FM 5839 TEST LOTS #1, 2, 3, 5, 2R

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# 1

CHARTS

U.S. Polymeric

FILLER TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

Filler Lot for NASA Lot# 1

1. Carbon Content, % QAI-5560			SAMPLE		
		#1-1	#1-2	#1-3	
		99.17	99.10	99.12	
		NASA LOT# 1	AVERAGE	99.13	
2. Ash Content, % PTM-71B		.005	.000	.000	
		.009	.014	.005	
	AVG.	.007	.007	.003	
		NASA LOT# 1	AVERAGE	.006	
3. Atomic Absorption, ppm CTM-53B (Values are average of 2 determinations)		#1-1	#1-2	#1-3	LOT#1 AVG.
	Na	3.0	2.0	1.5	2.2
	K	1.5	0.0	0.0	0.5
	Ca	0.0	0.0	0.0	0.0
	Mg	0.5	0.0	0.0	0.2
	Li	0.0	0.0	0.0	0.0
	TOTAL	5.0	2.0	1.5	2.8
3a. Moisture Content, % CTM-53B		.005	.010	.005	
		.019	.005	.005	
	AVG.	.010	.008	.005	
		NASA LOT# 1	AVERAGE	.008	
3b. Ash Content, % CTM-53B		0.000	0.000	0.000	
		0.000	0.000	0.005	
	AVG.	0.000	0.000	0.003	
		NASA LOT# 1	AVERAGE	0.001	
4. pH, Units ASTM D1512		4.85	4.85	4.95	
		4.90	4.90	5.05	
	AVG.	4.88	4.88	5.00	
		NASA LOT# 1	AVERAGE	4.92	
5. Particle Size, microns S.E.M. procedure (Average values are of 10 determinations)	AVG.	.45	.36	.38	
	Maximum	.65	.62	.85	
	Minimum	.22	.17	.22	
	Std. Dev	.08	.08	.08	
		NASA LOT# 1 AVERAGE SIZE		.40	
6a. TGA, °C at 50% Loss CTM-51		750	751	749	
		NASA LOT# 1	AVERAGE	750	

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Filler Lot for NASA Lot# 1

6b. TGA
CTM-51 — See Charts 6A-6C

7. Particle Size Distribution
CTM-72 — See Charts 7A-7C

7a. Particle Size, microns
CTM-72

	#1-1	#1-2	#1-3
	.87	.88	.92
	.86	.95	.95
AVG.	.86	.92	.94

NASA LOT# 1 AVERAGE .91

U.S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

Sample: 1-1
Size: 8.84 mg
Run No: MIR #12830 (13)
Date: JAN/31/86 12:59

TGA

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #93
File No: D 35.DAT V2.1
Plotted: FEB/04/86 07:23

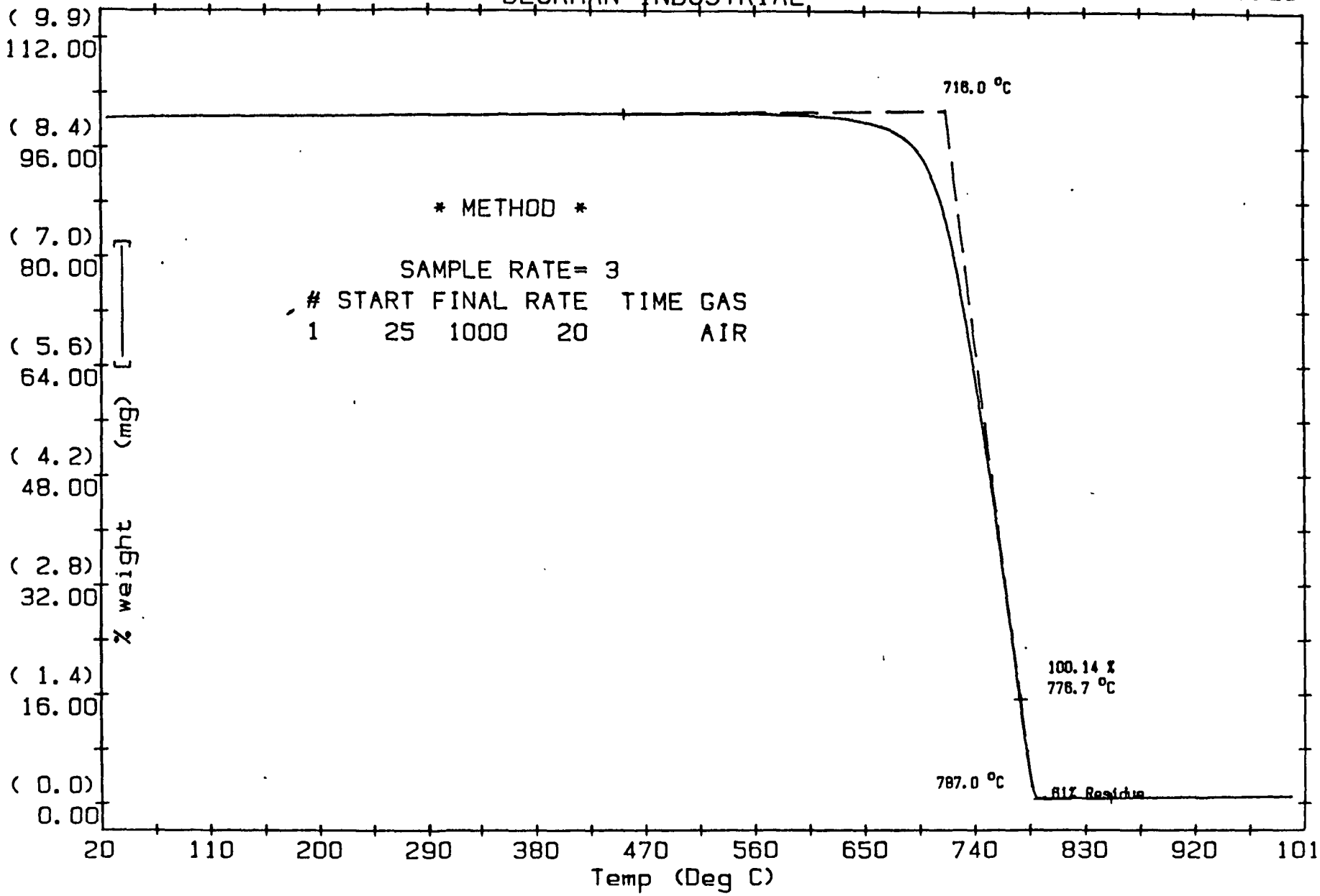

CHART 6A

Beckman Industrial™ ANALYTICAL LABORATORY SERVICES

Sample: 1-2
Size: 14.192 mg
Run No: MIR #12830 (I3)
Date: FEB/03/86 07:13

TGA

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #93
File No: D 36.DAT V2.1
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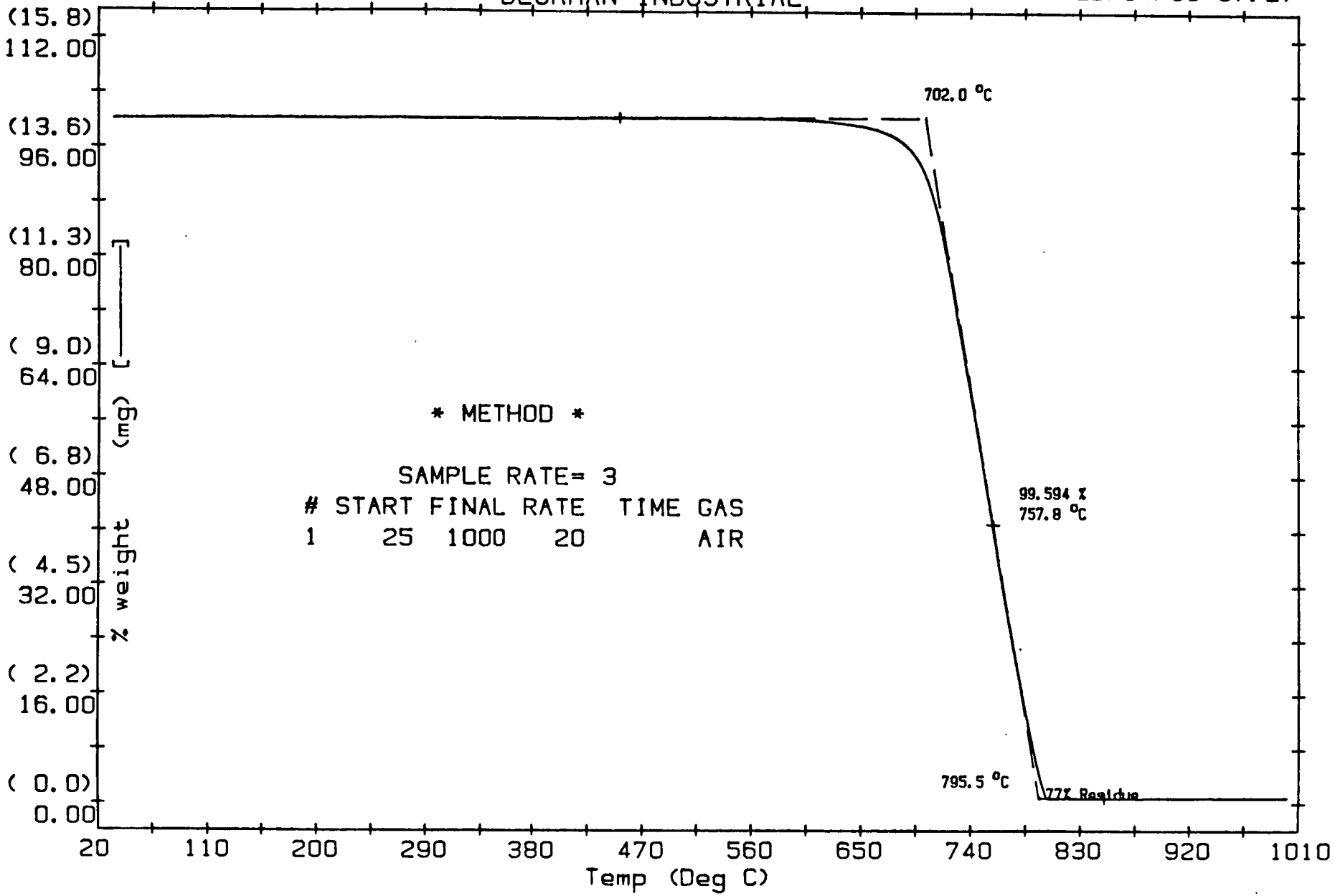


Beckman Industrial™ ANALYTICAL LABORATORY SERVICES

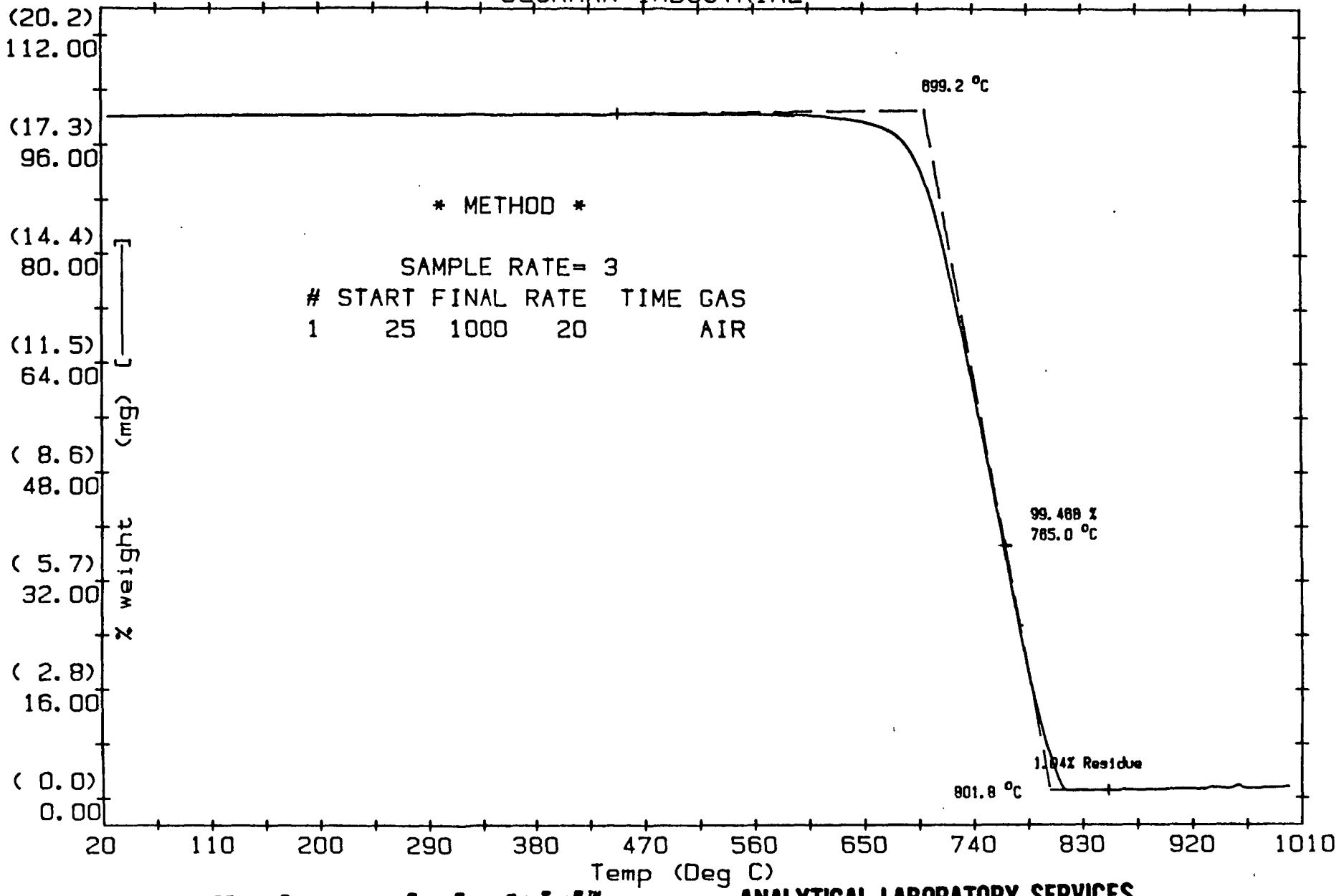
CHART 6B

Sample: 1-3
Size: 18.045 mg
Run No: MIR #12830 (I3)
Date: FEB/03/86 08:45

TGA

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #93
File No: D 37.DAT V2.1
Plotted: FEB/04/86 07:36



Beckman Industrial™ ANALYTICAL LABORATORY SERVICES

CHART 6C

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-22-86
#1 SAMPLE NASA LOT#1-1
SOLVENT ETHYL GLYCOL
C=0.013 mg/ml

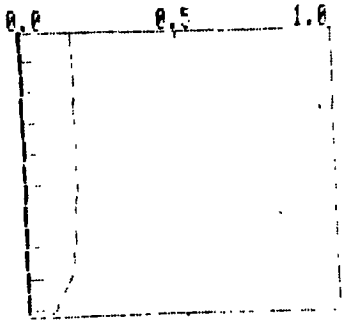
* CONDITIONS

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

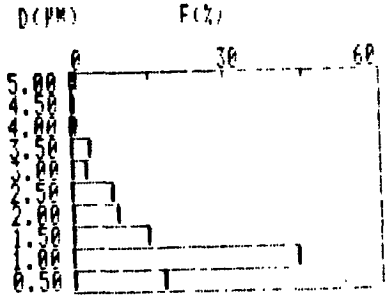


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.9	0.9
4.50-4.00	0.1	1.0
4.00-3.50	0.6	1.6
3.50-3.00	3.4	5.0
3.00-2.50	2.7	7.7
2.50-2.00	7.8	15.5
2.00-1.50	8.6	24.0
1.50-1.00	14.5	38.5
1.00-0.50	43.9	82.5
0.50-0.00	17.5	100.0

D(AVE) 0.87 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



LOT #1-1
Sample #1

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-22-86
#2 SAMPLE NASA LOT#1-1
SOLVENT ETHYL GLYCOL
C=0.013 mg/ml

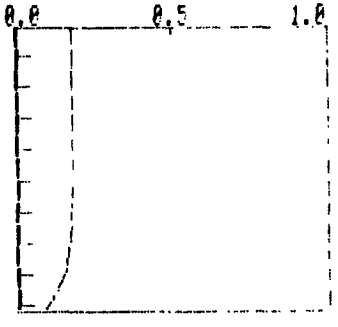
* CONDITIONS

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

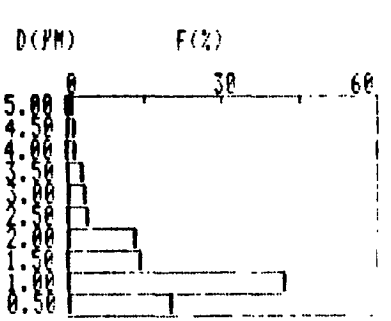


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.7	0.7
4.50-4.00	1.1	1.8
4.00-3.50	1.4	3.3
3.50-3.00	2.5	5.7
3.00-2.50	2.7	8.4
2.50-2.00	3.6	12.0
2.00-1.50	12.8	24.8
1.50-1.00	13.9	38.7
1.00-0.50	41.7	80.4
0.50-0.00	19.6	100.0

D(AVE) 0.86 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



LOT# 1-1
Sample #2

CHART 7A

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-24-86
#1 SAMPLE NASA Lot#1-2
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

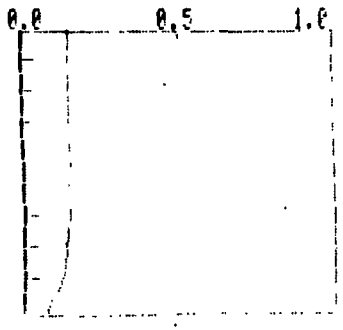
* CONDITIONS

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	0.0	0.0
3.50-3.00	0.0	0.0
3.00-2.50	1.1	1.1
2.50-2.00	8.2	9.3
2.00-1.50	13.7	23.0
1.50-1.00	17.2	40.2
1.00-0.50	39.9	80.1
0.50-0.00	19.9	100.0

D(AVE) 0.88 (PM)

* DISTRIBUTION GRAPH (BY VOL.)

Lot #1-2
Sample #1

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-24-86
#2 SAMPLE NASA Lot#1-2
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

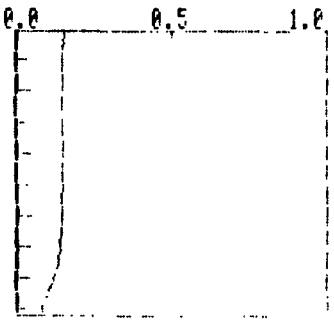
* CONDITIONS

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

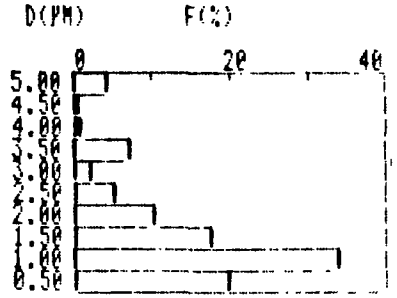


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	4.1	4.1
4.50-4.00	0.2	4.3
4.00-3.50	0.4	4.8
3.50-3.00	7.1	11.9
3.00-2.50	1.9	13.8
2.50-2.00	4.8	18.7
2.00-1.50	10.3	29.0
1.50-1.00	17.5	46.5
1.00-0.50	33.8	80.3
0.50-0.00	19.7	100.0

D(AVE) 0.95 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot #1-2
Sample #2

CHART 7B

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-24-86
#1 SAMPLE NASA LOT#1-3
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

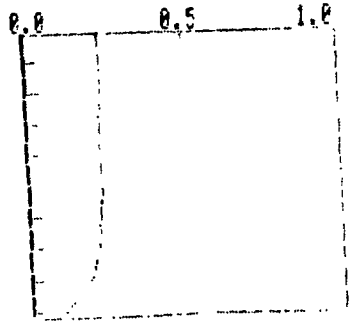
* CONDITIONS

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

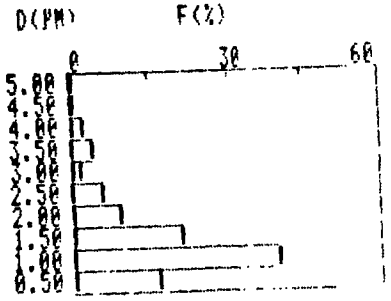


* DISTRIBUTION TABLE (BY VOL.)

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	2.1	2.1
3.50-3.00	4.0	6.0
3.00-2.50	1.5	7.5
2.50-2.00	5.8	13.3
2.00-1.50	9.2	22.5
1.50-1.00	20.8	43.3
1.00-0.50	40.4	83.7
0.50-0.00	16.3	100.0

D(AVE) 0.92 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



LOT#1-3
Sample#1

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-24-86
#2 SAMPLE NASA LOT#1-3
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

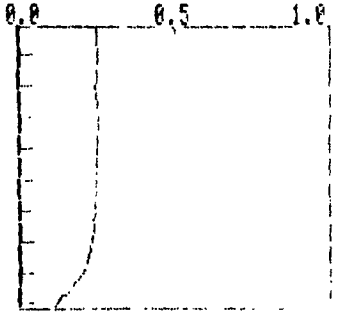
* CONDITIONS

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

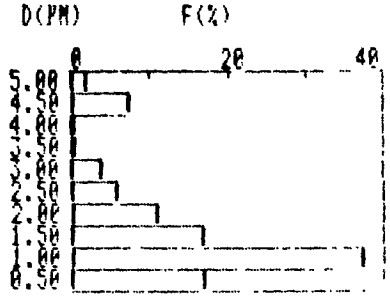


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	1.6	1.6
4.50-4.00	7.3	9.0
4.00-3.50	0.0	9.0
3.50-3.00	0.0	9.0
3.00-2.50	3.6	12.6
2.50-2.00	5.7	18.3
2.00-1.50	11.0	29.3
1.50-1.00	16.6	45.9
1.00-0.50	37.2	83.1
0.50-0.00	16.9	100.0

D(AVE) 0.95 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



LOT#1-3
Sample#2

CHART 7C

TABLE OF CONTENTS

RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

USP-39A Resin Lot for NASA Lot# 1

CHARTS

U.S. Polymeric

RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

USP-39A Resin Lot for NASA Lot# 1

1. Resin Solids, %			#1-1	#1-2	
PTM-7C			79.4	80.2	
			80.2	80.5	
			81.2	81.7	
		AVG.	80.3	80.8	
		LOT# 1 AVERAGE		80.6	
2. Specific Gravity @ 25°C			1.186	1.193	
PTM-29C		LOT# 1 AVERAGE		1.190	
3. Viscosity, Brookfield, cps. @ 22.8°C			16,750	18,750	
PTM-14C		LOT# 1 AVERAGE		17,750	
4. Gel Time, min:sec			3:30	3:47	
PTM-47B		LOT# 1 AVERAGE		3:39	
5. Atomic Absorption, ppm			#1-1	#1-2	LOT1 AVG
CTM-53B		Na	22.5	31.3	26.9
(Values are averages of		K	0.3	0.5	0.4
four determinations)		Ca	5.3	5.8	5.5
		Mg	2.0	2.0	2.0
		Li	0.0	0.0	0.0
		AVG.	30.0	39.5	34.8
6. Volatiles, Gas Chromatography			See Charts 6A-6B		
CTM-55					
7. TGA, % Weight Loss at 500°C			39.1	37.9	
CTM-51 (AIR)		LOT# 1 AVERAGE		38.5	
			See Chart 7A-7B		
8. DSC, temperature °C			187	187	
CTM-50A		LOT# 1 AVERAGE		187	
			See Chart 8A-8B		
9. HPLC			See Chart 9A-9B		
CTM-49A					
10. GPC, Average molecular wt.			1231	1291	
CTM-49A		LOT# 1 AVERAGE		1261	
			See Chart 10A-10B		

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USP-39A Resin Lot for NASA Lot# 1

11. pH, units
CTM-1B

	#1-1	#1-2
	8.3	8.4
LOT# 1 AVERAGE		8.4

12. Phenol Content, %
CTM-55 Appendix 1

	13.89	13.96
	13.77	14.03
AVG.	13.83	14.00
LOT# 1 AVERAGE		13.91

13. Chang's Index, ml.
CTM-5B

	23.4	23.8
LOT# 1 AVERAGE		23.6

14. RDS, Minimum Viscosity, cps.
CTM-57A

	Min. Visc.	°C
#1-1	229	115
#1-2	290	119
AVG.	259	117

See Charts 14A-14B

15. NMR
Vendor procedure

See Charts 15A-15B

U. S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

ORIGINAL PAGE IS
OF POOR QUALITY

TYPICAL GAS CHROMATOGRAPH SET-UP

Operator	Q.M.Z.	Date	12/4/86
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	USP39A, FI	Solvent	THF
Size	0.1 µl	Concn.	0.10227 g/ml

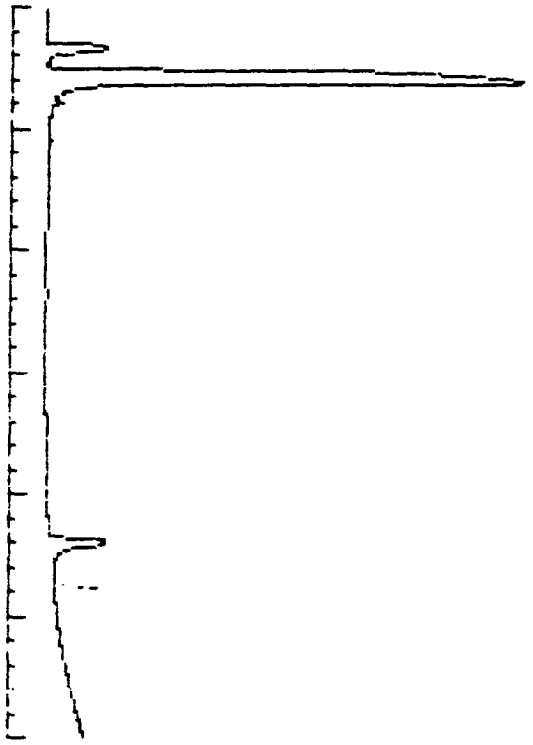
GAS CHROMATOGRAPHY STANDARD SOLVENT

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.

** REAL TIME CHROMATOGRAM ***



INAL FULL SCALE MV.=1000.00

AMPLE: USP39A 1-1
ISC.: C=0 1022T GMS/ML

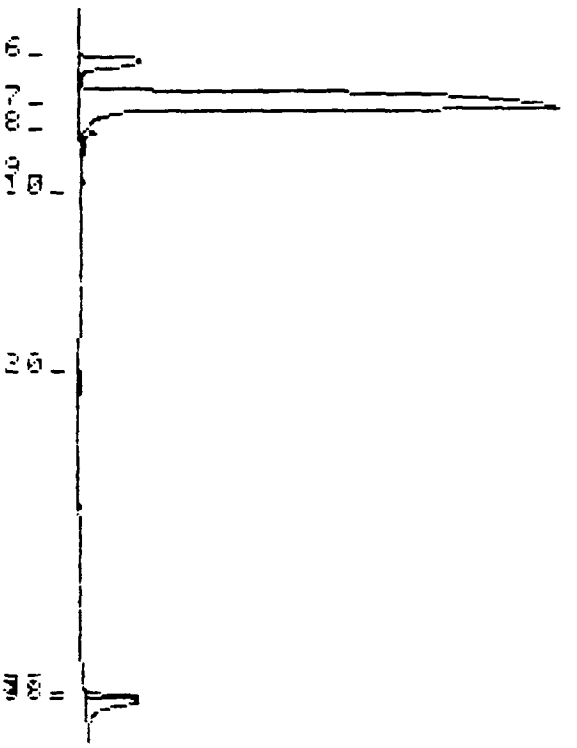
IME: 11:15
ATE: 12/11/86
PERATOR: JG2

UN TIME: 30 00 MINUTES
ELAY TIME: 0 00
HAN: 0

PK NO	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
3	65	2553	.068	3	262
6	1.70	255870	6.813	2	11563
7	3.25	3126900	83.261	3	90865
8	4 03	55251	1.471	4	2537
9	5 55	6042	.161	4	481
0	6 05	7408	.197	4	163
0	11.75	7490	.199	3	355
7	21.95	107040	2.850	2	10311
8	22 13	186990	4.979	2	10194

OTAL AREA= 3755543
HRESHOLD= 1
IN PK WIDTH= 15
REA REJECT= 1000

VERTICAL SCALE FACTOR 1X



SAMPLE: USP39A 1-1
MISC.: C=0.1022T GMS/ML

TIME: 11:15
DATE: 12/11/86
OPERATOR: JG2

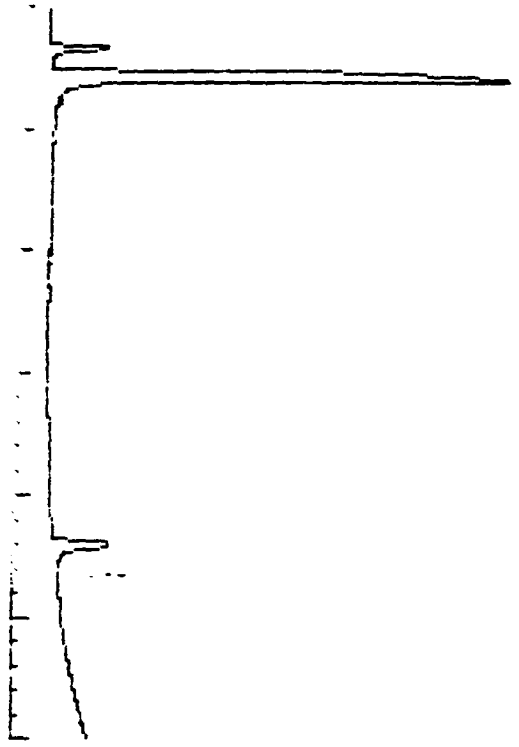
RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
6	1 70	255870	6.856	2	11563
7	3.25	3126900	83.785	3	90865
8	4.03	55251	1.480	4	2537
37	21 95	107040	2.868	2	10311
38	22.13	186990	5.010	2	10194

TOTAL AREA= 3732051
THRESHOLD= 1
MIN PK WIDTH= 15
AREA REJECT= 10000

CHART 6B

REAL TIME CHROMATOGRAM ***



NAL FULL SCALE MV.=1000.00

MPLE: USP39A 1-2
SC.: C=0.10006 GMS/ML

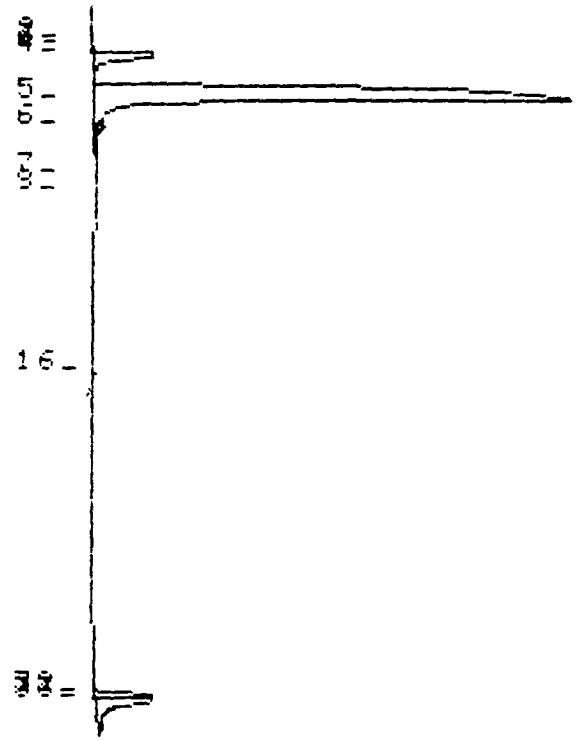
ME: 11:56
TE: 12/11/86
ERATOR: JGZ

N TIME: 30.00 MINUTES
LAY TIME: 0.00
AN: 0

RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
.65	1623	.056	2	202
1.25	1128	.039	2	53
1.45	1143	.040	2	122
1.73	195650	6.780	2	11047
3.15	2357000	81.673	3	87114
4.00	33273	1.153	4	1558
5.59	3232	.112	4	314
6.08	1817	.063	4	67
11.75	7514	.260	1	419
21.98	104640	3.626	2	10260
22.10	178880	6.198	2	10209

TAL AREA= 2885899
RESHOLD= 1
N PK WIDTH= 15
EA REJECT= 1000

VERTICAL SCALE FACTOR 1X



SAMPLE: USP39A 1-2
MISC. C=0.10006 GMS/ML

TIME: 11:56
DATE 12/11/86
OPERATOR: JGZ

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

PK NO.	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
4	1.73	195650	6.818	2	11047
5	3.15	2357000	82.141	3	87114
6	4.00	33273	1.160	4	1558
32	21.98	104640	3.647	2	10260
33	22.10	178880	6.234	2	10209

TOTAL AREA= 2869443
THRESHOLD= 1
MIN PK WIDTH= 15
AREA REJECT= 10000

Sample: USP39A71108 1-1
Size: 12.898 mg
Run No: MIR #13079 (I2)
Date: MAY/21/86 07:14

TGA

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #107
File No: D 32.DAT V2.1
Plotted: MAY/22/86 07:35

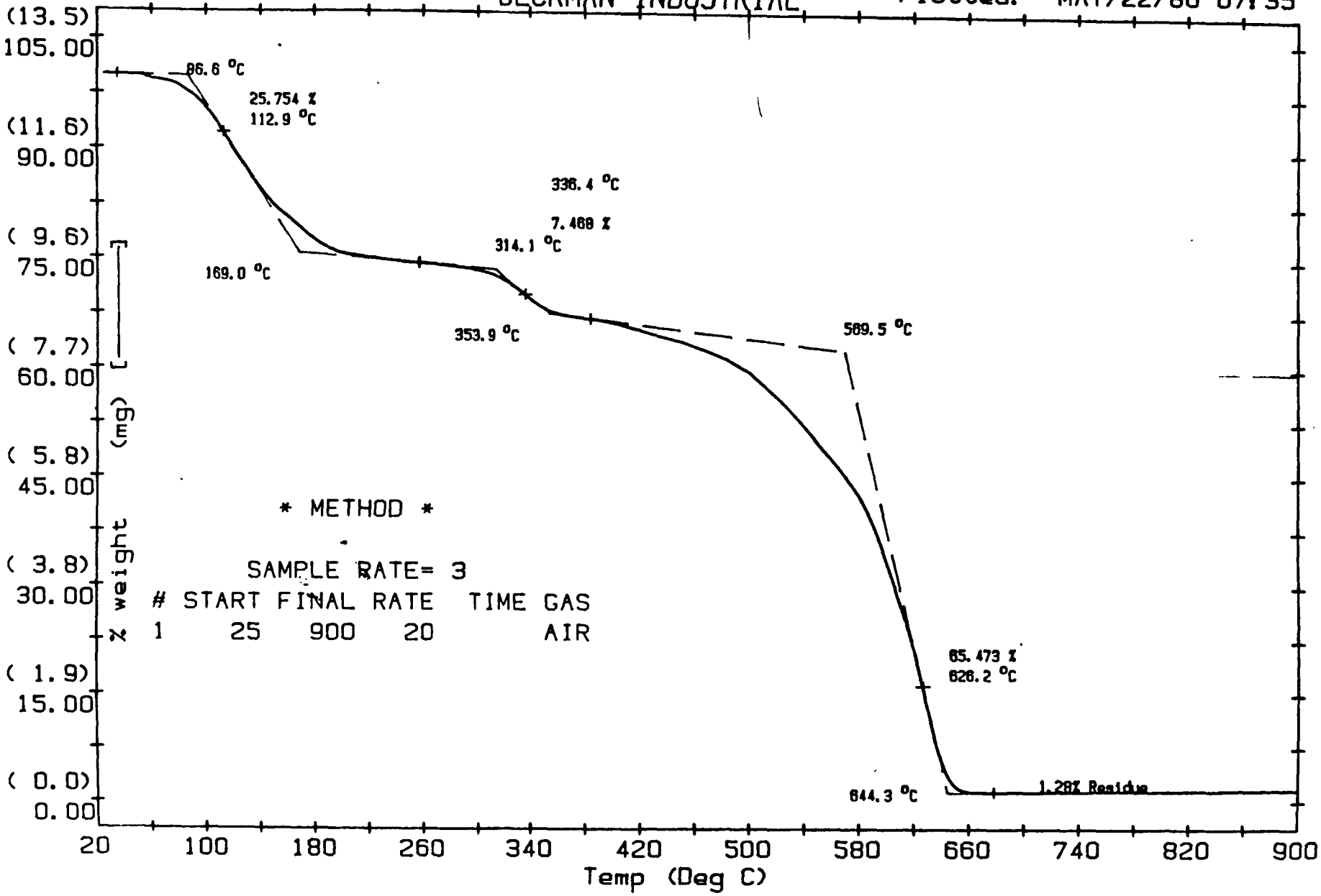


CHART 7A

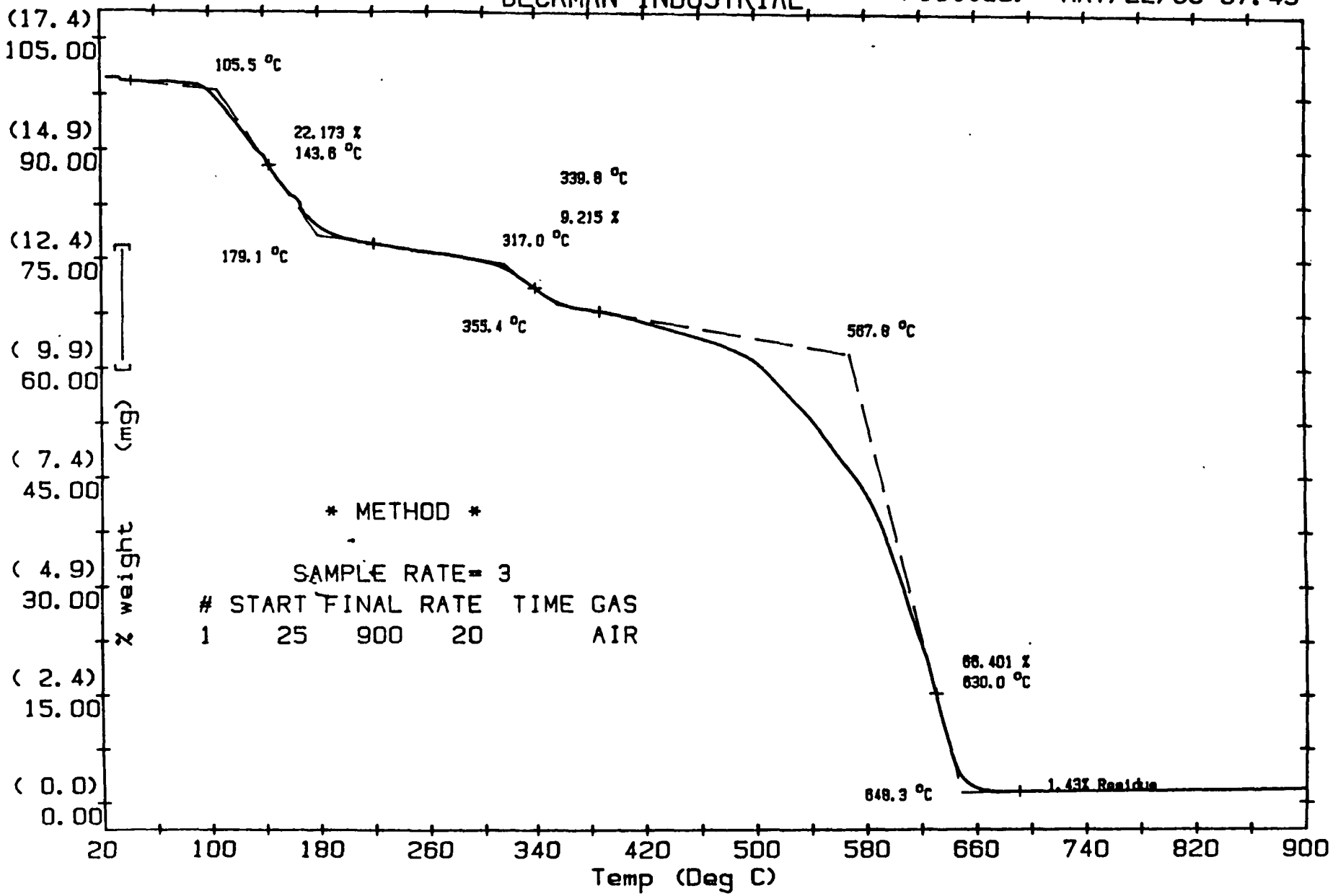
Beckman Industrial™ ANALYTICAL LABORATORY SERVICES

Sample: USP39A71108 1-2
Size: 16.572 mg
Run No: MIR #13079 (I2)
Date: MAY/21/86 08:28

TGA

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #107
File No: D 33.DAT V2.1
Plotted: MAY/22/86 07:45



Beckman Industrial™ ANALYTICAL LABORATORY SERVICES

CHART 7B

PART NO. 990088

CHART 8A

RUN NO ____ DATE 4/3/86

OPERATOR DD

SAMPLE: 1-1

ATM H_2 @ 1 atm.

FLOW RATE 40 ml/min.

T-AXIS

SCALE, °C/in 50

PROG. RATE, °C/min 20

HEAT / COOL ____ ISO ____

SHIFT, in 0

-1° ΔC°

DTA-DSC

SCALE, °C/in 1.0/5

[mcal/sec]/in ____

WEIGHT, mg 3.4

REFERENCE 1 AL CUP & SEA

DUPONT Instruments

MEASURED VARIABLE ____

3-31-86 LAST CALIBRATION DATE

-1° CALIBRATION DELTA °C

exotherm

188°

-1

187°C

0 50 100 150 200 250 300 35

TEMPERATURE, °C [CHRO

PART NO. 990088 CHART 8B

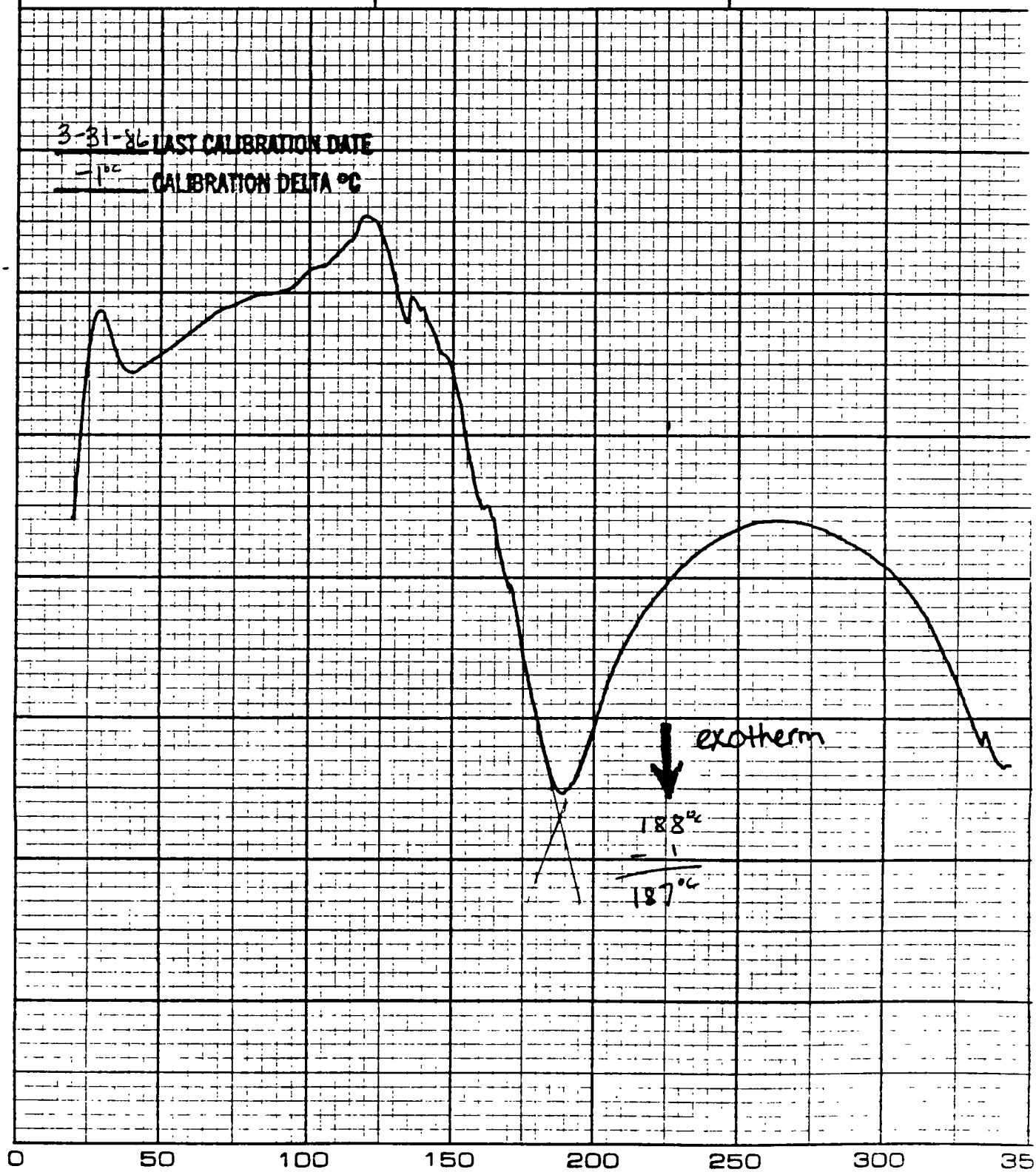
RUN NO. ___ DATE 4/3/86
OPERATOR [illegible]
SAMPLE: 1-2
ATM He @ 1 atm.
FLOW RATE 40 ml/min

T-AXIS
SCALE, °C/in 50
PROG. RATE, °C/min 20
HEAT / COOL ___ ISO ___
SHIFT, in 0
- 1° ΔC°

DTA-DSC
SCALE, °C/in 1.0/5
(mcal/sec)/in ___
WEIGHT, mg 3.4
REFERENCE ___
1 AL cup & SE+C

DUPONT Instruments

MEASURED VARIABLE



PRECEDING PAGE BLANK NOT FILMED

ethod recorded in file: A:PHENOLIC.MET

CHART 9A

ATA FILE A:PHEN026.HDR TAKEN 09-05-1986 11:06:32

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

```
**********************************************************************************
 Sample Name: USP39A,1-1,C=6.54                  Operator Initials: JGZ          *
 Date:  09-05-1986 11:06:32 Method:PHENOLIC    DATA FILE: A:PHEN026.PTS          *
 Interface: 4                Cycle#:  26        Channel#: 0    Vial#: N.A.      *
 Starting Peak Width:  10   Threshold:  .01                                      *
**********************************************************************************
  Instrument 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                                              *
**********************************************************************************
tarting Delay:   0.00                          Ending Retention Time:   10.00
```

k o.	Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
1	0.70	2030	1.1563	1	510	2.103	4.0
2	1.80	76982	43.8499	2	4940	79.736	15.6
3	2.05	96545	54.9937	2	5248	100.000	18.4

```
otal Area:      175557   Area Reject:      1000  One sample per   1.000 sec.
```

DATA FILE=PREND26 FROM 0.00 MIN. TO [illegible] MIN. [illegible]
USP-38A, 1-1, C=6.54 MG/ML, 9/5/86, JGZ

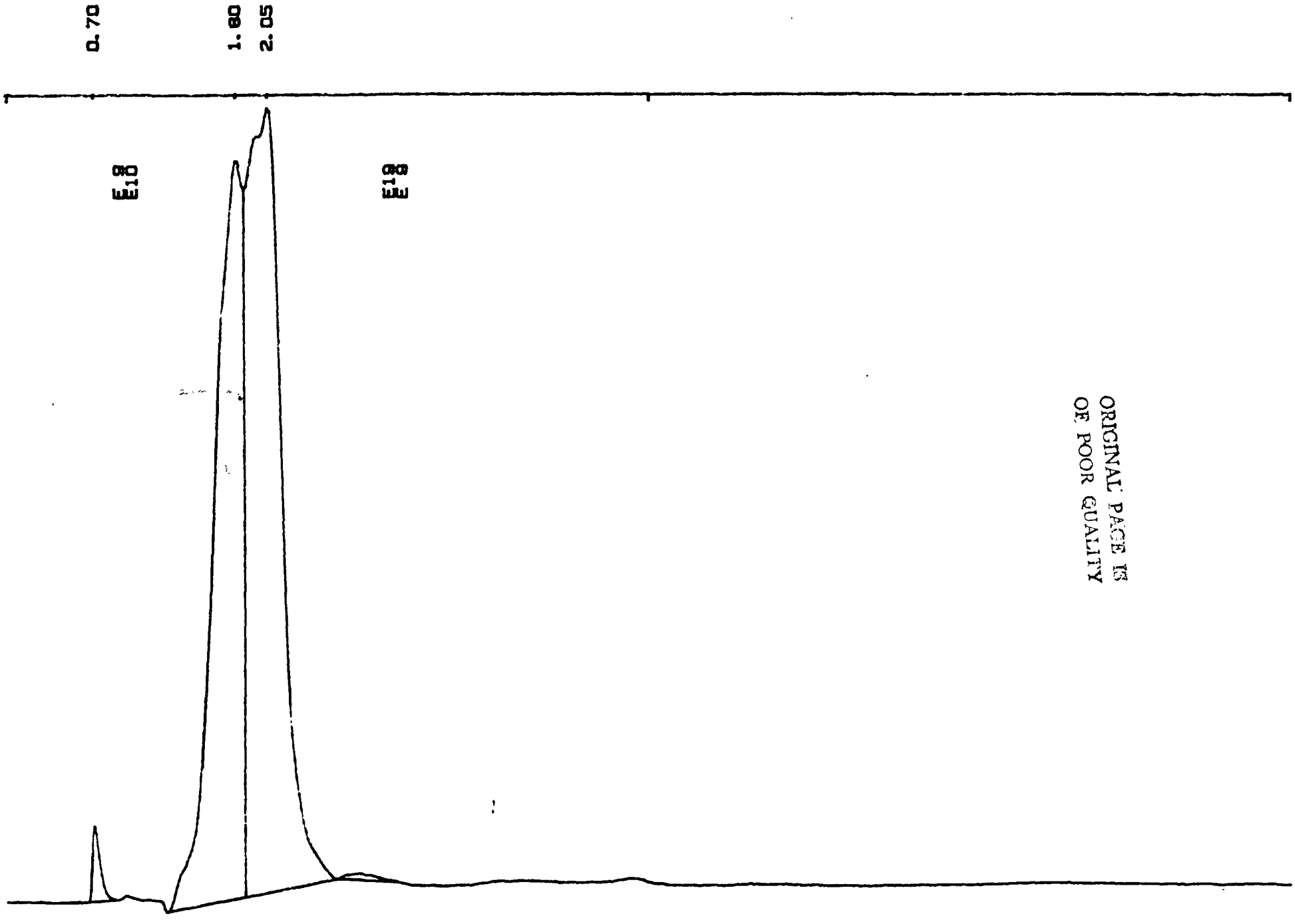


CHART 9B

FILE A:PHEND19.HDR TAKEN 09-01-1986 13:18:26

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

```
**********************************************************************
mple Name: USP39A,1-2,C=5.07                  Operator Initials: JGZ    *
te:  09-01-1986 13:18:26 Method:PHENOLIC    DATA FILE: A:PHEND19.PTS    *
terface: 4                Cycle#:  19        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
```

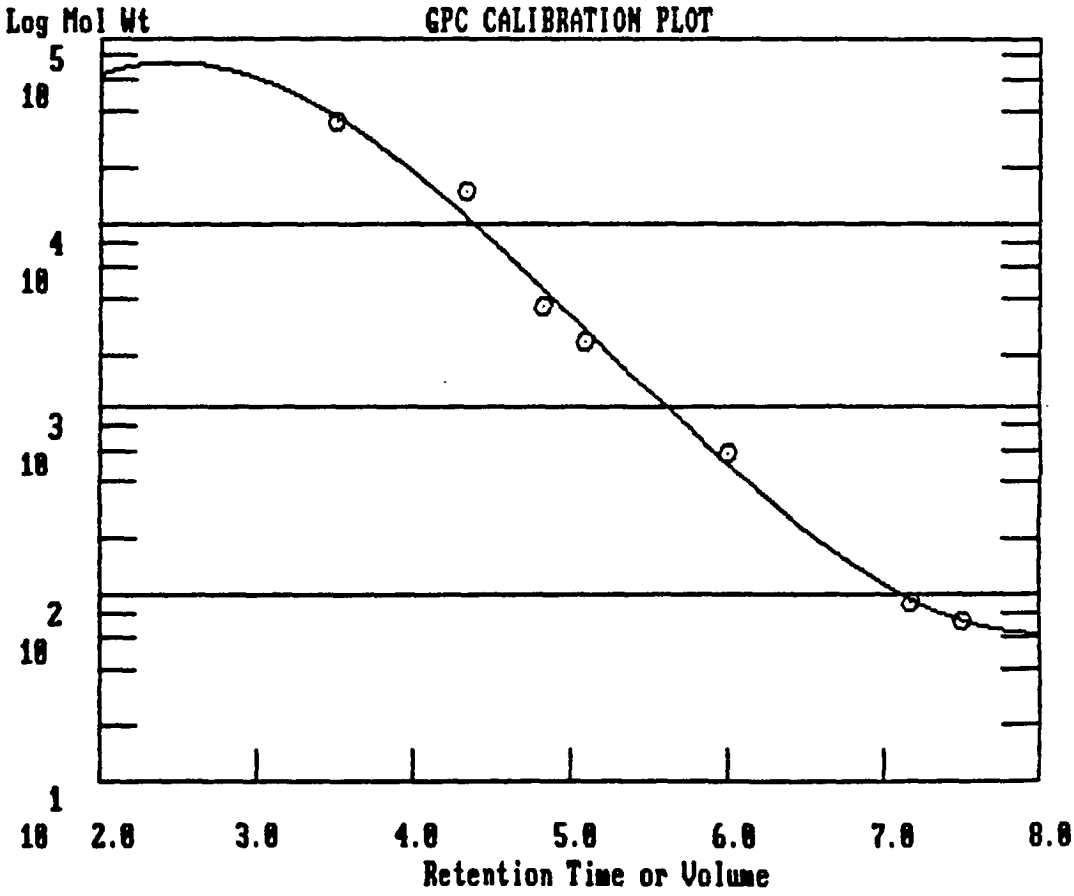
Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
0.76	4065	2.2807	1	1019	5.202	4.0
1.78	78141	43.8419	2	5072	100.000	15.4
1.93	34258	19.2209	2	5165	43.841	6.6
2.03	61769	34.6565	2	5379	79.049	11.5

```
al Area:      178233   Area Reject:      1000  One sample per   1.000 sec.
```

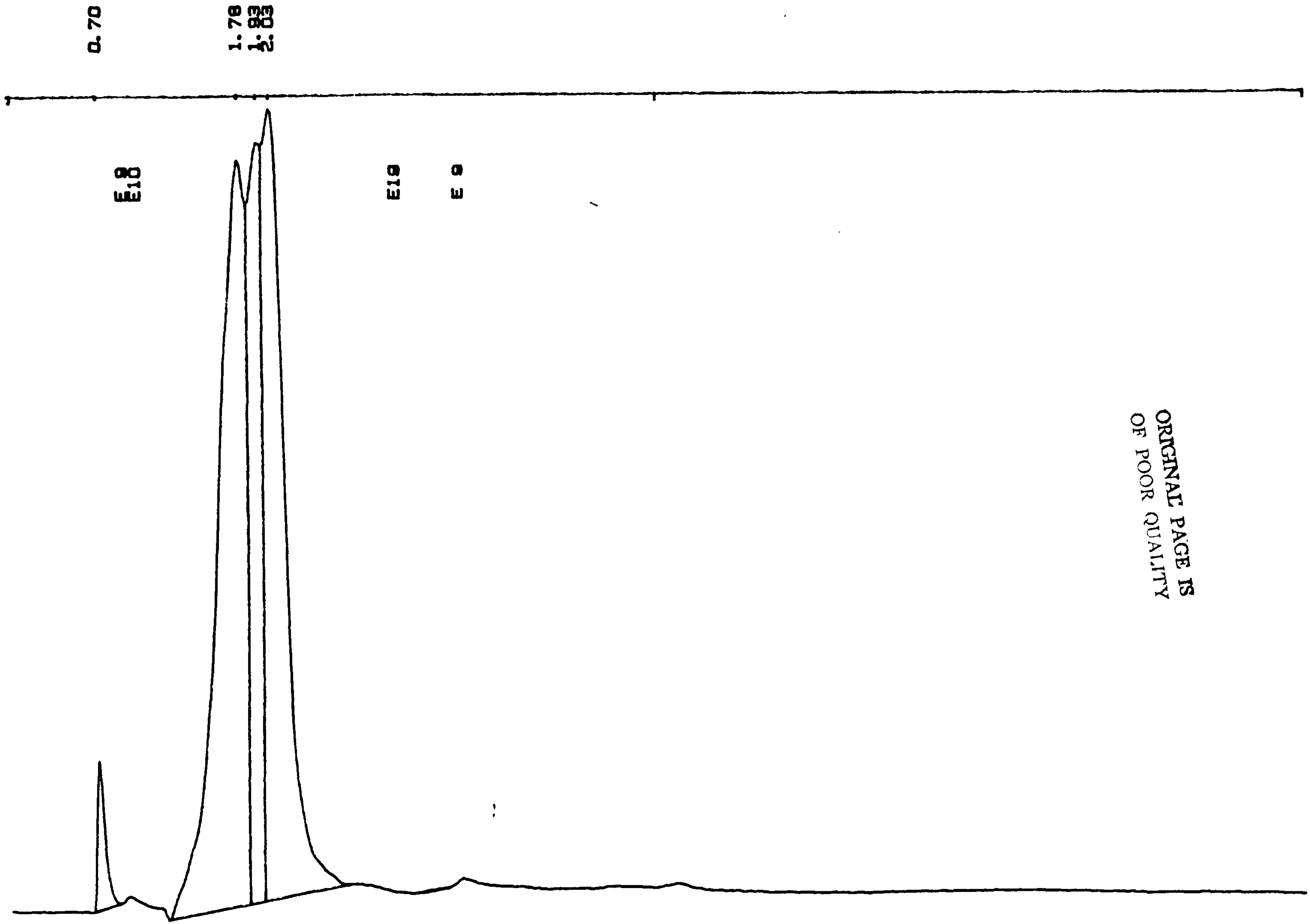
*** Calibration Data ***
Calibration Name:
Misc Information:

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



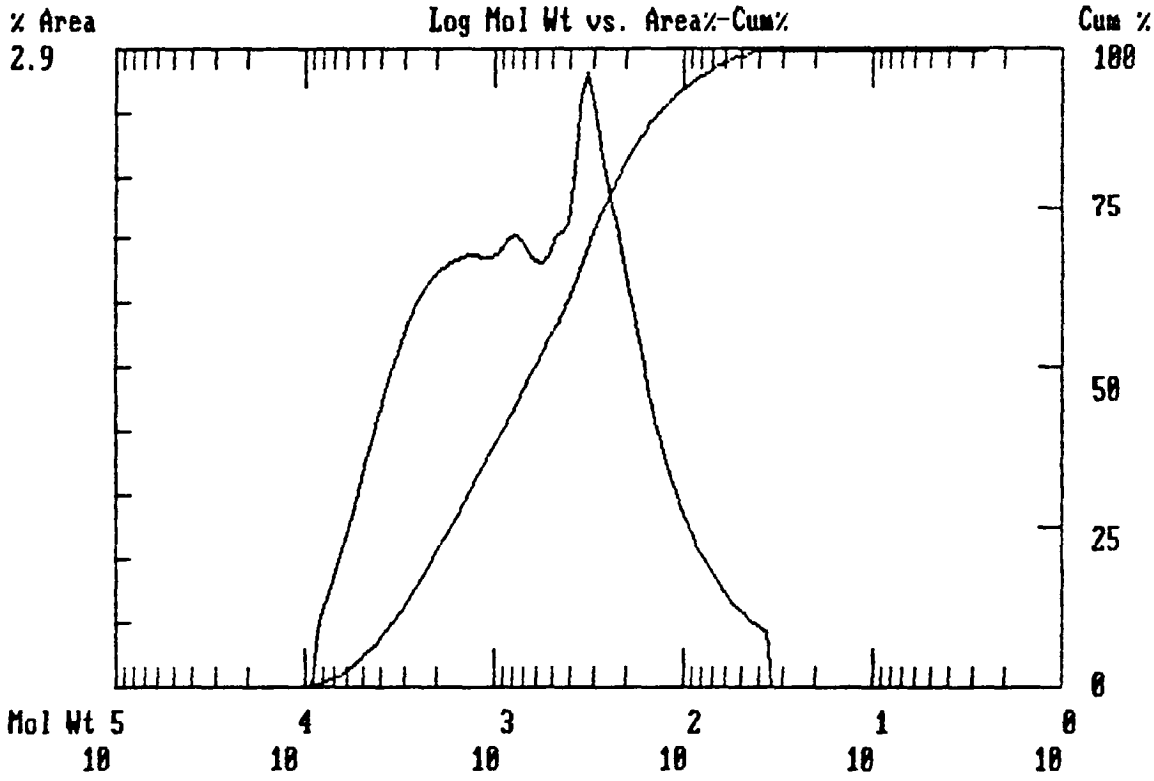
DATA FILE=PHENO19 FROM 0.00 MIN. TO ...
USP-39A, 1-2, C=5.07 MG/ML, 9/2/86, JGZ



9 FILE A:GPC31.HDR TAKEN 08-05-1986 17:39:57

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

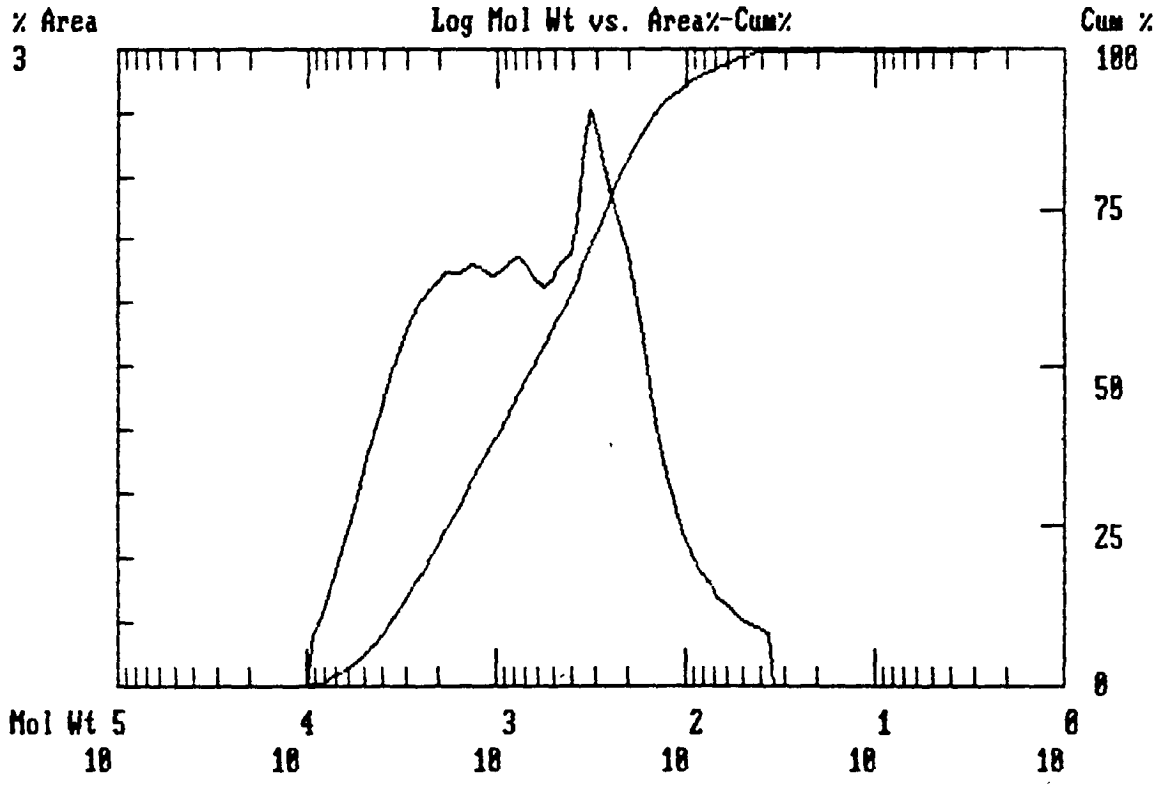
```
**********************************************************************
ample Name: USP39A 1-1=2.68                  Operator Initials: GBF      *
ate:  08-05-1986 15:00:24 Method:            DATA FILE: A:GPC31.PTS      *
nterface: 5               Cycle#:  31        Channel#: 0    Vial#: N.A.  *
tarting 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:       211188
                 1231
                  312
Mn=            3.9362
                 3069
                 1076
```



FILE A:GPC32.HDR TAKEN 08-05-1986 17:44:23

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

```
**********************************************************************
mple Name: USP39A 1-2=2.68                  Operator Initials: GBF      *
te:  08-05-1986 15:15:18 Method:            DATA FILE: A:GPC32.PTS      *
terface: 5              Cycle#:  32         Channel#: 0    Vial#: N.A.  *
arting Peak Width:  60  Threshold:  0                                   *
**********************************************************************
nstrument 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                                  *
**********************************************************************
ting 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
ess  TIMES:     3.85 to   10.00   MW:      22295 to          2
al Area:       211824
                 1291
                  324
Mn=            3.9783
                 3246
                 1126
```



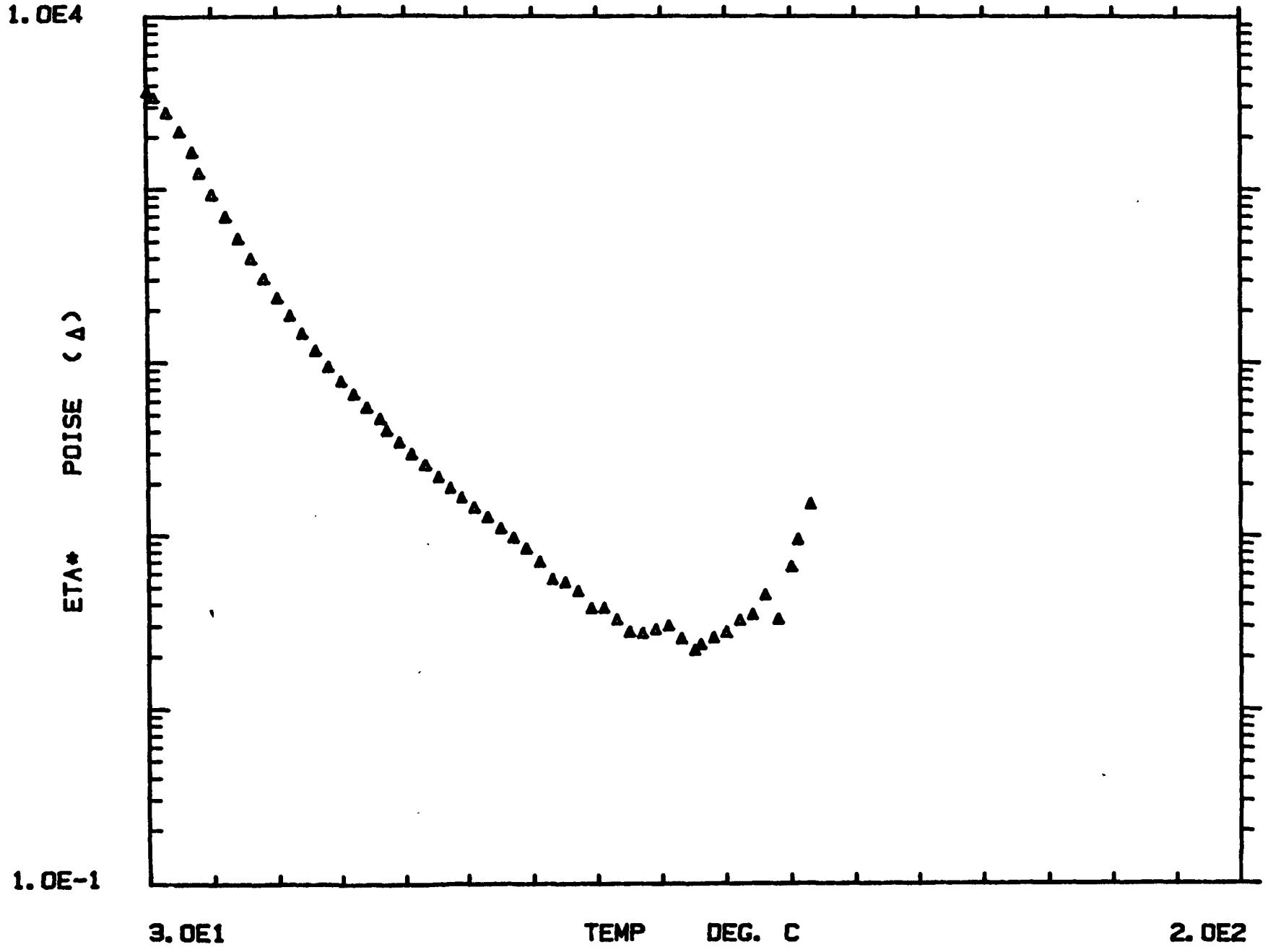

NASA FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT1-1
1.0E4
1.0E-1
ETA* POISE (Δ)
3.0E1
TEMP DEG. C
2.0E2

CHART 14A

Rheometrics RECAP II

-iment No. : 8 Sample No. : 1

e:
FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT1-1

ator :CP

and Time : Monday, August 18, 1986 - 15:30:51

ating Mode : DYNAMIC

p Type : CURE

etry : DISH & PLATE
RADIUS : 25.00
GAP : 0.50

s :
IN =50%
UENCY =10 RAD/SEC

A FINGERPRINT VISCOSITY PROFILE USP 79A RESIN NASA LOT1-1

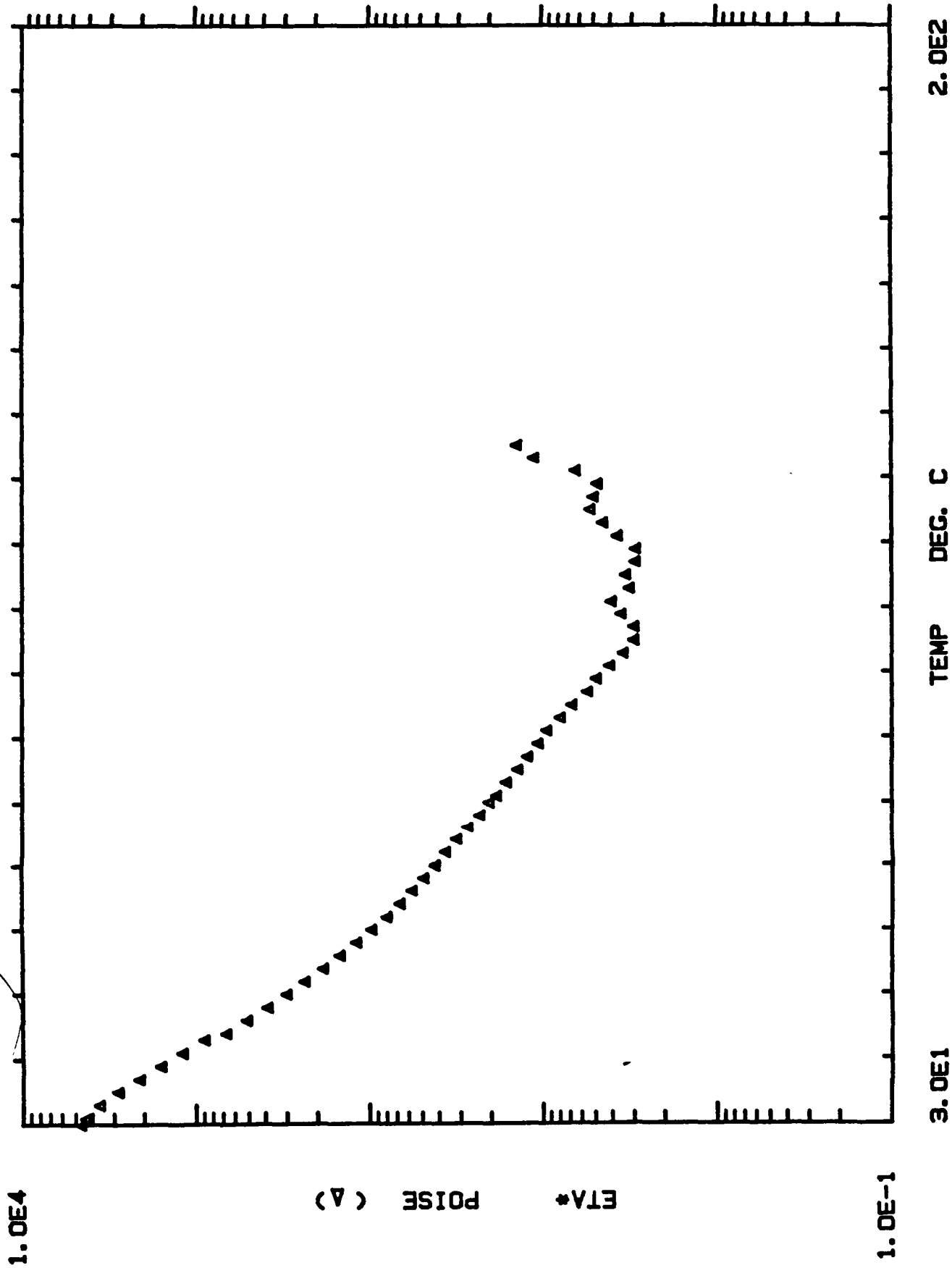
.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	3.813e+003	3.813e+003	6.049e+001	4.876e+002	0.000e-001	3.000e+001
2	3.514e+003	3.514e+003	6.792e+001	4.490e+002	1.000e+000	3.100e+001
3	2.873e+003	2.873e+003	4.505e+001	3.658e+002	2.000e+000	3.200e+001
4	2.233e+003	2.232e+003	4.101e+001	2.837e+002	3.000e+000	3.500e-001
5	1.691e+003	1.690e+003	3.527e+001	2.144e+002	4.000e+000	3.700e+001
6	1.277e+003	1.277e+003	3.445e+001	1.615e+002	5.000e+000	3.800e+001
7	9.594e+002	9.588e+002	3.542e+001	1.211e+002	6.000e+000	4.000e+001
8	7.177e+002	7.169e+002	3.398e+001	9.048e+001	7.000e+000	4.200e+001
9	5.372e+002	5.369e+002	2.240e+001	6.768e+001	8.000e+000	4.400e+001
0	4.111e+002	4.104e+002	2.378e+001	5.171e+001	9.000e+000	4.600e+001
1	3.153e+002	3.144e+002	2.382e+001	3.963e+001	1.000e+001	4.800e+001
2	2.442e+002	2.432e+002	2.197e+001	3.070e+001	1.100e+001	5.000e+001
3	1.934e+002	1.921e+002	2.359e+001	2.429e+001	1.200e+001	5.200e+001
4	1.529e+002	1.514e+002	2.136e+001	1.921e+001	1.300e+001	5.400e-001
5	1.214e+002	1.200e+002	1.858e+001	1.524e+001	1.400e+001	5.600e+001
6	9.808e+001	9.666e+001	1.659e+001	1.232e+001	1.500e+001	5.800e+001
7	8.082e+001	7.951e+001	1.448e+001	1.015e+001	1.600e+001	6.000e+001
8	6.811e+001	6.697e+001	1.242e+001	8.554e+000	1.700e+001	6.200e+001
9	5.720e+001	5.620e+001	1.064e+001	7.178e+000	1.800e+001	6.400e+001
0	4.908e+001	4.819e+001	9.274e+000	6.157e+000	1.900e+001	6.600e+001
1	4.220e+001	4.139e+001	8.182e+000	5.291e+000	2.000e+001	6.700e+001
2	3.613e+001	3.546e+001	6.922e+000	4.536e+000	2.100e+001	6.900e+001
3	3.089e+001	3.033e+001	5.841e+000	3.879e+000	2.200e+001	7.100e+001
4	2.675e+001	2.623e+001	5.276e+000	3.358e+000	2.300e+001	7.300e+001
5	2.282e+001	2.244e+001	4.144e+000	2.867e+000	2.400e+001	7.500e+001
6	1.974e+001	1.940e+001	3.659e+000	2.477e+000	2.500e+001	7.700e+001
7	1.732e+001	1.699e+001	3.366e+000	2.175e+000	2.600e+001	7.900e+001
8	1.517e+001	1.488e+001	2.933e+000	1.903e+000	2.700e+001	8.100e+001
9	1.335e+001	1.317e+001	2.145e+000	1.676e+000	2.800e+001	8.300e+001
0	1.149e+001	1.132e+001	1.950e+000	1.442e+000	2.900e+001	8.500e+001
1	1.013e+001	9.893e+000	2.167e+000	1.272e+000	3.000e+001	8.700e+001
2	8.766e+000	8.654e+000	1.396e+000	1.100e+000	3.100e+001	8.900e+001
3	7.337e+000	7.274e+000	9.610e-001	9.215e-001	3.200e+001	9.100e+001
4	5.831e+000	5.798e+000	6.145e-001	7.324e-001	3.300e+001	9.300e+001
5	5.574e+000	5.555e+000	4.656e-001	6.994e-001	3.400e+001	9.500e+001
6	4.962e+000	4.953e+000	3.040e-001	6.234e-001	3.500e+001	9.700e+001
7	3.948e+000	3.939e+000	2.647e-001	4.954e-001	3.600e+001	9.900e+001
8	3.987e+000	3.985e+000	1.262e-001	5.009e-001	3.700e+001	1.010e+002
9	3.405e+000	3.405e+000	0.723e-001	4.275e-001	3.800e+001	1.030e+002
0	2.898e+000	2.898e+000	0.000e+000	3.642e-001	3.900e+001	1.050e+002
1	2.857e+000	2.853e+000	1.393e-001	3.589e-001	4.000e+001	1.070e+002
2	3.003e+000	2.947e+000	5.728e-001	3.770e-001	4.100e+001	1.090e+002
3	3.157e+000	2.947e+000	1.133e+000	3.967e-001	4.200e+001	1.110e+002
4	2.663e+000	2.398e+000	1.157e+000	3.342e-001	4.300e+001	1.130e+002
5	2.290e+000	1.989e+000	1.135e+000	2.874e-001	4.400e+001	1.150e+002
6	2.477e+000	2.312e+000	8.892e-001	3.106e-001	4.500e+001	1.160e+002
7	2.705e+000	2.249e+000	1.504e+000	3.394e-001	4.600e+001	1.180e+002
8	2.911e+000	2.580e+000	1.347e+000	3.653e-001	4.700e+001	1.200e+002
9	3.417e+000	3.001e+000	1.634e+000	4.284e-001	4.800e+001	1.220e+002
0	3.687e+000	3.239e+000	1.761e+000	4.625e-001	4.900e+001	1.240e+002

FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT1-1

ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
4.786e+000	4.450e+000	1.759e+000	5.999e-001	5.000e+001	1.2e0e+002
3.464e+000	3.193e+000	1.343e+000	4.344e-001	5.100e+001	1.280e+002
6.979e+000	6.453e+000	2.657e+000	8.741e-001	5.200e+001	1.300e+002
1.003e+001	9.418e+000	3.457e+000	1.25Pe+000	5.300e+001	1.310e+002
1.616e+001	1.532e+001	5.138e+000	2.025e+000	5.400e+001	1.330e+002

ORIGINAL PAGE IS
OF POOR QUALITY

CHART 14B


NASA FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT1-2
1.0E4
ETA* POISE (Δ)
1.0E-1
3.0E1
TEMP DEG. C
2.0E2

Rheometrics RECAP II

---

eriment No. : 7 Sample No. : 1

le:
9A FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT1-2

erator :CP

e and Time : Monday, August 18, 1986 - 13:42:09

erating Mode : DYNAMIC

eep Type : CURE

ometry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

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

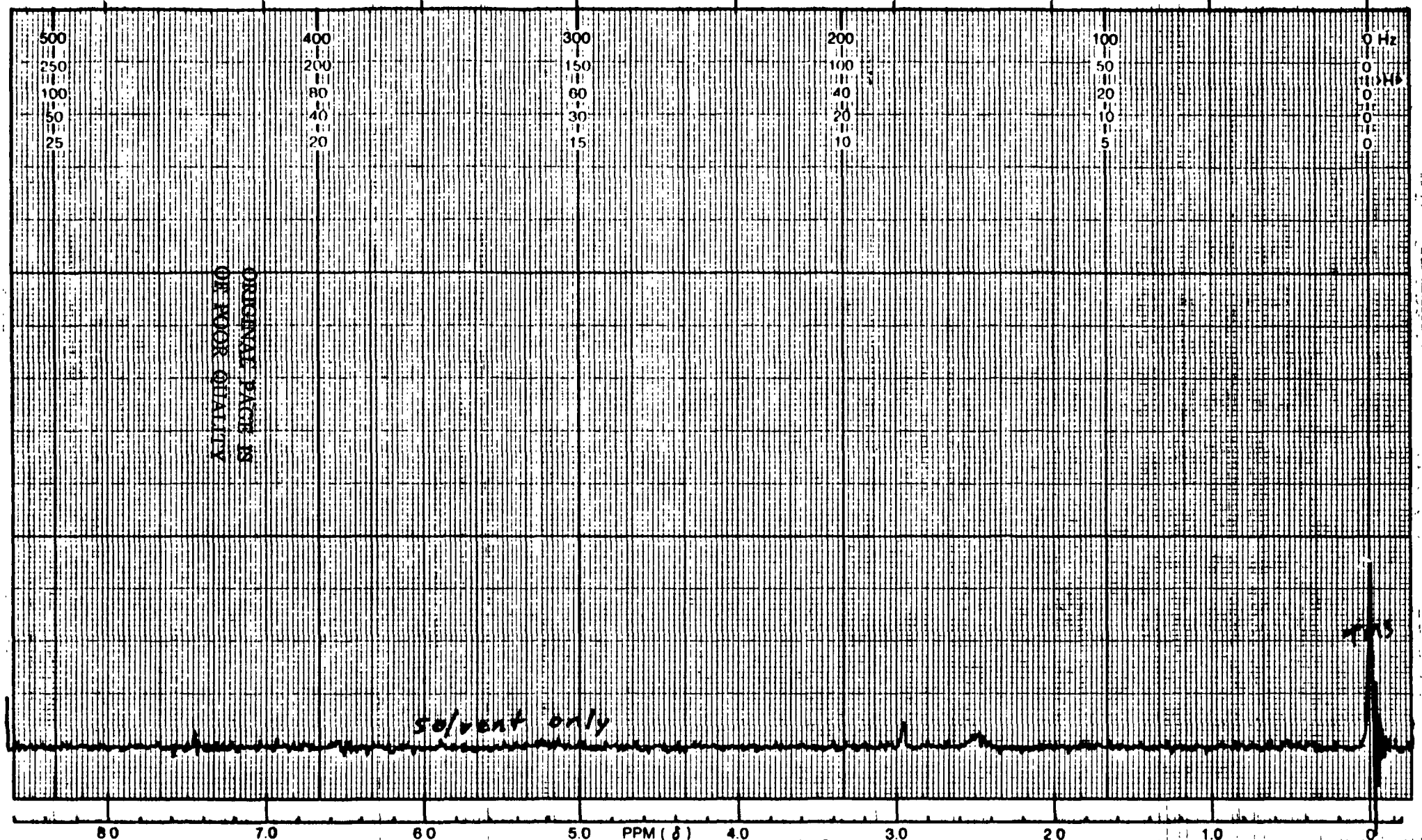
5A FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT1-2

O.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	4.660e+003	4.659e+003	9.050e+001	5.983e+002	2.000e-001	3.000e+001
2	4.371e+003	4.371e+003	6.108e+001	5.612e+002	1.000e+000	3.100e+001
3	3.598e+003	3.598e+003	5.110e+001	4.600e+002	2.000e+000	3.300e+001
4	2.798e+003	2.797e+003	3.594e+001	3.569e+002	3.000e+000	3.500e+001
5	2.107e+003	2.107e+003	3.108e+001	2.679e+002	4.000e+000	3.700e+001
6	1.583e+003	1.583e+003	3.224e+001	2.006e+002	5.000e+000	3.900e+001
7	1.190e+003	1.190e+003	3.339e+001	1.505e+002	6.000e+000	4.100e+001
8	8.865e+002	8.859e+002	3.148e+001	1.118e+002	7.000e+000	4.300e+001
9	6.653e+002	6.647e+002	2.780e+001	8.385e+001	8.000e+000	4.400e+001
10	5.079e+002	5.071e+002	2.798e+001	6.388e+001	9.000e+000	4.600e+001
11	3.852e+002	3.844e+002	2.502e+001	4.841e+001	1.000e+001	4.800e+001
12	2.984e+002	2.975e+002	2.327e+001	3.747e+001	1.100e+001	5.000e+001
13	2.342e+002	2.331e+002	2.289e+001	2.939e+001	1.200e+001	5.200e+001
14	1.840e+002	1.827e+002	2.245e+001	2.308e+001	1.300e+001	5.400e+001
15	1.473e+002	1.458e+002	2.022e+001	1.848e+001	1.400e+001	5.600e+001
16	1.183e+002	1.167e+002	1.911e+001	1.484e+001	1.500e+001	5.800e+001
17	9.661e+001	9.513e+001	1.683e+001	1.211e+001	1.600e+001	6.000e+001
18	7.932e+001	7.792e+001	1.482e+001	9.949e+000	1.700e+001	6.200e+001
19	6.663e+001	6.543e+001	1.260e+001	8.349e+000	1.800e+001	6.400e+001
20	5.676e+001	5.578e+001	1.050e+001	7.120e+000	1.900e+001	6.600e+001
21	4.854e+001	4.761e+001	9.465e+000	6.078e+000	2.000e+001	6.800e+001
22	4.177e+001	4.119e+001	6.924e+000	5.237e+000	2.100e+001	7.000e+001
23	3.651e+001	3.587e+001	6.826e+000	4.579e+000	2.200e+001	7.200e+001
24	3.142e+001	3.086e+001	5.898e+000	3.941e+000	2.300e+001	7.400e+001
25	2.703e+001	2.655e+001	5.087e+000	3.392e+000	2.400e+001	7.600e+001
26	2.308e+001	2.266e+001	4.377e+000	2.874e+000	2.500e+001	7.800e+001

[illegible]	2.043e+001	2.006e+001	3.877e+000	2.564e+000	2.600e+001	[illegible]
8	1.848e+001	1.810e+001	3.730e+000	2.317e+000	2.700e+001	8.100e+001
9	1.622e+001	1.590e+001	3.207e+000	2.036e+000	2.800e+001	8.300e+001
0	1.393e+001	1.366e+001	2.742e+000	1.747e+000	2.900e+001	8.500e+001
1	1.222e+001	1.199e+001	2.325e+000	1.577e+000	3.000e+001	8.700e+001
2	1.063e+001	1.038e+001	2.294e+000	1.332e+000	3.100e+001	8.900e+001
3	9.435e+000	9.306e+000	1.554e+000	1.183e+000	3.200e+001	9.100e+001
4	7.880e+000	7.823e+000	9.476e-001	9.897e-001	3.300e+001	9.300e+001
5	6.772e+000	6.706e+000	9.418e-001	8.497e-001	3.400e+001	9.500e+001
6	5.496e+000	5.459e+000	6.397e-001	6.900e-001	3.500e+001	9.700e+001
7	4.882e+000	4.861e+000	4.551e-001	6.127e-001	3.600e+001	9.900e+001
8	4.092e+000	4.089e+000	1.699e-001	5.140e-001	3.700e+001	1.010e+002
9	3.417e+000	3.417e+000	0.000e+000	4.292e-001	3.800e+001	1.030e+002
0	2.973e+000	2.954e+000	3.373e-001	3.735e-001	3.900e+001	1.050e+002
1	2.570e+000	2.929e+000	4.913e-001	3.727e-001	4.000e+001	1.070e+002
2	3.516e+000	3.200e+000	1.458e+000	4.412e-001	4.100e+001	1.090e+002
3	4.011e+000	3.256e+000	2.343e+000	5.040e-001	4.200e+001	1.110e+002
4	3.159e+000	2.754e+000	1.547e+000	3.966e-001	4.300e+001	1.130e+002
5	3.304e+000	2.921e+000	1.544e+000	4.144e-001	4.400e+001	1.150e+002
6	2.910e+000	2.125e+000	1.988e+000	3.649e-001	4.500e+001	1.170e+002
7	2.898e+000	2.125e+000	1.971e+000	3.637e-001	4.600e+001	1.190e+002
8	3.698e+000	2.828e+000	2.383e+000	4.639e-001	4.700e+001	1.210e+002
9	4.482e+000	3.466e+000	2.817e+000	5.620e-001	4.800e+001	1.230e+002
0	5.299e+000	4.021e+000	3.451e+000	6.639e-001	4.900e+001	1.250e+002

A FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT1-2

.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	5.075e+000	4.159e+000	2.903e+000	6.364e-001	5.000e+001	1.270e+002
2	4.836e+000	3.218e+000	3.610e+000	6.067e-001	5.100e+001	1.290e+002
3	6.447e+000	5.135e+000	3.898e+000	8.098e-001	5.200e+001	1.310e+002
4	1.123e+001	9.521e+000	5.956e+000	1.411e+000	5.300e+001	1.330e+002
5	1.413e+001	1.201e+001	7.434e+000	1.773e+000	5.400e+001	1.350e+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 — (500)
FILTER: 1 2 3 4 5 6 7 8 — (2)
RF POWER LEVEL: 0.30 — (.05)

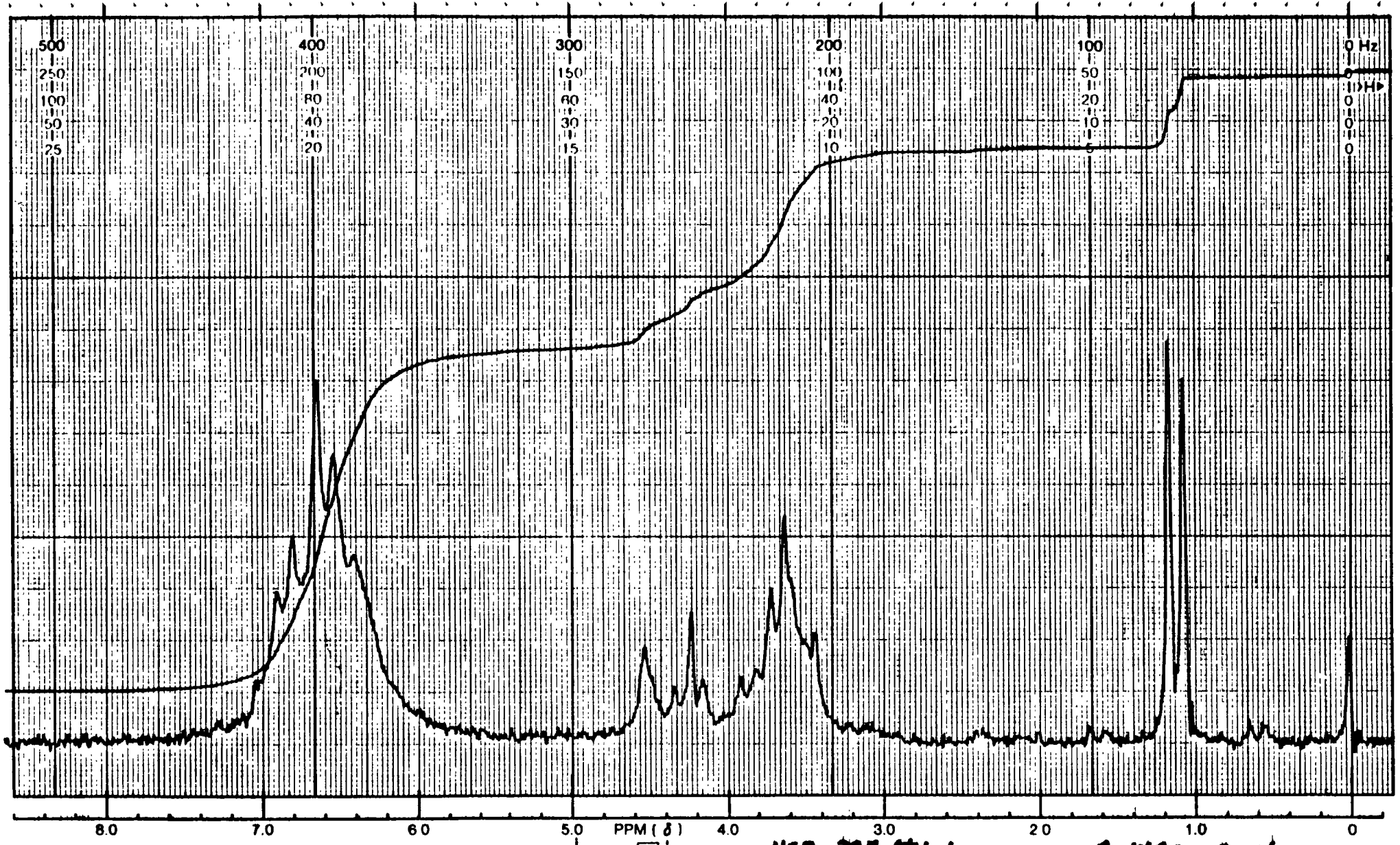
SAMPLE: Solvent
SOLVENT: Unisol-d + 0.82% TMS
DEC. LEVEL

REMARKS:

SOLVENT ONLY SCAN

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

DATE: 3-21-86 OPERATOR D&W SPECTRUM NO. 1A of 7
solvent scan



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

MANUAL

SWEEP TIME (SEC): 50 250 500 1000
SWEEP WIDTH (Hz): 25 50 100 250 500
FILTER: 1 2 3 4 5 6 7 8
RF POWER LEVEL: 0.25

AUTO ☐

(250)
(500)
(2)
(.05)

SAMPLE: USP-39A Lot 1-1
SOLVENT: Anisol-d+0.52TMS
DEC. LEVEL

REMARKS: 0.140 gm sample
0.698 gm solvent

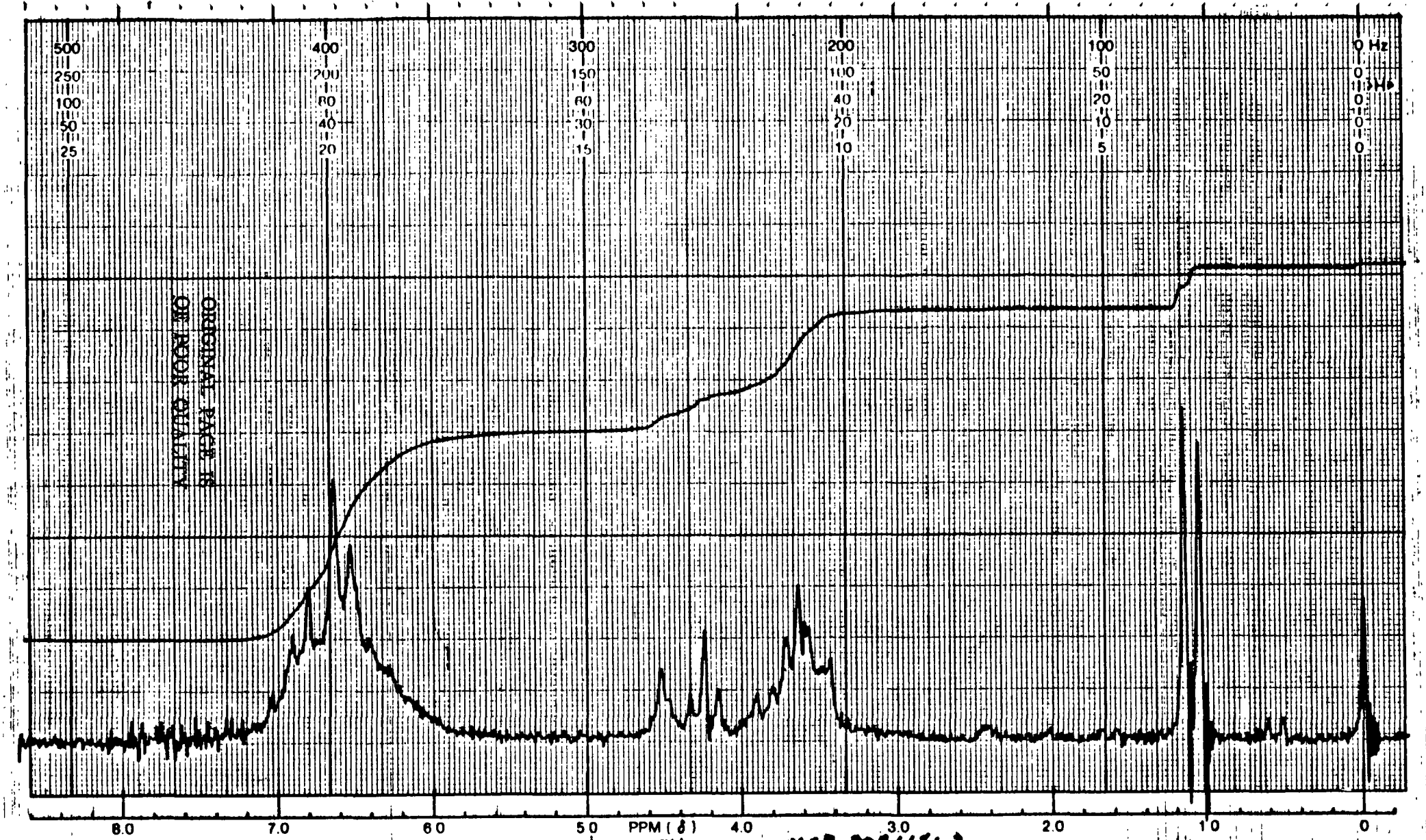
CHART 15A

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

DATE: 3-21-96

OPERATOR DGW

SPECTRUM NO. 1 of 7 USP-39A Lot #1-1



SWEEP OFFSET (Hz): 0
SPECTRUM AMPLITUDE: 8.0
INTEGRAL AMPLITUDE: 5.0
SPINNING RATE (RPS): 20

MANUAL
SWEEP TIME (SEC): 50 250 500 1000
SWEEP WIDTH (Hz): 25 50 100 250 500
FILTER: 1 2 3 4 5 6 7 8
RF POWER LEVEL: 0.25

AUTO ☐
(250)
(500)
(2)
(.05)

SAMPLE: USP-39A Lot#1-2
SOLVENT: Unisol-d + 0.5% TMS
DEC. LEVEL

REMARKS: 0.099 gm sample
0.817 gm solvent

CHART 15B

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

DATE: 3-21-96 OPERATOR DGW SPECTRUM NO. 2 of 7 USP-39A Lot #1-2

TABLE OF CONTENTS

FABRIC TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

PWB-6 Fabric for NASA Lot# 1

CHARTS

U.S. Polymeric

FABRIC TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

PWB-6 Fabric for NASA Lot# 1

		#1-1
1a. Breaking Strength, lbs/in, WARP		
ASTM D1682	PICK	48
	CENTER	47
	PLAIN	51
	AVG.	48.7
1b. Breaking Strength, lbs/in, FILL		
ASTM D1682	PICK	44
	CENTER	46
	PLAIN	49
	AVG.	46.3
2a. Carbon Assay, %		
MDQAI 5560	PICK	99.9
	CENTER	99.7
	PLAIN	99.9
	AVG.	99.83
2b. Hydrogen Assay, %		
MDQAI 5560	PICK	<.01
	CENTER	.01
	PLAIN	<.01
	AVG.	EST .004
2c. Nitrogen Assay, %		
MDQAI 5560	PICK	.1
	CENTER	.2
	PLAIN	.2
	AVG.	.13
3. Visual Inspection	See Chart 3A	
QCi-102		
4. Specific Gravity, Units		
PTM-84		1.8176
		1.8407
		1.8374
	AVG.	1.832
5. pH, Units		
CTM-24B		9.2
		9.4
	AVG.	9.3

6. TGA, °C at 50% Weight Loss	SET UP #1	
CTM-51 (AIR)	#1-1	873

See Chart 6A

HITCO MATERIALS DIVISION
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2407

PWB-6 Fabric for NASA Lot# 1

7a. Atomic Absorption, ppm
CTM-53B

	#1-1
Na	8
K	3
Ca	95
Mg	2
Li	0
AVG.	108

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

7c. Ash Content, % .087
CTM-53B

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

	#1-1
AVERAGE	9.25
Minimum	8.25
Maximum	10.80
Std. Dev	0.82

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

	#1-1
AVERAGE	9.91
Minimum	8.75
Maximum	12.20
Std. Dev	1.03

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

	#1-1
	30
	29
	28
	28
	28
AVG.	28.6

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

	25
	25
	25
	25
	25
AVG.	25.0

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

LEFT	2.342
CENTER	2.289
RIGHT	2.298
AVG.	2.310

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

LEFT	.26
CENTER	.31
RIGHT	.35
AVG.	.30

PWB-6 Fabric for NASA Lot# 1

10c. Weight Change on Acetone Wash, PTM-3A	%	#1-1
	LEFT	-.04
	CENTER	.04
	RIGHT	.04
	AVG.	.01

U.S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

USP NO. CHART 3A

DATE 3/17/86

FABRIC PWBG PANEY

MFG. STACKPOLE FABRICS LOT 1229-1

ROLL NO. 16-875A

YARDS 33

POUNDS 18.1 lbs

ORDER NO. OE71108

SPECIFICATION STD MFG CODE

Q.C. FILE # NASA #1-1

FOOTAGE

START Single

1-2 W

10 W

13 W

14 W

3 W

20 W

29 W

3 W

36 W

40 W

43

44 W 47 W

54 W 58 W

62 W

68 W 65 W

72 W

72 W

89 END

LEFT

TREATER OPERATOR READ UP

SYMBOLS

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

REMARKS

GRADE Group B

GARCIA

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OF POOR QUALITY

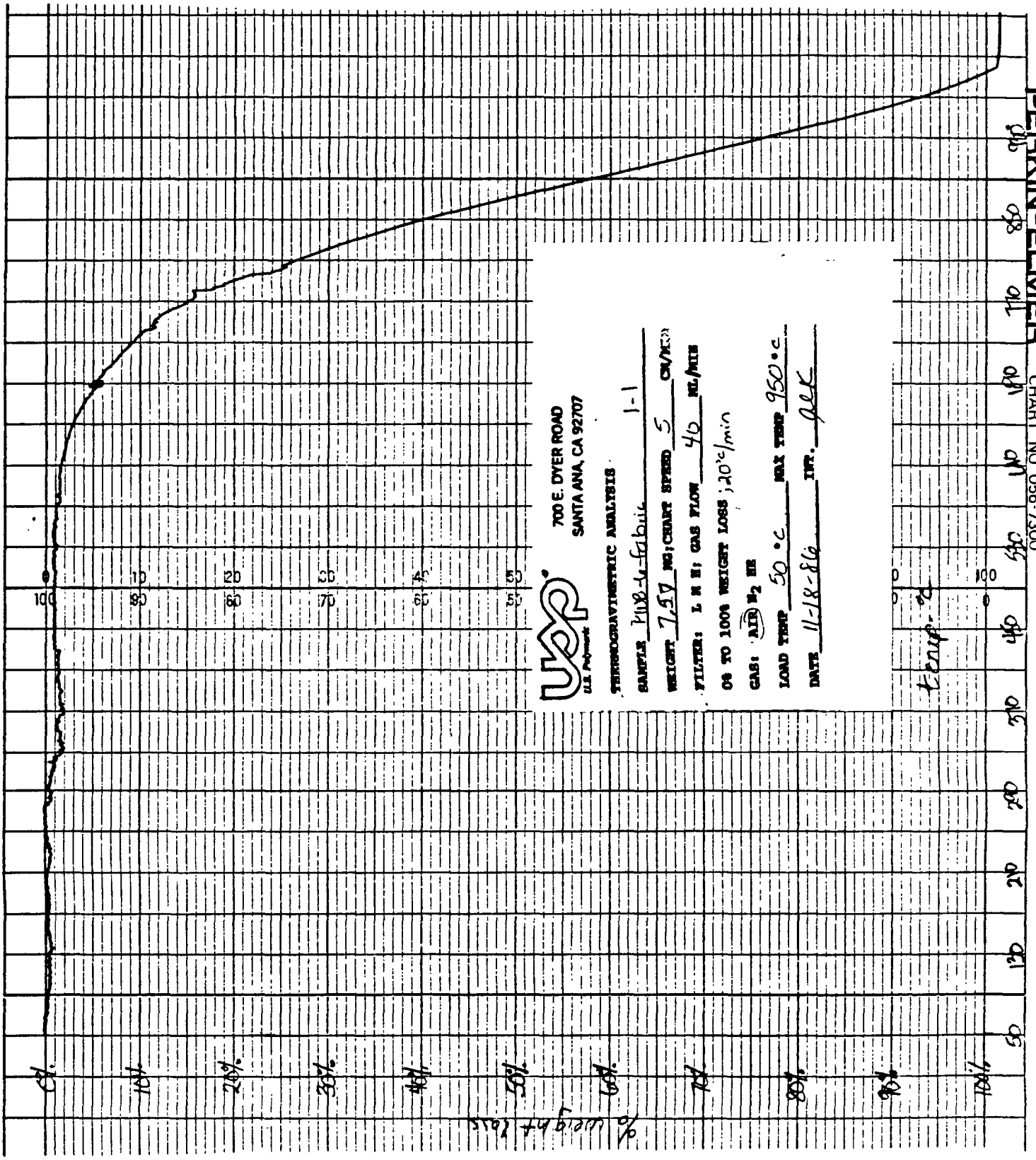

TABLE OF CONTENTS

PREPREG TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

FM 5839 NASA LOT# 1 U.S.P. LOT# C02136

CHARTS

U.S. Polymeric

PREPREG TESTING

NAS8-36298

U.S. POLYMERIC O.E.71108

FM 5839 NASA LOT# 1 U.S.P. LOT# C02136

		ROLL#1-S	ROLL#2-S
1a. Resin Content, Soxhlet, % CTM-6D		35.1	32.4
		34.7	33.0
		33.8	32.0
	AVG.	34.5	32.5
	NASA LOT# 1 AVERAGE		33.5
1b. Filler Content, Soxhlet, % CTM-6D		14.4	13.3
		14.2	13.5
		13.9	13.1
	AVG.	14.2	13.3
	NASA LOT# 1 AVERAGE		13.7
1c. Cloth Content, Soxhlet, % CTM-6D		50.5	54.3
		51.1	53.5
		52.3	54.9
	AVG.	51.3	54.2
	NASA LOT# 1 AVERAGE		52.8
2. Volatile Content, % PTM-17B		2.3	2.3
		2.2	2.2
		2.0	2.0
	AVG.	2.2	2.2
	NASA LOT# 1 AVERAGE		2.2
3. Flow, 1000 psi, % PTM-19G		14.6	10.0
		13.6	10.1
		16.3	10.9
	AVG.	14.8	10.3
	NASA LOT# 1 AVERAGE		12.6
4. Resin Content, Dry basis, % PTM-16F, Type II		34.6	33.9
		35.1	33.7
		34.9	34.7
	AVG.	34.9	33.9
	NASA LOT# 1 AVERAGE		34.4
5. Tack, lbs PTM-80		38	35
	NASA LOT# 1 AVERAGE		37
6. Gel Time, seconds PTM-20E		44	43
	NASA LOT# 1 AVERAGE		44

HITCO MATERIALS DIVISION
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2407

FM 5839 NASA LOT# 1 U.S.P. LOT# C02136

7a. Atomic Absorption, ppm CTM-53B		ROLL#1-S	ROLL#2-S	LOT#1 AVG.
	Na	5	8	7
	K	1	3	2
	Ca	13	5	9
	Mg	2	2	2
	Li	0	0	0
	TOTAL	21	18	20

7b. Moisture Content, % CTM-53B	ROLL#1-S	ROLL#2-S
	1.82	1.85
NASA LOT# 1 AVERAGE		1.84

7c. Ash Content, % CTM-53B		
	.16	.23
NASA LOT# 1 AVERAGE		.20

8. TGA, % Weight Loss at 500°C CTM-51 (Nitrogen)		
	8.0	8.8
NASA LOT# 1 AVERAGE		8.4

See chart 8A-8B

9. DSC, °C CTM-50A		ROLL#1-S	ROLL#2-S	LOT#1 AVG.
	First Temp	184	183	184

See Chart 9A-9B

10. Infrared (IRZB) Baseline CTM-21C			
	.85	.85	.85

See Chart 10A-10B

11. Environmental History

Date manufactured: 1 May 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
	1.564	1.565
	1.564	1.566
	1.565	1.568
AVG.	1.564	1.566
NASA LOT# 1 AVERAGE		1.565

13a. Tensile Strength, ksi, WARP FTMS 406-1011	ROLL#1-S	ROLL#2-S
	22.88	21.44
	23.60	21.47
	23.60	20.80
	24.86	20.53
	24.11	21.72
AVG.	23.81	21.19
NASA LOT# 1 AVERAGE		22.50

FM 5839 NASA LOT# 1 U.S.P. LOT# C02136

		ROLL#1-S	ROLL#2-S
13b. Tensile Modulus, msi, WARP		4.87	4.47
FTMS 406-1011		4.59	4.77
		5.10	4.65
		4.98	4.56
		4.86	4.64
	AVG.	4.88	4.62
	NASA LOT# 1 AVERAGE		4.75
13c. Tensile Elongation, %, WARP		.86	.82
FTMS 406-1011		1.10	.95
		1.06	1.00
		1.00	.82
		1.01	.84
	AVG.	1.01	.89
	NASA LOT# 1 AVERAGE		.95
14a. Flexural Strength, ksi, WARP		37.10	34.88
FTMS 406-1031		37.21	36.95
		37.10	35.46
		37.39	34.00
		39.28	34.45
	AVG.	37.62	35.15
	NASA LOT# 1 AVERAGE		36.38
14b. Flexural Modulus, msi, WARP		3.64	4.55
FTMS 406-1031		4.17	4.16
		4.13	3.96
		3.65	3.39
		4.28	4.26
	AVG.	3.97	4.06
	NASA LOT# 1 AVERAGE		4.02
15a. Compressive Strength, ksi, WARP		22.43	19.67
FTMS 406-1021		23.10	19.84
		22.15	19.51
		21.06	20.02
		21.52	19.11
	AVG.	22.05	19.63
	NASA LOT# 1 AVERAGE		20.84
15b. Compressive Modulus, msi, WARP		6.63	5.50
FTMS 406-1021		5.68	6.70
		5.66	5.57
		5.55	5.72
		6.37	5.27
	AVG.	5.98	5.75
	NASA LOT# 1 AVERAGE		5.87

FM 5839 NASA LOT# 1 U.S.P. LOT# C02136

		ROLL#1-S	ROLL#2-S
16. Double Shear Strength, ksi FTMS 406-1041A		3.57	4.16
		3.78	4.10
		3.57	4.03
		3.48	4.16
		3.68	3.98
	AVG.	3.62	4.09
	NASA LOT# 1 AVERAGE		3.85
17. Barcol Hardness, Units ASTM D-2583 (Average of 10 determinations)		68.2	68.0
	NASA LOT# 1 AVERAGE		68.1
18. Residual Volatiles, % PTM-98		1.82	1.55
		1.73	1.44
		1.77	1.61
	AVG.	1.77	1.53
	NASA LOT# 1 AVERAGE		1.65
19. Resin Content, Pyrolysis, % CTM-14B		31.95	31.07
		31.70	30.26
		31.28	29.56
	AVG.	31.64	30.30
	NASA LOT# 1 AVERAGE		30.97
20. Acetone Extraction, % CTM-18A		4.37	3.91
		4.67	3.80
		5.09	4.48
	AVG.	4.71	4.07
	NASA LOT# 1 AVERAGE		4.39
21a. CTE, in/in °F with PLY PTM-61B		1.22	-1.89
		-2.06	-1.73
	AVG.	-.42	-1.81
	NASA LOT# 1 AVERAGE		-1.12
21b. CTE, in/in °F Cross PLY PTM-61B		13.57	17.51
		12.38	15.37
	AVG.	12.98	16.44
	NASA LOT# 1 AVERAGE		14.71

See Chart 21A-21B

U.S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

CHART 8A

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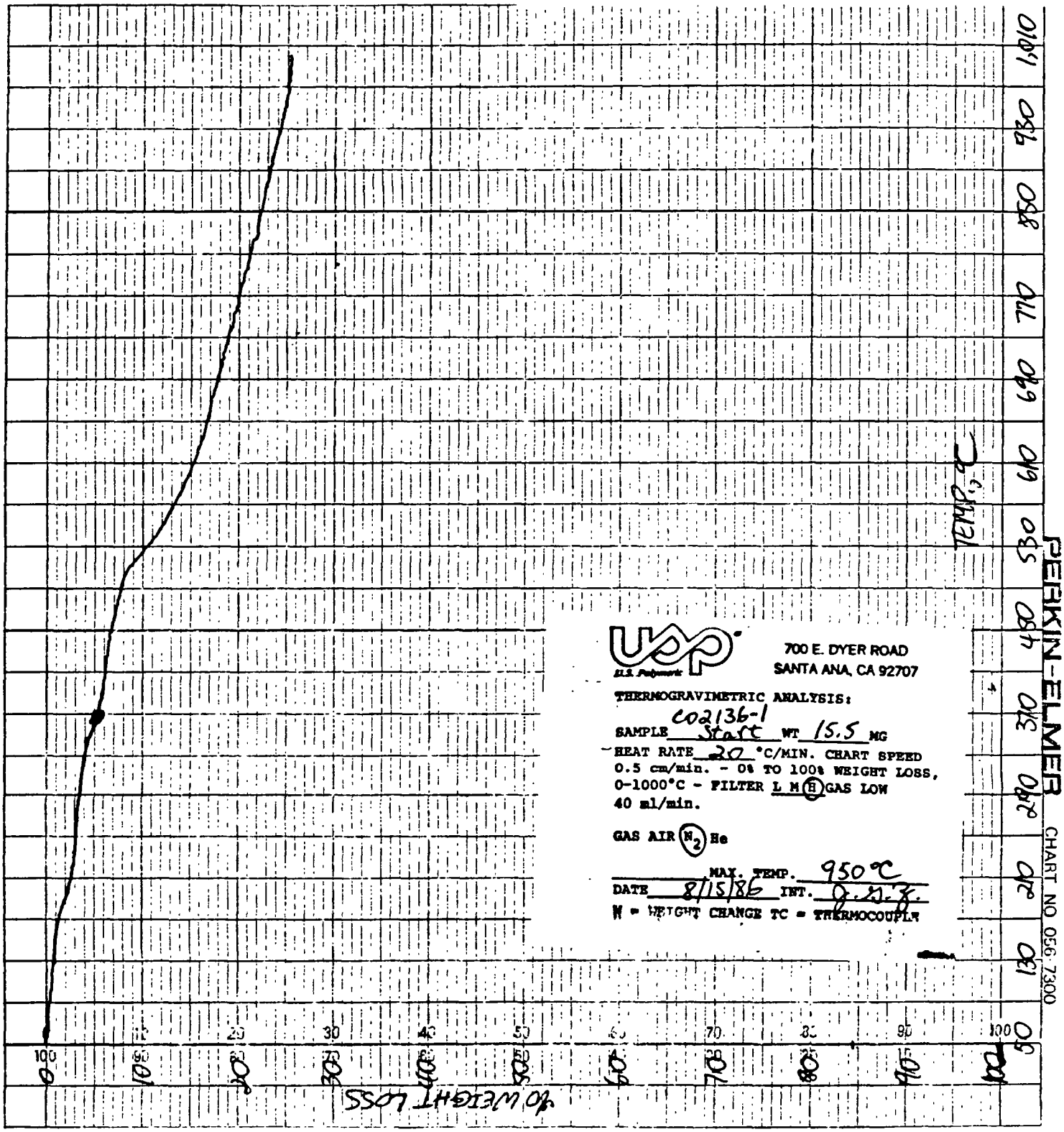
OF POOR QUALITY



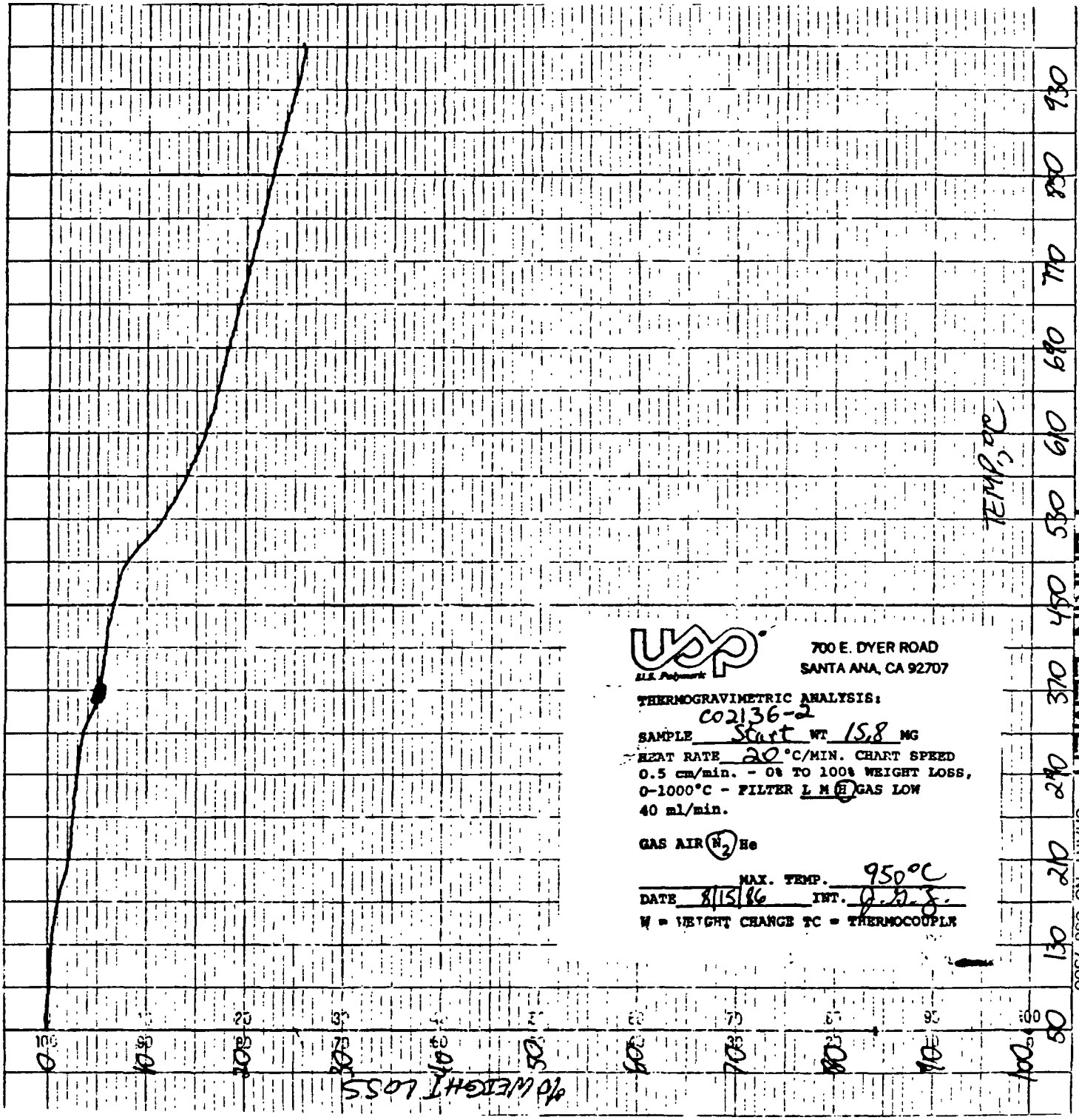


CHART 9A

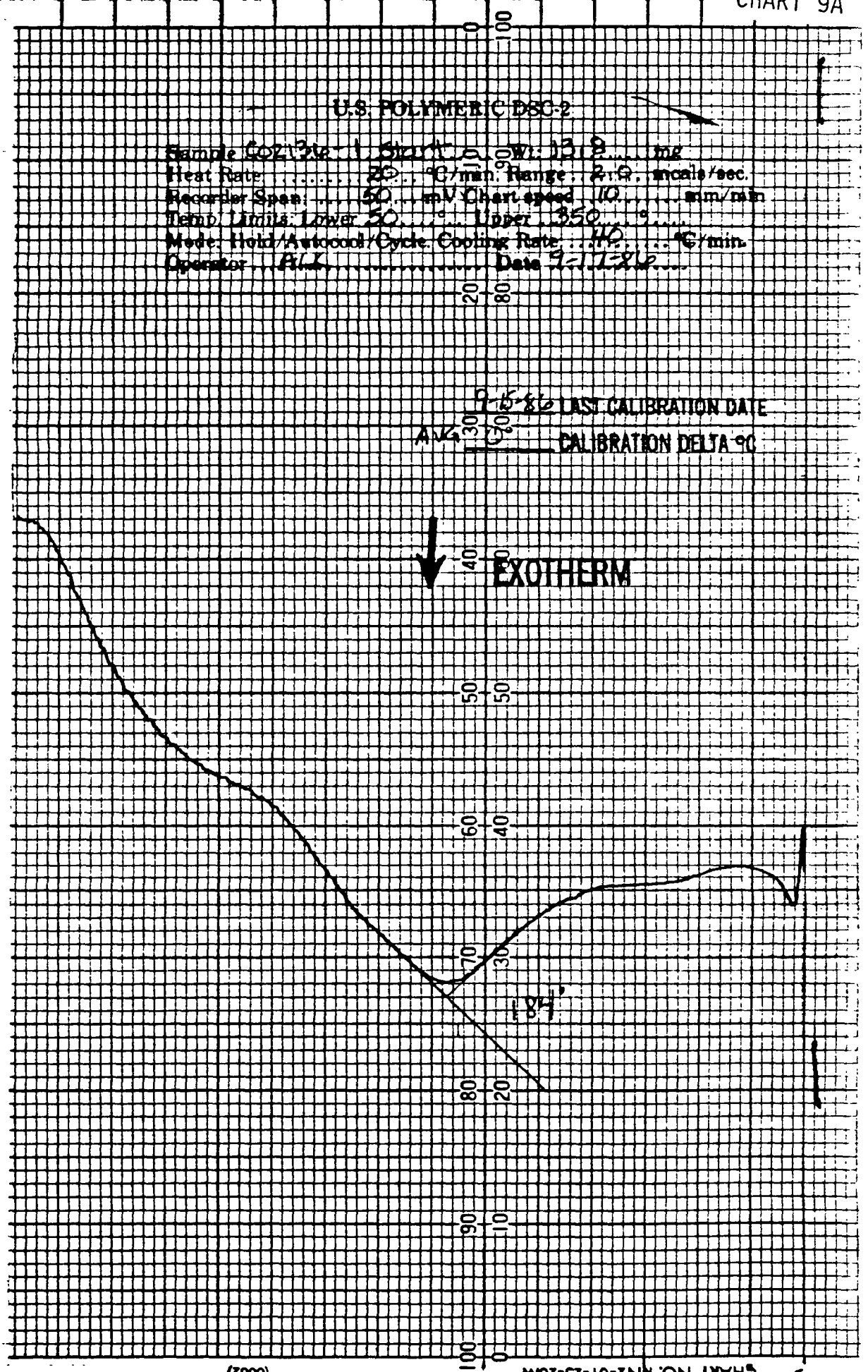
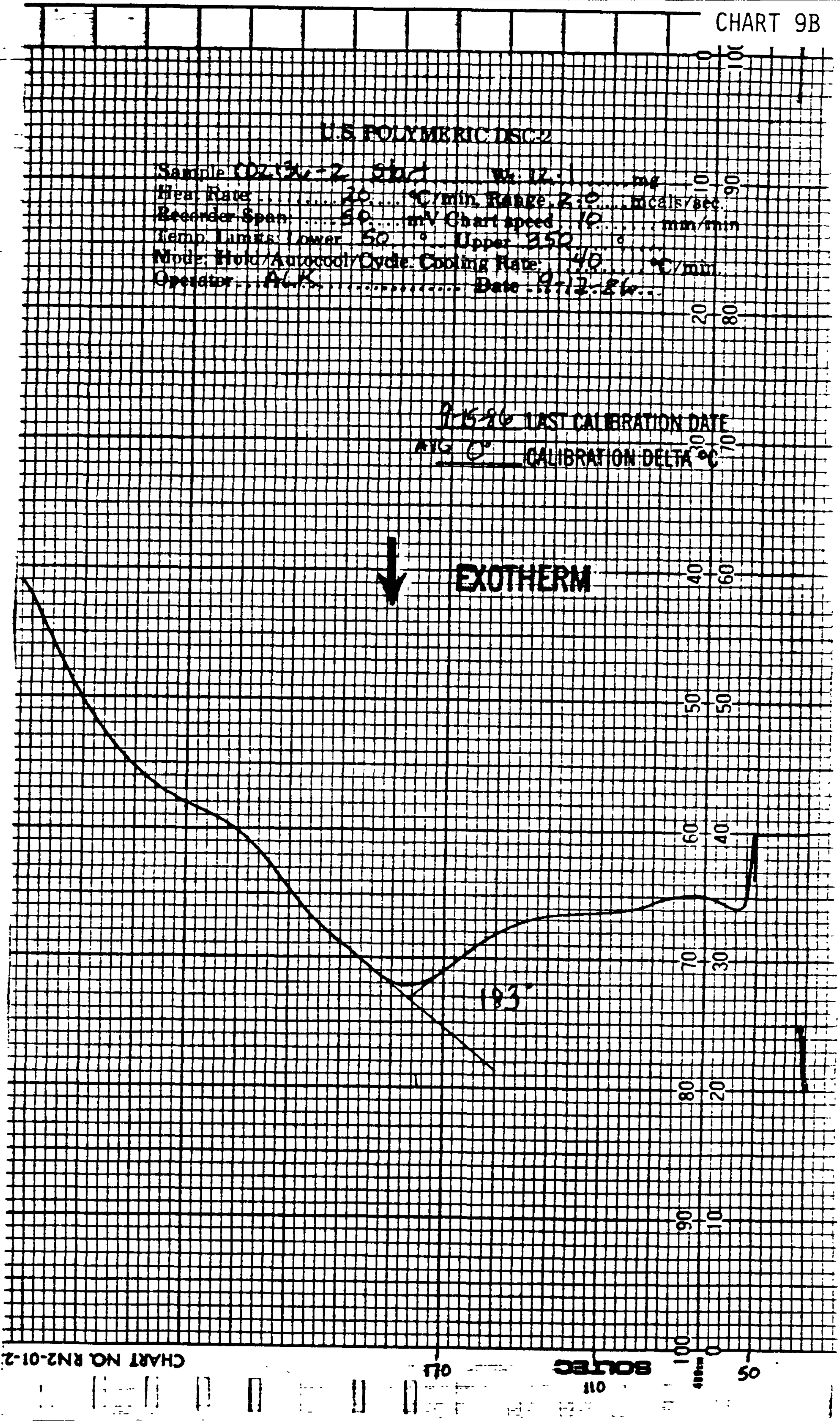


CHART 9B



SPECTRUM NO. 15199

DATE 7-08-86

SAMPLE FM 5839
CO2136 # ST-1

SOURCE

STRUCTURE

PATH 0.2 mm NACL

SOLVENT ACETONE

CONCENTRATION 30-50%T

PHASE 3

COMMENTS PRE-PREG
MATERIAL

ANALYST V. MIRANDA

Beckman®

INFRARED
SPECTROPHOTOMETER

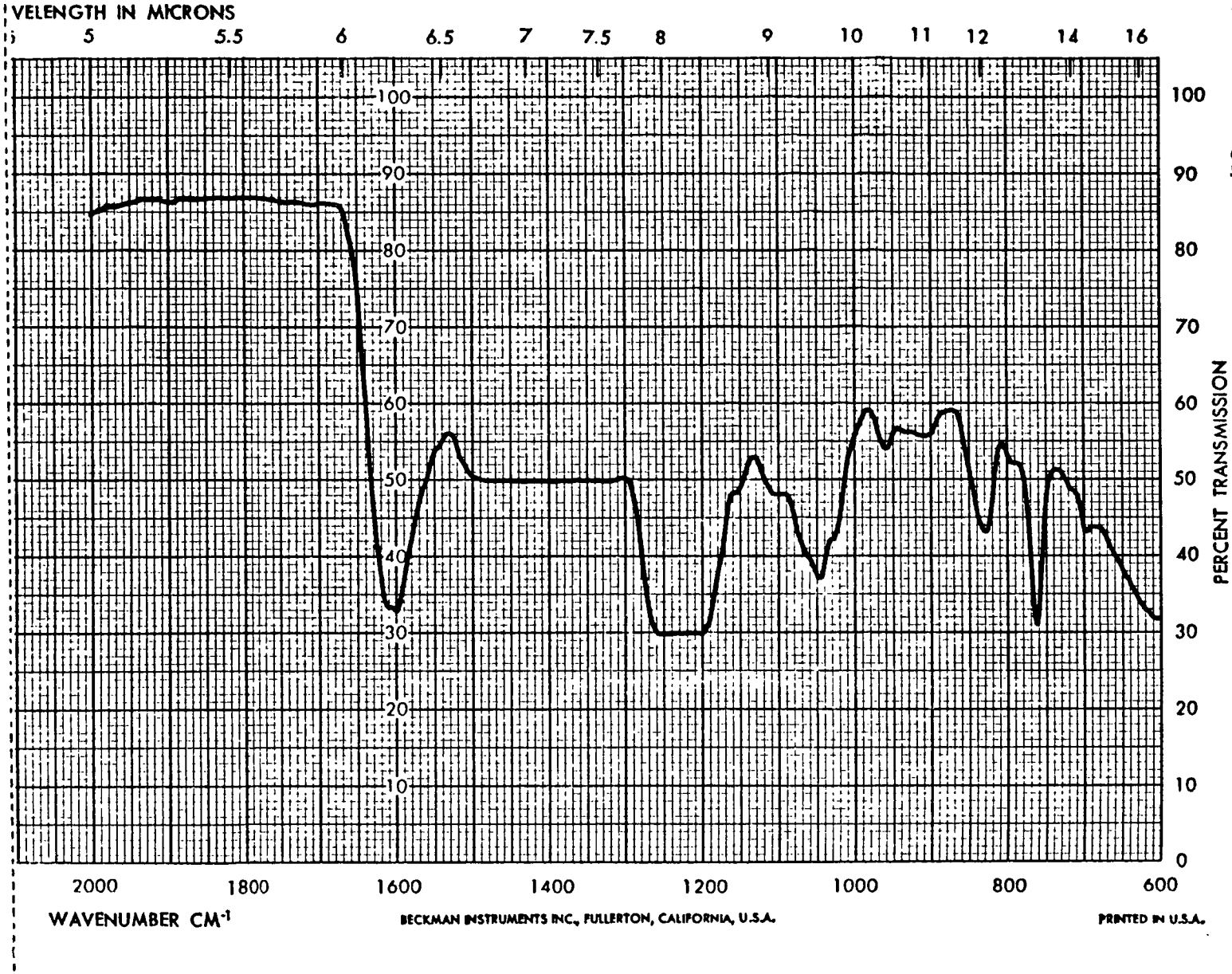


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CHART 10A

SPECTRUM NO. 15200

DATE 7-08-86

SAMPLE FM 5839

CO2136 # ST-2

SOURCE

STRUCTURE

PATH 0.2 mm NACL

SOLVENT ACETONE

CONCENTRATION 30-50%T

PHASE ?

COMMENTS PRE-PREG MATERIAL

ANALYST V. MIRANDA

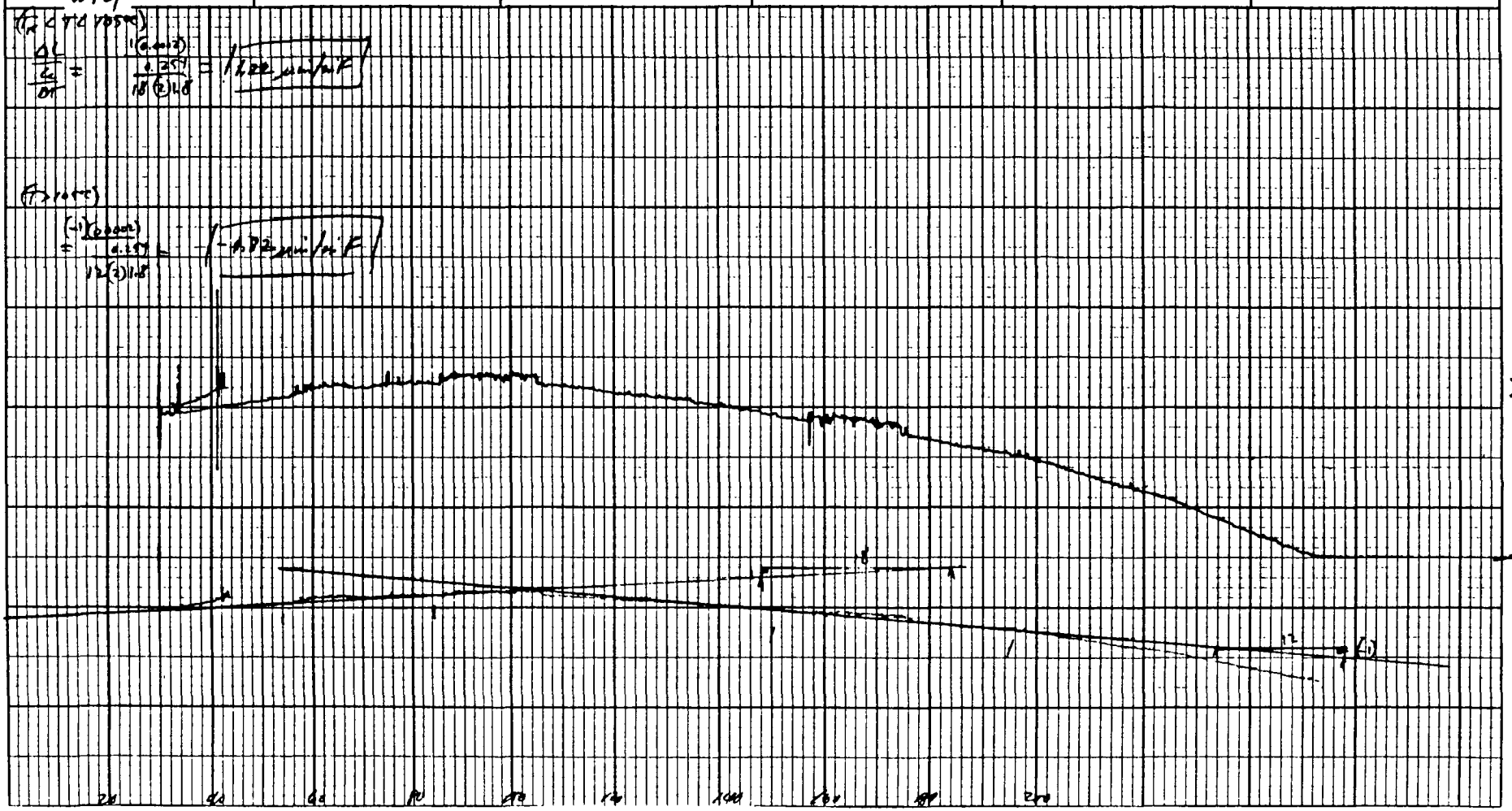
Beckman®

INFRARED SPECTROPHOTOMETER

CHART 10B

PART NO. 990088

RUN NO ___ DATE 9/24/94	T-AXIS	DTA-DSC	TGA	TMA	
OPERATOR TH	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	
Co2136-1-Smar-(1)	HEAT / COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.254	
ATM Air @ STP	SHIFT, in 0	REFERENCE	TIME CONST, sec	LOAD, g 10	
FLOW RATE 3-5 SCFH			dY, (mg/min) /in	dY, (10X), (mils/min)/in	
W PLY					



DUPONT Instruments

MEASURED VARIABLE

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Chart 21A1

PART NO. 990088

RUN NO ___ DATE 9/22/88	T-AXIS	DTA-DSC	TGA	TMA	
OPERATOR TH	SCALE, °C/in 50 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/0.2	
SAMPLE CO2136-1-sman-(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 0.253	
FLOW RATE 1-55cc	SHIFT, in 0	REFERENCE	TIME CONST, sec	LOAD, g 10	
w/Ar			dY, (mg/min)/in	dY, (10X), (mils/min)/in	

DUPONT Instruments

MEASURED VARIABLE

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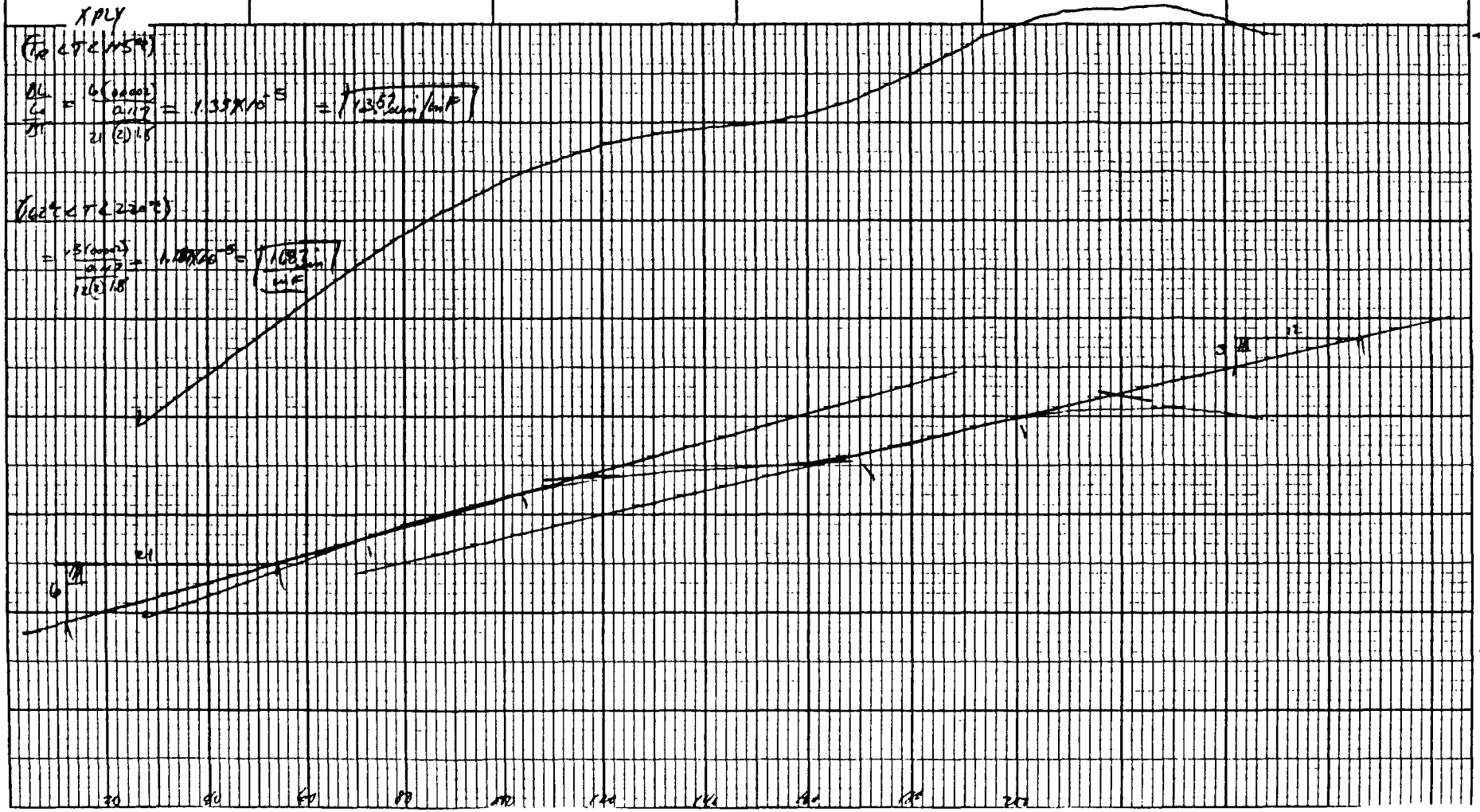
Chart 21A2

PART NO. 990068

RUN NO ___ DATE 9/15/94	T-AXIS	DTA-DSC	TGA	TMA	
OPERATOR TJ	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	
C02136-1-3mat-4	HEAT ✓ COOL ___ ISO	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.117	
ATM Air @ 50	SHIFT, In 0	REFERENCE	TIME CONST, sec	LOAD, g 10	
FLOW RATE 3-5scfh			dY, (mg/min) /in	dY, (10X) (mils/min) /in	

XPLY



DUPONT Instruments

MEASURED VARIABLE

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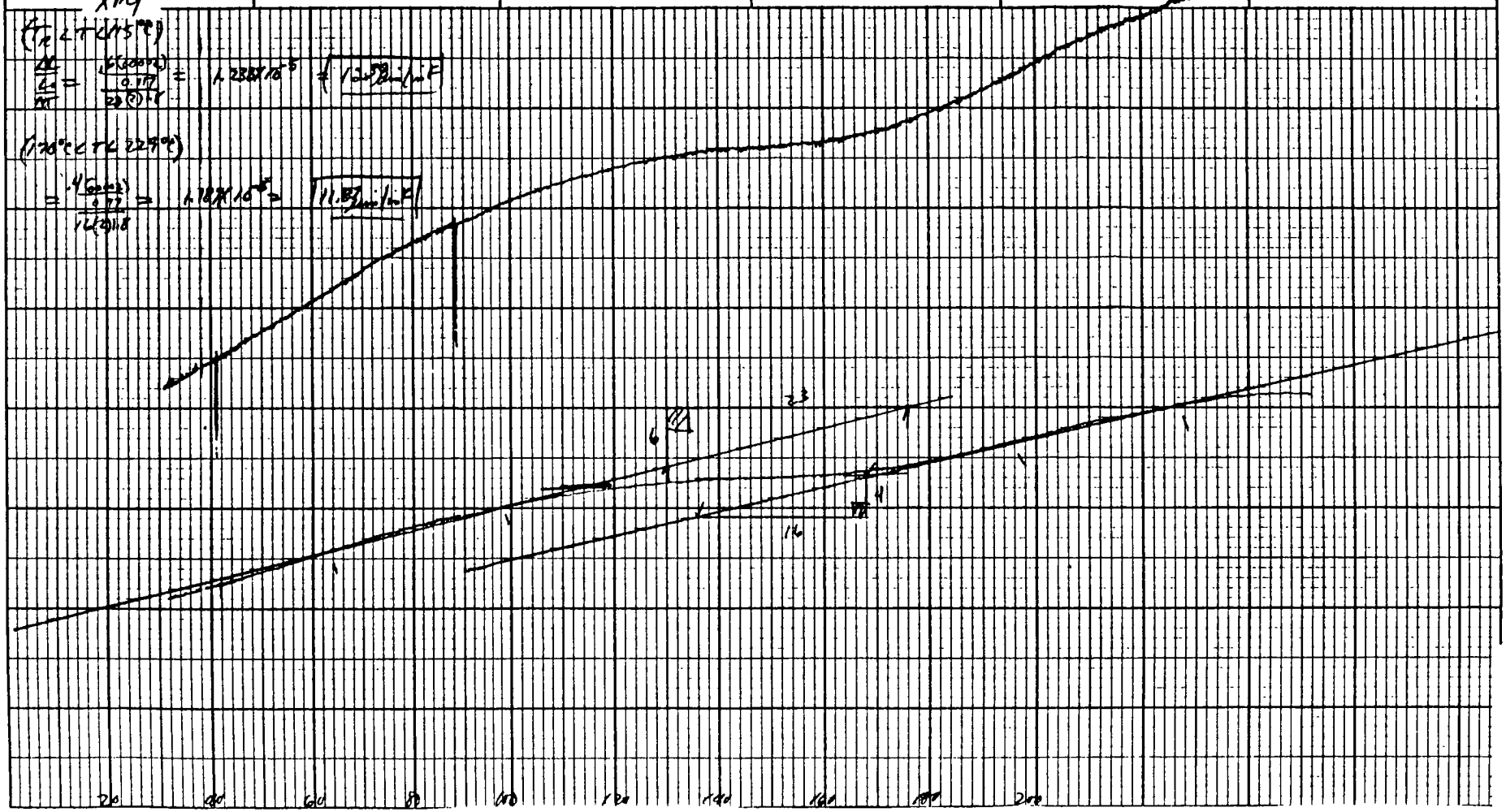
Chart 21A3

PART NO. 990088

RUN NO ___ DATE 9/19/86	T-AXIS	DTA-DSC	TGA	TMA	
OPERATOR DH	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	
C02136-1-SMART-(5)	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.117	
ATM Air @ STP	SHIFT, in 0	REFERENCE	TIME CONST, sec	LOAD, g 10	
FLOW RATE 2.55 LPH			dY, (mg/min) /in	dY, (10X), (mils/min)/in	

XPLY



MEASURED VARIABLE

DUPONT Instruments

Chart 21A4

Chart 21B1

PART NO. 990088

RUN NO ___ DATE 9/11/84
OPERATOR DL
SAMPLE
Co2136-2-Smax-(1)
ATM Air @ 50cc
FLOW RATE 3-55cc/m

T-AXIS
SCALE, °C/in 3820
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 ___

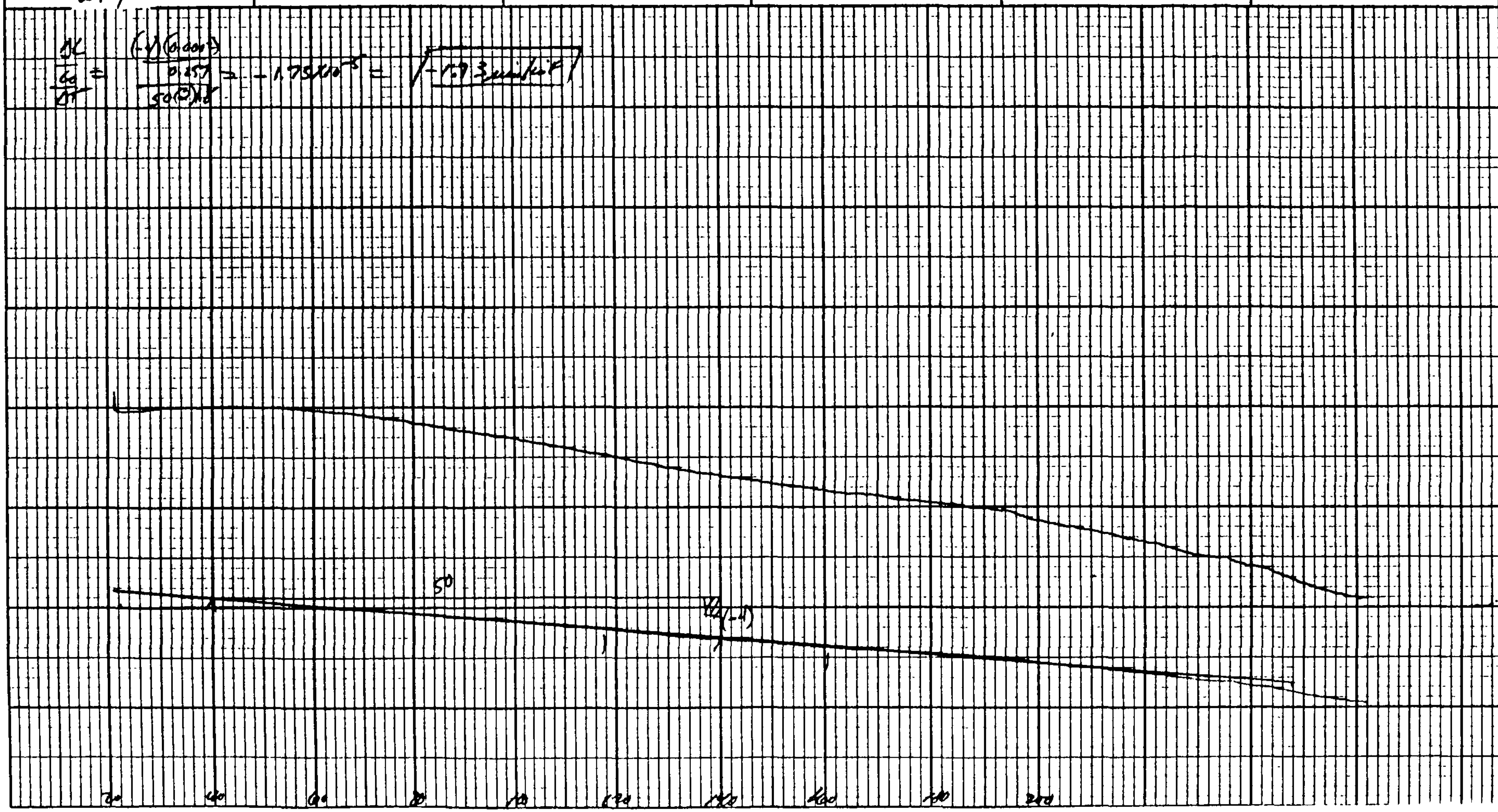
TMA
SCALE, mils/in 0.1/0.1
MODE Expansion
SAMPLE SIZE 0.256
LOAD, g 10
dY/dt [10X] [mils/min]/in ___

MEASURED VARIABLE

DUPONT Instruments

PART NO. 990088

RUN NO ____ DATE 9/20/84	T-AXIS	DTA-DSC	TGA	TMA	
OPERATOR TH	SCALE, °C/in 50 20	SCALE, °C/in ____	SCALE, mg/in ____	SCALE, mils/in 0.1/0.2	
SAMPLE: C02136-2-START-(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 0.257	
FLOW RATE 3-5SCFH	SHIFT, in 0	REFERENCE ____	TIME CONST, sec ____	LOAD, g 0	
WPY			dY, (mg/min)/in ____	dY,(10X),(mils/min)/in ____	

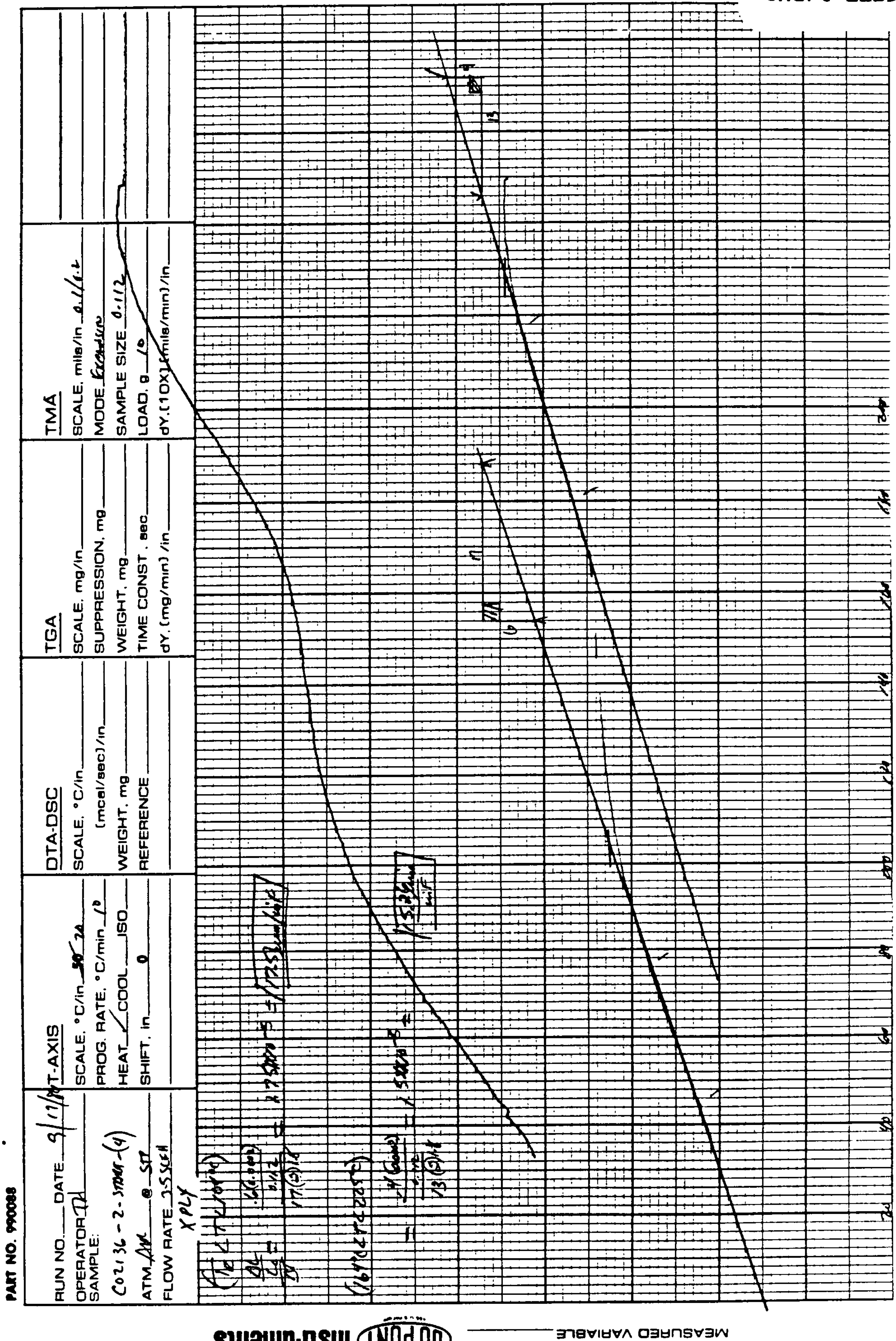


DUPONT Instruments

MEASURED VARIABLE

Chart 21B2

Chart 21B3



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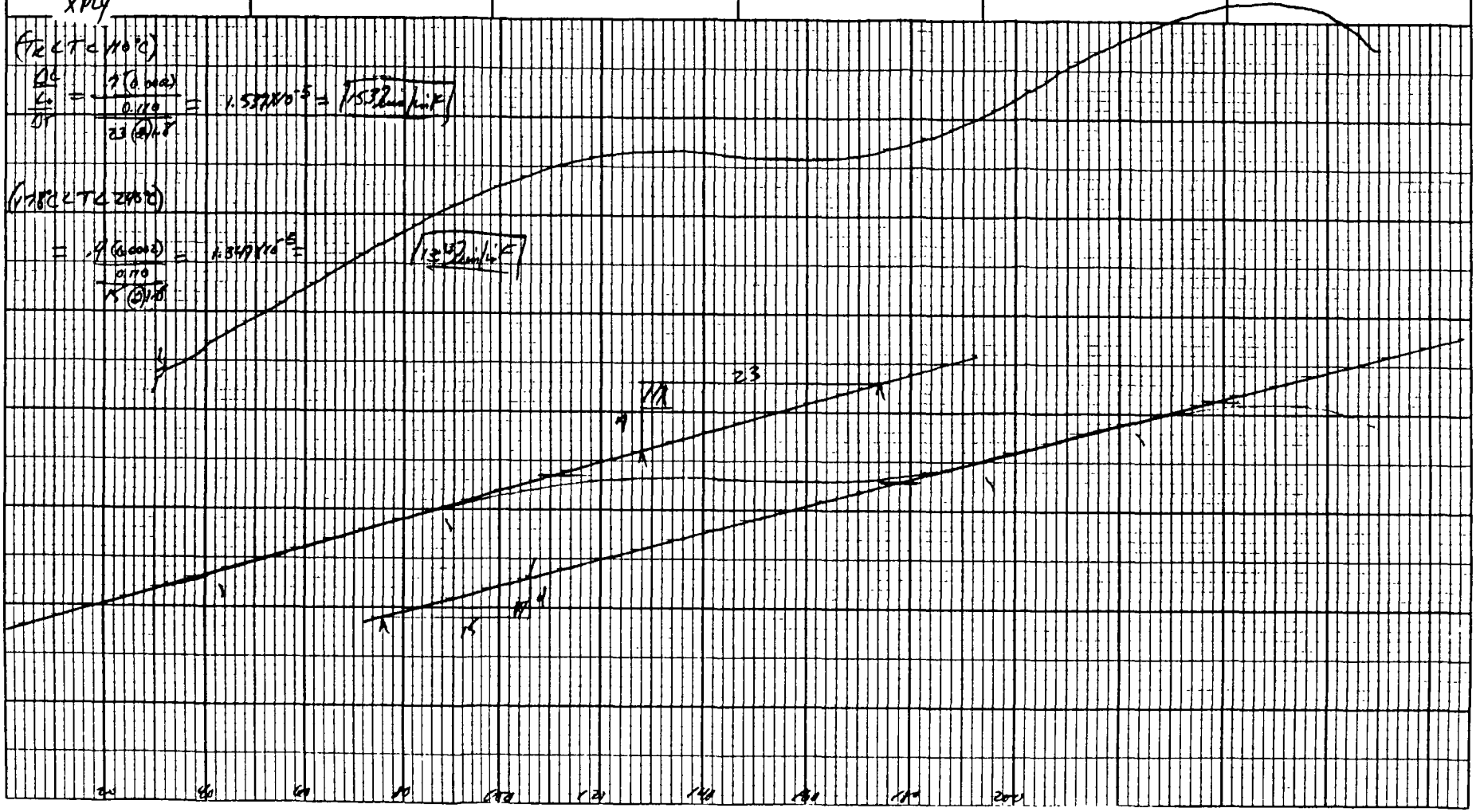
PART NO. 990088

RUN NO ___ DATE 9/19/14	T-AXIS	DTA-DSC	TGA	TMA	
OPERATOR TP	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	
Co136 - 2-stage - (5)	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.110	
ATM Air @ 30	SHIFT, in 0	REFERENCE	TIME CONST., sec	LOAD, g 10	
FLOW RATE 3-5 SCFH			dY, (mg/min) /in	dY, (10X), (mils/min) /in	
XPLY					



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DUPONT Instruments

MEASURED VARIABLE

Chart 21B4

TABLE OF CONTENTS

FILLER TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

Filler Lot for NASA Lot# 2

CHARTS

U.S. Polymeric

FILLER TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

Filler Lot for NASA Lot# 2

1. Carbon Content, %			SAMPLE		
QAI-5560		#2A-1	#2A-2	#2A-3	
		99.31	99.18	99.40	
		NASA LOT# 2	AVERAGE	99.30	
2. Ash Content, %		0.0	0.0	0.0	
PTM-71B		0.0	0.0	0.0	
	AVG.	0.0	0.0	0.0	
		NASA LOT# 2	AVERAGE	0.0	
3. Atomic Absorption, ppm		#2A-1	#2A-2	#2A-3	LOT#2
CTM-53B					AVG.
(Values are average of	Na	7.0	7.5	9.0	7.8
2 determinations)	K	1.5	1.0	2.5	1.7
	Ca	2.5	1.5	2.0	2.0
	Mg	0.0	0.0	0.0	0.0
	Li	0.0	0.0	0.0	0.0
	TOTAL	11.0	10.0	13.5	11.5
3a. Moisture Content, %		.041	.034	.039	
CTM-53B		.031	.020	.045	
	AVG.	.036	.027	.042	
		NASA LOT# 2	AVERAGE	.035	
3b. Ash Content, %		0.005	0.000	0.015	
CTM-53B		0.000	0.025	0.000	
	AVG.	0.003	0.013	0.008	
		NASA LOT# 2	AVERAGE	0.008	
4. pH, Units		4.60	4.40	4.50	
ASTM D1512		4.60	4.60	4.70	
	AVG.	4.60	4.50	4.60	
		NASA LOT# 2	AVERAGE	4.57	
5. Particle Size, microns	AVG.	.56	.57	.52	
S.E.M. procedure	Maximum	.90	1.25	1.17	
(Average values are	Minimum	.23	.20	.25	
of 20 determinations)	Std. Dev	.22	.28	.24	
		NASA LOT# 2	AVERAGE SIZE	.55	
6a. TGA, °C at 50% Loss		842	850	857	
CTM-51		NASA LOT# 2	AVERAGE	850	

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

Filler Lot for NASA Lot# 2

6b. TGA
CTM-51 — See Charts 6A-6C

7. Particle Size Distribution
CTM-72 — See Charts 7A-7C

7a. Particle Size, microns
CTM-72

	#2A-1	#2A-2	#2A-3
	.86	.97	.95
	.85	1.08	.92
AVG.	.86	1.02	.94

NASA LOT# 2 AVERAGE .94

U.S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

CHART 6A

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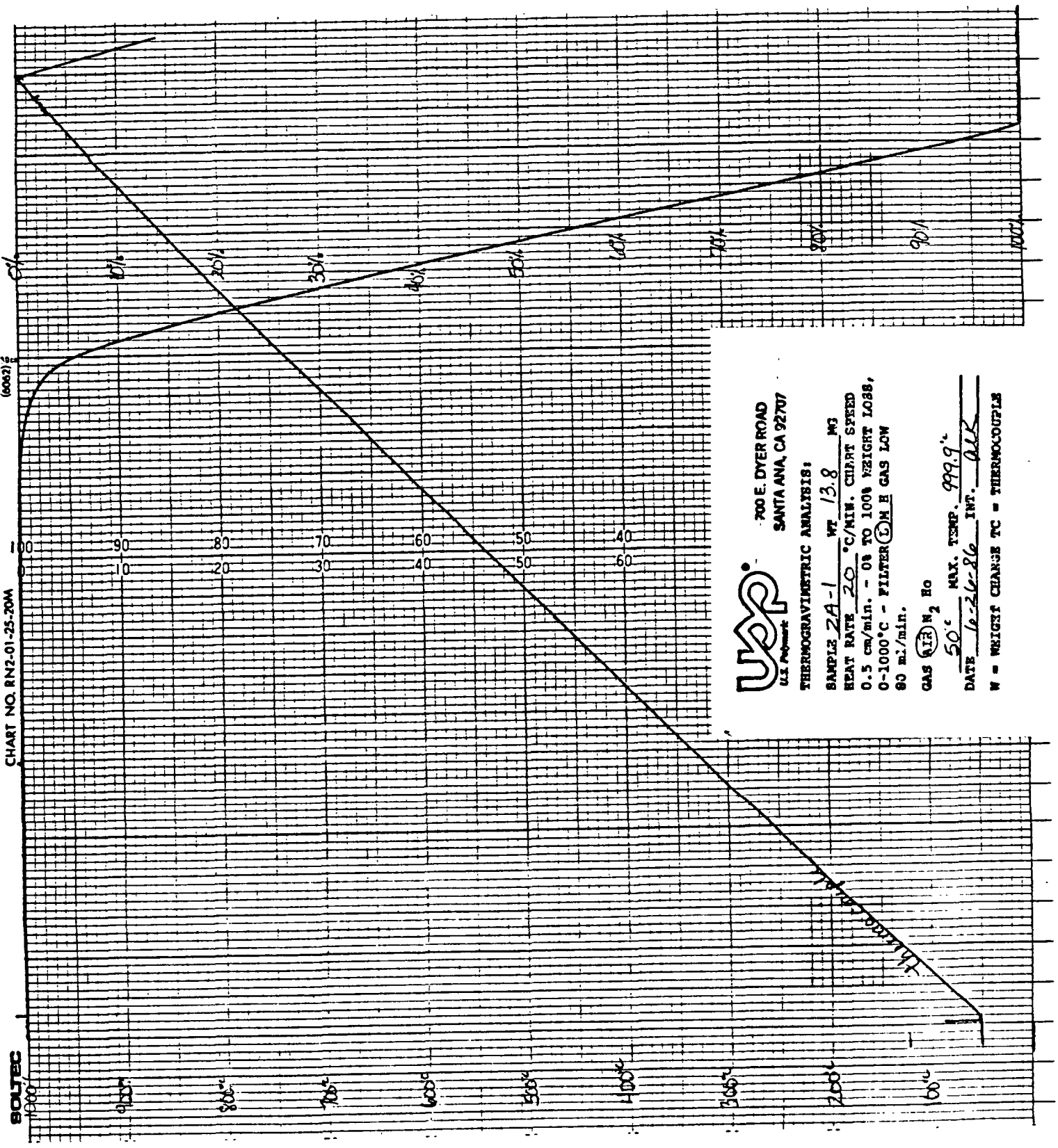

700 E. DYER ROAD
SANTA ANA, CA 92707

THERMOGRAVIMETRIC ANALYSIS;

SAMPLE 2A-1 WT 13.8 MG
HEAT RATE 20 °C/MIN. CHART SPEED
0.5 cm/min. - 0% TO 100% WEIGHT LOSS,
0-1000°C - FILTER (D) N E GAS LOW
80 ml/min.

GAS (AIR) N_2 He

50° MAX. TEMP. 999.9°
DATE 12-26-86 INT. DLK

W = WEIGHT CHANGE TC = THERMOCOUPLE

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CHART 6B

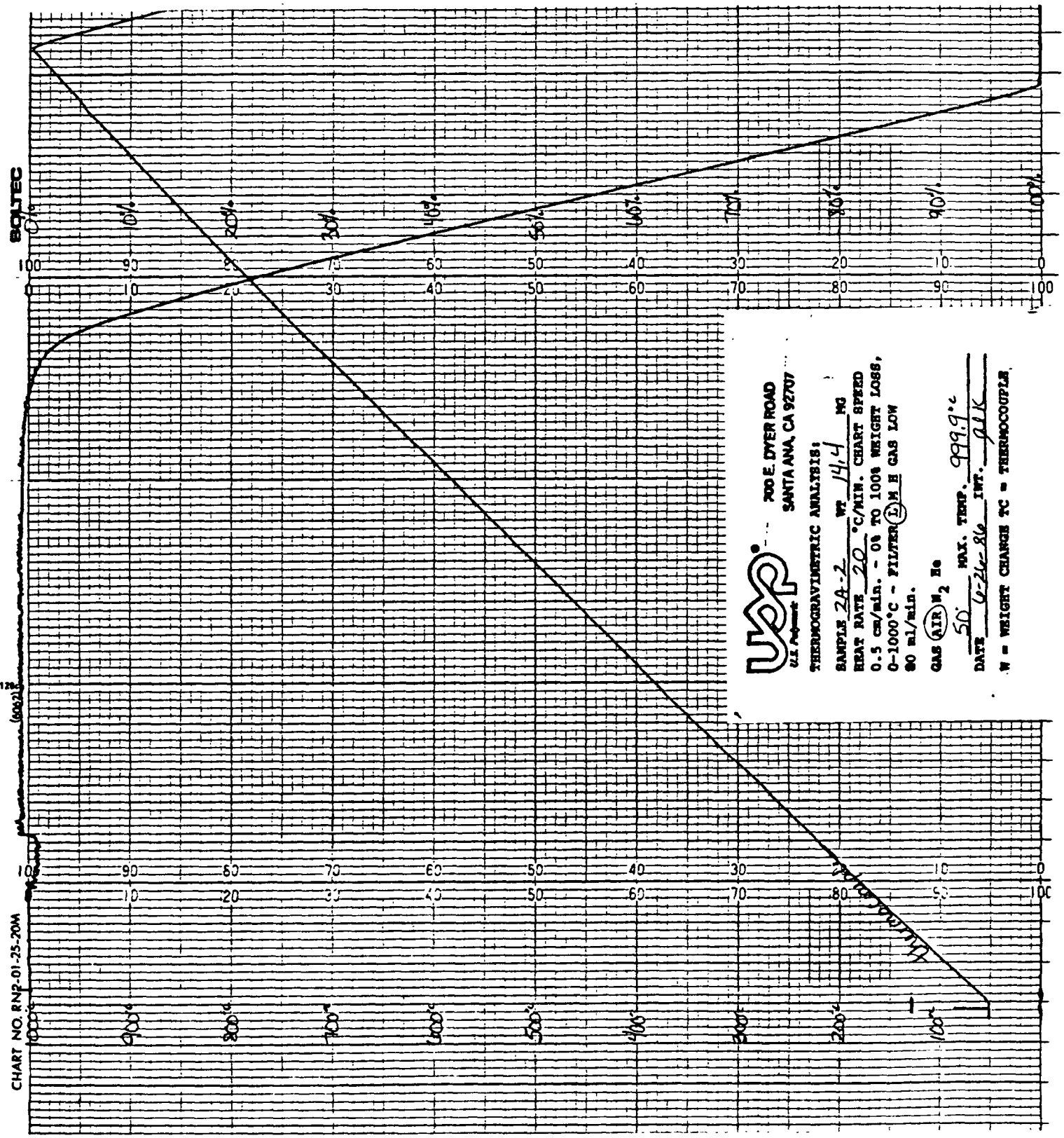

CHART 6C

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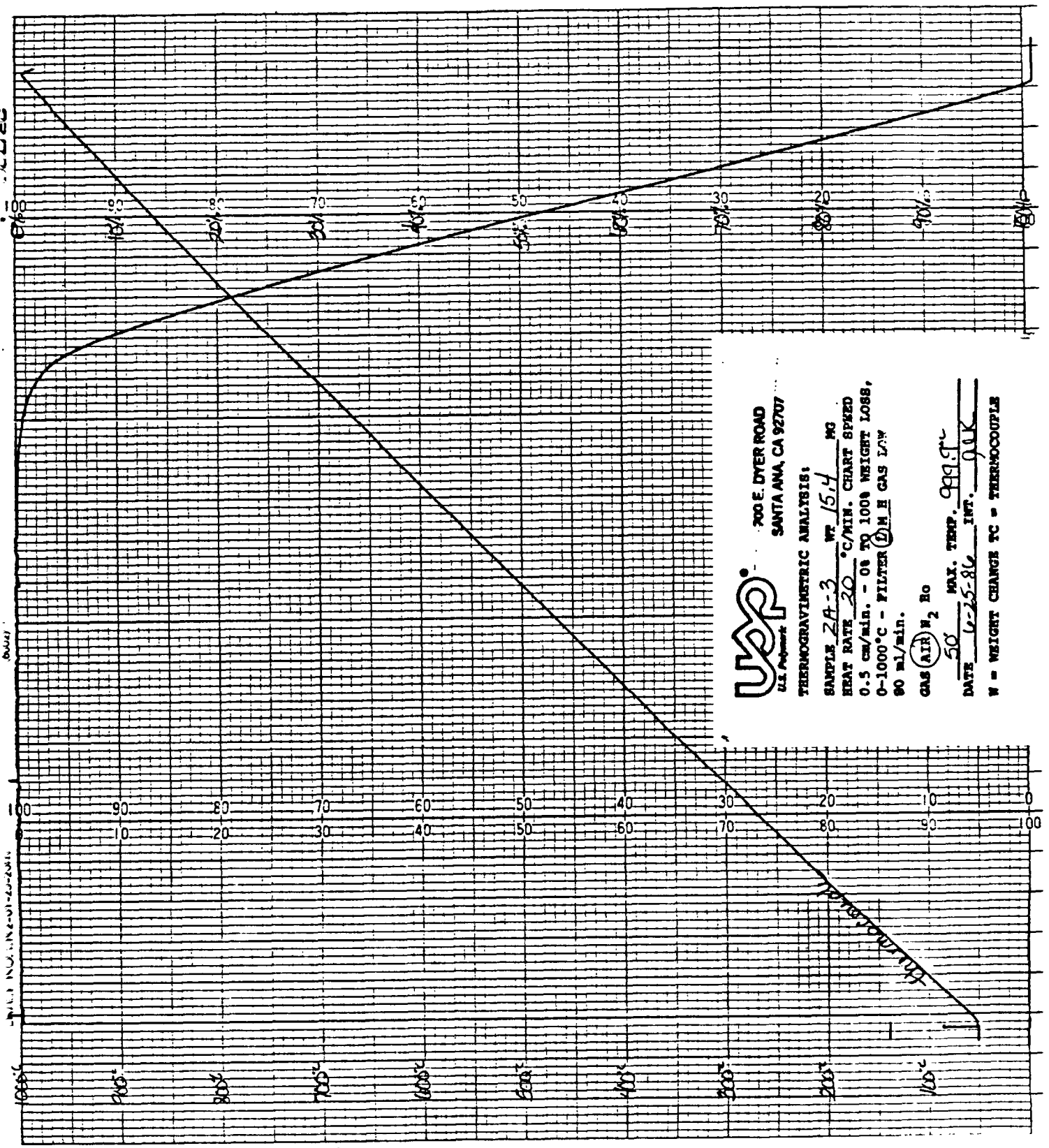


HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-24-86
#1 SAMPLE NASA LOT#2A-1
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

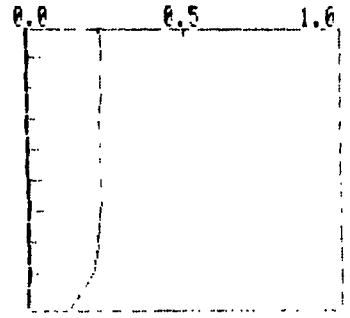
* CONDITIONS

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

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

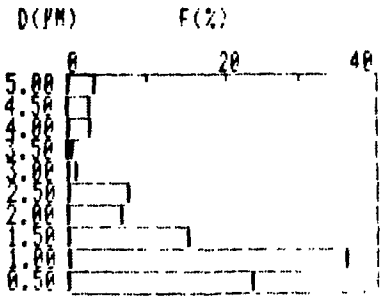


* DISTRIBUTION TABLE (BY VOL.)

D(UM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	3.3	3.3
4.50-4.00	2.6	5.9
4.00-3.50	2.7	8.7
3.50-3.00	0.5	9.2
3.00-2.50	0.9	10.0
2.50-2.00	7.8	17.8
2.00-1.50	7.0	24.7
1.50-1.00	15.2	39.9
1.00-0.50	36.1	76.0
0.50-0.00	24.0	100.0

D(AVE) 0.86 (UM)

* DISTRIBUTION GRAPH (BY VOL.)



LOT#2A-1
Sample #1

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-24-86
#2 SAMPLE NASA LOT#2A-1
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

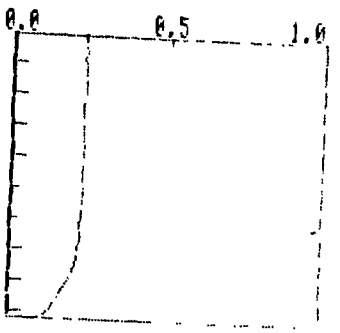
* CONDITIONS

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

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

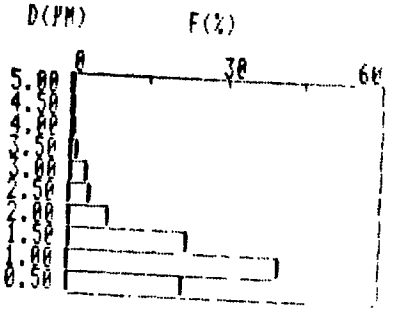


* DISTRIBUTION TABLE (BY VOL.)

D(UM)	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	0.0	0.0
3.50-3.00	1.1	1.1
3.00-2.50	3.0	4.1
2.50-2.00	3.8	7.8
2.00-1.50	7.4	15.2
1.50-1.00	22.4	37.6
1.00-0.50	40.8	78.3
0.50-0.00	21.7	100.0

D(AVE) 0.85 (UM)

* DISTRIBUTION GRAPH (BY VOL.)



LOT#2A-1
Sample#2

CHART 7A

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-24-86
#1 SAMPLE NASA LOT#2A2
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

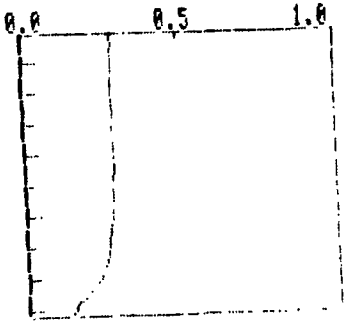
* CONDITIONS

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

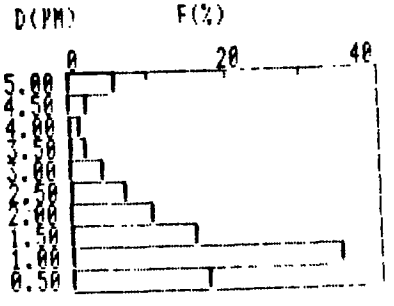


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	5.7	5.7
4.50-4.00	2.2	7.9
4.00-3.50	1.2	9.1
3.50-3.00	1.7	10.8
3.00-2.50	4.0	14.8
2.50-2.00	6.7	21.5
2.00-1.50	10.2	31.7
1.50-1.00	16.0	47.7
1.00-0.50	34.8	82.5
0.50-0.00	17.5	100.0

D(AVE) 0.97 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#2A-2
Sample#1

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-24-86
#2 SAMPLE NASA LOT#2A-2
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

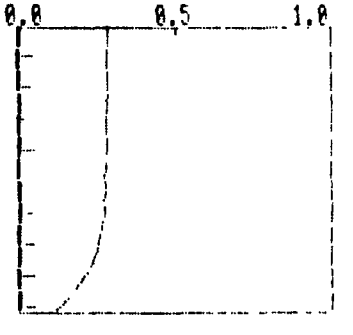
* CONDITIONS

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

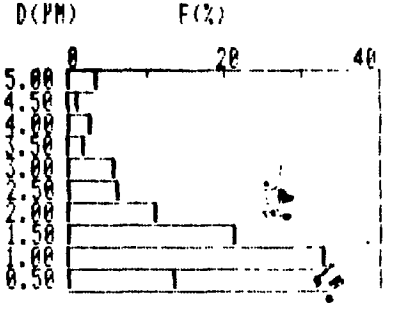


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	3.5	3.5
4.50-4.00	1.0	4.5
4.00-3.50	2.8	7.3
3.50-3.00	2.0	9.3
3.00-2.50	5.7	14.9
2.50-2.00	6.1	21.0
2.00-1.50	11.2	32.2
1.50-1.00	21.2	53.5
1.00-0.50	33.0	86.4
0.50-0.00	13.6	100.0

D(AVE) 1.08 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#2A-2
Sample#2

CHART 7B

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-24-86
#1 SAMPLE NASA LOT#2A-3
SOLVENT ETHYL.GLYCOL
C=0.01 mg/ml

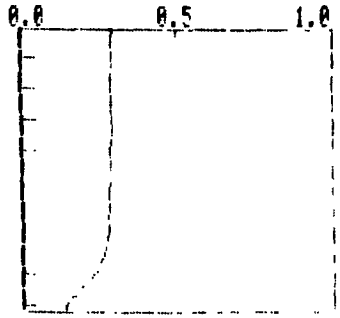
* CONDITIONS

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. (PPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

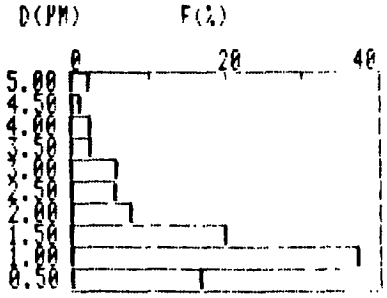


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	2.0	2.0
4.50-4.00	0.9	2.9
4.00-3.50	2.3	5.2
3.50-3.00	2.2	7.5
3.00-2.50	5.7	13.2
2.50-2.00	5.6	18.8
2.00-1.50	7.5	26.3
1.50-1.00	19.9	46.2
1.00-0.50	37.2	83.4
0.50-0.00	16.6	100.0

D(AVE) 0.95 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#2A-3
Sample #1

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HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-24-86
#2 SAMPLE NASA LOT#2A-3
SOLVENT ETHYL.GLYCOL
C=0.01 mg/ml

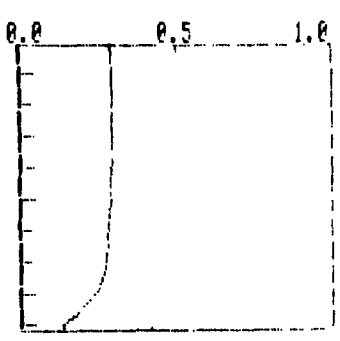
* CONDITIONS

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

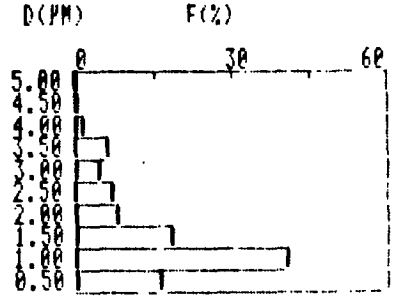


* DISTRIBUTION TABLE (BY VOL.)

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	1.1	1.1
3.50-3.00	5.8	6.9
3.00-2.50	4.1	11.1
2.50-2.00	6.9	18.0
2.00-1.50	7.7	25.7
1.50-1.00	17.8	43.4
1.00-0.50	40.7	84.1
0.50-0.00	15.9	100.0

D(AVE) 0.92 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#2A-3
Sample#2

CHART 7C

TABLE OF CONTENTS

RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

USP-39A Resin Lot for NASA Lot# 2

CHARTS

U.S. Polymeric

RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

USP-39A Resin Lot for NASA Lot# 2

1. Resin Solids, %		#2-1	#2-2	
PTM-7C		78.8	78.7	
		78.7	79.3	
		79.1	79.6	
	AVG.	78.9	79.2	
	Lot# 2 AVERAGE		79.1	
2. Specific Gravity @ 25°C		1.189	1.193	
PTM-29C	Lot# 2 AVERAGE		1.191	
3. Viscosity, Brookfield, cps. @ 22.8°C		17,400	16,800	
PTM-14C	Lot# 2 AVERAGE		17,100	
4. Gel Time, min:sec		4:00	4:20	
PTM-47B	Lot# 2 AVERAGE		4:10	
5. Atomic Absorption, ppm		#2-1	#2-2	LOT2 AVG
CTM-53B	Na	25.0	20.8	22.9
(Values are averages of	K	1.0	0.5	0.8
four determinations)	Ca	7.5	7.0	7.3
	Mg	2.0	2.0	2.0
	Li	0.0	0.0	0.0
	AVG.	35.5	30.3	32.9
6. Volatiles, Gas Chromatography		See Charts 6A-6B		
CTM-55				
7. TGA, % Weight Loss at 500°C		39.4	38.2	
CTM-51 (AIR)	Lot# 2 AVERAGE		38.8	
		See Chart 7A-7B		
8. DSC, temperature °C		190	189	
CTM-50A	Lot# 2 AVERAGE		190	
		See Chart 8A-8B		
9. HPLC		See Chart 9A-9B		
CTM-49A				
10. GPC, Average molecular wt.		1800	1631	
CTM-49A	Lot# 2 AVERAGE		1716	
		See Chart 10A-10B		

HITCO MATERIALS DIVISION
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2407

USP-39A Resin Lot for NASA Lot# 2

11. pH, units CTM-1B		#2-1 8.4	#2-2 8.5
	Lot# 2	AVERAGE	8.5
12. Phenol Content, % CTM-55 Appendix 1		13.29 12.94	13.65 13.31
	AVG.	13.12	13.48
	Lot# 2	AVERAGE	13.30
13. Chang's Index, ml. CTM-5B		23.6	23.8
	Lot# 2	AVERAGE	23.7

14. RDS, Minimum Viscosity, cps.
CTM-57A

	Min. Visc.	°C
#2-1	172	114
#2-2	124	114
AVG.	148	114

See Charts 14A-14B

15. NMR
Vendor procedure

See Charts 15A-15B

U. S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

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TYPICAL GAS CHROMATOGRAPH SET-UP

Operator	G.R.J.	Date	12/11/86
Column		Detector	FID
Length	6ft.	Voltage	
Dia.	1/4in.	Sensit.	
Liquid Phase	AT1000	Flow Rates, ml/min	
Wt. %	0.1	Hydrogen	60 Air 396
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	USP349,27	Solvent	THF
Size	0.1 µl	Concn.	0.1 1% g/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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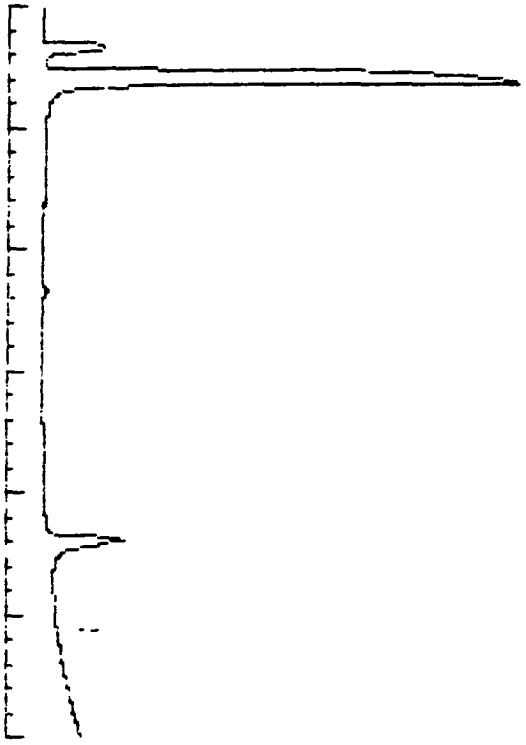
CHART 6A

:** REAL TIME CHROMATOGRAM ***



FINAL FULL SCALE MV.=1000 00

SAMPLE: USP39A 2-1
MISC C=0 11190 GMS/ML

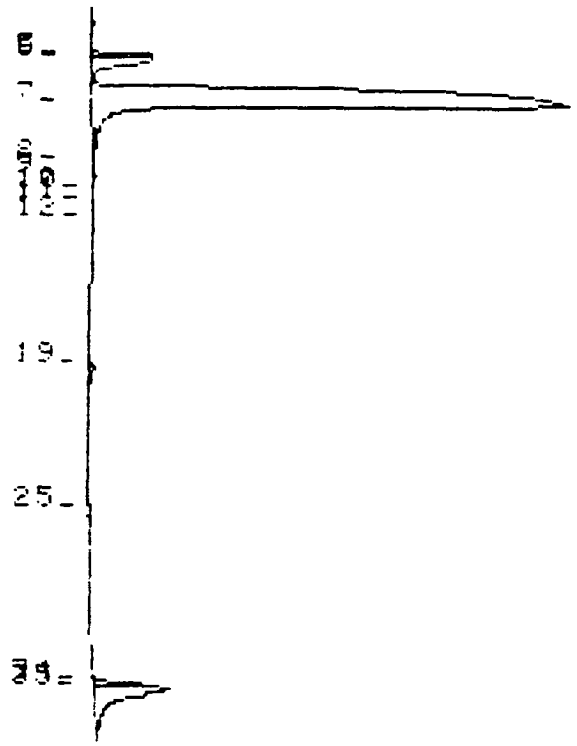
TIME: 12:59
DATE: 12/11/86
OPERATOR: JGZ

RUN TIME 30.00 MINUTES
DELAY TIME: 0 00
CHAN: 0

PK NO	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
2	63	7064	075	3	358
5	1 65	79730	1.953	2	11467
6	1.78	201690	4.940	2	11452
7	3.30	3335700	81.708	3	90562
8	5.08	6073	.149	4	251
9	5.55	5751	.141	4	417
10	6 03	4291	.105	4	182
11	6 38	4282	.105	4	172
12	6 95	1101	027	4	80
19	11.70	13778	.337	3	767
25	16.22	1075	026	2	61
34	21 85	68060	1.667	2	10096
35	22 00	357860	8.766	2	14615

TOTAL AREA= 4082456
THRESHOLD= 1
MIN PI WIDTH= 15
AREA REJECT= 1000

VERTICAL SCALE FACTOR 1X



SAMPLE USP39A 2-1
MISC C=0.11190 GMS/ML

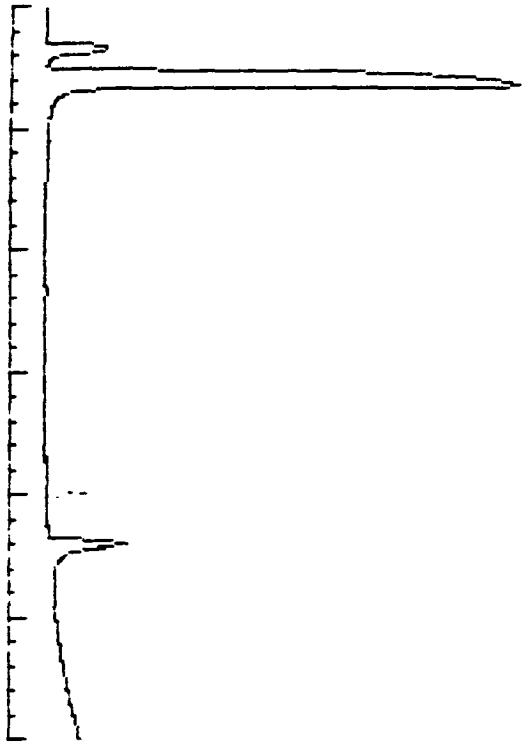
TIME 12:59
DATE: 12/11/86
OPERATOR: JGZ

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

PK NO.	PET TIME	PEAK AREA	AREA %	B L	PEAK HT.
5	1 65	79730	1.965	2	11467
6	1 78	201690	4.972	2	11452
7	3 30	3335700	82.225	3	90562
19	11.70	13778	.340	3	767
34	21 85	68060	1.678	2	10096
35	22.00	357860	8.821	2	14615

TOTAL AREA= 4056818
THRESHOLD= 1
MIN PI WIDTH= 15
AREA REJECT= 10000

*** REAL TIME CHROMATOGRAM ***



FINAL FULL SCALE MV.=1000.00

SAMPLE USP39A 2-2
MISC. C=0.10080 GMS/ML

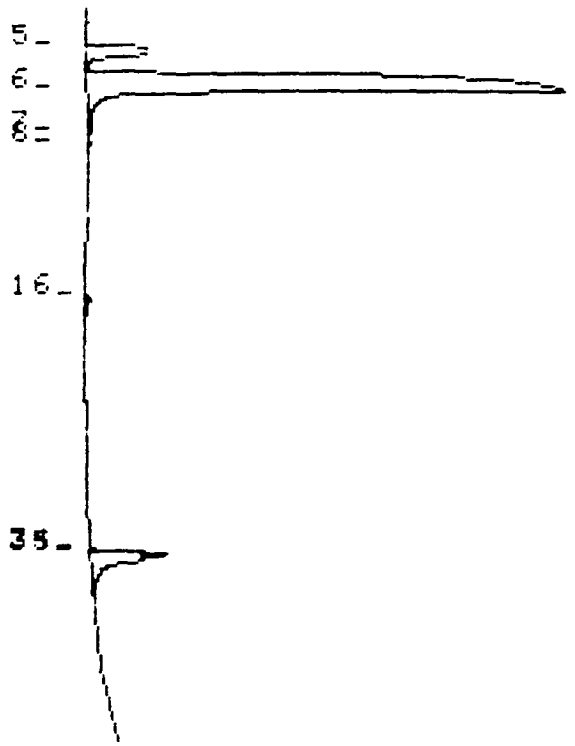
TIME: 14:47
DATE 12/11/86
OPERATOR: JGZ

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

PK NO	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
2	.63	2693	.061	3	360
5	1 69	298230	6.703	2	11370
6	3.39	3695300	83.049	3	89961
7	5.08	4838	.109	4	199
8	5.58	4532	.102	2	478
16	11 70	14184	.319	3	714
34	21 88	53228	1.196	2	10083
35	22 03	376520	8 462	3	14774

TOTAL AREA= 4449524
THRESHOLD= 1
MIN.PI.WIDTH= 15
AREA REJECT= 1000

VERTICAL SCALE FACTOR 1X



SAMPLE USP39A 2-2
MISC. C=0.10080 GMS/ML

TIME: 14:47
DATE: 12/11/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0 00
CHAN. 0

PK NO	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
5	1.68	298230	6.742	2	11370
6	3.38	3695300	83.542	3	89961
34	21 88	53228	1.203	2	10083
35	22 03	376520	8.512	3	14774

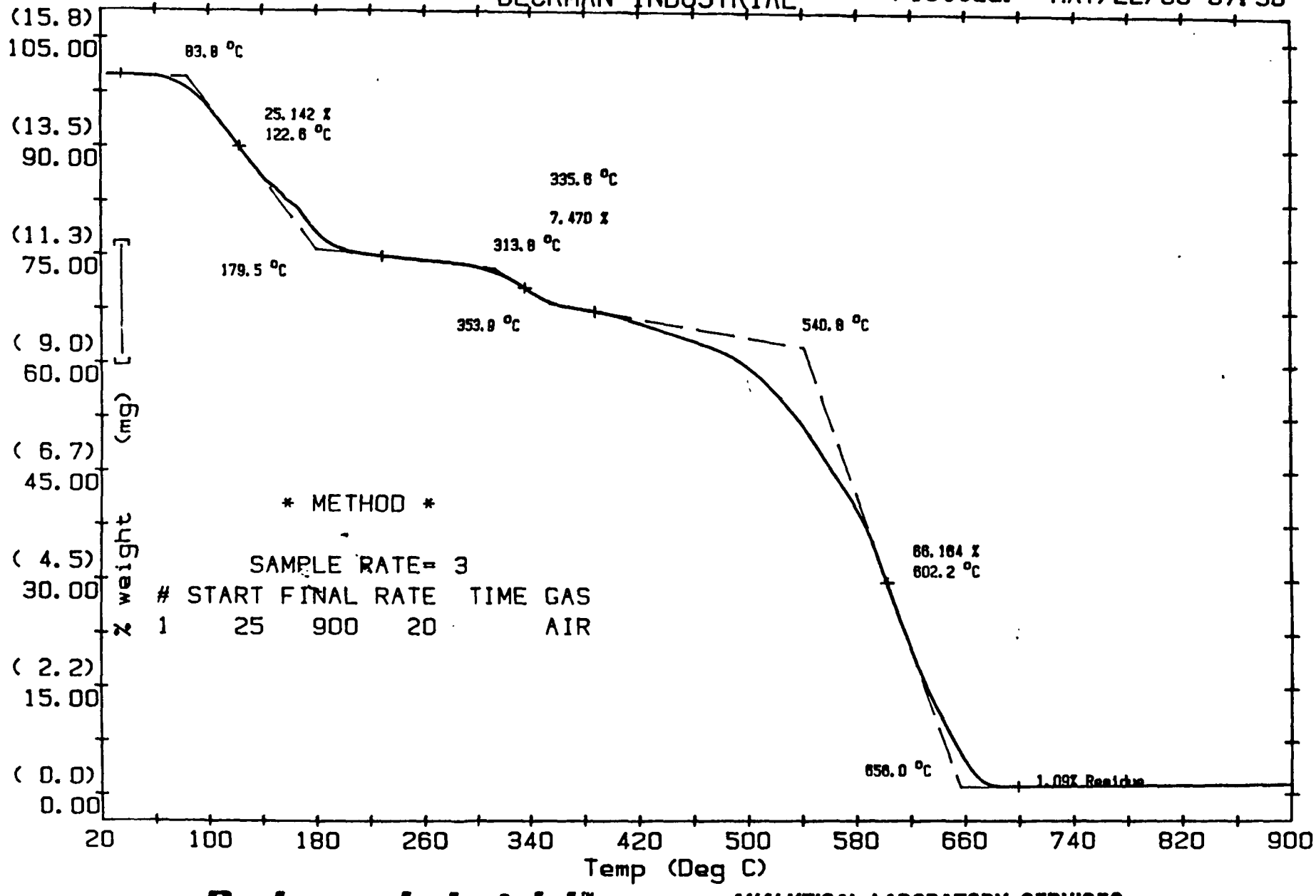
TOTAL AREA= 4423278
THRESHOLD= 1
MIN PI.WIDTH= 15
AREA REJECT= 15000

Sample: USP39A71108 2-1
Size: 15.101 mg
Run No: MIR #13079 (I2)
Date: MAY/21/86 10:28

TGA

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #107
File No: D 34.DAT V2.1
Plotted: MAY/22/86 07:50



Beckman Industrial™ ANALYTICAL LABORATORY SERVICES

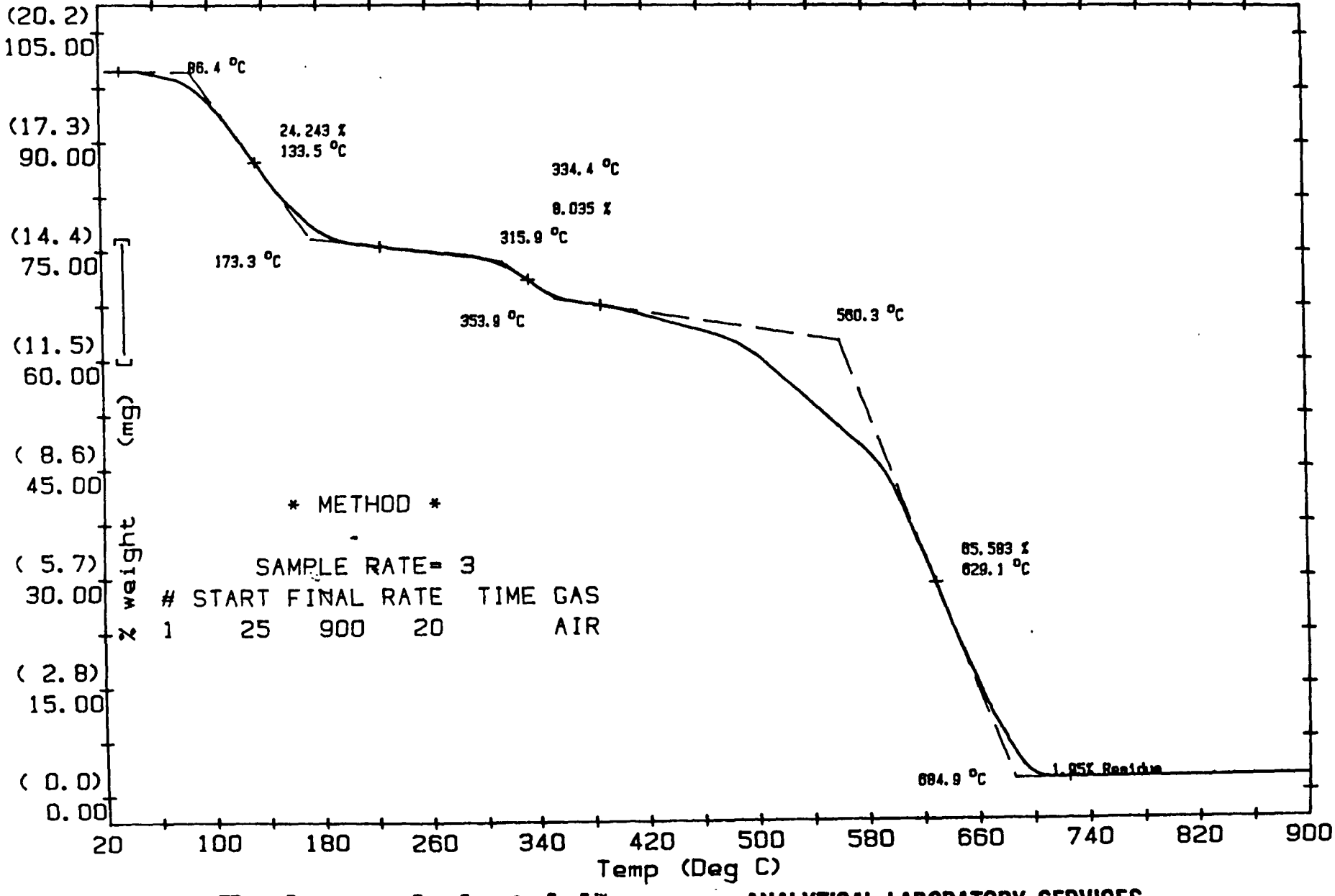
CHART 7A

Sample: USP39A71108 2-2
Size: 19.294 mg
Run No: MIR #13079 (I2)
Date: MAY/21/86 11:43

TGA

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #107
File No: D 35.DAT V2.1
Plotted: MAY/22/86 07:58



Beckman Industrial™ ANALYTICAL LABORATORY SERVICES

GRAPH 7B

PART NO. 990088

CHART 8A

RUN NO ___ DATE 4/3/86

OPERATOR ___

SAMPLE: 2 ℓ P

ATM He @ 1 atm.

FLOW RATE 40 ml/min

T-AXIS

SCALE, °C/in 50

PROG. RATE, °C/min 20

HEAT / COOL ___ ISO ___

SHIFT, in 0

− 1 °C

DTA-DSC

SCALE, °C/in 1.0/5

(mcal/sec)/in ___

WEIGHT, mg 4.5

REFERENCE ___

1 AL CUP PLUS SE

DUPONT Instruments

MEASURED VARIABLE ___

3-31-86 LAST CALIBRATION DATE

−1°C CALIBRATION DELTA °C

exotherm

191°

−1

190°C

0 50 100 150 200 250 300 35

TEMPERATURE, °C (CHRO

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PART NO. 990088

CHART 8B

ORIGINAL PAGE IS OF POOR QUALITY

RUN NO ___ DATE 2-23-87

OPERATOR ALK

SAMPLE: 2-2 USP 39A

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

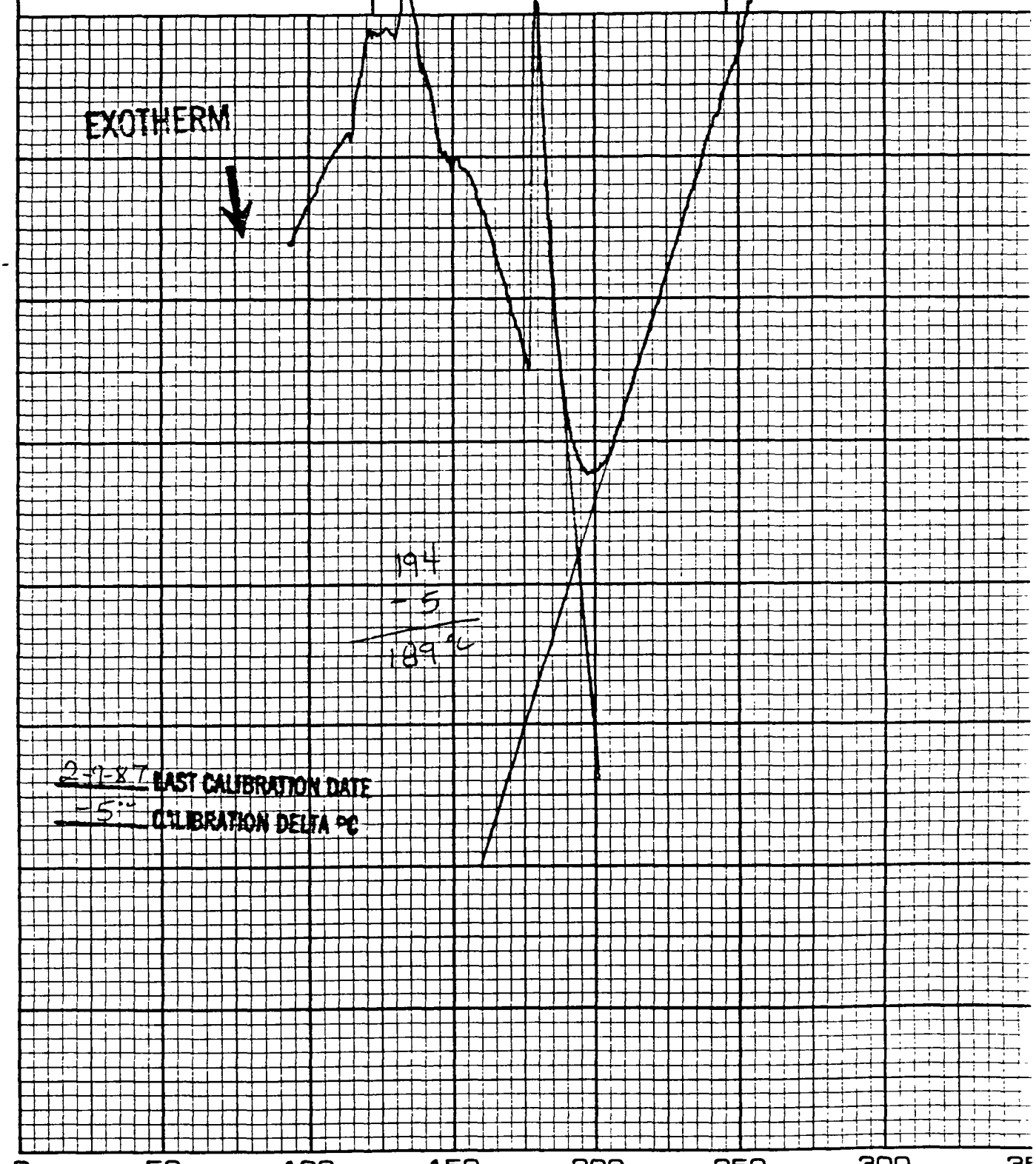
DTA-DSC

SCALE, °C/in 1.0 /5X

(mcal/sec)/in ___

WEIGHT, mg 3.1

REFERENCE 1 alum seal



MEASURED VARIABLE ___

DUPONT Instruments

DATA FILE A:PHEN020.HDR TAKEN 09-01-1986 15:13:56

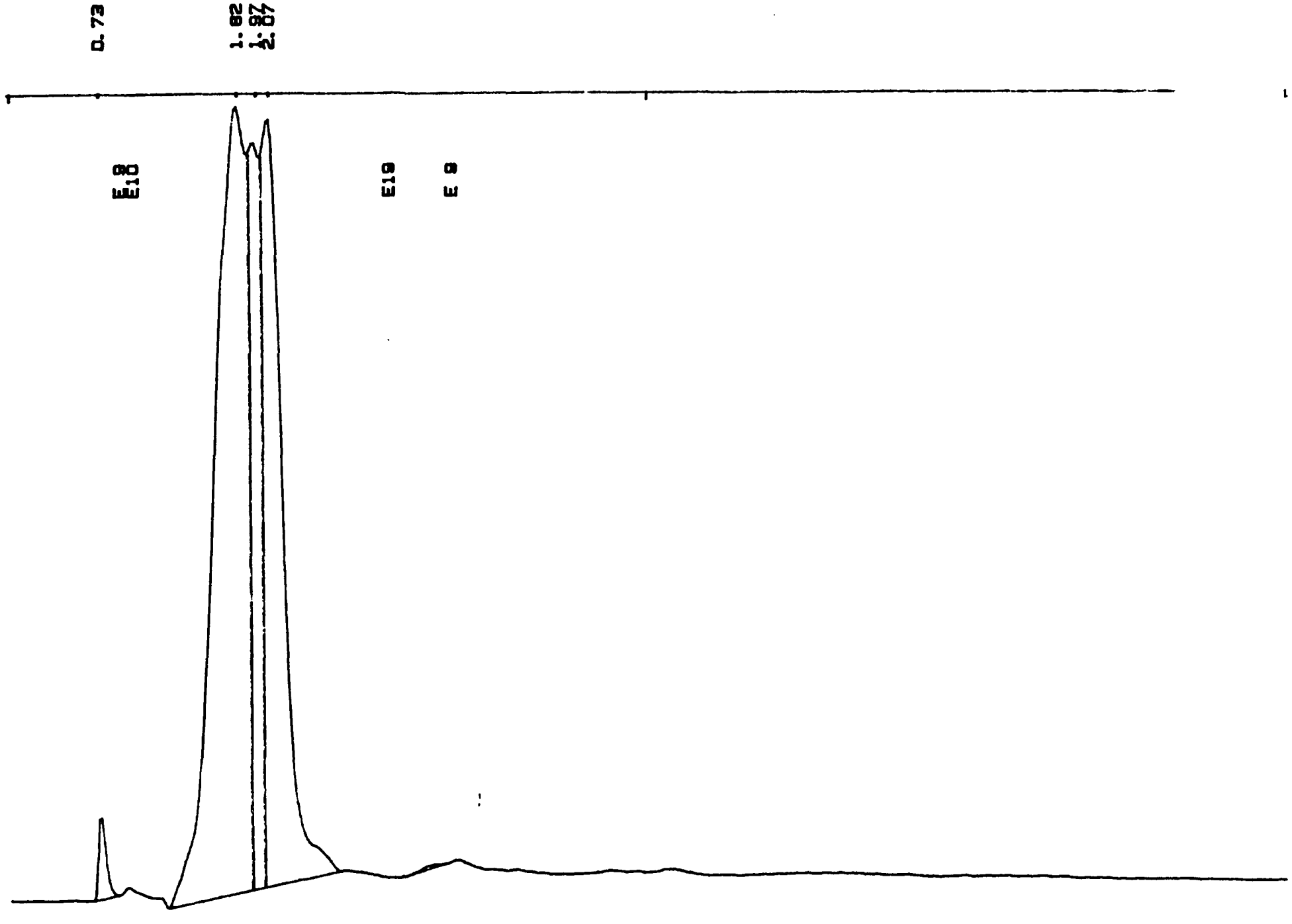
********* AREA PERCENT REPORT *********

```
**********************************************************************
* Sample Name: USP39A,2-1,C=5.555              Operator Initials: JGZ
* Date:  09-01-1986 15:13:56 Method:PHENOLIC   DATA FILE: A:PHEN020.PTS
* Interface: 4               Cycle#:  20       Channel#: 0    Vial#: N.A.
* Starting Peak Width:  10   Threshold:  .01
**********************************************************************
*  Instrument 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
**********************************************************************
Starting Delay:   0.00                      Ending Retention Time:   10.00
```

Pk No.	Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
1	0.73	2256	1.2208	1	562	2.392	4.0
2	1.82	94314	51.0355	2	5417	100.000	17.4
3	1.97	29598	16.0160	2	5094	31.382	5.8
4	2.07	58633	31.7278	2	5278	62.168	11.1

Total Area: 184801 Area Reject: 1000 One sample per 1.000 sec.

DATA FILE=PHEN020 FROM 0.00 MIN. TO 10.00 MIN. LOW SCALE 5.401 MV. HIGH SCALE= 10.850 MV.
USP-39A, 2-1, C=5.555 MG/ML, 8/2/86, JGZ



DATA FILE A:PHEN027.HDR TAKEN 09-05-1986 11:31:38

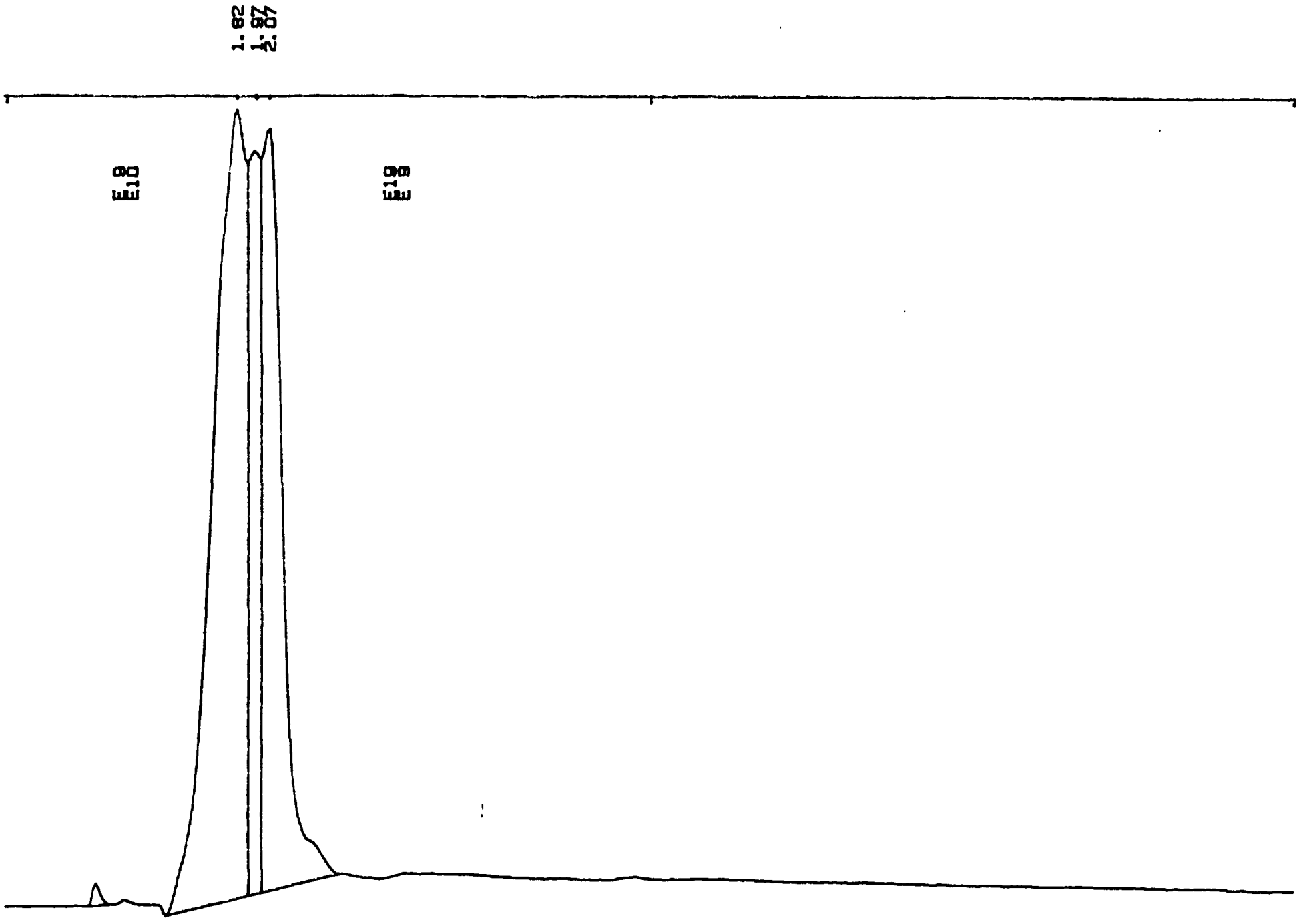
********* AREA PERCENT REPORT *********

```
**********************************************************************************
* Sample Name: USP39A,2-2,C=6.99                    Operator Initials: JGZ
* Date:  09-05-1986 11:31:38 Method:PHENOLIC    DATA FILE: A:PHEN027.PTS
* Interface: 4                Cycle#:  27        Channel#: 0    Vial#: N.A.
* Starting Peak Width:  10   Threshold:  .01
**********************************************************************************
*  Instrument 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
**********************************************************************************
Starting Delay:   0.00                        Ending Retention Time:   10.00
```

Pk No.	Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
2	1.82	96860	53.0012	2	5305	100.000	18.3
3	1.97	28712	15.7109	2	4980	29.643	5.8
4	2.07	57179	31.2879	2	5119	59.032	11.2

Total Area: 182750 Area Reject: 1000 One sample per 1.000 sec.

USP-38A, 2-2, C=6.88 MG/ML, 8/5/86, 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

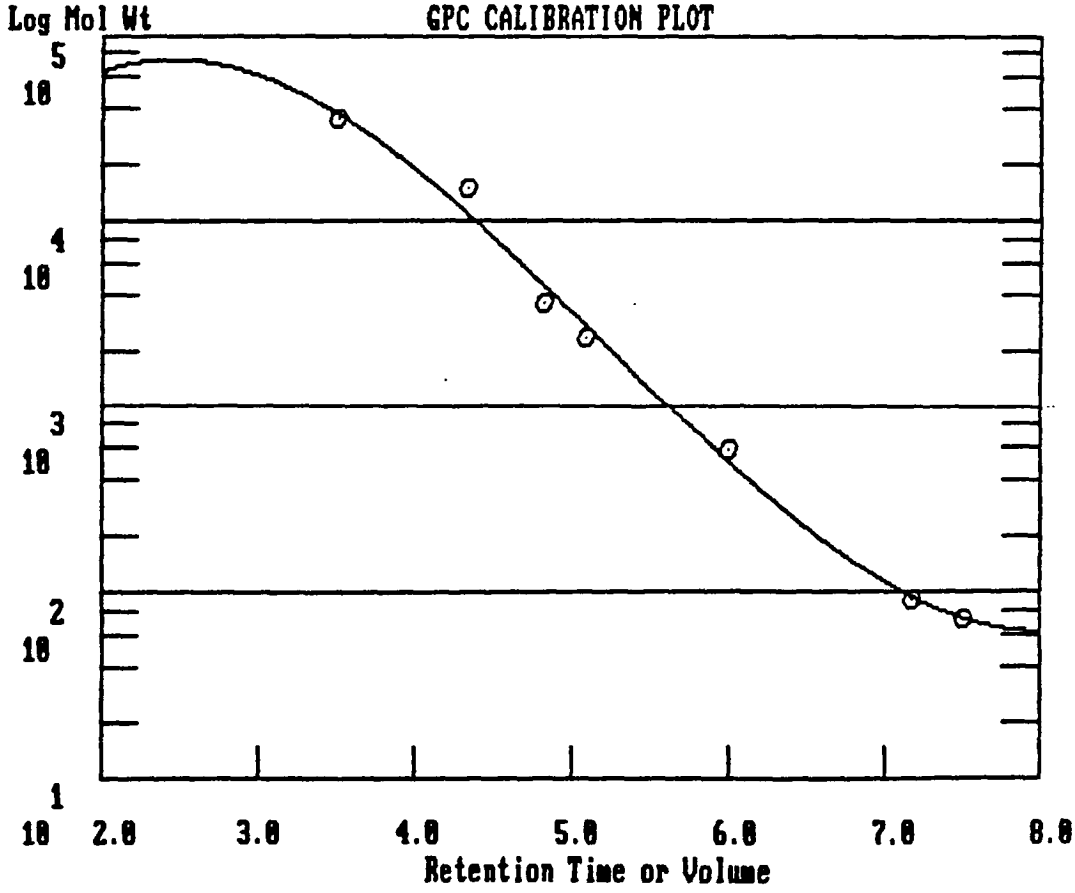


CHART 10A

DATA FILE A:GPC33.HDR TAKEN 08-05-1986 17:47:28

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

```
**********************************************************************************
* Sample Name: USP39A 2-1=2.68                    Operator Initials: GBF         *
* Date:  08-05-1986 15:48:25 Method:              DATA FILE: A:GPC33.PTS         *
* Interface: 5               Cycle#:  33          Channel#: 0    Vial#: N.A.     *
* Starting 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                                         *
**********************************************************************************
Starting Delay:    0.00                  Ending Retention Time:    10.00
Calibration file: GPCPHEN
Molecular Weight Distribution Averages
Baseline TIMES:     3.85 to    10.00    MW:       22295 to          2
Process  TIMES:     3.85 to    10.00    MW:       22295 to          2
Total Area:        243177
Mw=                  1800
Mn=                   334
Mw/Mn=             5.3756
Mz=                  4852
Mv=                  1551
```

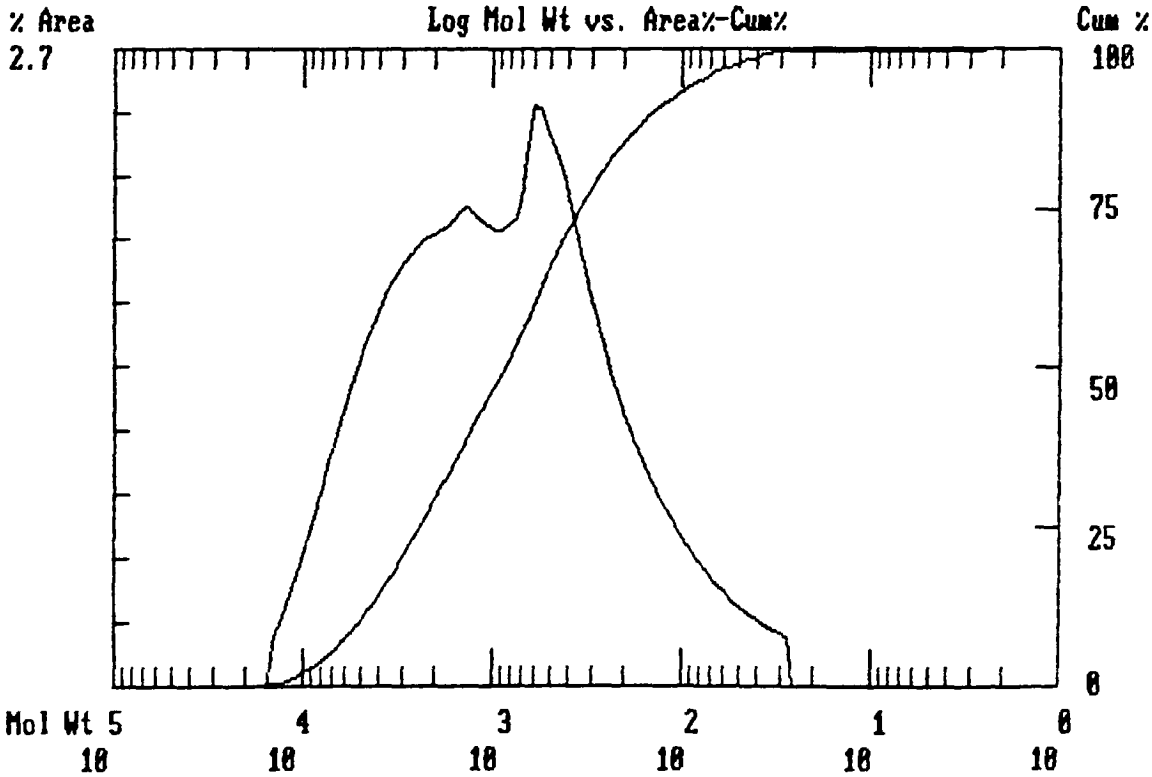
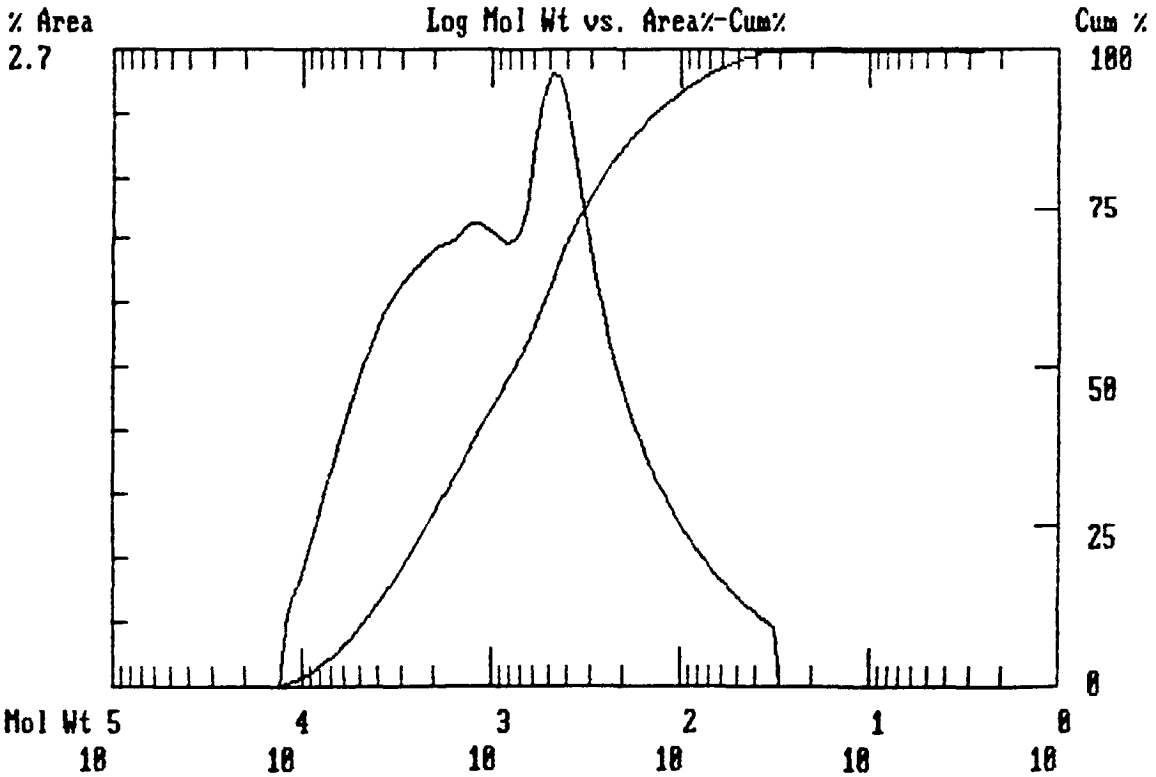


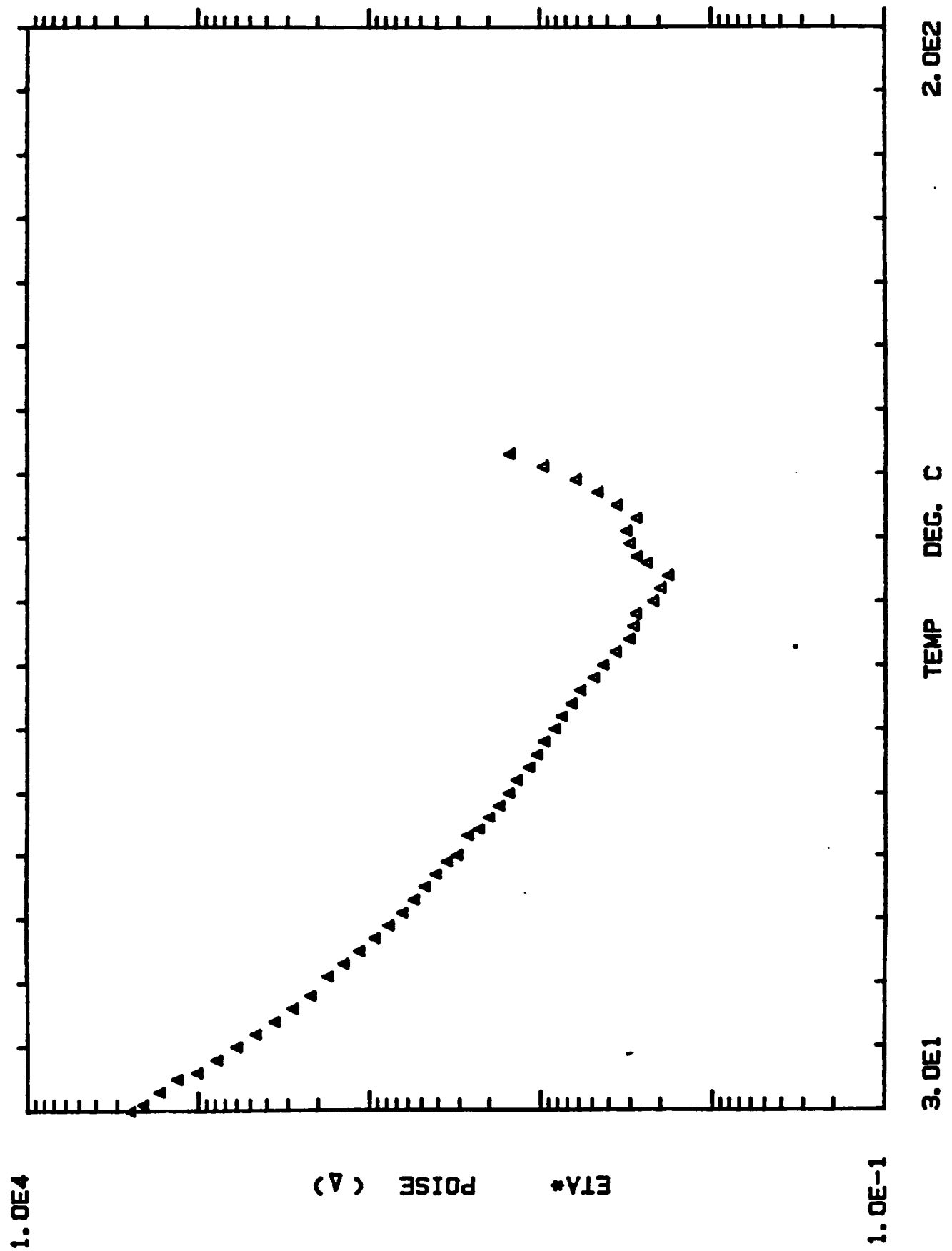
CHART 10B

A FILE A:GPC34.HDR TAKEN 08-05-1986 17:50:20

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

```
**********************************************************************************
ample Name: USP39A 2-2=2.68                    Operator Initials: GBF          *
ate:  08-05-1986 16:04:45 Method:              DATA FILE: A:GPC34.PTS          *
nterface: 5              Cycle#:  34           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:       198243
                 1631
                  328
Mn=            4.9600
                 4349
                 1407
```




NASA FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT2-1
1.0E4
ETA* POISE (A)
1.0E-1
3.0E1
TEMP DEG. C
2.0E2

Rheometrics RECAP II

---

eriment No. : 2 Sample No. : 1

le:
A FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT2-1

rator :CP

e and Time : Friday, August 15, 1986 - 12:30:37

rating Mode : DYNAMIC

ep Type : CURE

metry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

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

D.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	2.489e+003	2.488e+003	4.844e+001	3.172e+002	2.000e-001	2.800e+001
2	2.642e-003	2.641e+003	4.082e+001	3.370e+002	1.000e+000	2.900e+001
3	2.428e+003	2.428e+003	3.159e+001	3.095e+002	2.000e+000	3.000e+001
4	2.051e+003	2.051e+003	3.626e+001	2.607e+002	3.000e+000	3.100e+001
5	1.636e+003	1.636e+003	3.612e+001	2.076e+002	4.000e+000	3.200e+001
6	1.283e+003	1.282e+003	3.520e+001	1.625e-002	5.000e+000	3.500e+001
7	9.857e+002	9.849e+002	3.027e+001	1.245e+002	6.000e+000	3.600e+001
8	7.555e+002	7.550e+002	2.754e+001	9.537e+001	7.000e+000	3.800e+001
9	5.786e+002	5.780e+002	2.598e+001	7.296e+001	8.000e+000	4.000e+001
0	4.479e+002	4.473e+002	2.357e+001	5.638e+001	9.000e+000	4.200e+001
1	3.477e+002	3.469e+002	2.766e+001	4.376e+001	1.000e+001	4.400e+001
2	2.715e+002	2.706e+002	2.171e+001	3.414e+001	1.100e+001	4.600e+001
3	2.136e+002	2.126e+002	2.044e+001	2.686e+001	1.200e+001	4.800e+001
4	1.693e+002	1.680e+002	2.056e+001	2.126e+001	1.300e+001	5.100e+001
5	1.371e+002	1.356e+002	2.031e+001	1.722e+001	1.400e+001	5.300e+001
6	1.110e+002	1.094e+002	1.889e+001	1.374e+001	1.500e+001	5.500e+001
7	9.041e+001	8.878e+001	1.708e+001	1.135e+001	1.600e+001	5.700e+001
8	7.490e+001	7.343e+001	1.476e+001	9.399e+000	1.700e+001	5.900e+001
9	6.246e+001	6.116e+001	1.280e+001	7.847e+000	1.800e+001	6.100e+001
20	5.336e+001	5.221e+001	1.105e+001	6.692e+000	1.900e+001	6.300e+001
21	4.604e+001	4.506e+001	9.437e+000	5.777e+000	2.000e+001	6.500e+001
22	3.975e+001	3.897e+001	7.829e+000	4.985e+000	2.100e+001	6.700e+001
23	3.419e+001	3.357e+001	6.480e+000	4.291e+000	2.200e+001	6.900e+001
24	2.971e+001	2.916e+001	5.717e+000	3.731e+000	2.300e+001	7.000e+001
25	2.574e+001	2.528e+001	5.128e+000	3.229e+000	2.400e+001	7.300e+001
26	2.230e+001	2.191e+001	4.110e+000	2.800e+000	2.500e+001	7.400e+001
27	1.940e+001	1.907e+001	3.540e+000	2.434e+000	2.600e+001	7.600e+001
28	1.690e+001	1.657e+001	3.296e+000	2.121e+000	2.700e+001	7.800e+001
29	1.480e+001	1.453e+001	2.81ee+000	1.857e+000	2.800e+001	8.000e+001
30	1.328e+001	1.279e+001	2.741e+000	1.667e+000	2.900e+001	8.200e+001
31	1.133e+001	1.105e+001	2.093e+000	1.411e+000	3.000e+001	8.400e+001
32	1.007e+001	9.917e+000	1.751e+000	1.264e+000	3.100e+001	8.500e+001
33	9.165e+000	9.050e+000	1.573e+000	1.152e+000	3.200e+001	8.810e+001
34	7.913e+000	7.827e+000	1.152e+000	9.930e-001	3.300e+001	9.000e+001
35	7.192e+000	7.145e+000	8.195e-001	9.070e-001	3.400e+001	9.200e+001
36	6.315e+000	6.283e+000	5.316e-001	7.935e-001	3.500e+001	9.400e+001
37	5.609e+000	5.600e+000	3.201e-001	7.044e-001	3.600e+001	9.600e+001
38	4.670e+000	4.658e+000	3.331e-001	5.860e-001	3.700e+001	9.800e+001
39	4.120e+000	4.120e+000	0.000e+000	5.175e-001	3.800e+001	1.000e+002
40	3.470e+000	3.470e+000	4.507e-002	4.352e-001	3.900e+001	1.020e+002
41	2.889e+000	2.889e+000	0.000e+000	3.627e-001	4.000e+001	1.040e+002
42	2.743e+000	2.724e+000	3.160e-001	3.445e-001	4.100e+001	1.060e+002
43	2.657e+000	2.581e+000	6.310e-001	3.335e-001	4.200e+001	1.080e+002
44	2.102e+000	2.053e+000	4.494e-001	2.642e-001	4.300e+001	1.100e+002
45	1.906e+000	1.852e+000	4.519e-001	2.394e-001	4.400e+001	1.120e+002
46	1.720e+000	1.672e+000	4.071e-001	2.162e-001	4.500e+001	1.140e+002
47	2.296e+000	2.202e+000	6.523e-001	2.884e-001	4.600e+001	1.160e+002
48	2.627e+000	2.569e+000	5.507e-001	3.301e-001	4.700e+001	1.170e+002
49	2.853e+000	2.783e+000	7.547e-001	3.621e-001	4.800e+001	1.190e+002
50	3.034e+000	2.807e+000	1.135e-000	3.799e-001	4.900e+001	1.210e+002

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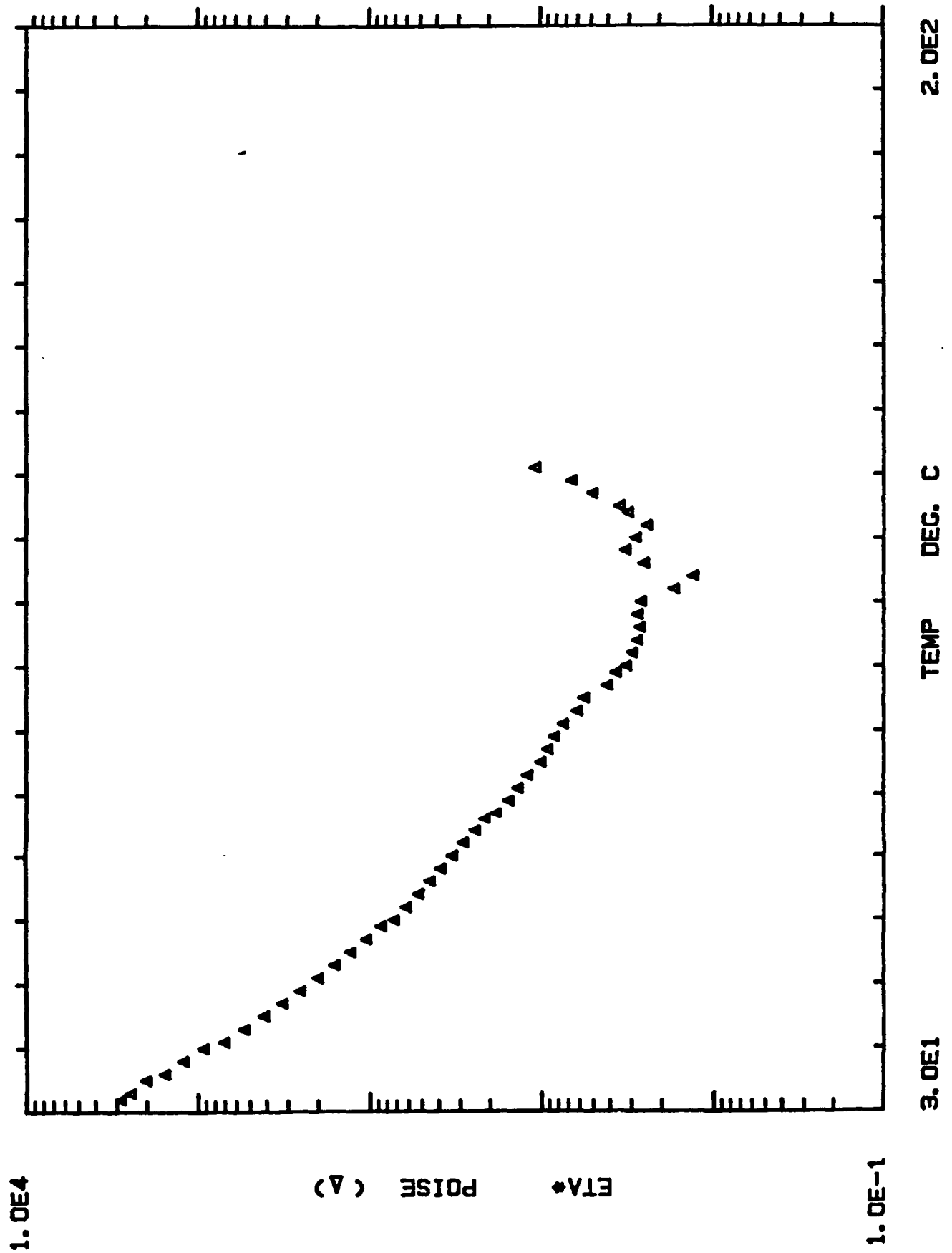
OF POOR QUALITY

J.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
51	2.642e+000	2.503e+000	8.451e-001	3.320e-001	5.000e+001	1.230e+002
52	3.438e+000	3.279e+000	1.035e+000	4.316e-001	5.100e+001	1.250e+002
53	4.448e+000	4.263e+000	1.269e+000	5.583e-001	5.200e+001	1.270e+002
54	5.984e+000	5.761e+000	1.618e+000	7.514e-001	5.300e+001	1.290e+002
55	9.317e+000	8.988e+000	2.454e+000	1.171e+000	5.400e+001	1.310e+002
56	1.470e+001	1.401e+001	4.424e+000	1.845e+000	5.500e+001	1.330e+002


NASA FINGERPRINT VISCOSITY PROFILE USP 38A RESIN NASA LOT2-2
1.0E4
ETA* POISE (Δ)
1.0E-1
3.0E1
TEMP DEG. C
2.0E2

Rheometrics RECAP II

---

eriment No. : 3 Sample No. : 1

:e:
FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT2-2

-ator :CP

e and Time : Friday, August 15, 1986 - 13:50:53

-ating Mode : DYNAMIC

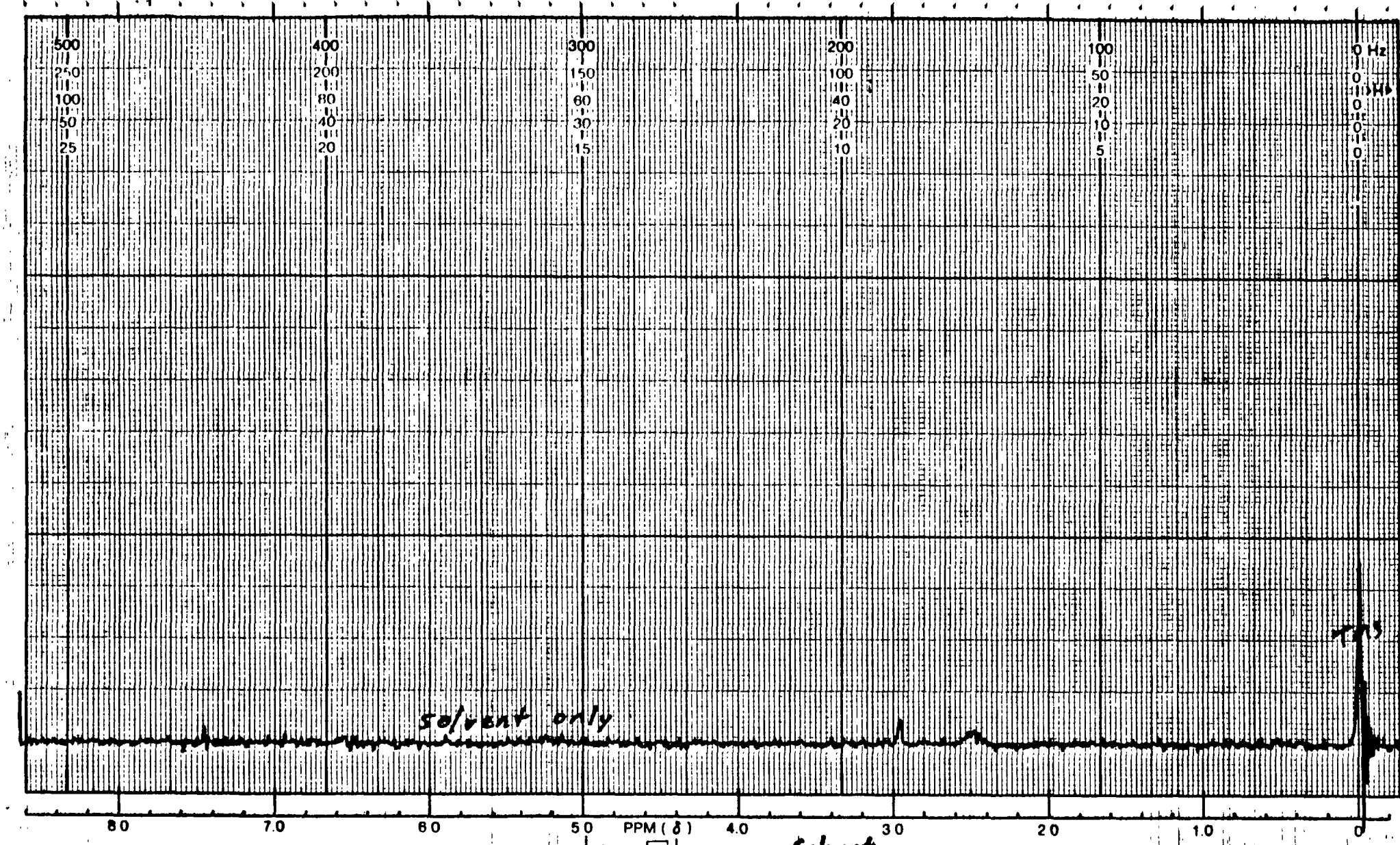
ep Type : CURE

metry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

es :
IN =50%
UENCY =10 RAD/SEC

1.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	2.748e+003	2.747e+003	4.963e+001	3.500e+002	2.000e-001	3.200e+001
2	2.751e+003	2.750e+003	5.589e+001	3.500e+002	1.000e+000	3.200e+001
3	2.407e+003	2.407e+003	4.550e+001	3.062e+002	2.000e+000	3.300e+0[illegible]
4	1.952e+003	1.952e+003	4.134e+001	2.476e+002	3.000e+000	3.500e+001
5	1.521e+003	1.520e+003	3.489e+001	1.925e+002	4.000e+000	3.600e+001
6	1.181e+003	1.180e+003	3.659e+001	1.493e+002	5.000e+000	3.800e+001
7	9.014e+002	9.010e+002	2.717e+001	1.137e+002	6.000e+000	4.000e+001
8	6.851e+002	6.845e+002	2.800e+001	8.640e+001	7.000e+000	4.100e+001
9	5.225e+002	5.219e+002	2.522e+001	6.579e+001	8.000e+000	4.300e+001
.0	4.013e+002	4.007e+002	2.174e+001	5.052e+001	9.000e+000	4.500e+001
1	3.136e+002	3.129e+002	2.112e+001	3.947e+001	1.000e+001	4.700e+001
.2	2.457e+002	2.449e+002	2.013e+001	3.090e+001	1.100e+001	4.900e+001
3	1.938e+002	1.928e+002	1.994e+001	2.436e+001	1.200e+001	5.100e+001
.4	1.561e+002	1.549e+002	1.938e+001	1.961e+001	1.300e+001	5.300e+001
.5	1.257e+002	1.244e+002	1.839e+001	1.580e+001	1.400e+001	5.500e+001
.6	1.014e+002	1.003e+002	1.543e+001	1.273e+001	1.500e+001	5.700e+001
.7	8.340e+001	8.234e+001	1.320e+001	1.047e+001	1.600e+001	5.900e+001
.8	7.033e+001	6.940e+001	1.145e+001	8.840e+000	1.700e+001	6.000e+001
.9	5.969e+001	5.884e+001	1.001e+001	7.496e+000	1.800e+001	6.200e+001
20	5.047e+001	4.972e+001	8.644e+000	6.340e+000	1.900e+001	6.400e+001
21	4.340e+001	4.276e+001	7.440e+000	5.447e+000	2.000e+001	6.600e+001
22	3.759e+001	3.701e+001	6.560e+000	4.720e+000	2.100e+001	6.800e+001
23	3.215e+001	3.168e+001	5.477e+000	4.034e+000	2.200e+001	7.000e+001
24	2.777e+001	2.736e+001	4.723e+000	3.486e+000	2.300e+001	7.200e+001
25	2.370e+001	2.333e+001	4.172e+000	2.977e+000	2.400e+001	7.400e+001
26	2.079e+001	2.049e+001	3.492e+000	2.609e+000	2.500e+001	7.600e+001
27	1.794e+001	1.770e+001	2.927e+000	2.253e+000	2.600e+001	7.700e+001
28	1.506e+001	1.483e+001	2.647e+000	1.870e+000	2.700e+001	7.900e+001
29	1.327e+001	1.309e+001	2.197e+000	1.666e+000	2.800e+001	8.100e+001
30	1.166e+001	1.154e+001	1.650e+000	1.463e+000	2.900e+001	8.300e+001
[illegible]	9.733e+000	9.579e+000	1.742e+000	1.222e+000	3.000e+001	2.500e+001
	[illegible].840e+000	6.742e+000	1.311e+000	1.110e+000	3.100e+001	8.700e+001
	8.088e+000	7.995e+000	1.222e+000	1.015e+000	3.200e+001	8.900e+001
34	7.169e+000	7.105e+000	9.554e-001	9.000e-001	3.300e+001	9.100e+001
35	5.902e+000	5.868e+000	6.306e-001	7.406e-001	3.400e+001	9.300e+001
36	5.403e+000	5.353e+000	7.368e-001	6.783e-001	3.500e+001	9.500e+001
37	3.945e+000	3.945e+000	3.298e-002	4.951e-001	3.600e+001	9.700e+001
38	3.514e+000	3.503e+000	2.691e-001	4.410e-001	3.700e+001	9.900e+001
39	3.057e+000	3.055e+000	1.028e-001	3.835e-001	3.800e+001	1.000e+002
40	2.824e+000	2.824e+000	5.250e-002	3.546e-001	3.900e+001	1.020e+002
41	2.639e+000	2.638e+000	5.008e-002	3.310e-001	4.000e+001	1.040e+002
42	2.532e+000	2.532e+000	0.000e+000	3.180e-001	4.100e+001	1.060e+002
43	2.625e+000	2.619e+000	1.781e-001	3.298e-001	4.200e+001	1.080e+002
44	2.504e+000	2.427e+000	6.148e-001	3.143e-001	4.300e+001	1.100e+002
45	1.607e+000	1.519e+000	5.247e-001	2.019e-001	4.400e+001	1.120e+002
46	1.244e+000	1.234e+000	1.583e-001	1.560e-001	4.500e+001	1.140e+002
47	2.451e+000	2.362e+000	5.321e-001	3.040e-001	4.600e+001	1.160e+002
48	3.097e+000	2.937e+000	9.815e-001	3.888e-001	4.700e+001	1.180e+002
49	2.654e+000	2.593e+000	6.906e-001	3.370e-001	4.800e+001	1.200e+002
50	2.321e+000	2.208e+000	7.159e-001	2.914e-001	4.900e+001	1.220e+002

O.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
51	2.992e+000	2.793e+000	1.074e+000	3.755e-001	5.000e+001	1.240e+002
52	3.334e+000	3.139e+000	1.123e+000	4.188e-001	5.100e+001	1.250e+002
53	4.823e+000	4.690e+000	1.125e+000	6.053e-001	5.200e+001	1.270e+002
54	6.376e+000	6.167e+000	1.617e+000	8.006e-001	5.300e+001	1.290e+002
55	1.043e+001	9.972e+000	3.074e+000	1.309e+000	5.400e+001	1.310e+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 — (500)
FILTER: 1 2 3 4 5 6 7 8 — (2)
RF POWER LEVEL: 0.30 — (.05)

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

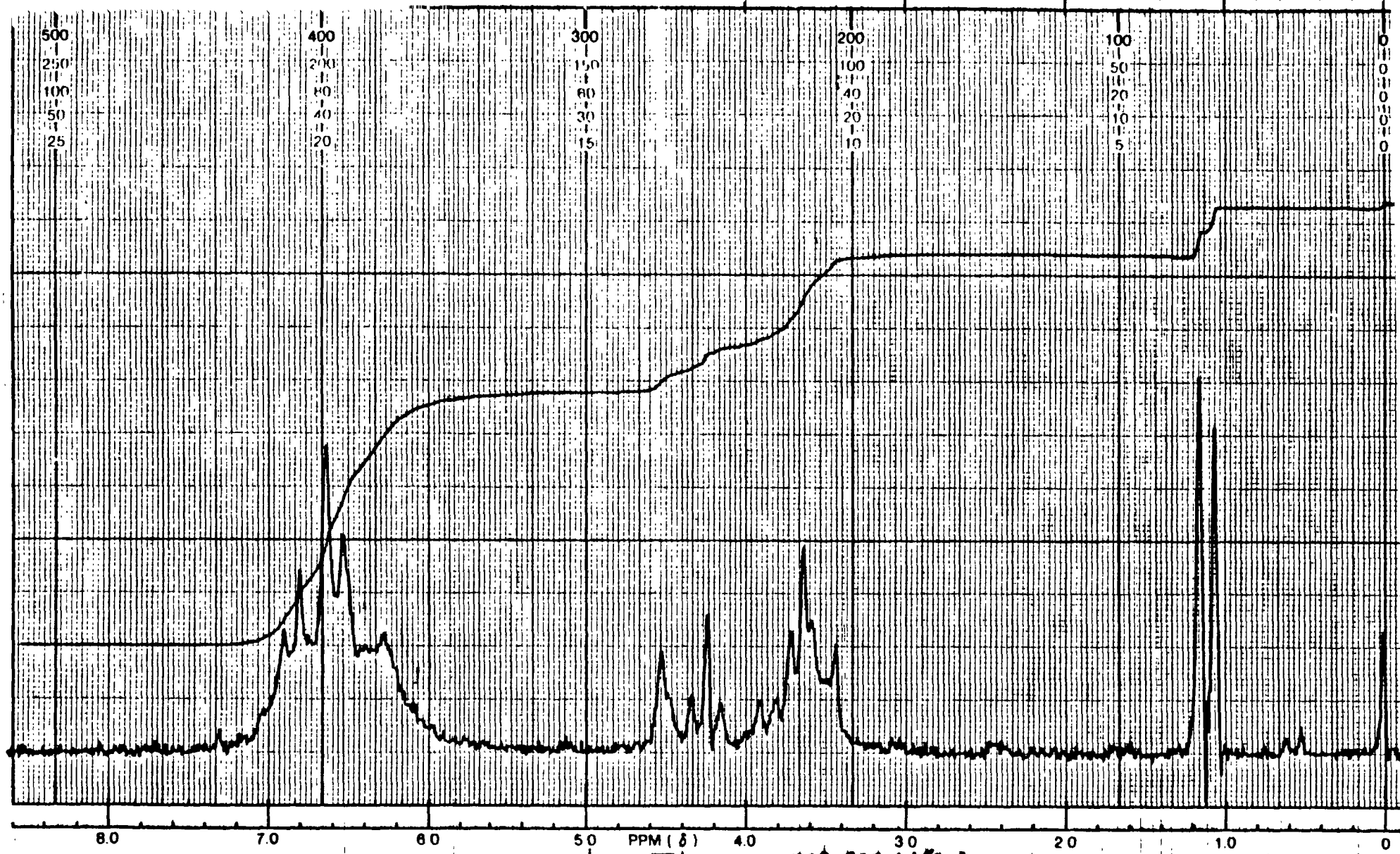
REMARKS:

ORIGINAL PAGE IS
OF POOR QUALITY

SOLVENT ONLY SCAN

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

DATE: 3-21-86 OPERATOR DGW SPECTRUM NO. 1A of 7
solvent scan



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

MANUAL ✓
SWEEP TIME (SEC): 50 250 500 1000
SWEEP WIDTH (Hz): 25 50 100 250 500 ✓
FILTER: 1 2 3 4 5 6 7 8
RF POWER LEVEL: 0.25

AUTO ☐
(250)
(500)
(2)
(.05)

SAMPLE: USP-39A Lot#2-1
SOLVENT: Unisol-d + 0.5% TMS
DEC. LEVEL

REMARKS: 0.130 gm sample
0.888 gm solvent

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OF POOR QUALITY

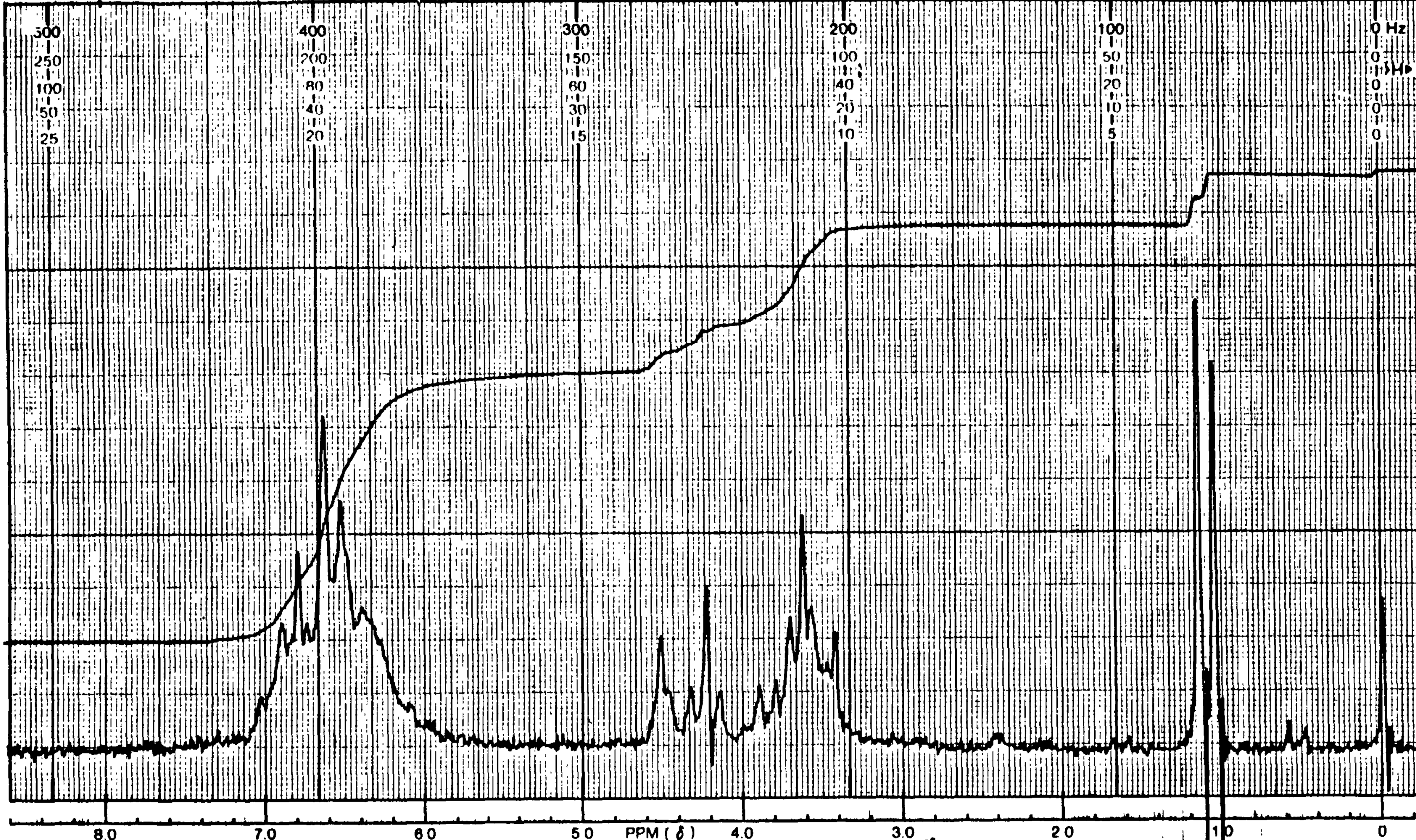
NORELL, INC.
LANDISVILLE, N.J. 08326
T60 Phone: (609) 697-0020

DATE: 3-21-86

OPERATOR DGW

SPECTRUM NO. 3 of 7 USP-39A Lot#2-1

CHART 15B



MANUAL

SWEEP OFFSET (Hz): 0
SPECTRUM AMPLITUDE: 8.0
INTEGRAL AMPLITUDE: 5.0
SPINNING RATE (RPS): 20

SWEEP TIME (SEC): 50 | 250 | 500 | 1000
SWEEP WIDTH (Hz): 25 | 50 | 100 | 250 | 500
FILTER: 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8
RF POWER LEVEL: 0.25

AUTO ☐
(250)
(500)
(2)
(.05)

SAMPLE: USP-39A Lot#2-2
SOLVENT: Anisol-d + 0.5% TMS
DEC. LEVEL

REMARKS: 0.162 gm sample
1.072 gm solvent

DATE: 3-21-86
OPERATOR: DGW
SPECTRUM NO. 4 of 7 USP-39A Lot# 2-2

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

ORIGINAL PAGE IS
OF POOR QUALITY

TABLE OF CONTENTS

FABRIC TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

PWB-6 Fabric for NASA Lot# 2

CHARTS

U.S. Polymeric

FABRIC TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

PWB-6 Fabric for NASA Lot# 2

			#2-14
1a. Breaking Strength, lbs/in, WARP			
ASTM D1682		PICK	21
		CENTER	25
		PLAIN	29
		AVG.	25.0
1b. Breaking Strength, lbs/in, FILL			
ASTM D1682		PICK	48
		CENTER	42
		PLAIN	31
		AVG.	40.3
2a. Carbon Assay, %			
MDQAI 5560		PICK	99.9
		CENTER	99.6
		PLAIN	99.9
		AVG.	99.8
2b. Hydrogen Assay, %			
MDQAI 5560		PICK	.01
		CENTER	.02
		PLAIN	<.01
		AVG. EST	.010
2c. Nitrogen Assay, %			
MDQAI 5560		PICK	.1
		CENTER	.2
		PLAIN	<.1
		AVG. EST	.10
3. Visual Inspection	See Chart 3A		
QCi-102			
4. Specific Gravity, Units			
PTM-84			1.8009
			1.8367
			1.8147
		AVG.	1.817
5. pH, Units			
CTM-24B			8.8
			8.7
		AVG.	8.75
6. TGA, °C at 50% Weight Loss	SET UP #2		
CTM-51 (AIR)	#2-14	828	
	See Chart 6A		

HITCO MATERIALS DIVISION
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2407

PWB-6 Fabric for NASA Lot# 2

7a. Atomic Absorption, ppm
CTM-53B

	#2-14
Na	2
K	1
Ca	104
Mg	1
Li	0
AVG.	108

7b. Moisture Content, % -.099
CTM-53B

7c. Ash Content, % .099
CTM-53B

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

	#2-14
AVERAGE	9.14
Minimum	8.00
Maximum	10.10
Std. Dev	0.66

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

	#2-14
AVERAGE	--
Minimum	--
Maximum	--
Std. Dev	--

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

	#2-14
	30
	28
	27
	27
	28
AVG.	28.0

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

	29
	29
	30
	29
	29
AVG.	29.2

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

LEFT	2.407
CENTER	2.365
RIGHT	2.440
AVG.	2.404

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

LEFT	.71
CENTER	.59
RIGHT	.57
AVG.	.62

PWB-6 Fabric for NASA Lot# 2

10c. Weight Change on Acetone Wash, % PTM-3A		#2-14
	LEFT	.00
	CENTER	-.04
	RIGHT	.00
	AVG.	-.01

U.S. Polymeric

Hamid M. Quraishi, Manager
Quality Assurance Department

USP NO. CHART 3A

DATE 6/6/86

FABRIC PWB6

MFG. STACK POLE Fibers Lot # 1513-1

ROLL NO. 161921

YARDS 38.0

POUNDS 16.75

ORDER NO. 7608

SPECIFICATION STd mfg Cuts

Q.C. FILE # NASA #2-14

FOOTAGE

FT	START	Sample
0–10		
10–20	W	
20–30	W	
30–40		
40–50		
50–60	W	
60–70		
70–80		
80–90		
90–100		
100–110	EWD 107	
110–120		
120–130		
130–140		
140–150		
150–160		
160–170		
170–180		
180–190		
190–200		
200–210		
210–220		
220–230		
230–240		
240–250		
250–260		

LEFT

TREATER OPERATOR READ UP

SYMBOLS

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

REMARKS

BAG 2" RT

GRADE Group B

GARCIA

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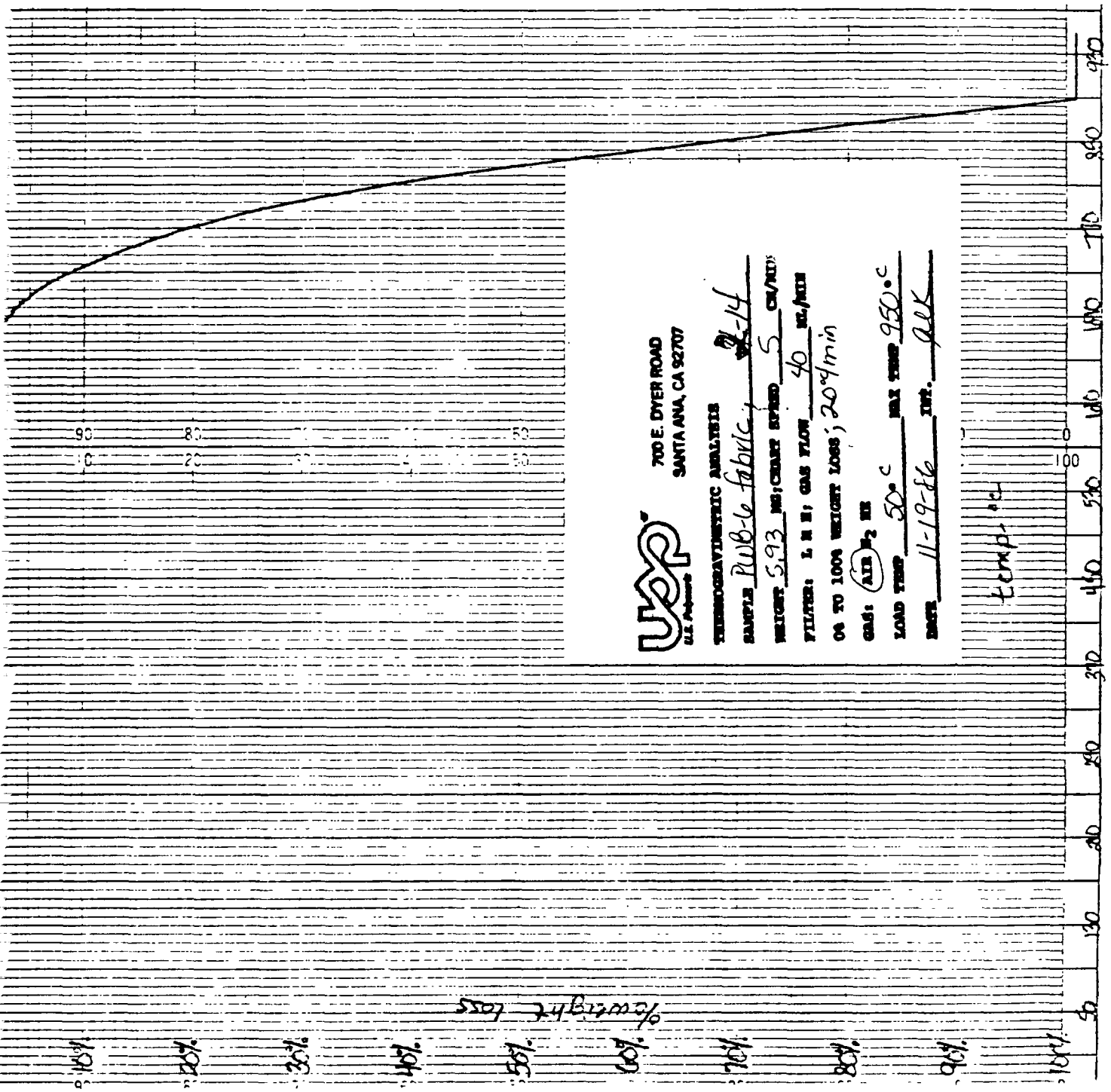

TABLE OF CONTENTS

PREPREG TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

FM 5839 NASA LOT# 2 U.S.P. LOT# D09318

CHARTS

U.S. Polymeric

PREPREG TESTING

NAS8-36298

U.S. POLYMERIC O.E.71108

FM 5839 NASA LOT# 2 U.S.P. LOT# D09318

		ROLL#1-S	ROLL#2-S
1a. Resin Content, Soxhlet, % CTM-6D		32.8	33.5
		33.1	35.1
		33.0	34.7
	AVG.	33.0	34.4
	NASA LOT# 2 AVERAGE		33.7
1b. Filler Content, Soxhlet, % CTM-6D		13.4	13.7
		13.5	14.3
		13.5	14.2
	AVG.	13.5	14.1
	NASA LOT# 2 AVERAGE		13.8
1c. Cloth Content, Soxhlet, % CTM-6D		53.8	52.8
		53.4	50.6
		53.5	51.1
	AVG.	53.6	51.5
	NASA LOT# 2 AVERAGE		52.5
2. Volatile Content, % PTM-17B		3.1	2.5
		3.3	2.6
		3.1	2.5
	AVG.	3.2	2.5
	NASA LOT# 2 AVERAGE		2.9
3. Flow, 1000 psi, % PTM-19G		14.1	11.8
		12.5	12.9
		13.1	13.3
	AVG.	13.2	12.7
	NASA LOT# 2 AVERAGE		13.0
4. Resin Content, Dry basis, % PTM-16F, Type II		36.2	40.7
		34.6	41.7
		34.4	41.6
	AVG.	35.1	41.3
	NASA LOT# 2 AVERAGE		38.2
5. Tack, lbs PTM-80		15	20
	NASA LOT# 2 AVERAGE		18
6. Gel Time, seconds PTM-20E		79	83
	NASA LOT# 2 AVERAGE		81

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700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2407

FM 5839 NASA LOT# 2 U.S.P. LOT# D09318

7a. Atomic Absorption, ppm CTM-53B		ROLL#1-S	ROLL#2-S	LOT#2 AVG.
	Na	8	10	9
	K	1	2	2
	Ca	27	26	27
	Mg	1	2	2
	Li	0	0	0
	TOTAL	37	40	39

7b. Moisture Content, % CTM-53B	ROLL#1-S	ROLL#2-S
	2.14	2.17
NASA LOT# 2 AVERAGE		2.15

7c. Ash Content, % CTM-53B		
	.06	.06
NASA LOT# 2 AVERAGE		.06

8. TGA, % Weight Loss at 500°C CTM-51 (Nitrogen)		
	7.5	9.4
NASA LOT# 2 AVERAGE		8.5

See chart 8A-8B

9. DSC, °C CTM-50A		ROLL#1-S	ROLL#2-S	LOT#2 AVG.
	First Temp	186	186	186

See Chart 9A-9B

10. Infrared (IRZB) Baseline CTM-21C			
	.81	.81	.81

See Chart 10A-10B

11. Environmental History

Date manufactured: 2 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
		1.569	1.558
		1.567	1.557
		1.568	1.555
	AVG.	1.568	1.557
NASA LOT# 2 AVERAGE			1.562

13a. Tensile Strength, ksi, WARP FTMS 406-1011			
		15.98	16.01
		17.01	14.94
		17.89	15.98
		16.13	14.00
		17.40	15.11
	AVG.	16.88	15.21
NASA LOT# 2 AVERAGE			16.05

FM 5839 NASA LOT# 2 U.S.P. LOT# D09318

		ROLL#1-S	ROLL#2-S
13b. Tensile Modulus, msi, WARP FTMS 406-1011		3.99	3.35
		4.19	3.23
		4.48	3.33
		3.82	2.93
		4.05	3.41
	AVG.	4.11	3.25
	NASA LOT# 2 AVERAGE		3.68
13c. Tensile Elongation, %, WARP FTMS 406-1011		.57	1.02
		.63	1.11
		.64	1.05
		.59	1.16
		.61	.95
	AVG.	.61	1.06
	NASA LOT# 2 AVERAGE		.83
14a. Flexural Strength, ksi, WARP FTMS 406-1031		28.40	26.60
		28.34	26.46
		33.12	26.39
		34.23	30.58
		28.90	30.43
	AVG.	30.60	28.09
	NASA LOT# 2 AVERAGE		29.35
14b. Flexural Modulus, msi, WARP FTMS 406-1031		3.23	2.91
		3.20	2.89
		3.92	2.80
		4.01	3.47
		3.76	3.40
	AVG.	3.62	3.09
	NASA LOT# 2 AVERAGE		3.36
15a. Compressive Strength, ksi, WARP FTMS 406-1021		21.74	23.20
		23.26	23.01
		23.13	24.75
		22.39	24.74
		23.23	21.27
	AVG.	22.75	23.39
	NASA LOT# 2 AVERAGE		23.07
15b. Compressive Modulus, msi, WARP FTMS 406-1021		3.24	3.69
		3.44	3.32
		3.71	3.41
		3.62	3.42
		3.75	3.36
	AVG.	3.55	3.44
	NASA LOT# 2 AVERAGE		3.50

FM 5839 NASA LOT# 2 U.S.P. LOT# D09318

		ROLL#1-S	ROLL#2-S
16. Double Shear Strength, ksi FTMS 406-1041A		3.36	3.87
		2.85	3.82
		3.16	3.72
		2.87	3.59
		3.50	3.56
	AVG.	3.15	3.71
	NASA LOT# 2 AVERAGE		3.43
17. Barcol Hardness, Units ASTM D-2583 (Average of 10 determinations)		67.5	69.5
	NASA LOT# 2 AVERAGE		68.5
18. Residual Volatiles, % PTM-98		1.15	1.44
		1.14	1.35
		1.29	1.34
	AVG.	1.19	1.38
	NASA LOT# 2 AVERAGE		1.28
19. Resin Content, Pyrolysis, % CTM-14B		30.88	34.04
		29.39	33.18
		31.40	33.66
	AVG.	30.55	33.63
	NASA LOT# 2 AVERAGE		32.09
20. Acetone Extraction, % CTM-18A		5.09	5.25
		6.20	3.82
		5.05	5.11
	AVG.	5.45	4.73
	NASA LOT# 2 AVERAGE		5.09
21a. CTE, in/in °F with PLY PTM-61B		-2.25	.97
		.00	.00
	AVG.	-1.13	.49
	NASA LOT# 2 AVERAGE		-.32
21b. CTE, in/in °F Cross PLY PTM-61B		5.05	3.01
		4.17	3.26
	AVG.	4.61	3.14
	NASA LOT# 2 AVERAGE		3.87

See Chart 21A-21B

U.S. Polymeric

Hamid M. Quraishi, Manager
Quality Assurance Department

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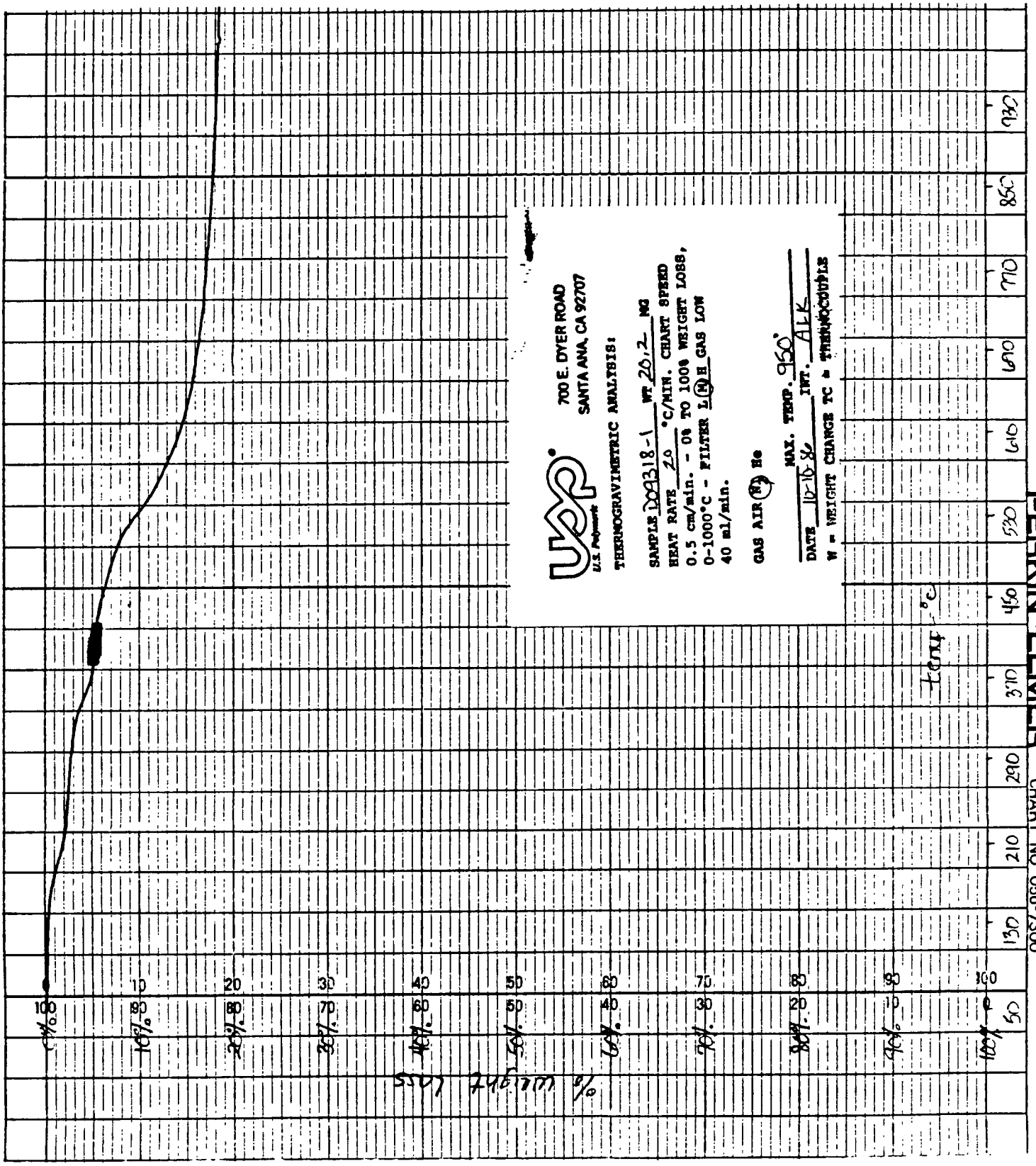

CHART 8B

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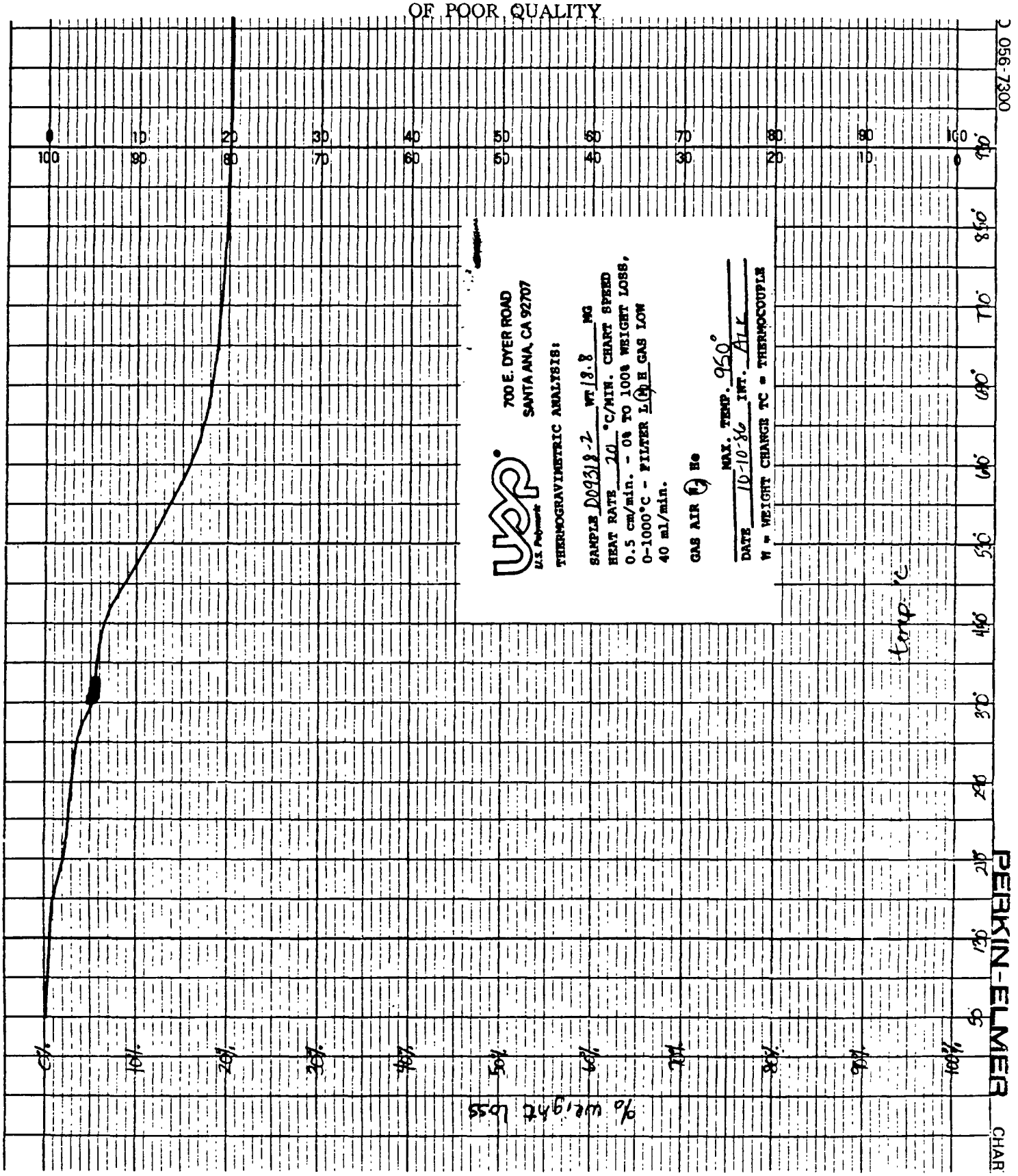
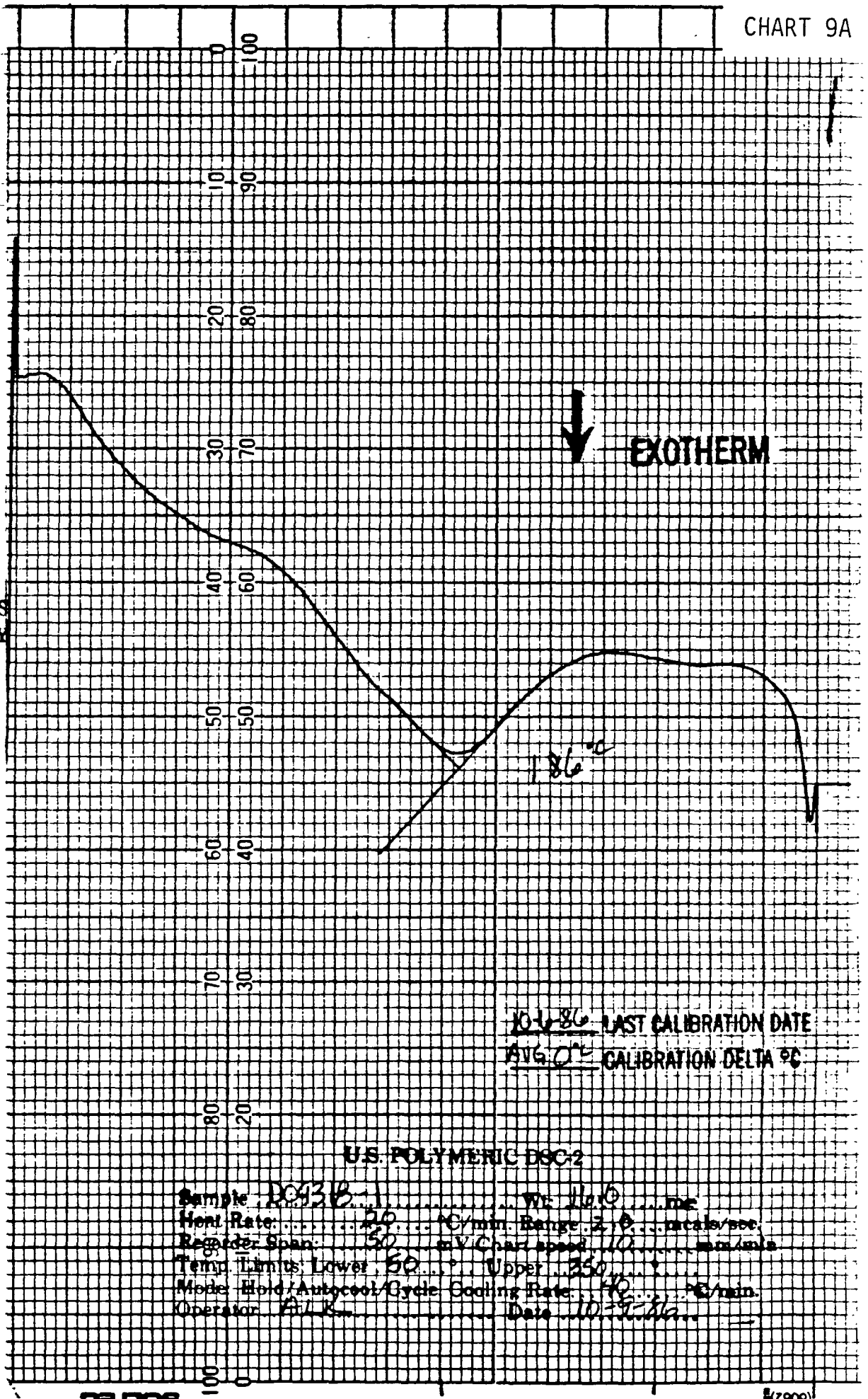
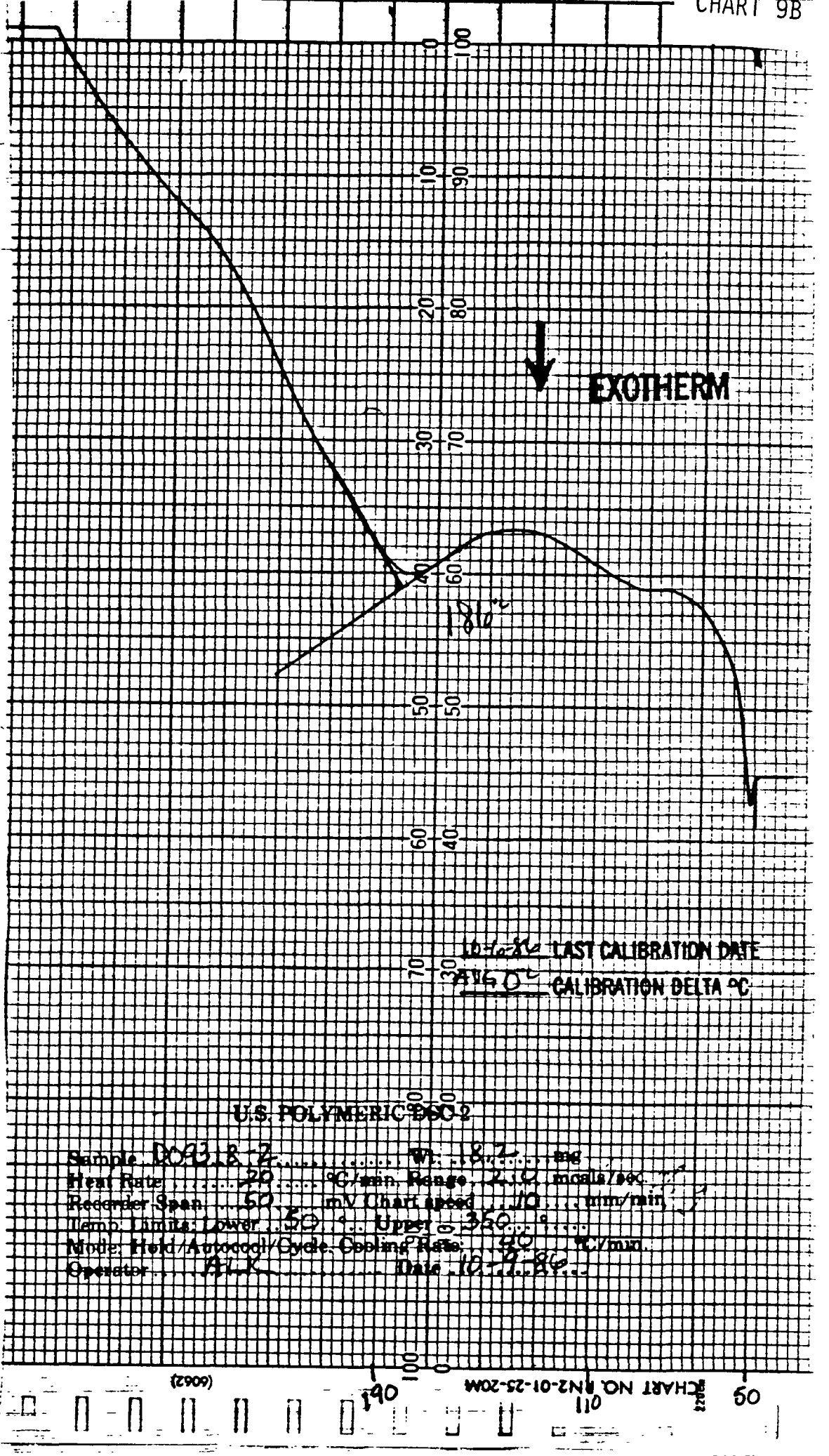


CHART 9A





SPECTRUM NO. 15253
DATE 7-09-86
SAMPLE FM 5839
509318 # ST-1

SOURCE
STRUCTURE

PATH 0.2 mm NACL
SOLVENT ACETONE
CONCENTRATION 30-50%
PHASE 3
COMMENTS PRE-PREG
MATERIAL

ANALYST V. MIRANDA

Beckman®
INFRARED
SPECTROPHOTOMETER

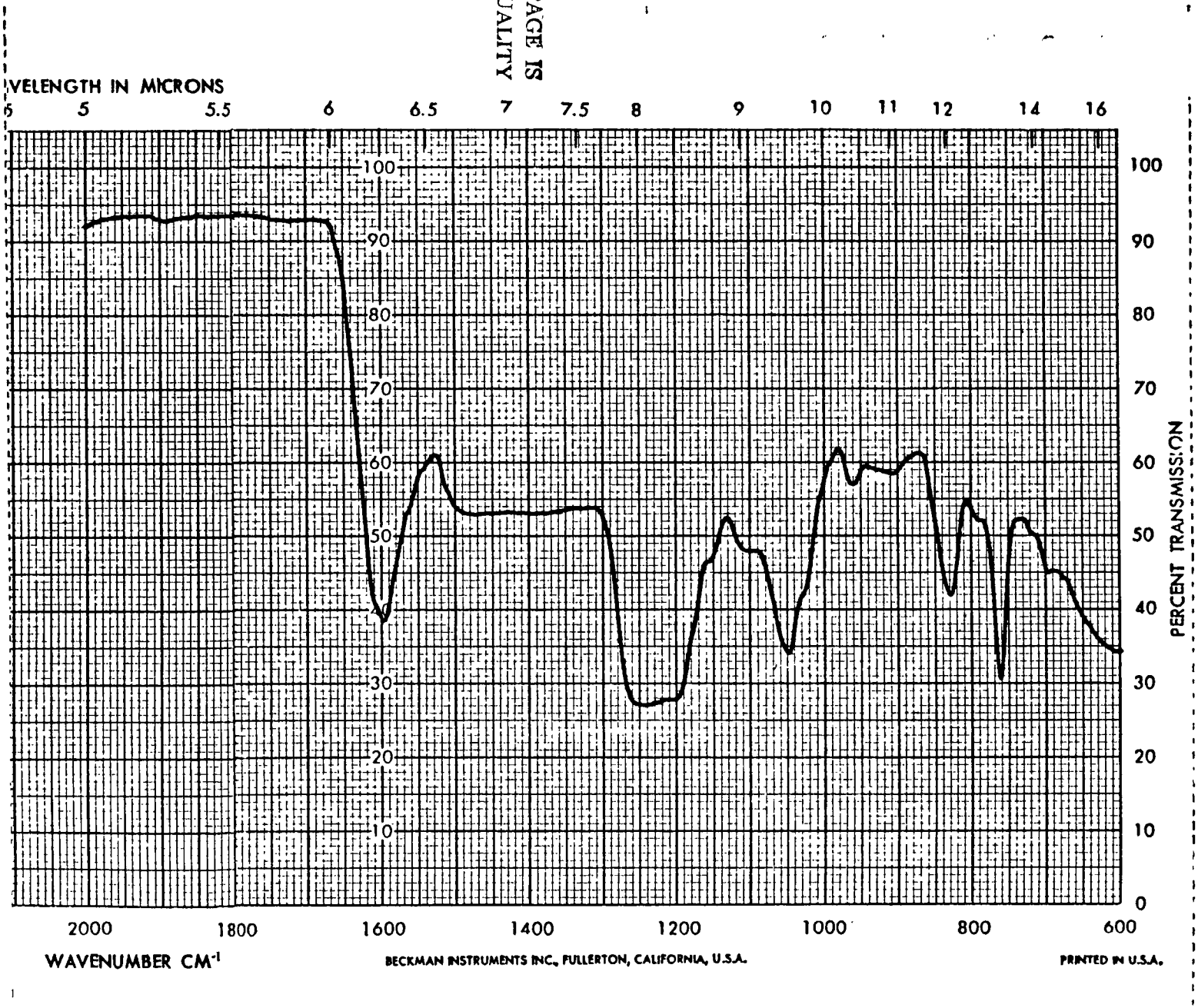


CHART 10A

SPECTRUM NO. 15255
DATE 7-10-86
SAMPLE FM 5839
D0931B # ST-2

SOURCE

STRUCTURE

PATH 0.2 mm NACL
SOLVENT ACETONE
CONCENTRATION 30-50 %wt
PHASE 3
COMMENTS PRE-PREG
MATERIAL

ANALYST V. MIRANDA

Beckman®
INFRARED
SPECTROPHOTOMETER

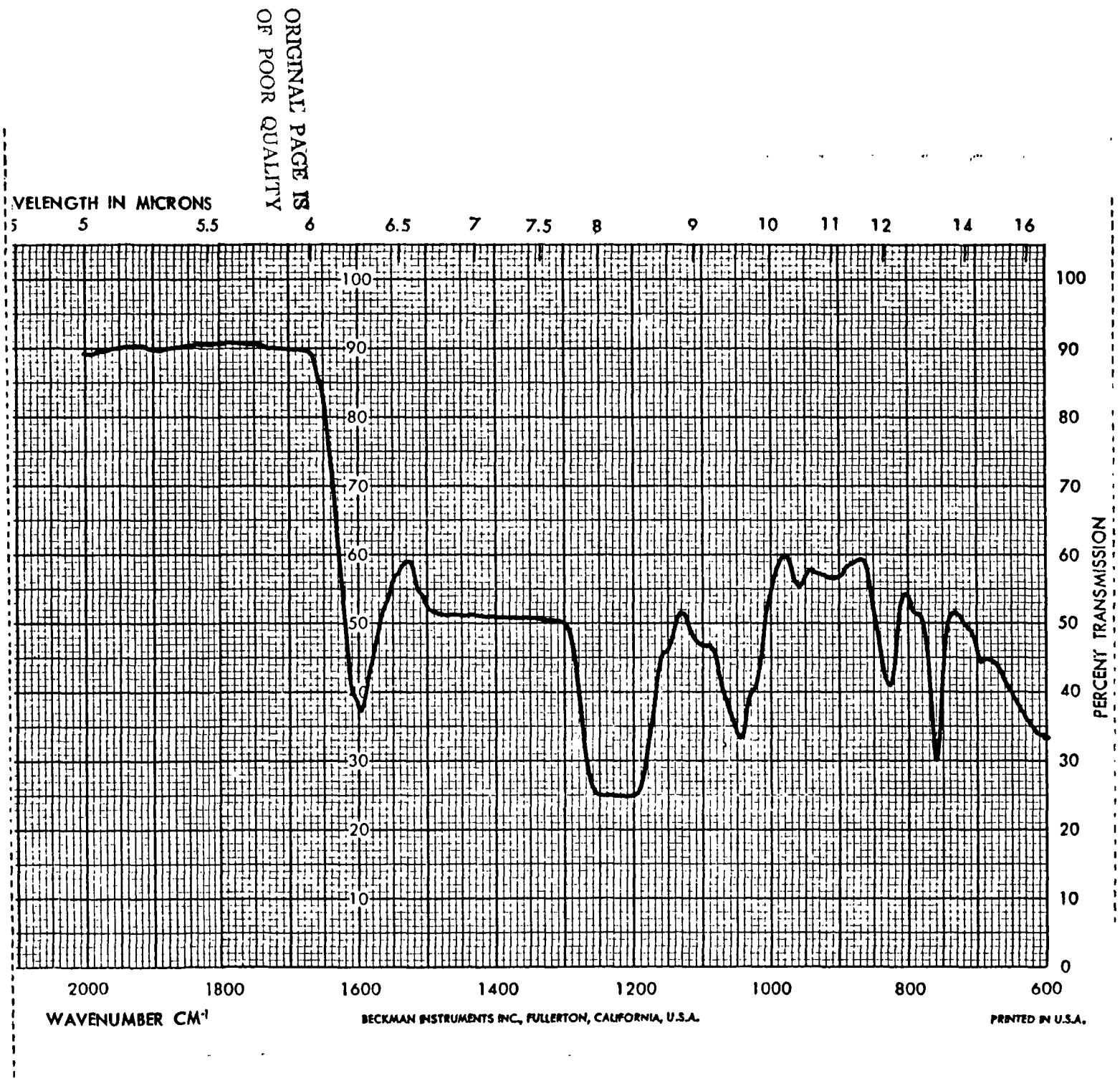


CHART 10B

PART NO. 990088

RUN NO___ DATE 12/8/94	T-AXIS	DTA-DSC	TGA	TMA (mil/mF)	
OPERATOR DH	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	
D09318-1-smxt-(1)	HEAT / COOL___ ISO___	WEIGHT, mg___	WEIGHT, mg___	SAMPLE SIZE 0.255	
ATM Air @ STP	SHIFT, in 0	REFERENCE___	TIME CONST., sec___	LOAD, g 10	
FLOW RATE 3.5(PP)			dY, (mg/min) /in___	dY,(10X),(mils/min)/in___	
w ply					

$\frac{dX}{dY} = \frac{(13)(0.0010)}{(0.255)(10)} = 2.25$

MEASURED VARIABLE_____

DUPONT Instruments

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Chart 21A1

Chart 21A2

PART NO. 990088

RUN NO ___ DATE 11/14/94
OPERATOR TP
SAMPLE
D0731-(-)MMA-(2)
ATM Air @ 30
FLOW RATE 100 (sccm)
way

T-AXIS
SCALE, °C/in 50 x2
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 Quartz (air)
SCALE, mils/in 4.0/1.0
MODE EXPANSION
SAMPLE SIZE 0.262
LOAD, g 10
dY/dT (10X) (mils/min)/in ___

MEASURED VARIABLE

DUPONT Instruments

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Chart 21A3

PART NO. 990088

RUN NO. ___ DATE 4/4/86
OPERATOR DL
SAMPLE
0063/8 - 1-stage (3)
ATM Air @ 25°
FLOW RATE 3.5 SCFH
Poly

T-AXIS
SCALE, °C/in 50 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 Penetration
SCALE, mils/in 0.1/0.2
MODE Expansion
SAMPLE SIZE 0.127
LOAD, g 10
dY/dT (10X) (mils/min)/in ___

Tg = 220(2)1.1 = 151.85°C

MEASURED VARIABLE

DUPONT instruments

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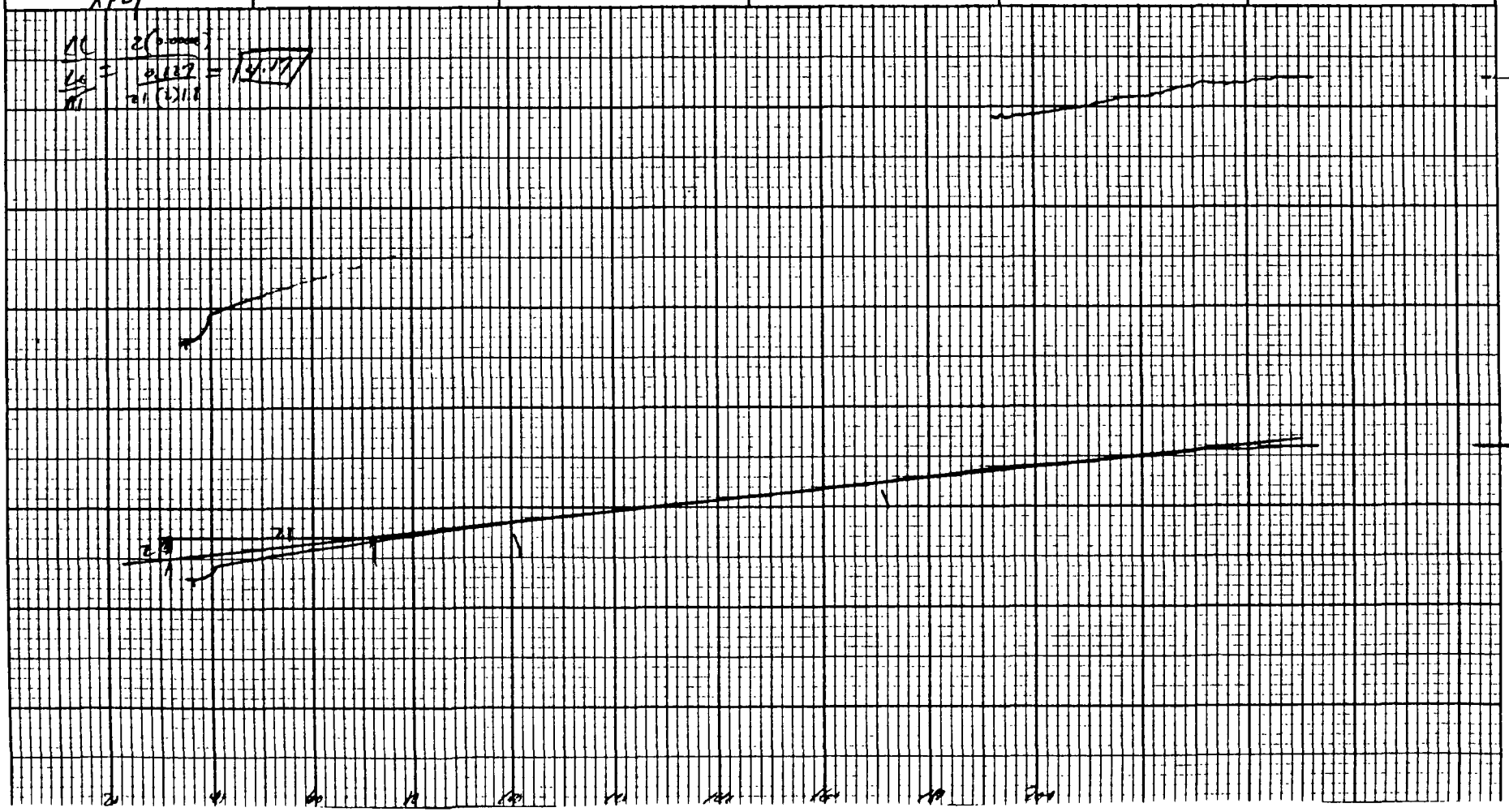
PART NO. 990088

RUN NO ___ DATE 12/10/86	T-AXIS	DTA-DSC	TGA	TMA (um/inF)	
OPERATOR TD	SCALE, °C/in 50 70	SCALE, °C/in ___	SCALE, mg/in ___	SCALE, mils/in 0.1/12	
SAMPLE	PROG. RATE, °C/min 10	(mcal/sec)/in ___	SUPPRESSION, mg ___	MODE EXPANSION	
DOG18-1 STRIP (4)	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg ___	WEIGHT, mg ___	SAMPLE SIZE 0.127	
ATM Air @ STP	SHIFT, in 0	REFERENCE ___	TIME CONST., sec ___	LOAD, g 10	
FLOW RATE 3.5 SCFH			dY, (mg/min) /in ___	dY, (10X), (mils/min) /in ___	

XPLY

$\frac{\Delta L}{L_0} = \frac{2(0.0008)}{0.127} = 14.17$



DUPONT Instruments

MEASURED VARIABLE

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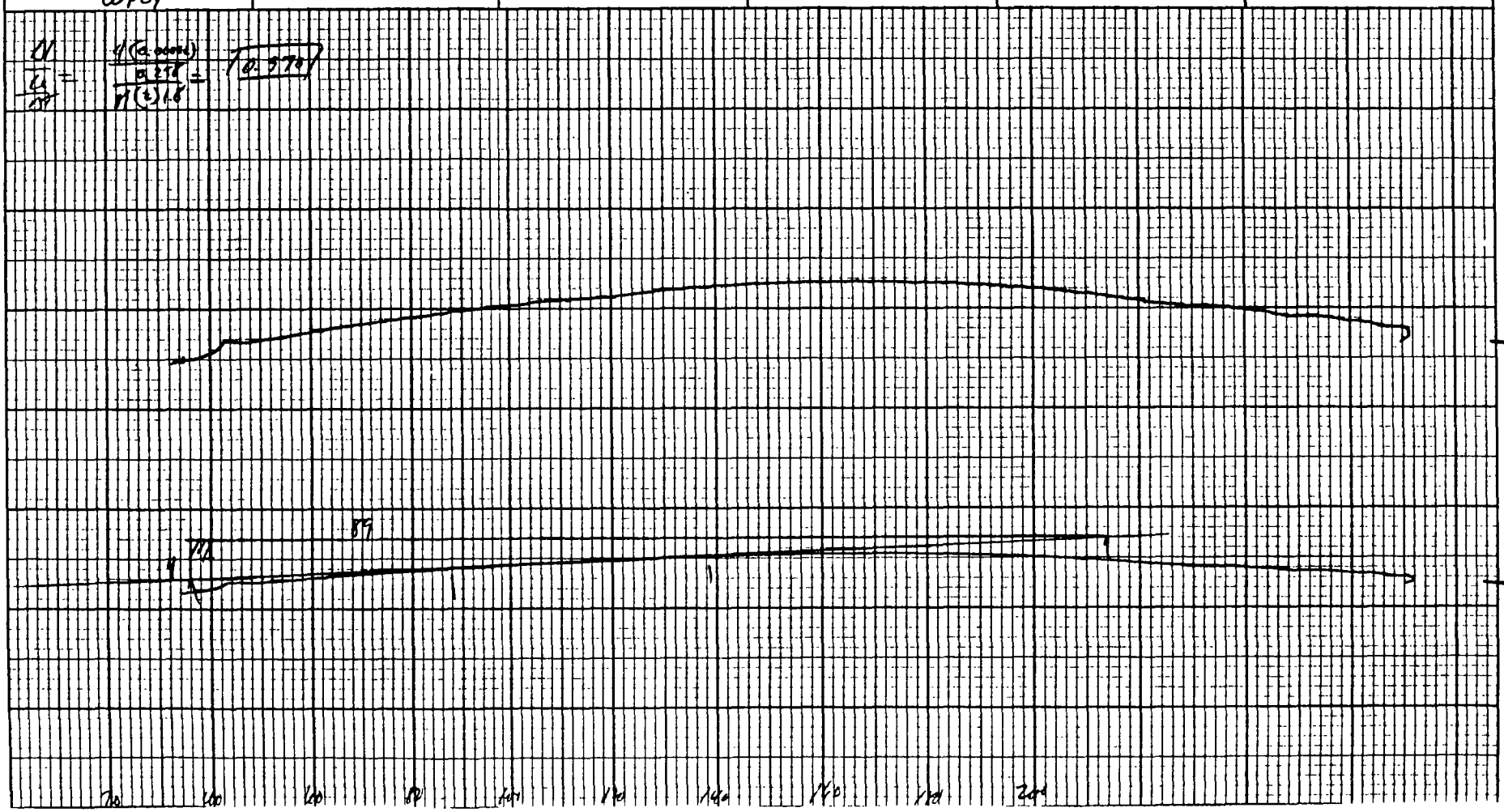
Chart 21A4

PART NO. 990088

RUN NO ___ DATE 1/8/18	T-AXIS	DTA-DSC	TGA	TMA (min/min)	
OPERATOR PJ	SCALE, °C/in 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.102	
SAMPLE	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE Expansion	
DG9318 - 2 - 5 mm - (1)	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.258	
ATM Air @ STP	SHIFT, in 0	REFERENCE	TIME CONST, sec	LOAD, g 10	
FLOW RATE 3-55 (54)			dY, (mg/min) /in	dY, (10X), (mils/min) /in	
w ply					

$\frac{H}{D} = \frac{4(6.0000)}{\pi(0.258)^2} = 0.970$



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MEASURED VARIABLE

DUPONT Instruments

Chart 21B1

Chart 21B2

PART NO. 990088

RUN NO ___ DATE 12/14/88

OPERATOR TJ

SAMPLE: D0931-2-Smear-(2)

ATM Air @ SP

FLOW RATE 3.5 SCFH

wply

T-AXIS

SCALE, °C/in 50 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 (μm/inch)

SCALE, mils/in 0.1/div

MODE Expansion

SAMPLE SIZE 0.255

LOAD, g 10

dY/dT, (10X), (mils/min)/in

MEASURED VARIABLE

DUPONT Instruments

Chart 21B3

PART NO. 990088

RUN NO ___ DATE 12/11/92
OPERATOR DK
SAMPLE
D05318 - 2 - Start-(3)
ATM Air @ 50
FLOW RATE 3.5 SCFH
XPLY

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 Air/Low (-)
SCALE, mils/in 0.1/low
MODE Expansion
SAMPLE SIZE 5.132
LOAD, g 10
dY/dT (10X) (mils/min)/in ___

3.01

MEASURED VARIABLE

DUPONT instruments

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Chart 21B4

PART NO. 990088

RUN NO ___ DATE 12/10/90
OPERATOR CP
SAMPLE
D0938-2-STAR-(4)
ATM AIR @ STP
FLOW RATE 2-SIDED
XPLY

T-AXIS
SCALE, °C/in 5020
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 (mil/4.8)
SCALE, mils/in 0.1/0.2
MODE Extension
SAMPLE SIZE 0.151
LOAD, g 10
dY/dT (10X) (mils/min)/in ___

MEASURED VARIABLE

DUPONT Instruments

TABLE OF CONTENTS

FILLER TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

Filler Lot for NASA Lot# 3

CHARTS

U.S. Polymeric

FILLER TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

Filler Lot for NASA Lot# 3

		SAMPLE			
1. Carbon Content, % QAI-5560		#3A-1	#3A-2	#3A-3	
		99.40	99.32	99.44	
	NASA LOT# 3		AVERAGE	99.39	
2. Ash Content, % PTM-71B		0.000	0.000	0.000	
		0.000	0.000	0.005	
	AVG.	0.000	0.000	0.002	
	NASA LOT# 3		AVERAGE	0.001	
3. Atomic Absorption, ppm CTM-53B (Values are average of 2 determinations)		#3A-1	#3A-2	#3A-3	LOT#3 AVG.
	Na	6.0	6.0	6.0	6.0
	K	2.5	1.0	2.0	1.8
	Ca	2.5	2.5	2.0	2.3
	Mg	0.0	0.0	0.0	0.0
	Li	0.0	0.0	0.0	0.0
	TOTAL	11.0	9.5	10.0	10.2
3a. Moisture Content, % CTM-53B		.010	.015	0.000	
		.005	.020	0.000	
	AVG.	.008	.018	0.000	
	NASA LOT# 3		AVERAGE	.008	
3b. Ash Content, % CTM-53B		.025	.000	.000	
		.025	.010	.000	
	AVG.	.025	.005	.000	
	NASA LOT# 3		AVERAGE	.010	
4. pH, Units ASTM D1512		4.80	4.75	4.85	
		4.95	4.80	4.80	
	AVG.	4.88	4.78	4.82	
	NASA LOT# 3		AVERAGE	4.83	
5. Particle Size, microns S.E.M. procedure (Average values are of 20 determinations)	AVG.	.51	.51	.42	
	Maximum	.99	.88	.85	
	Minimum	.20	.18	.15	
	Std. Dev	.23	.20	.17	
	NASA LOT# 3 AVERAGE SIZE			.48	
6a. TGA, °C at 50% Loss CTM-51		864	860	850	
	NASA LOT# 3		AVERAGE	858	

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

Filler Lot for NASA Lot# 3

6b. TGA
CTM-51 — See Charts 6A-6C

7. Particle Size Distribution
CTM-72 — See Charts 7A-7C

7a. Particle Size, microns
CTM-72

	#3A-1	#3A-2	#3A-3
	.89	.94	.89
	.94	.83	.86
AVG.	.92	.88	.88

NASA LOT# 3 AVERAGE .89

U.S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

CHART 6A

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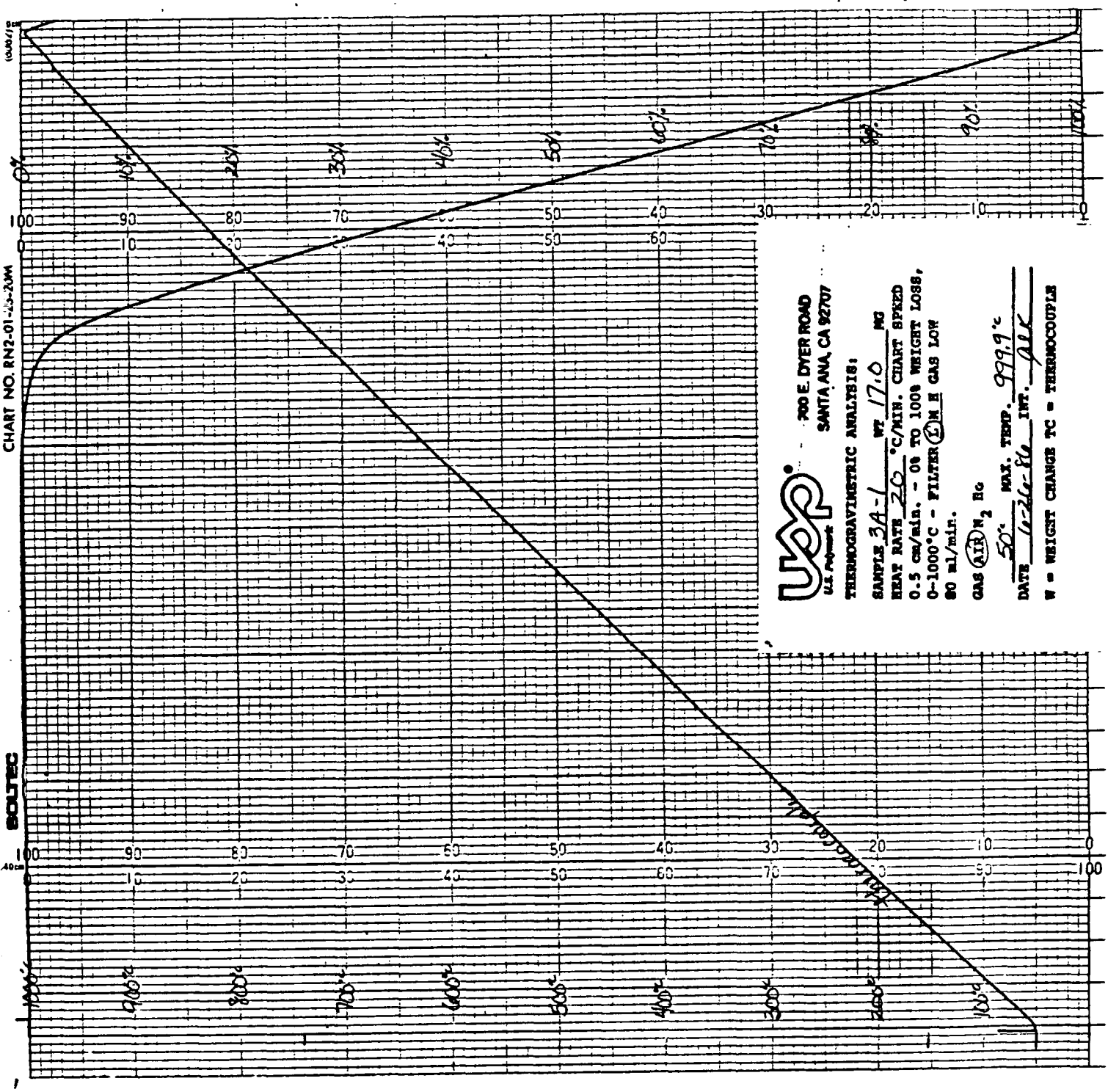

CHART 6B

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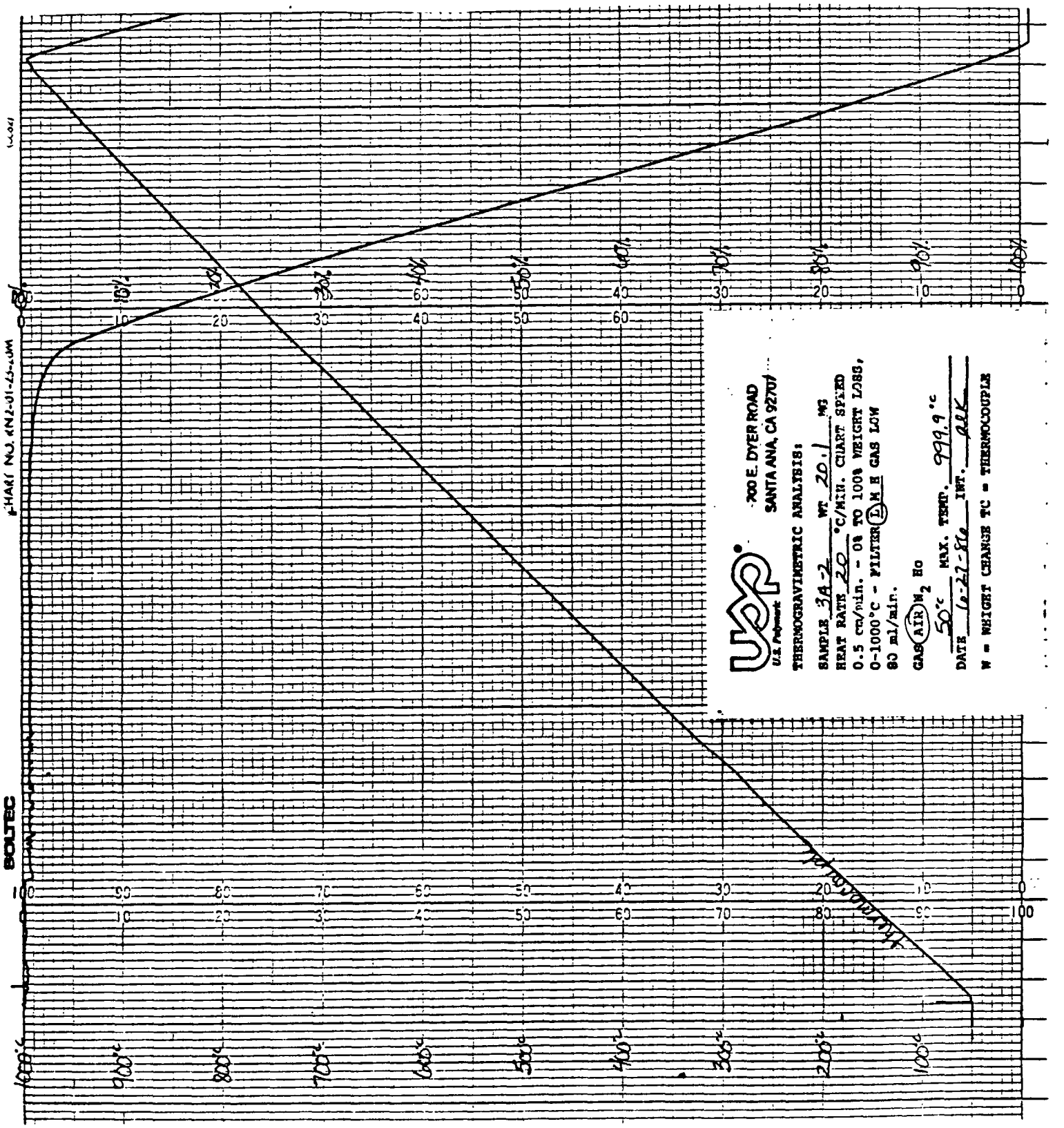

CHART 6C

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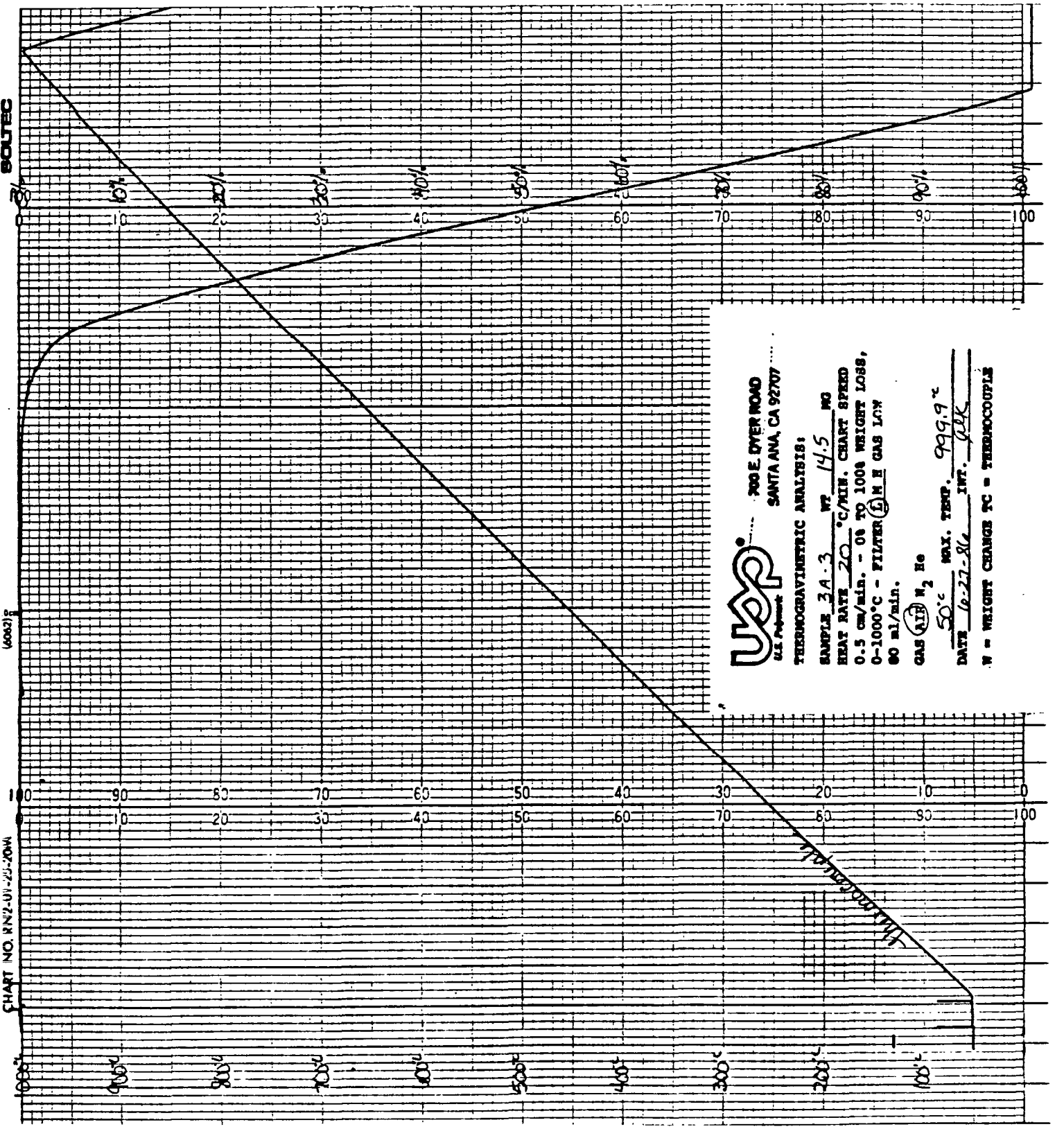


HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-27-86
#1 SAMPLE NASA LOT#3A1
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

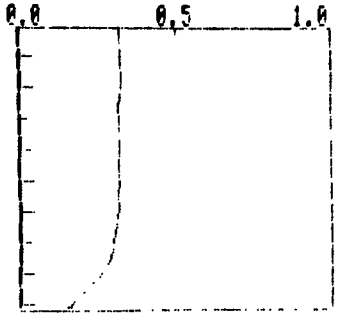
* CONDITIONS

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

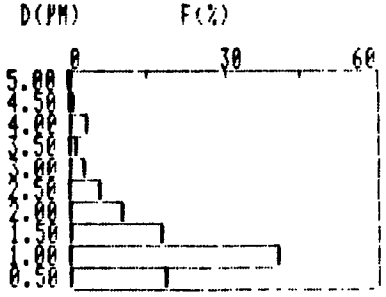


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.5	0.5
4.00-3.50	3.2	3.6
3.50-3.00	1.0	4.7
3.00-2.50	2.5	7.2
2.50-2.00	6.0	13.1
2.00-1.50	10.2	23.3
1.50-1.00	17.5	40.8
1.00-0.50	40.7	81.5
0.50-0.00	18.5	100.0

D(AVE) 0.89 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



LOT#3A-1
Sample#1

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-27-86
#2 SAMPLE NASA LOT#3A1
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

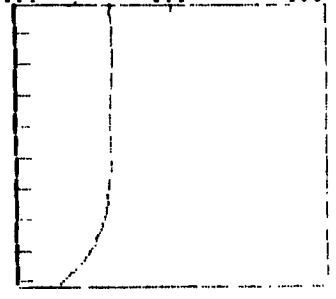
* CONDITIONS

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

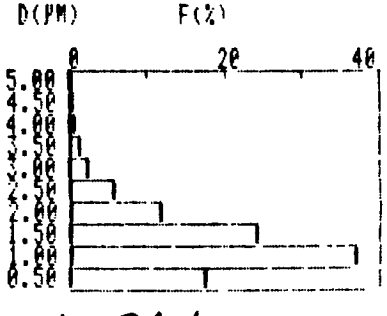


* DISTRIBUTION TABLE (BY VOL.)

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	0.6	0.6
3.50-3.00	1.2	1.8
3.00-2.50	2.3	4.1
2.50-2.00	5.6	9.7
2.00-1.50	11.8	21.5
1.50-1.00	24.2	45.7
1.00-0.50	37.0	82.7
0.50-0.00	17.3	100.0

D(AVE) 0.94 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



LOT 3A-1
Sample#2

CHART 7A

HORIBA CAPA-500
PARTICLE ANALYZER

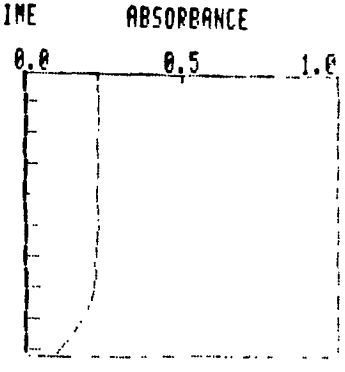
DATE 5-23-86
SAMPLE NASA Lot#3A-2
#1 SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

* 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

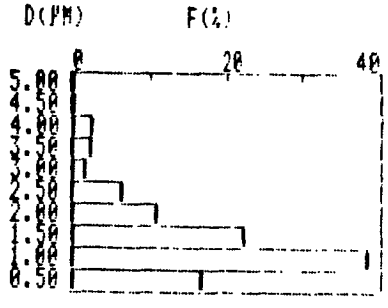


* DISTRIBUTION TABLE (BY VOL.)

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	2.3	2.3
3.50-3.00	2.4	4.7
3.00-2.50	1.5	6.2
2.50-2.00	6.2	12.5
2.00-1.50	10.6	23.1
1.50-1.00	22.3	45.4
1.00-0.50	38.4	83.8
0.50-0.00	16.2	100.0

D(AVE) 0.94 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



LOT#3A2
Sample#1

HORIBA CAPA-500
PARTICLE ANALYZER

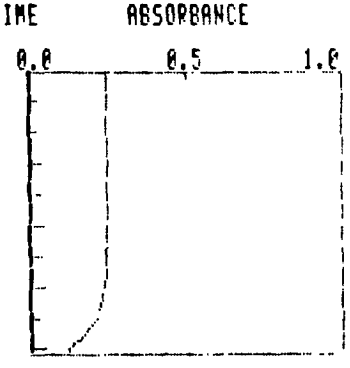
DATE 5-23-86
SAMPLE NASA LOT#3A-2
#2 SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

* 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

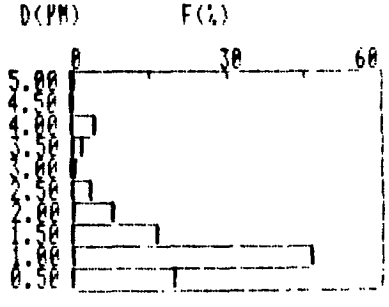


* DISTRIBUTION TABLE (BY VOL.)

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	4.2	4.2
3.50-3.00	1.6	5.9
3.00-2.50	0.6	6.4
2.50-2.00	3.6	10.0
2.00-1.50	7.8	17.8
1.50-1.00	16.3	34.2
1.00-0.50	46.3	80.5
0.50-0.00	19.5	100.0

D(AVE) 0.83 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



LOT#3A-2
Sample#2

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OF POOR QUALITY

CHART 7B

HORIBA CAPA-500
PARTICLE ANALYZER

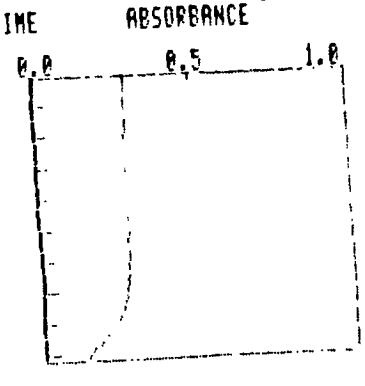
DATE 5-23-86
#1 SAMPLE NASA LOT#3A-3
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

* 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

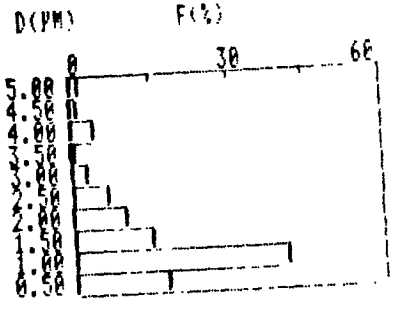


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	1.4	1.4
4.50-4.00	0.9	2.3
4.00-3.50	4.2	6.5
3.50-3.00	0.3	6.9
3.00-2.50	2.5	9.4
2.50-2.00	6.5	15.9
2.00-1.50	10.0	25.9
1.50-1.00	14.8	40.7
1.00-0.50	41.7	82.3
0.50-0.00	17.7	100.0

D(AVE) 0.89 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#3A-3
Sample #1

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HORIBA CAPA-500
PARTICLE ANALYZER

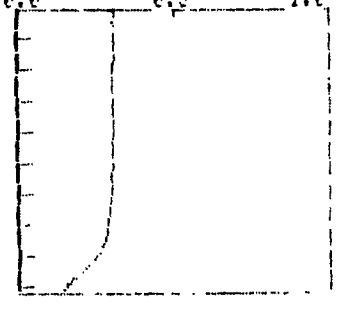
DATE 5-23-86
#2 SAMPLE NASA LOT#3A-3
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

* 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

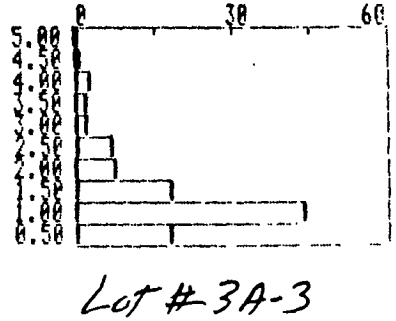


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.5	0.5
4.00-3.50	2.3	2.8
3.50-3.00	1.8	4.5
3.00-2.50	1.8	6.3
2.50-2.00	6.6	12.9
2.00-1.50	7.5	20.3
1.50-1.00	17.8	38.1
1.00-0.50	44.0	82.1
0.50-0.00	17.9	100.0

D(AVE) 0.86 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot #3A-3
Sample #2

CHART 7C

TABLE OF CONTENTS

RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

USP-39A Resin Lot for NASA Lot# 3

CHARTS

U.S. Polymeric

RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

USP-39A Resin Lot for NASA Lot# 3

1.	Resin Solids, % PTM-7C		#3-1 79.3 78.1 77.2
		AVG.	78.2
2.	Specific Gravity @ 25°C PTM-29C		1.181
3.	Viscosity, Brookfield, cps. @ 22.8°C PTM-14C		15,000
4.	Gel Time, min:sec PTM-47B		4:22
5.	Atomic Absorption, ppm CTM-53B (Values are averages of four determinations)	Na K Ca Mg Li TOTAL	18.0 1.8 5.8 1.3 0.0 26.8
6.	Volatiles, Gas Chromatography CTM-55		See Charts 6A
7.	TGA, % Weight Loss at 500°C CTM-51 (AIR)		39.9 See Chart 7A
8.	DSC, temperature °C CTM-50A		185 See Chart 8A
9.	HPLC CTM-49A		See Chart 9A
10.	GPC, Average molecular wt. CTM-49A		1932 See Chart 10A
11.	pH, units CTM-1B		8.2

HITCO MATERIALS DIVISION
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2407

USP-39A Resin Lot for NASA Lot# 3

12. Phenol Content, %
CTM-55 Appendix 1

	#3-1
	11.64
	12.02
AVG.	11.83

13. Chang's Index, ml.
CTM-5B

22.2

14. RDS, Minimum Viscosity, cps.
CTM-57A

	Min. Visc.	•C
#3-1	175	111

See Charts 14A

15. NMR
Vendor procedure

See Charts 15A

U. S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

TYPICAL GAS CHROMATOGRAPH SET-UP

Operator	Q.M.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, 3-1	Solvent	THF
Size	0.05 ul	Concn.	0.0892 g/ml

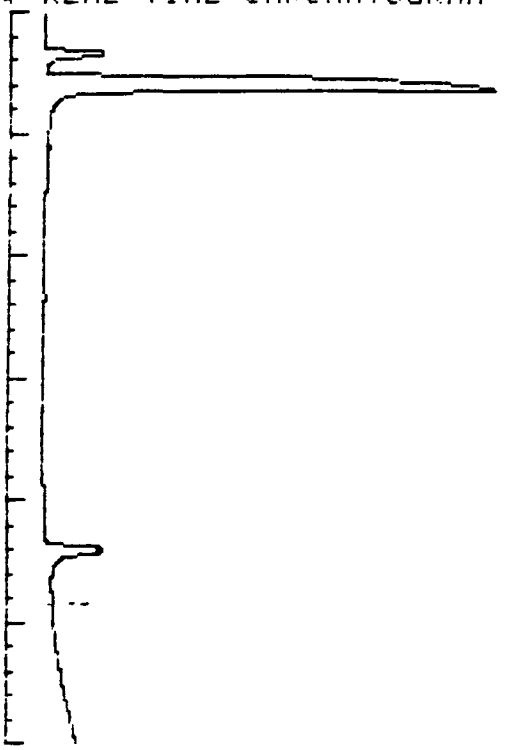
GAS CHROMATOGRAPHY STANDARD SOLVENT

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.

*** REAL TIME CHROMATOGRAM ***



FINAL FULL SCALE MV.=1000 00

SAMPLE: USF39A 3-1
MISC. C=0.10892 **GMS/ML**

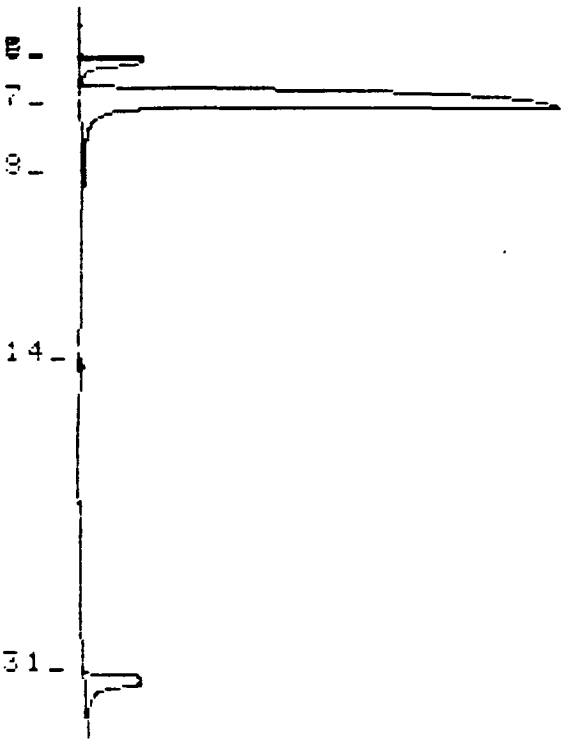
TIME: 15:29
DATE: 12/11/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0 00
CHAN: 0

PK NO.	RET TIME	PEAK AREA	AREA %	B L	PEAK HT
2	.65	1477	.041	2	220
5	1 70	76001	2.105	2	11151
6	1.80	187200	5 164	2	11148
7	3.30	2984100	82.637	2	85858
8	5.60	8003	.222	3	589
14	11 75	11088	.307	1	635
31	21.97	343230	9.505	3	10407

TOTAL AREA= 3611095
THRESHOLD= 1
MIN.PK WIDTH= 15
AREA REJECT= 1000

VERTICAL SCALE FACTOR 1%



SAMPLE: USF39A 3-1
MISC. C=0 10892 **GMS/ML**

TIME: 15:29
DATE: 12/11/86
OPERATOR: JGZ

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

PK NO.	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
5	1.70	76001	2.117	2	11151
6	1.80	187200	5.214	2	11148
7	3.30	2984100	83.110	2	85858
31	21.93	343230	9.559	3	10407

TOTAL AREA= 3590531
THRESHOLD= 1
MIN PK.WIDTH= 15
AREA REJECT= 12000

Sample: USP39A71108 3-1
Size: 23.424 mg
Run No: MIR #13079 (I2)
Date: MAY/21/86 12:58

TGA

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #107
File No: D 36.DAT V2.1
Plotted: MAY/22/86 08:07

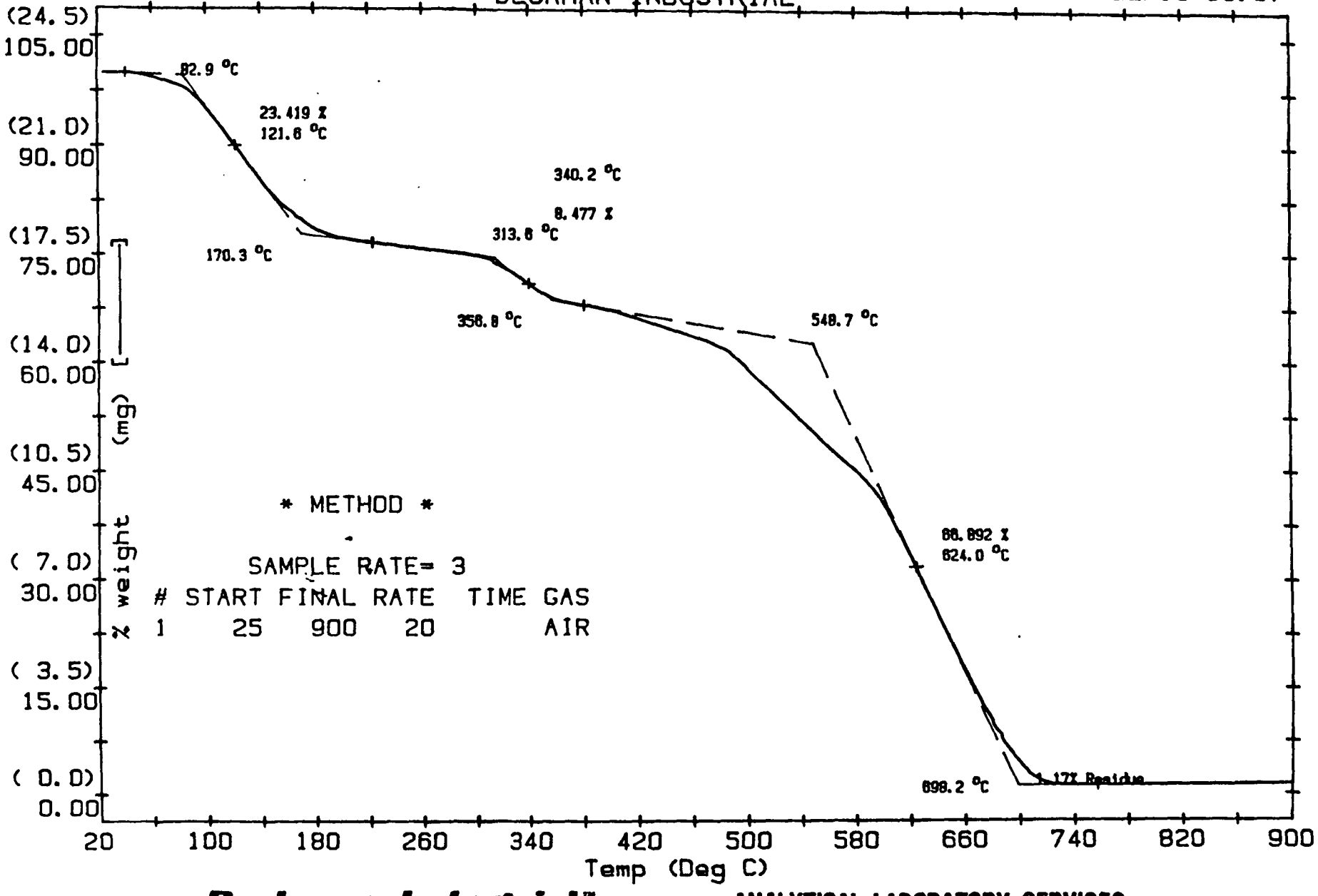


CHART 7A

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OF POOR QUALITY

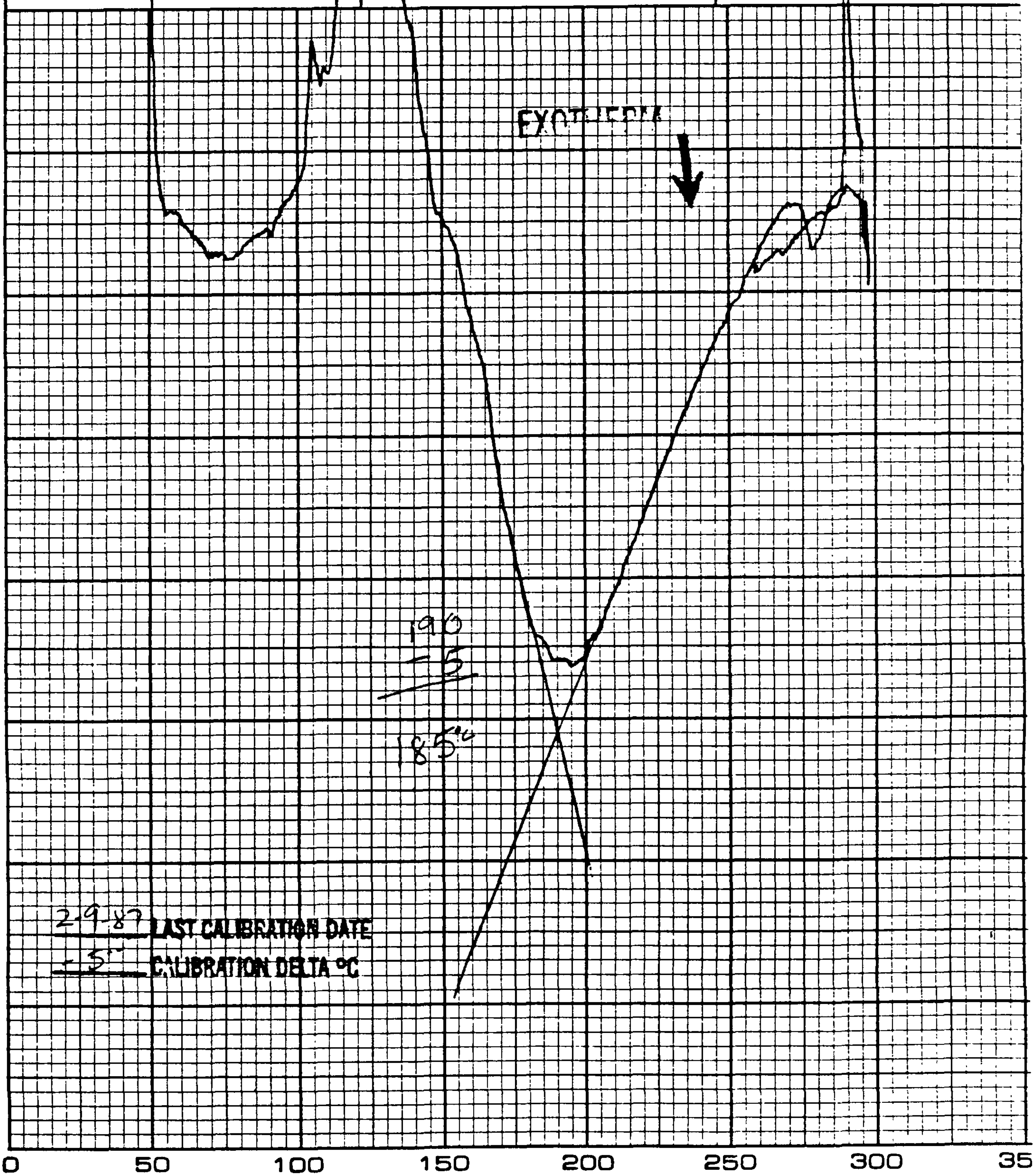
PART NO. 990088

CHART 8A

RUN NO. ____ DATE 2-23-87 OPERATOR gaK SAMPLE: 3-1 USP39A ATM N2 @ 1atm FLOW RATE 40ml/min	**T-AXIS** SCALE, °C/in 50 PROG. RATE, °C/min 20° HEAT ✓ COOL ____ ISO ____ SHIFT, in 0	**DTA-DSC** SCALE, °C/in 1.0/5X (mcal/sec)/in ____ WEIGHT, mg 3.8 REFERENCE ____ 1 alum seal

DUPONT Instruments

MEASURED VARIABLE ____



DATA FILE A:PHEN028.HDR TAKEN 09-05-1986 11:46:23

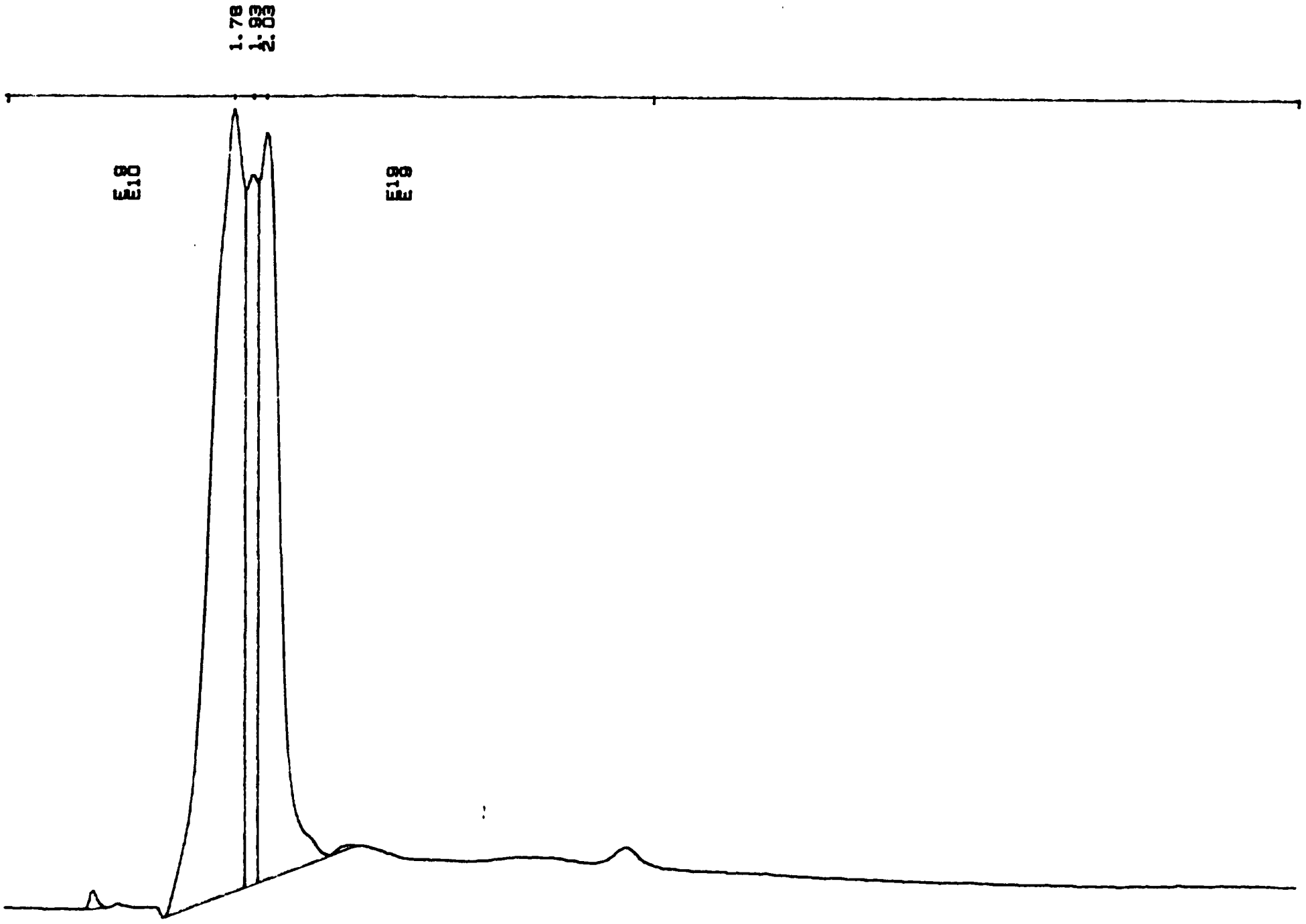
********* AREA PERCENT REPORT *********

```
**********************************************************************************
* Sample Name: USP39A,3-1,C=6.93                    Operator Initials: JGZ       *
* Date:  09-05-1986 11:46:23 Method:PHENOLIC    DATA FILE: A:PHEN028.PTS         *
* Interface: 4                Cycle#:  28        Channel#: 0    Vial#: N.A.     *
* Starting Peak Width:  10   Threshold:  .01                                     *
**********************************************************************************
*  Instrument 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                                              *
**********************************************************************************
Starting Delay:   0.00                          Ending Retention Time:   10.00
```

Pk No.	Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
2	1.78	89260	53.0494	2	5100	100.000	17.5
3	1.93	25796	15.3310	2	4619	28.899	5.6
4	2.03	53203	31.6196	2	4863	59.604	10.9

Total Area: 168258 Area Reject: 1000 One sample per 1.000 sec.

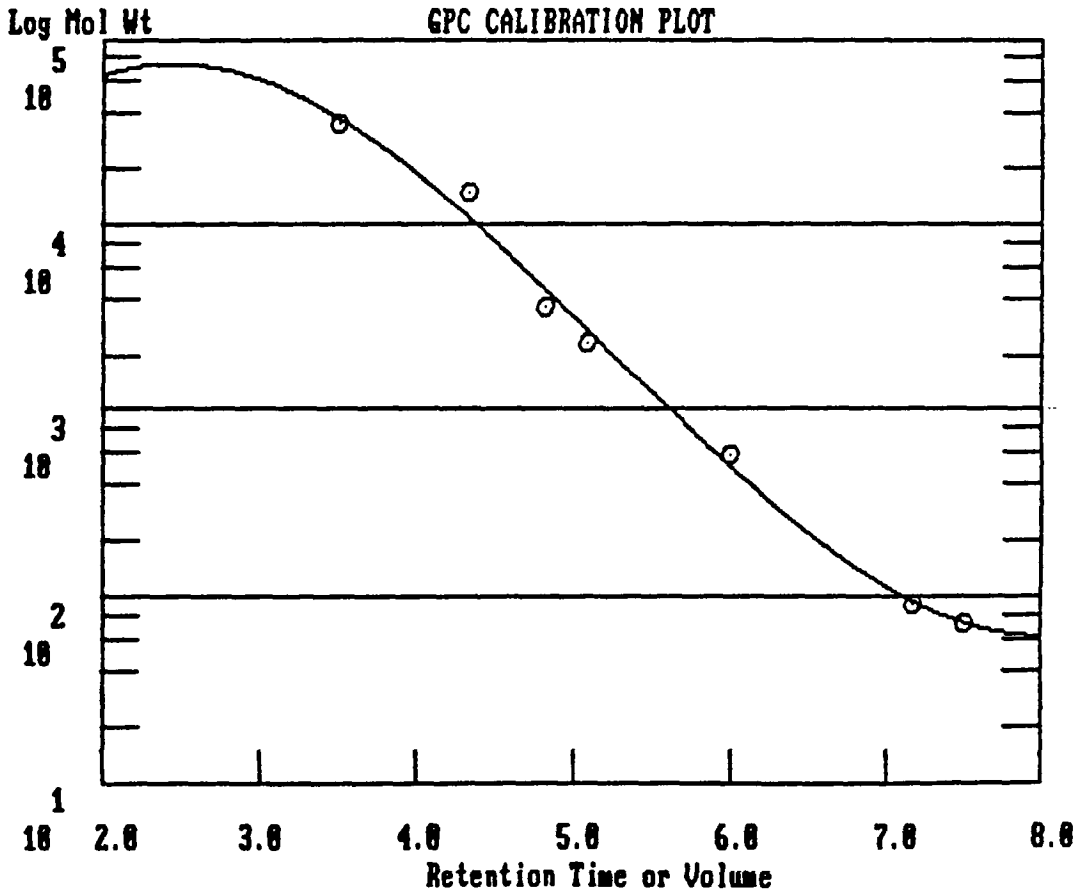
DATA FILE=PHEN028 FROM 0.00 MIN. TO 10.00 MIN. LOW SCALE= 5.422 Mv. HIGH SCALE= 10.700 Mv.
USP-39A, 3-1, C=6.93 MG/ML, 9/5/86, .JGZ



*** 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

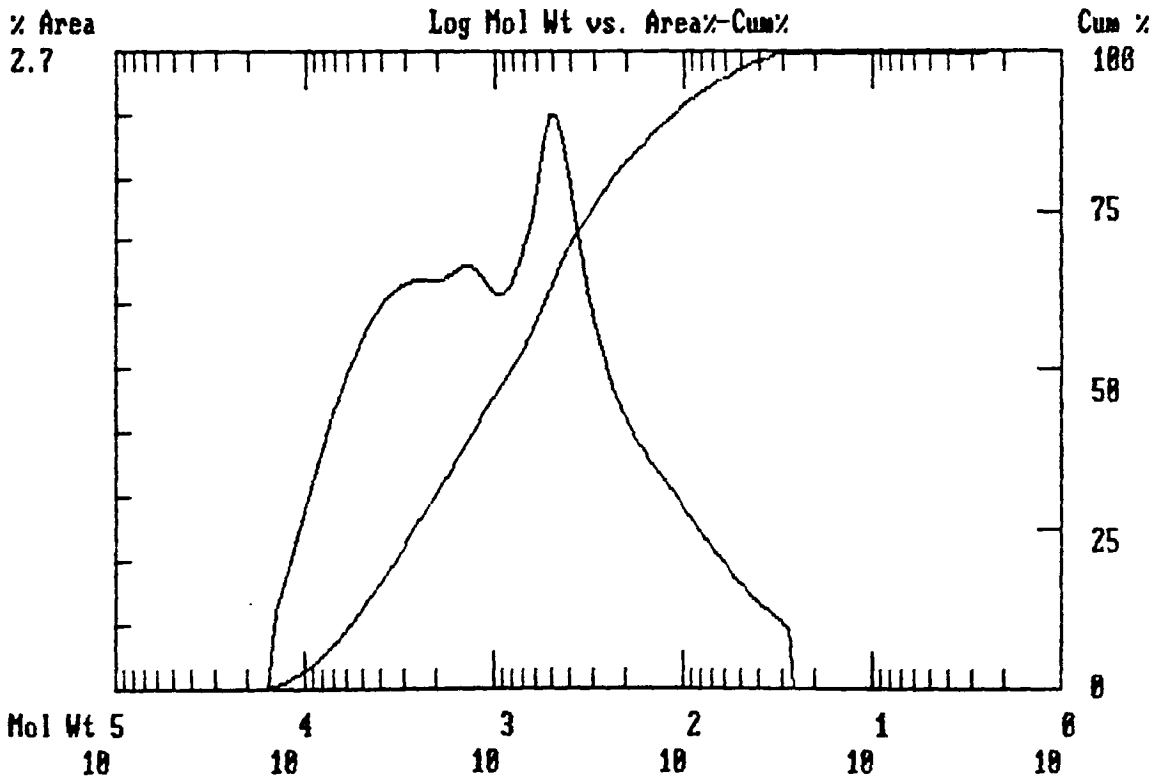
Ret Time	Molecular Weight	Log Mol Wt
3.50	35000	4.544
4.33	15000	4.176
4.83	3600	3.556
5.09	2350	3.371
6.00	570	2.756
7.17	92	1.964
7.50	72	1.857

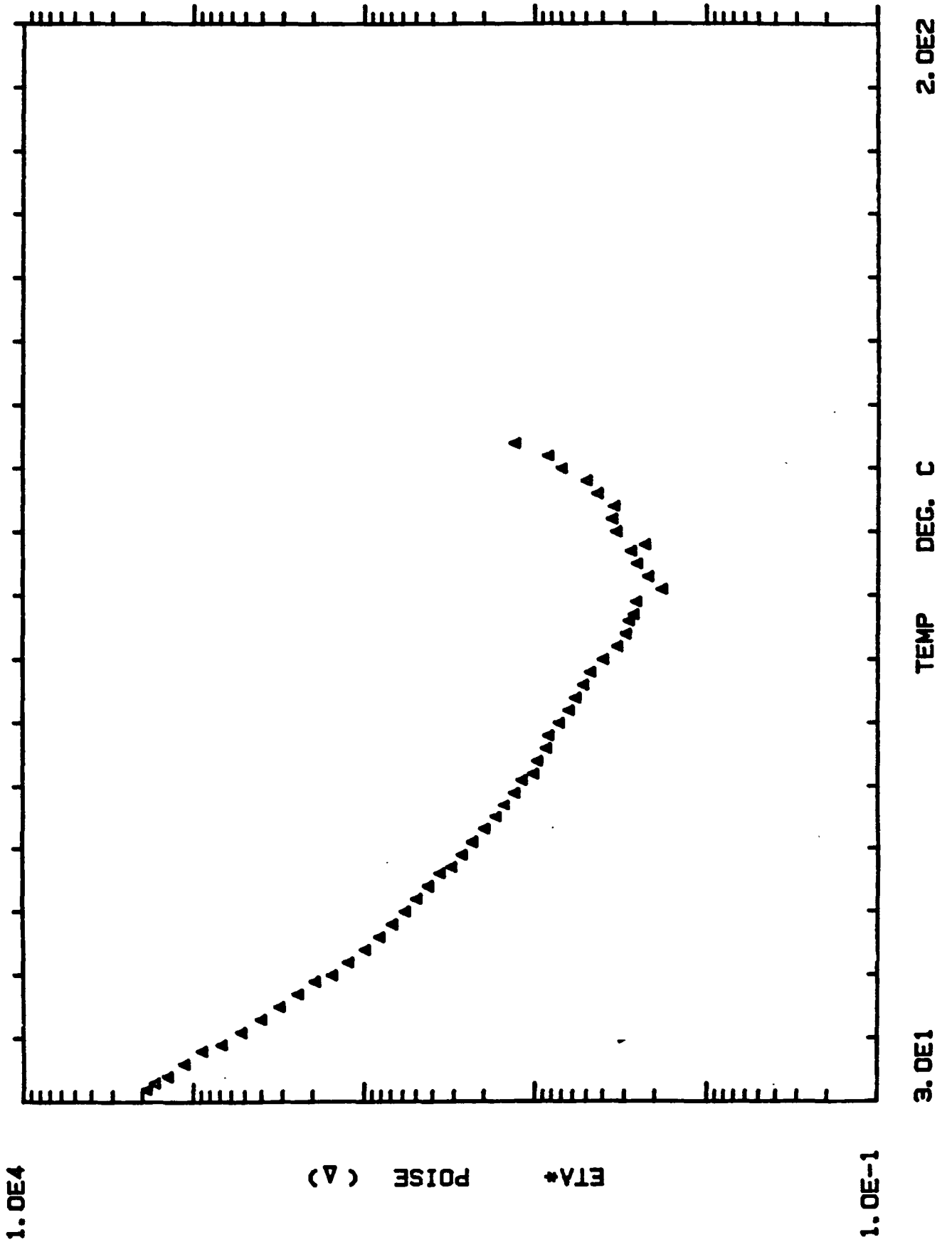


FILE A:GPC35.HDR TAKEN 08-05-1986 17:53:34

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

```
**********************************************************************************
mple Name: USP39A 3-1=2.68                    Operator Initials: GBF            *
te:  08-05-1986 16:21:21 Method:              DATA FILE: A:GPC35.PTS            *
terface: 5               Cycle#:  35          Channel#: 0    Vial#: N.A.        *
arting Peak Width:  60   Threshold:  0                                          *
**********************************************************************************
nstrument 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                                          *
**********************************************************************************
-ting Delay:    0.00                  Ending Retention Time:    10.00
'bration file: GPCPHEN
ecular Weight Distribution Averages
eline TIMES:    3.85 to   10.00   MW:      22295 to          2
:ess  TIMES:    3.85 to   10.00   MW:      22295 to          2
al Area:       203112
                 1932
                  297
Mn=            6.5017
                 5426
                 1642
```




NASA FINGERPRINT VISCOSITY PROFILE USP 38A RESIN NASA LOT 3-1
1.0E4
ETA* POISE (Δ)
1.0E-1
3.0E1
TEMP DEG. C
2.0E2

Rheometrics RECAP II

---

eriment No. : 4 Sample No. : 1

le:
A FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT 3-1

rator :CP

e and Time : Friday, August 15, 1986 - 15:26:35

rating Mode : DYNAMIC

ep Type : CURE

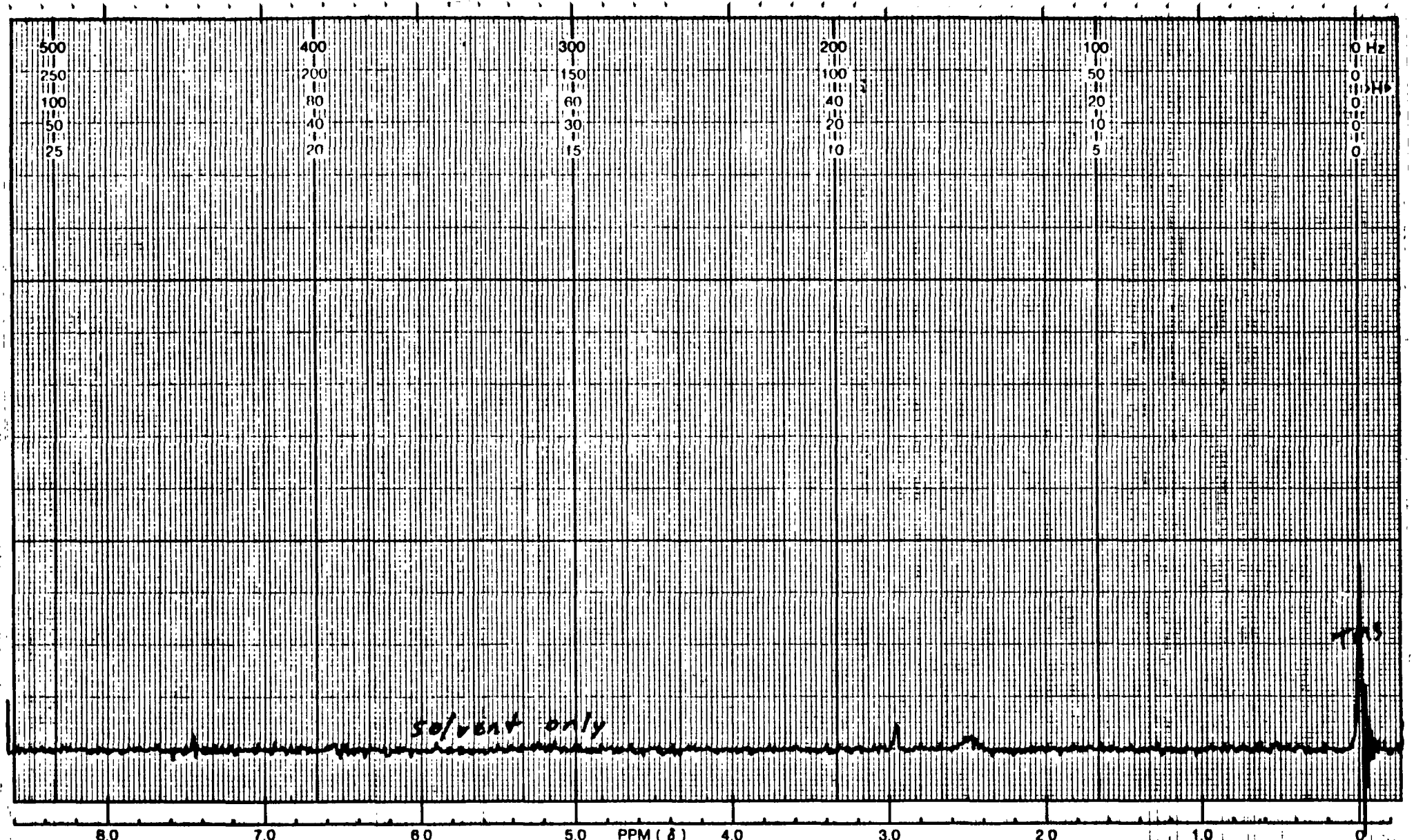
metry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

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

	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	1.827e+003	1.826e+003	4.904e+001	2.316e+002	2.000e-001	3.100e+001
2	1.830e+003	1.829e+003	3.896e-001	2.321e+002	1.000e+000	3.200e+001
3	1.640e+003	1.640e+003	3.551e+001	2.080e+002	2.000e+000	3.300e+001
4	1.376e+003	1.376e+003	3.174e+001	1.742e+002	3.000e+000	3.400e+001
5	1.096e+003	1.096e+003	2.514e+001	1.385e+002	4.000e+000	3.600e+001
6	8.598e+002	8.596e+002	2.120e+001	1.086e+002	5.000e+000	3.800e+001
7	6.593e+002	6.589e+002	2.233e+001	8.311e+001	6.000e+000	3.900e+001
8	5.063e+002	5.058e+002	2.205e+001	6.380e+001	7.000e+000	4.100e+001
9	3.902e+002	3.897e+002	2.009e+001	4.915e+001	8.000e+000	4.300e+001
10	3.032e+002	3.026e+002	2.016e+001	3.815e+001	9.000e+000	4.500e+001
11	2.362e+002	2.354e+002	2.004e+001	2.972e+001	1.000e+001	4.700e+001
12	1.873e+002	1.862e+002	2.007e+001	2.354e+001	1.100e+001	4.900e+001
13	1.488e+002	1.476e+002	1.913e+001	1.871e+001	1.200e+001	5.000e+001
14	1.200e+002	1.186e+002	1.818e+001	1.507e+001	1.300e+001	5.200e+001
15	9.599e+001	9.484e+001	1.479e+001	1.206e+001	1.400e+001	5.400e+001
16	7.890e+001	7.793e+001	1.230e+001	9.907e+000	1.500e+001	5.600e+001
17	6.639e+001	6.550e+001	1.082e+001	8.341e+000	1.600e+001	5.800e+001
18	5.590e+001	5.513e+001	9.240e+000	7.026e+000	1.700e+001	6.000e+001
19	4.797e+001	4.733e+001	7.814e+000	6.021e+000	1.800e+001	6.200e+001
20	4.102e+001	4.046e+001	6.764e+000	5.151e+000	1.900e+001	6.400e+001
21	3.510e+001	3.463e+001	5.702e+000	4.404e+000	2.000e+001	6.600e+001
22	3.006e+001	2.968e+001	4.734e+000	3.774e+000	2.100e+001	6.700e+001
23	2.608e+001	2.573e+001	4.225e+000	3.272e+000	2.200e+001	6.900e+001
24	2.257e+001	2.228e+001	3.622e+000	2.834e+000	2.300e+001	7.100e+001
25	1.929e+001	1.904e+001	3.129e+000	2.424e+000	2.400e+001	7.300e+001
26	1.656e+001	1.636e+001	2.552e+000	2.077e+000	2.500e+001	7.500e+001
27	1.472e+001	1.454e+001	2.279e+000	1.850e+000	2.600e+001	7.700e+001
28	1.290e+001	1.267e+001	2.161e+000	1.607e+000	2.700e+001	7.900e+001
29	1.155e+001	1.135e+001	2.176e+000	1.451e+000	2.800e+001	8.100e+001
30	9.881e+000	9.736e+000	1.688e+000	1.240e+000	2.900e+001	8.200e+001
31	9.387e+000	9.266e+000	1.504e+000	1.179e+000	3.000e+001	8.400e+001
32	8.299e+000	8.216e+000	1.170e+000	1.043e+000	3.100e+001	8.600e+001
33	8.047e+000	7.971e+000	1.102e+000	1.010e+000	3.200e+001	8.800e+001
34	6.981e+000	6.935e+000	8.019e-001	8.771e-001	3.300e+001	9.000e+001
35	6.092e+000	6.035e+000	8.276e-001	7.648e-001	3.400e+001	9.200e+001
36	5.588e+000	5.549e+000	6.617e-001	7.020e-001	3.500e+001	9.400e+001
37	5.038e+000	5.020e+000	4.197e-001	6.330e-001	3.600e+001	9.600e+001
38	4.581e+000	4.579e+000	1.556e-001	5.751e-001	3.700e+001	9.800e+001
39	3.851e+000	3.846e+000	1.960e-001	4.837e-001	3.800e+001	1.000e+002
40	3.181e+000	3.171e+000	2.447e-001	3.992e-001	3.900e+001	1.020e+002
41	2.850e+000	2.840e+000	2.398e-001	3.580e-001	4.000e+001	1.040e+002
42	2.731e+000	2.716e+000	2.852e-001	3.428e-001	4.100e+001	1.060e+002
43	2.562e+000	2.464e+000	7.029e-001	3.219e-001	4.200e+001	1.070e+002
44	2.467e+000	2.107e+000	1.283e+000	3.095e-001	4.300e+001	1.090e+002
45	1.730e+000	1.578e+000	7.560e-001	2.198e-001	4.400e+001	1.110e+002
46	2.104e+000	1.951e+000	7.875e-001	2.644e-001	4.500e+001	1.130e+002
47	2.460e+000	2.178e+000	1.143e+000	3.089e-001	4.600e+001	1.150e+002
48	2.662e+000	2.344e+000	1.262e+000	3.343e-001	4.700e+001	1.170e+002
49	2.178e+000	1.876e+000	1.146e+000	2.759e-001	4.800e+001	1.180e+002
50	3.229e+000	2.684e+000	1.796e+000	4.056e-001	4.900e+001	1.200e+002

FINGERPRINT VISCOSITY PROFILE USP 394 RESIN N48A LOT 3-1

ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
3.422e+000	2.934e+000	1.761e+000	4.297e-001	5.000e+001	1.220e+002
3.324e+000	2.903e+000	1.619e+000	4.175e-001	5.100e+001	1.240e+002
4.180e+000	3.654e+000	2.032e+000	5.247e-001	5.200e+001	1.260e+002
4.842e+000	4.446e+000	1.918e+000	6.081e-001	5.300e+001	1.280e+002
6.760e+000	6.299e+000	2.457e+000	8.497e-001	5.400e+001	1.300e+002
8.108e+000	7.529e+000	3.010e+000	1.018e+000	5.500e+001	1.320e+002
1.276e+001	1.180e+001	4.857e+000	1.603e+000	5.600e+001	1.340e+002



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

MANUAL
SWEEP TIME (SEC): 50 250 500 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: Solvent
SOLVENT: Unisol-d + 0.82 TMS
DEC. LEVEL

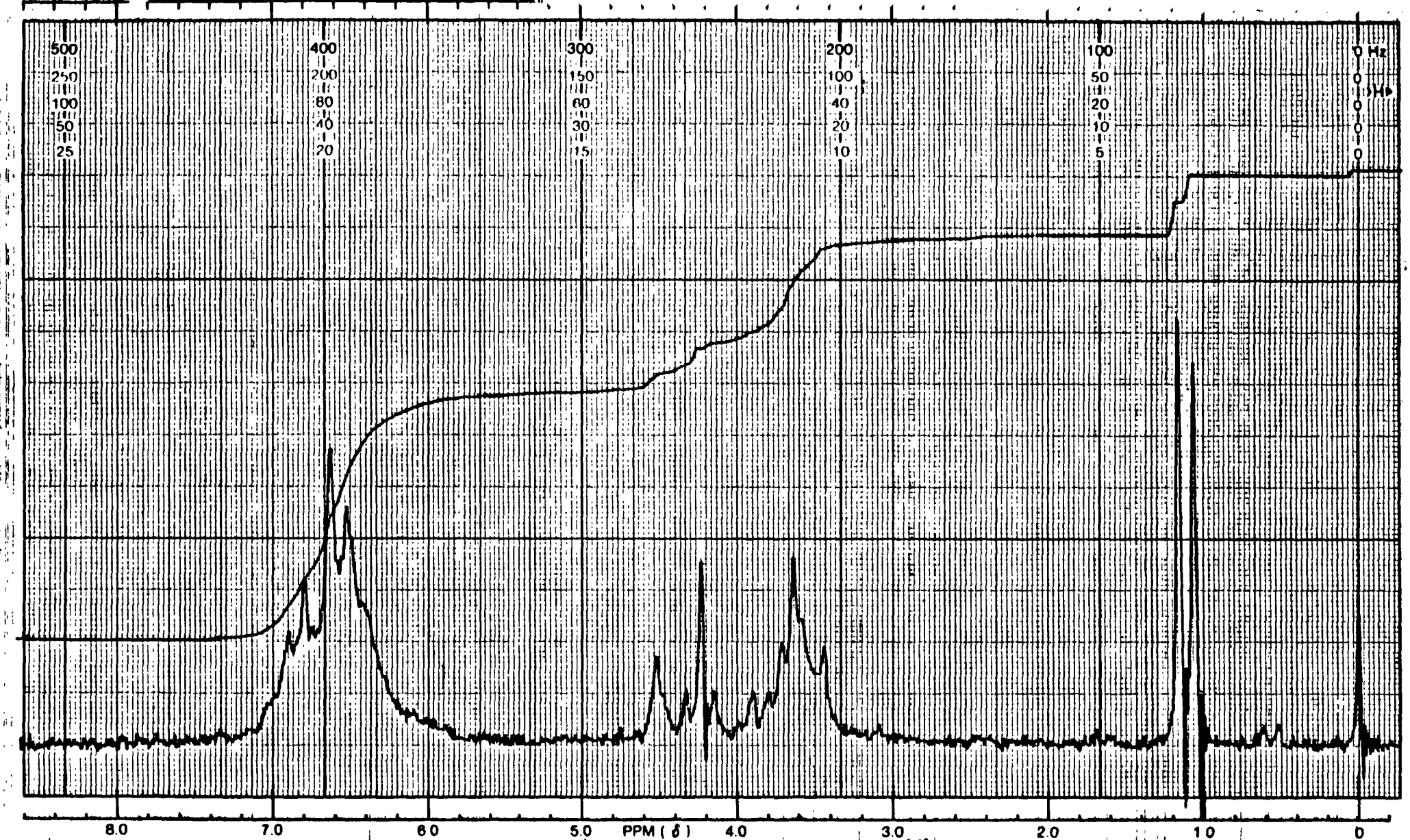
REMARKS:

ORIGINAL PAGE IS
OF POOR QUALITY

SOLVENT ONLY SCAN

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

DATE: 3-21-86 OPERATOR DGW SPECTRUM NO. 1A of 7
solvent scan



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: 0.25

AUTO ☐
(250)
(500)
(2)
(.05)

SAMPLE: USP-39A Lot#3-1
SOLVENT: Unisol-d + 0.5% TMS
DEC. LEVEL

REMARKS: 0.137 gm sample
0.937 gm solvent

CHART 15A

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

DATE: 3-21-86 OPERATOR DOW SPECTRUM NO. 5 of 7 USP-39A Lot#3-1

TABLE OF CONTENTS

FABRIC TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

PWB-6 Fabric for NASA Lot# 3

CHARTS

U.S. Polymeric

FABRIC TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

PWB-6 Fabric for NASA Lot# 3

1a. Breaking Strength, lbs/in, WARP
ASTM D1682

	#3-1	#3-2	LOT3 AVG
PICK	29	28	28.5
CENTER	30	26	28.0
PLAIN	39	25	32.0
AVG.	32.7	26.3	29.5

1b. Breaking Strength, lbs/inch, FILL
ASTM D1682

PICK	29	25	27.0
CENTER	21	29	25.0
PLAIN	28	25	25.5
AVG.	25.3	26.3	25.8

2a. Carbon Assay, %
MDQAI 5560

PICK	99.9	99.9	99.9
CENTER	99.9	99.9	99.9
PLAIN	99.7	99.9	99.8
AVG.	99.83	99.9	99.87

2b. Hydrogen Assay, %
MDQAI 5560

PICK	.01	<.01	EST .006
CENTER	<.01	.02	EST .011
PLAIN	<.01	<.01	EST .001
AVG.	EST .004	EST .007	EST .006

2c. Nitrogen Assay, %
MDQAI 5560

PICK	<.1	.1	EST .055
CENTER	.1	.1	.100
PLAIN	.1	.1	.100
AVG.	EST .07	.1	EST .085

3. Visual Inspection — See Charts 3A-3B
QCi-102

4. Specific Gravity, Units
PTM-84

PICK	1.7895	1.8435	1.8165
CENTER	1.7511	1.8725	1.8118
PLAIN	1.7103	1.8541	1.7822
AVG.	1.750	1.857	1.804

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PWB-6 Fabric for NASA Lot# 3

5. pH, Units
CTM-24B

	#3-1	#3-2	LOT3 AVG
	9.4	8.4	8.9
	9.3	8.4	8.85
AVG.	9.35	8.4	8.88

6. TGA, °C at 50% Weight Loss
CTM-51 (AIR)

SET UP# 1	SET UP# 2
#3-1 907	#3-2 809

See Chart 6A-6B

7a. Atomic Absorption, ppm
CTM-53B

	#3-1	#3-2	LOT3 AVG
Na	6	3	4.5
K	1	1	1.0
Ca	95	139	117.0
Mg	1	1	1.0
Li	0	0	0.0
AVG.	103	144	124.0

7b. Moisture Content, %
CTM-53B

	.034	.010	.022

7c. Ash Content, %
CTM-53B

	.075	.097	.086

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

AVERAGE	8.93	9.48	9.20
Minimum	7.55	8.20	7.55
Maximum	10.20	10.55	10.55
Std. Dev	0.74	0.64	0.73

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

AVERAGE	9.08
Minimum	8.25
Maximum	10.60
Std. Dev	0.67

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

	#3-1	#3-2	LOT3 AVG
	32	30	31.0
	30	29	29.5
	30	29	29.5
	30	29	29.5
	32	30	31.0
AVG.	30.8	29.4	30.1

PWB-6 Fabric for NASA Lot# 3

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

	#3-1	#3-2	LOT3 AVG
	28	30	29.0
	28	30	29.0
	29	30	29.5
	29	30	29.5
	28	31	29.5
AVG.	28.4	30.2	29.3

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

LEFT	2.540	2.954	2.747
CENTER	2.502	3.014	2.758
RIGHT	2.530	3.084	2.807
AVG.	2.524	3.017	2.771

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

LEFT	.47	.51	.49
CENTER	.56	.56	.56
RIGHT	.55	.49	.52
AVG.	.53	.52	.52

10c. Weight change on Acetone wash, %
PTM-3A

LEFT	.00	.03	.02
CENTER	.00	.07	.03
RIGHT	-.08	-.13	-.01
AVG.	-.03	-.01	-.02

U.S. Polymeric

Hamid M. Quraishi, Manager
Quality Assurance Department

USP NO. CHART 3A

DATE 3/17/86

FABRIC TWB-6 FAB 33"

MFG. STOCKPOLE FIBER CO. LOT 1467-3

ROLL NO. 16-1797B

YARDS 15.0

POUNDS 7.75

ORDER NO. O.E 71108

SPECIFICATION STD MFG. CERT

Q.C. FILE # NASA #3-1

FOOTAGE

	START	Sample	LEFT
BAS 5 W ⊖	1 W	8 W	
11 W 18 W		15 W	19 W
			22 V 30 V
33 W 37 W	40 ⊖		
37 V	43 END		

TREATER OPERATOR READ UP

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 C

GARCIA

USP NO. CHART 3B

DATE 3/17/86

FABRIC PWB-6

MFG. STOCKPOLE FABRIC LOT 1467-3

ROLL NO. 16-1799B

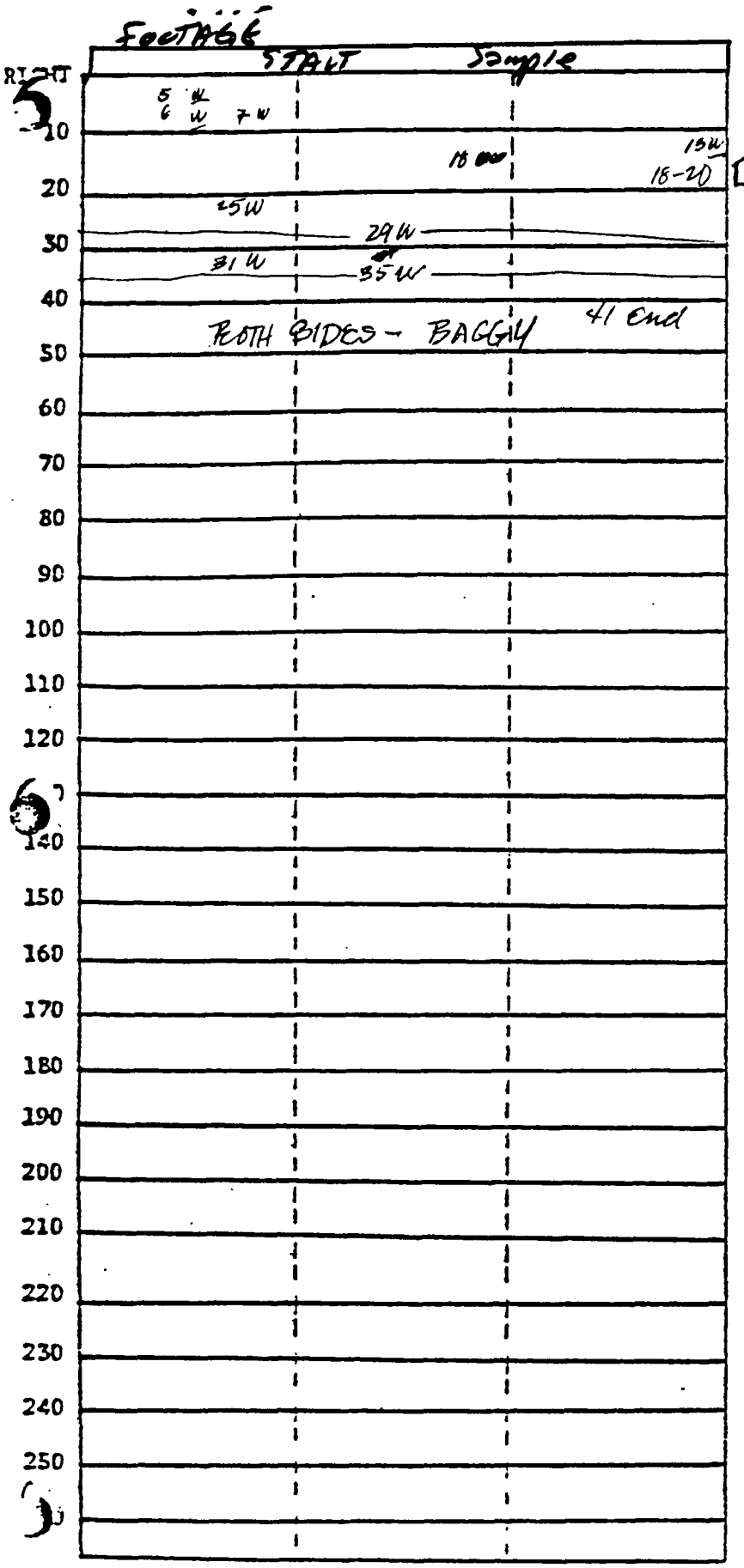
YARDS 15.0

POUNDS 17.25

~~ORDER~~ NO. OE 7110

SPECIFICATION Std Mfg Certs.

Q.C. FILE # NASA #3-2



SYMBOLS

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

REMARKS

GRADE Grap C

GARCIA

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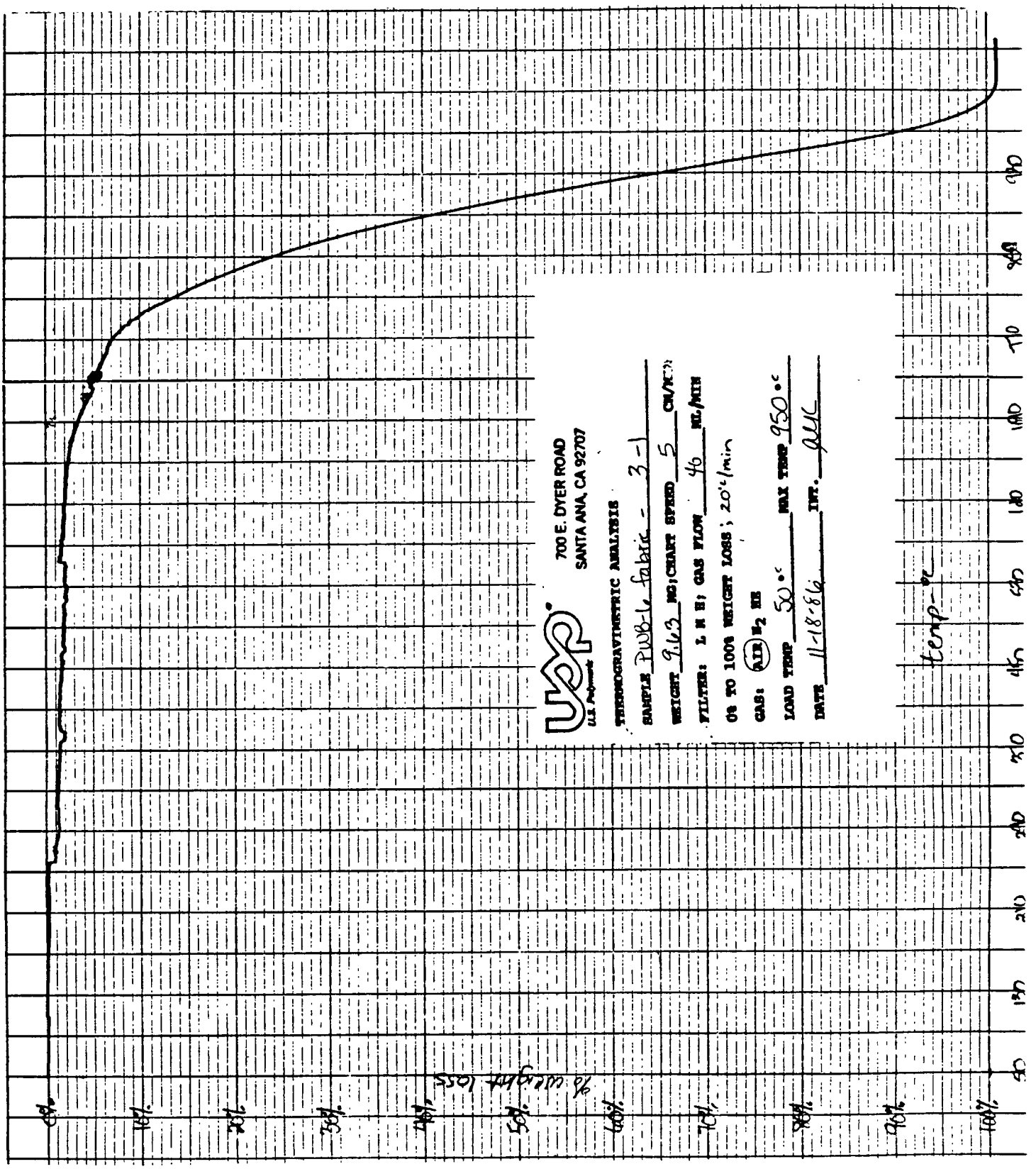

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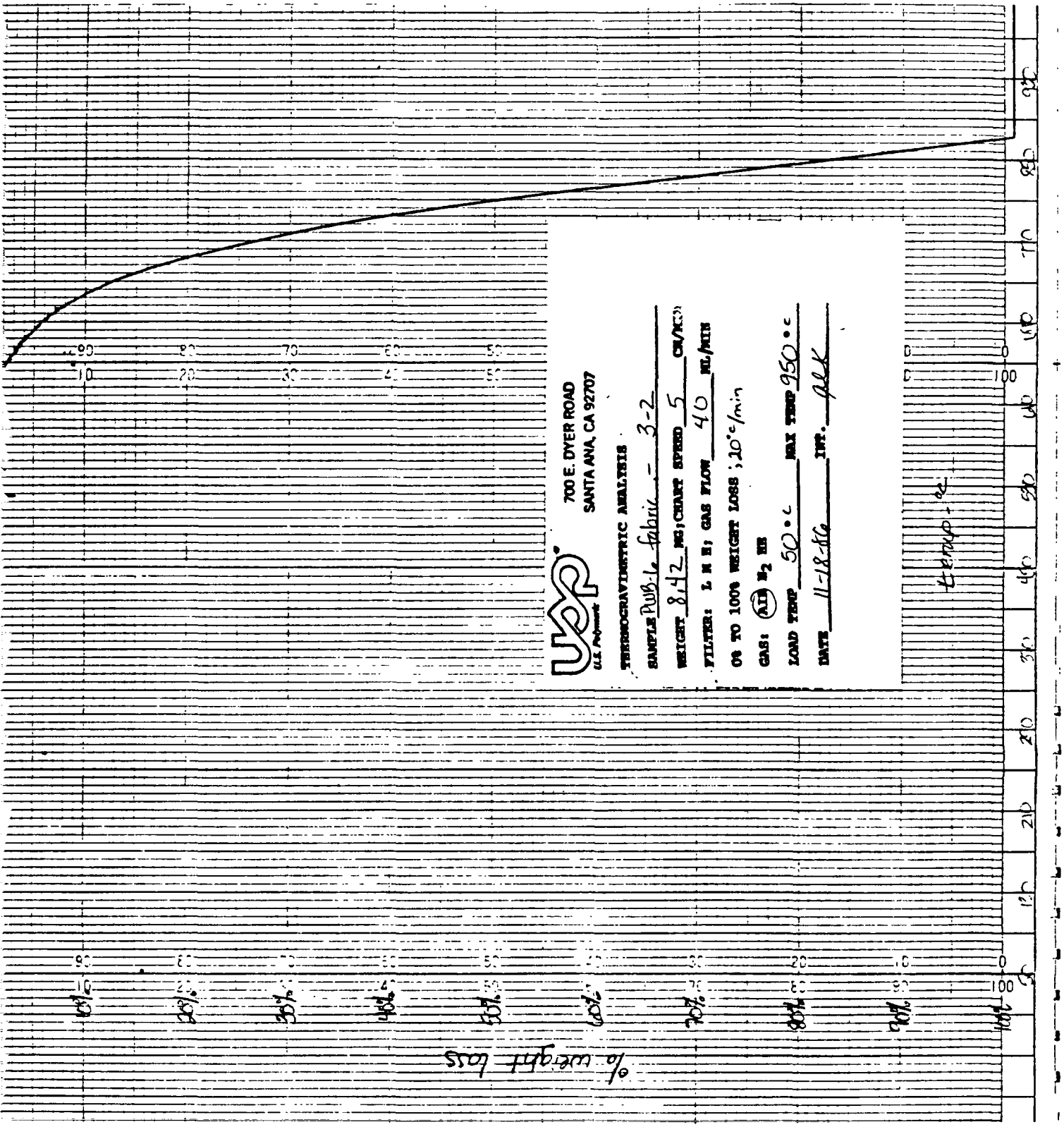

TABLE OF CONTENTS

PREPREG TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

FM 5839 NASA LOT# 3 U.S.P. LOT# C02139

CHARTS

U.S. Polymeric

PREPREG TESTING

NAS8-36298

U.S. POLYMERIC O.E.71108

FM 5839 NASA LOT# 3 U.S.P. LOT# C02139

		ROLL#1-S	ROLL#2-S
1a. Resin Content, Soxhlet, % CTM-6D		35.4	36.6
		35.5	37.0
		34.6	36.9
	AVG.	35.2	36.8
	NASA LOT# 3 AVERAGE		36.0
1b. Filler Content, Soxhlet, % CTM-6D		14.5	14.9
		14.5	15.1
		14.1	15.1
	AVG.	14.4	15.0
	NASA LOT# 3 AVERAGE		14.7
1c. Cloth Content, Soxhlet, % CTM-6D		50.1	48.5
		50.0	47.9
		51.3	48.0
	AVG.	50.5	48.1
	NASA LOT# 3 AVERAGE		49.3
2. Volatile Content, % PTM-17B		2.3	2.9
		2.4	2.8
		2.4	2.6
	AVG.	2.4	2.8
	NASA LOT# 3 AVERAGE		2.6
3. Flow, 1000 psi, % PTM-19G		16.9	14.2
		17.9	12.1
		17.5	13.3
	AVG.	17.4	13.2
	NASA LOT# 3 AVERAGE		15.3
4. Resin Content, Dry basis, % PTM-16F, Type II		35.3	34.2
		35.1	36.7
		32.9	37.2
	AVG.	34.4	36.0
	NASA LOT# 3 AVERAGE		35.2
5. Tack, lbs PTM-80		30	32
	NASA LOT# 3 AVERAGE		31
6. Gel Time, seconds PTM-20E		32	39
	NASA LOT# 3 AVERAGE		36

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FM 5839 NASA LOT# 3 U.S.P. LOT# C02139

7a. Atomic Absorption, ppm CTM-53B		ROLL#1-S	ROLL#2-S	LOT#3 AVG.
	Na	7	8	8
	K	1	1	1
	Ca	34	19	27
	Mg	2	8	5
	Li	0	0	0
	TOTAL	44	36	40

7b. Moisture Content, % CTM-53B	ROLL#1-S	ROLL#2-S
	1.84	2.04
NASA LOT# 3 AVERAGE		1.94

7c. Ash Content, % CTM-53B		
	.24	.27
NASA LOT# 3 AVERAGE		.25

8. TGA, % Weight Loss at 500°C CTM-51 (Nitrogen)		
	8.9	9.1
NASA LOT# 3 AVERAGE		9.0

See chart 8A-8B

9. DSC, °C CTM-50A		ROLL#1-S	ROLL#2-S	LOT#3 AVG.
	First Temp	183	184	184

See Chart 9A-9B

10. Infrared (IRZB) Baseline CTM-21C			
	.85	.85	.85

See Chart 10A-10B

11. Environmental History

Date manufactured: 2 May 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
		1.578	1.551
		1.579	1.554
		1.580	1.559
	AVG.	1.579	1.555
	NASA LOT# 3 AVERAGE		1.567

13a. Tensile Strength, ksi, WARP FTMS 406-1011			
		12.63	17.07
		13.56	16.76
		12.61	17.34
		12.82	16.04
		13.58	16.61
	AVG.	13.04	16.76
	NASA LOT# 3 AVERAGE		14.90

FM 5839 NASA LOT# 3 U.S.P. LOT# C02139

		ROLL#1-S	ROLL#2-S
13b. Tensile Modulus, msi, WARP FTMS 406-1011		2.80	3.19
		2.78	3.52
		2.79	3.69
		3.33	3.21
		2.77	3.75
	AVG.	2.89	3.47
	NASA LOT# 3 AVERAGE		3.18
13c. Tensile Elongation, %, WARP FTMS 406-1011		.79	1.10
		.96	.98
		.80	.86
		.66	.93
		1.02	.89
	AVG.	.85	.95
	NASA LOT# 3 AVERAGE		.90
14a. Flexural Strength, ksi, WARP FTMS 406-1031		25.91	29.31
		22.21	27.91
		22.29	31.30
		26.98	28.80
		26.52	27.81
	AVG.	24.78	29.02
	NASA LOT# 3 AVERAGE		26.90
14b. Flexural Modulus, msi, WARP FTMS 406-1031		2.72	2.95
		2.58	3.12
		2.23	4.03
		2.82	3.61
		3.06	2.34
	AVG.	2.68	3.21
	NASA LOT# 3 AVERAGE		2.95
15a. Compressive Strength, ksi, WARP FTMS 406-1021		20.01	20.09
		19.84	20.28
		19.30	20.97
		22.01	20.59
		19.10	20.56
	AVG.	20.05	20.50
	NASA LOT# 3 AVERAGE		20.28
15b. Compressive Modulus, msi, WARP FTMS 406-1021		3.48	3.65
		3.68	3.79
		3.13	4.04
		3.23	3.64
		3.39	4.46
	AVG.	3.38	3.92
	NASA LOT# 3 AVERAGE		3.65

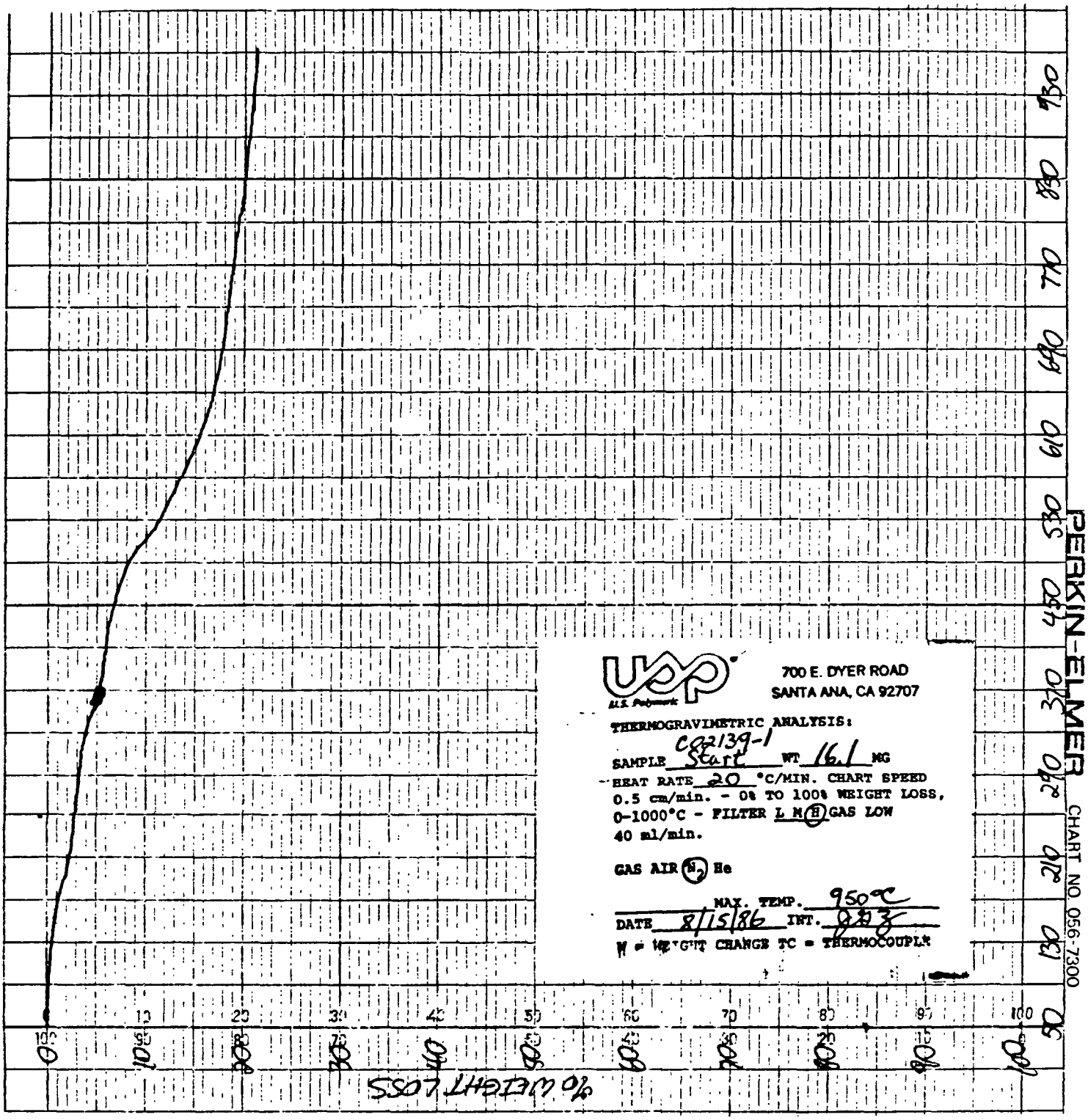
FM 5839 NASA LOT# 3 U.S.P. LOT# C02139

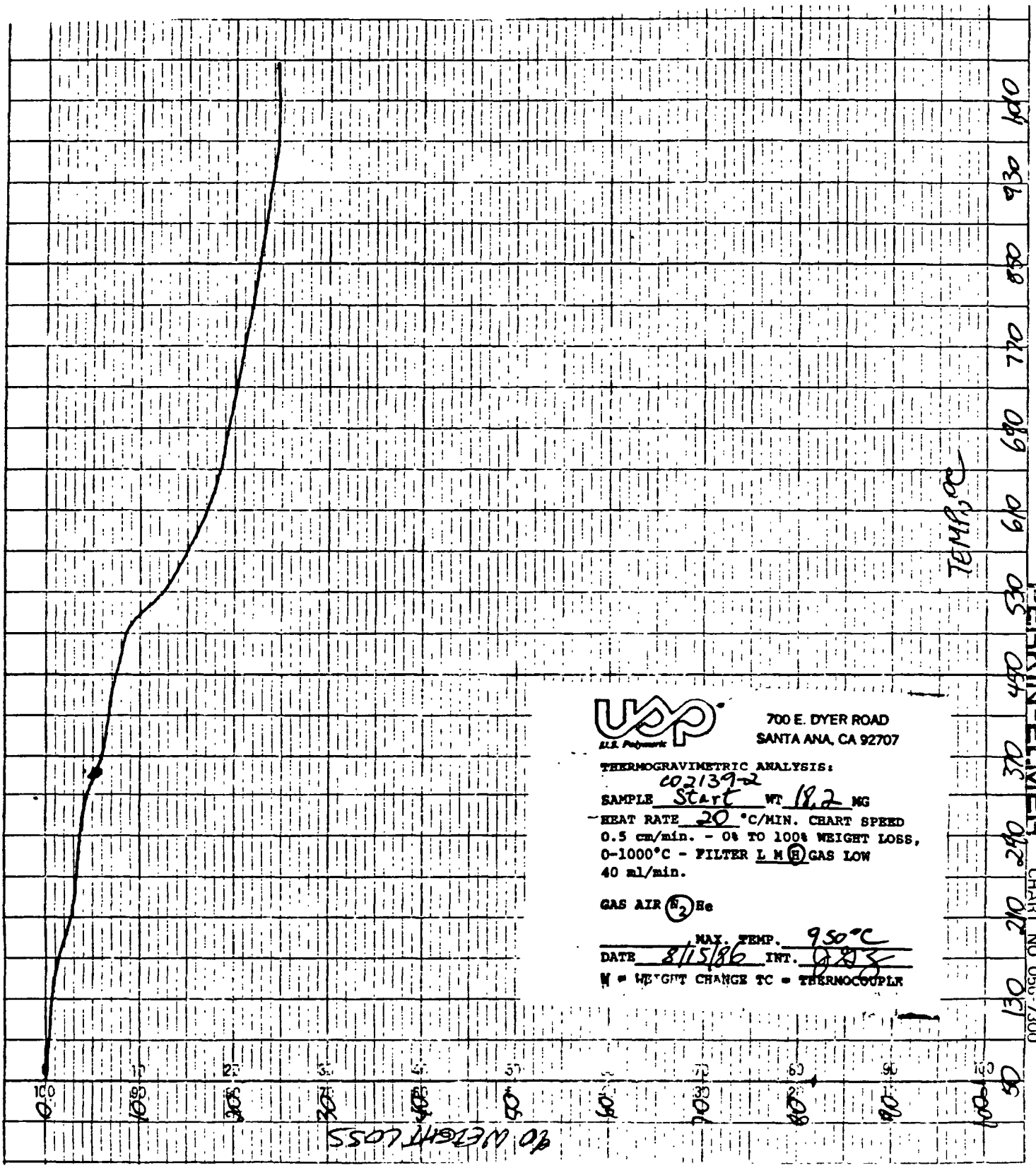
		ROLL#1-S	ROLL#2-S
16. Double Shear Strength, ksi FTMS 406-1041A		4.18	3.26
		4.29	3.77
		3.85	3.49
		3.76	3.47
		3.72	3.76
	AVG.	3.96	3.55
	NASA LOT# 3 AVERAGE		3.76
17. Barcol Hardness, Units ASTM D-2583 (Average of 10 determinations)		70.5	72.5
	NASA LOT# 3 AVERAGE		71.5
18. Residual Volatiles, % PTM-98		1.79	1.89
		1.72	1.89
		1.78	1.87
	AVG.	1.76	1.88
	NASA LOT# 3 AVERAGE		1.82
19. Resin Content, Pyrolysis, % CTM-14B		30.83	33.35
		30.45	33.42
		30.85	33.53
	AVG.	30.71	33.43
	NASA LOT# 3 AVERAGE		32.07
20. Acetone Extraction, % CTM-18A		3.40	3.47
		3.25	3.79
		3.29	4.12
	AVG.	3.31	3.79
	NASA LOT# 3 AVERAGE		3.55
21a. CTE, in/in °F with PLY PTM-61B		-1.45	2.04
		-1.92	-1.53
	AVG.	-1.69	.26
	NASA LOT# 3 AVERAGE		-.72
21b. CTE, in/in °F Cross PLY PTM-61B		5.97	8.29
		5.23	12.96
	AVG.	5.60	10.63
	NASA LOT# 3 AVERAGE		8.11

See Chart 21A-21B

U.S. Polymeric

Hamid M. Quraishi, Manager
Quality Assurance Department





700 E. DYER ROAD
SANTA ANA, CA 92707

THERMOGRAVIMETRIC ANALYSIS:
C02139-2
SAMPLE Start WT 18.2 MG
HEAT RATE 20 °C/MIN. CHART SPEED
0.5 cm/min. - 0% TO 100% WEIGHT LOSS,
0-1000°C - FILTER L M (H) GAS LOW
40 ml/min.

GAS AIR (N2) He

MAX. TEMP. 950°C
DATE 8/15/86 INT. 9893
W = WEIGHT CHANGE TC = THERMOCOUPLE

PERKIN-ELMER CHART NO. 056-7300

CHART 9A

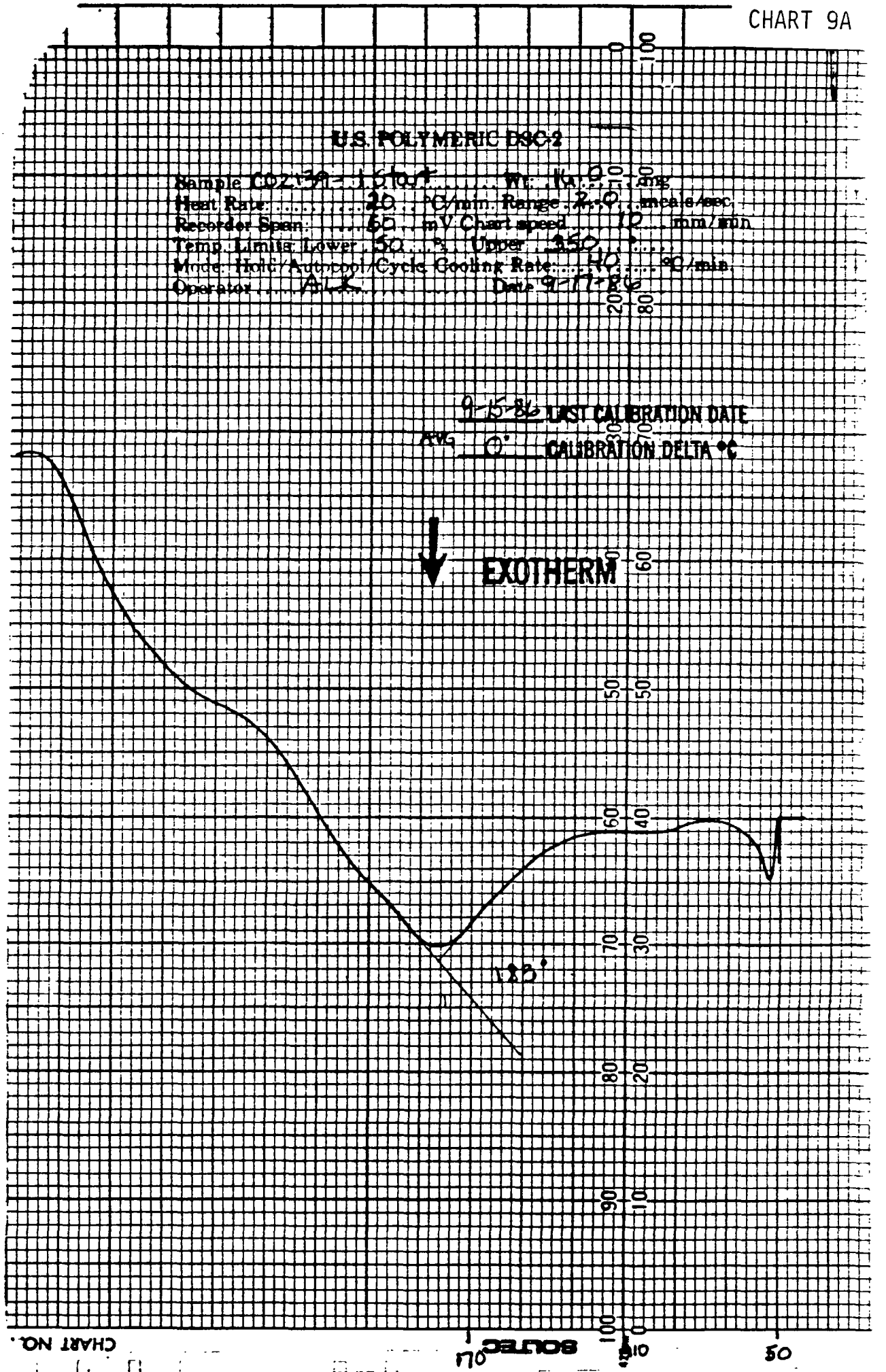
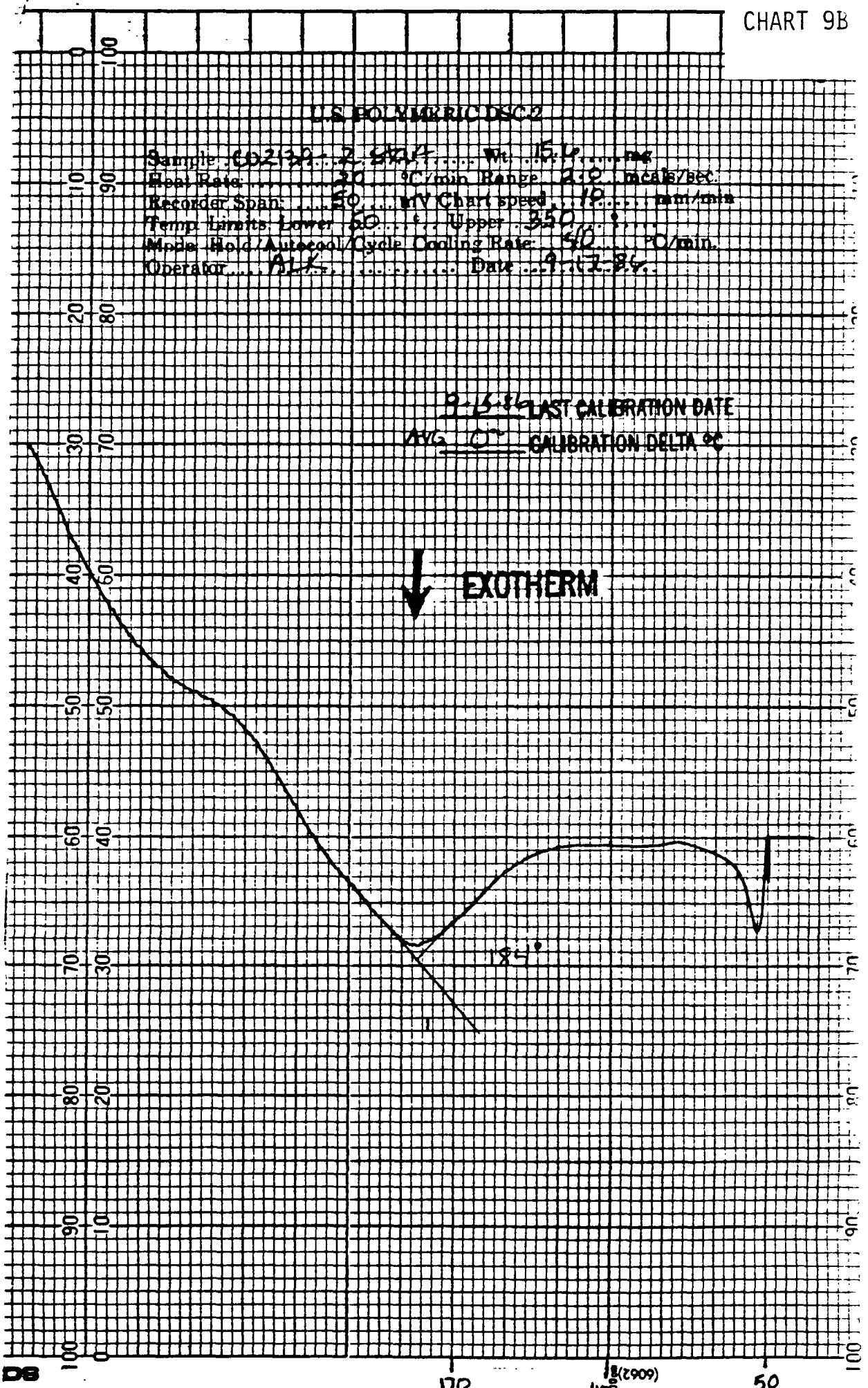


CHART 9B



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SPECTRUM NO. 15201
DATE 7-08-86
SAMPLE FM 5839
CO2139 # ST-1

SOURCE
STRUCTURE

PATH 0.2 mm NACL
SOLVENT ACETONE
CONCENTRATION 30-50%I
PHASE 3
COMMENTS PRE-PREG
MATERIAL

ANALYST V. MIRANDA

Beckman®
INFRARED
SPECTROPHOTOMETER

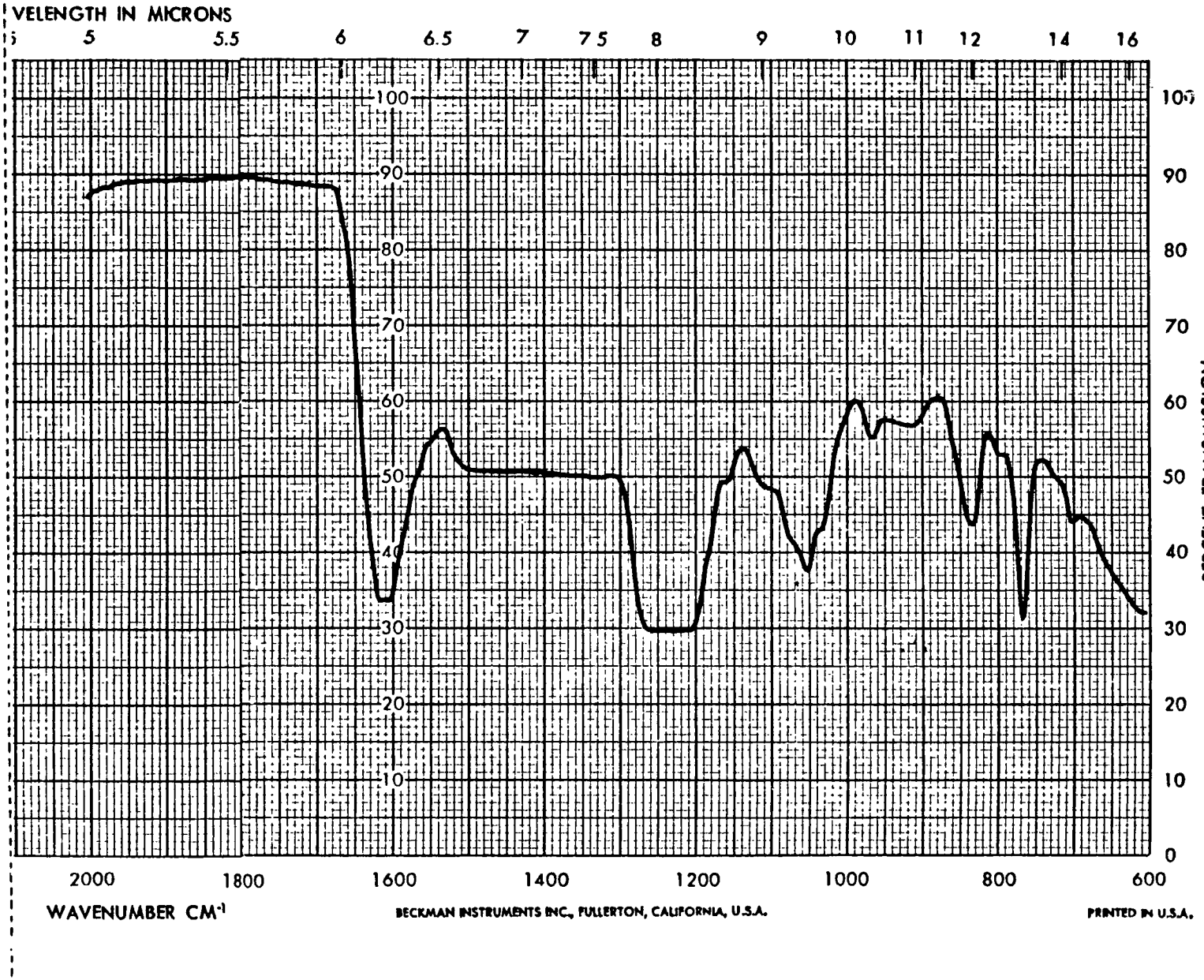

CHART 10A

ORIGINAL PAGE IS
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SPECTRUM NO. 15202
DATE 7-08-86
SAMPLE FM 5839
CW2139 # ST-2

SOURCE

STRUCTURE

PATH 0.2 mm NACL
SOLVENT ACETONE
CONCENTRATION 30-50%T
PHASE S
COMMENTS PRE-PREG
MATERIAL

ANALYST Y. MIRANDA

Beckman®
INFRARED
SPECTROPHOTOMETER

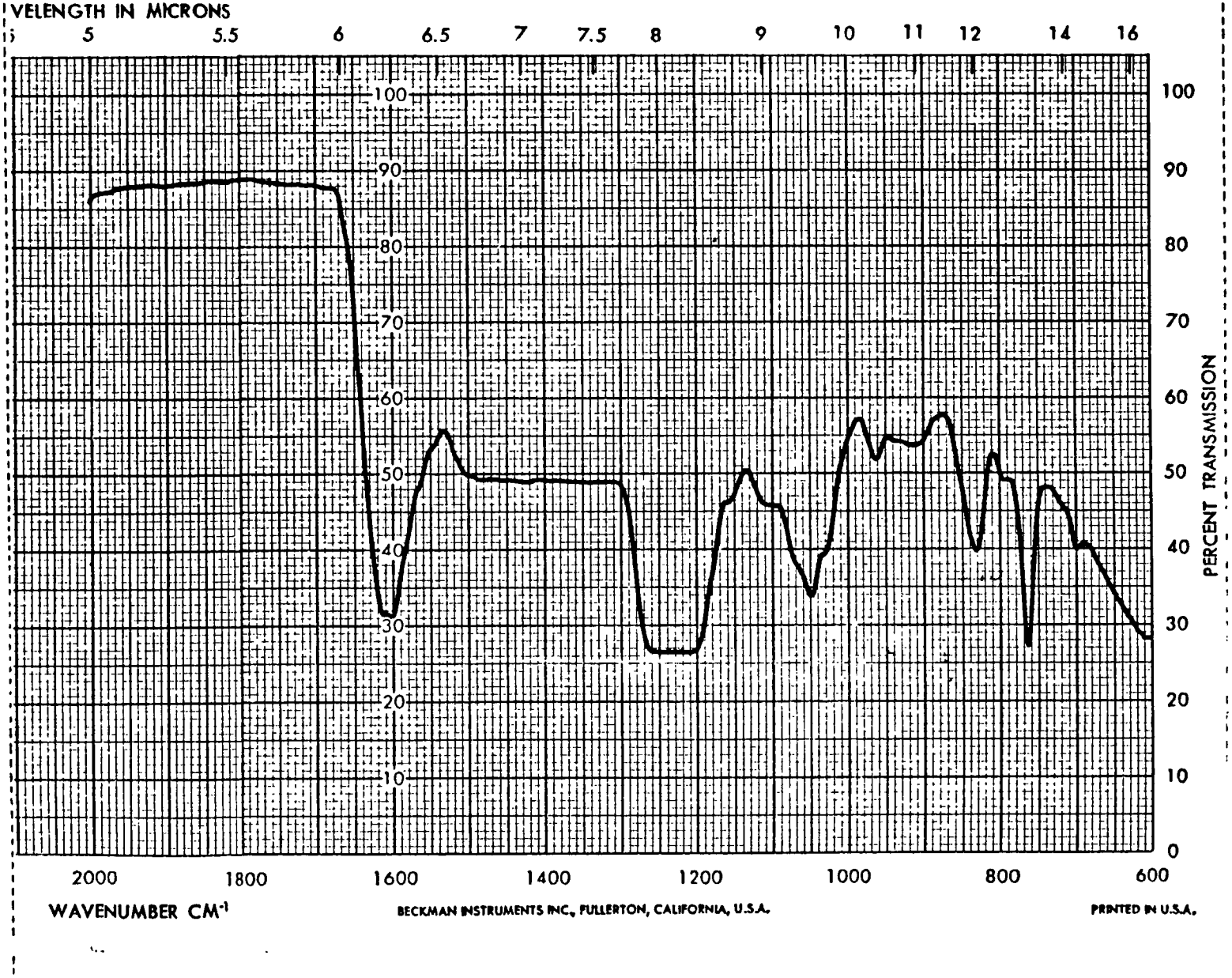
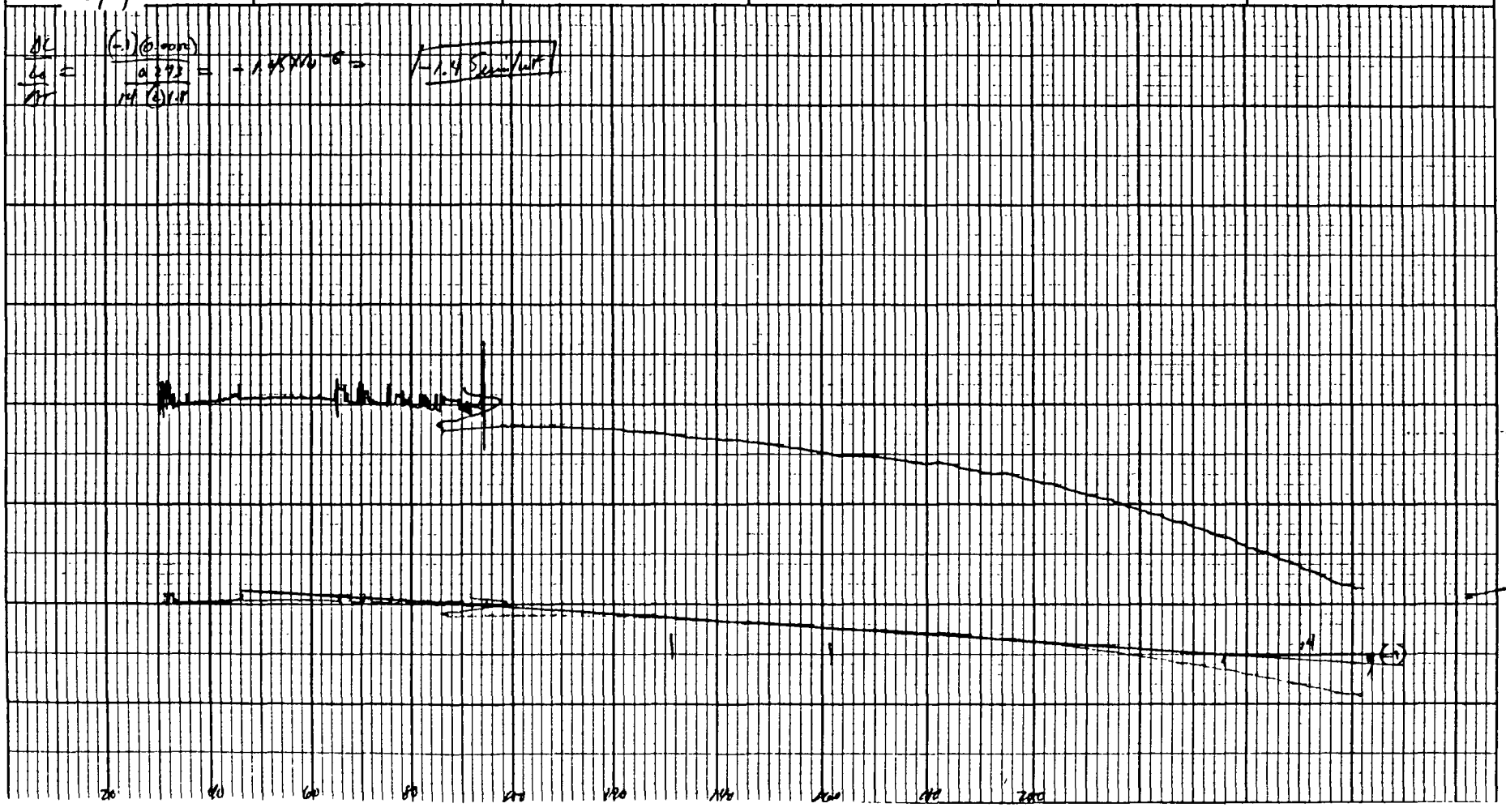


CHART 10B

PART NO. 990088

RUN NO ___ DATE 9/	T-AXIS	DTA-DSC	TGA	TMA	
OPERATOR TH	SCALE, °C/in 50	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/0.2	
SAMPLE	PROG. RATE, °C/min	(mcal/sec)/in	SUPPRESSION, mg	MODE Expansion	
CO2139 - Powder #1 -(1)	HEAT ___ COOL ___ ISO	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.273	
ATM Air @ 30#	SHIFT, in 0	REFERENCE	TIME CONST, sec	LOAD, g 1	
FLOW RATE 2.5SCFH			dY, (mg/min) /in	dY, (10X), (mils/min)/in	
wpy					

$\frac{dL}{dt} = \frac{(+)(0.004)}{0.273 \text{ in} \times 0.1 \text{ in}} = +1.465 \times 10^{-4} \Rightarrow$ [−1.5 Sample Wt]



MEASURED VARIABLE

DUPONT Instruments

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Chart 21A1

PART NO. 990088

RUN NO ___ DATE 9/20/96	T-AXIS	DTA-DSC	TGA	TMA	
OPERATOR DL	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	
Co2139-PANEL #1-(2)	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg ___	WEIGHT, mg ___	SAMPLE SIZE 0.263	
ATM Air @ STP	SHIFT, in 0	REFERENCE ___	TIME CONST, sec ___	LOAD, g 10	
FLOW RATE 3-5SCFH			dY, (mg/min) /in ___	dY, (10X), (mils/min) /in ___	
w/PLY					

$\frac{dC}{dt} = \frac{(-2)(0.0002)}{\frac{0.263}{2.2}(5)(.18)} = -1.92 \times 10^{-4} = -1.92 \text{ wt\%/min}$

MEASURED VARIABLE

DUPONT Instruments

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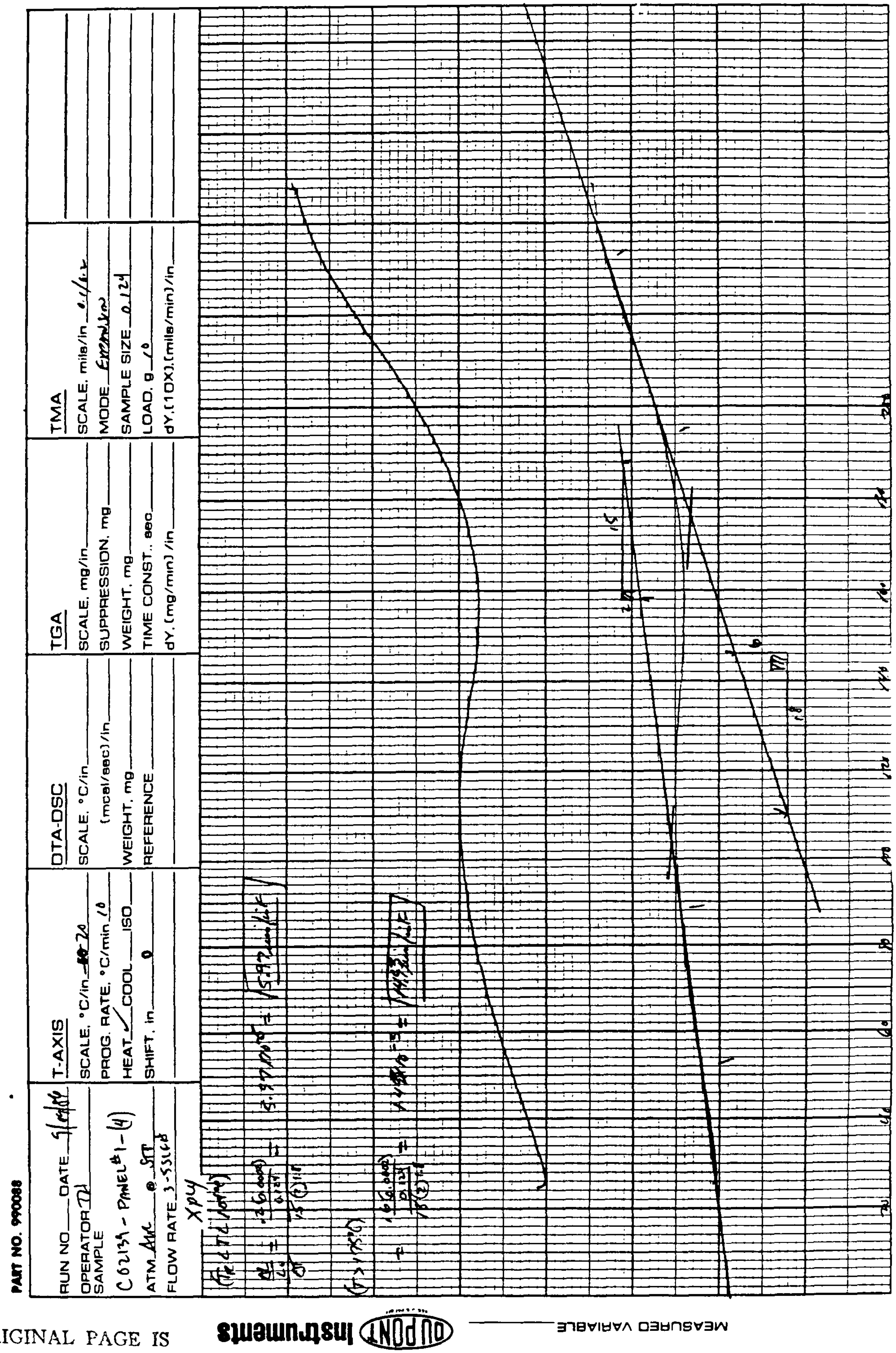
Chart 21A2

Chart 21A3



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DUPONT Instruments

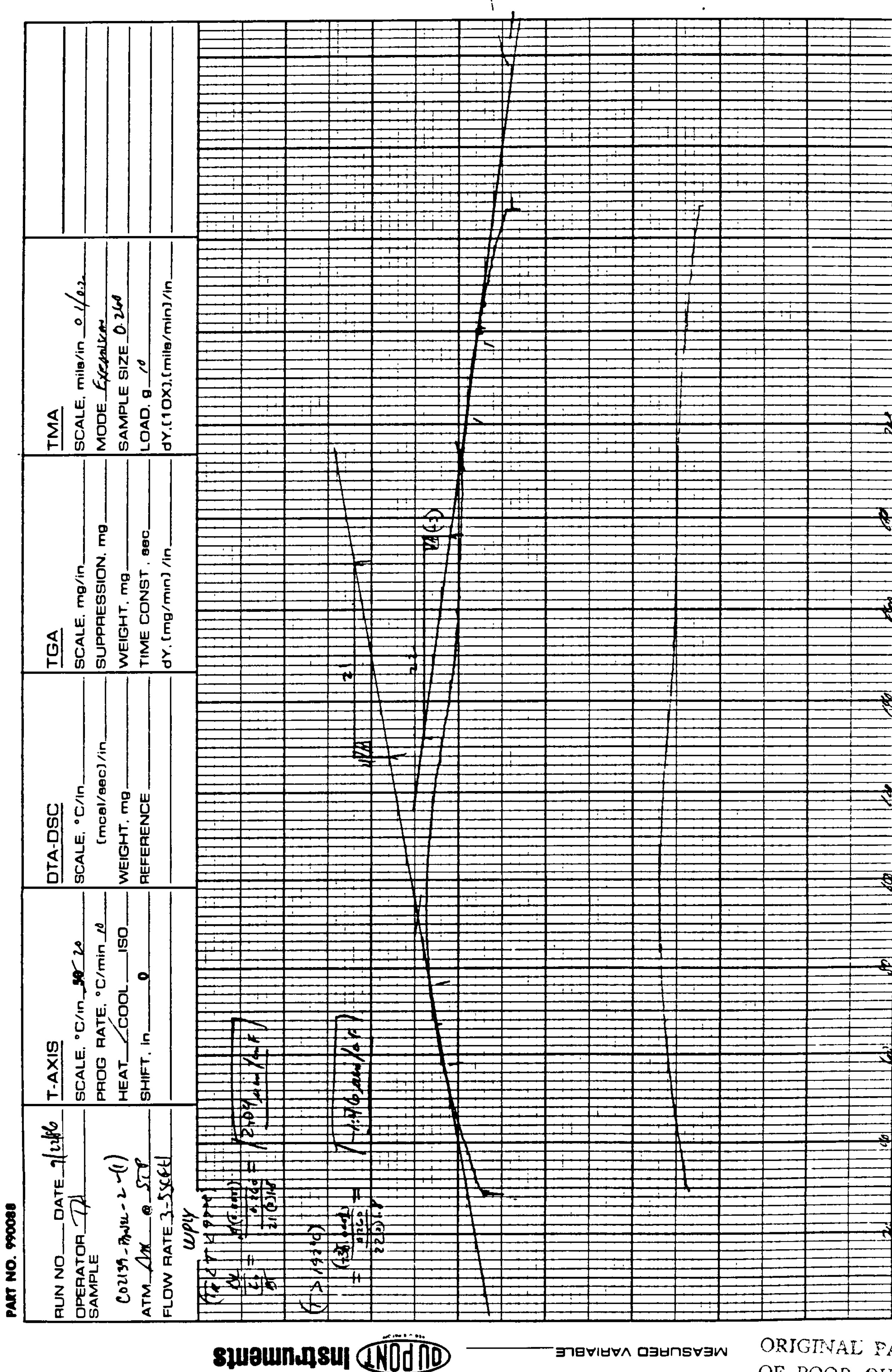
MEASURED VARIABLE

PART NO. 990088

RUN NO. ___ DATE 6/19/91	T-AXIS	DTA-DSC	TGA	TMA	
OPERATOR DH	SCALE, °C/in 50/20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/0.2	
SAMPLE: CO139 - PANEL #1 - (5)	PROG RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE Expansion	
ATM Air @ SSP	HEAT ___ COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.125	
FLOW RATE 3-5 SCFH	SHIFT, in / 0	REFERENCE	TIME CONST., sec	LOAD, g 10	
XPLY			dY, (mg/min) /in	dY, (10X), (mils/min)/in	

Chart 21A4

Chart 21B1



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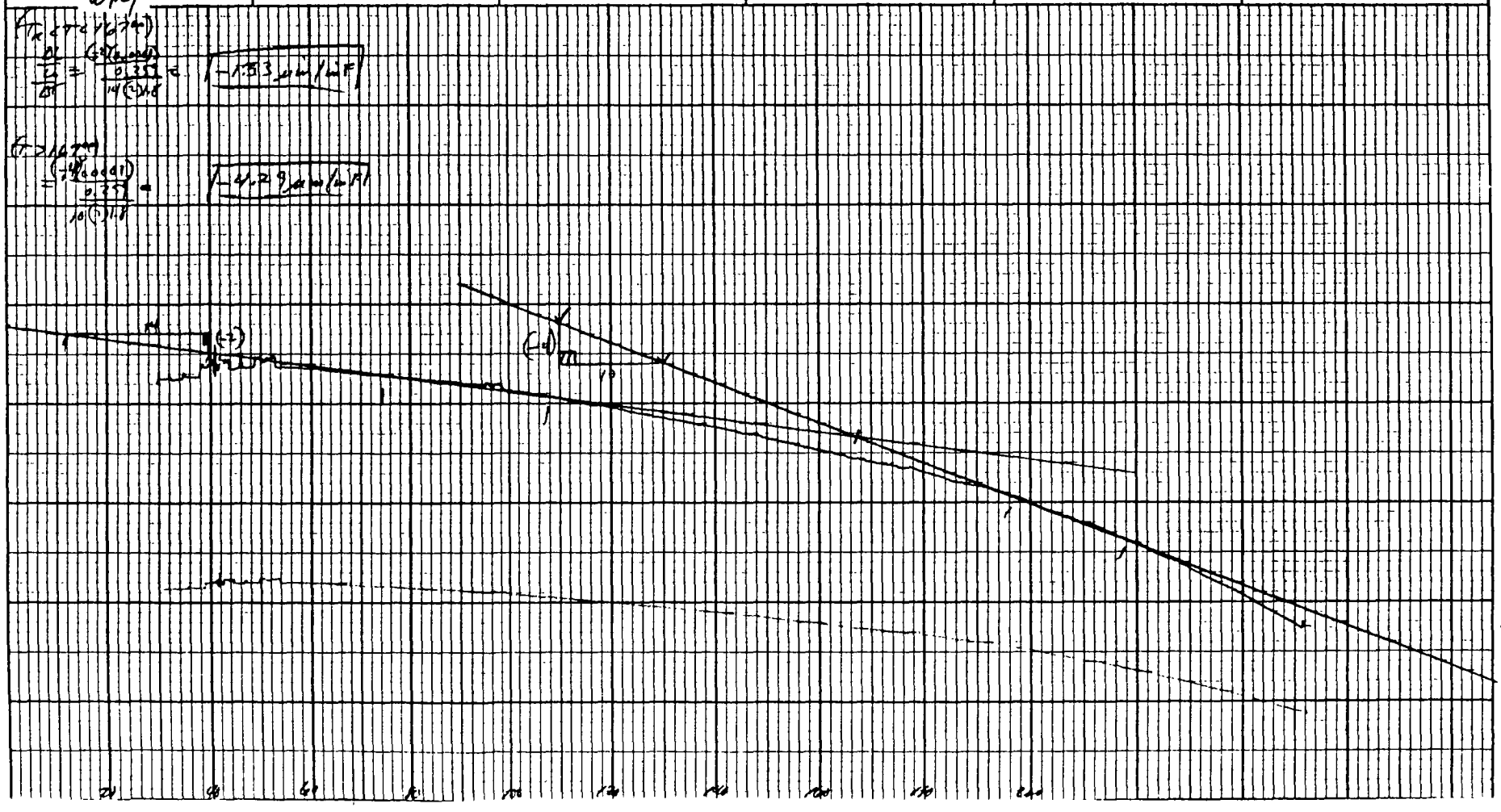
PART NO. 990088

RUN NO ___ DATE 9/22/96	T-AXIS	DTA-DSC	TGA	TMA	
OPERATOR TD	SCALE, °C/in 50 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/0.2	
SAMPLE: C0239-Panel 2-(2)	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE Expansion	
ATM Dry @ STP	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.259	
FLOW RATE 3-5 SCFH	SHIFT, in 0	REFERENCE	TIME CONST, sec	LOAD, g 10	
4 ply			dY, (mg/min)/in	dY, (10X), (mils/min)/in	



DUPONT Instruments

MEASURED VARIABLE

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Chart 21B2

PART NO. 990088

RUN NO ___ DATE 9/23/96	T-AXIS	DTA-DSC	TGA	TMA	
OPERATOR TA	SCALE, °C/in 50 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 6 1/02	
SAMPLE: C0239 - Barrel #2-(4)	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE Expansion	
ATM Air @ SF	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.134	
FLOW RATE 3-5 SCFH	SHIFT, in 0	REFERENCE	TIME CONST, sec	LOAD, g 10	
			dY, (mg/min)/in	dY, (10X), (mils/min)/in	

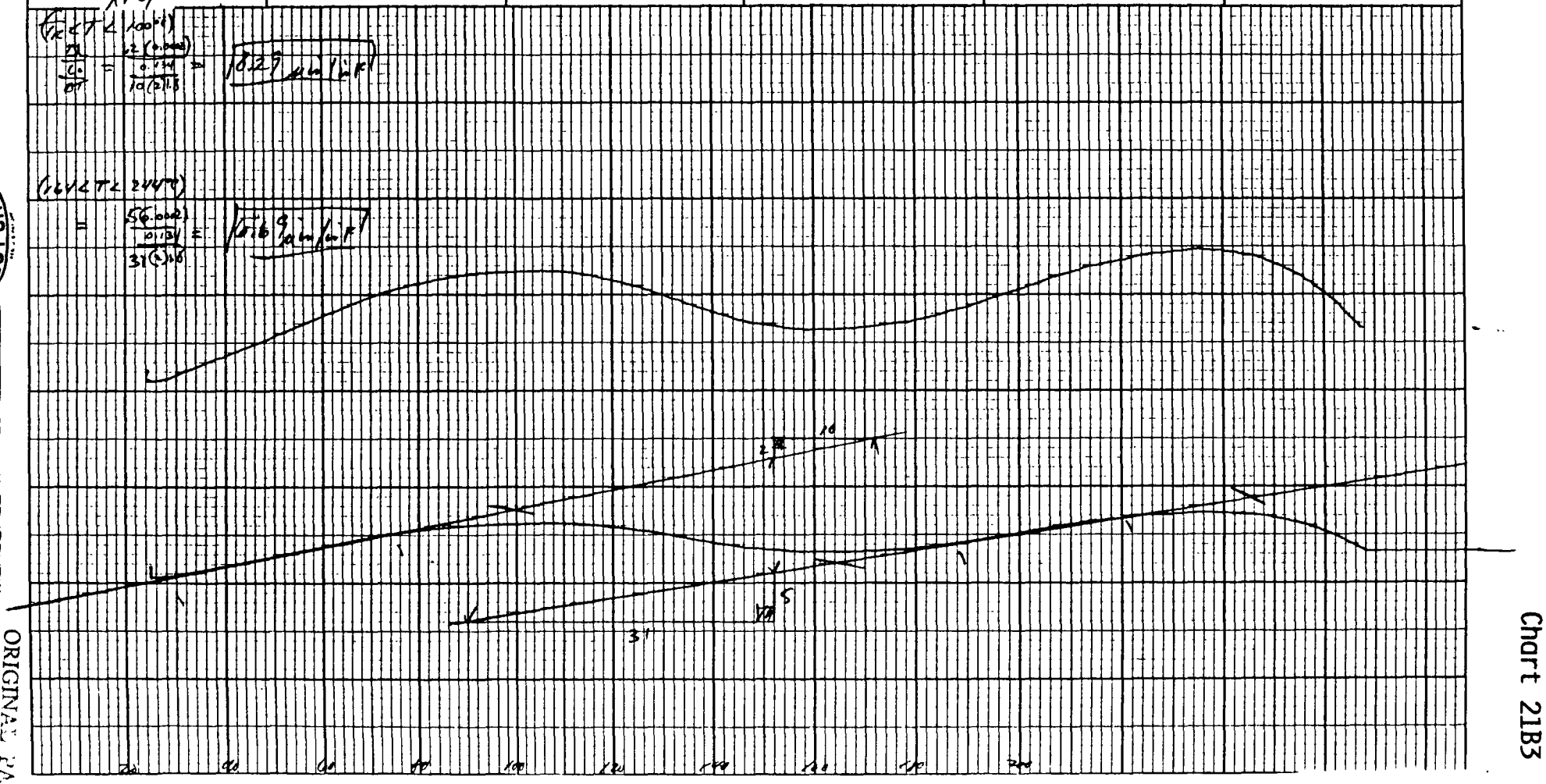
XPLY

(Tk < T < 100°C)

$\frac{\frac{22(0.002)}{0.134}}{10(21.3)} = 1032$ ohm/in/°F

(166 < T < 244°C)

$\frac{\frac{56.002}{0.134}}{31(6)10} = 1616$ ohm/in/°F



MEASURED VARIABLE

DUPONT Instruments

Chart 21B3

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T NO. 990088

RUN NO ___ DATE 9/23/86	T-AXIS	DTA-DSC	TGA	TMA	
OPERATOR TH	SCALE, °C/in 50 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/0.2	
SAMPLE C02139 - Powder #2 - (5)	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE Expansion	
ATM Air @ STP	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.134	
FLOW RATE 3.5 scfh	SHIFT, in 0	REFERENCE	TIME CONST, sec	LOAD, g 10	
			dY, (mg/min)/in	dY, (10X), (mils/min)/in	

XPLY

$\frac{T_2 - T_1}{\Delta t} = \frac{(T_2 + T_1)/2 - 100}{156.00 \text{ min}} = \frac{0.134}{16(2)^2} = 1.296 \text{ mm Hg}$

$\frac{\text{Rate at } T_2}{\text{at}} = \frac{.40(1000)}{16(2)^2} = 10.56 \text{ mm Hg}$

DUPONT Instruments

MEASURED VARIABLE

Chart 21B4

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

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

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

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

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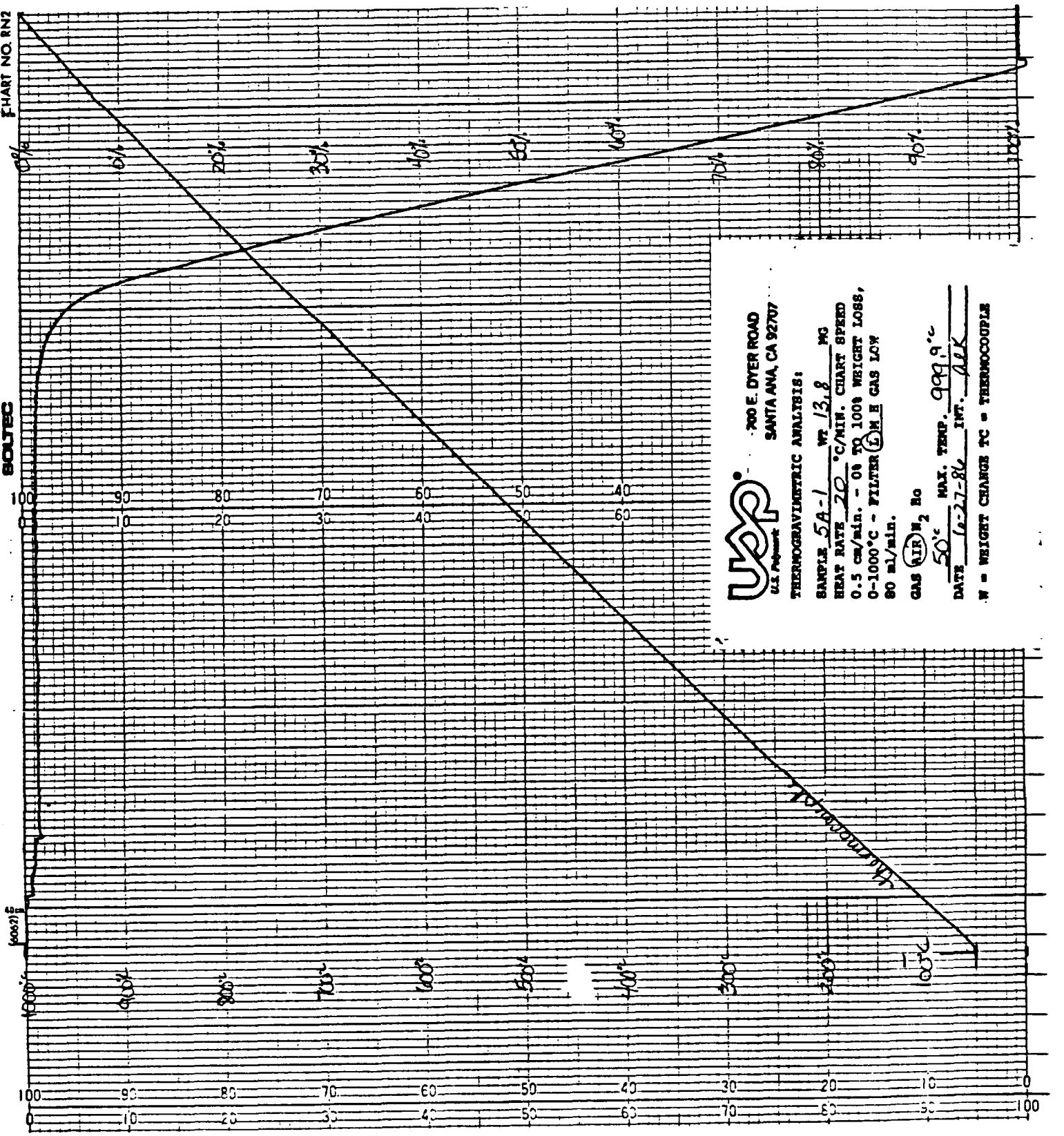
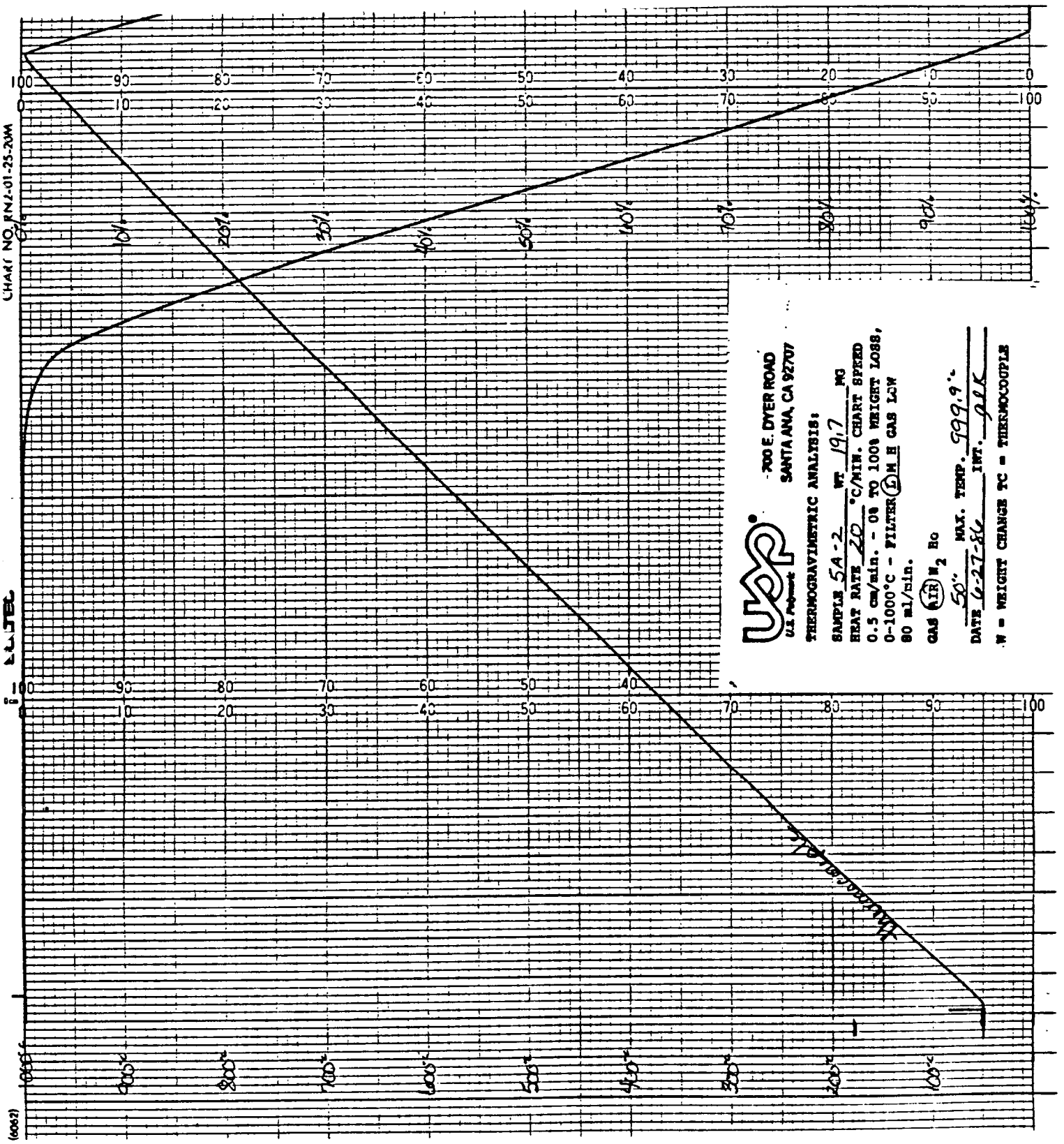


CHART 6B



700 E. DYER ROAD
SANTA ANA, CA 92707

THERMOGRAVIMETRIC ANALYSIS:

SAMPLE SA-2 WT. 19.7 MG
HEAT RATE 20 °C/MIN. CHART SPEED
0.5 cm/min. - 0% TO 100% WEIGHT LOSS,
0-1000°C - FILTER (L) H E GAS LOW
80 ml/min.
GAS (AIR) N_2 Bo
50" MAX. TEMP. 999.9°C
DATE 6-27-86 INT. glk
W = WEIGHT CHANGE TC = THERMOCOUPLE

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CHART 6C

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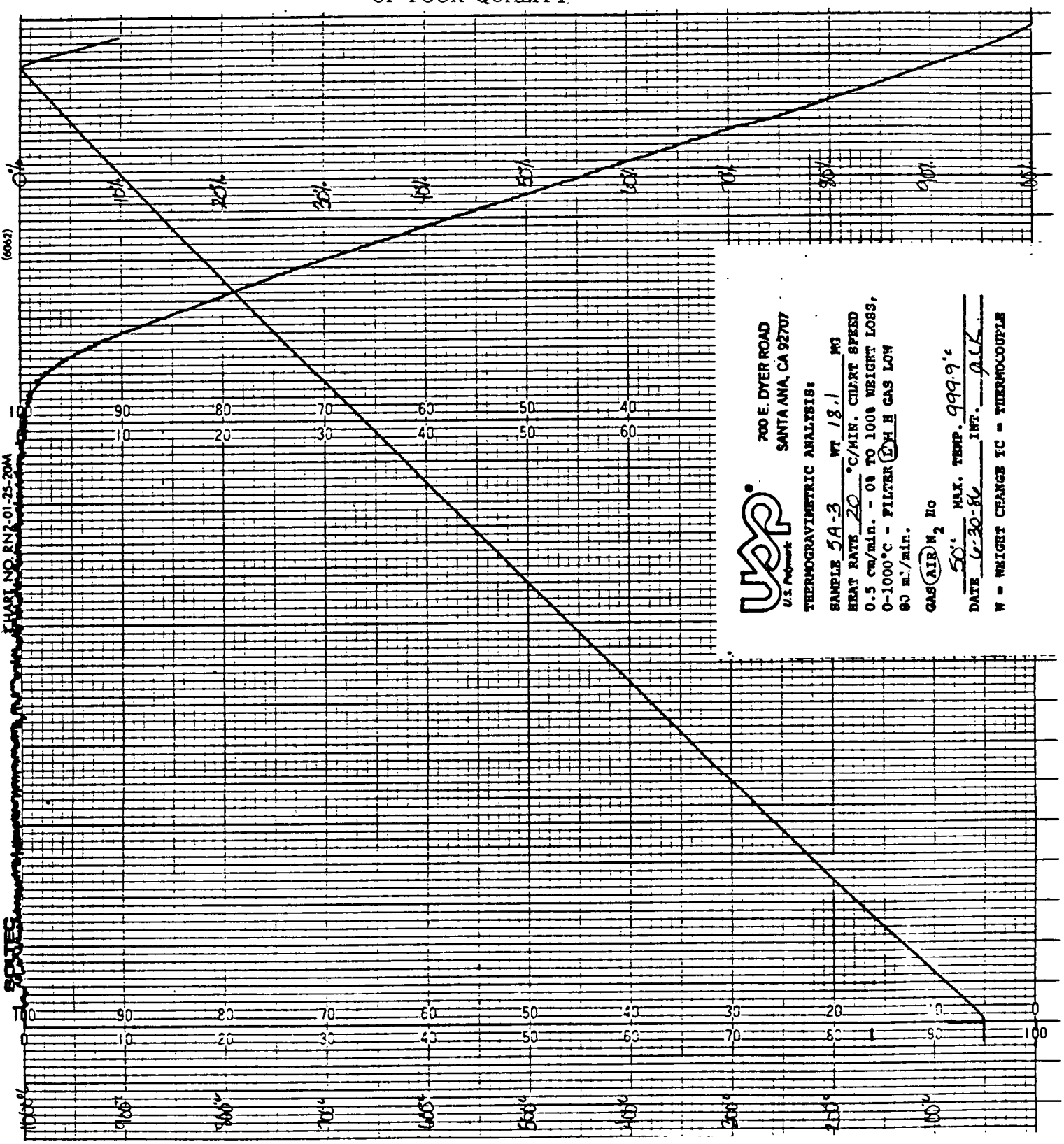


HORIBA CAPA-500
PARTICLE ANALYZER

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

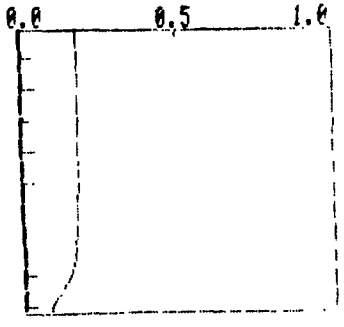
* CONDITIONS

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

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

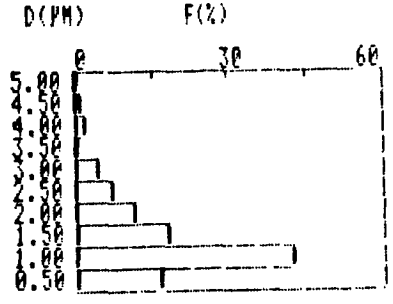


* DISTRIBUTION TABLE (BY VOL.)

D(μM)	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 (μM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#"5A-1
Sample"1

HORIBA CAPA-500
PARTICLE ANALYZER

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

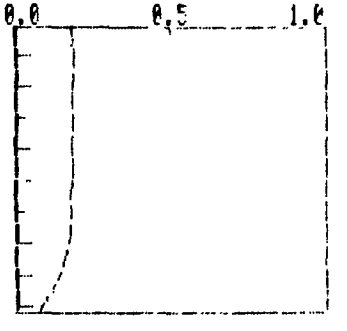
* CONDITIONS

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

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

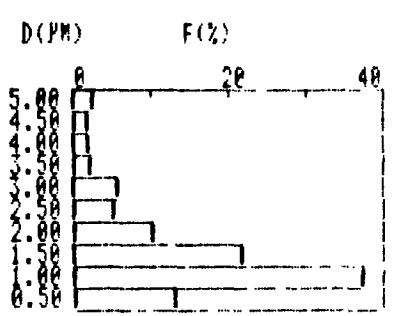


* DISTRIBUTION TABLE (BY VOL.)

D(μM)	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 (μM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#"5A-1
Sample#2

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

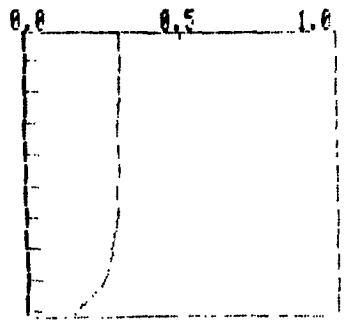
* CONDITIONS

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

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

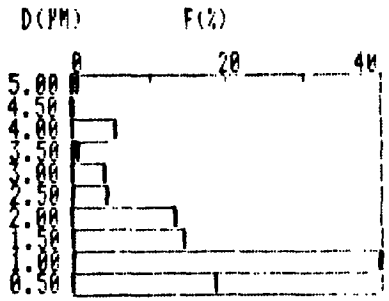


* DISTRIBUTION TABLE (BY VOL.)

D(μM)	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 (μM)

* 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

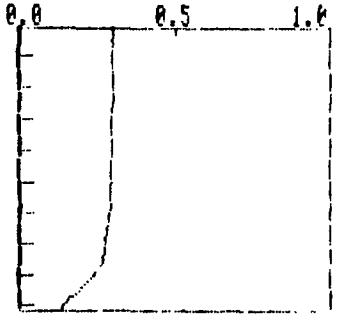
* CONDITIONS

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

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

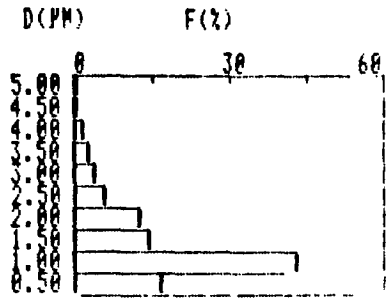


* DISTRIBUTION TABLE (BY VOL.)

D(μM)	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 (μM)

* 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

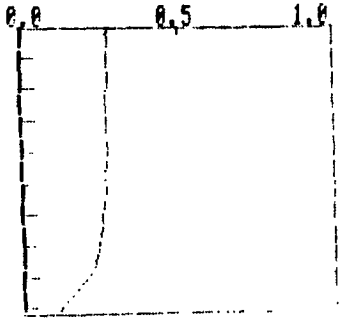
* CONDITIONS

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

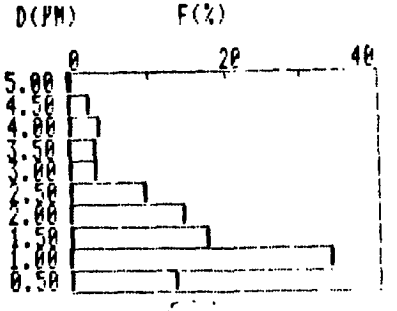


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	P(%)
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

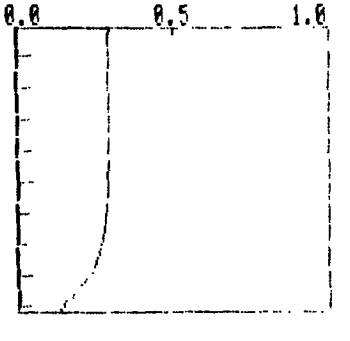
* CONDITIONS

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

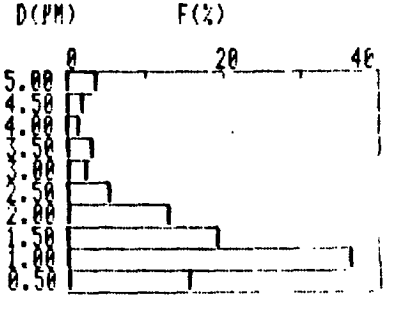


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	P(%)
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
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2407

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, Manager
Quality Assurance Department

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TYPICAL GAS CHROMATOGRAPH SET-UP

Operator Q.S.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 USP39A,5-1	Solvent THF
Size 0.05 µl	Concn. 0.11522 gm/gm

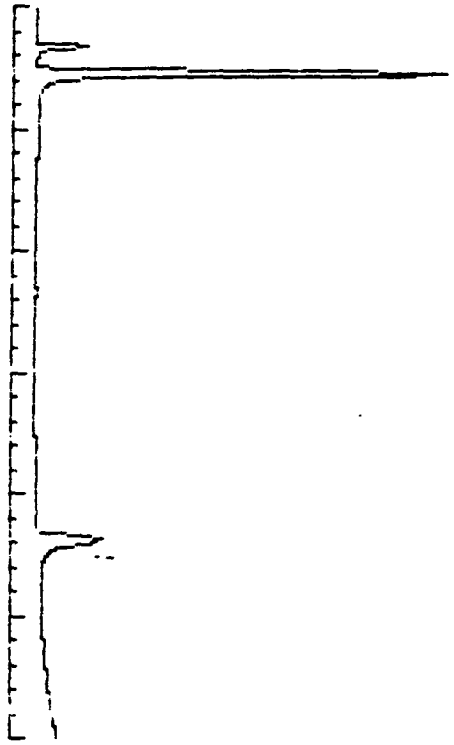
GAS CHROMATOGRAPHY STANDARD SOLVENT

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.

*** REAL TIME CHROMATOGRAM ***



FINAL FULL SCALE MV =1000.00

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

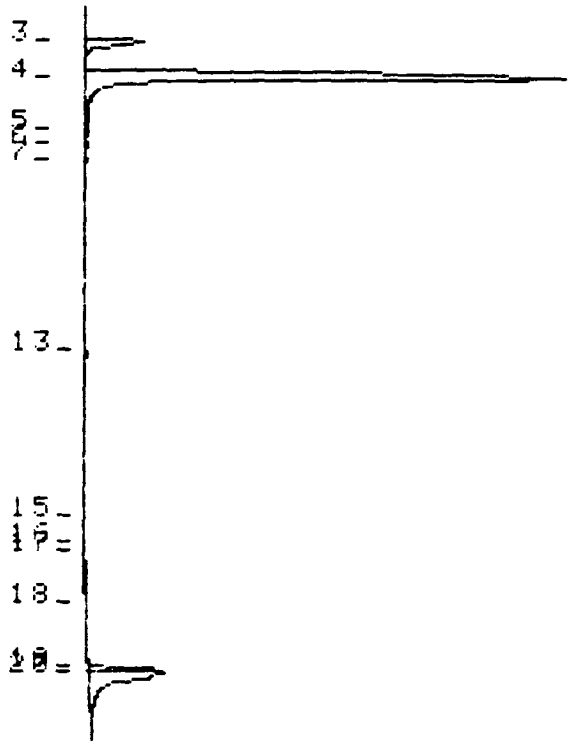
TIME: 15:39
DATE: 12/16/86
OPERATOR: JGZ

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	6.306	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
13	11.65	9414	.523	1	531
15	16.95	2969	.165	2	120
16	17.83	3178	.177	2	86
17	18.00	2327	.129	2	83
18	19.78	1467	.081	2	27
19	21.80	60561	3.364	2	10574
20	21.93	331290	18.401	3	12260

TOTAL AREA= 1800427
THRESHOLD= 1
MIN PK WIDTH= 15
AREA 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

CHART 7A

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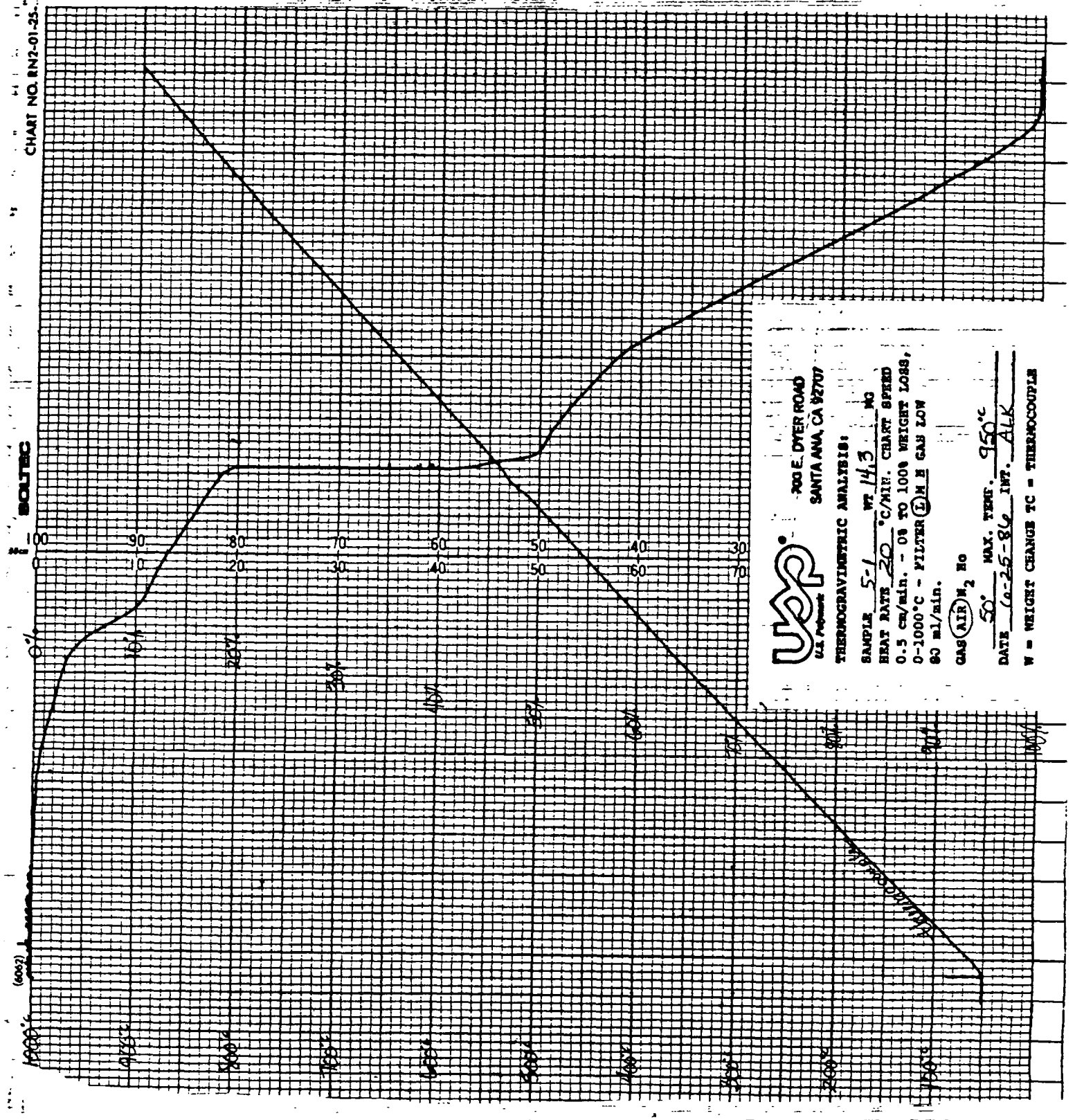

PART NO. 990088

CHART 8A

RUN NO ___ DATE 6-23-86

OPERATOR JLK

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

DUPONT Instruments

MEASURED VARIABLE

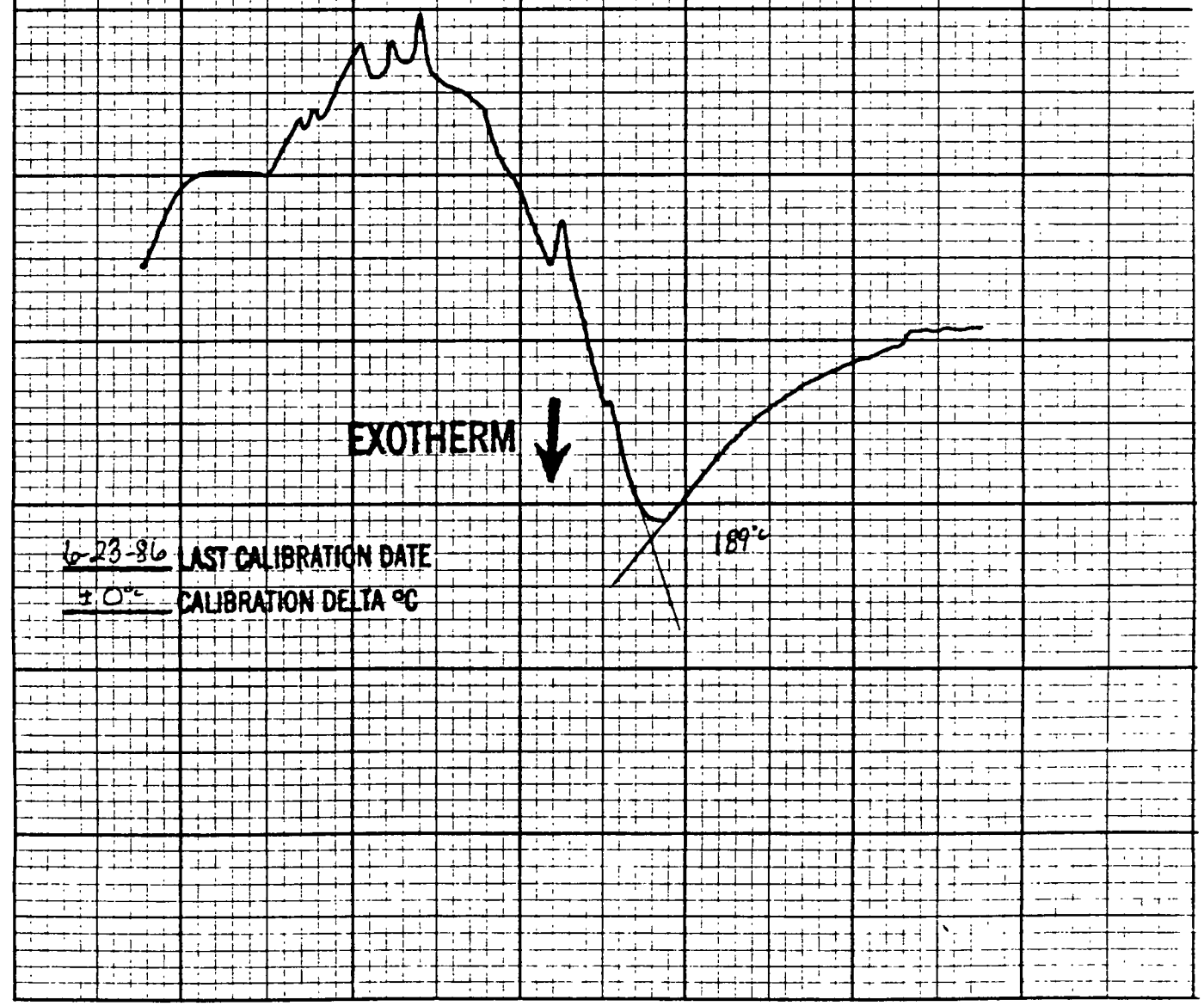

CHART 9A

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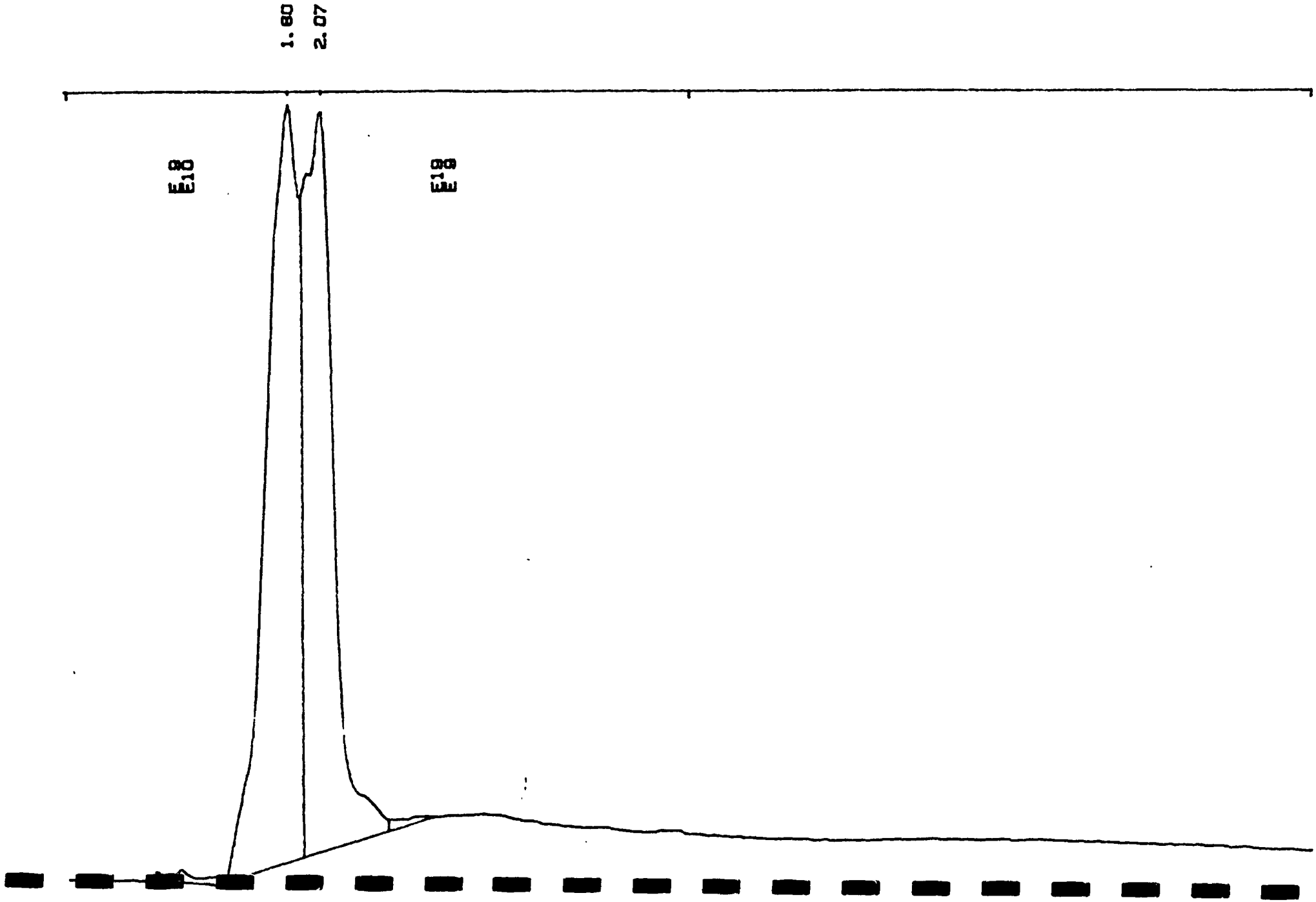
********* AREA PERCENT REPORT *********

```
**********************************************************************************
Sample Name: USP39A,5-1,C=6.89                    Operator Initials: JGZ        *
Date:  09-05-1986 12:21:10 Method:PHENOLIC    DATA FILE: A:PHENO30.PTS          *
Interface: 4                Cycle#:  30        Channel#: 0    Vial#: N.A.      *
Starting Peak Width:  10   Threshold:  .01                                      *
**********************************************************************************
 Instrument 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                                               *
**********************************************************************************
arting Delay:    0.00                        Ending Retention Time:    10.00
```

	Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
3	1.80	87265	52.6720	2	4839	100.000	18.0
4	2.07	78411	47.3281	2	4724	89.854	16.6

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

DATA FILE=PHEN030 FROM 0.00 MIN. TO 10.00 MIN. LOW SCALE= 5.485 Mv. HIGH SCALE= 10.460 Mv.
USP-39A, 5-1, C=6.89 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

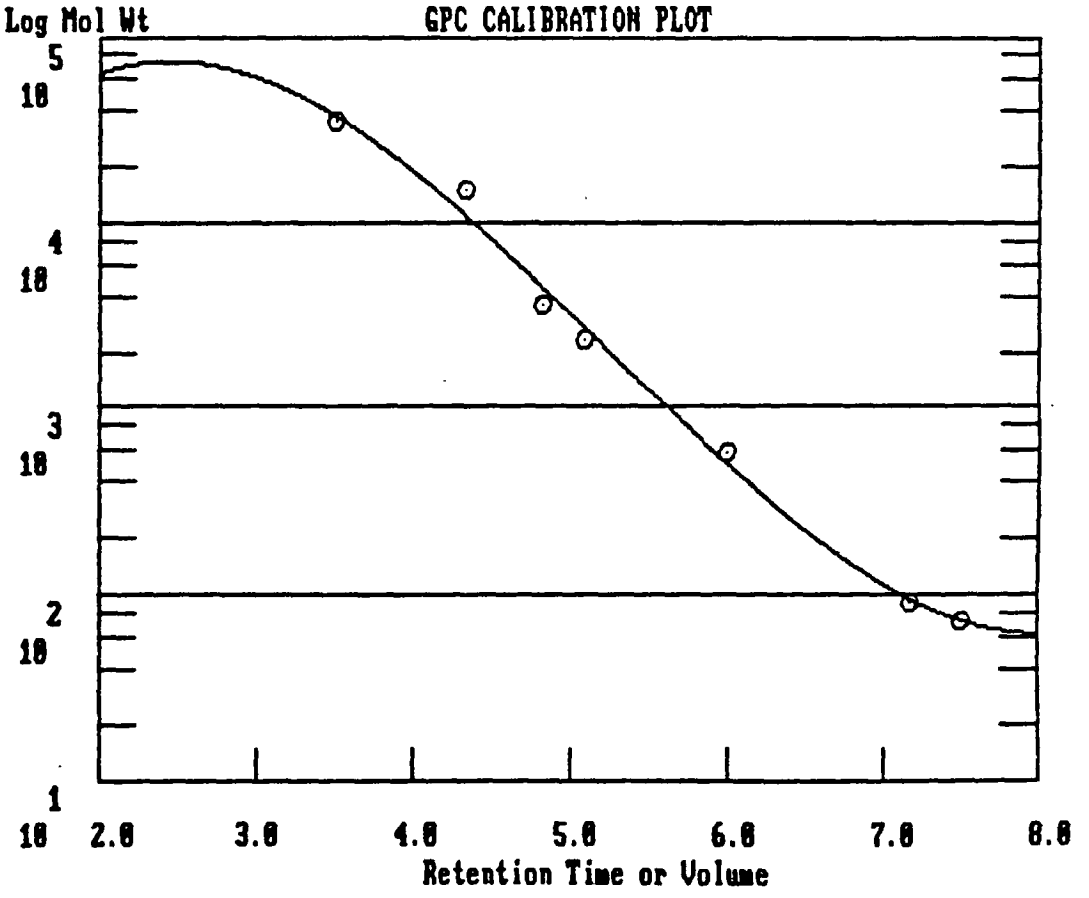


CHART 10A

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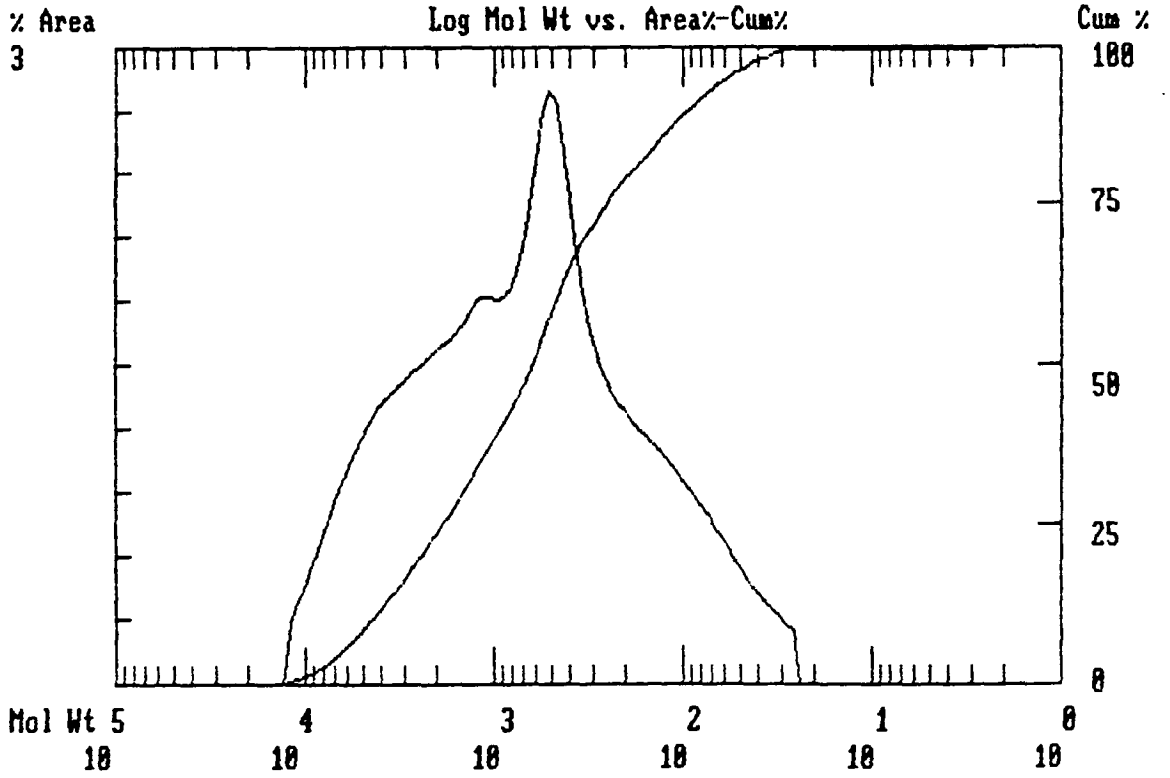
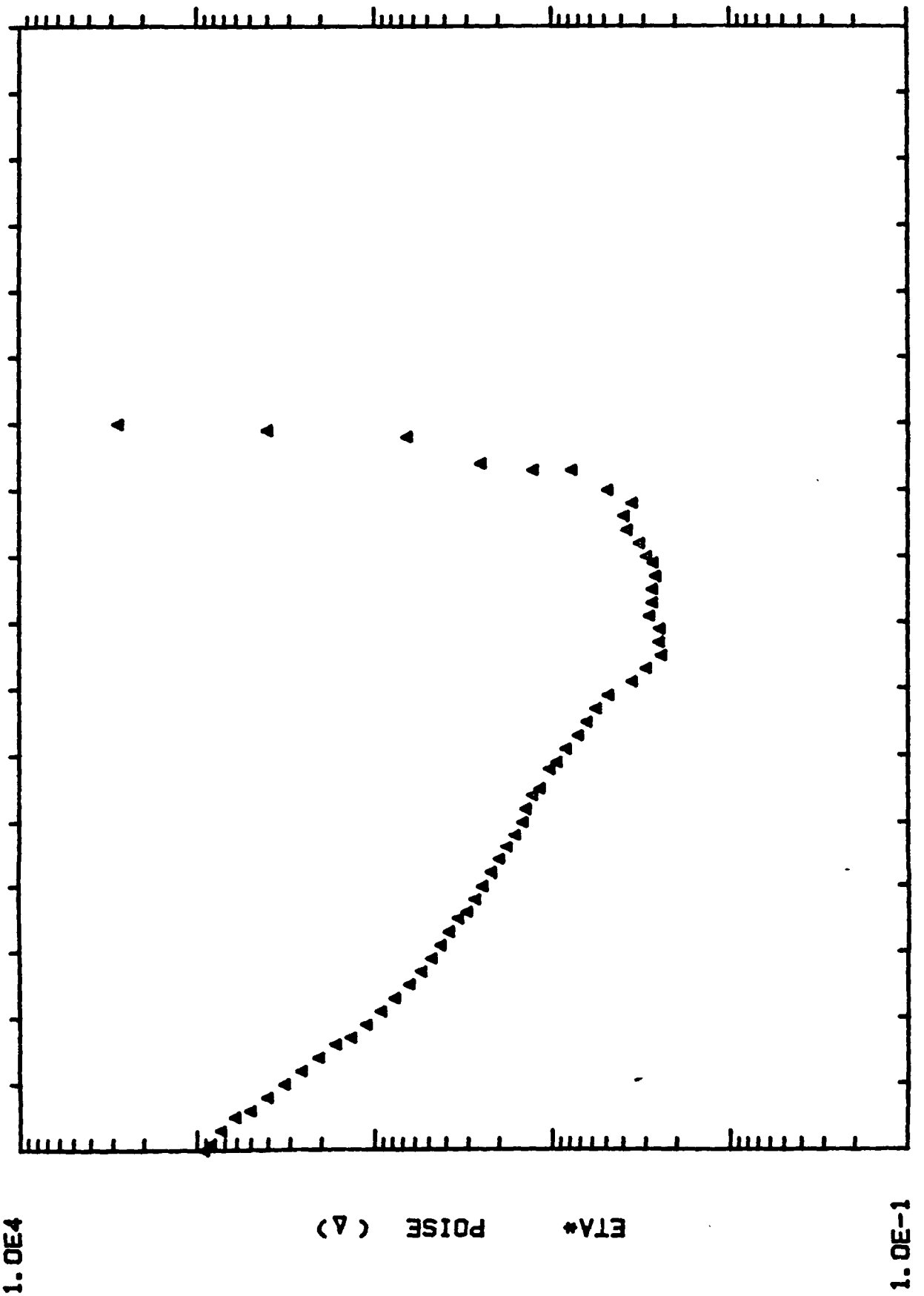
TA FILE A:GPC40.HDR TAKEN 08-06-1986 13:33:08

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

```
**********************************************************************************
Sample Name: USP39A 5-1IC                          Operator Initials: GBF        *
Date:  08-06-1986 13:23:35 Method:                 DATA FILE: A:GPC40.PTS        *
Interface: 5               Cycle#:  40             Channel#: 0    Vial#: N.A.    *
Starting 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                                          *
**********************************************************************************
arting Delay:   0.00                        Ending Retention Time:   10.00
libration file: GPCPHEN
lecular Weight Distribution Averages
seline TIMES:    3.85 to   10.00   MW:      22295 to          2
ocess  TIMES:    3.85 to   10.00   MW:      22295 to          2
tal Area:       204360
=                 1489
=                  254
/Mn=            5.8488
=                 4377
=                 1264
```




NASA FINGERPRINT VISCOSITY PROFILE USP 30ARESIN NASA LOT5-1 (B-351)
1.0E4
ETA* POISE (Δ)
1.0E-1
3.0E1
TEMP DEG. C
2.0E2

Rheometrics RDAP II

---

xperiment No. : 1 Sample No. : 1

itle:
4EA FINGERPRINT VISCOSITY PROFILE USP 39ARESIN NASA LOT5-1 (B-351)

perator :CP

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

perating Mode : DYNAMIC

weep Type : CURE

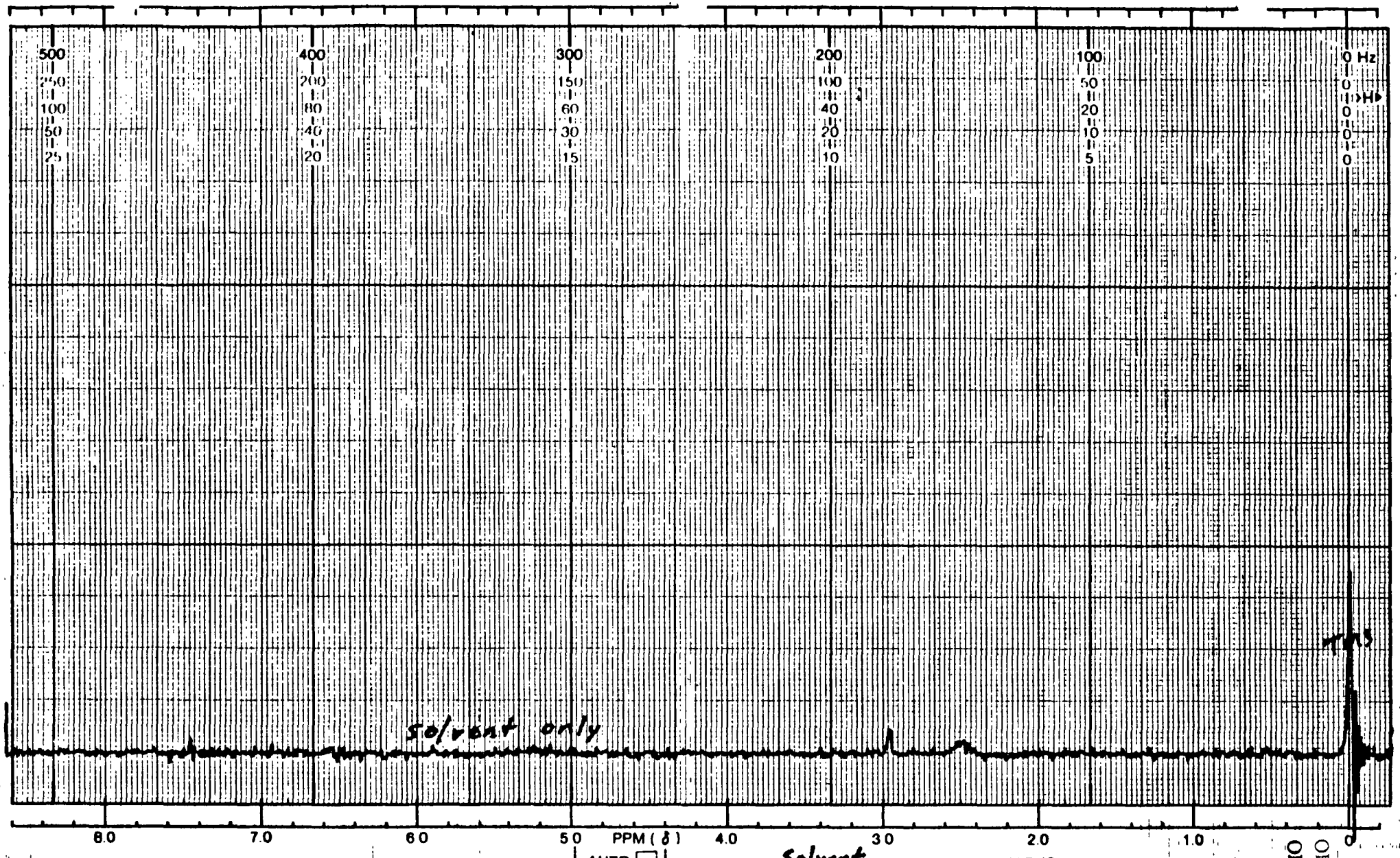
eometry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

otes :
TRAIN =50%
REQUENCY =10 RAD/SEC

NO.	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	1.609e+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	4.556e+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	8.900e+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

95Á FINGERPRINT VISCOSITY PROFILE USP 39ARESIN NAS9 LOTS-1 (E-351)

NO.	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	4.287e-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	2.584e+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	1.370e+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): 20

MANUAL

SWEEP TIME (SEC): 50 250 500 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: Solvent
SOLVENT: Unisol-d + 0.62 TMS
DEC. LEVEL

REMARKS:

SOLVENT ONLY SCAN

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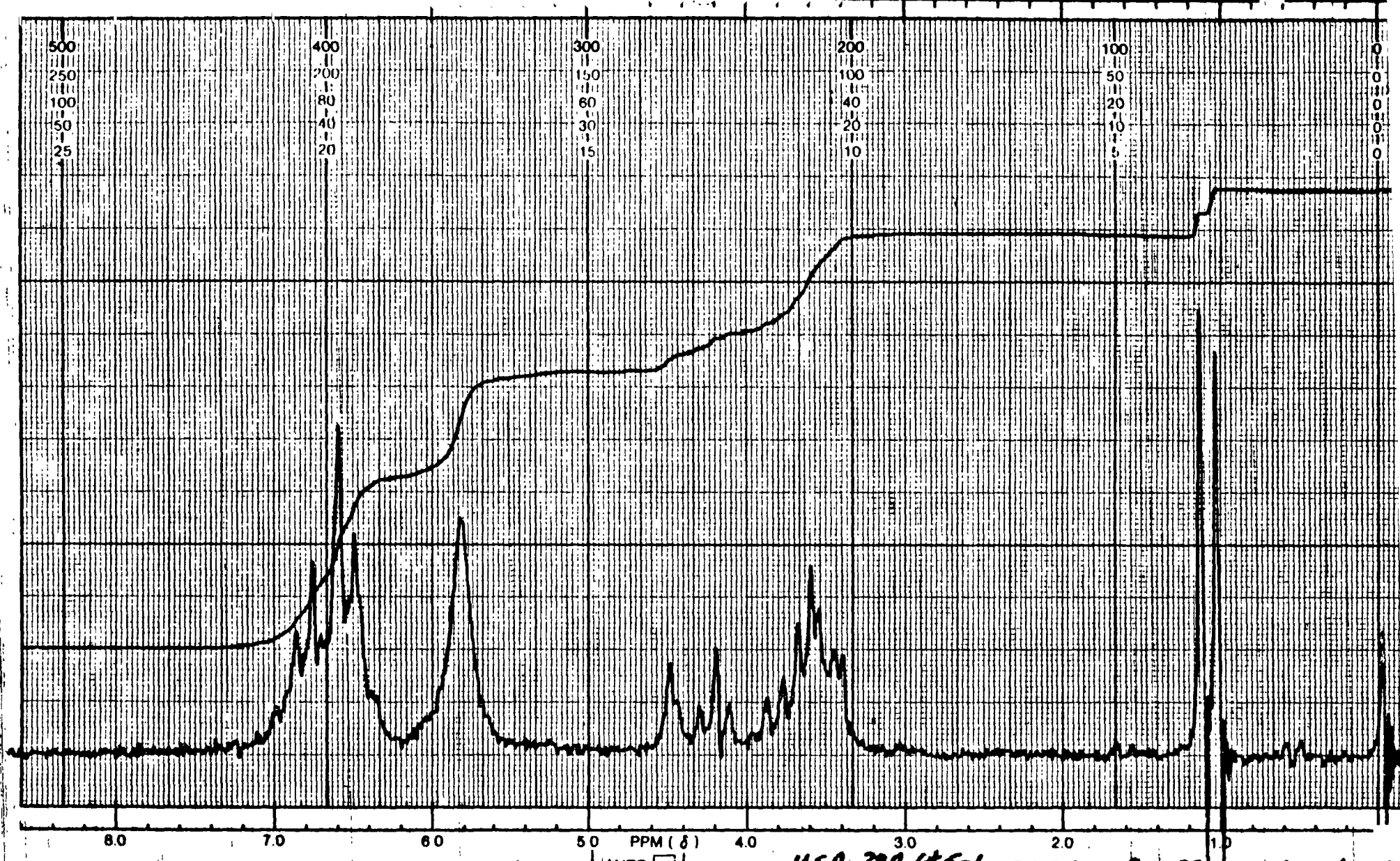
NORELL, INC.
LANDISVILLE, N.J. 08326
T60 Phone: (609) 697-0020

DATE: 3-21-86

OPERATOR DGW

SPECTRUM NO. 1A of 7
solvent scan



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
SOLVENT: Chloral-d + 0.5% TMS
DEC. LEVEL

REMARKS: 0.153 gm sample
0.917 gm solvent

CHART 15A

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

DATE: 6-19-86

OPERATOR DGW

ORIGINAL PAGE IS
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SPECTRUM NO. 3 of 3 USP-39 Lot 5-1

TABLE OF CONTENTS

FABRIC TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

PWB-6 Fabric for NASA Lot# 5

CHARTS

U.S. Polymeric

FABRIC TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

PWB-6 Fabric for NASA Lot# 5

1a. Breaking Strength, lbs/in, WARP
ASTM D1682

	#5-1	#5-2	LOT5 AVG
PICK	28	32	30.0
CENTER	28	30	29.0
PLAIN	33	28	30.5
AVG.	29.7	30.0	29.8

1b. Breaking Strength, lbs/inch, FILL
ASTM D1682

PICK	29	26	27.5
CENTER	35	34	34.5
PLAIN	31	36	33.5
AVG.	31.7	32.0	31.8

2a. Carbon Assay, %
MDQAI 5560

PICK	99.6	99.9	99.75
CENTER	99.9	99.9	99.90
PLAIN	99.9	99.9	99.90
AVG.	99.8	99.9	99.85

2b. Hydrogen Assay, %
MDQAI 5560

PICK	<.01	<.01	EST .001
CENTER	<.01	<.01	EST .001
PLAIN	<.01	.01	EST .006
AVG.	EST .001	EST .004	EST .003

2c. Nitrogen Assay, %
MDQAI 5560

PICK	.2	.1	.150
CENTER	.1	.1	.100
PLAIN	<.1	.1	EST .055
AVG.	EST .10	.1	EST .102

3. Visual Inspection — See Charts 3A-3B
QCi-102

4. Specific Gravity, Units
PTM-84

	1.8404	1.8008	1.8206
	1.8343	1.8068	1.8206
	1.8298	1.8081	1.8190
AVG.	1.835	1.805	1.820

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PWB-6 Fabric for NASA Lot# 5

5. pH, Units
CTM-24B

	#5-1	#5-2	LOT5 AVG
	8.4	7.8	8.1
	8.4	8.0	8.2
AVG.	8.4	7.9	8.15

6. TGA, •C at 50% Weight Loss
CTM-51 (AIR)

SET UP# 1	SET UP# 2
#5-1 900	#5-2 852

See Chart 6A-6B

7a. Atomic Absorption, ppm
CTM-53B

	#5-1	#5-2	LOT5 AVG
Na	4	5	4.5
K	3	2	2.5
Ca	38	38	38.0
Mg	1	1	1.0
Li	0	0	0.0
AVG.	46	46	46.0

7b. Moisture Content, %
CTM-53B

#5-1	#5-2	LOT5 AVG
.005	-.005	.000

7c. Ash Content, %
CTM-53B

#5-1	#5-2	LOT5 AVG
.025	.025	.025

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

AVERAGE	8.90	9.42	9.16
Minimum	7.55	8.60	7.55
Maximum	10.00	10.10	10.10
Std. Dev	0.84	0.54	0.74

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

AVERAGE	9.31
Minimum	8.40
Maximum	10.95
Std. Dev	0.81

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

	#5-1	#5-2	LOT5 AVG
	29	29	29.0
	29	28	28.5
	28	28	28.0
	28	29	28.5
	29	29	29.0
AVG.	28.6	28.6	28.6

PWB-6 Fabric for NASA Lot# 5

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

	#5-1	#5-2	LOT5 AVG
	26	26	26.0
	26	27	26.5
	26	26	26.0
	27	27	27.0
	27	27	27.0
AVG.	26.4	26.6	26.5

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

LEFT	2.329	2.231	2.280
CENTER	2.287	2.234	2.261
RIGHT	2.387	2.276	2.332
AVG.	2.334	2.247	2.291

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

LEFT	.69	.72	.70
CENTER	.57	.63	.60
RIGHT	.54	.62	.58
AVG.	.60	.65	.63

10c. Weight change on Acetone wash, %
PTM-3A

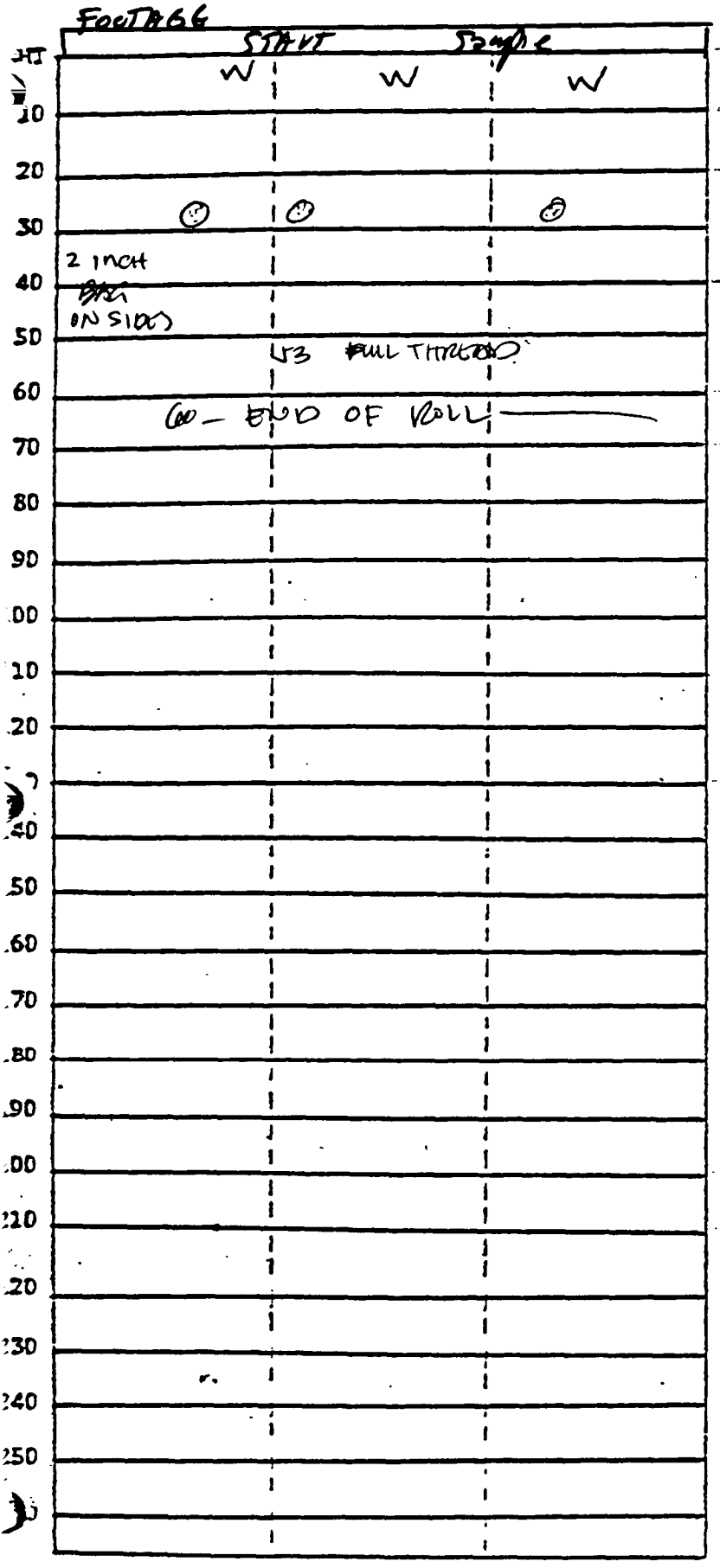
LEFT	-.09	-.23	-.16
CENTER	.04	-.09	-.02
RIGHT	.00	-.13	-.07
AVG.	-.01	-.15	-.08

U.S. Polymeric

Hamid M. Quraishi, Manager
Quality Assurance Department

USP NO. CHART 3A

Fact #66



DATE 28 APRIL 86

FABRIC PWB-6

MFG. STACKPOLE FIBER LOT 1493-4

ROLL NO. 16-1874 A

YARDS 23

POUNDS 11.7

ORDER NO. 71108

SPECIFICATION STD MFG CONTS -

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

GRADE Grap C

USP NO. CHART 3B

FT	Footage START	Sample	
10	W		
20			
30			
33	PULL	THREAD	
40		PULL THREAD	
50	W	W	
60			
70			
71	——	END OF ROLL ——	
80			
90			
00			
10			
20			
30			
40			
50			
60			
70			
80			
90			
00			
10			
20			
30			
40			
50			

1 FT

DATE 28 APR.86

FABRIC ~~STACKPOLE~~ PWB-6

MFG. STACKPOLE FIBER LOT: 1493-4

ROLL NO. 16-1867A

YARDS 26

POUNDS 13.5

ORDER NO. 71108

SPECIFICATION STD MFG CNTS.

Q.C. FILE # NASA # 5-2

TREATER OPERATOR READ UP

SYMBOLS

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

REMARKS

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GRADE Group B

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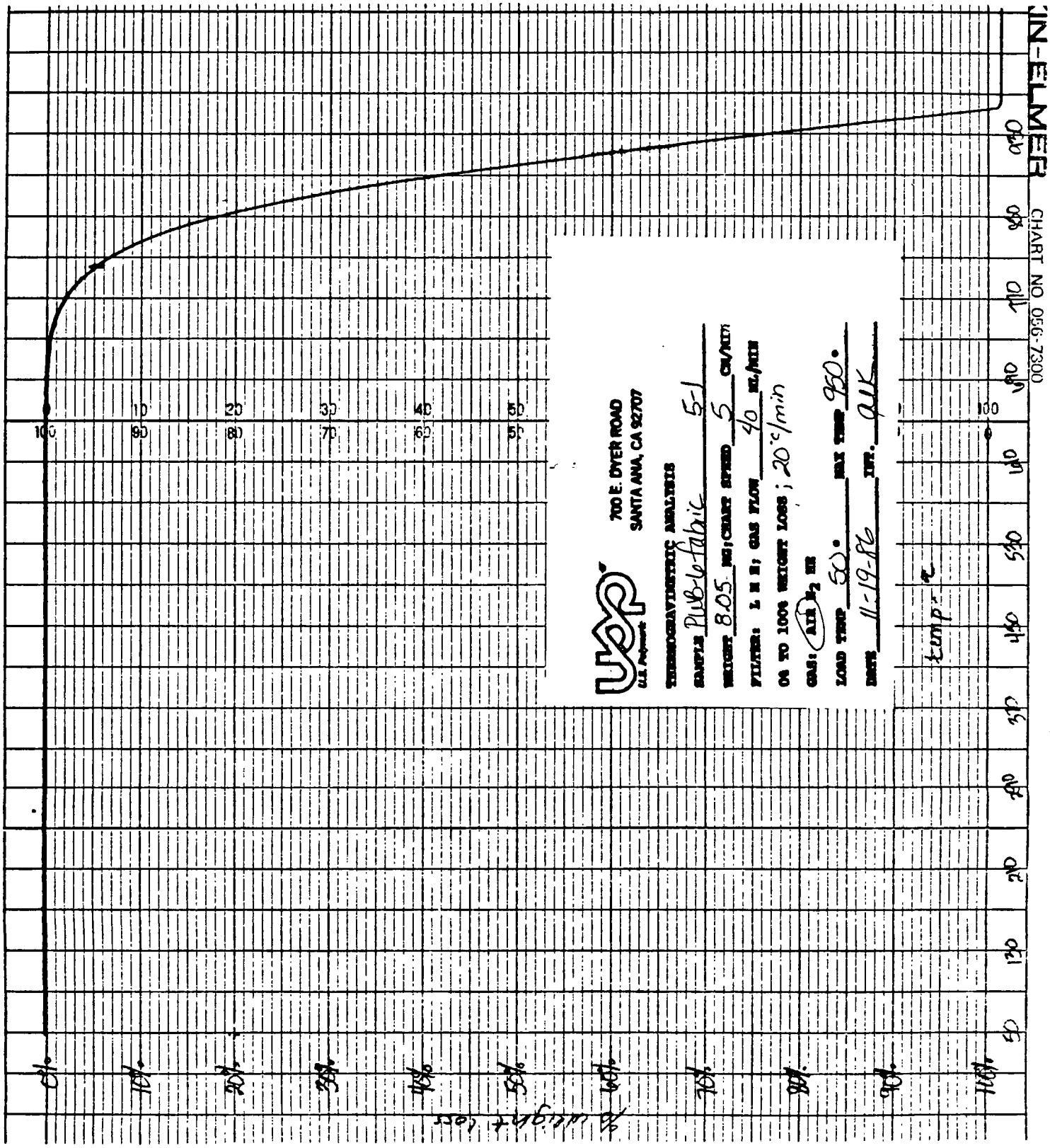

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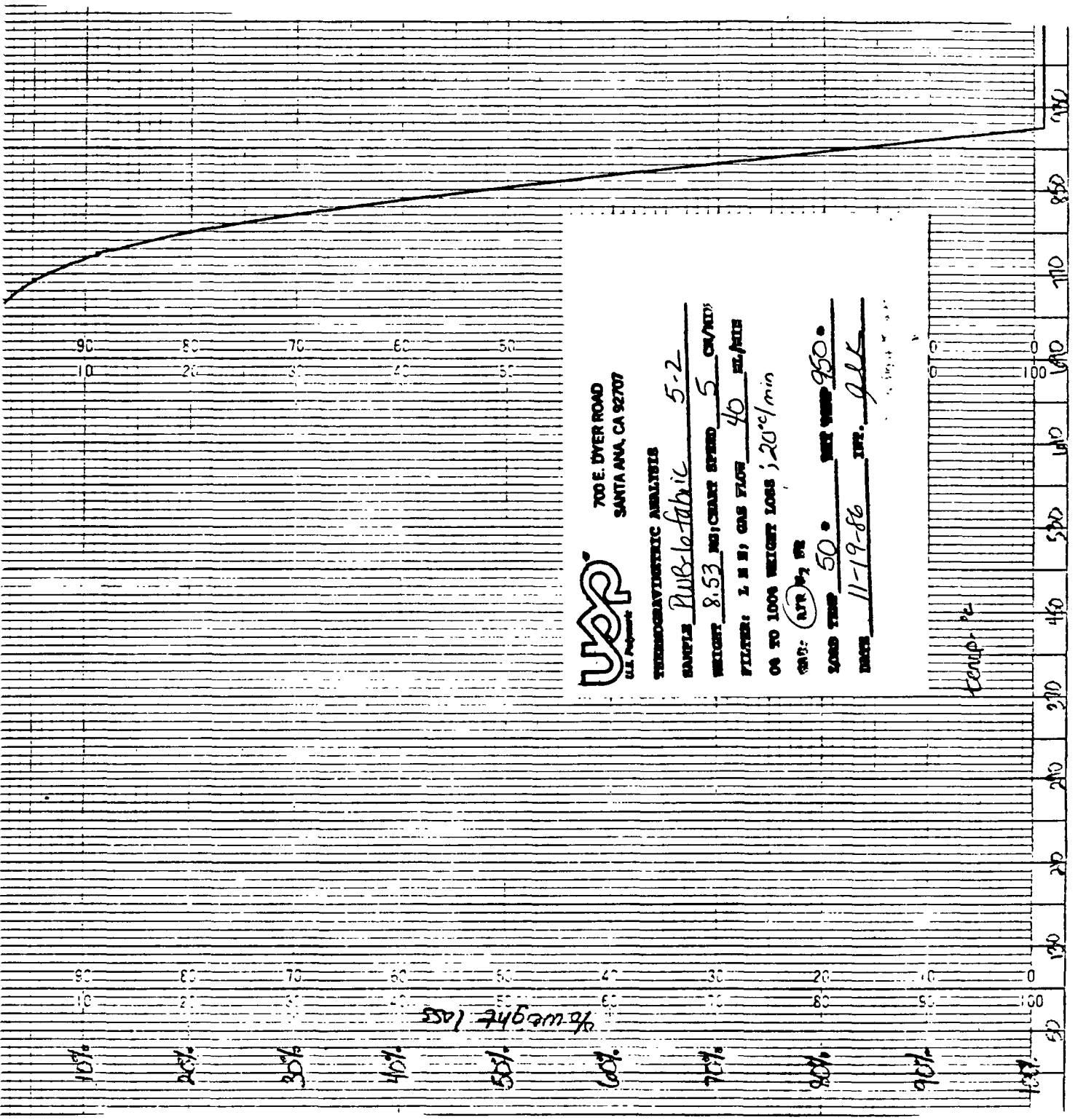

TABLE OF CONTENTS

PREPREG TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

FM 5839 NASA LOT# 5 U.S.P. LOT# D09338

CHARTS

U.S. Polymeric

PREPREG TESTING

NAS8-36298

U.S. POLYMERIC O.E.71108

FM 5839 NASA LOT# 5 U.S.P. LOT# D09338

		ROLL#1-S	ROLL#2-S
1a. Resin Content, Soxhlet, % CTM-6D		33.4	33.3
		33.6	35.1
		34.2	34.1
	AVG.	33.7	34.2
	NASA LOT# 5 AVERAGE		34.0
1b. Filler Content, Soxhlet, % CTM-6D		14.7	14.7
		14.8	15.5
		15.1	15.0
	AVG.	14.9	15.1
	NASA LOT# 5 AVERAGE		15.0
1c. Cloth Content, Soxhlet, % CTM-6D		51.9	52.0
		51.6	49.4
		50.7	50.9
	AVG.	51.4	50.8
	NASA LOT# 5 AVERAGE		51.1
2. Volatile Content, % PTM-17B		2.1	2.2
		2.2	2.3
		2.3	2.2
	AVG.	2.2	2.2
	NASA LOT# 5 AVERAGE		2.2
3. Flow, 1000 psi, % PTM-19G		9.7	8.1
		7.5	8.7
		9.7	9.1
	AVG.	9.0	8.6
	NASA LOT# 5 AVERAGE		8.8
4. Resin Content, Dry basis, % PTM-16F, Type II		37.0	32.6
		37.5	35.9
		37.5	35.4
	AVG.	37.3	34.6
	NASA LOT# 5 AVERAGE		36.0
5. Tack, lbs PTM-80		11	8
	NASA LOT# 5 AVERAGE		10
6. Gel Time, seconds PTM-20E		86	59
	NASA LOT# 5 AVERAGE		73

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FM 5839 NASA LOT# 5 U.S.P. LOT# D09338

7a. Atomic Absorption, ppm CTM-53B		ROLL#1-S	ROLL#2-S	LOT#5 AVG.
	Na	20	21	21
	K	2	3	3
	Ca	10	11	11
	Mg	2	2	2
	Li	0	0	0
	TOTAL	34	37	36

7b. Moisture Content, % CTM-53B	ROLL#1-S	ROLL#2-S
	1.99	2.13
NASA LOT# 5 AVERAGE		2.06

7c. Ash Content, % CTM-53B		
	.05	.05
NASA LOT# 5 AVERAGE		.05

8. TGA, % Weight Loss at 500°C CTM-51 (Nitrogen)		
	8.9	9.5
NASA LOT# 5 AVERAGE		9.2

See chart 8A-8B

9. DSC, °C CTM-50A		ROLL#1-S	ROLL#2-S	LOT#5 AVG.
	First Temp	184	183	184

See Chart 9A-9B

10. Infrared (IRZB) Baseline CTM-21C			
	.84	.87	.85

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
		1.556	1.548
		1.556	1.547
		1.555	1.546
	AVG.	1.555	1.547
NASA LOT# 5 AVERAGE			1.551

13a. Tensile Strength, ksi, WARP FTMS 406-1011			
		22.10	21.95
		20.55	21.23
		21.33	21.36
		20.09	25.05
		20.95	19.88
	AVG.	21.00	21.90
NASA LOT# 5 AVERAGE			21.45

FM 5839 NASA LOT# 5 U.S.P. LOT# D09338

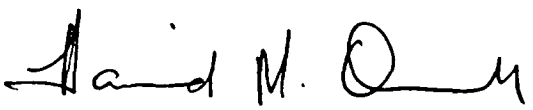
		ROLL#1-S	ROLL#2-S
13b. Tensile Modulus, msi, WARP FTMS 406-1011		4.34	3.99
		3.95	4.05
		3.97	3.85
		3.85	4.56
		4.06	3.67
	AVG.	4.03	4.02
	NASA LOT# 5 AVERAGE		4.03
13c. Tensile Elongation, %, WARP FTMS 406-1011		.80	.80
		.82	.75
		.95	.77
		.85	.74
		.81	.78
	AVG.	.85	.77
	NASA LOT# 5 AVERAGE		.81
14a. Flexural Strength, ksi, WARP FTMS 406-1031		39.98	37.73
		35.68	37.63
		33.85	37.38
		37.45	37.71
		35.83	36.32
	AVG.	36.56	37.35
	NASA LOT# 5 AVERAGE		36.96
14b. Flexural Modulus, msi, WARP FTMS 406-1031		4.81	4.28
		4.28	4.22
		4.04	4.01
		4.06	4.13
		4.06	4.40
	AVG.	4.25	4.21
	NASA LOT# 5 AVERAGE		4.23
15a. Compressive Strength, ksi, WARP FTMS 406-1021		26.13	23.59
		23.30	24.12
		26.00	22.89
		24.07	23.48
		25.34	23.15
	AVG.	24.97	23.45
	NASA LOT# 5 AVERAGE		24.21
15b. Compressive Modulus, msi, WARP FTMS 406-1021		5.14	4.73
		4.29	3.92
		5.20	4.59
		5.11	4.73
		5.05	4.72
	AVG.	4.96	4.54
	NASA LOT# 5 AVERAGE		4.75

FM 5839 NASA LOT# 5 U.S.P. LOT# D09338

		ROLL#1-S	ROLL#2-S
16. Double Shear Strength, ksi FTMS 406-1041A		4.22	4.52
		4.08	4.26
		3.80	4.07
		3.99	3.97
		3.85	4.47
	AVG.	3.99	4.26
	NASA LOT# 5 AVERAGE		4.12
17. Barcol Hardness, Units ASTM D-2583 (Average of 10 determinations)		69.0	68.9
	NASA LOT# 5 AVERAGE		69.0
18. Residual Volatiles, % PTM-98		1.92	1.99
		1.94	2.00
		1.92	1.96
	AVG.	1.93	1.98
	NASA LOT# 5 AVERAGE		1.96
19. Resin Content, Pyrolysis, % CTM-14B		34.49	33.85
		34.88	33.96
		33.26	34.35
	AVG.	34.21	34.05
	NASA LOT# 5 AVERAGE		34.13
20. Acetone Extraction, % CTM-18A		5.92	5.78
		6.15	6.97
		7.56	5.54
	AVG.	6.54	6.10
	NASA LOT# 5 AVERAGE		6.32
21a. CTE, in/in °F with PLY PTM-61B		-1.30	.99
		1.82	-1.98
	AVG.	.26	-.50
	NASA LOT# 5 AVERAGE		-.12
21b. CTE, in/in °F Cross PLY PTM-61B		2.28	5.03
		6.41	10.37
	AVG.	4.35	7.70
	NASA LOT# 5 AVERAGE		6.02

See Chart 21A-21B

U.S. Polymeric



Hamid M. Quraishi, Manager
Quality Assurance Department

CHART 8A

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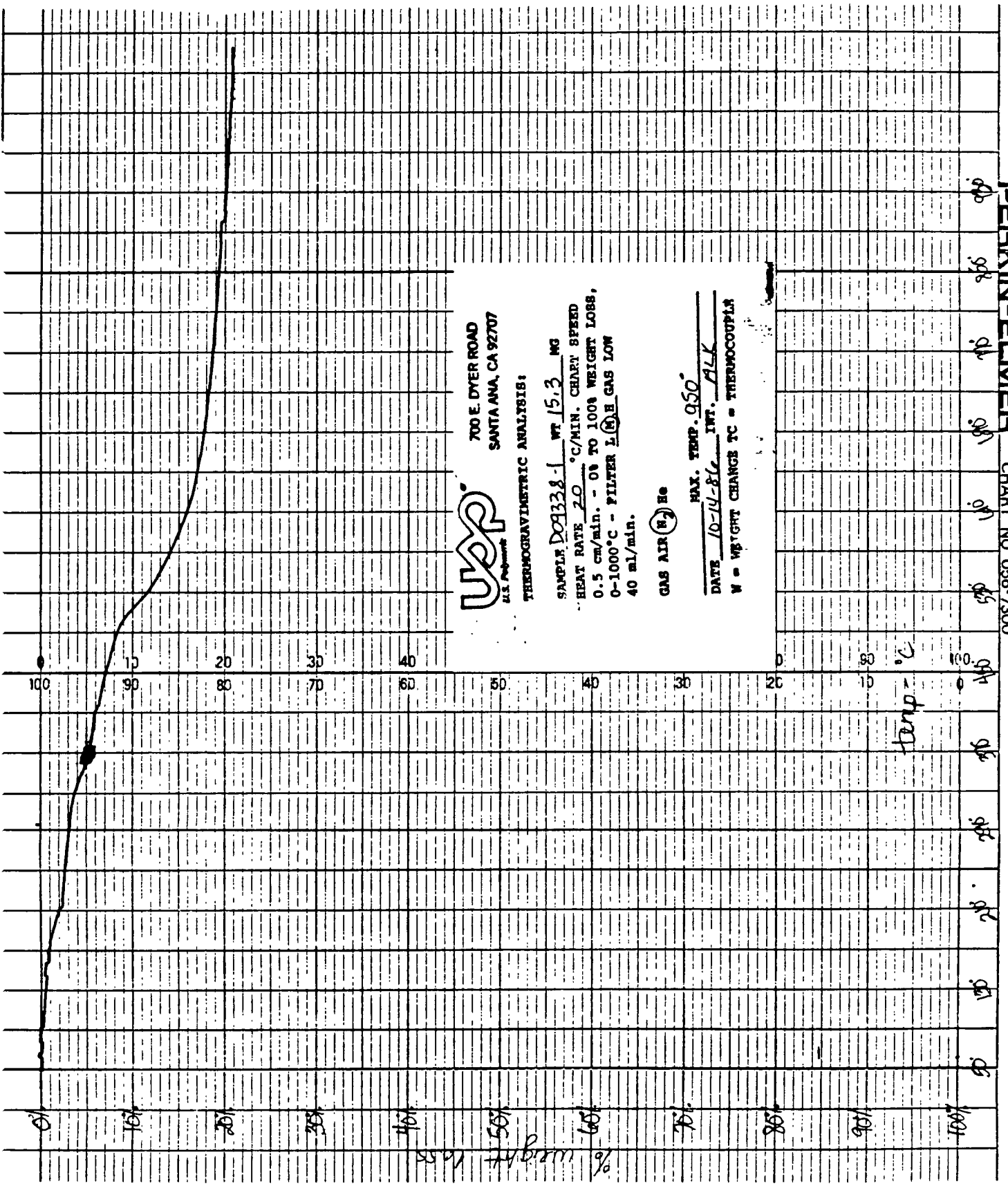

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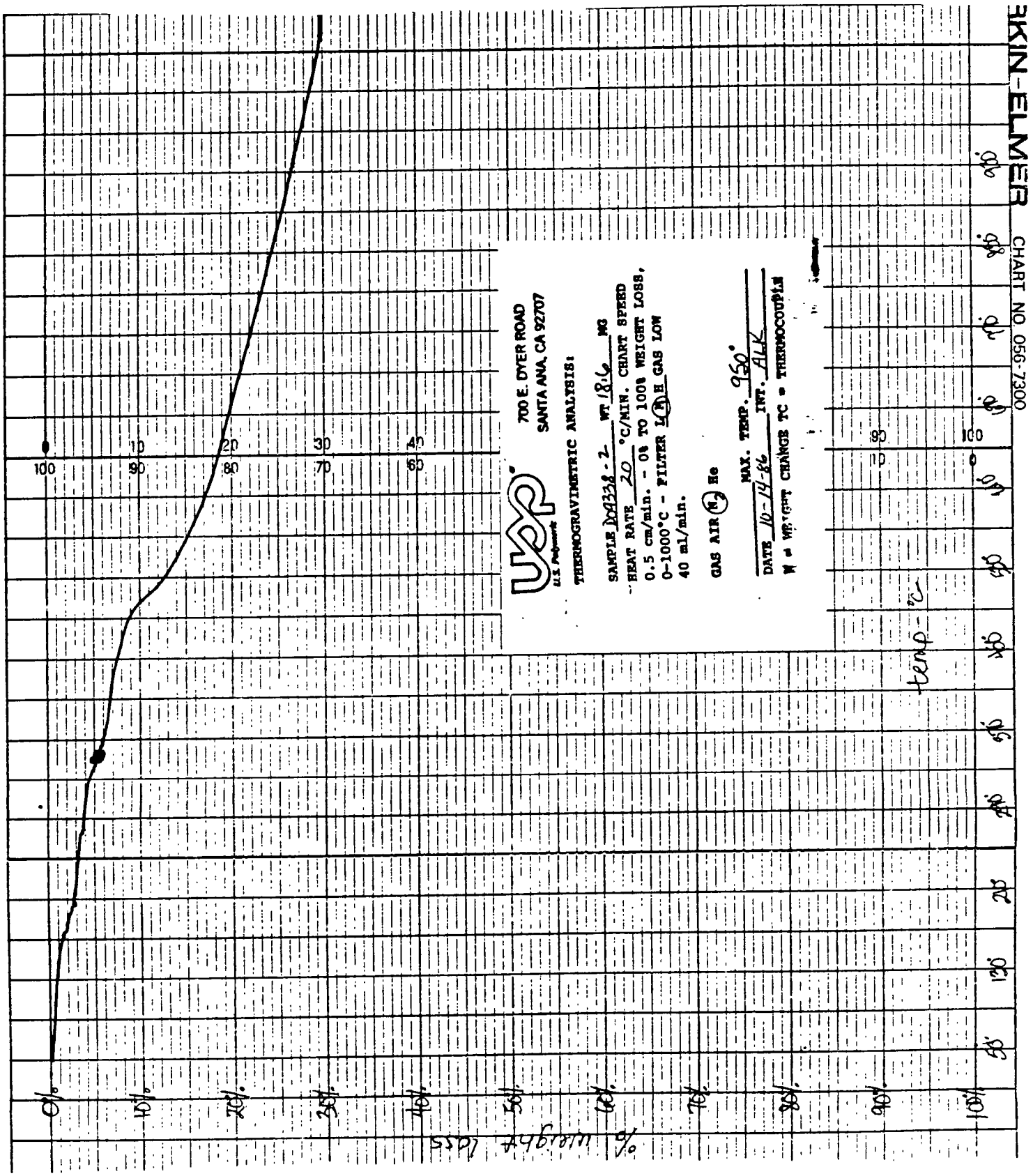

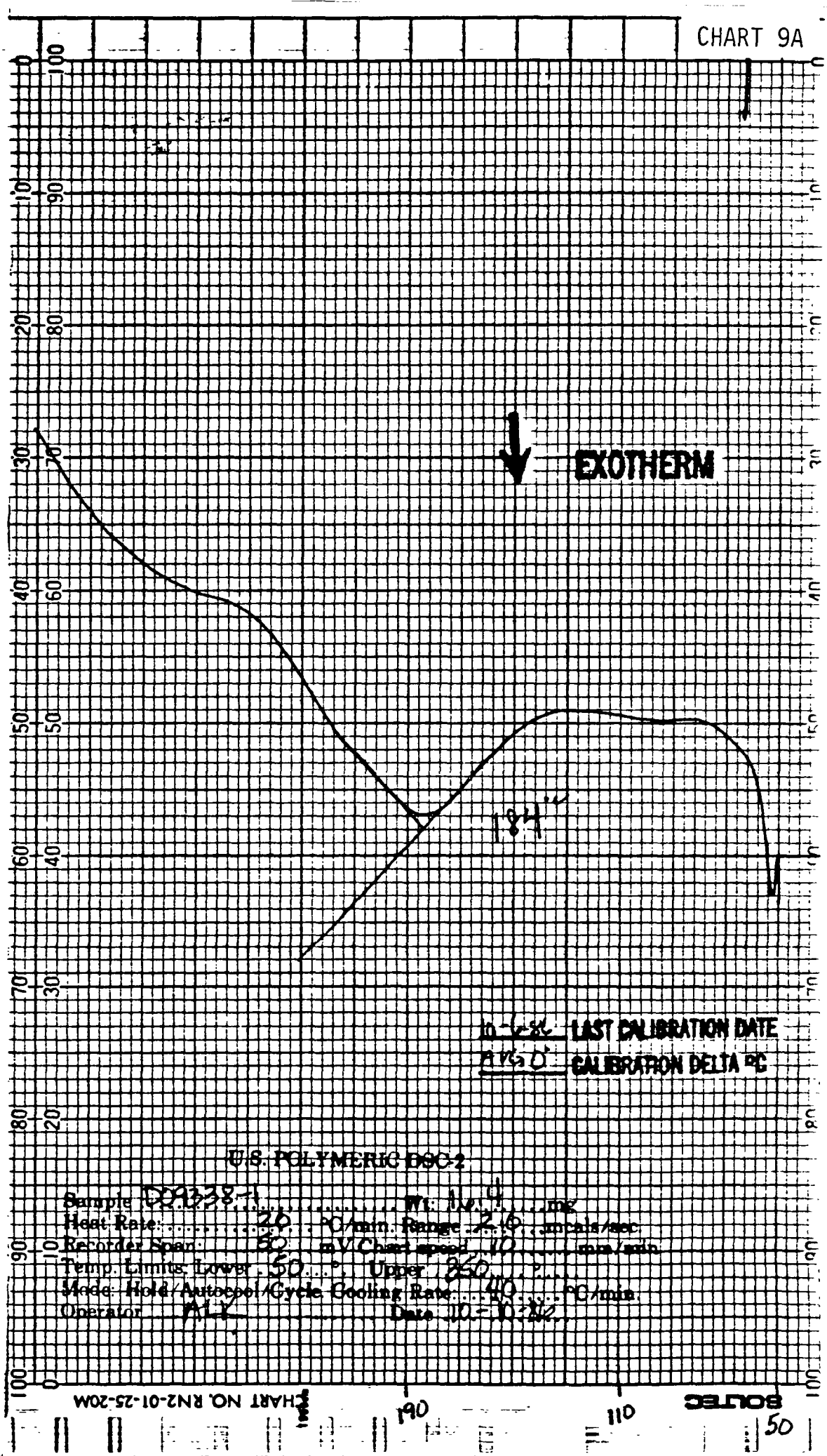

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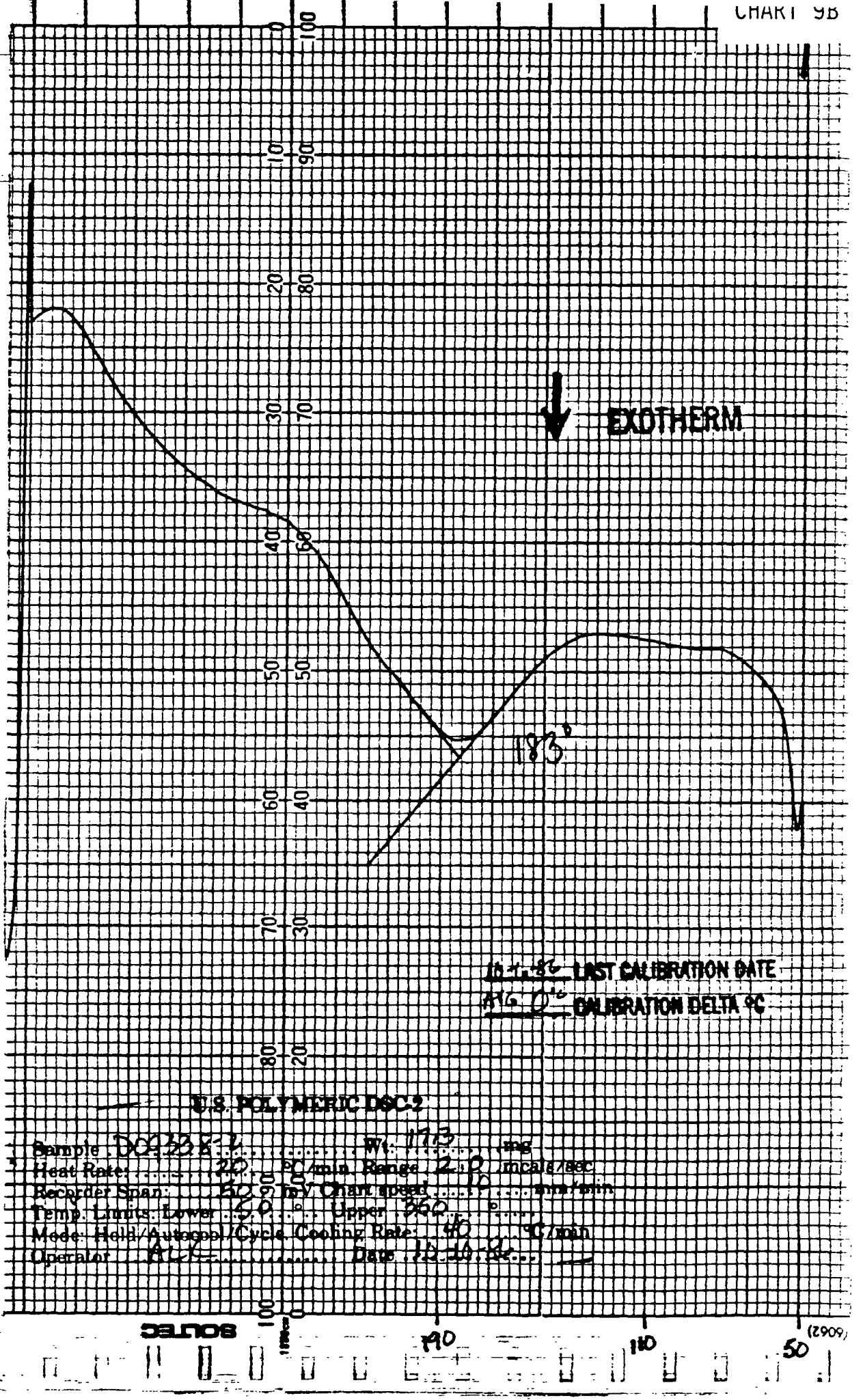


SPECTRUM NO. 15306
DATE 8-08-86
SAMPLE FM 5839
D09338 #1

SOURCE

STRUCTURE

PATH 0.2 mm NACL
SOLVENT ACETONE
CONCENTRATION 10-15% T
PHASE LIQUID
COMMENTS

ANALYST V. MIRANDA

Beckman®
INFRARED
SPECTROPHOTOMETER

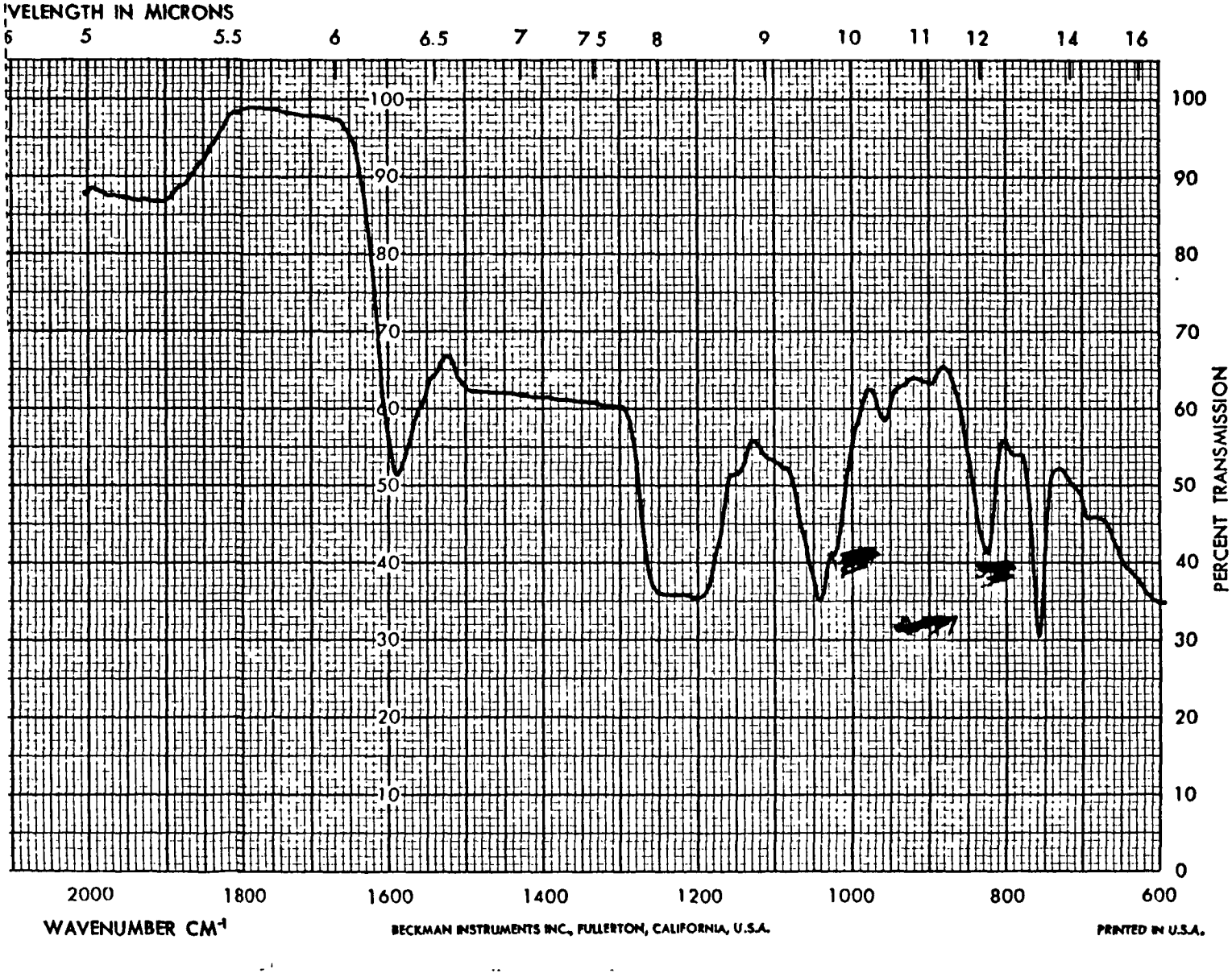


CHART 10A

SPECTRUM NO. 15307
DATE 8-08-86
SAMPLE FM 5839
DD9338 #2

SOURCE
STRUCTURE

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

ANALYST V. MIRANDA

Beckman®
INFRARED
SPECTROPHOTOMETER

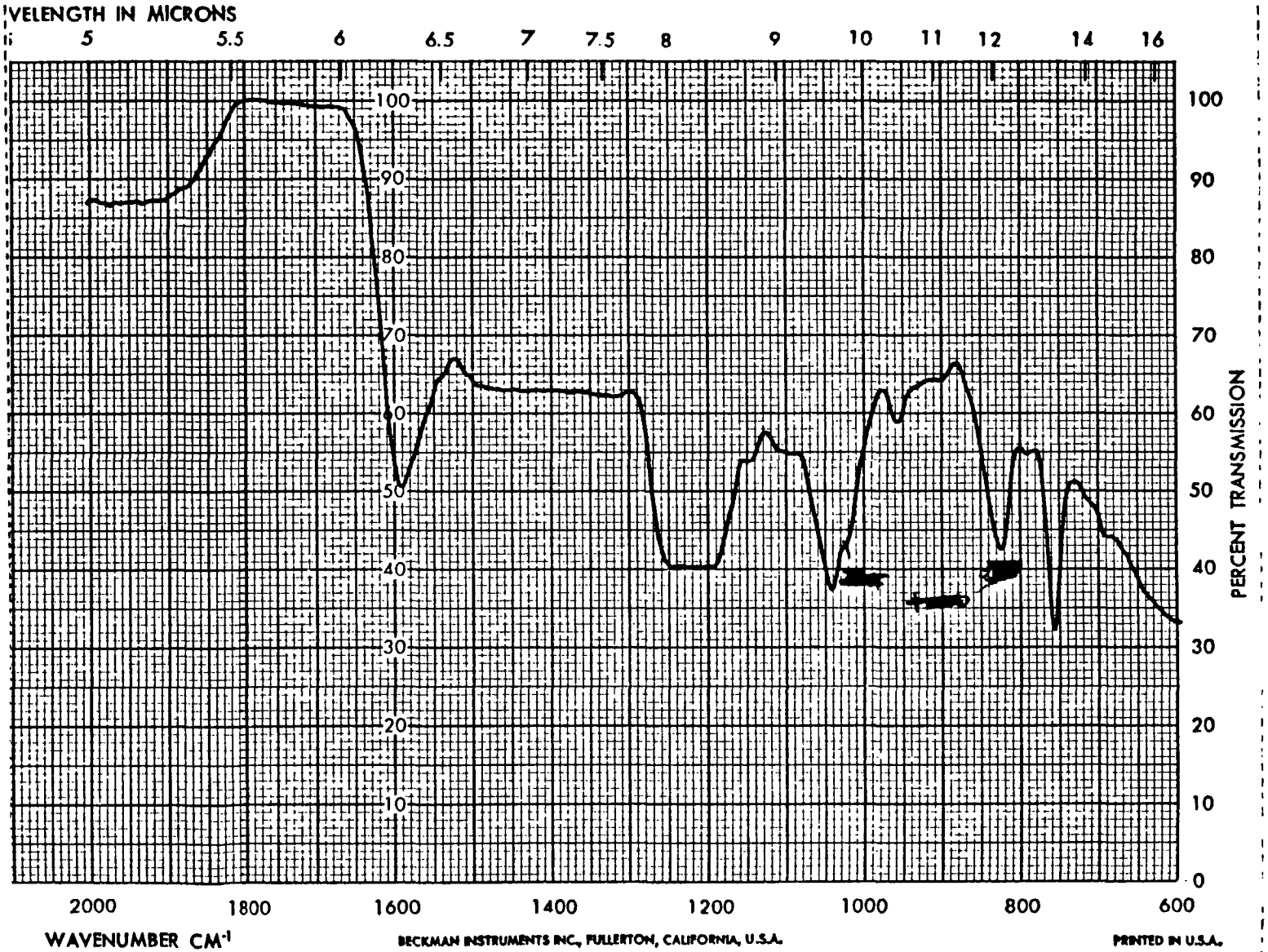
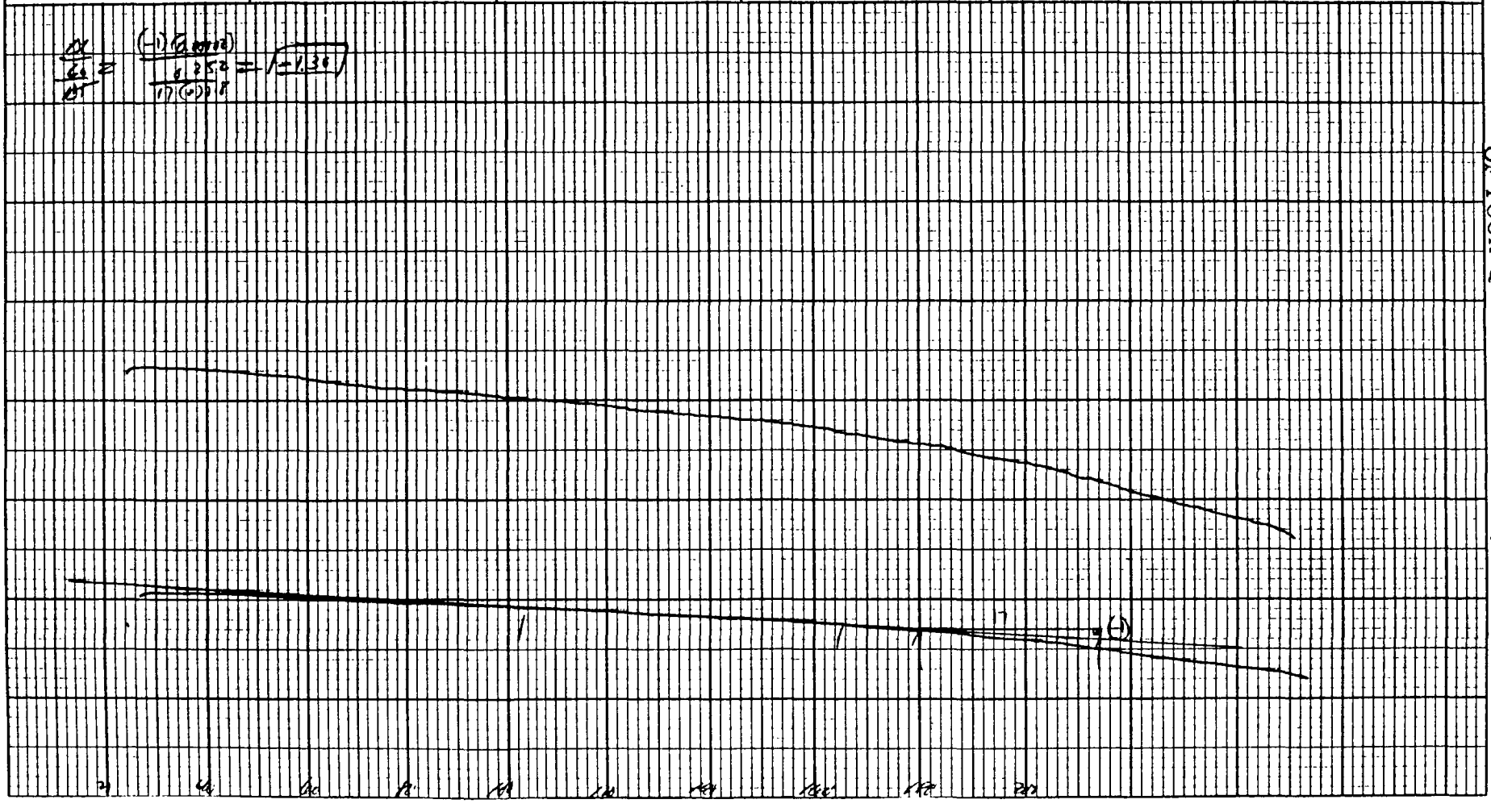


CHART 10B

PART NO. 990088

RUN NO ___ DATE 12/12/X	T-AXIS	DTA-DSC	TGA	TMA (Expansion)	
OPERATOR TH	SCALE, °C/in 30 70	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/1.0	
SAMPLE D09338-1-(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 0.452	
FLOW RATE 3 SCFH	SHIFT, in 0	REFERENCE	TIME CONST, sec	LOAD, g 10	
			dY, (mg/min) /in	dY, (10X), (mils/min)/in	

$$\frac{dX}{dt} = \frac{(-1)(0.0078)}{0.452} = -1.38$$



MEASURED VARIABLE

DUPONT Instruments

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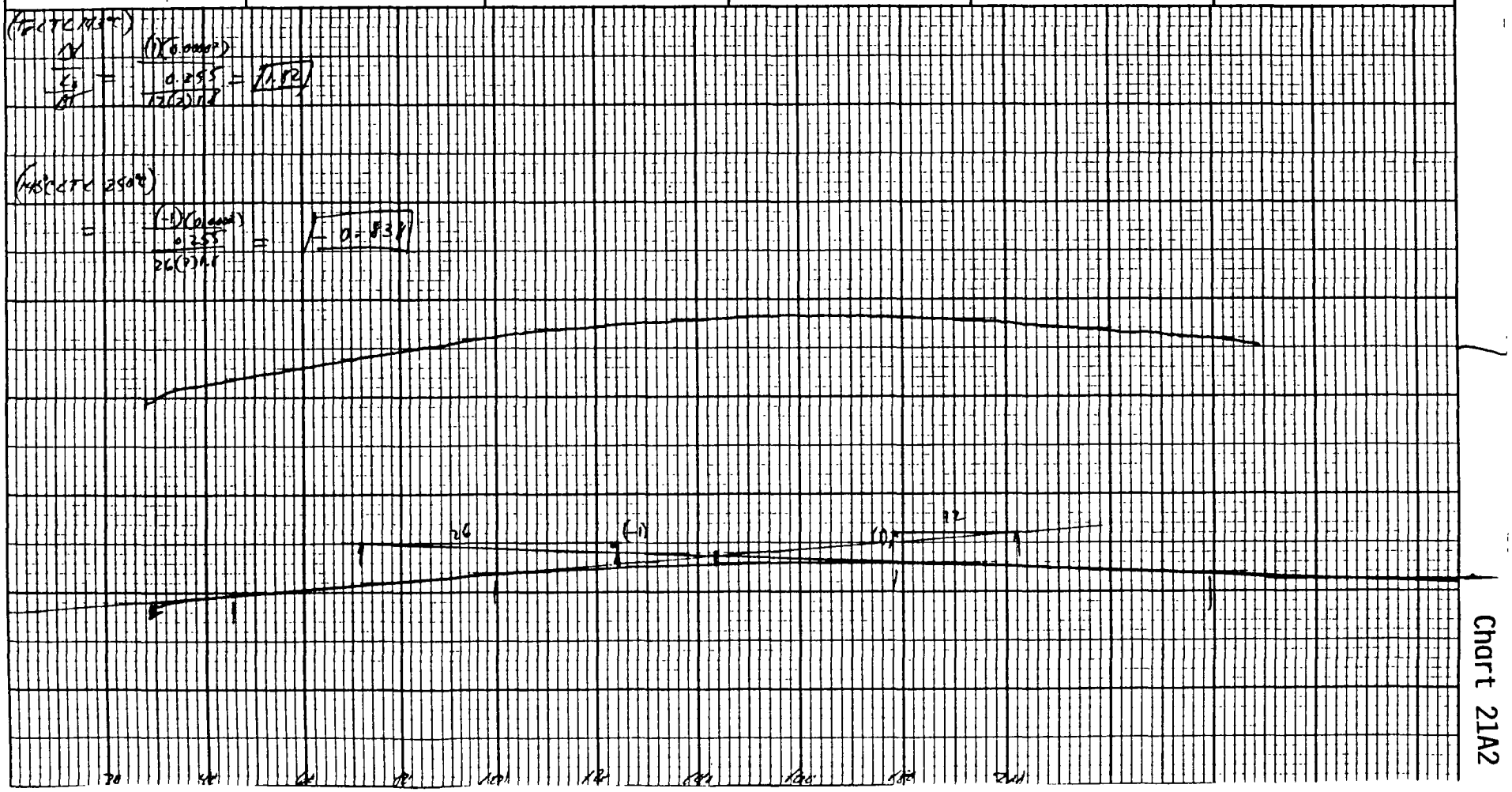
Chart 21A1

PART NO. 990088

RUN NO. ___ DATE 11/12/86	T-AXIS	DTA-DSC	TGA	TMA (mil/in/in F)	
OPERATOR TDI	SCALE, °C/in 80 20	SCALE, °C/in ___	SCALE, mg/in ___	SCALE, mils/in 0.1/0.2	
SAMPLE D09338-1-(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 0.255	
FLOW RATE 3-[illegible]	SHIFT, in 0	REFERENCE ___	TIME CONST., sec ___	LOAD, g 10	
			dY, (mg/min) /in ___	dY, (10X), (mils/min)/in ___	



DUPONT Instruments

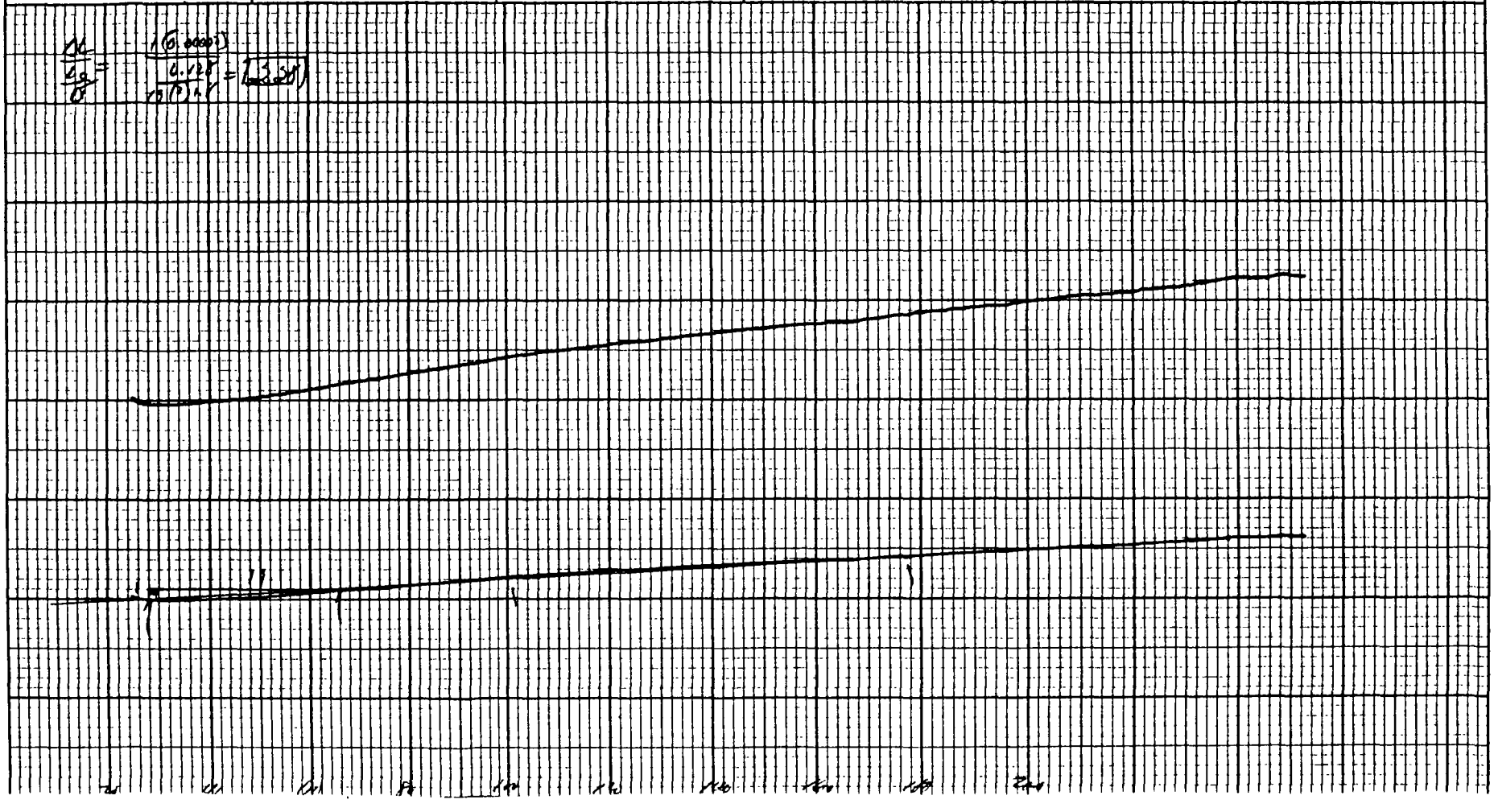
MEASURED VARIABLE ___

Chart 21A2

PART NO. 990088

RUN NO ___ DATE 12/16/86	T-AXIS	DTA-DSC	TGA	TMA (in/min)	
OPERATOR JST	SCALE, °C/in 50 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/0.2	
SAMPLE D09338-1-(3)	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE Expansion	
ATM Amb @ SSP	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.128	
FLOW RATE 3 SCFH	SHIFT, in 0	REFERENCE	TIME CONST., sec	LOAD, g 0	
			dY, (mg/min) /in	dY, (10X), (mils/min) /in	

$\frac{dL}{dg} = \frac{10(0.0001)}{0.128} = 7.81$



MEASURED VARIABLE _____ DUPONT Instruments

Chart 21A3

Chart 21A4

PART NO. 990088

RUN NO ____ DATE 11/16/84
OPERATOR TH
SAMPLE: D09335-1-(4)
ATM Air @ RT
FLOW RATE 3-3.5 cfm

T-AXIS
SCALE, °C/in 20-20
PROG. RATE, °C/min 10
HEAT ____ COOL 150
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 Furnace
SCALE, mils/in 0.1/0.2
MODE Expansion
SAMPLE SIZE 0.136
LOAD, g 10
dY/dT (10X), (mils/min)/in ____

MEASURED VARIABLE

DUPONT instruments

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Chart 21B1

PART NO. 990088

RUN NO ___ DATE 12/3/86
OPERATOR TDI
SAMPLE:
D05338-2-A1
ATM Air @ SP
FLOW RATE 3.2 SCFM

T-AXIS
SCALE, °C/in 50 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 (quartz/inv)
SCALE, mils/in 0.1/0.2
MODE Expansion
SAMPLE SIZE 0.25
LOAD, g 10
dY/dT (10X) (mils/min)/in ___

dY/dT = 1.25 = 1.875

MEASURED VARIABLE

DUPONT instruments

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Chart 21B2

PART NO. 990088

RUN NO ___ DATE 12/5/94
OPERATOR TJ
SAMPLE: D05338 - 1 - (2)
ATM Air @ 50P
FLOW RATE 100 SCCM

T-AXIS
SCALE, °C/in 50 10
PROG. RATE, °C/min 10
HEAT 50 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, (mg/min) /in ___

TMA (air/air)
SCALE, mils/in 0.1/0.2
MODE Expansion
SAMPLE SIZE 0.255
LOAD, g 1
dY, (10X) (mils/min) /in ___

(2) (4.0 mg) = 1.020 mg
1.020 (0.255) = 0.260 mg

MEASURED VARIABLE

DUPONT instruments

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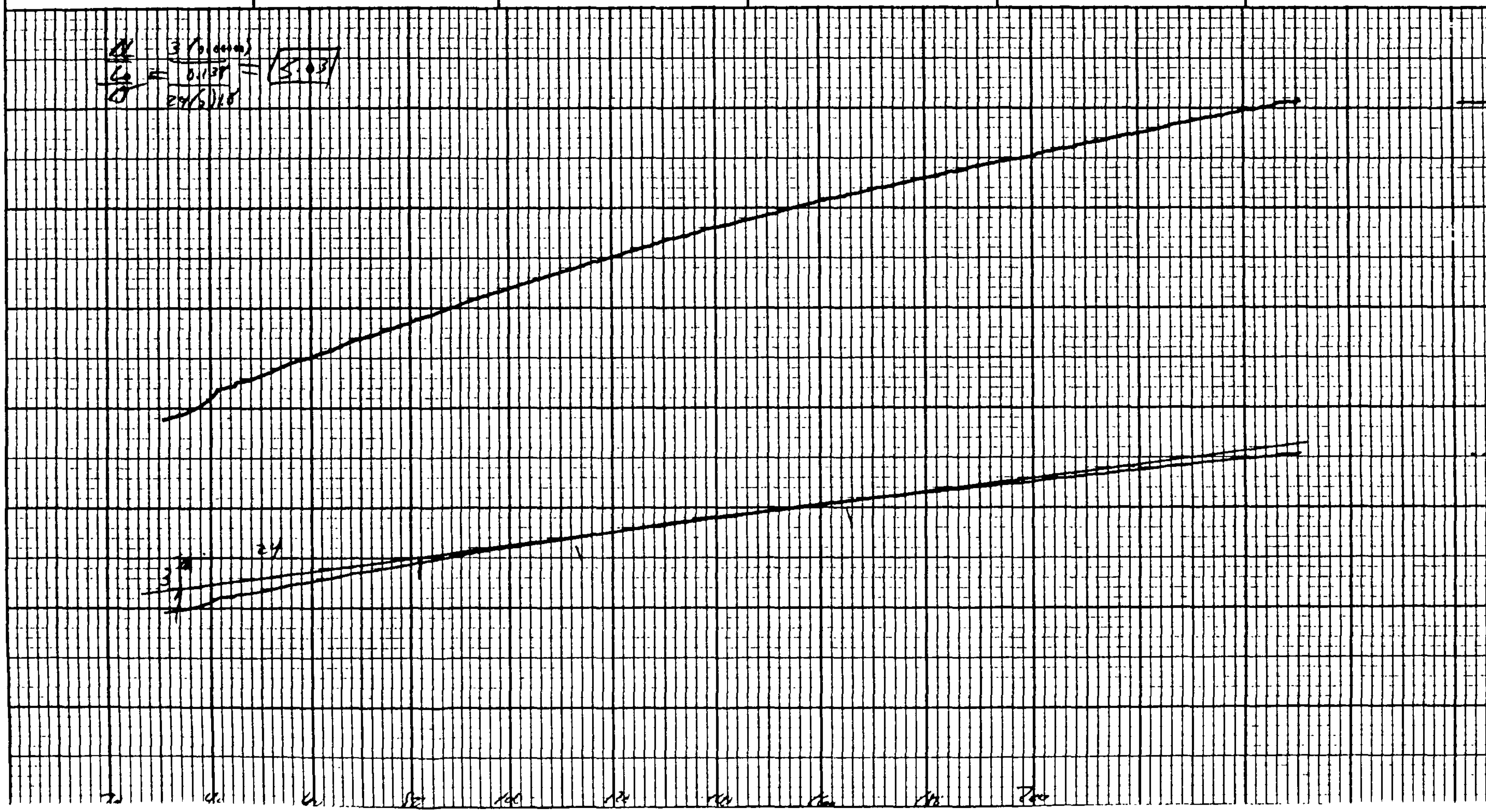
PART NO. 990088

RUN NO.___ DATE 11/16/76	T-AXIS	DTA-DSC	TGA	TMA Sci (ref)	
OPERATOR TA	SCALE, °C/in 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/0.2	
SAMPLE D05338-2-(3)	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE Expansion	
	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.138	
ATM Air @ STP	SHIFT, in 0	REFERENCE	TIME CONST, sec	LOAD, g 10	
FLOW RATE 3-5 SCFH			dY, (mg/min)/in	dY, (10X), (mils/min)/in	



MEASURED VARIABLE

DUPONT Instruments

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Chart 21B4

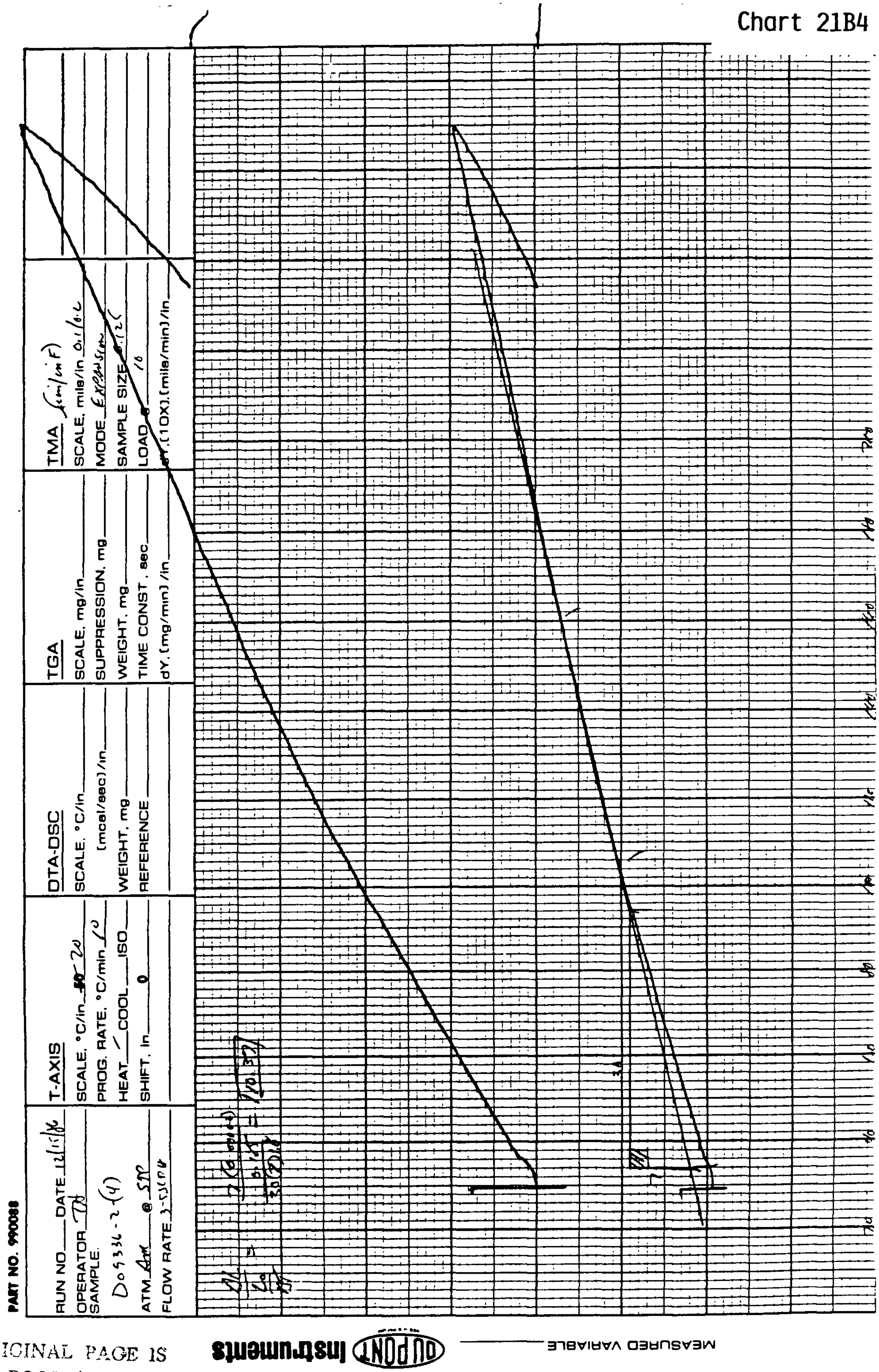

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TABLE OF CONTENTS

FILLER TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

Filler Lot for NASA Lot# 2

CHARTS

U.S. Polymeric

FILLER TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

Filler Lot for NASA Lot# 2

1. Carbon Content, % QAI-5560			SAMPLE		
		#2A-1	#2A-2	#2A-3	
		99.31	99.18	99.40	
		NASA LOT# 2	AVERAGE	99.30	
2. Ash Content, % PTM-71B		0.0	0.0	0.0	
		0.0	0.0	0.0	
	AVG.	0.0	0.0	0.0	
		NASA LOT# 2	AVERAGE	0.0	
3. Atomic Absorption, ppm CTM-53B (Values are average of 2 determinations)		#2A-1	#2A-2	#2A-3	LOT#2 AVG.
	Na	7.0	7.5	9.0	7.8
	K	1.5	1.0	2.5	1.7
	Ca	2.5	1.5	2.0	2.0
	Mg	0.0	0.0	0.0	0.0
	Li	0.0	0.0	0.0	0.0
	TOTAL	11.0	10.0	13.5	11.5
3a. Moisture Content, % CTM-53B		.041	.034	.039	
		.031	.020	.045	
	AVG.	.036	.027	.042	
		NASA LOT# 2	AVERAGE	.035	
3b. Ash Content, % CTM-53B		0.005	0.000	0.015	
		0.000	0.025	0.000	
	AVG.	0.003	0.013	0.008	
		NASA LOT# 2	AVERAGE	0.008	
4. pH, Units ASTM D1512		4.60	4.40	4.50	
		4.60	4.60	4.70	
	AVG.	4.60	4.50	4.60	
		NASA LOT# 2	AVERAGE	4.57	
5. Particle Size, microns S.E.M. procedure (Average values are of 20 determinations)	AVG.	.56	.57	.52	
	Maximum	.90	1.25	1.17	
	Minimum	.23	.20	.25	
	Std. Dev	.22	.28	.24	
		NASA LOT# 2 AVERAGE SIZE		.55	
6a. TGA, °C at 50% Loss CTM-51		842	850	857	
		NASA LOT# 2	AVERAGE	850	

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

Filler Lot for NASA Lot# 2

6b. TGA
CTM-51 — See Charts 6A-6C

7. Particle Size Distribution
CTM-72 — See Charts 7A-7C

7a. Particle Size, microns
CTM-72

	#2A-1	#2A-2	#2A-3
	.86	.97	.95
	.85	1.08	.92
AVG.	.86	1.02	.94

NASA LOT# 2 AVERAGE .94

U.S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

CHART 6A

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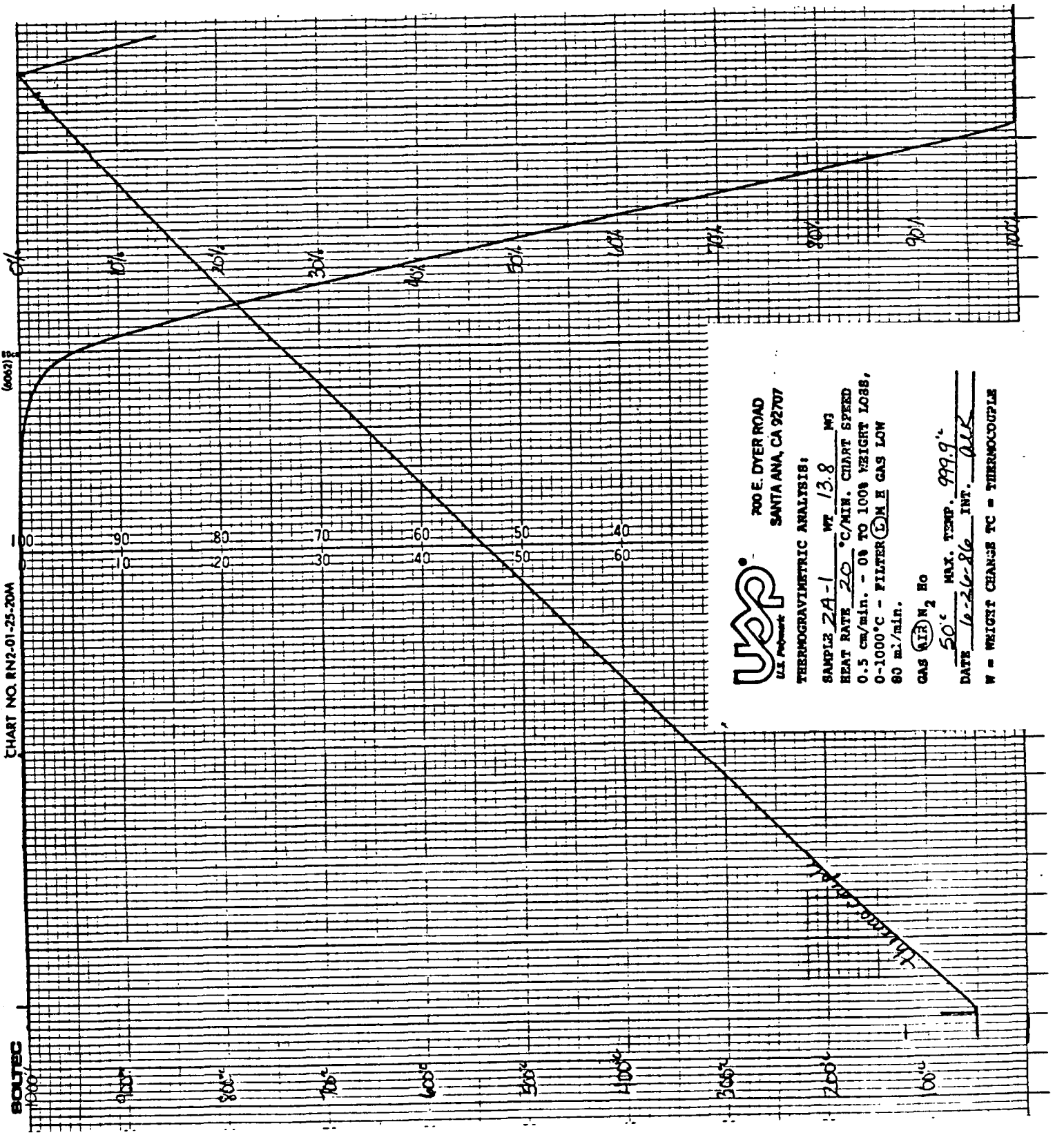

CHART 6B

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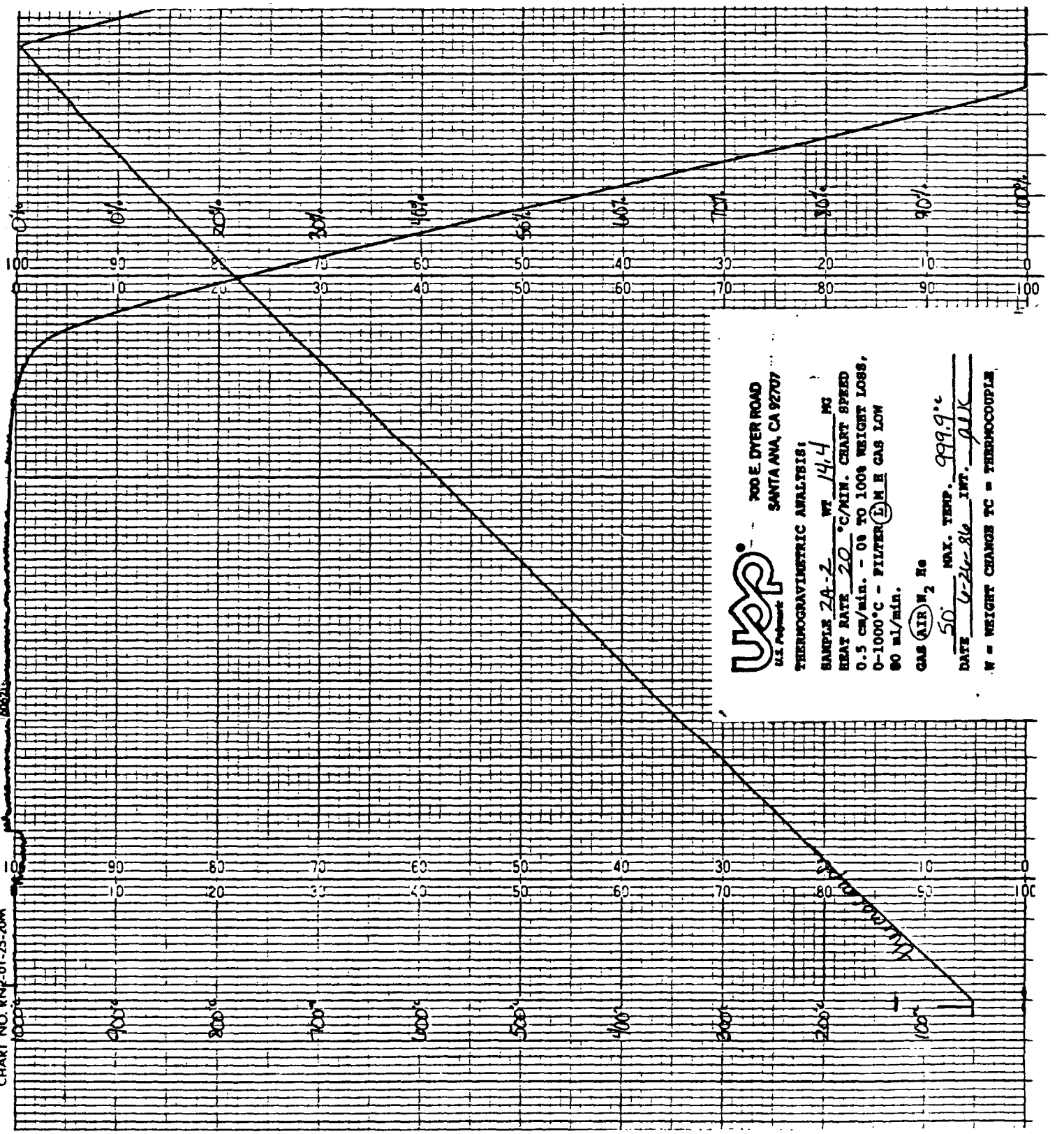

CHART NO. RNJ-01-25-20M

CHART 6C

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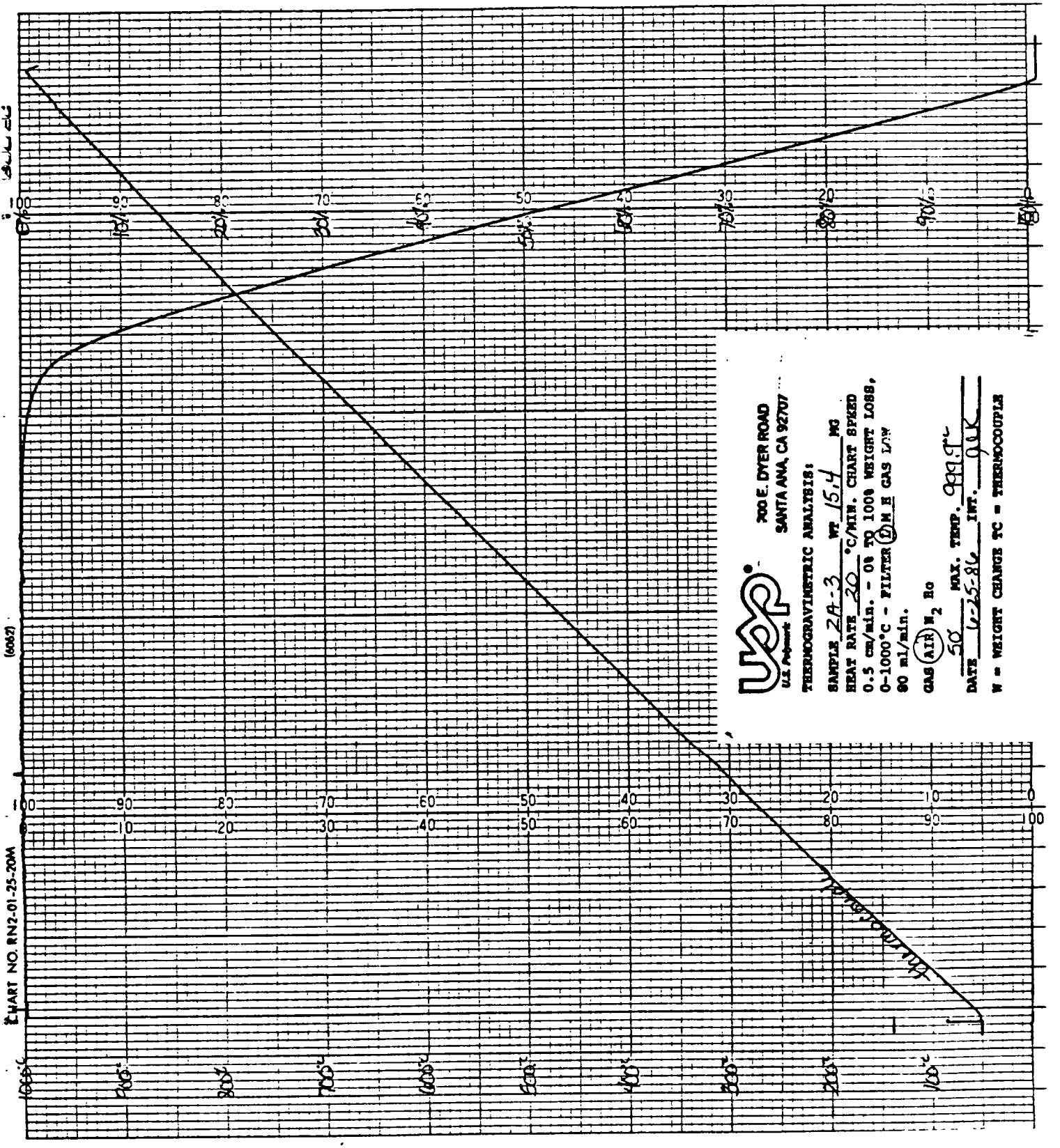


CHART NO. RN2-01-25-20M

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-24-86
#1 SAMPLE NASA LOT#2A-1
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

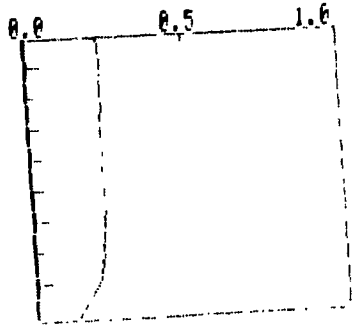
* CONDITIONS

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

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

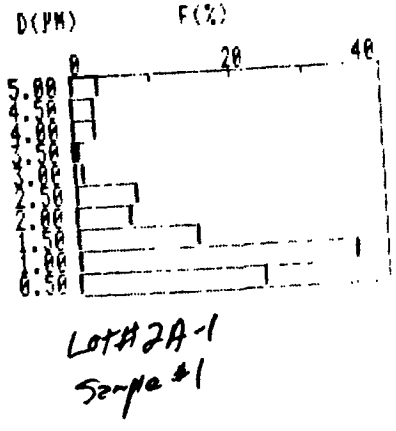


* DISTRIBUTION TABLE (BY VOL.)

D(μM)	F(%)	P(%)
5.00 <	0.0	0.0
5.00-4.50	3.3	3.3
4.50-4.00	2.6	5.9
4.00-3.50	2.7	8.7
3.50-3.00	0.5	9.2
3.00-2.50	0.9	10.0
2.50-2.00	7.8	17.8
2.00-1.50	7.0	24.7
1.50-1.00	15.2	39.9
1.00-0.50	36.1	76.0
0.50-0.00	24.0	100.0

D(AVE) 0.86 (μM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#2A-1
Sample #1

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-24-86
#2 SAMPLE NASA LOT#2A-1
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

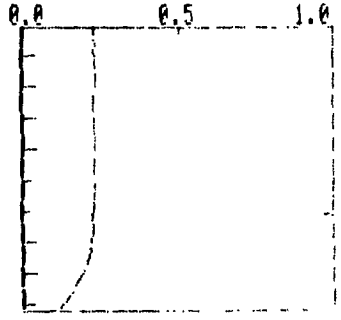
* CONDITIONS

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

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

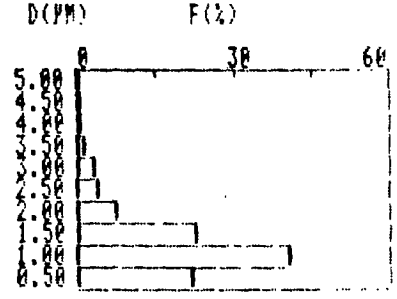


* DISTRIBUTION TABLE (BY VOL.)

D(μM)	F(%)	P(%)
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	0.0	0.0
3.50-3.00	1.1	1.1
3.00-2.50	3.0	4.1
2.50-2.00	3.8	7.8
2.00-1.50	7.4	15.2
1.50-1.00	22.4	37.6
1.00-0.50	40.8	78.3
0.50-0.00	21.7	100.0

D(AVE) 0.85 (μM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#2A-1
Sample#2

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CHART 7A

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-24-86
#1 SAMPLE NASA LOT#2A-2
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

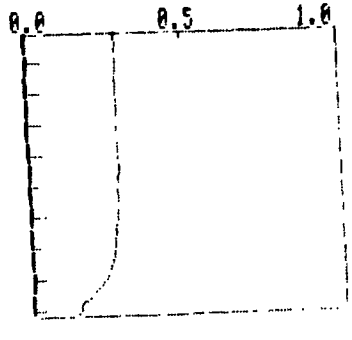
* CONDITIONS

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

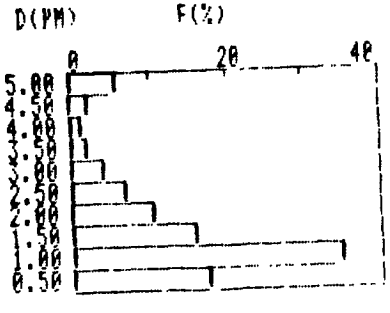


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	5.7	5.7
4.50-4.00	2.2	7.9
4.00-3.50	1.2	9.1
3.50-3.00	1.7	10.8
3.00-2.50	4.0	14.8
2.50-2.00	6.7	21.5
2.00-1.50	10.2	31.7
1.50-1.00	16.0	47.7
1.00-0.50	34.8	82.5
0.50-0.00	17.5	100.0

D(AVE) 0.97 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#2A-2
Sample#1

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-24-86
#2 SAMPLE NASA LOT#2A-2
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

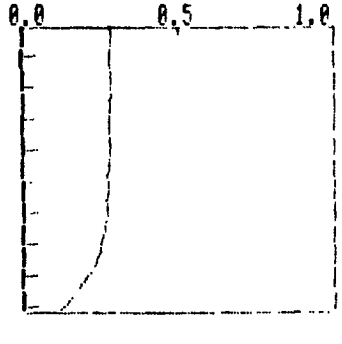
* CONDITIONS

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

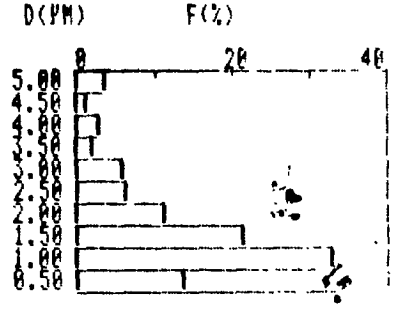


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	3.5	3.5
4.50-4.00	1.0	4.5
4.00-3.50	2.8	7.3
3.50-3.00	2.0	9.3
3.00-2.50	5.7	14.9
2.50-2.00	6.1	21.0
2.00-1.50	11.2	32.2
1.50-1.00	21.2	53.5
1.00-0.50	33.0	86.4
0.50-0.00	13.6	100.0

D(AVE) 1.08 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#2A-2
Sample#2

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CHART 7B

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-24-86

#1 SAMPLE NASA LOT#2A-3

SOLVENT ETHYL GLYCOL

C=0.01 mg/ml

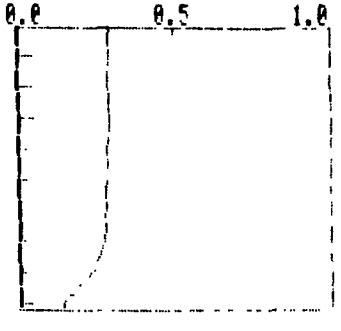
* CONDITIONS

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

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

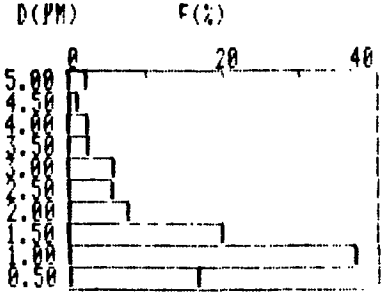


* DISTRIBUTION TABLE (BY VOL.)

D(μM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	2.0	2.0
4.50-4.00	0.9	2.9
4.00-3.50	2.3	5.2
3.50-3.00	2.2	7.5
3.00-2.50	5.7	13.2
2.50-2.00	5.6	18.8
2.00-1.50	7.5	26.3
1.50-1.00	19.9	46.2
1.00-0.50	37.2	83.4
0.50-0.00	16.6	100.0

D(AVE) 0.95 (μM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#2A-3
Sample #1

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-24-86

#2 SAMPLE NASA LOT#2A-3

SOLVENT ETHYL GLYCOL

C=0.01 mg/ml

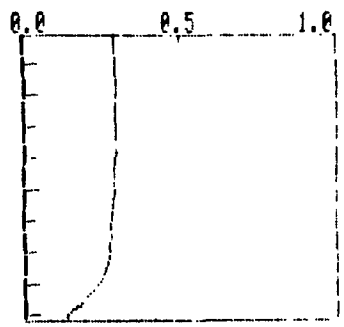
* CONDITIONS

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

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

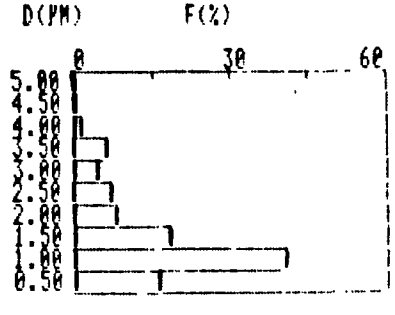


* DISTRIBUTION TABLE (BY VOL.)

D(μM)	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	1.1	1.1
3.50-3.00	5.8	6.9
3.00-2.50	4.1	11.1
2.50-2.00	6.9	18.0
2.00-1.50	7.7	25.7
1.50-1.00	17.8	43.4
1.00-0.50	40.7	84.1
0.50-0.00	15.9	100.0

D(AVE) 0.92 (μM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#2A-3
Sample#2

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OF POOR QUALITY

CHART 7C

TABLE OF CONTENTS

RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

USP-39A Resin Lot for NASA Lot# 2

CHARTS

RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

USP-39A Resin Lot for NASA Lot# 2

1. Resin Solids, %			#2-1	#2-2	
PTM-7C			78.8	78.7	
			78.7	79.3	
			79.1	79.6	
		AVG.	78.9	79.2	
		Lot# 2 AVERAGE		79.1	
2. Specific Gravity @ 25°C			1.189	1.193	
PTM-29C		Lot# 2 AVERAGE		1.191	
3. Viscosity, Brookfield, cps. @ 22.8°C			17,400	16,800	
PTM-14C		Lot# 2 AVERAGE		17,100	
4. Gel Time, min:sec			4:00	4:20	
PTM-47B		Lot# 2 AVERAGE		4:10	
5. Atomic Absorption, ppm			#2-1	#2-2	LOT2 AVG
CTM-53B		Na	25.0	20.8	22.9
(Values are averages of		K	1.0	0.5	0.8
four determinations)		Ca	7.5	7.0	7.3
		Mg	2.0	2.0	2.0
		Li	0.0	0.0	0.0
		AVG.	35.5	30.3	32.9
6. Volatiles, Gas Chromatography			See Charts 6A-6B		
CTM-55					
7. TGA, % Weight Loss at 500°C			39.4	38.2	
CTM-51 (AIR)		Lot# 2 AVERAGE		38.8	
			See Chart 7A-7B		
8. DSC, temperature °C			190	189	
CTM-50A		Lot# 2 AVERAGE		190	
			See Chart 8A-8B		
9. HPLC			See Chart 9A-9B		
CTM-49A					
10. GPC, Average molecular wt.			1800	1631	
CTM-49A		Lot# 2 AVERAGE		1716	
			See Chart 10A-10B		

HITCO MATERIALS DIVISION
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2407

USP-39A Resin Lot for NASA Lot# 2

11. pH, units
CTM-1B

	#2-1	#2-2
	8.4	8.5
Lot# 2 AVERAGE		8.5

12. Phenol Content, %
CTM-55 Appendix 1

	13.29	13.65
	12.94	13.31
AVG.	13.12	13.48
Lot# 2 AVERAGE		13.30

13. Chang's Index, ml.
CTM-5B

	23.6	23.8
Lot# 2 AVERAGE		23.7

14. RDS, Minimum Viscosity, cps.
CTM-57A

	Min. Visc.	°C
#2-1	172	114
#2-2	124	114
AVG.	148	114

See Charts 14A-14B

15. NMR
Vendor procedure

See Charts 15A-15B

U. S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

TYPICAL GAS CHROMATOGRAPH SET-UP

Operator	G.K.J.	Date	12/11/86
Column		Detector	FID
Length	6ft.	Voltage	
Dia.	1/4 in.	Sensit.	
Liquid Phase	AT1000	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, 2-1	Solvent	THF
Size	0.1 µl	Concn.	0.1 1% g/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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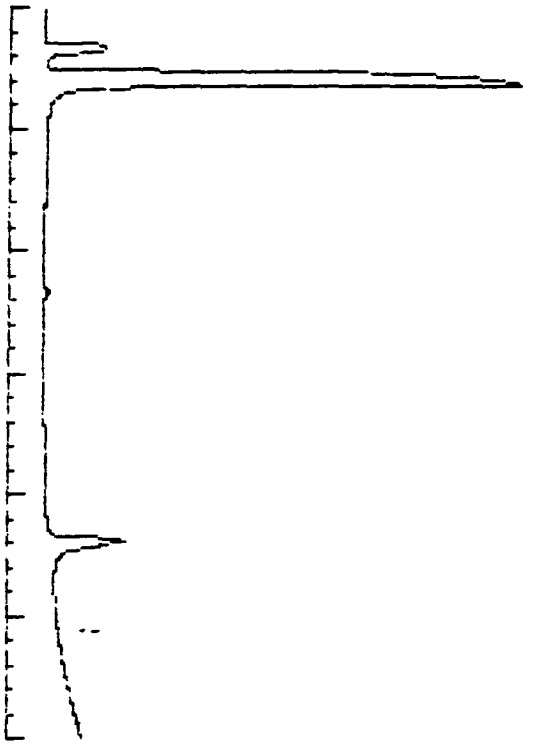
CHART 6A

*** REAL TIME CHROMATOGRAM ***



FINAL FULL SCALE MV.=1000 00

SAMPLE: USP39A 2-1
MISC C=0 11190 GMS/ML

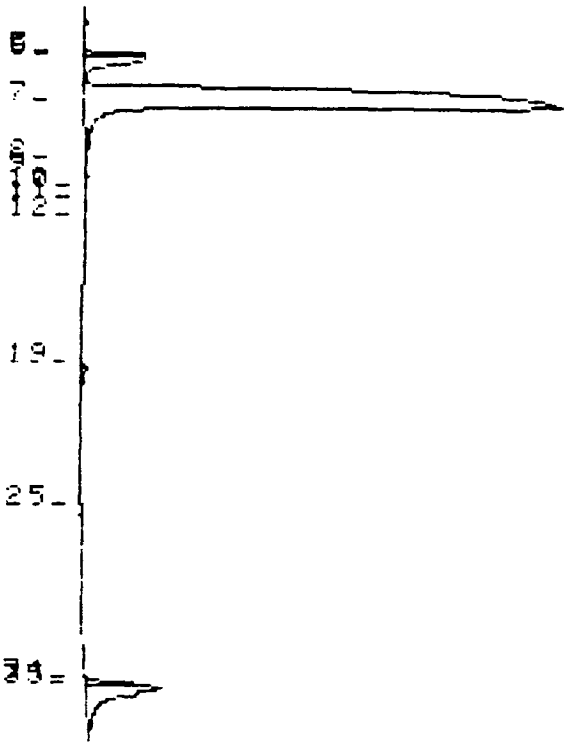
TIME: 12:59
DATE: 12/11/86
OPERATOR: JGZ

RUN TIME 30.00 MINUTES
DELAY TIME: 0 00
CHAN: 0

PK NO	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
2	63	3064	075	3	358
5	1 65	79730	1.953	2	11467
6	1.78	201690	4.940	2	11452
7	3.30	3335700	81.708	3	90562
8	5.00	6073	.149	4	251
9	5 55	5751	.141	4	417
10	6 03	4291	.105	4	182
11	6 38	4282	.105	4	172
12	6 95	1101	.027	4	80
19	11.70	13778	.337	3	767
25	16.27	1076	026	2	61
34	21 85	68060	1.667	2	10096
35	22 00	357860	8.766	2	14615

TOTAL AREA= 4082456
THRESHOLD= 1
MIN PI WIDTH= 15
AREA REJECT= 1000

VERTICAL SCALE FACTOR 1%



SAMPLE USP39A 2-1
MISC C=0.11190 GMS/ML

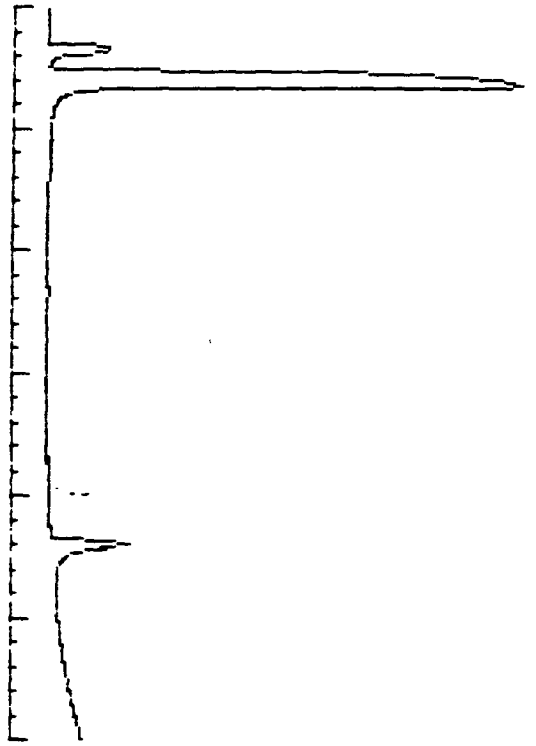
TIME 12:59
DATE: 12/11/86
OPERATOR: JGZ

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

PK NO.	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
5	1 65	79730	1.965	2	11467
6	1.78	201690	4.972	2	11452
7	3 30	3335700	82.225	3	90562
19	11.70	13778	.340	3	767
34	21.85	68060	1.678	2	10096
35	22.00	357860	8.821	2	14615

TOTAL AREA= 4056818
THRESHOLD= 1
MIN PI WIDTH= 15
AREA REJECT= 10000

*** REAL TIME CHROMATOGRAM ***



FINAL FULL SCALE MV.=1000.00

SAMPLE USP39A 2-2
MISC. C=0.10080 GMS/ML

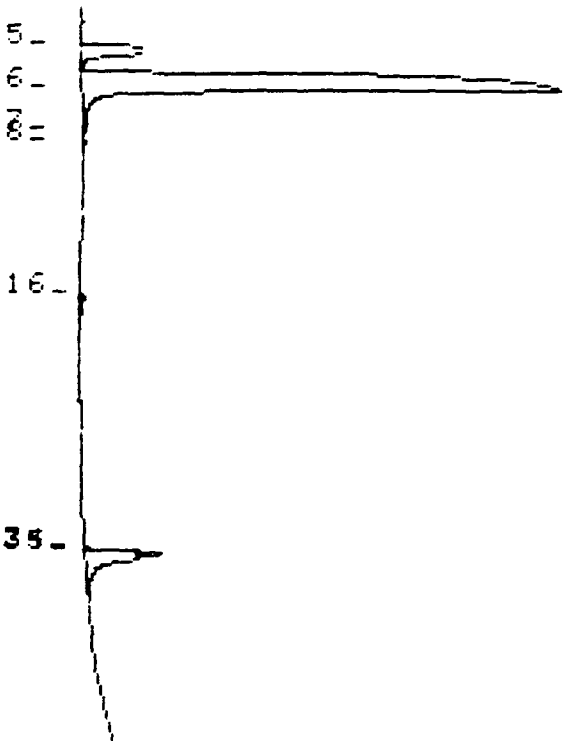
TIME: 14:47
DATE: 12/11/86
OPERATOR: JGZ

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

PK NO	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
2	.63	2693	.061	3	360
5	1.68	298230	6.703	2	11370
6	3.38	3695300	83.049	3	89961
7	5.08	4838	.109	4	199
8	5.58	4532	.102	2	478
16	11.70	14184	.319	3	714
34	21.88	53228	1.196	2	10083
35	22.03	376520	8.462	3	14774

TOTAL AREA= 4449524
THRESHOLD= 1
MIN.PK.WIDTH= 15
AREA REJECT= 1000

VERTICAL SCALE FACTOR: 1X



SAMPLE: USP39A 2-2
MISC. C=0.10080 GMS/ML

TIME: 14:47
DATE: 12/11/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME 0 00
CHAN: 0

PK NO	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
5	1.68	298230	6.742	2	11370
6	3.38	3695300	83.543	3	89961
34	21 88	53228	1.203	2	10083
35	22.03	376520	8.512	3	14774

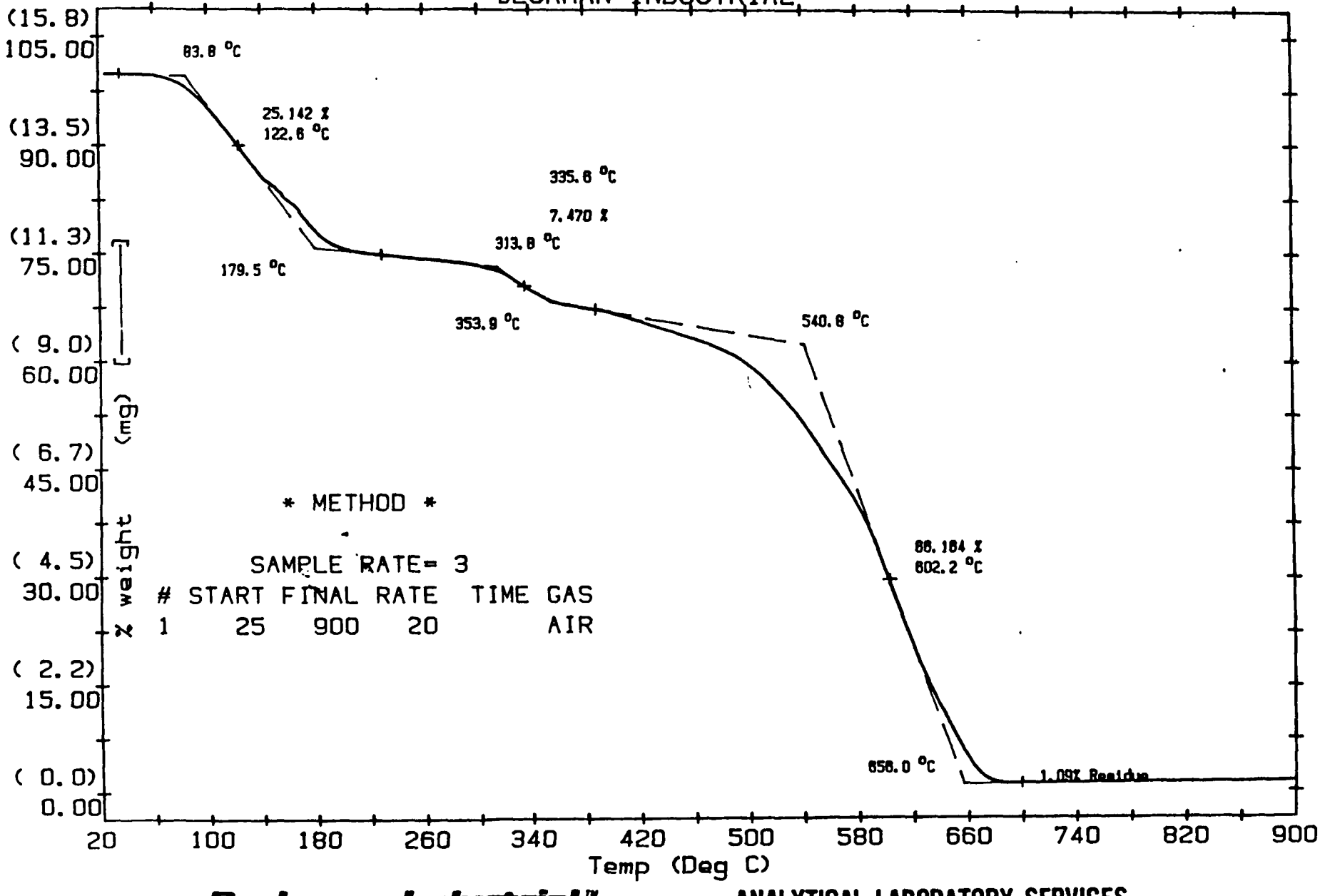
TOTAL AREA= 4423278
THRESHOLD= 1
MIN PK.WIDTH= 15
AREA REJECT= 15000

Sample: USP39A71108 2-1
Size: 15.101 mg
Run No: MIR #13079 (I2)
Date: MAY/21/86 10:28

TGA

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #107
File No: D 34.DAT V2.1
Plotted: MAY/22/86 07:50



Beckman Industrial™ ANALYTICAL LABORATORY SERVICES

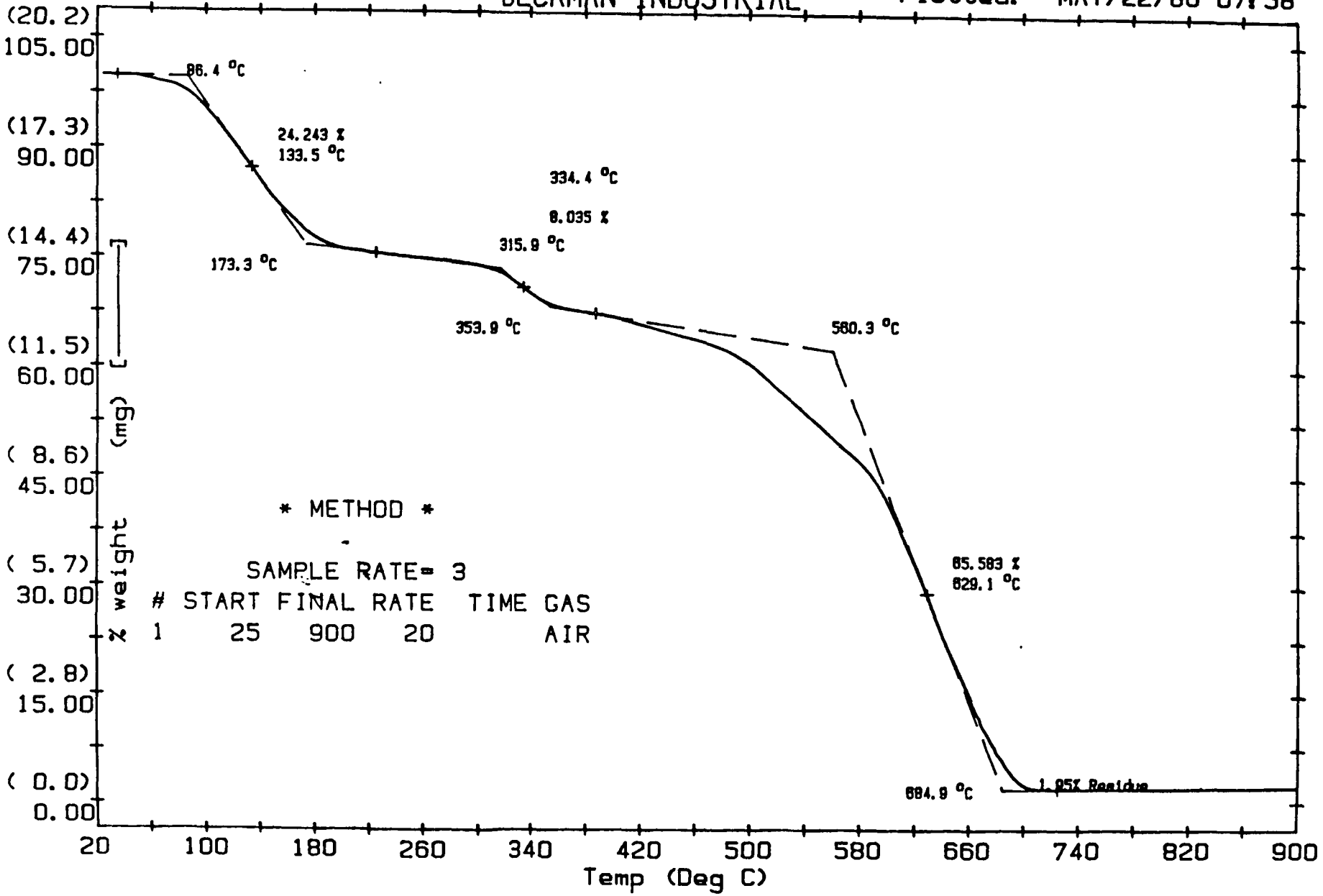
CHART 7A

Sample: USP39A71108 2-2
Size: 19.294 mg
Run No: MIR #13079 (I2)
Date: MAY/21/86 11:43

TGA

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #107
File No: D 35.DAT V2.1
Plotted: MAY/22/86 07:58



Beckman Industrial™ ANALYTICAL LABORATORY SERVICES

CHART 7B

PART NO. 990088

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CHART 8A

RUN NO.___ DATE 4/3/86

OPERATOR [illegible]

SAMPLE: 2 [illegible]

ATM He @ 1 atm.

FLOW RATE 40 ml/min

T-AXIS

SCALE, °C/in 50

PROG. RATE, °C/min 20

HEAT / COOL ___ ISO ___

SHIFT, in 0

− 1 °C

DTA-DSC

SCALE, °C/in 1.0/5

(mcal/sec)/in ___

WEIGHT, mg 4.5

REFERENCE ___

1 AL CUP PLUS SE

DUPONT Instruments

MEASURED VARIABLE ___

3-31-86 LAST CALIBRATION DATE

±1°C CALIBRATION DELTA °C

exotherm

191°
−1
190°C

0 50 100 150 200 250 300 35

TEMPERATURE, °C (CHRO

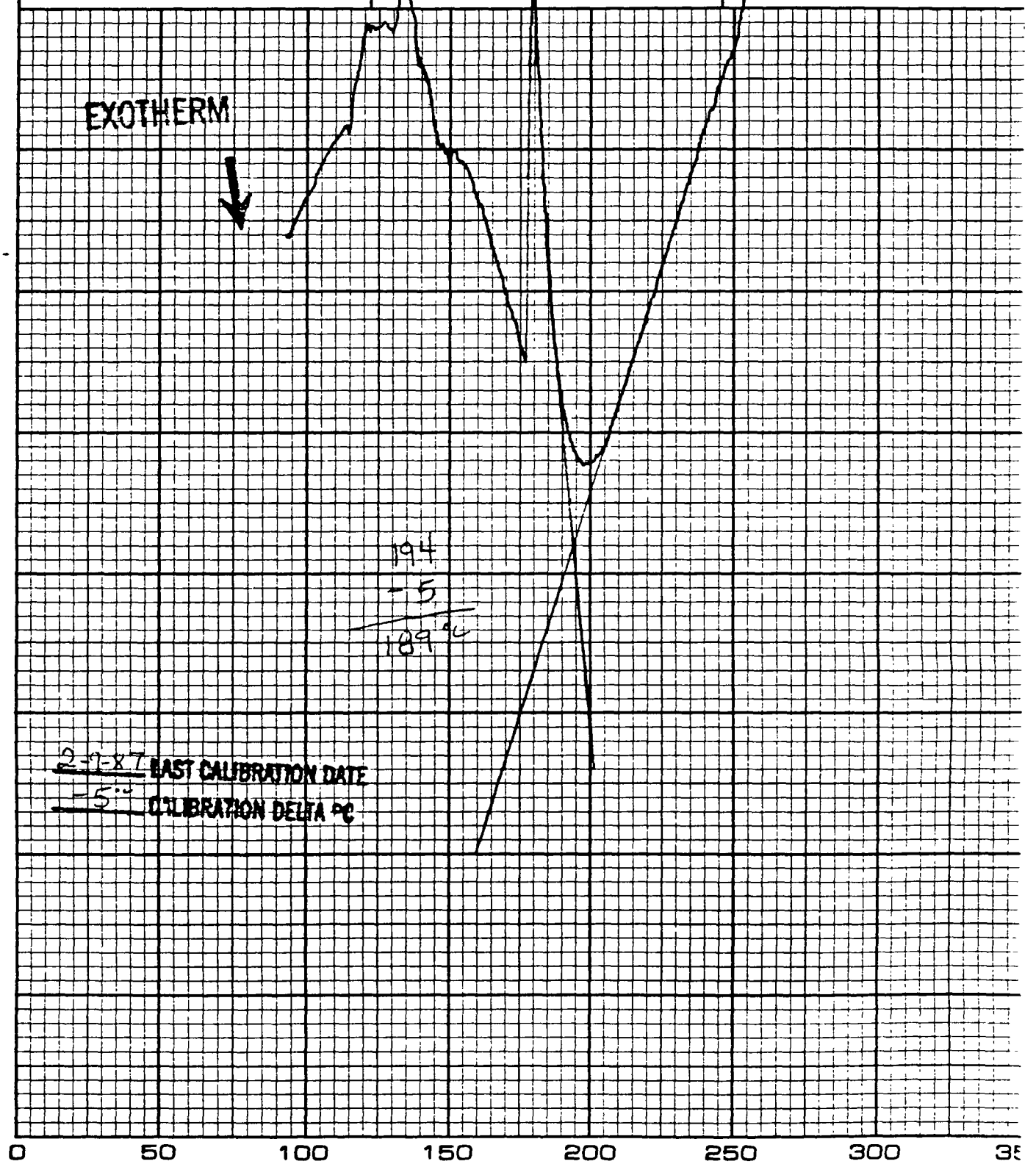
PART NO. 990088

CHART 8B

RUN NO ___ DATE 2-23-87
OPERATOR dek
SAMPLE: 2-2 USP 39A
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 1.0 /5x
(mcal/sec)/in ___
WEIGHT, mg 3.11
REFERENCE 1 alum seal



DUPONT Instruments

MEASURED VARIABLE ___

DATA FILE A:PHENO20.HDR TAKEN 09-01-1986 15:13:56

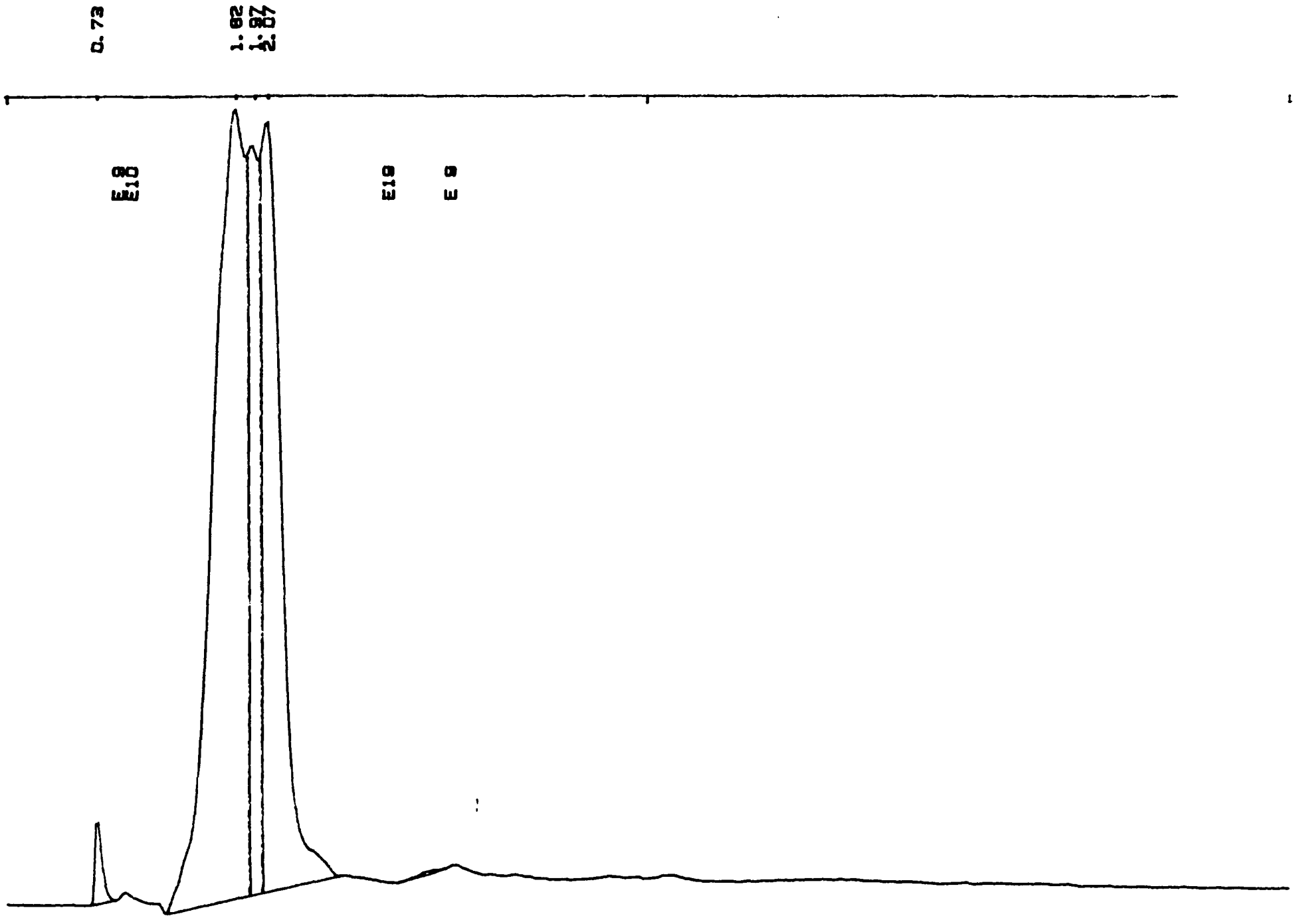
********* AREA PERCENT REPORT *********

```
**********************************************************************
* Sample Name: USP39A,2-1,C=5.555              Operator Initials: JGZ
* Date:  09-01-1986 15:13:56 Method:PHENOLIC   DATA FILE: A:PHENO20.PTS
* Interface: 4               Cycle#:  20       Channel#: 0    Vial#: N.A.
* Starting Peak Width:  10   Threshold:  .01
**********************************************************************
*  Instrument 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
**********************************************************************
Starting Delay:   0.00                      Ending Retention Time:   10.00
```

Pk No.	Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
1	0.73	2256	1.2208	1	562	2.392	4.0
2	1.82	94314	51.0355	2	5417	100.000	17.4
3	1.97	29598	16.0160	2	5094	31.382	5.8
4	2.07	58633	31.7278	2	5278	62.168	11.1

Total Area: 184801 Area Reject: 1000 One sample per 1.000 sec.

DATA FILE=PHEN020 FROM 0.00 MIN. TO 10.00 MIN. LOW SCALE= 5.401 Mv. HIGH SCALE= 10.930 Mv.
USP-39A, 2-1, C=5.555 MG/ML, 8/2/86, JGZ



DATA FILE A:PHEN027.HDR TAKEN 09-05-1986 11:31:38

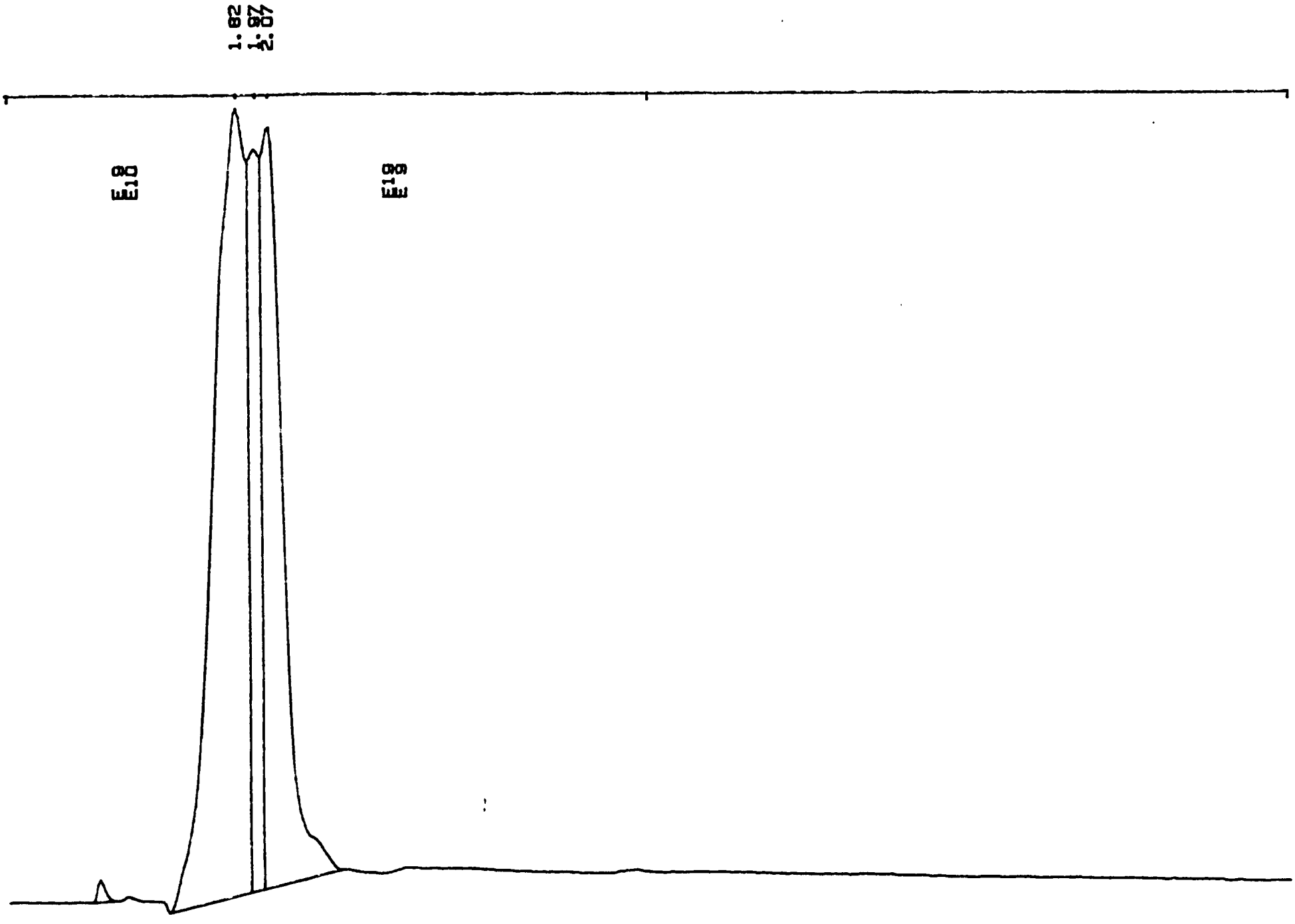
********* AREA PERCENT REPORT *********

```
**************************************************************************
* Sample Name: USP39A,2-2,C=6.99                Operator Initials: JGZ   *
* Date:  09-05-1986 11:31:38 Method:PHENOLIC    DATA FILE: A:PHEN027.PTS  *
* Interface: 4               Cycle#:  27        Channel#: 0   Vial#: N.A. *
* Starting Peak Width:  10   Threshold:  .01                              *
**************************************************************************
*  Instrument 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                                        *
**************************************************************************
Starting Delay:   0.00                      Ending Retention Time:   10.00
```

Pk No.	Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
2	1.82	96860	53.0012	2	5305	100.000	18.3
3	1.97	28712	15.7109	2	4980	29.643	5.8
4	2.07	57179	31.2879	2	5119	59.032	11.2

Total Area: 182750 Area Reject: 1000 One sample per 1.000 sec.

DATA FILE=PHEN027 FROM 0.00 MIN. TO 10.00 MIN. LOW SCALE= 5.424 MV. HIGH SCALE= 10.854 MV.
USP-39A, 2-2, C=6.88 MG/ML, 8/5/86, 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

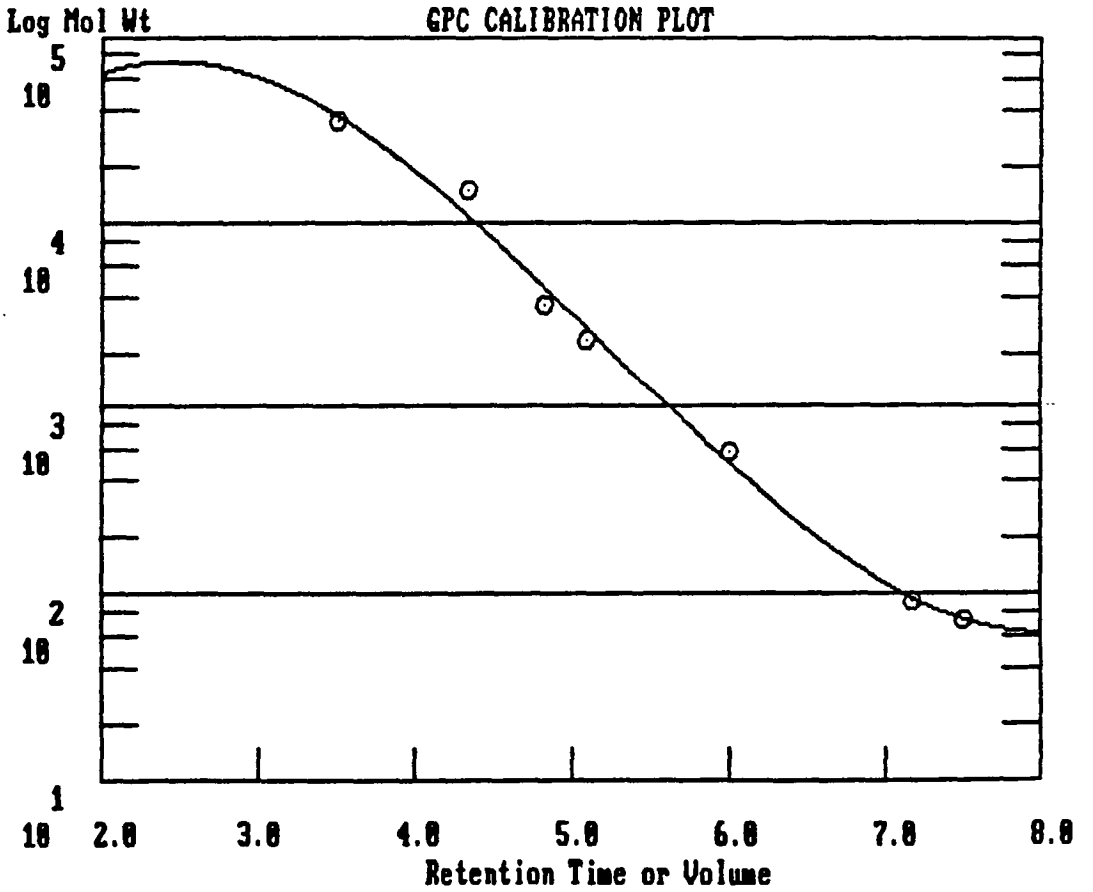


CHART 10A

ATA FILE A:GPC33.HDR TAKEN 08-05-1986 17:47:28

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

```
**********************************************************************************
 Sample Name: USP39A 2-1=2.68                    Operator Initials: GBF          *
 Date:  08-05-1986 15:48:25 Method:              DATA FILE: A:GPC33.PTS          *
 Interface: 5               Cycle#:  33          Channel#: 0    Vial#: N.A.      *
 Starting 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                                         *
**********************************************************************************
tarting Delay:   0.00                    Ending Retention Time:   10.00
alibration file: GPCPHEN
iolecular Weight Distribution Averages
aseline TIMES:    3.85 to   10.00   MW:      22295 to          2
rocess  TIMES:    3.85 to   10.00   MW:      22295 to          2
otal Area:       243177
1w=                1800
1n=                 334
1w/Mn=           5.3756
1z=                4852
1v=                1551
```

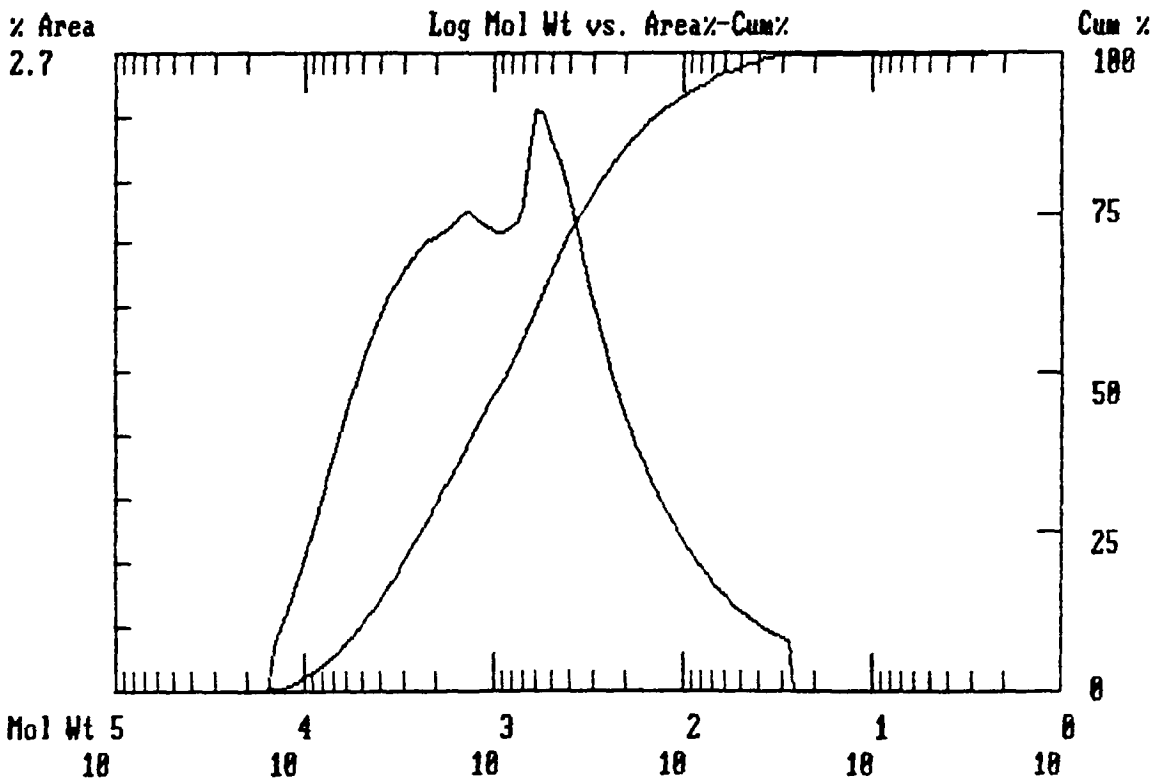
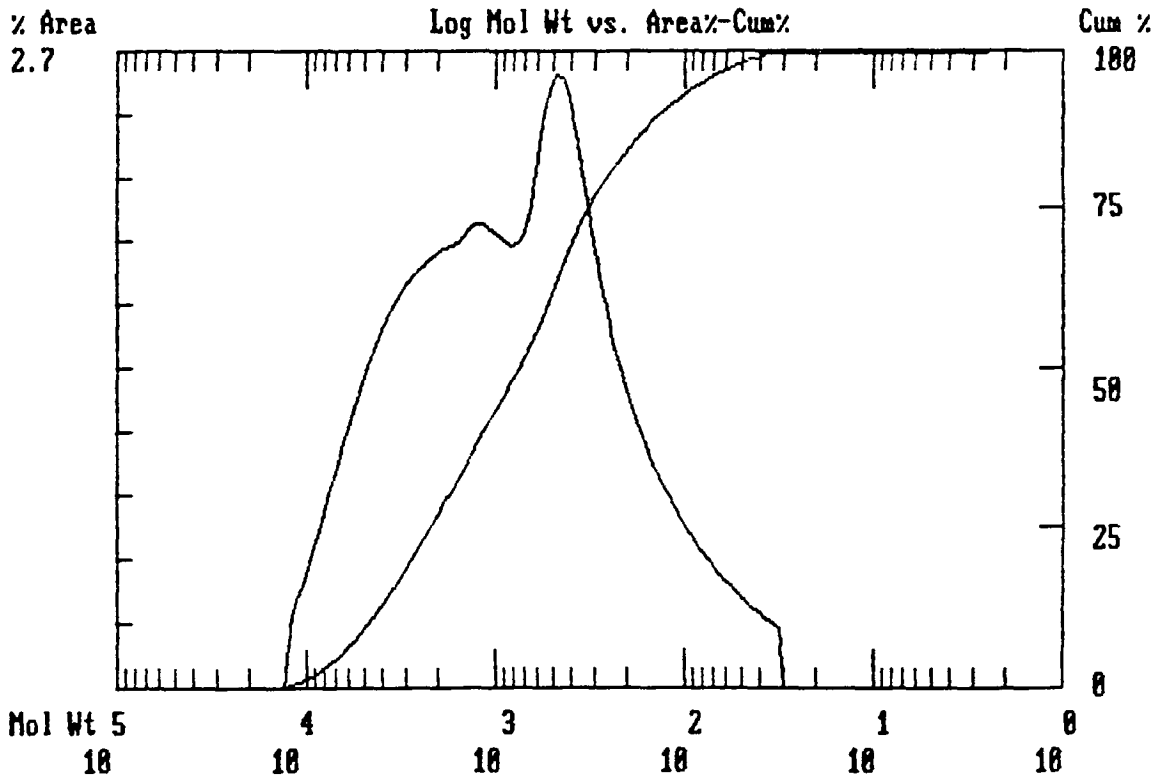


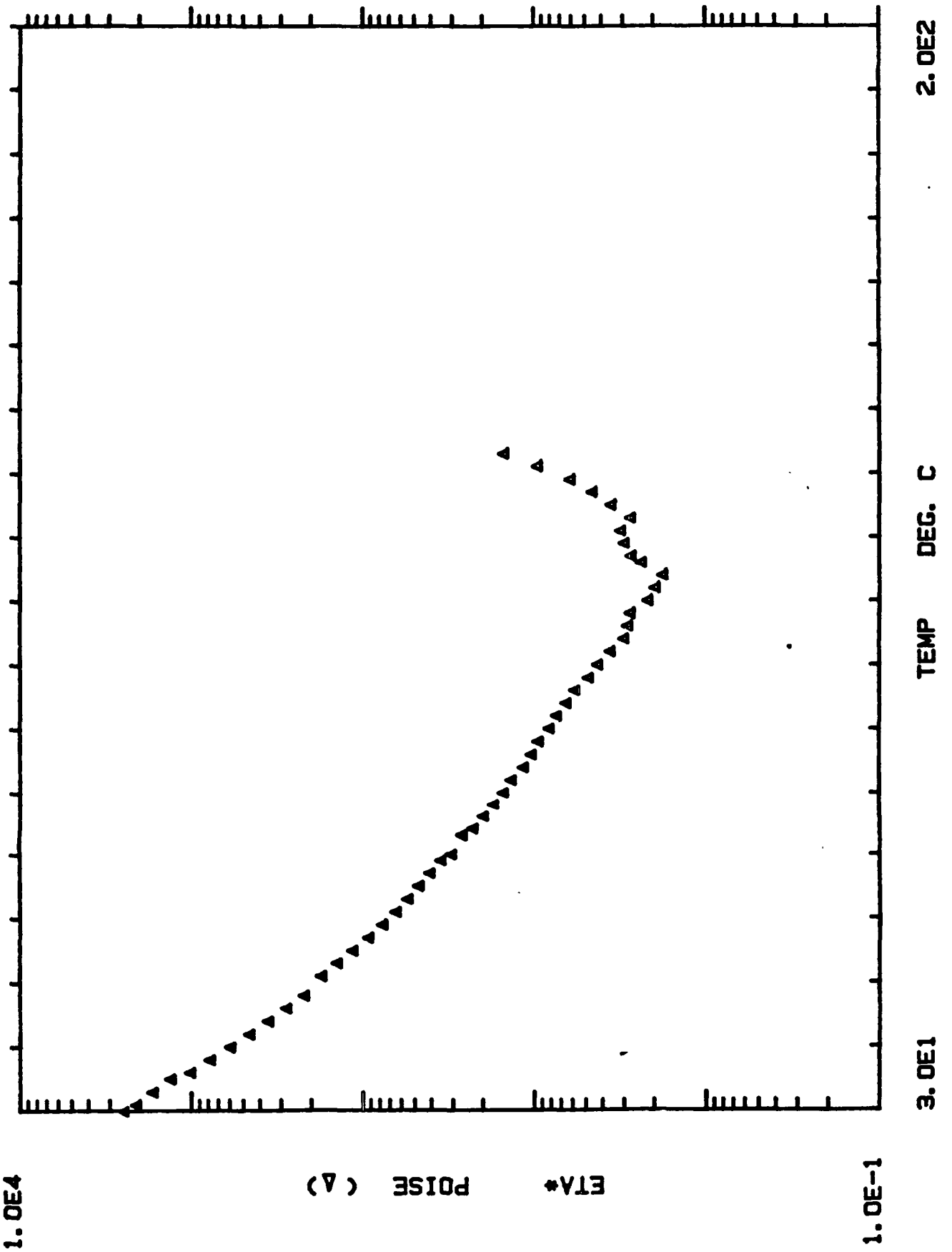
CHART 10B

TA FILE A:GPC34.HDR TAKEN 08-05-1986 17:50:20

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

```
**********************************************************************
Sample Name: USP39A 2-2=2.68                  Operator Initials: GBF    *
Date:  08-05-1986 16:04:45 Method:            DATA FILE: A:GPC34.PTS    *
Interface: 5              Cycle#:  34         Channel#: 0   Vial#: N.A. *
Starting 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                                  *
**********************************************************************
arting Delay:   0.00                  Ending Retention Time:   10.00
libration file: GPCPHEN
lecular Weight Distribution Averages
seline TIMES:    3.85 to   10.00   MW:      22295 to          2
ocess -TIMES:    3.85 to   10.00   MW:      22295 to          2
tal Area:       198243
=                 1631
=                  328
/Mn=            4.9600
=                 4349
=                 1407
```




NASA FINGERPRINT VISCOSITY PROFILE USP 30A RESIN NASA LOT2-1
1.0E4
ETA* POISE (Δ)
1.0E-1
3.0E1
TEMP DEG. C
2.0E2

Rheometrics RECAP II

---

eriment No. : 2 Sample No. : 1

le:
A FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT2-1

rator :CP

e and Time : Friday, August 15, 1986 - 12:30:37

rating Mode : DYNAMIC

ep Type : CURE

metry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

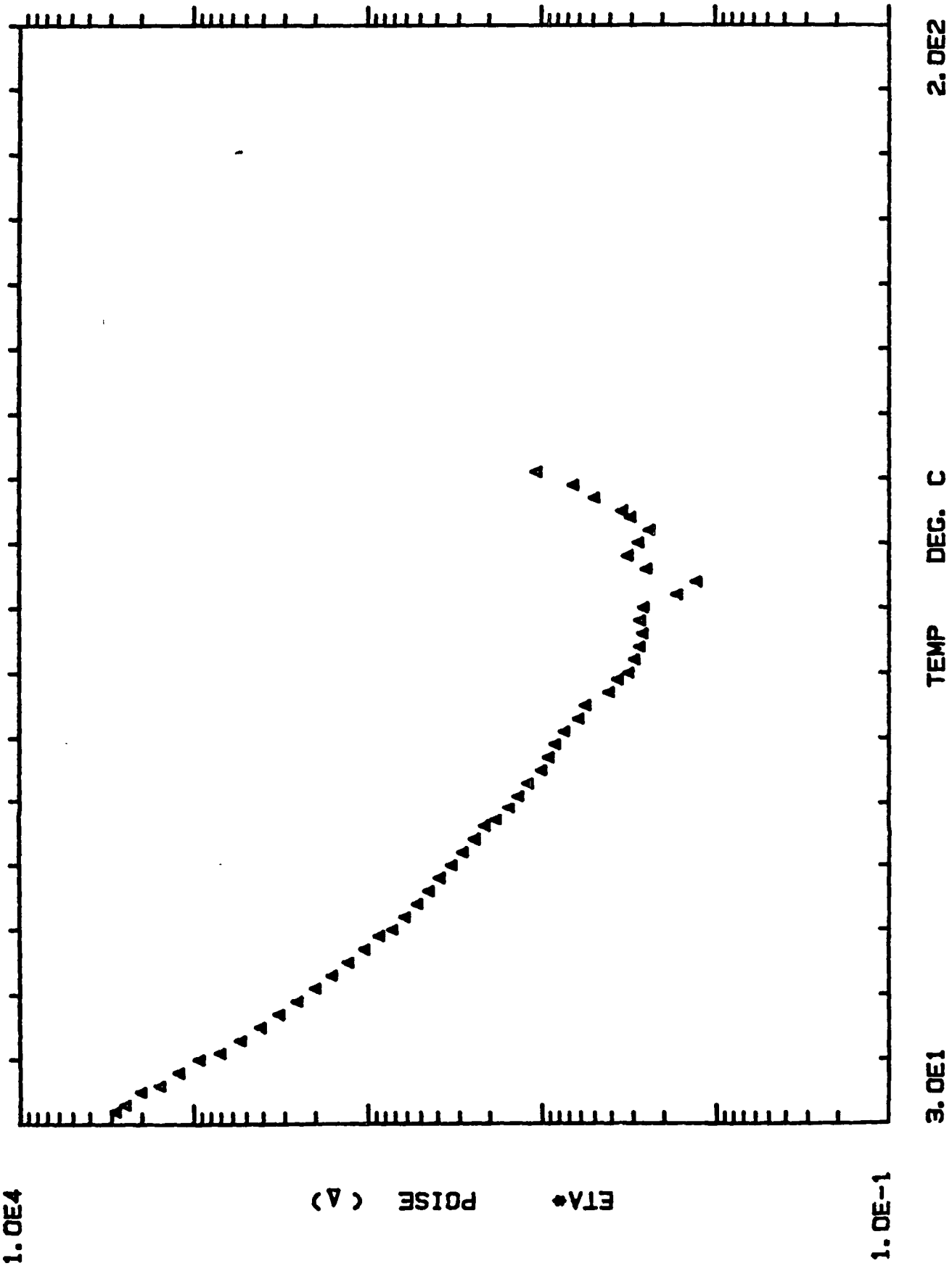
es :
AIN =50%
QUENCY =10 RAD/SEC

SA FINGERPRINT VISCOSITY PROFILE USF 39A RESIN NASA LOT3-1

O.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	2.489e+003	2.48[illegible]e+003	4.84[illegible]e+001	3.172e+002	2.000e-001	2.80[illegible]e+001
2	2.642e+003	2.641e+003	4.082e+001	3.370e+002	1.000e+000	2.90[illegible]e+001
3	2.428e+003	2.428e+003	3.159e+001	3.095e+002	2.000e+000	3.000e+001
4	2.051e+003	2.051e+003	3.626e+001	2.607e+002	3.000e+000	3.100e+001
5	1.636e+003	1.636e+003	3.612e+001	2.076e+002	4.000e+000	3.300e+001
6	1.283e+003	1.282e+003	3.520e+001	1.625e+002	5.000e+000	3.500e+001
7	9.857e+002	9.849e+002	3.027e+001	1.245e+002	6.000e+000	3.600e+001
8	7.555e+002	7.550e+002	2.754e+001	9.537e+001	7.000e+000	3.800e+001
9	5.786e+002	5.780e+002	2.598e+001	7.296e+001	8.000e+000	4.000e+001
10	4.479e+002	4.473e+002	2.357e+001	5.638e+001	9.000e+000	4.200e+001
11	3.477e+002	3.469e+002	2.768e+001	4.376e+001	1.000e+001	4.400e+001
12	2.715e+002	2.706e+002	2.171e+001	3.414e+001	1.100e+001	4.600e+001
13	2.136e+002	2.126e+002	2.044e+001	2.686e+001	1.200e+001	4.800e+001
14	1.693e+002	1.680e+002	2.056e+001	2.126e+001	1.300e+001	5.100e+001
15	1.371e+002	1.356e+002	2.031e+001	1.723e+001	1.400e+001	5.300e+001
16	1.110e+002	1.094e+002	1.829e+001	1.394e+001	1.500e+001	5.500e+001
17	9.041e+001	8.878e+001	1.708e+001	1.135e+001	1.600e+001	5.700e+001
18	7.490e+001	7.343e+001	1.476e+001	9.399e+000	1.700e+001	5.900e+001
19	6.248e+001	6.116e+001	1.280e+001	7.843e+000	1.800e+001	6.100e+001
20	5.336e+001	5.221e+001	1.105e+001	6.692e+000	1.900e+001	6.300e+001
21	4.604e+001	4.506e+001	9.437e+000	5.777e+000	2.000e+001	6.500e+001
22	3.975e+001	3.897e+001	7.829e+000	4.985e+000	2.100e+001	6.700e+001
23	3.415e+001	3.357e+001	6.480e+000	4.291e+000	2.300e+001	6.900e+001
24	2.971e+001	2.916e+001	5.717e+000	3.731e+000	2.300e+001	7.000e+001
25	2.574e+001	2.522e+001	5.128e+000	3.279e+000	2.400e+001	7.300e+001
26	2.230e+001	2.191e+001	4.110e+000	2.800e+000	2.500e+001	7.400e+001
27	1.940e+001	1.907e+001	3.540e+000	2.434e+000	2.600e+001	7.600e+001
28	1.690e+001	1.657e+001	3.296e+000	2.121e+000	2.700e+001	7.800e+001
29	1.480e+001	1.457e+001	2.816e+000	1.857e+000	2.800e+001	8.000e+001
30	1.328e+001	1.279e+001	2.741e+000	1.667e+000	2.900e+001	8.200e+001
31	1.125e+001	1.105e+001	2.093e+000	1.411e+000	3.000e+001	8.400e+001
32	1.007e+001	9.917e+000	1.751e+000	1.264e+000	3.100e+001	8.600e+001
33	9.185e+000	9.050e+000	1.573e+000	1.151e+000	3.200e+001	8.800e+001
34	7.912e+000	7.827e+000	1.152e+000	9.930e-001	3.300e+001	9.000e+001
35	7.192e+000	7.145e+000	8.195e-001	9.070e-001	3.400e+001	9.200e+001
36	6.315e+000	6.283e+000	5.316e-001	7.925e-001	3.500e+001	9.400e+001
37	5.609e+000	5.600e+000	3.201e-001	7.044e-001	3.600e+001	9.600e+001
38	4.670e+000	4.658e+000	3.331e-001	5.860e-001	3.700e+001	9.800e+001
39	4.120e+000	4.120e+000	0.000e+000	5.175e-001	3.800e+001	1.000e+002
40	3.470e+000	3.470e+000	4.507e-002	4.352e-001	3.900e+001	1.020e+002
41	2.889e+000	2.889e+000	0.000e+000	3.627e-001	4.000e+001	1.040e+002
42	2.743e+000	2.724e+000	3.160e-001	3.445e-001	4.100e+001	1.060e+002
43	2.657e+000	2.581e+000	6.310e-001	3.335e-001	4.200e+001	1.080e+002
44	2.102e+000	2.053e+000	4.494e-001	2.642e-001	4.300e+001	1.100e+002
45	1.906e+000	1.852e+000	4.519e-001	2.394e-001	4.400e+001	1.120e+002
46	1.720e+000	1.672e+000	4.071e-001	2.162e-001	4.500e+001	1.140e+002
47	2.256e+000	2.202e+000	6.523e-001	2.824e-001	4.600e+001	1.160e+002
48	2.627e+000	2.569e+000	5.507e-001	3.301e-001	4.700e+001	1.170e+002
49	2.883e+000	2.783e+000	7.547e-001	3.621e-001	4.800e+001	1.190e+002
50	3.024e+000	2.813e+000	1.135e+000	3.799e-001	4.900e+001	1.210e+002

FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT2-1

	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	2.642e+000	2.503e+000	8.451e-001	3.320e-001	5.000e+001	1.230e+002
2	3.438e+000	3.279e+000	1.035e+000	4.316e-001	5.100e+001	1.250e+002
3	4.448e+000	4.263e+000	1.269e+000	5.583e-001	5.200e+001	1.270e+002
4	5.984e+000	5.761e+000	1.618e+000	7.514e-001	5.300e+001	1.290e+002
5	9.317e+000	8.988e+000	2.454e+000	1.171e+000	5.400e+001	1.310e+002
6	1.470e+001	1.401e+001	4.424e+000	1.845e+000	5.500e+001	1.330e+002


NASA FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT2-2
1.0E4
ETA• POISE (Δ)
1.0E-1
2.0E2
TEMP DEG. C
3.0E1

Rheometrics RECAP II

---

eriment No. : 3 Sample No. : 1

e:
FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT2-2

ator :CP

e and Time : Friday, August 15, 1986 - 13:50:53

ating Mode : DYNAMIC

p Type : CURE

etry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

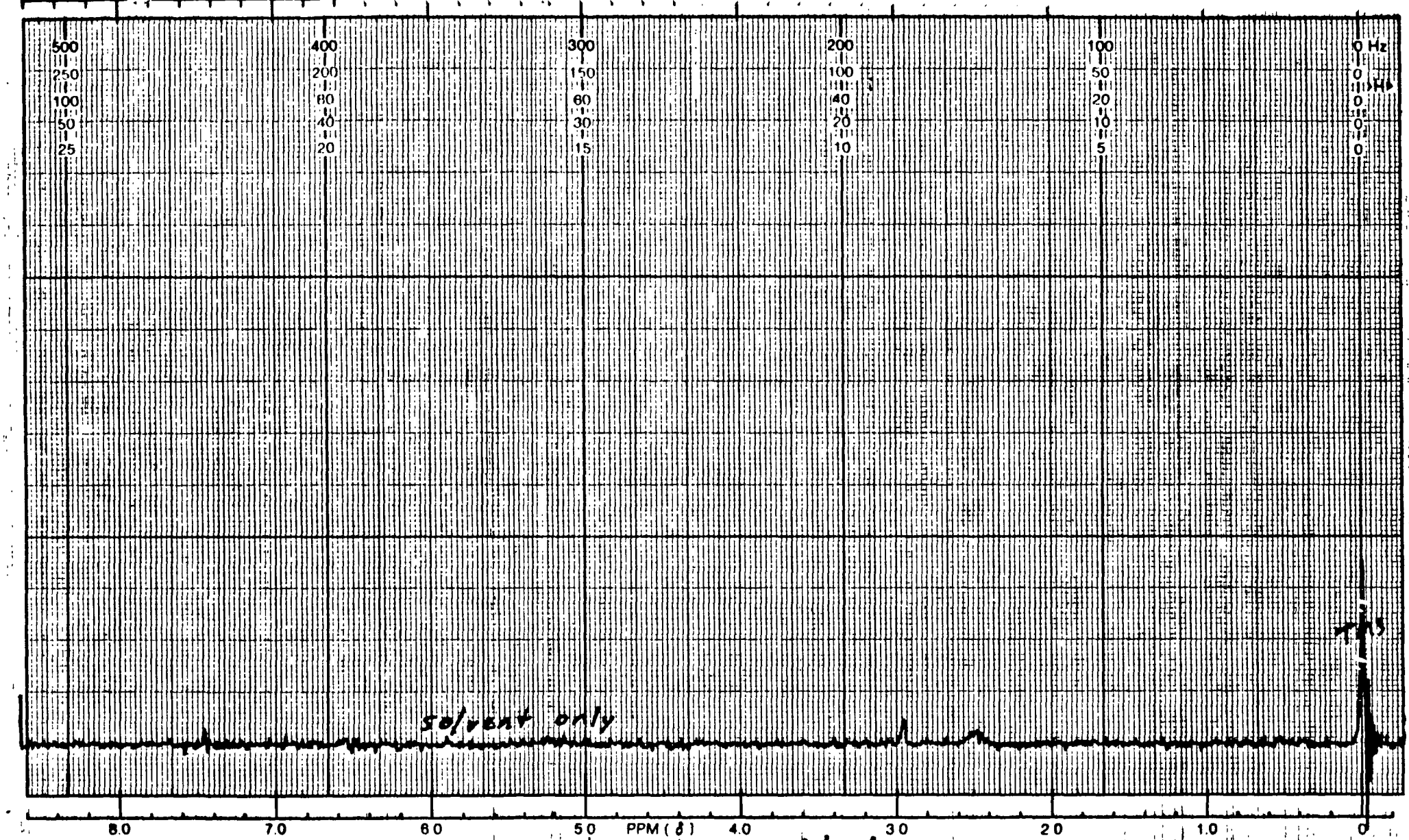
es :
IN =50%
UENCY =10 RAD/SEC

FINGERPRINT VISCOSITY PROFILE USF 39A RESIN N48A LOT2-2

ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
2.748e+003	2.747e+003	4.963e+001	3.500e+002	2.000e-001	3.200e+001
2.751e+003	2.750e+003	5.589e+001	3.503e+002	1.000e+000	3.200e+001
2.407e+003	2.407e+003	4.550e+001	3.063e+002	2.000e+000	3.300e+001
1.952e+003	1.952e+003	4.134e+001	2.476e+002	3.000e+000	3.500e+001
1.521e+003	1.520e+003	3.489e+001	1.925e+002	4.000e+000	3.600e+001
1.181e+003	1.180e+003	3.659e+001	1.493e+002	5.000e+000	3.800e+001
9.014e+002	9.010e+002	2.717e+001	1.137e+002	6.000e+000	4.000e+001
6.851e+002	6.845e+002	2.800e+001	8.640e+001	7.000e+000	4.100e+001
5.225e+002	5.219e+002	2.522e+001	6.579e+001	8.000e+000	4.300e+001
4.013e+002	4.007e+002	2.174e+001	5.052e+001	9.000e+000	4.500e+001
3.136e+002	3.129e+002	2.112e+001	3.947e+001	1.000e+001	4.700e+001
2.457e+002	2.449e+002	2.013e+001	3.090e+001	1.100e+001	4.900e+001
1.938e+002	1.928e+002	1.994e+001	2.436e+001	1.200e+001	5.100e+001
1.561e+002	1.549e+002	1.938e+001	1.961e+001	1.300e+001	5.300e+001
1.257e+002	1.244e+002	1.839e+001	1.580e+001	1.400e+001	5.500e+001
1.014e+002	1.003e+002	1.543e+001	1.273e+001	1.500e+001	5.700e+001
8.340e+001	8.234e+001	1.320e+001	1.047e+001	1.600e+001	5.900e+001
7.033e+001	6.940e+001	1.145e+001	8.840e+000	1.700e+001	6.000e+001
5.969e+001	5.884e+001	1.001e+001	7.496e+000	1.800e+001	6.200e+001
5.047e+001	4.972e+001	8.644e+000	6.340e+000	1.900e+001	6.400e+001
4.340e+001	4.276e+001	7.440e+000	5.447e+000	2.000e+001	6.600e+001
3.759e+001	3.701e+001	6.560e+000	4.720e+000	2.100e+001	6.800e+001
3.215e+001	3.168e+001	5.477e+000	4.034e+000	2.200e+001	7.000e+001
2.777e+001	2.736e+001	4.723e+000	3.488e+000	2.300e+001	7.200e+001
2.370e+001	2.333e+001	4.172e+000	2.977e+000	2.400e+001	7.400e+001
2.079e+001	2.049e+001	3.492e+000	2.609e+000	2.500e+001	7.600e+001
1.754e+001	1.770e+001	2.927e+000	2.253e+000	2.600e+001	7.700e+001
1.506e+001	1.483e+001	2.647e+000	1.890e+000	2.700e+001	7.900e+001
1.327e+001	1.309e+001	2.197e+000	1.666e+000	2.800e+001	8.100e+001
1.166e+001	1.154e+001	1.650e+000	1.463e+000	2.900e+001	8.300e+001
9.733e+000	9.579e+000	1.748e+000	1.232e+000	3.000e+001	8.500e+001
8.840e+000	8.742e+000	1.311e+000	1.110e+000	3.100e+001	8.700e+001
8.088e+000	7.995e+000	1.222e+000	1.015e+000	3.200e+001	8.900e+001
7.169e+000	7.105e+000	9.554e-001	9.000e-001	3.300e+001	9.100e+001
5.902e+000	5.868e+000	6.306e-001	7.406e-001	3.400e+001	9.300e+001
5.403e+000	5.353e+000	7.368e-001	6.783e-001	3.500e+001	9.500e+001
3.945e+000	3.945e+000	3.298e-002	4.951e-001	3.600e+001	9.700e+001
3.514e+000	3.503e+000	2.691e-001	4.410e-001	3.700e+001	9.900e+001
3.057e+000	3.055e+000	1.028e-001	3.835e-001	3.800e+001	1.000e+002
2.824e+000	2.824e+000	5.250e-002	3.546e-001	3.900e+001	1.020e+002
2.639e+000	2.638e+000	5.008e-002	3.310e-001	4.000e+001	1.040e+002
2.532e+000	2.532e+000	0.000e+000	3.180e-001	4.100e+001	1.060e+002
2.625e+000	2.619e+000	1.781e-001	3.298e-001	4.200e+001	1.080e+002
2.504e+000	2.427e+000	6.148e-001	3.143e-001	4.300e+001	1.100e+002
1.607e+000	1.519e+000	5.247e-001	2.019e-001	4.400e+001	1.120e+002
1.244e+000	1.234e+000	1.583e-001	1.560e-001	4.500e+001	1.140e+002
2.421e+000	2.362e+000	5.321e-001	3.040e-001	4.600e+001	1.160e+002
3.097e+000	2.937e+000	9.815e-001	3.888e-001	4.700e+001	1.180e+002
2.684e+000	2.593e+000	6.906e-001	3.370e-001	4.800e+001	1.200e+002
2.321e+000	2.208e+000	7.159e-001	2.914e-001	4.900e+001	1.220e+002

A FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT2-2

	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
31	2.992e+000	2.793e+000	1.074e+000	3.755e-001	5.000e+001	1.240e+002
32	3.334e+000	3.139e+000	1.123e+000	4.188e-001	5.100e+001	1.250e+002
33	4.823e+000	4.690e+000	1.125e+000	6.053e-001	5.200e+001	1.270e+002
34	6.376e+000	6.167e+000	1.617e+000	8.006e-001	5.300e+001	1.290e+002
35	1.043e+001	9.972e+000	3.074e+000	1.309e+000	5.400e+001	1.310e+002



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

MANUAL

SWEEP TIME (SEC): 50 250 500 1000 — AUTO ☐ (250)
SWEEP WIDTH (Hz): 75 50 100 250 500 — (500)
FILTER: 1 2 3 4 5 6 7 8 — (2)
RF POWER LEVEL: 0.30 — (.05)

SAMPLE: Solvent
SOLVENT: Unisol-d + 0.62 TMS
DEC. LEVEL

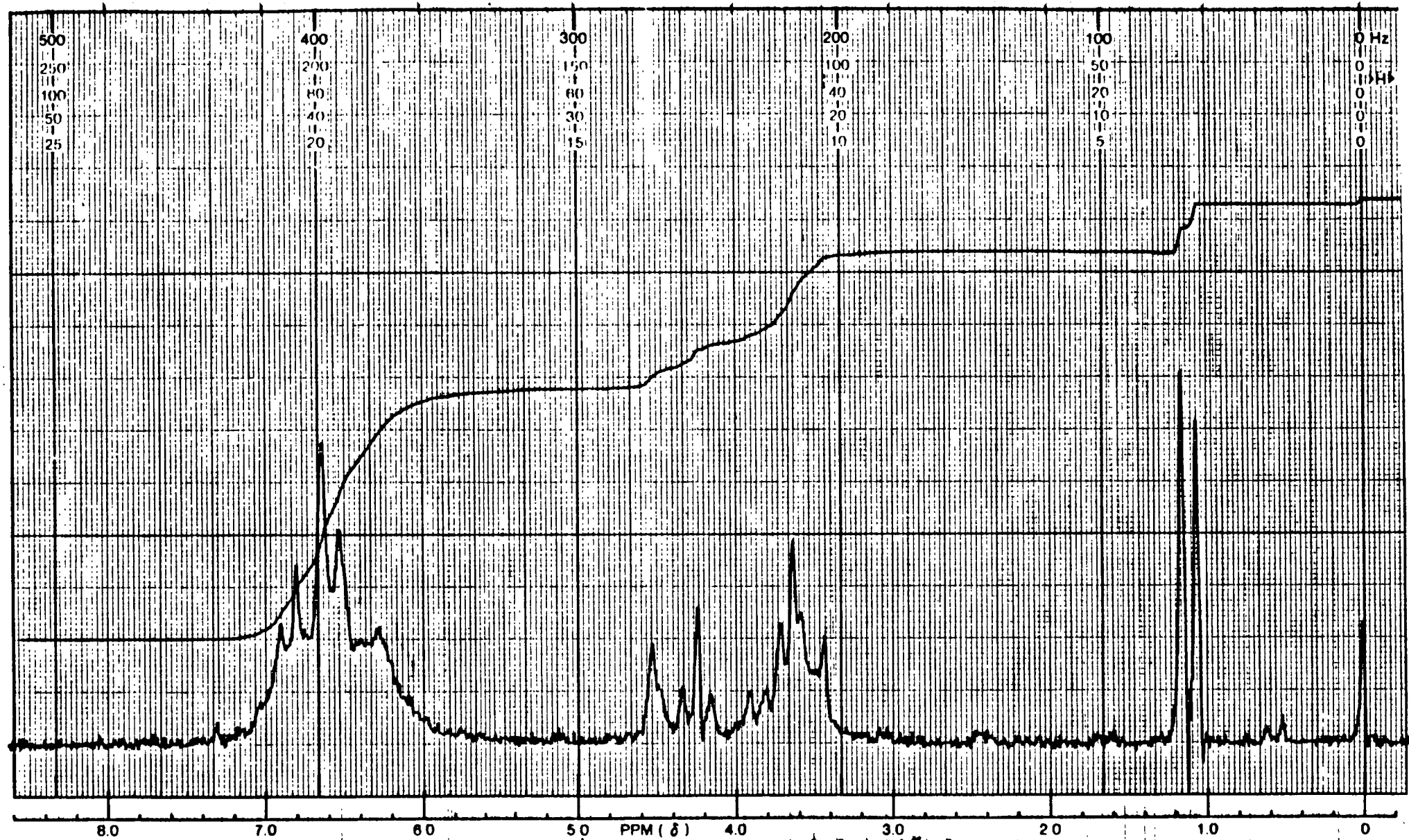
REMARKS:

ORIGINAL PAGE IS
OF POOR QUALITY

SOLVENT ONLY SCAN

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

DATE: 3-21-86 OPERATOR DGW SPECTRUM NO. 1A of 7
solvent scan



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

MANUAL
SWEEP TIME (SEC): 50 250 500 1000
SWEEP WIDTH (Hz): 25 50 100 250 500
FILTER: 1 2 3 4 5 6 7 8
RF POWER LEVEL: 0.25

AUTO ☐
(250)
(500)
(2)
(05)

SAMPLE: USP-39A Lot#2-1
SOLVENT: Unisol-d + 0.5% TMS
DEC. LEVEL

REMARKS: 0.130 gm sample
0.888 gm solvent

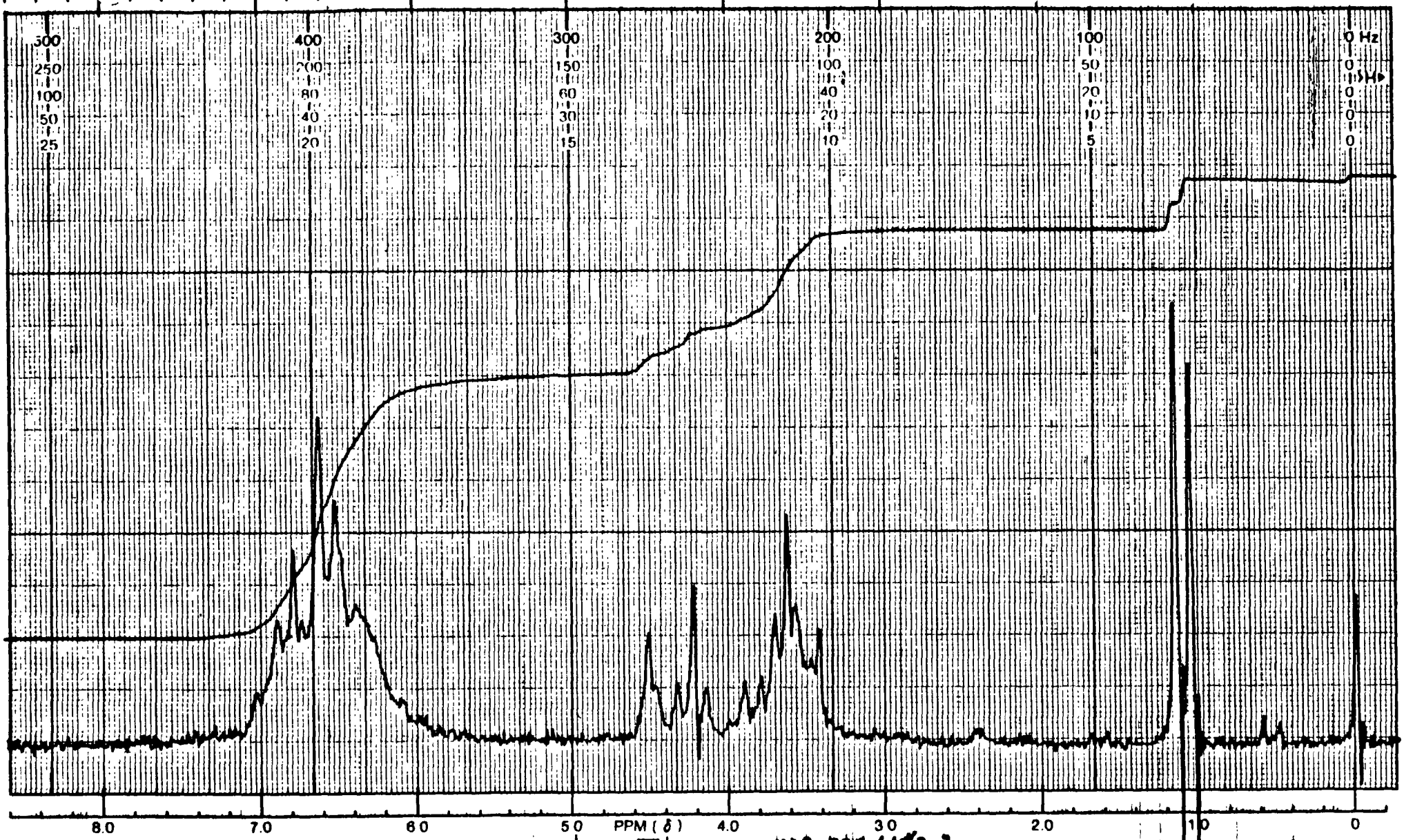
CHART 15A

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

DATE: 3-21-86

OPERATOR DGW

SPECTRUM NO. 3 of 7 USP-39A Lot#2-1



SWEEP OFFSET (Hz): 0
SPECTRUM AMPLITUDE: 8.0
INTEGRAL AMPLITUDE: 5.0
SPINNING RATE (RPS): 20

MANUAL
SWEEP TIME (SEC): 50 250 500 1000
SWEEP WIDTH (Hz): 25 50 100 750 500
FILTER: 1 2 3 4 5 6 7 8
RF POWER LEVEL: 0.25

AUTO ☐
(250)
(500)
(2)
(.05)

SAMPLE: USP-39A Lot#2-2
SOLVENT: Unisol-d+0.52TMS
DEC. LEVEL

REMARKS: 0.162 gm sample
1.072 gm solvent

CHART 15B

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

DATE: 3-21-96

OPERATOR DGW

SPECTRUM NO. 4 of 7 USP-39A Lot# 2-2

TABLE OF CONTENTS

FABRIC TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

PWB-6 Fabric for NASA Lot# 2 (Reject)

CHARTS

U.S. Polymeric

FABRIC TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

PWB-6 Fabric for NASA Lot# 2 (Reject)

1a. Breaking Strength, lbs/in, WARP		#2-1
ASTM D1682	PICK	4
	CENTER	4
	PLAIN	6
	AVG.	4.7
1b. Breaking Strength, lbs/in, FILL		
ASTM D1682	PICK	56
	CENTER	52
	PLAIN	45
	AVG.	51.0
2a. Carbon Assay, %		
MDQAI 5560	PICK	99.8
	CENTER	99.9
	PLAIN	99.9
	AVG.	99.87
2b. Hydrogen Assay, %		
MDQAI 5560	PICK	.01
	CENTER	.02
	PLAIN	.02
	AVG. EST	.017
2c. Nitrogen Assay, %		
MDQAI 5560	PICK	<.1
	CENTER	<.1
	PLAIN	<.1
	AVG. EST	.01
3. Visual Inspection	See Chart 3A	
QCi-102		
4. Specific Gravity, Units		
PTM-84		1.7546
		1.7981
		1.7965
	AVG.	1.783
5. pH, Units		
CTM-24B		9.3
		9.4
	AVG.	9.35
6. TGA, °C at 50% Weight Loss	SET UP #2	
CTM-51 (AIR)	#2-1	820

See Chart 6A

HITCO MATERIALS DIVISION
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2407

PWB-6 Fabric for NASA Lot# 2 (Reject)

7a. Atomic Absorption, ppm
CTM-53B

	#2-1
Na	4
K	2
Ca	81
Mg	1
Li	0
AVG.	88

7b. Moisture Content, % .045
CTM-53B

7c. Ash Content, % .078
CTM-53B

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

	#2-1
AVERAGE	9.73
Minimum	8.90
Maximum	11.90
Std. Dev	0.84

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

	#2-1
AVERAGE	9.99
Minimum	9.00
Maximum	12.10
Std. Dev	0.86

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

	#2-1
	28
	27
	27
	28
	29
AVG.	27.8

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

	30
	30
	30
	30
	30
AVG.	30.0

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

LEFT	2.569
CENTER	2.566
RIGHT	2.605
AVG.	2.580

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

LEFT	.39
CENTER	.39
RIGHT	.35
AVG.	.37

PWB-6 Fabric for NASA Lot# 2 (Reject)

10c. Weight Change on Acetone Wash, PTM-3A	%	#2-1
	LEFT	.12
	CENTER	.04
	RIGHT	-.08
	AVG.	.03

U.S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

USP NO. CHART 3A

DATE 3/21/86

FABRIC PWB-6

MFG. STACKPOLE FIBERS LOT 1471-3

ROLL NO. Roll 16-1832

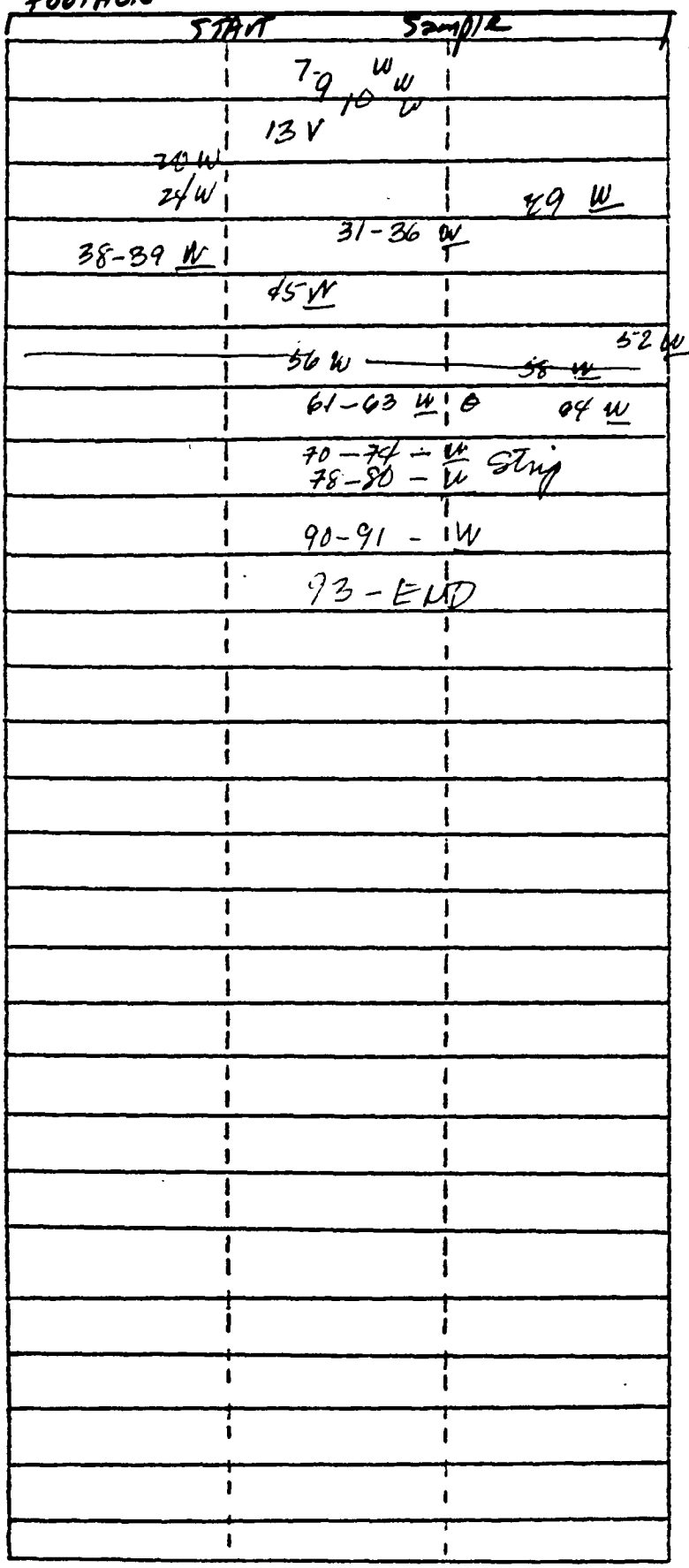
YARDS 33

POUNDS 18 3/4

ORDER NO. 7408

SPECIFICATION STD MFG CATS-

Q.C. FILE # NASA #2-1



SYMBOLS

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

REMARKS

GRADE Group B

GARCIA

CHART 6A

ORIGINAL PAGE IS
OF POOR QUALITY

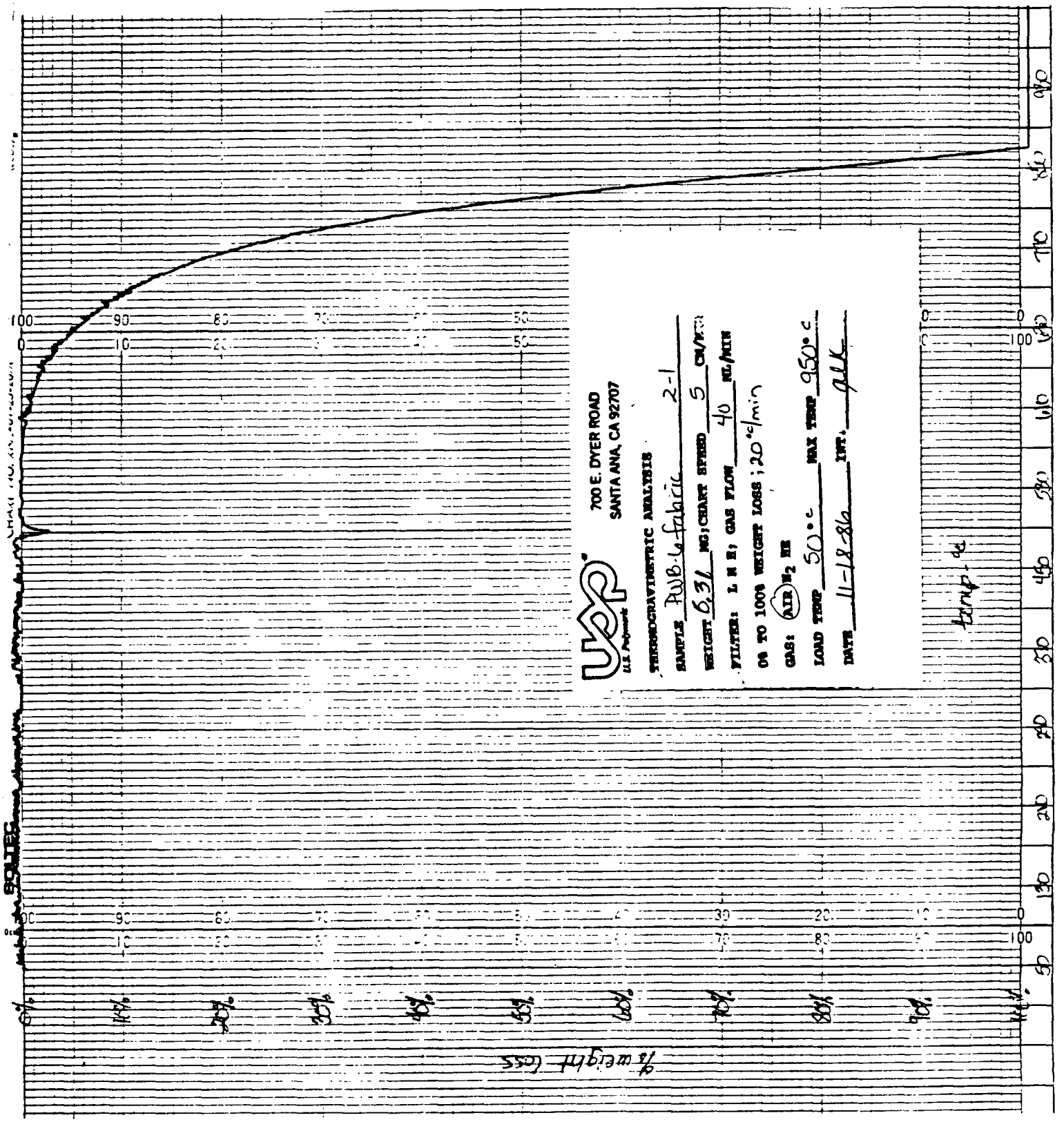


TABLE OF CONTENTS

PREPREG TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

FM 5839 NASA LOT# 2 (Reject) U.S.P. LOT# D09281

CHARTS

U.S. Polymeric

PREPREG TESTING

NAS8-36298

U.S. POLYMERIC O.E.71108

FM 5839 NASA LOT# 2 (Reject) U.S.P. LOT# D09281

		ROLL#1-S	ROLL#2-S
1a. Resin Content, Soxhlet, % CTM-6D		42.9	42.4
		42.8	41.5
		42.9	41.6
	AVG.	42.9	41.8
	NASA LOT# 2 AVERAGE		42.4
1b. Filler Content, Soxhlet, % CTM-6D		17.6	17.4
		17.6	17.0
		17.6	17.1
	AVG.	17.6	17.2
	NASA LOT# 2 AVERAGE		17.4
1c. Cloth Content, Soxhlet, % CTM-6D		39.5	40.2
		39.6	41.5
		39.5	41.3
	AVG.	39.5	41.0
	NASA LOT# 2 AVERAGE		40.3
2. Volatile Content, % PTM-17B		2.8	3.5
		2.8	3.4
		3.0	3.2
	AVG.	2.9	3.4
	NASA LOT# 2 AVERAGE		3.2
3. Flow, 1000 psi, % PTM-19G		30.9	35.4
		30.9	35.6
		31.4	35.4
	AVG.	31.1	35.5
	NASA LOT# 2 AVERAGE		33.3
4. Resin Content, Dry basis, % PTM-16F, Type II		31.5	40.6
		32.2	42.1
		31.3	42.2
	AVG.	31.7	41.6
	NASA LOT# 2 AVERAGE		36.7
5. Tack, lbs PTM-80		26	29
	NASA LOT# 2 AVERAGE		28
6. Gel Time, seconds PTM-20E		48	51
	NASA LOT# 2 AVERAGE		50

HITCO MATERIALS DIVISION
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2407

FM 5839 NASA LOT# 2 (Reject) U.S.P. LOT# D09281

7a. Atomic Absorption, ppm CTM-53B		ROLL#1-S	ROLL#2-S	LOT#2 AVG.
	Na	8	8	8
	K	1	1	1
	Ca	49	44	47
	Mg	2	2	2
	Li	0	0	0
	TOTAL	60	55	58

7b. Moisture Content, % CTM-53B	ROLL#1-S	ROLL#2-S
	2.45	2.68
NASA LOT# 2 AVERAGE		2.57

7c. Ash Content, % CTM-53B		
	.05	.06
NASA LOT# 2 AVERAGE		.06

8. TGA, % Weight Loss at 500°C CTM-51 (Nitrogen)		
	14.2	12.6
NASA LOT# 2 AVERAGE		13.4

See chart 8A-8B

9. DSC, °C CTM-50A		ROLL#1-S	ROLL#2-S	LOT#2 AVG.
	First Temp	185	185	185

See Chart 9A-9B

10. Infrared (IRZB) Baseline CTM-21C			
	.78	.81	.79

See Chart 10A-10B

11. Environmental History

Date manufactured: 2 June 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
		1.523	1.512
		1.522	1.510
		1.522	1.511
	AVG.	1.522	1.511
NASA LOT# 2 AVERAGE			1.517

13a. Tensile Strength, ksi, WARP FTMS 406-1011			
		10.49	16.21
		11.59	18.00
		11.90	17.56
		10.16	16.75
		10.16	14.45
	AVG.	10.95	16.59
NASA LOT# 2 AVERAGE			13.77

FM 5839 NASA LOT# 2 (Reject) U.S.P. LOT# D09281

		ROLL#1-S	ROLL#2-S
13b. Tensile Modulus, msi, WARP FTMS 406-1011		2.06	2.78
		2.07	3.06
		1.91	3.25
		2.06	3.24
		1.87	2.63
	AVG.	1.99	2.99
	NASA LOT# 2 AVERAGE		2.49
13c. Tensile Elongation, %, WARP FTMS 406-1011		1.30	1.08
		1.45	.92
		1.29	.66
		1.22	.60
		1.32	1.06
	AVG.	1.32	.86
	NASA LOT# 2 AVERAGE		1.09
14a. Flexural Strength, ksi, WARP FTMS 406-1031		19.13	30.81
		23.95	28.25
		19.68	29.14
		21.42	28.62
		21.79	26.66
	AVG.	21.19	28.70
	NASA LOT# 2 AVERAGE		24.95
14b. Flexural Modulus, msi, WARP FTMS 406-1031		1.86	2.90
		1.86	2.77
		1.88	2.71
		1.92	2.55
		1.90	2.45
	AVG.	1.88	2.68
	NASA LOT# 2 AVERAGE		2.28
15a. Compressive Strength, ksi, WARP FTMS 406-1021		23.90	24.08
		24.73	23.66
		22.40	25.19
		24.44	25.58
		26.22	23.92
	AVG.	24.34	24.49
	NASA LOT# 2 AVERAGE		24.41
15b. Compressive Modulus, msi, WARP FTMS 406-1021		4.24	3.94
		4.00	3.93
		4.06	3.87
		3.47	3.43
		3.79	3.80
	AVG.	3.91	3.79
	NASA LOT# 2 AVERAGE		3.85

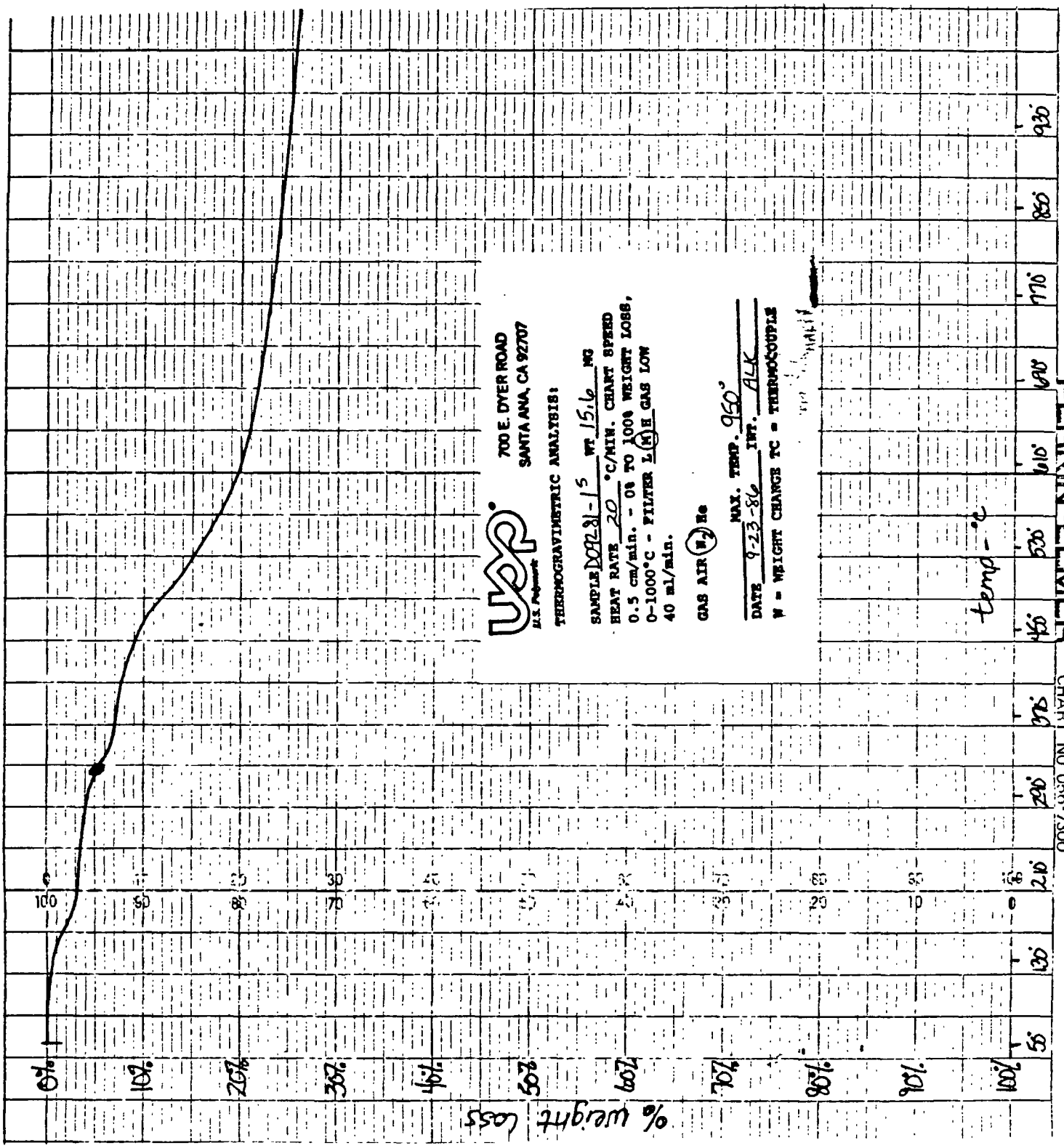
FM 5839 NASA LOT# 2 (Reject) U.S.P. LOT# D09281

		ROLL#1-S	ROLL#2-S
16. Double Shear Strength, ksi FTMS 406-1041A		5.00	4.98
		4.72	4.88
		4.53	4.36
		4.81	4.02
		4.69	4.89
	AVG.	4.75	4.62
	NASA LOT# 2 AVERAGE		4.69
17. Barcol Hardness, Units ASTM D-2583 (Average of 10 determinations)		68.8	69.5
	NASA LOT# 2 AVERAGE		69.2
18. Residual Volatiles, % PTM-98		2.38	2.53
		2.40	2.45
		2.36	2.55
	AVG.	2.38	2.51
	NASA LOT# 2 AVERAGE		2.44
19. Resin Content, Pyrolysis, % CTM-14B		38.80	40.70
		38.70	40.00
		38.20	39.70
	AVG.	38.57	40.13
	NASA LOT# 2 AVERAGE		39.35
20. Acetone Extraction, % CTM-18A		6.10	6.30
		5.80	6.00
		7.10	6.30
	AVG.	6.33	6.20
	NASA LOT# 2 AVERAGE		6.27
21a. CTE, in/in °F with ply PTM-61B		1.16	.67
		1.19	.00
	AVG.	1.18	.34
	NASA LOT# 2 AVERAGE		.76
21b. CTE, in/in °F cross ply PTM-61B		6.84	5.89
		7.06	4.96
	AVG.	6.95	5.43
	NASA LOT# 2 AVERAGE		6.19

See Chart 21A-21B

U.S. Polymeric

Hamid M. Qureishi, Manager
Quality Assurance Department



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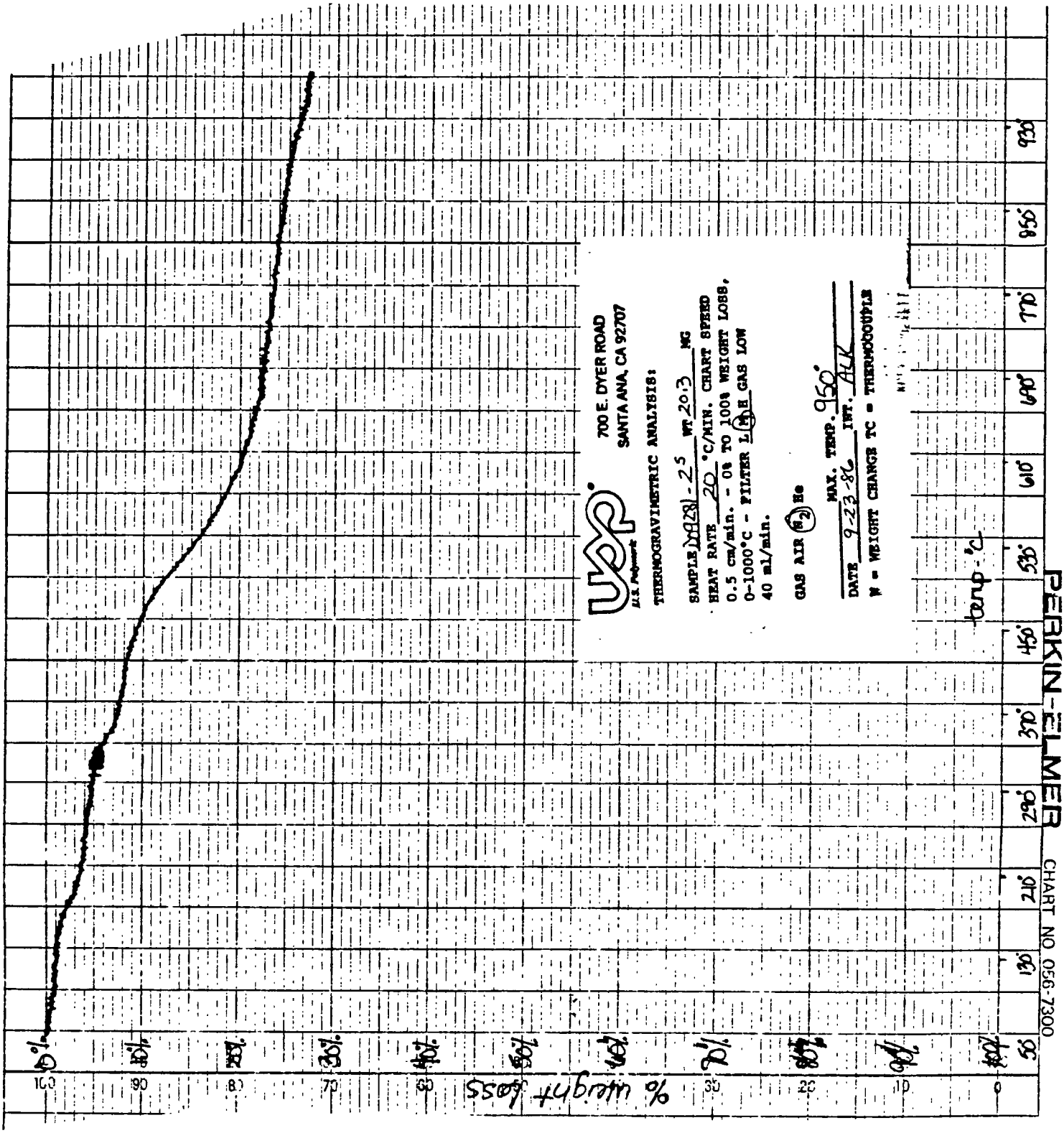

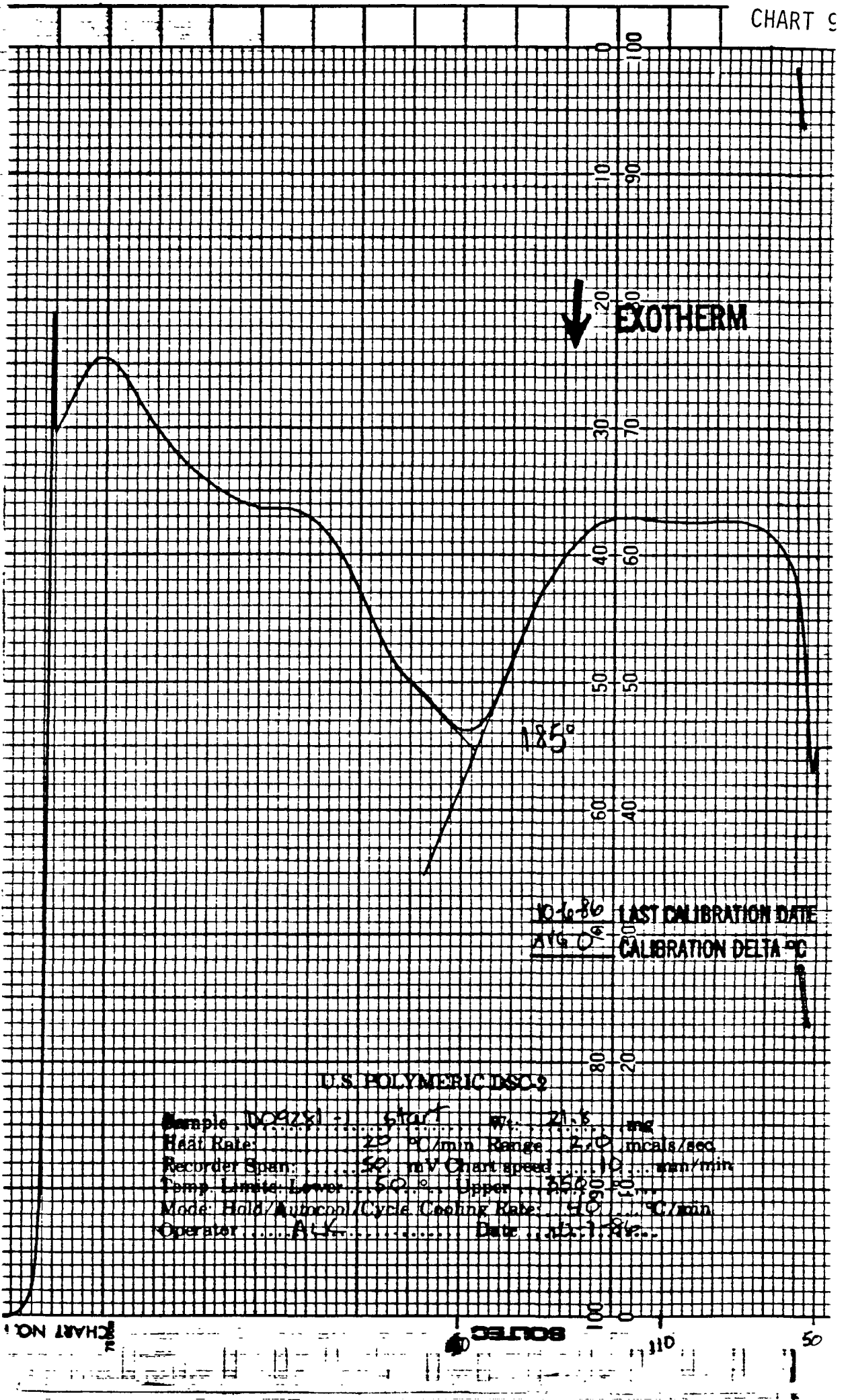

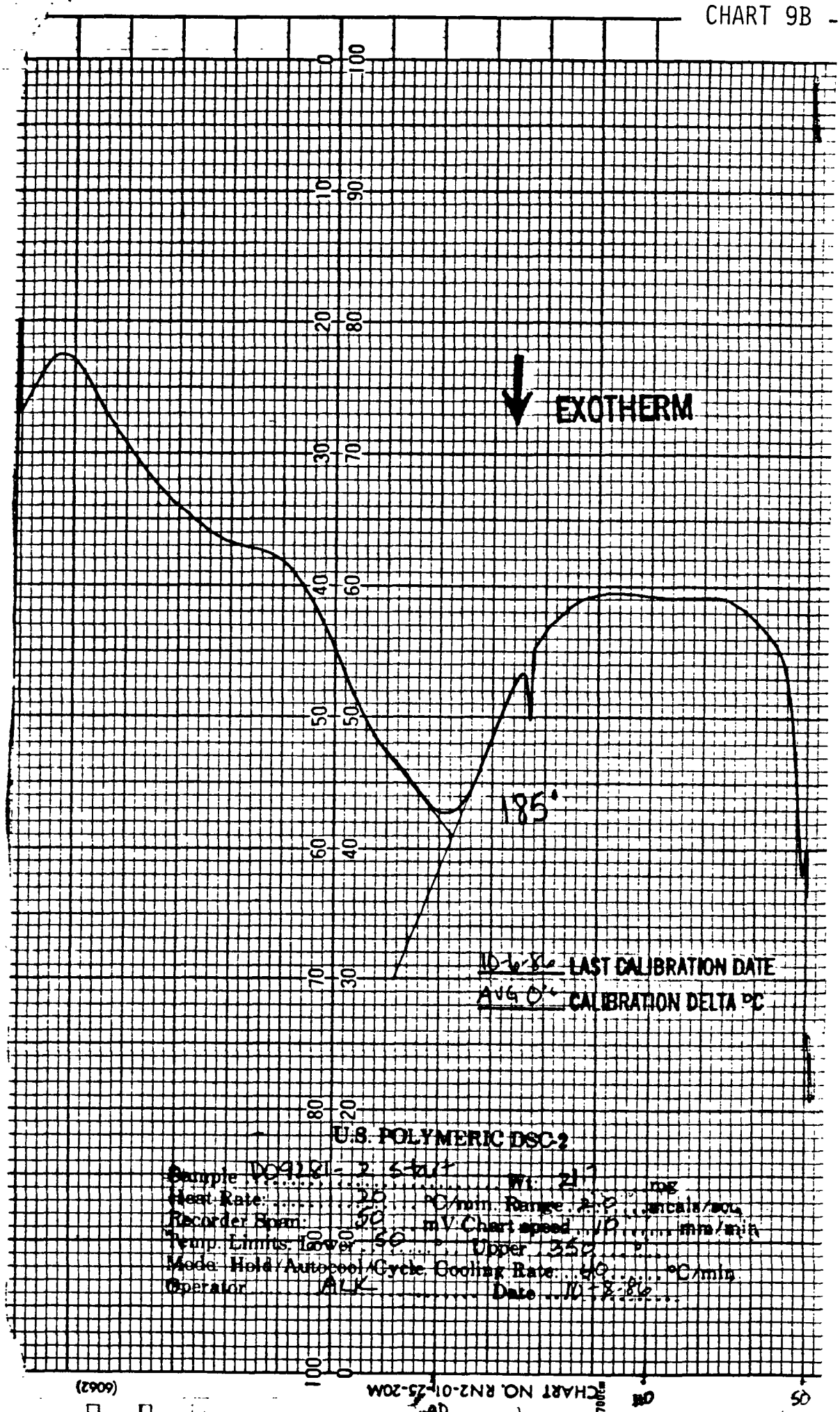

SPECTRUM NO. 15177

DATE 7-03-86

SAMPLE FM 5839

D09281 # 1

SOURCE

STRUCTURE

PATH 0.2 mm NACL

SOLVENT ACETONE

CONCENTRATION 30-50%T

PHASE 3

COMMENTS PRE-PREG MATERIAL

ANALYST V. MIRANDA

Beckman®

INFRARED SPECTROPHOTOMETER

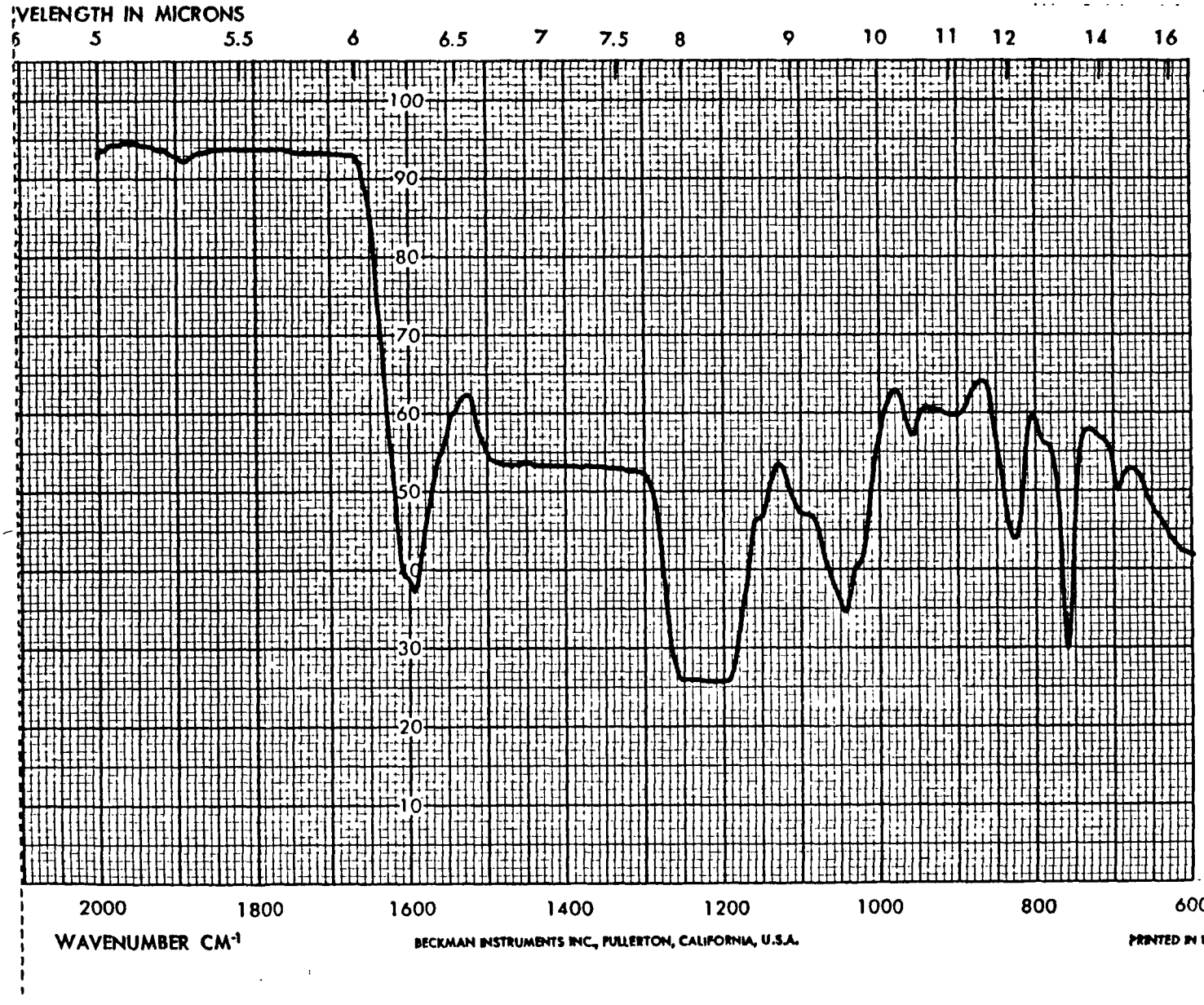

CHART 10A

SPECTRUM NO. 15178
DATE 7-03-86
SAMPLE FM 5839
D09281 # 2
SOURCE
STRUCTURE

PATH 0.2 mm NACL
SOLVENT ACETONE
CONCENTRATION 30-50%
PHASE S
COMMENTS PRE-PREG
MATERIAL
ANALYST V. MIRANDA

Beckman®
INFRARED
SPECTROPHOTOMETER

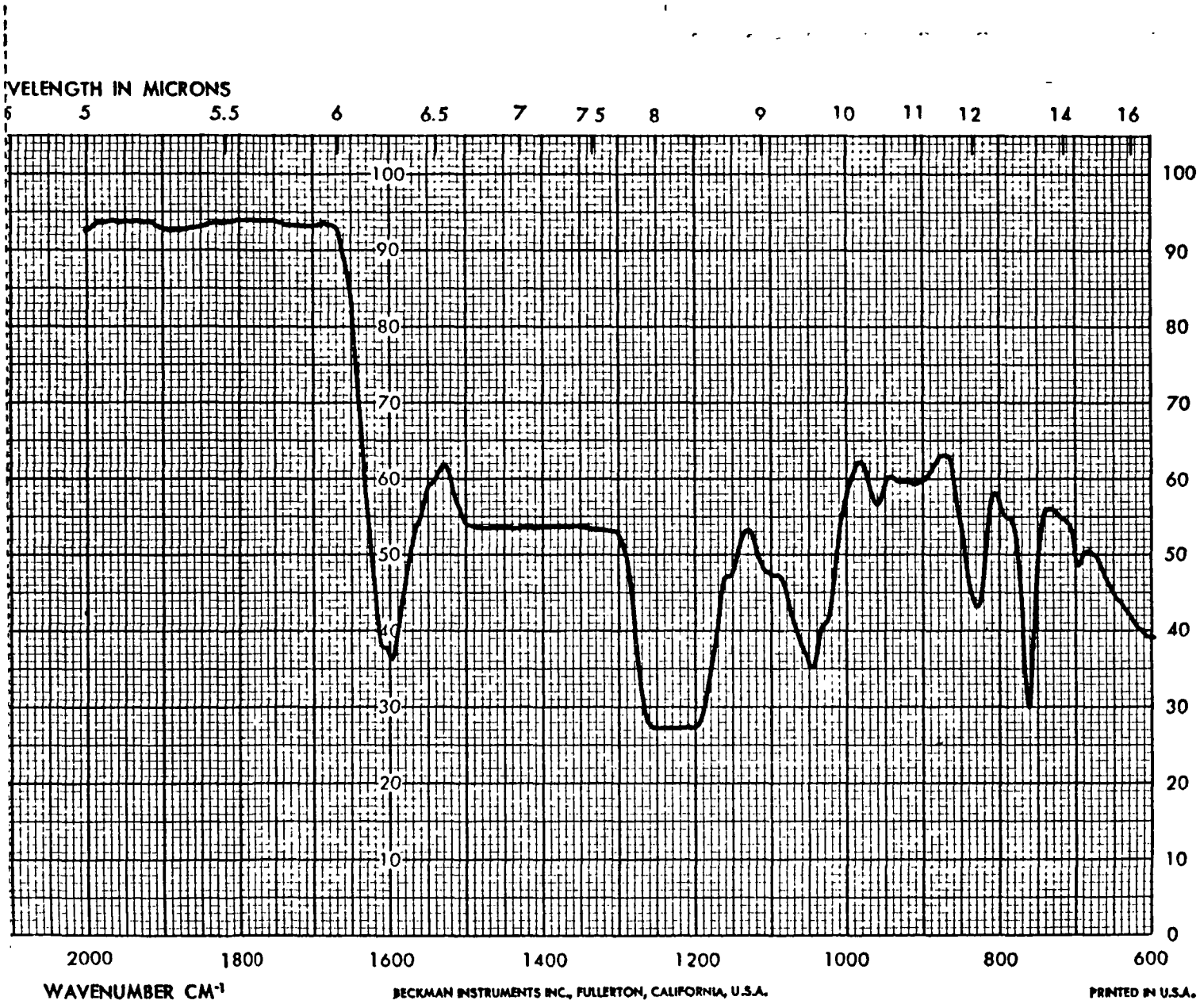

CHART 10B

PART NO. 990088

RUN NO ___ DATE 11/6/94	T-AXIS	DTA-DSC	TGA	TMA (uncl/unF)	
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	
D9281-1-STARCH (1)	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE ~1.5	
ATM Air @ STP	SHIFT, in 0	REFERENCE	TIME CONST., sec	LOAD, g 10	
FLOW RATE 3-TICE			dY, (mg/min) /in	dY, (10X), (mils/min) /in	
Wply					

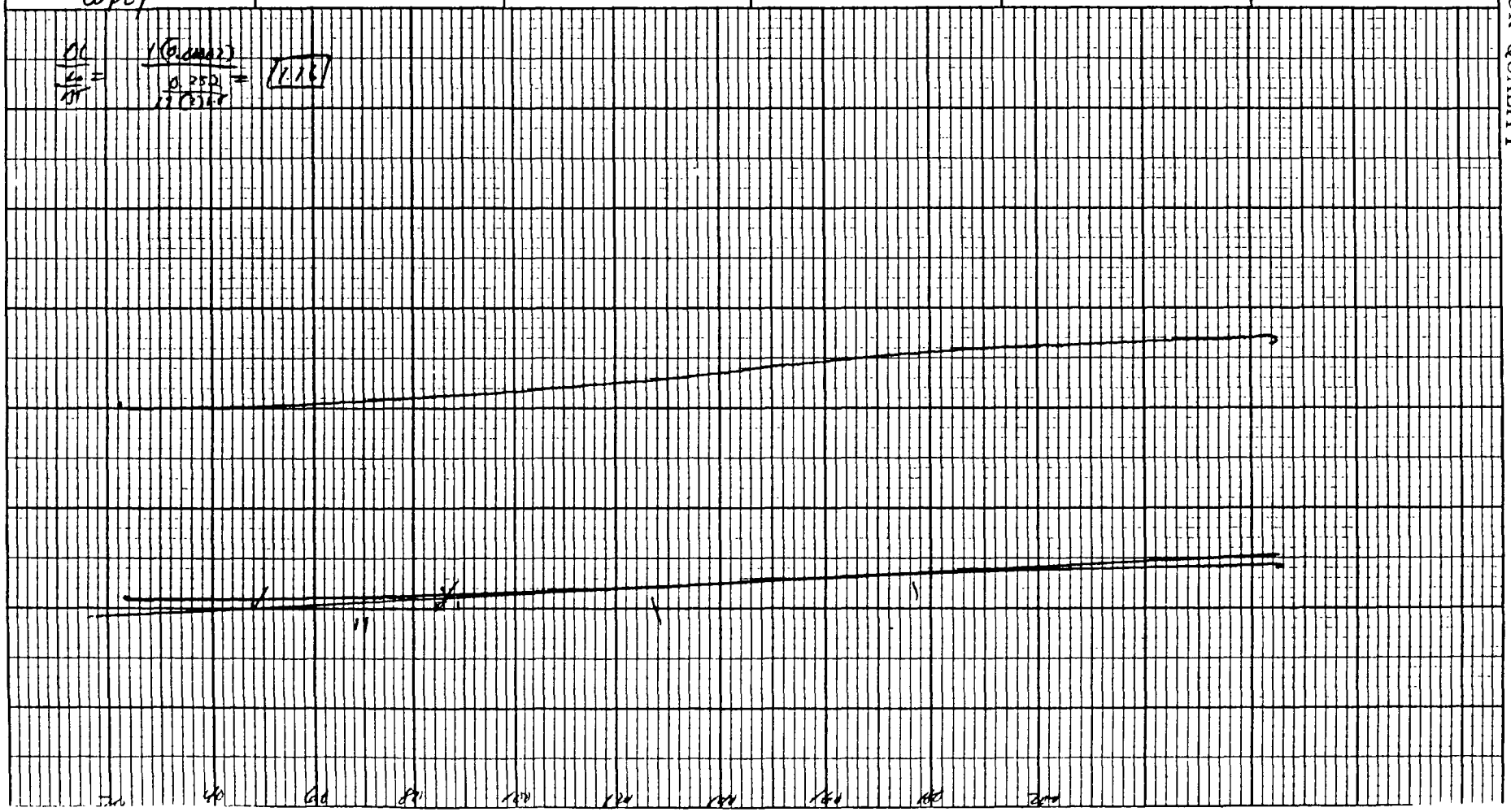

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Chart 21A1

PART NO. 990088

RUN NO ___ DATE 11/6/84	T-AXIS	DTA-DSC	TGA	TMA (1 cm/inf)	
OPERATOR TP	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	
DOS881-1-START-(2)	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg ___	WEIGHT, mg ___	SAMPLE SIZE 6.252	
ATM Air @ STP	SHIFT, in 0	REFERENCE ___	TIME CONST, sec ___	LOAD, g 10	
FLOW RATE 3-5 x CV			dY, (mg/min) /in ___	dY, (10X), (mils/min)/in ___	
WPLY					

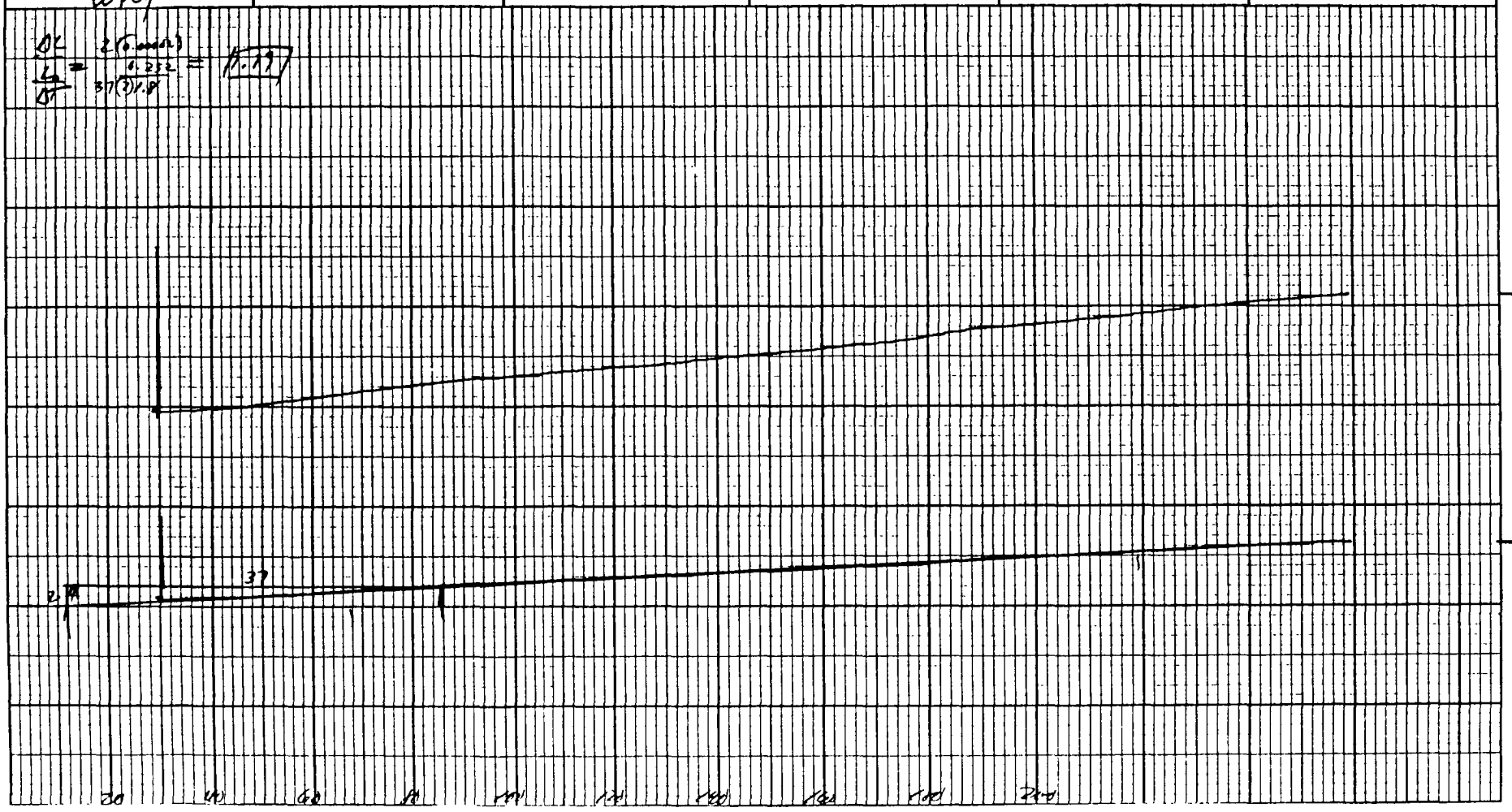

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Chart 21A2

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Chart 21A3

PART NO. 990088

RUN NO ___ DATE 11/14/94
OPERATOR TJ
SAMPLE
D9121-1-SMS-(5)
ATM Air @ SSS
FLOW RATE 2-Scfh
Xpcy

T-AXIS
SCALE, °C/in 50 20
PROG RATE, °C/min 2
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 (psi/in²)
SCALE, mils/in Default
MODE Extension
SAMPLE SIZE Quilt
LOAD, g 10
dY/dT (10X) (mils/min)/in ___

3.6 mm = 10.8 mils
2.4 mm = 7.2 mils
1.2 mm = 3.6 mils

MEASURED VARIABLE

DUPONT Instruments

PART NO. 990088

RUN NO ___ DATE 11/2/88
OPERATOR TJ
SAMPLE
Dolzall I-Spot -(4)
ATM Air @ 50
FLOW RATE 2-Stem
XPLY

T-AXIS
SCALE, °C/in 50 20
PROG. RATE, °C/min 10
HEAT ___ COOL ___ ISO ___
SHIFT, in 0

DTA-OSC
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 (Lenw/mF)
SCALE, mils/in 0.1/0.2
MODE Expansion
SAMPLE SIZE 0.1"
LOAD, g 10
dY/dT (10X) (mils/min)/in ___

Dolzall I-Spot (4) 11/2/88 TJ
Air @ 50
2-Stem
XPLY

MEASURED VARIABLE

DUPONT Instruments

C-5

PART NO. 990088

RUN NO ___ DATE 11/6/14	T-AXIS	DTA-DSC	TGA	TMA (mm/in F)	
OPERATOR DL	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	
D0928I-2-starter (1)	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg ___	WEIGHT, mg ___	SAMPLE SIZE 0.252	
ATM Air @ 50	SHIFT, in 0	REFERENCE ___	TIME CONST., sec ___	LOAD, g 10	
FLOW RATE 2	___	___	dY, (mg/min) /in ___	dY, (10X), (mils/min) /in ___	

supply

$\frac{\Delta L}{L_0} = \frac{(6 \text{ mils})}{33 \text{ (2) mils}} = 0.67$

33

Chart 21B1

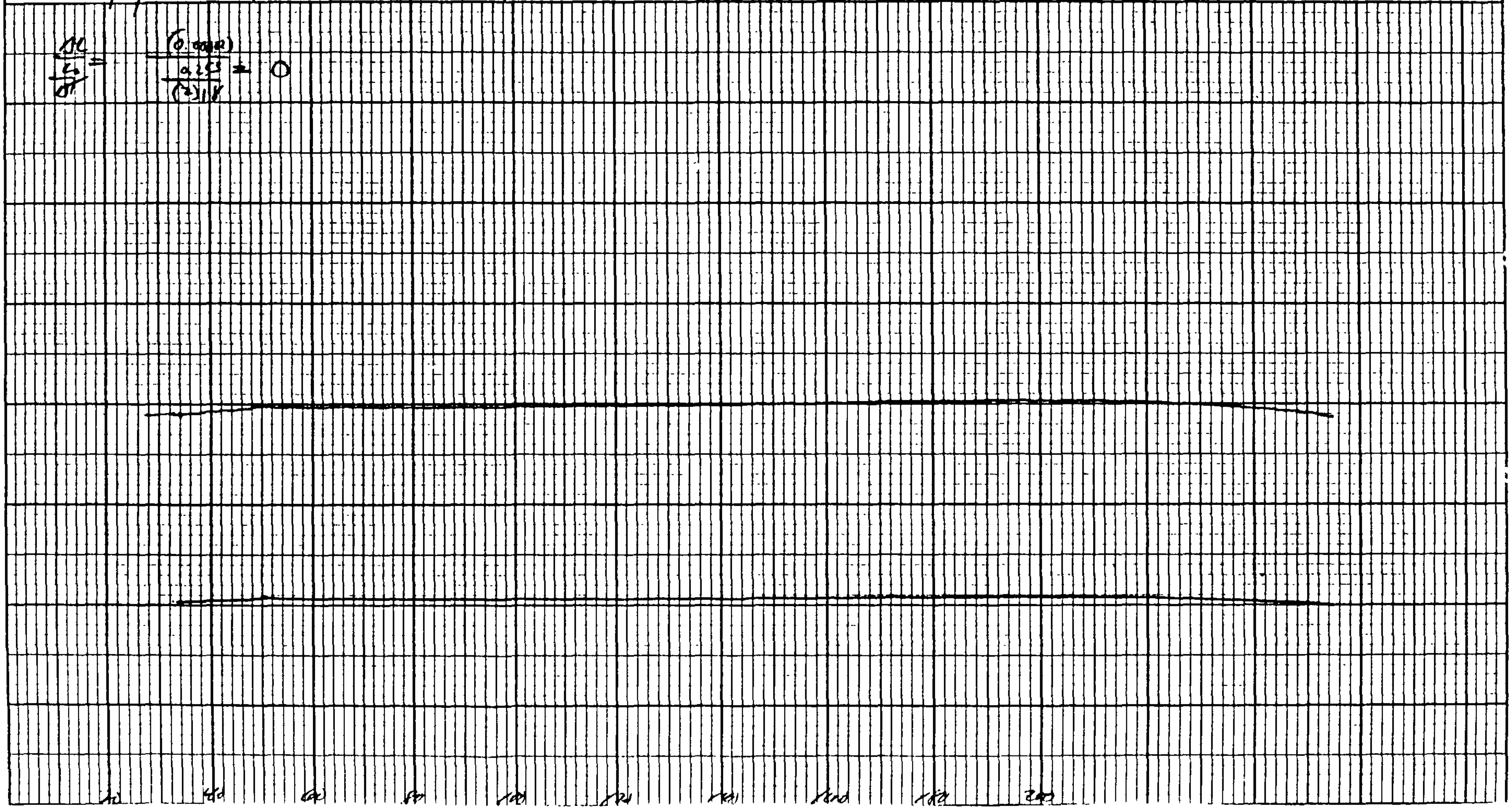
DUPONT Instruments

MEASURED VARIABLE

Chart 21B2

PART NO. 990088

	T-AXIS	DTA-DSC	TGA	TMA (μin/in°F)	
RUN NO.___ DATE 11/6/84	SCALE, °C/in ~~50~~ 20	SCALE, °C/in___	SCALE, mg/in___	SCALE, mils/in 0.1/0.2	
OPERATOR DL	PROG RATE, °C/min 10	(mcal/sec)/in___	SUPPRESSION, mg___	MODE Expansion	
SAMPLE D09281-2-START-2	HEAT ✓ COOL___ ISO___	WEIGHT, mg___	WEIGHT, mg___	SAMPLE SIZE 0.253	
ATM Ar @ STP	SHIFT, in 0	REFERENCE___	TIME CONST., sec___	LOAD, g 10	
FLOW RATE 1-5 SCFH			dY, (mg/min)/in___	dY, (10X), (mils/min)/in___	



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MEASURED VARIABLE

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Chart 21B3

PART NO. 990068

RUN NO ___ DATE 11/1/90	T-AXIS	DTA-DSC	TGA	TMA (air) (N2)
OPERATOR TJ	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
D6328-2-Insert-(3)	HEAT 600 COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.1"
ATM Air @ 50	SHIFT, in 0	REFERENCE	TIME CONST, sec	LOAD, g 10
FLOW RATE 3-5cc/m			dY, (mg/min)/in	dY, (10X), (mils/min)/in
Poly				

MEASURED VARIABLE

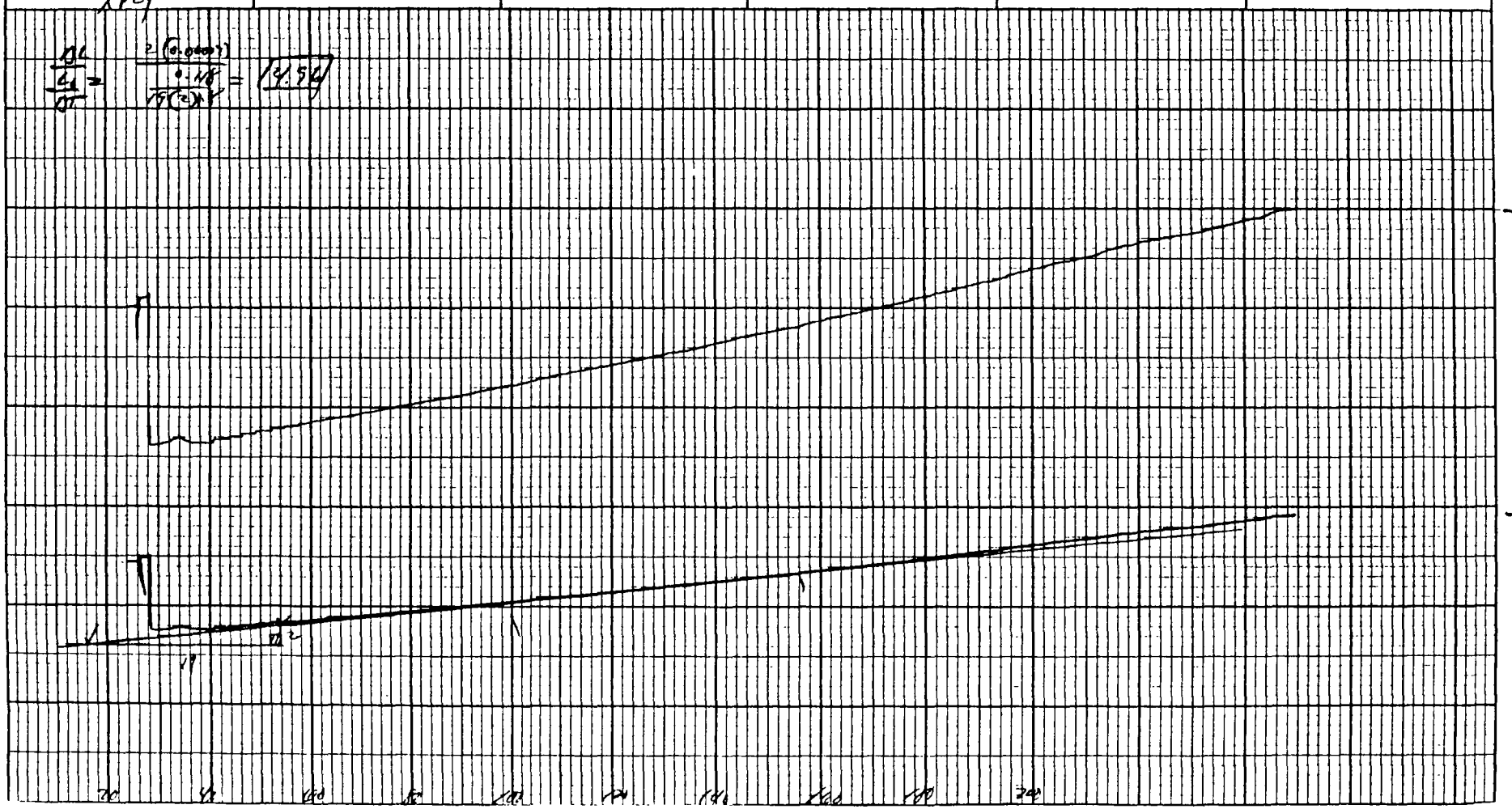
DUPONT Instruments

PART NO. 990088

RUN NO ___ DATE 11/7/90	T-AXIS	DTA-DSC	TGA	TMA (calc/mil)	
OPERATOR DH	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	
Dow 681-2-sheet (4)	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg ___	WEIGHT, mg ___	SAMPLE SIZE 0.118	
ATM Air @ STP	SHIFT, in 0	REFERENCE ___	TIME CONST., sec ___	LOAD, g 10	
FLOW RATE 25 SCF			dY, (mg/min) /in ___	dY, (10X), (mils/min)/in ___	

XPLY

$$\frac{\Delta L}{L_0} = \frac{2(0.0007)}{0.118} = 11.5\%$$



MEASURED VARIABLE

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Chart 21B4