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APPENDICES

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APPENDIX A

Mechanical properties

The temporary solder mask A

1. Tensile Strength

Table A.1 The tensile strength of solder mask with various NVP: HPMA monomer concentration

Amount of NVP: HPMA (phr)	Tensile strength (MPa)			
	Run #1	Run #2	Run #2	Average
30:20	3.05	3.32	3.38	3.25
25:25	3.67	3.45	3.53	3.55
20:30	3.71	3.68	3.62	3.67

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Table A.2 The tensile strength of solder mask with various amount of UT-50 acrylic polymer

Amount of UT-50 (phr)	Tensile strength (MPa)			
	Run #1	Run #2	Run #2	Average
40	3.16	3.41	3.36	3.31
50	2.93	3.16	3.06	3.05
60	1.75	1.69	2.07	1.87
70	0.43	0.35	0.39	0.39

Table A.3 The tensile strength of solder mask with various amount of pigment (TiO_2)

Amount of TiO_2 (phr)	Tensile strength (MPa)			
	Run #1	Run #2	Run #2	Average
1	3.16	3.07	2.95	3.06
2	3.07	3.03	3.31	3.17
3	3.12	3.14	3.07	3.11
4	3.11	3.08	3.08	3.09

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2. Elongation

Table A.4 The elongation (%) of solder mask with various NVP: HPMA monomer concentration

Amount of NVP: HPMA (phr)	Elongation (%)			
	Run #1	Run #2	Run #2	Average
30:20	48.95	51.03	50.02	50.00
25:25	67.00	65.23	65.77	66.00
20:30	41.05	39.95	39.00	40.00

Table A.5 The elongation (%) of solder mask with various amount of UT-50 acrylic polymer

Amount of UT-50 (phr)	Elongation (%)			
	Run #1	Run #2	Run #2	Average
40	110.18	118.32	120.13	116.21
50	196.71	197.22	193.14	195.69
60	391.30	390.60	401.30	394.40
70	527.01	540.98	537.01	535.00

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Table A.6 The elongation (%) of solder mask with various amount of pigment (TiO_2)

Amount of TiO_2 (phr)	Elongation (%)			
	Run #1	Run #2	Run #2	Average
1	196.37	198.25	195.81	196.81
2	197.93	196.41	196.42	196.92
3	193.59	192.84	193.22	193.21
4	187.08	192.13	191.12	190.11

The temporary solder mask B

Table A.7 The Effect of solder mask with various amount of polyvinyl alcohol

Properties	Amount of PVA (GH-17):PVA(GL-05) (phr)						
	5:5	5:10	5:15	5:20	10:5	15:5	20:5
Tensile strength (Mpa)	21.34	19.40	15.03	14.23	23.12	24.97	26.16
Elongation at break (%)	20.02	45.32	63.12	82.03	17.82	16.23	16.12
Adhesion	0B	0B	0B	0B	0B	0B	0B

Table A.8 The effect of solder mask with various amount of HPMA: NVP monomer

Properties	Amount of HPMA: NVP (phr)					
	1:1	1:2	1:3	2:2	2:1	3:1
Tensile strength (Mpa)	19.57	18.32	18.17	23.21	21.96	25.10
Elongation at break (%)	45.76	47.54	39.13	47.32	47.35	30.02
Adhesion	0B	0B	0B	0B	0B	0B

3. Adhesion strength

3.1 Adhesion strength (ASTM D 816-82 : Standard Test methods for rubber cements)

Table A.9 Adhesion strength of temporary solder masks with various amount of releasing agent (silicone oil 350s)

Amount of Silicone oil 350s (phr)	**Adhesion strength (N)**			
	Run #1	**Run #2**	**Run #2**	**Average**
0	209.47	219.80	220.98	216.75
2	153.56	153.92	150.20	152.56
5	132.13	124.86	125.09	127.36
10	105.70	102.00	110.30	106.00
15	72.00	70.46	70.48	70.98

Table A.10 The Effect of releasing agent

Properties	Test methods	Amount of releasing agent (phr)				
		0	2	5	10	15
Adhesion	ASTM D3359-97	1B	1B	1B	1B	0B

4. Viscosity of Temporary Solder Masks

Table A.11 Viscosity of solder masks A with various amounts of thickening agent (T-45)

Amount of T-45 (phr)	**Viscosity (Cps)**			
	Run #1	**Run #2**	**Run #2**	**Average**
2	63,200	63,900	64,000	63,700
5	66,300	66,100	65,900	66,100
10	74,400	74,700	74,700	74,600
15	80,000	80,300	80,000	80,100
20	83,150	83,080	83,070	83,100
25	94,400	94,650	94,750	94,600

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Table A.12 Viscosity of solder masks B with various amounts of thickening agent (xanthan gum)

Amount of xanthan gum (g)	**Viscosity (cps.)**
0.1	24,000
0.2	30,000
0.3	35,000
0.4	39,500
0.5	44,500

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APPENDIX B

The glass transition temperature was determined by DSC method under the following condition.

Sample weight:	10-20 mg
Container:	aluminum pan
Temperature:	0 – 300°C

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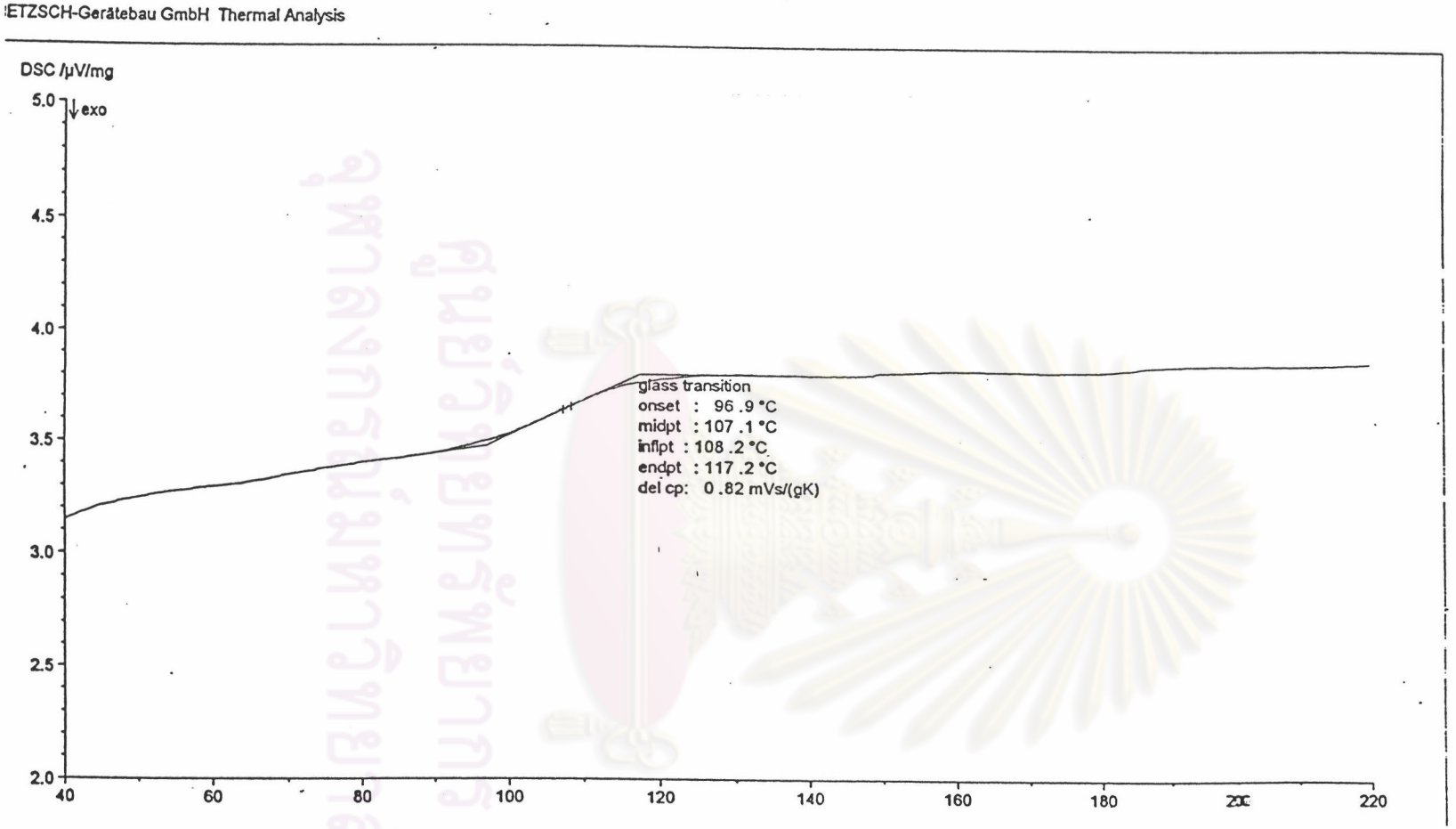

Figure B.1 DSC thermogram of temporary solder mask A

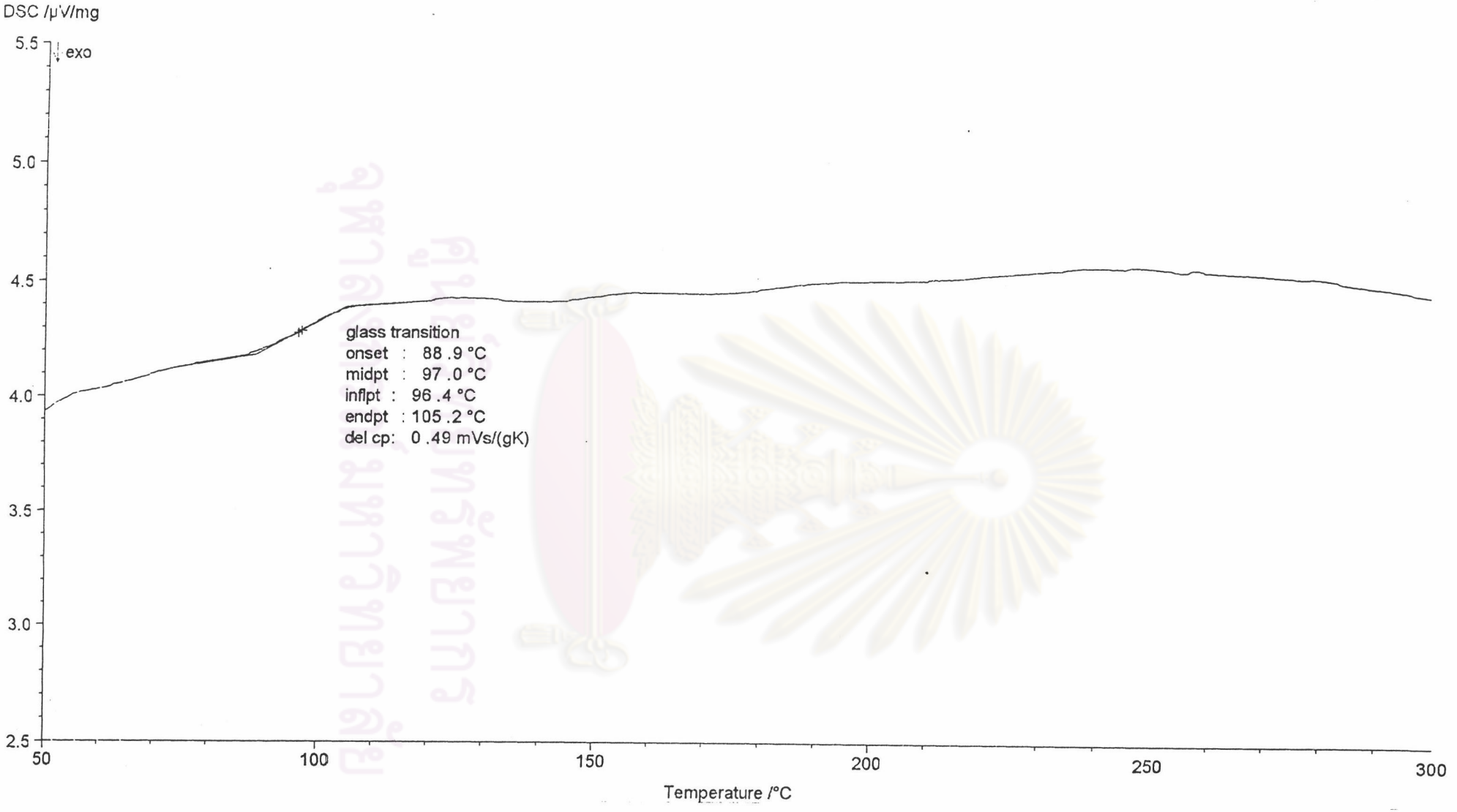

Figure B.2 DSC thermogram of temporary solder mask B

APPENDIX C

The thermal degradation property of the solder mask was obtained from thermogravimetric analysis (TGA) under the test conditions as shown below:

Sample Weight:	10 mg
Container:	Platinum pan
Temperature:	50-800°C
Heating-Cooling rate:	20°C/min
Purged-gas:	original air 30/15

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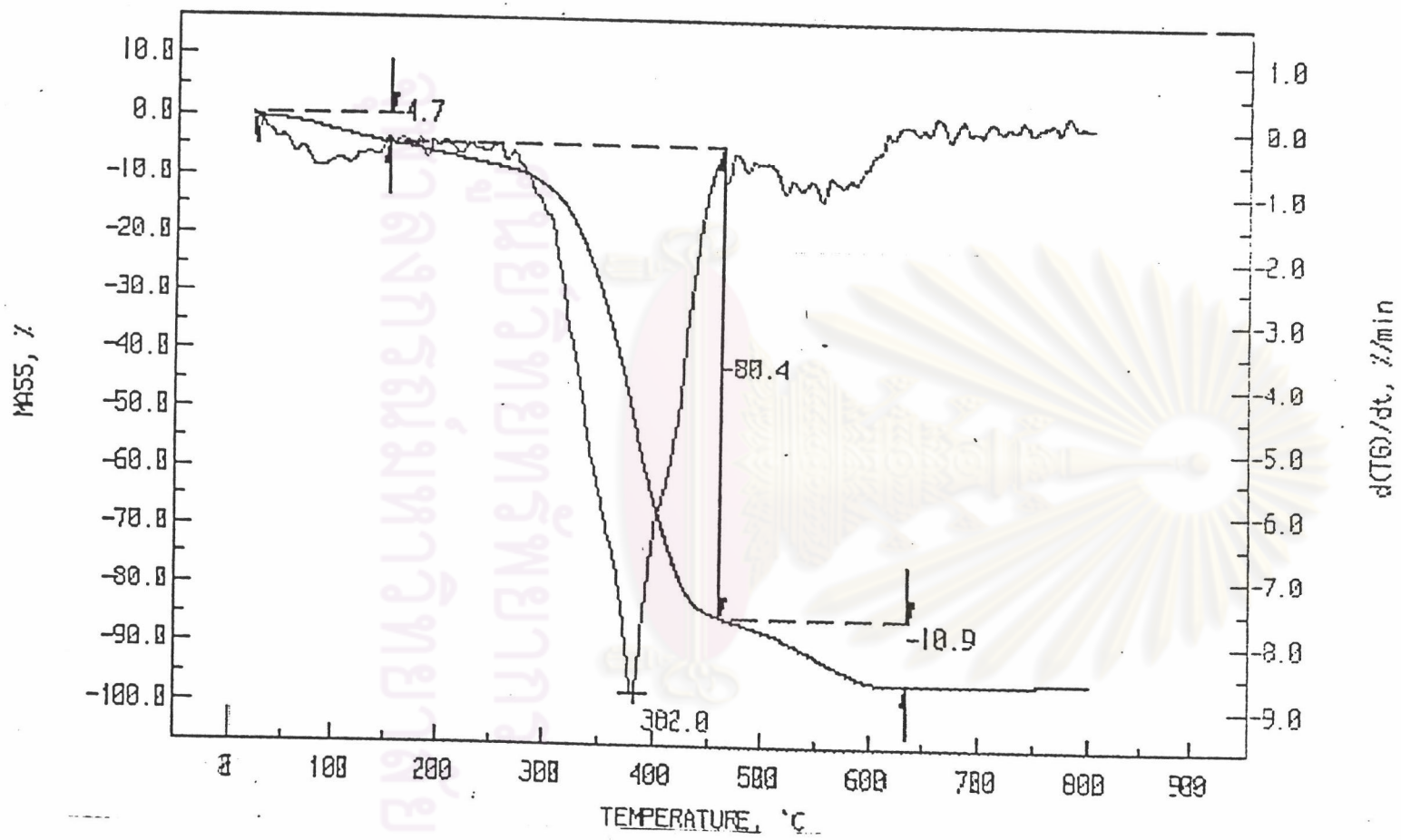

Figure C.1 TGA thermogram of temporary solder mask A before adding filler

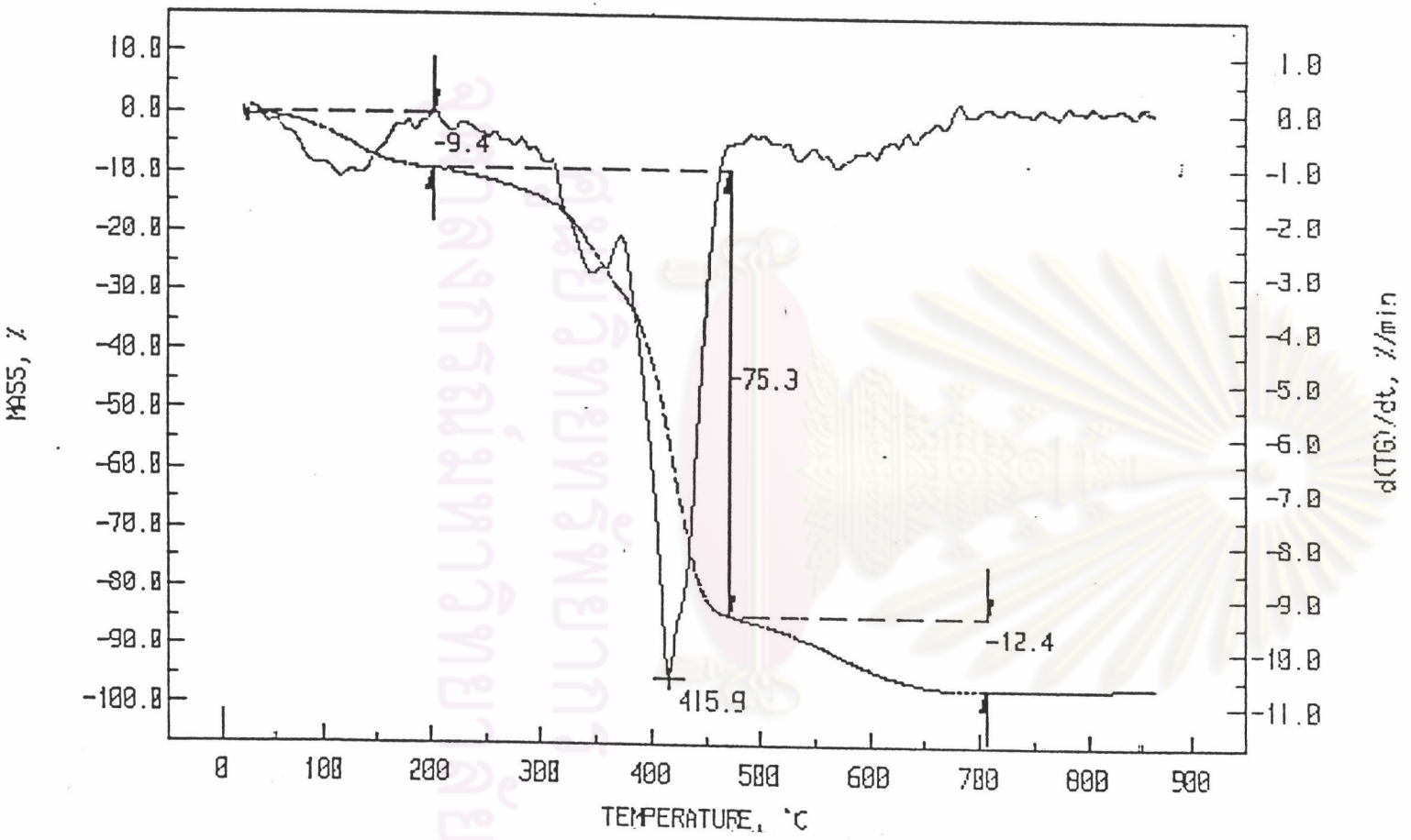

Figure C.2 TGA thermogram of temporary solder mask A after adding filler

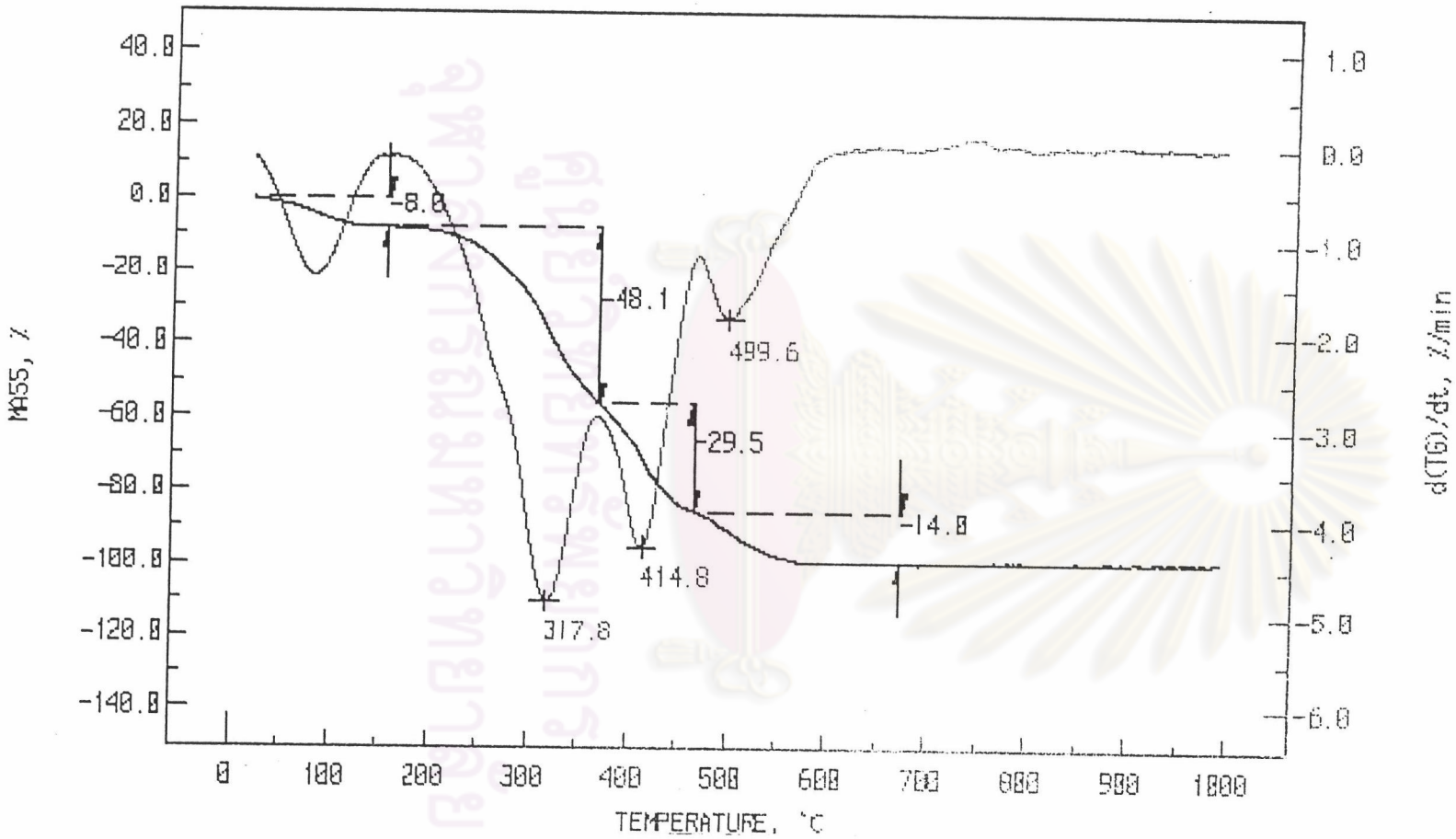

Figure C.3 TGA thermogram of temporary solder mask B

APPENDIX D

The characterization of the surface of the temporary solder mask was obtained from scanning electron microscopy (SEM) under the as shown below:

Sample weight	:	10-20 mg.
Container	:	aluminum pan
Temperature	:	50-150 °C

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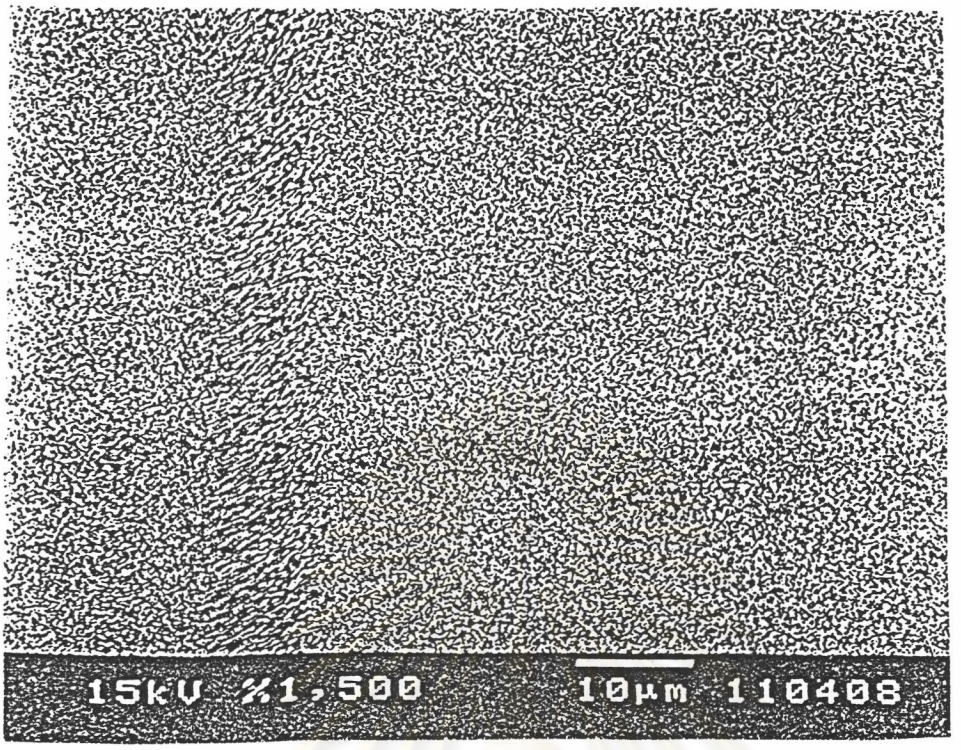

Figure D.1 SEM photomicrograph of temporary solder mask No.1

(1,500x magnification)

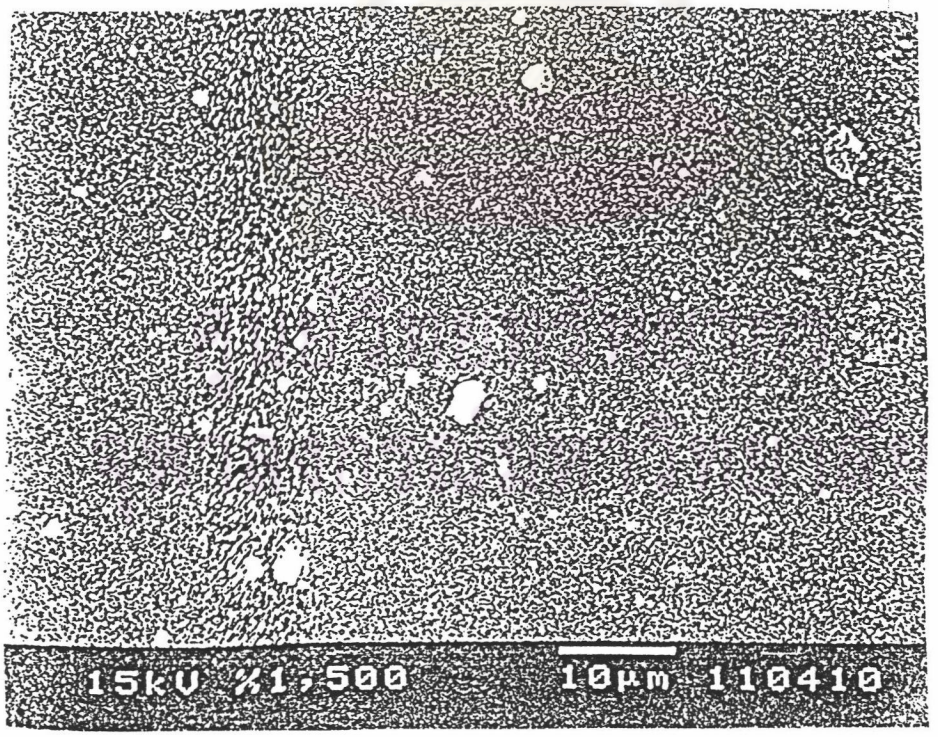

Figure D.2 SEM photomicrograph of temporary solder mask No.2

(10,000x magnification)

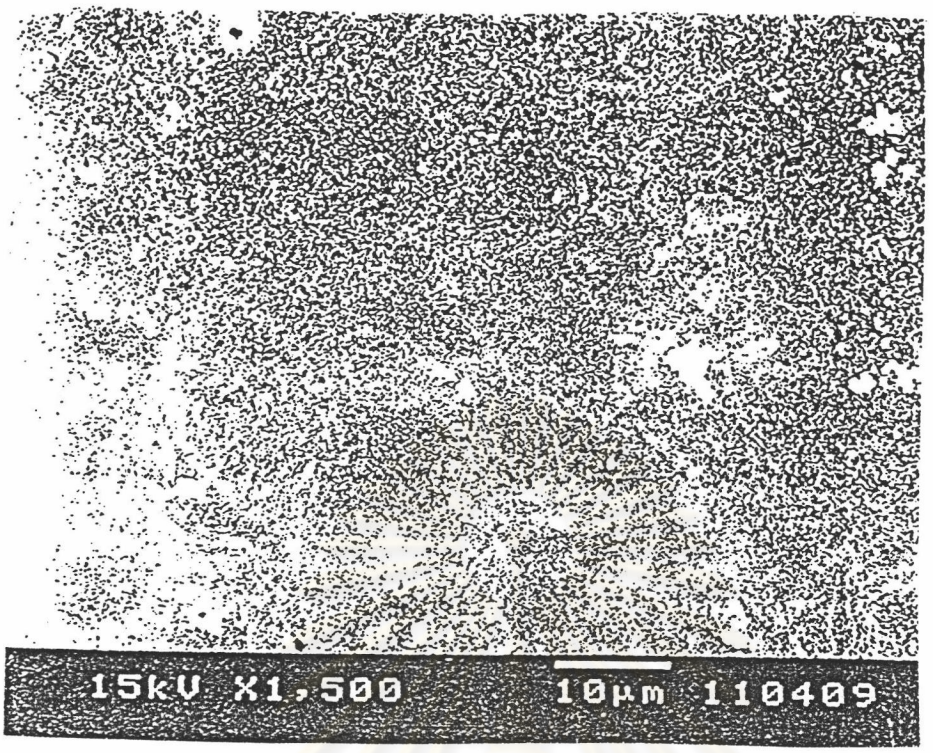

Figure D.3 SEM photomicrograph of temporary solder mask No.3 (1,500x magnification)

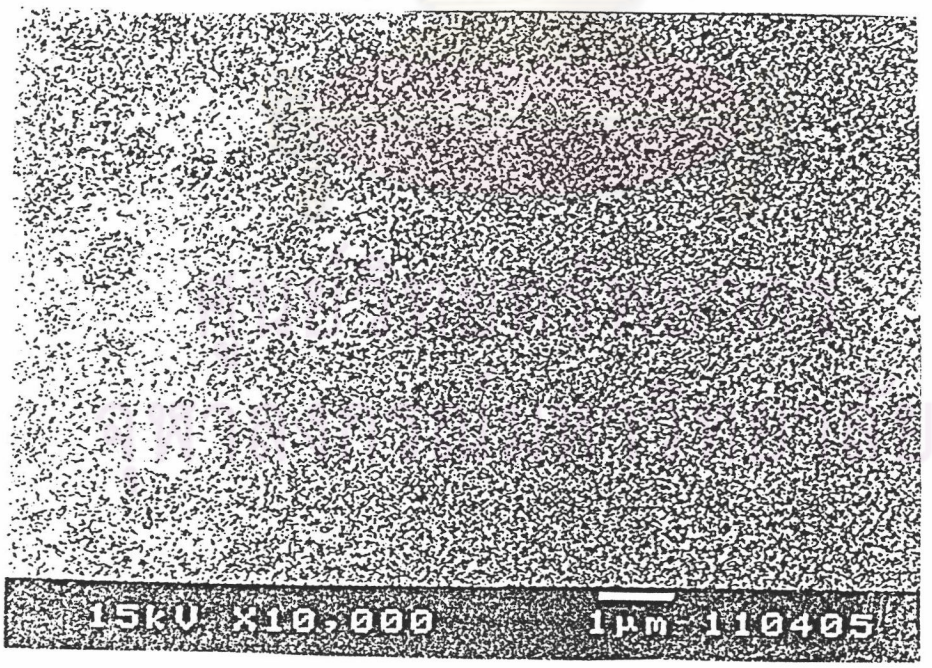

Figure D.4 SEM photomicrograph of temporary solder mask No.4 (1,500x magnification)

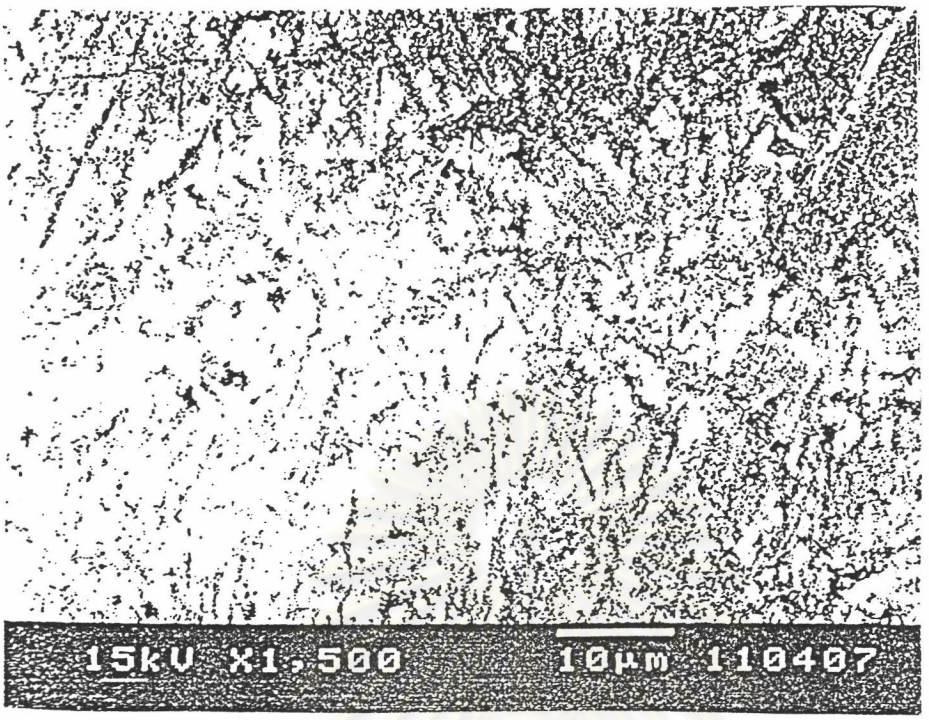

Figure D.5 SEM photomicrograph of temporary solder mask No. 5 (1,500x magnification)

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APPENDIX E

ATR FT-IR Spectroscopy

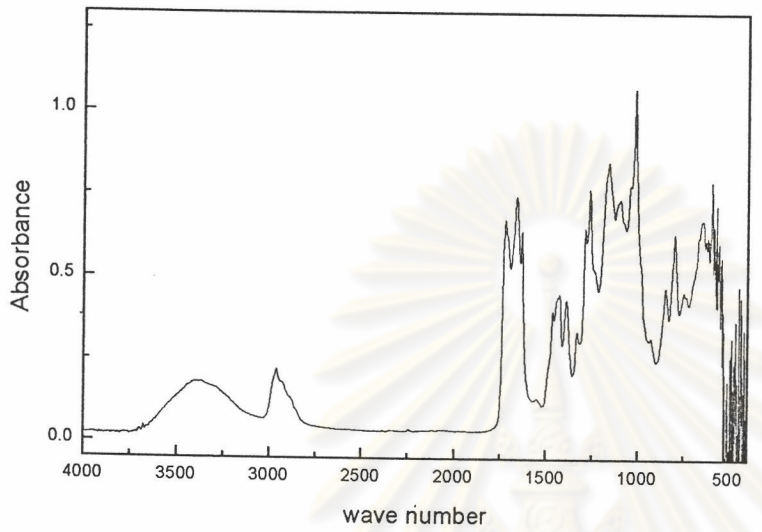

Figure E.1 The ATR FT-IR of ratio NVP:HPMA 30:20

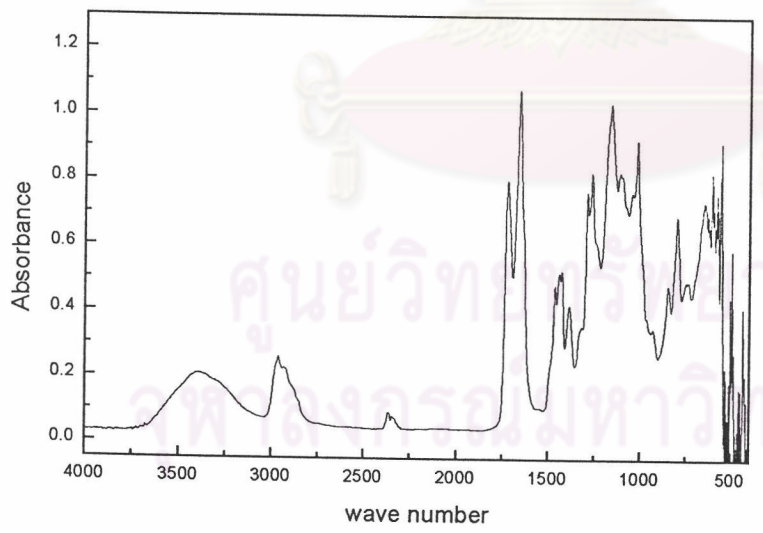

Figure E.2 The ATR FT-IR of ratio NVP:HPMA 25:25

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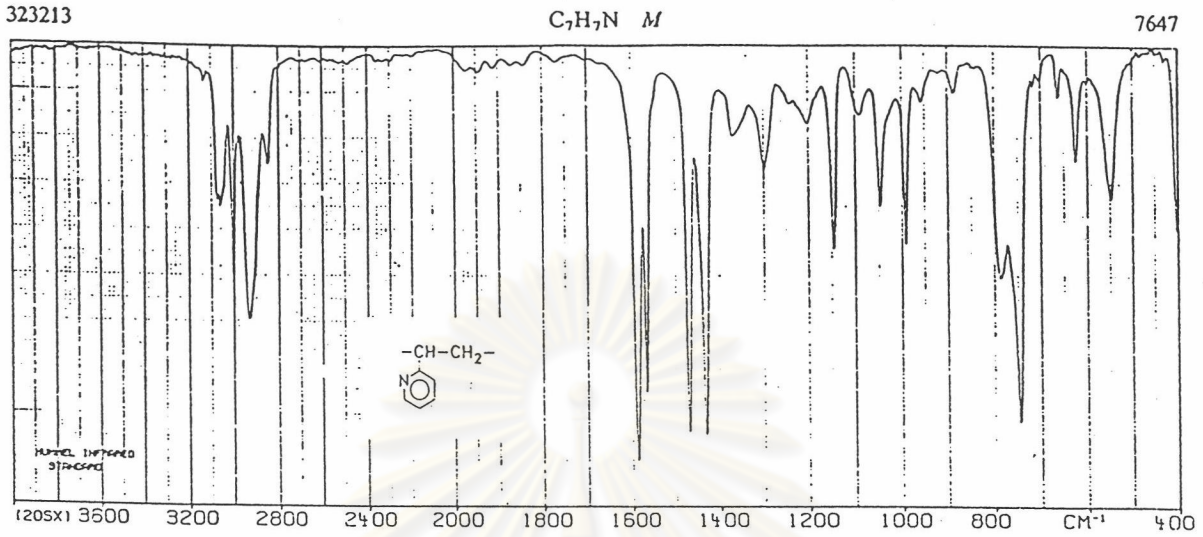

Figure E.3 The ATR FT-IR of poly(N-vinylpyrrolidone)

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จุฬาลงกรณ์มหาวิทยาลัย

VITA

Chucheep Apirug was born on October 19, 1976 in Bangkok, Thailand. He received the bachelor Degree of Science in Chemistry from the Faculty of Science, Chulalongkorn University in 1997. He has been a graduate student in the Program of Petrochemistry and Polymer Science, Faculty of Science, Chulalongkorn University since 1999 and completes his M.Sc. degree in 2002.

ศูนย์วิทยทรัพยากร
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