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APPENDICES

APPENDIX A

NMR spectra of L-lactide and poly(L-lactic acid)

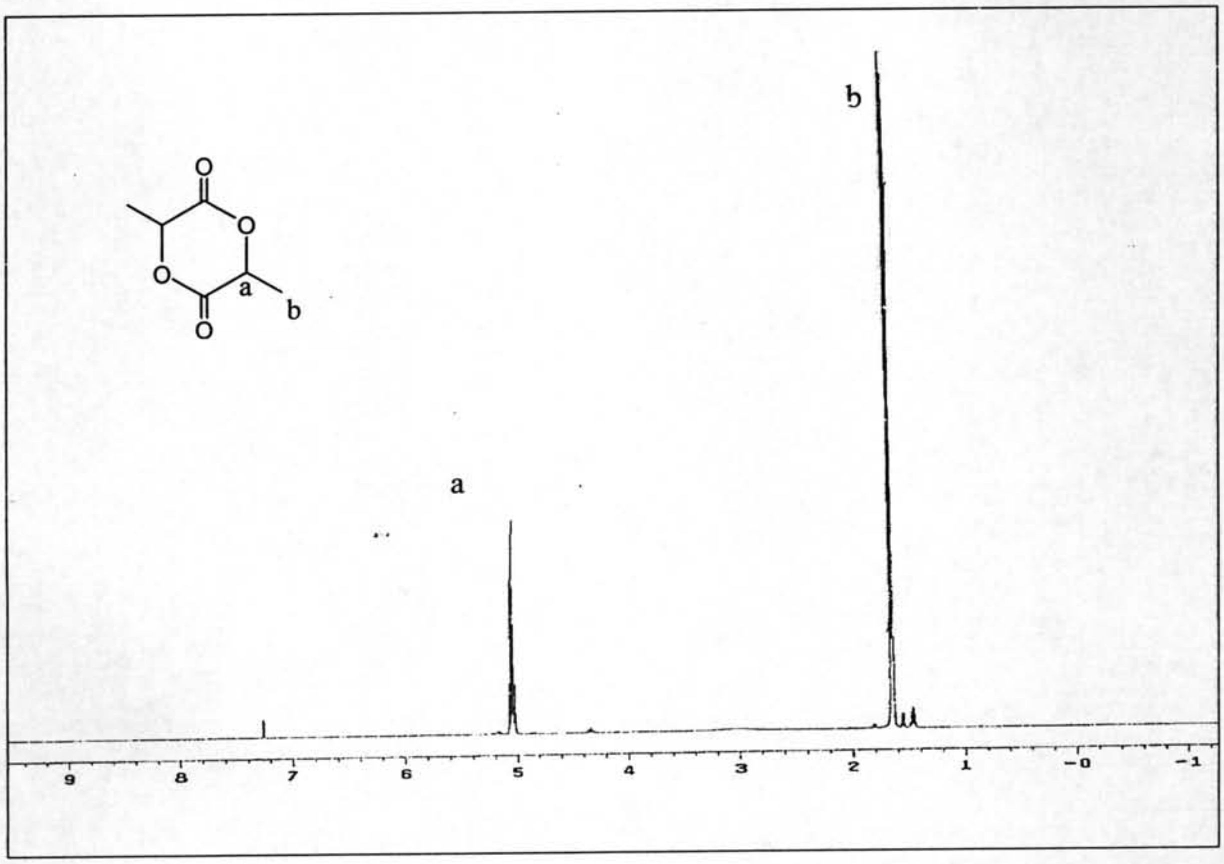

Figure A-1 400 MHz ^{1}H NMR spectrum of L-lactide

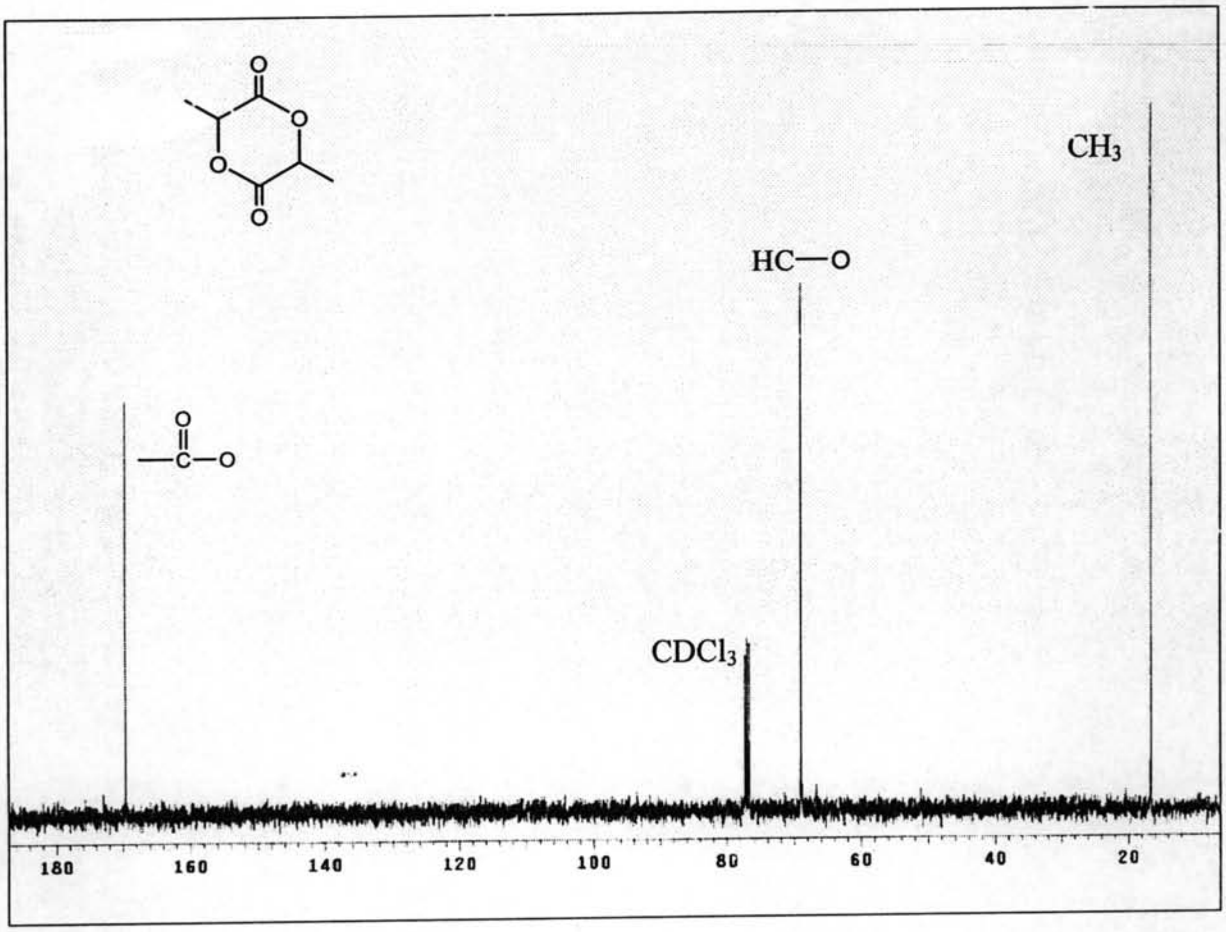

Figure A-2 400 MHz ^{13}C NMR spectrum of L-lactide

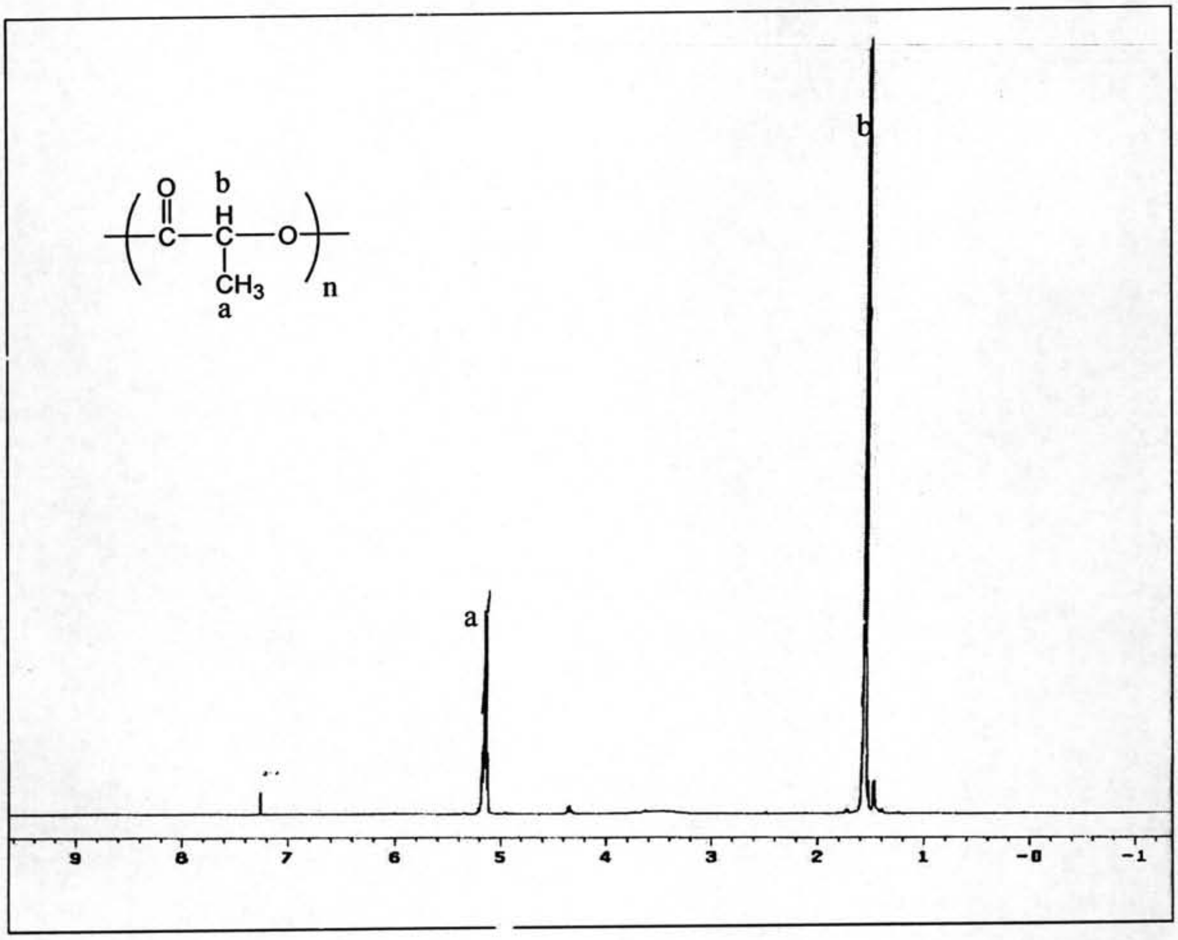

Figure A-3 400 MHz ^{1}H NMR spectrum of poly(L-lactic acid), 0.3 % w/w initiator

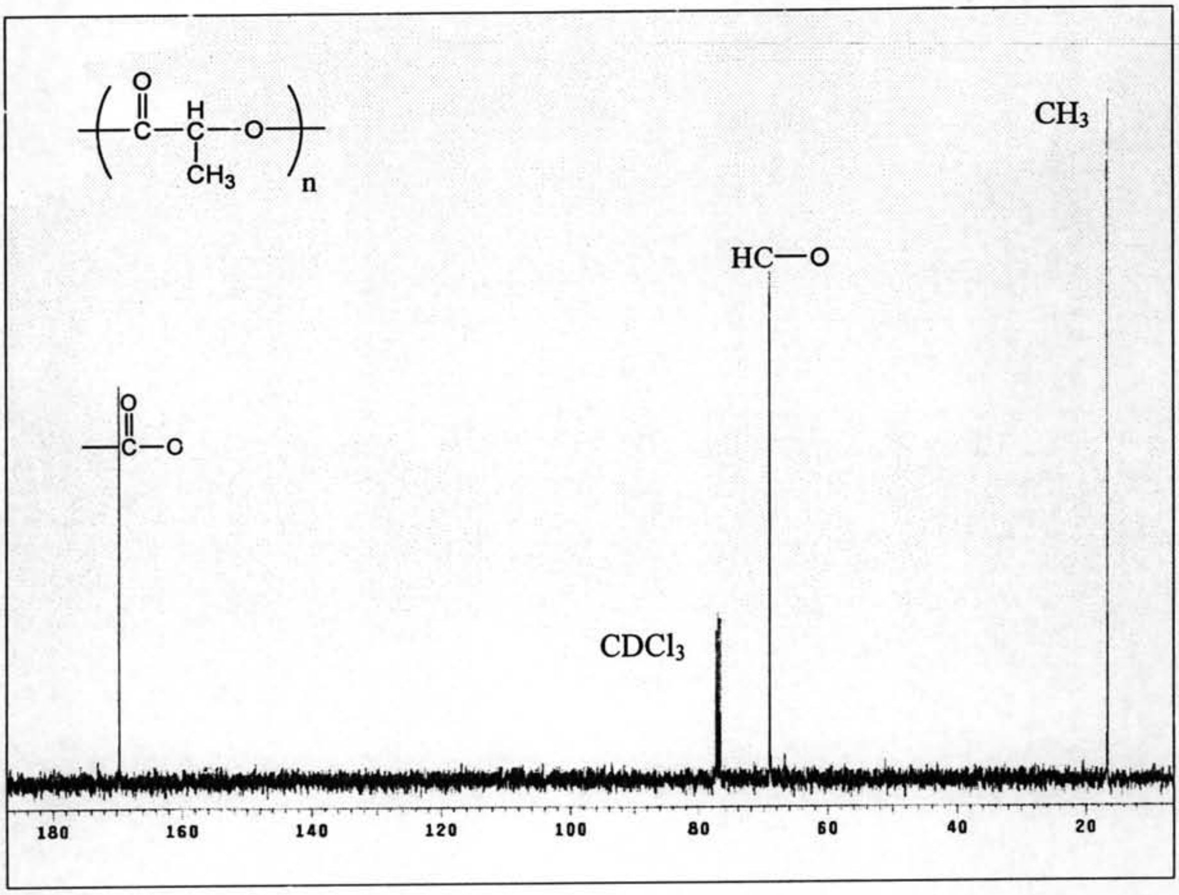

Figure A-4 400 MHz ^{13}C NMR spectrum of poly(L-lactic acid), 0.3 % w/w initiator

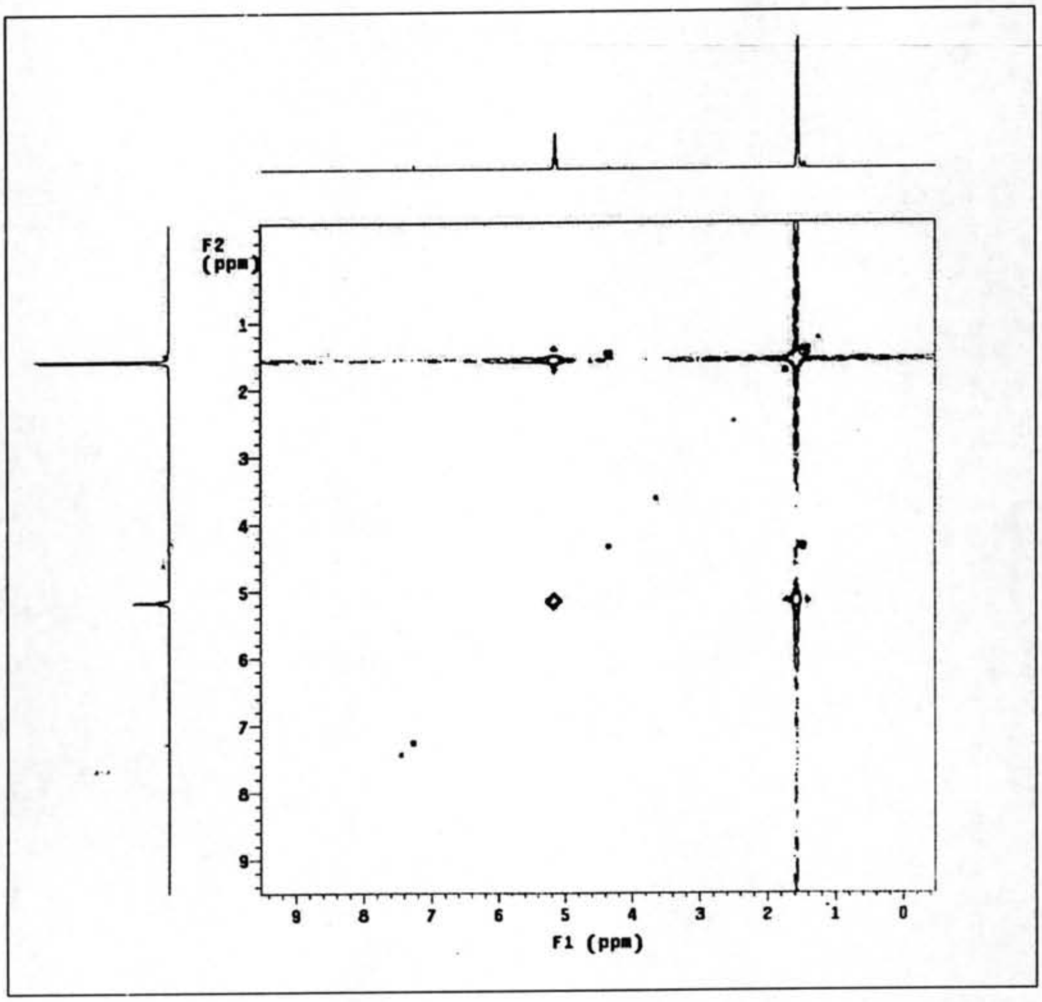

Figure A-5 400 MHz COSY-NMR spectrum of PLLA, 0.3 % w/w initiator

APPENDIX B

GPC chromatogram of poly(L-lactic acid)

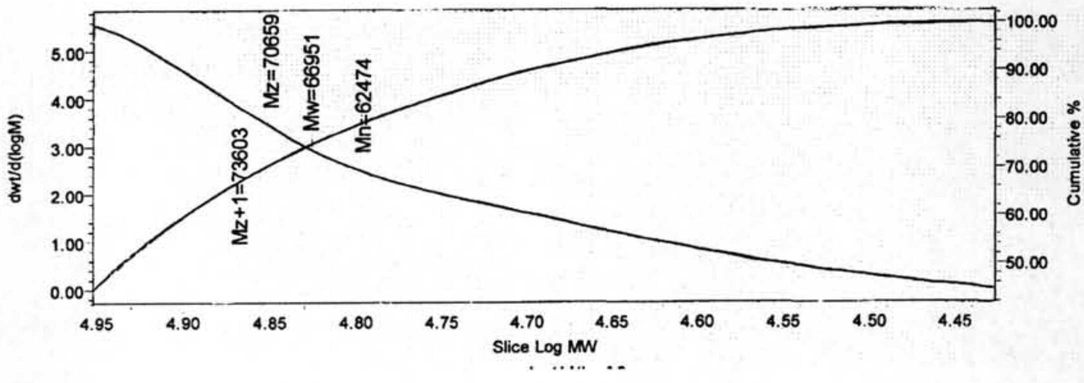

Figure B-1 GPC chromatogram of standard PLLA (commercial grade) from Taiwan $\overline{M}_w = 66951$

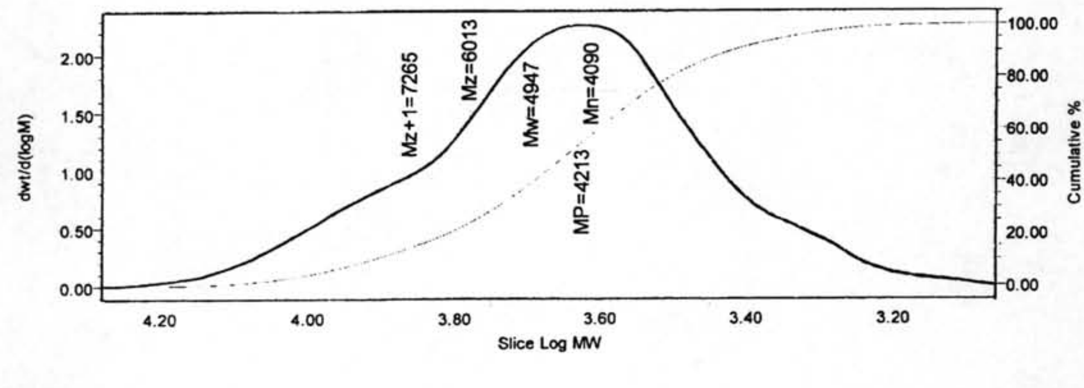

Figure B-2 GPC chromatogram of PLLA (at 120 °C, 12 hours) sample 1 in table 4.2 using $Sn(Oct)_2$ as the initiator, $\overline{M}_w = 4947$

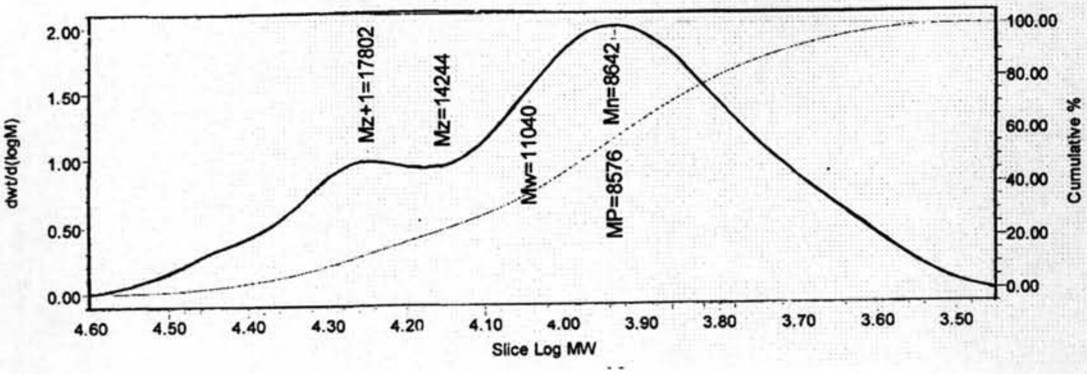

Figure B-3 GPC chromatogram of PLLA (at 120 °C, 24 hours) sample 2 in table 4.2 and sample 1 in table 4.5 using $Sn(Oct)_2$ as the initiator, $\overline{M}_w = 11040$

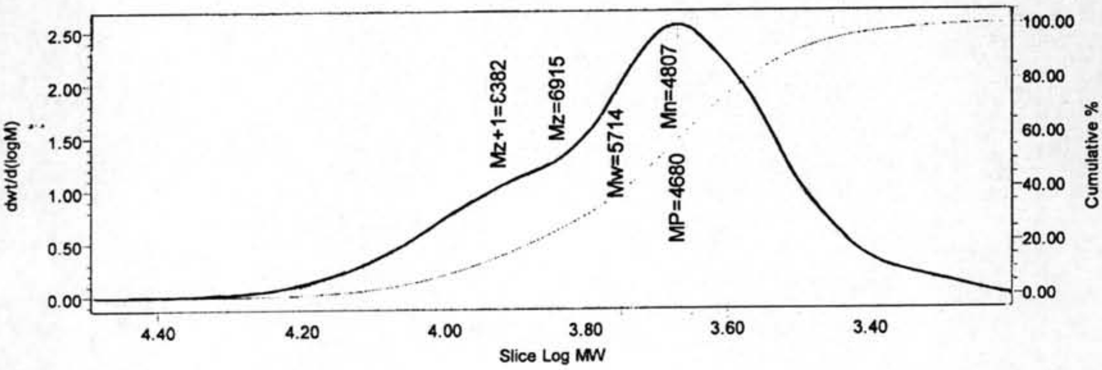

Figure B-4 GPC chromatogram of PLLA (at 120 °C, 12 hours) sample 2 in table 4.2 and sample 9 in table 4.6 using $Sn(Oct)_2$ as the initiator, $\overline{M}_w = 5714$

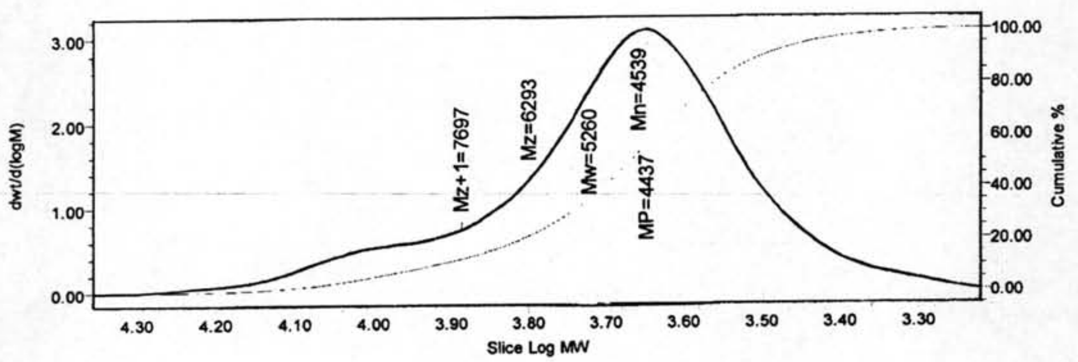

Figure B-5 GPC chromatogram of PLLA (at 100 °C, 96 hours) sample 1 in table 4.3 using creatine hydrate as the initiator, $\overline{M}_w = 5260$

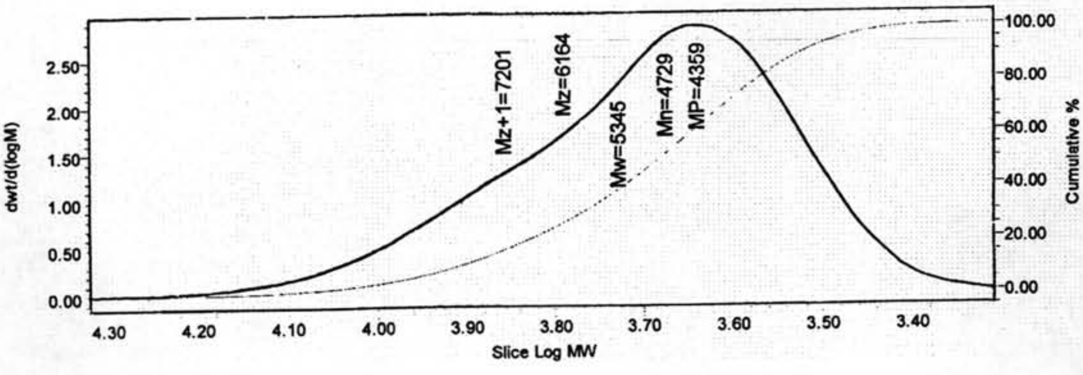

Figure B-6 GPC chromatogram of PLLA (at 120 °C, 96 hours) sample 2 in table 4.3 and sample 3 in table 4.4 using creatine hydrate as the initiator, $\overline{M}_w = 5345$

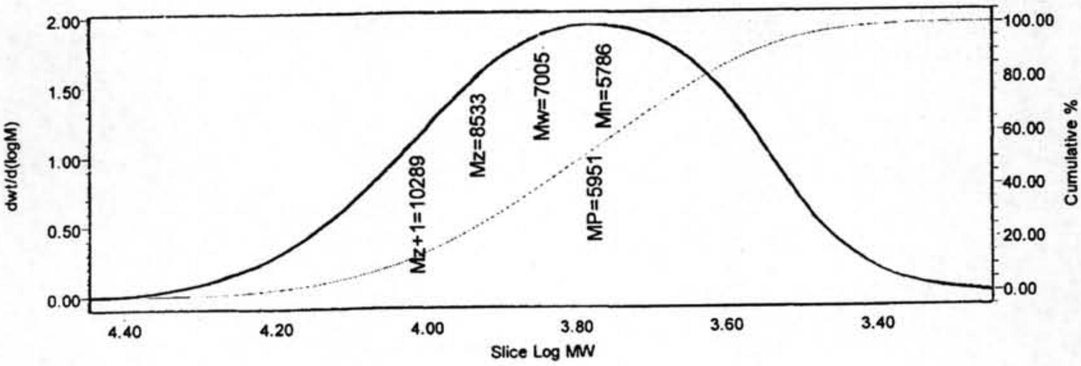

Figure B-7 GPC chromatogram of PLLA (at 140 °C, 96 hours) sample 3 in table 4.3 using creatine hydrate as the initiator, $\overline{M}_w = 7005$

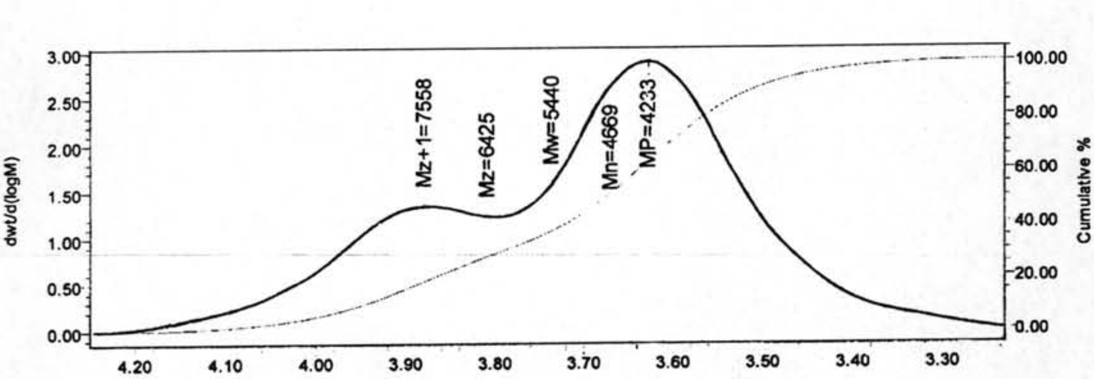

Figure B-8 GPC chromatogram of PLLA (at 120 °C, 24 hours) sample 1 in table 4.4, sample 4 in table 4.5 and sample 13 in table 4.6 using creatine hydrate as the initiator, $\overline{M}_w = 5440$

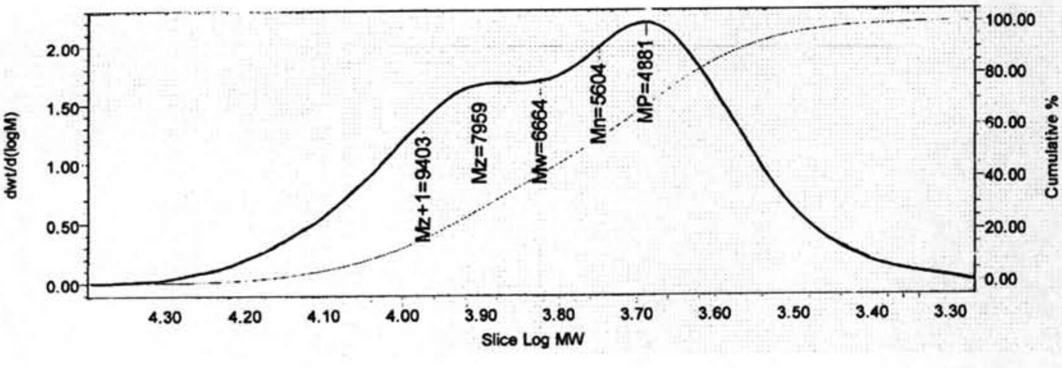

Figure B-9 GPC chromatogram of PLLA (at 120 °C, 48 hours) sample 2 in table 4.4, sample 7 in table 4.5 and sample 17 in table 4.6 using creatine hydrate as the initiator, $\overline{M}_w = 6664$

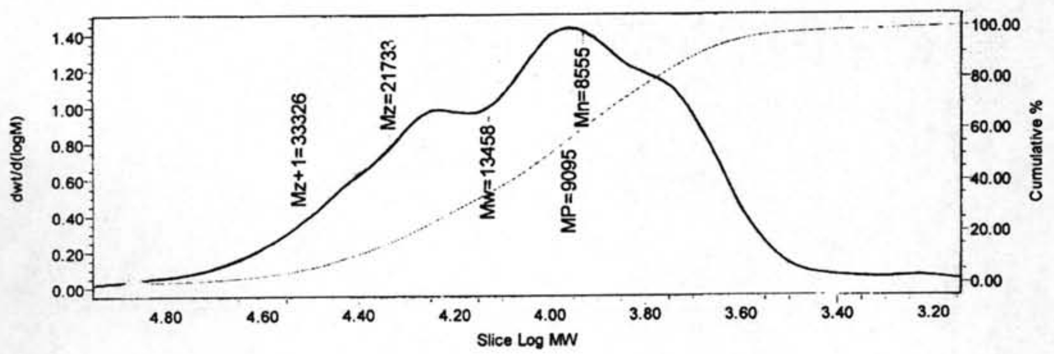

Figure B-10 GPC chromatogram of PLLA (at 120 °C, 24 hours) sample 2 in table 4.5 using HMDI as chain extender at the ratio of 1:1.1, $\overline{M}_w = 13458$

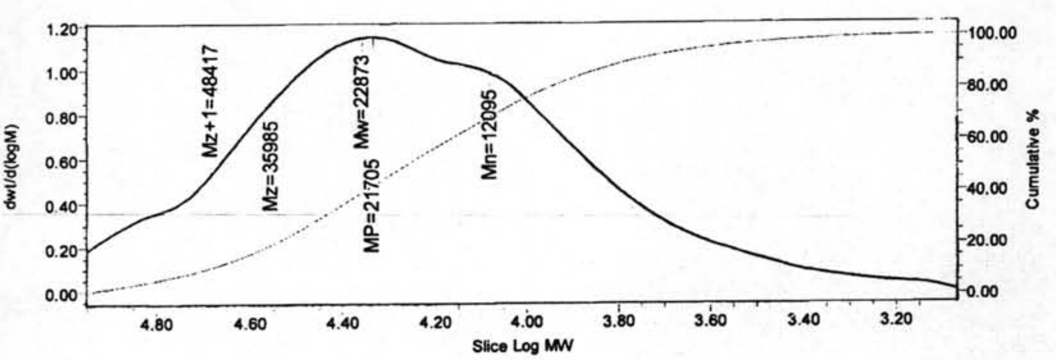

Figure B-11 GPC chromatogram of PLLA (at 120 °C, 24 hours) sample 3 in table 4.5 using tolylene 2,4-diisocyanate terminated poly 1,4-butanediol prepolymer as chain extender at the ratio of 1:1.1, $\overline{M}_w = 22873$

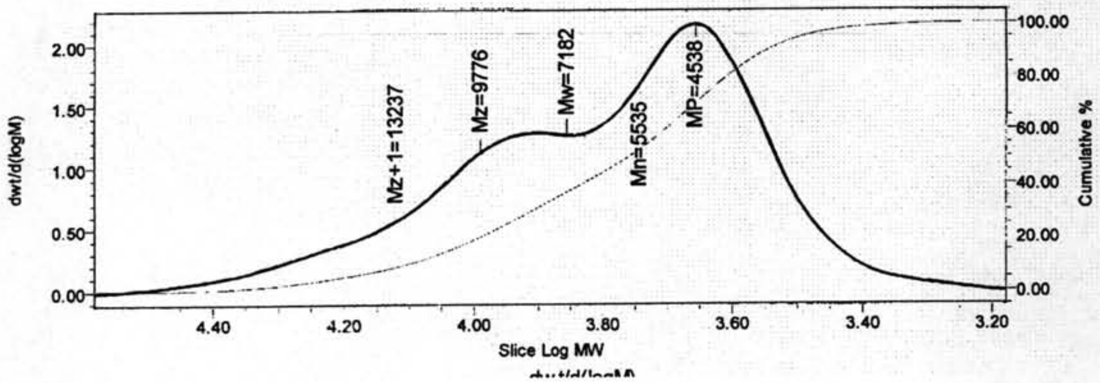

Figure B-12 GPC chromatogram of PLLA (at 120 °C, 24 hours) sample 5 in table 4.5 using HMDI as chain extender at the ratio of 1:1.1, $\overline{M}_w = 7182$

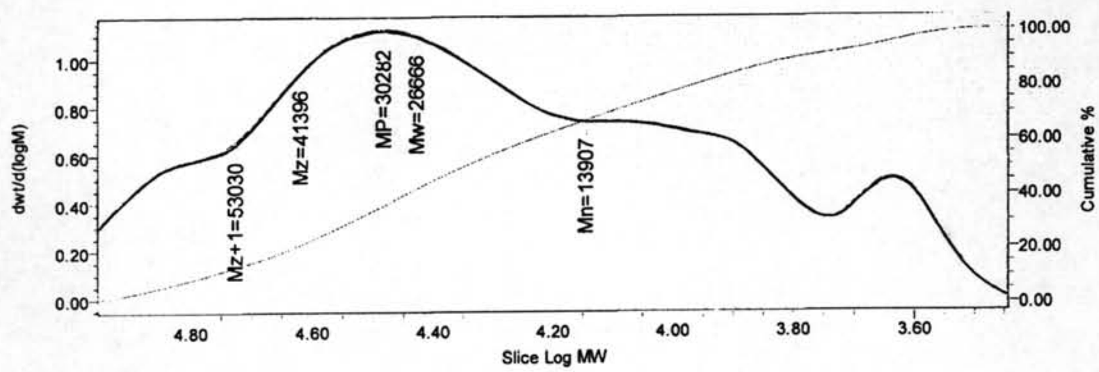

Figure B-13 GPC chromatogram of PLLA (at 120 °C, 24 hours) sample 6 in table 4.5 using tolylene 2,4-diisocyanate terminated poly 1,4-butanediol prepolymer as chain extender at the ratio of 1:1.1, $\overline{M}_w = 26666$

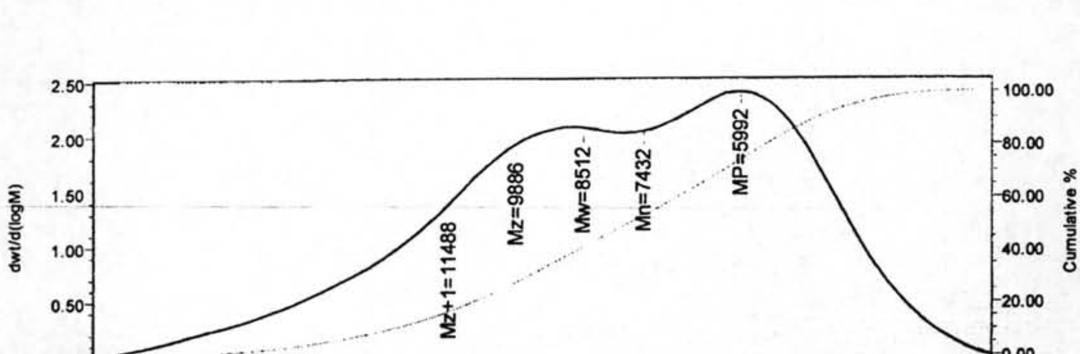

Figure B-14 GPC chromatogram of PLLA (at 120 °C, 48 hours) sample 8 in table 4.5 using HMDI as chain extender at the ratio of 1:1.1, $\overline{M}_w = 8512$

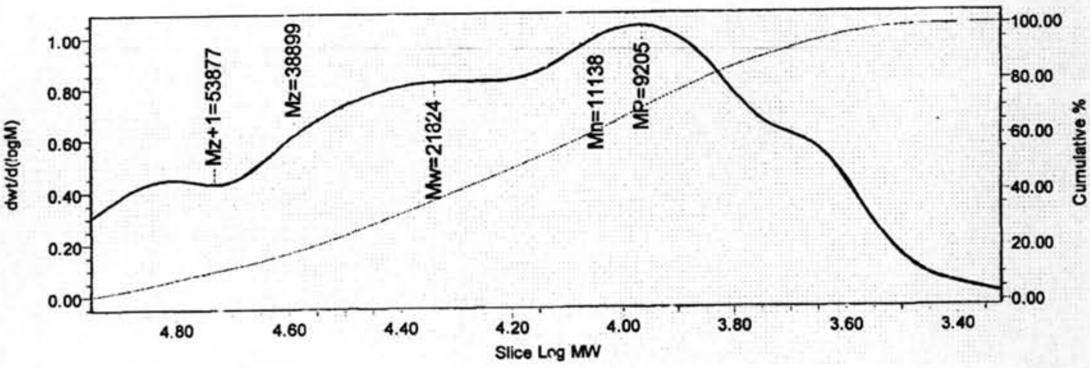

Figure B-15 GPC chromatogram of PLLA (at 120 °C, 48 hours) sample 9 in table 4.5 using tolylene 2,4-diisocyanate terminated poly 1,4-butanediol prepolymer as chain extender at the ratio of 1:1.1, $\overline{M}_w = 21824$

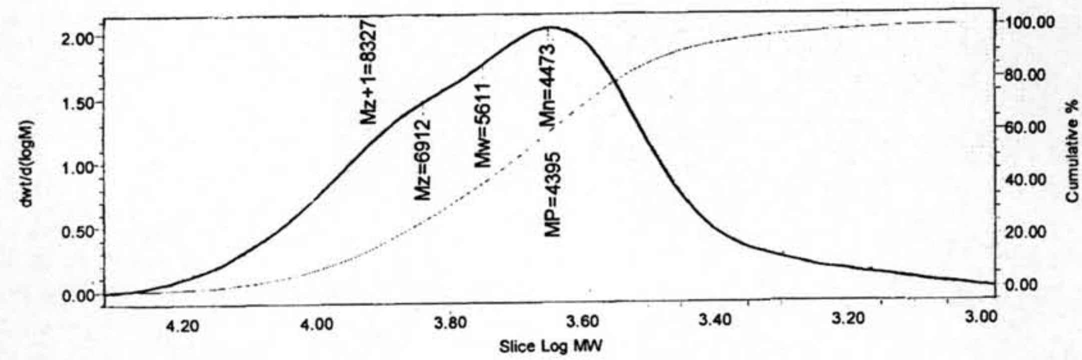

Figure B-16 GPC chromatogram of PLLA (at 120 °C, 24 hours) sample 1 in table 4.6 without chain extender, $\overline{M}_w = 5611$

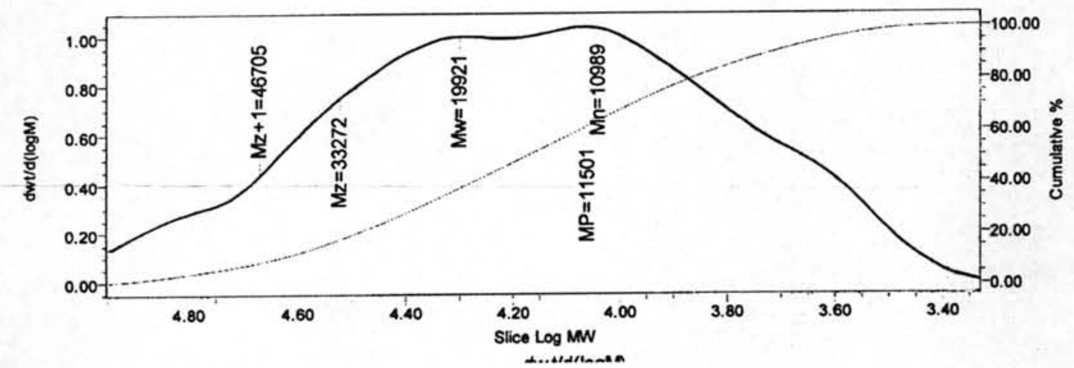

Figure B-17 GPC chromatogram of sample 2 in table 4.6: PLLA (at 120 °C, 24 hours) with tolylene 2,4-diisocyanate terminated poly 1,4-butanediol prepolymer at the ratio of 1:0.5, $\overline{M}_w = 19921$

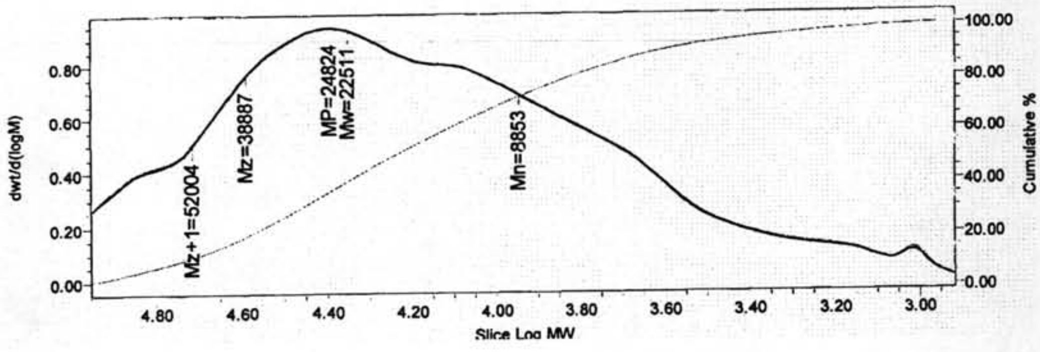

Figure B-18 GPC chromatogram of sample 3 in table 4.6: PLLA (at 120 °C, 24 hours) with tolylene 2,4-diisocyanate terminated poly 1,4-butanediol prepolymer at the ratio of 1:1.1, $\overline{M}_w = 22511$

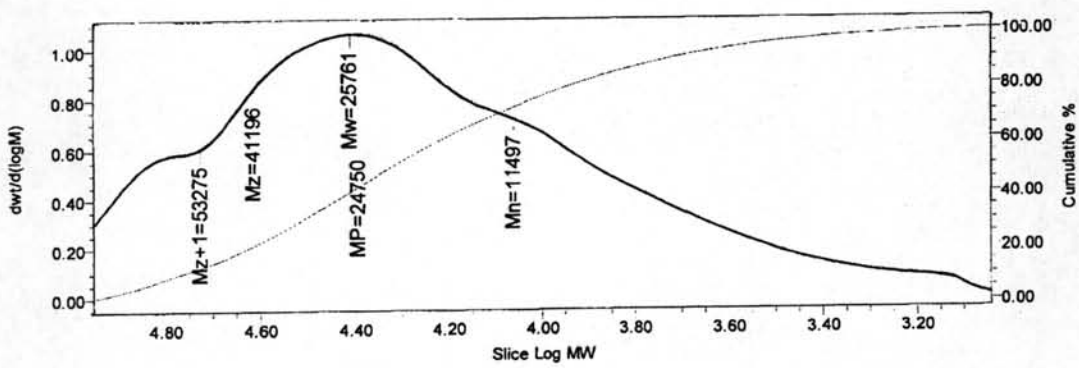

Figure B-19 GPC chromatogram of sample 4 in table 4.6: PLLA (at 120 °C, 24 hours) with tolylene 2,4-diisocyanate terminated poly 1,4-butanediol prepolymer at the ratio of 1:2, $\overline{M}_w = 25761$

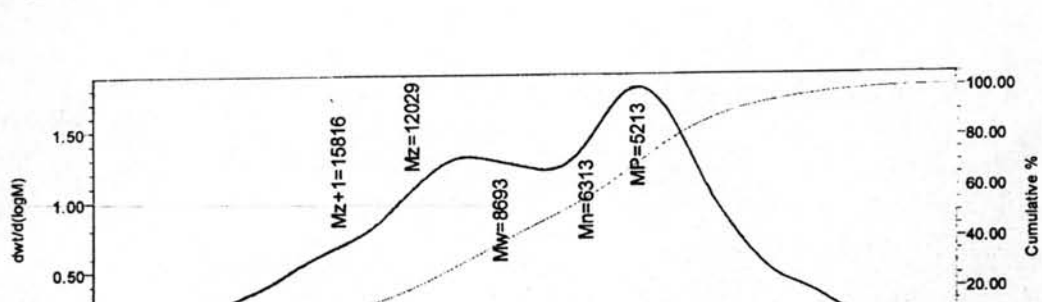

Figure B-20 GPC chromatogram of sample 5 in table 4.6: PLLA (at 120 °C, 24 hours) without chain extender, $\overline{M}_w = 8693$

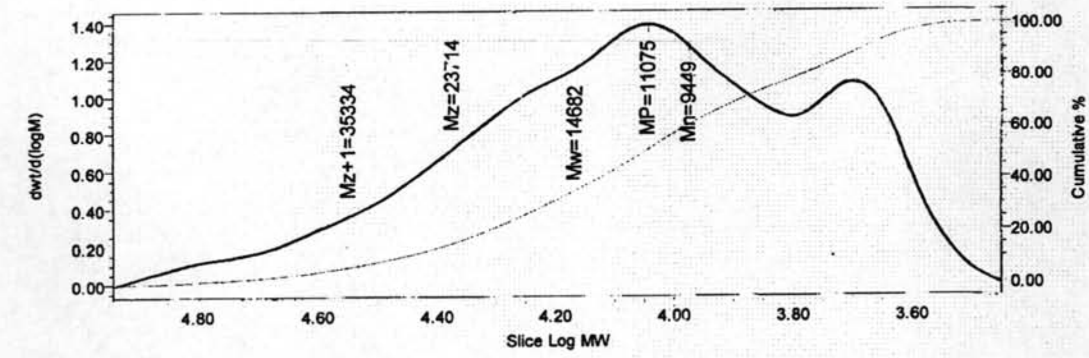

Figure B-21 GPC chromatogram of sample 6 in table 4.6: PLLA (at 120 °C, 24 hours) with tolylene 2,4-diisocyanate terminated poly 1,4-butanediol prepolymer at the ratio of 1:0.5, $\overline{M}_w = 14682$

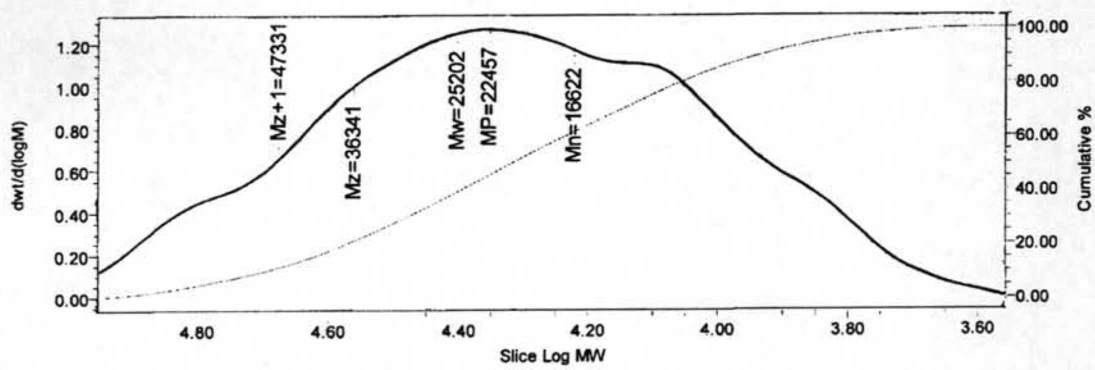

Figure B-22 GPC chromatogram of sample 7 in table 4.6: PLLA (at 120 °C, 24 hours) with tolylene 2,4-diisocyanate terminated poly 1,4-butanediol prepolymer at the ratio of 1:1.1, $\overline{M}_w = 25202$

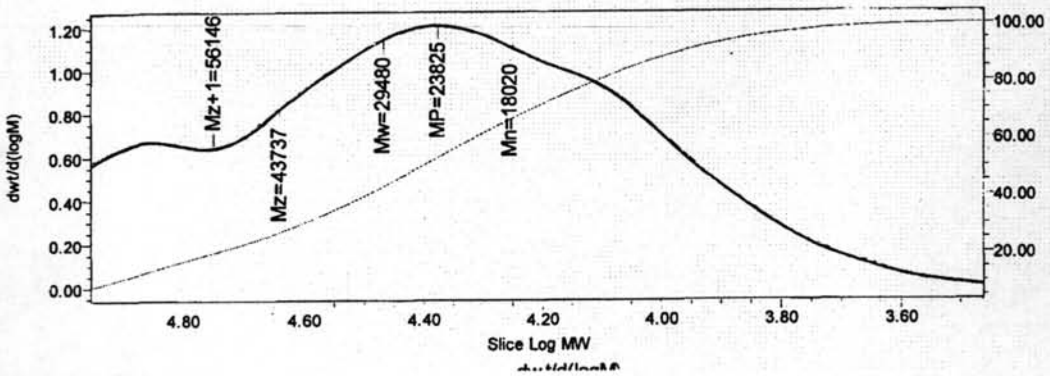

Figure B-23 GPC chromatogram of sample 8 in table 4.6: PLLA (at 120 °C, 24 hours) with tolylene 2,4-diisocyanate terminated poly 1,4-butanediol prepolymer at the ratio of 1:2, $\overline{M}_w = 29480$

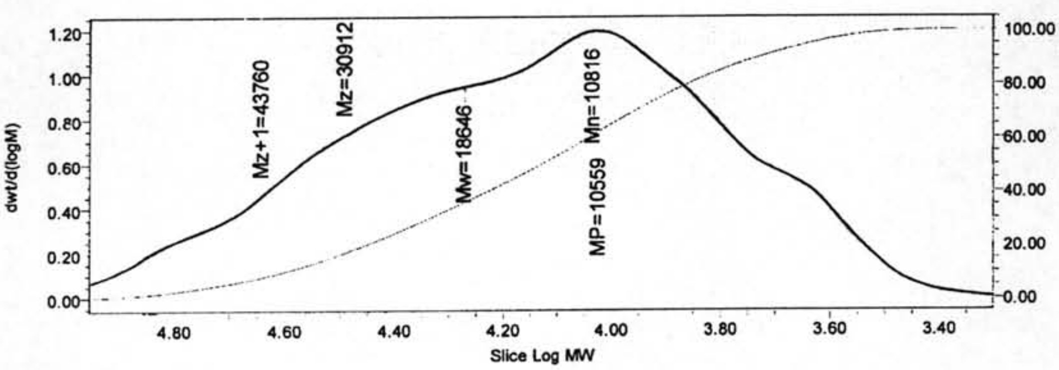

Figure B-24 GPC chromatogram of sample 10 in table 4.6: PLLA (at 120 °C, 48 hours) with tolylene 2,4-diisocyanate terminated poly 1,4-butanediol prepolymer at the ratio of 1:0.5, $\overline{M}_w = 18646$

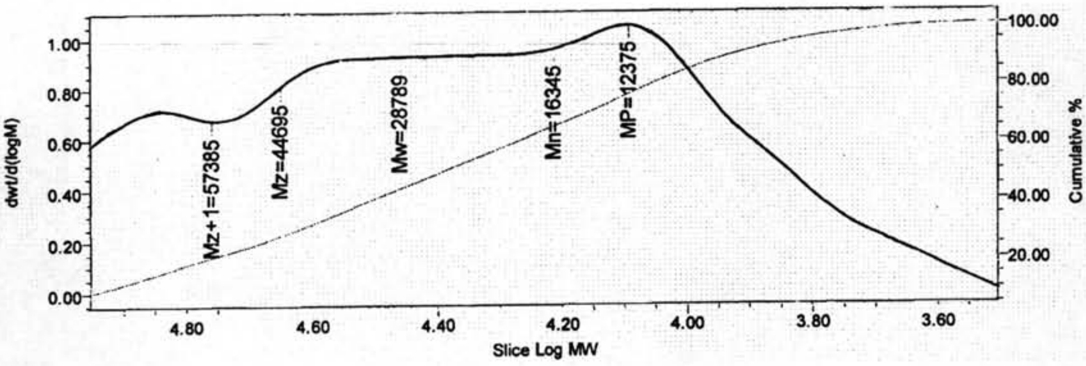

Figure B-25 GPC chromatogram of sample 11 in table 4.6: PLLA (at 120 °C, 48 hours) with tolylene 2,4-diisocyanate terminated poly 1,4-butanediol prepolymer at the ratio of 1:1.1, $\overline{M}_w = 28789$

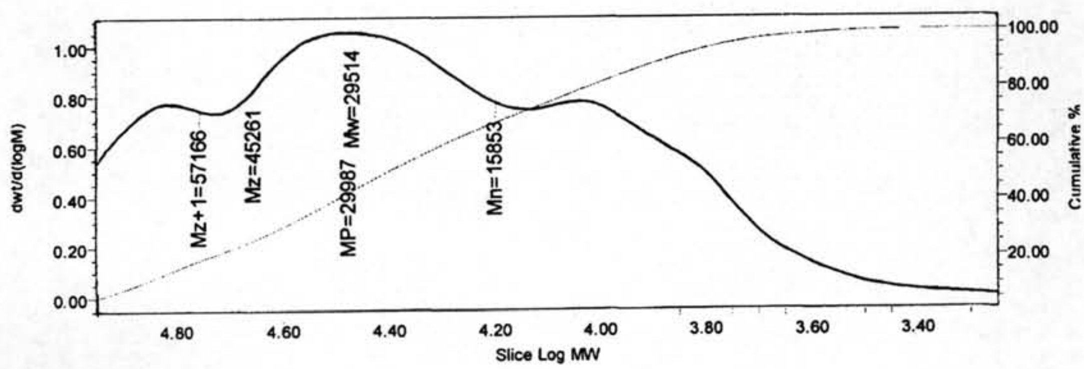

Figure B-26 GPC chromatogram of sample 12 in table 4.6: PLLA (at 120 °C, 48 hours) with tolylene 2,4-diisocyanate terminated poly 1,4-butanediol prepolymer at the ratio of 1:2, $\overline{M}_w = 29514$

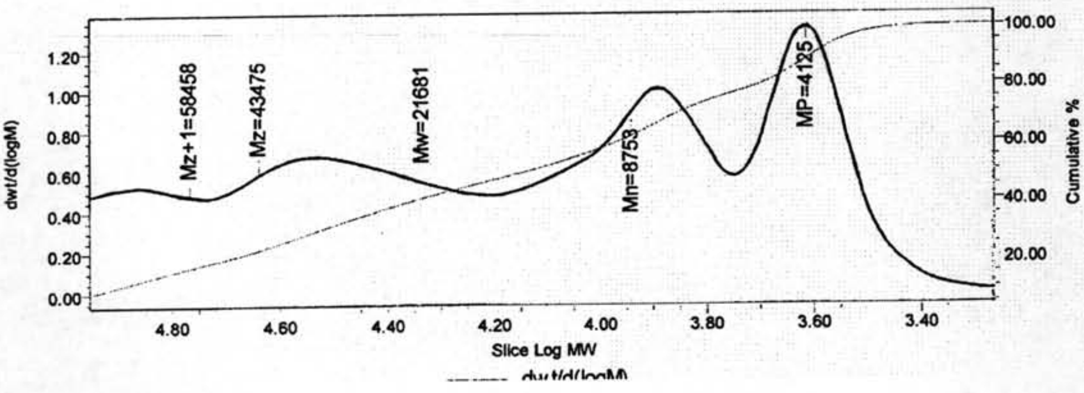

Figure B-27 GPC chromatogram of sample 14 in table 4.6: PLLA (at 120 °C, 24 hours) with tolylene 2,4-diisocyanate terminated poly 1,4-butanediol prepolymer at the ratio of 1:0.5, $\overline{M}_w = 21681$

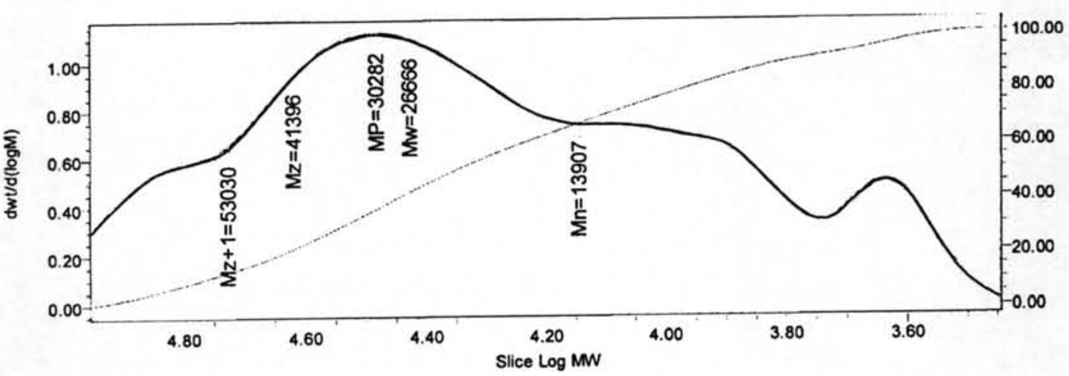

Figure B-28 GPC chromatogram of sample 15 in table 4.6: PLLA (at 120 °C, 24 hours) with tolylene 2,4-diisocyanate terminated poly 1,4-butanediol prepolymer at the ratio of 1:1.1, $\overline{M}_w = 26666$

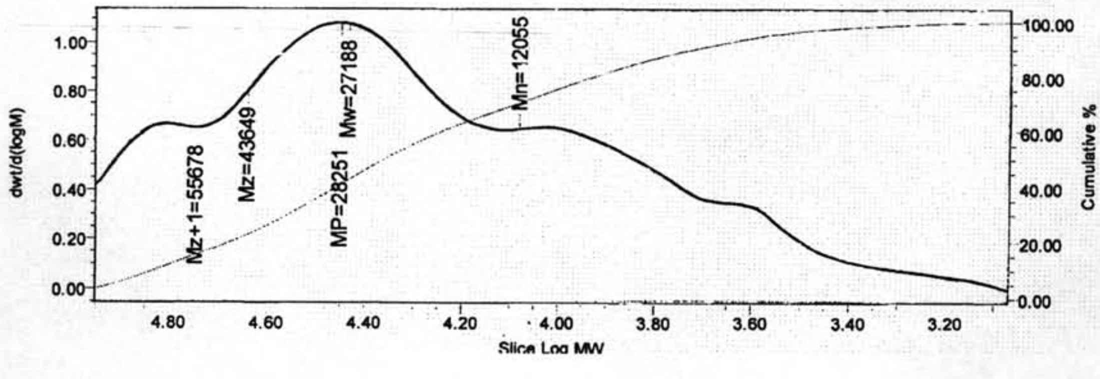

Figure B-29 GPC chromatogram of sample 16 in table 4.6: PLLA (at 120 °C, 24 hours) with tolylene 2,4-diisocyanate terminated poly 1,4-butanediol prepolymer at the ratio of 1:2, $\overline{M}_w = 27188$

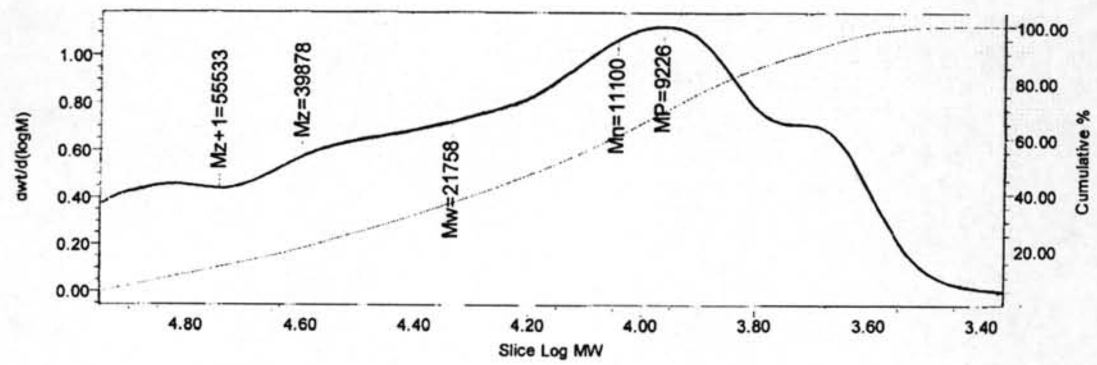

Figure B-30 GPC chromatogram of sample 18 in table 4.6: PLLA (at 120 °C, 48 hours) with tolylene 2,4-diisocyanate terminated poly 1,4-butanediol prepolymer at the ratio of 1:0.5, $\overline{M}_w = 21758$

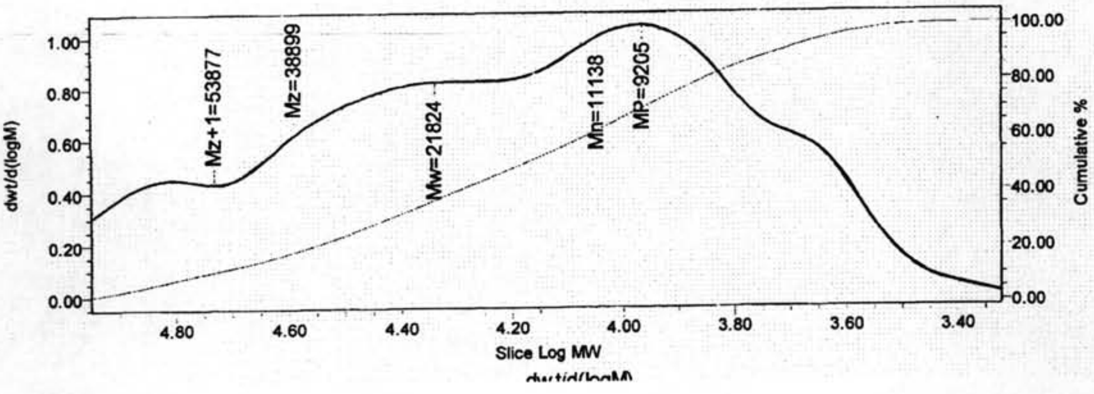

Figure B-31 GPC chromatogram of sample 19 in table 4.6: PLLA (at 120 °C, 48 hours) with tolylene 2,4-diisocyanate terminated poly 1,4-butanediol prepolymer at the ratio of 1:1.1, $\overline{M}_w = 21824$

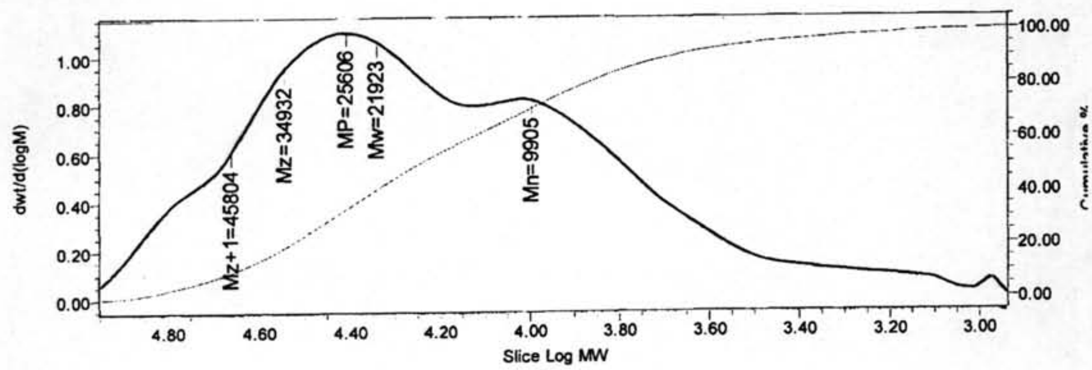

Figure B-32 GPC chromatogram of sample 20 in table 4.6: PLLA (at 120 °C, 48 hours) with tolylene 2,4-diisocyanate terminated poly 1,4-butanediol prepolymer at the ratio of 1:2, $\overline{M}_w = 21923$

APPENDIX C

DSC chromatogram of poly(L-lactic acid)

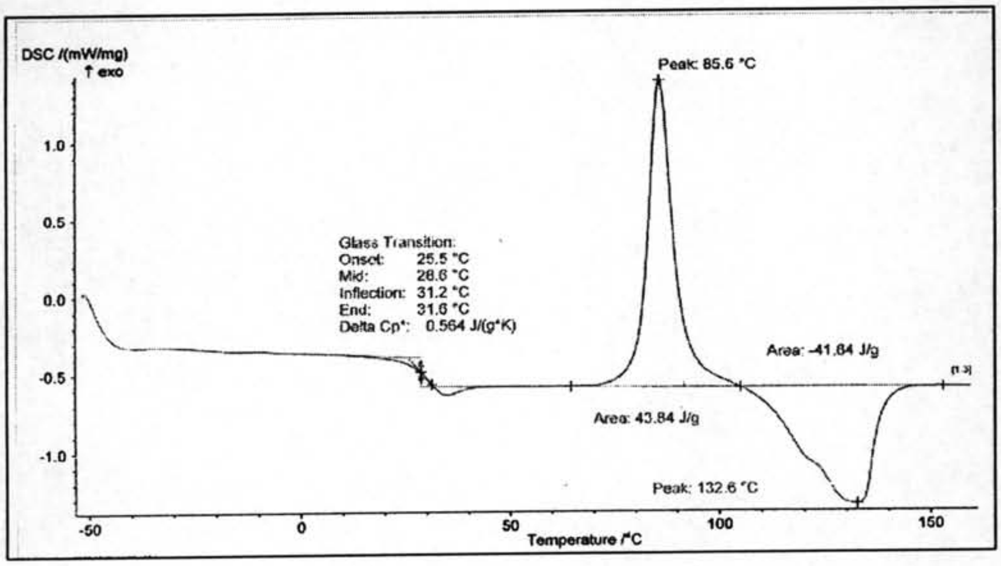

Figure C-1 DSC chromatogram of sample 9 in table 4.6: PLLA ($Sn(Oct)_2$, 120 °C, 48 hours), T_g = 28.6°C

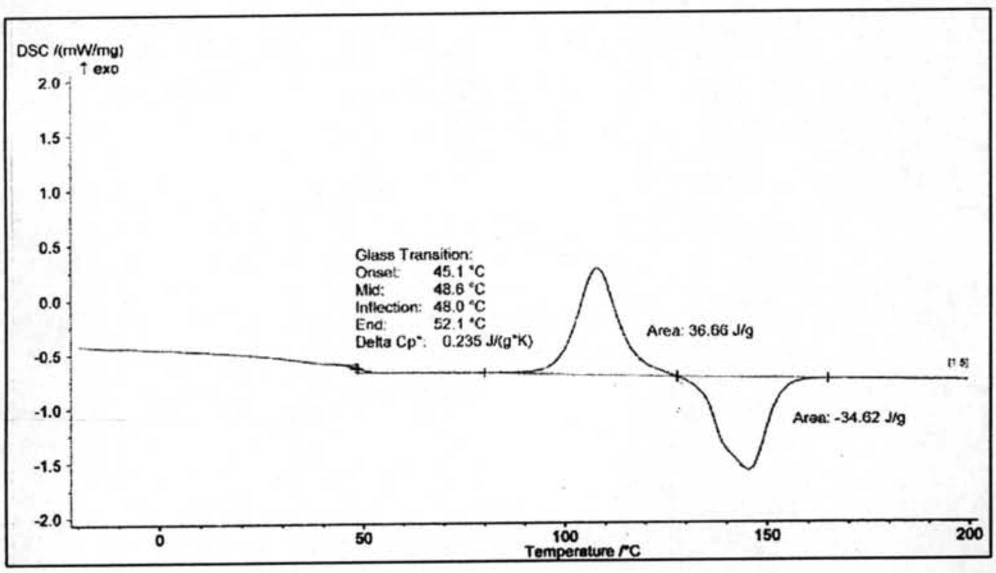

Figure C-2 DSC chromatogram of sample 10 in table 4.6: PLLA ($Sn(Oct)_2$, 120 °C, 48 hours) to tolylene 2,4-diisocyanate terminated poly 1,4-butanediol prepolymer in ratio 1:0.5, T_g = 48°C

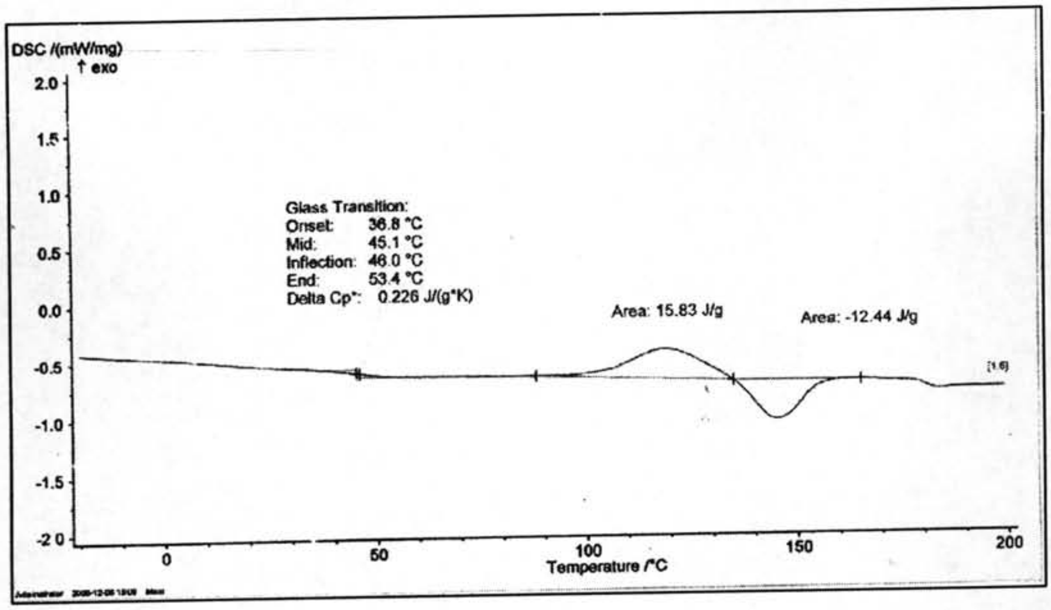

Figure C-3 DSC chromatogram of sample 11 in table 4.6: PLLA ($Sn(Oct)_2$, 120 °C, 48 hours) to tolylene 2,4-diisocyanate terminated poly 1,4-butanediol prepolymer in ratio 1:1.1, $T_g = 45.1$°C.

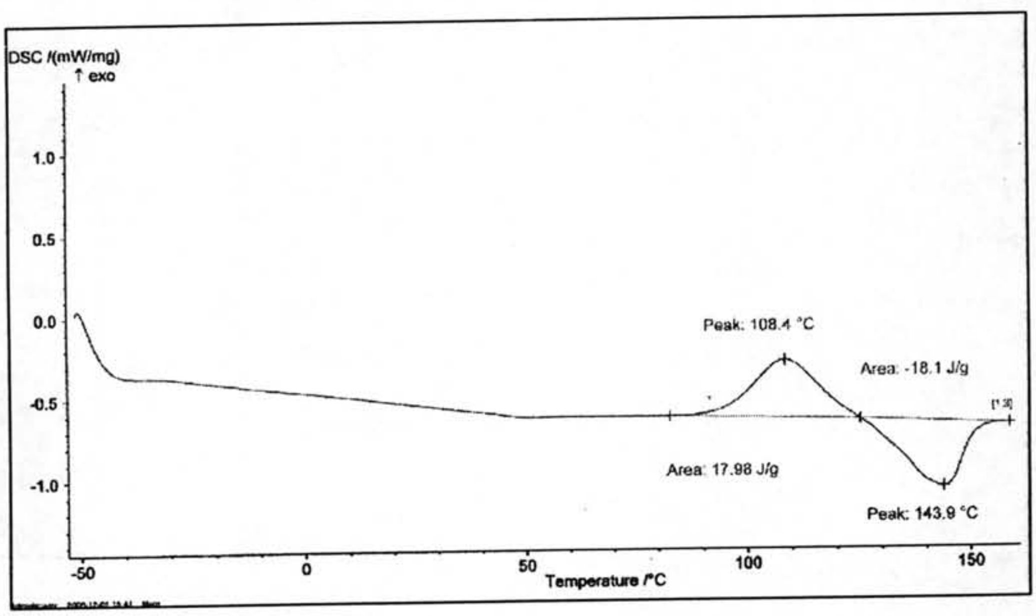

Figure C-4 DSC chromatogram of sample 12 in table 4.6: PLLA ($Sn(Oct)_2$, 120 °C, 48 hours) to tolylene 2,4-diisocyanate terminated poly 1,4-butanediol prepolymer in ratio 1:2, T_g cannot be detected.

VITAE

Miss Arpudsorn Thavornwan was born in Bangkok, Thailand, on June 4th, 1981. She received Bachelor degree of science in 2003 from Department of Chemistry, Faculty of Science, Chulalongkorn University. She started as a Master degree student in program of Petrochemistry and Polymer science, Chulalongkorn University in 2004 and completed program in 2006.