Supporting information for:

Dynamic Diselenide Containing Polyester from Alcoholysis/Oxidation of γ-Butyroselenolactone

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diethyl γ, γ'-diselenodibutyrate (1): Yellow liquid, yield >99%. ^{1}H NMR (300 MHz, $CDCl_3$) δ 4.15 (q, *J* = 7.1 Hz, 4H), 2.93 (t, *J* = 7.2 Hz, 4H), 2.43 (t, *J* = 7.3 Hz, 4H), 2.14-2.00 (m, 4H), 1.26 (t, *J* = 7.1 Hz, 6H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 173.53, 61.09, 34.39, 29.44, 26.69, 14.91. ^{77}Se NMR (114 MHz, $CDCl_3$) δ 302.81. HR-ESI-MS: *calculated m/z* $C_{12}H_{22}NaO_4Se_2$ [M+Na$^+$]: 412.9746; *experimental m/z* [M+Na$^+$]: 412.9807.

dimethyl γ, γ'-diselenodibutyrate (2): Yellow liquid, yield >99%; ^{1}H NMR (300 MHz, $CDCl_3$) δ 3.68 (s, 6H), 2.93 (t, *J* = 7.2Hz, 4H), 2.45 (t, *J* = 7.3 Hz, 4H), 2.13-2.01 (m, 4H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 173.95, 52.29, 34.08, 29.35, 26.61. ^{77}Se NMR (114 MHz, $CDCl_3$) δ 302.09. HR-ESI-MS: *calculated m/z* $C_{10}H_{18}NaO_4Se_2$[M+Na$^+$]: 384.9433; *experimental m/z* [M+Na$^+$]: 384.9515.

dipropyl γ, γ'-diselenodibutyrate (3): Yellow liquid, yield 99%; ^{1}H NMR (300 MHz, $CDCl_3$) δ 4.04 (t, *J* = 6.7 Hz, 4H), 2.94 (t, *J* = 7.2 Hz, 4H), 2.44 (t, *J* = 7.3 Hz, 4H), 2.13-2.00 (m, 4H), 1.72-1.58 (m, 4H), 0.94 (t, *J* = 7.4 Hz, 6H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 173.60, 66.73, 34.37, 29.44, 26.71, 22.64, 11.06. ^{77}Se NMR (114 MHz, $CDCl_3$) δ 302.58. HR-ESI-MS: *calculated m/z* $C_{14}H_{26}NaO_4Se_2$ [M+Na$^+$]: 441.0059; *experimental m/z* [M+Na$^+$]: 441.0039.

dibutyl γ, γ'-diselenodibutyrate (4): Yellow liquid, yield 91%; ^{1}H NMR (300 MHz, $CDCl_3$) δ 4.08 (t, *J* = 6.7 Hz, 4H), 2.93 (t, *J* = 7.2 Hz, 4H), 2.43 (t, *J* = 7.3 Hz, 4H), 2.13-2.00 (m, 4H), 1.67-1.54 (m, 4H), 1.45-1.30 (m, 4H), 0.93 (t, *J* = 7.3 Hz, 6H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 173.61, 65.03, 43.39, 31.33, 29.44, 26.71, 19.81, 14.37. ^{77}Se NMR (114 MHz, $CDCl_3$) δ 302.60. HR-ESI-MS: *calculated m/z* $C_{16}H_{30}NaO_4Se_2$ [M+Na$^+$]: 469.0372; *experimental m/z* [M+Na$^+$]:

469.0364.

dihexyl γ, γ'-diselenodibutyrate (5): Yellow liquid, yield 90%, ^{1}H NMR (300 MHz, $CDCl_3$) δ 4.07 (t, *J* = 6.7 Hz, 4H), 2.93 (t, *J* = 7.2 Hz, 4H), 2.43 (t, *J* = 7.3 Hz, 4H), 2.13-1.99 (m, 4H), 1.68-1.54 (m, 4H), 1.41-1.23 (m, 12H), 0.89 (t, *J* = 6.8 Hz, 6H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 173.64, 65.36, 34.41, 32.11, 29.46, 29.27, 26.73, 26.28, 23.22, 14.68. ^{77}Se NMR (114 MHz, $CDCl_3$) δ 302.49. HR-ESI-MS: *calculated m/z* $C_{20}H_{38}NaO_4Se_2$[M+Na$^+$]: 525.0998; *experimental m/z* [M+Na$^+$]: 525.0866.

di(2-methylallyl) γ, γ'-diselenodibutyrate (6): Yellow liquid, yield 91%; ^{1}H NMR (300 MHz, $CDCl_3$) δ 4.97 (d, *J* = 12.8 Hz, 4H), 4.51 (s, 4H), 2.94 (t, *J* = 7.2 Hz, 4H), 2.49 (t, *J* = 7.3 Hz, 4H), 2.16-2.02 (m, 4H), 1.76 (s, 6H). ^{13}C NMR (75 MHz, $CDCl_3$）δ 173.18, 140.55, 113.64, 68.70, 34.29, 29.35, 26.66, 20.20. ^{77}Se NMR (144 MHz, $CDCl_3$) δ 302.09. HR-ESI-MS: *calculated m/z* $C_{16}H_{26}NaO_4Se_2$[M+Na$^+$]: 465.0059; *experimental m/z* [M+Na$^+$]: 464.9926.

diisopropyl γ, γ'-diselenodibutyrate (7): Yellow liquid, yield 24%; ^{1}H NMR (300 MHz, $CDCl_3$) δ 5.08-4.92 (m, 2H), 2.93 (t, *J* = 7.3 Hz, 4H), 2.39 (t, *J* = 7.3 Hz, 4H), 2.12-1.99 (m, 4H), δ 1.22 (d, *J* = 6.3 Hz, 12H). ^{13}C NMR (75 MHz, $CDCl_3$）δ 173.03, 68.37, 34.74, 29.48, 26.77, 22.52. ^{77}Se NMR (114MHz, $CDCl_3$) δ 303.68. HR-ESI-MS: *calculated m/z* $C_{14}H_{26}NaO_4Se_2$ [M+Na$^+$]: 441.0059; *experimental m/z* [M+Na$^+$]: 441.0116.

di(prop-2-yn-1-yl) γ, γ'-diselenodibutyrate (8): Yellow liquid, yield 83%; ^{1}H NMR (300 MHz, $CDCl_3$) 4.68 (d, *J* = 2.5 Hz, 4H), 2.93 (t, *J* = 7.2 Hz, 4H), 2.50 (m, 6H), 2.16-2.01 (m, 4H). ^{13}C NMR (75 MHz, $CDCl_3$）δ 172.67, 78.29, 75.59, 52.62, 33.99, 29.15, 26.48. ^{77}Se NMR (114 MHz, $CDCl_3$) δ 302.45. HR-ESI-MS: *calculated m/z* $C_{14}H_{18}NaO_4Se_2$[M+Na$^+$]: 432.9433; *experimental m/z* [M+Na$^+$]: 432.9455.

dibenzyl γ, γ'-diselenodibutyrate (9): Yellow liquid, yield 98%; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.40-7.30 (m, *J* = 9.08 Hz, 10H), 5.12 (s, 4H), 2.91 (t, *J* = 7.2 Hz, 4H), 2.48 (t, *J* = 7.3 Hz, 4H), 2.15-2.01 (m, 4H). ^{13}C NMR (75 MHz, $CDCl_3$）δ 173.34, 136.57, 129.24, 128.90, 127.64, 66.98, 34.33, 29.33, 26.63. ^{77}Se NMR (114 MHz, $CDCl_3$) δ 320.55. HR-ESI-MS: *calculated m/z* $C_{22}H_{26}NaO_4Se_2$[M+Na$^+$]: 537.0059; *experimental m/z* [M+Na$^+$]: 537.0039.

dicyclohexylγ, γ'-diselenodibutyrate (10): Yellow liquid, yield 15%; ^{1}H NMR (300 MHz, $CDCl_3$) δ 4.80-4.69 (m, *J* = 8.9 Hz, 2H), 2.93 (t, *J* = 7.3 Hz, 4H), 2.41 (t, *J* = 7.3 Hz, 4H), 2.13-1.99 (m, 4H), 1.90-1.15 (m, 20H). ^{13}C NMR (75 MHz, $CDCl_3$）δ 172.98, 73.36, 34.82, 32.32, 29.52, 26.86, 26.04, 24.42. ^{77}Se NMR (114 MHz, $CDCl_3$) δ 303.60. HR-ESI-MS: *calculated m/z* $C_{20}H_{34}NaO_4Se_2$[M+Na$^+$]: 521.0685; *experimental m/z* [M+Na$^+$]: 521.0708.

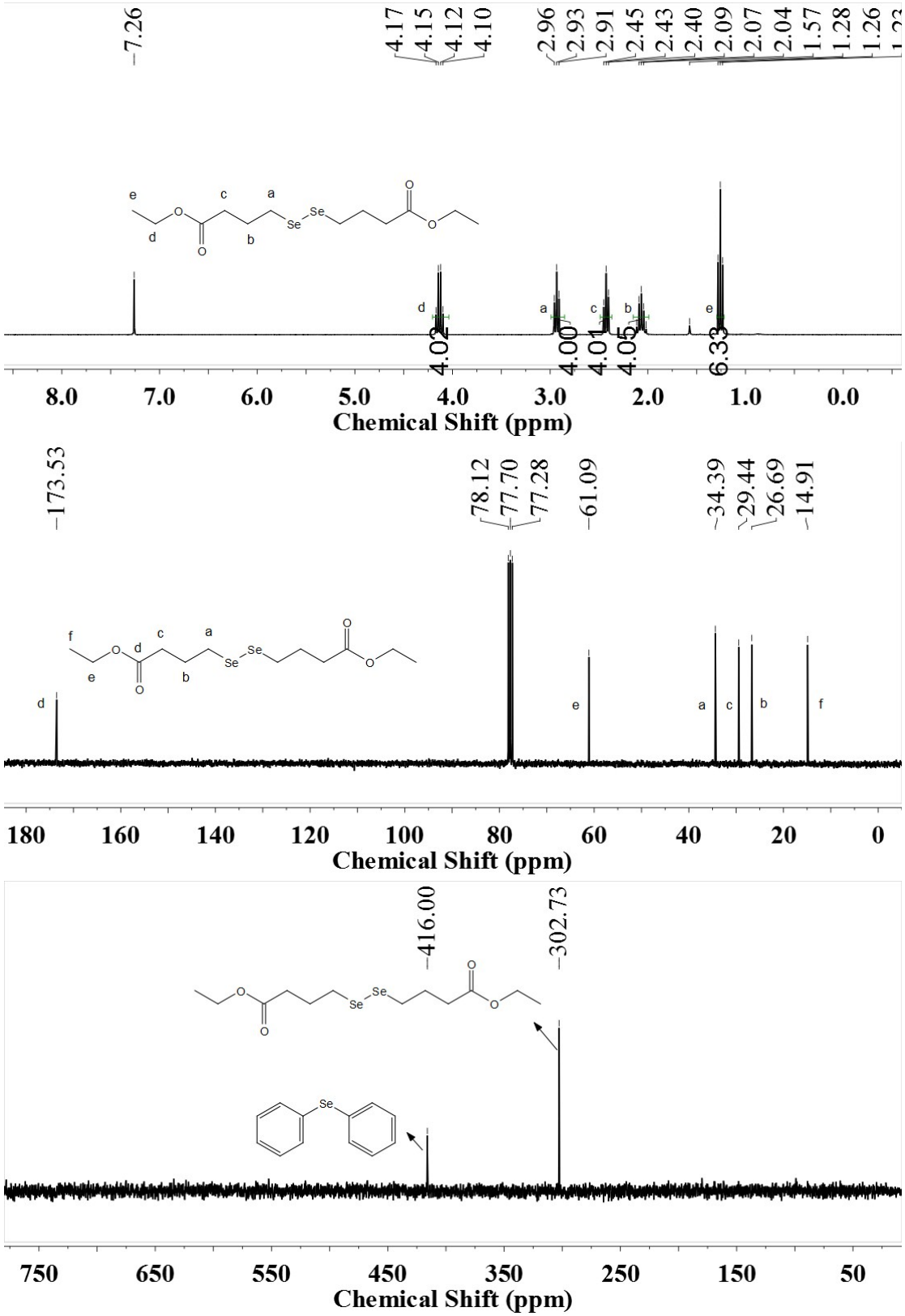


Figure S1. ^{1}H, ^{13}C, and ^{77}Se NMR spectra of diethyl γ, γ'-diselenodibutyrate.

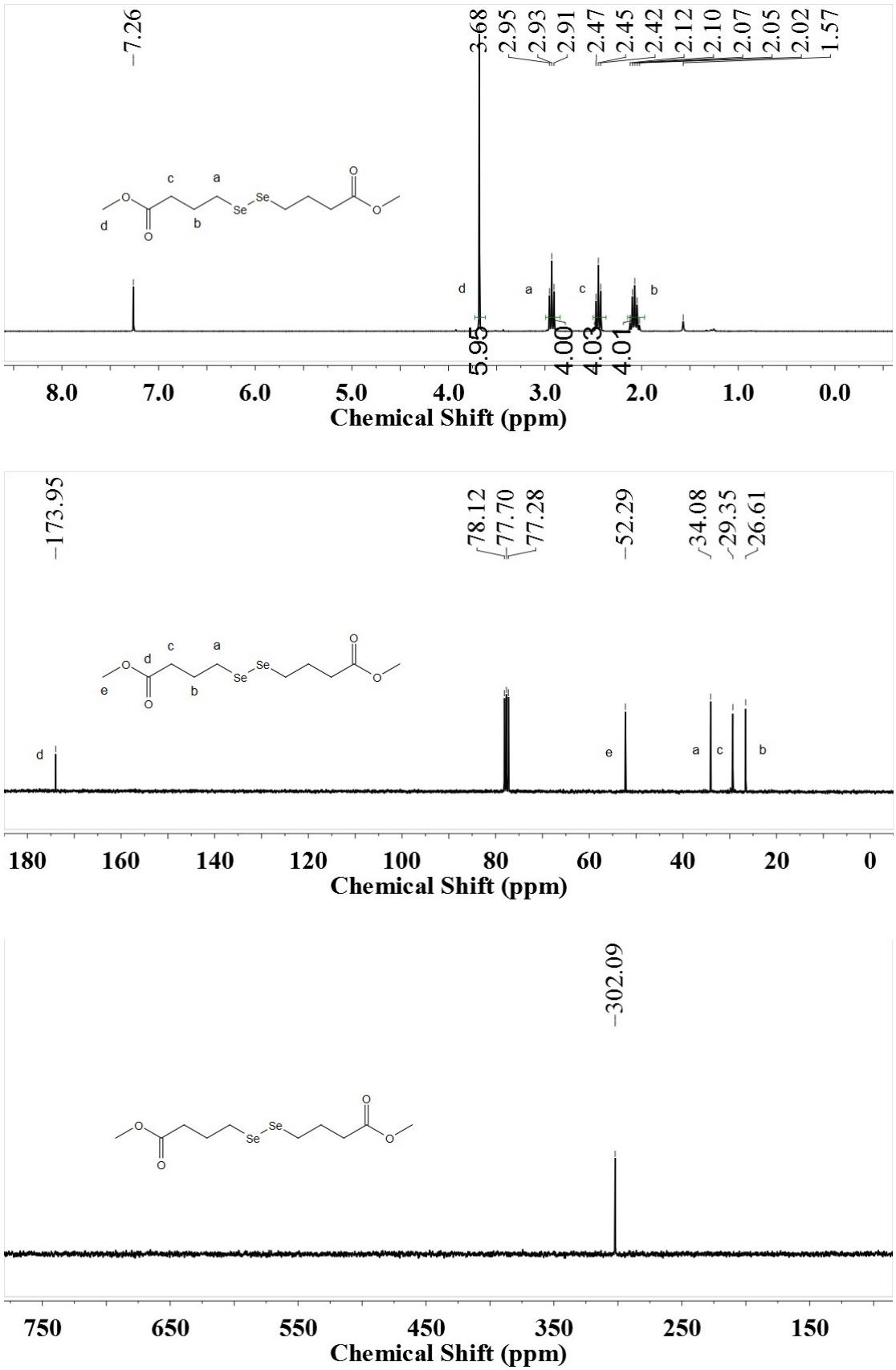


Figure S2. ^{1}H, ^{13}C, and ^{77}Se NMR spectra of dimethyl γ, γ'-diselenodibutyrate.

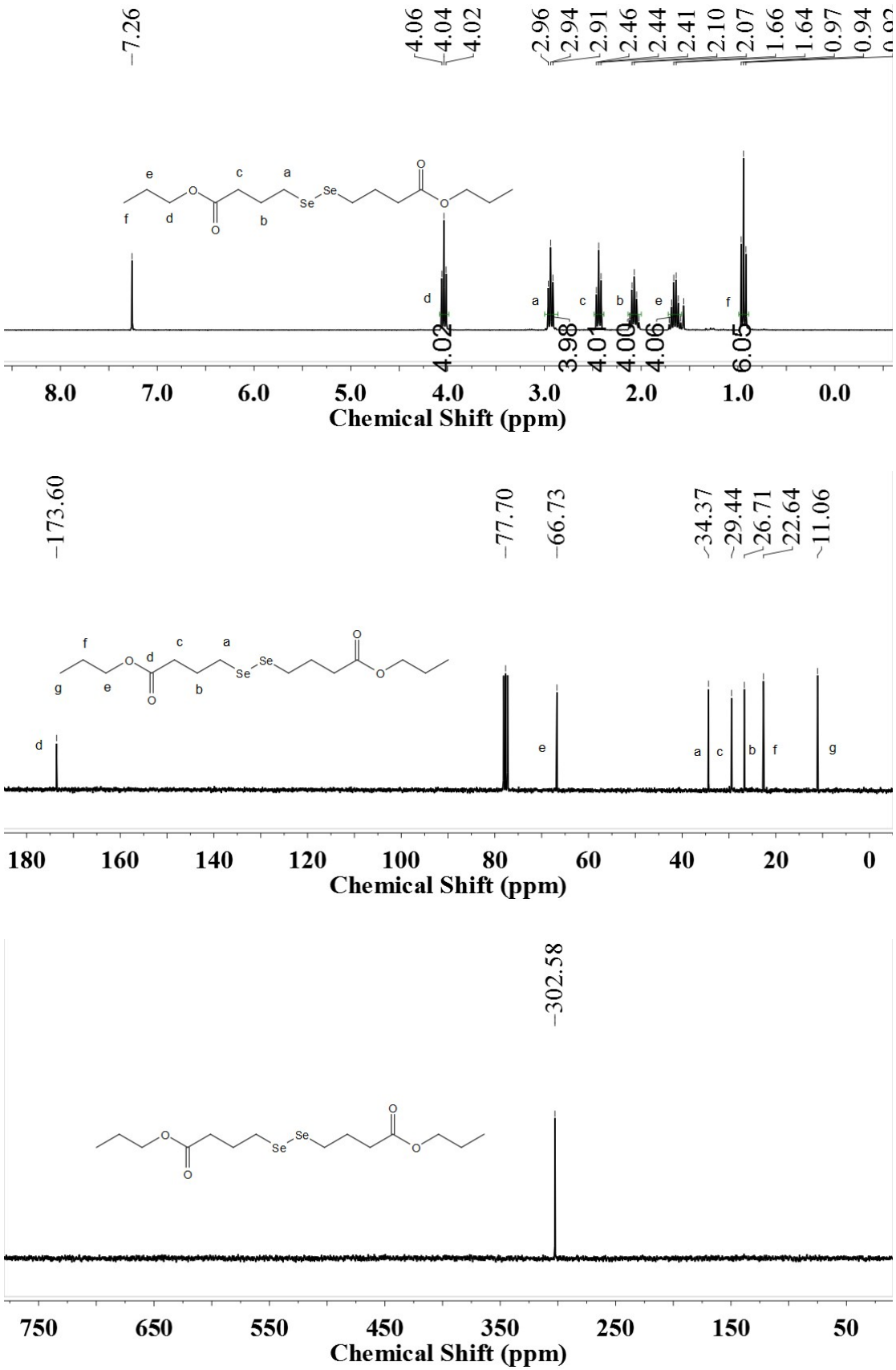


Figure S3. ^{1}H, ^{13}C, and ^{77}Se NMR spectra of dipropyl γ, γ'-diselenodibutyrate.

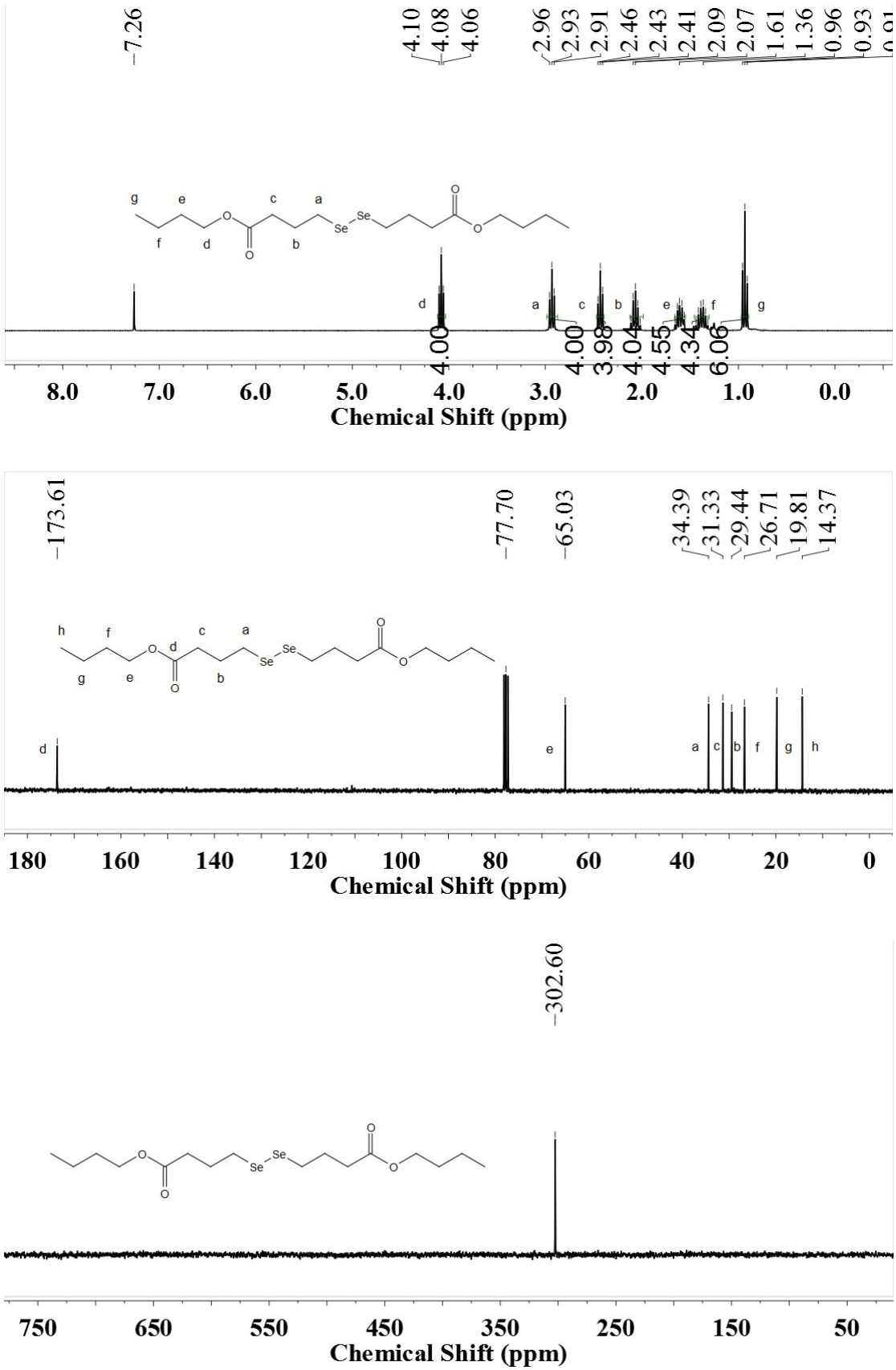


Figure S4. ^{1}H, ^{13}C, and ^{77}Se NMR spectra of dibutyl γ, γ'-diselenodibutyrate.

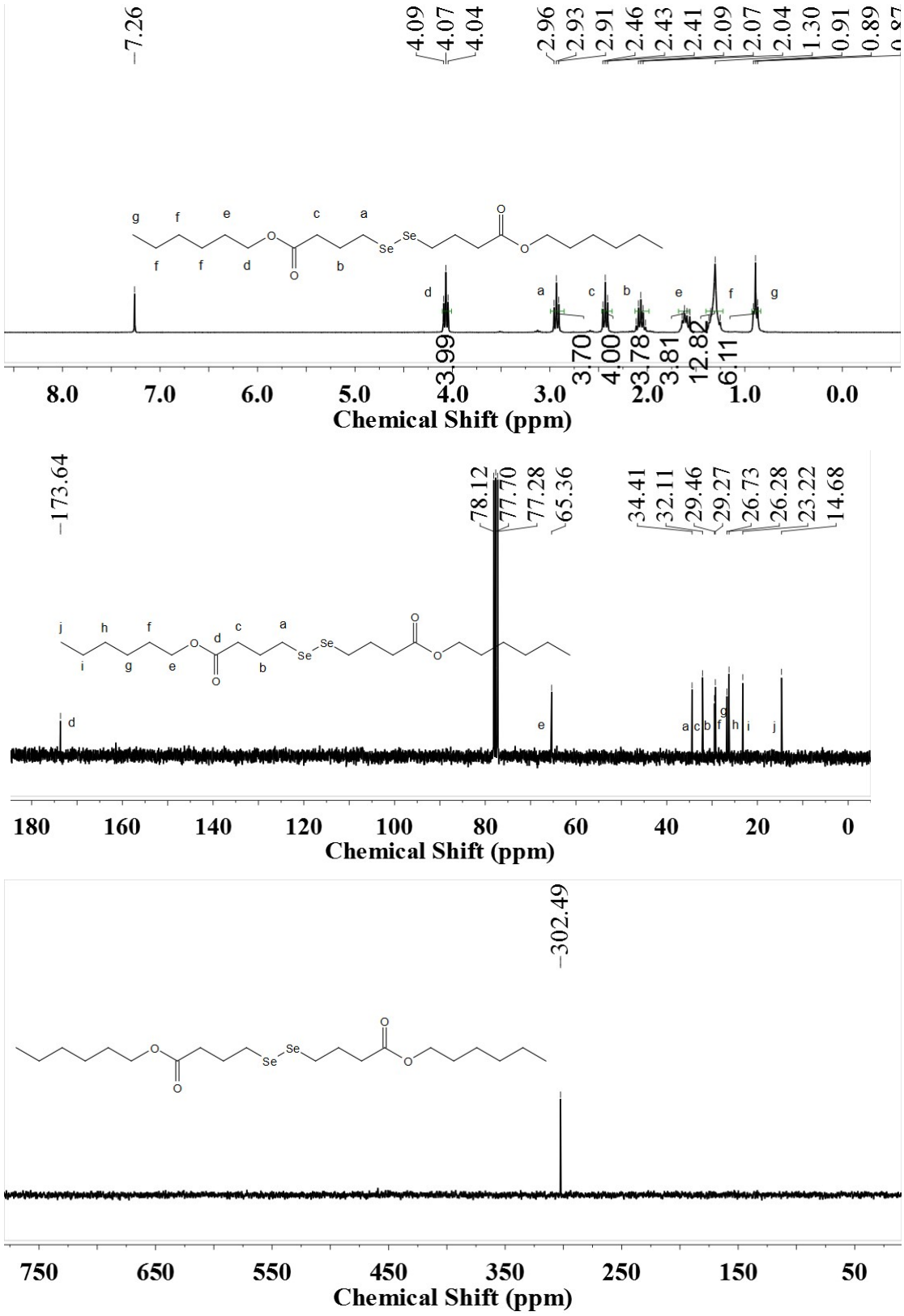


Figure S5. ^{1}H, ^{13}C, and ^{77}Se NMR spectra of dihexyl γ, γ'-diselenodibutyrate.

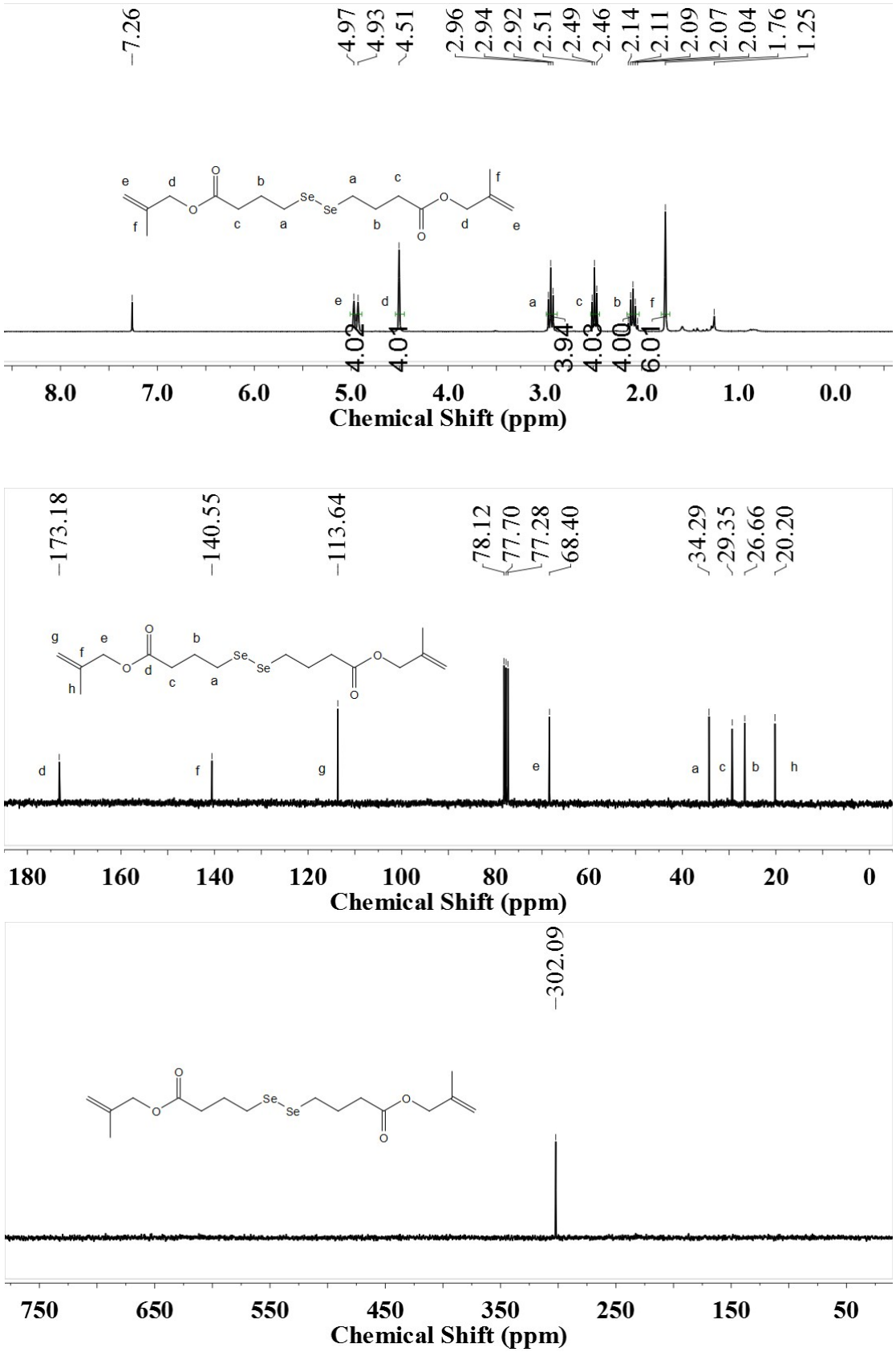


Figure S6. ^{1}H, ^{13}C, and ^{77}Se NMR spectra of di(2-methylallyl) γ, γ'-diselenodibutyrate.

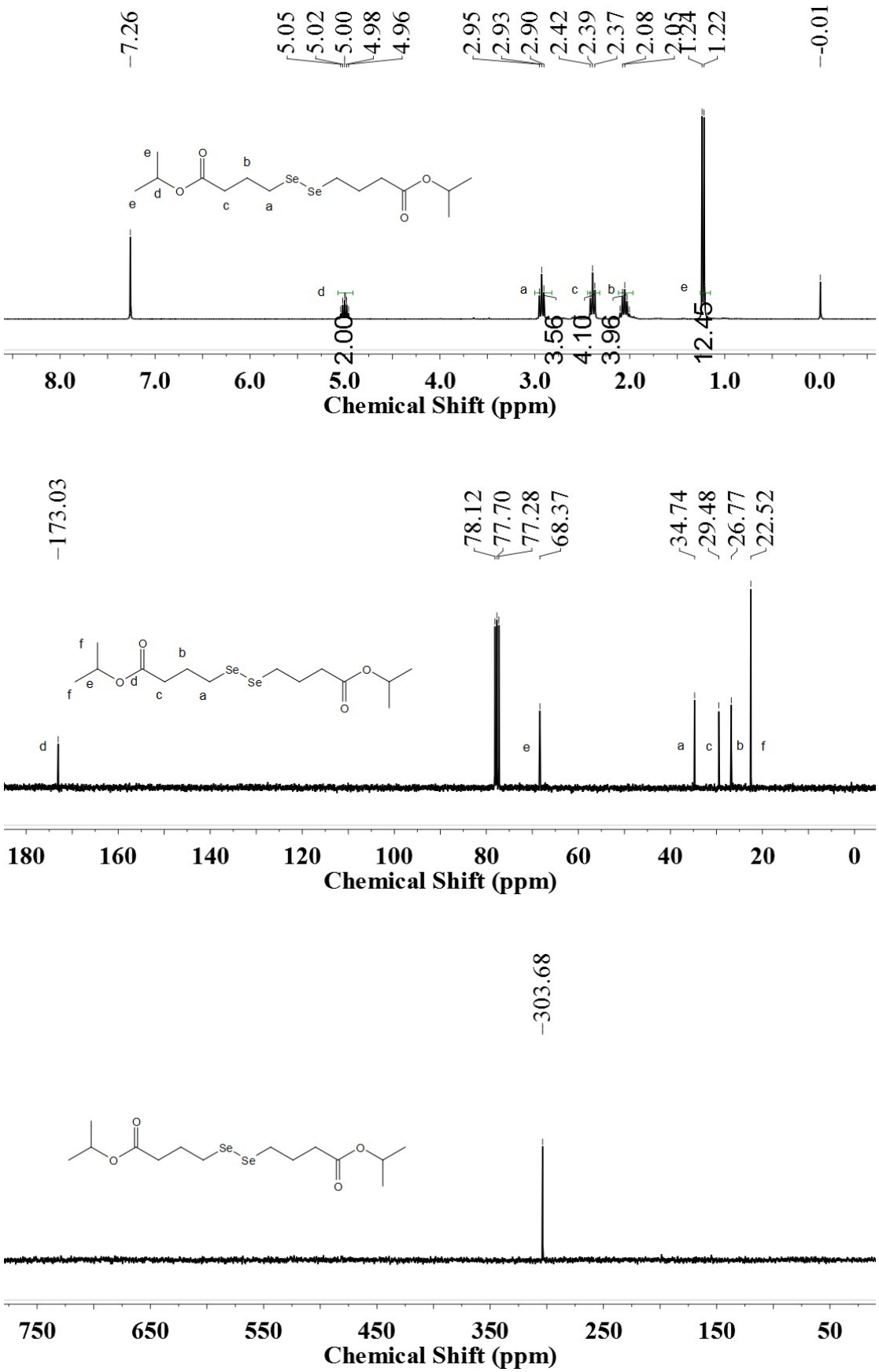


Figure S7. ^{1}H, ^{13}C, and ^{77}Se NMR spectra of diisopropyl γ, γ'-diselenodibutyrate.

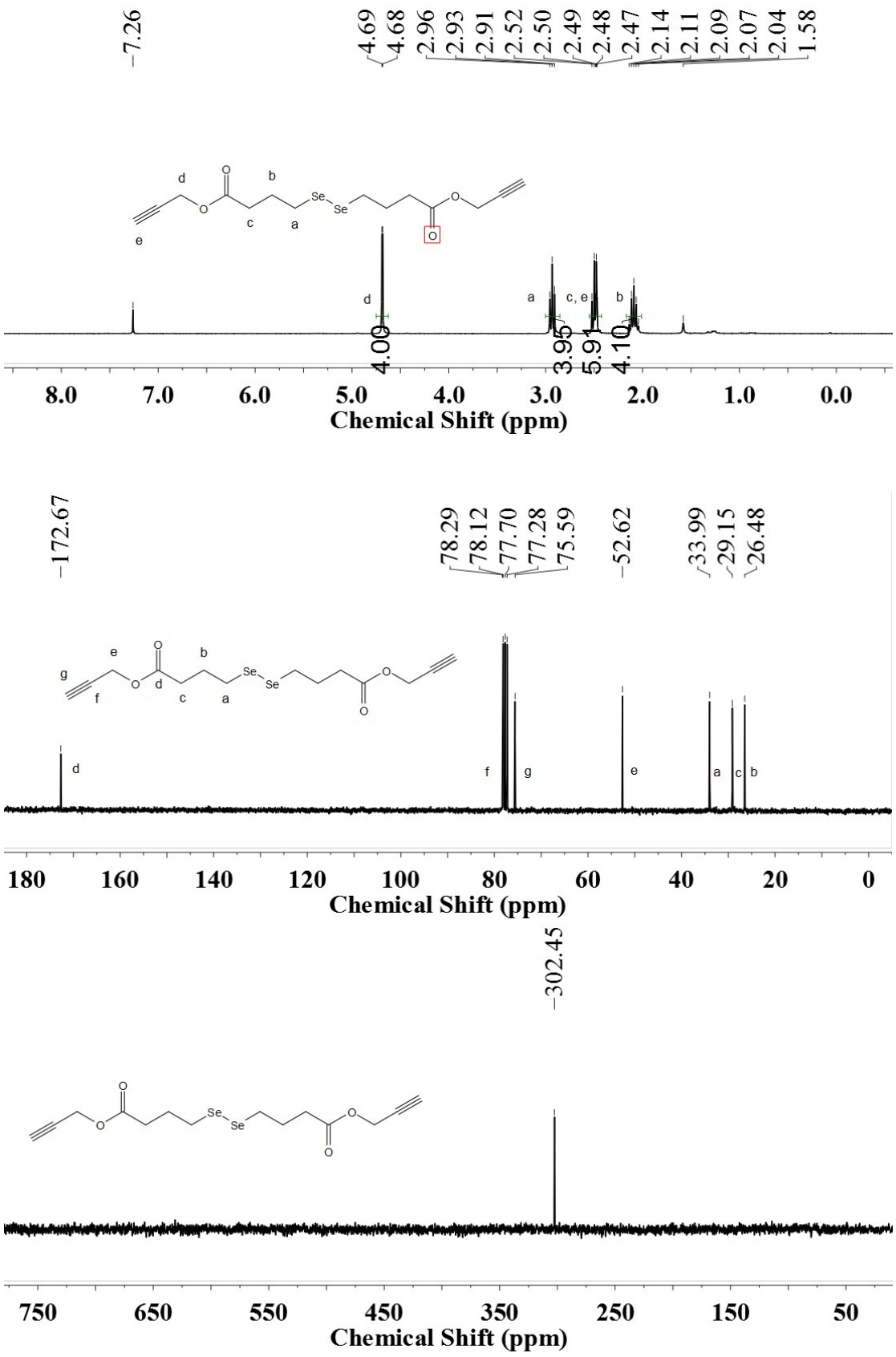


Figure S8. ^{1}H, ^{13}C, and ^{77}Se NMR spectra of di(prop-2-yn-1-yl) γ, γ'-diselenodibutyrate.

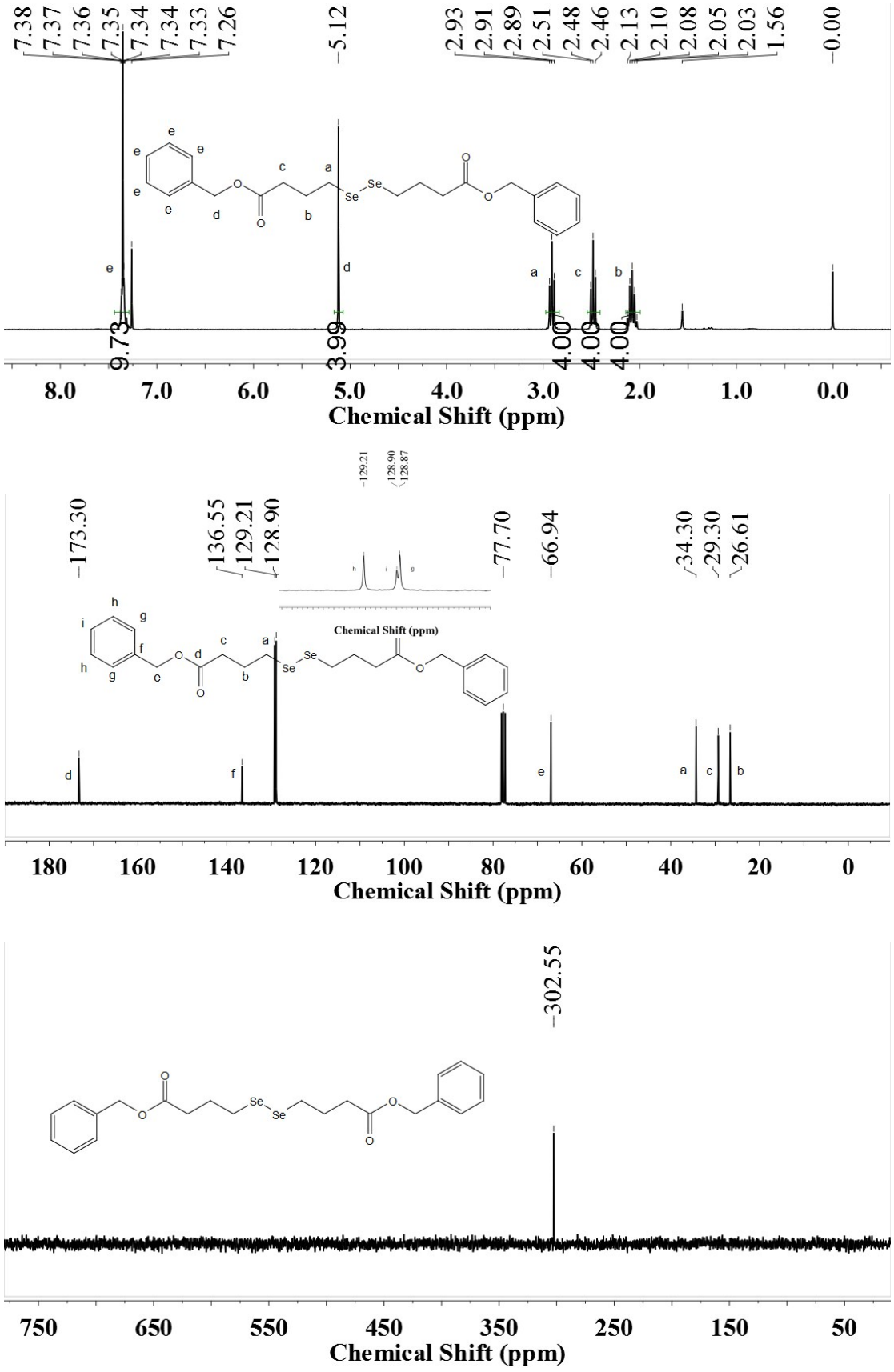


Figure S9. ^{1}H, ^{13}C, and ^{77}Se NMR spectra of dibenzyl γ, γ'-diselenodibutyrate.

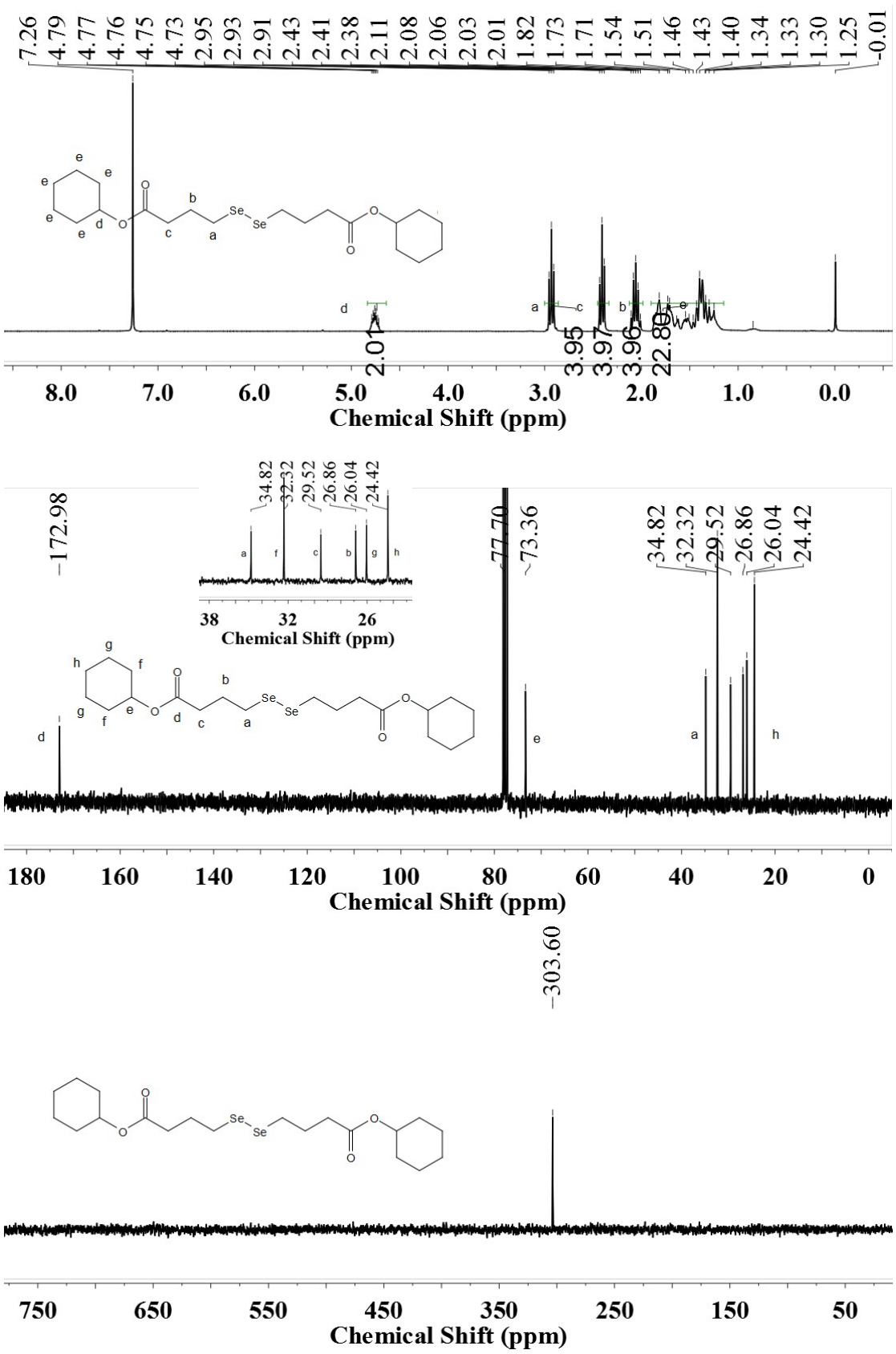


Figure S10. ^{1}H, ^{13}C, and ^{77}Se NMR spectra of dicyclohexyl γ, γ'-diselenodibutyrate.

Diselenide Containing Polyester：

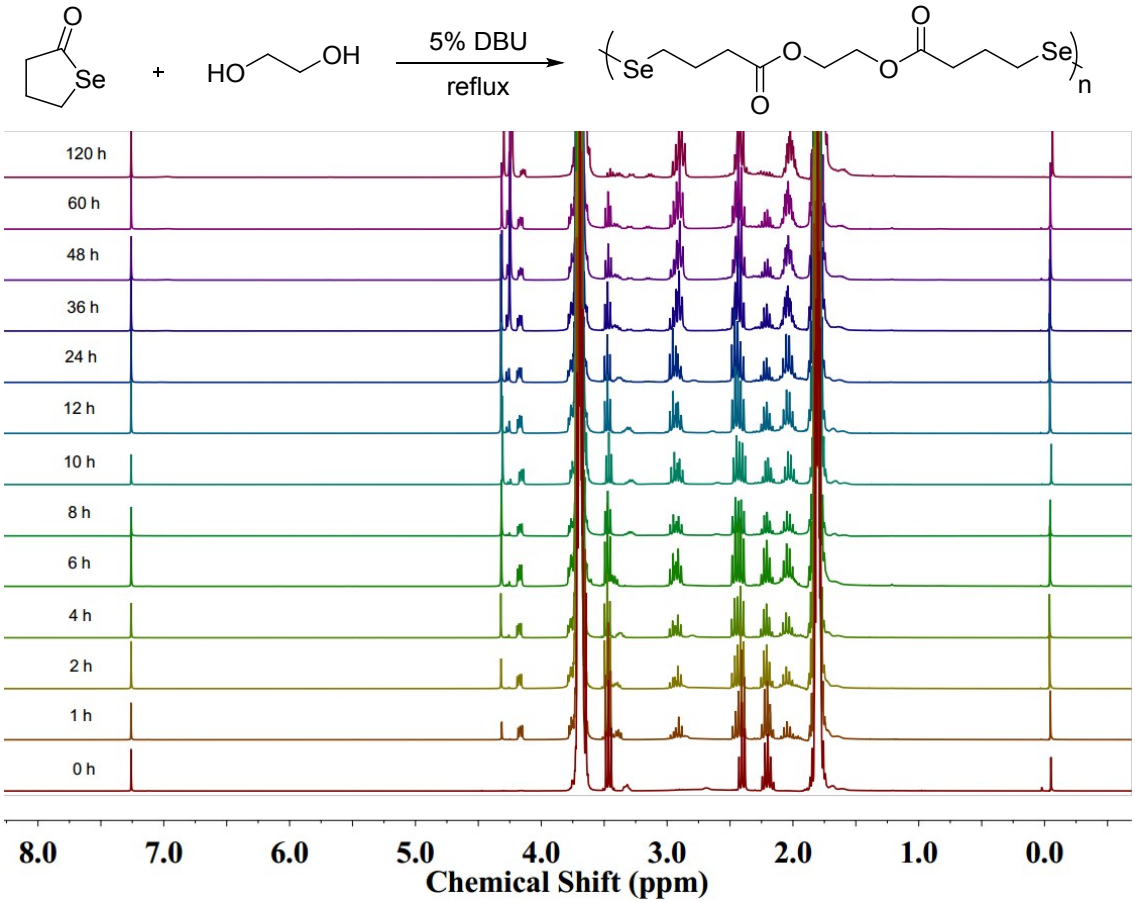


Figure S11. ^{1}H NMR spectra of the reaction solution of γ-butyroselenolactone with ethylene glycol.

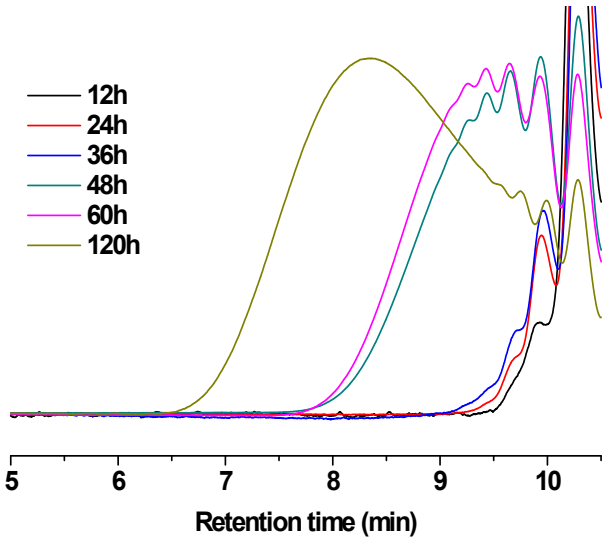


Figure S12. SEC curves of polymers from the reaction of ethylene glycol and γ-butyroselenolactone in THF ($EGSe_2$) (1×10^{-3} mol L^{-1}).

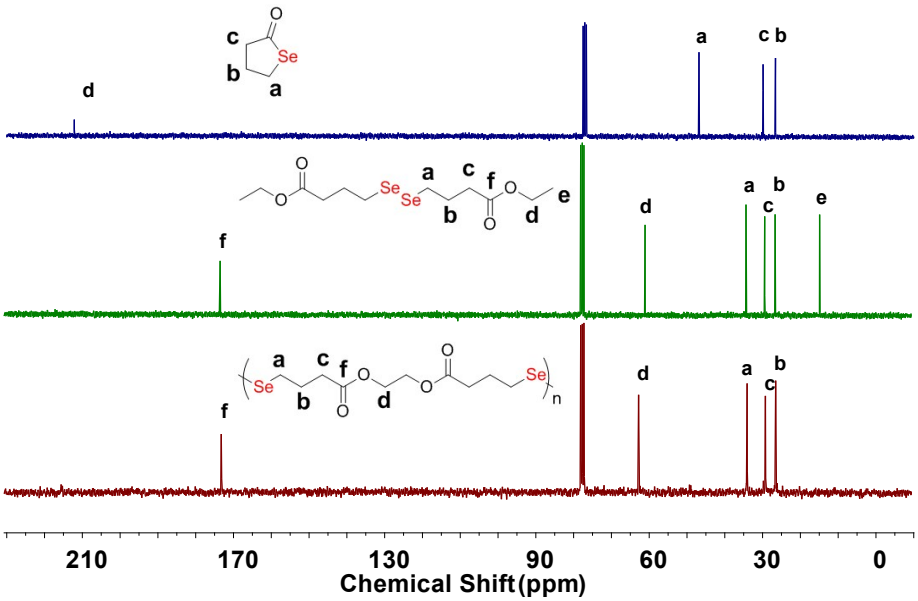


Figure S13 ^{13}C NMR spectra of γ-butyroselenolactone, diethyl γ, γ'-diselenodibutyrate and polyester ($EGSe_2$).

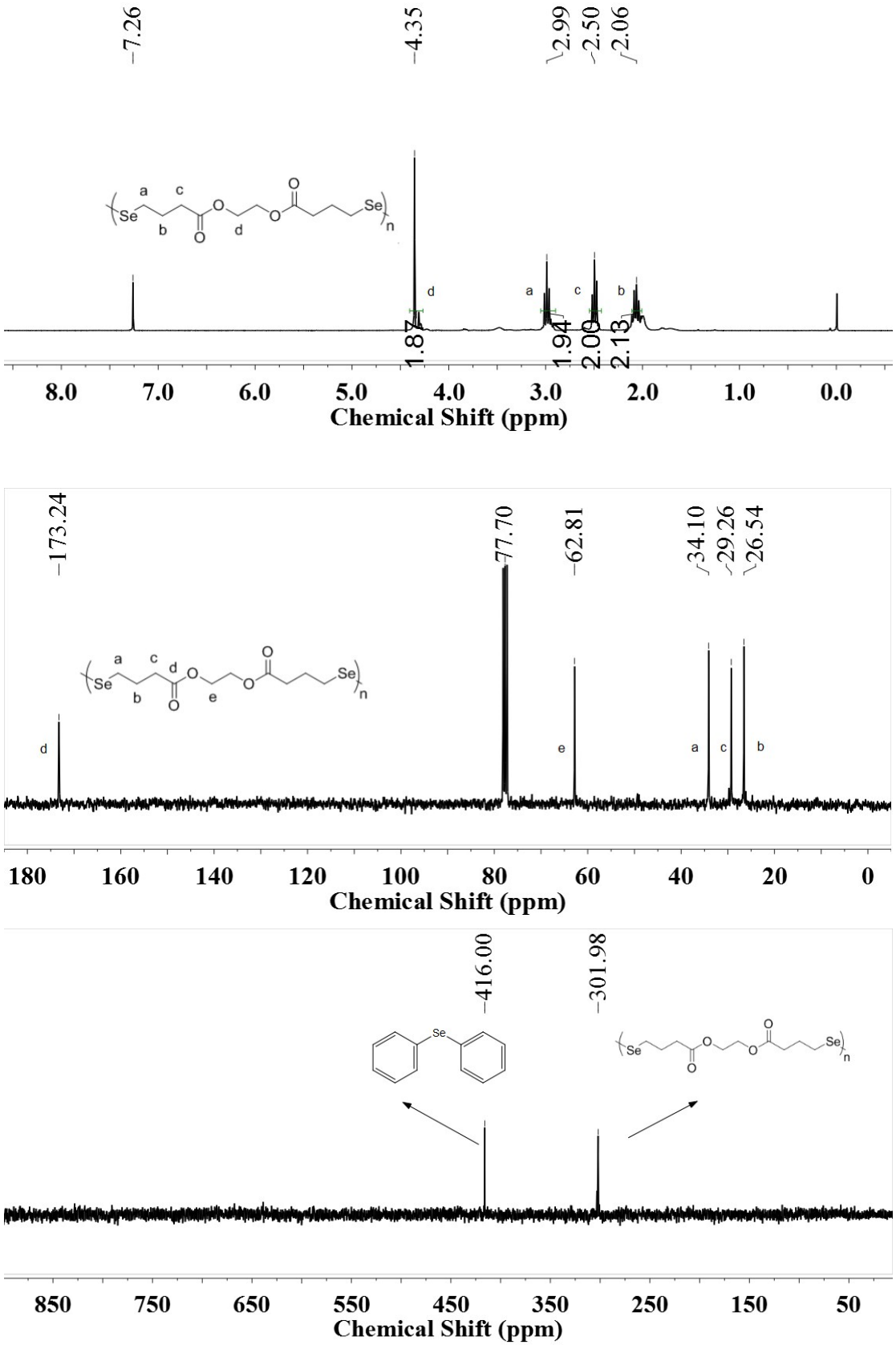


Figure S14. ^{1}H, ^{13}C, and ^{77}Se NMR spectra of $EGSe_2$.

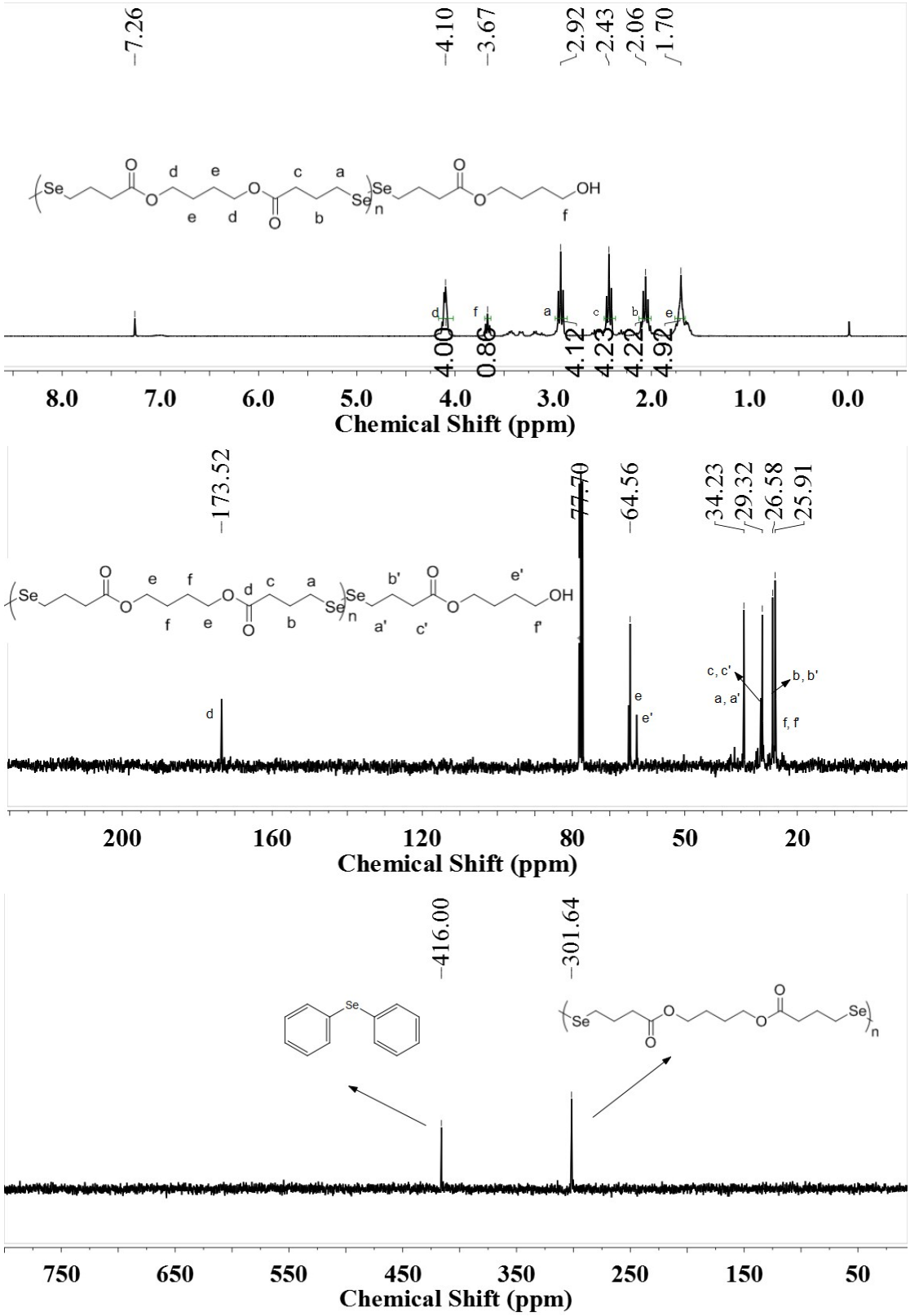


Figure S15. ^{1}H, ^{13}C, and ^{77}Se NMR spectra of $BDOSe_2$.

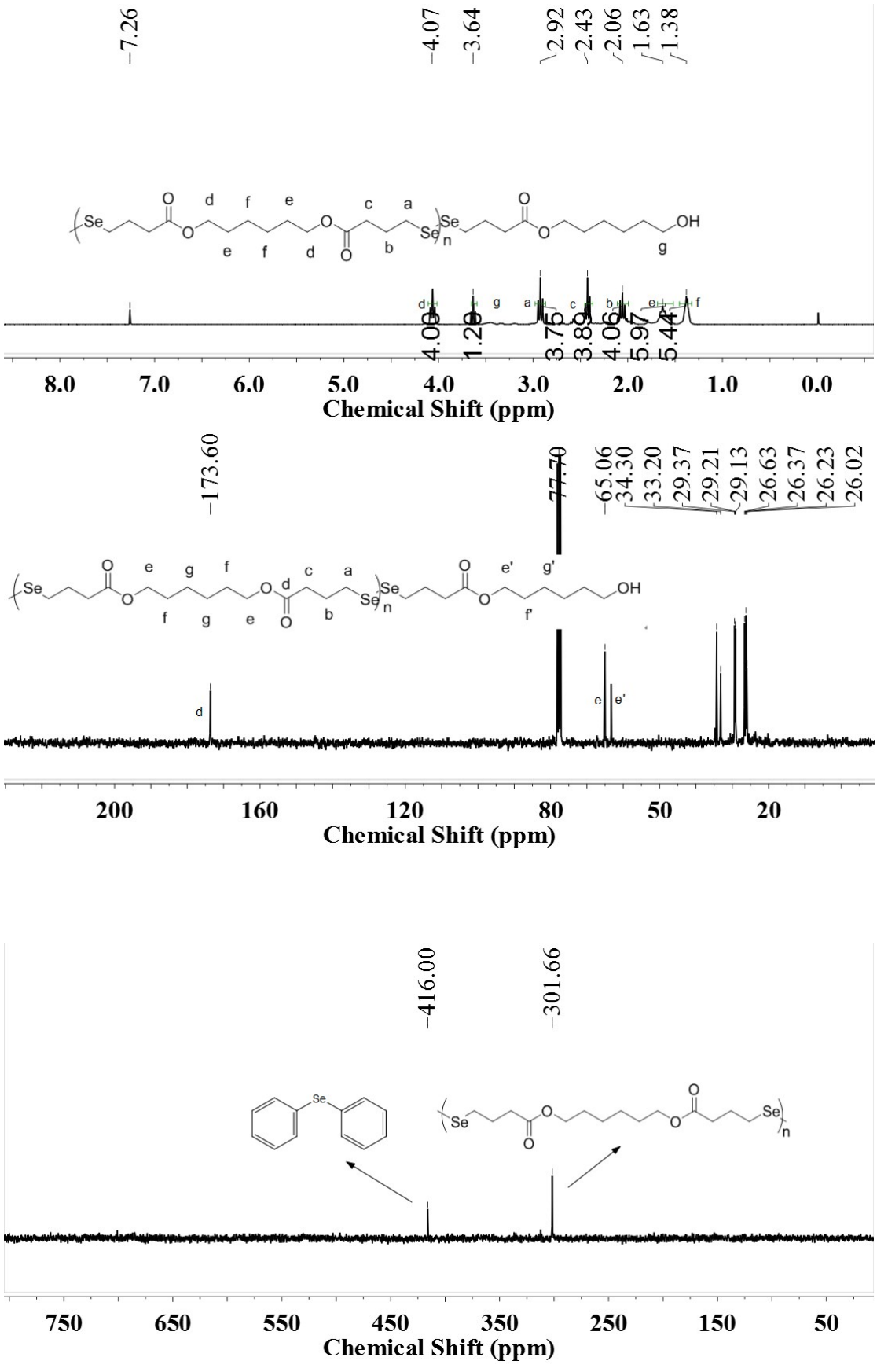


Figure S16. ^{1}H, ^{13}C, and ^{77}Se NMR spectra of $HDOSe_2$.

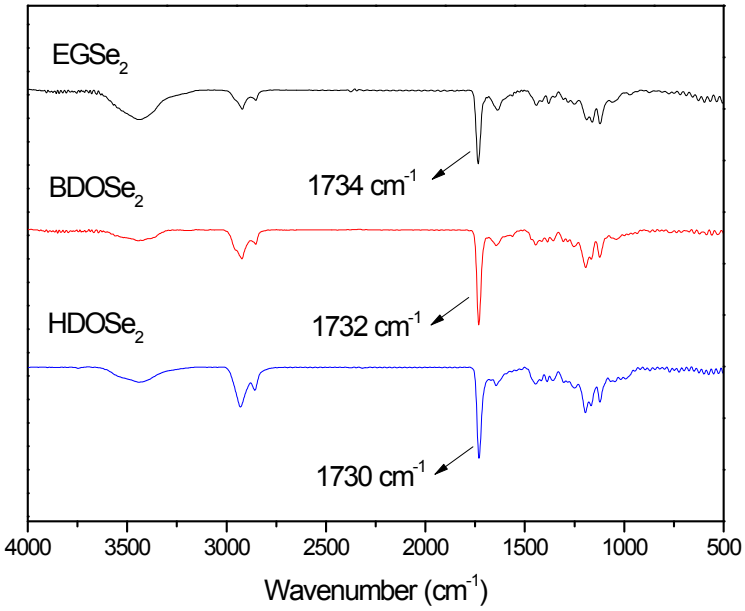


Figure S17. IR spectra of $EGSe_2$, $BDOSe_2$, $HDOSe_2$.

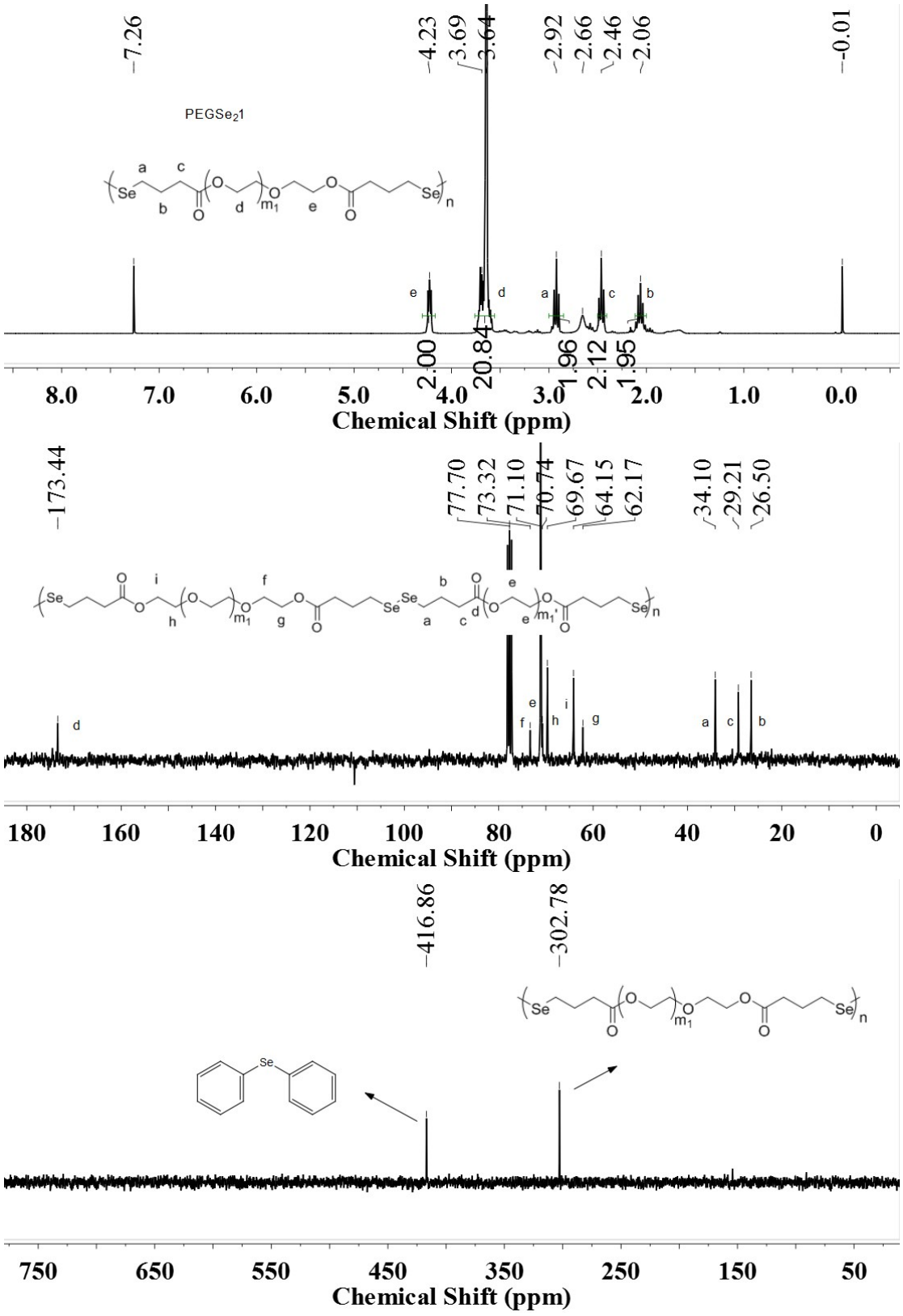


Figure S18. ^{1}H, ^{13}C, and ^{77}Se NMR spectra of $PEGSe_2$1.

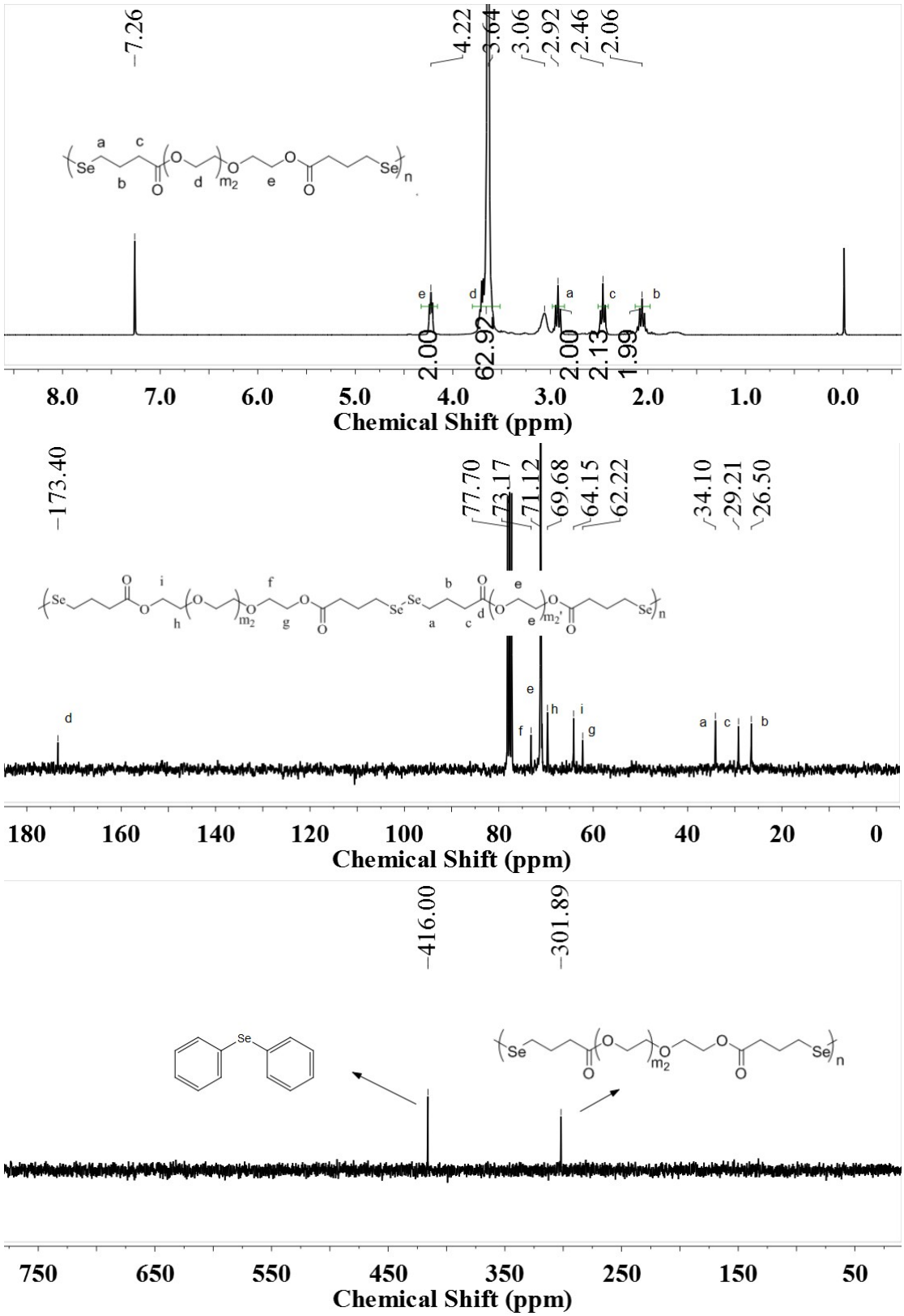


Figure S19. ^{1}H, ^{13}C, and ^{77}Se NMR spectra of $PEGSe_2$2.

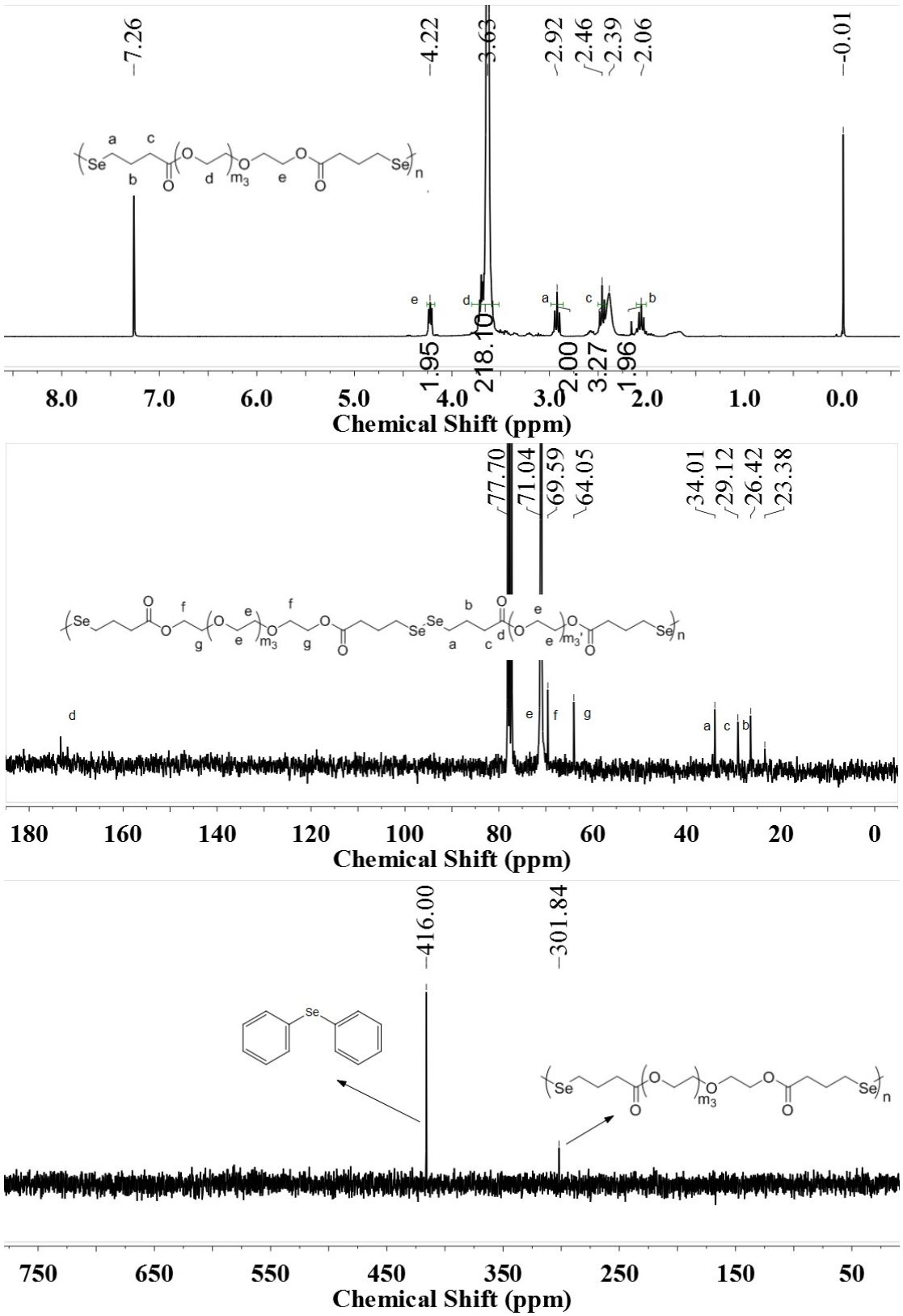


Figure S20. ^{1}H, ^{13}C, and ^{77}Se NMR spectra of $PEGSe_2$3.

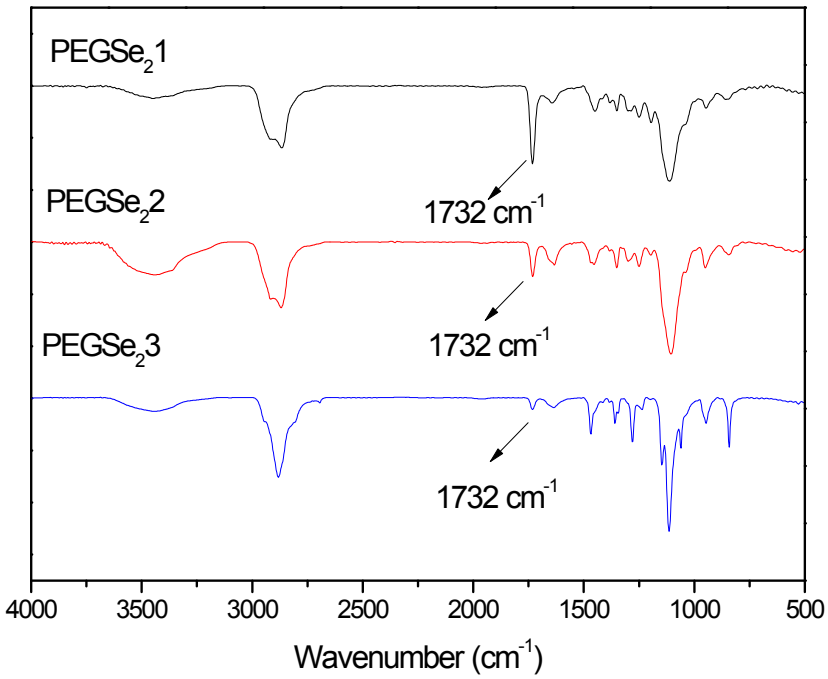


Figure S21. FTIR spectra of $PEGSe_2$1, $PEGSe_2$2, $PEGSe_2$3.

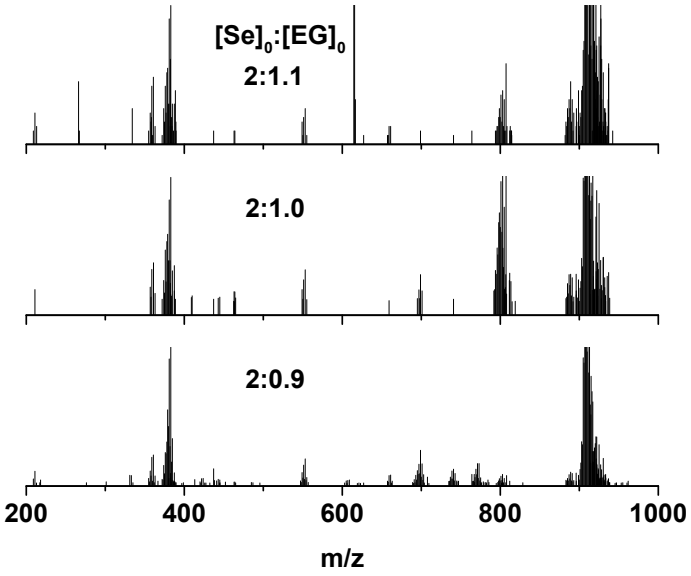
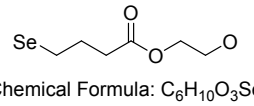
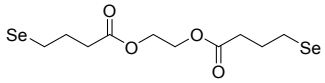
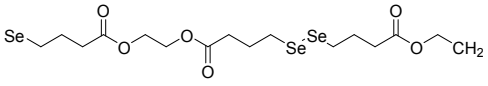
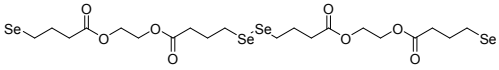
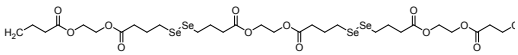


Figure S22. HRMS spectra of polyesters from the reaction of ethylene glycol and γ-butyroselenolactone with a ratio of $[Se]_0$: $[EG]_0$ = 2:0.9/2:1/2:1.1 in THF.

Table S1. Mass Measurement of Different Chain Populations of Oligomers Detected by LC-MS.

Entry	Structure	Calculated m/z (+H)	Calculated m/z (+Na)	Experimental m/z
1	 Chemical Formula: $C_6H_{10}O_3Se$ Exact Mass: 209.9795	210.9873	233.9771	210.9855
2	 Chemical Formula: $C_{10}H_{16}O_4Se_2$ Exact Mass: 359.9379	360.9457	382.9277	360.9435
3	 Chemical Formula: $C_{16}H_{26}O_6Se_3$ Exact Mass: 551.9233	552.9311	574.9131	553.0654
4	 Chemical Formula: $C_{20}H_{32}O_8Se_4$ Exact Mass: 717.8766	720.8836	740.8664	740.8715
5	 Chemical Formula: $C_{30}H_{48}O_{12}Se_4$ Exact Mass: 915.9822	916.9902	938.9720	917.0435

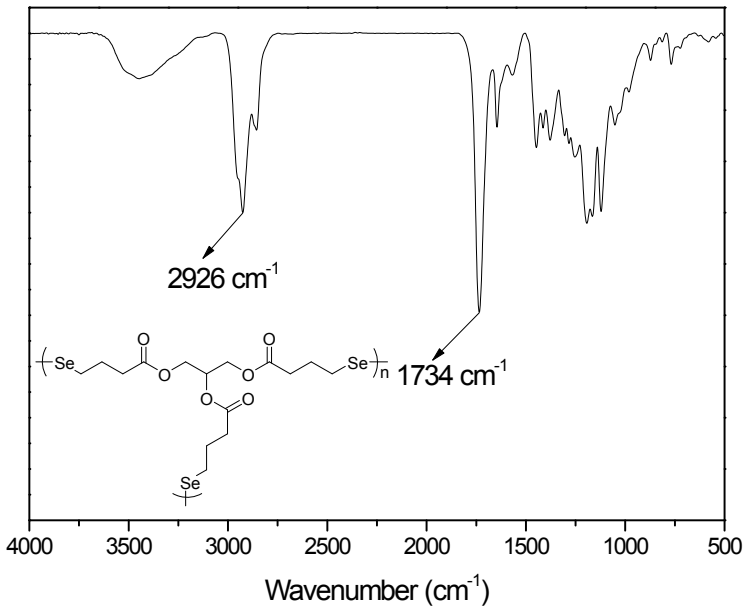


Figure S23. FTIR spectrum for the polyesters obtaining form reaction of γ-butyroselenolactone and glycerol in THF.

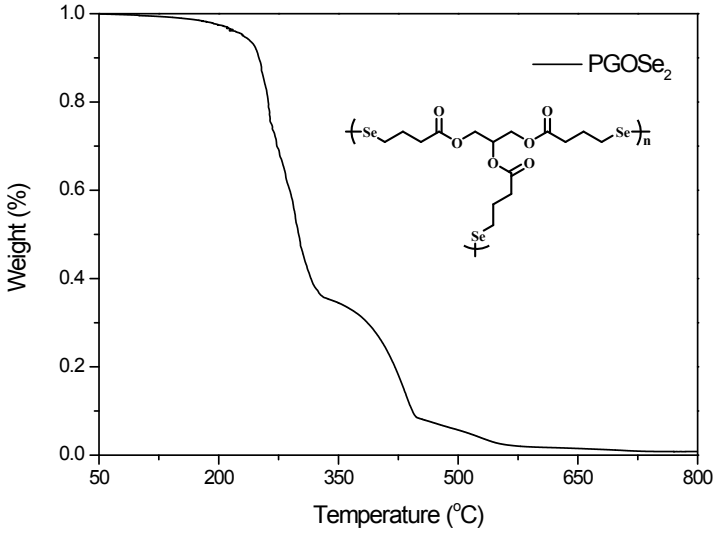


Figure S24. TGA spectrum for the polyesters obtaining form reaction of γ-butyroselenolactone and glycerol in THF.

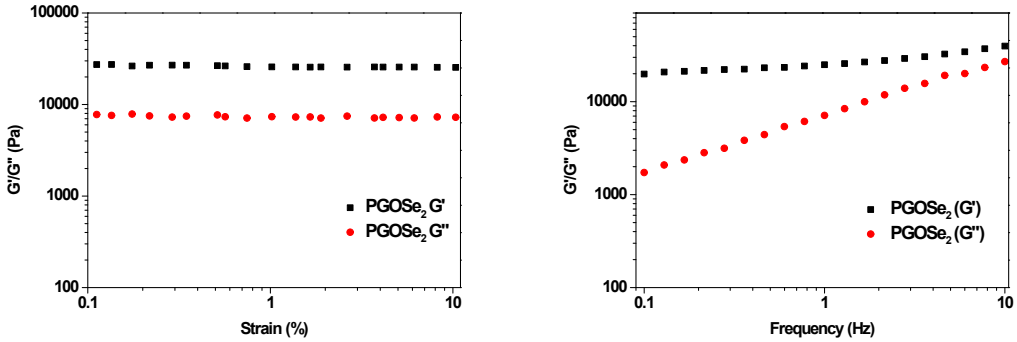


Figure S25. Rheological testing of polyester materials ($PGOSe_2$).

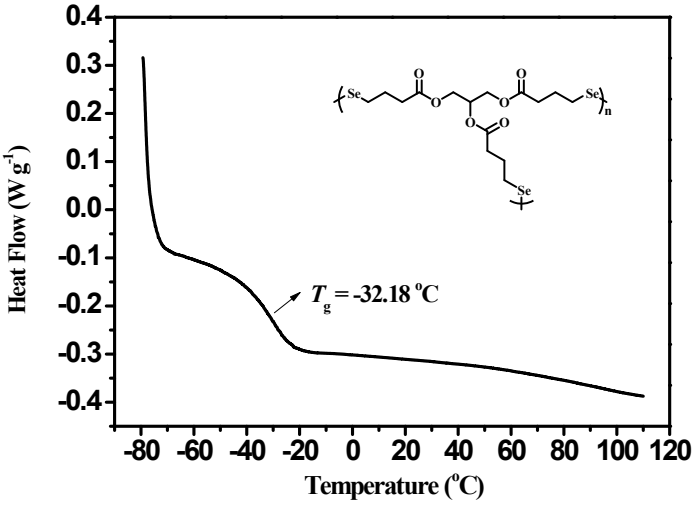


Figure S26. DSC curves of polyesters ($PGOSe_2$).