# APPENDICES

**APPENDIX A** Standard curve and sample's curve of GPC (room temp.)

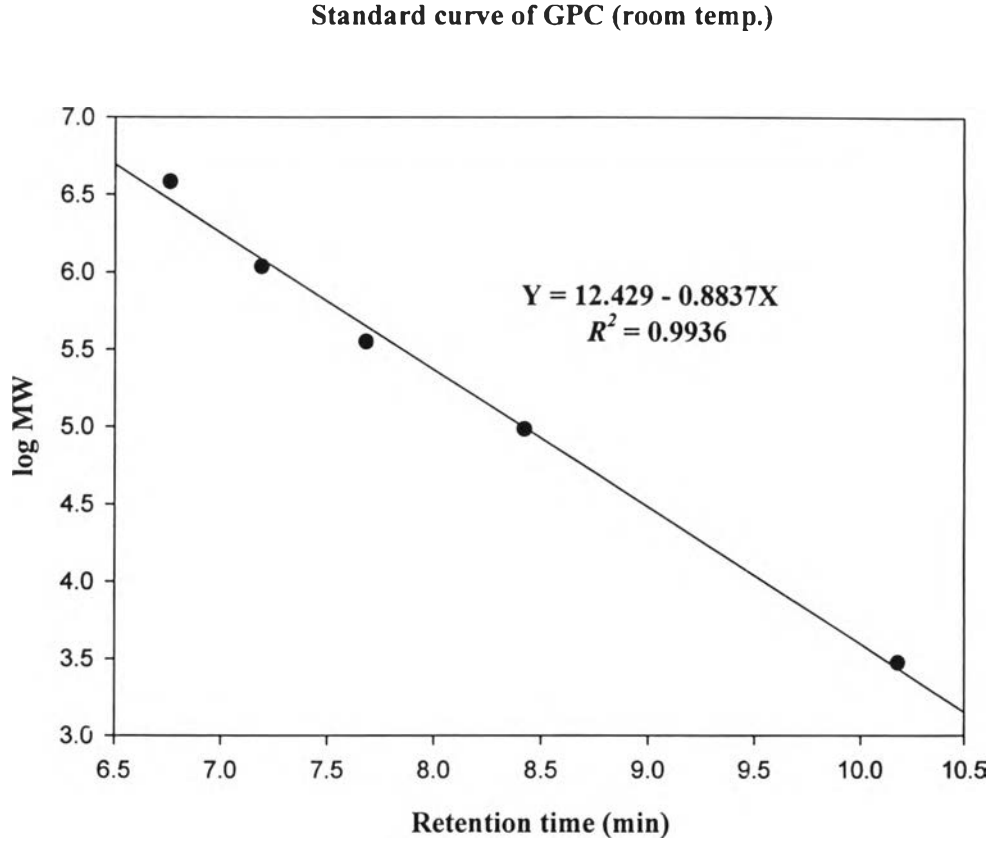



**Figure A1** Standard curve of polystyrene standard in THF by GPC (room temp.).

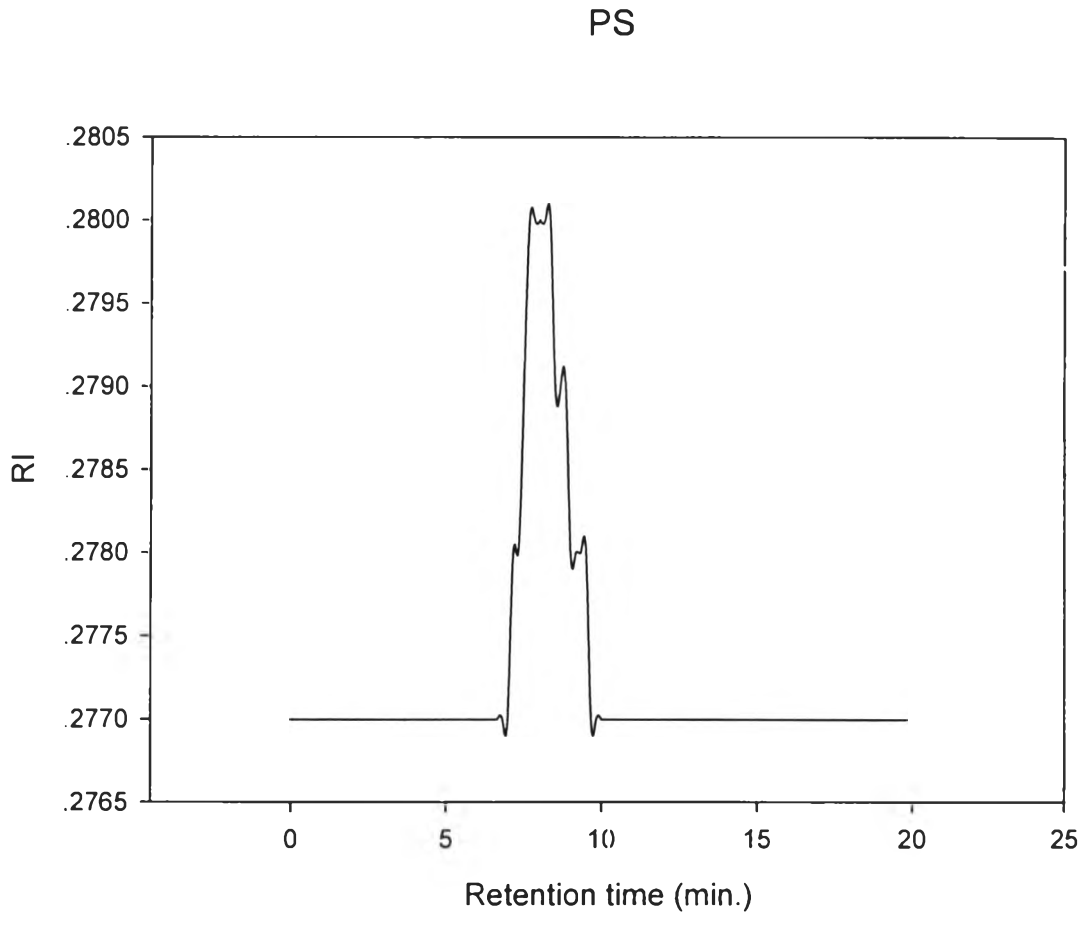



**Figure A2** GPC curve of polystyrene.

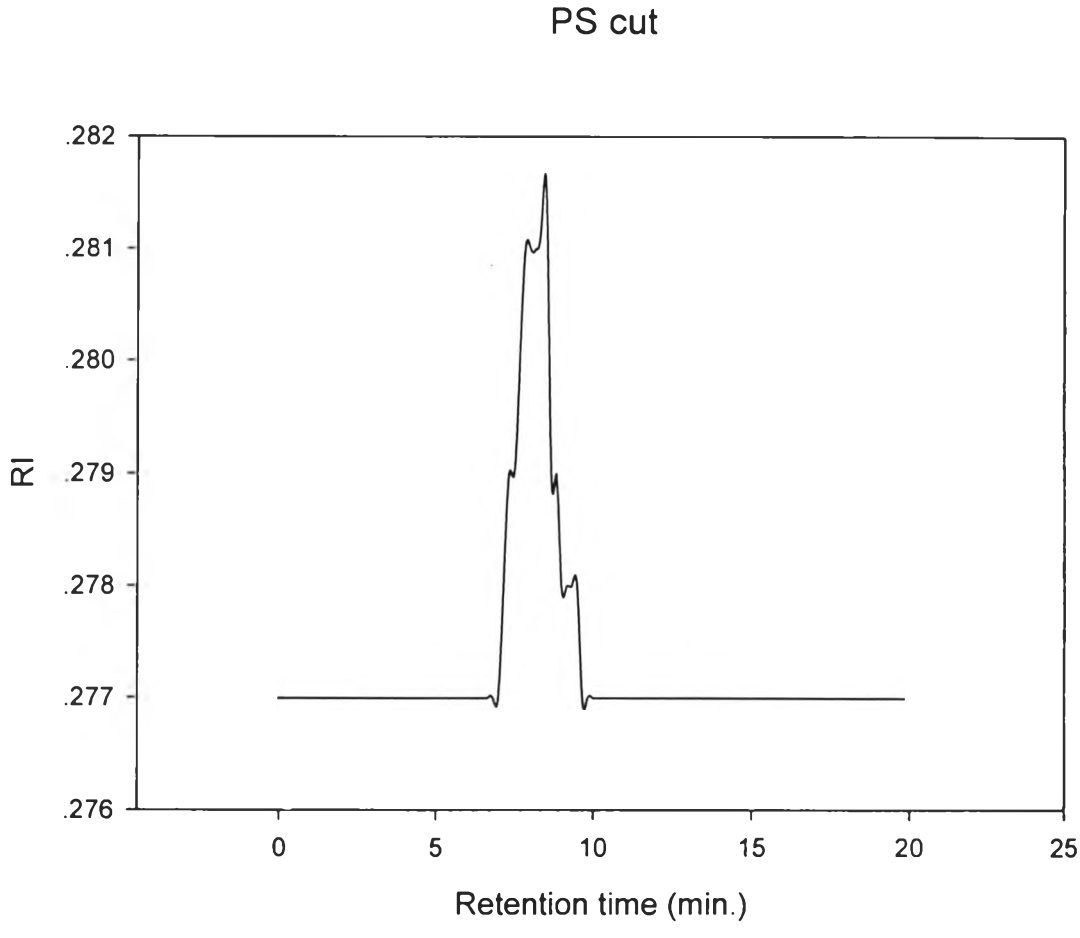



**Figure A3** GPC curve of polystyrene that was cut chain by dicumyl peroxide 0.5% (w/w).

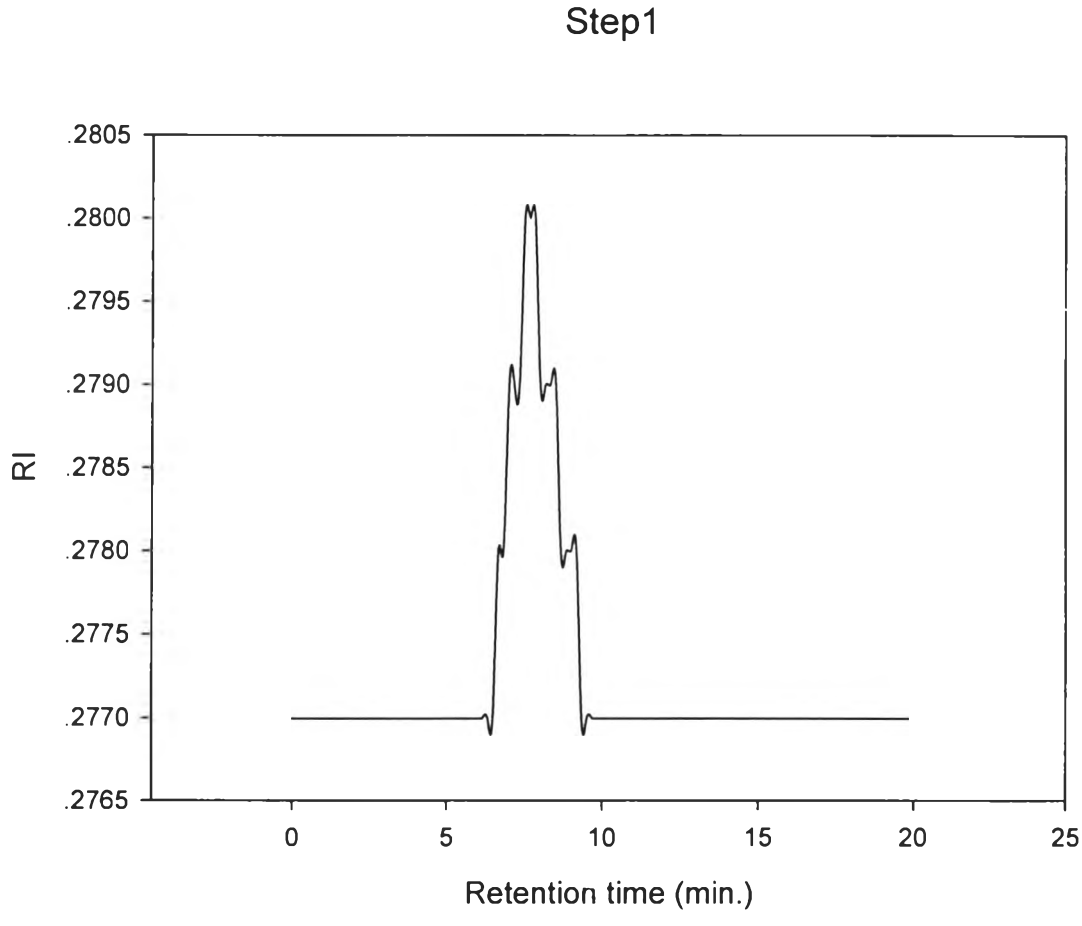



**Figure A4** GPC curve of ring-acylated polystyrene.

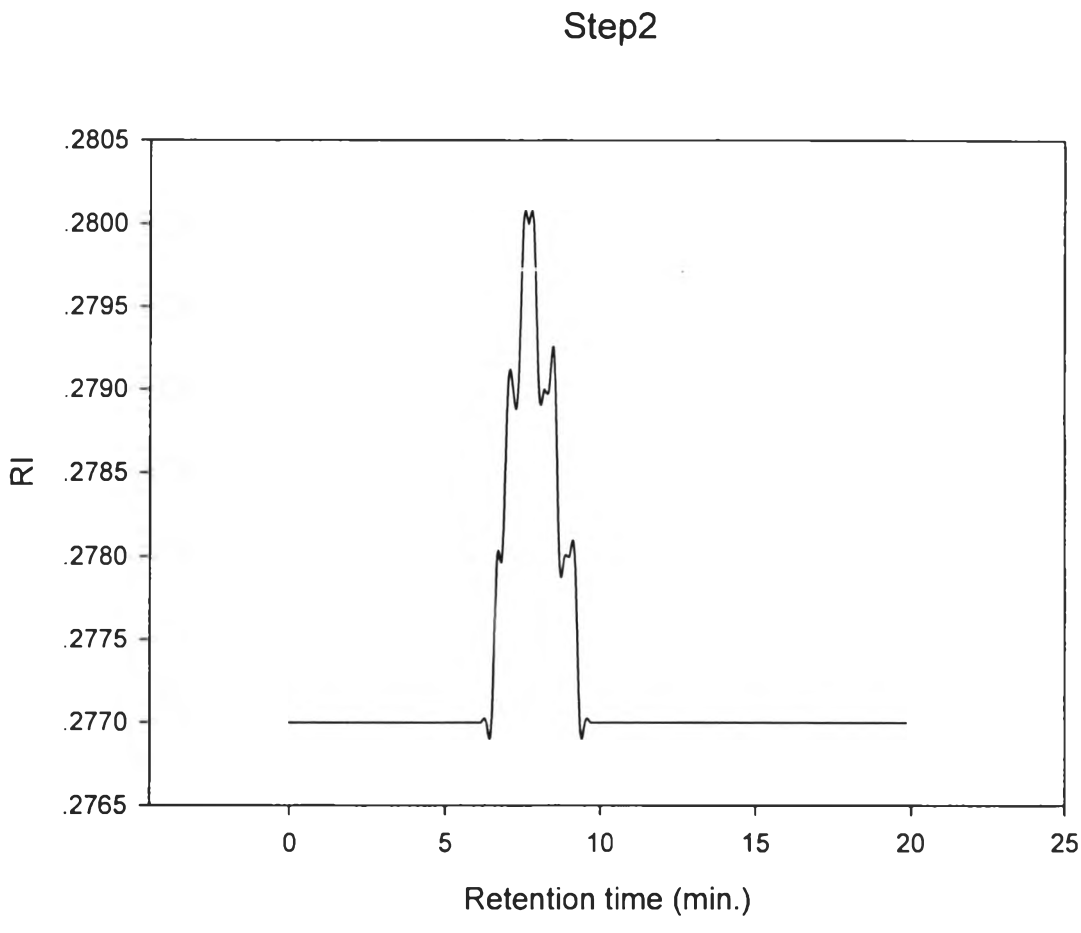



**Figure A5** GPC curve of polystyrene ring substituted with 1-hydroxypropyl group.

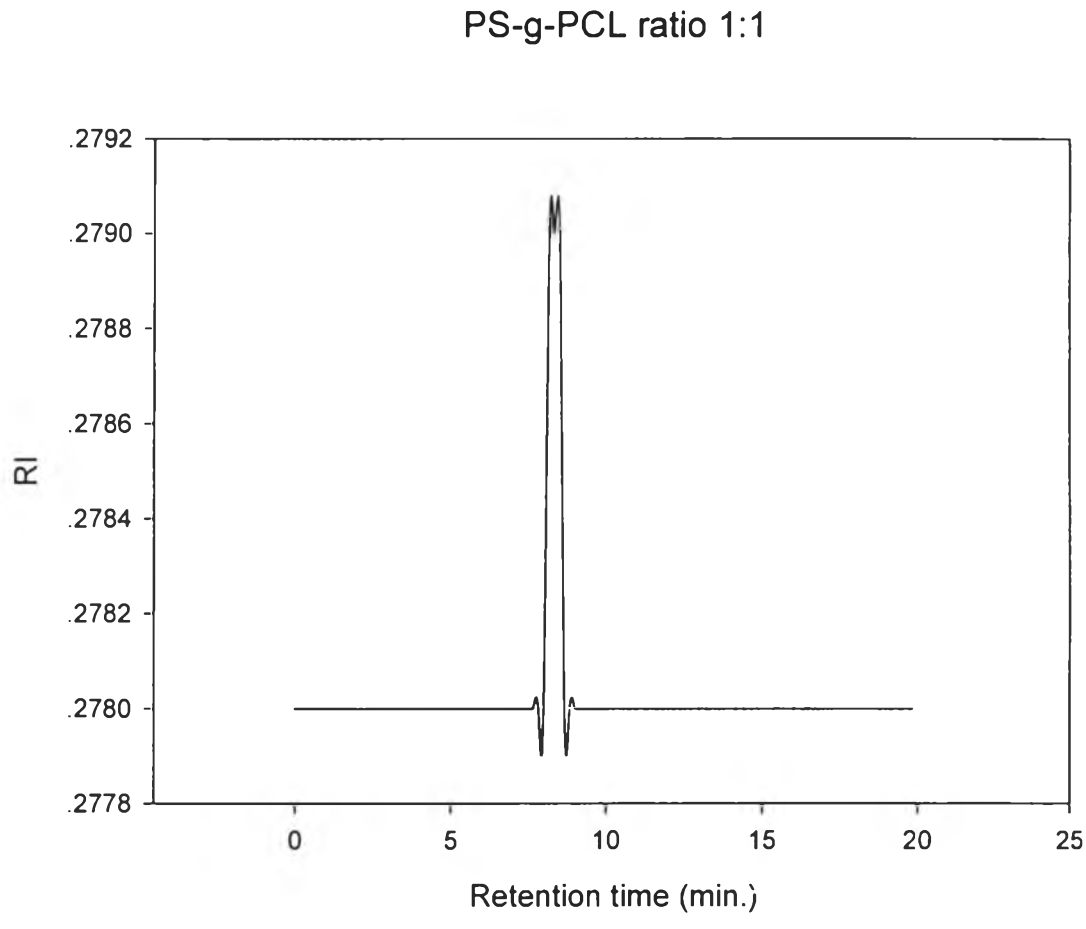



**Figure A6** GPC curve of PS-g-PCL in ratio 1:1.

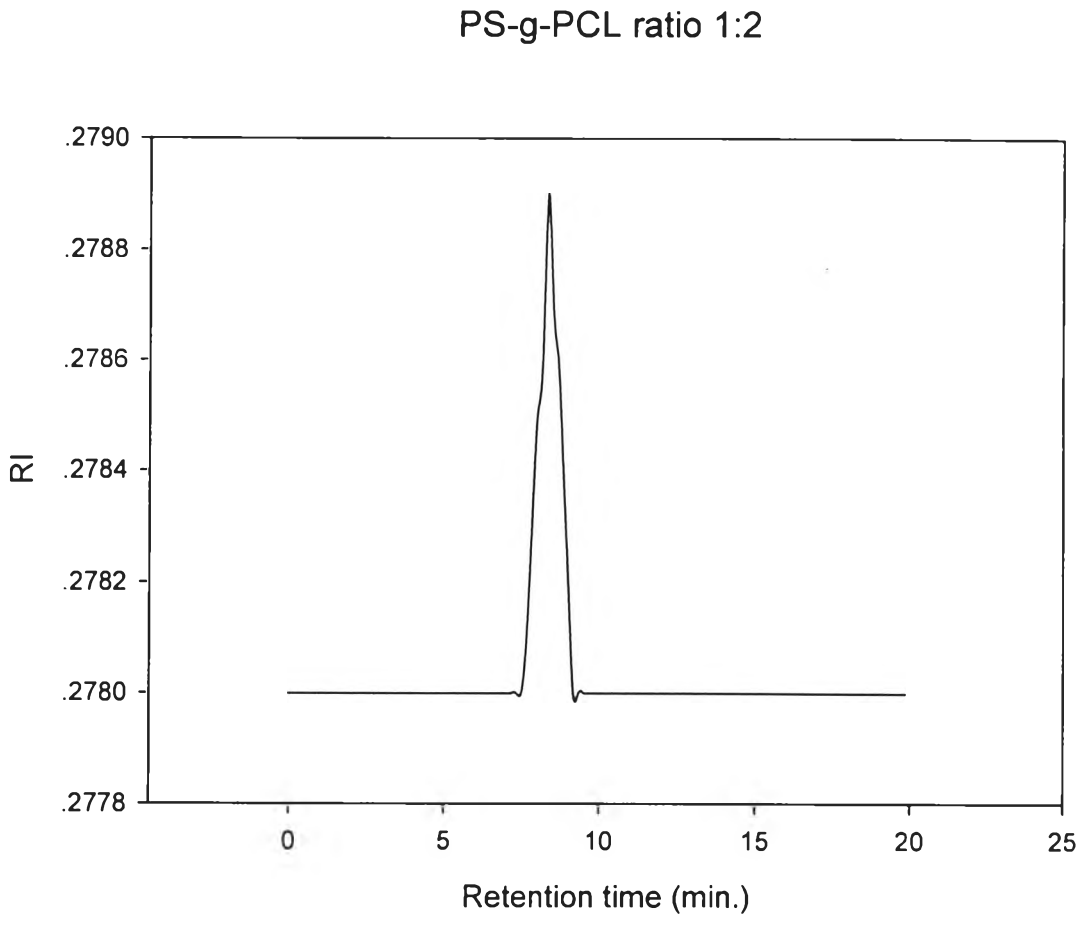



**Figure A7** GPC curve of PS-g-PCL in ratio 1:2.

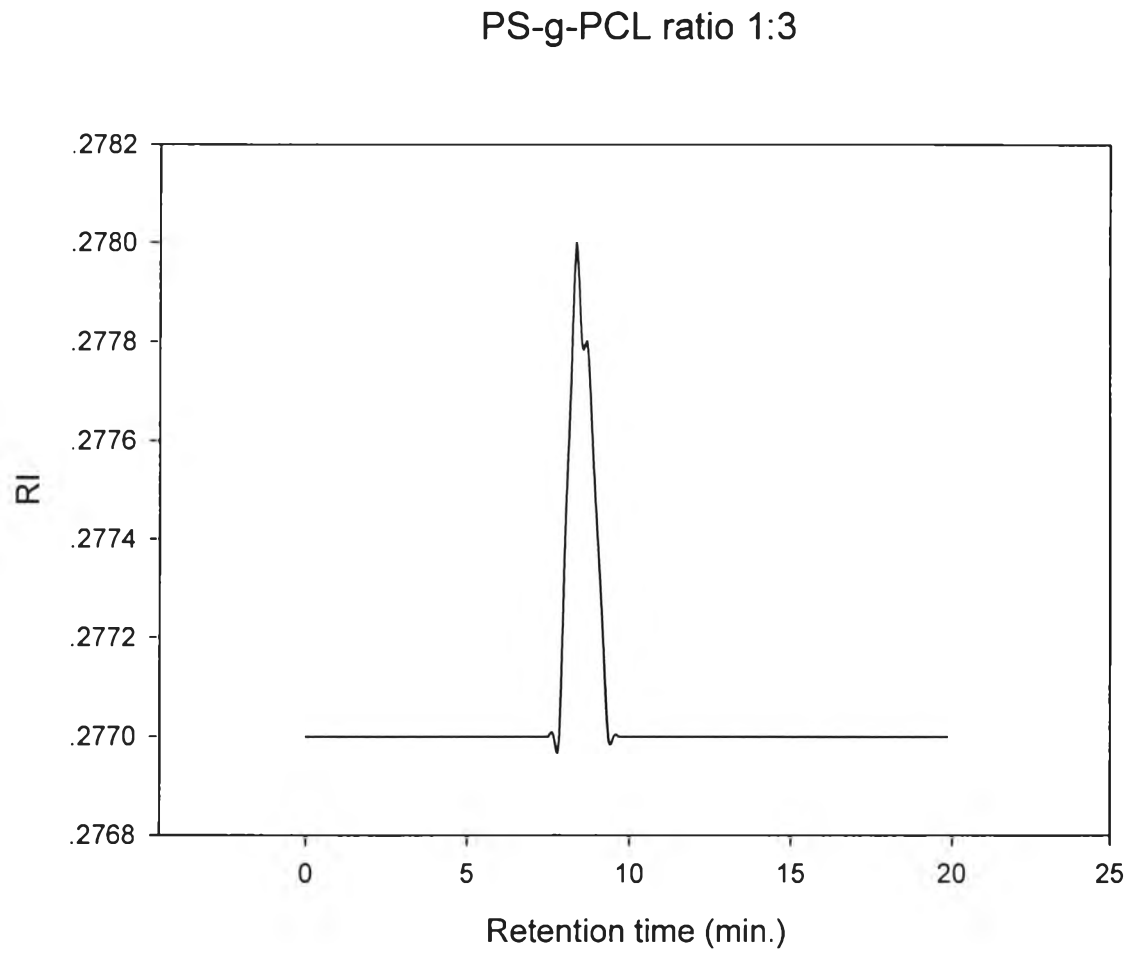



**Figure A8** GPC curve of PS-g-PCL in ratio 1:3.

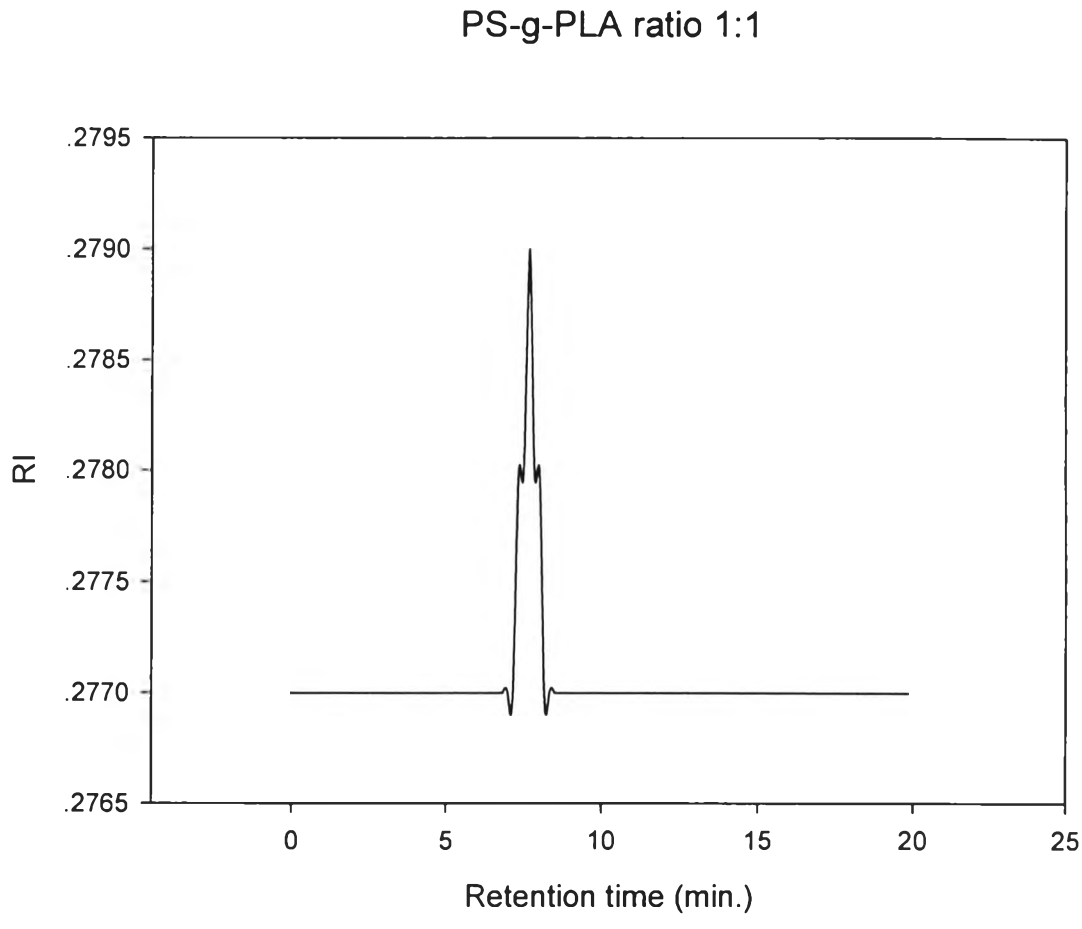



**Figure A9** GPC curve of PS-g-PLA in ratio 1:1.

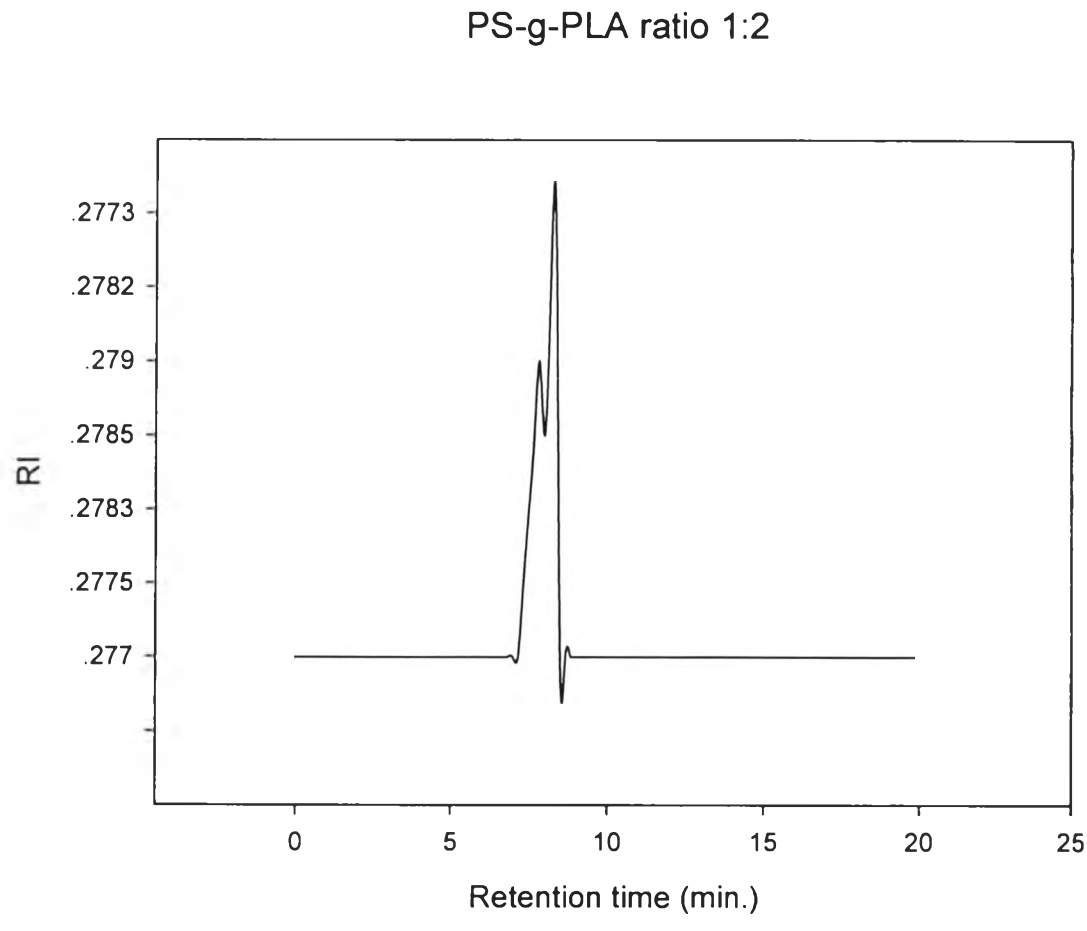



**Figure A10** GPC curve of PS-g-PLA in ratio 1:2.

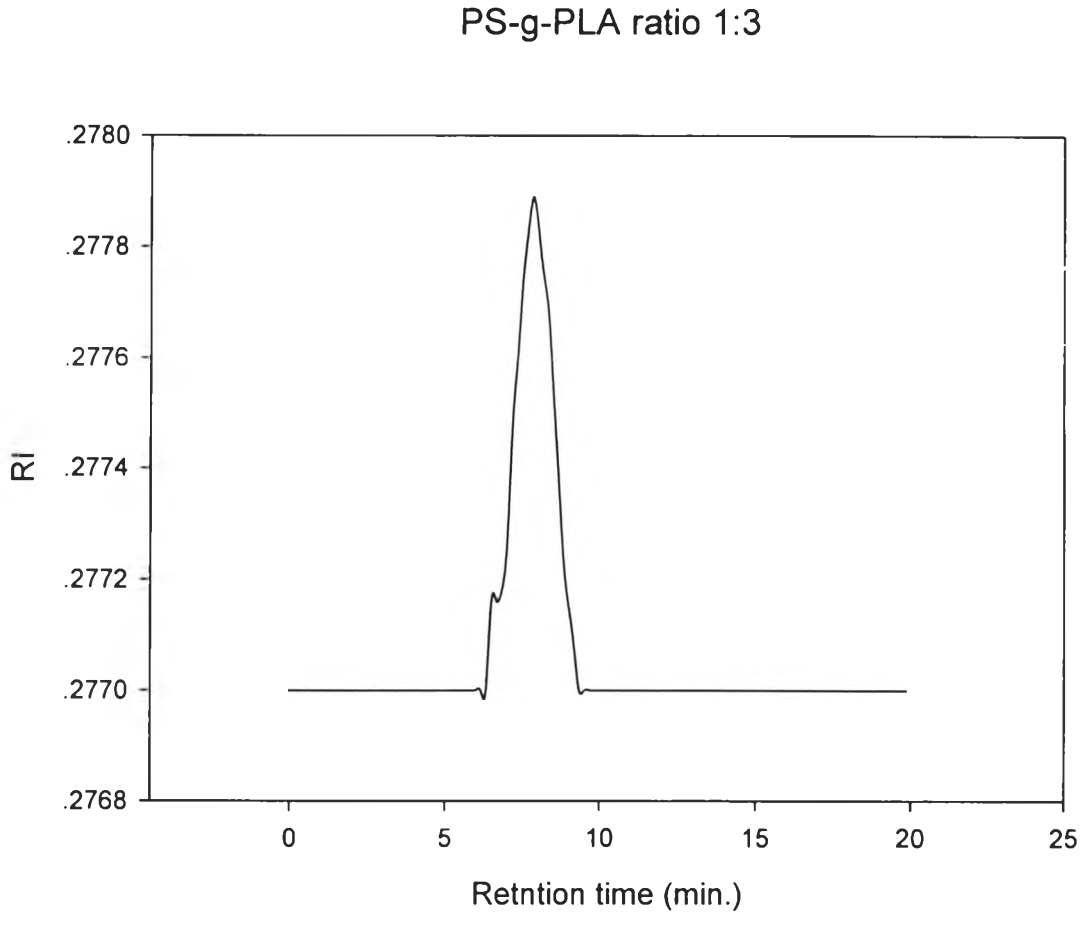



**Figure A11** GPC curve of PS-g-PLA in ratio 1:3.

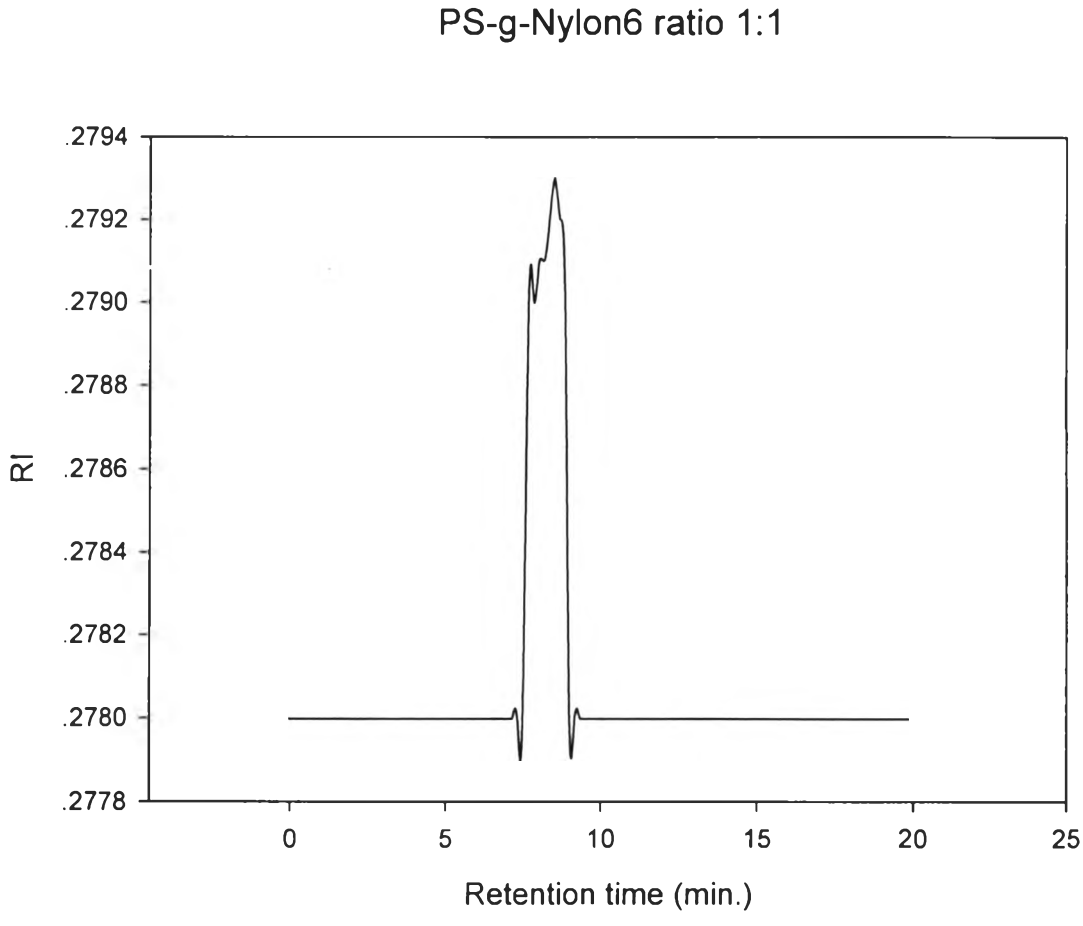



**Figure A12** GPC curve of PS-g-Nylon6 in ratio 1:1.

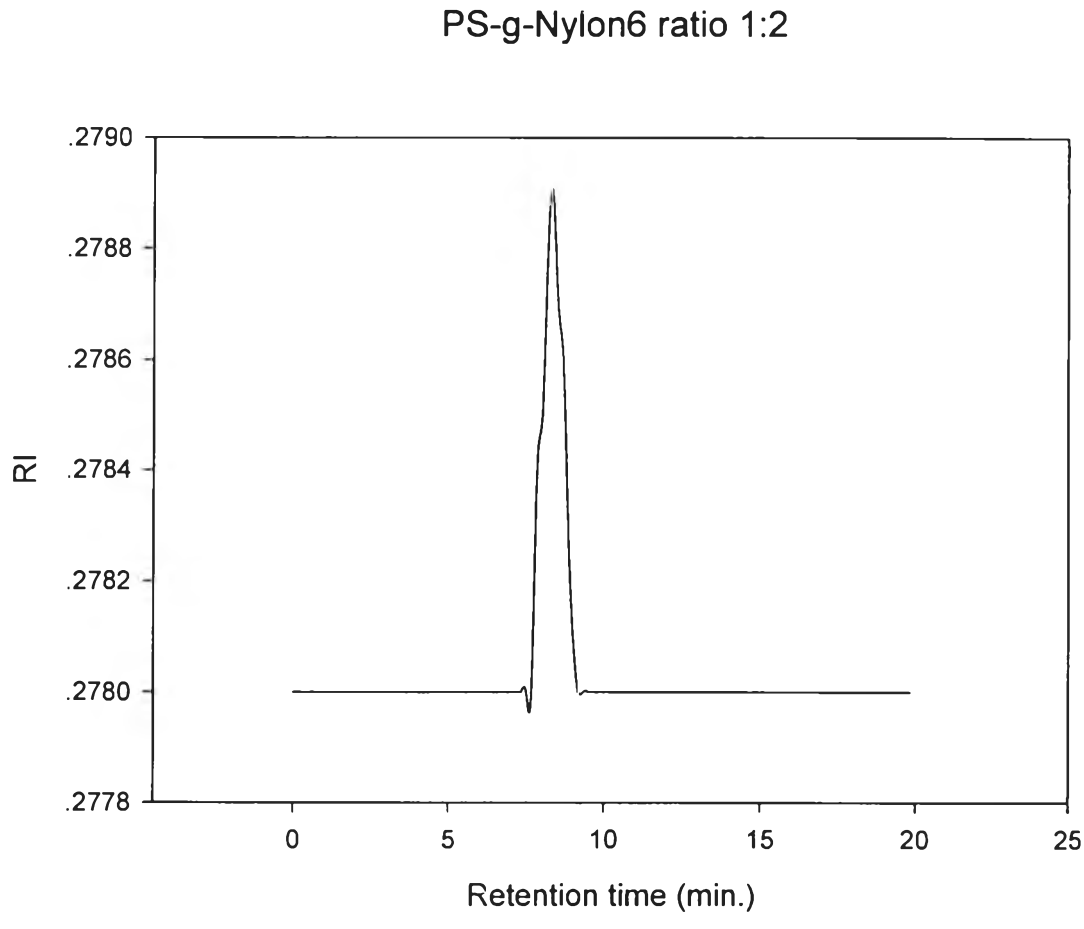



**Figure A13** GPC curve of PS-g-Nylon6 in ratio 1:2.

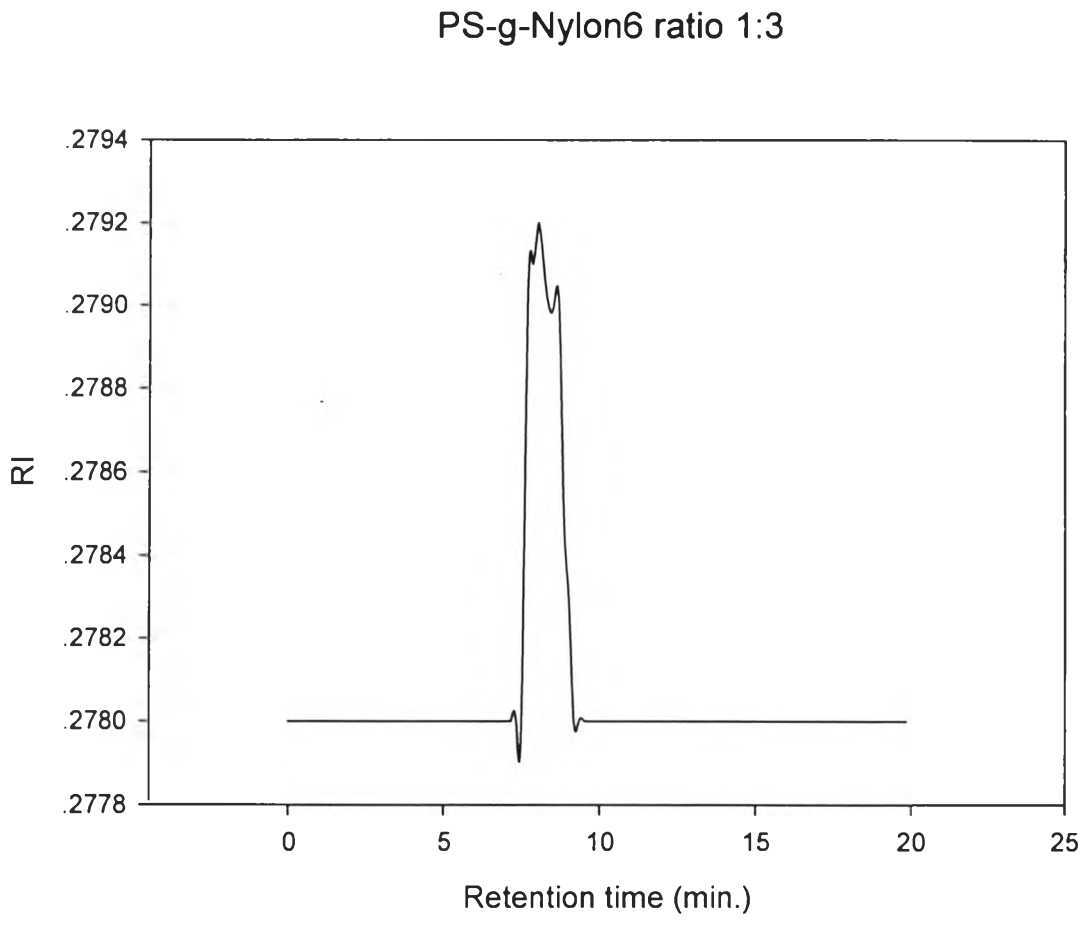



**Figure A14** GPC curve of PS-g-Nylon6 in ratio 1:3.

**APPENDIX B** Standard curve of GPC (water)

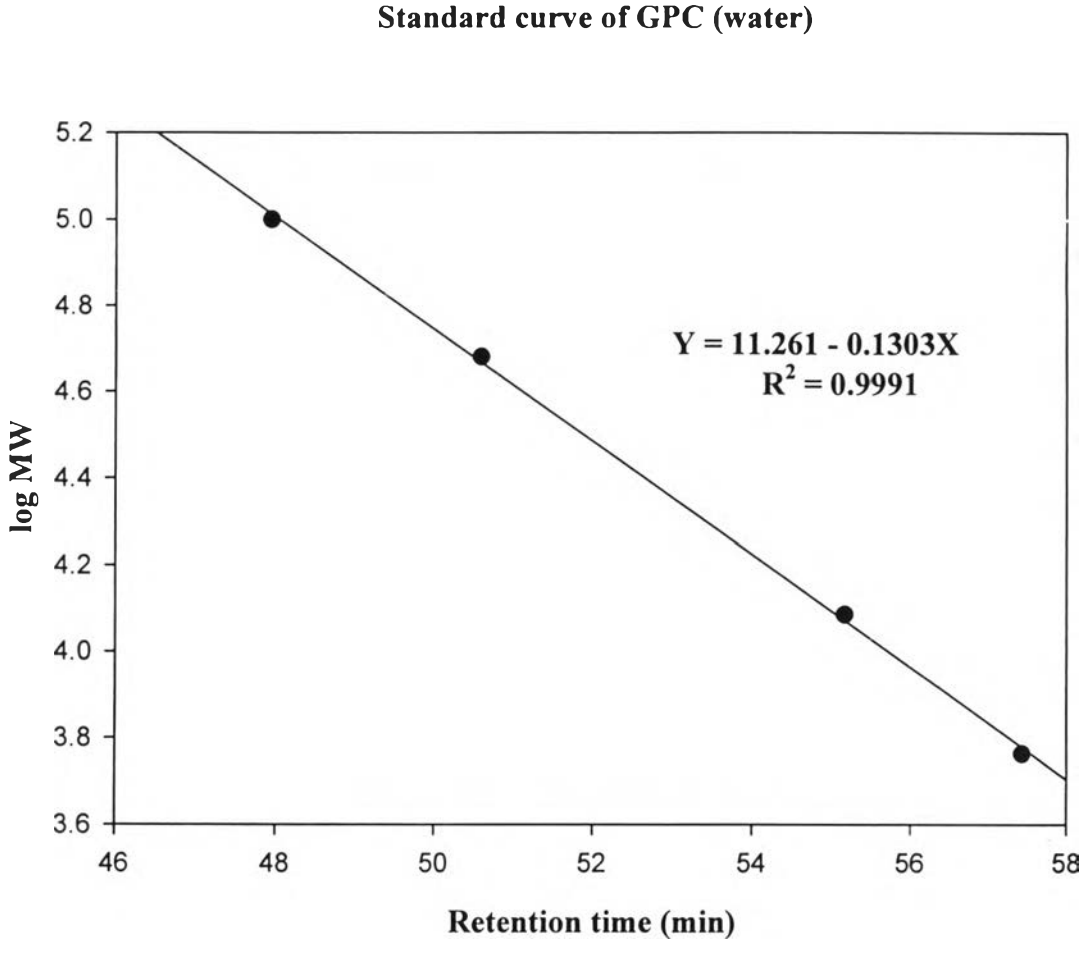



**Figure B1** Standard curve of glucose standard in water by GPC (water).

**APPENDIX C** NMR spectrum of graft copolymer and precursor polymer from paper

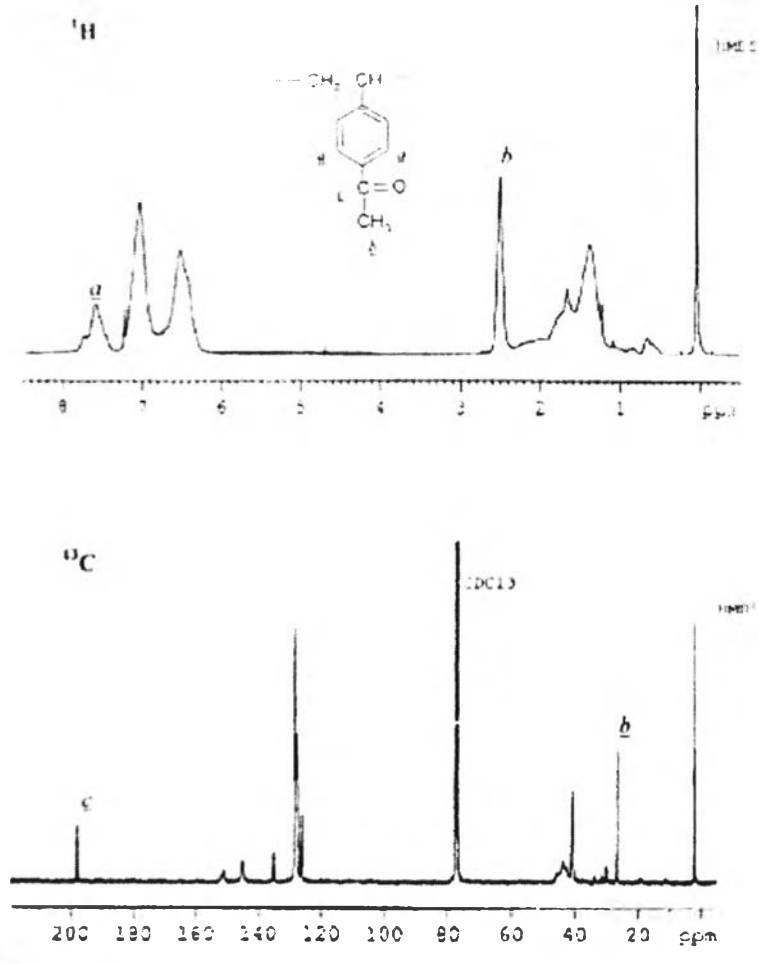



Fig. 1. $^{1}H$ and $^{13}C$ NMR spectra of ring-acetylated polystyrene (polymer A).

**Figure C1** $^{1}H$ and $^{13}C$ NMR spectra of ring-acetylated polystyrene from Janata, M. (2001).

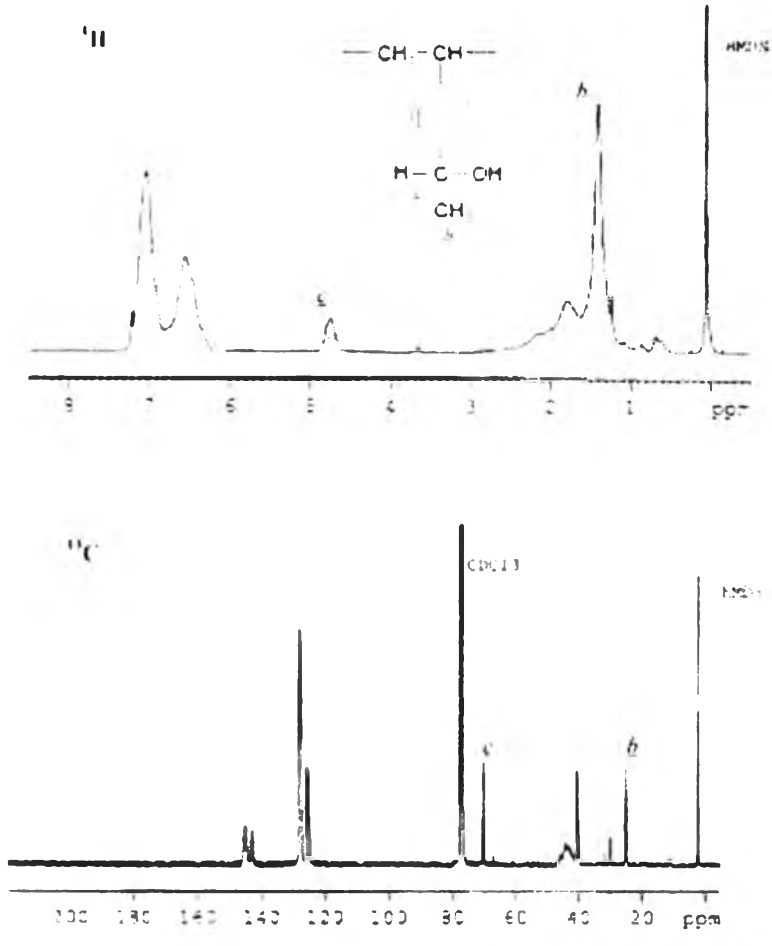



Fig. 2. $^{1}H$ and $^{13}C$ NMR spectra of the polystyrene ring-substituted with 1-hydroxyethyl group (polymer II).

**Figure C2** $^{1}H$ and $^{13}C$ NMR spectra of the polystyrene ring-substituted with 1-hydroxyethyl group from Janata, *et al.* (2001).

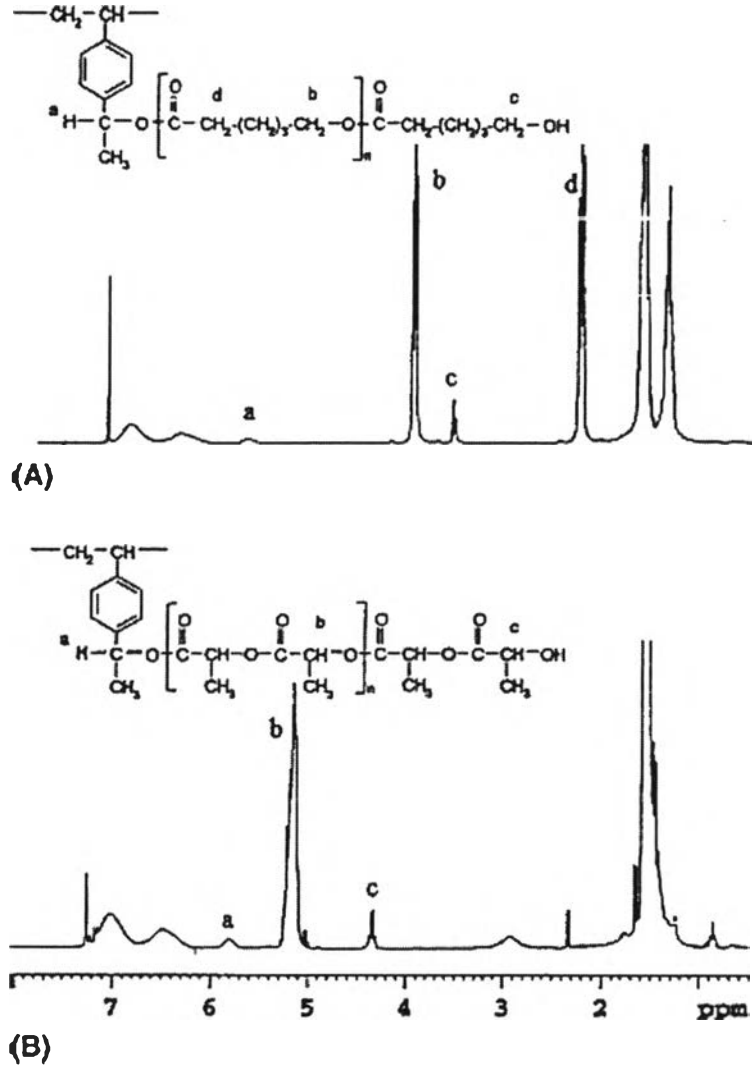



Fig. 2. $^1$H NMR spectra of (A) polystyrene-*graft*-poly(ε-caprolactone), (B) polystyrene-*graft*-poly(DL-lactide).

**Figure C3** $^1$H NMR spectra of (A) polystyrene-graft-poy(ε-caprolactone), (B) polystyrene-graft-poly(DL-lactide) from Janata, *et al.* (2003).

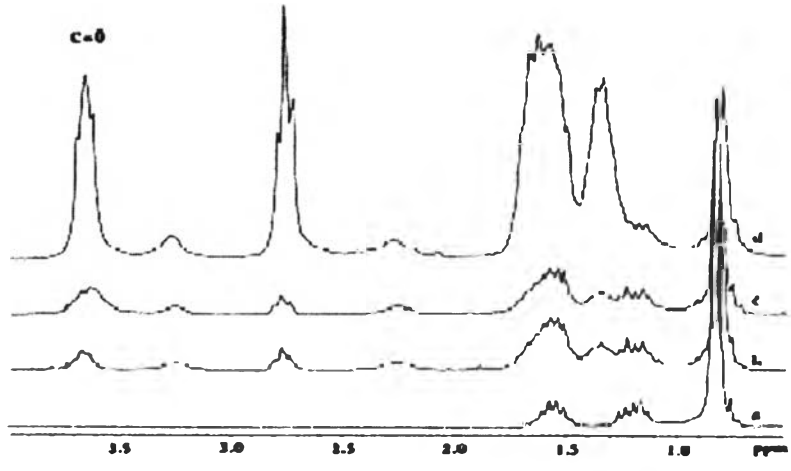



Fig. 3. The $^1$H-NMR spectrum of (a) pure PP and PP-b-NY6 containing (b) 24.0 (c) 23.5 (d) 71.5 mole% of NY6.

**Figure C4** $^1$H NMR spectra of Nylon6 mixed with Polypropylene.

**APPENDIX D** NMR spectrum of graft copolymer and precursor polymer from ChemDraw Ultra 8.0 program

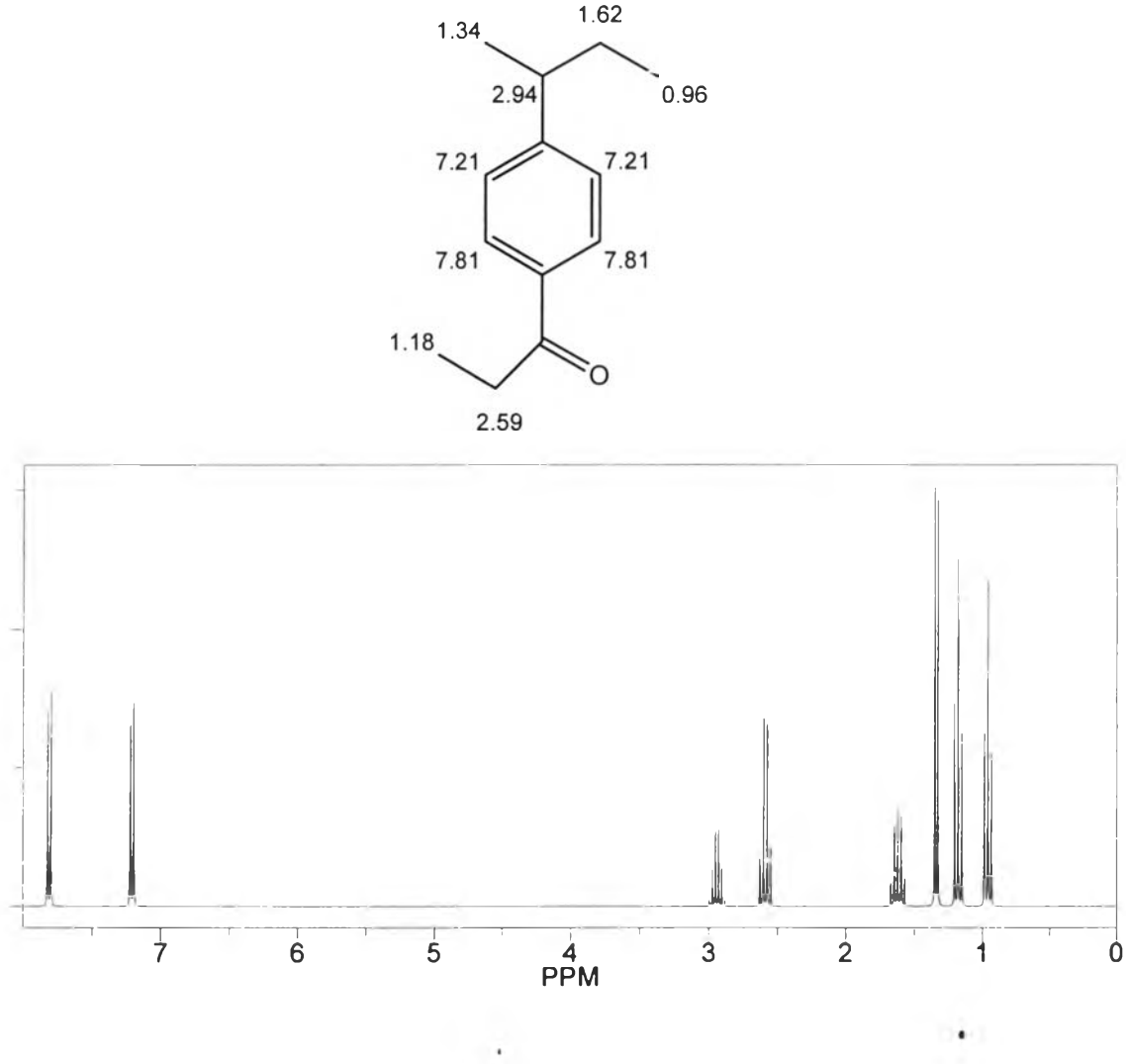



**Figure D1** $^{1}H$ NMR spectra of ring-acylated polystyrene from ChemDraw Ultra 8.0 Program.

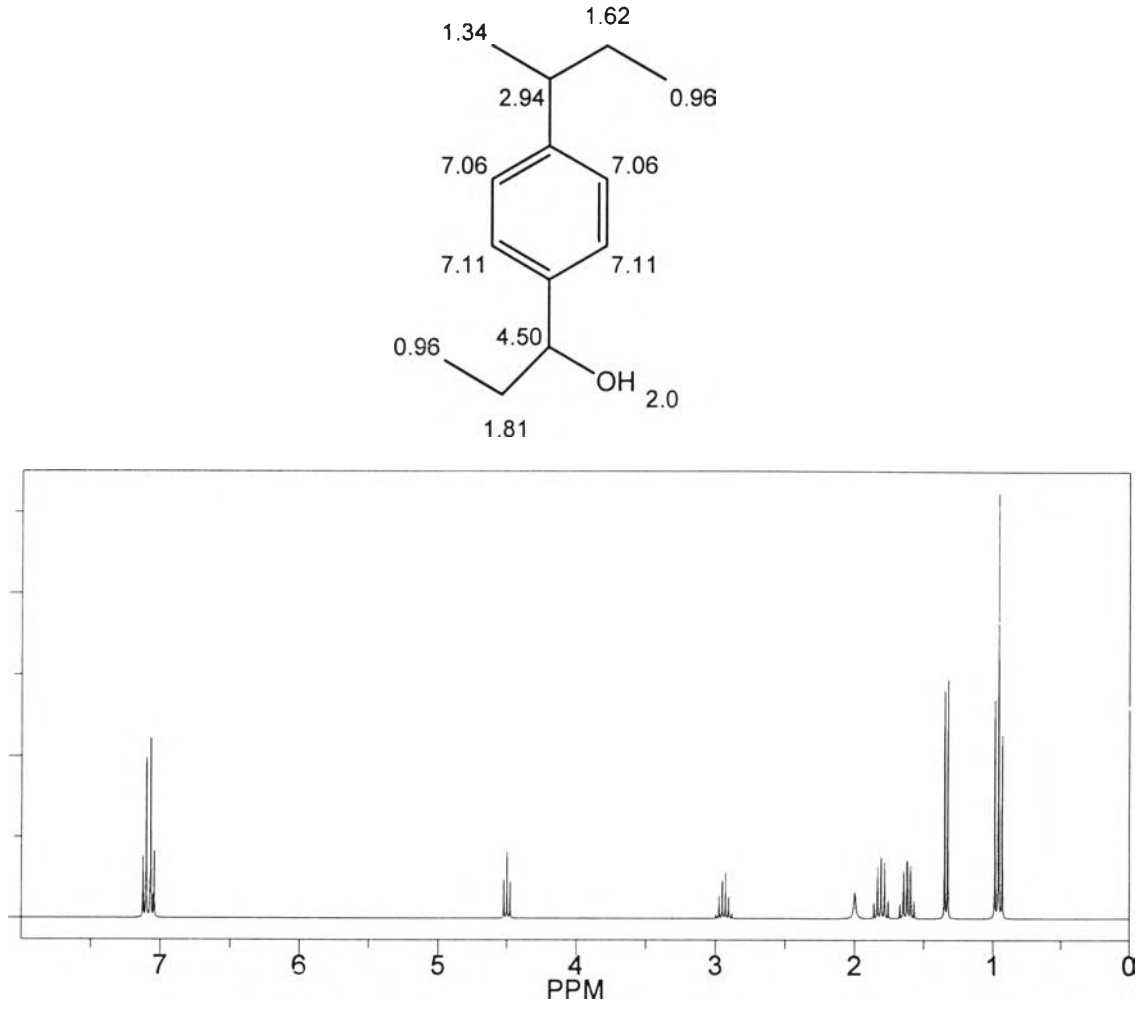
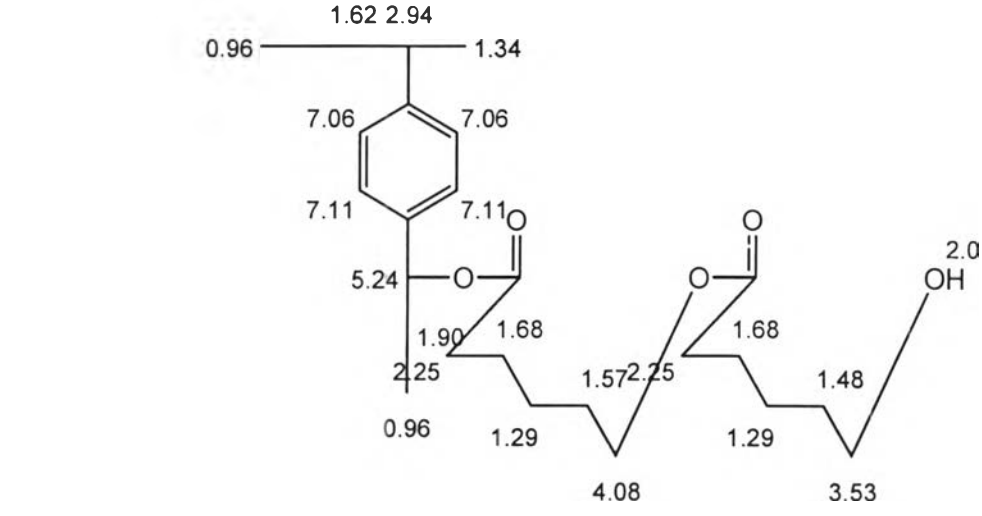



**Figure D2** $^{1}$H NMR spectra of the polystyrene ring-substituted with 1-hydroxypropyl group from ChemDraw Ultra 8.0 Program.).



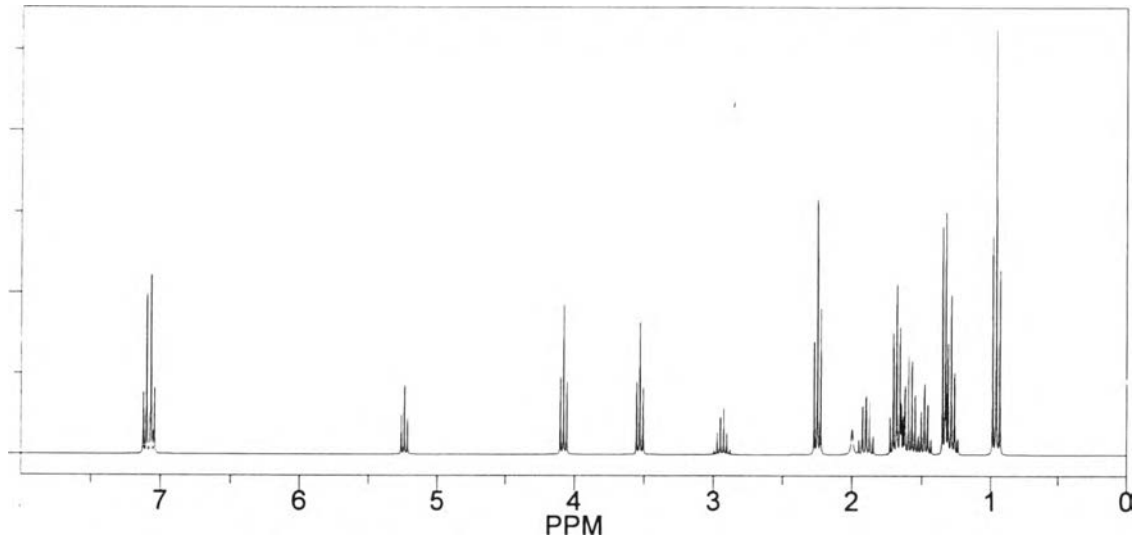




**Figure D3** $^{1}$H NMR spectra of PS-g-PCL from ChemDraw Ultra 8.0 Program.

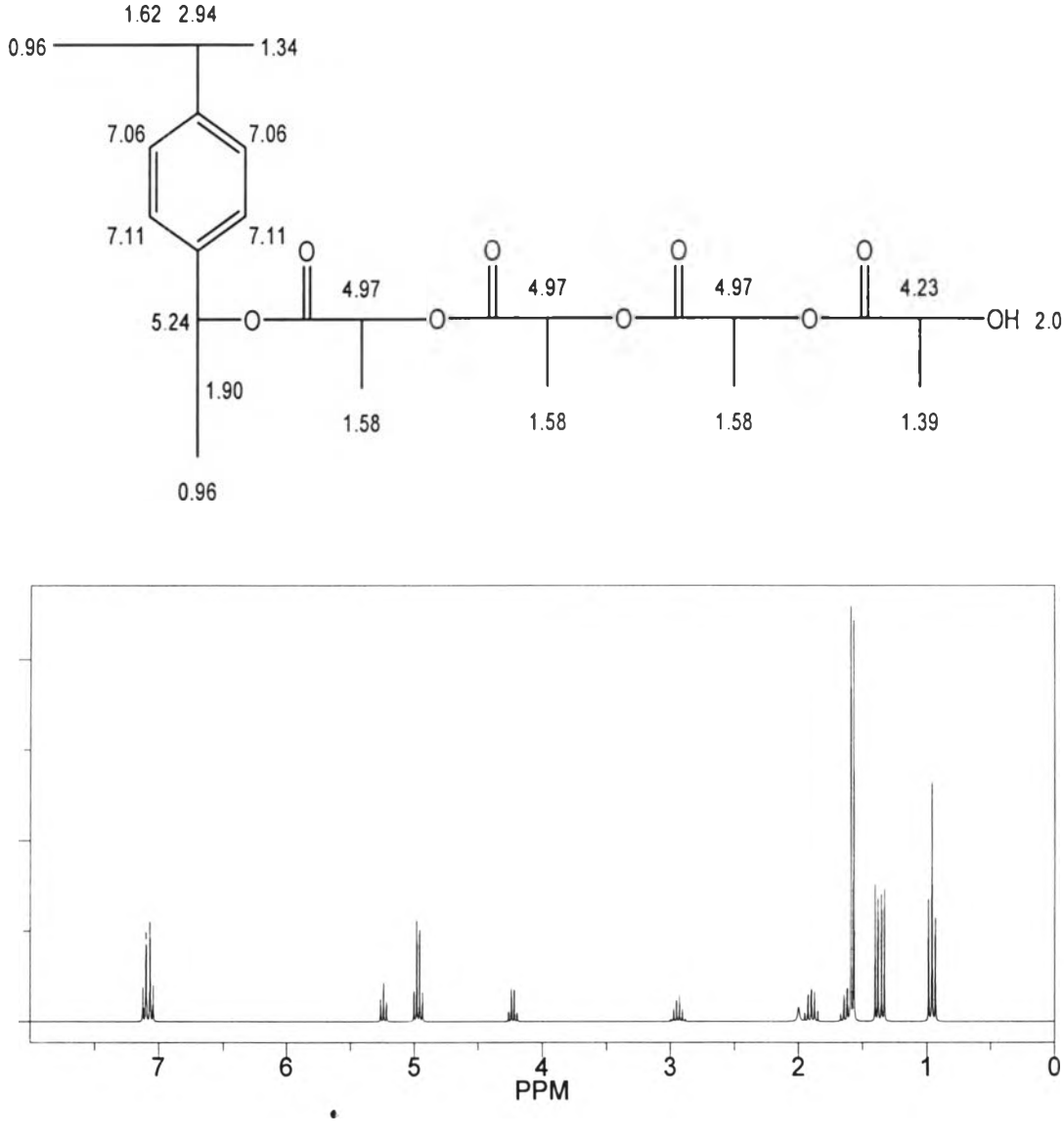



**Figure D4** $^{1}$H NMR spectra of PS-g-PLA from ChemDraw Ultra 8.0 Program.

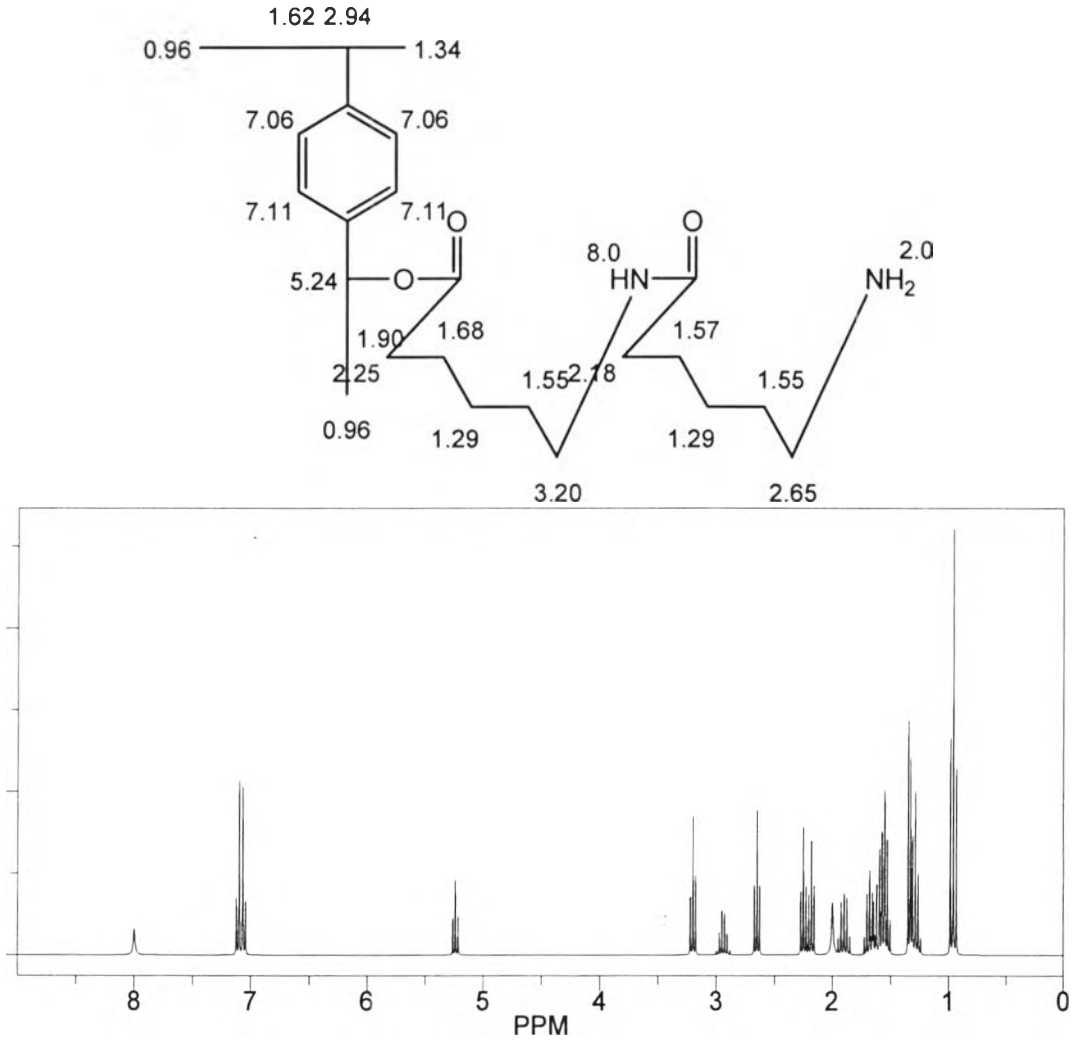



**Figure D5** $^{1}$H NMR spectra of PS-g-Nylon6 from ChemDraw Ultra 8.0 Program.

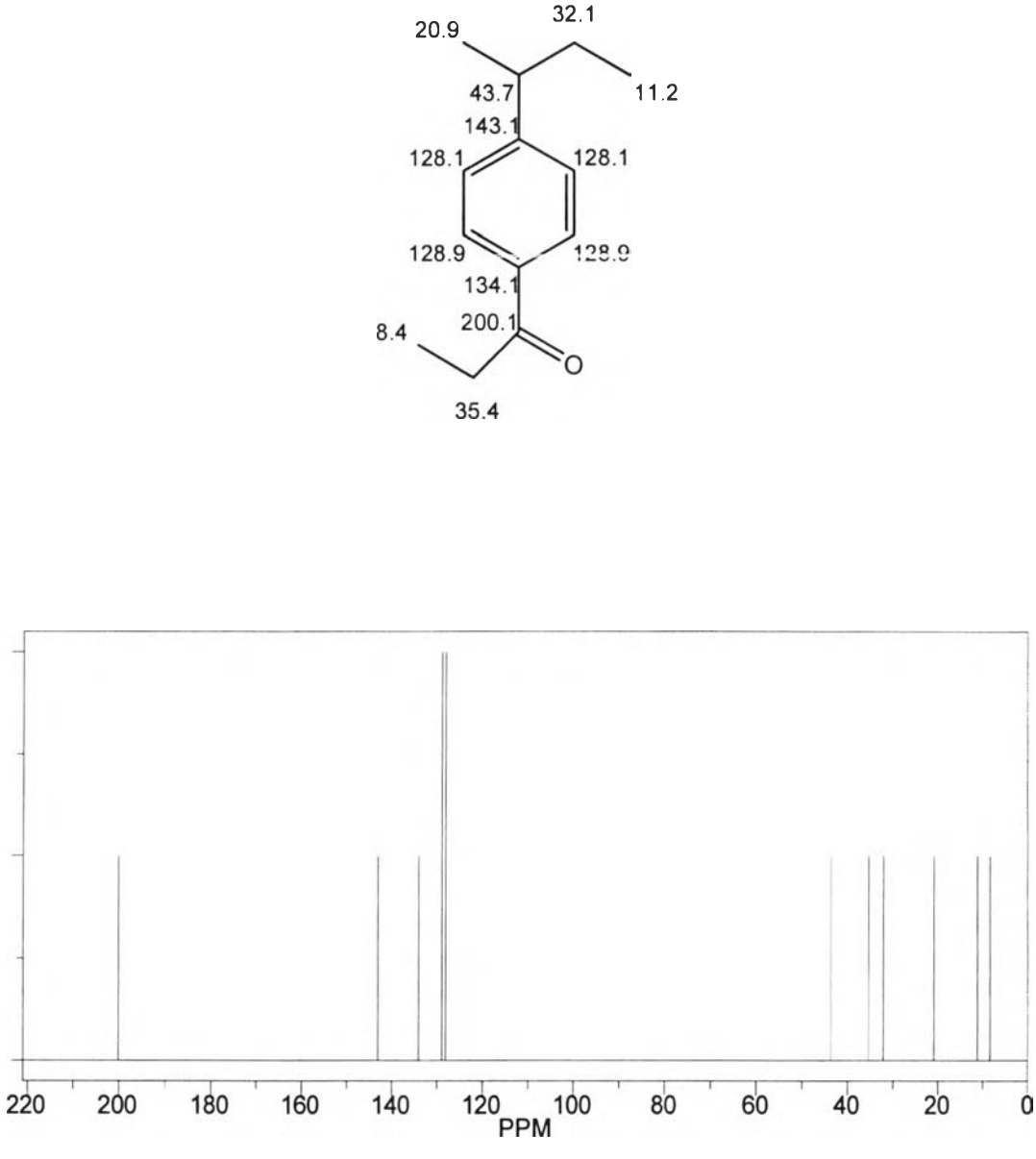



**Figure D6** $^{13}C$ NMR spectra of ring-acylated polystyrene from ChemDraw Ultra 8.0 Program.

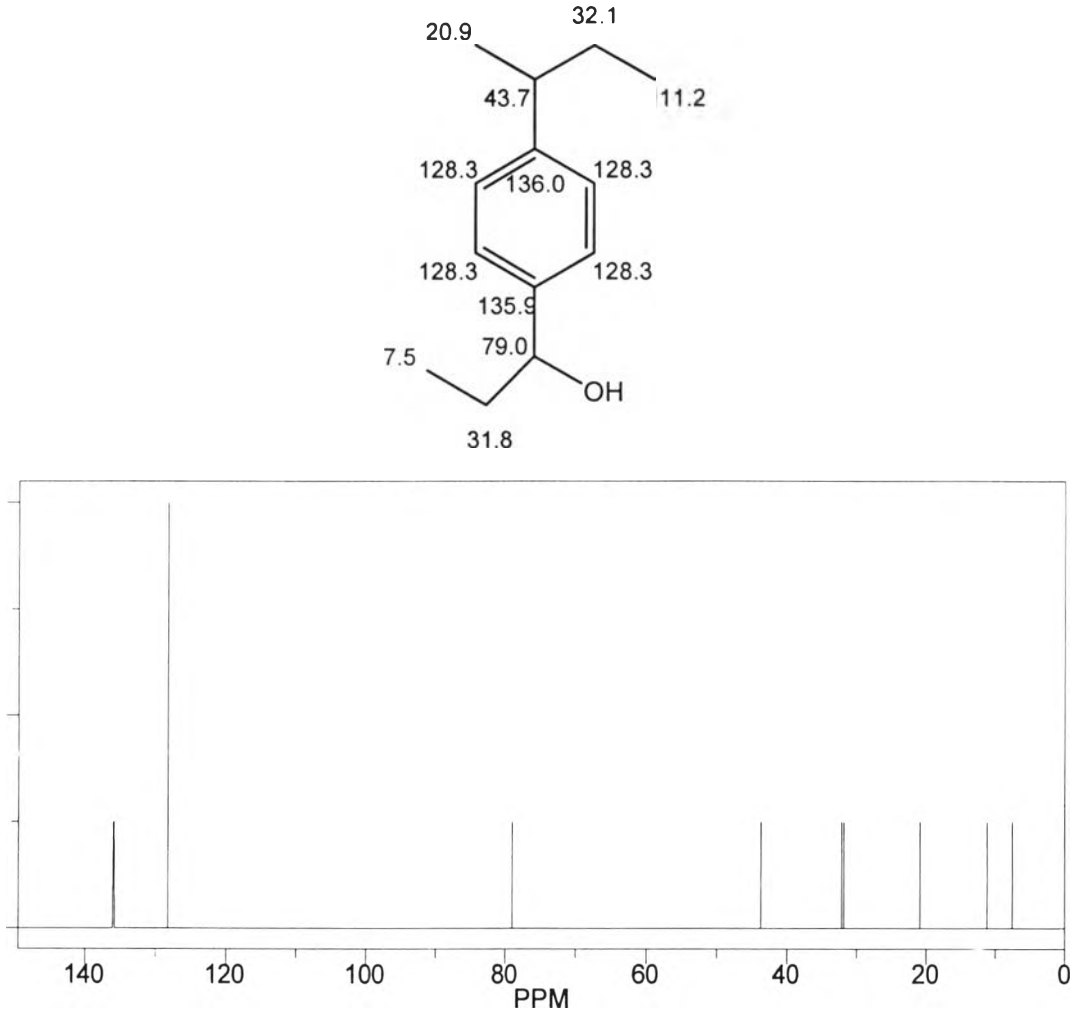



**Figure D7** $^{13}C$ NMR spectra of the polystyrene ring-substituted with 1-hydroxypropyl group from ChemDraw Ultra 8.0 Program.

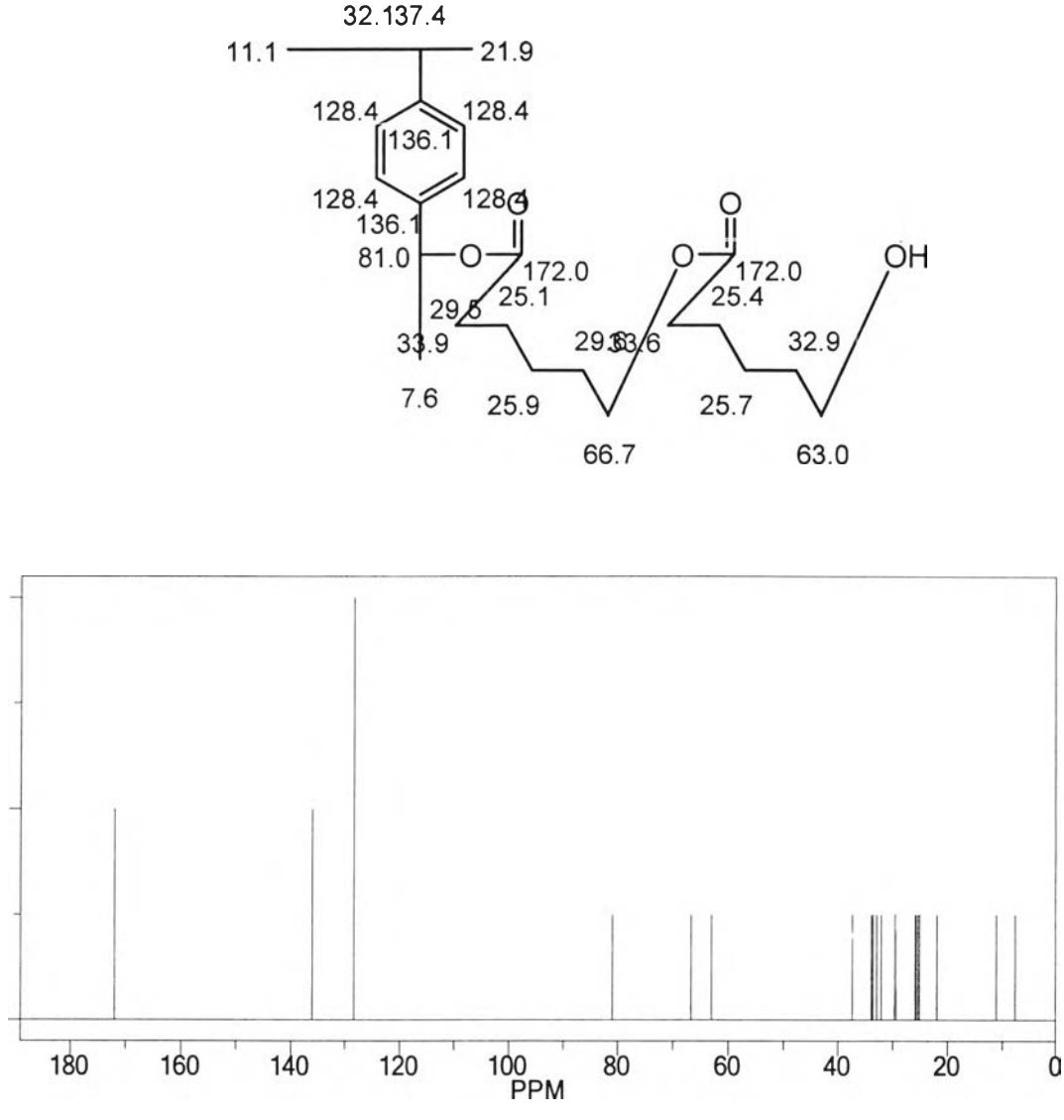
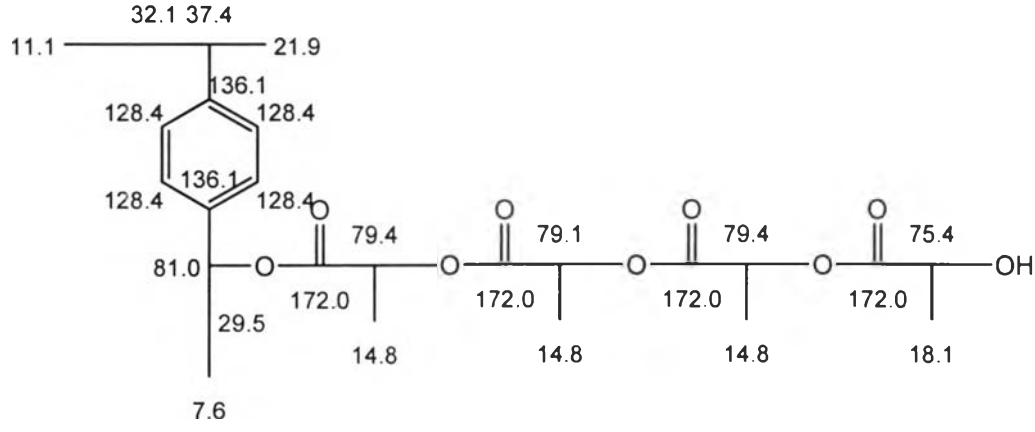



**Figure D8** $^{13}C$ NMR spectra of PS-g-PCL from ChemDraw Ultra 8.0 Program.



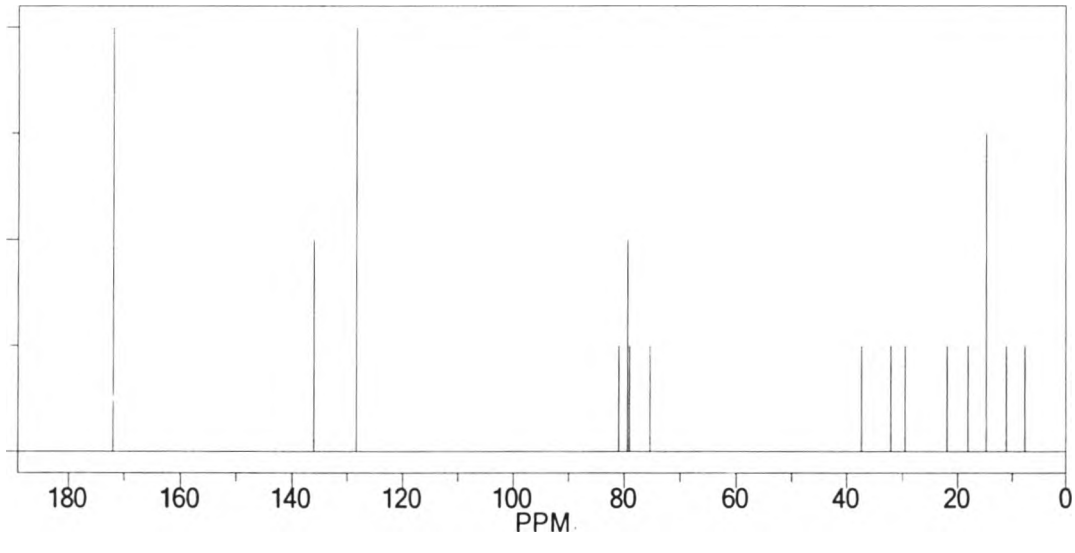




**Figure D9** $^{13}C$ NMR spectra of PS-g-PLA from ChemDraw Ultra 8.0 Program.


**Figure D10** $^{13}C$ NMR spectra of PS-g-Nylon6 from ChemDraw Ultra 8.0 Program.

**APPENDIX E** NMR spectrum of nitrobenzene, PCL, PLA, and Nylon6 from ChemDraw Ultra 8.0 program

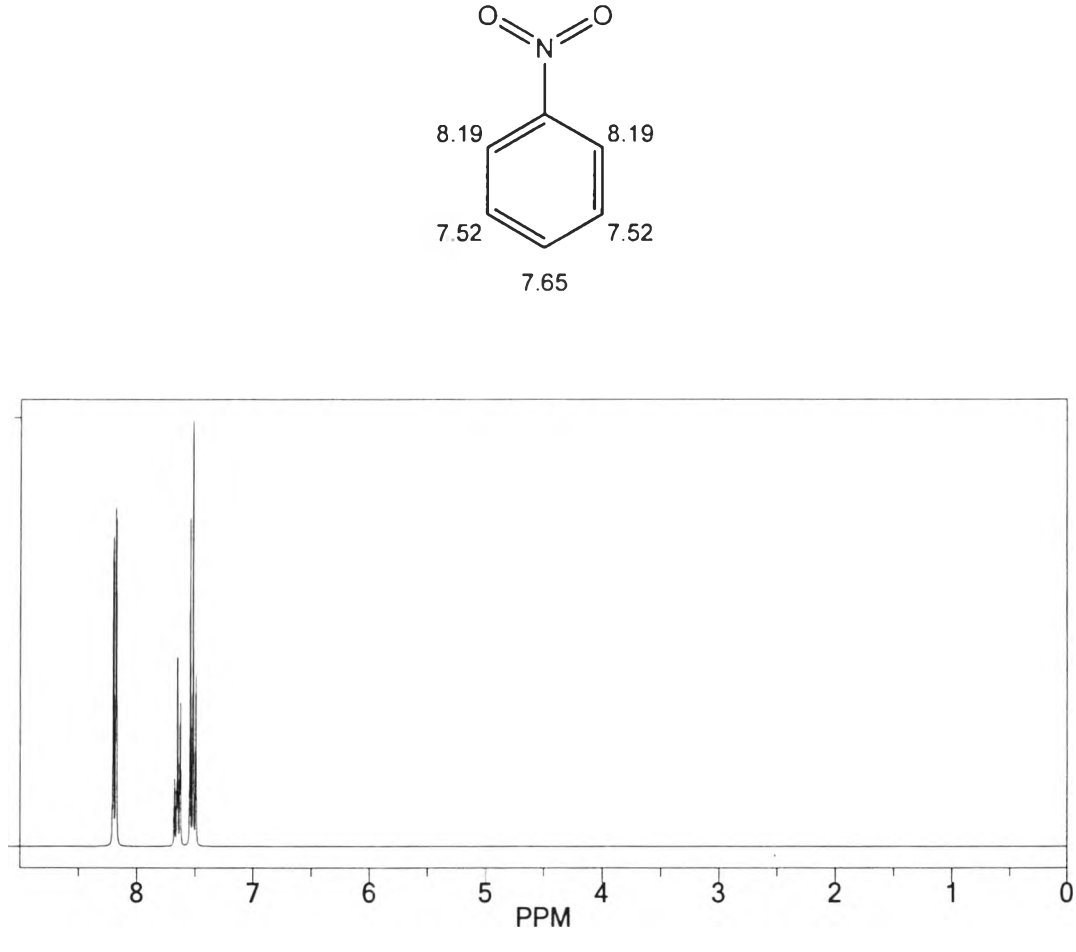



**Figure E1** $^{1}$H NMR spectra of nitrobenzene from ChemDraw Ultra 8.0 Program.

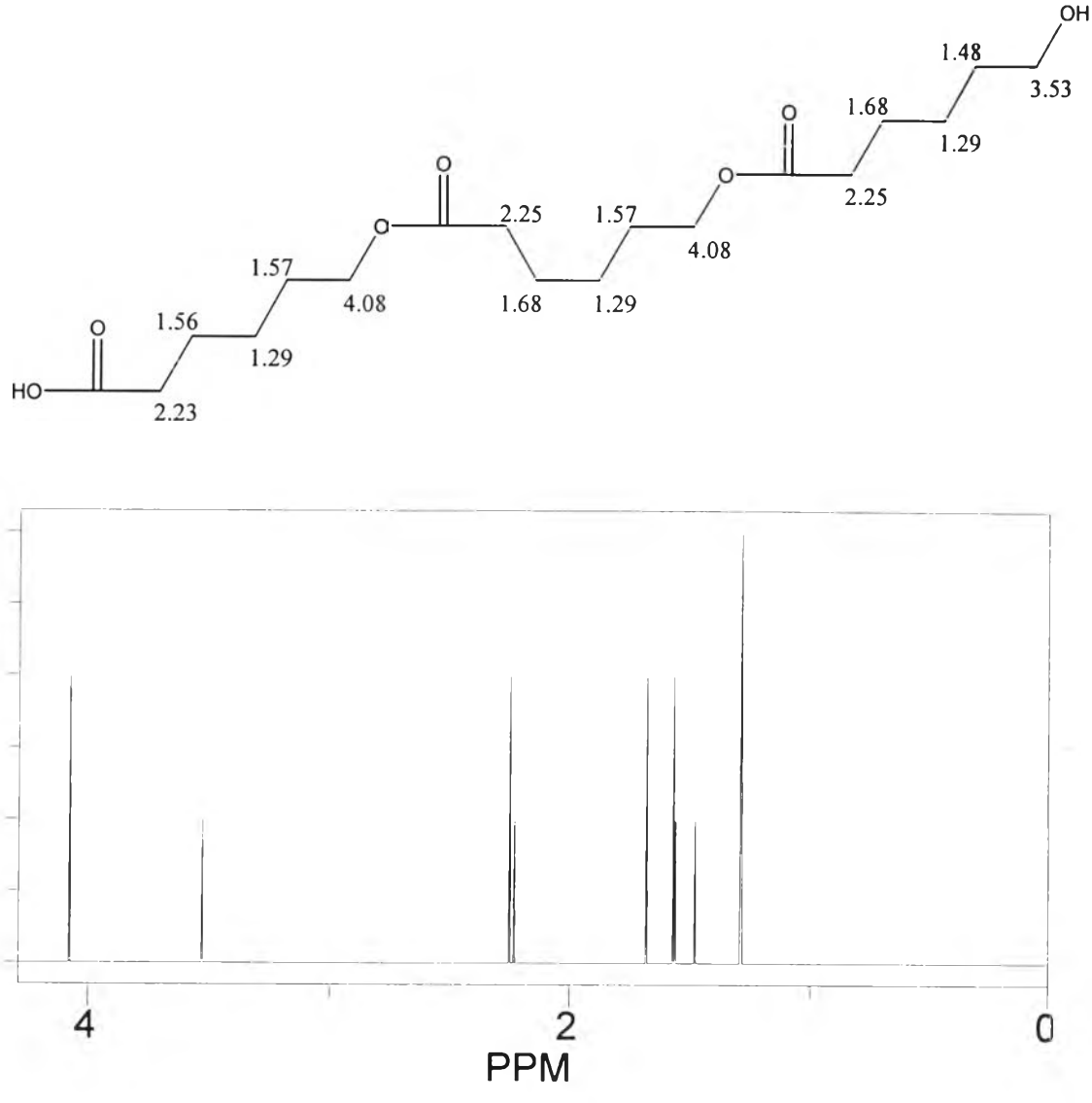
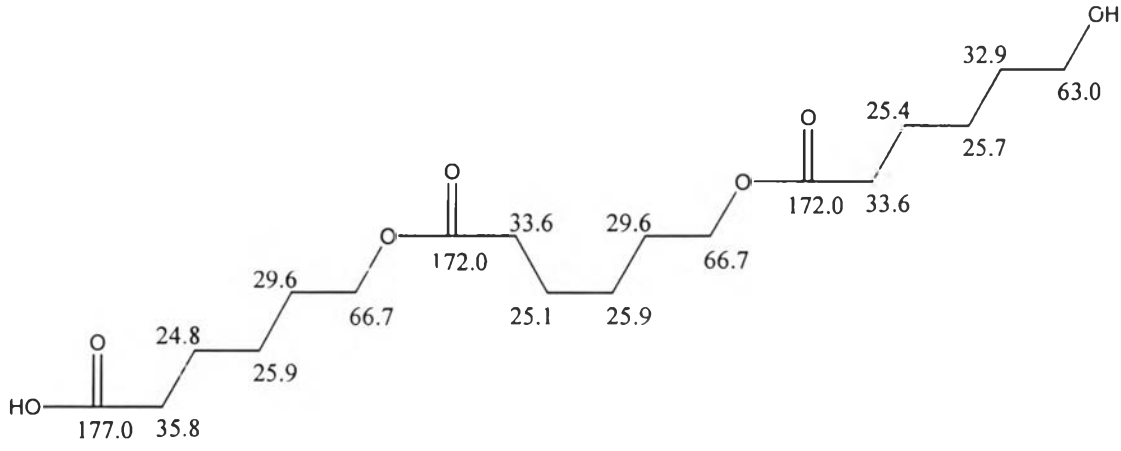



**Figure E2** $^{1}$H NMR spectra of PCL from ChemDraw Ultra 8.0 Program.



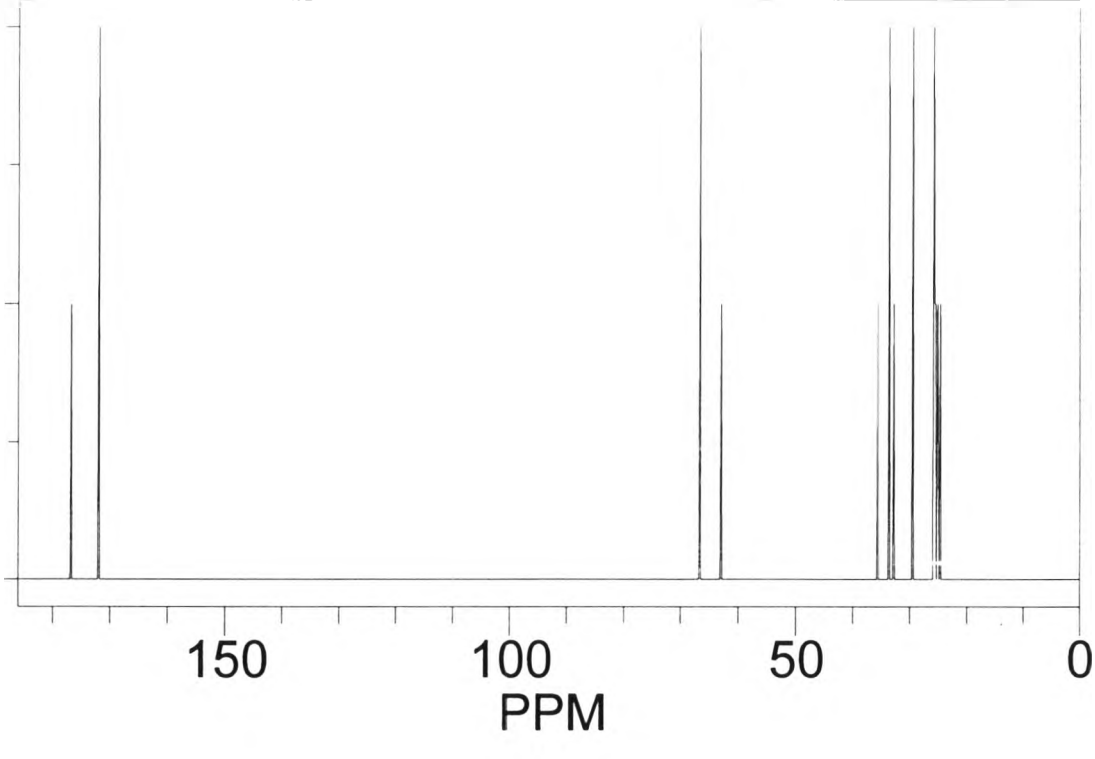




**Figure E3** $^{13}C$ NMR spectra of PCL from ChemDraw Ultra 8.0 Program.

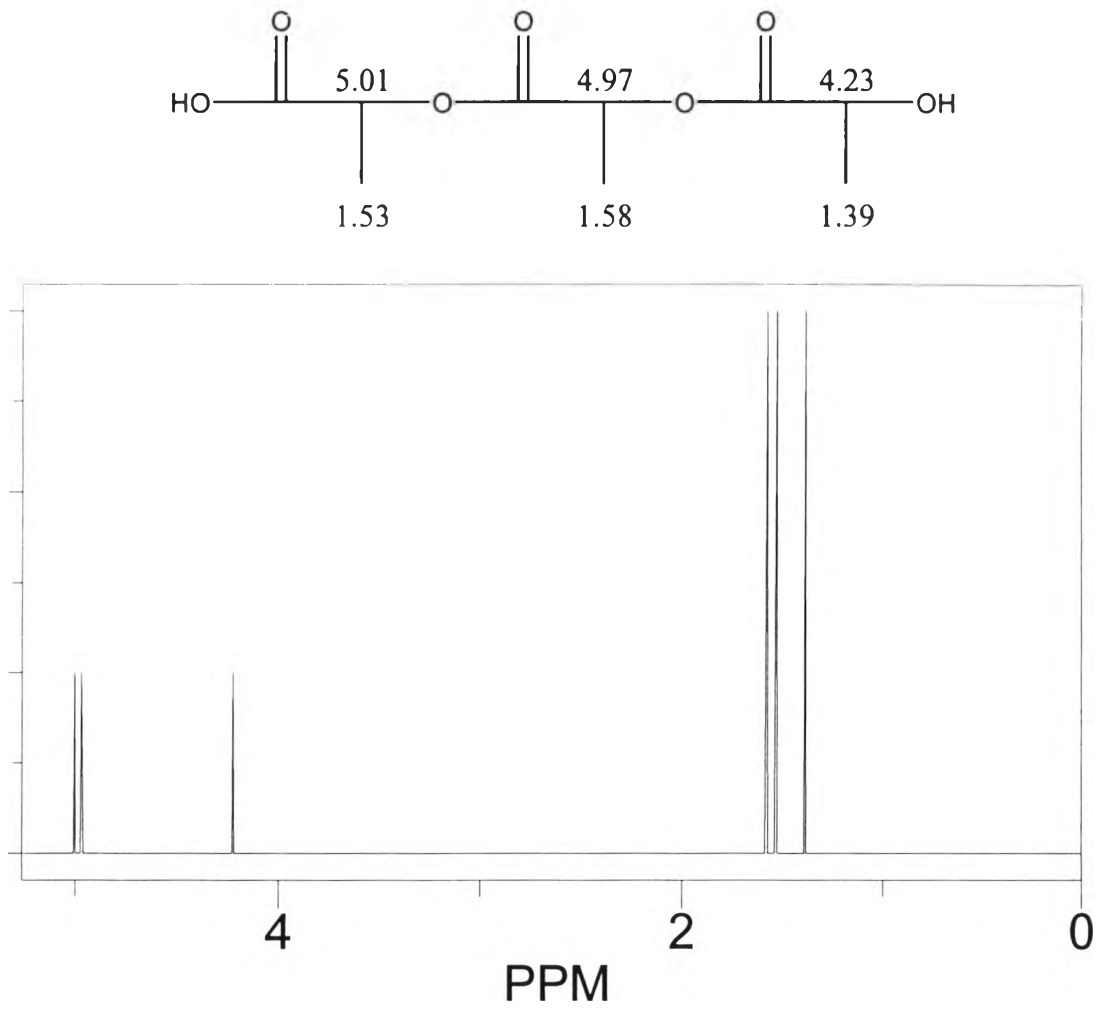



**Figure E4** $^{1}$H NMR spectra of PLA from ChemDraw Ultra 8.0 Program.

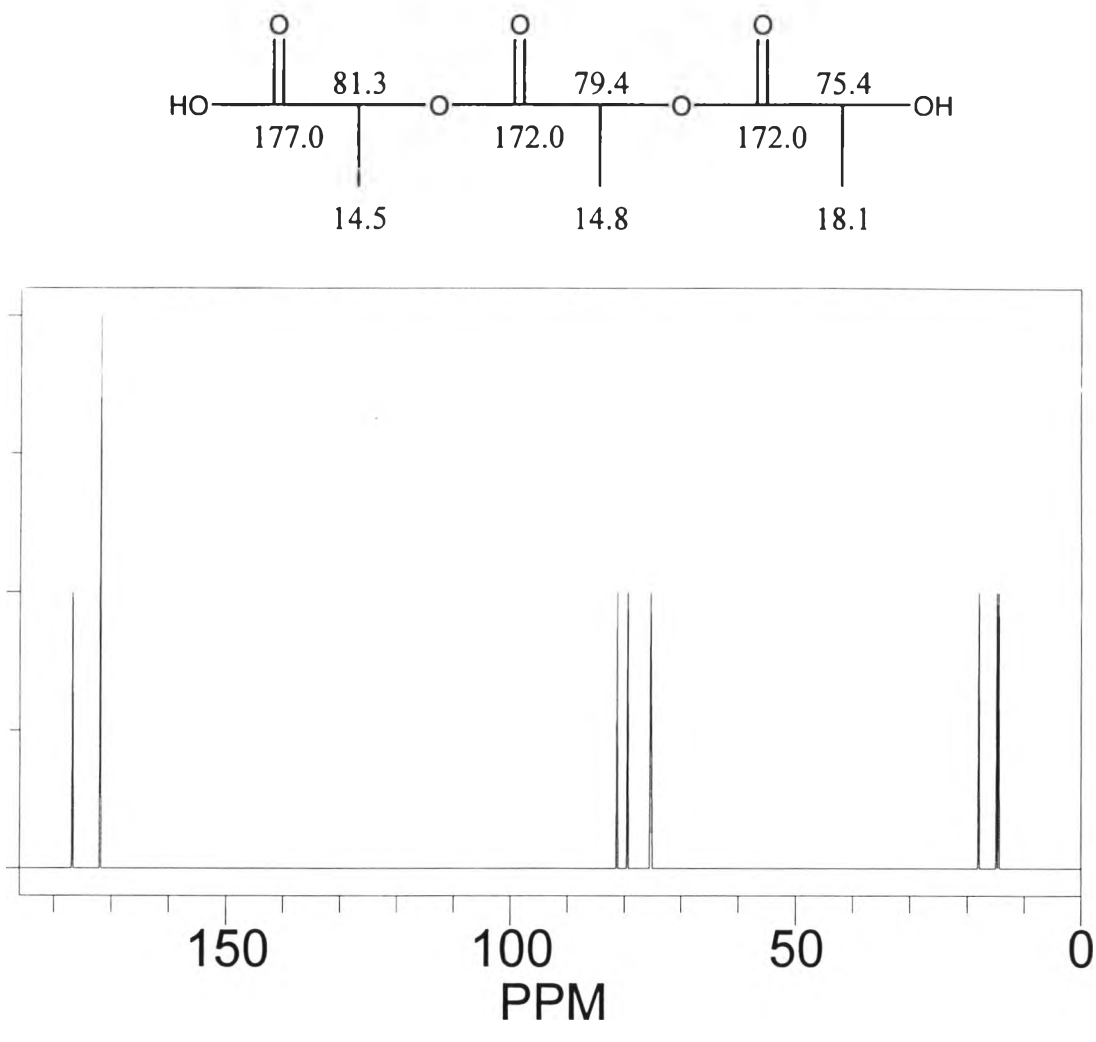



**Figure E5** $^{13}C$ NMR spectra of PLA from ChemDraw Ultra 8.0 Program.

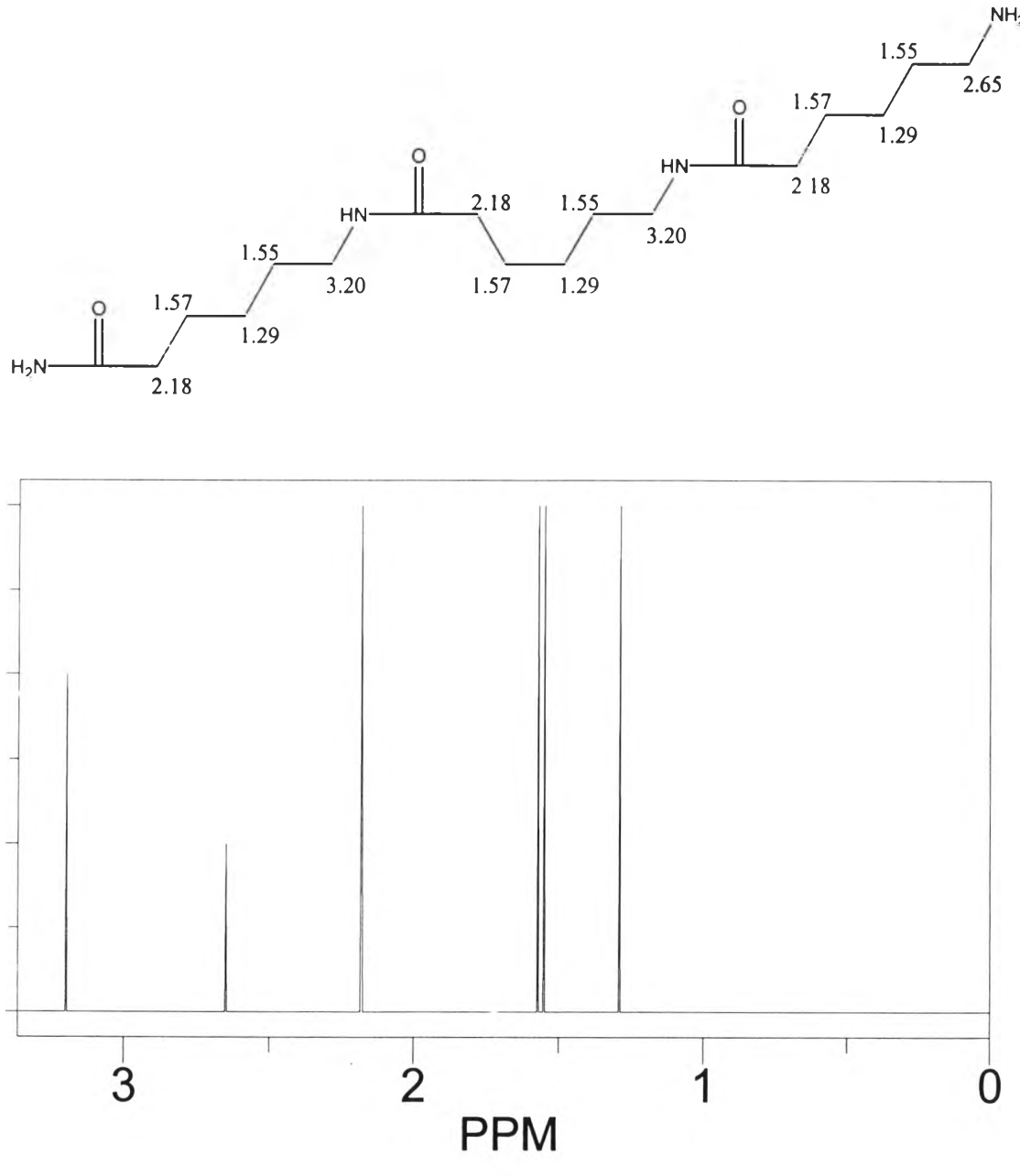
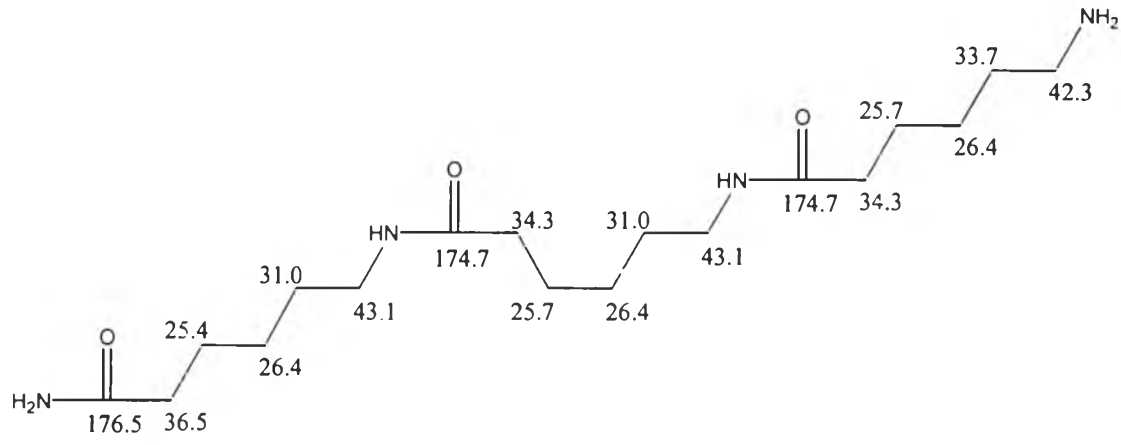



**Figure E6** $^{1}$H NMR spectra of Nylon6 from ChemDraw Ultra 8.0 Program.



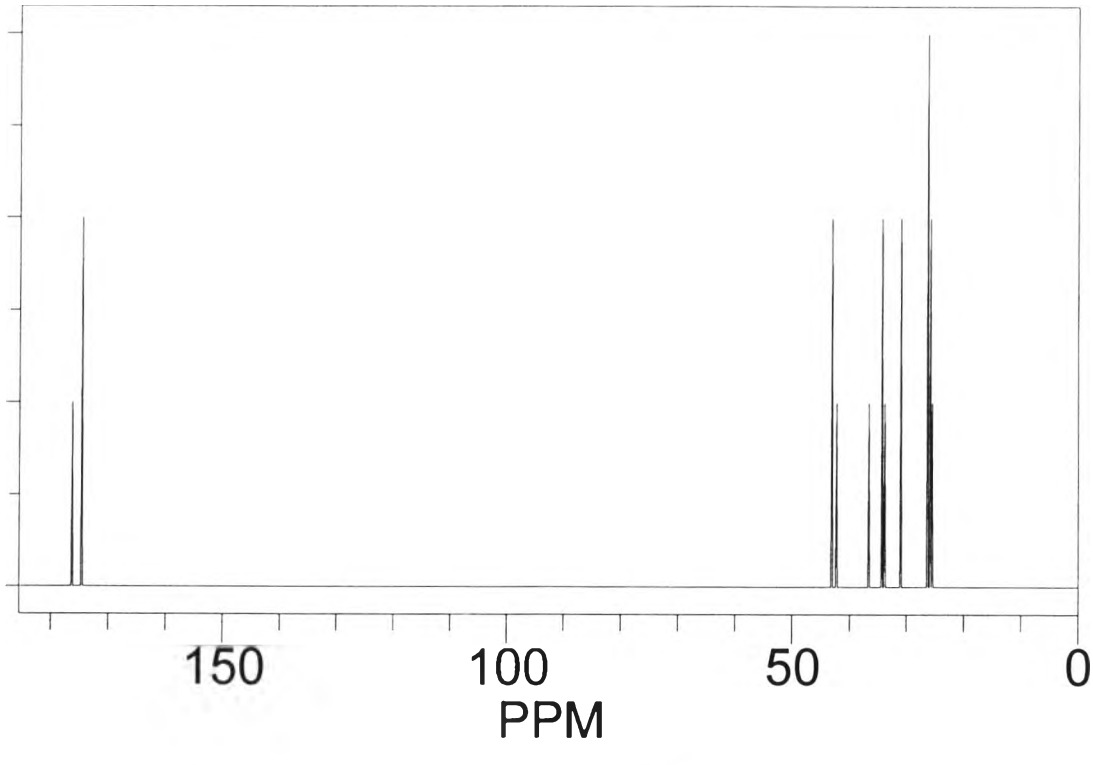
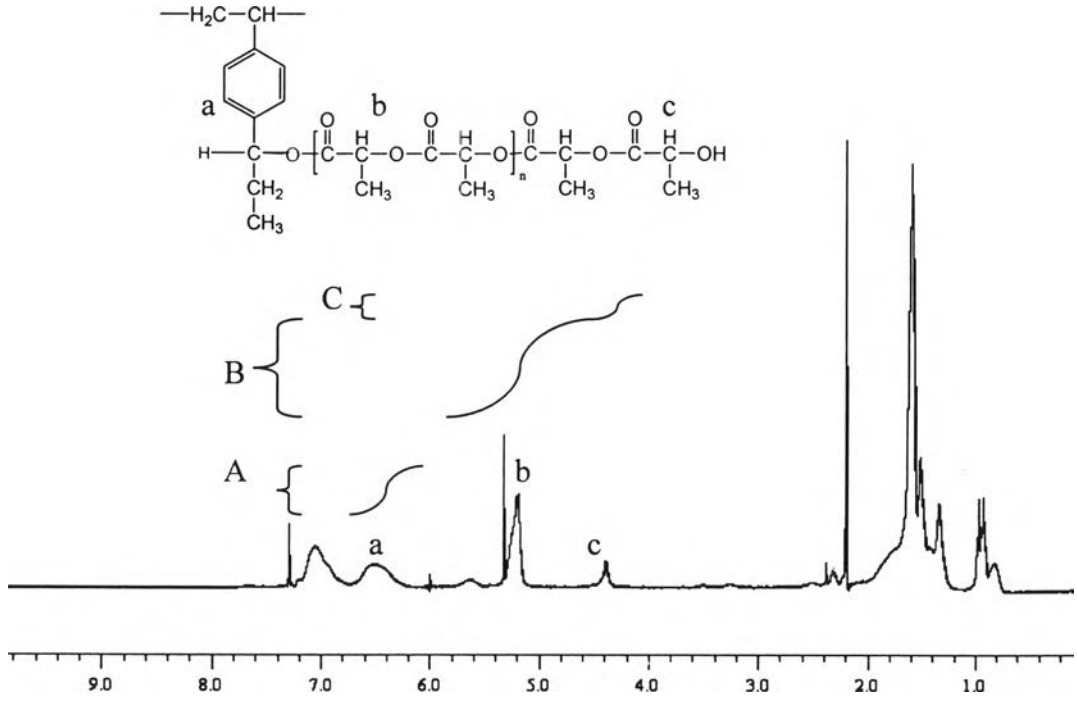




**Figure E7** $^{13}C$ NMR spectra of Nylon6 from ChemDraw Ultra 8.0 Program.

**APPENDIX F** Calculation of grafting percentage and the average length of grafting polymer




Grafting $Ratio_{NMR}$ (%mole) =

$$\frac{[0.25 \times (\text{Characteristic peak height})_{\text{grafted polymer}} \times (\text{proton No.})_{\text{grafted polymer}}]}{(\text{Characteristic peak height})_{PS} \times (\text{proton No.})_{PS}} \times 100\%$$

$$= \frac{0.25 \times A \times 2}{B \times 1} \times 100\% \qquad \text{(0.25 is degree of substituted)}$$

$$\text{Number of monomer in a grafting polymer chain} = \frac{\text{Height of specific peak of proton in grafting polymer chain}}{\text{Height of specific peak of proton at end grafting polymer chai}}$$

$$= \frac{B}{C}$$

**Figure F1** Calculation of grafting percentage and the average length of grafting polymer from $^1H$ NMR spectrum of PS-g-PLA in ratio 1:2.

**APPENDIX G** UV-Vis absorption spectrum of nitrobenzene

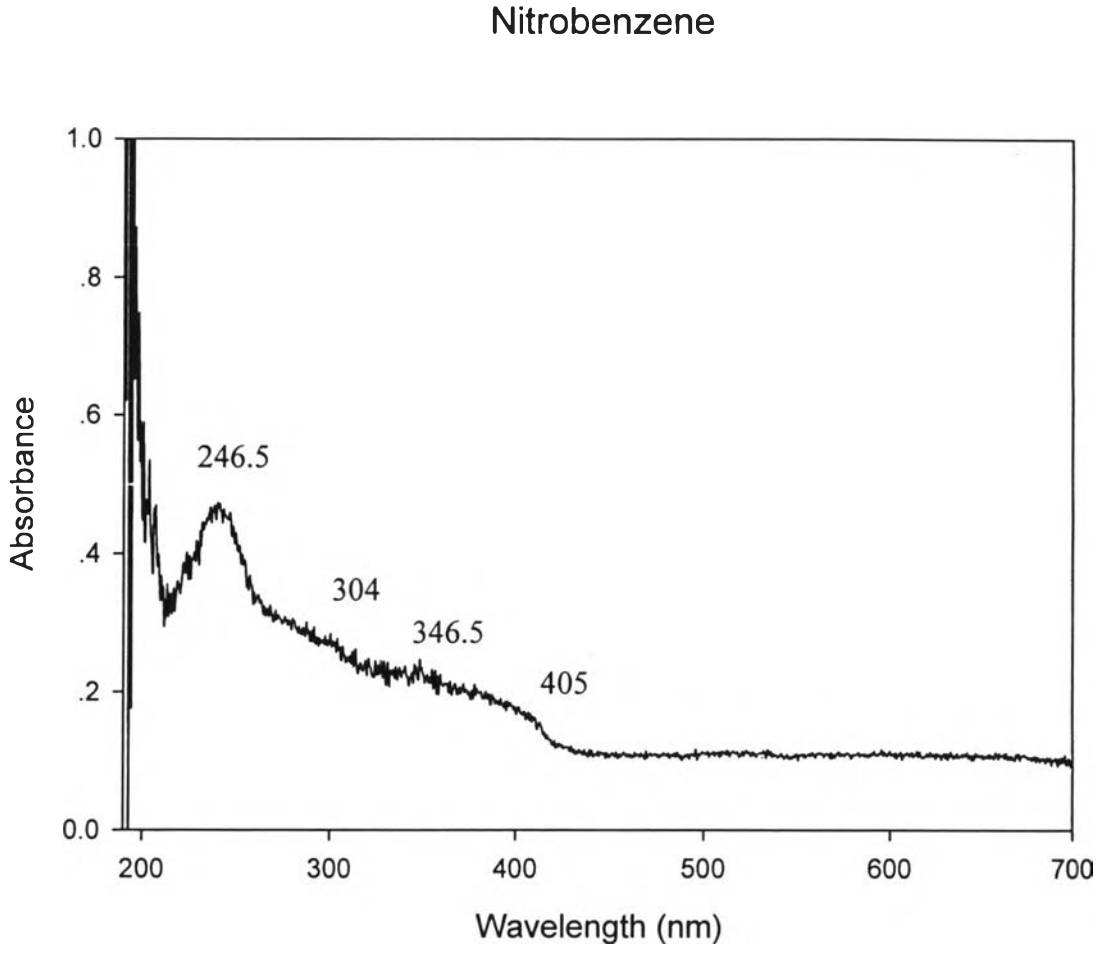
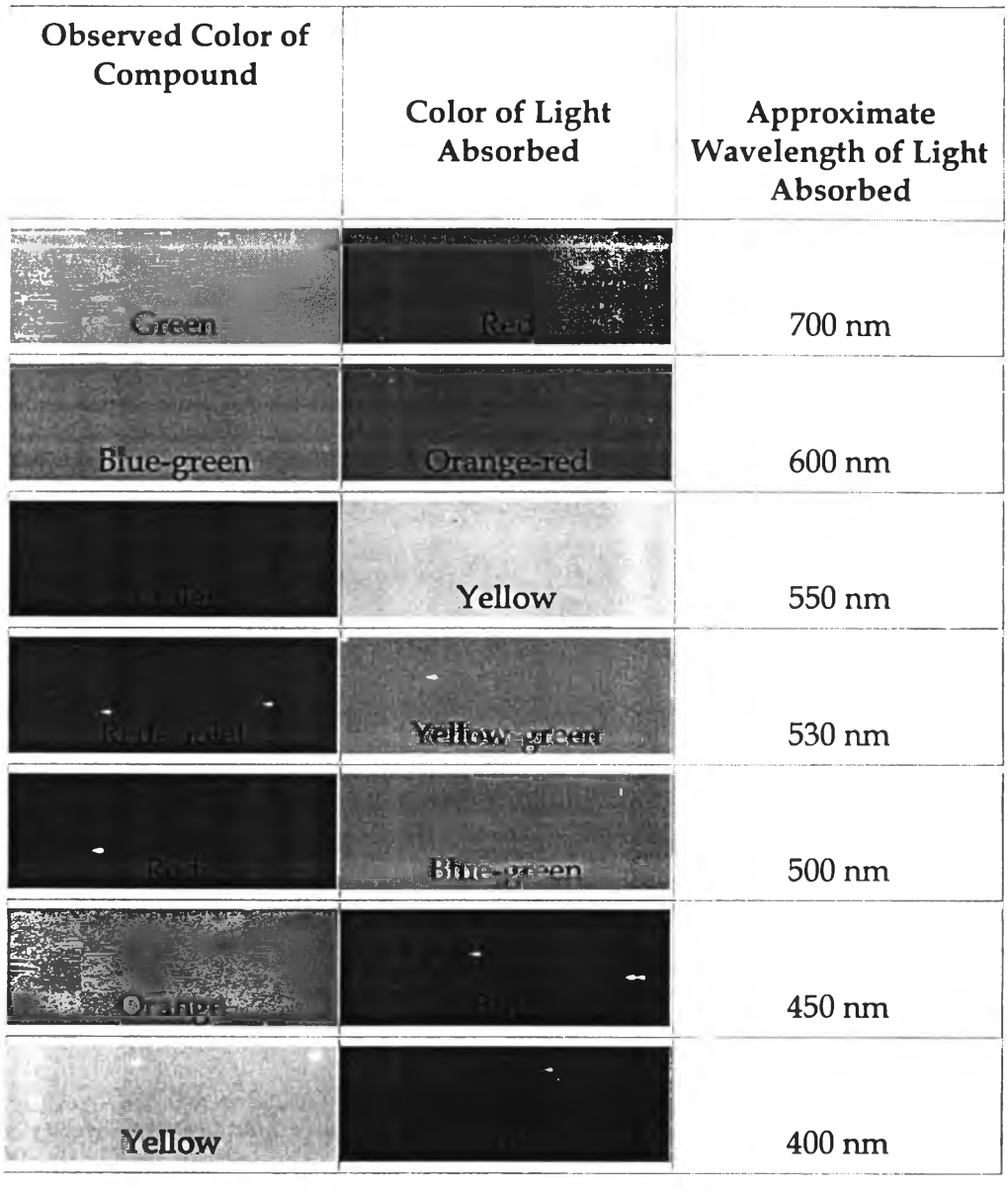



**Figure G1** UV-Vis absorption spectrum of nitrobenzene.

**APPENDIX H** Table of wavelength absorption and observed color of compound



| Observed Color of Compound | Color of Light Absorbed | Approximate Wavelength of Light Absorbed |
|---|---|---|
| Green | Red | 700 nm |
| Blue-green | Orange-red | 600 nm |
| [illegible] | Yellow | 550 nm |
| [illegible] | Yellow-green | 530 nm |
| [illegible] | Blue-green | 500 nm |
| Orange | [illegible] | 450 nm |
| Yellow | [illegible] | 400 nm |

**Figure H1** Table of wavelength absorption and observed color of compound.

**APPENDIX I** Degradation of side chain polymer

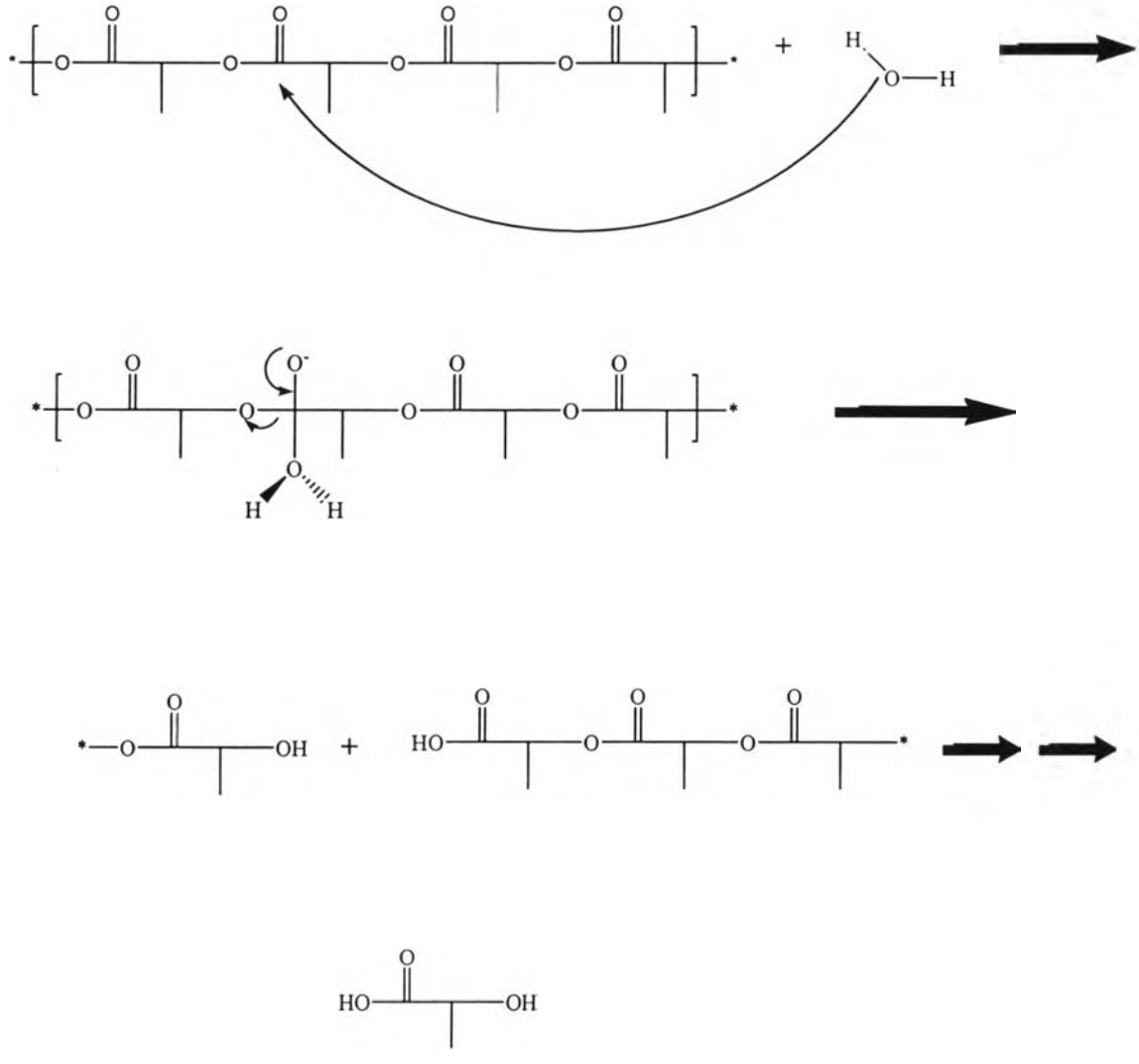



**Figure I1** Degradation of a polyester (polylactide) by hydrolytic scission of the main chain ester bonds.

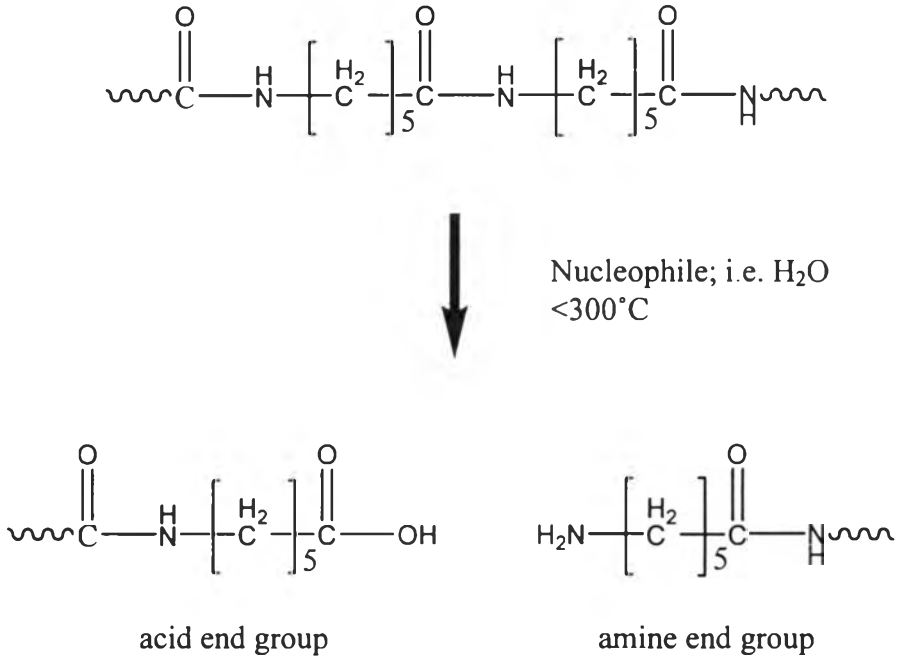



**Figure I2** Dominant nylon6 is in the presence of a nucleophile, such as water.

**APPENDIX J** TG-DTA curve of PS

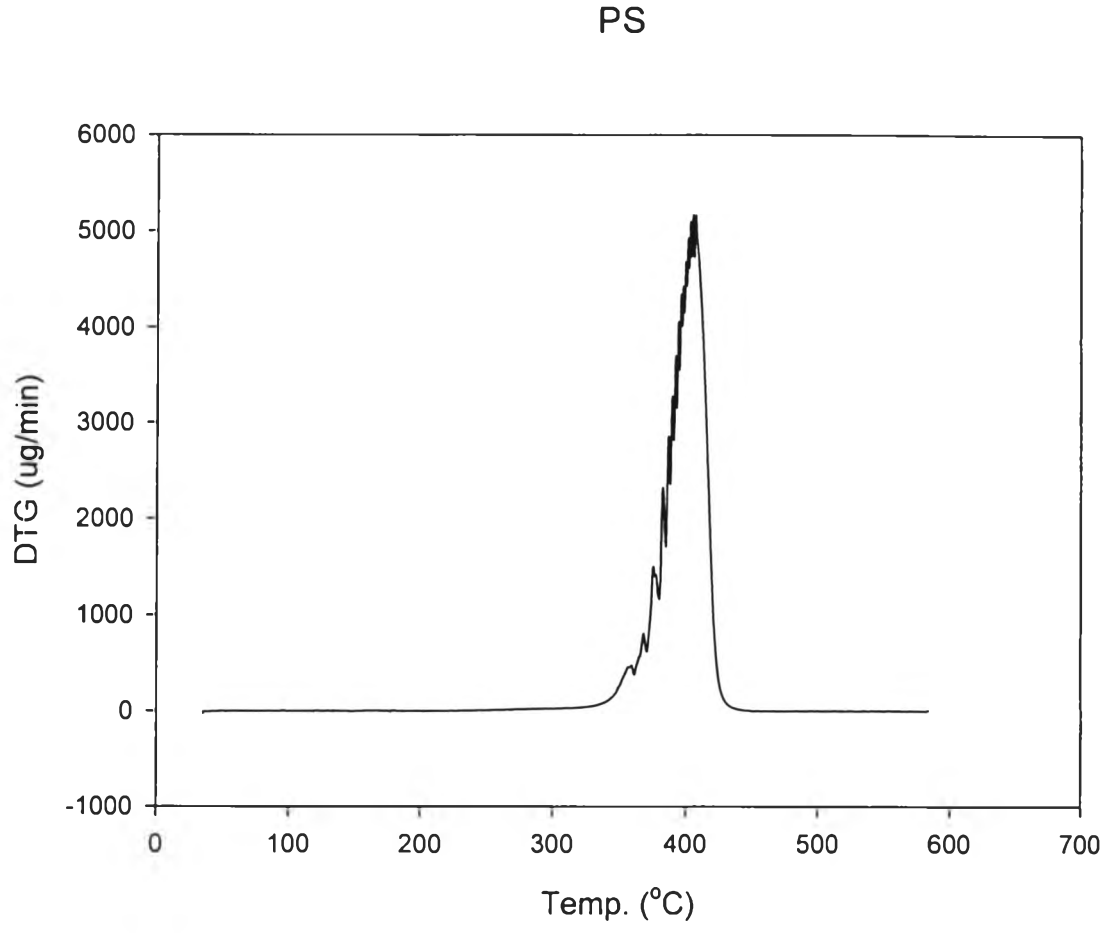



**Figure J1** TG-DTA curve of PS.

# CURRICULUM VITAE

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