Supporting Information for

Three-Component Polycondensation of Bis(diazoketone) with Dicarboxylic Acids and Cyclic Ethers: Synthesis of New Type of Polyesteretherketones

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14. Polymer **8f**.

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1. Compound **6**.

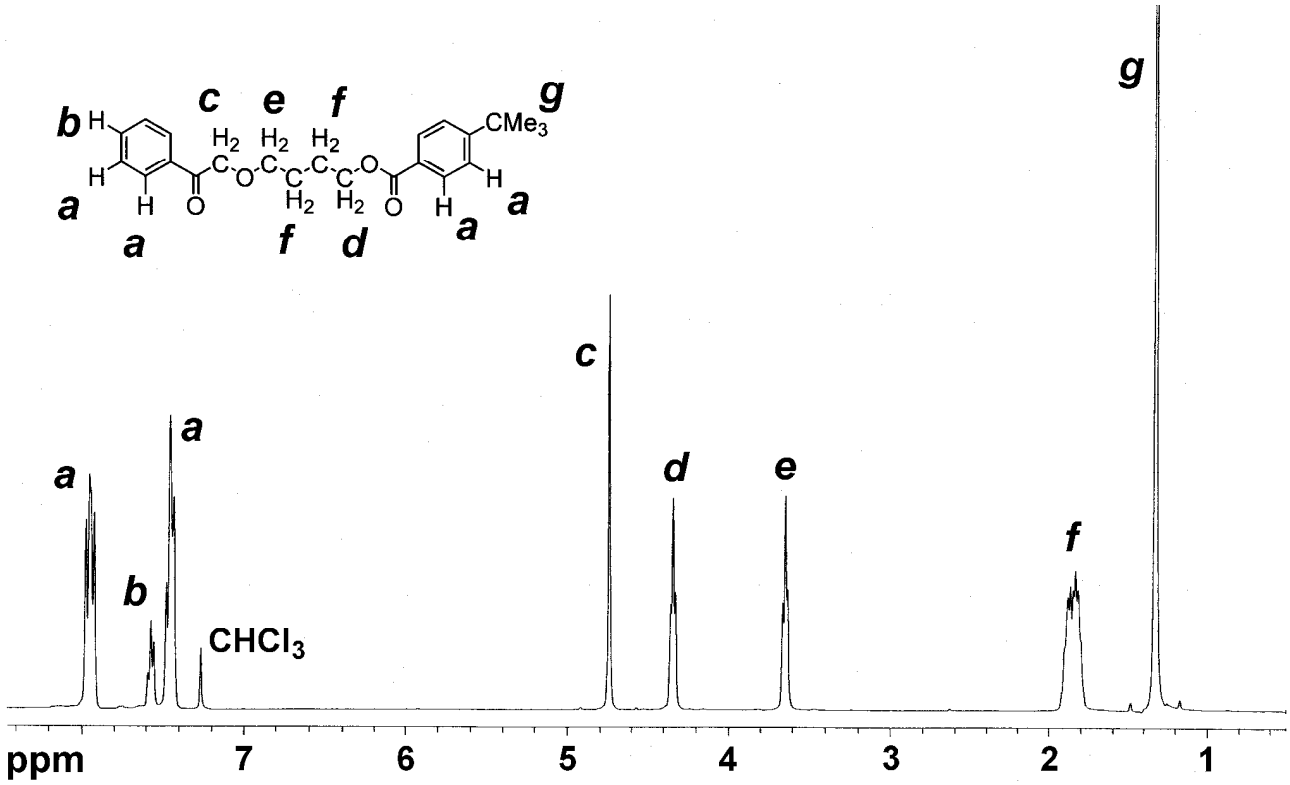

Figure S1. ^{1}H NMR spectrum for **6**.

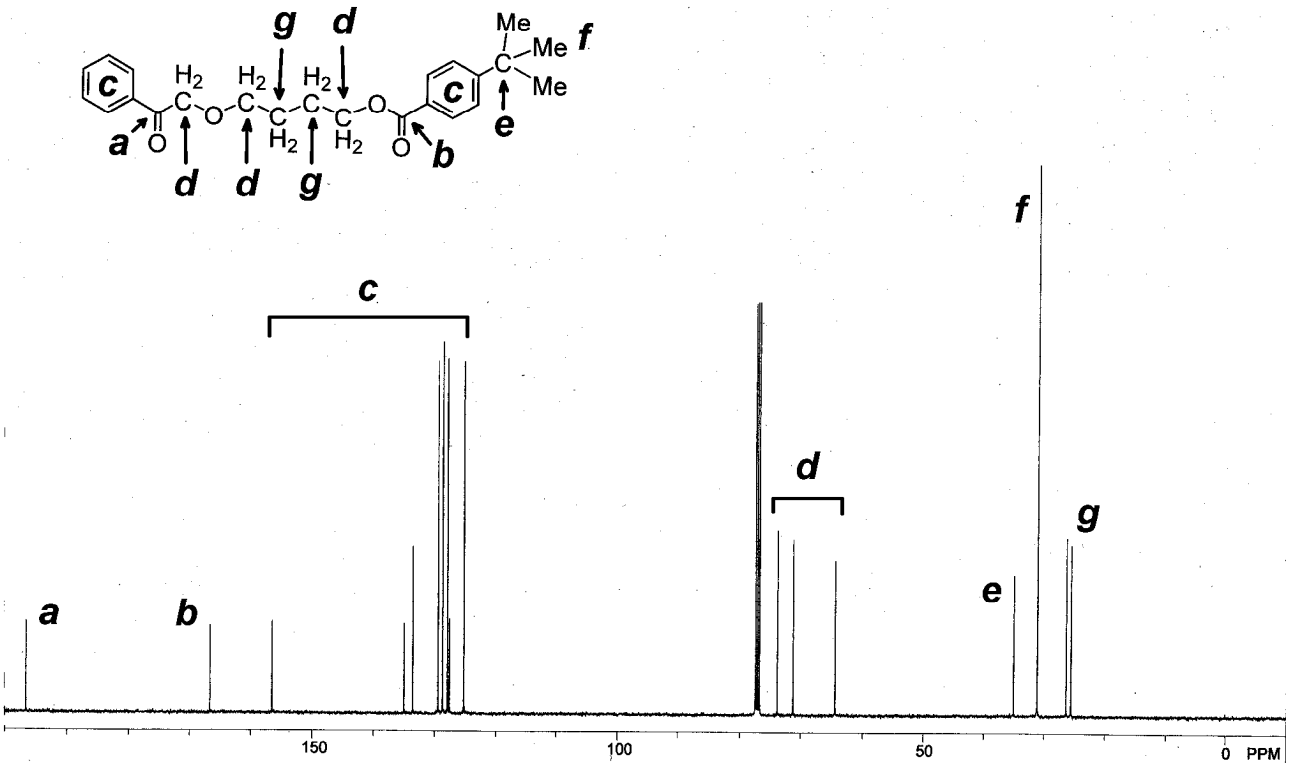

Figure S2. ^{13}C NMR spectrum for **6**.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.98-7.93 (m, 4H, *o*- or *m*-Ph[-*H*], *o*- or *m*-Ph[-*H*]-*t*Bu), 7.57 (t, *J* = 7.2 Hz, 1H, *p*-Ph[-*H*]), 7.46 (m, 4H, *o*- or *m*-Ph[-*H*], *o*- or *m*-Ph[-*H*]-*t*Bu), 4.75 (s, 2H, -O-C*H*$_2$-[C=O]-), 4.34 (t, *J* = 6.0 Hz, 2H, -[C=O]-O-C*H*$_2$-), 3.65 (t, *J* = 6.4 Hz, 2H, -C*H*$_2$-O-CH$_2$-[C=O]-), 1.89-1.82 (m, 4H, -O-CH$_2$-[C*H*$_2$]$_2$-CH$_2$-O-), 1.33 (s, 9H, -C[C*H*$_3$]$_3$).

^{13}C NMR(100MHz, $CDCl_3$) δ 196.6 (-O-CH$_2$-[*C*=O]-), 166.6 (-[*C*=O]-O-), 156.5 (Ph), 135.0 (Ph), 133.5 (Ph), 129.4 (Ph), 128.7 (Ph), 127.9 (Ph), 127.6 (Ph), 125.3 (Ph), 73.8 (-O-*C*H$_2$-), 71.3 (-O-*C*H$_2$-), 64.5 (-O-*C*H$_2$-), 35.1 (-*C*Me$_3$), 31.1 (-C[*C*H$_3$]$_3$), 26.3(-O-CH$_2$-*C*H$_2$-), 25.5 (-O-CH$_2$-*C*H$_2$-).

Anal Calcd for $C_{23}H_{28}O_4 \cdot 0.4H_2O$:C, 73.53; H, 7.51. Found: C, 73.23; H, 7.17.

2. Compound **7**.

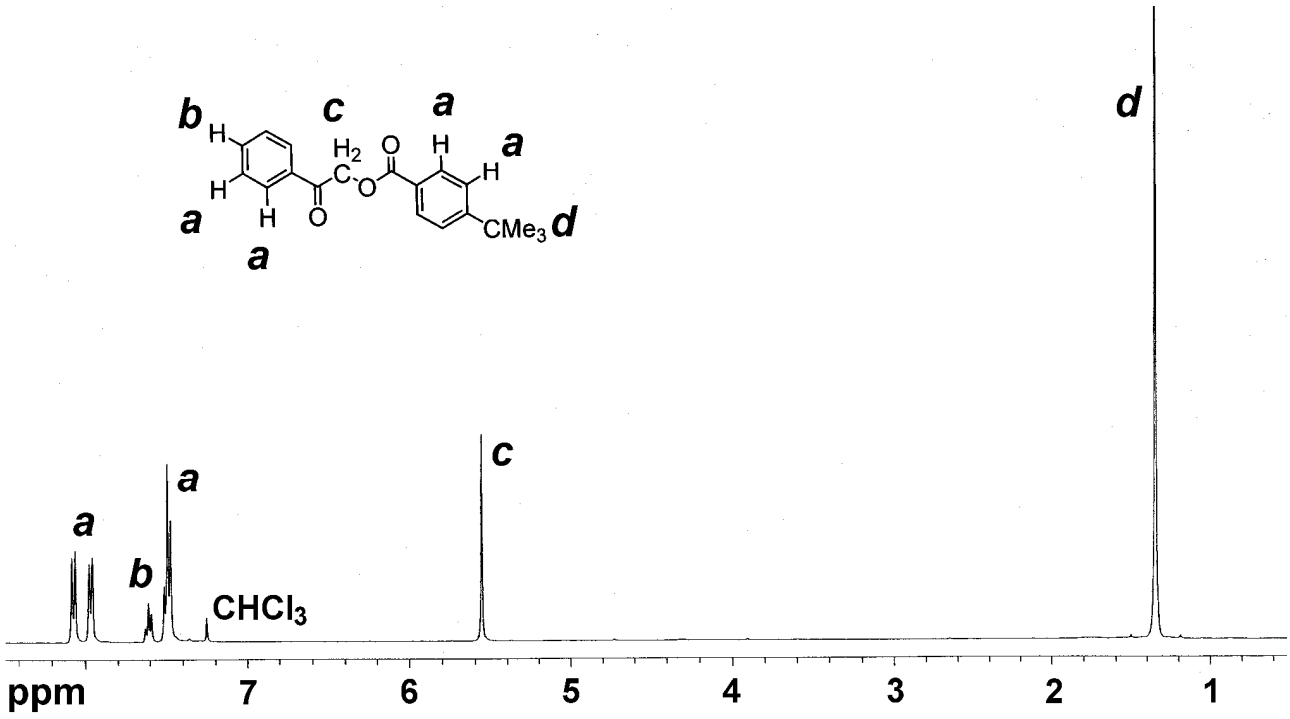

Figure S3. ^{1}H NMR spectrum for **7**.

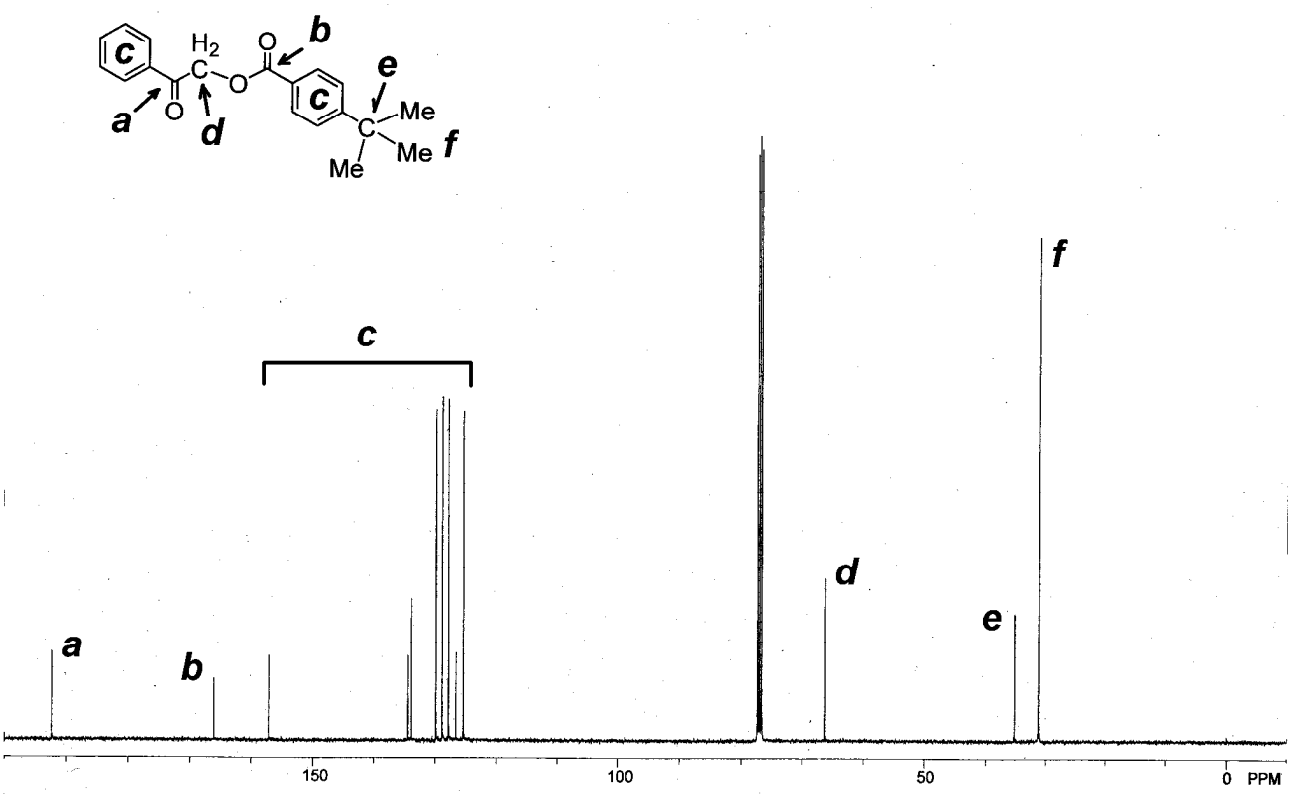

Figure S4. ^{13}C NMR spectrum for **7**.

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.06 (d, *J* = 8.4 Hz, 2H, *o*- or *m*-Ph[-*H*] or *o*- or *m*-Ph[-*H*]-*t*Bu), 7.96 (d, *J* = 7.6 Hz, 2H, *o*- or *m*-Ph[-*H*] or *o*- or *m*-Ph[-*H*]-*t*Bu), 7.61 (t, *J* = 6.4 Hz, 1H, *p*-Ph[-*H*]), 7.52-7.48 (m, 4H, *o*- or *m*-Ph[-*H*], *o*- or *m*-Ph[-*H*]-*t*Bu), 5.56 (s, 2H, -O-CH_2-[C=O]-), 1.35 (s, 9H, -C[CH_3]$_3$).

^{13}C NMR (100MHz, $CDCl_3$) δ 192.3 (-O-CH_2-[*C*=O]-), 166.1 (-[*C*=O]-O-), 157.1 (Ph), 134.4 (Ph), 133.9 (Ph), 129.9 (Ph), 128.9 (Ph), 127.9 (Ph), 126.6 (Ph), 125.5 (Ph), 66.4 (-O-*C*H_2-), 35.2 (-*C*Me_3), 31.1 (-C[*C*H_3]$_3$).

Anal Calcd for $C_{19}H_{20}O_3$: 77.00; H, 6.80. Found: C, 76.70; H, 7.00.

3. Compound **9**.

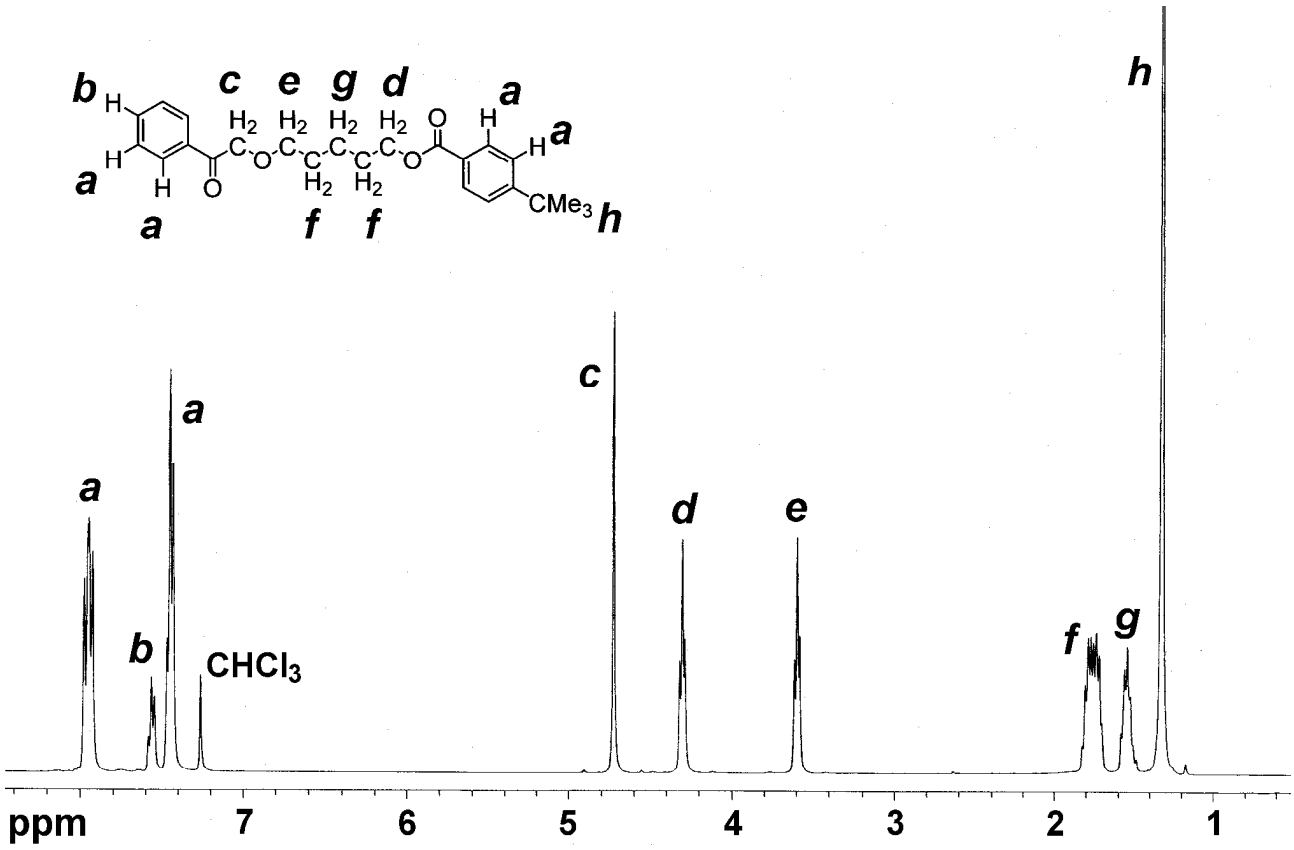

Figure S5. ^{1}H NMR spectrum for **9**.

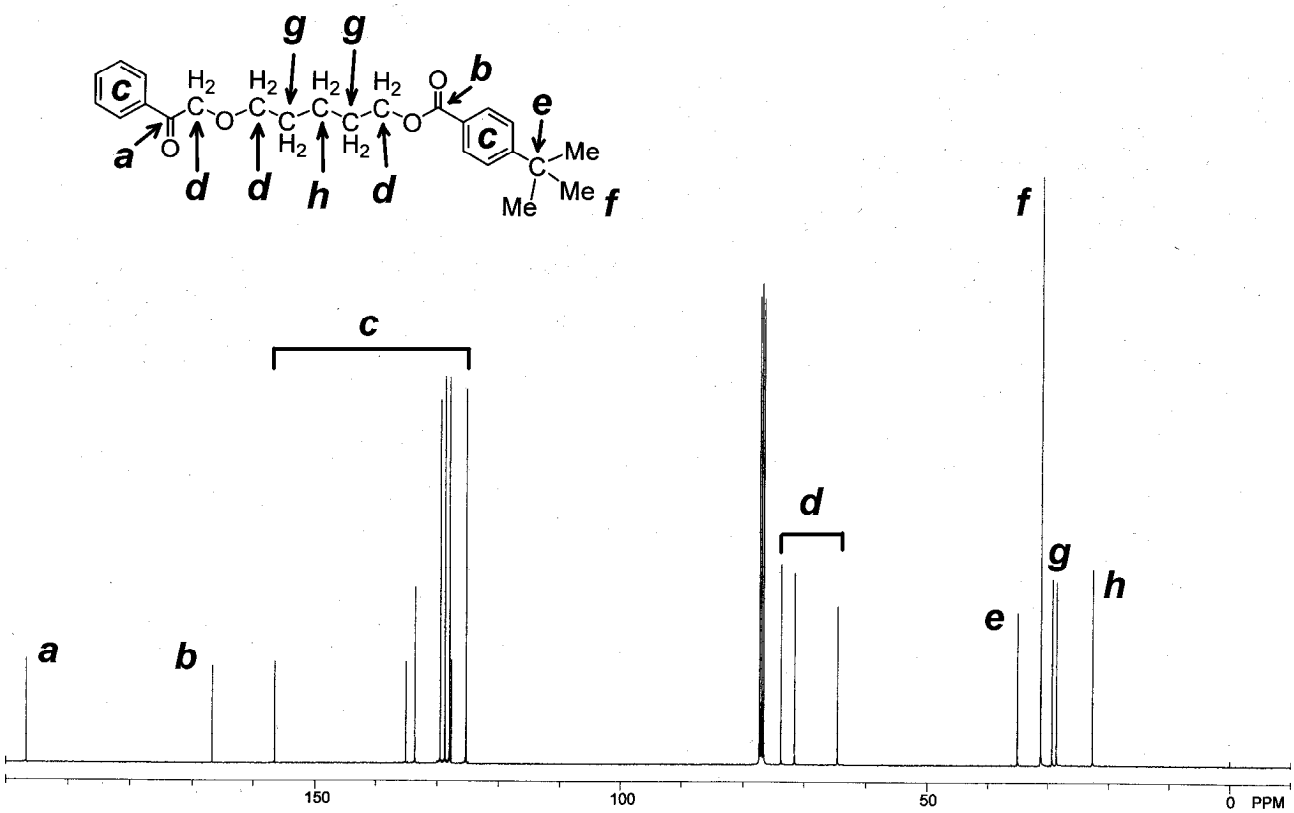

Figure S6. ^{13}C NMR spectrum for **9**.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.98-7.93 (m, 4H, *o*- or *m*-Ph[-*H*], *o*- or *m*-Ph[-*H*]-*t*Bu), 7.57 (t, *J* = 6.8 Hz, 1H, *p*-Ph[-*H*]), 7.46 (t, *J* = 6.8 Hz, 4H, *o*- or *m*-Ph[-*H*], *o*- or *m*-Ph[-*H*]-*t*Bu), 4.73 (s, 2H, -O-C*H*$_2$-[C=O]-), 4.31 (t, *J* = 6.4 Hz, 2H, -[C=O]-O-C*H*$_2$-), 3.60 (t, *J* = 6.8 Hz, 2H, -C*H*$_2$-O-CH$_2$-[C=O]-), 1.82-1.71 (m, 4H, -O-CH$_2$-C*H*$_2$-CH$_2$-C*H*$_2$-CH$_2$-O-), 1.51 (m, 2H, -O-[CH$_2$]$_2$-C*H*$_2$-[CH$_2$]$_2$-O-), 1.33 (s, 9H, -C[C*H*$_3$]$_3$).

^{13}C NMR (100MHz, $CDCl_3$) δ 196.7 (-O-CH$_2$-[*C*=O-]-), 166.7 (-[*C*=O]-O-), 156.5 (Ph), 135.0 (Ph), 133.5 (Ph), 129.4 (Ph), 128.7 (Ph), 128.0 (Ph), 127.7 (Ph), 125.3 (Ph), 73.9 (-O-*C*H$_2$-), 71.6 (-O-*C*H$_2$-), 64.7 (-O-*C*H$_2$-), 35.1 (-*C*Me$_3$), 31.2 (-C[*C*H$_3$]$_3$), 29.3 (-O-CH$_2$-*C*H$_2$-), 28.6 (-O-CH$_2$-*C*H$_2$-), 22.7 (-O-CH$_2$-CH$_2$-*C*H$_2$-CH$_2$-CH$_2$-O-).

Anal Calcd for $C_{24}H_{30}O_4$: C, 75.36; H, 7.91. Found: C, 74.92; H, 7.93.

4. Polymer **3a**.

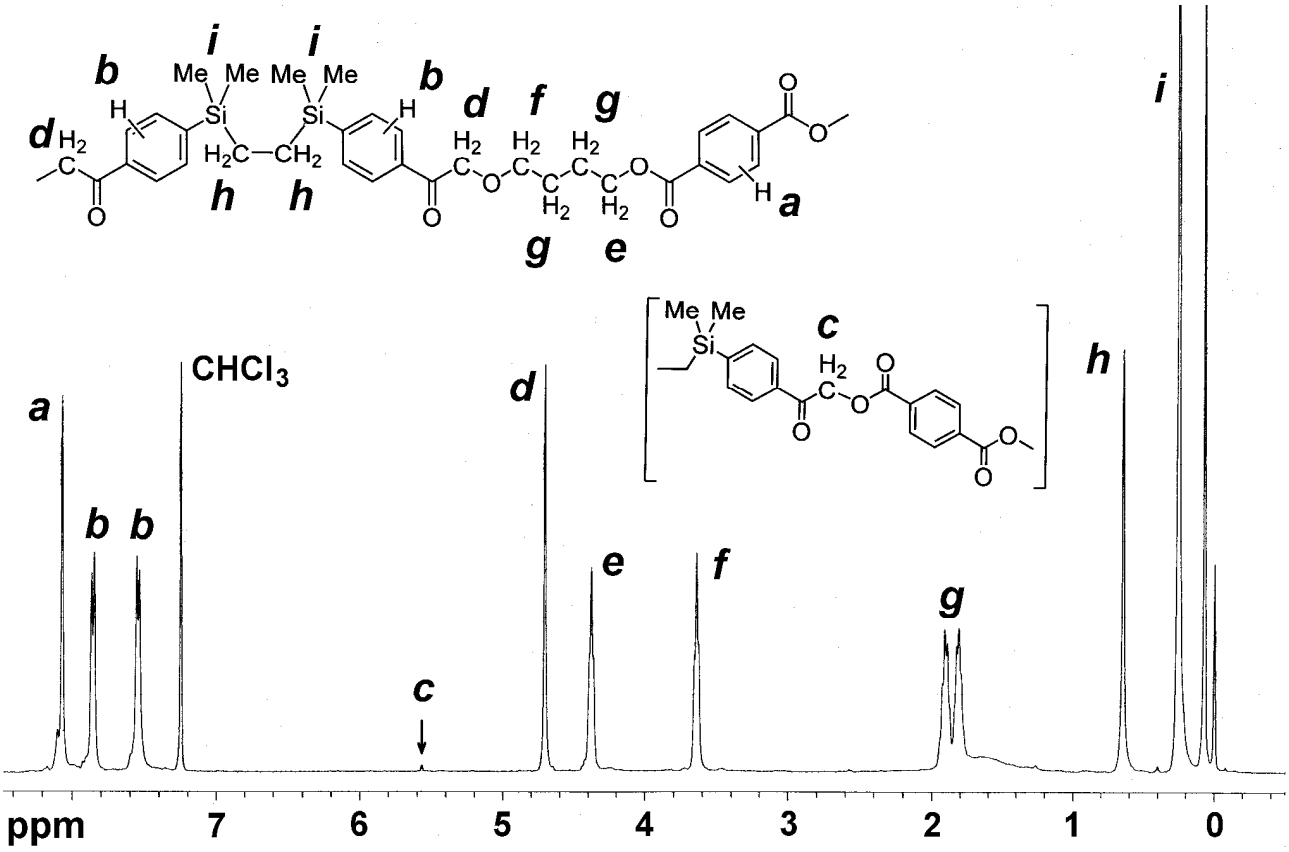

Figure S7. ^{1}H NMR spectrum for **3a**.

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.07 (s, -O-[C=O]-Ph[-*H*]-), 7.85 (d, *J* = 7.2 Hz, -Ph[-*H*]-$SiMe_2$-), 7.56 (d, *J* = 7.2 Hz, -Ph[-*H*]-$SiMe_2$-), 5.57 (s, -[C=O]-C*H*$_2$-O-[C=O]- [normal insertion unit]), 4.71 (s, -CH_2-O-C*H*$_2$-[C=O]- [THF incorporated unit]), 4.38 (t, *J* = 5.6 Hz, -[C=O]-O-C*H*$_2$-), 3.64 (t, *J* = 5.6 Hz, -C*H*$_2$-O-CH_2-[C=O]-), 1.91 (m, -O-CH_2-C*H*$_2$-), 1.81 (m, -O-CH_2-*C*H_2-), 0.64 (s, -$SiMe_2$-[C*H*$_2$]$_2$-$SiMe_2$-), 0.25 (s, -Si[C*H*$_3$]$_2$-[CH_2]$_2$-Si[C*H*$_3$]$_2$-).

5. Polymer **3b**.

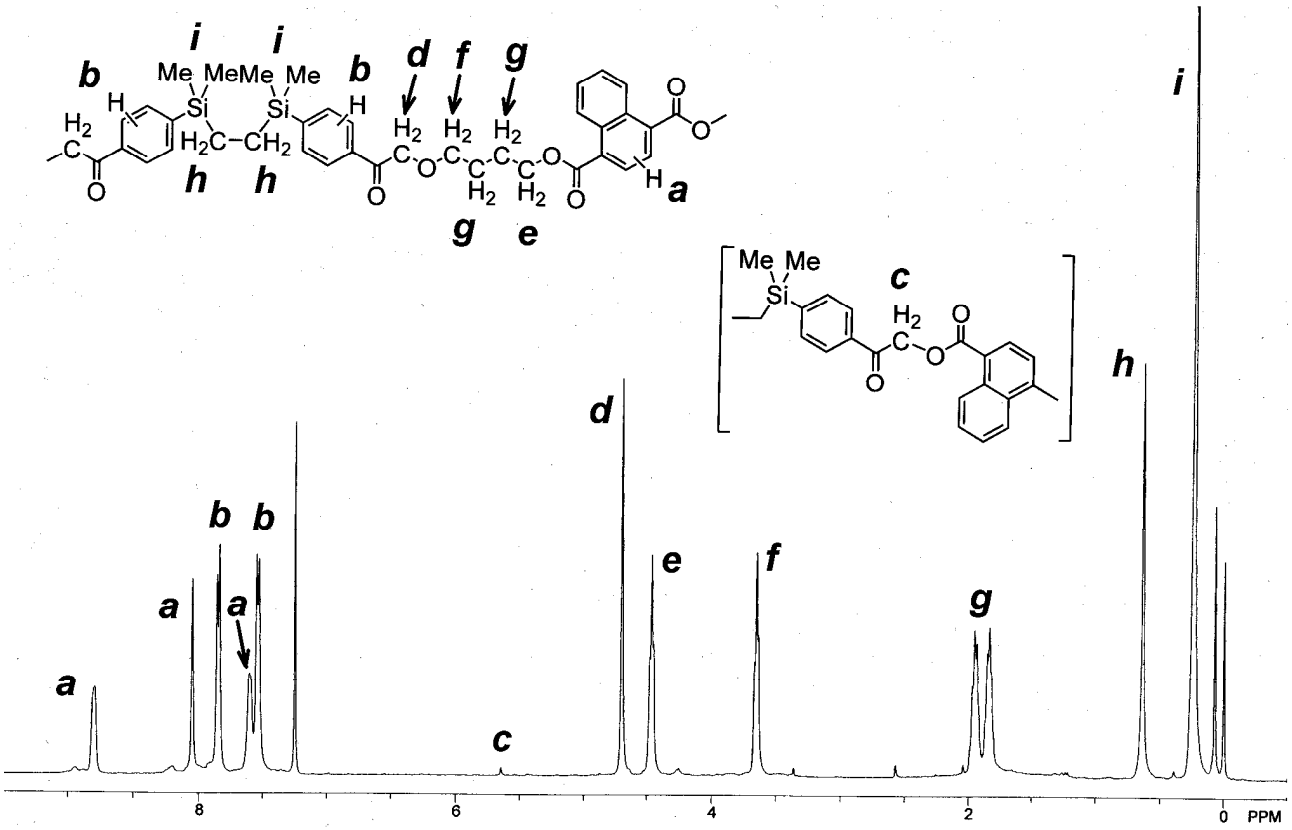

Figure S8. ^{1}H NMR spectrum for **3b**.

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.80 (m, -naphthalene[-*H*]-), 8.10 (s, -naphthalene[-*H*]-), 7.84 (d, *J* = 7.6 Hz, -Ph[-*H*]-$SiMe_2$-), 7.60 (m, -naphthalene[-*H*]-), 7.55 (d, *J* = 7.2 Hz, -Ph[-*H*]-$SiMe_2$-), 5.65 (s, -[C=O]-C*H*$_2$-O-[C=O]- [normal insertion unit]), 4.70 (s, -CH_2-O-C*H*$_2$-[C=O]- [THF incorporated unit]), 4.47 (t, *J* = 6.4 Hz, -[C=O]-O-C*H*$_2$-), 3.66 (t, *J* = 5.6 Hz, -C*H*$_2$-O-CH_2-[C=O]-), 1.96 (m, -O-CH_2-C*H*$_2$-C*H*$_2$-), 1.84 (m, -O-CH_2-C*H*$_2$-C*H*$_2$-), 0.64(s, -$SiMe_2$-[C*H*$_2$]$_2$-$SiMe_2$-), 0.24 (s, -Si[C*H*$_3$]$_2$-[CH_2]$_2$-Si[C*H*$_3$]$_2$-).

6. Polymer **3c**.

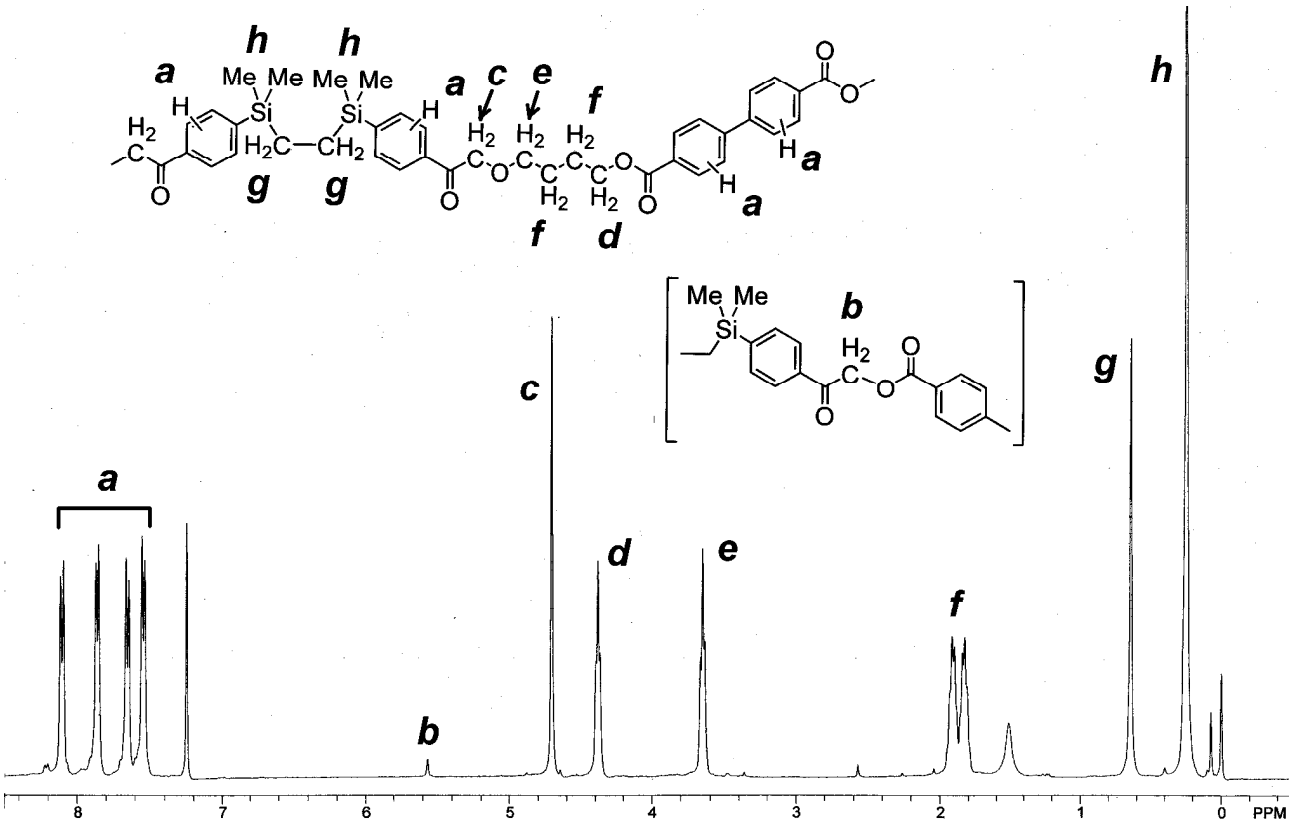

Figure S9. ^{1}H NMR spectrum for **3c**.

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.10 (d, J = 8.0 Hz, -Ph[-*H*]-Ph- or -Ph[-*H*]-$SiMe_2$-), 7.85 (d, J = 7.6 Hz, -Ph[-*H*]-Ph- or -Ph[-*H*]-$SiMe_2$-), 7.66 (d, J = 8.0 Hz, -Ph[-*H*]-Ph- or -Ph[-*H*]-$SiMe_2$-), 7.55 (d, J = 7.2 Hz, -Ph[-*H*]-Ph- or -Ph[-*H*]-$SiMe_2$-), 5.57 (s, -[C=O]-CH_2-O-[C=O]- [normal insertion unit]), 4.71 (s, -CH_2-O-CH_2-[C=O]- [THF incorporated unit]), 4.38 (t, J = 5.2 Hz, -[C=O]-O-CH_2-), 3.65 (t, J = 6.0 Hz, -CH_2-O-CH_2-[C=O]-), 1.91 (m, -[C=O]-O-CH_2-CH_2-CH_2-), 1.83 (m, -[C=O]-O-CH_2-CH_2-CH_2-), 0.64 (s, -$SiMe_2$-[CH_2]$_2$-$SiMe_2$-), 0.25 (s, -Si[CH_3]$_2$-[CH_2]$_2$-Si[CH_3]$_2$-).

7. Polymer **3d**.

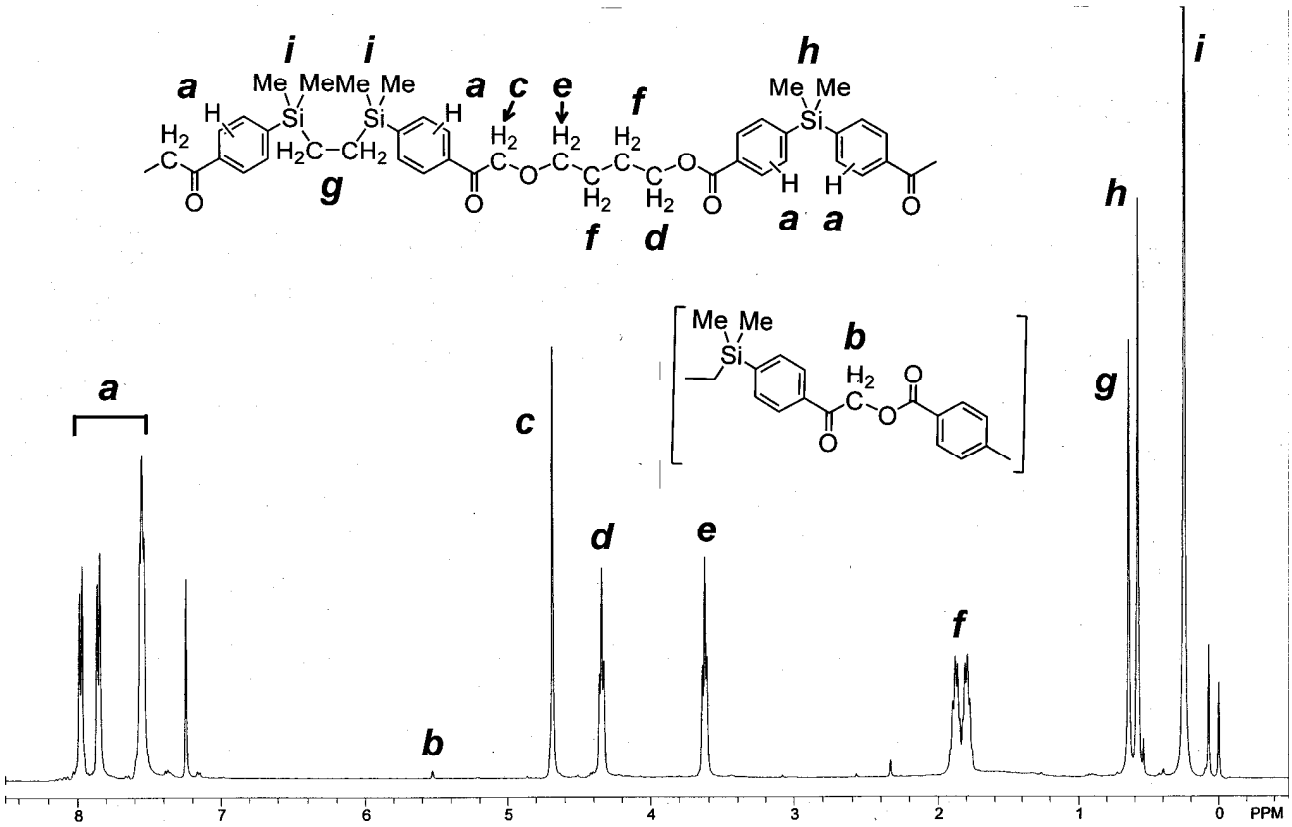

Figure S10. ^{1}H NMR spectrum for **3d**.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.97 (d, J = 7.6 Hz, -Ph[-*H*]-$SiMe_2$-), 7.85 (d, J = 7.6 Hz, -Ph[-*H*]-$SiMe_2$-), 7.55 (m, -Ph[-*H*]-$SiMe_2$-), 5.53 (s, -[C=O]-CH_2-O-[C=O]- [normal insertion unit]), 4.69 (s, -CH_2-O-CH_2-[C=O]- [THF incorporated unit]), 4.35 (t, J = 6.0 Hz, -[C=O]-O-CH_2-), 3.63 (t, J = 6.0 Hz, -CH_2-O-CH_2-[C=O]-), 1.91 (m, -O-CH_2-CH_2-), 1.78 (m, -O-CH_2-CH_2-), 0.65 (s, -$SiMe_2$-[CH_2]$_2$-$SiMe_2$-), 0.58 (s, -Ph-Si[CH_3]$_2$-Ph-), 0.25 (s, -Si[CH_3]$_2$-[CH_2]$_2$-Si[CH_3]$_2$-).

8. Polymer **3e**.

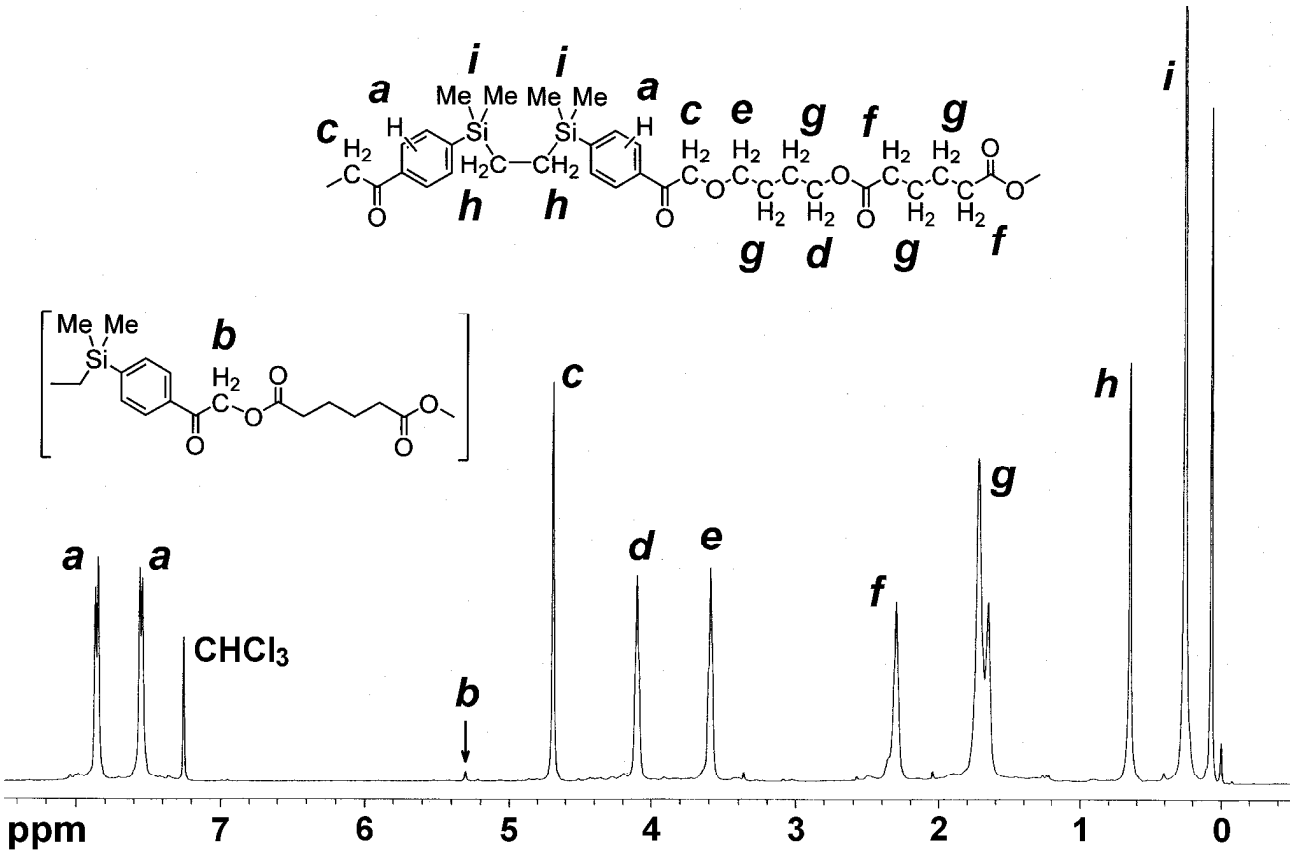

Figure S11. ^{1}H NMR spectrum for **3e**.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.85 (d, J = 6.8 Hz, -Ph[-H]-), 7.56 (d, J = 7.2 Hz, -Ph[-H]-), 5.30 (s, -[C=O]-CH_2-O-[C=O]- [normal insertion unit]), 4.69 (s, -CH_2-O-CH_2-[C=O]- [THP incorporated unit]), 4.10 (s, -[C=O]-O-CH_2-), 3.59 (s, -CH_2-O-CH_2-[C=O]-), 2.30 (s, -CH_2-[C=O]-O-), 1.6-1.8 (-CH_2-CH_2-CH_2-CH_2-), 0.65 (s, -$SiMe_2$-[CH_2]$_2$-$SiMe_2$-), 0.26 (s, -Si[CH_3]$_2$-[CH_2]$_2$-Si[CH_3]$_2$-).

9. Polymer **3f**.

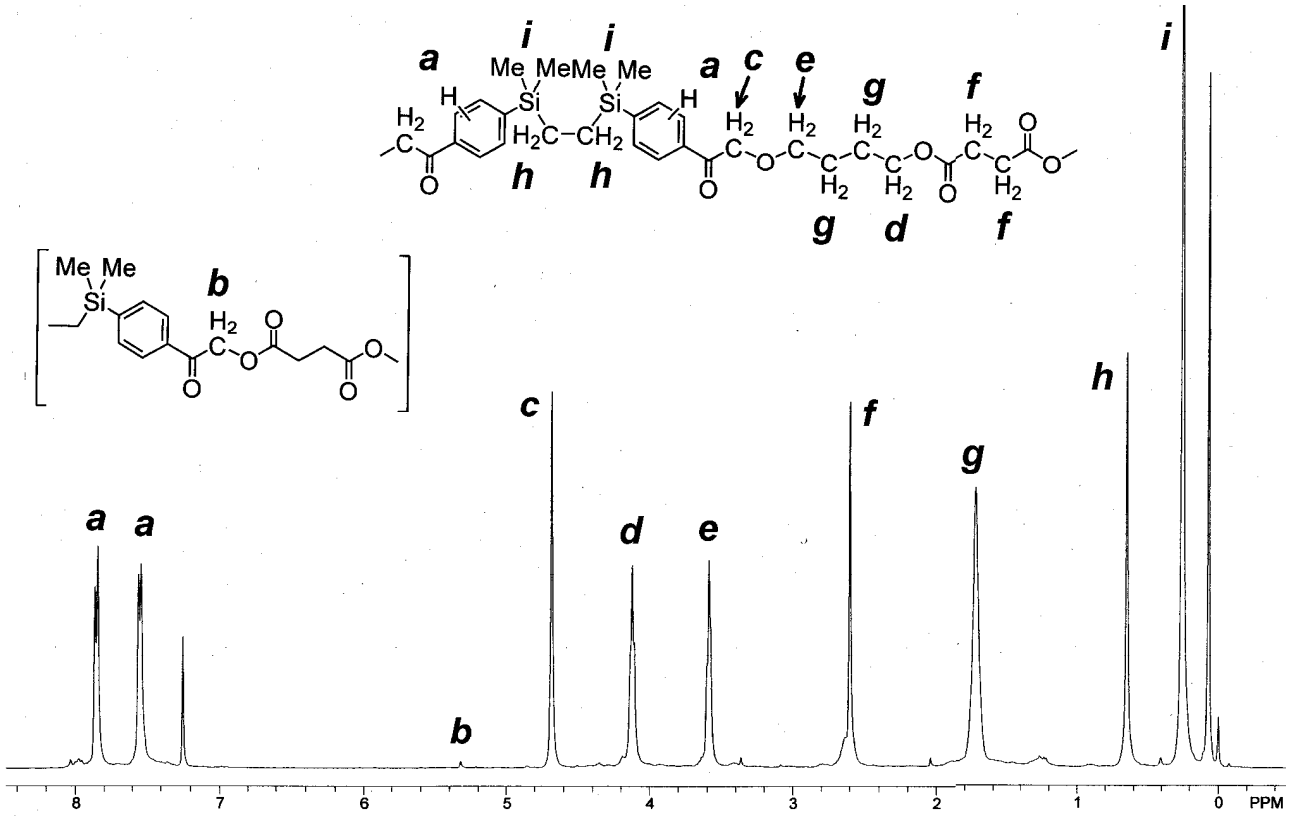

Figure S12. ^{1}H NMR spectrum for **3f**.

^{1}H NMR(400 MHz, $CDCl_3$) δ 7.85 (d, J = 7.2 Hz, -Ph[-H]-), 7.54 (d, J = 7.6 Hz, -Ph[-H]-), 5.32 (s, -[C=O]-CH_2-O-[C=O]- [normal insertion unit]), 4.68 (s, -CH_2-O-CH_2-[C=O]- [THF incorporated unit]), 4.12 (t, J = 5.6 Hz, -[C=O]-O-CH_2-), 3.59 (t, J = 5.2 Hz, -CH_2-O-CH_2-[C=O]-), 2.60 (s, -CH_2-CH_2-[C=O]-O-), 1.73 (s, -O-CH_2-[CH_2]$_2$-CH_2-O-), 0.65 (s, -$SiMe_2$-[CH_2]$_2$-$SiMe_2$-), 0.26 (s, -Si[CH_3]$_2$-[CH_2]$_2$-Si[CH_3]$_2$-).

10. Polymer **8a**.

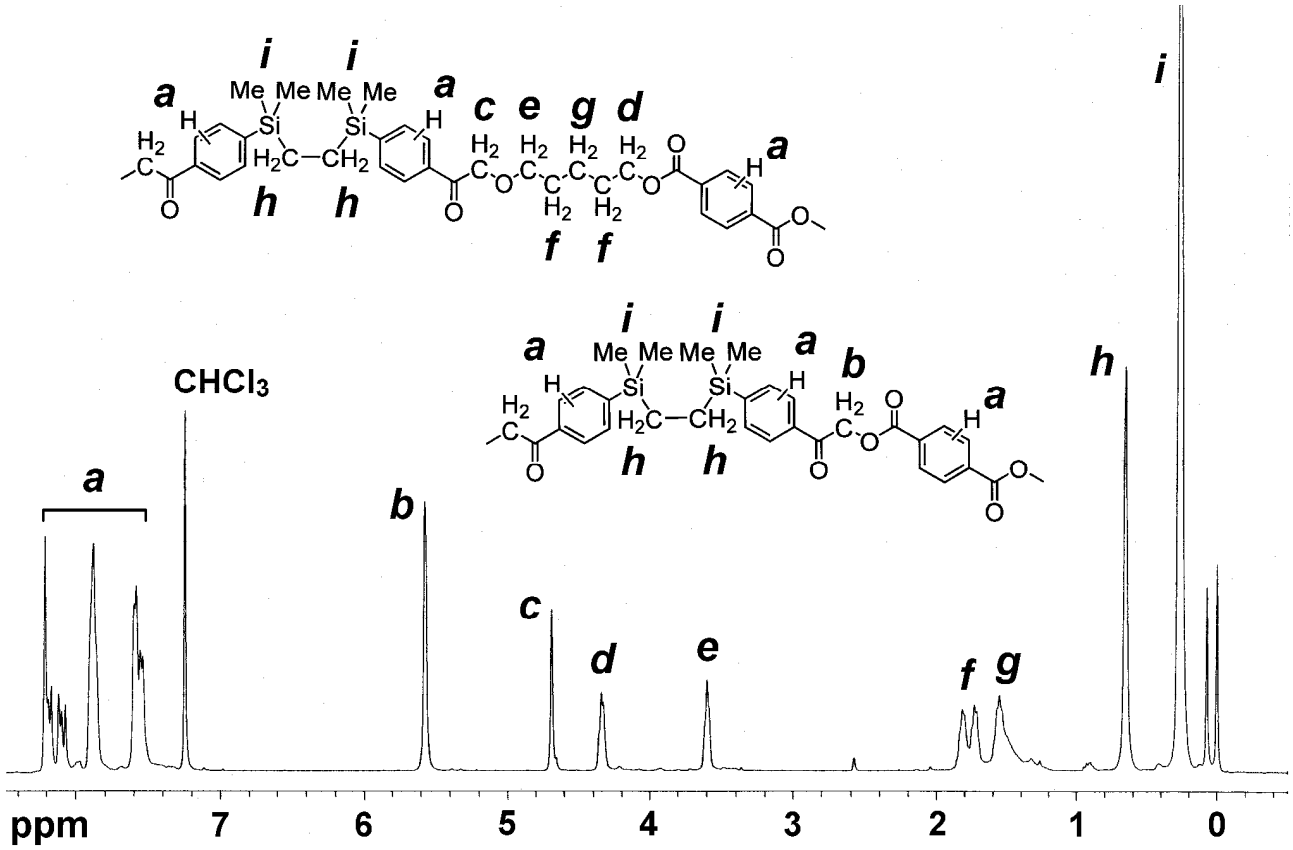

Figure S13. ^{1}H NMR spectrum for **8a**.

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.25-7.48 (-Ph[-*H*]-), 5.57 (s, -[C=O]-C*H*$_2$-O-[C=O]- [normal insertion unit]), 4.69 (s, -CH$_2$-O-C*H*$_2$-[C=O]- [THP incorporated unit]), 4.35 (t, *J* = 5.2 Hz, -[C=O]-O-C*H*$_2$-CH$_2$-), 3.60 (t, *J* = 4.4 Hz, -C*H*$_2$-O-CH$_2$-[C=O]-), 1.82 (m, -O-CH$_2$-C*H*$_2$-), 1.74 (m, -O-CH$_2$-C*H*$_2$-), 1.56 (m, -O-[CH$_2$]$_2$-C*H*$_2$-[CH$_2$]$_2$-O-), 0.66 (s, -SiMe$_2$-[C*H*$_2$]$_2$-SiMe$_2$-), 0.28 (s, -Si[C*H*$_3$]$_2$-[CH$_2$]$_2$-Si[C*H*$_3$]$_2$-).

11. Polymer **8b**.

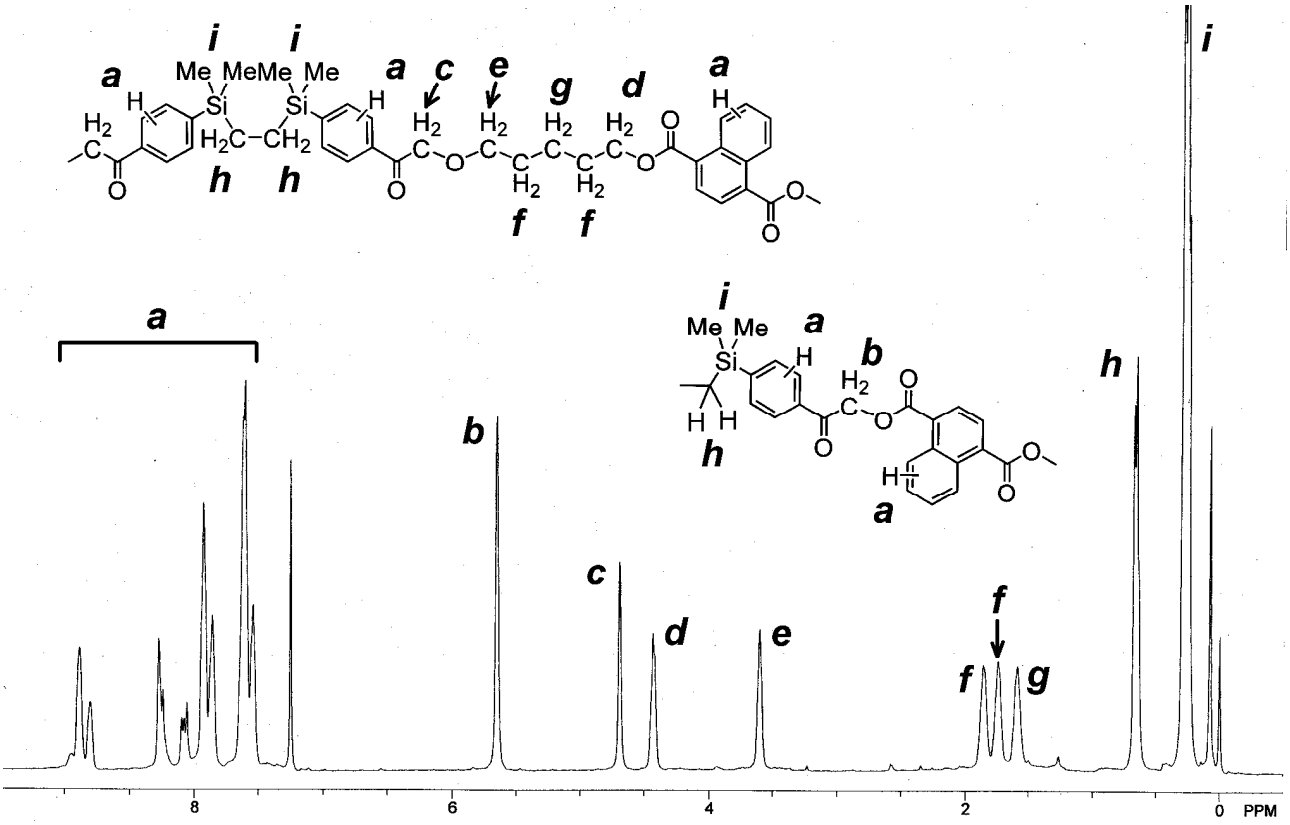

Figure S14. ^{1}H NMR spectrum for **8b**.

^{1}H NMR(400 MHz, $CDCl_3$) δ 8.98-7.48 (-Ph[-*H*]-, naphthalene[-*H*]-), 5.65 (s, -[C=O]-C*H*$_2$-O-[C=O]- [normal insertion unit]), 4.69 (s, -CH$_2$-O-C*H*$_2$-[C=O]- [THP incorporated unit]), 4.43 (t, *J* = 4.4 Hz, -[C=O]-O-C*H*$_2$-CH$_2$-), 3.61 (s, -C*H*$_2$-O-CH$_2$-[C=O]-), 1.86 (m, -O-CH$_2$-C*H*$_2$-), 1.74 (m, -O-CH$_2$-C*H*$_2$-), 1.59 (m, -O-[CH$_2$]$_2$-C*H*$_2$-[CH$_2$]$_2$-O-), 0.66 (m, -SiMe$_2$-[C*H*$_2$]$_2$-SiMe$_2$-), 0.29 (m, -Si[C*H*$_3$]$_2$-[CH$_2$]$_2$-Si[C*H*$_3$]$_2$-).

12. Polymer **8d**.

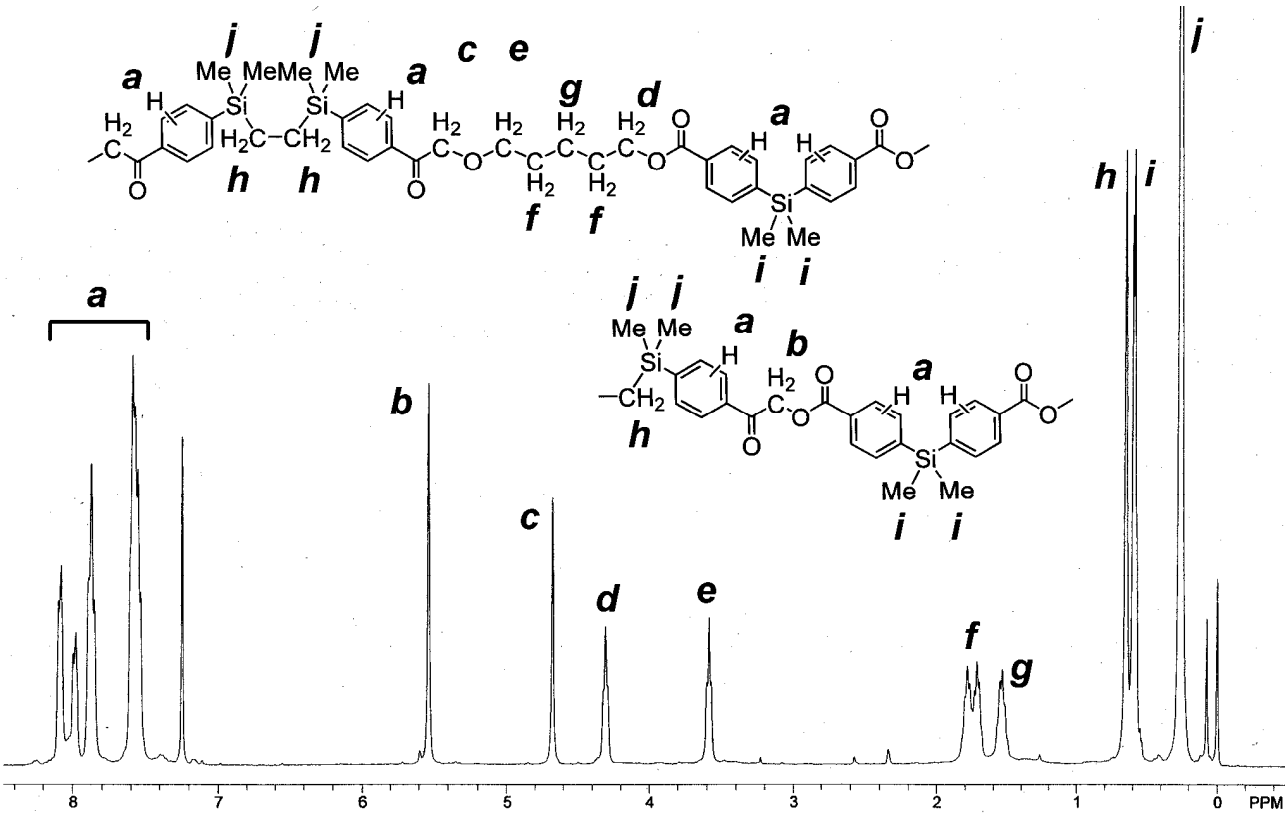

Figure S15. ^{1}H NMR spectrum for **8d**.

^{1}H NMR(400 MHz, $CDCl_3$) δ 8.2-7.5 (-Ph[-*H*]-), 5.53 (s, -Ph-[C=O]-C*H*$_2$-O-[C=O]-Ph- [normal insertion unit]), 4.68 (s, -CH$_2$-O-C*H*$_2$-[C=O]-Ph- [THP incorporated unit]), 4.31 (t, *J* = 5.6 Hz, -Ph-[C=O]-O-C*H*$_2$-CH$_2$-), 3.59 (t, *J* = 6.4 Hz, -C*H*$_2$-O-CH$_2$-[C=O]-Ph-), 1.85-1.77 (-O-CH$_2$-C*H*$_2$-), 1.77-1.69 (-O-CH$_2$-C*H*$_2$-), 1.54 (m, -O-CH$_2$-CH$_2$-C*H*$_2$-CH$_2$-CH$_2$-O-), 0.65 (s, -SiMe$_2$-[C*H*$_2$]$_2$-SiMe$_2$-), 0.59 (m, -Ph-Si[C*H*$_2$]$_2$-Ph-), 0.27(s, -Si[C*H*$_3$]$_2$-[CH$_2$]$_2$- Si[C*H*$_3$]$_2$-).

13. Polymer **8e**.

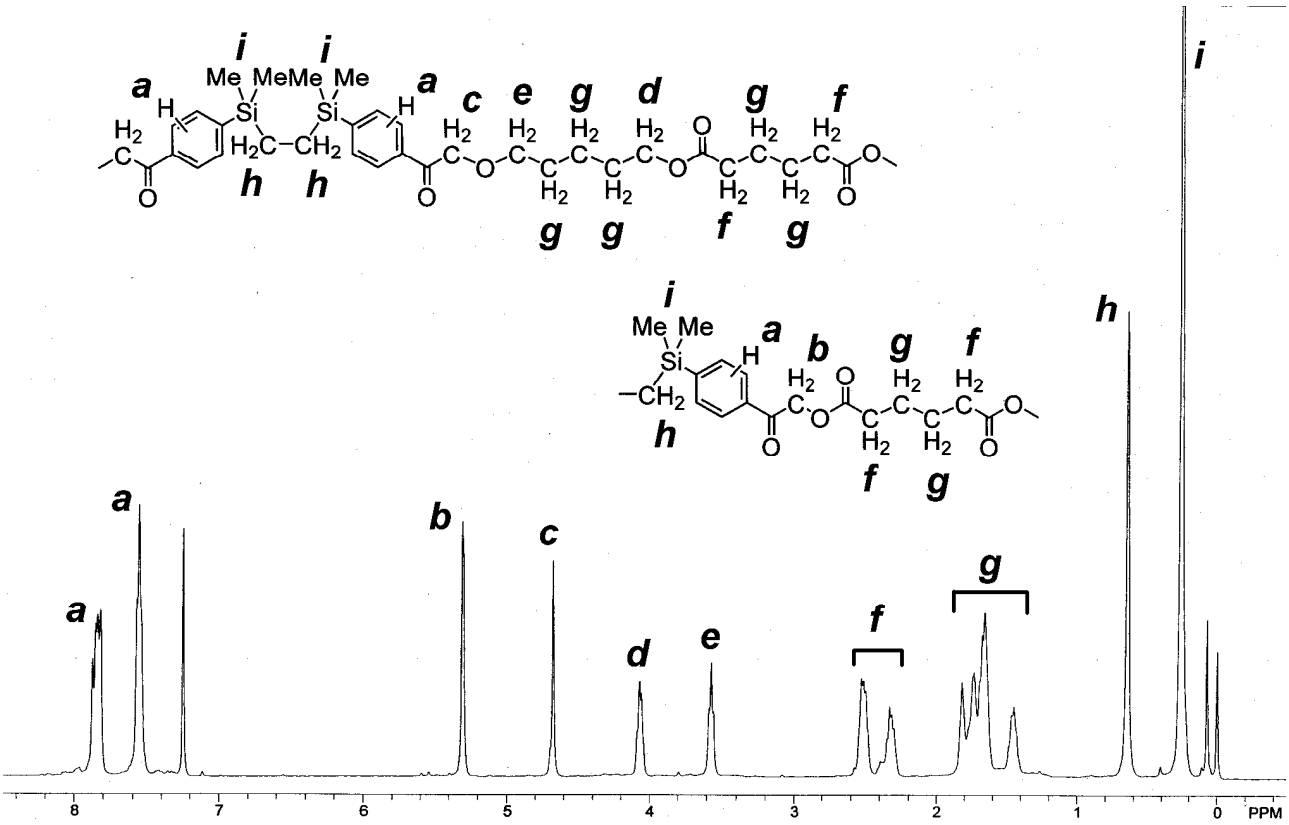

Figure S16. ^{1}H NMR spectrum for **8e**.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.9-7.5 (-Ph[-*H*]-), 5.31 (s, -Ph-[C=O]-C*H*$_2$-O-[C=O]- [normal insertion unit]), 4.68 (s, -CH$_2$-O-C*H*$_2$-[C=O]- [THP incorporated unit]), 4.07 (t, *J* = 4.8 Hz, -[C=O]-O-C*H*$_2$-CH$_2$-), 3.57 (t, *J* = 5.6 Hz, -C*H*$_2$-O-CH$_2$-[C=O]-Ph-), 2.51-2.35 (-O-[C=O]-C*H*$_2$-), 1.8-1.4 (-[C=O]-O-CH$_2$-C*H*$_2$-C*H*$_2$-C*H*$_2$-CH$_2$-O-, -O-[C=O]-CH$_2$-[C*H*$_2$]$_2$-CH$_2$-[C=O]-O-), 0.65 (s, -SiMe$_2$-[C*H*$_2$]$_2$-SiMe$_2$-), 0.26 (s, -Si[C*H*$_3$]$_2$-[CH$_2$]$_2$-Si[C*H*$_3$]$_2$-).

14. Polymer **8f**.

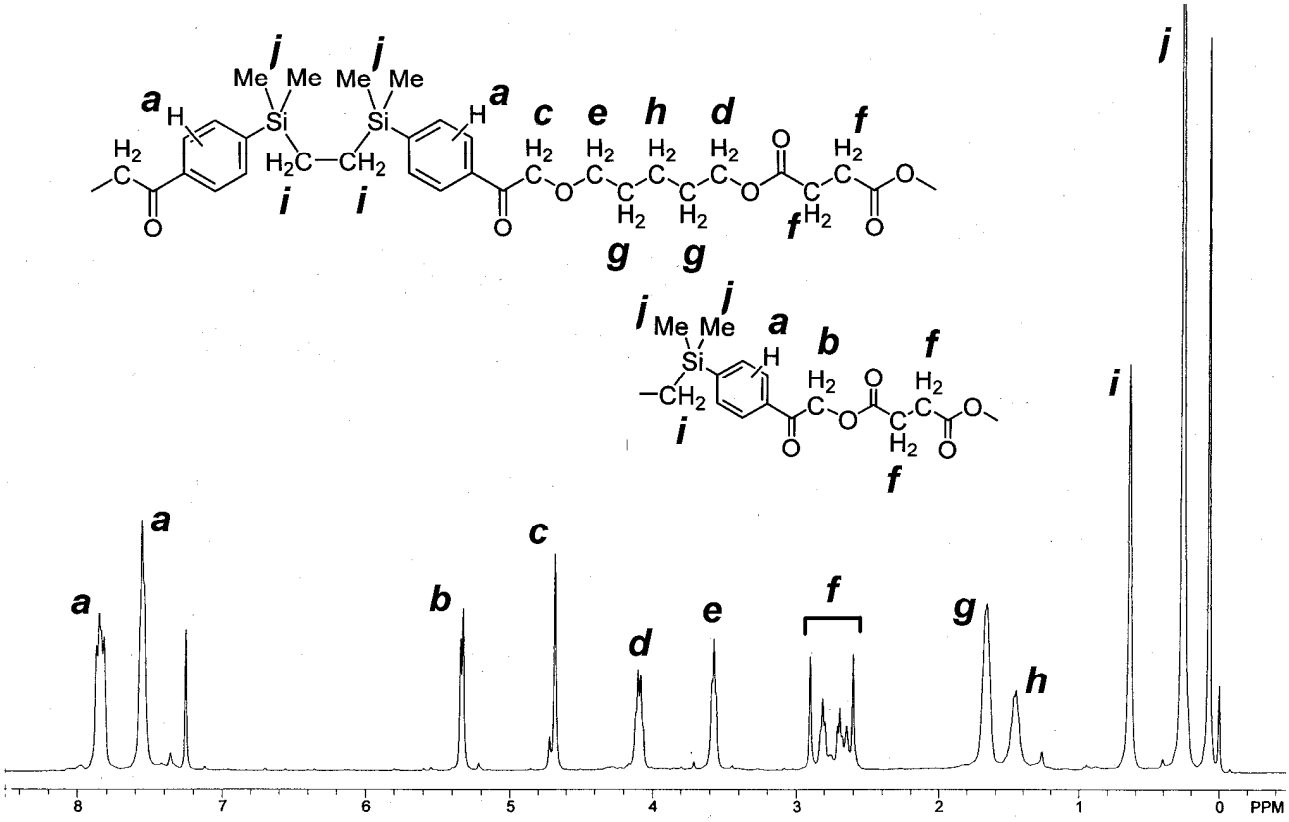

Figure S17. ^{1}H NMR spectrum for **8f**.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.9-7.5 (-Ph-[*H*]-), 5.33 (-[C=O]-C*H*$_2$-O-[C=O]- [normal insertion unit]), 4.68 (s, -CH$_2$-O-C*H*$_2$-[C=O]- [THP incorporated unit]), 4.10 (m, -[C=O]-O-C*H*$_2$-CH$_2$-), 3.57 (t, *J* = 6.0 Hz, -C*H*$_2$-O-CH$_2$-[C=O]-), 2.93-2.58(-O-[C=O]-[C*H*$_2$]$_2$-[C=O]-O-), 1.66 (m, -O-CH$_2$-C*H*$_2$-CH$_2$-C*H*$_2$-CH$_2$-O-), 1.45 (m, -O-[CH$_2$]$_2$-C*H*$_2$-[CH$_2$]$_2$-O-), 0.64 (s, -SiMe$_2$-[C*H*$_2$]$_2$-SiMe$_2$-), 0.26 (s, -Si[C*H*$_3$]$_2$-[CH$_2$]$_2$-Si[C*H*$_3$]$_2$-).