REFERENCES

1. Herbert, F.L. **The McGraw-Hill Recycling Handbook.** New York: McGraw-Hill, 1993.
2. Shirakawa, H., Louis, E.J., MacDiarmid, A.G., Chiang, C.K., Heeger, A.J. **J. C. S. Chem.** (1977): 578.
3. Techagumpuch, A., Nalwa S., Miyata, S. Promising Application of Conducting Polymer. In T.A. Skotheim (ed.), **Electroresponsive Molecular and Polymeric System**, Vol. 2, New York: Marcel Dekker,(1991). pp. 257-279.
4. De Paoli, M., Waltman, R.L., Diaz, A.F., and Bargon, J. **J. of Polm. Sci.** 23 (1994): 1687-1698.
5. Bhat, N.V., Yasmin, S. **J. Appl. Polym. Sci.** 55 (1995): 1827-1835.
6. Ogura, K., Yano, J., Goto H. **J. Polym Sci.Part A. Polym. Chem.** 32 (1994): 33-38.
7. Sailor, M.J., Ginsburg, E.J. **Science** 24 (1990): 1146.
8. Berius, M.L. **Plastics Engineering Handbook of the Society of the Plastics Industry.** 5th ed, New York: 1991.
9. Naarmam, H., and Strohrieg, P. Conducting and Photoconducting polymers. In H.R. Kricheldorf (ed.), **Handbook of Polymer Synthesis,** New York: Marcel Dekker, Inc., (1992). pp. 1374-1383.
10. Stanley, J. Polypyrrole. In **Encyclopedia of Polymer Science and Engineering**, 13 (1988). pp. 42-53.
11. Kanatzidis, M.G. Conducting polymer. In **Chemical and Engineering News,** 68 (1990). pp. 36-54.
12. Bredas, J.L., and Street, G.B. Polaron, Bipolarons and Solution in conducting polymer. **Acc. Chem. Res.** 18 (1985): 309-315.

13. Ojio, T., and Miyata, S. Highly transparent and conducting polypyrrole-poly(vinyl alcohol) composite films prepared by gas state polymerization. **Polym. J.** 18 (1986): 95-98.

14. Daiz, A.F., and Bargon, J. **Electrical Synthesis.** California: IBM Research Laboratory, 1970.

15. Odian, G. **Principle of Polymerization,** 3rd ed. New York: Wiley & sons, Inc., 1991.

16. Harry, R., and Frederick, W. **Contemporary Polymer Chemistry**, New Jersey: Prentice-Hall, Inc., 1981.

17. Chao, T.H., and March, J.A. Study of polypyrrole synthesized with oxidative transition metal ions. **J. of Polym. Sci.** 26 (1988): 743-753.

18. Ohtani, A., and Shimidzu, T. **Bull. Chem. Soc. Jpn.** 62 (1989): 234.

19. Bjorklund, R.B., and Lundstrom, I. **J. Electron. Mater.** 13 (1984): 211.

20. Nakata, M., Shiraishi, Y., Taga, M., and Kise, H. **Makromol. Chem.** 193 (1992): 765.

21. Nakata, M., Shiraishi, Y., Taga, M., and Kise, H. **Polym. J.** 24 (1992): 437.

22. van der Pauw, L.J. **Philips Res. Repts.** 13 (1958): 1-9.

23. Blythe, A.R. **Electrical properties of polymer.** Master 's thesis, Chembridge University, 1979.

24. Swee, N.T., and Hailin, G. **Polymer** 37 (1996): 965.

25. Haddadi-Asl, V., Kazacos, M., Skyllas-Kazacos, M. **J. Appl. Polym. Sci.** 57 (1995): 1455-1463.

26. Armes, S.P. Ph.D. thesis. University of Bristol, 1987.

27. Brame, S.P. **Application of polymer spectroscopy.** New York: Academic press, 1978.

28. David, F. **Organic Photochemistry**. Thailand: Prince of Songkhla University, (1991). pp. 25-32.

29. Mukul, B., and Anindita, R. **J. Appl. Polym. Sci.** 51 (1994): 1575-1580.

30. Mukherjee, D. **Prog. Rubber Plast. Thechol.** 6 (1990): 34.

31. Scott, J.C., Bredas, J.L., Yakushi, K., Pfluger, P., and Street, G.B. **Syn. Met.** 9 (1984): 165.

32. Socrates, G. **Infrared Characteristic Group Frequencies,** New York: Wiley, (1980). p. 98.

33. Silverstein, R.M., Bassler, G.C., and Morrill, T.C. **Spectrometric identification of organic compounds**, 5th ed. New York: (1991). p 91.

34. Mac Darmid, A.G., and Kanr, R.B. **Handbook of conducting polymers,** New York: Marcel Dekker, Inc., (1986). pp. 690-727.

Appendices

Appendix A

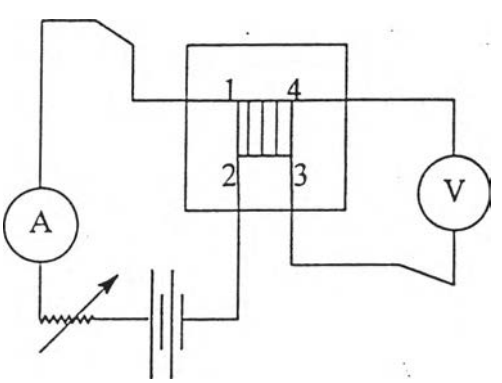
Measurement method and Calculation of σ by van der Pauw.

Conducting plastic film was prepared by CVD of pyrrole. The thickness was measured by vernier caliber. After that electrical conductivity of prepared conducting film was measured by van der Pauw method.

Four ohmic contacts at the edge of the square sample are made for the measurement, first suitable current (I_{12}) was applied through contacts 1 and 2 and measure potential different (V_{34}) between contact 3 and 4 and obtain ratio

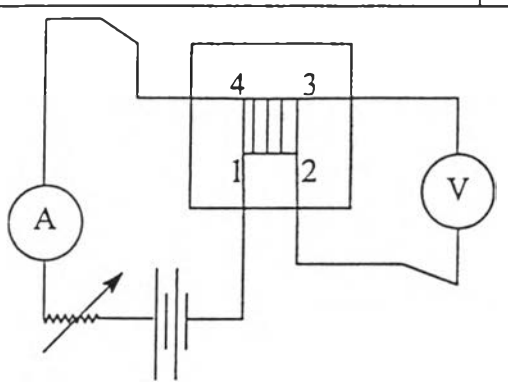
$$R_1 = |V_{34}|/I_{12}.$$

I_{12} (mA)	$\|V_{34}\|$ (mV)	R_{1234} (Ω)
0.1411	95	673.28
0.2103	100	475.51
0.1281	115	897.51
0.0937	127	1354.43
average R_{1234} (R_1)		850.24



Secondaly, I_{23} is applied through the contact 2 and 3 and measure the potential difference, V_{41} which will give the ratio $R_2 = |V_{41}|/I_{23}$

I_{12} (mA)	$\|V_{34}\|$ (mV)	R_{1234} (Ω)
0.1313	160	1218.58
0.0843	118	1399.76
0.1704	120	704.22
0.2525	93	368.28
average R_{2341} (R_2)		922.71



Then calculate for the conductivity (σ_1) of the square sample by equation

$$\sigma = (\sigma_1 + \sigma_2 + \sigma_3 + \sigma_4)/4$$

The above data will give the following information (in principle, σ_1, σ_2, σ_3, and σ_4 can be calculated by changing the position of electrodes around).

Thickness $d_1 = 0.0071$ cm ; $R_1 = 850.24\ \Omega$

$d_2 = 0.0068$ cm ; $R_2 = 922.71\ \Omega$

$d_3 = 0.0070$ cm ; $R_3 = 950.02\ \Omega$

$d_4 = 0.0065$ cm ; $R_4 = 915.75\ \Omega$

Conductivity can be calculated by equation

$$\sigma = 1/Rd \quad S/cm$$

R = resistance, Ω : d = Film thickness, cm

$\sigma_1 = 1.66 \times 10^{-1}$

$\sigma_2 = 1.59 \times 10^{-1}$

$\sigma_3 = 1.51 \times 10^{-1}$

$\sigma_4 = 1.61 \times 10^{-1}$

$\sigma_{average} = 1.61 \times 10^{-1}$

Finally, the average σ of prepared conducting plastic film can be calculated by van der Pauw method to be 1.61×10^{-1} S/cm.

Appendix B

FT-IR spectra of prepared conducting plastic and original films.

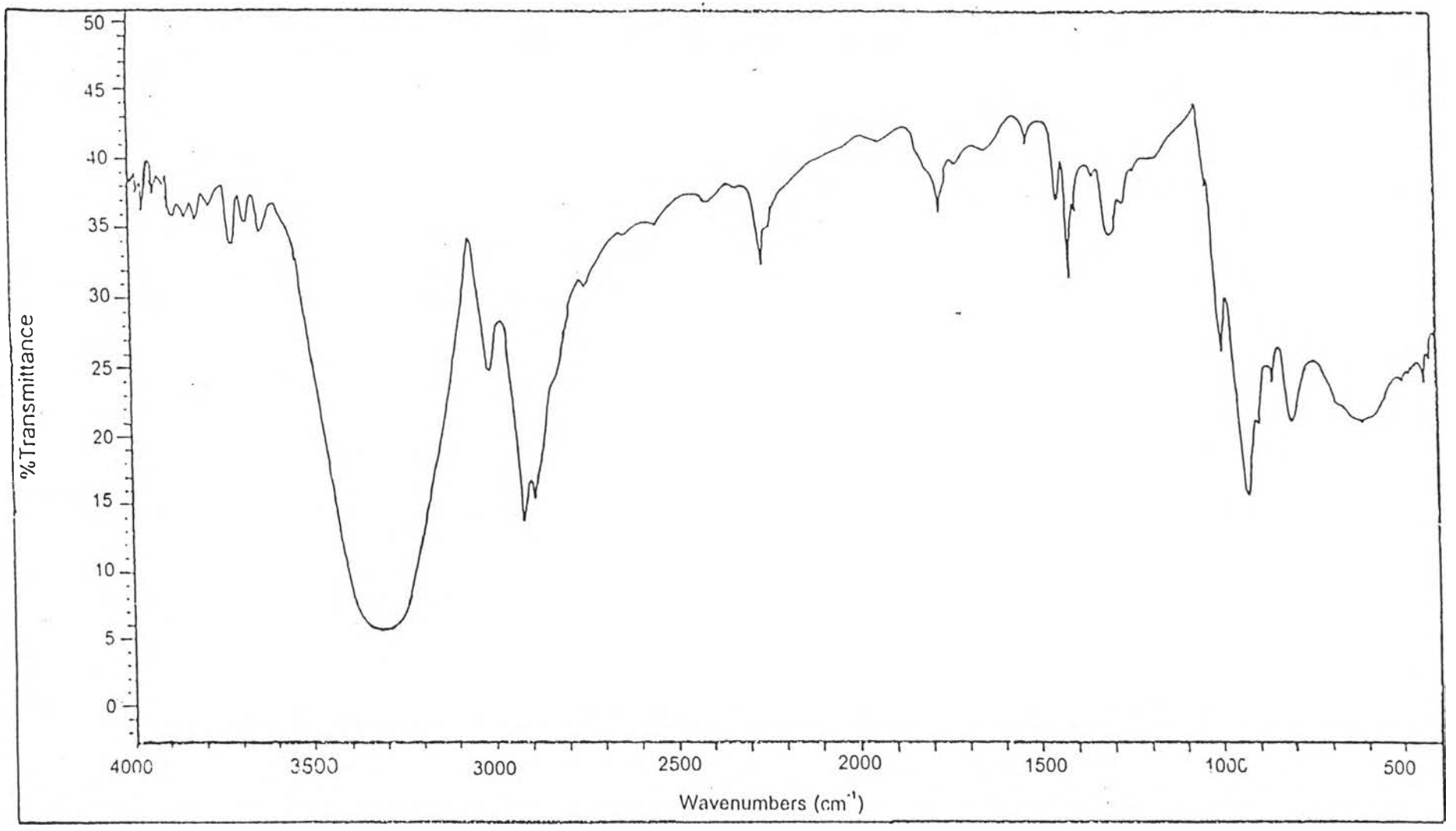


Figure B-1 FT-IR spectrum of PVA film.

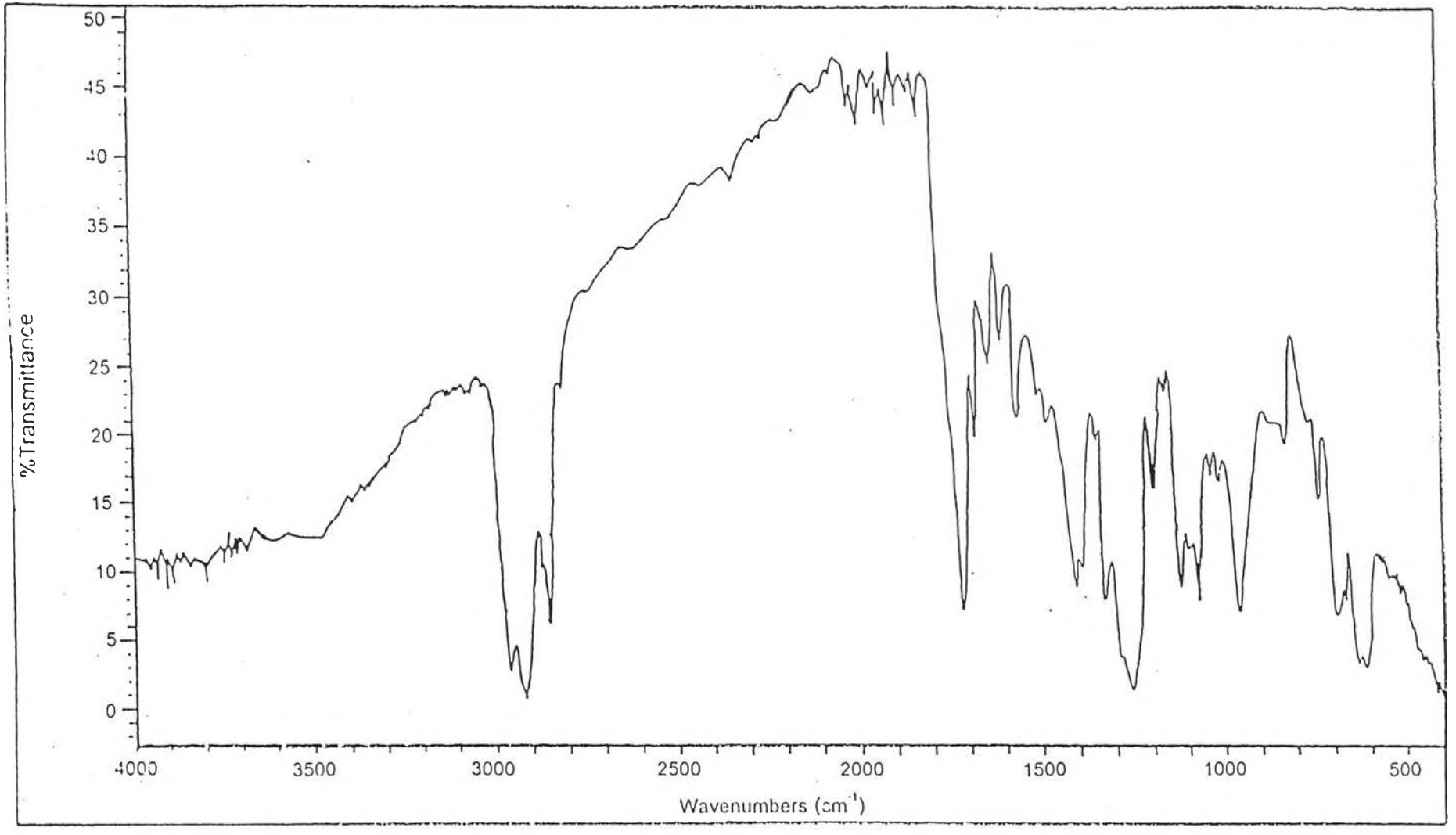


Figure B-2 FT-IR spectrum of PVC film.

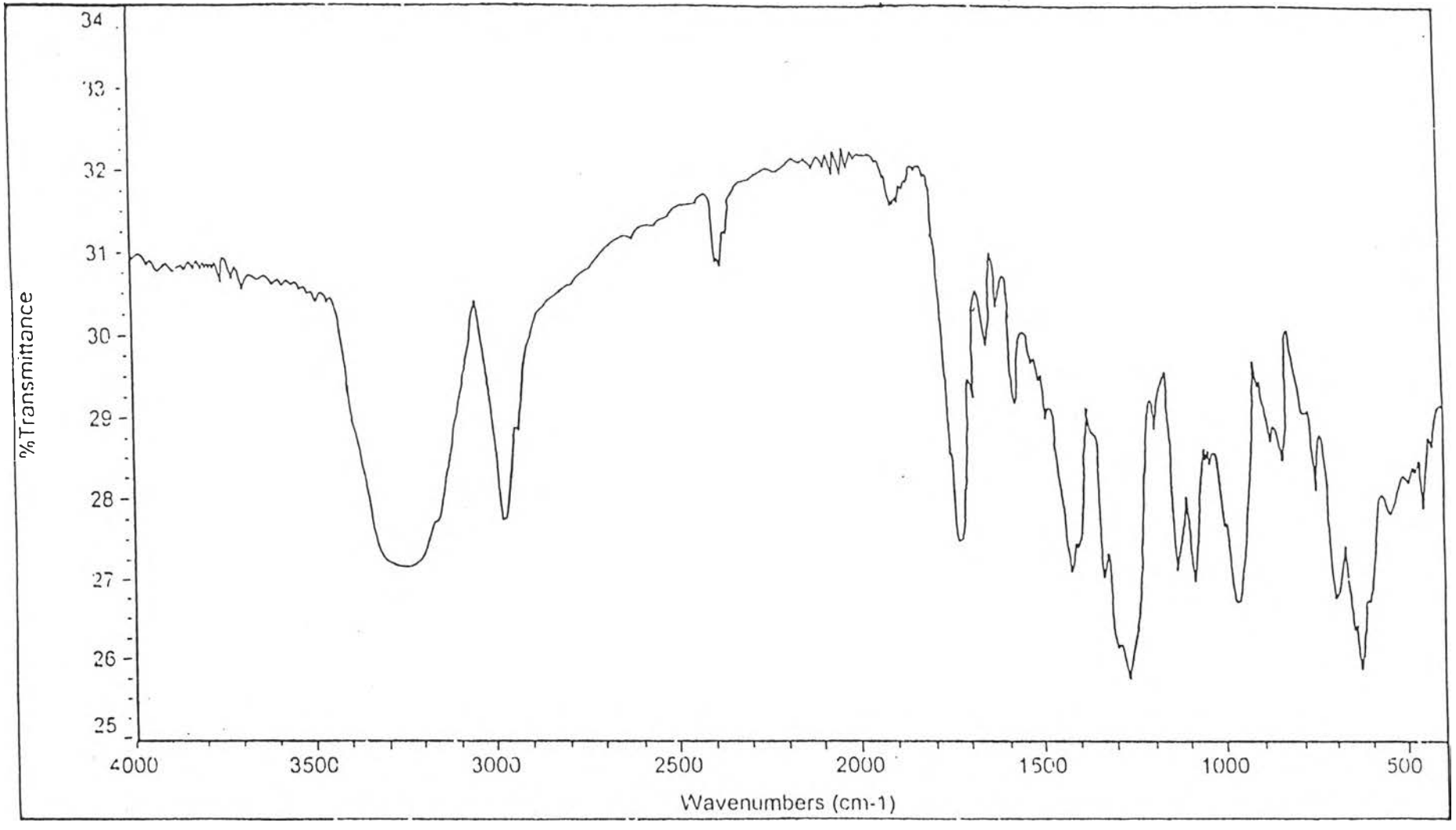


Figure B-3 FT-IR spectrum of PP film.

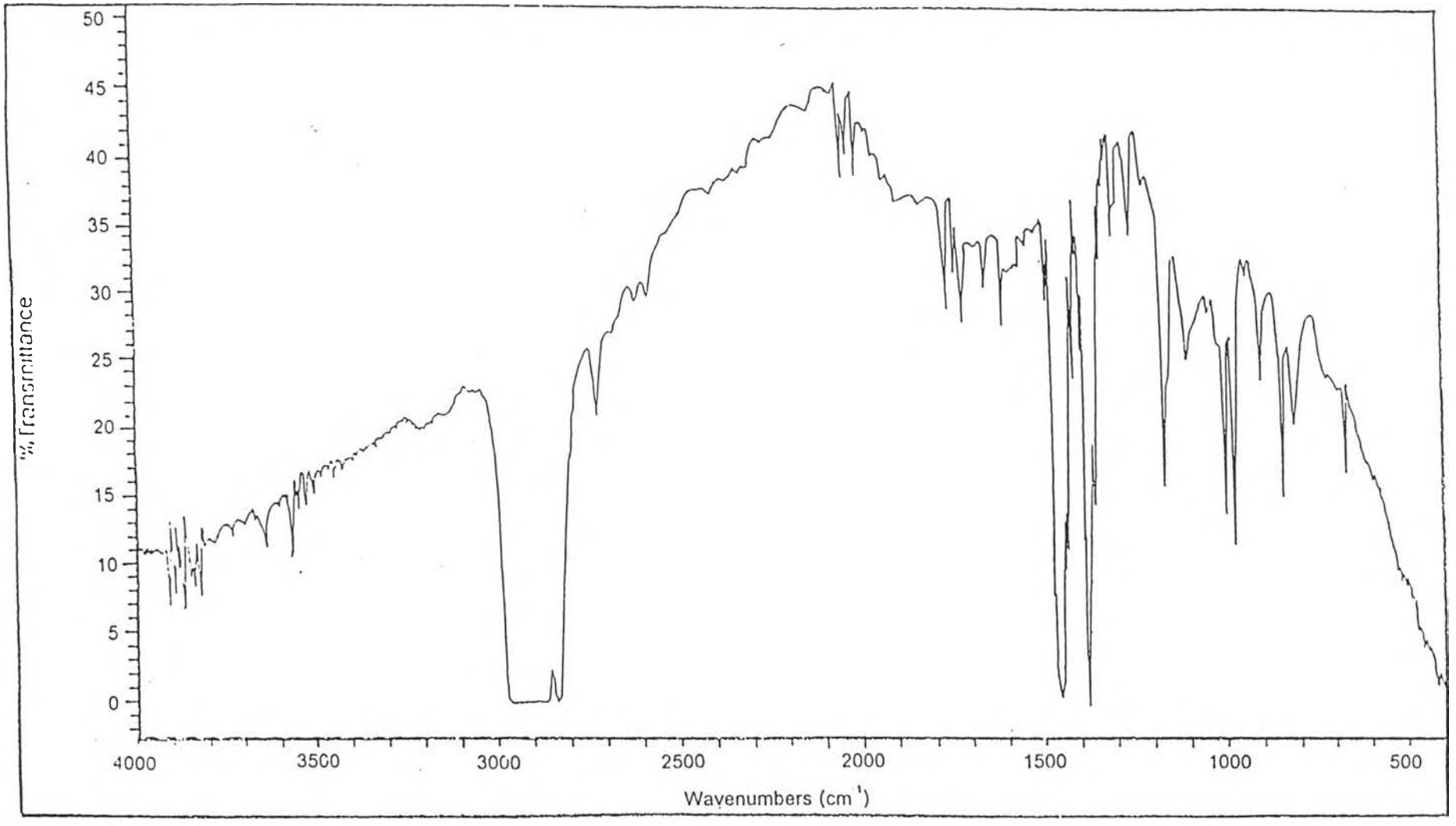


Figure B-4 FT-IR spectrum of LDPE film.

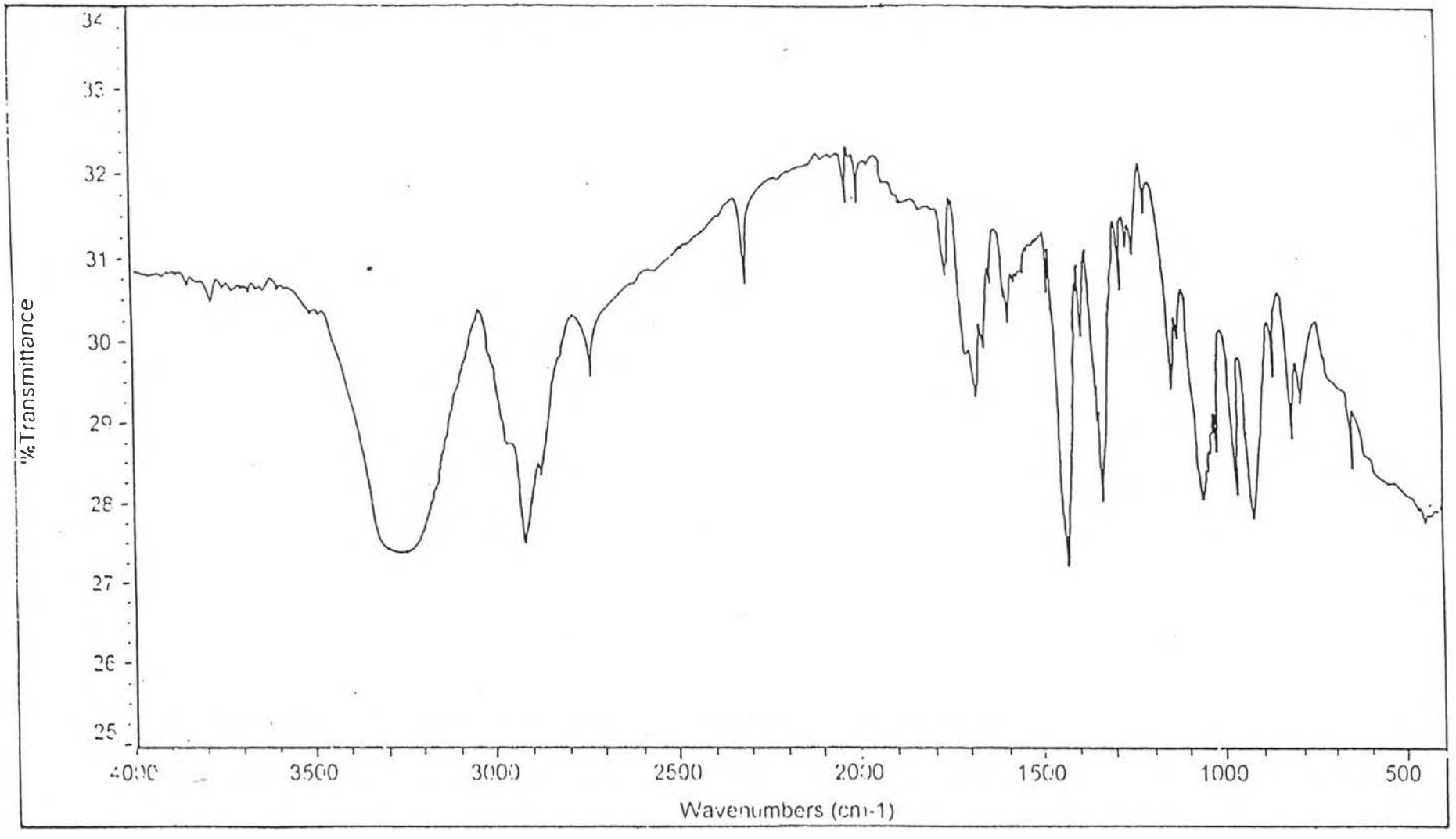


Figure B-5 FT-IR spectrum of PVC/25%$FeCl_3$ film @ -15^{0}C.

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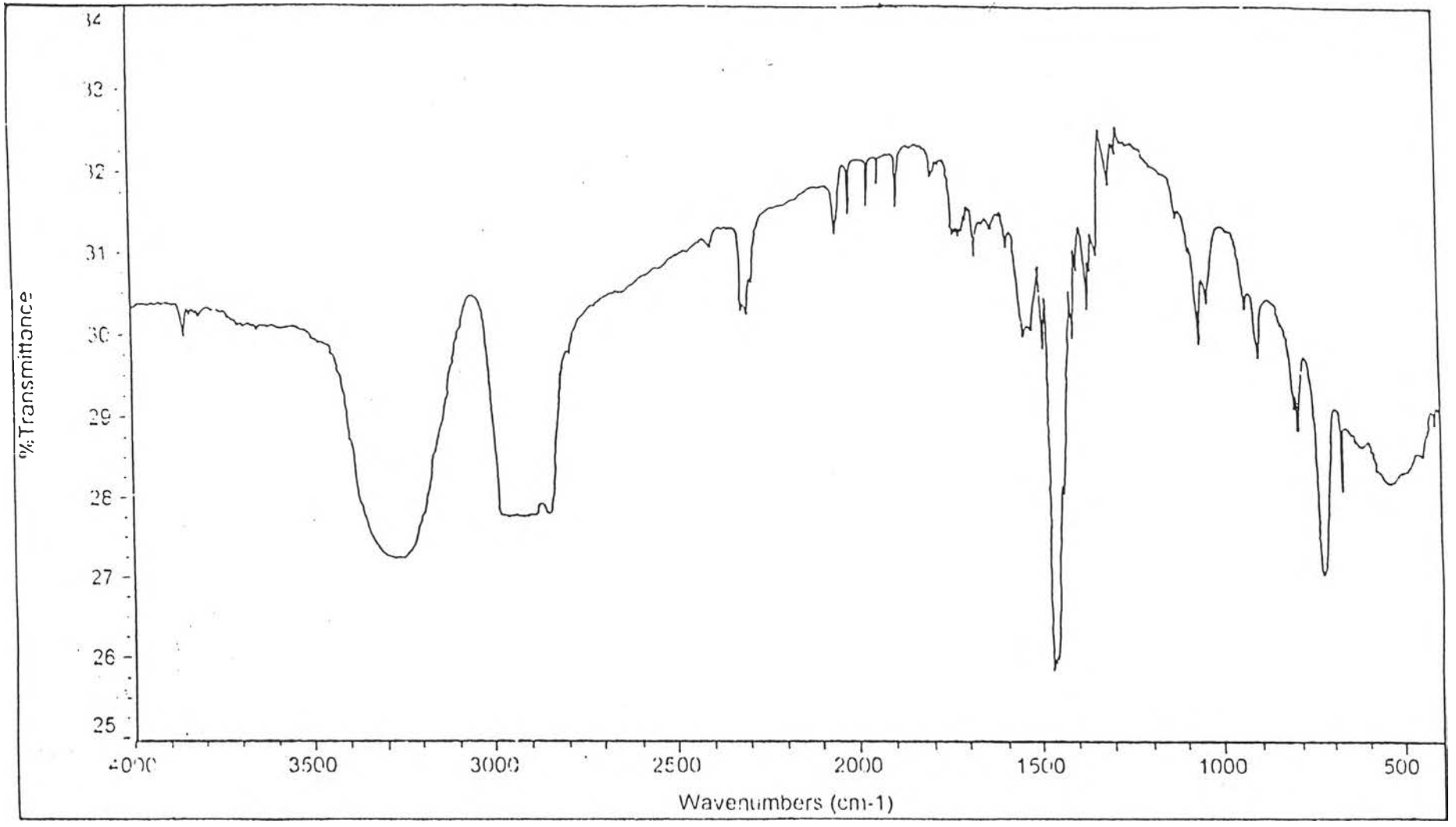


Figure B-7 FT-IR spectrum of LDPE/25%$FeCl_3$ film @ -15^{0}C.

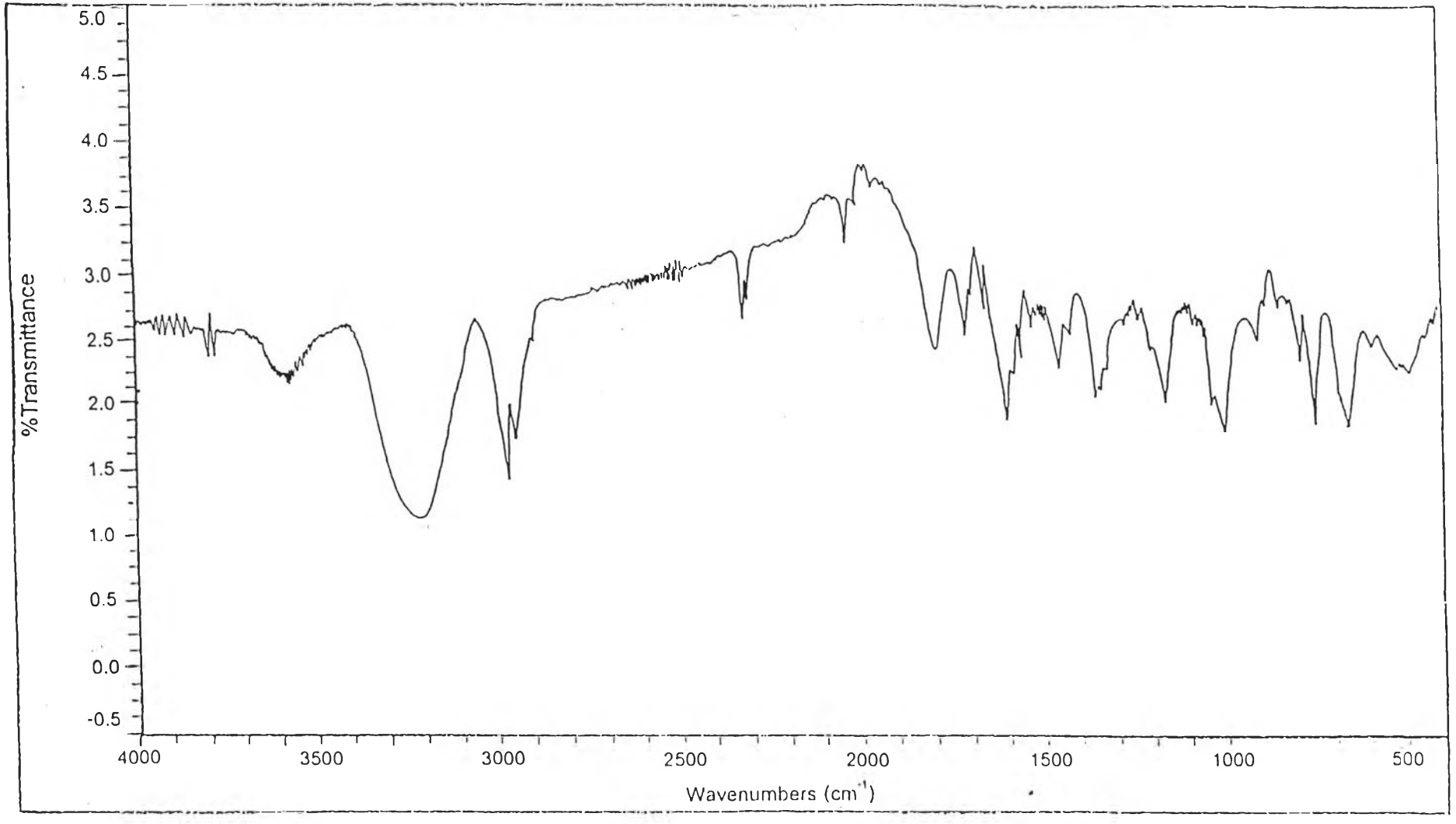


Figure B-8 FT-IR spectrum of PVC/PPY film from 25%$FeCl_3$, 5%pyrrole, @ -15^{0}C and 10 hours for polymerization.

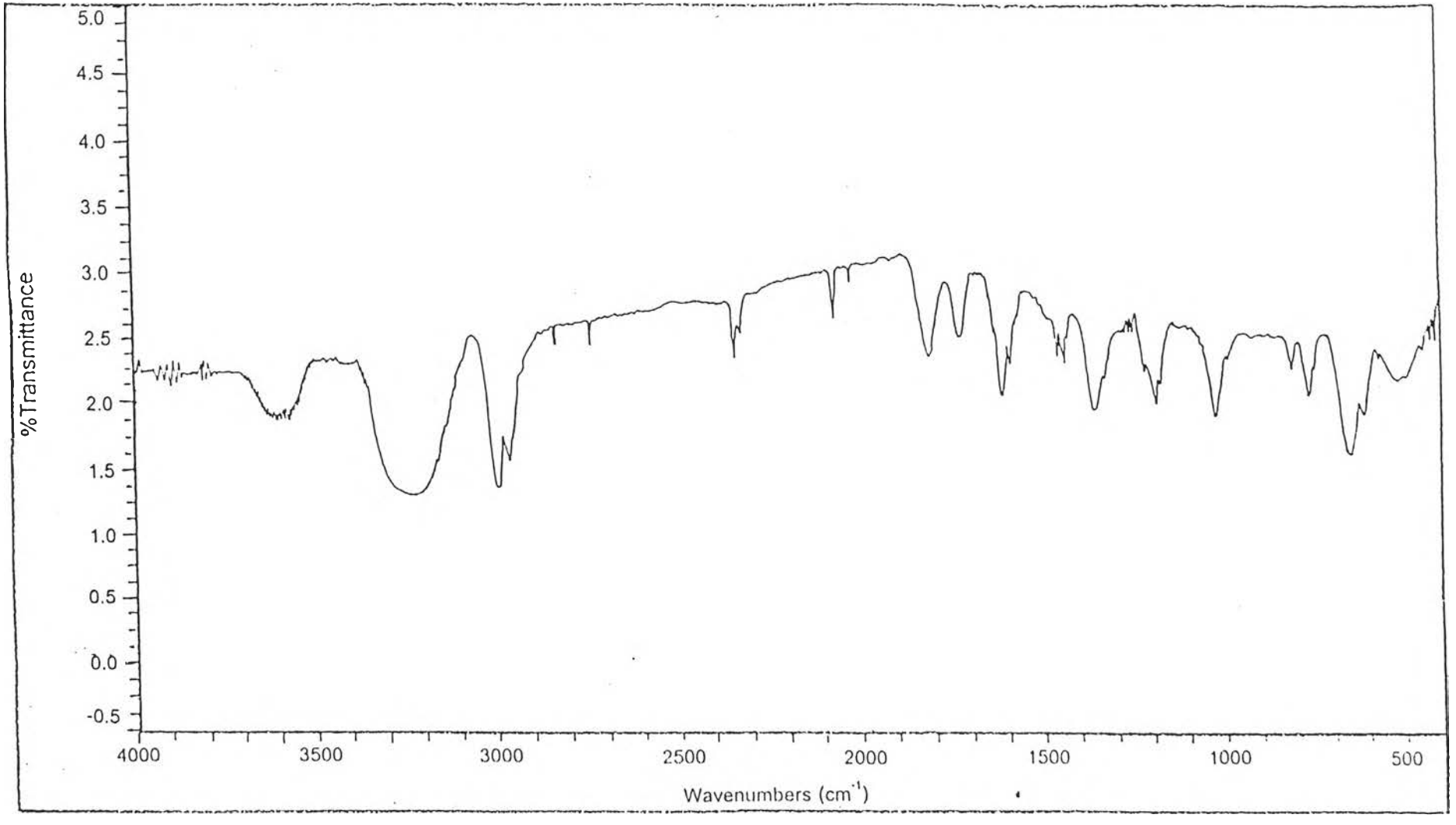


Figure B-9 FT-IR spectrum of PVC/PPY film from 25%$FeCl_3$, 10%pyrrole, @ -15^{0}C and 10 hours for polymerization.

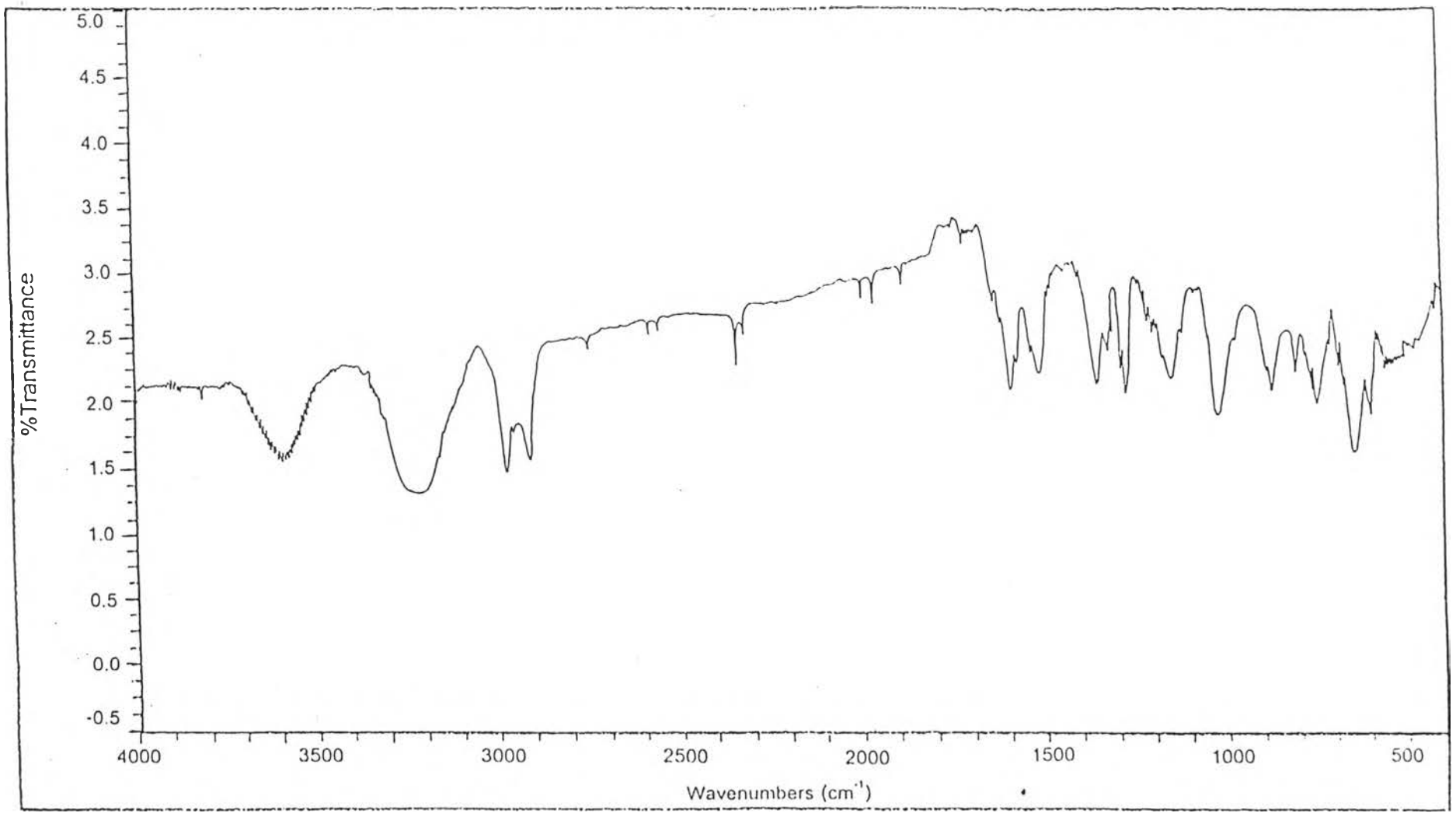


Figure B-10 FT-IR spectrum of PVC/PPY film from 25%$FeCl_3$, 15%pyrrole, @ -15^{0}C and 10 hours for polymerization.

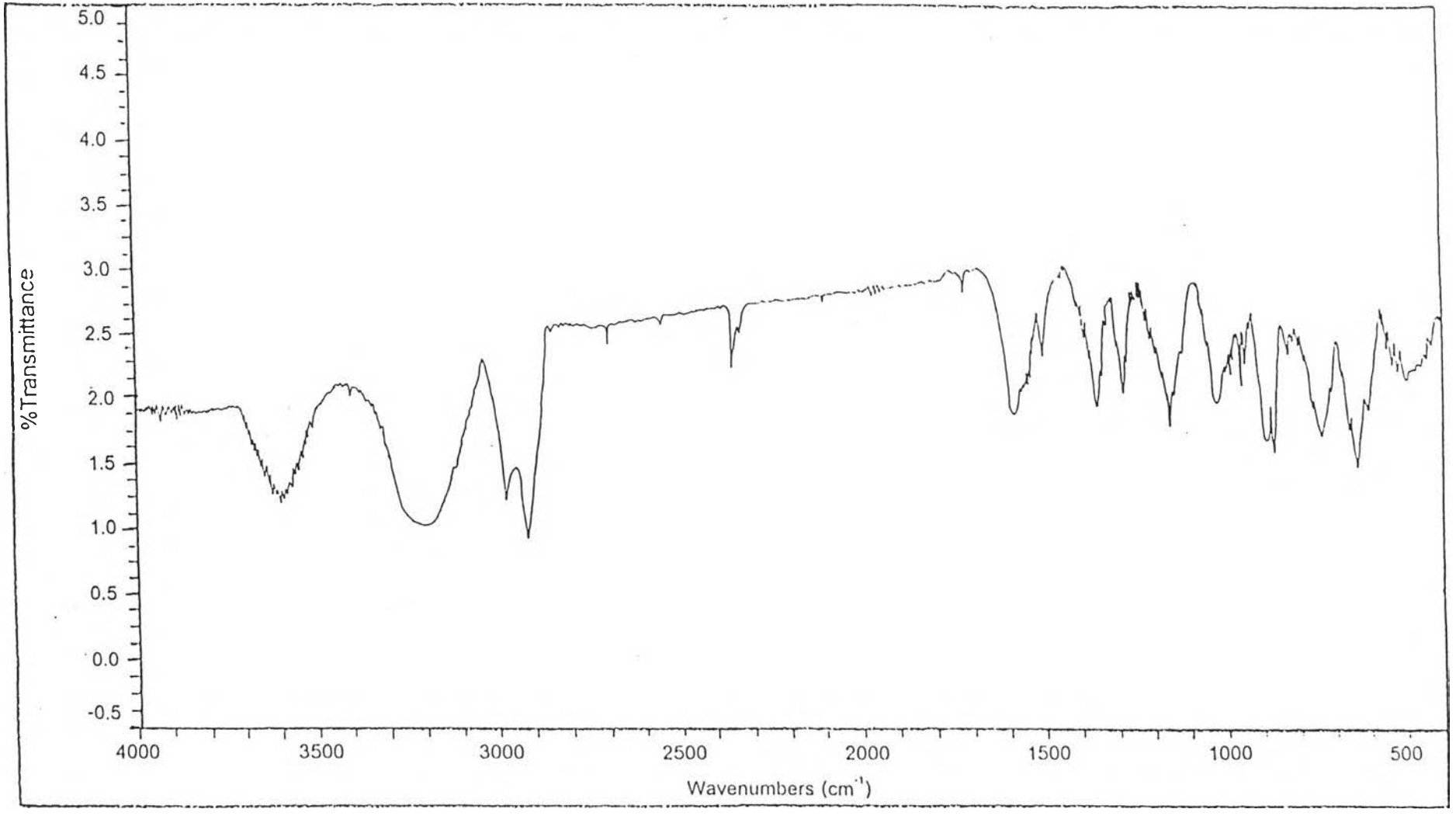


Figure B-11 FT-IR spectrum of PVC/PPY film from 25%$FeCl_3$, 20%pyrrole, @ -15^{0}C and 10 hours for polymerization.

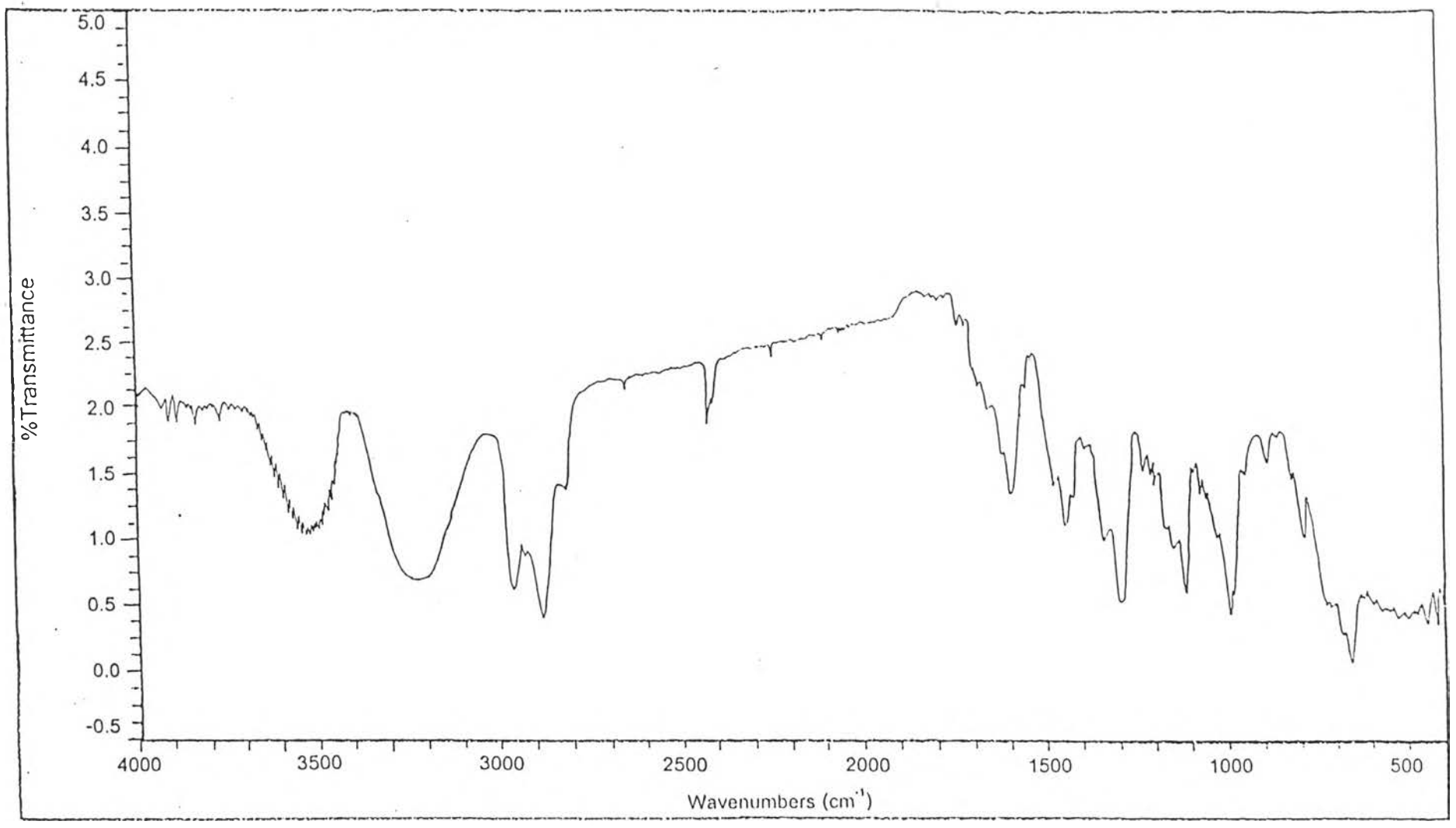


Figure B-12 FT-IR spectrum of PVC/PPY film from 25%$FeCl_3$, 25%pyrrole, @ -15^{0}C and 10 hours for polymerization.

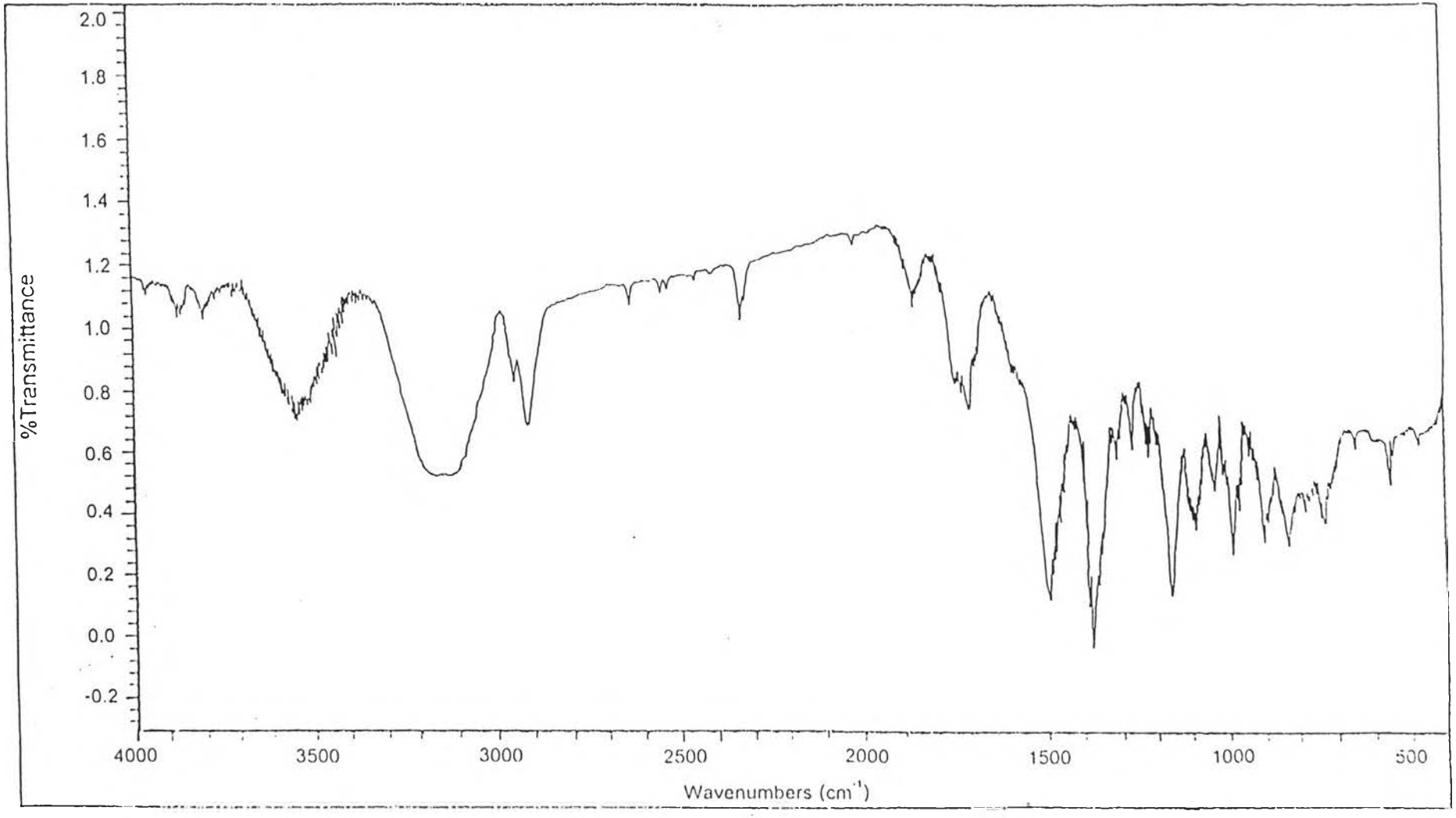


Figure B-13 FT-IR spectrum of PP/PPY film from 25%$FeCl_3$, 25%pyrrole, @ -15^{0}C and 15 hours for polymerization.

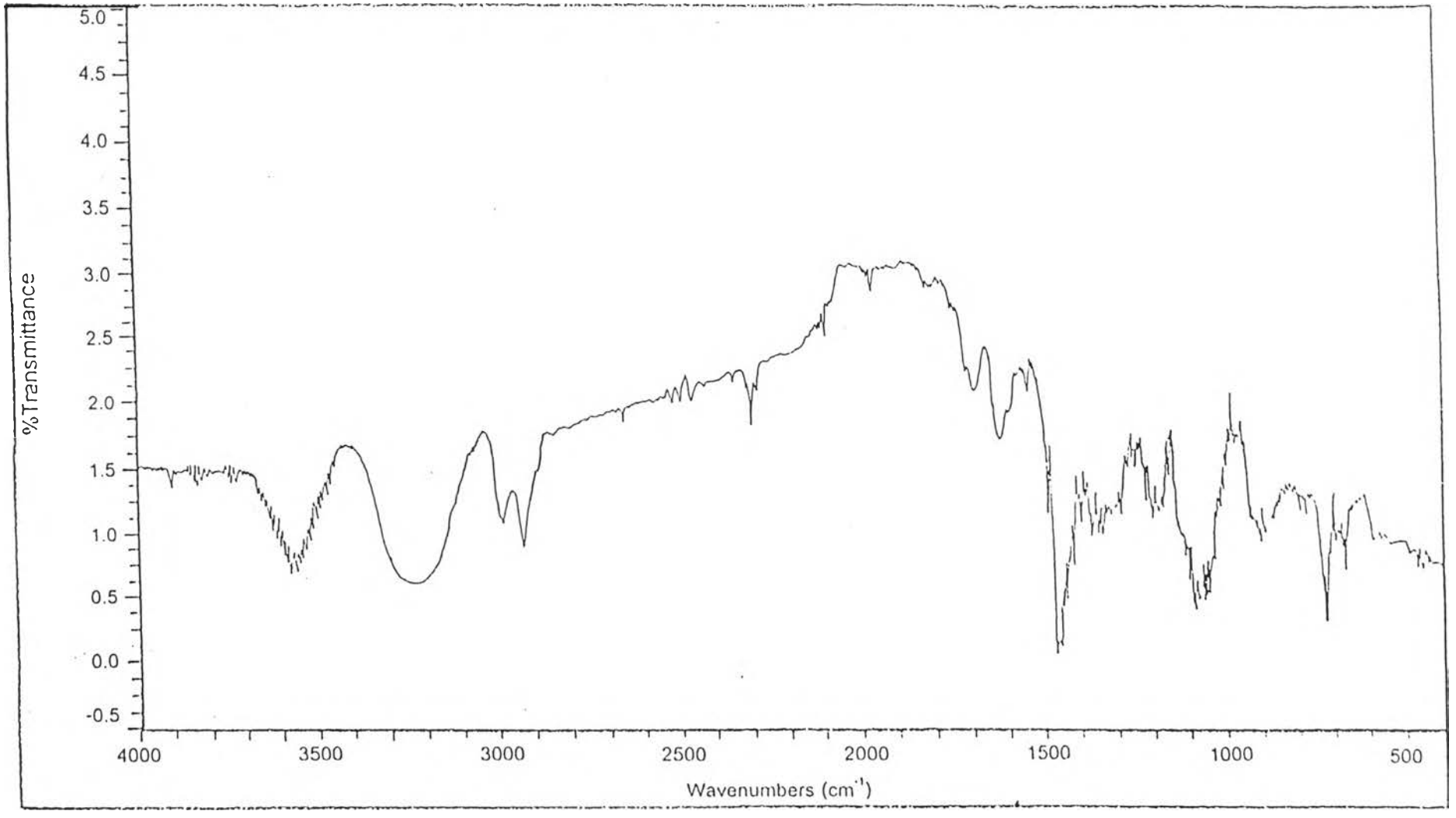


Figure B-14 FT-IR spectrum of LDPE/PPY film from 25%$FeCl_3$, 25%pyrrole, @ -15^{0}C and 10 hours for polymerization.

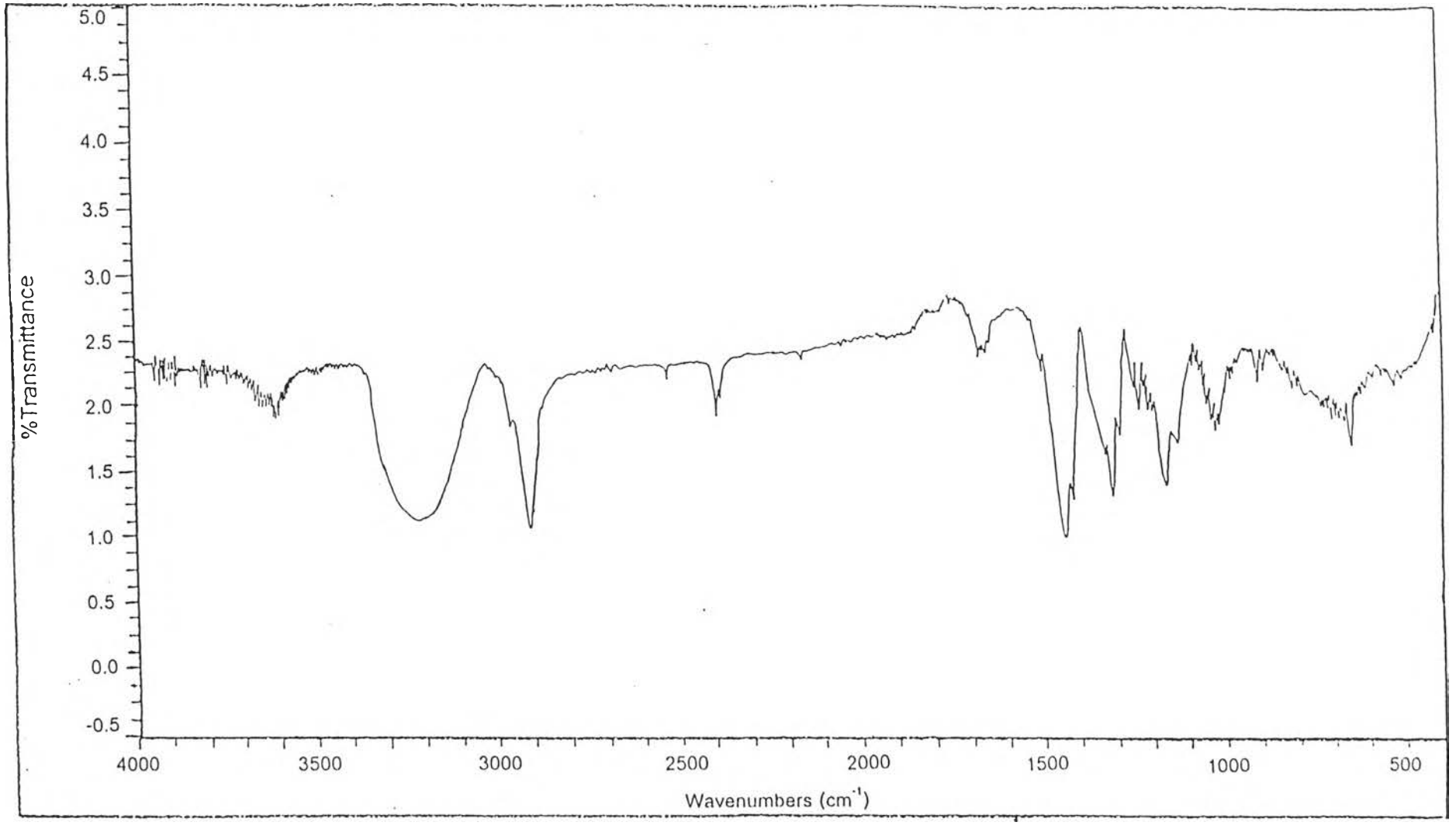


Figure B-15 FT-IR spectrum of PVC/PPY film from 25%$FeCl_3$, 25%pyrrole, @ -15^{0}C and 5 hours for polymerization.

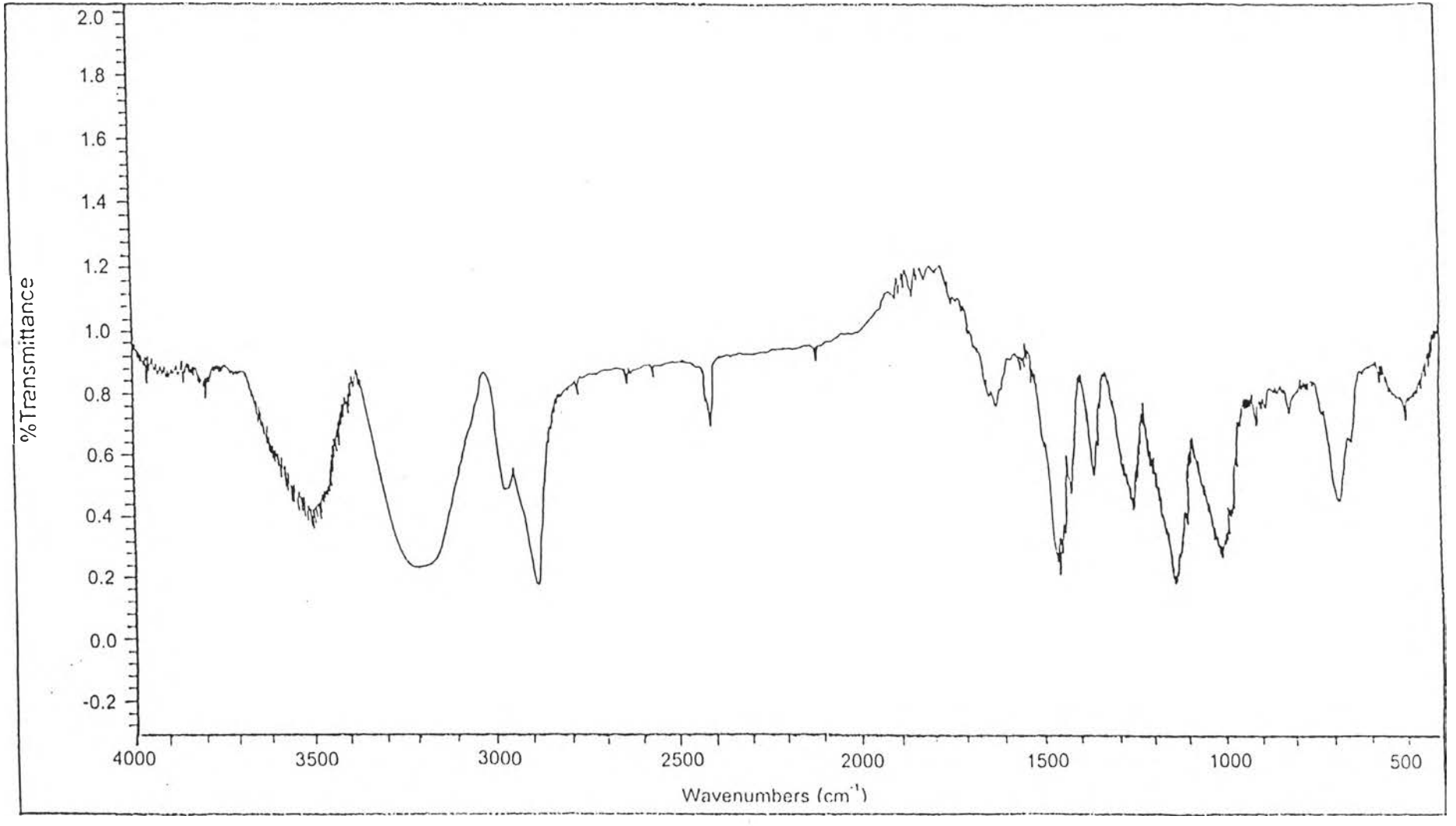


Figure B-16 FT-IR spectrum of PVC/PPY film from 25%$FeCl_3$, 25%pyrrole, @ -15^{0}C and 15 hours for polymerization.

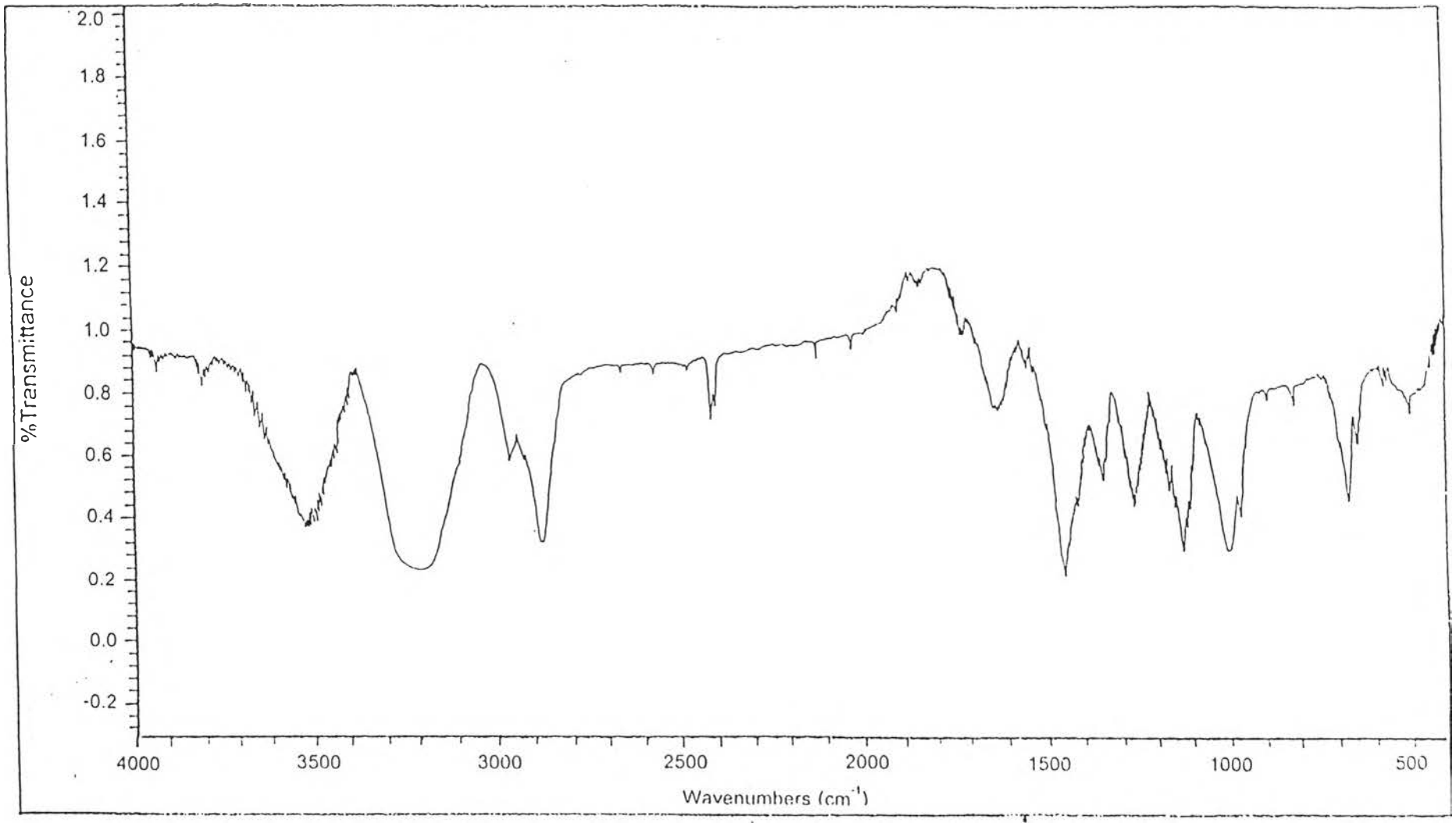


Figure B-17 FT-IR spectrum of PVC/PPY film from 25%$FeCl_3$, 25%pyrrole, @ -15^{0}C and 20 hours for polymerization.

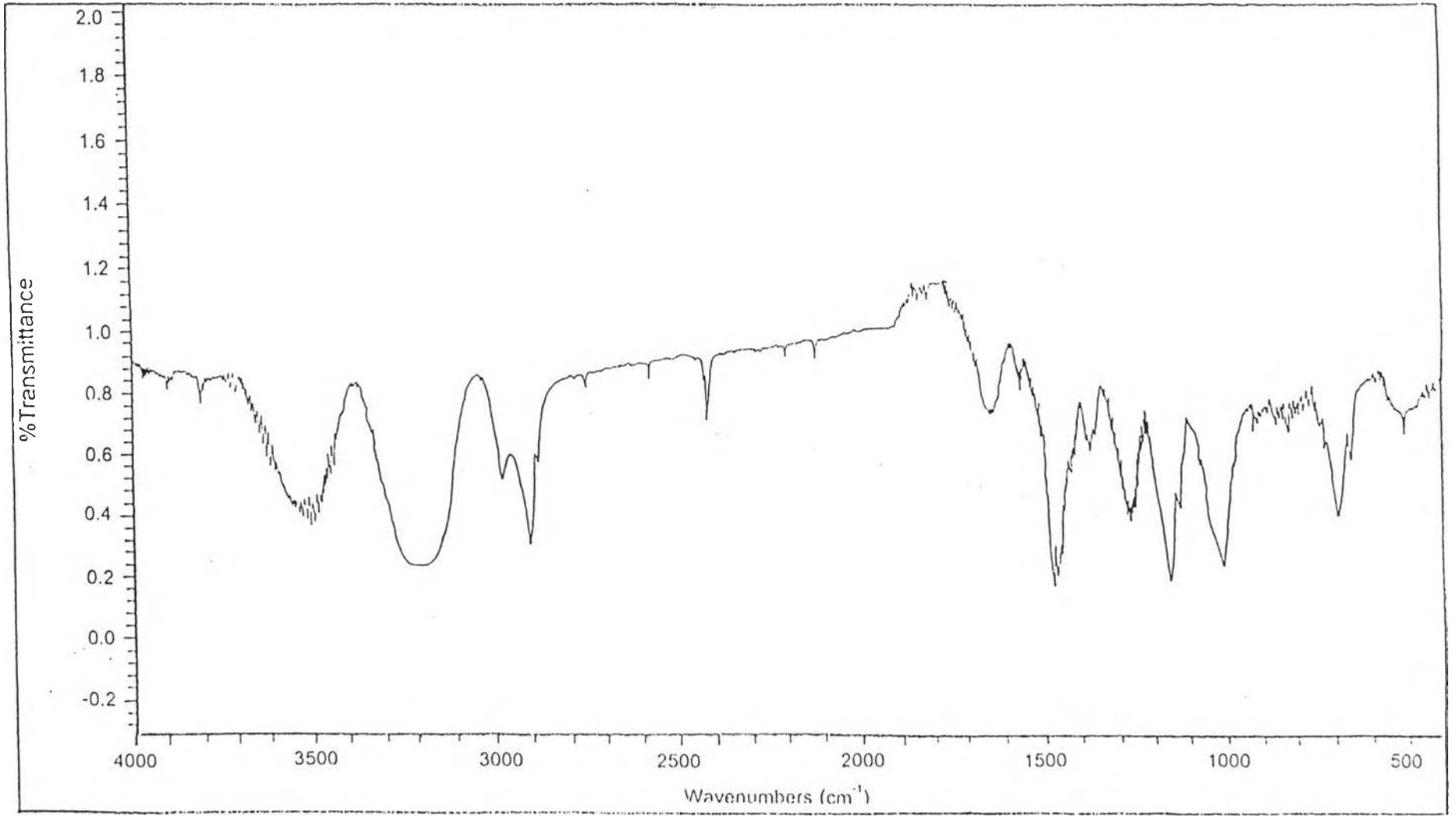


Figure B-18 FT-IR spectrum of PVC/PPY film from 25%$FeCl_3$, 25%pyrrole, @ -15^{0}C and 25 hours for polymerization.

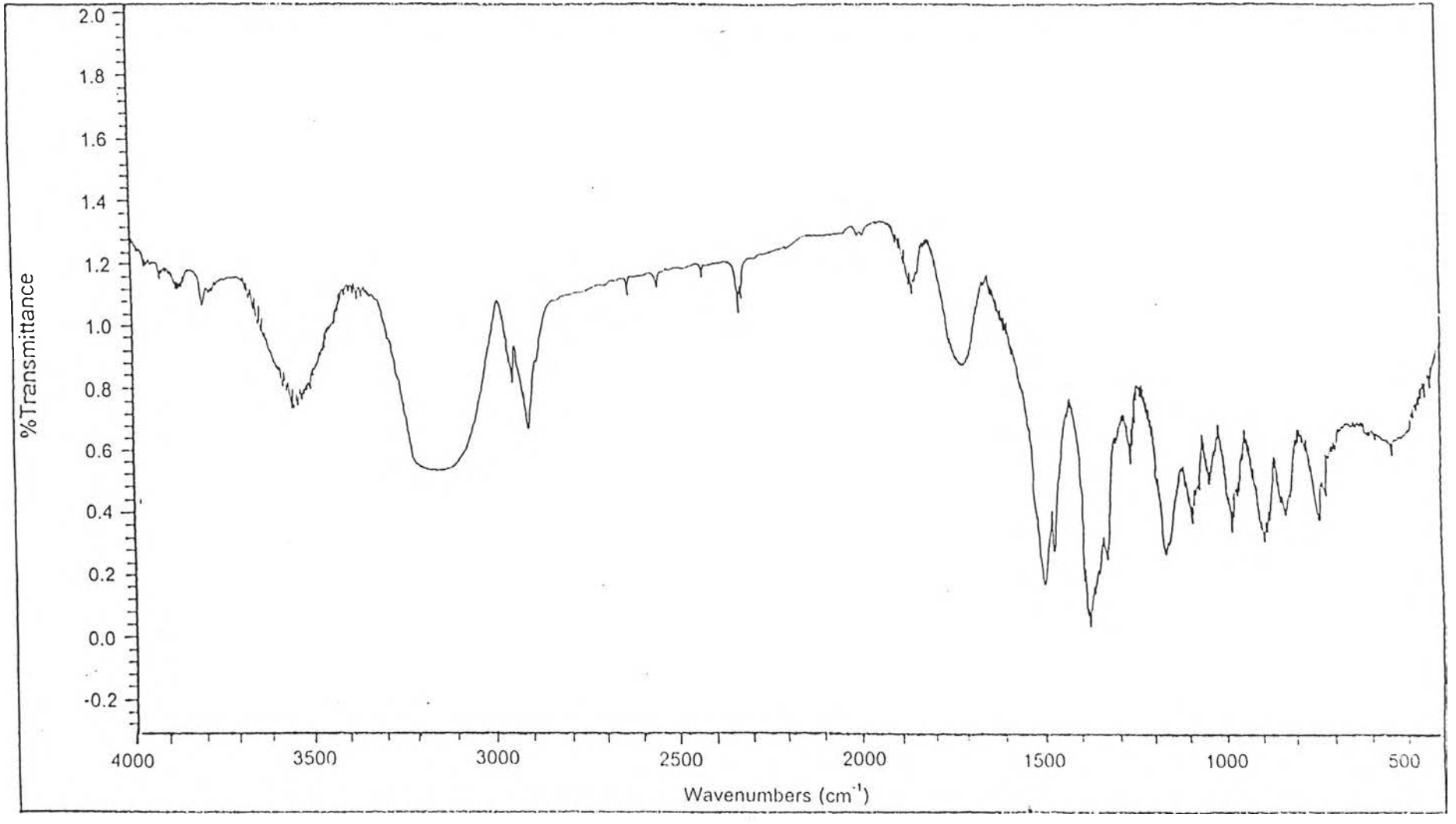


Figure B-19 FT-IR spectrum of PP/PPY film from 25%$FeCl_3$, 25%pyrrole, @ -15^{0}C and 20 hours for polymerization.

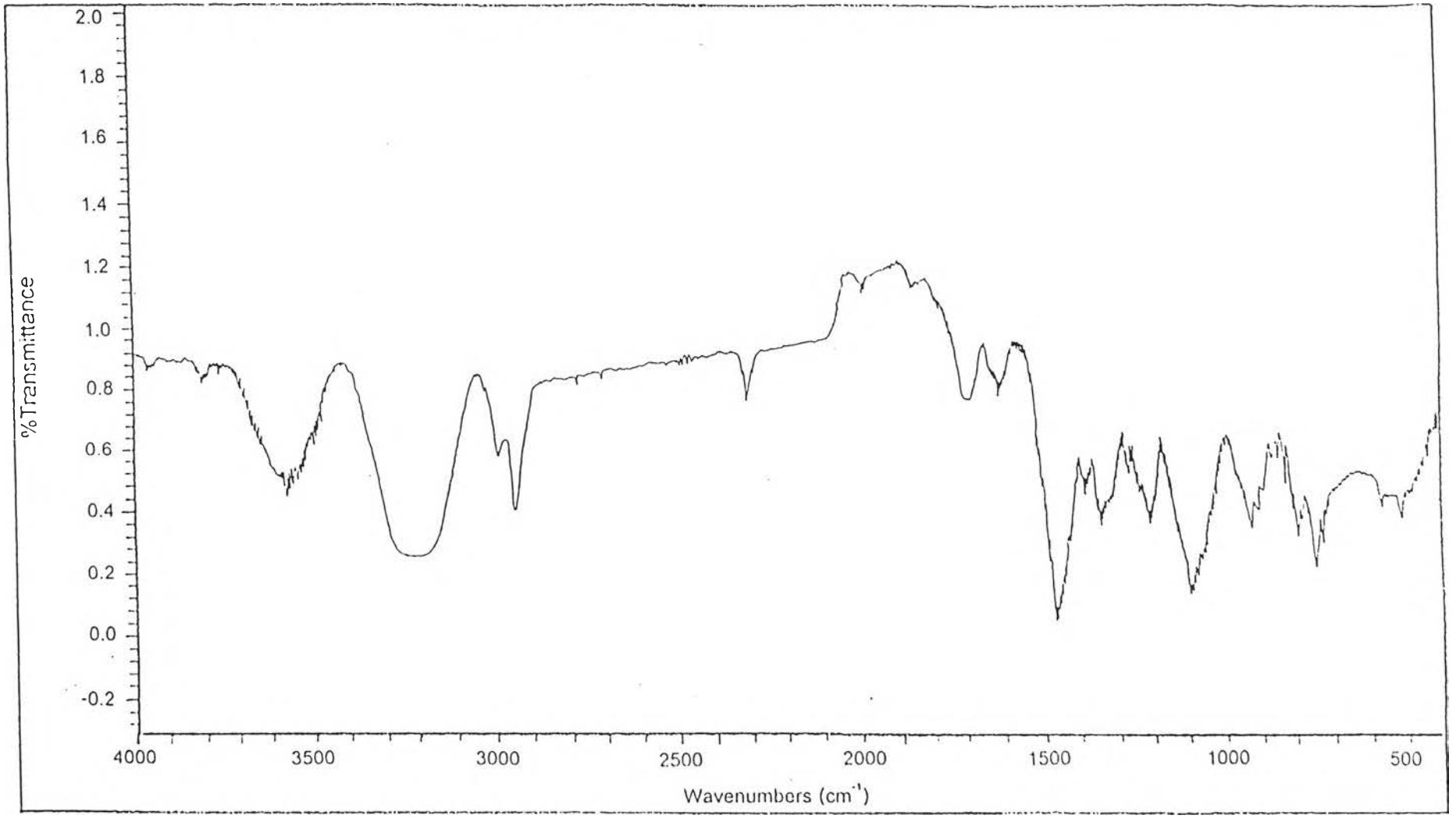


Figure B-20 FT-IR spectrum of LDPE/PPY film from 25%$FeCl_3$, 25%pyrrole, @ -15^{0}C and 20 hours for polymerization.

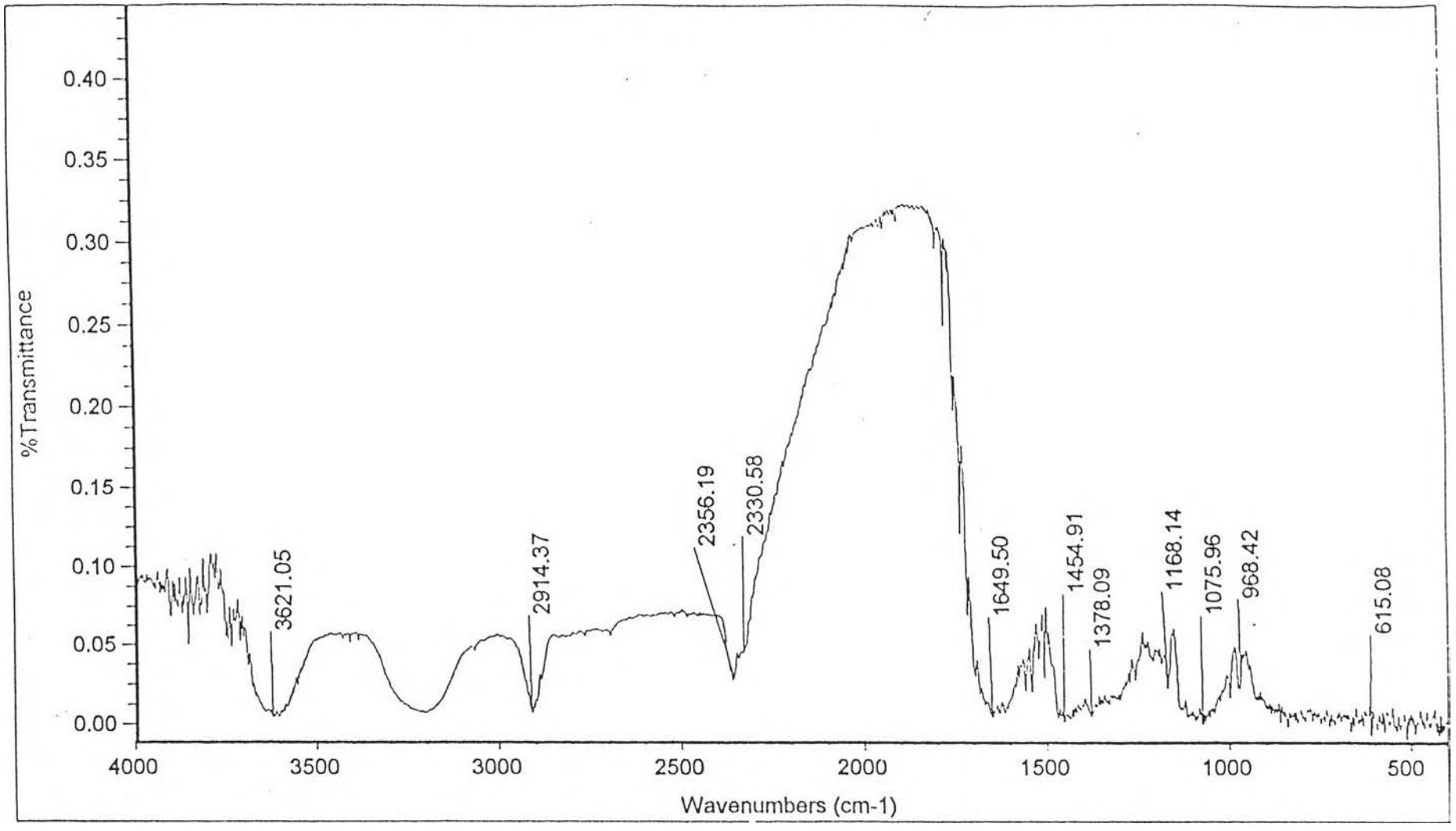


Figure B-21 FT-IR spectrum of PP/PPY film from 25%$FeCl_3$, 25%pyrrole, @ -15^{0}C, 20 hours for polymerization and 30 minutes iodine doping time @ 30^{0}C.

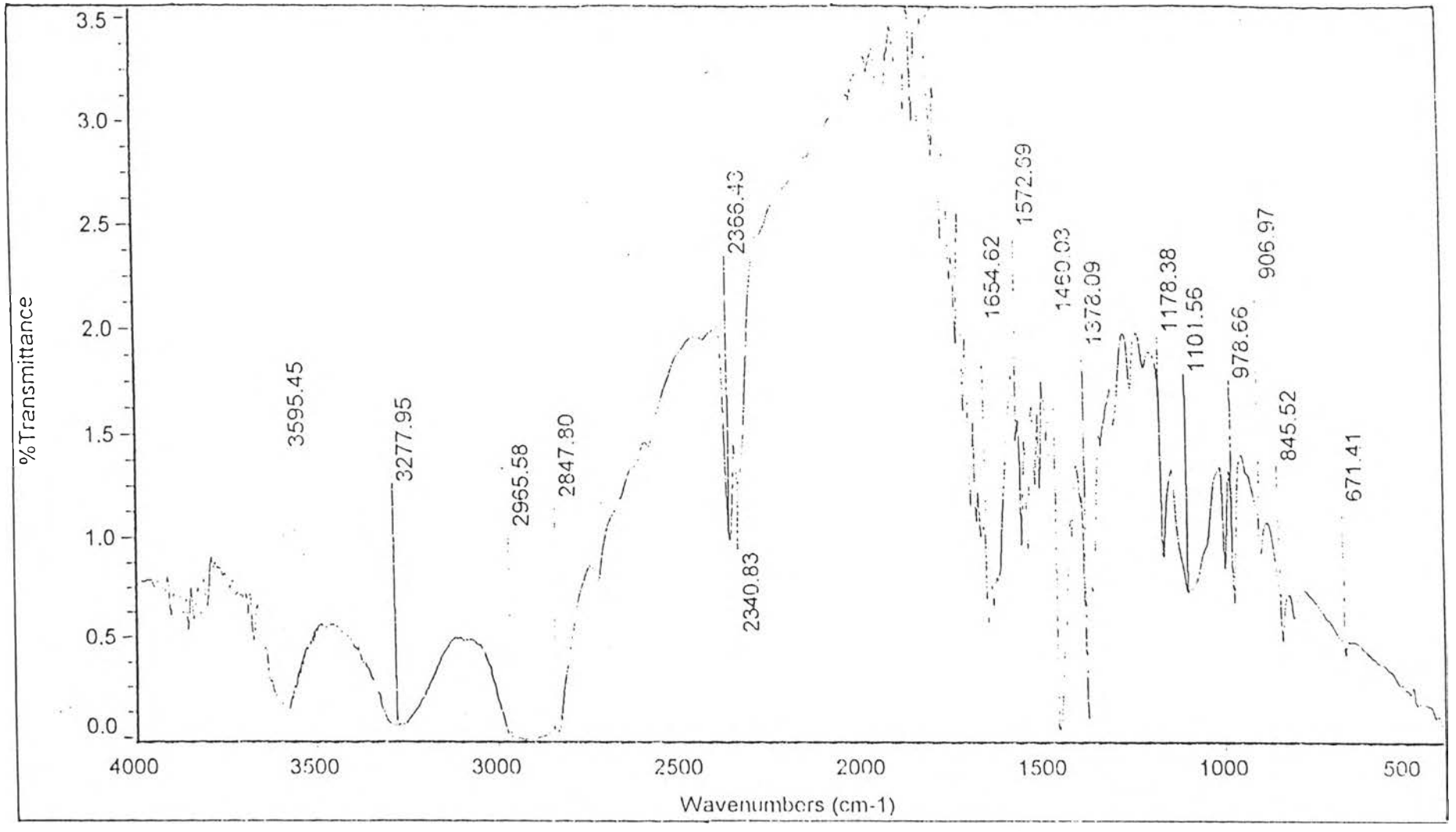


Figure B-22 FT-IR spectrum of PP/PPY film from 25%$FeCl_3$, 25%pyrrole, @ -15°C, 20 hours for polymerization and 60 minutes iodine doping time @ 30°C

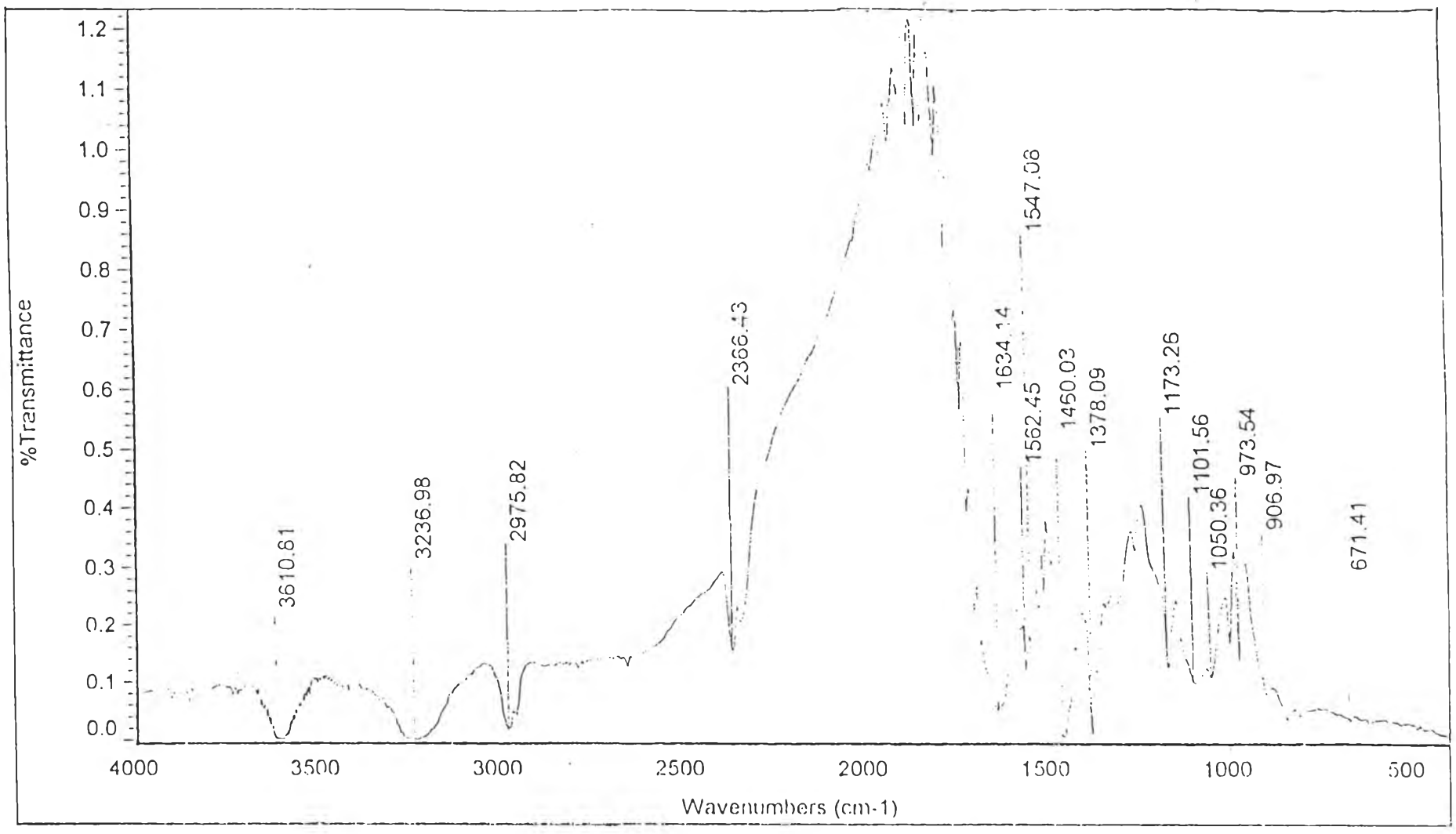


Figure B-23 FT-IR spectrum of PP/PPY film from 25%$FeCl_3$, 25%pyrrole, @ -15^{0}C, 20 hours for polymerization and 90 minutes iodine doping time @ 30^{0}C.

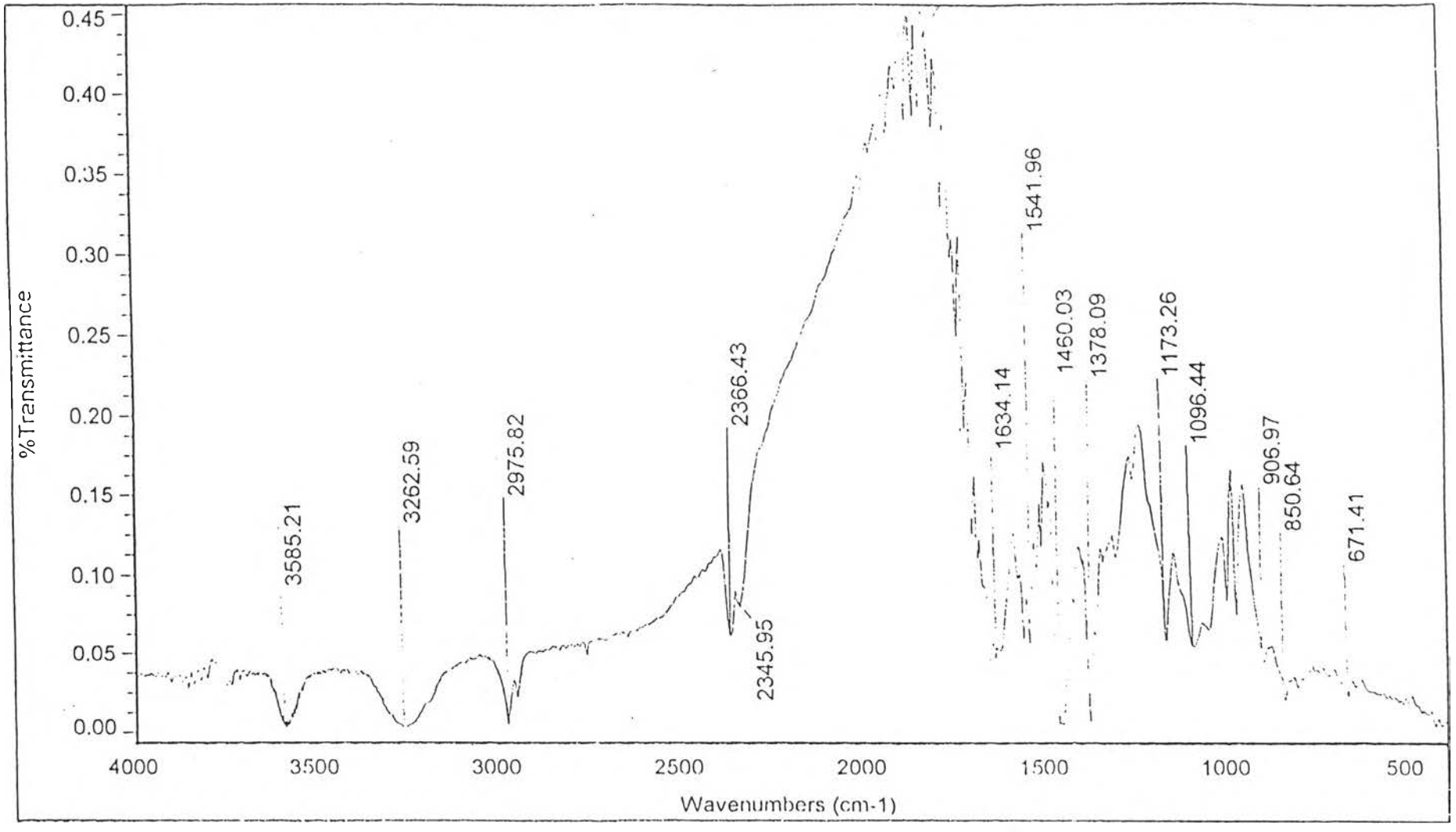


Figure B-24 FT-IR spectrum of PP/PPY film from 25%$FeCl_3$, 25%pyrrole, @ -15^{0}C, 20 hours for polymerization and 120 minutes iodine doping time @ 30°C

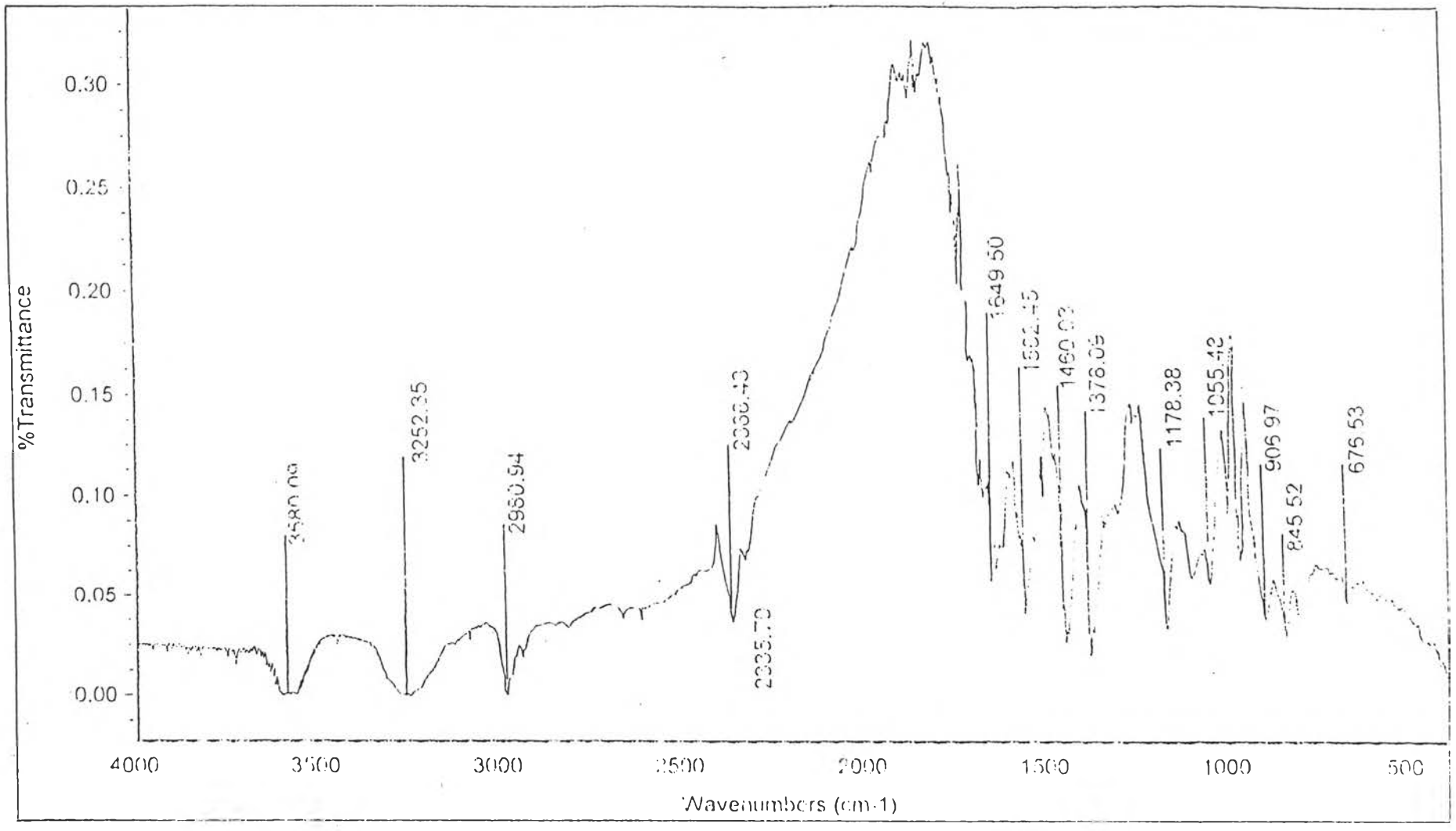


Figure B-25 FT-IR spectrum of PP/PPY film from 25%$FeCl_3$, 25%pyrrole, @ -15^{0}C, 20 hours for polymerization and 60 minutes iodine doping time @ -15^{0}C.

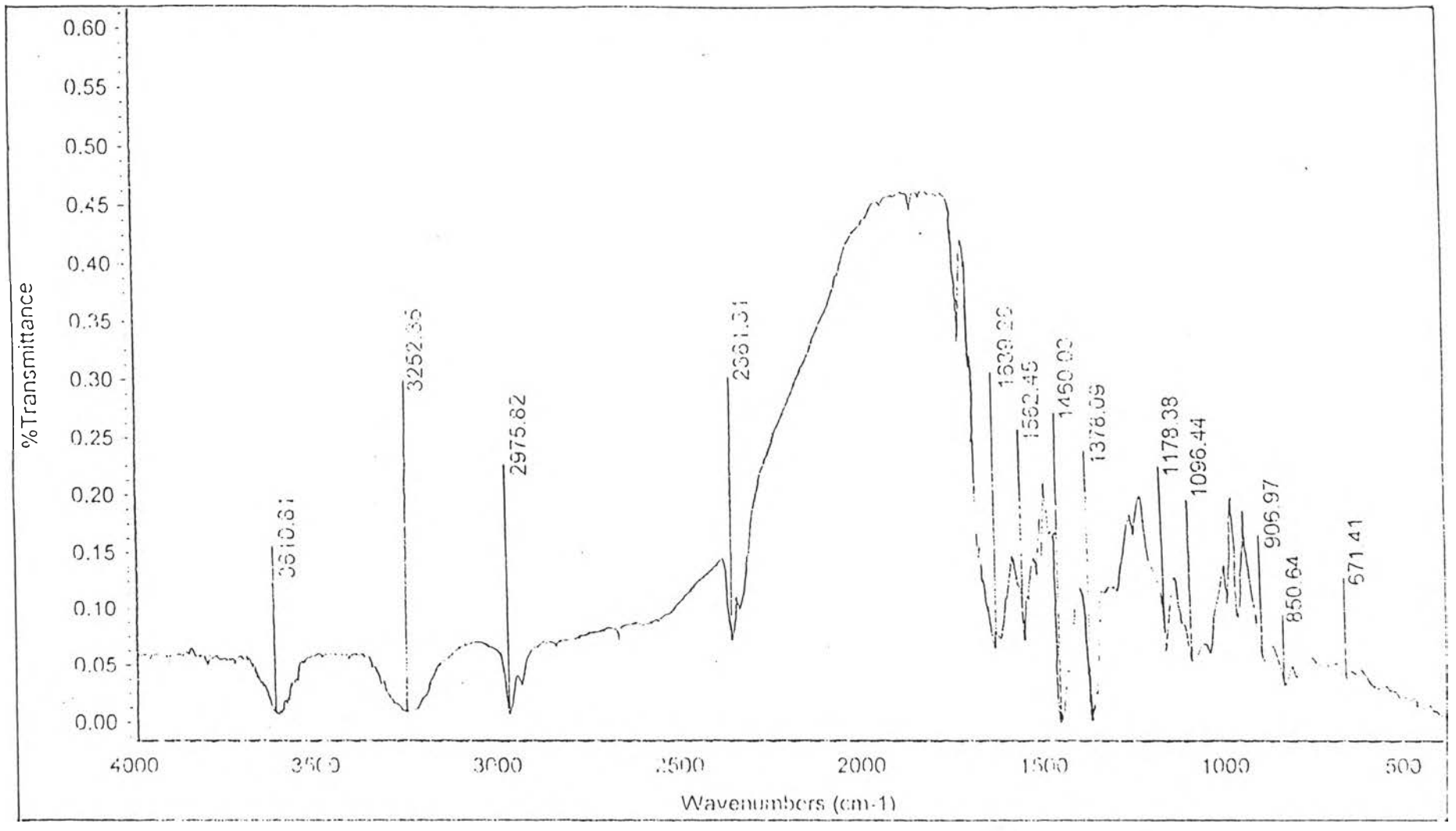


Figure B-26 FT-IR spectrum of PP/PPY film from 25%$FeCl_3$, 25%pyrrole, @ -15^{0}C, 20 hours for polymerization and 30 minutes iodine doping time @ 70^{0}C.

Appendix C

Optical micrograph of film's surface magnified at 100 times.

Figure C-1 PVC/PPY from 25%$FeCl_3$, 25%pyrrole, at-15°C and 20 hrs. for polymerization.

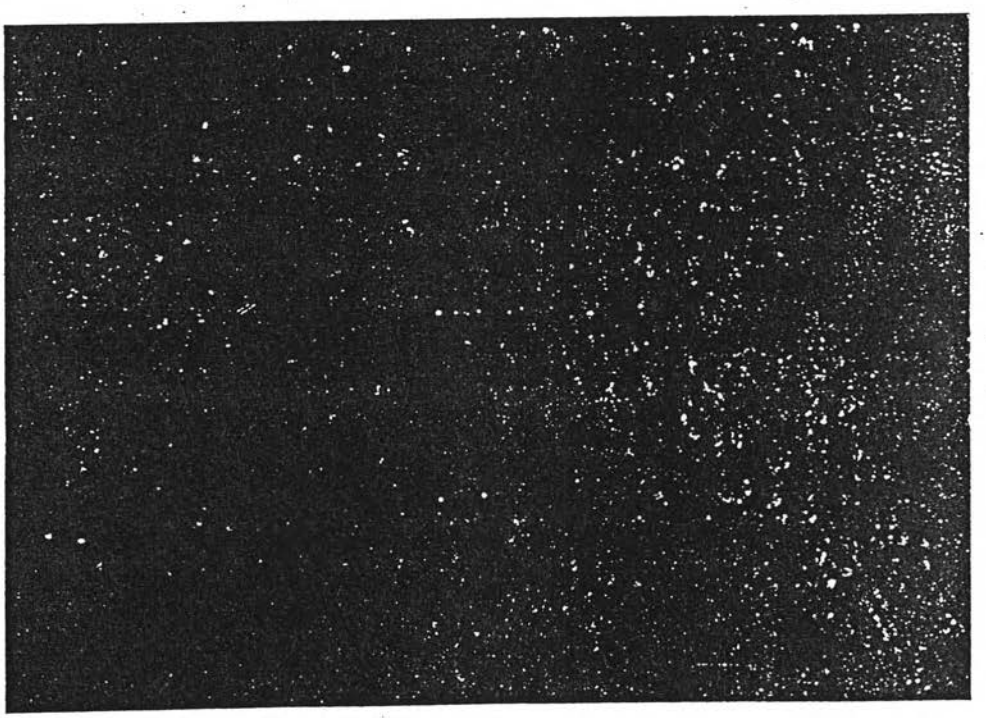


Figure C-2 PP/PPY from 25%$FeCl_3$, 25%pyrrole, at-15°C and 20 hrs. for polymerization.

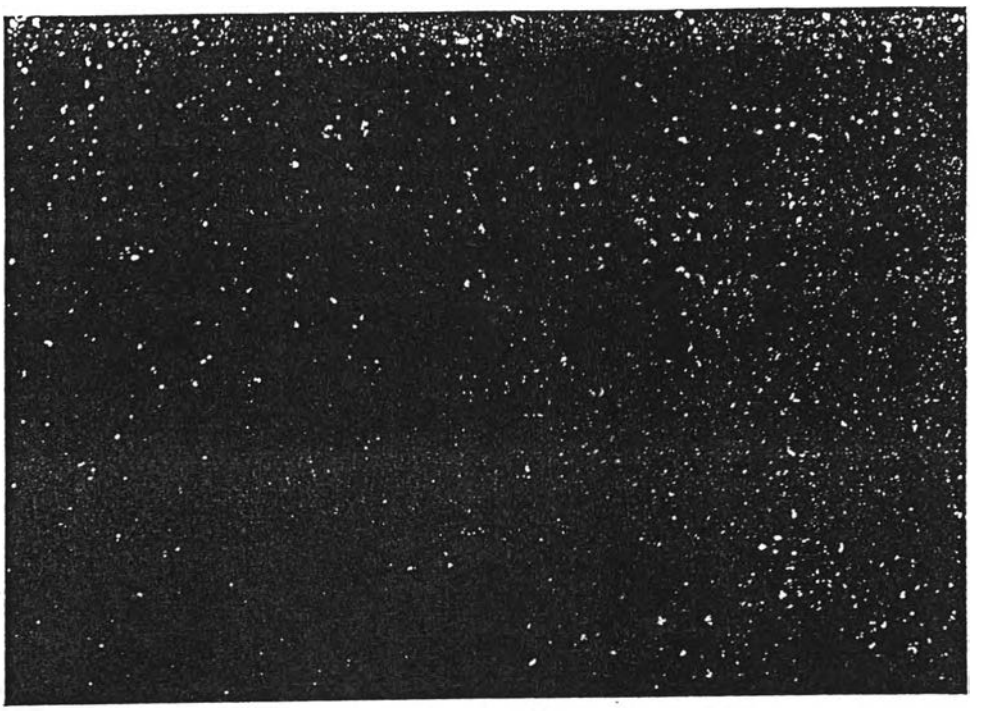


Figure C-3 LDPE/PPY from 25%$FeCl_3$, 25%pyrrole, at-15°C and 20 hrs. for polymerization.

Figure C-4 PVC/PPY from 25%$FeCl_3$, 25%pyrrole, at 30°C and 20 hrs. for polymerization.

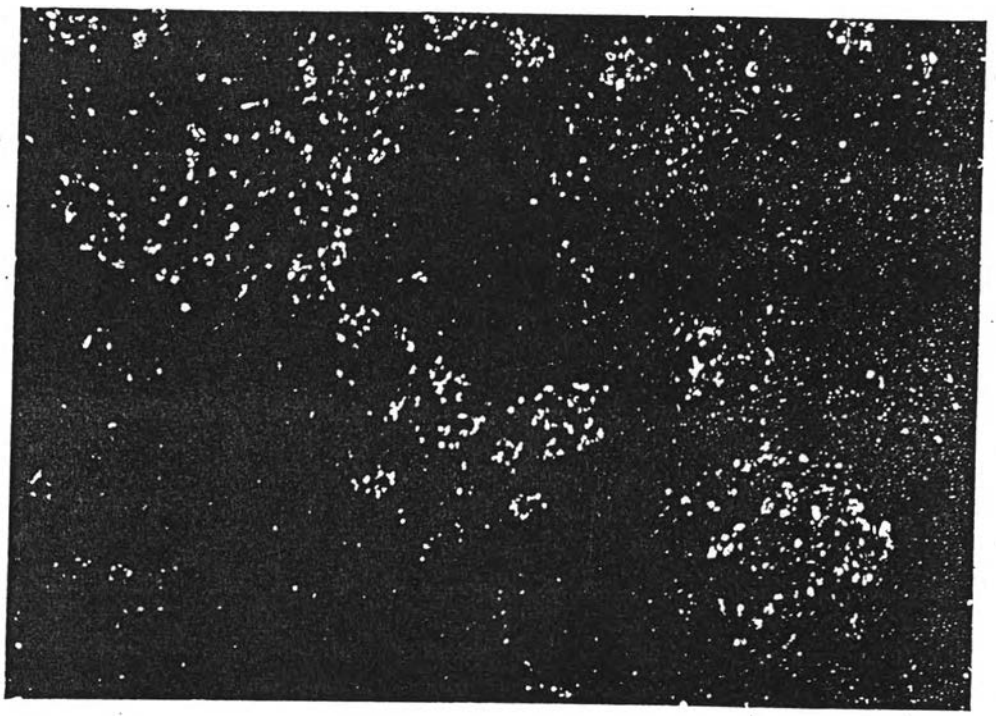


Figure C-5 PP/PPY from 25%$FeCl_3$, 25%pyrrole, at 30°C and 20 hrs. for polymerization.

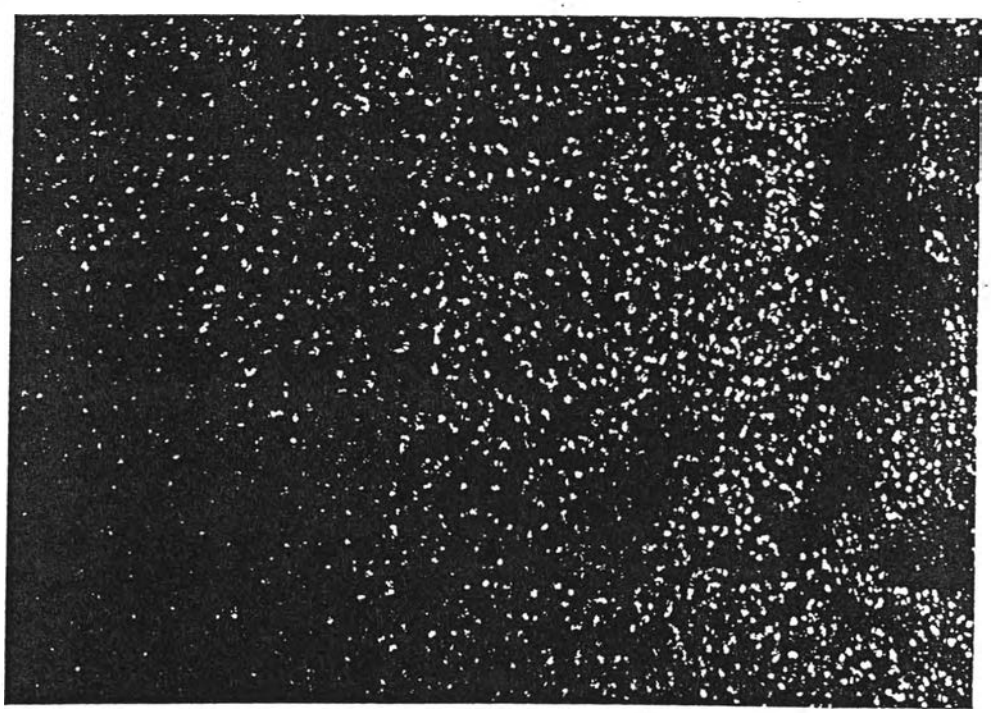


Figure C-6 LDPE/PPY from 25%$FeCl_3$, 25%pyrrole, at 30°C and 20 hrs. for polymerization.

Figure C-7 PVC/PPY from 25%$FeCl_3$, 25%pyrrole, at 70°C and 20 hrs. for polymerization.

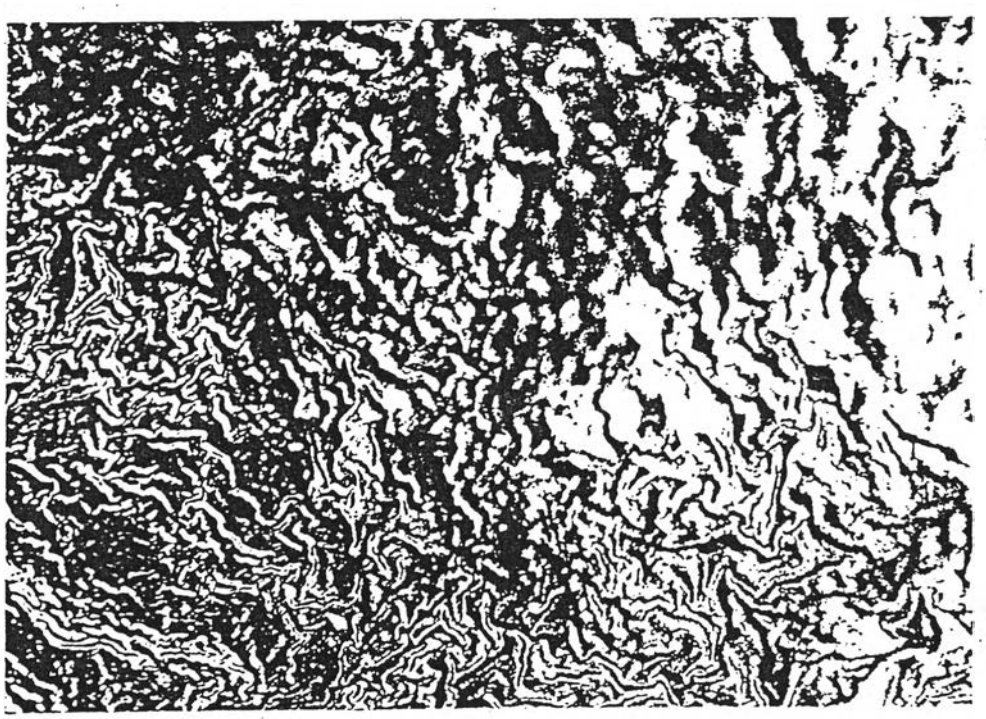


Figure C-8 EP/PPY from 25%$FeCl_3$, 25%pyrrole, at 70°C and 20 hrs. for polymerization.

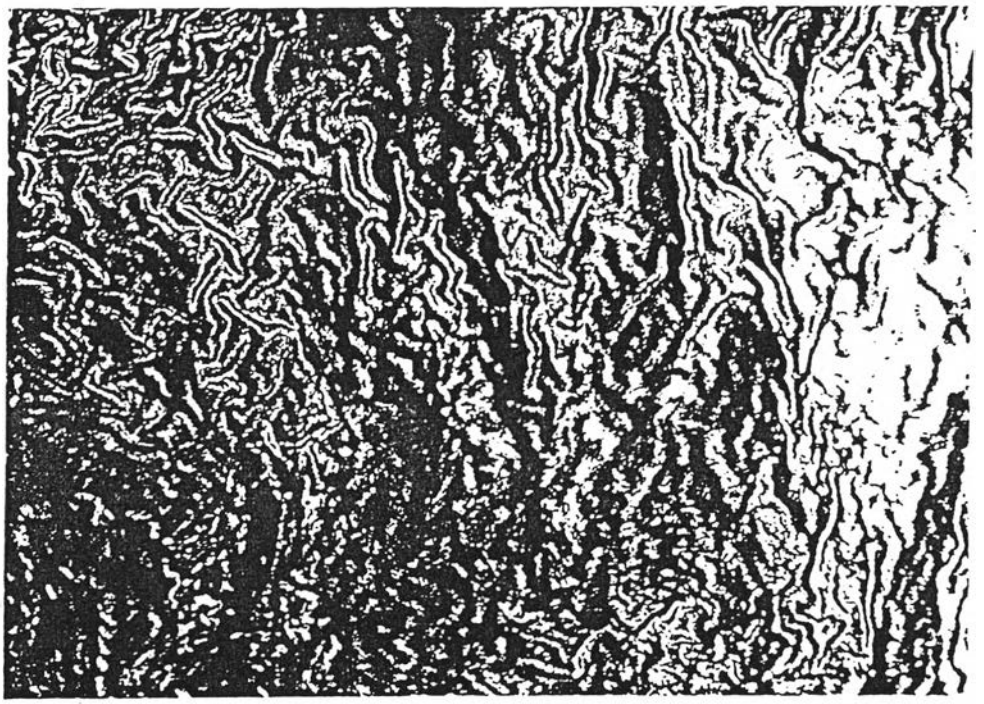


Figure C-9 LDPE/PPY from 25%$FeCl_3$, 25%pyrrole, at 70°C and 20 hrs. for polymerization.

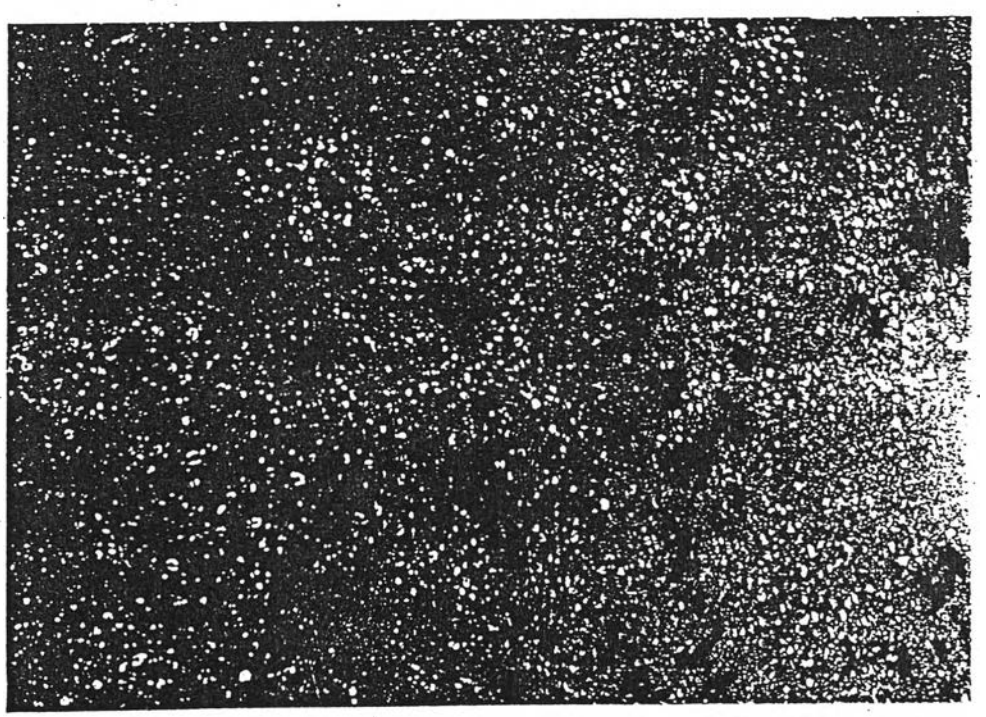


Figure C-10 PP/PPY from 25%$FeCl_3$, 25%pyrrole, at -15°C, 20 hrs. and 60 minutes iodine doping at -15°C.

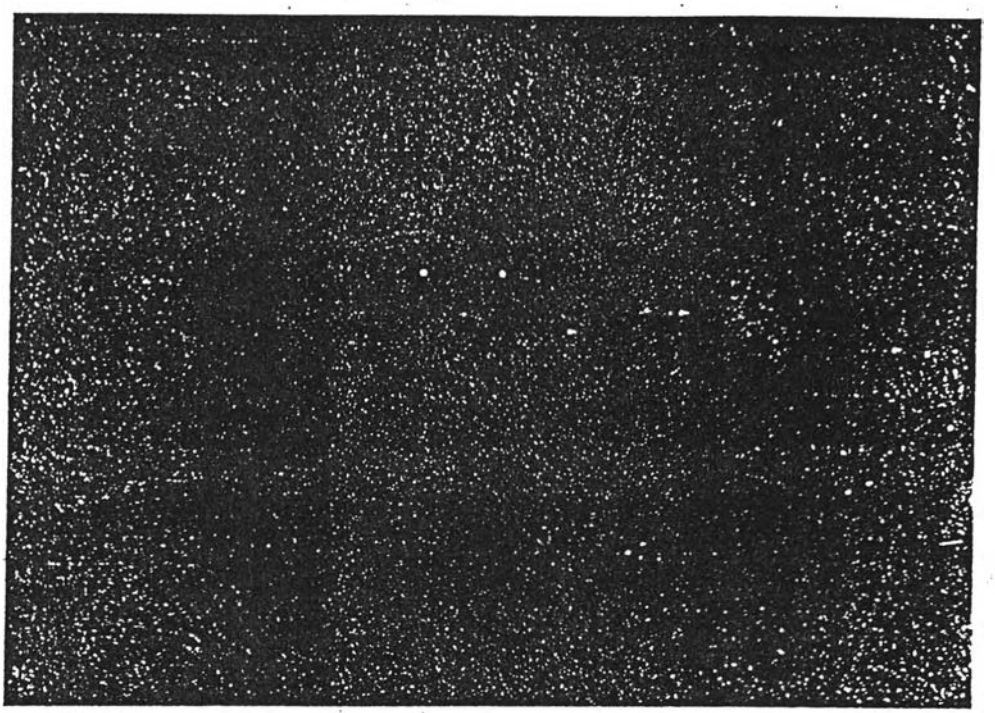


Figure C-11 PP/PPY from 25%$FeCl_3$, 25%pyrrole, at-15°C, 20 hrs. and 60 minutes iodine doping at 30°C.

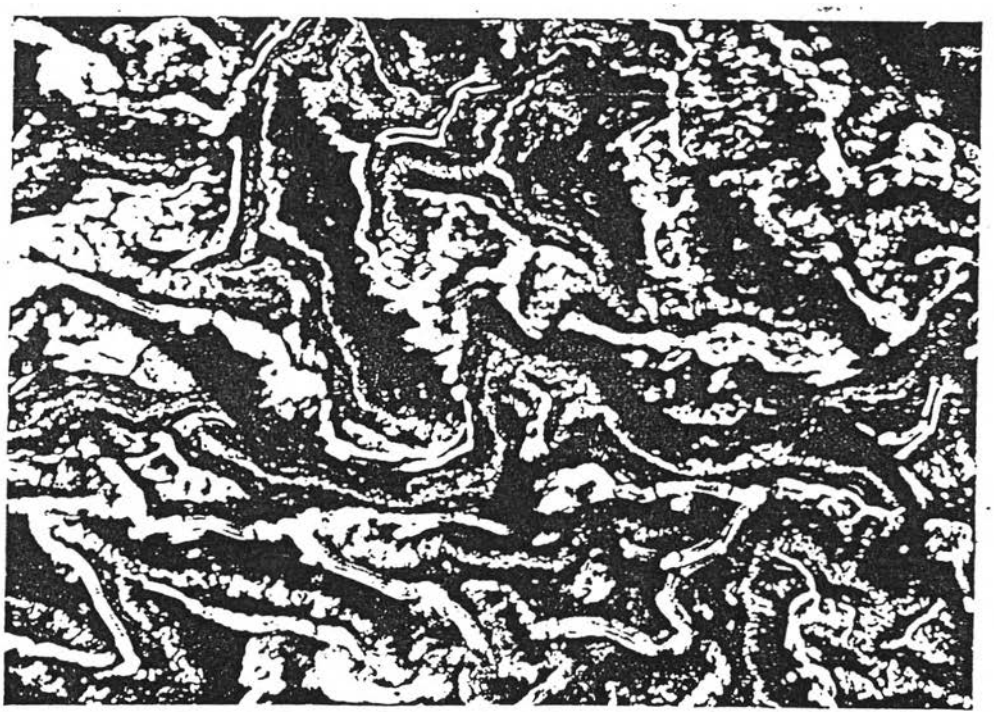


Figure C-12 PP/PPY from 25%$FeCl_3$, 25%pyrrole, at-15°C, 20 hrs. and 60 minutes iodine doping at 70°C.

Appendix D

Raw Data from testing by universal testing material machine.

Table D-1 Technical data of stretched PVC films (MD and TD directions, respectively).

MD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	43.72	15.95	94.97	52.99	10.44	390.9	0.038000
2	40.05	23.18	116.5	51.68	12.09	356.6	0.038000
3	43.75	52.03	209.5	58.34	12.24	371.4	0.039000
4	40.32	45.62	183.8	53.76	12.78	380.9	0.040000
5	33.72	43.23	204.9	56.20	10.50	377.7	0.043000
6	40.93	12.05	167.0	56.46	10.44	386.1	0.041000
7	37.16	11.41	150.5	59.45	10.48	345.0	0.042000
8	39.90	55.99	251.6	61.39	11.36	361.0	0.040000
average	**39.94**	**32.43**	**172.3**	**56.28**	**11.29**	**361.0**	**0.040000**
SD	3.1574	18.6802	42.6411	3.3550	0.9631	36.2310	0.001850

TD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	47.00	75.20	167.3	63.96	7.915	958.2	0.038000
2	61.57	98.14	124.0	70.68	10.98	511.2	0.039000
3	62.68	100.3	124.1	69.15	10.61	450.7	0.042000
4	48.10	73.89	163.8	62.97	11.06	555.5	0.039000
5	47.30	69.85	170.7	59.57	9.355	467.8	0.037000
6	58.21	86.24	108.9	67.14	11.40	468.1	0.041000
7	49.40	62.38	185.2	60.98	14.00	449.7	0.039000
8	59.51	99.18	122.1	69.94	9.606	520.1	0.040000
average	**54.22**	**83.15**	**145.8**	**65.55**	**10.62**	**547.7**	**0.039000**
SD	6.8684	14.8402	28.8522	4.2584	1.7852	170.0413	0.001590

Table D-2 Technical data of stretched PP films (MD and TD directions, respectively).

MD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	19.91	7.804	700.5	22.58	11.94	142.3	0.035000
2	26.97	9.189	944.9	21.57	11.12	446.1	0.045000
3	24.99	19.92	1050.0	23.37	13.38	204.3	0.035000
4	21.82	10.05	822.3	20.99	13.75	163.4	0.041000
5	20.07	12.74	899.4	20.03	17.57	207.0	0.040000
6	20.41	12.38	818.4	22.59	16.82	180.2	0.036000
7	27.58	22.63	993.9	22.82	12.74	183.1	0.042000
average	**23.11**	**13.43**	**899.9**	**21.99**	**13.90**	**218.1**	**0.039000**
SD	3.3381	5.6174	119.1120	1.1770	2.4221	103.1100	0.002510

TD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	18.08	6.598	43.89	19.55	13.37	73.08	0.037000
2	18.92	6.294	36.60	18.92	7.591	291.9	0.040000
3	19.91	4.196	93.46	22.13	12.94	375.5	0.036000
4	19.84	4.371	75.27	21.44	15.75	144.8	0.037000
5	18.08	4.265	38.73	18.55	8.727	211.5	0.039000
6	19.99	4.082	144.7	19.99	12.65	341.7	0.040000
7	17.01	8.660	54.95	17.90	13.61	120.50	0.037000
average	**18.83**	**5.495**	**69.66**	**19.78**	**12.09**	**222.7**	**0.038000**
SD	1.1532	1.7480	39.0711	1.5362	2.8854	116.4102	0.001632

Table D-3 Technical data of stretched LDPE films (MD and TD directions, respectively).

MD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	21.86	19.72	250.1	9.499	22.24	92.69	0.040000
2	18.20	21.70	276.8	10.01	22.60	85.73	0.032000
3	20.10	20.26	293.8	9.833	18.56	103.3	0.036000
4	20.75	18.93	318.0	9.980	22.23	58.12	0.037000
5	20.64	22.10	287.6	11.09	29.00	111.2	0.037000
6	20.83	20.75	250.5	9.689	18.45	96.46	0.040000
7	19.68	23.84	283.8	10.54	24.34	66.20	0.043000
8	22.20	21.92	272.8	9.878	22.03	96.52	0.041000
average	**20.53**	**21.15**	**279.2**	**10.06**	**22.43**	**88.78**	**0.038000**
SD	1.2560	1.5562	22.4521	0.05122	3.3364	18.1540	0.003450

TD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	8.392	4.101	137.1	10.44	14.69	139.8	0.039000
2	9.842	4.539	266.9	10.09	21.85	80.67	0.038000
3	8.621	4.673	123.1	10.78	18.86	108.6	0.038000
4	9.842	5.569	208.0	9.842	21.28	102.0	0.040000
5	10.15	3.815	229.2	10.68	22.32	81.06	0.039000
6	9.956	4.501	257.7	9.956	19.99	119.1	0.035000
7	10.07	5.822	256.4	10.12	18.27	68.54	0.043000
8	8.469	4.768	139.0	10.59	16.79	143.8	0.045000
average	**9.418**	**4.723**	**202.2**	**10.31**	**19.26**	**105.4**	**0.040000**
SD	0.7744	0.6784	60.3001	0.3549	2.6417	27.8512	0.003110

Table D-4 Technical data of stretched PVA and PVA/5%$FeCl_3$ films, respectively.

PVA FILM

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	30.12	34.13	213.7	38.01	56.32	22.64	0.038000
2	33.81	21.54	219.4	29.54	66.53	40.39	0.043000
3	29.58	26.01	387.1	35.20	53.47	30.76	0.041000
4	33.01	30.53	601.6	18.53	43.67	41.75	0.037000
5	34.53	32.48	453.3	32.99	51.61	30.33	0.039000
6	29.88	13.64	287.4	30.37	32.02	44.28	0.037000
7	35.20	20.59	779.6	28.13	48.44	26.45	0.039000
average	**32.30**	**25.56**	**420.3**	**30.40**	**50.29**	**33.80**	**0.039000**
SD	2.3871	7.4071	210.1030	11.0321	10.7500	8.3290	0.002236

PVA/5%$FeCl_3$ FILM

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	29.35	31.27	177.8	32.34	53.74	29.03	0.037000
2	32.11	32.52	138.6	21.74	51.94	34.27	0.041000
3	35.83	28.10	398.9	33.46	49.93	47.58	0.040000
4	26.20	20.31	481.9	27.39	37.83	31.22	0.043000
5	31.97	21.15	199.1	31.68	61.70	33.51	0.037000
6	29.09	18.53	259.4	29.20	45.44	28.18	0.043000
7	28.32	26.55	350.5	23.97	41.59	30.01	0.039000
average	**30.41**	**25.49**	**286.6**	**28.54**	**48.88**	**33.40**	**0.040000**
SD	3.1530	5.5514	127.1302	4.4230	8.0152	6.6384	0.002502

Table D-5 Technical data of stretched PVA/10%$FeCl_3$ and PVA/15%$FeCl_3$ films, respectively.

PVA/10%$FeCl_3$ FILM

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	25.41	26.53	310.9	26.63	45.32	31.07	0.041000
2	30.28	24.31	366.4	32.47	53.71	28.90	0.039000
3	32.09	28.37	311.9	27.20	48.65	27.62	0.037000
4	27.93	21.44	357.8	31.05	43.94	30.21	0.043000
5	37.89	27.91	289.2	27.81	50.23	29.49	0.048000
6	34.00	22.44	188.6	25.38	55.87	33.27	0.039000
7	29.54	25.47	270.3	30.57	56.06	20.34	0.040000
average	**31.02**	**25.21**	**299.3**	**28.73**	**50.54**	**28.70**	**0.041000**
SD	4.1023	2.6387	59.7410	2.6321	4.8882	4.0920	0.003570

PVA/15%$FeCl_3$ FILM

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	31.33	26.35	390.31	38.23	47.34	24.53	0.041000
2	36.09	30.67	450.80	29.69	46.91	22.29	0.039000
3	25.24	14.11	298.46	25.43	51.27	34.50	0.040000
4	30.50	23.59	301.99	29.33	46.68	26.34	0.042000
5	29.36	20.36	250.5	30.47	45.52	30.63	0.038000
6	32.01	26.28	201.85	28.34	43.51	27.54	0.040000
7	31.28	33.71	365.0	32.08	50.36	21.77	0.040000
average	**30.83**	**25.01**	**322.7**	**30.51**	**47.37**	**26.80**	**0.040000**
SD	3.2410	6.5013	85.2500	3.9725	2.6825	4.5741	0.001290

Table D-6 Technical data of stretched PVA/20%$FeCl_3$ and PVA/25%$FeCl_3$ films, respectively.

PVA/20%$FeCl_3$ FILM

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	25.56	26.51	411.7	23.73	42.90	19.49	0.040000
2	29.07	17.00	390.3	25.34	44.11	21.18	0.038000
3	31.05	27.83	387.6	27.55	42.47	23.56	0.041000
4	27.83	24.47	300.5	25.88	38.92	19.24	0.040000
5	25.96	23.59	287.6	31.08	48.27	17.57	0.042000
6	30.57	27.65	333.4	29.44	40.44	31.92	0.046000
7	28.27	25.36	348.7	30.25	44.03	21.74	0.040000
average	**28.33**	**24.63**	**351.4**	**27.61**	**43.02**	**22.11**	**0.041000**
SD	2.1022	3.7142	47.3520	2.7562	2.9871	4.7442	0.002514

PVA/25%$FeCl_3$ FILM

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	27.43	30.11	286.9	22.13	46.48	22.07	0.032000
2	29.77	12.48	450.8	26.76	43.92	18.19	0.041000
3	31.20	26.26	458.9	30.25	39.84	15.38	0.040000
4	25.41	20.93	370.5	25.48	43.61	27.26	0.039000
5	26.48	29.59	400.1	28.27	45.43	20.02	0.040000
6	27.53	23.90	295.6	26.37	51.38	21.45	0.041000
7	30.28	25.43	344.7	32.40	55.08	14.37	0.040000
average	**28.30**	**24.10**	**372.5**	**27.38**	**46.53**	**19.82**	**0.039000**
SD	2.1410	6.0253	68.7702	3.3374	5.1302	4.3815	0.003164

Table D-7 Technical data of stretched PVC/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, and 20 hours for polymerization (MD and TD directions, respectively).

MD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	41.90	33.46	202.4	52.64	14.56	347.0	0.071000
2	44.49	37.41	198.7	54.72	15.11	343.7	0.070000
3	37.81	34.90	195.3	56.77	16.22	346.4	0.070000
4	39.45	32.73	200.5	58.03	14.30	347.6	0.070000
5	40.91	35.94	201.9	59.45	16.01	348.4	0.070000
6	39.98	35.01	200.1	54.98	16.13	345.1	0.071000
7	41.45	34.93	196.8	54.01	14.70	352.6	0.069000
8	41.53	33.54	198.7	52.44	13.53	349.2	0.069000
average	**40.94**	**34.74**	**199.3**	**55.38**	**15.07**	**347.5**	**0.070000**
SD	1.9665	1.5032	2.4325	2.5110	0.9778	2.7091	0.000755

TD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	57.12	83.46	183.4	65.43	16.49	550.1	0.071000
2	49.71	88.36	187.7	67.40	19.35	547.0	0.070000
3	52.74	85.20	185.8	64.39	18.23	549.4	0.069000
4	51.59	88.62	185.9	70.25	17.99	545.5	0.069000
5	53.47	83.62	188.7	65.73	23.58	551.6	0.071000
6	50.53	84.53	186.9	68.45	19.30	545.8	0.070000
7	54.31	84.99	184.9	63.37	18.99	543.7	0.069000
8	51.89	84.57	187.9	63.14	17.35	550.1	0.071000
average	**52.67**	**85.43**	**186.4**	**66.02**	**18.91**	**547.9**	**0.070000**
SD	2.3382	2.0103	1.7462	2.5100	2.1304	2.7844	0.000925

Table D-8 Technical data of stretched PVC/PPY films from 25%$FeCl_3$, 25%pyrrole, @ 30°C, and 20 hours for polymerization (MD and TD directions, respectively).

MD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	40.23	32.47	182.6	53.26	13.12	330.4	0.069000
2	38.43	30.52	183.4	54.18	12.51	328.1	0.071000
3	39.47	33.23	184.3	51.57	14.05	331.7	0.070000
4	31.38	36.30	185.7	55.76	13.16	334.8	0.070000
5	42.75	29.97	193.5	52.29	11.54	332.9	0.068000
6	40.18	34.20	182.1	57.29	12.06	335.3	0.072000
7	39.87	32.17	186.7	50.34	15.16	336.1	0.070000
8	36.17	31.22	187.3	52.75	11.47	341.9	0.054000
average	**38.56**	**32.51**	**185.7**	**53.43**	**12.89**	**333.9**	**0.068000**
SD	3.4392	2.0684	3.6681	2.2583	1.2724	4.1980	0.002134

TD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	51.37	84.14	177.1	59.52	14.21	538.8	0.071000
2	56.02	86.92	182.7	57.32	16.91	540.3	0.069000
3	58.39	82.57	180.9	59.90	14.78	535.7	0.077000
4	55.14	84.70	178.3	58.01	15.35	530.1	0.070000
5	62.10	87.16	180.9	57.32	16.63	542.3	0.069000
6	56.07	86.69	177.4	61.57	15.43	535.4	0.072000
7	57.12	84.39	180.5	57.75	16.36	536.6	0.070000
8	55.31	86.47	176.6	60.13	14.81	538.4	0.070000
average	**56.44**	**85.38**	**179.3**	**58.94**	**15.56**	**537.2**	**0.071000**
SD	3.0541	1.6612	2.2321	1.5644	0.9755	3.7012	0.002620

Table D-9 Technical data of stretched PVC/PPY films from 25%$FeCl_3$, 25%pyrrole, @ 70°C, and 20 hours for polymerization (MD and TD directions, respectively).

MD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	38.02	19.92	91.54	39.37	10.07	110.43	0.078000
2	37.75	17.79	97.73	35.54	9.110	98.71	0.070000
3	34.41	14.63	100.1	38.19	8.050	100.5	0.070000
4	35.25	20.15	94.83	39.35	9.311	101.4	0.069000
5	40.38	19.29	89.15	37.05	7.435	95.12	0.070000
6	39.17	22.50	92.51	40.42	8.113	99.84	0.069000
7	38.38	15.33	96.37	36.81	6.034	105.4	0.070000
8	36.24	17.47	99.20	33.43	5.981	102.2	0.072000
average	**37.45**	**18.01**	**95.18**	**37.52**	**8.013**	**101.7**	**0.071000**
SD	2.0130	2.9571	3.8775	2.2993	1.4882	4.5886	0.002974

TD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	46.68	55.23	136.4	55.51	13.71	491.2	0.070000
2	48.31	51.52	137.9	54.27	12.73	488.4	0.069000
3	45.54	53.61	131.2	52.68	14.01	494.0	0.071000
4	49.32	59.34	133.6	55.17	13.96	493.5	0.070000
5	44.67	54.33	138.7	54.66	17.36	489.7	0.069000
6	49.26	57.48	135.8	51.94	16.44	490.6	0.070000
7	43.19	65.84	134.1	54.36	12.51	491.5	0.071000
8	49.19	58.17	139.5	50.21	13.04	486.7	0.070000
average	**47.02**	**56.94**	**135.9**	**53.60**	**14.22**	**490.7**	**0.070000**
SD	2.3652	4.4238	2.8200	1.8274	1.7614	2.4473	0.000755

Table D-10 Technical data of stretched PP/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, and 20 hours for polymerization (MD and TD directions, respectively).

MD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	19.89	20.02	998.7	35.64	18.82	234.2	0.072000
2	19.59	22.93	1068.5	24.47	23.70	240.6	0.071000
3	21.42	30.41	1010.5	28.31	21.25	243.3	0.068000
4	24.97	20.34	1020.1	24.26	17.63	234.7	0.077000
5	22.22	23.15	999.8	27.34	19.92	235.0	0.074000
6	25.40	25.17	995.5	21.45	18.19	238.5	0.070000
7	23.17	24.72	1000.7	23.96	22.45	234.8	0.072000
average	**22.38**	**23.82**	**1013.4**	**26.49**	**20.28**	**237.3**	**0.072000**
SD	2.2874	3.5086	25.7310	4.6290	2.2734	3.5641	0.002881

TD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	17.56	5.537	75.02	26.72	13.27	229.1	0.070000
2	20.25	8.115	74.57	19.92	14.41	225.7	0.071000
3	19.43	11.95	73.14	18.56	14.13	222.3	0.069000
4	19.63	8.013	71.71	21.89	15.16	230.8	0.071000
5	23.65	7.324	70.53	23.38	17.28	224.9	0.071000
6	15.83	7.540	71.22	21.02	13.44	231.2	0.068000
7	17.14	6.421	69.98	23.14	12.55	226.4	0.070000
average	**19.07**	**7.843**	**72.31**	**22.09**	**14.32**	**227.2**	**0.070000**
SD	2.5601	2.0284	1.9702	2.6630	1.5552	3.2857	0.001372

Table D-11 Technical data of stretched PP/PPY films from 25%$FeCl_3$, 25%pyrrole, @ 30°C, and 20 hours for polymerization (MD and TD directions, respectively).

MD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	24.79	23.08	990.4	25.23	22.34	233.7	0.071000
2	26.14	21.43	987.6	33.59	18.43	235.5	0.070000
3	27.56	22.35	989.9	27.65	19.46	227.8	0.061000
4	21.45	19.61	989.3	25.74	20.34	231.9	0.069000
5	29.63	20.04	992.8	28.81	17.15	226.3	0.067000
6	25.03	21.42	993.5	27.26	17.72	229.5	0.070000
7	23.27	19.84	997.7	29.82	14.69	228.1	0.068000
average	**25.41**	**21.11**	**991.6**	**28.30**	**18.59**	**230.4**	**0.068000**
SD	2.7000	1.3312	3.3632	2.8291	2.4483	3.3872	0.003316

TD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	22.61	8.119	70.65	18.16	14.61	227.8	0.071000
2	17.22	9.247	71.80	17.35	12.68	217.5	0.077000
3	15.56	8.354	72.53	24.42	13.02	221.7	0.069000
4	19.04	6.683	68.84	20.01	12.53	220.4	0.070000
5	16.27	6.968	71.36	18.53	15.47	217.1	0.068000
6	17.33	5.034	69.79	19.47	12.04	219.0	0.070000
7	20.84	4.721	68.32	21.22	13.87	215.8	0.072000
average	**18.41**	**7.018**	**70.47**	**19.88**	**13.46**	**219.9**	**0.071000**
SD	2.557	1.6972	1.5592	2.3720	1.2396	4.0230	0.001210

Table D-12 Technical data of stretched PP/PPY films from 25%$FeCl_3$, 25%pyrrole, @ 70°C, and 20 hours for polymerization (MD and TD directions, respectively).

MD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	20.74	14.25	780.9	20.37	16.28	221.3	0.070000
2	24.53	13.51	786.7	22.49	15.13	226.2	0.070000
3	26.18	12.73	783.5	24.22	14.07	224.1	0.071000
4	21.51	8.310	790.3	20.83	13.22	223.4	0.067000
5	26.46	16.39	792.9	19.56	15.94	227.8	0.078000
6	28.32	14.46	788.4	24.09	13.81	225.7	0.071000
7	22.57	12.05	784.2	23.77	13.89	230.7	0.070000
average	**24.33**	**13.10**	**786.7**	**22.19**	**14.62**	**225.6**	**0.071000**
SD	2.8241	2.52811	4.1713	1.9320	1.1692	3.0762	0.001271

TD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	18.34	3.276	65.28	18.44	13.18	183.5	0.069000
2	17.56	6.023	61.32	19.19	11.53	181.3	0.070000
3	20.22	5.001	64.27	17.52	14.46	185.2	0.070000
4	23.10	3.417	67.05	15.38	16.27	188.3	0.072000
5	22.17	4.095	62.61	19.46	12.94	188.9	0.068000
6	21.43	3.520	57.98	15.37	13.33	184.8	0.071000
7	19.28	4.852	64.94	16.86	15.10	180.9	0.070000
average	**20.30**	**4.312**	**63.35**	**17.46**	**13.83**	**184.7**	**0.070000**
SD	2.0410	1.0203	3.0082	1.6842	1.5661	3.1172	0.001295

Table D-13 Technical data of stretched LDPE/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, and 20 hours for polymerization (MD and TD directions, respectively).

MD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	22.17	25.11	285.7	14.59	30.27	88.74	0.070000
2	24.11	27.27	288.3	15.15	27.71	91.45	0.070000
3	21.54	25.23	281.6	14.40	29.33	90.02	0.070000
4	24.23	21.90	291.7	15.81	31.46	87.16	0.071000
5	20.72	28.49	280.4	16.35	26.95	85.86	0.071000
6	19.96	21.54	279.5	11.47	29.43	92.07	0.072000
7	18.84	20.81	284.1	10.72	24.23	99.61	0.069000
8	22.35	23.49	279.9	12.38	28.70	89.93	0.075000
average	**21.74**	**24.23**	**283.9**	**13.78**	**28.51**	**89.93**	**0.071000**
SD	1.8120	2.7802	4.4142	2.0051	2.2280	4.7112	0.001854

TD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	12.05	7.045	215.5	10.19	16.23	132.9	0.069000
2	9.944	6.113	219.1	8.683	15.50	126.1	0.065000
3	10.93	8.237	213.3	14.23	20.28	131.6	0.071000
4	11.51	6.933	216.8	12.00	18.51	129.7	0.070000
5	13.62	7.839	234.0	14.58	19.20	133.5	0.068000
6	9.186	5.441	209.4	13.41	16.47	128.4	0.070000
7	10.57	7.940	220.8	9.354	17.83	126.8	0.069000
8	12.43	6.532	211.9	10.27	22.46	131.0	0.070000
average	**11.28**	**7.010**	**217.6**	**11.59**	**18.31**	**130.0**	**0.069000**
SD	1.4260	0.9680	7.6032	2.2854	2.3221	2.7340	0.001851

Table D-14 Technical data of stretched LDPE/PPY films from 25%$FeCl_3$, 25%pyrrole, @ 30°C,and 20 hours for polymerization (MD and TD directions, respectively).

MD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	22.41	20.83	278.4	14.04	26.66	95.72	0.075000
2	21.94	20.69	275.9	16.53	25.60	98.70	0.070000
3	24.53	23.11	280.5	15.02	26.68	89.97	0.072000
4	23.70	22.36	279.4	13.88	25.07	90.41	0.072000
5	22.83	24.80	282.5	15.34	31.35	87.89	0.069000
6	25.17	25.48	279.2	12.52	29.80	88.53	0.069000
7	28.62	25.16	277.8	15.34	24.45	92.26	0.070000
8	24.56	21.97	280.7	13.81	28.31	88.60	0.071000
average	**24.22**	**23.05**	**279.3**	**14.56**	**27.24**	**91.51**	**0.071000**
SD	2.1092	1.9111	2.0103	1.2404	2.4031	3.8550	0.001520

TD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	9.431	6.195	211.7	8.934	19.76	120.4	0.069000
2	10.56	7.183	215.4	10.16	18.32	121.6	0.070000
3	14.73	8.014	213.2	11.52	15.73	124.8	0.071000
4	8.239	5.818	210.9	8.134	14.81	121.5	0.070000
5	12.11	6.017	214.8	10.04	21.06	126.7	0.070000
6	10.83	7.143	211.4	8.930	18.37	123.0	0.070000
7	9.960	8.841	213.6	8.682	16.37	118.5	0.070000
8	11.02	6.773	216.2	10.56	17.09	125.9	0.068000
average	**10.86**	**6.998**	**213.4**	**9.620**	**17.71**	**122.8**	**0.070000**
SD	1.9411	1.0374	1.9642	1.1344	2.1042	2.8342	0.001071

Table D-15 Technical data of stretched LDPE/PPY films from 25%$FeCl_3$, 25%pyrrole, @ 70°C, and 20 hours for polymerization (MD and TD directions, respectively).

MD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	18.87	20.56	269.5	13.29	25.70	66.72	0.070000
2	21.81	19.84	271.4	16.14	22.38	64.39	0.068000
3	19.56	20.43	263.9	13.42	27.11	68.46	0.071000
4	20.62	23.40	267.5	15.31	25.56	66.11	0.071000
5	22.95	24.71	270.8	18.05	22.40	61.95	0.071000
6	20.34	19.97	267.1	14.93	24.73	59.96	0.070000
7	21.56	25.80	275.9	17.58	20.15	64.84	0.069000
8	18.61	24.25	264.3	12.16	26.61	68.13	0.070000
average	**20.54**	**22.37**	**268.8**	**15.11**	**24.33**	**65.07**	**0.070000**
SD	1.5112	2.4210	3.9732	2.0963	2.4341	2.9520	0.001071

TD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
1	10.14	5.931	202.6	11.47	15.37	102.4	0.069000
2	8.635	3.831	200.7	13.15	17.61	100.9	0.071000
3	10.33	6.682	197.5	9.946	17.36	99.17	0.071000
4	11.72	5.573	199.3	10.95	14.58	93.03	0.072000
5	8.894	8.178	204.6	8.841	18.40	96.35	0.075000
6	9.837	7.014	200.4	11.52	17.14	99.85	0.071000
7	10.39	6.551	204.1	9.426	15.43	105.8	0.068000
8	7.775	7.528	198.8	10.54	16.11	103.3	0.071000
average	**9.715**	**6.411**	**201.0**	**10.73**	**16.50**	**100.1**	**0.071000**
SD	1.2333	1.3311	2.5510	1.3625	1.3231	4.0294	0.002071

Table D-16 Technical data of stretched PVC/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, 20 hours for polymerization and 60 minutes iodine doping @ -15°C in vacuum (MD and TD directions, respectively).

MD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	36.57	34.48	188.2	56.71	12.96	348.4	0.069000
2	38.90	33.59	194.3	55.59	17.48	346.2	0.071000
3	39.34	34.72	195.4	54.88	16.52	347.3	0.070000
4	36.12	36.02	198.7	55.80	17.08	342.7	0.071000
5	39.05	32.70	189.5	58.92	15.53	347.2	0.071000
6	41.49	32.37	191.8	54.31	19.58	341.9	0.070000
7	37.96	35.61	190.7	57.19	16.80	347.1	0.068000
8	37.96	33.15	194.6	53.88	14.69	344.8	0.070000
average	**38.73**	**34.08**	**192.9**	**55.91**	**16.33**	**345.7**	**0.070000**
SD	1.8133	1.3425	3.4736	1.6564	1.9784	2.3470	0.001070

TD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	47.46	84.16	186.2	61.36	17.13	550.3	0.071000
2	49.70	81.93	183.7	60.11	14.71	546.0	0.069000
3	51.81	87.89	185.6	64.44	13.93	548.4	0.070000
4	52.23	83.76	182.5	62.20	17.88	545.1	0.070000
5	54.82	84.53	189.3	67.24	14.04	546.7	0.068000
6	48.97	88.36	188.4	65.81	13.63	545.8	0.071000
7	51.16	86.12	187.1	63.34	16.61	546.9	0.070000
8	49.45	83.41	184.4	61.02	15.03	549.2	0.071000
average	**50.70**	**85.02**	**185.9**	**63.19**	**15.37**	**547.3**	**0.070000**
SD	2.2931	2.2467	2.3321	2.4895	1.6192	1.8174	0.001072

Table D-17 Technical data of stretched PVC/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, 20 hours for polymerization and 60 minutes iodine doping @ 70°C in vacuum (MD and TD directions, respectively).

MD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	33.71	15.53	91.02	39.98	10.81	98.41	0.072000
2	34.60	16.22	95.80	38.56	6.715	102.7	0.071000
3	37.79	14.89	94.17	40.91	9.013	99.56	0.070000
4	37.78	23.55	95.89	44.22	8.361	105.2	0.070000
5	36.14	17.73	95.17	43.30	10.80	103.4	0.075000
6	34.88	18.62	93.46	42.56	10.72	103.1	0.071000
7	36.45	16.88	96.50	47.32	11.57	96.70	0.068000
8	33.53	15.94	93.11	37.15	6.571	98.13	0.071000
average	**35.61**	**17.42**	**94.39**	**41.75**	**9.320**	**100.9**	**0.071000**
SD	1.6881	2.7521	1.8210	3.2812	1.9563	3.0742	0.001153

TD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	55.22	56.71	129.4	55.89	14.23	438.7	0.069000
2	49.87	55.56	131.7	60.64	17.11	437.2	0.071000
3	50.53	54.27	132.5	61.23	16.37	436.5	0.071000
4	49.97	51.94	131.1	54.17	13.48	430.7	0.070000
5	48.81	53.01	128.7	52.54	15.68	434.6	0.068000
6	52.42	55.47	129.8	59.84	11.91	436.8	0.071000
7	50.17	51.82	130.1	60.41	17.24	436.8	0.070000
8	51.89	55.70	129.9	61.52	14.06	433.5	0.070000
average	**51.11**	**54.31**	**130.4**	**58.28**	**15.01**	**435.6**	**0.070000**
SD	2.0200	1.8563	1.2642	3.531	1.8952	2.5432	0.001066

Table D-18 Technical data of stretched PP/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, 20 hours for polymerization and 60 minutes iodine doping @ -15°C in vacuum (MD and TD directions, respectively).

MD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	21.41	25.53	979.1	22.24	18.17	239.9	0.071000
2	26.29	24.74	985.4	19.37	17.38	237.0	0.072000
3	19.51	24.44	987.7	20.75	16.14	238.1	0.073000
4	18.73	22.32	984.8	18.89	19.56	234.4	0.072000
5	20.15	24.63	980.6	25.44	20.23	241.2	0.071000
6	22.54	24.81	984.2	20.49	15.81	236.5	0.074000
7	20.47	18.03	981.3	22.34	15.56	236.1	0.071000
average	**21.30**	**23.50**	**983.3**	**21.36**	**17.55**	**237.6**	**0.072000**
SD	2.5251	2.6093	3.0485	2.2200	1.8532	2.3294	0.001151

TD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	21.15	6.213	70.40	17.40	14.71	220.6	0.071000
2	21.27	9.426	68.42	22.14	17.26	221.8	0.071000
3	18.45	8.913	72.57	20.21	15.38	226.4	0.068000
4	17.86	7.215	77.79	21.37	20.63	227.9	0.070000
5	20.47	8.812	71.55	21.66	18.13	227.1	0.070000
6	19.41	3.657	69.93	19.53	19.41	226.7	0.070000
7	16.98	6.934	72.43	18.34	16.28	224.5	0.070000
average	**19.37**	**7.310**	**71.87**	**20.12**	**17.40**	**225.0**	**0.070000**
SD	1.6752	2.0001	2.9947	1.7293	2.1455	2.8142	0.001000

Table D-19 Technical data of stretched PP/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, 20 hours for polymerization and 60 minutes iodine doping @ 70°C in vacuum (MD and TD directions, respectively).

MD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	19.98	16.79	954.5	16.68	10.10	218.7	0.069000
2	17.25	12.48	948.8	15.74	11.52	223.4	0.071000
3	21.23	15.01	949.6	18.53	12.15	217.8	0.070000
4	25.32	11.37	952.8	17.15	10.27	222.2	0.072000
5	23.43	13.59	957.3	14.37	11.24	227.1	0.069000
6	19.96	17.42	945.7	19.91	9.341	217.5	0.076000
7	18.92	13.37	949.0	18.23	8.952	218.9	0.070000
average	**20.87**	**14.29**	**951.1**	**17.23**	**10.51**	**220.8**	**0.071000**
SD	2.7394	2.2251	3.9584	1.8522	1.1763	3.5660	0.002451

TD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	17.05	3.139	61.51	18.07	14.11	186.1	0.069000
2	20.75	5.027	64.27	20.24	12.85	187.9	0.071000
3	21.26	4.118	66.88	19.56	11.27	177.5	0.071000
4	19.54	5.103	65.34	19.20	13.40	185.3	0.070000
5	16.59	3.945	59.95	16.53	11.73	180.8	0.070000
6	19.73	6.571	61.73	15.88	15.46	181.2	0.068000
7	17.24	6.224	62.79	17.71	14.35	185.0	0.071000
average	**18.88**	**4.287**	**63.21**	**18.17**	**13.31**	**183.4**	**0.070000**
SD	1.8971	1.1940	2.4163	1.6042	1.4842	3.6543	0.001152

Table D-20 Technical data of stretched LDPE/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, 20 hours for polymerization and 60 minutes iodine doping @ -15°C in vacuum (MD and TD directions, respectively).

MD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	27.79	25.11	280.4	13.33	23.61	92.26	0.071000
2	24.83	28.80	284.3	12.76	29.40	89.05	0.071000
3	23.63	23.87	290.7	15.03	28.19	87.85	0.069000
4	22.42	27.73	291.6	14.35	31.23	92.77	0.070000
5	25.98	20.19	284.0	16.86	30.59	93.41	0.072000
6	23.27	22.56	286.0	15.52	24.28	88.56	0.077000
7	26.90	21.34	285.1	11.32	28.77	90.40	0.068000
8	21.35	22.48	283.5	13.71	27.34	85.70	0.070000
average	**24.52**	**24.01**	**285.7**	**14.11**	**27.93**	**90.00**	**0.071000**
SD	2.2492	3.0274	3.7423	1.7254	2.7573	2.9602	0.002721

TD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	10.02	6.387	217.0	9.531	18.06	127.2	0.065000
2	9.831	5.840	214.6	8.902	19.12	127.1	0.071000
3	8.157	4.350	213.8	8.814	23.59	126.4	0.068000
4	11.47	7.711	218.5	12.45	16.63	131.6	0.067000
5	12.53	8.127	215.4	12.02	15.48	132.0	0.066000
6	10.84	5.843	213.3	10.13	18.95	127.5	0.070000
7	9.997	9.731	220.5	12.05	16.73	130.8	0.067000
8	13.47	7.155	218.1	9.881	14.32	133.4	0.070000
average	**10.79**	**6.893**	**216.4**	**10.47**	**17.86**	**129.5**	**0.068000**
SD	1.6812	1.6583	2.5384	1.4783	2.8442	2.7311	0.002000

Table D-21 Technical data of stretched LDPE/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, 20 hours for polymerization and 60 minutes iodine doping @ 70°C in vacuum (MD and TD directions, respectively).

MD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	19.83	19.74	261.0	12.04	22.86	77.96	0.070000
2	22.37	23.11	257.3	14.07	23.18	79.92	0.069000
3	20.50	19.85	259.2	15.61	21.04	70.00	0.070000
4	23.46	21.72	263.7	13.84	21.43	80.12	0.071000
5	20.28	19.04	262.5	56.01	27.80	77.50	0.069000
6	24.46	20.35	260.9	12.49	22.51	76.87	0.071000
7	22.53	28.29	258.4	15.32	24.39	82.39	0.070000
8	20.01	24.54	257.8	14.71	21.27	81.80	0.070000
average	**21.68**	**22.08**	**260.1**	**13.33**	**23.06**	**78.32**	**0.070000**
SD	1.7592	3.1284	2.2992	2.2980	2.2213	3.9021	0.000761

TD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	11.12	7.002	195.4	10.95	17.00	101.3	0.070000
2	9.062	7.110	193.8	9.956	16.92	108.7	0.070000
3	10.84	4.325	196.5	10.11	14.32	102.5	0.068000
4	9.918	8.310	205.7	12.54	17.86	97.43	0.070000
5	9.763	6.952	199.8	13.65	15.28	93.91	0.068000
6	11.24	5.471	201.3	14.28	17.32	102.1	0.071000
7	10.59	5.278	200.7	9.504	19.01	92.81	0.072000
8	8.987	4.352	198.0	10.29	14.53	96.45	0.079000
average	**10.19**	**6.100**	**198.9**	**11.41**	**16.53**	**99.40**	**0.071000**
SD	0.8884	1.1502	3.7963	1.8290	1.6632	5.2534	0.003500

Table D-22 Technical data of stretched PVC/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, 20 hours for polymerization and 30 minutes iodine doping @ 30°C in vacuum (MD and TD directions, respectively).

MD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	42.53	36.47	187.4	55.34	11.73	345.4	0.070000
2	35.57	35.21	188.9	56.46	12.81	350.7	0.069000
3	38.96	31.47	190.7	52.82	10.52	340.5	0.068000
4	40.11	34.34	190.5	54.16	13.14	345.1	0.070000
5	42.41	32.52	193.8	56.01	14.70	339.8	0.071000
6	37.59	31.48	191.5	48.12	10.93	338.4	0.071000
7	38.94	32.71	186.2	51.28	15.13	342.6	0.072000
8	40.21	36.20	187.8	52.45	11.12	341.5	0.069000
average	**39.54**	**33.80**	**189.6**	**53.33**	**12.51**	**343.0**	**0.070000**
SD	2.3361	2.0284	2.4901	2.7800	1.7382	3.9552	0.001112

TD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	52.37	83.78	180.7	56.46	16.90	543.9	0.072000
2	48.84	81.94	184.9	55.61	19.22	544.4	0.070000
3	49.49	85.54	184.5	58.51	18.01	550.1	0.070000
4	55.78	88.50	186.3	58.83	16.31	549.6	0.071000
5	47.93	86.34	184.6	56.66	18.45	544.8	0.068000
6	51.84	87.97	181.7	54.83	15.27	546.3	0.069000
7	46.52	86.32	181.1	67.17	17.13	553.7	0.071000
8	52.11	84.01	180.2	59.37	14.71	550.4	0.069000
average	**50.61**	**85.55**	**183.0**	**58.43**	**17.00**	**547.9**	**0.070000**
SD	2.9731	2.2142	2.3220	3.8801	1.5490	3.5463	0.001310

Table D-23 Technical data of stretched PVC/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, 20 hours for polymerization and 60 minutes iodine doping @ 30°C in vacuum (MD and TD directions, respectively).

MD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	37.40	34.15	185.9	57.43	17.56	337.5	0.069000
2	41.25	31.87	186.2	51.36	14.80	344.0	0.070000
3	40.06	36.50	192.8	52.70	13.37	341.9	0.071000
4	41.18	34.46	190.2	56.41	15.27	343.9	0.071000
5	41.76	34.03	187.3	55.74	12.59	338.8	0.071000
6	42.50	34.27	187.3	56.33	14.31	340.2	0.071000
7	39.48	30.02	190.5	51.44	15.84	348.7	0.068000
8	38.53	28.94	189.4	53.71	15.30	339.4	0.069000
average	**40.27**	**33.03**	**188.7**	**54.39**	**14.88**	**341.8**	**0.070000**
SD	1.7283	2.5350	2.4147	2.3935	1.5251	3.6383	0.001951

TD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	52.04	84.33	179.5	59.96	16.04	547.9	0.069000
2	54.61	82.73	177.9	65.47	15.53	560.2	0.072000
3	51.35	83.01	179.1	56.76	18.41	543.4	0.069000
4	52.81	88.27	181.2	63.04	14.32	547.8	0.070000
5	52.38	88.52	184.4	61.93	17.28	549.4	0.069000
6	55.48	83.03	183.3	59.81	17.80	541.7	0.070000
7	54.17	86.68	179.5	59.37	15.23	540.2	0.071000
8	56.52	83.11	178.3	57.34	14.91	543.8	0.070000
average	**53.67**	**84.96**	**180.4**	**60.46**	**16.19**	**546.8**	**0.070000**
SD	1.8120	2.4763	2.3611	2.9080	1.4754	6.3096	0.001069

Table D-24 Technical data of stretched PVC/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, 20 hours for polymerization and 90 minutes iodine doping @ 30°C in vacuum (MD and TD directions, respectively).

MD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	43.46	35.16	189.4	50.06	10.13	343.4	0.072000
2	3789	27.25	180.9	52.73	13.98	339.0	0.069000
3	40.82	29.98	183.8	48.88	14.45	340.1	0.070000
4	38.41	28.41	182.7	55.48	11.57	346.7	0.071000
5	39.80	30.06	206.2	48.91	1.92	329.8	0.070000
6	42.53	32.08	189.3	54.90	14.93	341.3	0.068000
7	47.63	34.25	180.1	49.58	12.52	334.6	0.071000
8	40.34	32.57	188.4	47.30	14.50	331.5	0.069000
average	**41.36**	**31.22**	**187.6**	**50.98**	**13.25**	**338.3**	**0.070000**
SD	3.1532	2.7725	8.3862	3.0171	1.6863	5.8733	0.001310

TD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	48.85	78.83	175.9	61.27	15.80	526.3	0.068000
2	50.48	83.13	176.6	55.37	14.79	533.8	0.070000
3	52.61	84.78	170.1	56.36	18.27	533.0	0.071000
4	49.23	79.95	161.6	55.70	14.81	532.1	0.071000
5	51.36	83.66	178.3	54.18	13.23	528.4	0.069000
6	50.66	80.36	175.9	55.93	17.83	527.8	0.069000
7	49.74	83.81	170.8	61.30	13.51	538.6	0.071000
8	48.51	81.72	176.4	60.21	4.80	532.8	0.071000
average	**50.18**	**82.03**	**173.2**	**57.54**	**15.38**	**531.6**	**0.070000**
SD	1.3774	2.1400	5.5074	2.8925	1.8385	3.9690	0.001201

Table D-25 Technical data of stretched PVC/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, 20 hours for polymerization and 120 minutes iodine doping @ 30°C in vacuum (MD and TD directions, respectively).

MD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	37.79	27.95	180.1	49.84	12.02	334.1	0.072000
2	36.23	26.28	283.2	51.21	9.330	325.4	0.068000
3	40.76	33.40	188.5	51.12	16.40	326.9	0.070000
4	35.57	31.97	178.0	50.51	15.39	334.1	0.070000
5	36.63	31.07	186.3	46.83	10.37	332.8	0.072000
6	39.51	32.35	189.6	41.96	12.51	331.6	0.071000
7	40.26	29.53	188.4	46.61	13.83	329.5	0.069000
8	41.81	27.69	180.3	44.32	14.23	326.4	0.068000
average	**38.57**	**30.03**	**184.3**	**47.80**	**13.01**	**330.1**	**0.070000**
SD	2.3264	2.5551	4.4892	3.4380	2.4223	3.5448	0.001601

TD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	50.41	83.20	168.9	60.22	15.59	532.8	0.070000
2	44.40	76.81	165.9	57.93	16.92	533.4	0.071000
3	48.93	85.56	170.7	55.32	17.72	521.8	0.070000
4	50.30	79.53	188.6	63.41	16.15	538.7	0.070000
5	47.36	83.37	172.9	52.98	15.98	529.8	0.070000
6	46.94	80.49	170.7	57.96	17.84	528.4	0.070000
7	54.72	84.51	167.4	63.27	15.57	528.9	0.071000
8	52.30	82.37	169.3	62.19	14.63	539.4	0.068000
average	**49.42**	**81.98**	**171.8**	**59.16**	**16.30**	**530.4**	**0.070000**
SD	3.2511	2.8725	7.1184	3.8010	1.1168	4.8582	0.000921

Table D-26 Technical data of stretched PP/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, 20 hours for polymerization and 30 minutes iodine doping @ 30°C in vacuum (MD and TD directions, respectively).

MD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	21.23	23.14	985.3	20.84	19.95	231.7	0.070000
2	20.83	23.84	986.1	21.56	23.46	237.6	0.069000
3	19.47	20.46	980.6	23.12	15.43	236.3	0.066000
4	18.51	19.59	984.3	20.00	18.89	323.8	0.070000
5	19.28	20.41	983.1	20.84	19.53	235.7	0.070000
6	22.24	30.35	981.5	22.67	22.18	238.6	0.068000
7	23.24	21.32	979.4	19.93	21.26	230.9	0.070000
average	**20.76**	**22.73**	**982.9**	**21.28**	**20.10**	**234.8**	**0.069000**
SD	1.8412	3.6934	2.5011	1.2410	2.6000	3.0041	0.001501

TD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	19.92	6.601	58.42	19.00	12.23	214.8	0.071000
2	15.27	8.231	67.87	16.65	13.57	216.4	0.069000
3	14.96	7.506	59.94	20.24	11.93	216.7	0.070000
4	21.58	7.931	66.83	19.13	15.81	221.5	0.072000
5	17.65	8.057	65.48	18.72	14.77	220.4	0.071000
6	18.41	9.323	62.71	17.34	16.38	219.7	0.068000
7	16.53	6.951	60.59	16.95	13.52	217.2	0.069000
average	**17.76**	**7.800**	**63.12**	**18.29**	**14.03**	**218.1**	**0.070000**
SD	2.4241	0.8975	3.6674	1.3283	1.7011	2.4485	0.001400

Table D-27 Technical data of stretched PP/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, 20 hours for polymerization and 60 minutes iodine doping @ 30°C in vacuum (MD and TD directions, respectively).

MD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	22.25	19.43	977.1	21.17	14.15	232.1	0.069000
2	25.18	20.35	975.4	19.99	17.33	228.7	0.071000
3	26.97	19.70	980.7	20.36	19.83	229.3	0.070000
4	21.31	18.22	987.0	18.90	17.78	230.8	0.070000
5	24.84	17.54	981.3	21.75	15.94	233.4	0.070000
6	23.92	21.39	979.8	22.42	17.39	228.9	0.071000
7	25.07	22.04	975.2	16.88	16.44	236.6	0.069000
average	**24.22**	**19.81**	**979.5**	**20.21**	**16.98**	**231.4**	**0.070000**
SD	1.9162	1.6122	4.1241	1.8730	1.7534	2.8824	0.000816

TD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	20.88	6.849	71.52	18.96	12.28	222.8	0.069000
2	17.39	5.417	70.41	17.35	17.63	217.2	0.075000
3	20.22	7.120	66.47	20.12	16.40	211.6	0.070000
4	21.47	7.004	67.38	20.10	17.50	218.4	0.071000
5	18.36	4.951	79.25	19.83	13.38	216.3	0.070000
6	19.94	7.170	61.96	18.41	14.45	210.7	0.072000
7	16.49	6.513	65.73	22.50	16.72	213.6	0.070000
average	**19.25**	**6.432**	**68.96**	**19.61**	**15.48**	**215.8**	**0.071000**
SD	1.8654	0.8897	5.5183	1.6263	2.1133	4.2120	0.002000

Table D-28 Technical data of stretched PP/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, 20 hours for polymerization and 90 minutes iodine doping @ 30°C in vacuum (MD and TD directions, respectively).

MD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	19.94	17.33	970.2	21.34	16.74	220.4	0.068000
2	22.59	18.47	969.4	24.52	17.11	221.4	0.071000
3	24.22	19.59	978.6	20.81	19.73	224.5	0.070000
4	28.55	15.99	975.7	19.50	18.88	230.7	0.072000
5	21.38	17.01	976.1	21.71	18.64	217.3	0.069000
6	24.41	16.83	974.6	24.12	17.89	219.4	0.070000
7	22.56	15.32	971.3	25.57	19.25	214.7	0.070000
average	**23.34**	**17.22**	**973.7**	**22.51**	**18.32**	**221.2**	**0.070000**
SD	2.7421	1.4441	3.4421	2.2342	1.1120	5.2041	0.001290

TD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	15.94	4.013	60.81	14.98	18.29	210.9	0.072000
2	17.59	5.129	66.39	15.41	17.36	215.0	0.069000
3	19.53	5.031	69.50	14.82	16.07	198.8	0.071000
4	20.80	6.112	65.85	17.73	14.59	217.4	0.068000
5	16.94	5.576	66.72	16.61	14.27	217.8	0.070000
6	19.14	4.314	62.84	14.52	17.83	210.6	0.071000
7	17.25	4.839	60.93	13.87	19.12	206.5	0.069000
average	**18.17**	**5.002**	**64.72**	**15.42**	**16.79**	**211.0**	**0.070000**
SD	1.7021	0.7137	3.2692	1.3240	1.8625	6.7381	0.001411

Table D-29 Technical data of stretched PP/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, 20 hours for polymerization and 120 minutes iodine doping @ 30°C in vacuum (MD and TD directions, respectively).

MD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	20.03	16.37	970.7	19.84	16.01	213.7	0.071000
2	19.57	14.82	969.2	18.79	18.40	230.5	0.076000
3	21.75	17.02	973.0	20.05	13.81	223.6	0.070000
4	23.20	18.19	974.3	24.75	14.38	225.7	0.069000
5	21.57	15.54	972.7	21.23	15.95	218.4	0.070000
6	22.34	19.98	968.9	20.54	12.46	216.5	0.071000
7	24.28	17.01	972.4	19.91	13.71	217.2	0.070000
average	**21.82**	**16.99**	**971.6**	**20.73**	**14.96**	**220.8**	**0.071000**
SD	1.6611	1.7114	2.0394	1.9210	1.9743	5.9661	0.002311

TD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	16.82	4.013	67.22	15.59	13.14	201.8	0.069000
2	17.01	5.214	63.68	18.47	12.61	200.5	0.071000
3	19.38	4.112	64.71	16.83	13.08	210.4	0.070000
4	18.02	3.996	66.44	18.02	14.17	206.2	0.070000
5	19.50	5.223	60.85	19.18	15.42	196.8	0.070000
6	18.23	3.524	76.11	18.53	13.99	197.3	0.071000
7	16.74	2.856	62.57	16.79	13.35	196.8	0.069000
average	**17.96**	**4.134**	**65.94**	**17.63**	**13.68**	**201.4**	**0.070000**
SD	1.1675	0.8556	4.9873	1.2631	0.9371	5.2301	0.000816

Table D-30 Technical data of stretched LDPE/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, 20 hours for polymerization and 30 minutes iodine doping @ 30°C in vacuum (MD and TD directions, respectively).

MD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	20.11	19.96	273.9	16.29	23.04	86.47	0.070000
2	25.53	23.51	276.3	15.71	24.13	91.07	0.071000
3	24.17	24.01	280.5	14.38	26.85	87.91	0.071000
4	22.86	19.57	280.9	13.83	30.79	85.43	0.071000
5	20.95	21.23	281.4	14.60	30.41	92.37	0.068000
6	20.85	24.10	277.5	14.30	29.35	90.54	0.070000
7	21.24	37.72	275.9	13.15	26.93	87.85	0.071000
8	29.49	20.14	270.4	14.22	24.58	91.16	0.069000
average	**23.15**	**23.78**	**277.1**	**14.22**	**27.01**	**89.10**	**0.070000**
SD	3.1621	5.9361	3.8154	1.0038	2.9591	2.5141	0.001072

TD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	10.91	7.391	214.6	10.93	15.09	123.2	0.070000
2	11.18	8.185	219.2	9.847	20.27	126.4	0.068000
3	9.847	7.976	217.7	9.950	20.43	127.2	0.072000
4	10.99	8.004	211.9	12.01	16.95	124.3	0.069000
5	12.13	6.023	220.0	12.97	17.98	120.4	0.071000
6	10.98	7.688	209.8	13.14	18.33	119.8	0.070000
7	12.37	5.546	216.3	10.23	15.90	126.6	0.070000
8	9.832	6.211	213.7	9.803	16.73	121.7	0.069000
average	**11.03**	**7.128**	**215.4**	**11.11**	**17.71**	**123.7**	**0.070000**
SD	0.9168	1.0391	3.5622	1.4067	1.9300	2.8951	0.001310

Table D-31 Technical data of stretched LDPE/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, 20 hours for polymerization and 60 minutes iodine doping @ 30°C in vacuum (MD and TD directions, respectively).

MD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	27.63	24.54	275.4	12.57	25.76	86.19	0.070000
2	25.05	23.95	269.3	14.20	34.38	88.07	0.074000
3	24.27	21.71	271.7	15.55	22.74	85.93	0.069000
4	26.81	22.93	275.3	12.39	23.50	89.41	0.072000
5	23.75	26.27	278.2	13.81	24.43	88.84	0.071000
6	28.15	21.22	280.3	15.02	28.52	84.59	0.072000
7	24.86	24.35	275.5	14.26	27.01	85.93	0.070000
8	23.80	20.39	271.1	11.80	24.78	90.48	0.070000
average	**25.54**	**23.17**	**274.6**	**13.70**	**26.39**	**87.43**	**0.071000**
SD	1.7462	1.9714	3.7061	1.3285	3.7274	2.0611	0.001601

TD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	9.112	5.873	217.2	9.213	18.15	122.4	0.070000
2	10.03	7.112	215.9	9.934	16.13	119.8	0.070000
3	10.40	8.014	210.2	11.12	19.52	121.9	0.070000
4	8.937	7.516	208.9	10.93	16.80	122.5	0.070000
5	8.206	5.141	210.2	8.996	17.86	118.7	0.069000
6	11.23	6.283	215.3	10.81	15.35	123.8	0.071000
7	9.951	6.559	213.7	9.342	16.97	124.6	0.071000
8	10.35	6.078	209.4	9.815	14.82	117.5	0.069000
average	**9.777**	**6.572**	**212.6**	**10.02**	**16.95**	**121.4**	**0.070000**
SD	0.9664	0.9355	3.2954	0.8342	1.5437	2.4932	0.000760

Table D-32 Technical data of stretched LDPE/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, 20 hours for polymerization and 90 minutes iodine doping @ 30°C in vacuum (MD and TD directions, respectively).

MD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	23.09	24.15	275.1	15.20	25.01	83.14	0.064000
2	22.84	25.12	272.6	16.73	24.97	92.86	0.071000
3	23.57	21.38	274.7	13.51	27.37	82.28	0.070000
4	25.70	23.63	271.7	14.12	28.33	88.96	0.071000
5	27.24	21.20	270.4	8.740	25.22	87.17	0.068000
6	26.83	20.59	275.1	11.07	28.83	86.39	0.069000
7	25.11	24.24	276.3	12.35	29.50	81.53	0.069000
8	20.58	19.93	270.5	13.00	27.81	84.71	0.070000
average	**24.37**	**22.53**	**273.3**	**13.09**	**27.13**	**85.88**	**0.069000**
SD	2.2551	1.9672	2.2915	2.4644	1.8232	3.7961	0.002271

TD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	13.29	4.948	208.4	9.713	17.35	119.0	0.069000
2	9.847	7.055	214.7	8.894	16.40	117.3	0.070000
3	11.03	6.504	205.5	7.543	14.87	123.9	0.067000
4	10.59	5.805	208.5	10.49	19.55	119.0	0.071000
5	10.91	5.913	213.9	10.88	25.32	115.7	0.071000
6	9.973	5.886	215.6	10.07	18.88	120.1	0.070000
7	11.35	6.012	213.3	11.24	20.21	123.8	0.069000
8	9.887	6.437	209.7	9.014	19.98	120.4	0.072000
average	**10.86**	**6.070**	**211.2**	**9.731**	**19.07**	**119.9**	**0.070000**
SD	1.1351	0.6192	3.6481	1.2134	3.1441	2.8672	0.001601

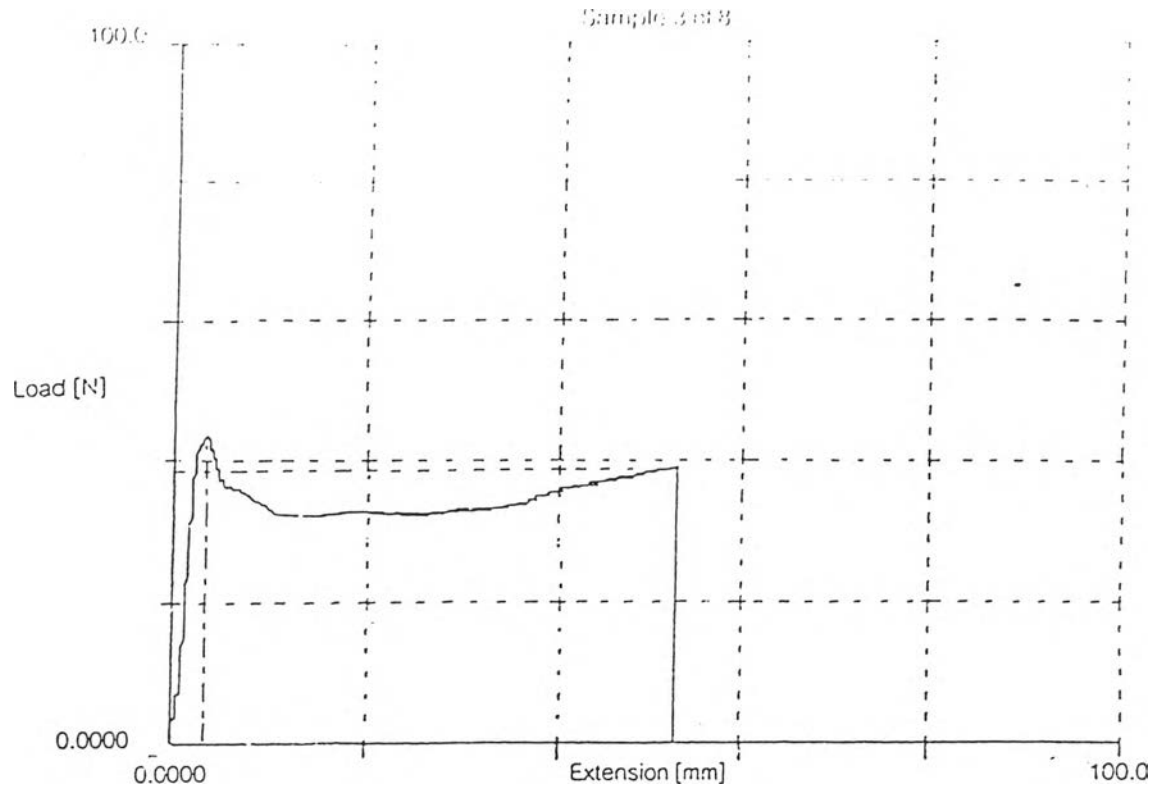
Table D-33 Technical data of stretched LDPE/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, 20 hours for polymerization and 120 minutes iodine doping @ 30°C in vacuum (MD and TD directions, respectively).

MD DIRECTION

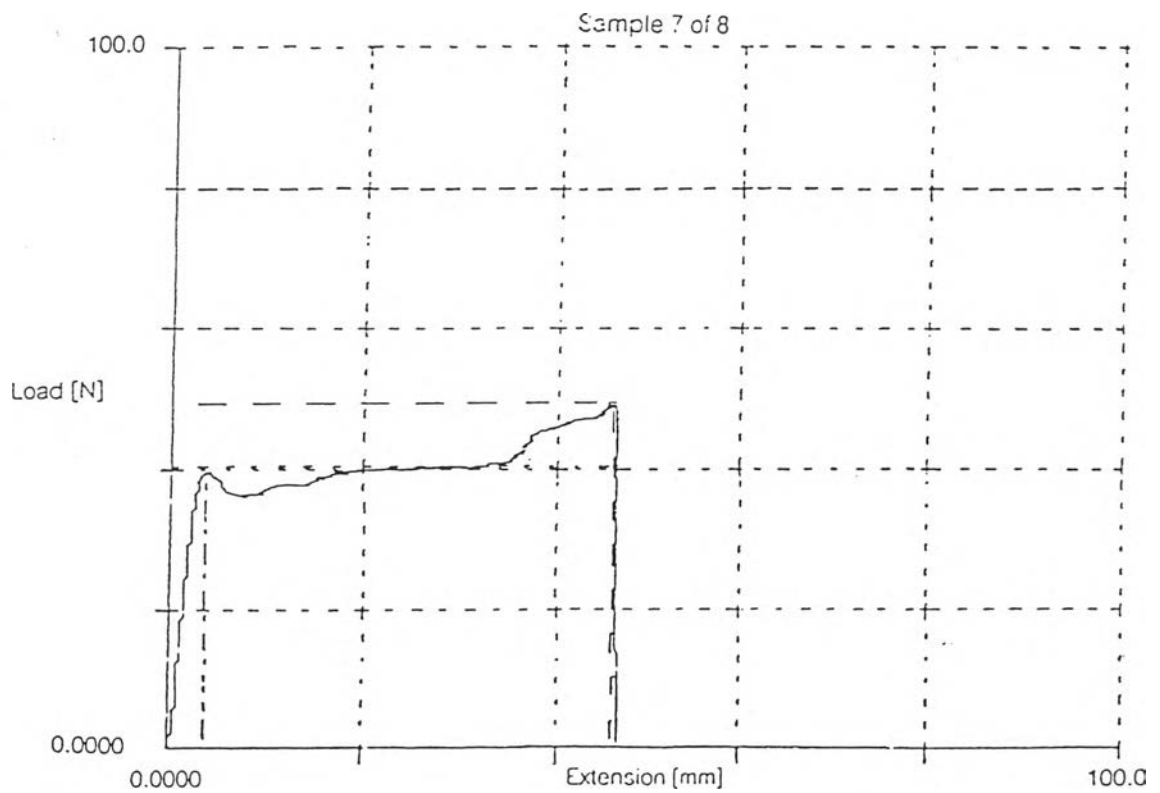
sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	22.41	21.89	281.7	13.16	27.09	87.07	0.070000
2	23.04	19.99	268.1	14.18	25.77	86.04	0.071000
3	20.50	23.46	266.7	15.47	23.86	85.30	0.070000
4	21.49	21.31	276.6	13.50	26.47	81.54	0.072000
5	19.81	20.27	265.4	12.81	23.90	84.21	0.071000
6	22.73	23.86	281.5	11.27	33.68	80.43	0.069000
7	20.64	21.43	273.8	10.89	25.71	94.14	0.069000
8	20.58	23.79	269.4	11.44	24.88	81.27	0.068000
average	**21.40**	**22.00**	**272.9**	**12.84**	**26.42**	**85.00**	**0.070000**
SD	1.1990	1.5421	6.5011	1.5804	3.1483	4.4144	0.001301

TD DIRECTION

sample no.	Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thickness (mm)
1	10.54	4.980	210.8	9.944	14.37	120.4	0.070000
2	10.38	4.951	213.2	8.997	13.59	110.4	0.070000
3	11.57	5.376	211.7	10.05	18.42	117.5	0.070000
4	14.37	7.015	201.3	9.029	14.48	115.9	0.070000
5	13.50	6.843	222.5	11.98	17.63	118.4	0.070000
6	11.84	7.593	208.9	10.77	16.66	120.7	0.071000
7	9.860	4.141	205.4	12.51	13.40	121.8	0.069000
8	12.34	6.133	203.8	11.20	14.89	118.9	0.070000
average	**11.80**	**5.879**	**209.7**	**10.56**	**15.43**	**118.0**	**0.070000**
SD	1.5682	1.2050	6.6092	1.2933	1.8947	3.6032	0.000534

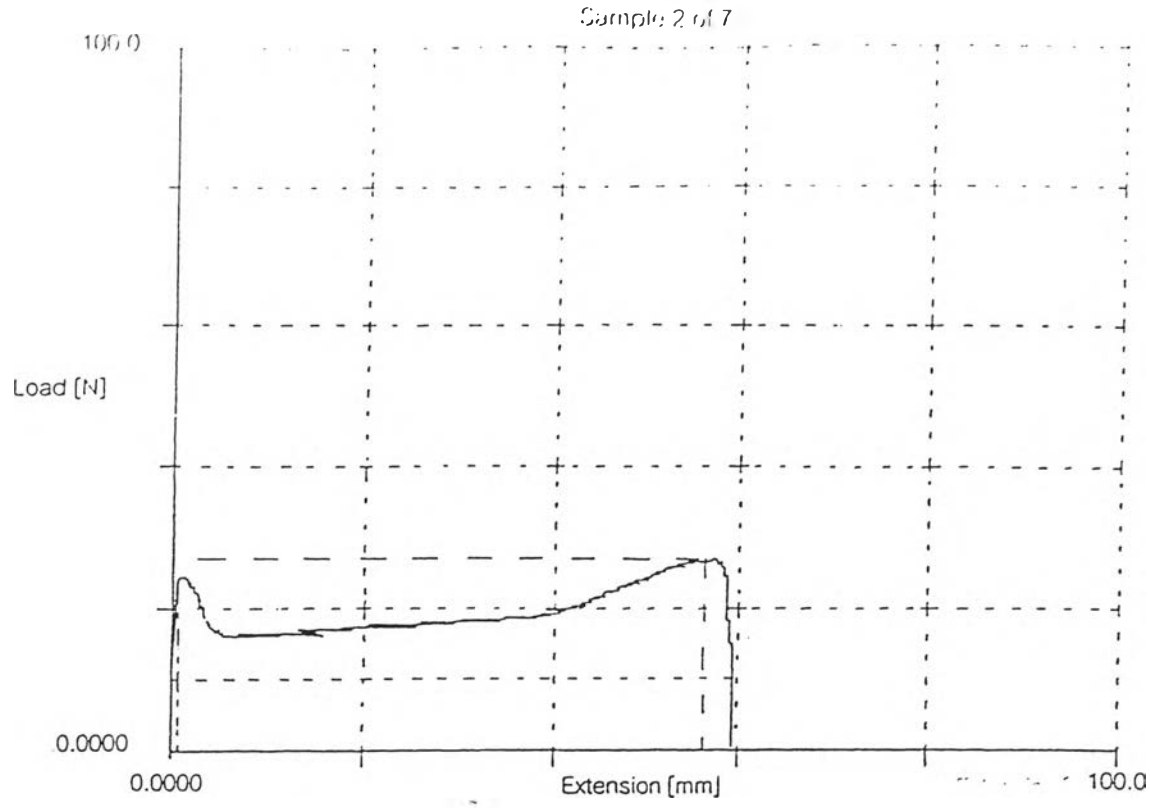


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
43.75	52.03	209.5	58.34	12.24	371.4	0.039000

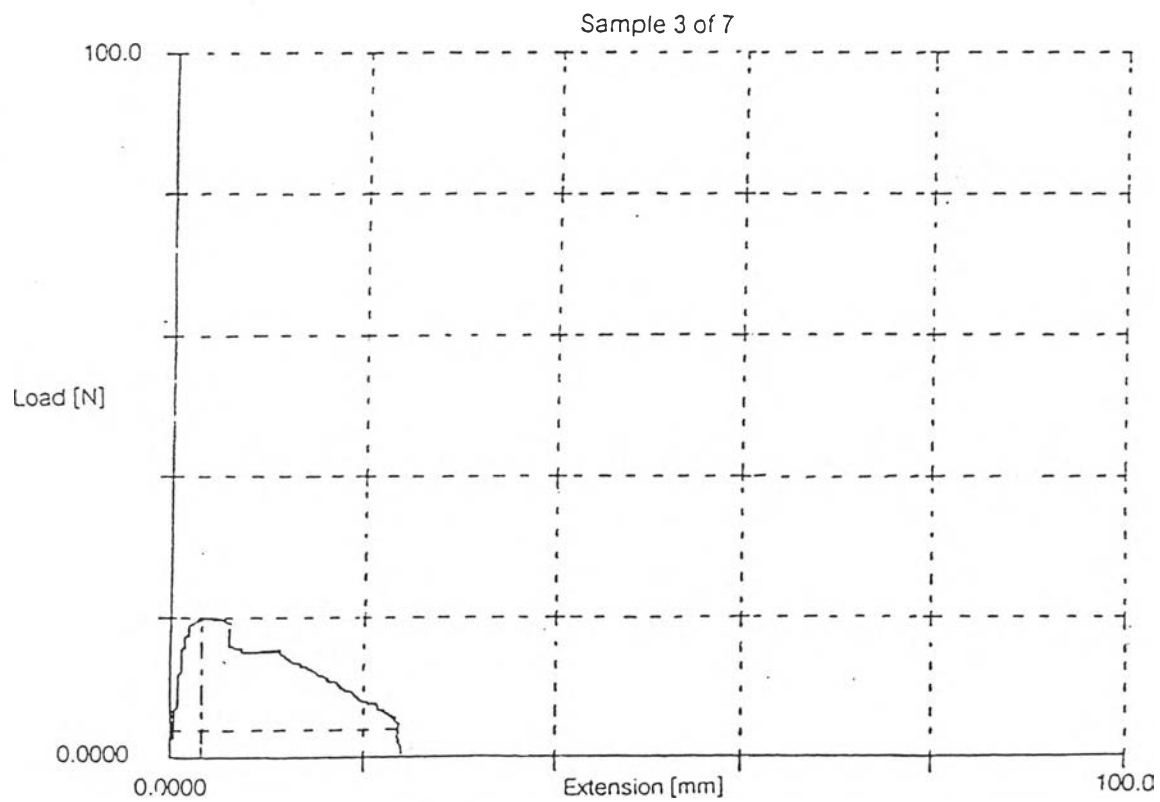


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
49.40	62.38	185.2	60.98	14.60	449.7	0.039000

Table D-1 Load-extension curve of stretched PVC films (MD and TD directions, respectively).

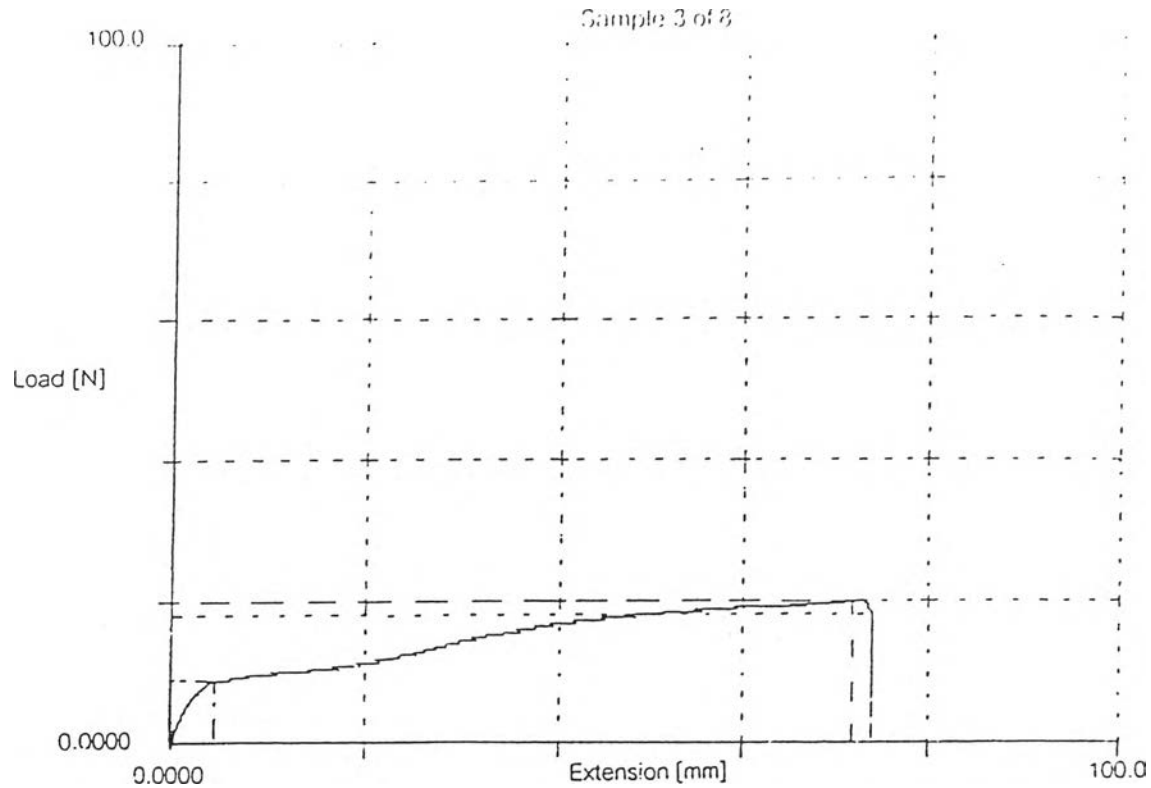


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
26.97	9.189	944.9	21.57	11.12	446.1	0.045000

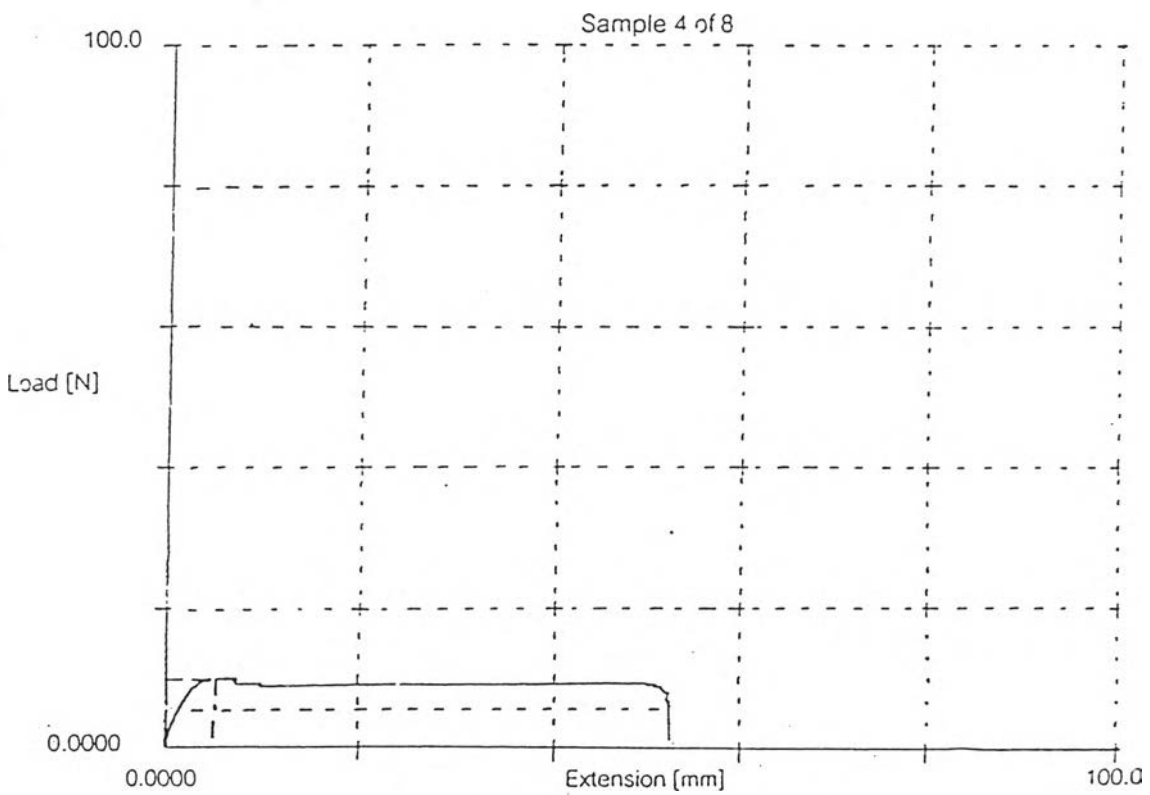


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
17.91	4.196	93.46	22.13	12.94	375.5	0.036000

Table D-2 Load-extension curve of stretched PP films (MD and TD directions, respectively).

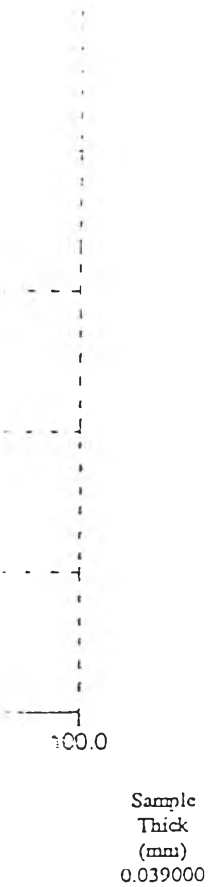


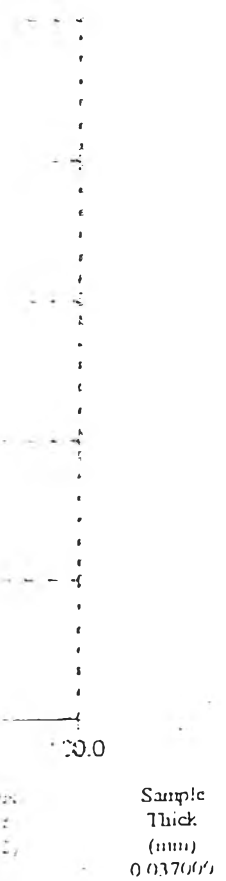
Maximum Load (N)	Stress @ Break (N/mm2)	Srain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
20.10	20.26	293.8	9.833	18.56	103.3	0.036000



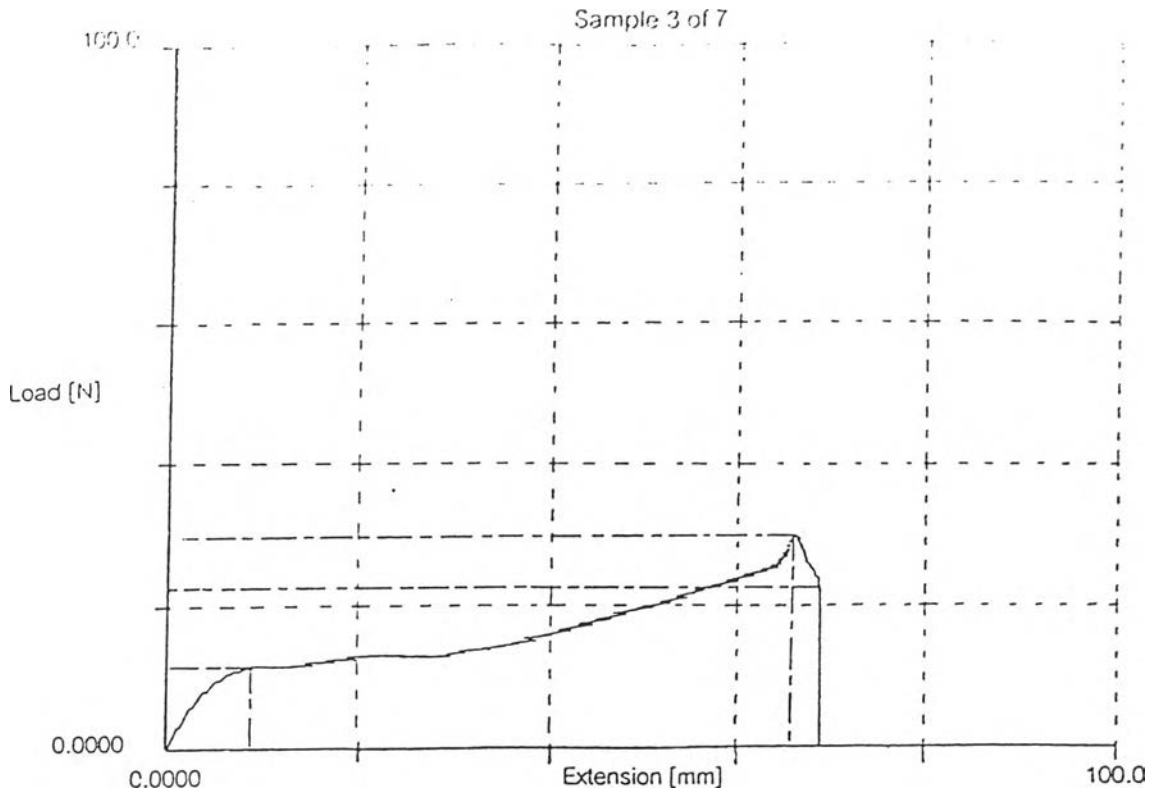
Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
9.842	5.569	262.0	9.842	21.25	102.0	0.036000

Table D-3 Load-extension curve of stretched LDPE films (MD and TD directions, respectively).

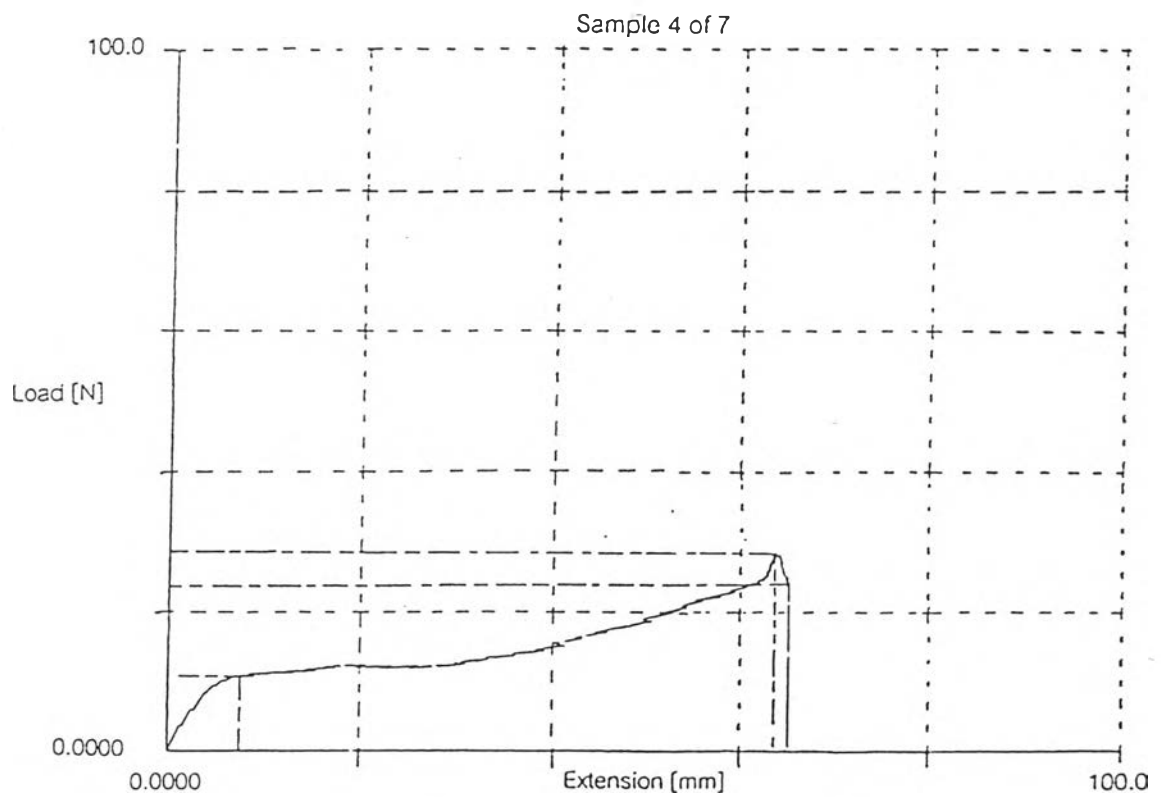




$FeCl_3$ films,

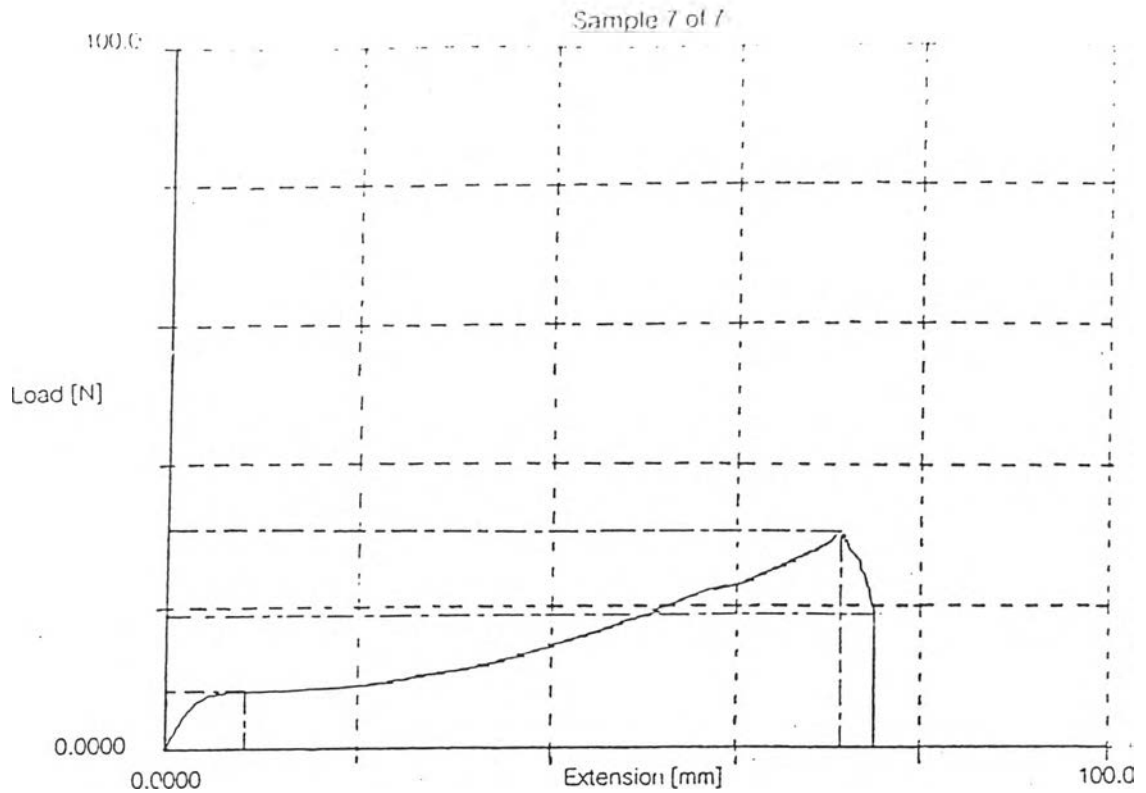


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
32.09	28.37	311.9	27.20	48.65	27.62	0.037000

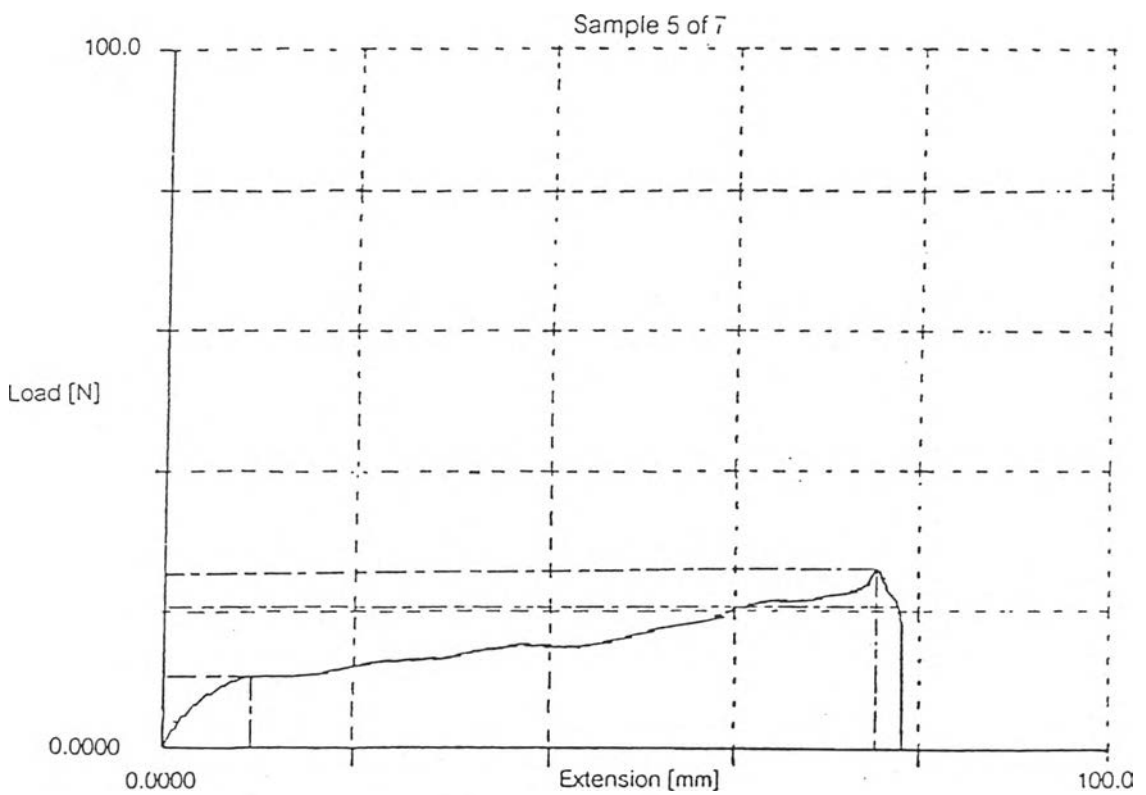


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick. (mm)
30.50	23.59	301.99	29.33	46.68	26.34	0.042000

Table D-5 Load-extension curve of stretched PVA/10%$FeCl_3$ and PVA/15%$FeCl_3$ films, respectively.

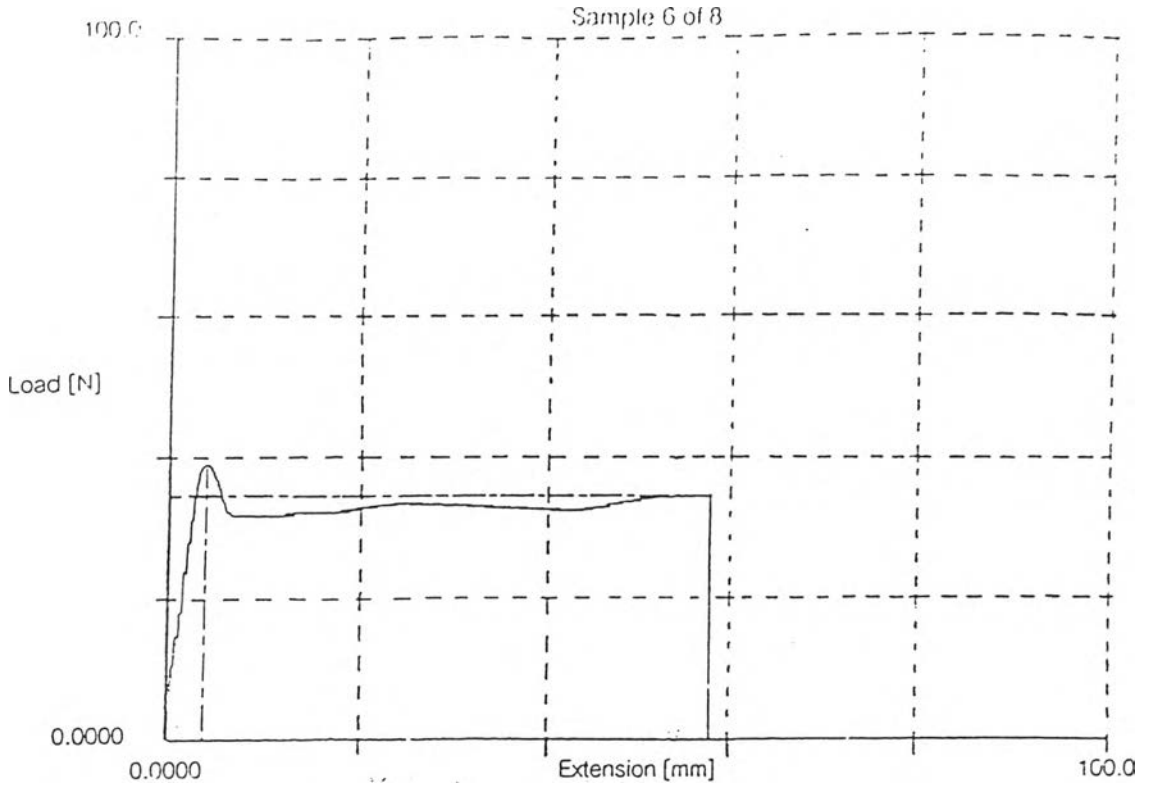


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
28.27	25.36	348.7	30.25	44.03	21.74	0.040000

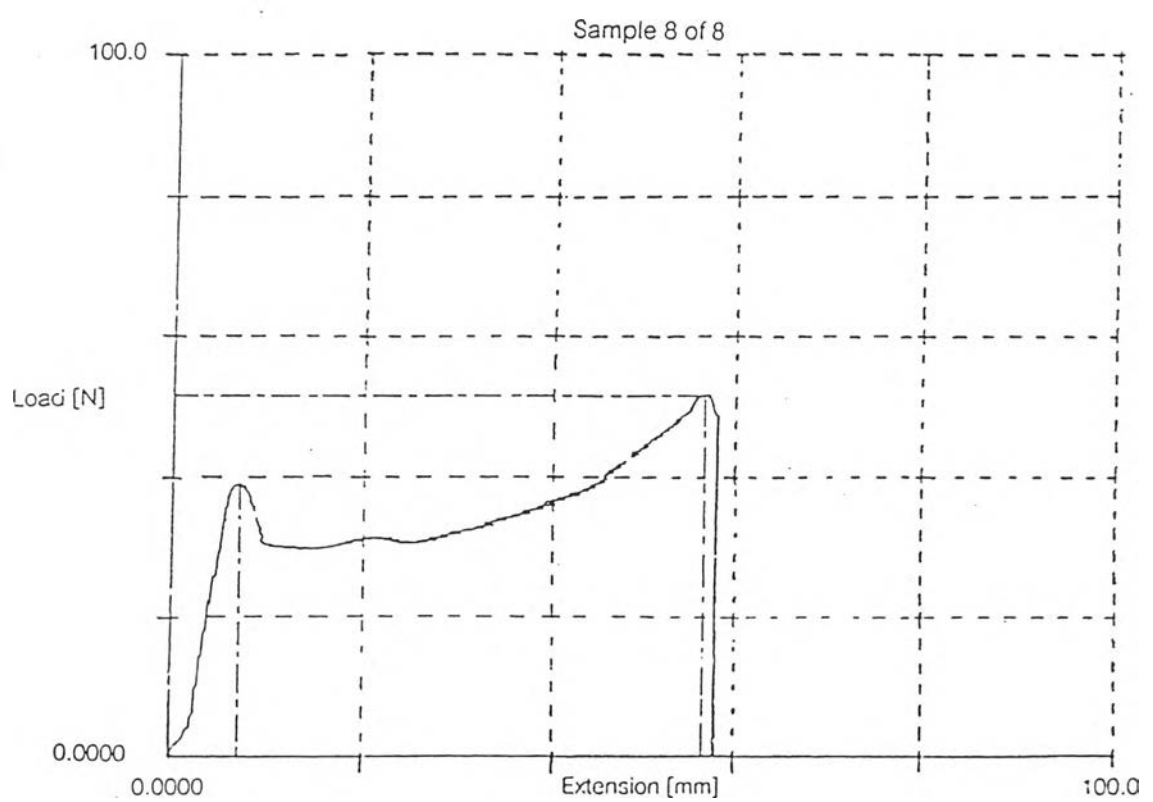


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
26.48	29.59	400.1	28.27	45.43	20.02	0.040000

Table D-6 Load-extension curve data of stretched PVA/20%$FeCl_3$ and PVA/25%$FeCl_3$ films, respectively.

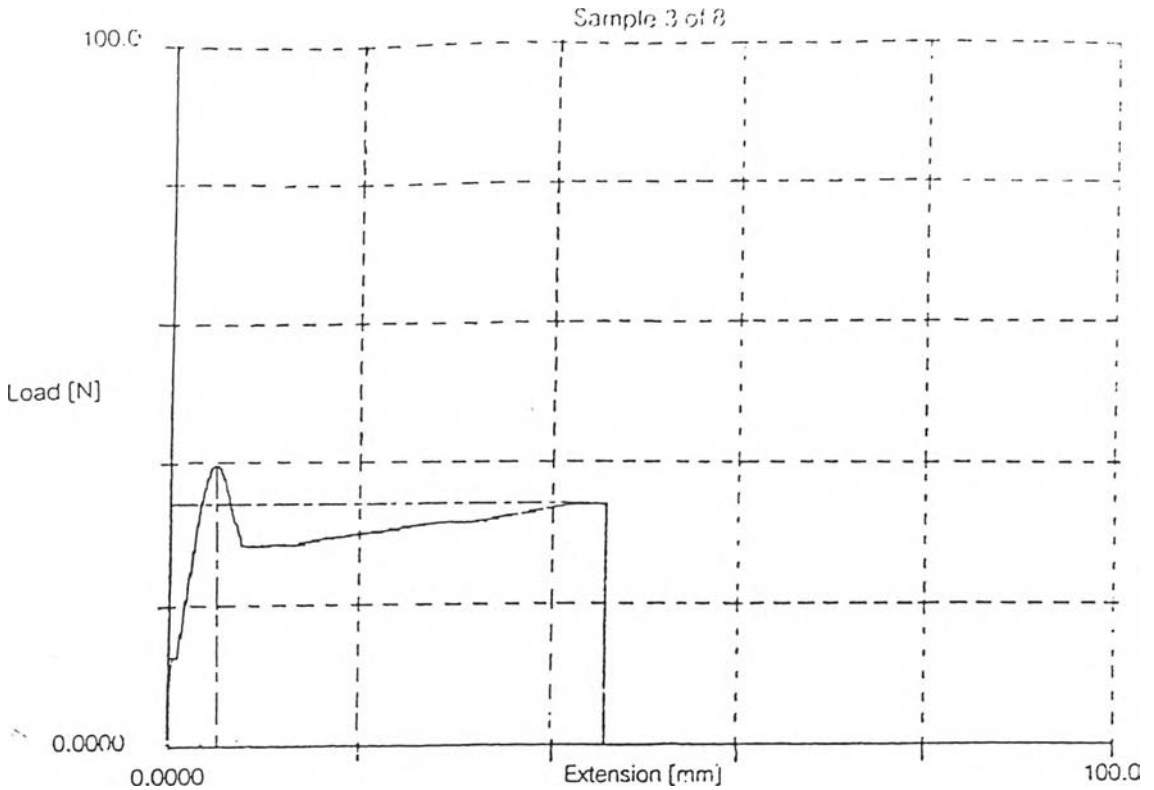


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
39.98	35.01	200.1	54.98	16.13	345.1	0.071000

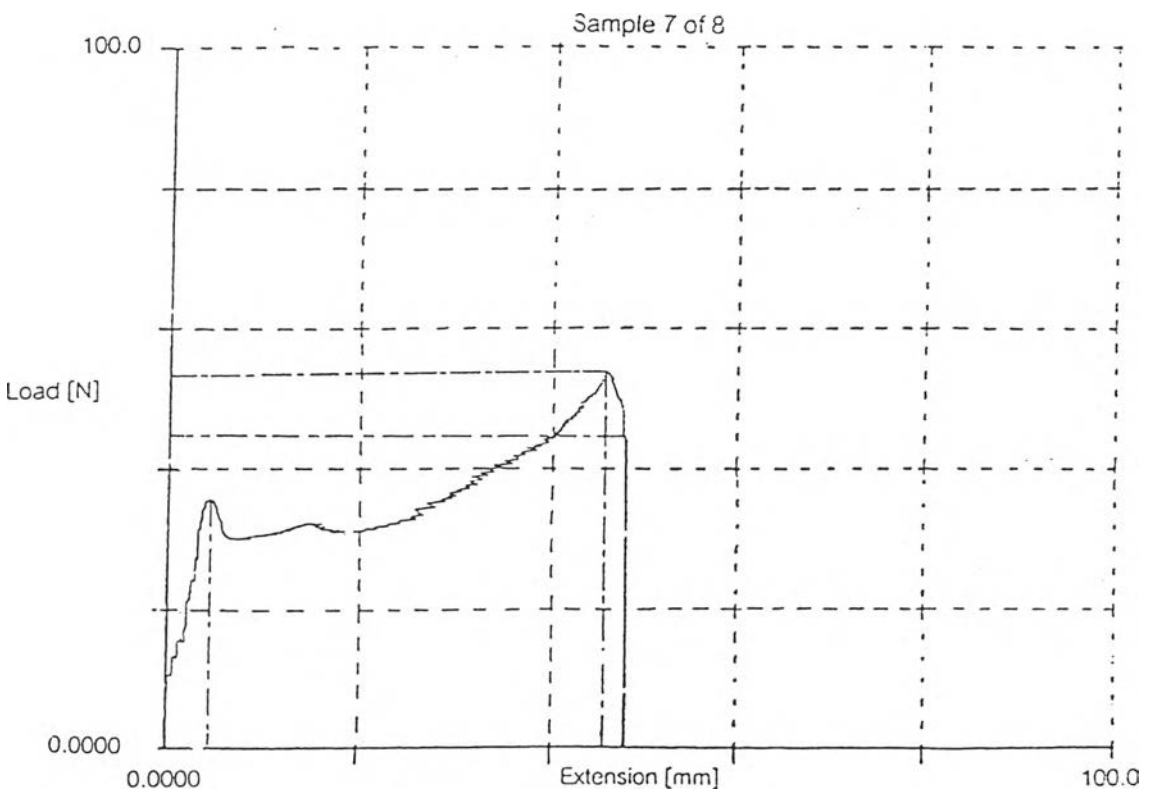


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
51.89	54.57	[illegible]	63.14	17.3[illegible]	5[illegible]1	0.071000

Table D-7 Load-extension curve of stretched PVC/PPY films from 25%$FeCl_3$, 25%pyrrole, @-15°C, and 20 hours for polymerization (MD and TD directions, respectively).

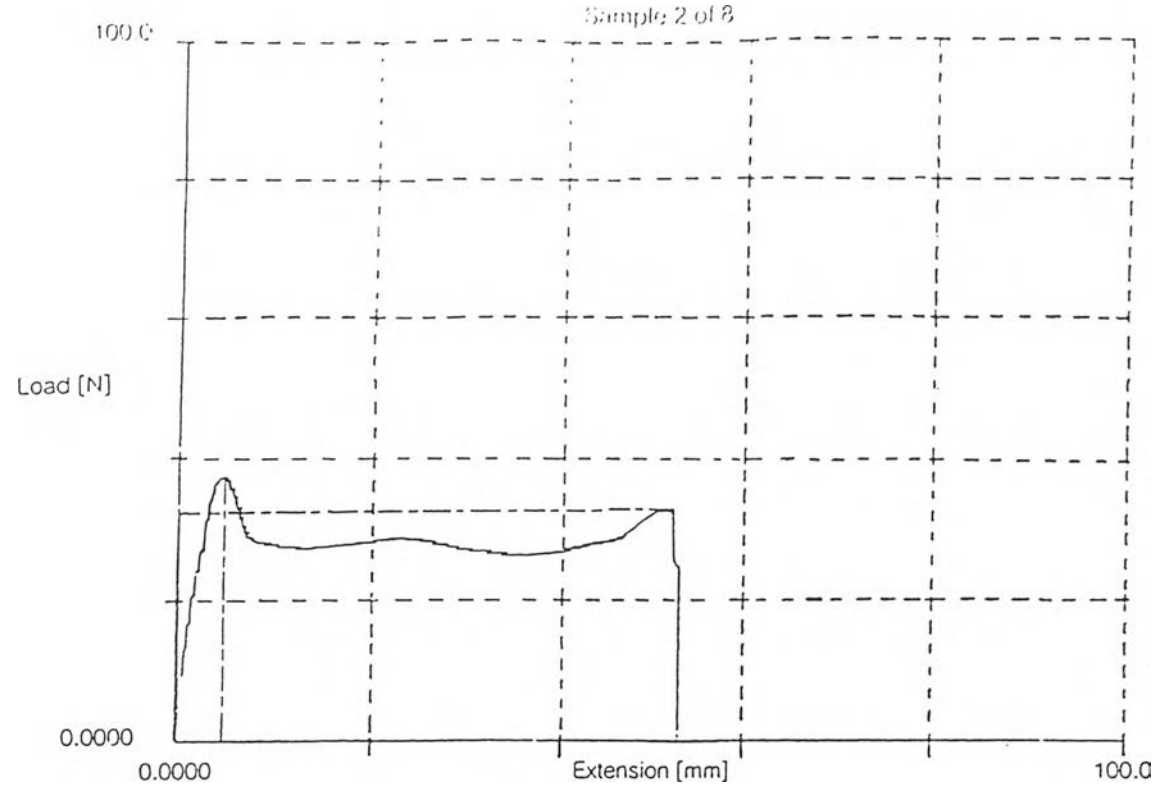


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
39.47	33.23	184.3	51.57	14.05	331.7	0.070000

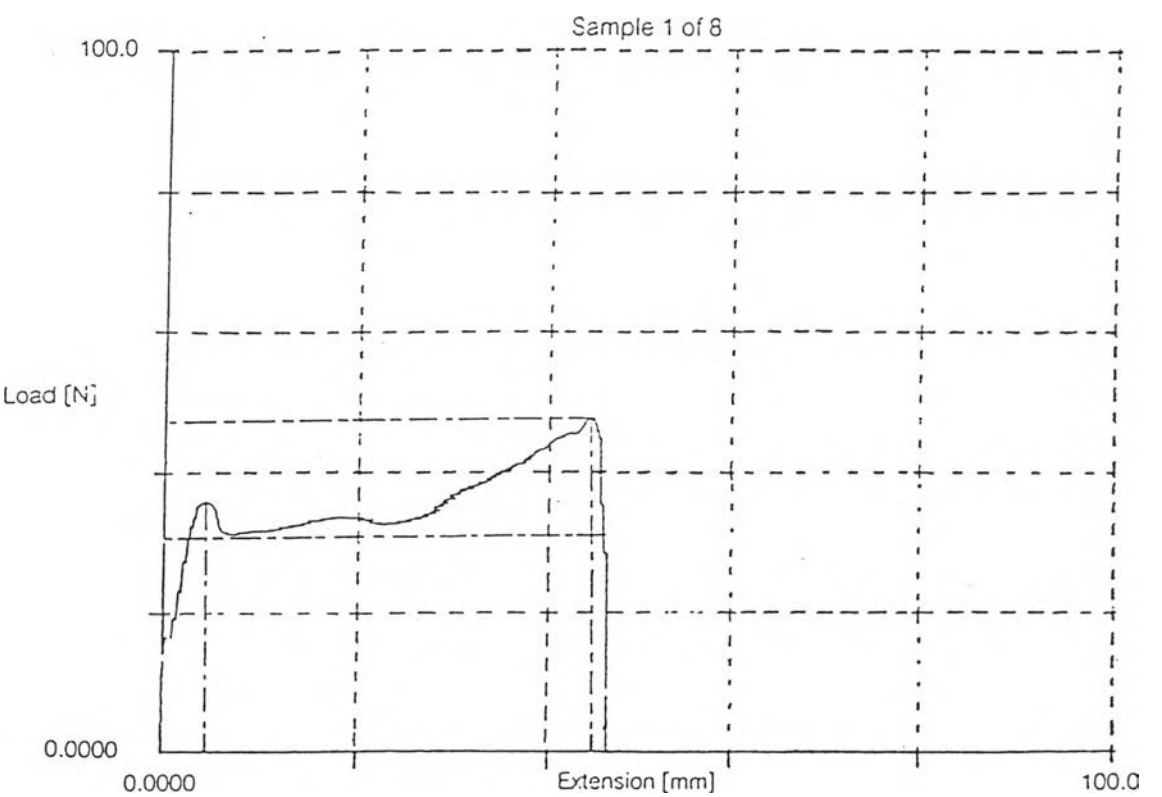


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
57.12	84.39	180.5	57.75	16.36	536.6	0.070000

Table D-8 Load-extension curve of stretched PVC/PPY films from 25%$FeCl_3$, 25%pyrrole, @ 30°C, and 20 hours for polymerization (MD and TD directions, respectively).

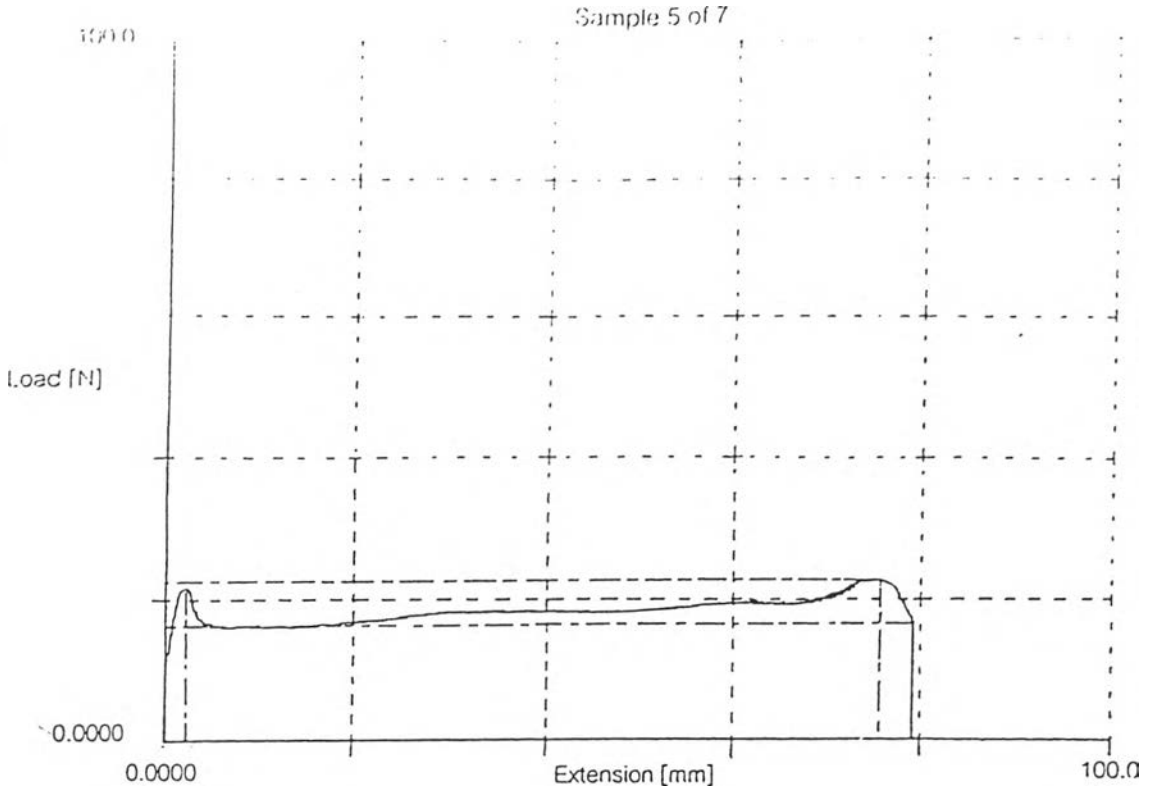


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
37.75	17.79	97.73	35.54	9.110	98.71	0.070000

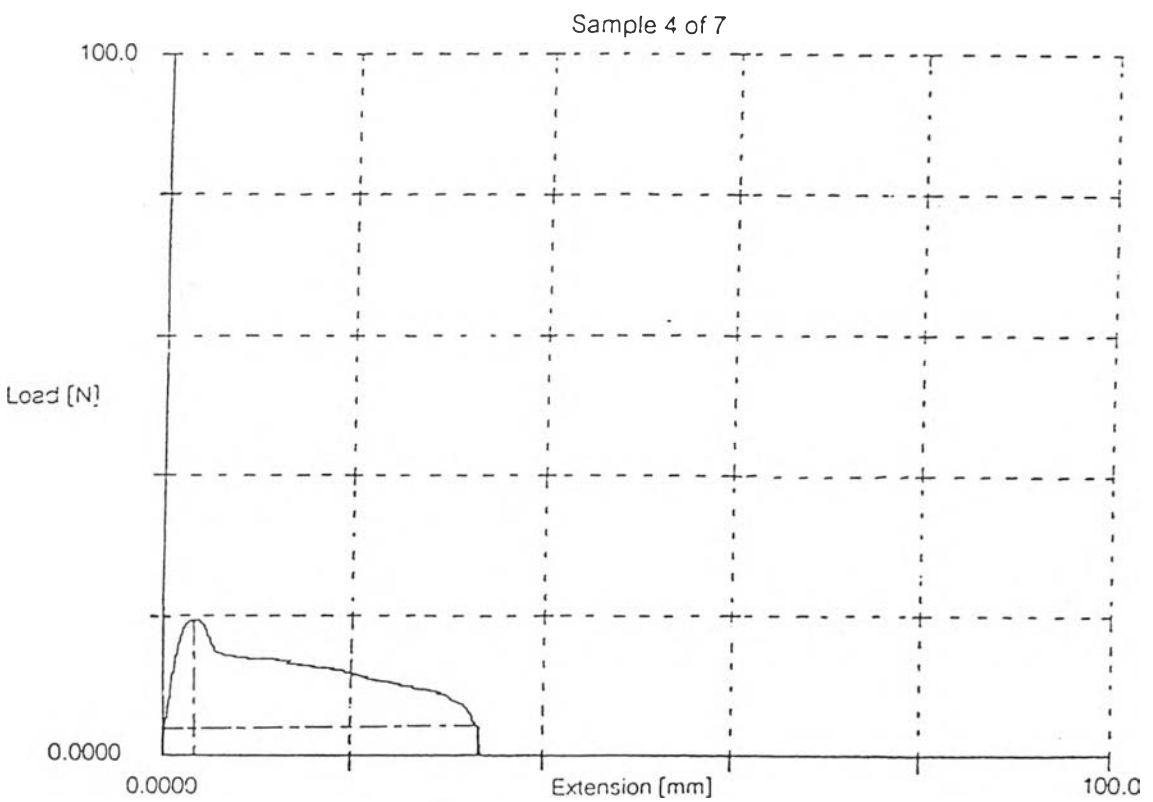


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
46.68	55.23	13.71	55.51	13.71	421.2	0.070000

Table D-9 Load-extension curve of stretched PVC/PPY films from 25%$FeCl_3$, 25%pyrrole, @ 70°C, and 20 hours for polymerization (MD and TD directions, respectively).

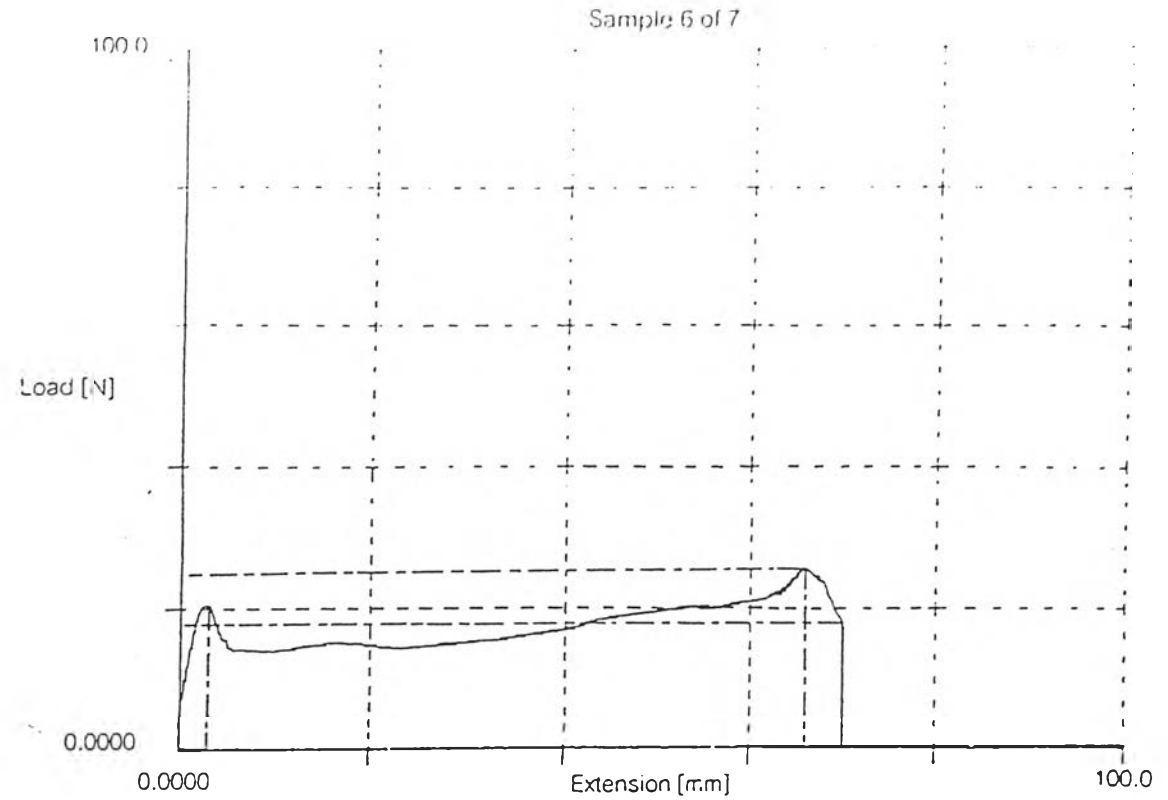


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
22.22	23.15	999.8	27.34	19.92	235.0	0.074000

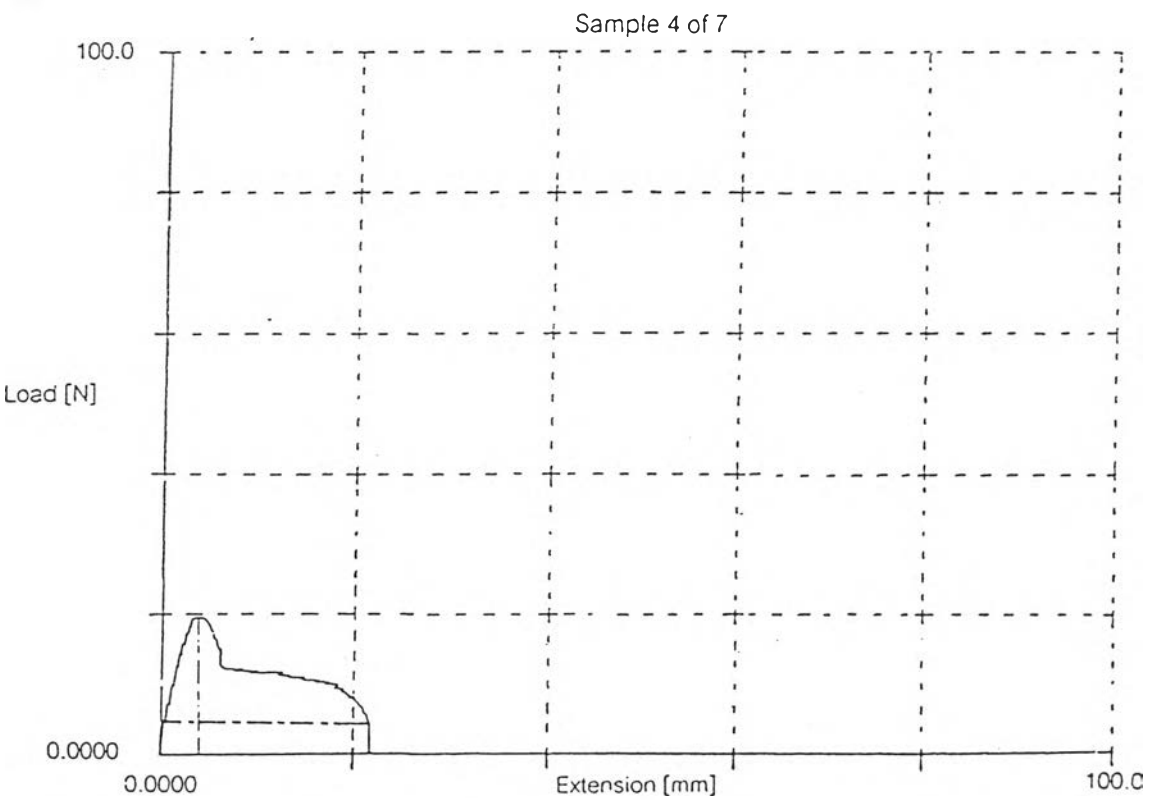


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
19.63	8.013	71.71	21.89	15.16	230.8	0.071000

Table D-10 Load-extension curve of stretched PP/PPY films from 25%$FeCl_3$, 25%pyrrole, @-15°C, and 20 hours for polymerization (MD and TD directions, respectively).

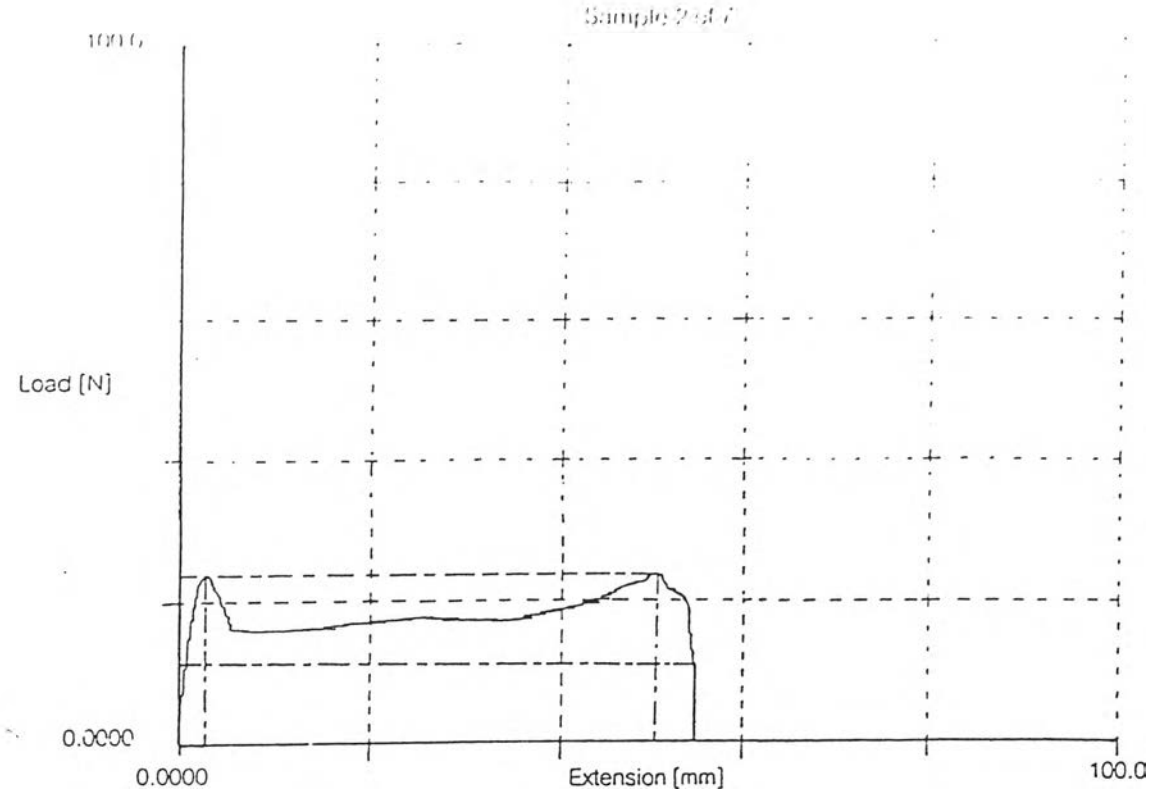


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
25.03	21.42	993.5	27.26	17.72	229.5	0.070000

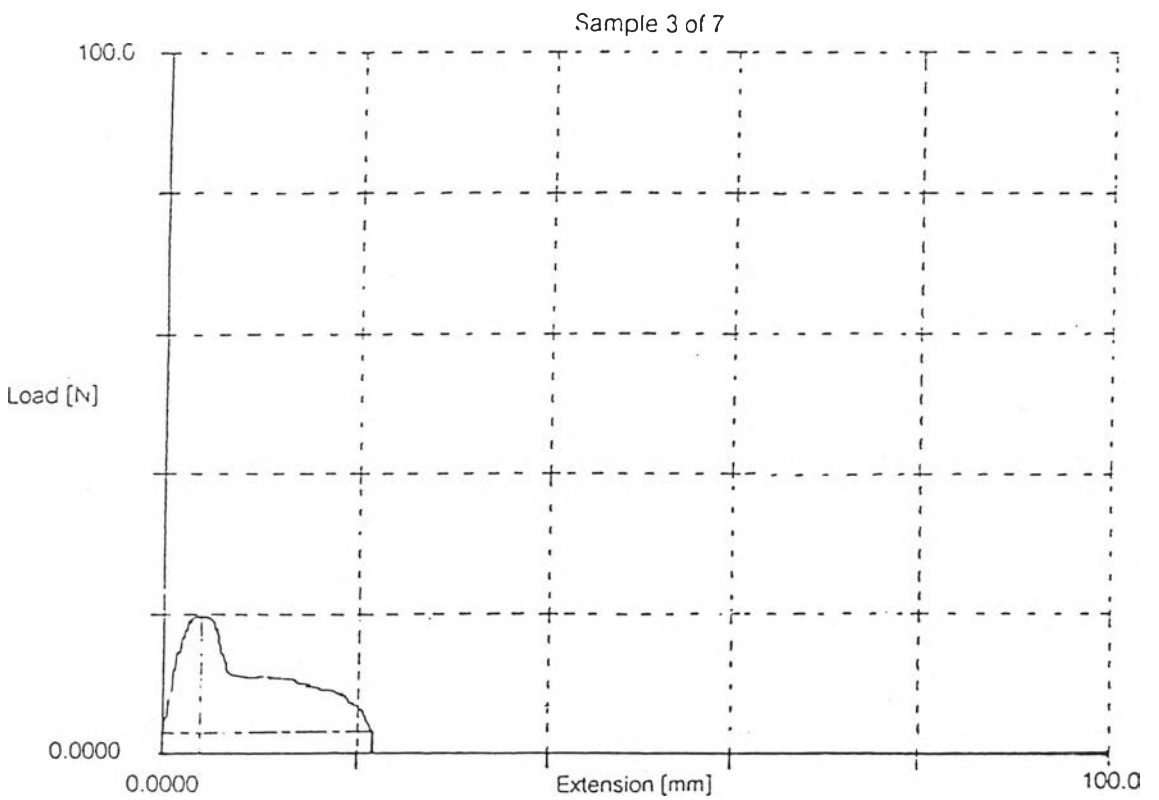


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
19.04	0.683	68.84	20.01	12.33	220.1	0.070000

Table D-11 Load-extension curve of stretched PP/PPY films from 25%$FeCl_3$, 25%pyrrole, @ 30°C, and 20 hours for polymerization (MD and TD directions, respectively).

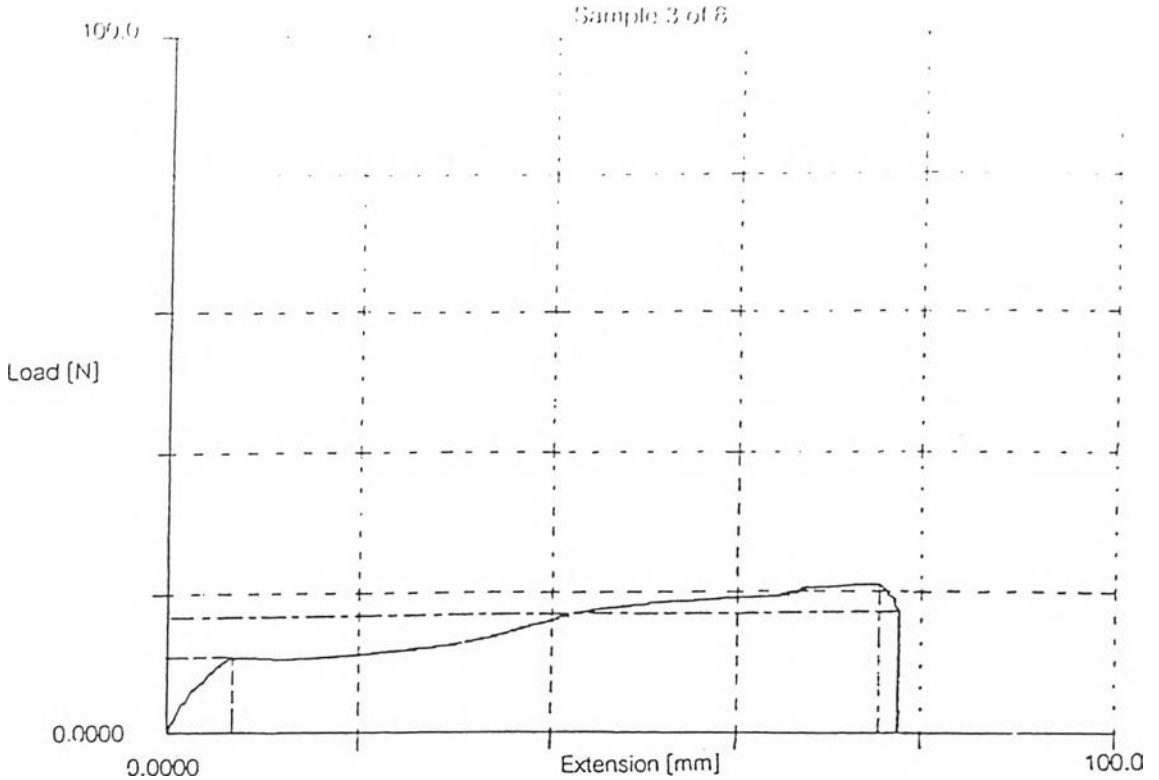


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
24.53	13.51	786.7	22.49	15.13	226.2	0.070000

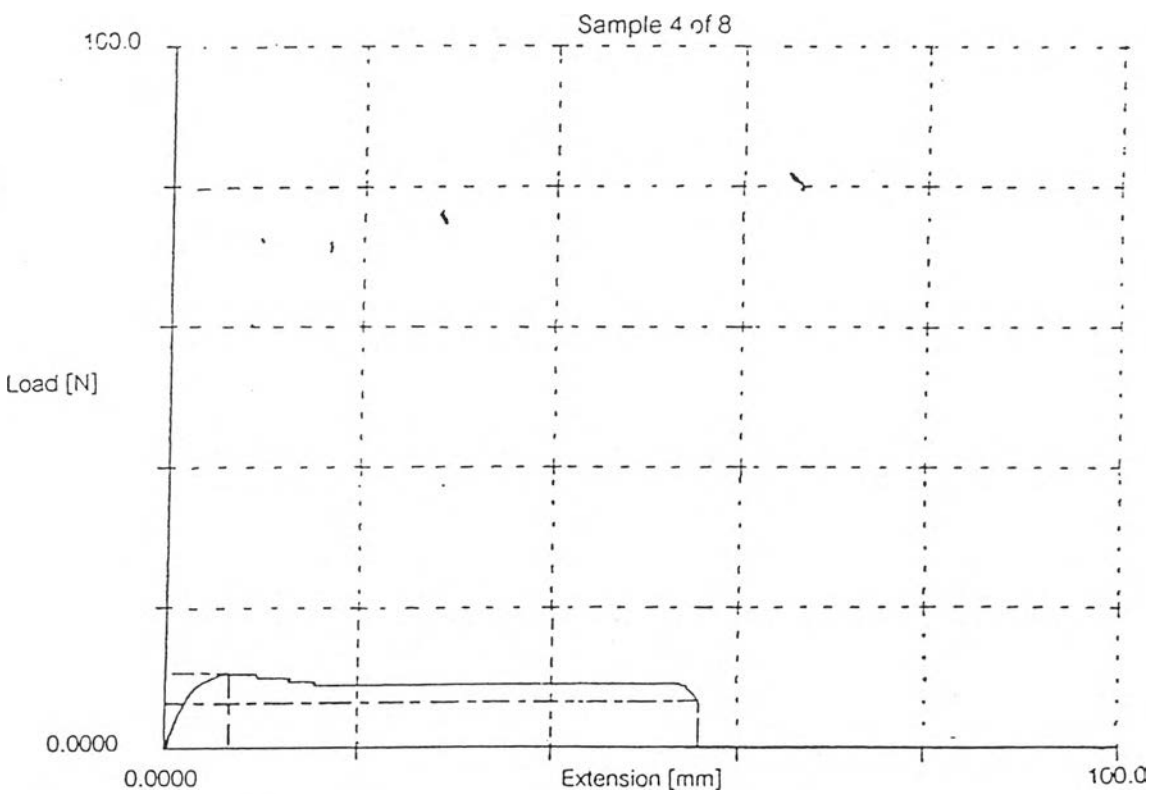


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
26.22	5.001	64.27	17.52	14.46	135.2	0.070000

Table D-12 Load-extension curve of stretched PP/PPY films from 25%$FeCl_3$, 25%pyrrole, @ 70°C, and 20 hours for polymerization (MD and TD directions, respectively).

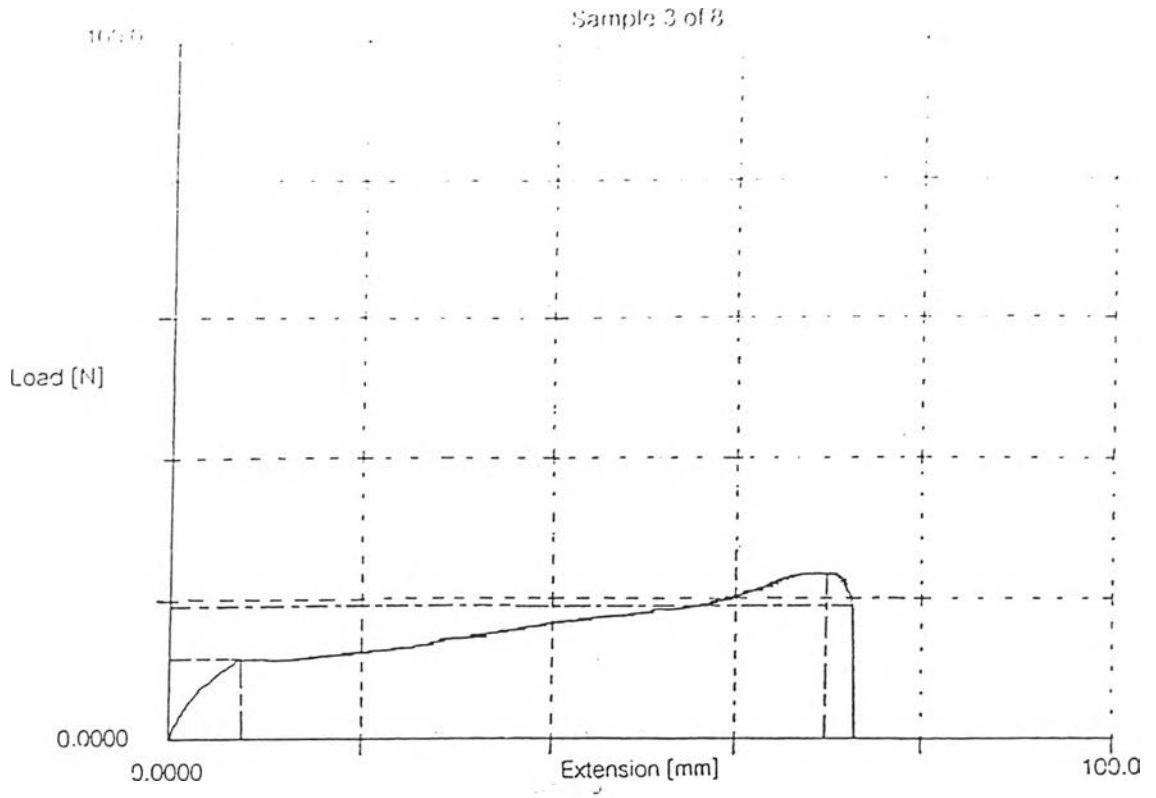


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
21.54	25.23	281.6	14.40	29.33	90.02	0.070000

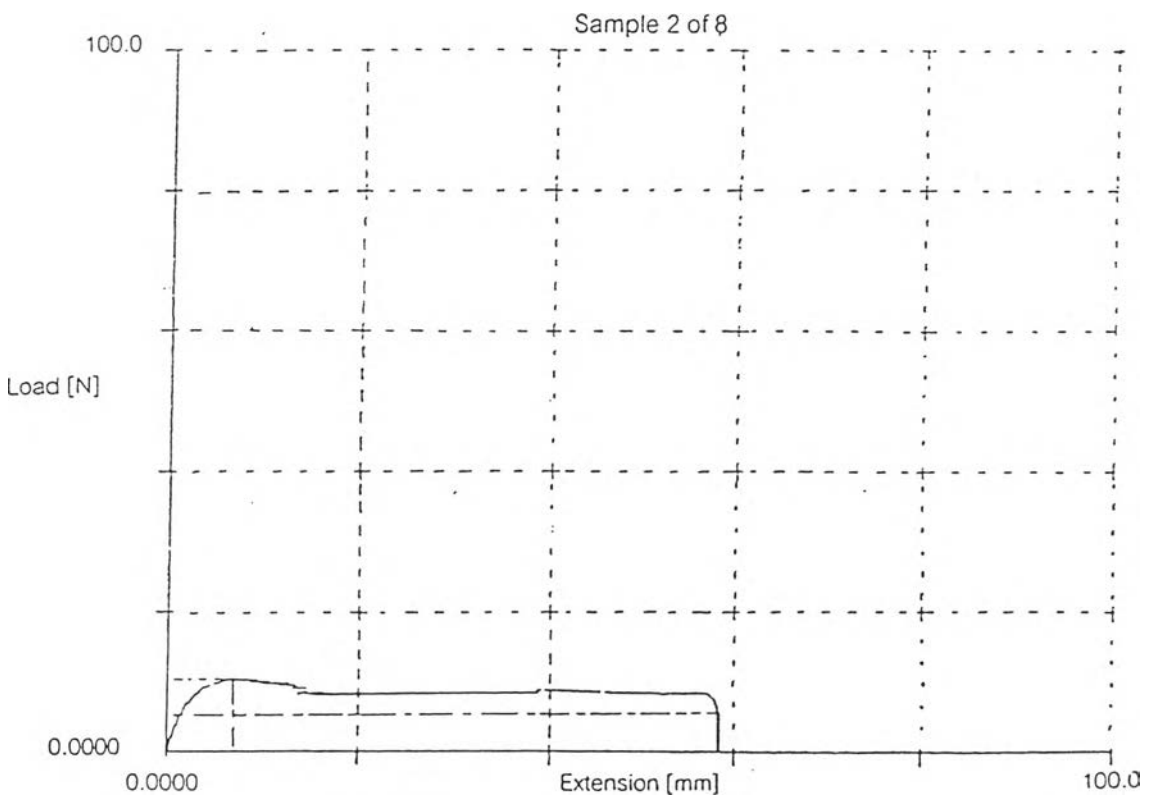


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
11.51	6.933	216.8	12.00	18.51	129.7	0.070000

Table D-13 Load-extension curve of stretched LDPE/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, and 20 hours for polymerization (MD and TD directions, respectively).

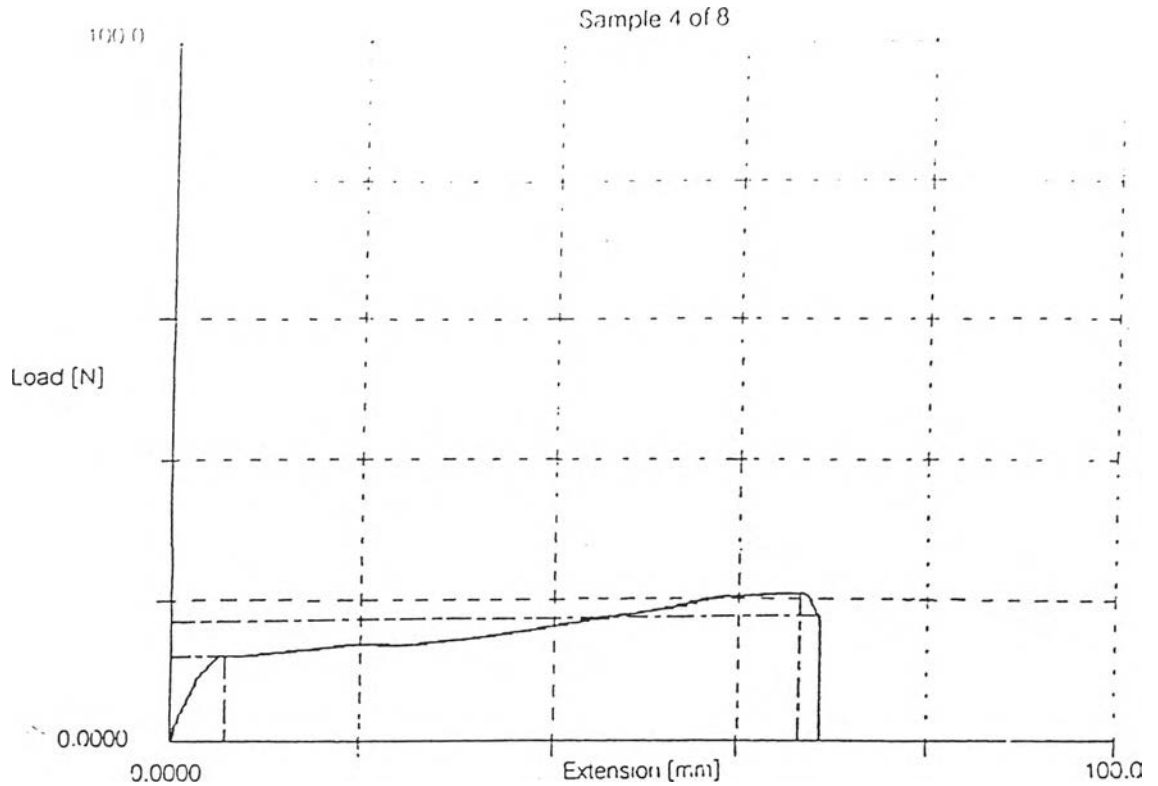


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
24.53	23.11	280.5	15.02	26.68	89.97	0.072000

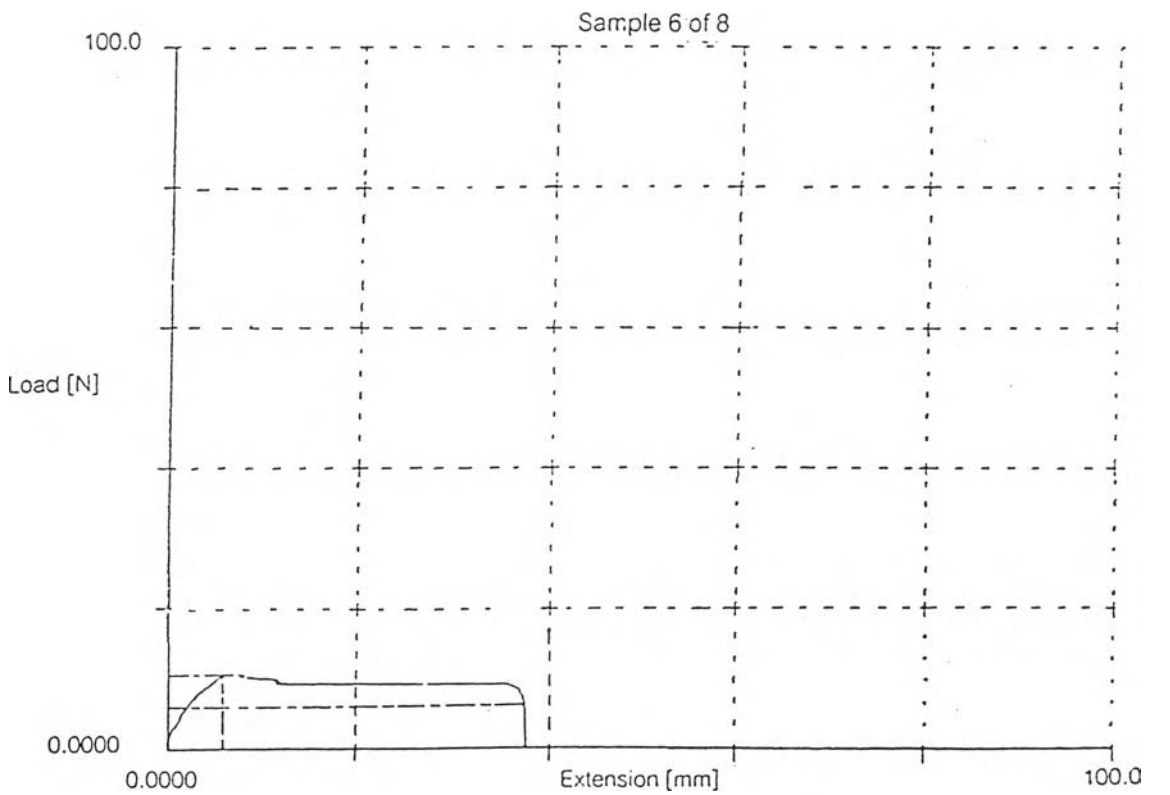


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
10.56	7.183	215.4	10.16	18.32	121.6	0.070000

Table D-14 Load-extension curve of stretched LDPE/PPY films from 25%$FeCl_3$, 25%pyrrole, @ 30°C,and 20 hours for polymerization (MD and TD directions, respectively).

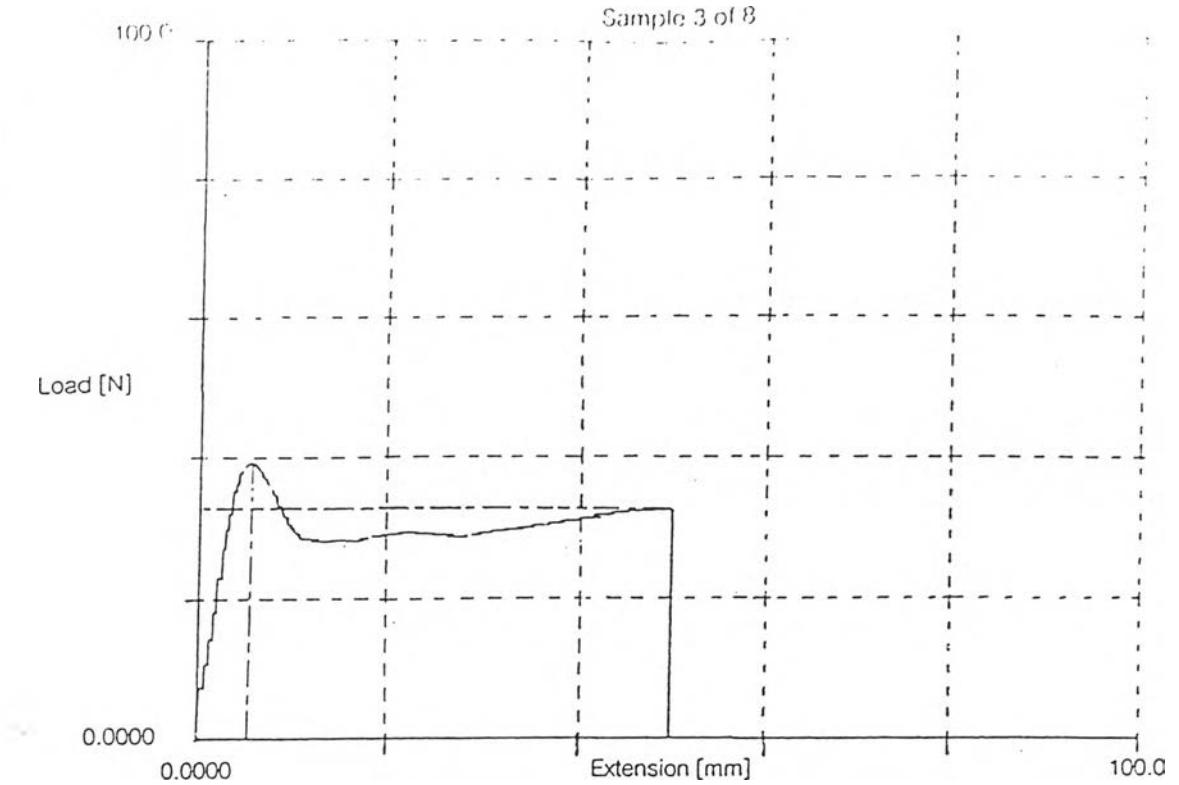


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
20.62	23.40	267.5	15.31	25.56	66.11	0.071000

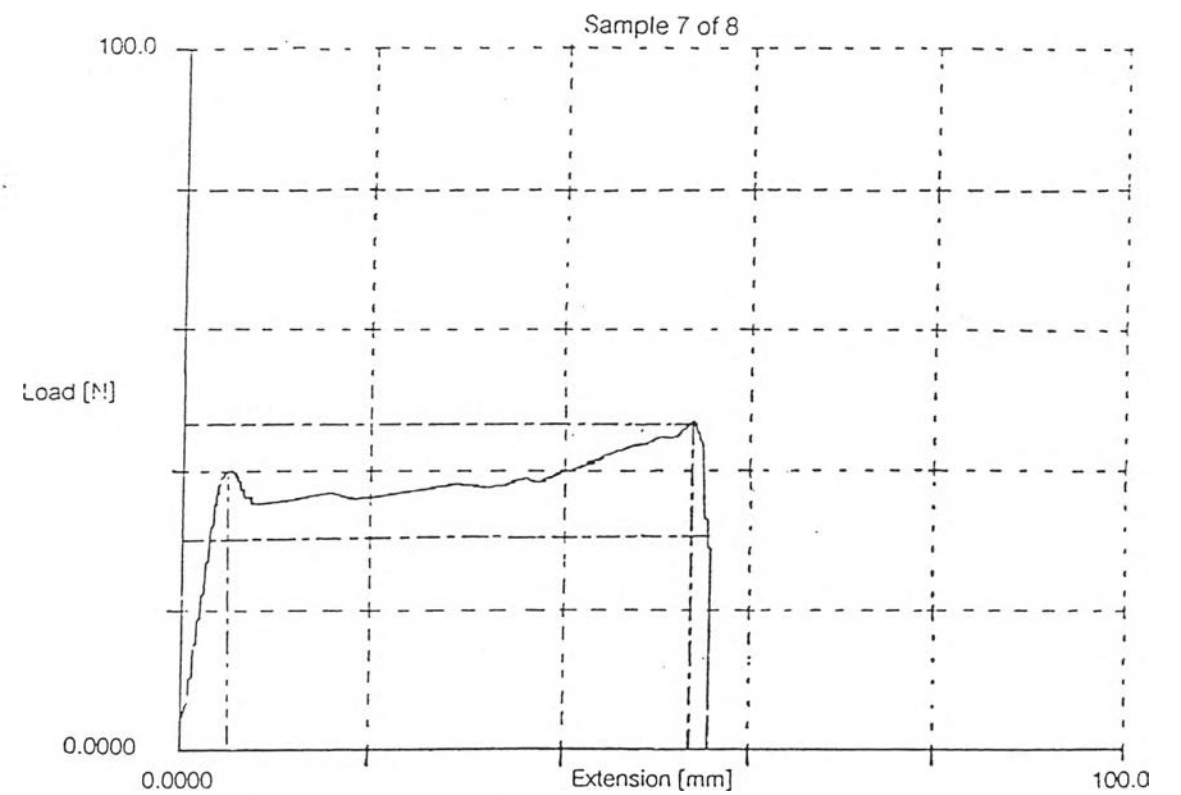


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
9.837	7.014	200.4	11.52	17.14	99.85	0.071000

Table D-15 Load-extension curve of stretched LDPE/PPY films from 25%$FeCl_3$, 25%pyrrole, @ 70°C, and 20 hours for polymerization (MD and TD directions, respectively).

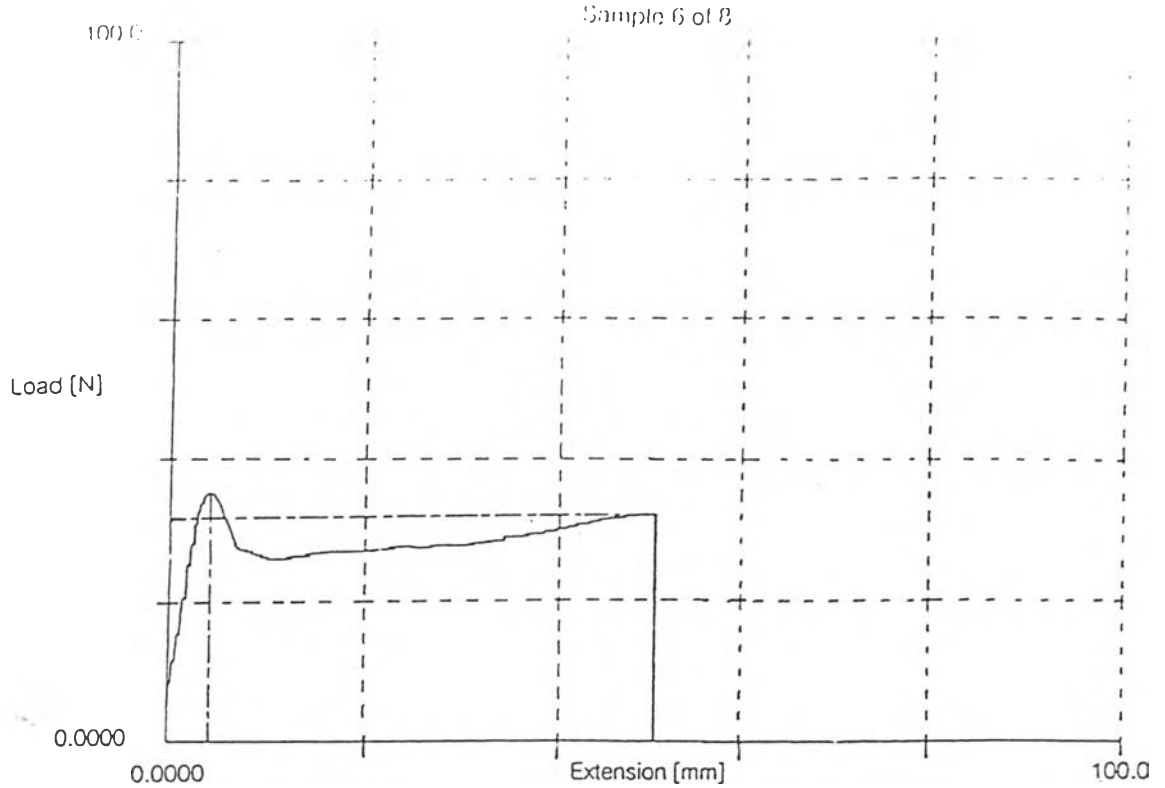


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
39.34	34.72	195.4	54.88	16.52	347.3	0.070000

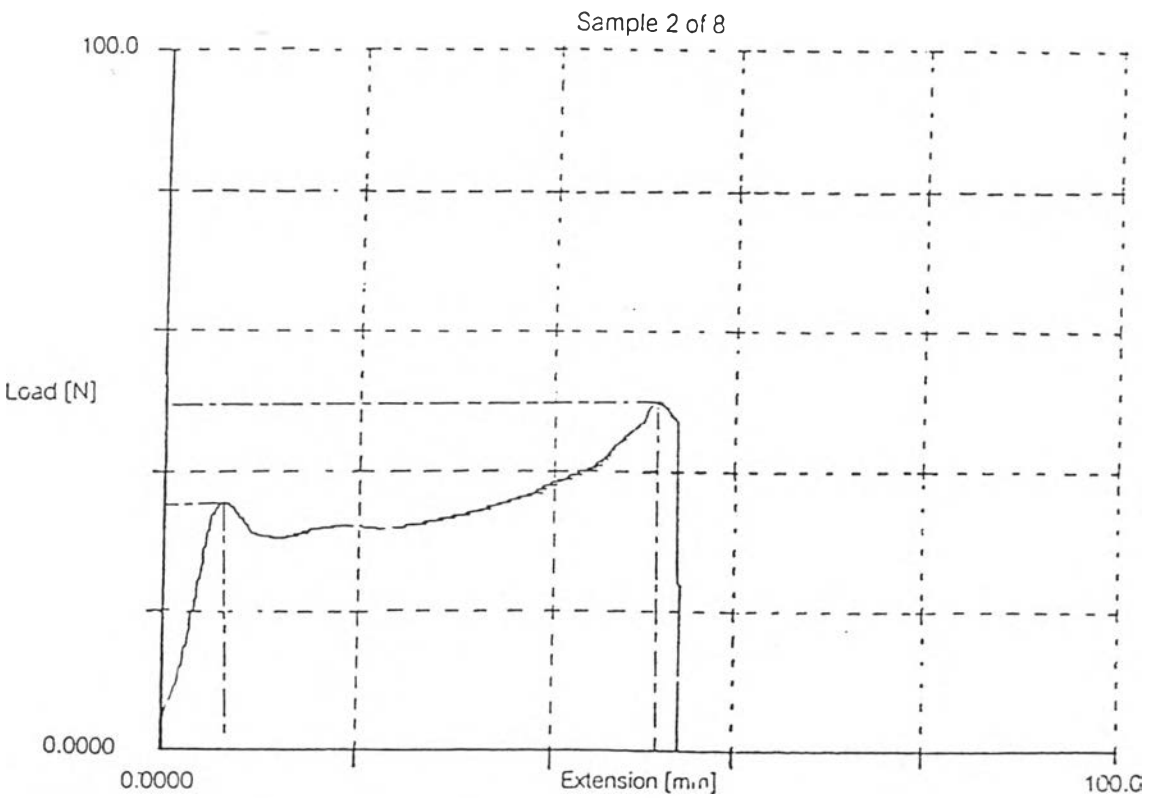


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
51.16	26.12	187.1	63.34	16.61	516.9	0.070000

Table D-16 Technical data of stretched PVC/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, 20 hours for polymerization and 60 minutes iodine doping @ -15°C in vacuum (MD and TD directions, respectively).

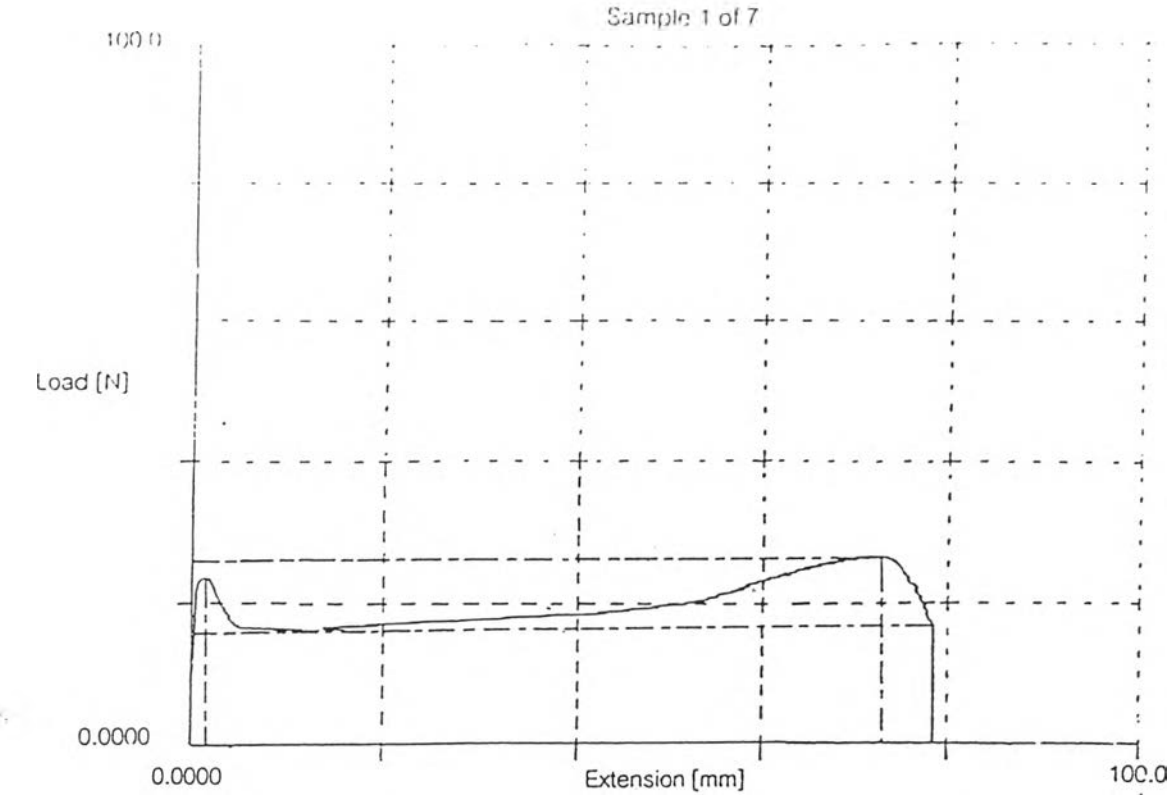


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
34.88	18.62	93.46	42.56	10.72	103.1	0.071000

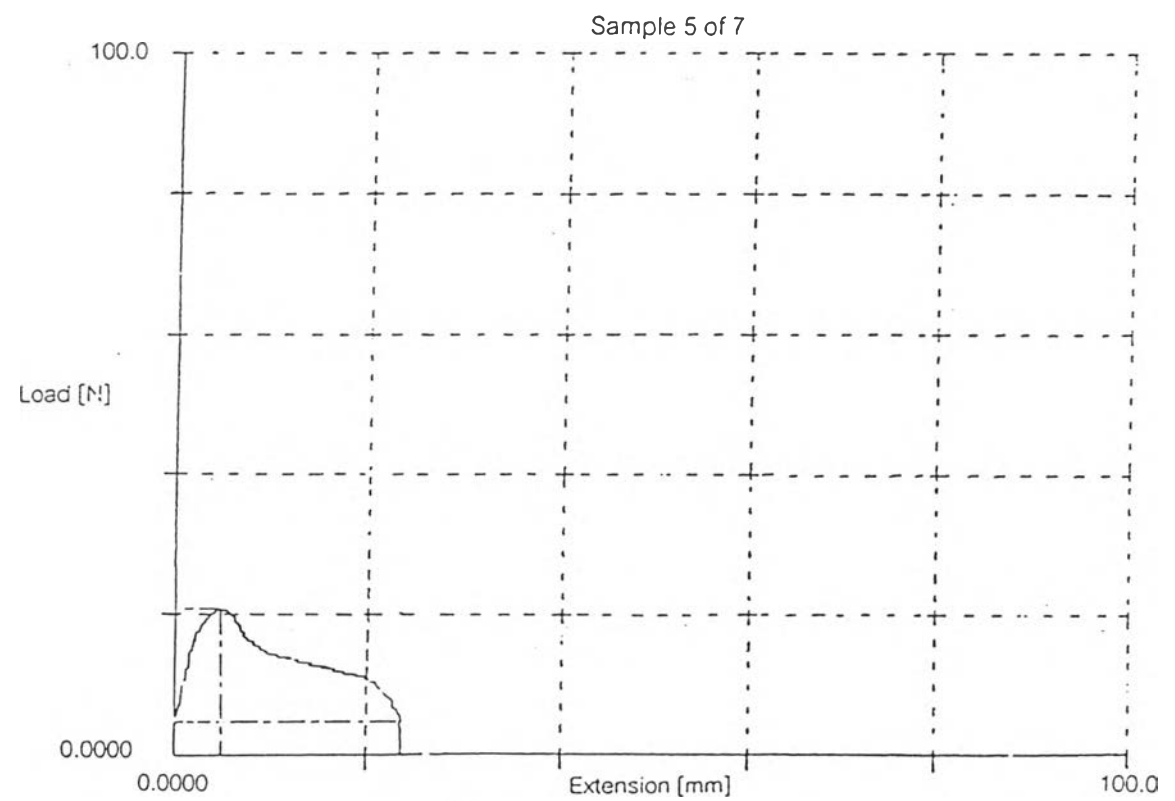


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
49.87	55.56	131.7	[illegible]	17.11	437.2	0.071000

Table D-17 Load-extension curve of stretched PVC/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, 20 hours for polymerization and 60 minutes iodine doping @ 70°C in vacuum (MD and TD directions, respectively).

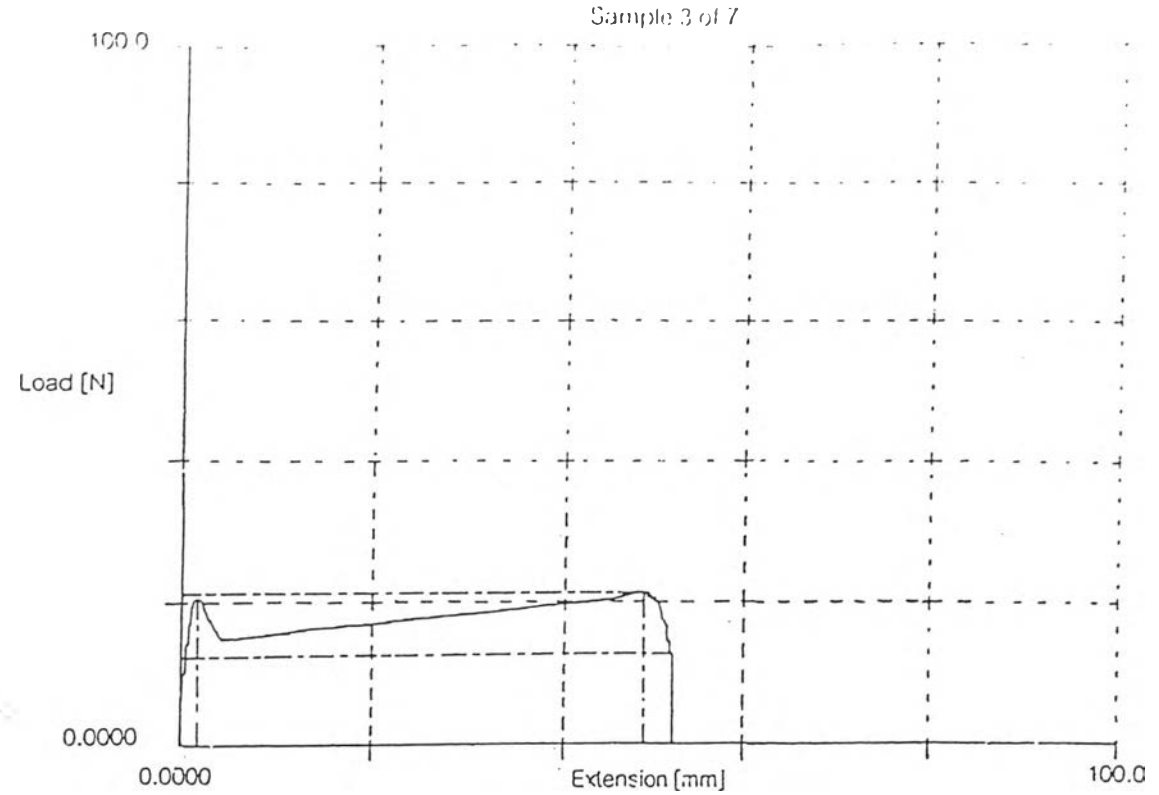


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
21.41	25.53	979.1	22.24	18.17	239.9	0.071000

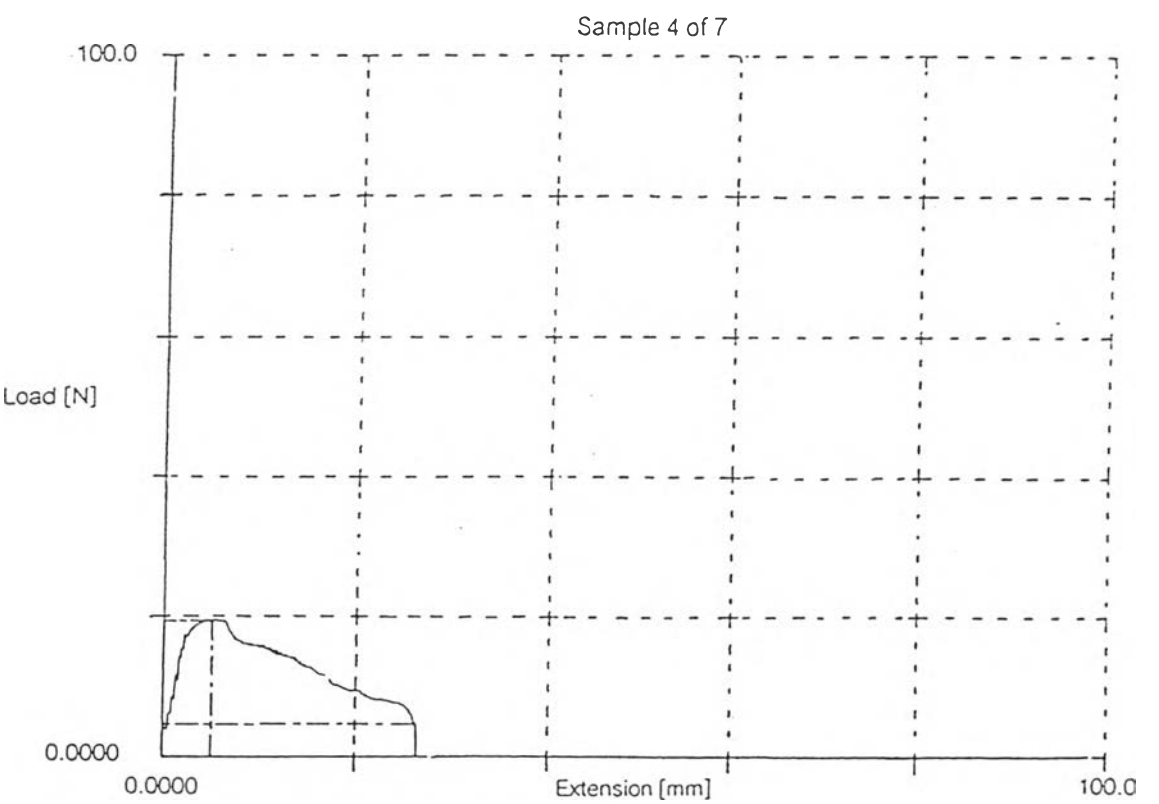


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
20.47	8.812	71.55	21.66	18.13	227.1	0.070000

Table D-18 Load-extension curve of stretched PP/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, 20 hours for polymerization and 60 minutes iodine doping @ -15°C in vacuum (MD and TD directions, respectively).

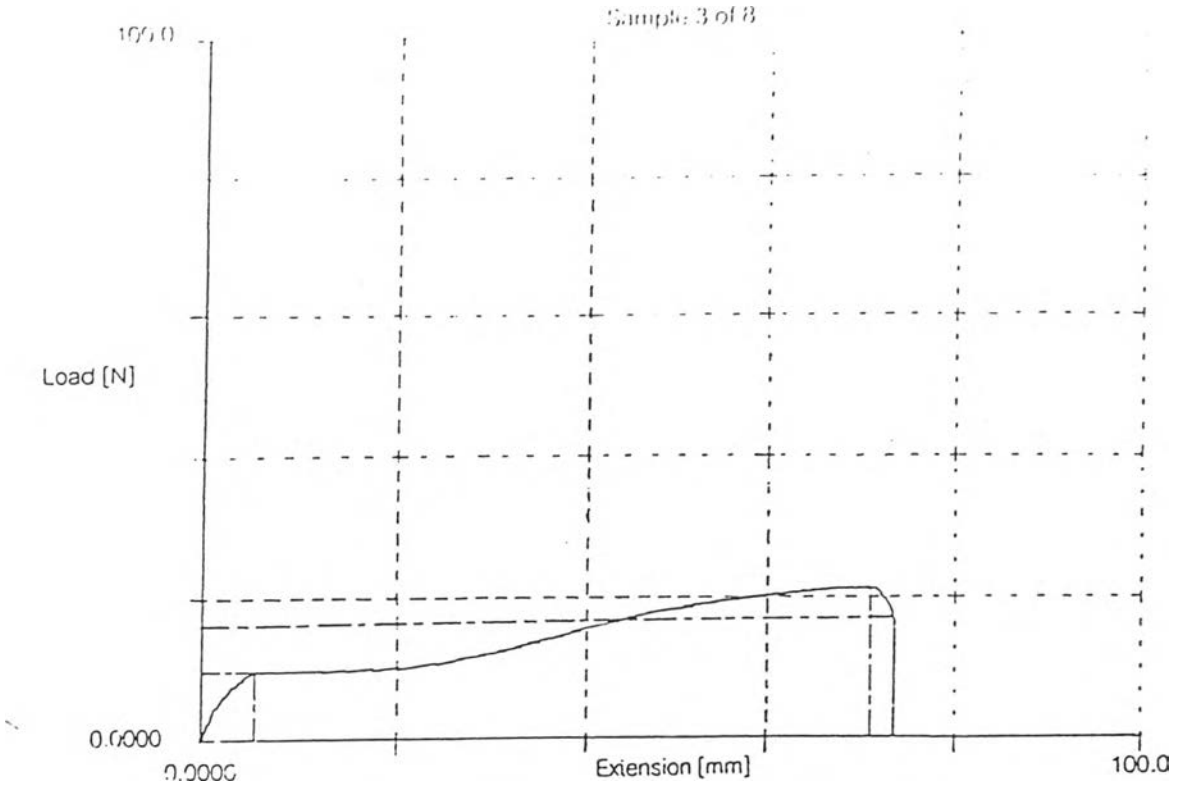


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
21.23	15.01	949.6	18.53	12.15	217.8	0.070000

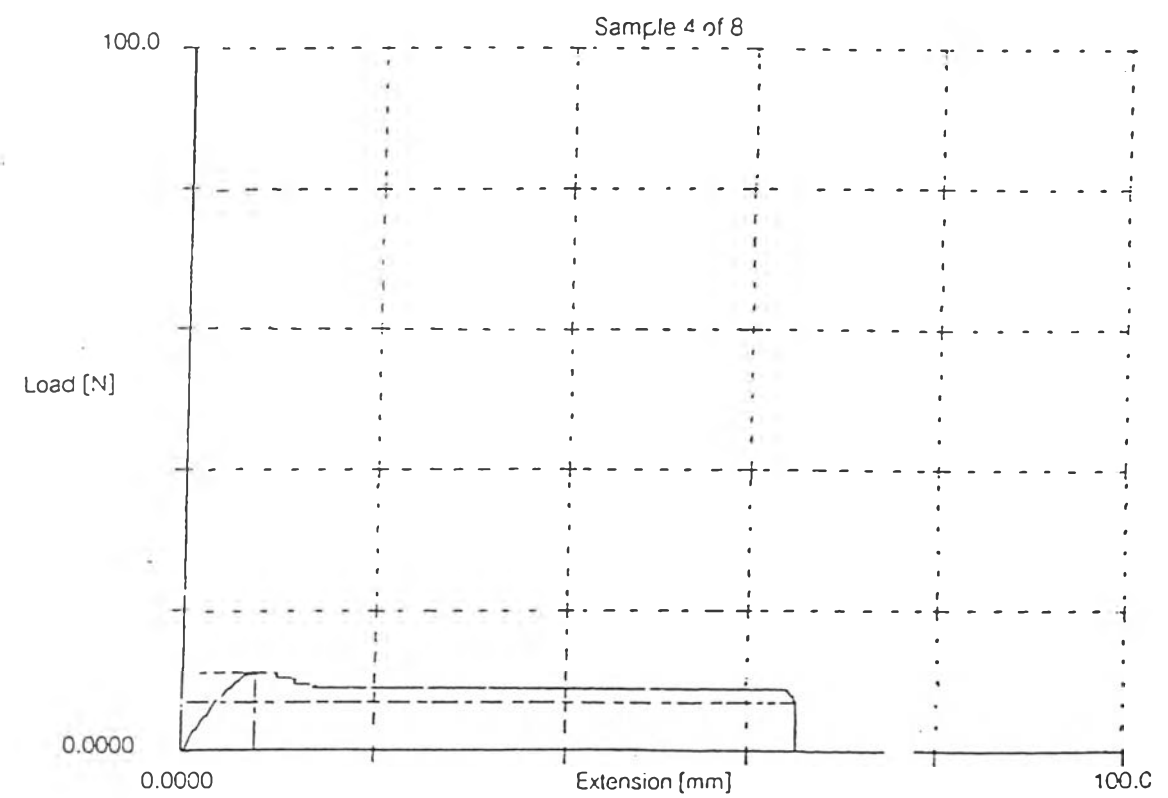


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
19.54	5.103	65.34	19.20	13.40	185.3	0.070000

Table D-19 Load-extension curve of stretched PP/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, 20 hours for polymerization and 60 minutes iodine doping @ 70°C in vacuum (MD and TD directions, respectively).

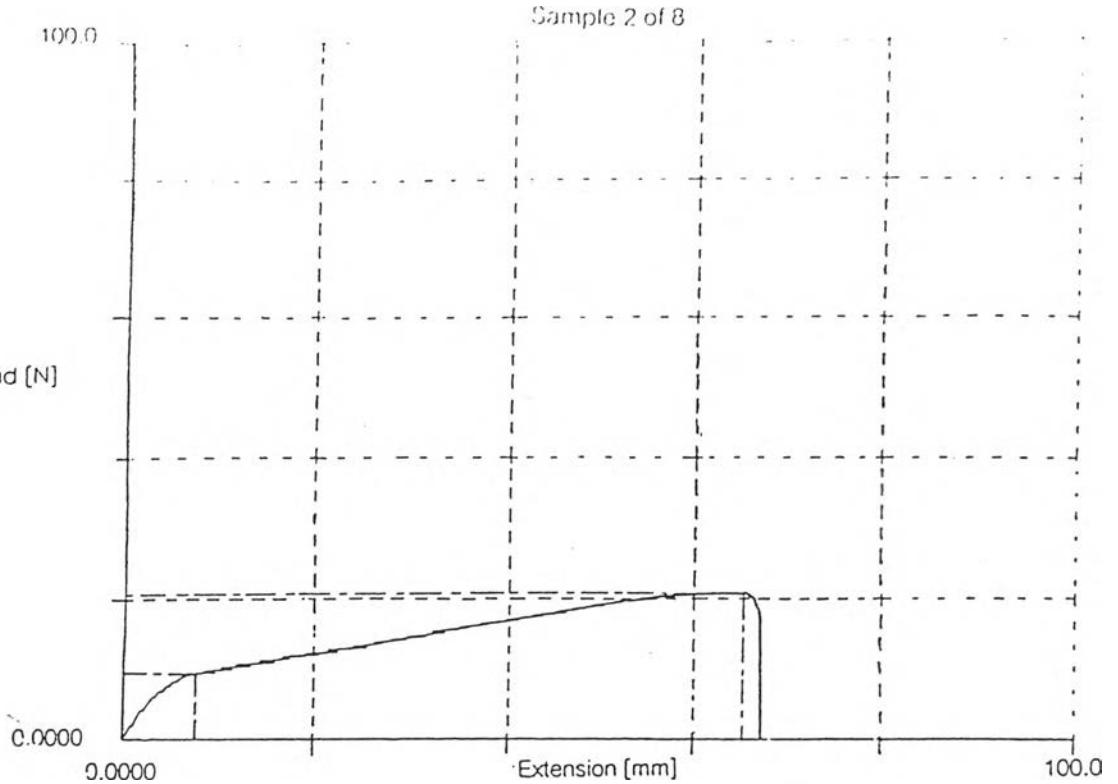


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
23.63	23.87	290.7	15.03	28.19	87.85	0.069000

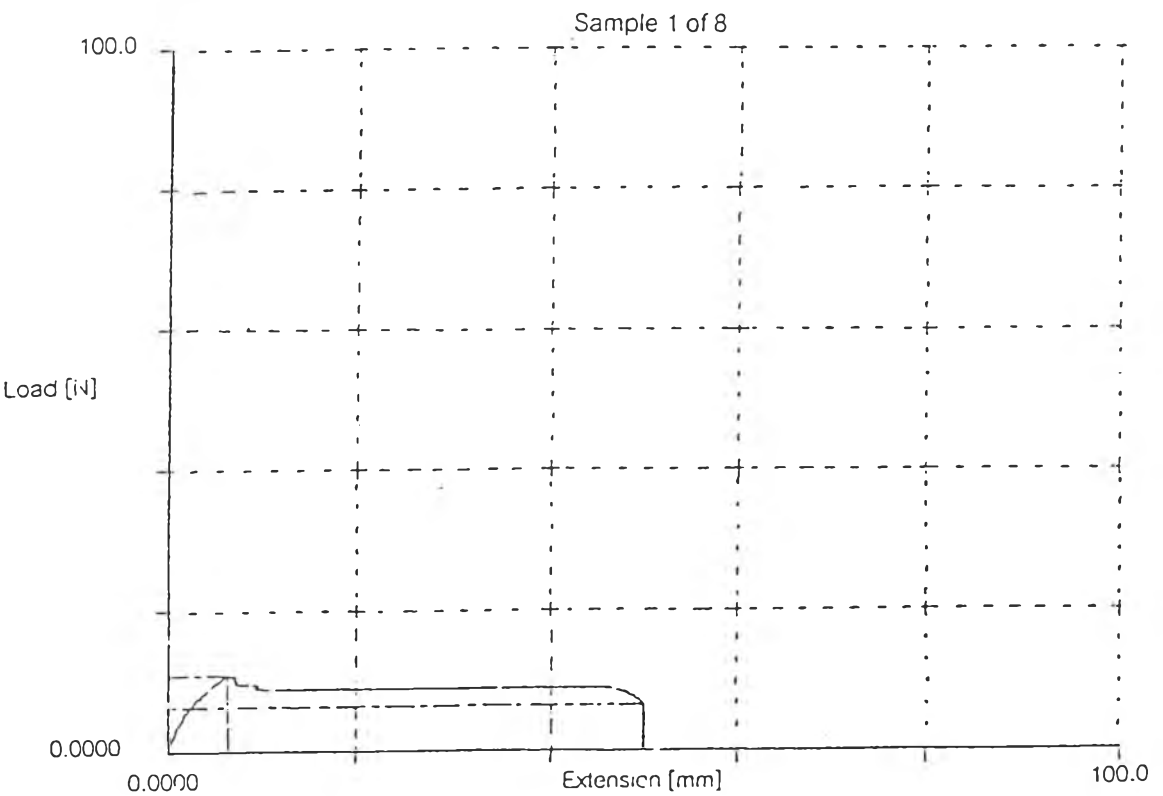


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
11.47	7.711	218.5	12.45	16.63	131.6	0.067000

Table D-20 Load-extension curve of stretched LDPE/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, 20 hours for polymerization and 60 minutes iodine doping @ -15°C in vacuum (MD and TD directions, respectively).

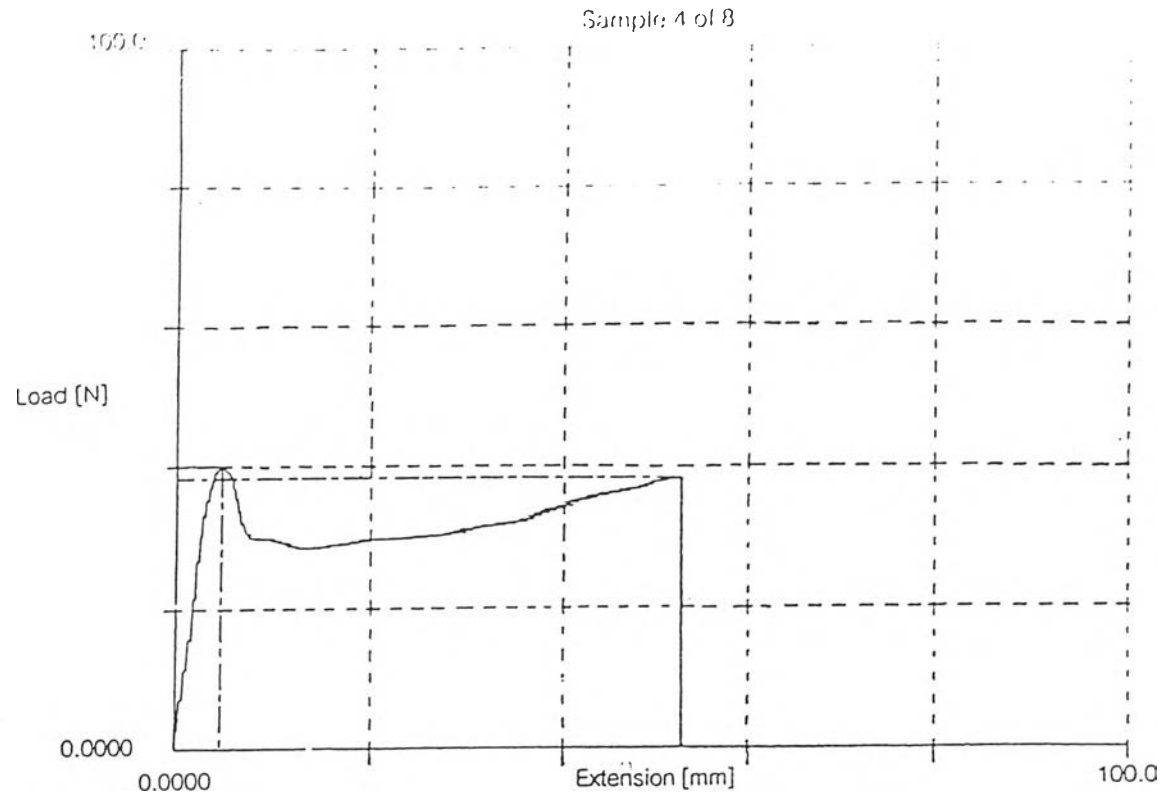


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
22.37	23.11	257.3	14.07	23.18	79.92	0.069000

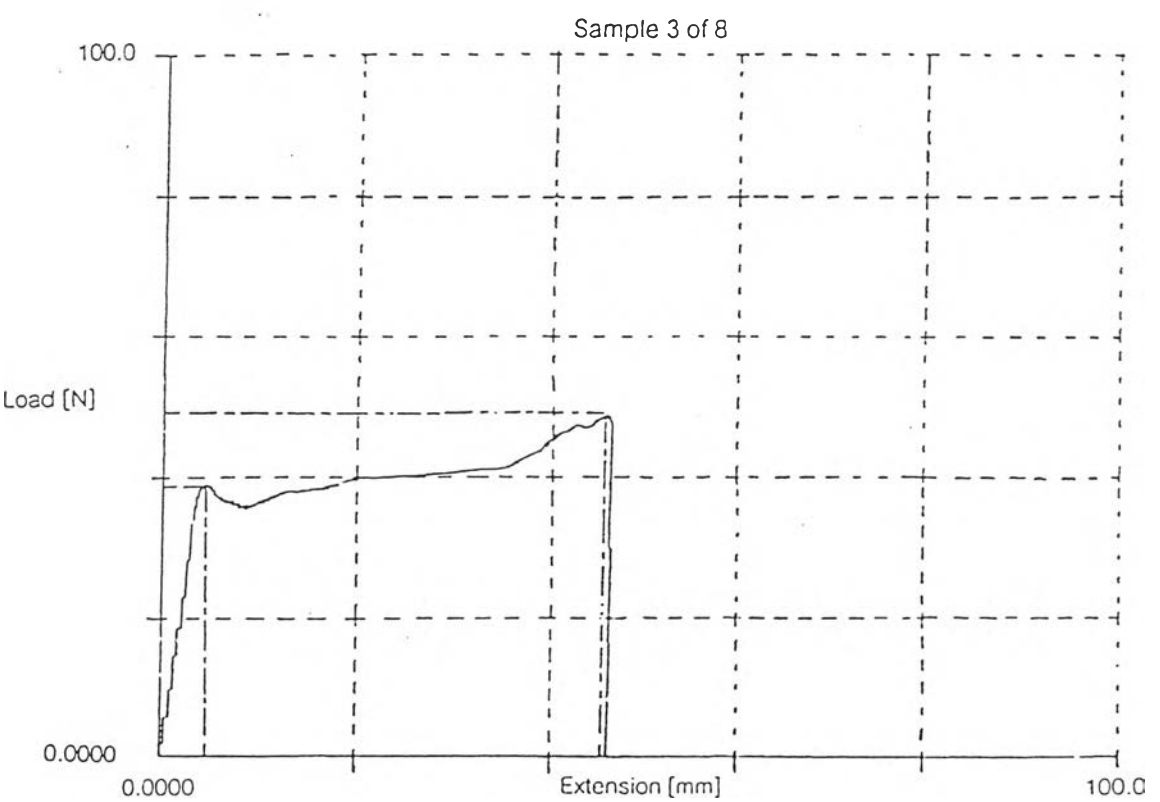


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
11.12	7.002	195.4	10.95	17.00	101.3	0.070000

Table D-21 Load-extension curve of stretched LDPE/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, 20 hours for polymerization and 60 minutes iodine doping @ 70°C in vacuum (MD and TD directions, respectively).

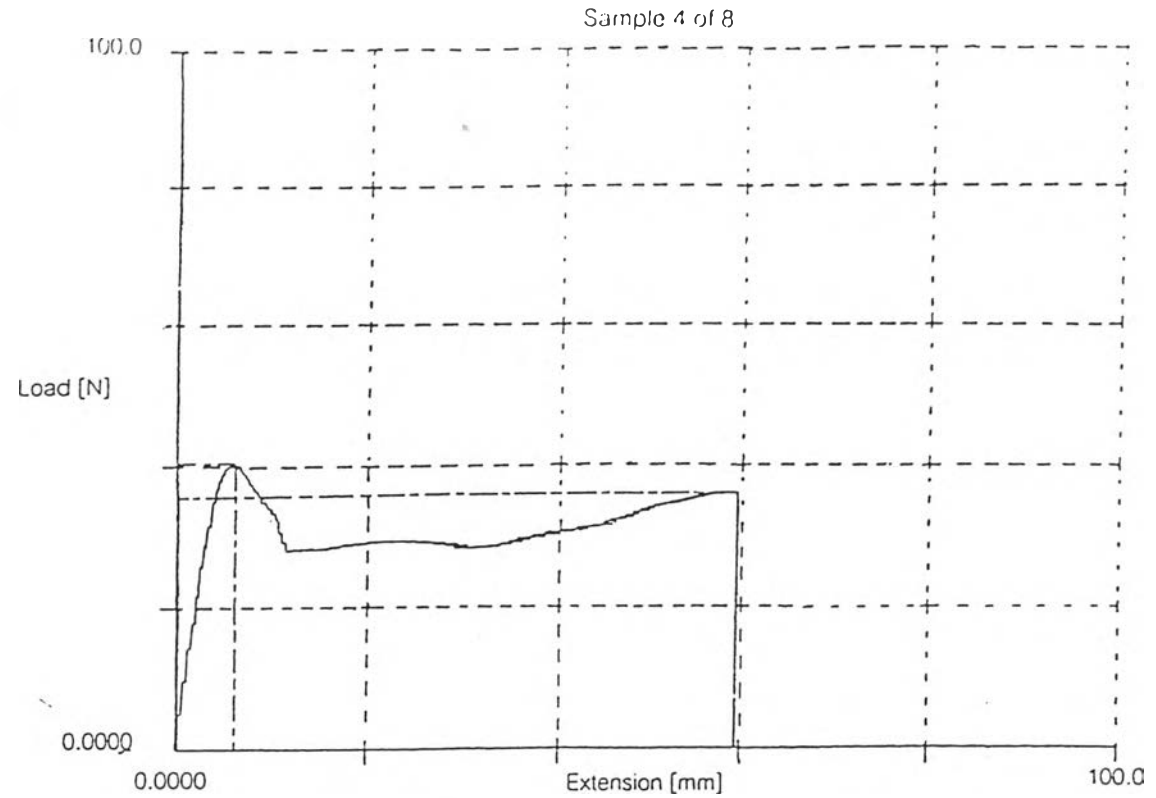


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
40.11	34.34	190.5	54.16	13.14	345.1	0.070000

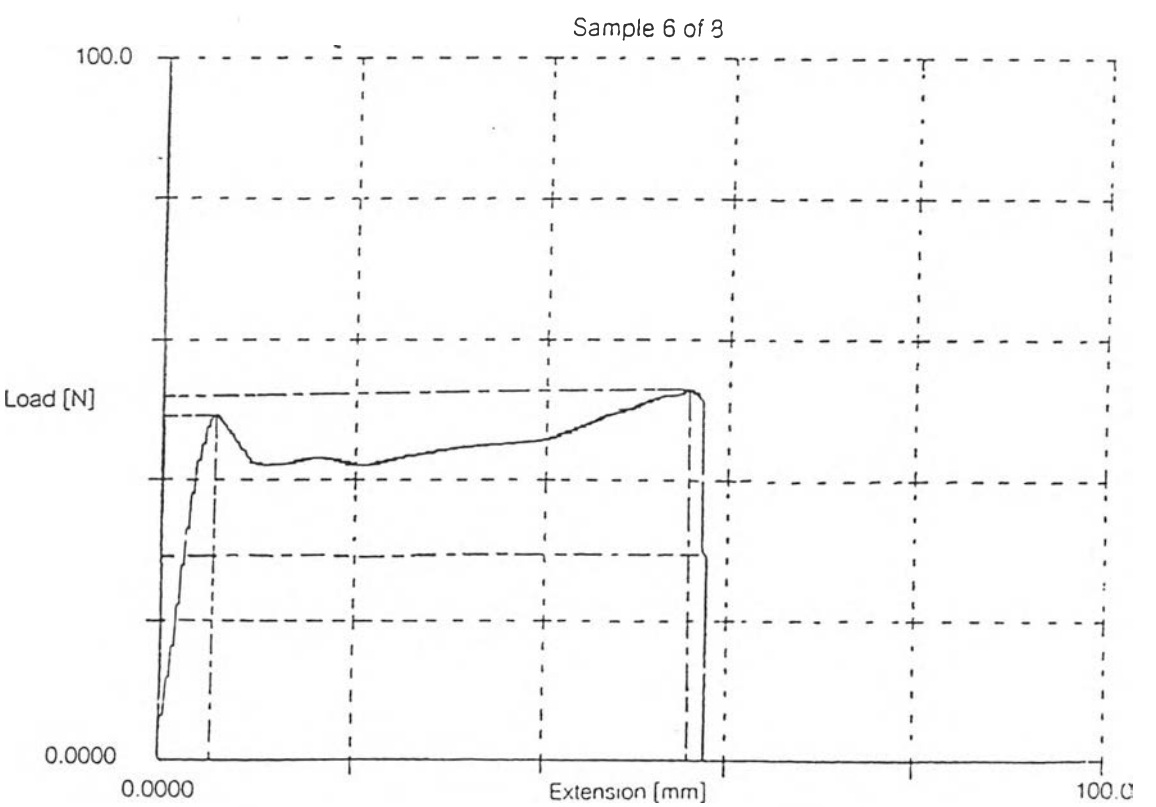


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
49.49	85.54	184.5	58.51	18.01	550.1	0.070000

Table D-22 Load-extension curve of stretched PVC/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, 20 hours for polymerization and 30 minutes iodine doping @ 30°C in vacuum (MD and TD directions, respectively).

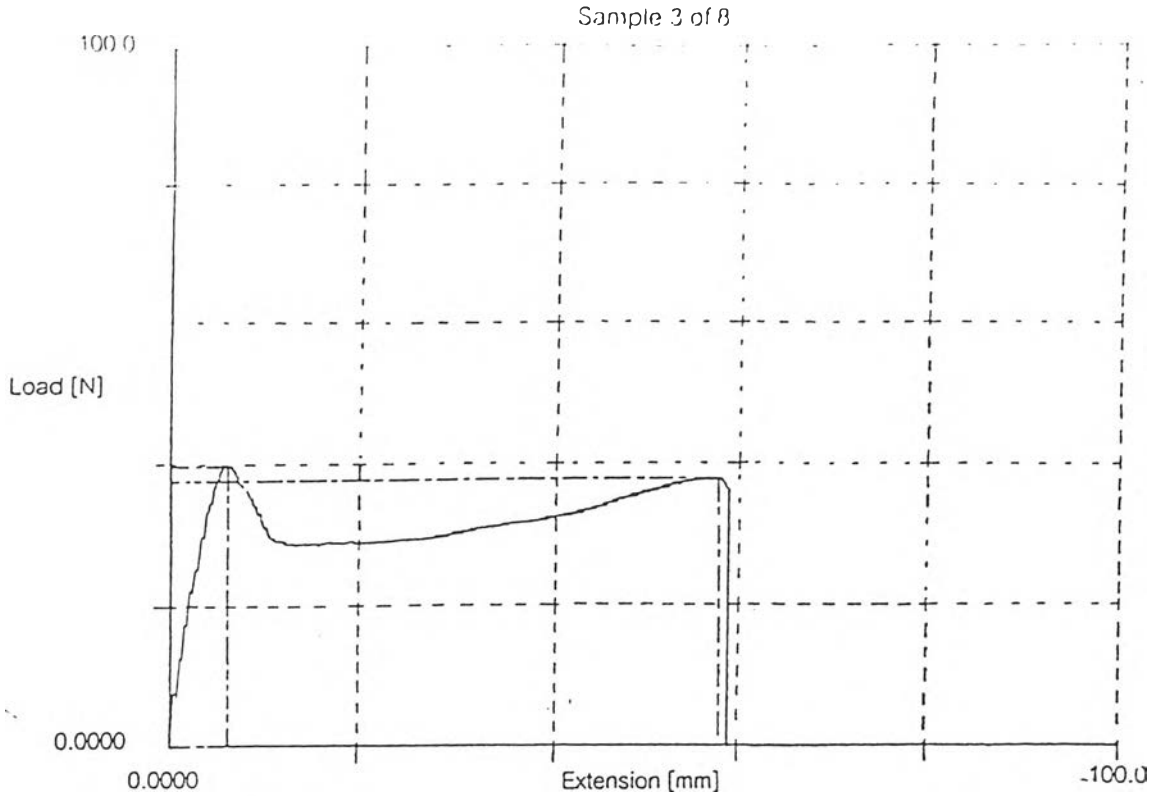


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
41.18	34.46	190.2	56.11	15.27	343.9	0.071000

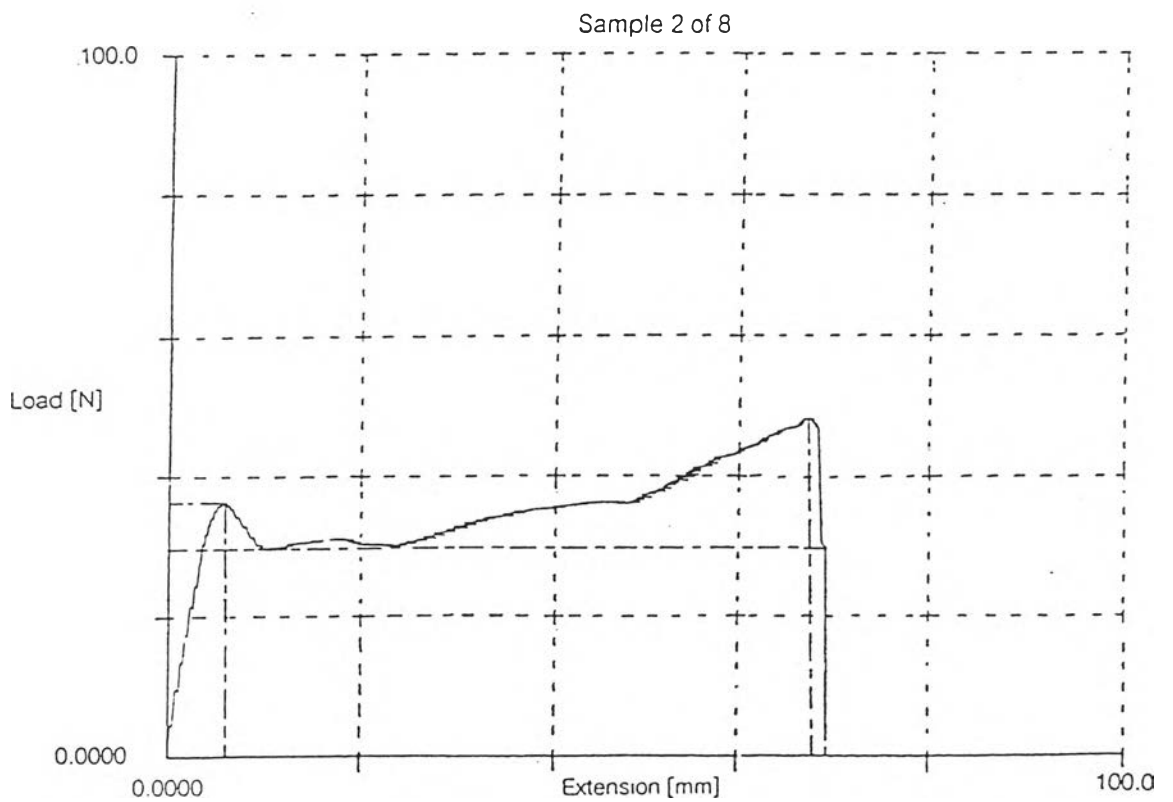


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
55.48	83.03	183.3	89.81	17.80	811.7	0.070000

Table D-23 Load-extension curve of stretched PVC/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, 20 hours for polymerization and 60 minutes iodine doping @ 30°C in vacuum (MD and TD directions, respectively).

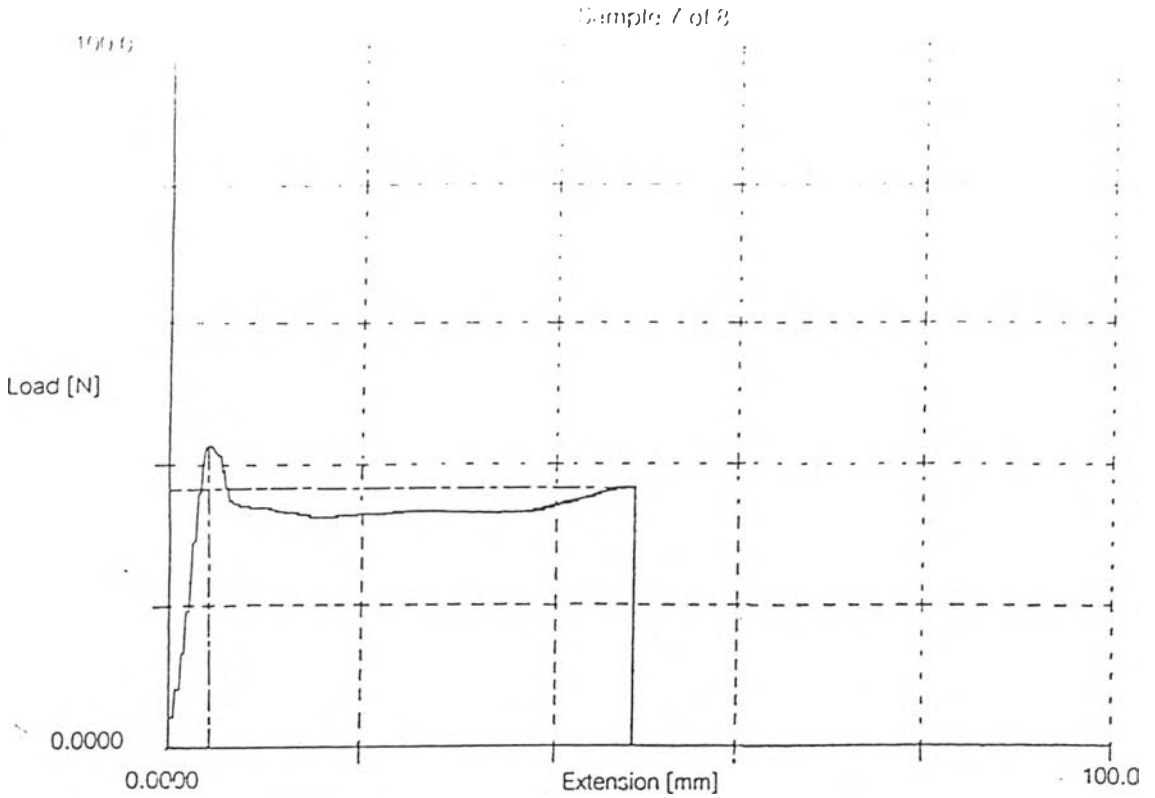


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
10.82	29.98	183.8	48.88	14.45	340.1	0.070000

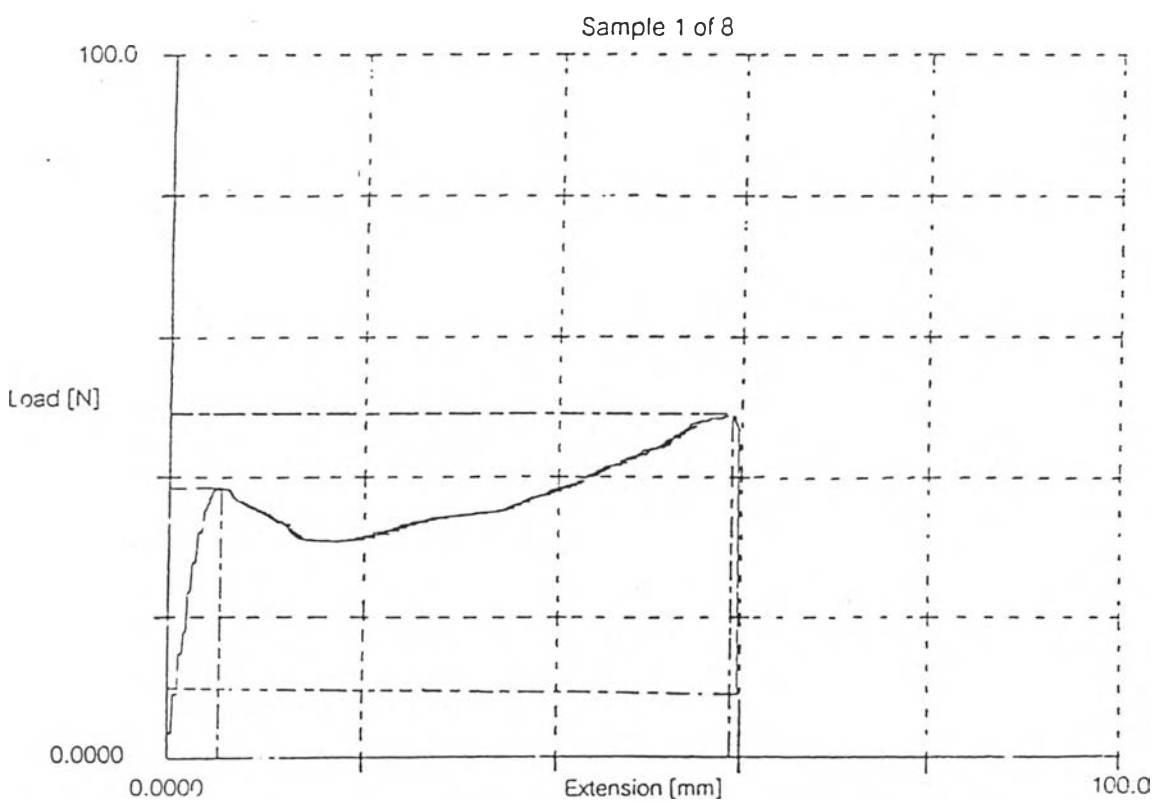


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
9.48	83.13	176.6	55.37	14.79	533.8	0.070000

Table D-24 Technical data of stretched PVC/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, 20 hours for polymerization and 90 minutes iodine doping @ 30°C in vacuum (MD and TD directions, respectively).

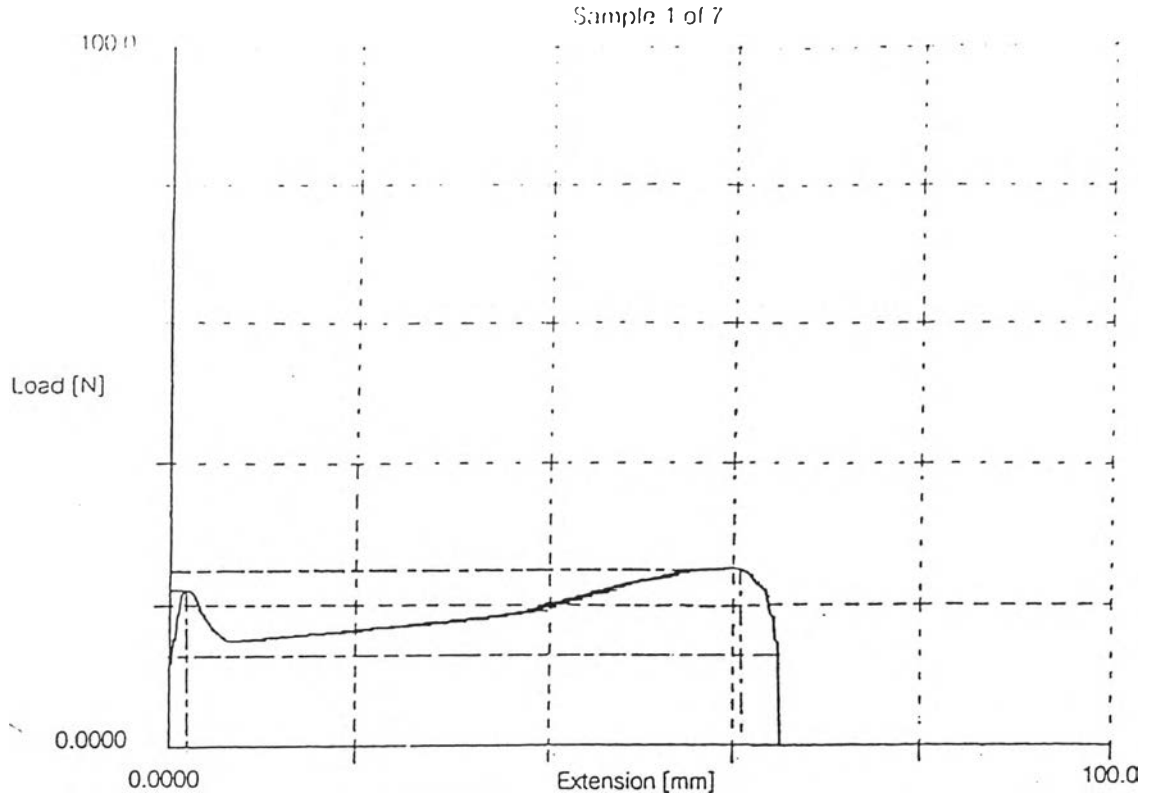


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Taick (mm)
40.26	29.53	183.4	46.61	13.83	329.5	0.069000

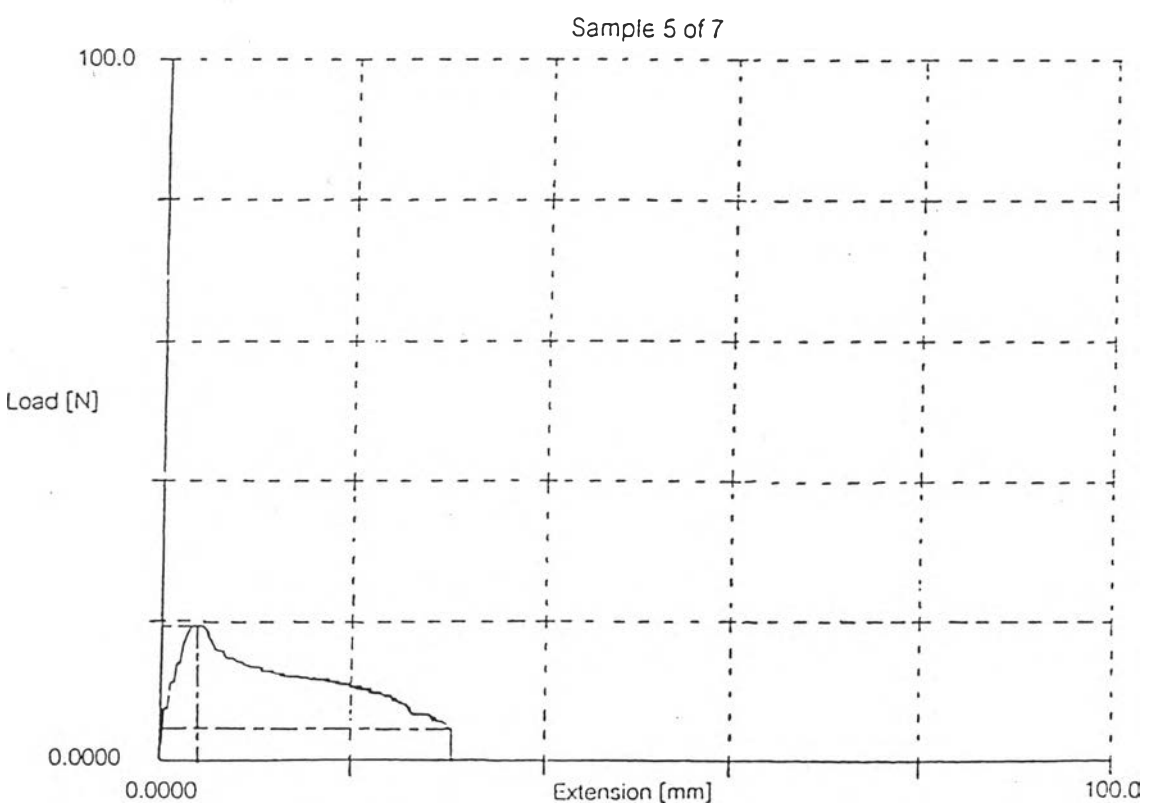


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
50.41	83.20	168.9	60.22	15.59	532.8	0.070000

Table D-25 Load-extension curve of stretched PVC/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, 20 hours for polymerization and 120 minutes iodine doping @ 30°C in vacuum (MD and TD directions, respectively).

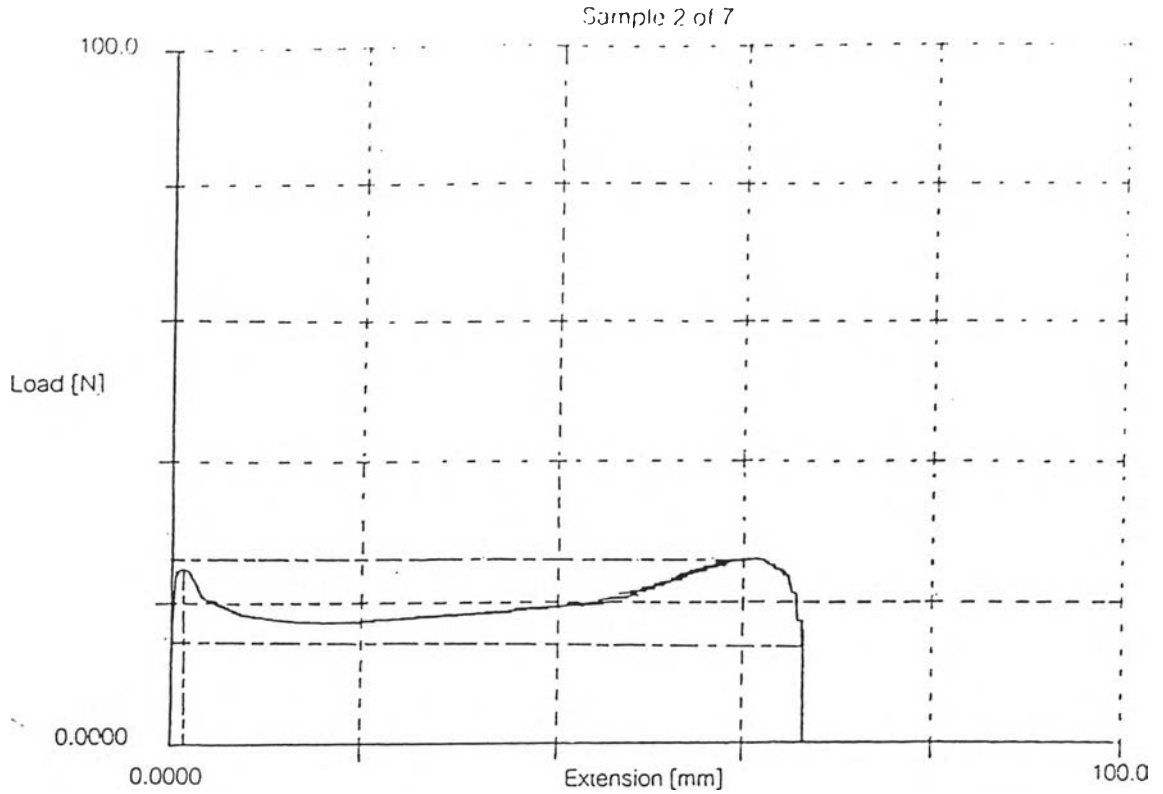


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
21.23	23.14	985.3	20.84	19.95	231.7	0.070000

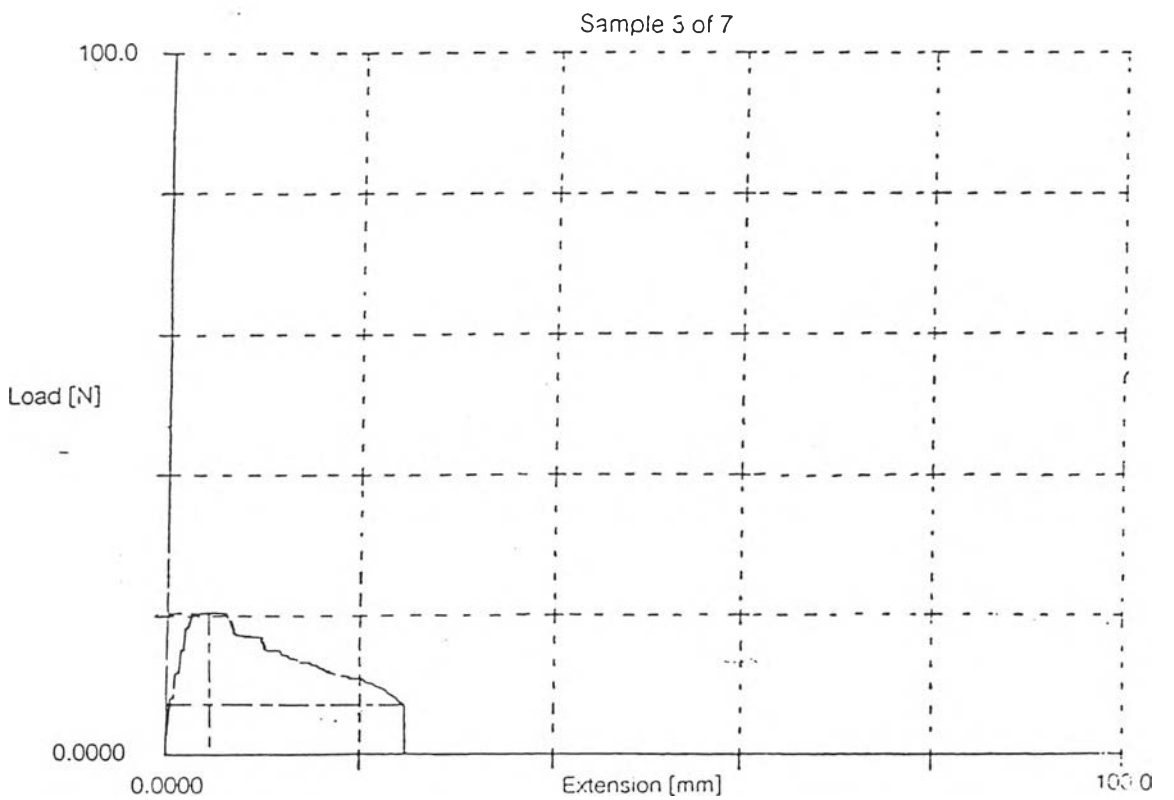


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
17.65	8.057	65.48	18.72	14.77	220.4	0.071000

Table D-26 Load-extension curve of stretched PP/PPY films from 25%$FeCl_3$, 25%pyrrole, @-15°C, 20 hours for polymerization and 30 minutes iodine doping @ 30°C in vacuum (MD and TD directions, respectively).

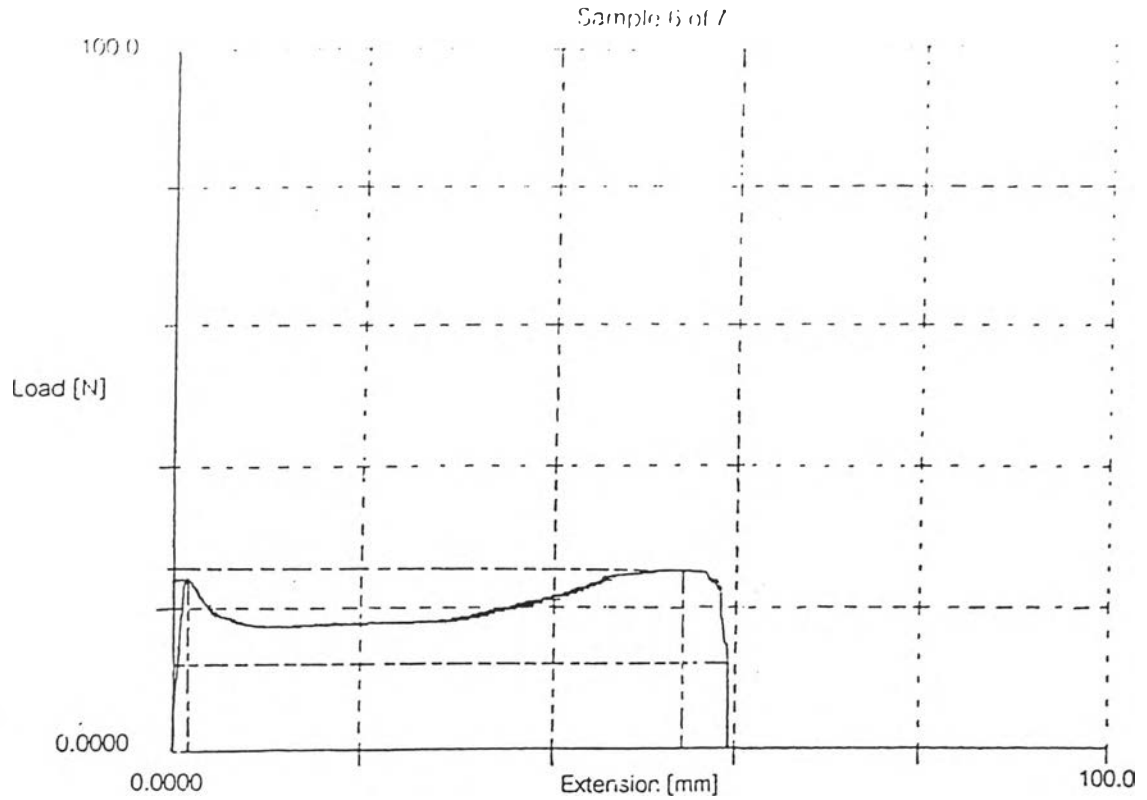


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
25.18	20.35	975.4	19.99	17.33	228.7	0.071000

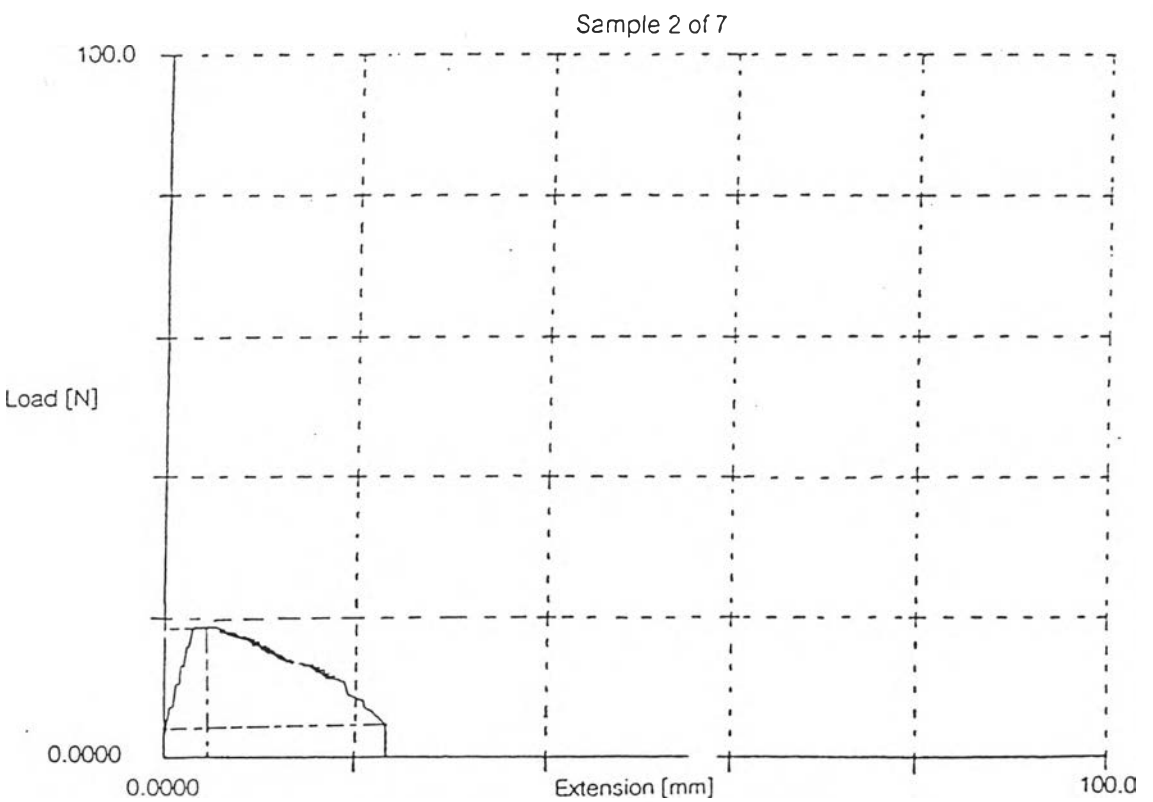


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
20.22	7.120	66.47	20.12	16.40	211.6	

Table D-27 Load-extension curve of stretched PP/PPY films from 25%$FeCl_3$, 25%pyrrole, @-15°C, 20 hours for polymerization and 60 minutes iodine doping @ 30°C in vacuum (MD and TD directions, respectively).

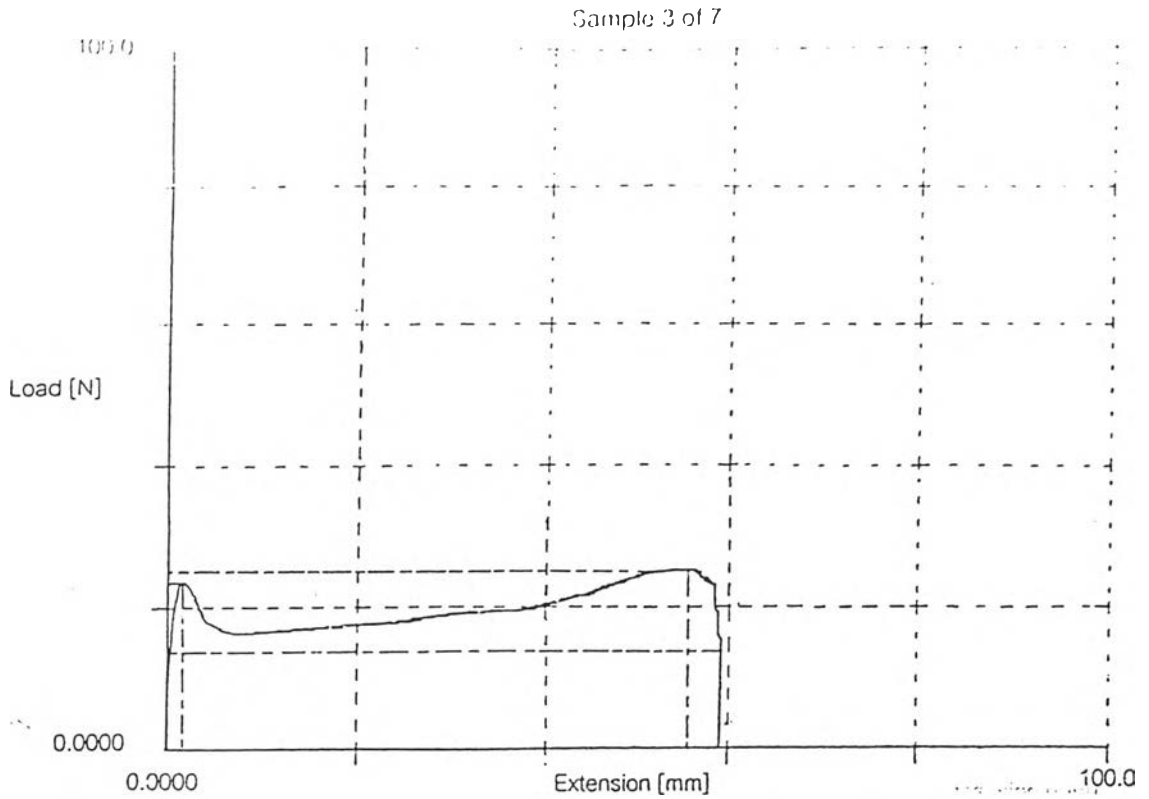


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
24.41	16.83	974.6	24.12	17.89	219.4	0.070000

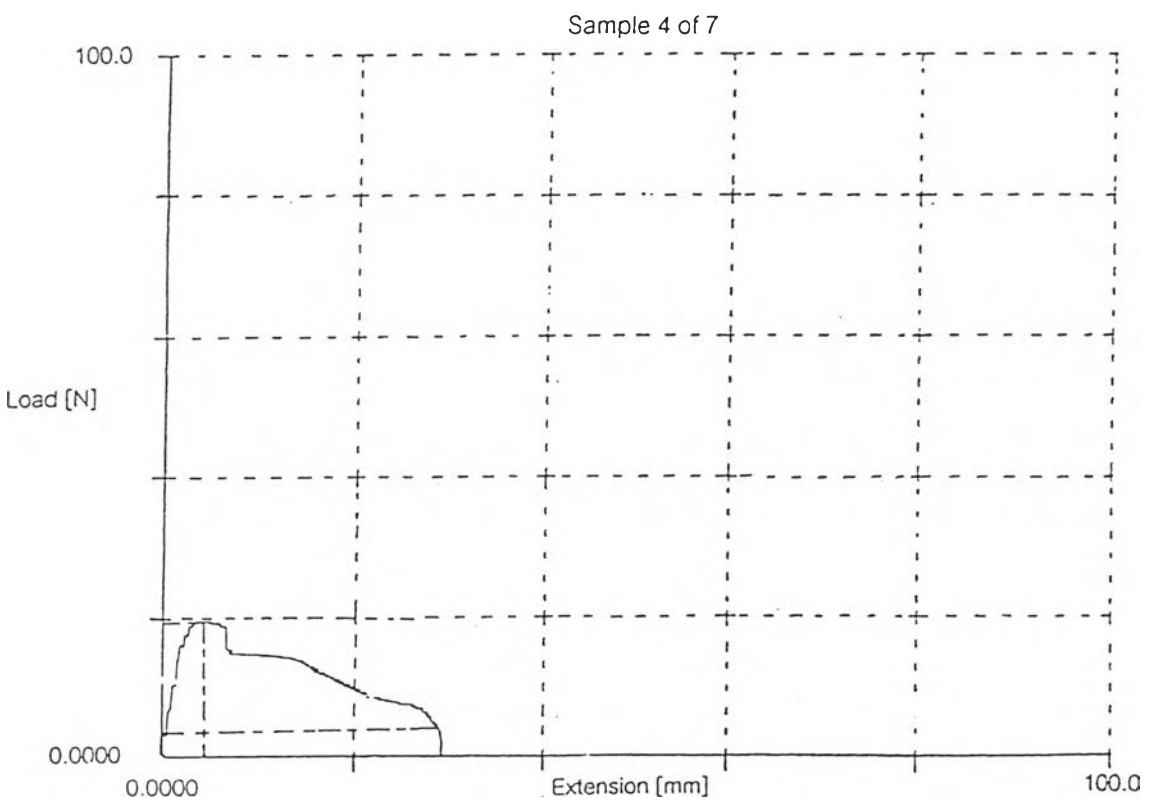


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
17.59	5.129	66.39	15.41	17.36	215.0	0.069000

Table D-28 Load-extension curve of stretched PP/PPY films from 25%$FeCl_3$, 25%pyrrole, @-15°C, 20 hours for polymerization and 90 minutes iodine doping @ 30°C in vacuum (MD and TD directions, respectively).

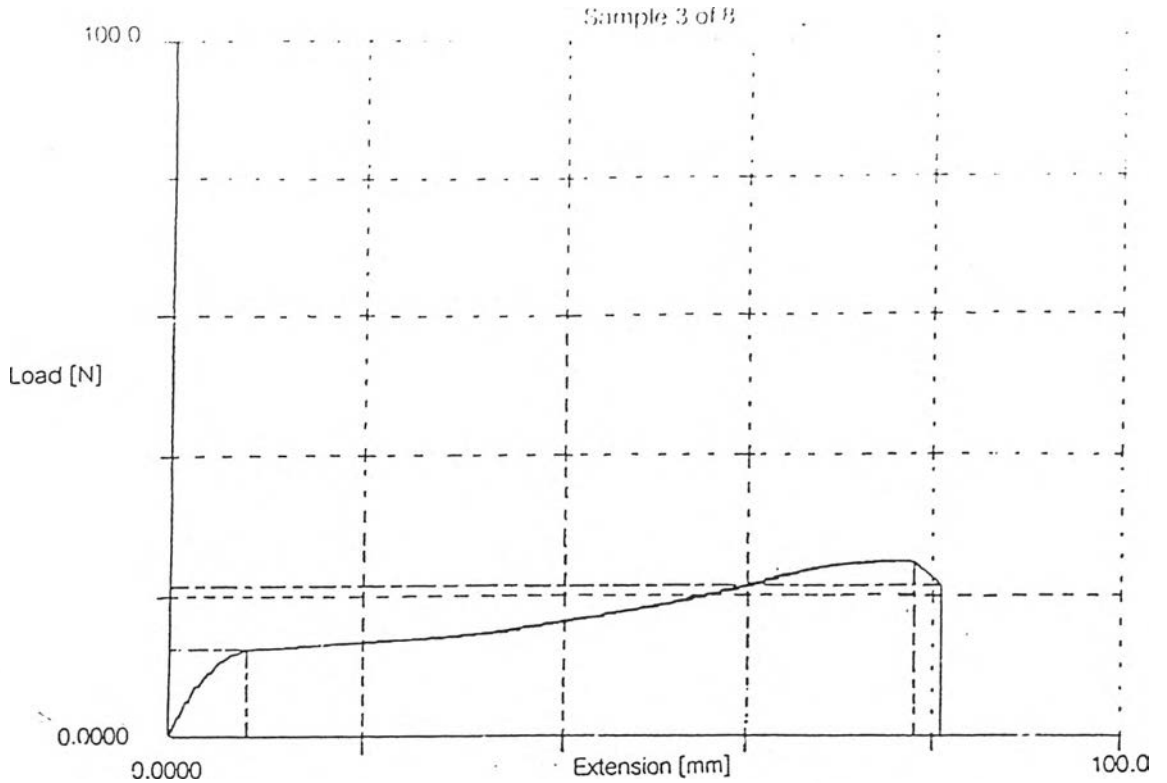


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
21.75	17.02	973.0	20.05	13.81	223.6	0.070000

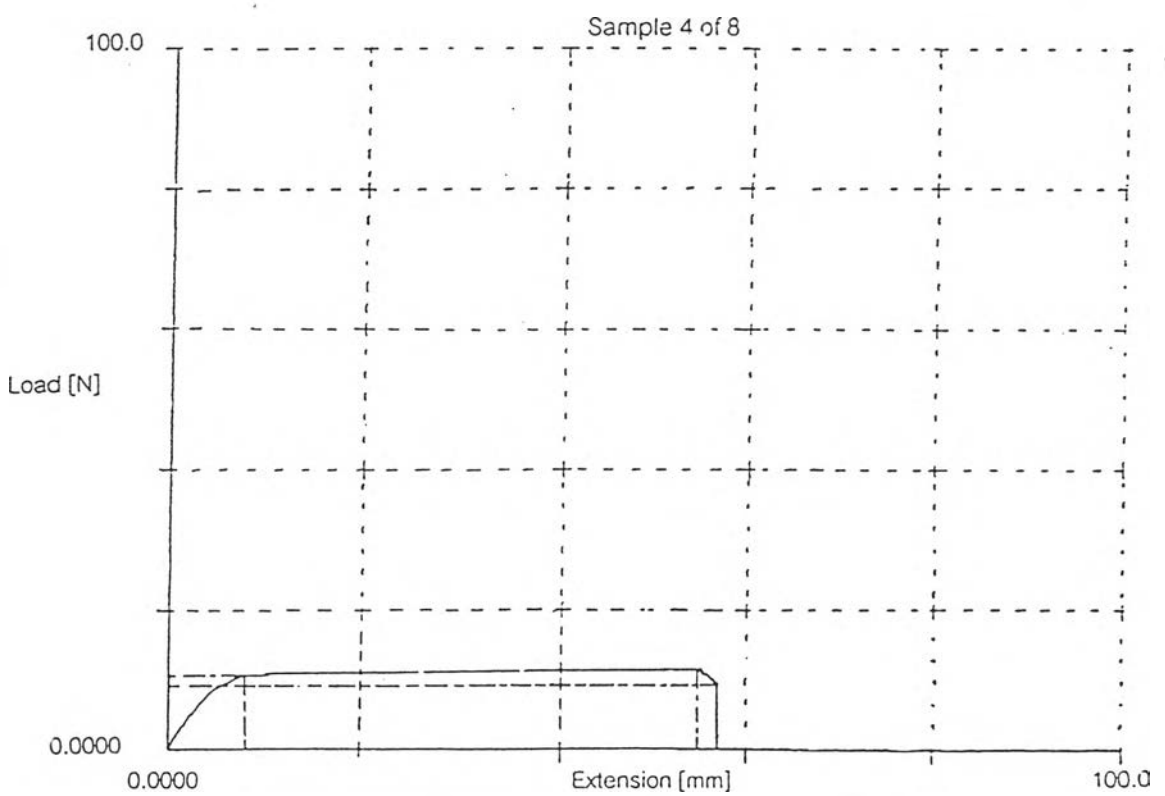


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
18.02	3.996	66.44	18.02	14.17	206.2	0.070000

Table D-29 Load-extension curve of stretched PP/PPY films from 25%$FeCl_3$, 25%pyrrole, @-15°C, 20 hours for polymerization and 120 minutes iodine doping @ 30°C in vacuum (MD and TD directions, respectively).

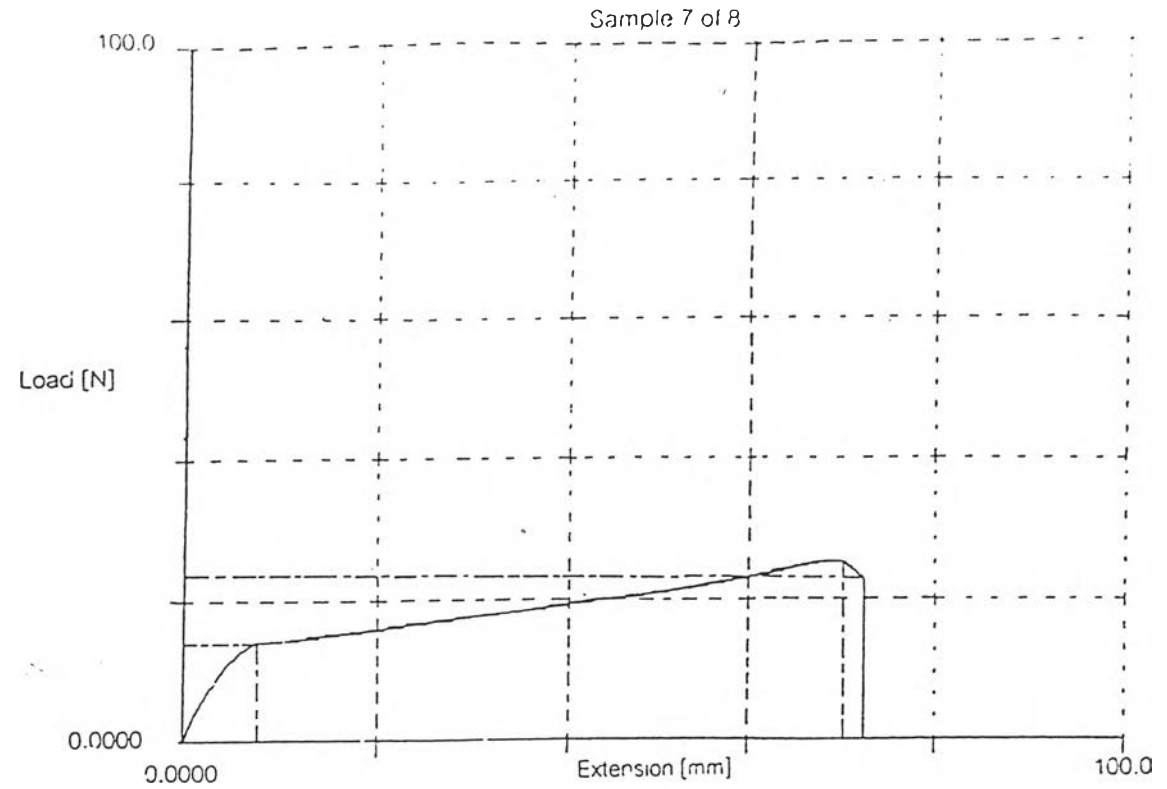


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
24.17	24.01	280.5	14.38	26.85	87.91	0.071000

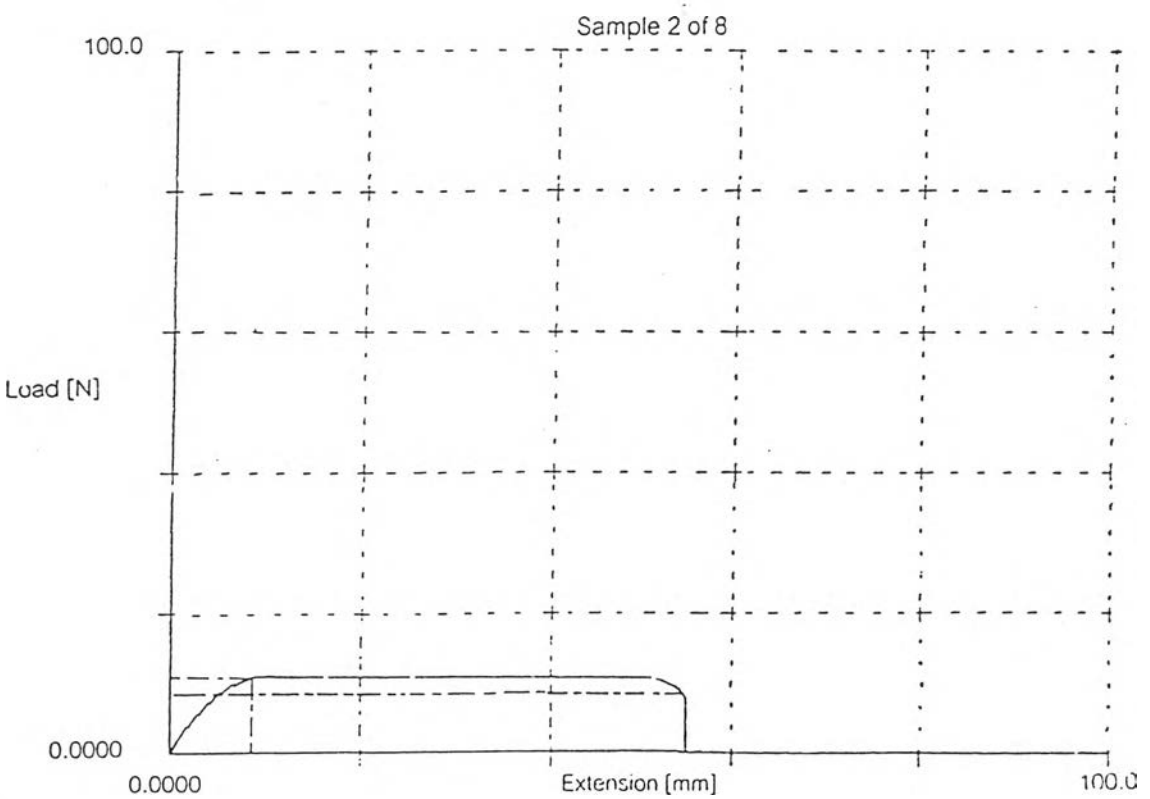


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
10.99	8.004	211.9	12.01	16.92	124.3	0.060000

Table D-30 Load-extension curve of stretched LDPE/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, 20 hours for polymerization and 30 minutes iodine doping @ 30°C in vacuum (MD and TD directions, respectively).

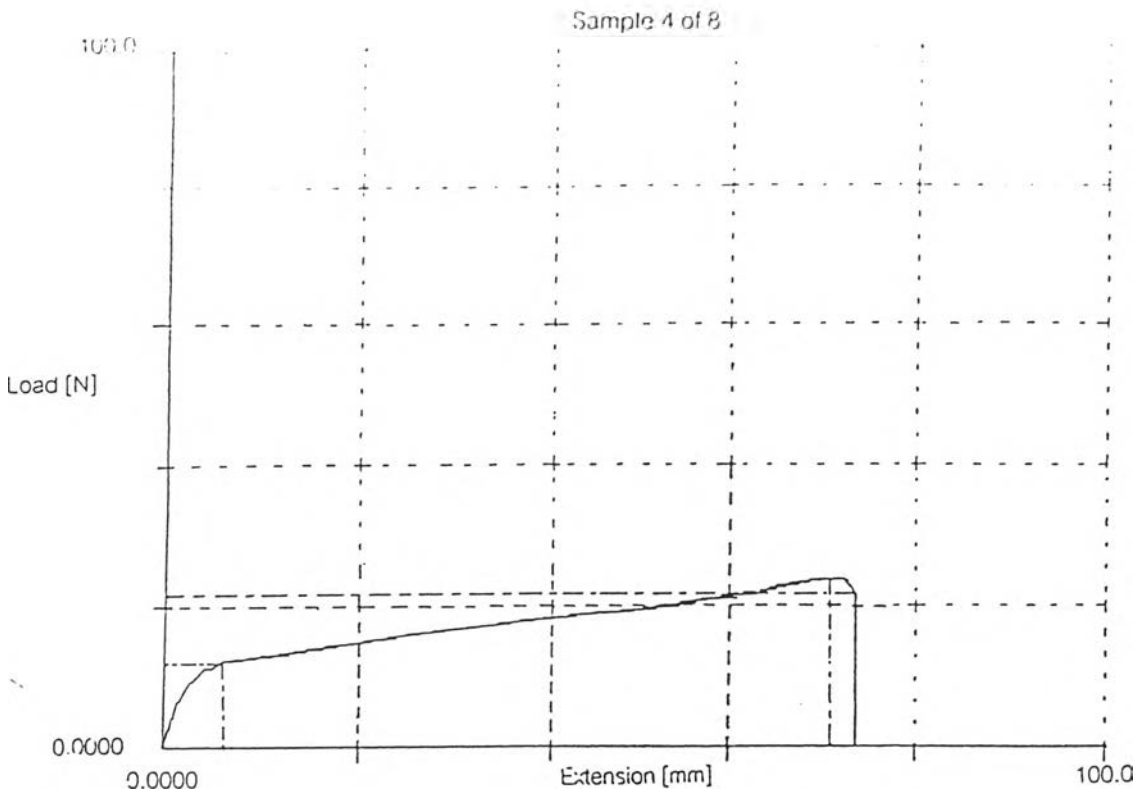


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm.)
24.86	24.35	275.5	14.26	27.01	85.93	0.070000

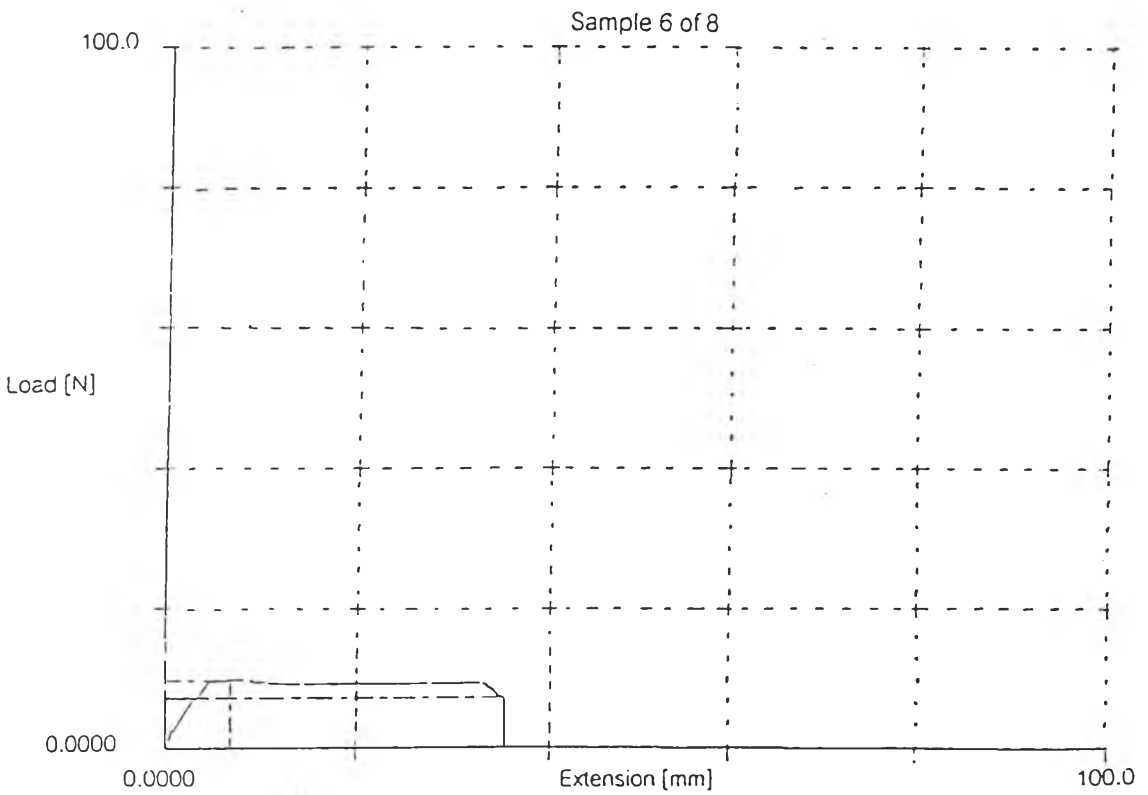


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm.)
10.03	7.112	[illegible]	[illegible]	16.13	[illegible]	[illegible]

Table D-31 Load-extension curve of stretched LDPE/PPY films from 25%$FeCl_3$, 25%pyrrole, @-15°C, 20 hours for polymerization and 60 minutes iodine doping @ 30°C in vacuum (MD and TD directions, respectively).

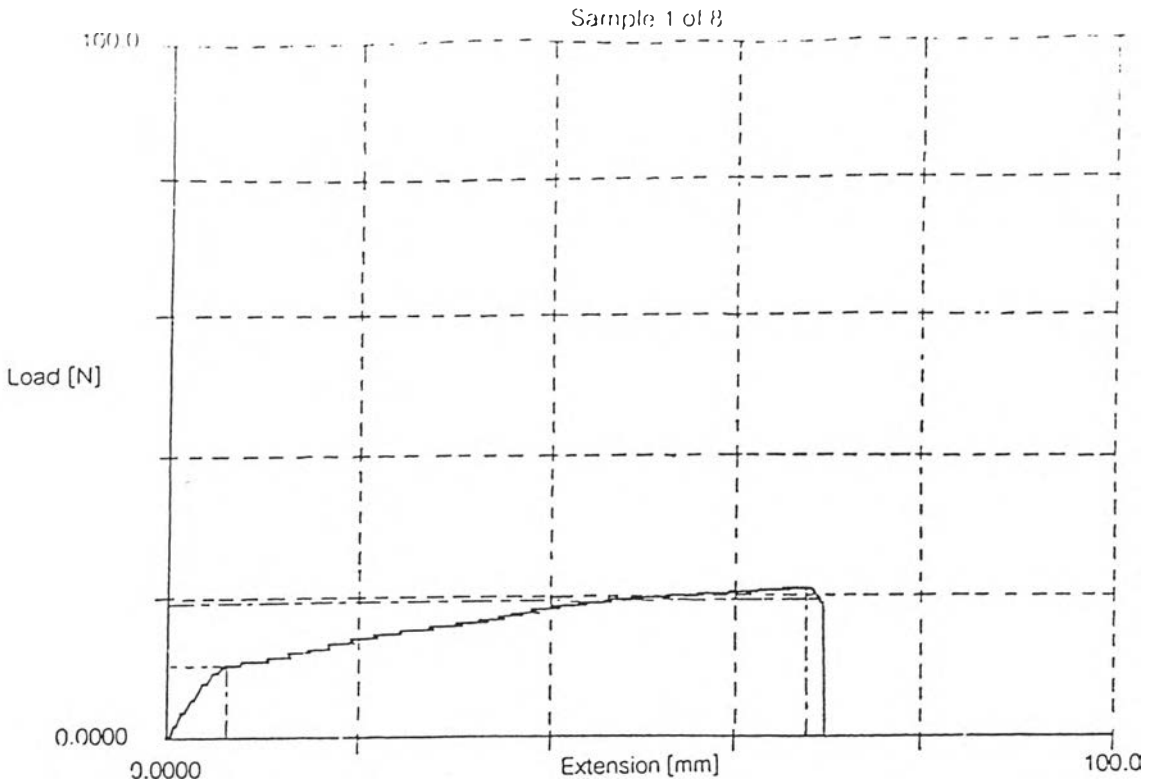


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
25.70	23.63	271.7	14.12	28.33	88.96	0.071000

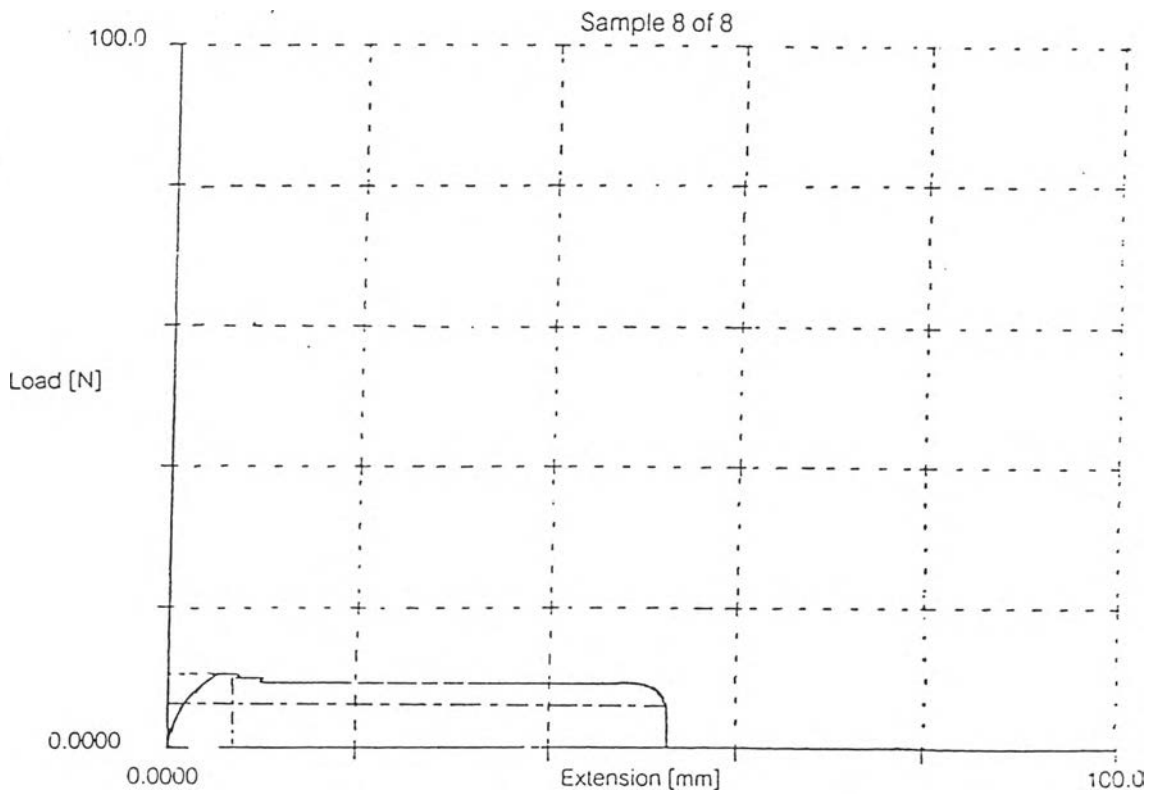


Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Stress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
9.973	5.836	215.6	10.07	18.88	120.1	0.070000

Table D-32 Load-extension curve of stretched LDPE/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, 20 hours for polymerization and 90 minutes iodine doping @ 30°C in vacuum (MD and TD directions, respectively).



Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
22.41	21.89	281.7	13.16	27.09	87.07	0.070000



Maximum Load (N)	Stress @ Break (N/mm2)	Strain @ Break (%)	Sress @ High Yld (N/mm2)	Strain @ High Yld (%)	Modulus of Elast (N/mm2)	Sample Thick (mm)
12.34	6.133	203.8	11.20	14.89	112.9	0.070000

Table D-33 Load-extension curve of stretched LDPE/PPY films from 25%$FeCl_3$, 25%pyrrole, @ -15°C, 20 hours for polymerization and 120 minutes iodine doping @ 30°C in vacuum (MD and TD directions, respectively).

Appendix E

DSC and TGA thermograms of original and prepared conducting films.

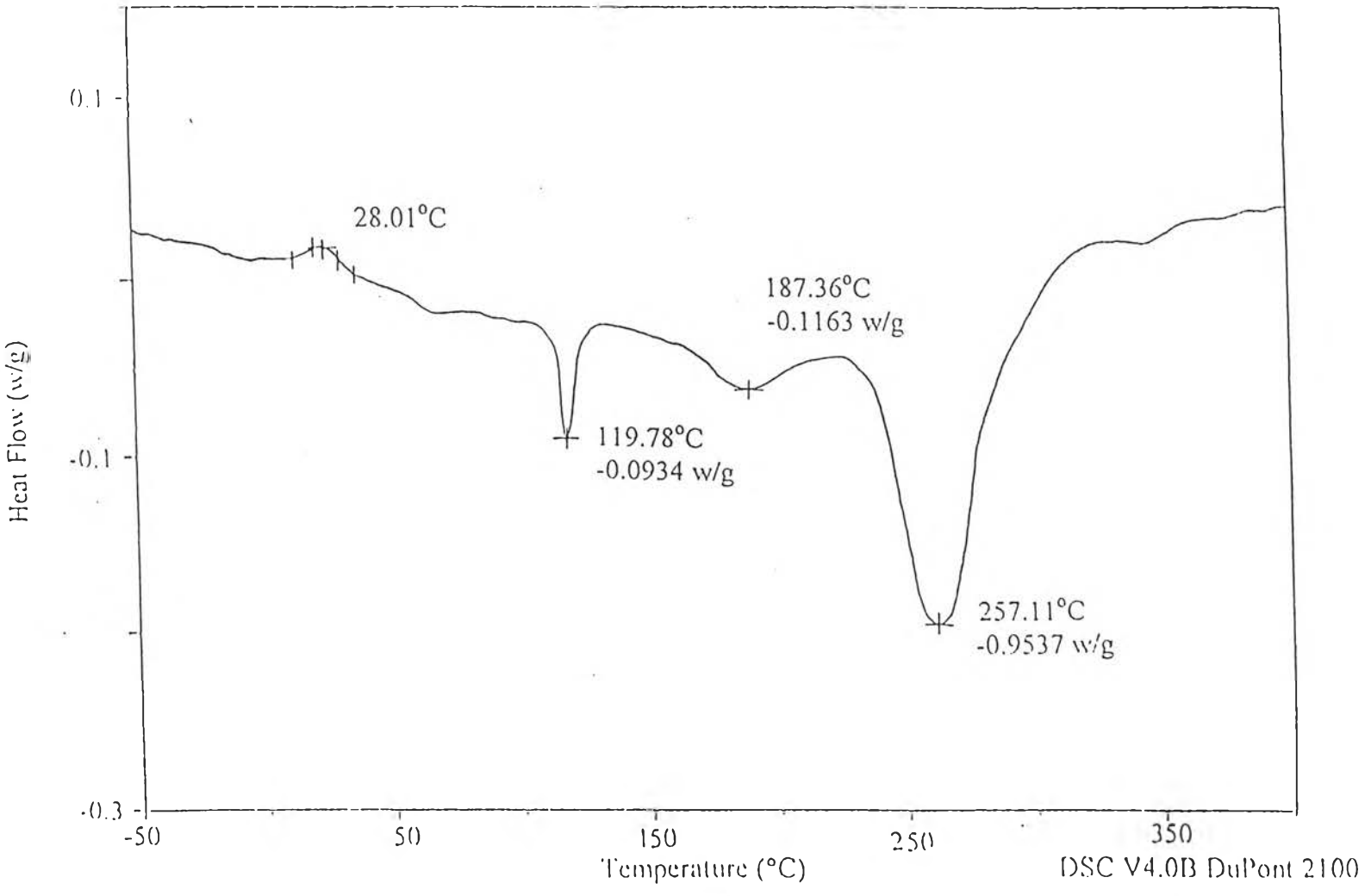


Figure E-1 DSC thermogram of PVA film.

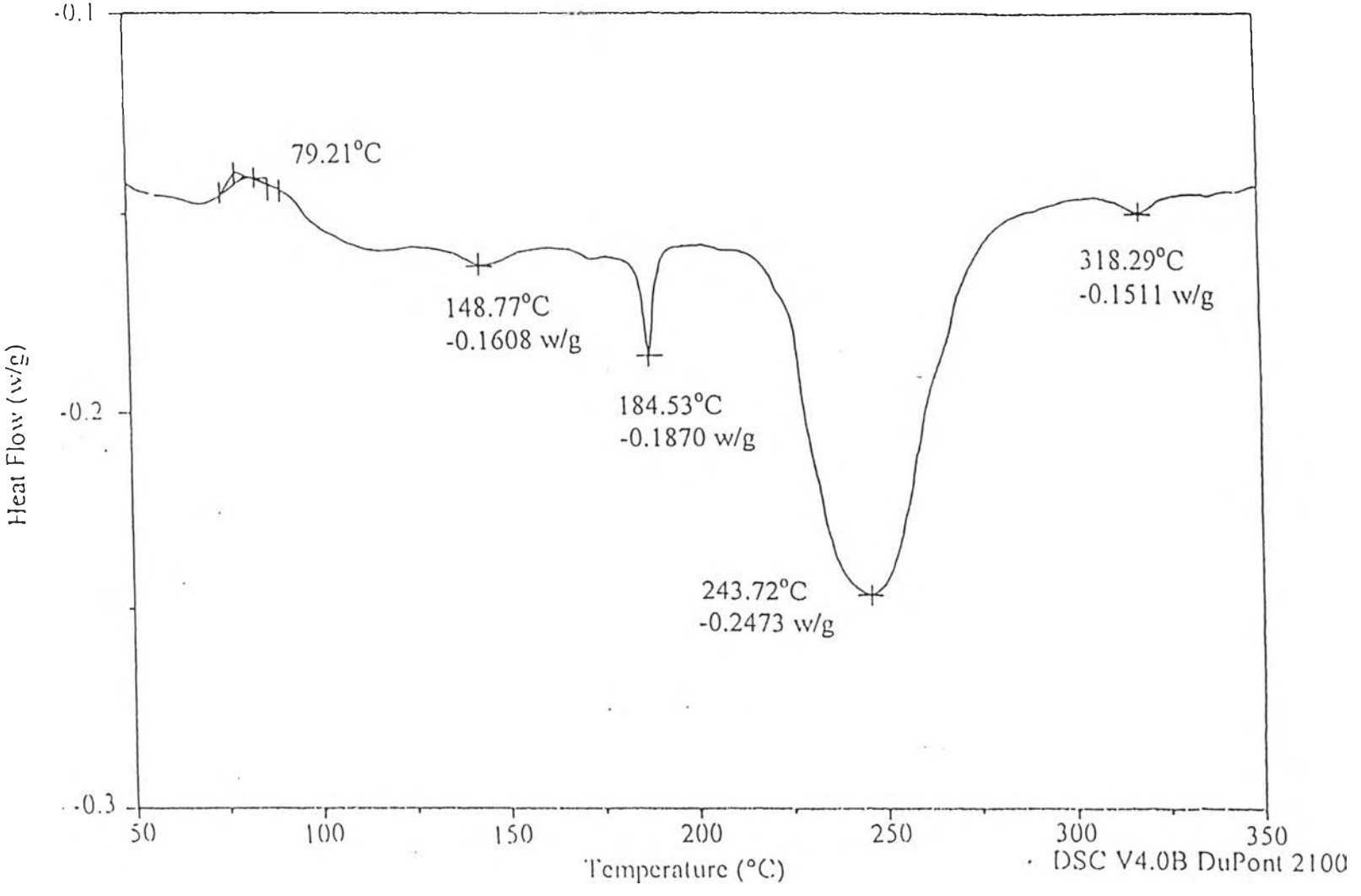


Figure E-2 DSC thermiogram of PVC film.

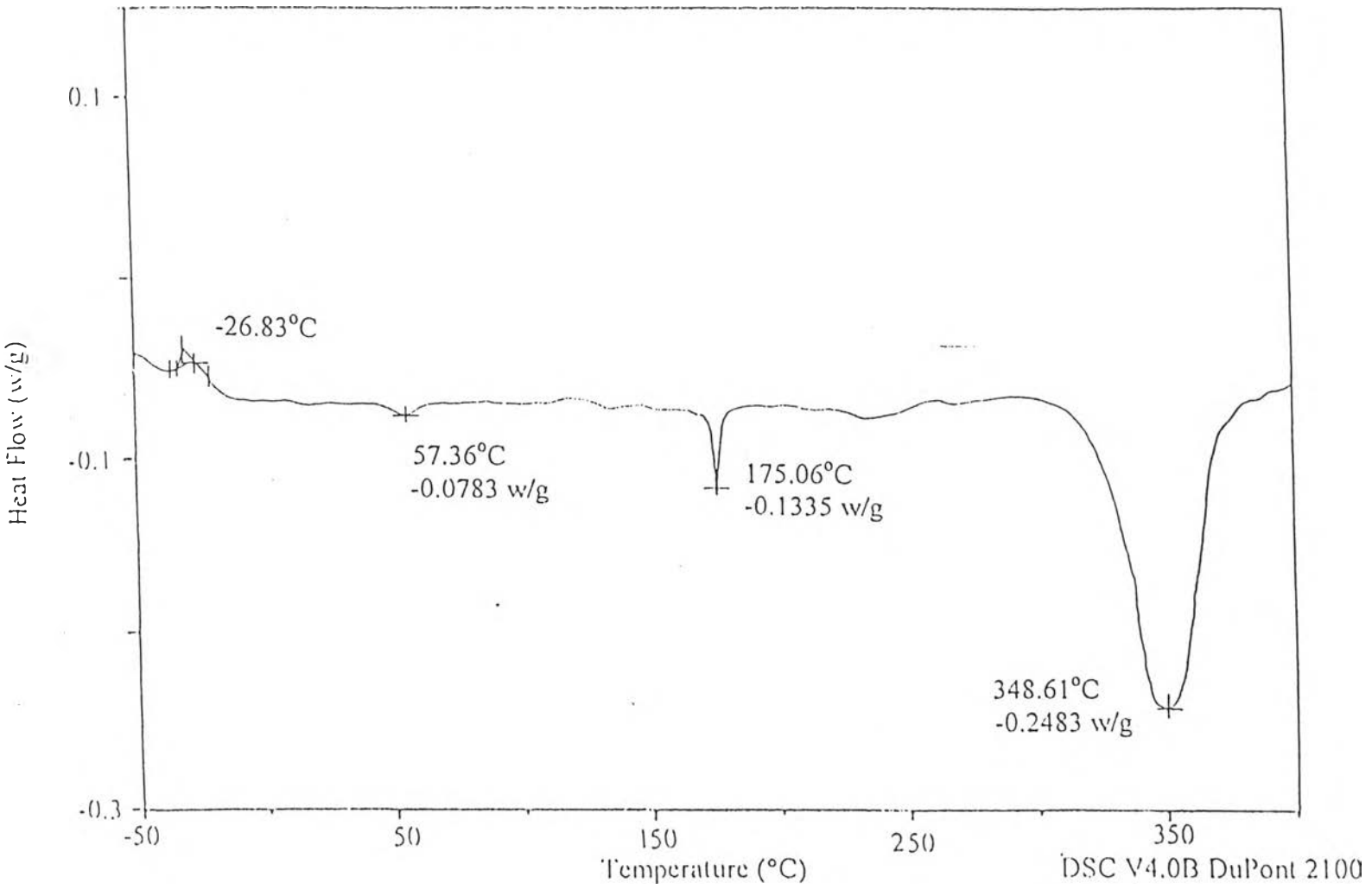


Figure E-3 DSC thermogram of PP film.

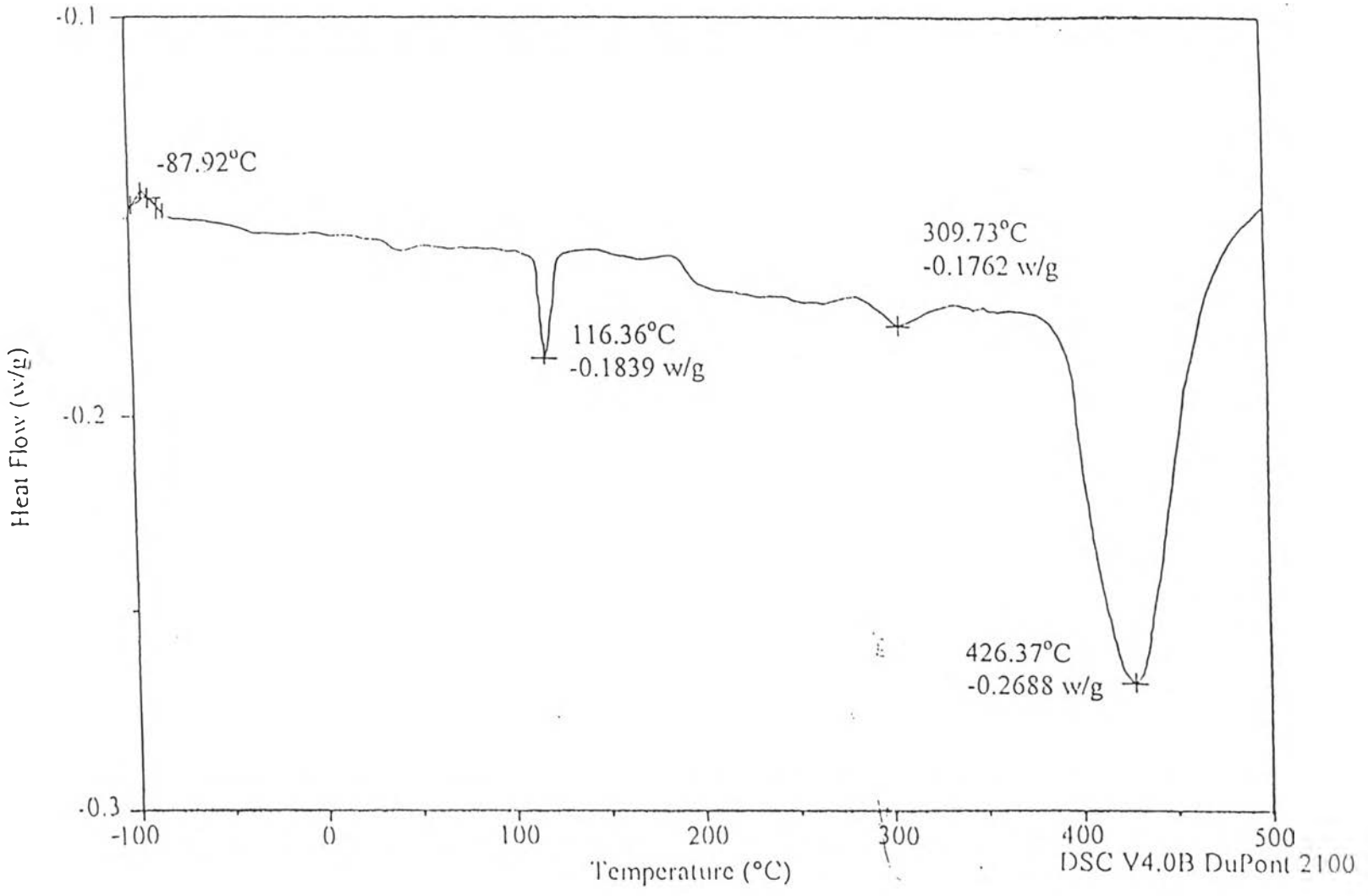


Figure E-4 DSC thermogram of LDPE film.

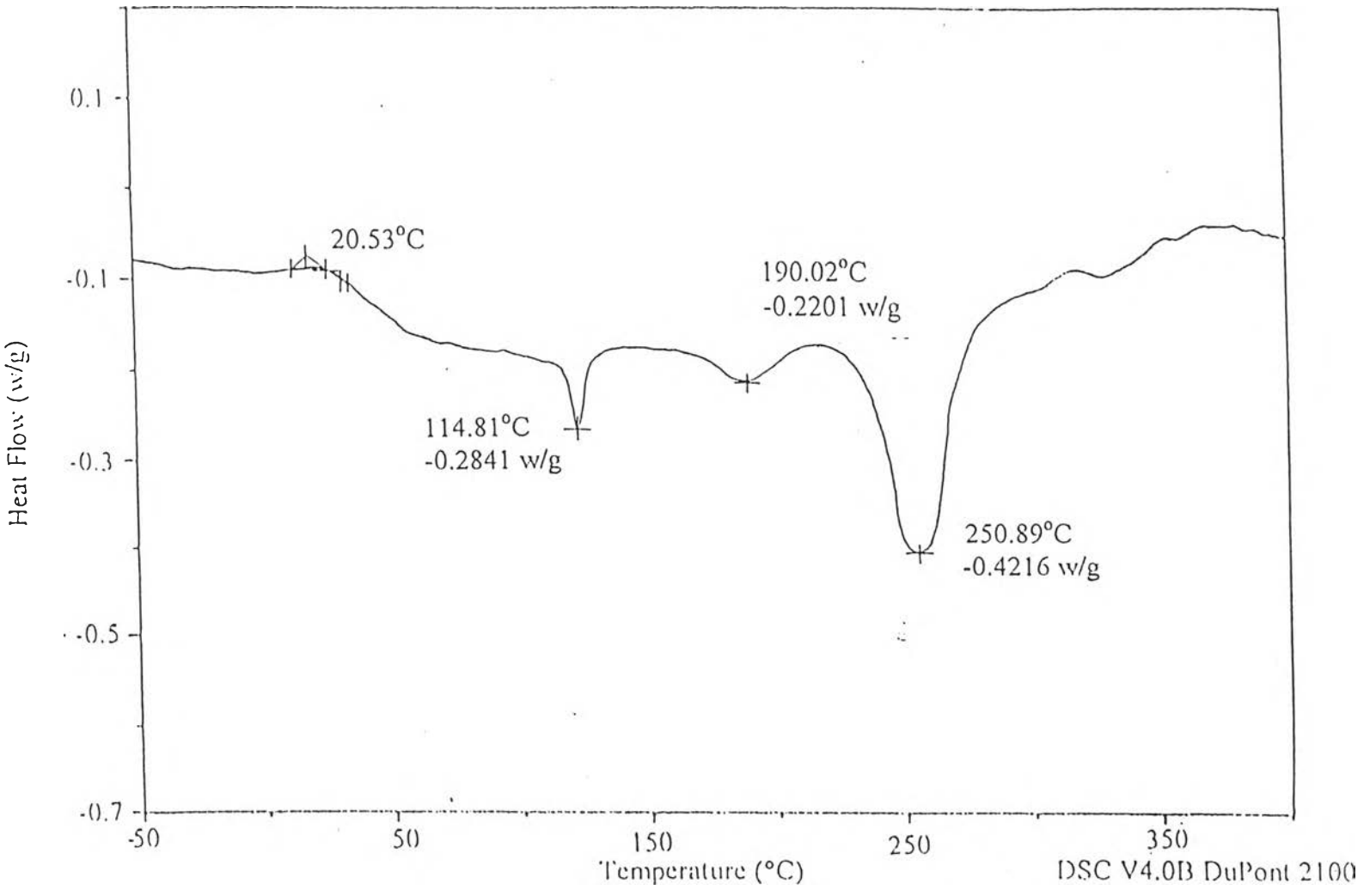


Figure E-5 DSC thermogram of PVA/25%$FeCl_3$ film.

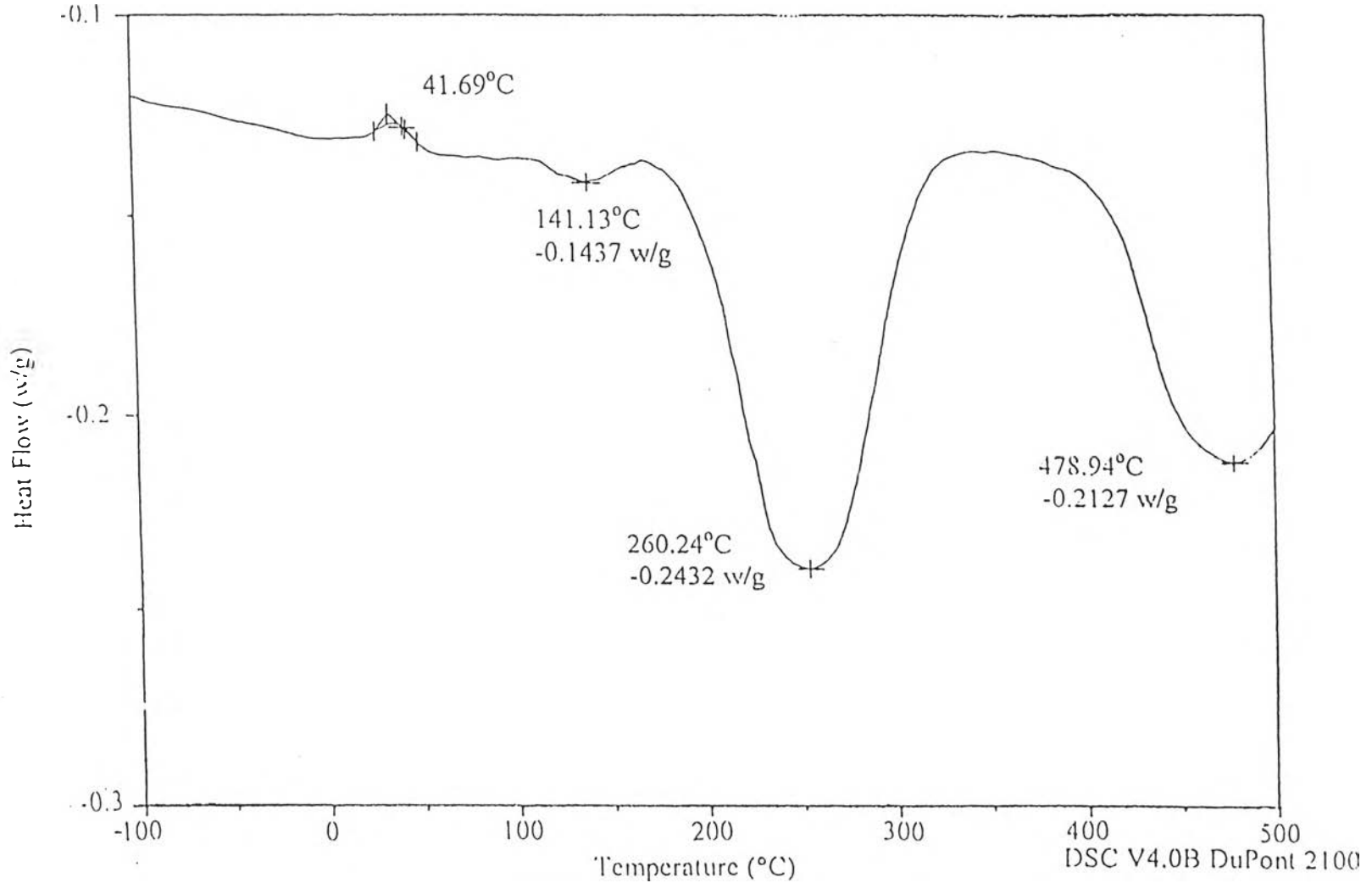


Figure E-6 DSC thermogram of PVA/PPY film from 25%$FeCl_3$, 25%pyrrole, at 30°C and 20 hrs. for polymerization.

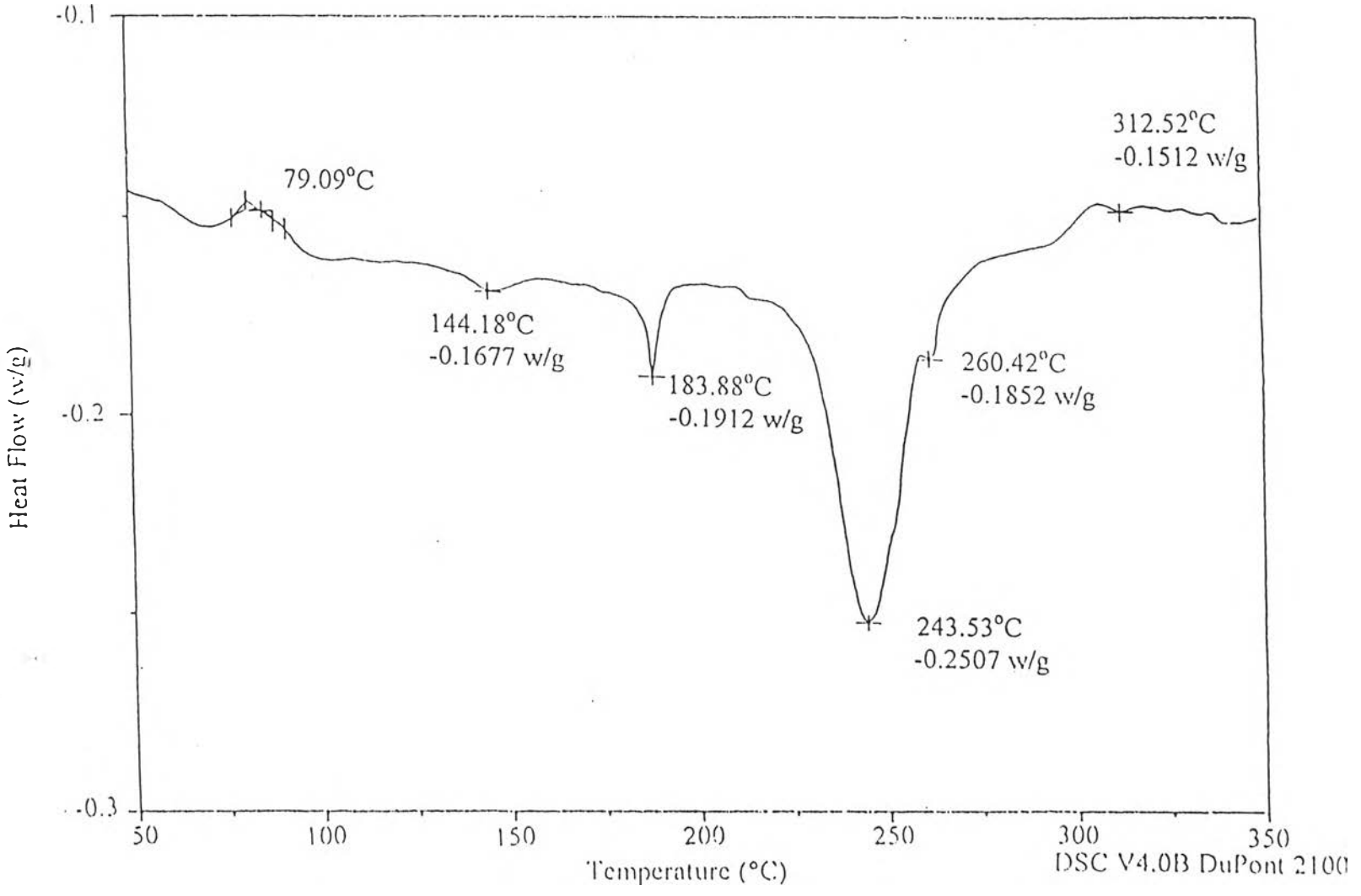


Figure E-7 DSC thermogram of PVC/PPY film from 25%$FeCl_3$, 25%pyrrole, at -15°C and 20 hrs. for polymerization.

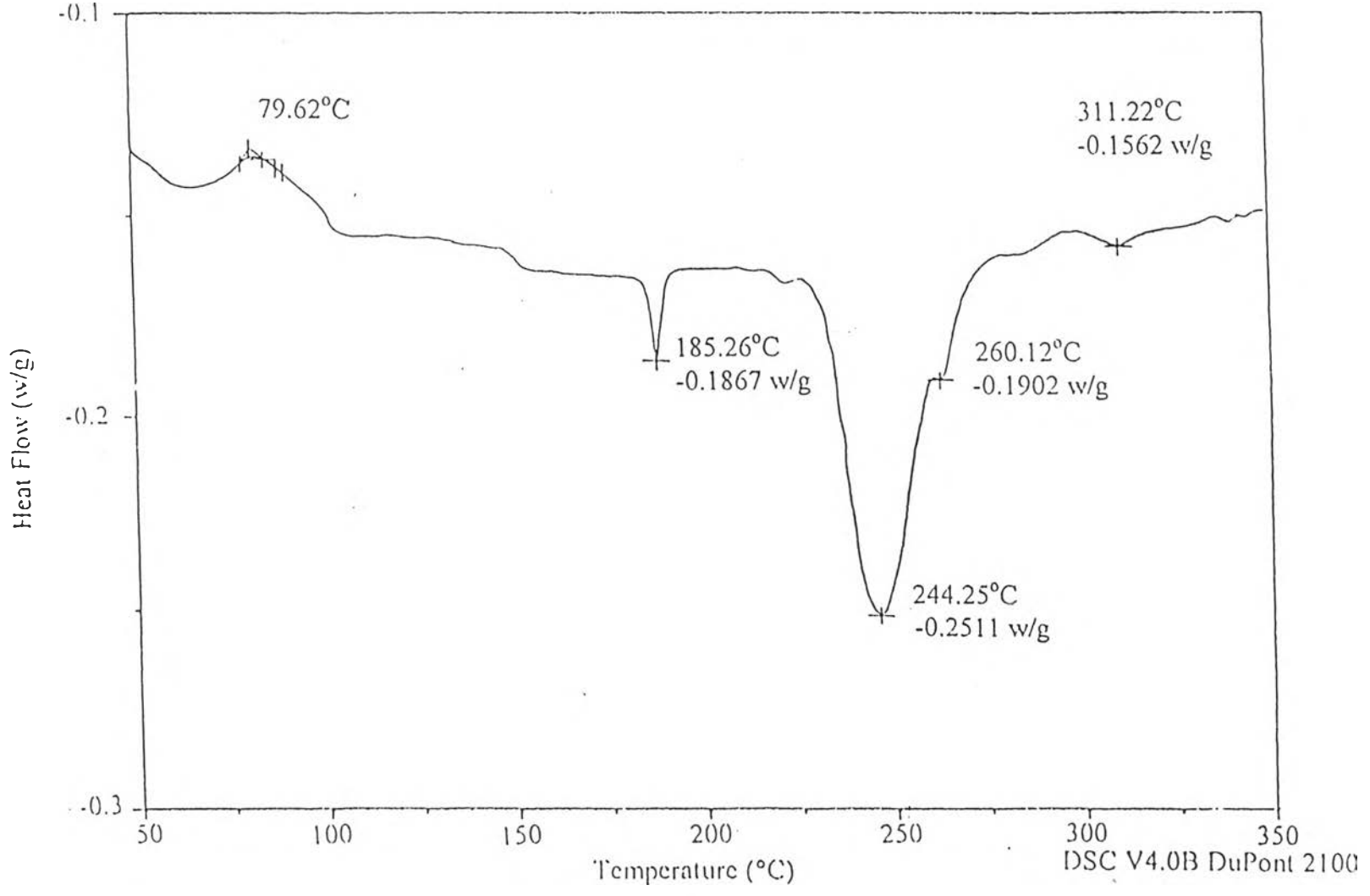


Figure E-8 DSC thermogram of PVC/PPY film from 25%$FeCl_3$, 25%pyrrole, at 30°C and 20 hrs. for polymerization.

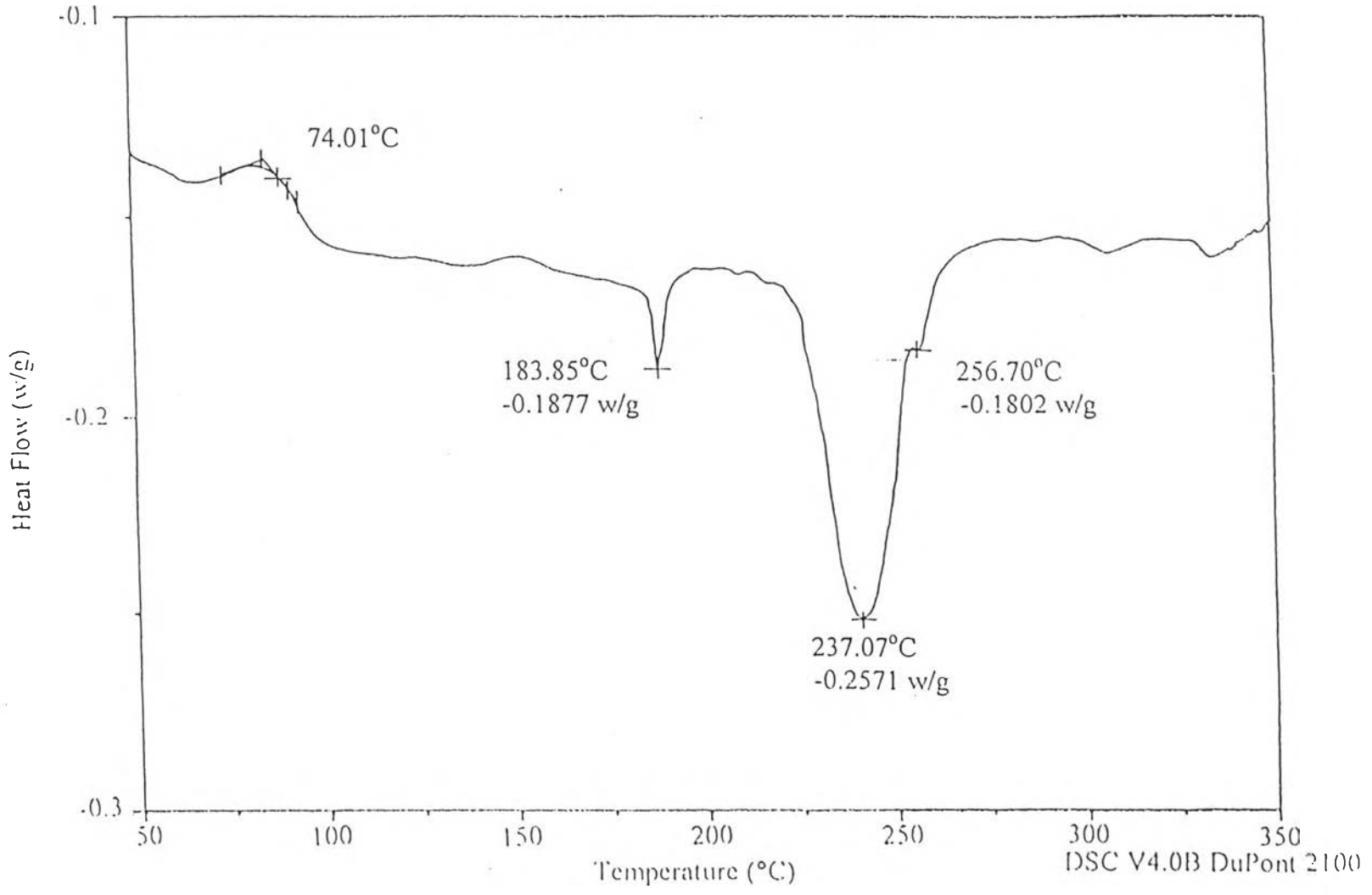


Figure E-9 DSC thermogram of PVC/PPY film from 25%$FeCl_3$, 25%pyrrole, at 70°C and 20 hrs. for polymerization.

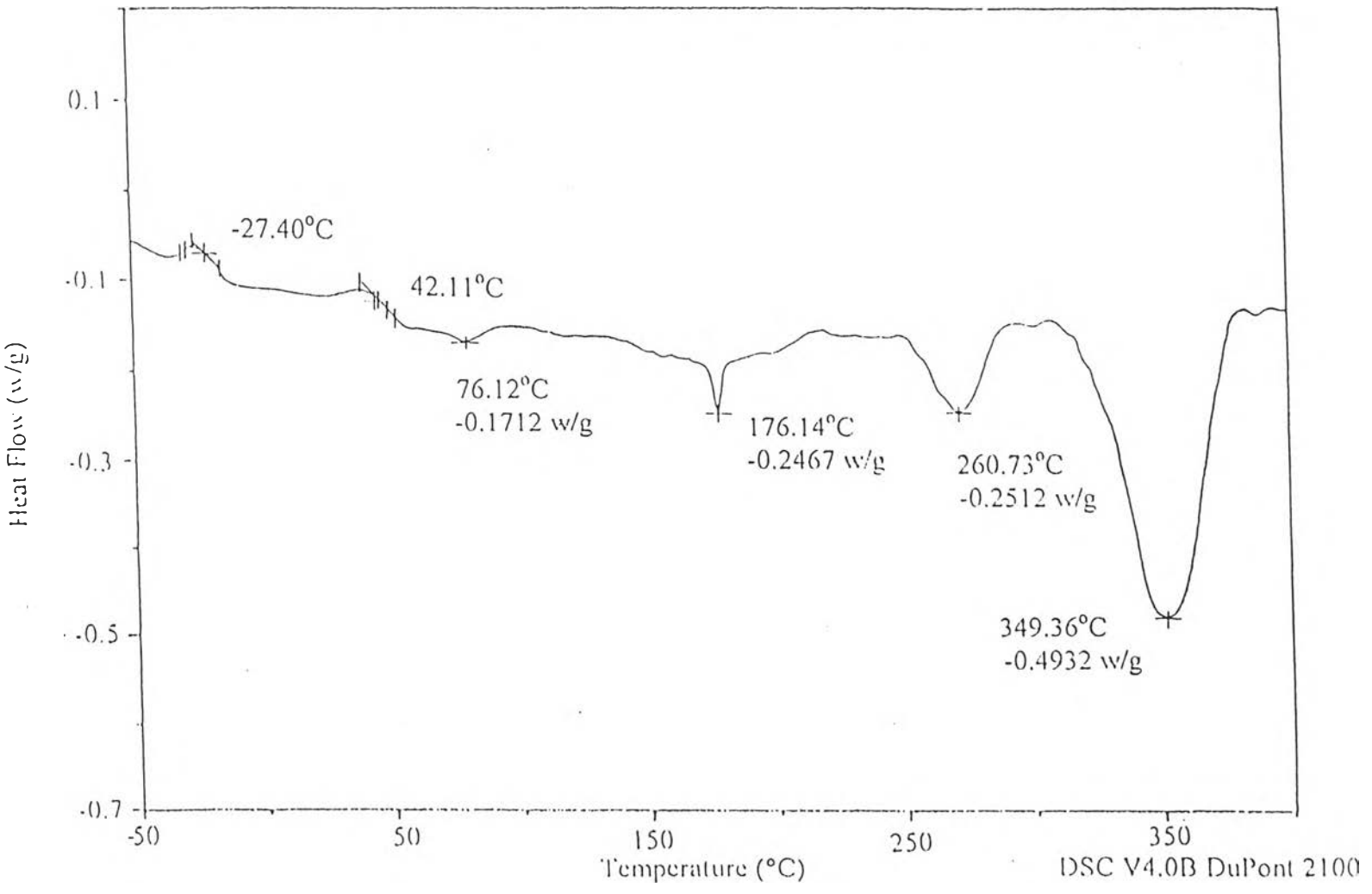


Figure E-10 DSC thermogram of PP/PPY film from 25%$FeCl_3$, 25%pyrrole, at -15°C and 20 hrs. for polymerization.

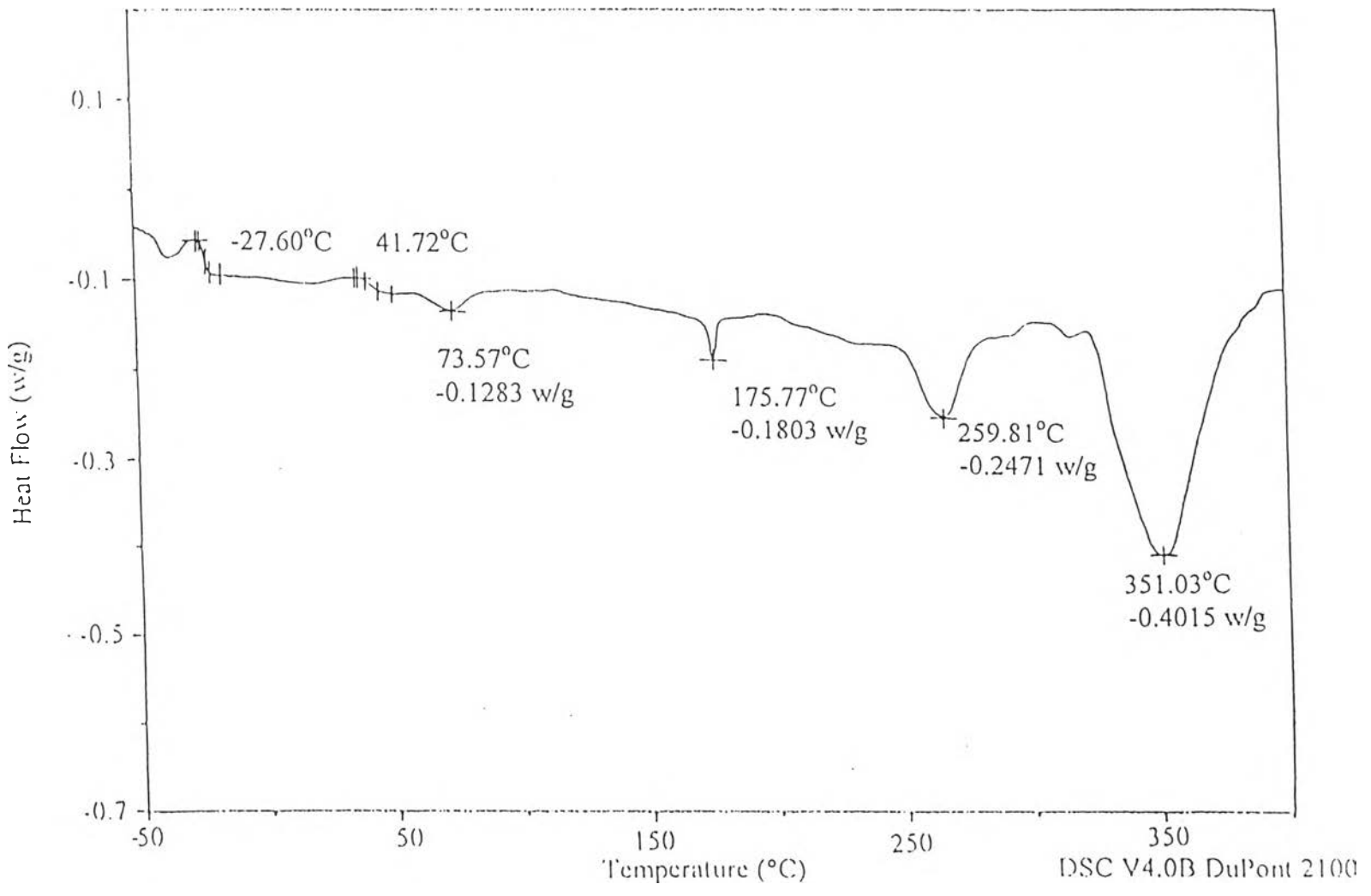


Figure E-11 DSC thermogram of PP/PPY film from 25%$FeCl_3$, 25%pyrrole, at 30°C and 20 hrs. for polymerization.

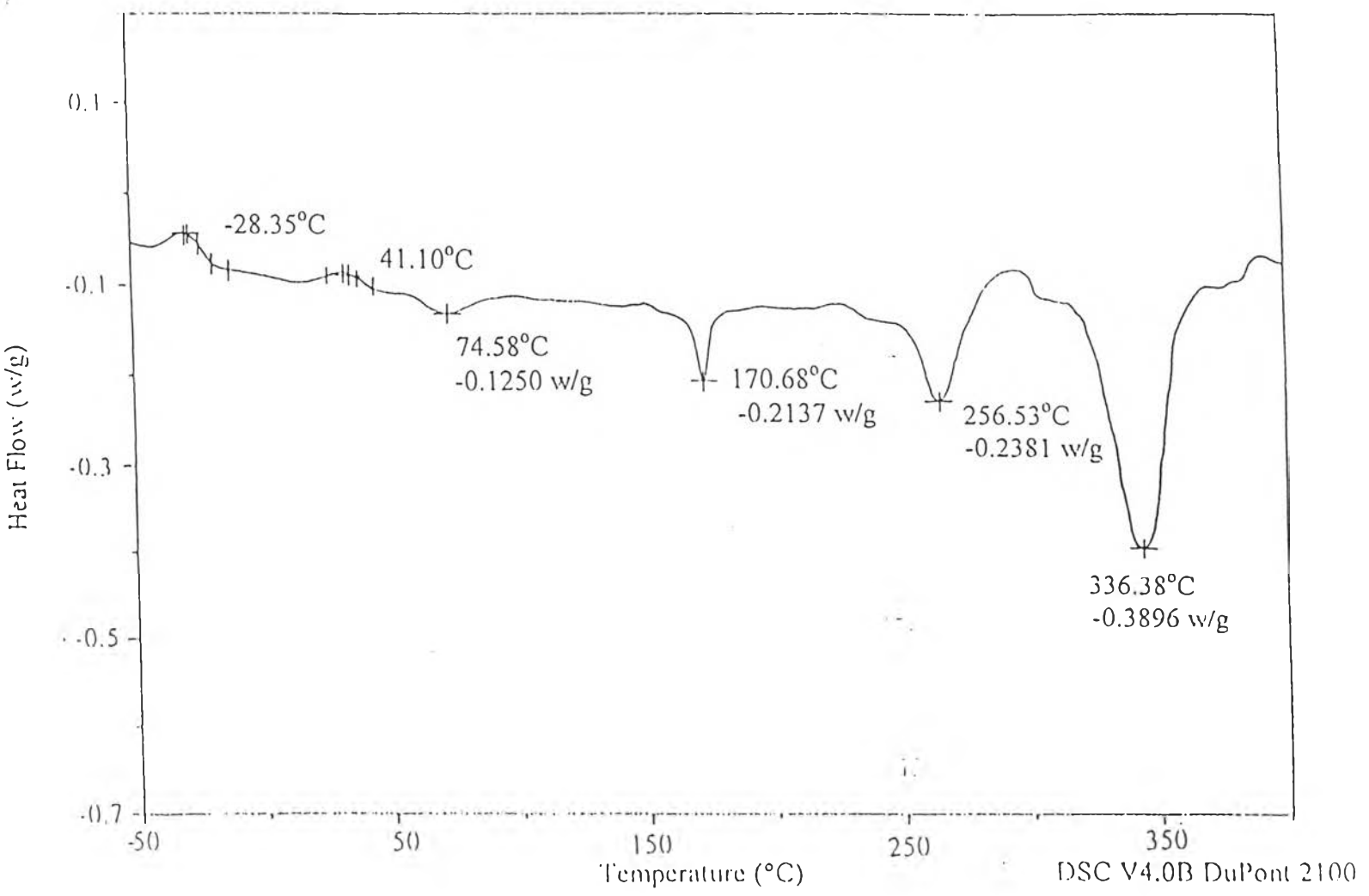


Figure E-12 DSC thermogram of PP/PPY film from 25%$FeCl_3$, 25%pyrrole, at 70°C and 20 hrs. for polymerization.

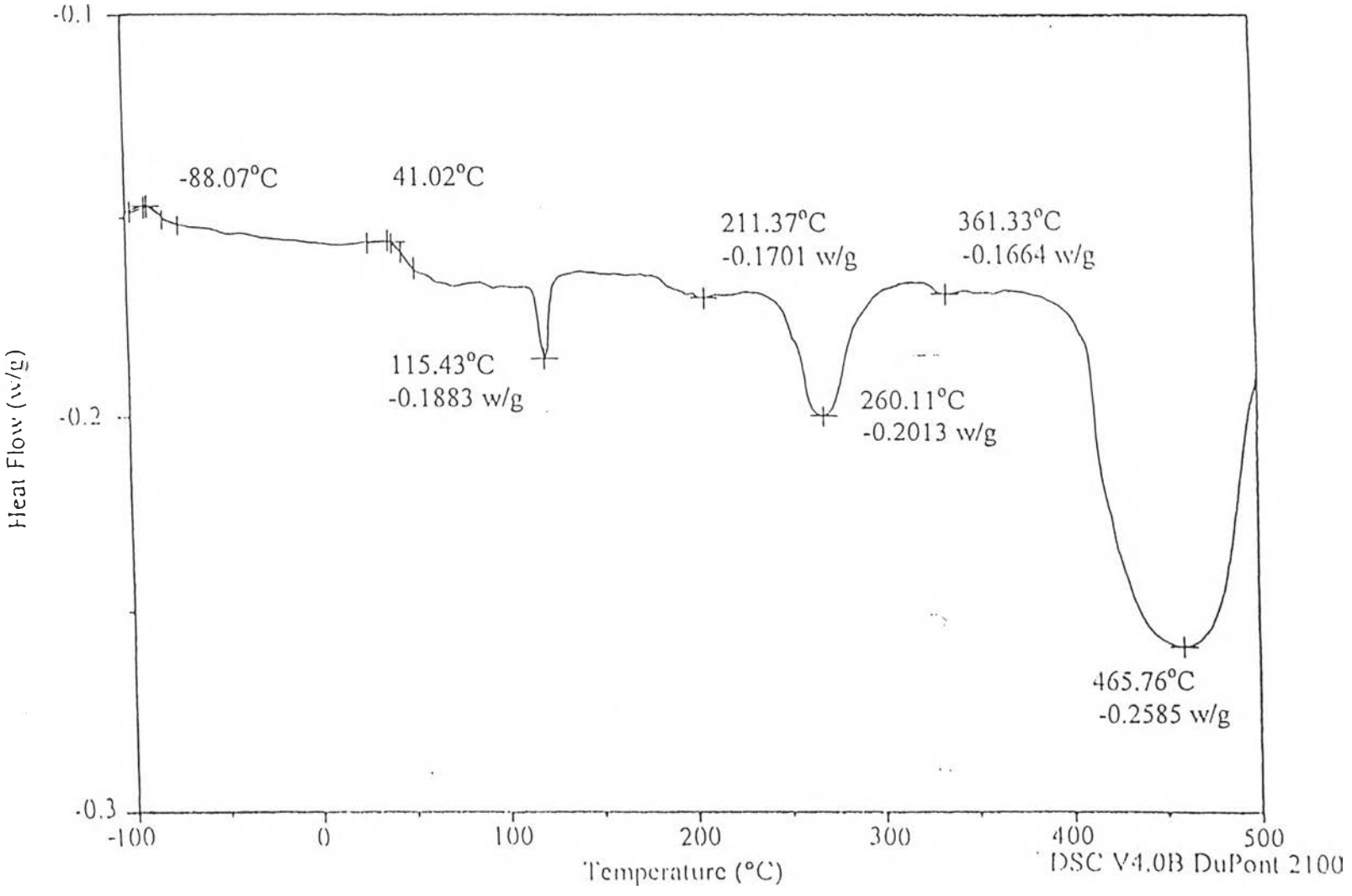


Figure E-13 DSC thermogram of LDPE/PPY film from 25%$FeCl_3$, 25%pyrrole, at -15°C and 20 hrs. for polymerization.

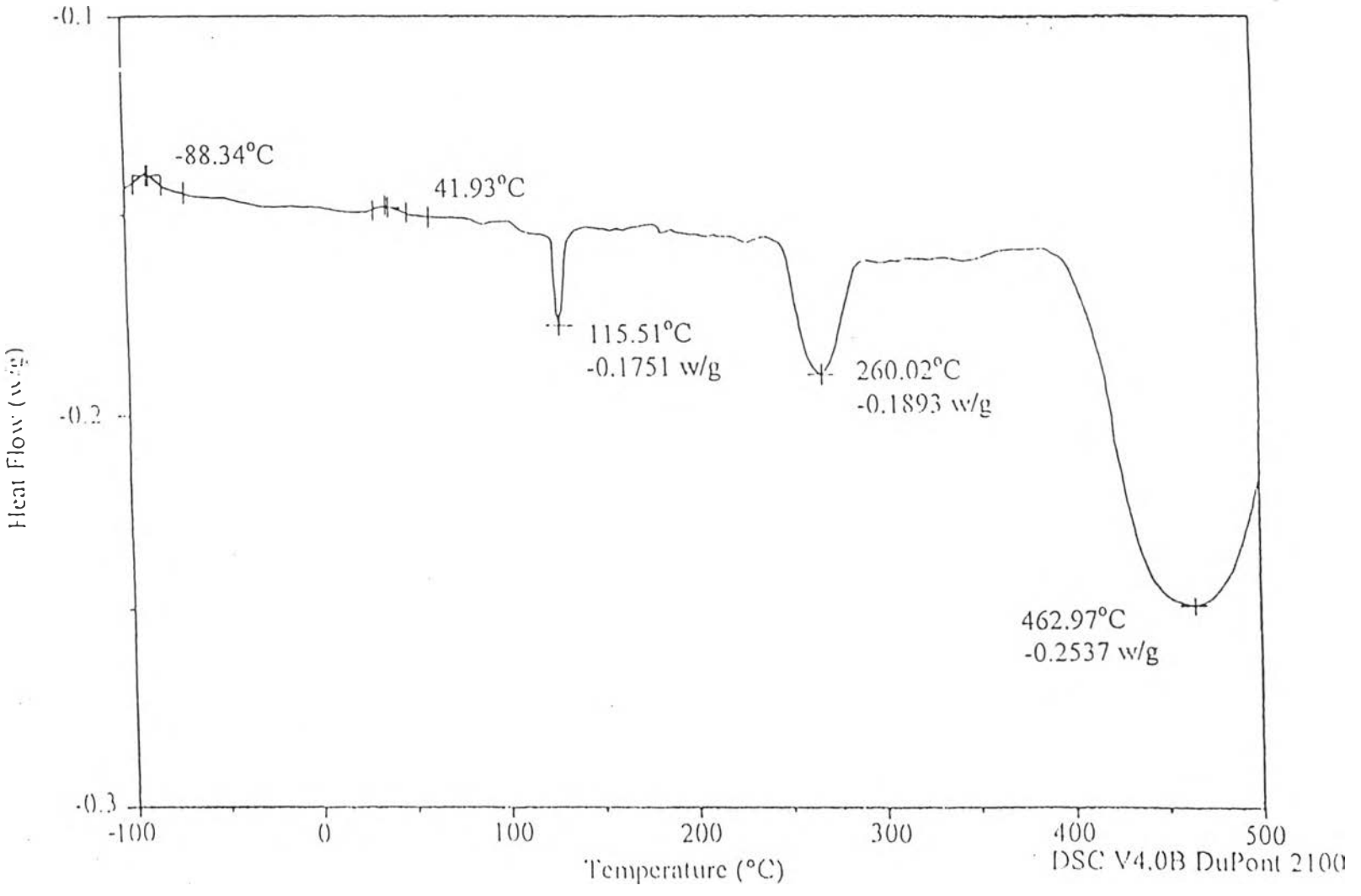


Figure E-14 DSC thermogram of LDPE/PPY film from 25%$FeCl_3$, 25%pyrrole, at 30°C and 20 hrs. for polymerization.

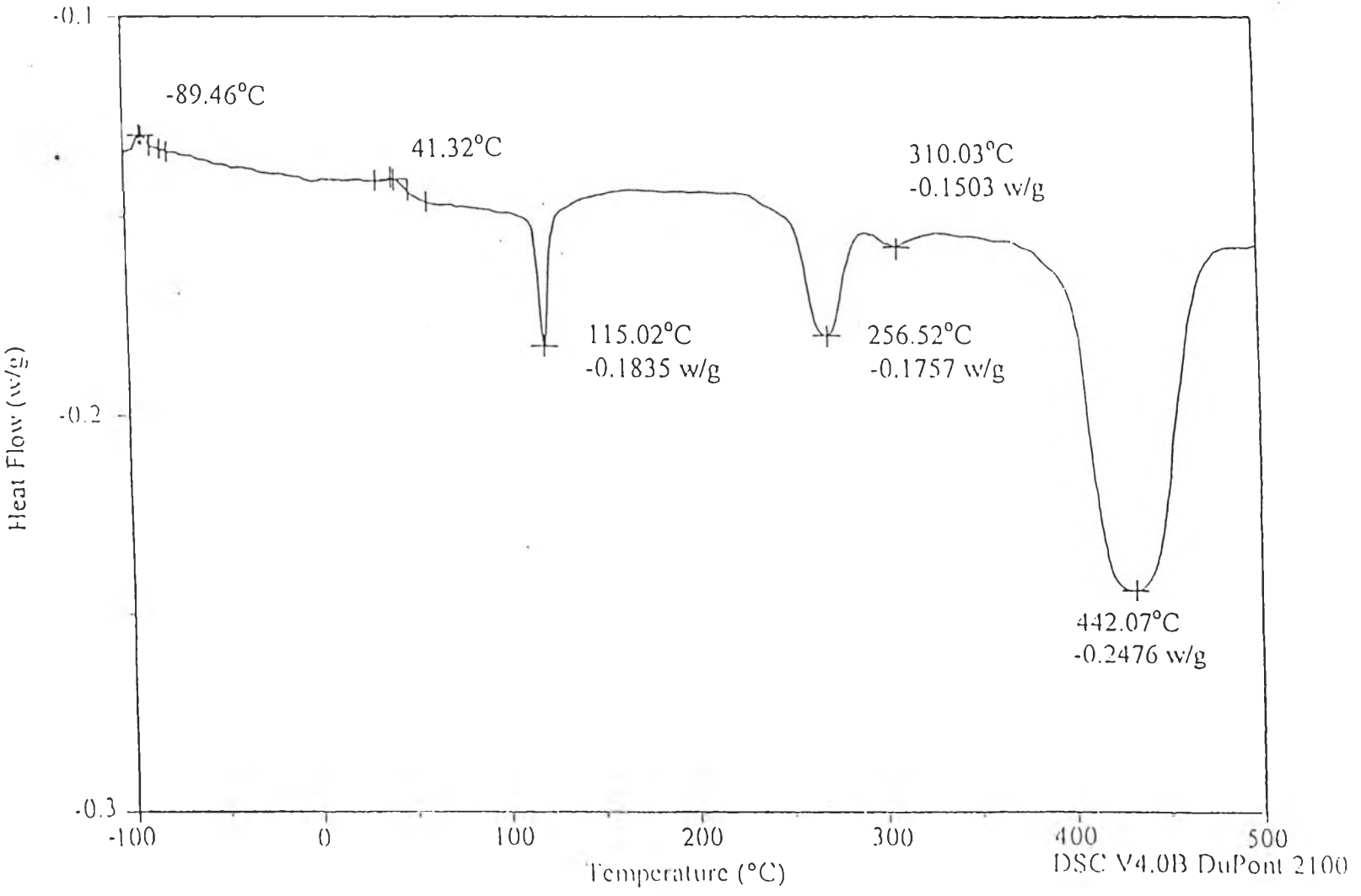


Figure E-15 DSC thermogram of LDPE/PPY film from 25%$FeCl_3$, 25%pyrrole, at 70°C and 20 hrs. for polymerization.

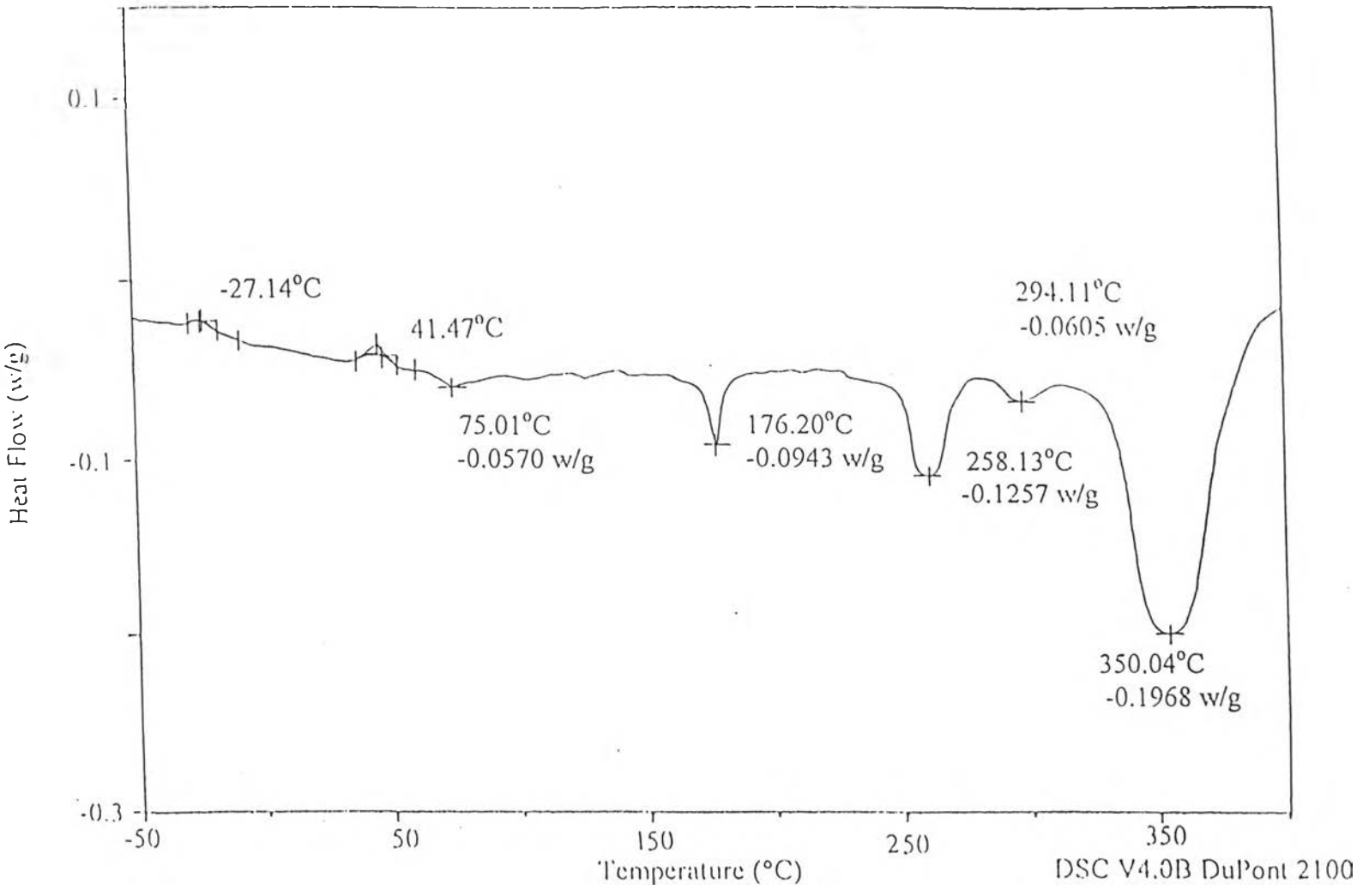


Figure E-16 DSC thermogram of PP/PPY film from 25%$FeCl_3$, 25%pyrrole, at -15°C, 20 hrs. for polymerization and 30 minutes iodine doping at -15°C.

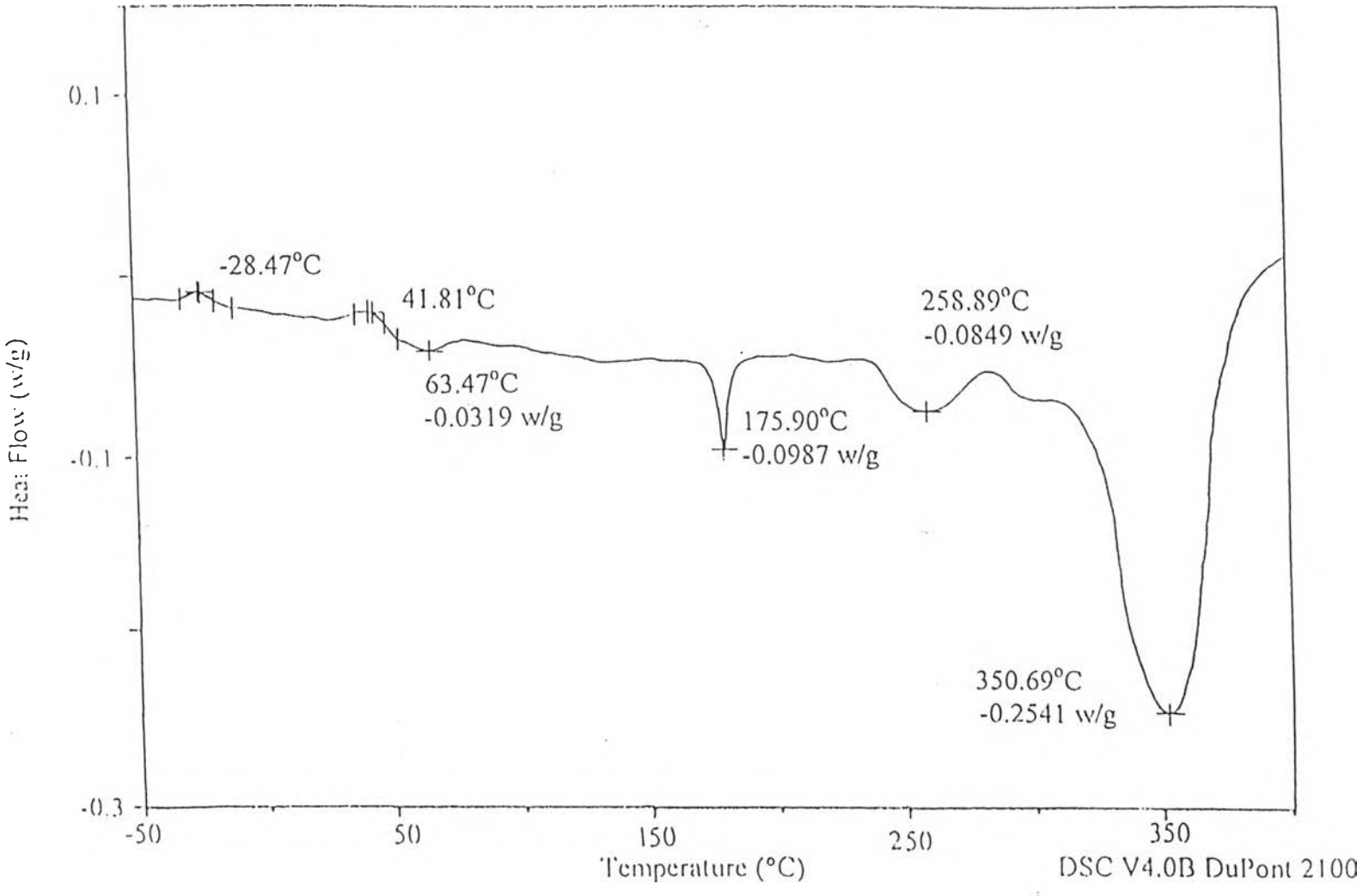


Figure E-17 DSC thermogram of PP/PPY film from 25%$FeCl_3$, 25%pyrrole, at -15°C, 20 hrs. for polymerization and 30 minutes iodine doping at 30°C.

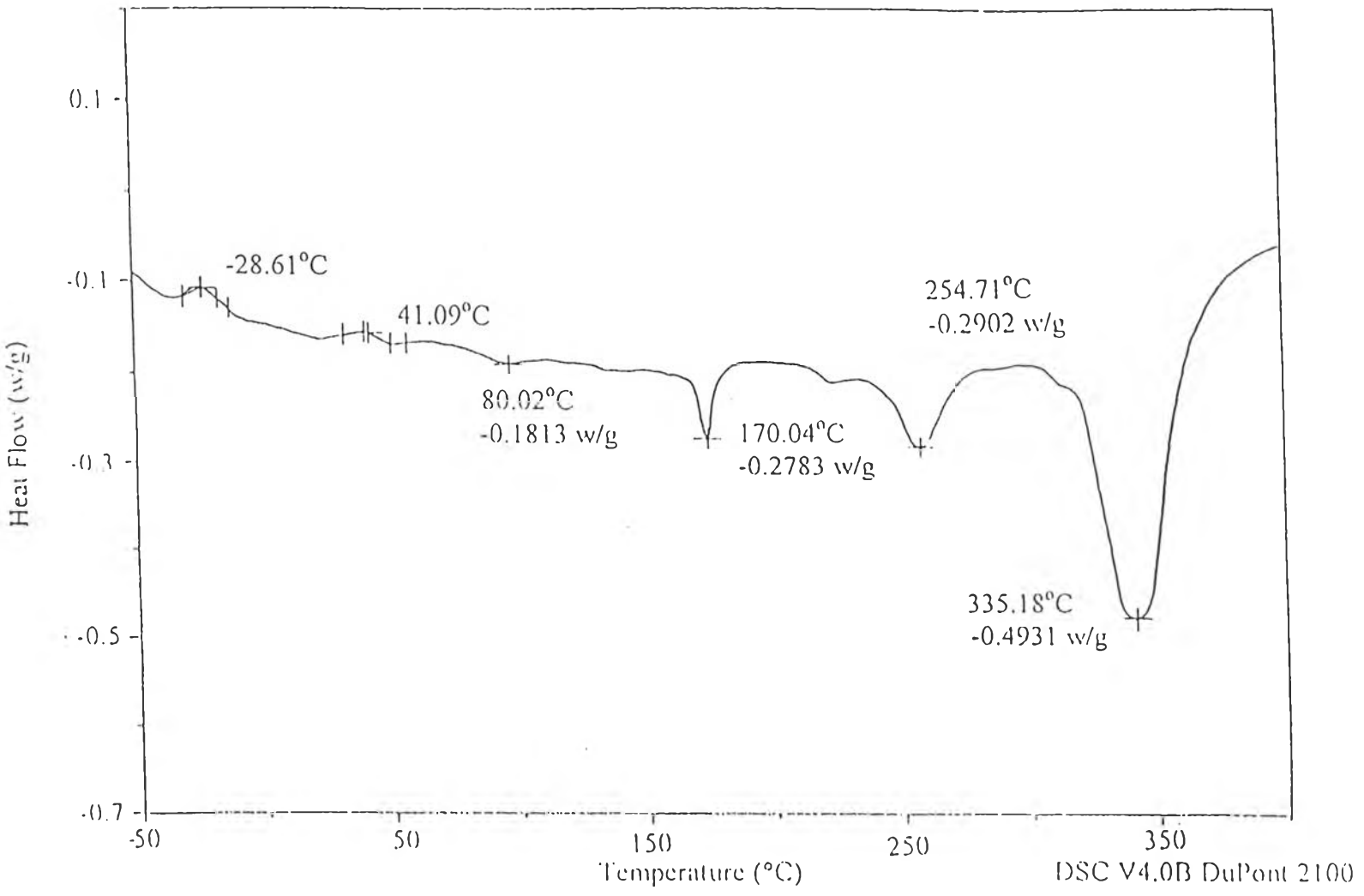


Figure E-18 DSC thermogram of PP/PPY film from 25%$FeCl_3$, 25%pyrrole, at -15°C, 20 hrs. for polymerization and 30 minutes iodine doping at 70°C.

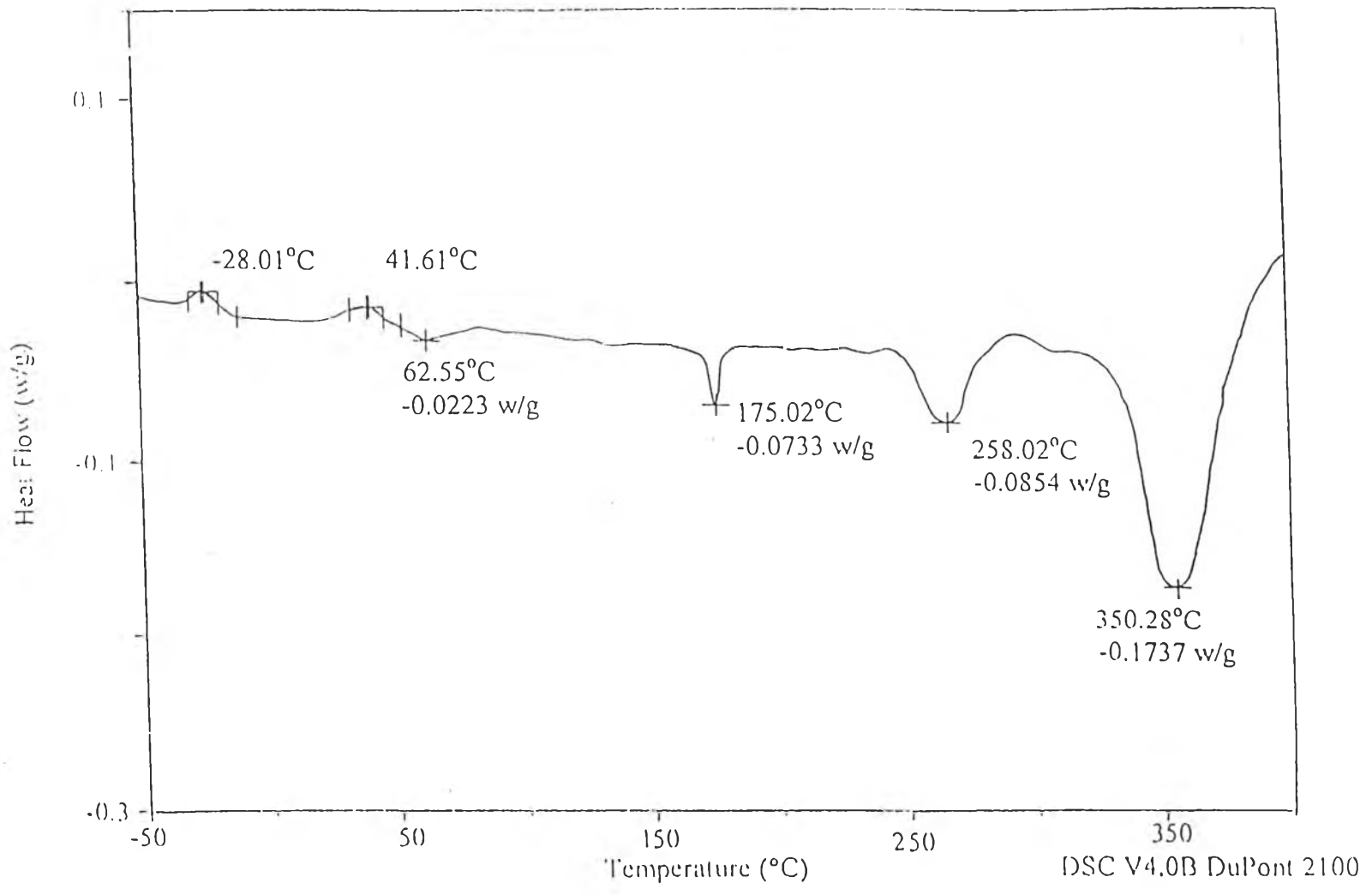


Figure E-19 DSC thermogram of PP/PPY film from 25%$FeCl_3$, 25%pyrrole, at -15°C, 20 hrs. for polymerization and 120 minutes iodine doping at 30°C.

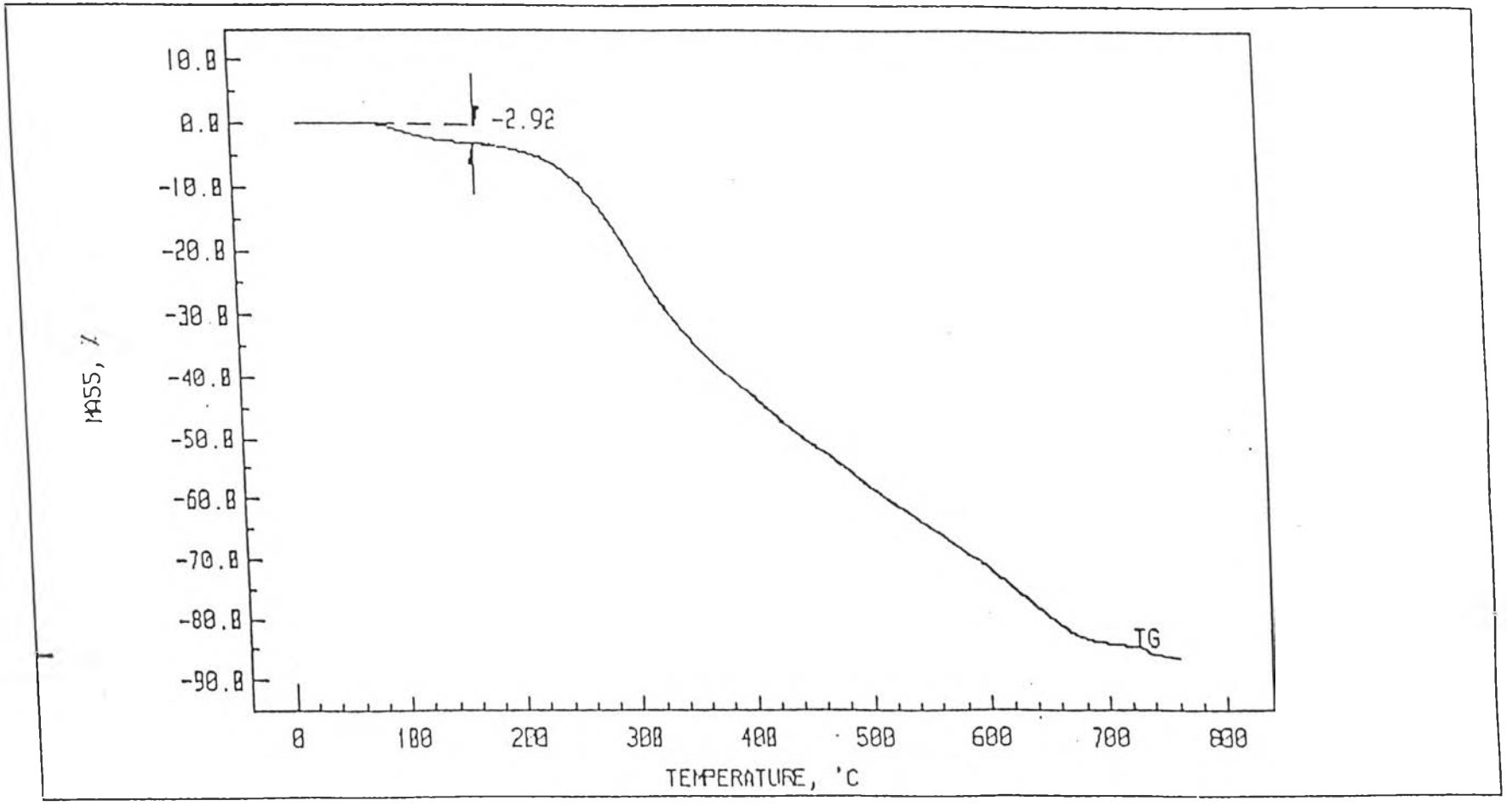


Figure E-20 TGA thermogram of PVC film.

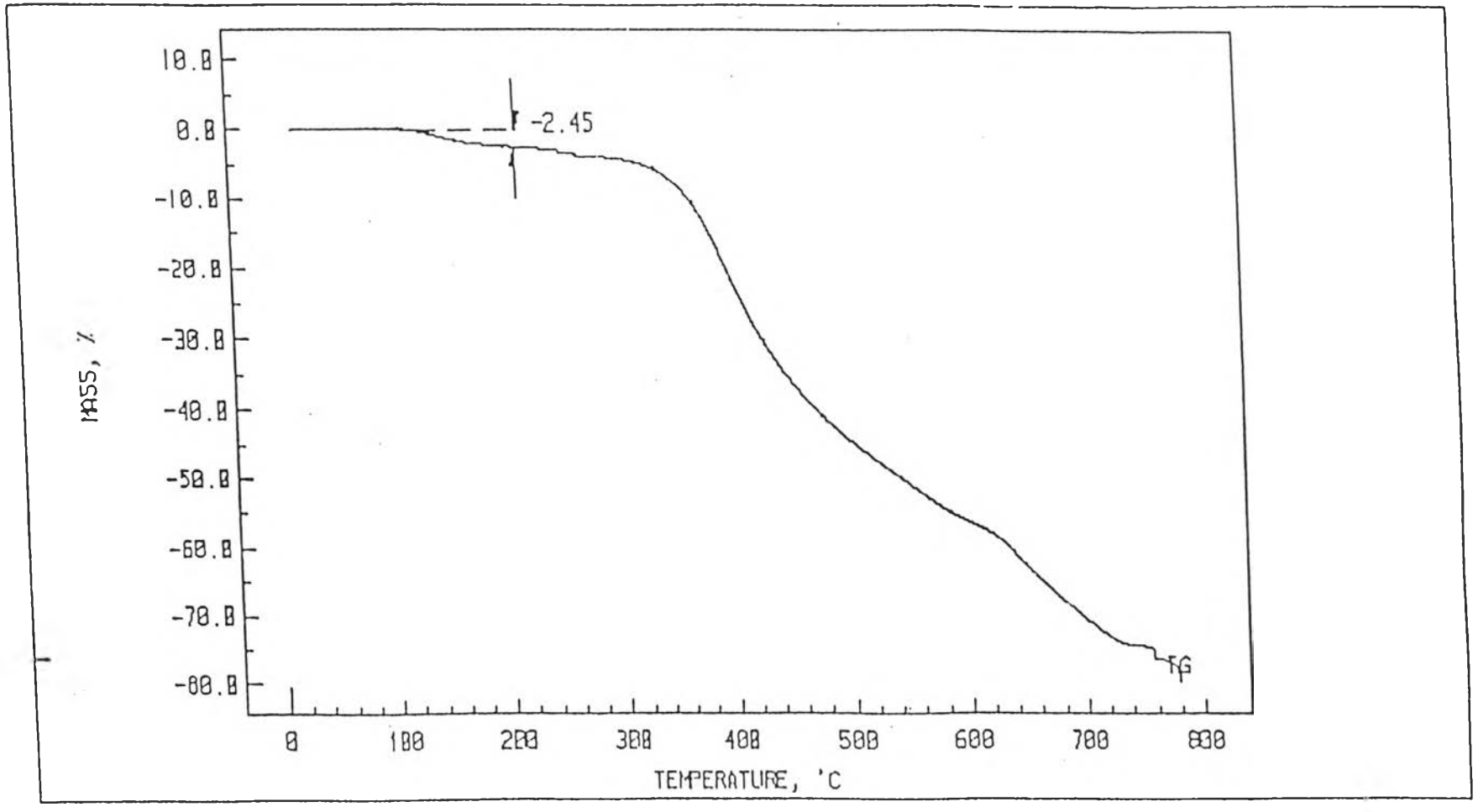


Figure E-21 TGA thermogram of PP film.

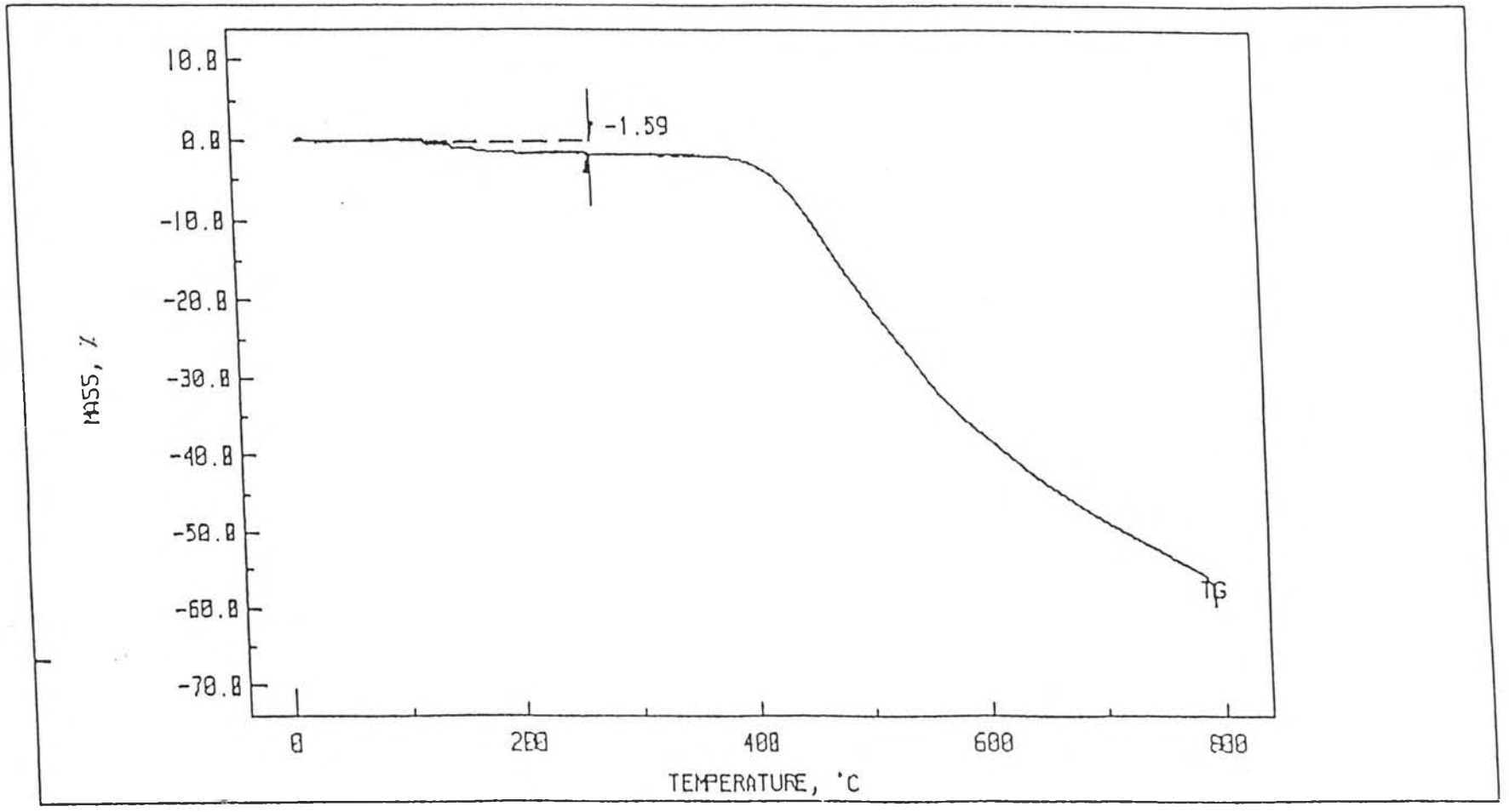


Figure E-22 TGA thermogram of LDPE film.

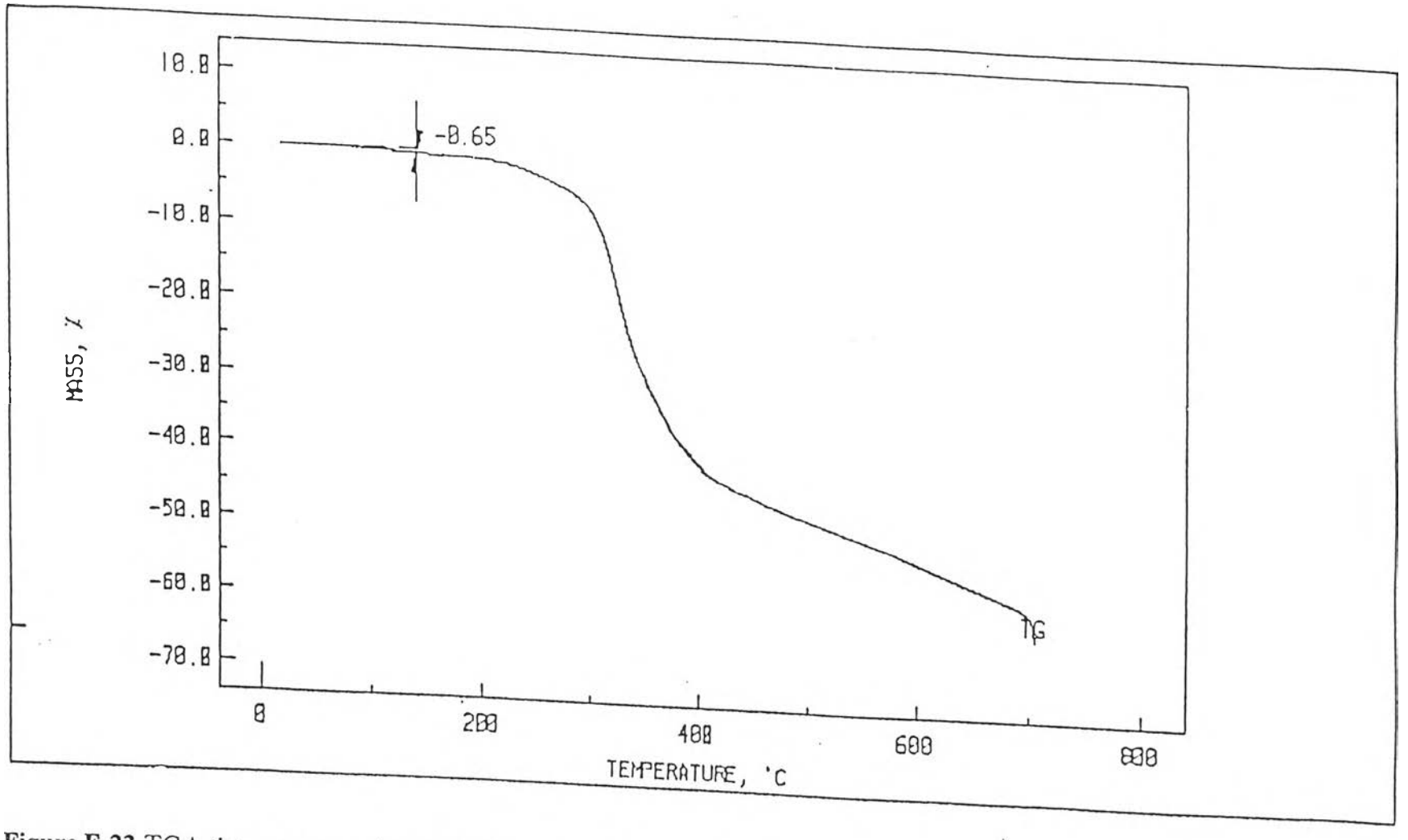


Figure E-23 TGA thermogram of PVC/PPY from 25%$FeCl_3$, 25%pyrrole, @ -15^{0}C and 20 hours for polymerization.

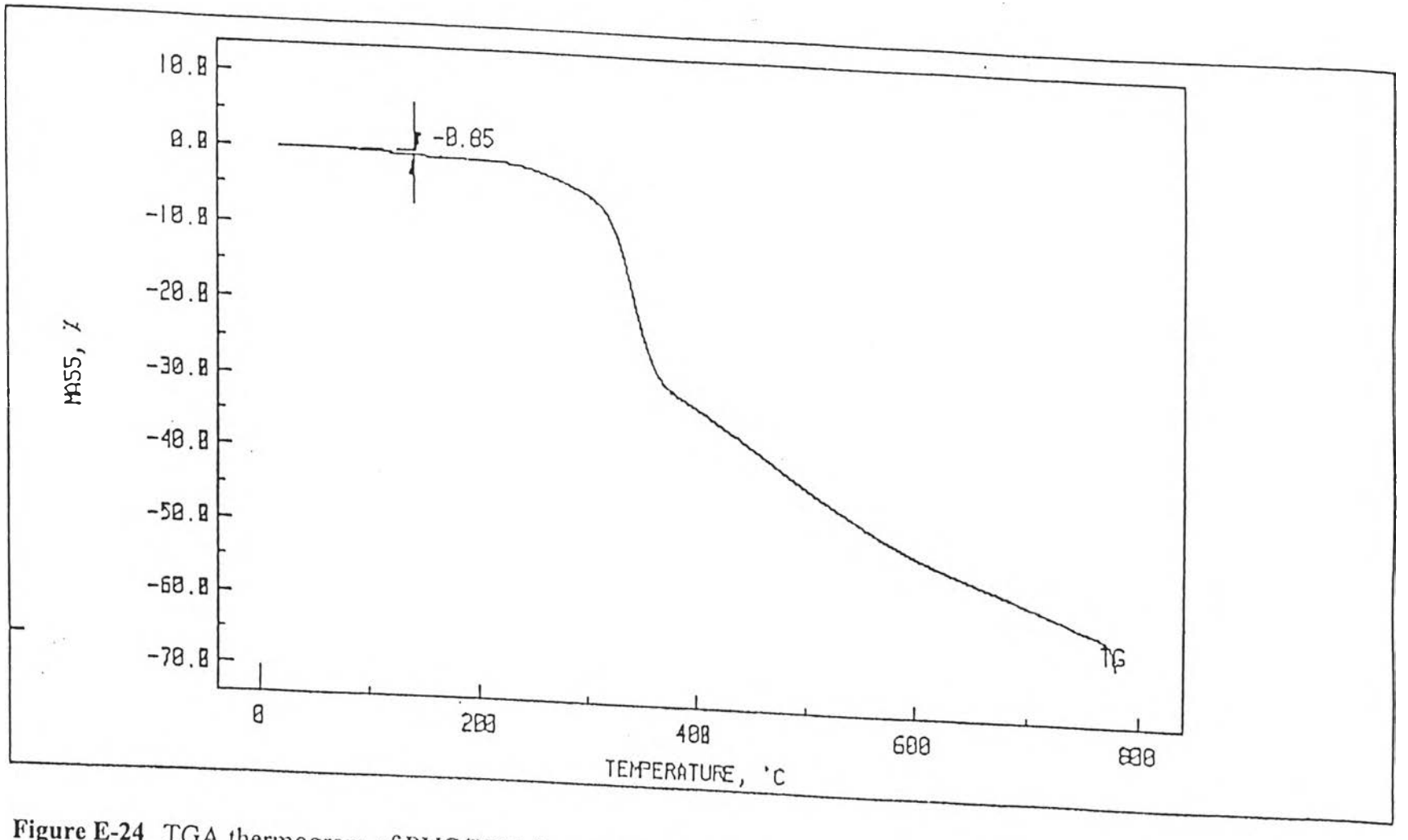


Figure E-24 TGA thermogram of PVC/PPY from 25%$FeCl_3$, 25%pyrrole, @ 30^0C and 20 hours for polymerization.

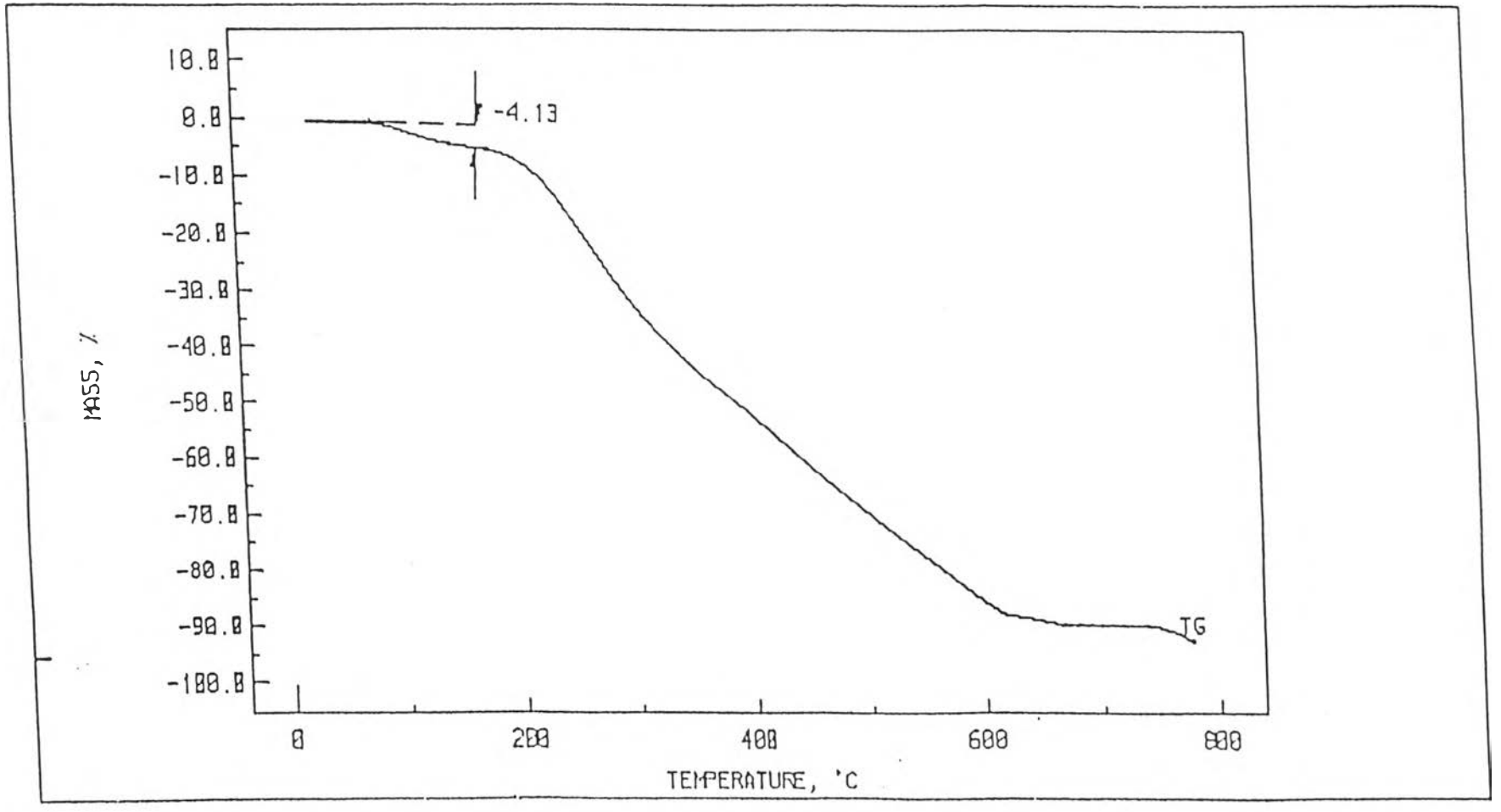


Figure E-25 TGA thermogram of PVC/PPY from 25%$FeCl_3$, 25%pyrrole, @ 70^0C and 20 hours for polymerization.

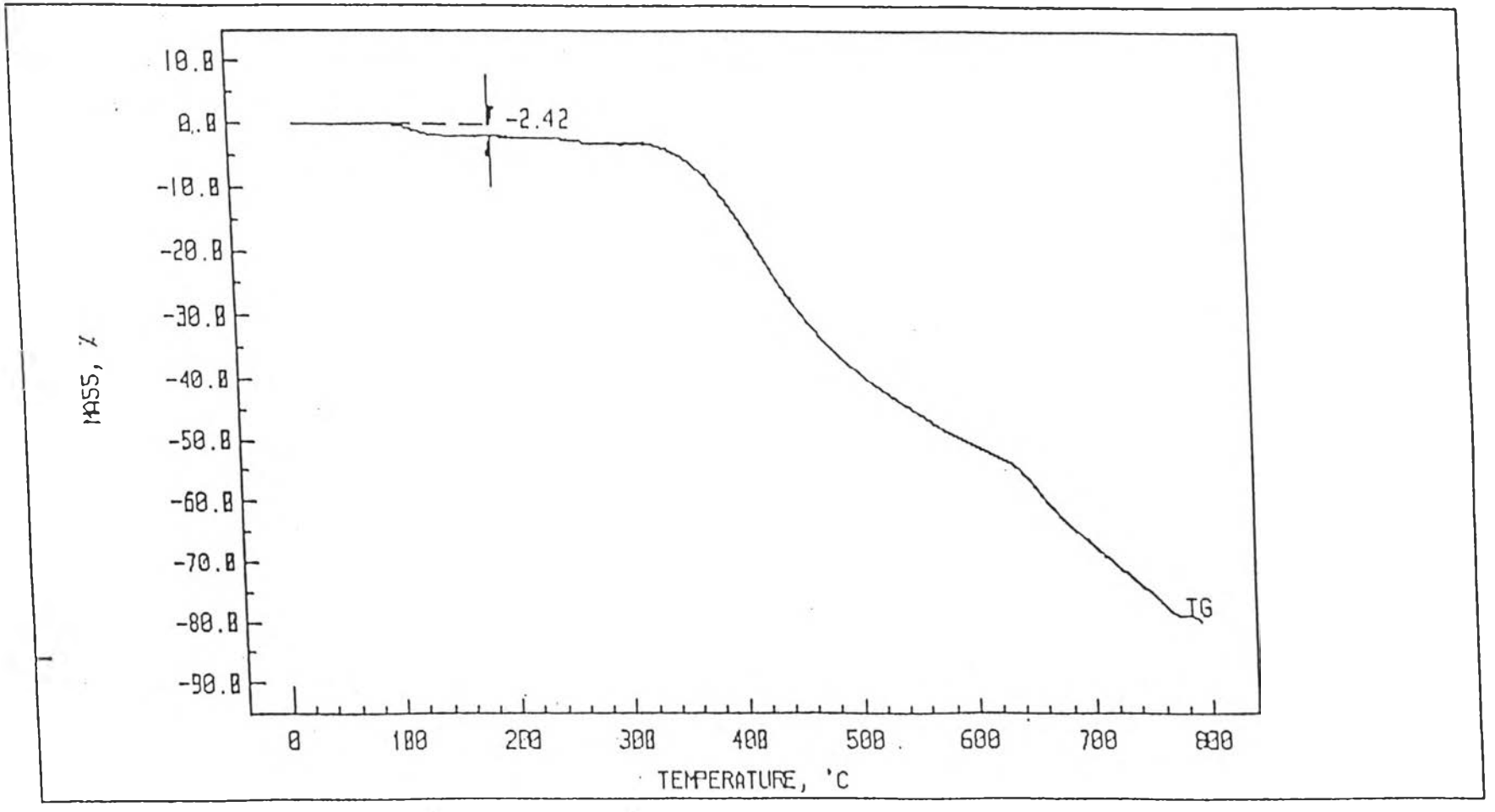


Figure E-26 TGA thermogram of PP/PPY from 25%$FeCl_3$, 25%pyrrole, @ 70^0C and 20 hours for polymerization.

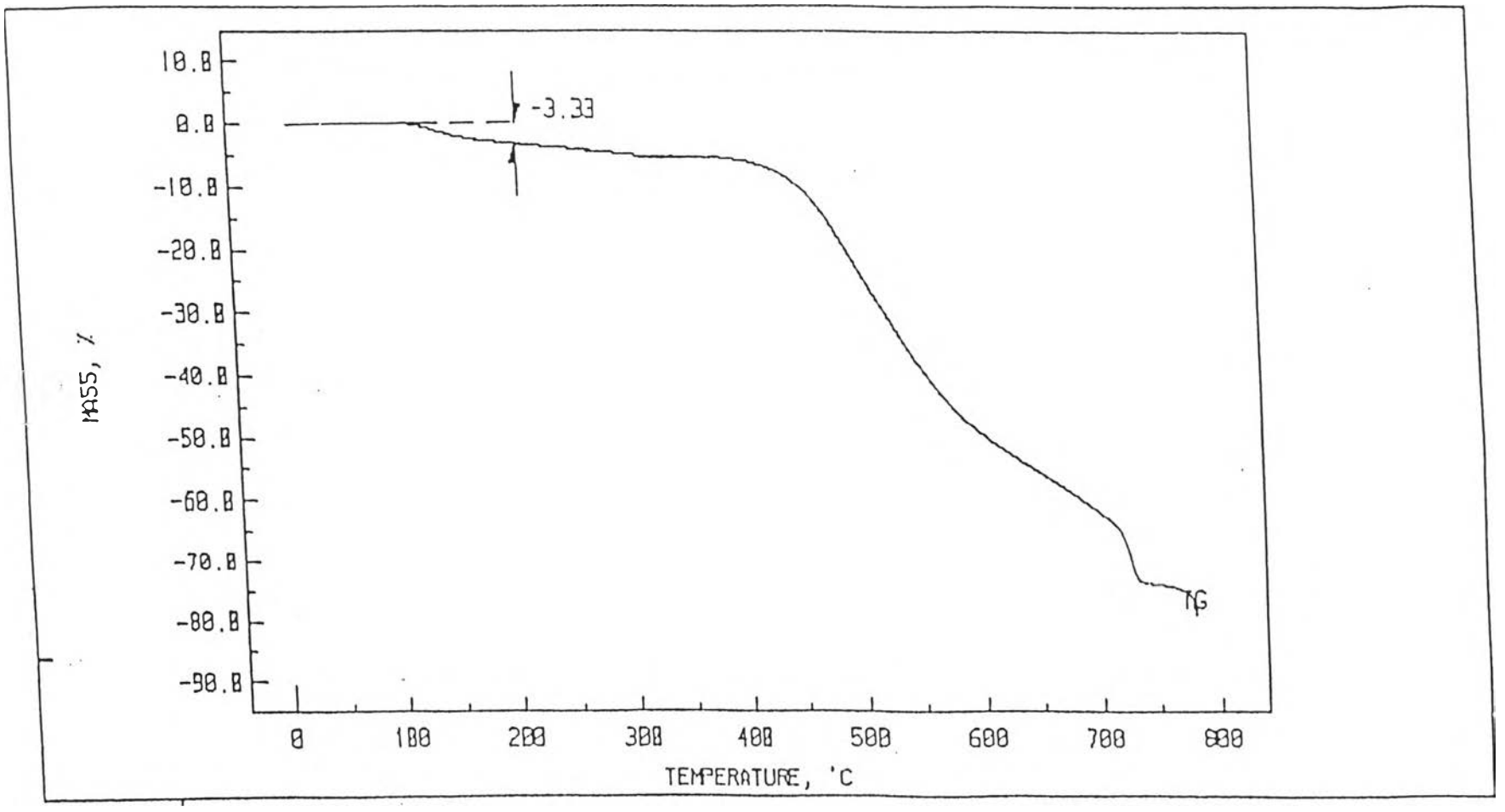


Figure E-27 TGA thermogram of LDPE/PPY from 25%$FeCl_3$, 25%pyrrole, @ 70^0C and 20 hours for polymerization.

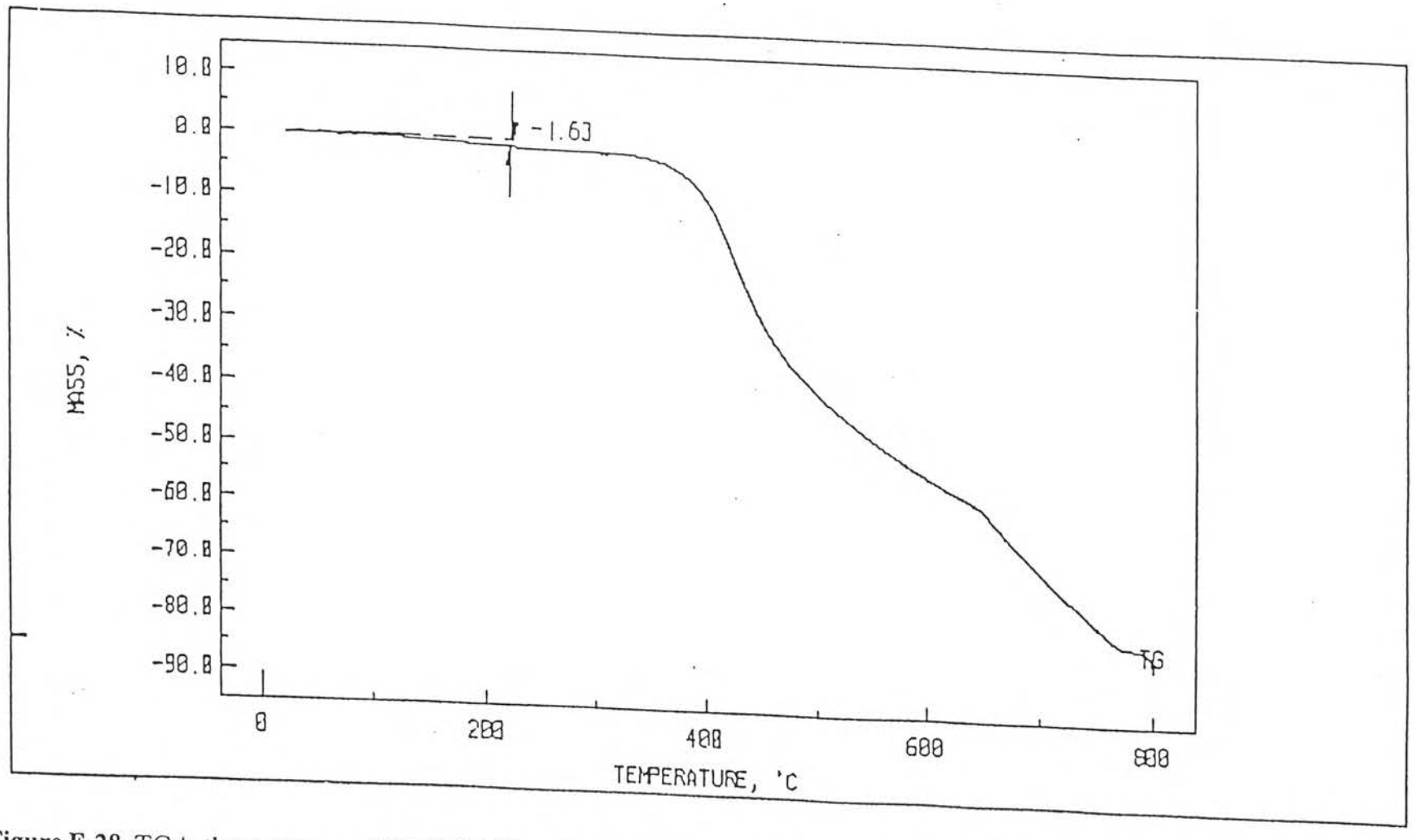


Figure E-28 TGA thermogram of PP/PPY film from 25%$FeCl_3$, 25%pyrrole, @ ~15^{0}C, 20 hours for polymerization and 30 minutes iodine doping time @ 30^{0}C.

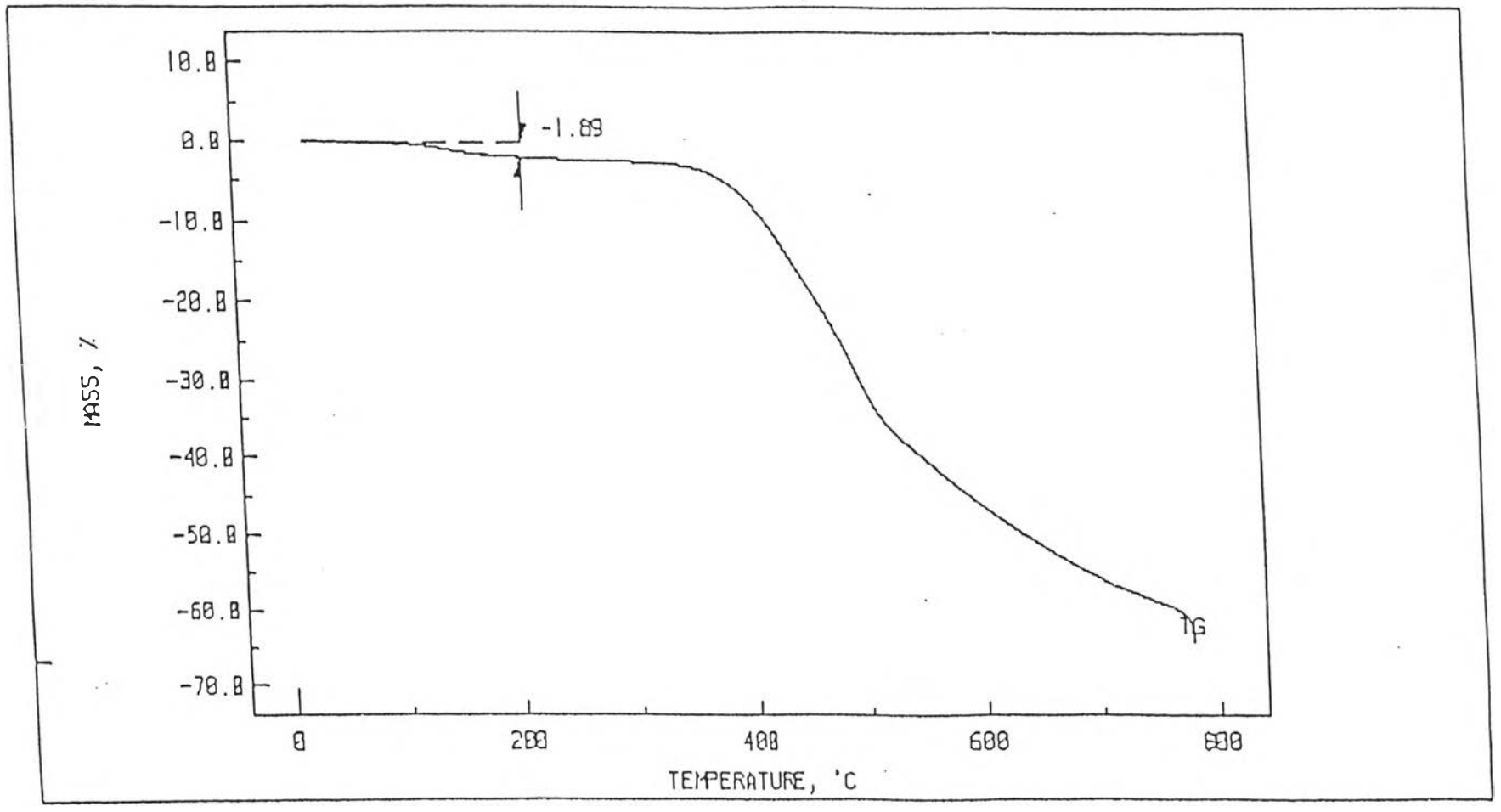


Figure E-29 TGA thermogram of PP/PPY film from 25%$FeCl_3$, 25%pyrrole, @ -15^{0}C, 20 hours for polymerization and 120 minutes iodine doping time @ 30^{0}C.

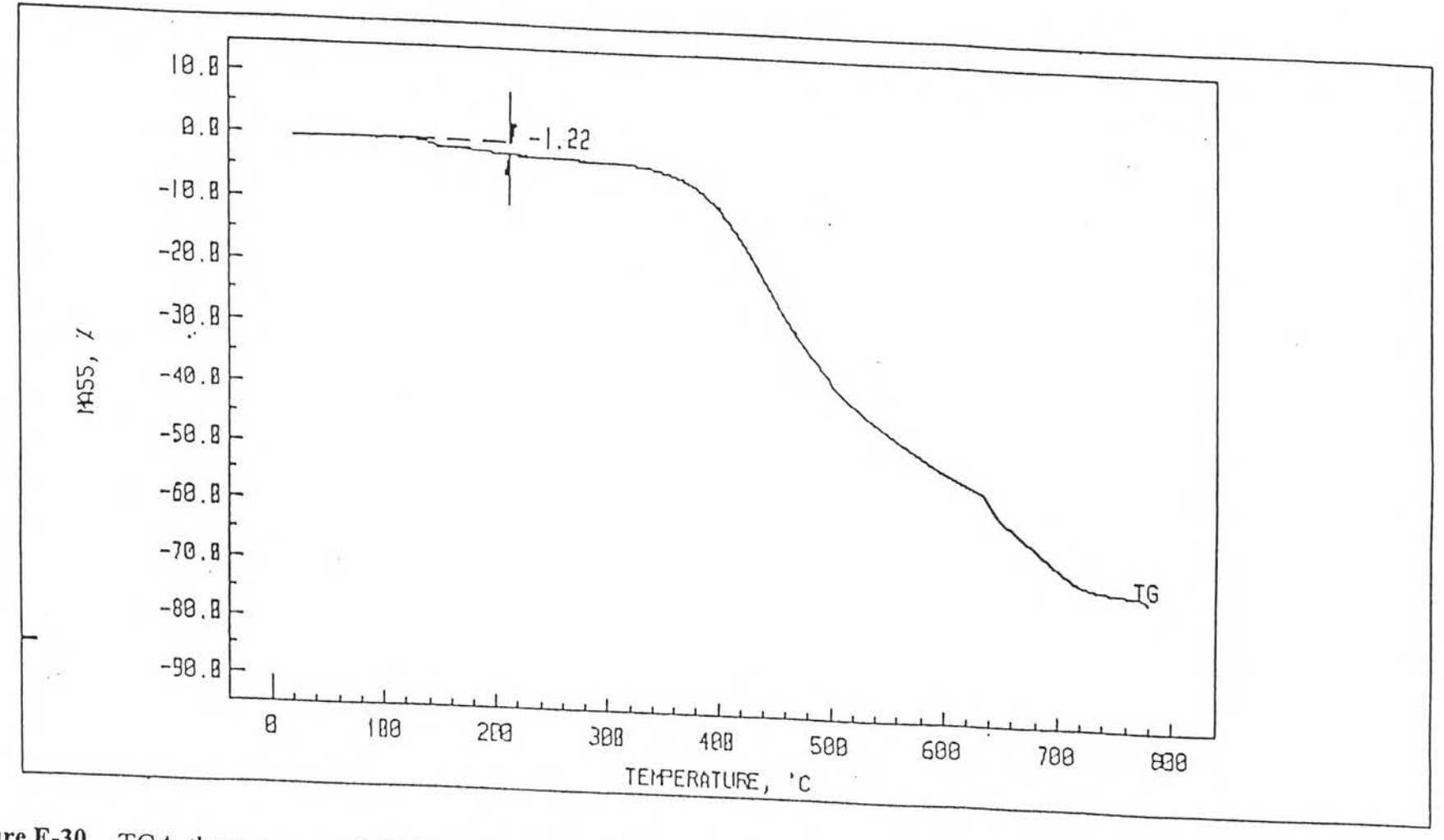


Figure E-30 TGA thermogram of PP/PPY film from 25%$FeCl_3$, 25%pyrrole, @ -15^{0}C, 20 hours for polymerization and 30 minutes iodine doping time @ -15^{0}C.

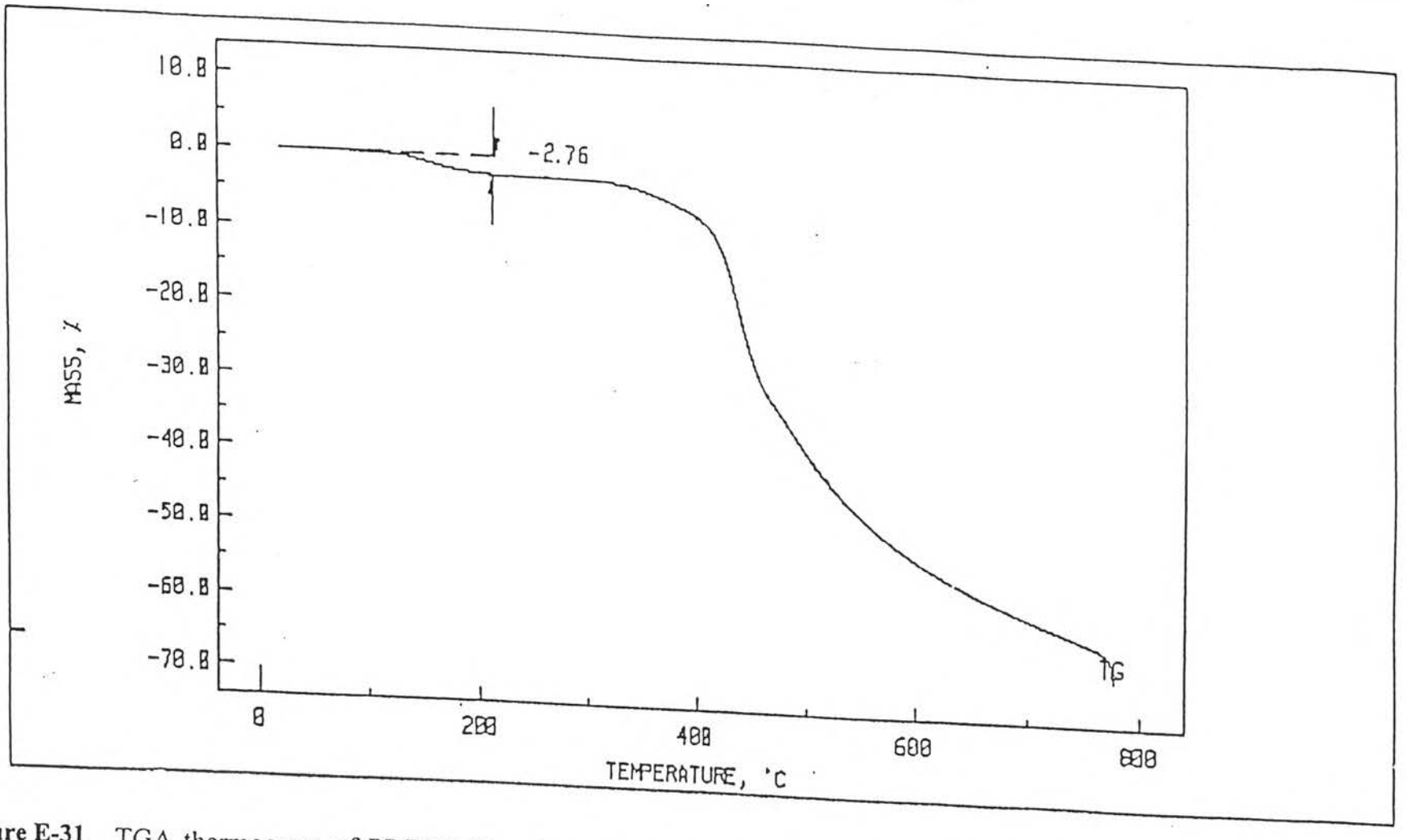
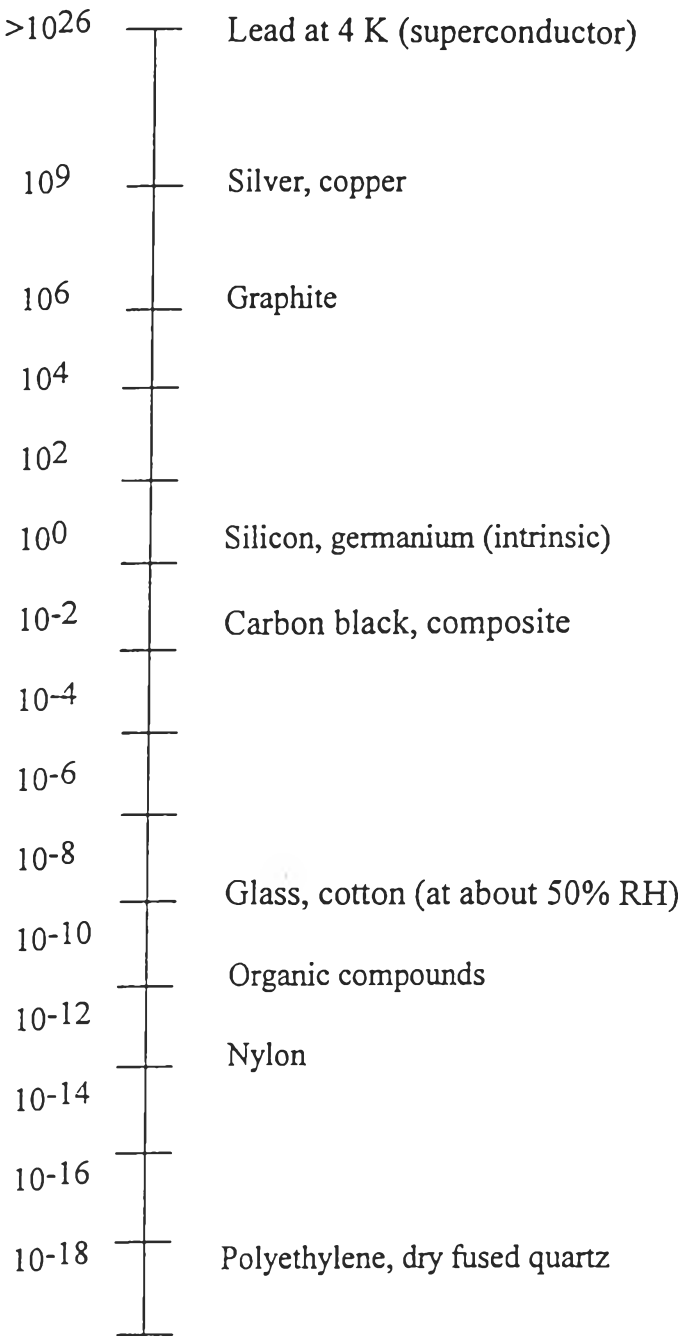


Figure E-31 TGA thermogram of PP/PPY film from 25%$FeCl_3$, 25%pyrrole, @ -15^{0}C, 20 hours for polymerization and 30 minutes iodine doping time @ 70^{0}C.

Appendix F

The Electrical conductivity of reference material [34].



Appendix G

Time-decay electrical conductivity of prepared conducting plastic film.

After storing prepared conducting plastic film in open air at room temperature for a period of time and repeatedly measured their σ, it was found that σ decreased gradually with time until it reached zero.

Table G-1 Time-decay σ of prepared conducting plastic film was prepared as follows:

$FeCl_3$ initiator concentration : 25% in distilled water
Pyrrole monomer concentration : 25% in distilled water
Reaction temperature : -15°C
Reaction time : 20 hrs.
Plastic film : LDPE
Reaction conditions : in reduced pressure

Time (day)	σ (S/cm)
1	1.45×10^{-1}
5	0.26×10^{-2}
10	0.47×10^{-4}
15	0.15×10^{-7}
20	0
25	0
30	0

It is quite possible that for the polymer stored under open air circulation the charge decay is accelerated. This can be explained that the moisture in open air

interferes with interaction force between polymer chain of PPY. Thus the σ was reduced.

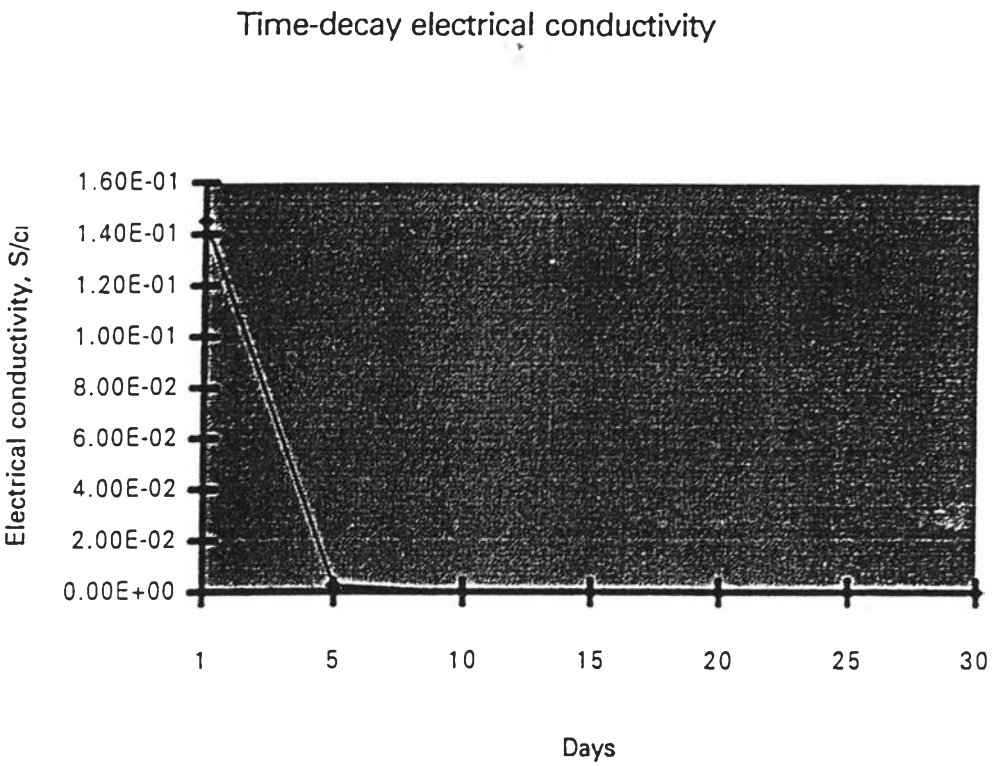


Figure G-1 Plotting Time and Electrical conductivity for time-decay of prepared conducting plastic film.

VITA

Mr. Weeraphan Pratumchai was born on October 20, 1971 in Khonkaen province, Thailand. He received the bachelor of Science Degree (Chemistry) from the Faculty of Science, Prince of Songkhla University, in 1993. After graduation, he worked at Tank Farm 1 Section, Thai Petrochemical Industry Public Co., Ltd.. Then in 1996, he entered the master degree programme in Petrochemistry and Polymer Science, Graduate School, Chulalongkorn University.