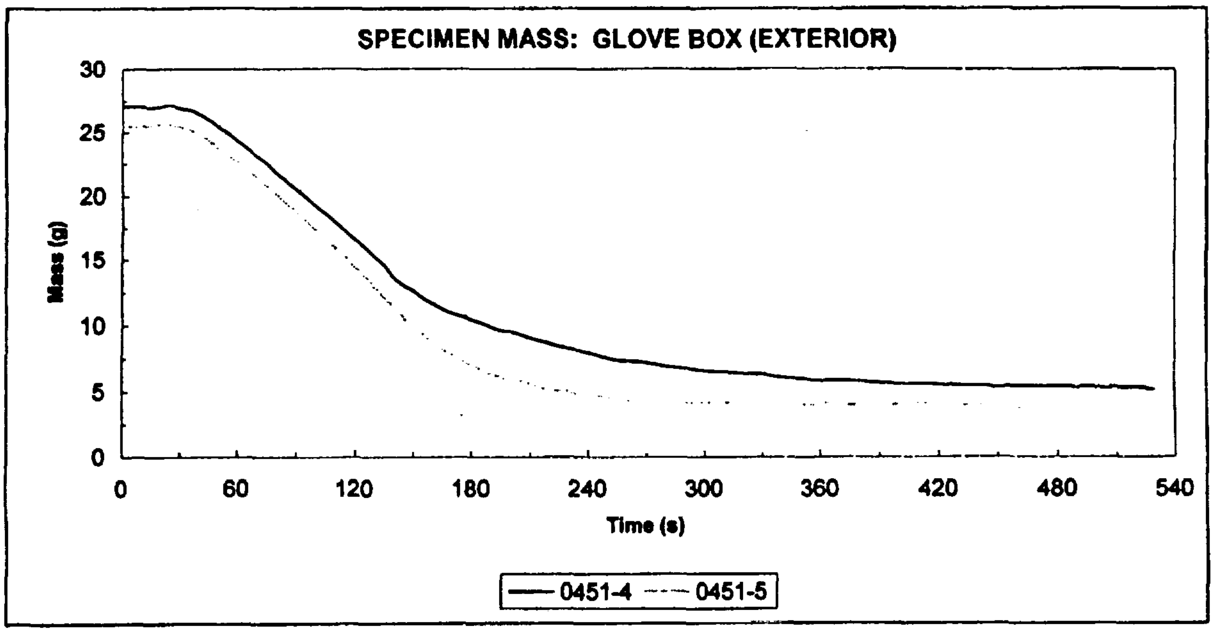




Notes & Observations:

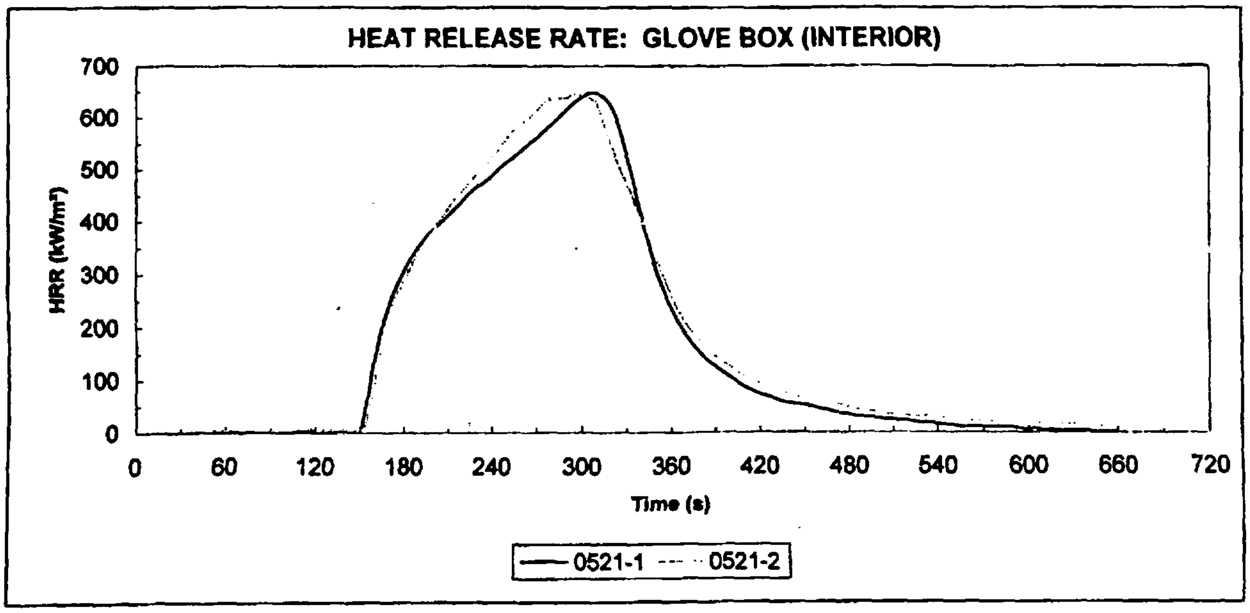
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Glove Box (Interior)
Part Number:	22587440	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,max}$ (kW/m²)
0521-1	02/21/01	152	427	647	305	106.7	273	458	345	637
0521-2	02/21/01	154	430	646	295	111.2	294	475	355	639
Average		153	428	647	300	108.9	283	466	350	638

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
32.8	3.1	29.4	89.7	16.1	32.1	5.81	9	3389	3399	1019
32.2	3.1	29.0	90.1	15.9	33.9	5.83	26	3416	3442	1041
32.5	3.1	29.2	89.9	16.0	33.0	5.82	18	3403	3420	1030



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Glove Box (Interior)
SwRI Project No:	18.03614.01	*Heat Flux:*	20 kW/m²

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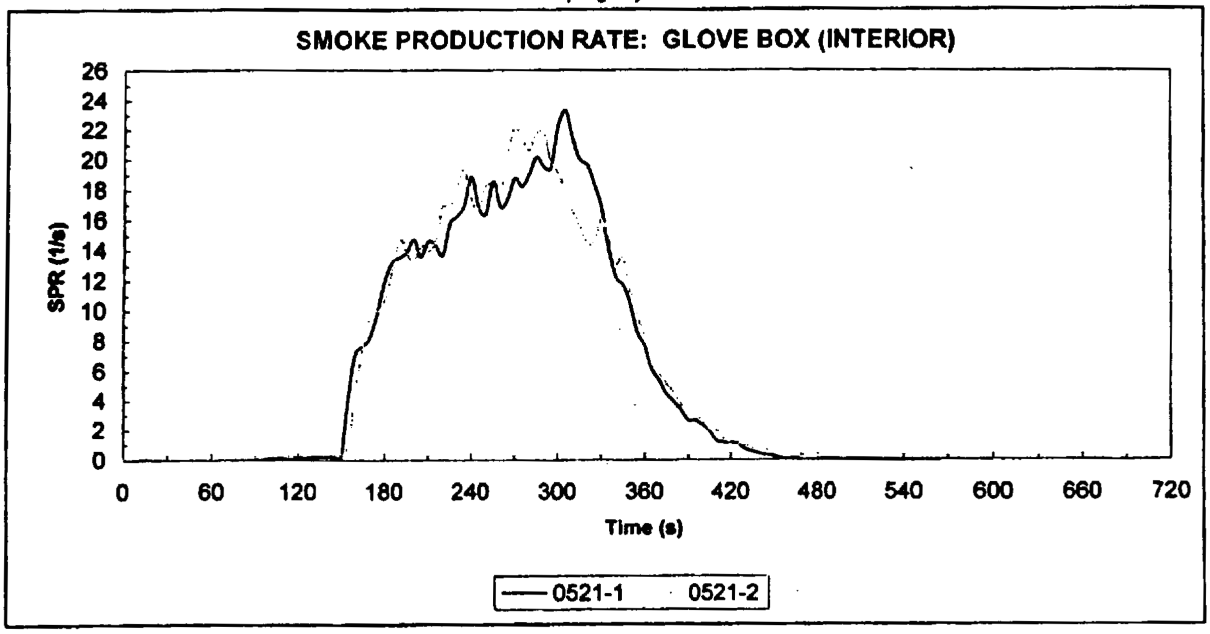
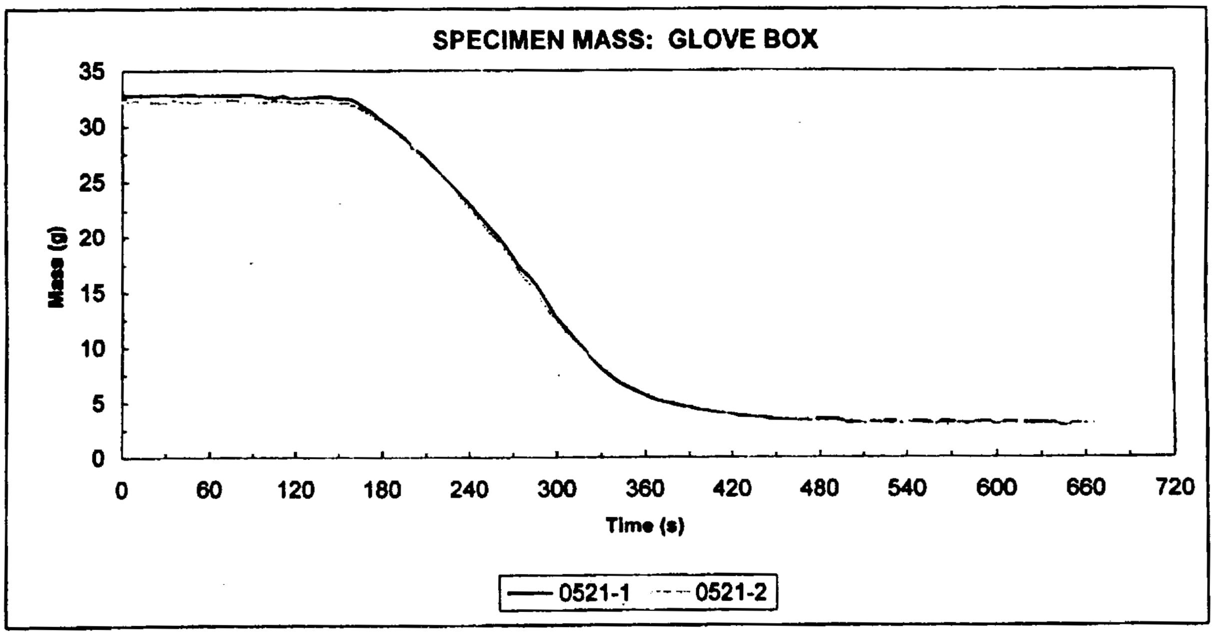




Notes & Observations:

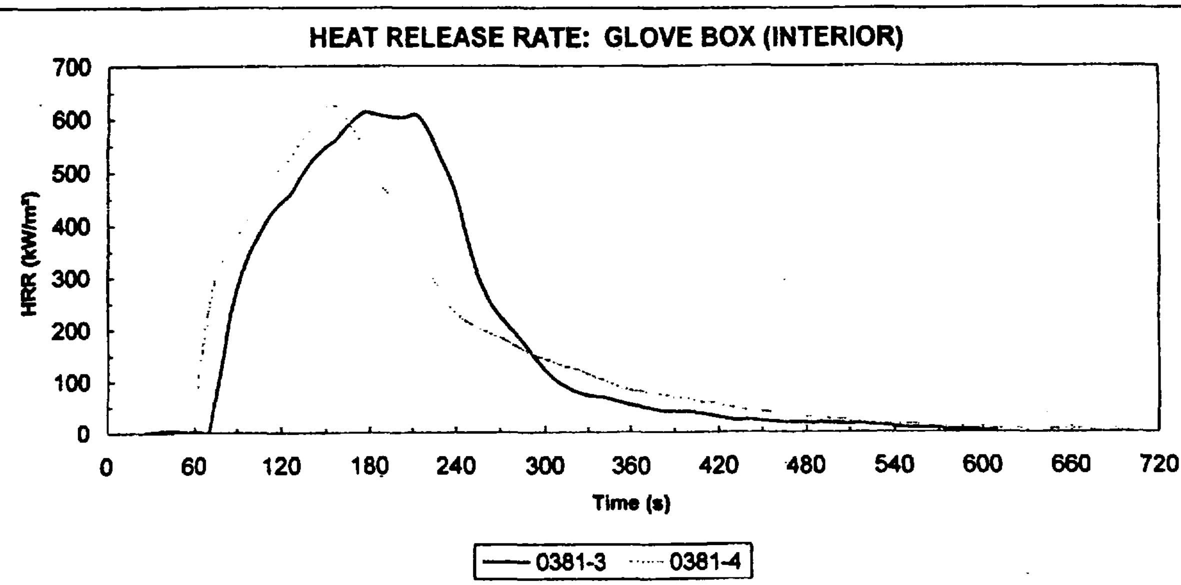
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Glove Box (Interior)
Part No.:	22587440	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\,max}$ (kW/m²)
0381-3	02/07/01	73	456	613	175	105.6	356	484	339	608
0381-4	02/07/01	61	556	626	150	105.8	363	438	322	608
Average		67	506	620	163	105.7	359	461	331	608

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
32.7	1.0	31.8	97.1	16.9	29.4	7.06	19	3759	3778	1046
33.3	1.1	32.0	96.2	12.9	29.2	6.25	12	3864	3876	1066
33.0	1.1	31.9	96.7	14.9	29.3	6.66	16	3812	3827	1056



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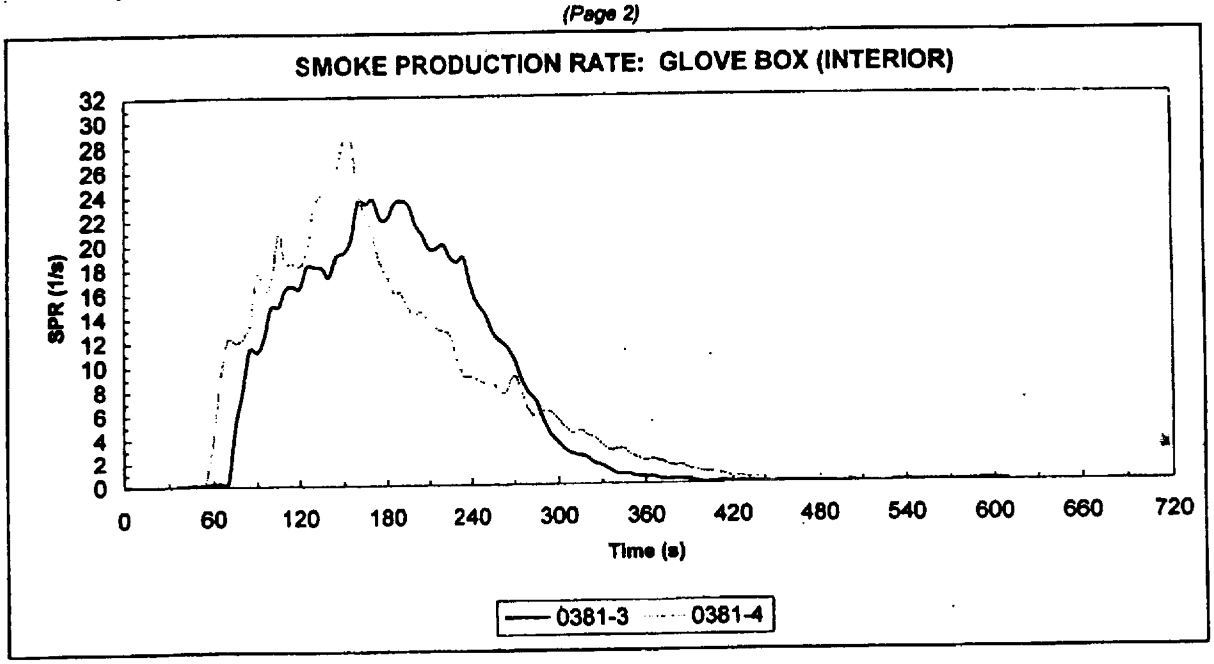
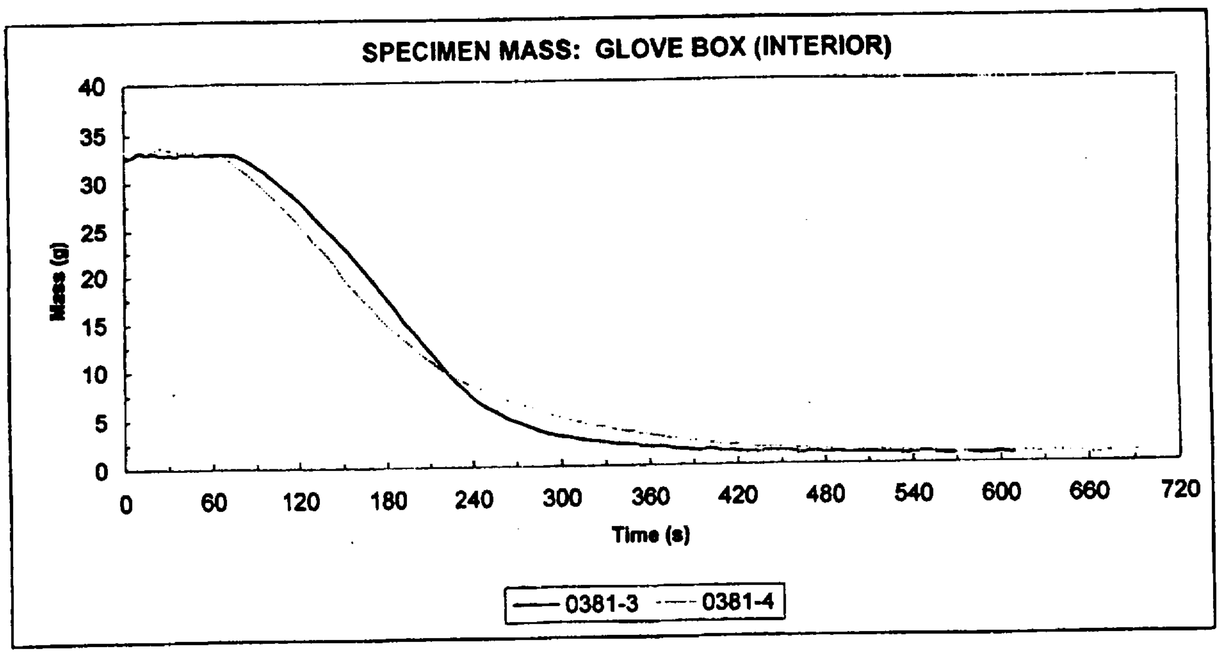
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Glove Box (Interior)
SwRI Project No:	18.03614.01	*Heat Flux:*	35 kW/m²

(Page 2)





Notes & Observations:

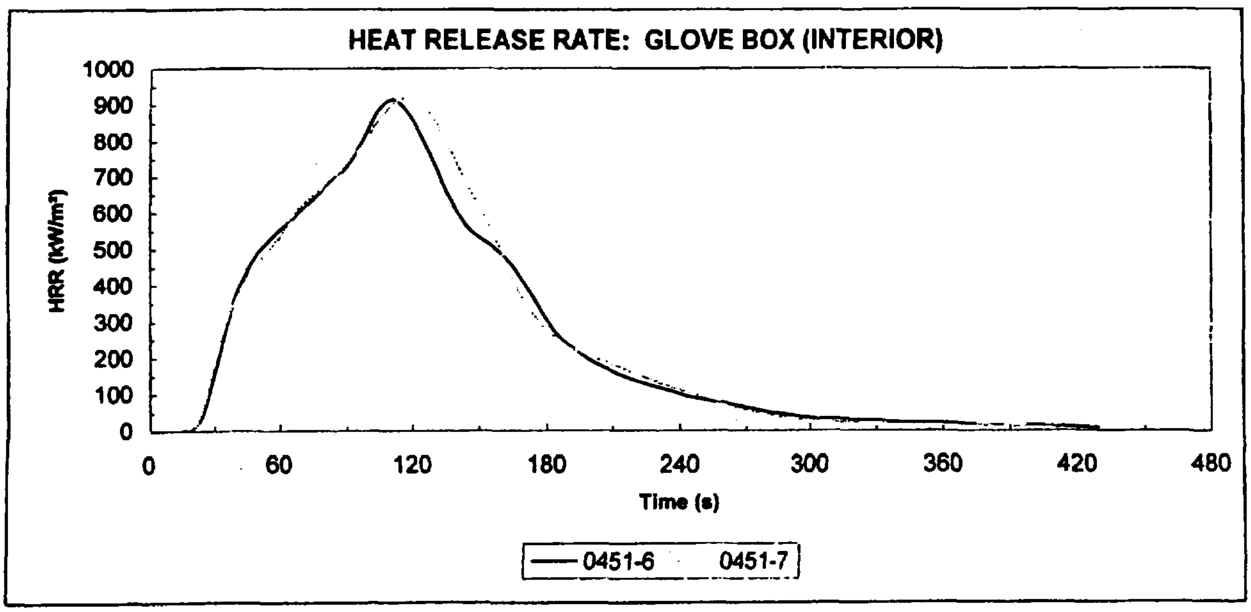
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Glove Box (Interior)
Part Number:	22587440	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0451-6	02/14/01	23	323	915	110	106.9	474	538	355	866
0451-7	02/14/01	23	301	918	115	109.5	472	554	365	888
Average		23	312	916	113	108.2	473	546	360	877

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
32.8	0.7	32.2	98.1	21.6	29.4	11.76	8	4107	4115	1128
33.4	0.4	32.7	97.8	21.1	29.6	13.06	9	4303	4311	1165
33.1	0.5	32.4	98.0	21.3	29.5	12.41	9	4205	4213	1146



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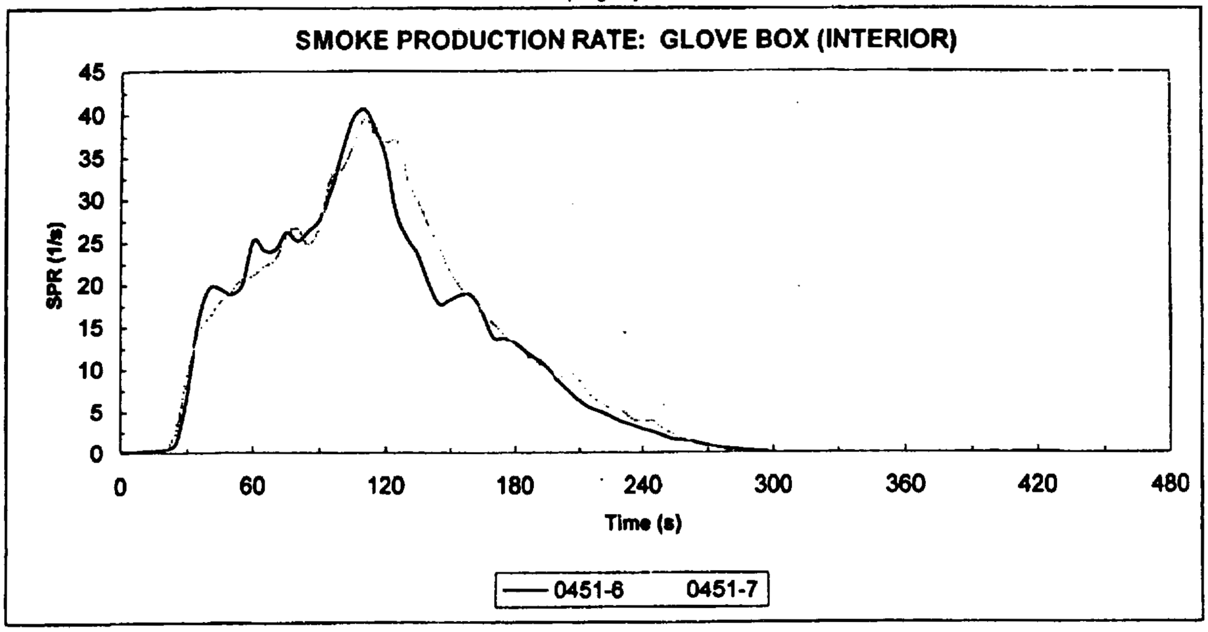
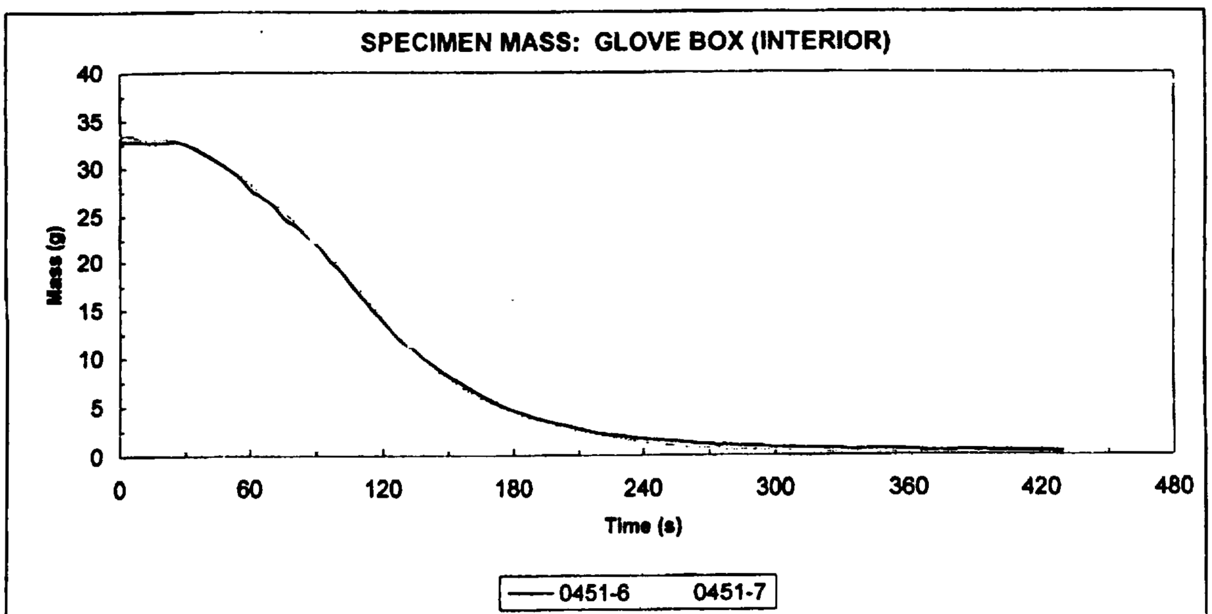
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client: General Motors
SwRI Project No: 18.03614.01
Material ID: Glove Box (Interior)
Heat Flux: 50 kW/m²

(Page 2)





Notes & Observations:
Foil under sample burned away at the center, intense flaming.

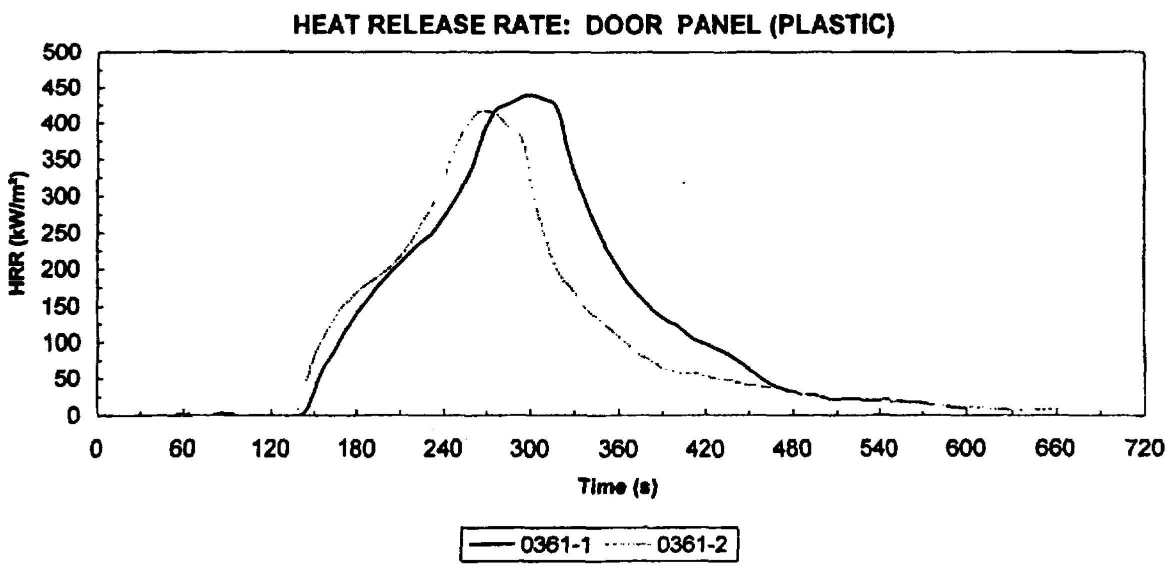
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Door Panel (Plastic)
Part No.:	22618443	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0361-1	02/05/01	130	390	440	300	71.4	73	236	225	435
0361-2	02/05/01	134	437	418	265	61.4	120	253	192	410
Average		132	414	429	283	66.4	97	245	208	423

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
29.2	13.9	15.5	52.9	7.0	40.9	1.25	31	626	657	358
28.5	15.6	12.7	44.6	5.8	42.7	0.76	5	431	437	300
28.9	14.7	14.1	48.8	6.4	41.8	1.01	18	529	547	329



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client: General Motors
SwRI Project No: 18.03614.01
Material ID: Door Panel (Plastic)
Heat Flux: 20 kW/m²

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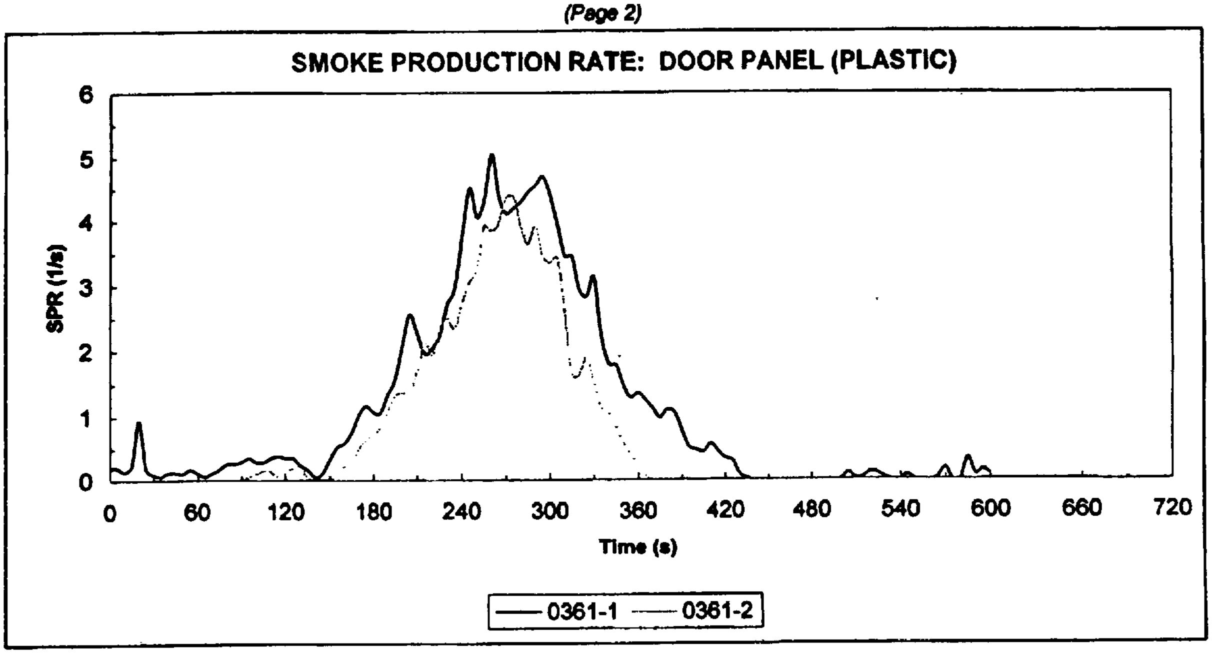
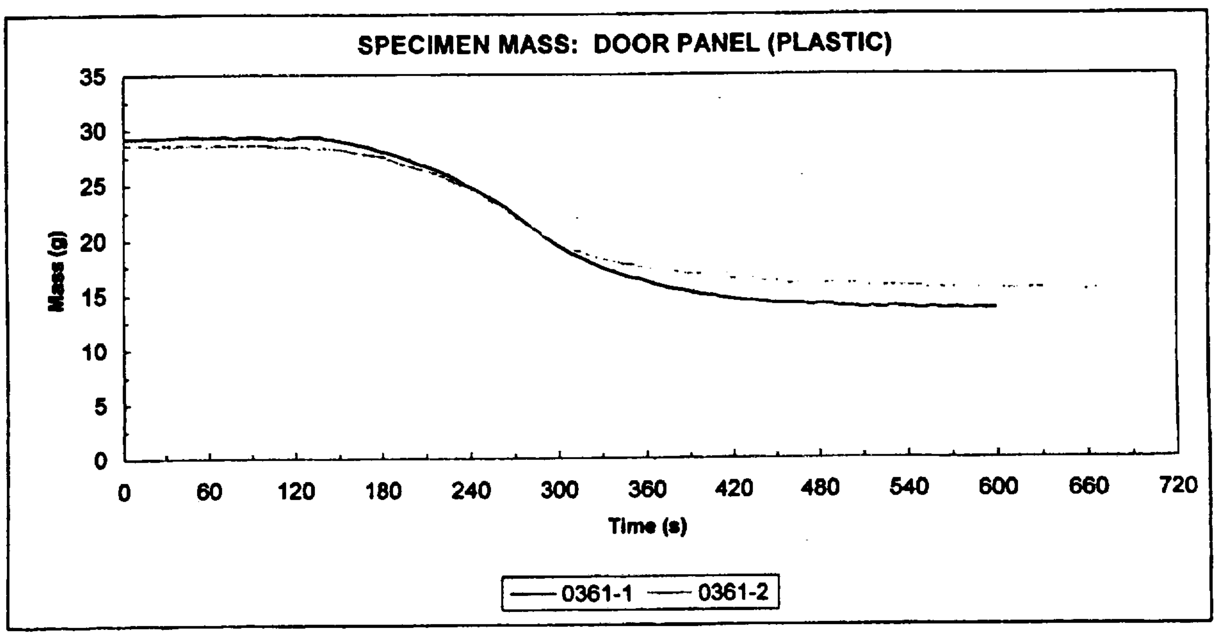




Notes & Observations:
Sample was observed to drip from the sample holder during both tests.

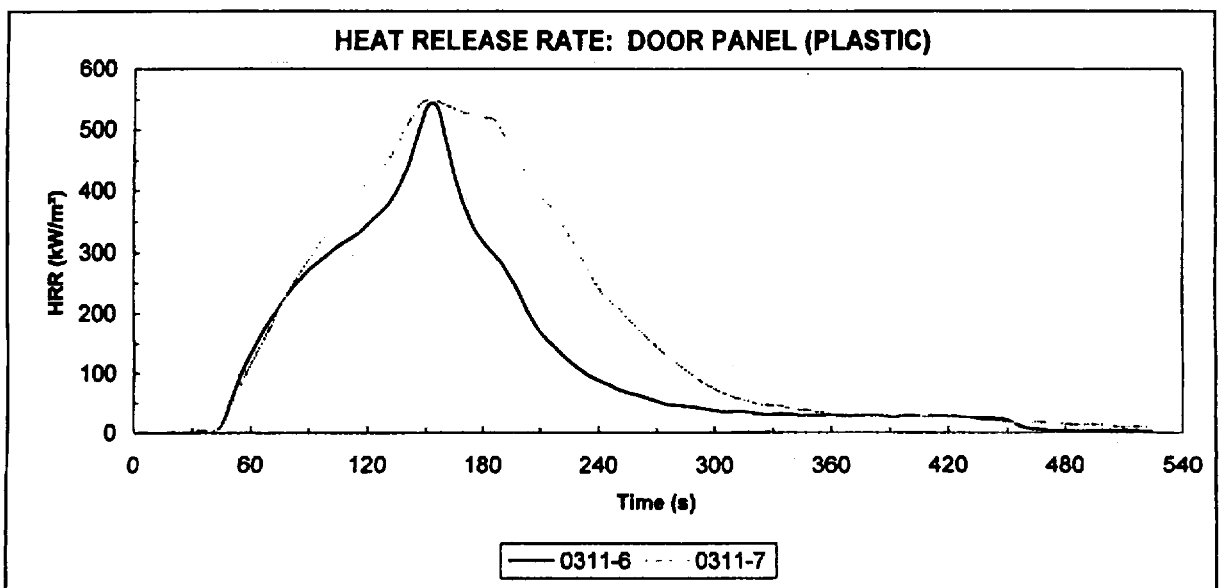
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Door Panel (Plastic)
Part No.:	22618443	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0311-6	01/31/01	42	402	540	150	61.2	172	285	194	485
0311-7	01/31/01	44	406	550	150	86.3	199	376	278	539
Average		43	404	545	150	73.7	185	331	236	512

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
31.0	14.4	16.5	53.4	5.4	32.7	1.25	4	558	563	299
28.5	8.0	20.4	71.7	7.5	37.3	1.61	3	730	732	316
29.8	11.2	18.5	62.5	6.5	35.0	1.43	3	644	648	307



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client: General Motors
SwRI Project No: 18.03614.01
Material ID: Door Panel (Plastic)
Heat Flux: 35 kW/m²

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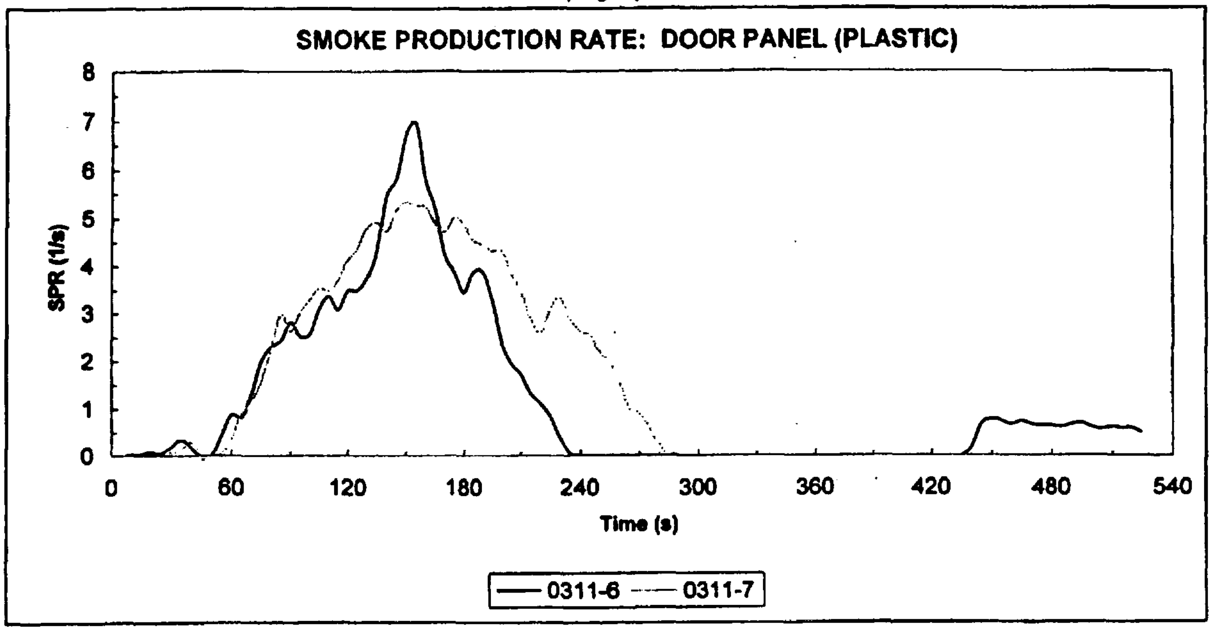
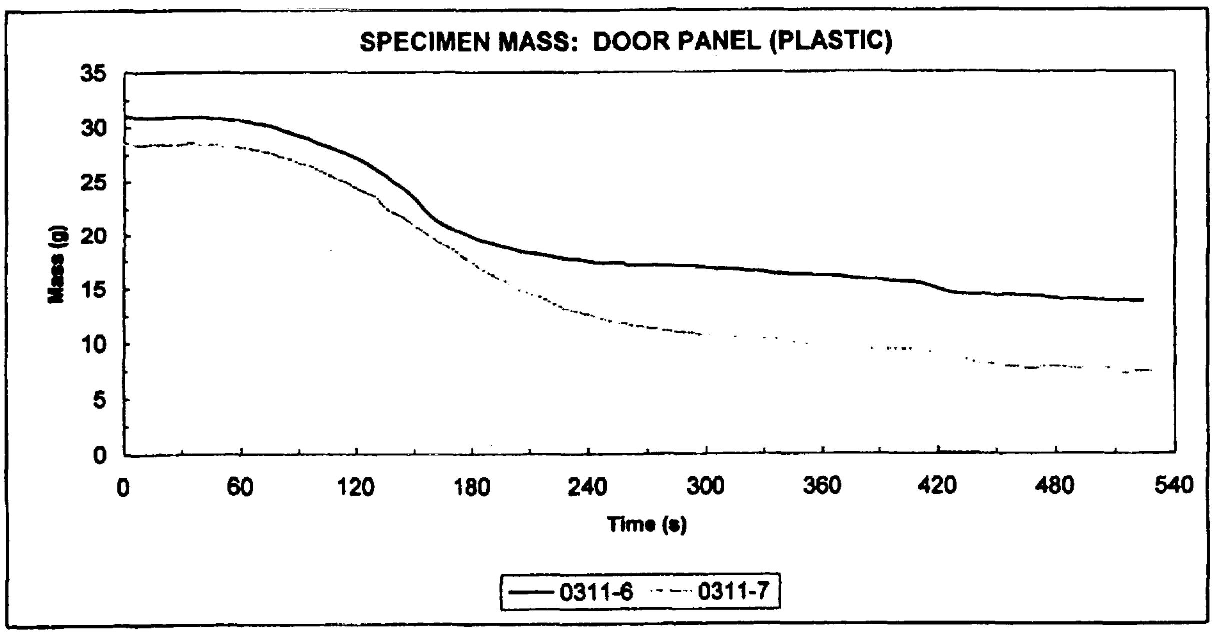




Notes & Observations:
0311-6: Sample was observed dripping from specimen holder.

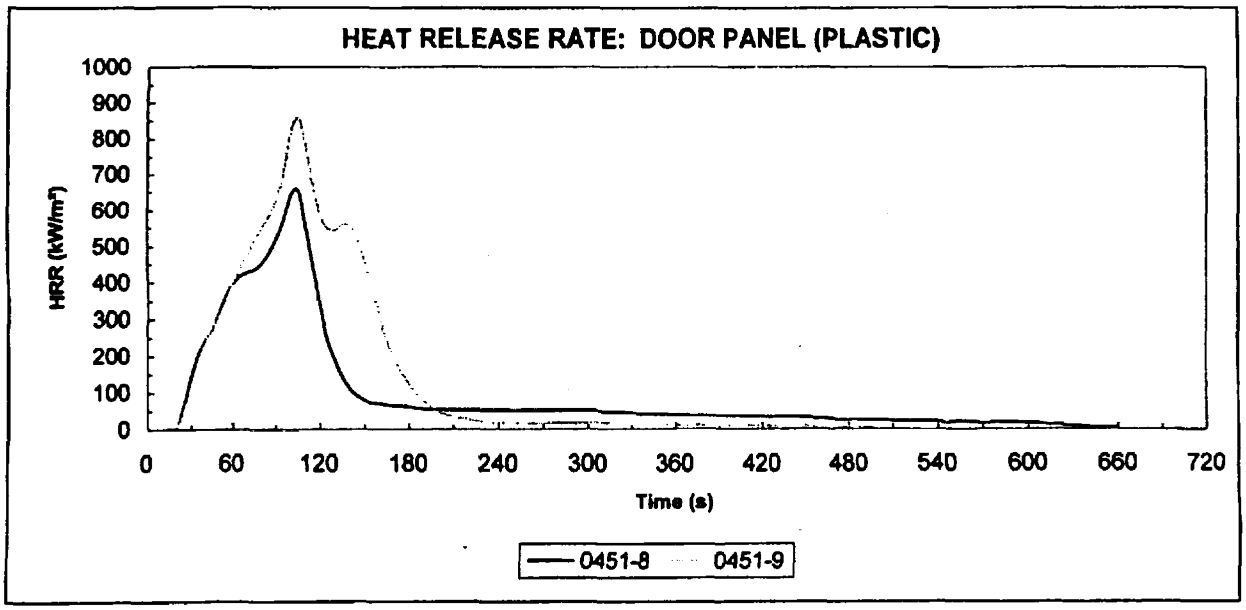
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Door Panel (Plastic)
Part Number:	22618443	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0451-8	02/14/01	21	560	655	105	61.3	292	262	178	569
0451-9	02/14/01	21	398	858	105	75.8	304	401	249	740
Average		21	479	757	105	68.5	298	331	213	655

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
31.7	9.4	22.2	69.9	7.7	24.4	0.73	0	424	424	169
28.8	3.4	25.3	87.7	8.8	26.5	1.60	1	678	679	237
30.3	6.4	23.7	78.8	8.3	25.5	1.16	1	551	551	203



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Door Panel (Plastic)
SwRI Project No:	18.03614.01	*Heat Flux:*	50 kW/m²

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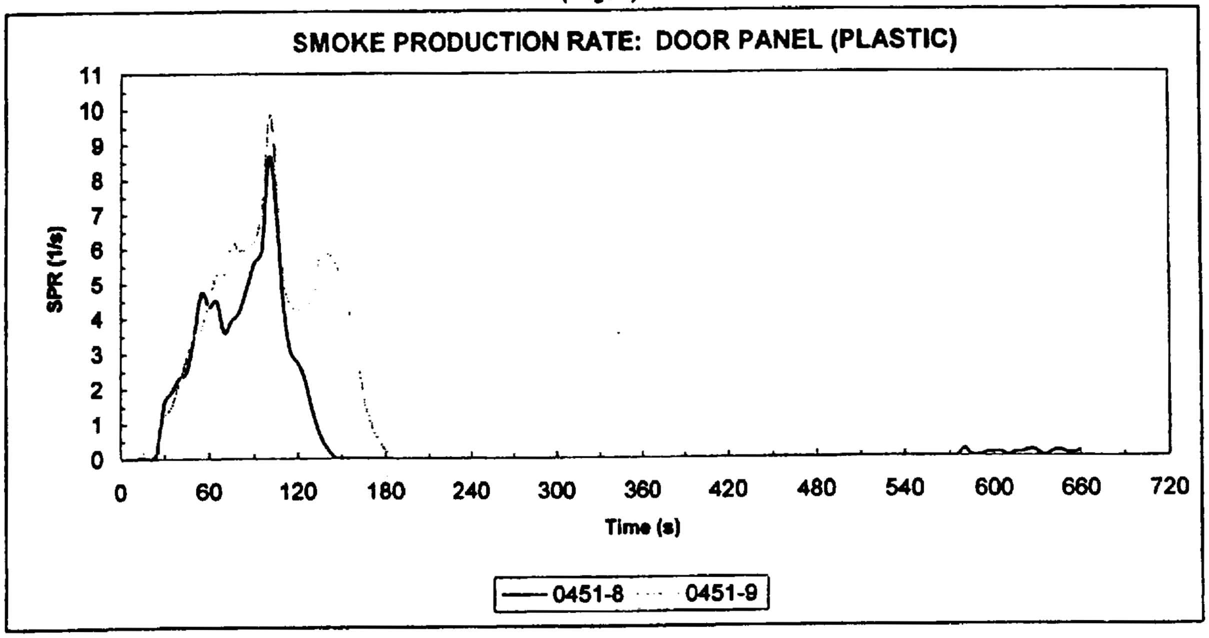
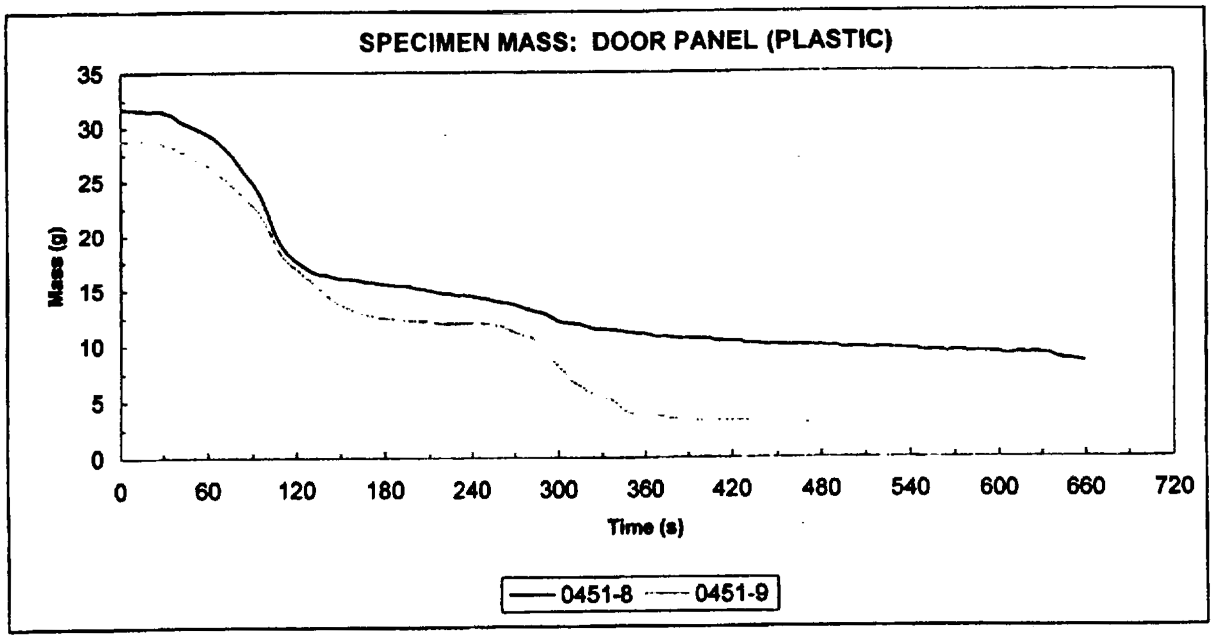




Notes & Observations:

Sample dripped outside of the sample holder for both tests.

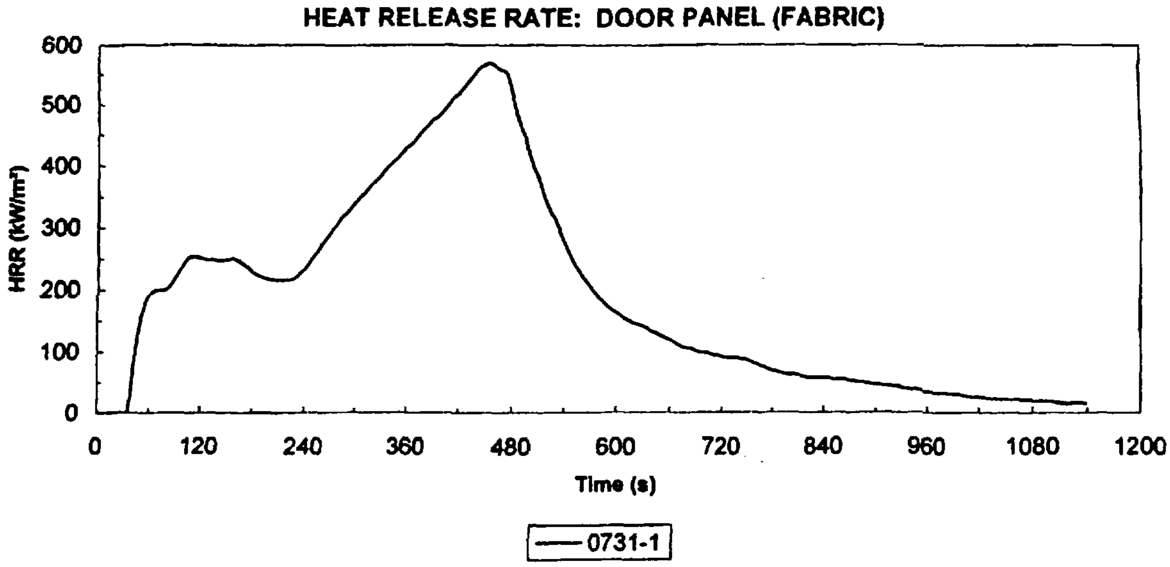
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Door Panel (Fabric)
Part No.:	22618443	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0731-1	03/14/01	43	1012	571	455	214.0	199	224	260	565
Average		43	1012	571	455	214.0	199	224	260	565

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
52.3	3.2	48.8	93.2	8.7	38.8	2.34	40	2441	2481	443
52.3	3.2	48.8	93.2	8.7	38.8	2.34	40	2441	2481	443



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Door Panel (Fabric)
SwRI Project No:	18.03614.01	*Heat Flux:*	35 kW/m²

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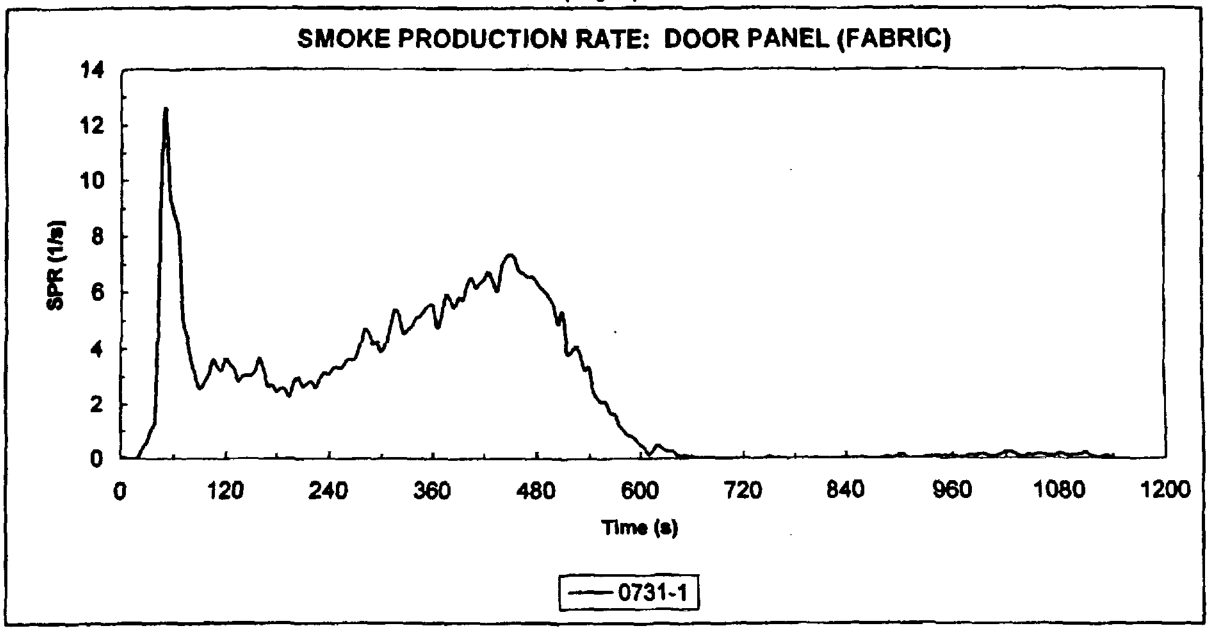
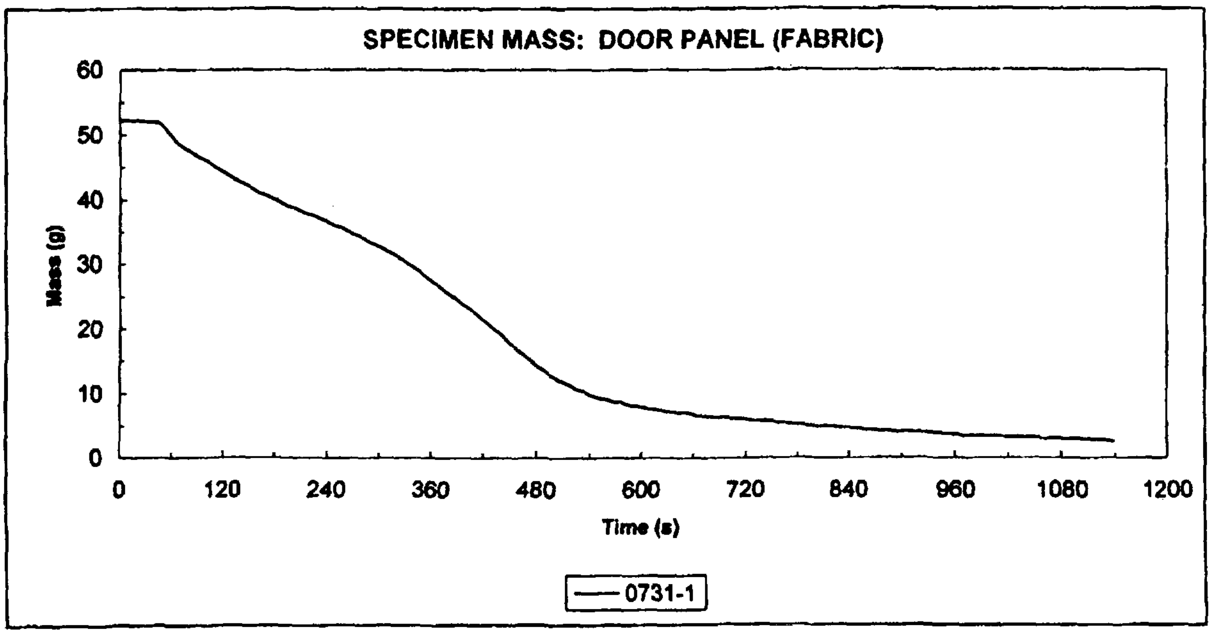




Notes & Observations:

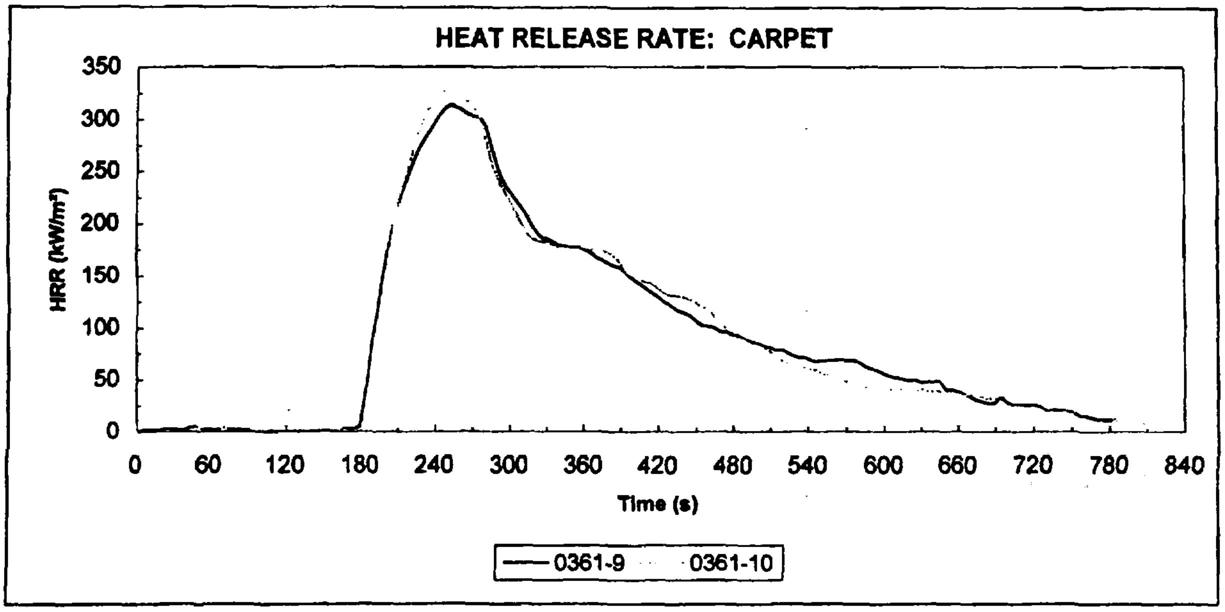
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Carpet
Part No.:	22628609	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\,max}$ (kW/m²)
0361-9	02/05/01	171	533	313	250	69.5	146	215	185	308
0361-10	02/05/01	173	561	331	250	69.6	171	221	190	325
Average		172	547	322	250	69.5	159	218	187	317

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
42.5	20.1	22.2	52.2	6.6	27.7	1.13	13	788	801	314
44.2	20.7	23.4	52.8	6.4	26.3	1.06	4	781	786	296
43.4	20.4	22.8	52.5	6.5	27.0	1.09	9	785	793	305



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Carpet
SwRI Project No:	18.03614.01	*Heat Flux:*	20 kW/m²

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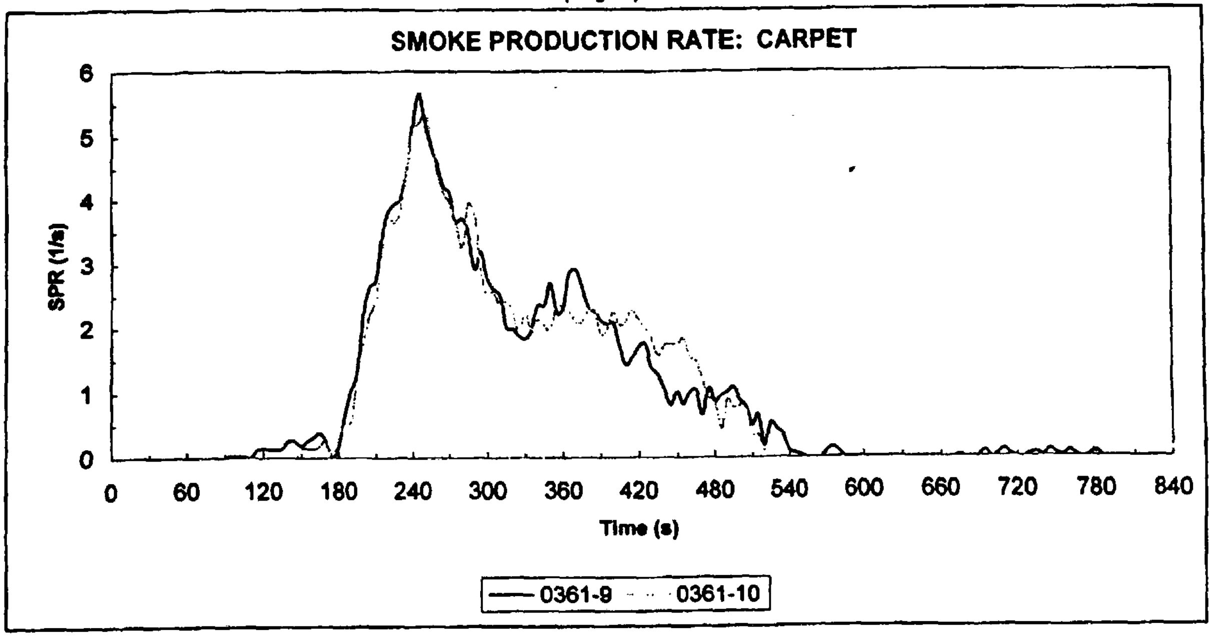
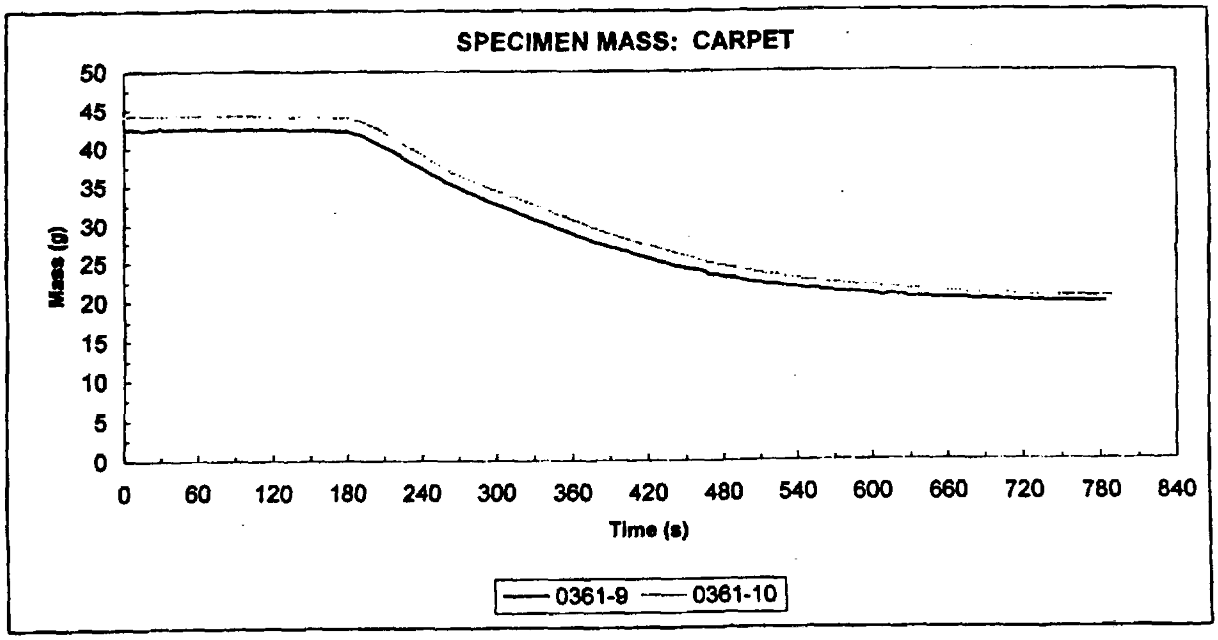




Notes & Observations:
Samples were 20 mm in thickness.

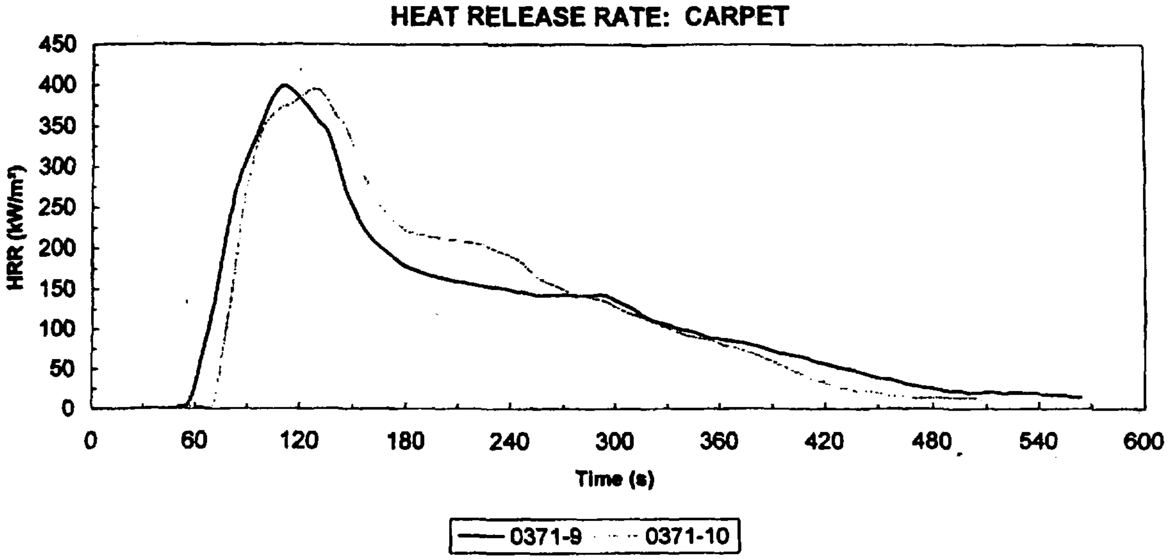
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Carpet
Part No.:	22628609	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\,max}$ (kW/m²)
0371-9	02/06/01	58	426	399	110	64.5	277	235	192	383
0371-10	02/06/01	65	368	395	130	64.5	256	255	203	383
Average		62	397	397	120	64.5	266	245	197	383

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
39.8	18.0	21.8	54.7	7.4	26.2	1.82	4	886	890	360
38.8	17.4	21.4	55.2	8.6	26.6	2.06	5	900	905	372
39.3	17.7	21.6	55.0	8.0	26.4	1.94	4	893	897	366



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Carpet
SwRI Project No:	18.03614.01	*Heat Flux:*	35 kW/m²

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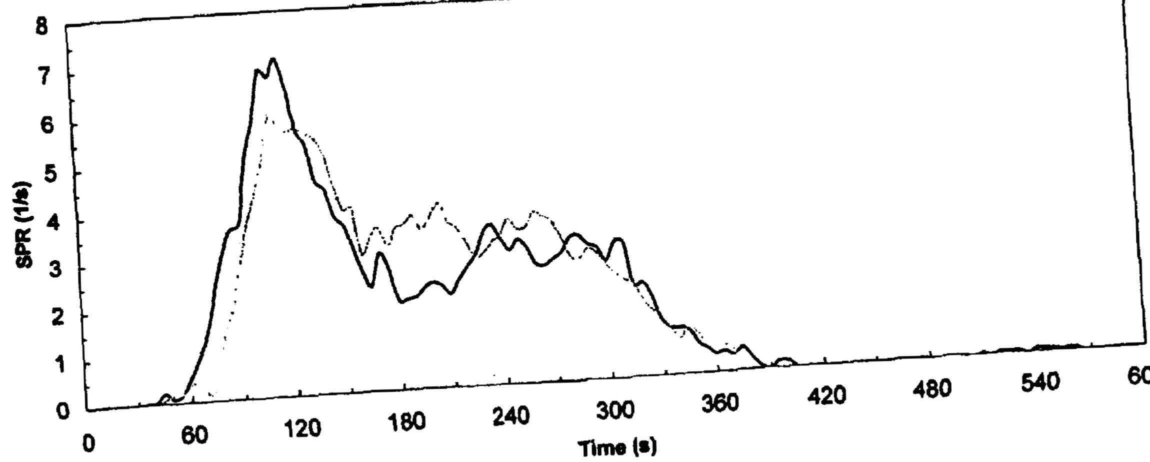
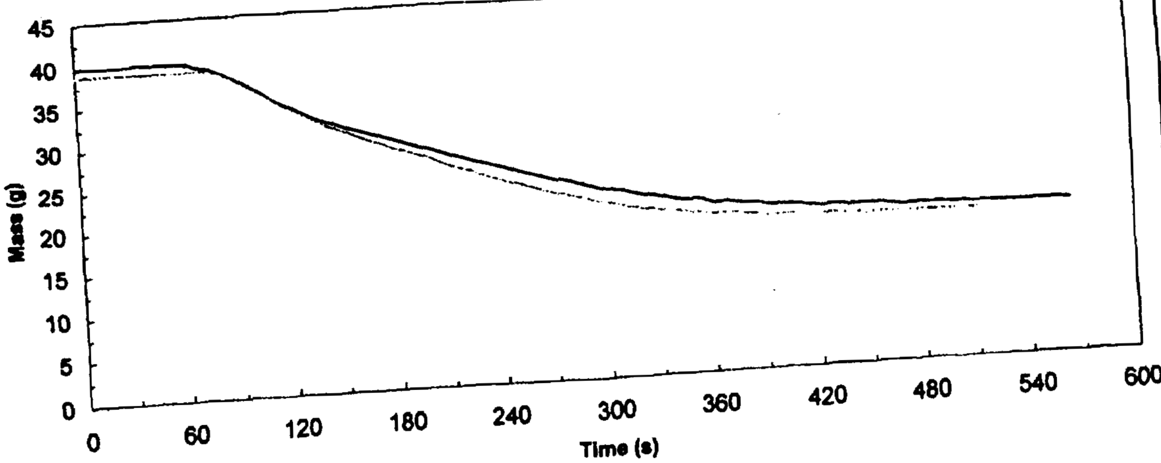
SMOKE PRODUCTION RATE: CARPET



SPECIMEN MASS: CARPET



Notes & Observations:
Samples curled and bent upwards at 40 secs.

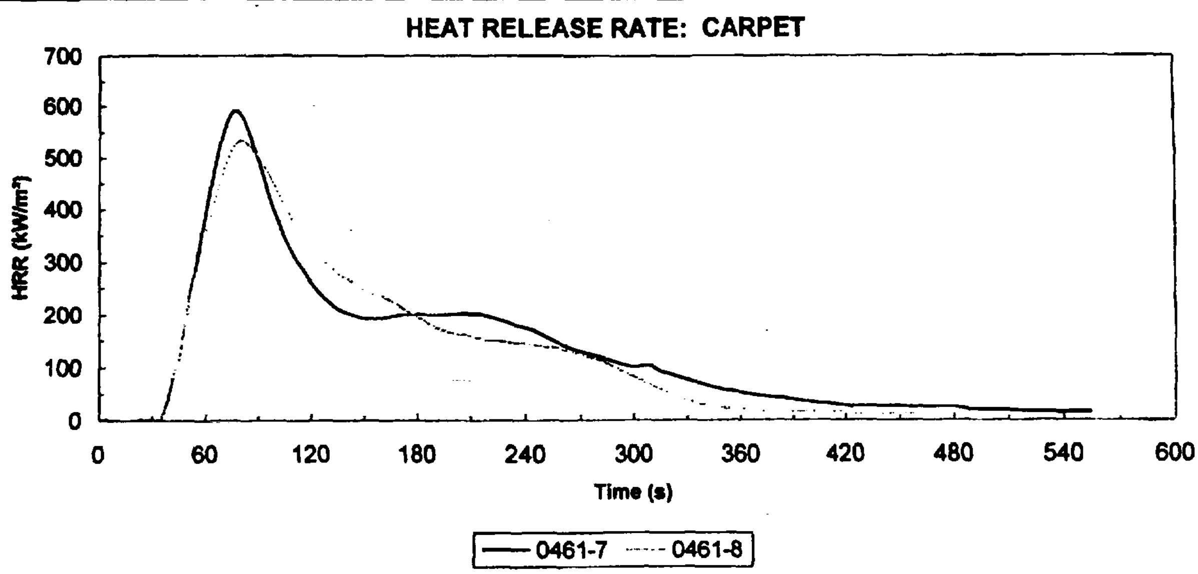
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Carpet
Part Number:	22628609	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0461-7	02/15/01	35	437	590	75	72.1	380	282	223	536
0461-8	02/15/01	34	342	534	80	66.3	354	291	218	501
Average		34	390	562	78	69.2	367	286	220	519

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
43.5	19.6	23.8	54.6	9.3	26.8	2.33	2	1106	1108	412
40.5	17.6	22.9	56.6	10.4	25.6	3.23	7	1219	1226	470
42.0	18.6	23.3	55.6	9.9	26.2	2.78	4	1163	1167	441



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client: General Motors
SwRI Project No: 18.03614.01
Material ID: Carpet
Heat Flux: 50 kW/m²

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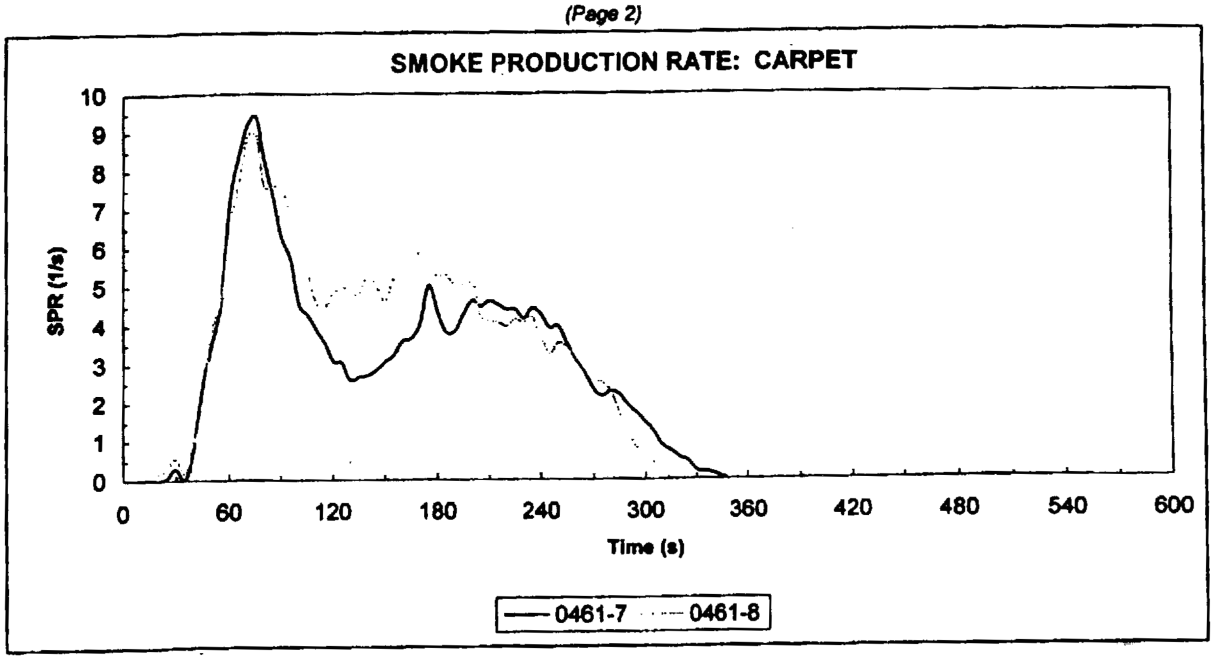
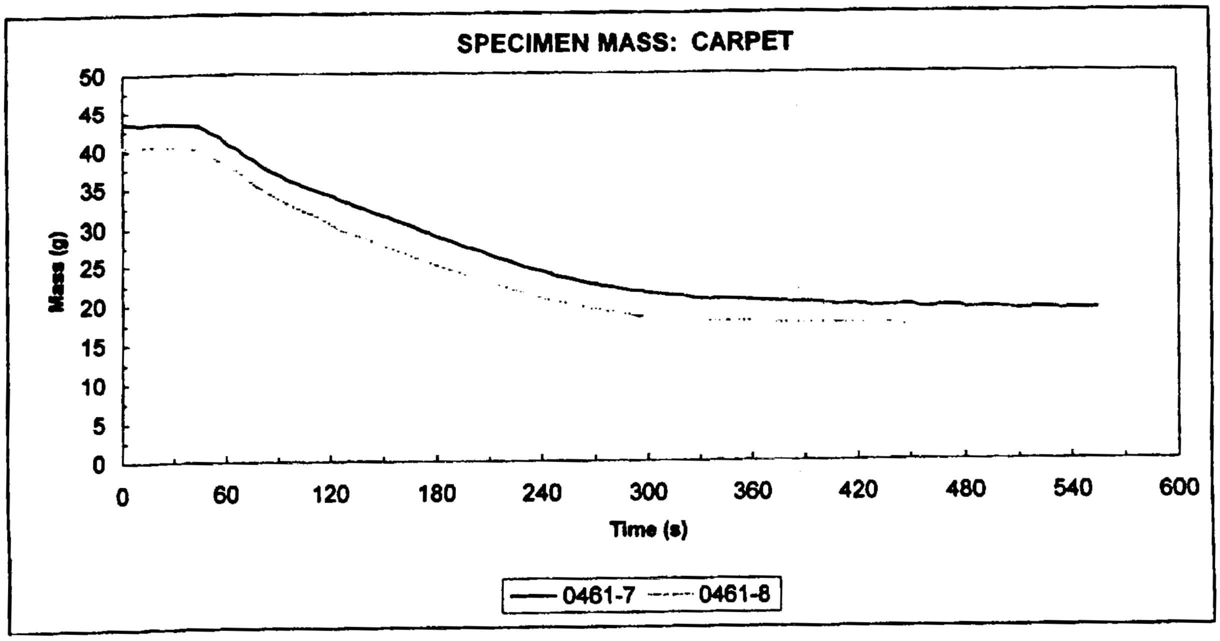




Notes & Observations:

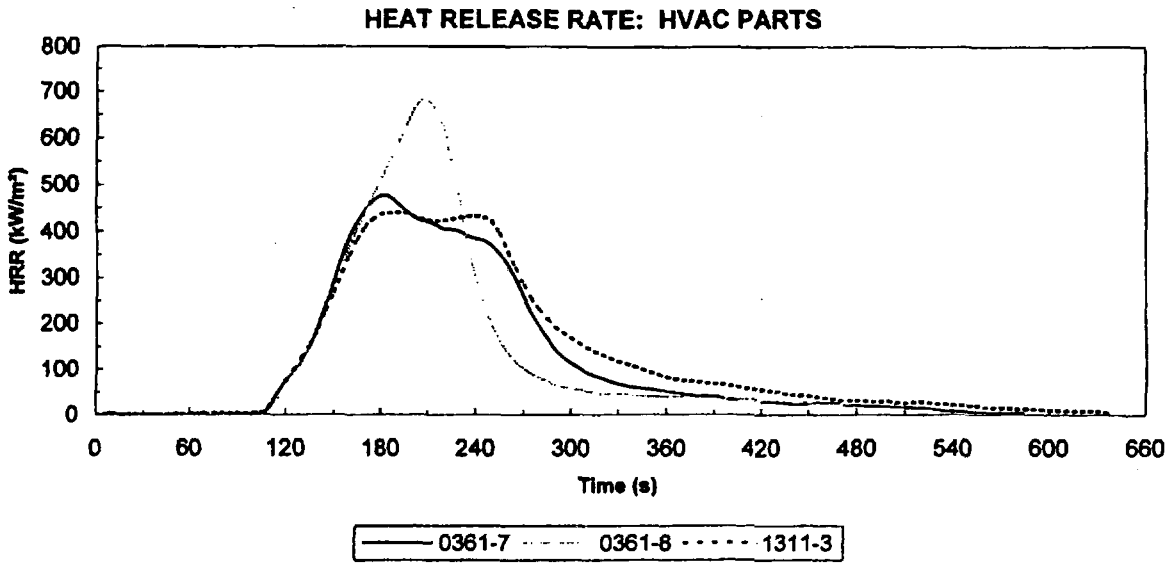
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	HVAC parts
Part No.:	52460744	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0361-7	2/5/01	101	400	477	180	67.8	149	310	217	462
0361-8	2/5/01	101	419	682	205	66.6	140	321	211	651
1311-3	5/11/01	93	459	441	190	76.4	115	307	235	437
Average		98	426	533	192	70.3	135	313	221	516

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
20.5	6.5	14.0	68.1	8.2	42.9	1.02	3	513	516	325
21.7	8.0	13.6	62.6	8.2	43.4	0.98	17	497	513	323
21.9	6.8	15.1	68.7	7.4	44.9	1.14	5	629	633	369
21.4	7.1	14.2	66.5	7.9	43.7	1.05	8	546	554	339



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	HVAC parts
SwRI Project No:	18.03614.01	*Heat Flux:*	20 kW/m²

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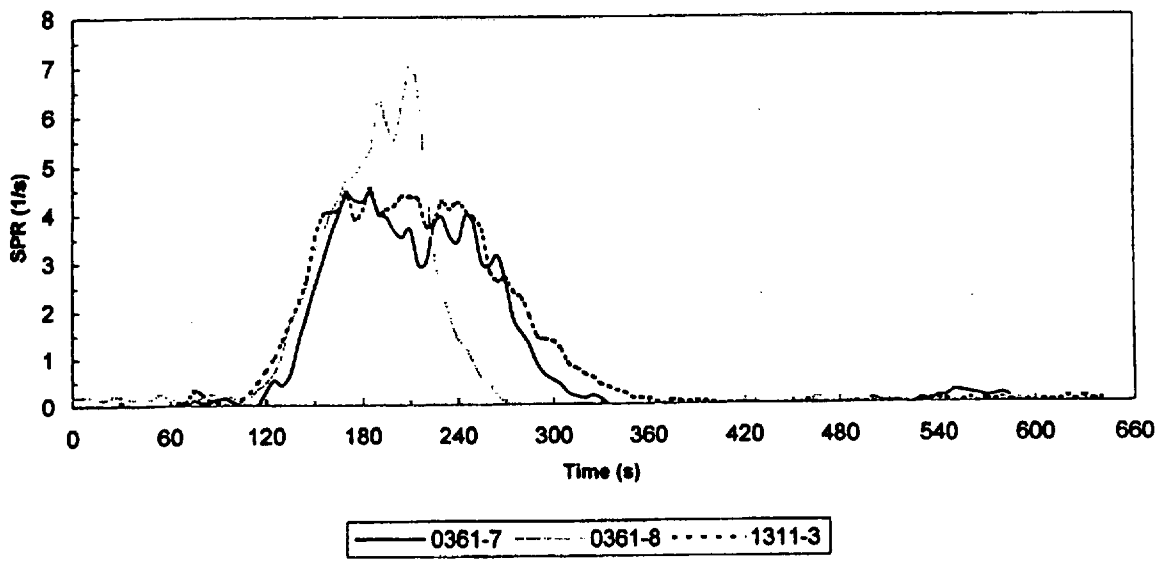
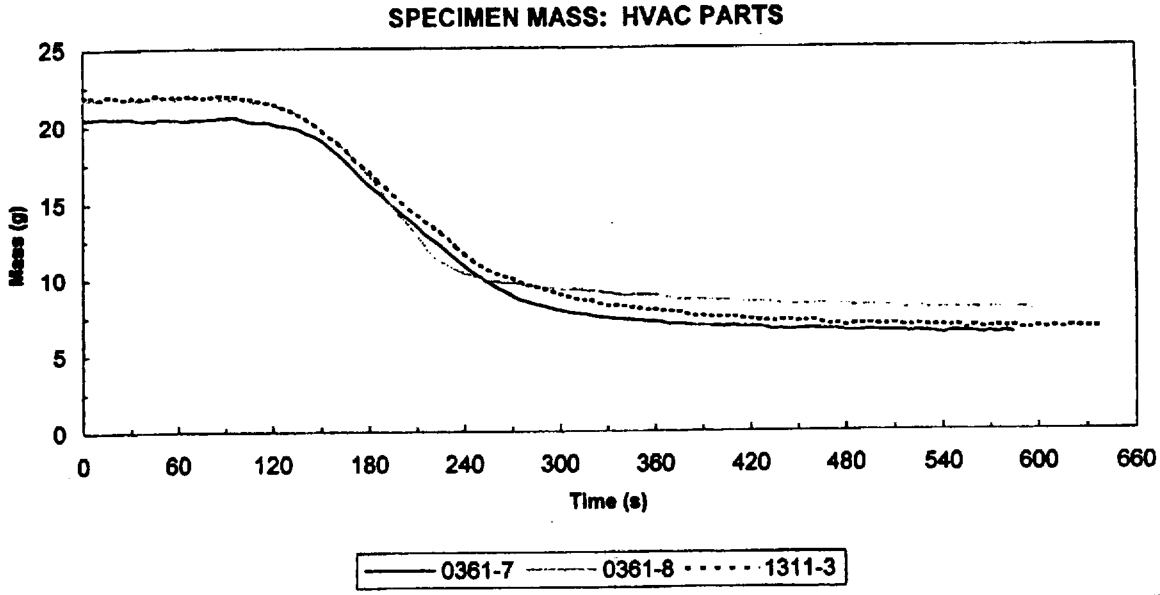
SMOKE PRODUCTION RATE: HVAC PARTS



SPECIMEN MASS: HVAC PARTS



Notes & Observations:

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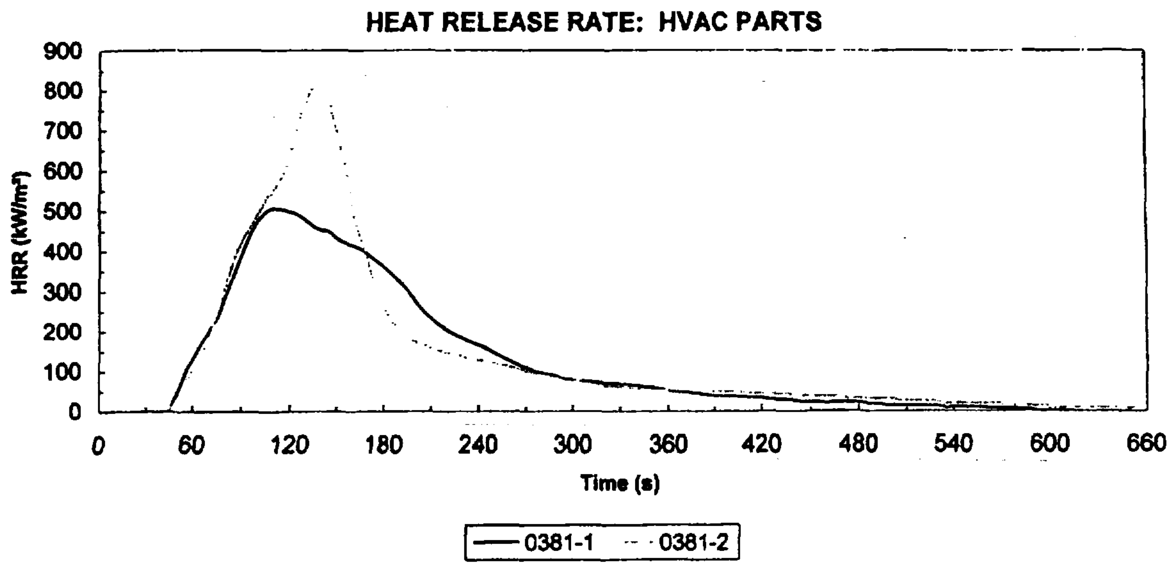
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	HVAC parts
Part No.:	52460744	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\,max}$ (kW/m²)
0381-1	02/07/01	43	489	506	110	79.6	249	338	246	496
0381-2	02/07/01	43	530	813	135	88.4	253	380	265	758
Average		43	510	659	123	84.0	251	359	256	627

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
21.8	5.0	17.0	78.1	7.5	41.3	1.54	5	816	821	423
23.7	4.9	18.4	77.7	7.8	42.4	1.34	0	780	780	374
22.8	4.9	17.7	77.9	7.6	41.9	1.44	3	798	800	399



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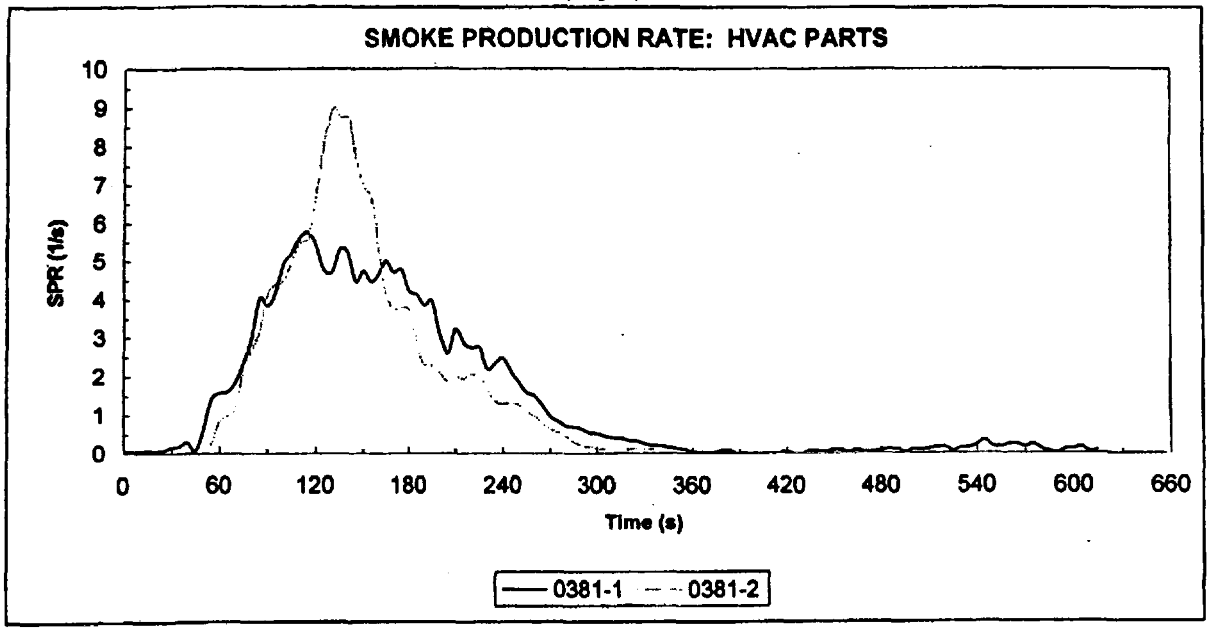
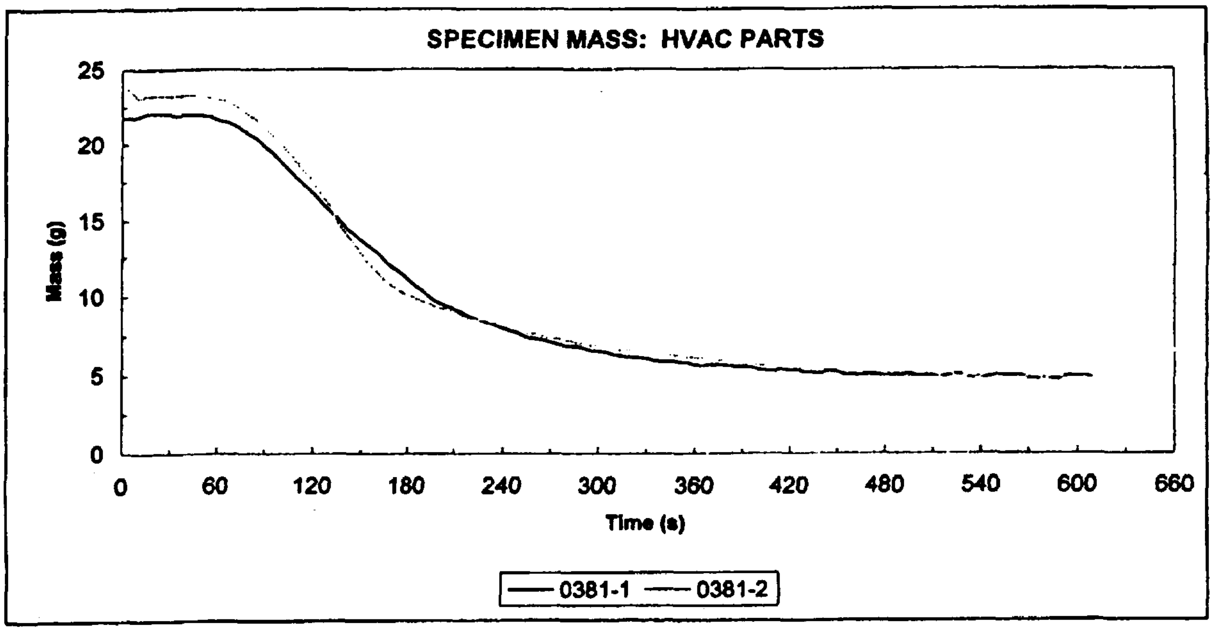
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	HVAC parts
SwRI Project No:	18.03614.01	*Heat Flux:*	35 kW/m²

(Page 2)





Notes & Observations:

0381-1: Sample was constructed of three pieces of the following dimensions: 100 x 20 mm, 80 x 85 mm, and 15 x 80 mm.

0381-2: Sample was constructed of three pieces of the following dimensions: 50 x 90 mm, 50 x 90 mm, and 10 x 100 mm.

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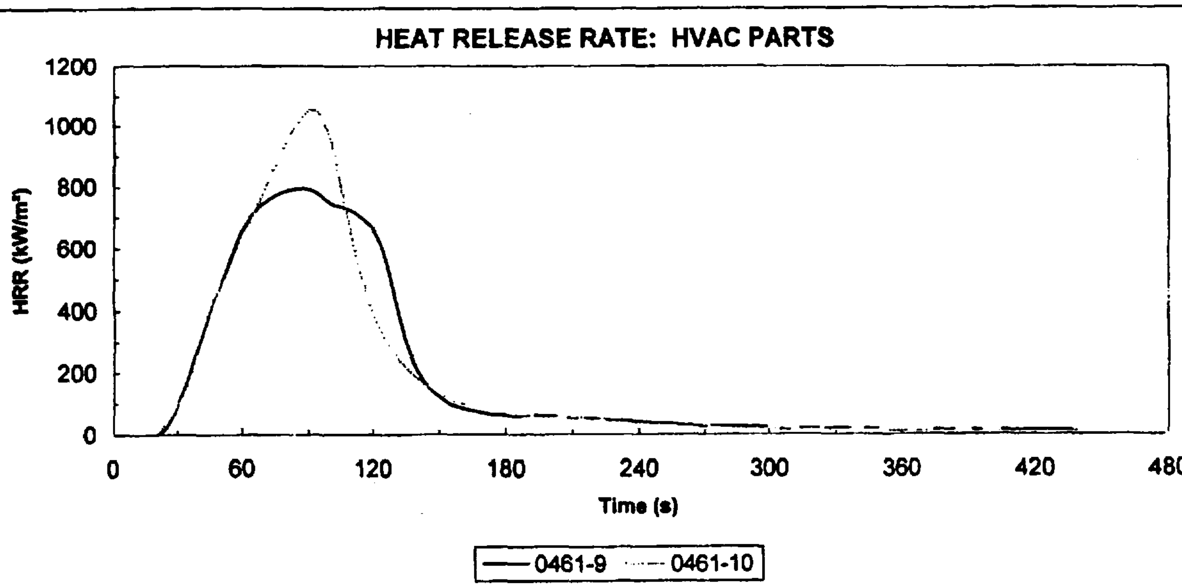
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	HVAC parts
Part Number:	52460744	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,max}$ (kW/m²)
0461-9	02/15/01	20	354	795	85	76.0	444	393	250	779
0461-10	02/15/01	20	372	1053	90	77.3	458	398	254	972
Average		20	363	924	88	76.6	451	396	252	876

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
21.2	5.5	15.7	74.2	14.2	42.7	2.22	0	843	843	474
20.8	4.9	16.1	77.2	13.2	42.5	2.35	3	925	928	509
21.0	5.2	15.9	75.7	13.7	42.6	2.29	1	884	886	492



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client: General Motors
SwRI Project No: 18.03614.01
Material ID: HVAC parts
Heat Flux: 50 kW/m²

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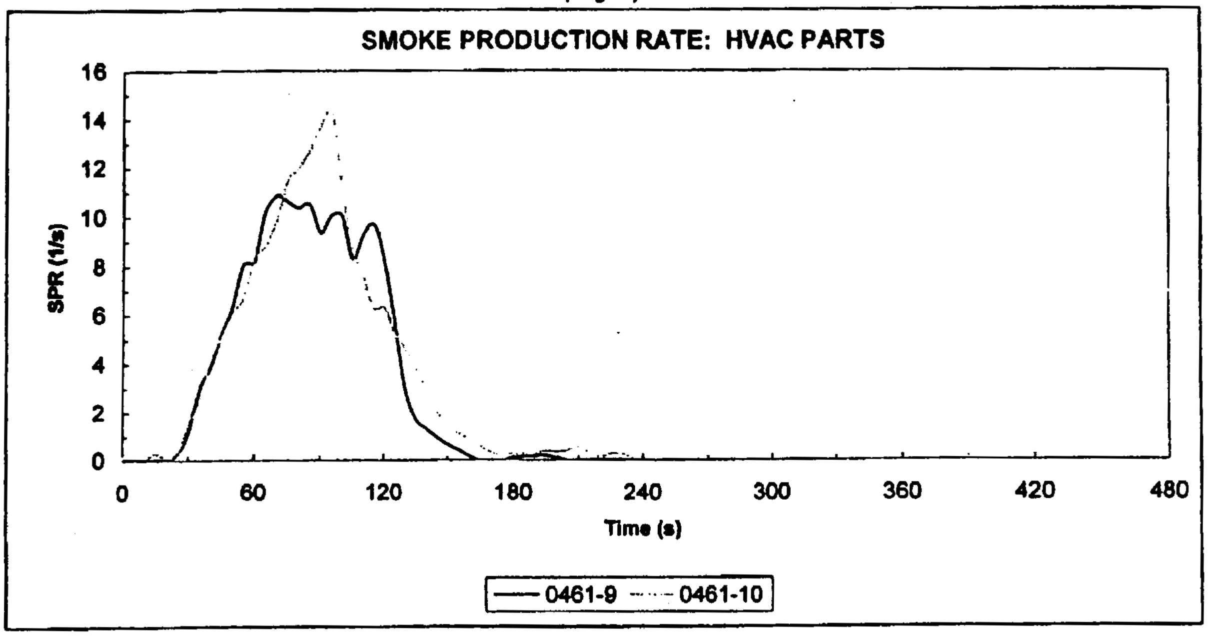

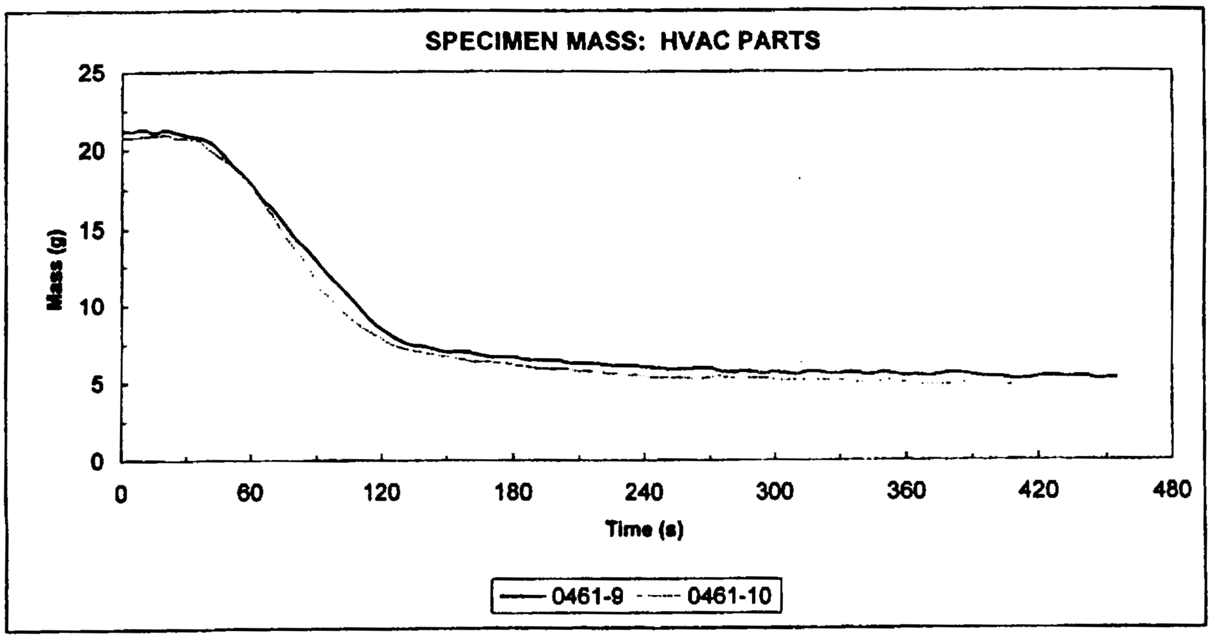

Notes & Observations:

0461-9: Sample constructed from three pieces of the following dimensions: 20 x 100 mm, 80 x 80 mm, and 20 x 80 mm.

0461-10: Sample constructed from two pieces of the following dimensions: 50 x 100 mm, and 50 x 100 mm.

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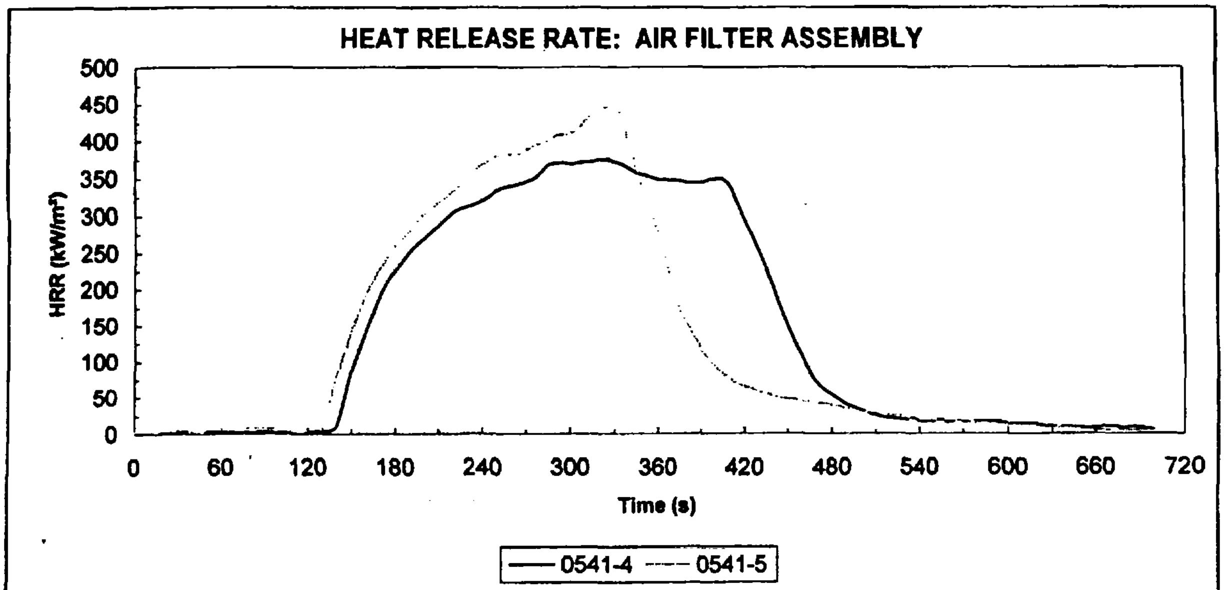
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Air Filter Assembly
Part No.:	10488727	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0541-4	02/23/01	135	485	376	320	98.9	152	273	300	374
0541-5	02/23/01	127	487	448	330	88.7	153	292	277	438
Average		131	486	412	325	93.8	153	282	288	406

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
32.9	12.1	20.6	62.6	8.1	42.5	1.59	22	970	992	417
29.6	11.0	18.5	62.6	8.8	42.3	1.40	19	851	870	405
31.3	11.6	19.6	62.6	8.5	42.4	1.50	20	911	931	411



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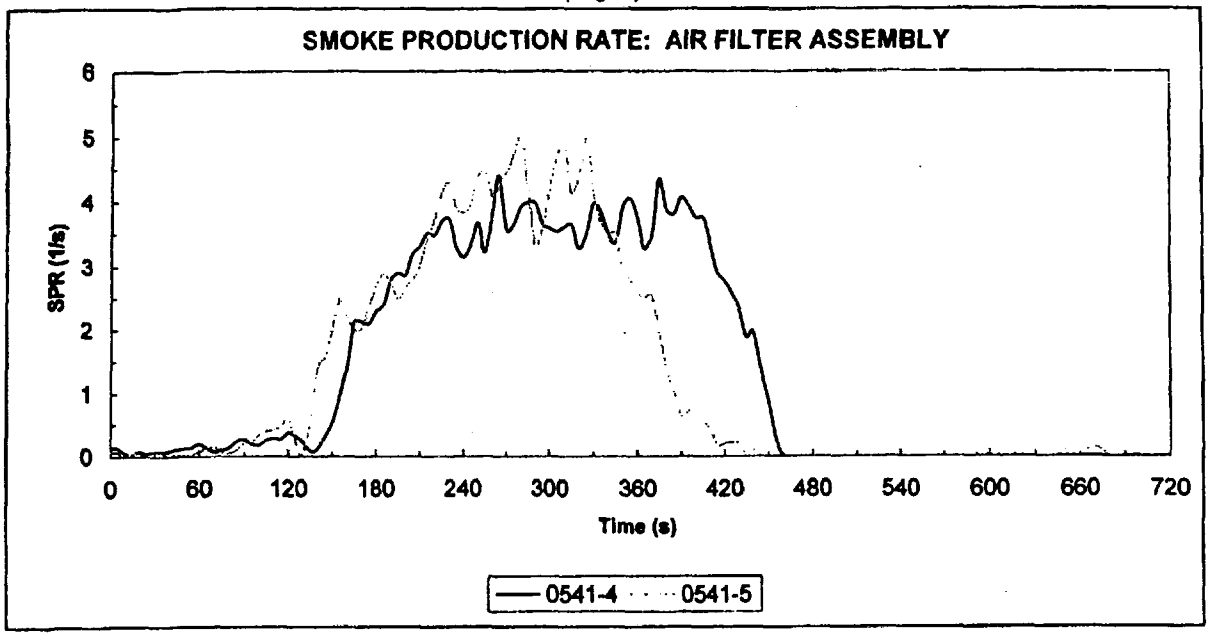
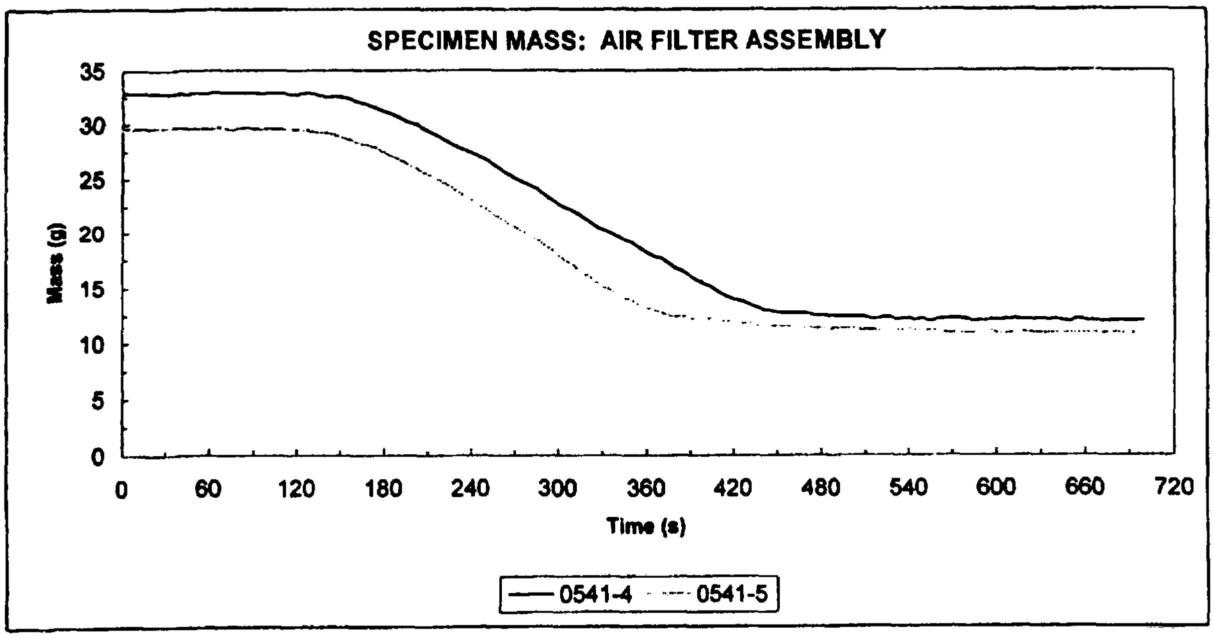
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Air Filter Assembly
SwRI Project No:	18.03614.01	*Heat Flux:*	20 kW/m²

(Page 2)





Notes & Observations:

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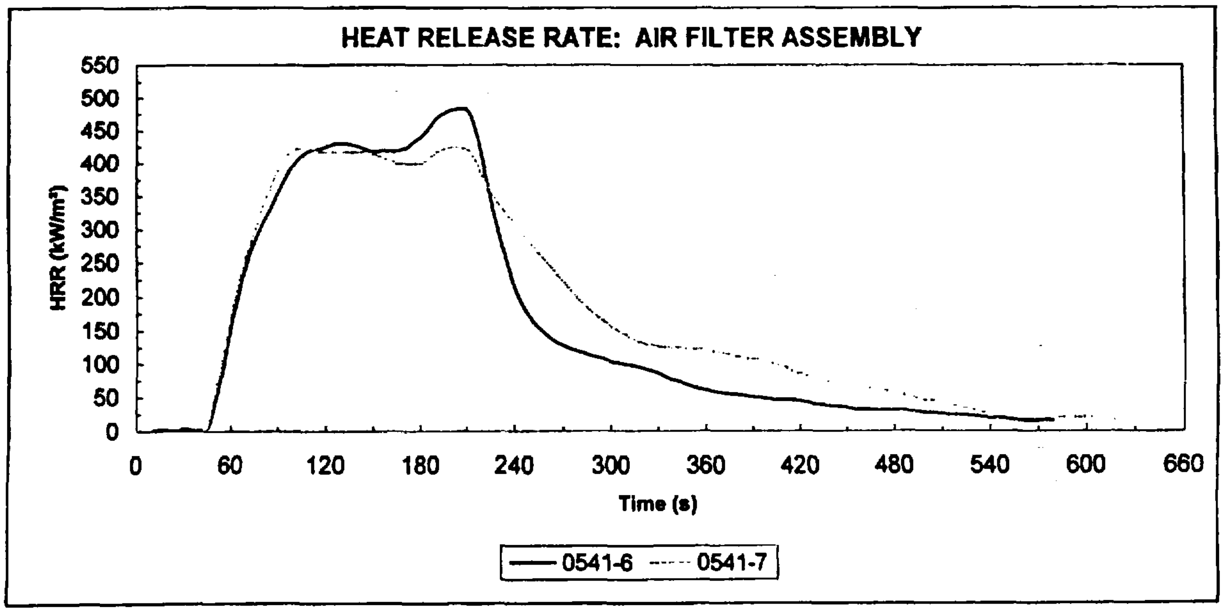
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Air Filter Assembly
Part No.:	10488727	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\ max}$ (kW/m²)
0541-6	02/23/01	35	460	483	205	90.6	185	352	277	475
0541-7	02/23/01	35	533	425	200	105.9	202	343	296	420
Average		35	496	454	203	98.2	194	348	287	447

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
30.3	11.4	19.0	62.8	8.0	42.1	2.01	3	1001	1004	465
35.3	12.9	22.4	63.6	7.1	41.7	2.19	2	1255	1258	494
32.8	12.1	20.7	63.2	7.6	41.9	2.10	3	1128	1131	480



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Air Filter Assembly
SwRI Project No:	18.03614.01	*Heat Flux:*	35 kW/m²

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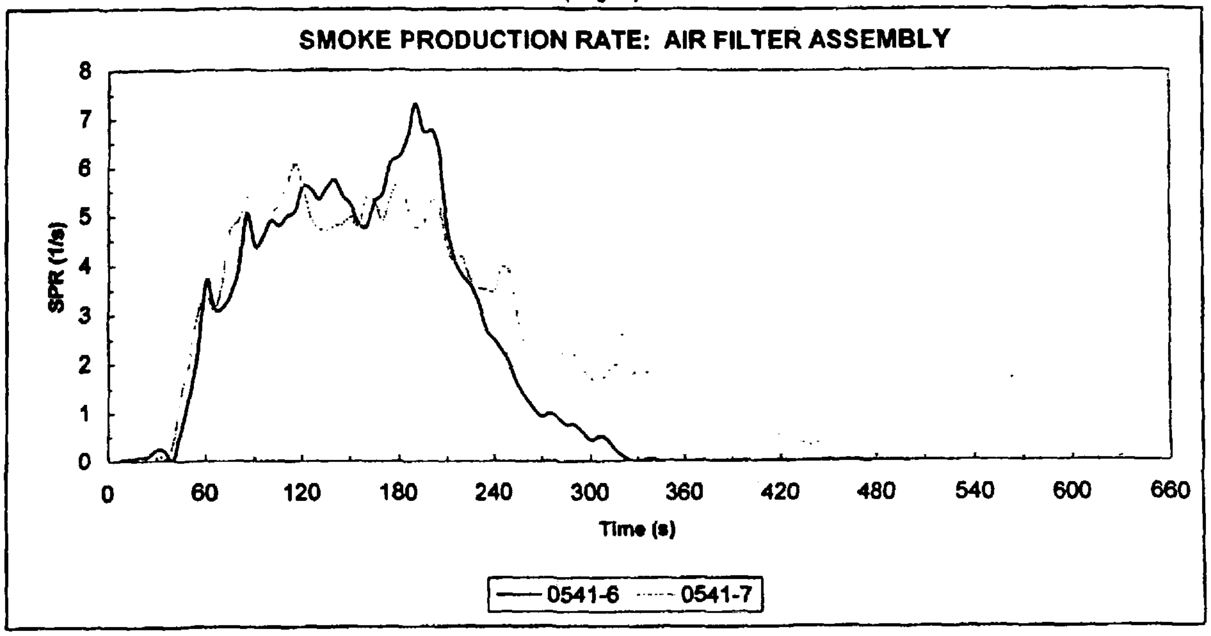

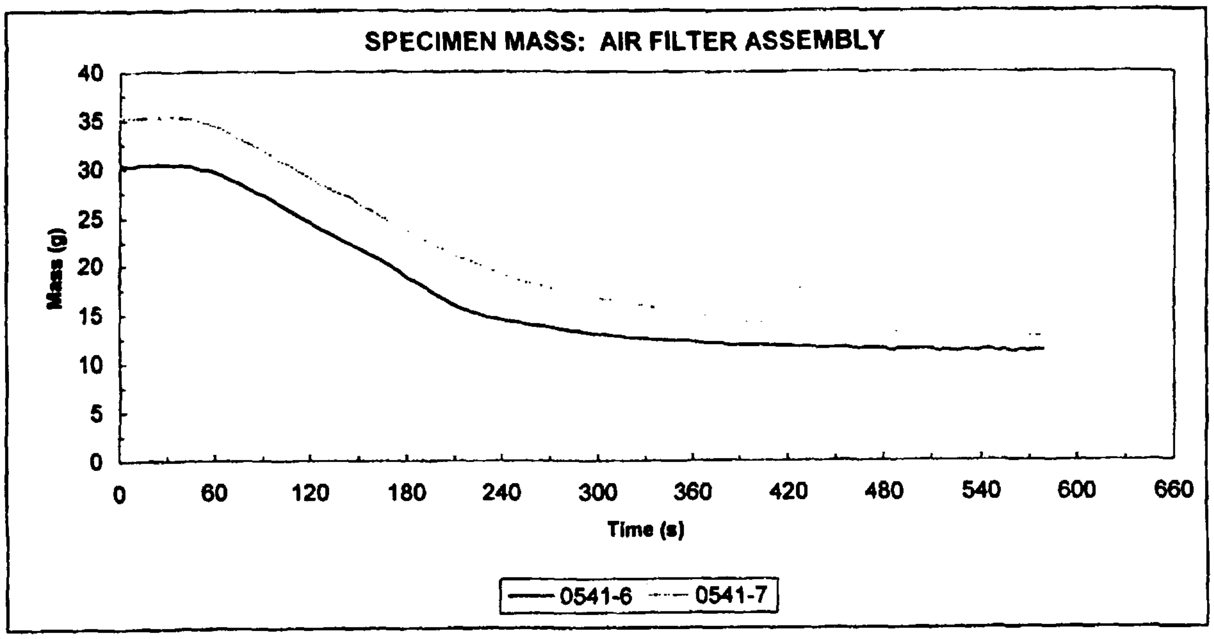

Notes & Observations:
Samples were 2.6 mm in thickness.

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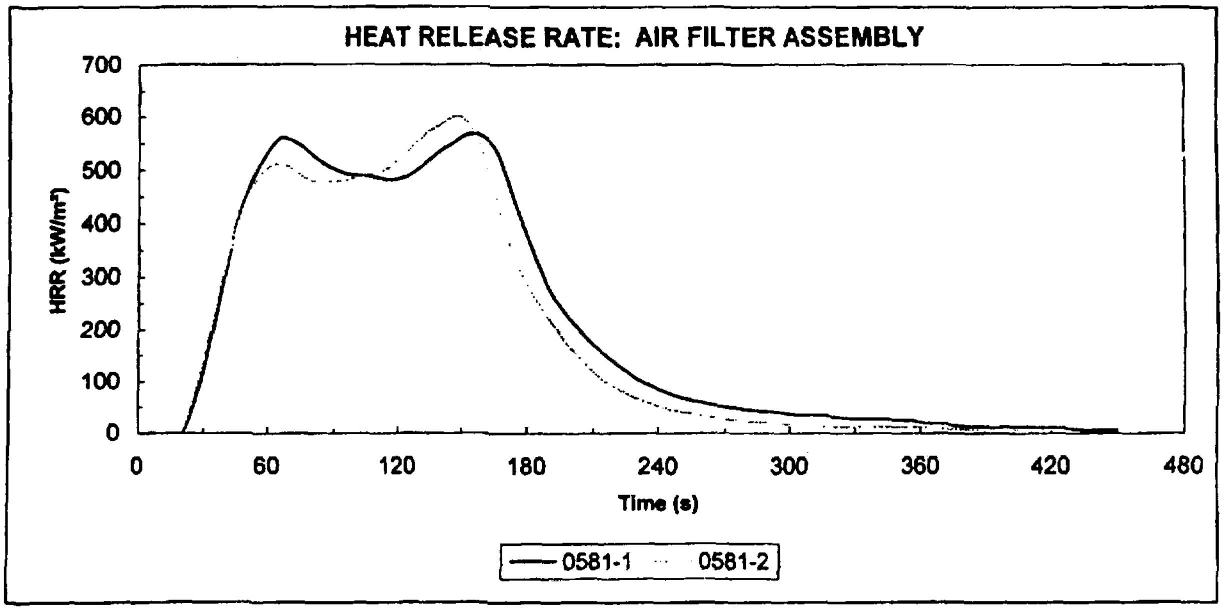
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Air Filter Assembly
Part No.:	10488727	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0581-1	02/27/01	18	345	568	155	89.9	373	439	296	552
0581-2	02/27/01	17	317	601	150	82.4	318	419	274	580
Average		18	331	585	153	86.2	345	429	285	566

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
30.0	10.1	19.4	64.8	11.3	40.9	3.36	1	1242	1244	565
27.6	9.5	18.2	65.9	12.2	40.1	3.60	1	1223	1223	595
28.8	9.8	18.8	65.3	11.8	40.5	3.48	1	1233	1233	580



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Air Filter Assembly
SwRI Project No:	18.03614.01	*Heat Flux:*	50 kW/m²

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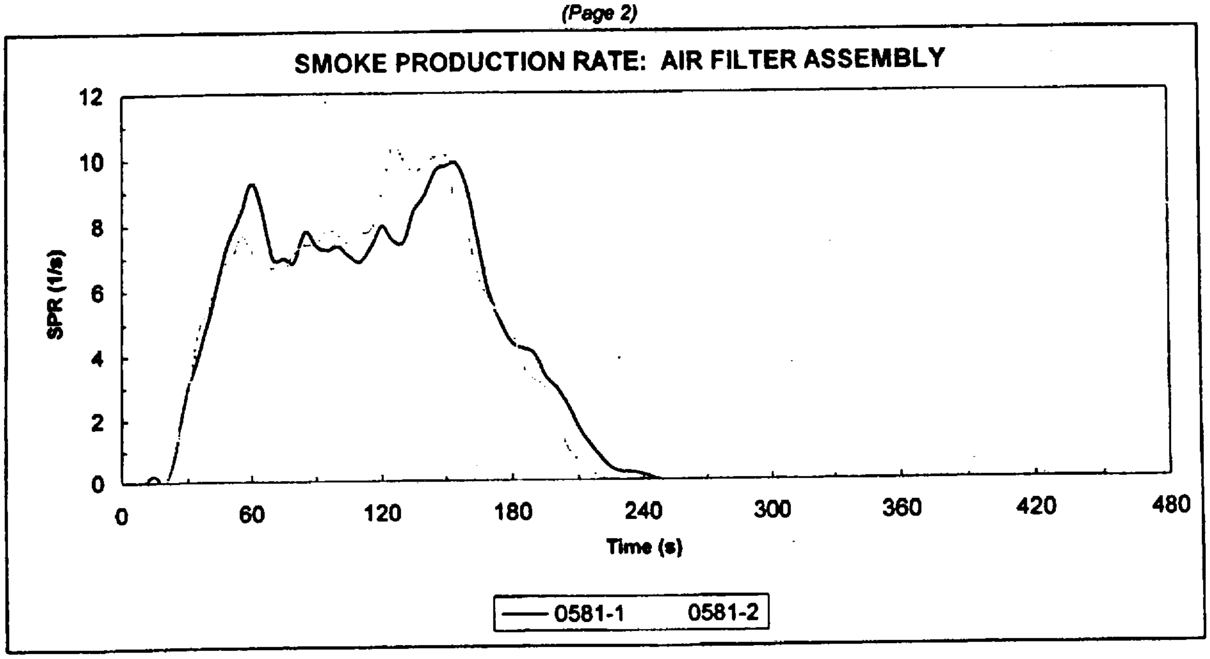

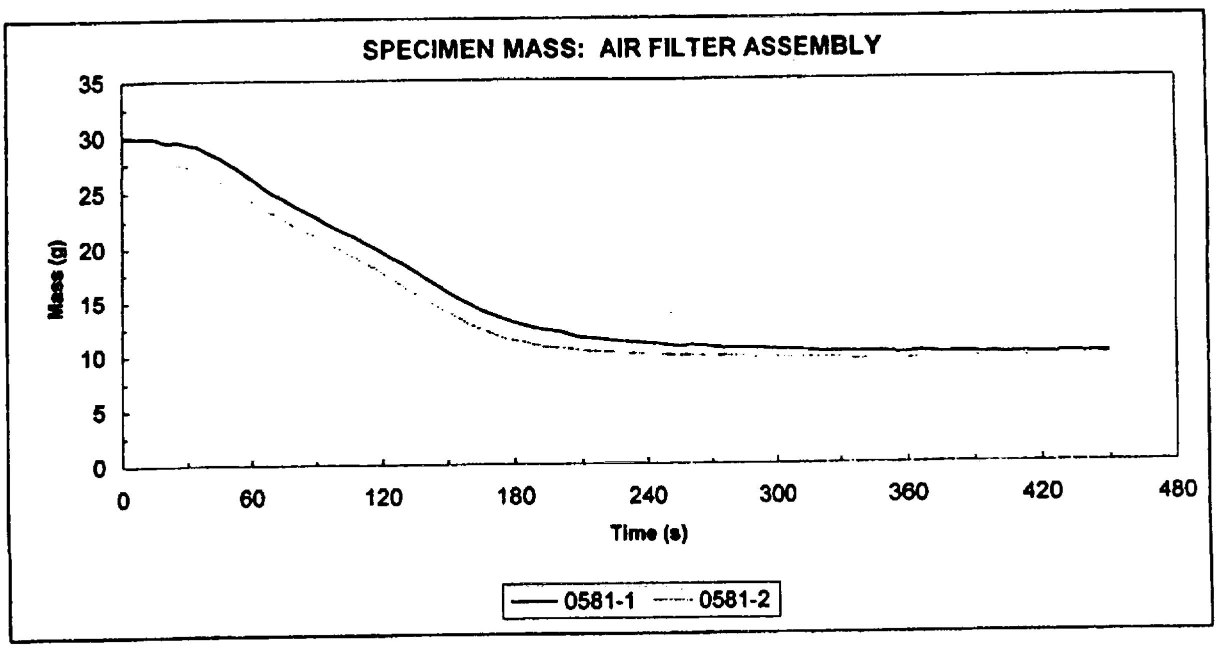

Notes & Observations:

Test specimens were 2.6 mm in thickness.

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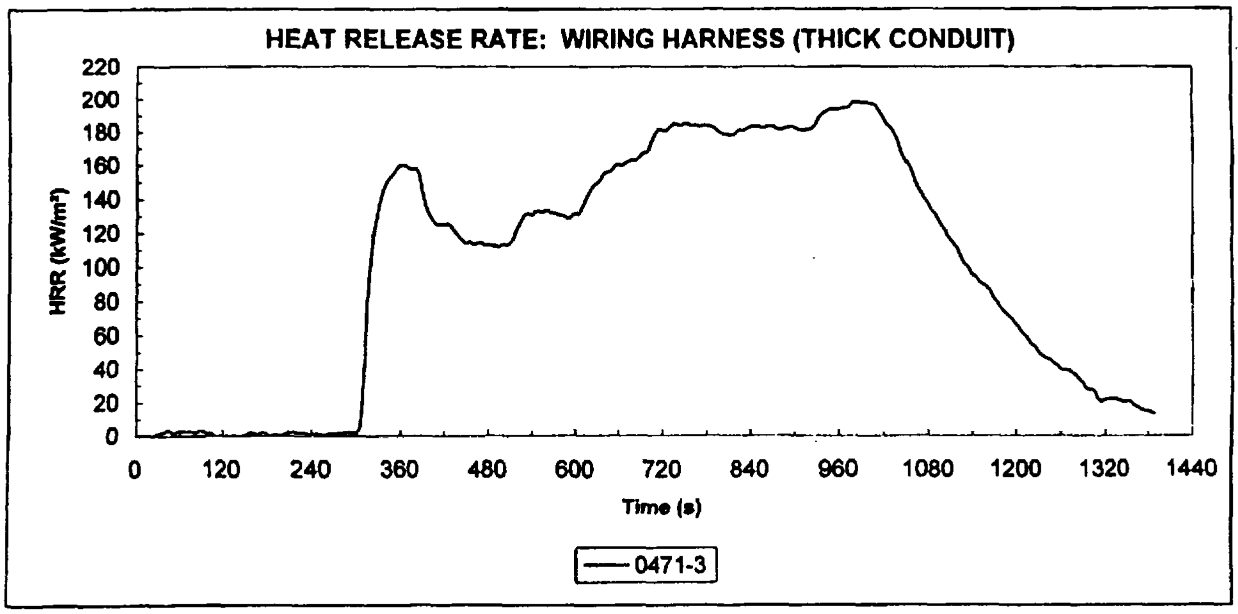
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Wiring Harness (Thick Conduit)
Part Number:	22621025	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0471-3	02/16/01	301	1011	198	995	138.8	111	124	125	198
Average		301	1011	198	995	138.8	111	124	125	198

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
120.5	78.7	40.8	33.8	5.6	30.1	1.44	93	1801	1893	391
120.5	78.7	40.8	33.8	5.6	30.1	1.44	93	1801	1893	391



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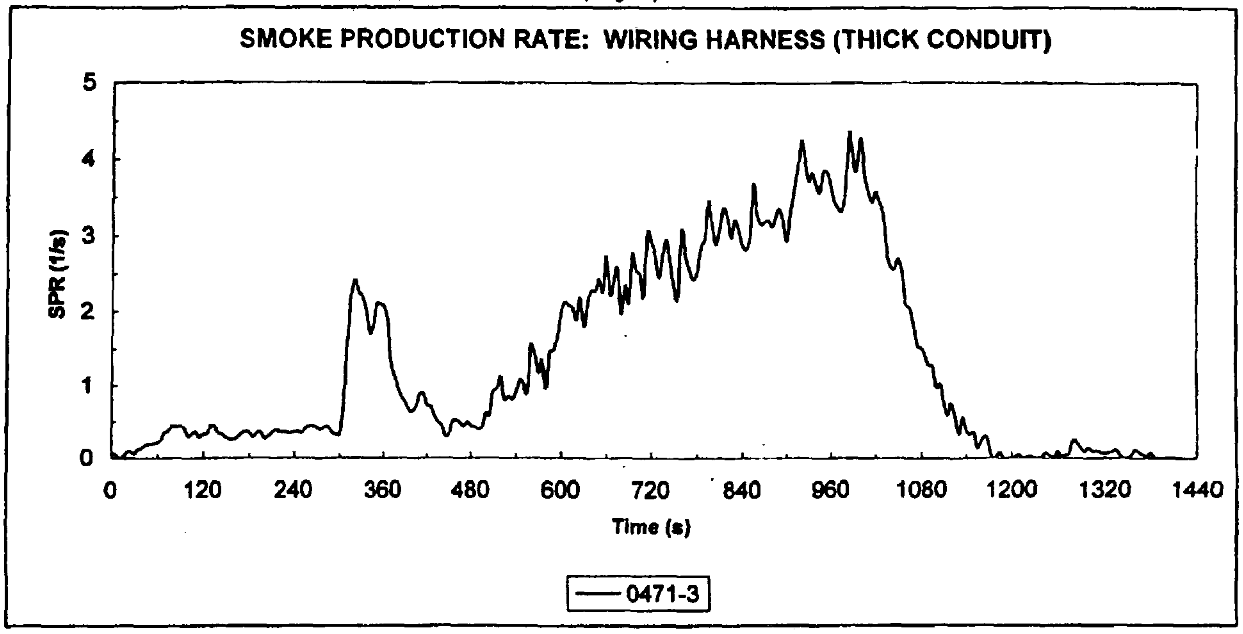
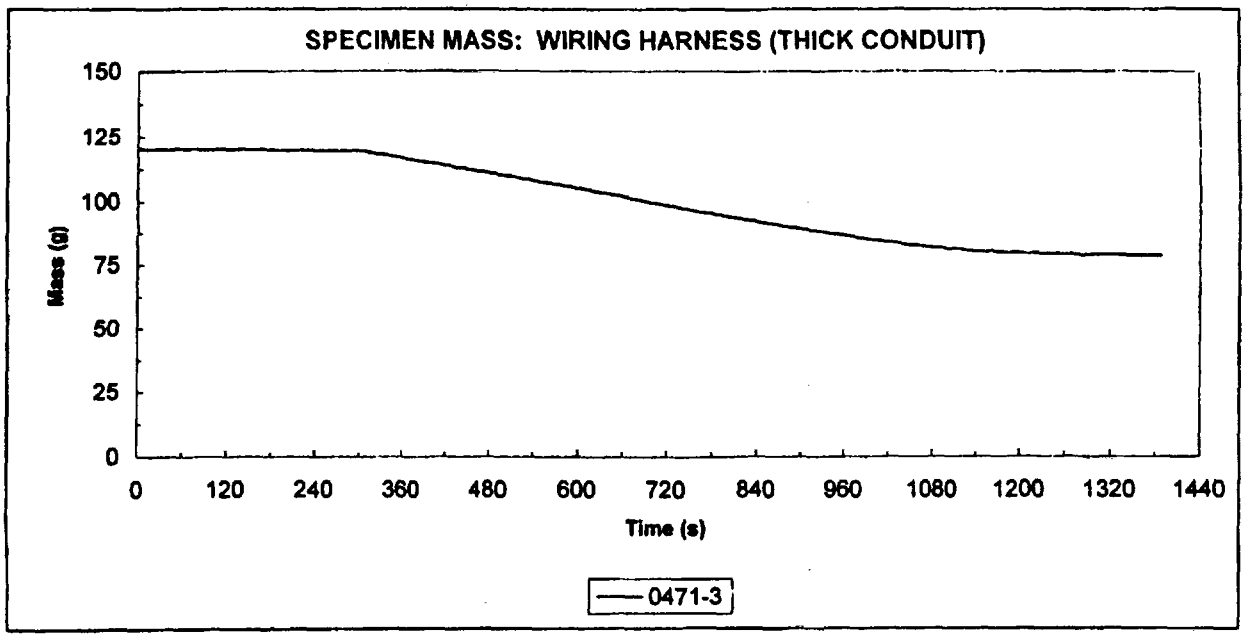
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Wiring Harness (Thick Conduit)
SwRI Project No:	18.03614.01	*Heat Flux:*	20 kW/m²

(Page 2)





Notes & Observations:

Test specimen was constructed of four cylindrical pieces of conduit 100-mm long, and each containing 35 small gauge insulated wiring. Diameter of each conduit piece was approximately 22 mm.

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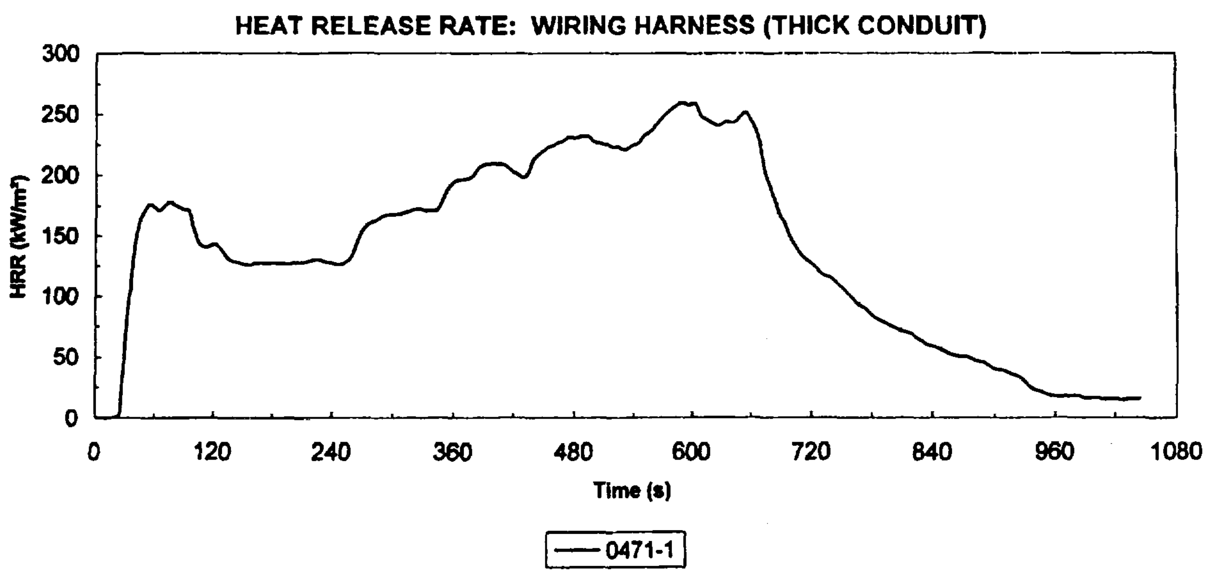
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Wiring Harness (Thick Conduit)
Part Number:	22621025	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\,max}$ (kW/m²)
0471-1	02/16/01	26	932	260	590	143.5	148	140	143	257
Average		26	932	260	590	143.5	148	140	143	257

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
121.1	78.9	42.2	34.8	6.6	30.1	2.50	3	2411	2415	505
121.1	78.9	42.2	34.8	6.6	30.1	2.50	3	2411	2415	505



ASTM E 1354 CONE CALORIMETER TEST REPORT

Client: General Motors
SwRI Project No: 18.03614.01
Material ID: Wiring Harness (Thick Conduit)
Heat Flux: 35 kW/m²

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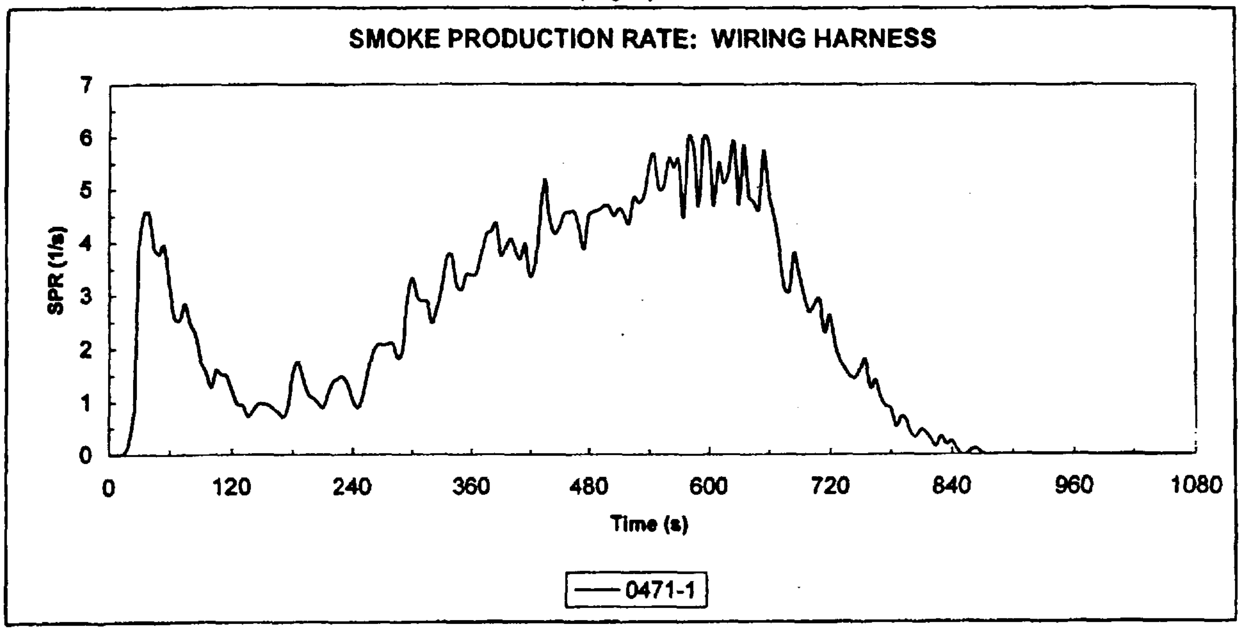
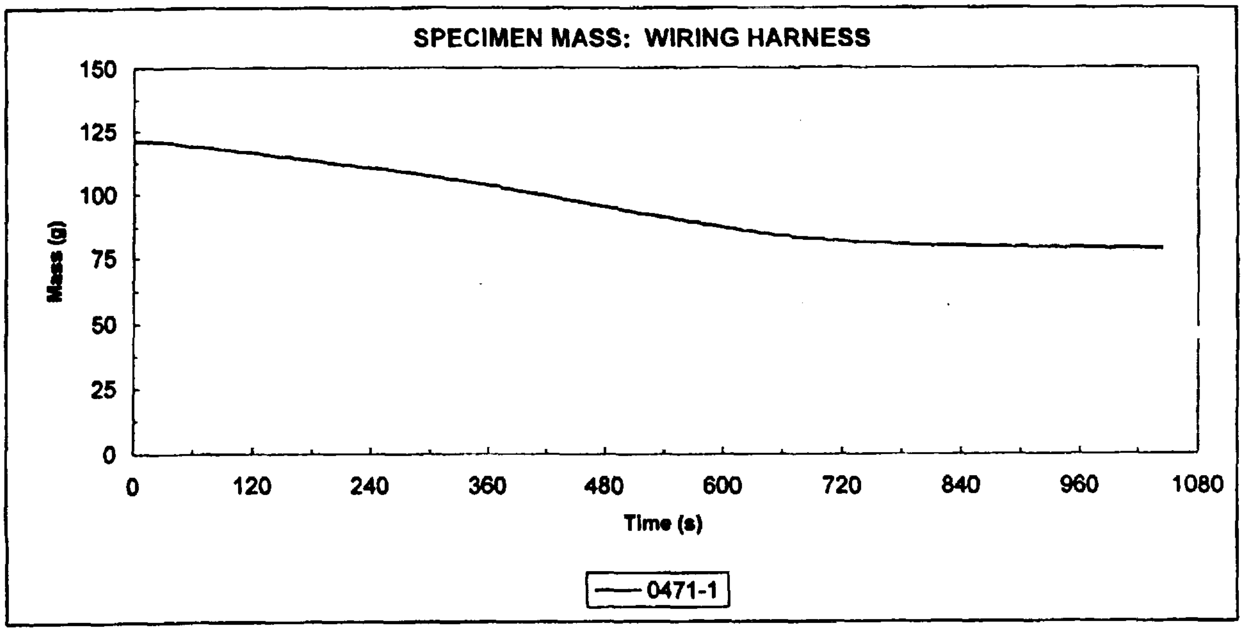




Notes & Observations:
Test specimen was constructed of four cylindrical pieces of conduit 100-mm long, and each containing 35 small gauge insulated wiring. Diameter of each conduit piece was approximately 22 mm.

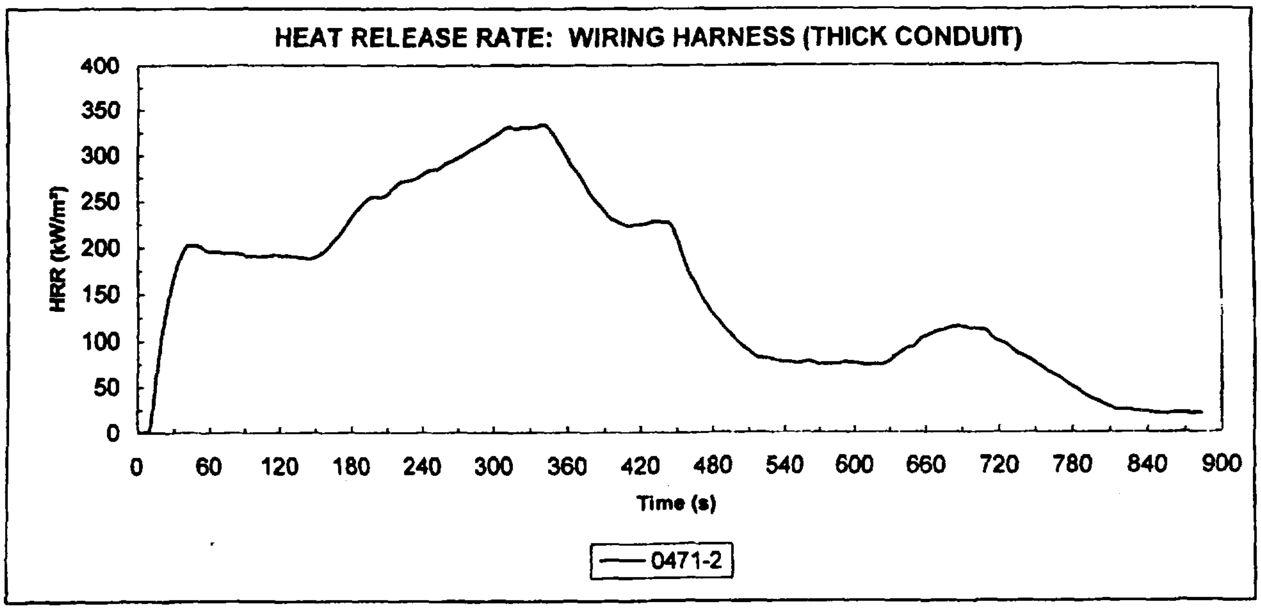
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Wiring Harness (Thick Conduit)
Part Number:	22621025	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0471-2	02/16/01	10	796	333	340	138.4	163	187	227	331
Average		10	796	333	340	138.4	163	187	227	331

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
121.3	78.8	42.5	35.0	7.7	28.8	3.56	8	2877	2885	598
121.3	78.8	42.5	35.0	7.7	28.8	3.56	8	2877	2885	598

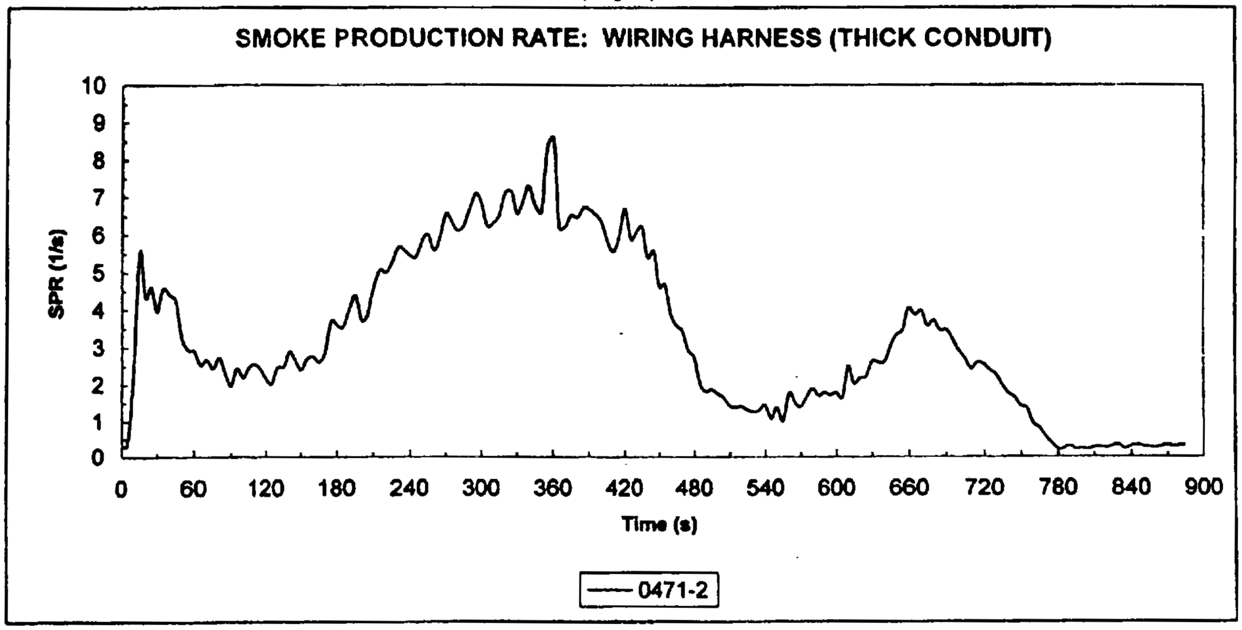


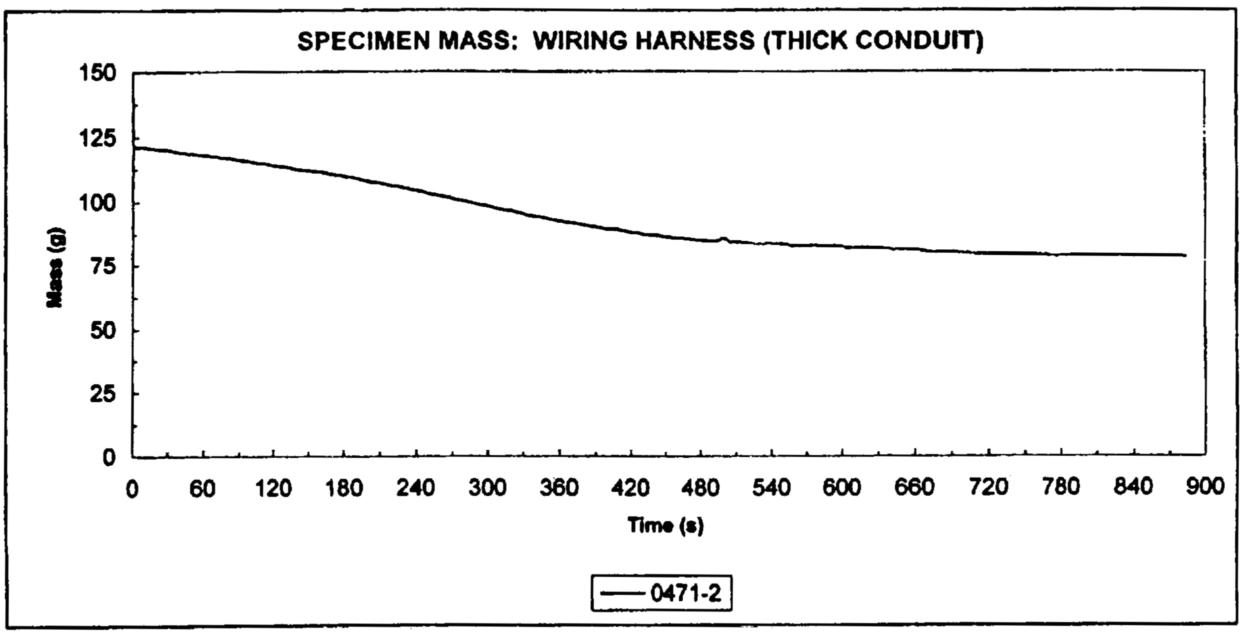
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Wiring Harness (Thick Conduit)
SwRI Project No:	18.03614.01	*Heat Flux:*	50 kW/m²

(Page 2)





Notes & Observations:

Test specimen was constructed of four cylindrical pieces of conduit 100-mm long, and each containing 35 small gauge insulated wiring. Diameter of each conduit piece was approximately 22 mm.

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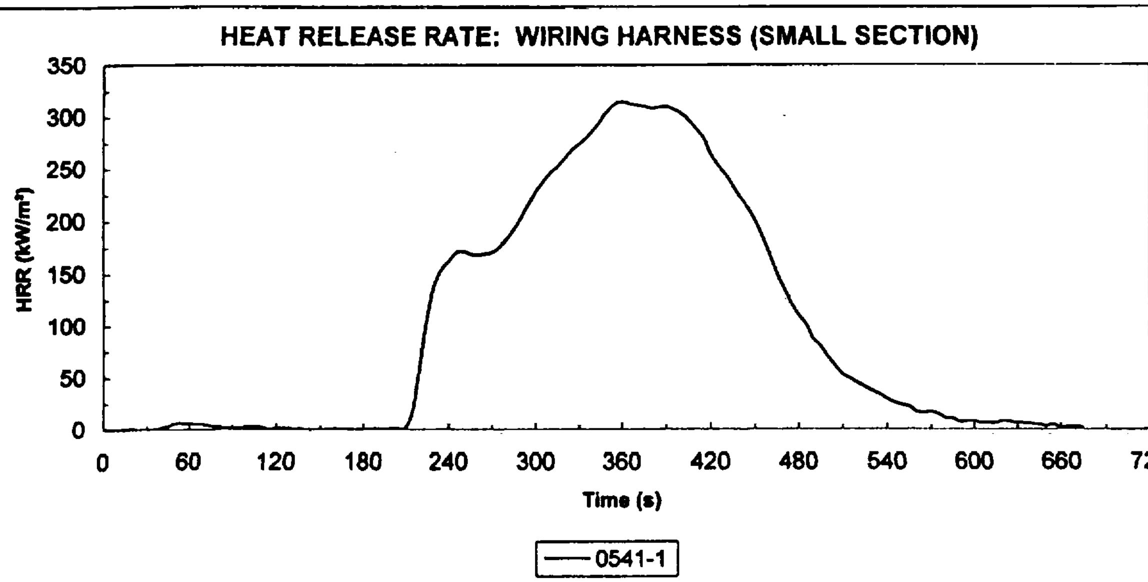
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Wiring Harness (Small Section)
Part No.:	22621025	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\ max}$ (kW/m²)
0541-1	02/23/01	203	349	315	360	64.1	119	212	208	312
Average		203	349	315	360	64.1	119	212	208	312

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
36.2	19.5	15.7	43.4	6.9	36.1	1.74	62	903	965	509
36.2	19.5	15.7	43.4	6.9	36.1	1.74	62	903	965	509



ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Wiring Harness (Small Section)
SwRI Project No:	18.03614.01	*Heat Flux:*	20 kW/m²

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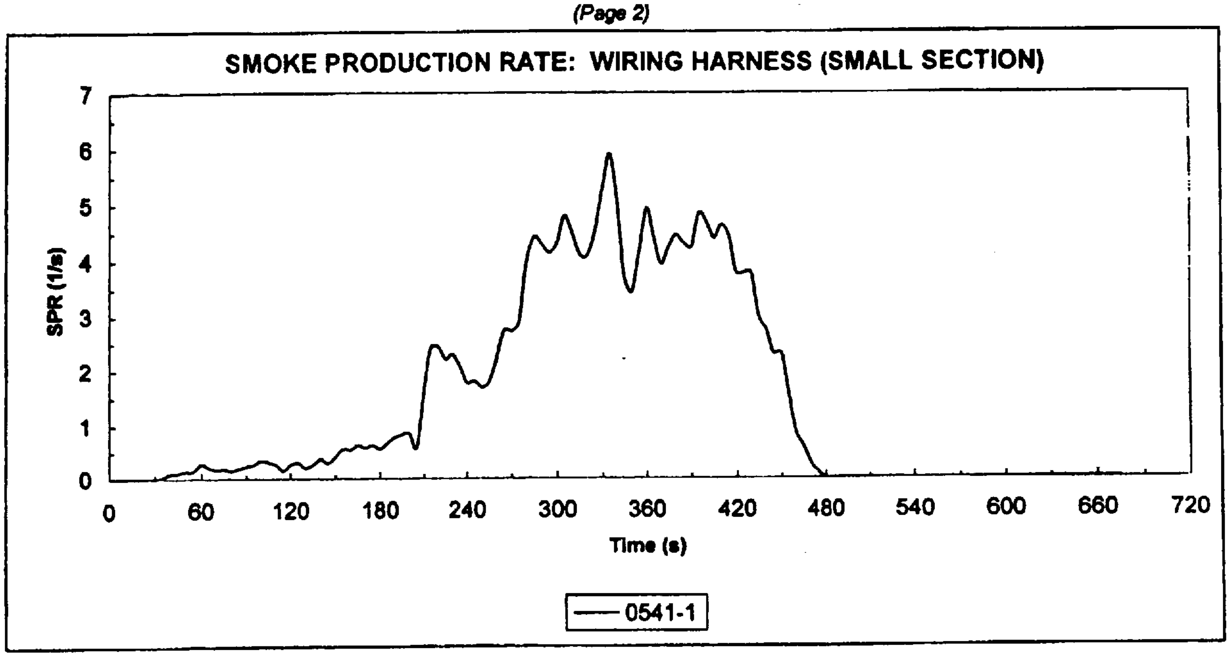

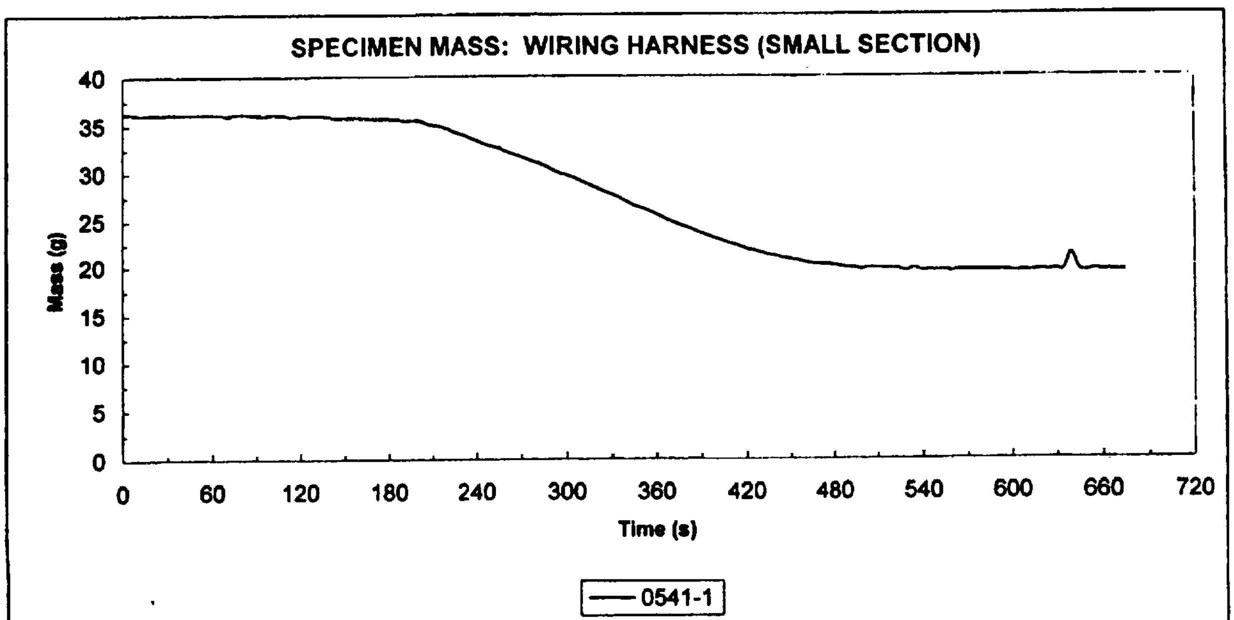

Notes & Observations:

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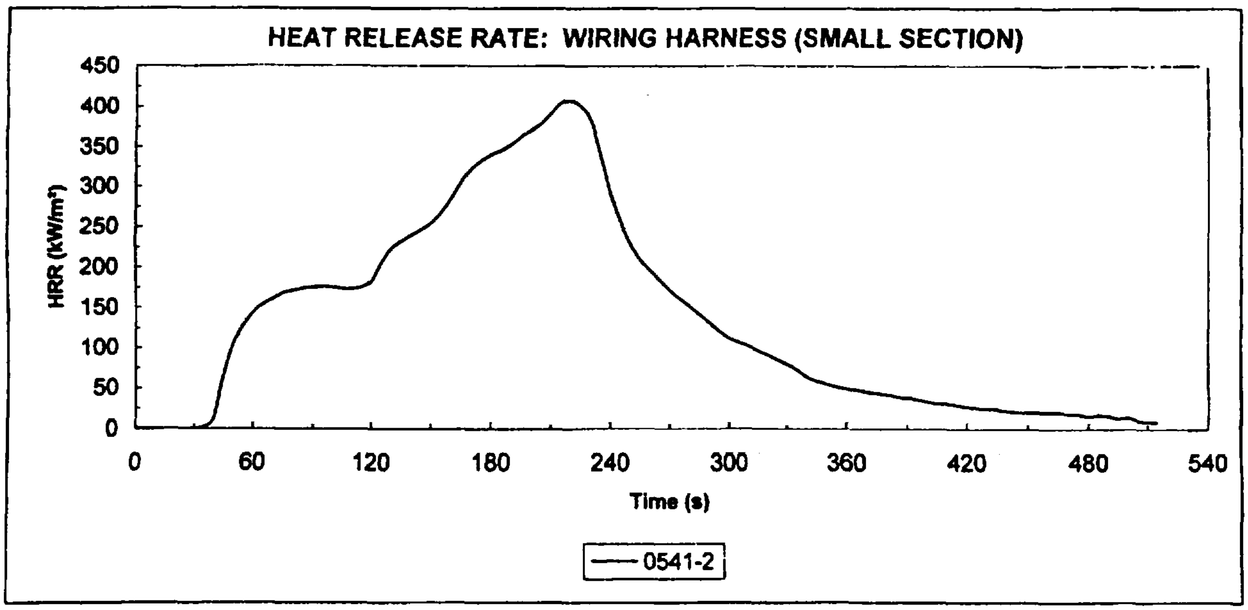
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Wiring Harness (Small Section)
Part No.:	22621025	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0541-2	02/23/01	25	406	408	220	68.5	100	206	212	394
Average		25	406	408	220	68.5	100	206	212	394

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
41.0	20.7	20.3	49.6	9.0	29.8	1.91	8	824	832	358
41.0	20.7	20.3	49.6	9.0	29.8	1.91	8	824	832	358



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Wiring Harness (Small Section)
SwRI Project No:	18.03614.01	*Heat Flux:*	35 kW/m²

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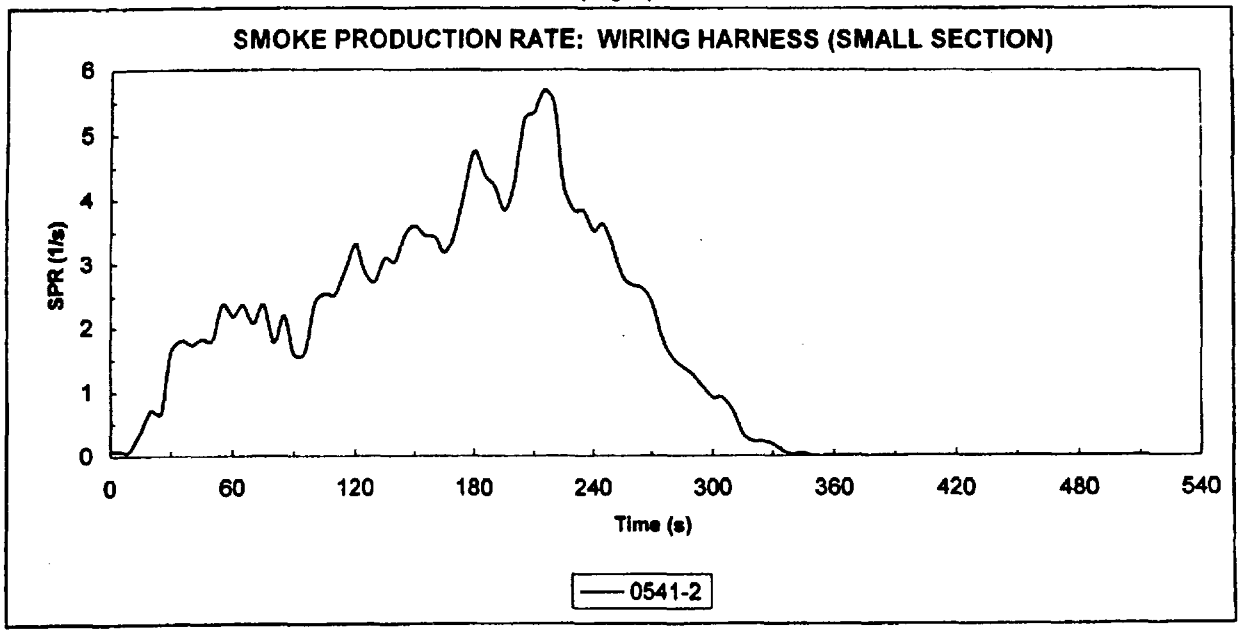

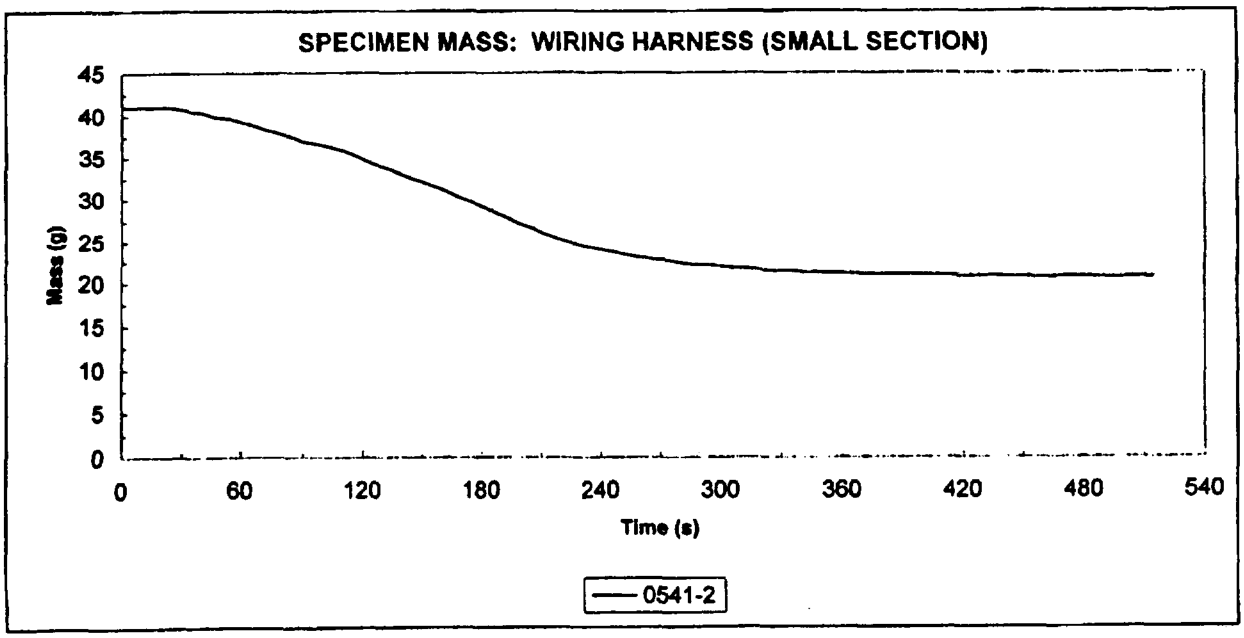

Notes & Observations:
Each sample was constructed from nine sections (10-mm diameter) of 100-mm lengh conduit.

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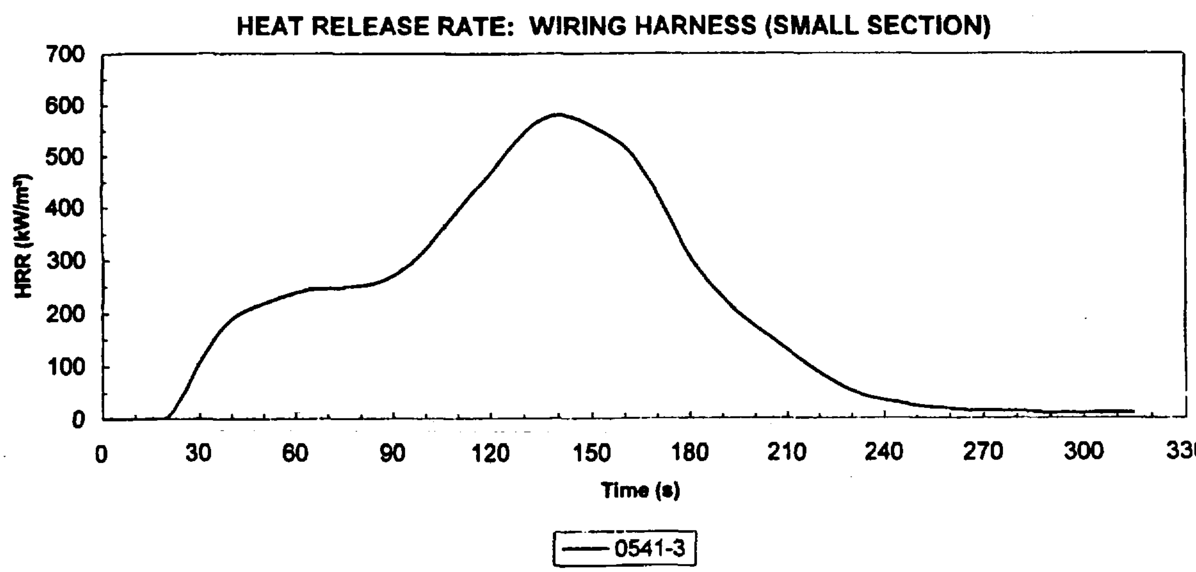
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Wiring Harness (Small Section)
Part No.:	22621025	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\ max}$ (kW/m²)
0541-3	02/23/01	10	221	581	140	63.1	147	321	211	561
Average		10	221	581	140	63.1	147	321	211	561

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
34.1	17.3	16.8	49.2	12.2	33.2	4.39	0	1032	1033	543
34.1	17.3	16.8	49.2	12.2	33.2	4.39	0	1032	1033	543



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Wiring Harness (Small Section)
SwRI Project No:	18.03614.01	*Heat Flux:*	50 kW/m²

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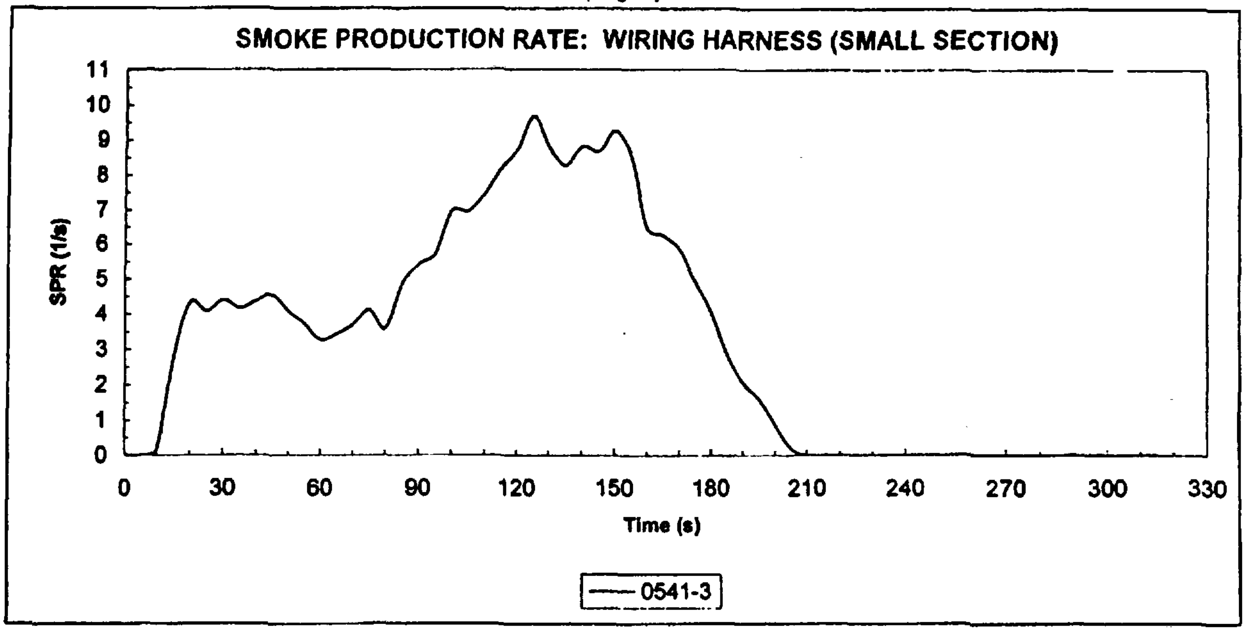

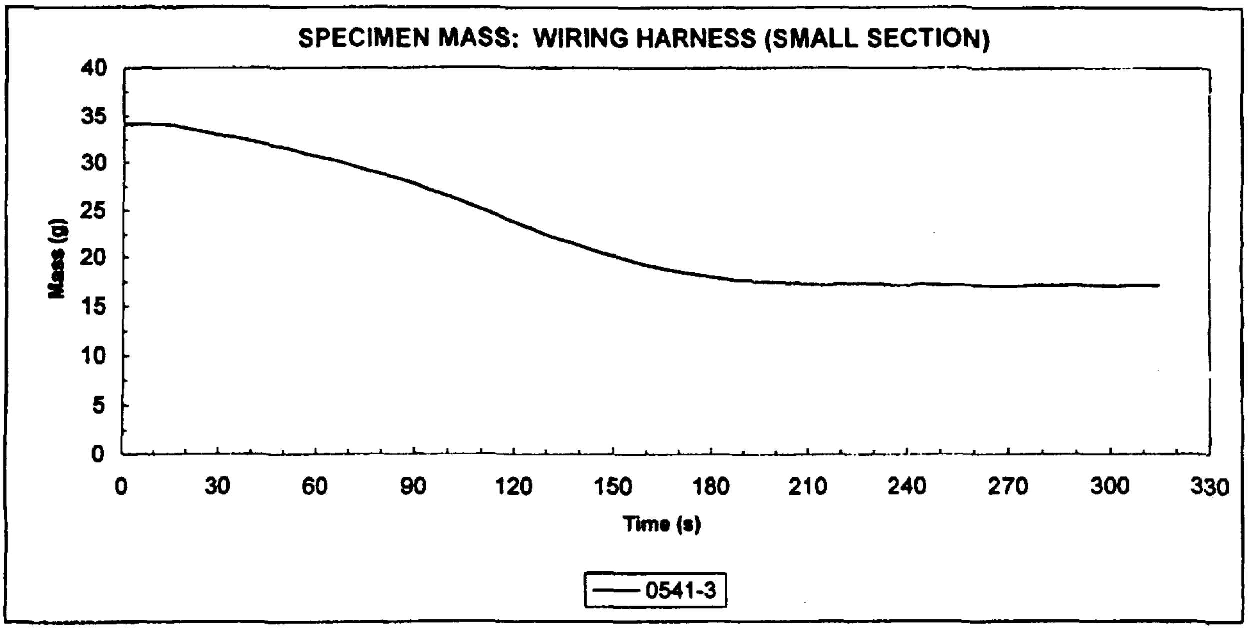

Notes & Observations:

Each sample was constructed from nine sections (10-mm diameter) of 100-mm lengh conduit.

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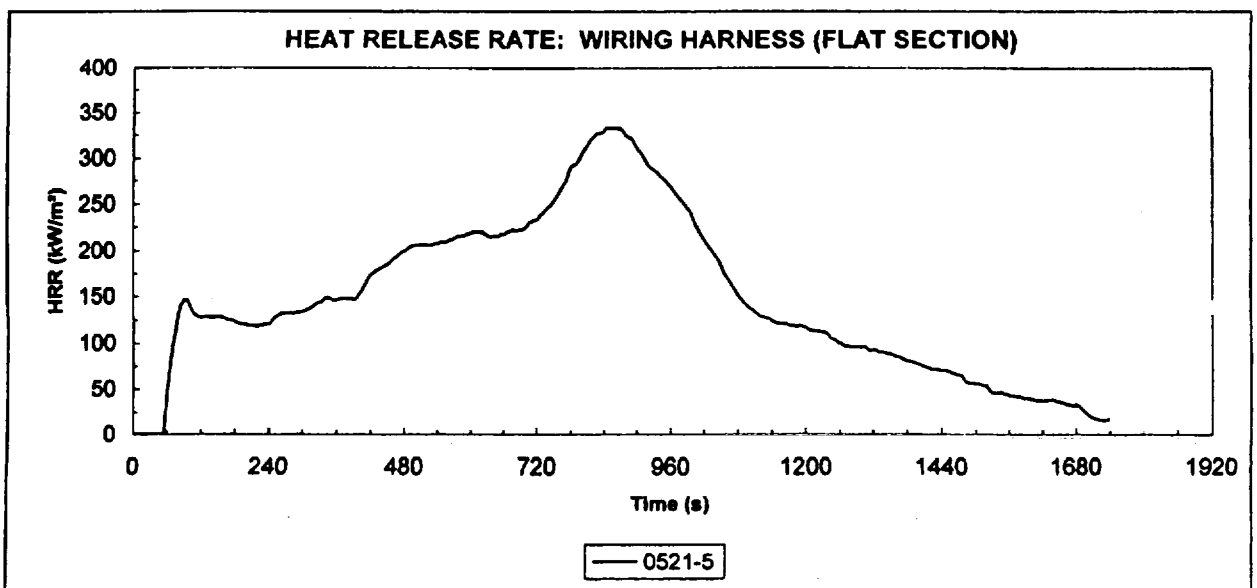
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Chevrolet Cavalier
SwRI Project No:	18.03614.01	*Material ID:*	Wiring Harness (Flat Section)
Part Number:	22621025	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,max}$ (kW/m²)
0521-5	02/21/01	48	1621	334	845	256.8	103	117	124	334
Average		48	1621	334	845	256.8	103	117	124	334

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
186.4	115.8	70.7	37.9	6.7	32.1	2.37	9	3960	3969	495
186.4	115.8	70.7	37.9	6.7	32.1	2.37	9	3960	3969	495



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Wiring Harness (Flat Section)
SwRI Project No:	18.03614.01	*Heat Flux:*	35 kW/m²

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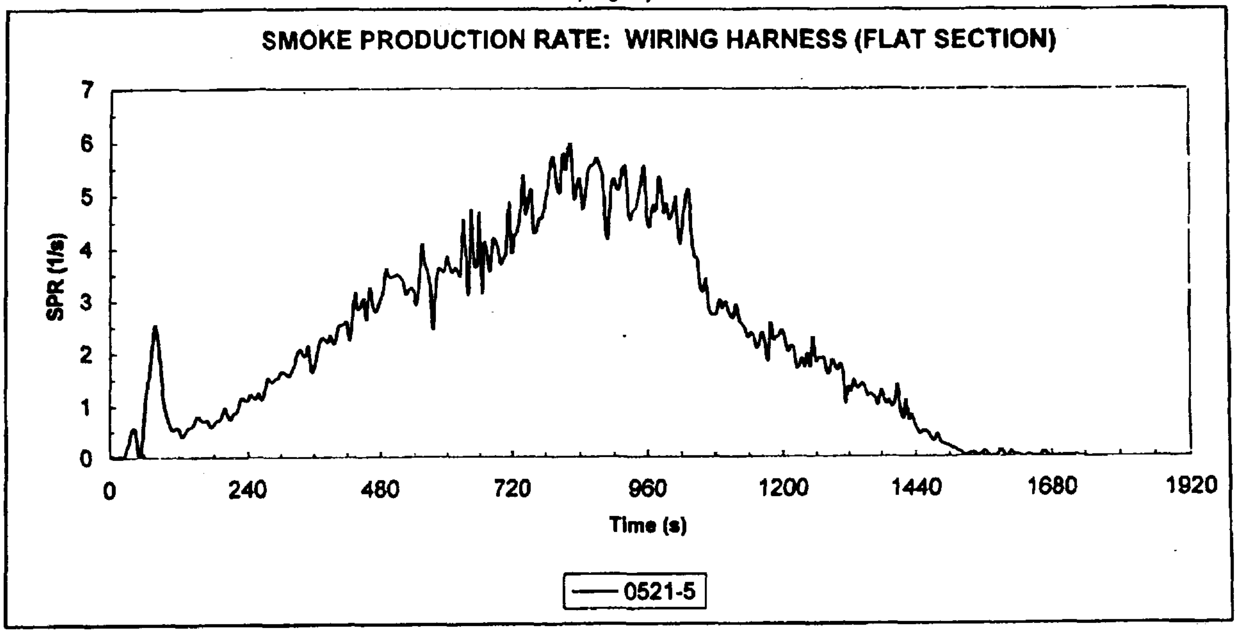

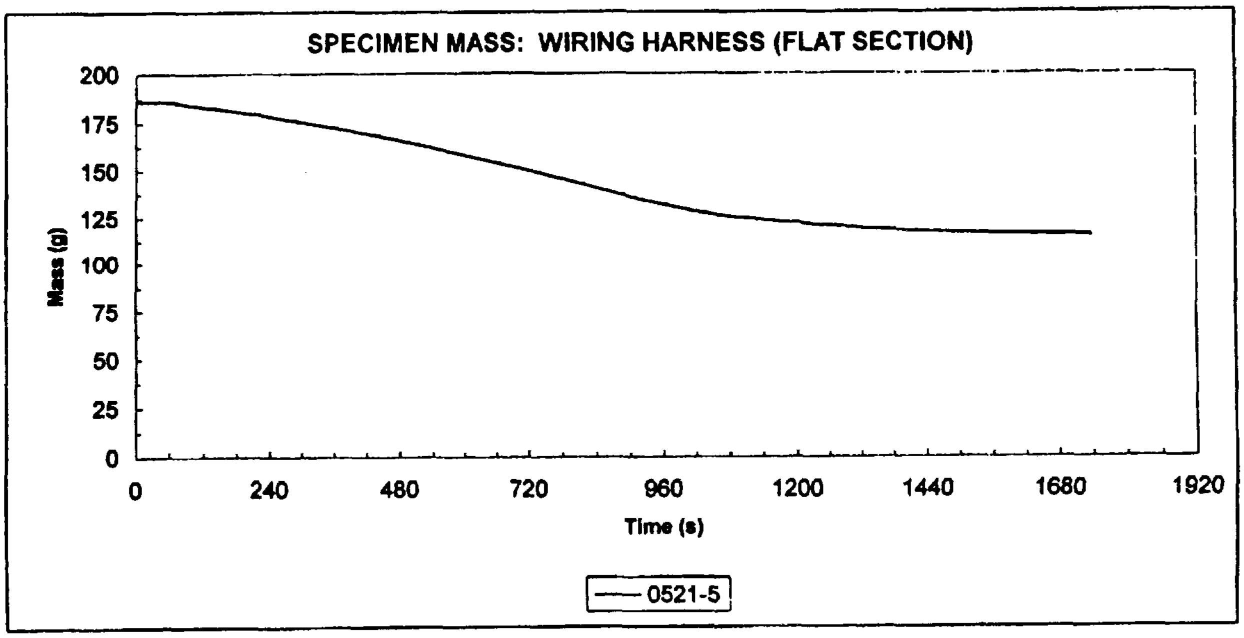

Notes & Observations:
Flashing occurred at 41 sec.

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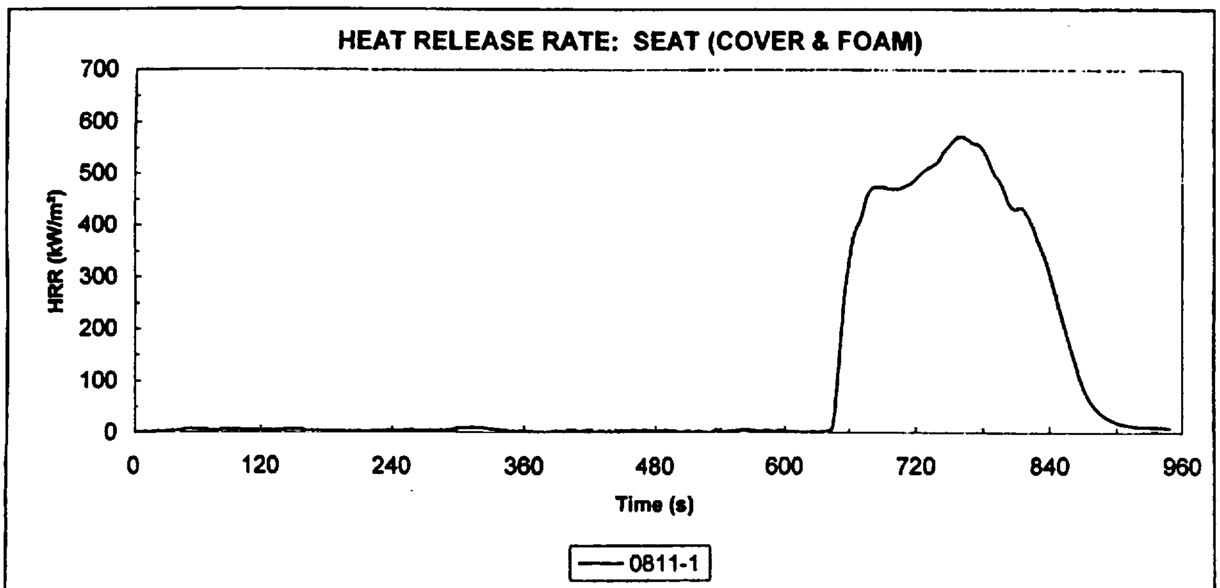
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Dodge Neon
SwRI Project No:	18.03614.01	*Material ID:*	Seat (Cover & Foam)
Part No.:	SL491AZZA	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0811-1	03/22/01	641	227	574	760	94.6	340	452	316	564
Average		641	227	574	760	94.6	340	452	316	564

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
42.9	5.8	31.7	73.9	19.1	26.4	2.23	514	1433	1948	400
42.9	5.8	31.7	73.9	19.1	26.4	2.23	514	1433	1948	400



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client: General Motors
SwRI Project No: 18.03614.01
Material ID: Seat (Cover & Foam)
Heat Flux: 20 kW/m²

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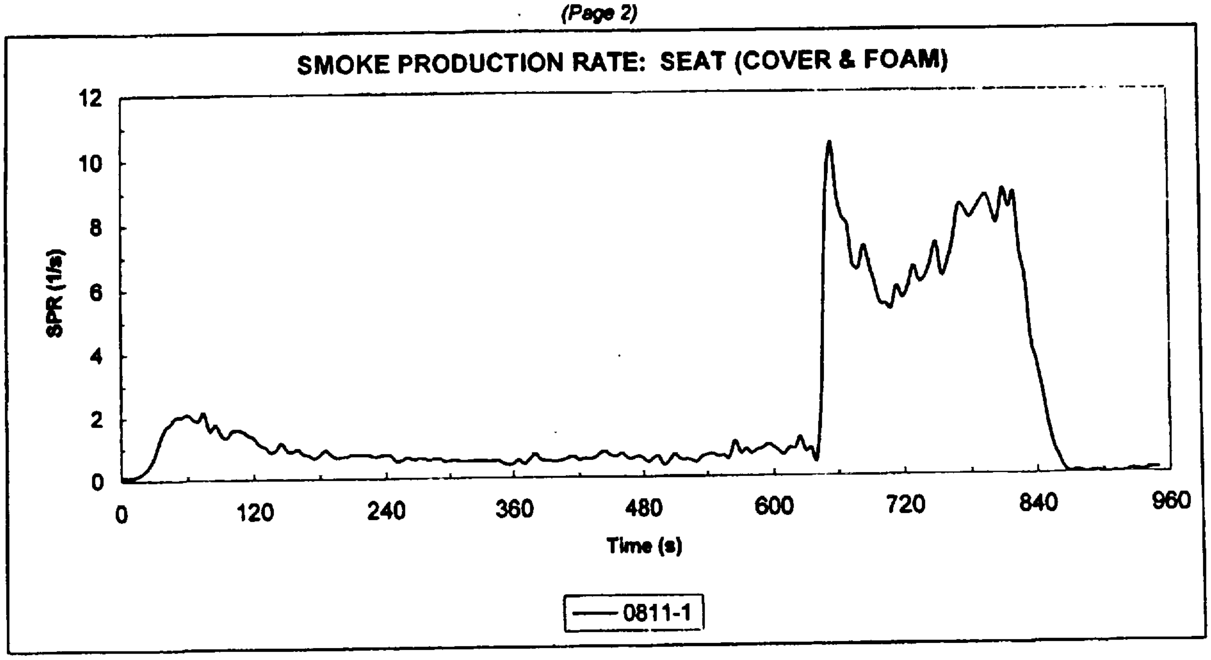
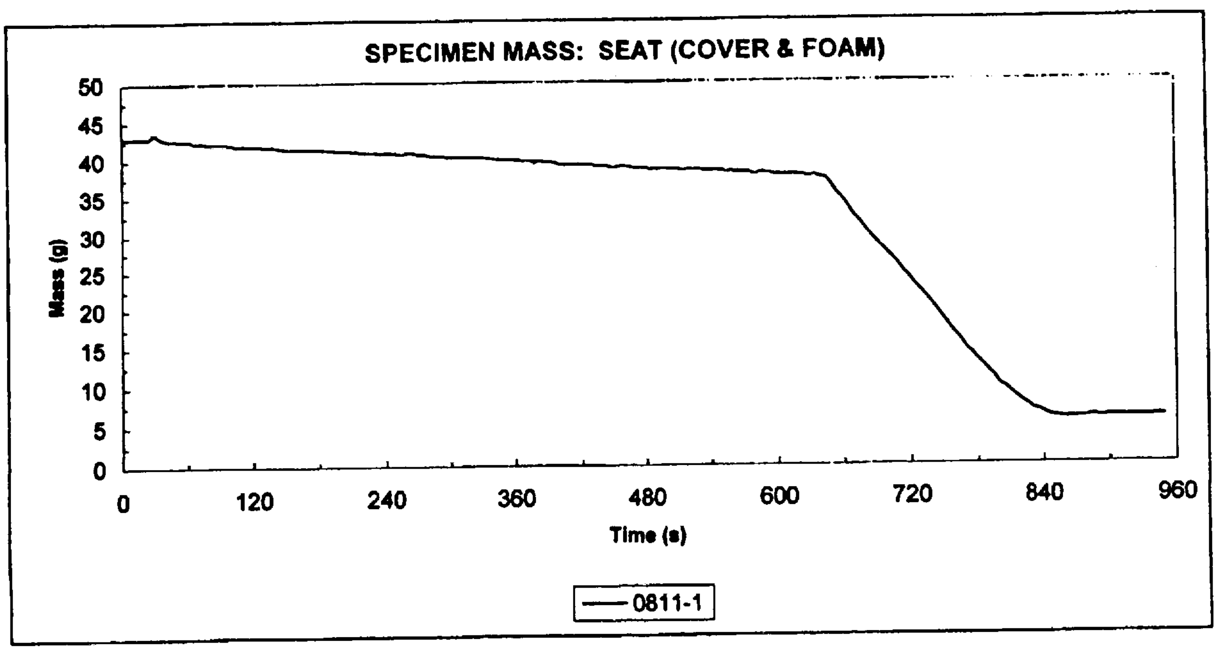




Notes & Observations:
Sample Mass
Cover - 16.6
Foam - 26.3 g
Sample shrunk down upon the insertion, and a delayed ignition resulted.

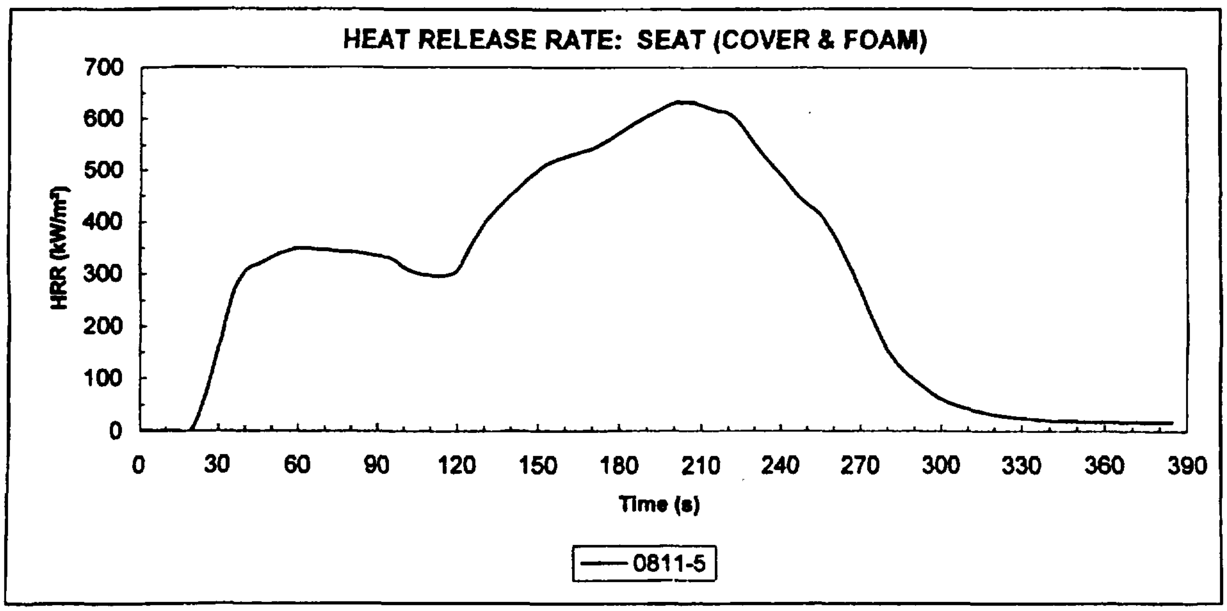
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Dodge Neon
SwRI Project No:	18.03614.01	*Material ID:*	Seat (Cover & Foam)
Part No.:	SL491AZZA	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0811-5	03/22/01	21	276	633	205	109.5	277	390	366	623
Average		21	276	633	205	109.5	277	390	366	623

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
43.1	4.3	38.5	89.2	18.8	25.2	5.35	22	1583	1605	364
43.1	4.3	38.5	89.2	18.8	25.2	5.35	22	1583	1605	364



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Seat (Cover & Foam)
SwRI Project No:	18.03614.01	*Heat Flux:*	35 kW/m²

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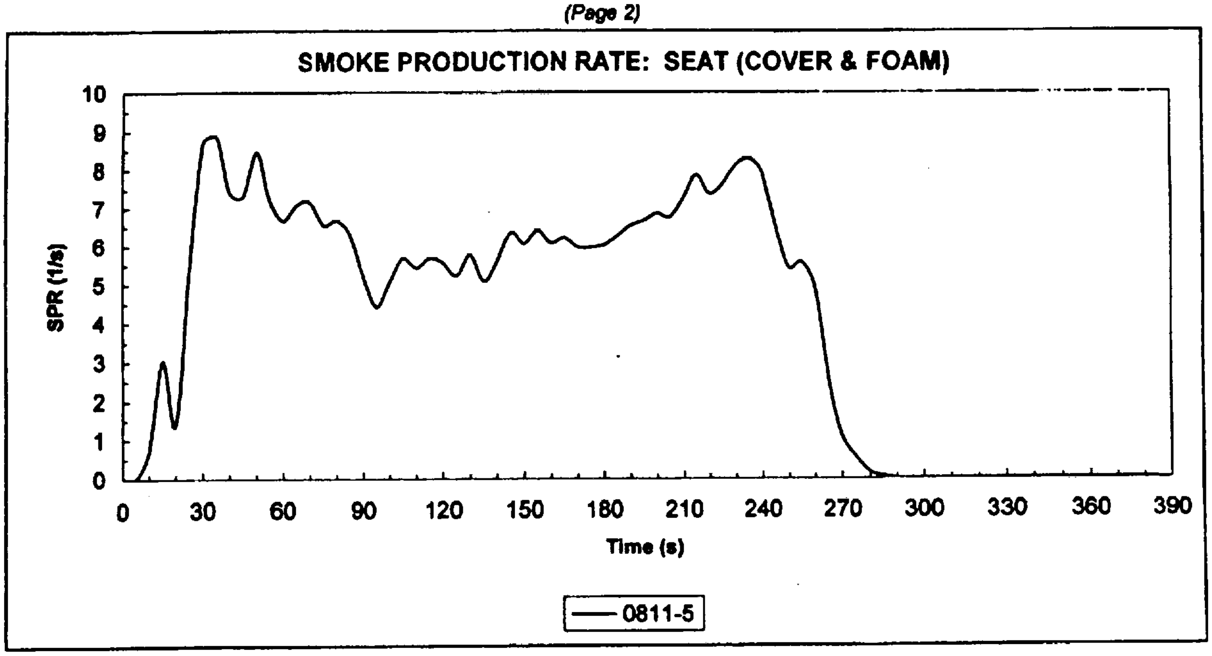
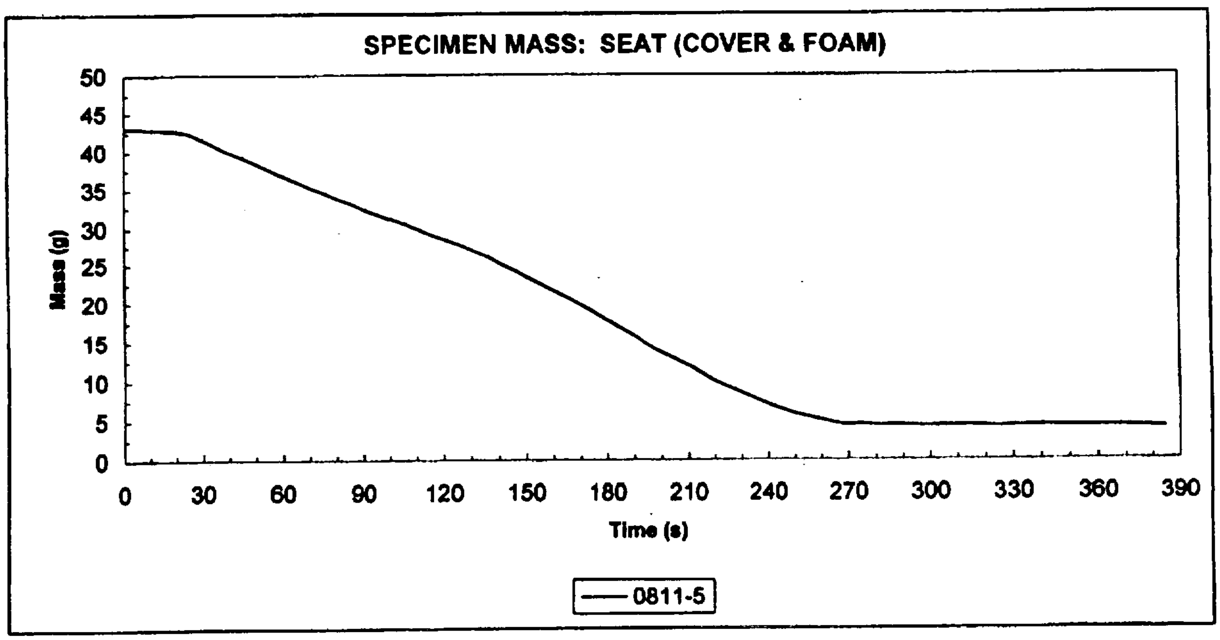




Notes & Observations:
Sample Mass
Cover - 18.3 g
Foam - 24.8 g

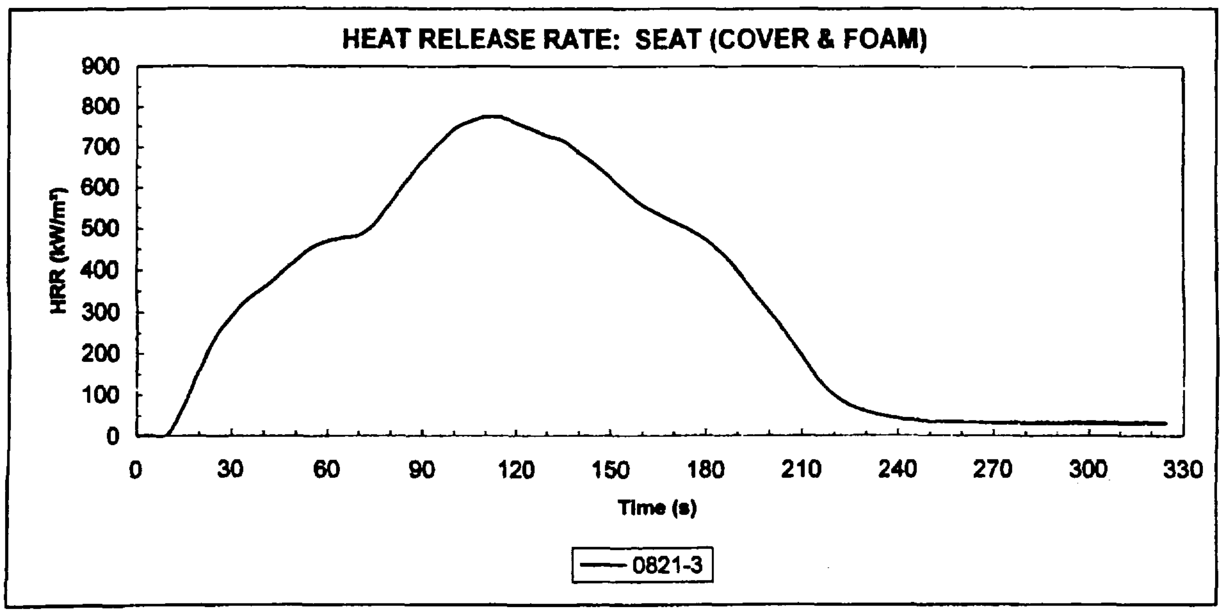
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Dodge Neon
SwRI Project No:	18.03614.01	*Material ID:*	Seat (Cover & Foam)
Part No.:	SL491AZZA	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0821-3	03/23/01	8	210	775	110	102.5	325	528	342	759
Average		8	210	775	110	102.5	325	528	342	759

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
38.6	3.3	35.3	91.4	23.6	25.7	6.64	9	1485	1494	372
38.6	3.3	35.3	91.4	23.6	25.7	6.64	9	1485	1494	372



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Seat (Cover & Foam)
SwRI Project No:	18.03614.01	*Heat Flux:*	50 kW/m²

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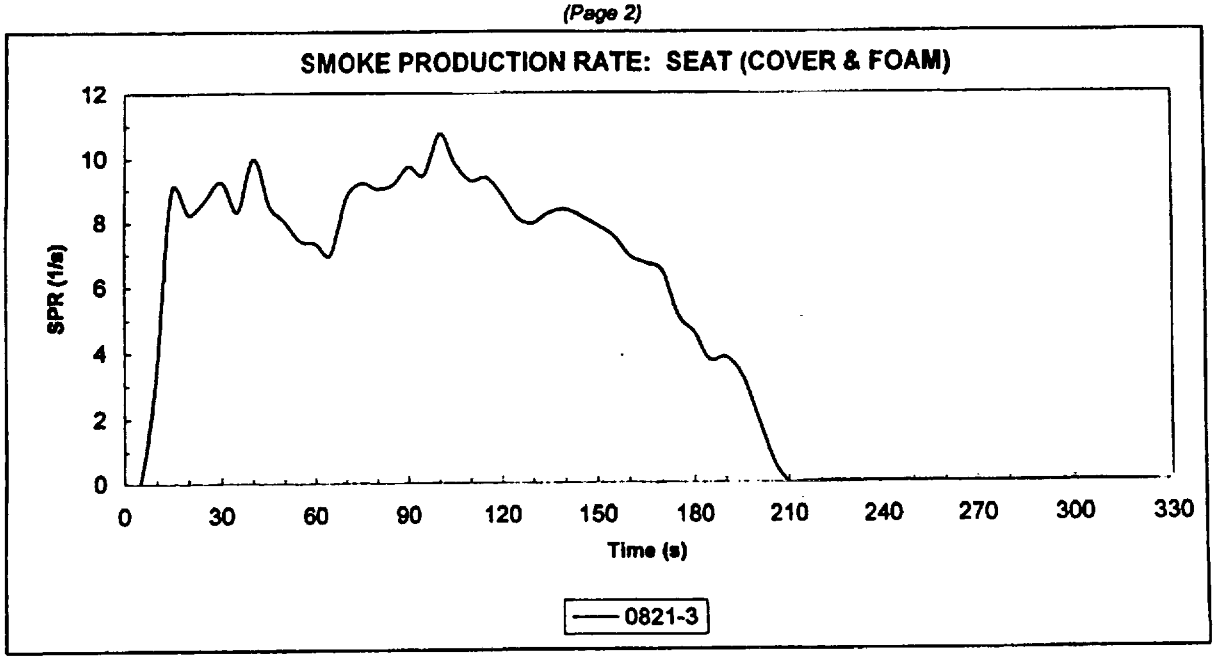

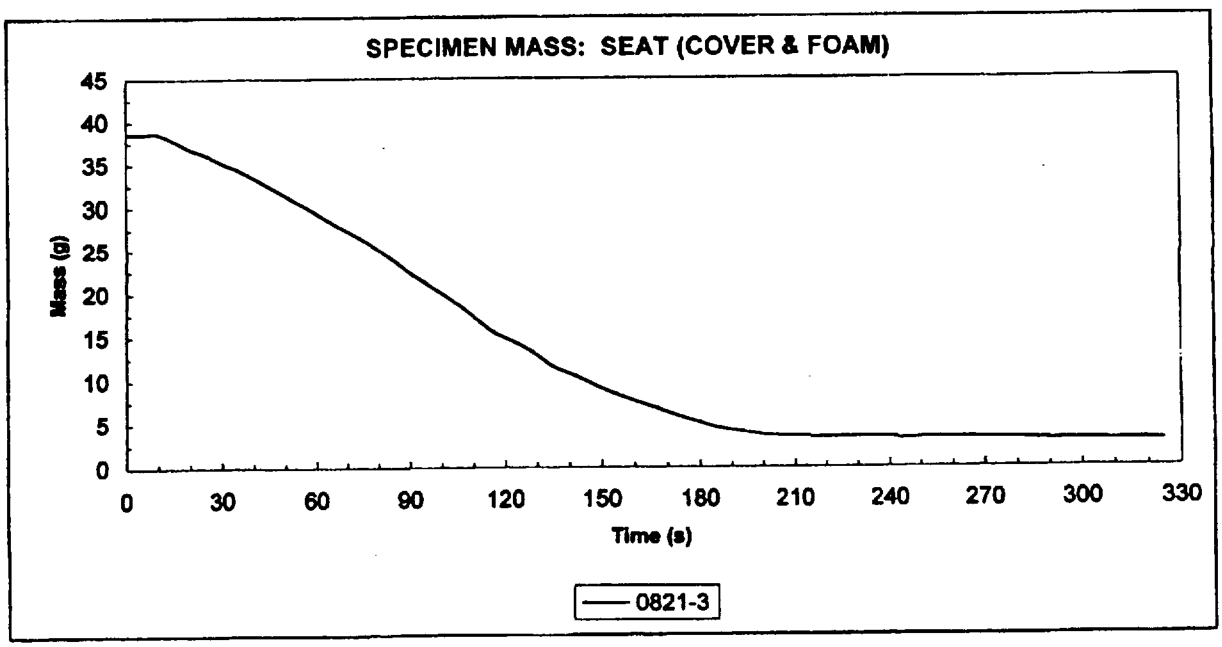

Notes & Observations:

Sample mass

Cover - 16.3 g

Foam - 22.3 g

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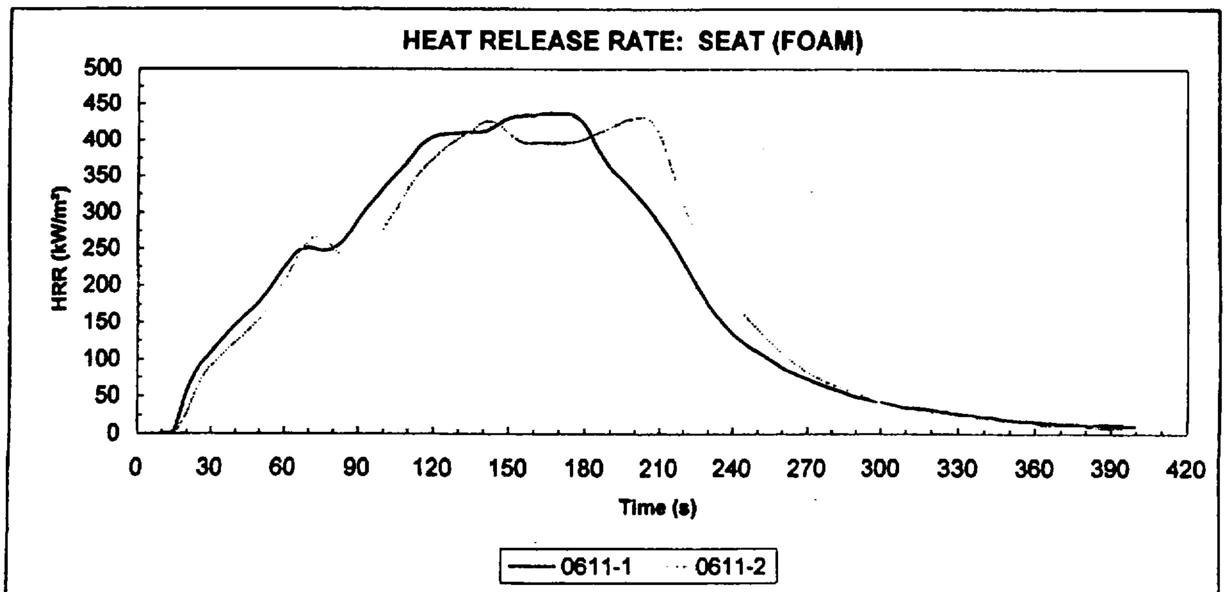
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Dodge Neon
SwRI Project No:	18.03614.01	*Material ID:*	Seat (Foam)
Part No.:	SL491AZZA	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,max}$ (kW/m²)
0611-1	03/02/01	9	308	438	165	71.5	139	297	238	435
0611-2	03/02/01	11	304	432	200	72.9	122	277	243	421
Average		10	306	435	183	72.2	131	287	240	428

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
25.9	4.7	21.1	81.4	12.3	30.0	1.88	1	600	601	252
26.2	4.5	21.8	83.4	12.8	29.5	2.15	1	688	689	279
26.1	4.6	21.5	82.4	12.5	29.7	2.02	1	644	645	265



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Seat (Foam)
SwRI Project No:	18.03614.01	*Heat Flux:*	20 kW/m²

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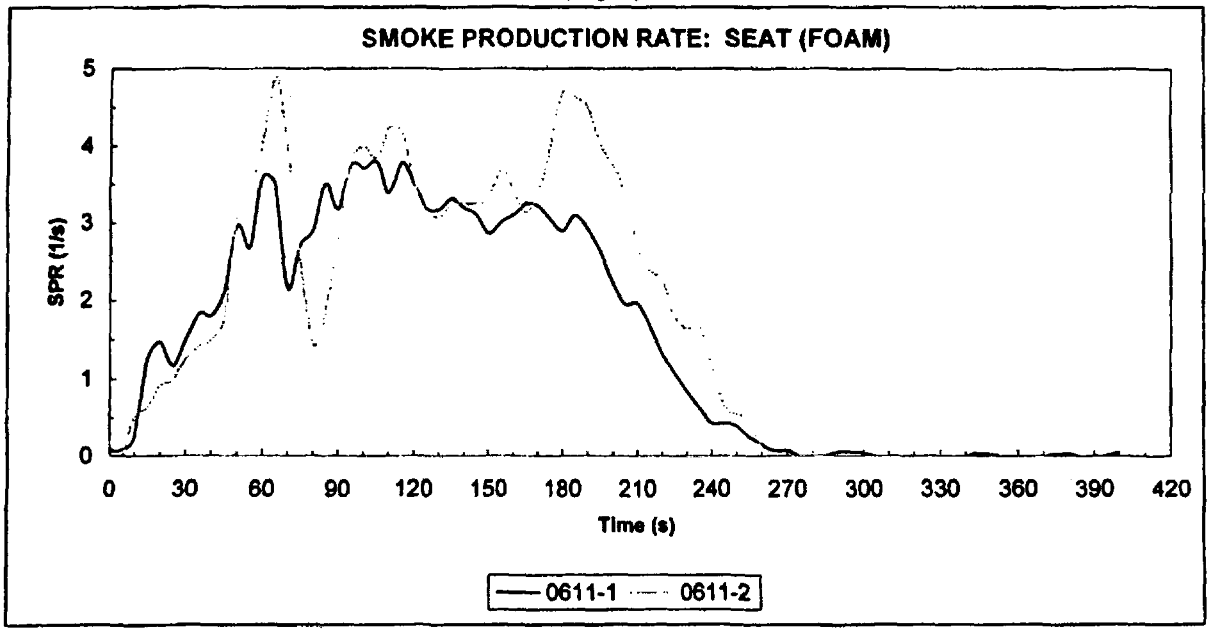
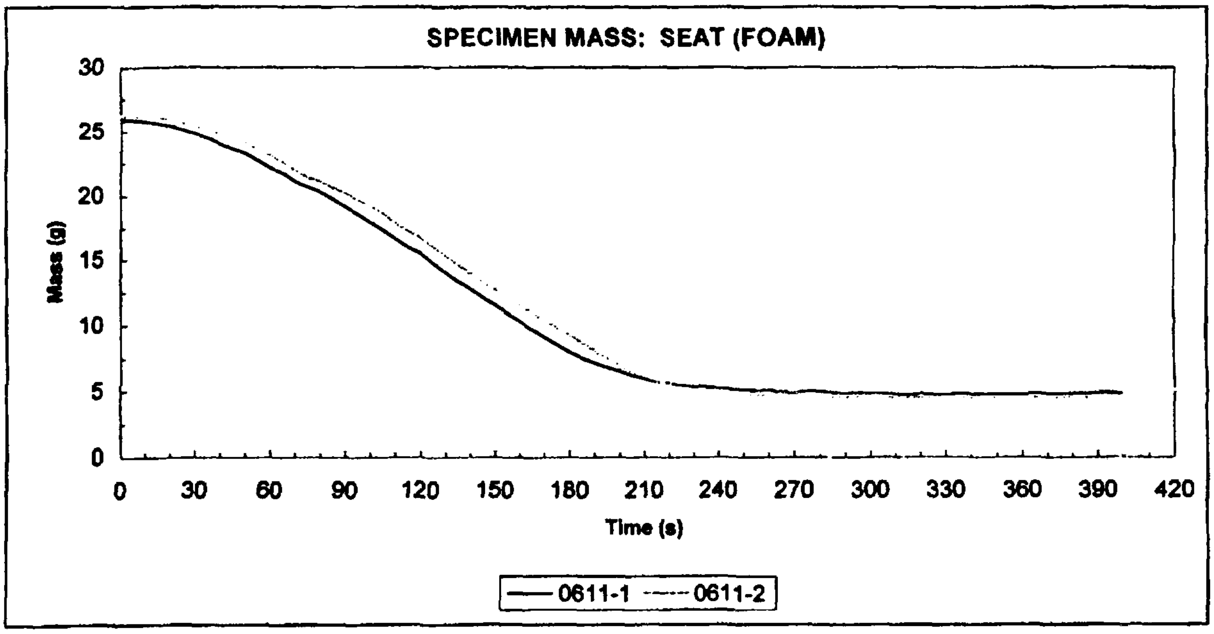




Notes & Observations:

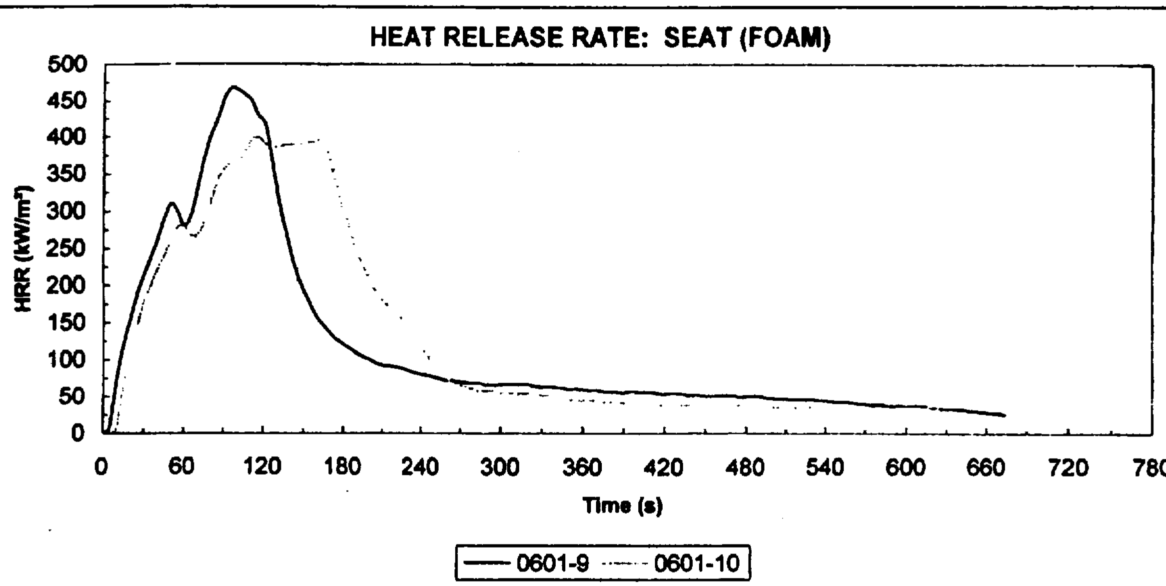
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Dodge Neon
SwRI Project No:	18.03614.01	*Material ID:*	Seat (Foam)
Part No.:	SL491AZZA	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\ max}$ (kW/m²)
0601-9	03/01/01	3	590	469	95	74.9	215	276	199	454
0601-10	03/01/01	3	636	400	115	81.8	176	298	228	392
Average		3	613	435	105	78.4	195	287	214	423

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
24.2	3.7	20.5	84.8	5.0	32.2	1.18	7	696	703	300
27.6	3.5	24.1	87.3	5.7	30.0	1.20	3	771	775	283
25.9	3.6	22.3	86.0	5.3	31.1	1.19	5	734	739	291

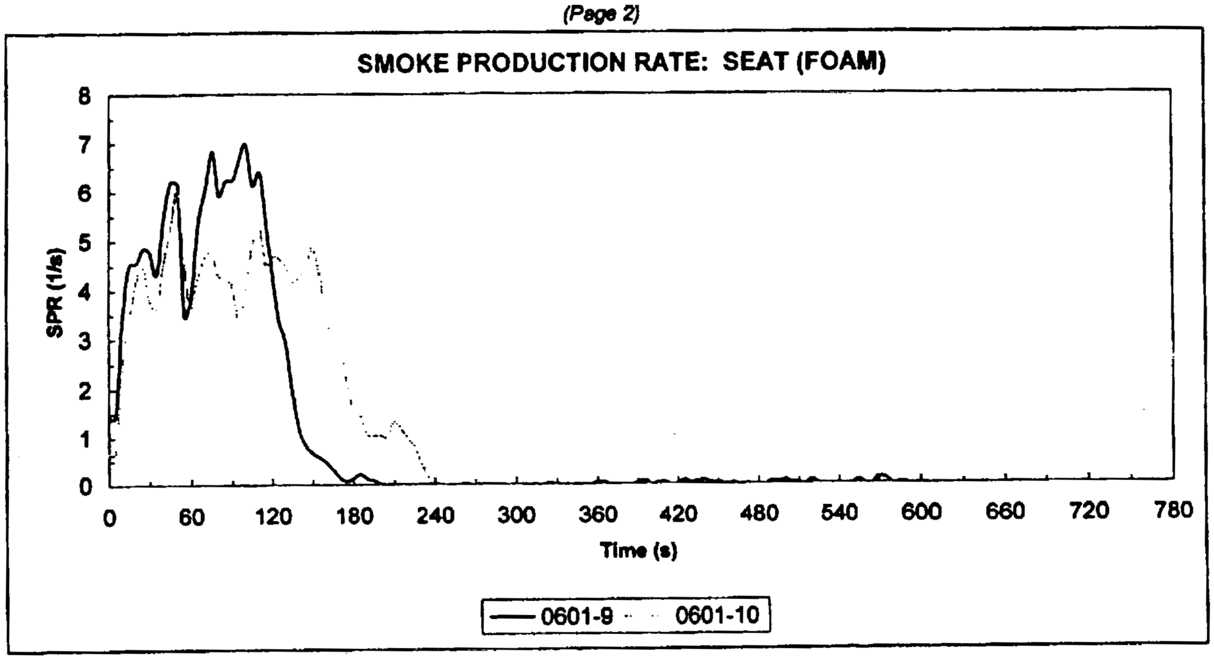


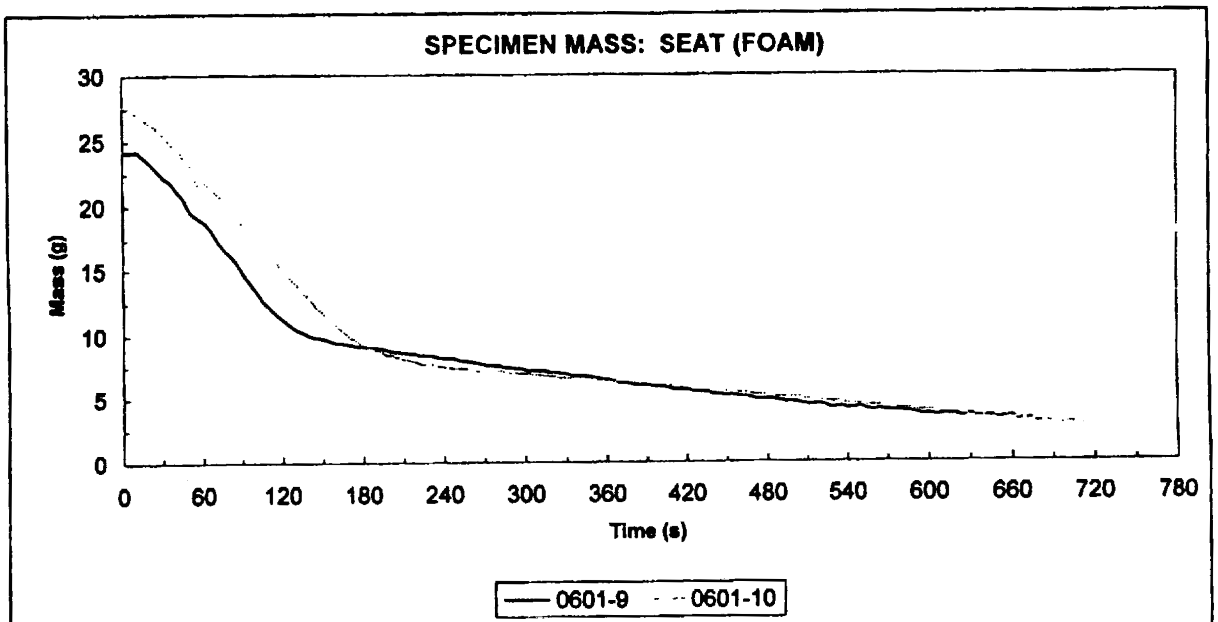
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Seat (Foam)
SwRI Project No:	18.03614.01	*Heat Flux:*	35 kW/m²

(Page 2)





Notes & Observations:

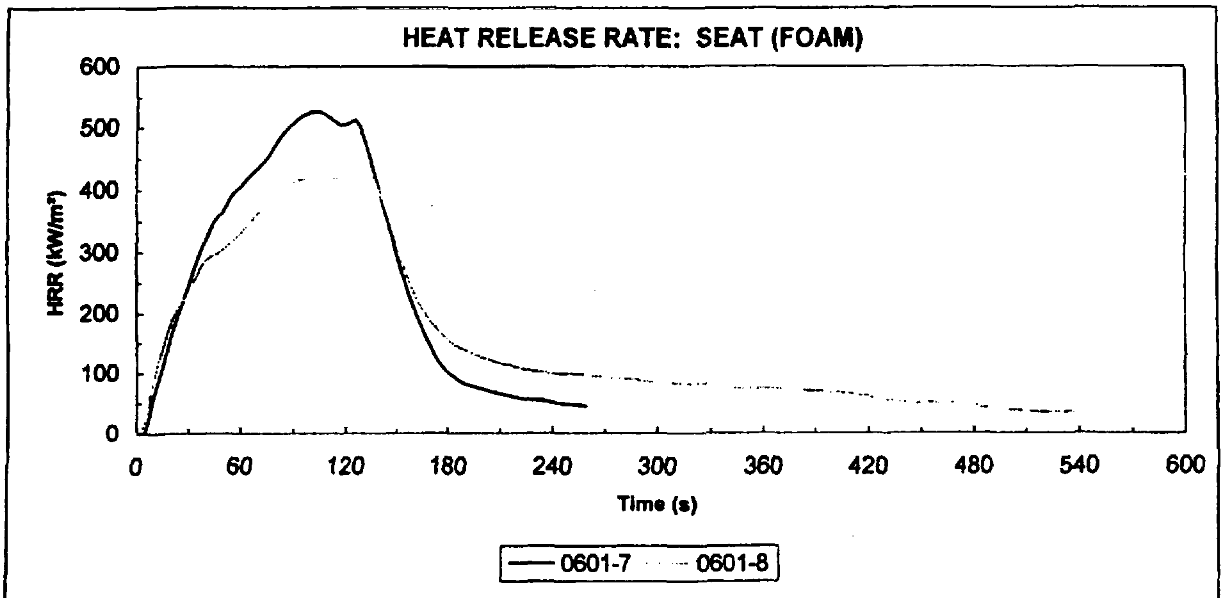
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Dodge Neon
SwRI Project No:	18.03614.01	*Material ID:*	Seat (Foam)
Part No.:	SL491AZZA	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\,max}$ (kW/m²)
0601-7	03/01/01	3	172	525	100	60.3	259	337	202	516
0601-8	03/01/01	2	452	425	130	78.3	209	304	225	421
Average		2	312	475	115	69.3	234	320	214	469

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
21.0	1.9	19.1	90.9	16.4	27.9	4.19	23	720	743	333
24.9	3.0	21.9	87.8	7.5	31.7	1.93	0	882	882	357
23.0	2.5	20.5	89.3	12.0	29.8	3.06	12	801	813	345



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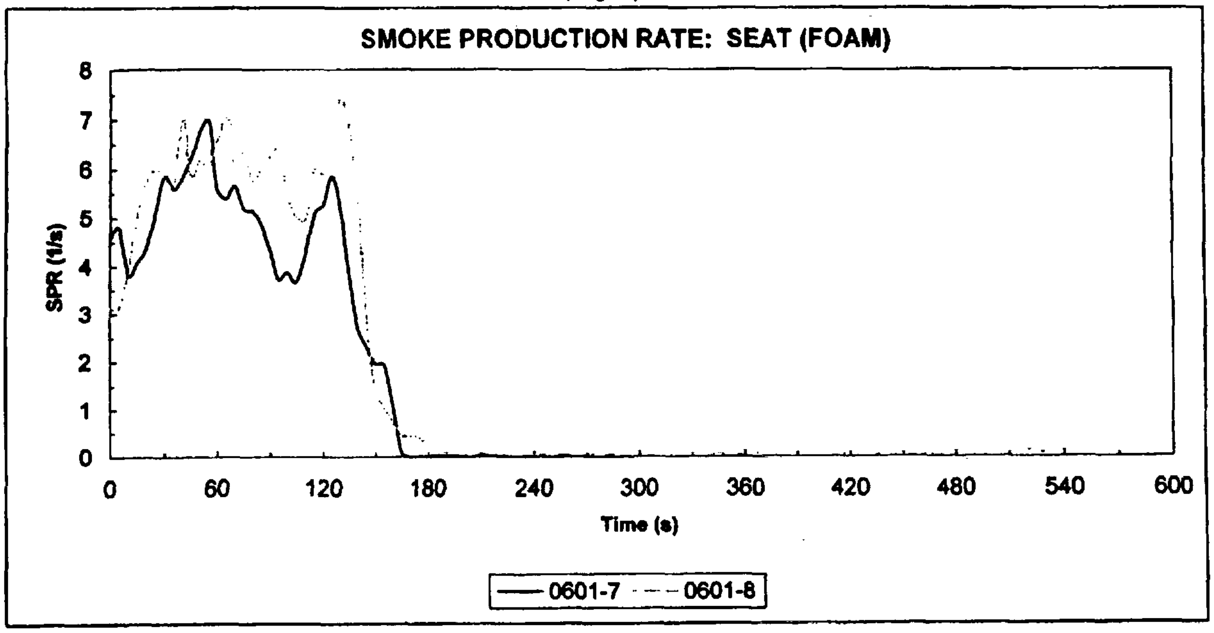
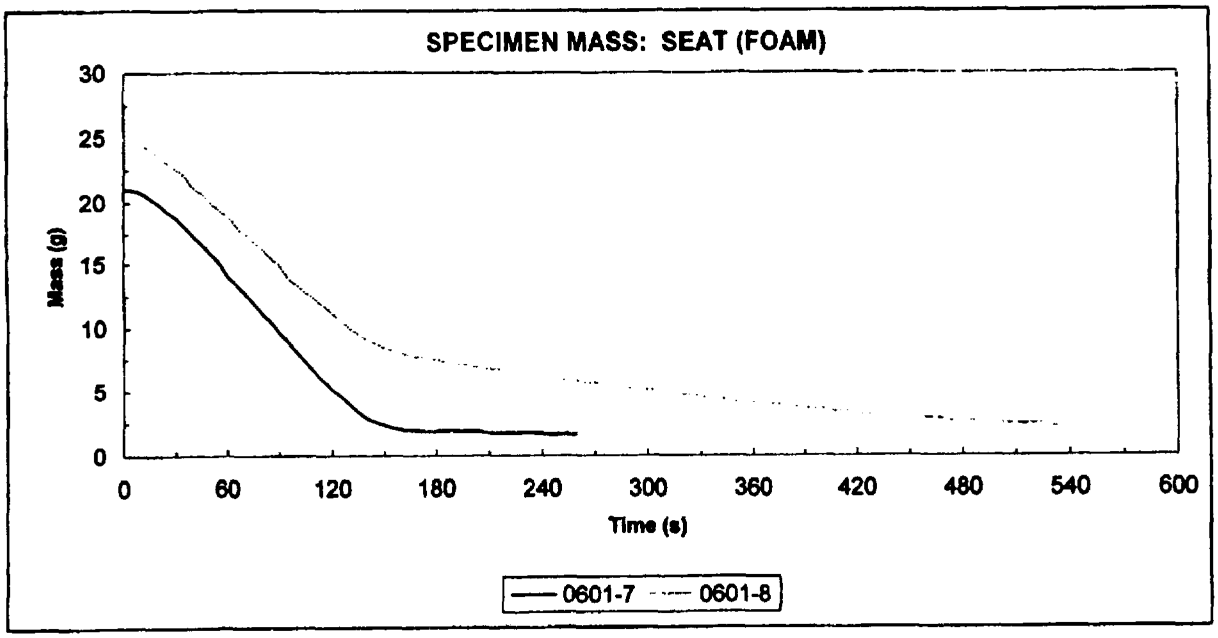
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Seat (Foam)
SwRI Project No:	18.03614.01	*Heat Flux:*	50 kW/m²

(Page 2)





Notes & Observations:

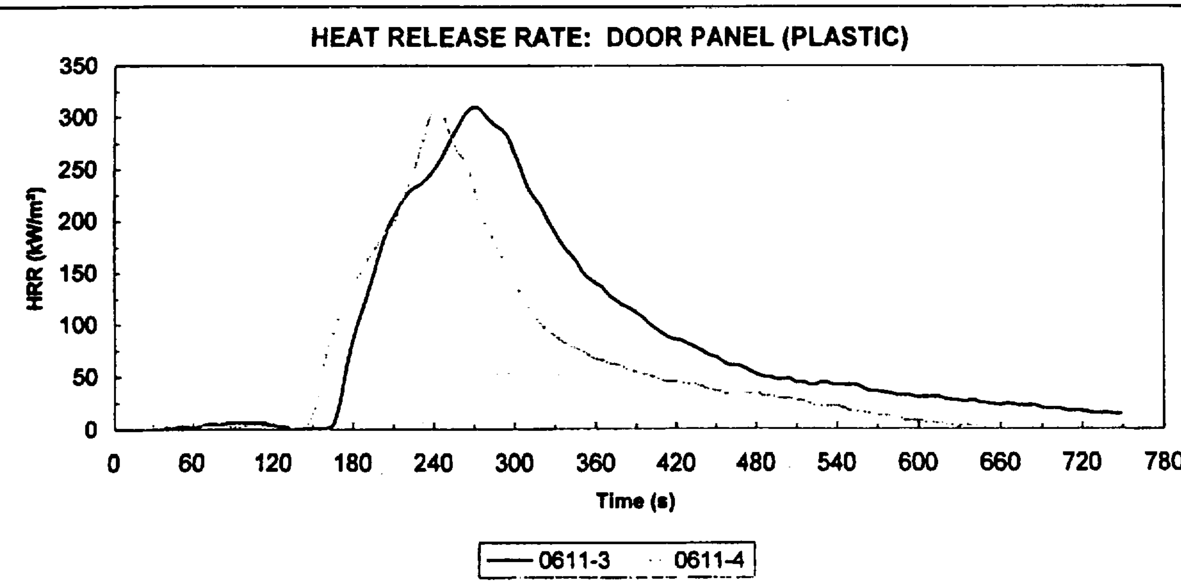
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Dodge Neon
SwRI Project No:	18.03614.01	*Material ID:*	Door Panel (Plastic)
Part No.:	PZ15WL5AK	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\,max}$ (kW/m²)
0611-3	03/02/01	158	514	311	270	58.6	121	210	169	302
0611-4	03/02/01	142	424	309	240	42.4	98	175	130	290
Average		150	469	310	255	50.5	110	192	149	296

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
27.5	16.5	10.9	39.5	4.1	47.7	0.70	36	439	475	357
27.5	19.9	7.6	27.6	4.0	49.3	0.46	19	242	261	282
27.5	18.2	9.2	33.6	4.1	48.5	0.58	28	341	368	320



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client: General Motors
SwRI Project No: 18.03614.01
Material ID: Door Panel (Plastic)
Heat Flux: 20 kW/m²

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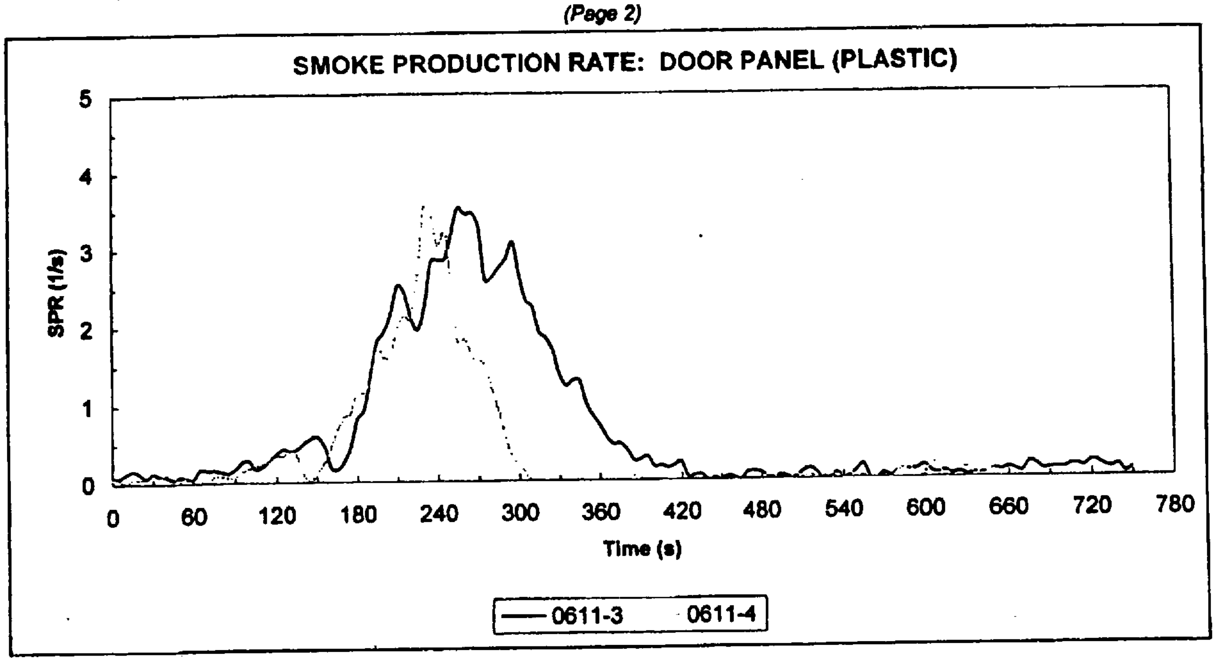
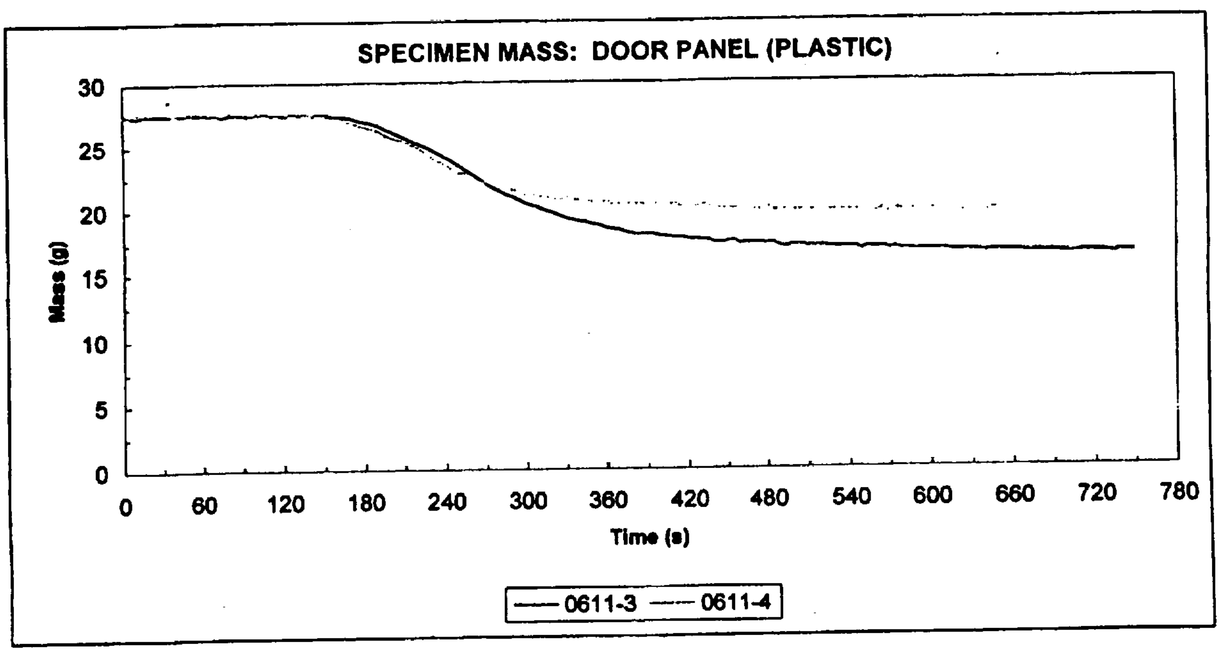




Notes & Observations:

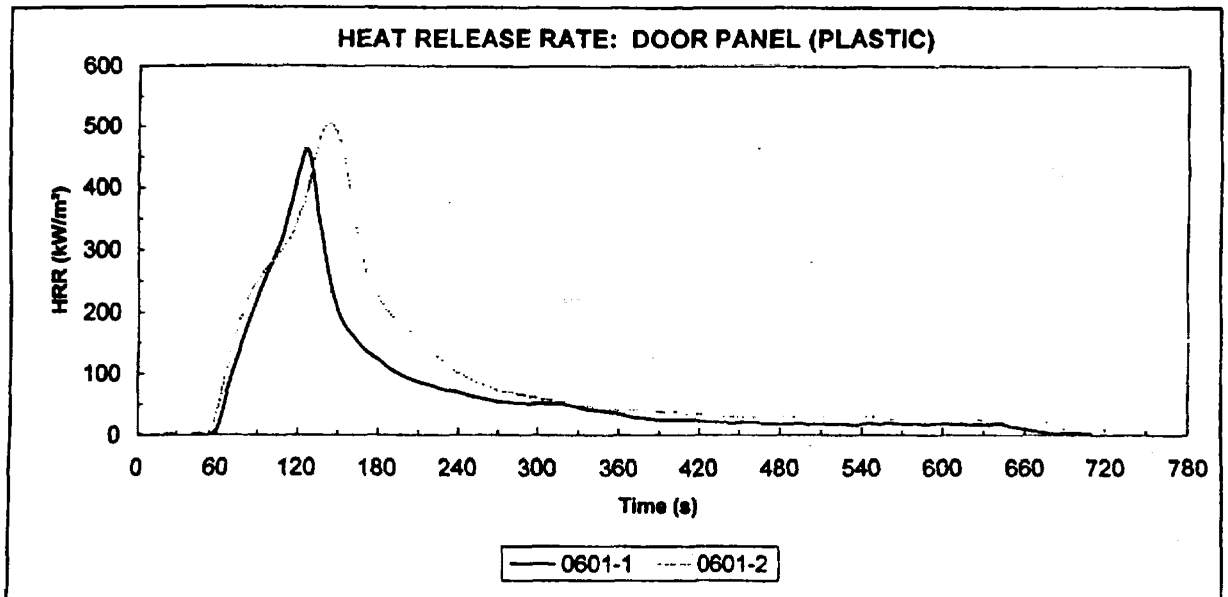
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Dodge Neon
SwRI Project No:	18.03614.01	*Material ID:*	Door Panel (Plastic)
Part No.:	PZ15WL5AK	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\,max}$ (kW/m²)
0601-1	03/01/01	48	584	464	125	45.4	156	183	131	394
0601-2	03/01/01	50	617	503	140	63.9	179	255	180	468
Average		49	600	483	133	54.6	168	219	156	431

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
21.5	10.3	11.6	53.8	3.4	34.7	0.55	2	348	350	266
26.7	12.9	13.8	51.8	3.3	40.9	0.81	4	537	541	344
24.1	11.6	12.7	52.8	3.4	37.8	0.68	3	443	446	305



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Door Panel (Plastic)
SwRI Project No:	18.03614.01	*Heat Flux:*	35 kW/m²

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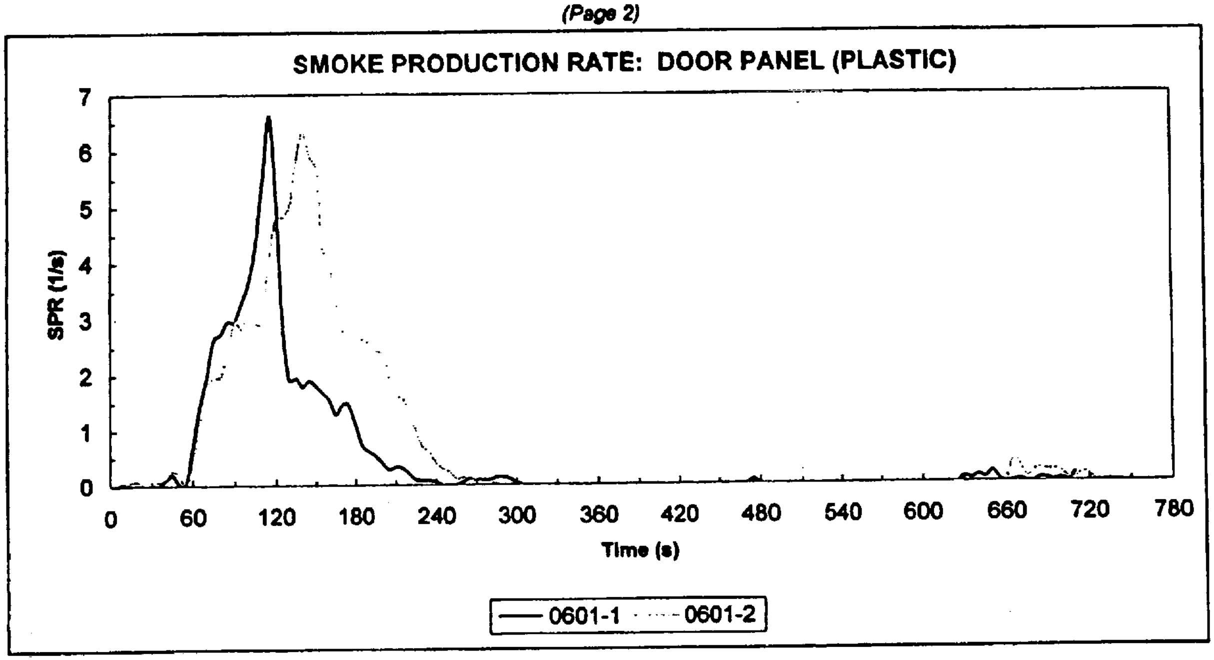

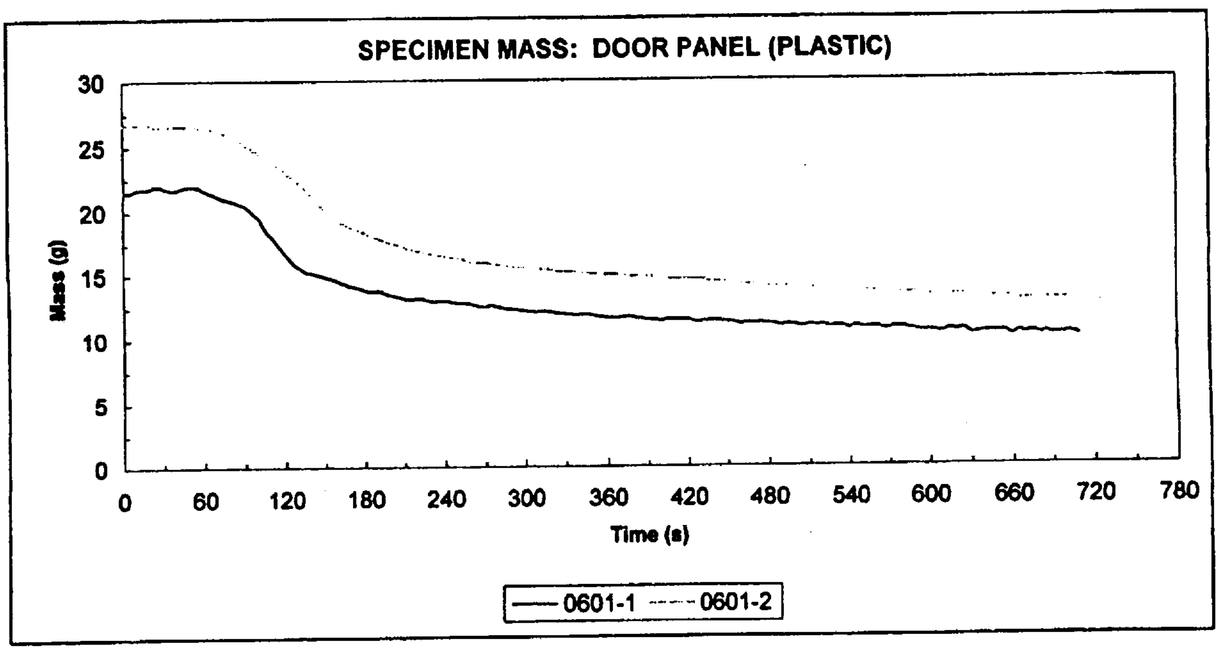

Notes & Observations:
Sample melted and dripped from the holder during both tests.

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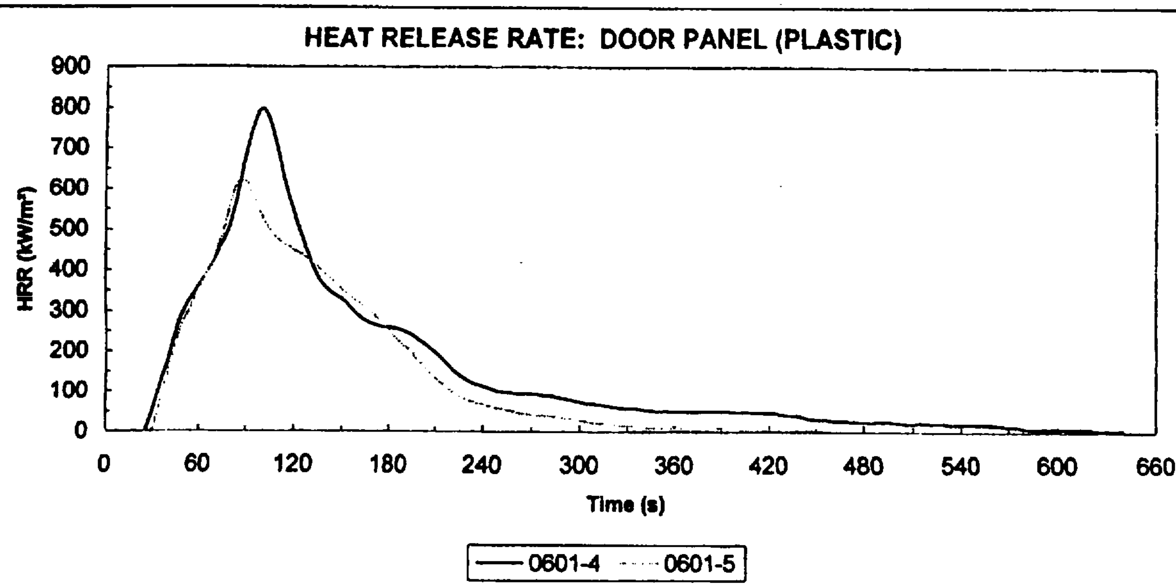
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Dodge Neon
SwRI Project No:	18.03614.01	*Material ID:*	Door Panel (Plastic)
Part No.:	PZ15WL5AK	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0601-4	03/01/01	23	536	798	100	90.8	307	386	274	717
0601-5	03/01/01	24	349	620	85	70.1	298	349	232	568
Average		24	442	709	93	80.5	302	368	253	642

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
26.5	5.9	20.6	77.6	7.3	39.0	1.89	1	1067	1068	459
22.3	7.3	14.7	66.1	8.6	42.0	2.69	0	1023	1023	613
24.4	6.6	17.7	71.9	8.0	40.5	2.29	1	1045	1046	536



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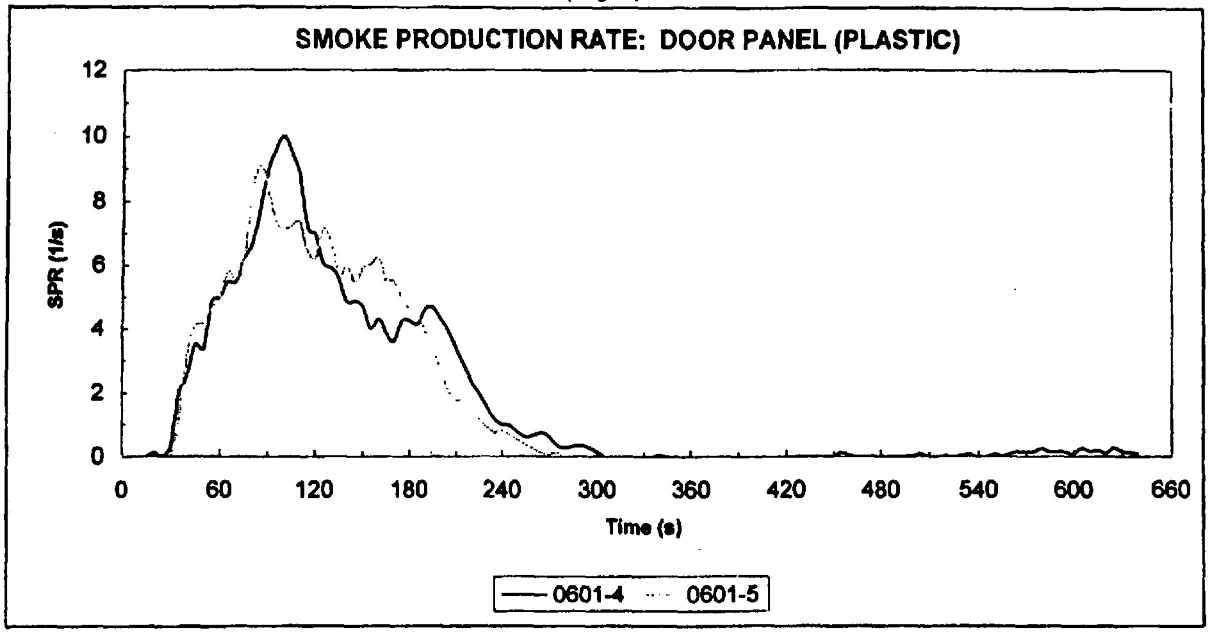
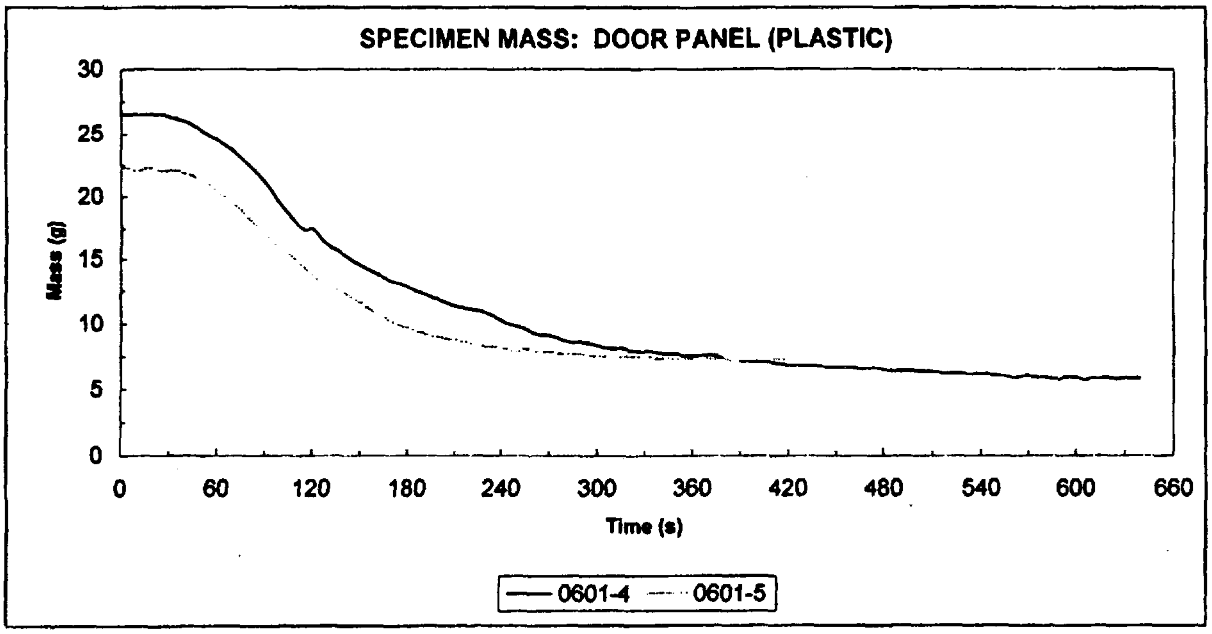
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Door Panel (Plastic)
SwRI Project No:	18.03614.01	*Heat Flux:*	50 kW/m²

(Page 2)





Notes & Observations:

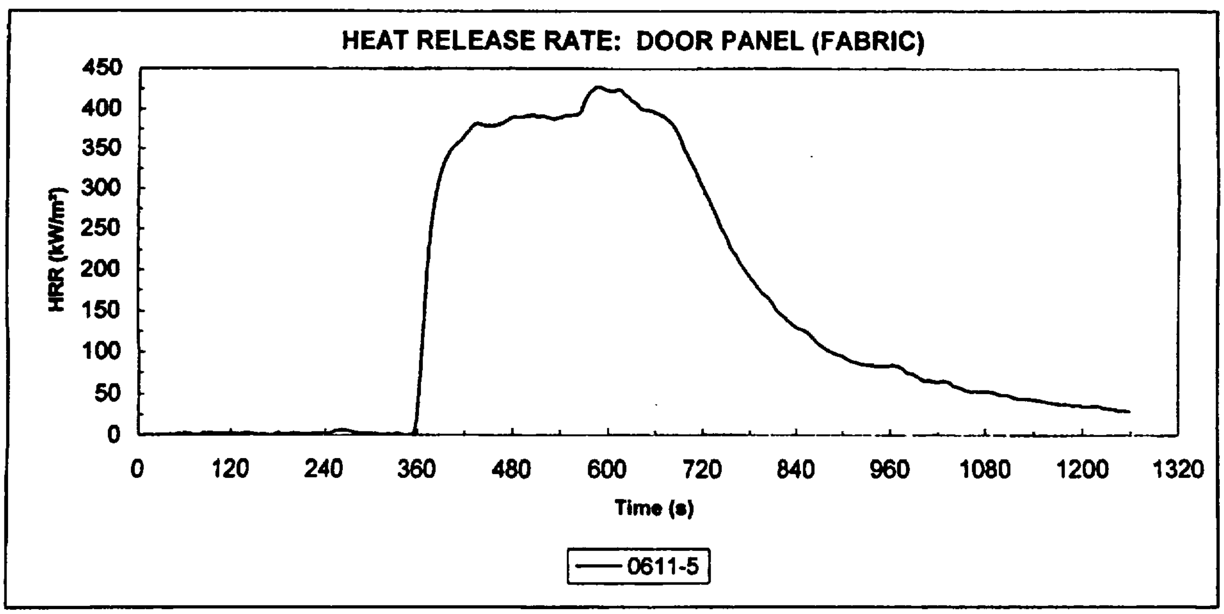
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Dodge Neon
SwRI Project No:	18.03614.01	*Material ID:*	Door Panel (Fabric)
Part No.:	PZ15WL5AK	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\ max}$ (kW/m²)
0611-5	03/02/01	351	829	428	585	182.2	220	329	361	425
Average		351	829	428	585	182.2	220	329	361	425

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
54.5	11.3	43.0	78.9	9.3	37.5	3.21	97	3706	3803	762
54.5	11.3	43.0	78.9	9.3	37.5	3.21	97	3706	3803	762



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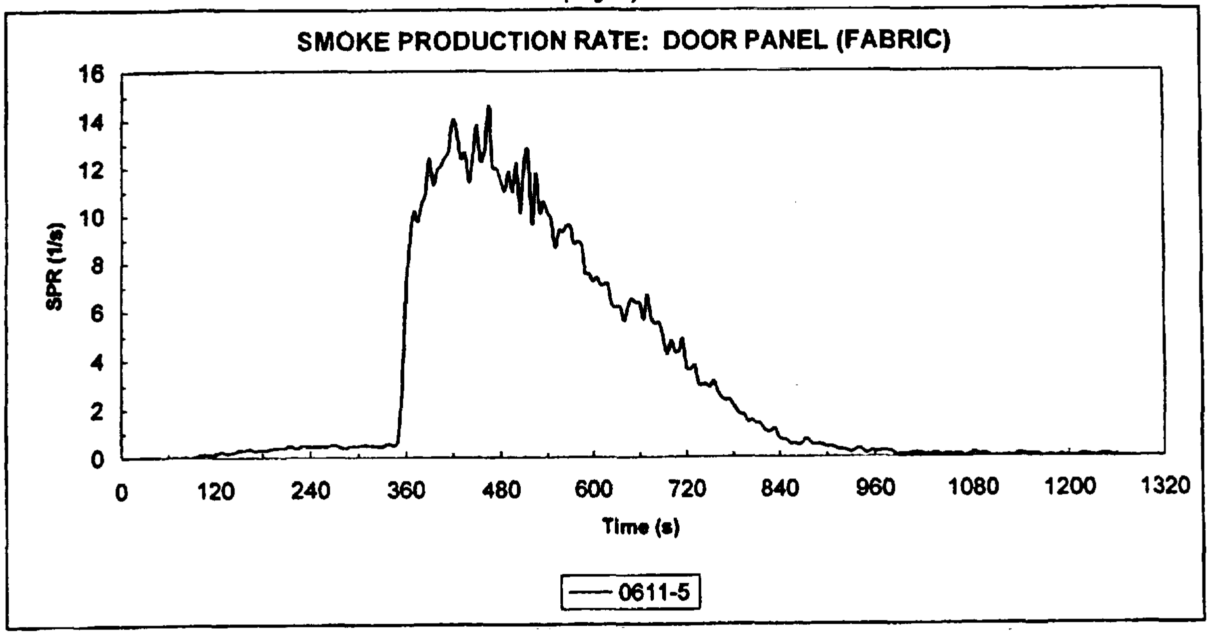
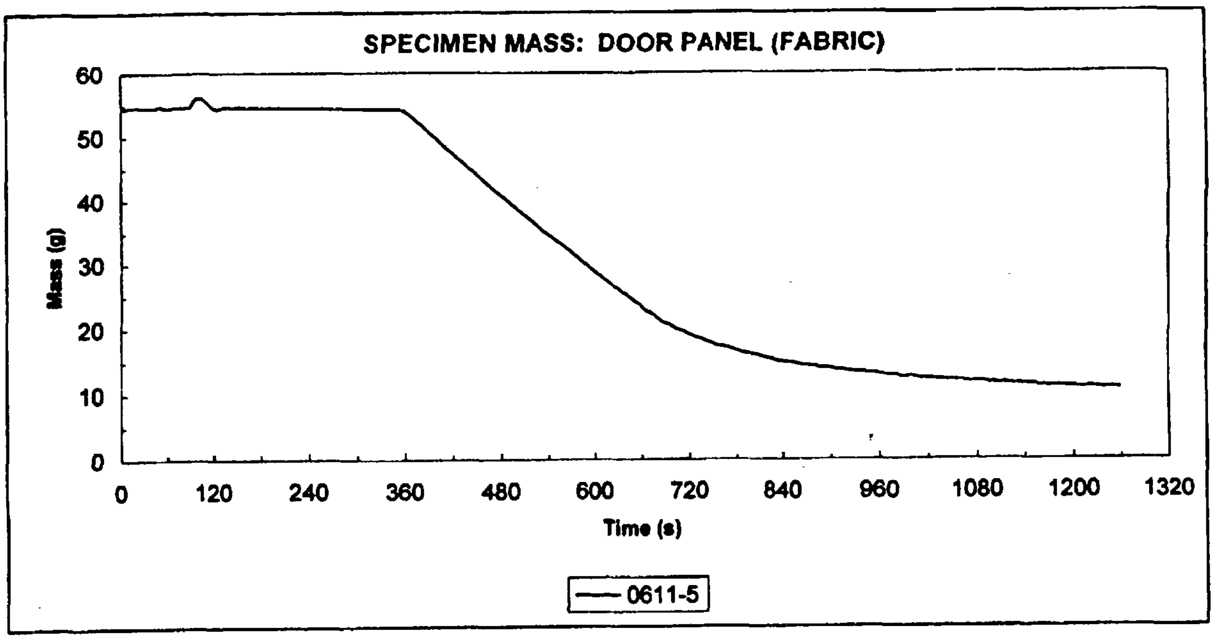
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Door Panel (Fabric)
SwRI Project No:	18.03614.01	*Heat Flux:*	20 kW/m²

(Page 2)





Notes & Observations:

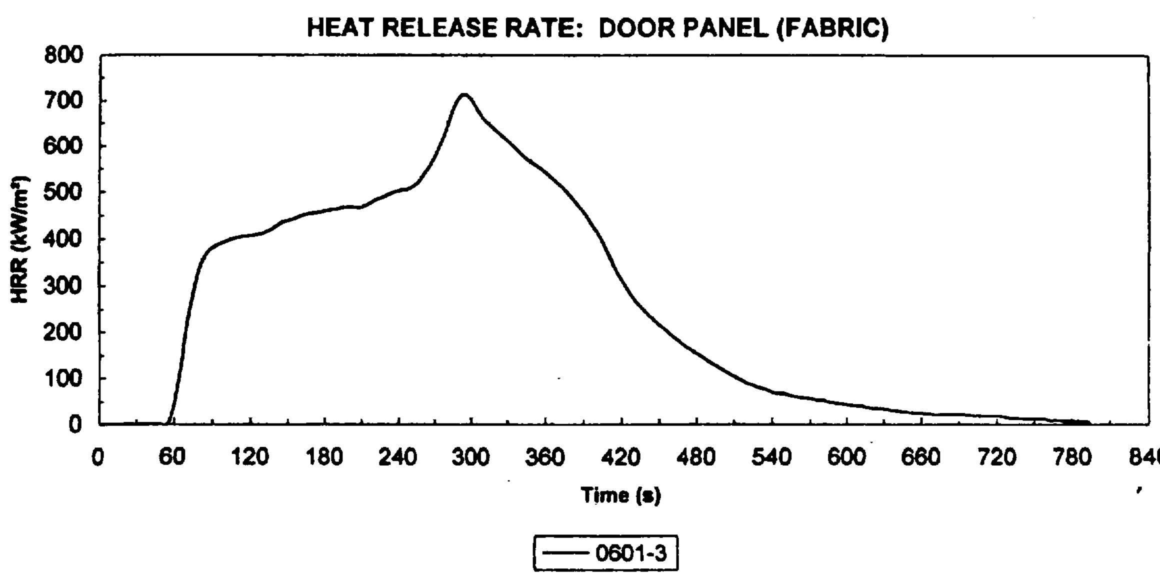
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Dodge Neon
SwRI Project No:	18.03614.01	*Material ID:*	Door Panel (Fabric)
Part No.:	PZ15WL5AK	*Heat Flux:*	35 kW/m^2
Orientation:	Horizontal	*Sample Area:*	0.00884 m^2
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m^2)	t_{peak} (s)	THR (MJ/m^2)	HRR_{60s} (kW/m^2)	HRR_{180s} (kW/m^2)	HRR_{300s} (kW/m^2)	$HRR_{30s, max}$ (kW/m^2)
0601-3	03/01/01	54	659	714	295	200.8	294	400	482	691
Average		54	659	714	295	200.8	294	400	482	691

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m^2-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m^2/m^2)	SR_2 (m^2/m^2)	TSR (m^2/m^2)	SEA (m^2/kg)
54.3	1.3	52.9	97.4	14.7	33.6	7.78	7	5596	5603	935
54.3	1.3	52.9	97.4	14.7	33.6	7.78	7	5596	5603	935



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Door Panel (Fabric)
SwRI Project No:	18.03614.01	*Heat Flux:*	35 kW/m²

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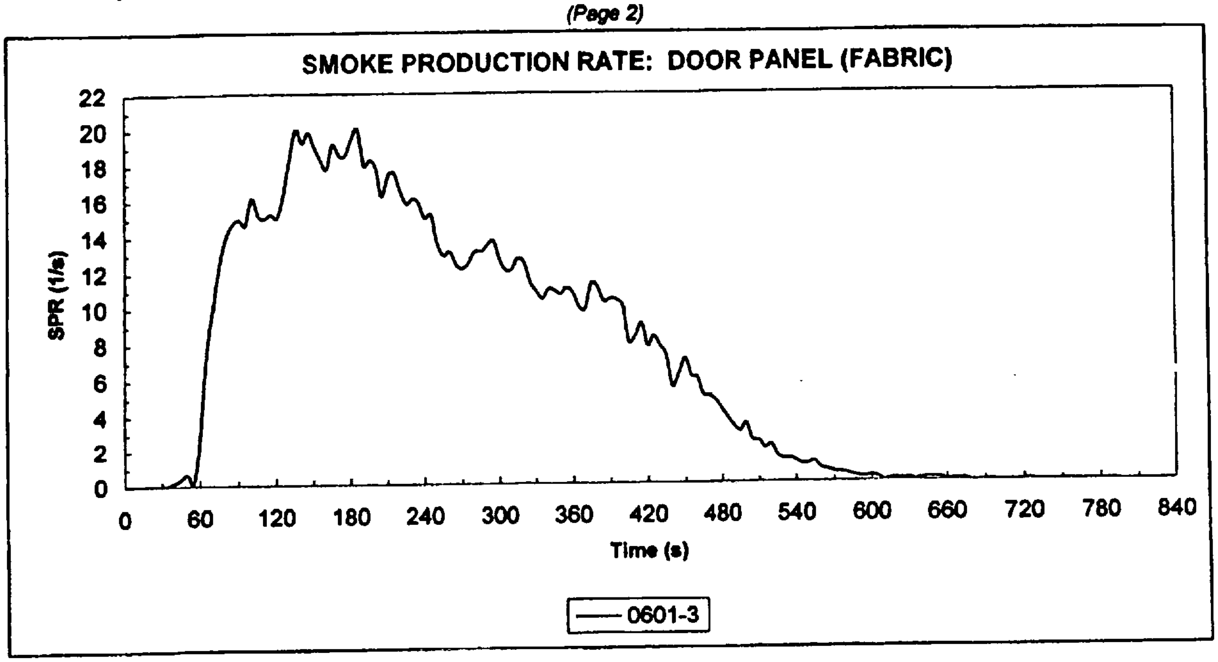
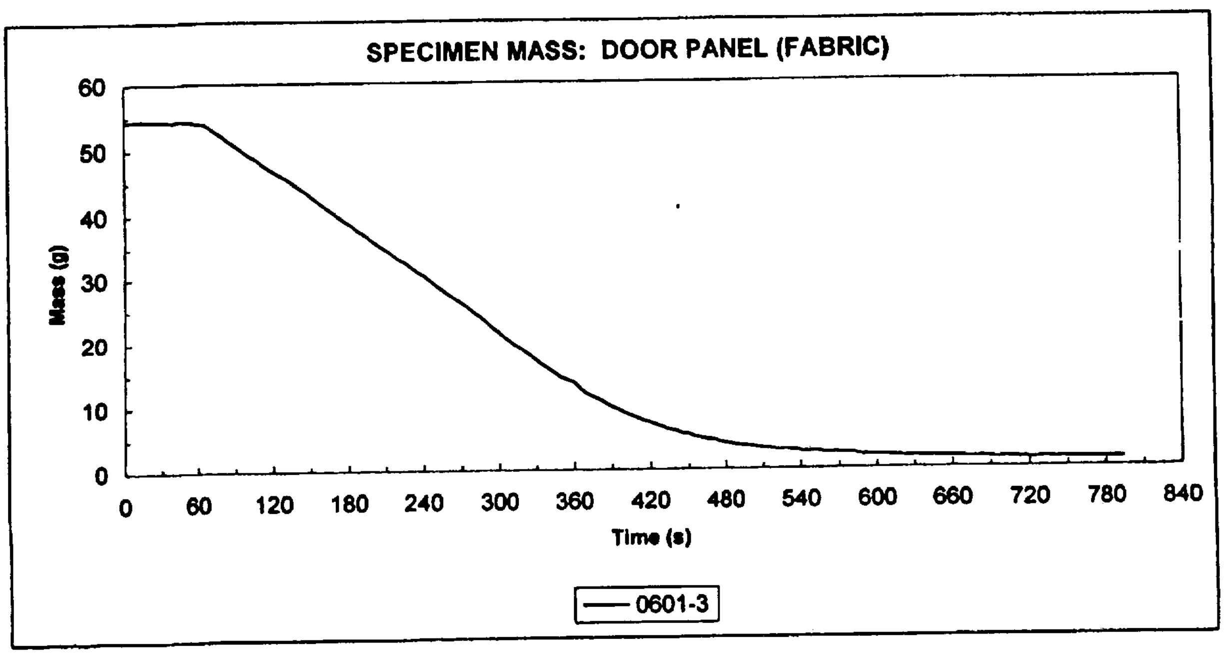




Notes & Observations:

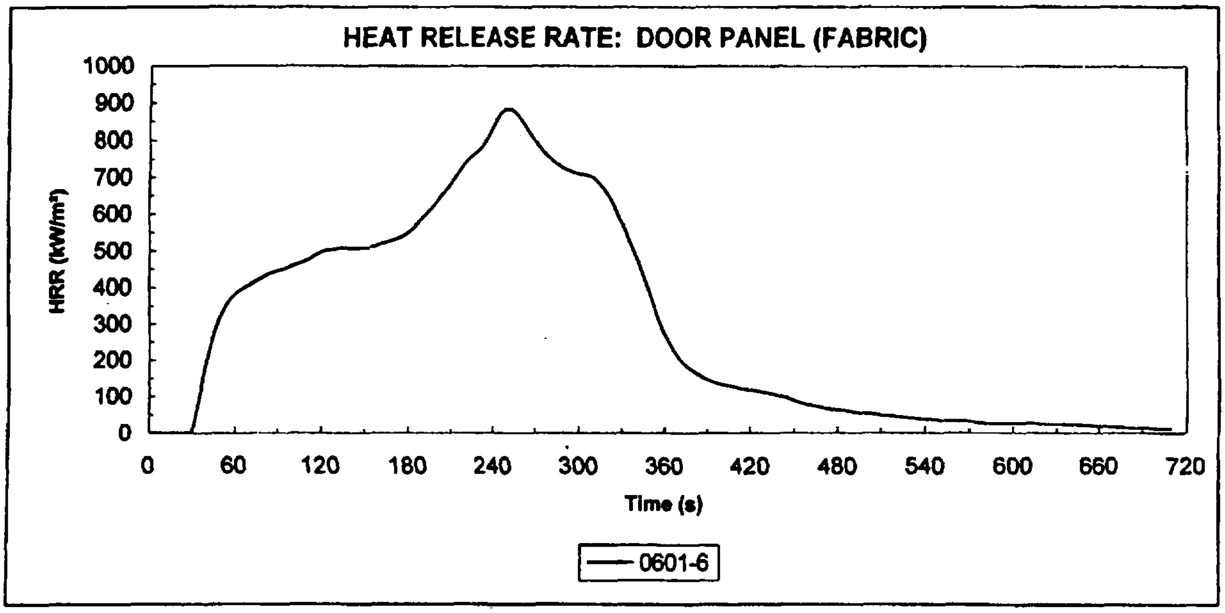
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Dodge Neon
SwRI Project No:	18.03614.01	*Material ID:*	Door Panel (Fabric)
Part No.:	PZ15WL5AK	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0601-6	03/01/01	27	597	885	250	208.1	293	445	571	857
Average		27	597	885	250	208.1	293	445	571	857

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
55.5	3.0	52.4	94.4	17.9	35.1	8.87	2	5588	5590	943
55.5	3.0	52.4	94.4	17.9	35.1	8.87	2	5588	5590	943



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Door Panel (Fabric)
SwRI Project No:	18.03614.01	*Heat Flux:*	50 kW/m²

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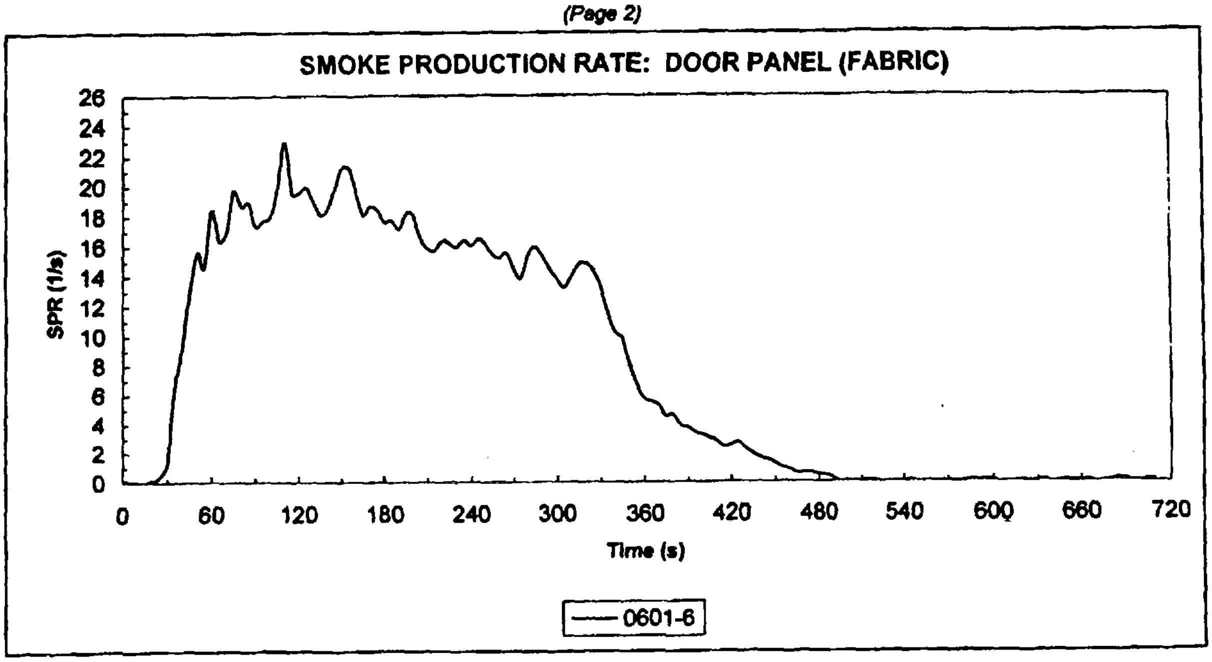
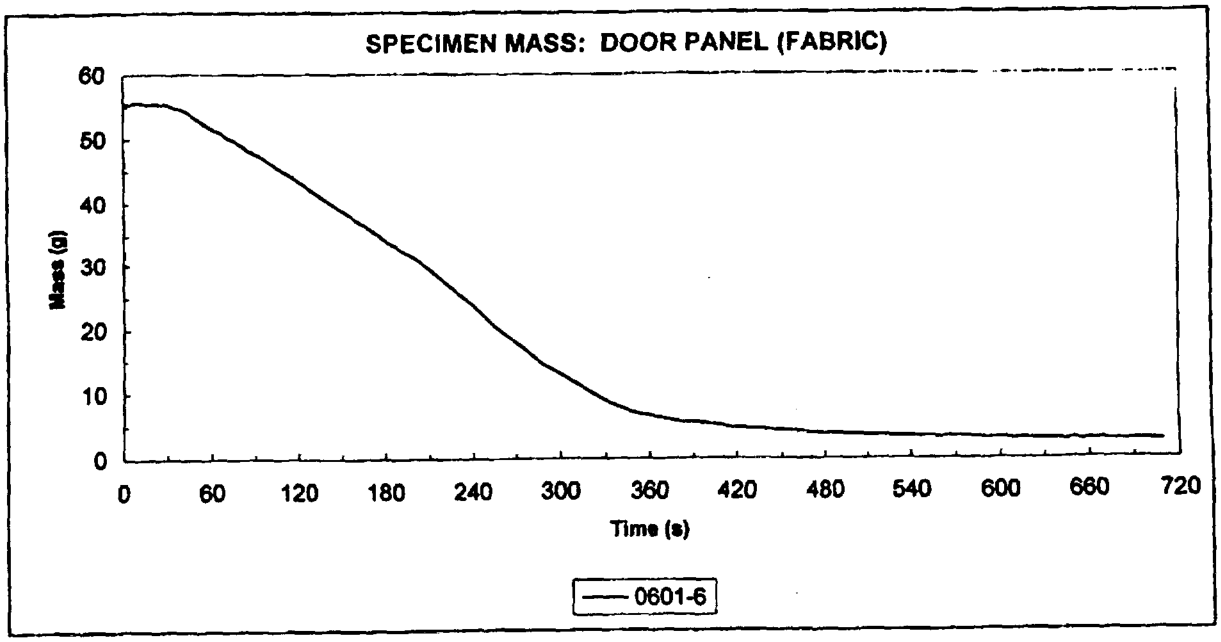




Notes & Observations:

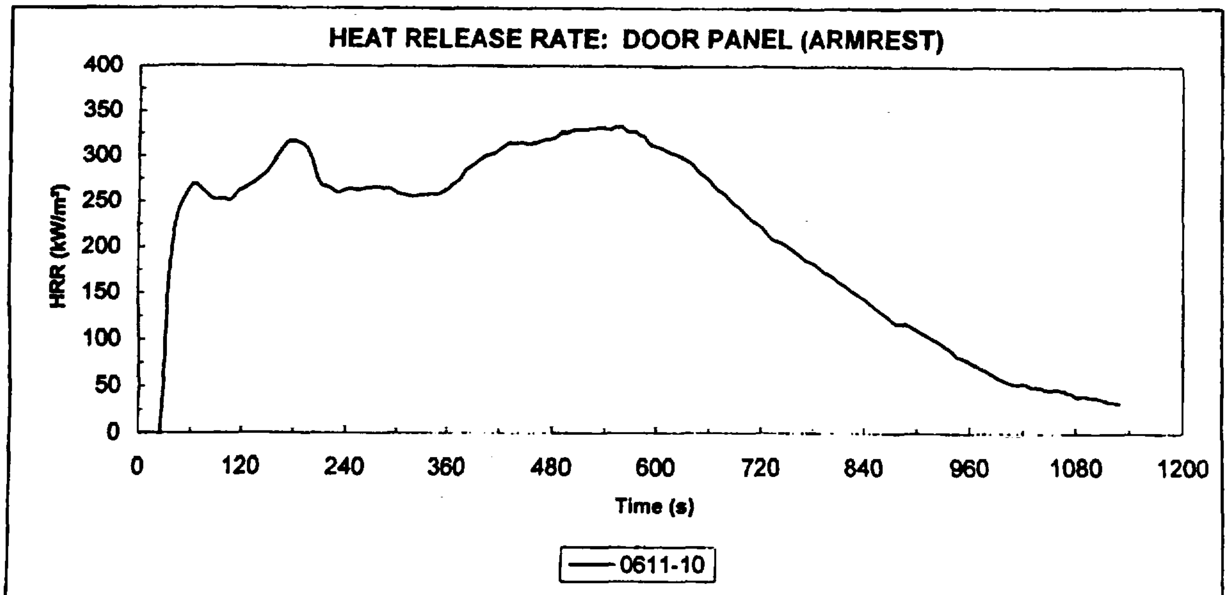
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Dodge Neon
SwRI Project No:	18.03614.01	*Material ID:*	Door Panel (Armrest)
Part No.:	PZ15WL5AK	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0611-10	03/02/01	27	1026	333	560	236.5	219	261	262	332
Average		27	1026	333	560	236.5	219	261	262	332

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
93.7	14.4	79.3	84.6	11.0	26.4	8.31	4	8806	8810	982
93.7	14.4	79.3	84.6	11.0	26.4	8.31	4	8806	8810	982



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Door Panel (Armrest)
SwRI Project No:	18.03614.01	*Heat Flux:*	35 kW/m²

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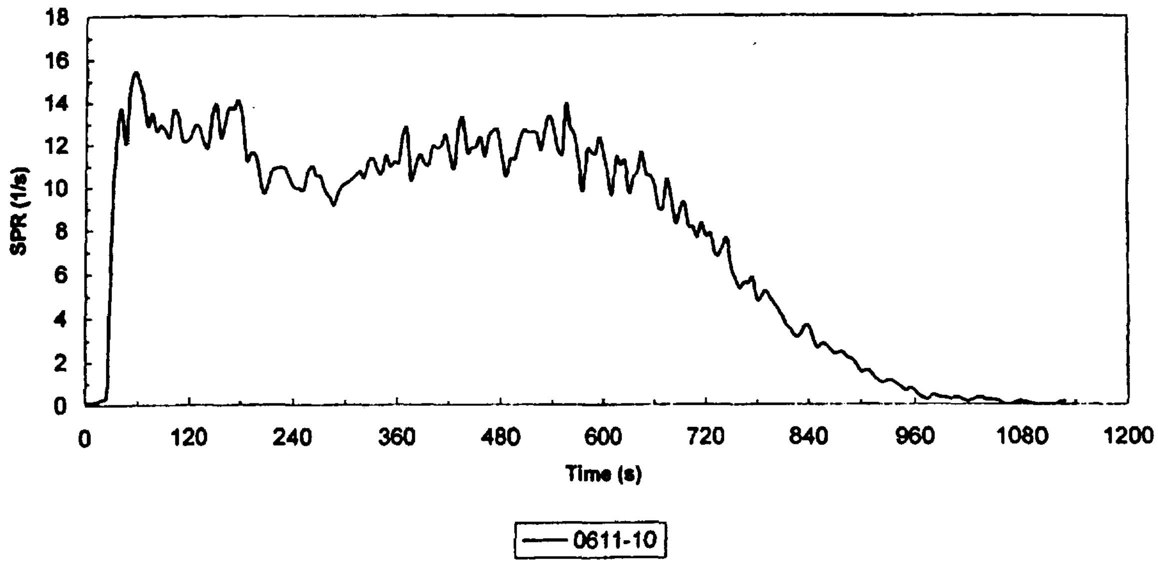
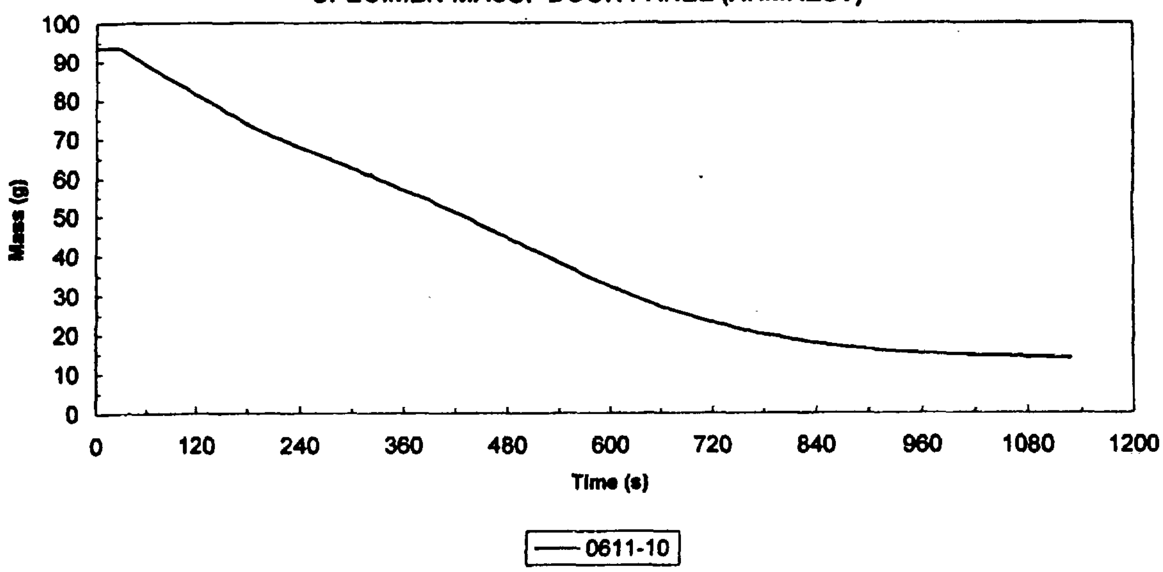
SMOKE PRODUCTION RATE: DOOR PANEL (ARMREST)



SPECIMEN MASS: DOOR PANEL (ARMREST)



Notes & Observations:

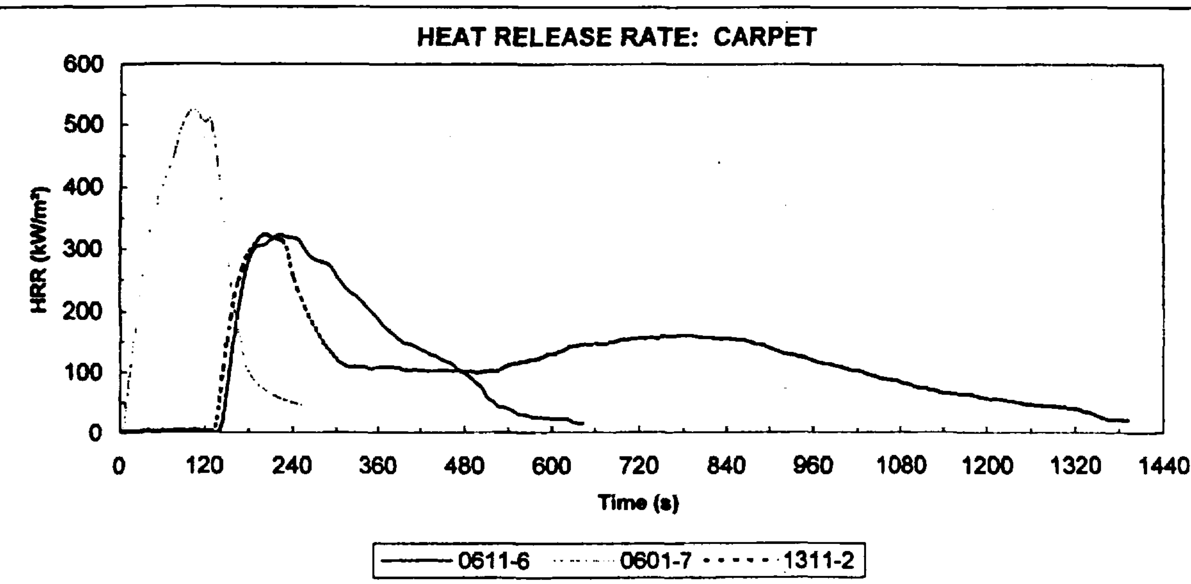
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Dodge Neon
SwRI Project No:	18.03614.01	*Material ID:*	Carpet
Part No.:	TN47XDVAA	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\,max}$ (kW/m²)
0611-6	03/02/01	136	399	323	220	75.5	175	253	222	320
0601-7	03/02/01	3	172	525	100	60.3	259	337	202	516
1311-2	05/11/01	122	1194	324	200	149.2	141	209	168	319
*Average**		129	797	323	210	112.4	158	231	195	320

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
38.1	16.6	21.5	56.4	8.1	31.1	1.17	10	620	630	255
21.0	1.9	19.1	90.9	16.4	27.9	4.19	23	720	743	333
76.5	35.8	40.6	53.1	4.4	32.5	1.03	14	1349	1364	294
57.3	26.2	31.0	54.7	6.3	31.8	1.10	12	985	997	275



SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client: General Motors
SwRI Project No: 18.03614.01
Material ID: Carpet
Heat Flux: 20 kW/m²

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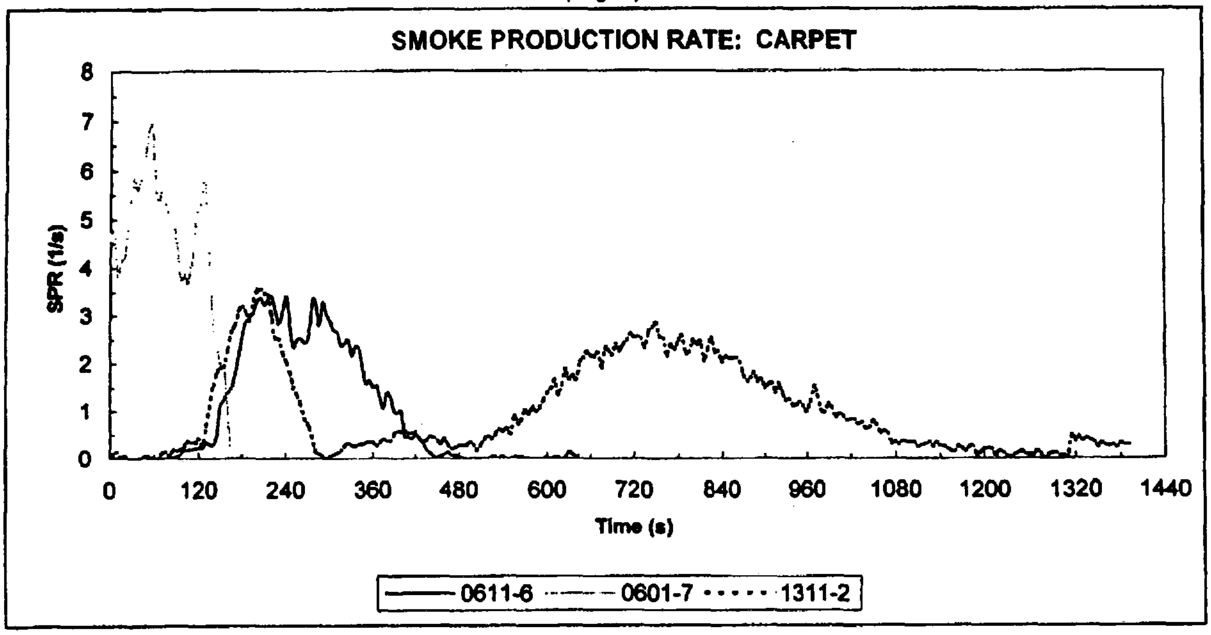

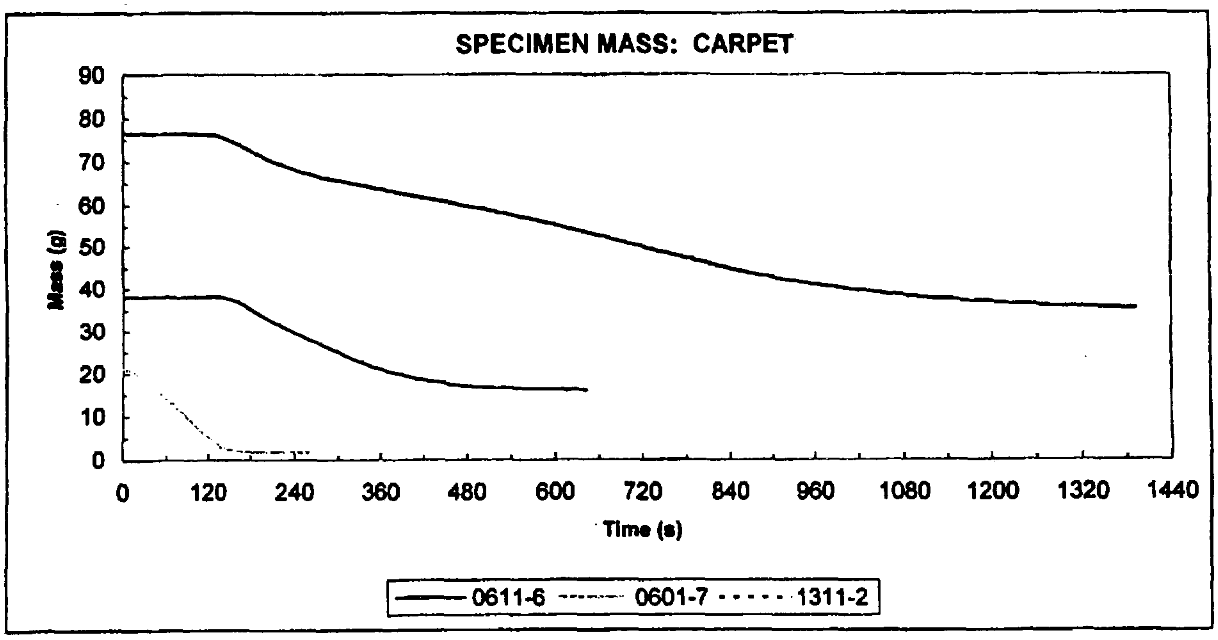

*Notes & Observations: *Average of tests 0611-6 and 1311-2*

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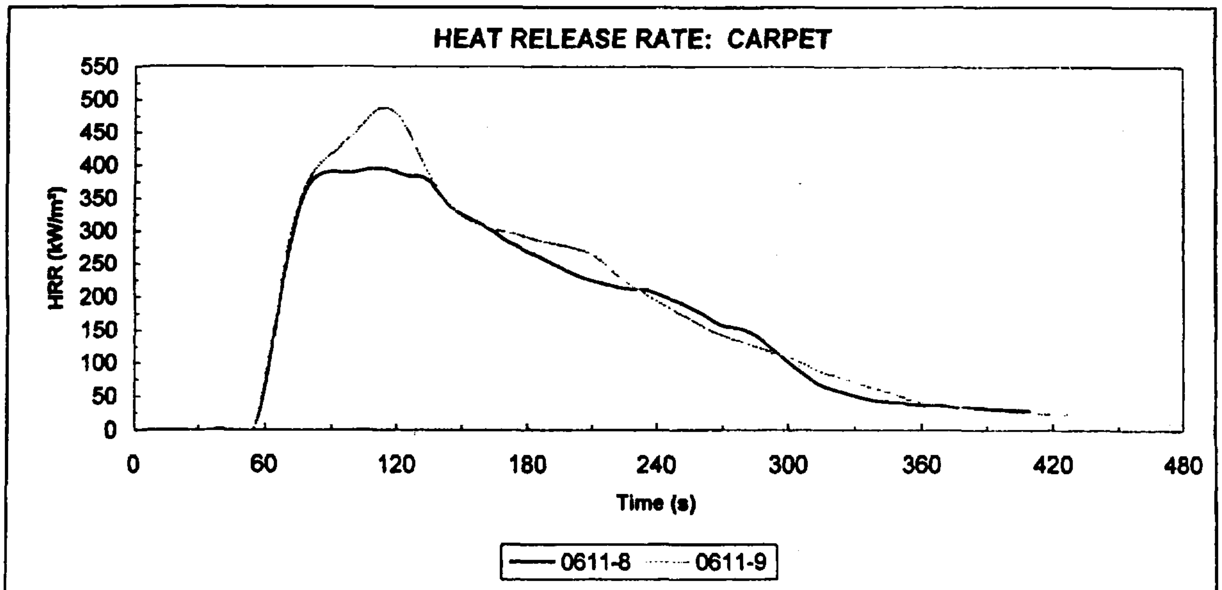
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Dodge Neon
SwRI Project No:	18.03614.01	*Material ID:*	Carpet
Part No.:	TN47XDVAA	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0611-8	03/02/01	54	271	397	110	66.0	312	297	220	393
0611-9	03/02/01	53	295	487	115	72.0	345	324	241	469
Average		54	283	442	113	69.0	328	310	231	431

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
33.4	14.0	19.3	57.7	10.0	30.3	2.39	2	787	789	361
36.2	15.6	20.3	56.1	10.8	31.4	2.44	6	861	867	375
34.8	14.8	19.8	56.9	10.4	30.8	2.42	4	824	828	368



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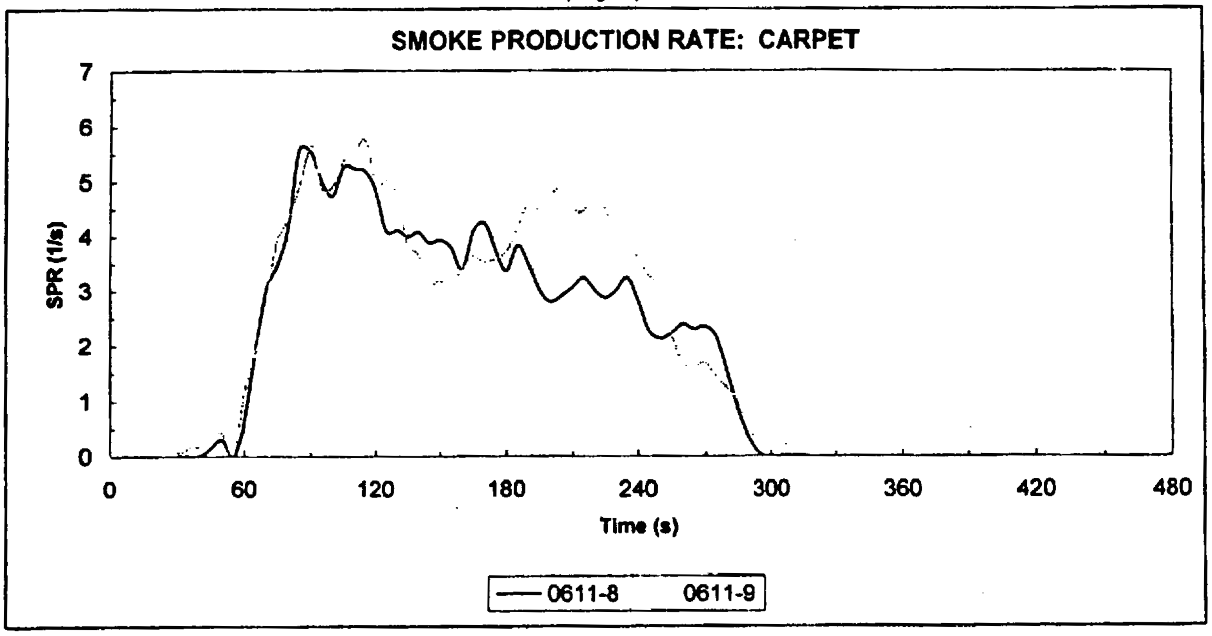
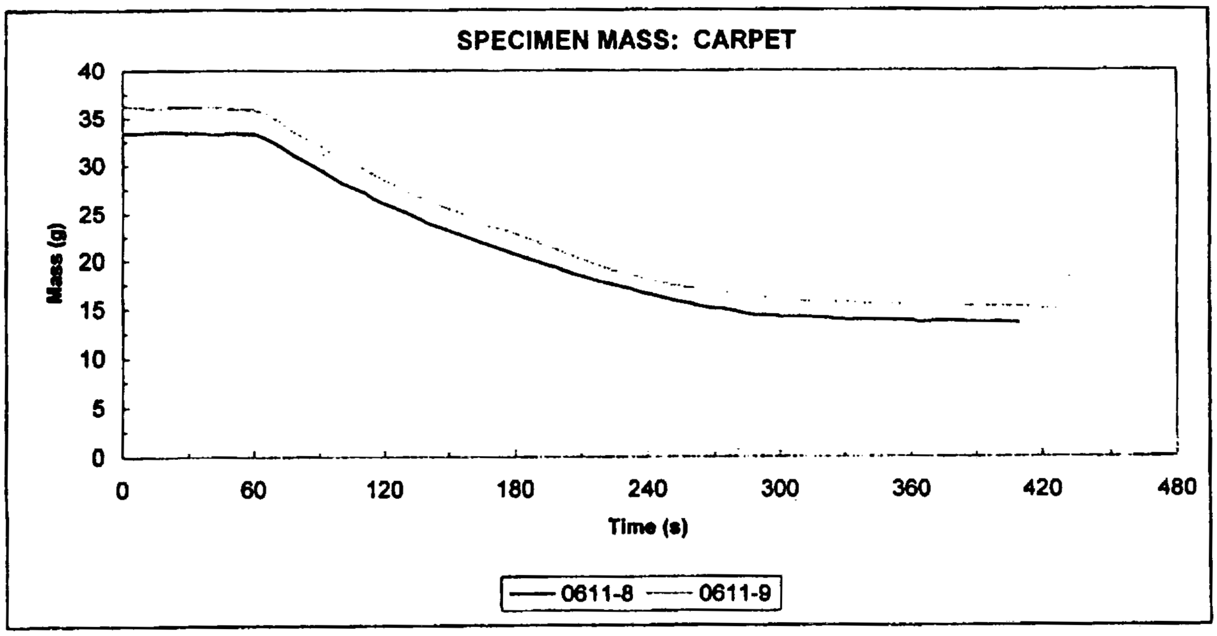
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Carpet
SwRI Project No:	18.03614.01	*Heat Flux:*	35 kW/m²

(Page 2)





Notes & Observations:

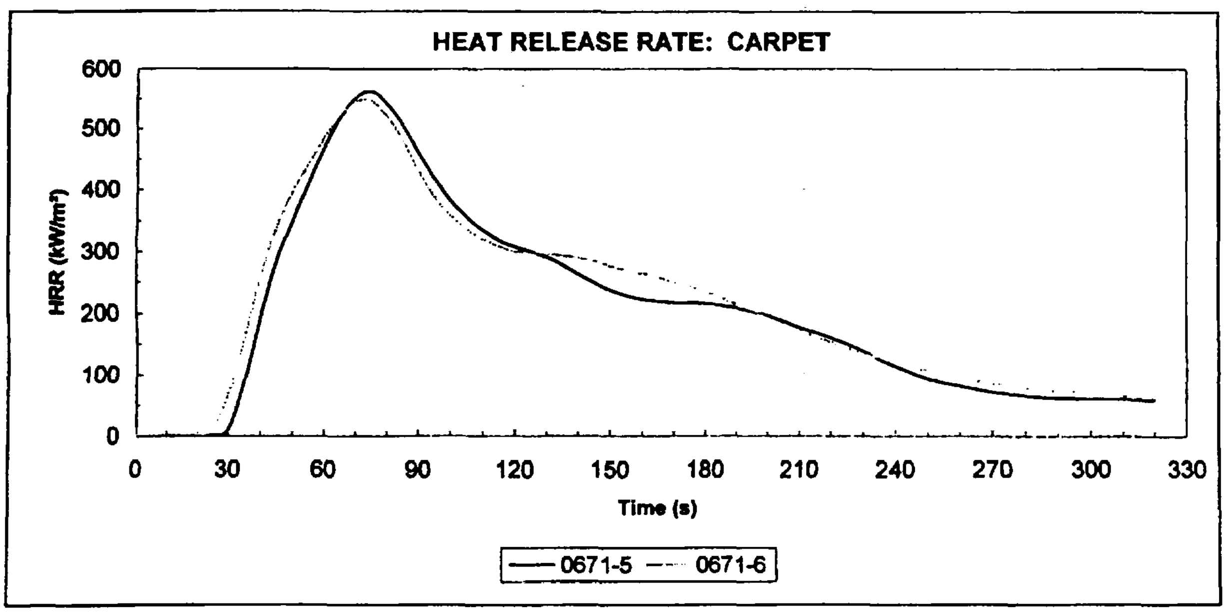
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Dodge Neon
SwRI Project No:	18.03614.01	*Material ID:*	Carpet
Part No.:	TN47XDVAA	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0671-5	03/08/01	28	245	562	75	63.1	393	309	211	524
0671-6	03/08/01	25	255	547	70	66.3	378	317	222	514
Average		26	250	554	73	64.7	386	313	216	519

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
35.1	15.1	20.0	57.1	12.5	27.8	3.30	2	920	923	406
35.5	15.5	20.1	56.8	12.2	29.1	2.92	1	830	831	364
35.3	15.3	20.1	56.9	12.3	28.5	3.11	2	875	877	385



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Carpet
SwRI Project No:	18.03614.01	*Heat Flux:*	50 kW/m²

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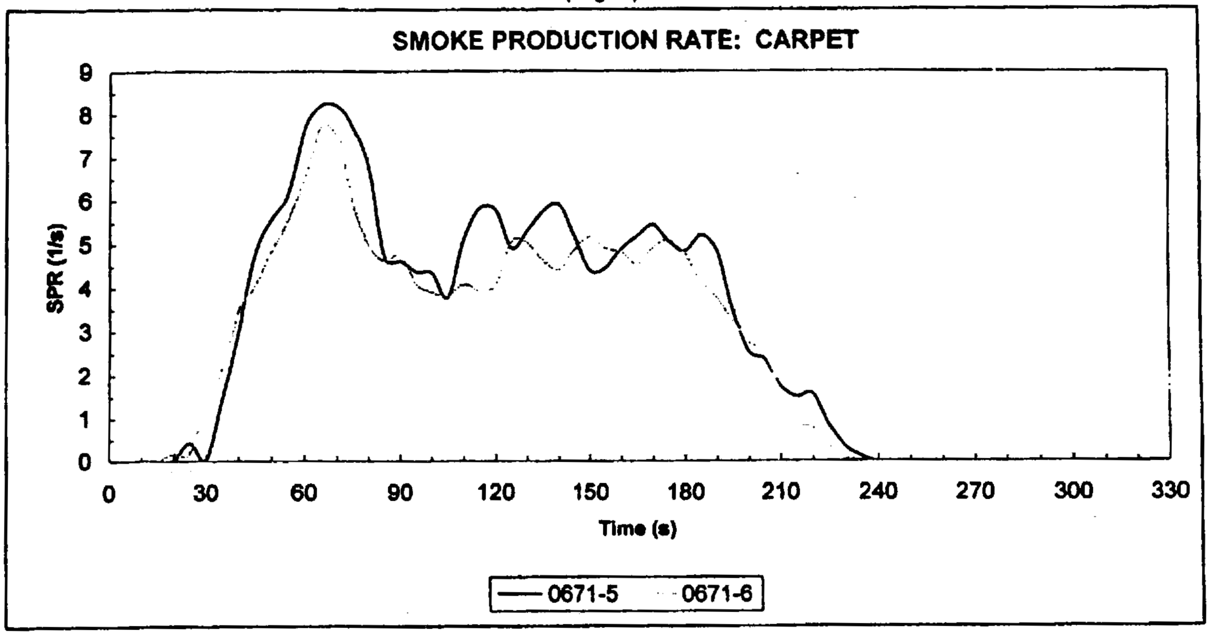
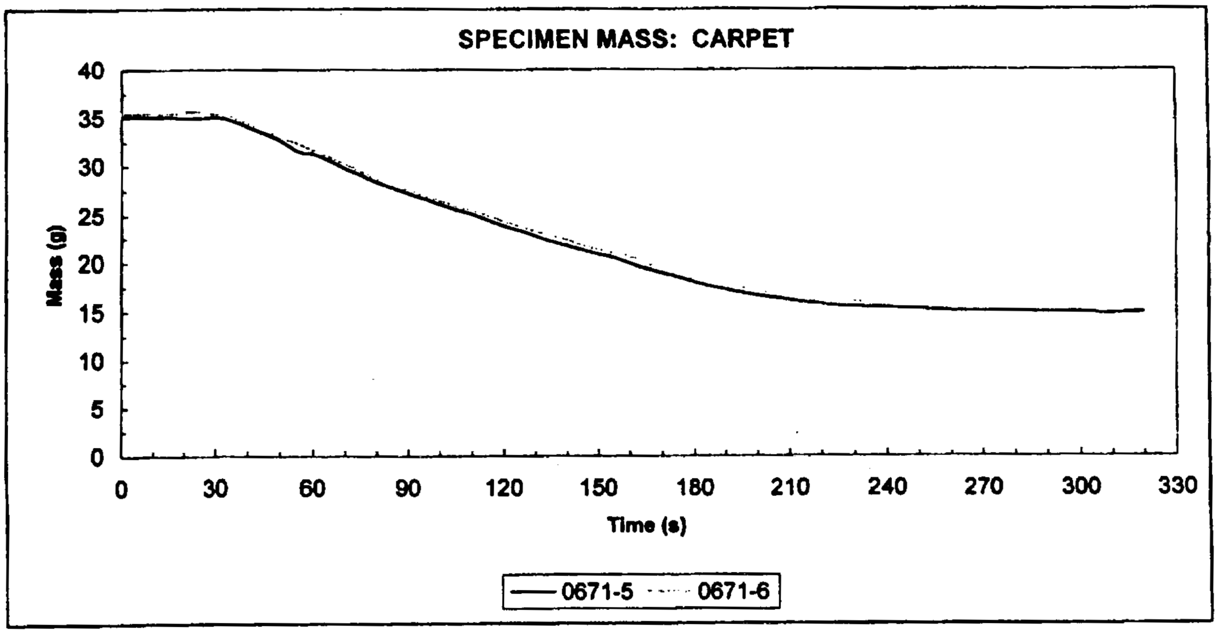




Notes & Observations:

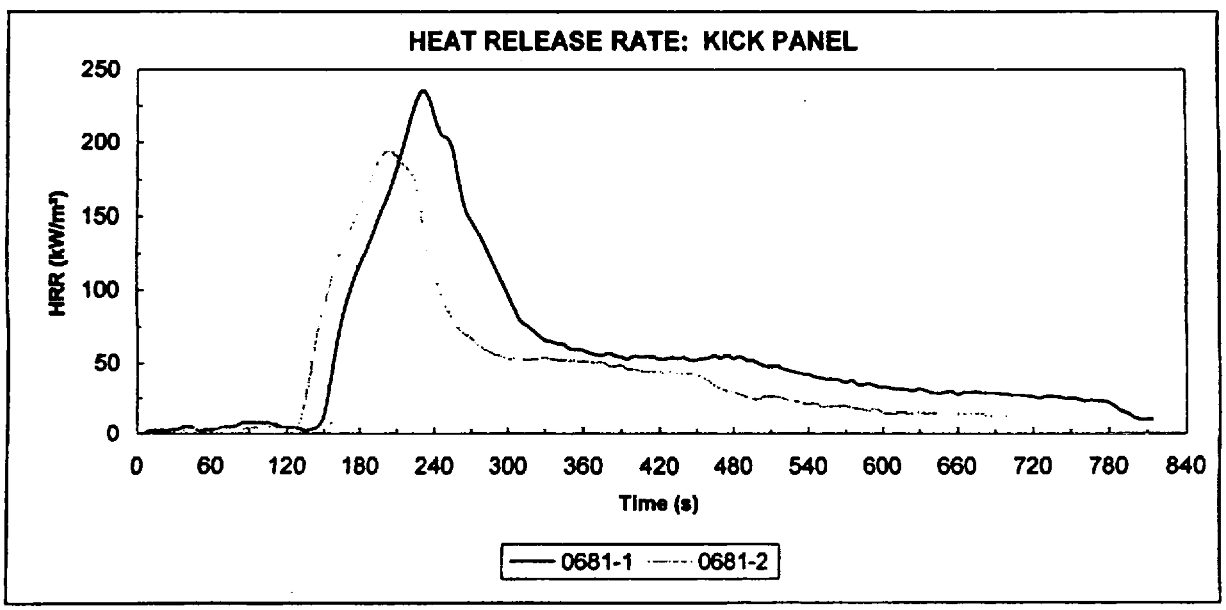
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Dodge Neon
SwRI Project No:	18.03614.01	*Material ID:*	Kick Panel
Part No.:	PV77WL5AB	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0681-1	03/09/01	145	635	236	230	43.3	98	136	104	221
0681-2	03/09/01	131	535	194	205	31.1	107	110	86	188
Average		138	585	215	218	37.2	102	123	95	205

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
24.9	10.8	14.0	56.4	4.6	27.3	0.33	28	233	261	147
21.4	15.8	5.1	24.0	1.9	53.6	0.15	10	87	98	151
23.2	13.3	9.6	40.2	3.3	40.4	0.24	19	160	179	149



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Kick Panel
SwRI Project No:	18.03614.01	*Heat Flux:*	20 kW/m²

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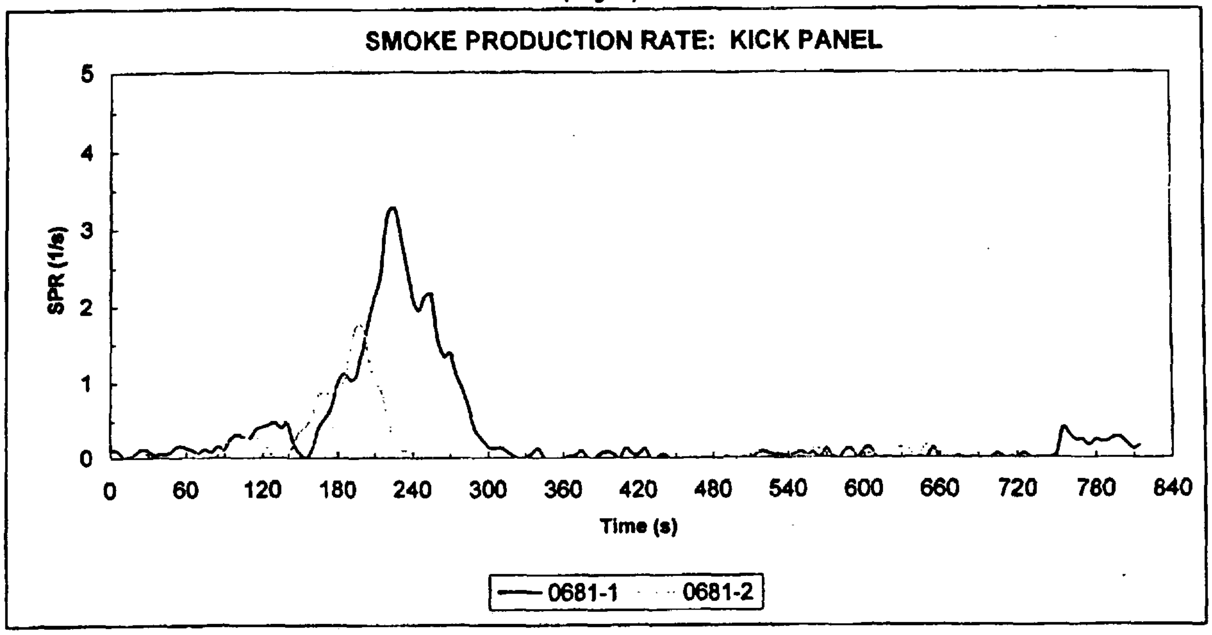
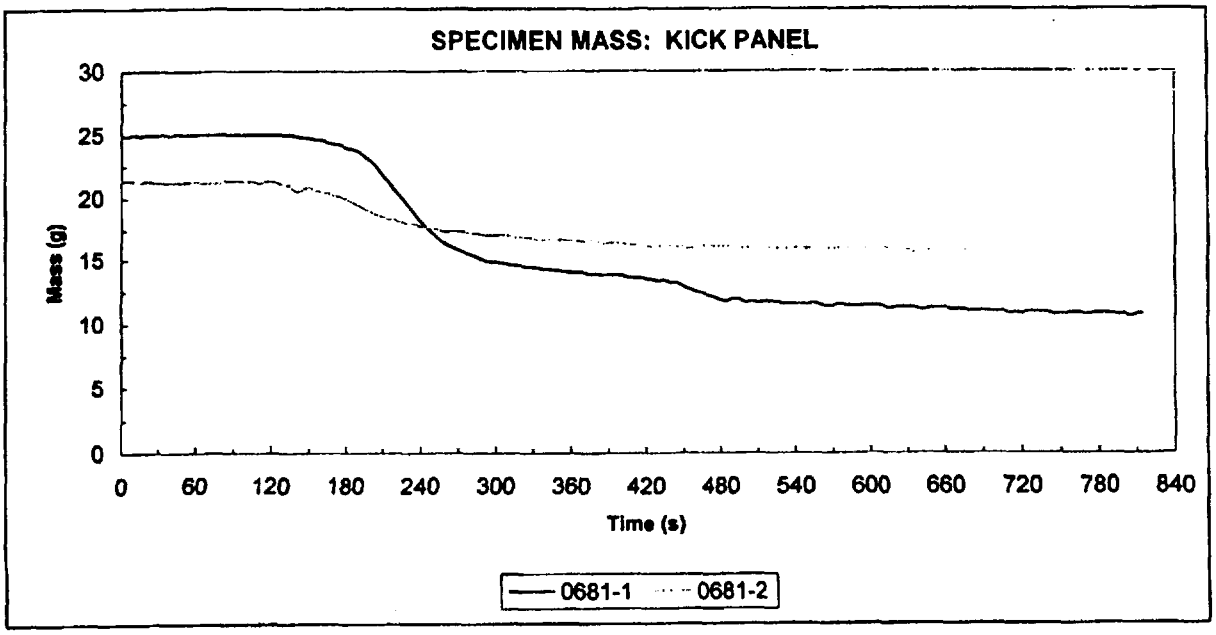




Notes & Observations:

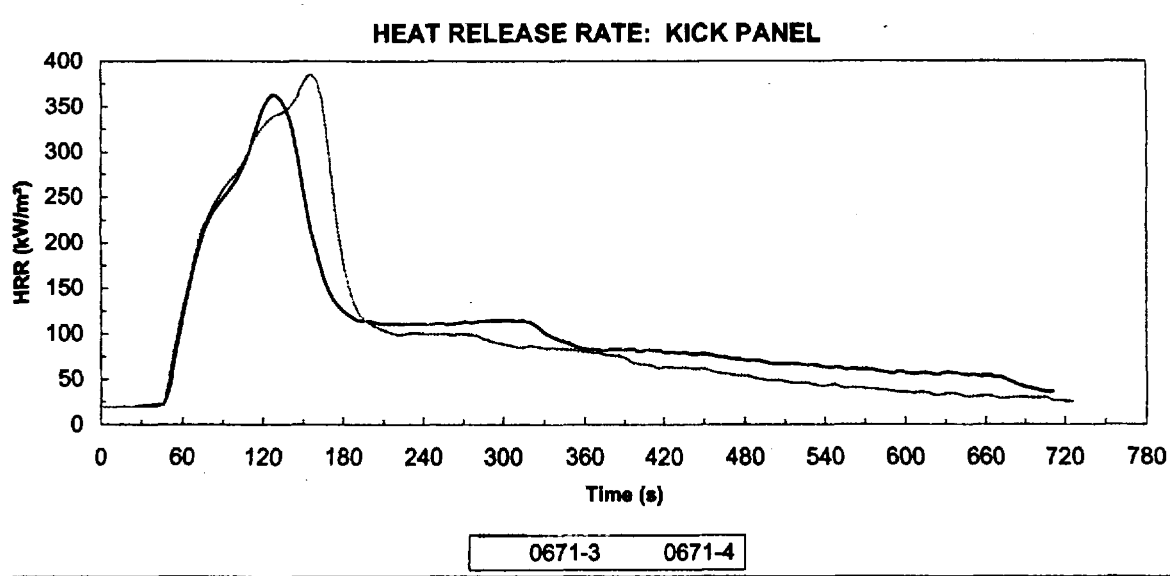
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Dodge Neon
SwRI Project No:	01.04021.01.019	*Material ID:*	Kick Panel
Part No.:	PV77WL5AB	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0671-3	03/08/01	47	623	344	125	60.1	167	182	146	327
0671-4	03/08/01	46	640	367	155	57.6	176	210	156	347
Average		46	632	356	140	58.8	171	196	151	337

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
26.9	11.6	15.5	57.7	3.7	34.2	0.40	1	267	268	152
27.0	16.5	10.5	38.8	3.7	48.6	0.82	5	559	564	471
27.0	14.0	13.0	48.3	3.7	41.4	0.61	3	413	416	312



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Kick Panel
SwRI Project No:	01.04021.01.019	*Heat Flux:*	35 kW/m²

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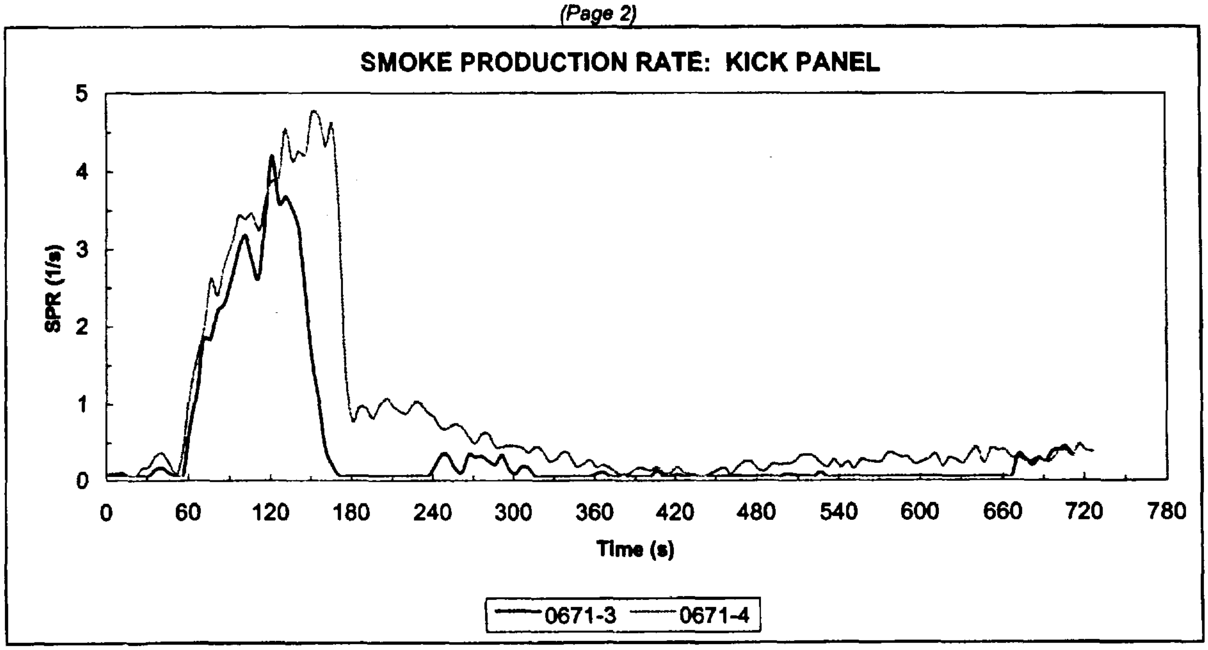
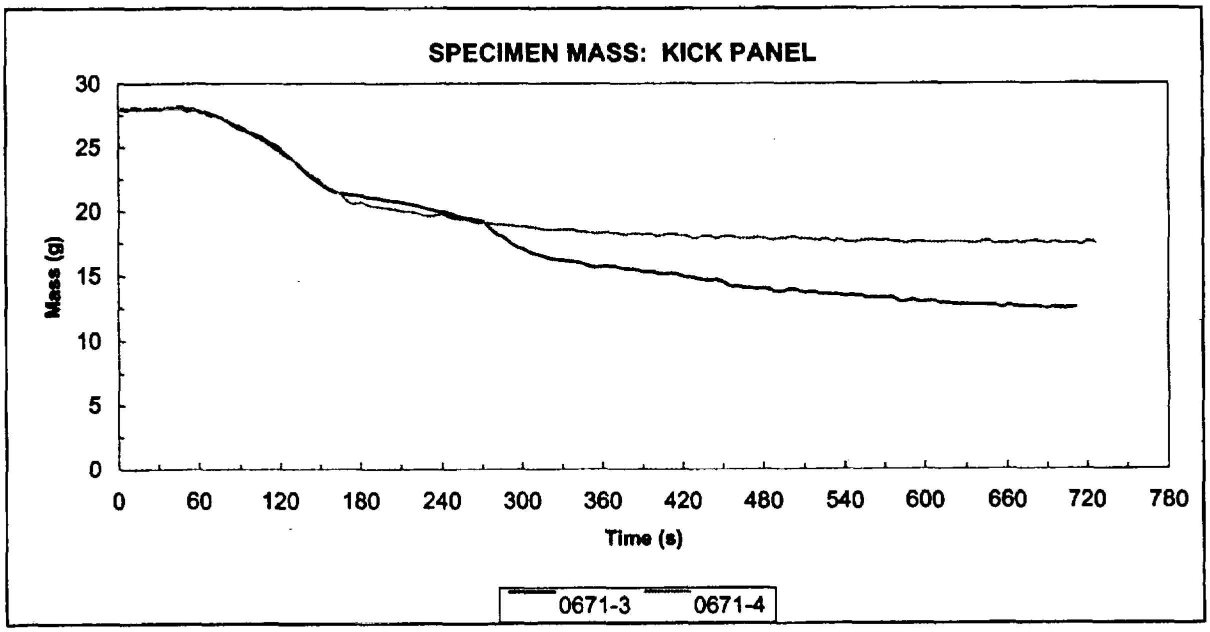




Notes & Observations:

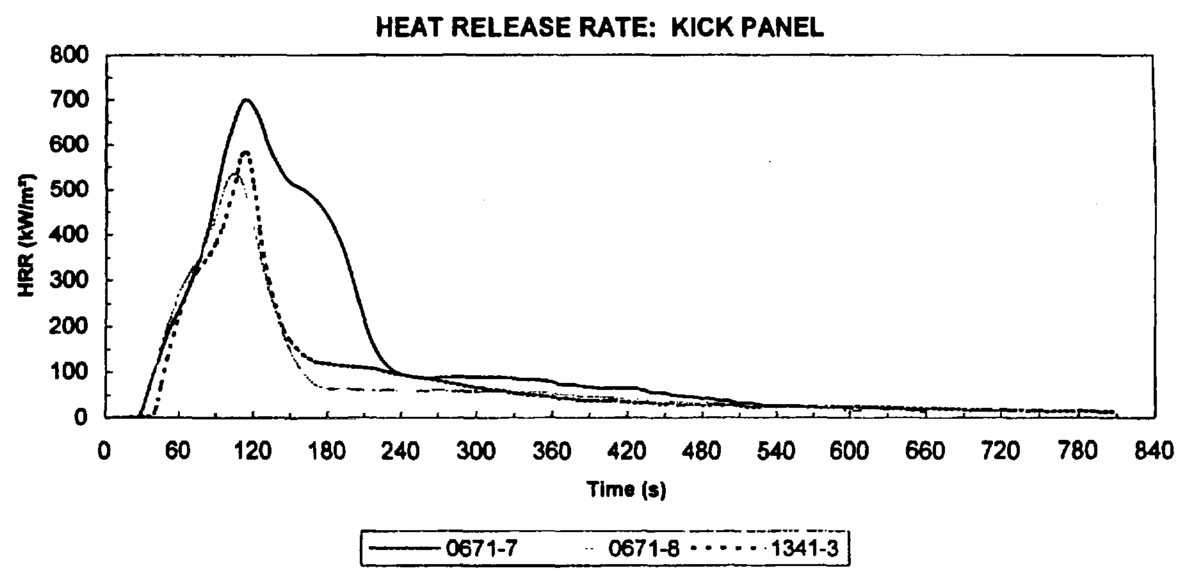
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Dodge Neon
SwRI Project No:	18.03614.01	*Material ID:*	Kick Panel
Part No.:	PV77WL5AB	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0671-7	03/08/01	26	595	699	115	101.8	205	416	292	667
0671-8	03/08/01	29	586	535	105	59.3	248	235	164	495
1341-3	05/14/01	25	701	581	115	64.1	169	237	176	509
Average		27	627	605	112	75.0	207	296	211	557

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
24.7	4.5	20.2	82.0	9.2	44.4	1.93	4	1203	1207	525
23.1	11.2	12.2	52.8	3.2	43.0	0.83	4	507	512	368
27.4	11.6	16.0	58.3	3.2	35.5	0.63	1	457	458	253
25.1	9.1	16.1	64.4	5.2	41.0	1.13	3	722	726	382



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Kick Panel
SwRI Project No:	18.03614.01	*Heat Flux:*	50 kW/m²

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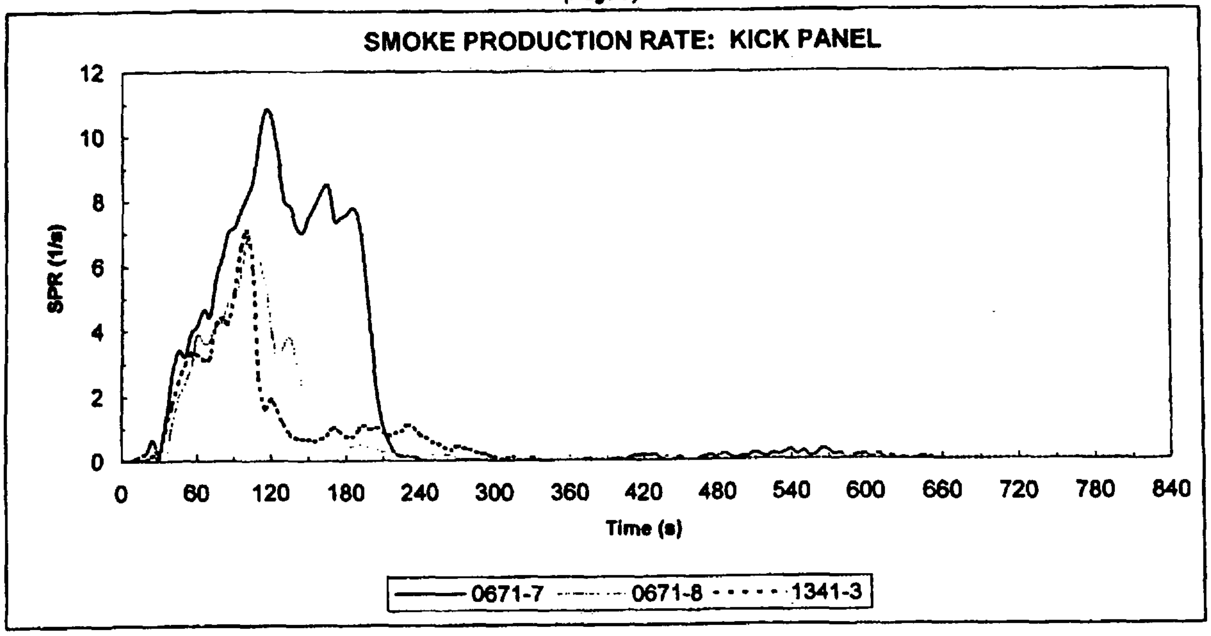
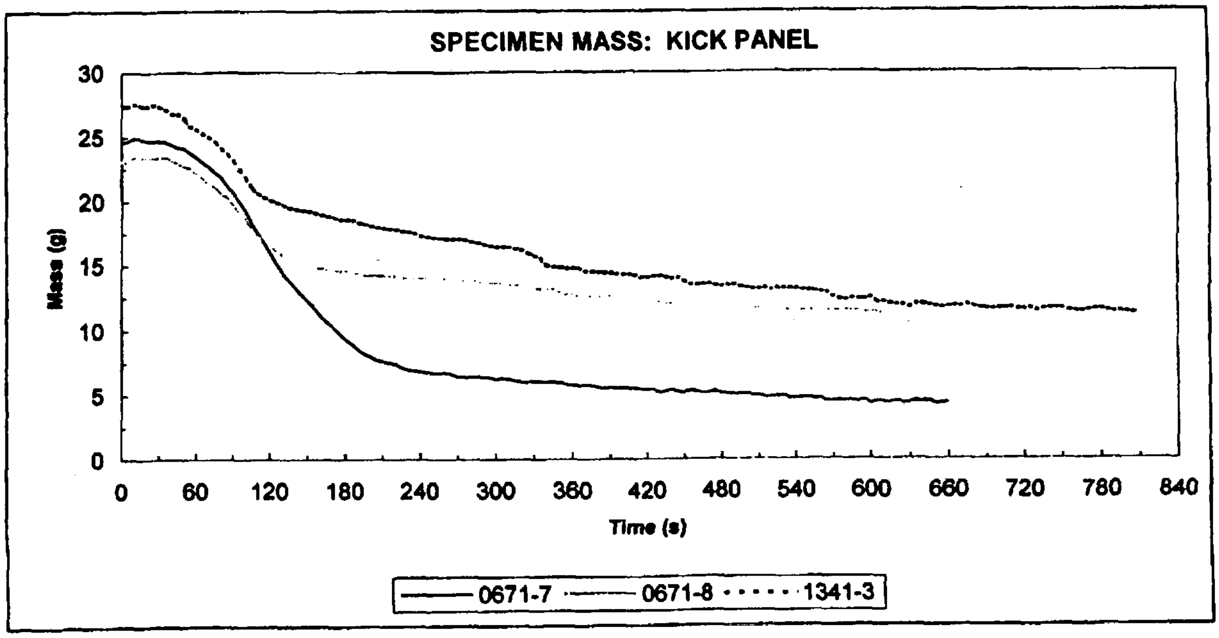




Notes & Observations:

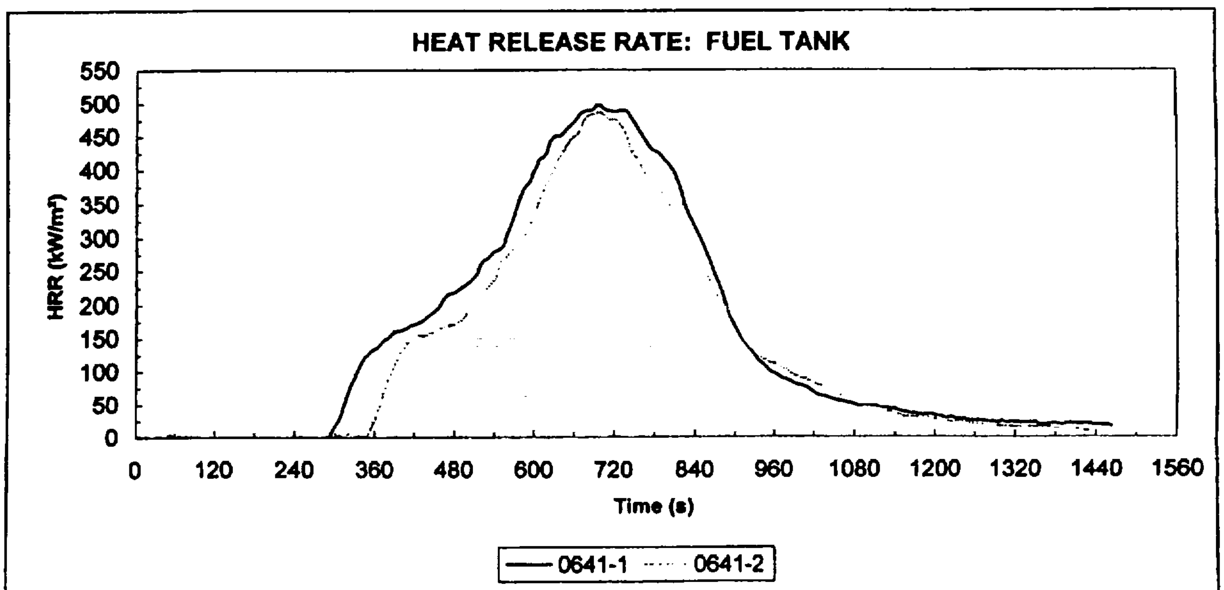
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Dodge Neon
SwRI Project No:	18.03614.01	*Material ID:*	Fuel Tank
Part No.:	50172094A	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,max}$ (kW/m²)
0641-1	03/04/01	295	1118	498	700	209.5	76	139	196	493
0641-2	03/04/01	342	1059	487	700	183.3	57	131	201	484
Average		318	1088	492	700	196.4	66	135	198	489

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
68.7	21.9	46.8	68.2	9.1	39.5	1.00	58	1358	1416	256
66.8	18.7	48.3	72.3	10.1	33.5	0.93	59	1254	1312	229
67.8	20.3	47.6	70.3	9.6	36.5	0.97	58	1306	1364	243



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Fuel Tank
SwRI Project No:	18.03614.01	*Heat Flux:*	20 kW/m²

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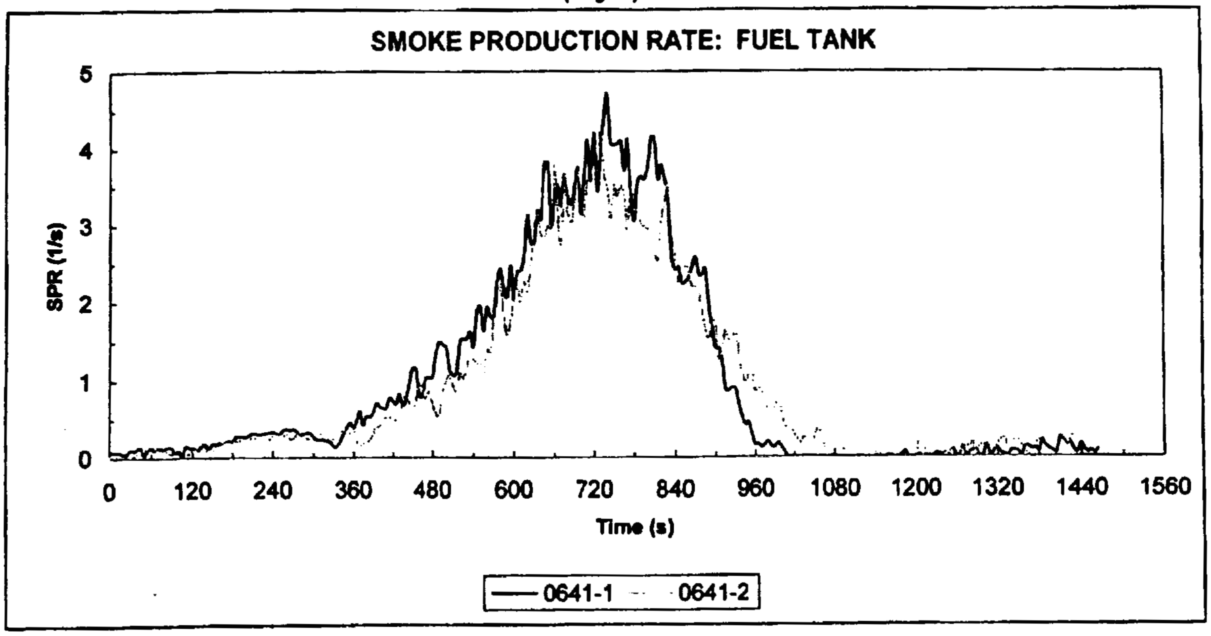

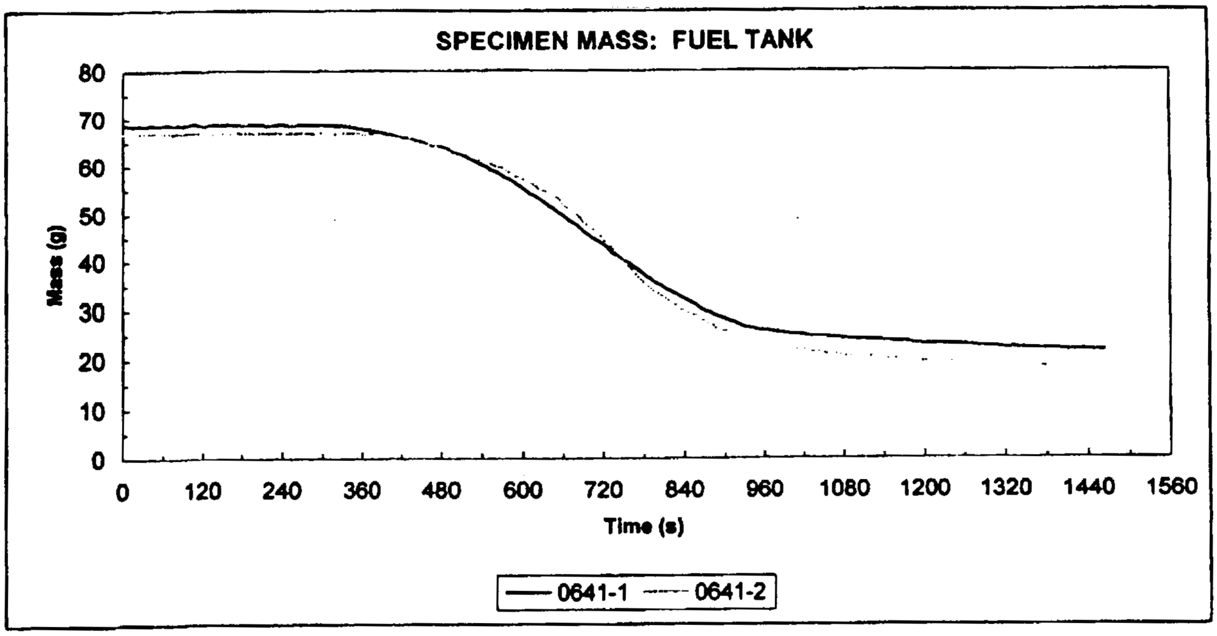

Notes & Observations:

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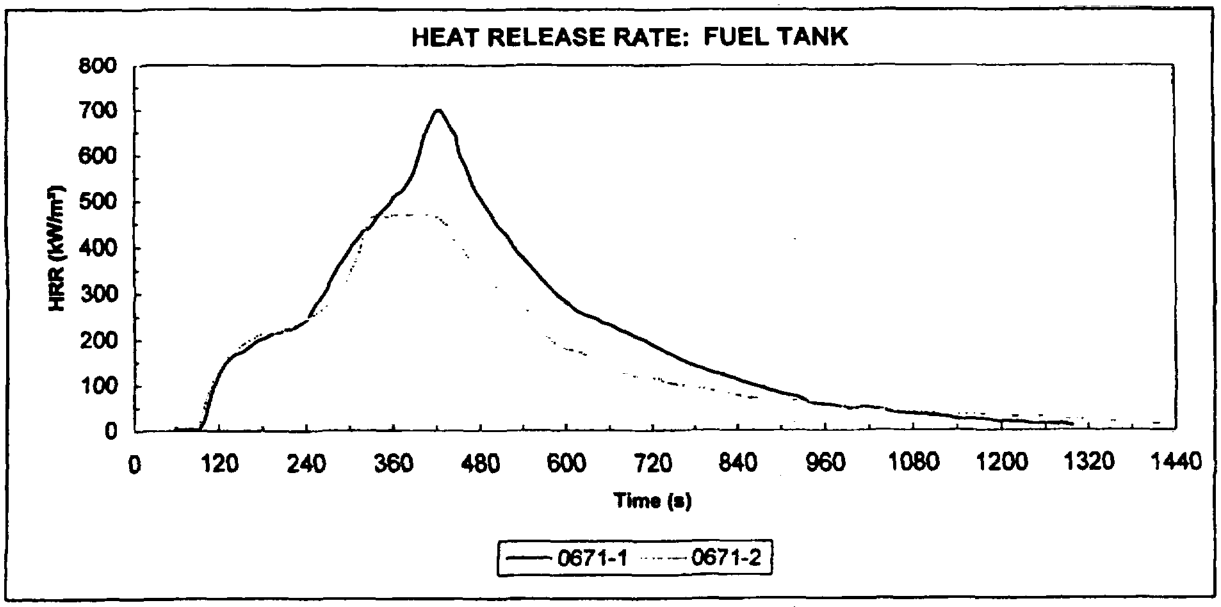
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Dodge Neon
SwRI Project No:	18.03614.01	*Material ID:*	Fuel Tank
Part No.:	50172094A	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0671-1	03/08/01	90	1171	701	420	254.6	104	186	291	685
0671-2	03/08/01	88	1305	472	400	206.1	118	191	277	471
Average		89	1238	586	410	230.4	111	188	284	578

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
73.5	17.2	56.5	76.8	10.6	39.9	1.61	19	2017	2036	316
73.2	20.1	52.9	72.3	9.7	34.4	0.85	11	1186	1197	198
73.4	18.7	54.7	74.6	10.2	37.1	1.23	15	1602	1617	257



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Fuel Tank
SwRI Project No:	18.03614.01	*Heat Flux:*	35 kW/m²

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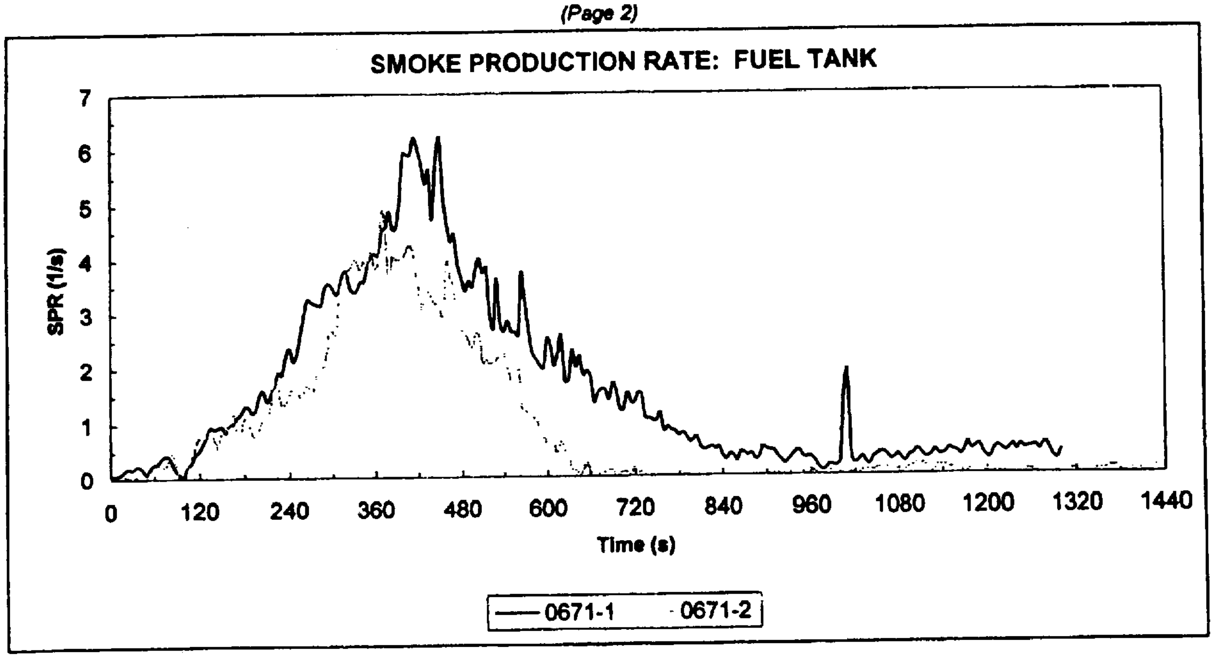
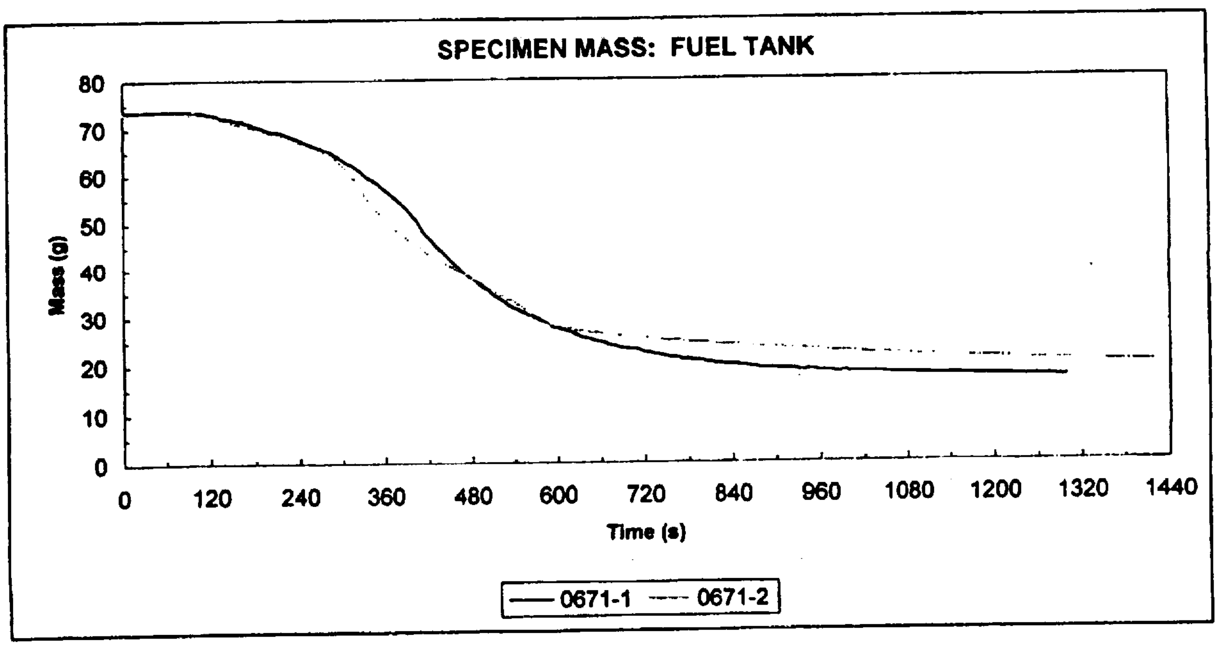




Notes & Observations:
Heavy sample dripping from the retainer frame during both tests.

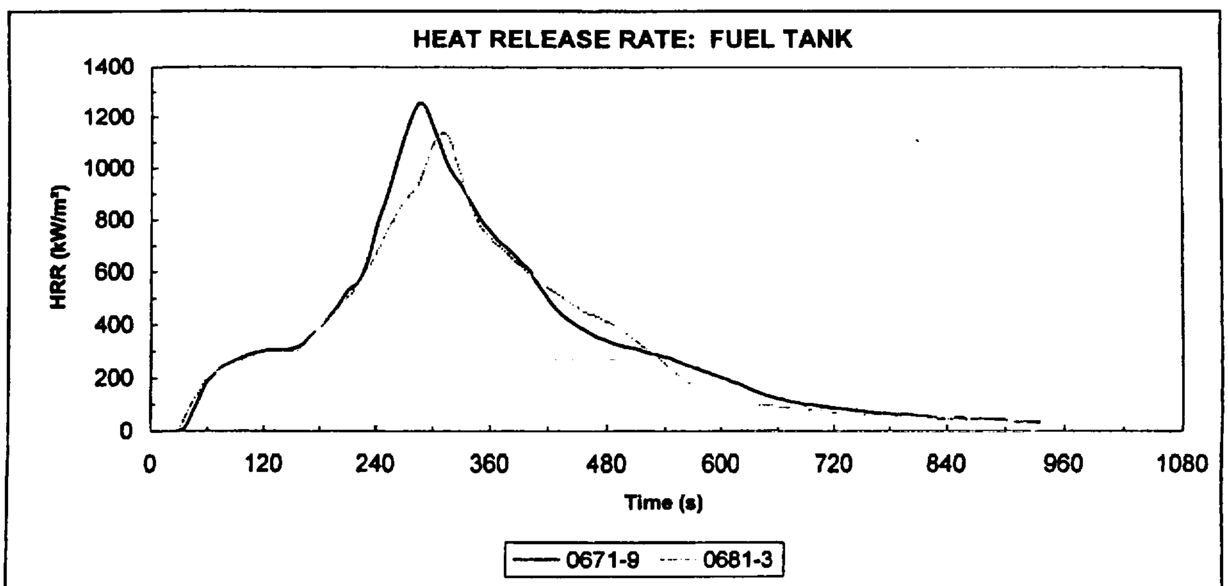
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Dodge Neon
SwRI Project No:	18.03614.01	*Material ID:*	Fuel Tank
Part No.:	50172094A	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0671-9	03/08/01	40	859	1259	285	312.9	200	313	580	1214
0681-3	03/09/01	39	914	1142	310	298.7	208	310	540	1102
Average		40	886	1200	298	305.8	204	311	560	1158

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
72.1	8.8	63.0	87.4	15.2	43.9	2.78	3	2516	2519	353
72.3	10.6	61.8	85.4	16.2	42.8	2.64	0	2537	2537	363
72.2	9.7	62.4	86.4	15.7	43.3	2.71	2	2527	2528	358

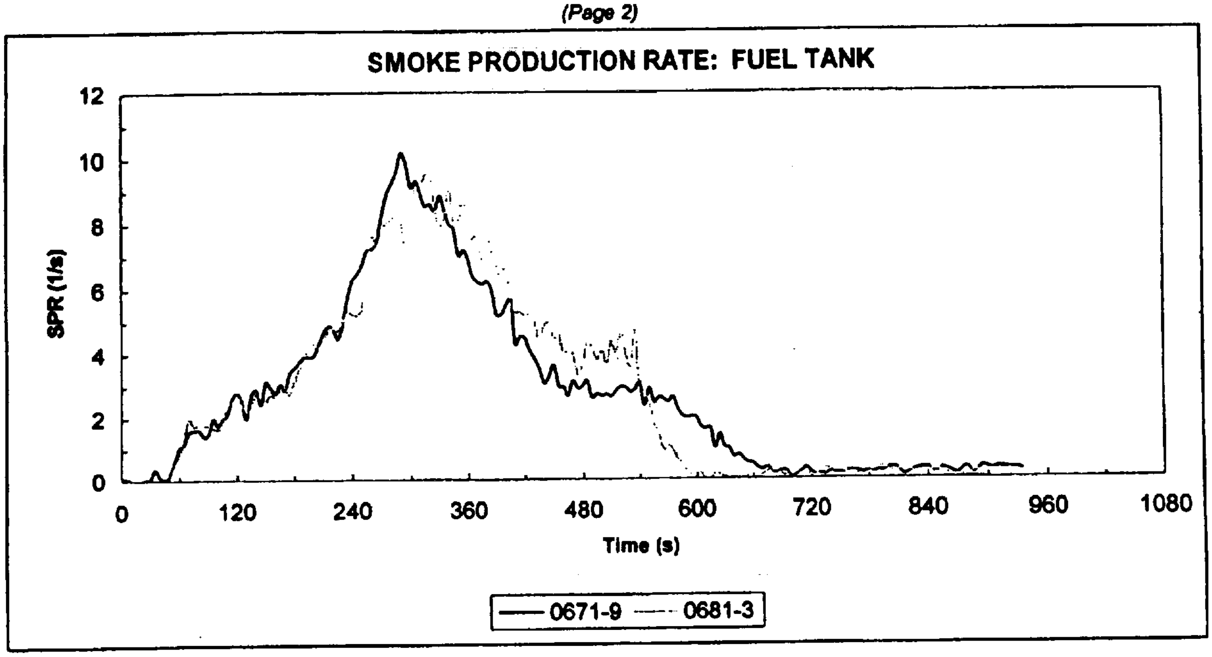


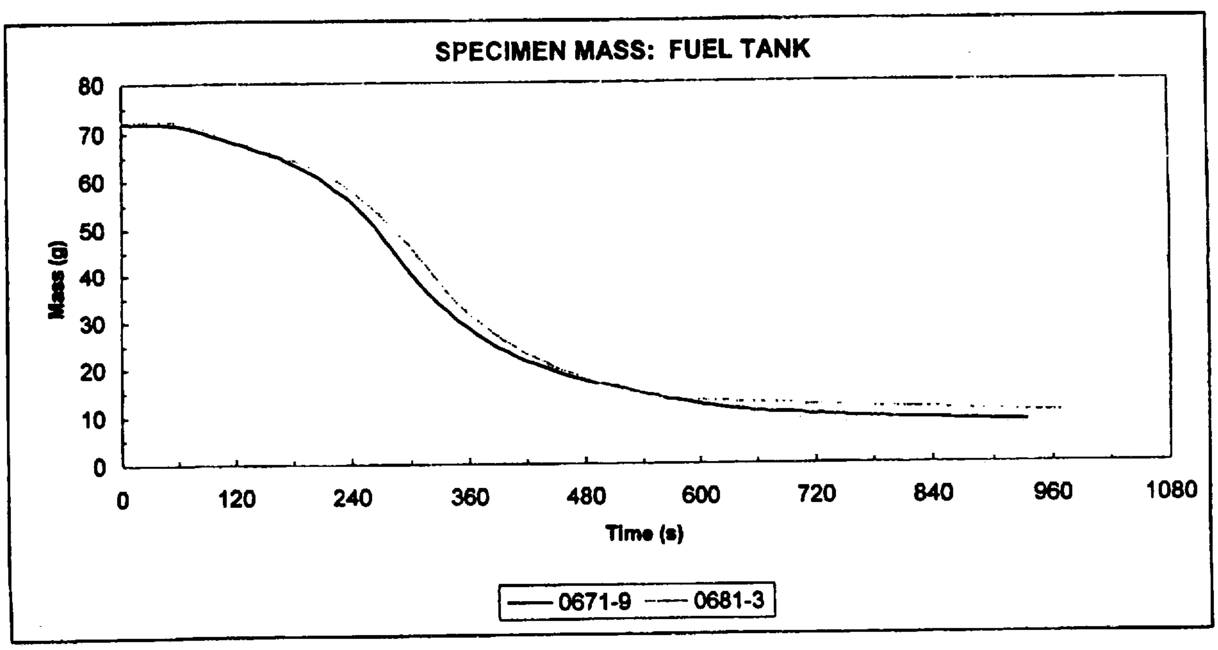
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Fuel Tank
SwRI Project No:	18.03614.01	*Heat Flux:*	50 kW/m²

(Page 2)





Notes & Observations:
0671-9: Heavy dripping from the sample retainer frame.

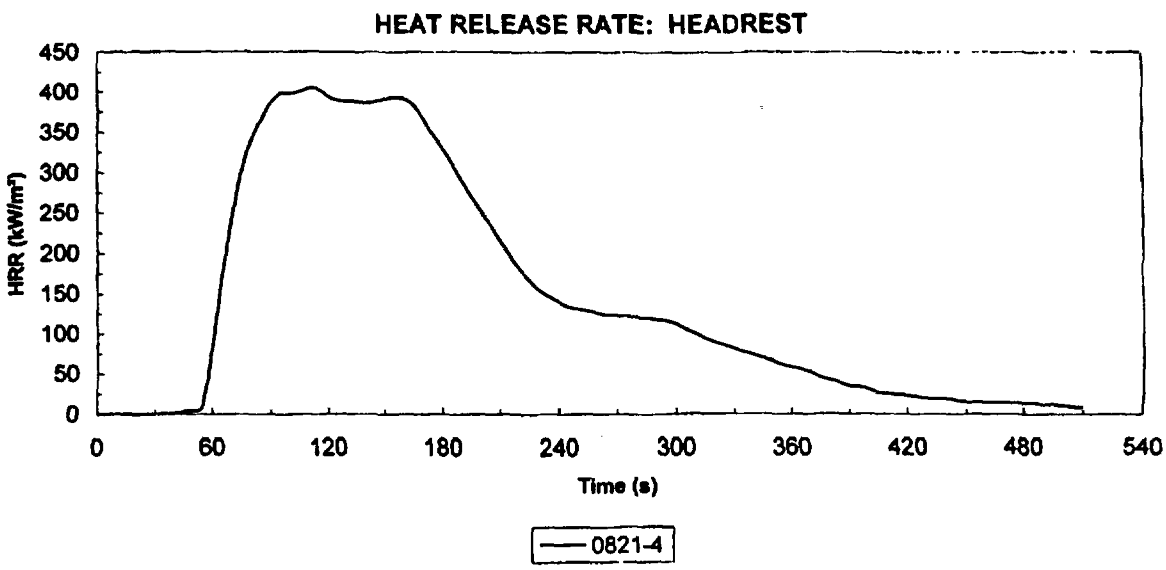
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Ford Focus
SwRI Project No:	18.03614.01	*Material ID:*	Headrest
Part No.:	YS4Z54611AO8BBB	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\,max}$ (kW/m²)
0821-4	03/23/01	49	375	406	110	71.5	277	307	229	400
Average		49	375	406	110	71.5	277	307	229	400

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
27.9	3.6	23.8	85.2	10.5	26.6	1.80	14	762	776	283
27.9	3.6	23.8	85.2	10.5	26.6	1.80	14	762	776	283



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Headrest
SwRI Project No:	18.03614.01	*Heat Flux:*	20 kW/m²

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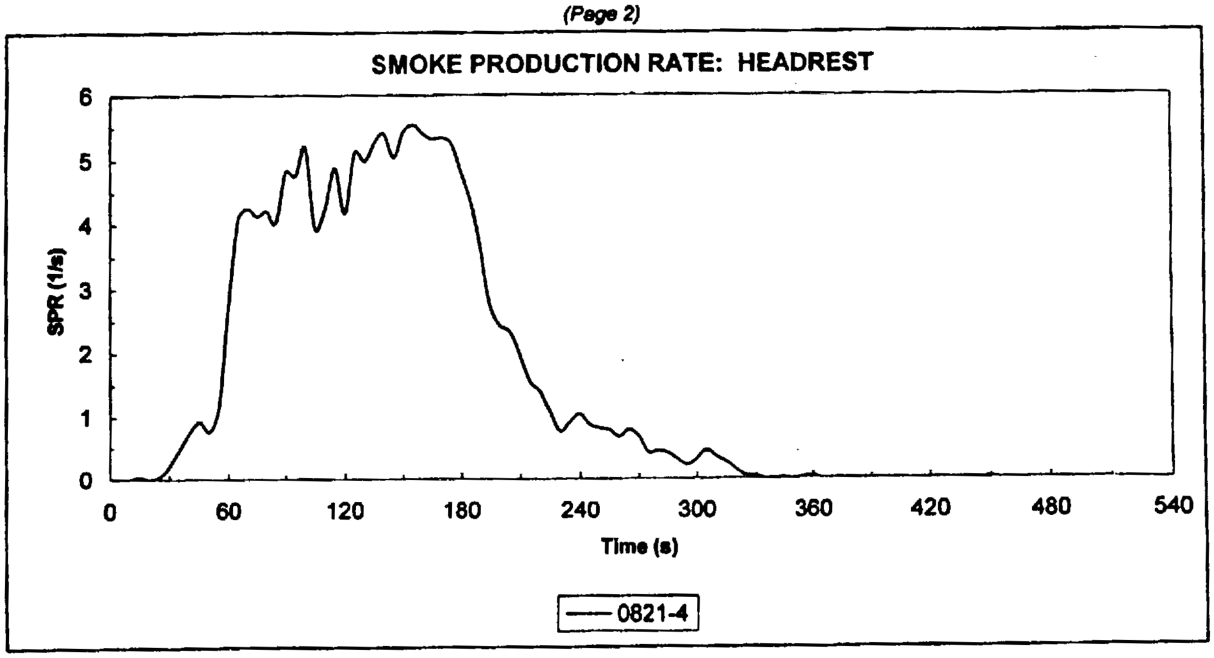

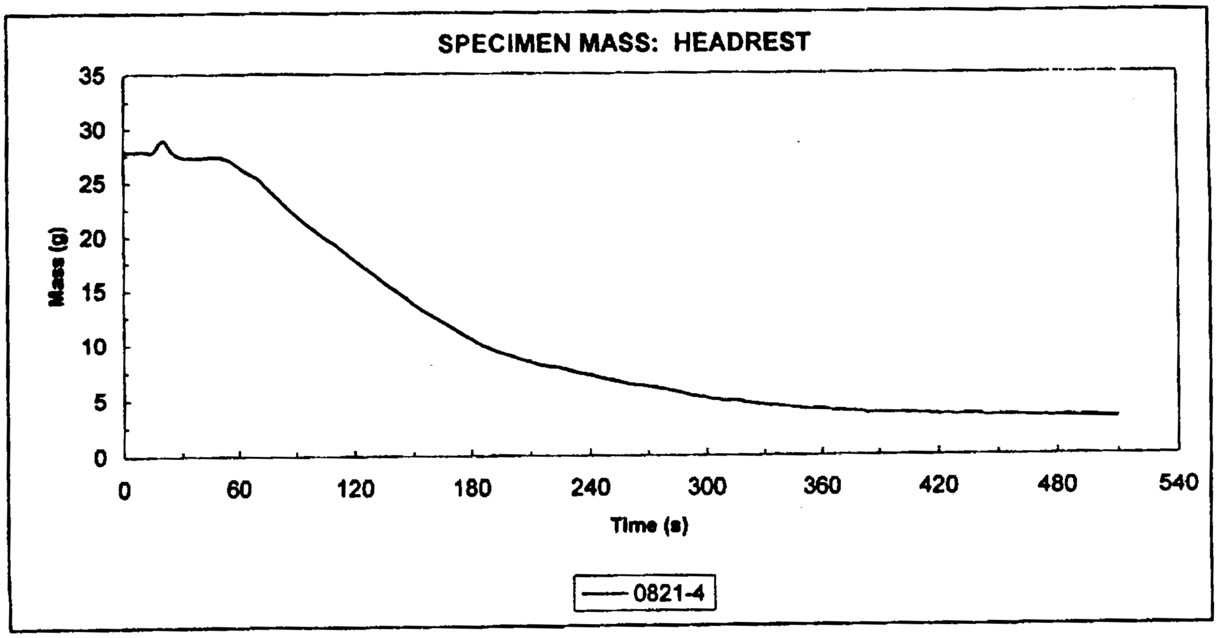

Notes & Observations:

Sample Thickness
- Vynyl - 1 mm
- Foam - 47 mm

Sample Mass
- Vynyl - 6.3 g
- Foam - 21.6 g

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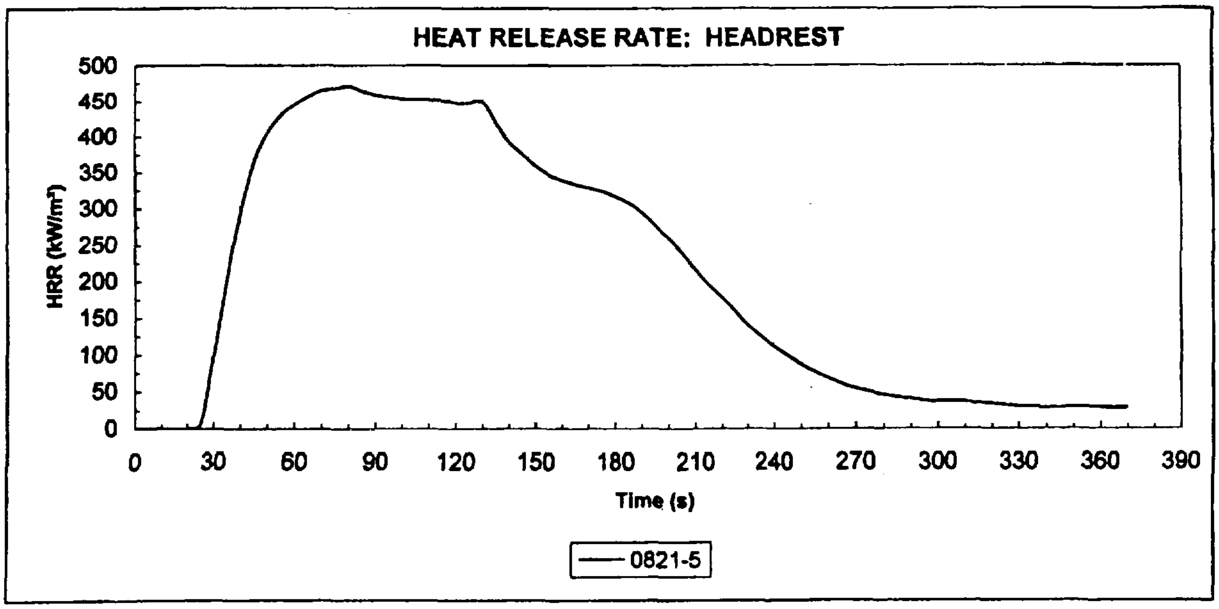
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Ford Focus
SwRI Project No:	18.03614.01	*Material ID:*	Headrest
Part No.:	YS4Z54611AO8BBB	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\,max}$ (kW/m²)
0821-5	03/23/01	23	249	471	80	75.5	360	373	252	464
Average		23	249	471	80	75.5	360	373	252	464

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
29.3	3.0	31.3	106.8	17.7	21.3	3.50	24	938	962	265
29.3	3.0	31.3	106.8	17.7	21.3	3.50	24	938	962	265



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Headrest
SwRI Project No:	18.03614.01	*Heat Flux:*	35 kW/m²

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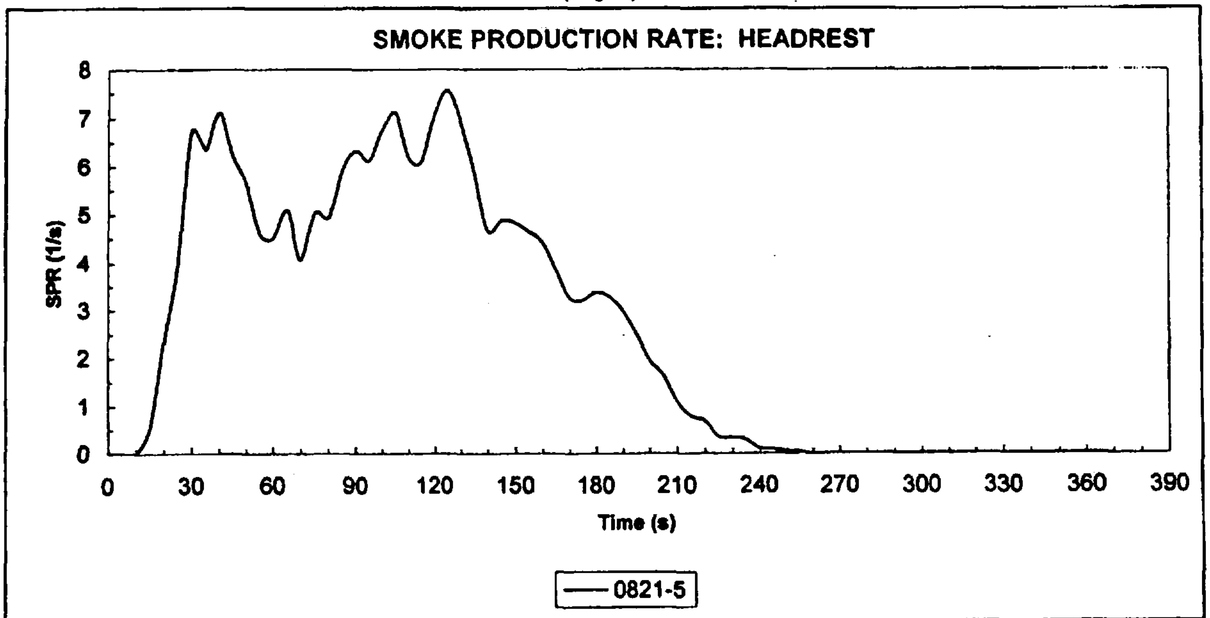

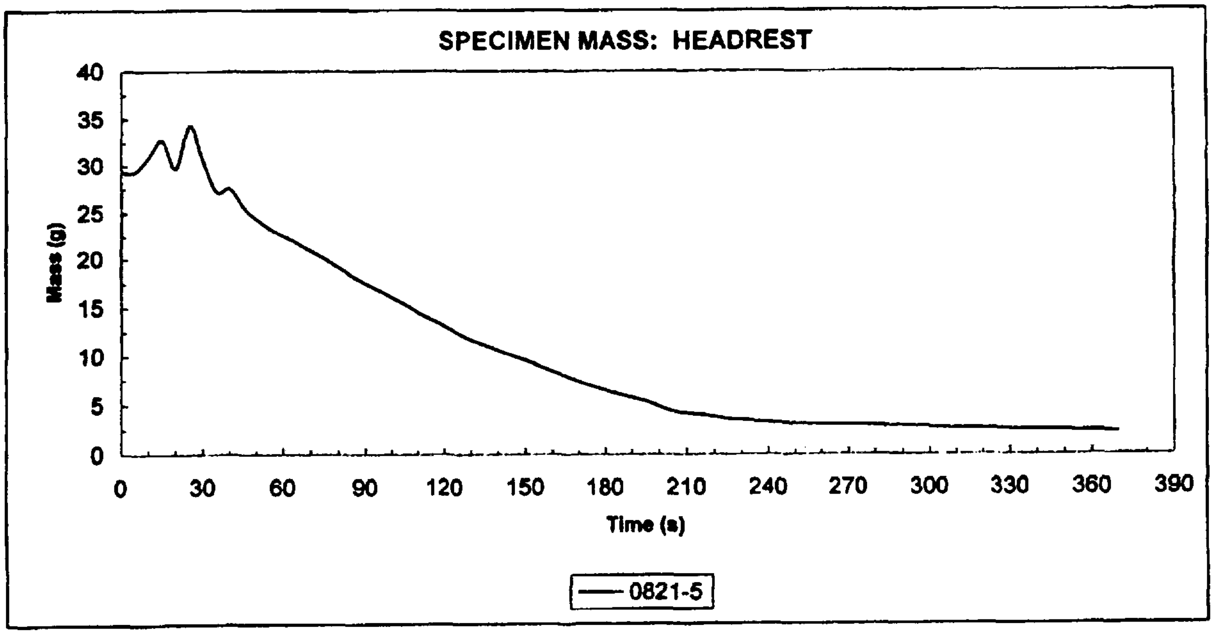

Notes & Observations:

Sample thickness
- Vinyl - 1 mm
- Foam - 47 mm

Sample mass
- Vinyl - 6.9 g
- Foam - 22.4 g

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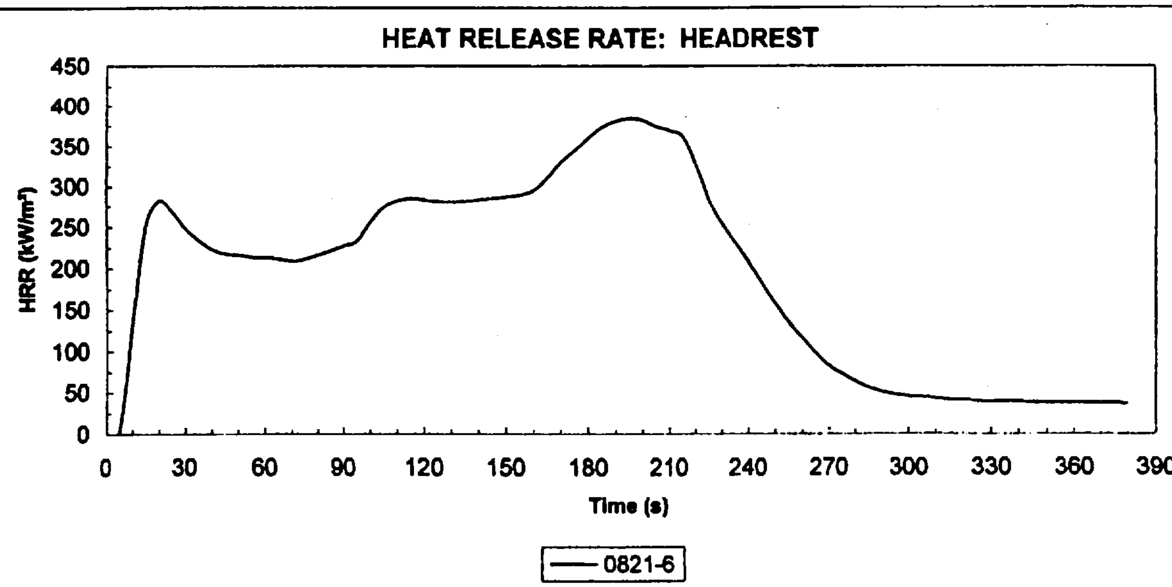
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Ford Focus
SwRI Project No:	18.03614.01	*Material ID:*	Headrest
Part No.:	YS4Z54611AO8BBB	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,max}$ (kW/m²)
0821-6	03/23/01	5	288	385	195	70.3	217	257	235	377
Average		5	288	385	195	70.3	217	257	235	377

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
30.3	3.9	26.4	87.1	12.3	23.5	5.63	1	1688	1689	565
30.3	3.9	26.4	87.1	12.3	23.5	5.63	1	1688	1689	565



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Headrest
SwRI Project No:	18.03614.01	*Heat Flux:*	50 kW/m²

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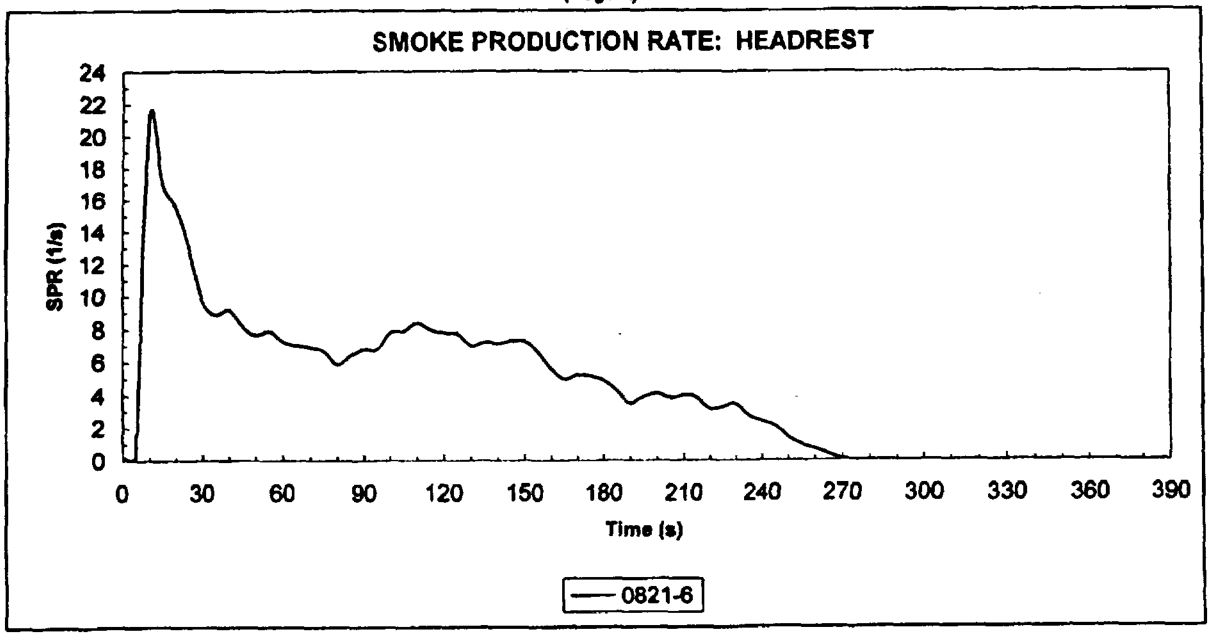

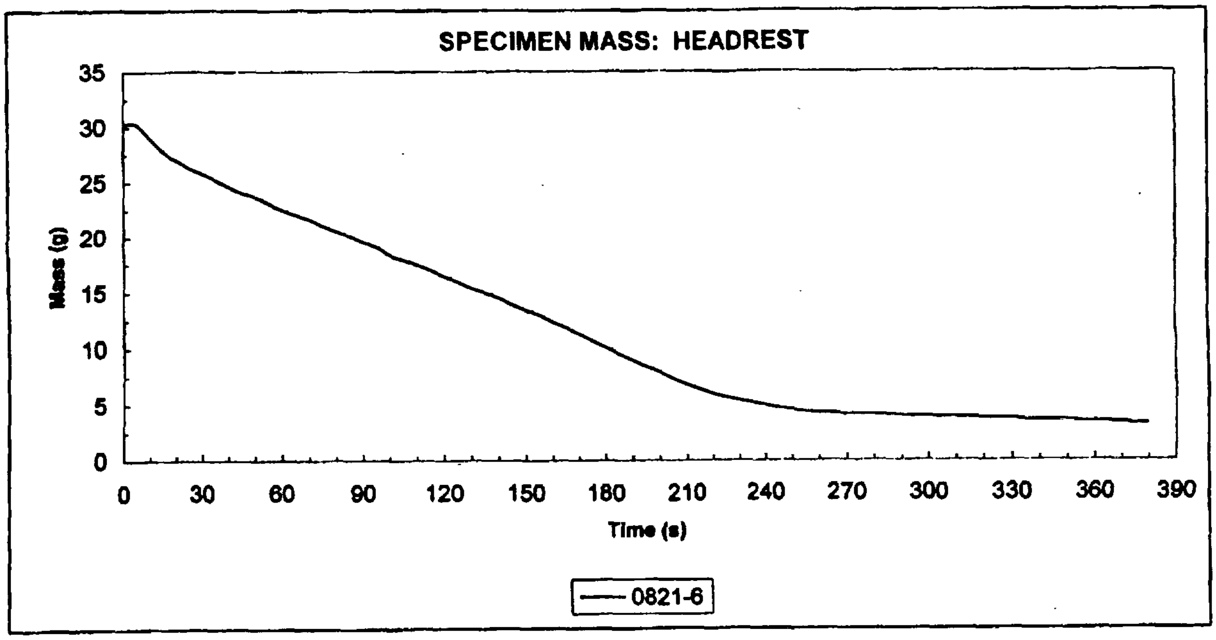

Notes & Observations:

Sample thickness	Sample mass
Vinyl - 1 mm	Vinyl - 8.8 g
Foam - 47 mm	Foam - 21.5 g

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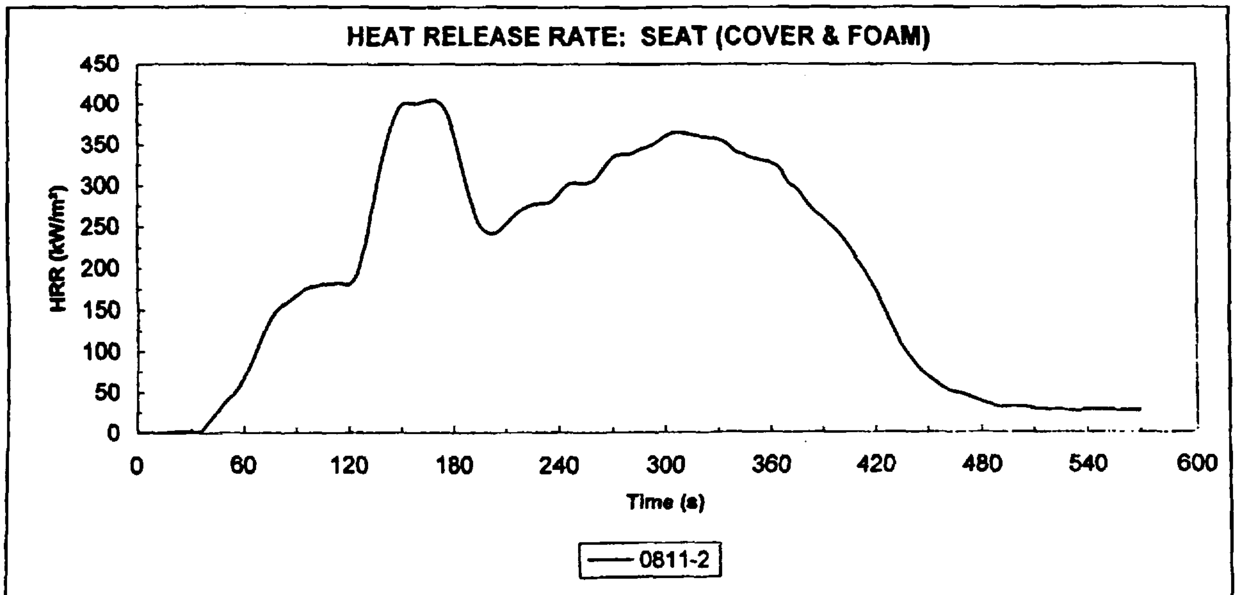
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Ford Focus
SwRI Project No:	18.03614.01	*Material ID:*	Seat (Cover & Foam)
Part No.:	YS4Z5462900BAB	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0811-2	03/22/01	30	445	404	165	108.1	78	216	259	399
Average		30	445	404	165	108.1	78	216	259	399

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
55.0	8.0	47.0	85.4	15.7	20.4	4.06	3	1948	1951	367
55.0	8.0	47.0	85.4	15.7	20.4	4.06	3	1948	1951	367



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client: General Motors
SwRI Project No: 18.03614.01
Material ID: Seat (Cover & Foam)
Heat Flux: 20 kW/m²

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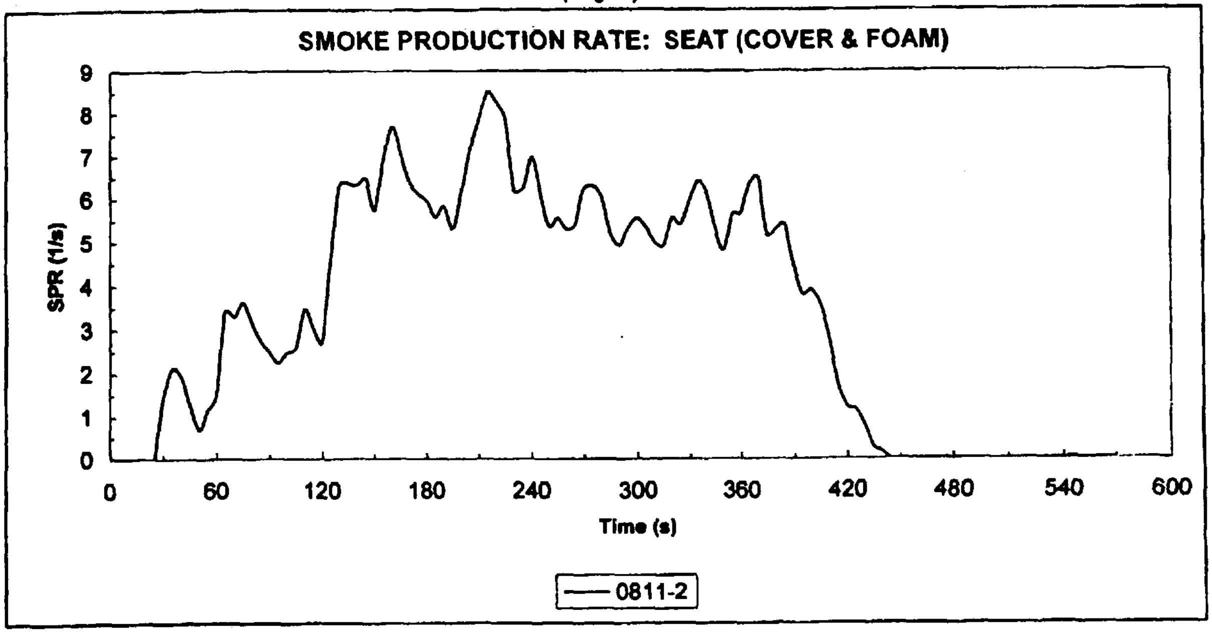

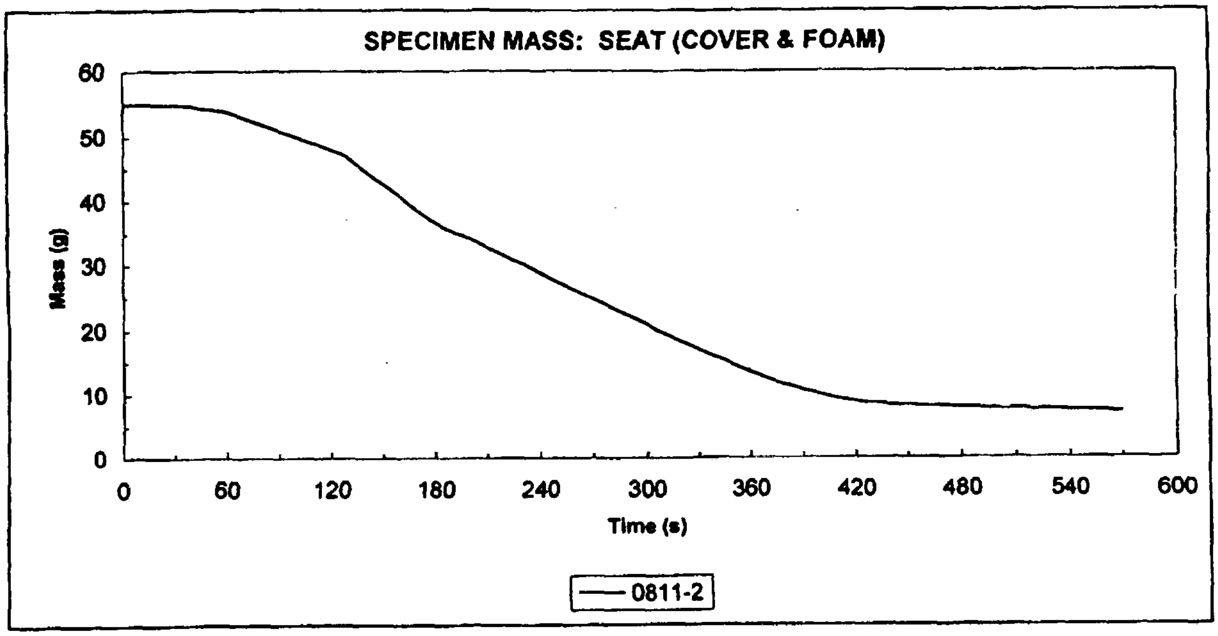

Notes & Observations:

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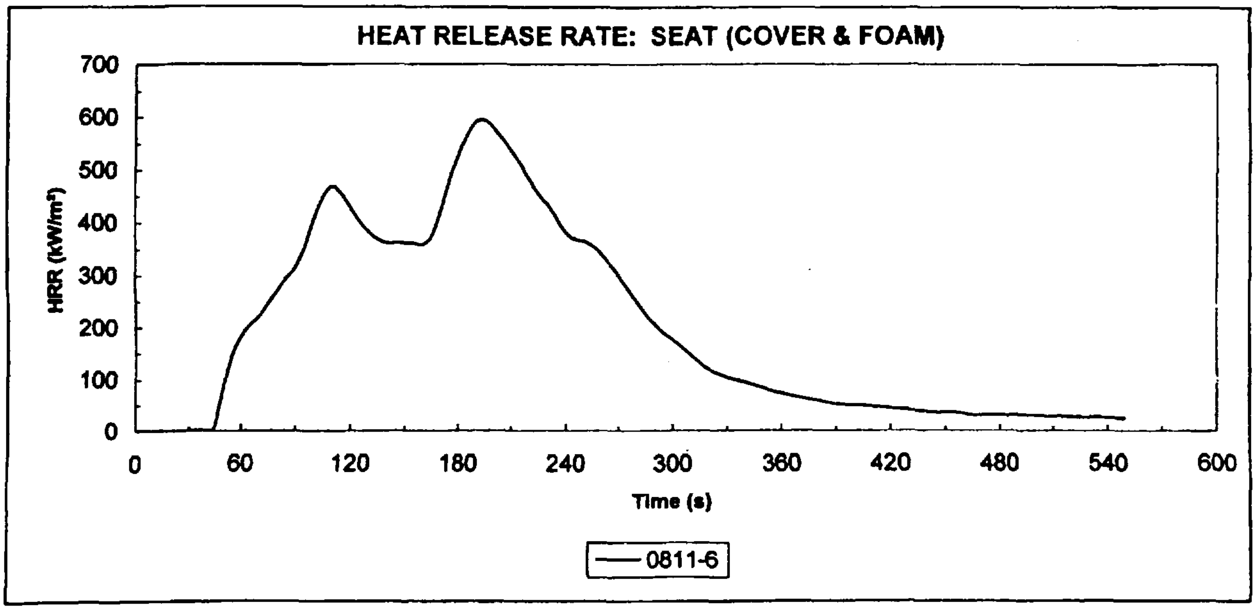
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Ford Focus
SwRI Project No:	18.03614.01	*Material ID:*	Seat (Cover & Foam)
Part No.:	YS4Z54629000BAB	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\,max}$ (kW/m²)
0811-6	03/22/01	43	417	594	195	105.2	247	388	330	571
Average		43	417	594	195	105.2	247	388	330	571

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
49.4	5.9	43.0	87.0	19.9	21.7	2.54	17	1163	1181	239
49.4	5.9	43.0	87.0	19.9	21.7	2.54	17	1163	1181	239



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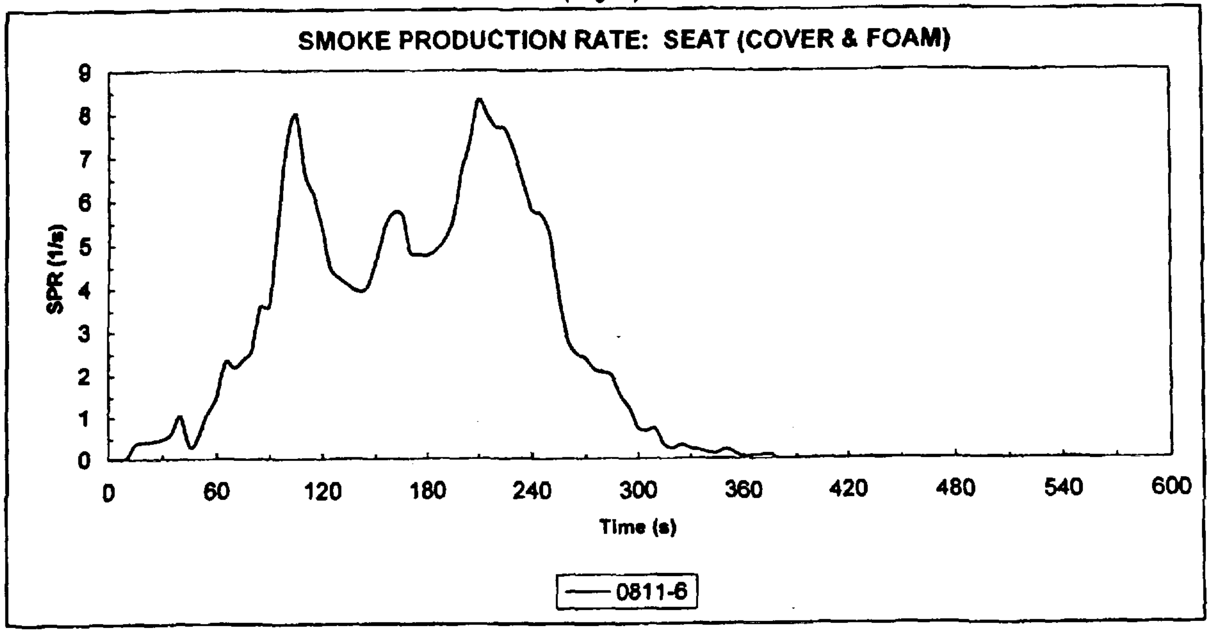
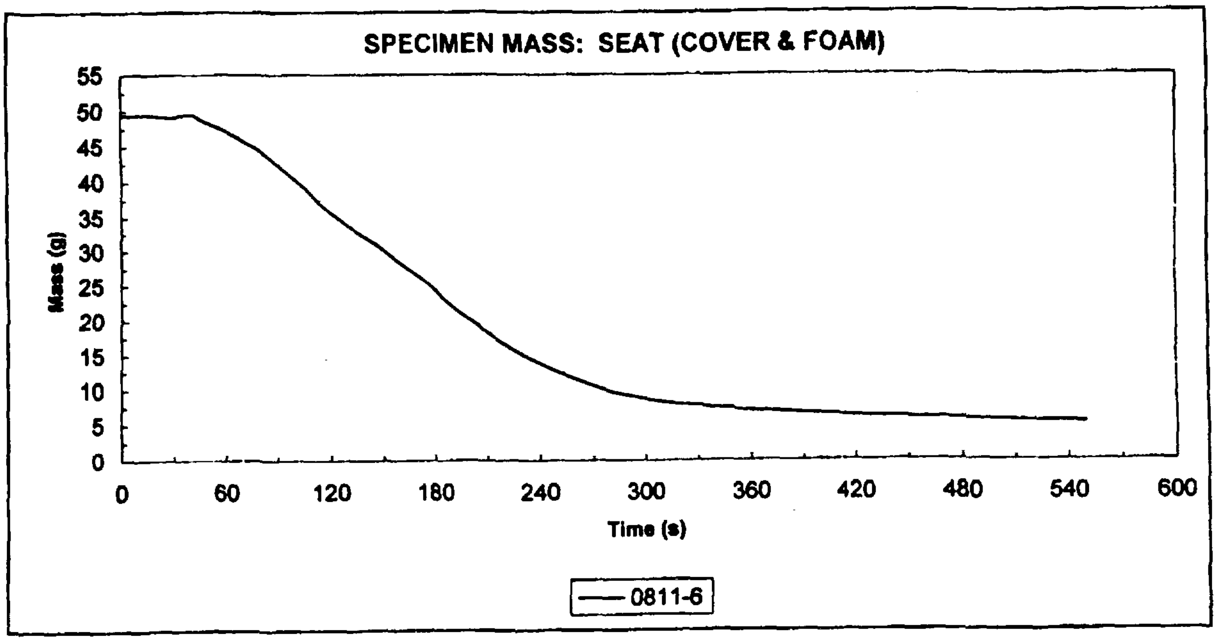
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Seat (Cover & Foam)
SwRI Project No:	18.03614.01	*Heat Flux:*	35 kW/m²

(Page 2)





Notes & Observations:

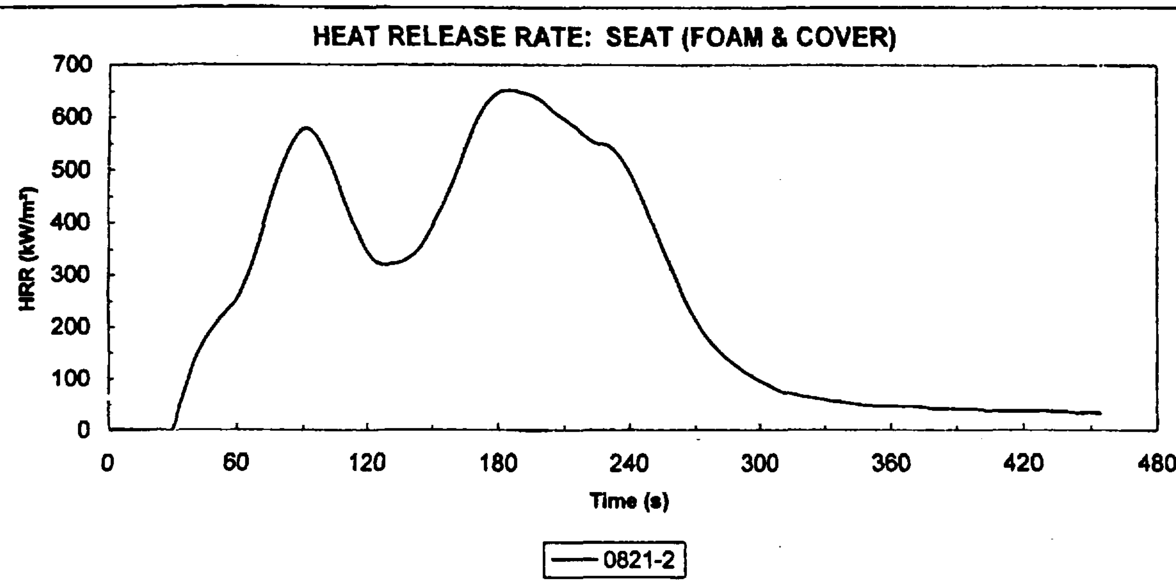
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Ford Focus
SwRI Project No:	18.03614.01	*Material ID:*	Seat (Foam & Cover)
Part No.:	YS4Z54629000BAB	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0821-2	03/23/01	23	341	653	185	112.7	245	412	369	641
Average		23	341	653	185	112.7	245	412	369	641

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
47.3	0.9	45.7	96.7	23.0	21.8	2.99	19	1086	1105	210
47.3	0.9	45.7	96.7	23.0	21.8	2.99	19	1086	1105	210



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Seat (Foam & Cover)
SwRI Project No:	18.03614.01	*Heat Flux:*	50 kW/m²

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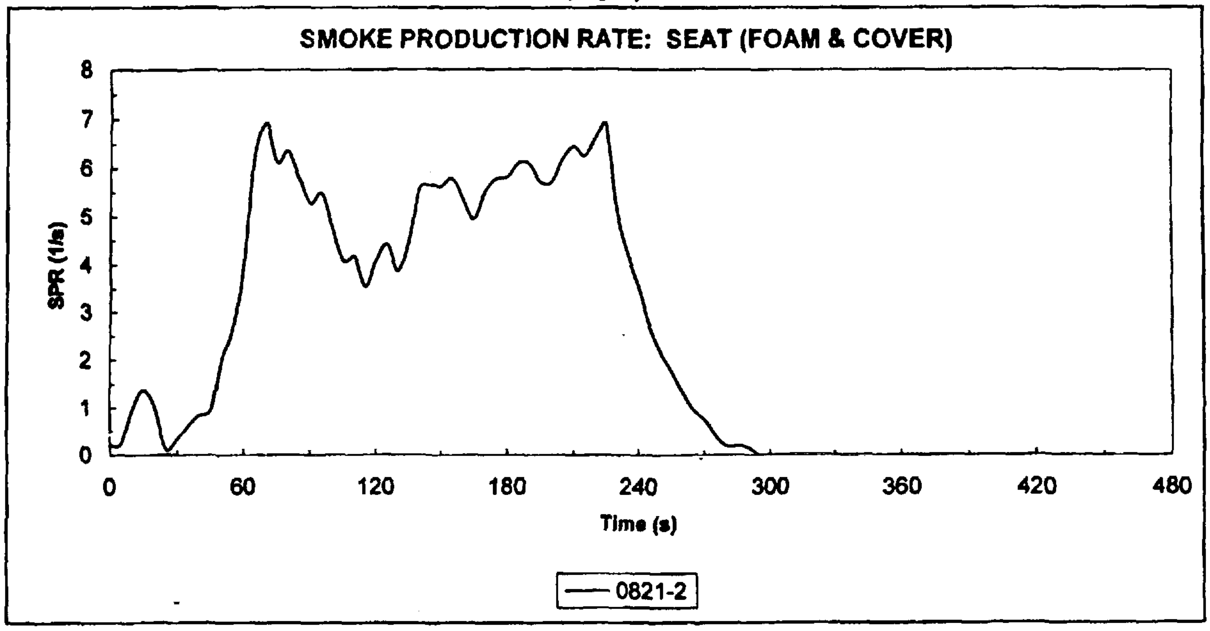

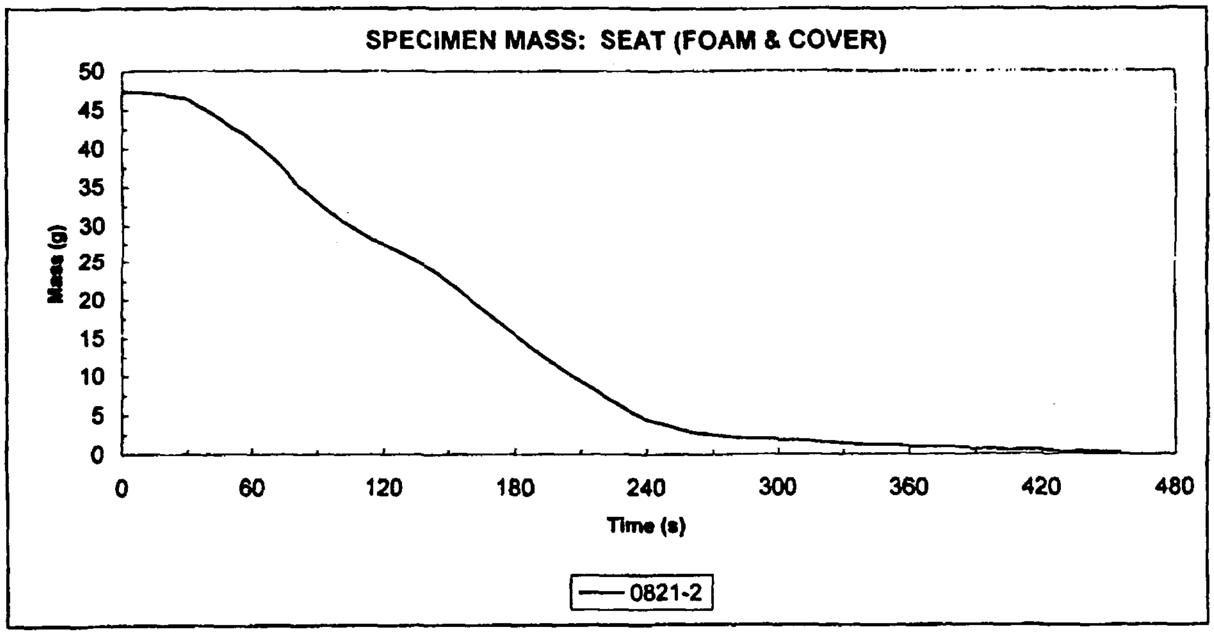

Notes & Observations:

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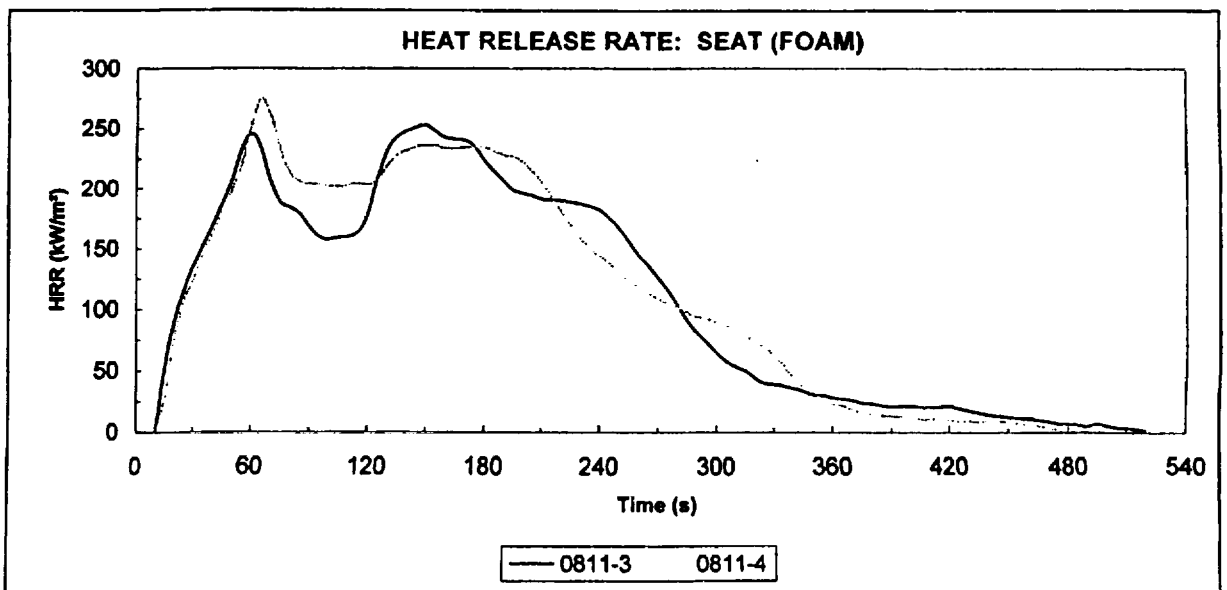
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Ford Focus
SwRI Project No:	18.03614.01	*Material ID:*	Seat (Foam)
Part No.:	YS4Z5464810AB	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0811-3	03/22/01	8	425	253	150	55.9	159	192	174	248
0811-4	03/22/01	9	404	275	65	56.8	157	200	177	241
Average		8	414	264	108	56.3	158	196	176	244

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
18.7	1.8	16.7	89.4	7.0	29.5	0.89	1	390	391	206
19.3	1.5	17.9	92.6	7.2	28.1	1.38	2	576	578	285
19.0	1.7	17.3	91.0	7.1	28.8	1.13	2	483	484	245



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Seat (Foam)
SwRI Project No:	18.03614.01	*Heat Flux:*	20 kW/m²

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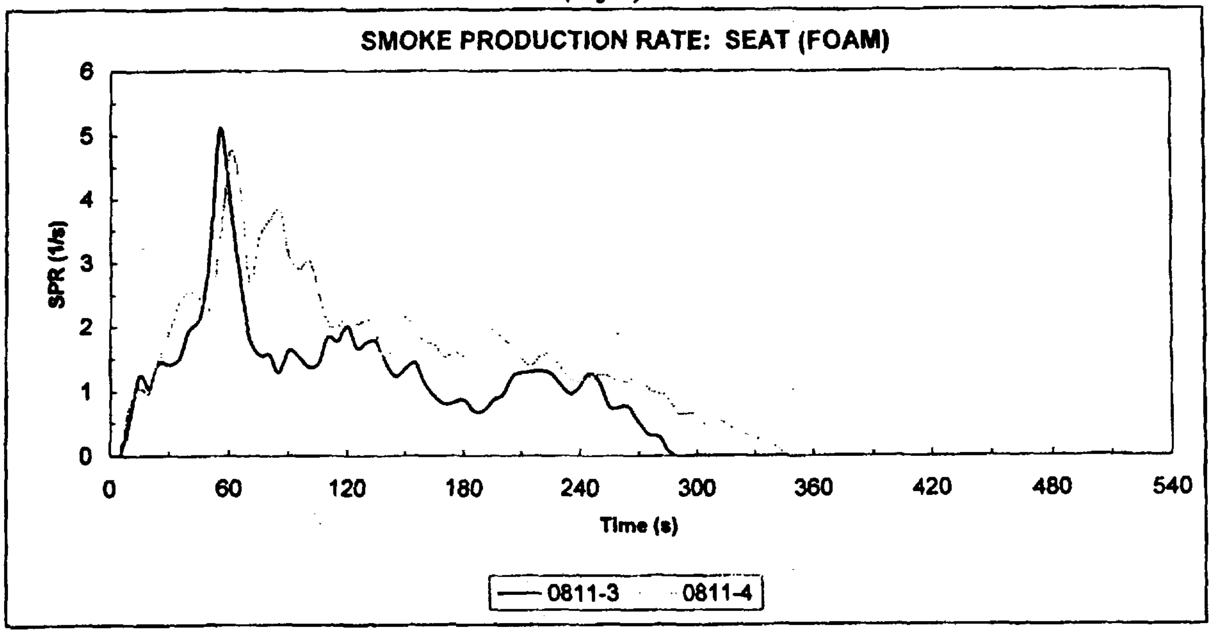
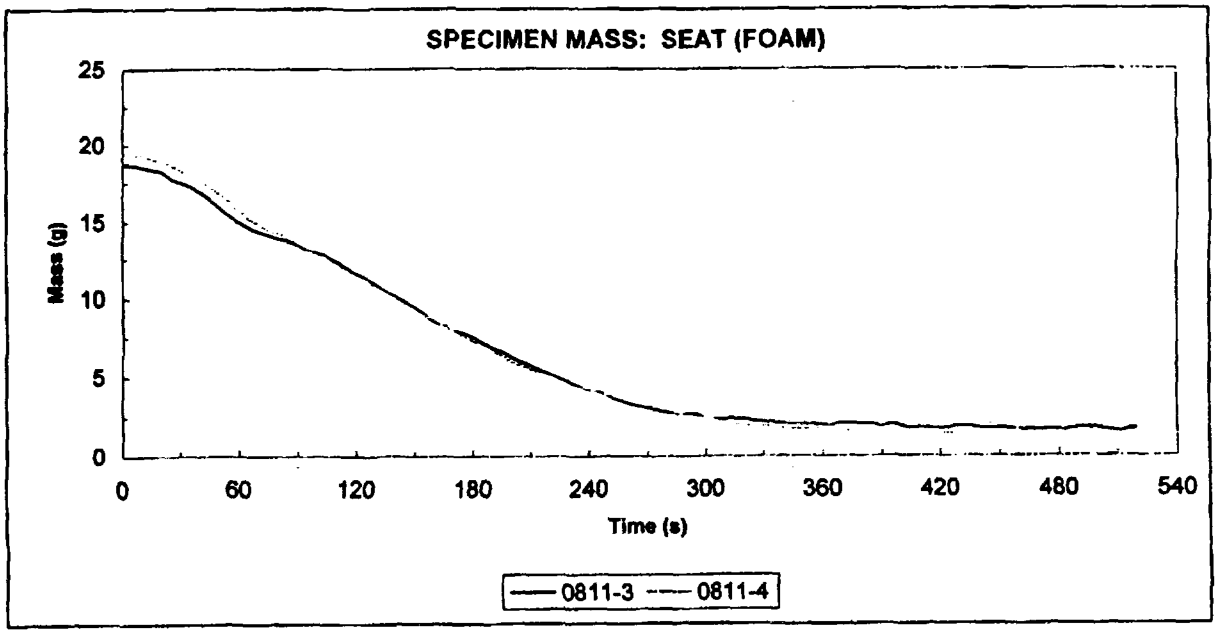




Notes & Observations:

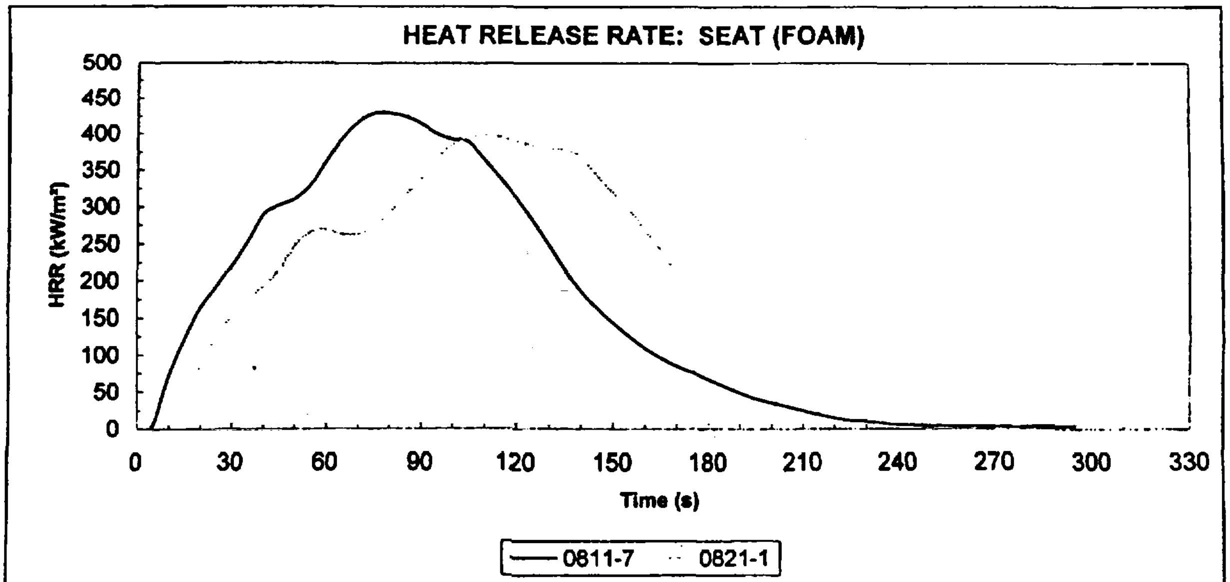
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Ford Focus
SwRI Project No:	18.03614.01	*Material ID:*	Seat (Foam)
Part No.:	YS4Z5464810AB	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0811-7	03/22/01	4	211	430	80	47.0	235	255	157	419
0821-1	03/23/01	4	212	399	110	49.6	157	263	166	392
Average		4	212	414	95	48.3	196	259	161	405

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
15.8	0.6	15.2	96.2	12.5	27.4	2.68	6	580	586	337
17.1	1.2	15.9	93.0	11.5	27.6	2.73	5	593	597	329
16.5	0.9	15.6	94.6	12.0	27.5	2.70	5	587	591	333



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Seat (Foam)
SwRI Project No:	18.03614.01	*Heat Flux:*	35 kW/m²

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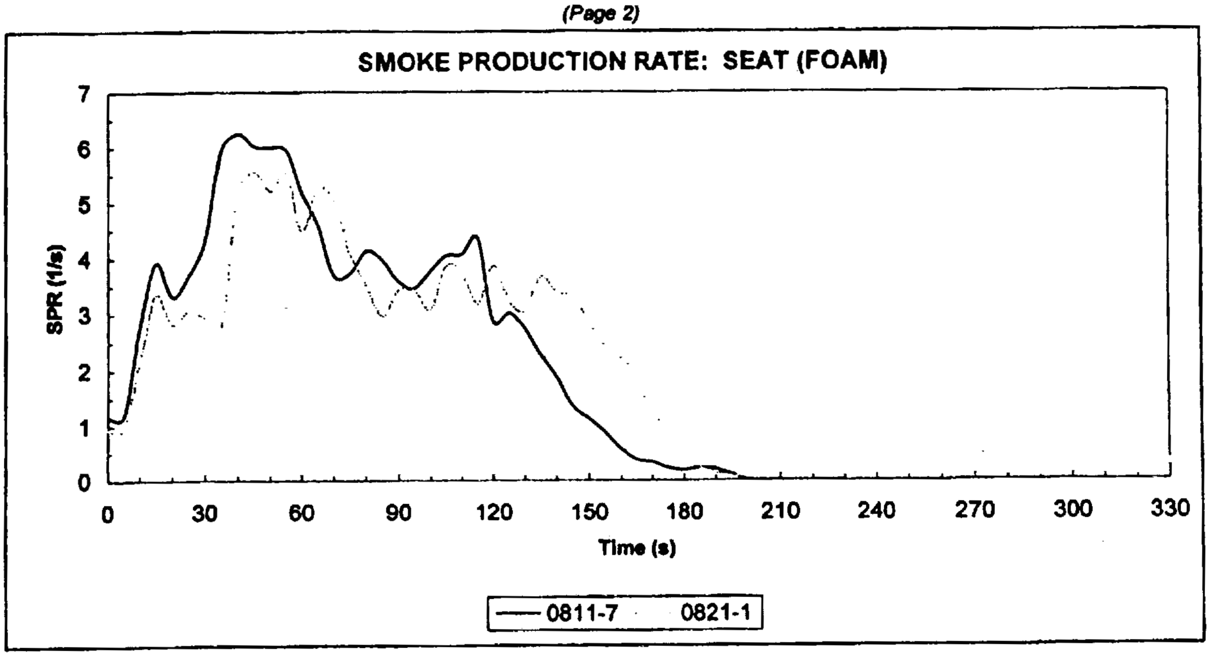
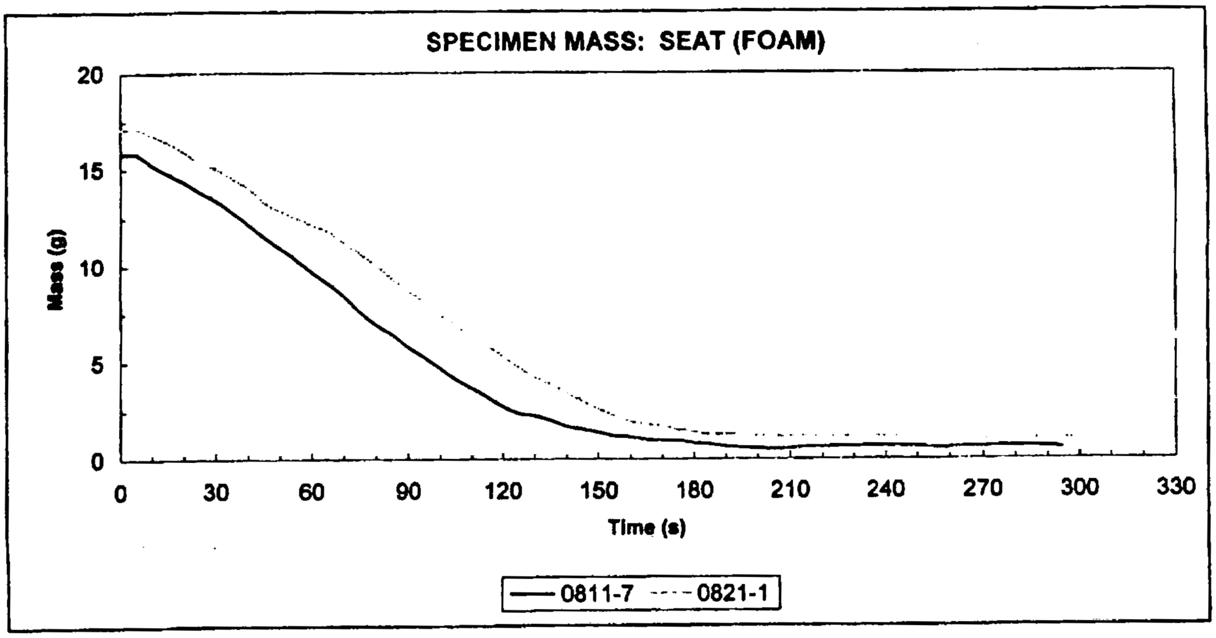




Notes & Observations:

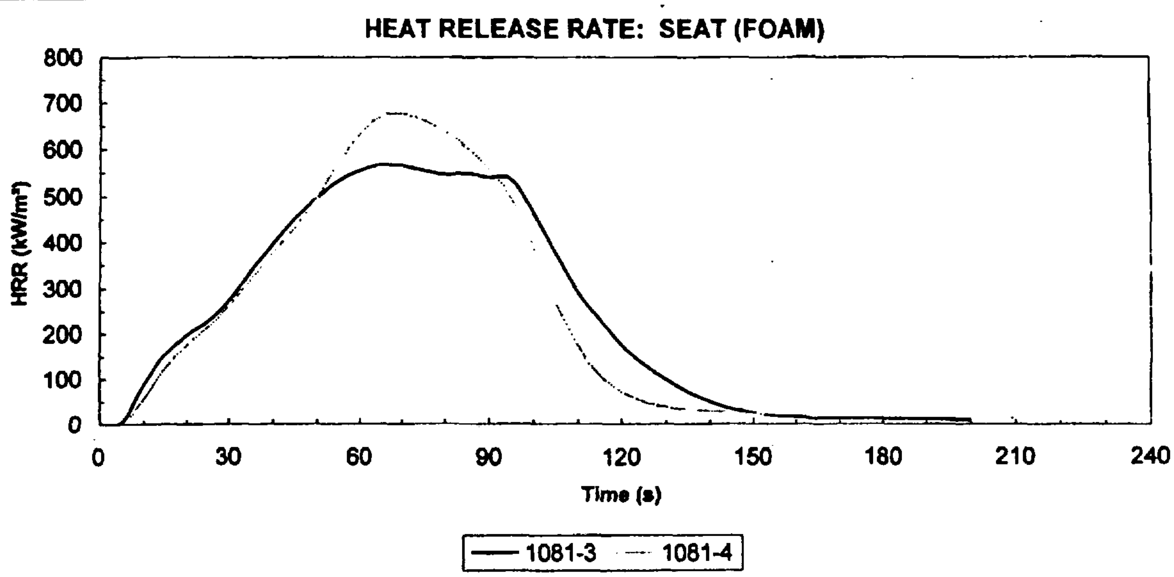
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Ford Focus
SwRI Project No:	18.03614.01	*Material ID:*	Seat (Foam)
Part No.:	YS4Z5464810AB	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
1081-3	04/18/01	2	140	567	65	47.3	287	264	158	555
1081-4	04/18/01	2	123	676	70	45.2	280	252	151	646
Average		2	132	622	68	46.2	284	258	155	600

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
15.4	0.9	14.5	94.4	17.5	28.8	4.17	0	599	599	364
14.9	0.8	14.1	94.9	19.7	28.2	4.45	0	574	574	359
15.2	0.8	14.3	94.6	18.6	28.5	4.31	0	587	587	362

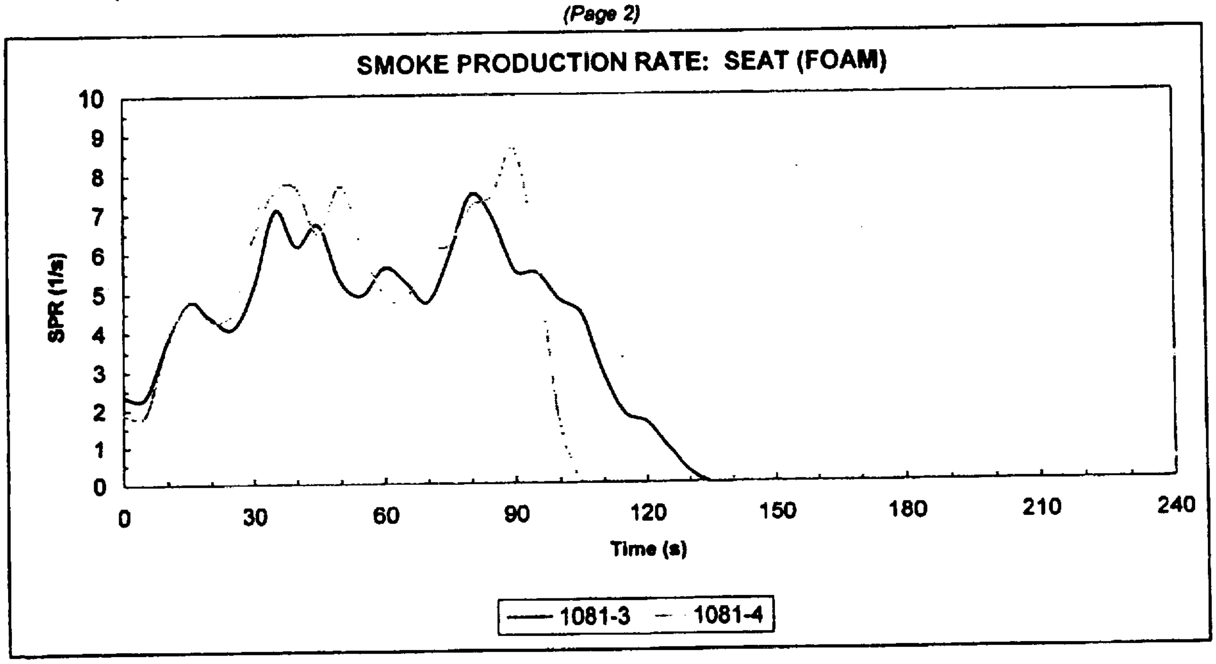


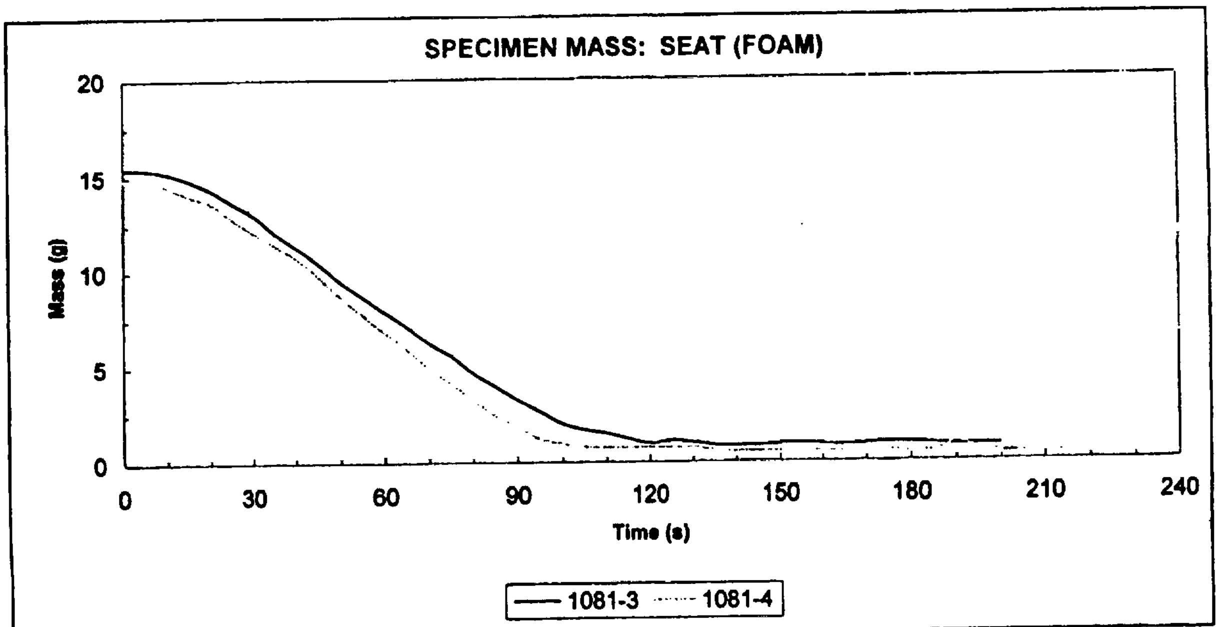
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Seat (Foam)
SwRI Project No:	18.03614.01	*Heat Flux:*	50 kW/m²

(Page 2)





Notes & Observations:

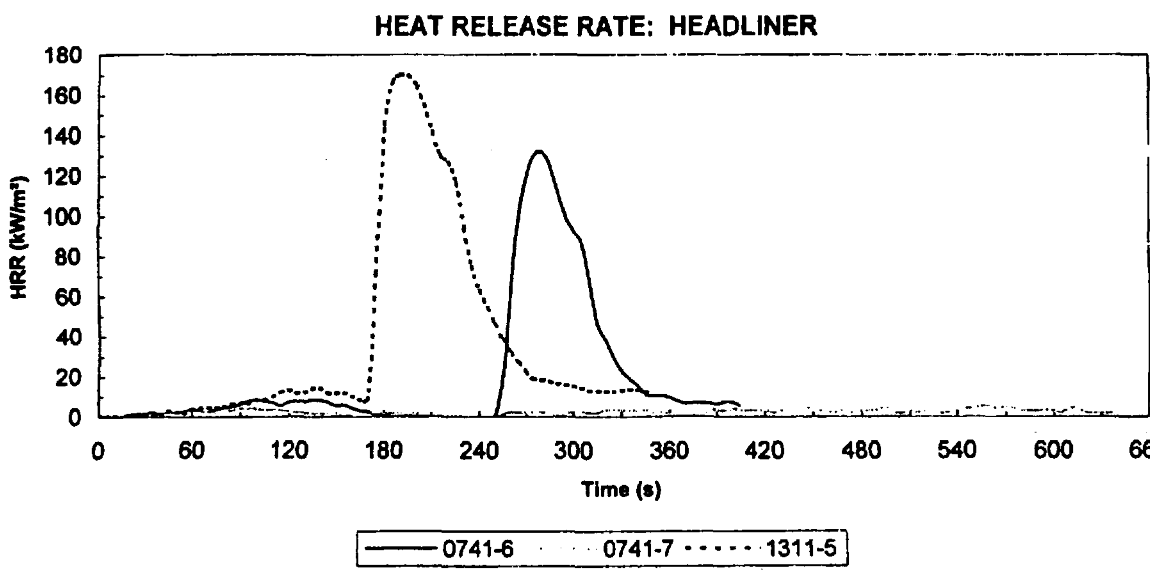
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Ford Focus
SwRI Project No:	18.03614.01	*Material ID:*	Headliner
Part No.:	YS4Z5451916AAB	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\ max}$ (kW/m²)
0741-6	03/15/01	254	106	132	280	6.8	97	38	23	120
0741-7	03/15/01	No Ignition		5	0	1.5	1	2	2	5
1311-5	05/11/01	165	99	170	190	9.9	126	56	33	162
*Average**		210	102	151	235	8	112	47	28	141

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
10.0	5.1	0.5	4.7	2.1	127.7	0.87	296	20	317	381
10.1	6.7	3.4	33.6	0.8	3.9	0.67	427	N/A	427	1110
10.7	5.4	3.9	36.2	7.0	22.7	1.07	87	201	288	459
10.3	5.3	2.2	20.5	4.6	22.7	1.0	191.5	110.7	302.2	420.2



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client: General Motors
SwRI Project No: 18.03614.01
Material ID: Headliner
Heat Flux: 20 kW/m²

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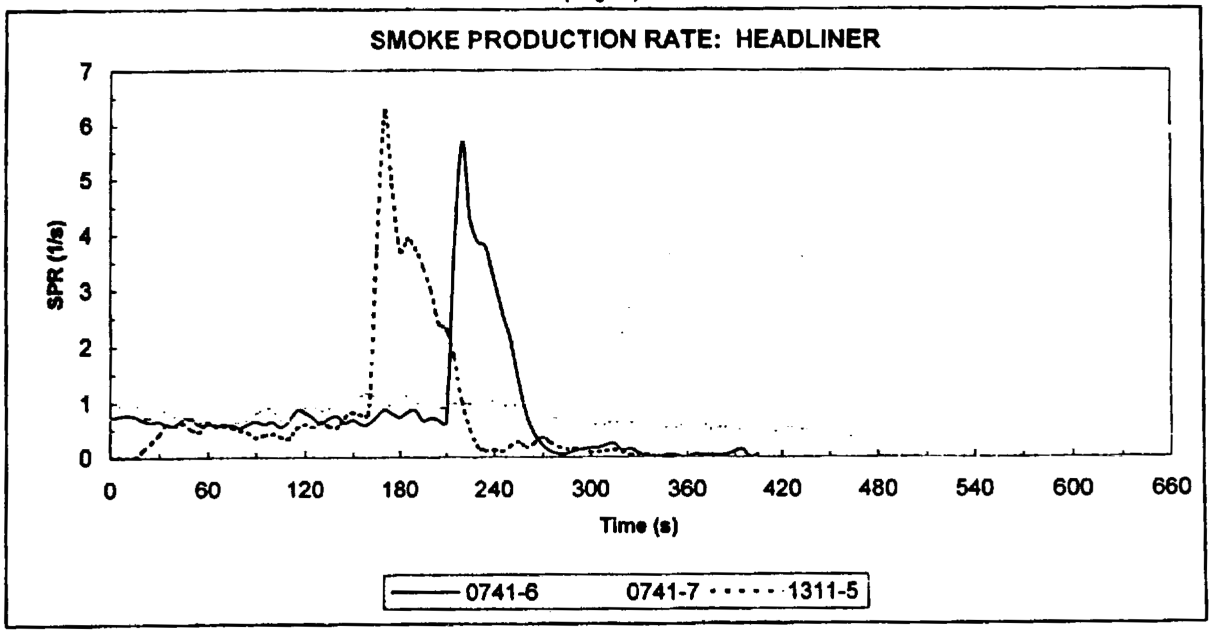
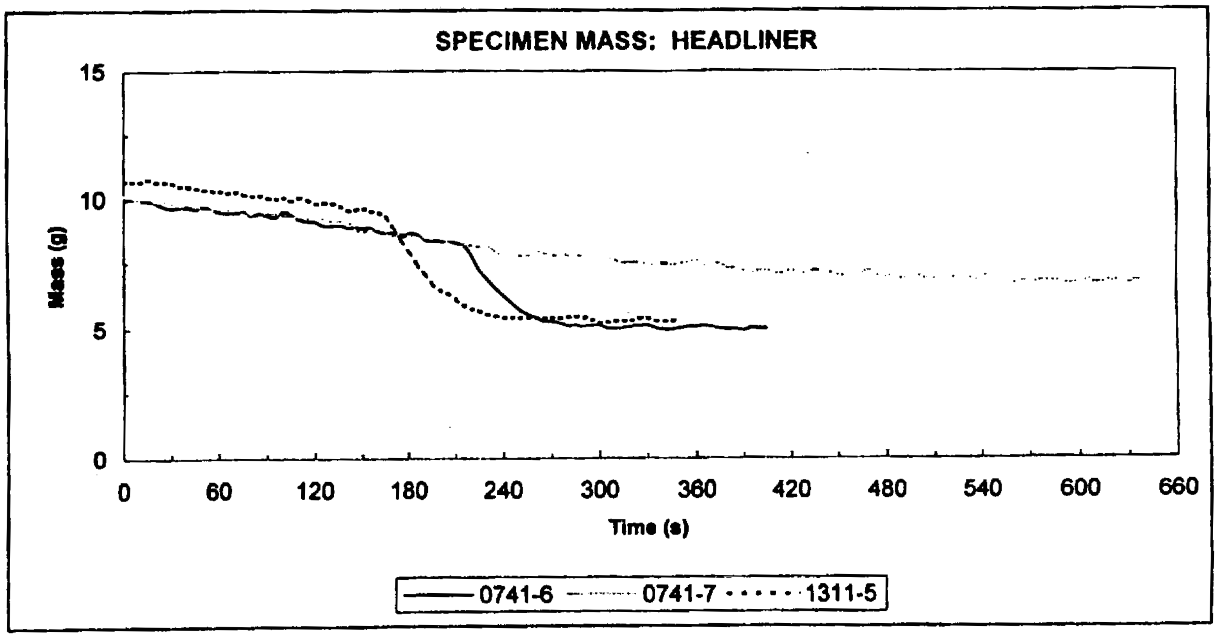




*Notes & Observations: *Average of tests 0741-6 and 1311-5 (1311-5 only for EHC)*

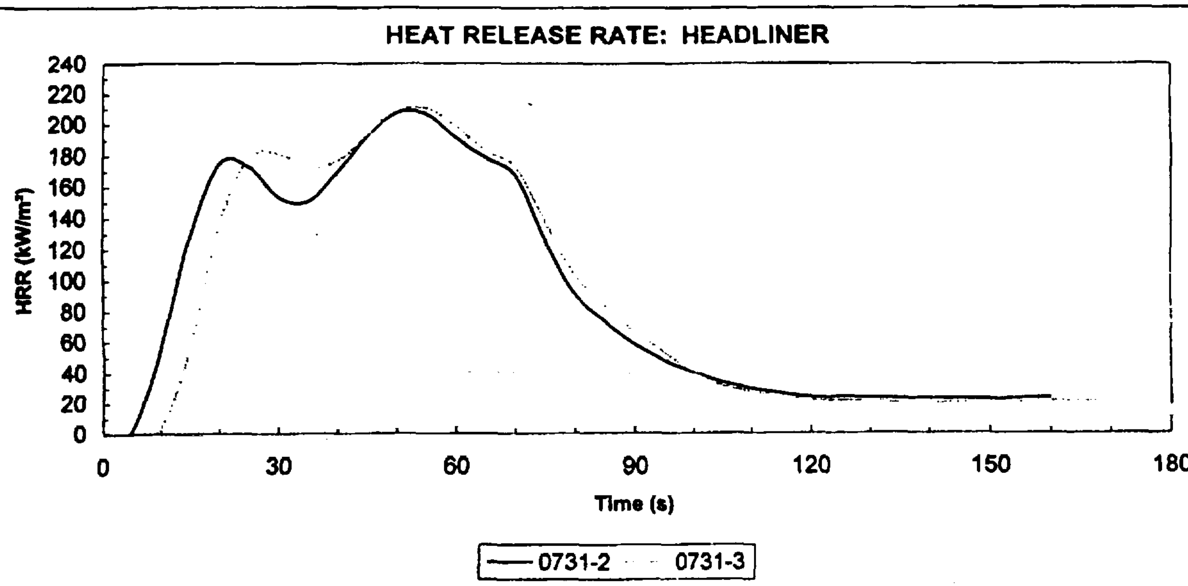
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Ford Focus
SwRI Project No:	18.03614.01	*Material ID:*	Headliner
Part No.:	YS4Z5451916AAB	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,max}$ (kW/m²)
0731-2	03/14/01	16	104	208	50	12.9	175	72	43	191
0731-3	03/14/01	15	111	211	55	13.3	176	74	44	195
Average		16	108	209	53	13.1	175	73	44	193

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
10.3	4.2	6.0	58.2	9.0	19.0	2.95	6	362	368	534
10.1	3.9	6.2	61.1	11.2	19.0	2.98	5	381	386	546
10.2	4.0	6.1	59.6	10.1	19.0	2.96	5	372	377	540



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Headliner
SwRI Project No:	18.03614.01	*Heat Flux:*	35 kW/m²

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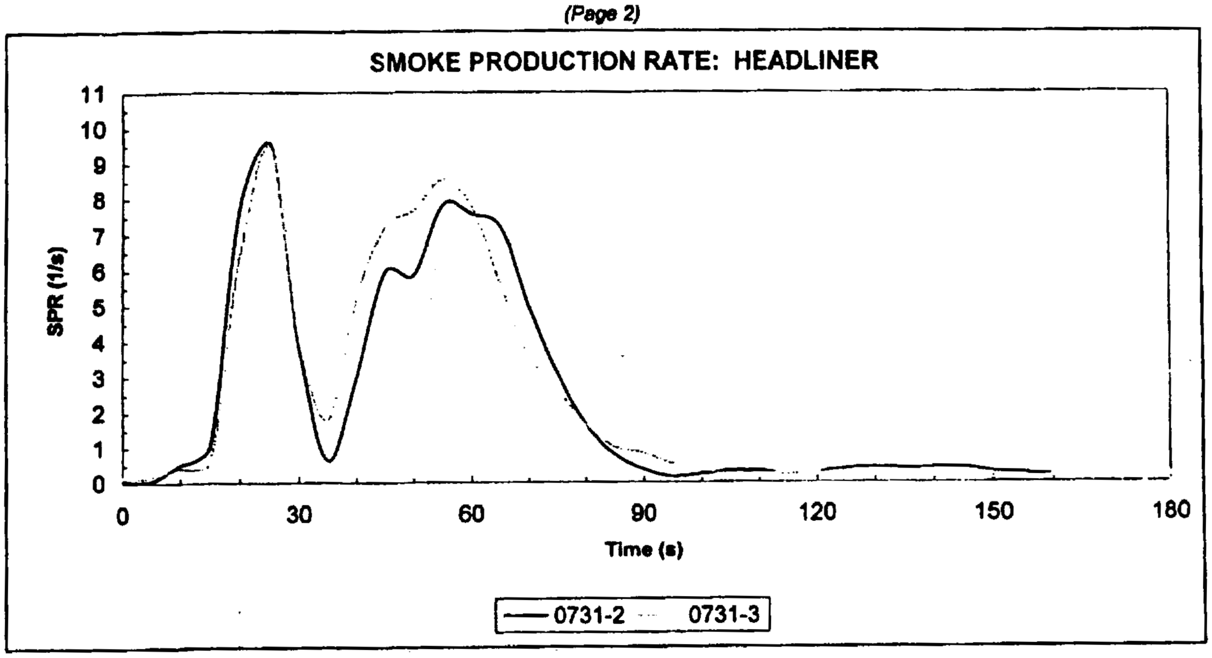
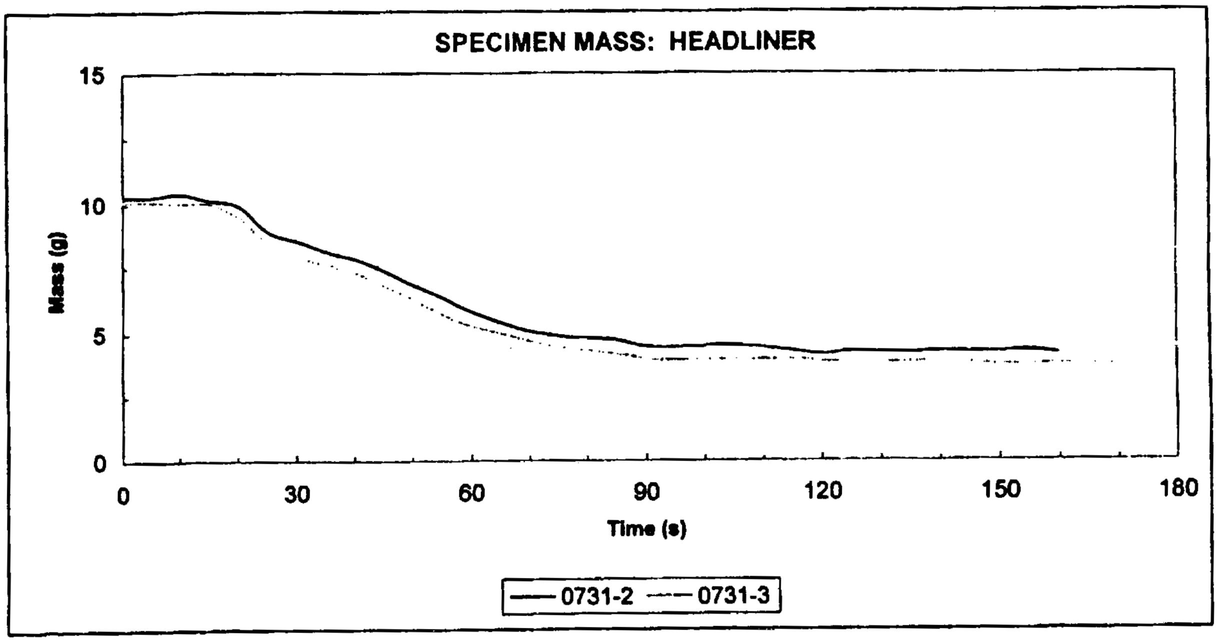




Notes & Observations:

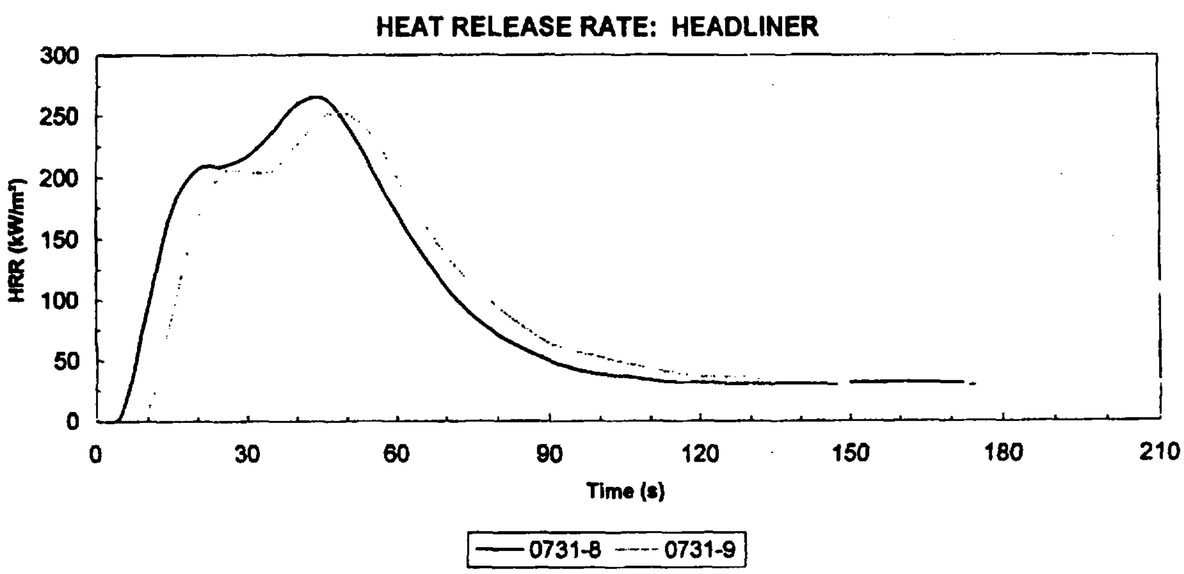
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Ford Focus
SwRI Project No:	18.03614.01	*Material ID:*	Headliner
Part No.:	YS4Z5451916AAB	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\ max}$ (kW/m²)
0731-8	03/14/01	9	106	265	45	14.6	203	82	49	238
0731-9	03/14/01	9	120	252	50	15.1	189	85	51	229
Average		9	113	258	48	14.9	196	83	50	234

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
10.1	3.3	6.7	66.2	12.1	19.3	3.27	6	387	393	511
10.2	3.5	6.7	65.4	10.1	20.0	3.13	8	414	422	548
10.2	3.4	6.7	65.8	11.1	19.7	3.20	7	401	407	529



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client: General Motors
SwRI Project No: 18.03614.01

Material ID: Headliner
Heat Flux: 50 kW/m²

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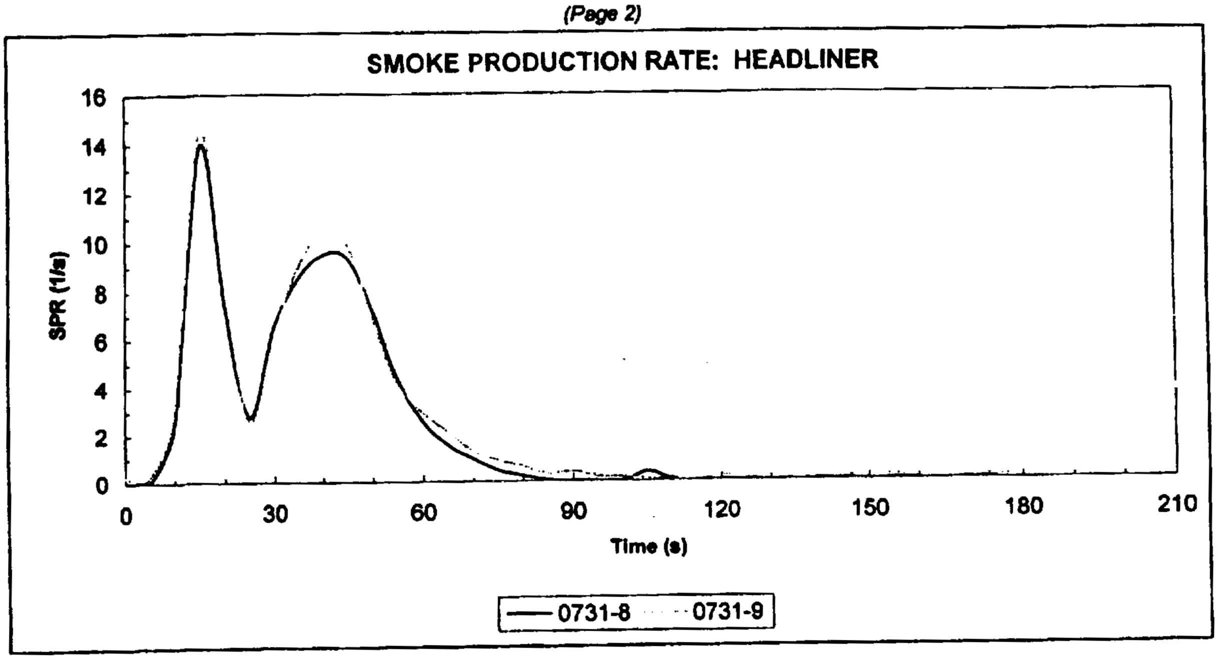
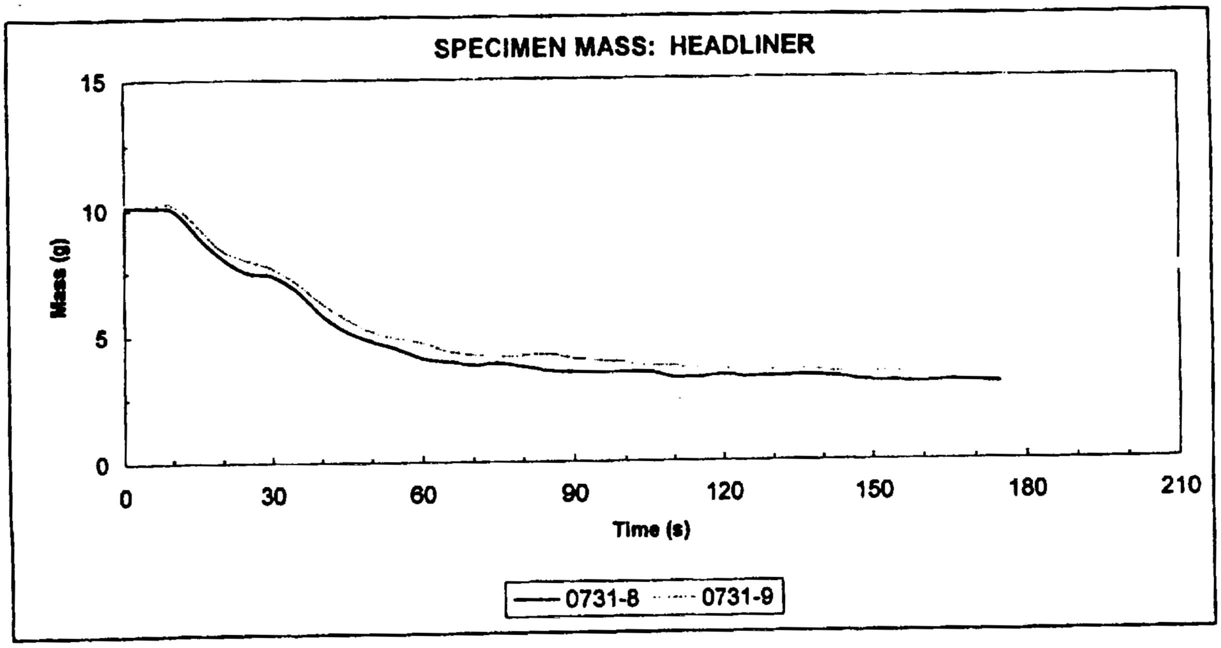




Notes & Observations:

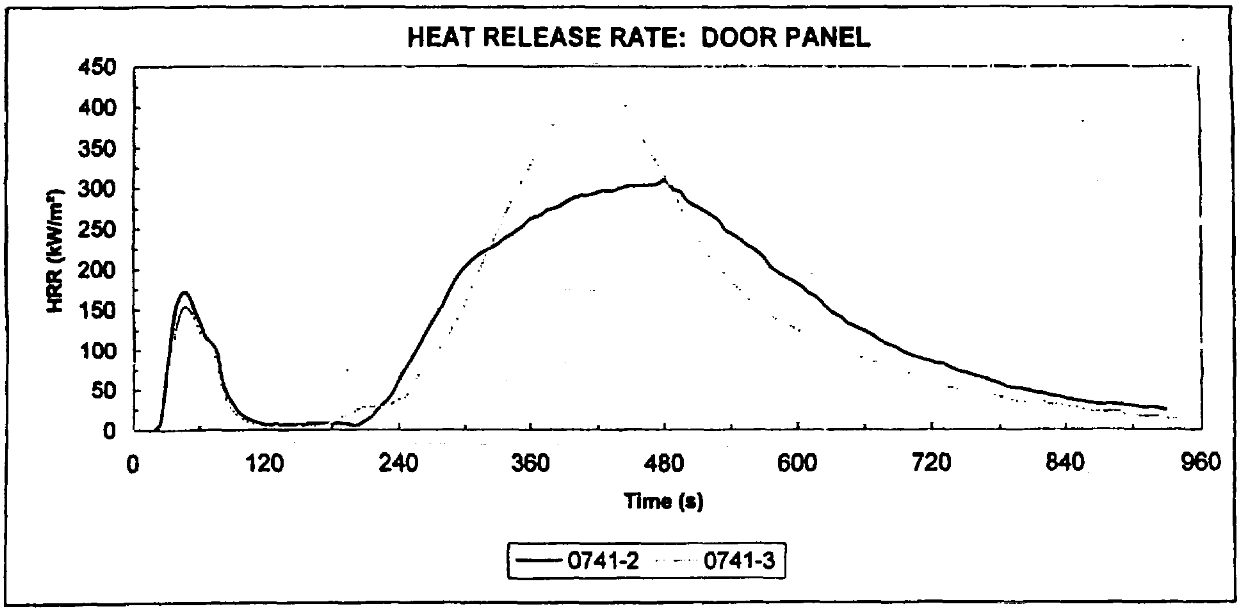
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Ford Focus
SwRI Project No:	18.03614.01	*Material ID:*	Door Panel
Part No.:	YS4Z5423942AAB	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\ max}$ (kW/m²)
0741-2	03/15/01	26	874	310	480	120.5	118	47	76	306
0741-3	03/15/01	23	871	425	415	116.2	101	41	62	423
Average		24	872	367	448	118.4	109	44	69	364

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
31.3	8.3	22.6	72.3	5.8	47.1	1.35	75	1128	1203	441
29.7	7.0	21.9	74.0	6.5	46.8	1.16	68	954	1021	384
30.5	7.7	22.3	73.1	6.2	47.0	1.25	71	1041	1112	413



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Door Panel
SwRI Project No:	18.03614.01	*Heat Flux:*	20 kW/m²

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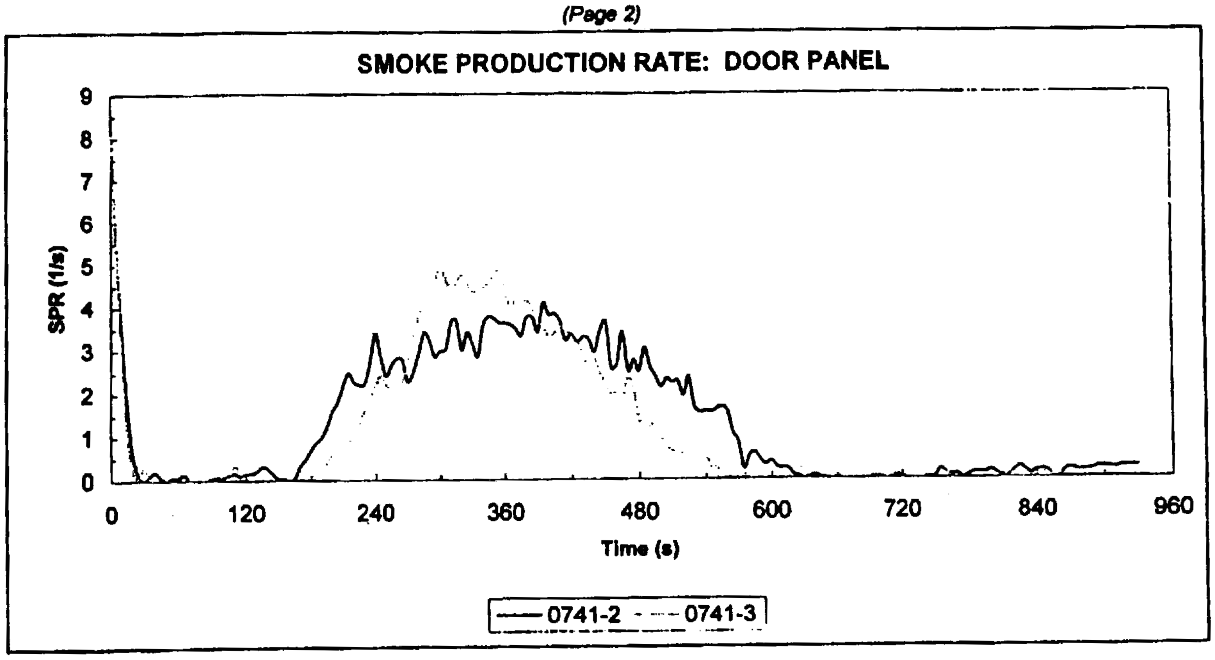
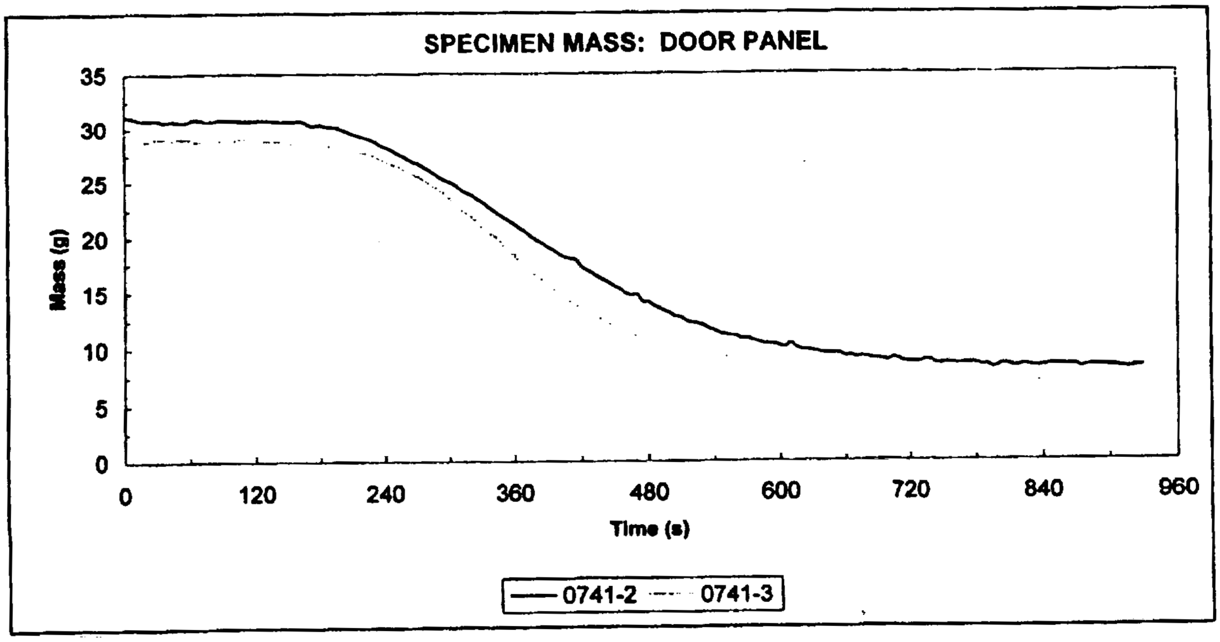




Notes & Observations:

Top layer ignited and extinguished after ~80 secs. A second ignition occurred at ~200 secs.

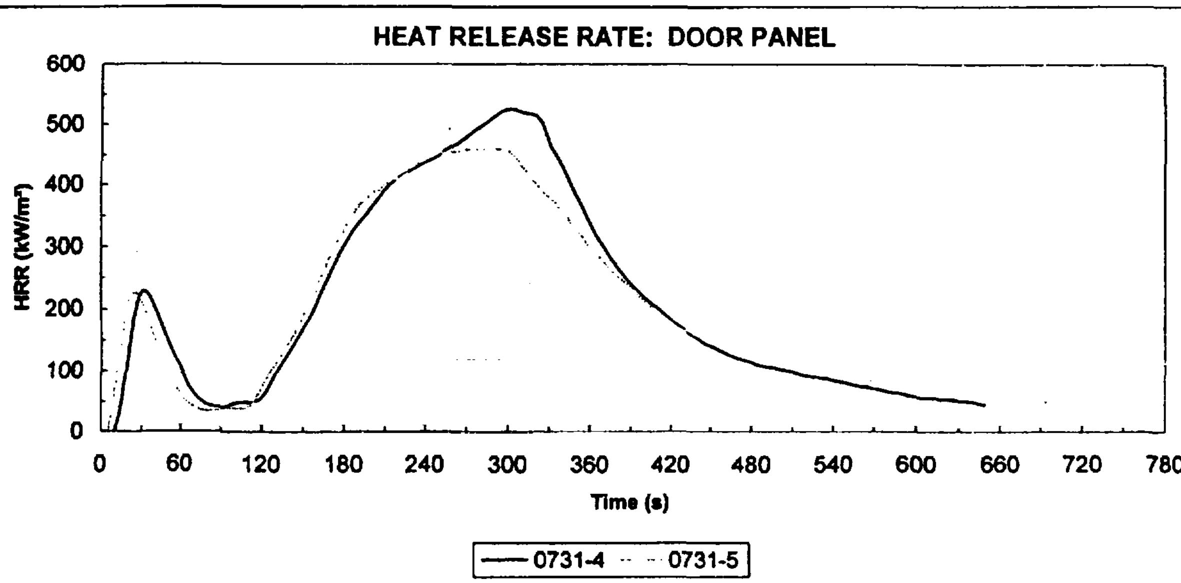
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Ford Focus
SwRI Project No:	18.03614.01	*Material ID:*	Door Panel
Part No.:	YS4Z5423942AAB	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0731-4	03/14/01	13	588	526	300	134.7	143	145	270	521
0731-5	03/14/01	11	682	460	295	136.5	135	141	258	459
Average		12	635	493	298	135.6	139	143	264	490

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
36.5	6.4	29.6	81.1	7.5	40.2	3.35	33	1992	2025	595
35.6	5.7	30.1	84.4	6.6	40.1	2.76	1	1929	1930	567
36.1	6.1	29.8	82.8	7.1	40.2	3.05	17	1961	1978	581



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client: General Motors
SwRI Project No: 18.03614.01
Material ID: Door Panel
Heat Flux: 35 kW/m²

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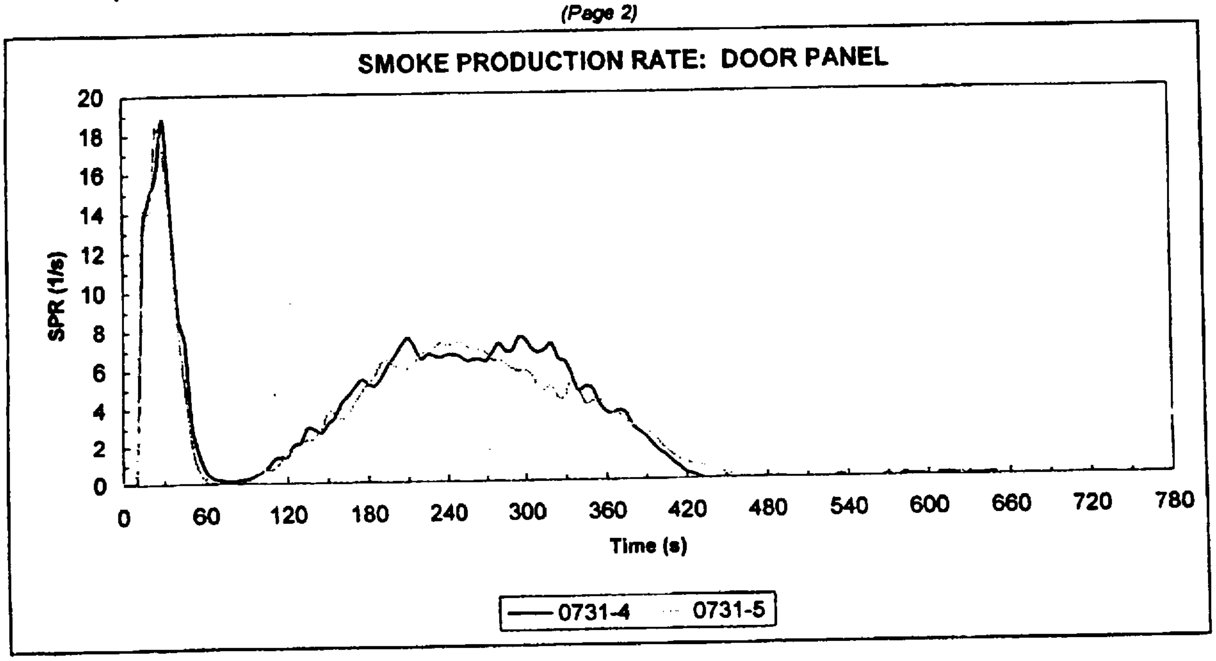
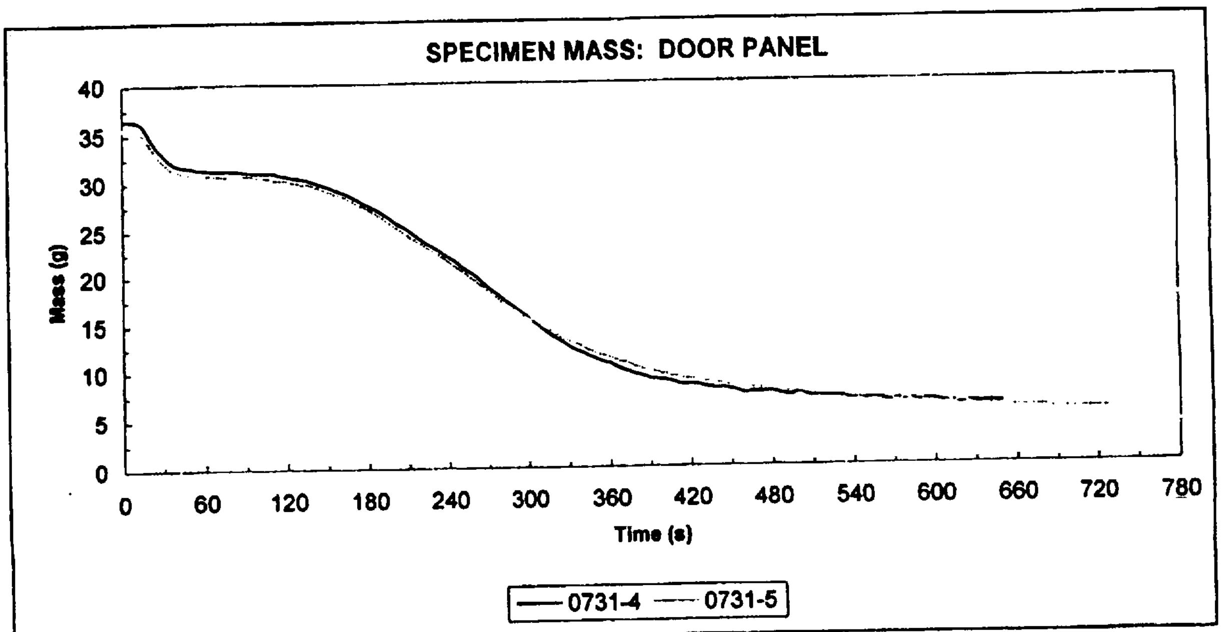




Notes & Observations:

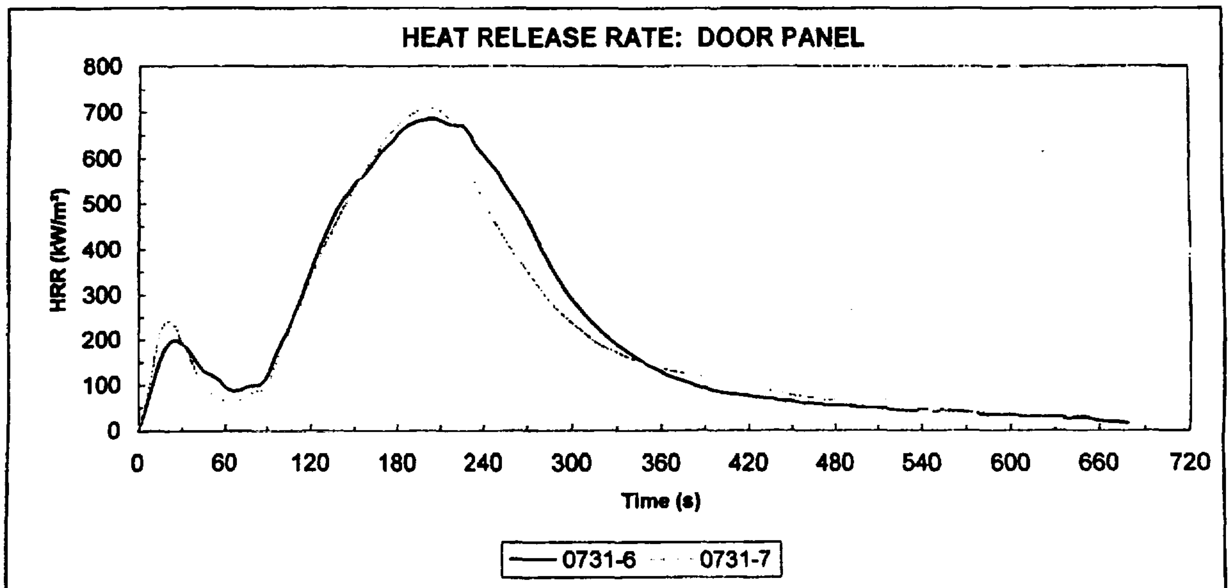
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Ford Focus
SwRI Project No:	18.03614.01	*Material ID:*	Door Panel
Part No.:	YS4Z542392AAB	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\ max}$ (kW/m²)
0731-6	03/14/01	7	627	685	205	145.0	141	294	395	680
0731-7	03/14/01	7	589	712	200	137.6	142	289	369	702
Average		7	608	698	203	141.3	141	292	382	691

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
37.0	6.0	31.0	83.7	8.9	41.4	3.11	0	1987	1987	567
33.8	4.4	29.4	86.9	10.0	41.4	3.27	0	1964	1964	591
35.4	5.2	30.2	85.3	9.5	41.4	3.19	0	1976	1975	579



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client: General Motors
SwRI Project No: 18.03614.01
Material ID: Door Panel
Heat Flux: 50 kW/m²

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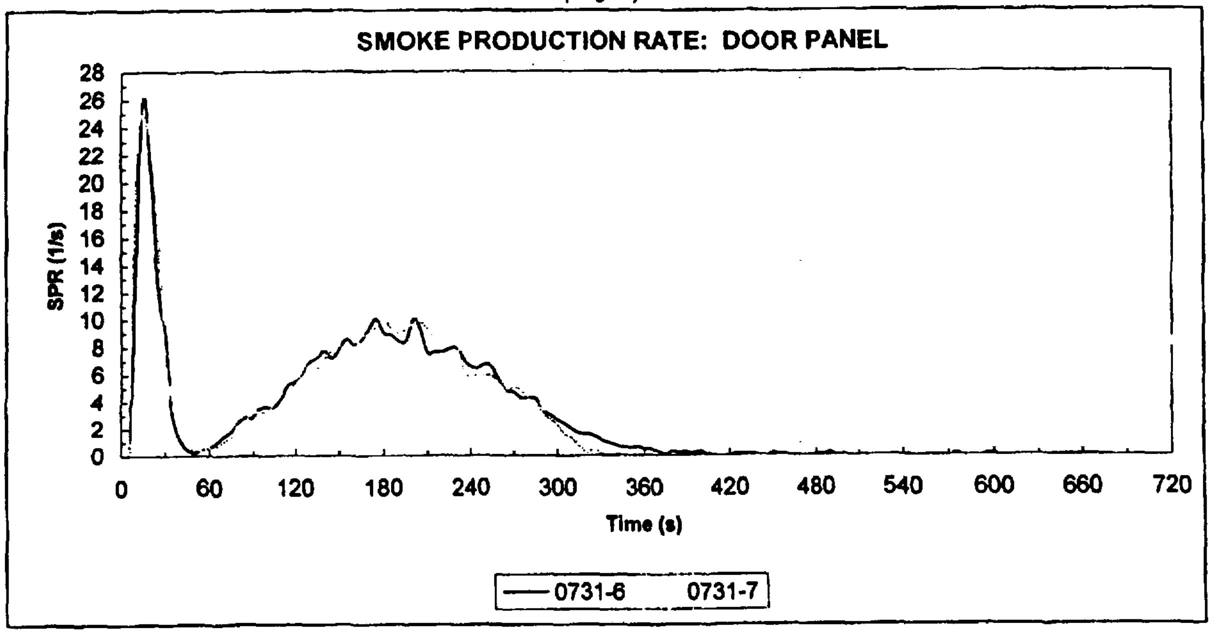
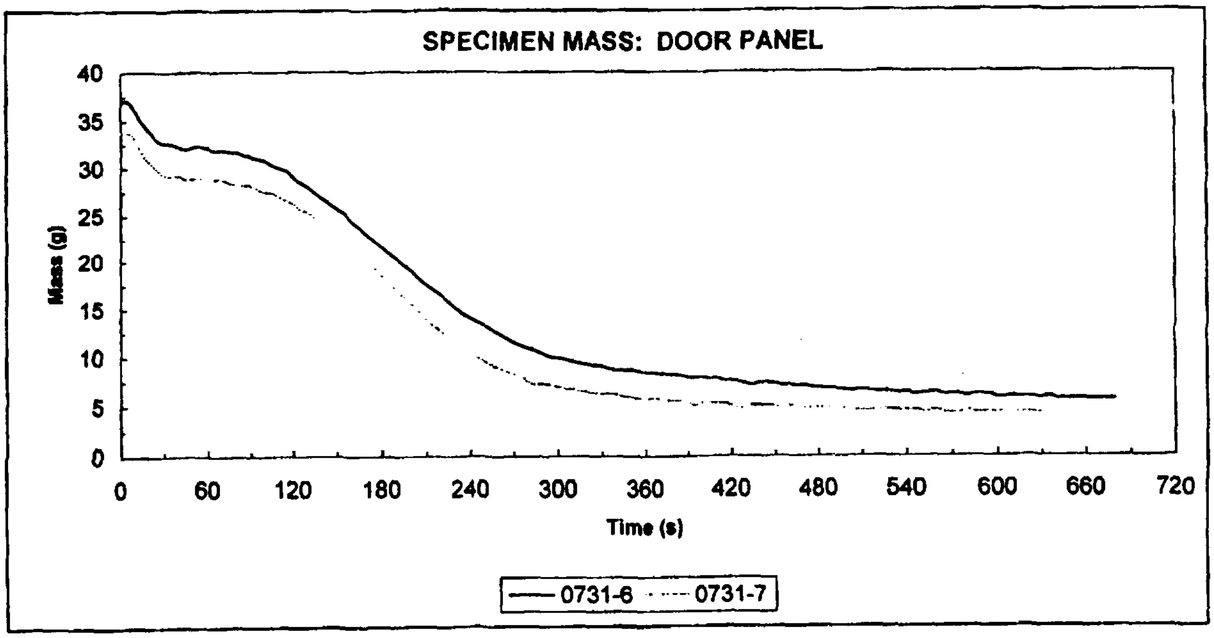




Notes & Observations:

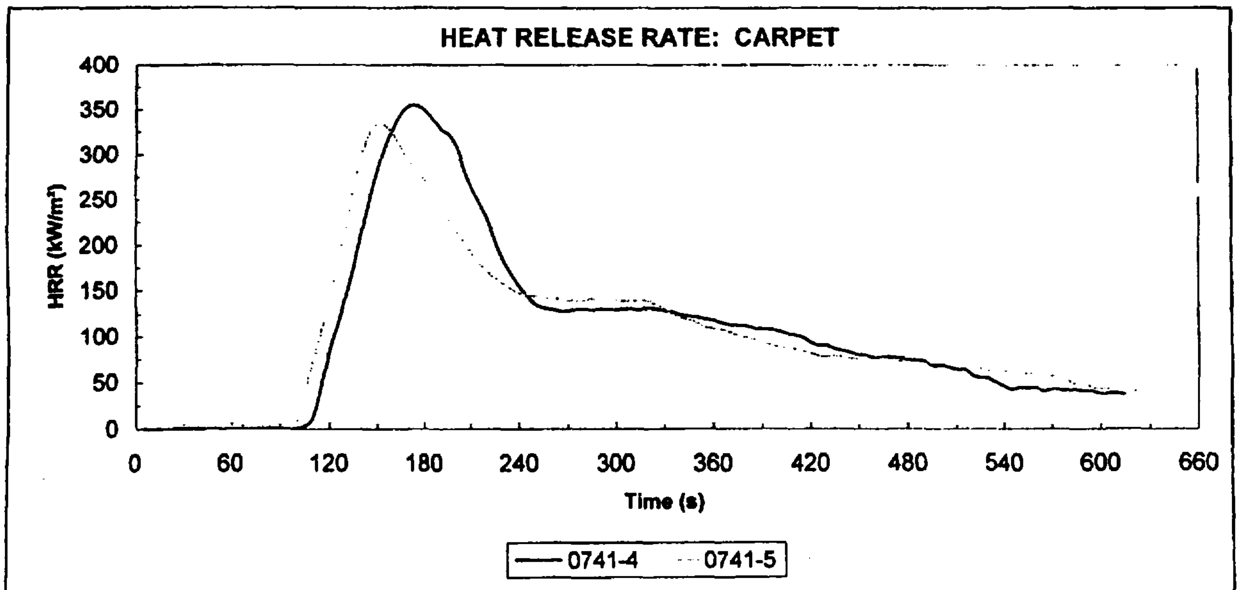
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Ford Focus
SwRI Project No:	18.03614.01	*Material ID:*	Carpet
Part No.:	YS4Z5413000BAF	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0741-4	03/15/01	102	473	355	170	64.1	152	206	173	346
0741-5	03/15/01	102	478	334	150	63.1	208	199	168	319
Average		102	476	345	160	63.6	180	203	170	332

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
31.8	11.7	18.0	56.7	5.6	31.4	0.68	52	341	393	167
32.0	12.5	17.3	54.1	4.6	32.2	0.54	42	275	317	140
31.9	12.1	17.7	55.4	5.1	31.8	0.61	47	308	355	154



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client: General Motors
SwRI Project No: 18.03614.01
Material ID: Carpet
Heat Flux: 20 kW/m²

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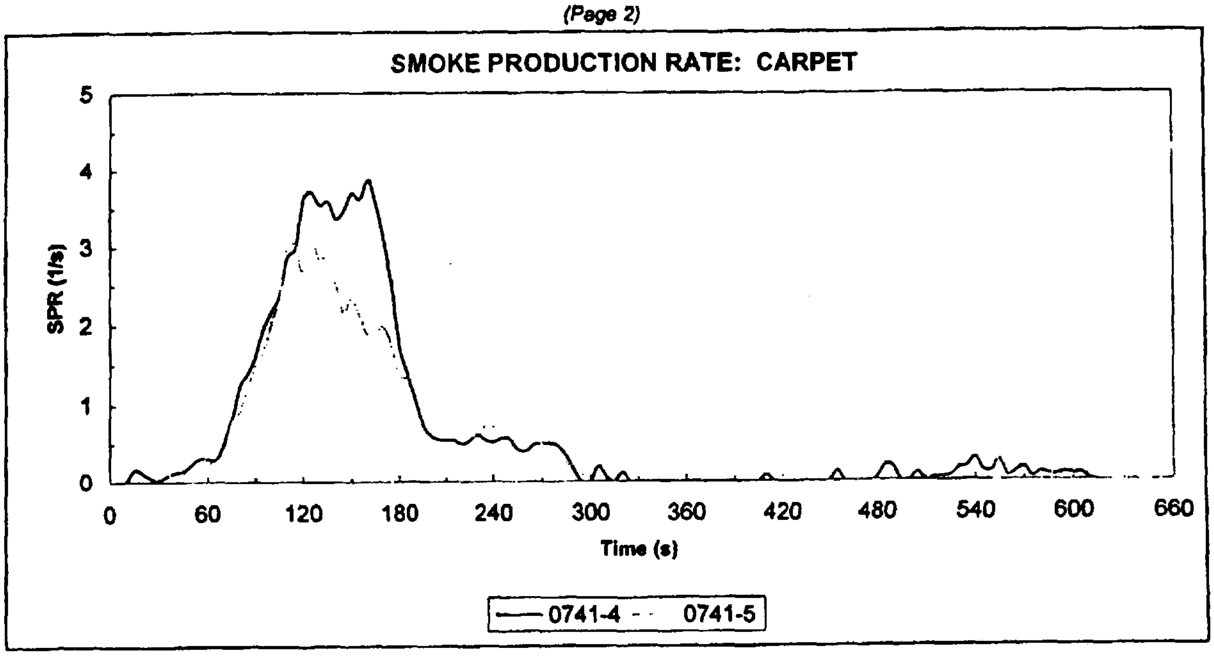
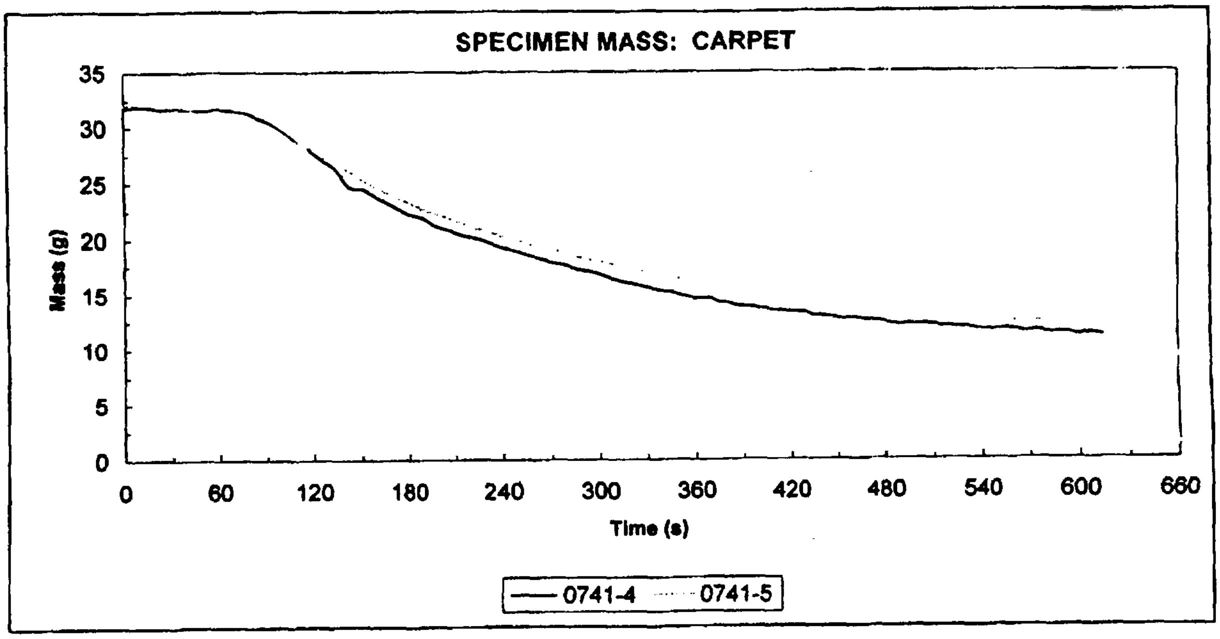




Notes & Observations:

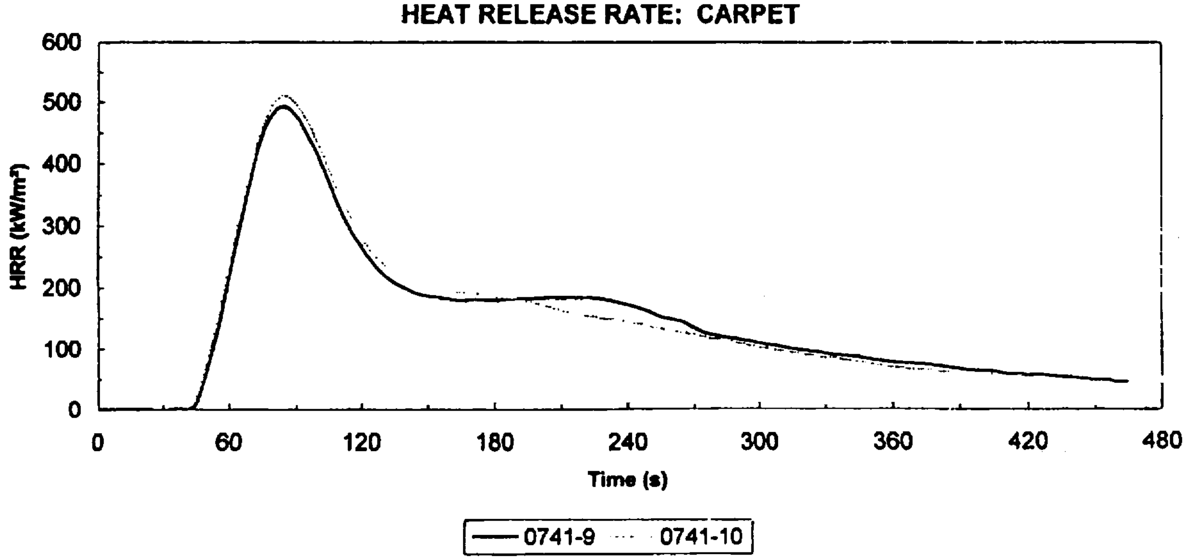
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Ford Focus
SwRI Project No:	18.03614.01	*Material ID:*	Carpet
Part No.:	YS4Z5413000BAF	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\ max}$ (kW/m²)
0741-9	03/15/01	42	384	493	85	66.1	305	246	200	458
0741-10	03/15/01	42	372	511	85	65.0	320	255	200	475
Average		42	378	502	85	65.6	313	250	200	467

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
32.0	11.0	16.9	53.0	6.7	34.5	1.39	121	478	599	250
31.8	10.7	17.2	54.2	6.9	33.4	1.29	95	446	541	229
31.9	10.8	17.1	53.6	6.8	33.9	1.34	108	462	570	239



SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client: General Motors
SwRI Project No: 18.03614.01
Material ID: Carpet
Heat Flux: 35 kW/m²

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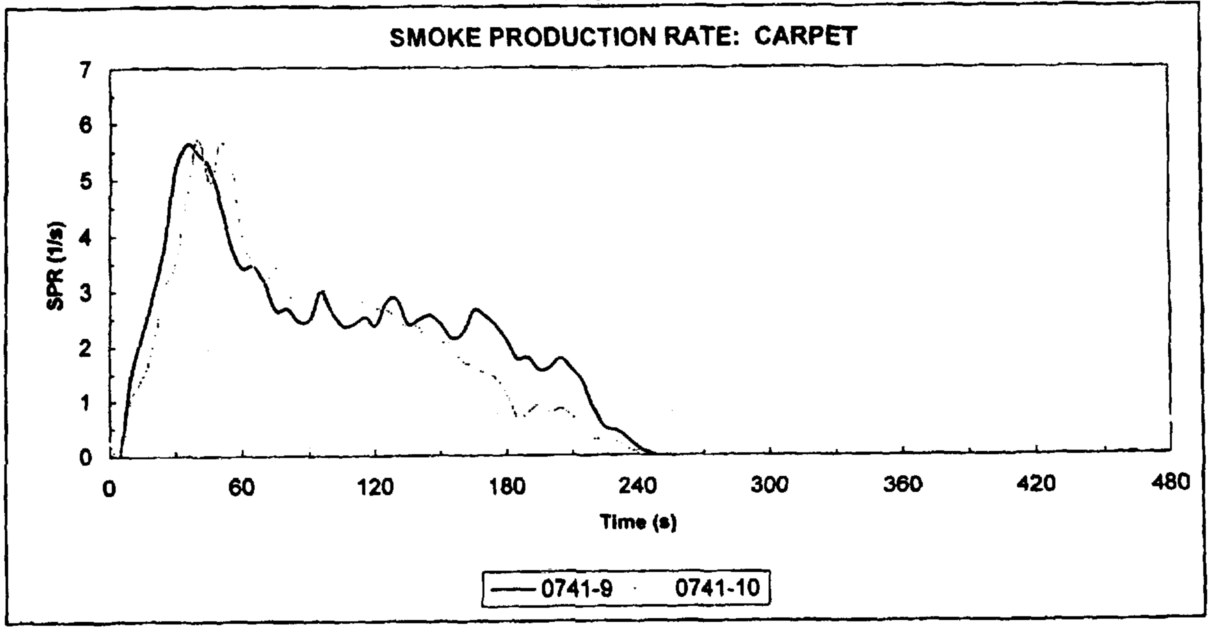
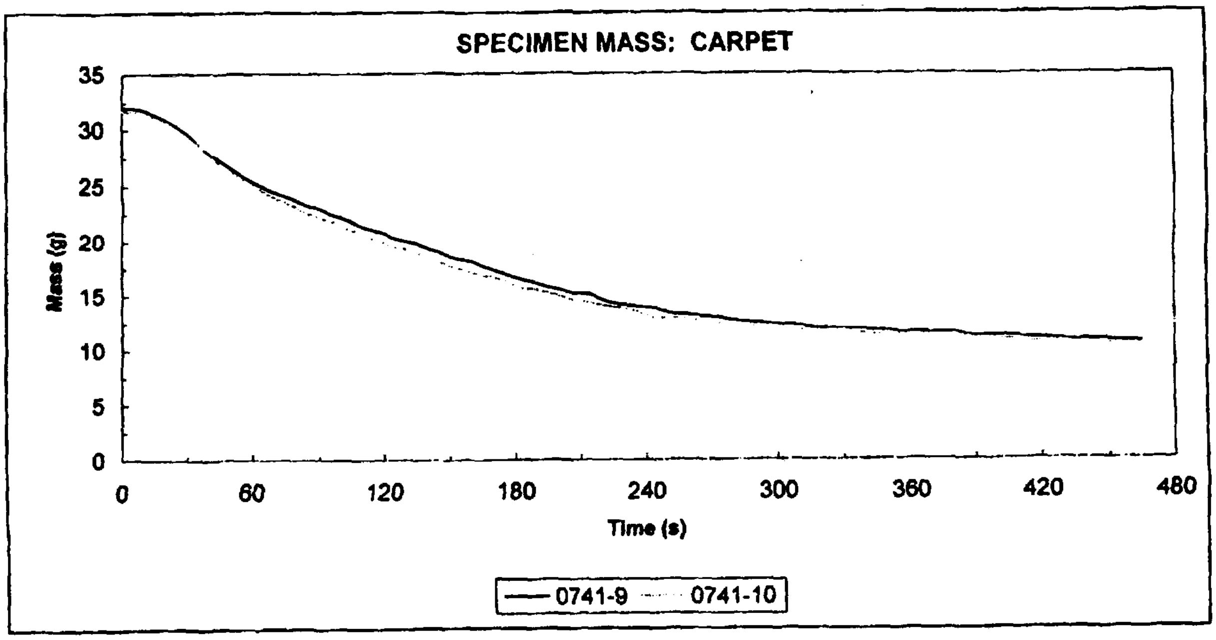




Notes & Observations:

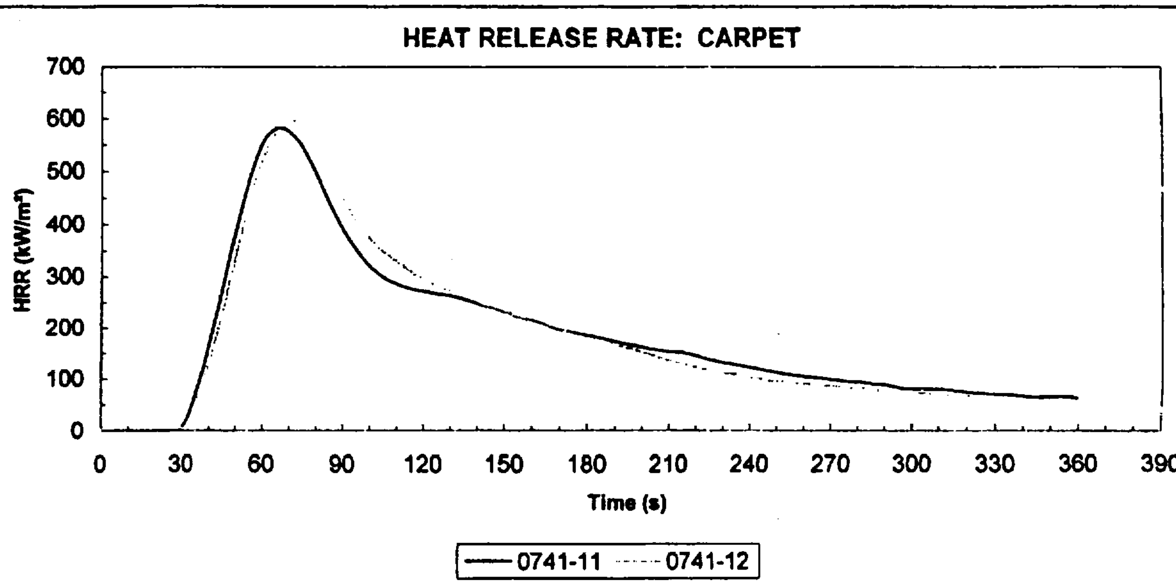
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Ford Focus
SwRI Project No:	18.03614.01	*Material ID:*	Carpet
Part No.:	YS4Z5413000BAF	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\,max}$ (kW/m²)
0741-11	03/15/01	27	290	582	65	63.5	362	285	212	535
0741-12	03/15/01	28	277	599	70	62.5	394	296	209	550
Average		28	284	590	68	63.0	378	291	211	542

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
31.0	10.9	16.0	51.6	8.3	35.1	1.98	152	477	629	263
29.7	9.9	14.8	49.7	8.6	37.3	2.23	182	501	683	299
30.4	10.4	15.4	50.7	8.5	36.2	2.11	167	489	656	281



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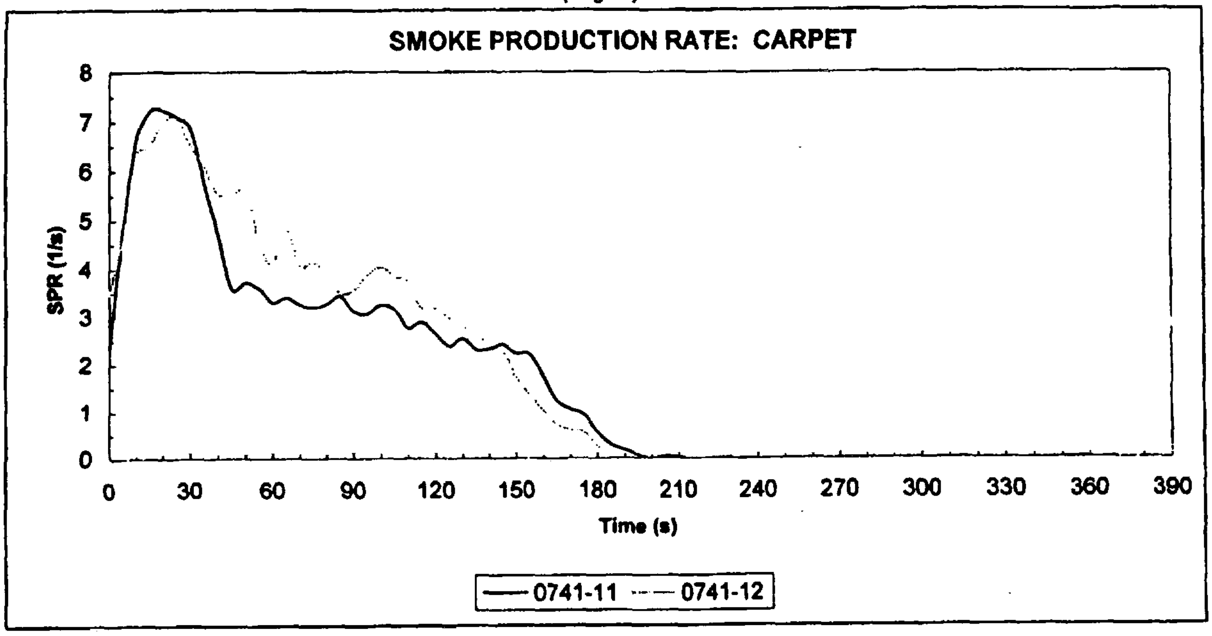
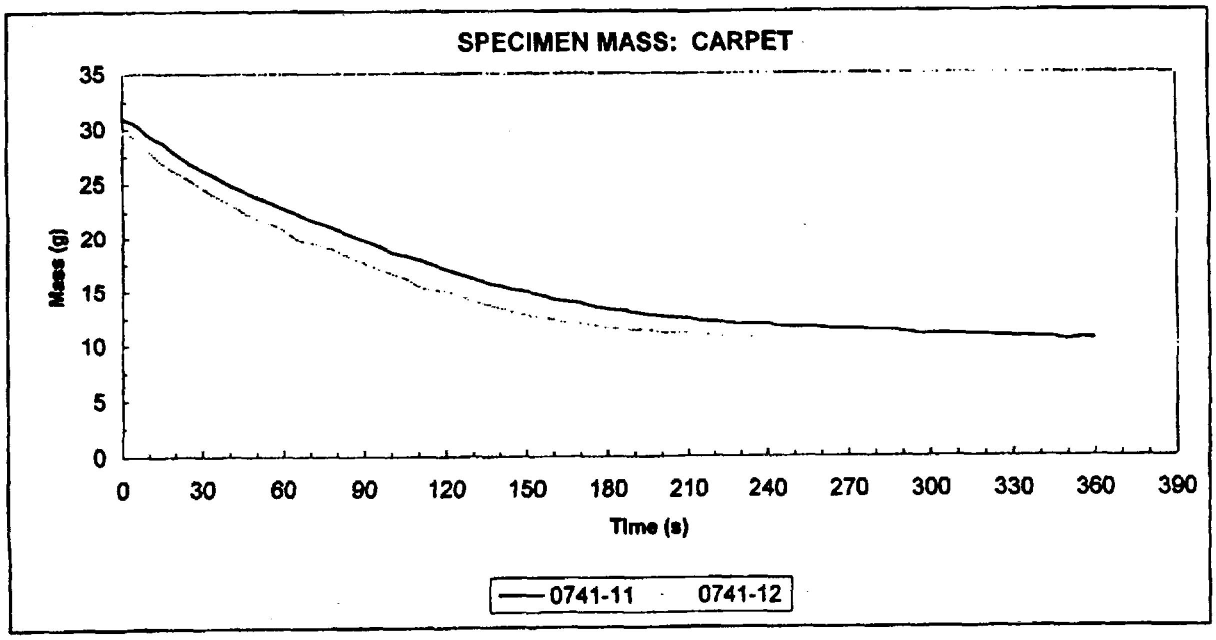
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Carpet
SwRI Project No:	18.03614.01	*Heat Flux:*	50 kW/m²

(Page 2)





Notes & Observations:

SOUTHWEST RESEARCH INSTITUTE

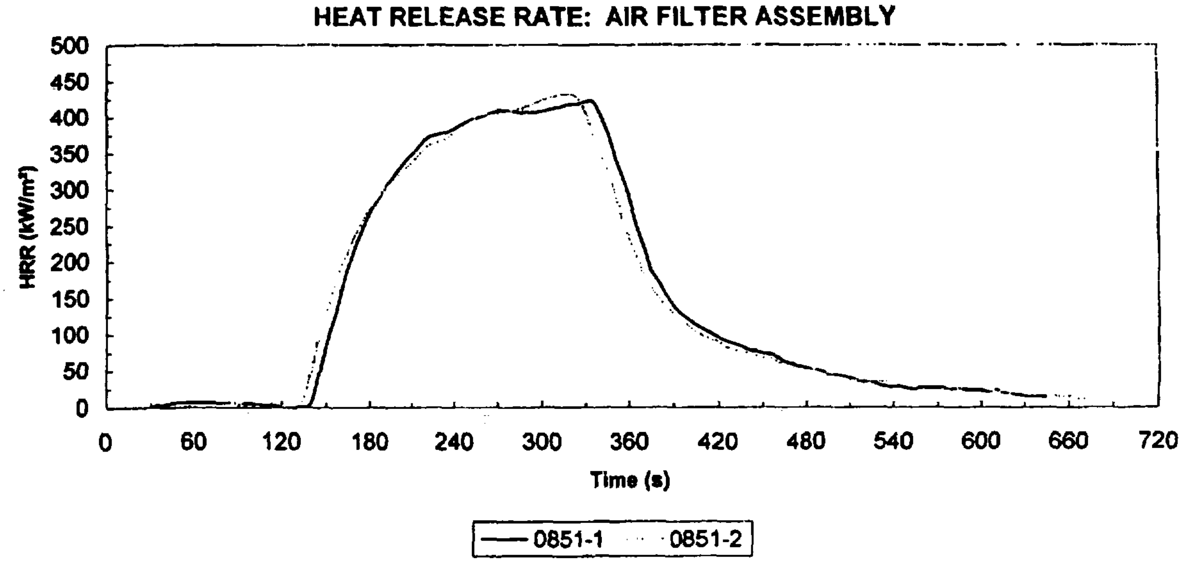
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Ford Focus
SwRI Project No:	18.03614.01	*Material ID:*	Air Filter Assembly
Part No.:	YS4Z9600NA	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\ max}$ (kW/m²)
0851-1	03/26/01	125	435	423	330	91.5	124	294	282	419
0851-2	03/26/01	119	483	433	315	91.2	125	289	276	429
Average		122	459	428	323	91.3	124	291	279	424

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
27.9	9.3	18.6	66.8	8.0	43.4	1.55	16	859	875	408
27.5	9.1	18.3	66.6	7.7	44.0	1.34	17	795	812	383
27.7	9.2	18.5	66.7	7.9	43.7	1.45	17	827	844	396

HEAT RELEASE RATE: AIR FILTER ASSEMBLY



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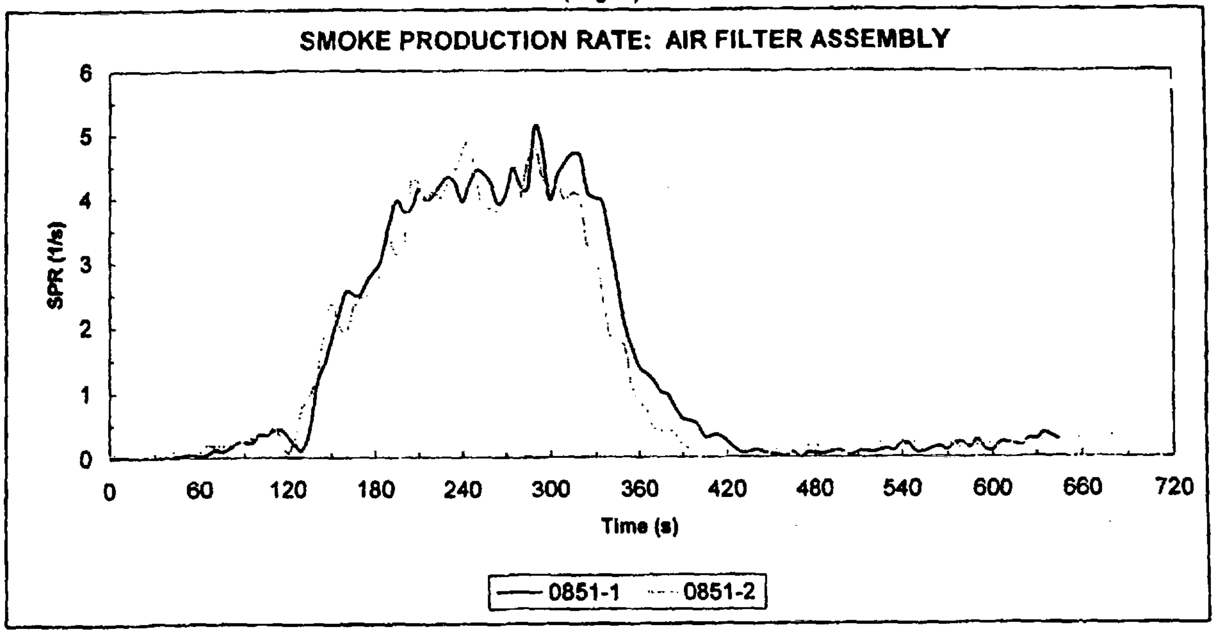
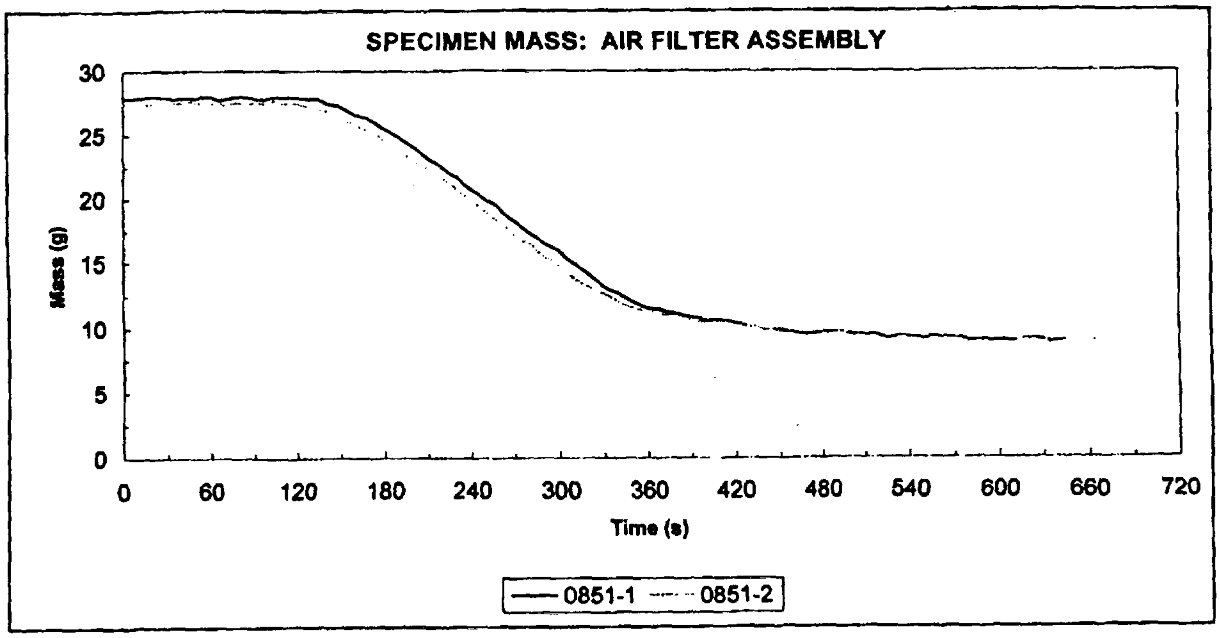
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Air Filter Assembly
SwRI Project No:	18.03614.01	*Heat Flux:*	20 kW/m²

(Page 2)





Notes & Observations:

Test specimens were assembled from a 90-mm and 10-mm thick strip cut from the assembly.

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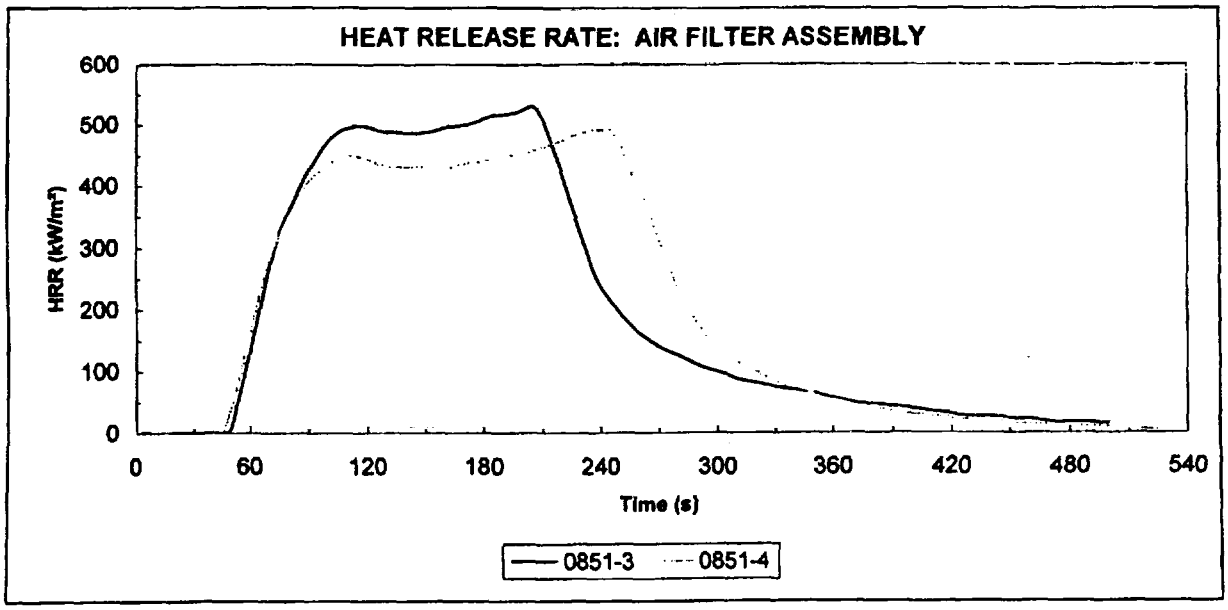
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Ford Focus
SwRI Project No:	18.03614.01	*Material ID:*	Air Filter Assembly
Part No.:	YS479600NA	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\,max}$ (kW/m²)
0851-3	03/26/01	36	374	530	205	96.4	202	399	308	520
0851-4	03/26/01	36	400	493	240	104.6	208	364	335	486
Average		36	387	511	223	100.5	205	382	321	503

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
29.5	9.9	19.7	66.9	9.7	43.2	2.35	4	972	976	435
32.1	10.5	21.7	67.4	10.3	42.7	2.82	3	1237	1240	505
30.8	10.2	20.7	67.2	10.0	42.9	2.58	4	1105	1108	470



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client: General Motors
SwRI Project No: 18.03614.01
Material ID: Air Filter Assembly
Heat Flux: 35 kW/m²

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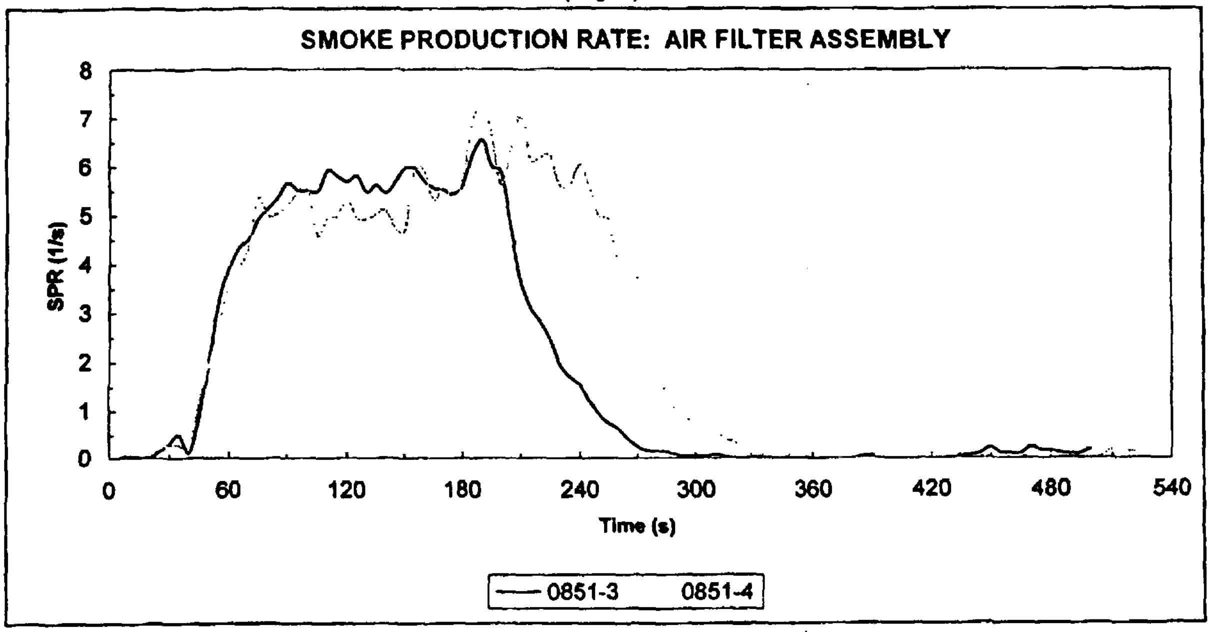

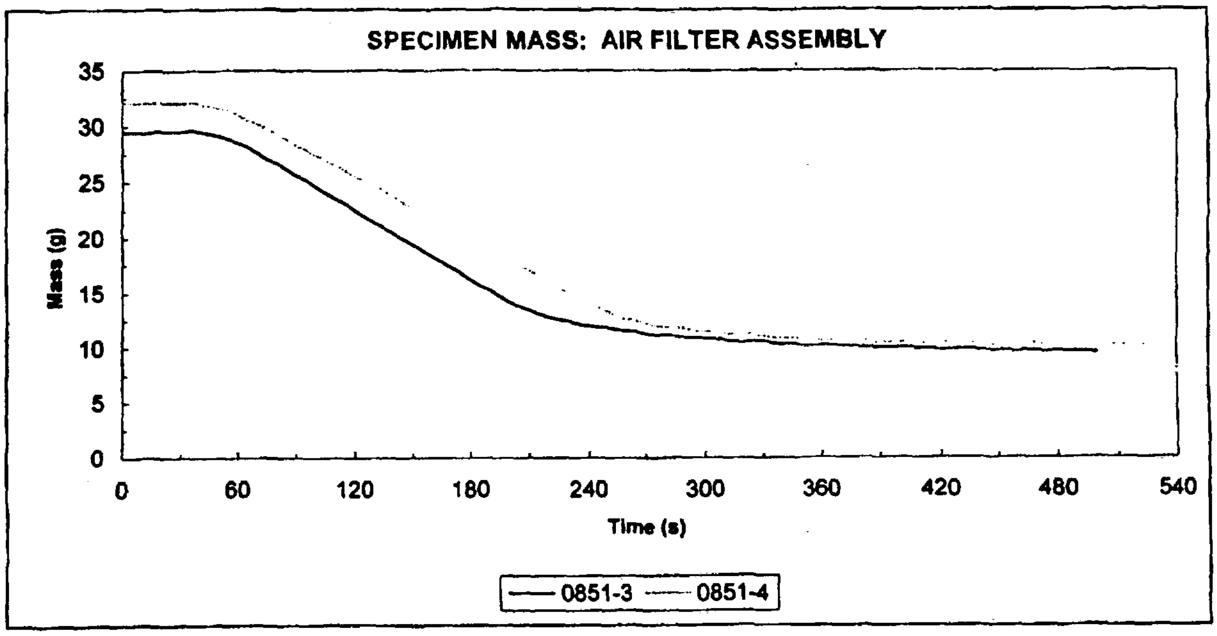

Notes & Observations:

0851-3: Test specimen assembled from 25 and 75-mm strips, 100-mm in length.

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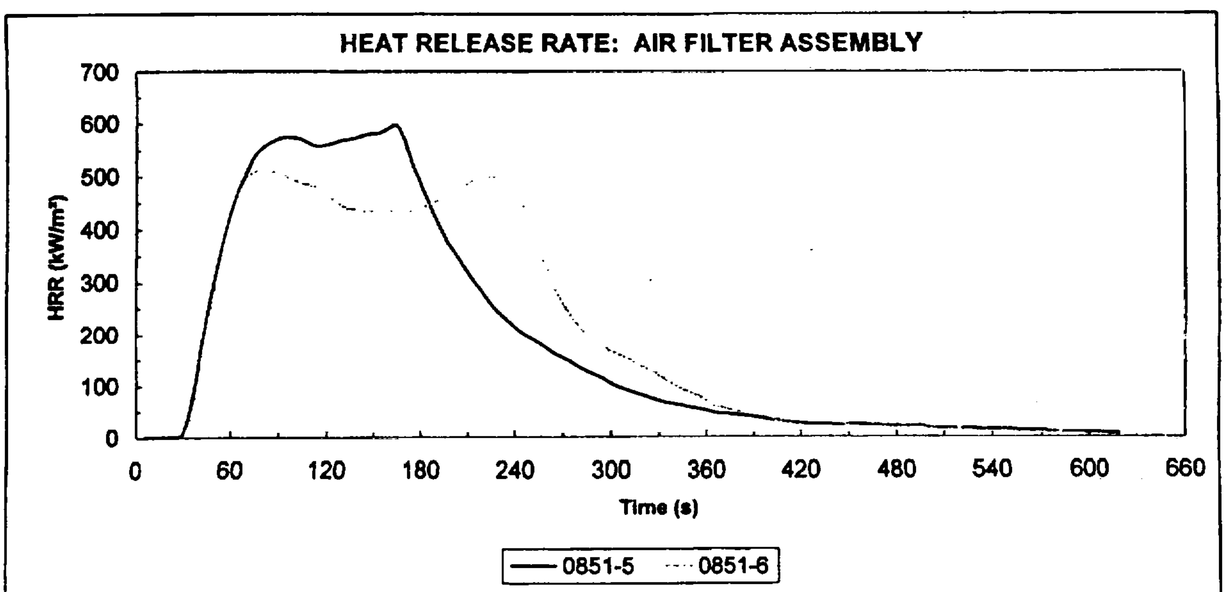
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Ford Focus
SwRI Project No:	18.03614.01	*Material ID:*	Air Filter Assembly
Part No.:	YS479600NA	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\ max}$ (kW/m²)
0851-5	03/26/01	19	514	597	165	112.1	276	455	348	585
0851-6	03/26/01	20	483	511	80	119.9	263	395	370	505
Average		20	498	554	123	116.0	270	425	359	545

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
34.0	10.9	23.2	68.4	10.3	42.6	2.44	1	1318	1319	501
36.7	11.8	25.0	68.0	9.8	42.4	3.10	3	1579	1582	559
35.4	11.4	24.1	68.2	10.0	42.5	2.77	2	1449	1450	530



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Air Filter Assembly
SwRI Project No:	18.03614.01	*Heat Flux:*	50 kW/m²

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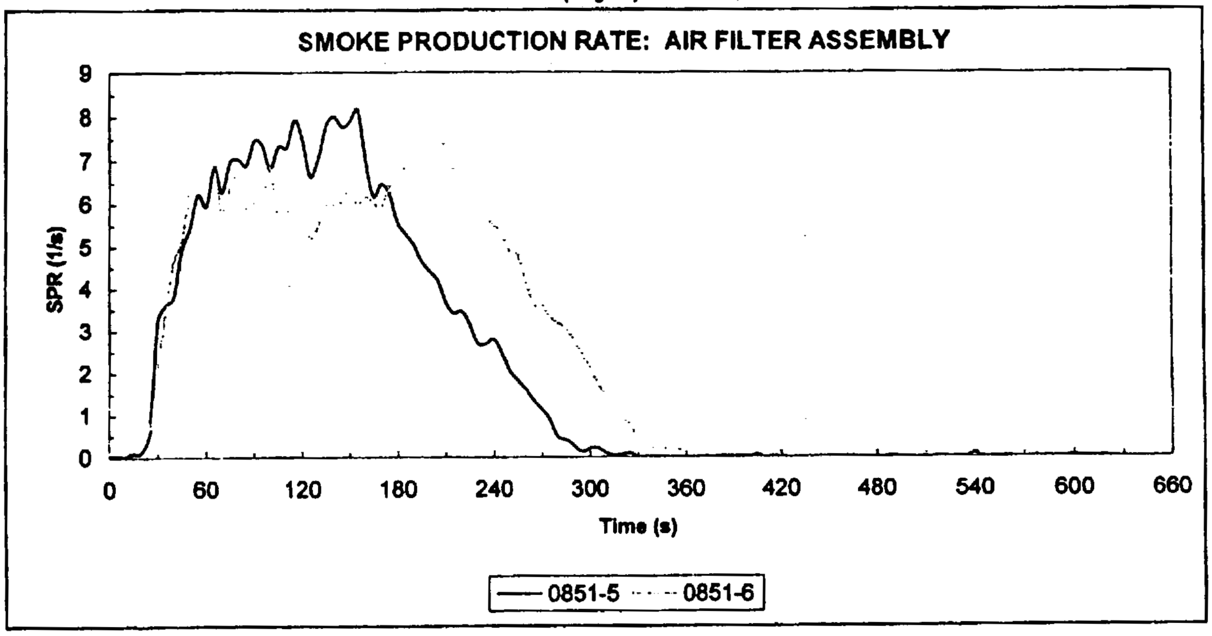
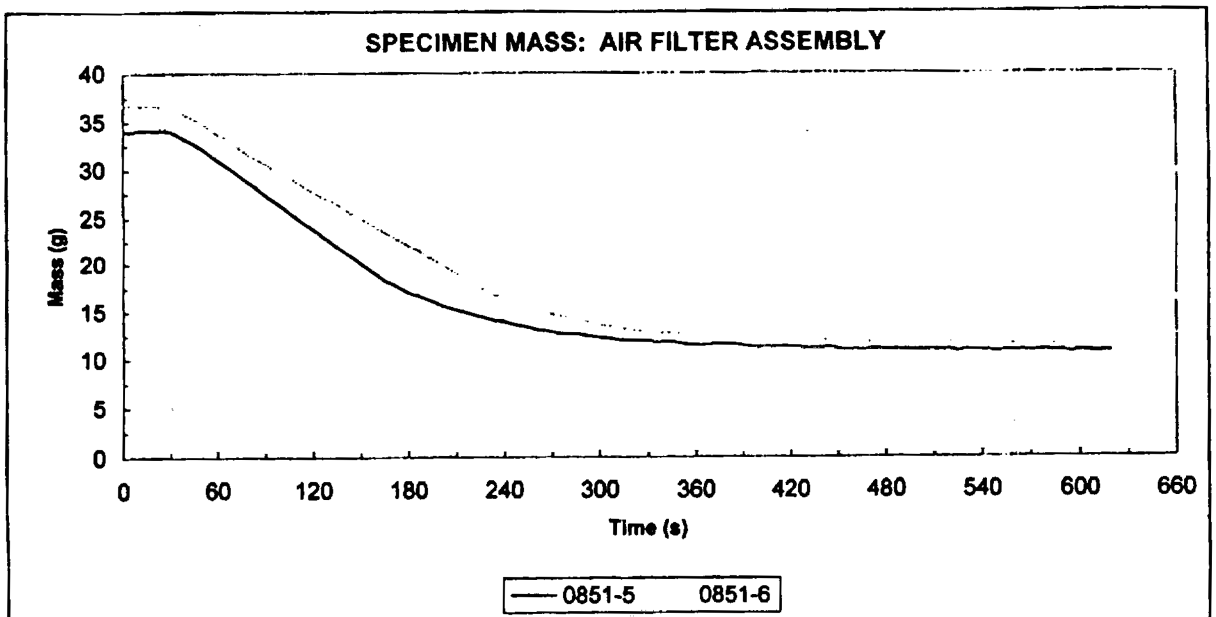




Notes & Observations:
Samples were cut (1 piece) from the air cleaner assembly.

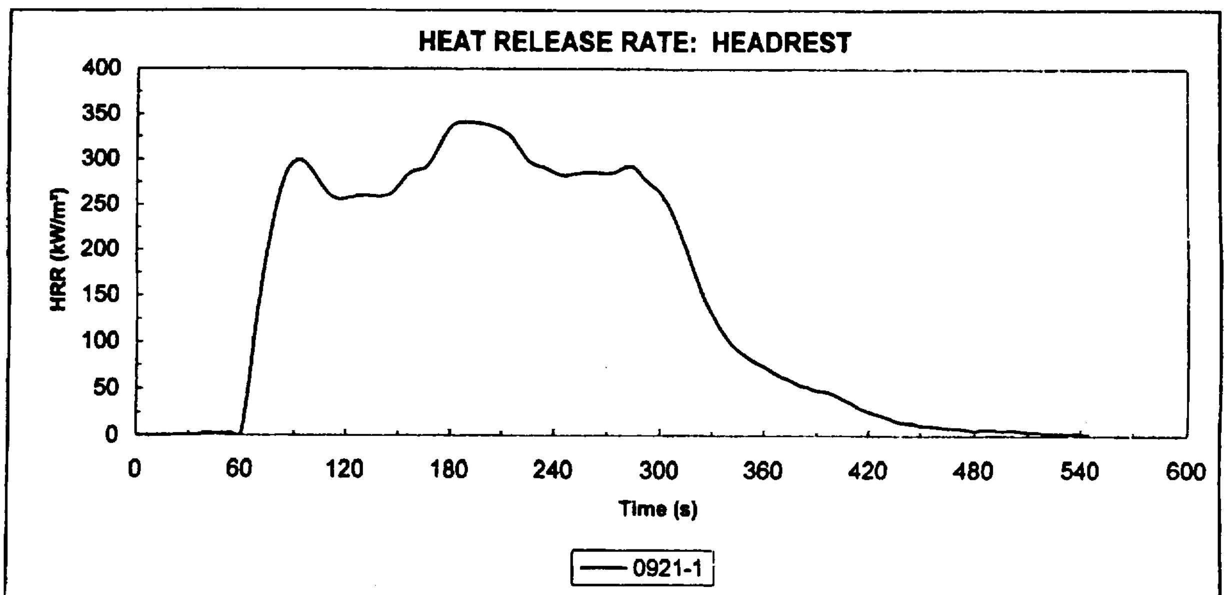
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Honda Civic
SwRI Project No:	18.03614.01	*Material ID:*	Headrest
Part No.:	81140-55A-A01ZA	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0921-1	04/02/01	60	398	341	185	79.4	229	277	253	339
Average		60	398	341	185	79.4	229	277	253	339

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
33.3	5.3	27.8	83.6	11.7	25.2	3.14	22	1436	1458	456
33.3	5.3	27.8	83.6	11.7	25.2	3.14	22	1436	1458	456



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Headrest
SwRI Project No:	18.03614.01	*Heat Flux:*	20 kW/m²

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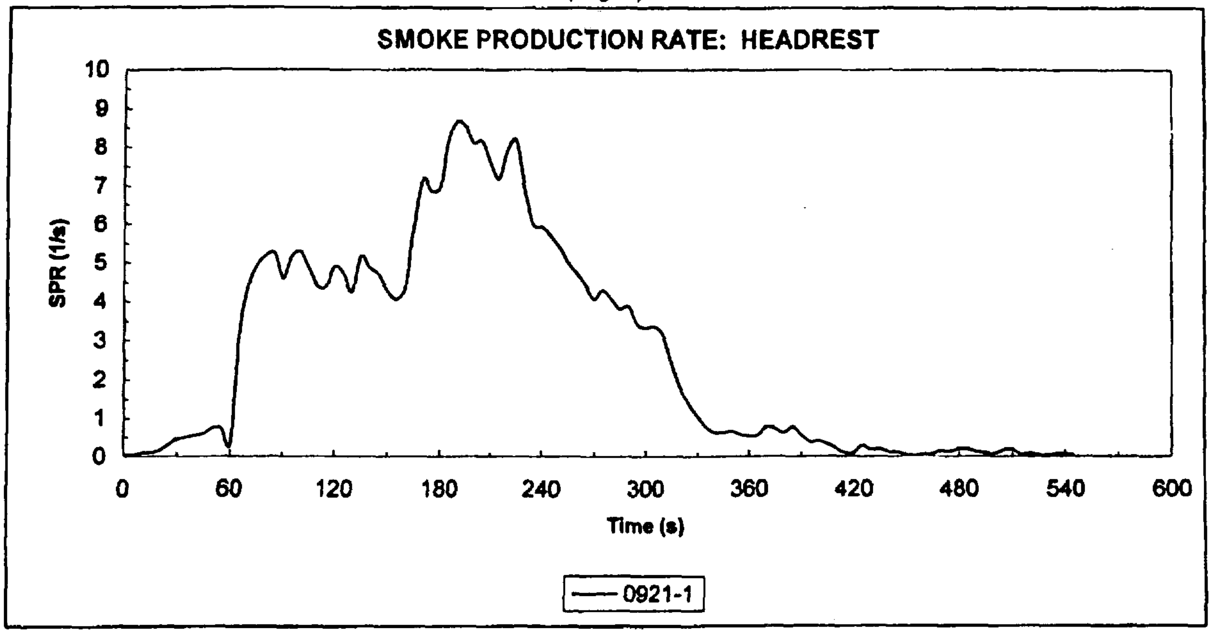
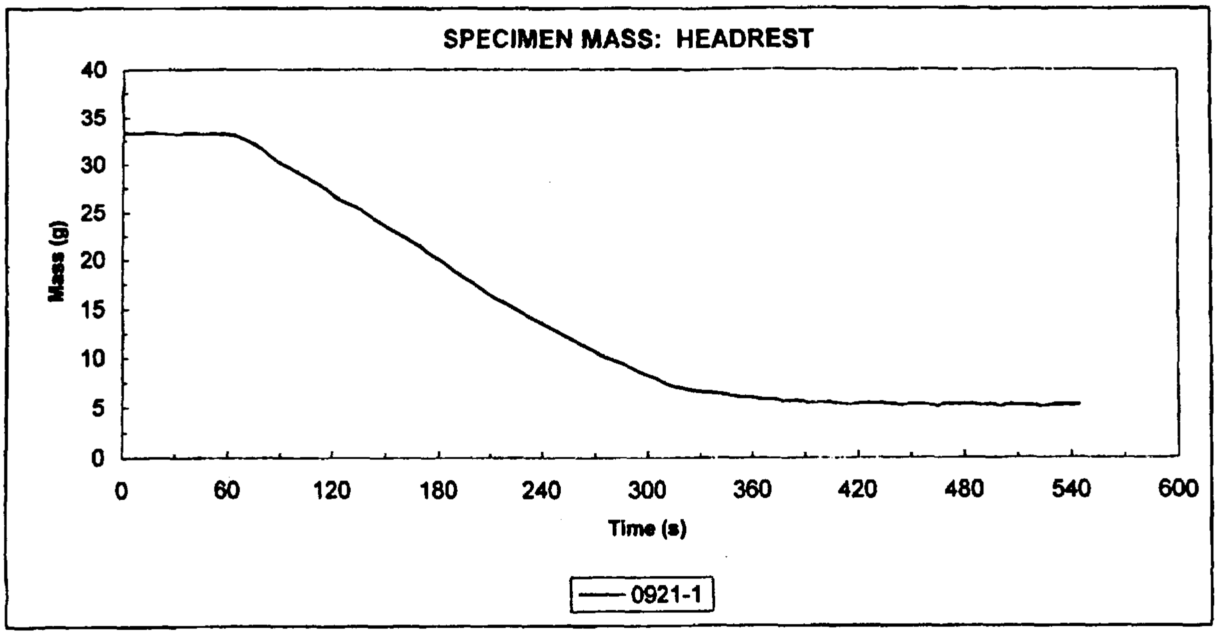




Notes & Observations:

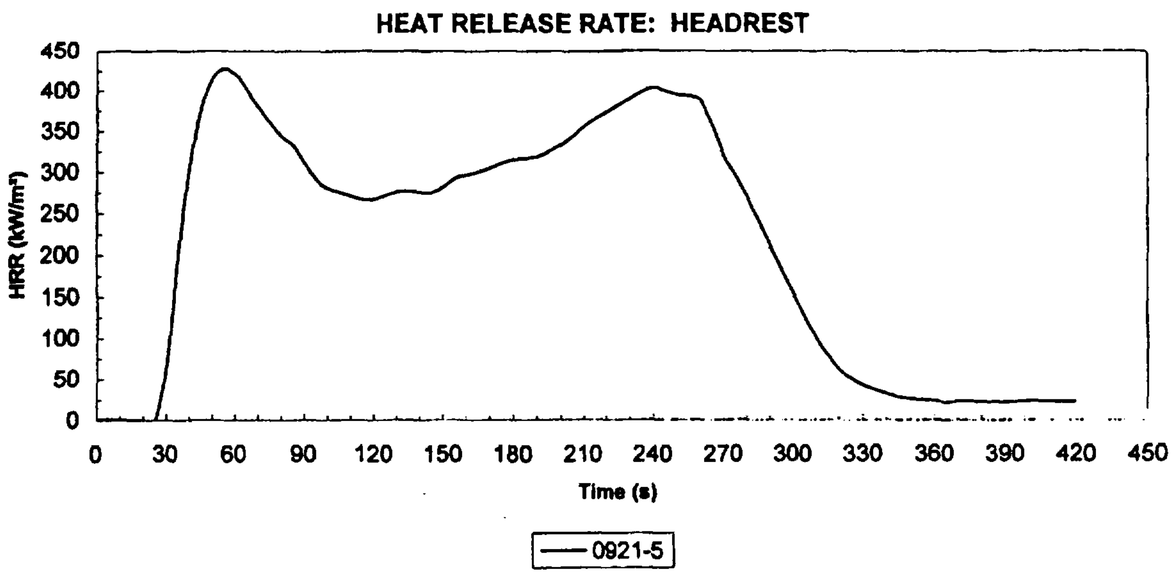
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Honda Civic
SwRI Project No:	18.03614.01	*Material ID:*	Headrest
Part No.:	81140-55A-A01ZA	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0921-5	04/02/01	24	307	428	55	89.3	322	304	297	402
Average		24	307	428	55	89.3	322	304	297	402

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
35.8	4.8	30.9	86.3	13.3	25.6	5.00	14	1662	1675	476
35.8	4.8	30.9	86.3	13.3	25.6	5.00	14	1662	1675	476



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client: General Motors
SwRI Project No: 18.03614.01
Material ID: Headrest
Heat Flux: 35 kW/m²

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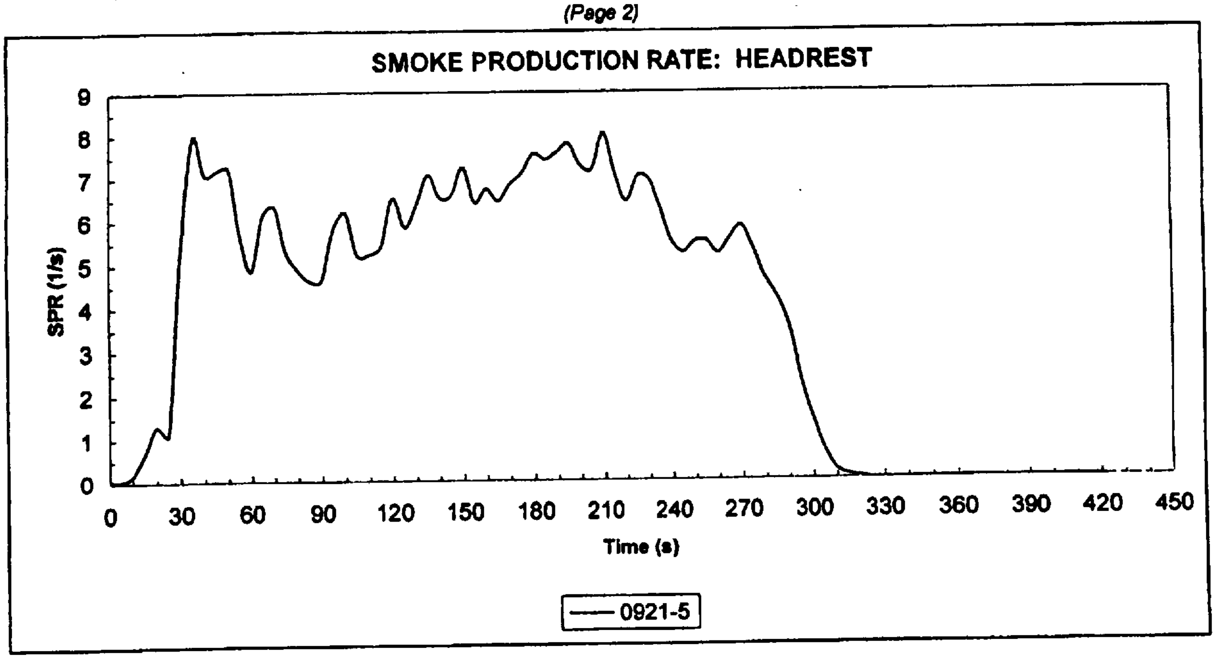
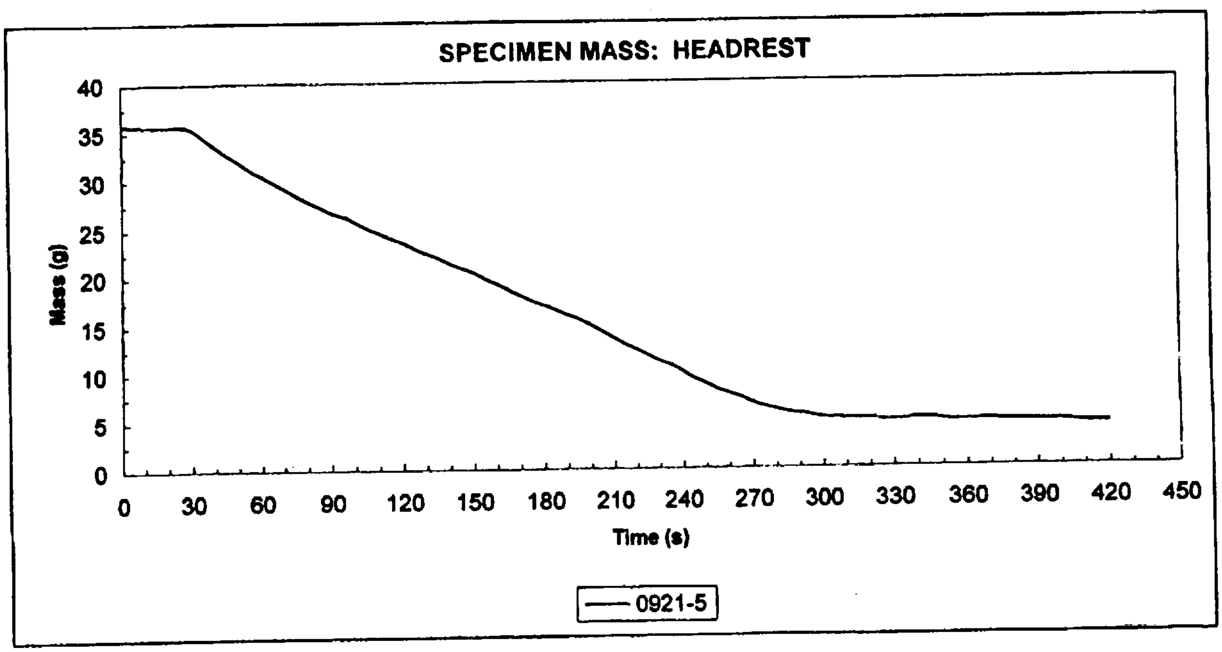




Notes & Observations:

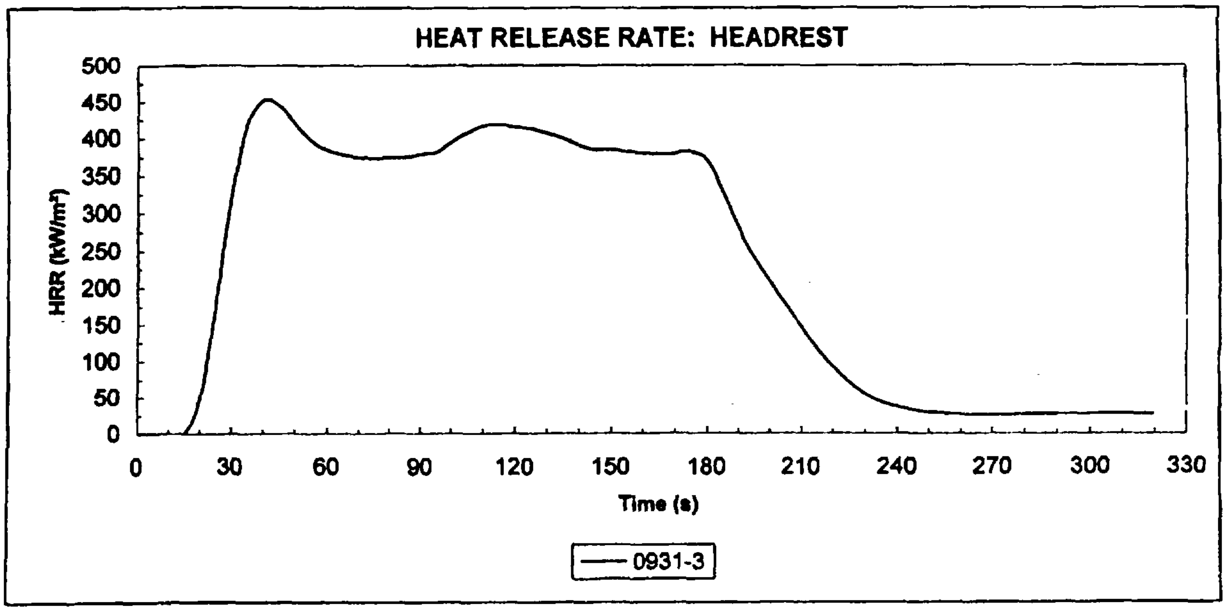
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Honda Civic
SwRI Project No:	18.03614.01	*Material ID:*	Headrest
Part No.:	81140-55A-A01ZA	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0931-3	04/03/01	17	216	453	40	70.9	333	366	237	416
Average		17	216	453	40	70.9	333	366	237	416

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
28.9	4.2	24.7	85.4	15.9	25.4	5.45	9	1299	1308	466
28.9	4.2	24.7	85.4	15.9	25.4	5.45	9	1299	1308	466



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Headrest
SwRI Project No:	18.03614.01	*Heat Flux:*	50 kW/m²

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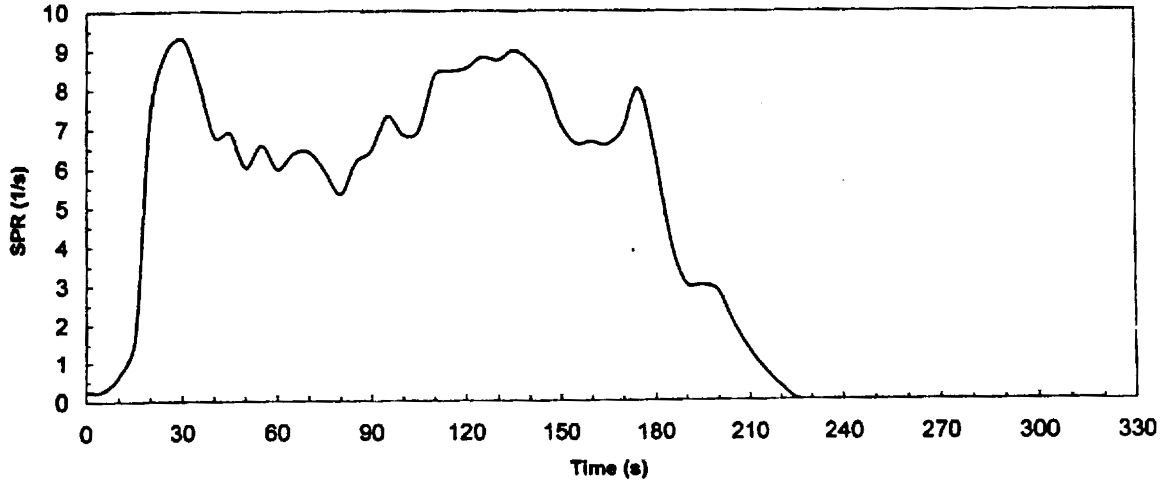
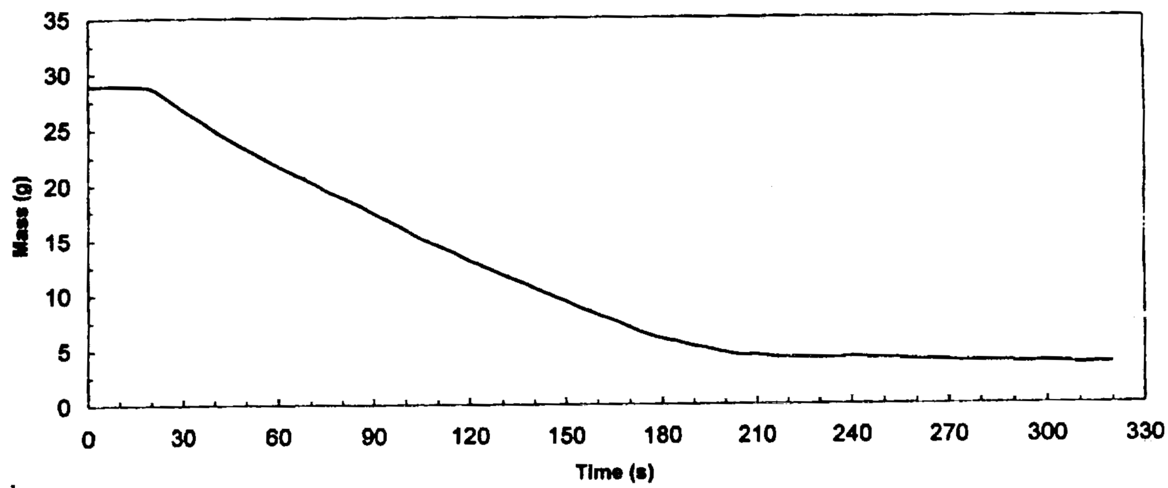
SMOKE PRODUCTION RATE: HEADREST



SPECIMEN MASS: HEADREST



Notes & Observations:

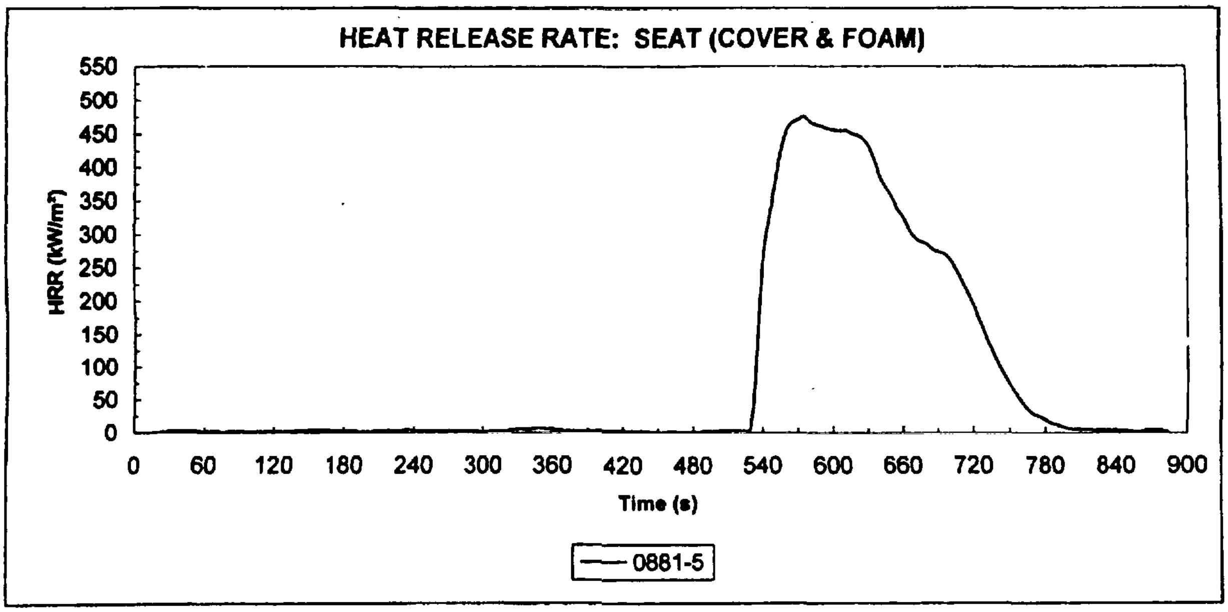
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Honda Civic
SwRI Project No:	18.03614.01	*Material ID:*	Seat (Cover & Foam)
Part No.:	81521-S5A-A01ZA	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0881-5	03/29/01	531	261	476	575	73.4	377	366	245	468
Average		531	261	476	575	73.4	377	366	245	468

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
44.3	8.2	28.6	64.6	17.9	22.7	1.81	539	904	1442	279
44.3	8.2	28.6	64.6	17.9	22.7	1.81	539	904	1442	279



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client: General Motors
SwRI Project No: 18.03614.01
Material ID: Seat (Cover & Foam)
Heat Flux: 20 kW/m²

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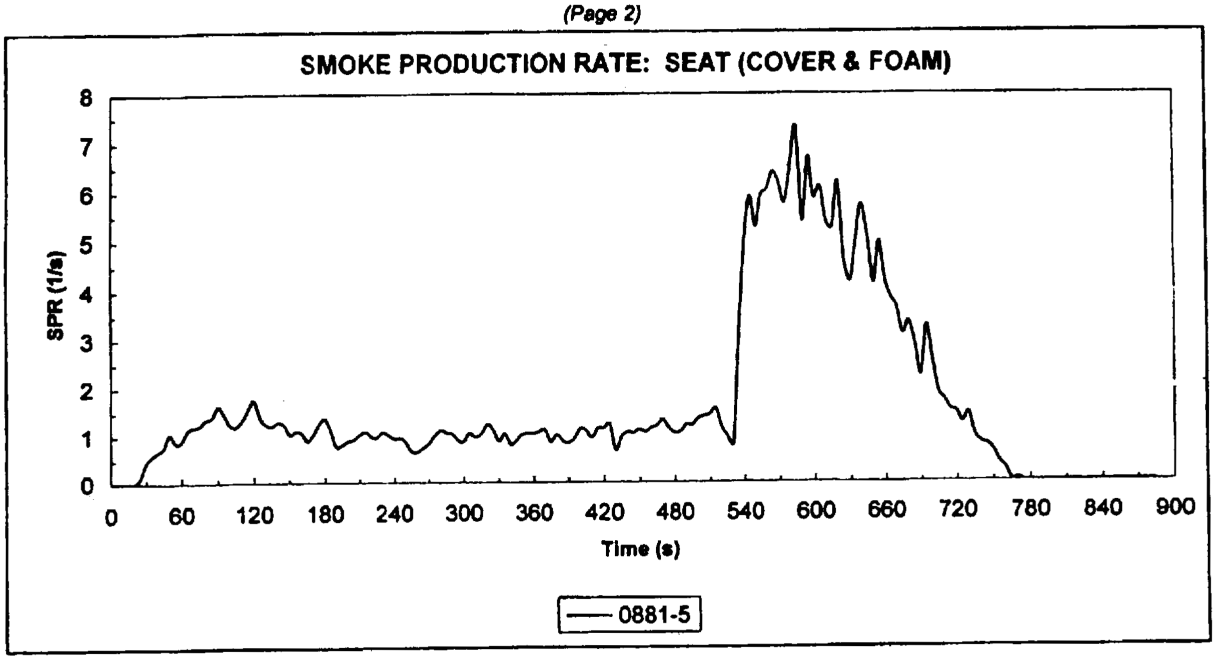
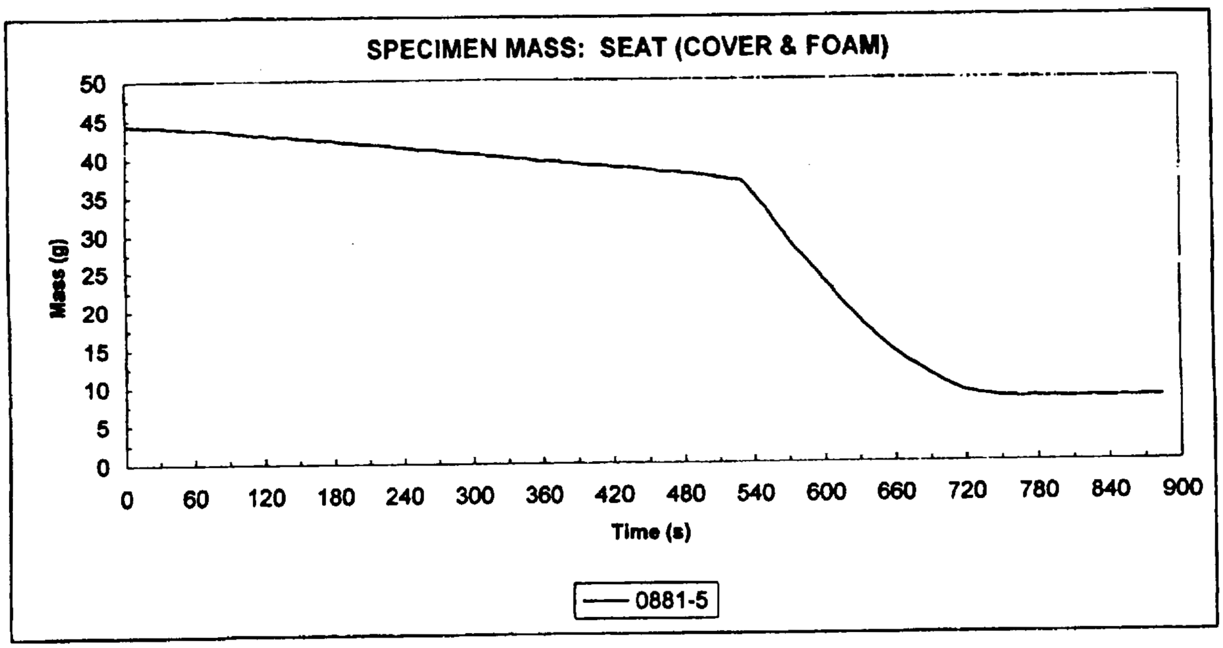




Notes & Observations:
Sample mass
Fabric - 15.2 g
Foam - 29.1 g

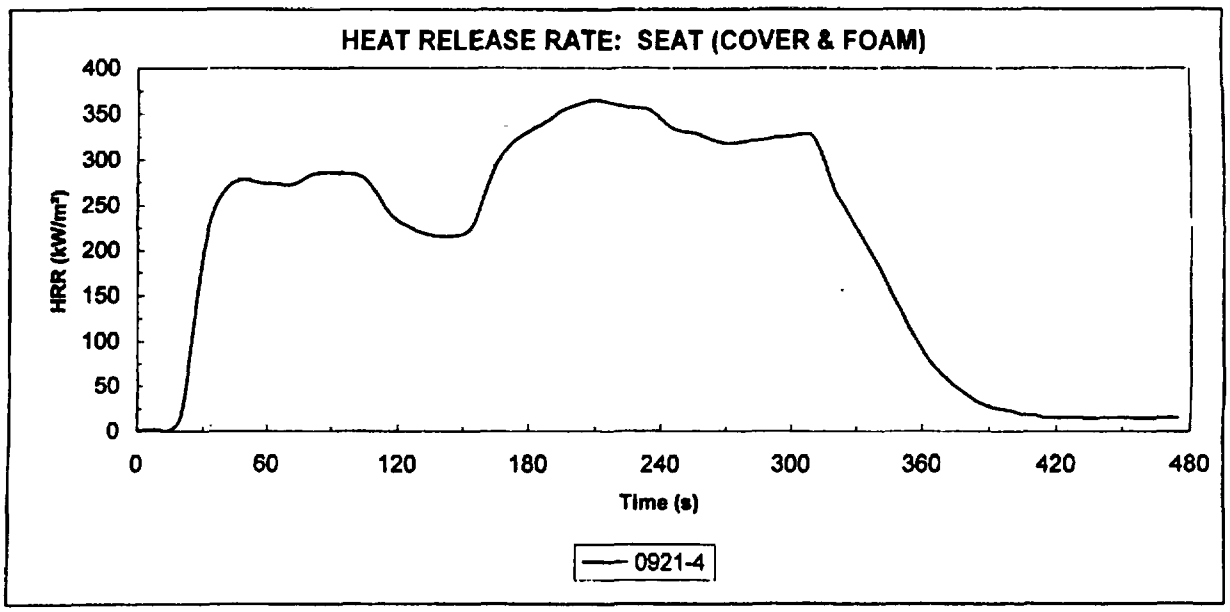
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Honda Civic
SwRI Project No:	18.03614.01	*Material ID:*	Seat (Cover & Foam)
Part No.:	81521-S5A-A01ZA	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0921-4	04/02/01	17	367	365	210	96.3	217	253	287	361
Average		17	367	365	210	96.3	217	253	287	361

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
47.7	7.2	40.3	84.4	14.6	21.1	4.12	8	1597	1605	351
47.7	7.2	40.3	84.4	14.6	21.1	4.12	8	1597	1605	351

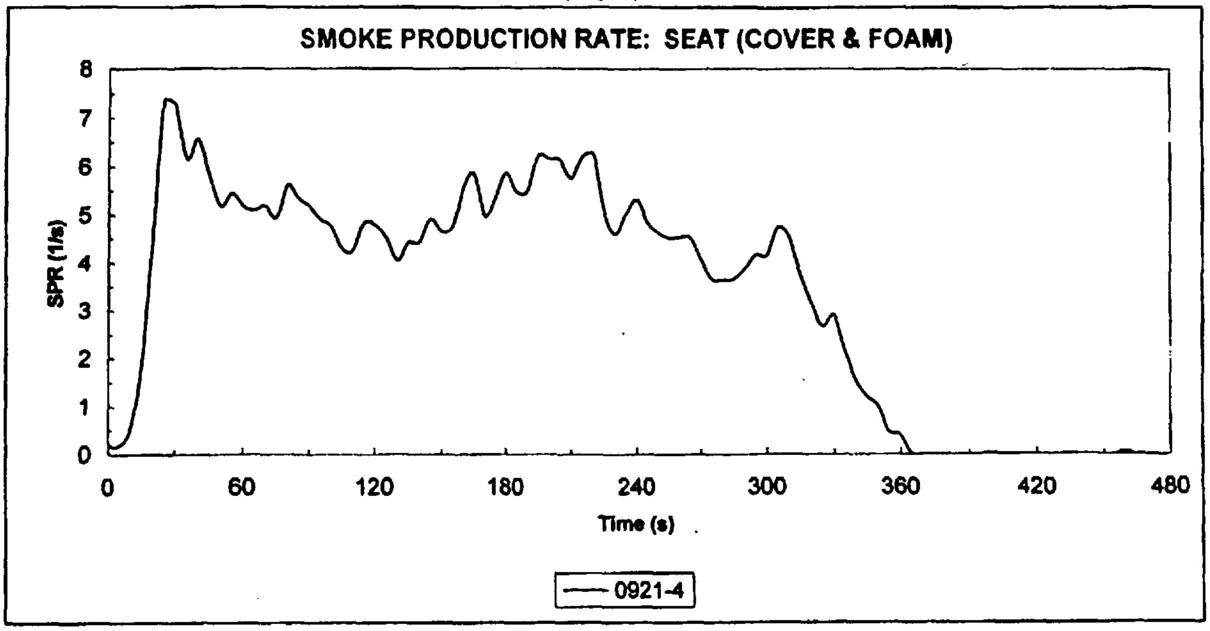


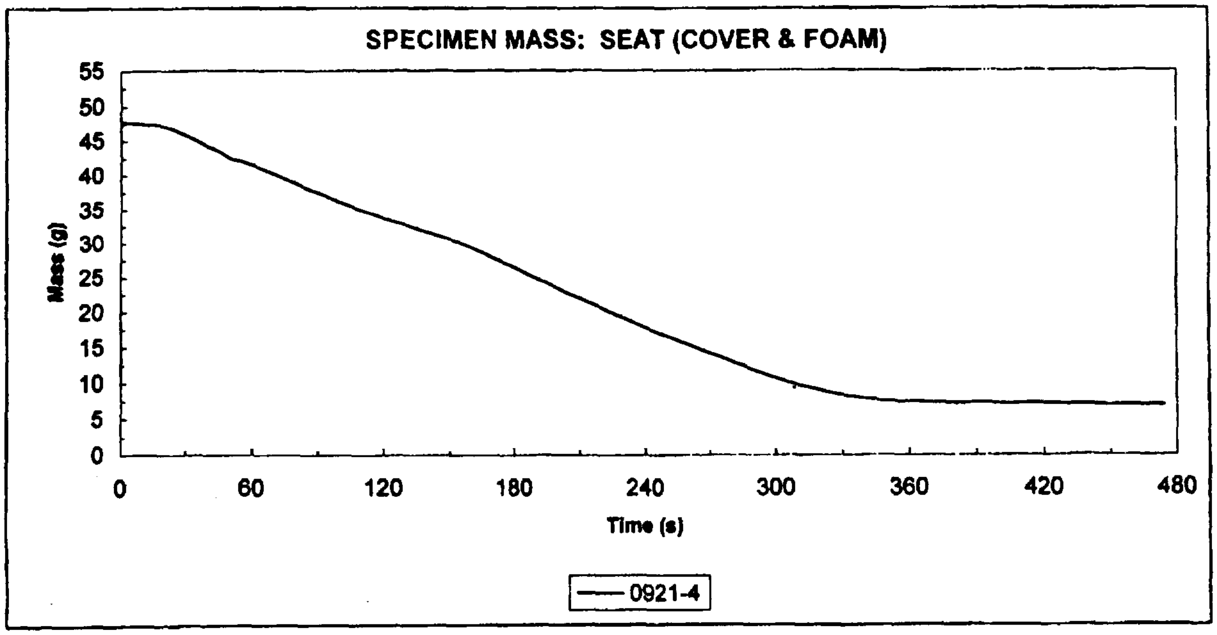
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Seat (Cover & Foam)
SwRI Project No:	18.03614.01	*Heat Flux:*	35 kW/m²

(Page 2)





Notes & Observations:

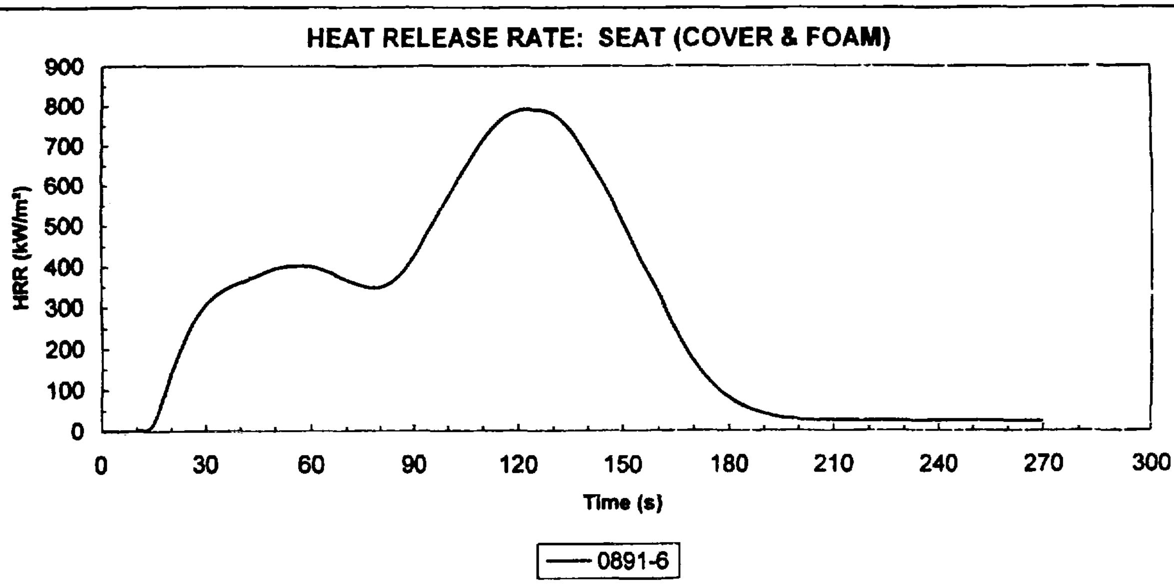
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Honda Civic
SwRI Project No:	18.03614.01	*Material ID:*	Seat (Cover & Foam)
Part No.:	81521-S5A-A01ZA	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0891-6	03/30/01	11	170	790	125	73.2	296	408	245	758
Average		11	170	790	125	73.2	296	408	245	758

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
35.6	4.5	31.1	87.3	25.6	20.8	6.54	2	1207	1210	343
35.6	4.5	31.1	87.3	25.6	20.8	6.54	2	1207	1210	343

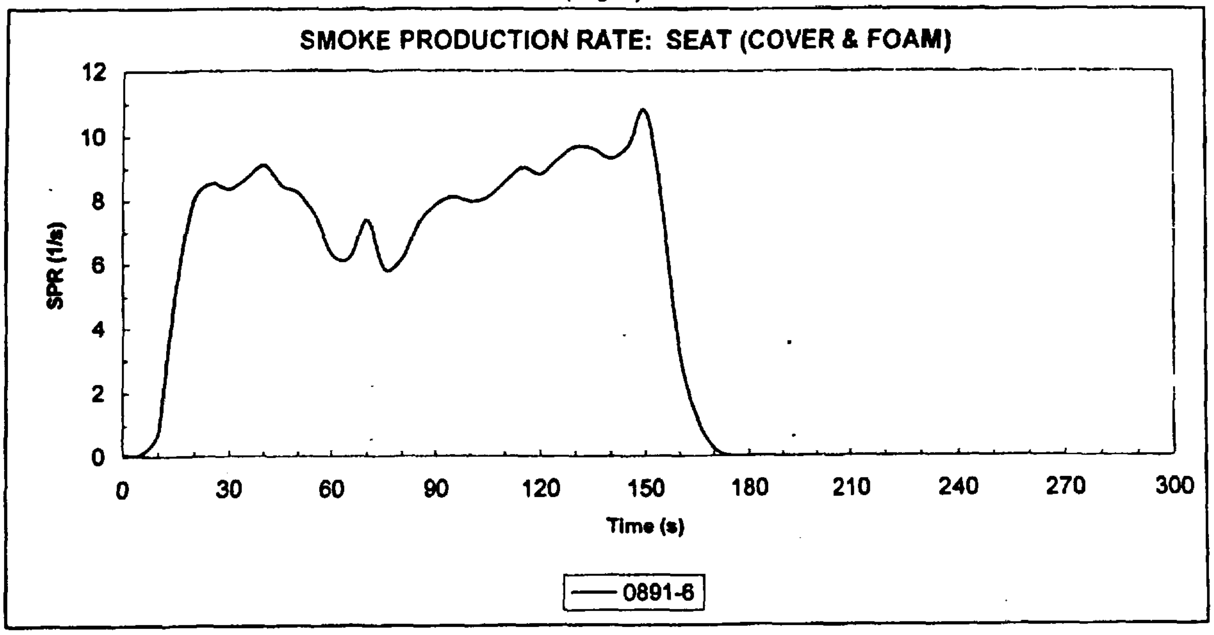


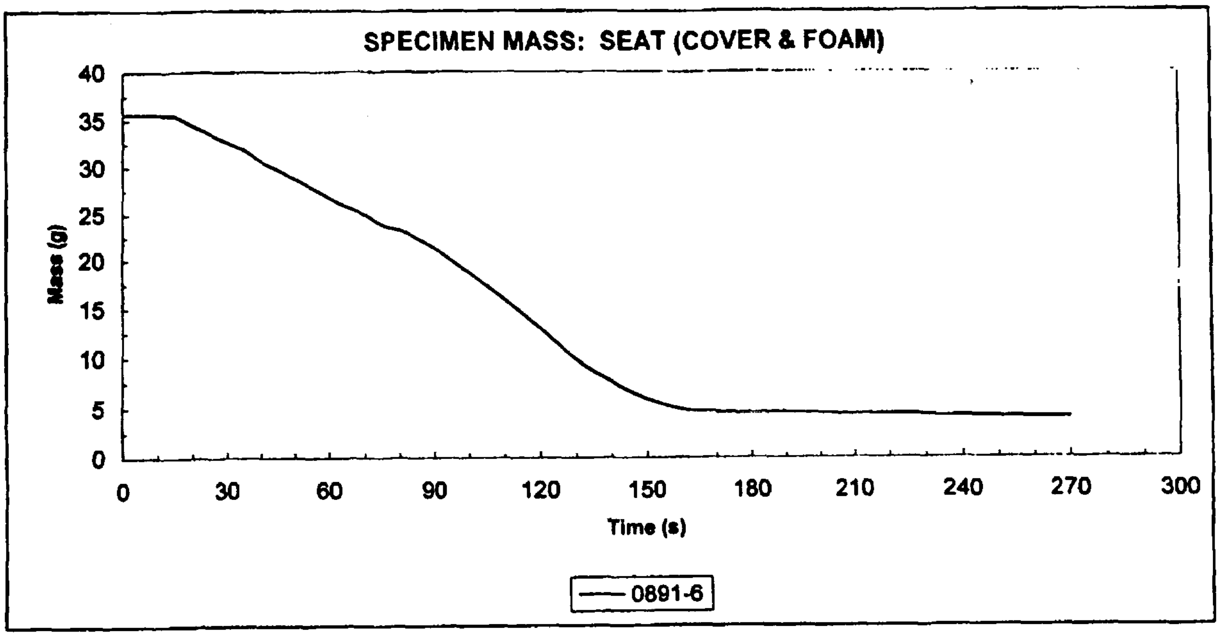
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Seat (Cover & Foam)
SwRI Project No:	18.03614.01	*Heat Flux:*	50 kW/m²

(Page 2)





Notes & Observations:

Sample mass

Fabric -14.7 g

Foam - 20.9 g

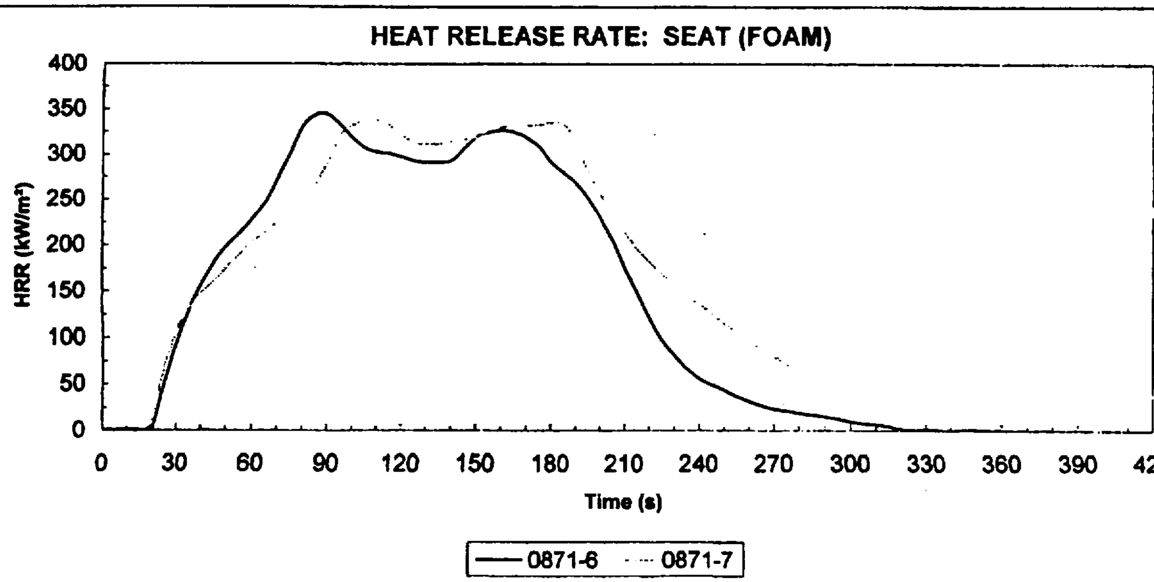
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Honda Civic
SwRI Project No:	18.03614.01	*Material ID:*	Seat (Foam)
Part No.:	81522-55A-A01	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,max}$ (kW/m²)
0871-6	03/28/01	21	277	345	90	54.6	185	265	182	329
0871-7	03/28/01	15	291	338	110	60.5	145	259	202	332
Average		18	284	341	100	57.6	165	262	192	331

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
18.9	2.2	16.8	88.8	10.1	28.8	1.35	8	404	411	213
21.0	2.2	18.7	89.2	10.0	28.6	1.83	6	560	566	264
20.0	2.2	17.8	89.0	10.0	28.7	1.59	7	482	488	238



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client: General Motors
SwRI Project No: 18.03614.01
Material ID: Seat (Foam)
Heat Flux: 20 kW/m²

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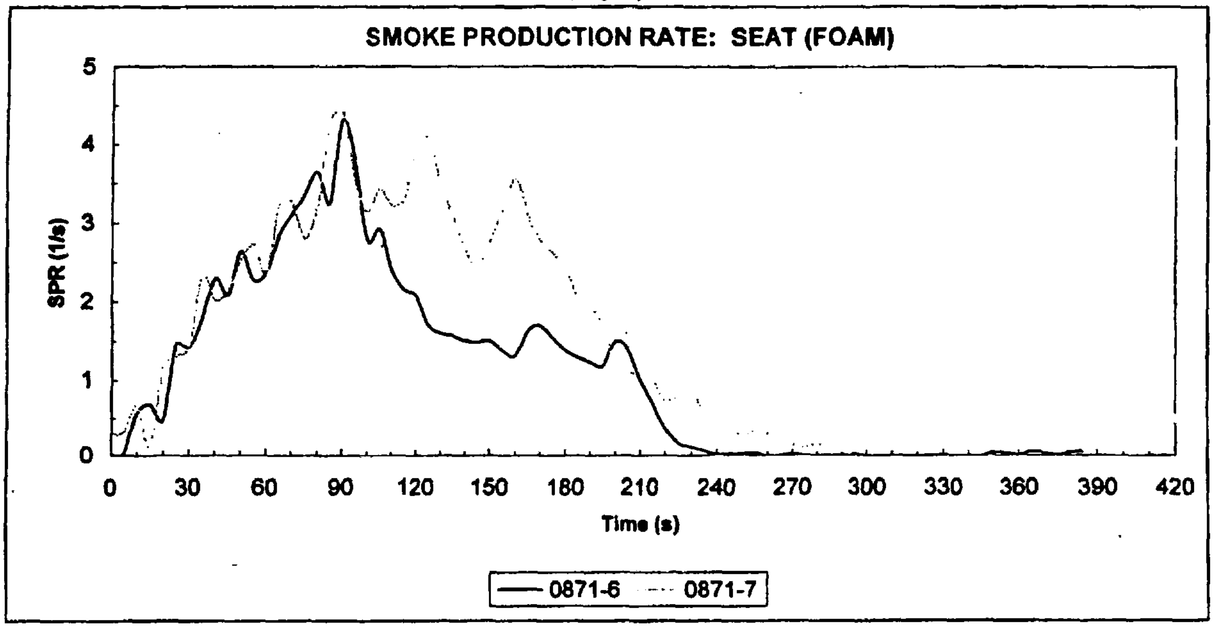
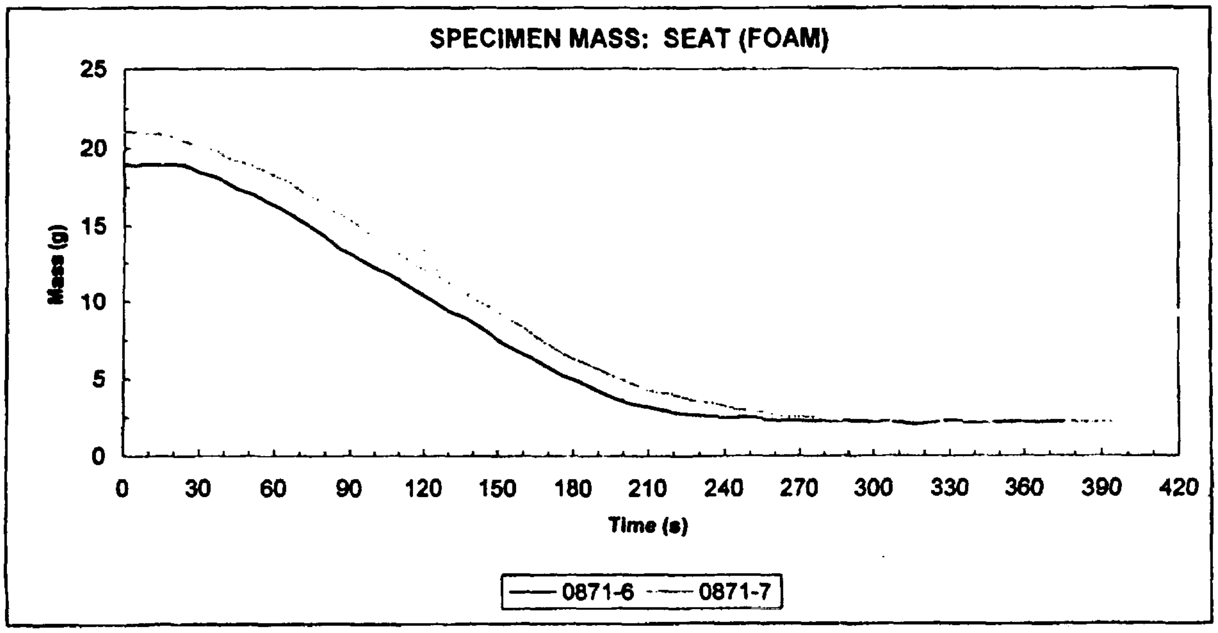




Notes & Observations:

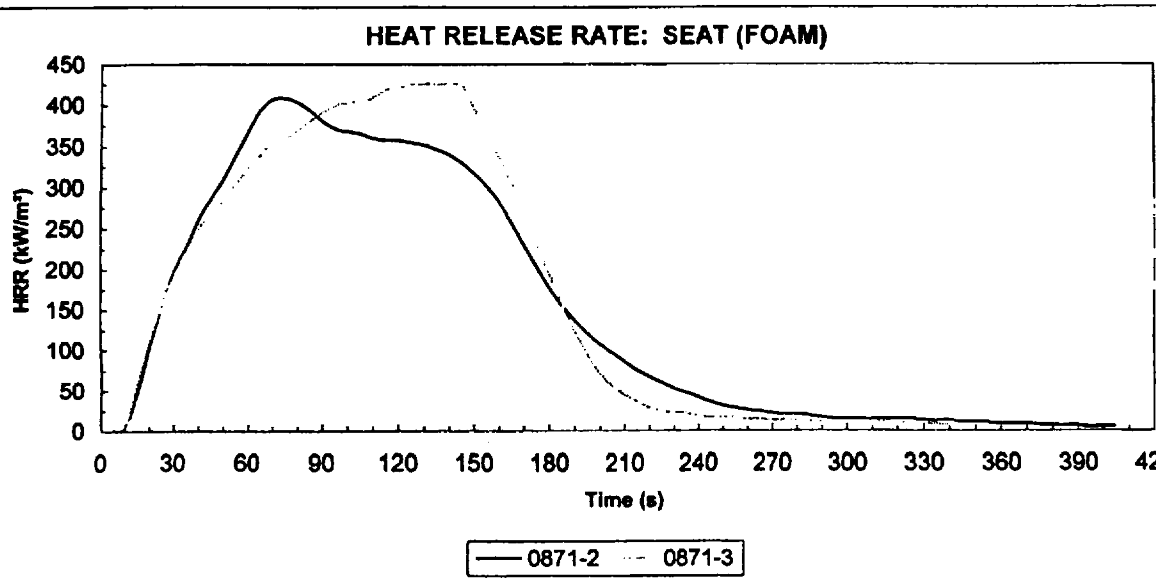
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Honda Civic
SwRI Project No:	18.03614.01	*Material ID:*	Seat (Foam)
Part No.:	81522-55A-A01	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0871-2	03/28/01	9	301	409	75	58.6	241	294	195	397
0871-3	03/28/01	8	244	426	130	58.9	223	313	196	424
Average		8	272	417	103	58.7	232	303	196	411

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
19.1	1.3	17.7	92.6	12.3	29.3	1.57	8	485	493	242
19.9	1.7	18.2	91.3	13.1	28.6	2.16	9	541	550	263
19.5	1.5	17.9	91.9	12.7	29.0	1.87	9	513	521	253



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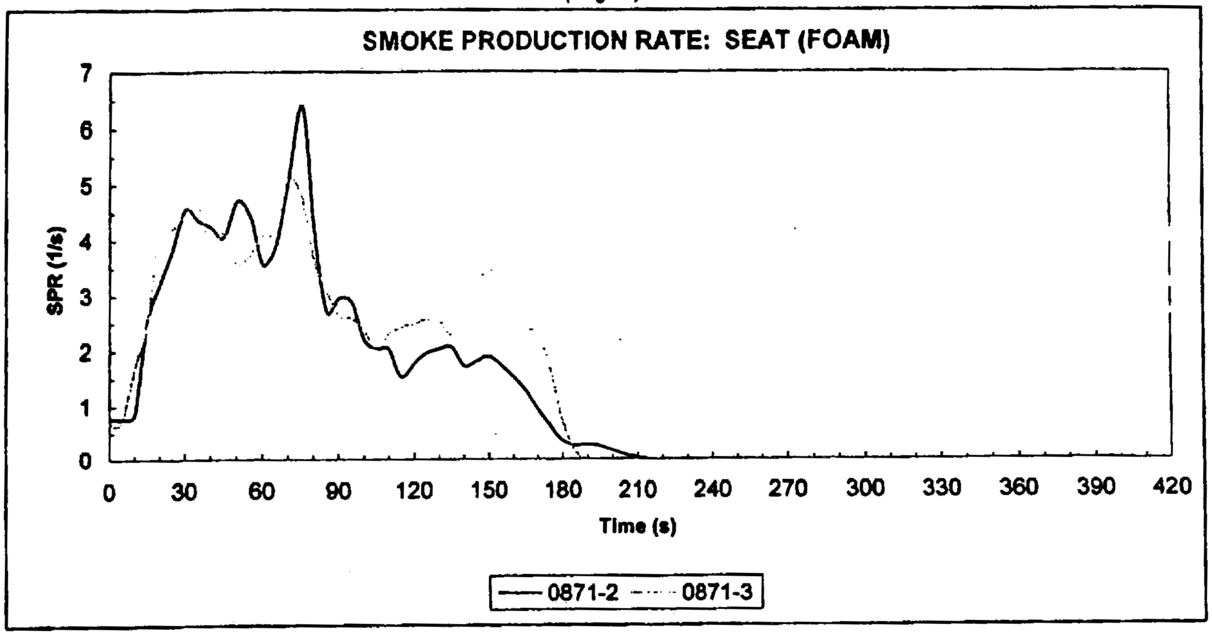
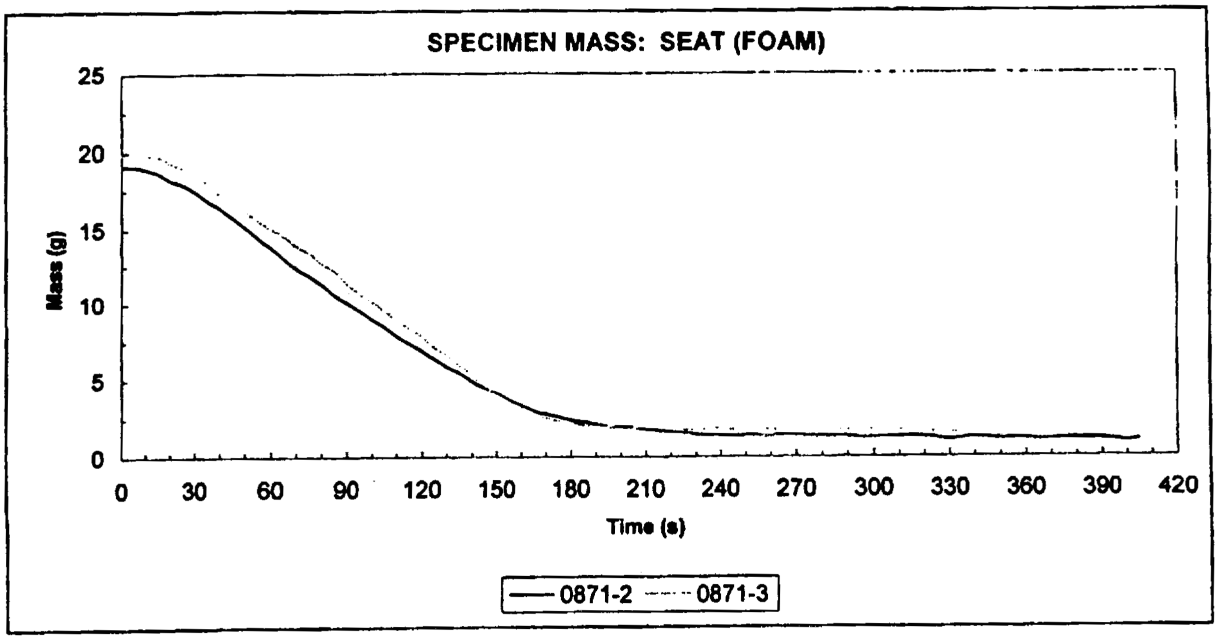
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Seat (Foam)
SwRI Project No:	18.03614.01	*Heat Flux:*	35 kW/m²

(Page 2)





Notes & Observations:

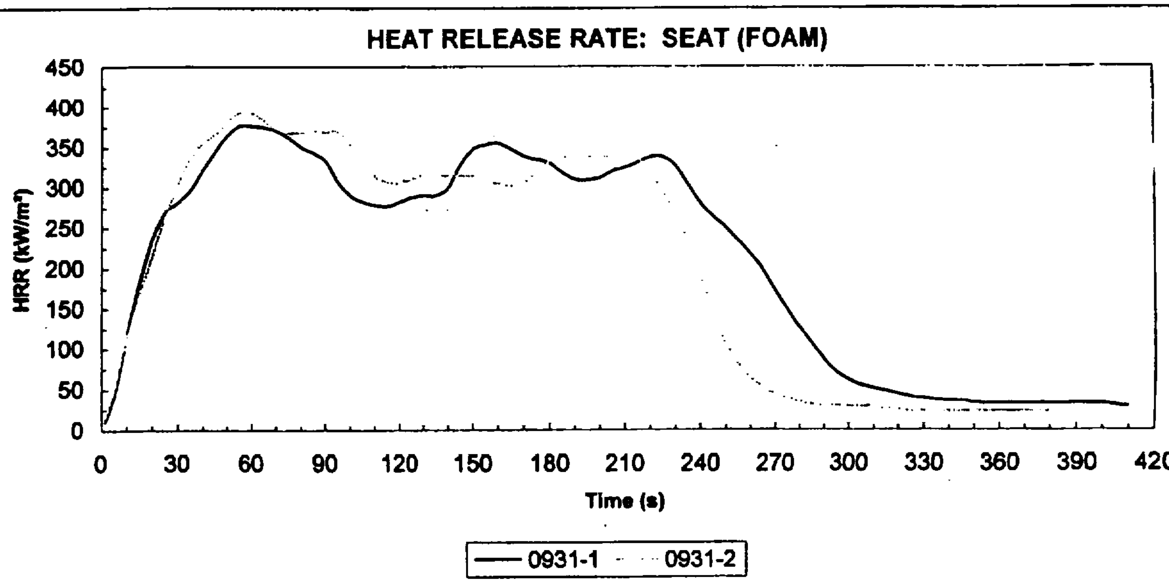
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Honda Civic
SwRI Project No:	18.03614.01	*Material ID:*	Seat (Foam)
Part No.:	81522-55A-A01	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0931-1	04/03/01	2	321	377	55	84.9	252	300	279	370
0931-2	04/03/01	2	297	394	55	78.4	262	310	261	382
Average		2	309	385	55	81.7	257	305	270	376

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
30.8	3.9	26.9	87.5	12.2	27.8	3.17	0	1039	1039	341
27.7	2.9	24.8	89.5	12.5	28.0	2.75	0	832	832	297
29.3	3.4	25.9	88.5	12.3	27.9	2.96	0	936	936	319



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client: General Motors
SwRI Project No: 18.03614.01
Material ID: Seat (Foam)
Heat Flux: 50 kW/m²

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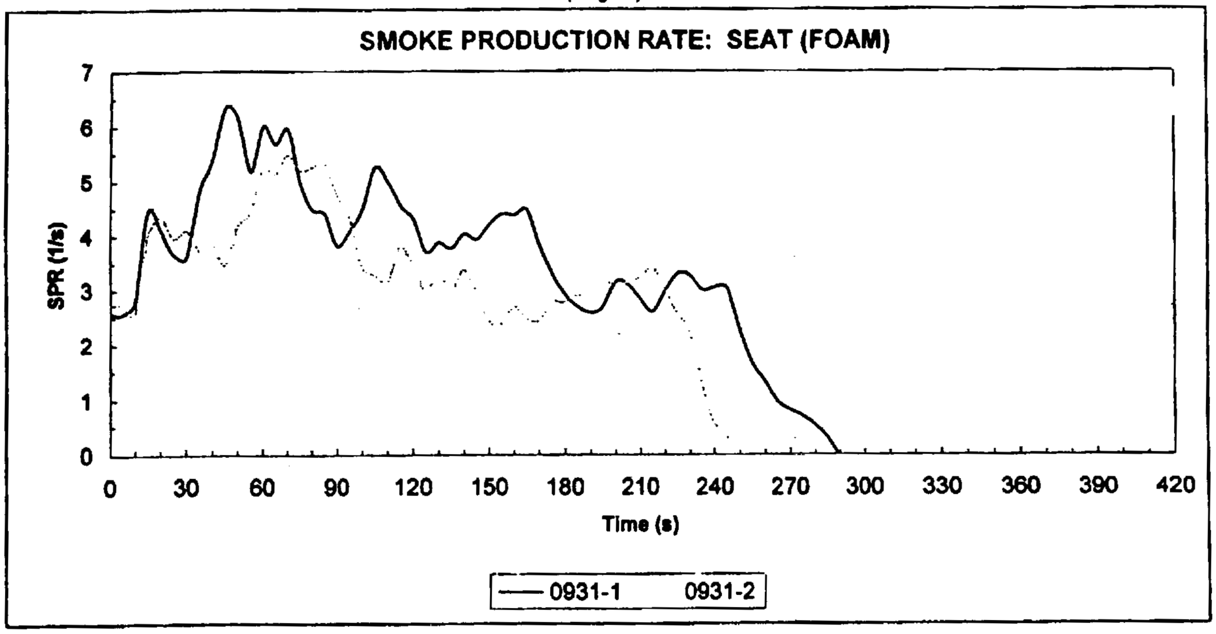
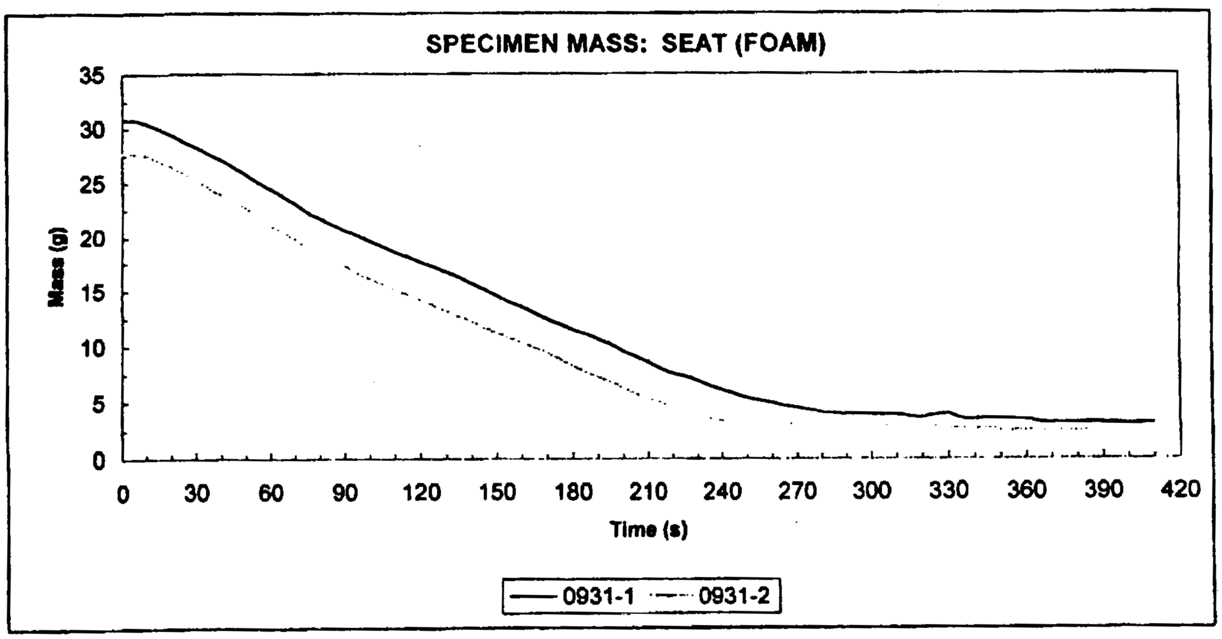




Notes & Observations:

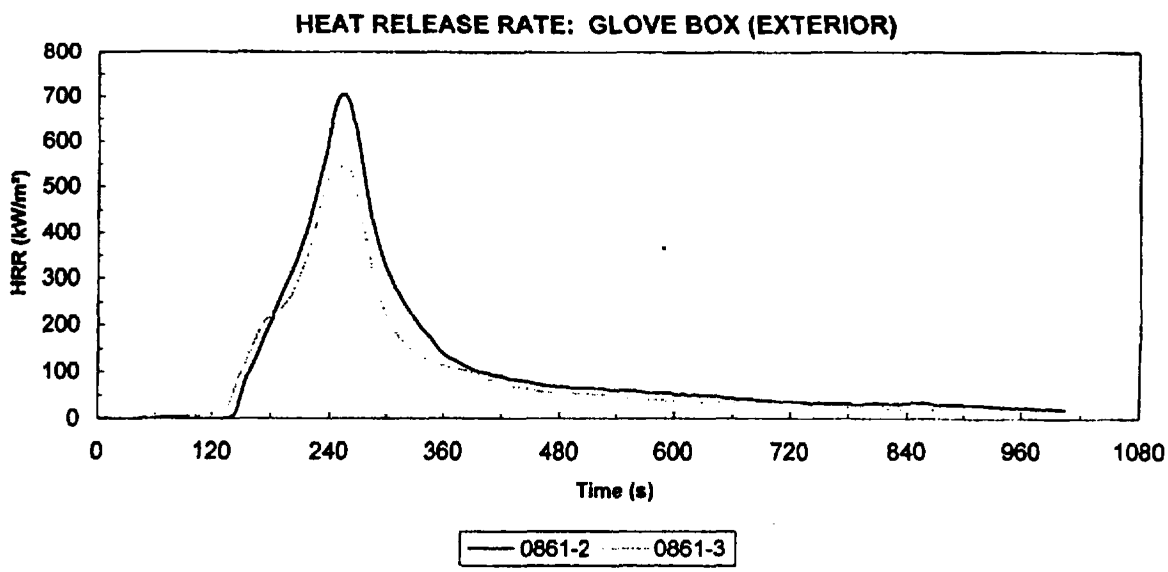
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Honda Civic
SwRI Project No:	18.03614.01	*Material ID:*	Glove Box (Exterior)
Part No.:	T1500-S5A-A01ZA	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0861-2	03/27/01	134	788	705	255	103.7	131	361	272	670
0861-3	03/27/01	129	680	547	255	82.5	137	299	224	532
Average		132	734	626	255	93.1	134	330	248	601

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
28.5	7.8	20.5	71.9	4.4	44.7	0.91	26	815	841	351
28.9	12.8	16.3	56.3	4.4	44.9	0.63	7	504	511	274
28.7	10.3	18.4	64.1	4.4	44.8	0.77	17	660	676	313



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Glove Box (Exterior)
SwRI Project No:	18.03614.01	*Heat Flux:*	20 kW/m²

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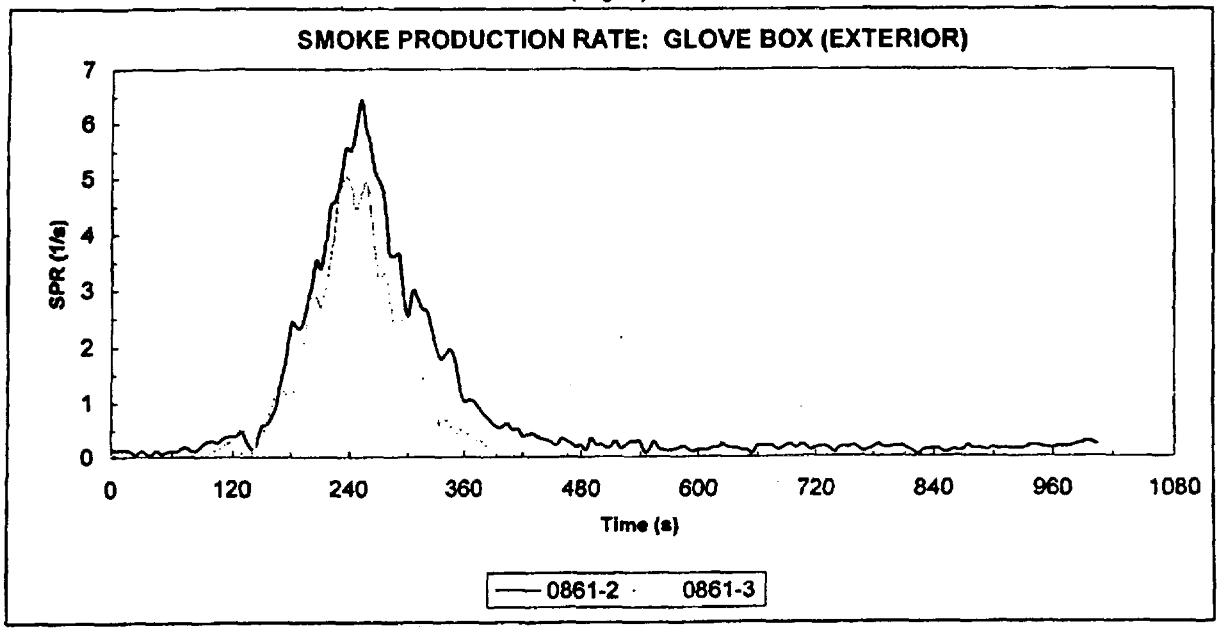

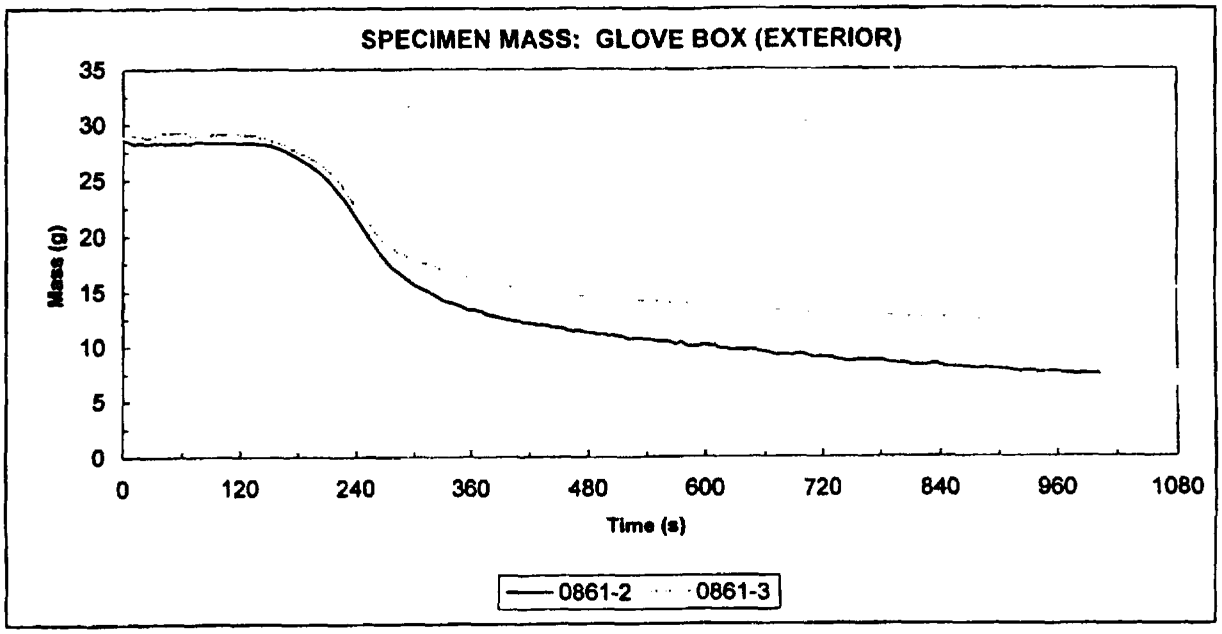

Notes & Observations:
Low flaming was observed from ~500 secs to the end of testing.

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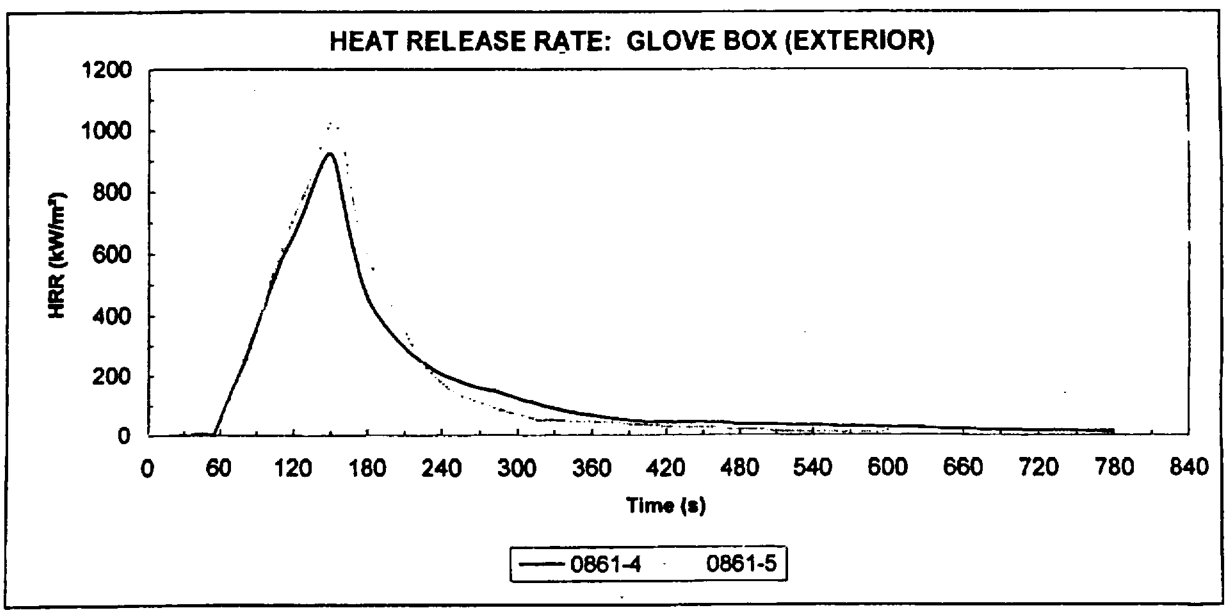
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Honda Civic
SwRI Project No:	18.03614.01	*Material ID:*	Glove Box (Exterior)
Part No.:	T1500-S5A-A01ZA	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0861-4	03/27/01	50	648	924	150	112.7	258	459	332	858
0861-5	03/27/01	51	527	1027	150	110.1	254	515	348	958
Average		50	588	975	150	111.4	256	487	340	908

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
28.8	6.9	22.0	76.2	7.9	45.4	1.29	1	911	912	367
27.1	5.5	21.7	80.0	11.9	44.9	1.62	1	949	950	387
28.0	6.2	21.8	78.1	9.9	45.1	1.46	1	930	931	377



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Glove Box (Exterior)
SwRI Project No:	18.03614.01	*Heat Flux:*	35 kW/m²

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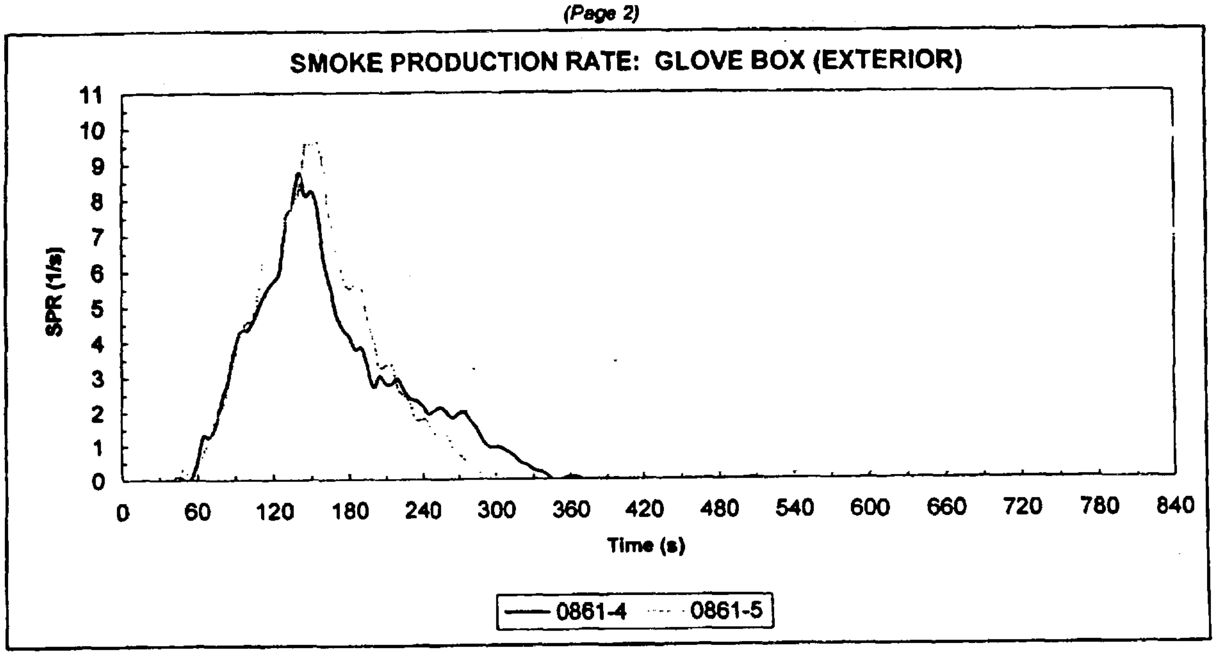
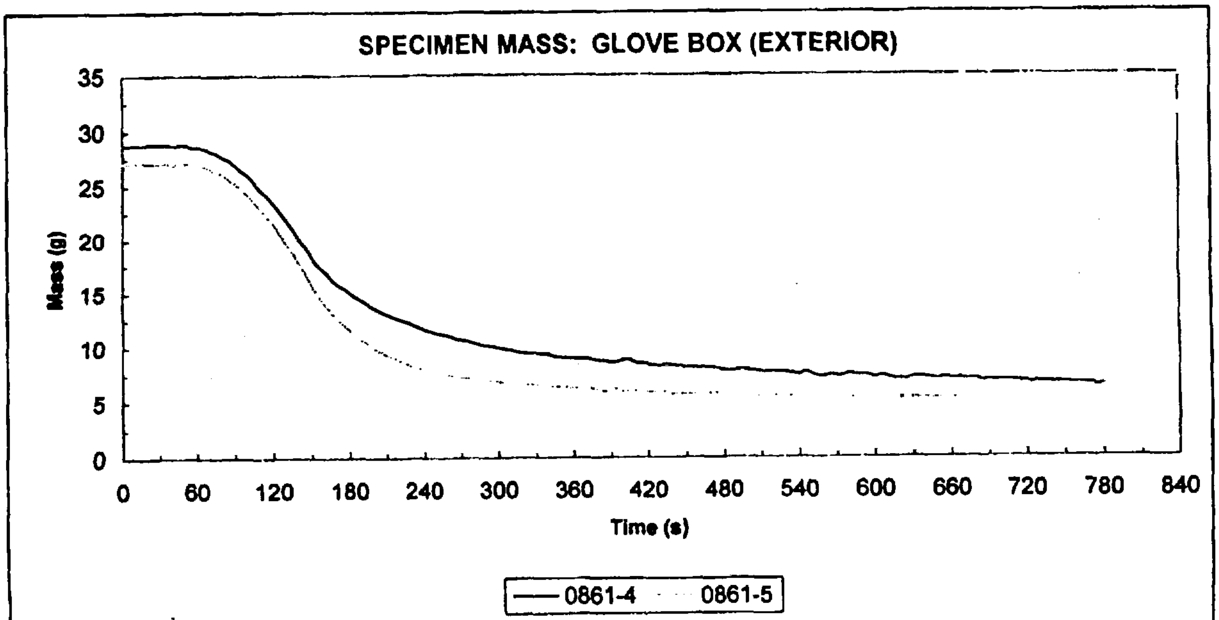




Notes & Observations:

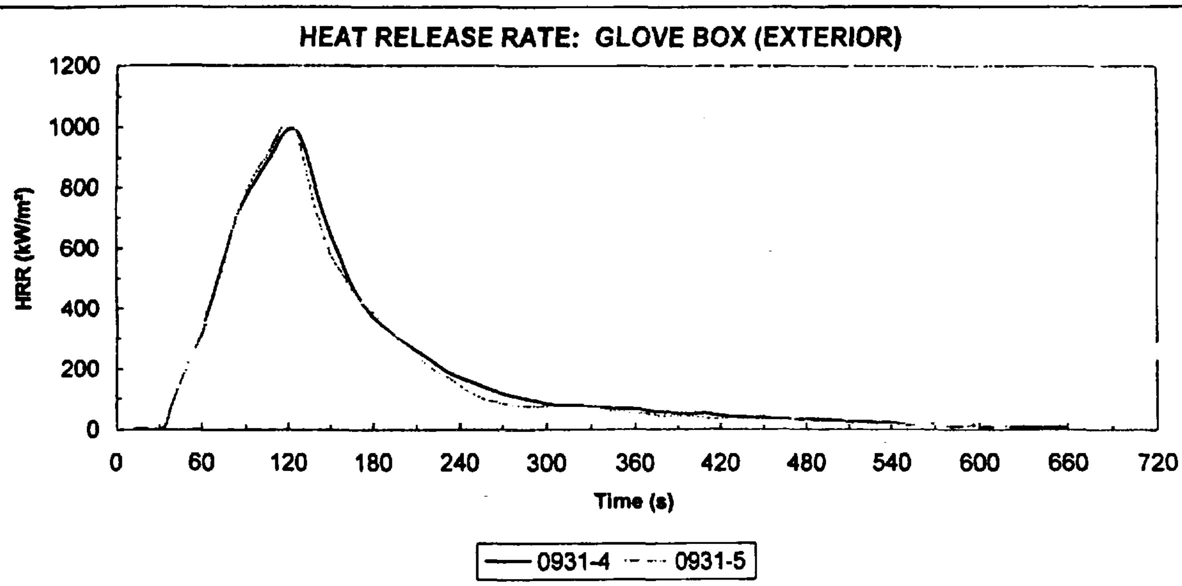
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Honda Civic
SwRI Project No:	18.03614.01	*Material ID:*	Glove Box (Exterior)
Part No.:	T1500-S5A-A01ZA	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\,max}$ (kW/m²)
0931-4	04/01/01	29	543	996	120	123.8	354	542	379	952
0931-5	04/01/01	29	508	1020	120	117.7	350	535	366	962
Average		29	526	1008	120	120.7	352	538	373	957

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
30.1	5.4	24.7	82.0	10.9	44.4	2.11	3	1211	1214	434
32.1	8.7	23.3	72.5	11.1	44.7	1.89	3	1015	1018	385
31.1	7.1	24.0	77.2	11.0	44.5	2.00	3	1113	1116	410



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Glove Box (Exterior)
SwRI Project No:	18.03614.01	*Heat Flux:*	50 kW/m²

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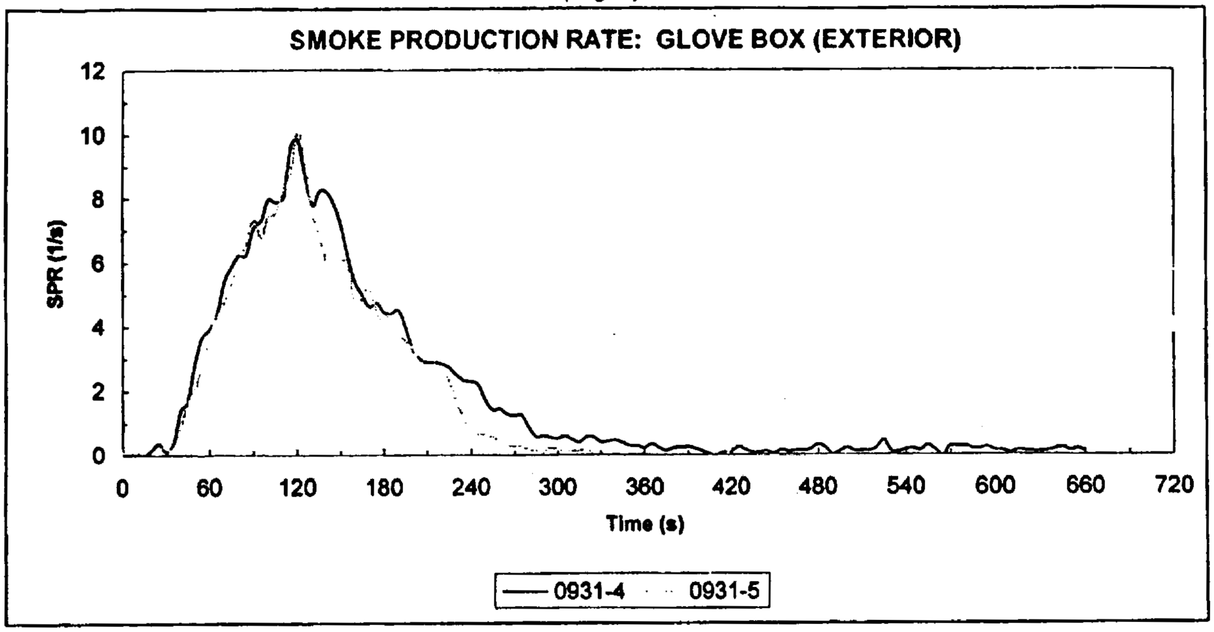
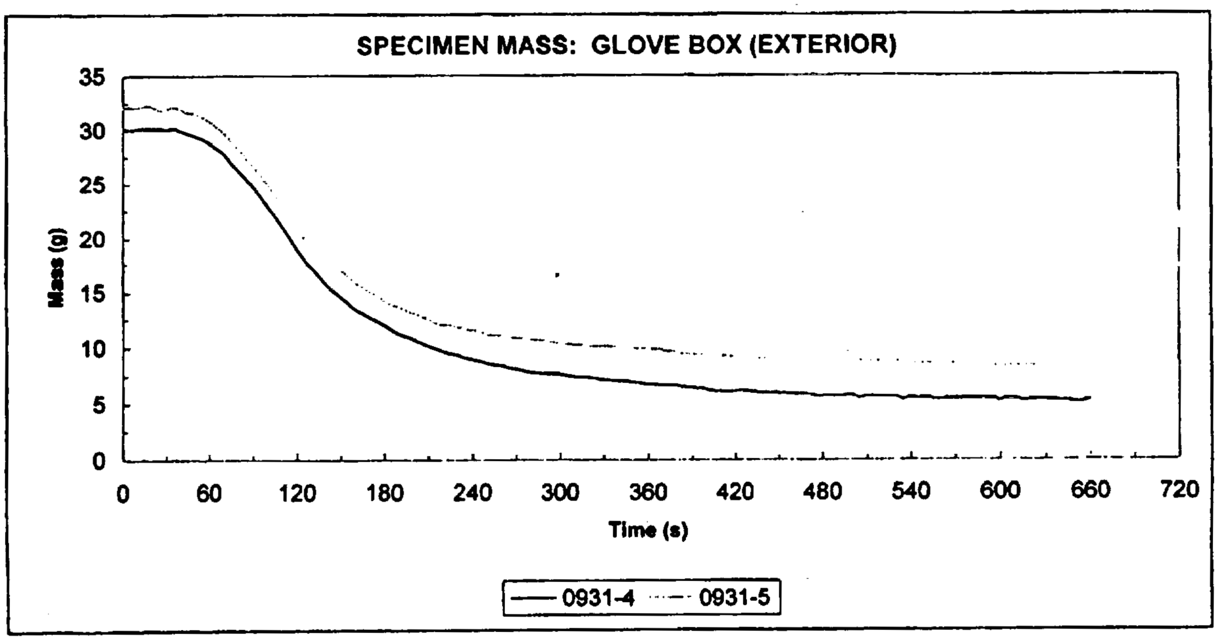




Notes & Observations:

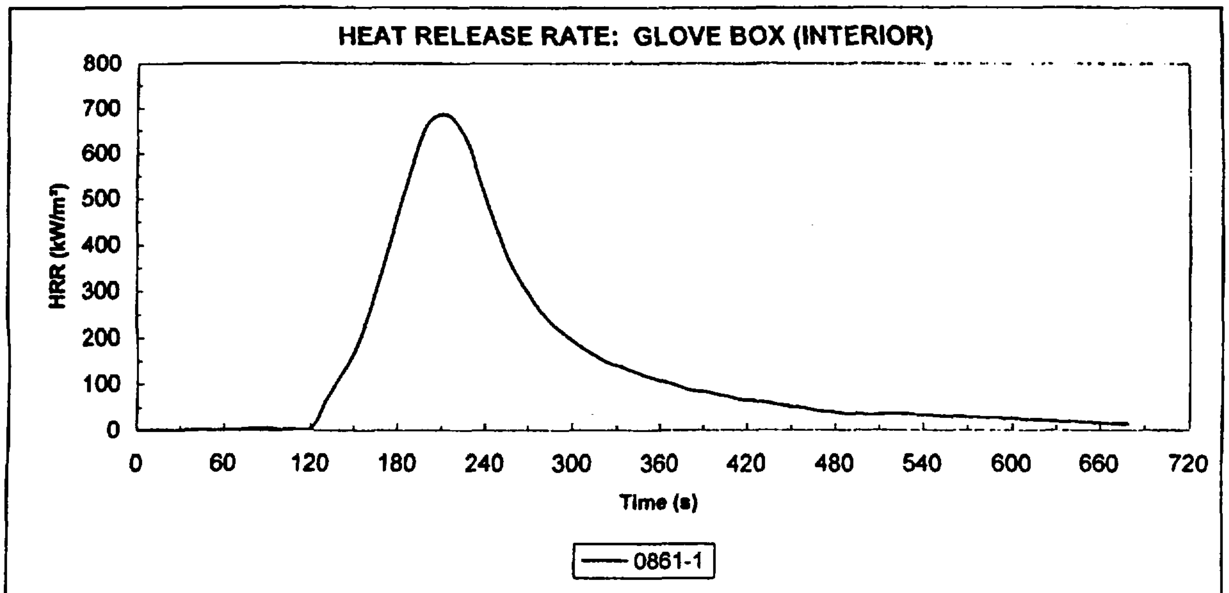
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Honda Civic
SwRI Project No:	18.03614.01	*Material ID:*	Glove Box (Interior)
Part No.:	T1500-S5A-A01ZA	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,max}$ (kW/m²)
0861-1	03/27/01	116	478	687	210	88.2	160	370	270	671
Average		116	478	687	210	88.2	160	370	270	671

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
23.9	7.7	16.3	68.1	7.2	47.9	1.04	14	611	625	332
23.9	7.7	16.3	68.1	7.2	47.9	1.04	14	611	625	332



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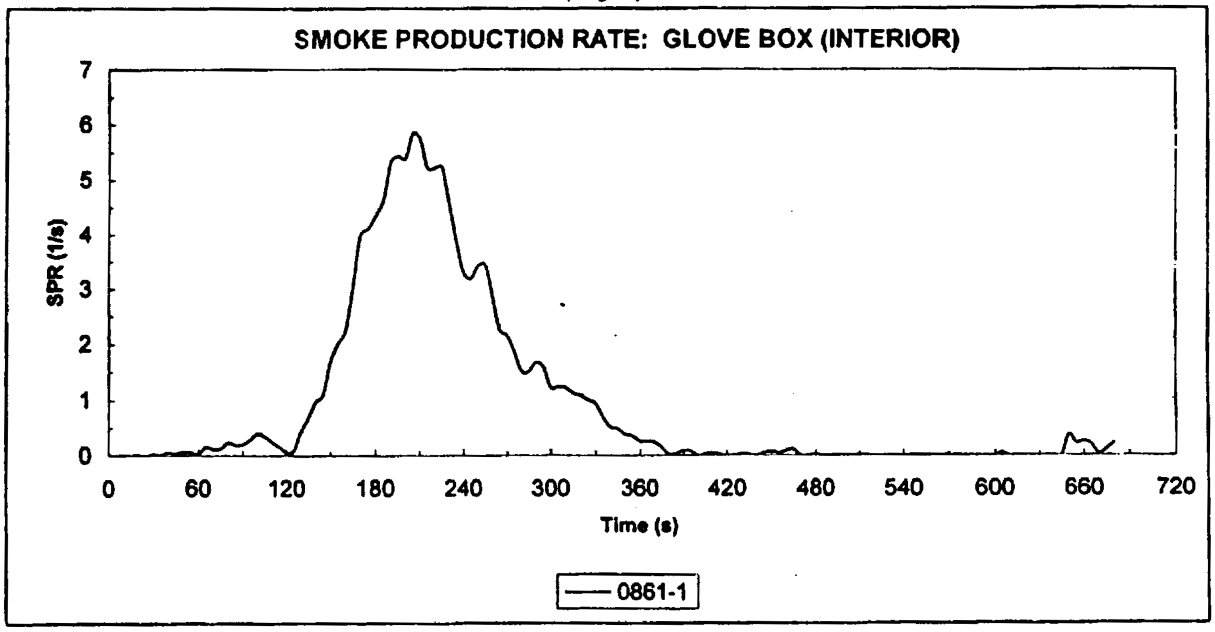
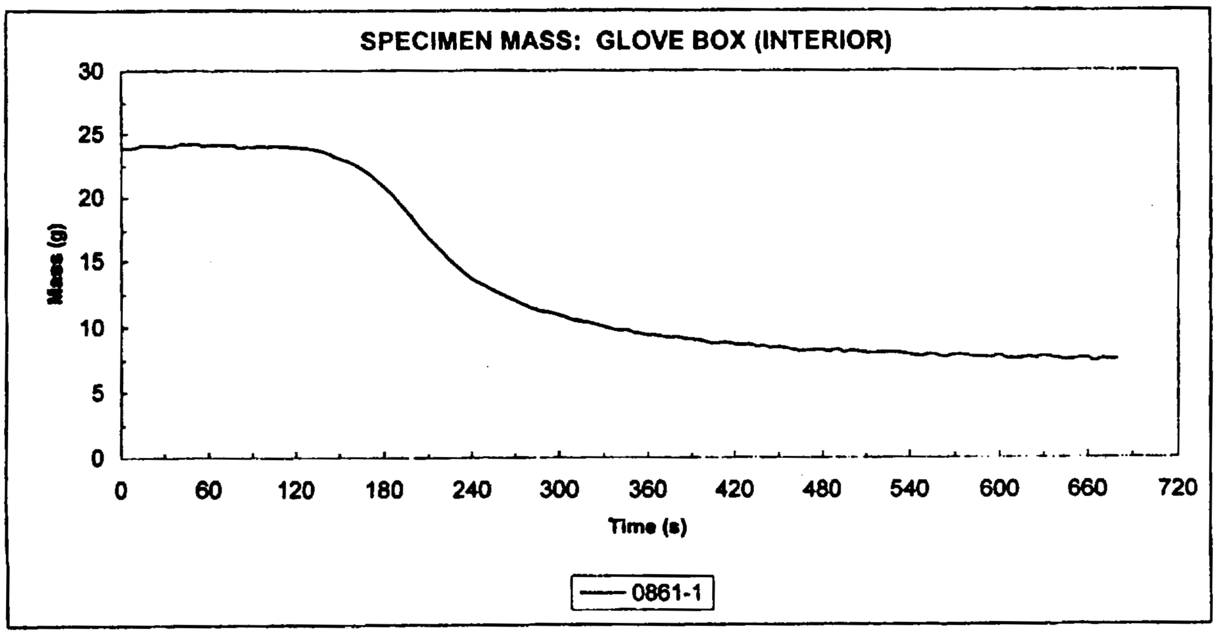
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client: General Motors | *Material ID:* Glove Box (Interior)

SwRI Project No: 18.03614.01 | *Heat Flux:* 20 kW/m²

(Page 2)





Notes & Observations:

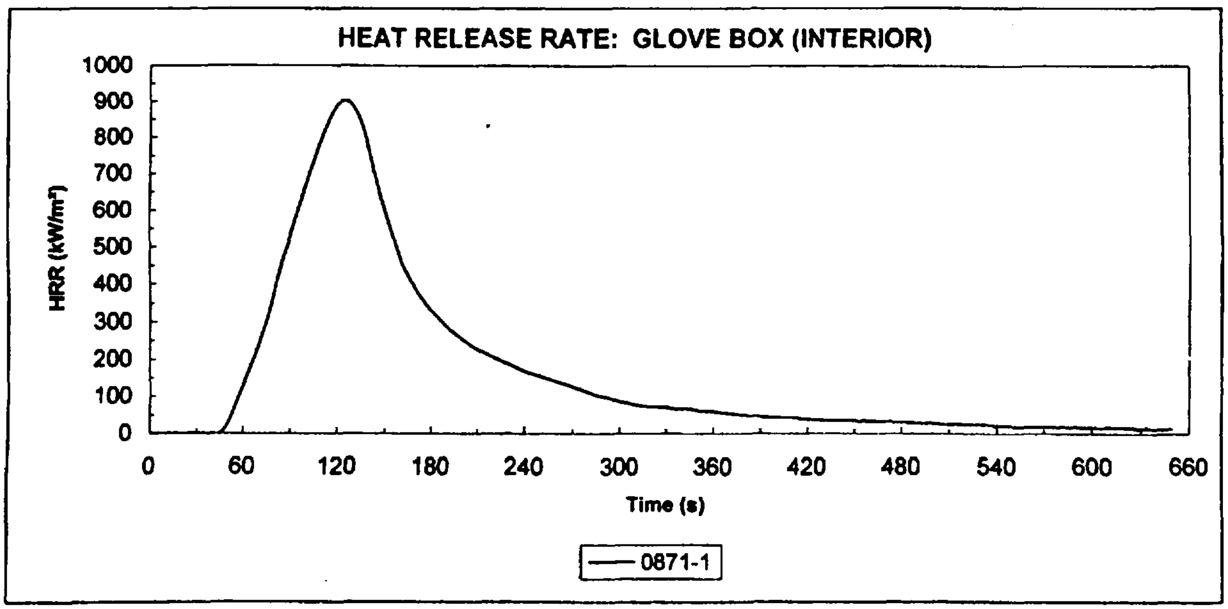
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Honda Civic
SwRI Project No:	18.03614.01	*Material ID:*	Glove Box (Interior)
Part No.:	T1500-S5A-A01ZA	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0871-1	03/28/01	42	522	902	125	102.7	272	443	314	858
Average		42	522	902	125	102.7	272	443	314	858

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
25.0	4.6	20.2	80.9	8.1	44.9	1.70	8	960	968	420
25.0	4.6	20.2	80.9	8.1	44.9	1.70	8	960	968	420

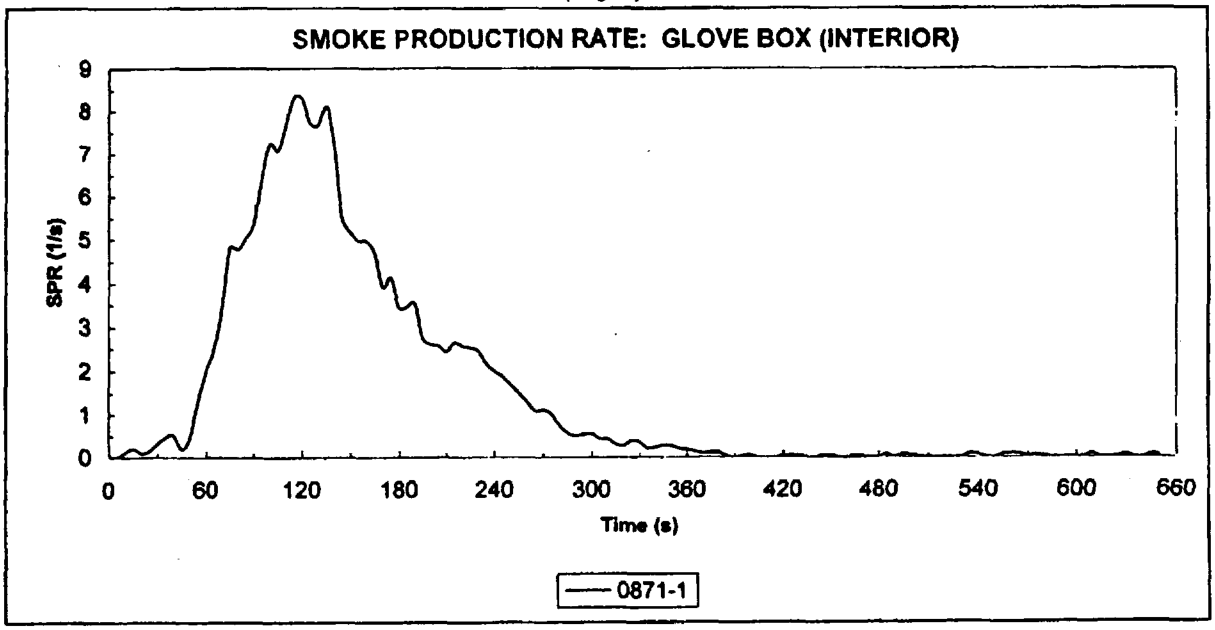


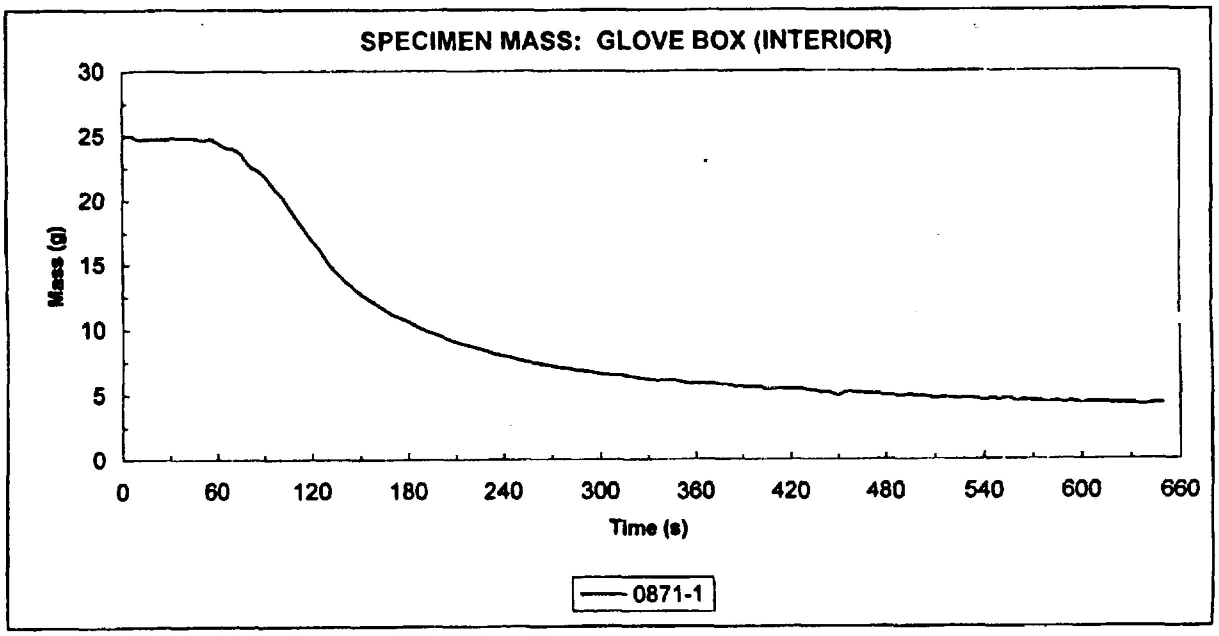
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Glove Box (Interior)
SwRI Project No:	18.03614.01	*Heat Flux:*	35 kW/m²

(Page 2)





Notes & Observations:

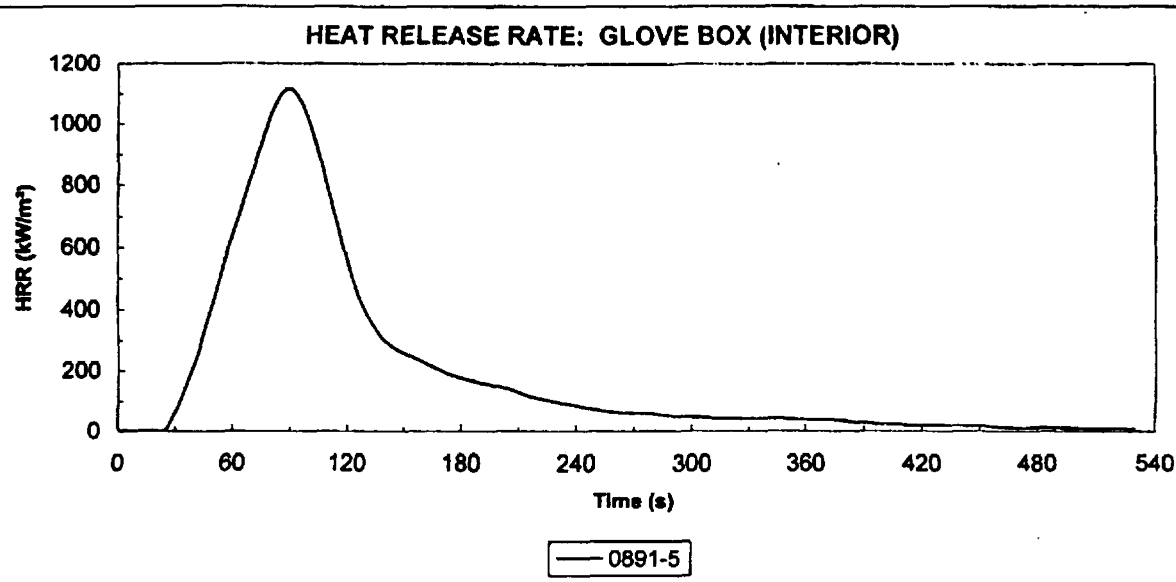
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Honda Civic
SwRI Project No:	18.03614.01	*Material ID:*	Glove Box (Interior)
Part No.:	T1500-S5A-A01ZA	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0891-5	03/30/01	23	422	1117	90	98.1	538	475	314	1043
Average		23	422	1117	90	98.1	538	475	314	1043

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
22.1	3.3	18.9	85.6	10.4	45.8	2.21	3	991	993	463
22.1	3.3	18.9	85.6	10.4	45.8	2.21	3	991	993	463



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Glove Box (Interior)
SwRI Project No:	18.03614.01	*Heat Flux:*	50 kW/m²

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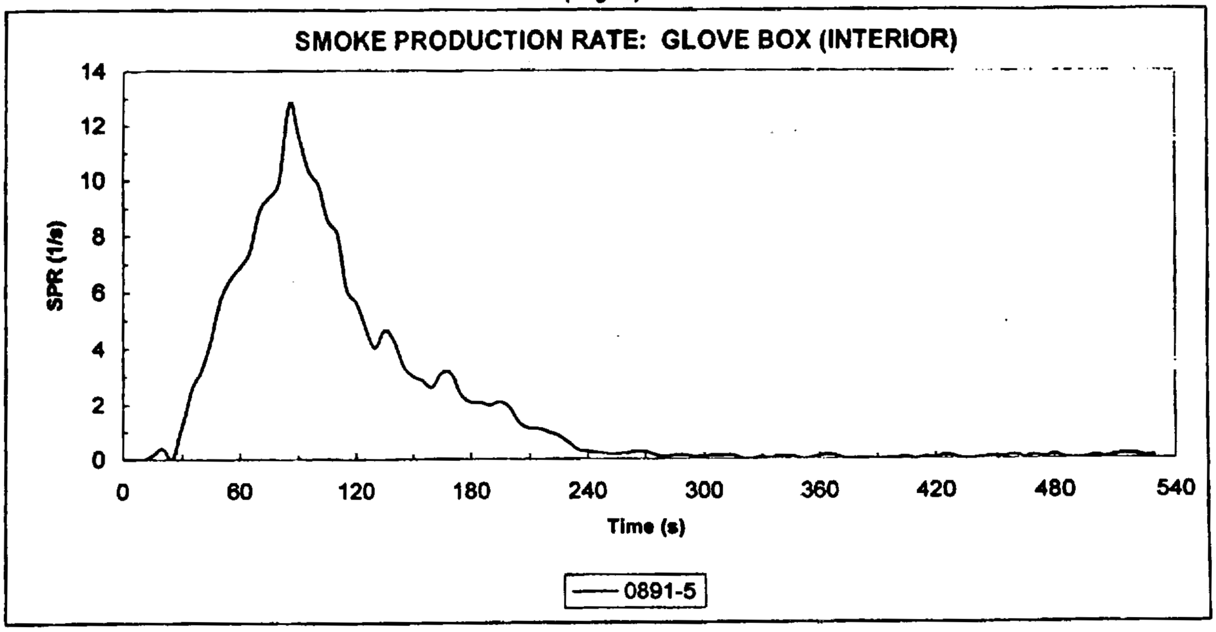
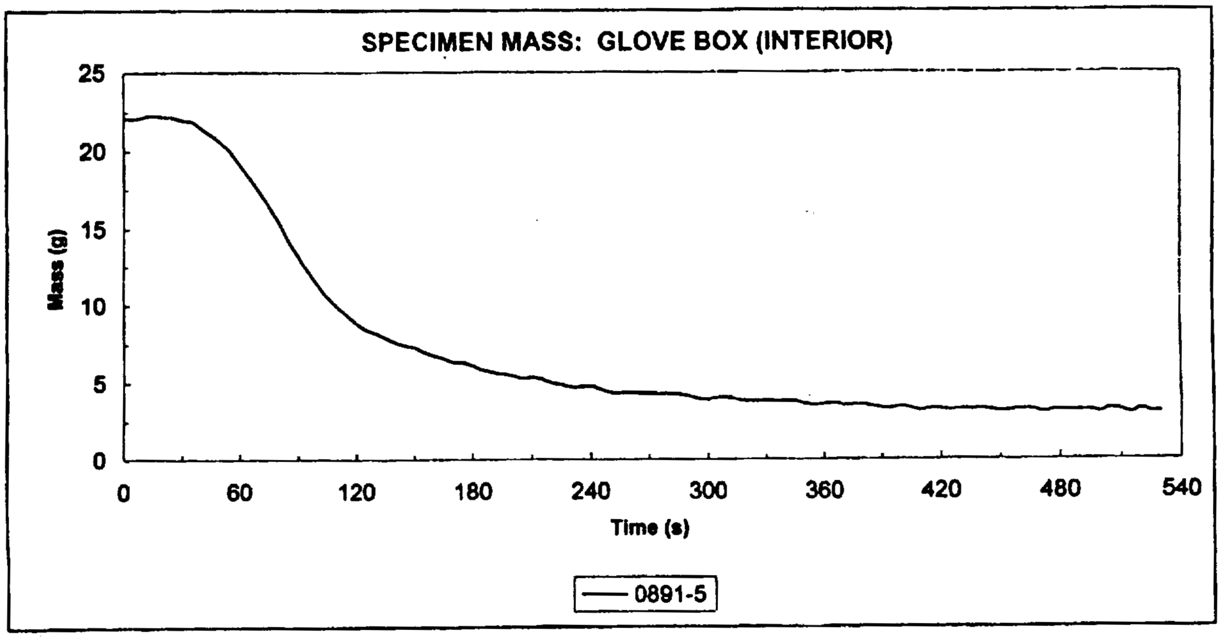




Notes & Observations:

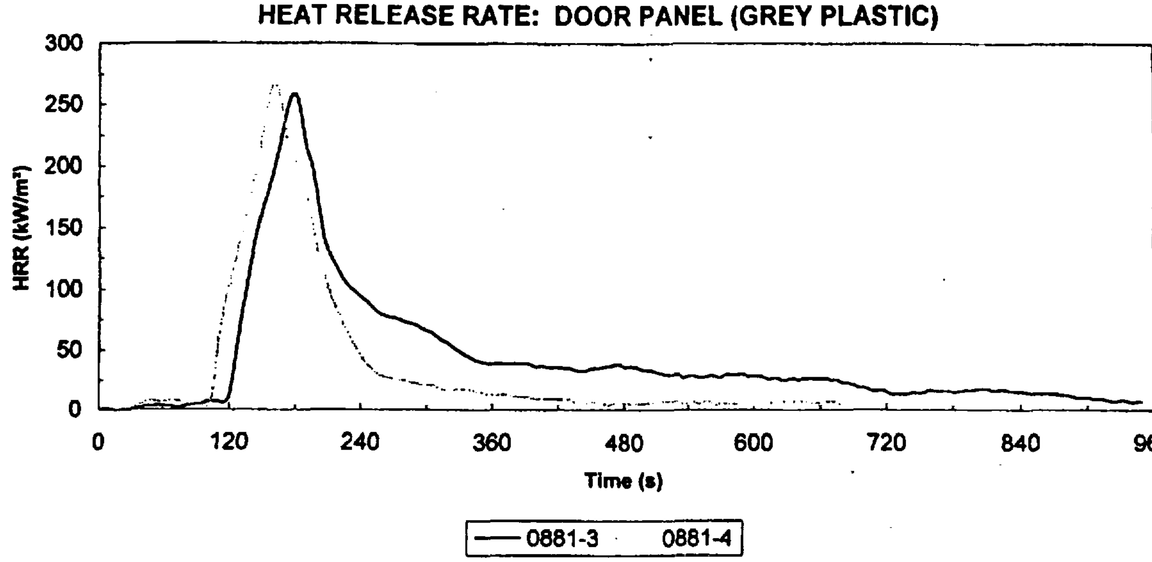
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Honda Civic
SwRI Project No:	18.03614.01	*Material ID:*	Door Panel (Grey Plastic)
Part No.:	83583-S5A-A01ZC	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\ max}$ (kW/m²)
0881-3	03/29/01	112	753	258	180	39.5	114	125	94	236
0881-4	03/29/01	98	495	268	160	24.4	140	118	77	241
Average		105	624	263	170	31.9	127	121	86	239

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
20.4	13.0	7.4	36.4	1.3	47.0	0.14	11	114	126	136
19.2	14.0	5.1	26.8	2.7	41.9	0.16	2	93	94	159
19.8	13.5	6.3	31.6	2.0	44.4	0.15	7	104	110	148



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Door Panel (Grey Plastic)
SwRI Project No:	18.03614.01	*Heat Flux:*	20 kW/m²

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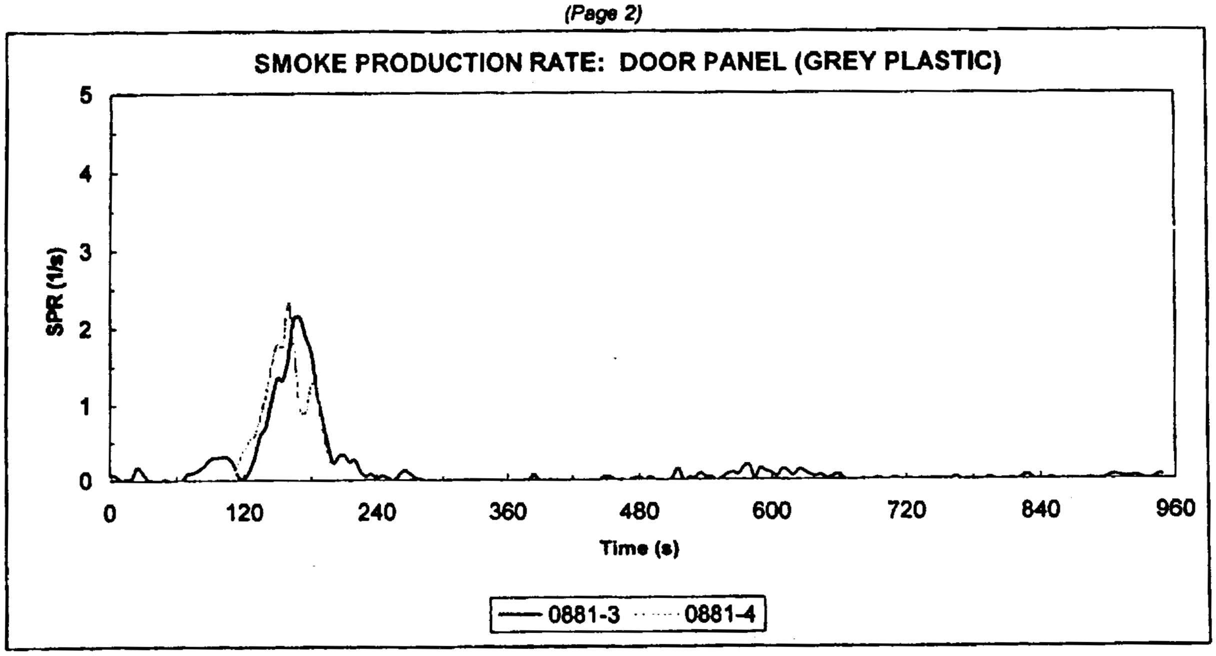
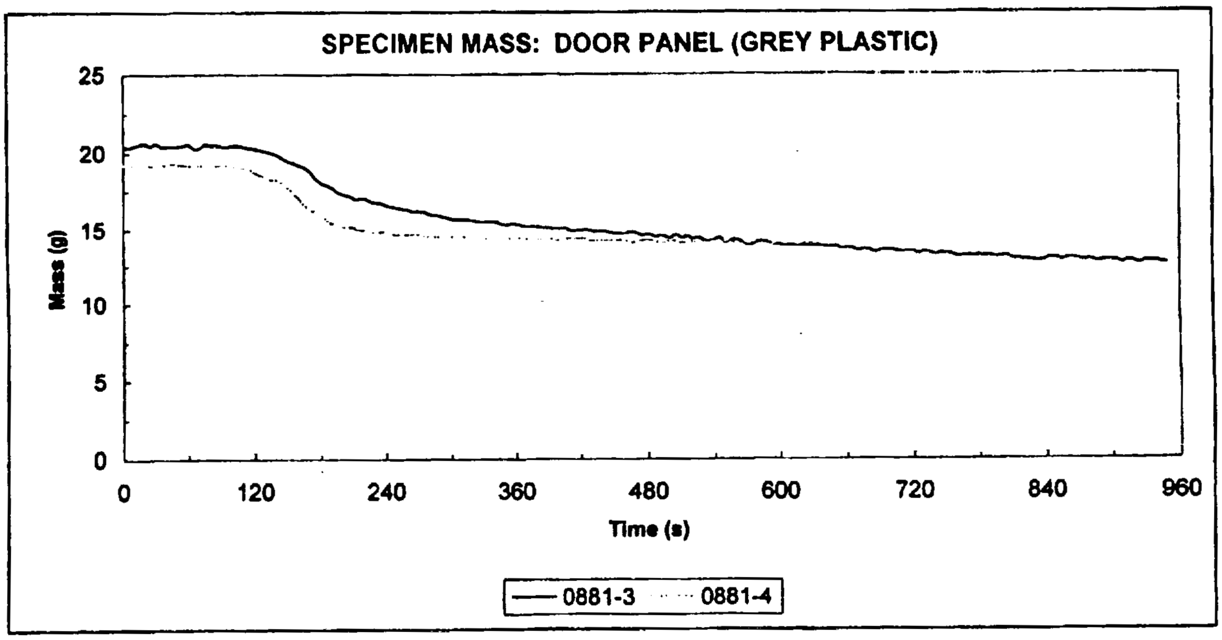




Notes & Observations:

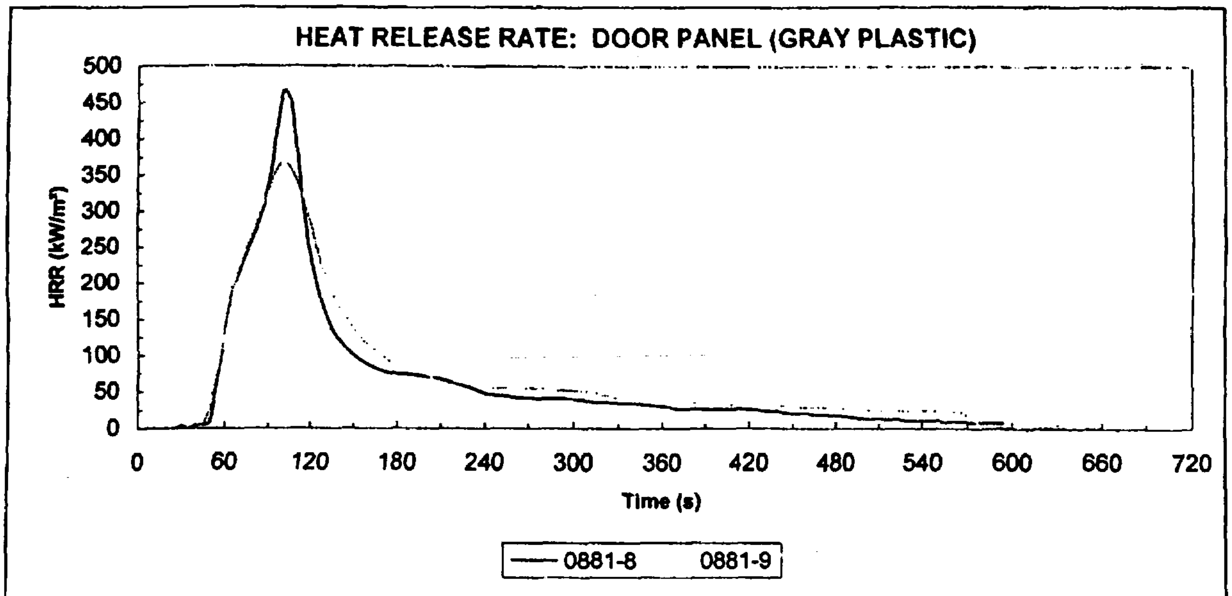
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Honda Civic
SwRI Project No:	18.03614.01	*Material ID:*	Door Panel (Gray Plastic)
Part No.:	83583-S5A-A01ZC	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0881-8	03/29/01	44	465	466	100	38.4	237	164	115	391
0881-9	03/29/01	42	517	369	100	43.4	194	169	122	344
Average		43	491	417	100	40.9	216	166	119	367

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
19.7	11.4	8.3	42.0	2.6	40.9	0.43	4	218	222	232
21.9	11.7	10.2	46.7	2.6	37.5	0.41	2	229	231	198
20.8	11.6	9.3	44.4	2.6	39.2	0.42	3	224	226	215



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Door Panel (Gray Plastic)
SwRI Project No:	18.03614.01	*Heat Flux:*	35 kW/m²

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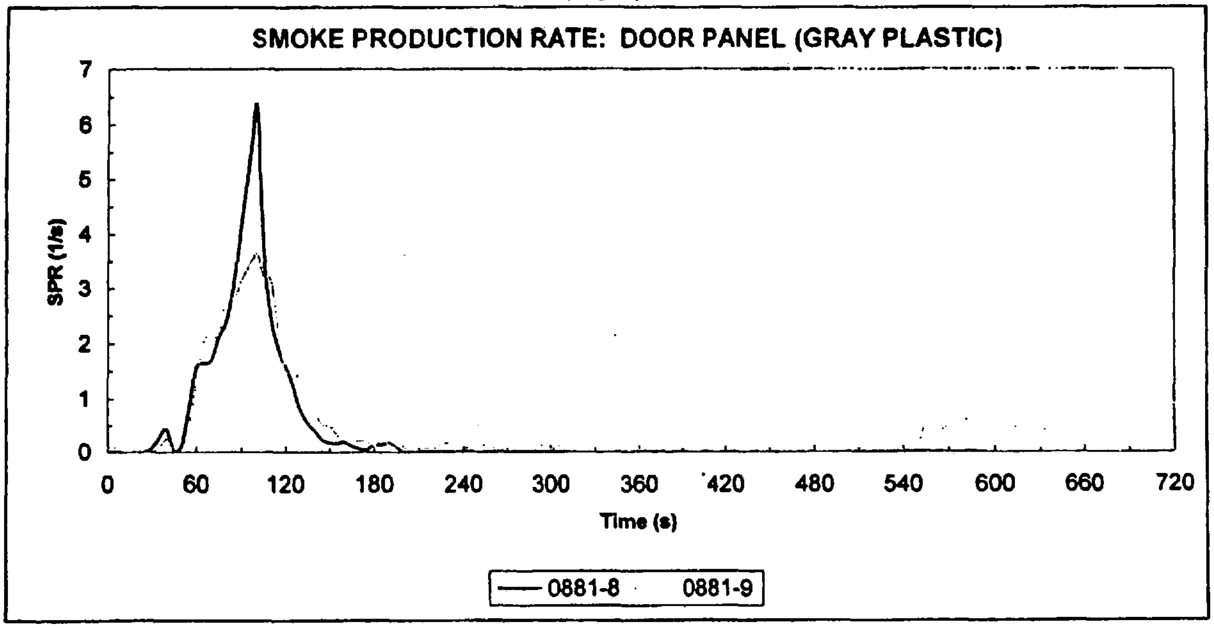
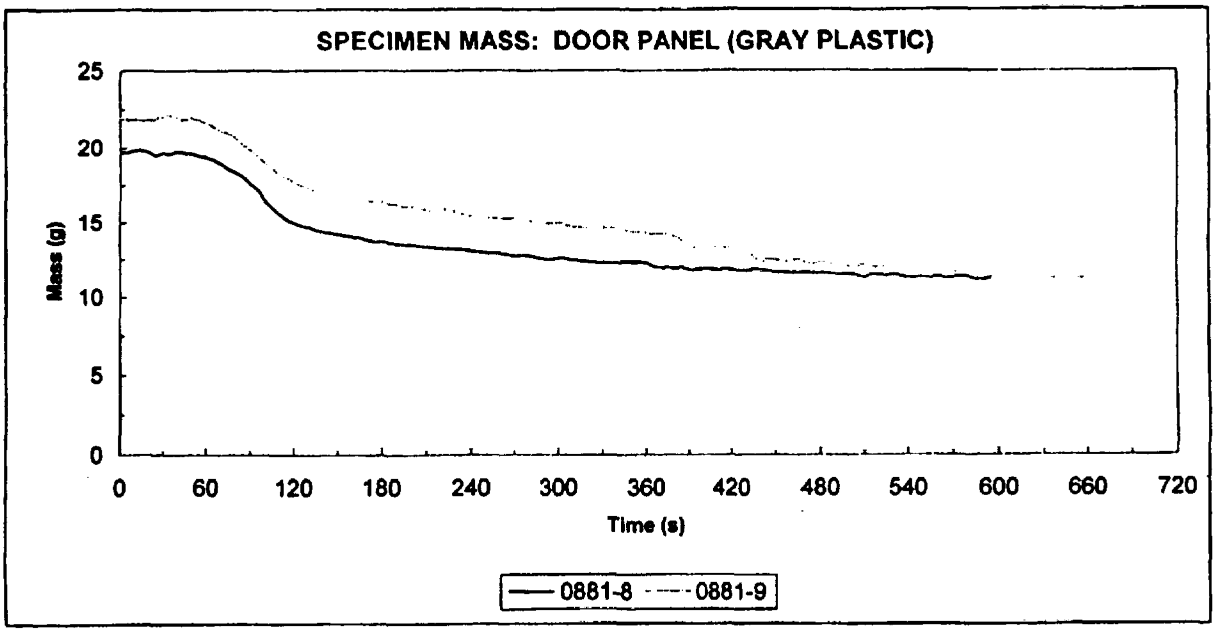




Notes & Observations:

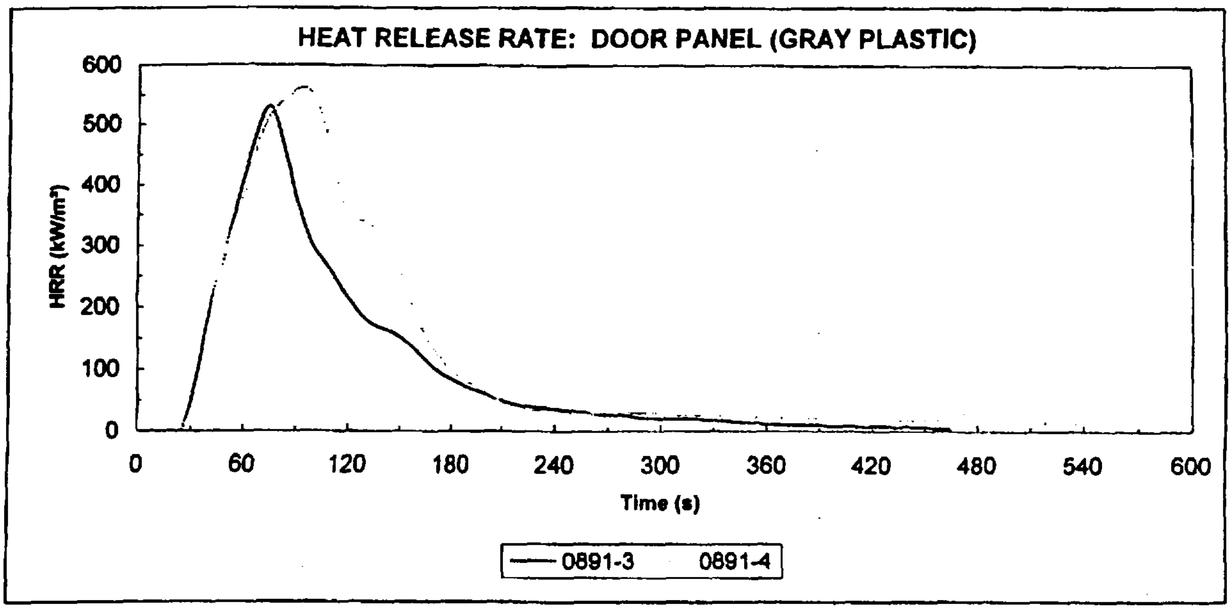
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Honda Civic
SwRI Project No:	18.03614.01	*Material ID:*	Door Panel (Gray Plastic)
Part No.:	83583-S5A-A01ZC	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0891-3	03/30/01	23	354	531	75	44.9	322	225	147	473
0891-4	03/30/01	24	377	563	95	58.6	318	294	189	544
Average		24	366	547	85	51.7	320	260	168	509

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
19.7	9.8	9.8	49.9	4.9	40.4	1.22	4	458	461	412
18.8	6.8	11.7	62.4	7.6	44.1	1.56	2	631	633	475
19.3	8.3	10.8	56.1	6.3	42.3	1.39	3	545	547	444



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Door Panel (Gray Plastic)
SwRI Project No:	18.03614.01	*Heat Flux:*	50 kW/m²

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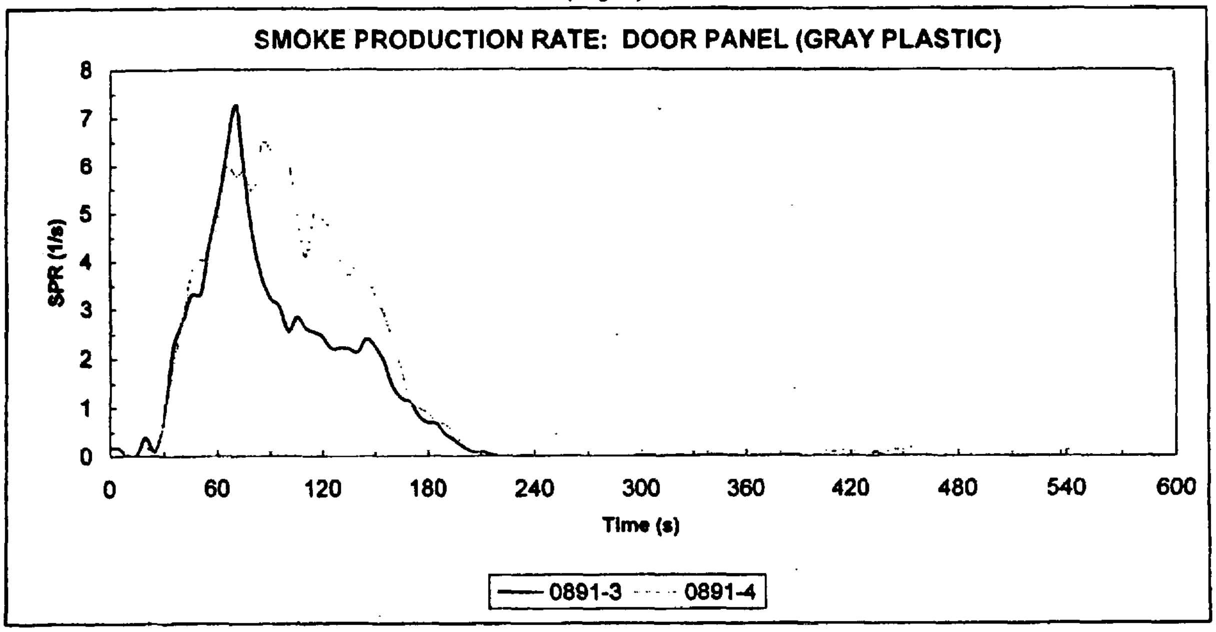
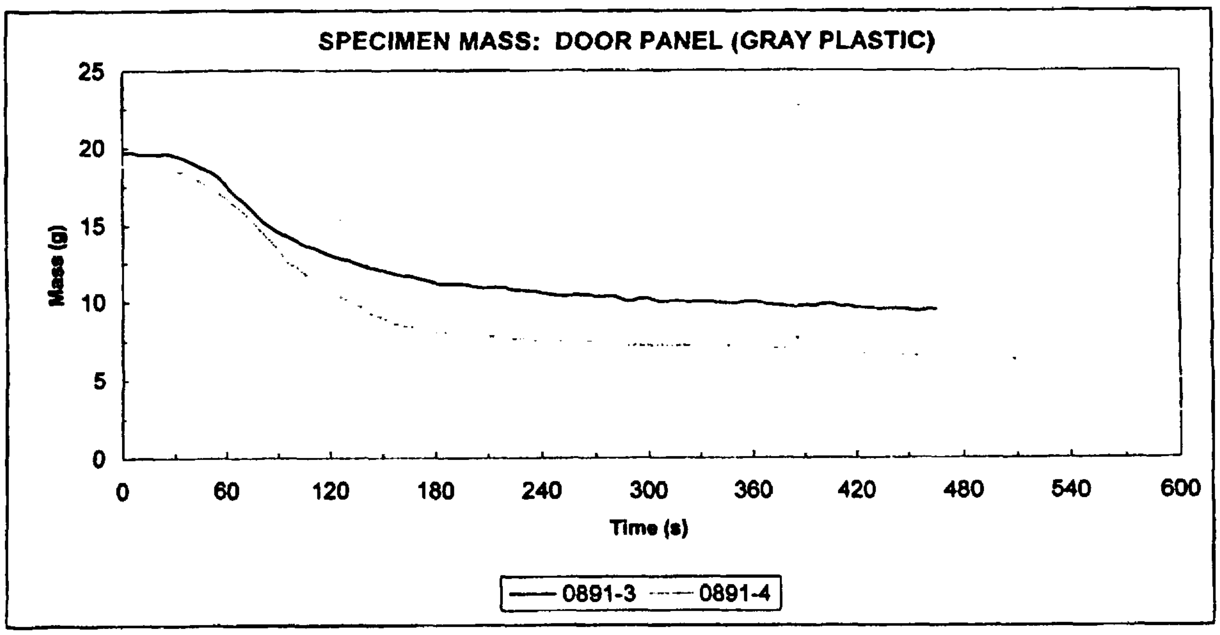




Notes & Observations:

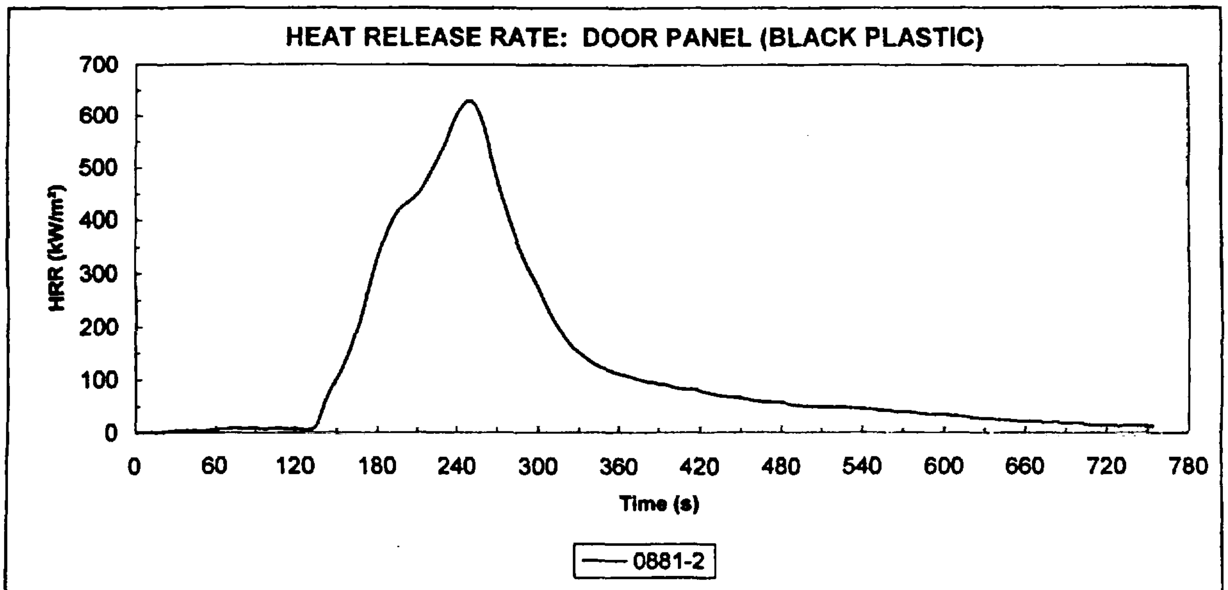
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Honda Civic
SwRI Project No:	18.03614.01	*Material ID:*	Door Panel (Black Plastic)
Part No.:	83583-S5A-A01ZC	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0881-2	03/29/01	128	540	629	250	90.2	179	366	266	602
Average		128	540	629	250	90.2	179	366	266	602

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
29.3	11.9	17.2	58.6	6.3	46.5	0.79	6	527	533	271
29.3	11.9	17.2	58.6	6.3	46.5	0.79	6	527	533	271



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client: General Motors
SwRI Project No: 18.03614.01
Material ID: Door Panel (Black Plastic)
Heat Flux: 20 kW/m²

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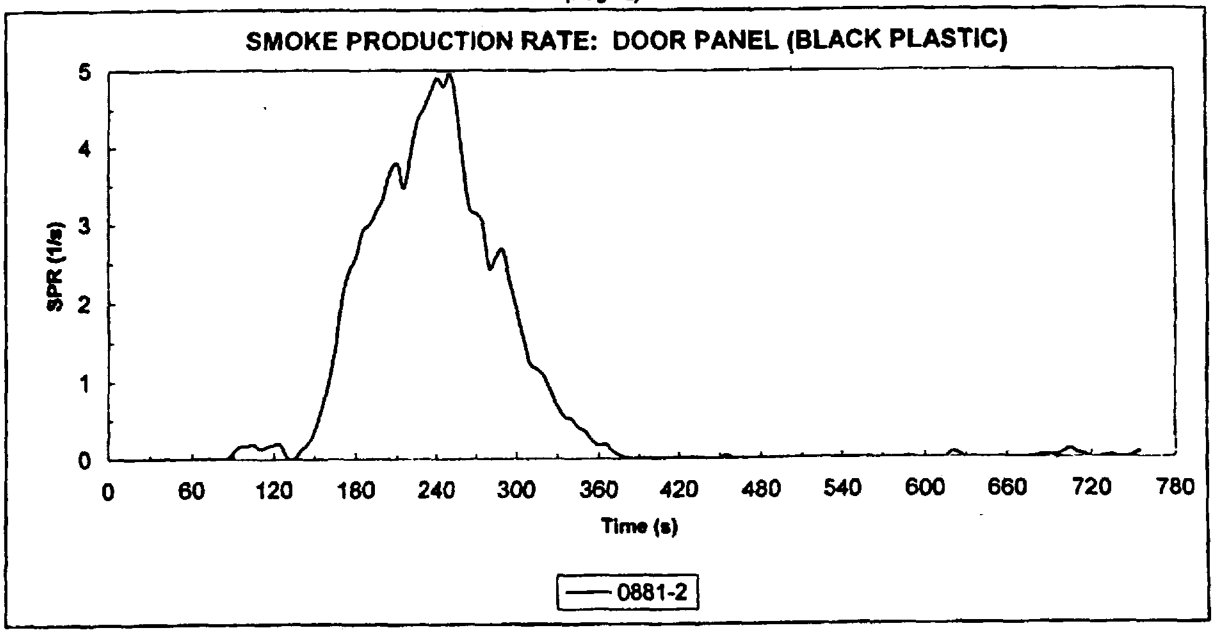
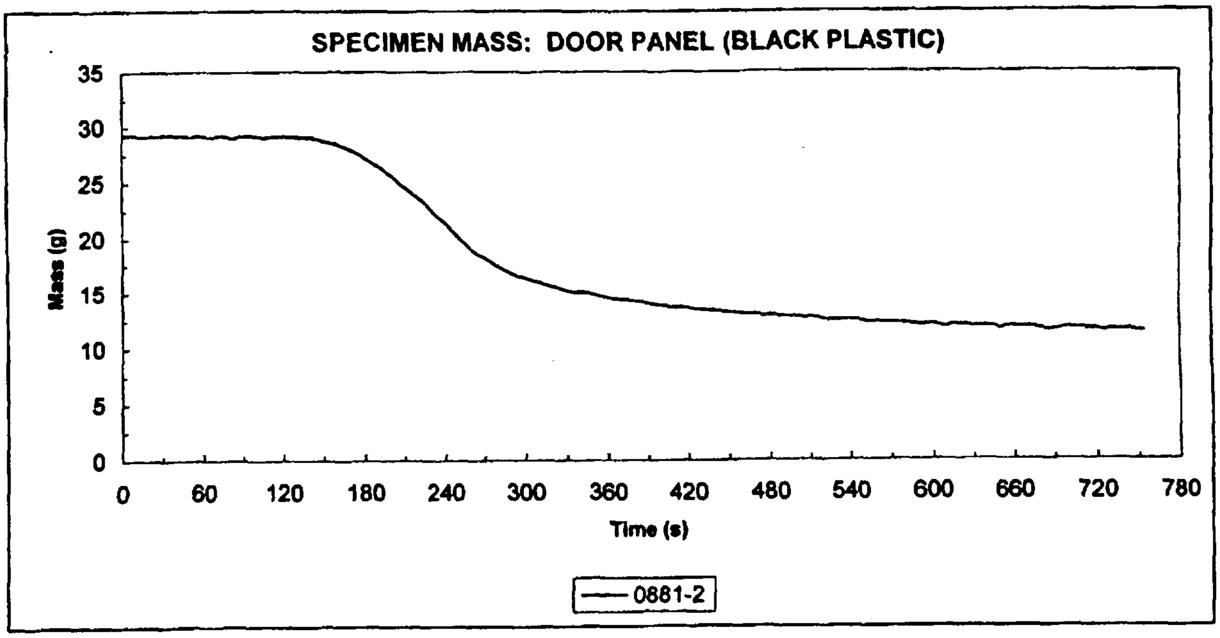




Notes & Observations:

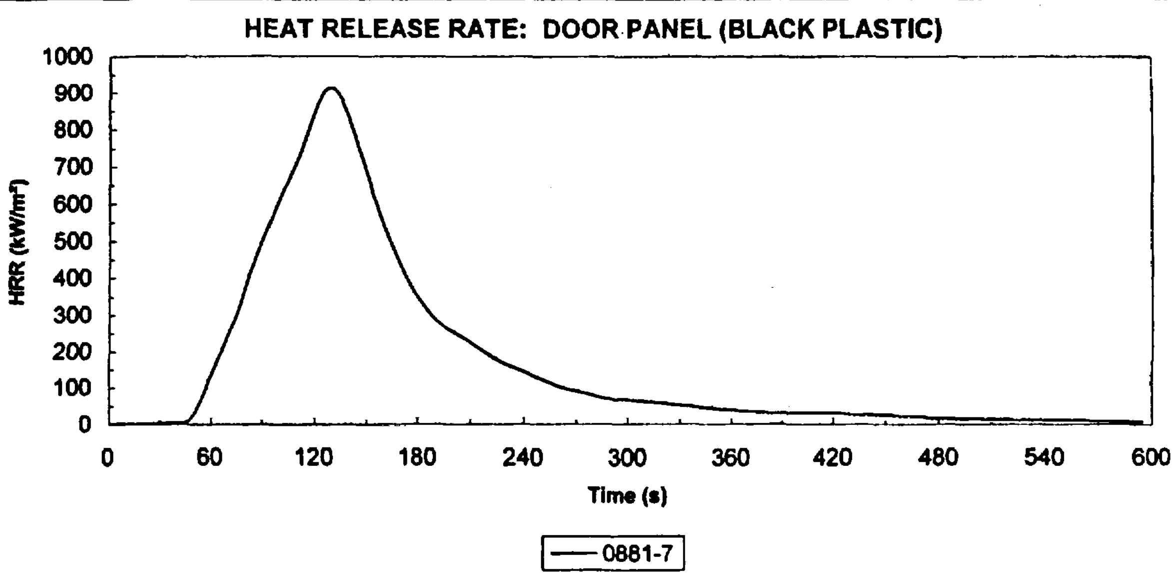
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Honda Civic
SwRI Project No:	18.03614.01	*Material ID:*	Door Panel (Black Plastic)
Part No.:	83583-S5A-A01ZC	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0881-7	03/29/01	40	454	914	130	97.2	263	450	308	858
Average		40	454	914	130	97.2	263	450	308	858

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
24.5	5.8	18.8	76.8	10.0	45.7	1.71	3	850	853	400
24.5	5.8	18.8	76.8	10.0	45.7	1.71	3	850	853	400



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Door Panel (Black Plastic)
SwRI Project No:	18.03614.01	*Heat Flux:*	35 kW/m²

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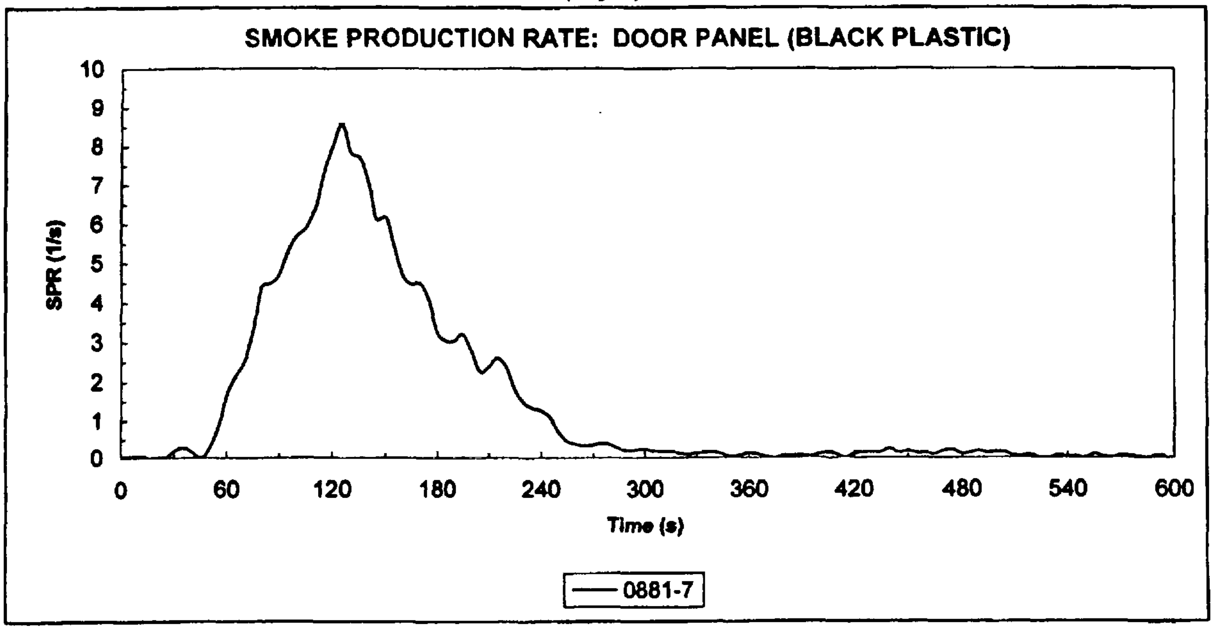
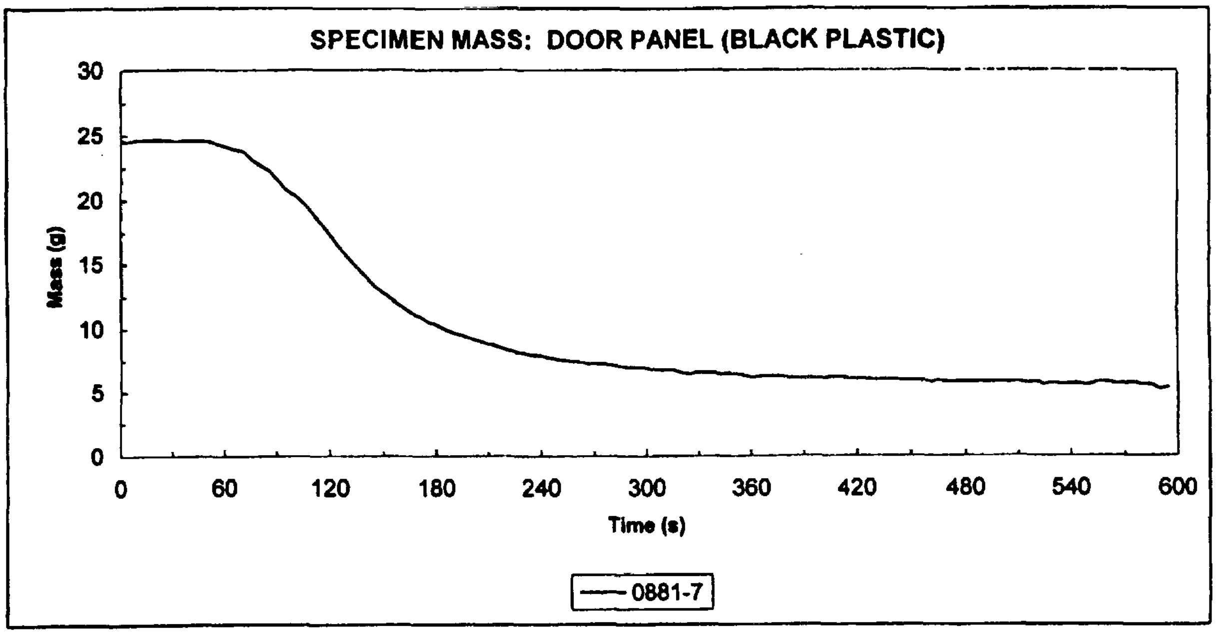




Notes & Observations:

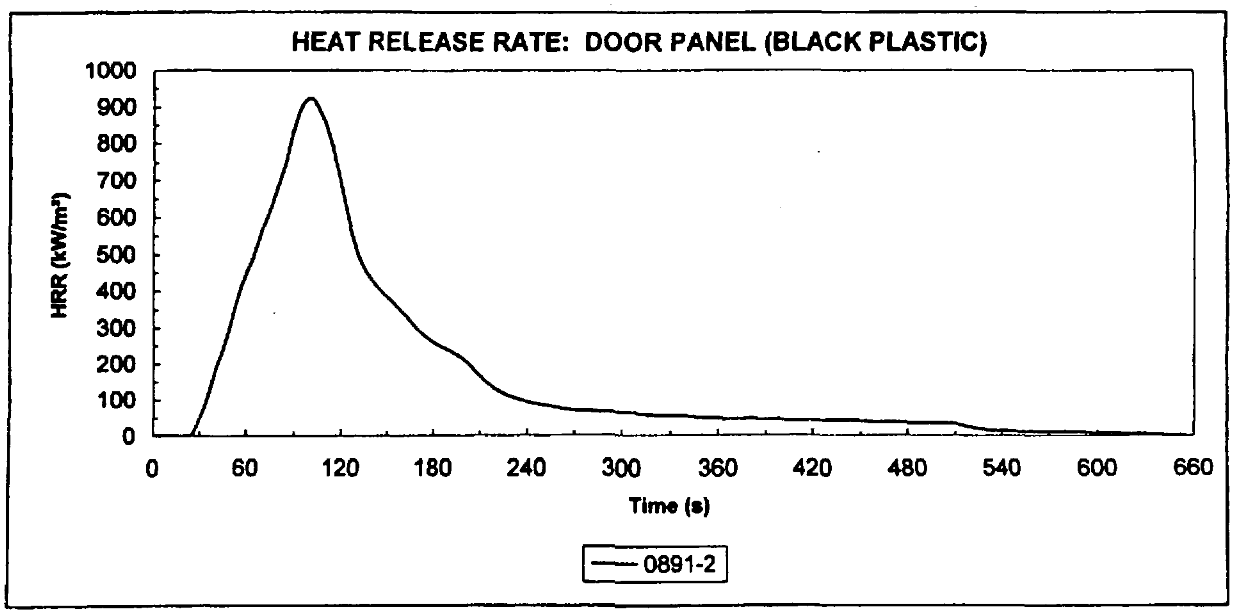
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Honda Civic
SwRI Project No:	18.03614.01	*Material ID:*	Door Panel (Black Plastic)
Part No.:	83583-S5A-A01ZC	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0891-2	03/30/01	23	538	924	100	101.8	377	456	309	865
Average		23	538	924	100	101.8	377	456	309	865

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
23.8	3.2	20.7	86.8	8.1	43.6	2.13	6	1198	1204	512
23.8	3.2	20.7	86.8	8.1	43.6	2.13	6	1198	1204	512



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Door Panel (Black Plastic)
SwRI Project No:	18.03614.01	*Heat Flux:*	50 kW/m²

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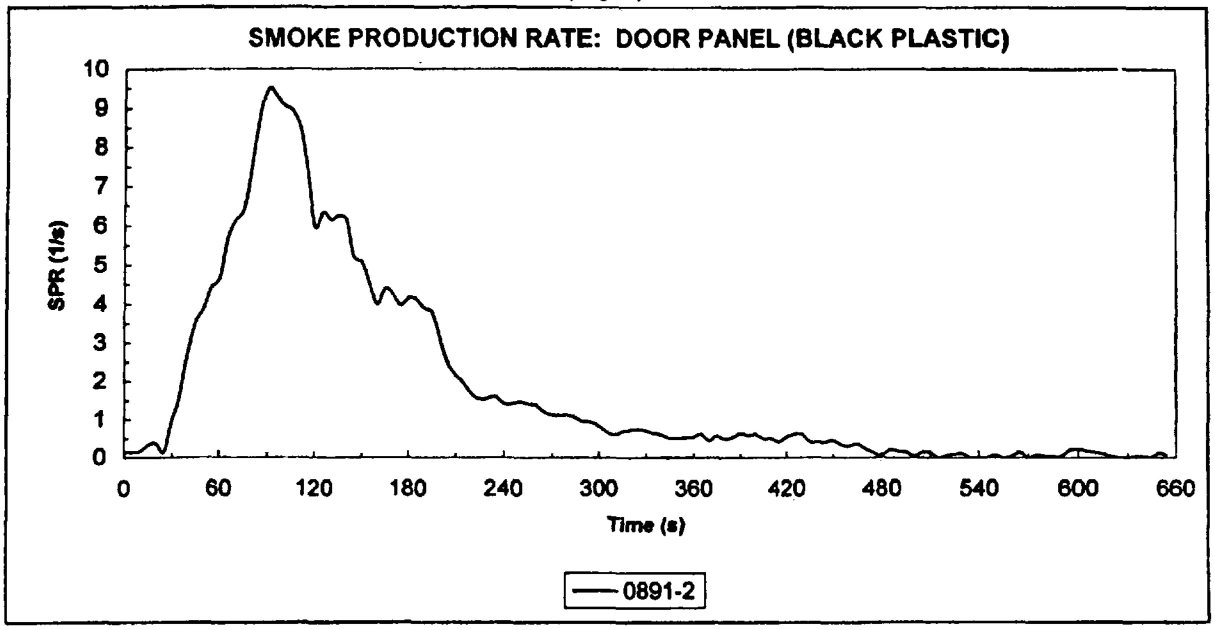
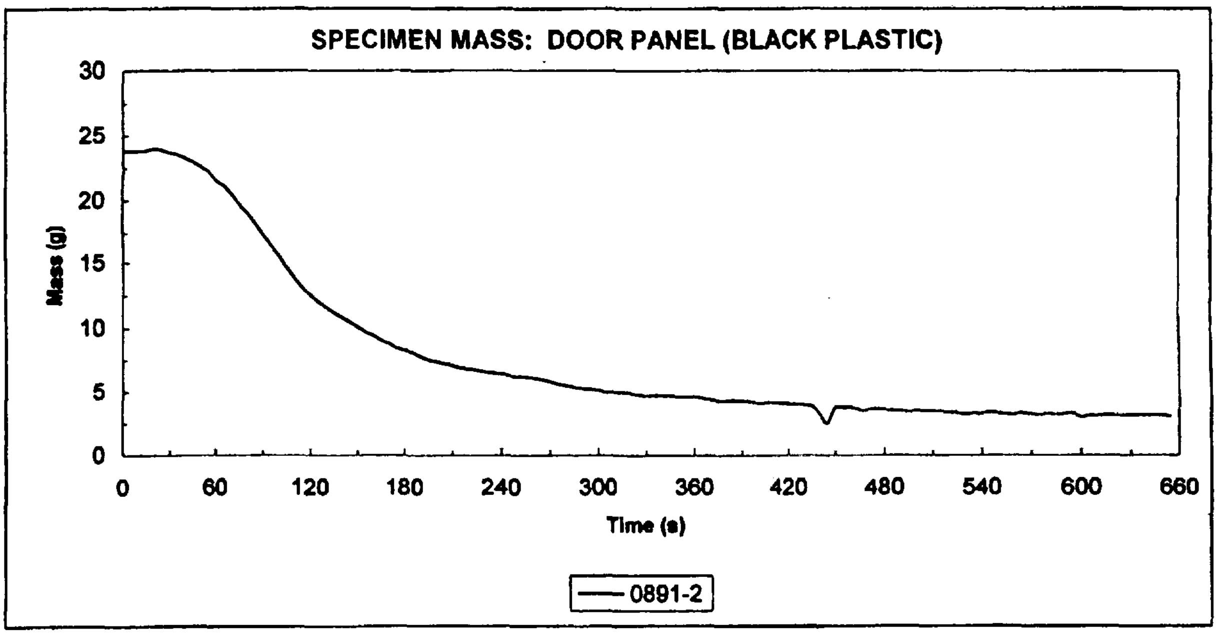




Notes & Observations:

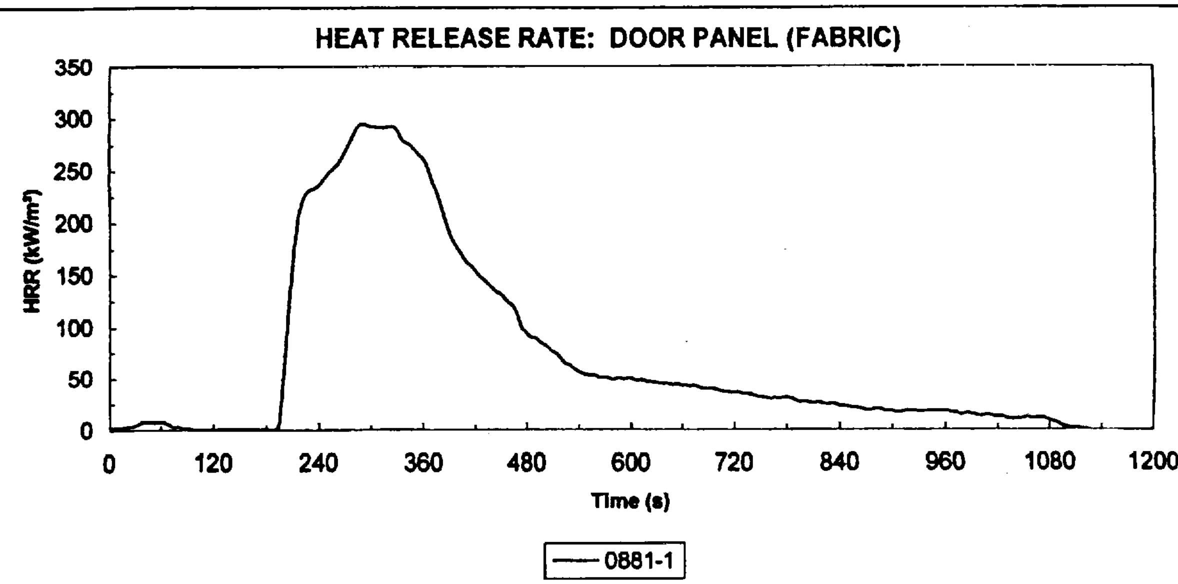
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Honda Civic
SwRI Project No:	18.03614.01	*Material ID:*	Door Panel (Fabric)
Part No.:	83583-S5A-A01ZC	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\ max}$ (kW/m²)
0881-1	03/29/01	190	850	295	290	80.4	171	242	205	293
Average		190	850	295	290	80.4	171	242	205	293

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
31.5	14.0	17.5	55.7	3.5	40.5	0.70	9	721	730	363
31.5	14.0	17.5	55.7	3.5	40.5	0.70	9	721	730	363



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Door Panel (Fabric)
SwRI Project No:	18.03614.01	*Heat Flux:*	20 kW/m²

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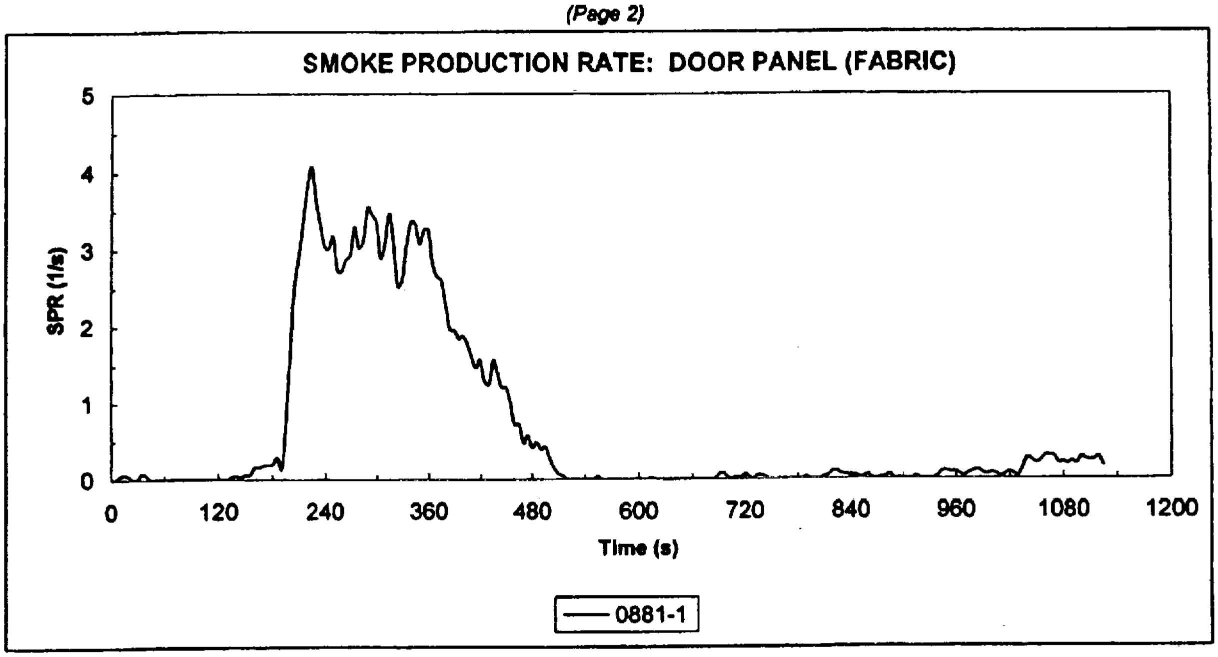

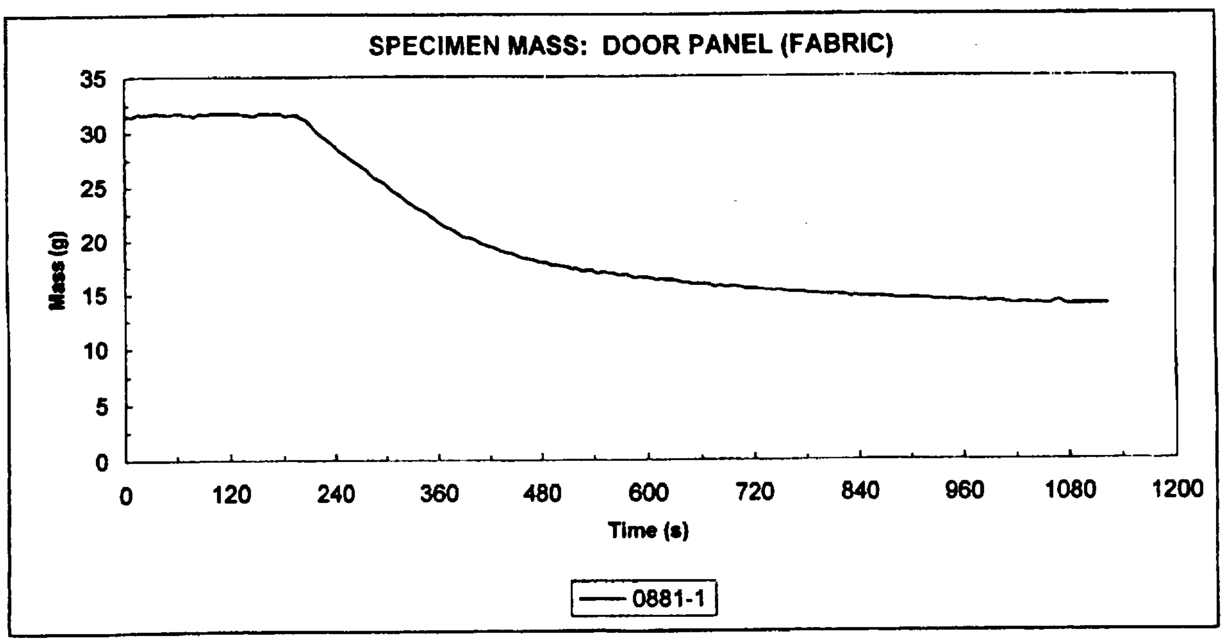

Notes & Observations:

Sample thickness

Plastic - 3 mm

Fabric - 1 mm

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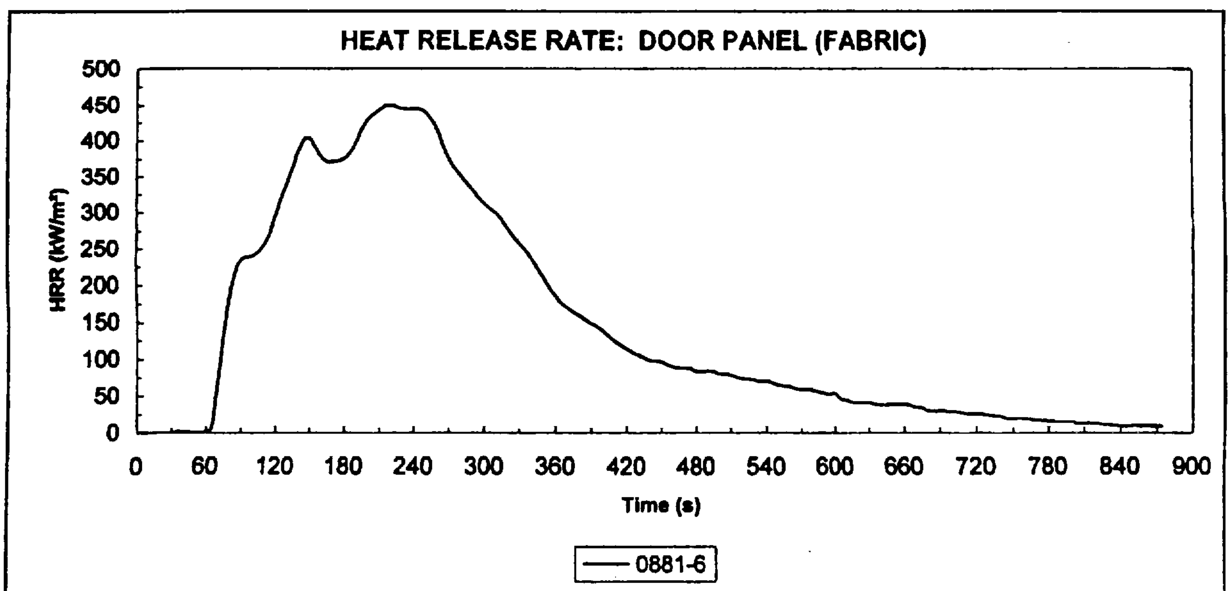
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Honda Civic
SwRI Project No:	18.03614.01	*Material ID:*	Door Panel (Fabric)
Part No.:	83583-S5A-A01ZC	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0881-6	03/29/01	58	732	450	220	126.1	186	329	324	447
Average		58	732	450	220	126.1	186	329	324	447

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
33.0	5.2	27.7	84.0	6.6	40.2	1.63	2	1291	1293	412
33.0	5.2	27.7	84.0	6.6	40.2	1.63	2	1291	1293	412



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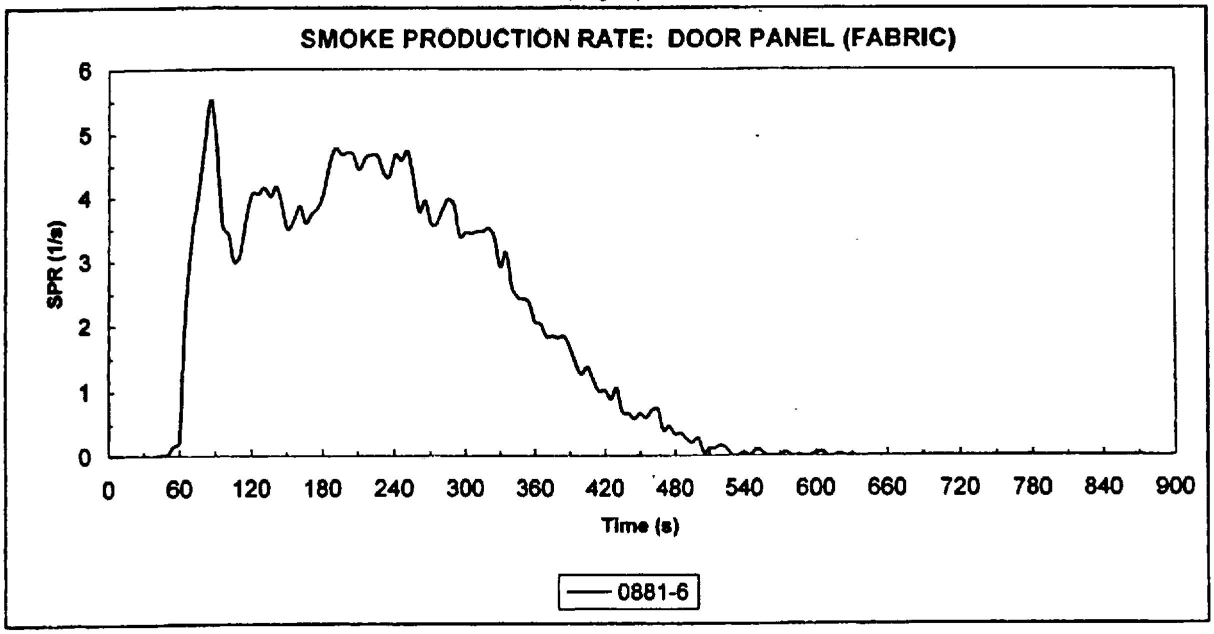
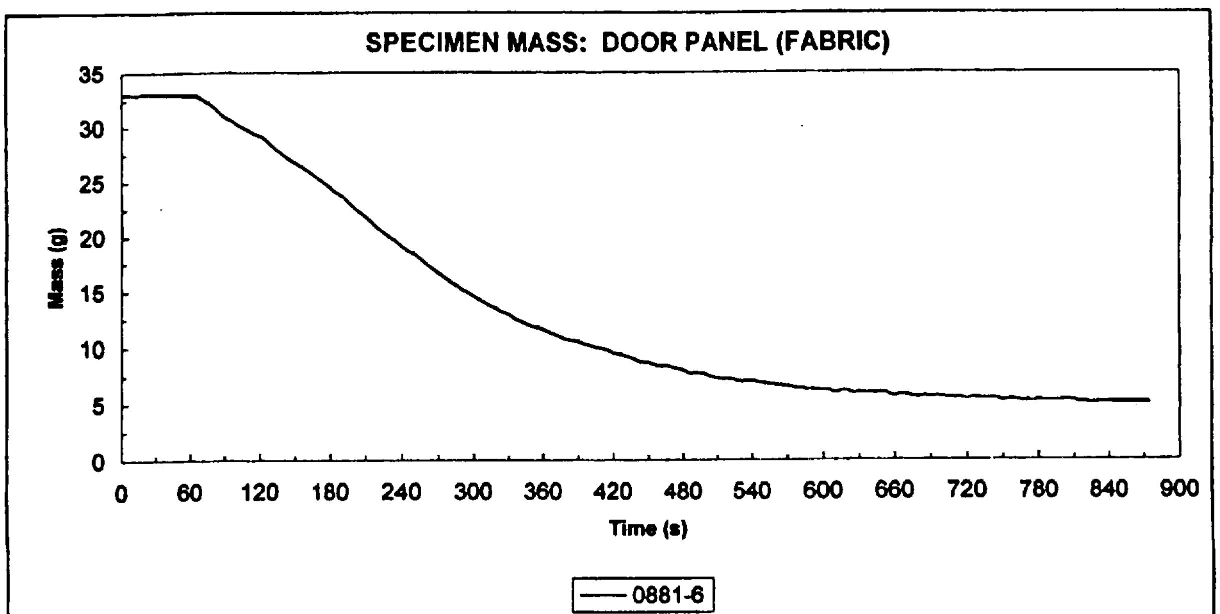
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Door Panel (Fabric)
SwRI Project No:	18.03614.01	*Heat Flux:*	35 kW/m²

(Page 2)





Notes & Observations:

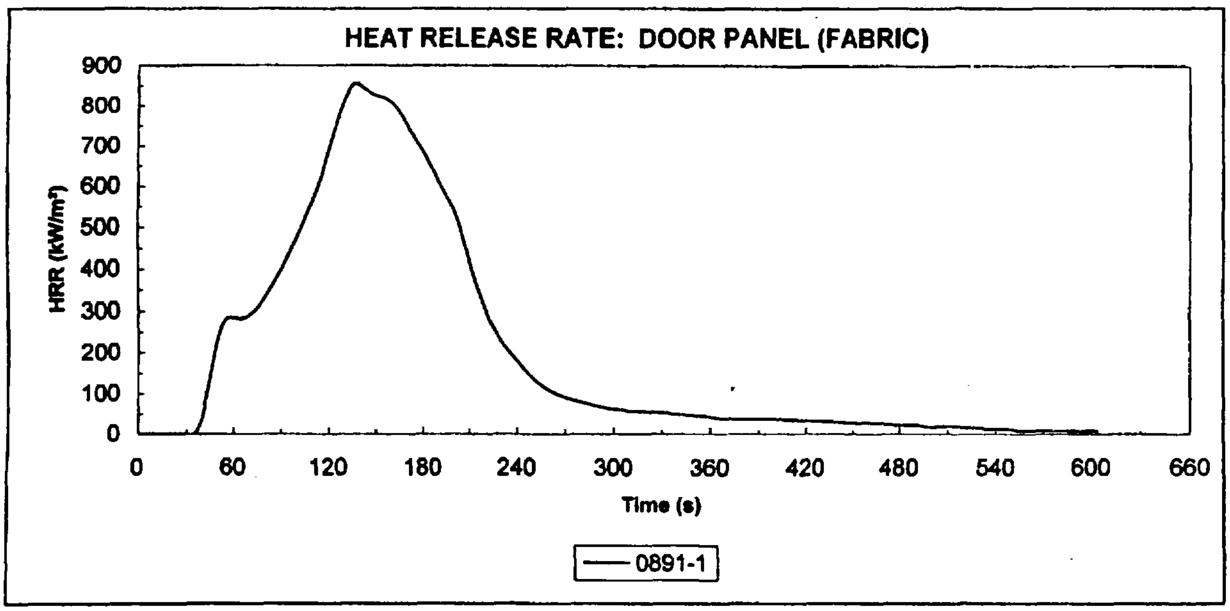
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Honda Civic
SwRI Project No:	18.03614.01	*Material ID:*	Door Panel (Fabric)
Part No.:	83583-S5A-A01ZC	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0891-1	03/30/01	35	481	856	135	116.4	265	535	369	834
Average		35	481	856	135	116.4	265	535	369	834

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
28.7	1.8	26.9	93.7	10.1	38.3	2.92	3	1515	1518	498
28.7	1.8	26.9	93.7	10.1	38.3	2.92	3	1515	1518	498



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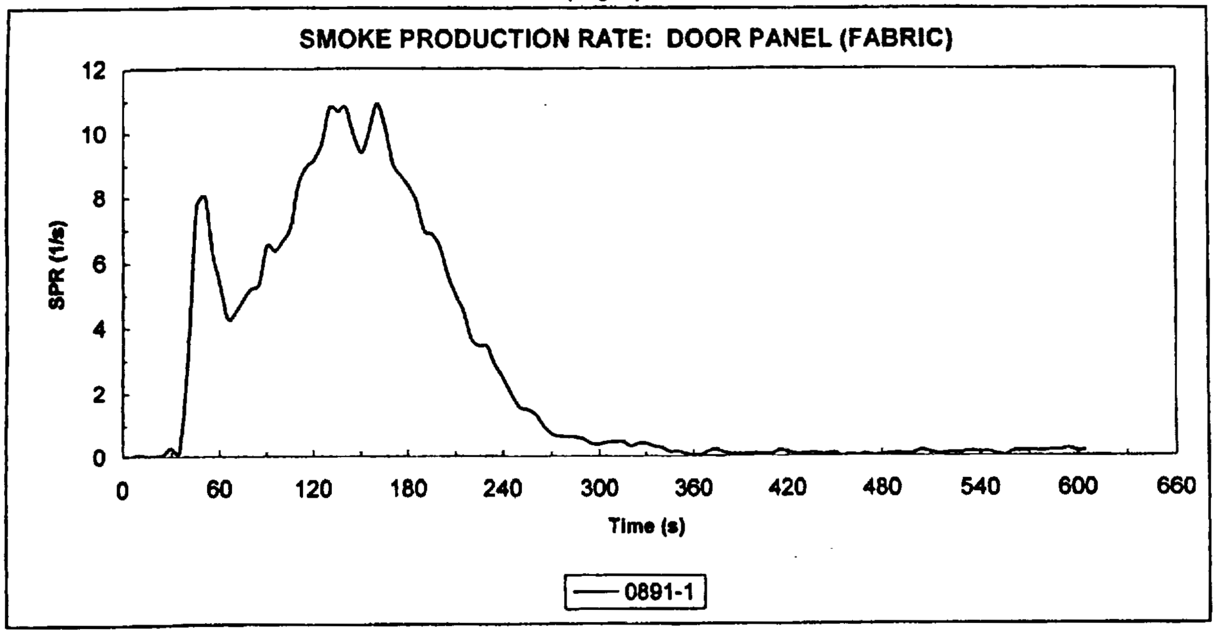
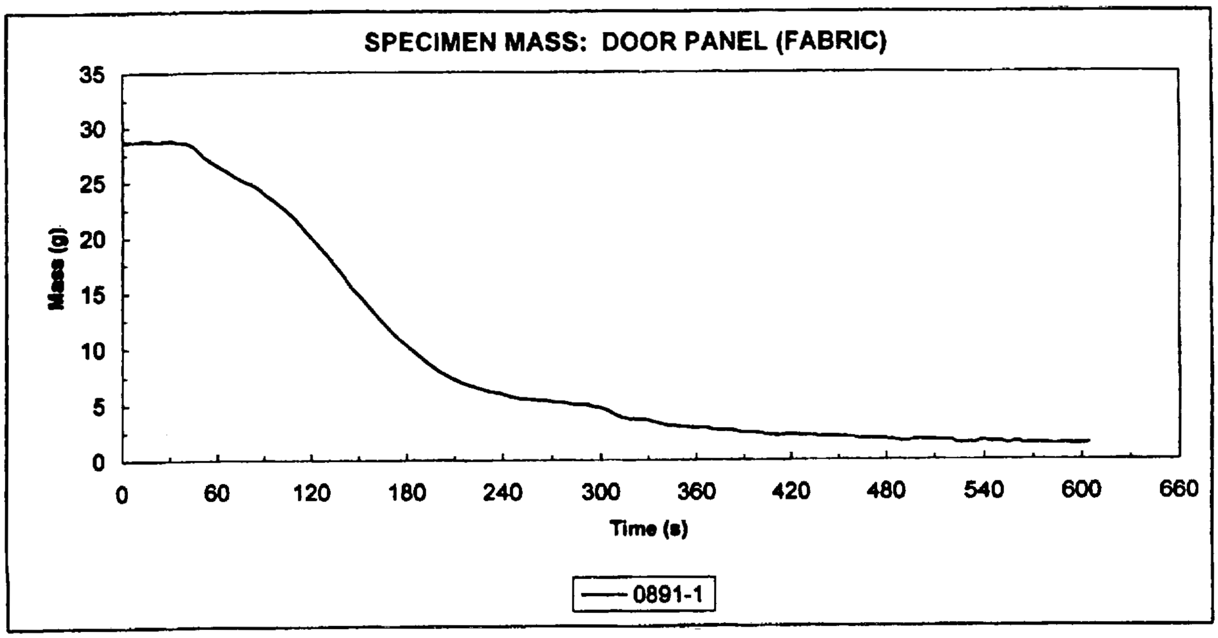
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Door Panel (Fabric)
SwRI Project No:	18.03614.01	*Heat Flux:*	50 kW/m²

(Page 2)





Notes & Observations:

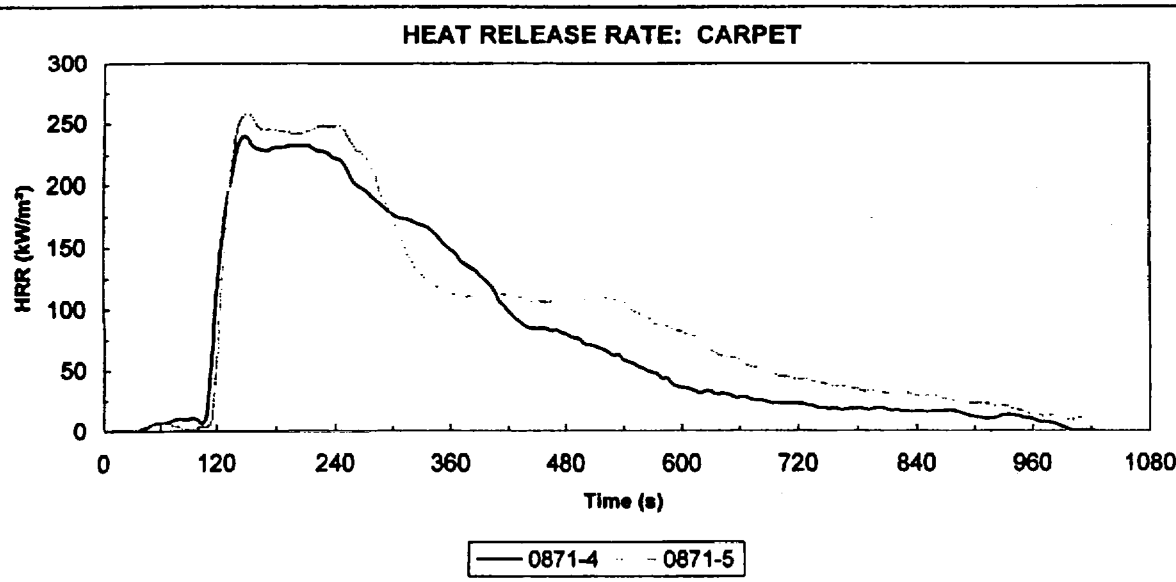
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Honda Civic
SwRI Project No:	18.03614.01	*Material ID:*	Carpet
Part No.:	83801-S5A-A01ZB	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0871-4	03/28/01	98	841	239	145	76.2	151	198	182	233
0871-5	03/28/01	101	829	259	150	88.3	145	209	179	251
Average		100	835	249	148	82.2	148	203	181	242

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
31.1	7.9	23.1	74.4	4.2	29.1	0.93	9	870	880	333
32.8	7.8	24.8	75.8	4.4	31.4	1.11	3	1035	1038	368
32.0	7.8	24.0	75.1	4.3	30.3	1.02	6	953	959	350



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Carpet
SwRI Project No:	18.03614.01	*Heat Flux:*	20 kW/m²

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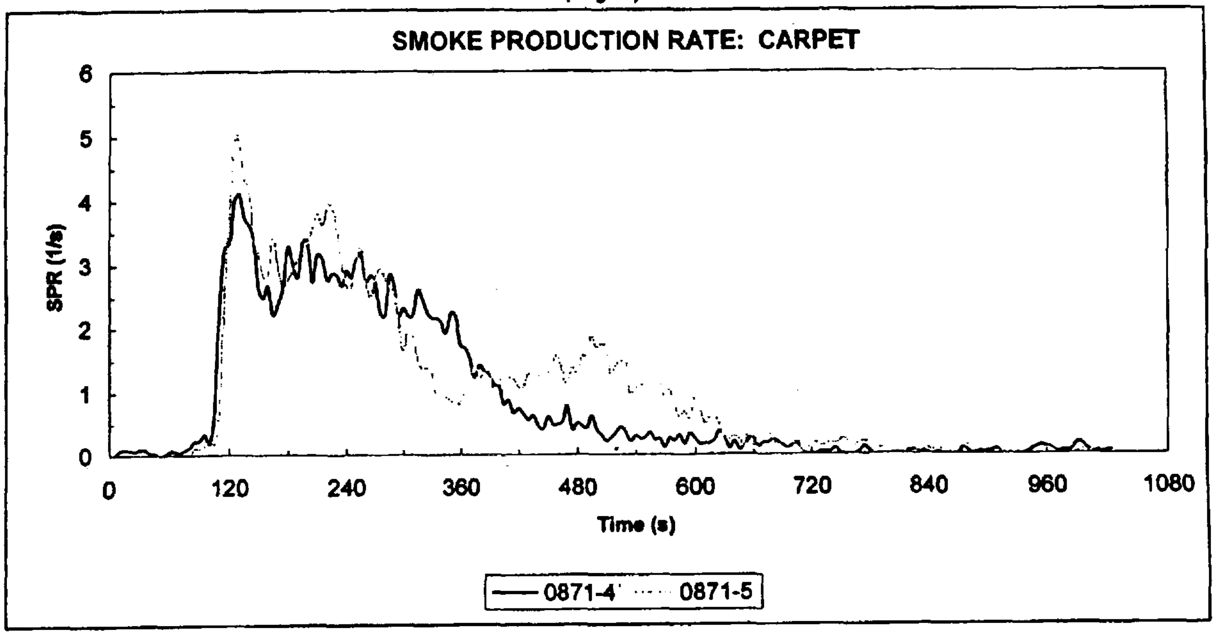

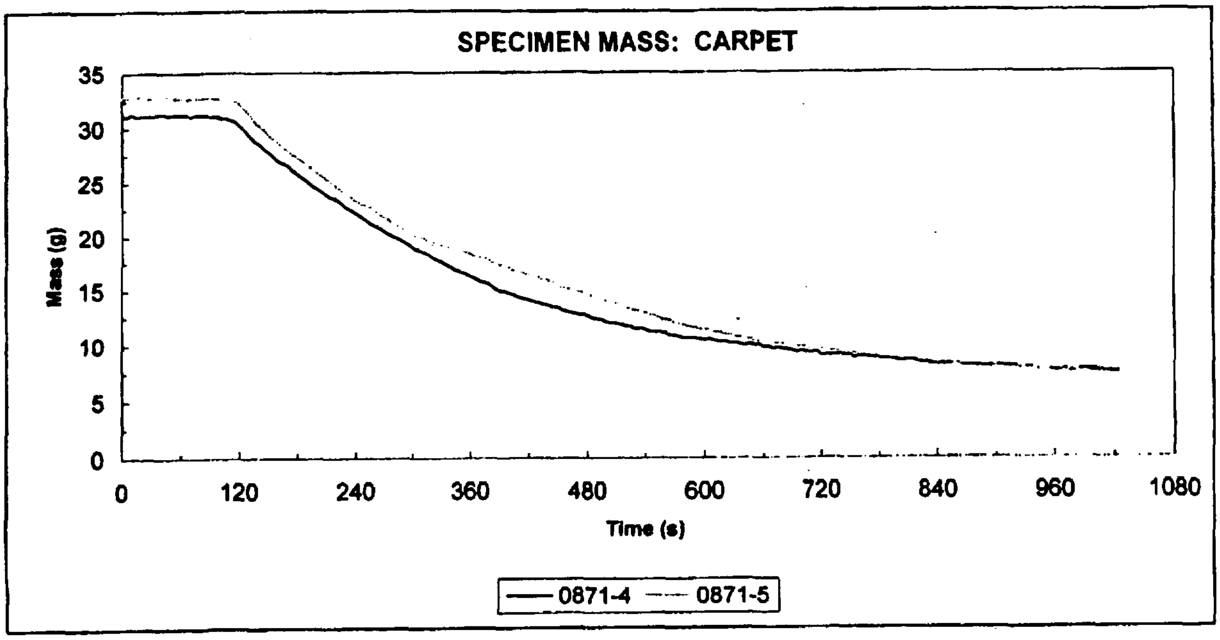

Notes & Observations:
Sample thickness
Pad - 16 mm
Carpet - 6 mm

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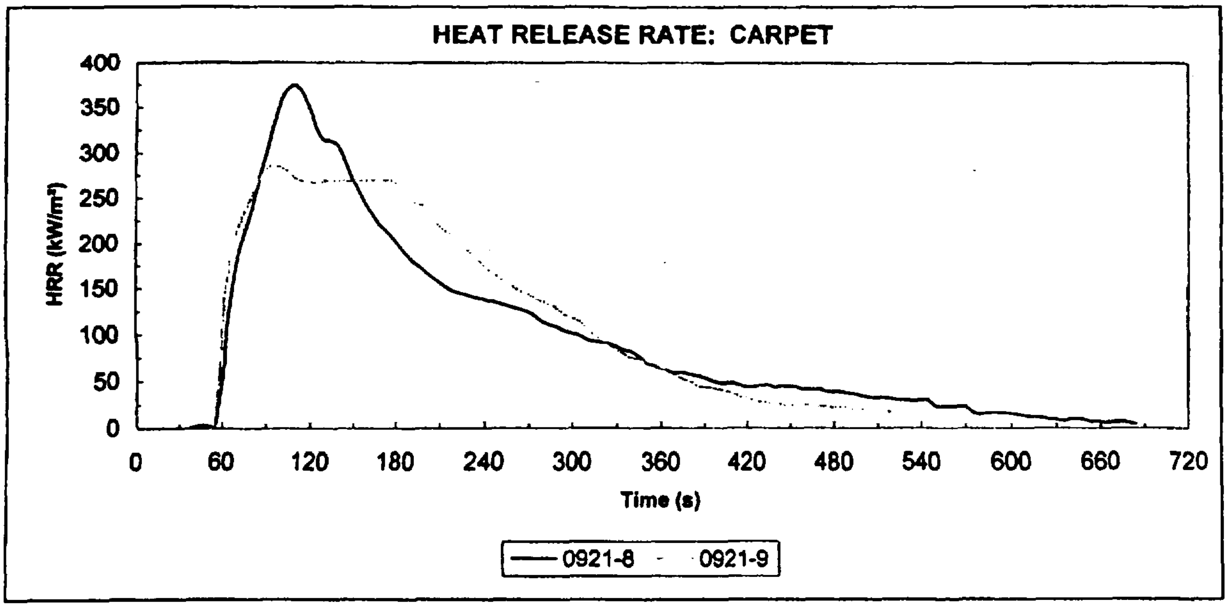
ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Honda Civic
SwRI Project No:	18.03614.01	*Material ID:*	Carpet
Part No.:	83801-S5A-A01ZB	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\ max}$ (kW/m²)
0921-8	04/02/01	55	545	374	110	64.1	247	232	182	357
0921-9	04/02/01	52	465	287	95	63.7	209	238	193	279
Average		54	505	331	103	63.9	228	235	188	318

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
26.8	8.6	18.2	68.0	5.6	31.1	1.43	6	856	862	415
26.0	7.4	18.7	71.8	6.9	30.2	1.92	9	991	1000	470
26.4	8.0	18.4	69.9	6.2	30.6	1.67	8	924	931	442



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Carpet
SwRI Project No:	18.03614.01	*Heat Flux:*	35 kW/m²

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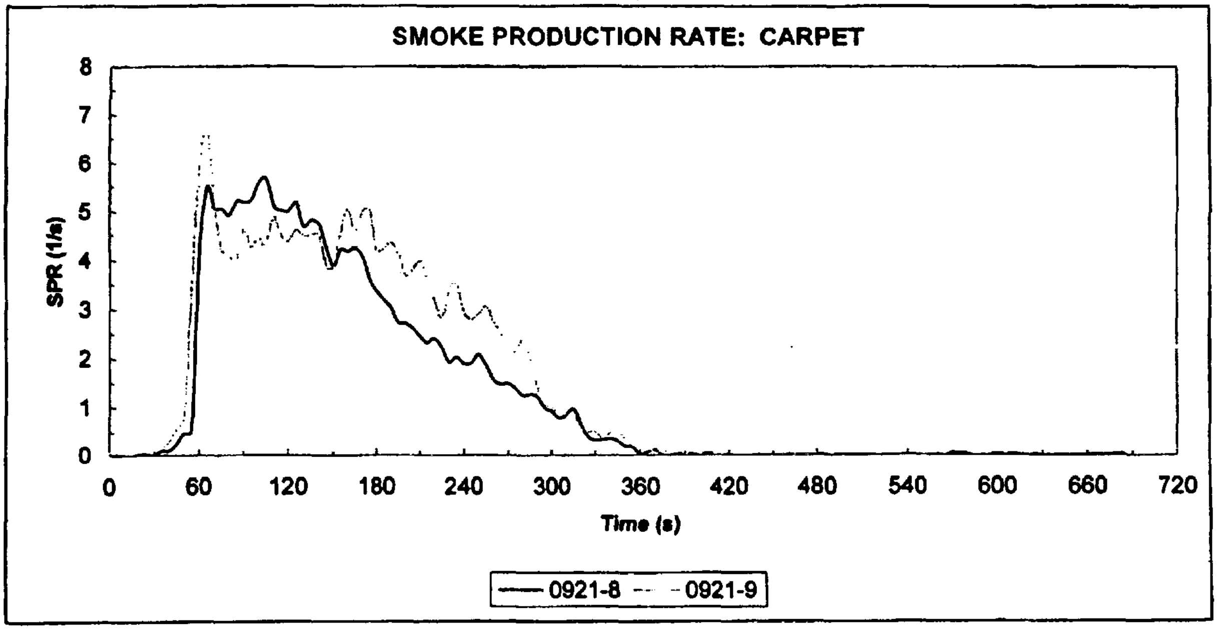
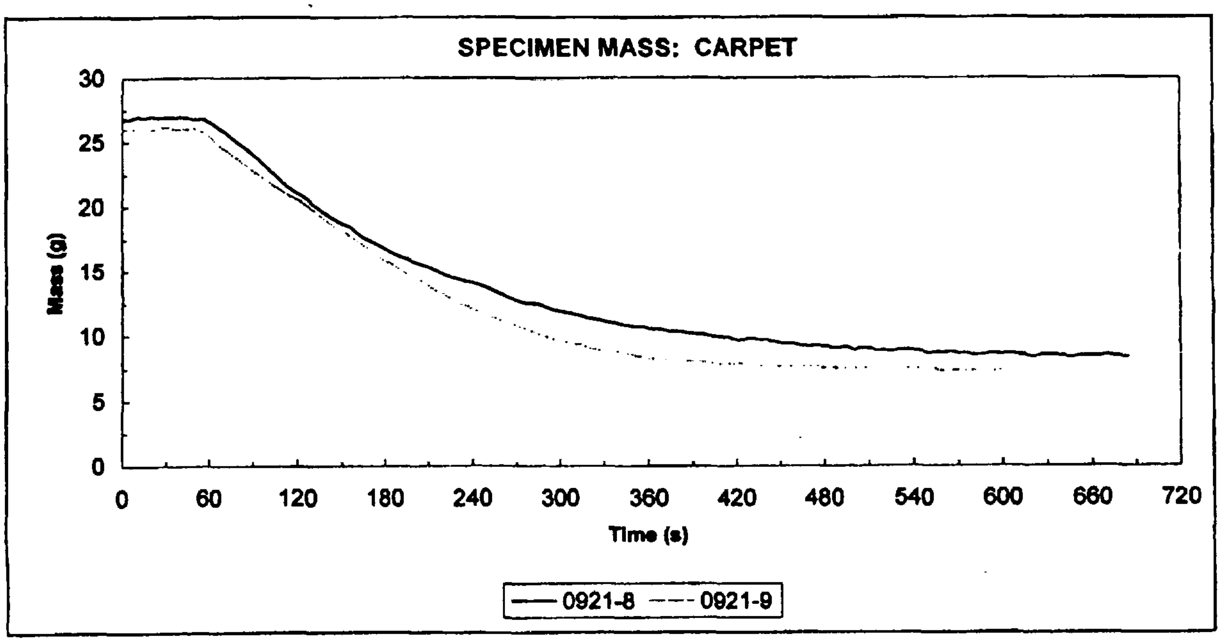




Notes & Observations:

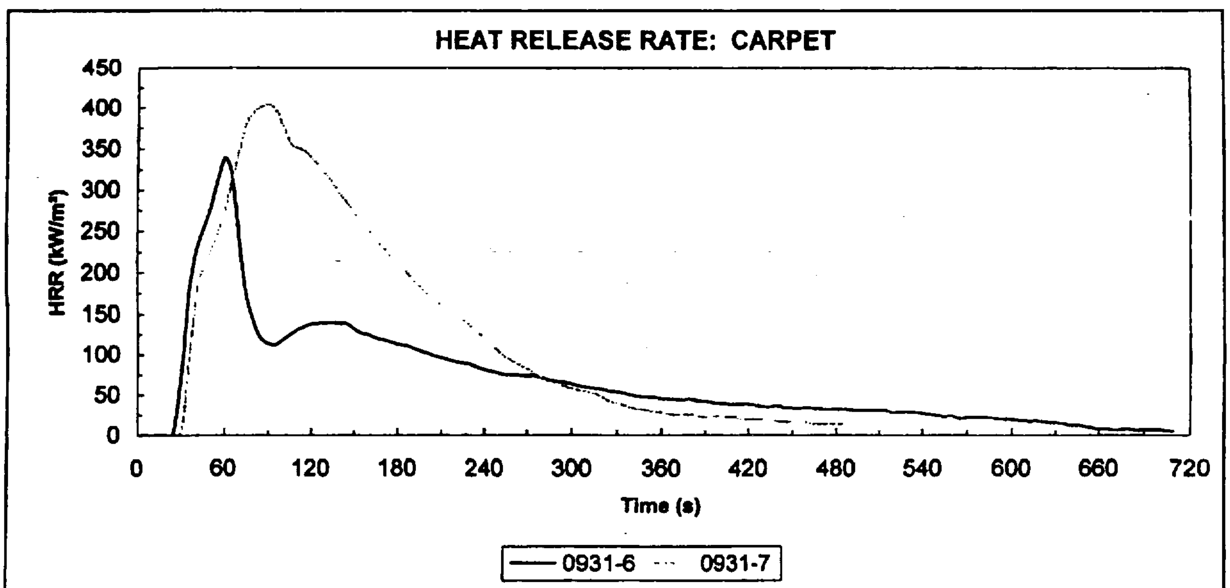
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Honda Civic
SwRI Project No:	18.03614.01	*Material ID:*	Carpet
Part No.:	83801-S5A-A01ZB	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0931-6	04/01/01	25	591	340	60	46.5	214	154	122	287
0931-7	04/01/01	29	387	404	90	62.3	270	273	200	391
Average		27	489	372	75	54.4	242	213	161	339

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
26.2	13.9	12.3	46.8	3.1	33.5	0.56	2	342	345	247
25.7	7.1	18.6	72.2	8.4	29.7	2.31	6	966	972	460
26.0	10.5	15.4	59.5	5.7	31.6	1.43	4	654	658	353



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Carpet
SwRI Project No:	18.03614.01	*Heat Flux:*	50 kW/m²

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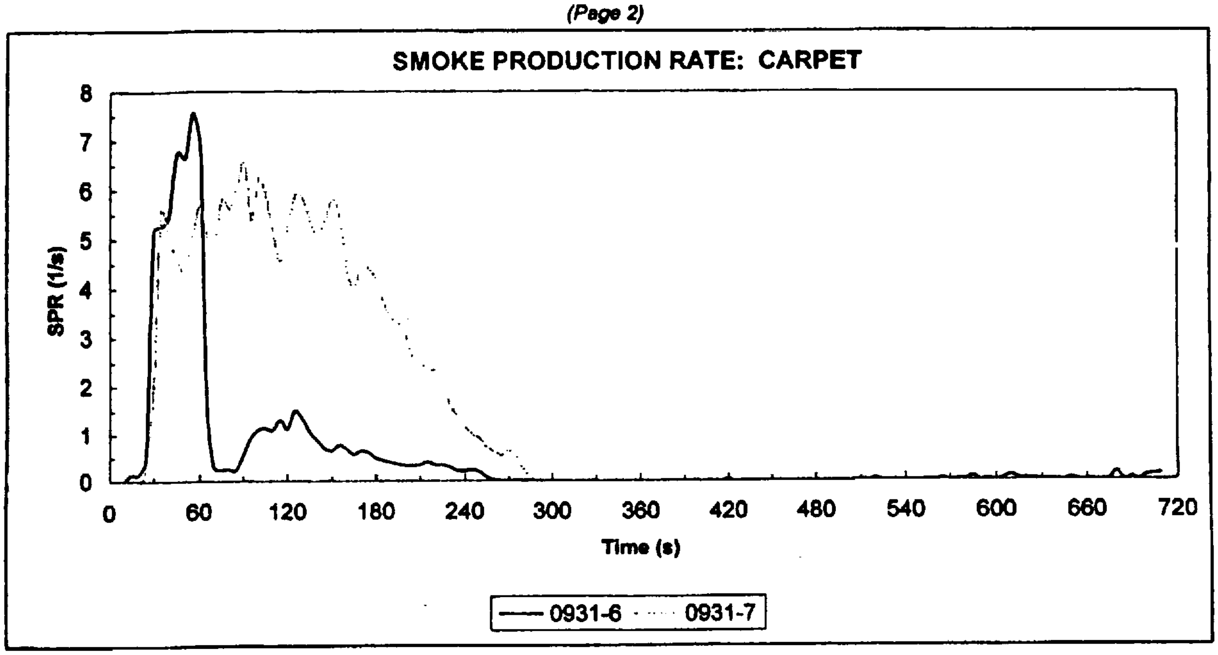
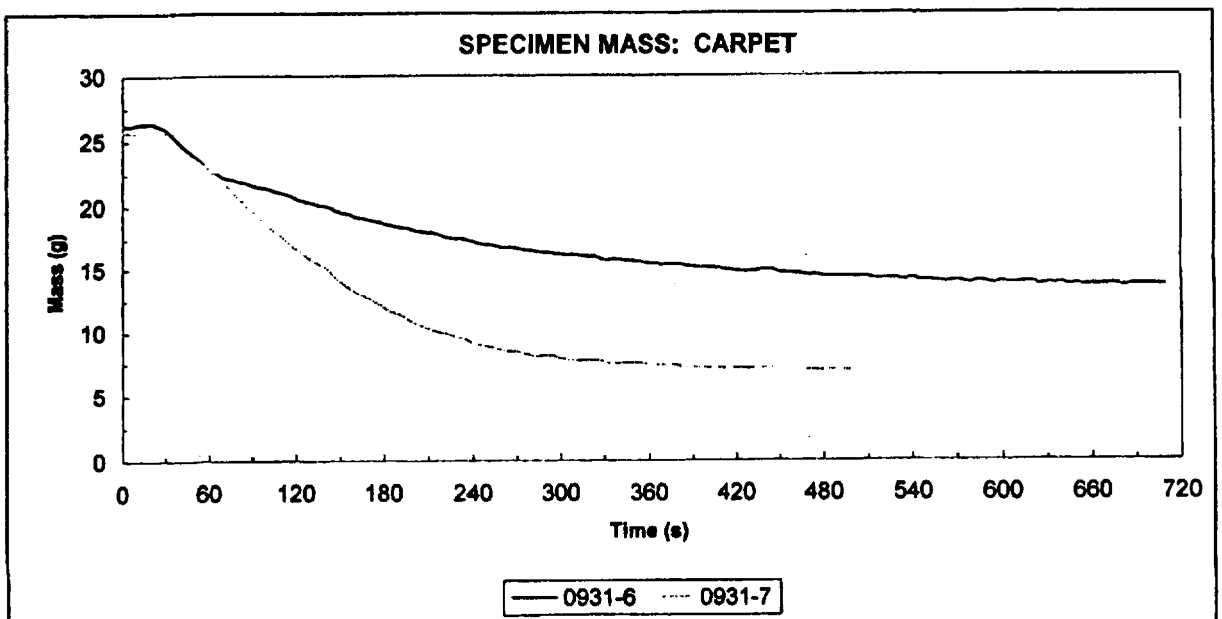




Notes & Observations:

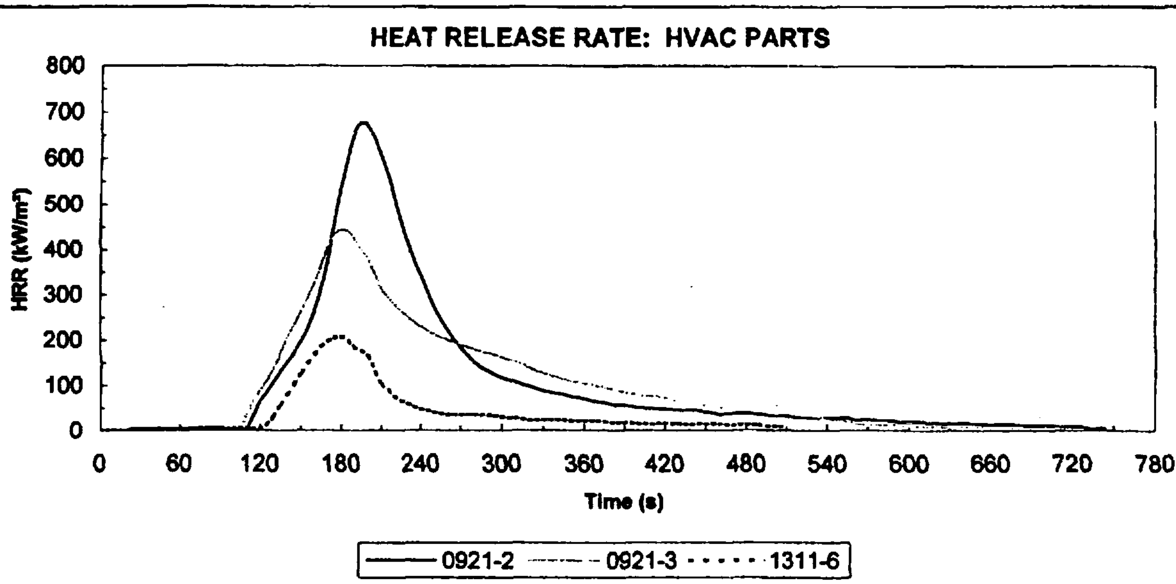
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Honda Civic
SwRI Project No:	18.03614.01	*Material ID:*	HVAC Parts
Part No.:	77400-S5A-A01	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0921-2	04/02/01	102	560	680	195	75.5	110	316	225	640
0921-3	04/02/01	99	526	445	180	68.1	149	249	199	423
1311-6	05/11/01	109	312	207	180	19.0	85	90	63	195
Average		103	466	444	185	54.2	115	218	162	419

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
19.2	4.0	15.2	79.1	5.5	43.9	0.92	4	609	612	354
19.6	6.5	13.1	67.0	4.7	45.9	0.67	1	421	423	284
15.2	11.3	3.9	25.8	2.3	42.8	0.10	5	37	42	84
18.0	7.3	10.7	57.3	4.1	44.2	0.56	3	356	359	241



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	HVAC Parts
SwRI Project No:	18.03614.01	*Heat Flux:*	20 kW/m²

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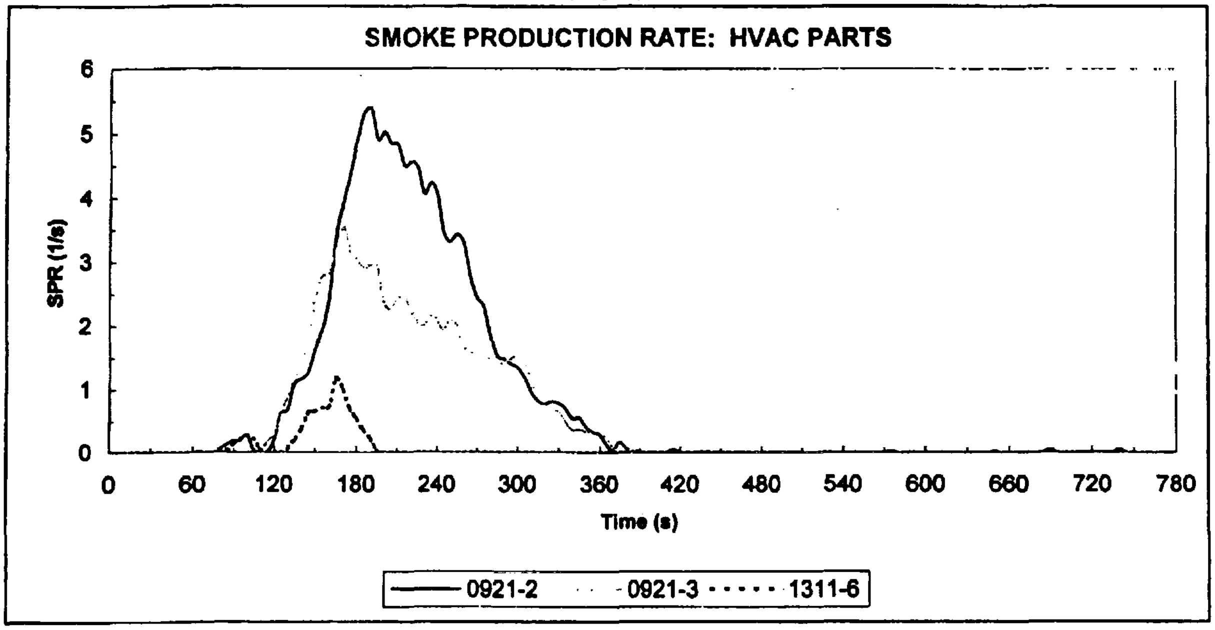
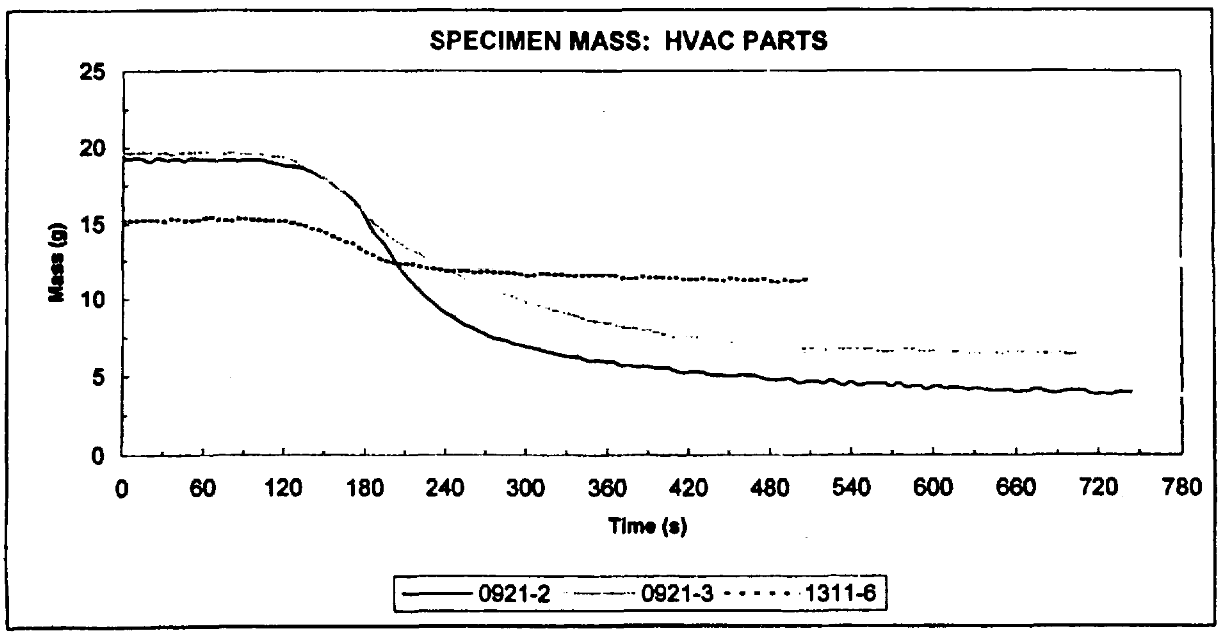




Notes & Observations:

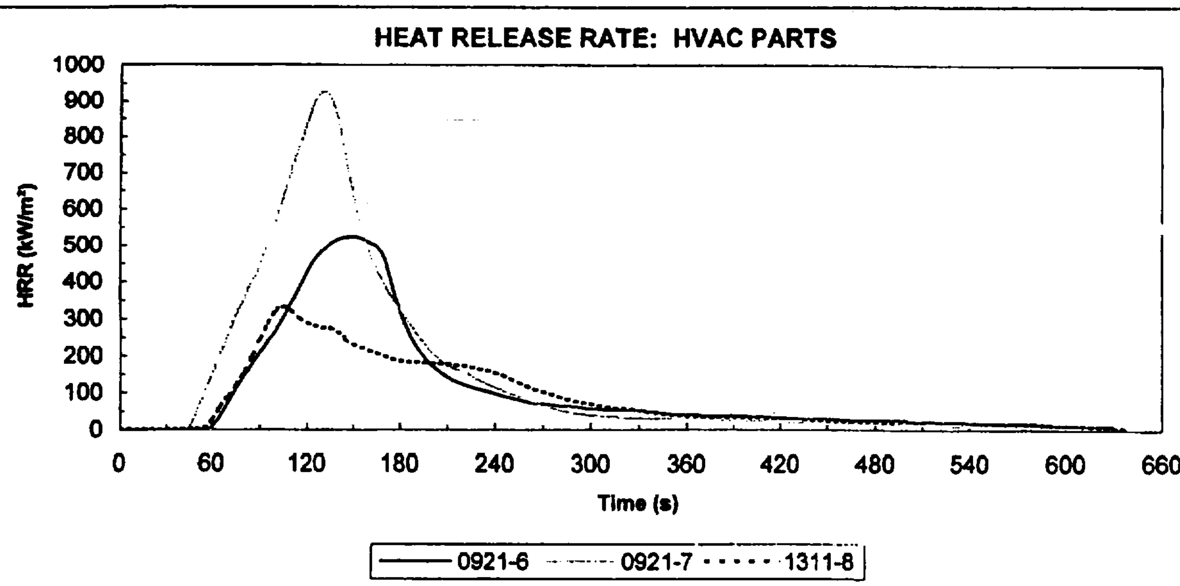
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Honda Civic
SwRI Project No:	18.03614.01	*Material ID:*	HVAC Parts
Part No.:	77400-S5A-A01	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0921-6	04/02/01	50	494	525	150	64.3	146	279	194	516
0921-7	04/02/01	46	512	927	130	90.0	306	433	286	862
1311-8	05/11/01	41	498	332	105	52.4	114	193	156	309
Average		46	501	595	128	68.9	189	302	212	562

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
18.9	4.8	14.1	74.6	5.7	40.3	0.75	4	406	410	254
20.4	2.6	17.5	85.8	10.6	45.4	1.68	3	948	951	479
13.5	2.5	11.1	82.4	4.3	41.6	0.65	8	347	354	275
17.6	3.3	14.2	81.0	6.8	42.5	1.03	5	567	572	336



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	HVAC Parts
SwRI Project No:	18.03614.01	*Heat Flux:*	35 kW/m²

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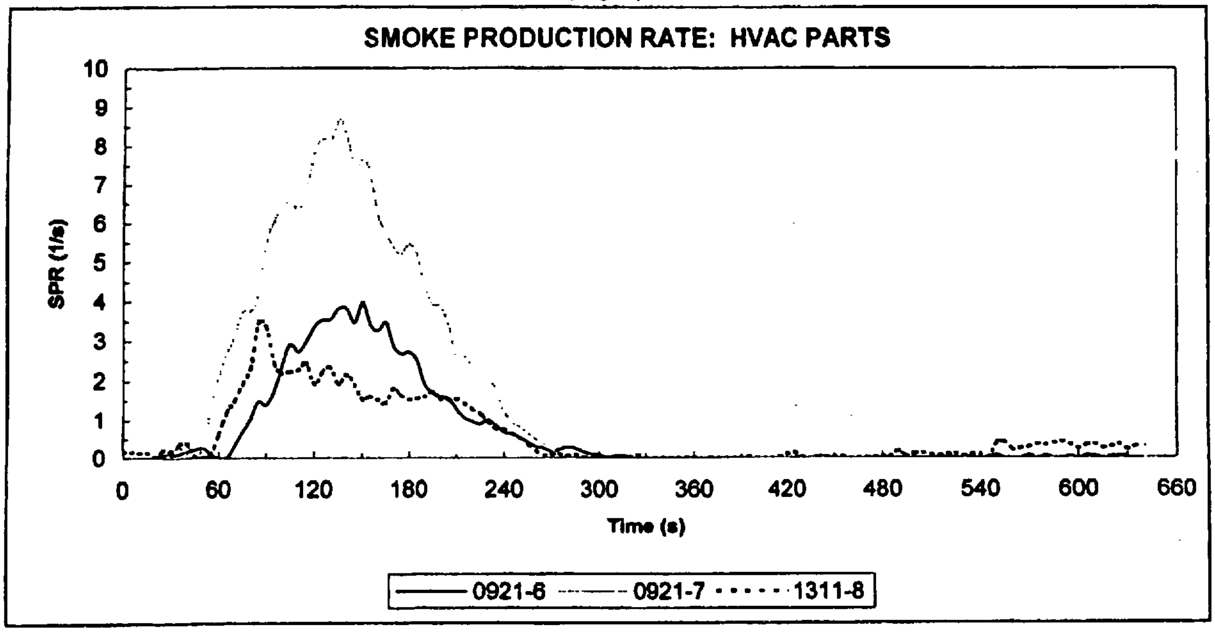
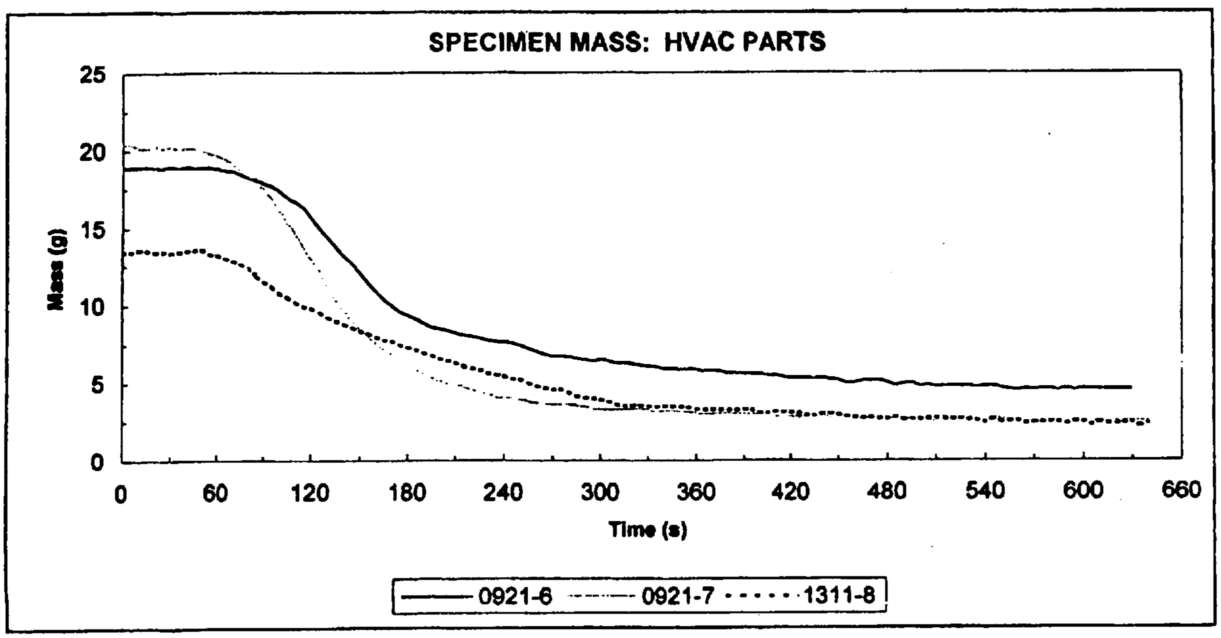




Notes & Observations:

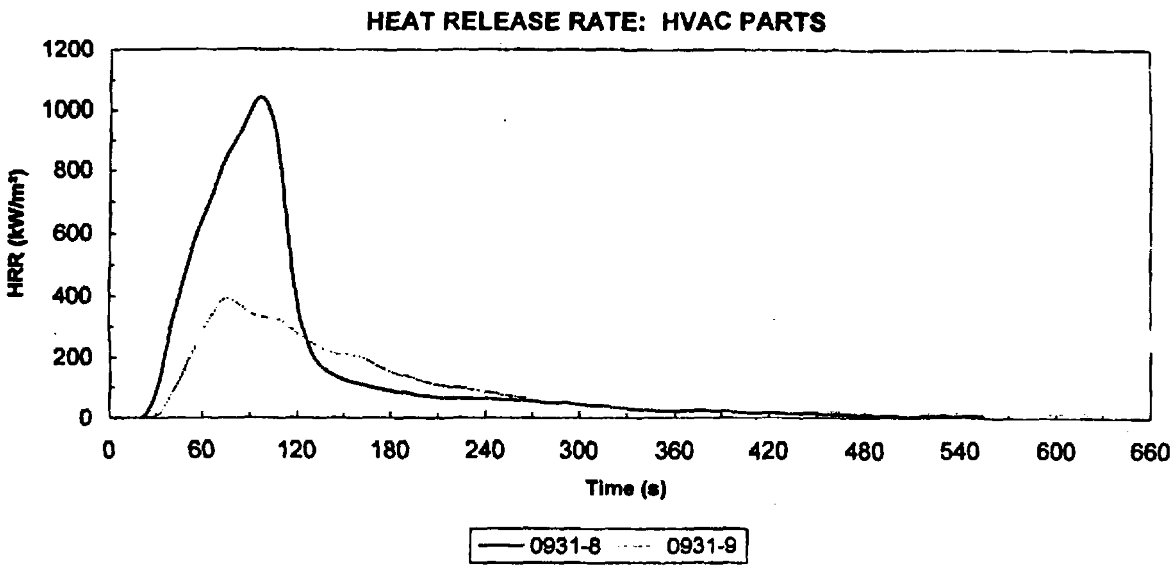
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Honda Civic
SwRI Project No:	18.03614.01	*Material ID:*	HVAC Parts
Part No.:	77400-S5A-A01	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0931-8	04/01/01	20	448	1042	95	82.8	456	403	265	967
0931-9	04/01/01	24	512	391	75	53.6	214	224	162	365
Average		22	480	716	85	68.2	335	314	214	666

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
20.7	4.8	16.0	77.5	8.3	45.6	1.49	1	707	708	389
20.6	6.6	13.9	67.7	4.7	34.0	0.72	0	386	387	245
20.7	5.7	15.0	72.6	6.5	39.8	1.10	1	547	547	317



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ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	HVAC Parts
SwRI Project No:	18.03614.01	*Heat Flux:*	50 kW/m²

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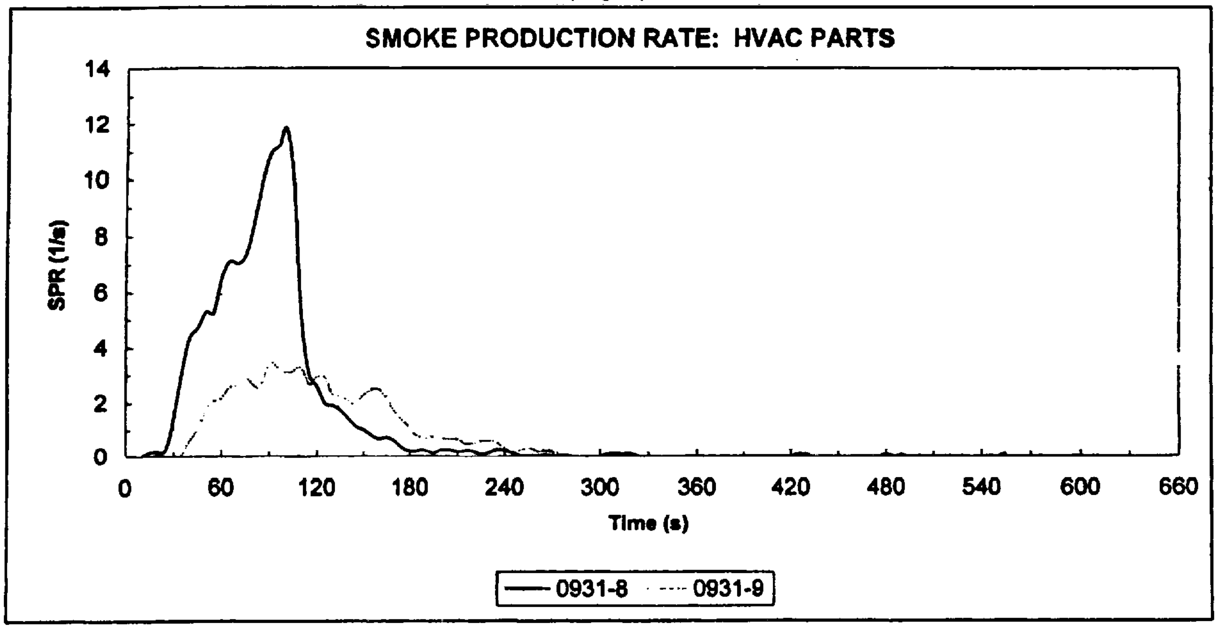
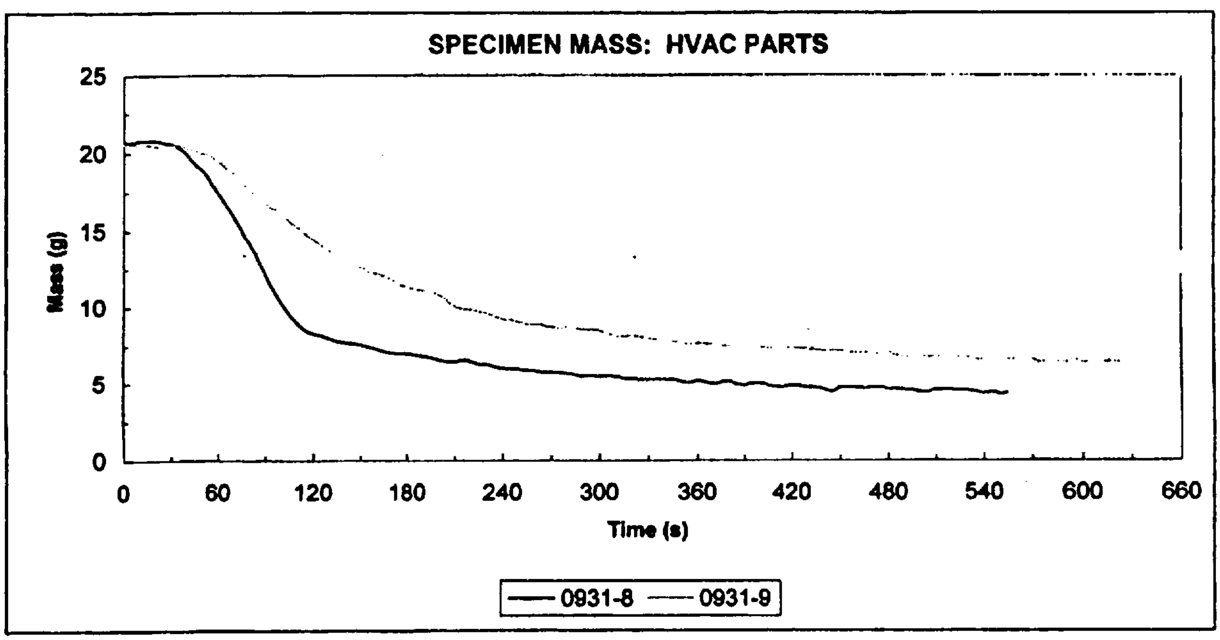




Notes & Observations:

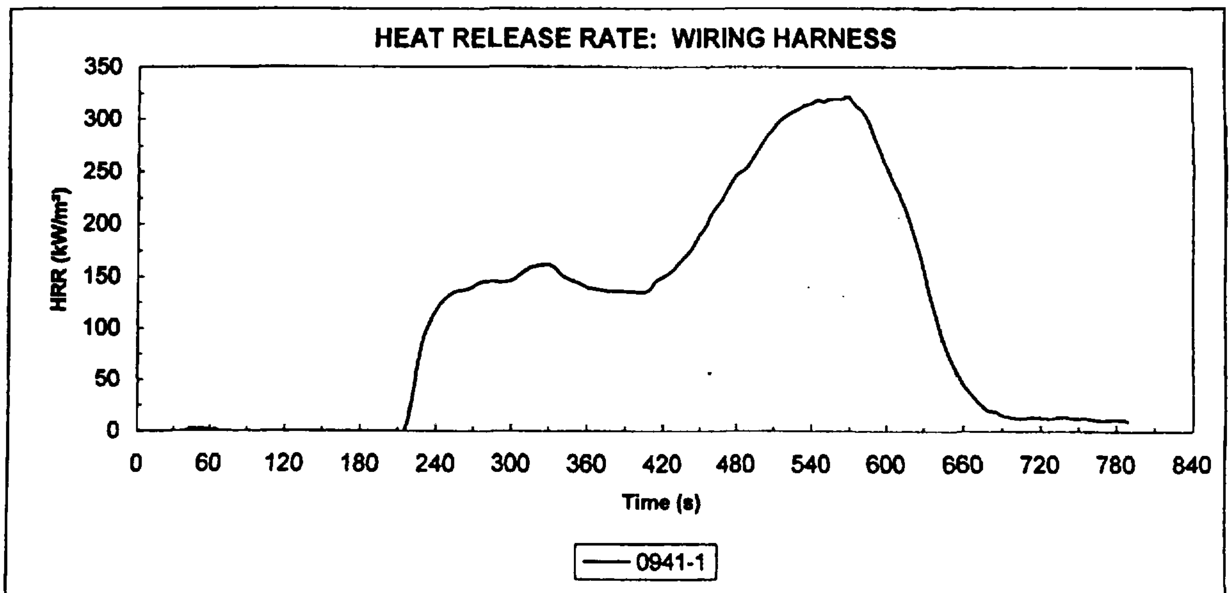
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Honda Civic
SwRI Project No:	18.03614.01	*Material ID:*	Wiring Harness
Part No.:	32200-S5A-A00	*Heat Flux:*	20 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\,max}$ (kW/m²)
0941-1	04/04/01	210	497	322	570	84.9	94	129	157	319
Average		210	497	322	570	84.9	94	129	157	319

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
92.8	60.8	31.2	33.7	8.8	24.0	4.38	85	3022	3107	855
92.8	60.8	31.2	33.7	8.8	24.0	4.38	85	3022	3107	855

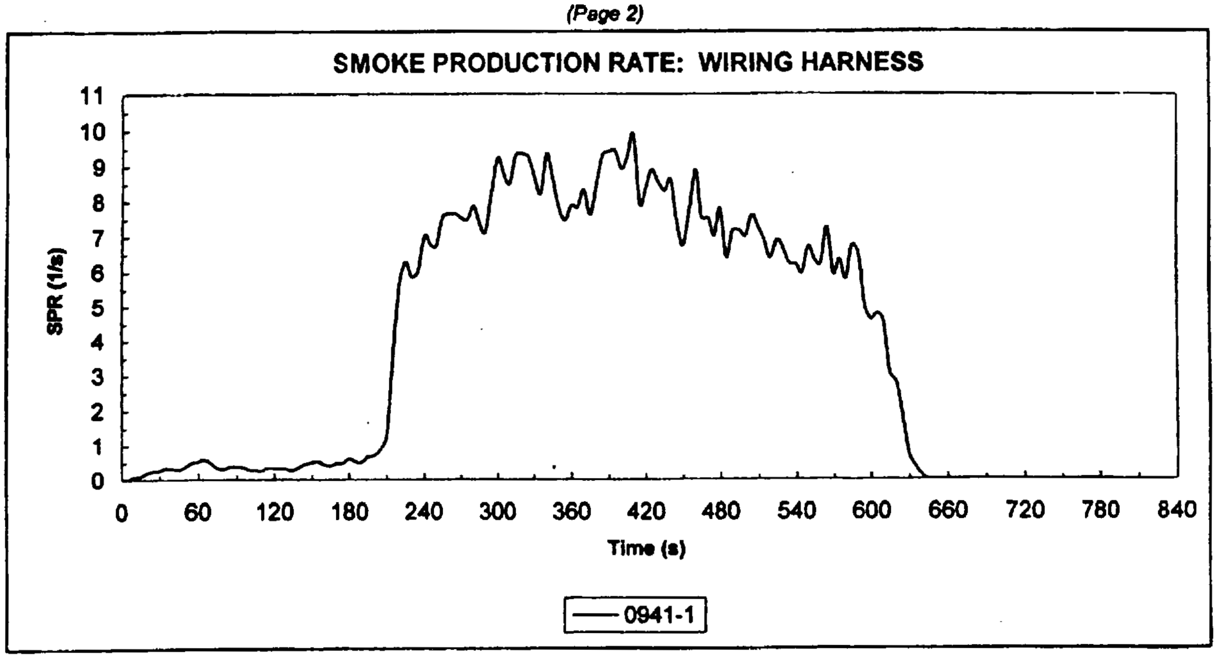


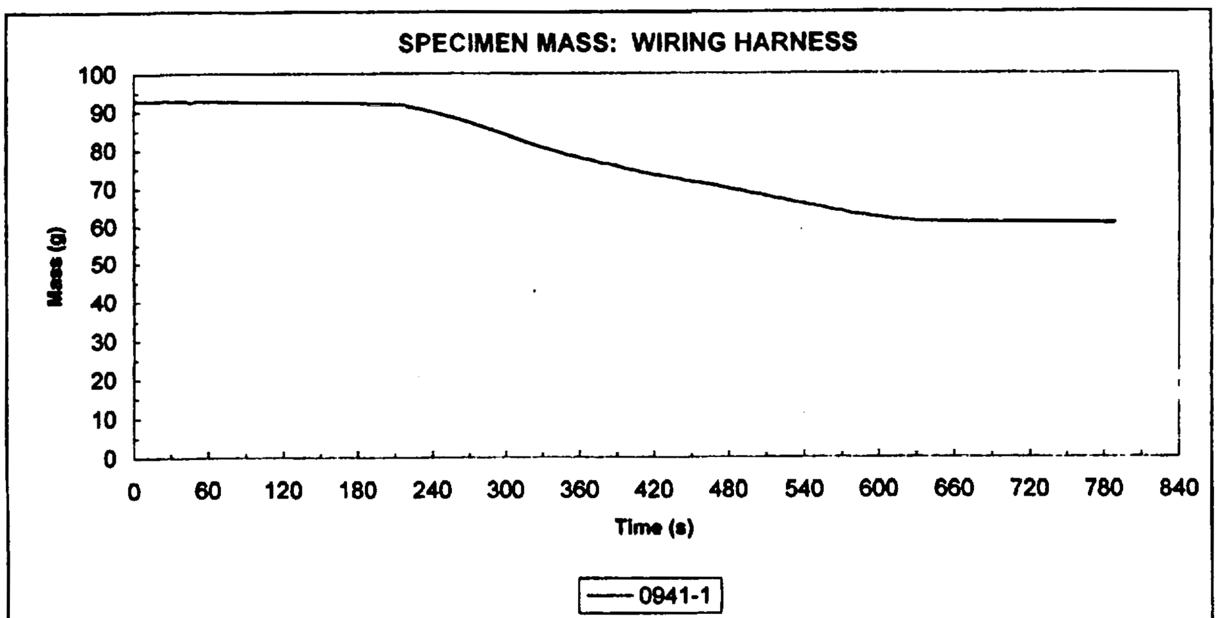
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Wiring Harness
SwRI Project No:	18.03614.01	*Heat Flux:*	20 kW/m²

(Page 2)





Notes & Observations:

18-mm diameter wire housing used in testing contained 18 wires per section. 5 sections of harness per test.

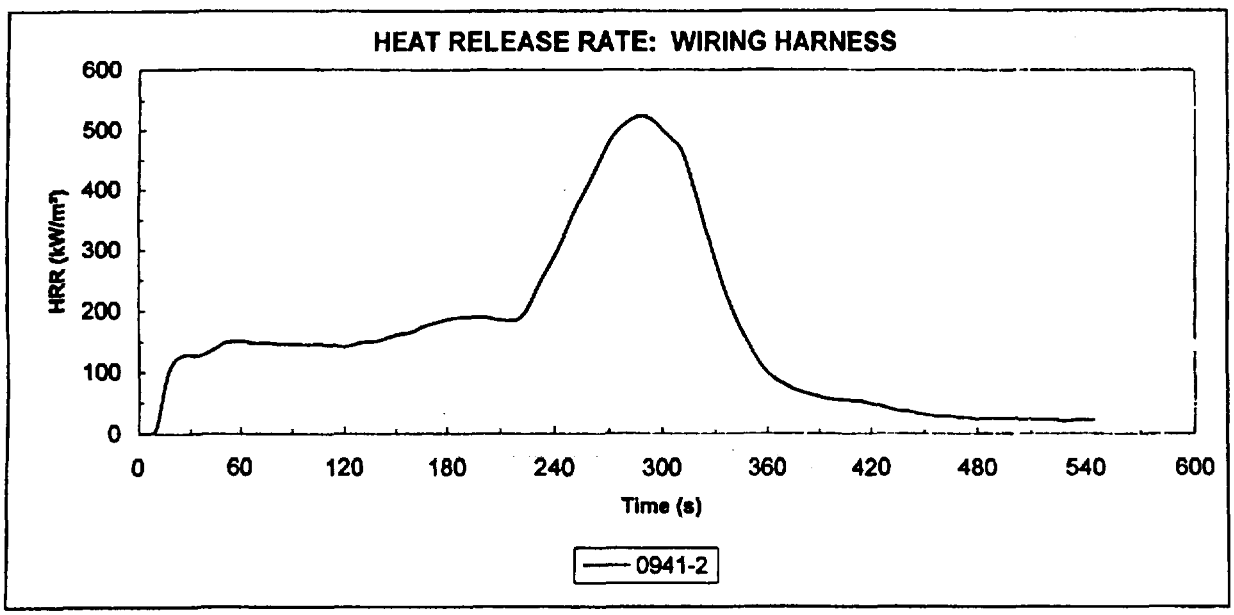
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Honda Civic
SwRI Project No:	18.03614.01	*Material ID:*	Wiring Harness
Part No.:	32200-S5A-A00	*Heat Flux:*	35 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s,\,max}$ (kW/m²)
0941-2	04/04/01	11	447	524	285	87.1	127	147	230	512
Average		11	447	524	285	87.1	127	147	230	512

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
93.3	60.9	32.4	34.7	11.3	23.8	6.87	0	3196	3196	872
93.3	60.9	32.4	34.7	11.3	23.8	6.87	0	3196	3196	872

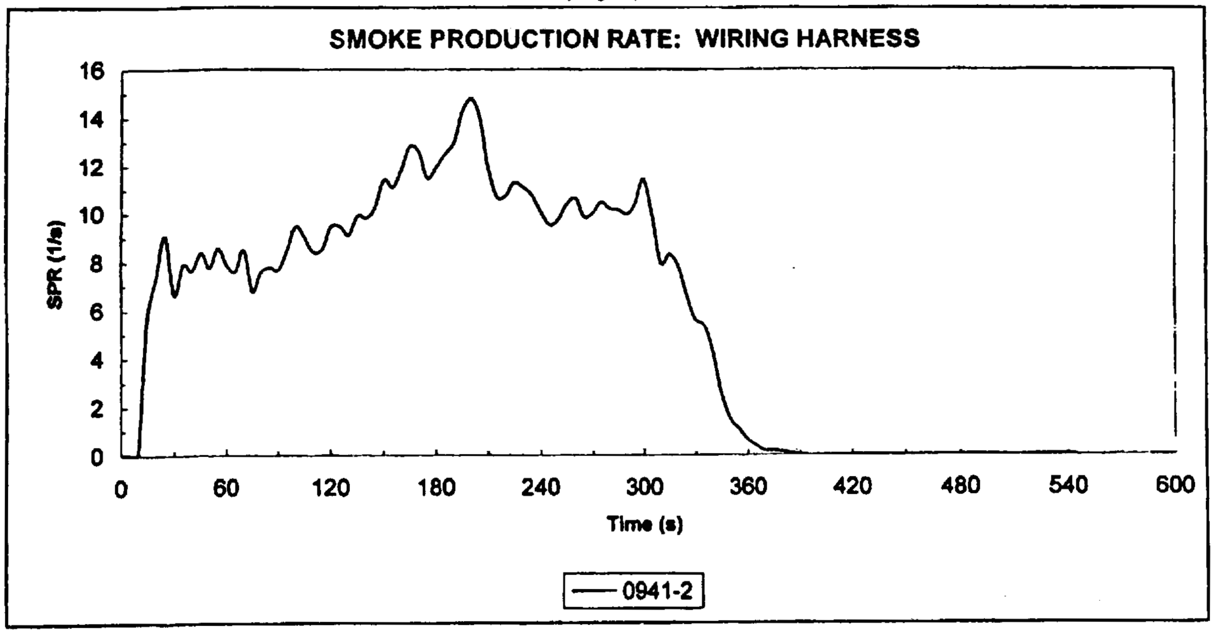


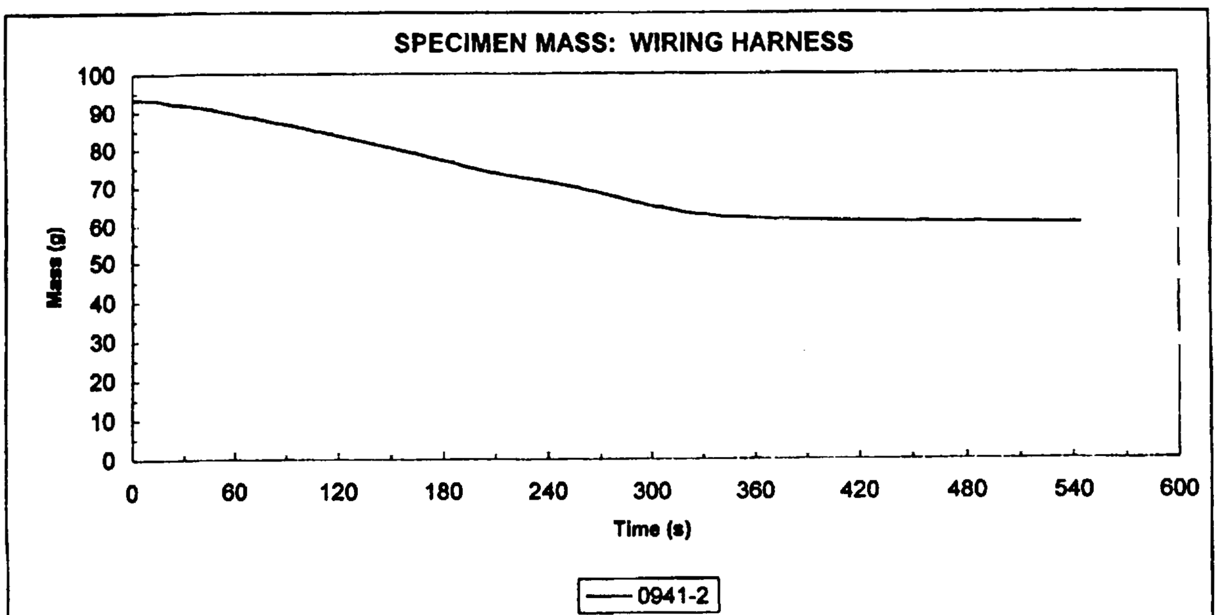
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Wiring Harness
SwRI Project No:	18.03614.01	*Heat Flux:*	35 kW/m²

(Page 2)





Notes & Observations:

18-mm diameter wire housing used in testing contained 18 wires per section. 5 sections of harness per test.

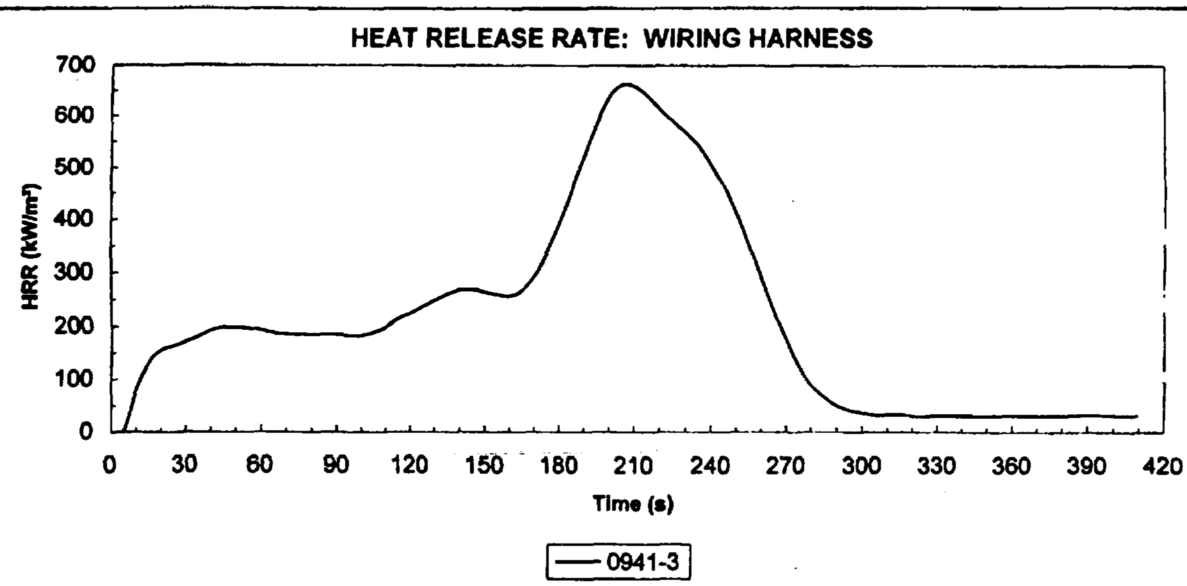
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Make/Model:*	Honda Civic
SwRI Project No:	18.03614.01	*Material ID:*	Wiring Harness
Part No.:	32200-S5A-A00	*Heat Flux:*	50 kW/m²
Orientation:	Horizontal	*Sample Area:*	0.00884 m²
Frame:	Yes	*Distance:*	25 mm
Spark Igniter:	Yes	*Operator:*	J. Anderson

Test ID	Test Date	t_{ig} (s)	t_b (s)	HRR_{peak} (kW/m²)	t_{peak} (s)	THR (MJ/m²)	HRR_{60s} (kW/m²)	HRR_{180s} (kW/m²)	HRR_{300s} (kW/m²)	$HRR_{30s, max}$ (kW/m²)
0941-3	04/04/01	6	290	663	205	84.1	163	216	281	634
Average		6	290	663	205	84.1	163	216	281	634

Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Mass Loss (%)	10-90 MLR (g/m²-s)	EHC (MJ/kg)	SPR (1/s)	SR_1 (m²/m²)	SR_2 (m²/m²)	TSR (m²/m²)	SEA (m²/kg)
91.9	59.9	32.0	34.8	15.2	23.2	11.24	0	3372	3372	932
91.9	59.9	32.0	34.8	15.2	23.2	11.24	0	3372	3372	932

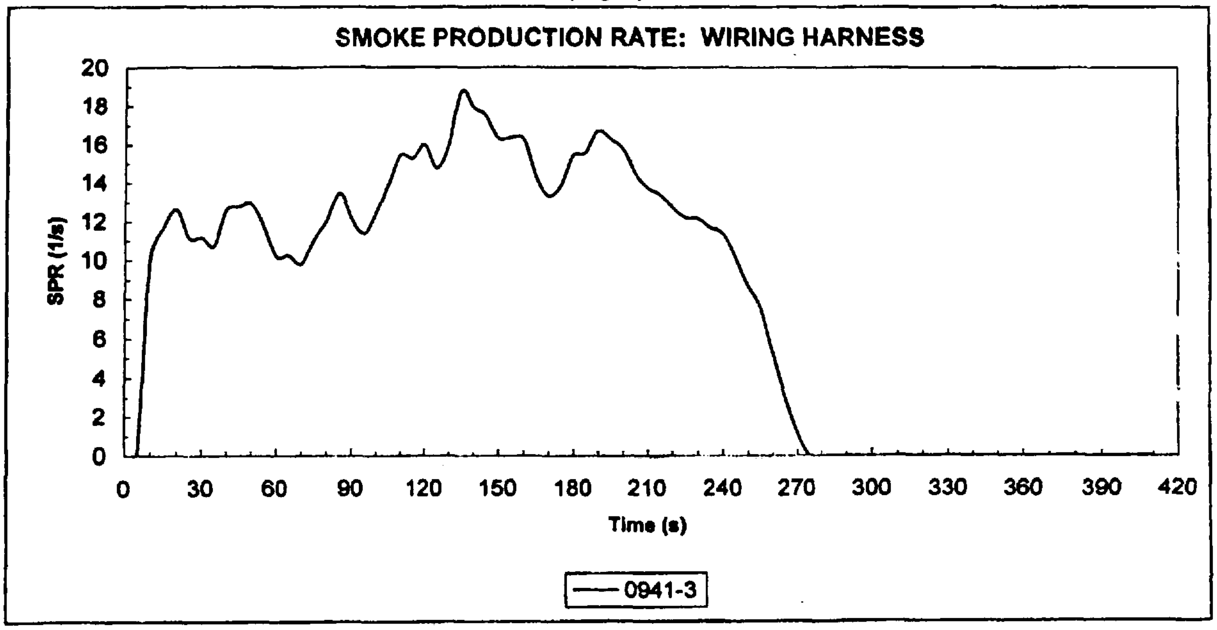


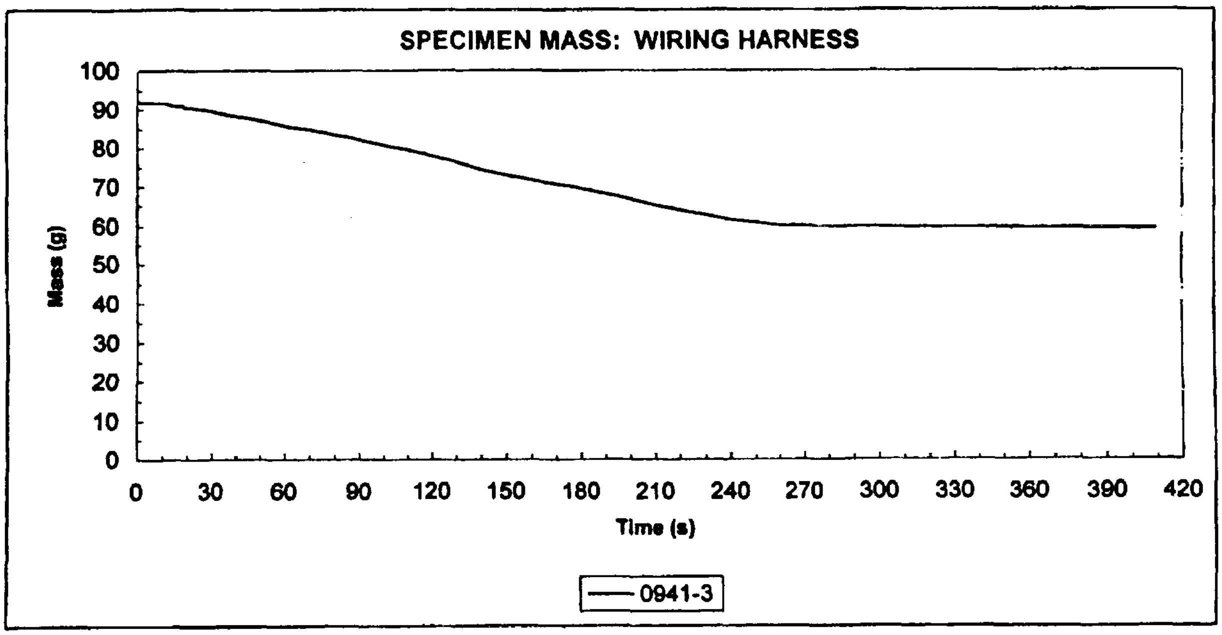
SOUTHWEST RESEARCH INSTITUTE

ASTM E 1354 CONE CALORIMETER TEST REPORT

Client:	General Motors	*Material ID:*	Wiring Harness
SwRI Project No:	18.03614.01	*Heat Flux:*	50 kW/m²

(Page 2)





Notes & Observations:

18-mm diameter wire housing used in testing contained 18 wires per section. 5 sections of harness per test.

APPENDIX E

ICAL TEST REPORTS

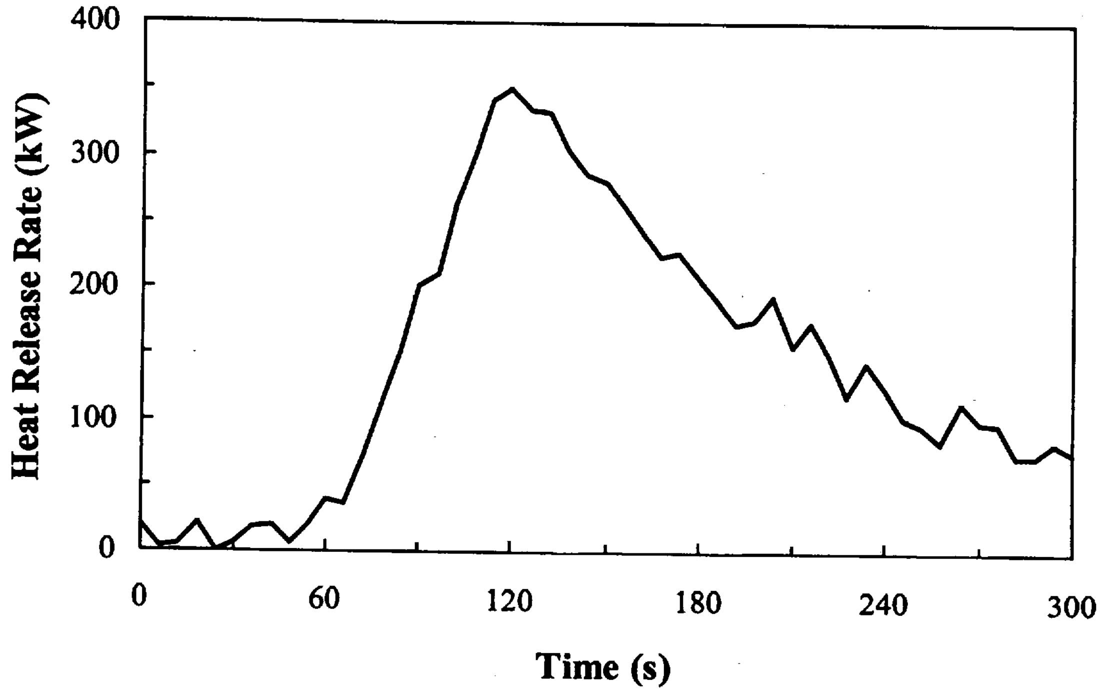


Figure D.1 Heat release rate of seatback and headrest at 20 kW/m^2

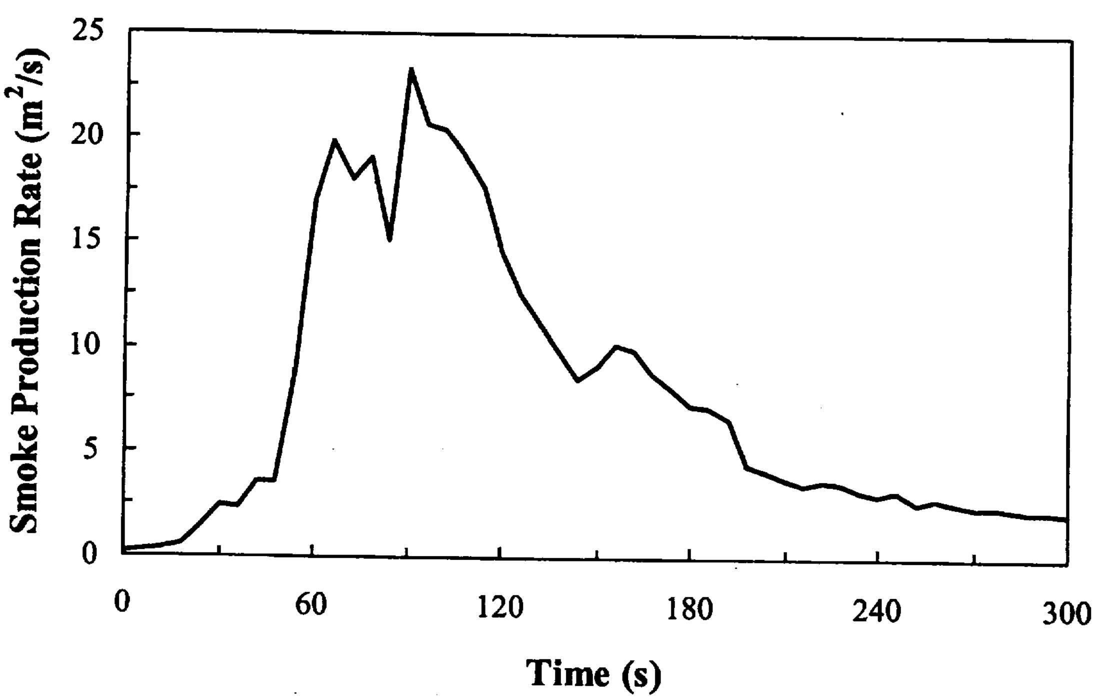


Figure D.2 Smoke production rate of seatback and headrest at 20 kW/m^2

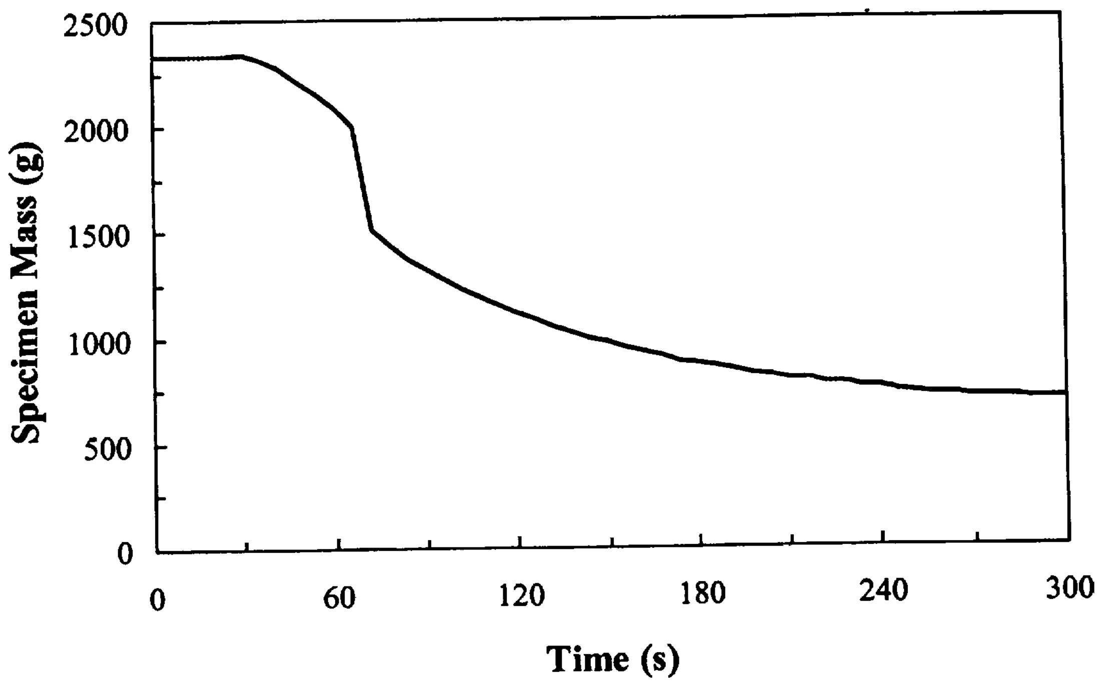


Figure D.3 Specimen mass loss of seatback and headrest at 20 kW/m^2

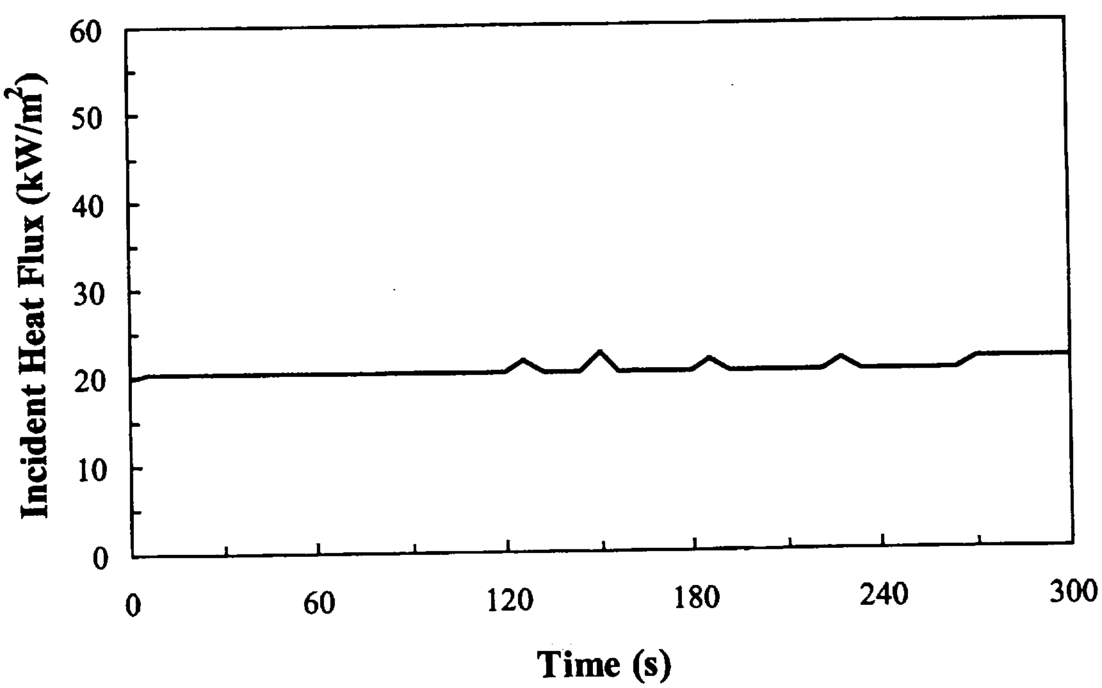


Figure D.4 Incident heat flux for seatback and headrest test at 20 kW/m^2

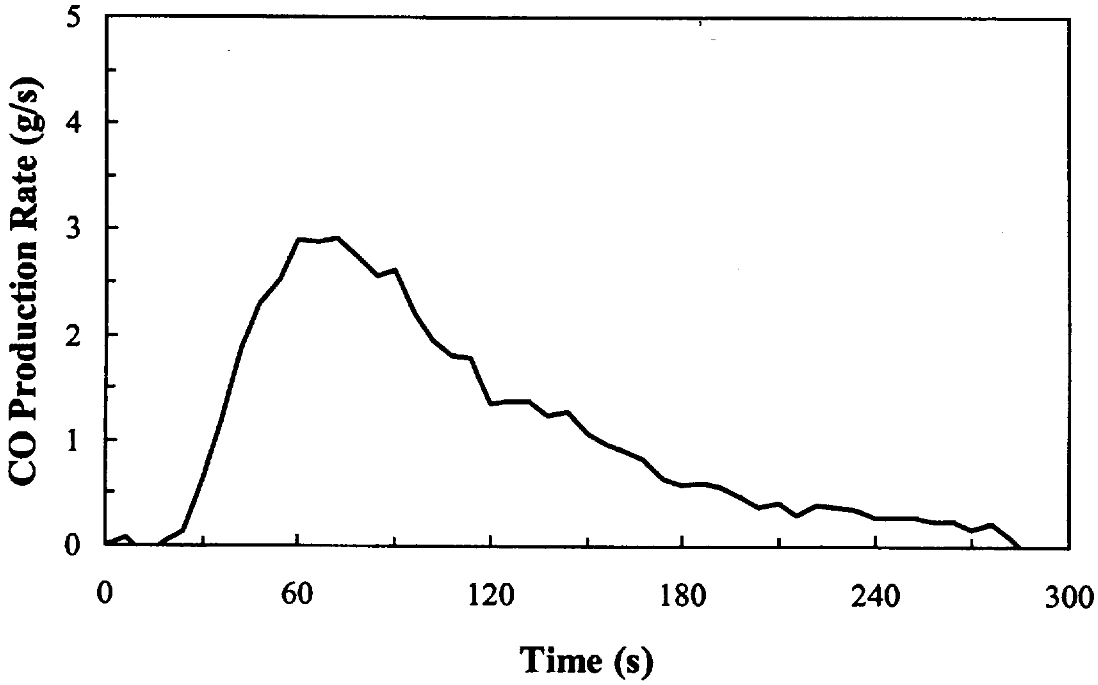


Figure D.5 CO generation rate of seatback and headrest at 20 kW/m^2

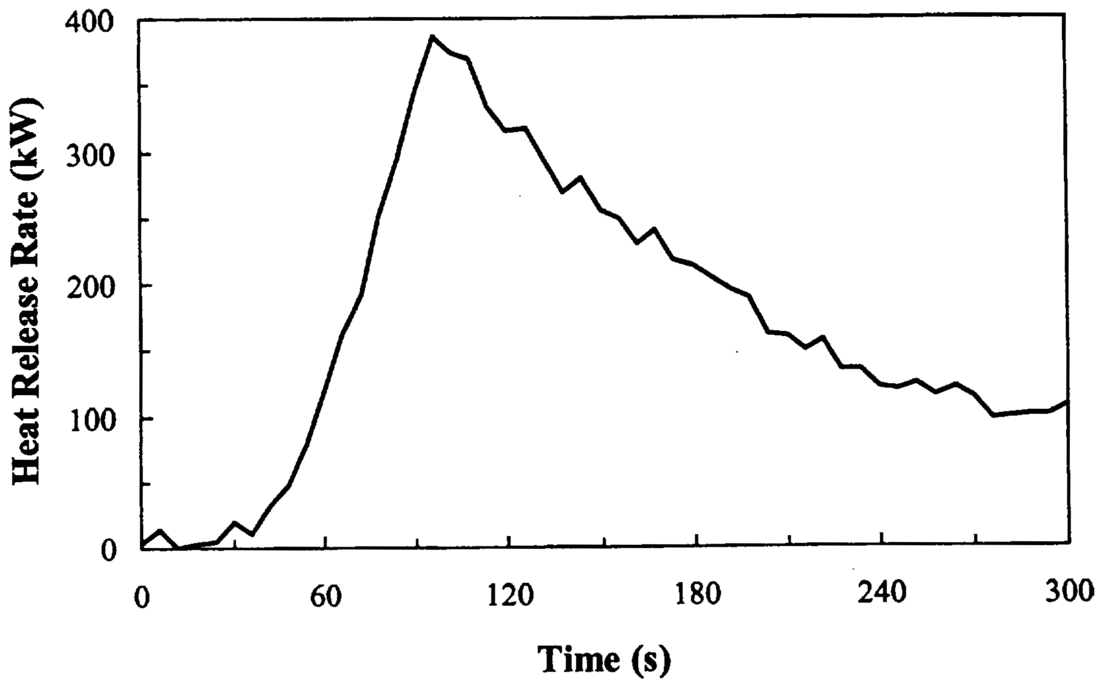


Figure D.6 Heat release rate of seatback and headrest at 35 kW/m^2

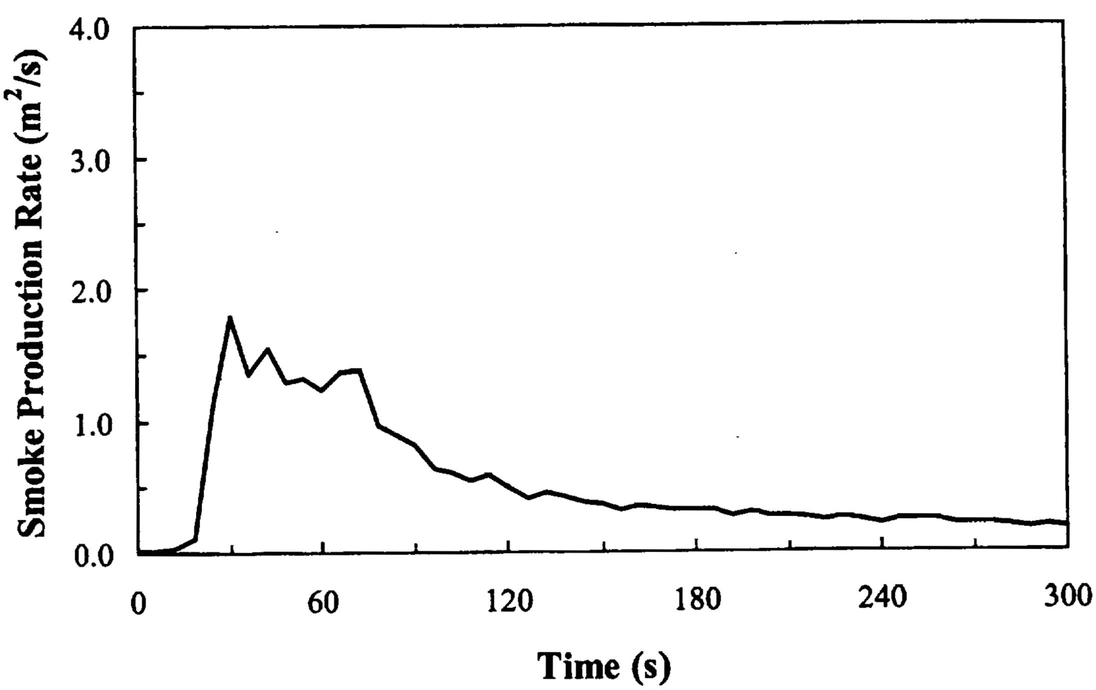


Figure D.7 Smoke production rate of seatback and headrest at 35 kW/m^2

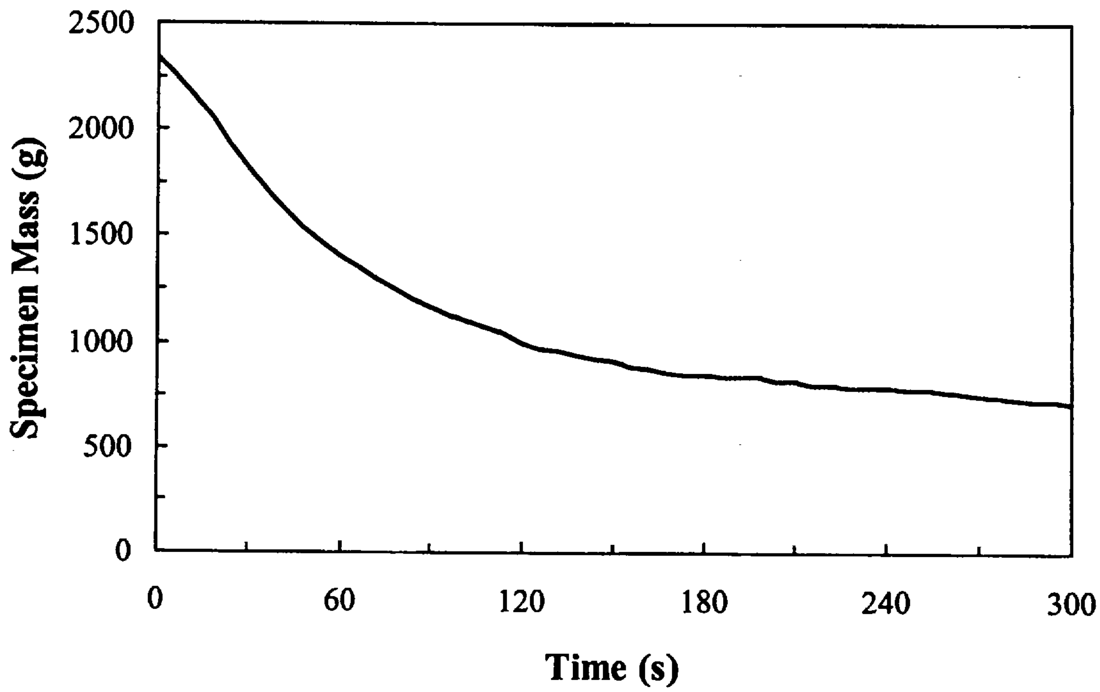


Figure D.8 Specimen mass loss of seatback and headrest at 35 kW/m^2

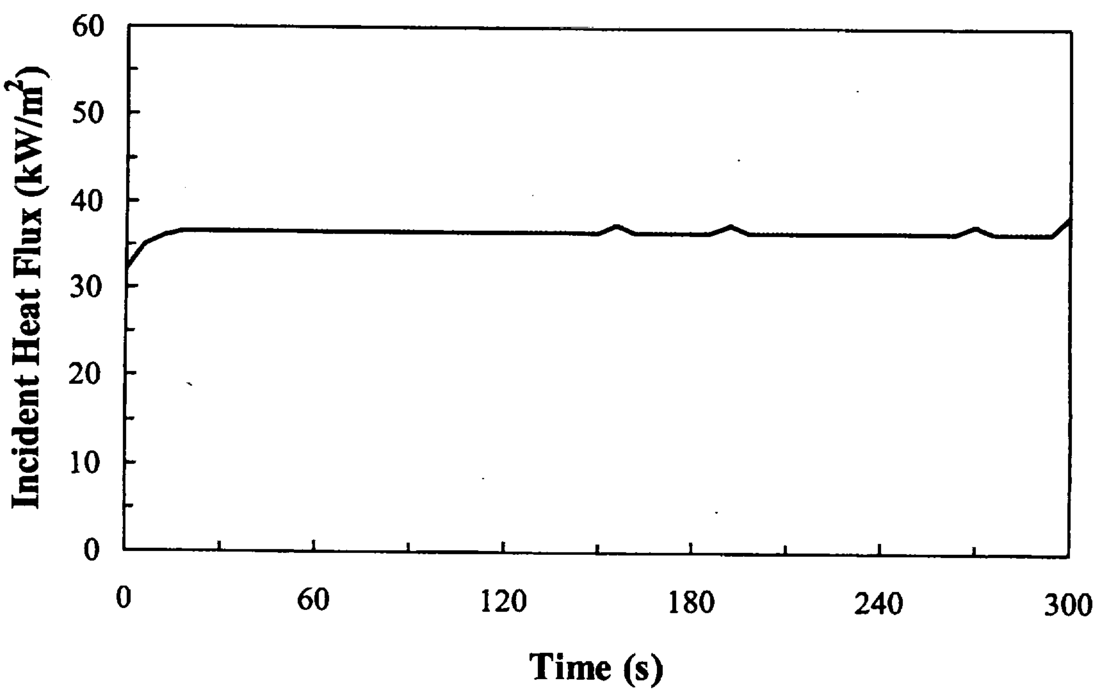


Figure D.9 Incident heat flux for seatback and headrest test at 35 kW/m^2

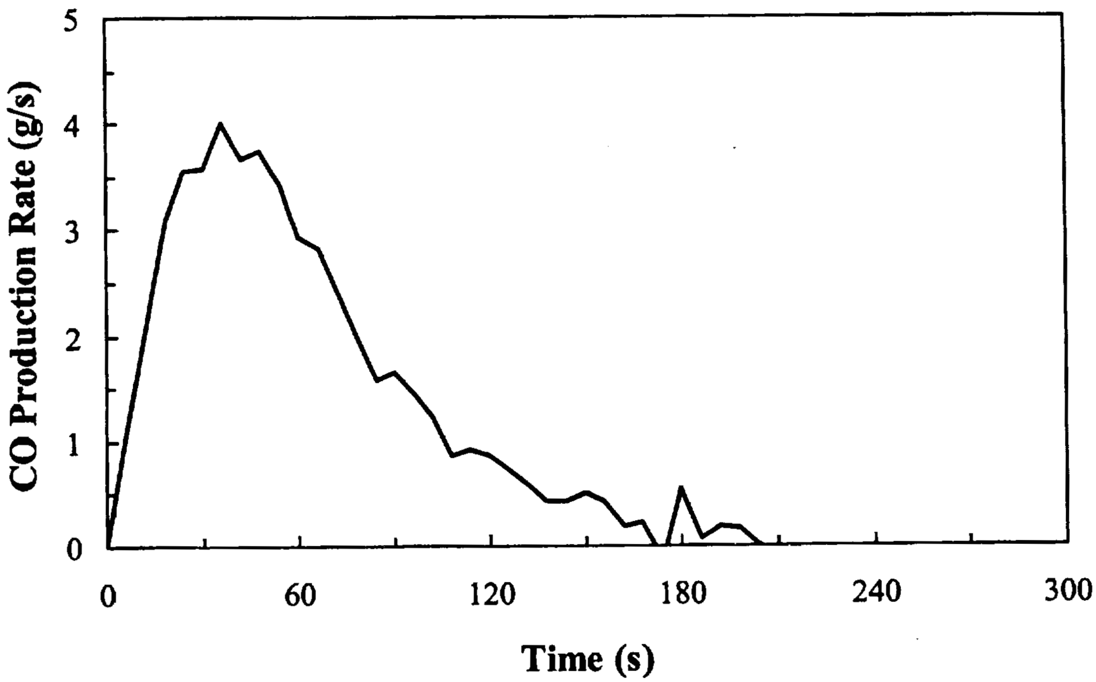


Figure D.10 CO generation rate of seatback and headrest at 35 kW/m^2

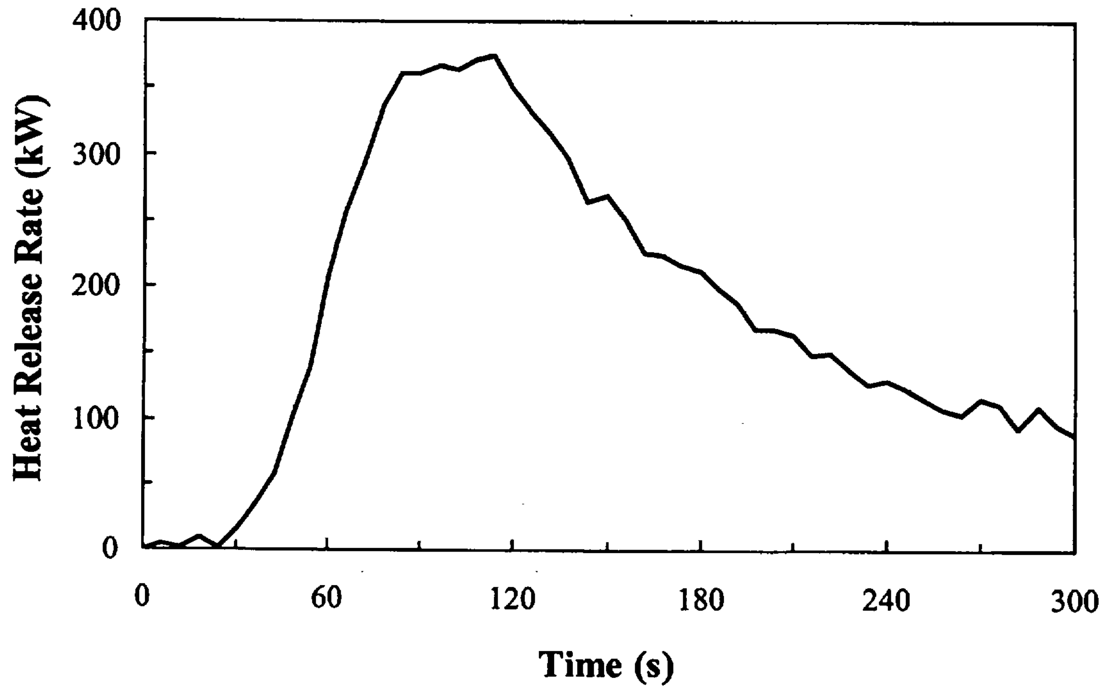


Figure D.11 Heat release rate of seatback and headrest at 50 kW/m^2

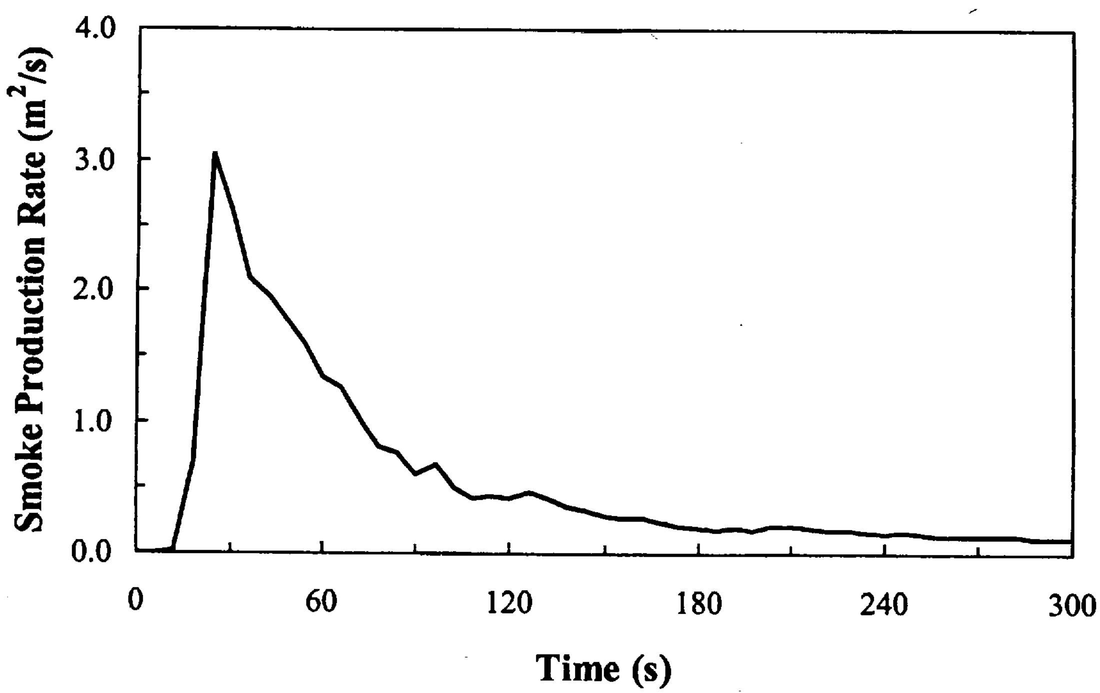


Figure D.12 Smoke production rate of seatback and headrest at 50 kW/m^2

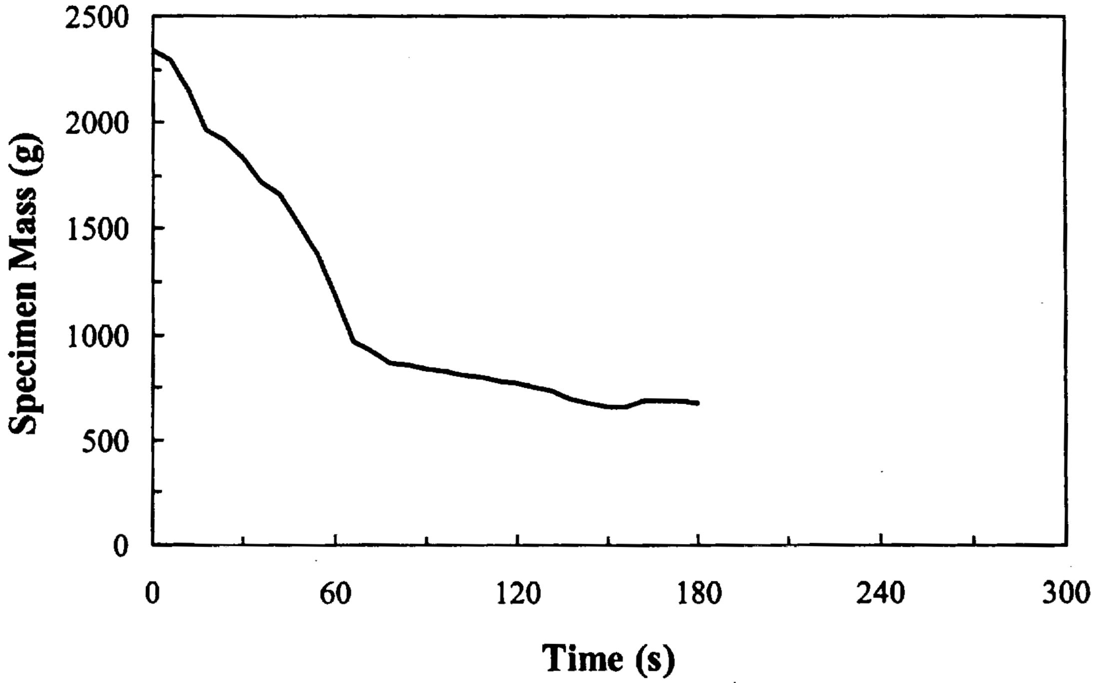


Figure D.13 Specimen mass loss of seatback and headrest at 50 kW/m^2

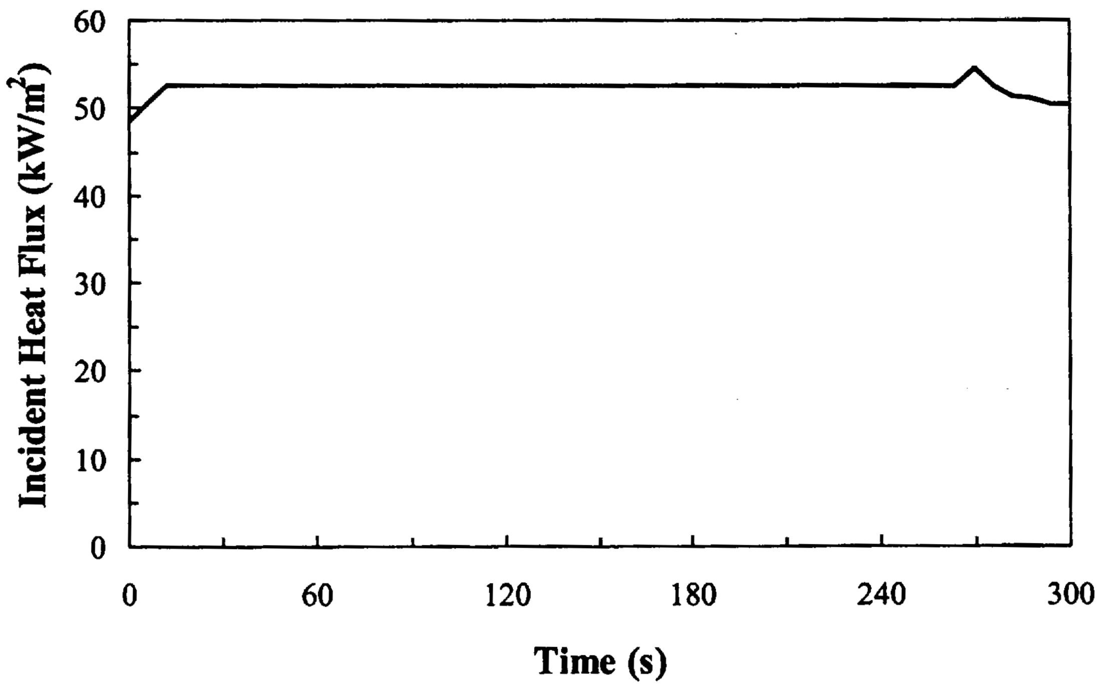


Figure D.14 Incident heat flux for seatback and headrest test at 50 kW/m^2

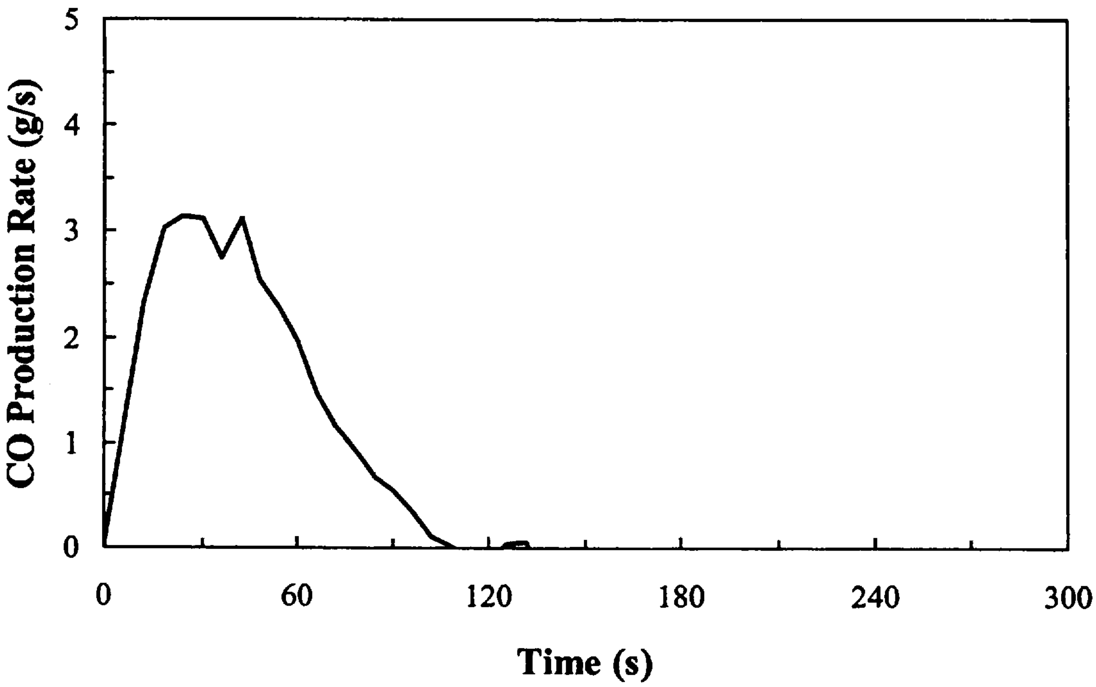


Figure D.15 CO generation rate of seatback and headrest at 50 kW/m^2

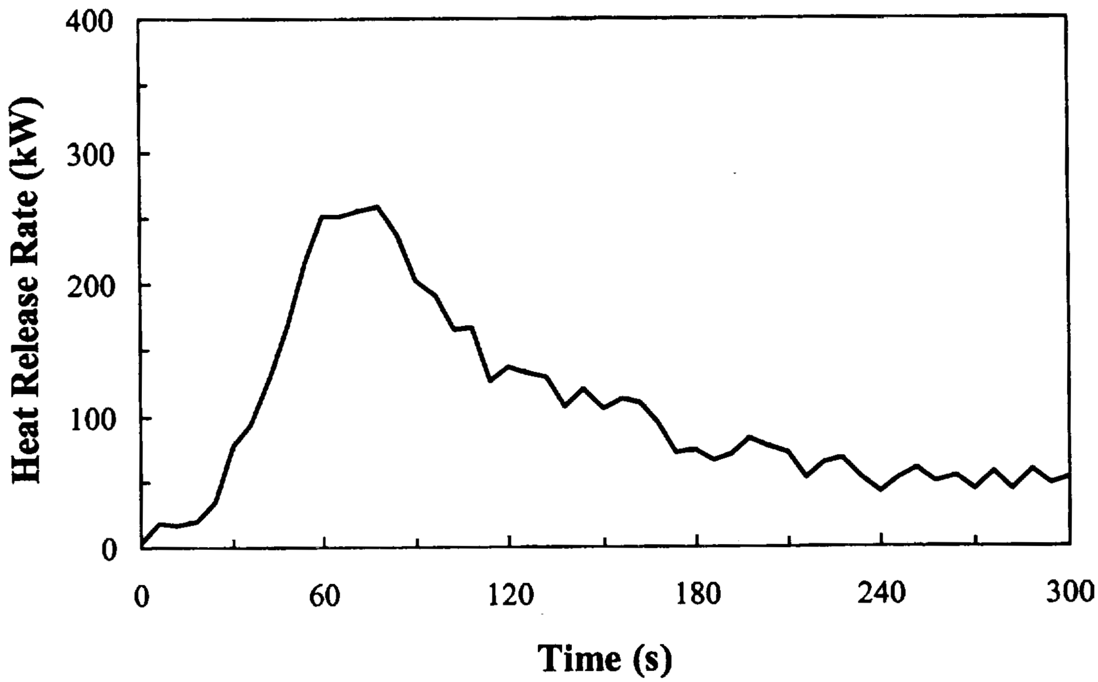


Figure D.16 Heat release rate of seat foam at 20 kW/m^2

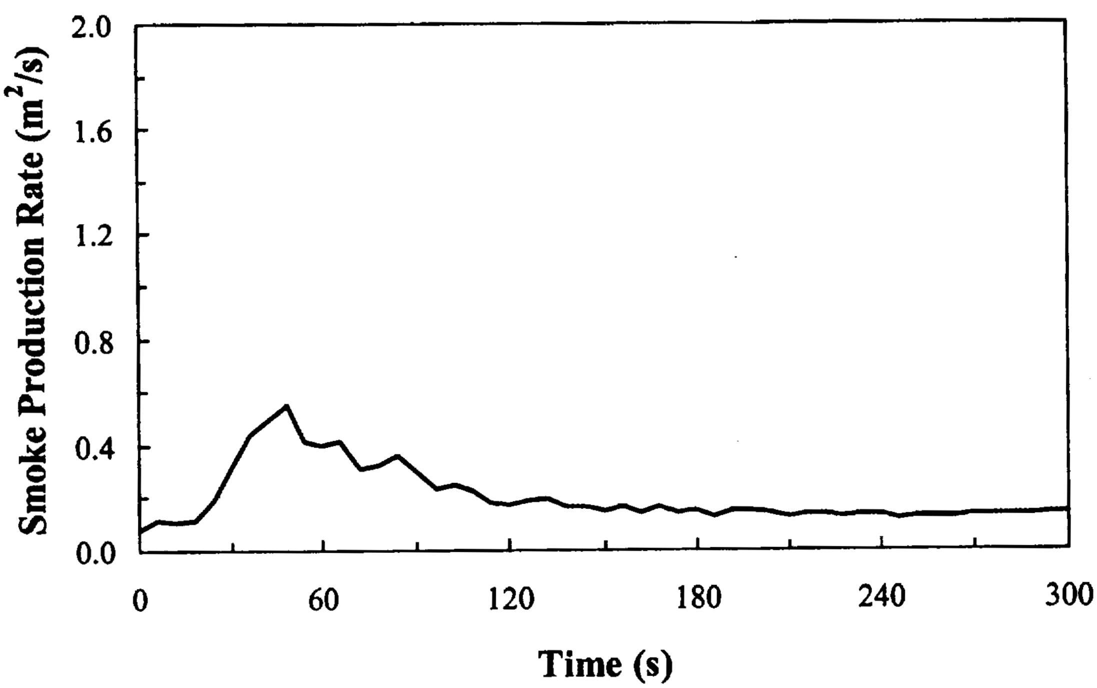


Figure D.17 Smoke production rate of seat foam at 20 kW/m^2

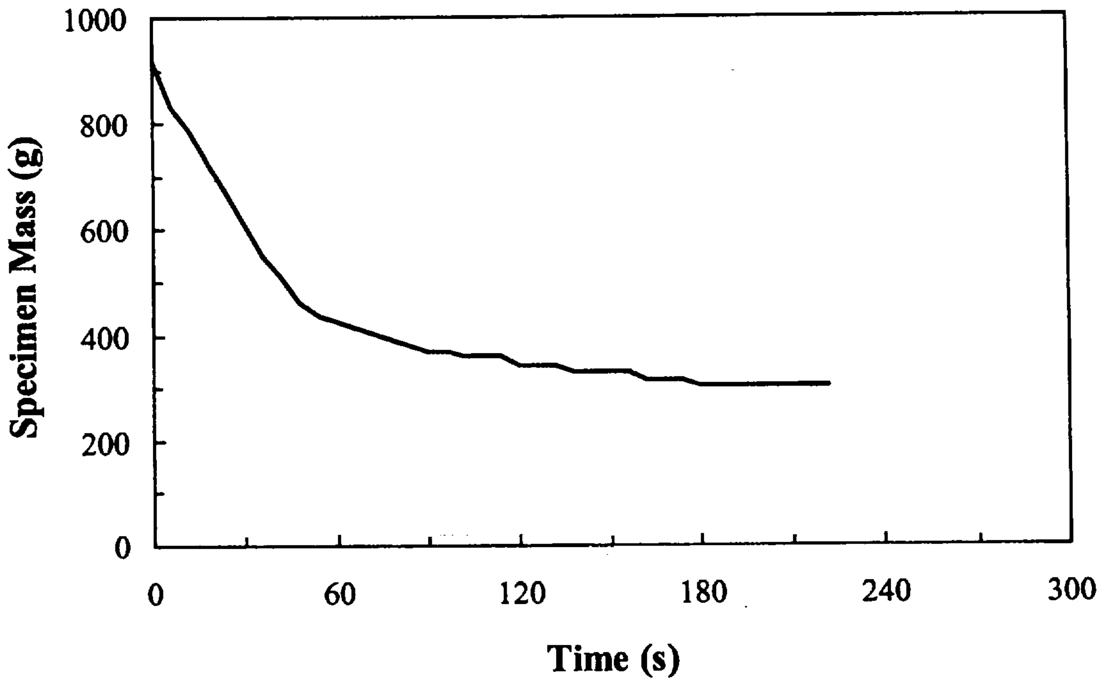


Figure D.18 Specimen mass loss of seat foam at 20 kW/m²

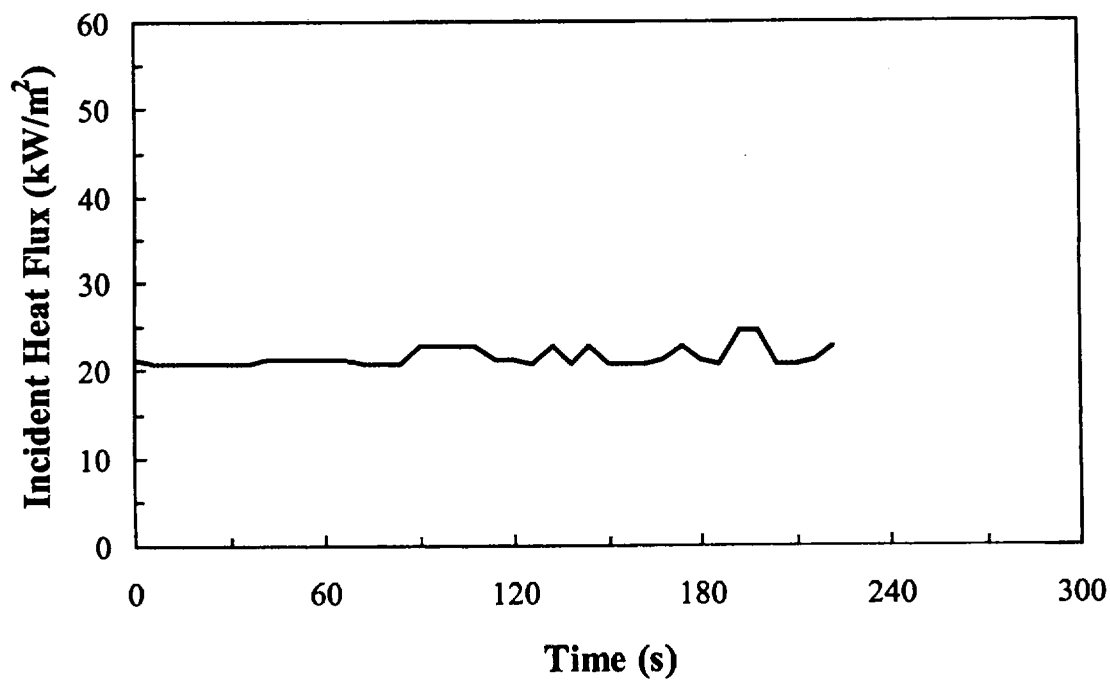


Figure D.19 Incident heat flux for seat foam test at 20 kW/m²

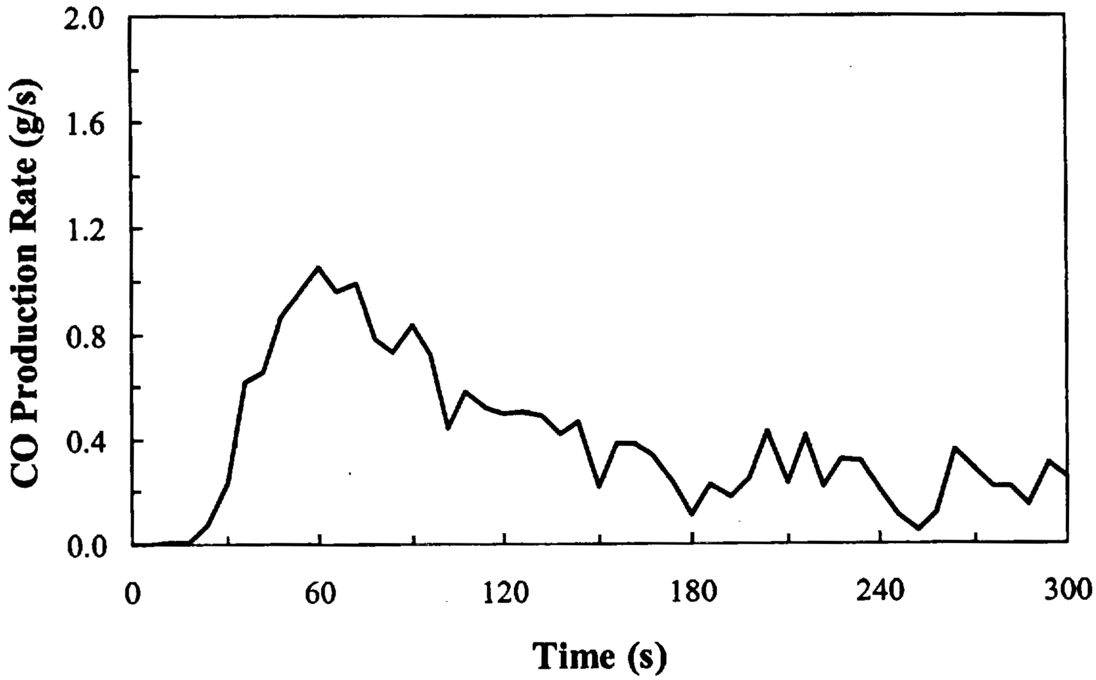


Figure D.20 CO generation rate of seat foam at 20 kW/m^2

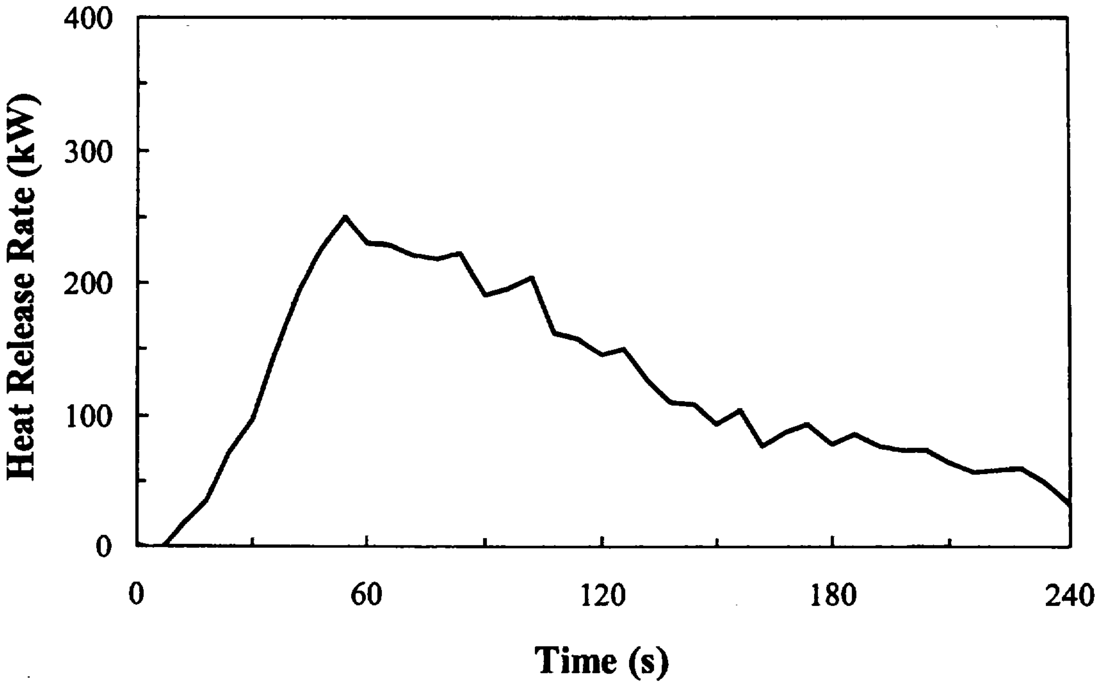


Figure D.21 Heat release rate of seat foam at 35 kW/m^2

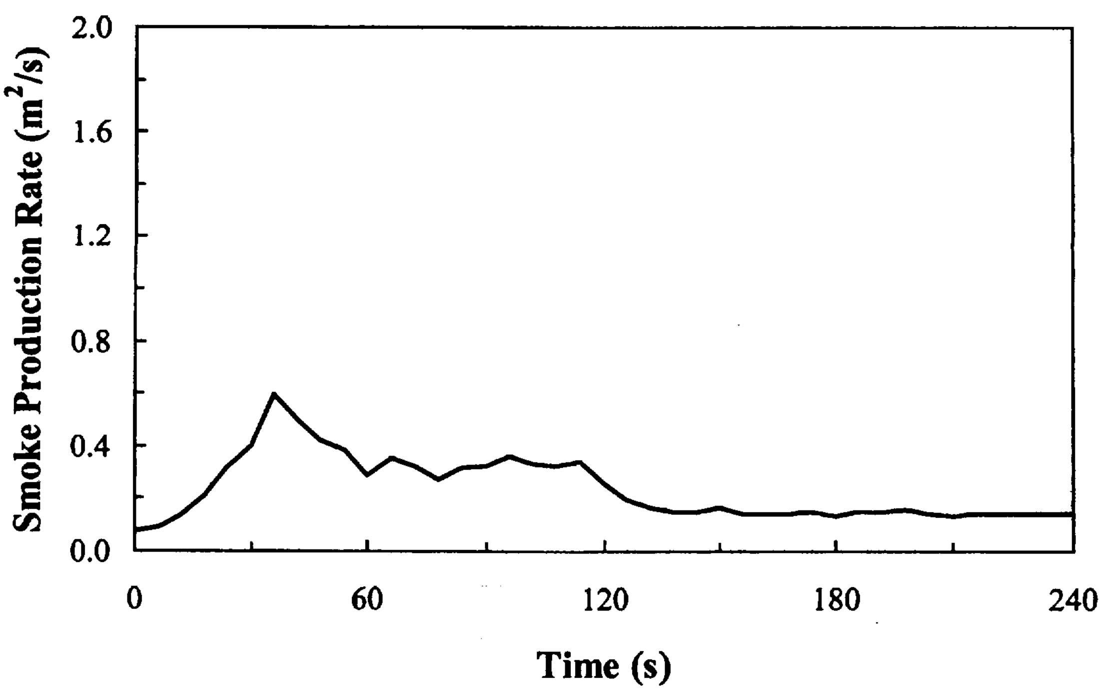


Figure D.22 Smoke production rate of seat foam at 35 kW/m^2

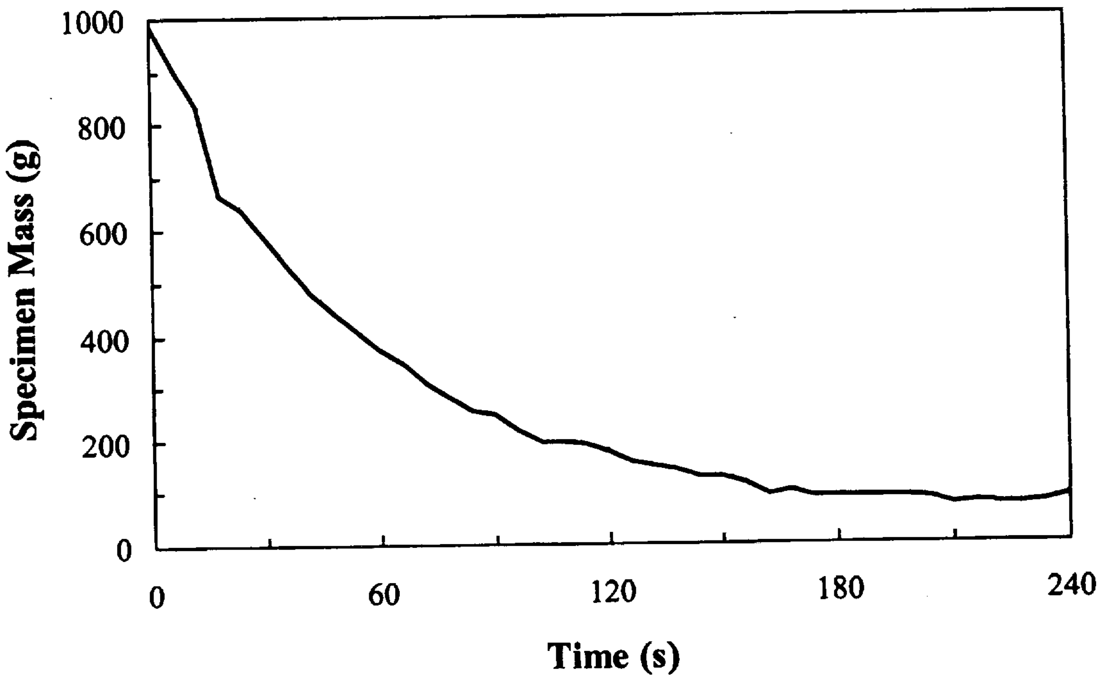


Figure D.23 Specimen mass loss of seat foam at 35 kW/m^2

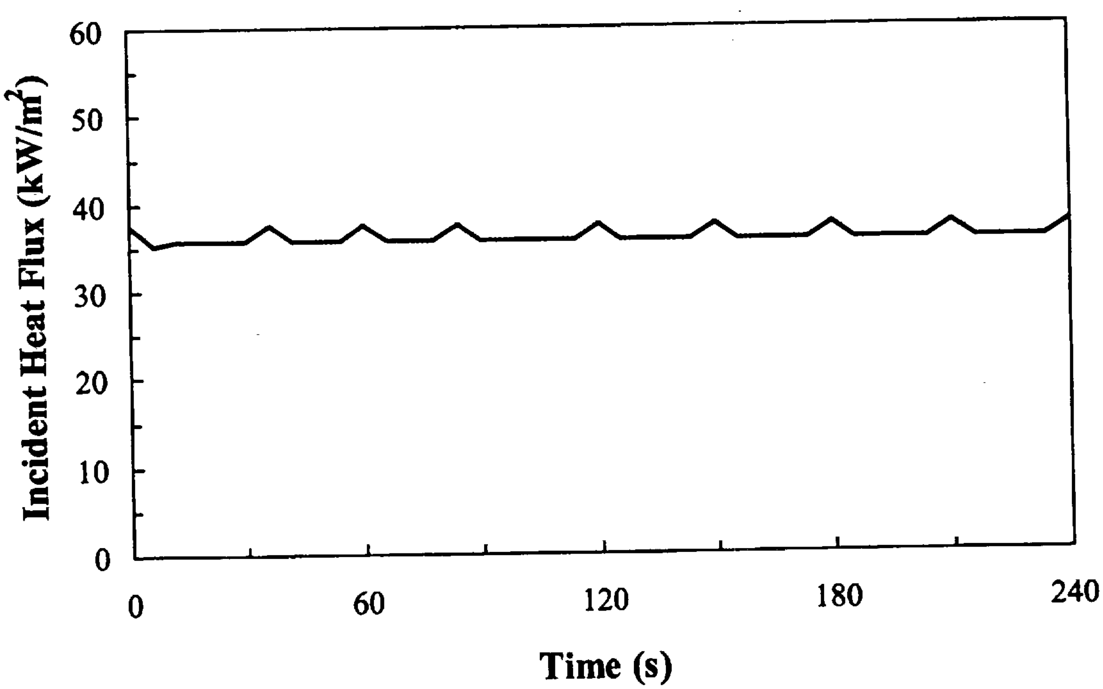


Figure D.24 Incident heat flux for seat foam test at 35 kW/m^2

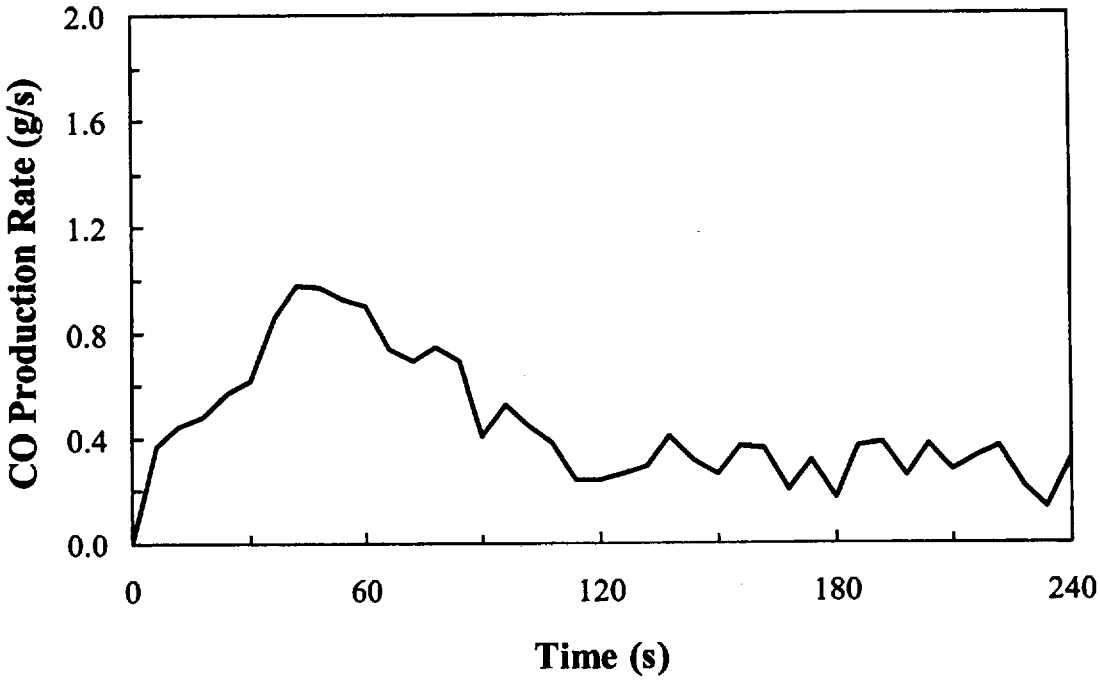


Figure D.25 CO generation rate of seat foam at 35 kW/m^2

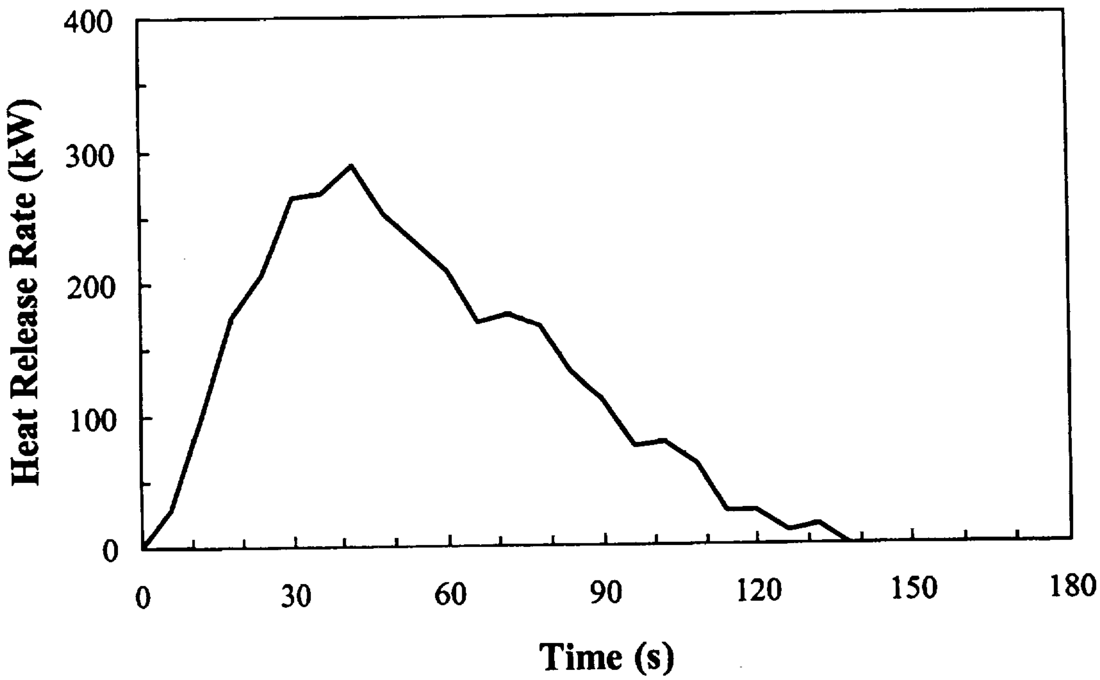


Figure D.26 Heat release rate of seat foam at 50 kW/m^2

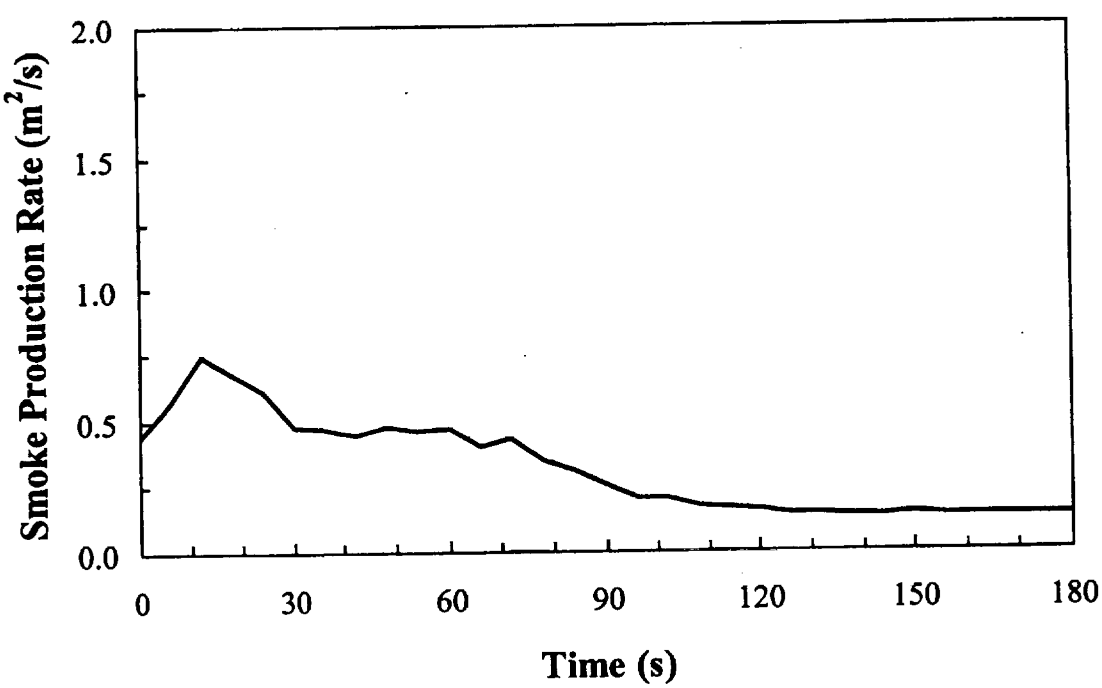


Figure D.27 Smoke production rate of seat foam at 50 kW/m^2

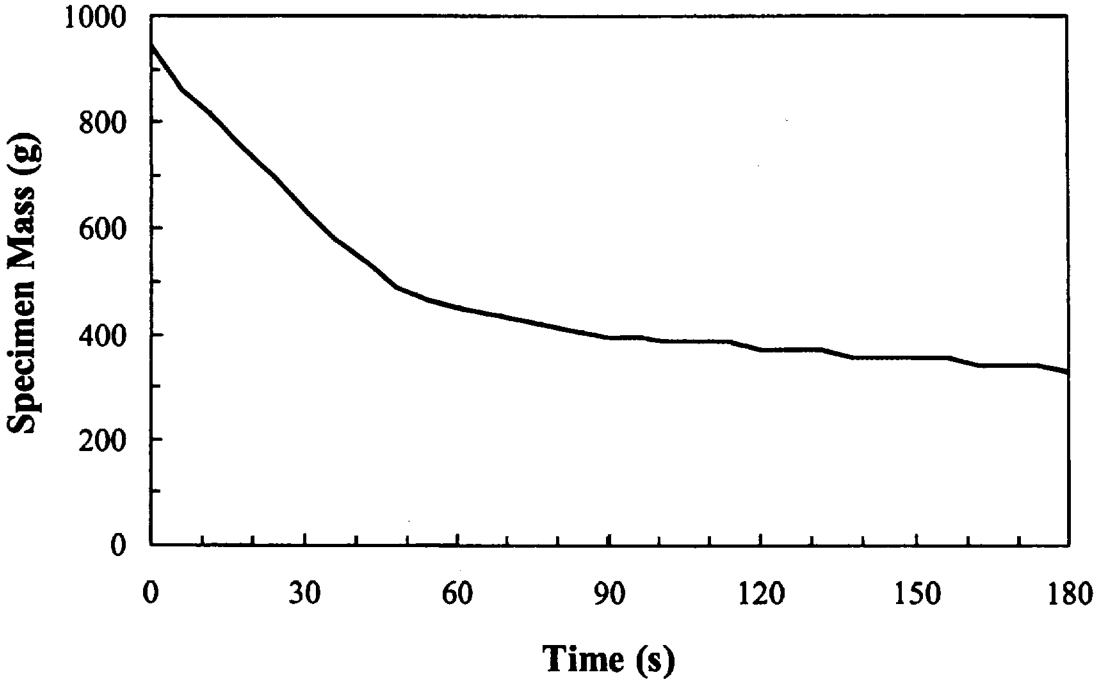


Figure D.28 Specimen mass loss of seat foam at 50 kW/m²

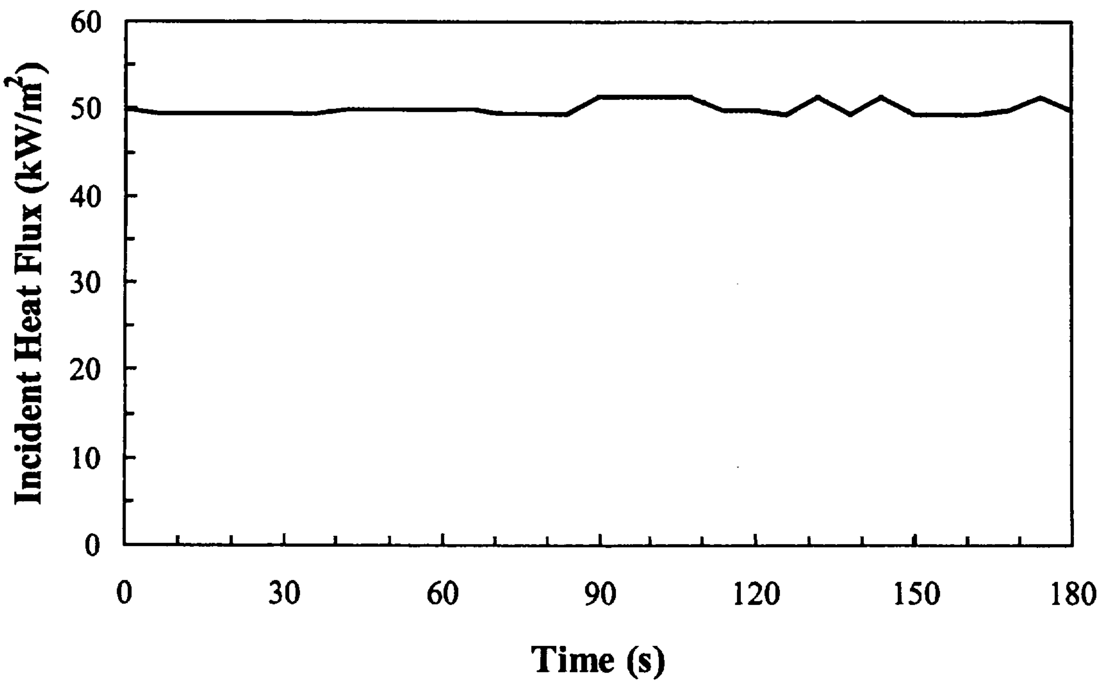


Figure D.29 Incident heat flux for seat foam test at 50 kW/m²

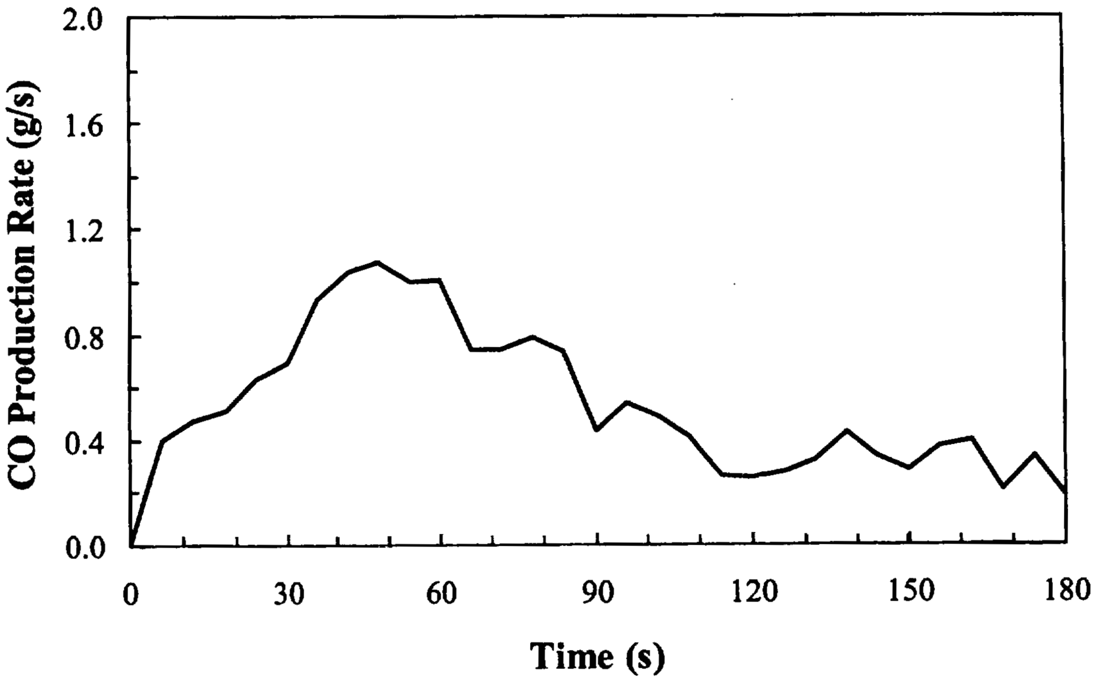


Figure D.30 CO generation rate of seat foam at 50 kW/m^2

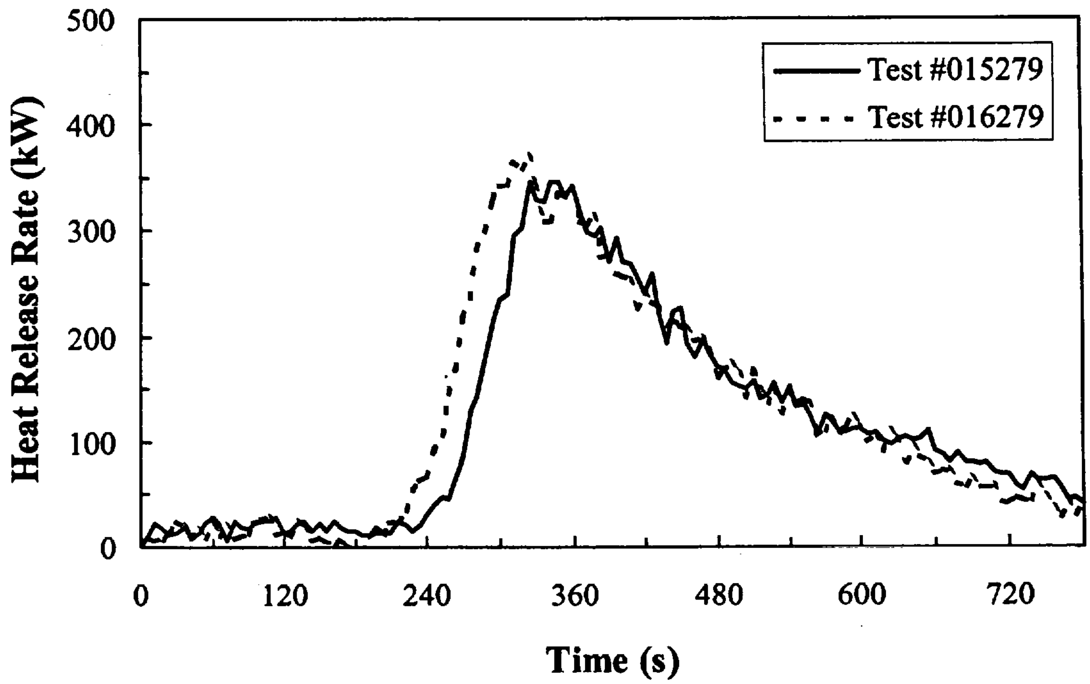


Figure D.31 Heat release rate of door panel at 20 kW/m^2

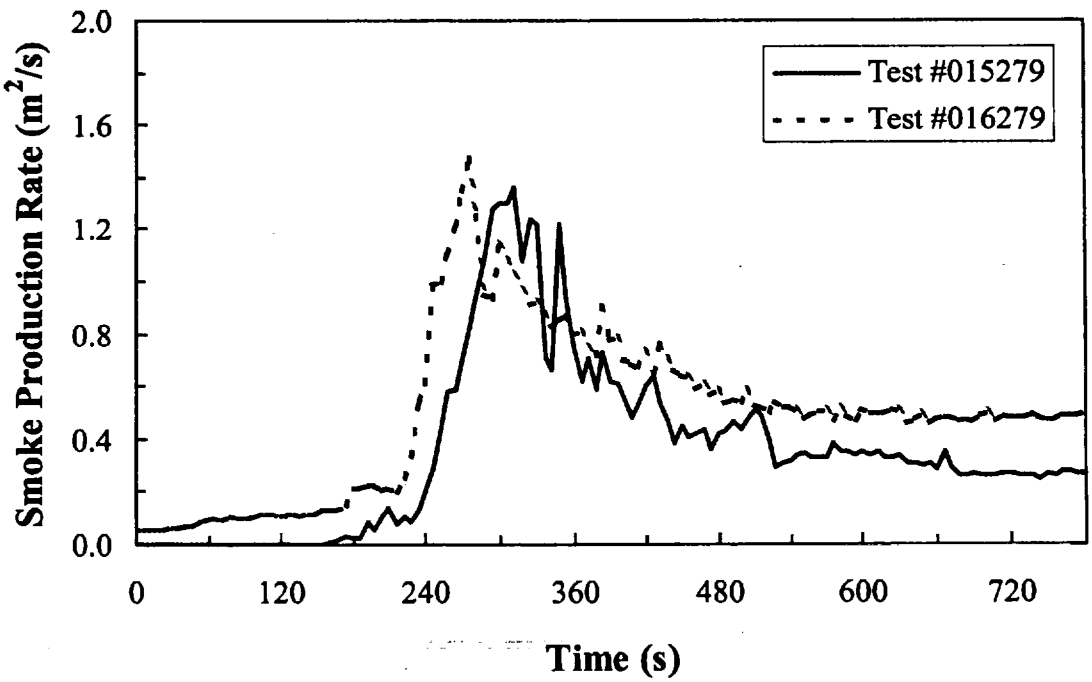


Figure D.32 Smoke production rate of door panel at 20 kW/m^2

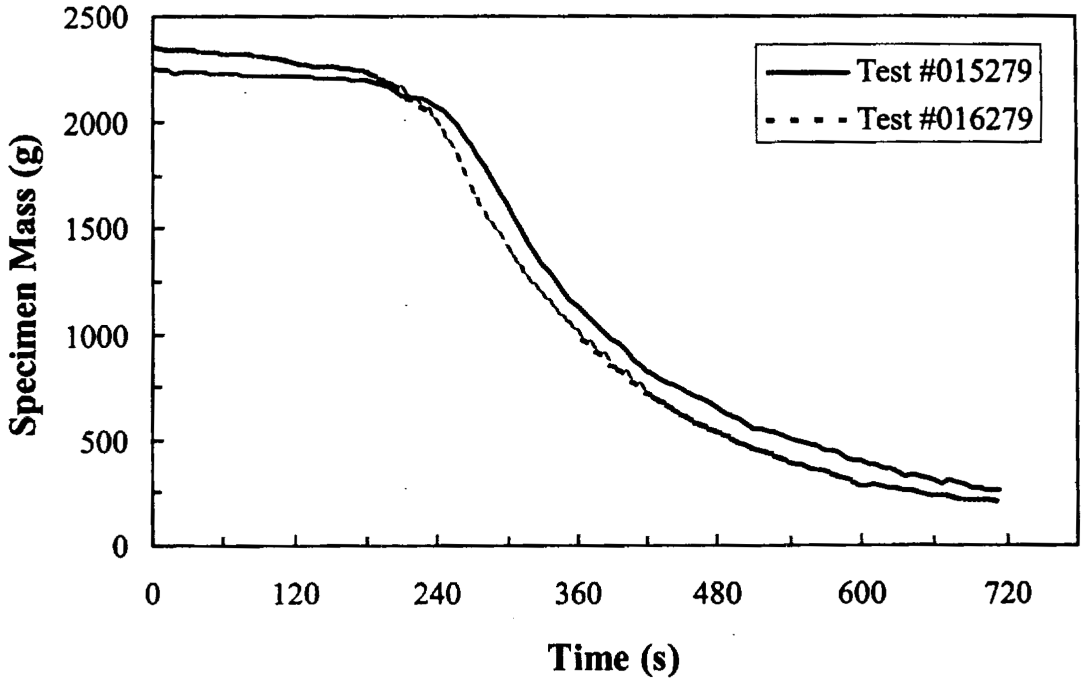


Figure D.33 Specimen mass loss of door panel at 20 kW/m^2

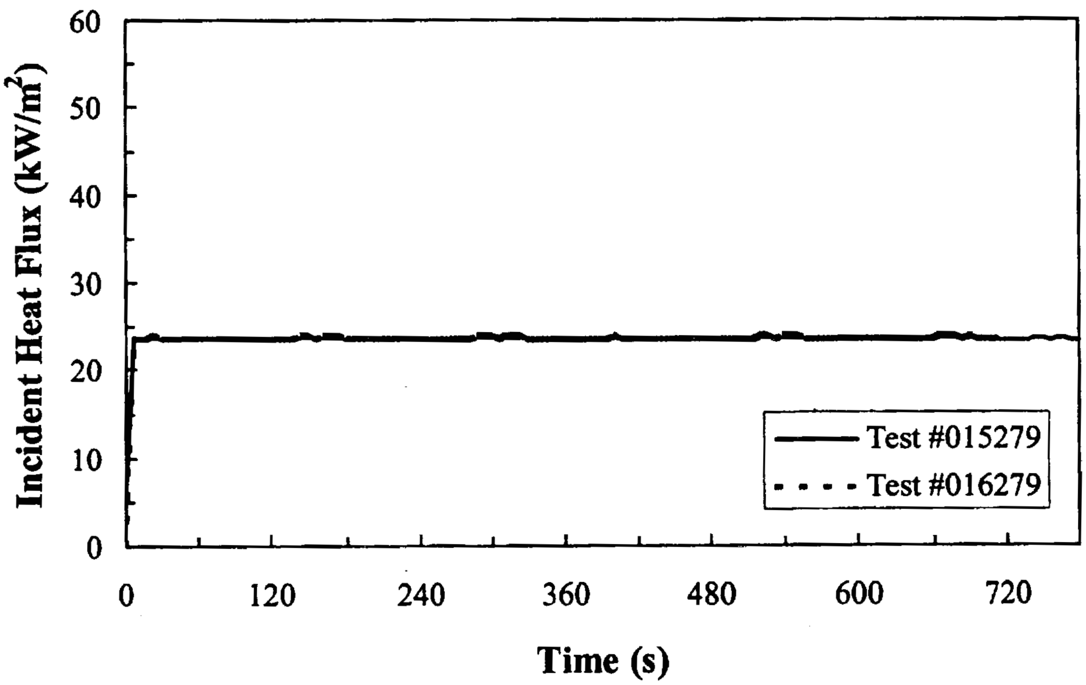


Figure D.34 Incident heat flux for door panel tests at 20 kW/m^2

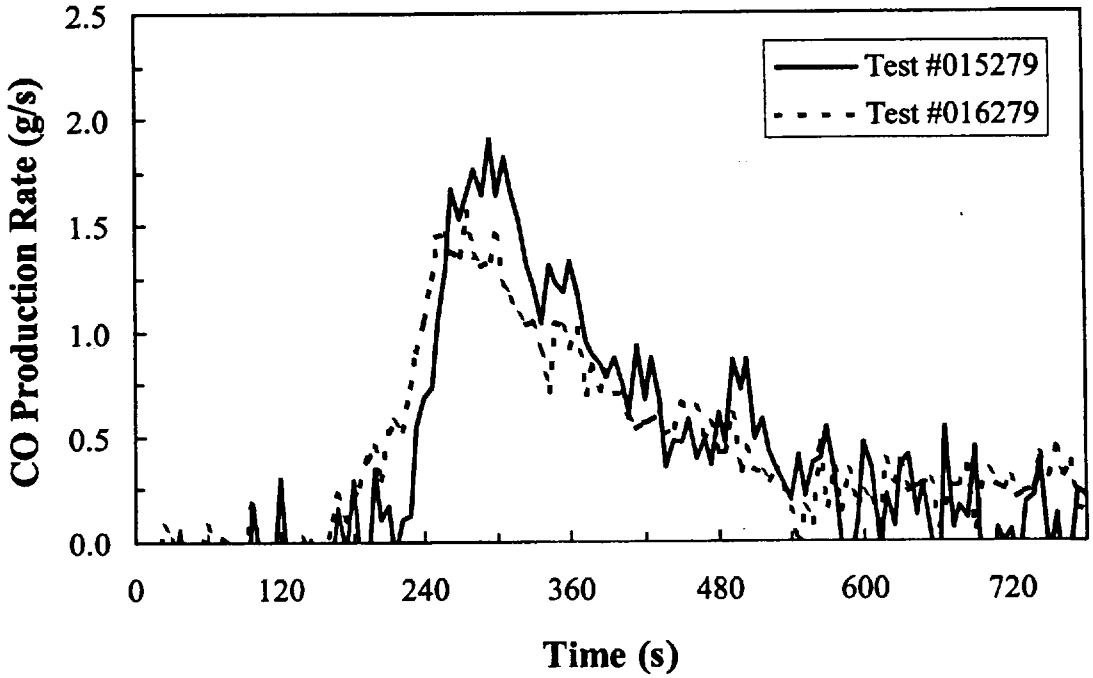


Figure D.35 CO generation rate of door panel at 20 kW/m^2

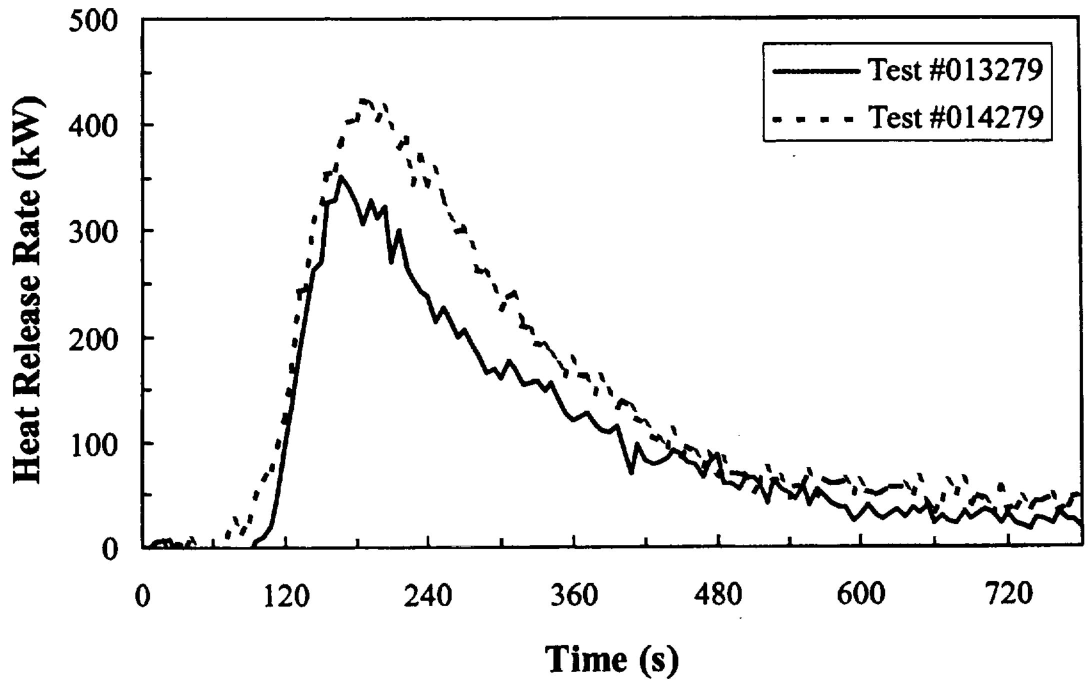


Figure D.36 Heat release rate of door panel at 35 kW/m^2

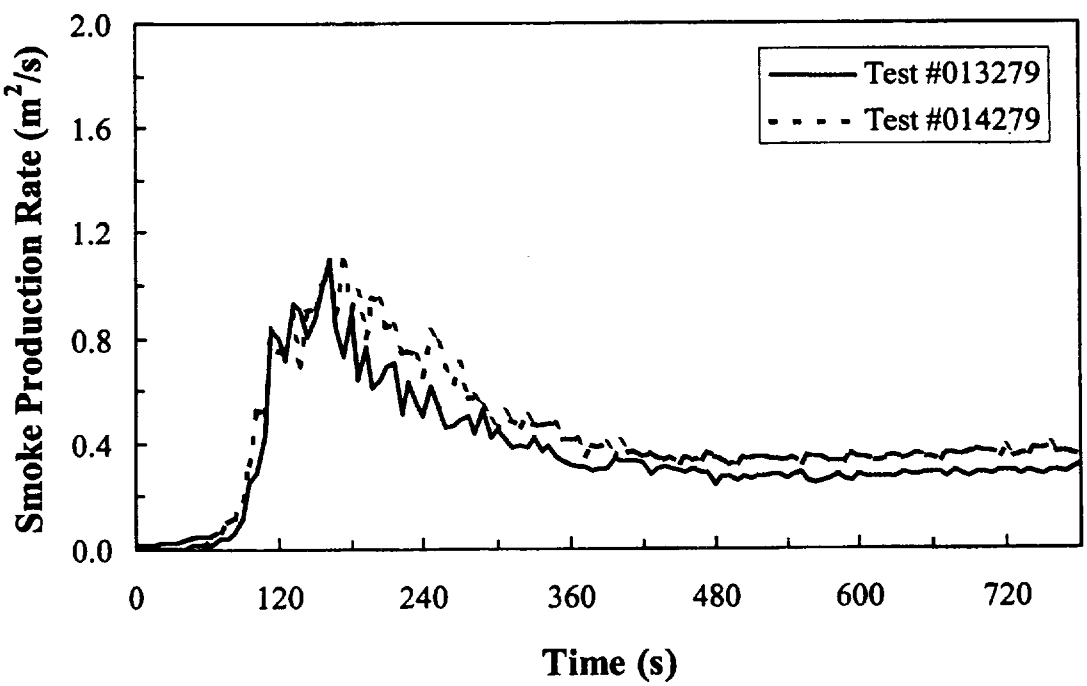


Figure D.37 Smoke production rate of door panel at 35 kW/m^2

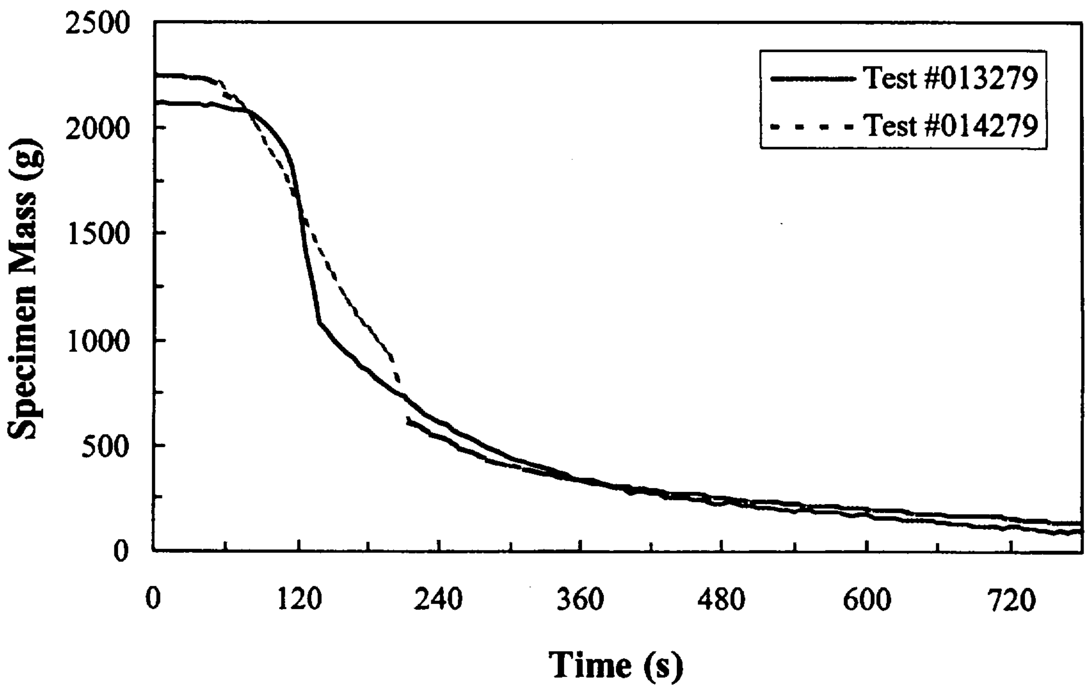


Figure D.38 Specimen mass loss of door panel at 35 kW/m²

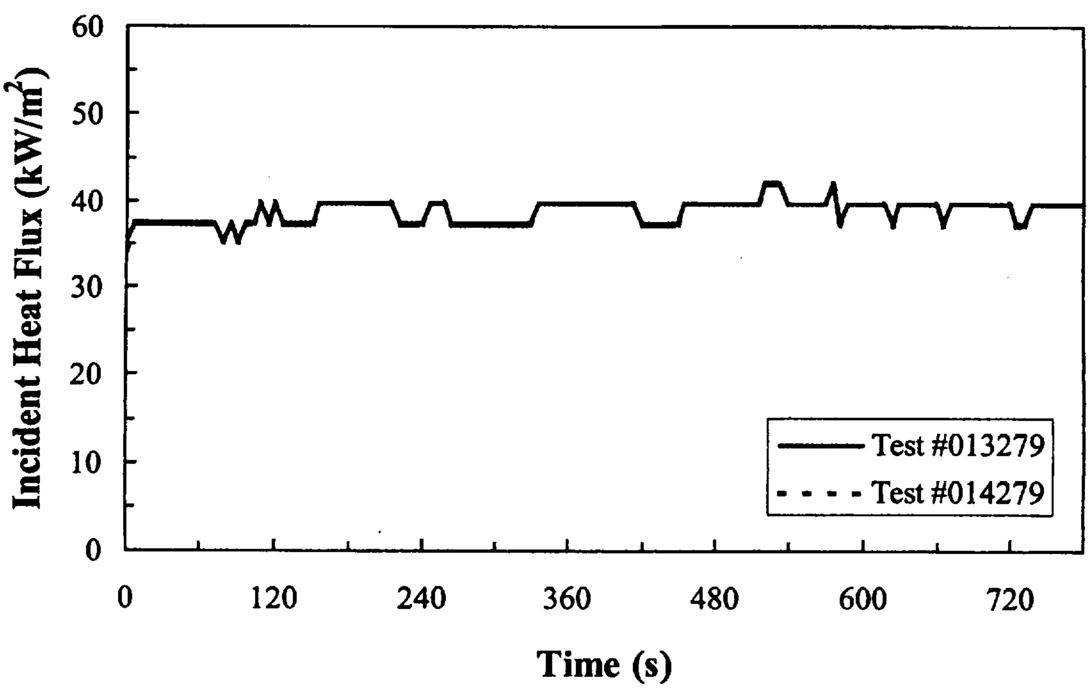


Figure D.39 Incident heat flux for door panel tests at 35 kW/m²

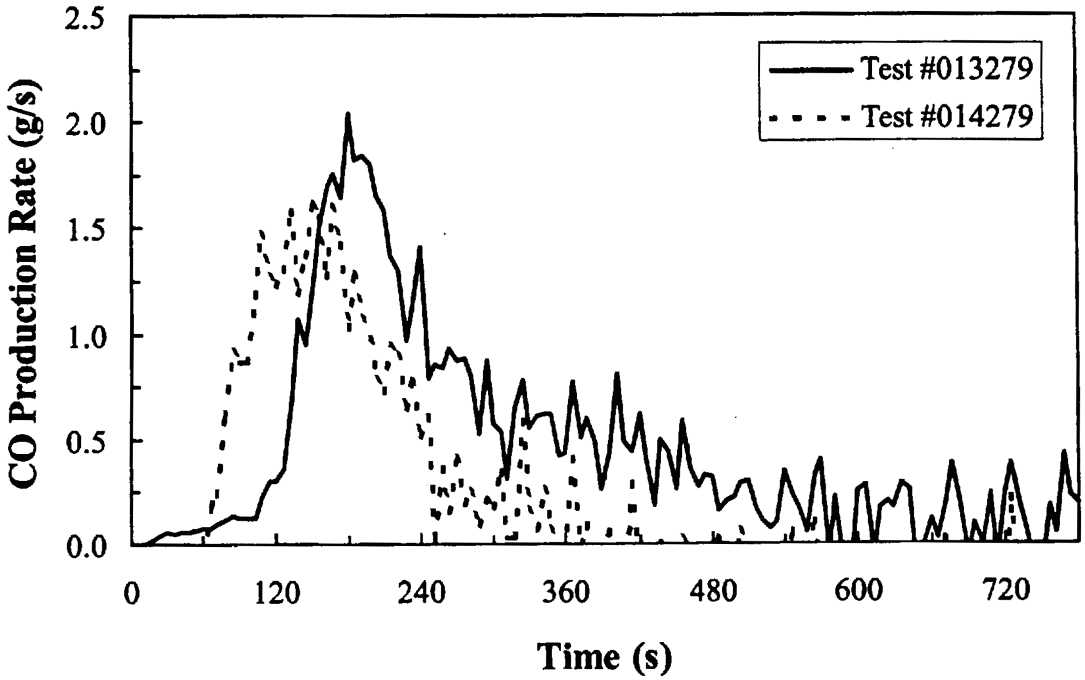


Figure D.40 CO generation rate of door panel at 35 kW/m^2

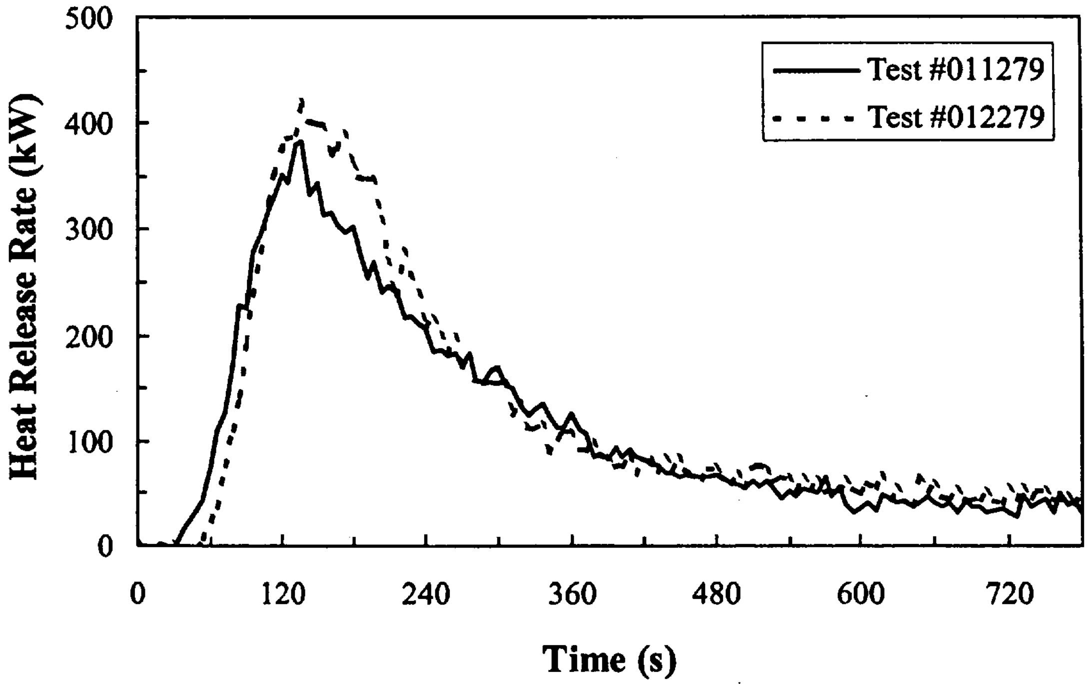


Figure D.41 Heat release rate of door panel at 50 kW/m^2

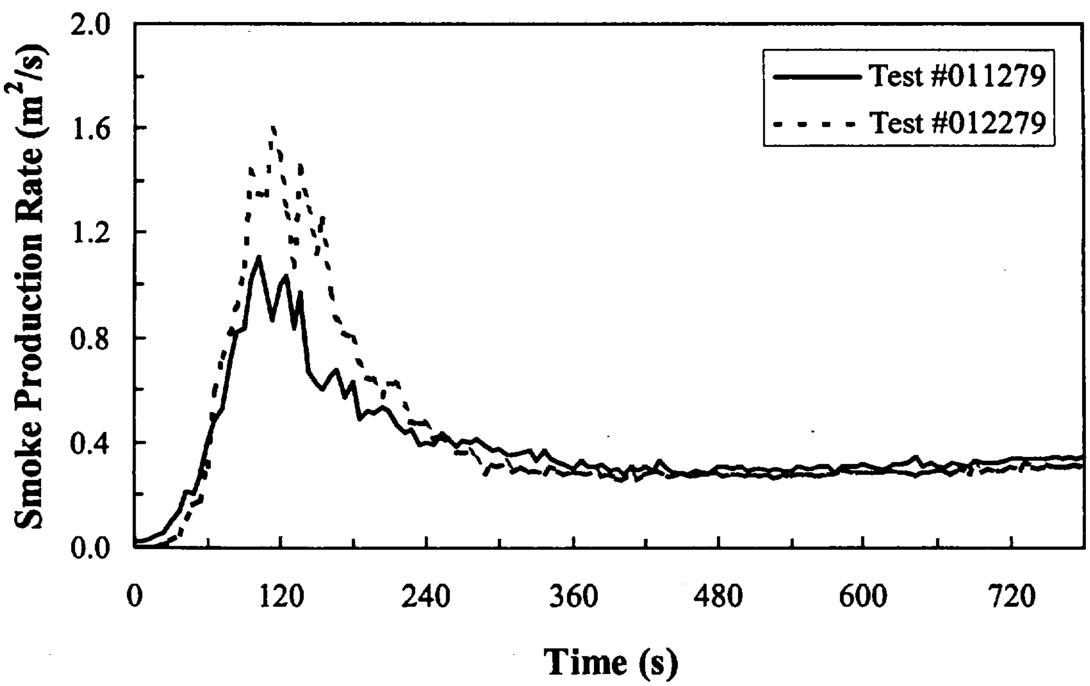


Figure D.42 Smoke production rate of door panel at 50 kW/m^2

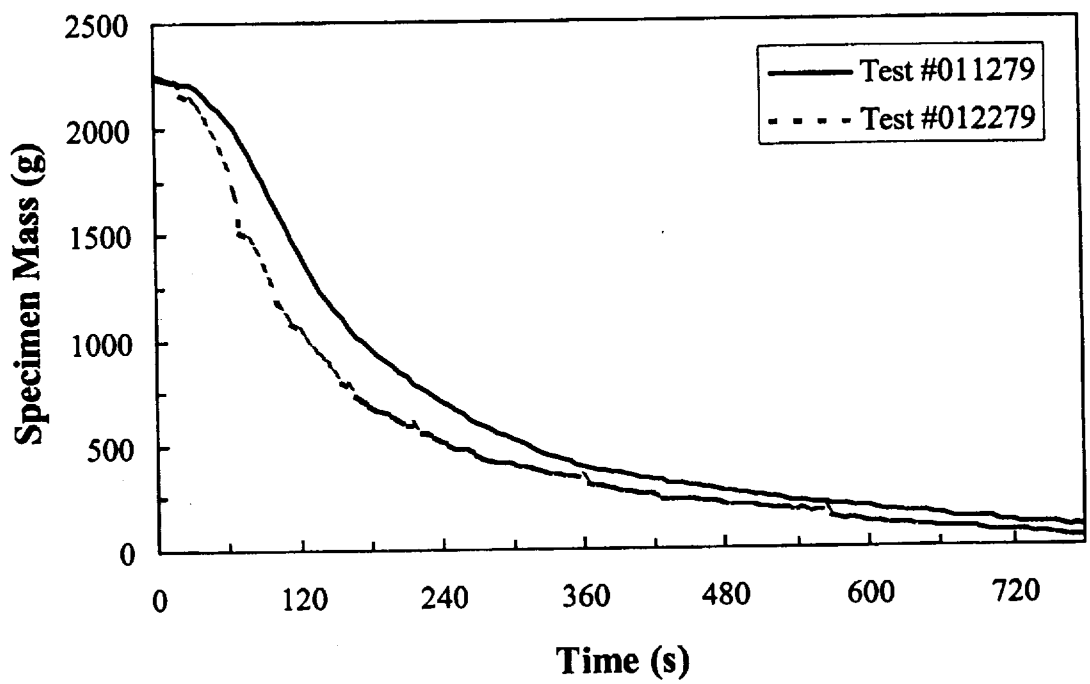


Figure D.43 Specimen mass loss of door panel at 50 kW/m²

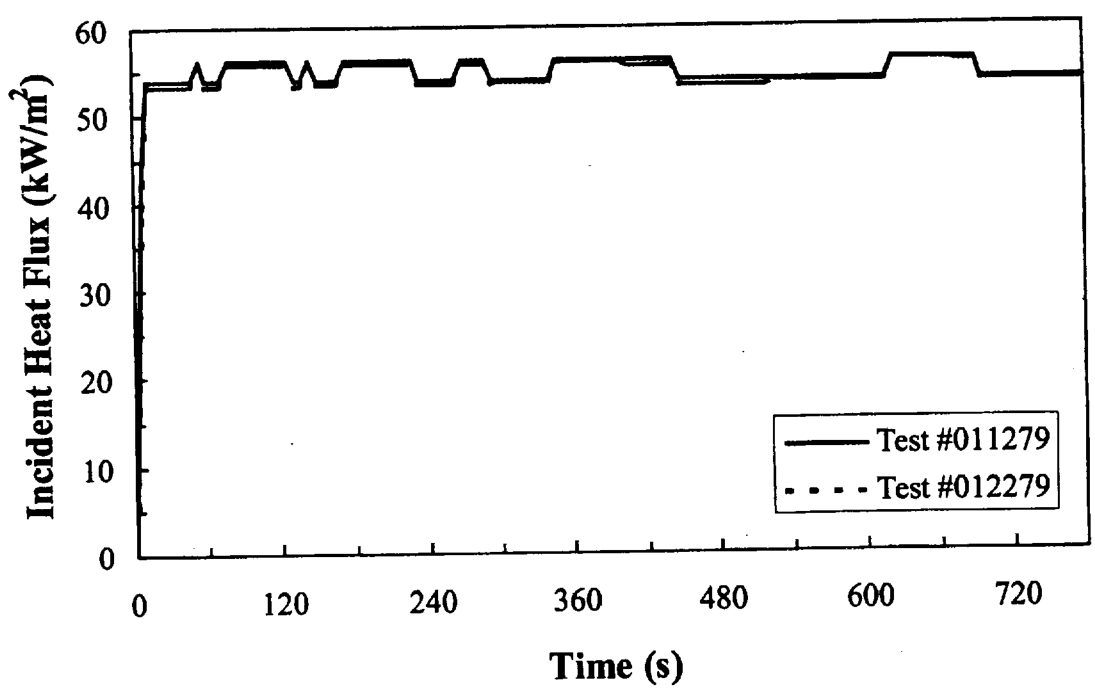


Figure D.44 Incident heat flux for door panel tests at 50 kW/m²

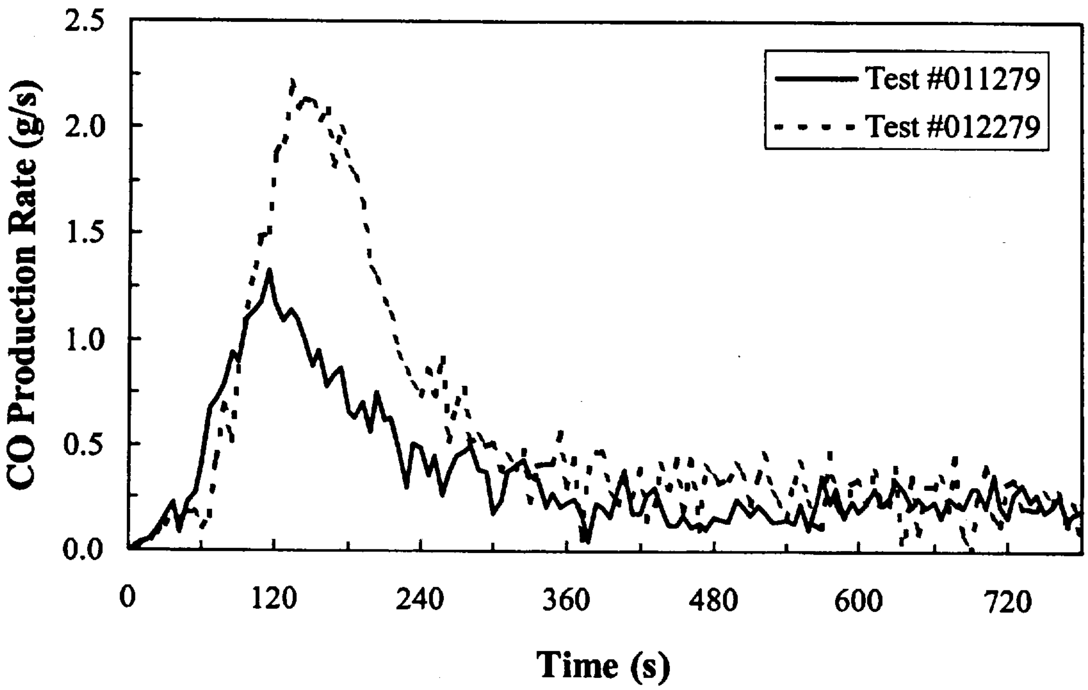


Figure D.45 CO generation rate of door panel at 50 kW/m^2

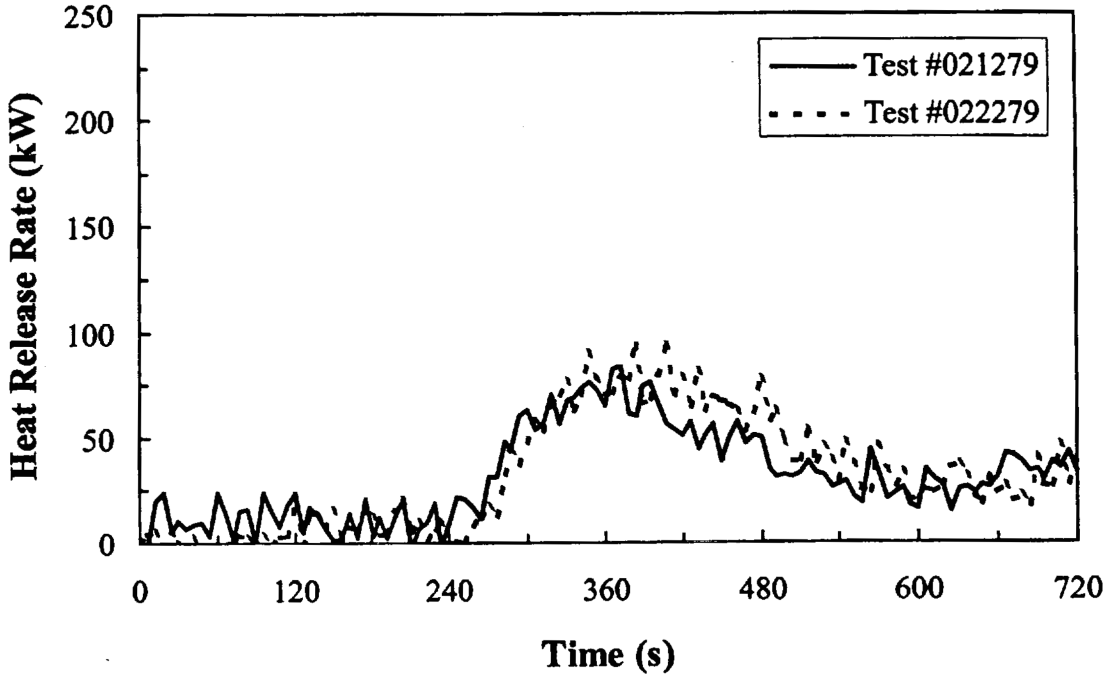


Figure D.46 Heat release rate of carpet at 20 kW/m^2

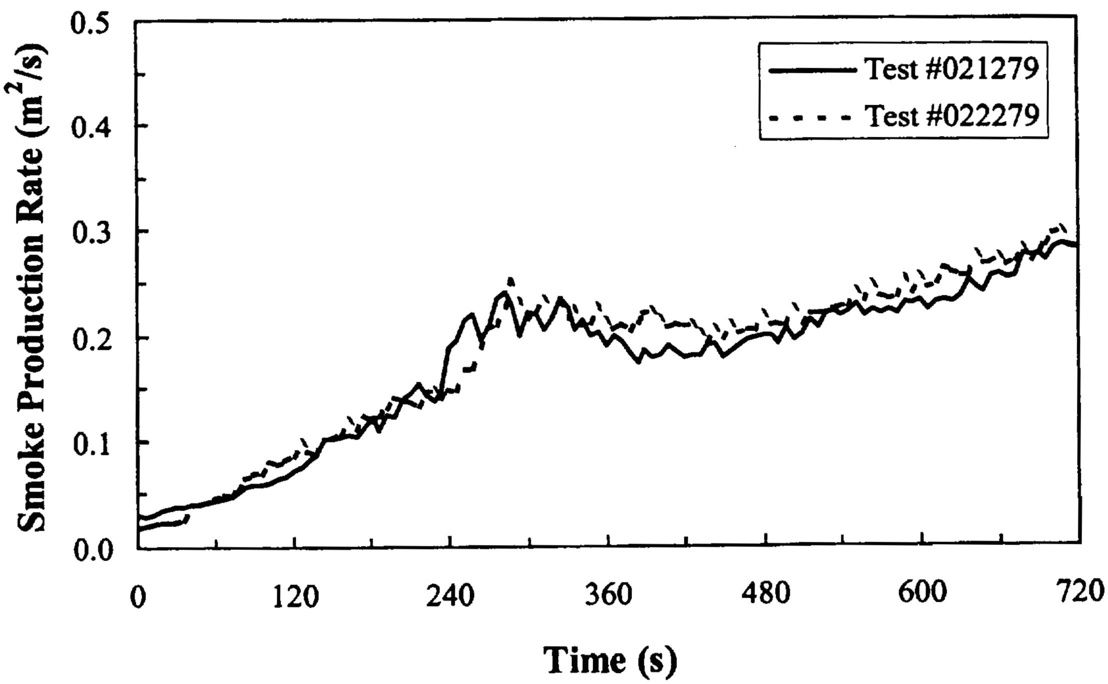


Figure D.47 Smoke production rate of carpet at 20 kW/m^2

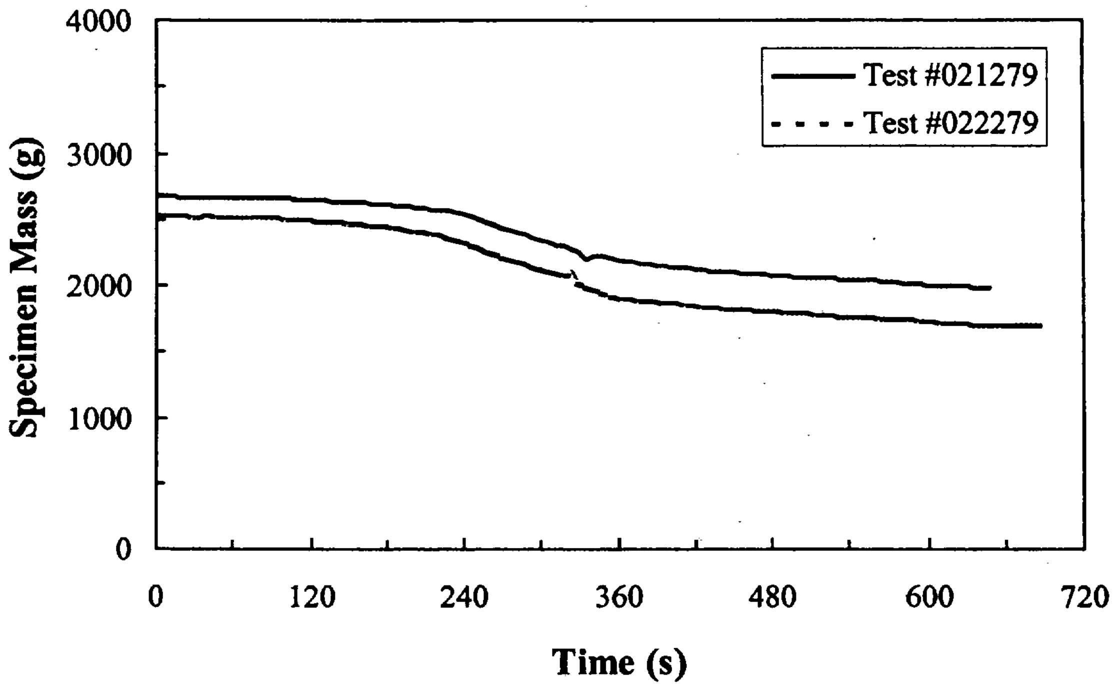


Figure D.48 Specimen mass loss of carpet at 20 kW/m^2

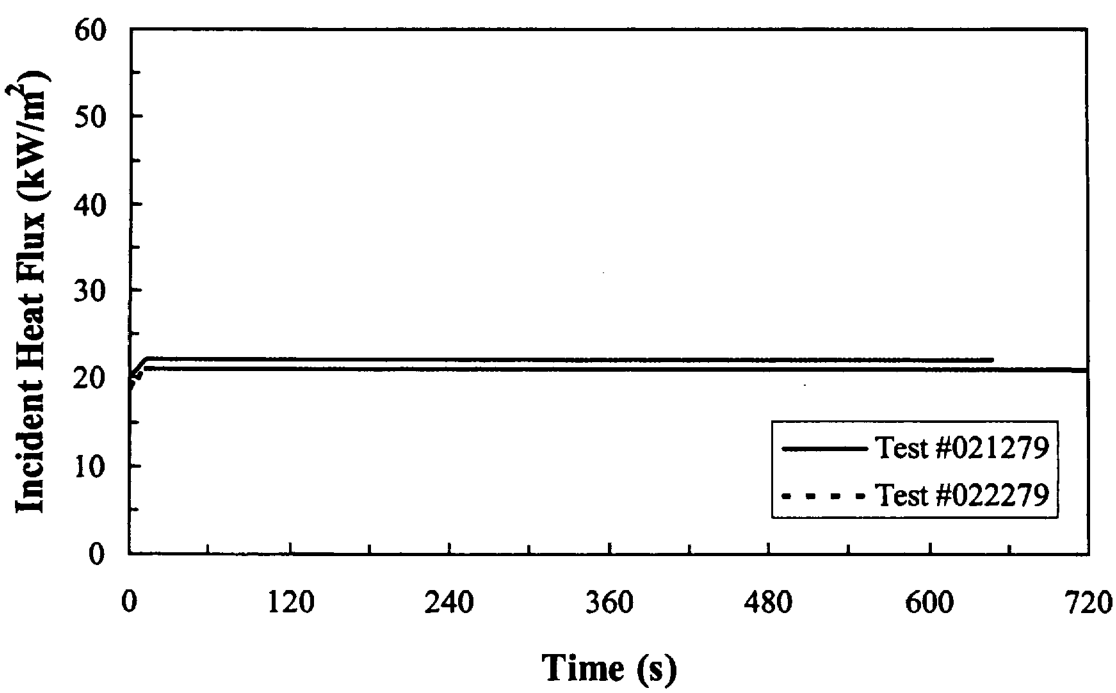


Figure D.49 Incident heat flux for carpet tests at 20 kW/m^2

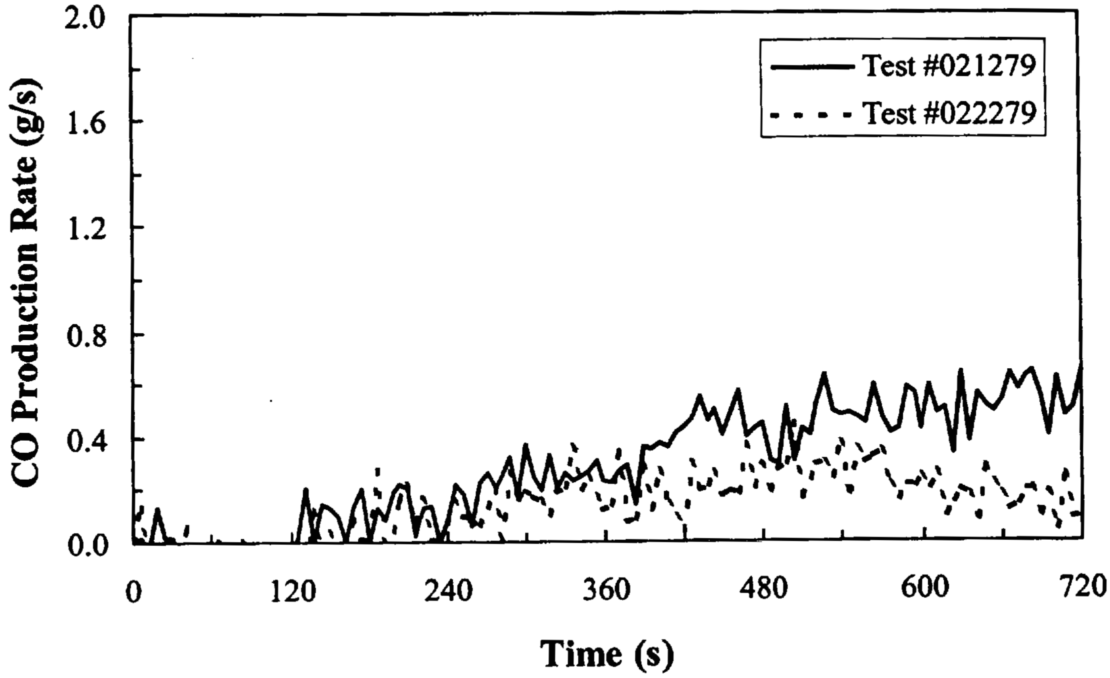


Figure D.50 CO generation rate of carpet at 20 kW/m^2

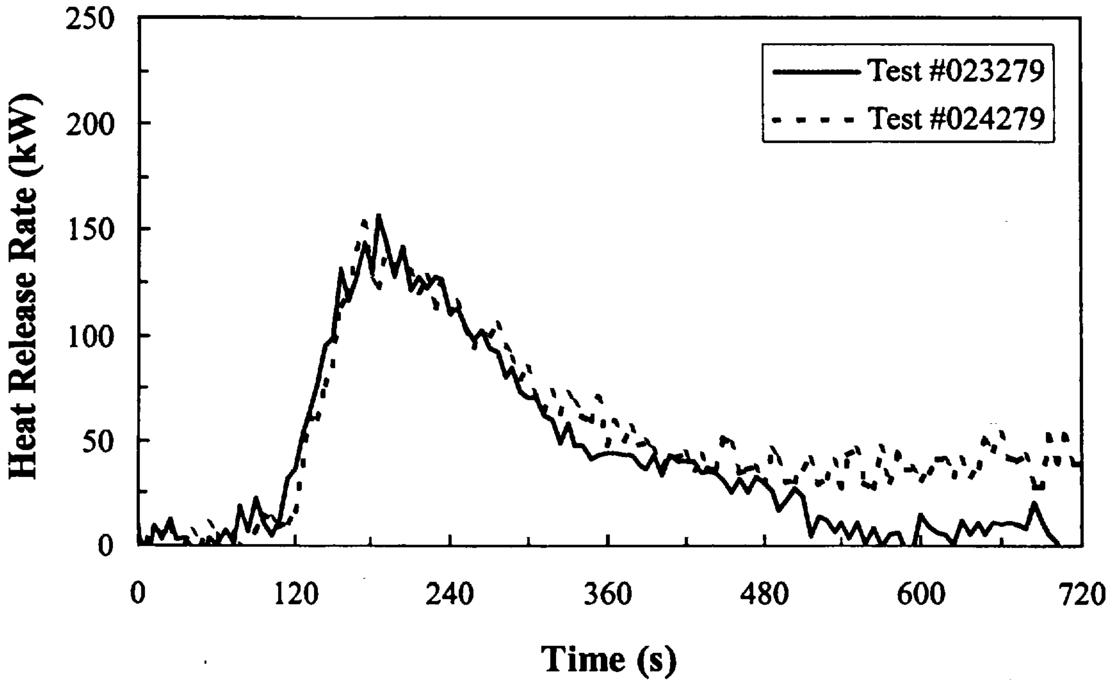


Figure D.51 Heat release rate of carpet at 35 kW/m^2

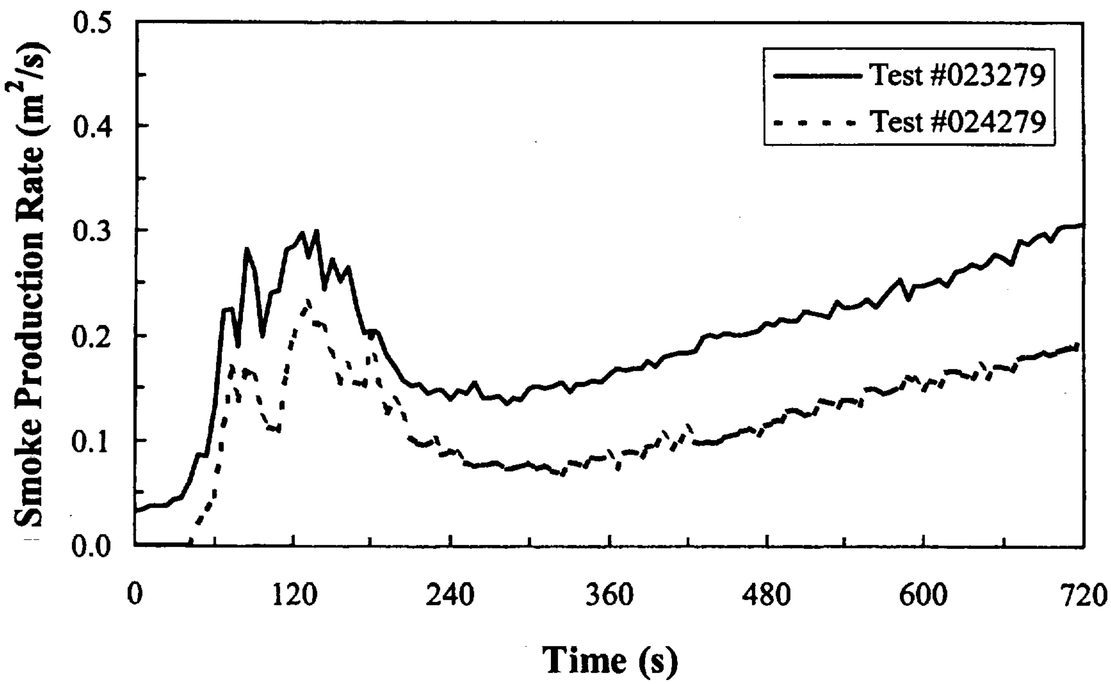


Figure D.52 Smoke production rate of carpet at 35 kW/m^2

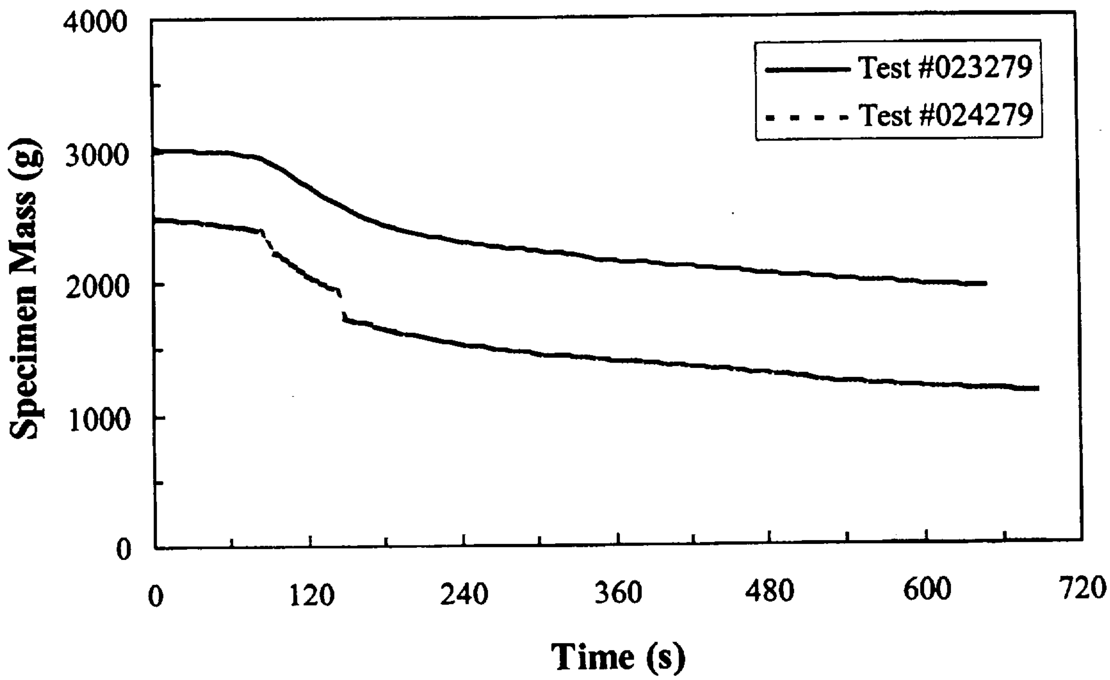


Figure D.53 Specimen mass loss of carpet at 35 kW/m^2

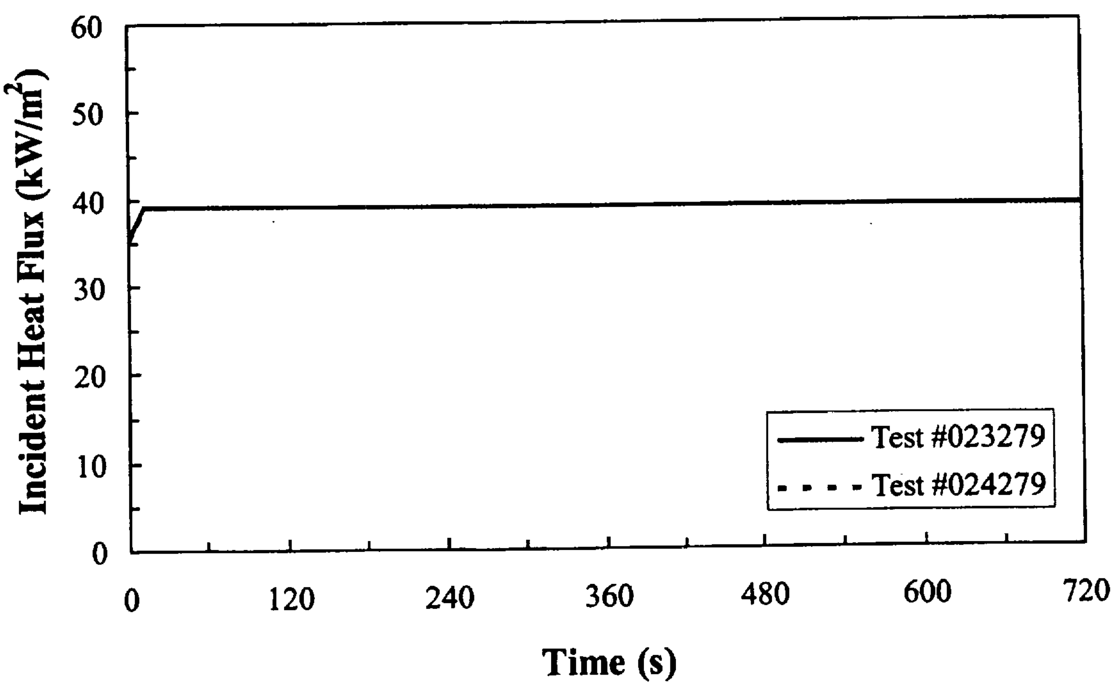


Figure D.54 Incident heat flux for carpet tests at 35 kW/m^2

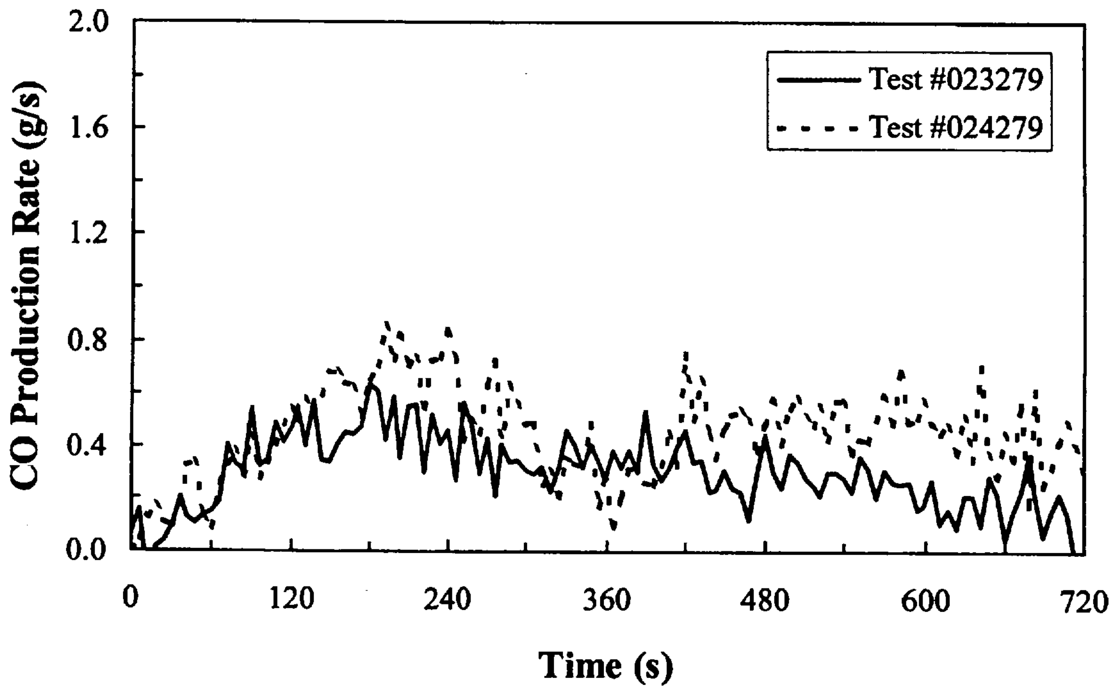


Figure D.55 CO generation rate of carpet at 35 kW/m^2

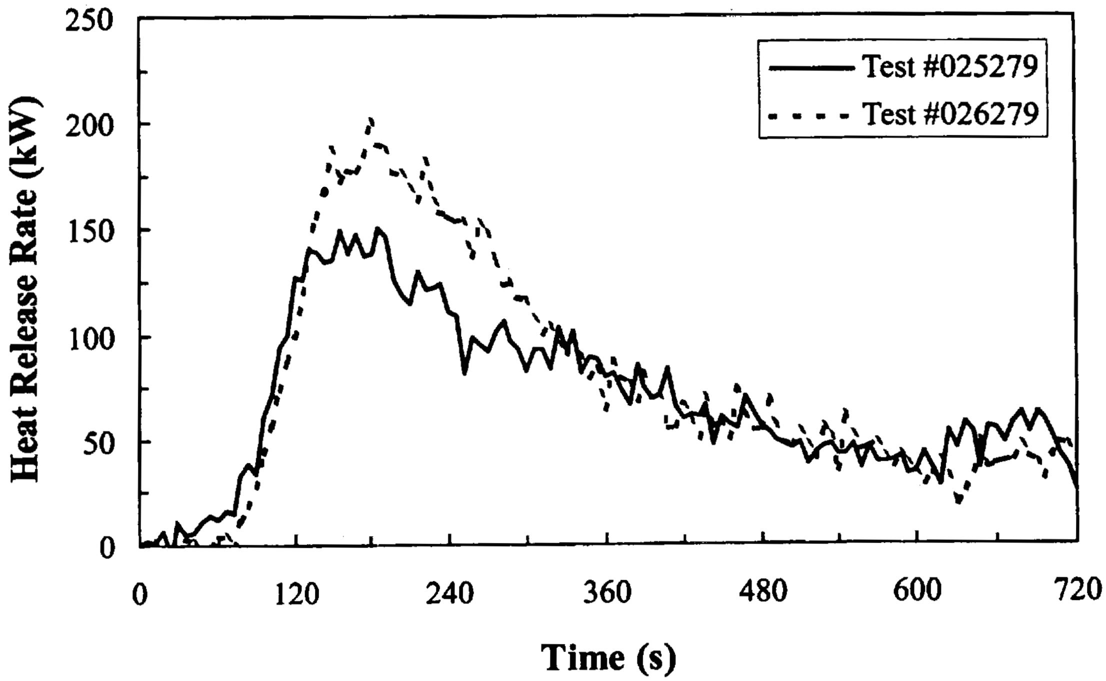


Figure D.56 Heat release rate of carpet at 50 kW/m^2

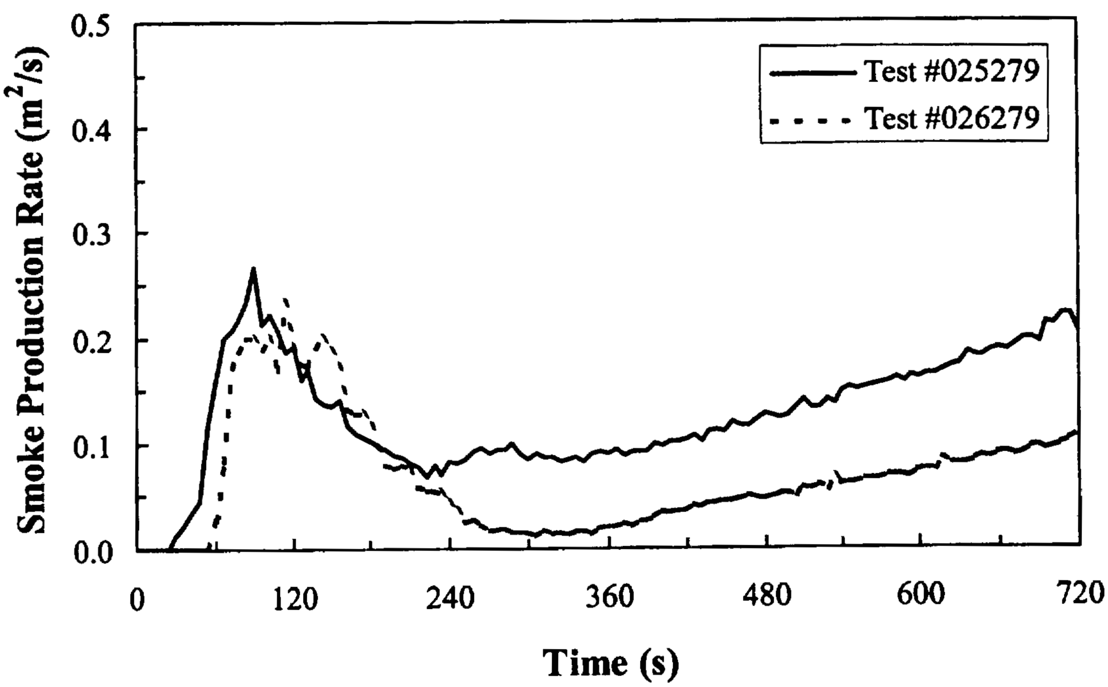


Figure D.57 Smoke production rate of carpet at 50 kW/m^2

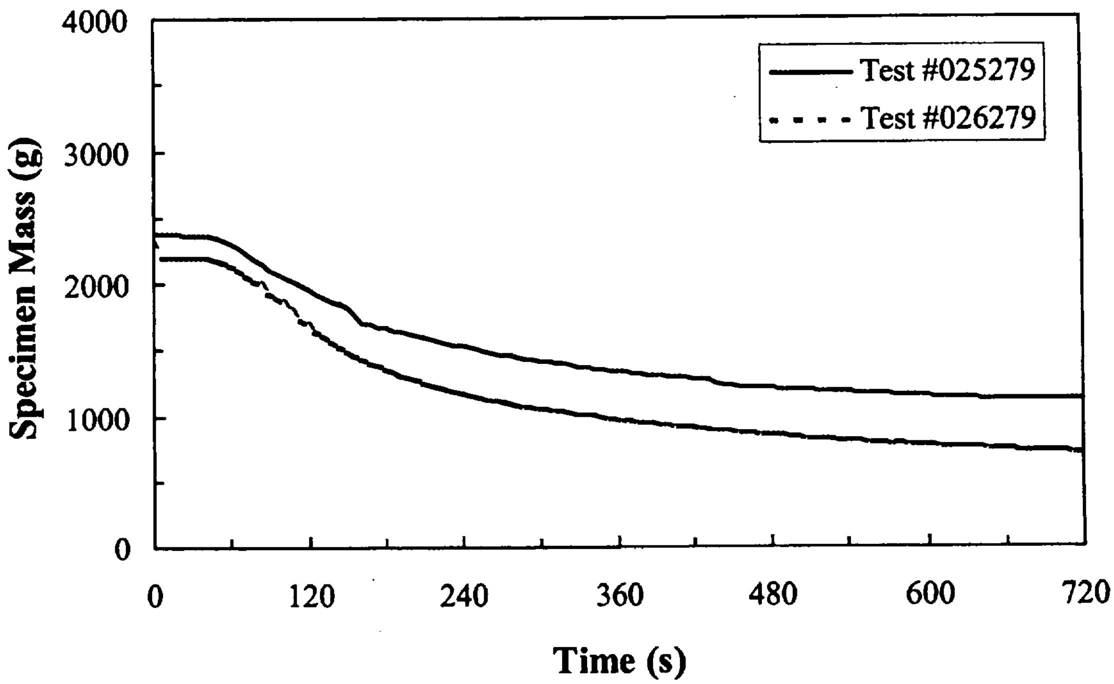


Figure D.58 Specimen mass loss of carpet at 50 kW/m^2

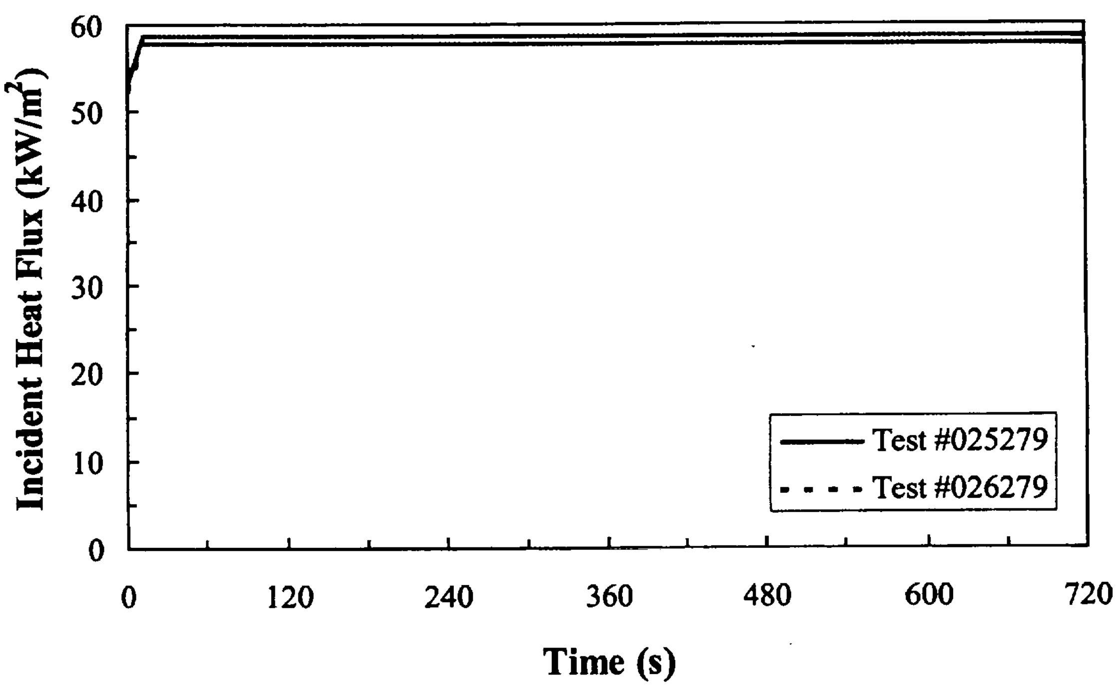


Figure D.59 Incident heat flux for carpet tests at 50 kW/m^2

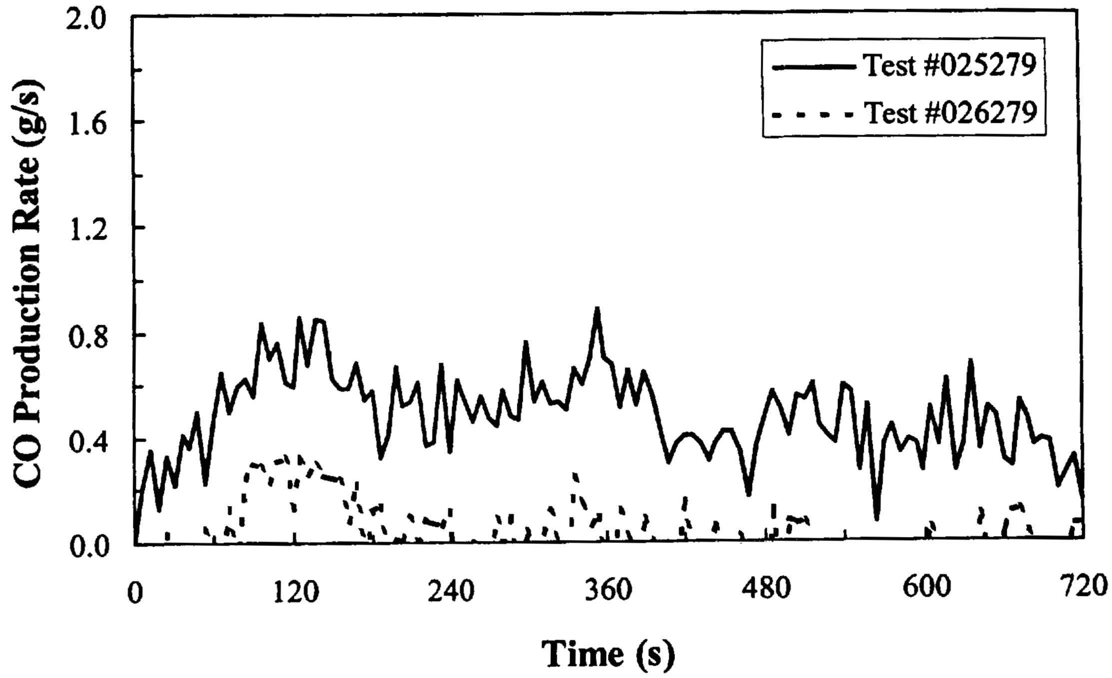


Figure D.60 CO generation rate of carpet at 50 kW/m^2

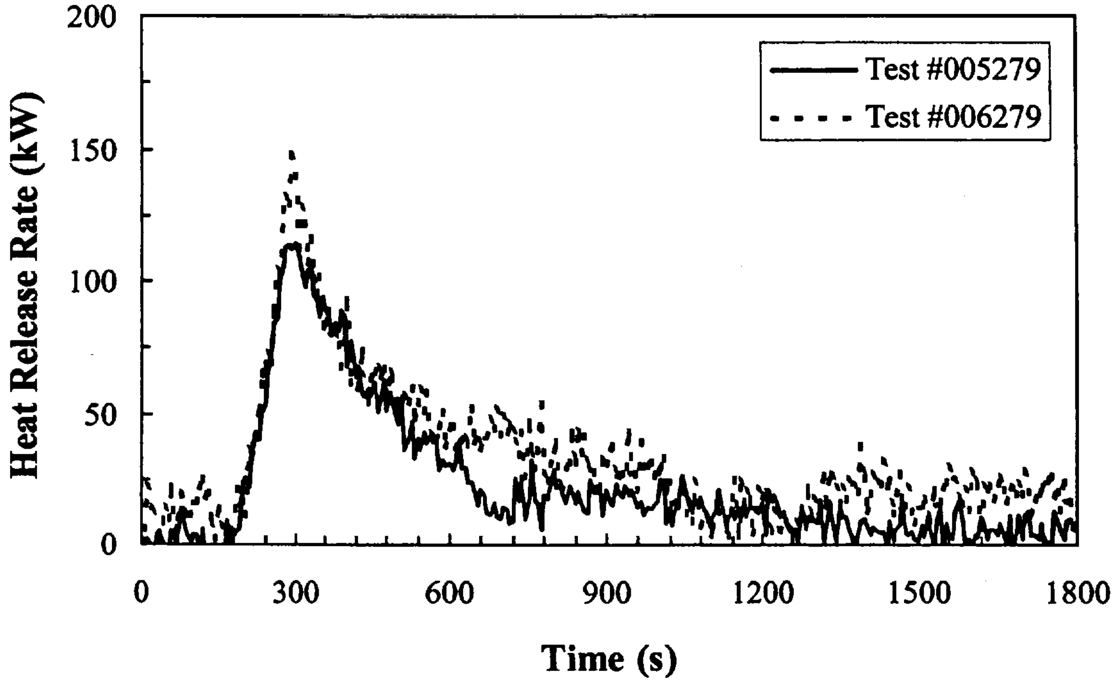


Figure D.61 Heat release rate of air filter box at 20 kW/m^2

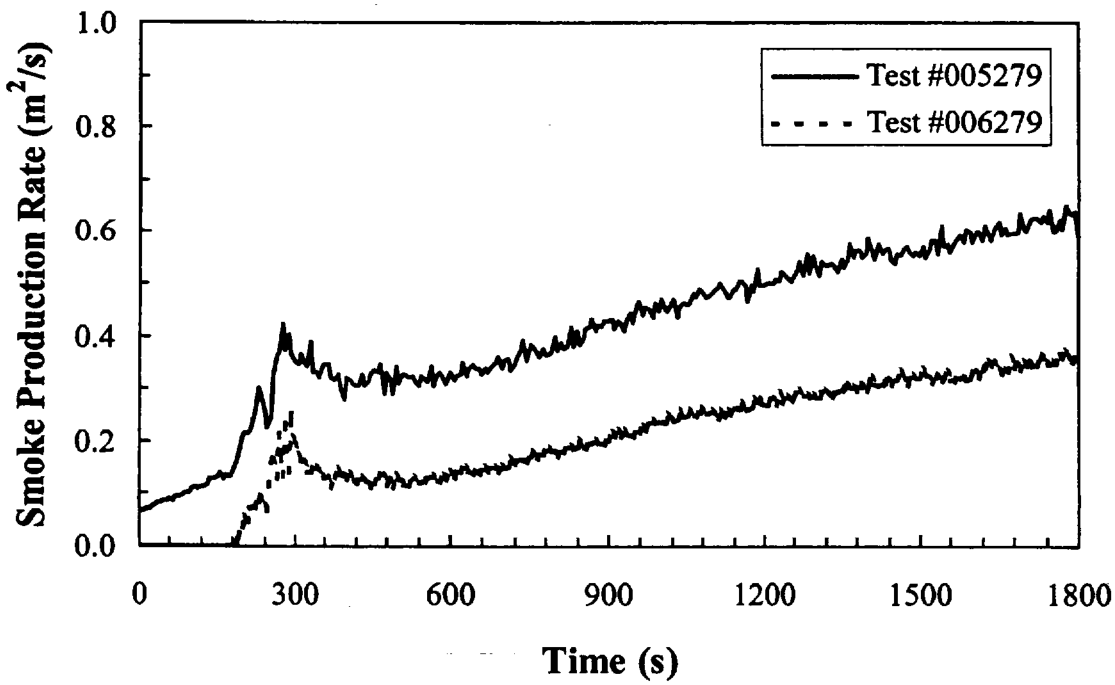


Figure D.62 Smoke production rate of air filter box at 20 kW/m^2

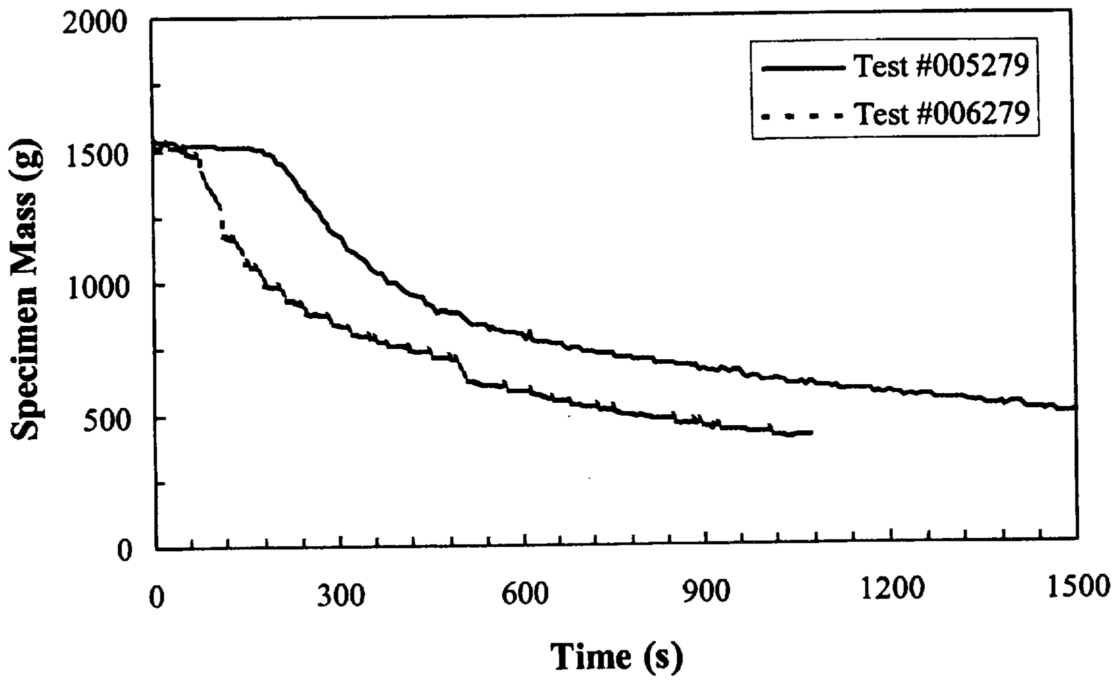


Figure D.63 Specimen mass loss of air filter box at 20 kW/m²

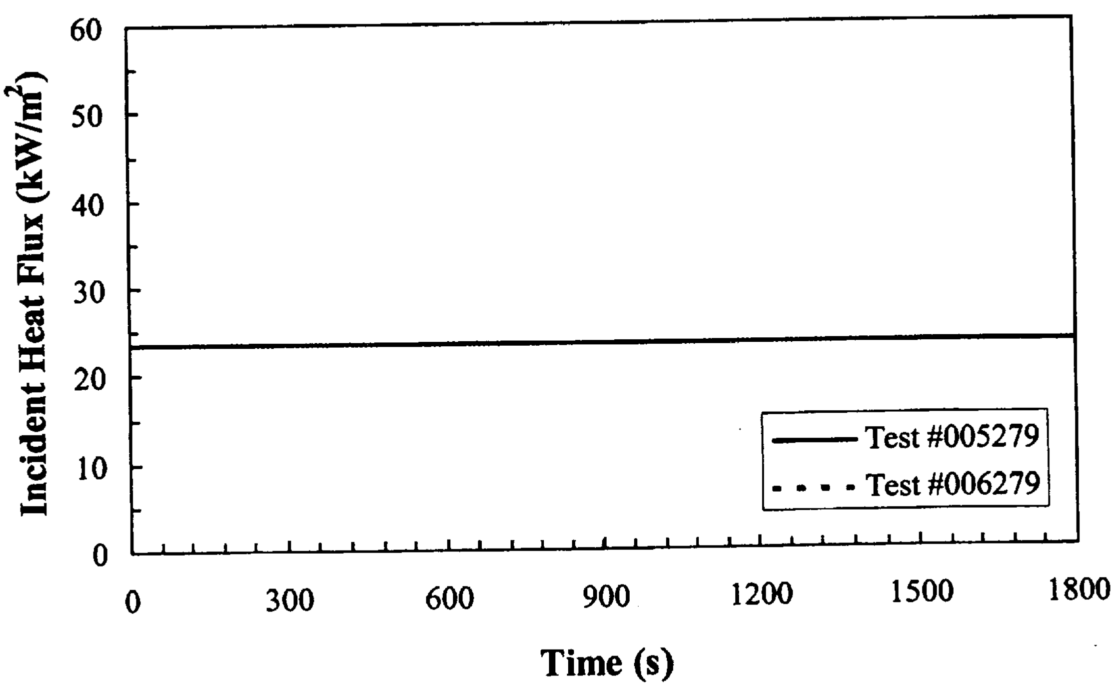


Figure D.64 Incident heat flux for air filter box tests at 20 kW/m²

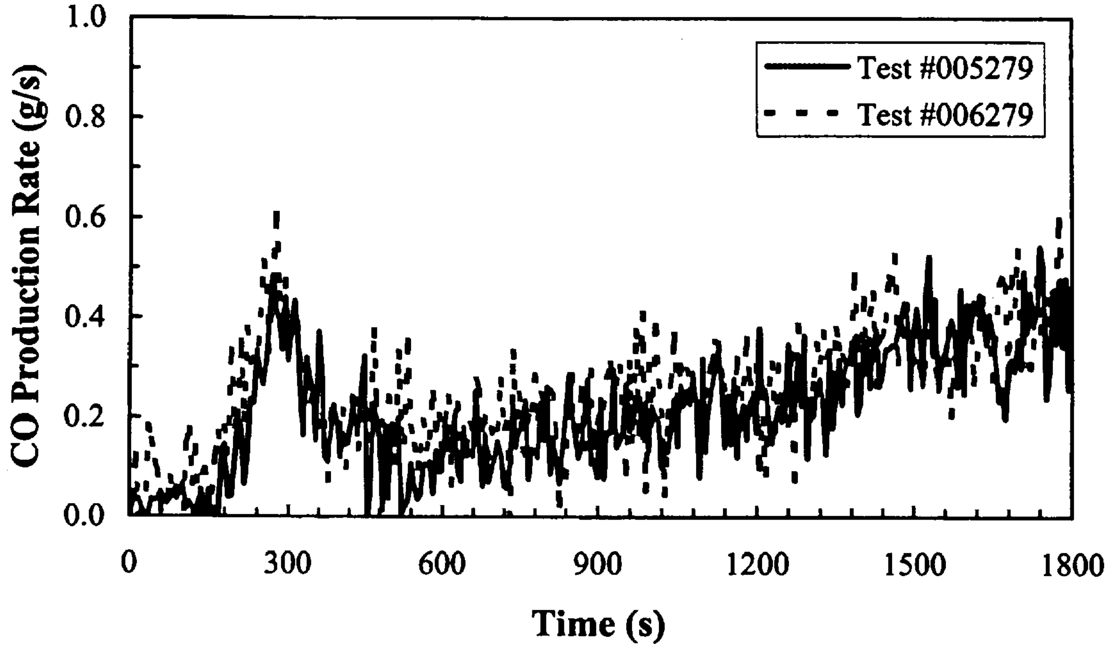


Figure D.65 CO generation rate of air filter box at 20 kW/m^2

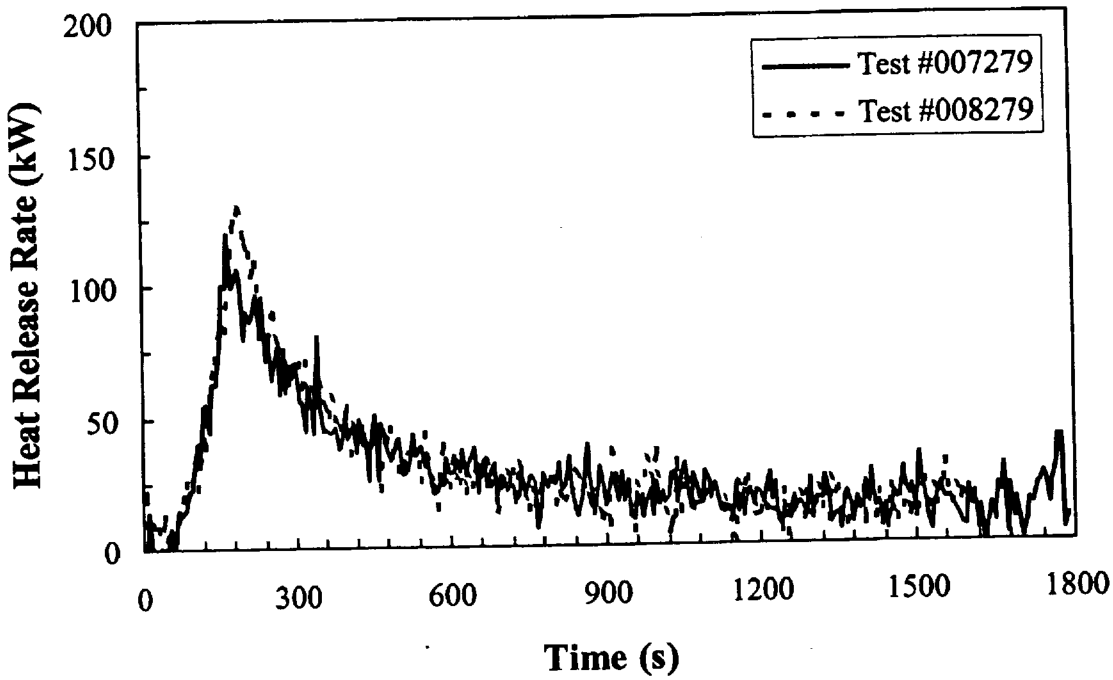


Figure D.66 Heat release rate of air filter box at 35 kW/m^2

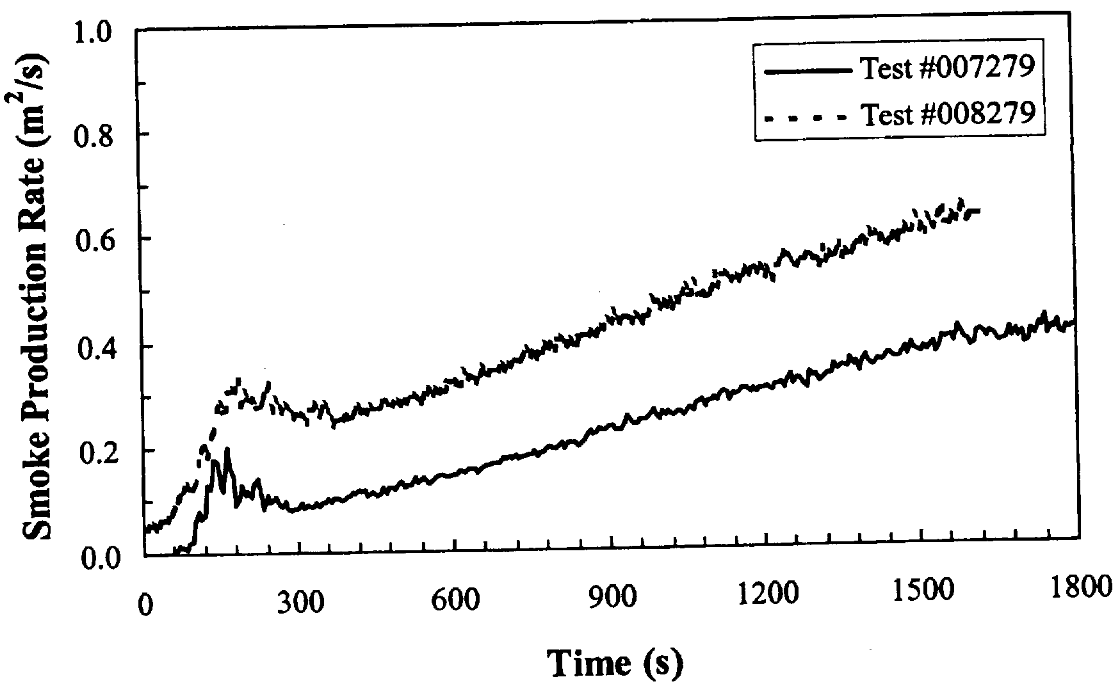


Figure D.67 Smoke production rate of air filter box at 35 kW/m^2

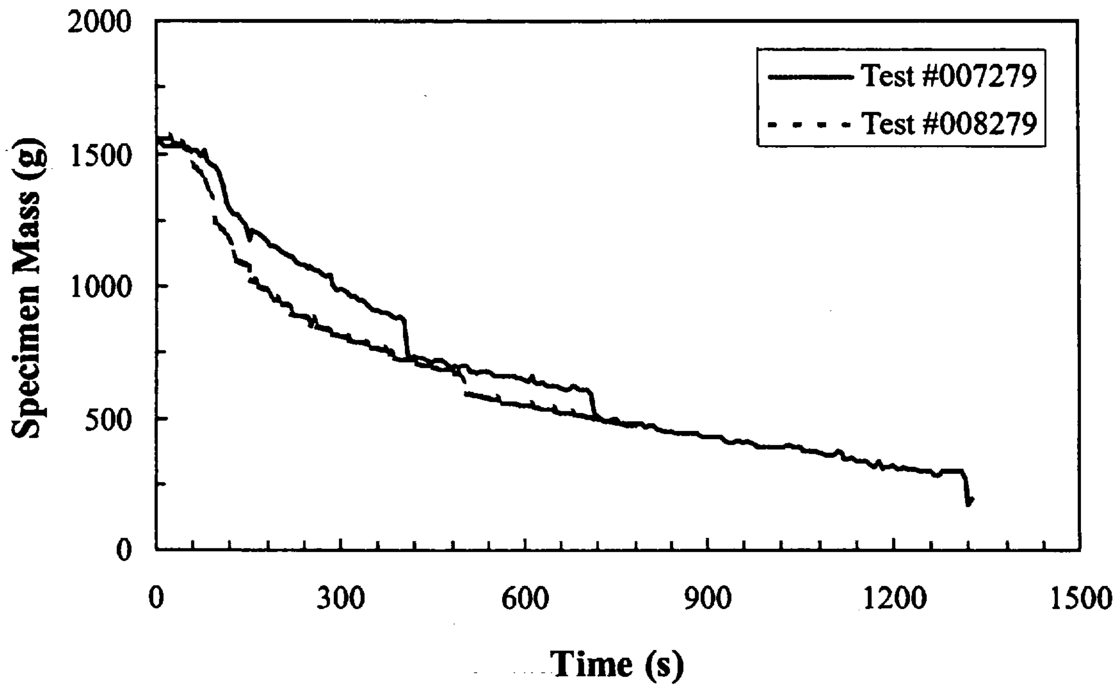


Figure D.68 Specimen mass loss of air filter box at 35 kW/m^2

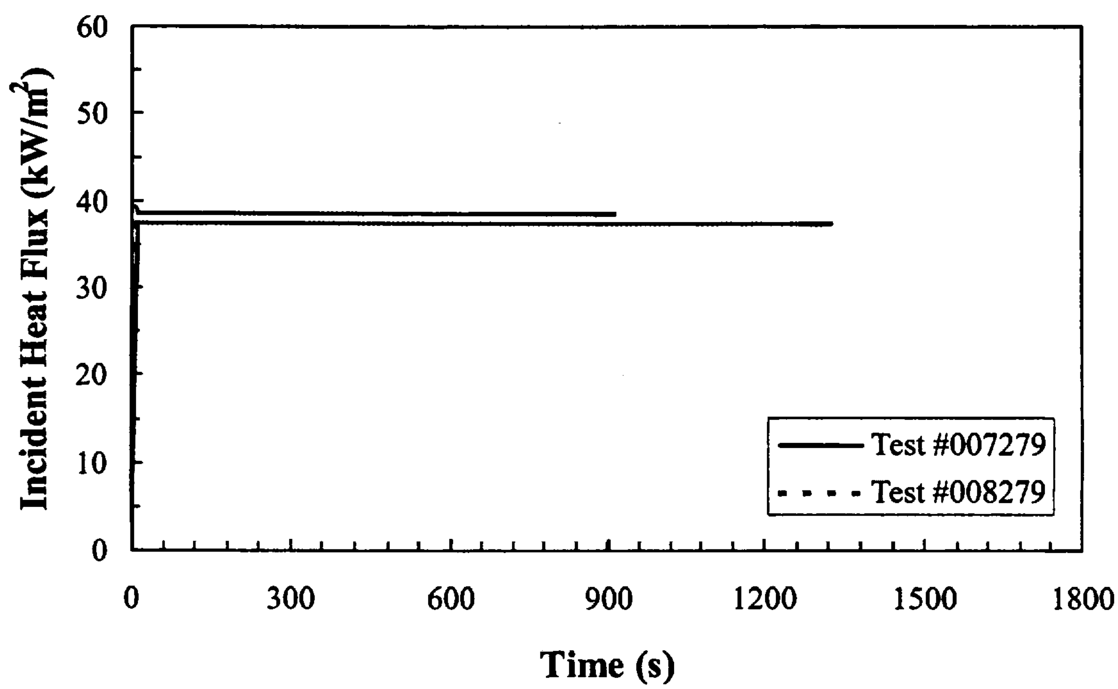


Figure D.69 Incident heat flux for air filter box tests at 35 kW/m^2

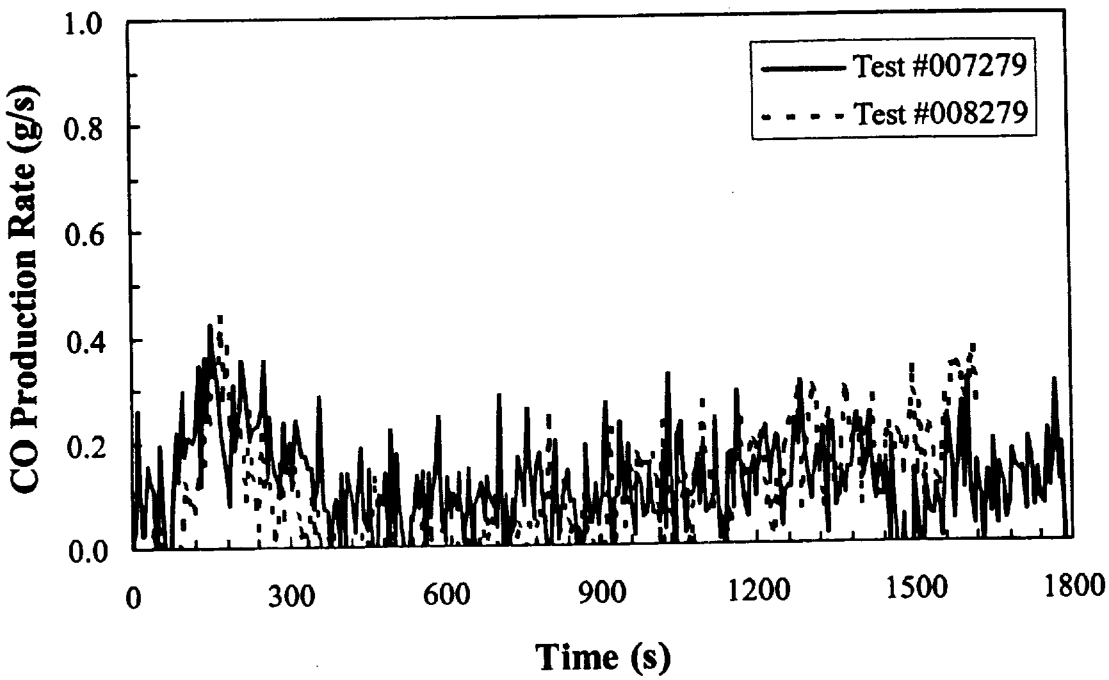


Figure D.70 CO generation rate of air filter box at 35 kW/m^2

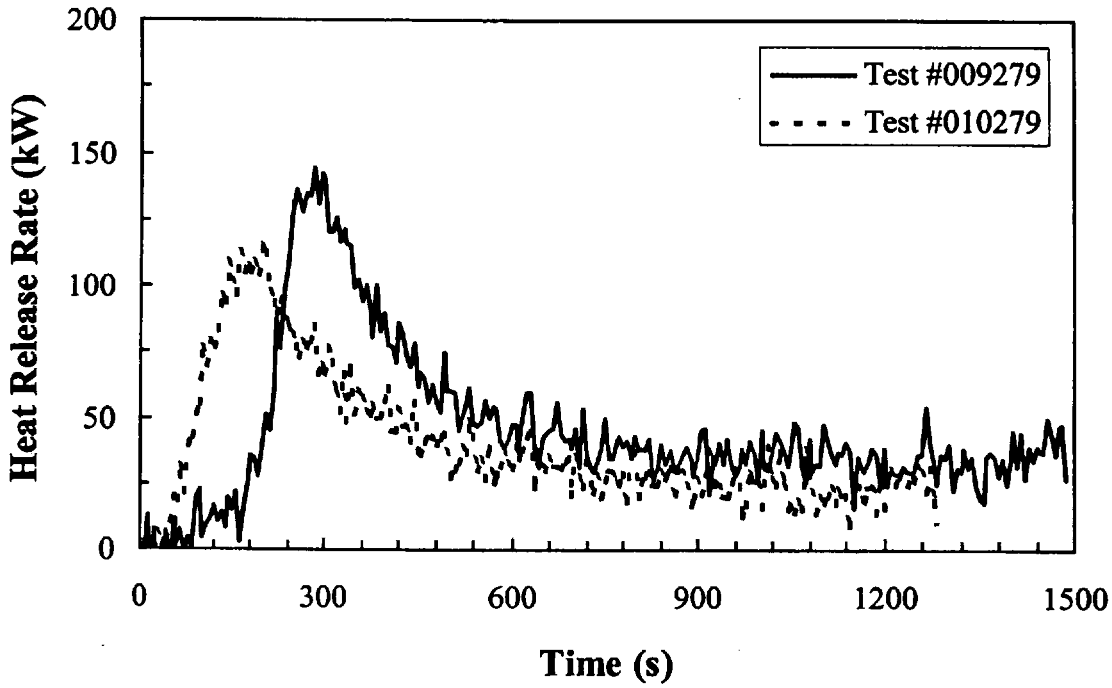


Figure D.71 Heat release rate of air filter box at 50 kW/m²

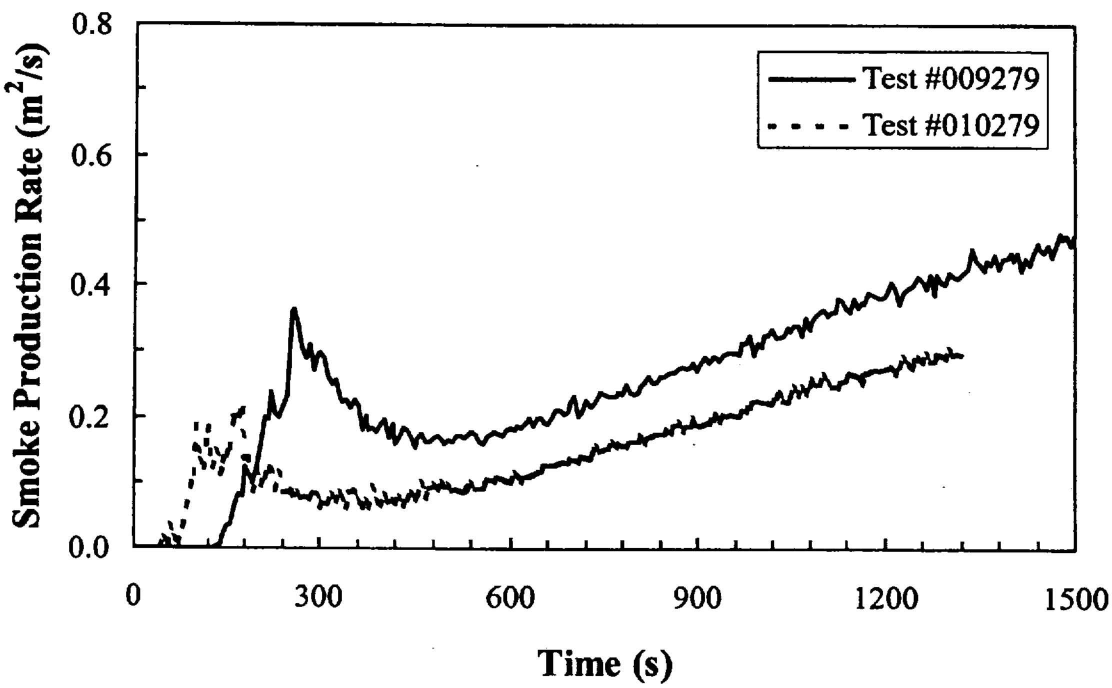


Figure D.72 Smoke production rate of air filter box at 50 kW/m²

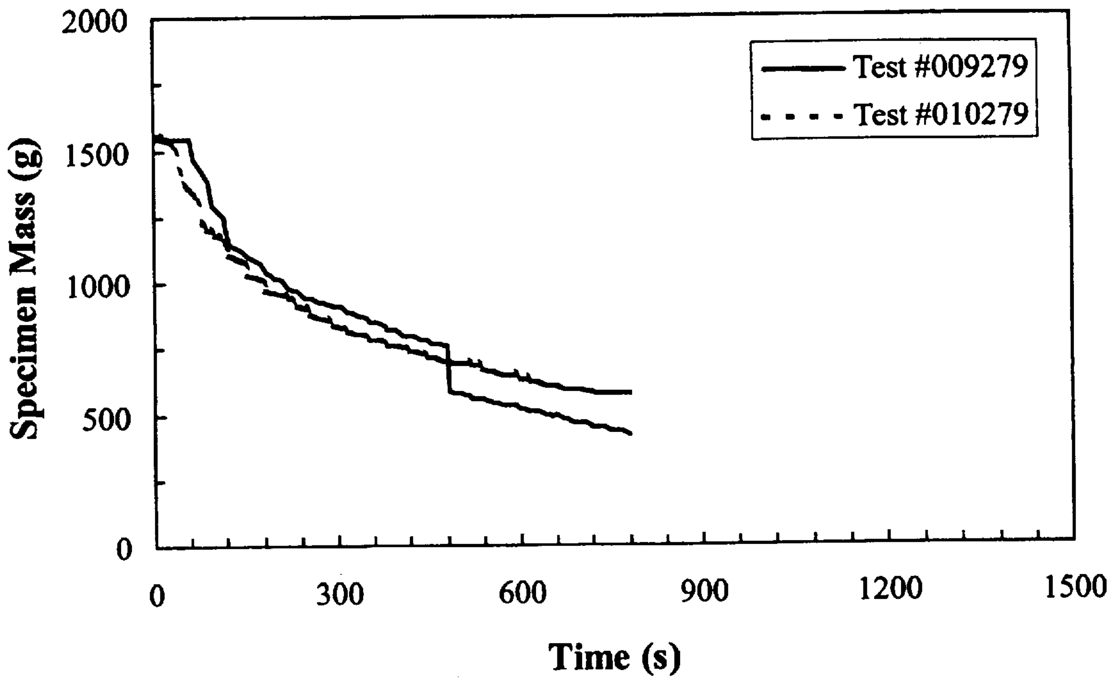


Figure D.73 Specimen mass loss of air filter box at 50 kW/m²

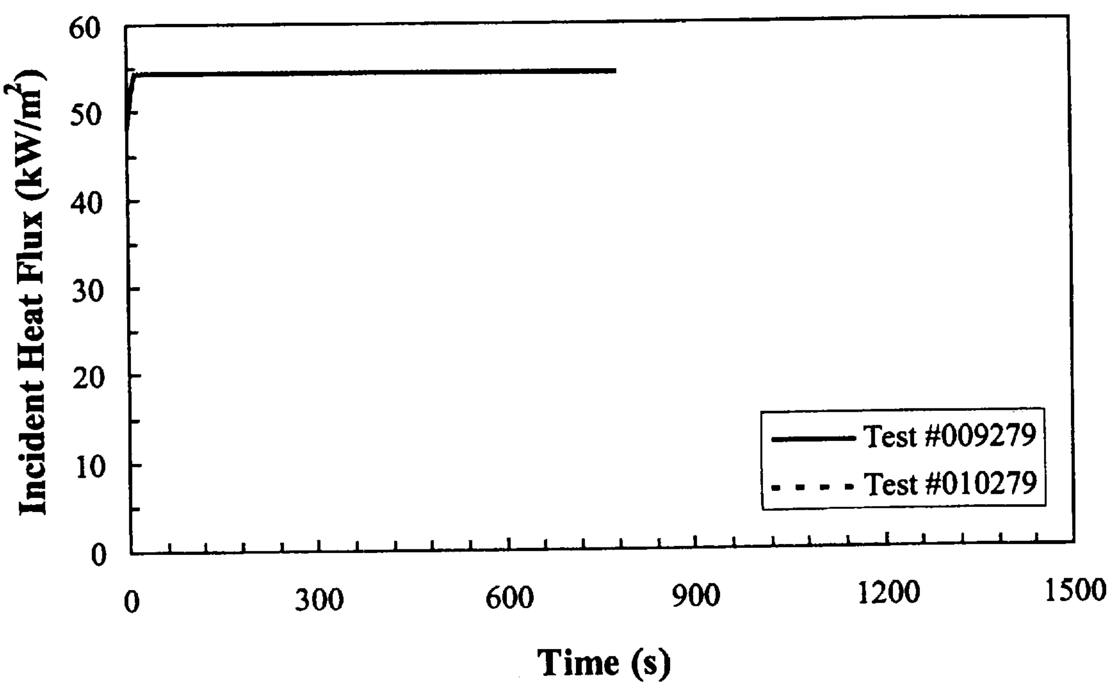


Figure D.74 Incident heat flux for air filter box tests at 50 kW/m²

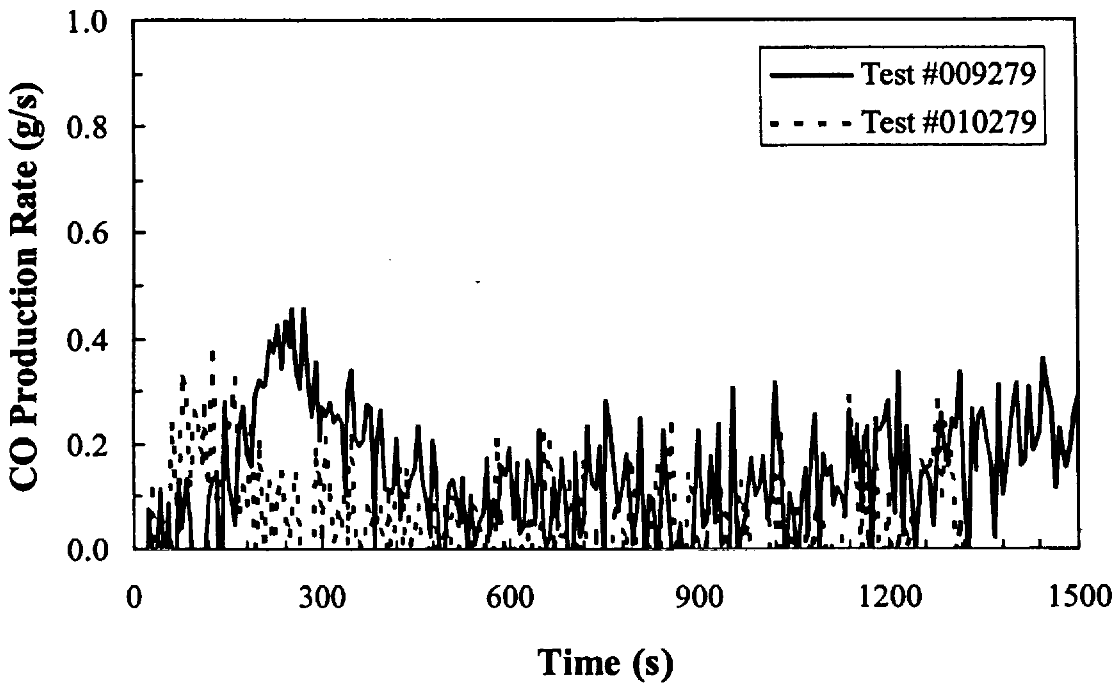


Figure D.75 CO generation rate of air filter box at 50 kW/m^2