CAPP

International Research Project on the Effects of Chemical Ageing of Polymers on Performance Properties

Interim Report on Chemical and Thermal Analysis

TEXAS RESEARCH INSTITUTE AUSTIN, INC.

9063 Bee Caves Road, Austin
Texas 78733-6201, U.S.A.
Tel: 1-512-263-2101
Fax: 1-512-263-3530

MERL
MATERIALS ENGINEERING RESEARCH LABORATORY

Tamworth Road, Hertford
SG13 7DG, England
Tel: 44-(0) 992-500120
Fax: 44-(0) 992-586439

Interim Report On
Chemical And Thermal Analysis

Prepared for: CAPP International Consortium

Prepared by: J.W. Bulluck & R.A. Rushing

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SYNOPSIS

Work during the past six months has included significant research in several areas aimed at further clarification of the aging and chemical failure mechanism of thermoplastics (PVDF or Tefzel) pipes. Among the areas investigated were the crystallinity changes associated with both the Coflon and Tefzel after various simulated environmental exposures using X-ray diffraction analysis. We have found that significant changes in polymer crystallinity levels occur as a function of the exposures. These crystallinity changes may have important consequences on the fracture, fatigue, tensile, and chemical resistance of the materials. We have also noted small changes in the molecular weight distribution. Again these changes may result in variations in the mechanical and chemical properties in the material. We conducted numerous analytical studies with methods including X-ray Diffraction, Gel Permeation Chromatography, Fourier Transform Infrared Spectroscopy, Ultra-Violet Scanning Analysis, GC/Mass Spectrometry, Differential Scanning Calorimetry and Thermomechanical Analysis. In the ultra-violet analysis we noted the presence of an absorption band indicative of triene formation. We investigated a number of aged samples of both Tefzel and Coflon that were forwarded from MERL. We also cast films at SWT and subjected these films to a refluxing methanol 1% ethylene diamine solution. An updated literature search was conducted using Dialog and DROLLS to identify any new papers that may have been published in the open literature since the start of this project. The updated literature search and abstracts are contained in the Appendix section of this report.

1.0 HIGH TEMPERATURE AGING OF COFLON FOR MECHANISTIC ANALYSIS

1.1 Test Apparatus

The apparatus for the experimentation involved a round bottom flask fitted with a reflux condenser for aging of the Coflon film. Into the reflux condenser the diamine containing methanol solution was charged, and the Coflon film was added.

1.2 Sample Preparations

The virgin Coflon was dissolved in hot DMAC and cast into thin films. The solvent was allowed to evaporate prior to the beginning of the aging experiments.

1.3 Test Conditions

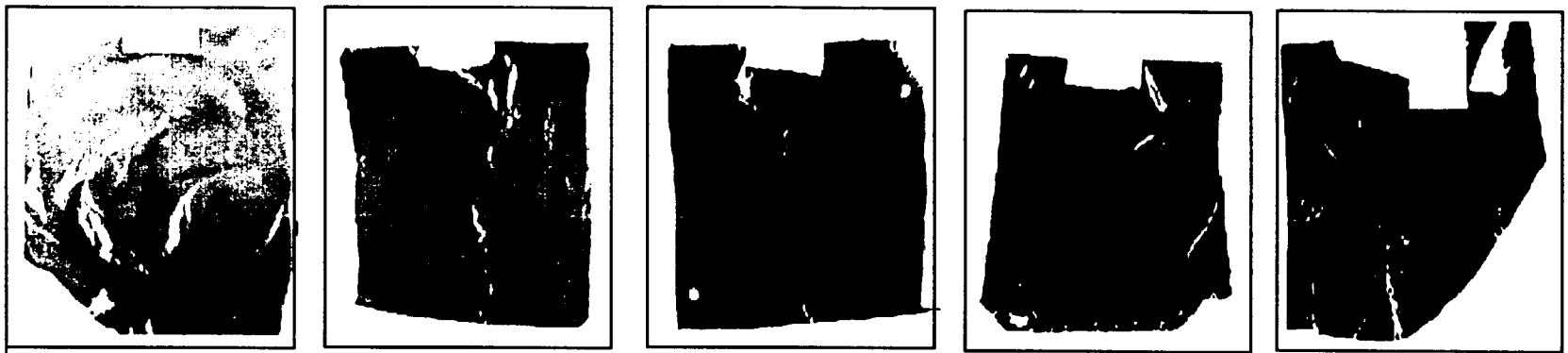
The tests were conducted by immersing the Coflon films in the refluxing methanol ethylene diamine solution. The test films were removed periodically for later chemical analysis. Photographs that exhibit the visual changes of the Coflon upon aging follow on the next page.

2.0 CHEMICAL ANALYSIS ASSESSMENT OF AGING EFFECTS

2.1 Gel Permeation Chromatography of Aged Coflon

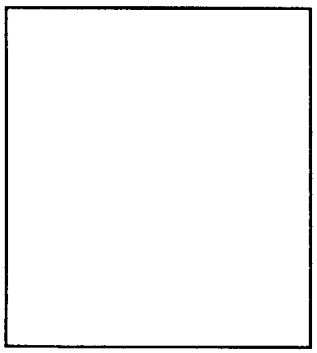
Gel Permeation Chromatography was conducted on a number of environmentally aged Coflon test pieces. The solvent was NMP and the flow rate was 2mL/ minute. The injection volume was 100 uL the detector temperature was set at 30°C and the columns were run at 30°C.

Sample Identification	Visual Appearance	Molecular Weights Mn,Mw, Mz	Exposure
Control Coflon	White Translucent	81,700-538,900-3,217,000	Laboratory Exposure and Conditions
T-75 Coflon	White	177,460-536,509-1,062,095	Fluid F, 140°C 3 day
T-77 Coflon	Brown	170,504-532,717-1,052,564	Fluid F, 140°C 8 days
T-74 Coflon	White	152,905-534,361-1,080,943	Fluid F, 120°C 2 weeks
T-87 Coflon	White	171,265-538,897-1,067,315	27 days 120-135°C air oven
T-88 Coflon	White	177,880-549,827-1,084,282	Fluid F, 120°C 5 ksi 1 weeks
T-89 Coflon	White	173,803-539,103-1,073,977	Fluid F, 120 ° C 5 ksi 3 weeks
T-76 Coflon	White	173,329-534,908-1,059,213	Fluid F, 140° C 5 day
T-53 Coflon	Brown	158,990-519,823-990,690	Fluid F, 120° C 5 ksi 4 weeks gas phase

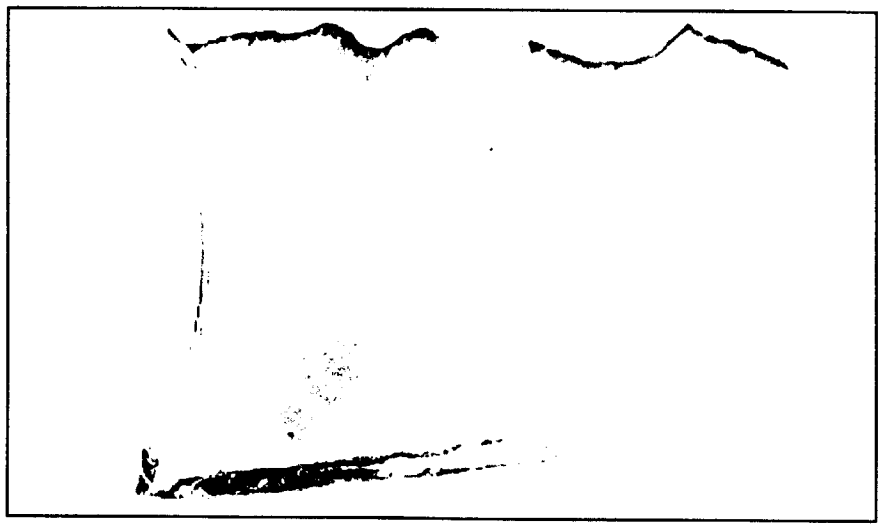


For 1 Hour | For 2 Hours | For 3 Hours | For 4 Hours | For 17 Hours

After Aging in Methanol + 1% Ethylene Diamine at Reflux



Before Aging



PVDF Solution (NMP) Dried on Hot Plate
for 3 hours (Temp. 150-160°C)

New PVDF Films

2.2 X-Ray Diffraction - Crystallinity Changes

X-ray Diffraction was conducted on both samples from the exposed Tefzel and Coflon thermoplastics. The exposure fluids for the environmentally aged samples are detailed below.

(1) Fluid A- 100% Methanol
(2) Fluid B- 97/3 CH4/CO2 with saturated water vapor
(3) Fluid C- 97/3 CH4/CO2
(4) Fluid D- 94/5/1 CH4/CO2/ H2S
(5) Fluid E- 94/5/1 CH4/CO2/H2S with saturated water vapor
(6) Fluid F- As fluid E plus 1% ethylene diamine
(7) Fluid G- As fluid A plus 1% ethylene diamine
(8) Fluid H- As Fluid B plus 1% ethylene diamine
(9) Fluid I- MERL Formulated aromatic and aliphatic hydrocarbon solution

The percentage crystallinity was calculated on the samples. Twelve polymer samples were analyzed, ten PVDF (Coflon) samples and two Tefzel samples. The degree of crystallinity ranges from as low as 9% to as high as 48%. The Coflon samples were more crystalline. Below are the results of the analysis including the fluids the samples were exposed to prior to testing. Color changes were slight with both the Tefzel and Coflon materials in this batch of samples.

Sample Identification	Visual Appearance	Percentage Crystallinity	Exposure
Control Tefzel	White Translucent	26.0%	Laboratory Temperature and Conditions
T-105 Tefzel	White Translucent	9%	Fluid A, 6 days 140° C vapor pressure
Control Coflon	White Translucent	41.5%	Laboratory Exposure and Conditions
T-73 Coflon	Beige	39%	Fluid F, 3 months 100° C
T-74 Coflon	Beige	35	Fluid F, 120° C, 2 weeks
T-75 Coflon	Beige	31% prev. 26%	Fluid F, 140° C 3 days
T-77 Coflon	Beige	34% prev. 29%	Fluid E, 140° C 8 days
T-87 Coflon	White Translucent	40%	After 27 days at 120-130° C in air oven
T-90 Coflon	Beige	29% prev. 39%	Fluid F, 140° C 5 ksi 2 weeks
T-91 Coflon	Beige	37%	Fluid F, 140° C 5 ksi 4 weeks
T-100 Coflon	Brown	39%	Fluid G, 65° C, reflux 2 weeks
T-102 Coflon	Beige	48%	Fluid I, 140° C, 5 ksi 10 weeks

We can seen clearly that all of the exposures for both materials had an effect on the percentage crystallinity. The greatest decrease in crystallinity for both polymers was observed with the Tefzel Fluid G exposure in methanol with ethylene diamine. We also note that the percentage of crystallinity for Coflon increases or decreases depending on the exposure. At the end of this report in Appendix we have attached a number of plots pertaining to the X-ray diffraction analysis of the Coflon and Tefzel test pieces.

2.3 FTIR and Ultraviolet Analysis

The Coflon films described in Section 1.0 were analyzed using Fourier Transform Infrared Spectroscopy (FTIR) and Ultraviolet (UV) spectroscopy. Changes in the molecular structure of PVDF were therefore determined as a function of exposure time. The aging media for the films was methanol with 1% ethylene diamine (EDA). Exposure times were 0, 1, 2, 3, 4 and 17 hours.

Film thicknesses were 0.01 mm for the all tests. FTIR analyses were performed on a Nicolet 20 SX spectrophotometer in the transmission mode. A Varian DMS 200 UV/Vis spectrophotometer was used for the ultraviolet measurements.

FTIR Results

Appendix 4.1 displays the complete FTIR spectra for each Coflon film tested. Figure 2-1 compares an enlarged section of the baseline and 17 hour aged specimens. A clear indication of C=C formation is observed at 1700 cm^{-1}. The decrease in the intensity of the peak at 1400 cm^{-1} may be due to loss of plasticizer (carbonyl) or carbon-fluorine.

Ultraviolet Results

The UV absorption at 290 nm of the PVDF films aged in methanol/EDA were recorded at room temperature. Absorption at this frequency is known to be associated with C=C double bonds, particularly conjugated trienes. The figure displayed in Appendix 4.2 shows the results for the five aged specimens and the baseline sample. An increase in the absorbance was found after aging of the PVDF films. This growth in absorbance translates into a decrease in percent transmittance in the samples. The absorbance change was found to increase with time of exposure to the methanol/amine mixture.

2.4 Gas Chromatography couples with Mass Spectrometry

We conducted GC/Mass Spec on Sample T-89 extracted with methanol. The extract showed primarily the presence of the dibutyl ester of decanedioic acid. Secondarily evident was the free acid decanedioic acid. The decanedioic acid is a degradation product of the plasticizer. The chromatograms are included in Appendix 4.4.

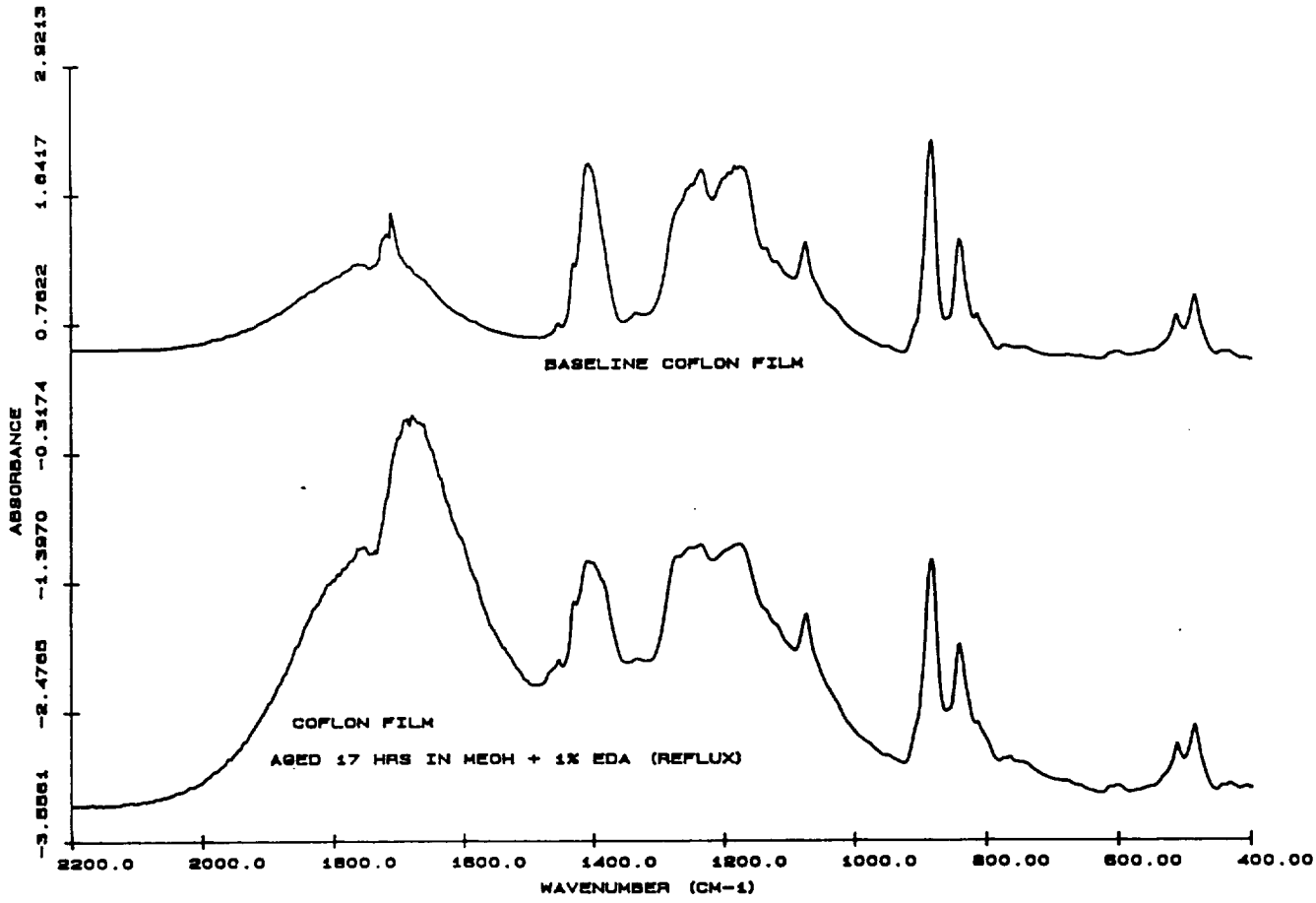


Figure 2-1. FTIR Spectra of Baseline and Aged Coflon Films

3.0 THERMAL STABILITY AND COMPOSITIONAL ANALYSIS

3.1 Creep Analysis using TMA

The Coflon films described in Section 1.0 were subjected to creep testing in TRI's 943 Thermomechanical Analyzer (TMA) after aging in methanol/EDA. The films were cut into 0.15 inch (3.8 mm) widths. The specimens were mounted in a tensile fixture. A dead load was applied sufficient to impose a stress of 500 psi. The TMA furnace was then placed around the sample compartment. The sample temperature was ramped up 10°C per minute to 150°C. In this manner the creep behavior was observed while the specimen was undergoing an increase in temperature.

Appendix Figure 4.1 displays the results for the unaged Coflon and three of the aged specimens. The specimen which was aged for 17 hours was to brittle to

fixture and is not indicated in Appendix Figure 4.1 for this reason. A significant increase in the resistance to creep with temperature was noted in the aged specimens. This behavior may be a result of dehydrofluorination and possible subsequent crosslinking within the polymer.

3.2 DSC of Aged Materials

A separate set of PVDF films was prepared for the DSC tests. The films were prepared as described in Section 1.0 with the exception of having a slightly thicker crossection. These specimens were again exposed to methanol/EDA for 0.25, 1.0, and 15 hours respectively. After exposure, sections of the films were subjected to Differential Scanning Calorimetry (DSC) testing. Sections were cut from the dry aged films and placed into tared DSC sample pans. The sample temperature was raised at a constant rate of 10°C per minute to a maximum of 200°C. Melt onset onset, peak temperature, and heat of fusion were thus determined.

DSC Results

DSC plots are displayed in Appendix 4.2. Tabular data describing the melt aspects and heats of fusion is shown in Table 3.1.

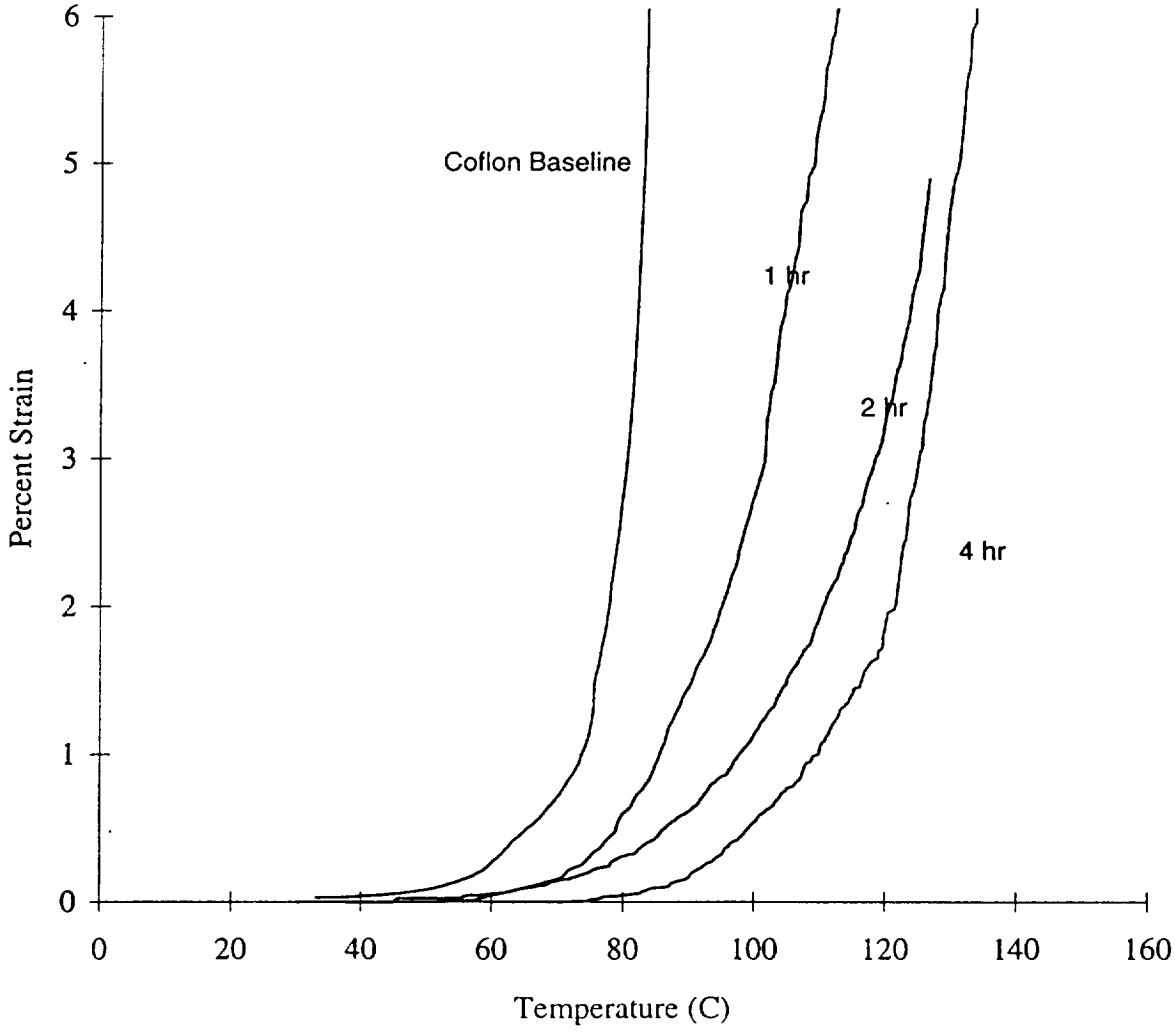
Coflon Film Sample	Melt Onset (°C)	Melt Peak (°C)	Heat of Fusion (J/g)
Baseline	161.45	173.74	58.49
Aged 0.25 hrs	162.11	177.12	56.89
Aged 1.0 hrs	160.76	174.55	68.21
Aged 15 hrs	153.87	169.39	40.17

A slight increase in melt temperatures was noted with the 0.25 hour aged specimen. At the 1 hour and 15 hour exposure level the temperatures appear to be decreasing. Most notable are the values obtained from the specimen which was aged 15 hours. Here the melt onset and peak temperatures dropped significantly as did the heat of fusion. This results lends credibility to the hypothesis that initial aging of PVDF in this fluid causes some crosslinking and at longer exposure times lower molecular weight species begin to appear which may lower the melt points and heats of fusion.

4.0 Appendix

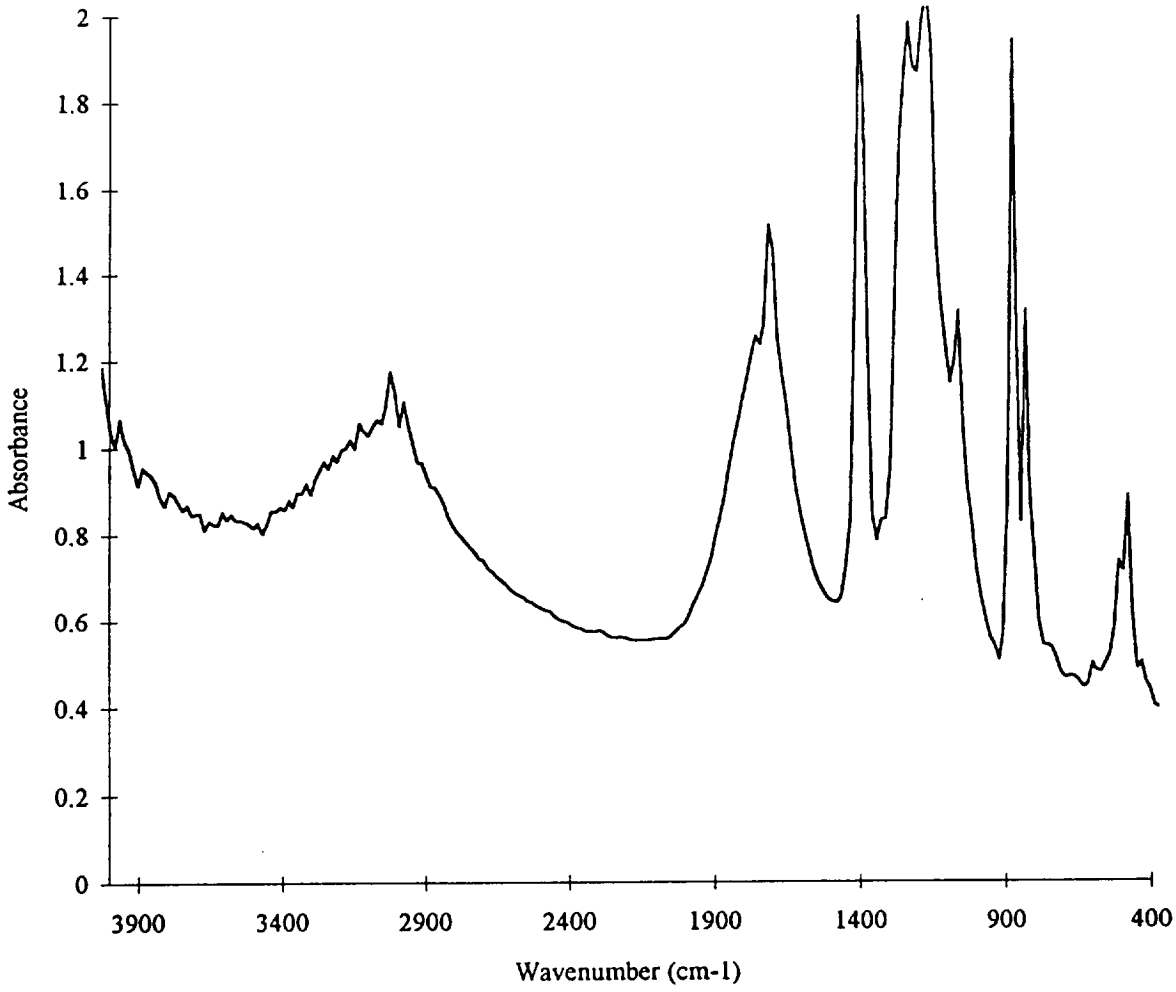
4.1 TMA

Creep Behavior of Coflon Films
Aged in Methanol + 1% EDA

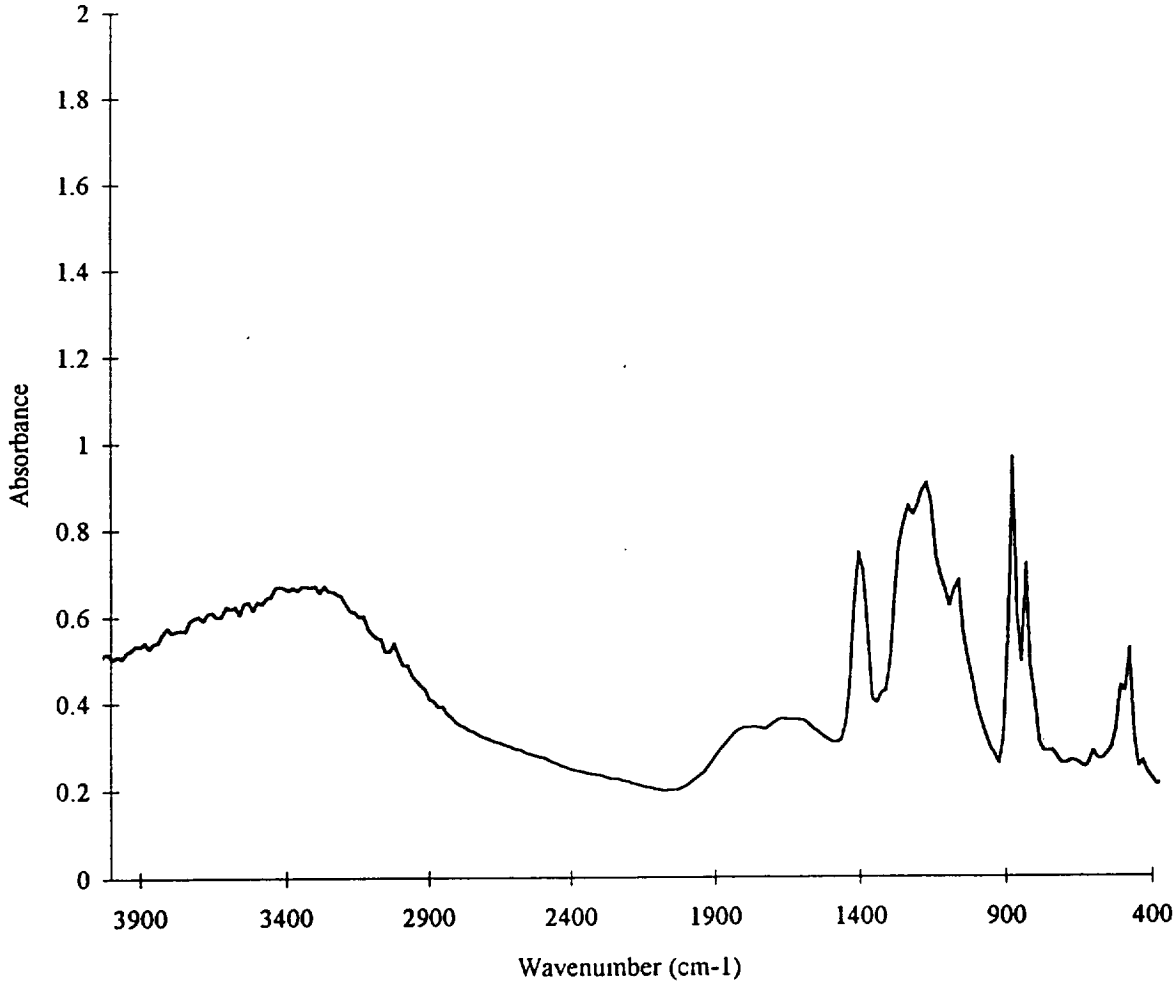


4.2 FTIR and Ultraviolet Absorption Plots

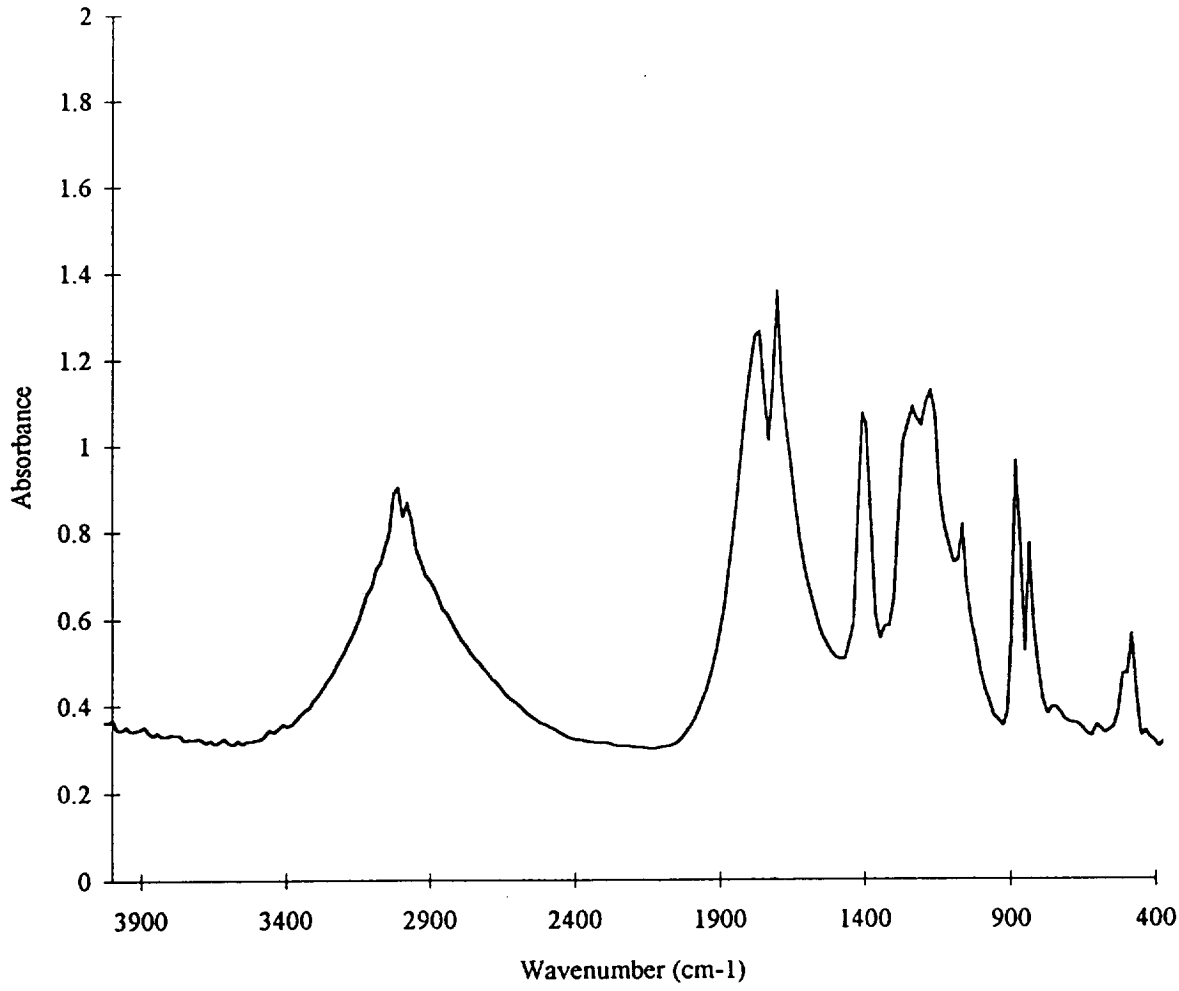
FTIR Spectra
Coflon Film Unaged Baseline



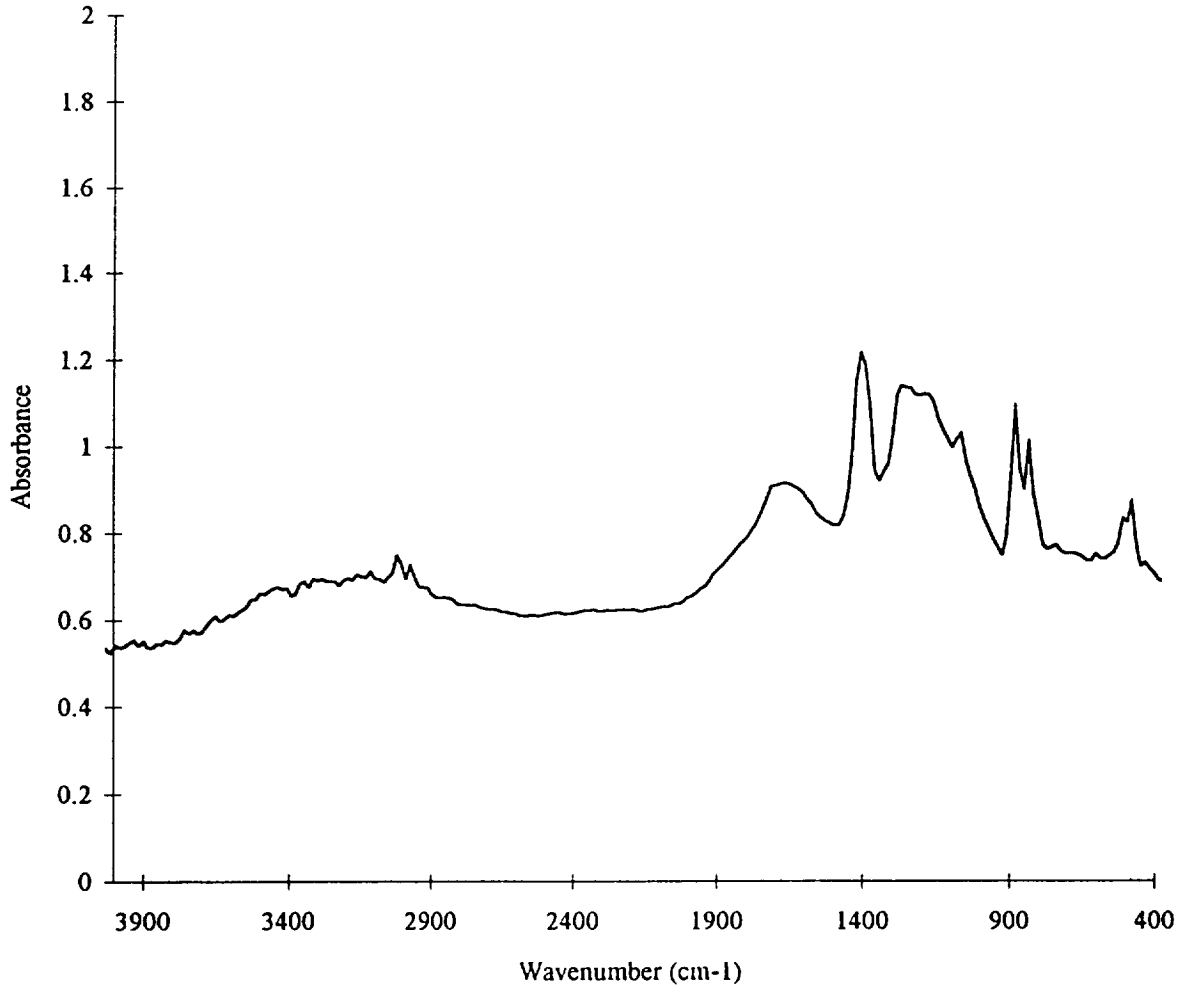
FTIR Spectra
Coflon Film Aged 1 hr MeOH + 1% EDA Reflux



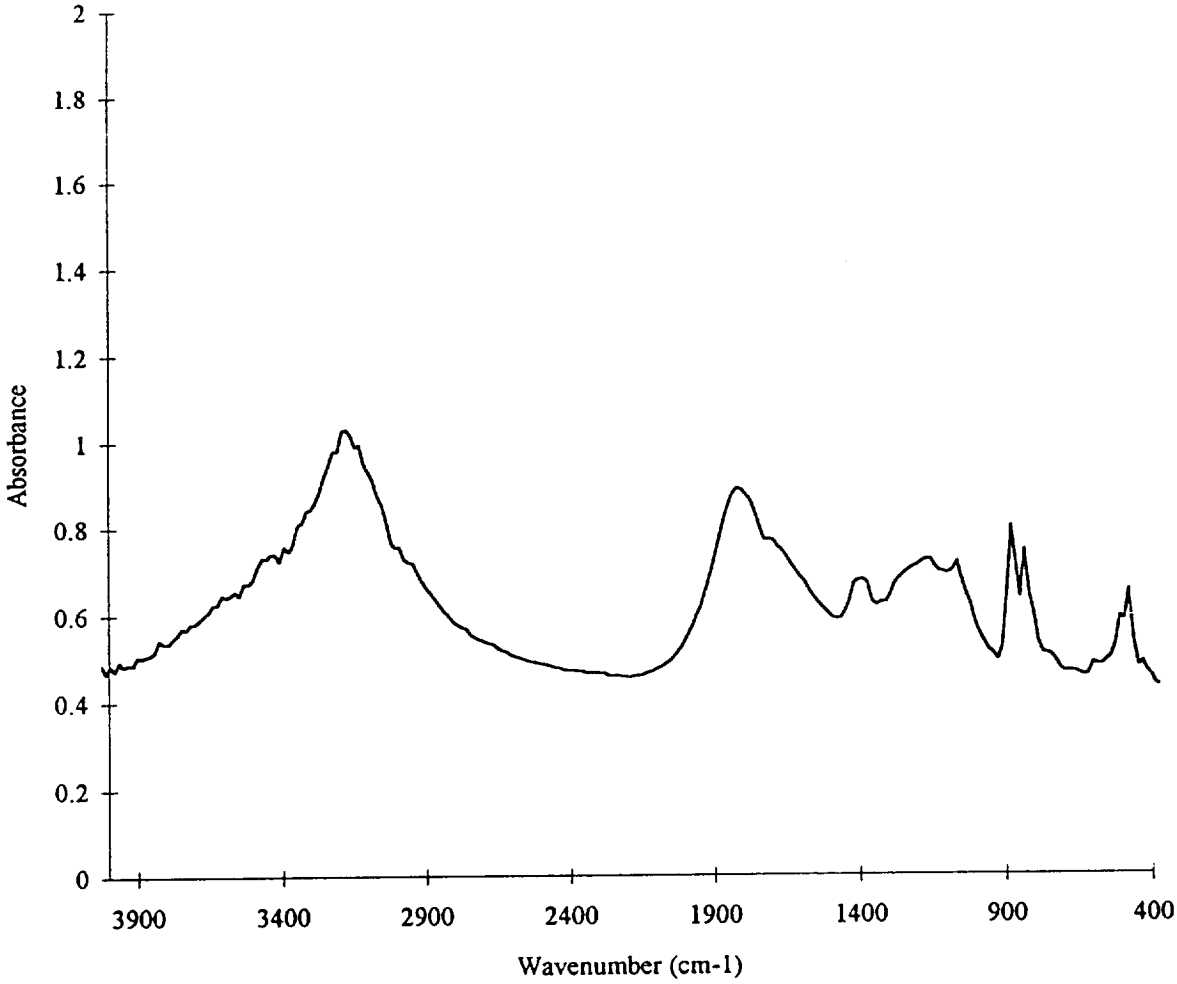
ITIR Spectra
Coflon Film Aged 2 hrs MeOH + 1% EDA Reflux



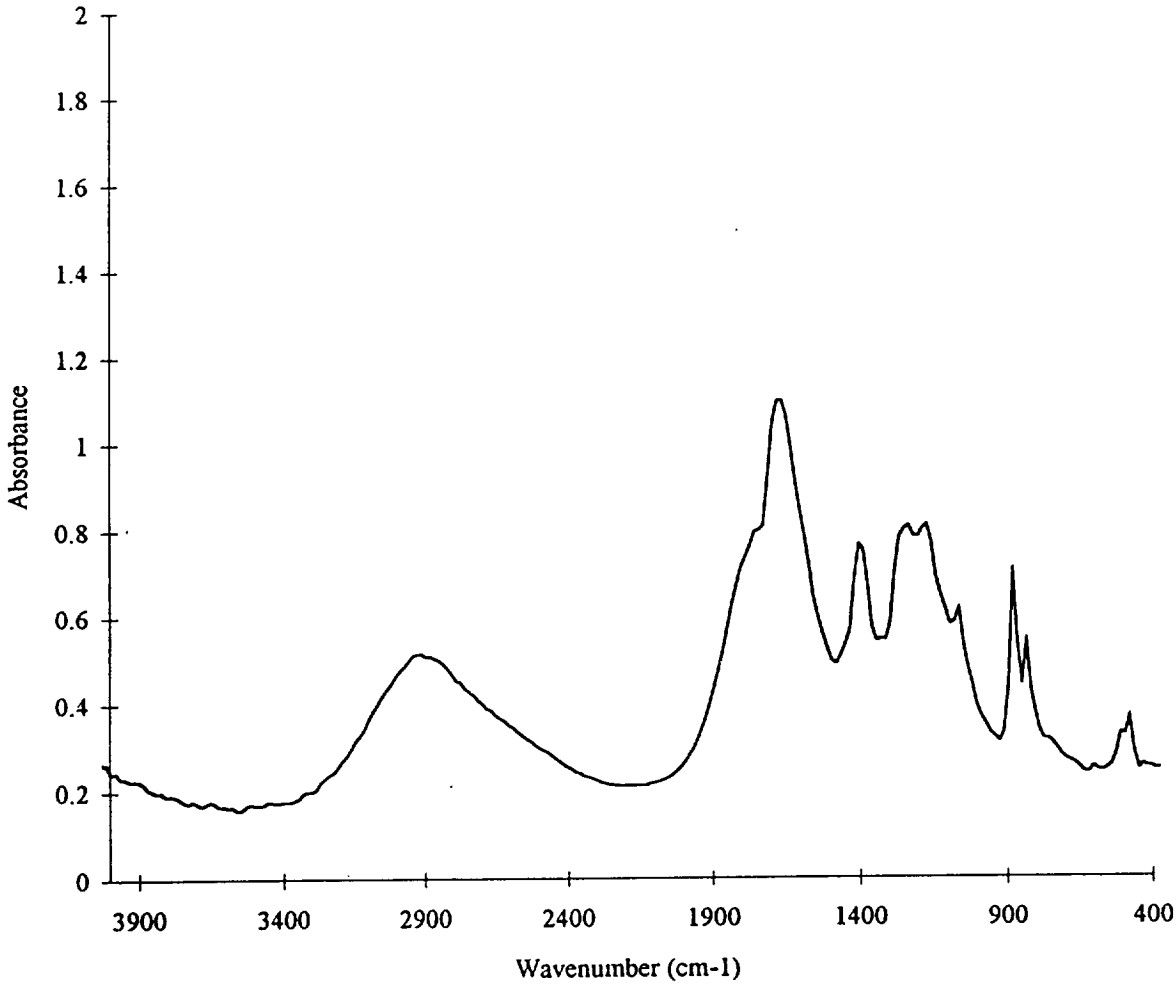
FTIR Spectra
Coflon Film Aged 3 hrs MeOH + 1% EDA Reflux



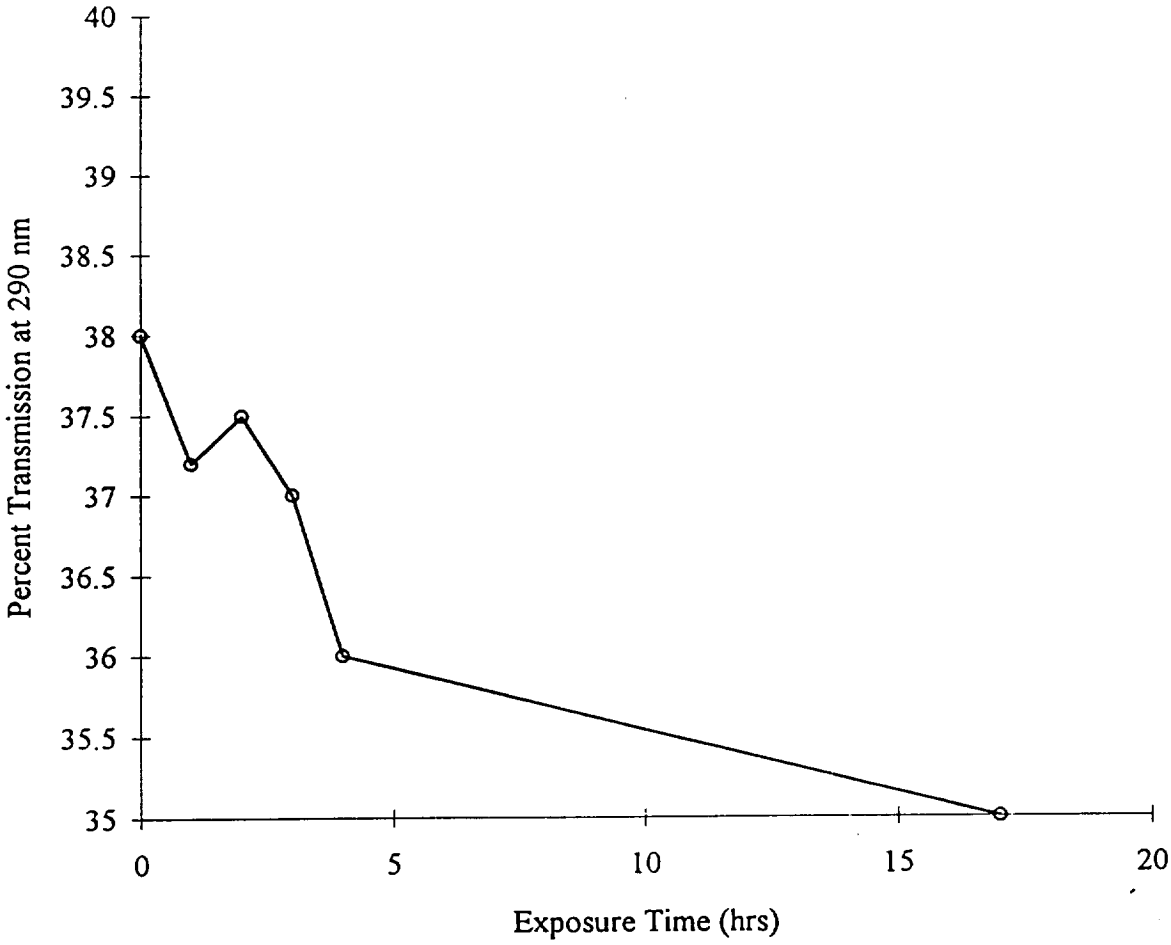
FTIR Spectra
Coflon Film Aged 4 hrs MeOH + 1% EDA Reflux



FTIR Spectra
Coflon Film Aged 17 hrs MeOH + 1% EDA Reflux



Aged Coflon Films
Changes in UV Absorption at 290 nm
After Exposure to Methanol + 1% EDA



4.2 DSC Plots

Sample: COFLON BASELINE
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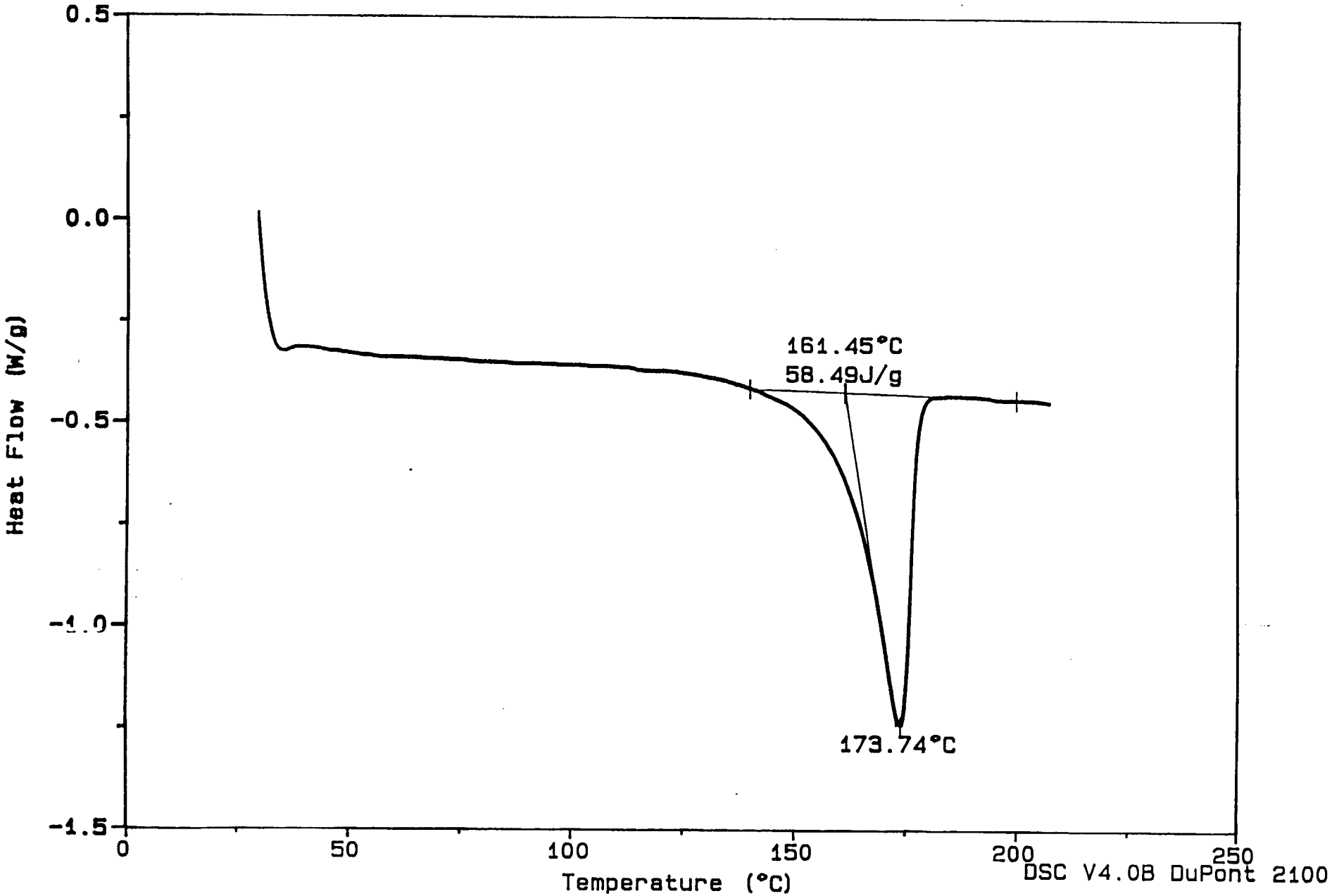
Method: 10R300

DSC

File: COF107.01
Operator: CPT
Run Date: 5-Dec-96 15:40



Sample: COFLON 15MIN MEOH + 1% EDA
Size: 29.2000 mg
Method: 10R300

DSC

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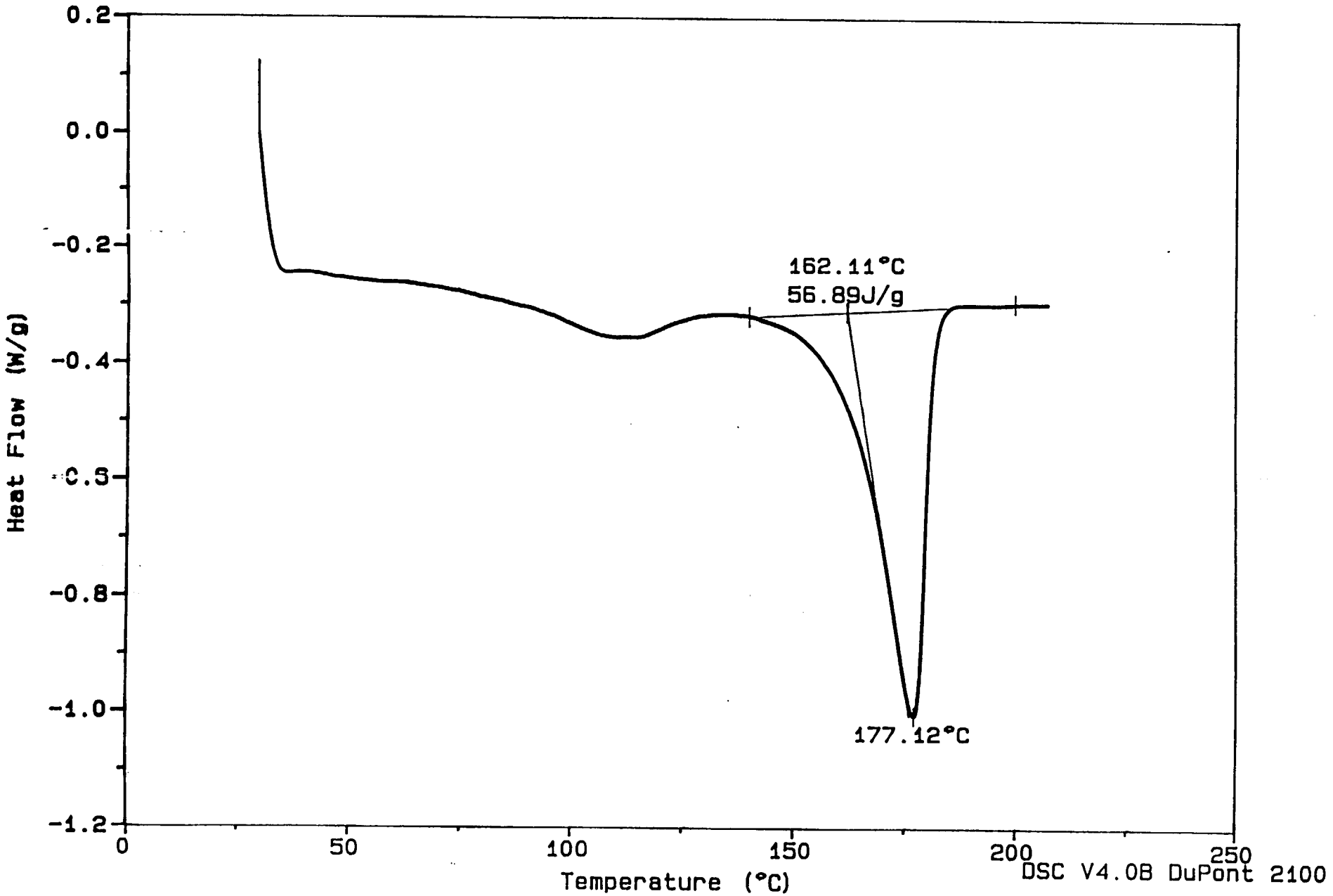

Sample: COFLON 1HR MEOH + 1% EDA
Size: 24.5000 mg
Method: 10R300

DSC

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Operator: CPT
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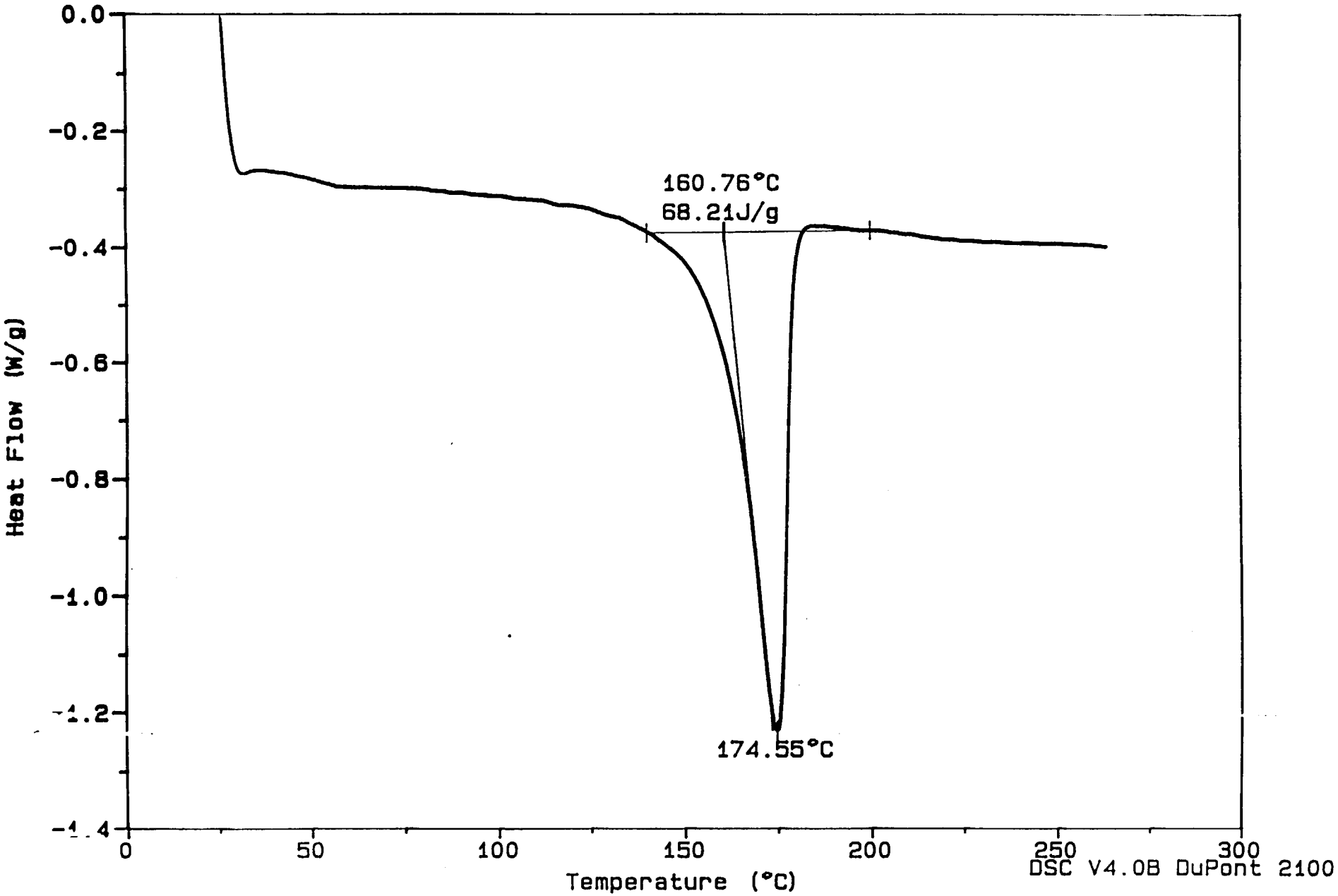

Sample: COFLON 15HR MEOH + 1% EDA
Size: 26.6000 mg
Method: 10R300

DSC

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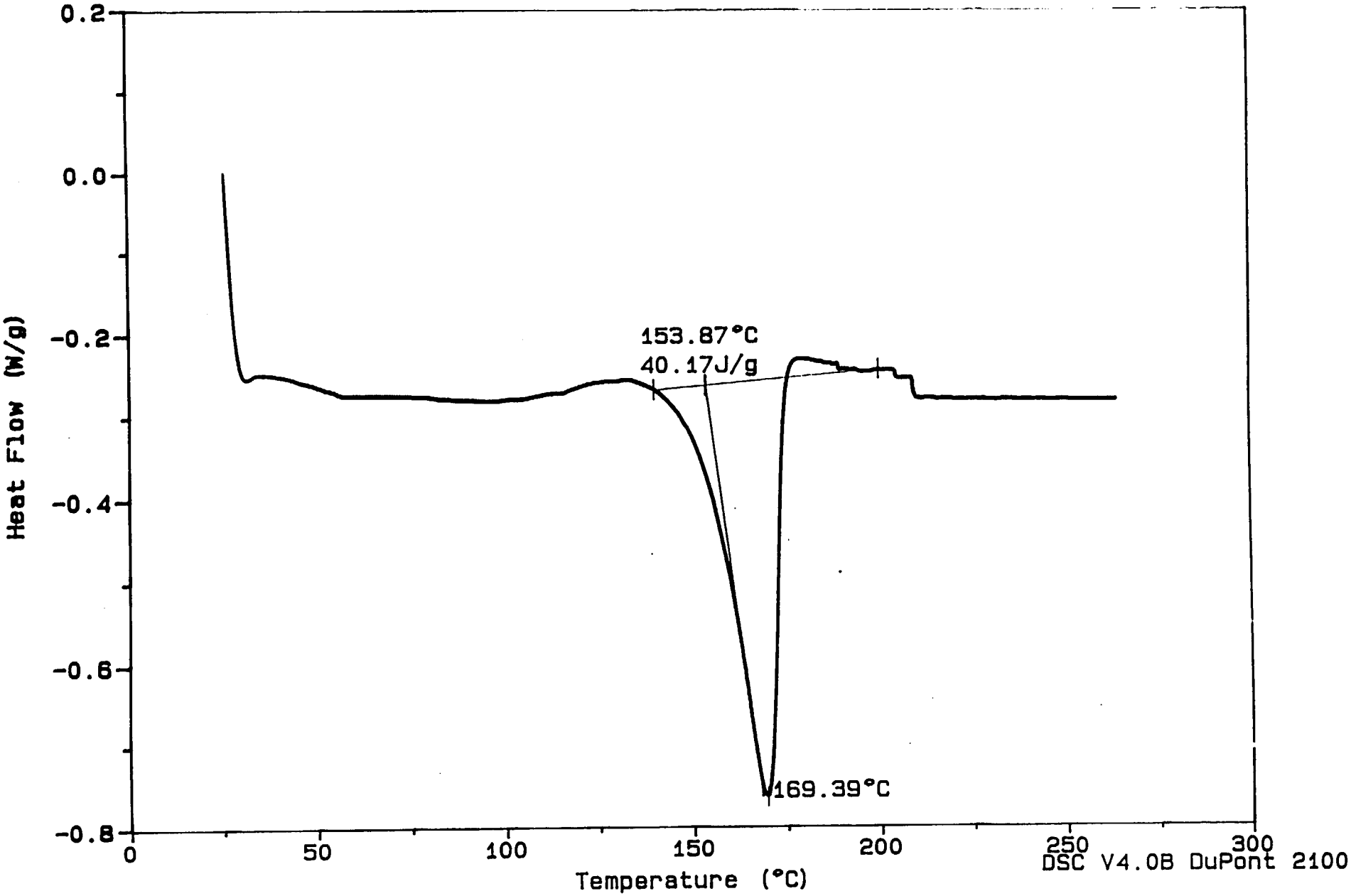

4.3 X-Ray Diffraction Plots

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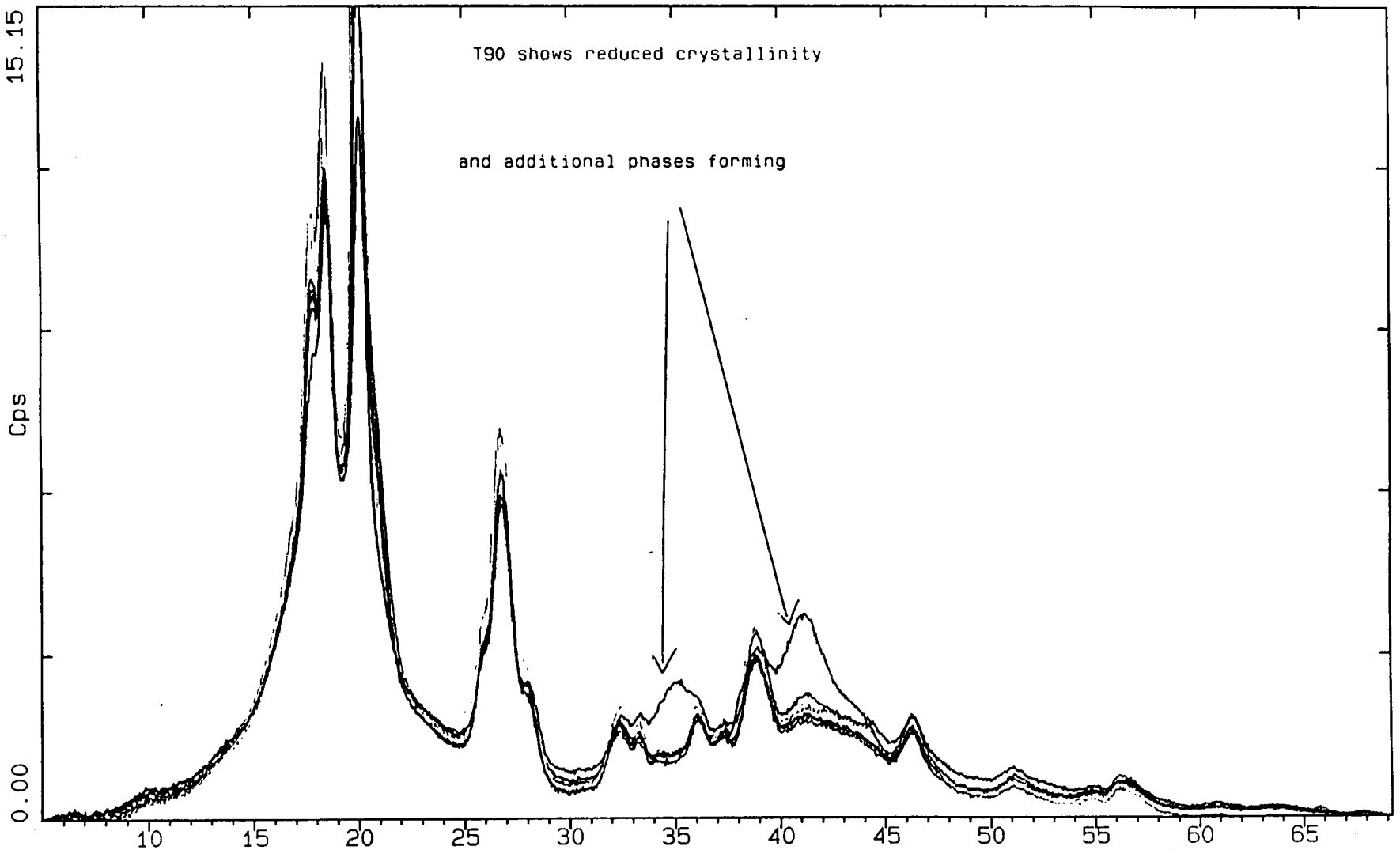

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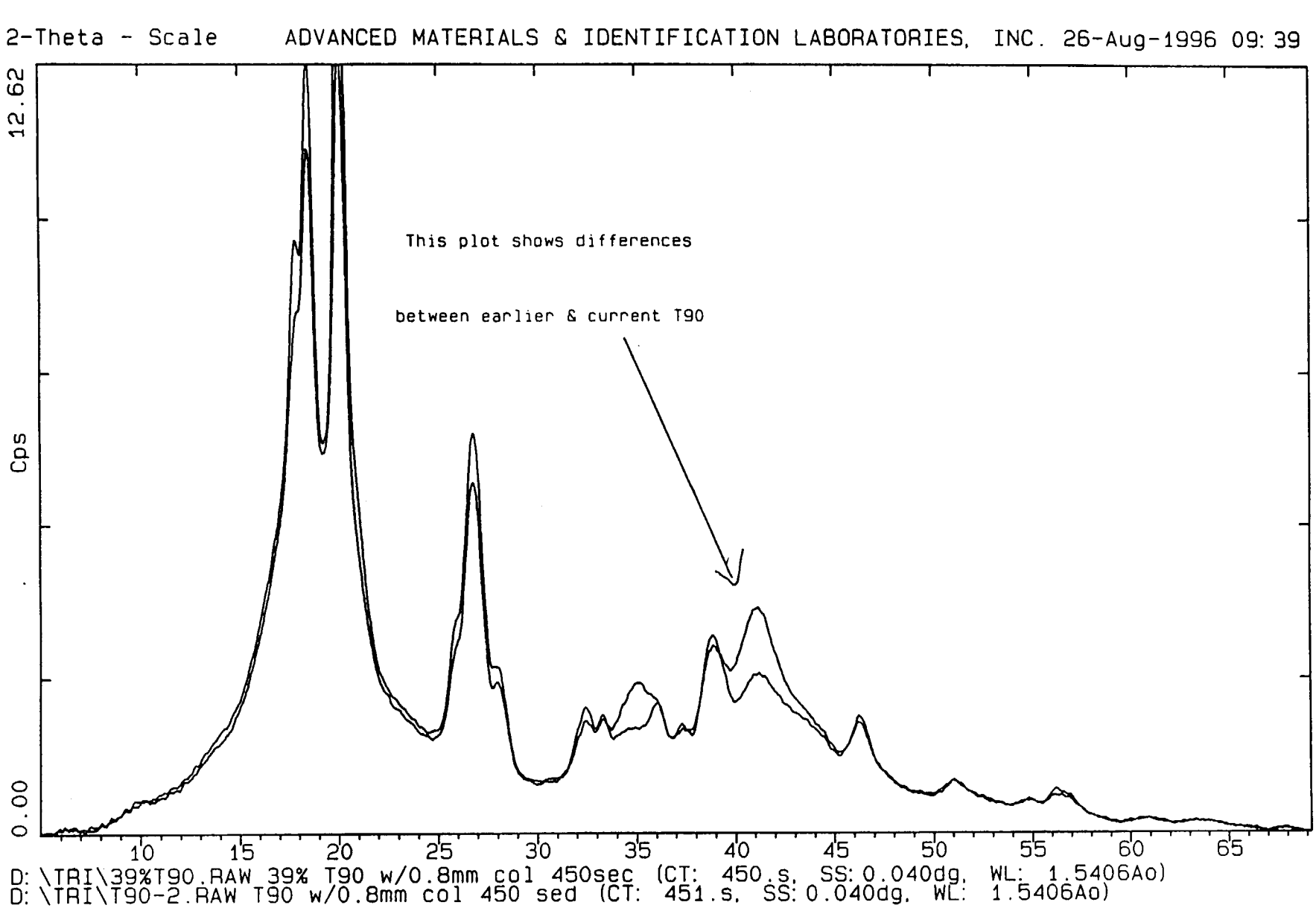
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12.62
Cps
0.00
This plot shows differences
between earlier & current T90
10
15
20
25
30
35
40
45
50
55
60
65
D:\TRI\39%T90.RAW 39% T90 w/0.8mm col 450sec (CT: 450.s, SS:0.040dg, WL: 1.5406Ao)
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4.4 GC/Mass Spectrometry Chromatograms T-89

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Instrument : 5971 - In
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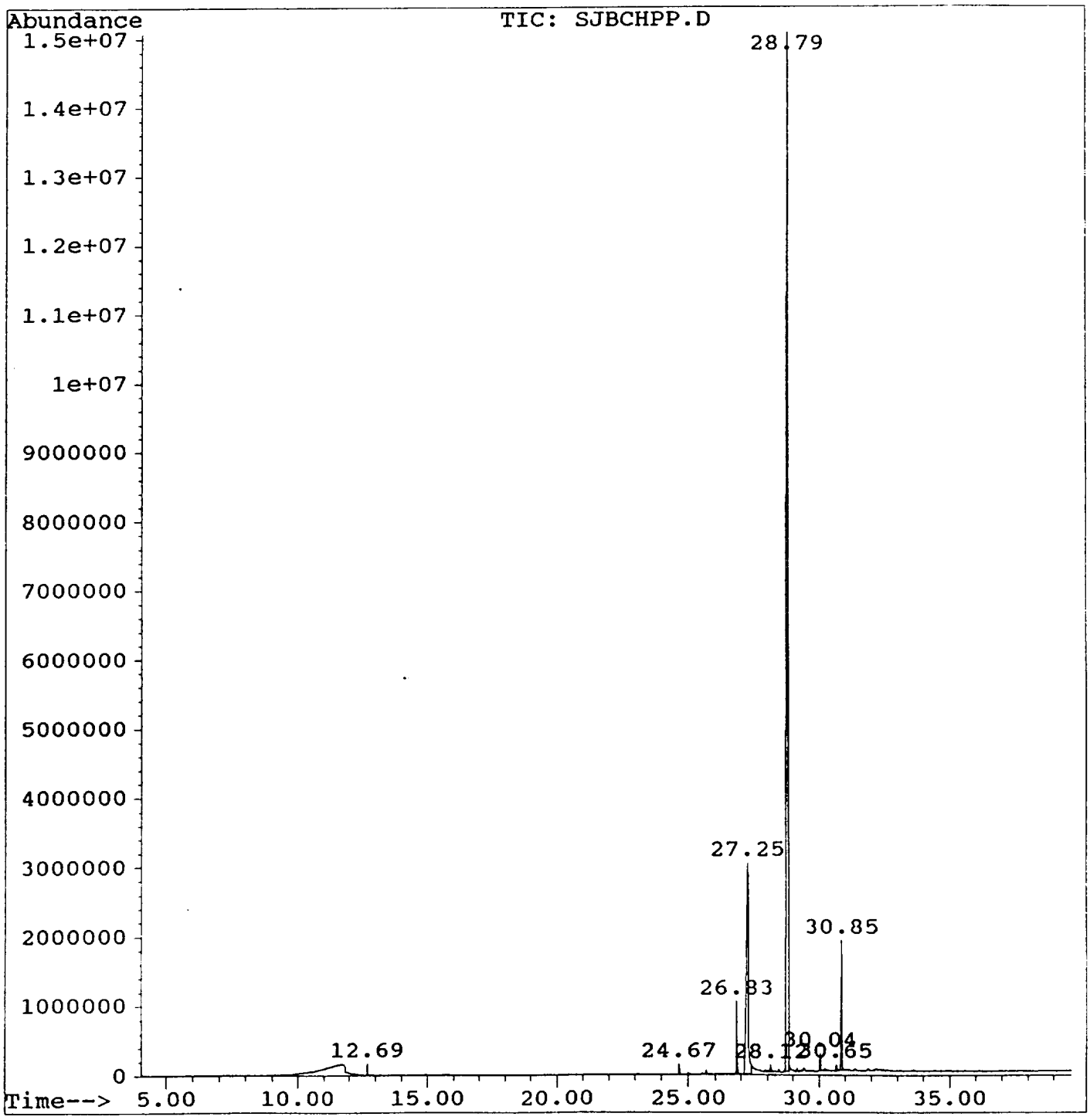
Misc Info :
Vial Number: 1



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Sample Name: MeOH extract of PVDF 12/04/96
Misc Info :
Vial Number: 1

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C:\HPCHEM\DATABASE\WILEY.L Minimum Quality: 0

Unknown Spectrum: Apex minus start of peak
Integration Params: current RTEINT parameters

Pk#	RT	Area%	Library/ID	Ref#	CAS#	Qual
1	12.69	0.40	C:\HPCHEM\DATABASE\NBS49K.L			
			Furan, 2-propyl-	2056	004229-91-8	78
			Cyanic acid, propyl ester	577	001768-36-1	56
			1-Butanol	321	000071-36-3	56
2	24.67	0.35	C:\HPCHEM\DATABASE\NBS49K.L			
			Decanedioic acid, dimethyl ester	24022	000106-79-6	43
			1,2-Butanediol, 1-(2-furyl)-	9571	004208-60-0	27
			1H-Imidazole-2-methanol	1088	003724-26-3	25
3	26.83	2.41	C:\HPCHEM\DATABASE\NBS49K.L			
			Thiophene, 2-nonyl-	20564	057754-07-1	35
			Carbofenothion sulfoxide	39492	017297-40-4	32
			1,2-Butanediol, 1-(2-furyl)-	9571	004208-60-0	30
4	27.25	19.60	C:\HPCHEM\DATABASE\NBS49K.L			
			1,3-Cyclopentanedione	1100	003859-41-4	22
			2(1H)-Pyridinone, 4-hydroxy-1,6-di	6085	006052-75-1	16
			4-PENTYNOIC ACID	1096	006089-09-4	14
5	28.12	0.35	C:\HPCHEM\DATABASE\NBS49K.L			
			Hexanedioic acid, bis(2-methylprop	28339	000141-04-8	35
			2,6-Piperazinedione, monooxime	4477	056700-84-6	27
			HEXANEDIOIC ACID, MONO(2-ETHYLHEXY	28340	004337-65-9	25
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			Decanedioic acid, dibutyl ester	35446	000109-43-3	49
			Silacyclopent-3-ene, 3-methyl-	1113	054077-65-5	20
			1H-1,2,4-Triazol-3-amine, N-methyl	1081	015285-16-2	18
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			Oxacyclotetradecane-2,11-dione, 13	25629	074685-36-2	32
			Cyclohexanone, 2-ethyl-	3946	004423-94-3	23
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			Hexadecanedioic acid, dimethyl est	35447	019102-90-0	25
			Cyclohexanone, 2-(1-methylethyl)-	6384	001004-77-9	14
			Aziridine, 1,2-diisopropyl-3-methy	6573	006124-84-1	10

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			Cyclohexene, 1-(1,1-dimethylethoxy	12238	040648-25-7	30
			Piperidine, 1,4-dimethyl-	2473	000695-15-8	22

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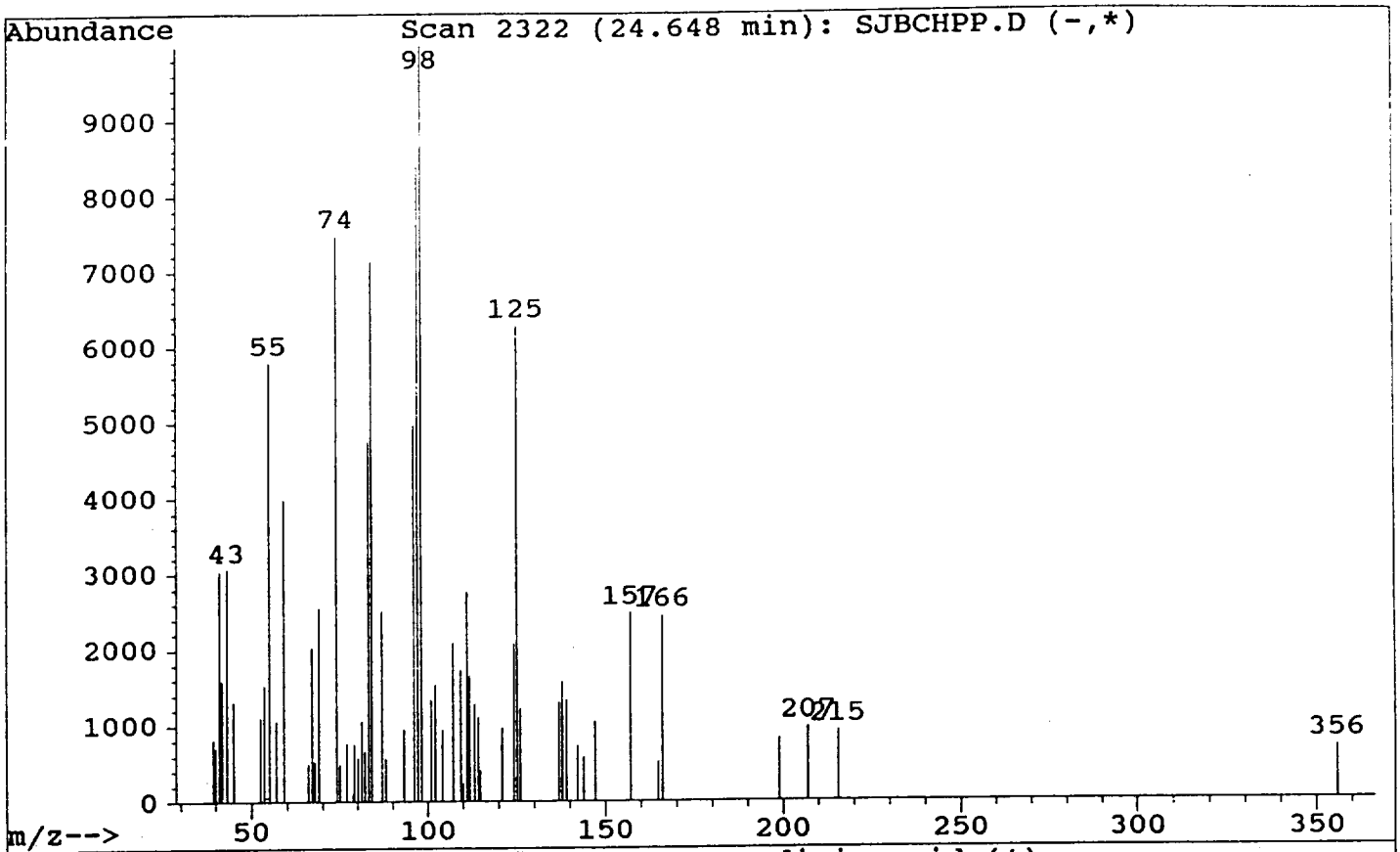
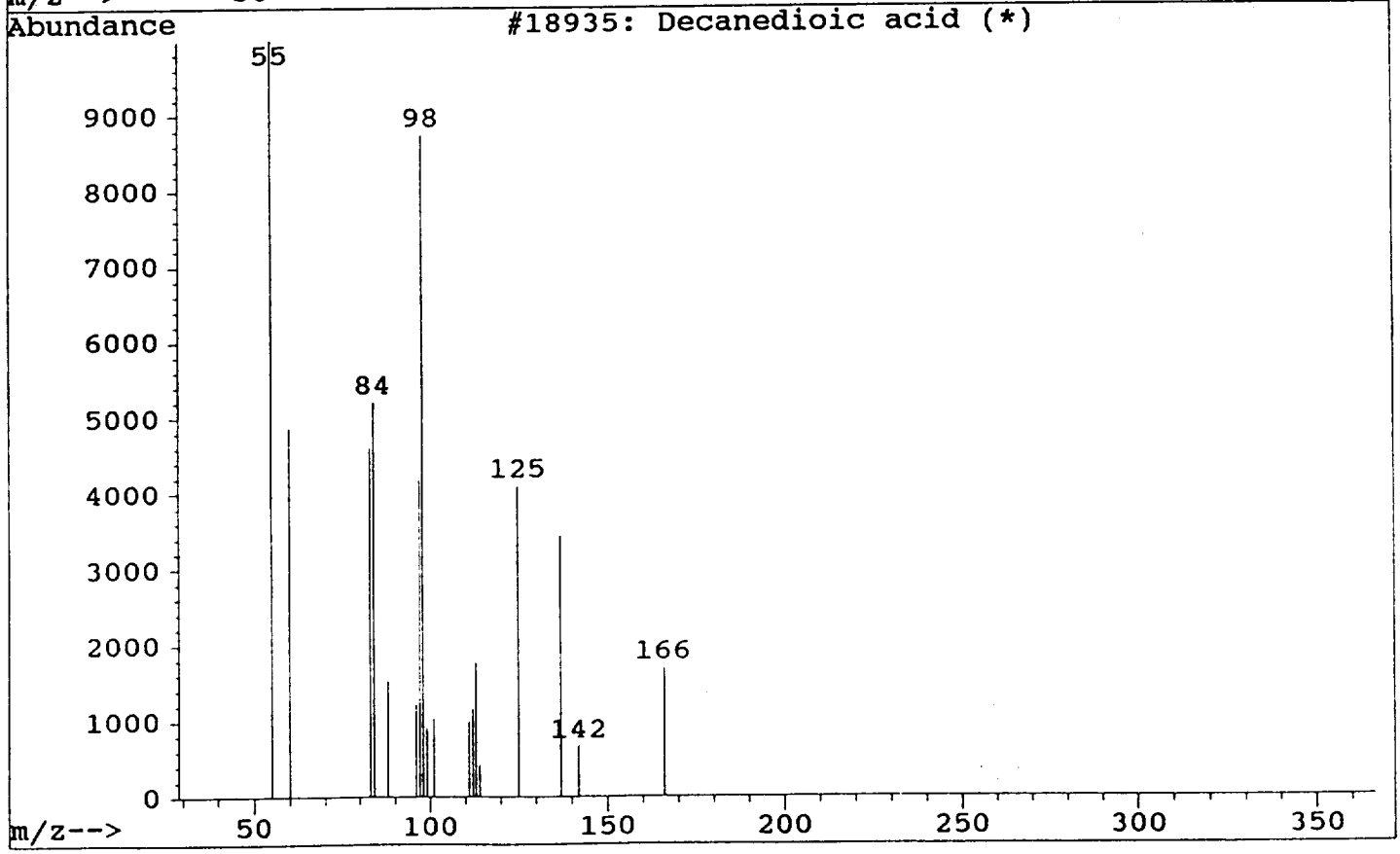
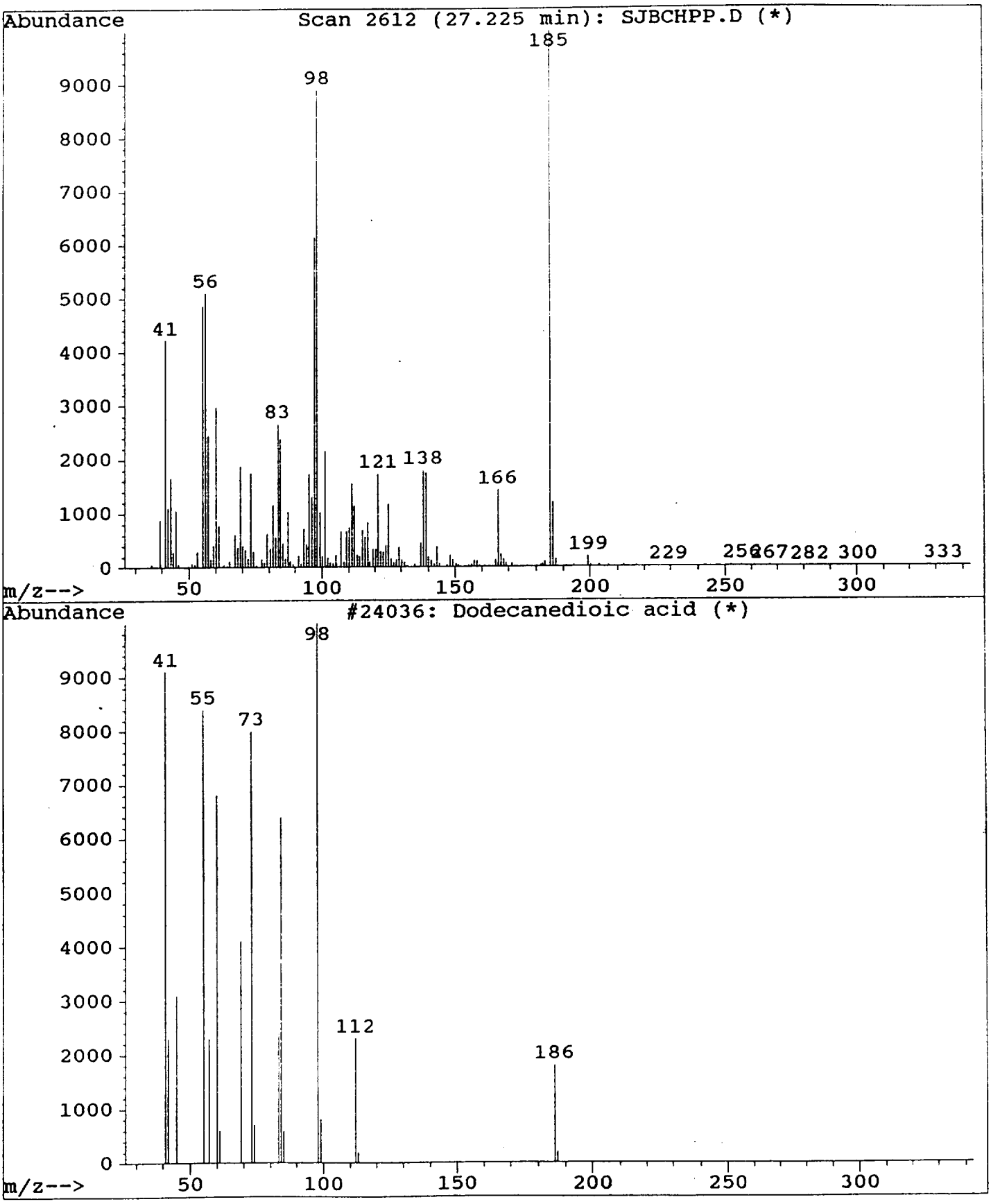
ID : Decanedioic acid

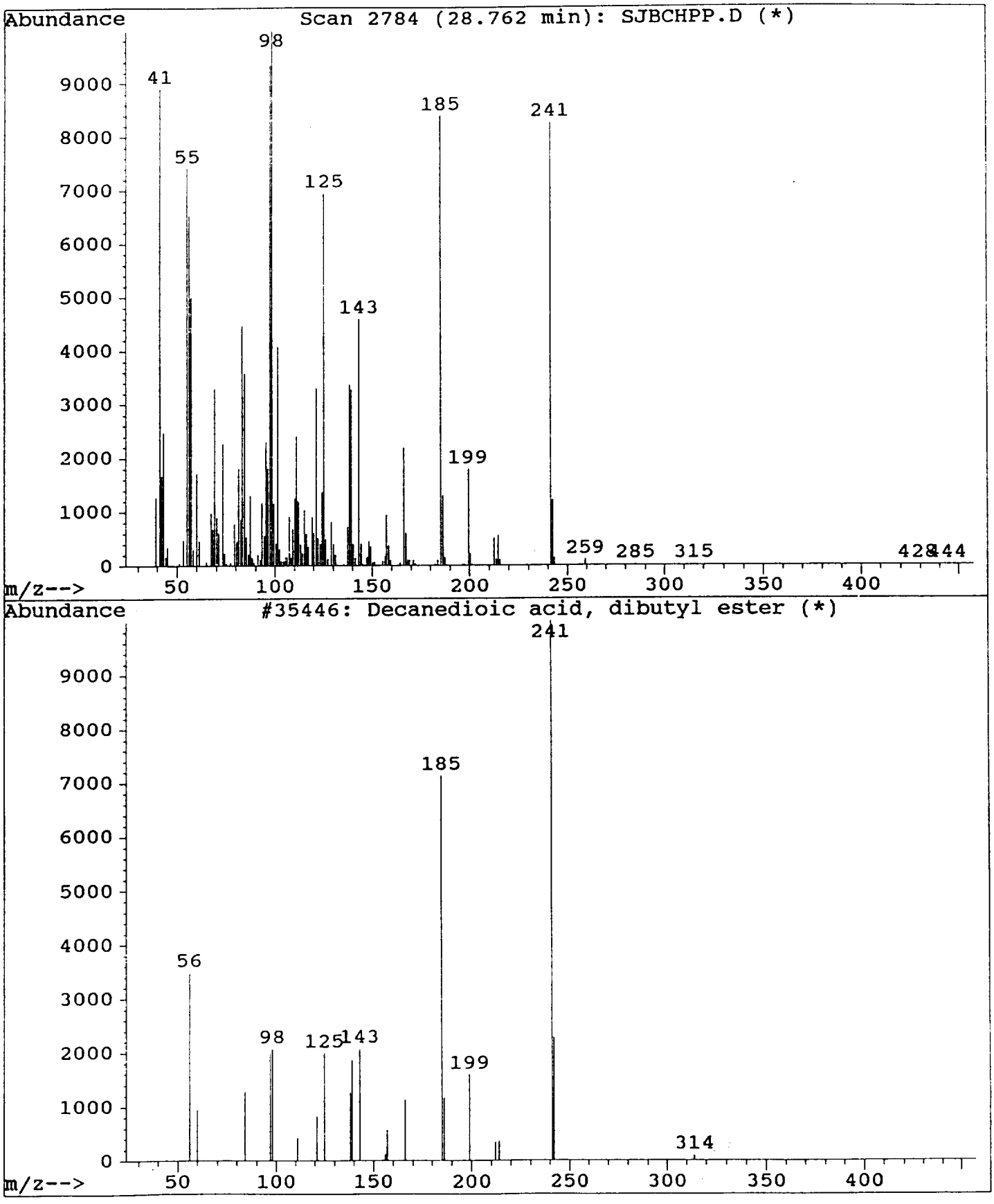




Library Searched : C:\HPCHEM\DATABASE\NBS49K.L
Quality : 10
ID : Dodecanedioic acid



Library Searched : C:\HPCHEM\DATABASE\NBS49K.L
Quality : 38
ID : Decanedioic acid, dibutyl ester



4.5 Literature Search

```
3str@
%fluoropolymer
pvdf
:oflon
polyvinylidene fluoride
tefzel
lacs=%fluoropolymer
lacs=pvdf
lacs=coflon
lacs=polyvinylidene fluoride
lacs=tefzel
and
%flexible pip
degradation
lacs=%flexible pip
lacs=degradation
end
--   TECHNICAL REPORTS STATISTICS  PAGE  1 OF  6  NOV 22, 1996

--TOTAL-SEARCH FINDS**---------------      5      ARMY--       Ø
--  FIRST LEVEL FINDS**--------------    217      NAVY--       Ø
--  FIRST AND SECOND LEVEL FINDS**---      5      AF----       Ø
--  1+2+3 LEVEL FINDS**--------------      Ø      OTHER-       Ø
--  1+2+3+4 LEVEL FINDS**------------      Ø
```

```
--    1   OF     5
-- 1 -  AD NUMBER: C046455
-- 2 -  FIELDS AND GROUPS: 1/3, 11/1, 1/3.3
-- 3 -  ENTRY CLASSIFICATION:   UNCLASSIFIED
-- 5 -  CORPORATE AUTHOR: MATERIALS RESEARCH LABS  ASCOT VALE (AUSTRALIA)
-- 6 -  UNCLASSIFIED TITLE:     CHEMICAL DESEALING OF A FLUOROSILICONE
--      SEALANT.
-- 8 -  TITLE CLASSIFICATION:   UNCLASSIFIED
-- 9 -  DESCRIPTIVE NOTE: TECHNICAL REPT.,
--10 -  PERSONAL AUTHORS: HANELLA, PETER J.; HUANG, ROBERT H.; MAZURUK,
--      WALDEMAR
--11 -  REPORT DATE:      MAR    , 1990
--12 -  PAGINATION:     31P   MEDIA COST:  $  6.00 PRICE CODE:   AA
--14 -  REPORT NUMBER:    MRL-TR-90-6
--18 -  MONITOR ACRONYM:  DODA
-- 19 -  MONITOR SERIES:   AR-006-296
--20 -  REPORT CLASSIFICATION:  CONFIDENTIAL
--22 -  LIMITATIONS (ALPHA):    DISTRIBUTION AUTHORIZED TO DOD ONLY; OTHER
--      REQUESTS SHALL BE REFERRED TO EMBASSY OF AUSTRALIA, ATTN: JOAN
--      BLISS, HEAD, PUB. SEC.-DEP/SCI., 1601 MASSACHUSETTS AVE., NW.
--      WASHINGTON, DC 20036.
--23 -  DESCRIPTORS:      *FUEL TANKS, *JET FIGHTERS, *WINGS, *SEALING
--      COMPOUNDS, LEAKAGE(FLUID), FLUOROPOLYMERS, POLYMERS, DEGRADATION,

-
--      CHEMICAL REACTIONS, AUSTRALIA.
--24 -  DESCRIPTOR CLASSIFICATION:    UNCLASSIFIED
--25 -  IDENTIFIERS:      *WING FUEL TANKS, 04-2817 FLUOROSILICONE SEALANT,
--      RAAF F-111 AIRCRAFT, F-111 AIRCRAFT.
--26 -  IDENTIFIER CLASSIFICATION:    UNCLASSIFIED
--29 -  INITIAL INVENTORY:     2
--32 -  REGRADE CATEGORY: F
--33 -  LIMITATION CODES: 14
--35 -  SOURCE CODE:      409014
--36 -  ITEM LOCATION:     DTIC
--40 -  GEOPOLITICAL CODE:      AU
--41 -  TYPE CODE:  8
--43 -  IAC DOCUMENT TYPE:
--******
--    2   OF     5
-- 1 -  AD NUMBER: B209155
-- 2 -  FIELDS AND GROUPS: 11/9, 11/10, 18/6
-- 3 -  ENTRY CLASSIFICATION:   UNCLASSIFIED
-- 5 -  CORPORATE AUTHOR: BATTELLE MEMORIAL INST  COLUMBUS OH RADIATION
--      EFFECTS INFORMATION CENTER
-- 6 -  UNCLASSIFIED TITLE:     THE EFFECT OF NUCLEAR RADIATION ON
--      FLUOROPOLYMERS.
-- 8 -  TITLE CLASSIFICATION:   UNCLASSIFIED

-
-- 9 -  DESCRIPTIVE NOTE: MEMORANDUM REPT.,
--10 -  PERSONAL AUTHORS: BROADWAY, N. J.; PALINCHAK, S.
--11 -  REPORT DATE:      JUN 30, 1959
--12 -  PAGINATION:     21P   MEDIA COST:  $  6.00 PRICE CODE:   AA
-- 14 -  REPORT NUMBER:    BEIC-M-17
--15 -  CONTRACT NUMBER:  AF 33(616)-6564
--16 -  PROJECT NUMBER:   2133
--18 -  MONITOR ACRONYM:  XC
--19 -  MONITOR SERIES:   USAF
--20 -  REPORT CLASSIFICATION:  UNCLASSIFIED
```

--22 - LIMITATIONS (ALPHA): DISTRIBUTION: DTIC USERS ONLY.
--23 - DESCRIPTORS: *ELASTOMERS, *NUCLEAR RADIATION, *FLUOROPOLYMERS,
-- *RADIATION EFFECTS, GUIDED MISSILES, TENSILE STRENGTH, STABILITY,
-- SPACECRAFT, DEGRADATION, COPOLYMERS, FLUORINE, GAMMA RAYS,
-- IRRADIATION, VALVES, NITRIC ACID, ACRYLATES, HARDNESS, ELONGATION,
-- POLYESTER PLASTICS, RADIATION DOSAGE, SILICONES, WEAR RESISTANCE,
-- COBALT, SILASTIC COMPOUNDS, CHEMICAL ATTACK(DEGRADATION),
-- TETRAFLUOROETHYLENE RESINS, PLASTIC COATINGS, ELECTRICAL INSULATION,
-- ABRASION, RADIATION RESISTANCE, HALOCARBON PLASTICS, HOSES, O RINGS.
--24 - DESCRIPTOR CLASSIFICATION: UNCLASSIFIED
--25 - IDENTIFIERS: KEL-F, COBALT 60, VITON, ADIPATES
--26 - IDENTIFIER CLASSIFICATION: UNCLASSIFIED
--27 - ABSTRACT: FLUOROPOLYMERS ARE USEFUL IN MISSILE CONSTRUCTION

-
-- BECAUSE OF THEIR CHEMICAL INERTNESS, HIGH-TEMPERATURE RESISTANCE,
-- AND GOOD ELECTRICAL PROPERTIES. SINCE THEY ARE RESISTANT TO FUMING
-- NITRIC ACID AND OTHER OXIDIZING AGENTS, SUCH MATERIALS AS TEFLON
-- AND KEL-F ARE ESSENTIAL MATERIALS FOR VALVES, HOSES, AND ELECTRICAL
-- INSULATION. THEIR HEAT RESISTANCE HAS MADE THEM INVALUABLE FOR HIGH-
-- TEMPERATURE APPLICATIONS. THIS RESISTANCE TO HEAT AND CHEMICALS IS
-- DUE TO THE CARBON-FLUORINE BOND WHICH IS CHEMICALLY ONE OF THE MOST
-- STABLE OF ORGANIC LINKAGES. BECAUSE OF THEIR IMPORTANT APPLICATIONS,
-- THESE MATERIALS WERE INVESTIGATED FOR USE IN A RADIATION
-- ENVIRONMENT. IT WAS FOUND THAT THE RADIATION RESISTANCE OF
-- FLUOROPOLYMERS IS NOT AS GOOD AS THEIR CHEMICAL AND HEAT RESISTANCE.
-- TEFLON HAS VERY POOR RADIATION RESISTANCE, WHILE THE OTHER
-- FLUOROPOLYMERS ARE ONLY SLIGHTLY BETTER. THIS MEMORANDUM SUMMARIZES
-- THE AVAILABLE DATA ON THE RADIATION STABILITY OF TEFLON AND KEL-F
-- PLASTICS, AND KEL-F, POLYFLUOROBUTYL ACRYLATE (POLYFBA)
-- HEXAFLUOROPENTAMETHYLENE ADIPATE (A POLYESTER), AND SILASTIC LS-53
-- (A FLUORINATED SILICONE) ELASTOMERS.
--28 - ABSTRACT CLASSIFICATION: UNCLASSIFIED
--29 - INITIAL INVENTORY: 1
--33 - LIMITATION CODES: 12
--35 - SOURCE CODE: 293900
--36 - ITEM LOCATION: DTIC
--40 - GEOPOLITICAL CODE: 3912

-
--41 - TYPE CODE: W
--43 - IAC DOCUMENT TYPE:
--******
--
-- ********************
-- EXPORT CONTROL
-- ********************
-- 3 OF 5
-- 1 - AD NUMBER: B132607
-- 2 - FIELDS AND GROUPS: 11/1, 11/3, 6/13
-- 3 - ENTRY CLASSIFICATION: UNCLASSIFIED
-- 5 - CORPORATE AUTHOR: TECHNICAL RESEARCH ASSOCIATES INC SALT LAKE CITY
- UT
-- 6 - UNCLASSIFIED TITLE: THE BIODEGRADATION OF FLUOROSILICONE. PHASE
-- 1.
-- 8 - TITLE CLASSIFICATION: UNCLASSIFIED
-- 9 - DESCRIPTIVE NOTE: FINAL REPT. JUL 88-FEB 89,
- 10 - PERSONAL AUTHORS: BOWERS-IRONS, GAIL; PRYOR, ROBERT; TRAN, QUYNH
--11 - REPORT DATE: MAY , 1989
--12 - PAGINATION: 71P MEDIA COST: $ 6.00 PRICE CODE: AA
--15 - CONTRACT NUMBER: F33615-88-C-5462

--16 - PROJECT NUMBER: 3005
--17 - TASK NUMBER: 50
--18 - MONITOR ACRONYM: WRDC

-
--19 - MONITOR SERIES: TR-89-4042
--20 - REPORT CLASSIFICATION: UNCLASSIFIED
--21 - SUPPLEMENTARY NOTE: ORIGINAL CONTAINS COLOR PLATES: ALL DTIC
-- REPRODUCTIONS WILL BE IN BLACK AND WHITE.
--22 - LIMITATIONS (ALPHA): DISTRIBUTION AUTHORIZED TO U.S. GOV'T.
-- AGENCIES ONLY; SPECIFIC AUTHORITY, PROPRIETARY INFO.; FEB 89. OTHER
-- REQUESTS SHALL BE REFERRED TO WRDC/MLBC, WRIGHT-PATTERSON AFB, OH
-- 45433-6533. THIS DOCUMENT CONTAINS EXPORT-CONTROLLED TECHNICAL DATA.
--23 - DESCRIPTORS: *BIODETERIORATION, *RUBBER COATINGS, *ELASTOMERS,
-- *MICROORGANISMS, *PAINTS, *SEALING COMPOUNDS, AGAR, AIR FORCE,
-- AIRCRAFT, BIOLOGY, CHEMICALS, COMPOSITE MATERIALS, CORROSION
-- INHIBITION, DAMAGE, DEGRADATION, DETERIORATION, EFFICIENCY, ENZYMES,
-- FLUORINE COMPOUNDS, FUNGICIDES, GERMICIDES, HAZARDS, MAINTENANCE,
-- METABOLISM, NUTRIENTS, POLYSULFIDES, REMOVAL, REPAIR, SILICONES,
-- SOUP, SURFACES, TETRAFLUOROETHYLENE RESINS, FLUOROPOLYMERS.
--24 - DESCRIPTOR CLASSIFICATION: UNCLASSIFIED
--25 - IDENTIFIERS: PE65502F, WUWRDC30055090, EXPORT CONTROL,
-- FLUOROSILICONE POLYSULFIDE, POLYSULFIDE ELASTOMERS.
--26 - IDENTIFIER CLASSIFICATION: UNCLASSIFIED
--29 - INITIAL INVENTORY: 1
--33 - LIMITATION CODES: 3 57
--34 - SOURCE SERIES: F
--35 - SOURCE CODE: 397355

-
--36 - ITEM LOCATION: DTIC
--40 - GEOPOLITICAL CODE: 4902
--41 - TYPE CODE: 4
--42 - IAC ACCESSION NUMBER: PL-053019
--43 - IAC DOCUMENT TYPE:
-- PLASTEC-MICROFICHE
--44 - IAC SUBJECT TERMS: F--(U)CORROSION RESISTANCE, MICROBIOLOGICAL
-- DETERIORATION, BIODEGRADATION, POLYSULFIDES, FLUOROSILICONES,
-- SEALANTS, FLUOROCARBONS, MONITORING, DEGRADATION, FOURIER TRANSFORM
-- IR, SPECTROSCOPY, PAINTS, ENZYME DEGRADATION, TEFLON, ELASTOMERS,
-- PTFE, COATINGS, ZZ CONTROLLED USGO.,;
--*******
-- 4 OF 5
-- 1 - AD NUMBER: A294734
-- 2 - FIELDS AND GROUPS: 7/3, 7/4, 7/6, 8/8
-- 24/4
-- 3 - ENTRY CLASSIFICATION: UNCLASSIFIED
-- 5 - CORPORATE AUTHOR: COLD REGIONS RESEARCH AND ENGINEERING LAB
HANOVER NH
- 6 - UNCLASSIFIED TITLE: SUSCEPTIBILITY OF ABS, FEP, FRE, FRP, PTFE,
-- AND PVC WELL CASINGS TO DEGRADATION BY CHEMICALS.
-- 8 - TITLE CLASSIFICATION: UNCLASSIFIED
-- 9 - DESCRIPTIVE NOTE: SPECIAL REPT.,

-
--10 - PERSONAL AUTHORS: KANNEY, THOMAS A.; PARKER, LOUISE V.
--11 - REPORT DATE: JAN , 1995
--12 - PAGINATION: 24P MEDIA COST: $ 6.00 PRICE CODE: AA
--14 - REPORT NUMBER: CRREL-SR-95-1
--18 - MONITOR ACRONYM: SFIM-AEC-ET, XA

--19 - MONITOR SERIES: CR-94071, SFIM-AEC-ET
--20 - REPORT CLASSIFICATION: UNCLASSIFIED
--23 - DESCRIPTORS: *FIBERGLASS, *ACRYLONITRILE POLYMERS, *PROPENES,
-- *BUTADIENES, *WATER WELLS, *FLUORINATED HYDROCARBONS, *ETHYLENES,
-- *POLYVINYL CHLORIDE, *REINFORCED PLASTICS, DEGRADATION, MONITORING,
-- CHEMICALS, PHYSICAL PROPERTIES, RESISTANCE, TEST EQUIPMENT, GROUND
-- WATER, PARTICLES, GLASS FIBERS, WEIGHT, GAIN, ORGANIC COMPOUNDS,
-- INERT MATERIALS, ENVIRONMENTAL PROTECTION, DETERIORATION,
-- FLUOROPOLYMERS, FLUORINATION, ALKALINITY.
--24 - DESCRIPTOR CLASSIFICATION: UNCLASSIFIED
--25 - IDENTIFIERS: *FLUORINATED ETHYLENE PROPYLENE,
-- *POLYTETRAFLUOROETHYLENE, FEP(FLUORINATED ETHYLENE PROPYLENE),
-- FRE(FIBERGLASS REINFORCED EPOXY), FIBERGLASS REINFORCED EPOXY,
-- FRP(FIBERGLASS REINFORCED PLASTICS), FIBERGLASS REINFORCED PLASTICS,
-- PTFE(POLYTETRAFLUOROETHYLENE), PVC(POLYVINYL CHLORIDE), NEAT
-- ORGANIC COMPOUNDS, WELL CASINGS
--26 - IDENTIFIER CLASSIFICATION: UNCLASSIFIED
--27 - ABSTRACT: THIS STUDY COMPARES THE CHEMICAL RESISTANCE OF FOUR

-
-- LESS COMMONLY USED MATERIALS FOR CASING GROUNDWATER MONITORING
-- WELLS: ACRYLONITRILE BUTADIENE STYRENE (ABS), FLUORINATED ETHYLENE
-- PROPYLENE (FEP), FIBERGLASS-REINFORCED EPOXY (FRE), AND FIBERGLASS-
-- REINFORCED PLASTIC (FRP), WITH TWO MORE COMMONLY USED CASING
-- MATERIALS: POLYVINYL CHLORIDE (PVC) AND POLYTETRAFLUOROETHYLENE
-- (PTFE). THE SIX MATERIALS WERE EXPOSED TO 28 NEAT ORGANIC COMPOUNDS
-- (INCLUDING ONE ACID) AND TO EXTREMELY ACIDIC AND ALKALINE
-- CONDITIONS FOR UP TO 112 DAYS. THIS WAS DONE TO SIMULATE SOME OF
-- THE MOST AGGRESSIVE ENVIRONMENTS THAT MONITORING WELL CASINGS MAY
-- BE EXPOSED TO. THE CASINGS WERE OBSERVED FOR CHANGES IN WEIGHT AND
-- SIGNS OF PHYSICAL DEGRADATION (SWELLING, SOFTENING, DECREASE IN
-- STRENGTH, DETERIORATION, OR DISSOLUTION). AS EXPECTED, THE TWO
-- FLUORINATED POLYMERS (FEP AND PTFE) WERE THE MOST INERT MATERIALS
-- TESTED. THEY WERE NOT DEGRADED BY ANY OF THE TEST CHEMICALS,
-- ALTHOUGH SAMPLES EXPOSED TO A FEW ORGANIC CHEMICALS DID SHOW A
-- SLIGHT WEIGHT GAIN (APPROX. 1%). AMONG THE NONFLUORINATED PRODUCTS
-- TESTED, FRE WAS THE MOST INERT. THREE ORGANIC CHEMICALS CAUSED
-- PARTICLES TO FLAKE FROM THE FRE SURFACE, FOLLOWED BY SEPARATION OF
-- THE GLASS FIBERS, AND TWO ORGANIC CHEMICALS CAUSED WEIGHT GAINS
-- EXCEEDING 10%. ALSO, HIGHLY ACIDIC CONDITIONS (PH<1) DEGRADED THIS
-- MATERIAL, AND THIS MAY LIMIT THE USE OF THIS MATERIAL IN ACIDIC
-- ENVIRONMENTS. JG
--28 - ABSTRACT CLASSIFICATION: UNCLASSIFIED

-
--29 - INITIAL INVENTORY: 2
--33 - LIMITATION CODES: 1
--35 - SOURCE CODE: 037100
--36 - ITEM LOCATION: DTIC/NTIS
--40 - GEOPOLITICAL CODE: 3300
--41 - TYPE CODE: A
--43 - TAC DOCUMENT TYPE:
--******
-- 5 OF 5
-- 1 - AD NUMBER: A234188
-- 2 - FIELDS AND GROUPS: 11/9
-- 3 - ENTRY CLASSIFICATION: UNCLASSIFIED
-- 5 - CORPORATE AUTHOR: NATIONAL CENTER FOR COMPOSITE MATERIALS RESEARCH
-- URBANA IL
-- 6 - UNCLASSIFIED TITLE: CHARACTERIZATION STUDIES OF FLUORINATED

```
--      EPOXY RESINS: NAVAL EXPERIMENTAL RESIN C8/1SA AS A STRUCTURAL
--      MATERIAL AND FOR USE IN BLENDS AND COMPOSITES.
-- 8 -  TITLE CLASSIFICATION:   UNCLASSIFIED
-- 9 -  DESCRIPTIVE NOTE: TECHNICAL REPT.,
--10 -  PERSONAL AUTHORS: TWARDOWSKI, T. E.; GEIL, P. H.
--11 -  REPORT DATE:      JUN 01, 1990
--12 -  PAGINATION:     78P   MEDIA COST:  $  6.00 PRICE CODE:   AA
--14 -  REPORT NUMBER:    UIUC-NCCMR-89-0013

-
--18 -  MONITOR ACRONYM:  XN
--19 -  MONITOR SERIES:   ONR
--20 -  REPORT CLASSIFICATION:  UNCLASSIFIED
--23 -  DESCRIPTORS:       , ADHESION, COMPOSITE MATERIALS, CONSTRUCTION
--      MATERIALS, DEGRADATION, ENVIRONMENTS, EPOXY COMPOUNDS, EPOXY RESINS,
--      FILLERS, FLAMES, FLUOROPOLYMERS, LIGHTWEIGHT, LOW ANGLES, MATERIALS,
--      MEASUREMENT, MODIFICATION, POLYMERS, PROCESSING, RESISTANCE,
--      SIZES(DIMENSIONS), STABILITY, THERMAL STABILITY, THERMOPLASTIC
--      RESINS, WATER.
--24 -  DESCRIPTOR CLASSIFICATION:    UNCLASSIFIED
--25 -  IDENTIFIERS:       *EPOXY RESINS.
--26 -  IDENTIFIER CLASSIFICATION:    UNCLASSIFIED
--27 -  ABSTRACT:   EPOXY THERMOSETS ARE CURRENTLY THE MATERIAL OF CHOICE
--      FOR HIGH PERFORMANCE COMPOSITE MATERIALS. THEY HAVE HIGH MODULUS,
--      LOW WEIGHT, EXCELLENT ADHESION TO THE FILLER COMPONENT, AND HIGH
--      DIMENSIONAL AND THERMAL STABILITY AS WELL AS PROCESSING
--      CHARACTERISTICS MUCH MORE TRACTABLE THAN THERMOPLASTICS.
--      UNFORTUNATELY, EPOXIES ARE OFTEN ATTACKED BY ENVIRONMENTAL ELEMENTS,
--      ESPECIALLY WATER, RESULTING IN A DEGRADATION OF PROPERTIES. AS SUCH,
--      MODIFICATION OF EPOXIES TO IMPROVE THEIR ENVIRONMENTAL RESISTANCE
--      IS VALUABLE CONSIDERATION. EPOXY RESINS INCORPORATING LARGE
--      FLUORINE CONTENTS HAVE MET THIS CHALLENGE, SHOWING LOW CONTACT
--      ANGLE, LOW MEASURE UPTAKE AND IMPROVED FLAME RESISTANCE. WHAT

-
--      REMAINS IS THE NEED TO INVESTIGATE THE SUITABILITY OF SUCH RESINS
--      FOR USE IN STRUCTURAL MATERIALS.
--28 -  ABSTRACT CLASSIFICATION:       UNCLASSIFIED
--29 -  INITIAL INVENTORY:     2
--33 -  LIMITATION CODES:  1
--35 -  SOURCE CODE:       422821
--36 -  ITEM LOCATION:     DTIC/NTIS
--40 -  GEOPOLITICAL CODE:       1719
--41 -  TYPE CODE:  0
--42 -  IAC ACCESSION NUMBER:       PL-055137
--43 -  IAC DOCUMENT TYPE:
--                        PLASTEC-MICROFICHE
--44 -  IAC SUBJECT TERMS:       P--(U)MODIFIER EFFECTS, INTERFACE STRENGTH,
--      CHARACTERIZATION, FLUORINATED EPOXY, GLASS TRANSITION, DSC,
--      MOISTURE ABSORPTION, BLENDS, COMPOSITES, EPON 828, SWELLING, EPOXY
--      828, AGING, STRESS STRAIN, ADHESION, THERMAL STABILITY, PROPERTY
--      DEGRADATION, WATER IMMERSION, TENSILE PROPERTIES, ZZ UNLIMITED.;
--*******



--                  <<ENTER NEXT COMMAND>>
```

```
### Status: Path 1 of [Dialog]

### Status: Initializing Port COM2 using (Baud 19200 Handshake XON/XOFF DataBits 7 Pari
ty Even StopBits 1)

### Status: Initializing modem ...
ATE1Q0V1X4&C1&D2
OK
### Status: Dialing primary number (448-4611)...

ATDT448-4611
PROTOCOL: LAP-M

COMPRESSION: NONE

CONNECT 19200
### Status: Connection established at 19200 baud
/ARQ

please type your terminal identifier
-3523:01-005-
please log in: DIALOG


DIALOG: call connected
### Status: Connected


DIALOG INFORMATION SERVICES
PLEASE LOGON:
 ******** HHHHHHHH SSSSSSSS?
### Status: Signing onto Dialog
 ********
ENTER PASSWORD:
 ******** HHHHHHHH SSSSSSSS? ********
Welcome to DIALOG
### Status: Connected


Dialog level 42.10.06D

Last logoff:  22nov96 09:36:40
Logon file405 22nov96 10:54:50
Banner display set OFF.
HILIGHT set on as '*'
KWIC is set to 5.
BLIP set on
NOTICE set ON to $25.00
You will be prompted to confirm each TYPE or PRINT request where
format charges exceeds $25.00
COST        = ONESEARCH.
Please enter SUBACCOUNT name/number:
?bulluck/n7402
Is BULLUCK/N7402 the SUBACCOUNT you want to use? (Y/N)
?y
Subaccount is set to BULLUCK/N7402
SYSTEM:HOME
Menu System II: D2 version 1.7.8 term=ASCII
Terminal set to DLINK
                    *** DIALOG HOMEBASE(SM) Main Menu ***
 Information:
  1.  Announcements (new files, free connect time, price changes, etc.)
  2.  Database, Rates, & Command Descriptions
  3.  Help in Choosing Databases for Your Topic
  4.  Customer Services (telephone assistance, training, seminars, etc.)
  5.  Product Descriptions
```

```
 Connections:
  6.  DIALOG Menus(SM)
  7.  DIALOG Business Connection(R) and DIALOG Headlines(SM)
  8.  KR SourceOne(SM) Document Delivery
  9.  Data Star(R)
 10.  Other Online Menu Services & Files (MoneyCenter(R), OAG, TNT, etc.)

              (c) 1995 Knight-Ridder Information, Inc.

      /H = Help            /L = Logoff          /NOMENU = Command Mode

Enter an option number to view information or to connect to an online
 service.  Enter a BEGIN command plus a file number to search a database
(e.g., B1 for ERIC).
?b411

       22nov96 10:54:55 User036172 Session D803.1
       Sub account: BULLUCK/N7402
            $0.00    0.001 Hrs FileHomeBase
     $0.00  Estimated cost FileHomeBase
     $0.01  TYMNET
     $0.01  Estimated cost this search
     $0.01  Estimated total session cost   0.001 Hrs.

File 411:DIALINDEX(R)

DIALINDEX(R)
   (c) 1996 Knight-Ridder Info

*** DIALINDEX search results display in an abbreviated ***
*** format unless you enter the SET DETAIL ON command. ***
?sf chemlit,chemeng,plastics,material
   You have 43 files in your file list.
   (To see banners, use SHOW FILES command)
?s ((pvdf or coflon or polyvinylidene()fluoride or tefzel) and (flexible()pip? or degra
dation))/ti,de,id

Your SELECT statement is:
   s ((pvdf or coflon or polyvinylidene()fluoride or tefzel) and
(flexible()pip? or degradation))/ti,de,id

          Items   File
          -----   ----
              4     2: INSPEC_1969-1996/Nov W3
             10     8: Ei Compendex(R)_1970-1996/Dec W4
              3    31: World Surface Coatings Abs_1976-1996/Oct
             12    94: JICST-EPlus_1985-1996/Oct W4
>>>Term "ID" is not defined in file 144 and is ignored
             14   144: Pascal_1973-1996/Oct
>>>Term "ID" is not defined in file 322 and is ignored
              1   322: Polymer Online_
            128   323: RAPRA Rubber & Plastics_1972-1996/Dec B2
>>>Term "DE" is not defined in file 340 and is ignored
>>>Term "ID" is not defined in file 340 and is ignored
              2   340: CLAIMS(R)/US PATENTS ABS_1950-1996/SEP
>>>File 399 processing for PIP? stopped at
        PIPERAZINYLALKANOYLDIHYDROBENZOFURANS
             84   399: CA SEARCH(R)_1967-1996/UD=12522
              5   434: Scisearch(R) Cited Ref Sci_1974-1996/Nov W2
              6     6: NTIS_64-1996/Dec W5
              2   293: Eng Materials Abs(R)_1986-1996/Dec
>>>Term "ID" is not defined in file 108 and is ignored
              1   108: Aerospace Database_1962-1996/Nov

   13 files have one or more items; file list includes 43 files.
   One or more terms were invalid in 26 files.
```

```
?save temp
Temp SearchSave "TD228" stored
?b hits
       22nov96 10:57:23 User036172 Session D803.2
       Sub account: BULLUCK/N7402
            $1.50    0.050 Hrs File411
     $1.50  Estimated cost File411
     $0.60  TYMNET
     $2.10  Estimated cost this search
     $2.11  Estimated total session cost   0.051 Hrs.


SYSTEM:OS  - DIALOG OneSearch
*File 399: Use is subject to the terms of your user/customer agreement.
For format prices, including formats 6 & 8, see HELP RATES 399.
You have  13 files in your file list.
(To see file names, coverage dates, and copyright notices, enter SHOW FILES.)

      Set  Items  Dscription
      ---  -----  -----------
?exs td228
Hilight option is not available in file(s) 6, 293, 399
HILIGHT set on as '*'
KWIC is set to 5.
KWIC option is not available in file(s) 6, 293, 399
>>>Term "ID" is not defined in one or more files
>>>Term "DE" is not defined in one or more files
>>>File 399 processing for PIP? stopped at PIPERAZINYLALKANOYLDIHYDROBENZO
  FURANS
Processed  10 of  13 files ...
Completed processing all files
           4969  PVDF/TI,DE,ID
              3  COFLON/TI,DE,ID
          12502  POLYVINYLIDENE/TI,DE,ID
         194611  FLUORIDE/TI,DE,ID
           9055  POLYVINYLIDENE/TI,DE,ID(W)FLUORIDE/TI,DE,ID
            141  TEFZEL/TI,DE,ID
         121920  FLEXIBLE/TI,DE,ID
         365537  PIP?/TI,DE,ID
            900  FLEXIBLE/TI,DE,ID(W)PIP?/TI,DE,ID
         268842  DEGRADATION/TI,DE,ID
      S1     272  ((PVDF OR COFLON OR POLYVINYLIDENE()FLUORIDE OR TEFZEL)
                  AND (FLEXIBLE()PIP? OR DEGRADATION))/TI,DE,ID
?rd s1
>>>Duplicate detection is not supported for File 94.
>>>Duplicate detection is not supported for File 322.
>>>Duplicate detection is not supported for File 340.

>>>Records from unsupported files will be retained in the RD set.
...examined 50 records  (50)
...examined 50 records  (100)
...examined 50 records  (150)
...examined 50 records  (200)
...examined 50 records  (250)
...completed examining records
      S2     253  RD S1 (unique items)
?s s2/eng
>>>Term "ENG" is not defined in one or more files
      S3     183  S2/ENG
?s s3 and py=1992:8888
>>>One or more prefixes are unsupported
>>>  or undefined in one or more files.
Processed  10 of  13 files ...
Completed processing all files
            183  S3
       13684327  PY=1992 : PY=8888
```

S4 47 S3 AND PY=1992:8888
?t 4/6/all

4/6/1 (Item 1 from file: 8)
04187181
Title: Piezo- and pyroelectric properties of dehydrofluorinated *PVDF* films
Conference Title: Proceedings of the 8th International Symposium on Electrets (ISE 8)

4/6/2 (Item 2 from file: 8)
03681363
Title: Advanced *flexible* *pipe* materials for aggressive hydrocarbon service
Conference Title: Proceedings of the Third (1993) International Offshore and Polar Engineering Conference

4/6/3 (Item 3 from file: 8)
03641106
Title: Application of TGA/FTIR to the thermal *degradation* mechanism of tetrafluoroethylene-propylene copolymers

4/6/4 (Item 4 from file: 8)
03623563
Title: XPS studies of radiation-induced structural changes in *polyvinylidene* *fluoride*

4/6/5 (Item 5 from file: 8)
03423047
Title: X-ray induced *degradation* of poly(vinylidene fluoride) films.

4/6/6 (Item 1 from file: 94)
03333595 JICST ACCESSION NUMBER: 96A0668980 FILE SEGMENT: JICST-E
Systematic Peptide Fragmentation of Polyvinylidene Difluoride(*PVDF*)-Immobilizes Proteins Prior to Microsequencing.

4/6/7 (Item 1 from file: 144)
12383888 PASCAL No.: 96-0030620
Thermal decomposition kinetics of a commercial fluoropolymer

4/6/8 (Item 2 from file: 144)
12251841 PASCAL No.: 95-0476866
KeV ion beam irradiation of *polyvinylidene* *fluoride* (*PVDF*)

4/6/9 (Item 3 from file: 144)
12251412 PASCAL No.: 95-0476413
Temperature influence on the gas desorption from *polyvinylidene* *fluoride* (*PVDF*) irradiated with helium beams

4/6/10 (Item 4 from file: 144)
11583591 PASCAL No.: 94-0469531
A FTIR study of *PVDF* irradiated by means of swift heavy ions

4/6/11 (Item 5 from file: 144)
11504125 PASCAL No.: 94-0344727
Utilization of *PVDF* sensors to determine impact damage in graphite/epoxy plates by acousto-ultrasonic technique

4/6/12 (Item 6 from file: 144)
11349383 PASCAL No.: 94-0171771
Monosaccharide and oligosaccharide analysis of glycoproteins electrotransferred onto *PVDF* membranes

4/6/13 (Item 7 from file: 144)
10964625 PASCAL No.: 93-0474091
Retention of beer spoilage microorganisms by *polyvinylidene* *fluoride* microporous membranes with various retention ratings

4/6/14 (Item 1 from file: 323)
00585817
TITLE: FAMILY FORTUNES

4/6/15 (Item 2 from file: 323)
00581044
TITLE: RADIATION EFFECTS ON FLUOROPOLYMERS: RADIATION-INDUCED STRUCTURAL AND CRYSTALLINITY CHANGES OF *TEFZEL*

4/6/16 (Item 3 from file: 323)
00577457
TITLE: COMPARISON OF HIGH PERFORMANCE, CLEAR FILMS USED FOR LONG TERM PRODUCTION

4/6/17 (Item 4 from file: 323)
00577237
TITLE: POLYMER COMPOSITIONS INTENDED FOR THE MANUFACTURE OF CABLES AND *FLEXIBLE* *PIPES* AND ARTICLES BASED ON THESE COMPOSITIONS

4/6/18 (Item 5 from file: 323)
00576607
TITLE: ACID-BASE INTERACTIONS AT POLYMER INTERFACES

4/6/19 (Item 6 from file: 323)
00575390
TITLE: CRYSTALLISATION BEHAVIOUR AND PHASE DIAGRAM OF EXTENDED-CHAIN CRYSTALS OF POLY(VINYLIDENE FLUORIDE) UNDER HIGH PRESSURE

4/6/20 (Item 7 from file: 323)
00564145
TITLE: RADIATION-INDUCED ENHANCEMENT OF CRYSTALLINITY IN POLYMERS

4/6/21 (Item 8 from file: 323)
00559287
TITLE: ELECTROCHEMISTRY AS THE WAY TO TRANSFORM POLYMERS

4/6/22 (Item 9 from file: 323)
00559286
TITLE: ELECTROCHEMICALLY INDUCED FUNCTIONALISATION OF FLUOROCONTAINING POLYOLEFINS

4/6/23 (Item 10 from file: 323)
00559052
TITLE: BLENDS OF GLYCIDYL METHACRYLATE(GMA)/METHYL METHACRYLATE(MMA)

COPOLYMERS WITH *POLYVINYLIDENE* *FLUORIDE*

4/6/24 (Item 11 from file: 323)
00554472
TITLE: POLYMER SUPPORTS IN SYNTHESIS

4/6/25 (Item 12 from file: 323)
00549288
TITLE: YIELD BEHAVIOUR OF *PVDF* AND THE DEFORMATION PROCESS AT HIGH TEMPERATURE

4/6/26 (Item 13 from file: 323)
00509576
TITLE: STUDY OF THE THERMAL *DEGRADATION* OF POLYCHLOROTRIFLUOROETHYLENE, *POLYVINYLIDENE* *FLUORIDE* AND COPOLYMERS OF CHLOROTRIFLUOROETHYLENE AND VINYLIDENE FLUORIDE

4/6/27 (Item 14 from file: 323)
00496424
TITLE: RADIATION EFFECTS ON *PVDF*

4/6/28 (Item 15 from file: 323)
00492182
TITLE: GRAFTING OF SILICON PHTHALOCYANINE DICHLORIDE ONTO *PVDF* FILM SURFACES BY ULTRASOUND

4/6/29 (Item 16 from file: 323)
00474223
TITLE: PLASTICS HEAT EXCHANGERS

4/6/30 (Item 17 from file: 323)
00472912
TITLE: SEEKING THE PERFECT BLEND

4/6/31 (Item 18 from file: 323)
00470711
TITLE: X-RAY PHOTOELECTRON SPECTROSCOPY(XPS) STUDIES OF RADIATION-INDUCED STRUCTURAL CHANGES IN *POLYVINYLIDENE* *FLUORIDE*

4/6/32 (Item 19 from file: 323)
00448524
TITLE: REACTIONS OF ATOMIC OXYGEN WITH POLYMER FILMS

4/6/33 (Item 1 from file: 340)
2620850 9516422
C/POLYMER COMPOSITIONS INTENDED FOR THE MANUFACTURE OF CABLES AND *FLEXIBLE* *PIPES* AND ARTICLES BASED ON THESE COMPOSITIONS; *POLYVINYLIDENE* *FLUORIDE* BLEND

4/6/34 (Item 2 from file: 340)
2439164 9402057
C/METHOD FOR EXTRUDING POLYOLEFINS CONTAINING VINYLIDENE CHLORIDE POLYMERS ; COATING EQUIPMENT WITH *POLYVINYLIDENE* *FLUORIDE* TO PREVENT *DEGRADATION* OF THE CHLOROPOLYMER

4/6/35 (Item 1 from file: 399)
DIALOG(R)File 399:(c) 1996 American Chemical Society. All rts. reserv.

KeV-MeV ion irradiation of polyvinylidene fluoride (PVDF) films

4/6/36 (Item 2 from file: 399)
DIALOG(R)File 399:(c) 1996 American Chemical Society. All rts. reserv.

Photodegradation of fluorocarbon resin films. A new evaluation method using an ESR spectrometer

4/6/37 (Item 3 from file: 399)
DIALOG(R)File 399:(c) 1996 American Chemical Society. All rts. reserv.

Testing the utility of EIS measurements to predict and monitor the behavior of organically coated aluminum during atmospheric exposure

4/6/38 (Item 4 from file: 399)
DIALOG(R)File 399:(c) 1996 American Chemical Society. All rts. reserv.

Swift heavy ion modification of polymers

4/6/39 (Item 5 from file: 399)
DIALOG(R)File 399:(c) 1996 American Chemical Society. All rts. reserv.

Radical in heavy ion-irradiated polyvinylidene fluoride

4/6/40 (Item 6 from file: 399)
DIALOG(R)File 399:(c) 1996 American Chemical Society. All rts. reserv.

Photoacoustic detection of the decomposition kinetics of polymers: interpretation of acoustic signals

4/6/41 (Item 7 from file: 399)
DIALOG(R)File 399:(c) 1996 American Chemical Society. All rts. reserv.

Crystallite damage studies on irradiated poly(vinylidene fluoride)

4/6/42 (Item 8 from file: 399)
DIALOG(R)File 399:(c) 1996 American Chemical Society. All rts. reserv.

Derivatization of polyvinylidene difluoride membranes for the solid-phase sequence analysis of a phosphorylated sea urchin embryo histone H1 peptide

4/6/43 (Item 9 from file: 399)
DIALOG(R)File 399:(c) 1996 American Chemical Society. All rts. reserv.

Surface analysis of poly(vinylidene difluoride) membranes

4/6/44 (Item 10 from file: 399)
DIALOG(R)File 399:(c) 1996 American Chemical Society. All rts. reserv.

Low dose .gamma.-irradiation of some fluoropolymers: effect of polymer chemical structure

4/6/45 (Item 1 from file: 434)
14349564 Genuine Article#: TF649 Number of References: 15

Title: THERMAL-DECOMPOSITION KINETICS OF A COMMERCIAL FLUOROPOLYMER (
Abstract Available)

4/6/46 (Item 1 from file: 6)
1787467 NTIS Accession Number: PB94-886397/XAB
Polyvinylidene Fluoride: Structure and Degradation. (Latest citations from the Rubber and Plastics Research Association Database)
(Published Search)
NTIS Prices: PC N01/MF N01

4/6/47 (Item 1 from file: 293)
126857
Thermal Degradation of Commercial Fluoropolymers in Air.
?
Status: Signing Off...
logoff
22nov96 11:01:37 User036172 Session D803.3
Sub account: BULLUCK/N7402
$7.38 0.083 Hrs FileOS
$3.50 47 Types
$10.88 Estimated cost FileOS
OneSearch, 13 files, 0.083 Hrs FileOS
$1.00 TYMNET
$11.88 Estimated cost this search
$13.99 Estimated total session cost 0.134 Hrs.

Status: Signed Off. (7 minutes)

```
### Status: Path 1 of [Dialog]

### Status: Initializing Port COM2 using (Baud 19200 Handshake XON/XOFF DataBits 7 Pari
ty Even StopBits 1)

### Status: Initializing modem ...
ATE1Q0V1X4&C1&D2
OK
### Status: Dialing primary number (448-4611)...

ATDT448-4611
PROTOCOL: LAP-M

COMPRESSION: NONE

CONNECT 19200
### Status: Connection established at 19200 baud
/ARQ

please type your terminal identifier
-3523:01-004-
please log in: DIALOG


DIALOG: call connected
### Status: Connected


DIALOG INFORMATION SERVICES
PLEASE LOGON:
 ******** HHHHHHHH SSSSSSSS?
### Status: Signing onto Dialog
 ********
ENTER PASSWORD:
 ******** HHHHHHHH SSSSSSSS? ********
Welcome to DIALOG
### Status: Connected


Dialog level 42.10.06D

Last logoff:  22nov96 11:01:38
Logon file405 22nov96 15:00:32
Banner display set OFF.
HILIGHT set on as '*'
KWIC is set to 5.
BLIP set on
NOTICE set ON to $25.00
You will be prompted to confirm each TYPE or PRINT request where
format charges exceeds $25.00
COST       = ONESEARCH.
Please enter SUBACCOUNT name/number:
?bulluck/n7402
Is BULLUCK/N7402 the SUBACCOUNT you want to use? (Y/N)
?y
Subaccount is set to BULLUCK/N7402
SYSTEM:HOME
Menu System II: D2 version 1.7.8 term=ASCII
Terminal set to DLINK
                    *** DIALOG HOMEBASE(SM) Main Menu ***
 Information:
  1.  Announcements (new files, free connect time, price changes, etc.)
  2.  Database, Rates, & Command Descriptions
  3.  Help in Choosing Databases for Your Topic
  4.  Customer Services (telephone assistance, training, seminars, etc.)
  5.  Product Descriptions
```

Connections:
6. DIALOG Menus(SM)
7. DIALOG Business Connection(R) and DIALOG Headlines(SM)
8. KR SourceOne(SM) Document Delivery
9. Data Star(R)
10. Other Online Menu Services & Files (MoneyCenter(R), OAG, TNT, etc.)

/H = Help /L = Logoff /NOMENU = Command Mode

Enter an option number to view information or to connect to an online service. Enter a BEGIN command plus a file number to search a database (e.g., B1 for ERIC).
?b8

22nov96 15:00:36 User036172 Session D804.1
Sub account: BULLUCK/N7402
$0.00 0.001 Hrs FileHomeBase
$0.00 Estimated cost FileHomeBase
$0.01 TYMNET
$0.01 Estimated cost this search
$0.01 Estimated total session cost 0.001 Hrs.

File 8:Ei Compendex(R) 1970-1996/Dec W4
(c) 1996 Engineering Info. Inc.

Set	Items	Description
S0	1	03681363
S0	2	03641106

?k 03681363;k 03641106
?t 0/5/all

0/5/1
DIALOG(R)File 8:Ei Compendex(R)

03681363 E.I. No: EIP93081046180
Title: Advanced flexible pipe materials for aggressive hydrocarbon service
Author: Hill, R.T.; Measamer, J.C.
Corporate Source: Wellstream Corp, Panama City, FL, USA
Conference Title: Proceedings of the Third (1993) International Offshore and Polar Engineering Conference
Conference Location: Singapore, Singapore Conference Date: 19930606-19930611
E.I. Conference No.: 18719
Source: Proceedings of the Third (1993) International Offshore and Polar Engineering Conference Proc Third 93 Int Offshore Polar Eng Conf 1993. Publ by Int Soc of Offshore and Polar Engineerns (ISOPE), P.O.Box 1107, Golden, CO, USA. p 359-364
Publication Year: 1993
ISBN: 1-880653-09-5
Language: English
Document Type: CA; (Conference Article) Treatment: X; (Experimental)
Journal Announcement: 9309W4
Abstract: The increasing development of marginal offshore hydrocarbon deposits has resuld in production of increasingly corrosive fluids. This has increased the need for pipelines capable of operating at elevated temperatures in the presence of high concentrations of H//2S and CO//2 gases. Conventional pipelines requires the use of stainless steels or corrosion resistant alloys which drives up the cost of materials and fabrication/installation of the system. The use of flexible pipe systems is assuming as important role ir these applications where stainless steel and

CRA carcass materials may be economically utilized. This paper discuses testing of flexible pipe carcass materials and a new PVDF homopolymer fluid barrier material. (Author abstract) 7 Refs.
  Descriptors: *Offshore pipelines; Submarine pipelines; Corrosion resistance; Seawater effects; Plastic pipe
  Identifiers: Flexible pipes; Plasticized homopolymer; Corrosive fluids; PVDF homopolymer, Carcass layer
  Classification Codes:
  619.1.2 (Pipe Materials)
  619.1 (Pipe, Piping & Pipelines); 539.2 (Corrosion Protection); 511.2 (Oil Field Equipment)
  619 (Pipes, Tanks & Accessories); 539 (Metals Corrosion & Protection); 511 (Oil Field Equipment & Production Operations)
  61 (PLANT & POWER ENGINEERING); 53 (METALLURGICAL ENGINEERING); 51 (PETROLEUM ENGINEERING)

 0/5/2
DIALOG(R)File 8:Ei Compendex(R)

03641106 E.I. No: EIP93050995198
  Title: Application of TGA/FTIR to the thermal degradation mechanism of tetrafluoroethylene-propylene copolymers
  Author: Schild, H.G.
  Source: Journal of Polymer Science, Part A: Polymer Chemistry v 31 n 6 May 1993. p 1629-1632
  Publication Year: 1993
  CODEN: JPACEC ISSN: 0887-624X
  Language: English
  Document Type: JA; (Journal Article) Treatment: A; (Applications); G; (General Review); X; (Experimental)
  Journal Announcement: 9307W4
  Abstract: Aflas, produced by Asahi Glass Co. Ltd., Tokyo, Japan and marketed in the United States by 3M, is a high-performance elastomeric tetrafluoroethylene (TFE)/propylene copolymer with superior high temperature stability, electrical, and chemical resistance properties. (Edited author abstract) 14 Refs.
  Descriptors: *Copolymers; Polypropylenes; Polytetrafluoroethylenes; Pyrolysis; Thermoanalysis; Infrared spectroscopy
  Identifiers: Aflas; Tefzel; Thermogravimetric analysis; Fourier transform infrared spectroscopy; Tetrafluoroethylene; Reaction mechanism
  Classification Codes:
  815.1.1 (Organic Polymers)
  815.1 (Polymeric Materials); 802.2 (Chemical Reactions); 801.1 (Chemistry, General)
  815 (Plastics & Polymeric Materials); 802 (Chemical Apparatus & Plants); 801 (Chemical Analysis & Physical Chemistry)
  81 (CHEMICAL PROCESS INDUSTRIES); 80 (CHEMICAL ENGINEERING)
?b144
       22nov96 15:01:03 User036172 Session D804.2
       Sub account: BULLUCK/N7402
            $1.44   0.016 Hrs File8
            $3.00 2 Types
     $4.44 Estimated cost File8
     $0.19 TYMNET
     $4.63 Estimated cost this search
     $4.64 Estimated total session cost   0.018 Hrs.

File 144:Pascal 1973-1996/Oct
       (c) 1996 INIST/CNRS

      Set Items Description
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?k 12383888
      S0   1 12383888

?t 0/5

0/5/1
DIALOG(R)File 144:Pascal
(c) 1996 INIST/CNRS. All rts. reserv.

12383888 PASCAL No.: 96-0030620
Thermal decomposition kinetics of a commercial fluoropolymer
VISHWA PRASAD A; SINGH R P
National chemical lab., polymer chemistry div., Pune 411 008, India
Journal: Materials research bulletin, 1995, 30 (11) 1407-1412
ISSN: 0025-5408 CODEN: MRBUAC Availability: INIST-13343;
354000059050140120
No. of Refs.: 15 ref.
Document Type: P (Serial) ; A (Analytic)
Country of Publication: USA
Language: English
Thermal decomposition kinetics of a fluoropolymer (Tefzel) in the temperature range 359-550 Degree C by thermogravimetry (TG) and 235-270 Degree C by differential scanning calorimetry (DSC) was investigated under nitrogen flux. The temperature range studied (225-550 Degree C) includes the range of recommended continuous use and processing temperature of these commercial resins. The activation energy (DELTA E) for decomposition was 53.33 k.cal mole SUP - SUP 1 in TG at 10 Degree C/min rate, whereas it was 9.49 k.cal mole SUP - SUP 1 in DSC. The effect of heating rate on TG and DSC thermograms was studied.
English Descriptors: Fluoroelastomer; Ethylene copolymer; Tetrafluoroethylene copolymer; Commercial form; Thermal degradation; Kinetics; Rate constant; Activation energy; Heating rate; Experimental study

French Descriptors: Caoutchouc fluor; Ethylene copolymere; Ethylene(tetrafluoro) copolymere; Forme commerciale; Degradation thermique; Cinetique; Constante vitesse; Energie activation; Vitesse chauffage; Etude experimentale; Tefzel

Classification Codes: 001D09D03D
?b323
22nov96 15:01:51 User036172 Session D804.3
Sub account: BULLUCK/N7402
$0.96 0.016 Hrs File144
$1.15 1 Types
$2.11 Estimated cost File144
$0.19 TYMNET
$2.30 Estimated cost this search
$6.94 Estimated total session cost 0.034 Hrs.

File 323:RAPRA Rubber & Plastics 1972-1996/Dec B2
(c) 1996 RAPRA Technol Ltd

Set	Items	Description
S0	1	00549288
S0	2	00509576

?k 00549288;k 00509576
?t 0/5/all

0/5/1
DIALOG(R)File 323:RAPRA Rubber & Plastics
(c) 1996 RAPRA Technol Ltd. All rts. reserv.

00549288
TITLE: YIELD BEHAVIOUR OF PVDF AND THE DEFORMATION PROCESS AT HIGH TEMPERATURE
AUTHOR(S): Hellinckx S; Bauwens J C

CORPORATE SOURCE: Brussels,Free University
SOURCE: Coll.Polym.Sci.; 273, No.3, March 1995, p.219-26
CODEN: CPMSB6 JOURNAL ANNOUNCEMENT: 9507 RAPRA UPDATE: 9513
DOCUMENT TYPE: Journal
LANGUAGE: English
SUBFILE: (R) RAPRA
ABSTRACT: Tensile yield stress measurements on PVDF were carried out, covering as many as seven decades of strain rates at temps. from -50 to 150C. The data were analysed on the basis of four Ree-Eyring processes acting in parallel, three of which were identified. At high temps. and low strain rates, a threshold yield stress was observed. A model was proposed, permitting description of the yield behaviour both at the threshold and in its adjacent strain rate dependent range. It consisted of a modification of the Ree-Eyring theory using an asymmetrical free energy barrier for the rate process. The data were consistent with the above model, which implied that yielding occurred only when the stress was higher than a threshold. In this case, a rejuvenation (or de-ageing) effect should be assumed in the deformation process which could consist of a melting of a chain segment located between two folds. 21 refs.
SUBJECT HEADING (RAPRA): TENSILE PROPERTIES, PVDF; VINYLIDENE FLUORIDE POLYMERS, tensile properties
GEOGRAPHIC LOCATION: BELGIUM; EUROPEAN COMMUNITY; EUROPEAN UNION; WESTERN EUROPE
DESCRIPTORS: DATA; DEFORMATION; FLUOROPOLYMER; FREE ENERGY; GRAPH; HIGH TEMPERATURE; LOW TEMPERATURE; MECHANICAL PROPERTIES; MELTING; MODEL; PLASTIC; POLYVINYLIDENE FLUORIDE; PROPERTIES; PVDF; STRAIN RATE; TABLES ; TECHNICAL; TEMPERATURE; TENSILE PROPERTIES; THEORY; THERMAL DEGRADATION; THERMOPLASTIC; YIELD; YIELD STRESS
RAPRA CLASSIFICATION CODE: 42C386; 95111
CATEGORY CODES: UG; KM

0/5/2
DIALOG(R)File 323:RAPRA Rubber & Plastics

00509576
TITLE: STUDY OF THE THERMAL DEGRADATION OF POLYCHLOROTRIFLUOROETHYLENE, POLYVINYLIDENE FLUORIDE AND COPOLYMERS OF CHLOROTRIFLUOROETHYLENE AND VINYLIDENE FLUORIDE
AUTHOR(S): Zulfiqar S; Zulfiqar M; Rizvi M; Munir A; McNeill I C
CORPORATE SOURCE: Quaid-i-Azam,University; Glasgow,University
SOURCE: Polym.Degradat.Stabil.; 43, No.3, 1994, p.423-30
CODEN: PDSTDW JOURNAL ANNOUNCEMENT: 9406 RAPRA UPDATE: 9410
DOCUMENT TYPE: Journal
LANGUAGE: English
SUBFILE: (R) RAPRA
ABSTRACT: A systematic study of the thermal degradation of a series of homopolymers and copolymers of chlorotrifluoroethylene and vinylidene fluoride was carried out using TGA and thermal volatilisation analysis(TVA). Volatile products were separated by sub-ambient TVA and characterised by means of IR spectroscopy and mass spectrometry. On degradation, polychlorotrifluoroethylene gave the monomer as the major product and carbon dioxide, C2F2Cl2, C3F5Cl and C2F3Cl3 in traces. Polyvinylidene fluoride formed hydrogen fluoride in appreciable amount along with the monomer and C4H3F3. The copolymers showed a similar type of degradation pattern. The structural changes which took place during degradation were also studied and mechanisms of formation of the various products are discussed. 12 refs.
SUBJECT HEADING (RAPRA): DEGRADATION, thermal, PCTFE, PVDF; CHLOROTRIFLUOROETHYLENE POLYMERS, thermal degradation; VINYLIDENE FLUORIDE POLYMERS, thermal degradation
IDENTIFIERS (Non-Polymer Terms): CARBON DIOXIDE; CHLORINE COMPOUND; CHLOROPENTAFLUOROPROPENE; DICHLORODIFLUOROPROPENE; FLUORINE COMPOUND; HYDROFLUORIC ACID; HYDROGEN FLUORIDE; TRICHLOROTRIFLUOROPROPENE; TRIFLUOROBUTADIENE

GEOGRAPHIC LOCATION: EUROPEAN COMMUNITY; PAKISTAN; UK; WESTERN EUROPE
DESCRIPTORS: CHARACTERISATION; CHLOROTRIFLUOROETHYLENE COPOLYMER; DATA; DEGRADATION; DEGRADATION PRODUCT; FLUOROPOLYMER; GRAPH; IR SPECTROSCOPY ; MASS SPECTROMETRY; MECHANISM; PCTFE; PLASTIC; POLYTRIFLUOROCHLOROETHYLENE; POLYVINYLIDENE FLUORIDE; PROPERTIES; PVDF; TABLES; TECHNICAL; TGA; THERMAL DEGRADATION; THERMAL VOLATILISATION ANALYSIS; THERMOGRAVIMETRIC ANALYSIS; THERMOPLASTIC; TRIFLUOROCHLOROETHYLENE COPOLYMER; VINYLIDENE FLUORIDE COPOLYMER; VOLATILE
RAPRA CLASSIFICATION CODE: 42C38; 932
CATEGORY CODES: UE; KM
?b340
22nov96 15:02:34 User036172 Session D804.4
Sub account: BULLUCK/N7402
$0.96 0.016 Hrs File323
$3.80 2 Types
$4.76 Estimated cost File323
$0.19 TYMNET
$4.95 Estimated cost this search
$11.89 Estimated total session cost 0.051 Hrs.

File 340:CLAIMS(R)/US PATENTS ABS 1950-1996/SEP
(c) 1996 IFI/Plenum Data Corp.

Set	Items	Description
?k 2620850		
S0	1	2620850

?t 0/5

0/5/1
DIALOG(R)File 340:CLAIMS(R)/US PATENTS ABS
(c) 1996 IFI/Plenum Data Corp. All rts. reserv.

2620850 9516422
C/POLYMER COMPOSITIONS INTENDED FOR THE MANUFACTURE OF CABLES AND FLEXIBLE PIPES AND ARTICLES BASED ON THESE COMPOSITIONS; POLYVINYLIDENE FLUORIDE BLEND
Document Type: UTILITY
Inventors: Lambert Yves-Julian (BE); Lasson Pierre (BE); Maquet Nestor (BE) ; Thulliez Vincent (BE); Vanderveken Yves (BE)
Assignee: Solvay S A BE Assignee Code: 78176

	Patent Number	Issue Date	Applic Number	Applic Date
Patent:	US 5429849	950704	US 188418	940124
Priority Applic:			BE 9300070	930125

Abstract:
Polymer compositions based on fluoropolymers intended especially for the manufacture of electrical cables and of flexible pipes, comprising, by weight, (A) from 25 to 75% of PVDF homopolymer; (B) from 25 to 75% of a thermoplastic copolymer of VF2 and of at least one other fluoromonomer, exhibiting a content of 5 to 25% of this other monomer. This other fluorocomonomer may be in particular CTFE (chlorotrifluoroethylene), HFP (hexafluoropropylene) or TrFE (trifluoroethylene). Articles produced from these compositions have good mechanical properties at low temperature.

Exemplary Claim:
1. A polymer composition based on polyvinylidene fluoride (PVDF) homopolymer and at least one fluorocopolymer, comprising: a mixture of fluoropolymers comprised of, by weight: (A) from about 25 to about 75% of at least one PVDF homopolymer; and (B) from about 25 to about 75% of at least one thermoplastic copolymer comprising vinylidene fluoride (VF2) and from about 5 to about 25% by weight of at least one other fluoromonomer selected from the group consisting of hexafluoropropylene and chlorotrifluoroethylene.

Class: 428036900
Class Cross Ref: 428379000; 525199000
IPC: C08L-027/16
IPC Cross Ref: B29D-022/00; B29D-023/22
?b399
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            $1.10 1 Types
     $3.02 Estimated cost File340
     $0.19 TYMNET
     $3.21 Estimated cost this search
    $15.10 Estimated total session cost   0.068 Hrs.

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?s (photoacoustic and decomposition and kinetics and polymers)/ti
            2924 PHOTOACOUSTIC/TI
           43550 DECOMPOSITION/TI (SEE ?IGNOTE)
          110434 KINETICS/TI
          125120 POLYMERS/TI (SEE ?CLASS)
      S1   1 (PHOTOACOUSTIC AND DECOMPOSITION AND KINETICS AND
                  POLYMERS)/TI
?t 1/9

 1/9/1
DIALOG(R)File 399:CA SEARCH(R)
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 121058553   CA: 121(6)58553r   JOURNAL
 Photoacoustic detection of the decomposition kinetics of polymers:
interpretation of acoustic signals
  AUTHOR(S): Kukreja, L. M.; Hess, P.
  LOCATION: Institute of Physical Chemistry, University of Heidelberg, Im
Neuenheimer Feld 253, Heidelberg, Germany, 69120
  JOURNAL: Appl. Surf. Sci. DATE: 1994 VOLUME: 79-80 NUMBER: 1-4
  PAGES: 399-402 CODEN: ASUSEE ISSN: 0169-4332 LANGUAGE: English
  SECTION:
CA237004 Plastics Manufacture and Processing
CA273XXX Optical, Electron, and Mass Spectroscopy, and Other Related
    Properties
  IDENTIFIERS: polyimide degrdn kinetics photoacoustic detection, PVDF
piezoelec transducer polyimide ablation
  DESCRIPTORS:
Photoacoustic effect...
    in laser-induced ablation of polyimides
Polyethers,polyimide-,properties... Polyimides,polyether-,properties...
    laser-induced degrdn. of, PVDF for photoacoustic detection of
Ablation,laser-induced... Polymer degradation,laser-induced...
    of polyimides, photoacoustic detection of
Kinetics of polymer degradation,photochem....
    with laser source, of polyimides, photoacoustic detection of
  CAS REGISTRY NUMBERS:
25036-53-7 25038-81-7 laser-induced degrdn. of, PVDF for photoacoustic
    detection of
24937-79-9 piezoelec. foil transducer, for photoacoustic detection of
    polyimide degrdn.
?s (crystallite and irradiated and poly(vinylidene()fluoride))/ti
             783 CRYSTALLITE/TI
           24726 IRRADIATED/TI

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                0  POLY(VINYLIDENE/TI
                0  FLUORIDE)/TI
                0  POLY(VINYLIDENE/TI(W)FLUORIDE)/TI
       S2       0  (CRYSTALLITE AND IRRADIATED AND
                   POLY(VINYLIDENE()FLUORIDE))/TI
 ?s (crystallite and damage and irradiated)/ti
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            27703  DAMAGE/TI
            24726  IRRADIATED/TI
       S3       1  (CRYSTALLITE AND DAMAGE AND IRRADIATED)/TI
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 DIALOG(R)File 399:CA SEARCH(R)
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  120219059    CA: 120(18)219059f    JOURNAL
  Crystallite damage studies on irradiated poly(vinylidene fluoride)
   AUTHOR(S): Zhao Zhudi; Chu Jin; Chen Xinfang
   LOCATION: Inst. Mater. Sci., Jilin Univ., Changchun, Peop. Rep. China,
 130023
   JOURNAL: Radiat. Phys. Chem.  DATE: 1994  VOLUME: 43  NUMBER: 6  PAGES:
 523-6  CODEN: RPCHDM  ISSN: 0146-5724  LANGUAGE: English
   SECTION:
 CA236005 Physical Properties of Synthetic High Polymers
   IDENTIFIERS: PVDF crystallite radiation damage, polyvinylidene fluoride
 crystallite irradn
   DESCRIPTORS:
 Crystallites...
     in poly(vinylidene fluoride), damage of, by irradn.
 Polymer degradation,radiochem....
     of poly(vinylidene fluoride), crystallite damage in
 Crystallinity... Heat of fusion and Heat of freezing... Polymer
 morphology,cryst., spherulitic...
     of poly(vinylidene fluoride), radiation effect on
   CAS REGISTRY NUMBERS:
 24937-79-9  crystallite damage of irradiated
 ?s (surface and analysis and membranes)/ti
           195990  SURFACE/TI  (SEE ?IGNOTE)
           306491  ANALYSIS/TI  (SEE ?IGNOTE)
            53770  MEMBRANES/TI
       S4      20  (SURFACE AND ANALYSIS AND MEMBRANES)/TI
 ?s s4 and poly
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           909548  POLY
       S5       6  S4 AND POLY
 ?s s5 and vinylidene
                6  S5
            13851  VINYLIDENE
       S6       1  S5 AND VINYLIDENE
 ?t 6/9

  6/9/1
 DIALOG(R)File 399:CA SEARCH(R)
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  117050189    CA: 117(6)50189y    JOURNAL
  Surface analysis of poly(vinylidene difluoride) membranes
   AUTHOR(S): Floesch, D.; Lehmann, H. D.; Reichl, R.; Inacker, O.; Goepel,
 W.
   LOCATION: Inst. Phys. Theor. Chem., Univ. Tuebingen, Tuebingen, Germany,
 D-7400
   JOURNAL: J. Membr. Sci.  DATE: 1992  VOLUME: 70  NUMBER: 1  PAGES: 53-63
   CODEN: JMESDO  ISSN: 0376-7388  LANGUAGE: English
   SECTION:
 CA238003 Plastics Fabrication and Uses
   IDENTIFIERS: PVDF membrane surface analysis spectroscopy
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DESCRIPTORS:
Membranes,microporous...
hydrophilic and hydrophobic PVDF, surface anal. of, by x-ray, IR and mass spectroscopy
Fluoropolymers...
membranes, hydrophilic and hydrophobic, surface anal. of, by x-ray, IR and mass spectroscopy
Surface analysis...
of hydrophilic and hydrophobic PVDF membranes
Polymer degradation,radiochem....
of hydrophilic and hydrophobic PVDF membranes, by x-ray
Surface structure...
of hydrophilic and hydrophobic PVDF membranes, surface anal. of, by x-ray, IR and mass spectroscopy
Mass spectra,secondary-ion...
of hydrophilic and hydrophobic PVDF membranes, surface structure in relation to
CAS REGISTRY NUMBERS:
24937-79-9 membranes, hydrophilic and hydrophobic, surface anal. of, by x-ray and IR and mass spectroscopy
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Status: Signing Off...
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$5.85 3 Types
$17.85 Estimated cost File399
$1.20 TYMNET
$19.05 Estimated cost this search
$34.15 Estimated total session cost 0.168 Hrs.

Status: Signed Off. (9 minutes)