FM 5064J TEST LOT #5 (H)

D-09337

FINGERPRINT TEST DATA REPORT

NAS8-36298 COPY # 21

TABLE OF CONTENTS

FILLER TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

Filler Lot for NASA Lot# 5

CHARTS

U.S. Polymeric

FILLER TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

Filler Lot for NASA Lot# 5

1. Carbon Content, %			SAMPLE		
QAI-5560		#5A-1	#5A-2	#5A-3	
		99.27	99.36	99.28	
		NASA LOT# 5	AVERAGE	99.30	
2. Ash Content, %		0.000	0.011	0.005	
PTM-71B		0.000	0.005	0.020	
	AVG.	0.000	0.008	0.012	
		NASA LOT# 5	AVERAGE	0.007	
3. Atomic Absorption, ppm		#5A-1	#5A-2	#5A-3	LOT#5 AVG.
CTM-53B					
(Values are average of	Na	18.5	18.0	19.0	18.5
2 determinations)	K	2.0	2.0	2.5	2.2
	Ca	2.0	2.0	2.0	2.0
	Mg	0.0	0.0	0.0	0.0
	Li	0.0	0.0	0.0	0.0
	TOTAL	22.5	22.0	23.5	22.7
3a. Moisture Content, %		.010	.000	.000	
CTM-53B		.021	.000	.000	
	AVG.	.016	.000	.000	
		NASA LOT# 5	AVERAGE	.005	
3b. Ash Content, %		0.000	0.010	0.025	
CTM-53B		0.015	0.015	0.010	
	AVG.	0.008	0.013	0.018	
		NASA LOT# 5	AVERAGE	0.013	
4. pH, Units		5.25	5.55	5.55	
ASTM D1512		5.40	5.50	5.60	
	AVG.	5.32	5.52	5.58	
		NASA LOT# 5	AVERAGE	5.47	
5. Particle Size, microns	AVG.	.50	.45	.50	
S.E.M. procedure	Maximum	.99	.79	.88	
(Average values are	Minimum	.16	.20	.20	
of 20 determinations)	Std. Dev	.27	.15	.19	
		NASA LOT# 5	AVERAGE SIZE	.48	
6a. TGA, °C at 50% Loss		837	870	880	
CTM-51		NASA LOT# 5	AVERAGE	862	

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Filler Lot for NASA Lot# 5

6b. TGA
CTM-51

See Charts 6A-6C

7. Particle Size Distribution
CTM-72

See Charts 7A-7C

7a. Particle Size, microns
CTM-72

	#5A-1	#5A-2	#5A-3
	.90	.90	1.08
	1.00	.88	.98
AVG.	.95	.89	1.03

NASA LOT# 5 AVERAGE .96

U.S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

CHART 6A

ORIGINAL PAGE IS
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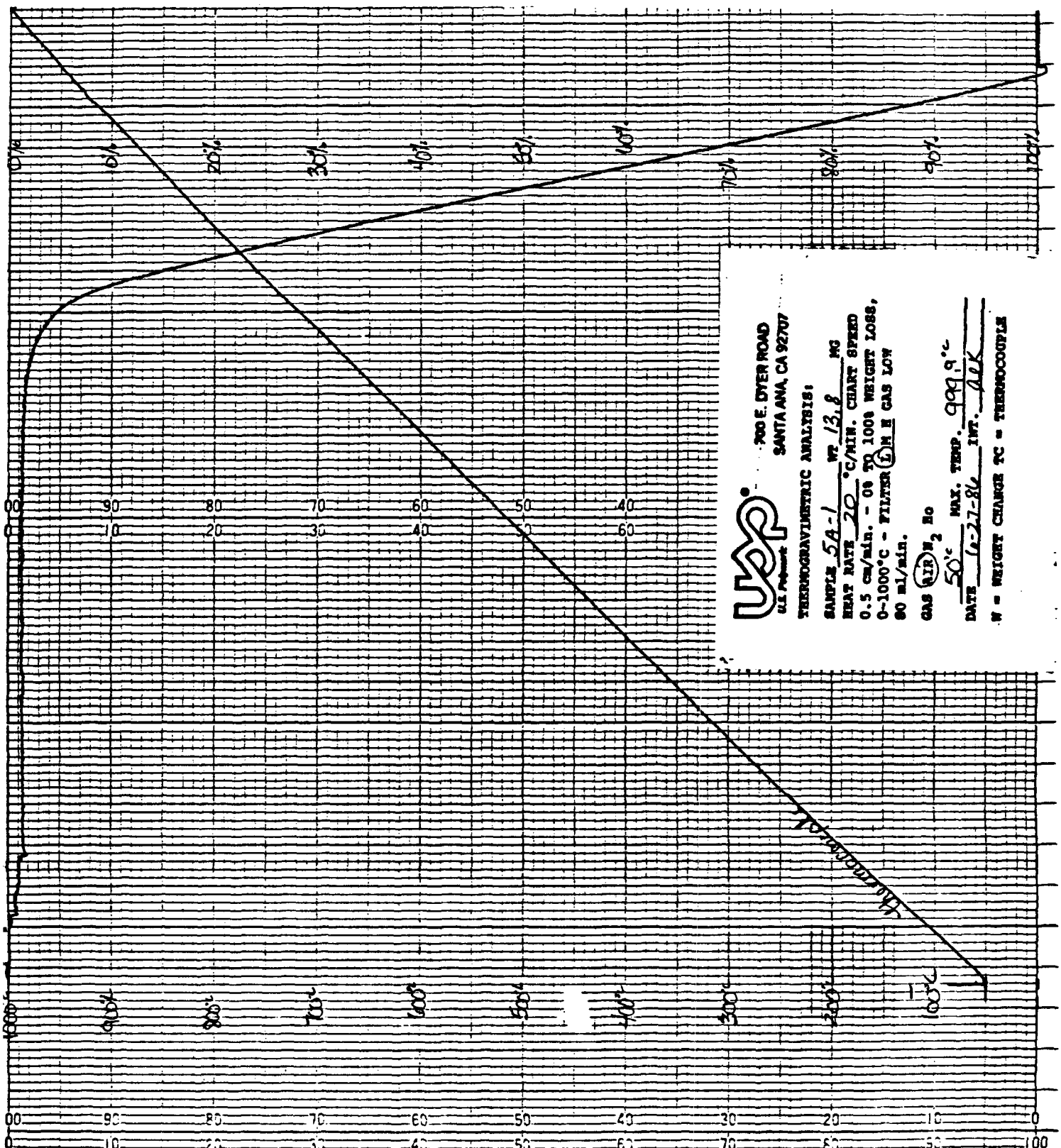

CHART 6B

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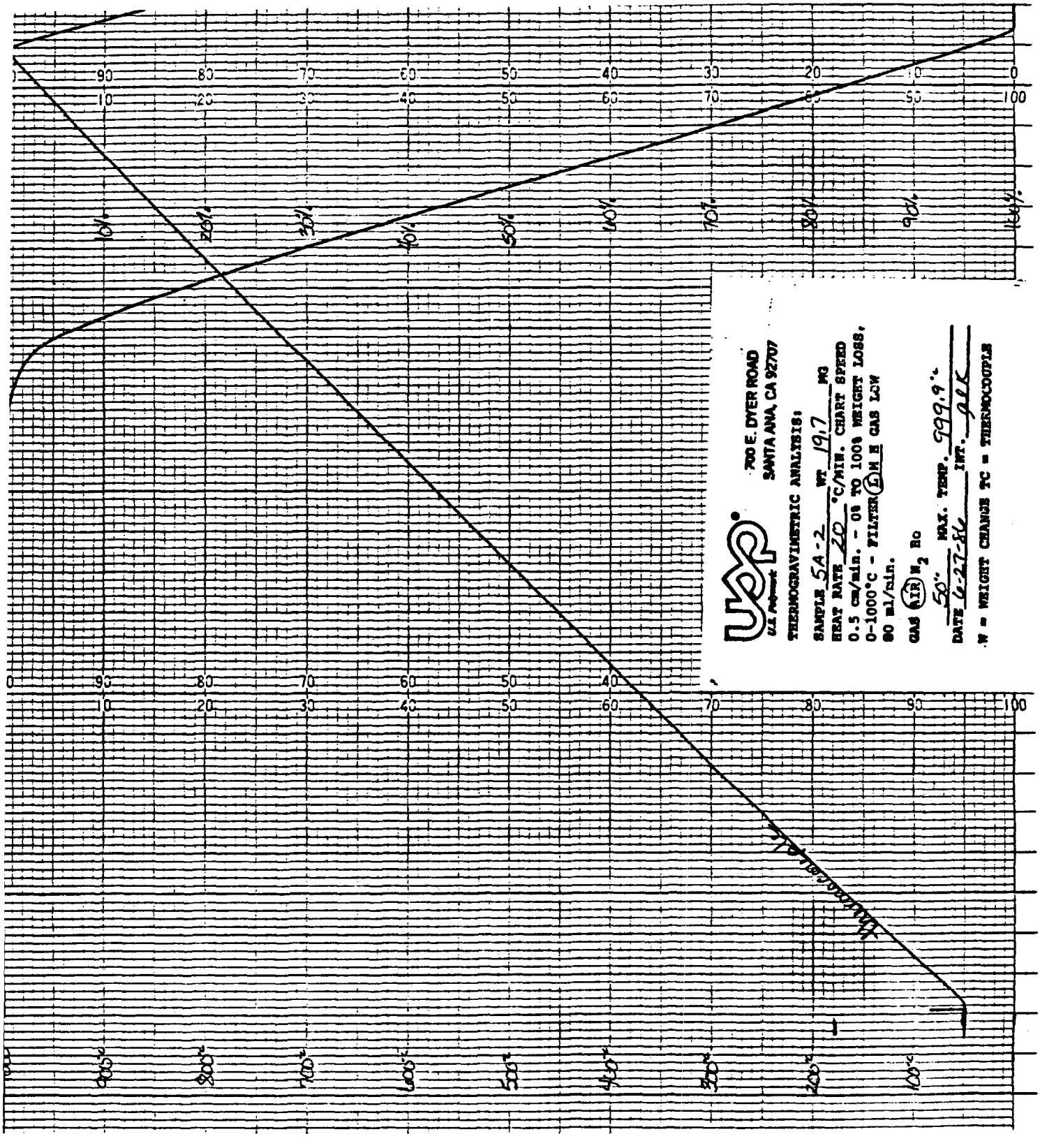

CHART 6C

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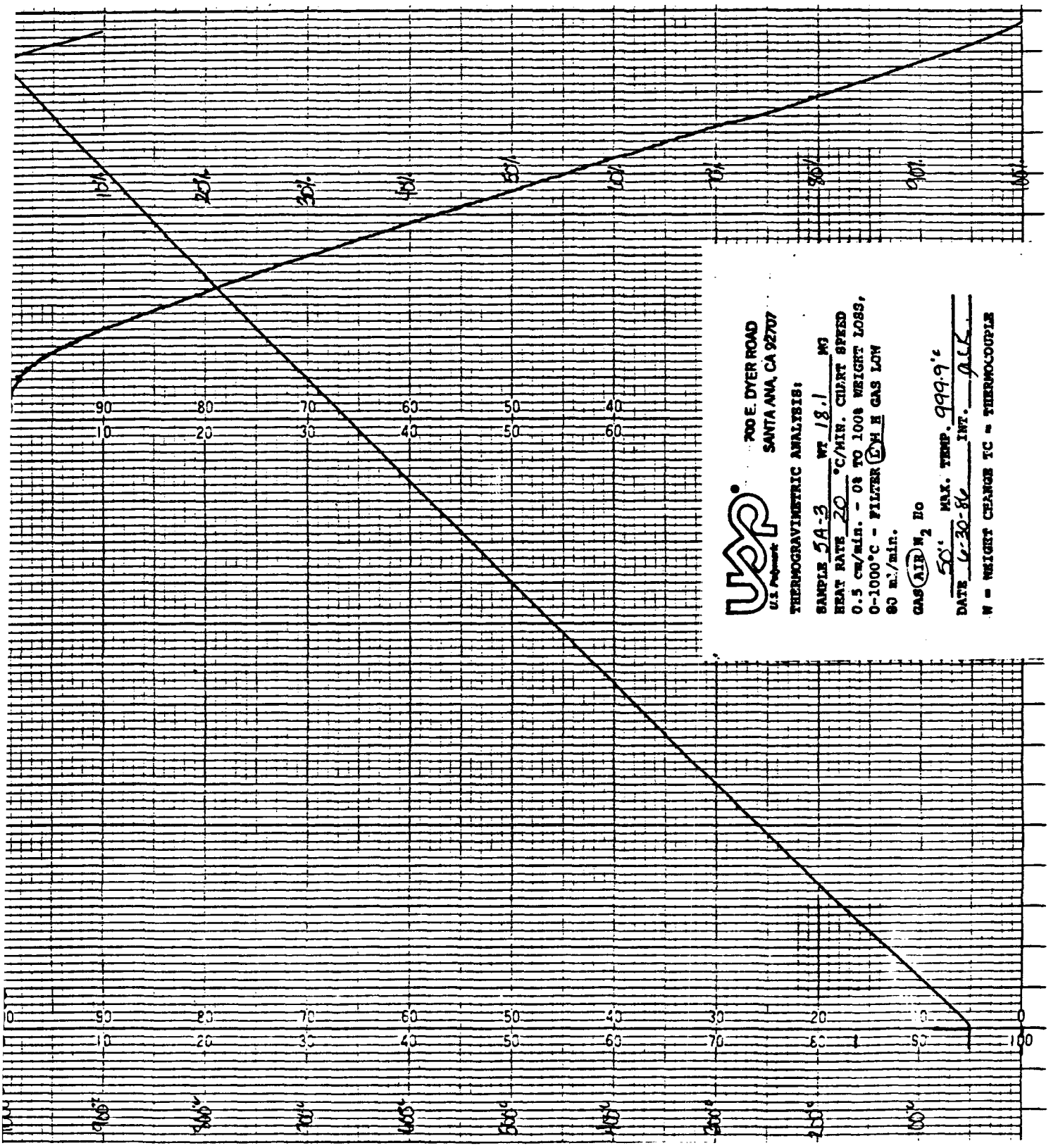


HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-22-86
#1 SAMPLE NASA LOT#5A-1
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

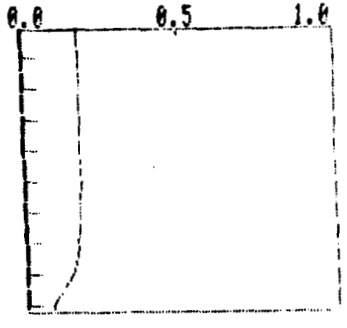
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE



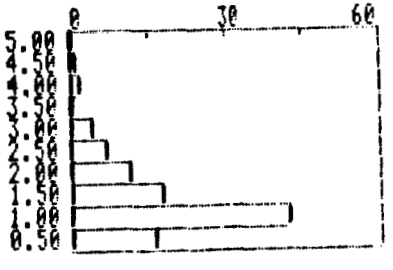
* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.8	0.8
4.00-3.50	1.4	2.2
3.50-3.00	0.0	2.2
3.00-2.50	3.7	5.9
2.50-2.00	6.6	12.6
2.00-1.50	11.4	23.9
1.50-1.00	17.7	41.6
1.00-0.50	42.3	84.0
0.50-0.00	16.0	100.0

D(AVE) 0.90 (PM)

* DISTRIBUTION GRAPH (BY VOL.)

D(PM) F(%)



Lot#"5A-1
Sample"1

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-22-86
#2 SAMPLE NASA LOT#5A-1
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

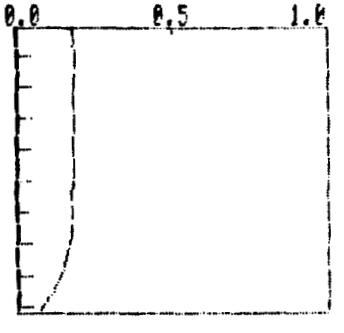
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE



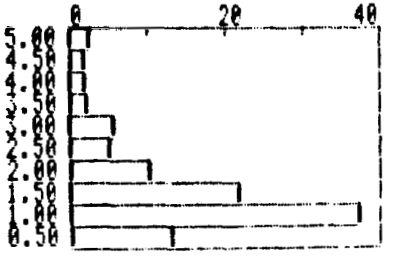
* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	2.2	2.2
4.50-4.00	1.6	3.8
4.00-3.50	1.8	5.6
3.50-3.00	1.9	7.4
3.00-2.50	5.6	13.0
2.50-2.00	5.0	18.0
2.00-1.50	10.1	28.1
1.50-1.00	21.8	49.9
1.00-0.50	37.3	87.1
0.50-0.00	12.9	100.0

D(AVE) 1.00 (PM)

* DISTRIBUTION GRAPH (BY VOL.)

D(PM) F(%)



Lot#"5A-1
Sample#2

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CHART 7A

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-27-86
#1 SAMPLE NASA LOT#5A-2
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

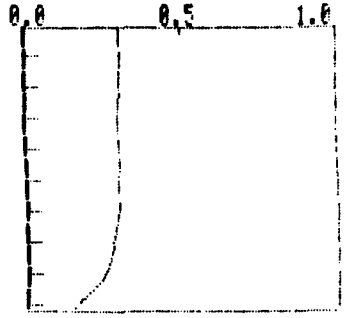
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

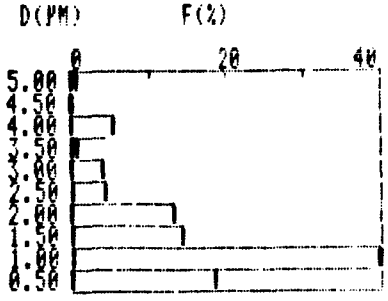


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.6	0.6
4.50-4.00	0.0	0.6
4.00-3.50	5.3	5.9
3.50-3.00	0.5	6.5
3.00-2.50	4.0	10.4
2.50-2.00	4.1	14.5
2.00-1.50	13.1	27.7
1.50-1.00	14.1	41.7
1.00-0.50	39.7	81.4
0.50-0.00	18.6	100.0

D(AVE) 0.90 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



LOT# 5A-2
Sample #1

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-27-86
#2 SAMPLE NASA LOT#5A-2
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

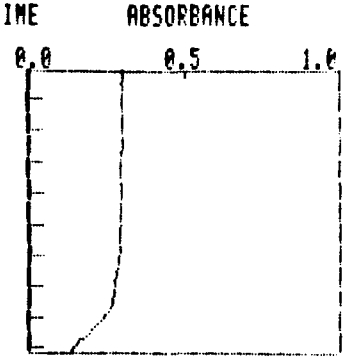
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

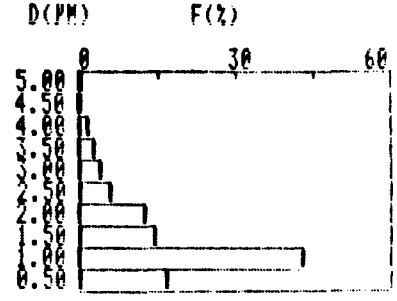


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	1.5	1.5
3.50-3.00	2.5	3.9
3.00-2.50	3.8	7.8
2.50-2.00	5.6	13.4
2.00-1.50	12.4	25.8
1.50-1.00	14.2	40.0
1.00-0.50	43.2	83.2
0.50-0.00	16.8	100.0

D(AVE) 0.88 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



LOT# 5A-2
Sample #2

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CHART 7B

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-27-86
#1 SAMPLE NASA LOT#5A-3
SOLVENT ETHYL GLYCOL
C=0.01mg/ml

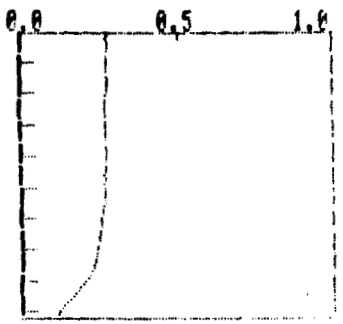
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

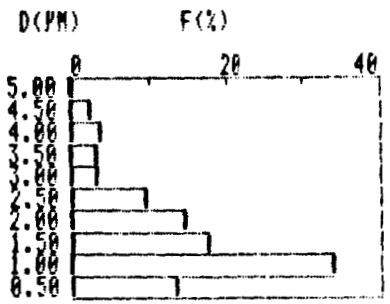


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	2.3	2.3
4.00-3.50	3.4	5.7
3.50-3.00	3.1	8.8
3.00-2.50	3.1	11.9
2.50-2.00	9.2	21.2
2.00-1.50	14.5	35.7
1.50-1.00	17.2	52.9
1.00-0.50	33.9	86.8
0.50-0.00	13.2	100.0

D(AVE) 1.08 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



LOT# 5A-3
Sample #1

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-27-86
#2 SAMPLE NASA LOT#5A-3
SOLVENT ETHYL GLYCOL
C=0.01mg/ml

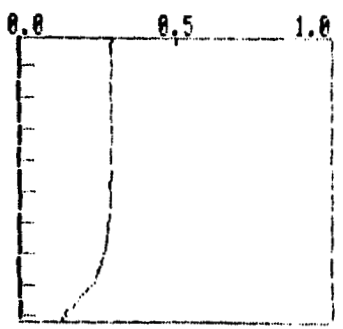
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

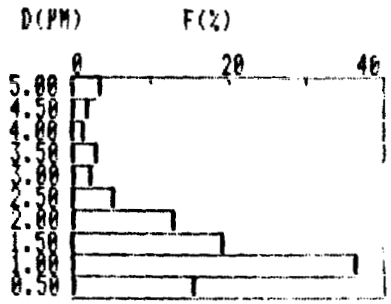


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	3.5	3.5
4.50-4.00	1.7	5.3
4.00-3.50	1.2	6.5
3.50-3.00	3.0	9.5
3.00-2.50	2.1	11.6
2.50-2.00	5.1	16.6
2.00-1.50	12.6	29.3
1.50-1.00	19.1	48.4
1.00-0.50	36.3	84.7
0.50-0.00	15.3	100.0

D(AVE) 0.98 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot # 5A-3
Sample #2

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CHART 7C

TABLE OF CONTENTS

RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

USP-39A Resin Lot for NASA Lot# 5

CHARTS

U.S. Polymeric

RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

USP-39A Resin Lot for NASA Lot# 5

1. Resin Solids, % PTM-7C			#5-1
			78.2
			78.9
			78.1
		AVG.	78.4
2. Specific Gravity @ 25°C PTM-29C			1.203
3. Viscosity, Brookfield, cps. @ 22.8°C PTM-14C			10,000
4. Gel Time, min:sec PTM-47B			3:54
5. Atomic Absorption, ppm CTM-53B (Valves are averages of one determination)		Na	12
		K	1
		Ca	2
		Mg	3
		Li	1
		AVG.	19
6. Volatiles, Gas Chromatography CTM-55			See Chart 6A
7. TGA, % Weight Loss at 500°C CTM-51 (AIR)			16.3 (U.S.P.)
			See Chart 7A
8. DSC, temperature °C CTM-50A			189
			See Chart 8A
9. HPLC CTM-49A			See Chart 9A
10. GPC, Average molecular wt. CTM-49A			1489
			See Chart 10A
11. pH, units CTM-1B			8.3

HITCO MATERIALS DIVISION
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USP-39A Resin Lot for NASA Lot# 5

12. Phenol Content, % CTM-55 Appendix 1		#5-1 14.02 14.39 AVG. 14.20	
13. Chang's Index, ml. CTM-5B		24.1	
14. RDS, Minimum Viscosity, cps. CTM-57A		Min. Visc.	°C
	#5-1	235	105

See Chart 14A

15. NMR
Vendor procedure

See Chart 15A

U. S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

TYPICAL GAS CHROMATOGRAPH SET-UP

Operator Q.X.Z.	Date 12/16/86
Column	Detector FID
Length 6 ft.	Voltage
Dia. 1/4 in.	Sensit.
Liquid Phase AT-1000	Flow Rates, ml/min
Wt. % 0.1	Hydrogen 60 Air 96
Support GRAPHPAC	Scavenge
Mesh 80/100	Split
Carrier Gas He	Temperature, °C
Rotameter	Det. 220 Inj. 200
Inlet Press 60 psig	Column Initial 60
Rate 30 ml/min	Final 210
CHART SPEED	Rate 5°C/MIN
SAMPLE USP 39A, 5-1	Solvent THF
Size 0.05 µl	Concn. 0.11522 gms/ml

GAS CHROMATOGRAPHY STANDARD SOLVENT

TEST METHOD CTM-55

STANDARD SOLVENT/MONOMER	RETENTION TIME (MINS.)
MEOH	.6
ETHANOL	1.18
MECL2	1.28
ACETONE	1.45
IPA	1.83
THF	3.08
ACETONITRILE	3.2
CRESOL	4.03
MEK	4.08
FURFURAL	15.03
TOLUENE	17.98
CHLOROBENZENE	19.6
PHENOL	22.08

NOTE: THF WAS USED TO DILUTE THE RESIN SAMPLES.

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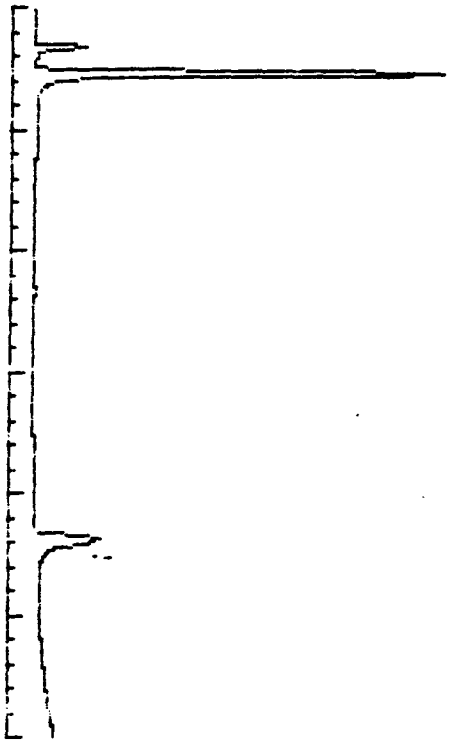
** REAL TIME CHROMATOGRAM ***



INAL FULL SCALE MV.=1000.00

AMPLE: USP39A 5-1
ISC.: C=0.11522 GMS/ML

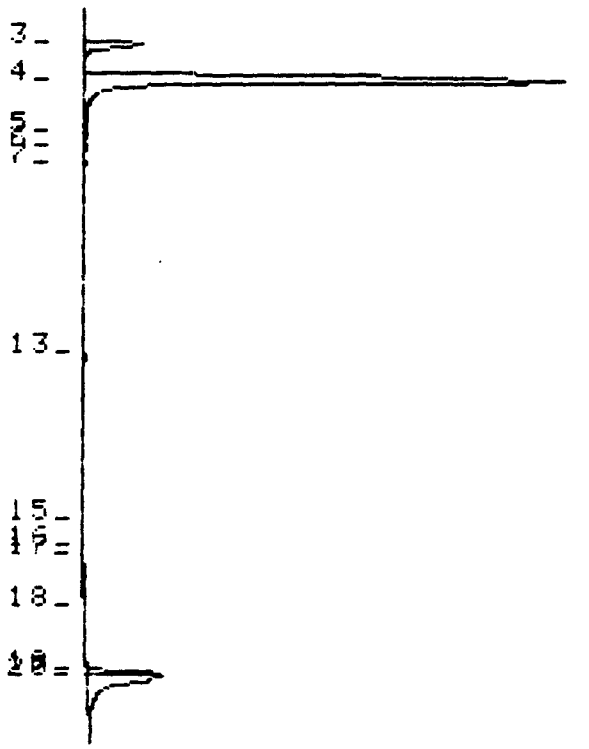
IME: 15:39
ATE: 12/16/86
PERATOR: JGZ

UN TIME: 30.00 MINUTES
ELAY TIME: 0.00
HAN: 0

PK NO	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
3	1.65	113540	6.306	2	9668
4	2.90	1265100	70.267	3	78069
5	4.50	4459	.248	4	121
6	5.00	2337	.130	4	144
7	5.50	3785	.210	3	337
3	11.65	9414	.523	1	531
5	16.95	2969	.165	2	120
6	17.83	3178	.177	2	86
7	18.08	2327	.129	2	83
8	19.78	1467	.081	2	27
9	21.80	60561	3.364	2	10574
0	21.93	331290	18.401	3	12260

OTAL AREA= 1800427
HRESHOLD= 1
IN PK WIDTH= 15
REA REJECT= 1000

VERTICAL SCALE FACTOR:1X



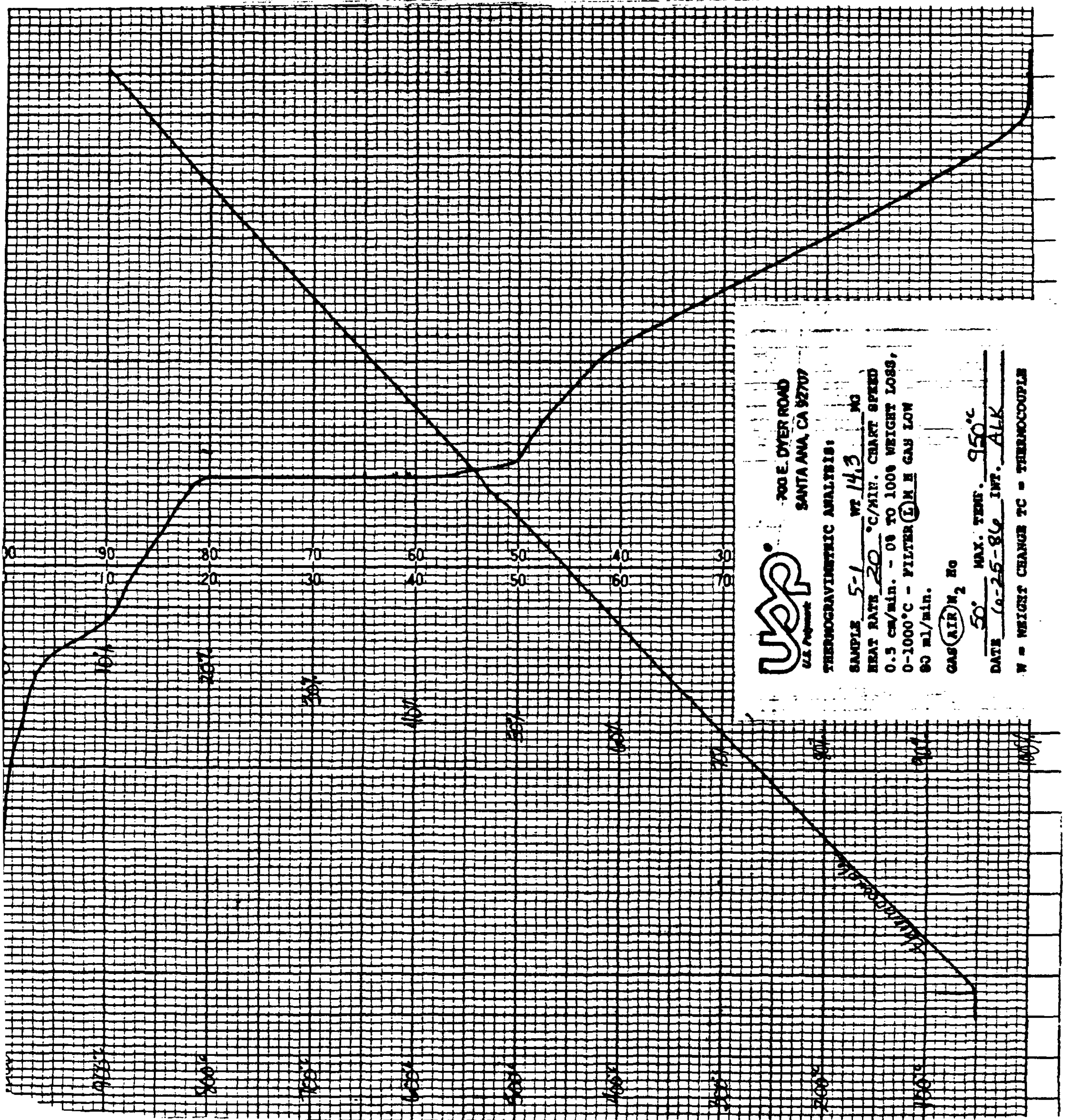
SAMPLE: USP39A 5-1
MISC.: C=0.11522 GMS/ML

TIME: 15:39
DATE: 12/16/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO.	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
3	1.65	113540	6.413	2	9668
4	2.90	1265100	71.455	3	78069
19	21.80	60561	3.421	2	10574
20	21.93	331290	18.712	3	12260

TOTAL AREA= 1770491
THRESHOLD= 1
MIN.PK.WIDTH= 15
AREA REJECT= 10000



PART NO. 990088

CHART 8A

RUN NO ___ DATE 6-23-86

OPERATOR glk

SAMPLE: USP-39A 5-1

ATM N2 @ 1 atm

FLOW RATE 40 ml/min

T-AXIS

SCALE, °C/in 50

PROG. RATE, °C/min 20°

HEAT ✓ COOL ___ ISO ___

SHIFT, in 0

DTA-DSC

SCALE, °C/in 5.0 /5x

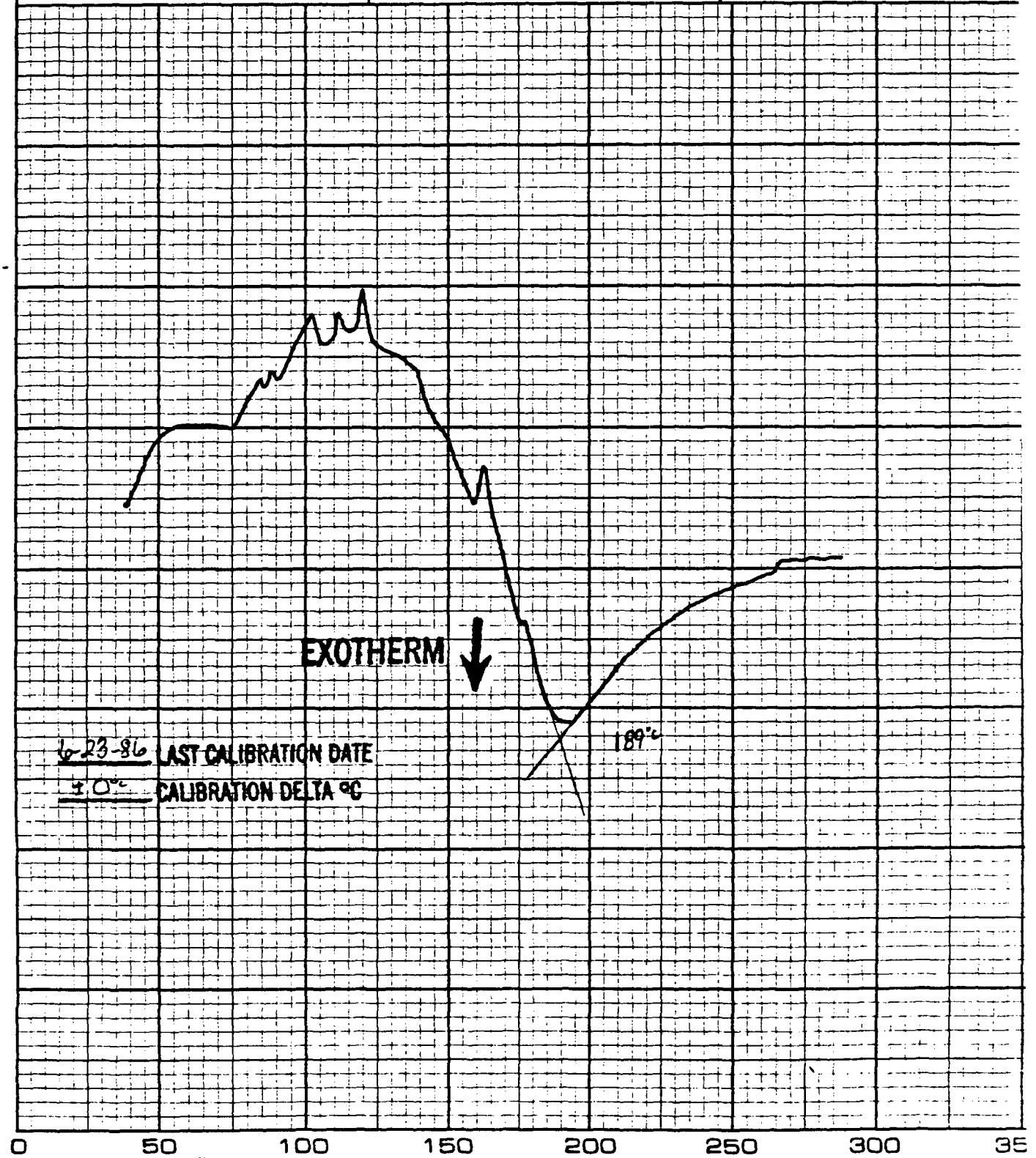
(mcal/sec)/in ___

WEIGHT, mg 8.6

REFERENCE 1 alum seal

DU PONT Instruments

MEASURED VARIABLE



******** AREA PERCENT REPORT *********

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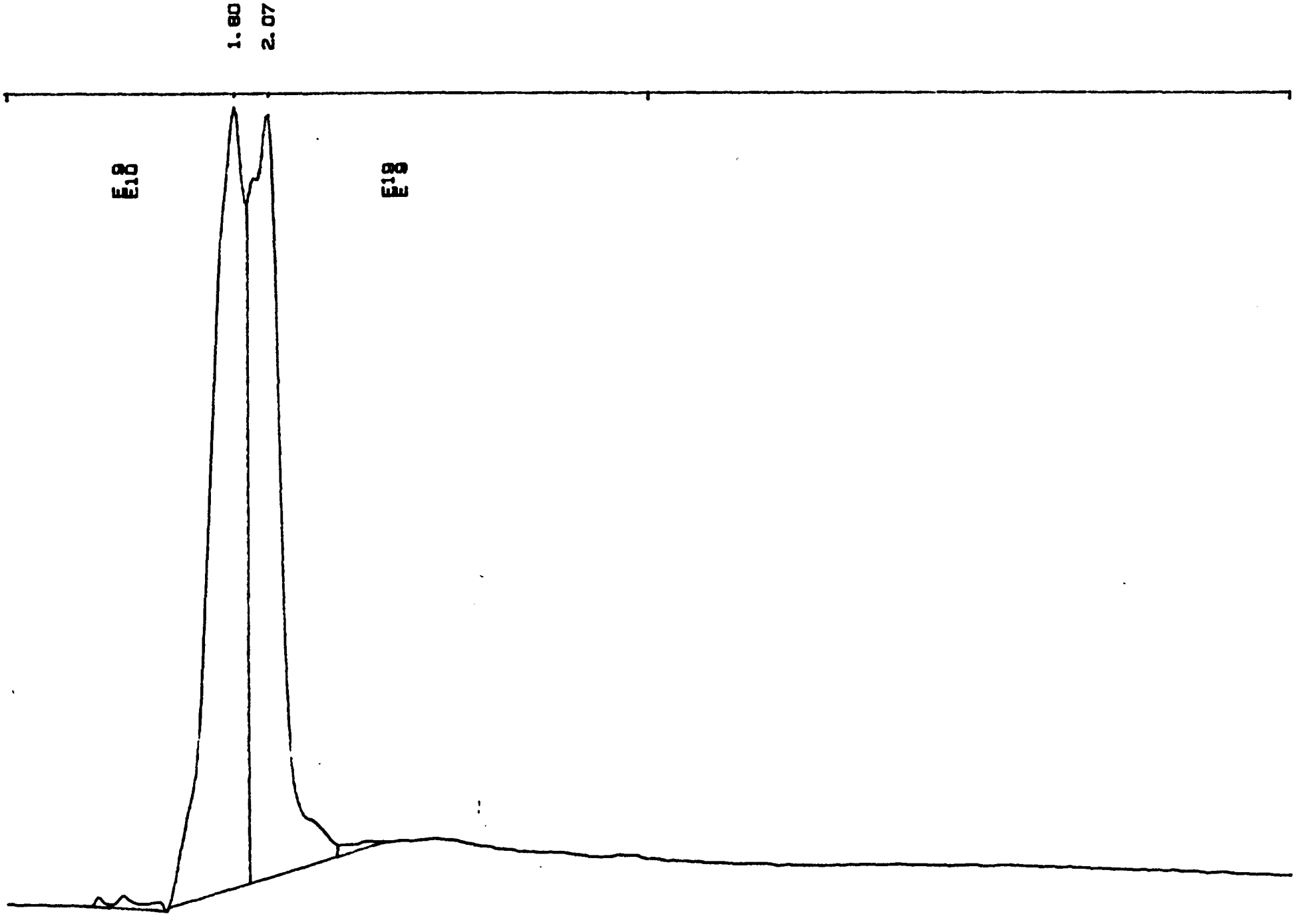
te:  09-05-1986 12:21:10 Method:PHENOLIC     DATA FILE: A:PHEN030.PTS         *
terface: 4                Cycle#:  30         Channel#: 0    Vial#: N.A.     *
arting Peak Width:  10    Threshold:  .01                                     *
*****************************************************************************
nstrument Type: BECKMAN HPLC            Column Type: MICROBONDAPAK C-18       *
          Solvent Description: THF/WATER, 2:1 BY WEIGHT                      *
Operating Conditions: R.T., FLOWRATE=1.5 ML/MIN                              *
         Detector 0: 220NM/.5AU          Detector 1:                         *
  Misc. Information:  LENGTH=25                                              *
*****************************************************************************
ting Delay:   0.00                        Ending Retention Time:   10.00
```

Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
1.80	87265	52.6720	2	4839	100.000	18.0
2.07	78411	47.3281	2	4724	89.854	16.6

```
l Area:       165676   Area Reject:       1000  One sample per   1.000 sec.
```

DATA FILE=PHEN030 FROM 0.00 MIN. TO 10.00 MIN. LOW SCALE= 5.465 Mv. HIGH SCALE= 10.460 Mv.
USP-39A, 5-1, C=6.88 MG/ML, 9/5/86, JGZ



*** Calibration Data ***
Calibration Name:
Misc Information:

Fit Type: 3
Log Mol Wt = A + Bx + Cx^2 + Dx^3
A= 2.538977 B= 2.115815 C= -.5646824 D= 3.606432E-02
Coefficient of Determination: 0.9902

Ret Time	Molecular Weight	Log Mol Wt
3.50	35000	4.544
4.33	15000	4.176
4.83	3600	3.556
5.09	2350	3.371
6.00	570	2.756
7.17	92	1.964
7.50	72	1.857

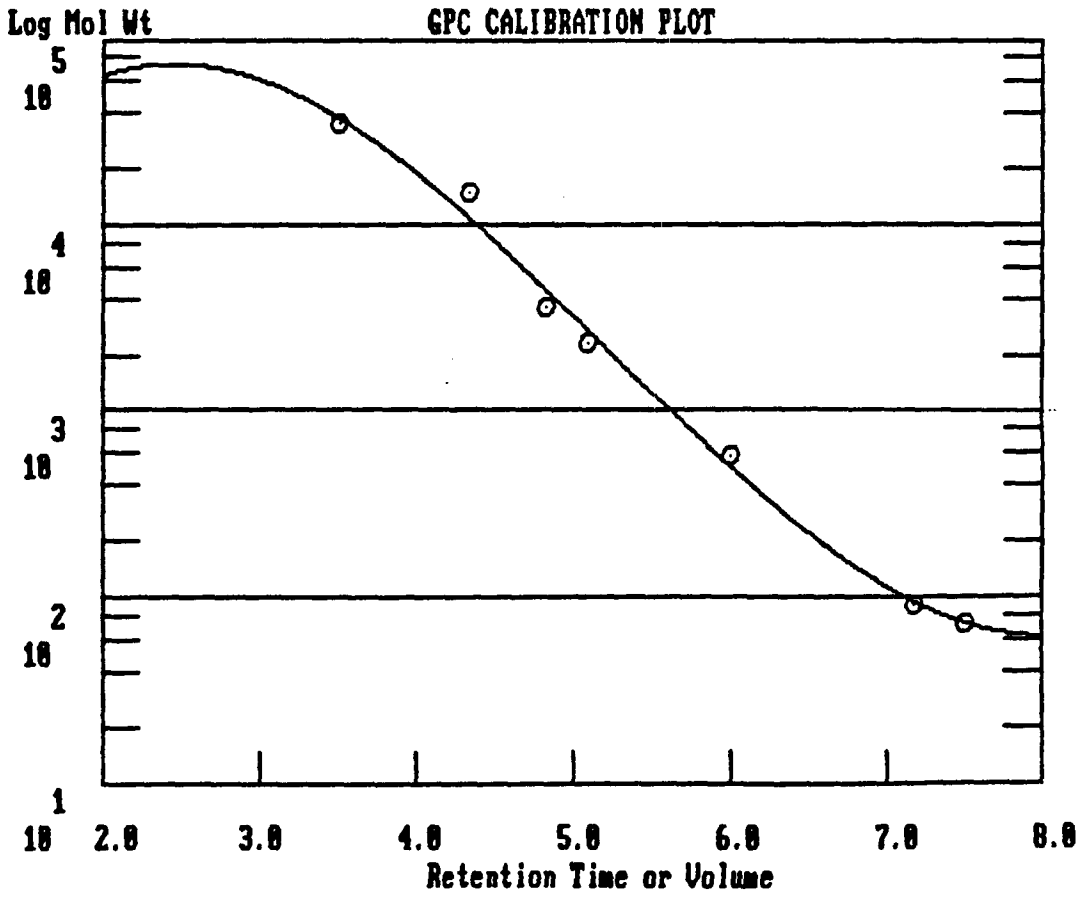


CHART 10A

ORIGINAL PAGE IS
OE POOR QUALITY

A FILE A:GPC40.HDR TAKEN 08-06-1986 13:33:08

********* GPC REPORT *********

```
**********************************************************************
ample Name: USP39A 5-1IC                    Operator Initials: GBF      *
ate:  08-06-1986 13:23:35 Method:           DATA FILE: A:GPC40.PTS      *
nterface: 5               Cycle#:  40       Channel#: 0    Vial#: N.A.  *
tarting Peak Width:  60   Threshold:  0                                 *
**********************************************************************
Instrument Type: HPLC/BECKMAN          Column Type: ULTRASTYRAGEL 500A  *
          Solvent Description: THF                                     *
 Operating Conditions: T=35C FLOWRATE=2.0ML/MIN                        *
          Detector 0: 254NM/.1AU          Detector 1:                  *
   Misc. Information: CALIBRATION/GPC                                  *
**********************************************************************
rting Delay:   0.00                    Ending Retention Time:   10.00
ibration file: GPCPHEN
ecular Weight Distribution Averages
eline TIMES:    3.85 to   10.00   MW:      22295 to          2
cess  TIMES:    3.85 to   10.00   MW:      22295 to          2
al Area:       204360
:                1489
:                 254
Mn=            5.8488
:                4377
:                1264
```

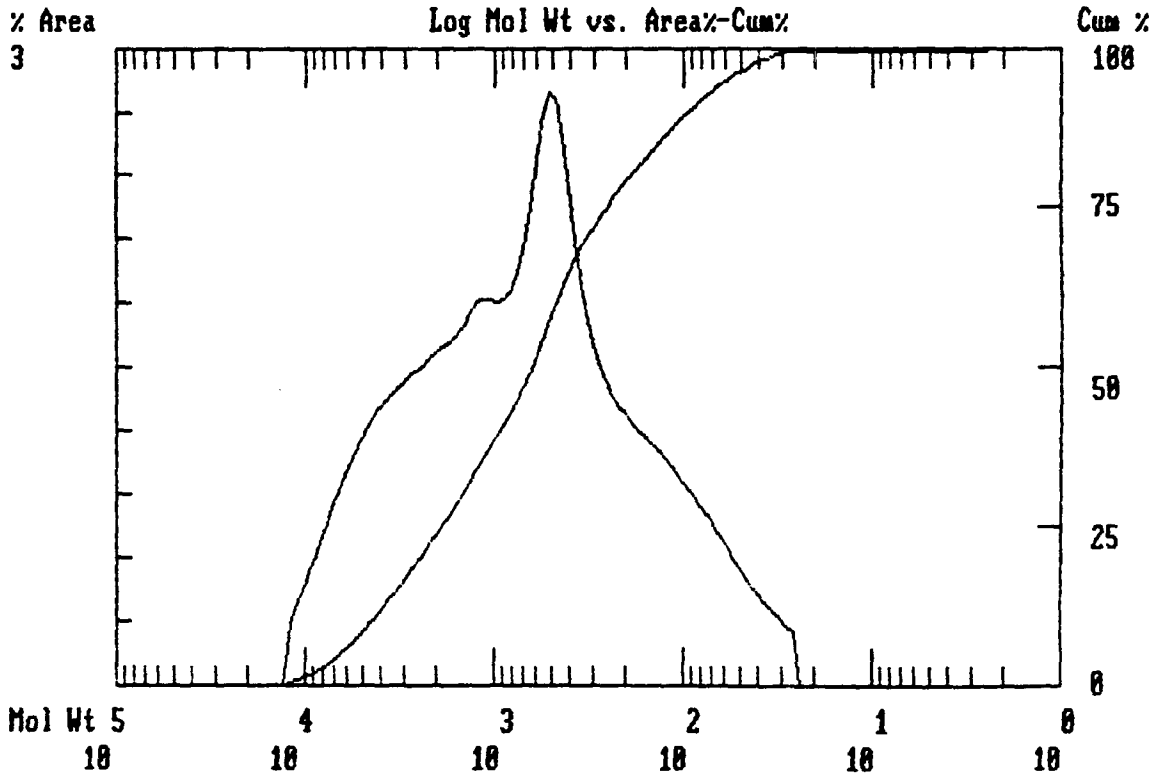
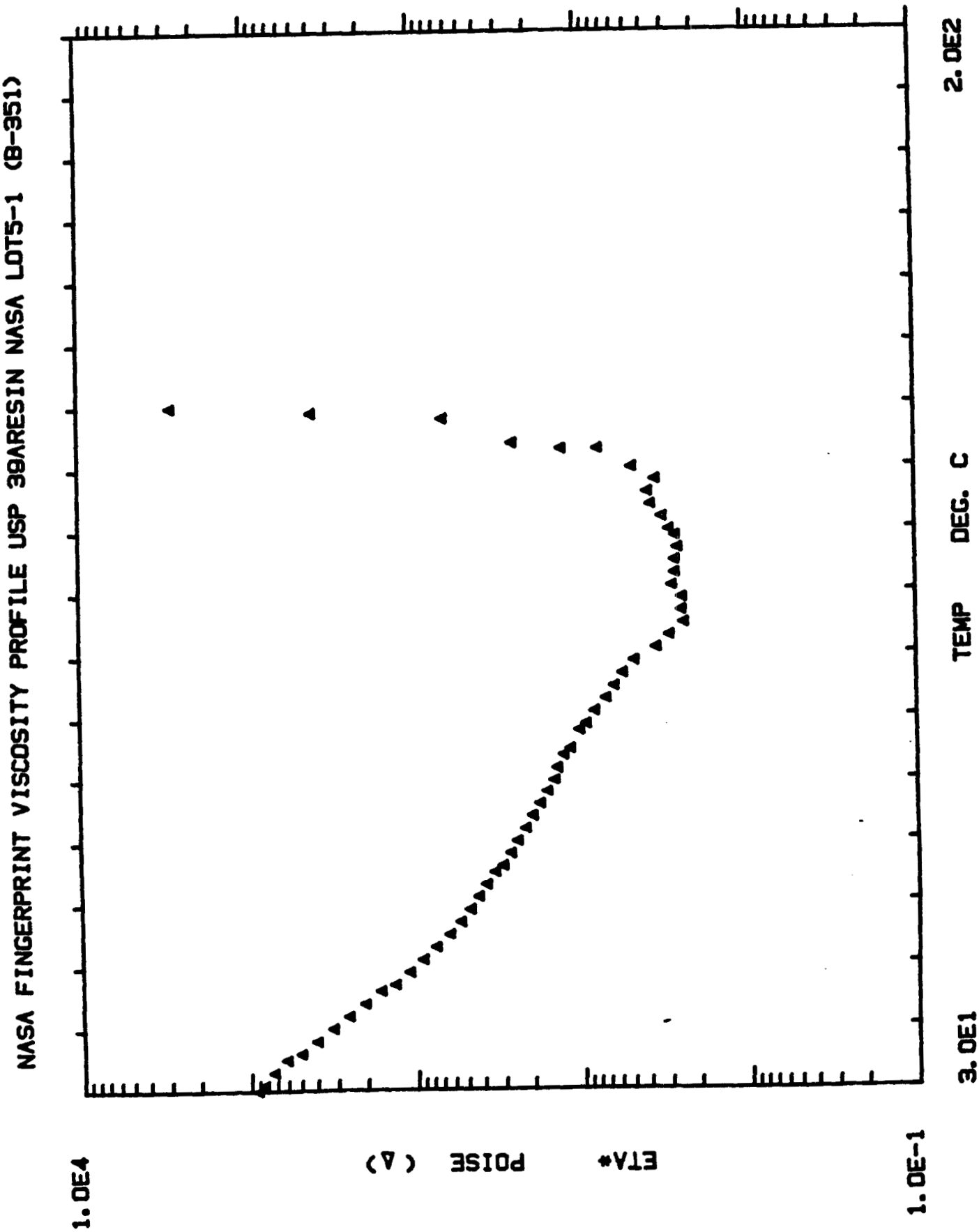


CHART 14A


NASA FINGERPRINT VISCOSITY PROFILE USP 39ARESIN NASA LOT5-1 (B-351)
1.0E4
ETA* POISE (Δ)
1.0E-1
3.0E1
TEMP DEG. C
2.0E2

Rheometrics RECAP II

---

eriment No. : 1 Sample No. : 1

le:
9 FINGERPRINT VISCOSITY PROFILE USP 39ARESIN NASA LOT5-1 (B-351)

rator :CP

e and Time : Friday, August 15, 1986 - 10:13:01

rating Mode : DYNAMIC

ep Type : CURE

metry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

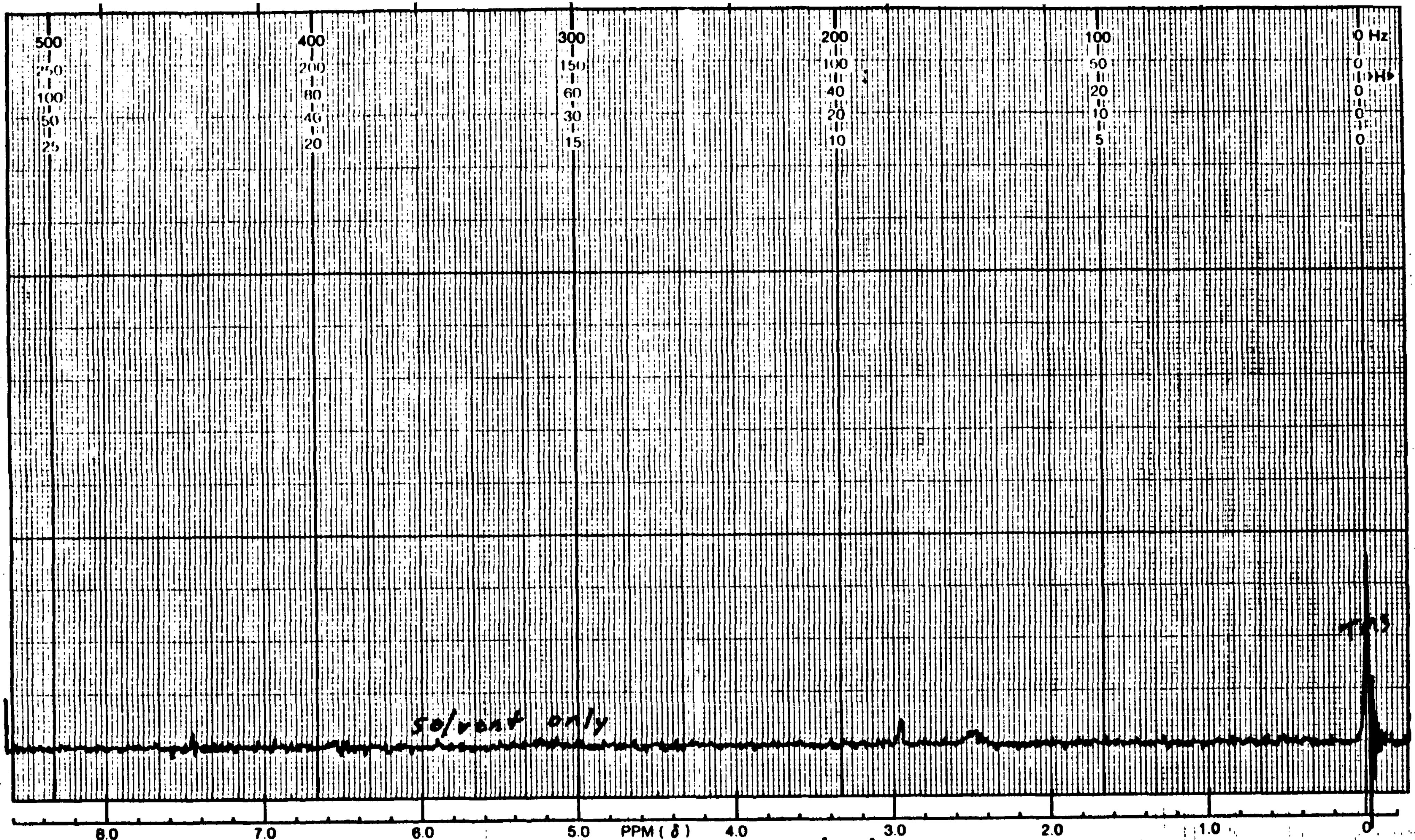
es :
AIN =50%
QUENCY =10 RAD/SEC

SA FINGERPRINT VISCOSITY PROFILE USP 39ARESIN NASA LOT5-1 (B-351)

O.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	8.938e+002	8.926e+002	4.624e+001	1.127e+002	2.000e-001	3.000e+001
2	8.139e+002	8.131e+002	3.566e+001	1.025e+002	1.000e+000	3.100e+001
3	7.136e+002	7.129e+002	3.548e+001	8.990e+001	2.000e+000	3.300e+001
4	5.960e+002	5.949e+002	3.631e+001	7.504e+001	3.000e+000	3.500e+001
5	4.876e+002	4.865e+002	3.176e+001	6.137e+001	4.000e+000	3.600e+001
6	3.907e+002	3.897e+002	2.876e+001	4.912e+001	5.000e+000	3.800e+001
7	3.129e+002	3.115e+002	2.866e+001	3.935e+001	6.000e+000	4.000e+001
8	2.504e+002	2.490e+002	2.654e+001	3.144e+001	7.000e+000	4.200e+001
9	2.004e+002	1.987e+002	2.625e+001	2.518e+001	8.000e+000	4.400e+001
10	1.608e+002	1.591e+002	2.328e+001	2.022e+001	9.000e+000	4.600e+001
11	1.318e+002	1.295e+002	2.435e+001	1.655e+001	1.000e+001	4.700e+001
12	1.079e+002	1.055e+002	2.290e+001	1.356e+001	1.100e+001	4.900e+001
13	8.938e+001	8.671e+001	2.167e+001	1.122e+001	1.200e+001	5.100e+001
14	7.477e+001	7.187e+001	2.063e+001	9.388e+000	1.300e+001	5.300e+001
15	6.194e+001	5.907e+001	1.863e+001	7.766e+000	1.400e+001	5.500e+001
16	5.310e+001	5.031e+001	1.696e+001	6.658e+000	1.500e+001	5.700e+001
17	4.653e+001	4.380e+001	1.570e+001	5.838e+000	1.600e+001	5.900e+001
18	4.132e+001	3.880e+001	1.420e+001	5.179e+000	1.700e+001	6.100e+001
19	3.710e+001	3.492e+001	1.253e+001	4.652e+000	1.800e+001	6.300e+001
20	3.290e+001	3.103e+001	1.095e+001	4.123e+000	1.900e+001	6.500e+001
21	2.947e+001	2.790e+001	9.496e+000	3.695e+000	2.000e+001	6.600e+001
22	2.649e+001	2.517e+001	8.277e+000	3.319e+000	2.100e+001	6.800e+001
23	2.410e+001	2.294e+001	7.364e+000	3.020e+000	2.200e+001	7.000e+001
24	2.151e+001	2.047e+001	6.587e+000	2.694e+000	2.300e+001	7.200e+001
25	1.942e+001	1.849e+001	5.936e+000	2.434e+000	2.400e+001	7.400e+001
26	1.755e+001	1.678e+001	5.147e+000	2.200e+000	2.500e+001	7.600e+001
27	1.577e+001	1.508e+001	4.566e+000	1.975e+000	2.600e+001	7.800e+001
28	1.430e+001	1.368e+001	4.192e+000	1.794e+000	2.700e+001	8.000e+001
29	1.372e+001	1.309e+001	4.125e+000	1.719e+000	2.800e+001	8.200e+001
30	1.255e+001	1.210e+001	3.313e+000	1.573e+000	2.900e+001	8.400e+001
31	1.143e+001	1.097e+001	3.206e+000	1.432e+000	3.000e+001	8.500e+001
32	1.005e+001	9.729e+000	2.526e+000	1.260e+000	3.100e+001	8.800e+001
33	9.122e+000	8.869e+000	2.134e+000	1.142e+000	3.200e+001	8.900e+001
34	8.100e+000	7.914e+000	1.730e+000	1.015e+000	3.300e+001	9.100e+001
35	6.923e+000	6.819e+000	1.196e+000	8.680e-001	3.400e+001	9.300e+001
36	6.168e+000	6.092e+000	9.605e-001	7.726e-001	3.500e+001	9.500e+001
37	5.475e+000	5.420e+000	7.744e-001	6.864e-001	3.600e+001	9.700e+001
38	4.671e+000	4.640e+000	5.372e-001	5.849e-001	3.700e+001	9.900e+001
39	3.435e+000	3.415e+000	3.679e-001	4.304e-001	3.800e+001	1.010e+002
40	2.861e+000	2.854e+000	1.942e-001	3.583e-001	3.900e+001	1.030e+002
41	2.349e+000	2.240e+000	7.054e-001	2.942e-001	4.000e+001	1.050e+002
42	2.422e+000	2.177e+000	1.062e+000	3.036e-001	4.100e+001	1.070e+002
43	2.406e+000	2.246e+000	8.635e-001	3.015e-001	4.200e+001	1.090e+002
44	2.742e+000	2.119e+000	1.741e+000	3.437e-001	4.300e+001	1.110e+002
45	2.643e+000	2.181e+000	1.493e+000	3.310e-001	4.400e+001	1.130e+002
46	2.641e+000	2.152e+000	1.531e+000	3.310e-001	4.500e+001	1.150e+002
47	2.532e+000	1.606e+000	1.957e+000	3.170e-001	4.600e+001	1.170e+002
48	2.622e+000	1.740e+000	1.962e+000	3.285e-001	4.700e+001	1.190e+002
49	2.850e+000	2.090e+000	1.938e+000	3.566e-001	4.800e+001	1.200e+002
50	3.130e+000	2.505e+000	1.877e+000	3.919e-001	4.900e+001	1.220e+002

5A FINGERPRINT VISCOSITY PROFILE USP 39ARESIN NASA LOT5-1 (B-351)

D.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
51	3.662e+000	2.895e+000	2.243e+000	4.582e-001	5.000e+001	1.240e+002
52	3.809e+000	3.234e+000	2.011e+000	4.766e-001	5.100e+001	1.260e+002
53	3.423e+000	2.945e+000	1.746e+000	4.297e-001	5.200e+001	1.280e+002
54	4.720e+000	4.333e+000	1.870e+000	5.904e-001	5.300e+001	1.300e+002
55	7.517e+000	7.059e+000	2.594e+000	9.413e-001	5.400e+001	1.330e+002
56	1.248e+001	1.160e+001	4.601e+000	1.562e+000	5.500e+001	1.330e+002
57	2.466e+001	2.256e+001	9.953e+000	3.088e+000	5.600e+001	1.340e+002
58	6.417e+001	5.123e+001	3.864e+001	8.038e+000	5.700e+001	1.380e+002
59	3.926e+002	1.400e+002	3.668e+002	4.919e+001	5.800e+001	1.390e+002
60	2.702e+003	3.217e+002	2.683e+003	3.377e+002	5.900e+001	1.400e+002



SWEEP OFFSET (Hz): 0
SPECTRUM AMPLITUDE: 8.0
INTEGRAL AMPLITUDE: —
SPINNING RATE (RPS): 30

MANUAL

SWEEP TIME (SEC): 30 | 250 | 500 | 1000 — AUTO (250)
SWEEP WIDTH (Hz): 25 | 50 | 100 | 250 | 500 — AUTO (500)
FILTER: 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 — AUTO (2)
RF POWER LEVEL: 0.30 — AUTO (.05)

SAMPLE: Solvent
SOLVENT: Unisol-d + 0.5% TMS
DEC. LEVEL

REMARKS:

ORIGINAL PAGE IS OF POOR QUALITY

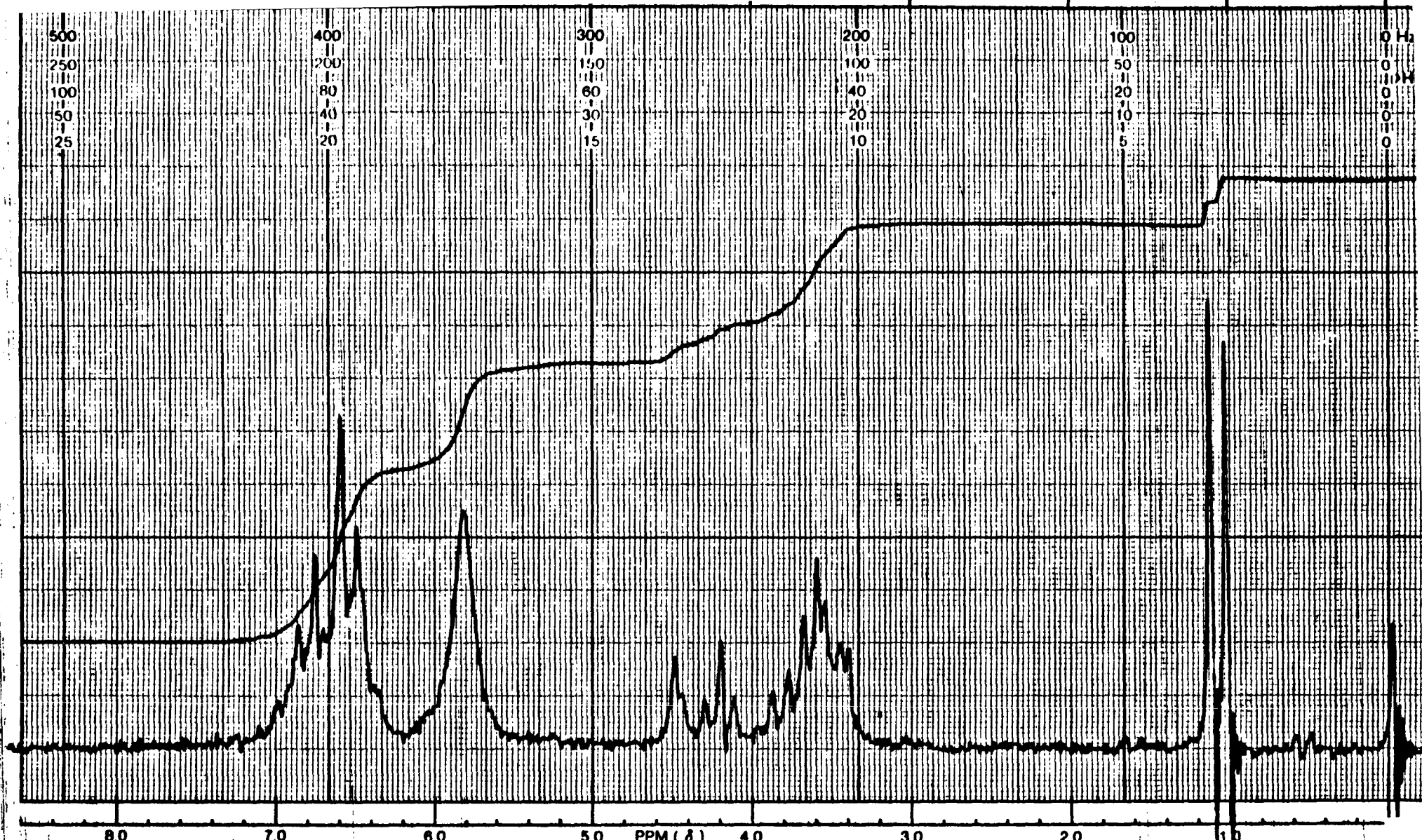
SOLVENT ONLY SCAN

DATE: 3-21-86

OPERATOR: DGW

SPECTRUM NO. 1A of 7
solvent scan

NORELL, INC.
LANDISVILLE, N.J. 08326
T60 Phone: (609) 697-0020



SWEEP OFFSET (Hz): 0
SPECTRUM AMPLITUDE: 8.0
INTEGRAL AMPLITUDE: 5.0
SPINNING RATE (RPS): 30

MANUAL
SWEEP TIME (SEC): 30 250 500 1000
SWEEP WIDTH (Hz): 25 50 100 250 500
FILTER: 1 2 3 4 5 6 7 8
RF POWER LEVEL: 0.30

AUTO ☐
(250)
(500)
(2)
(.05)

SAMPLE: USP-39A Lot 5-1 REMARKS: 0.153 gm sample
SOLVENT: Chloroform-d + 1% TMS 0.917 gm solvent
DEC. LEVEL

CHART 15A

NORELL, INC.
LANDISVILLE, N.J. 08326
T60 Phone: (609) 697-0020

DATE: 6-19-86 OPERATOR DGW SPECTRUM NO. 3 of 3 USP-39A Lot 5-1

TABLE OF CONTENTS

FABRIC TESTING

NAS8-36298

U.S. Polymeric Q.E. 71108

WCA Fabric for NASA Lot# 5 (HITCO)

CHARTS

U.S. Polymeric

FABRIC TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

WCA Fabric for NASA Lot# 5 (HITCO)

1a. Breaking Strength, lbs/in, WARP			#5-1
ASTM D1682		PICK	37
		CENTER	31
		PLAIN	35
		AVG.	34.3
1b. Breaking Strength, lbs/in, FILL			
ASTM D1682		PICK	8
		CENTER	8
		PLAIN	10
		AVG.	8.7
2a. Carbon Assay, %			
MDQAI 5560		PICK	99.9
		CENTER	99.3
		PLAIN	99.8
		AVG.	99.67
2b. Hydrogen Assay, %			
MDQAI 5560		PICK	<.01
		CENTER	<.01
		PLAIN	<.01
		AVG.	EST .001
2c. Nitrogen Assay, %			
MDQAI 5560		PICK	.10
		CENTER	.10
		PLAIN	.20
		AVG.	.133
3. Visual Inspection			See Chart 3A
QCi-102			
4. Specific Gravity, Units			
PTM-84			1.6980
			1.6879
			1.6741
		AVG.	1.687
5. pH, Units			
CTM-24B			6.4
			6.4
		AVG.	6.4
6. TGA, °C at 50% Weight Loss	SET UP #2		
CTM-51 (AIR)	#5-1 888		
			See Chart 6A

HITCO MATERIALS DIVISION
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2437

WCA Fabric for NASA Lot # 5 (HITCO)

7a. Atomic Absorption, ppm
CTM-53B

	#5-1
Na	4
K	0
Ca	3
Mg	2
Li	0
AVG.	9

7b. Moisture Content, %
CTM-53B — .005

7c. Ash Content, %
CTM-53B — .010

8a. Filament diameter, microns, WARP
S.E.M. procedure
(diameters are an average 10 measurements)

	#5-1
AVERAGE	10.30
Minimum	8.10
Maximum	12.05
Std. Dev	1.06

8b. Filament diameter, microns, FILL
S.E.M. procedure
(diameters are an average of 10 measurements)

	#5-1
AVERAGE	10.11
Minimum	7.65
Maximum	13.50
Std. Dev	1.66

9a. Thread Count, per inch, WARP
PTM-5A

	#5-1
	29
	29
	29
	29
	29
AVG.	29.0

9b. Thread Count, per inch, FILL
PTM-5A

	22
	22
	22
	22
	22
AVG.	22.0

10a. Areal weight as received, gm/4x4
PTM-3A

LEFT	2.569
CENTER	2.542
RIGHT	2.564
AVG.	2.558

10b. Volatiles as received, %
PTM-3A

LEFT	.58
CENTER	.55
RIGHT	.66
AVG.	.60

WCA Fabric for NASA Lot# 5 (HITCO)

10c. Weight Change on Acetone Wash, %
PTM-3A

	#5-1
LEFT	-.12
CENTER	0.08
RIGHT	-.08
AVG.	-.04

U.S. Polymeric

Hamid M. Quraishi, Manager
Quality Assurance Department

USP NO. CHART 3A

DATE 5-20-86

FABRIC WCA GRAPHITE

MFG. UNION CARBIDE

ROLL NO. 283 4C6WCA-1

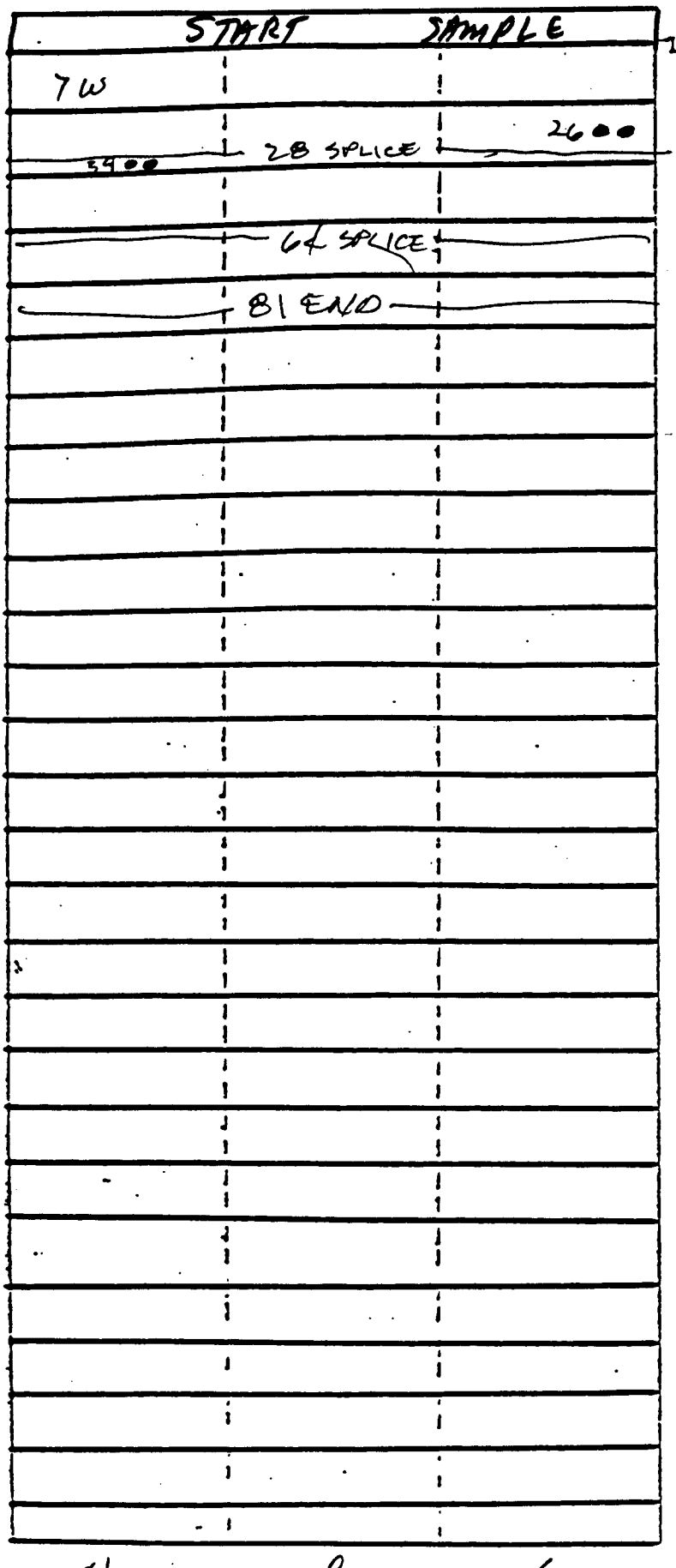
YARDS 30

POUNDS 17

ORDER NO. QE. 71108

SPECIFICATION VARIOUS

Q.C. FILE # NASA 5-1



SYMBOLS

- TEAR
- SPOTS OR STAINS
- FOLDS
- EDGE CURL
- TIGHT WEAVE OR SELVAGE
- WEAVE DISTORTION
- VISIBLE PUCKERS
- ONE PUCKER CREASING
- TWO OR MORE CREASINGS

REMARKS

ORIGINAL PAGE IS
OF POOR QUALITY

GRADE Group B

TABLE OF CONTENTS

PREPREG TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

FM 5064J NASA LOT# 5 U.S.P. LOT# D09337

CHARTS

U.S. Polymeric

PREPREG TESTING

NAS8-36298

U.S. POLYMERIC O.E.71108

FM 5064J NASA LOT# 5 U.S.P. LOT# D09337 (HITCO)

		ROLL#1-S	ROLL#2-S
1a. Resin Content, Soxhlet, % CTM-6D		33.1	34.1
		32.7	33.8
		34.2	34.2
	AVG.	33.3	34.0
	NASA LOT# 5 AVERAGE		33.7
1b. Filler Content, Soxhlet, % CTM-6D		14.6	15.0
		14.4	14.9
		15.1	15.1
	AVG.	14.7	15.0
	NASA LOT# 5 AVERAGE		14.9
1c. Cloth Content, Soxhlet, % CTM-6D		52.3	50.9
		52.9	51.3
		50.7	50.7
	AVG.	52.0	51.0
	NASA LOT# 5 AVERAGE		51.5
2. Volatile Content, % PTM-17B		3.3	3.2
		3.3	3.3
		3.3	3.3
	AVG.	3.3	3.3
	NASA LOT# 5 AVERAGE		3.3
3. Flow, % PTM-19G		11.3	12.6
		11.7	12.7
		10.6	12.7
	AVG.	11.2	12.6
	NASA LOT# 5 AVERAGE		11.9
4. Resin Content, Dry basis, % PTM-16F, Type II		33.9	35.2
		33.9	35.3
		34.3	35.1
	AVG.	34.0	35.2
	NASA LOT# 5 AVERAGE		34.6
5. Tack, lbs PTM-80		31	29
	NASA LOT# 5 AVERAGE		30
6. Gel Time, seconds PTM-20E		72	78
	NASA LOT# 5 AVERAGE		75

HITCO MATERIALS DIVISION
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2437

FM 5064J NASA LOT# 5 U.S.P. LOT# D09337 (HITCO)

7a. Atomic Absorption, ppm CTM-53B		ROLL#1-S	ROLL#2-S	LOT#5 AVG.
	Na	12	15	14
	K	1	1	1
	Ca	4	2	3
	Mg	1	1	1
	Li	0	0	0
	TOTAL	18	19	19

7b. Moisture Content, % CTM-53B	ROLL#1-S	ROLL#2-S
	2.44	2.20
NASA LOT# 5 AVERAGE		2.32

7c. Ash Content, % CTM-53B		
	.01	.00
NASA LOT# 5 AVERAGE		.01

8. TGA, % Weight Loss at 500°C CTM-51 (Nitrogen)		
	10.3	9.9
NASA LOT# 5 AVERAGE		10.1

See chart 8A-8B

9. DSC, °C CTM-50A		ROLL#1-S	ROLL#2-S	LOT#5 AVG.
	First Temp	183	183	183

See Chart 9A-9B

10. Infrared (IRZB) Baseline CTM-21C			
	.92	.82	.87

See Chart 10A-10B

11. Environmental History

Date manufactured: 25 July 1986
Packaged in: MIL-B-131 class I bag
Date shipped: Test lot - not shipped

12. Specific Gravity, Cured, Units ASTM D792		ROLL#1-S	ROLL#2-S
		1.435	1.435
		1.434	1.434
		1.436	1.432
	AVG.	1.435	1.434
	NASA LOT# 5 AVERAGE		1.434

13a. Tensile Strength, ksi, WARP FTMS 406-1011			
		19.31	22.22
		19.84	21.21
		19.95	21.35
		20.08	22.50
		19.14	22.15
	AVG.	19.66	21.89
	NASA LOT# 5 AVERAGE		20.77

FM 5064J NASA LOT# 5 U.S.P. LOT# D09337 (HITCO)

		ROLL#1-S	ROLL#2-S
13b. Tensile Modulus, msi, WARP FTMS 406-1011		1.80	2.16
		1.96	2.00
		1.95	1.80
		1.84	1.91
		1.96	2.08
	AVG.	1.90	1.99
	NASA LOT# 5 AVERAGE		1.95
13c. Tensile Elongation, %, WARP FTMS 406-1011		1.24	1.44
		1.22	1.36
		1.24	1.31
		1.46	1.38
		1.24	1.37
	AVG.	1.28	1.37
	NASA LOT# 5 AVERAGE		1.33
14a. Flexural Strength, ksi, WARP FTMS 406-1031		28.37	24.87
		29.27	25.10
		28.58	22.10
		29.06	27.99
		26.62	25.91
	AVG.	28.38	25.19
	NASA LOT# 5 AVERAGE		26.79
14b. Flexural Modulus, msi, WARP FTMS 406-1031		2.01	1.84
		2.04	1.79
		1.96	1.72
		1.98	1.87
		1.96	1.84
	AVG.	1.99	1.81
	NASA LOT# 5 AVERAGE		1.90
15a. Compressive Strength, ksi, WARP FTMS 406-1021		19.92	13.17
		17.42	14.31
		16.68	14.57
		16.22	15.84
		17.20	14.20
	AVG.	17.49	14.42
	NASA LOT# 5 AVERAGE		15.95
15b. Compressive Modulus, msi, WARP FTMS 406-1021		2.10	2.15
		2.19	2.11
		2.15	2.25
		2.12	2.25
		2.11	2.12
	AVG.	2.13	2.18
	NASA LOT# 5 AVERAGE		2.16

FM 5064J NASA LOT# 5 U.S.P. LOT# D09337 (HITCO)

		ROLL#1-S	ROLL#2-S
16. Double Shear Strength, ksi FTMS 406-1041A		2.26	2.31
		2.39	2.33
		2.19	2.42
		2.27	2.33
		2.27	2.33
	AVG.	2.28	2.34
	NASA LOT# 5 AVERAGE		2.31
17. Barcol Hardness, Units ASTM D-2583 (Average of 10 determinations)		58.9	59.5
	NASA LOT# 5 AVERAGE		59.2
18. Residual Volatiles, % PTM-98		1.89	1.76
		1.92	1.66
		1.80	1.73
	AVG.	1.87	1.71
	NASA LOT# 5 AVERAGE		1.79
19. Resin Content, Pyrolysis, % CTM-14B		33.71	31.39
		31.46	30.98
		33.35	31.00
	AVG.	32.84	31.13
	NASA LOT# 5 AVERAGE		31.98
20. Acetone Extraction, % CTM-18A		7.19	7.70
		6.03	6.61
		4.87	5.69
	AVG.	6.03	6.67
	NASA LOT# 5 AVERAGE		6.35
21a. CTE, in/in •F with PLY PTM-61B		2.23	1.87
		1.34	1.37
	AVG.	1.79	1.62
	NASA LOT# 5 AVERAGE		1.70
21b. CTE, in/in •F Cross PLY PTM-61B		4.20	3.34
		1.63	2.87
	AVG.	2.92	3.11
	NASA LOT# 5 AVERAGE		3.01

See Chart 21A-21B

U.S. Polymeric

Hamid M. Quraishi, Manager
Quality Assurance Department

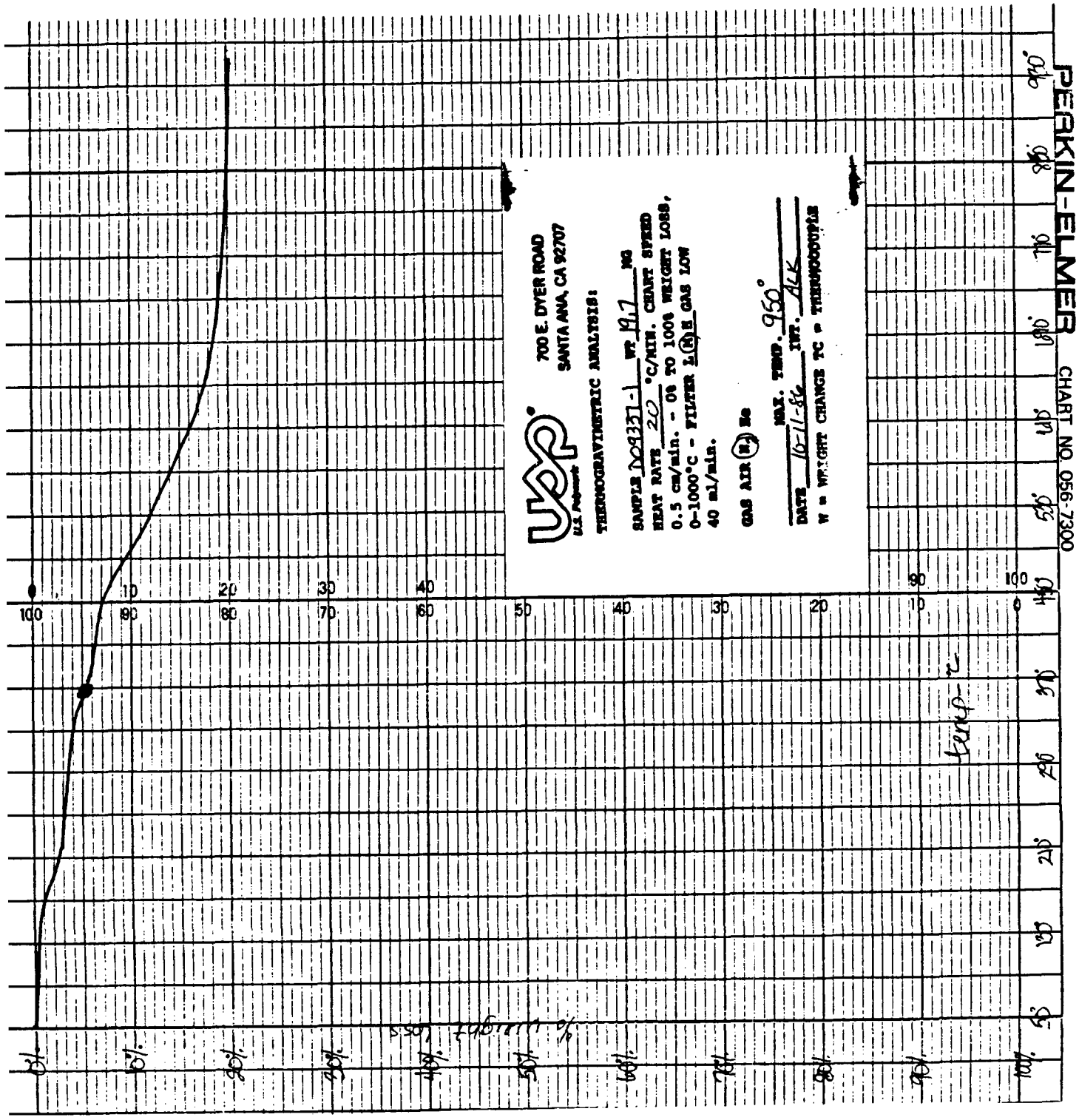


CHART 8B

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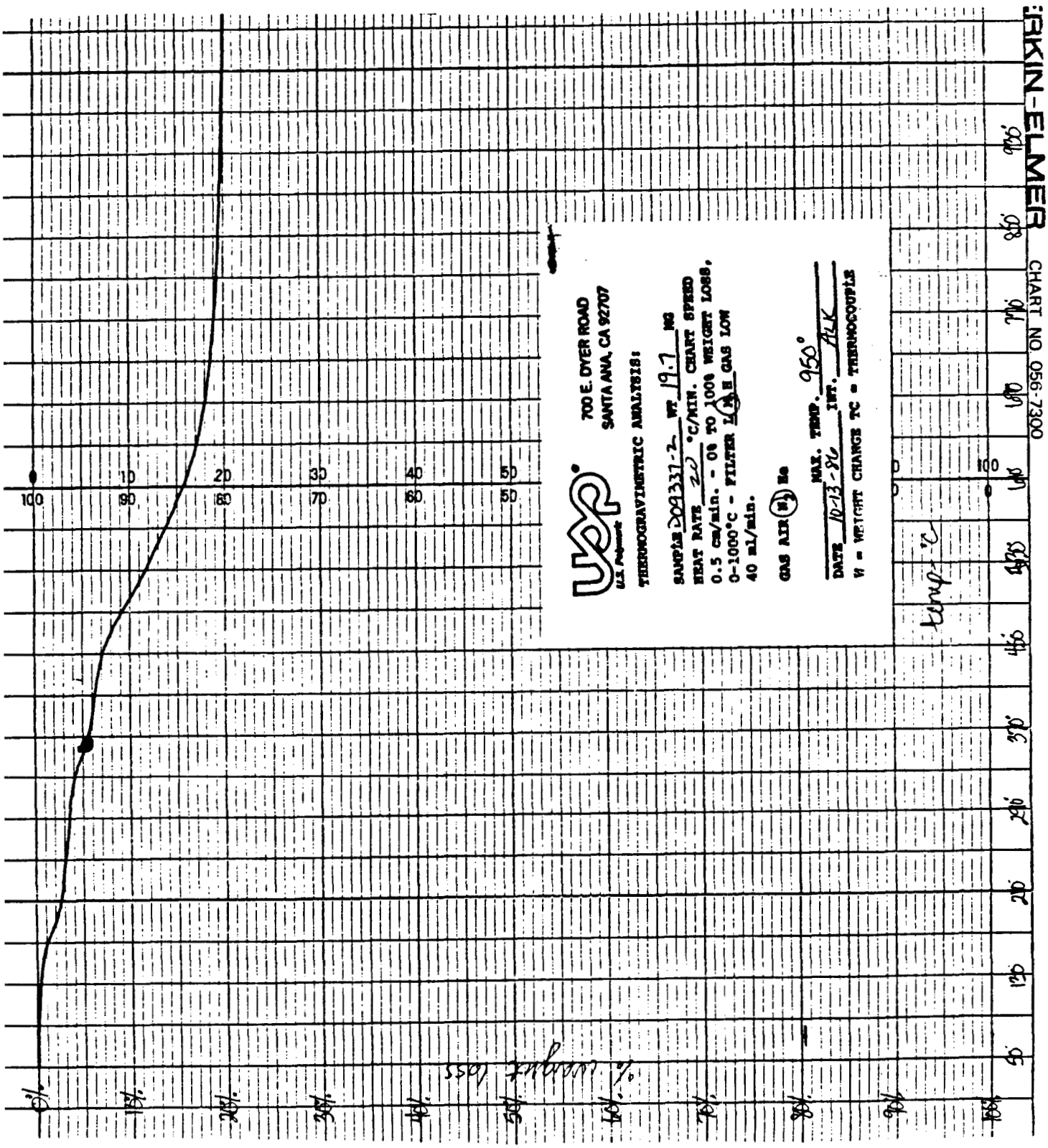

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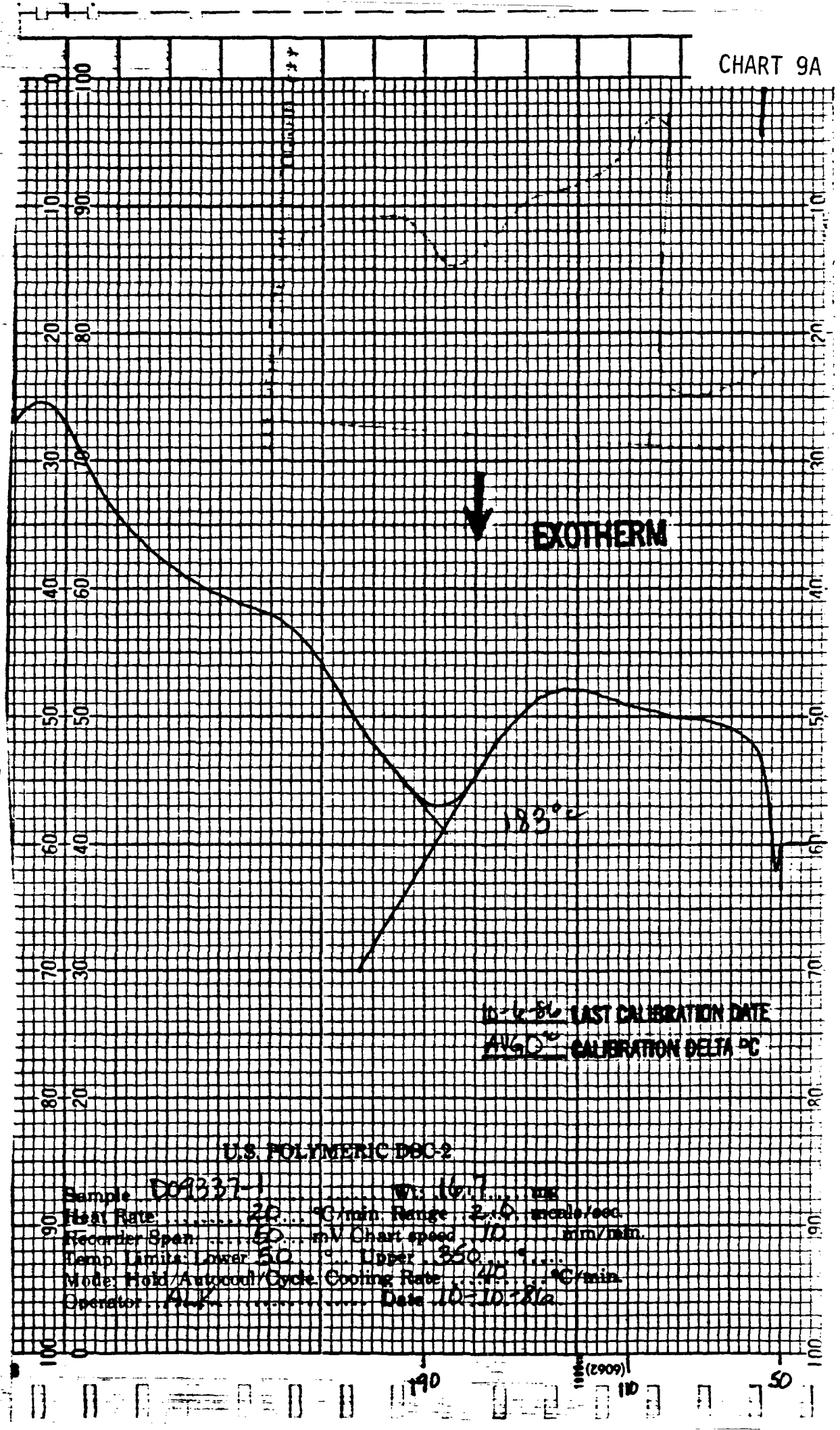

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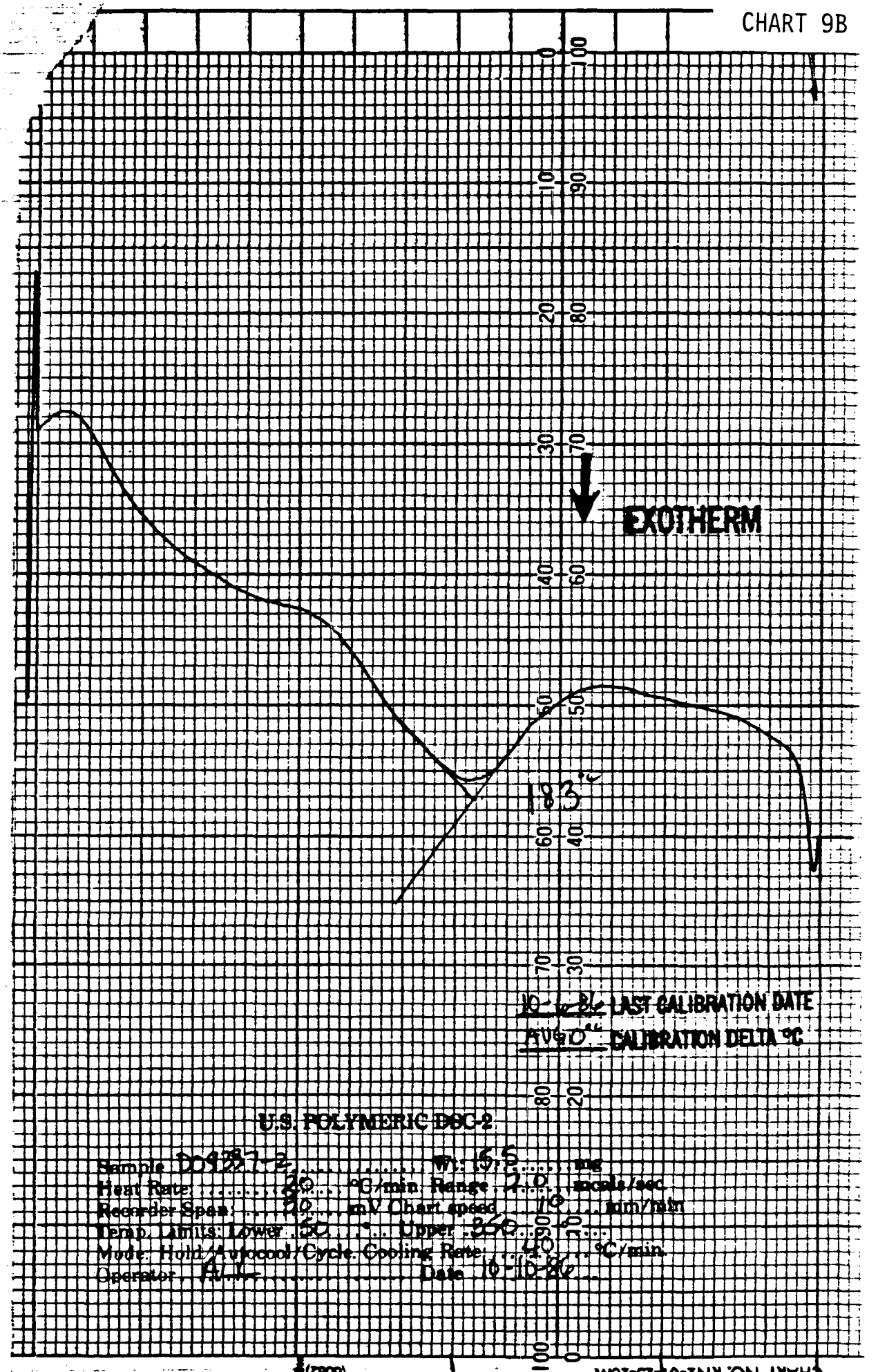

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SPECTRUM NO. 15304
DATE 8-8-84
SAMPLE FM 5064J
D09337 #1

SOURCE
STRUCTURE

PATH 0.2 mm NACL
SOLVENT ACETONE
CONCENTRATION 40-45%
PHASE LIQUID
COMMENTS

ANALYST V. MIRANDA

Beckman®
INFRARED
SPECTROPHOTOMETER

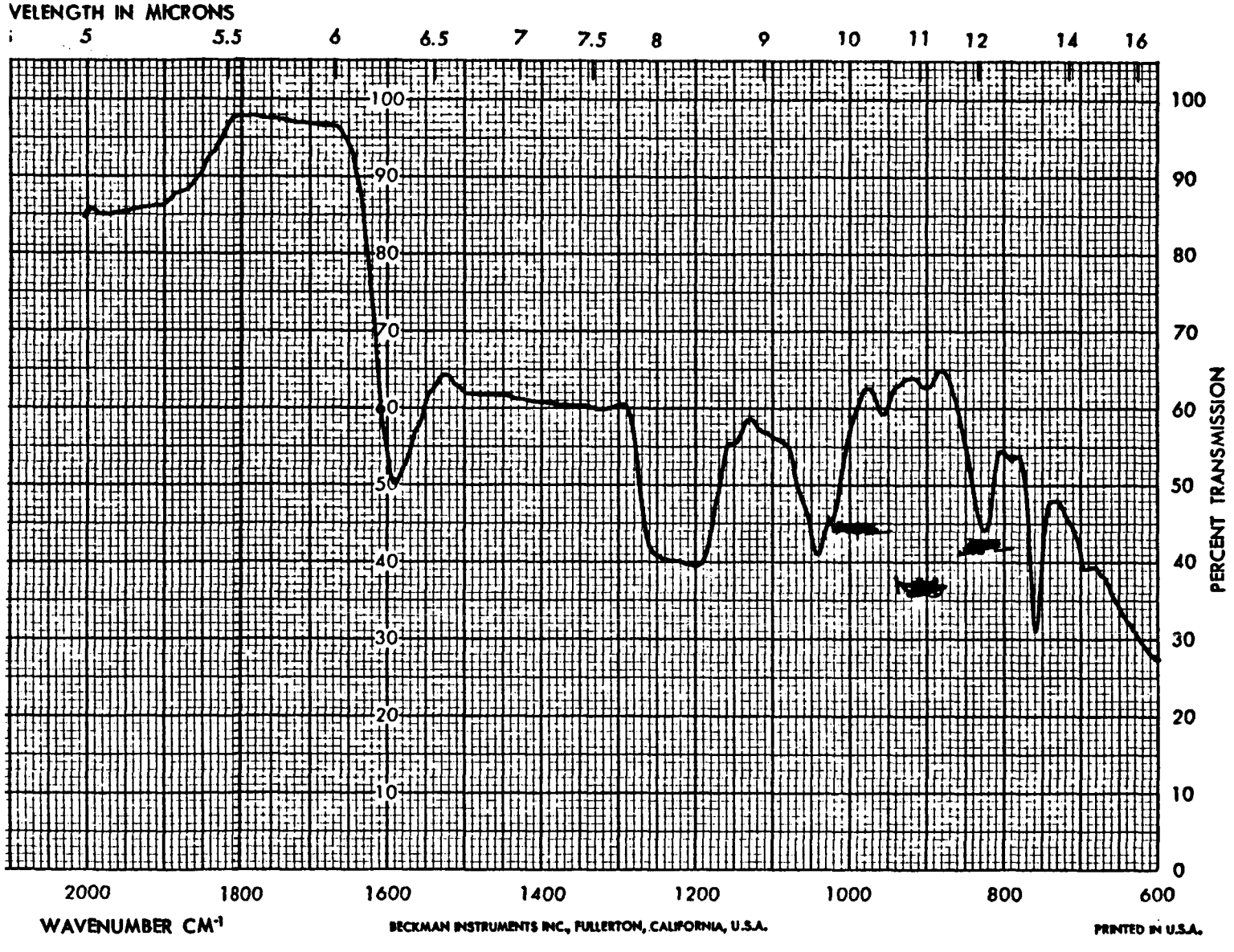

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CHART 10A

SPECTRUM NO. 15305
DATE 8-8-86
SAMPLE FM 5064 J
D09337 # 2

SOURCE
STRUCTURE

PATH 0.2 mm NACL
SOLVENT ACETONE
CONCENTRATION 10-45% T
PHASE LIQUID
COMMENTS

ANALYST V. MIRANDA

Beckman®
INFRARED
SPECTROPHOTOMETER

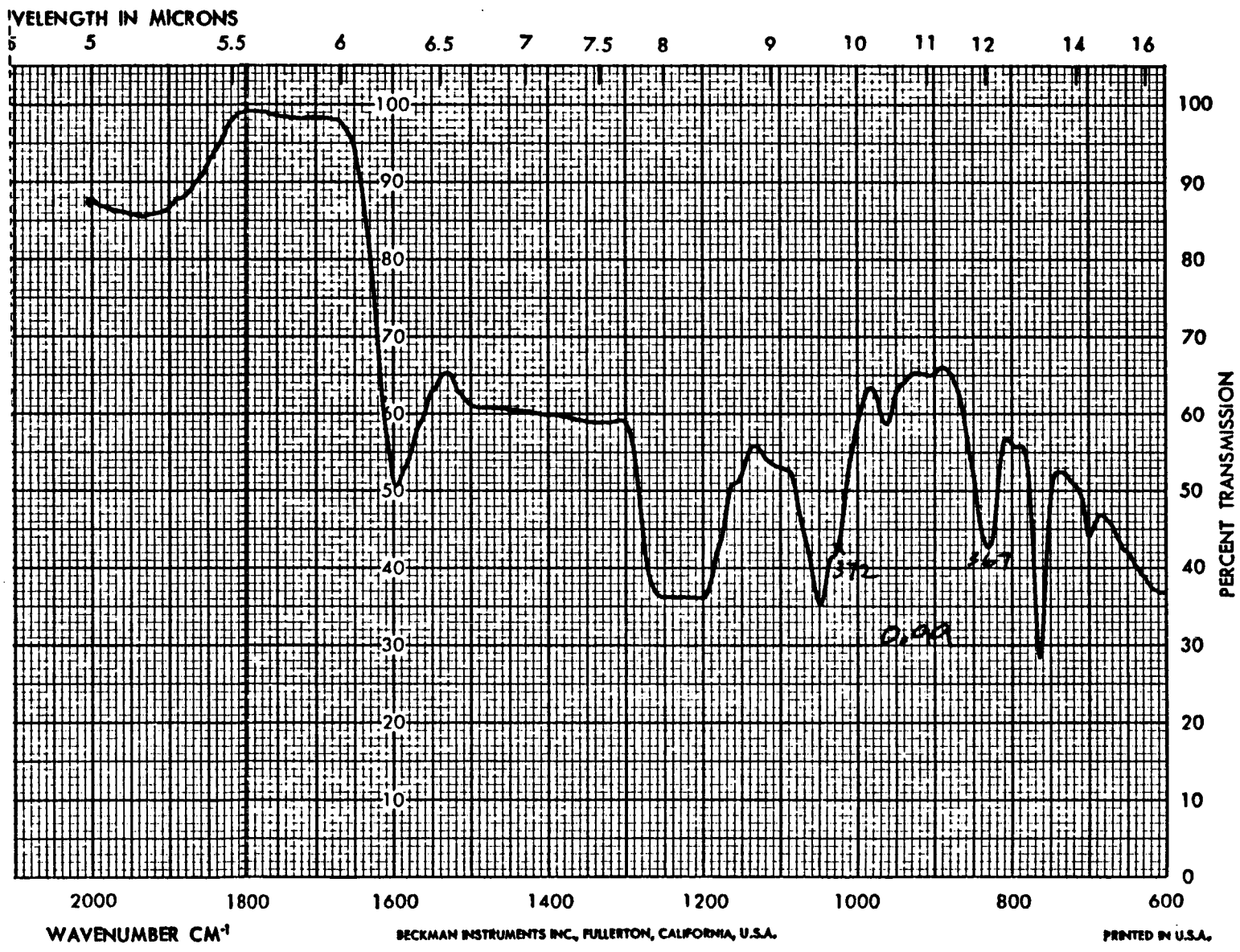

CHART 10B

DUPONT Instruments

PART NO. 990088

RUN NO ___ DATE 12/14/88	T-AXIS	DTA-DSC	TGA	TMA (um/mil)	
OPERATOR DJ	SCALE, °C/in 50 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/0.2	
SAMPLE:	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE EXPANSION	
Dof 337-1-(1)	HEAT — COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.258	
ATM Air @ SSP	SHIFT, in 0	REFERENCE	TIME CONST., sec	LOAD, g 10	
FLOW RATE 3.53 CFH			dY, (mg/min) /in	dY, (10X), (mils/min)/in	

MEASURED VARIABLE

Chart 21A1

DUPONT Instruments

MEASURED VARIABLE _____

PART NO. 990088

RUN NO ___ DATE 12/12/94	T-AXIS	DTA-DSC	TGA	TMA (Expansion)	
OPERATOR TH	SCALE, °C/in 50 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/0.2	
SAMPLE: D09337-1 (2)	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE Expansion	
ATM Air @ STP	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.259	
FLOW RATE 35SCFH	SHIFT, in 0	REFERENCE	TIME CONST., sec	LOAD, g 10	
W Pkg			dY, (mg/min) /in	dY, (10X), (mils/min)/in	

$\frac{\Delta L}{L_0 \Delta T} = \frac{2(0.0004)}{\frac{0.259}{32(2)10}} = 1.34$

Chart 21A2

Chart 21A3

PART NO. 990088

RUN NO ___ DATE 12/14/94
OPERATOR DL
SAMPLE:
D65337-1 - (3)
ATM Air @ STP
FLOW RATE 3-SCCM

T-AXIS
SCALE, °C/in 20 20
PROG. RATE, °C/min 10
HEAT ✓ COOL ___ ISO ___
SHIFT, in 0

DTA-DSC
SCALE, °C/in ___
(mcal/sec)/in ___
WEIGHT, mg ___
REFERENCE ___

TGA
SCALE, mg/in ___
SUPPRESSION, mg ___
WEIGHT, mg ___
TIME CONST., sec ___
dY/dT (mg/min) /in ___

TMA (mils/min)
SCALE, mils/in 0.1/0.2
MODE Extension
SAMPLE SIZE 0.121
LOAD, g 10
dY/dT (10X) (mils/min) /in ___

MEASURED VARIABLE

DUPONT instruments

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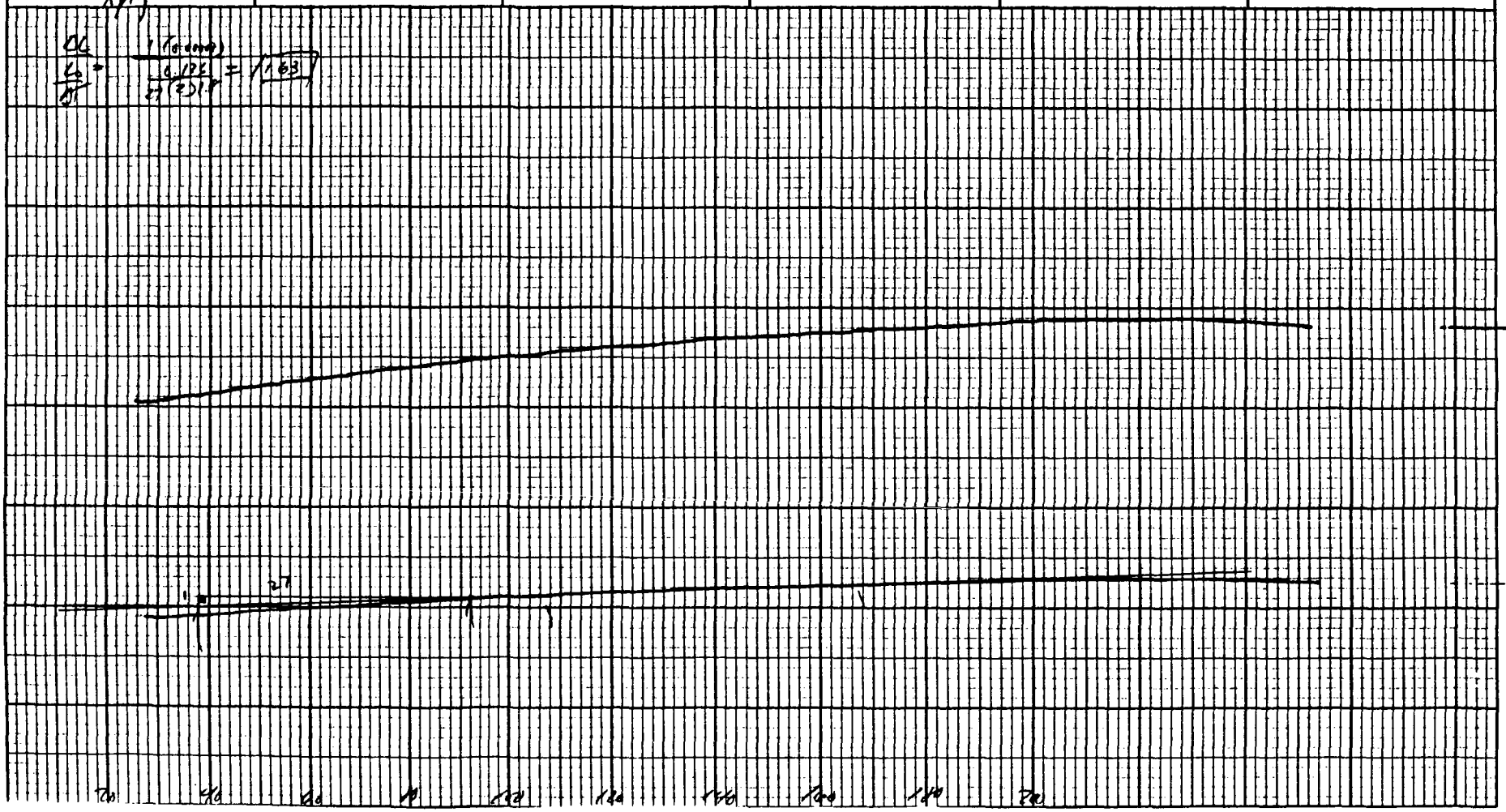
PART NO. 990088

RUN NO. ___ DATE 12/15/94	T-AXIS	DTA-DSC	TGA	TMA (in/inF)	
OPERATOR DL	SCALE, °C/in 50 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/0.2	
SAMPLE: D09337-1-(4)	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE EXPANSION	
ATM Air @ STP	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.126	
FLOW RATE 2-SSCFH	SHIFT, in 0	REFERENCE	TIME CONST., sec	LOAD, g 10	
X poly			dY, (mg/min) /in	dY, (10X), (mils/min)/in	



MEASURED VARIABLE

DUPONT Instruments

Chart 21A4

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PART NO. 990088

RUN NO. ___ DATE 12/12/84	T-AXIS	DTA-DSC	TGA	TMA (Lucite/unit)	
OPERATOR RJ	SCALE, °C/in 50 20	SCALE, °C/in ___	SCALE, mg/in ___	SCALE, mils/in 0.1/0.2	
SAMPLE:	PROG. RATE, °C/min 10	(mcal/sec)/in ___	SUPPRESSION, mg ___	MODE Expansion	
D04337-2-(1)	HEAT ___ COOL ___ ISO ___	WEIGHT, mg ___	WEIGHT, mg ___	SAMPLE SIZE 0.259	
ATM Air @ 50P	SHIFT, in 0	REFERENCE ___	TIME CONST., sec ___	LOAD, g 10	
FLOW RATE 3.5 SCFH	___	___	dY, (mg/min) /in ___	dY, (10X), (mils/min)/in ___	
Copy					

$\frac{\Delta L}{L_0 \Delta T} = \frac{2(0.00002)}{0.259} = \frac{0.00004}{23.18} = 1.87$

MEASURED VARIABLE ___

DUPONT Instruments

Chart 21B1

DuPont Instruments

MEASURED VARIABLE

PART NO. 990088

RUN NO ___ DATE 12/12/84	T-AXIS	DTA-DSC	TGA	TMA (mil/min)	
OPERATOR TJ	SCALE, °C/in 50 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/0.2	
SAMPLE: D09337-2-(2)	PROG. RATE, °C/min 10	[mcal/sec]/in	SUPPRESSION, mg	MODE Expansion	
ATM Air @ 50	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.254	
FLOW RATE 3 SCFH	SHIFT, in 0	REFERENCE	TIME CONST., sec	LOAD, g 10	
w/ply			dY, [mg/min] /in	dY, (10X), [mils/min] /in	

$\frac{dL}{L_0} = \frac{1\ (\text{annul})}{\frac{0.254}{10(0.0)(1.6)}} = 11.377$

Chart 21B2

DUPONT Instruments

MEASURED VARIABLE _____

PART NO. 990068

RUN NO ___ DATE 12/15/16	T-AXIS	DTA-DSC	TGA	TMA (air/inert)	
OPERATOR TN	SCALE, °C/in 50 20	SCALE, °C/in ___	SCALE, mg/in ___	SCALE, mils/in 0.1/0.2	
SAMPLE: D09337-2-(3)	PROG. RATE, °C/min 10	(mcal/sec)/in ___	SUPPRESSION, mg ___	MODE EXPANSION	
ATM Air @ 50	HEAT ___ COOL ___ ISO ___	WEIGHT, mg ___	WEIGHT, mg ___	SAMPLE SIZE 0.125	
FLOW RATE 3 SCFH	SHIFT, in 0	REFERENCE ___	TIME CONST., sec ___	LOAD, g 10	
Xply			dY, (mg/min) /in ___	dY, (10X), (mils/min) /in ___	

$\frac{\Delta L}{L_0 \Delta T} = \frac{2(0.0005)}{26(3)15} = 3.39$

Chart 21B3

PART NO. 990068

RUN NO. ___ DATE 11/15/96	T-AXIS	DTA-DSC	TGA	TMA (um/min)	
OPERATOR TH	SCALE, °C/in 50 20	SCALE, °C/in ___	SCALE, mg/in ___	SCALE, mils/in 0.1/0.2	
SAMPLE: D05337-2-(1)	PROG. RATE, °C/min 10	(mcal/sec)/in ___	SUPPRESSION, mg ___	MODE EXPANSION	
ATM Air @ STP	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg ___	WEIGHT, mg ___	SAMPLE SIZE 0.129	
FLOW RATE 5 SCCM	SHIFT, in 0	REFERENCE ___	TIME CONST., sec ___	LOAD, g 10	
Xpl 7			dY, (mg/min) /in ___	dY, (10X), (mils/min)/in ___	

$\frac{dY}{dt} = \frac{Y_{adjusted}}{\frac{0.125}{15(2)10}} = 13.87$

MEASURED VARIABLE

DUPONT Instruments

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Chart 21B4