FM 5064J (HITCO) LOTS #1 (H) - #4 (H)

FINGERPRINT TEST DATA REPORT

NAS8-36298 COPY # 21

P-261

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NAS8-36298

U.S. Polymeric O.E. 71108

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U.S. Polymeric

FILLER TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

Filler Lot for NASA Lot# 1

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

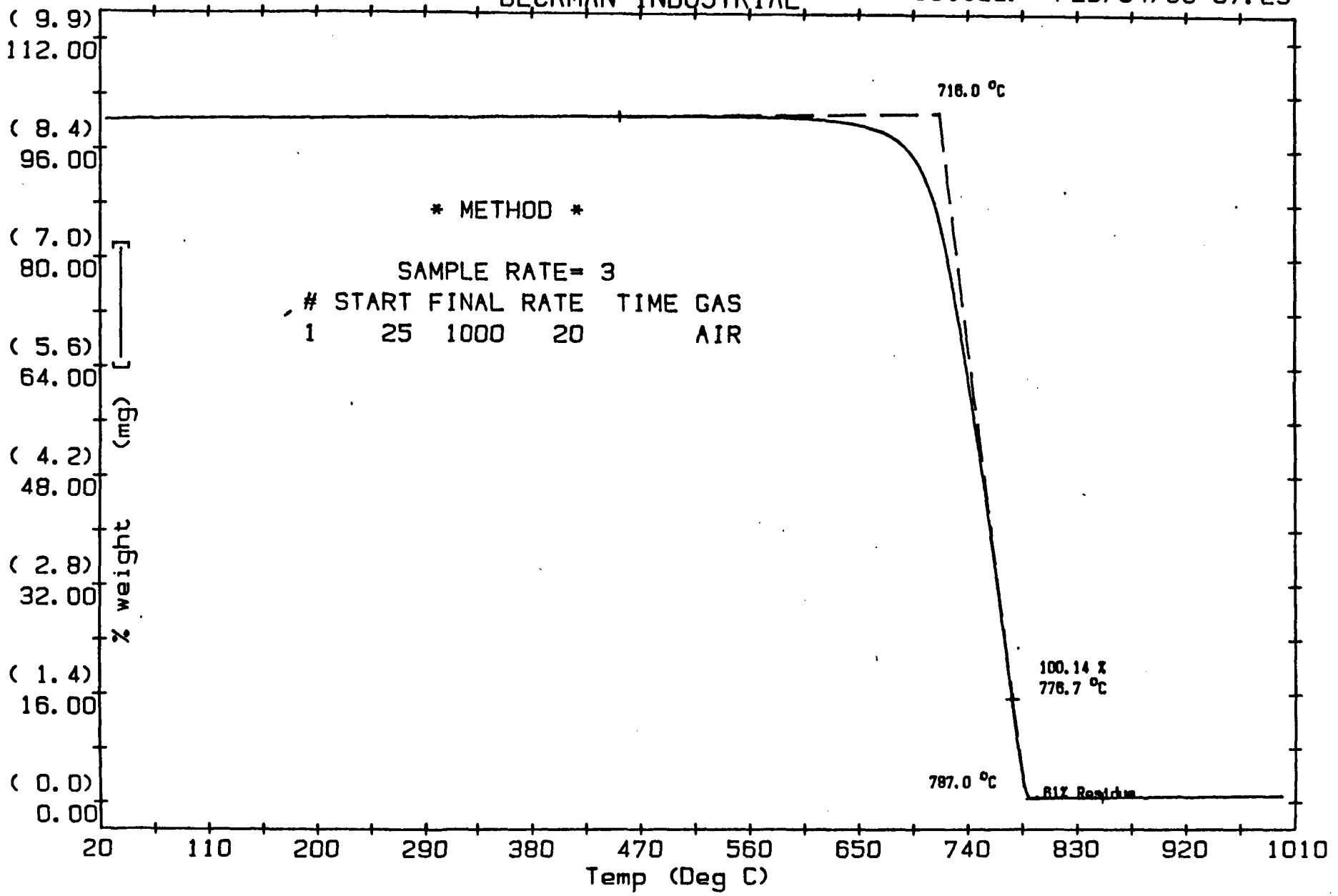


CHART 6A

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
Plotted: FEB/04/86 07:27

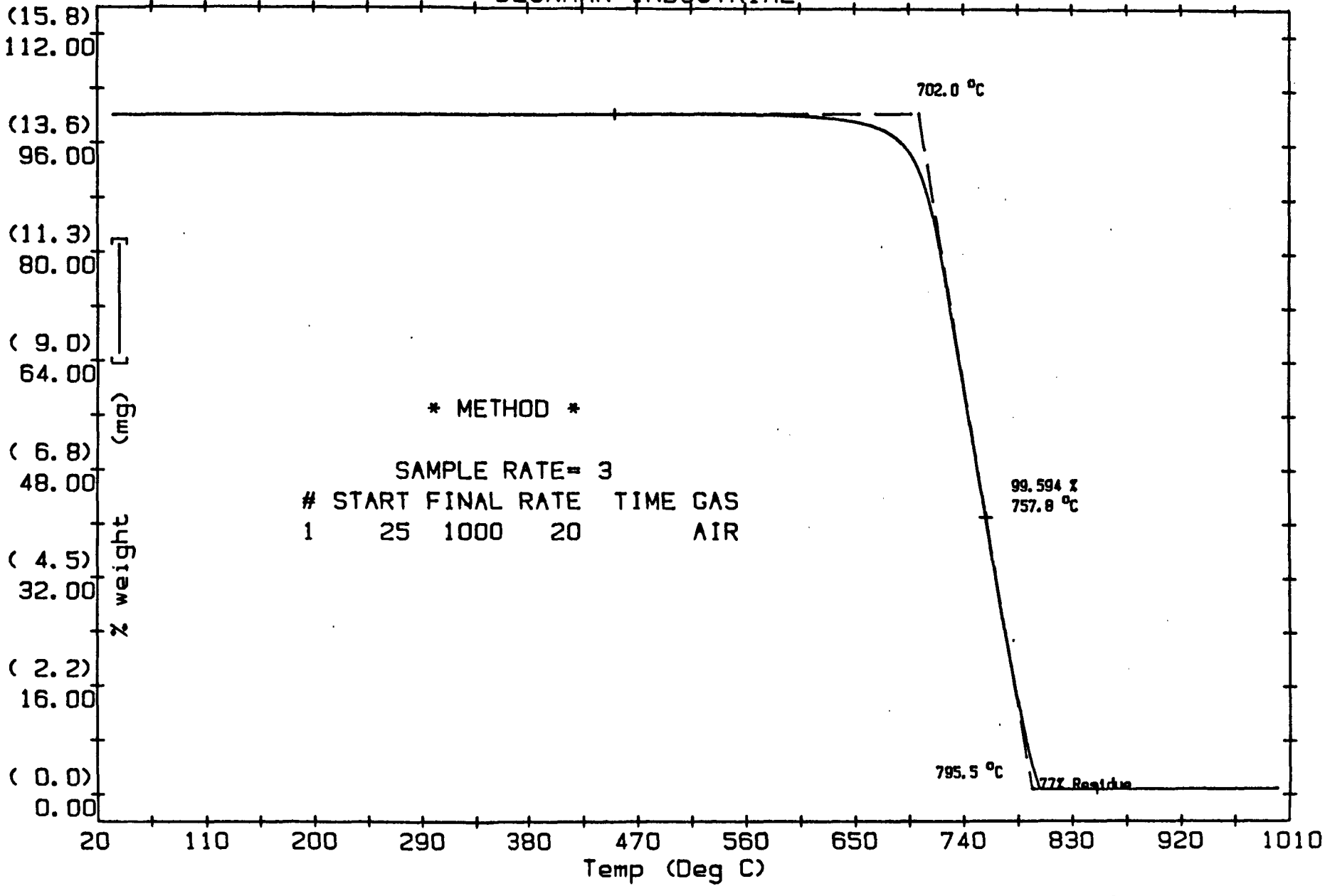


CHART 6B

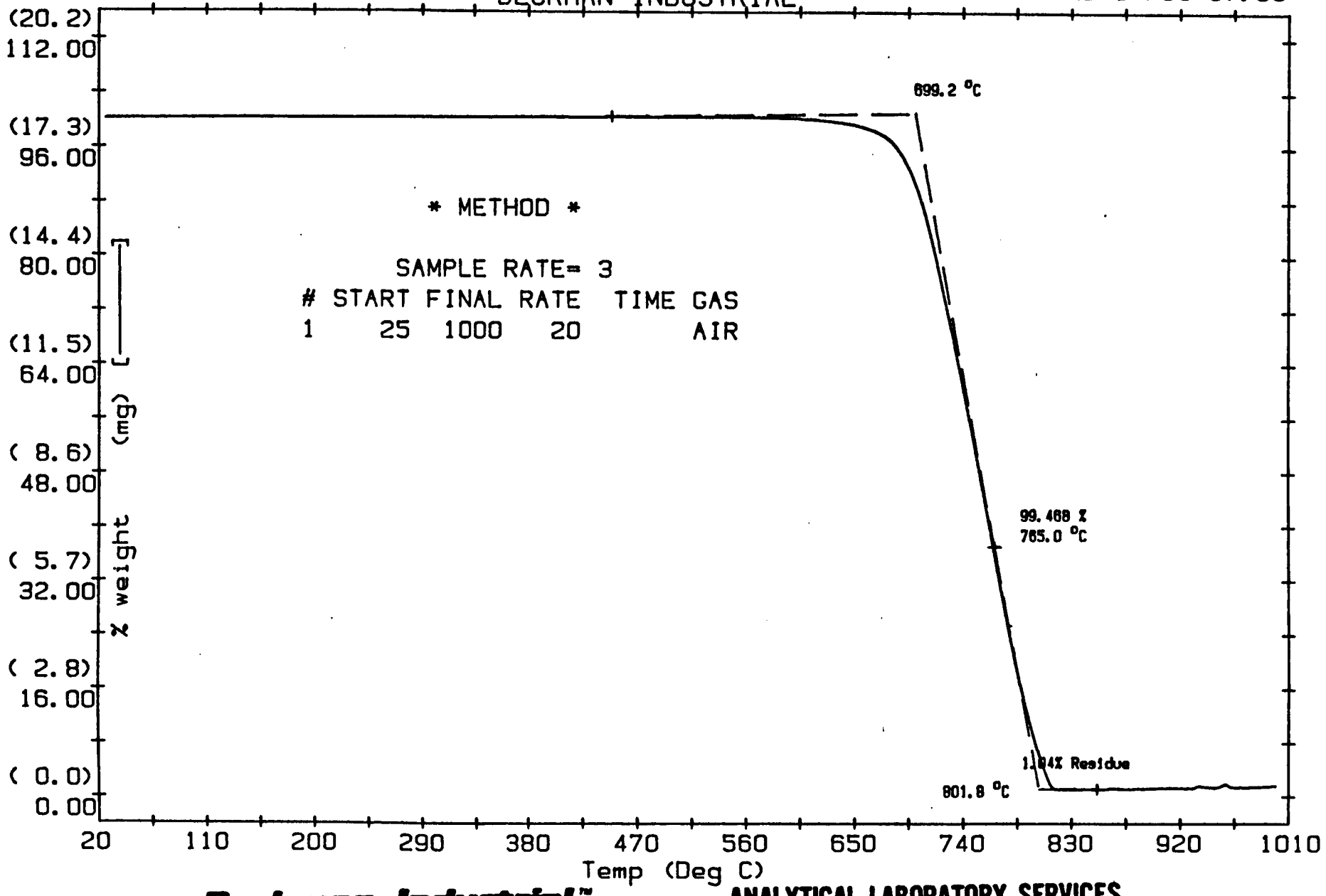
Beckman Industrial™ ANALYTICAL LABORATORY SERVICES

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

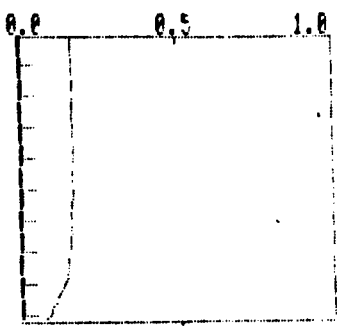
* CONDITIONS

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

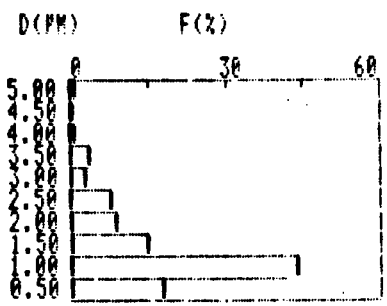
TIME ABSORBANCE



* 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

ORIGINAL PAGE IS
OF POOR QUALITY

HORIBA CAPA-500
PARTICLE ANALYZER

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

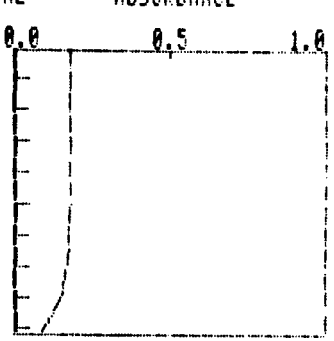
* CONDITIONS

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

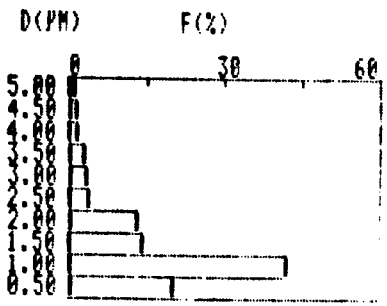
TIME ABSORBANCE



* 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

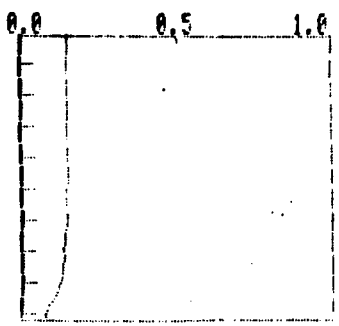
* CONDITIONS

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

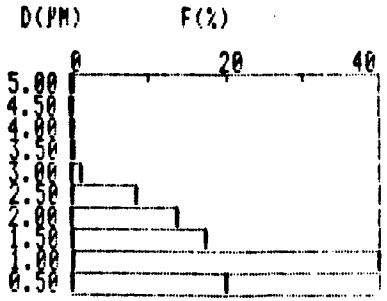
TIME ABSORBANCE



* 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

ORIGINAL PAGE IS
OF POOR QUALITY

HORIBA CAPA-500
PARTICLE ANALYZER

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

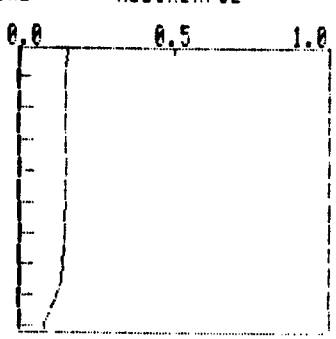
* CONDITIONS

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

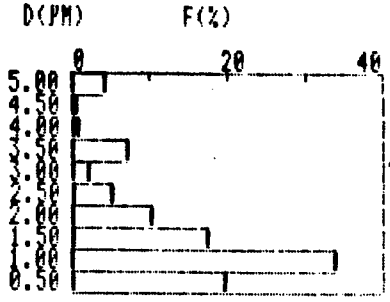
TIME ABSORBANCE



* 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

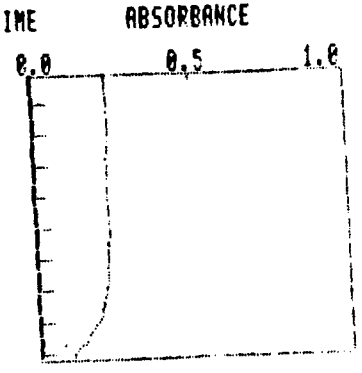
DATE 5-24-86
#1 SAMPLE NASA LOT#1-3
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

* 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

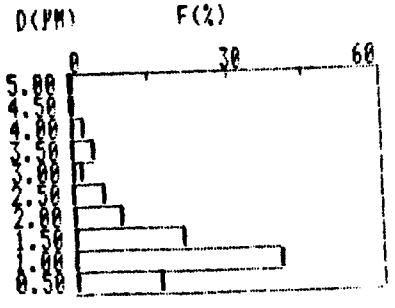


* DISTRIBUTION TABLE (BY VOL.)

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

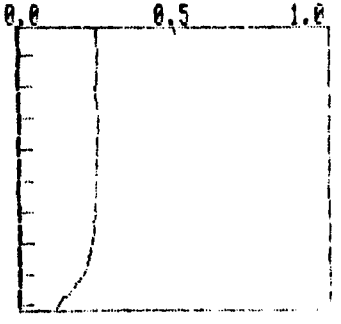
DATE 5-24-86
#2 SAMPLE NASA LOT#1-3
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

* 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

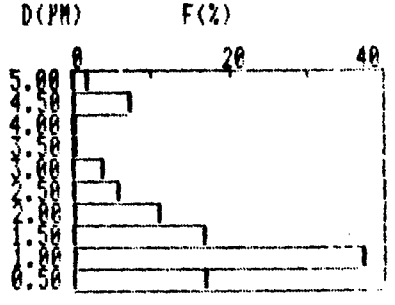


* DISTRIBUTION TABLE (BY VOL.)

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

TEST		PAGE
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3.	Brookfield Viscosity	1
4.	Gel Time	1
5.	Atomic Absorption	1
6.	Gas Chromatography	1
7.	TGA	1
8.	DSC	1
9.	HPLC	1
10.	GPC	1
11.	pH	2
12.	Phenol Content	2
13.	Chang's Index	2
14.	RDS	2
15.	NMR	2

CHARTS

Gas Chromatography	6A - 6B
TGA	7A - 7B
DSC	8A - 8B
HPLC	9A - 9B
GPC	10A - 10B
RDS	14A - 14B
NMR	15A - 15B

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		

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# 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

TYPICAL GAS CHROMATOGRAPH SET-UP

Operator	Q.M.Z.	Date	12/11/86
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 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	USP39A, F-1	Solvent	THF
Size	0.1 µl	Concn.	0.10227 g/ml

GAS CHROMATOGRAPHY STANDARD SOLVENT

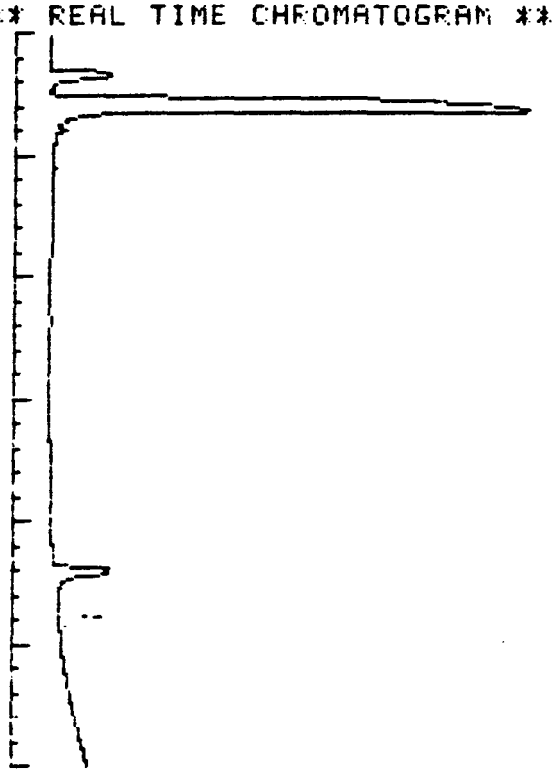
TEST METHOD CTM-55

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.

CHART 6A

*** REAL TIME CHROMATOGRAM ***



FINAL FULL SCALE MV.=1000.00

SAMPLE: USP39A 1-1
MISC.: C=0 10227GMS/ML

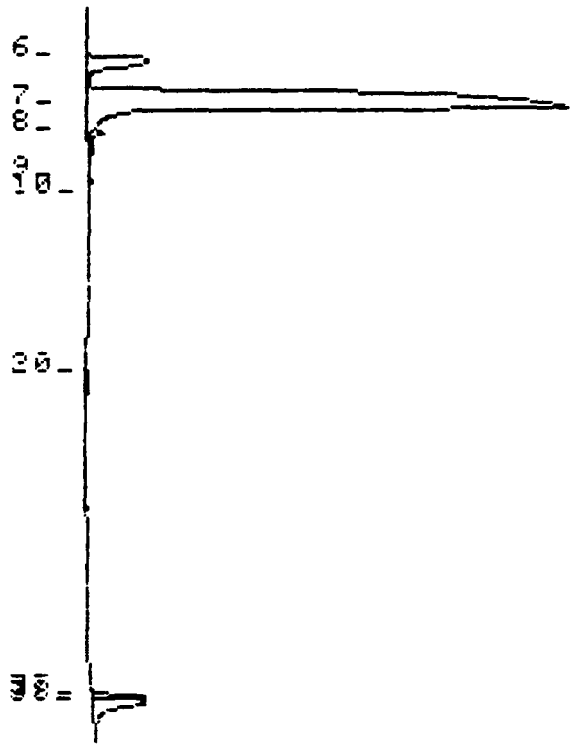
TIME: 11:15
DATE: 12/11/86
OPERATOR: JGZ

RUN TIME: 30 00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO.	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
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
10	6.05	7408	.197	4	163
20	11.75	7490	.199	3	355
37	21.95	107040	2.850	2	10311
38	22.13	186990	4.979	2	10194

TOTAL AREA= 3755543
THRESHOLD= 1
MIN PK.WIDTH= 15
AREA REJECT= 1000

VERTICAL SCALE FACTOR: 1X



SAMPLE: USP39A 1-1
MISC.: C=0.10227GMS/ML

TIME: 11:15
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.
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

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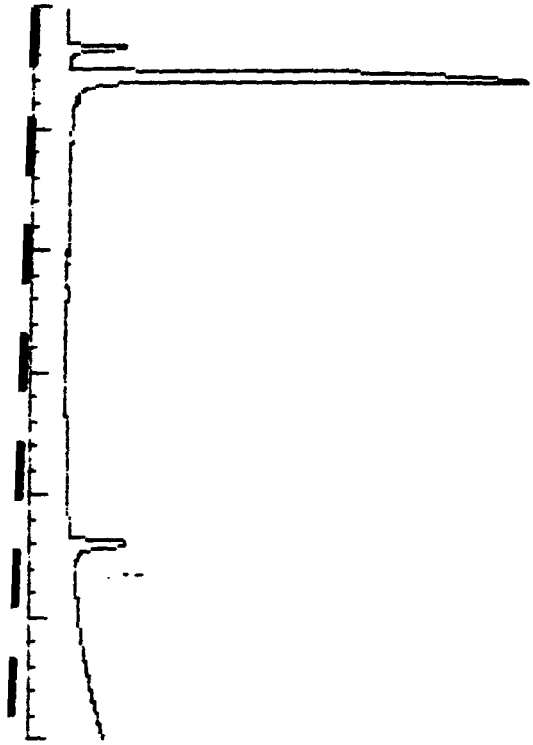
OF POOR QUALITY

CHART 6B



NAL FULL SCALE MV.=1000.00

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

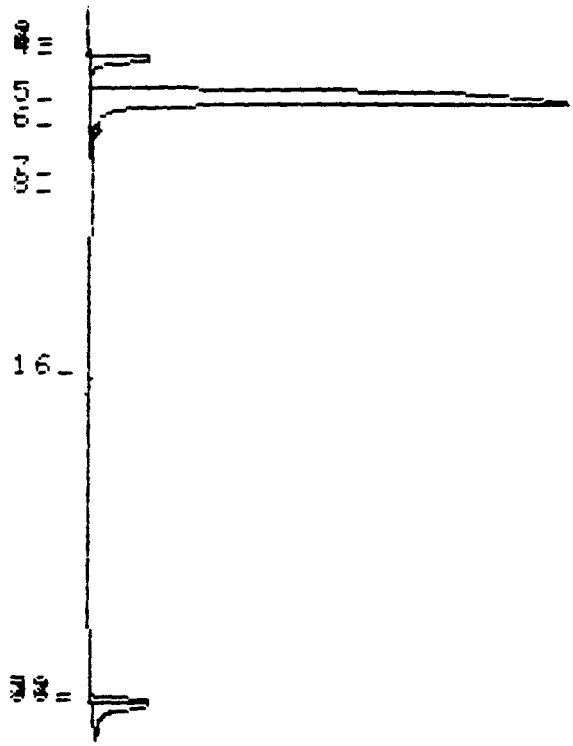
IME: 11:56
ATE: 12/11/86
PERATOR: JGZ

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

K O	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
1	.65	1623	.056	2	202
2	1.25	1128	.039	2	53
3	1.45	1143	.040	2	122
4	1.73	195650	6.780	2	11047
5	3.15	2357000	81.673	3	87114
6	4.00	33273	1.153	4	1558
7	5.58	3232	.112	4	314
8	6.08	1817	.063	4	67
5	11.75	7514	.260	1	419
2	21.98	104640	3.626	2	10260
3	22.10	178880	6.198	2	10209

OTAL AREA= 2885899
HRESHOLD= 1
IN.PK.WIDTH= 15
REA 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

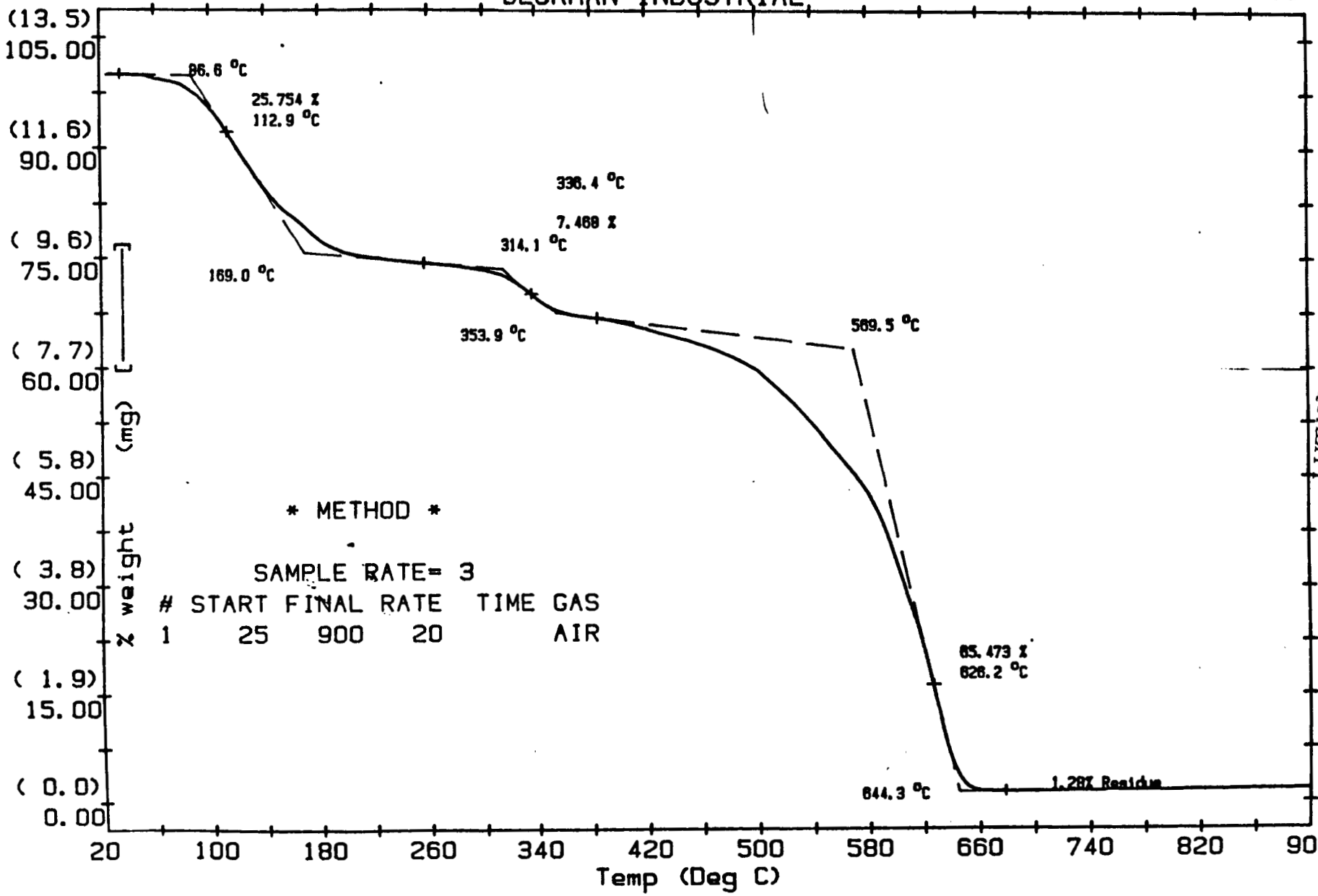


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CHART 7A

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

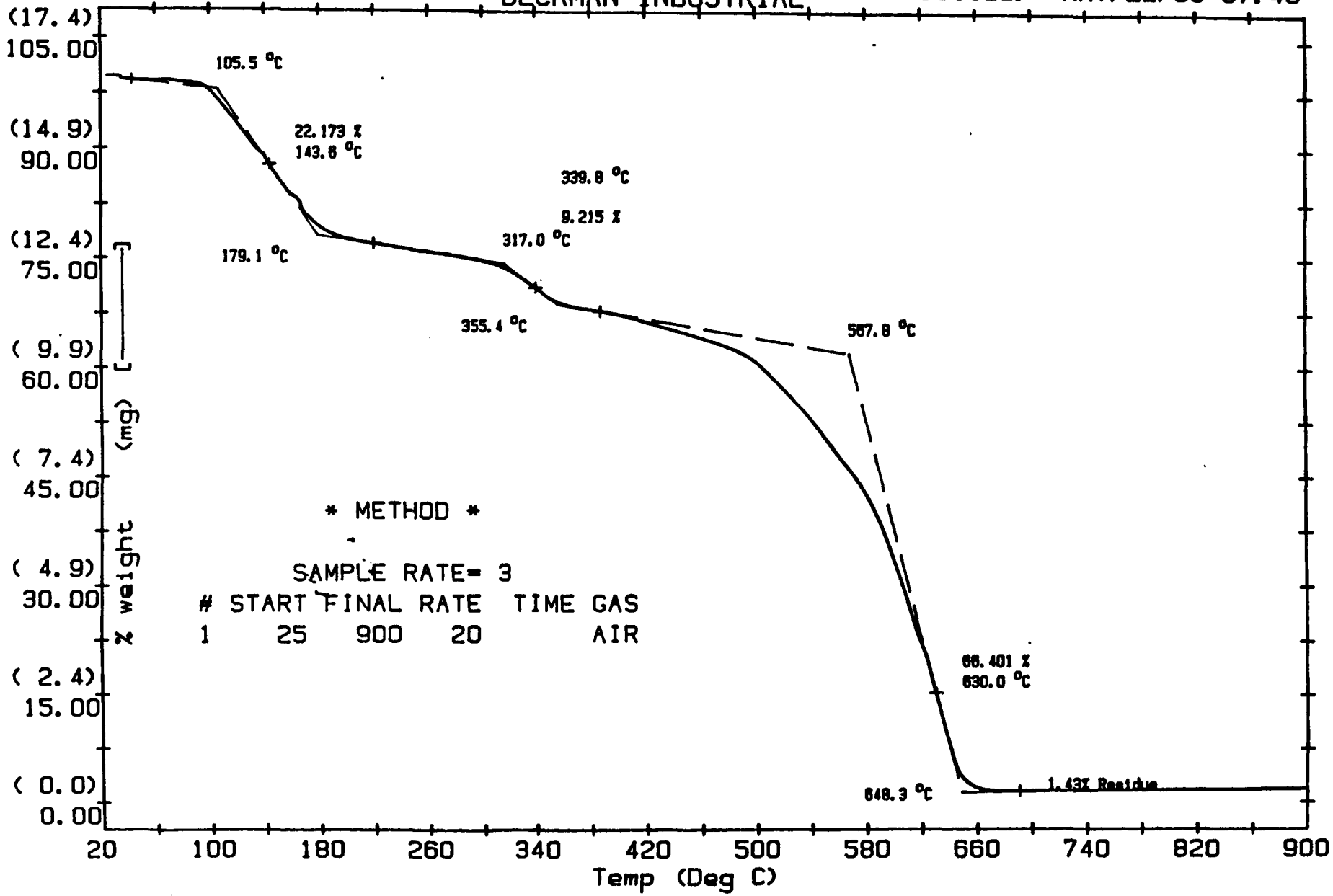

CHART 7B

PART NO. 990088

CHART 8A

RUN NO ___ DATE 4/3/86

OPERATOR [illegible]

SAMPLE: 1-1

ATM H_2 @ 1 atm.

FLOW RATE 40 ml/min.

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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

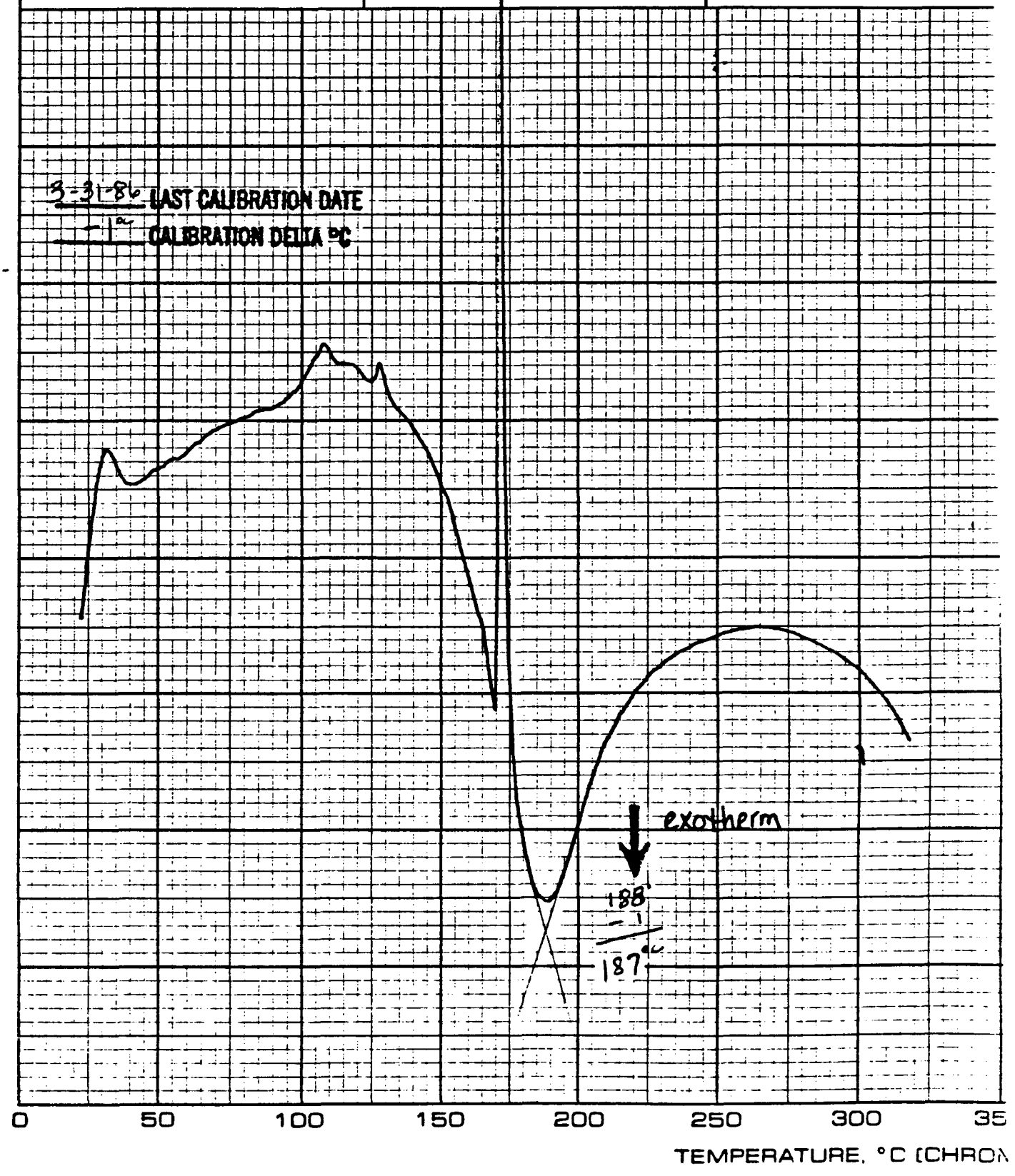
[mcal/sec]/in ___

WEIGHT, mg 3.4

REFERENCE 1 AL CUP & SEA

DUPONT Instruments

MEASURED VARIABLE ___



PART NO. 990088

CHART 8B

RUN NO ____ DATE 4/3/86

OPERATOR ____

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 ____

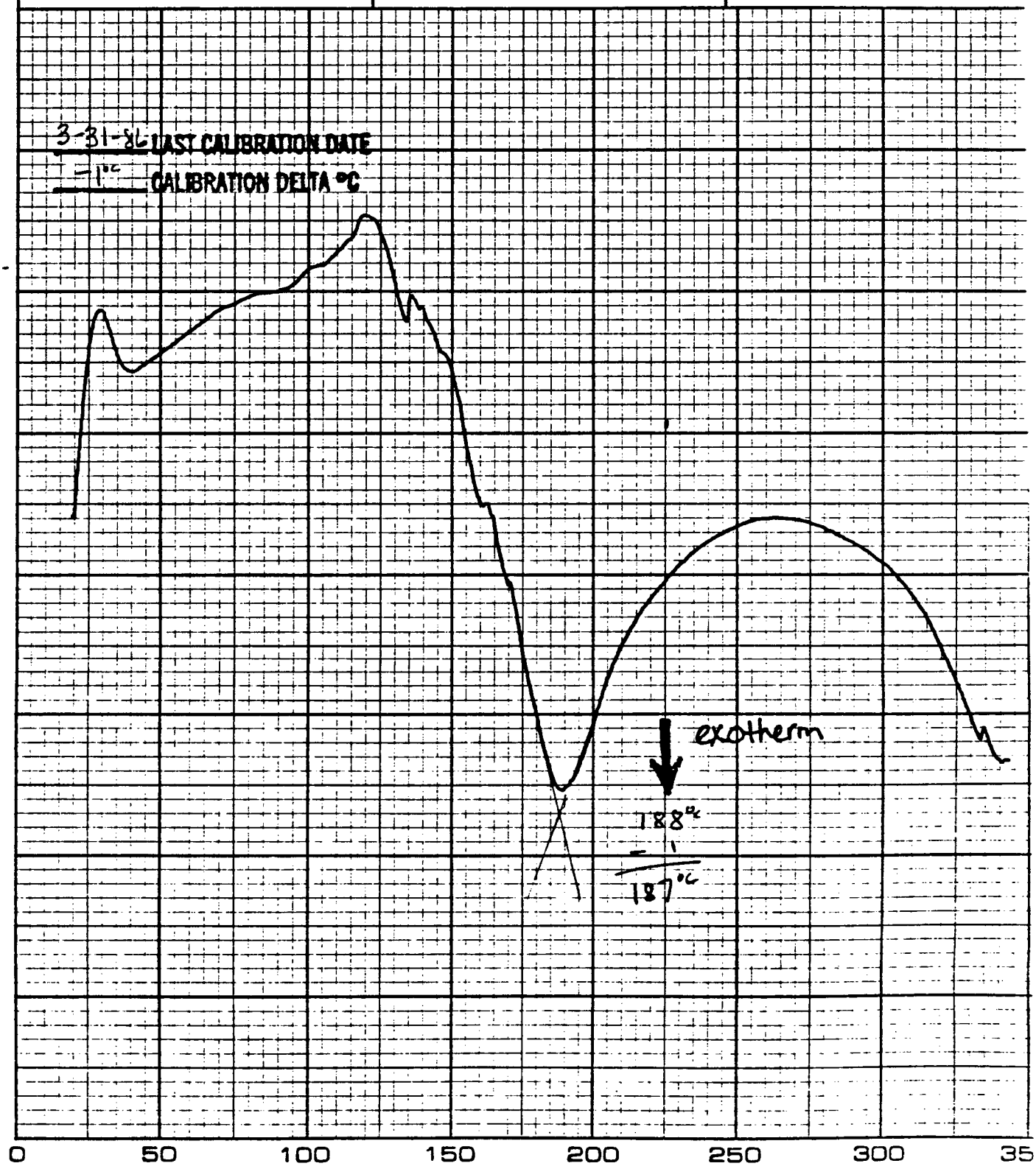
WEIGHT, mg 3.4

REFERENCE ____

1 AL cup & SE+C

DUPONT Instruments

MEASURED VARIABLE ____



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=PHEN026 FROM 0.00 MIN. TO 10.00 MIN. LOW SCALE= 5.400 Mv. HIGH SCALE= 10.790 Mv.
USP-39A, 1-1, C=6.54 MG/ML, 9/5/86, JGZ

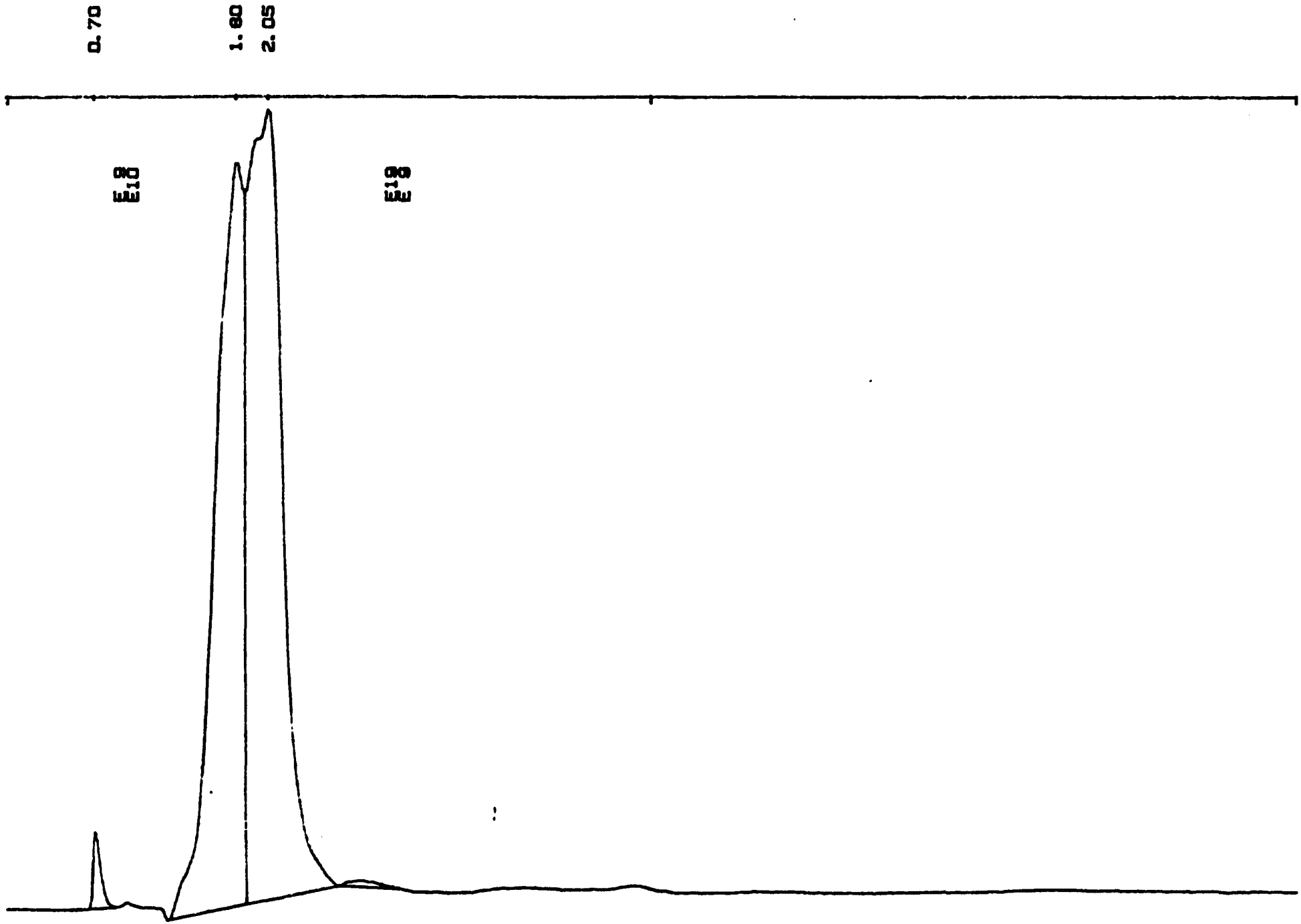


CHART 9B

FILE A:PHEN019.HDR TAKEN 09-01-1986 13:18:26

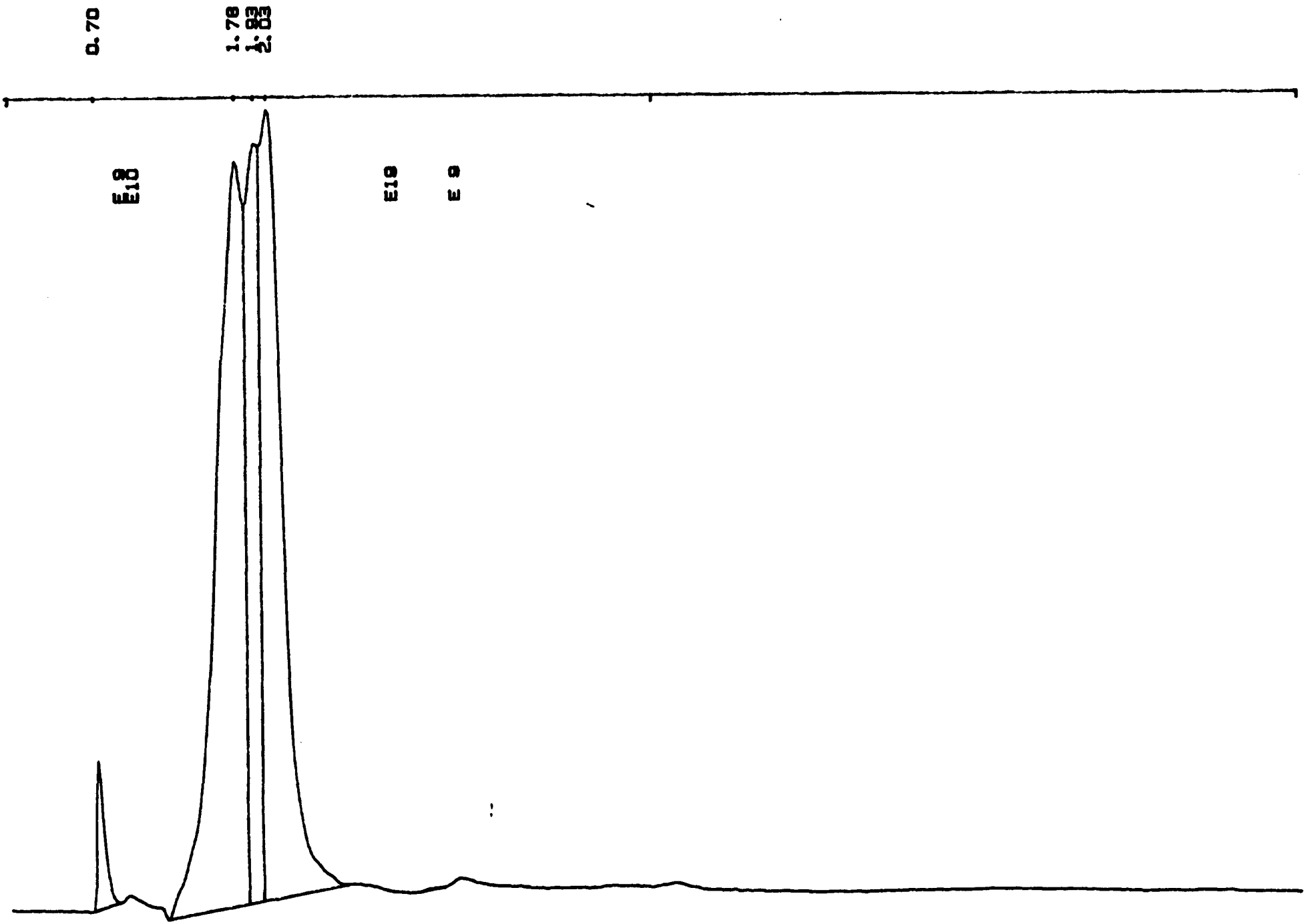
********* AREA PERCENT REPORT *********

Sample Name: USP39A,1-2,C=5.07 Operator Initials: JGZ
Date: 09-01-1986 13:18:26 Method:PHENOLIC DATA FILE: A:PHEN019.PTS
Interface: 4 Cycle#: 19 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

	Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
	0.76	4065	2.2807	1	1019	5.202	4.0
2	1.78	78141	43.8419	2	5072	100.000	15.4
3	1.93	34258	19.2209	2	5165	43.841	6.6
	2.03	61769	34.6565	2	5379	79.049	11.5

Total Area: 178233 Area Reject: 1000 One sample per 1.000 sec.

DATA FILE=PHEN019 FROM 0.00 MIN. TO 10.00 MIN. LOW SCALE [redacted] MV. HIGH SCALE [redacted] MV.
USP-38A, 1-2, C=5.07 MG/ML, 9/2/86, 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

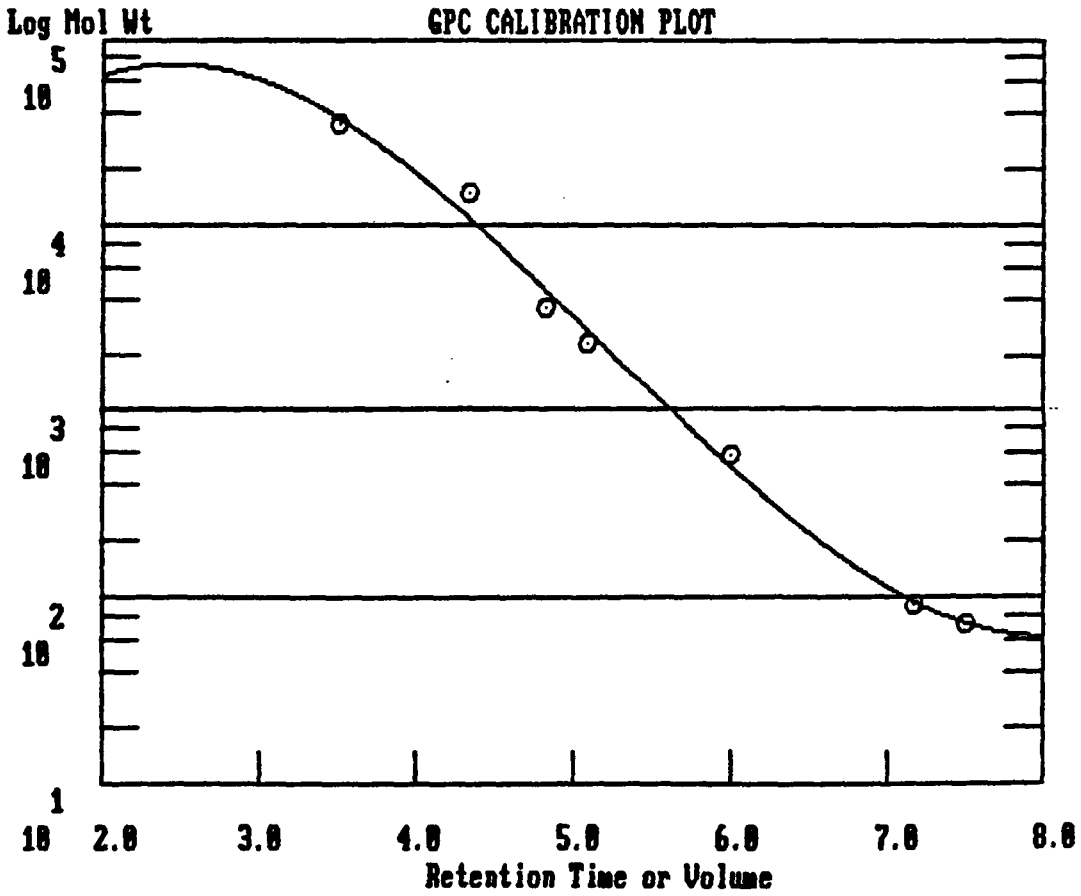


CHART 10A

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

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

```
**********************************************************************************
 Sample Name: USP39A 1-1=2.68                    Operator Initials: GBF          *
 Date:  08-05-1986 15:00:24 Method:              DATA FILE: A:GPC31.PTS          *
 Interface: 5               Cycle#:  31          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
ibration file: GPCPHEN
olecular Weight Distribution Averages
aseline TIMES:    3.85 to   10.00   MW:      22295 to          2
ocess  TIMES:     3.85 to   10.00   MW:      22295 to          2
tal Area:        211188
w=                 1231
=                   312
/Mn=             3.9362
z=                 3069
=                  1076
```

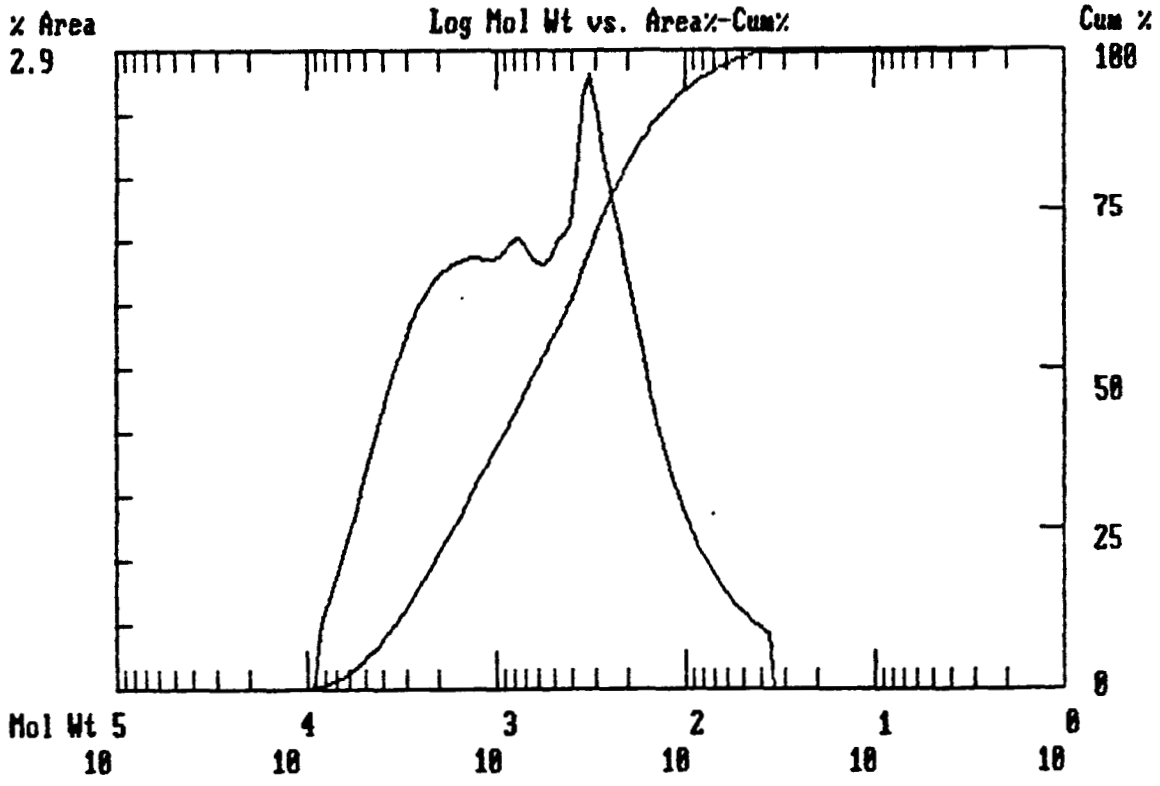


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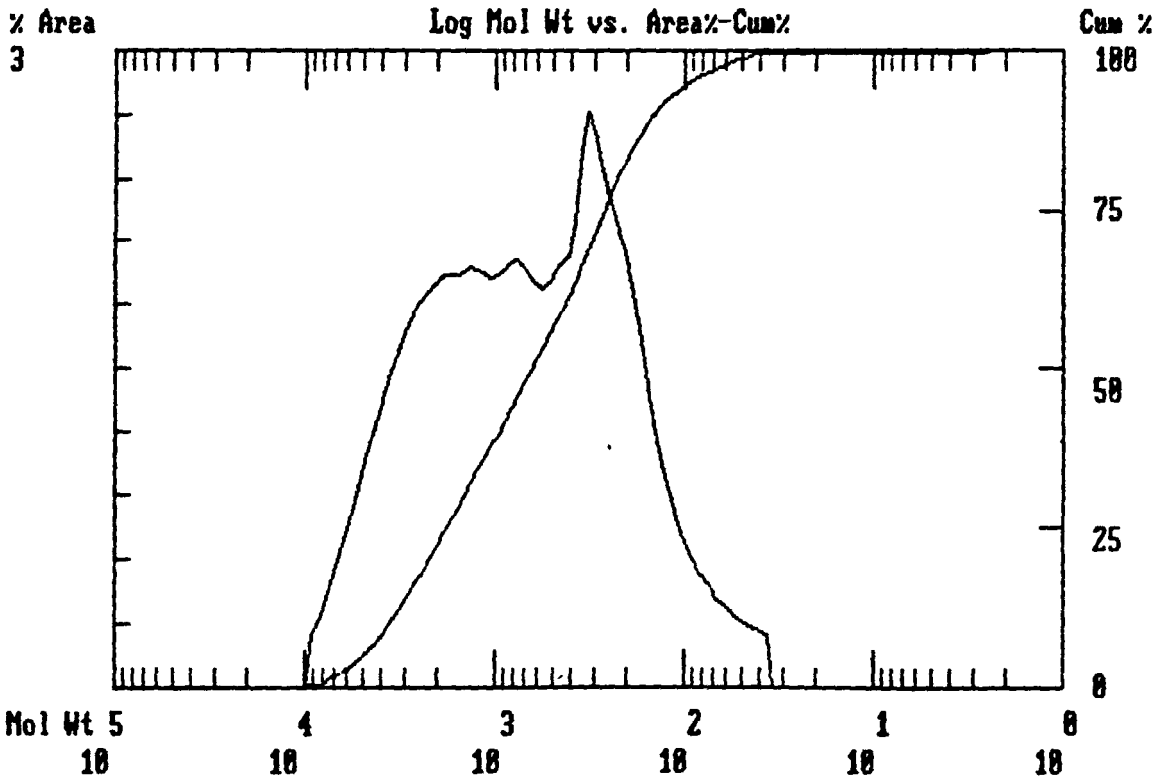
CHART 10B

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

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

```
**********************************************************************************
ple Name: USP39A 1-2=2.68                    Operator Initials: GBF              *
:e:  08-05-1986 15:15:18 Method:             DATA FILE: A:GPC32.PTS              *
erface: 5              Cycle#:  32           Channel#: 0    Vial#: N.A.          *
rting 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
cular Weight Distribution Averages
line TIMES:    3.85 to   10.00   MW:      22295 to          2
ess  TIMES:    3.85 to   10.00   MW:      22295 to          2
l Area:       211824
               1291
                324
in=           3.9783
               3246
               1126
```



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

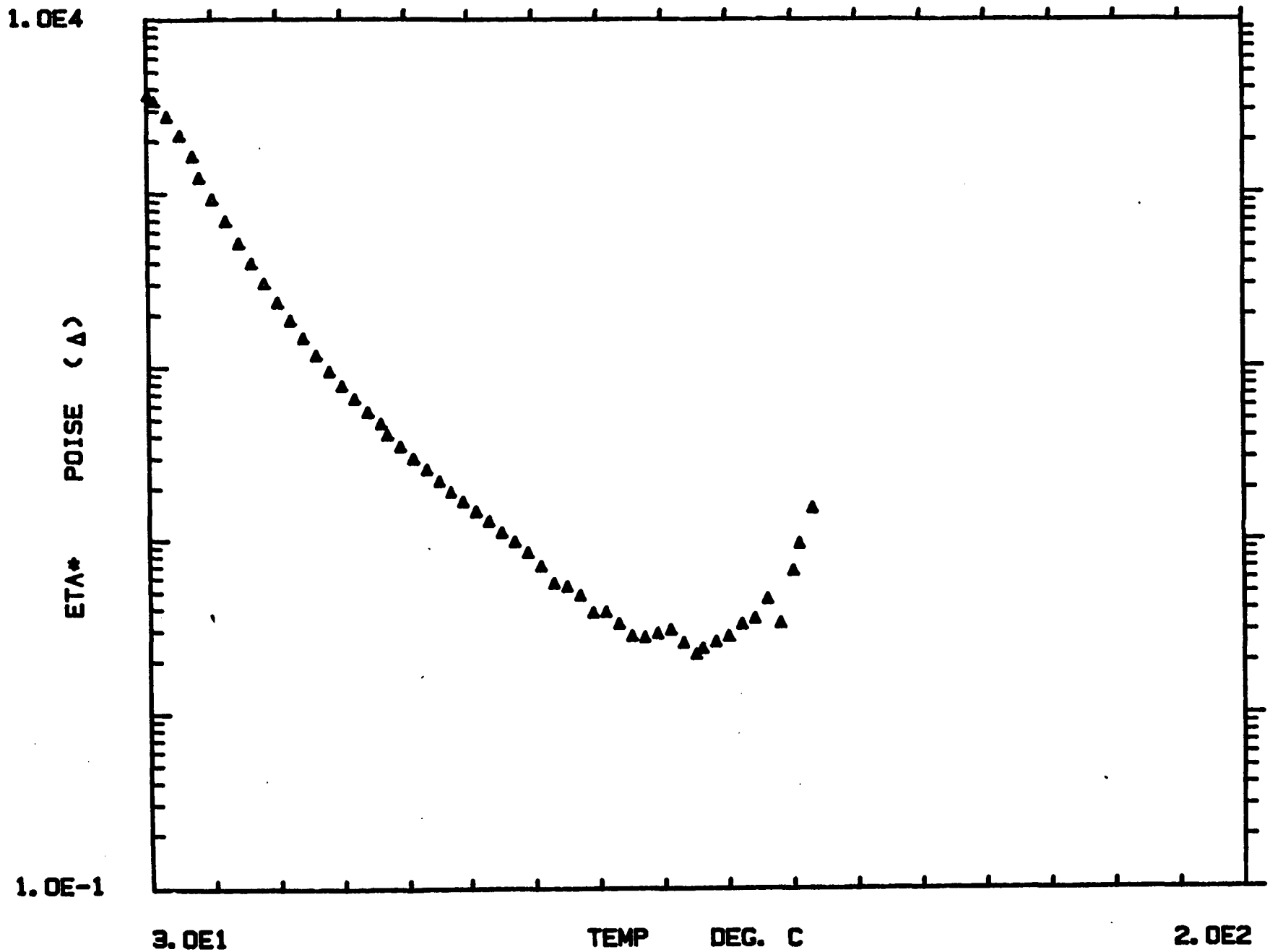


CHART 14A

Rheometrics RECAP II

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eriment No. : 8 Sample No. : 1

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

ator :CP

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

rating Mode : DYNAMIC

ep Type : CURE

metry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

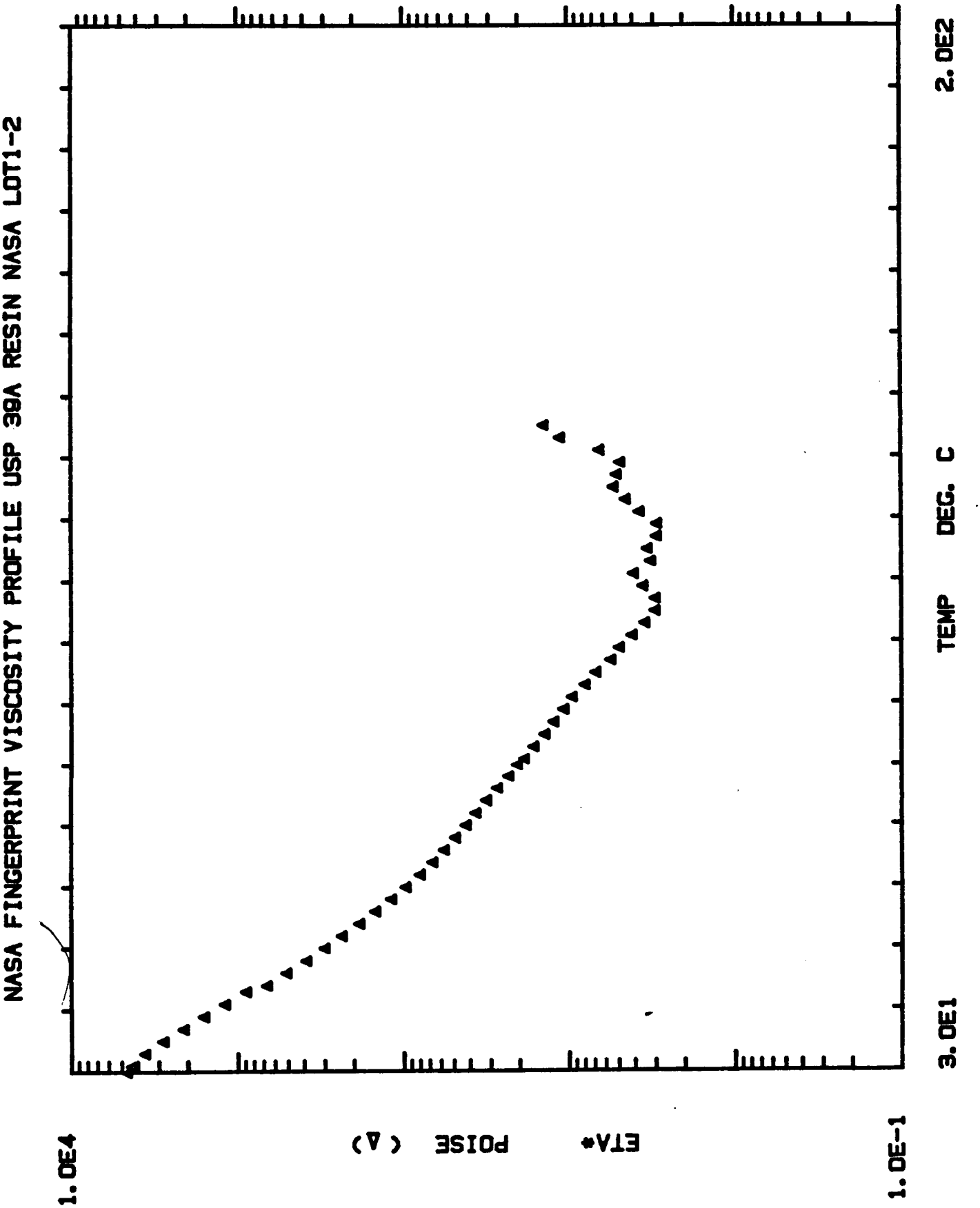
es :
AIN =50%
QUENCY =10 RAD/SEC

5A FINGERPRINT VISCOSITY PROFILE USP 39A 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	2.000e-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	3.300e+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	5.368e+002	2.240e+001	6.768e+001	8.000e+000	4.400e+001
10	4.111e+002	4.104e+002	2.378e+001	5.171e+001	9.000e+000	4.600e+001
11	3.153e+002	3.144e+002	2.382e+001	3.963e+001	1.000e+001	4.800e+001
12	2.442e+002	2.432e+002	2.197e+001	3.070e+001	1.100e+001	5.000e+001
13	1.934e+002	1.921e+002	2.259e+001	2.429e+001	1.200e+001	5.200e+001
14	1.529e+002	1.514e+002	2.136e+001	1.921e+001	1.300e+001	5.400e+001
15	1.214e+002	1.200e+002	1.858e+001	1.524e+001	1.400e+001	5.600e+001
16	9.808e+001	9.666e+001	1.659e+001	1.232e+001	1.500e+001	5.800e+001
17	8.082e+001	7.951e+001	1.448e+001	1.015e+001	1.600e+001	6.000e+001
18	6.811e+001	6.697e+001	1.242e+001	8.554e+000	1.700e+001	6.200e+001
19	5.720e+001	5.620e+001	1.064e+001	7.178e+000	1.800e+001	6.400e+001
20	4.908e+001	4.819e+001	9.274e+000	6.157e+000	1.900e+001	6.600e+001
21	4.220e+001	4.139e+001	8.182e+000	5.291e+000	2.000e+001	6.700e+001
22	3.613e+001	3.546e+001	6.922e+000	4.536e+000	2.100e+001	6.900e+001
23	3.089e+001	3.033e+001	5.841e+000	3.879e+000	2.200e+001	7.100e+001
24	2.675e+001	2.623e+001	5.276e+000	3.358e+000	2.300e+001	7.300e+001
25	2.282e+001	2.244e+001	4.144e+000	2.867e+000	2.400e+001	7.500e+001
26	1.974e+001	1.940e+001	3.659e+000	2.477e+000	2.500e+001	7.700e+001
27	1.732e+001	1.699e+001	3.366e+000	2.175e+000	2.600e+001	7.900e+001
28	1.517e+001	1.488e+001	2.933e+000	1.903e+000	2.700e+001	8.100e+001
29	1.335e+001	1.317e+001	2.145e+000	1.676e+000	2.800e+001	8.300e+001
30	1.149e+001	1.132e+001	1.950e+000	1.442e+000	2.900e+001	8.500e+001
31	1.013e+001	9.893e+000	2.167e+000	1.272e+000	3.000e+001	8.700e+001
32	8.766e+000	8.654e+000	1.396e+000	1.100e+000	3.100e+001	8.900e+001
33	7.337e+000	7.274e+000	9.610e-001	9.215e-001	3.200e+001	9.100e+001
34	5.831e+000	5.798e+000	6.145e-001	7.324e-001	3.300e+001	9.300e+001
35	5.574e+000	5.555e+000	4.656e-001	6.994e-001	3.400e+001	9.500e+001
36	4.962e+000	4.953e+000	3.040e-001	6.234e-001	3.500e+001	9.700e+001
37	3.948e+000	3.939e+000	2.647e-001	4.954e-001	3.600e+001	9.900e+001
38	3.987e+000	3.985e+000	1.262e-001	5.009e-001	3.700e+001	1.010e+002
39	3.405e+000	3.405e+000	0.723e-001	4.275e-001	3.800e+001	1.030e+002
40	2.898e+000	2.898e+000	0.000e+000	3.642e-001	3.900e+001	1.050e+002
41	2.857e+000	2.853e+000	1.393e-001	3.589e-001	4.000e+001	1.070e+002
42	3.003e+000	2.947e+000	5.728e-001	3.770e-001	4.100e+001	1.090e+002
43	3.157e+000	2.947e+000	1.133e+000	3.967e-001	4.200e+001	1.110e+002
44	2.663e+000	2.398e+000	1.157e+000	3.342e-001	4.300e+001	1.130e+002
45	2.290e+000	1.969e+000	1.135e+000	2.874e-001	4.400e+001	1.150e+002
46	2.477e+000	2.312e+000	8.892e-001	3.106e-001	4.500e+001	1.160e+002
47	2.705e+000	2.249e+000	1.504e+000	3.394e-001	4.600e+001	1.180e+002
48	2.911e+000	2.580e+000	1.347e+000	3.653e-001	4.700e+001	1.200e+002
49	3.417e+000	3.001e+000	1.634e+000	4.284e-001	4.800e+001	1.220e+002
50	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
1	4.786e+000	4.450e+000	1.759e+000	5.999e-001	5.000e+001	1.260e+002
2	3.464e+000	3.193e+000	1.343e+000	4.344e-001	5.100e+001	1.280e+002
3	6.979e+000	6.453e+000	2.657e+000	8.741e-001	5.200e+001	1.300e+002
4	1.003e+001	9.418e+000	3.457e+000	1.258e+000	5.300e+001	1.310e+002
5	1.616e+001	1.532e+001	5.138e+000	2.025e+000	5.400e+001	1.330e+002


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

ORIGINAL PAGE IS
OF POOR QUALITY

Rheometrics RECAP II

---

erimeni No. : 7 Sample No. : 1

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

rator :CP

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

rating Mode : DYNAMIC

ep Type : CURE

metry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

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

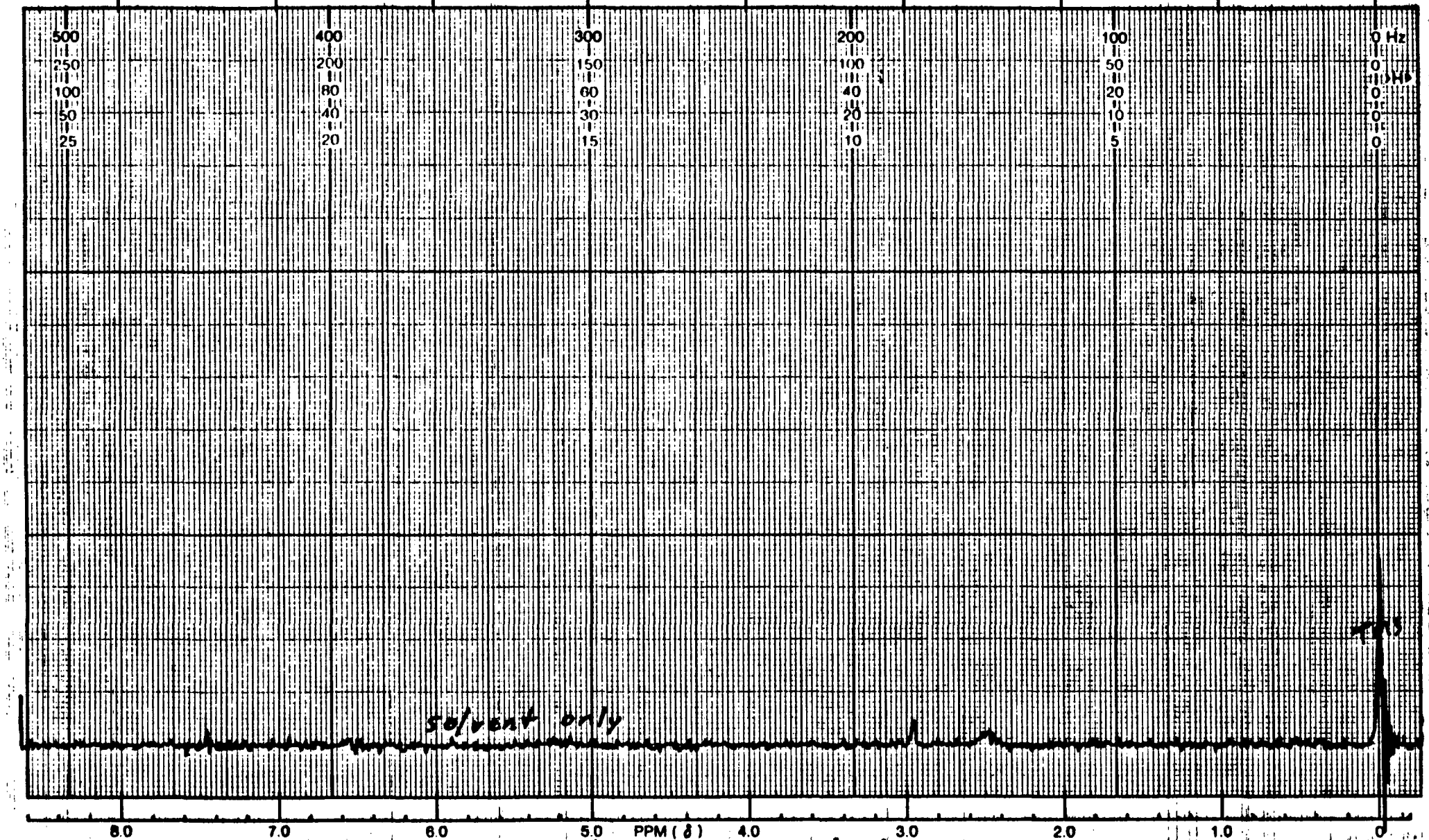
6A FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT1-2

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	6.109e+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	2.082e+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

7	2.043e+001	2.006e+001	3.877e+000	2.564e+000	2.600e+001	8.000e+001
8	1.849e+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	2.329e+000	1.533e+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	2.970e+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	3.486e+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

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

p.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
51	5.075e+000	4.159e+000	2.908e+000	6.364e-001	5.000e+001	1.270e+002
52	4.836e+000	3.218e+000	3.610e+000	6.067e-001	5.100e+001	1.290e+002
53	6.447e+000	5.135e+000	3.898e+000	8.098e-001	5.200e+001	1.310e+002
54	1.123e+001	9.521e+000	5.956e+000	1.411e+000	5.300e+001	1.330e+002
55	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 ✓ AUTO ☐

SWEEP TIME (SEC): 50 250 500 1000 (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: Uvasol-d + 0.82% TMS
DEC. LEVEL

REMARKS:

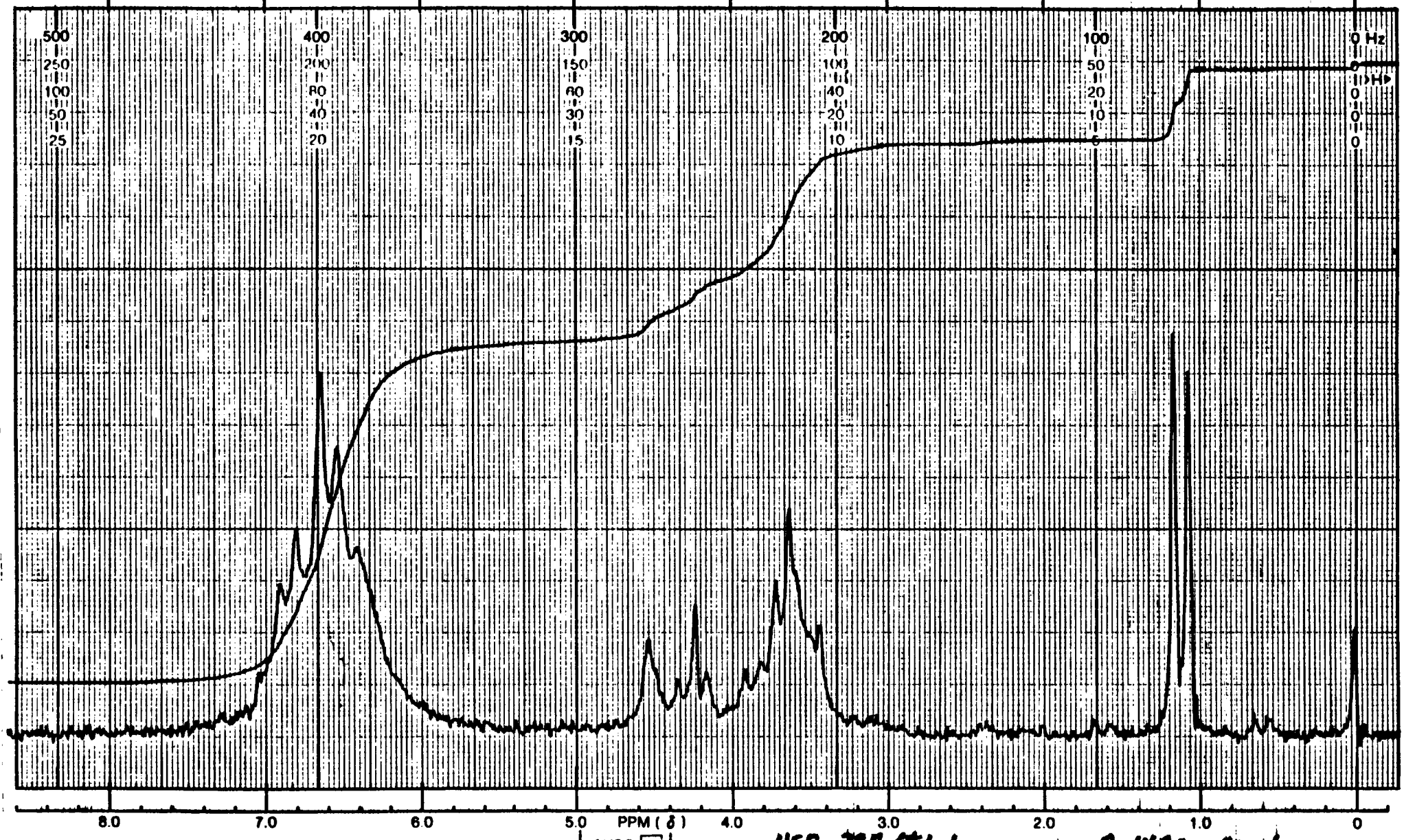
ORIGINAL PAGE IS
OF POOR QUALITY

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): 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

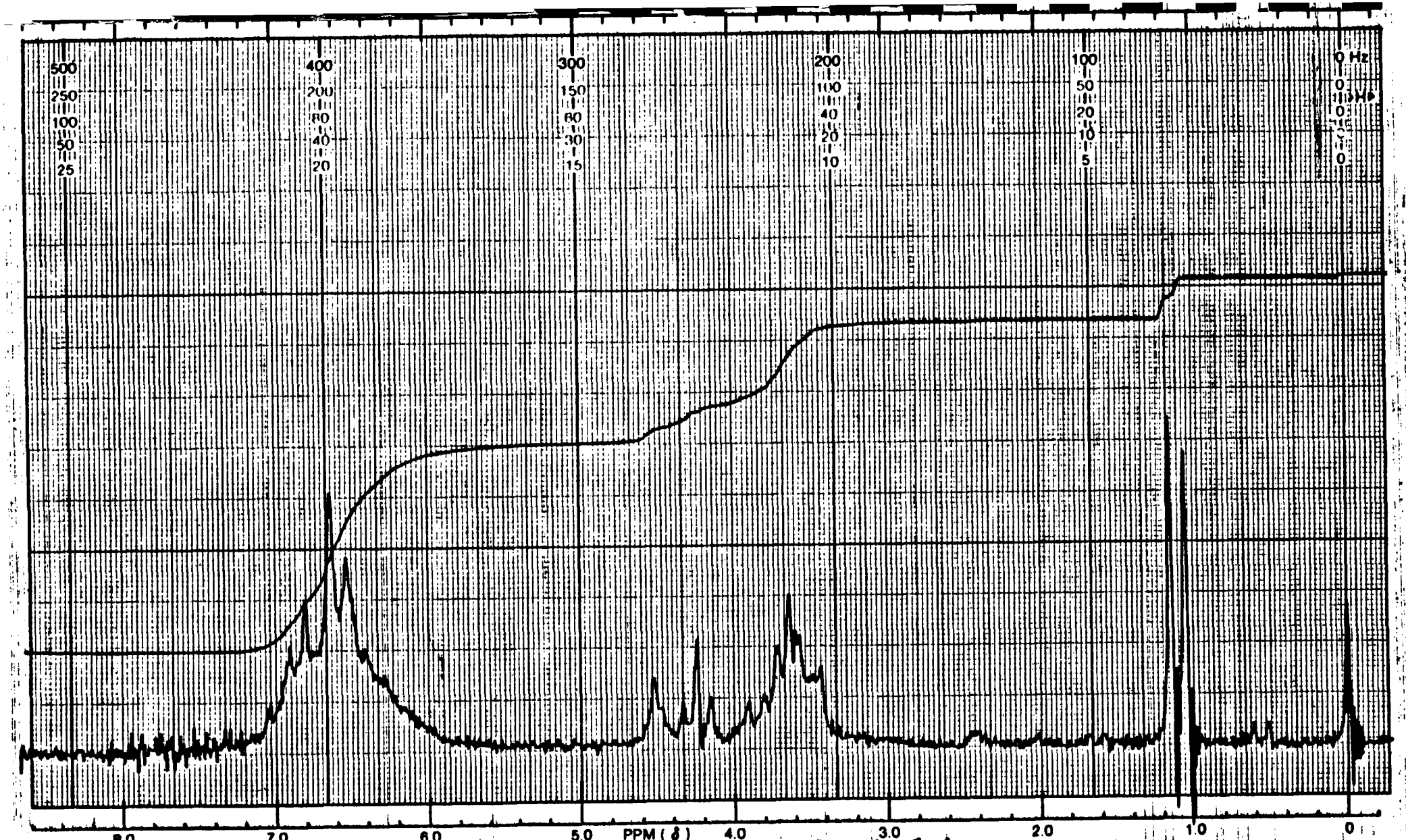
CHART 15A

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

DATE: 3-21-86

OPERATOR DGW

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



SWEEP OFFSET (Hz): 0
SPECTRUM AMPLITUDE: 2.0
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: Uniid-d + 0.5% TMS
DEC. LEVEL

REMARKS: 0.099 gm sample
0.817 gm solvent

ORIGINAL PAGE IS
OF POOR QUALITY

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

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

CHART 15B

TABLE OF CONTENTS

FABRIC TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

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1b.	Breaking Strength, FILL	1
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2b.	Hydrogen Assay	1
2c.	Nitrogen Assay	1
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7b.	Moisture Content	2
7c.	Ash Content	2
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CHARTS

Visual Inspection ..... 3A - 3B

TGA ..... 6A - 6C

U.S. Polymeric

FABRIC TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

WCA Fabric for NASA Lot# 1 (HITCO)

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

	#1-1S	#1-1E	#1-2S	LOT1 AVG
PICK	50	46	38	44.7
CENTER	56	39	44	46.3
PLAIN	60	42	48	50.0
AVG.	55.3	42.3	43.3	47.0

1b. Breaking Strength, lbs/inch, FILL
ASTMD 1682

PICK	14	7	15	12.0
CENTER	15	9	12	12.0
PLAIN	14	12	14	13.3
AVG.	14.3	9.3	13.7	12.4

2a. Carbon Assay, %
MDQAI 5560

PICK	99.3	99.9	99.8	99.67
CENTER	99.7	99.9	99.9	99.83
PLAIN	99.6	99.8	99.8	99.73
AVG.	99.53	99.87	99.83	99.74

2b. Hydrogen Assay, %
MDQAI 5560

PICK	<.01	<.01	<.01	EST .001
CENTER	<.01	<.01	<.01	EST .001
PLAIN	.01	<.01	<.01	EST .004
AVG.	EST .004	EST .001	EST .001	EST .002

2c. Nitrogen Assay, %
MDQAI 5560

PICK	.30	.10	.20	.200
CENTER	.04	.08	.10	.073
PLAIN	.03	.05	.10	.060
AVG.	.123	.077	.133	.111

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

4. Specific Gravity, Units
PTM-84

PICK	1.6487	1.6606	1.6345	1.6479
CENTER	1.6029	1.6529	1.6248	1.6269
PLAIN	1.6003	1.6846	1.6351	1.6400
AVG.	1.617	1.666	1.631	1.638

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

WCA Fabric for NASA Lot# 1 (HITCO)

5. pH, Units
CTM-24B

	#1-1S	#1-1E	#1-2S	LOT1 AVG
	6.6	6.4	6.6	6.53
	6.4	6.3	6.6	6.43
AVG.	6.5	6.35	6.6	6.48

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

SET UP# 1		SET UP# 2	
1-1S	935	1-1E	855
1-2S	936		
AVG.	936		

See Chart 6A-6C

7a. Atomic Absorption, ppm
CTM-53B

	#1-1S	#1-1E	#1-2S	LOT1 AVG
Na	18	23	6	15.7
K	1	0	0	0.3
Ca	8	8	7	7.7
Mg	1	0	1	0.7
Li	0	0	0	0.0
AVG.	28	31	14	24.3

7b. Moisture Content, %
CTM-53B

	.025	.015	.010	.017

7c. Ash Content, %
CTM-53B

	.010	.020	.020	.017

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

AVERAGE	10.88	11.54	11.77	11.40
Minimum	10.00	9.95	10.10	9.95
Maximum	12.45	13.00	13.95	13.95
Std. Dev	0.79	1.02	1.18	1.05

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

AVERAGE	10.07
Minimum	7.95
Maximum	13.05
Std. Dev	1.48

WCA Fabric for NASA Lot# 1 (HITCO)

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

	#1-1S	#1-1E	#1-2S	LOT1 AVG
	30	29	29	29.3
	30	29	29	29.3
	30	29	29	29.3
	30	29	29	29.3
	30	29	29	29.3
AVG.	30.0	29.0	29.0	29.3

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

	23	22	22	22.3
	23	22	22	22.3
	23	22	22	22.3
	23	22	22	22.3
	23	22	22	22.3
AVG.	23.0	22.0	22.0	22.3

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

LEFT	2.566	2.538	2.523	2.542
CENTER	2.520	2.528	2.488	2.512
RIGHT	2.578	2.566	2.524	2.556
AVG.	2.555	2.544	2.512	2.537

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

LEFT	.43	.43	.44	.43
CENTER	.24	.28	.36	.29
RIGHT	.47	.58	.79	.61
AVG.	.38	.43	.53	.45

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

LEFT	.35	.36	.28	.33
CENTER	-.04	-.08	.00	-.04
RIGHT	.31	.43	.56	.43
AVG.	.21	.24	.28	.24

U.S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

USP NO. CHART 3A

FOOTAGE -

START SAMPLE

LEFT

	4W	9W 2W 5W
		12W
	20W	24W
		31W 32W
	40W	
		53W
		75W
		83W 85W 90W
		91W 92W
		105W 108W
124W	121W	
		157-158 W
		168
		165-170 W
		188
		207W
		211W 215W
	230W	
	237W 39	
257 splice		

TREATER OPERATOR READ UP

DATE 3/17/86

FABRIC THORNEL WCA GRAPHITE

MFG. UNION CARBIDE

ROLL NO. 849 12CSWCA-7

YARDS 180

POUNDS 101

ORDER NO. OE71108

SPECIFICATION Various

Q.C. FILE # NASA 1-1

SYMBOLS

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

REMARKS Continued -

265W, 271W, 277W, 283W, 290W, 299W, 304W, 314W, 321W

331W, 339W, 342W, 345-347W, 390W, 415W, 425W, 437W, 450 SPLICE, 462W, 469

481W, 516V, 528W

534

GRADE Grad C

END SAMPLE

ORIGINAL PAGE IS OF POOR QUALITY

USP NO. CHART 3B

FOOTAGE

DATE 3/17/86

FABRIC THORNEL WCA GRAPHITE CLOTH

MFG. UNION CARBIDE

ROLL NO. 850 PC5WCA-7

YARDS 180

POUNDS 99

ORDER NO. 0E71108

SPECIFICATION Various

~~Q.C. FILE~~ # NASA 1-2

START SAMPLE

LEFT

7W 3W
14W
22W 22W 30●
35W 38W 40W 43W
57●
73W
103● 106●
131W 137W● 145W●
152W
163W
194W 196●
205W
212W
224W
234W
240W
243W
253W
277W
283W
292
298V
305
310W
321W
330W
355W
358W
400W
412W
433W
481W
478W
485 SPLICE
493W
506W
510W

END SAMPLE

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 C

CHART 6A

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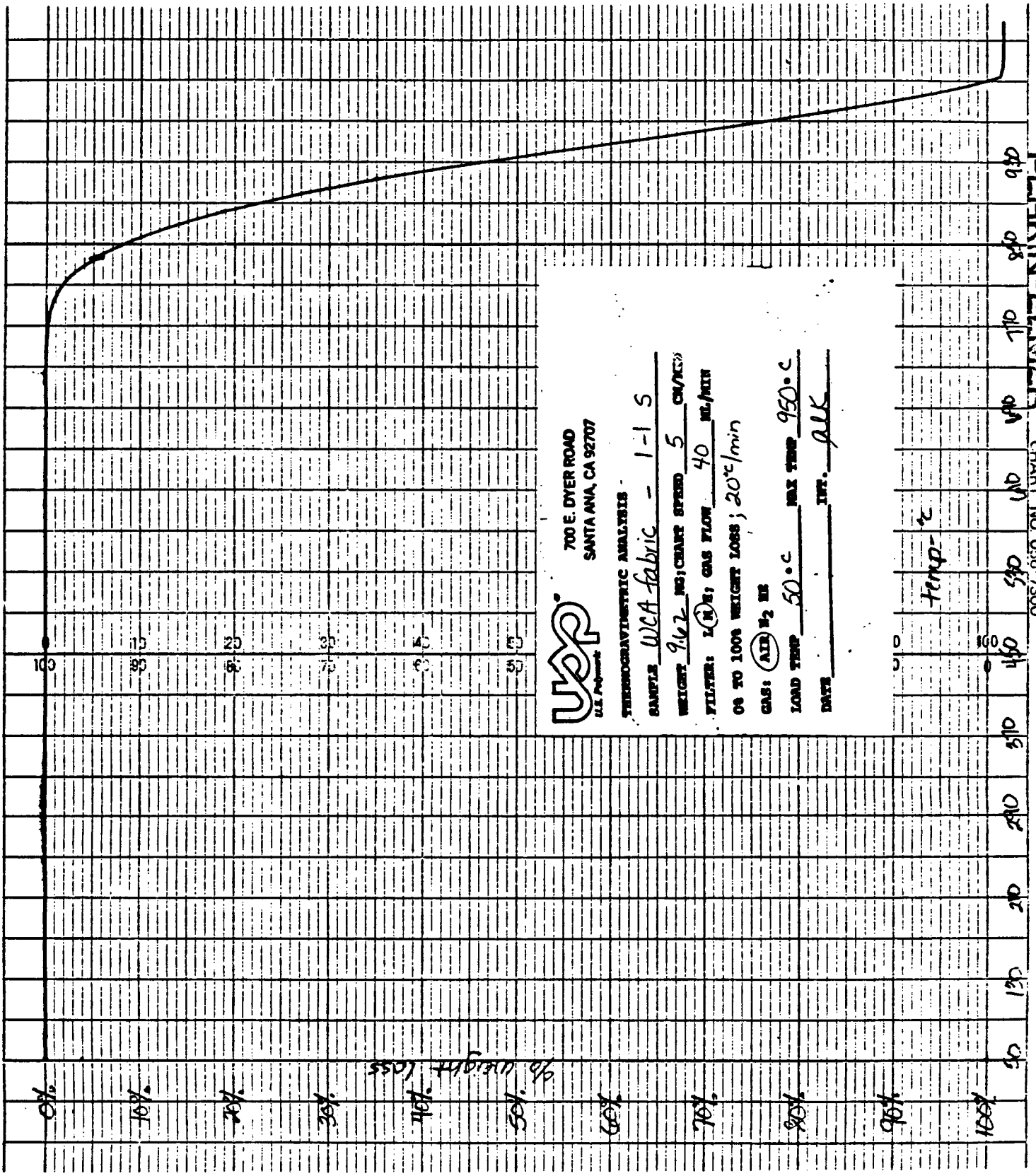

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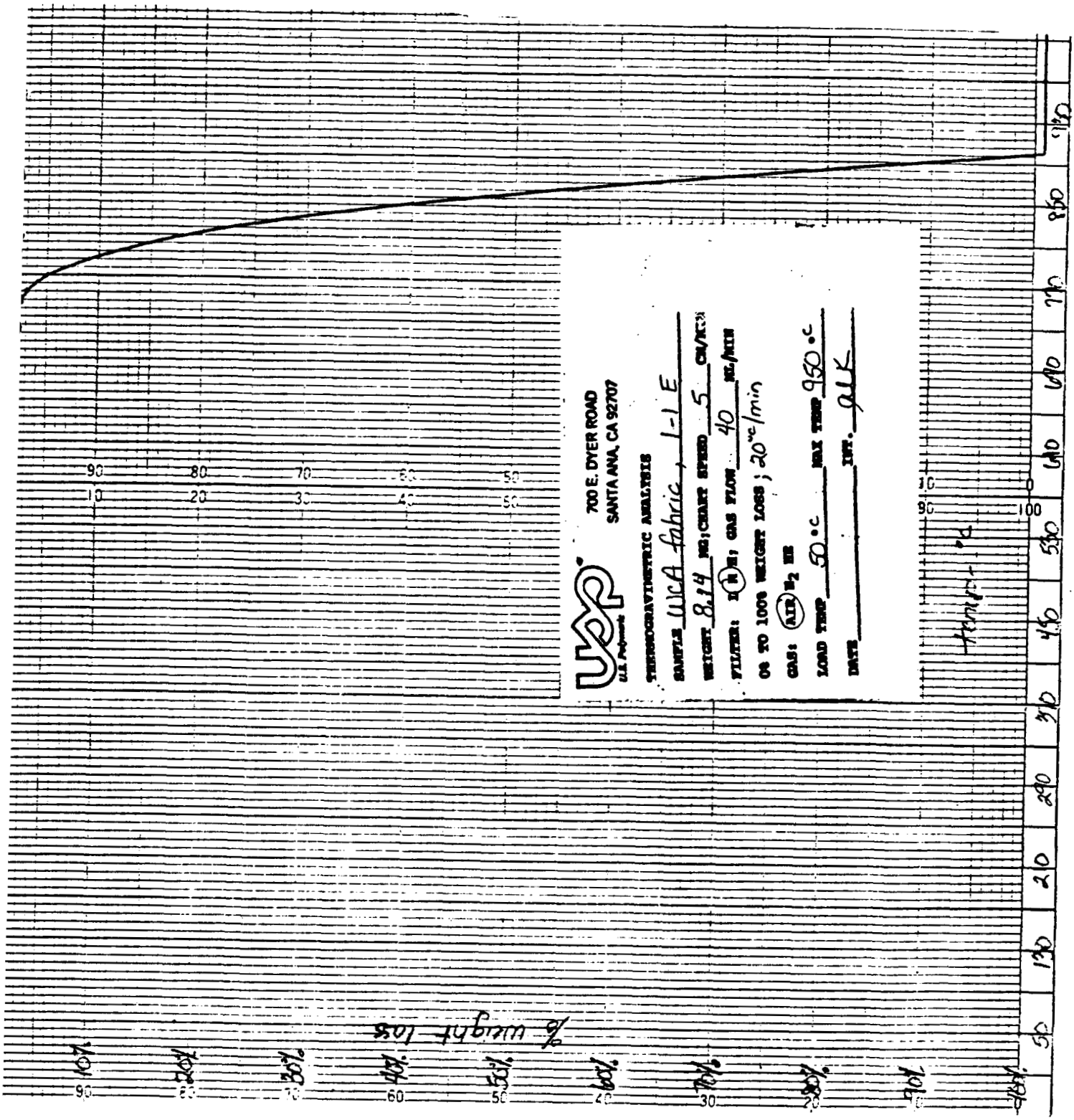

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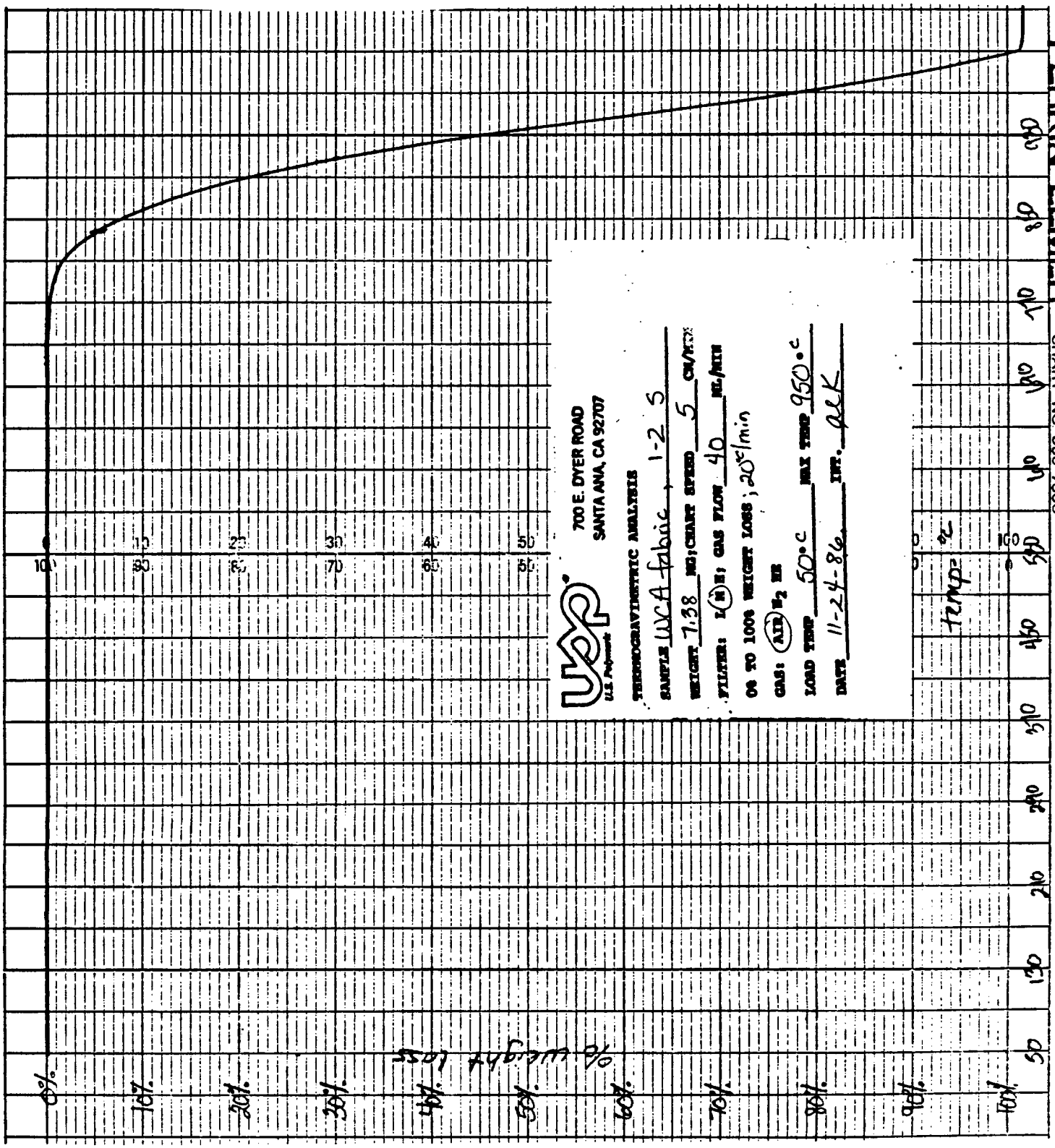

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PREPREG TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

FM 5064J NASA LOT# 1 U.S.P. LOT# C02134 (HITC0)

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3.	Flow	1
4.	Resin Content, Dry Basis	1
5.	Tack	1
6.	Gel Time	1
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7b.	Moisture Content	2
7c.	Ash Content	2
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DSC	9A - 9D
Infrared (IRZB) Baseline	10A - 10D
CTE	21A - 21D

U.S. Polymeric

PREPREG TESTING

NAS8-36298

U.S. POLYMERIC O.E.71108

FM 5064J NASA LOT# 1 U.S.P. LOT# C02134 (HITCO)

		ROLL#1 START	ROLL#1 END	ROLL#2 START	ROLL#2 END
1a. Resin Content, Soxhlet, % CTM-6D		35.8	35.3	34.9	36.3
		34.8	34.2	34.5	34.3
		35.4	34.4	34.0	34.7
	AVG.	35.3	34.6	34.5	35.1
			NASA LOT# 1 AVERAGE		34.9
1b. Filler Content, Soxhlet, % CTM-6D		14.7	14.5	14.3	14.9
		14.3	14.0	14.2	14.1
		14.5	14.1	14.0	14.2
	AVG.	14.5	14.2	14.2	14.4
			NASA LOT# 1 AVERAGE		14.3
1c. Cloth Content, Soxhlet, % CTM-6D		49.5	50.2	50.8	48.8
		50.9	51.8	51.3	51.6
		50.1	51.5	52.0	51.1
	AVG.	50.2	51.2	51.4	50.5
			NASA LOT# 1 AVERAGE		50.8
2. Volatile Content, % PTM-17B		3.4	2.9	3.0	3.2
		3.3	3.0	2.9	3.0
		3.4	3.1	2.8	3.0
	AVG.	3.4	3.0	2.9	3.1
			NASA LOT# 1 AVERAGE		3.1
3. Flow, % PTM-19G		14.3	10.2	12.1	14.6
		13.7	10.8	10.2	13.9
		15.1	11.7	9.2	13.6
	AVG.	14.4	10.9	10.5	14.0
			NASA LOT# 1 AVERAGE		12.5
4. Resin Content, Dry Basis, % PTM-16F, Type II		34.0	33.4	34.0	34.9
		33.3	33.5	33.9	34.8
		34.0	33.8	33.7	35.2
	AVG.	33.8	33.6	33.9	35.0
			NASA LOT# 1 AVERAGE		34.0
5. Tack, lbs PTM-80		55	50	35	58
			NASA LOT# 1 AVERAGE		50
6. Gel Time, Seconds PTM-20E		96	84	69	64
			NASA LOT# 1 AVERAGE		78

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

FM 5064J NASA LOT# 1 U.S.P. LOT# C02134 (HITCO)

7a. Atomic Absorption, ppm
CTM-53B

	ROLL#1 START	ROLL#1 END	ROLL#2 START	ROLL#2 END	LOT#1 AVG.
Na	4	3	4	7	5
K	0	0	0	1	0
Ca	1	1	1	0	1
Mg	3	2	1	1	2
Li	0	0	0	0	0
TOTAL	8	6	6	9	7

7b. Moisture Content, %
CTM-53B

ROLL1# START	ROLL#1 END	ROLL#2 START	ROLL#2 END
2.11	2.08	1.96	1.90
	NASA LOT# 1	AVERAGE	2.01

7c. Ash Content, %
CTM-53B

.20	.20	.08	.22
	NASA LOT# 1	AVERAGE	.17

8. TGA, % Weight Loss at 500°C
CTM-51 (Nitrogen)

7.9	6.6	6.4	10.5
	NASA LOT# 1	AVERAGE	7.9

See Chart 8A-8D

9. DSC, °C
CTM-50A

181	183	183	182
	NASA LOT# 1	AVERAGE	182

See Chart 9A-9D

10. Infrared (IRZB) Baseline
CTM-21C

.82	.76	.81	.83
	NASA LOT# 1	AVERAGE	.80

See Chart 10A-10D

11. Environmental History

Date manufactured: 1 May 1986
Packaged in: MIL-B-131 class I bag supported in cardboard carton
Date shipped: 16 June 1986 in 40°F truck

12. Specific Gravity, Cured Units
ASTM D792

	ROLL#1 START	ROLL#1 END	ROLL#2 START	ROLL#2 END
	1.422	1.424	1.425	1.425
	1.422	1.424	1.426	1.425
	1.422	1.424	1.426	1.426
AVG.	1.422	1.424	1.426	1.425
		NASA LOT# 1	AVERAGE	1.424

FM 5064J NASA LOT# 1 U.S.P. LOT# C02134 (HITCO)

		ROLL#1 START	ROLL#1 END	ROLL#2 START	ROLL#2 END
13a. Tensile Strength, ksi, WARP FTMS 406-1011		18.65	18.67	20.09	20.89
		19.88	19.11	18.58	20.62
		19.58	18.94	19.20	20.59
		19.31	19.66	18.48	20.58
		19.69	19.25	18.96	21.30
	AVG.	19.42	19.13	19.06	20.79
			NASA LOT# 1 AVERAGE		19.60
13b. Tensile Modulus, msi, WARP FTMS 406-1011		1.93	1.98	1.98	2.07
		1.96	1.90	1.94	2.02
		2.04	1.97	1.81	2.15
		1.98	1.97	1.91	2.06
		2.09	1.89	1.94	2.08
	AVG.	2.00	1.94	1.92	2.08
			NASA LOT# 1 AVERAGE		1.98
13c. Tensile Elongation, %, WARP FTMS 40C-1011		1.27	1.22	1.40	1.49
		1.46	1.32	1.28	1.52
		1.36	1.28	1.41	1.35
		1.32	1.36	1.32	1.47
		1.40	1.37	1.32	1.48
	AVG.	1.36	1.31	1.35	1.46
			NASA LOT# 1 AVERAGE		1.37
14a. Flexural Strength, ksi, WARP FTMS 406-1031		27.64	27.81	26.10	24.98
		29.19	26.36	24.82	28.41
		29.05	25.38	26.02	26.61
		28.56	27.94	24.28	24.69
		26.00	26.13	26.24	26.94
	AVG.	27.69	26.72	25.49	26.33
			NASA LOT# 1 AVERAGE		26.56
14b. Flexural Modulus, msi, WARP FTMS 406-1031		1.60	1.68	1.70	1.84
		1.71	1.72	1.67	1.76
		1.59	1.58	1.66	1.67
		1.67	1.85	1.58	1.80
		1.69	1.59	1.59	1.68
	AVG.	1.65	1.68	1.64	1.75
			NASA LOT# 1 AVERAGE		1.68
15a. Compressive Strength, ksi, WARP FTMS 406-1021		18.07	12.34	16.18	21.49
		16.16	19.88	17.12	20.82
		16.29	19.61	16.14	18.62
		20.66	11.83	15.27	20.07
		20.22	14.76	17.23	17.69
	AVG.	18.28	15.68	16.39	19.74
			NASA LOT# 1 AVERAGE		17.52

FM 5064J NASA LOT# 1 U.S.P. LOT# C02134 (HITCO)

		ROLL#1 START	ROLL#1 END	ROLL#2 START	ROLL#2 END
15b. Compressive Modulus, msi, WARP FTMS 406-1021		2.20	2.26	2.03	2.14
		2.40	2.22	2.37	2.19
		2.31	2.19	2.06	2.15
		2.27	2.30	2.04	2.11
		2.30	2.20	1.93	2.09
	AVG.	2.30	2.23	2.09	2.14
			NASA LOT# 1	AVERAGE	2.19
16. Double Shear Strength, ksi FTMS 406-1041A		2.54	2.58	2.35	2.27
		2.31	2.68	2.31	2.46
		2.44	2.68	2.42	2.56
		2.47	2.49	2.49	2.44
		2.53	2.41	2.58	2.54
	AVG.	2.46	2.57	2.43	2.45
			NASA LOT# 1	AVERAGE	2.48
17. Barcol Hardness, Units ASTM D-2583 (Average of 10 determinations)		61.8	61.5	62.4	63.4
			NASA LOT# 1	AVERAGE	62.3
18. Residual Volatiles, % PTM-98		1.65	1.69	1.83	1.74
		1.75	1.72	1.86	1.58
		1.78	1.54	1.83	1.78
	AVG.	1.72	1.65	1.84	1.70
			NASA LOT# 1	AVERAGE	1.73
19. Resin Content, Pyrolysis, % CTM-14B		31.22	32.54	32.55	32.23
		31.48	32.34	32.35	31.75
		31.49	32.26	31.69	32.08
	AVG.	31.39	32.38	32.20	32.02
			NASA LOT# 1	AVERAGE	32.00
20. Acetone Extraction, % CTM-18A		6.50	7.69	7.09	7.49
		6.03	7.24	8.54	6.98
		7.02	7.16	6.14	6.50
	AVG.	6.52	7.36	7.26	6.99
			NASA LOT# 1	AVERAGE	7.03
21a. CTE, in/in °F, with PLY PTM-61B		-1.33	3.60	3.69	3.59
		-.80	2.87	2.73	2.07
	AVG.	-1.07	3.24	3.21	2.83
			NASA LOT# 1	AVERAGE	2.05

FM 5064J NASA LOT# 1 U.S.P. LOT# C02134 (HITCO)

21b. CTE, in/in •F, Cross PLY
PTM-61B

	ROLL#1 START	ROLL#1 END	ROLL#2 START	ROLL#2 END
	2.80	6.88	9.01	6.58
	4.72	10.02	4.51	6.19
AVG.	3.76	8.45	6.76	6.39

NASA LOT# 1 AVERAGE 6.34

See Chart 21A-21D

U. S. Polymeric

Hamid M. Quraishi, Manager
Quality Assurance Department

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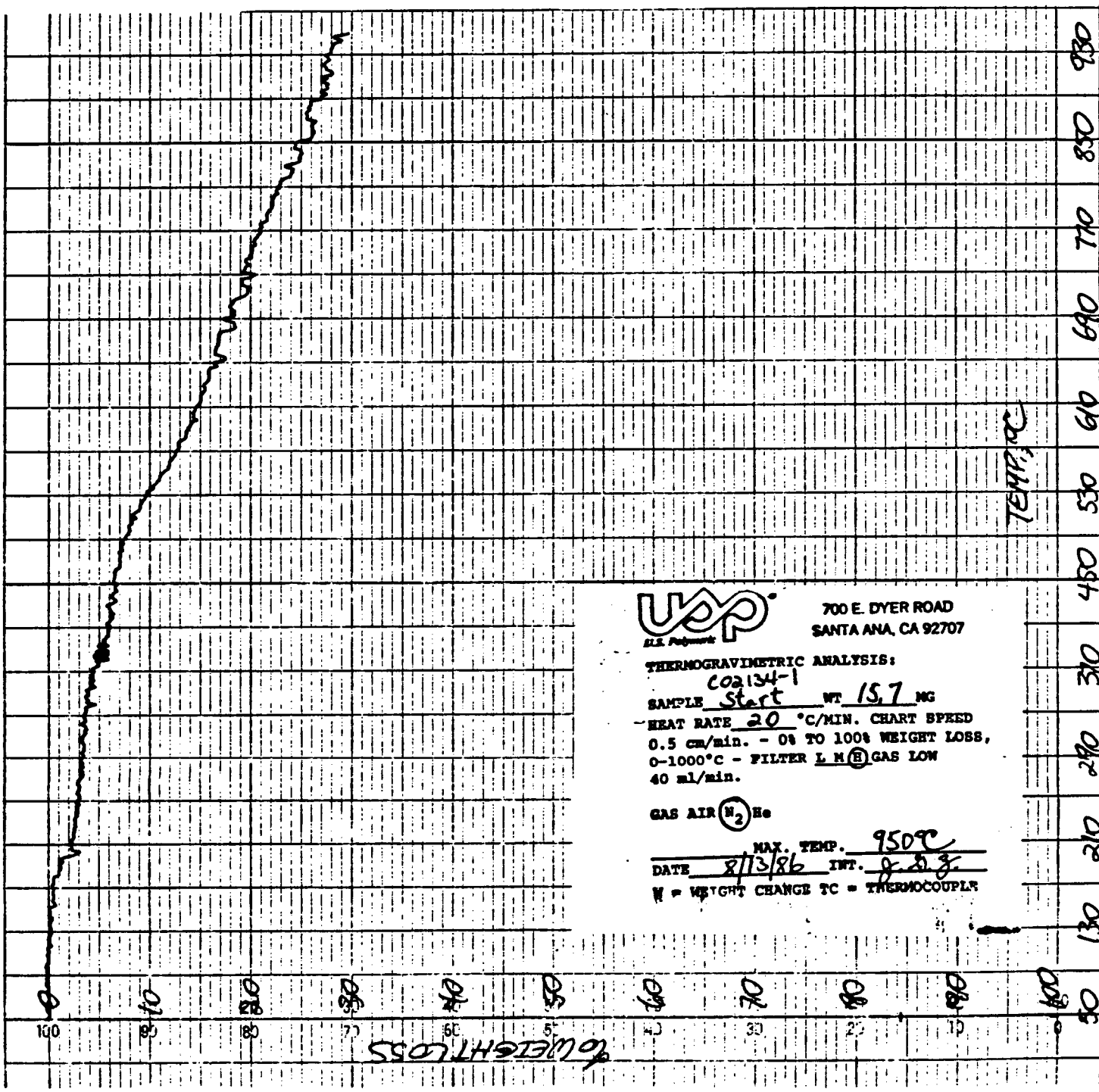

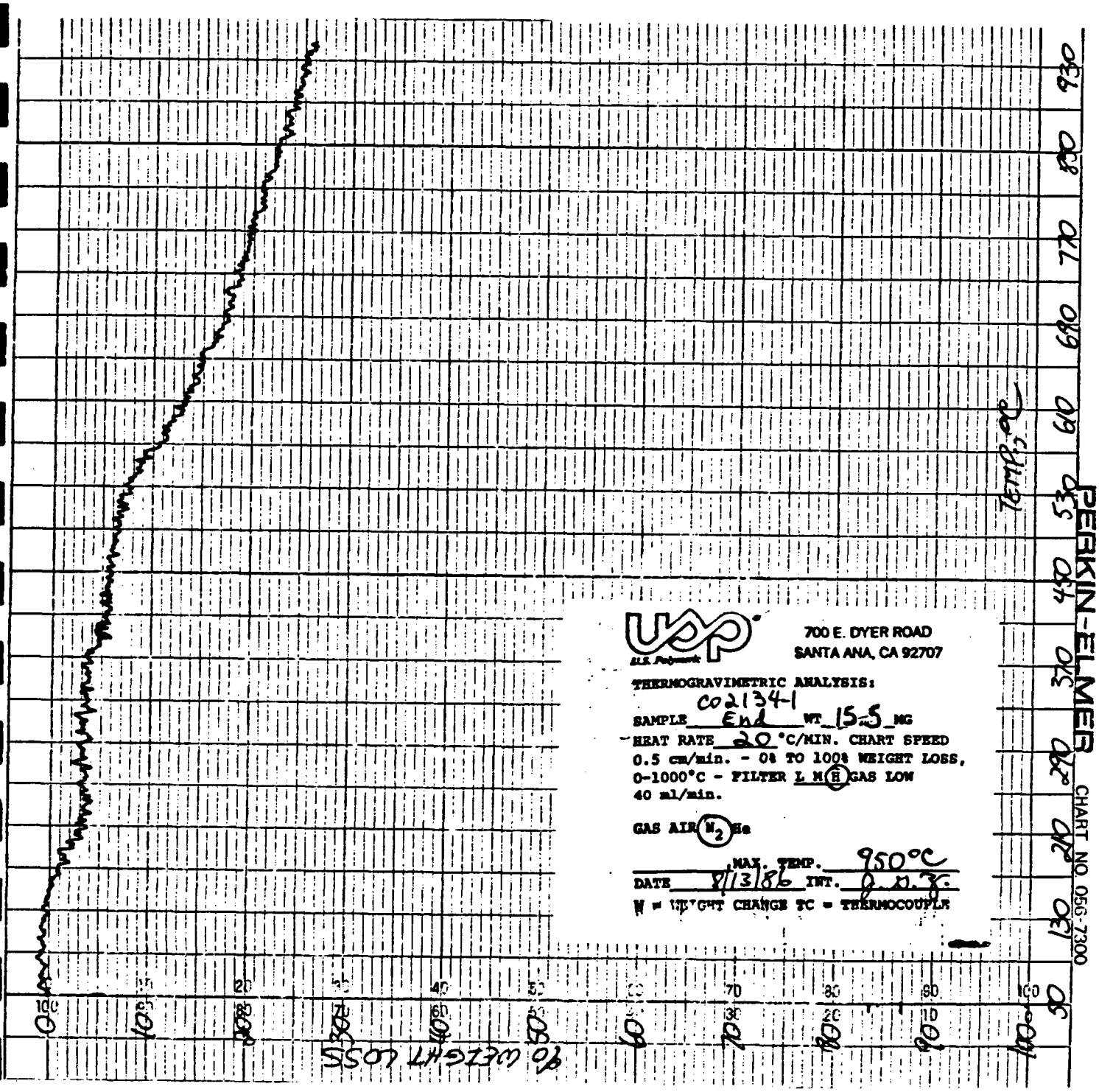

USP U.S. Pharmacopeia
700 E. DYER ROAD
SANTA ANA, CA 92707

THERMOGRAVIMETRIC ANALYSIS:
SAMPLE co2134-1 End WT. 15.5 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 (N_2) He

MAX. TEMP. 950°C
DATE 8/13/86 INT. D.D.T.
W = WEIGHT CHANGE TC = THERMOCOUPLE

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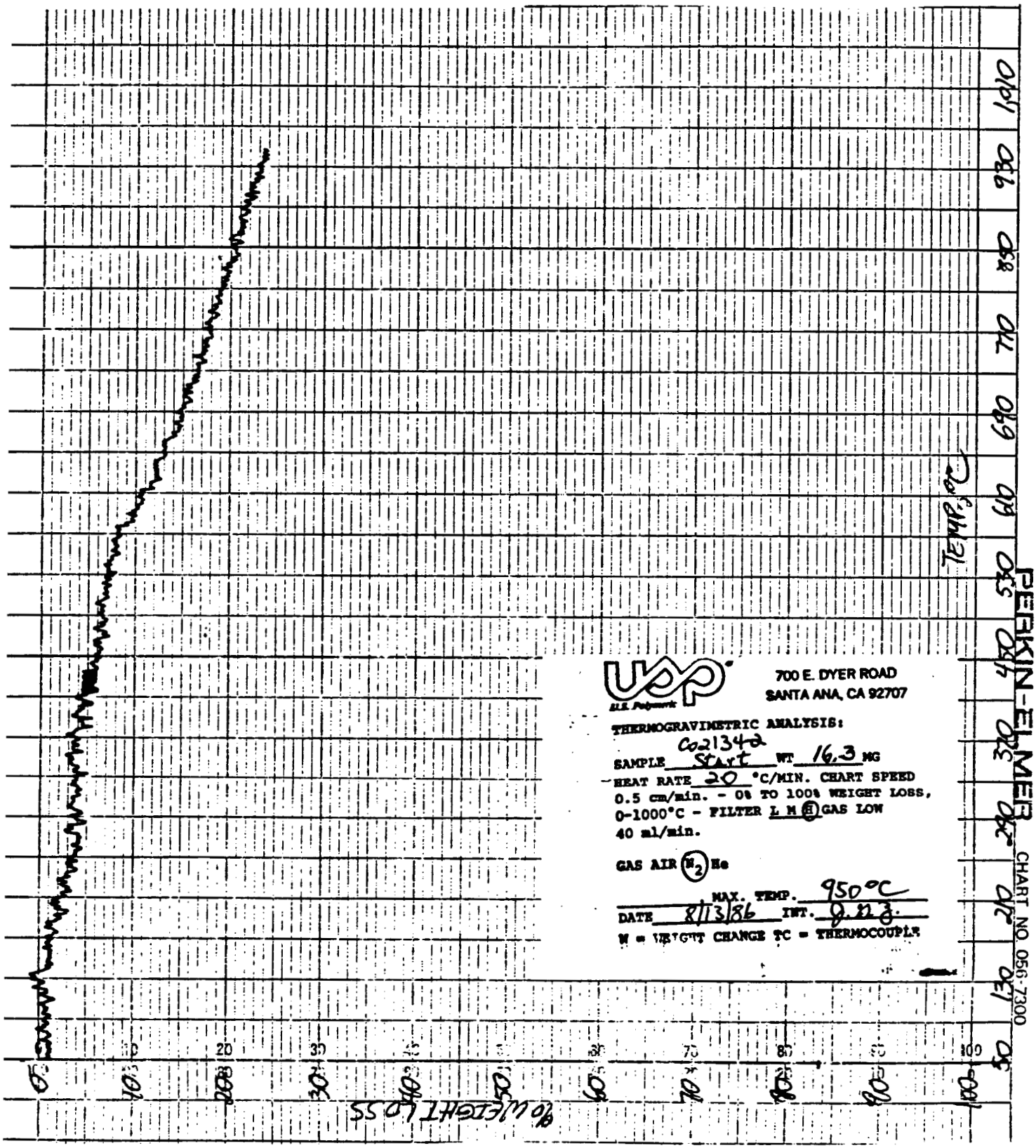

USP
A.E. Polymerik

700 E. DYER ROAD
SANTA ANA, CA 92707

THERMOGRAVIMETRIC ANALYSIS:

SAMPLE Co21342 Start WT. 16.3 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 8/13/86 INT. 9.223.

W = WEIGHT CHANGE TC = THERMOCOUPLE

PERKIN-ELMER CHART NO. 056-7300

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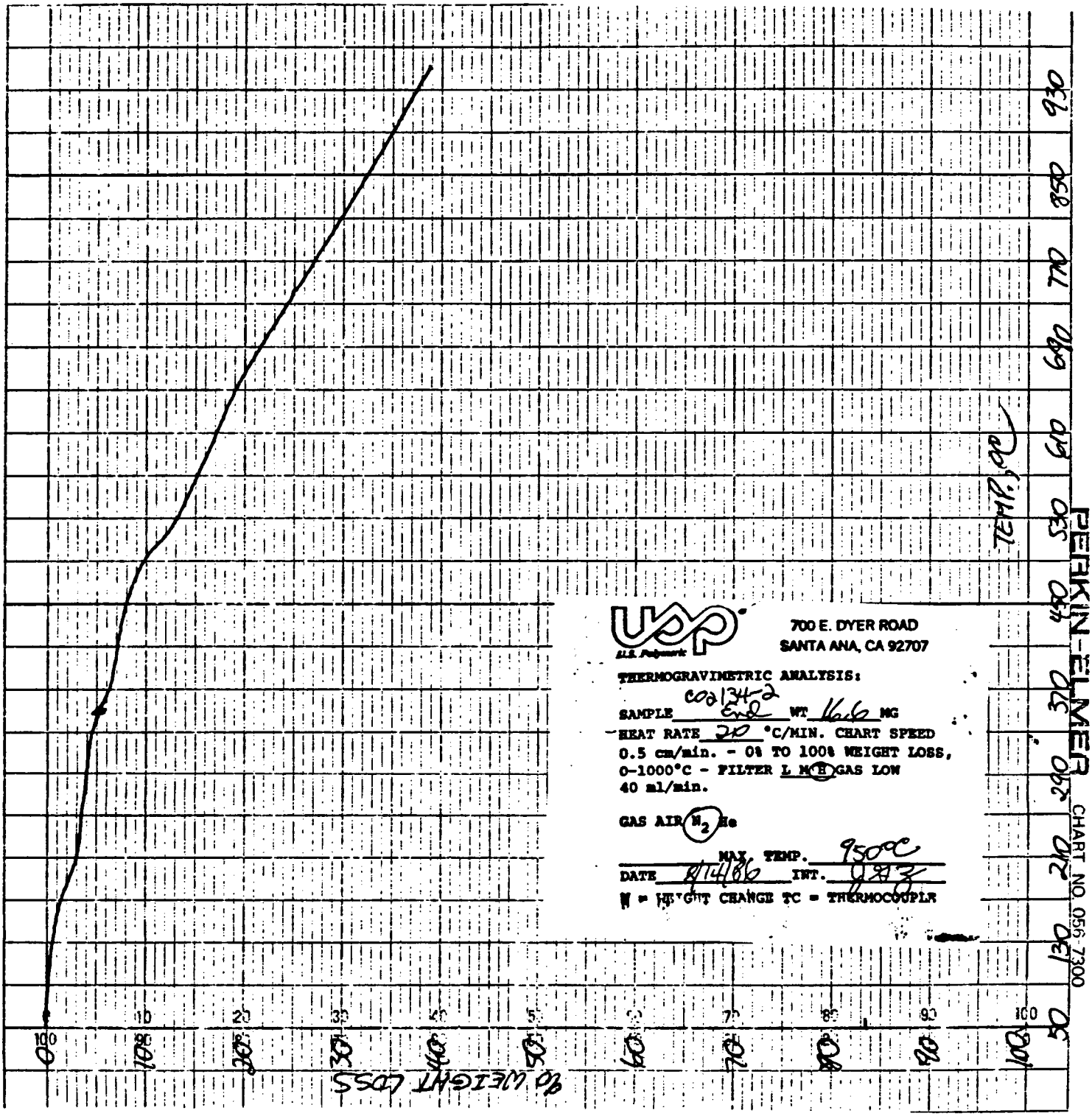

CHART 9A

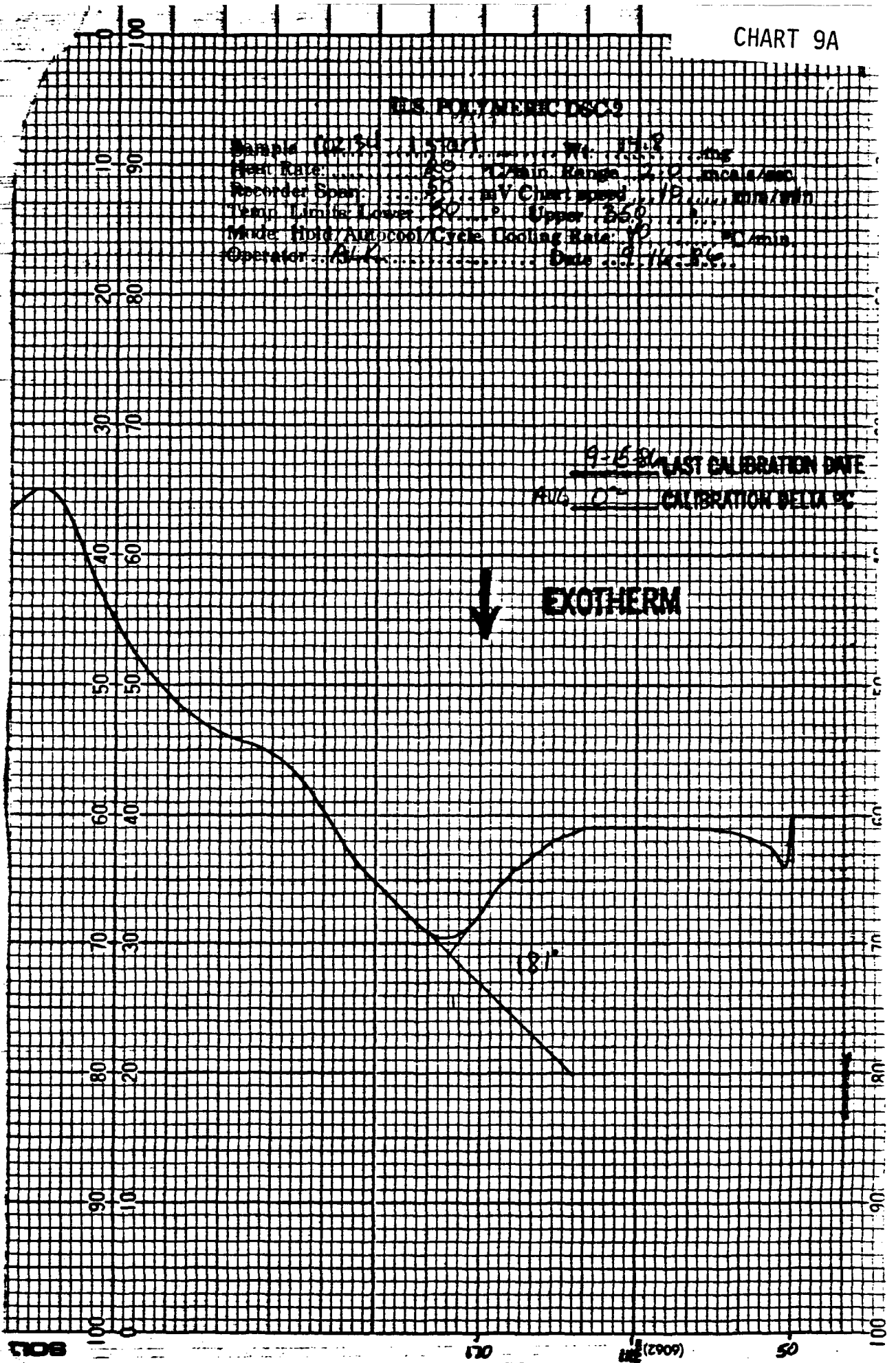

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CHART 9B

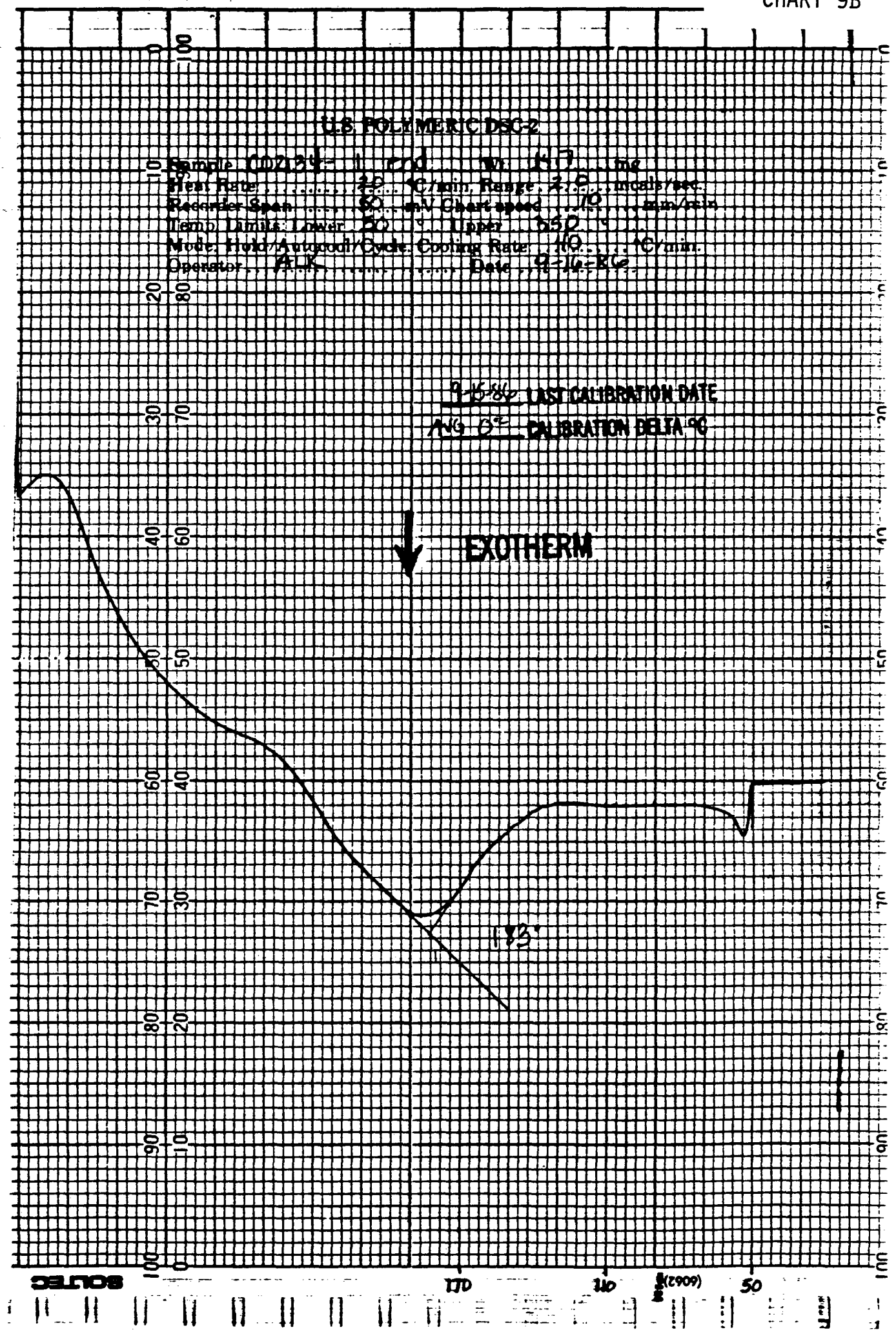
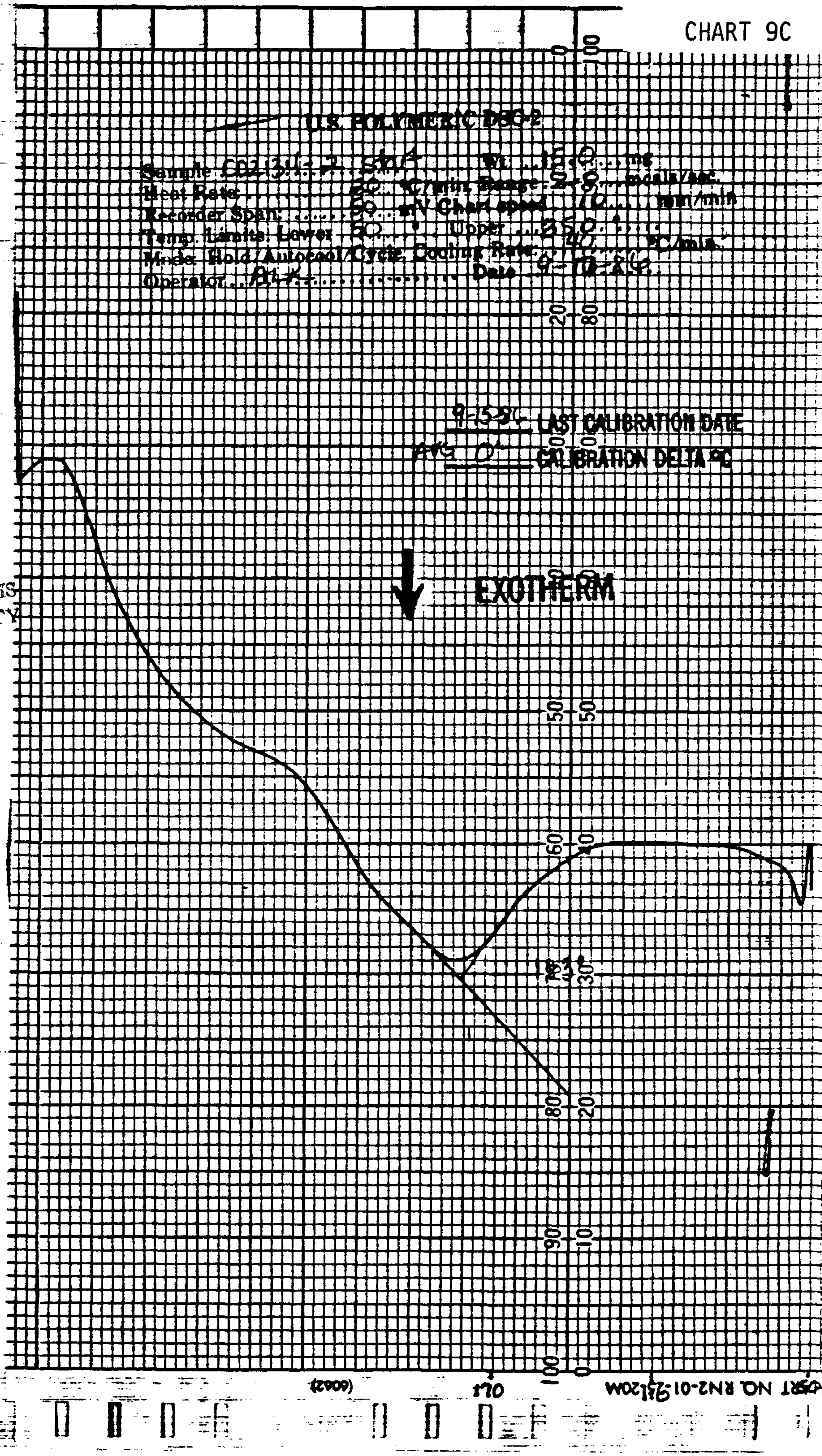
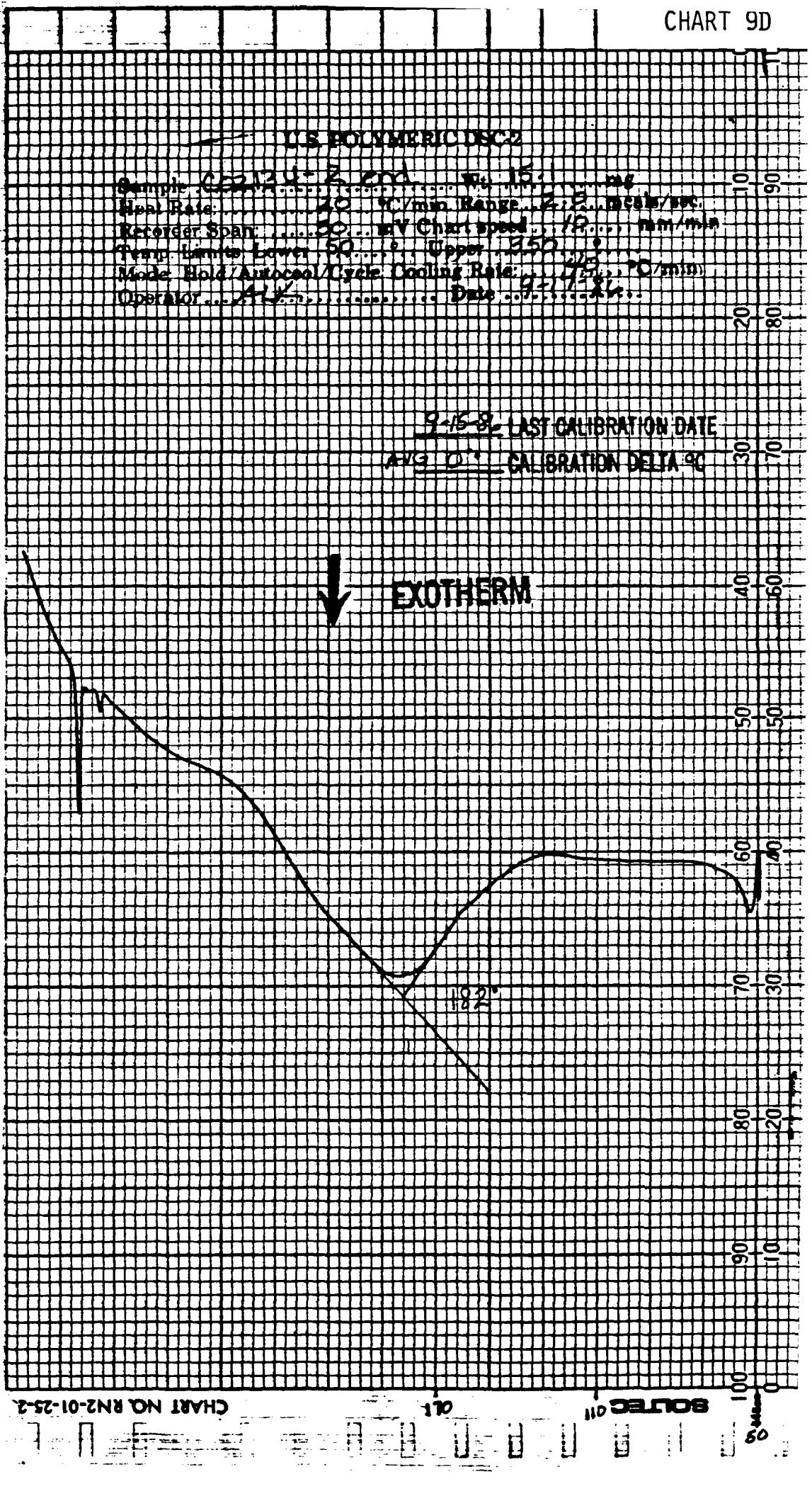


CHART 9C





SPECTRUM NO. 15181
DATE 7-07-86
SAMPLE FM5064J
C02134 # 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

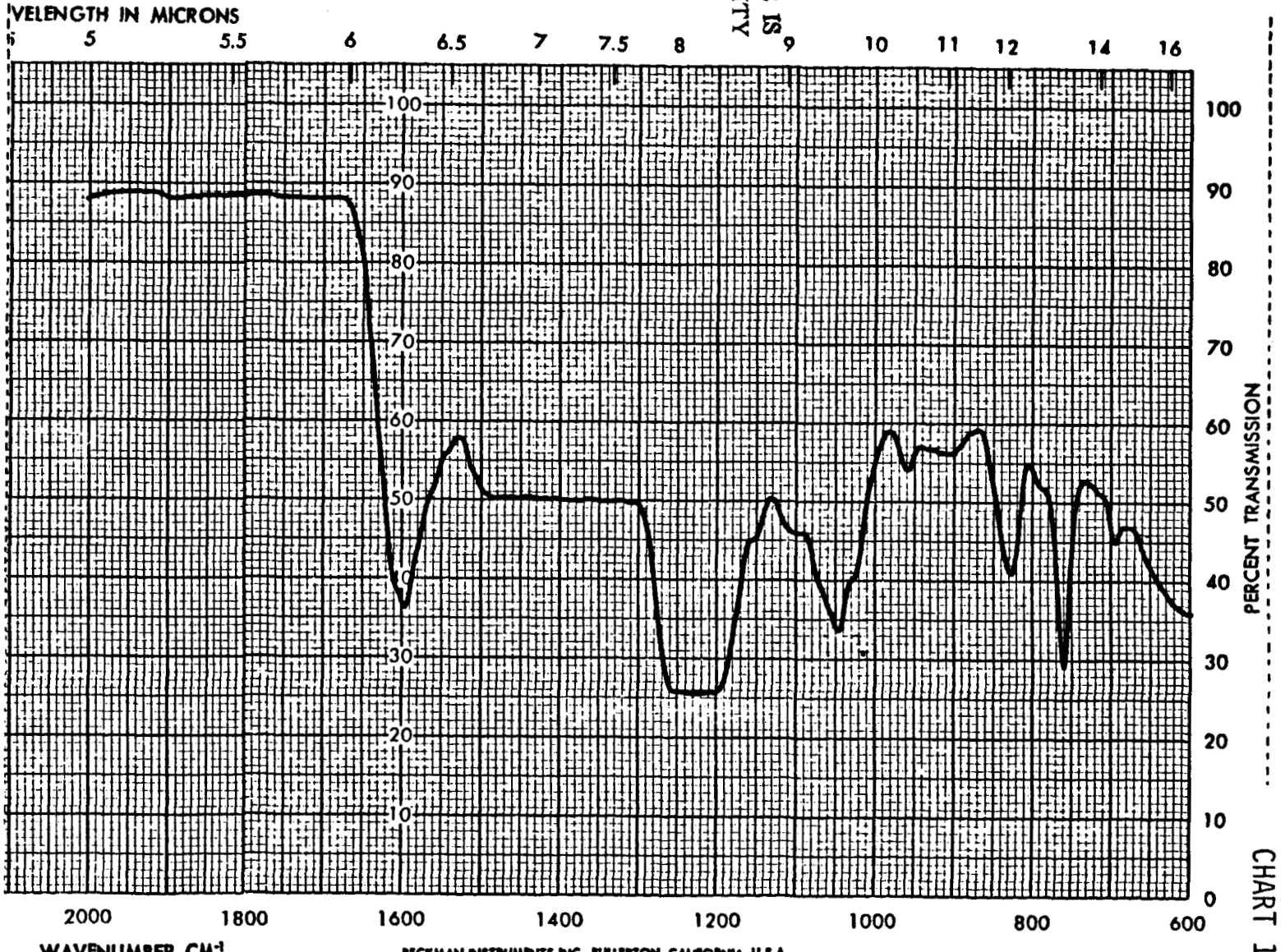


CHART 10A

SPECTRUM NO. 15182
DATE 7-07-86
SAMPLE FM 5064 J
C02134 # E-1

SOURCE
STRUCTURE

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

ANALYST Y. MIRANDA

Beckman®
INFRARED
SPECTROPHOTOMETER

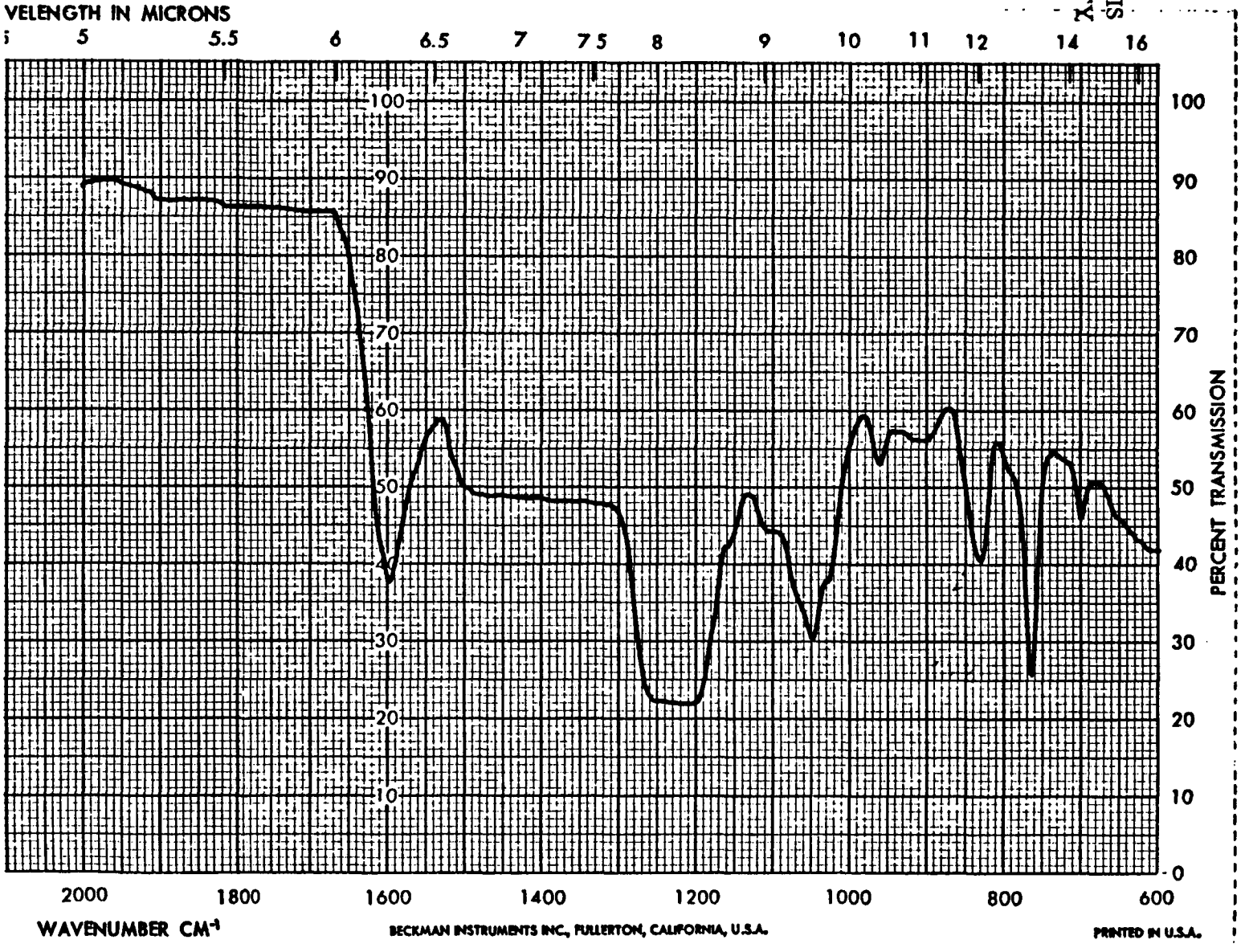


CHART 10B

SPECTRUM NO. 15183
DATE 7-07-86
SAMPLE FM 5064 J
CO2134 # ST. 2
SOURCE
STRUCTURE

PATH 0.2 mm NACL
SOLVENT ACETONE
CONCENTRATION 30-50%T
PHASE 3
COMMENTS PRE-PREG
MATERIAL
ANALYST Y. MIRANDA

Beckman®
INFRARED
SPECTROPHOTOMETER

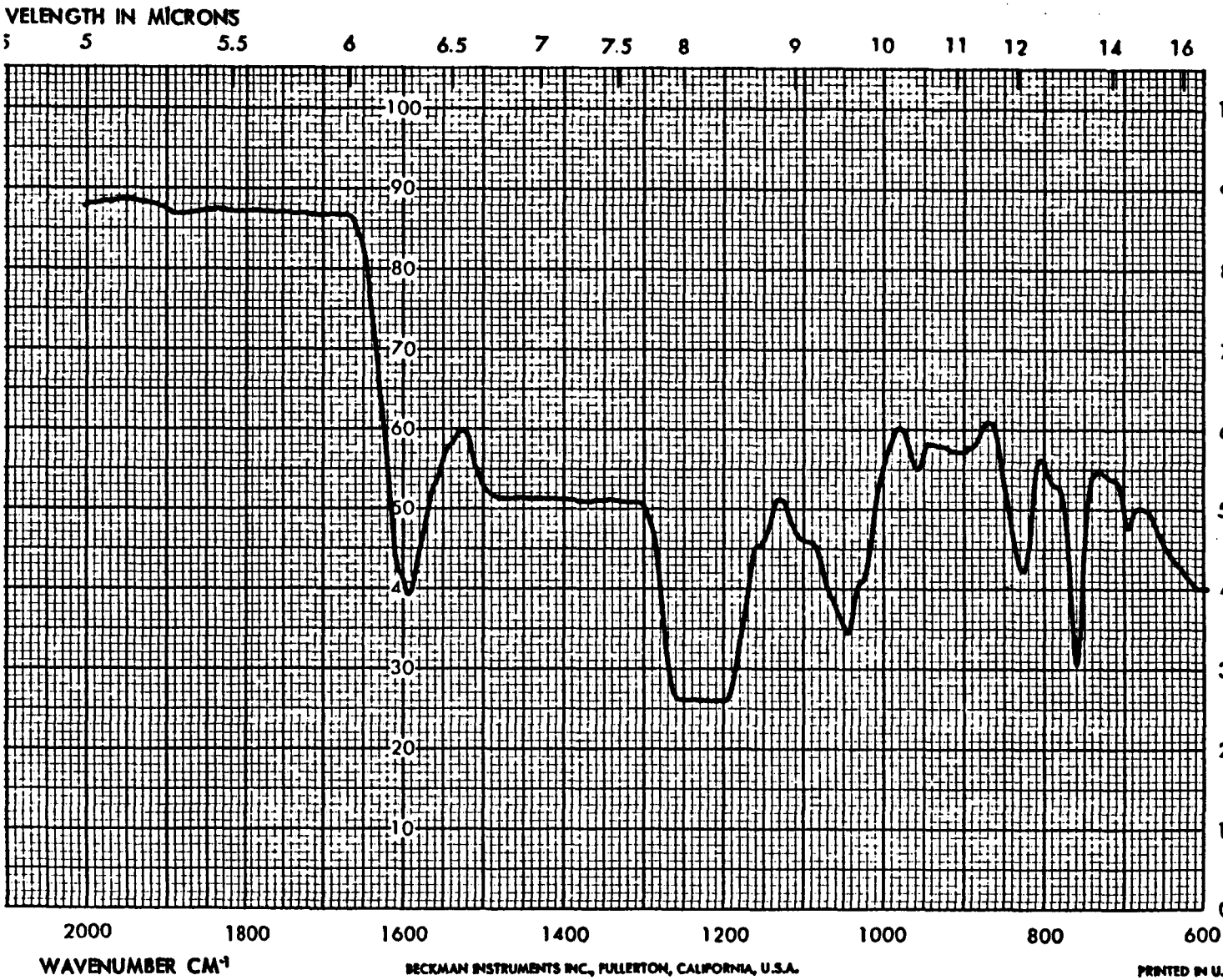


CHART 10C

SPECTRUM NO. 15184
DATE 7-07-86
SAMPLE FM 5064 J
C02134 # E-2

SOURCE
STRUCTURE

PATH 0.2 mm NACL
SOLVENT ACETONE
CONCENTRATION 80-50%T
PHASE 3
COMMENTS PRE-PREG
MATERIAL

ANALYST Y. MIRANDA

Beckman®
INFRARED
SPECTROPHOTOMETER

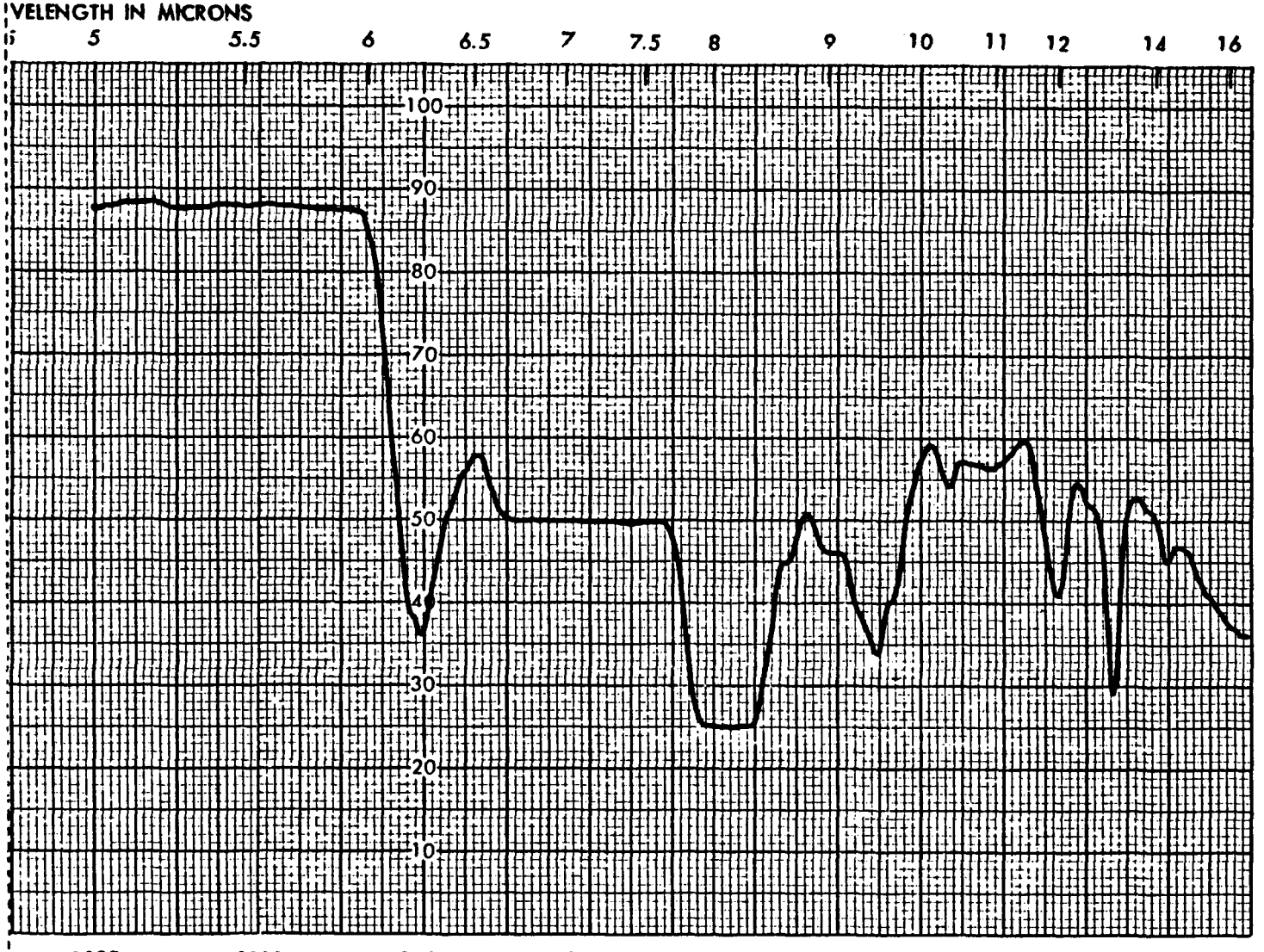


CHART 10D

Chart 21A1

PART NO. 990088

RUN NO ___ DATE 3/14/96
OPERATOR TH
SAMPLE:
Coal 34 - 1 - Sheet - (1)
ATM Air @ STP
FLOW RATE 3-5SCFH
wpy

T-AXIS
SCALE, °C/in 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, (mg/min) /in ___

TMA
SCALE, mils/in 0.1/0.2
MODE Expansion
SAMPLE SIZE 0.261
LOAD, g 10
dY, (10X), (mils/min)/in ___

$\frac{dL}{dT} = \frac{0.261}{123.3 \text{ min}} = 1.33 \times 10^{-3} = 1.33 \text{ mm/min}$

MEASURED VARIABLE

DUPONT instruments

DUPONT Instruments

MEASURED VARIABLE

PART NO. 990088-

RUN NO ___ DATE 9/16/86 OPERATOR TA SAMPLE: C02134-1-Smear-(1) ATM Amb @ SP FLOW RATE 3 SSCM w/Ply	T-AXIS SCALE, °C/in 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, (mg/min) /in ___	TMA SCALE, mils/in 0.1/0.2 MODE Expansion SAMPLE SIZE 0.257 LOAD, g 10 dY, (10X), (mils/min) /in ___	___ ___ ___ ___ ___ ___

$\frac{\Delta L}{L_0 \Delta T} = \frac{(2.1)(0.002)}{(0.257)(2)(18)} = -8.0 \times 10^{-3} = -.80$ mils/in °F

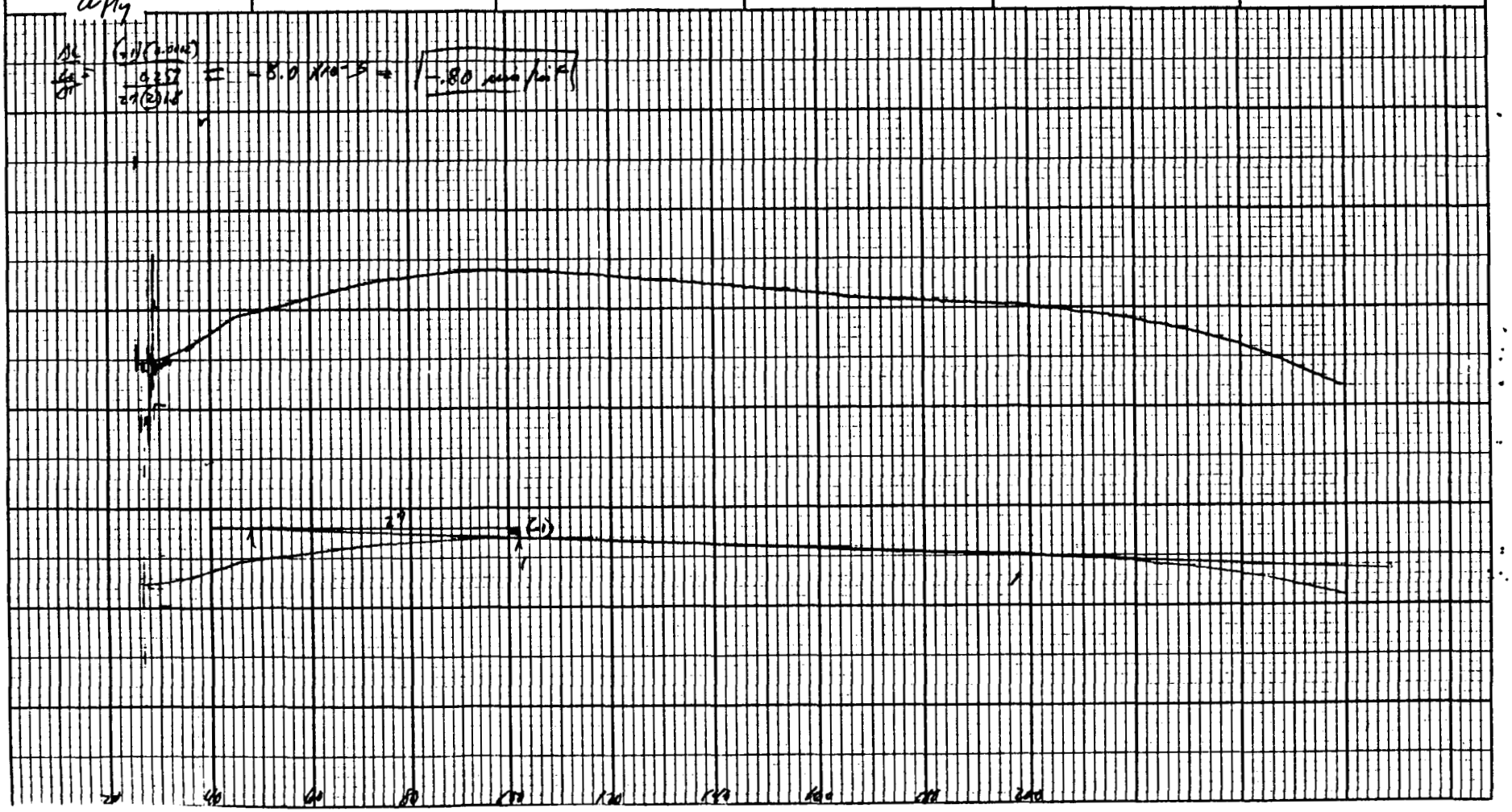
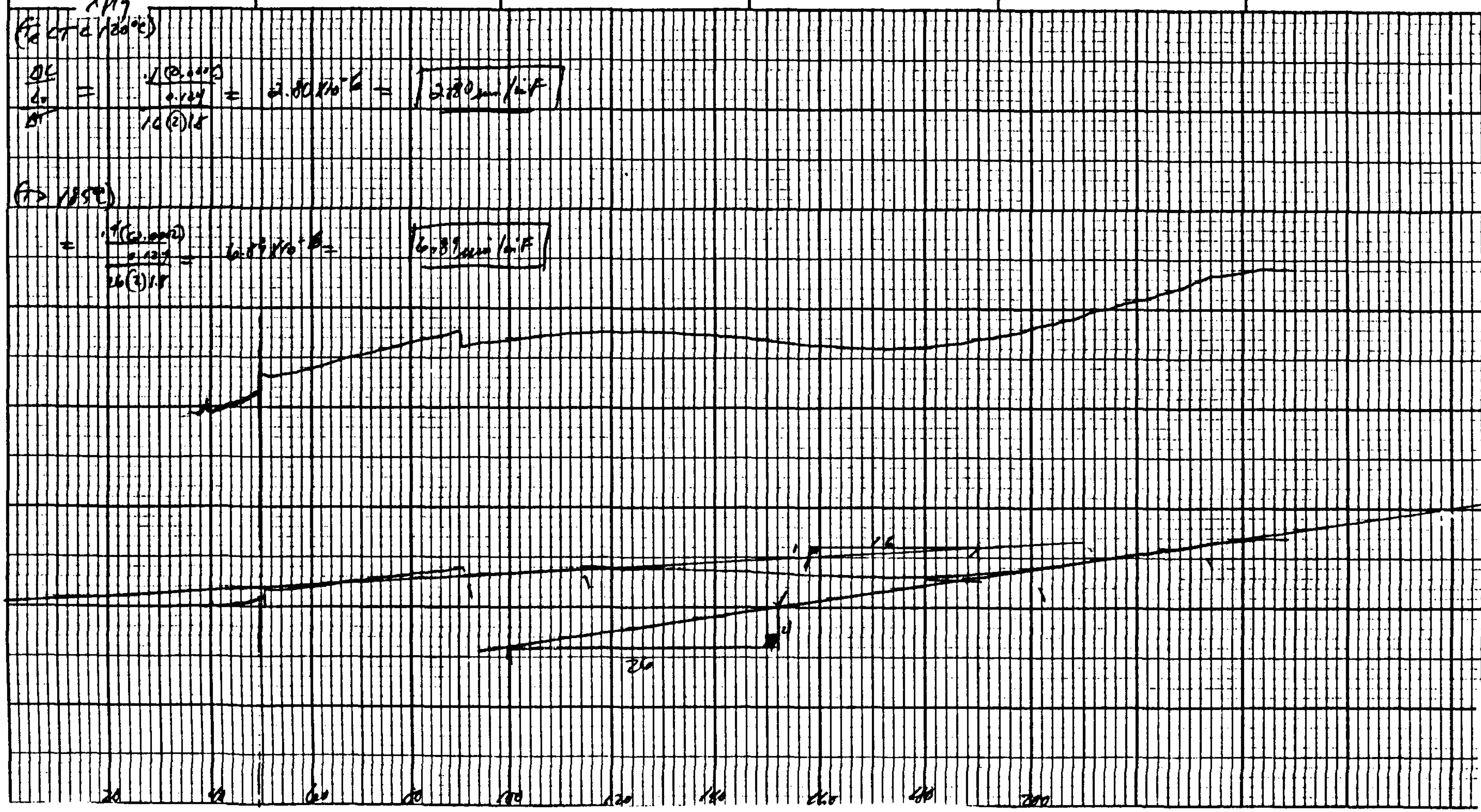


Chart 21A2

Chart 21A3

PART NO. 990088

RUN NO.____ DATE 9/16/86	**T-AXIS**	**DTA-DSC**	**TGA**	**TMA**	
OPERATOR TK	SCALE, °C/in 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/1.2	
SAMPLE: C02134-1-Start-(4)	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE Expansion	
	HEAT ✓ COOL____ ISO____	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.124	
ATM Air @ STP	SHIFT, in 0	REFERENCE	TIME CONST., sec	LOAD, g 10	
FLOW RATE 3-SCFH			dY, (mg/min)/in	dY,(10X),(mils/min)/in	



MEASURED VARIABLE

DU PONT Instruments

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DUPONT Instruments

MEASURED VARIABLE _____

PART NO. 990088

RUN NO ___ DATE 7/17/89	T-AXIS	DTA-DSC	TGA	TMA	
OPERATOR TH	SCALE, °C/in 50 20	SCALE, °C/in ___	SCALE, mg/in ___	SCALE, mils/in 0.1/02	
SAMPLE: CO 2134 - 1 - smear - (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 0.124	
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 ___	

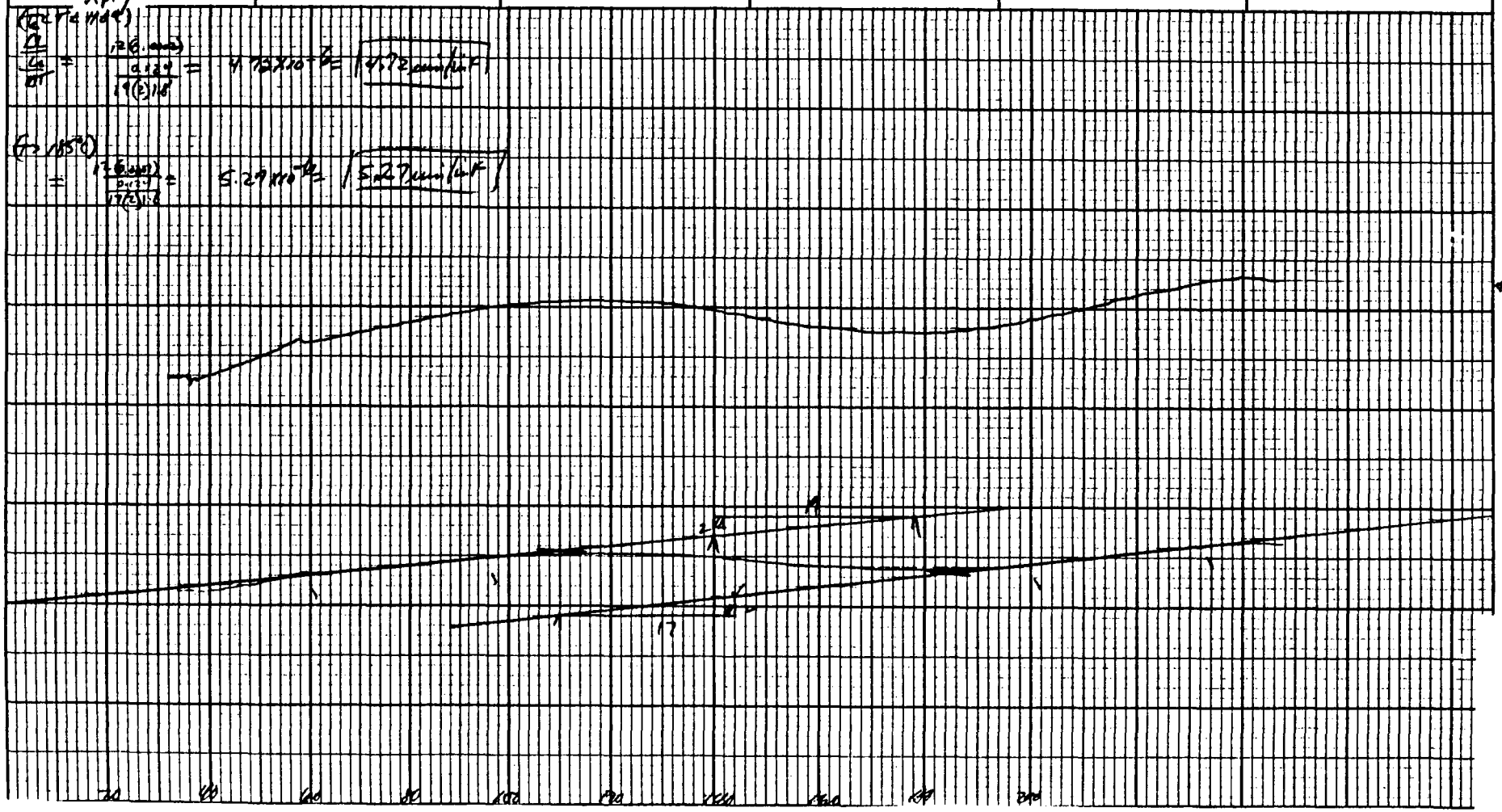

Chart 21A4

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DUPONT Instruments

MEASURED VARIABLE

PART NO. 990088

RUN NO. ___ DATE 9/14/16	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: CO2134-1-EMD-(1)	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE Expansion	
ATM Air @ XP	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.257	
FLOW RATE 3-55CB	SHIFT, in 0	REFERENCE	TIME CONST., sec	LOAD, g 10	
wpl7			dY, (mg/min) /in	dY, (10X), (mils/min)/in	

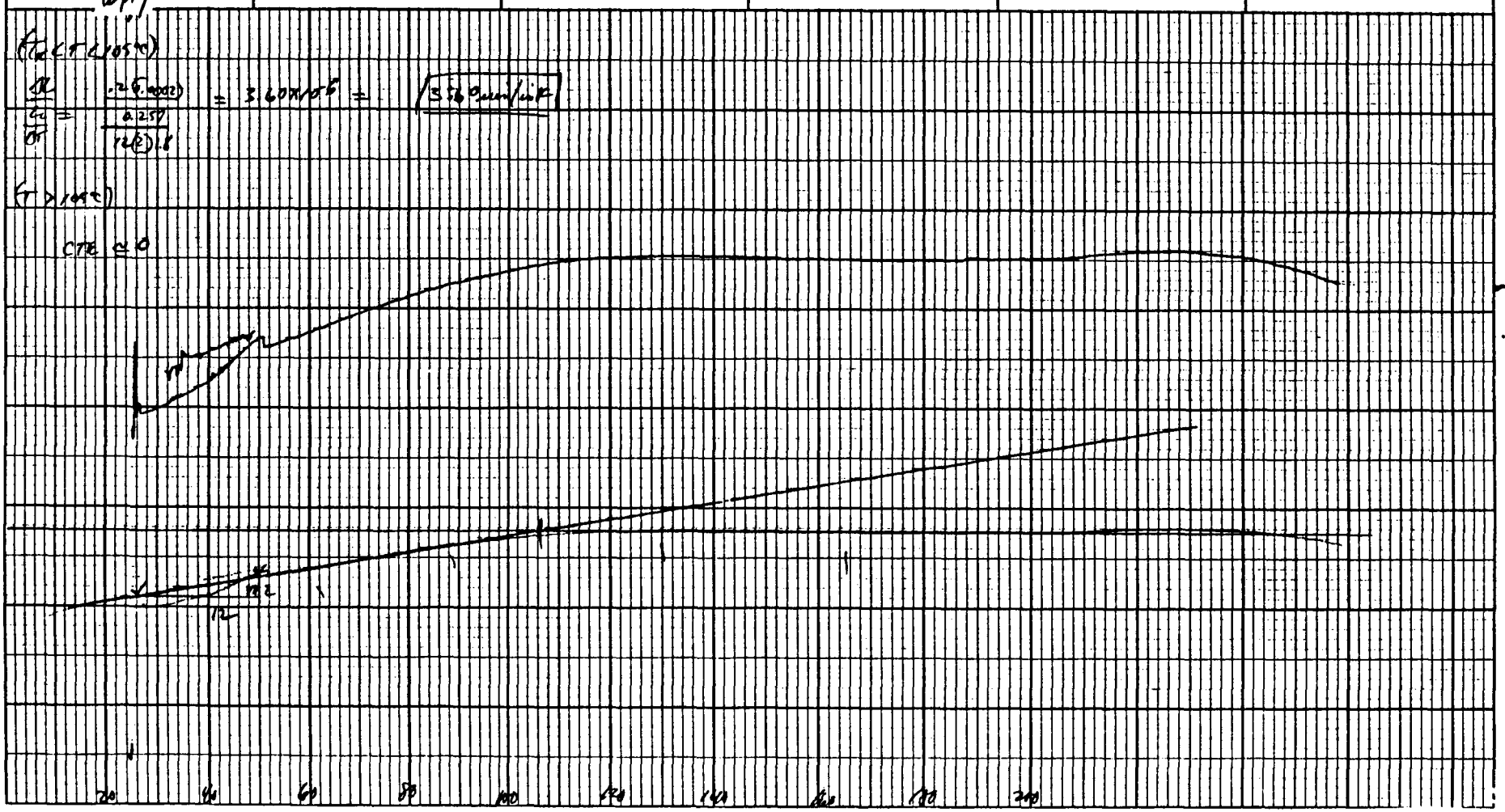
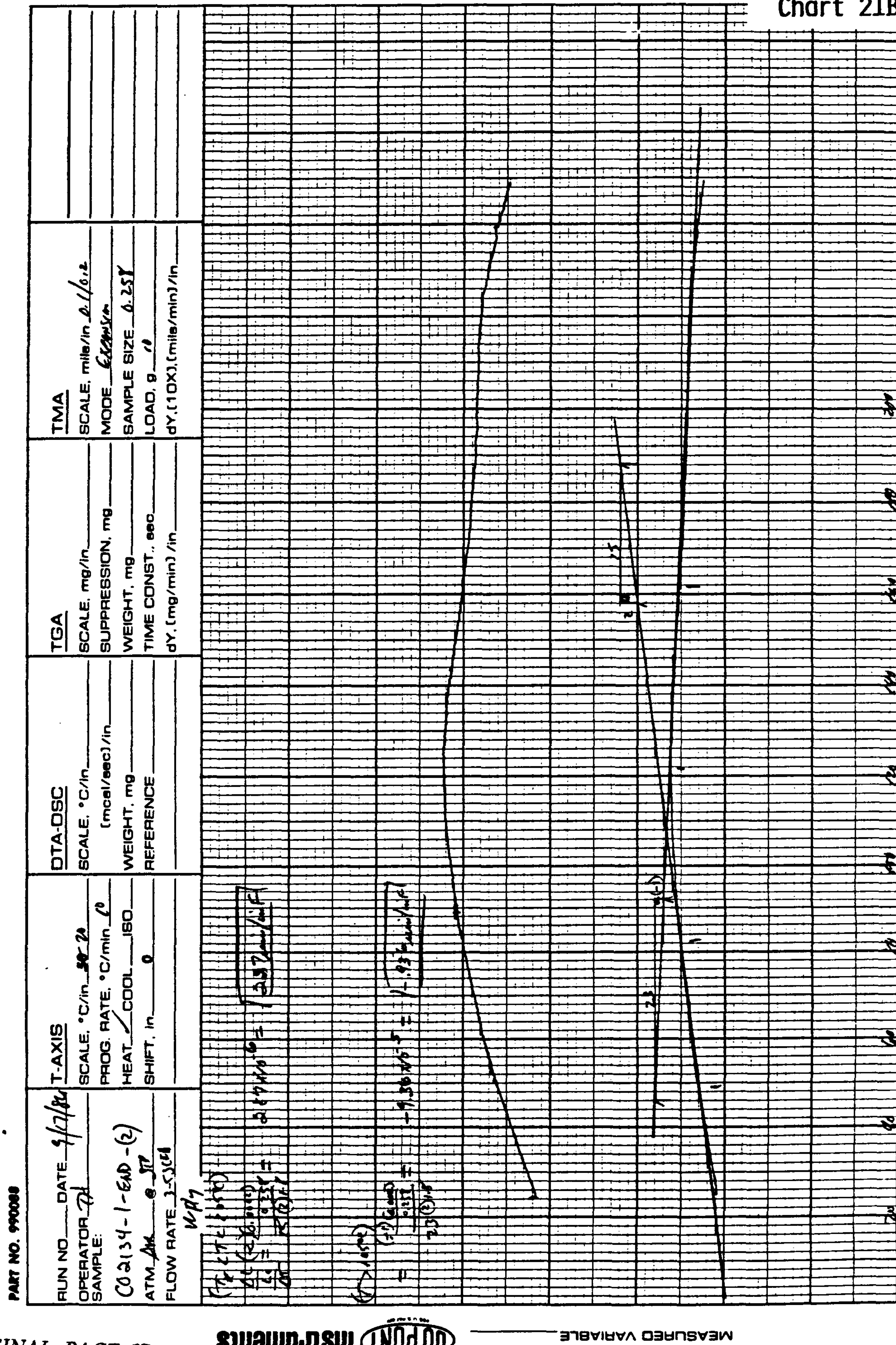


Chart 21B1

Chart 21B2



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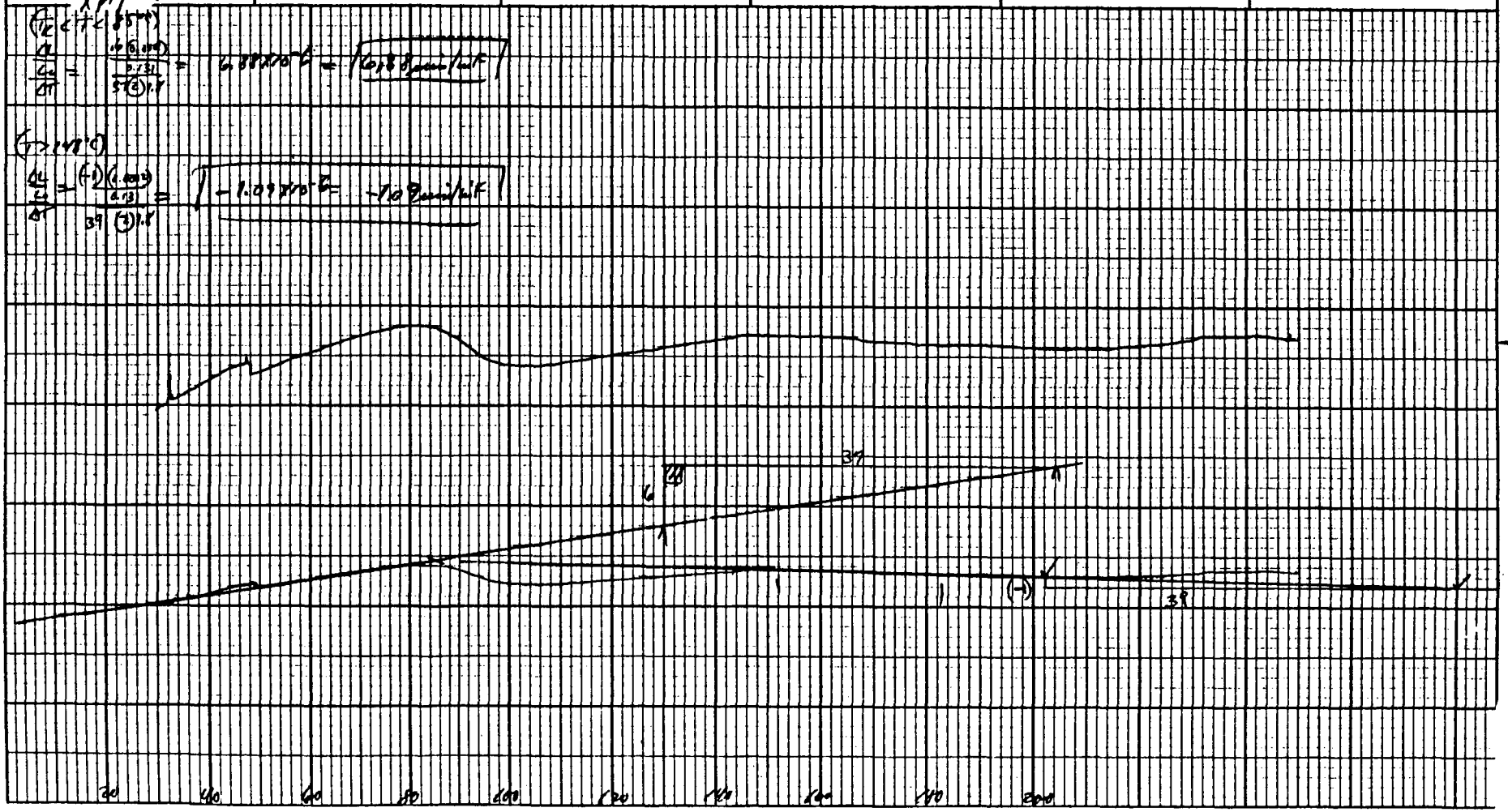
PART NO. 990088

RUN NO. ___ DATE 9/12/96	T-AXIS	DTA-DSC	TGA	TMA	
OPERATOR DH	SCALE, °C/in 50 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/62	
SAMPLE:	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE Expansion	
C02134-1E10-(4)	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.131	
ATM Air @ 8P	SHIFT, in 0	REFERENCE	TIME CONST., sec	LOAD, g 0	
FLOW RATE 3-5 SCFH			dY, (mg/min)/in	dY, (10X), (mils/min)/in	

XPL



MEASURED VARIABLE

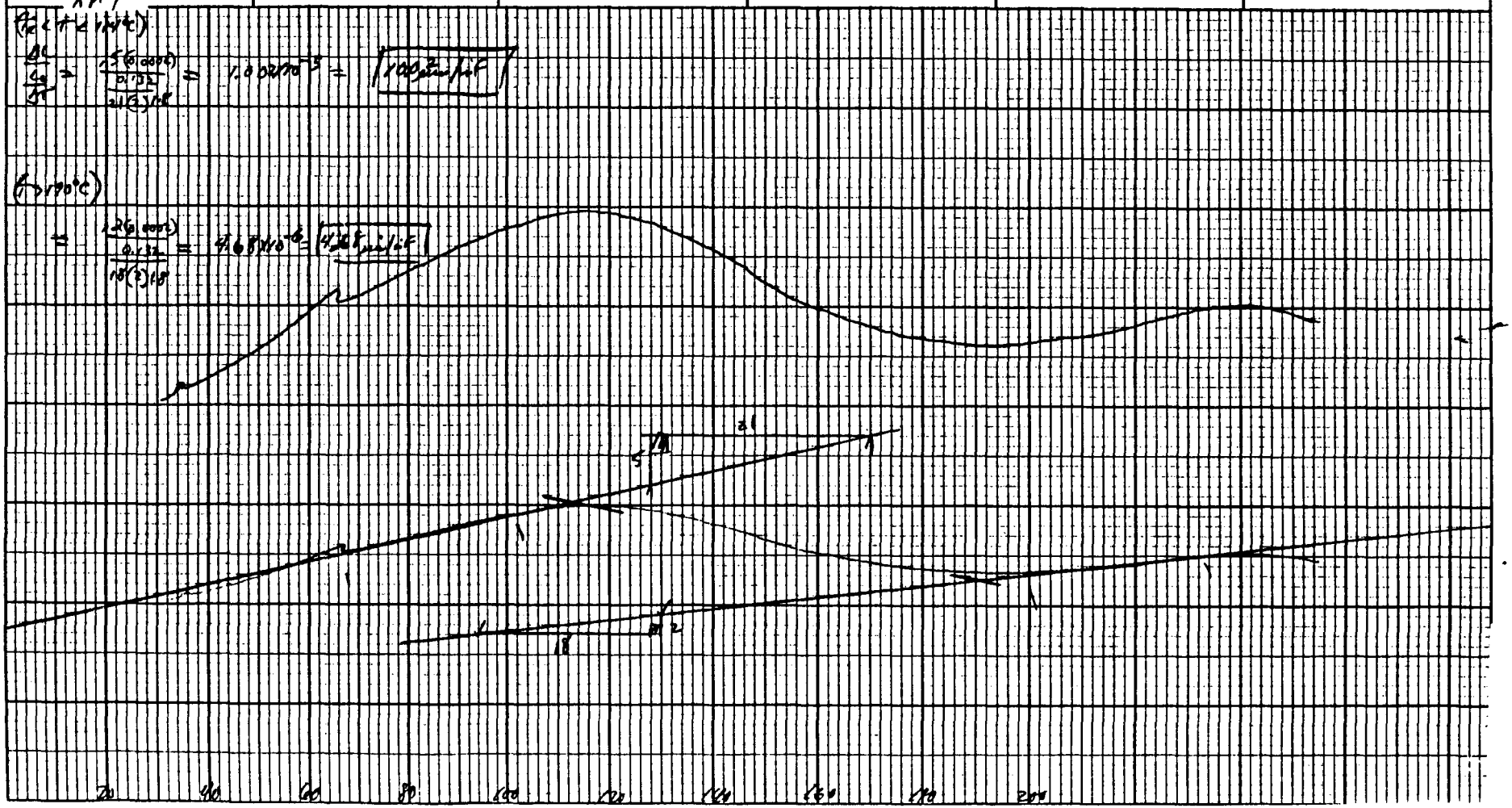
DUPONT Instruments

Chart 21B3

PART NO. 990088

RUN NO ___ DATE 9/17/86	T-AXIS	DTA-DSC	TGA	TMA	
OPERATOR TH	SCALE, °C/in 50 10	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	
CO2134-1-END-(5)	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.132	
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	

XP14



MEASURED VARIABLE

DUPONT Instruments

Chart 21B4

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DUPONT Instruments

MEASURED VARIABLE

PART NO. 990088

RUN NO. ___ DATE 9/20/90	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: C0234-2-Starter-(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 0.266	
FLOW RATE 3.5 SCFH	SHIFT, in 0	REFERENCE	TIME CONST., sec	LOAD, g 10	
w p/y			dY, (mg/min) /in	dY, (10X), (mils/min) /in	

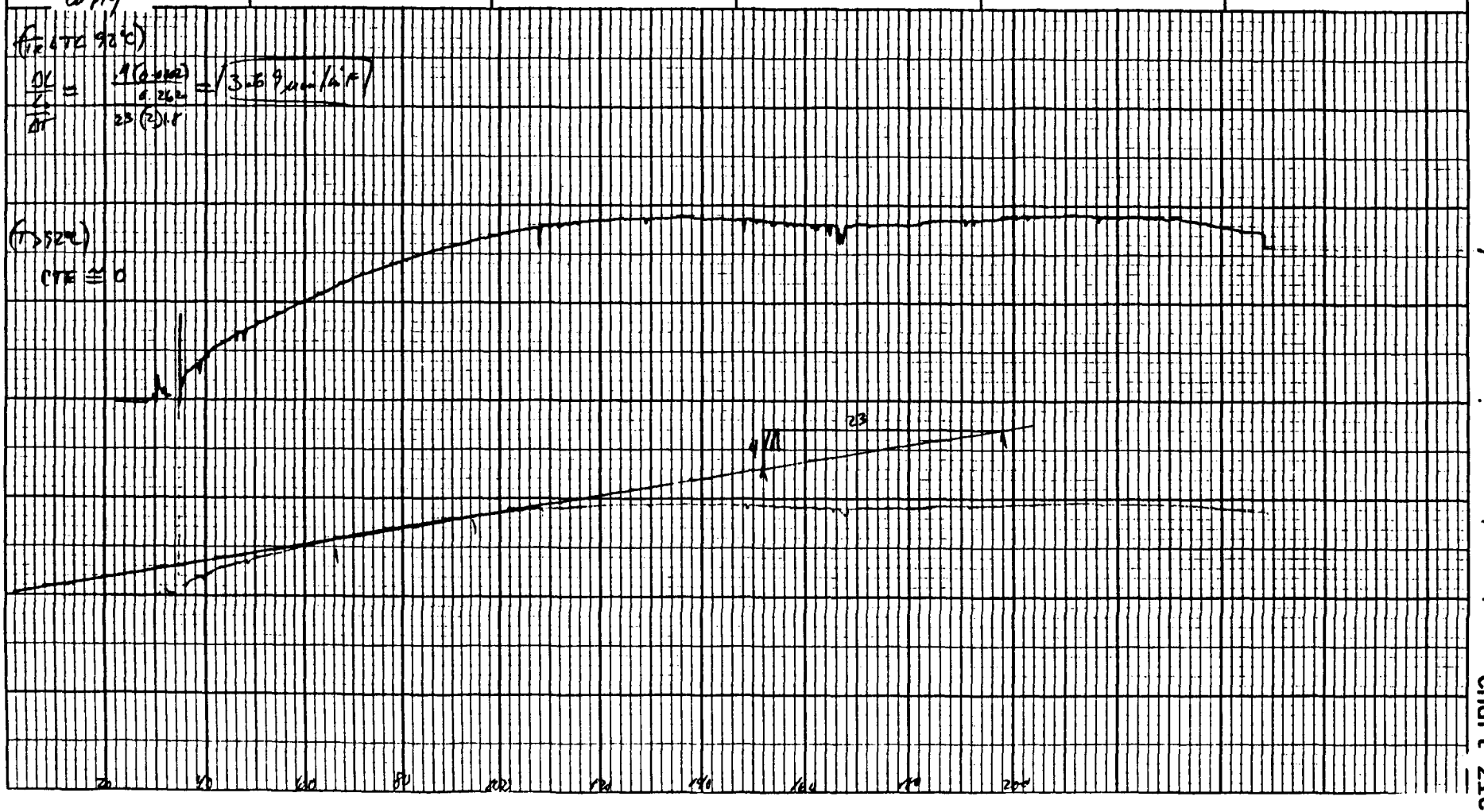


Chart 21C1

ORIGINAL PAGE IS
OF POOR QUALITY

PART NO. 990068

RUN NO. ___ DATE 9/20/86	T-AXIS	DTA-DSC	TGA	TMA	
OPERATOR TH	SCALE, °C/in 50 V	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/0.1	
SAMPLE: C02134-2-SHEET-(2)	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE Expanded	
ATM Air @ SCF	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.254	
FLOW RATE 3-5X60	SHIFT, in 0	REFERENCE	TIME CONST., sec	LOAD, g 10	
			dY, (mg/min)/in	dY, (10X), (mils/min)/in	

MEASURED VARIABLE

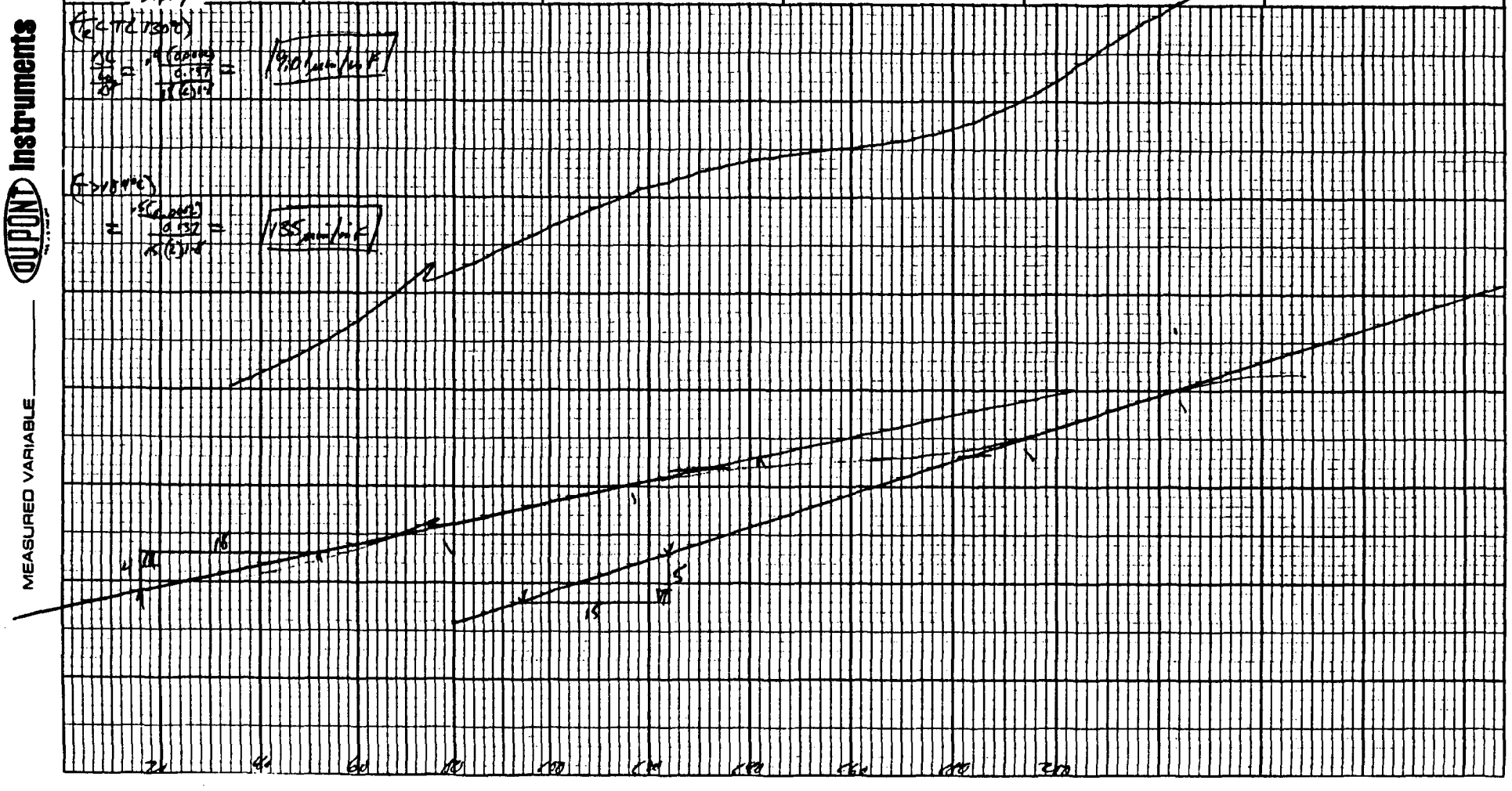
DUPONT Instruments

Chart 21C2

PART NO. 990068

RUN NO ___ DATE 9/17/96	T-AXIS	DTA-DSC	TGA	TMA	
OPERATOR TH	SCALE, °C/in 30-20	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	
CO2134-2-SMAS-(4)	HEAT ___ COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.137	
ATM Ar @ 50	SHIFT, in 0	REFERENCE	TIME CONST., sec	LOAD, g 10	
FLOW RATE 3-5 XCC			dY, (mg/min) /in	dY, (10X), (mils/min) /in	

XPLY



MEASURED VARIABLE

DUPONT Instruments

Chart 21C3

Chart 21C4

PART NO. 990088

RUN NO ___ DATE 9/17/86
OPERATOR DL
SAMPLE: C0234-2-SMART-(5)
ATM Dry @ STP
FLOW RATE 3-SCCM
XP1/7

T-AXIS
SCALE, °C/in 10-20
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, (mg/min) /in ___

TMA
SCALE, mils/in 4/6.2
MODE Expansion
SAMPLE SIZE 0.137
LOAD, g 1
dY, (10X), (mils/min) /in ___

MEASURED VARIABLE

DUPONT Instruments

ORIGINAL PAGE IS
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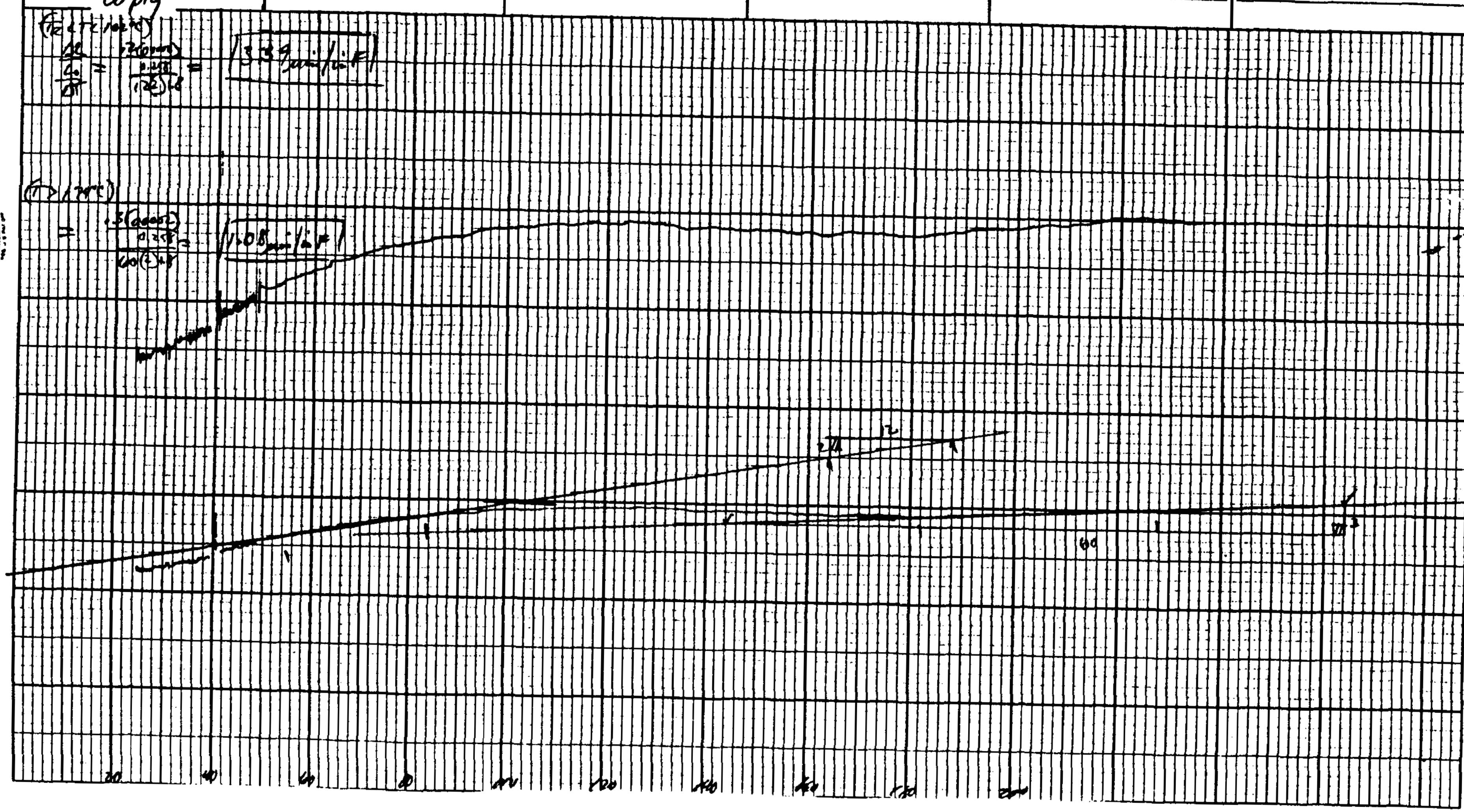
PART NO. 990088

RUN NO. ___ DATE 7/22/84	T-AXIS	DTA-DSC	TGA	TMA	
OPERATOR TD	SCALE, °C/in. 20	SCALE, °C/in. ___	SCALE, mg/in. ___	SCALE, mils/in. 6.1/0.2	
SAMPLE: C02134-2-END-(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 0.258	
FLOW RATE 3-5 SCFH	SHIFT, in. 0	REFERENCE ___	TIME CONST., sec. ___	LOAD, g 10	
			dY, (mg/min)/in. ___	dY, (10X), (mils/min)/in. ___	



DU PONT Instruments

MEASURED VARIABLE

Chart 21D1

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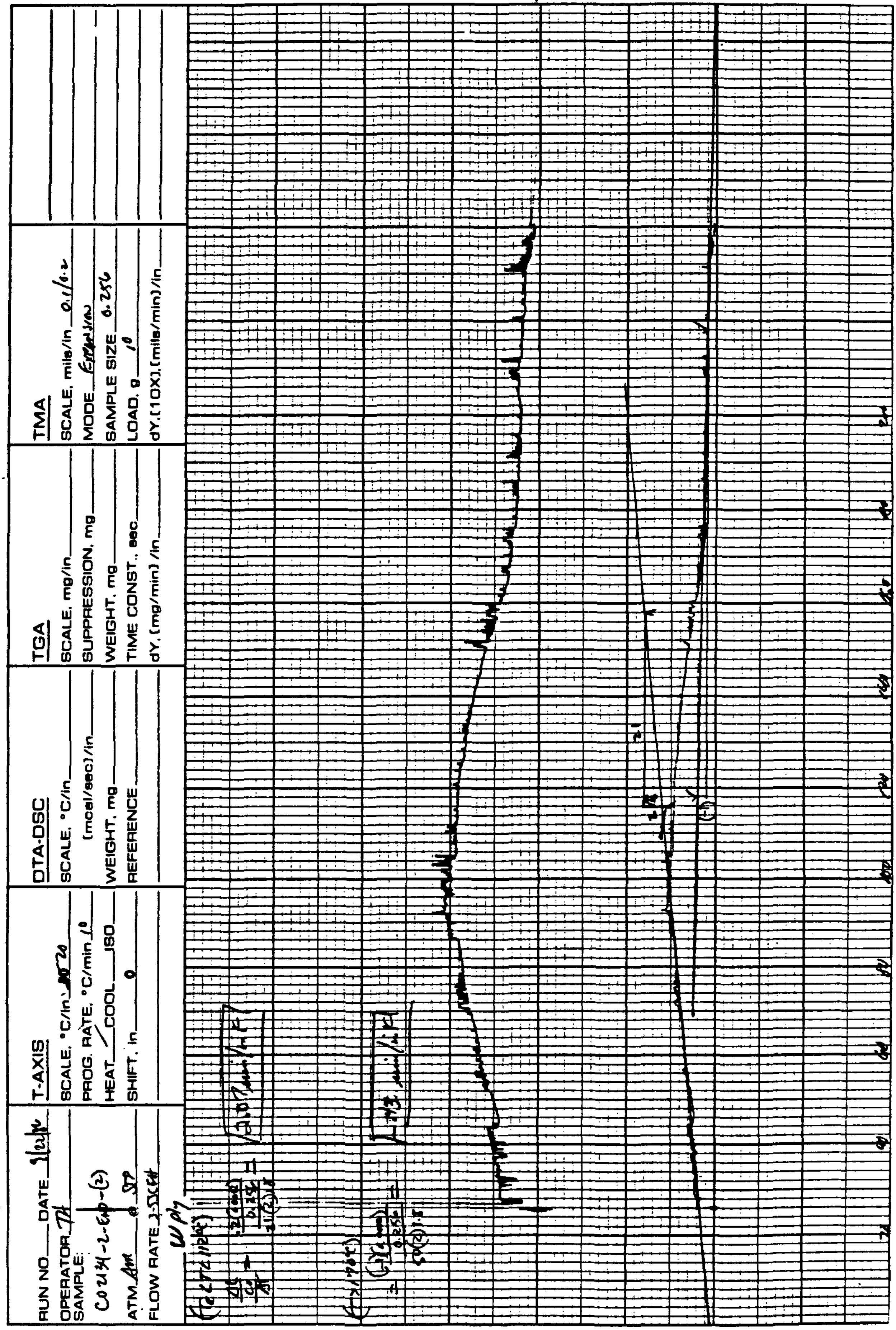
Chart 21D2



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DUPONT Instruments

MEASURED VARIABLE

PART NO. 990088

RUN NO. ___ DATE 9/17/82	T-AXIS	DTA-DSC	TGA	TMA	
OPERATOR DH	SCALE, °C/in 5020	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/0.2	
SAMPLE: C02134-2-F40-(4)	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE EXPANSION	
ATM Ar @ SSP	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0132	
FLOW RATE 3-5 SCFH	SHIFT, in 0	REFERENCE	TIME CONST., sec	LOAD, g 10	
			dY, (mg/min) /in	dY, (10X), (mils/min) /in	

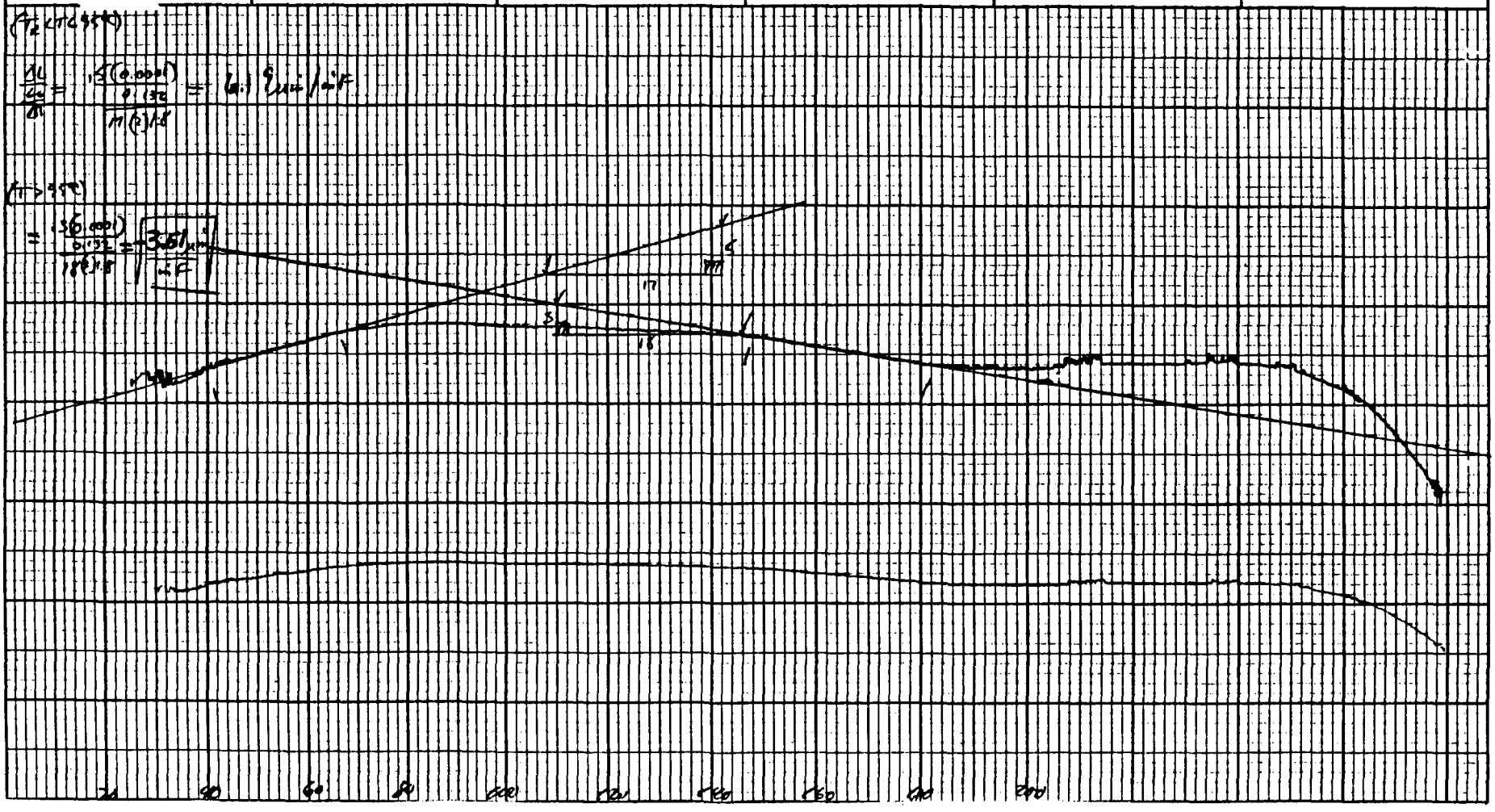

Chart 21D3

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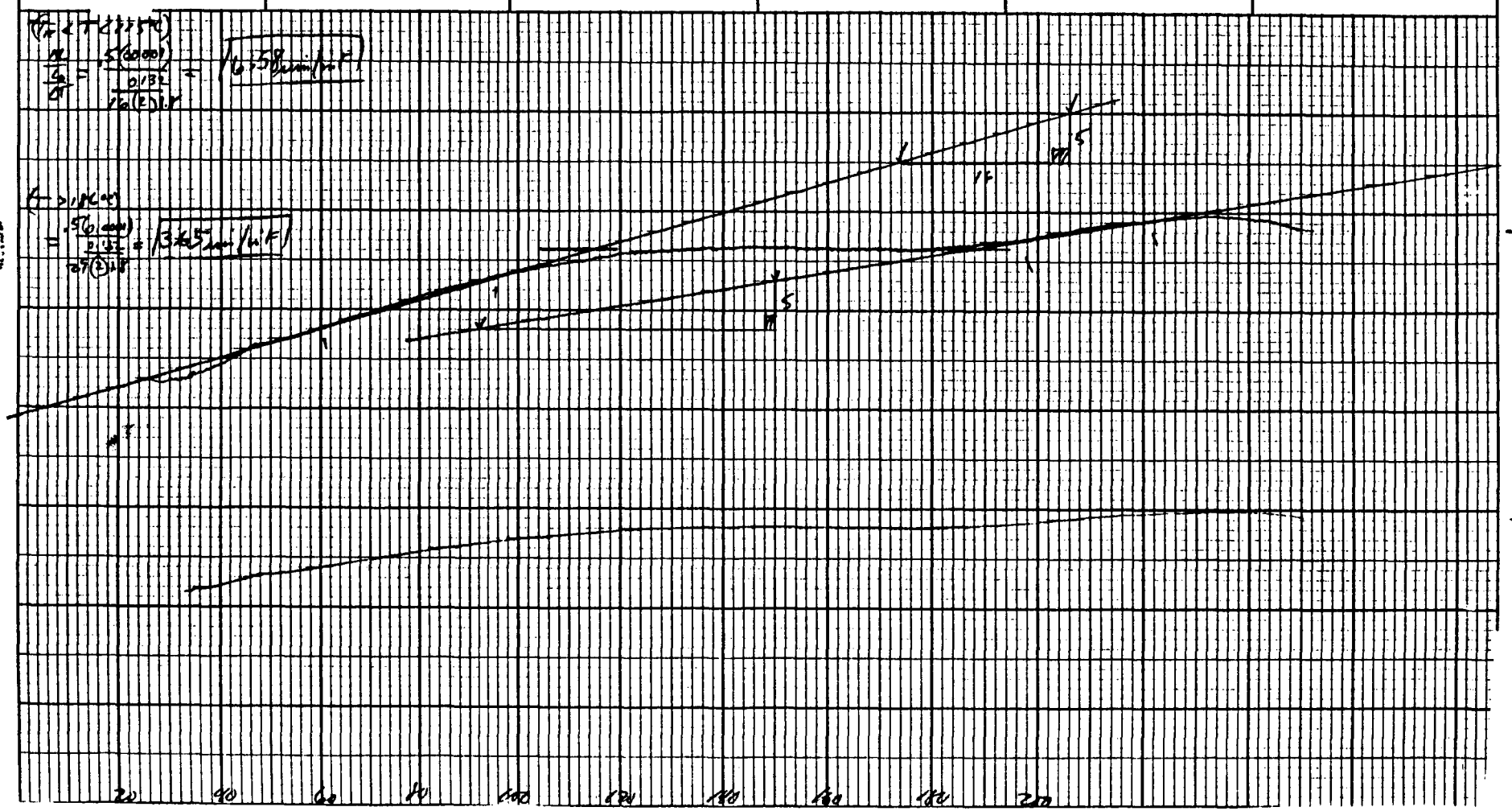
PART NO. 990088

RUN NO. ___ DATE 9/17/86	T-AXIS	DTA-DSC	TGA	TMA	
OPERATOR TH	SCALE, °C/in 50 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 6-1/0.2	
SAMPLE:	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE EXPANSION	
C02134-2-END-(5)	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.132	
ATM Air @ STP	SHIFT, in 0	REFERENCE	TIME CONST., sec	LOAD, g 10	
FLOW RATE 3-5 SCCM			dY, (mg/min)/in	dY, (10X), (mils/min)/in	



MEASURED VARIABLE

DUPONT Instruments

Chart 21D4

TABLE OF CONTENTS

FILLER TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

Filler Lot for NASA Lot# 2

TEST		PAGE
1.	Carbon Content	1
2.	Ash Content	1
3.	Atomic Absorption	1
3a.	Moisture Content	1
3b.	Ash Content	1
4.	pH	1
5.	Particle Size, S.E.M. procedure	1
6a.	TGA, °C at 50% Loss	1
6b.	TGA	2
7.	Particle Size Distribution	2
7a.	Particle Size, Horiba	2

CHARTS

TGA	6A - 6C
Particle Size Distribution	7A - 7C

USP
U.S. Polymeric

FILLER TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

Filler Lot for NASA Lot# 2

		SAMPLE		
1. Carbon Content, % QAI-5560		#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

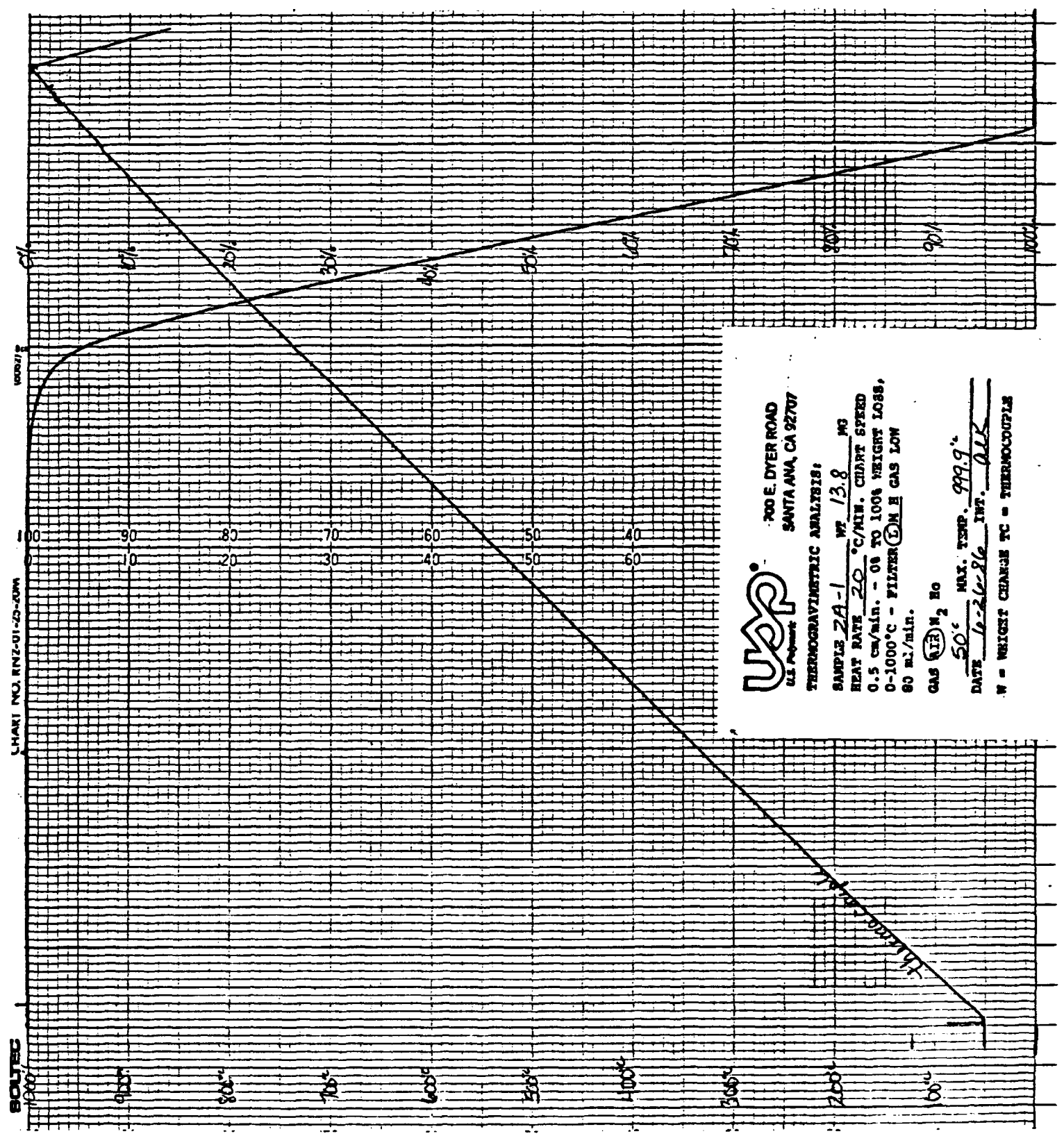


CHART 6B

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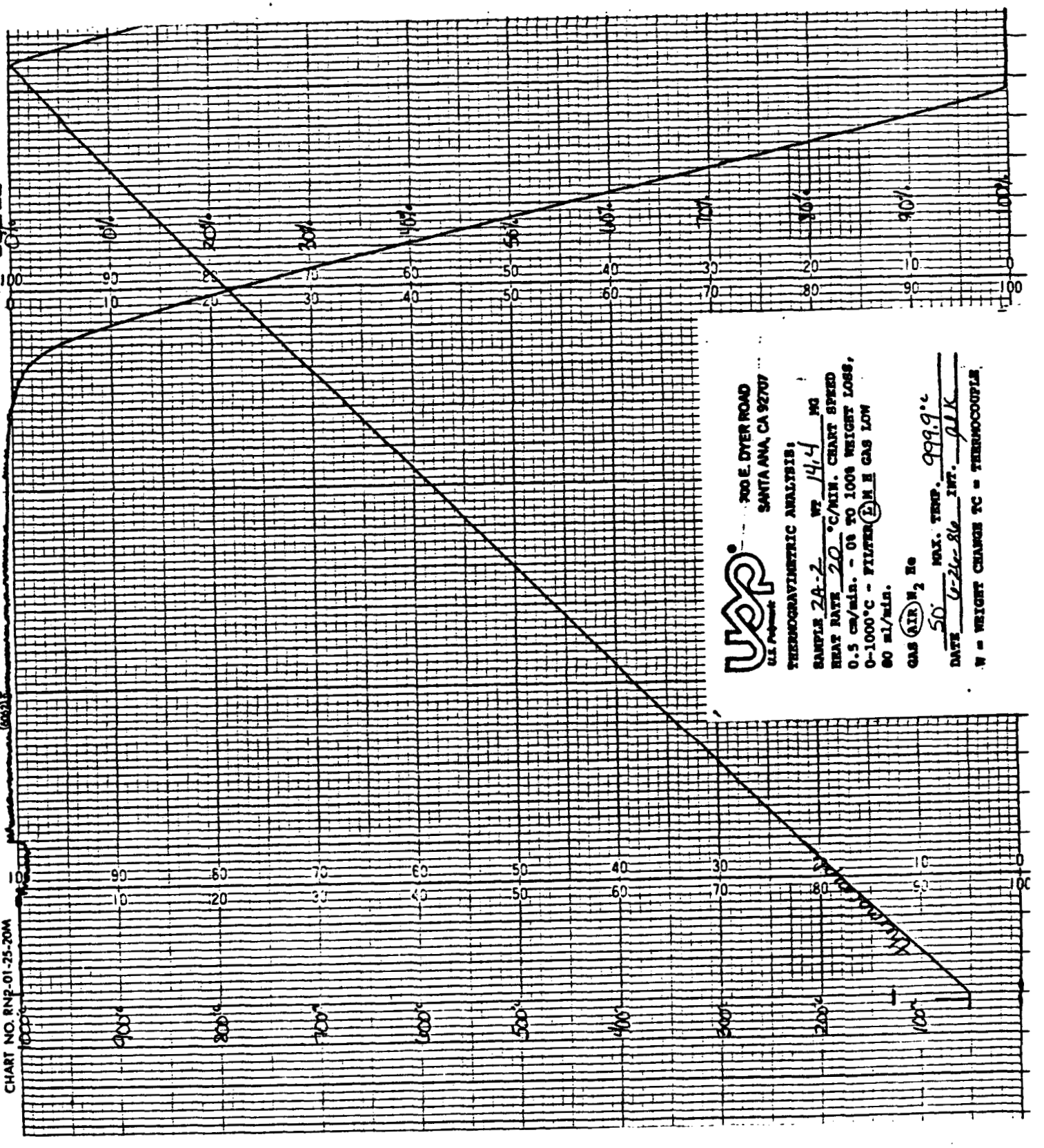

CHART 6C

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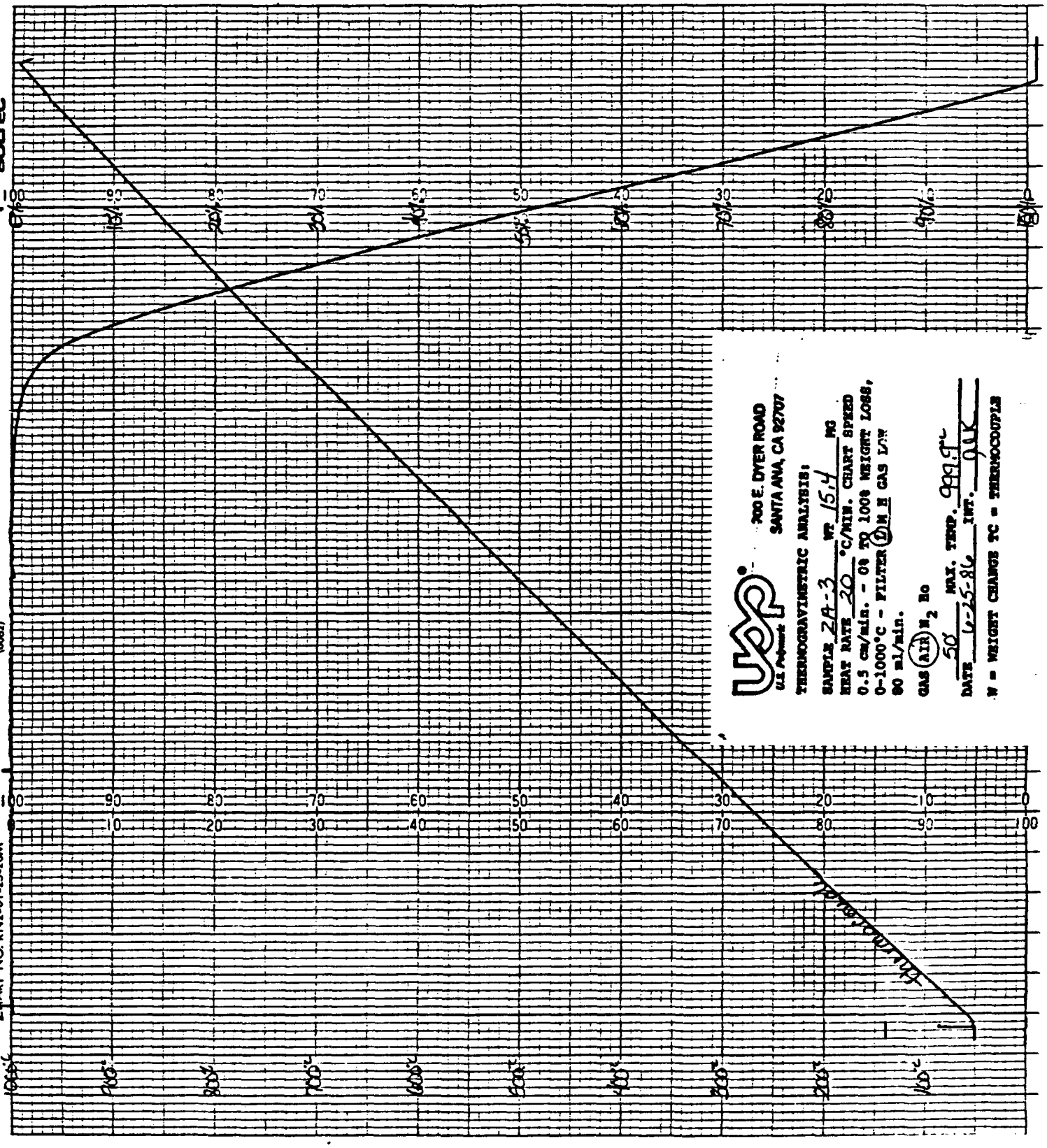


HORIBA CAPA-500
PARTICLE ANALYZER

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

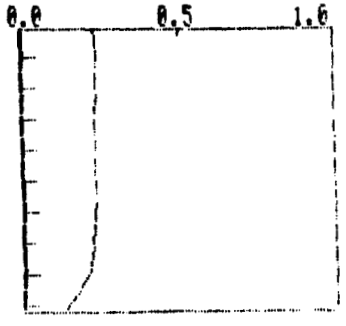
* CONDITIONS

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

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

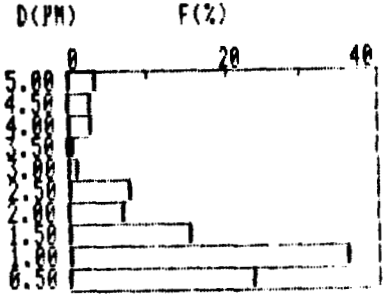


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	3.3	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 (PM)

* 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

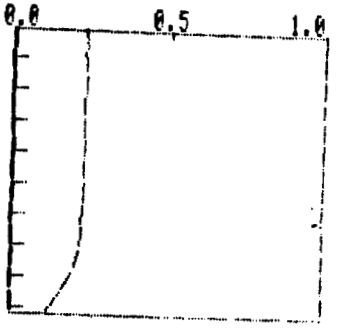
* CONDITIONS

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

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

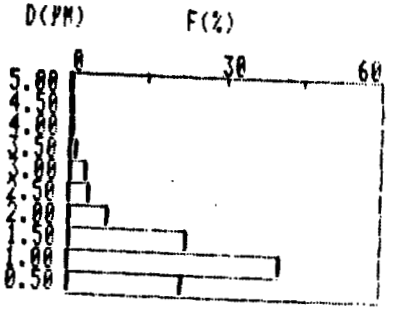


* DISTRIBUTION TABLE (BY VOL.)

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	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 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



LOT#2A-1
Sample#2

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

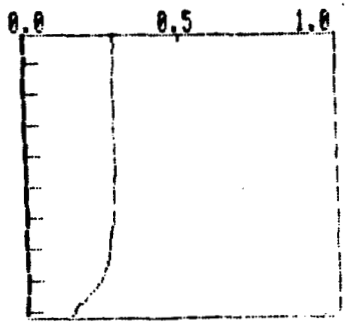
* CONDITIONS

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

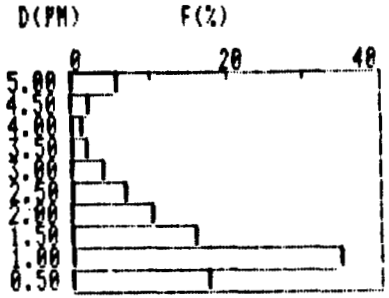


* DISTRIBUTION TABLE (BY VOL.)

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

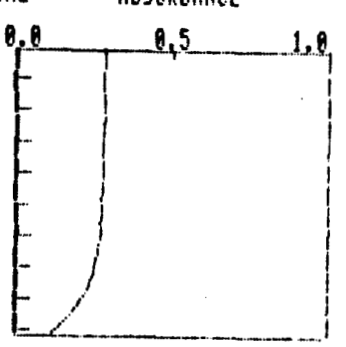
* CONDITIONS

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

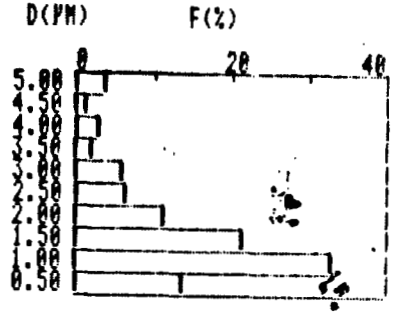


* DISTRIBUTION TABLE (BY VOL.)

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

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

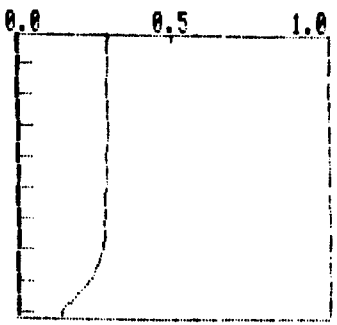
* CONDITIONS

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. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

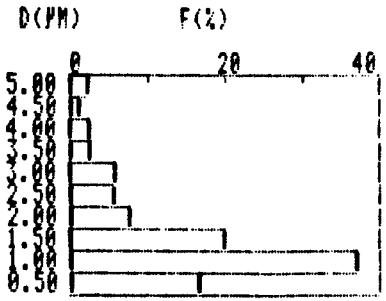


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	2.0	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

HORIBA CAPA-500
PARTICLE ANALYZER

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

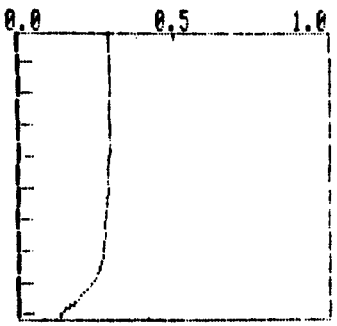
* CONDITIONS

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

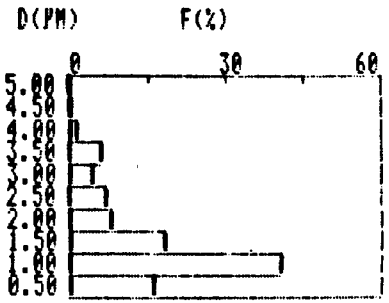


* DISTRIBUTION TABLE (BY VOL.)

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

TEST		PAGE
1.	Resin Solids	1
2.	Specific Gravity	1
3.	Brookfield Viscosity	1
4.	Gel Time	1
5.	Atomic Absorption	1
6.	Gas Chromatography	1
7.	TGA	1
8.	DSC	1
9.	HPLC	1
10.	GPC	1
11.	pH	2
12.	Phenol Content	2
13.	Chang's Index	2
14.	RDS	2
15.	NMR	2

CHARTS

Gas Chromatography	6A - 6B
TGA	7A - 7B
DSC	8A - 8B
HPLC	9A - 9B
GPC	10A - 10B
RDS	14A - 14B
NMR	15A - 15B

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	#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	J.M.J.	Date	12/11/86
Column		Detector	FID
Length	6ft.	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, 2-1	Solvent	THF
Size	0.1 µl	Concn.	0.1/10 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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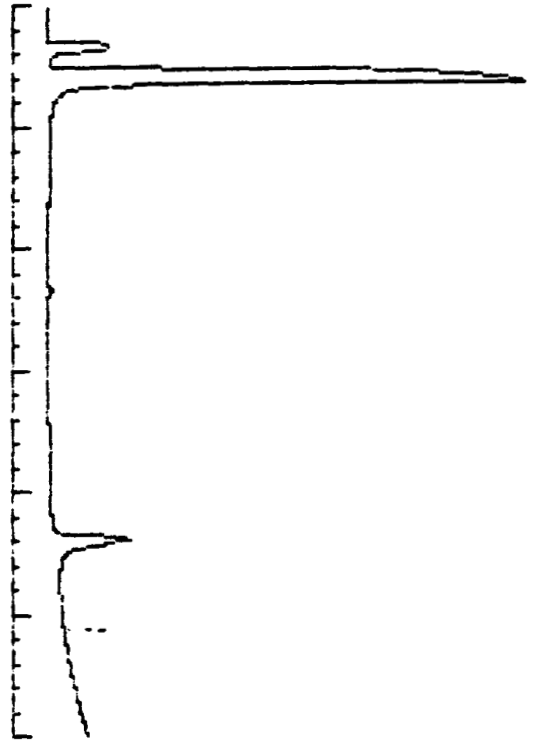
CHART 6A

*** REAL TIME CHROMATOGRAM ***



FINAL FULL SCALE MV.=1000 00

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

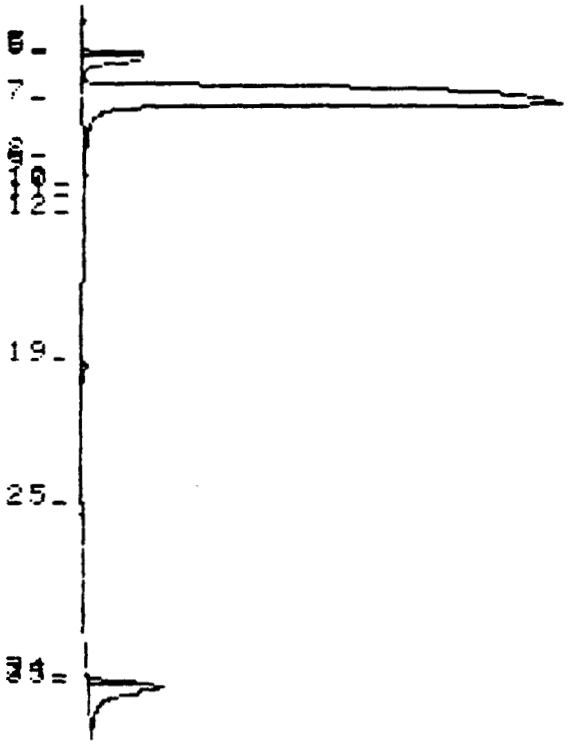
TIME: 12:59
DATE: 12/11/86
OPERATOR: JGZ

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	5.08	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	16.23	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 PK WIDTH= 15
AREA REJECT= 1000

VERTICAL SCALE FACTOR 1X



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

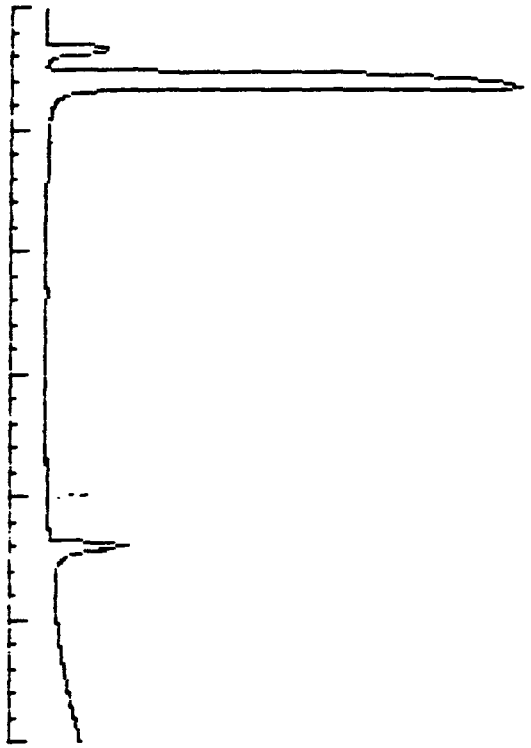
TIME 12:59
DATE: 12/11/86
OPERATOR: JGZ

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

PK NO.	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 PK WIDTH= 15
AREA REJECT= 10000

*** REAL TIME CHROMATOGRAM ***



FINAL FULL SCALE MV.=1000.00

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

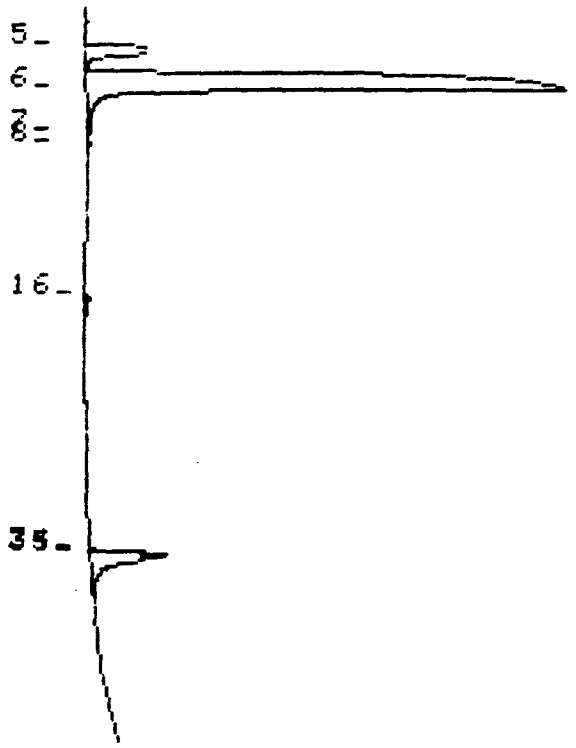
TIME: 14:47
DATE: 12/11/86
OPERATOR: JGZ

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	83.542	3	89961
34	21.88	53228	1.203	2	10083
35	22.03	376520	8.512	3	14774

TOTAL AREA= 4423278
THRESHOLD= 1
MIN.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

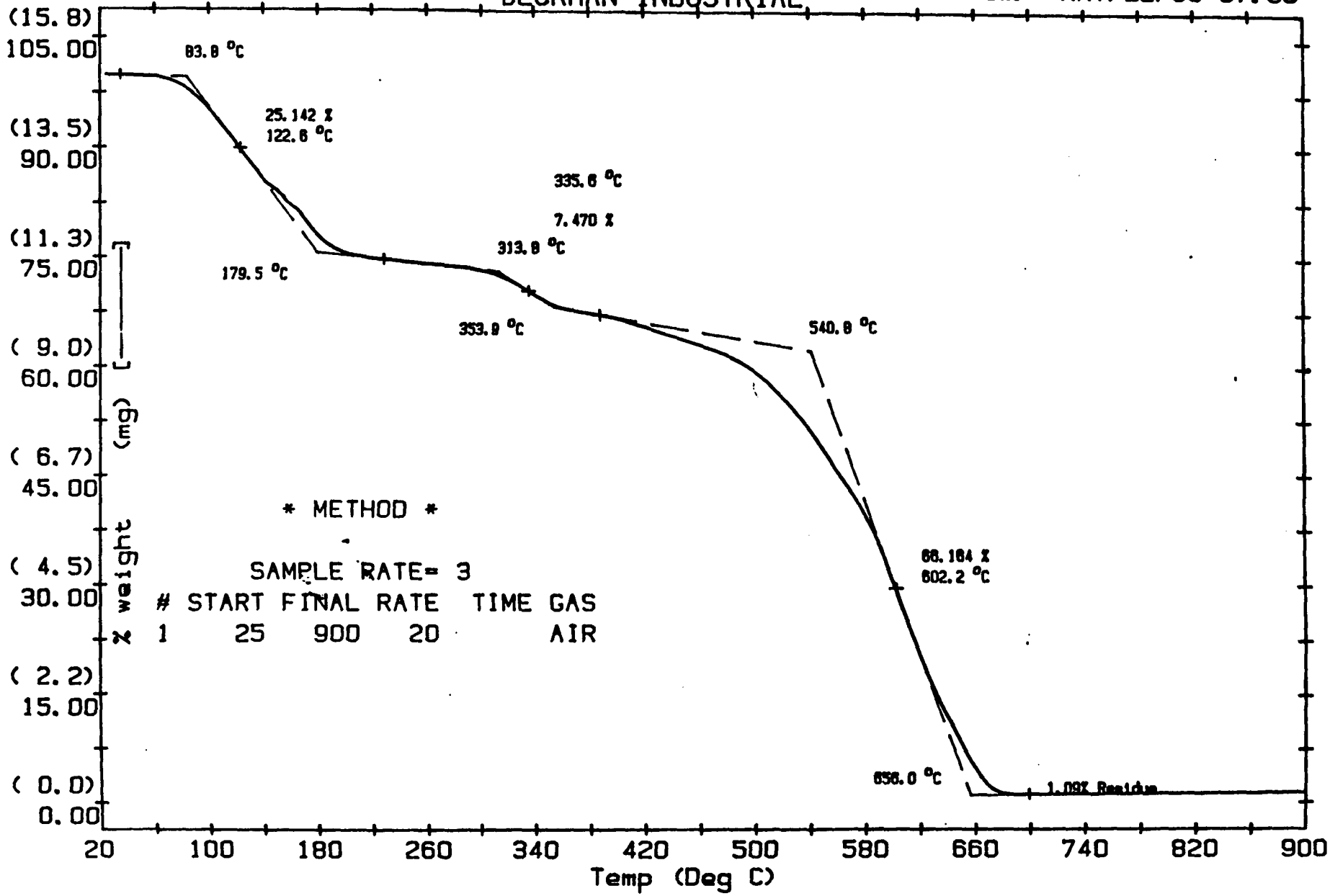


CHART 7A

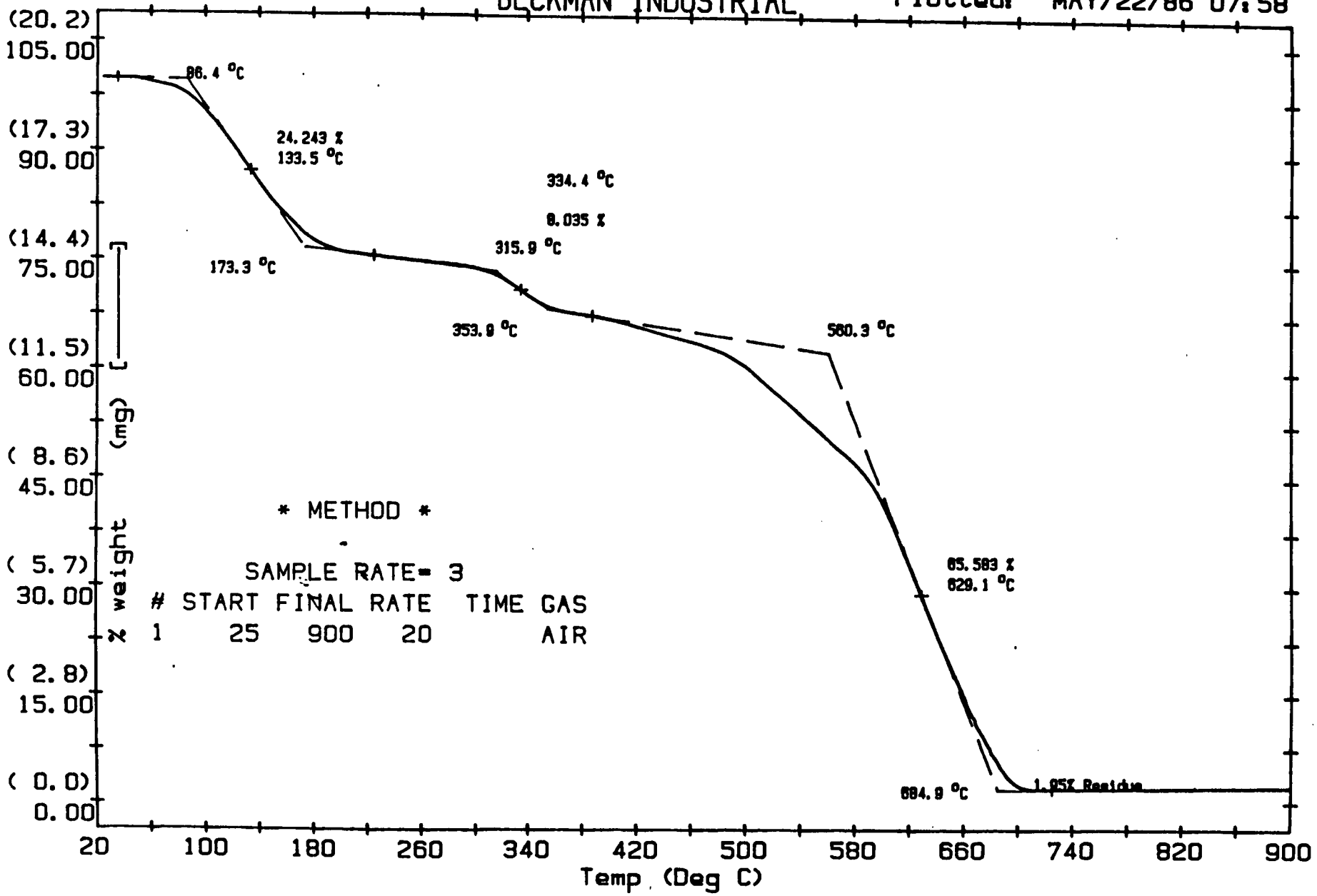
Beckman Industrial™ ANALYTICAL LABORATORY SERVICES

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

CHART 8A

RUN NO ___ DATE 4/3/86

OPERATOR ___

SAMPLE: 2 ℓ

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

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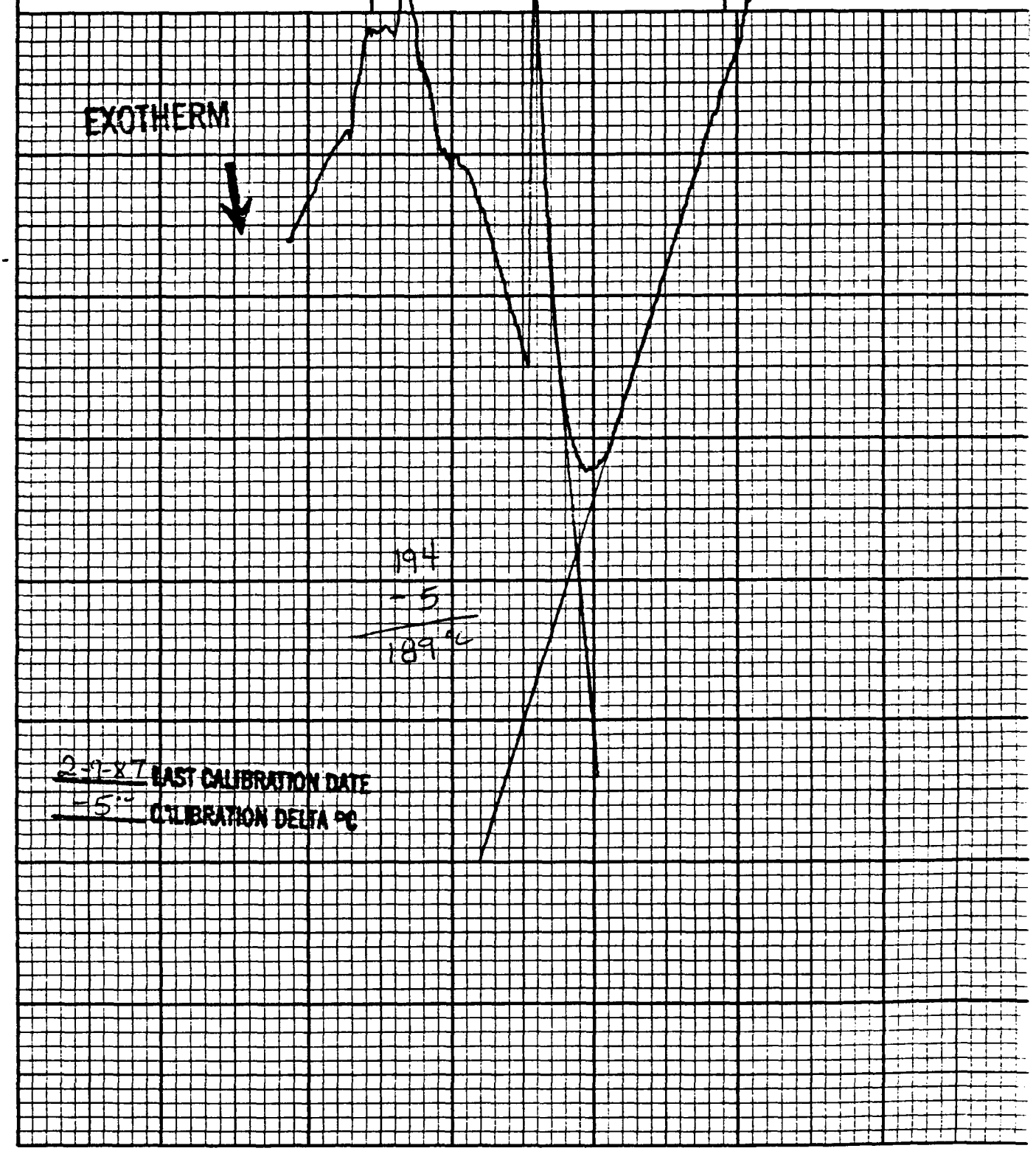
CHART 8B

RUN NO ___ DATE 2-23-87
OPERATOR [illegible]
SAMPLE: 2-2
USP 39A
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 3.11
REFERENCE 1 alum seal



DUPONT Instruments

MEASURED VARIABLE ___

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

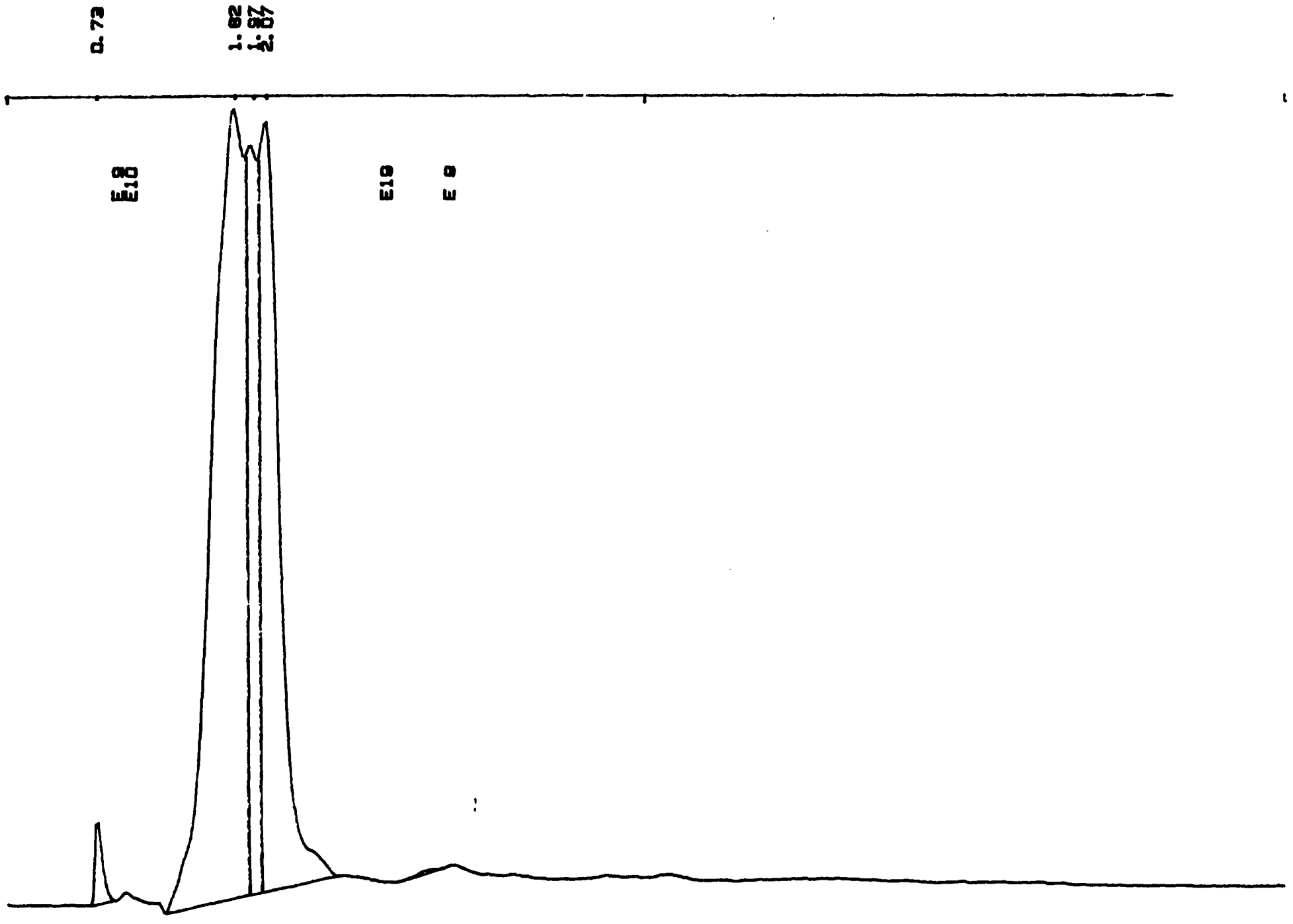
********* AREA PERCENT REPORT *********

```
**********************************************************************
* 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= 10.930 Mv.
USP-39A, 2-1, C=5.555 MG/ML, 8/2/88, JGZ



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

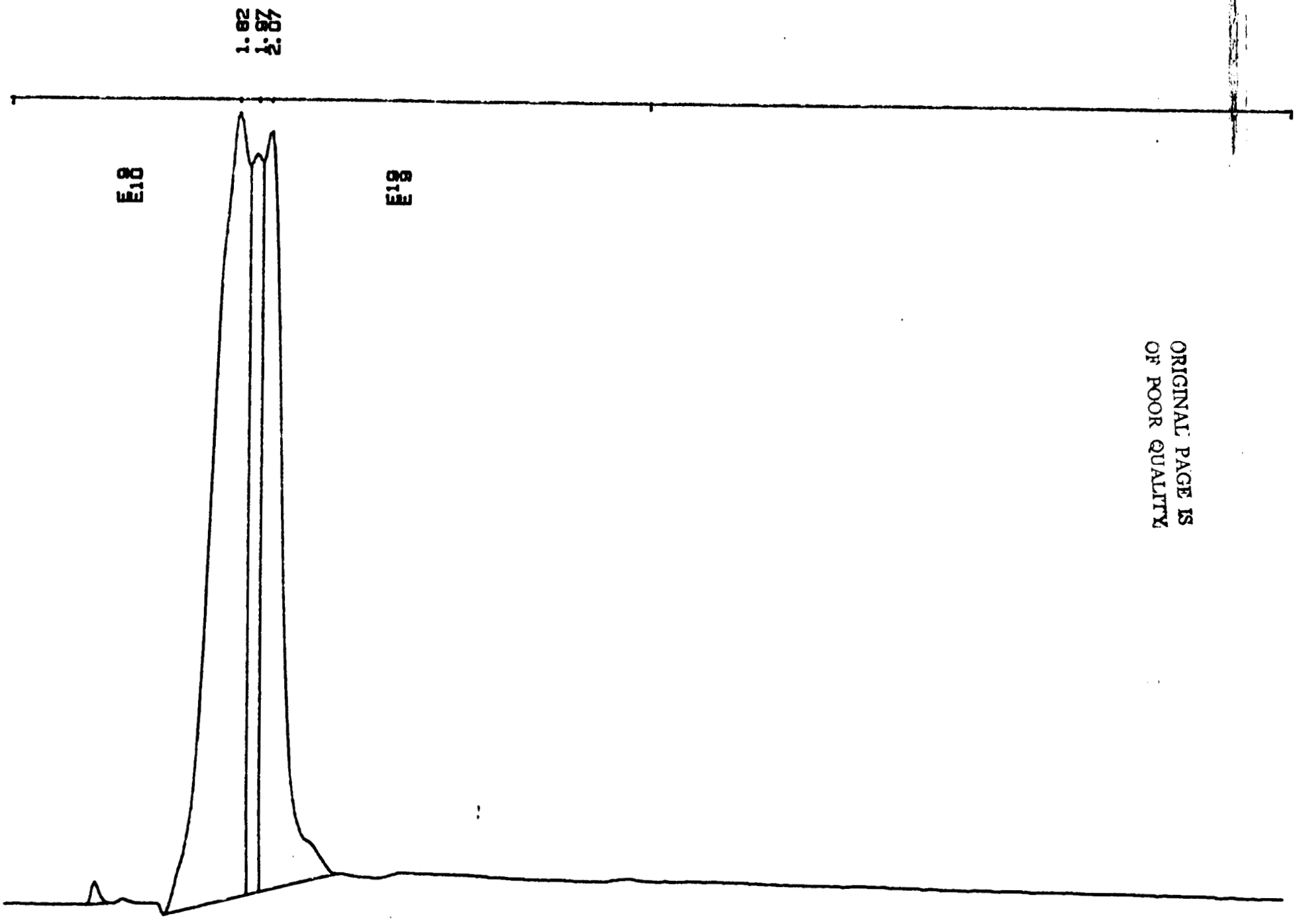
********* AREA PERCENT REPORT *********

```
**********************************************************************
* 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-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

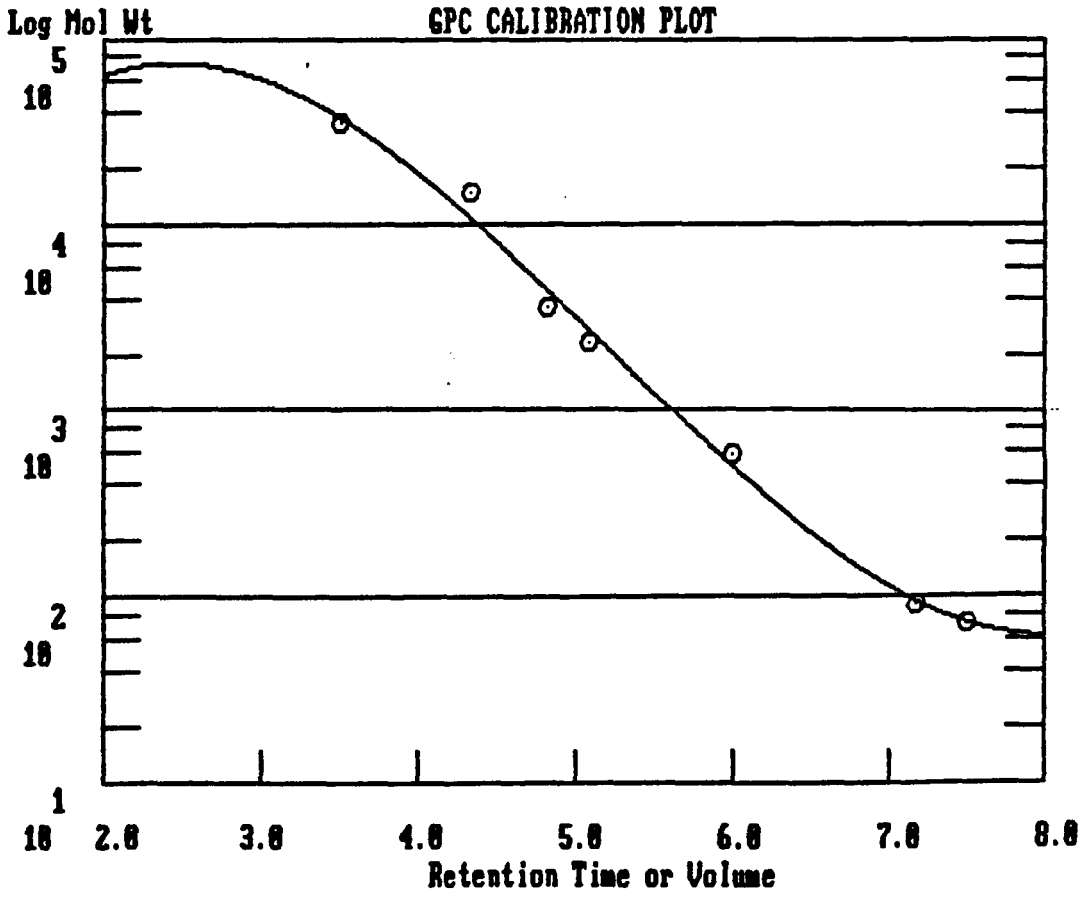
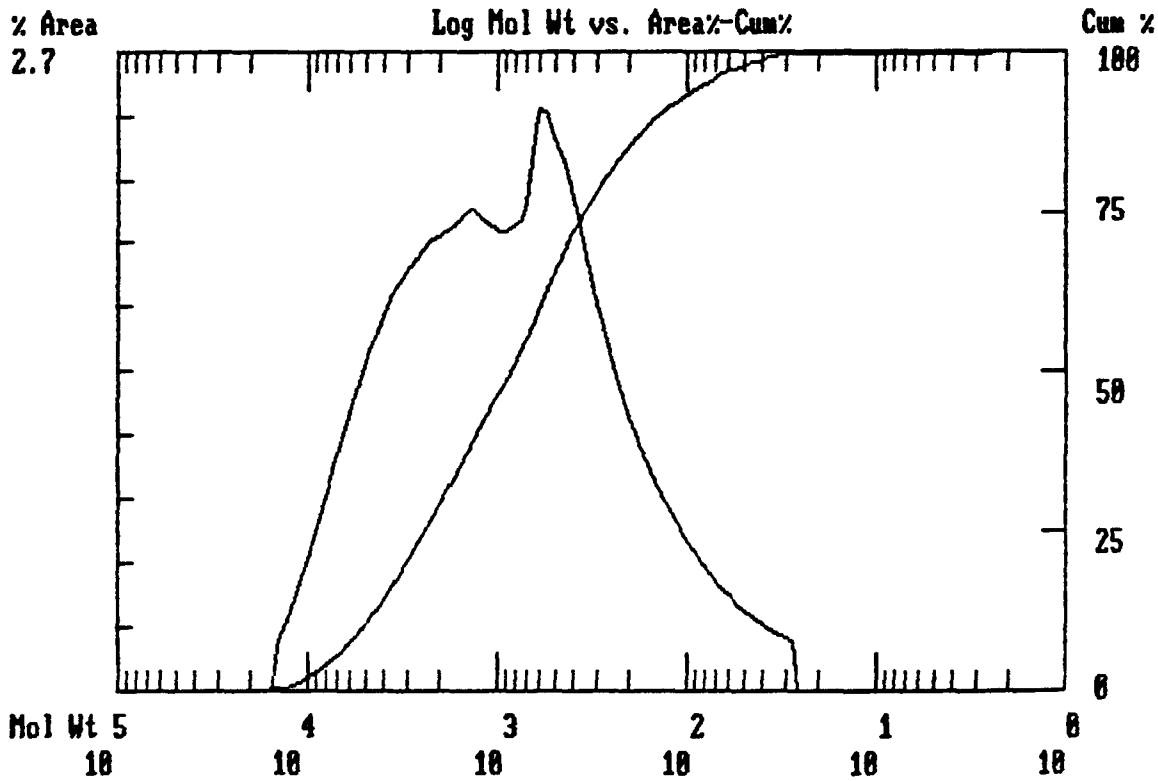


CHART 10A

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

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

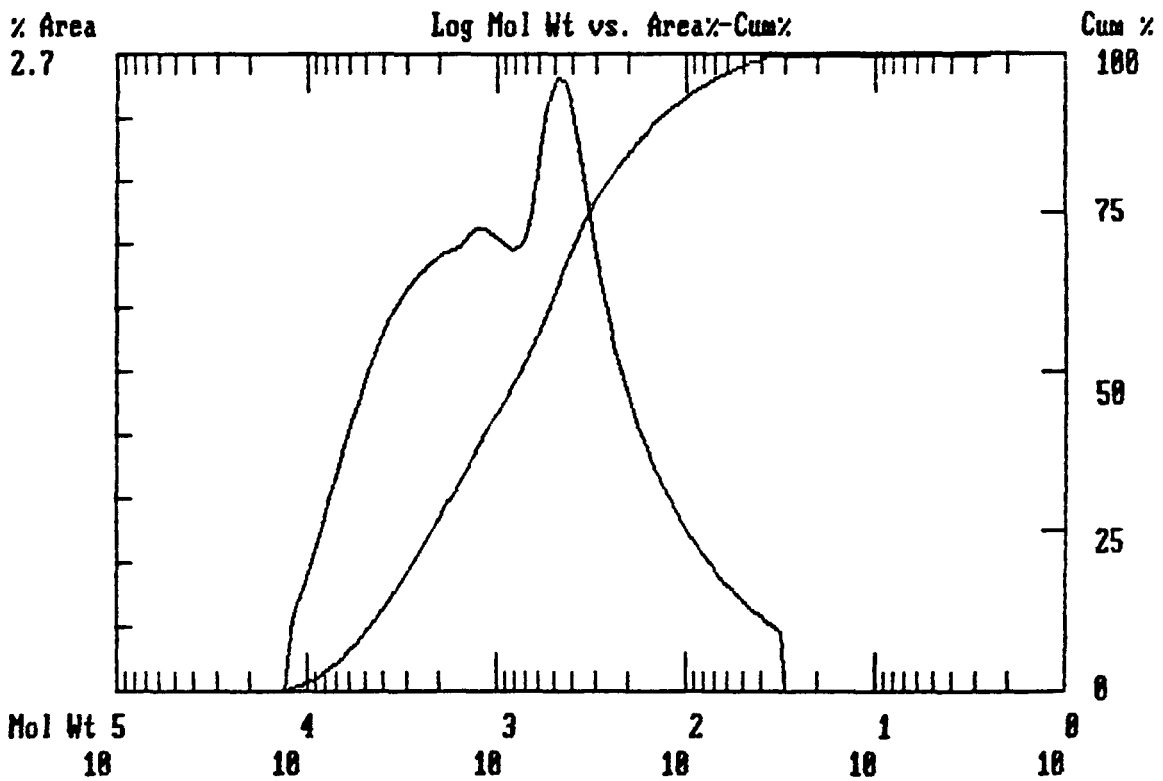
```
**********************************************************************************
* Sample Name: USP39A 2-1=2.68                    Operator Initials: GBF         *
* Date:  08-05-1986 15:48:25 Method:              DATA FILE: A:GPC33.PTS         *
* Interface: 5               Cycle#:  33          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
```



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
ibration file: GPCPHEN
olecular Weight Distribution Averages
aseline TIMES:    3.85 to   10.00   MW:      22295 to          2
ocess  TIMES:     3.85 to   10.00   MW:      22295 to          2
otal Area:       198243
N=                 1631
=                   328
/Mn=              4.9600
=                  4349
=                  1407
```

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

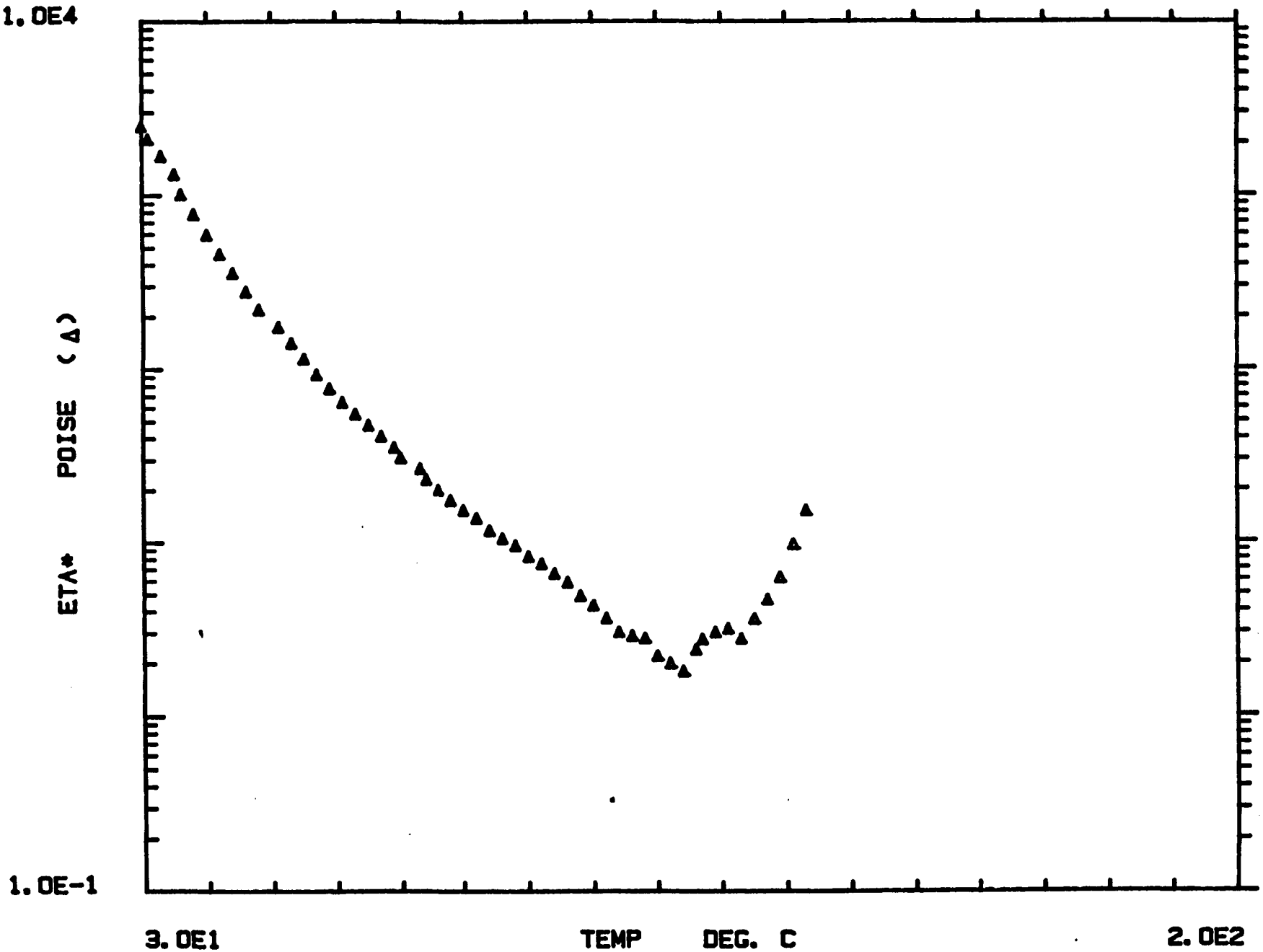


CHART 14A

Rheometrics RECAP II

Experiment No. : 2 Sample No. : 1

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

Operator :CP

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

Operating Mode : DYNAMIC

Sweep Type : CURE

Geometry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

Notes :
STRAIN =50%
FREQUENCY =10 RAD/SEC

O.	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	3.300e+001
6	1.283e+003	1.282e+003	3.520e+001	1.625e+002	5.000e+000	3.500e+001
7	9.853e+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	2.268e+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	1.889e+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	1.478e+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	3.419e+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	2.522e+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	3.298e+000	2.121e+000	2.700e+001	7.800e+001
29	1.480e+001	1.453e+001	2.816e+000	1.857e+000	2.800e+001	8.000e+001
30	1.328e+001	1.299e+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	1.153e+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	9.030e-001	3.400e+001	9.200e+001
36	6.315e+000	6.283e+000	6.316e-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	4.072e-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	2.883e+000	2.783e+000	7.547e-001	3.621e-001	4.800e+001	1.190e+002
50	3.024e+000	2.903e+000	1.135e+000	3.799e-001	4.900e+001	1.210e+002

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

NO.	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	5.588e-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 39A RESIN NASA LOT2-2

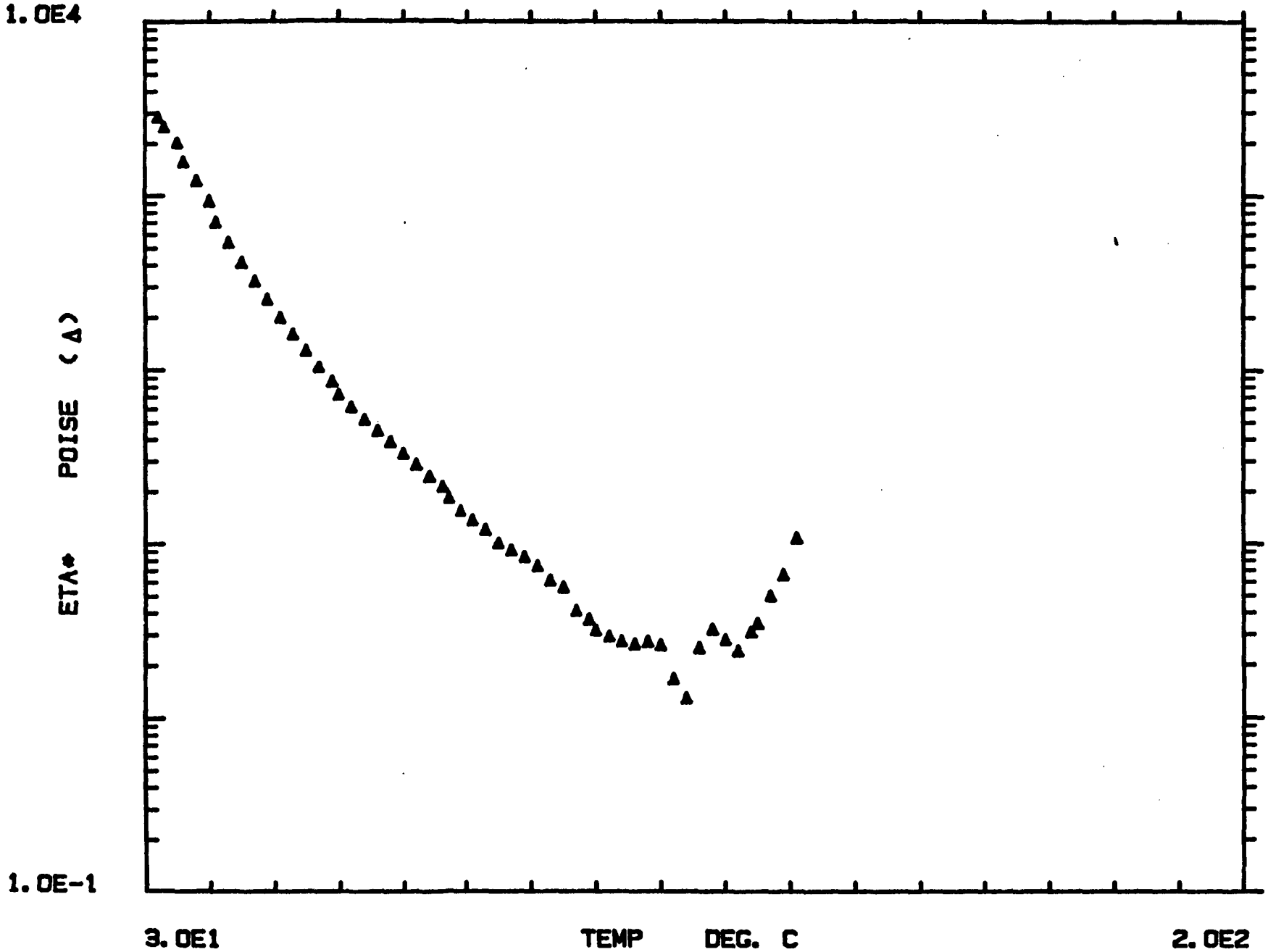


CHART 14B

Rheometrics RECAP II

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xperiment No. : 3 Sample No. : 1

i le:
ASA FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT2-2

erator :CP

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

erating Mode : DYNAMIC

ep Type : CURE

ometry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

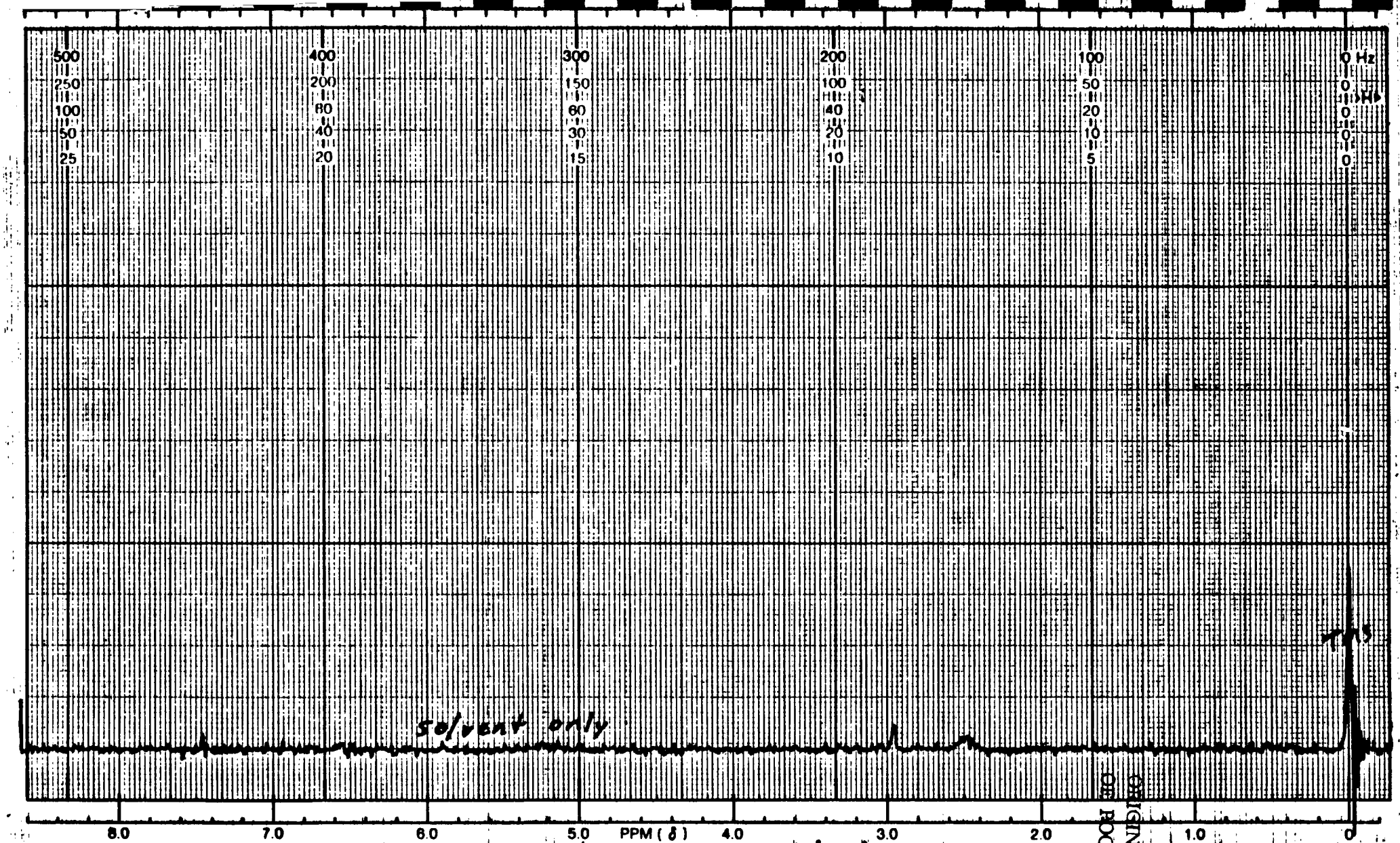
es :
AIN =50%
EQUENCY =10 RAD/SEC

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

NO.	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	3.503e+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+001
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
10	4.013e+002	4.007e+002	2.174e+001	5.052e+001	9.000e+000	4.500e+001
11	3.136e+002	3.129e+002	2.112e+001	3.947e+001	1.000e+001	4.700e+001
12	2.457e+002	2.449e+002	2.013e+001	3.090e+001	1.100e+001	4.900e+001
13	1.938e+002	1.928e+002	1.994e+001	2.436e+001	1.200e+001	5.100e+001
14	1.561e+002	1.549e+002	1.938e+001	1.961e+001	1.300e+001	5.300e+001
15	1.257e+002	1.244e+002	1.839e+001	1.580e+001	1.400e+001	5.500e+001
16	1.014e+002	1.003e+002	1.543e+001	1.273e+001	1.500e+001	5.700e+001
17	8.340e+001	8.234e+001	1.320e+001	1.047e+001	1.600e+001	5.900e+001
18	7.033e+001	6.940e+001	1.145e+001	8.840e+000	1.700e+001	6.000e+001
19	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	1.890e+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
31	9.738e+000	9.579e+000	1.748e+000	1.222e+000	3.000e+001	8.500e+001
32	8.840e+000	8.742e+000	1.311e+000	1.110e+000	3.100e+001	8.700e+001
33	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	2.421e+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	2.684e+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

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

NO.	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
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 + 0.02% TMS
DEC. LEVEL

REMARKS:

SOLVENT ONLY SCAN

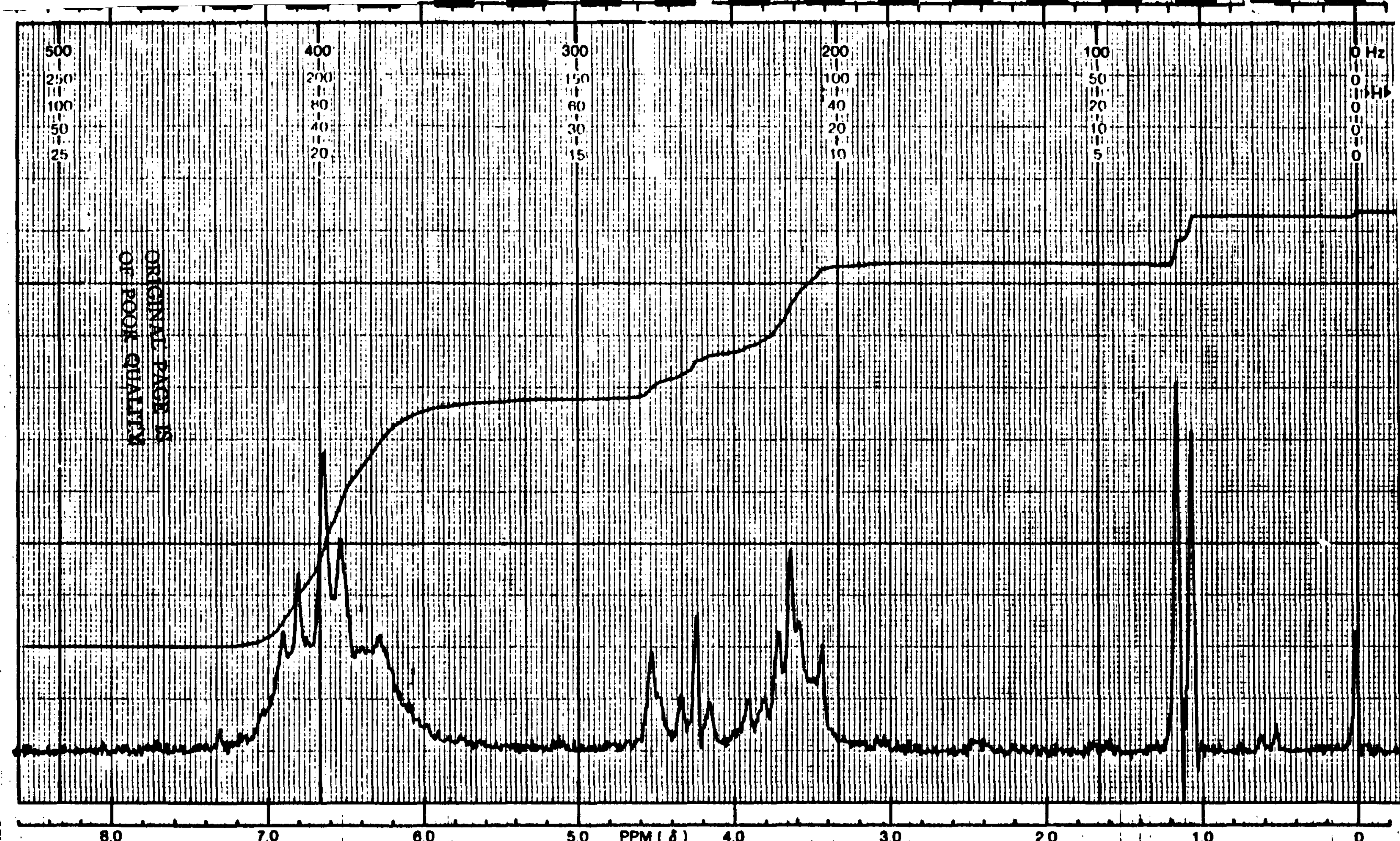
ORIGINAL PAGE IS OF POOR QUALITY

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

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

Solvent scan

CHART 15A



MANUAL

AUTO ☐

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

SWEEP TIME (SEC): 50 | 250 | 500 | 1000 (250)
SWEEP WIDTH (Hz): 25 | 50 | 100 | 250 | 500 (500)
FILTER: 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 (2)
RF POWER LEVEL: 0.25 (.05)

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

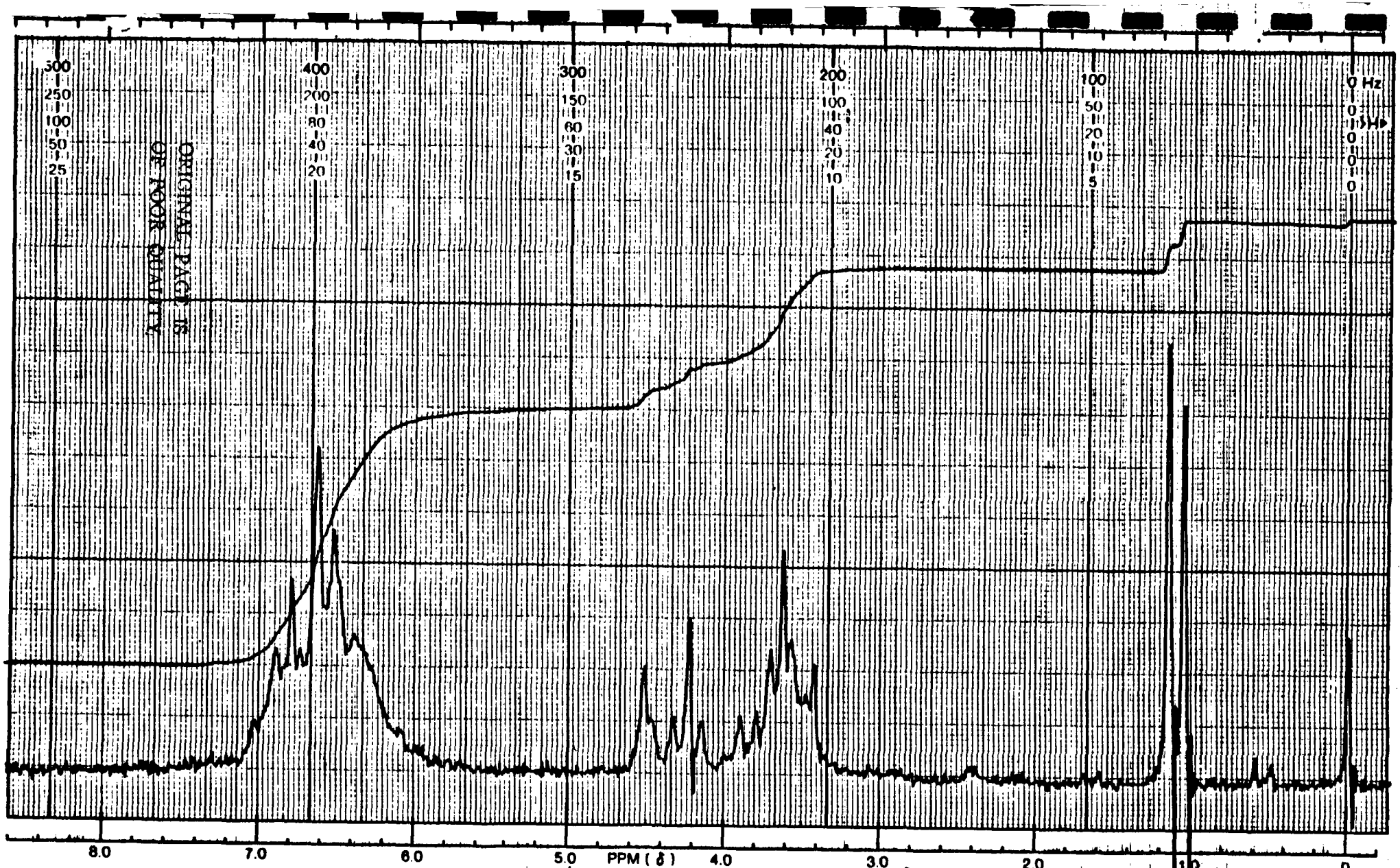
REMARKS: 0.130 gm sample
0.888 gm solvent

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

DATE: 3-21-86

OPERATOR DGW

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



ORIGINAL PAGE IS OF POOR QUALITY

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-39M 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

WCA Fabric for NASA Lot# 2 (HITCO)

TEST		PAGE
1a.	Breaking Strength, WARP	1
1b.	Breaking Strength, FILL	1
2a.	Carbon Assay	1
2b.	Hydrogen Assay	1
2c.	Nitrogen Assay	1
3.	Visual Inspection	1
4.	Specific Gravity	1
5.	pH	2
6.	TGA	2
7a.	Atomic Absorption	2
7b.	Moisture Content	2
7c.	Ash Content	2
8a.	Filament diameter, WARP	2
8b.	Filament diameter, FILL	2
9a.	Thread Count, WARP	2
9b.	Thread Count, FILL	3
10a.	Areal weight	3
10b.	Volatiles	3
10c.	Weight Change on Acetone Wash	3

CHARTS

Visual Inspection 3A

TGA ..... 6A - 6B

U.S. Polymeric

FABRIC TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

WCA Fabric for NASA Lot# 2 (HITCO)

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

	#2-1S	#2-1E	LOT2 AVG
PICK	47	42	44.5
CENTER	52	49	50.5
PLAIN	64	57	60.5
AVG.	54.3	49.3	51.8

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

PICK	30	16	23.0
CENTER	27	16	21.5
PLAIN	44	25	34.5
AVG.	33.7	19.0	26.3

2a. Carbon Assay, %
MDQAI 5560

PICK	99.4	99.4	99.40
CENTER	99.6	99.5	99.50
PLAIN	99.8	99.5	99.65
AVG.	99.6	99.47	99.53

2b. Hydrogen Assay, %
MDQAI 5560

PICK	.03	.02	.025
CENTER	.03	.01	.020
PLAIN	.01	.02	.015
AVG.	.023	.017	.020

2c. Nitrogen Assay, %
MDQAI 5560

PICK	.10	.20	.15
CENTER	.10	.20	.15
PLAIN	.10	.10	.10
AVG.	.10	.17	.13

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

4. Specific Gravity, Units
PTM-84

PICK	1.6122	1.6644	1.6383
CENTER	1.6379	1.6827	1.6603
PLAIN	1.6166	1.6599	1.6383
AVG.	1.622	1.669	1.646

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

WCA Fabric for NASA Lot# 2 (HITCO)

5. pH, Units
CTM-24B

	#2-1S	#2-1E	LOT2 AVG
	6.3	6.7	6.50
	6.3	6.8	6.55
AVG.	6.3	6.75	6.53

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

SET UP# 1	SET UP# 2
#2-1S 943	#2-1E 868

See Chart 6A-6B

7a. Atomic Absorption, ppm
CTM-53B

	#2-1S	#2-1E	LOT2 AVG
Na	27	19	23.0
K	0	0	0.0
Ca	8	8	8.0
Mg	0	0	0.0
Li	0	0	0.0
AVG.	35	27	31.0

7b. Moisture Content, %
CTM-53B

#2-1S	#2-1E	LOT2 AVG
.025	.015	.020

7c. Ash Content, %
CTM-53B

#2-1S	#2-1E	LOT2 AVG
.010	.030	.020

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

AVERAGE	10.28	10.63	10.45
Minimum	8.00	9.25	8.00
Maximum	14.55	11.80	14.55
Std. Dev	1.81	0.75	1.36

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

AVERAGE	10.48
Minimum	9.05
Maximum	12.50
Std. Dev	0.97

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

	#2-1S	#2-1E	LOT2 AVG
	29	29	29
	29	29	29
	30	29	29.5
	29	29	29
	29	29	29
AVG.	29.2	29.0	29.1

WCA Fabric for NASA Lot# 2 (HITCO)

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

	#2-1S	#2-1E	LOT2 AVG
	22	22	22
	22	22	22
	22	22	22
	22	22	22
	22	22	22
AVG.	22.0	22.0	22.0

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

LEFT	2.446	2.539	2.493
CENTER	2.416	2.511	2.464
RIGHT	2.469	2.546	2.508
AVG.	2.444	2.532	2.488

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

LEFT	.70	.51	.60
CENTER	.46	.44	.45
RIGHT	.04	.04	.04
AVG.	.40	.33	.36

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

LEFT	.58	.28	.43
CENTER	.00	.04	.02
RIGHT	-.16	-.12	-.14
AVG.	.14	.07	.10

U.S. Polymeric

Hamid M. Quraishi, Manager
Quality Assurance Department

CHART 3A

FOOTAGE

START SAMPLE		
13 S	3 W 20 W	
	33 SPLICE ~~BREAK~~	
79 ●●	78 SPLICE	
	126 SPLICE	124 ●●
		219 S
268 S		
	307 ●●	
333 ●●		
	367 SPLICE	
	475 ●●	
END 518 END SAMPLE		
N	C	S

LEFT

TREATER OPERATOR READ UP

USP NO.

DATE 5-20-86

FABRIC WCA GRAPHITE

MFG. UNION CARBIDE

ROLL NO. 292 4C6WCA-2

YARDS 180.0

POUNDS 99.0

ORDER NO. O.E. 71108

SPECIFICATION VARious

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 Grap C

[signature]

CHART 6A

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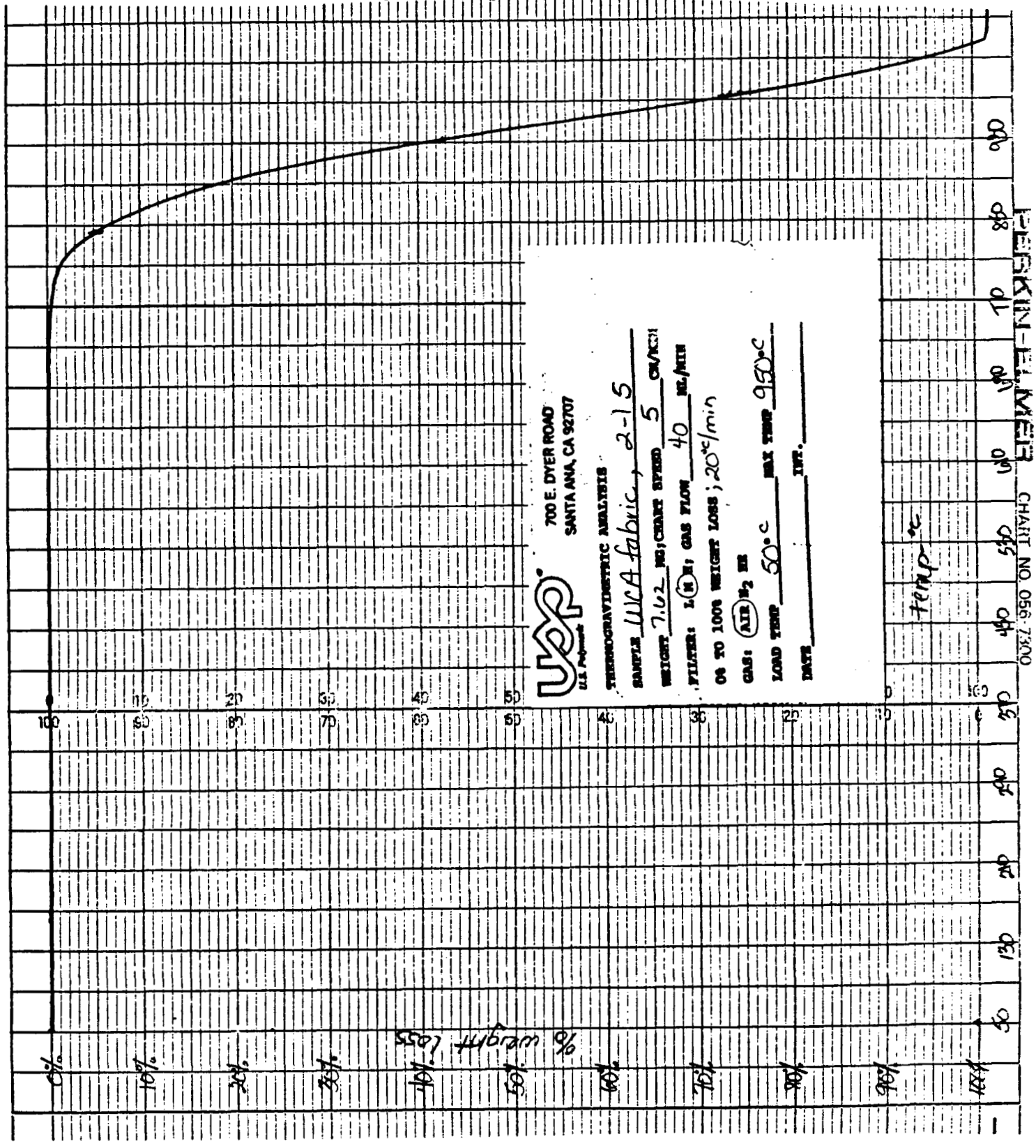

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TABLE OF CONTENTS

PREPREG TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

FM 5064J NASA LOT# 2 U.S.P. LOT# D09279 (HITCO)

TEST		PAGE
1a.	Resin Content, Soxhlet	1
1b.	Filler Content, Soxhlet	1
1c.	Cloth Content, Soxhlet	1
2.	Volatile Content	1
3.	Flow	1
4.	Resin Content, Dry Basis	1
5.	Tack	1
6.	Gel Time	1
7a.	Atomic Absorption	1
7b.	Moisture Content	1
7c.	Ash Content	2
8.	TGA	2
9.	DSC	2
10.	Infrared (IRZB) Baseline	2
11.	Environmental History	2
12.	Specific Gravity	2
13a.	Tensile Strength	2
13b.	Tensile Modulus	2
13c.	Tensile Elongation	2
14a.	Flexural Strength	2
14b.	Flexural Modulus	3
15a.	Compressive Strength	3
15b.	Compressive Modulus	3
16.	Double Shear Strength	3
17.	Barcol Hardness	3
18.	Residual Volatiles	3
19.	Resin Content, Pyrolysis	3
20.	Acetone Extraction	3
21a.	CTE, with ply	3
21b.	CTE, crossply	4

CHARTS

TGA	8A
DSC	9A
Infrared (IRZB) Baseline	10A
CTE	21A

U.S. Polymeric

PREPREG TESTING

NAS8-36298

U.S. POLYMERIC O.E.71108

FM 5064J NASA LOT# 2 U.S.P. LOT# D09279 (HITCO)

		ROLL#1-S
1a. Resin Content, Soxhlet, % CTM-6D		35.2
		34.0
		34.8
	AVG.	34.7
1b. Filler Content, Soxhlet, % CTM-6D		14.4
		14.0
		14.3
	AVG.	14.2
1c. Cloth Content, Soxhlet, % CTM-6D		50.4
		52.0
		50.9
	AVG.	51.1
2. Volatile Content, % PTM-17B		3.6
		3.6
		3.4
	AVG.	3.5
3. Flow, % PTM-19G		15.0
		15.1
		14.8
	AVG.	15.0
4. Resin Content, Dry basis, % PTM-16F, Type II		35.3
		35.1
		35.1
	AVG.	35.2
5. Tack, lbs PTM-80		25
6. Gel Time, seconds PTM-20E		91
7a. Atomic Absorption, ppm CTM-53B	Na	7
	K	0
	Ca	11
	Mg	2
	Li	0
	TOTAL	20
7b. Moisture Content, % CTM-53B		2.17

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

FM 5064J NASA LOT# 2 U.S.P. LOT# D09279 (HITCO)

7c. Ash Content, % CTM-53B			ROLL#1-S .06
8. TGA, % Weight Loss at 500°C CTM-51 (Nitrogen)	See Chart 8A		8.8
9. DSC, °C CTM-50A	First Temp See Chart 9A		184
10. Infrared (IRZB) Baseline CTM-21C	See Chart 10A		.82
11. Environmental History	Date manufactured: 30 May 1986 Packaged in: MIL-B-131 Class I bag supported in cardboard carton Date shipped: 14 June 1986 in 40°F truck		
12. Specific Gravity, Cured, Units ASTM D792			1.431 1.431 1.431 1.431
		AVG.	1.431
13a. Tensile Strength, ksi, WARP FTMS 406-1011			18.74 20.19 18.82 18.71 19.36
		AVG.	19.16
13b. Tensile Modulus, msi, WARP FTMS 406-1011			1.91 1.87 1.86 1.71 1.72
		AVG.	1.81
13c. Tensile Elongation, %, WARP FTMS 406-1011			1.23 1.24 1.13 1.24 1.23
		AVG.	1.21
14a. Flexural Strength, ksi, WARP FTMS 406-1031			28.25 26.52 27.08 27.66 27.64
		AVG.	27.43

FM 5064J NASA LOT# 2 U.S.P. LOT# D09279 (HITCO)

		ROLL#1-S
14b. Flexural Modulus, msi, WARP FTMS 406-1031		1.89
		1.80
		1.90
		1.91
		1.85
	AVG.	1.87
15a. Compressive Strength, ksi, WARP FTMS 406-1021		17.01
		16.71
		15.89
		15.70
		13.74
	AVG.	15.81
15b. Compressive Modulus, msi, WARP FTMS 406-1021		2.04
		2.12
		2.11
		1.94
		2.13
	AVG.	2.07
16. Double Shear Strength, ksi FTMS 406-1041A		2.61
		2.45
		2.65
		2.67
		2.62
	AVG.	2.60
17. Barcol Hardness, Units ASTM D-2583 (Average of 10 determinations)		52.4
18. Residual Volatiles, % PTM-98		1.32
		1.19
		1.33
	AVG.	1.28
19. Resin Content, Pyrolysis, % CTM-14B		32.29
		31.97
		32.80
	AVG.	32.35
20. Acetone Extraction, % CTM-18A		6.84
		5.89
		5.66
	AVG.	6.13
21a. CTE, in/in •F with PLY PTM-61B		2.56
		2.70
	AVG.	2.63

FM 5064J NASA LOT# 2 U.S.P. LOT# D09279 (HITCO)

21b. CTE, in/in •F Cross PLY
PTM-61B

	3.61
	8.53
AVG.	6.07

See Chart 21A

U.S. Polymeric

Hamid M. Quraishi, Manager
Quality Assurance Department

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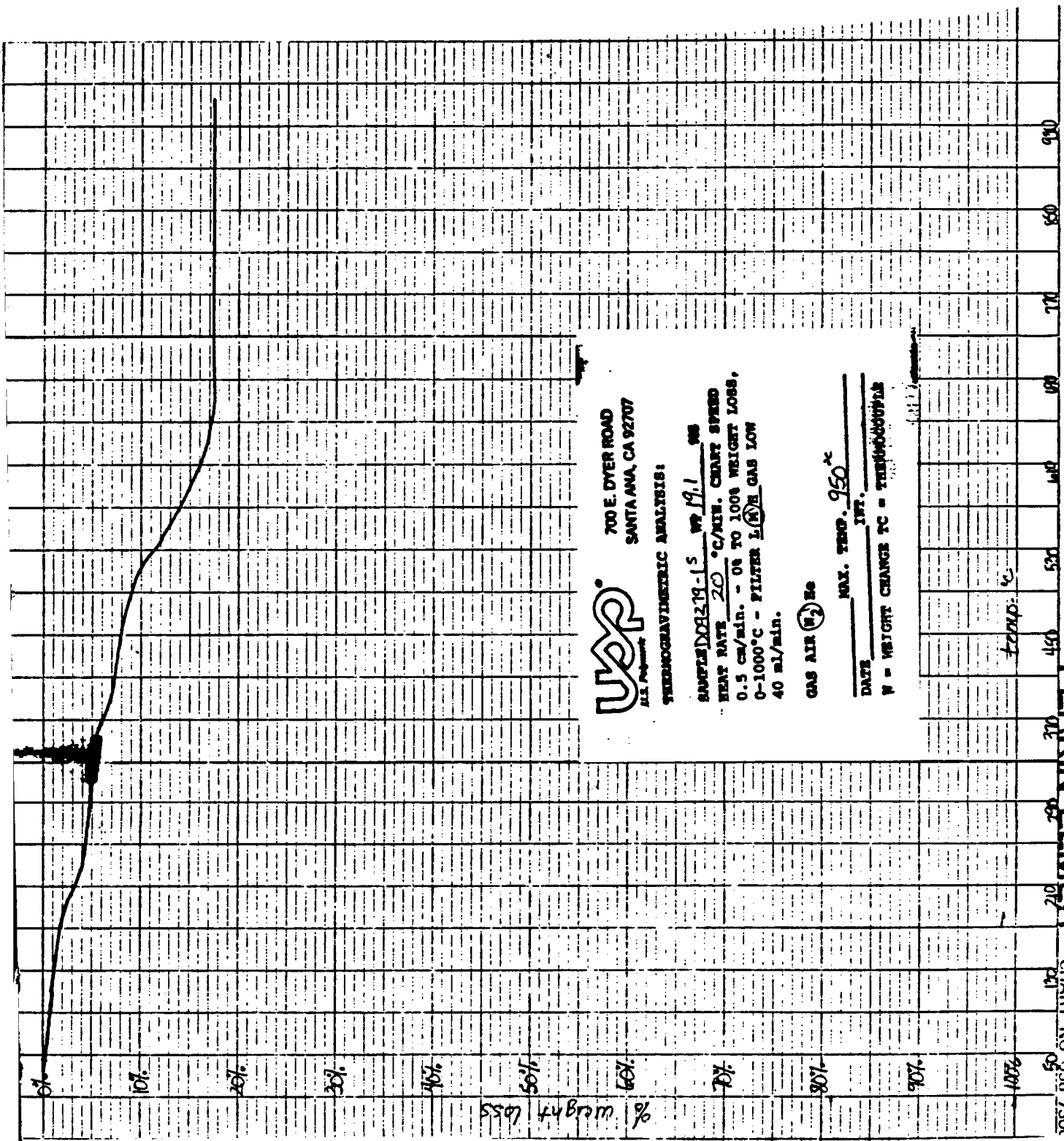
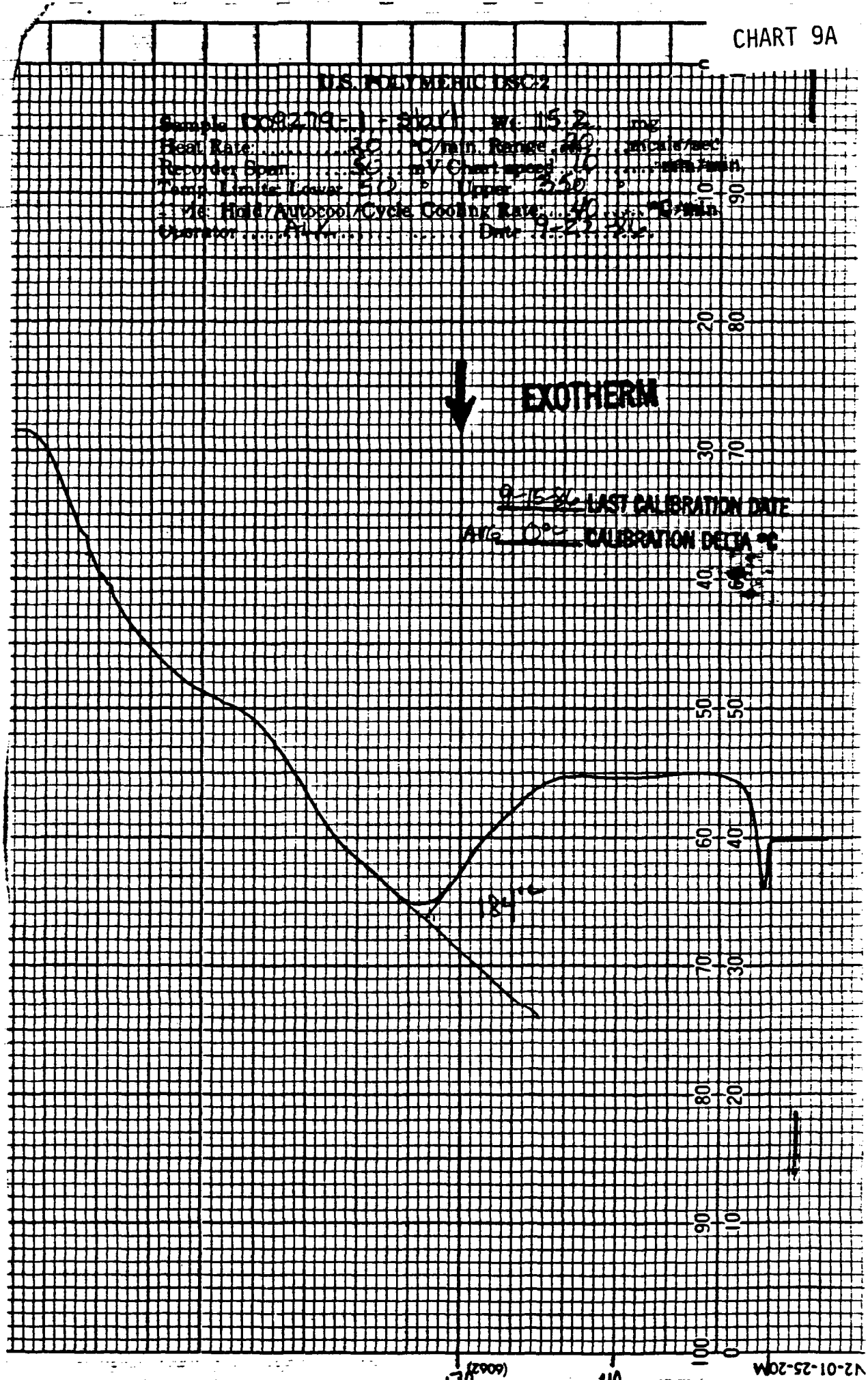


CHART 9A



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SPECTRUM NO. 15188
DATE 7-07-86
SAMPLE FM 5064 J
D09279 #1

SOURCE
STRUCTURE

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

ANALYST Y. MIRANDA

Beckman®
INFRARED
SPECTROPHOTOMETER

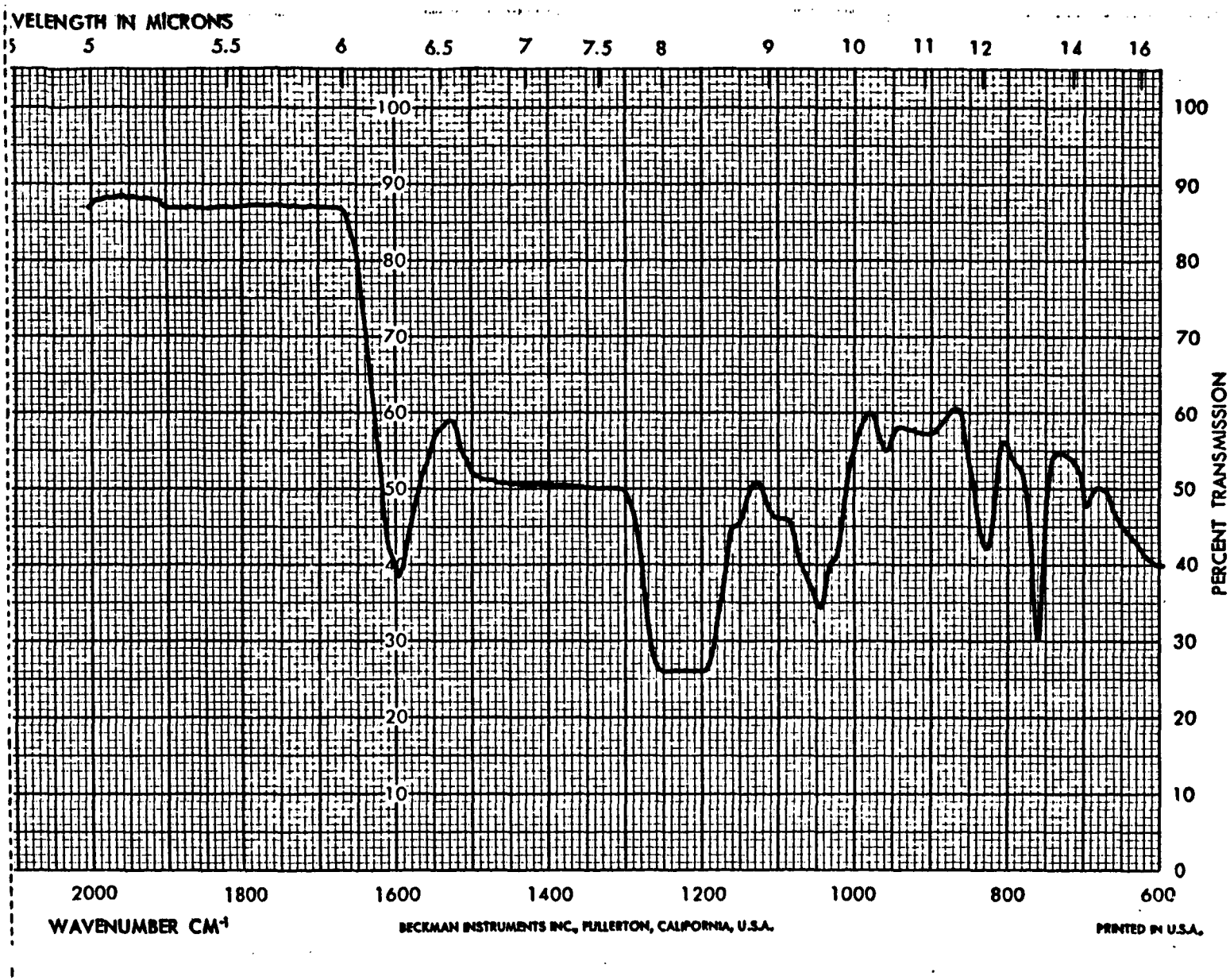

CHART 10A

Chart 21A1

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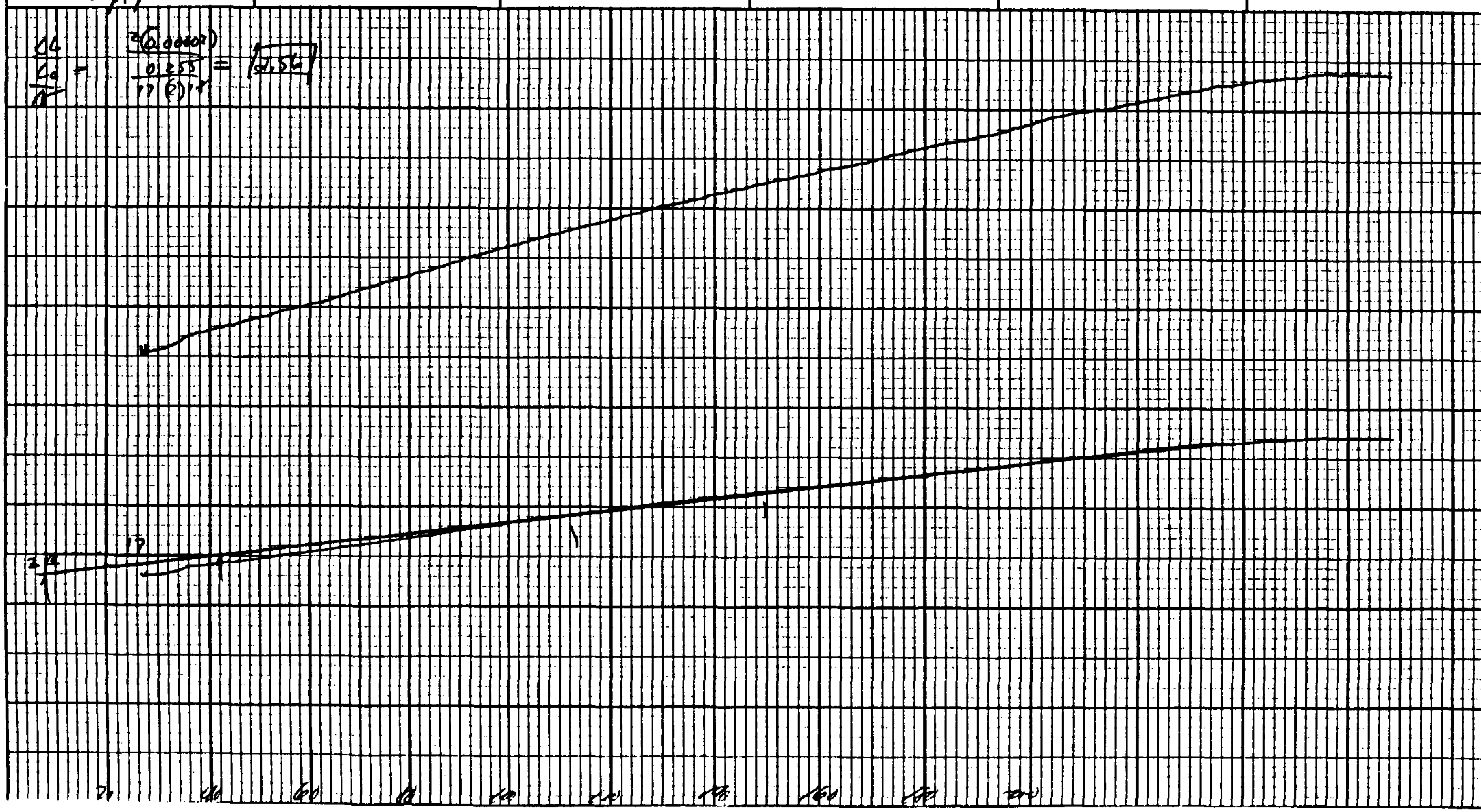
PART NO. 990088

RUN NO ___ DATE 11/1/86	T-AXIS	DTA-DSC	TGA	TMA (Sani/inF)	
OPERATOR TA	SCALE, °C/in ~~50~~ 20	SCALE, °C/in ___	SCALE, mg/in ___	SCALE, mils/in 0.1/0.2	
SAMPLE: Do 5279-1-short-(1)	PROG. RATE, °C/min 10	(mcal/sec)/in ___	SUPPRESSION, mg ___	MODE Expansion	
	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg ___	WEIGHT, mg ___	SAMPLE SIZE 0.255	
ATM Ar @ STP	SHIFT, in 0	REFERENCE ___	TIME CONST., sec ___	LOAD, g 10	
FLOW RATE 3-5SCCH w/ply			dY, (mg/min) /in ___	dY,(10X),(mils/min)/in ___	



MEASURED VARIABLE ___

DUPONT Instruments

Chart 21A2

PART NO. 990088

RUN NO ___ DATE 10/1/14
OPERATOR TJ
SAMPLE:
D-9271-1-SMART-(2)
ATM Air @ SM2
FLOW RATE 1-SCCM

T-AXIS
SCALE, °C/in 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 Sam/Lwr
SCALE, mils/in 0.1/0.2
MODE Expansion
SAMPLE SIZE 0.157
LOAD, g 10
dY/dT (10X) (mils/min) /in ___

MEASURED VARIABLE

DUPONT instruments

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PART NO. 990068

RUN NO. ___ DATE 11/3/16	T-AXIS	DTA-DSC	TGA	TMA (5mm/inF)	
OPERATOR TH	SCALE, °C/in 50 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/0.2	
SAMPLE: DU9279 - 1-stmer-(3)	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE EXPANSION	
ATM Air @ STP	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.123	
FLOW RATE 3-5SCFH	SHIFT, in 0	REFERENCE	TIME CONST., sec	LOAD, g 10	
			dY, (mg/min) /in	dY, (10X), (mils/min)/in	

XP/4

$\frac{\Delta C}{\Delta T} = \frac{2(0.00697)}{\frac{0.123}{25}(311)} = 15.677$

25

MEASURED VARIABLE

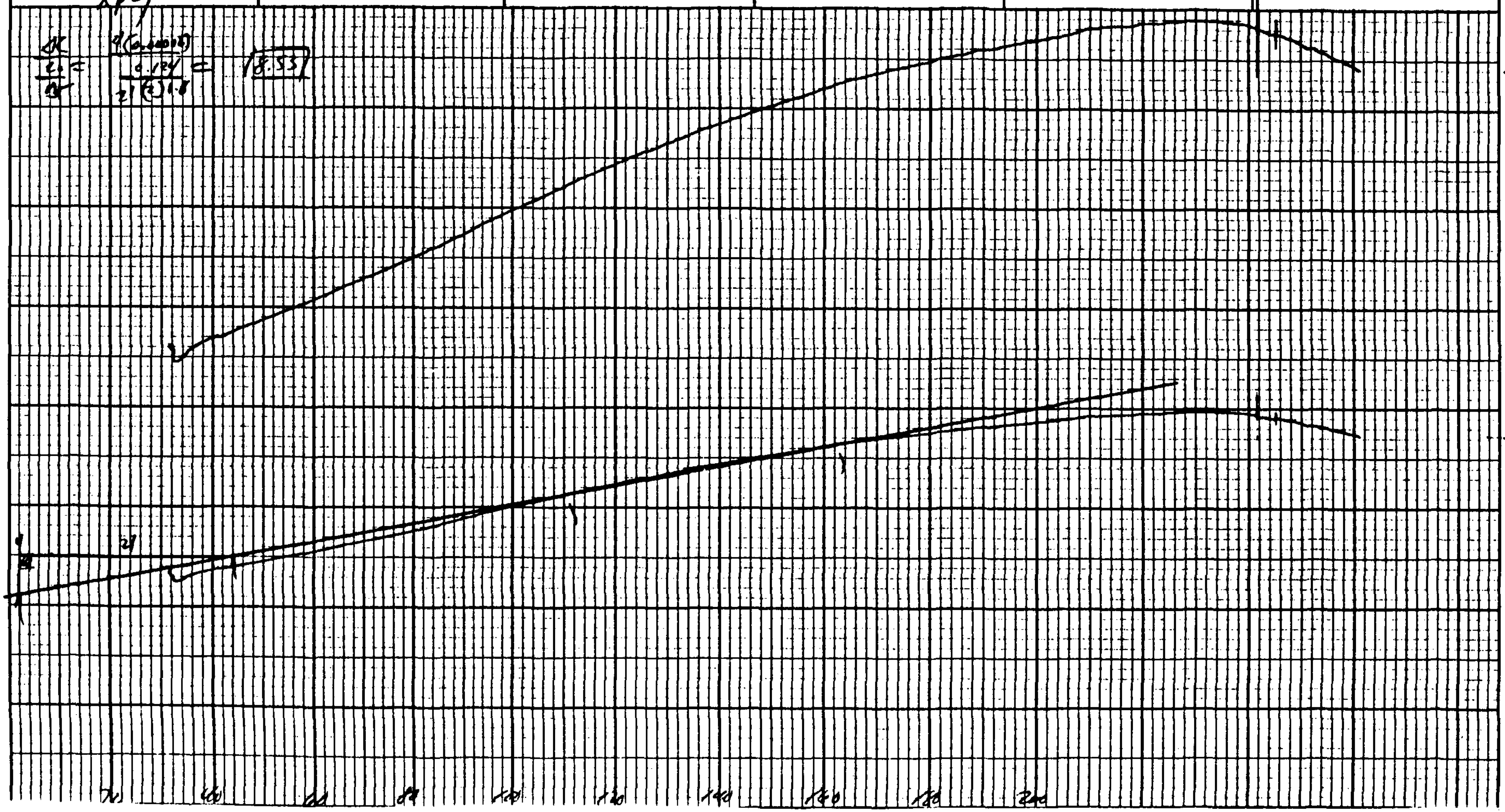
DUPONT Instruments

Chart 7A2

Chart 21A4

PART NO. 990088

RUN NO ___ DATE 11/3/86	**T-AXIS**	**DTA-DSC**	**TGA**	**TMA** (μin/in°F)	
OPERATOR TL	SCALE, °C/in 20	SCALE, °C/in ___	SCALE, mg/in ___	SCALE, mils/in 0.1/0.2	
SAMPLE: D05279-1-START-4	PROG. RATE, °C/min 10	(mcal/sec)/in ___	SUPPRESSION, mg ___	MODE EXPANSION	
ATM Ar @ STP	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg ___	WEIGHT, mg ___	SAMPLE SIZE 0.124	
FLOW RATE 3-5SCFH	SHIFT, in 0	REFERENCE ___	TIME CONST., sec ___	LOAD, g 10	
XPLY			dY, (mg/min) /in ___	dY, (10X), (mils/min) /in ___	



DUPONT Instruments

MEASURED VARIABLE ___

TABLE OF CONTENTS

FILLER TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

Filler Lot for NASA Lot# 3

TEST		PAGE
1.	Carbon Content	1
2.	Ash Content	1
3.	Atomic Absorption	1
3a.	Moisture Content	1
3b.	Ash Content	1
4.	pH	1
5.	Particle Size, S.E.M. procedure	1
6a.	TGA, °C at 50% Loss	1
6b.	TGA	2
7.	Particle Size Distribution	2
7a.	Particle Size, Horiba	2

CHARTS

TGA	6A - 6C
Particle Size Distribution	7A - 7C

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	

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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. Qureishi

Hamid M. Qureishi, Manager
Quality Assurance Department

CHART 6A

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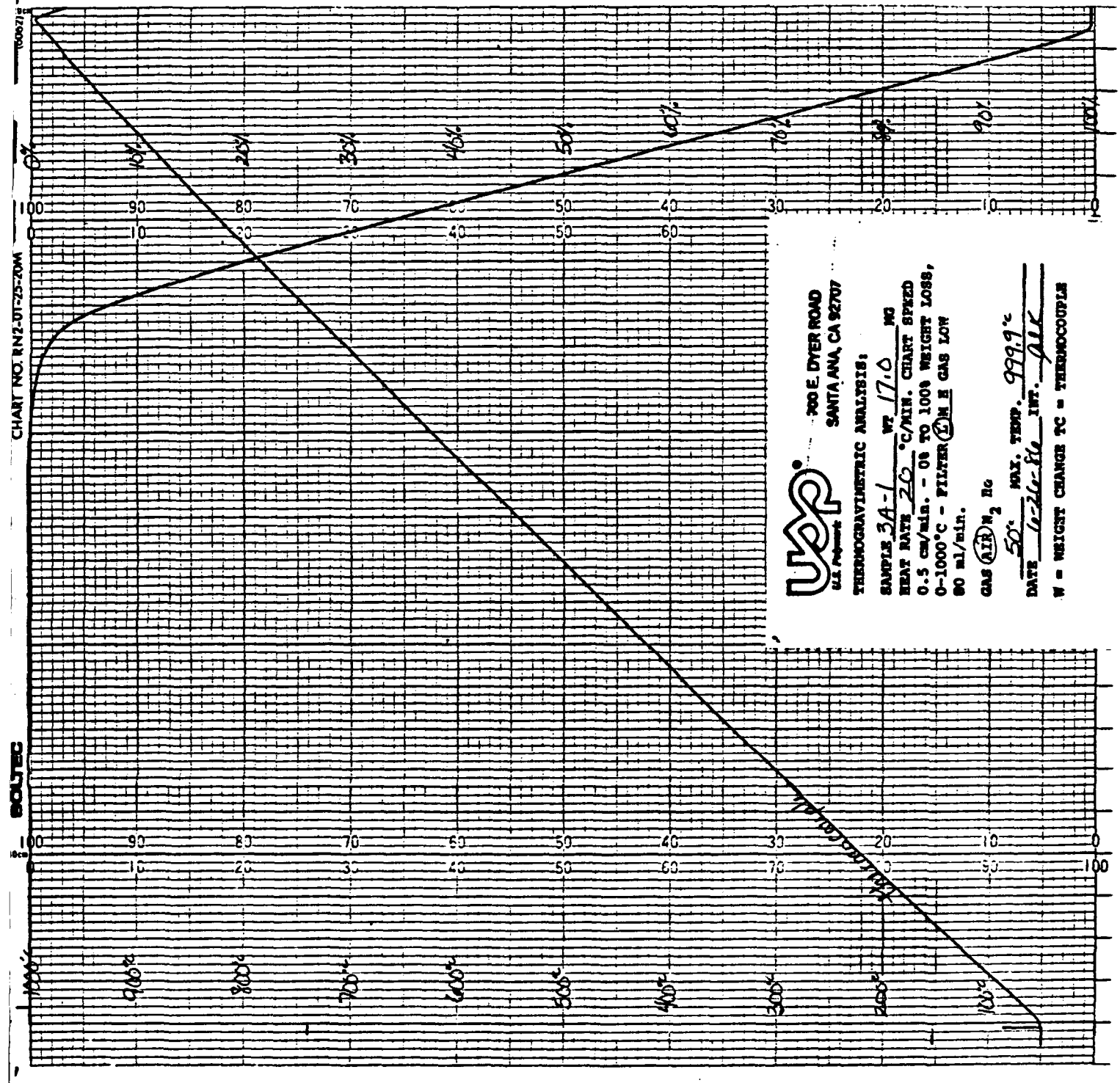

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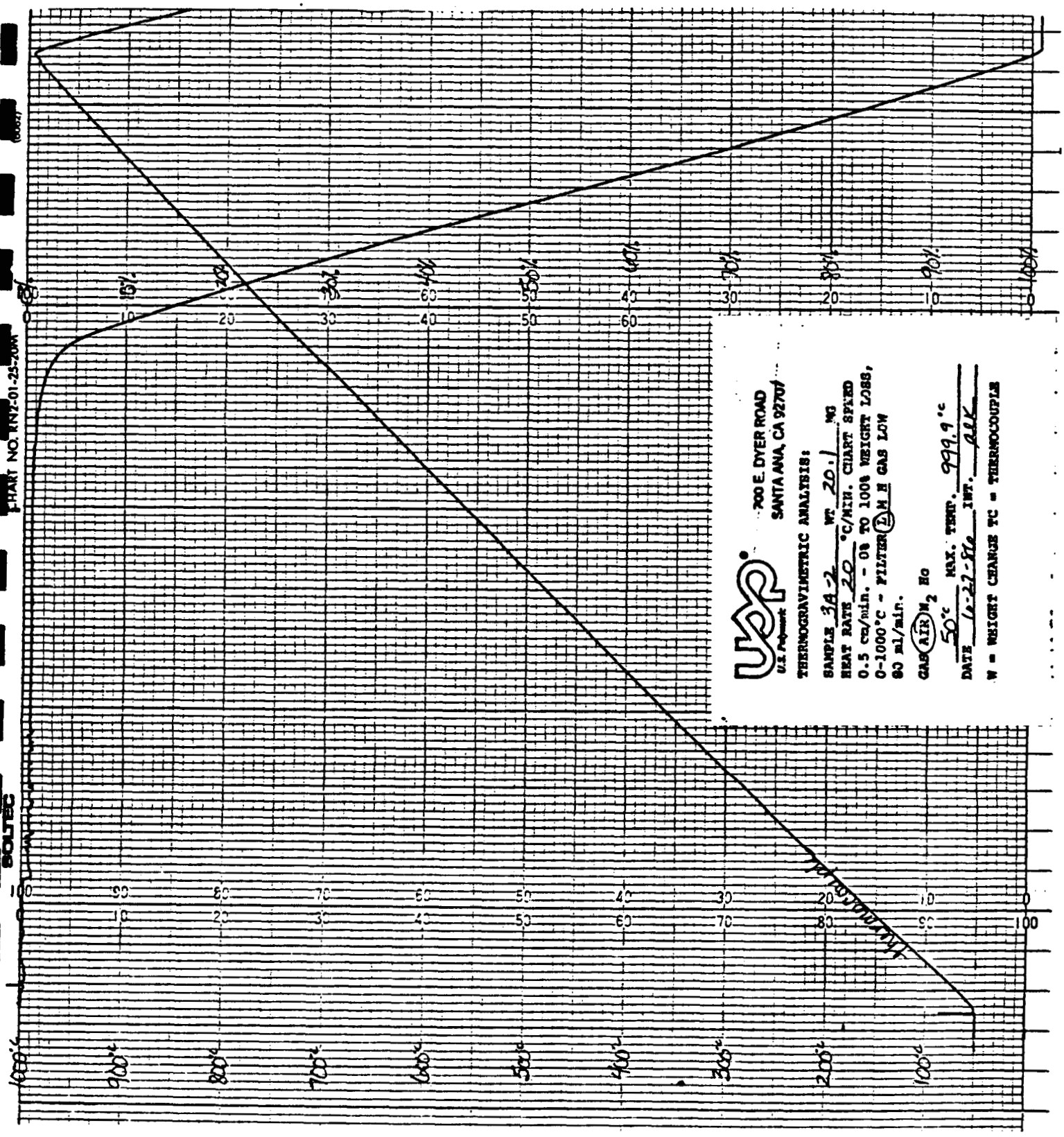

CHART 6C

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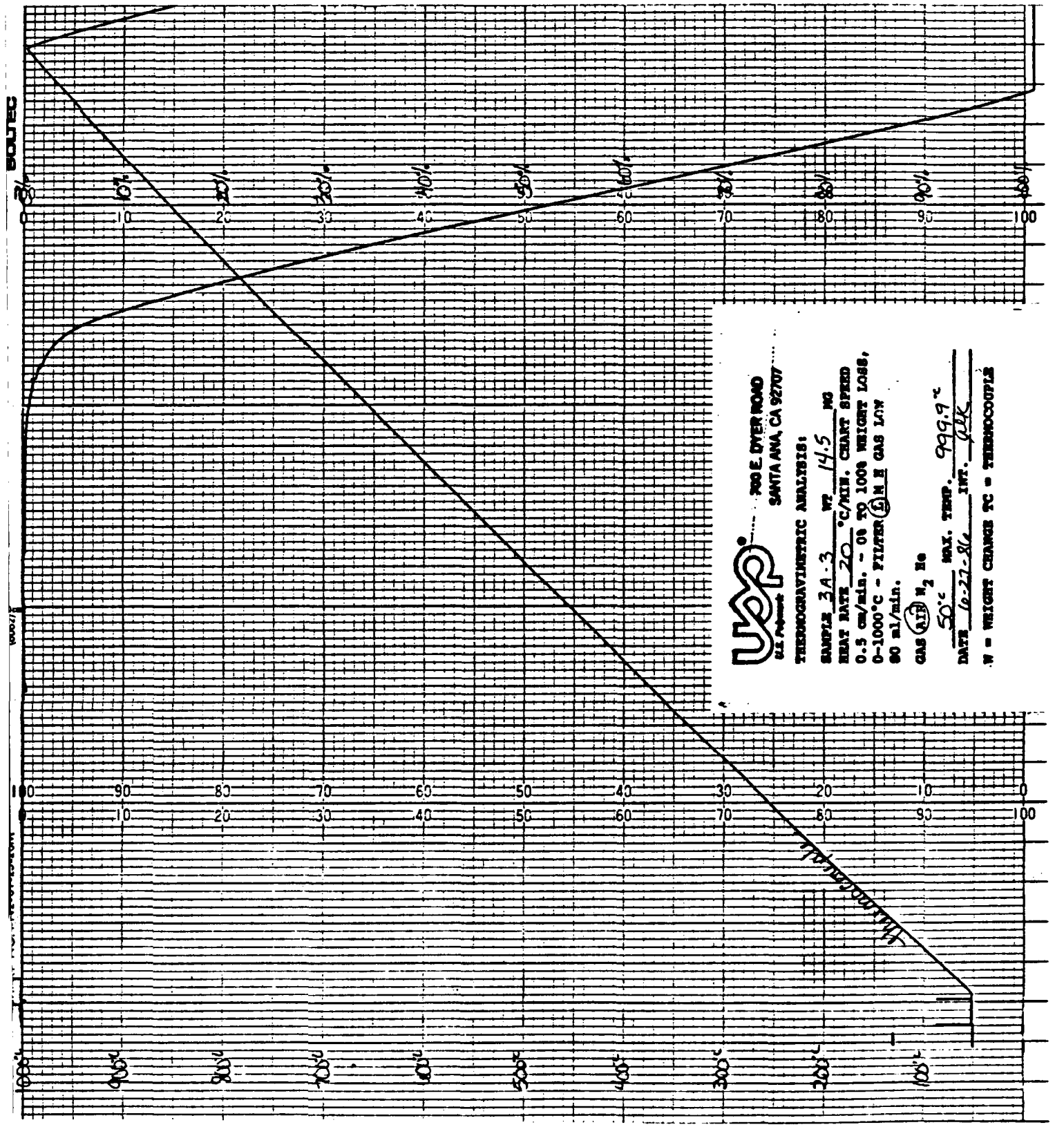


HORIBA CAPA-500
PARTICLE ANALYZER

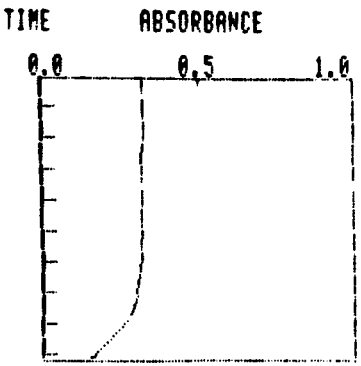
DATE 5-27-86
#1 SAMPLE NASA LOT#3A1
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

* 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

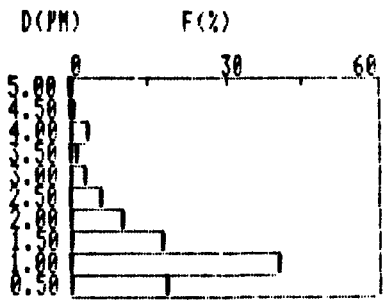


* DISTRIBUTION TABLE (BY VOL.)

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

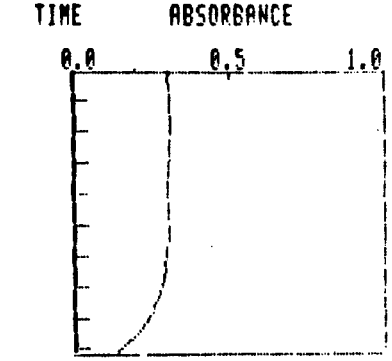
DATE 5-27-86
#2 SAMPLE NASA LOT#3A1
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

* 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

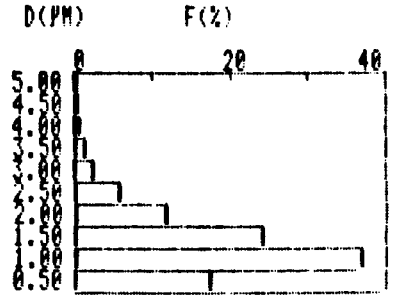


* DISTRIBUTION TABLE (BY VOL.)

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

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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

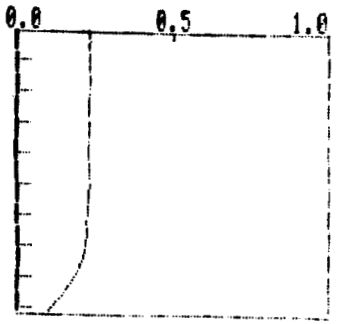
* CONDITIONS

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

TIME ABSORBANCE

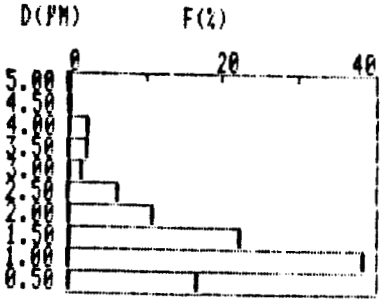


* DISTRIBUTION TABLE (BY VOL.)

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	2.3	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

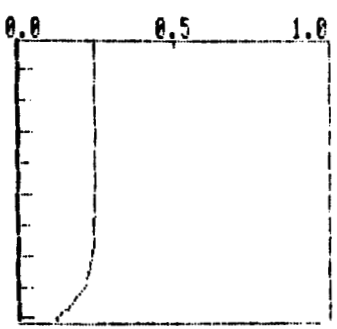
* CONDITIONS

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

TIME ABSORBANCE

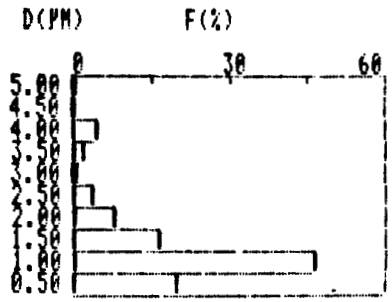


* DISTRIBUTION TABLE (BY VOL.)

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	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

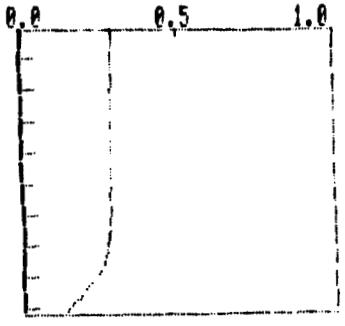
* CONDITIONS

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

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

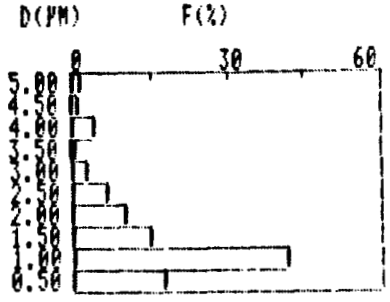


* DISTRIBUTION TABLE (BY VOL.)

D(MM)	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 (MM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#3A-3
Sample#1

HORIBA CAPA-500
PARTICLE ANALYZER

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

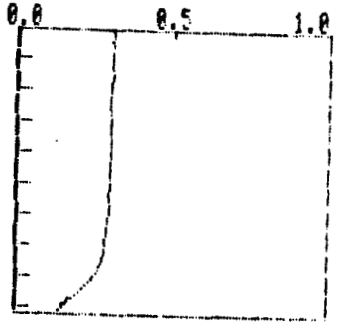
* CONDITIONS

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

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

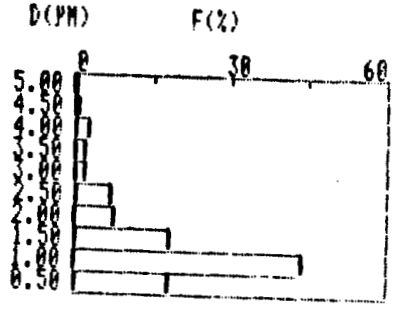


* DISTRIBUTION TABLE (BY VOL.)

D(MM)	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 (MM)

* 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

TEST		PAGE
1.	Resin Solids	1
2.	Specific Gravity	1
3.	Brookfield Viscosity	1
4.	Gel Time	1
5.	Atomic Absorption	1
6.	Gas Chromatography	1
7.	TGA	1
8.	DSC	1
9.	HPLC	1
10.	GPC	1
11.	pH	1
12.	Phenol Content	2
13.	Chang's Index	2
14.	RDS	2
15.	NMR	2

CHARTS

Gas Chromatography	6A
TGA	7A
DSC	8A
HPLC	9A
GPC	10A
RDS	14A
NMR	15A

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	18.0
		K	1.8
		Ca	5.8
		Mg	1.3
		Li	0.0
		TOTAL	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	G.M.B.	Date	12/16/86
Column		Detector	FID
Length	6ft.	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,3-1	Solvent	THF
Size	0.05 ul	Concn.	0.0892 g/ml

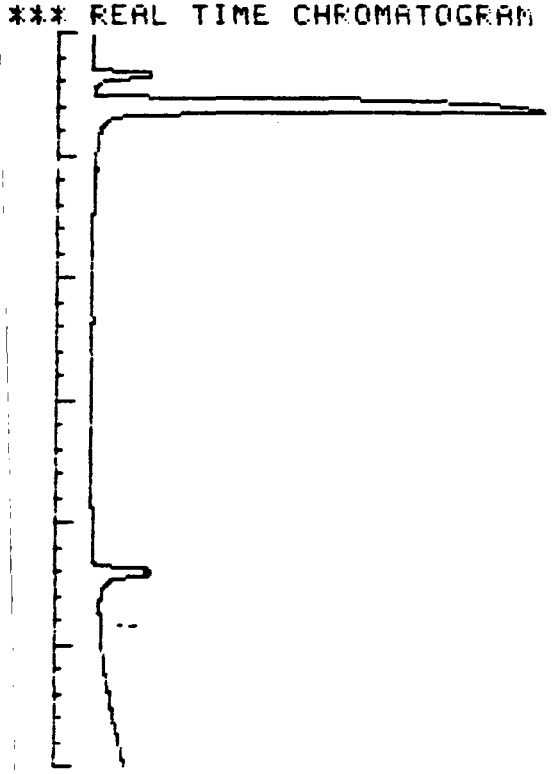
GAS CHROMATOGRAPHY STANDARD SOLVENT

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 ***



INAL FULL SCALE MV.=1000.00

AMPLE: USP39A 3-1
ISC.: C=0.10892 GMS/ML

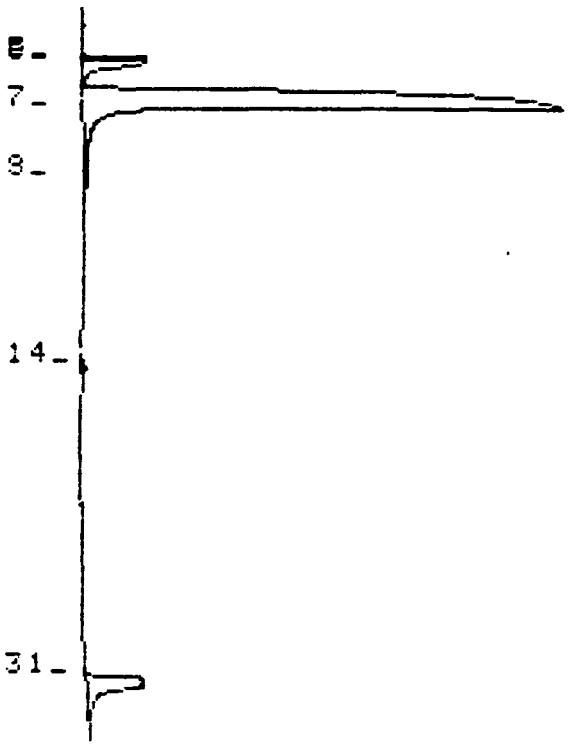
IME: 15:29
ATE: 12/11/86
PERATOR: JGZ

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

K O.	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	6003	.222	3	589
4	11.75	11088	.307	1	635
1	21.97	343230	9.505	3	10407

OTAL AREA= 3611099
RESHOLD= 1
IN.PK. WIDTH= 15
EA REJECT= 1000

VERTICAL SCALE FACTOR: 1X



SAMPLE: USP39A 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

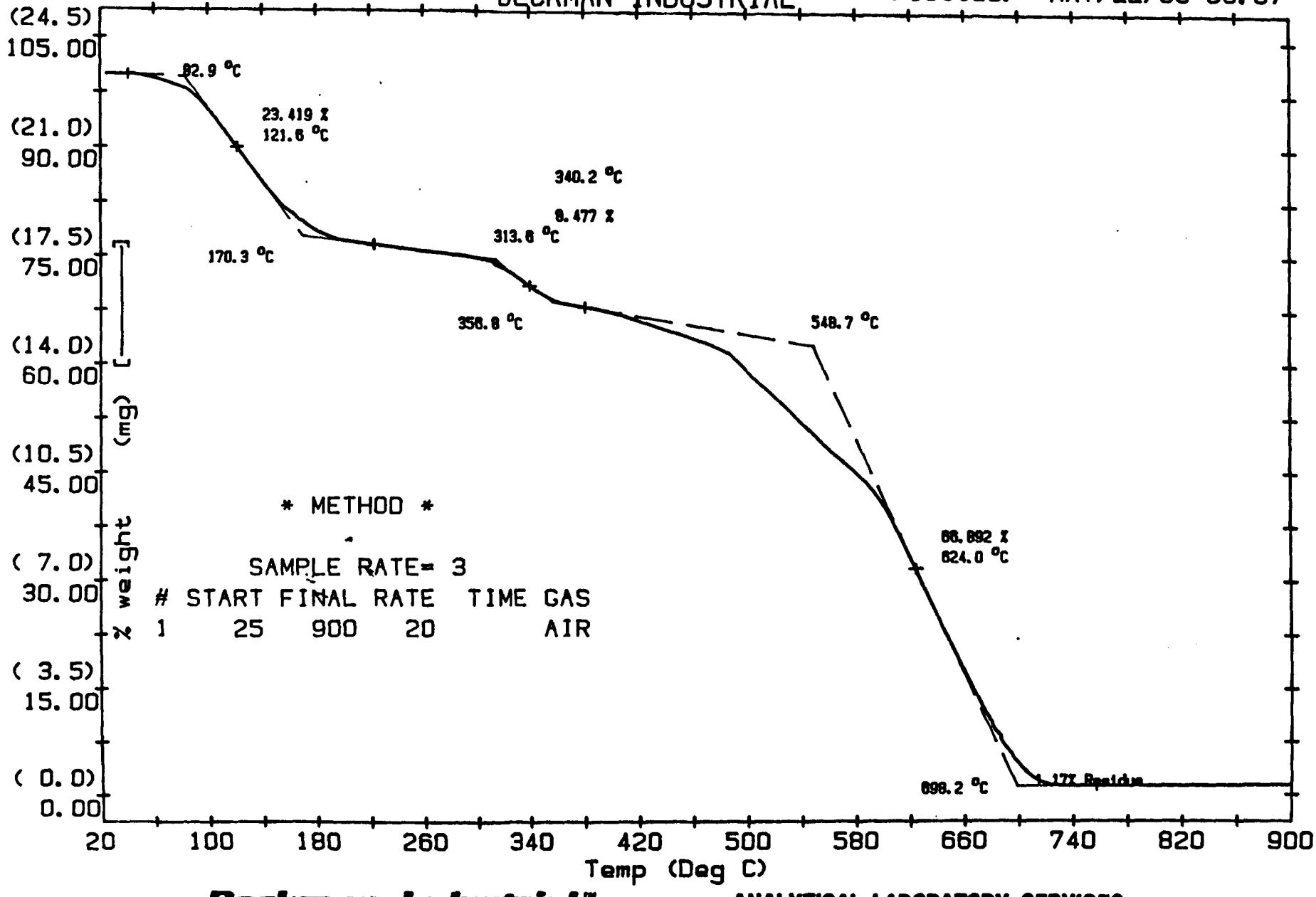


CHART 7A

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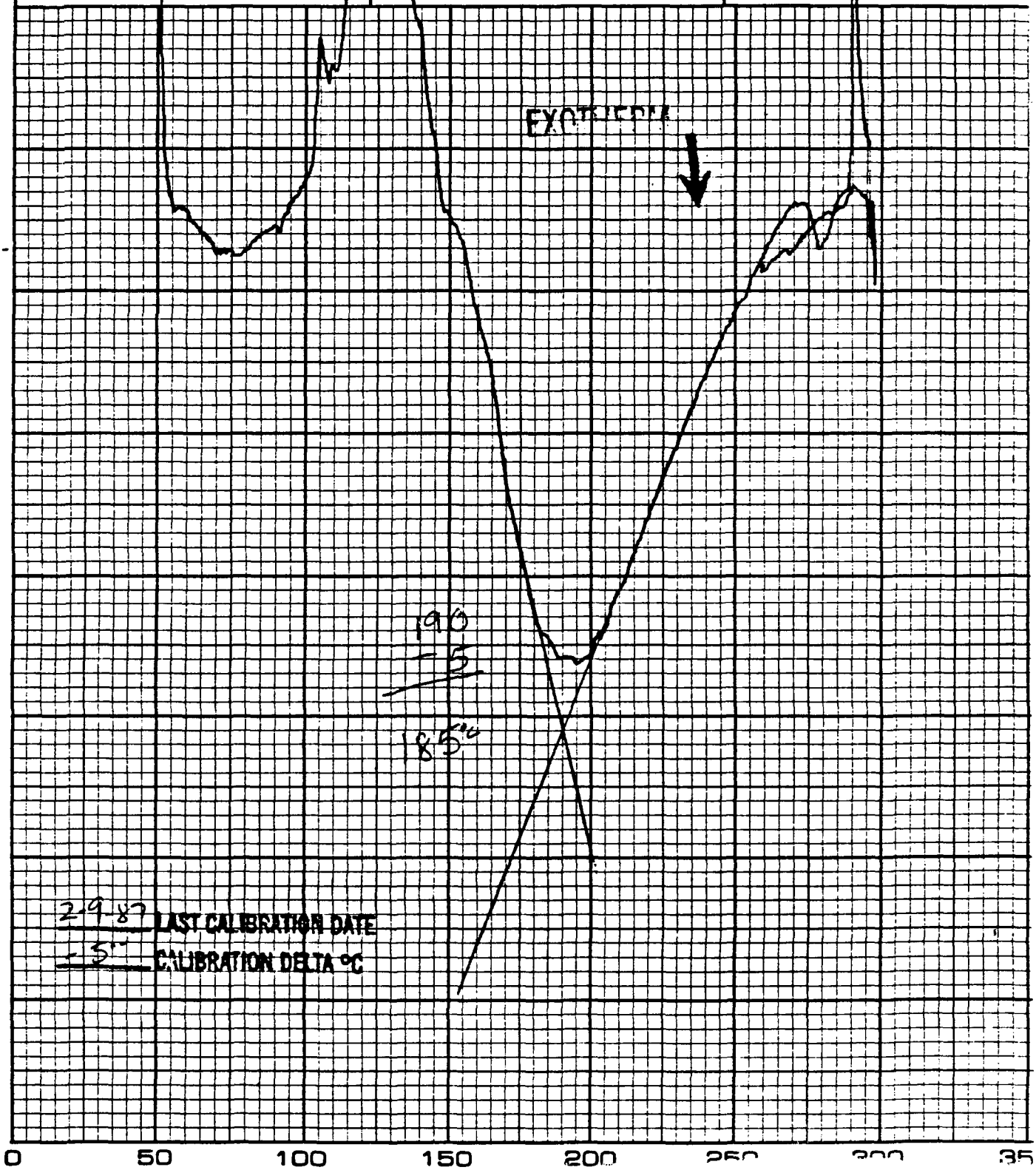
PART NO. 990088

CHART 8A

RUN NO. ___ DATE 2-23-87	T-AXIS	DTA-DSC
OPERATOR quick	SCALE, °C/in 50	SCALE, °C/in 1.0/5X
SAMPLE: 3-1 usp39A	PROG. RATE, °C/min 20°	[mcal/sec]/in ___
ATM N2 @ 1atm	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg 3.8
FLOW RATE 40ml/min	SHIFT, in 0	REFERENCE Al pan seal



DUPONT Instruments

MEASURED VARIABLE ___

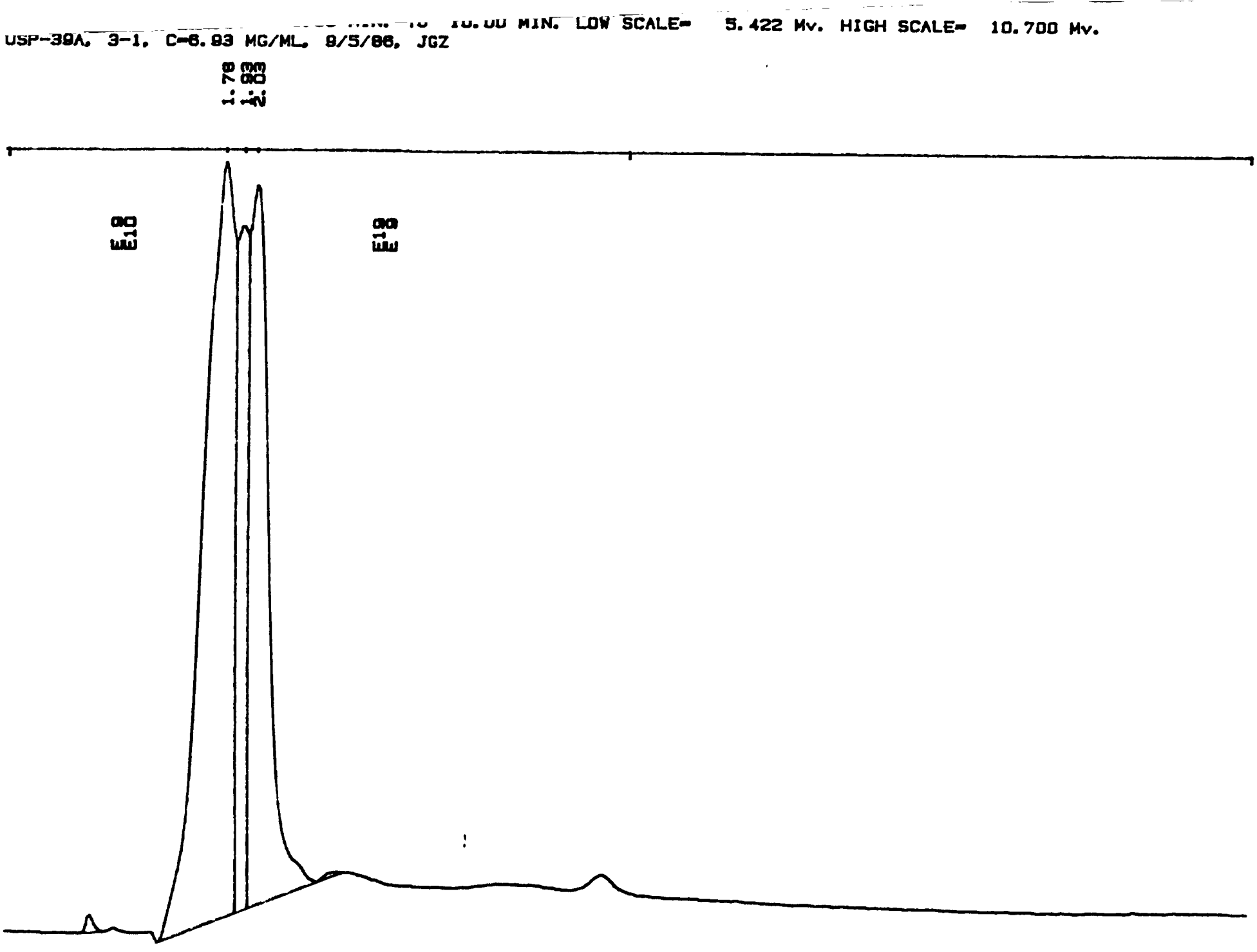
DATA FILE A:PHEN028.HDR TAKEN 09-05-1986 11:46:23

********* 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

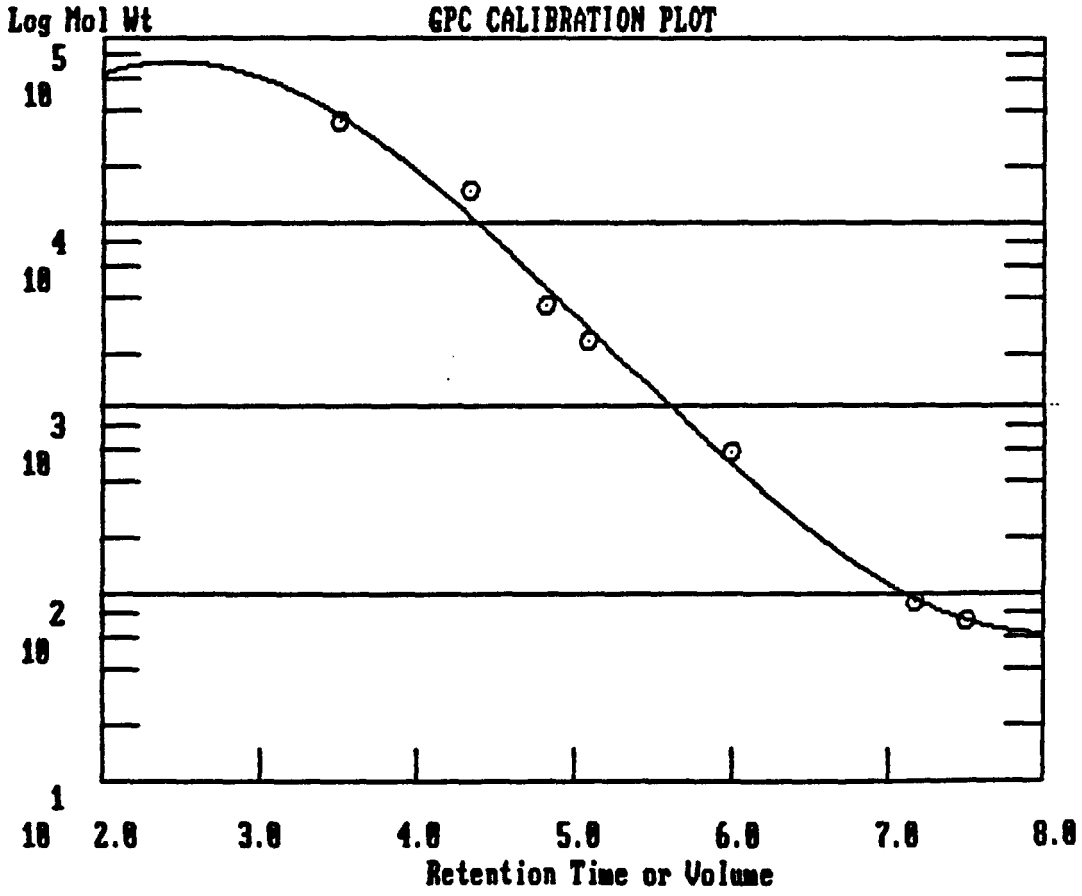
Total Area: 168258 Area Reject: 1000 One sample per 1.000 sec.


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
1.78
1.93
2.03
E10
E19

*** 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

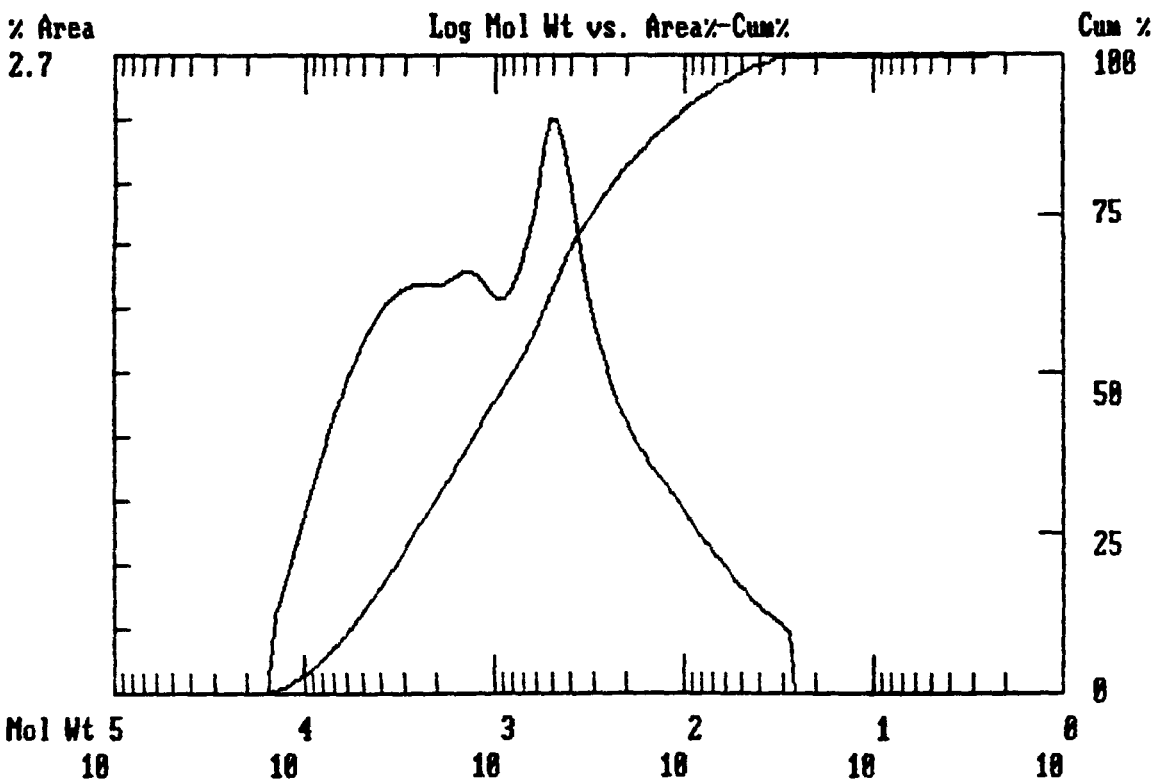
Ret Time	Molecular Weight	Log Mol Wt
3.50	35000	4.544
4.33	15000	4.176
4.83	3600	3.556
5.09	2350	3.371
6.00	570	2.756
7.17	92	1.964
7.50	72	1.857



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
cular Weight Distribution Averages
line TIMES:    3.85 to   10.00   MW:      22295 to          2
ess  TIMES:    3.85 to   10.00   MW:      22295 to          2
l Area:       203112
                1932
                 297
n=            6.5017
                5426
                1642
```



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

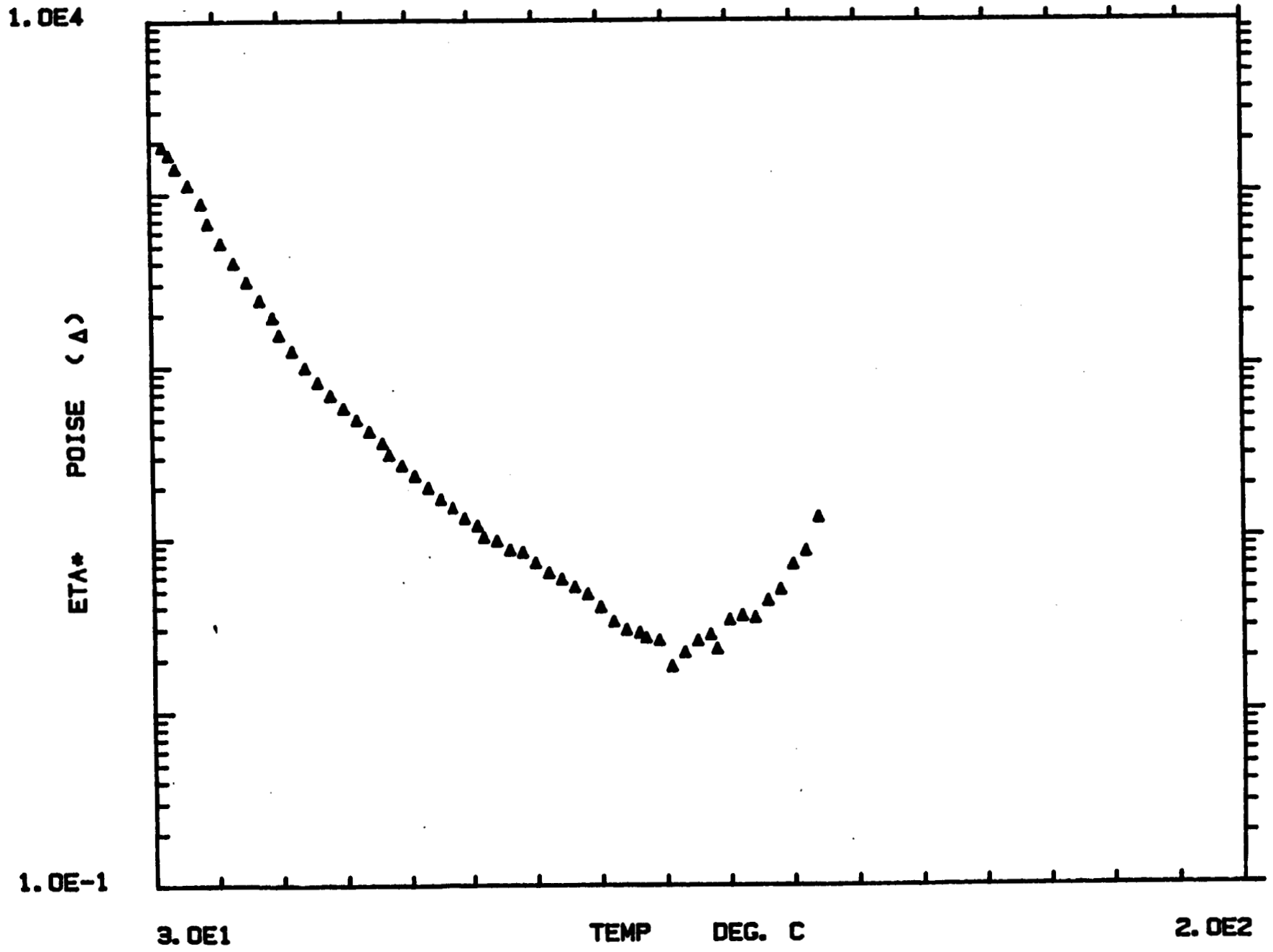


CHART 14A

Rheometrics RECAP II

Experiment No. : 4 Sample No. : 1

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

Operator :CP

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

Operating Mode : DYNAMIC

Sweep Type : CURE

Geometry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

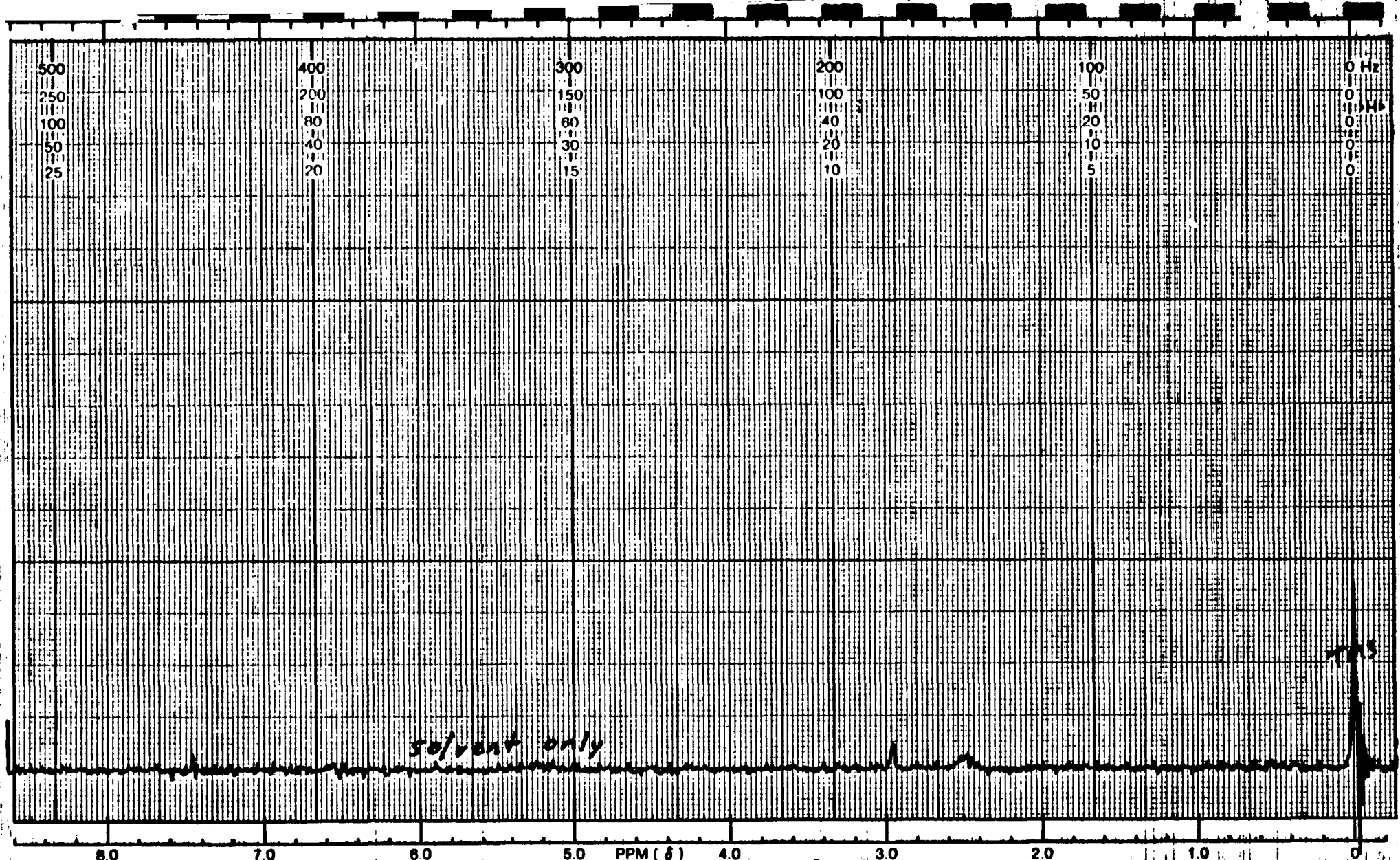
Notes :
STRAIN =50%
FREQUENCY =10 RAD/SEC

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

NO.	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	3.200e+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	2.270e+000	1.850e+000	2.600e+001	7.700e+001
28	1.290e+001	1.262e+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	1.750e+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	2.198e+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 39A RESIN NASA 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	2.453e+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	4.853e+000	1.603e+000	5.600e+001	1.340e+002



SWEEP OFFSET (Hz): 0
SPECTRUM AMPLITUDE: n.a.
INTEGRAL AMPLITUDE: —
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: Solvent
SOLVENT: Uniref-d + 0.82 TMS
DEC. LEVEL

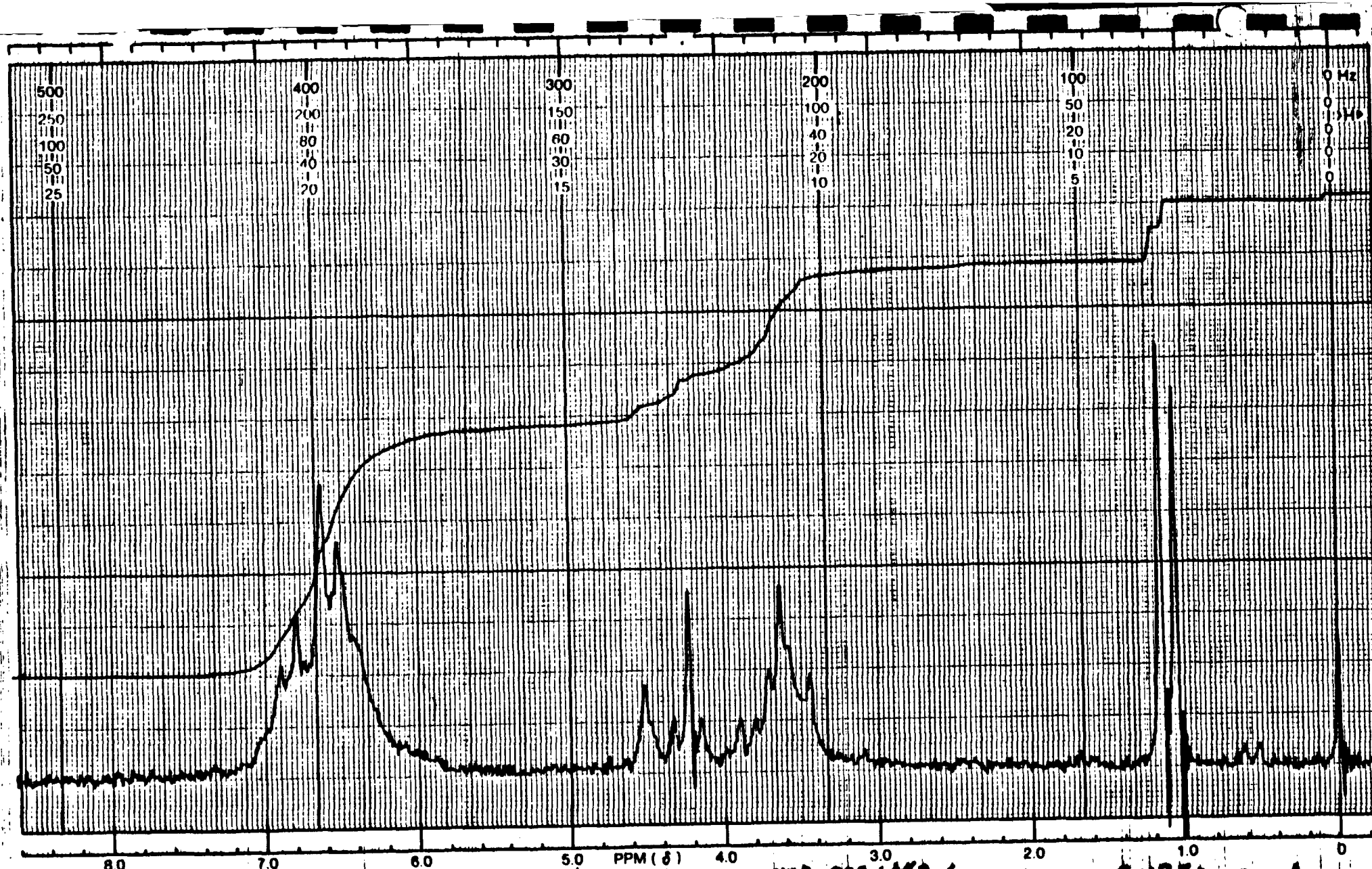
REMARKS:

ORIGINAL PAGE IS
OF POOR QUALITY

SOLVENT ONLY SCAN

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

DATE: 3-21-85 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#3-1 REMARKS: 0.137gm sample
SOLVENT: Unisol-d+0.5%TMS 0.937gm solvent
DEC. LEVEL

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DATE: 3-21-86 OPERATOR DOW SPECTRUM NO. 5of7 USP-39A Lot#3-1

CHART 15A

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

TABLE OF CONTENTS

FABRIC TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

WCA Fabric for NASA Lot# 3 (HITCO)

TEST		PAGE
1a.	Breaking Strength, WARP	1
1b.	Breaking Strength, FILL	1
2a.	Carbon Assay	1
2b.	Hydrogen Assay	1
2c.	Nitrogen Assay	1
3.	Visual Inspection	1
4.	Specific Gravity	1
5.	pH	1
6.	TGA	1
7a.	Atomic Absorption	2
7b.	Moisture Content	2
7c.	Ash Content	2
8a.	Filament diameter, WARP	2
8b.	Filament diameter, FILL	2
9a.	Thread Count, WARP	2
9b.	Thread Count, FILL	2
10a.	Areal weight	2
10b.	Volatiles	2
10c.	Weight Change on Acetone Wash	3

CHARTS

Visual Inspection 3A

TGA 6A

U.S. Polymeric

FABRIC TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

WCA Fabric for NASA Lot# 3 (HITCO)

1a. Breaking Strength, lbs/in, WARP			#3-1S
ASTM D1682		PICK	43
		CENTER	61
		PLAIN	53
		AVG.	52.3
1b. Breaking Strength, lbs/in, FILL			
ASTM D1682		PICK	16
		CENTER	16
		PLAIN	22
		AVG.	18.0
2a. Carbon Assay, %			
MDQAI 5560		PICK	99.7
		CENTER	99.9
		PLAIN	99.1
		AVG.	99.57
2b. Hydrogen Assay, %			
MDQAI 5560		PICK	<.01
		CENTER	.01
		PLAIN	<.01
		AVG. EST	.004
2c. Nitrogen Assay, %			
MDQAI 5560		PICK	.2
		CENTER	.04
		PLAIN	<.05
		AVG. EST	.08
3. Visual Inspection		See Chart 3A	
QCi-102			
4. Specific Gravity, Units			
PTM-84			1.6247
			1.6975
			1.6674
		AVG.	1.663
5. pH, Units			
CTM-24B			6.4
			6.4
		AVG.	6.4
6. TGA, °C at 50% Weight Loss	SET UP #1		
CTM-51 (AIR)	#3-1S 951		
	See Chart 6A		

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

WCA Fabric for NASA Lot# 3 (HITCO)

7a. Atomic Absorption, ppm
CTM-53B

	#3-1S
Na	10
K	0
Ca	6
Mg	2
Li	0
AVG.	18

7b. Moisture Content, %
CTM-53B

.000

7c. Ash Content, %
CTM-53B

.005

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

	#3-1S
AVERAGE	9.33
Minimum	8.00
Maximum	10.30
Std. Dev	0.77

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

	#3-1S
AVERAGE	9.36
Minimum	7.10
Maximum	10.55
Std. Dev	1.17

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

	#3-1S
	29
	29
	29
	29
	29
AVG.	29.0

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

	22
	22
	22
	22
	22
AVG.	22.0

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

LEFT	2.508
CENTER	2.455
RIGHT	2.496
AVG.	2.486

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

LEFT	.28
CENTER	.24
RIGHT	.32
AVG.	.28

WCA Fabric for NASA Lot# 3 (HITCO)

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

U.S. Polymeric

Hamid M. Quraishi, Manager
Quality Assurance Department

USP NO.___ CHART 3A

DATE 3/17/86

FABRIC WCA GRAPHITE

MFG. UNION CARBIDE

ROLL NO. 804 12C5 WCA-2

YARDS 180

POUNDS 100

ORDER NO. 0E71108

SPECIFICATION Various

Q.C. FILE # NASA 3-1

FOOTAGE

RIGHT — LEFT

TREATER OPERATOR READ UP

Footage	Start	Sample
0	Start	Sample
10		
20	14 W, 26 W	
30	30 W, 36 W	
40	47 W	
50		
60		
70	77 ●●	
80	88 SPLICE	
[illegible]		99 W
100		102 W – 8
110		110 W – 113 W
[illegible]	124 W	
[illegible]	133 W	136 – 143 W
150	150 W	
[illegible]		
[illegible]	170 W	
180	183 – 184 W	
[illegible]		199 W
200		210 ●●
[illegible]	218 W	
[illegible]	227 W	
230		236 W
[illegible]	243 W	
250	259 W	
[illegible]	263	

53W

SYMBOLS

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

REMARKS
272 W
282 W
290 W
296 W
301 W
309 W
313 W
324 a
334 SPLICE
336 W
348 W
352 W
353 W
360 W
364 W
366 W
374 W
377 W
391 W
400 W
404 W
406 – 7 W
422 W
428 W
432 W
449 W
451 W
464 ●●
472 W
475
480 ●
481 W
485 W
492 W
498 W
510 W
511 W
518 W
524 W

GRADE Group C

END Sample

CHART 6A

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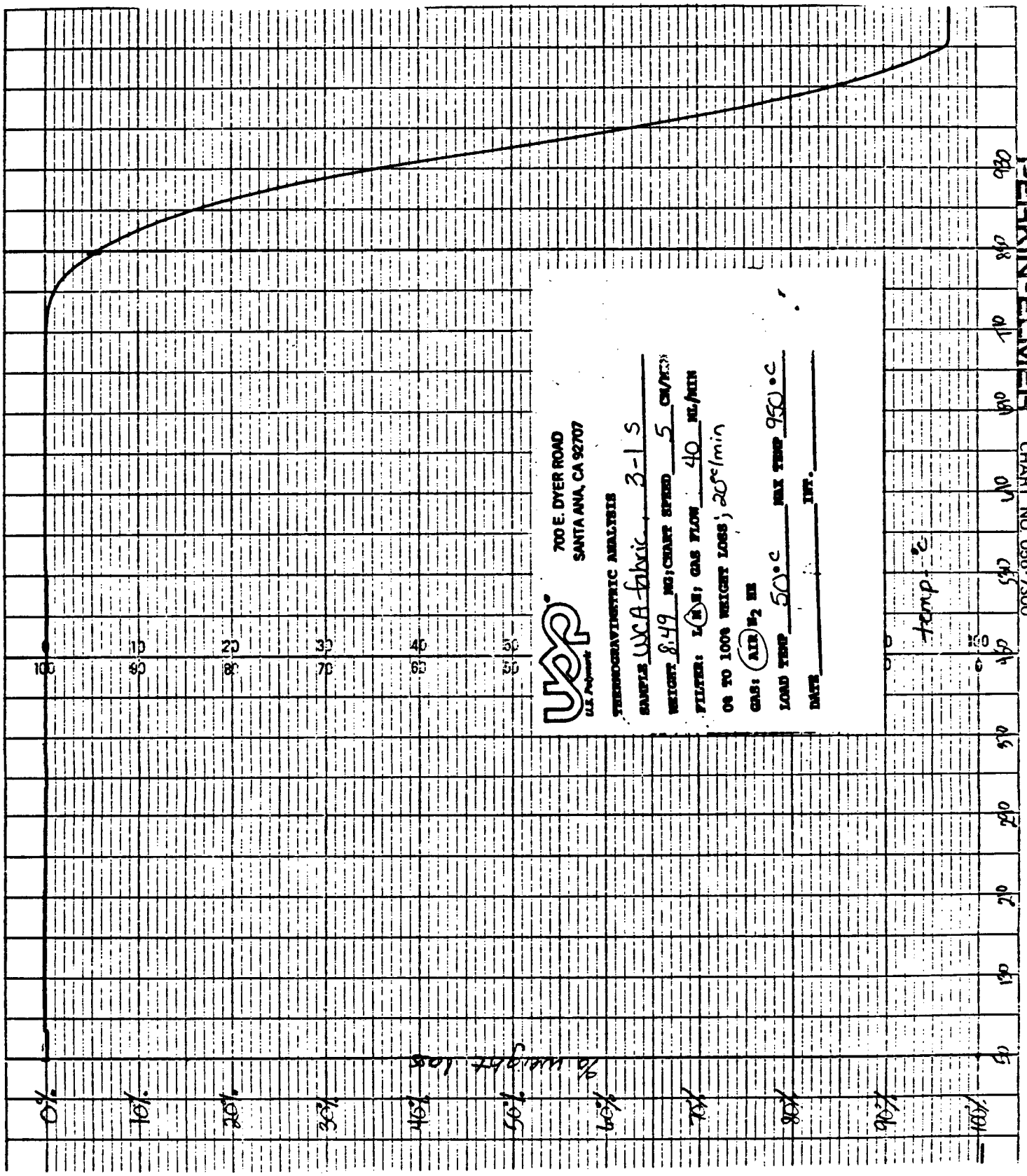

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PREPREG TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

FM 5064JB NASA LOT# 3 U.S.P. LOT# C02137 (HITCO)

TEST		PAGE
1a.	Resin Content, Soxhlet	1
1b.	Filler Content, Soxhlet	1
1c.	Cloth Content, Soxhlet	1
2.	Volatile Content	1
3.	Flow	1
4.	Resin Content, Dry Basis	1
5.	Tack	1
6.	Gel Time	1
7a.	Atomic Absorption	1
7b.	Moisture Content	1
7c.	Ash Content	2
8.	TGA	2
9.	DSC	2
10.	Infrared (IRZB) Baseline	2
11.	Environmental History	2
12.	Specific Gravity	2
13a.	Tensile Strength	2
13b.	Tensile Modulus	2
13c.	Tensile Elongation	2
14a.	Flexural Strength	2
14b.	Flexural Modulus	3
15a.	Compressive Strength	3
15b.	Compressive Modulus	3
16.	Double Shear Strength	3
17.	Barcol Hardness	3
18.	Residual Volatiles	3
19.	Resin Content, Pyrolysis	3
20.	Acetone Extraction	3
21a.	CTE, with ply	3
21b.	CTE, crossply	4

CHARTS

TGA	8A
DSC	9A
Infrared (IRZB) Baseline	10A
CTE	21A

U.S. Polymeric

PREPREG TESTING

NAS8-36298

U.S. POLYMERIC O.E.71108

FM 5064J NASA LOT# 3 U.S.P. LOT# C02137 (HITCO)

		ROLL#1-S
1a. Resin Content, Soxhlet, % CTM-6D		34.2
		33.7
		33.2
	AVG.	33.7
1b. Filler Content, Soxhlet, % CTM-6D		14.0
		13.8
		13.6
	AVG.	13.8
1c. Cloth Content, Soxhlet, % CTM-6D		51.8
		52.5
		53.2
	AVG.	52.5
2. Volatile Content, % PTM-17B		3.0
		2.9
		2.8
	AVG.	2.9
3. Flow, % PTM-19G		12.0
		11.7
		10.7
	AVG.	11.5
4. Resin Content, Dry basis, % PTM-16F, Type II		34.3
		34.6
		33.8
	AVG.	34.2
5. Tack, lbs PTM-80		30
6. Gel Time, seconds PTM-20E		46
7a. Atomic Absorption, ppm CTM-53B	Na	5
	K	0
	Ca	0
	Mg	3
	Li	0
	TOTAL	8
7b. Moisture Content, % CTM-53B		2.04

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

FM 5064J NASA LOT# 3 U.S.P. LOT# C02137 (HITCO)

			ROLL#1-S
7c. Ash Content, % CTM-53B			.25
8. TGA, % Weight Loss at 500°C CTM-51 (Nitrogen)	See Chart 8A		10.1
9. DSC, °C CTM-50A	First Temp See Chart 9A		182
10. Infrared (IRZB) Baseline CTM-21C	See Chart 10A		.82
11. Environmental History	Date manufactured: 2 May 1986 Packaged in: MIL-B-131 Class I bag supported in cardboard carton Date shipped: 16 June 1986 in 40°F truck		
12. Specific Gravity, Cured, Units ASTM D792			1.430 1.430 1.430 1.430
		AVG.	1.430
13a. Tensile Strength, ksi, WARP FTMS 406-1011			20.38 21.27 20.46 20.88 16.69
		AVG.	19.93
13b. Tensile Modulus, msi, WARP FTMS 406-1011			2.02 2.03 1.99 1.84 1.89
		AVG.	1.95
13c. Tensile Elongation, %, WARP FTMS 406-1011			1.33 1.41 1.17 1.26 1.16
		AVG.	1.27
14a. Flexural Strength, ksi, WARP FTMS 406-1031			27.10 30.21 27.79 28.12 29.19
		AVG.	28.48

FM 5064J NASA LOT# 3 U.S.P. LOT# C02137 (HITCO)

		ROLL#1-S
14b. Flexural Modulus, msi, WARP FTMS 406-1031		1.69
		1.84
		1.58
		1.49
		1.39
	AVG.	1.60
15a. Compressive Strength, ksi, WARP FTMS 406-1021		16.16
		20.12
		17.49
		18.49
		19.37
	AVG.	18.33
15b. Compressive Modulus, msi, WARP FTMS 406-1021		2.25
		2.34
		2.38
		2.15
		2.17
	AVG.	2.26
16. Double Shear Strength, ksi FTMS 406-1041A		2.51
		2.33
		2.37
		2.38
		2.63
	AVG.	2.45
17. Barcol Hardness, Units ASTM D-2583 (Average of 10 determinations)		61.9
18. Residual Volatiles, % PTM-98		1.57
		1.55
		1.32
	AVG.	1.48
19. Resin Content, Pyrolysis, % CTM-14B		32.40
		31.65
		31.92
	AVG.	31.99
20. Acetone Extraction, % CTM-18A		3.50
		4.13
		4.22
	AVG.	3.95
21a. CTE, in/in °F with PLY PTM-61B		3.26
		4.70
	AVG.	3.98

FM 5064J NASA LOT# 3 U.S.P. LOT# C02137 (HITCO)

21b. CTE, in/in °F Cross PLY
PTM-61B

	16.88
	11.75
AVG.	14.32

See Chart 21A

U.S. Polymeric

Hamid M. Quraishi, Manager
Quality Assurance Department

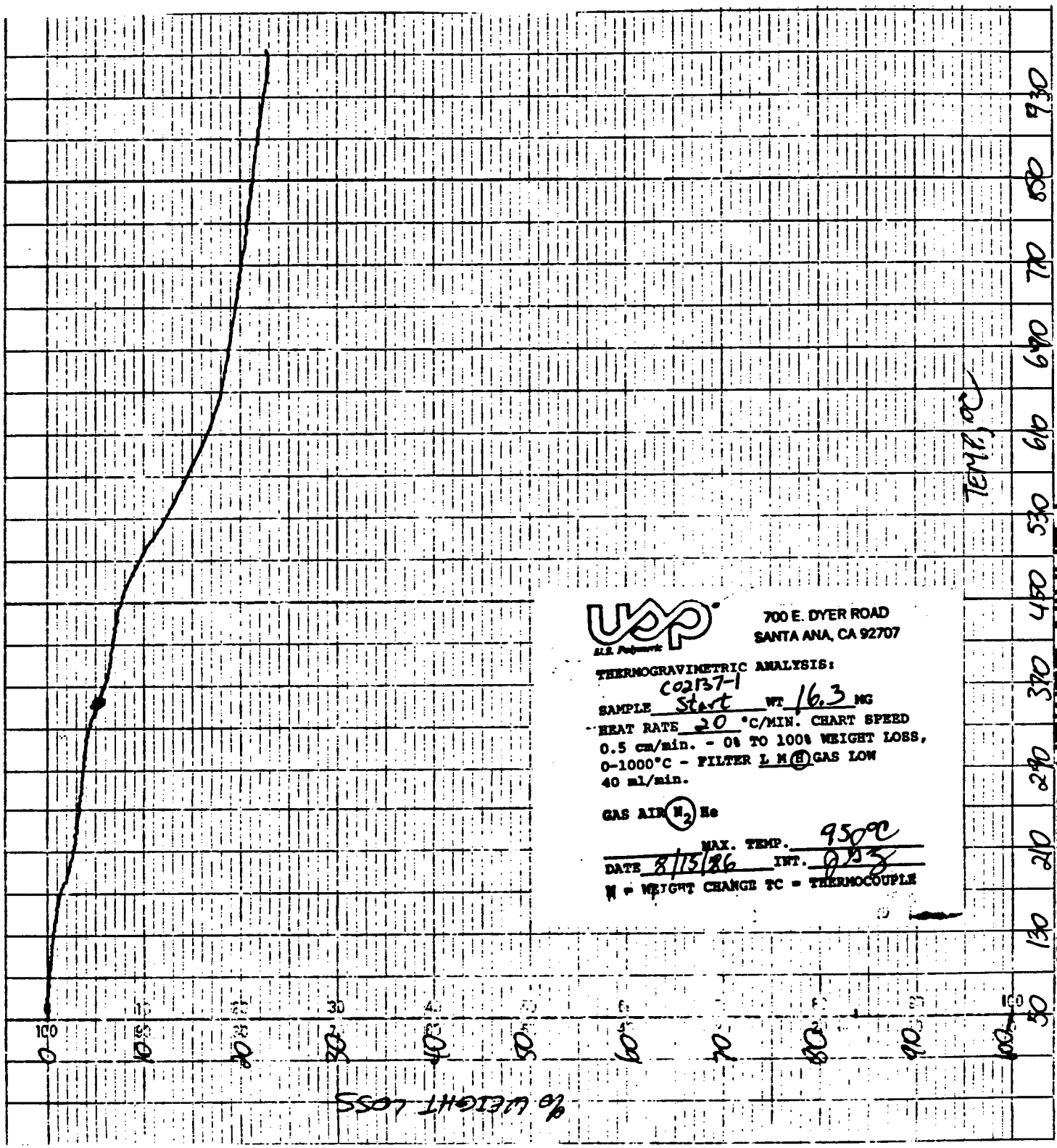
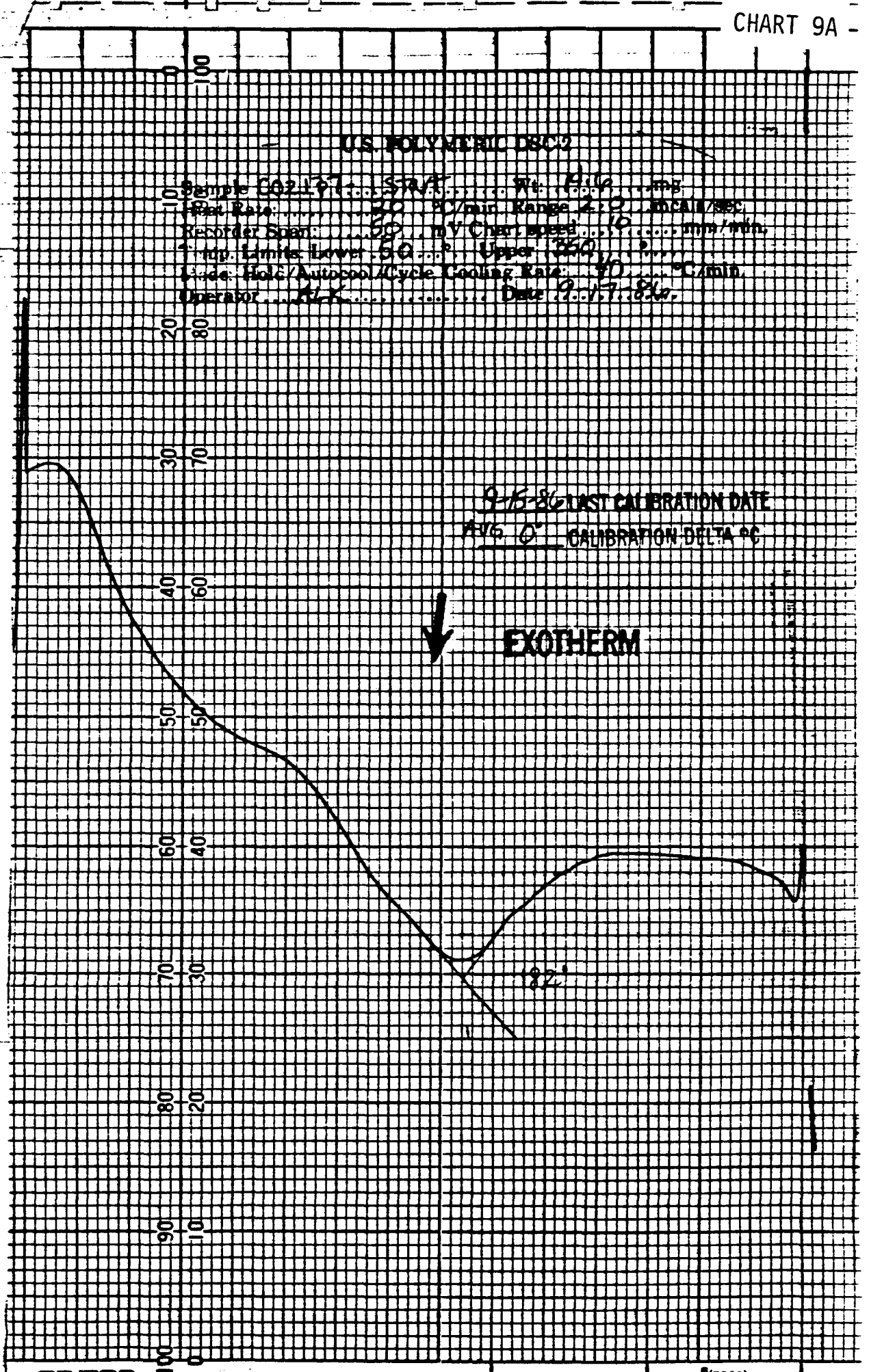


CHART 9A -



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SPECTRUM NO. 15186
DATE 7-07-86
SAMPLE FM 5064 J
CO2137 # 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

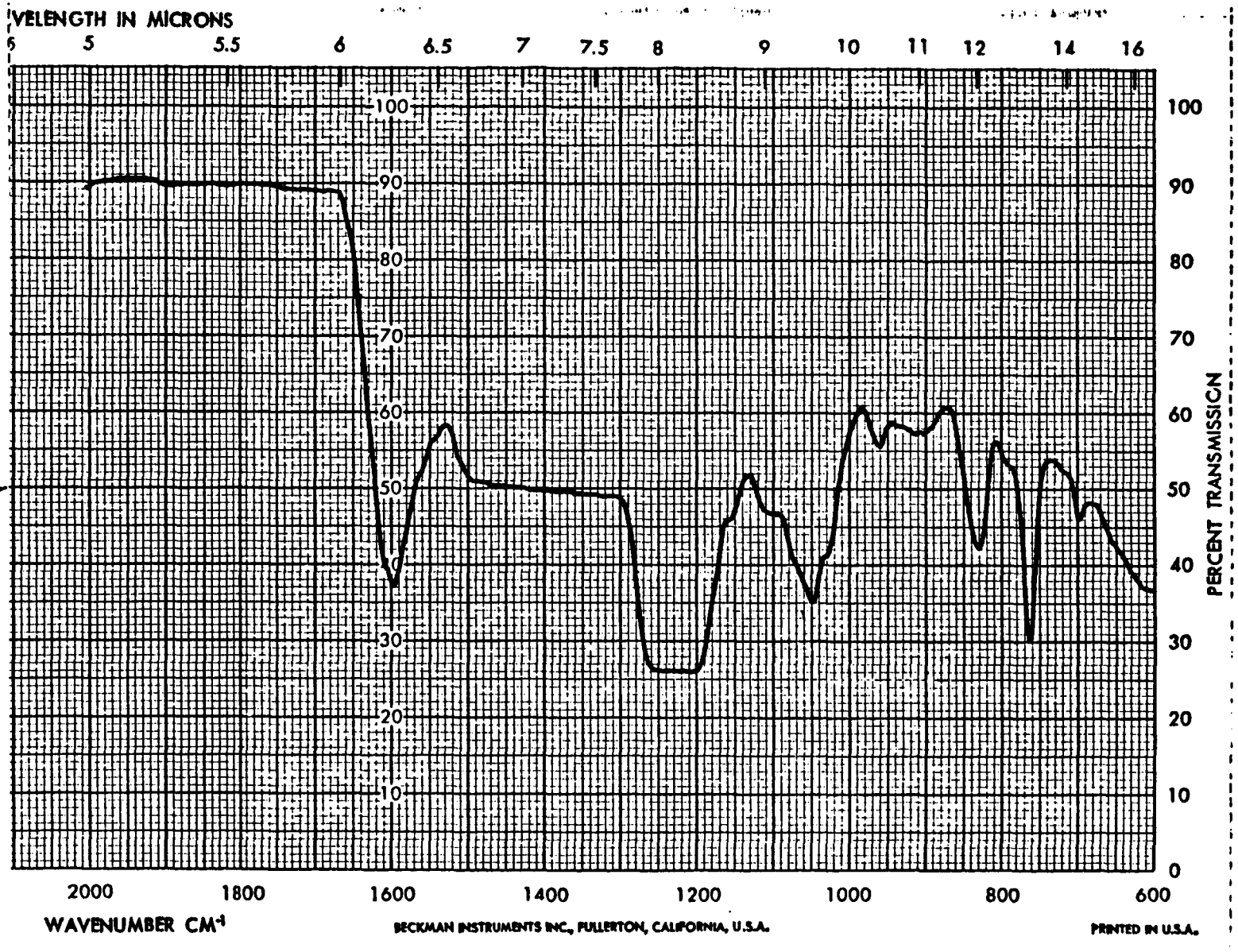


CHART 10A

Chart 21A1

PART NO. 990088

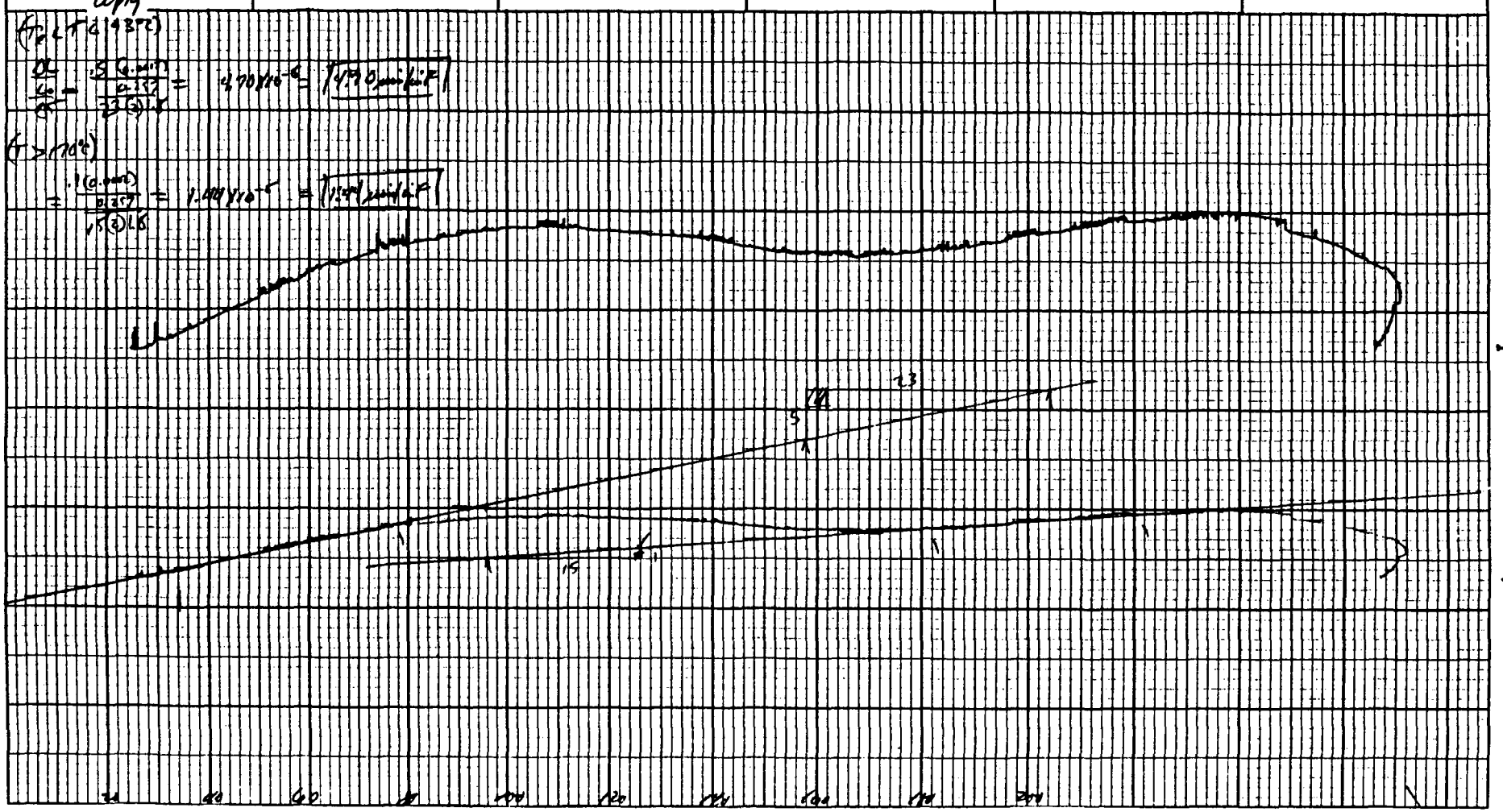
	T-AXIS	DTA-DSC	TGA	TMA
RUN NO ___ DATE 1/20/84	SCALE, °C/in 50 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/0.2
OPERATOR TH	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE Expansion
SAMPLE: Polymer-1-Sample-(1)	HEAT ___ COOL ___ ISO	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.250
ATM Air @ 30	SHIFT, in 0	REFERENCE	TIME CONST., sec	LOAD, g 1
FLOW RATE 100cc/M			dY, (mg/min) /in	dY, (10X), (mils/min) /in

MEASURED VARIABLE

DUPONT instruments

PART NO. 990088

RUN NO ___ DATE 9/20/96	T-AXIS	DTA-DSC	TGA	TMA	
OPERATOR TM	SCALE, °C/in 50 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/4.2	
SAMPLE:	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE Expansion	
C02137-1-START-(2)	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.259	
ATM Air @ STP	SHIFT, in 0	REFERENCE	TIME CONST., sec	LOAD, g 1	
FLOW RATE 3-5 SCFH			dY, (mg/min) /in	dY, (10X), (mils/min)/in	



DUPONT Instruments

MEASURED VARIABLE

Chart 21A2

PART NO. 990088

RUN NO ___ DATE 9/15/96	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	
COUST-1-SMAT-(4)	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg ___	WEIGHT, mg ___	SAMPLE SIZE 0.12	
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 ___	

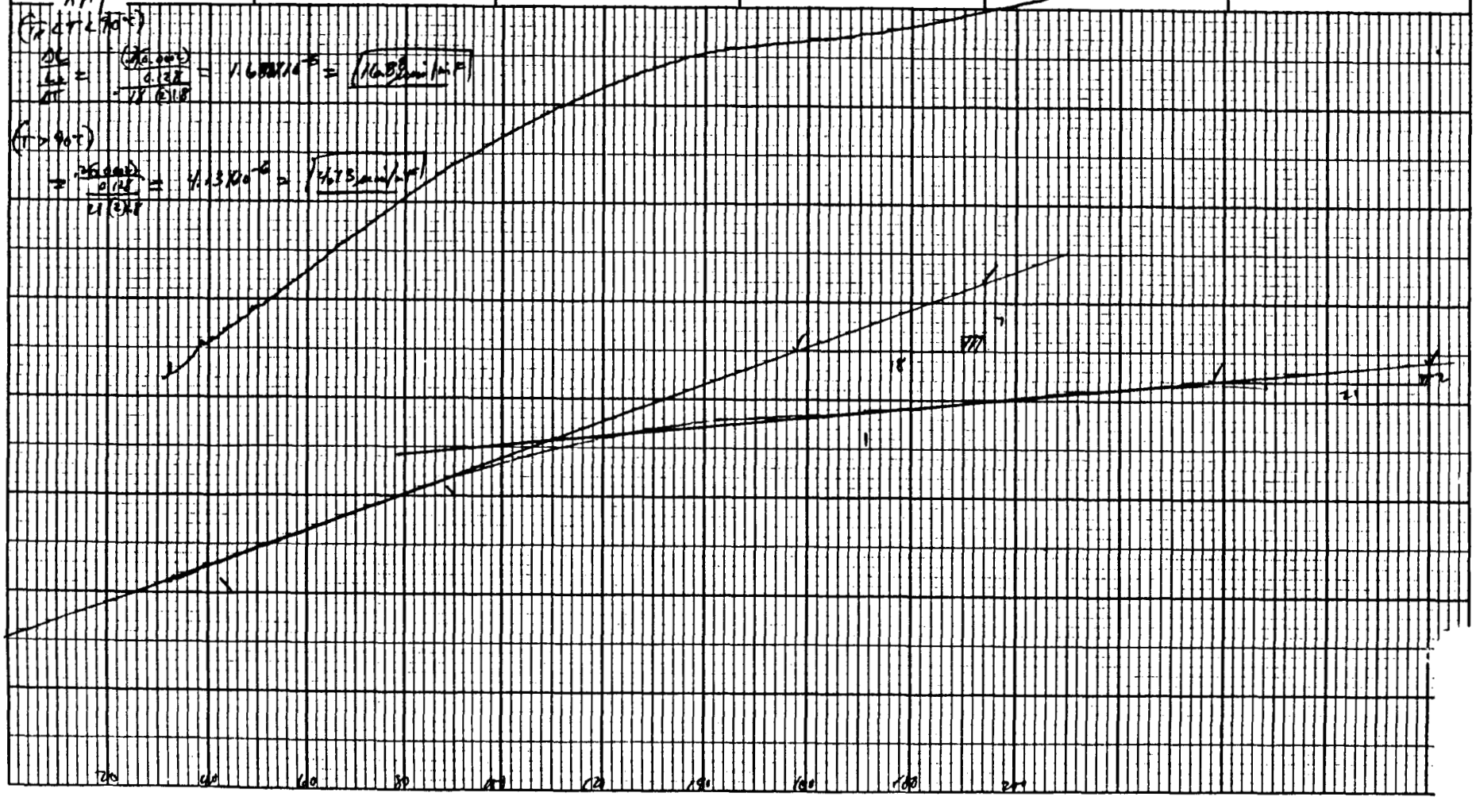
X plot

(T < 40°C)

$$\frac{\Delta L}{\Delta T} = \frac{(26.000)}{\frac{0.38}{12}(21.8)} = 1.68 \times 10^{-5} \approx 16.8\ \text{mil/in°F}$$

(T > 40°C)

$$\frac{\Delta L}{\Delta T} = \frac{(26.000)}{\frac{0.12}{12}(21.8)} = 4.13 \times 10^{-6} \approx 4.13\ \text{mil/in°F}$$



MEASURED VARIABLE ___

DUPONT Instruments

ORIGINAL PAGE IS
OF POOR QUALITY

Chart 21A3

Chart 2TA4

PART NO. 990000

	T-AXIS	DTA-DSC	TGA	TMA
RUN NO. ___ DATE 1/19/96	SCALE, °C/in 50 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/0.2
OPERATOR TH	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE Expansion
SAMPLE: Co2137-1-Smart-(5)	HEAT ✓ COOL 150	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE Probe 0.124
ATM Air @ 50	SHIFT, in 0	REFERENCE	TIME CONST., sec	LOAD, g
FLOW RATE 3-5 SCFH			dY/dT (mg/min)/in	dY/dT (10X) (mils/min)/in

MEASURED VARIABLE

DUPONT instruments

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FILLER TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

Filler Lot for NASA Lot# 4

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2.	Ash Content	1
3.	Atomic Absorption	1
3a.	Moisture Content	1
3b.	Ash Content	1
4.	pH	1
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6a.	TGA, °C at 50% Loss	1
6b.	TGA	2
7.	Particle Size Distribution	2
7a.	Particle Size, Horiba	2

CHARTS

TGA..... 6A - 6C

Particle Size Distribution..... 7A - 7C

U.S. Polymeric

FILLER TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

Filler Lot for NASA Lot# 4

		SAMPLE		
1. Carbon Content, % QAI-5560		#4-1	#4-2	#4-3
		99.75	99.57	99.17
		NASA LOT# 4 AVERAGE 99.50		
2. Ash Content, % PTM-71B		.005	.000	.010
		.021	.015	.005
	AVG.	.013	.008	.008
		NASA LOT# 4 AVERAGE .010		

3. Atomic Absorption, ppm CTM-53B (Values are average of 2 determinations)		#4-1	#4-2	#4-3	LOT#4 AVG.
	Na	2.0	2.0	1.0	1.7
	K	1.5	2.0	1.0	1.5
	Ca	1.5	0.5	1.5	1.2
	Mg	1.0	1.0	0.0	0.7
	Li	0.0	0.0	0.0	0.0
	TOTAL	6.0	5.5	3.5	5.0

3a. Moisture Content, % CTM-53B		0.018	0.005	0.010
		0.030	0.015	0.015
	AVG.	0.024	0.010	0.013
		NASA LOT# 4 AVERAGE 0.016		
3b. Ash Content, % CTM-53B		0.005	0.005	0.000
		0.000	0.005	0.000
	AVG.	0.003	0.005	0.000
		NASA LOT# 4 AVERAGE 0.003		
4. pH, Units ASTM D1512		4.70	4.80	4.80
		4.80	4.85	4.65
	AVG.	4.75	4.82	4.72
		NASA LOT# 4 AVERAGE 4.76		

5. Particle Size, microns S.E.M. procedure (Average values are of 10 determinations)	AVG.	.42	.38	.43
	Maximum	.56	.73	.70
	Minimum	.20	.20	.23
	Std. Dev	.08	.05	.08
	NASA LOT# 4 AVERAGE SIZE .41			
6a. TGA, °C at 50% Loss CTM-51		701	688	697
		NASA LOT# 4 AVERAGE 695		

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Filler Lot for NASA Lot# 4

6b. TGA
CTM-51 — See Charts 6A-6C

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

7a. Particle Size, microns
CTM-72

	#4-1	#4-2	#4-3
	.94	.79	.98
	.94	.82	.91
AVG.	.94	.80	.94

NASA LOT# 4 AVERAGE .89

U.S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

Sample: 4-1
Size: 17.543 mg
Run No: MIR #12831 (12)
Date: FEB/04/86 07:06

TGA.

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #93
File No: D 44.DAT V2.1
Plotted: FEB/04/86 10:23

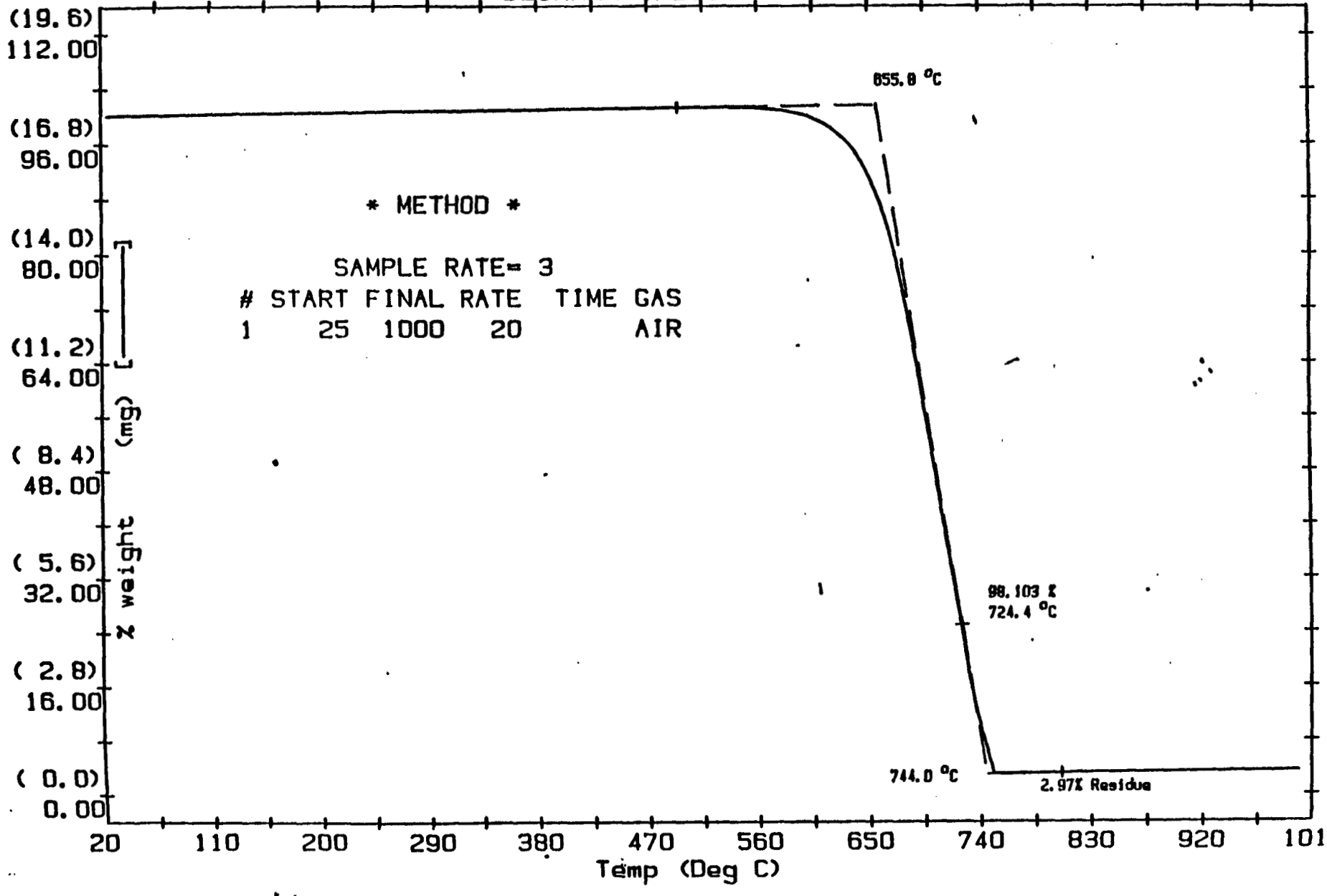


CHART 6A

Beckman Industrial™ ANALYTICAL LABORATORY SERVICES

Sample: 4-2
Size: 19.186 mg
Run No: MIR #12831 (I2)
Date: FEB/04/86 08:21

TGA.

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #93
File No: D 45.DAT V2.1
Plotted: FEB/04/86 10:54

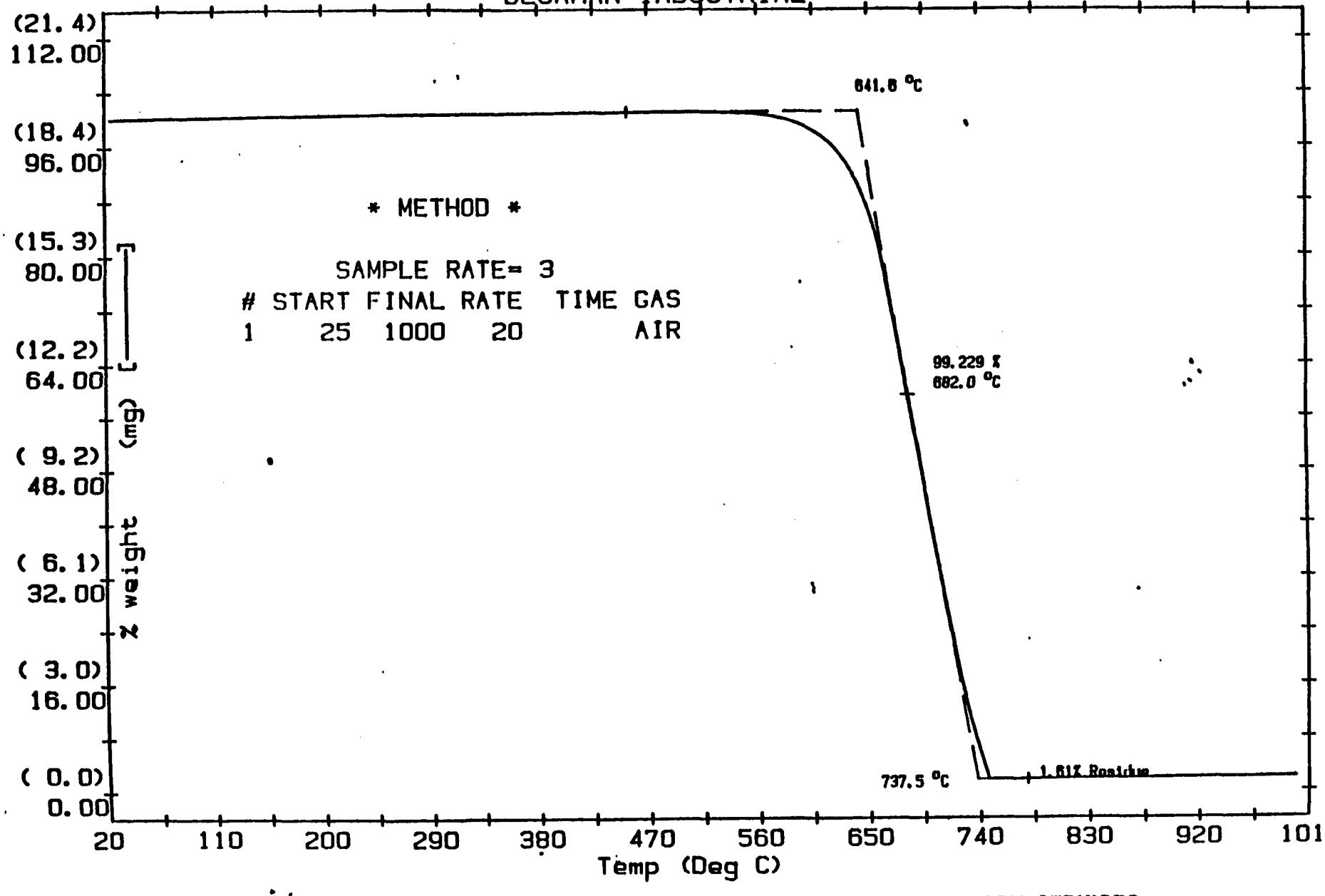


CHART 6B

Beckman Industrial™ ANALYTICAL LABORATORY SERVICES

Sample: 4-3
Size: 15.594 mg
Run No: MIR #12831 (I2)
Date: FEB/04/86 10:14

TGA

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #93
File No: D 46.DAT V2.1
Plotted: FEB/04/86 11:43

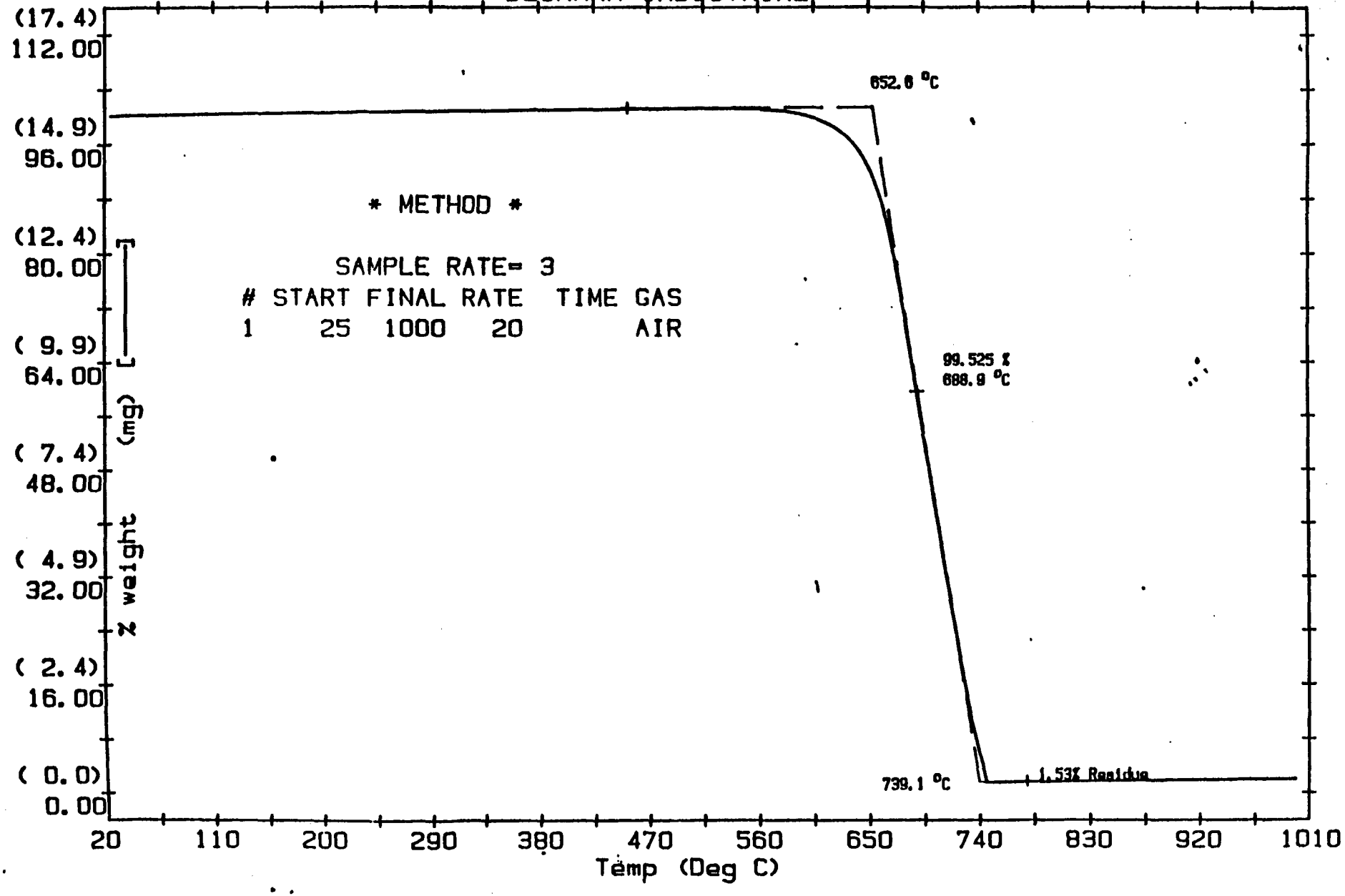


CHART 6C

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-27-86
#1 SAMPLE NASA LOT#4-1
SOLVENT ETHYL.GLYCOL
C=0.01 mg/mL

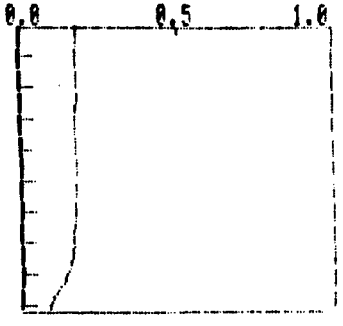
* CONDITIONS

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

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

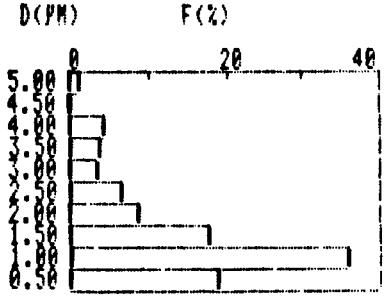


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	1.1	1.1
4.50-4.00	0.0	1.1
4.00-3.50	4.4	5.5
3.50-3.00	3.8	9.3
3.00-2.50	3.4	12.7
2.50-2.00	6.5	19.2
2.00-1.50	8.6	27.9
1.50-1.00	17.5	45.4
1.00-0.50	35.8	81.2
0.50-0.00	18.8	100.0

D(AVE) 0.94 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



LOT#4-1
Sample#1

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-27-86
#2 SAMPLE NASA LOT#4-1
SOLVENT ETHYL.GLYCOL
C=0.01 mg/mL

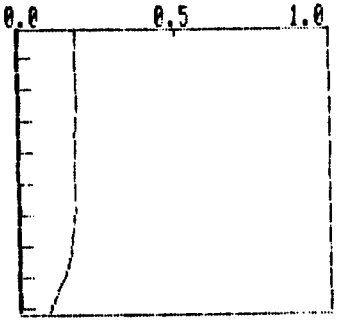
* CONDITIONS

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

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

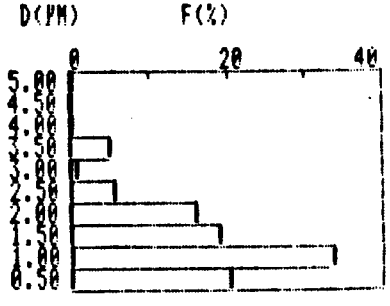


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	0.0	0.0
3.50-3.00	5.1	5.1
3.00-2.50	0.6	5.7
2.50-2.00	5.5	11.2
2.00-1.50	16.0	27.2
1.50-1.00	18.8	46.0
1.00-0.50	33.7	79.7
0.50-0.00	20.3	100.0

D(AVE) 0.94 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



LOT#4-1
Sample#2

CHART 7A

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-27-86
#2 SAMPLE NASA LoI #4-2
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

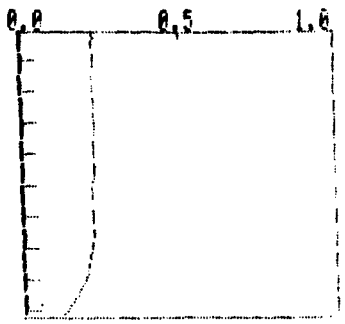
* CONDITIONS

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

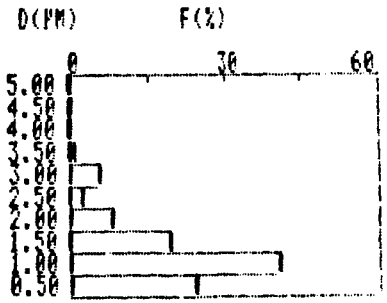


* DISTRIBUTION TABLE (BY VOL.)

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	0.7	0.7
3.00-2.50	5.5	6.2
2.50-2.00	2.2	8.4
2.00-1.50	7.9	16.3
1.50-1.00	19.2	35.5
1.00-0.50	41.1	76.5
0.50-0.00	23.5	100.0

D(AVE) 0.82 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot #4-2
Sample #2

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-27-86
#1 SAMPLE NASA LoI #4-2
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

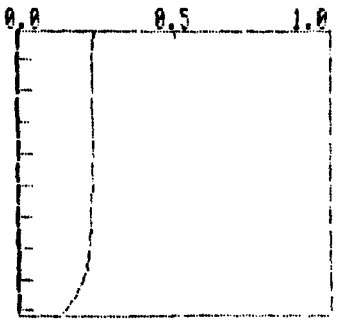
* CONDITIONS

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

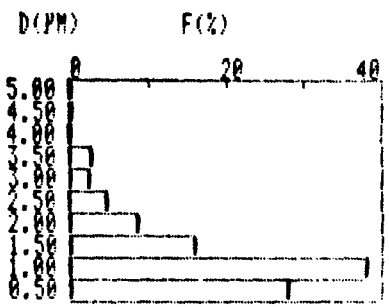


* DISTRIBUTION TABLE (BY VOL.)

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	2.7	2.7
3.00-2.50	2.4	5.1
2.50-2.00	4.7	9.8
2.00-1.50	8.4	18.2
1.50-1.00	15.7	33.9
1.00-0.50	38.1	72.0
0.50-0.00	28.0	100.0

D(AVE) 0.79 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot #4-2
Sample #1

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-27-86
#1 SAMPLE NASA LOT#43
SOLVENT ETHYL.GLYCOL
C=0.01 mg/ml

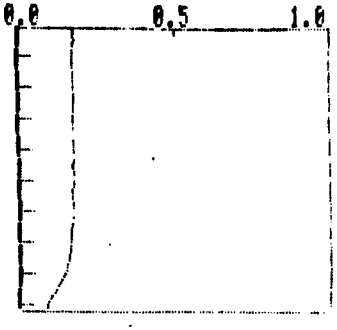
* CONDITIONS

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

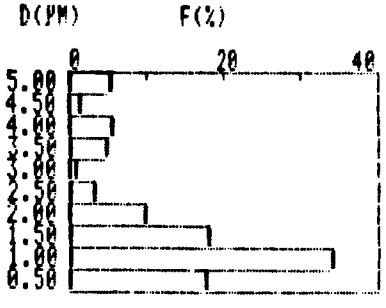


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	5.3	5.3
4.50-4.00	1.3	6.6
4.00-3.50	5.5	12.2
3.50-3.00	4.6	16.8
3.00-2.50	0.7	17.5
2.50-2.00	3.0	20.5
2.00-1.50	9.9	30.4
1.50-1.00	18.0	48.4
1.00-0.50	34.1	82.4
0.50-0.00	17.6	100.0

D(AVE) 0.98 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#43 Sample#1

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-27-86
#2 SAMPLE NASA LOT#43
SOLVENT ETHYL.GLYCOL
C=0.01 mg/ml

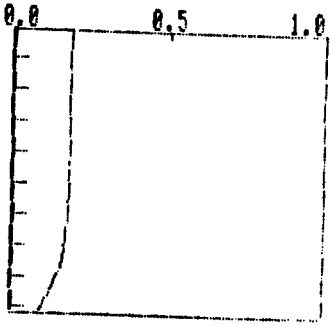
* CONDITIONS

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

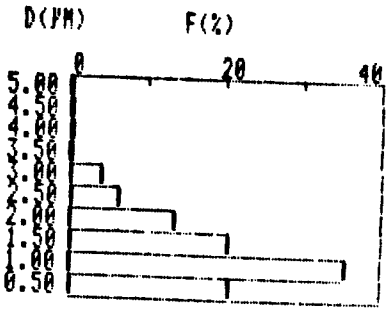


* DISTRIBUTION TABLE (BY VOL.)

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	3.8	3.8
2.50-2.00	6.2	10.0
2.00-1.50	13.5	23.6
1.50-1.00	20.3	43.8
1.00-0.50	35.6	79.4
0.50-0.00	20.6	100.0

D(AVE) 0.91 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#43 Sample#2

CHART 7C

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RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

USP-39A Resin Lot for NASA Lot# 4

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3.	Brookfield Viscosity	1
4.	Gel Time	1
5.	Atomic Absorption	1
6.	Gas Chromatography	1
7.	TGA	1
8.	DSC	1
9.	HPLC	1
10.	GPC	1
11.	pH	2
12.	Phenol Content	2
13.	Chang's Index	2
14.	RDS	2
15.	NMR	2

CHARTS

Gas Chromatography	6A - 6B
TGA	7A - 7B
DSC	8A - 8B
HPLC	9A - 9B
GPC	10A - 10B
RDS	14A - 14B
NMR	15A - 15B

U.S. Polymeric

RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

USP-39A Resin Lot for NASA Lot# 4

1. Resin Solids, %			#4-1	#4-2	
PTM-7C			83.0	82.8	
			83.6	83.2	
			82.4	83.5	
		AVG.	83.0	83.2	
		Lot# 4 AVERAGE		83.1	
2. Specific Gravity @ 25°C			1.167	1.169	
PTM-29C		Lot# 4 AVERAGE		1.168	
3. Viscosity, Brookfield, cps. @ 22.8°C			13,750	13,500	
PTM-14C		Lot# 4 AVERAGE		13,625	
4. Gel Time, min:sec			4:15	4:05	
PTM-47B		Lot# 4 AVERAGE		4:10	
5. Atomic Absorption, ppm			#4-1	#4-2	LOT4 AVG
CTM-53B		Na	91.0	100.0	95.5
(Values are averages of		K	3.0	3.0	3.0
two determinations)		Ca	12.5	14.5	13.5
		Mg	4.0	3.5	3.8
		Li	0.0	0.0	0.0
		AVG.	110.5	121.0	115.8
6. Volatiles, Gas Chromatography			See Charts 6A-6B		
CTM-55					
7. TGA, % Weight Loss at 500°C			42.8	42.5	
CTM-51 (AIR)		Lot# 4 AVERAGE		42.7	
			See Chart 7A-7B		
8. DSC, temperature °C			186	188	
CTM-50A		Lot# 4 AVERAGE		187	
			See Chart 8A-8B		
9. HPLC			See Chart 9A-9B		
CTM-49A					
10. GPC, Average molecular wt.			1679	1577	
CTM-49A		Lot# 4 AVERAGE		1628	
			See Chart 10A-10B		

C-3

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USP-39A Resin Lot for NASA Lot# 4

11. pH, units
CTM-1B

	#4-1	#4-2
	8.18	8.20
Lot# 4	AVERAGE	8.19

12. Phenol Content, %
CTM-55 Appendix 1

	12.83	12.93
	12.55	12.84
AVG.	12.69	12.88
Lot# 4	AVERAGE	12.79

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

	24.9	24.6
Lot# 4	AVERAGE	24.8

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

	Min. Visc.	°C
#4-1	148	106
#4-2	143	106
AVG.	145	106

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 J.S.Z.	Date 12/16/86
Column	Detector FID
Length 6FT.	Voltage
Dia. 1/4 in.	Sensit.
Liquid Phase OV-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. 320 Inj. 200
Inlet Press 60 psig	Column Initial 60
Rate 30 ml/min	Final 210
CHART SPEED	Rate 8°C/MIN
SAMPLE USP39A,4-1	Solvent THF
Size 0.05 ul	Concn. 0.1631 gm/5ml

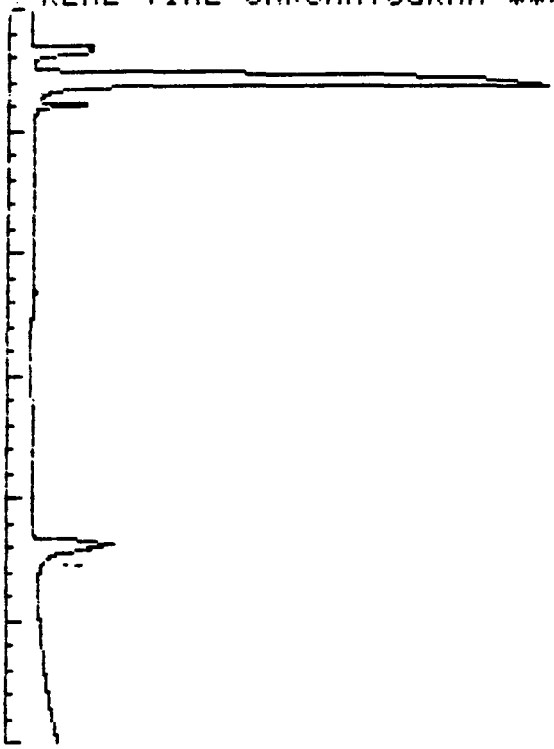
GAS CHROMATOGRAPHY STANDARD SOLVENT

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 4-1
MISC.: C=0.11631 GMS/ML

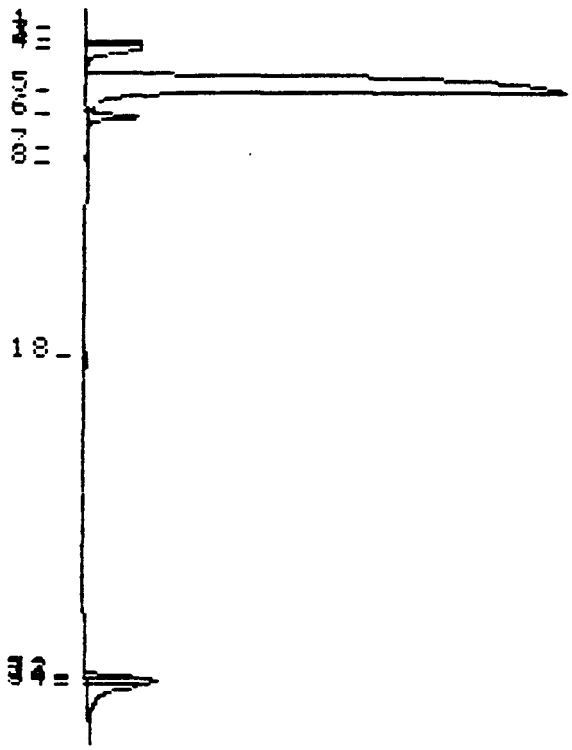
TIME: 12:34
DATE: 12/16/86
OPERATOR: JGZ

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

PK NO	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
1	.63	1162	.029	1	191
3	1.60	76625	1.922	2	11349
4	1.80	191960	4.815	2	11360
5	3.20	3116800	78.236	2	97574
6	3.98	136680	3.429	3	10372
7	5.03	3086	.077	4	153
8	5.50	3265	.082	2	326
18	11.63	13890	.348	2	675
32	21.78	54611	1.370	2	10649
33	21.90	178710	4.483	2	14799
34	22.10	207590	5.207	2	10581

TOTAL AREA= 3986379
THRESHOLD= 1
MIN.PK.WIDTH= 15
AREA REJECT= 1000

VERTICAL SCALE FACTOR:1X



SAMPLE: USP39A 4-1
MISC.: C=0.11631 GMS/ML

TIME: 12:34
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	1.60	76625	1.933	2	11349
4	1.80	191960	4.841	2	11360
5	3.20	3118800	78.659	2	97574
6	3.98	136680	3.447	3	10372
32	21.78	54611	1.377	2	10649
33	21.90	178710	4.507	2	14799
34	22.10	207590	5.236	2	10581

TOTAL AREA= 3964976
THRESHOLD= 1
MIN.PK.WIDTH= 15
AREA REJECT= 15000

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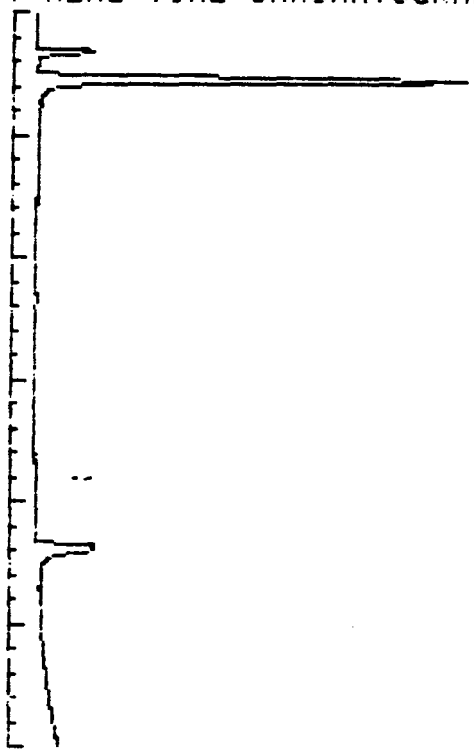
OF POOR QUALITY

*** REAL TIME CHROMATOGRAM ***



FINAL FULL SCALE MV.=1000.00

SAMPLE: USP39A 4-2
MISC.: C=0.10199 GMS/ML

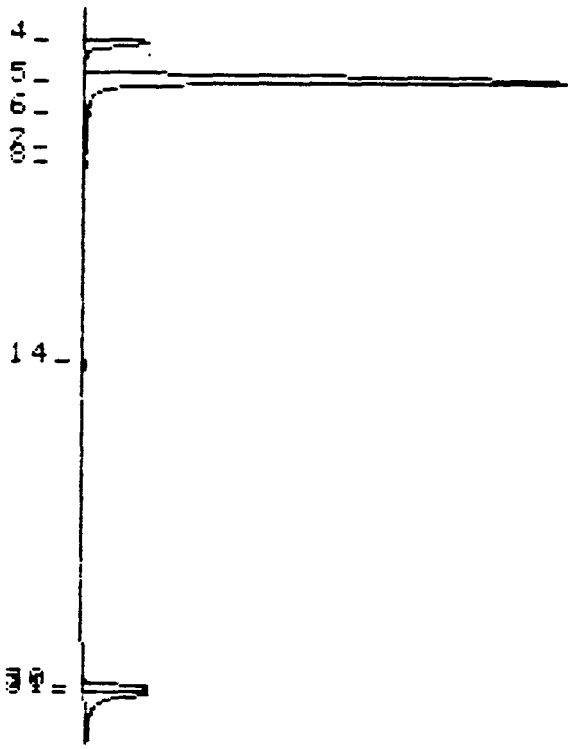
TIME: 14:04
DATE: 12/16/86
OPERATOR: JGZ

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

PK NO	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
4	1 65	139370	7.563	2	10853
5	2.90	1343400	72.896	3	81323
6	3.88	16833	.913	4	843
7	4.98	2075	.113	4	123
8	5.48	2769	.150	3	235
14	11.65	9910	.538	1	512
30	21 85	121440	6.590	2	10620
31	22.03	207110	11.238	2	10643

TOTAL AREA= 1842907
THRESHOLD= 1
MIN.PK.WIDTH= 15
AREA REJECT= 1000

VERTICAL SCALE FACTOR:1X



SAMPLE: USP39A 4-2
MISC.: C=0.10199 GMS/ML

TIME: 14:04
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.
4	1.65	139370	7.694	2	10853
5	2.90	1343400	74.167	3	81323
30	21.85	121440	6.705	2	10620
31	22.03	207110	11.434	2	10643

TOTAL AREA= 1811320
THRESHOLD= 1
MIN PK.WIDTH= 15
AREA REJECT= 17000

Sample: SUP39A71108 4-1
Size: 19.594 mg
Run No: MIR #13079 (I2)
Date: MAY/21/86 14:16

TGA

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #107
File No: D 37.DAT V2.1
Plotted: MAY/22/86 08:15

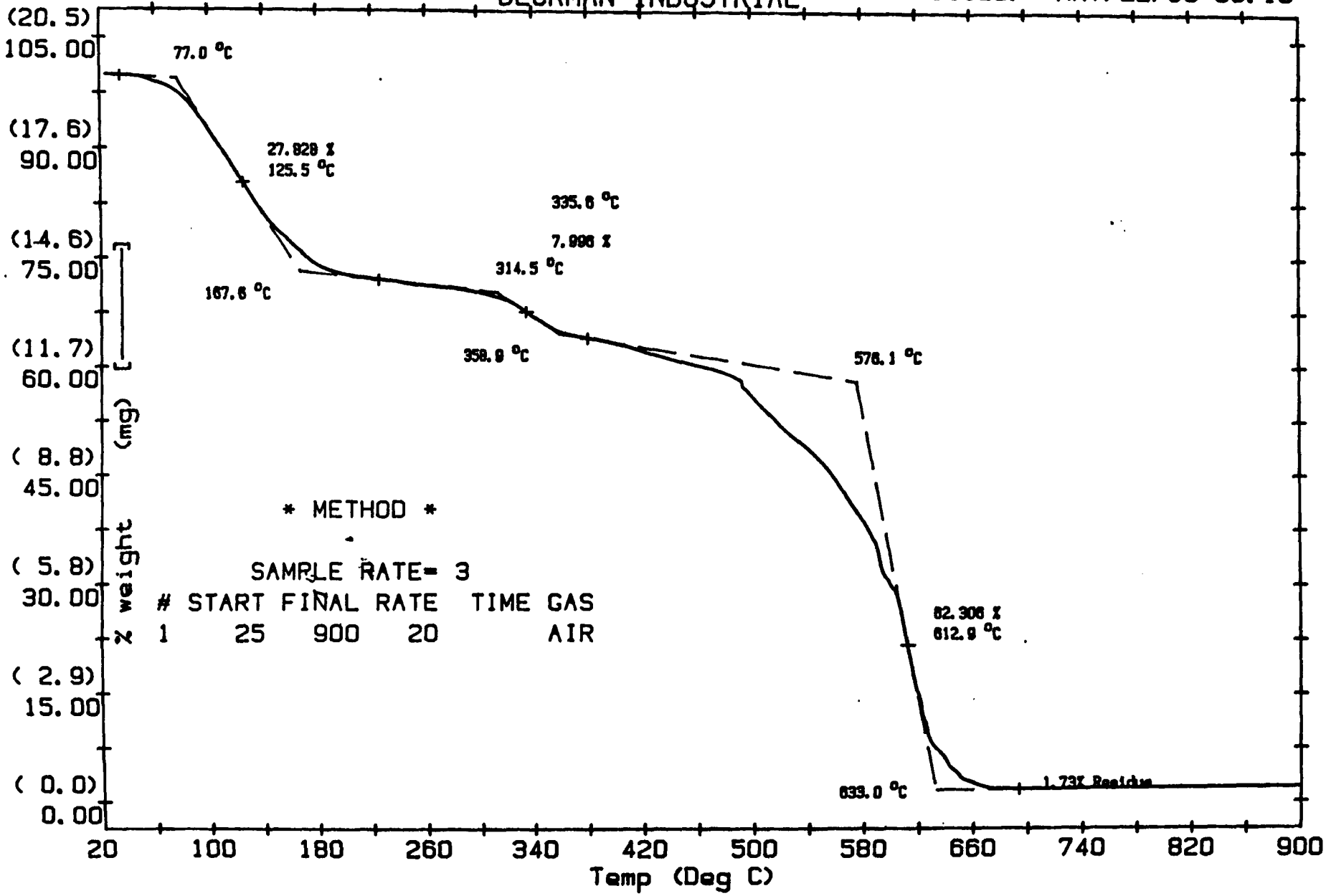


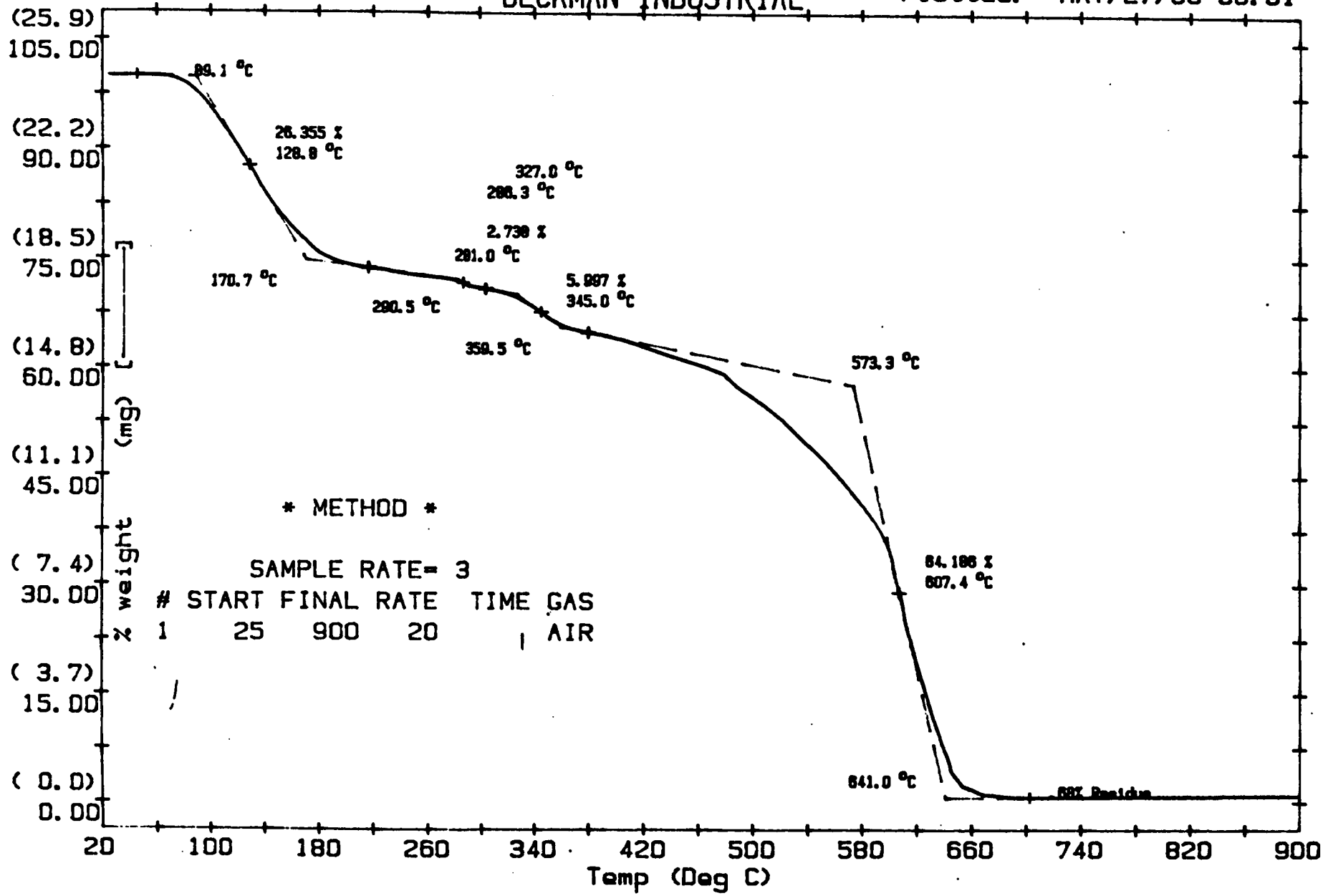
CHART 7A

Sample: USP39A71108 4-2
Size: 24.694 mg
Run No: MIR #13080 (I2)
Date: MAY/22/86 07:18

TGA

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #107
File No: D 46.DAT V2.1
Plotted: MAY/27/86 08:01



* METHOD *

SAMPLE RATE= 3

#	START	FINAL	RATE	TIME	GAS
1	25	900	20		AIR

CHART 7B

PART NO. 990088

CHART 8A

ORIGINAL PAGE IS OF POOR QUALITY

RUN NO.____ DATE 2-23-87

OPERATOR ak

SAMPLE: 4-1 USP 39A

ATM N_2 @ 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. ____

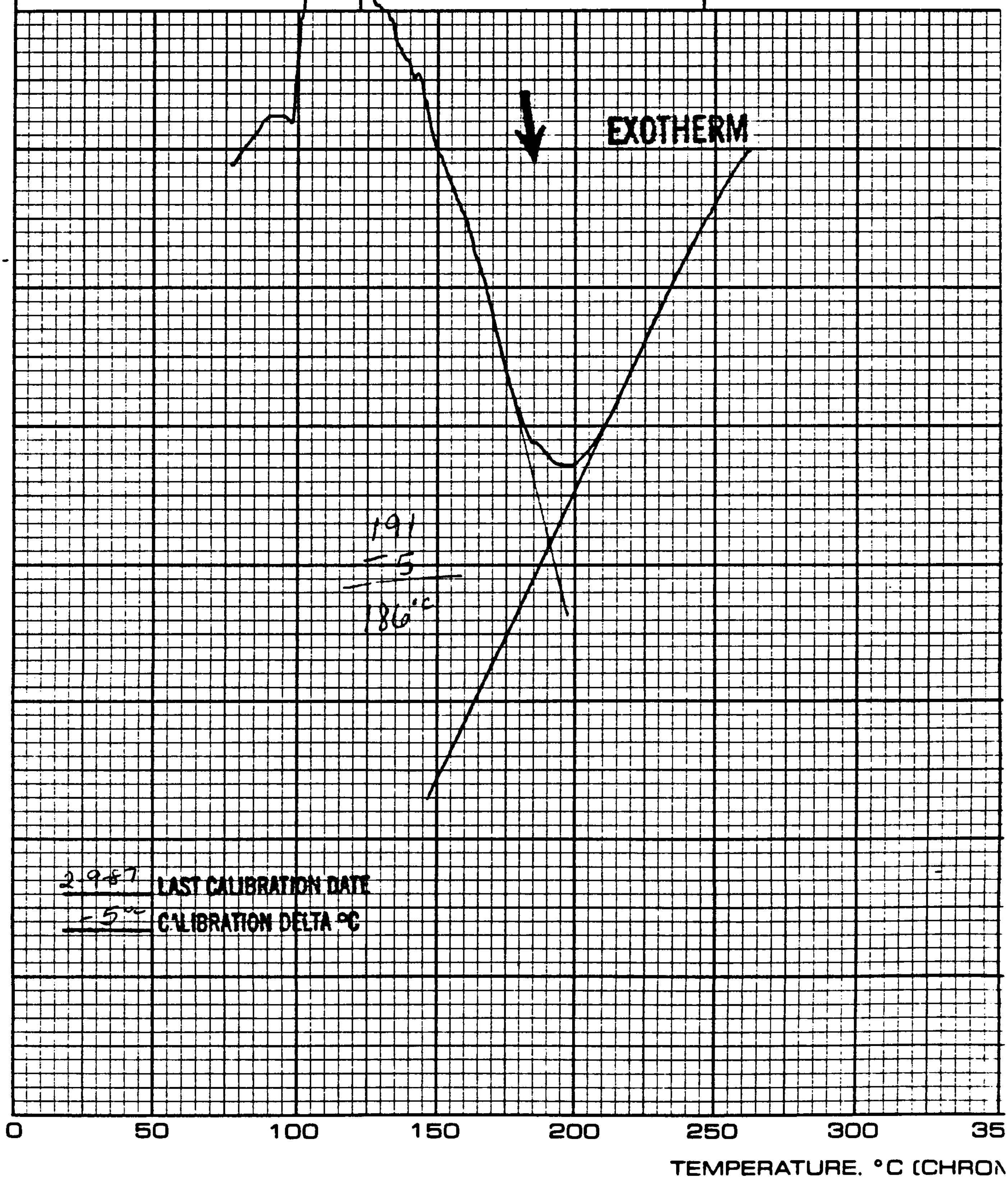
WEIGHT, mg 3.2

REFERENCE ____

1 alum seal

DUPONT Instruments

MEASURED VARIABLE ____



PART NO. 990088

CHART 8B

RUN NO ___ DATE 2-23-87

OPERATOR gek

SAMPLE: USP39A 4-2

ATM N2 @ 1atm

FLOW RATE 40ml/min

T-AXIS

SCALE, °C/in 50

PROG. RATE, °C/min 20°

HEAT ✓ COOL ___ ISO ___

SHIFT, in 0

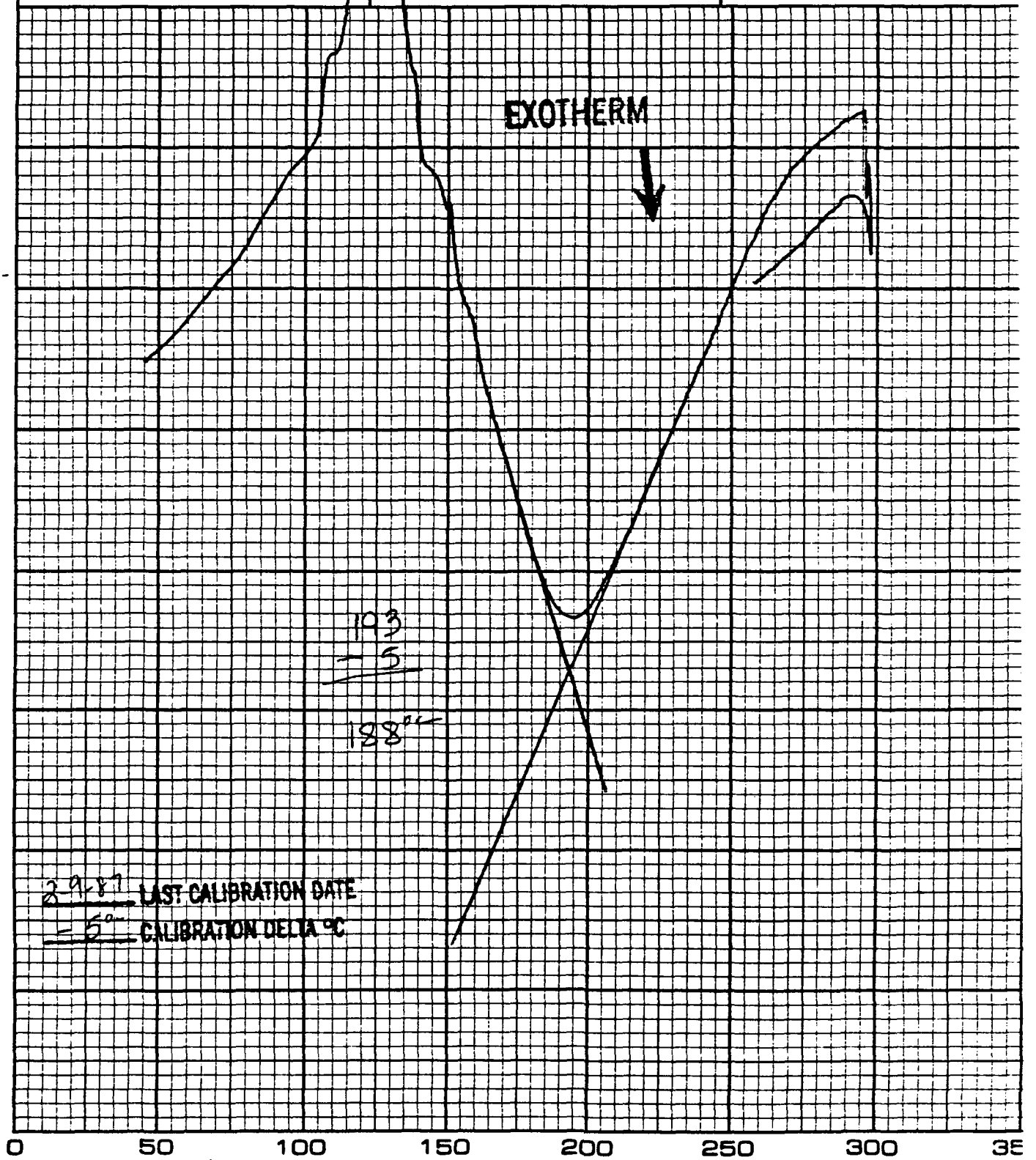
DTA-DSC

SCALE, °C/in 1.0 /5x

(mcal/sec)/in ___

WEIGHT, mg 3.9

REFERENCE Talum seal



MEASURED VARIABLE ___

DUPONT Instruments REG U.S. PAT. OFF.

CHART 9A

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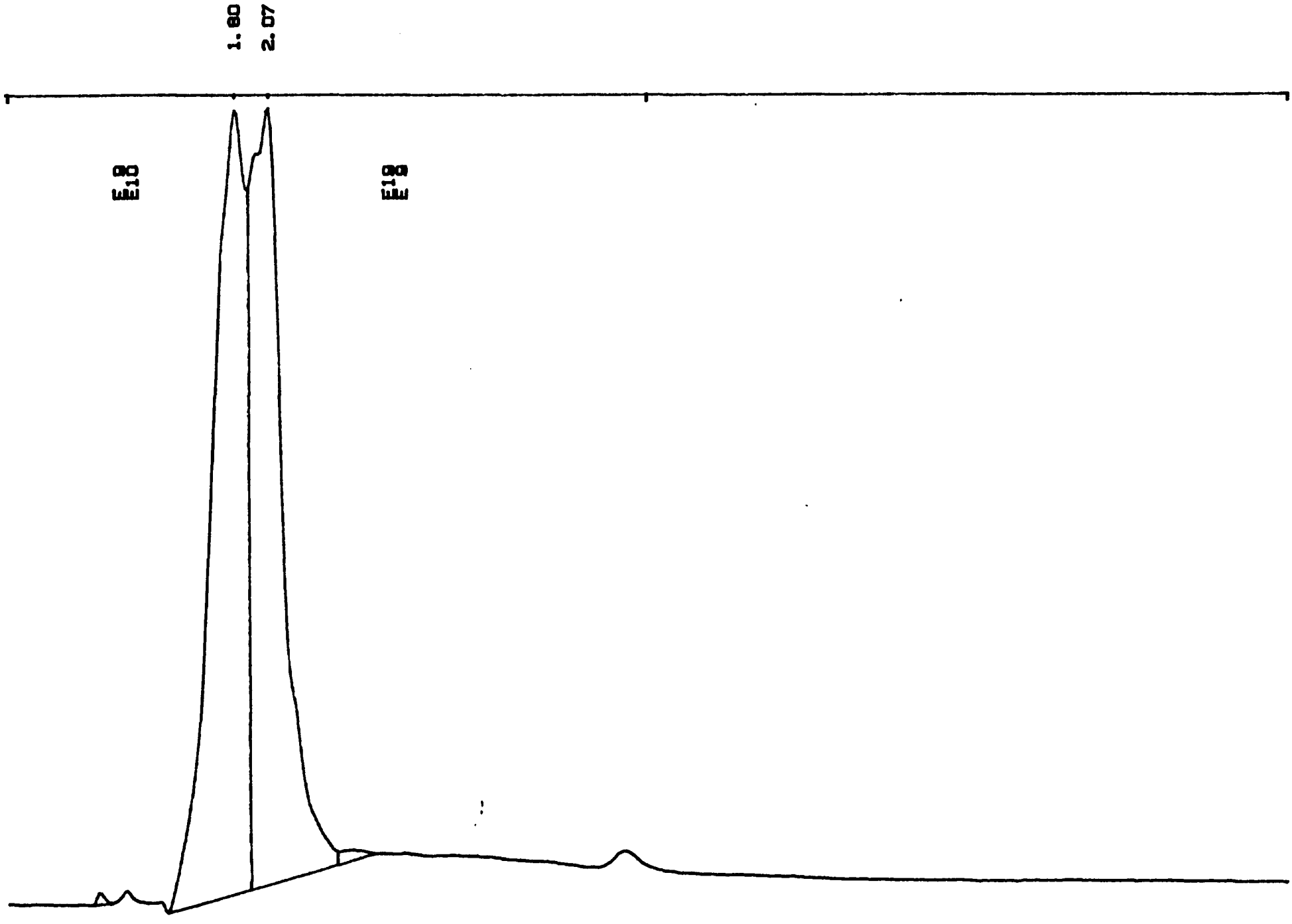
********* AREA PERCENT REPORT *********

```
*******************************************************************************
* Sample Name: USP39A,4-1,C=6.67                  Operator Initials: JGZ      *
* Date:  09-05-1986 12:02:14 Method:PHENOLIC    DATA FILE: A:PHEN029.PTS      *
* Interface: 4                Cycle#:  29        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	1.80	89195	51.2031	2	4841	100.000	18.4
3	2.07	85003	48.7969	2	4793	95.301	17.7

Total Area: 174198 Area Reject: 1000 One sample per 1.000 sec.

DATA FILE=PHEN028 FROM 0.00 MIN. TO 10.00 MIN. LOW SCALE= 5.416 Mv. HIGH SCALE= 10.398 Mv.
USP-38A, 4-1, C=6.67 MG/ML, 9/5/86, JGZ



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

Sample Name: USP39A,4-2,C=4.96 Operator Initials: JGZ
Date: 09-01-1986 15:58:03 Method:PHENOLIC DATA FILE: A:PHEN021.PTS
Interface: 4 Cycle#: 21 Channel#: 0 Vial#: N.A.
Starting Peak Width: 10 Threshold: .01

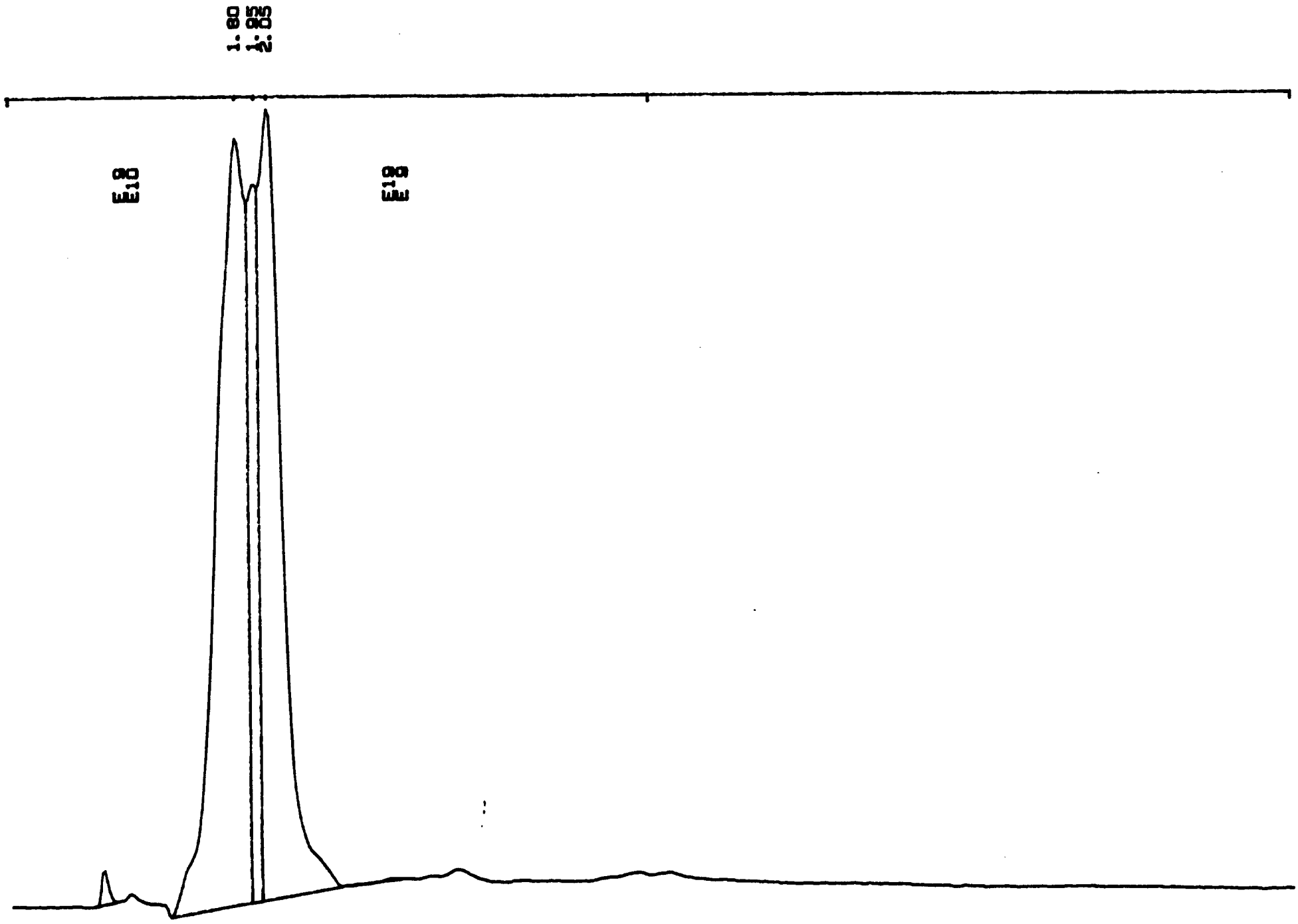
Instrument Type: BECKMAN HPLC Column Type: MICROBONDAPAK C-18
Solvent Description: THF/WATER, 2:1 BY WEIGHT
Operating Conditions: R.T., FLOWRATE=1.5 ML/MIN
Detector 0: 220NM/.5AU Detector 1:
Misc. Information: LENGTH=25

Starting Delay: 0.00 Ending Retention Time: 10.00

Pk No.	Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
2	1.80	81017	49.7413	2	4923	100.000	16.5
3	1.95	22173	13.6137	2	4605	27.369	4.8
4	2.05	59686	36.6450	2	5071	73.671	11.8

Total Area: 162876 Area Reject: 1000 One sample per 1.000 sec.

DATA FILE=PHEN021 FROM 0.00 MIN. TO 10.00 MIN. LOW SCALE= 5.445 Mv. HIGH SCALE= 10.636 Mv.
USP-39A, 4-2, C=4.96 MG/ML, 9/2/86, 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

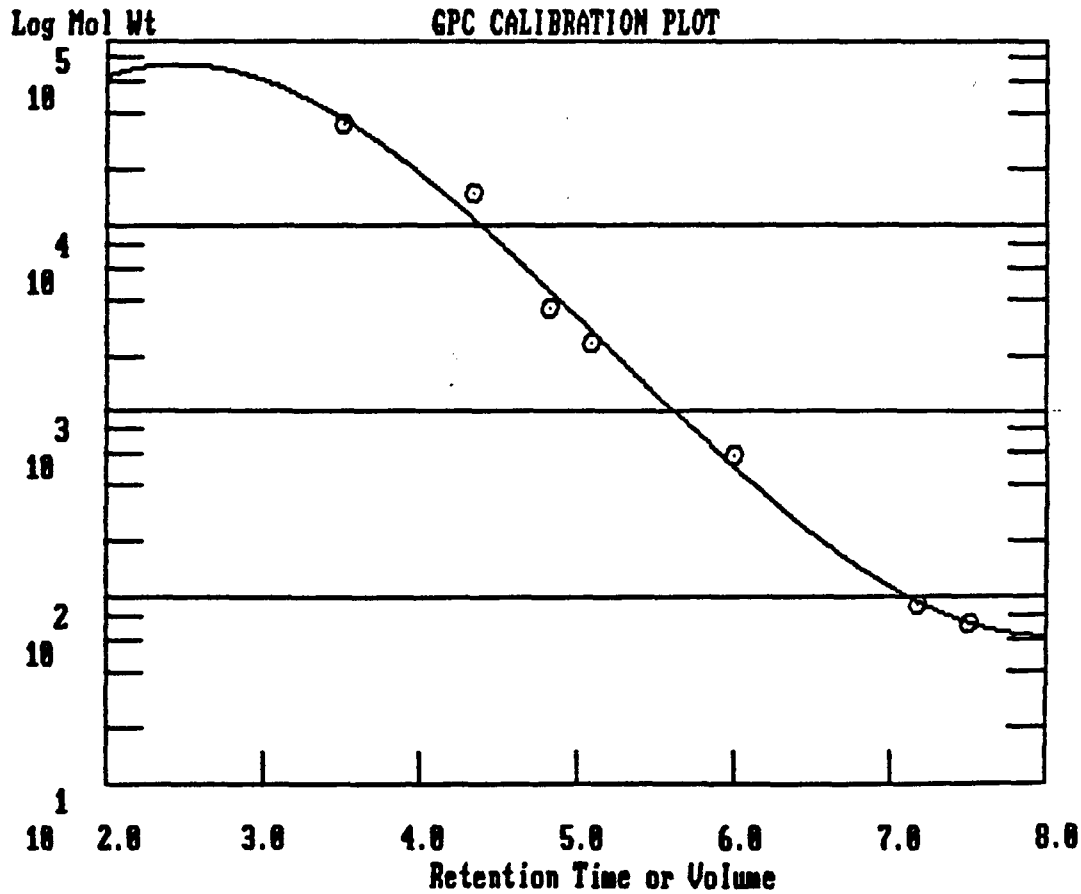


CHART 10A

A FILE A:GPC36.HDR TAKEN 08-05-1986 17:56:32

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

```
**********************************************************************************
ample Name: USP39A 4-1=2.68                    Operator Initials: GBF          *
ate:  08-05-1986 16:34:28 Method:              DATA FILE: A:GPC36.PTS          *
nterface: 5               Cycle#:  36          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                                           *
**********************************************************************************
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
l Area:        229203
                 1679
                  422
n=             3.9799
                 4462
                 1459
```

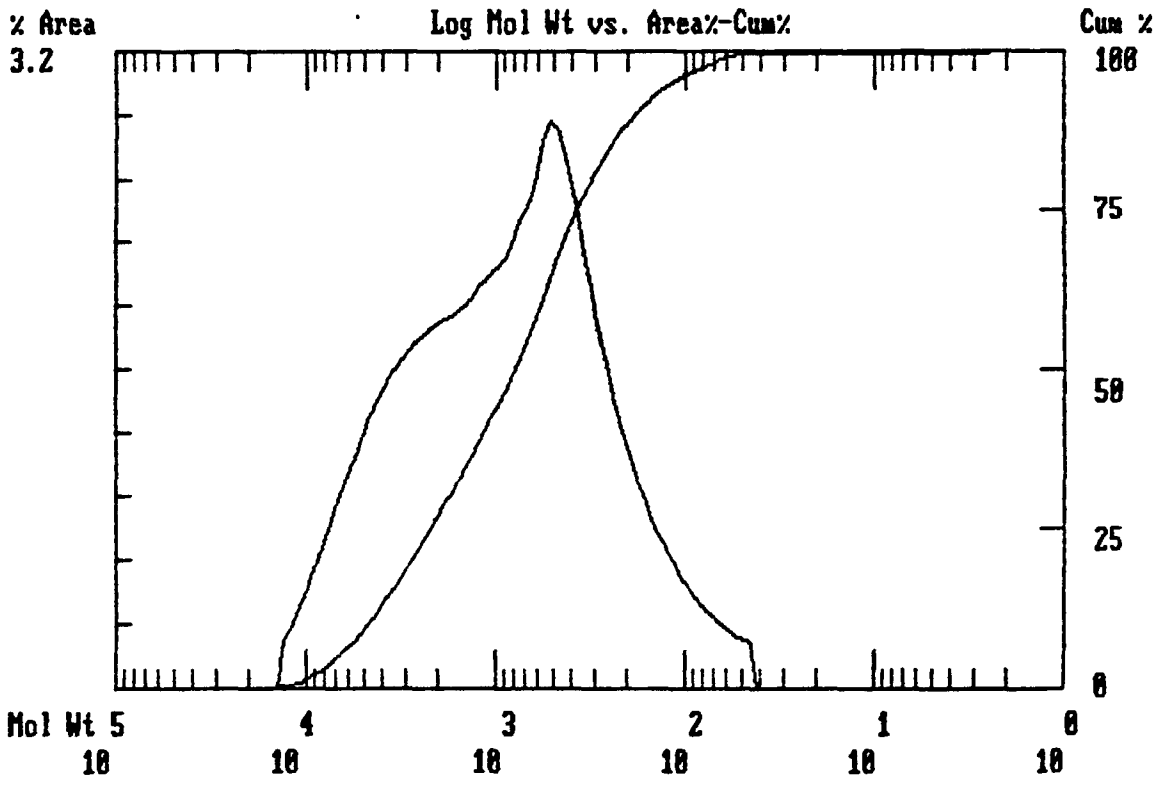


CHART 10B

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FILE A:GPC37.HDR TAKEN 08-05-1986 17:59:34

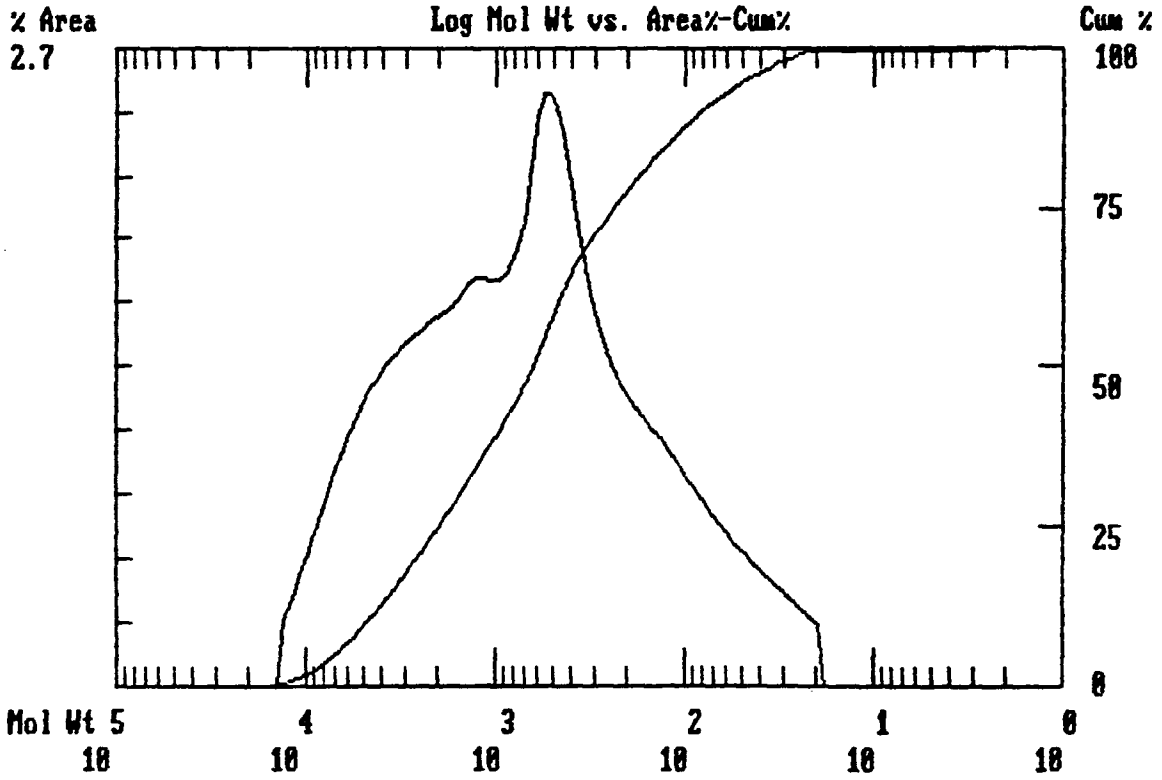
********* GPC REPORT *********

Sample Name: USP39A 4-2=2.68 Operator Initials: GBF
Date: 08-05-1986 16:46:38 Method: DATA FILE: A:GPC37.PTS
Interface: 5 Cycle#: 37 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:	192576				
Mw=	1577				
Mz=	217				
Mn=	7.2524				
Mv=	4789				
Mp=	1326				



NASA FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT4-1

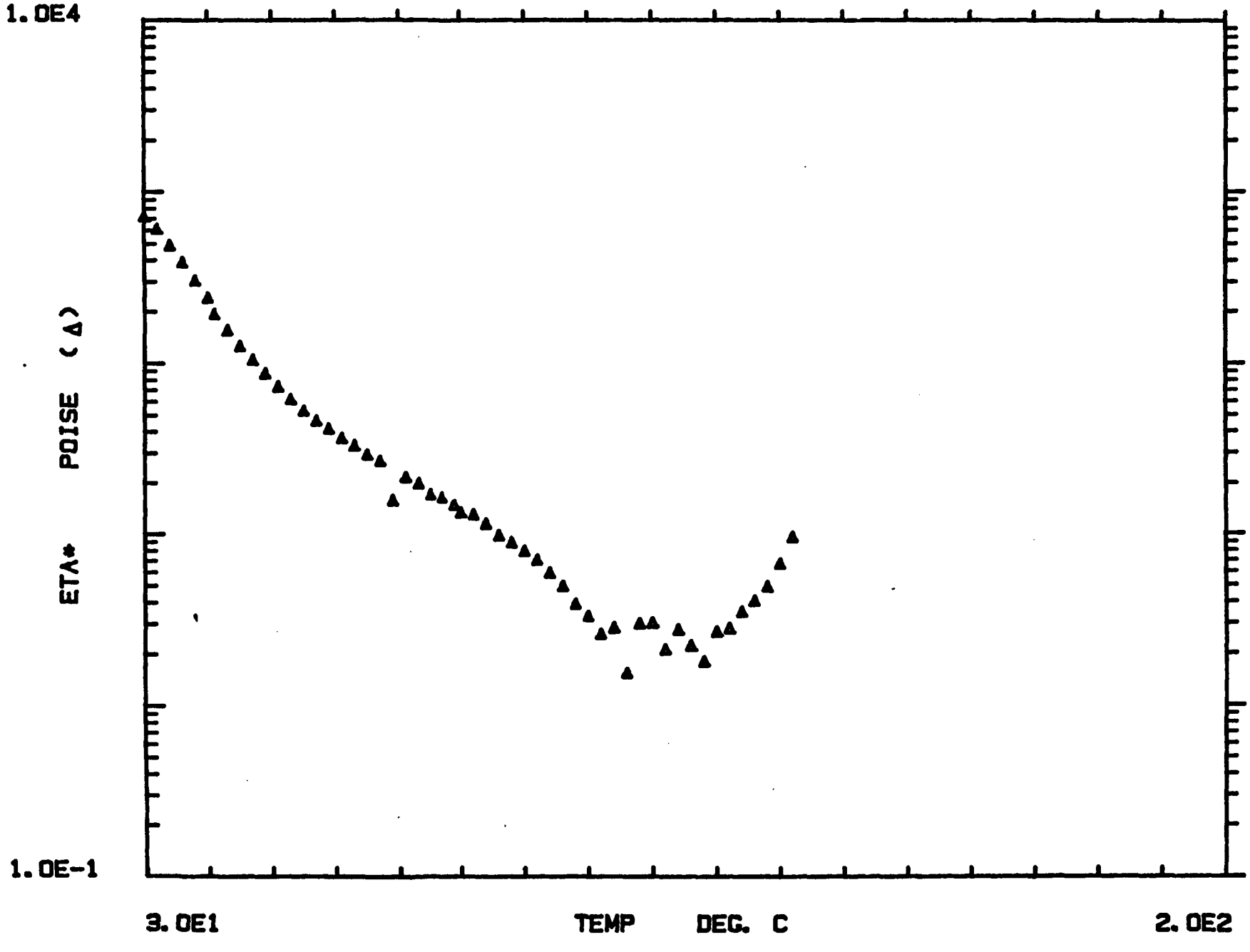


CHART 14A

Rheometrics RECAP II

---

eriment No. : 5 Sample No. : 1

le:
A FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT4-1

rator :cp

e and Time : Monday, August 18, 1986 - 10:37:58

rating Mode : DYNAMIC

ep Type : CURE

metry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

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

SA FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT4-1

O.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	7.356e+002	7.347e+002	3.604e+001	9.281e+001	2.000e-001	2.900e+001
2	6.972e+002	6.962e+002	3.653e+001	8.800e+001	1.000e+000	3.000e+001
3	5.909e+002	5.901e+002	3.035e+001	7.450e+001	2.000e+000	3.200e+001
4	4.739e+002	4.732e+002	2.555e+001	5.973e+001	3.000e+000	3.400e+001
5	3.764e+002	3.753e+002	2.849e+001	4.741e+001	4.000e+000	3.600e+001
6	2.946e+002	2.931e+002	2.905e+001	3.704e+001	5.000e+000	3.800e+001
7	2.327e+002	2.314e+002	2.503e+001	2.927e+001	6.000e+000	4.000e+001
8	1.876e+002	1.859e+002	2.533e+001	2.357e+001	7.000e+000	4.100e+001
9	1.507e+002	1.487e+002	2.445e+001	1.893e+001	8.000e+000	4.300e+001
10	1.215e+002	1.193e+002	2.343e+001	1.527e+001	9.000e+000	4.500e+001
11	1.010e+002	9.834e+001	2.309e+001	1.268e+001	1.000e+001	4.700e+001
12	8.408e+001	8.084e+001	2.311e+001	1.055e+001	1.100e+001	4.900e+001
13	7.028e+001	6.723e+001	2.049e+001	8.813e+000	1.200e+001	5.100e+001
14	5.958e+001	5.642e+001	1.915e+001	7.477e+000	1.300e+001	5.300e+001
15	5.106e+001	4.824e+001	1.673e+001	6.413e+000	1.400e+001	5.500e+001
16	4.459e+001	4.208e+001	1.475e+001	5.599e+000	1.500e+001	5.700e+001
17	4.010e+001	3.795e+001	1.295e+001	5.030e+000	1.600e+001	5.900e+001
18	3.536e+001	3.360e+001	1.100e+001	4.437e+000	1.700e+001	6.100e+001
19	3.190e+001	3.052e+001	9.294e+000	3.999e+000	1.800e+001	6.300e+001
20	2.823e+001	2.706e+001	8.066e+000	3.540e+000	1.900e+001	6.500e+001
21	2.593e+001	2.497e+001	6.980e+000	3.254e+000	2.000e+001	6.700e+001
22	1.516e+001	1.340e+001	7.078e+000	1.902e+000	2.100e+001	6.900e+001
23	2.092e+001	2.021e+001	5.397e+000	2.625e+000	2.200e+001	7.100e+001
24	1.918e+001	1.861e+001	4.625e+000	2.406e+000	2.300e+001	7.300e+001
25	1.646e+001	1.596e+001	4.031e+000	2.066e+000	2.400e+001	7.500e+001
26	1.582e+001	1.536e+001	3.810e+000	1.985e+000	2.500e+001	7.700e+001
27	1.428e+001	1.386e+001	3.450e+000	1.792e+000	2.600e+001	7.900e+001
28	1.286e+001	1.247e+001	3.145e+000	1.612e+000	2.700e+001	8.000e+001
29	1.250e+001	1.219e+001	2.770e+000	1.569e+000	2.800e+001	8.200e+001
30	1.103e+001	1.065e+001	2.864e+000	1.385e+000	2.900e+001	8.400e+001
31	9.406e+000	9.166e+000	2.113e+000	1.180e+000	3.000e+001	8.600e+001
32	8.563e+000	8.359e+000	1.860e+000	1.075e+000	3.100e+001	8.800e+001
33	7.639e+000	7.351e+000	2.078e+000	9.584e-001	3.200e+001	9.000e+001
34	6.766e+000	6.563e+000	1.644e+000	8.495e-001	3.300e+001	9.200e+001
35	5.684e+000	5.498e+000	1.444e+000	7.128e-001	3.400e+001	9.400e+001
36	4.764e+000	4.696e+000	8.022e-001	5.979e-001	3.500e+001	9.600e+001
37	3.731e+000	2.963e+000	2.268e+000	4.681e-001	3.600e+001	9.800e+001
38	3.183e+000	3.105e+000	6.963e-001	3.995e-001	3.700e+001	1.000e+002
39	2.505e+000	2.229e+000	1.143e+000	3.142e-001	3.800e+001	1.020e+002
40	2.716e+000	2.646e+000	6.147e-001	3.410e-001	3.900e+001	1.040e+002
41	1.481e+000	1.330e+000	6.518e-001	1.860e-001	4.000e+001	1.060e+002
42	2.881e+000	2.760e+000	8.249e-001	3.613e-001	4.100e+001	1.080e+002
43	2.905e+000	2.869e+000	4.572e-001	3.646e-001	4.200e+001	1.100e+002
44	2.030e+000	1.850e+000	8.377e-001	2.546e-001	4.300e+001	1.120e+002
45	2.647e+000	2.470e+000	9.504e-001	3.320e-001	4.400e+001	1.140e+002
46	2.124e+000	1.852e+000	1.040e+000	2.663e-001	4.500e+001	1.160e+002
47	1.724e+000	1.529e+000	7.970e-001	2.164e-001	4.600e+001	1.180e+002
48	2.573e+000	2.267e+000	1.219e+000	3.231e-001	4.700e+001	1.200e+002
49	2.691e+000	2.318e+000	1.368e+000	3.377e-001	4.800e+001	1.220e+002
50	3.367e+000	2.814e+000	1.849e+000	4.228e-001	4.900e+001	1.240e+002

FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT4-1

ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
3.894e+000	3.271e+000	2.112e+000	4.887e-001	5.000e+001	1.260e+002
4.707e+000	3.972e+000	2.525e+000	5.911e-001	5.100e+001	1.280e+002
6.426e+000	5.930e+000	2.477e+000	8.062e-001	5.200e+001	1.300e+002
9.204e+000	8.352e+000	3.868e+000	1.156e+000	5.300e+001	1.320e+002

NASA FINGERPRINT VISCOSITY PROFILE USP 39ARESIN NASA LOT4-2

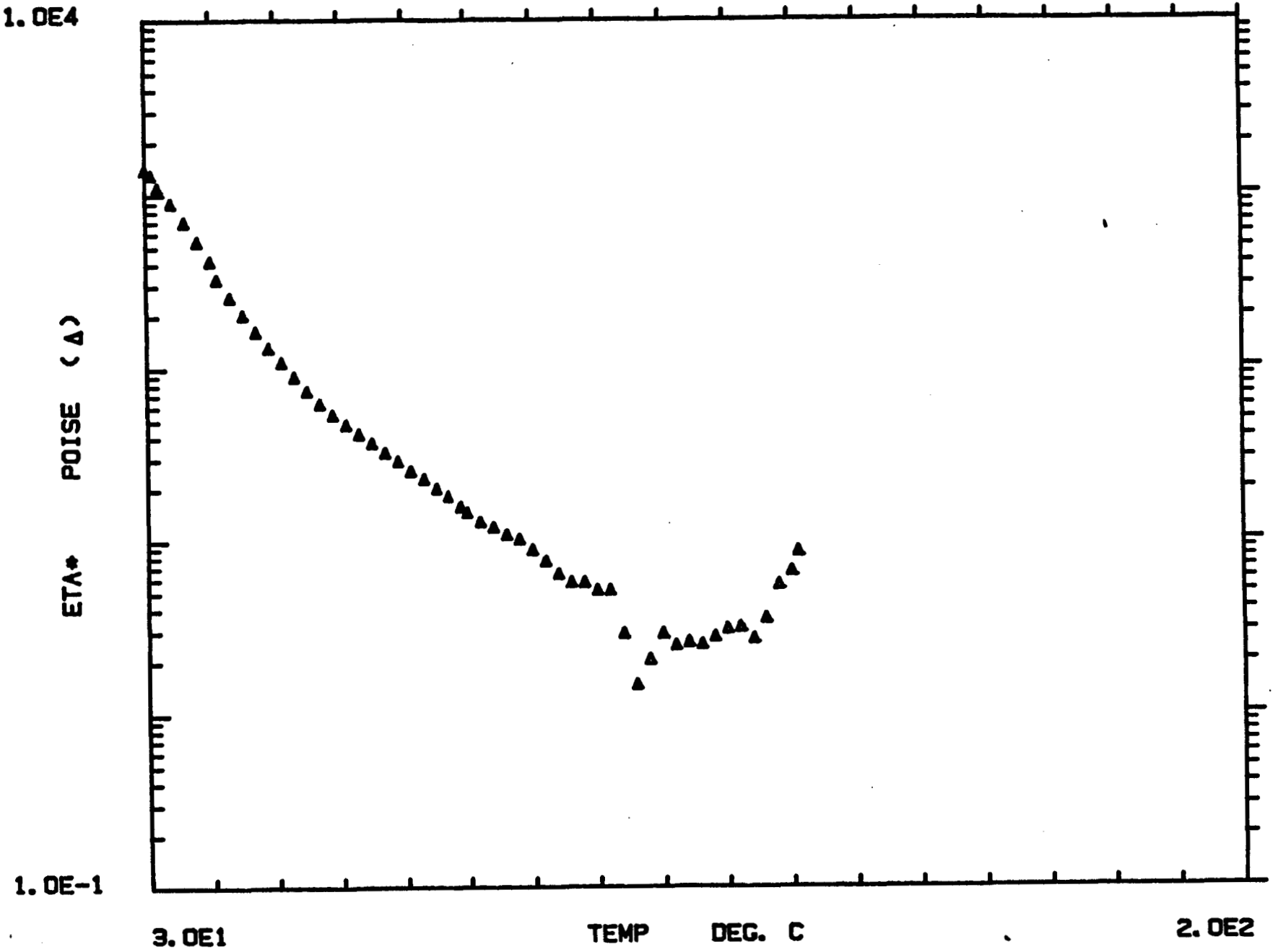


CHART 14B

Rheometrics RECAP II

Experiment No. : 6 Sample No. : 1

Title:
NASA FINGERPRINT VISCOSITY PROFILE USP 39ARESIN NASA LOT4-2

Operator :CP

Date and Time : Monday, August 18, 1986 - 12:16:20

Operating Mode : DYNAMIC

Sweep Type : CURE

Geometry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

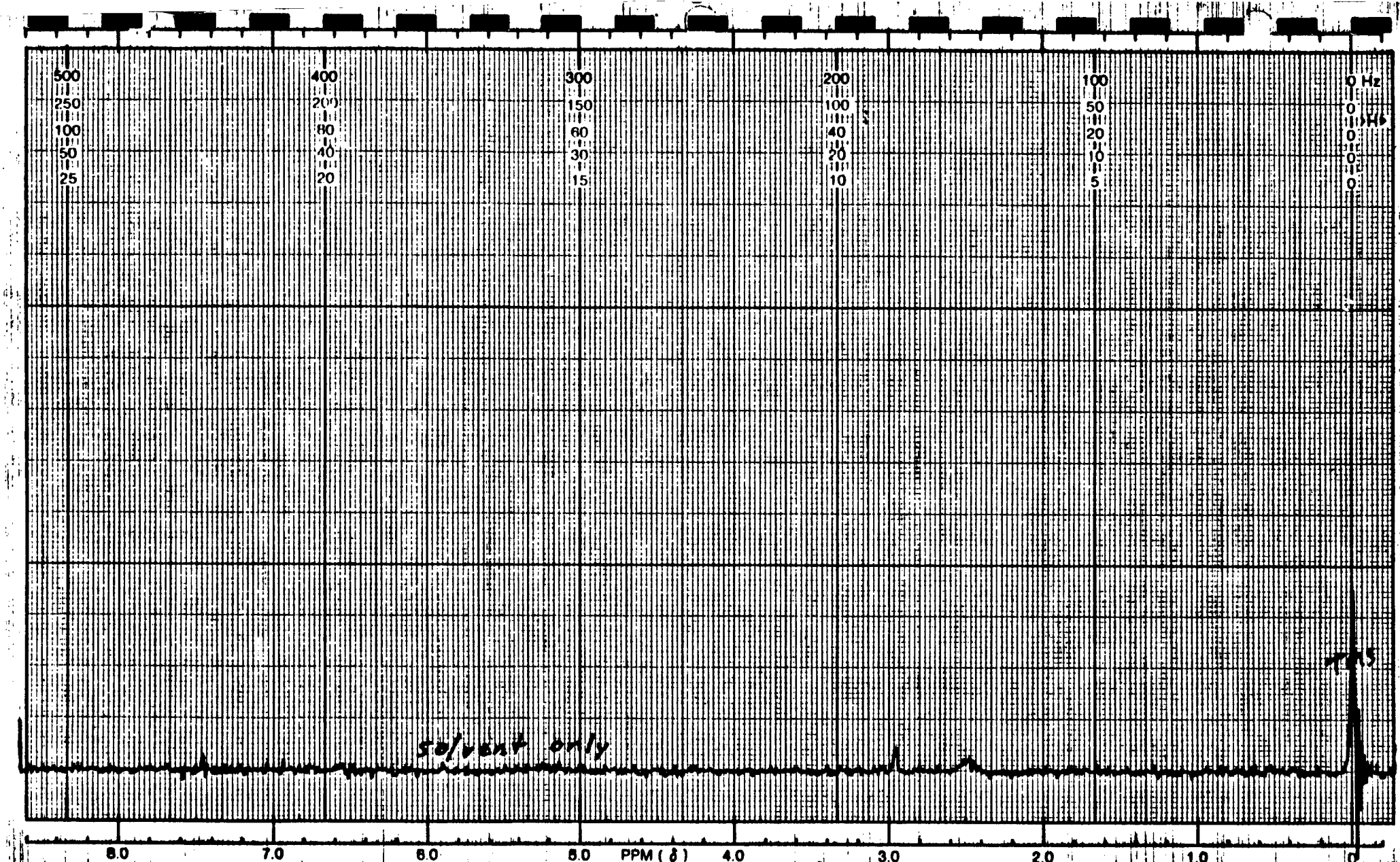
Notes :
STRAIN =50%
FREQUENCY =10 RAD/SEC

FINGERPRINT VISCOSITY PROFILE UBP 39ARESIN NASA LOT4-2

	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	1.376e+003	1.376e+003	4.762e+001	1.742e+002	2.000e-001	3.000e+001
2	1.278e+003	1.278e+003	4.150e+001	1.617e+002	1.000e+000	3.100e+001
3	1.080e+003	1.080e+003	3.796e+001	1.365e+002	2.000e+000	3.200e+001
4	8.738e+002	8.731e+002	3.545e+001	1.104e+002	3.000e+000	3.400e+001
5	6.808e+002	6.801e+002	3.189e+001	8.591e+001	4.000e+000	3.600e+001
6	5.270e+002	5.263e+002	2.742e+001	6.640e+001	5.000e+000	3.800e+001
7	4.063e+002	4.055e+002	2.577e+001	5.118e+001	6.000e+000	4.000e+001
8	3.184e+002	3.173e+002	2.581e+001	4.002e+001	7.000e+000	4.100e+001
9	2.503e+002	2.490e+002	2.551e+001	3.146e+001	8.000e+000	4.300e+001
0	1.979e+002	1.963e+002	2.496e+001	2.488e+001	9.000e+000	4.500e+001
1	1.583e+002	1.565e+002	2.356e+001	1.988e+001	1.000e+001	4.700e+001
2	1.275e+002	1.253e+002	2.335e+001	1.602e+001	1.100e+001	4.900e+001
3	1.055e+002	1.030e+002	2.283e+001	1.325e+001	1.200e+001	5.100e+001
4	8.678e+001	8.404e+001	2.163e+001	1.089e+001	1.300e+001	5.300e+001
5	7.219e+001	6.930e+001	2.022e+001	9.058e+000	1.400e+001	5.500e+001
6	6.079e+001	5.825e+001	1.737e+001	7.630e+000	1.500e+001	5.700e+001
7	5.253e+001	5.019e+001	1.553e+001	6.596e+000	1.600e+001	5.900e+001
8	4.614e+001	4.405e+001	1.374e+001	5.792e+000	1.700e+001	6.100e+001
9	4.050e+001	3.972e+001	1.186e+001	5.084e+000	1.800e+001	6.300e+001
0	3.587e+001	3.452e+001	9.737e+000	4.501e+000	1.900e+001	6.500e+001
1	3.161e+001	3.043e+001	8.555e+000	3.968e+000	2.000e+001	6.700e+001
2	2.825e+001	2.730e+001	7.263e+000	3.544e+000	2.100e+001	6.900e+001
3	2.474e+001	2.393e+001	6.270e+000	3.106e+000	2.200e+001	7.100e+001
4	2.225e+001	2.159e+001	5.389e+000	2.791e+000	2.300e+001	7.300e+001
5	1.955e+001	1.898e+001	4.673e+000	2.455e+000	2.400e+001	7.500e+001
6	1.766e+001	1.711e+001	4.373e+000	2.216e+000	2.500e+001	7.700e+001
7	1.533e+001	1.497e+001	3.306e+000	1.924e+000	2.600e+001	7.900e+001
8	1.419e+001	1.375e+001	3.507e+000	1.781e+000	2.700e+001	8.000e+001
9	1.251e+001	1.205e+001	3.343e+000	1.570e+000	2.800e+001	8.200e+001
0	1.159e+001	1.127e+001	2.722e+000	1.456e+000	2.900e+001	8.400e+001
	1.051e+001	1.023e+001	2.409e+000	1.318e+000	3.000e+001	8.600e+001
2	9.883e+000	9.514e+000	2.674e+000	1.240e+000	3.100e+001	8.800e+001
3	8.555e+000	8.397e+000	1.638e+000	1.073e+000	3.200e+001	9.000e+001
4	7.367e+000	7.234e+000	1.393e+000	9.245e-001	3.300e+001	9.200e+001
5	6.196e+000	6.091e+000	1.133e+000	7.771e-001	3.400e+001	9.400e+001
	5.547e+000	5.406e+000	1.240e+000	6.961e-001	3.500e+001	9.600e+001
	5.524e+000	5.374e+000	1.278e+000	6.927e-001	3.600e+001	9.800e+001
	5.003e+000	4.947e+000	7.478e-001	6.278e-001	3.700e+001	1.000e+002
	4.991e+000	4.896e+000	9.667e-001	6.258e-001	3.800e+001	1.020e+002
	2.805e+000	2.645e+000	9.323e-001	3.519e-001	3.900e+001	1.040e+002
	1.425e+000	1.229e+000	7.202e-001	1.788e-001	4.000e+001	1.060e+002
	1.995e+000	1.774e+000	9.136e-001	2.504e-001	4.100e+001	1.080e+002
	2.815e+000	2.740e+000	6.471e-001	3.534e-001	4.200e+001	1.100e+002
	2.394e+000	2.342e+000	4.931e-001	3.003e-001	4.300e+001	1.120e+002
	2.505e+000	2.484e+000	3.215e-001	3.146e-001	4.400e+001	1.140e+002
	2.430e+000	2.340e+000	6.570e-001	3.049e-001	4.500e+001	1.160e+002
	2.698e+000	2.495e+000	1.000e+000	3.374e-001	4.600e+001	1.180e+002
	2.979e+000	2.814e+000	9.793e-001	3.741e-001	4.700e+001	1.200e+002
	3.045e+000	2.971e+000	6.678e-001	3.820e-001	4.800e+001	1.220e+002
	2.614e+000	2.449e+000	9.131e-001	3.281e-001	4.900e+001	1.240e+002

A FINGERPRINT VISCOSITY PROFILE USP 39ARESIN NASA LOT4-2

	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
51	3.427e+000	3.307e+000	8.978e-001	4.300e-001	5.000e+001	1.260e+002
52	5.347e+000	5.018e+000	1.845e+000	6.710e-001	5.100e+001	1.280e+002
53	6.402e+000	6.055e+000	2.079e+000	8.032e-001	5.200e+001	1.300e+002
54	8.322e+000	7.985e+000	2.347e+000	1.045e+000	5.300e+001	1.310e+002



SWEEP OFFSET (Hz): 0
SPECTRUM AMPLITUDE: 8.2
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: Uniol-d4 0.527ml
DEC. LEVEL

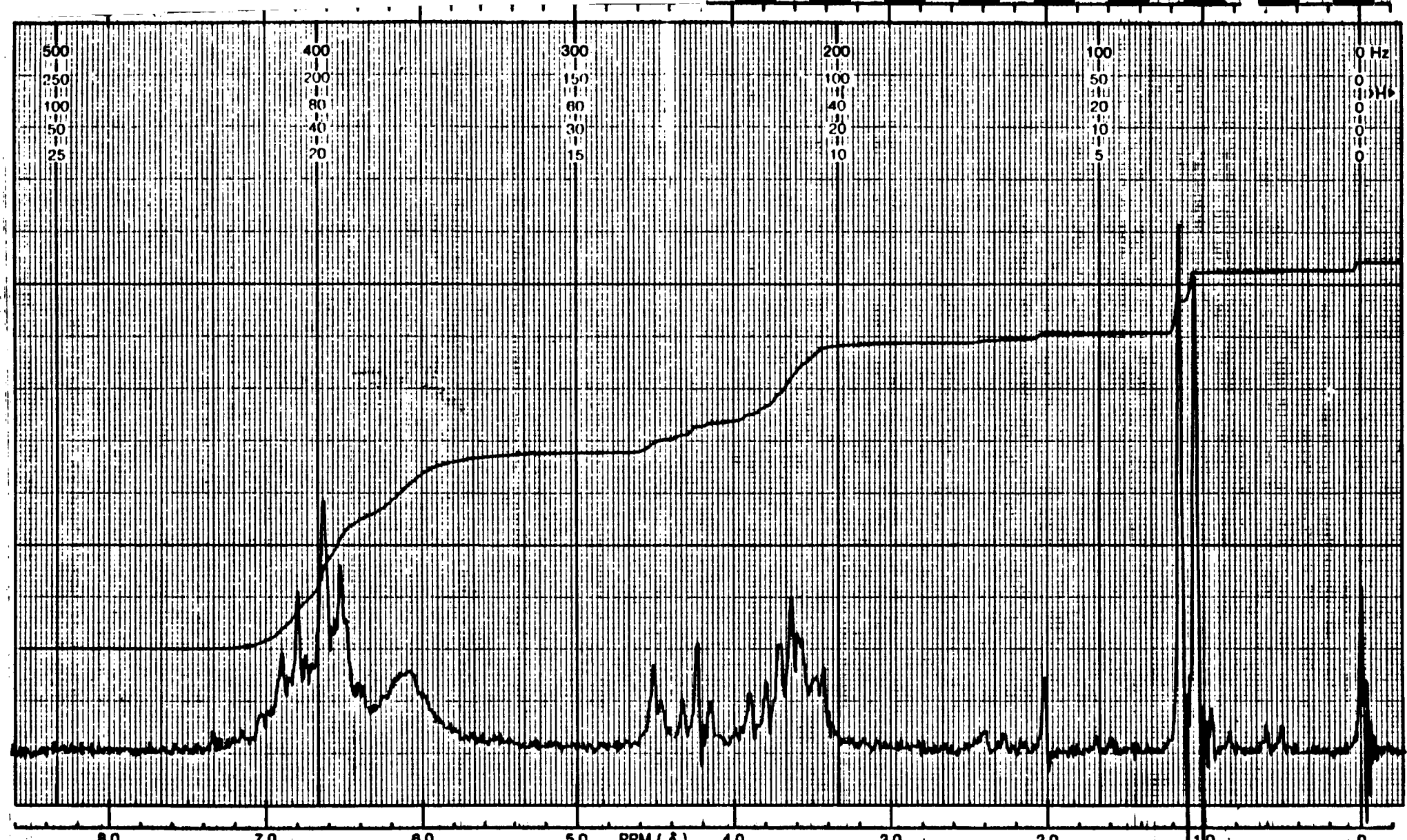
REMARKS:

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 DEW 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#4-1 REMARKS: 0.106 gm sample
SOLVENT: Unisol-d + 0.52 TMS 0.906 gm solvent
DEC. LEVEL

CHART 15A

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

DATE: 3-21-86

OPERATOR DFW

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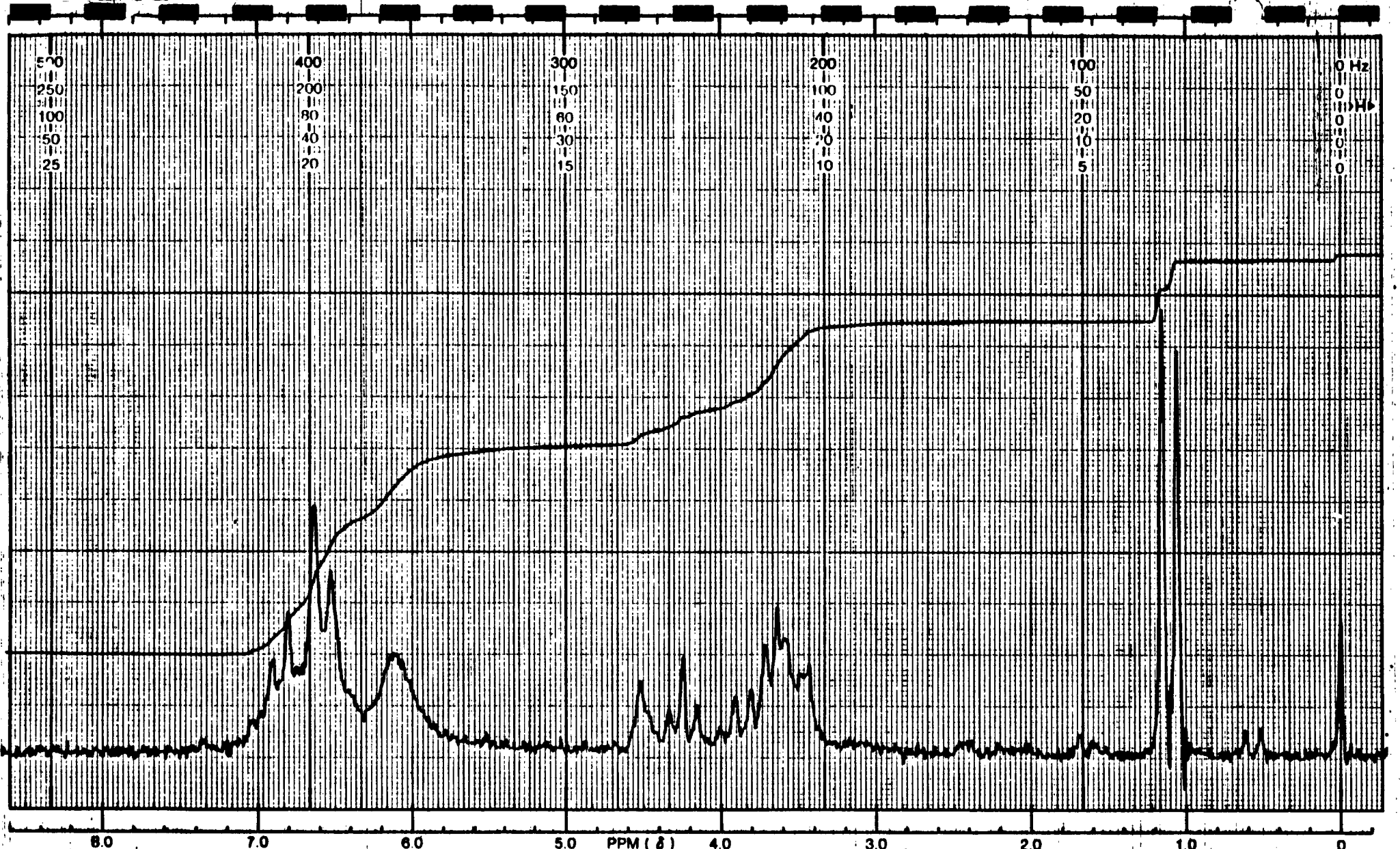
OF POOR QUALITY

SPECTRUM NO. 6 of 7 USP-39A Lot#4-1



SWEEP OFFSET (Hz): 0
SPECTRUM AMPLITUDE: 8.0
INTEGRAL AMPLITUDE: 6.0
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-394 Lot#4-2
SOLVENT: Uniso-d + 0.5% TMS
DEC. LEVEL

REMARKS: 0.108gm sample
0.936 gm solvent

ORIGINAL PAGE IS
OF POOR QUALITY

CHART 15B

NORELL, INC.
LANDISVILLE, N.J. 08328
T60 Phone: (609) 697-0020

DATE: 3-21-86 OPERATOR DGW SPECTRUM NO. 7 of 7 USP-394 Lot # 4-2

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FABRIC TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

WCA Fabric for NASA Lot# 4 (HITCO)

TEST		PAGE
1a.	Breaking Strength, WARP	1
1b.	Breaking Strength, FILL	1
2a.	Carbon Assay	1
2b.	Hydrogen Assay	1
2c.	Nitrogen Assay	1
3.	Visual Inspection	1
4.	Specific Gravity	1
5.	pH	2
6.	TGA	2
7a.	Atomic Absorption	2
7b.	Moisture Content	2
7c.	Ash Content	2
8a.	Filament diameter, WARP	2
8b.	Filament diameter, FILL	2
9a.	Thread Count, WARP	2
9b.	Thread Count, FILL	3
10a.	Areal weight	3
10b.	Volatiles	3
10c.	Weight Change on Acetone Wash	3

CHARTS

Visual Inspection 3A

TGA ..... 6A - 6B

U.S. Polymeric

FABRIC TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

WCA Fabric for NASA Lot# 4 (HITCO)

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

	#4-1S	#4-1E	LOT4 AVG
PICK	52	28	40.0
CENTER	66	28	47.0
PLAIN	49	39	44.0
AVG.	55.7	31.7	43.7

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

PICK	33	11	22.0
CENTER	25	11	18.0
PLAIN	29	8	18.5
AVG.	29.0	10.0	19.5

2a. Carbon Assay, %
MDQAI 5560

PICK	99.9	99.6	99.75
CENTER	98.8	99.7	99.25
PLAIN	99.5	99.7	99.60
AVG.	99.4	99.67	99.53

2b. Hydrogen Assay, %
MDQAI 5560

PICK	.01	<.01	EST .006
CENTER	<.01	.02	EST .010
PLAIN	<.01	<.01	EST .001
AVG.	EST .004	EST .007	EST .006

2c. Nitrogen Assay, %
MDQAI 5560

PICK	.1	.2	.15
CENTER	.4	.1	.25
PLAIN	.5	.2	.35
AVG.	.33	.17	.25

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

4. Specific Gravity, Units
PTM-84

PICK	1.6075	1.6389	1.6232
CENTER	1.6065	1.6451	1.6258
PLAIN	1.6183	1.6441	1.6312
AVG.	1.611	1.643	1.627

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

WCA Fabric for NASA Lot# 4 (HITCO)

5. pH, Units
CTM-24B

	#4-1S	#4-1E	LOT4 AVG
	6.3	6.4	6.35
	6.3	6.4	6.35
AVG.	6.3	6.4	6.35

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

SET UP# 1	SET UP# 2
#4-1E 954	#4-1S 868

See Chart 6A-6B

7a. Atomic Absorption, ppm
CTM-53B

	#4-1S	#4-1E	LOT4 AVG
Na	10	9	9.5
K	0	0	0.0
Ca	6	5	5.5
Mg	3	2	2.5
Li	0	0	0.0
AVG.	19	16	17.5

7b. Moisture Content, %
CTM-53B

#4-1S	#4-1E	LOT4 AVG
.000	.015	.007

7c. Ash Content, %
CTM-53B

#4-1S	#4-1E	LOT4 AVG
.010	.010	.010

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

	#4-1S	#4-1E	LOT4 AVG
AVERAGE	10.46	10.12	10.29
Minimum	9.50	9.10	9.10
Maximum	12.00	11.00	12.00
Std. Dev	0.90	0.54	0.75

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

AVERAGE	9.21
Minimum	8.50
Maximum	10.35
Std. Dev	0.64

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

	#4-1S	#4-1E	LOT4 AVG
	29	29	29
	29	29	29
	29	29	29
	29	29	29
	29	29	29
AVG.	29.0	29.0	29.0

WCA Fabric for NASA Lot# 4 (HITCO)

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

	#4-1S	#4-1E	LOT4 AVG
	22	22	22
	22	22	22
	22	22	22
	22	22	22
	22	22	22
AVG.	22.0	22.0	22.0

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

LEFT	2.453	2.614	2.534
CENTER	2.408	2.585	2.497
RIGHT	2.463	2.608	2.536
AVG.	2.441	2.602	2.522

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

LEFT	.49	.50	.49
CENTER	.42	.46	.44
RIGHT	.45	.54	.49
AVG.	.45	.50	.47

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

LEFT	.00	-.08	-.04
CENTER	-.08	-.16	-.12
RIGHT	.08	.04	.06
AVG.	.00	-.06	-.03

U.S. Polymeric

Hamid M. Quraishi, Manager
Quality Assurance Department

CHART 3A

USP NO.___

DATE 28 APR.86

FABRIC WCA GRAPHITE CLOTH

MFG. UNION CARBIDE

ROLL NO. 18J 3C6WCA-4

YARDS 143

POUNDS 83

ORDER NO. OE 71108

SPECIFICATION VARIOUS

Q.C. FILE # NASA 4-1

FOOTAGE — LEFT

FT	START		SAMPLE	
10				
20				
30		BREAK		
40				
50				
60		BREAK		
70	F			
80				
86		BREAK		
90				
100				
110				
120				
123		BREAK		
130				
140				
150				
160		BREAK		
170				
180				
190				
200				
210				
220				
230		BREAK		
240				
250				
260				

292 PULL THREAD

306 BREAK

344 BREAK

430 ~~END~~ END OF ROLL sample

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 B

[signature]

CHART 6A

ORIGINAL PAGE IS
OF POOR QUALITY

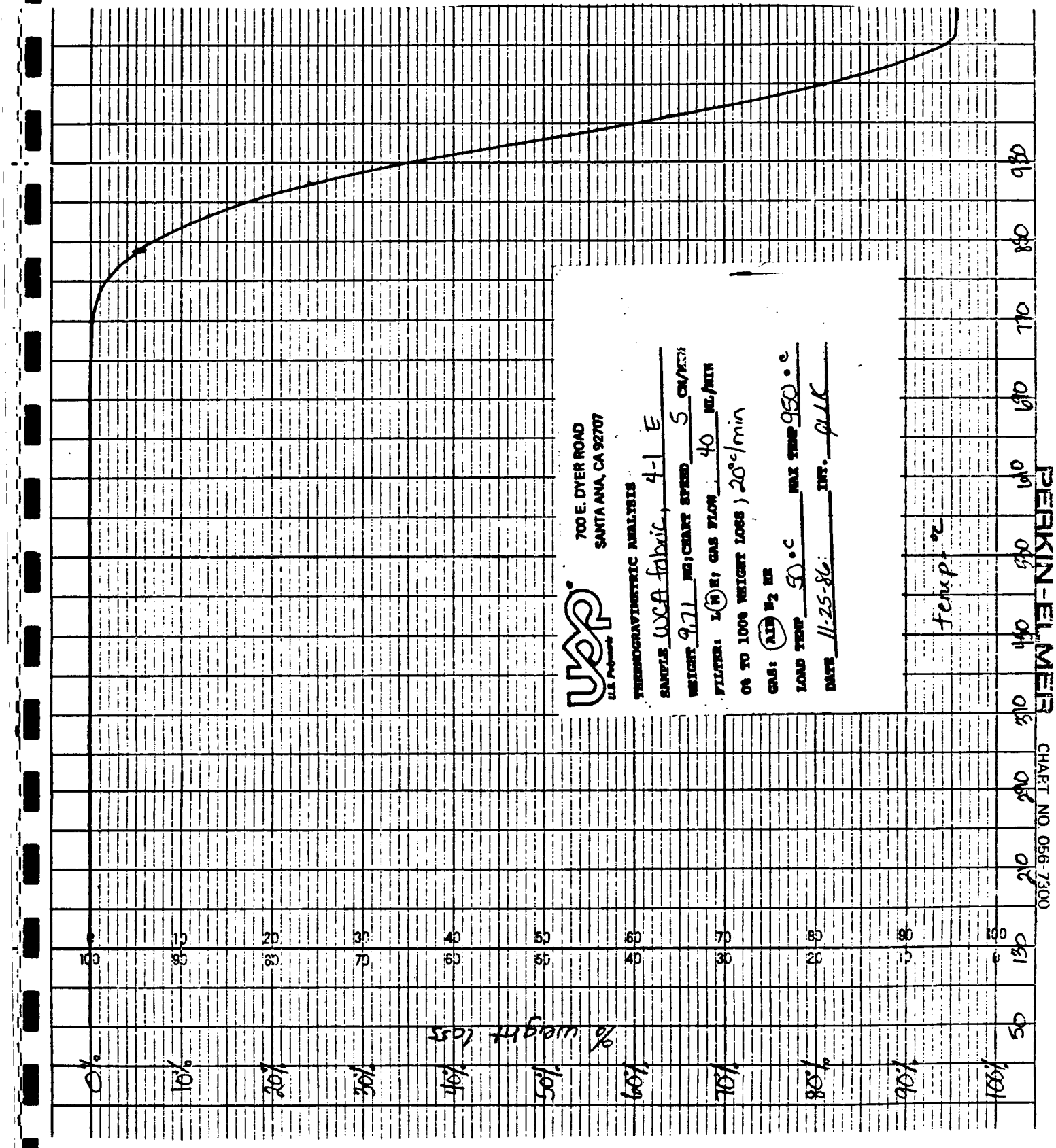

TABLE OF CONTENTS

PREPREG TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

FM 5064J NASA LOT# 4 U.S.P. LOT# D09315 (HITCO)

TEST		PAGE
1a.	Resin Content, Soxhlet	1
1b.	Filler Content, Soxhlet	1
1c.	Cloth Content, Soxhlet	1
2.	Volatile Content	1
3.	Flow	1
4.	Resin Content, Dry Basis	1
5.	Tack	1
6.	Gel Time	1
7a.	Atomic Absorption	2
7b.	Moisture Content	2
7c.	Ash Content	2
8.	TGA	2
9.	DSC	2
10.	Infrared (IRZB) Baseline	2
11.	Environmental History	2
12.	Specific Gravity	2
13a.	Tensile Strength	2
13b.	Tensile Modulus	3
13c.	Tensile Elongation	3
14a.	Flexural Strength	3
14b.	Flexural Modulus	3
15a.	Compressive Strength	3
15b.	Compressive Modulus	3
16.	Double Shear Strength	4
17.	Barcol Hardness	4
18.	Residual Volatiles	4
19.	Resin Content, Pyrolysis	4
20.	Acetone Extraction	4
21a.	CTE, with ply	4
21b.	CTE, crossply	4

CHARTS

TGA	8A - 8B
DSC	9A - 9B
Infrared (IRZB) Baseline	10A - 10B
CTE	21A - 21B

U.S. Polymeric

PREPREG TESTING

NAS8-36298

U.S. POLYMERIC O.E.71108

FM 5064J NASA LOT# 4 U.S.P. LOT# D09315 (HITCO)

		ROLL#1-S	ROLL#1-E
1a. Resin Content, Soxhlet, % CTM-6D		33.5	33.2
		33.1	32.9
		33.9	33.7
	AVG.	33.5	33.3
	NASA LOT# 4 AVERAGE		33.4
1b. Filler Content, Soxhlet, % CTM-6D		14.2	14.1
		14.1	14.0
		14.4	14.3
	AVG.	14.2	14.1
	NASA LOT# 4 AVERAGE		14.2
1c. Cloth Content, Soxhlet, % CTM-6D		52.3	52.7
		52.8	53.1
		51.7	52.0
	AVG.	52.3	52.6
	NASA LOT# 4 AVERAGE		52.4
2. Volatile Content, % PTM-17B		3.1	3.0
		3.1	3.1
		3.1	3.4
	AVG.	3.1	3.2
	NASA LOT# 4 AVERAGE		3.1
3. Flow, % PTM-19G		8.0	12.5
		9.5	10.5
		9.8	13.5
	AVG.	9.1	12.2
	NASA LOT# 4 AVERAGE		10.6
4. Resin Content, Dry basis, % PTM-16F, Type II		33.7	35.1
		32.8	35.4
		33.5	34.5
	AVG.	33.3	35.0
	NASA LOT# 4 AVERAGE		34.2
5. Tack, lbs PTM-80		30	30
	NASA LOT# 4 AVERAGE		30
6. Gel Time, seconds PTM-20E		69	75
	NASA LOT# 4 AVERAGE		72

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

FM 5064J NASA LOT# 4 U.S.P. LOT# D09315 (HITCO)

7a. Atomic Absorption, ppm
CTM-53B

	ROLL#1-S	ROLL#1-E	LOT#4 AVG.
Na	24	26	25
K	1	2	2
Ca	10	10	10
Mg	2	2	2
Li	0	0	0
TOTAL	37	40	39

7b. Moisture Content, %
CTM-53B

	ROLL#1-S	ROLL#1-E
	2.25	2.31
NASA LOT# 4 AVERAGE		2.28

7c. Ash Content, %
CTM-53B

	.03	.09
NASA LOT# 4 AVERAGE		.06

8. TGA, % Weight Loss at 500°C
CTM-51 (Nitrogen)

	10.5	10.9
NASA LOT# 4 AVERAGE		10.7

See Chart 8A-8B

9. DSC, °C
CTM-50A

	ROLL#1-S	ROLL#1-E	LOT#4 AVG.
First Temp	184	185	185

See Chart 9A-9B

10. Infrared (IRZB) Baseline .82 .77 .80
CTM-21C

See Chart 10A-10B

11. Environmental History

Date manufactured: 30 June 1986
Packaged in: MIL-B-131 Class I bag supported in cardboard carton
Date shipped: 14 July 1986 in 40°F truck

12. Specific Gravity, Cured, Units
ASTM D792

	ROLL#1-S	ROLL#1-E
	1.427	1.425
	1.429	1.424
	1.429	1.424
AVG.	1.428	1.424
NASA LOT# 4 AVERAGE		1.426

13a. Tensile Strength, ksi, WARP
FTMS 406-1011

	20.91	21.88
	19.92	20.16
	19.70	19.41
	21.10	21.33
	20.39	20.32
AVG.	20.40	20.62
NASA LOT# 4 AVERAGE		20.51

FM 5064J NASA LOT# 4 U.S.P. LOT# D09315 (HITCO)

		ROLL#1-S	ROLL#1-E
13b. Tensile Modulus, msi, WARP FTMS 406-1011		2.06	2.04
		2.21	2.06
		2.22	1.77
		2.13	2.03
		1.84	1.96
	AVG.	2.09	1.97
	NASA LOT# 4 AVERAGE		2.03
13c. Tensile Elongation, %, WARP FTMS 406-1011		1.43	1.22
		1.18	1.32
		1.17	1.29
		1.38	1.38
		1.28	1.27
	AVG.	1.29	1.30
	NASA LOT# 4 AVERAGE		1.29
14a. Flexural Strength, ksi, WARP FTMS 406-1031		25.82	29.08
		27.79	30.76
		27.59	30.52
		28.13	30.88
		26.88	28.48
	AVG.	27.24	29.94
	NASA LOT# 4 AVERAGE		28.59
14b. Flexural Modulus, msi, WARP FTMS 406-1031		1.97	2.21
		2.11	2.36
		1.92	2.18
		1.95	2.23
		2.03	2.30
	AVG.	2.00	2.26
	NASA LOT# 4 AVERAGE		2.13
15a. Compressive Strength, ksi, WARP FTMS 406-1021		14.71	19.84
		16.26	19.64
		13.02	20.45
		15.87	19.62
		15.31	19.59
	AVG.	15.03	19.83
	NASA LOT# 4 AVERAGE		17.43
15b. Compressive Modulus, msi, WARP FTMS 406-1021		2.07	2.00
		2.02	2.02
		2.07	2.06
		2.09	2.04
		2.03	2.06
	AVG.	2.06	2.04
	NASA LOT# 4 AVERAGE		2.05

FM 5064J NASA LOT# 4 U.S.P. LOT# D09315 (HITCO)

		ROLL#1-S	ROLL#1-E
16. Double Shear Strength, ksi FTMS 406-1041A		2.37	2.57
		2.49	2.77
		2.58	2.84
		2.47	2.68
		2.55	2.63
	AVG.	2.49	2.70
	NASA LOT# 4 AVERAGE		2.59
17. Barcol Hardness, Units ASTM D-2583 (Average of 10 determinations)		57.2	62.0
	NASA LOT# 4 AVERAGE		59.6
18. Residual Volatiles, % PTM-98		1.44	1.39
		1.48	1.44
		1.52	1.49
	AVG.	1.48	1.44
	NASA LOT# 4 AVERAGE		1.46
19. Resin Content, Pyrolysis, % CTM-14B		32.26	32.41
		32.37	32.05
		33.11	32.09
	AVG.	32.58	32.18
	NASA LOT# 4 AVERAGE		32.38
20. Acetone Extraction, % CTM-18A		4.19	5.27
		5.29	5.80
		4.79	6.10
	AVG.	4.75	5.72
	NASA LOT# 4 AVERAGE		5.24
21a. CTE, in/in °F with PLY PTM-61B		1.54	3.29
		3.80	2.69
	AVG.	2.67	2.99
	NASA LOT# 4 AVERAGE		2.83
21b. CTE, in/in °F Cross PLY PTM-61B		3.20	3.01
		1.84	3.10
	AVG.	2.52	3.06
	NASA LOT# 4 AVERAGE		2.79

See Chart 21A-21B

U.S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

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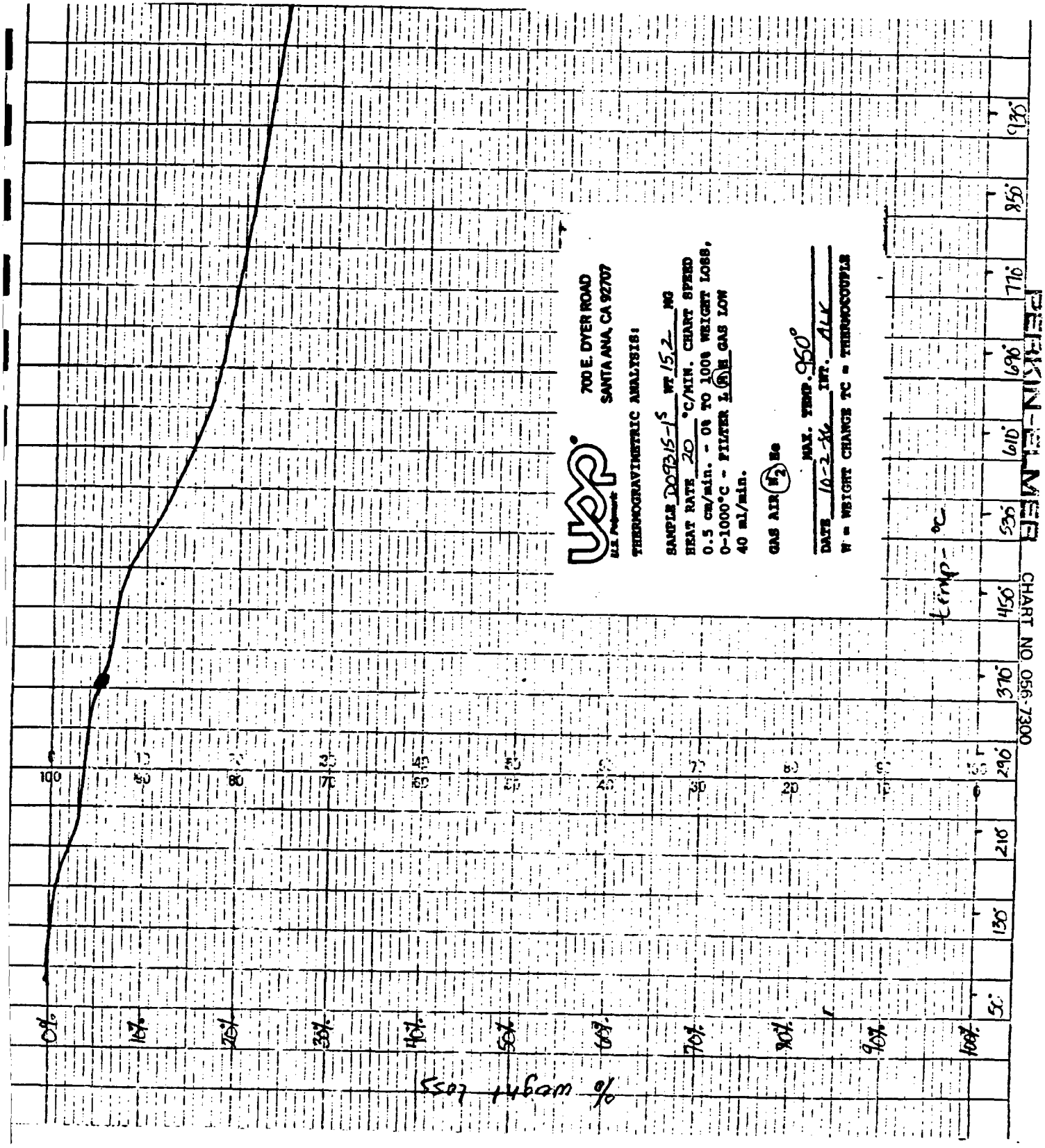

CHART 8B

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CHART 9A

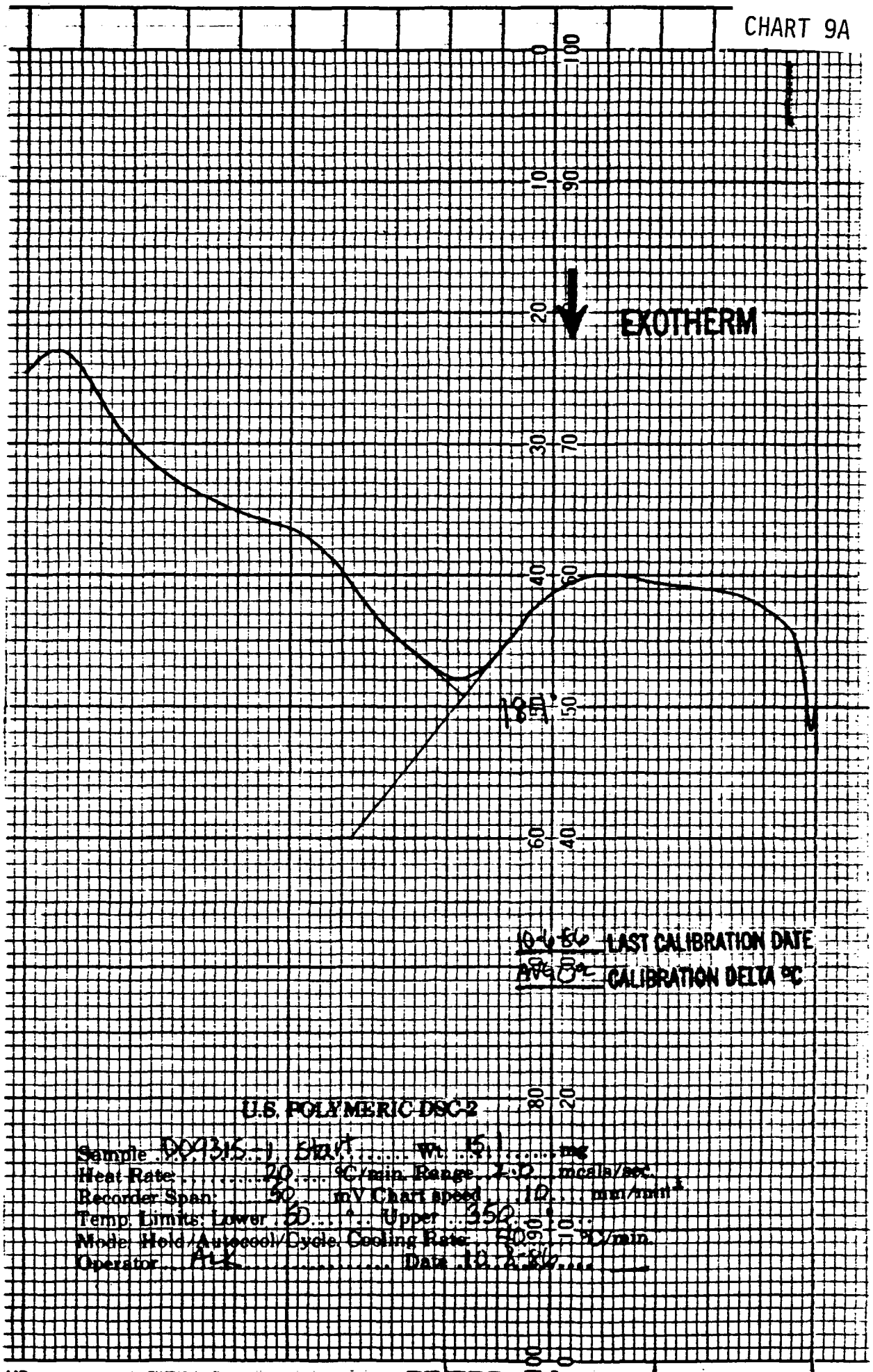
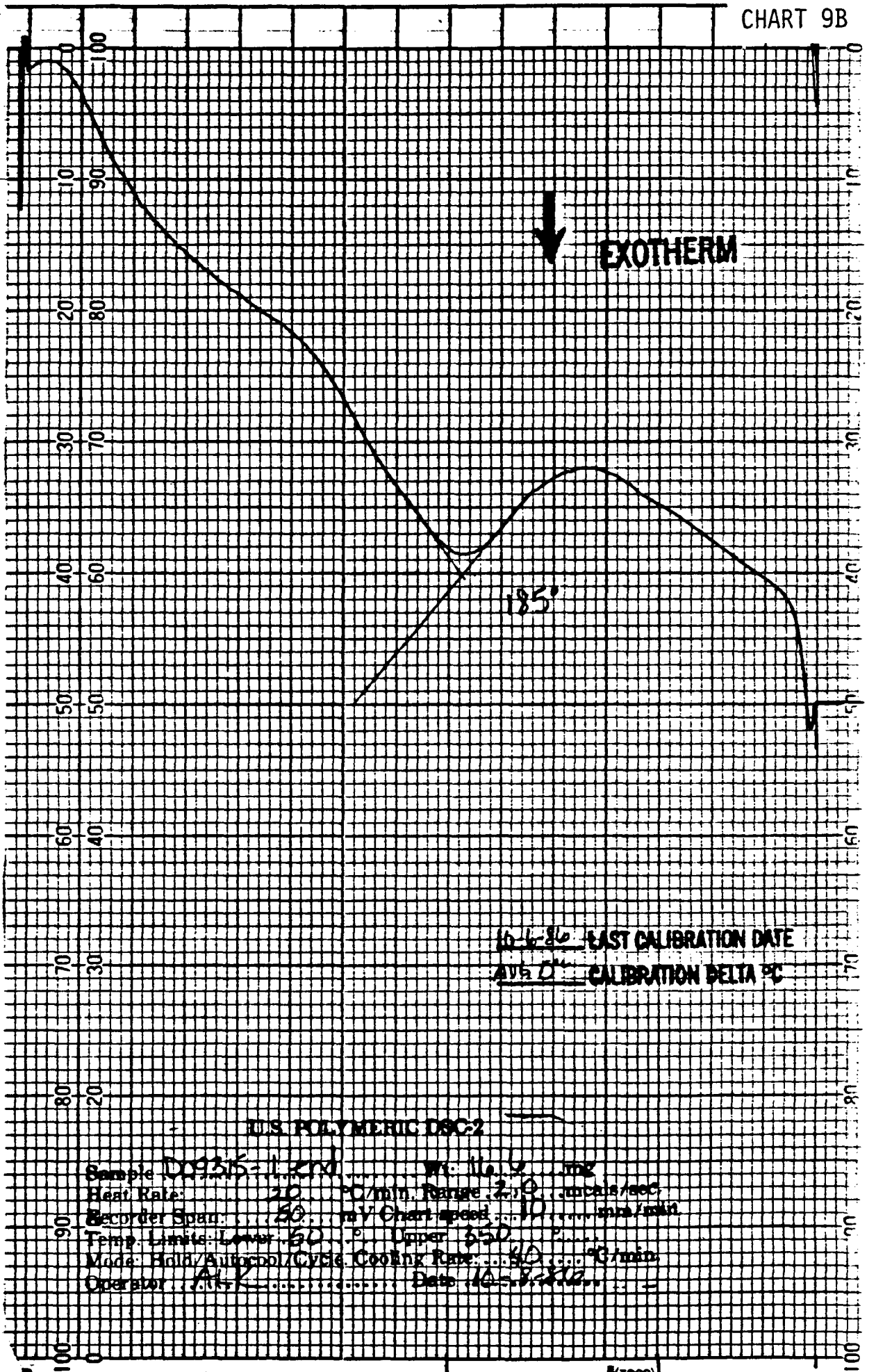


CHART 9B



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SPECTRUM NO. 15195
DATE 7-07-86
SAMPLE FM 5064 J
D09315 #6T-1

SOURCE

STRUCTURE

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

ANALYST V. MIRANDA

Beckman®
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SPECTROPHOTOMETER

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CHART 10A

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SPECTRUM NO. 15196
DATE 7-07-86
SAMPLE FM 5064.1
D09315 # E-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

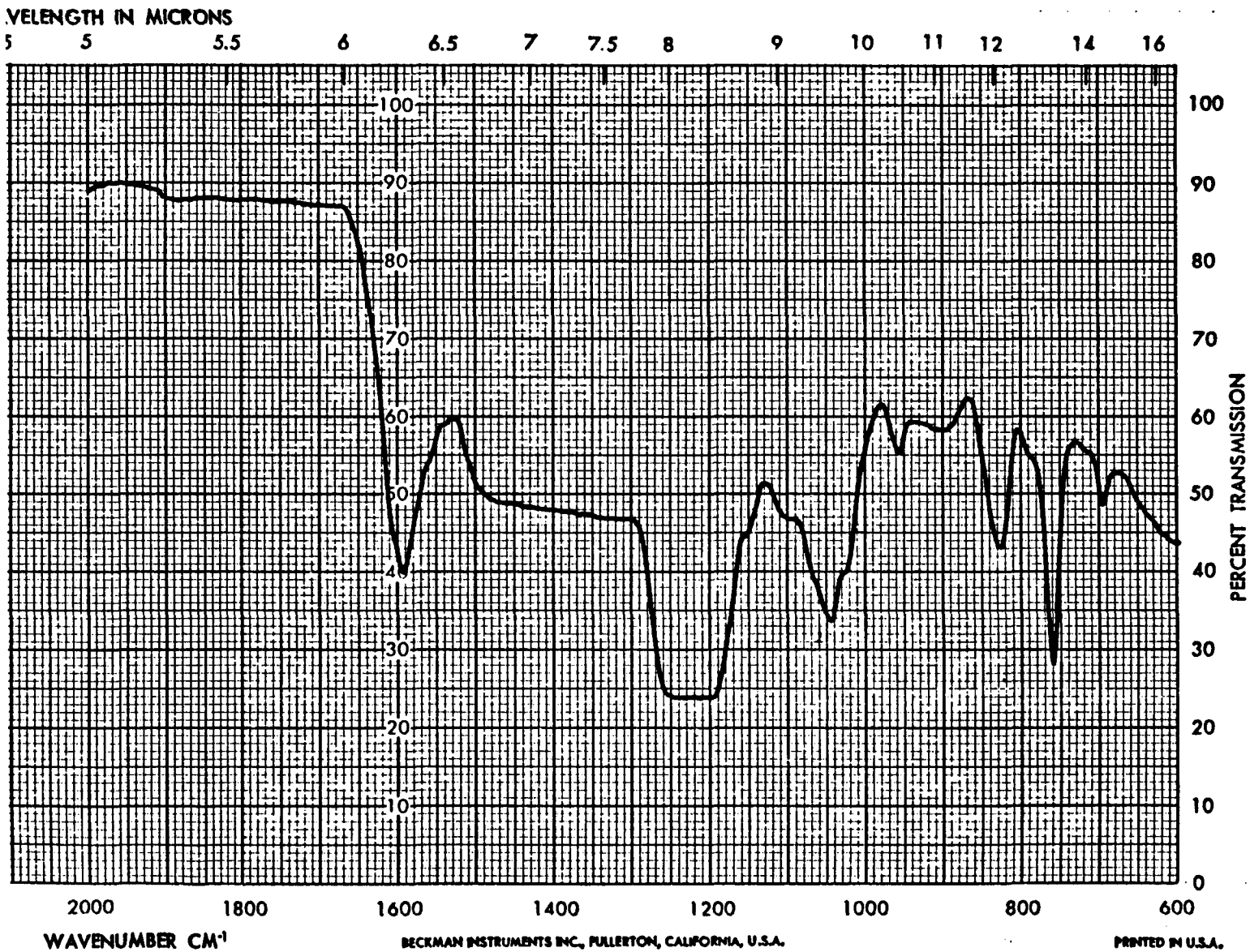

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CHART 10B

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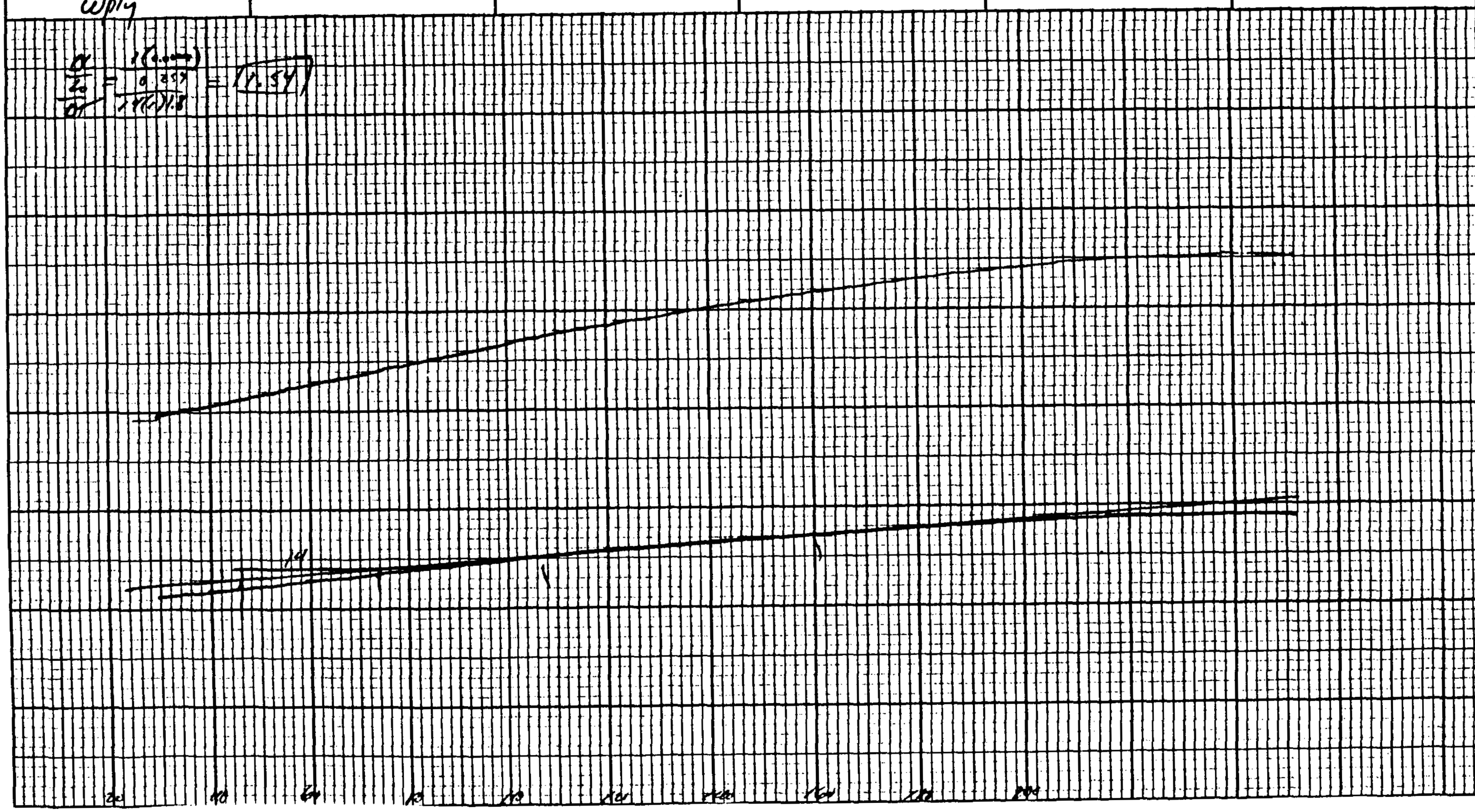
PART NO. 990088

RUN NO.___ DATE 12/3/81	T-AXIS	DTA-DSC	TGA	TMA (cm/cm F)	
OPERATOR TH	SCALE, °C/in 20	SCALE, °C/in___	SCALE, mg/in___	SCALE, mils/in 0.1/0.2	
SAMPLE: D05315-1-3 (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 0.257	
FLOW RATE 3-CFH	SHIFT, in 0	REFERENCE___	TIME CONST., sec___	LOAD, g 10	
			dY, (mg/min)/in___	dY,(10X),(mils/min)/in___	



MEASURED VARIABLE

DU PONT Instruments

Chart 21A1

Chart 21A2

ORIGINAL PAGE IS
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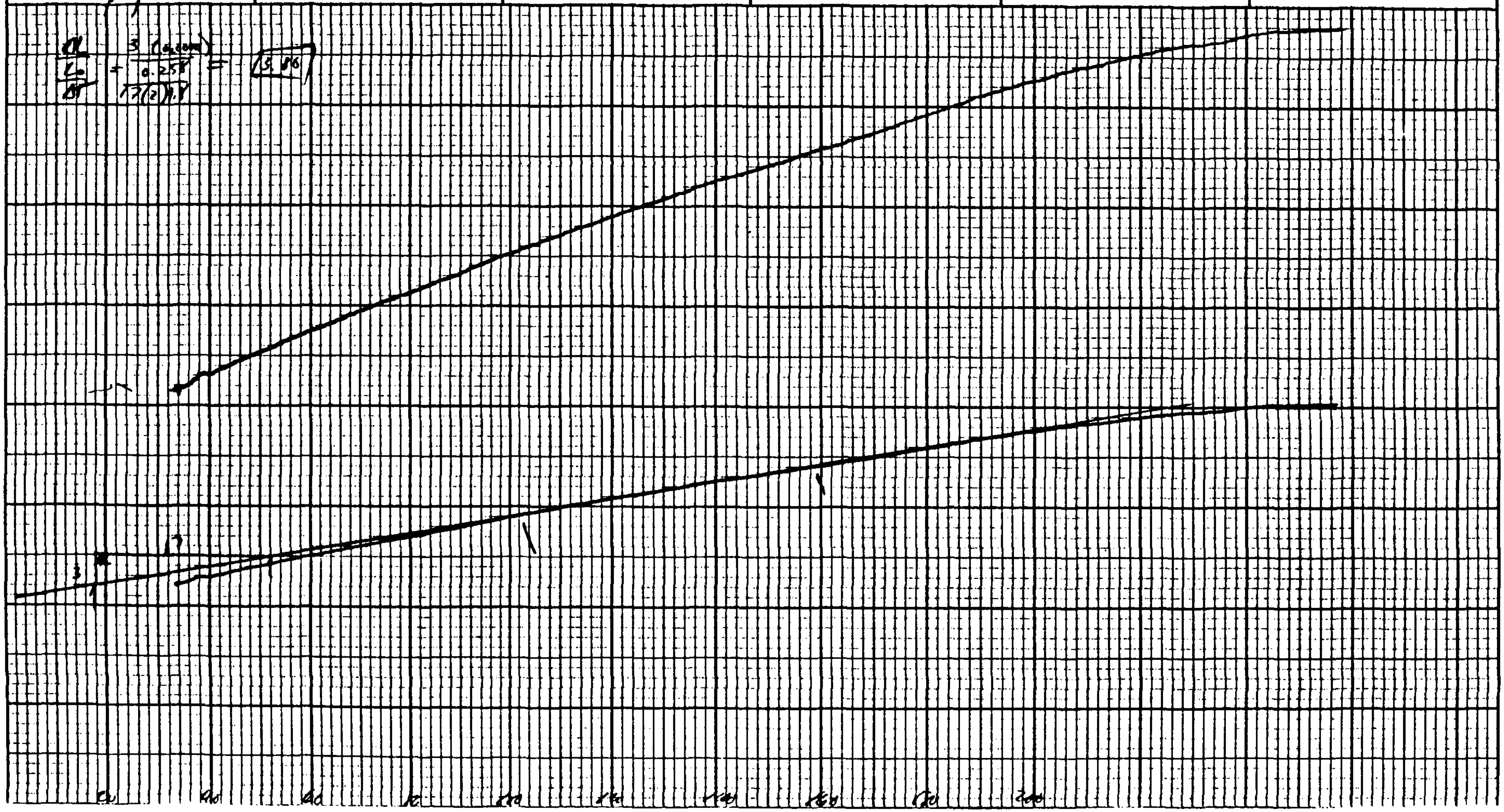
PART NO. 990088

RUN NO.___ DATE 12/3/82	T-AXIS	DTA-DSC	TGA	TMA
OPERATOR DL	SCALE, °C/in 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/0.2
SAMPLE: D09315-1-Starr-(2)	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE Expansion
ATM Air @ 50	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.258
FLOW RATE 3-SCFH	SHIFT, in 0	REFERENCE	TIME CONST., sec	LOAD, g 10
			dY, (mg/min)/in	dY, (10X), (mils/min)/in



DUPONT Instruments

MEASURED VARIABLE

Chart 21A5

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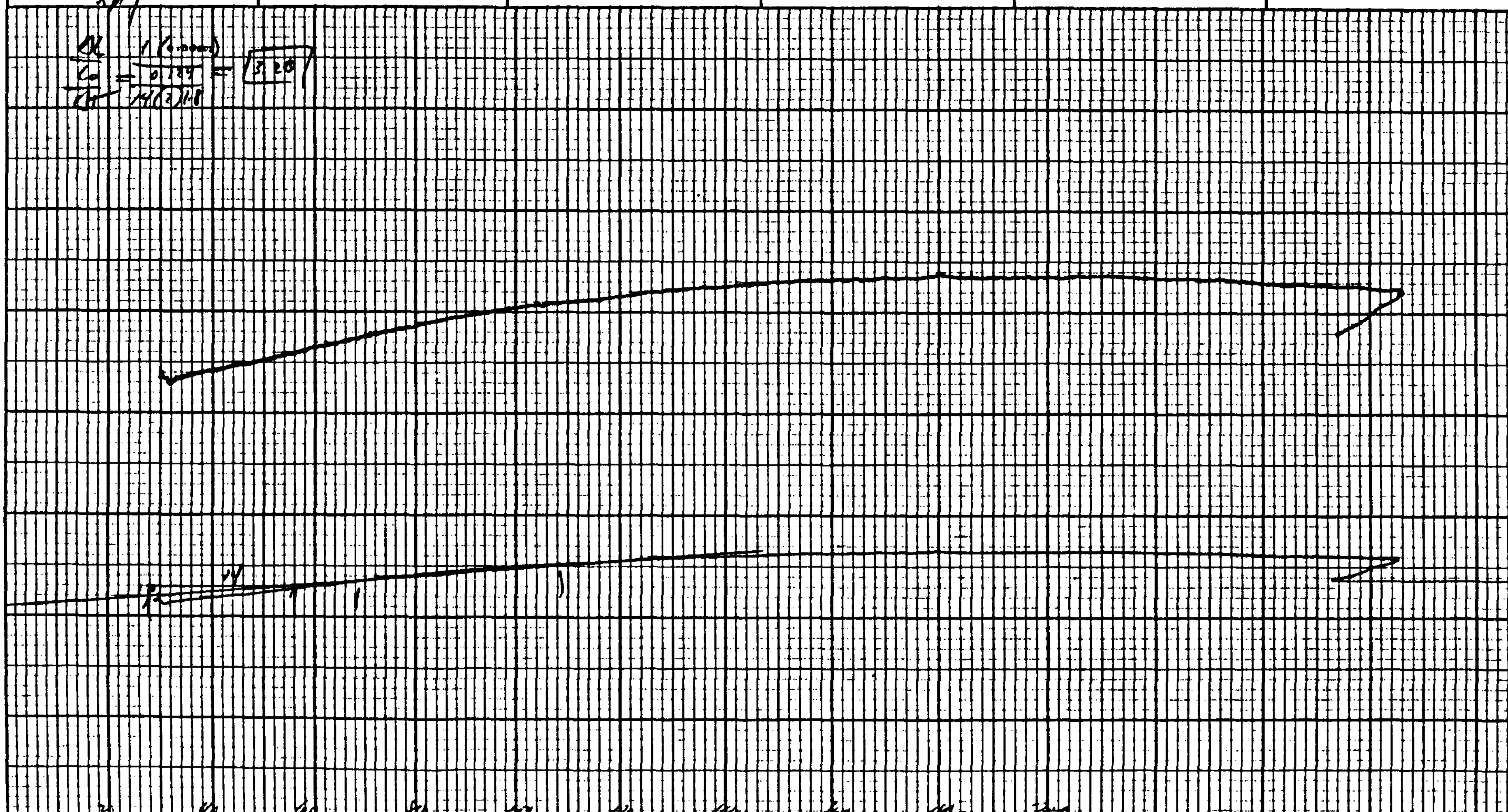
PART NO. 990068

RUN NO.___ DATE 12/1/K.	T-AXIS	DTA-DSC	TGA	TMA (μin/in°F)	
OPERATOR PH	SCALE, °C/in 50 20	SCALE, °C/in ___	SCALE, mg/in ___	SCALE, mils/in 0.1/0.c	
SAMPLE: D07 315-1-start-(3)	PROG. RATE, °C/min ^	(mcal/sec)/in ___	SUPPRESSION, mg ___	MODE Expansion	
ATM Air @ STP	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg ___	WEIGHT, mg ___	SAMPLE SIZE 0.124	
FLOW RATE 3-5 scfh	SHIFT, in 0	REFERENCE ___	TIME CONST., sec ___	LOAD, g 0	
			dY, (mg/min) /in ___	dY, [10X], (mils/min) /in ___	



MEASURED VARIABLE

DUPONT Instruments

Chart 21A4

ORIGINAL PAGE IS
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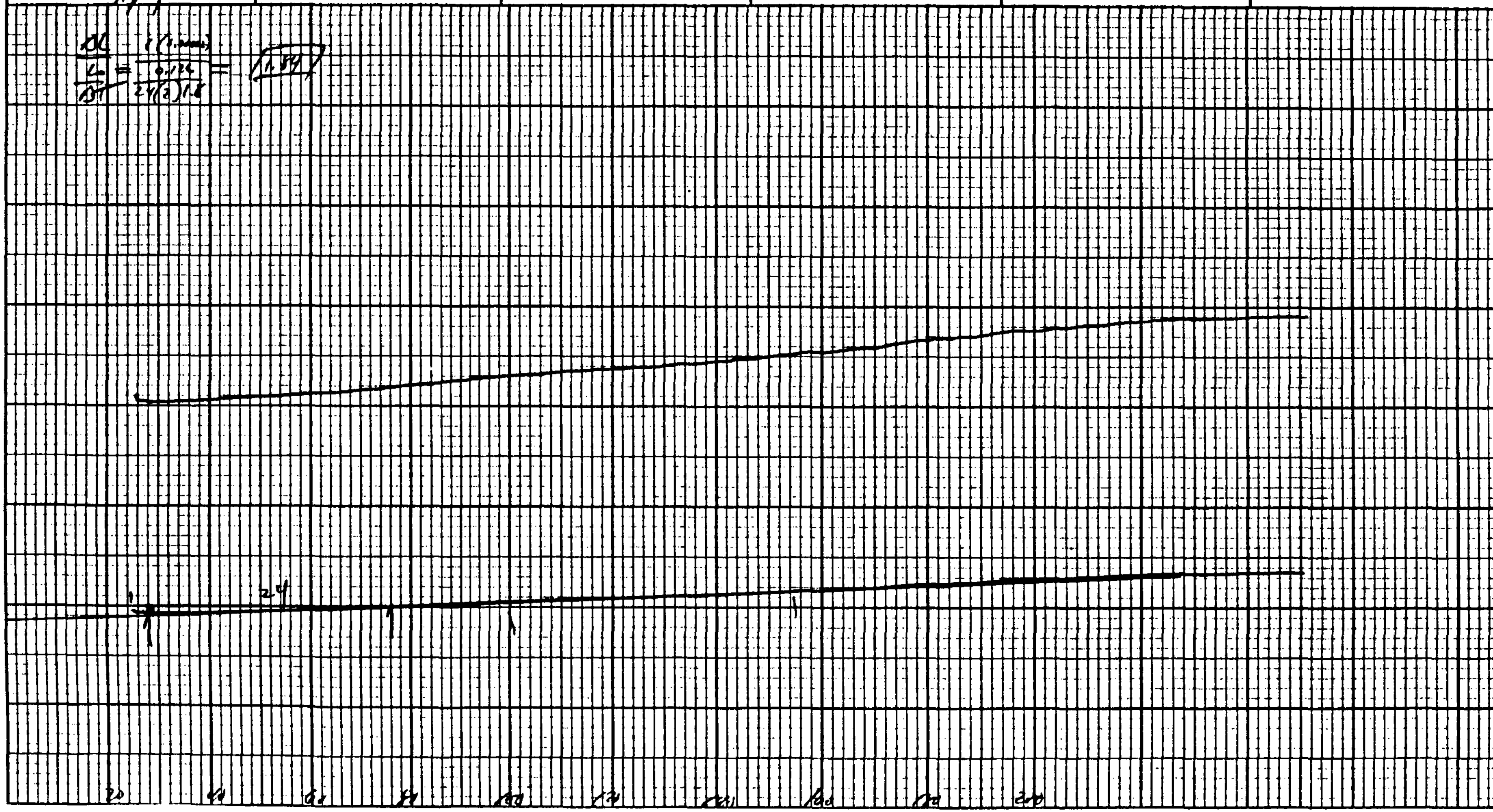
PART NO. 990088

RUN NO.____ DATE 12/2/86	**T-AXIS**	**DTA-DSC**	**TGA**	**TMA** (μin/in°F)	
OPERATOR DL	SCALE, °C/in ~~50~~ 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1 c.c	
SAMPLE: D0935-1-start-(4)	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE Expansion	
	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.126	
ATM Ar @ 3SP	SHIFT, in 0	REFERENCE	TIME CONST., sec	LOAD, g 10	
FLOW RATE 3.53 (60)			dY, (mg/min)/in	dY, (10X), (mils/min)/in	

Xply



MEASURED VARIABLE

DUPONT Instruments

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PART NO. 990088

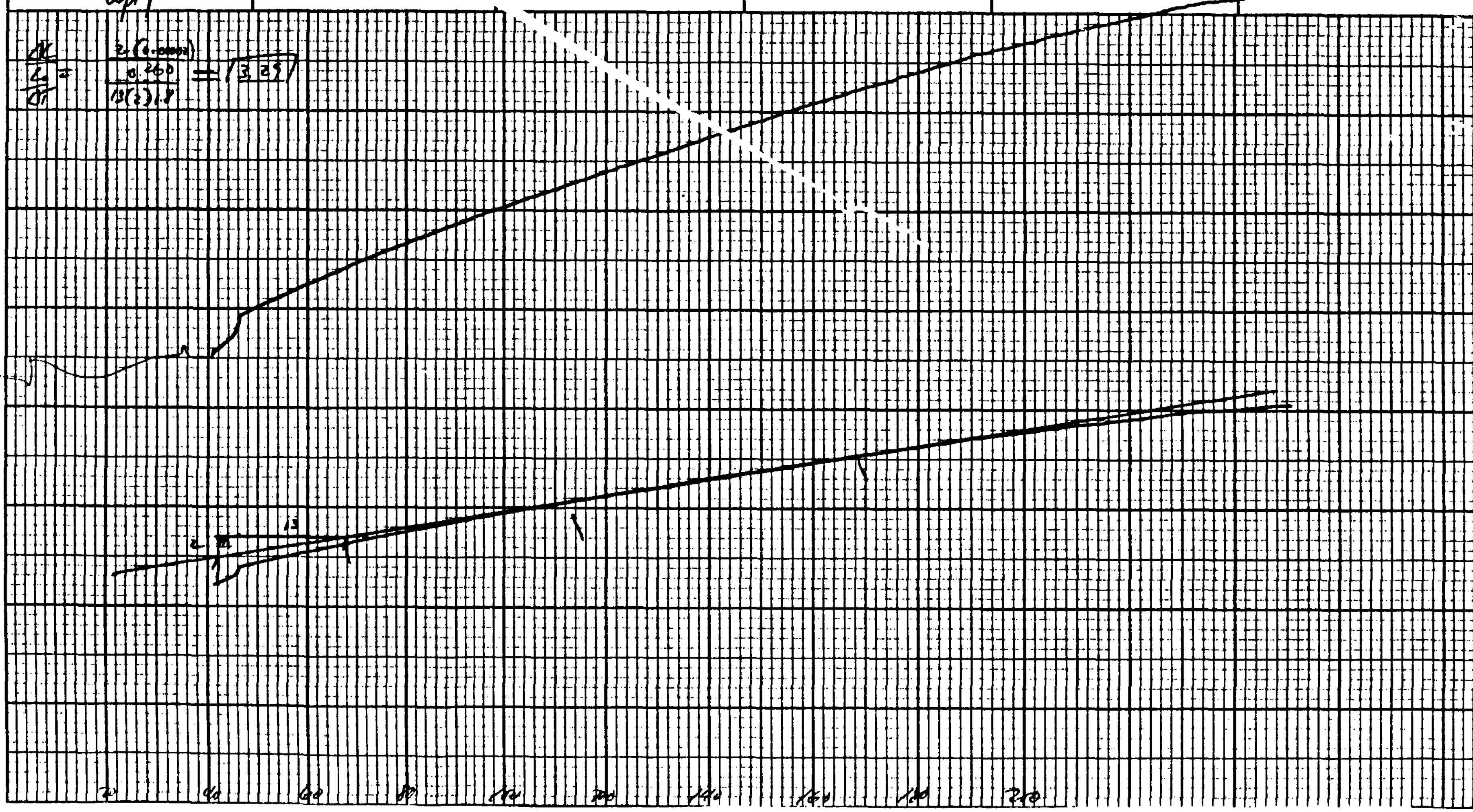
RUN NO.____ DATE 12/3/[illegible]
OPERATOR [illegible]
SAMPLE: D09315-1-[illegible] (1)
ATM [illegible] @ [illegible]
FLOW RATE [illegible]

[illegible] AXIS
SCA[illegible] °C/in ~~50~~ 20
PROG. RA[illegible] °C/min 10
HEAT ____ COL ____ 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 [illegible]
SCALE, mils/in. [illegible]
MODE [illegible]
SAMPLE SIZE 0.260
LOAD, g 10
dY,(10X),(mils/min)/in. ____



MEASURED VARIABLE

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Chart 21B1

ORIGINAL PAGE IS
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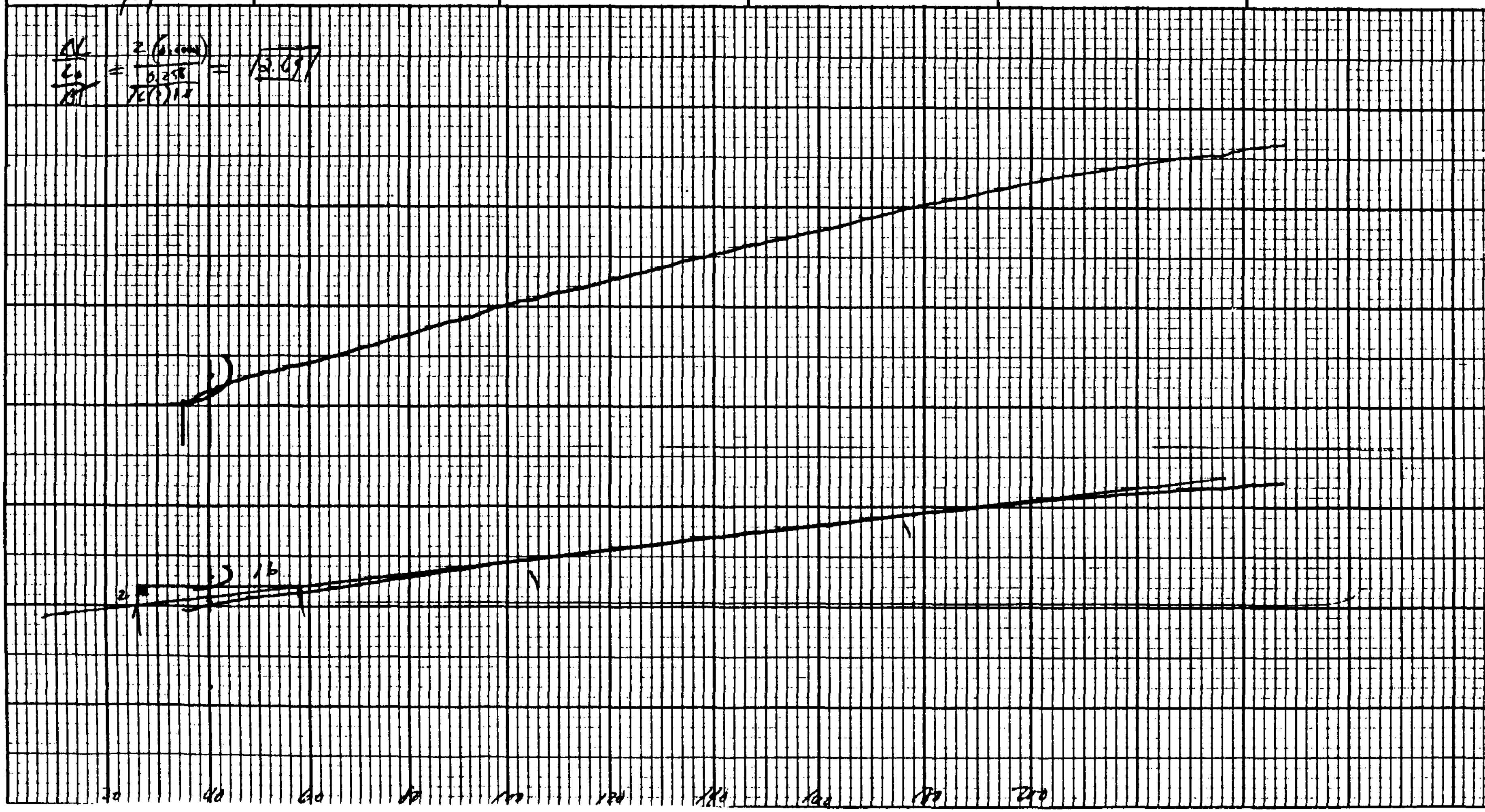
PART NO. 990088

RUN NO.___ DATE 12/3/80	T-AXIS	DTA-DSC	TGA	TMA (cm/cm°C)	
OPERATOR TN	SCALE, °C/in. ~~50~~ 20	SCALE, °C/in.___	SCALE, mg/in.___	SCALE, mils/in. 0.1/0.2	
SAMPLE: D09315-1-END-(2)	PROG. RATE, °C/min 10	(mcal/sec)/in.___	SUPPRESSION, mg___	MODE Expansion	
	HEAT ✓ COOL___ ISO___	WEIGHT, mg___	WEIGHT, mg___	SAMPLE SIZE 0.258	
ATM Ar @ 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.___	



DU PONT Instruments

MEASURED VARIABLE

Chart 21B2

Chart 21B3

ORIGINAL PAGE IS
OF POOR QUALITY

PART NO. 990088

RUN NO. ___ DATE 12/2/84	T-AXIS	DTA-DSC	TGA	TMA (mils/inF)	
OPERATOR TH	SCALE, °C/in 20	SCALE, °C/in ___	SCALE, mg/in ___	SCALE, mils/in 0.1/0.2	
SAMPLE: D0531S-1-END-(3)	PROG. RATE, °C/min 5	(mcal/sec)/in ___	SUPPRESSION, mg ___	MODE Expansion	
ATM Air @ STP	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg ___	WEIGHT, mg ___	SAMPLE SIZE 0.142	
FLOW RATE 3-5SCFD	SHIFT, in 0	REFERENCE ___	TIME CONST., sec ___	LOAD, g 10	
			dY, (mg/min) /in ___	dY, (10X), (mils/min) /in ___	

MEASURED VARIABLE

DUPONT Instruments

ORIGINAL PAGE IS
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PART NO. 990088

RUN NO ___ DATE 12/2/94	T-AXIS	DTA-DSC	TGA	TMA (μm/mK)	
OPERATOR [illegible]	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	
D0531S-1-FILD-(4)	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 35SCFH			dY, (mg/min) /in	dY, (10X), (mils/min)/in	

Xply

$\frac{\Delta H}{L_0} = \frac{2\,(\text{column})}{0.138} = 3.18$

$\frac{\Delta H}{2(3.1)1.7}$

MEASURED VARIABLE

DUPONT Instruments

Chart 21B4