Electronic Supplementary Material (ESI) for Polymer Chemistry.

Supporting Information for

One-Pot Cascade Polymerization Based on Addition Reaction of Electrophilic Selenium Reagent to Alkene

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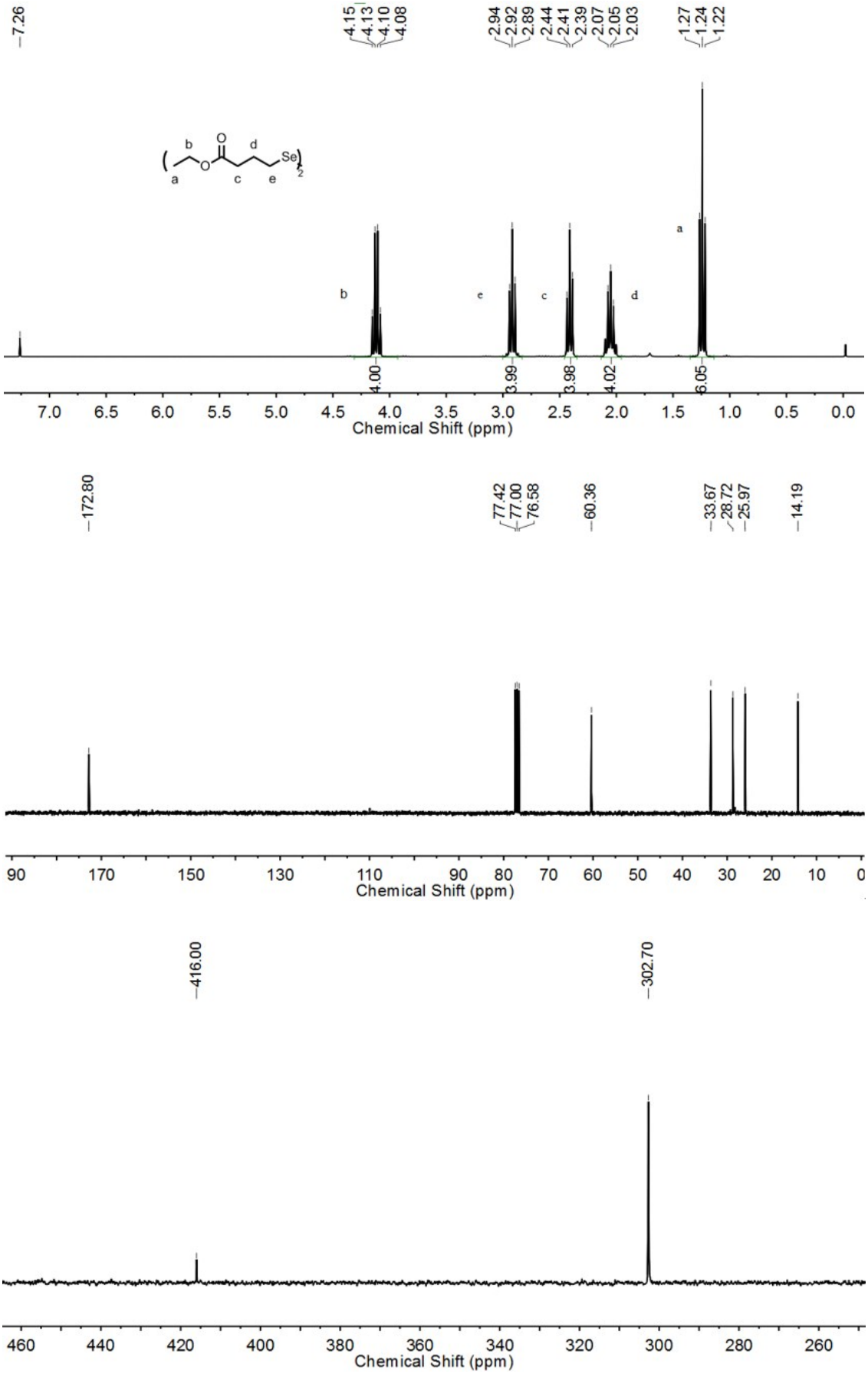

Fig. S1 ^{1}H, ^{13}C, and ^{77}Se NMR spectra of diethyl γ, γ'-diselenodibutyrate.

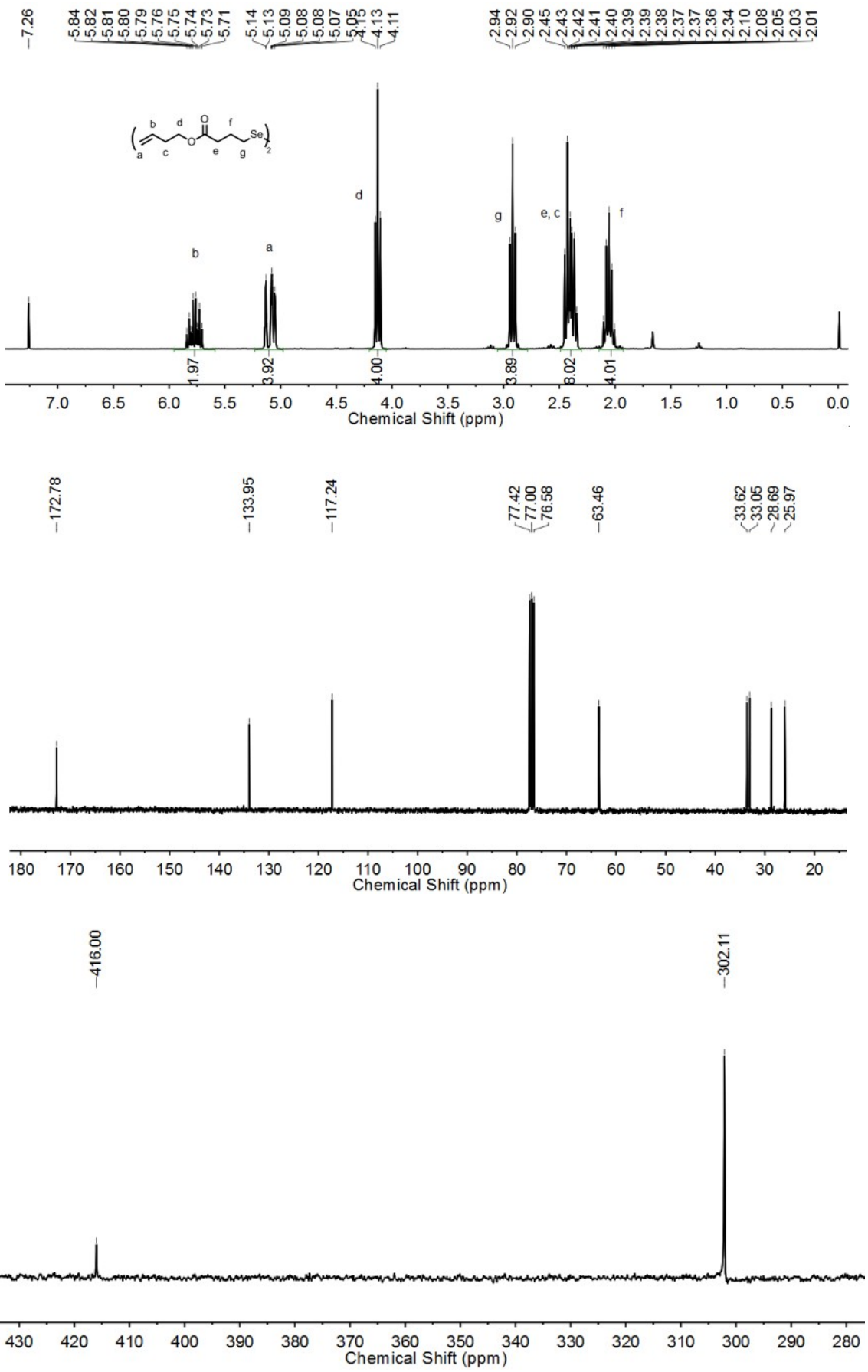

Fig. S2 ^{1}H, ^{13}C, and ^{77}Se NMR spectra of di(but-3-en-1-yl) γ, γ'-diselenodibutyrate.

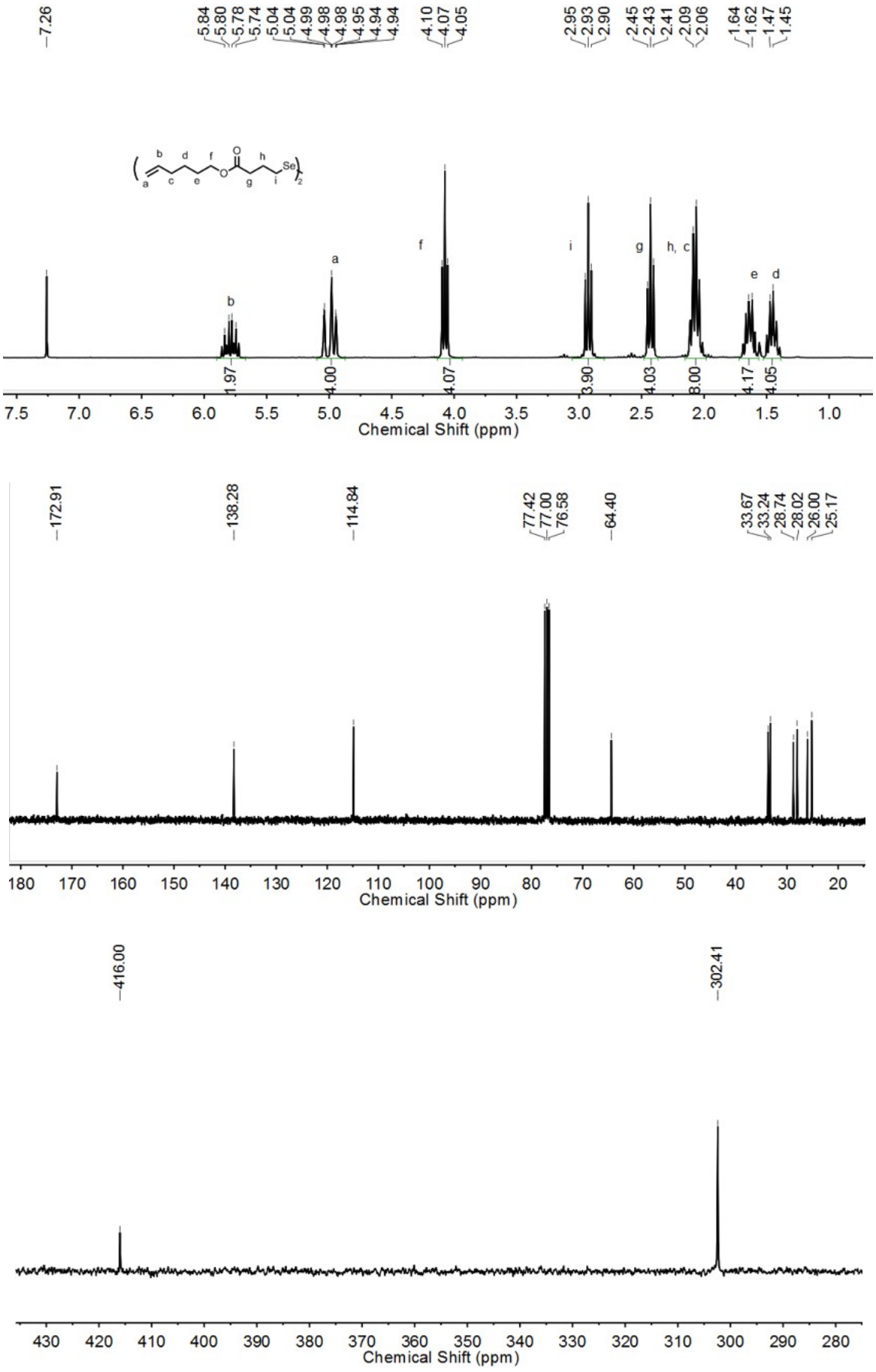

Fig. S3 ^{1}H, ^{13}C, and ^{77}Se NMR spectra of di(hex-5-en-1-yl) γ, γ'-diselenodibutyrate.

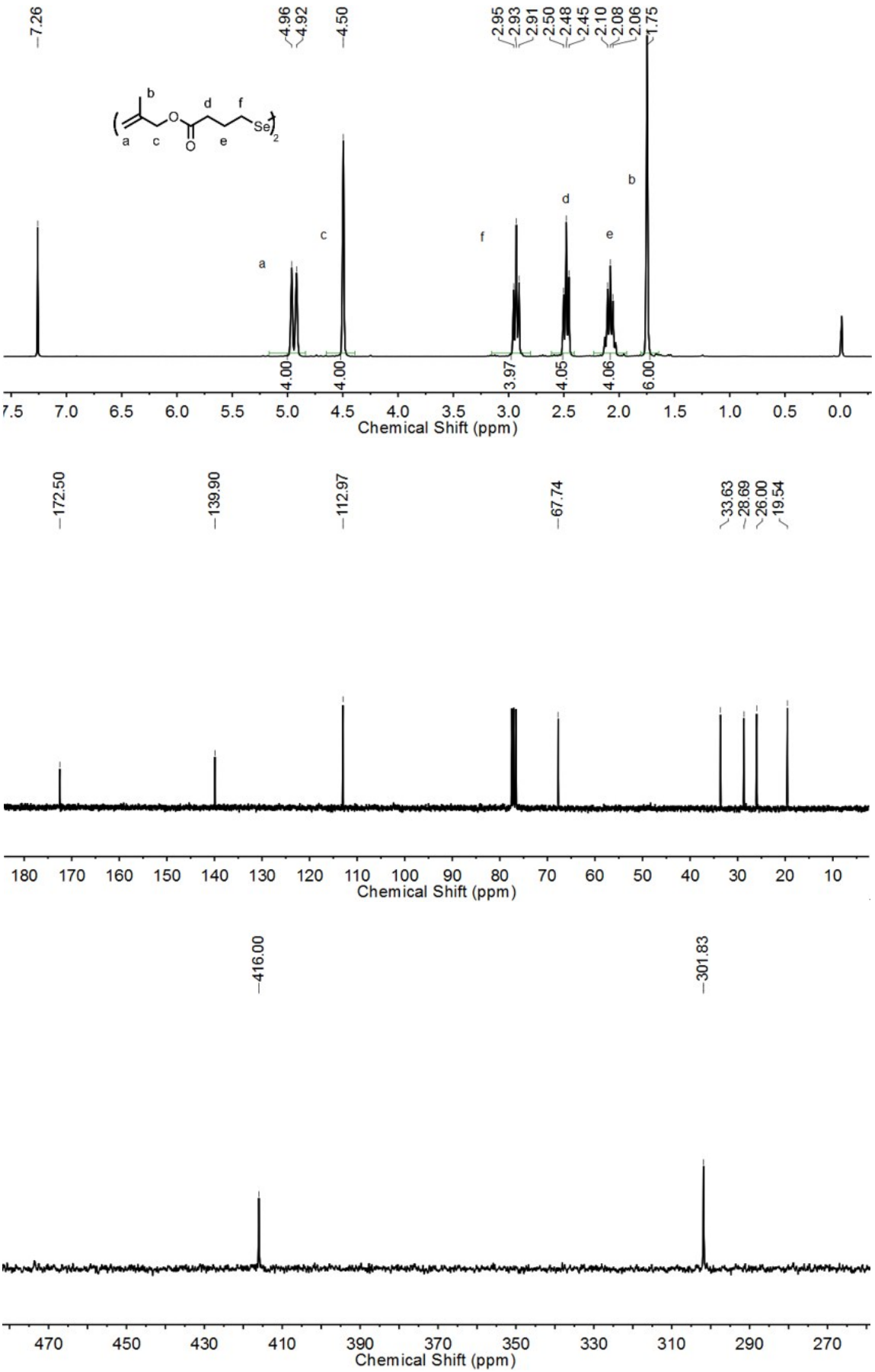

Fig. S4 ^{1}H, ^{13}C, and ^{77}Se NMR spectra of di(2-methylallyl) γ, γ'-diselenodibutyrate.

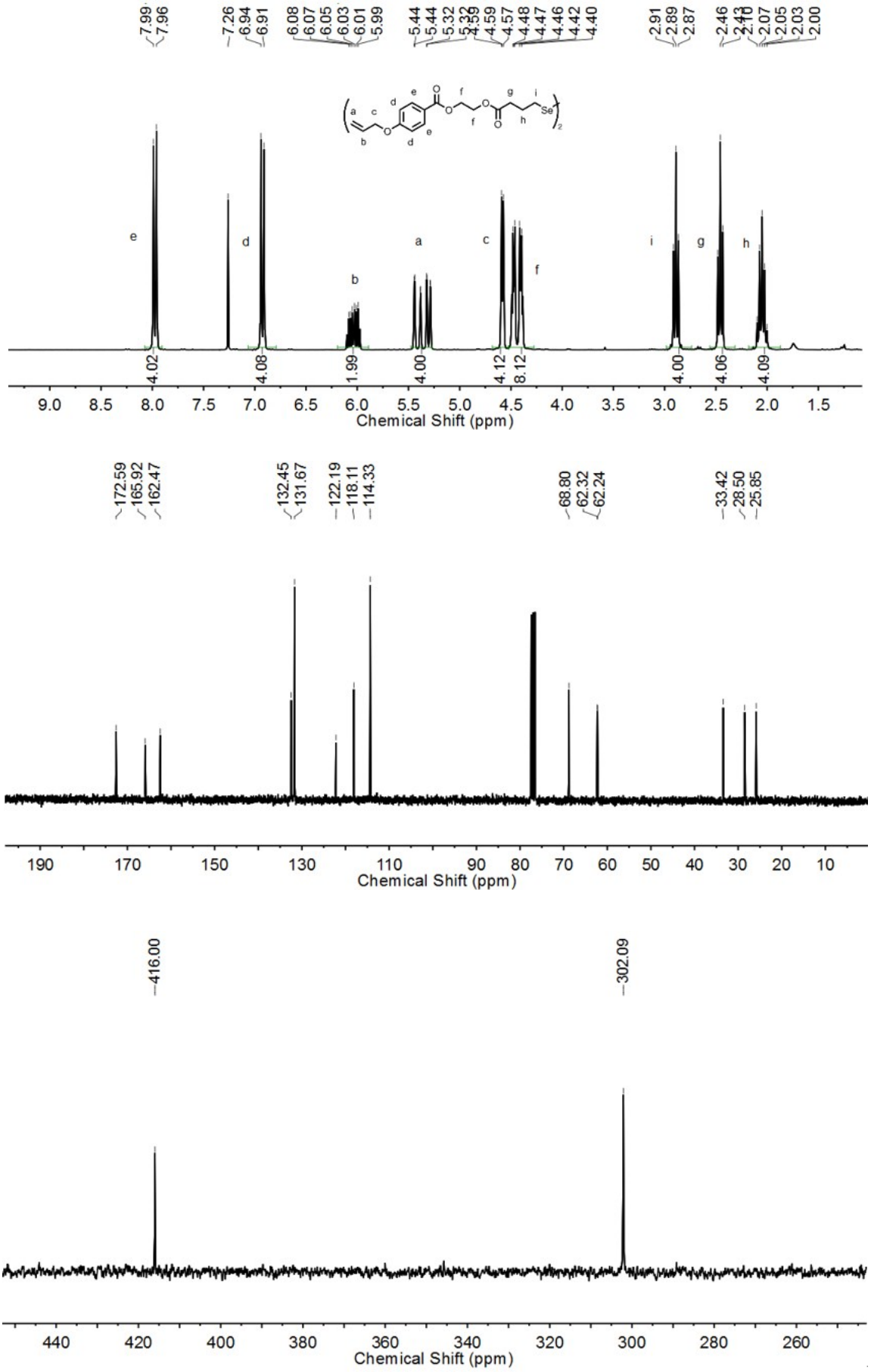

Fig. S5 ^{1}H, ^{13}C, and ^{77}Se NMR spectra of di(2-(4-(allyloxy)phenyloyloxy)ethyl) γ, γ'-diselenodibutyrate.

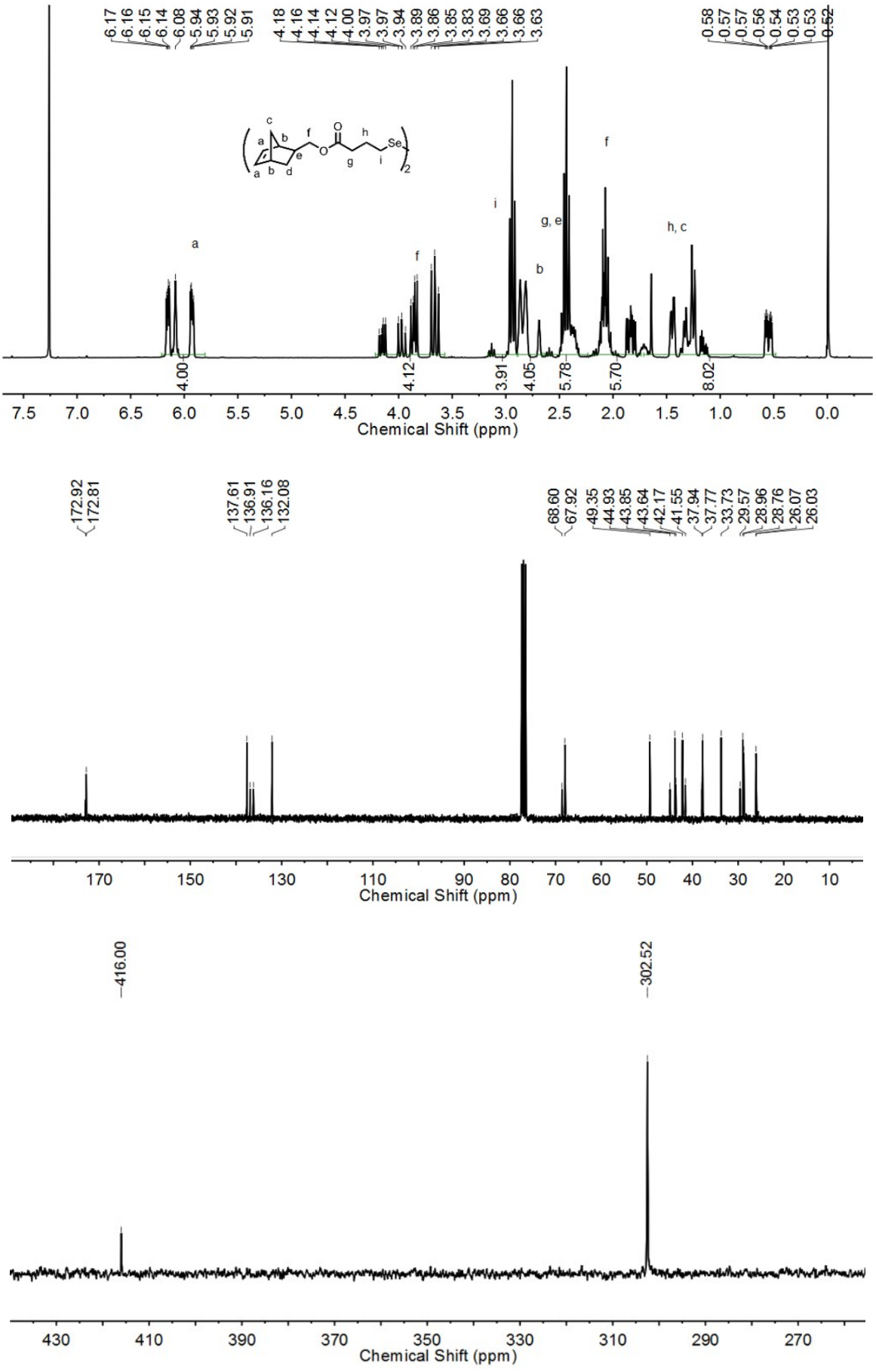

Fig. S6 ^{1}H, ^{13}C, and ^{77}Se NMR spectra of di(bicyclo[2.2.1]hept-5-en-2-ylmethyl) γ, γ'-diselenodibutyrate.

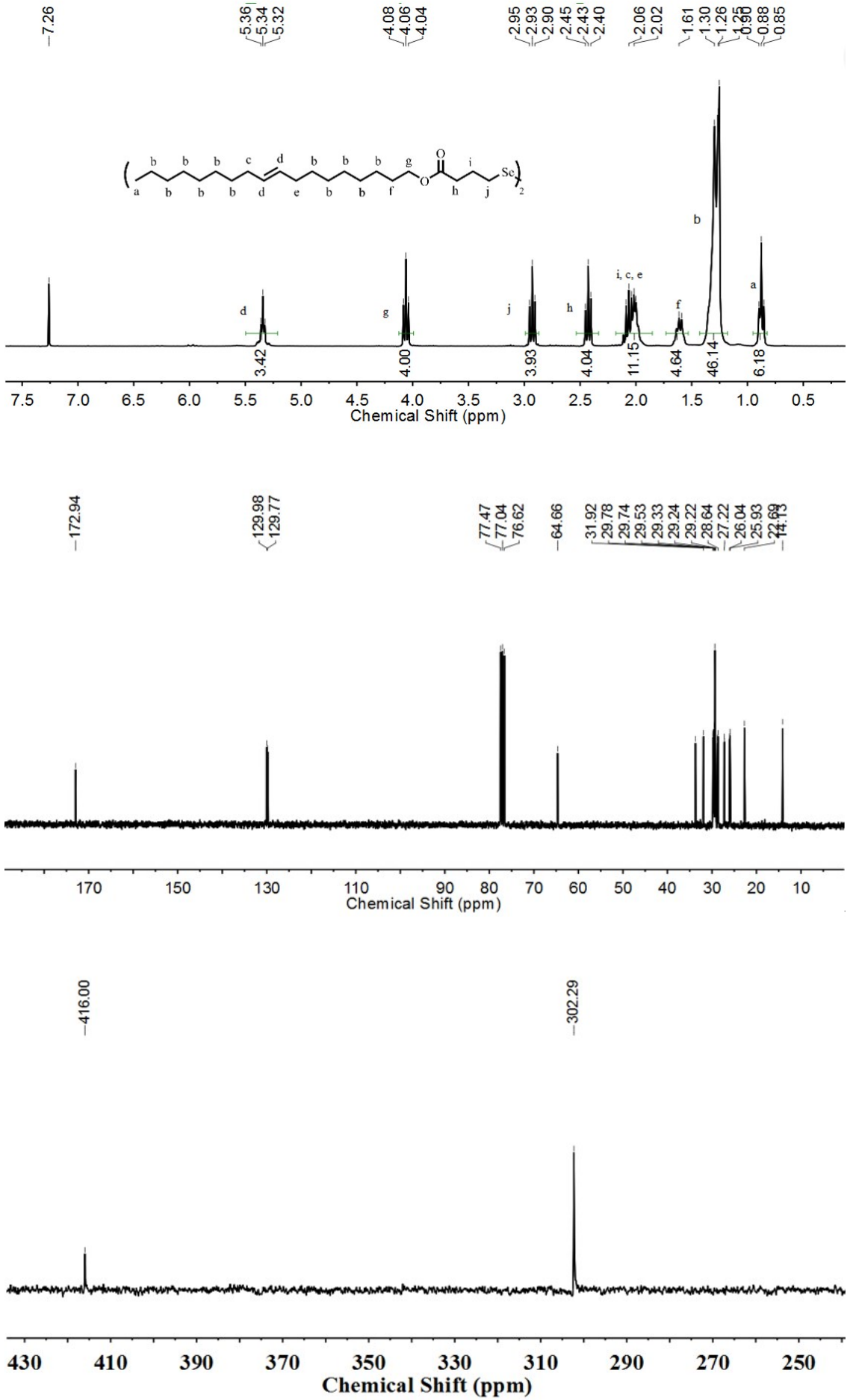

Fig. S7 ^{1}H, ^{13}C, and ^{77}Se NMR spectra of di(9-octadecen-1-yl) γ, γ'-diselenodibutyrate.

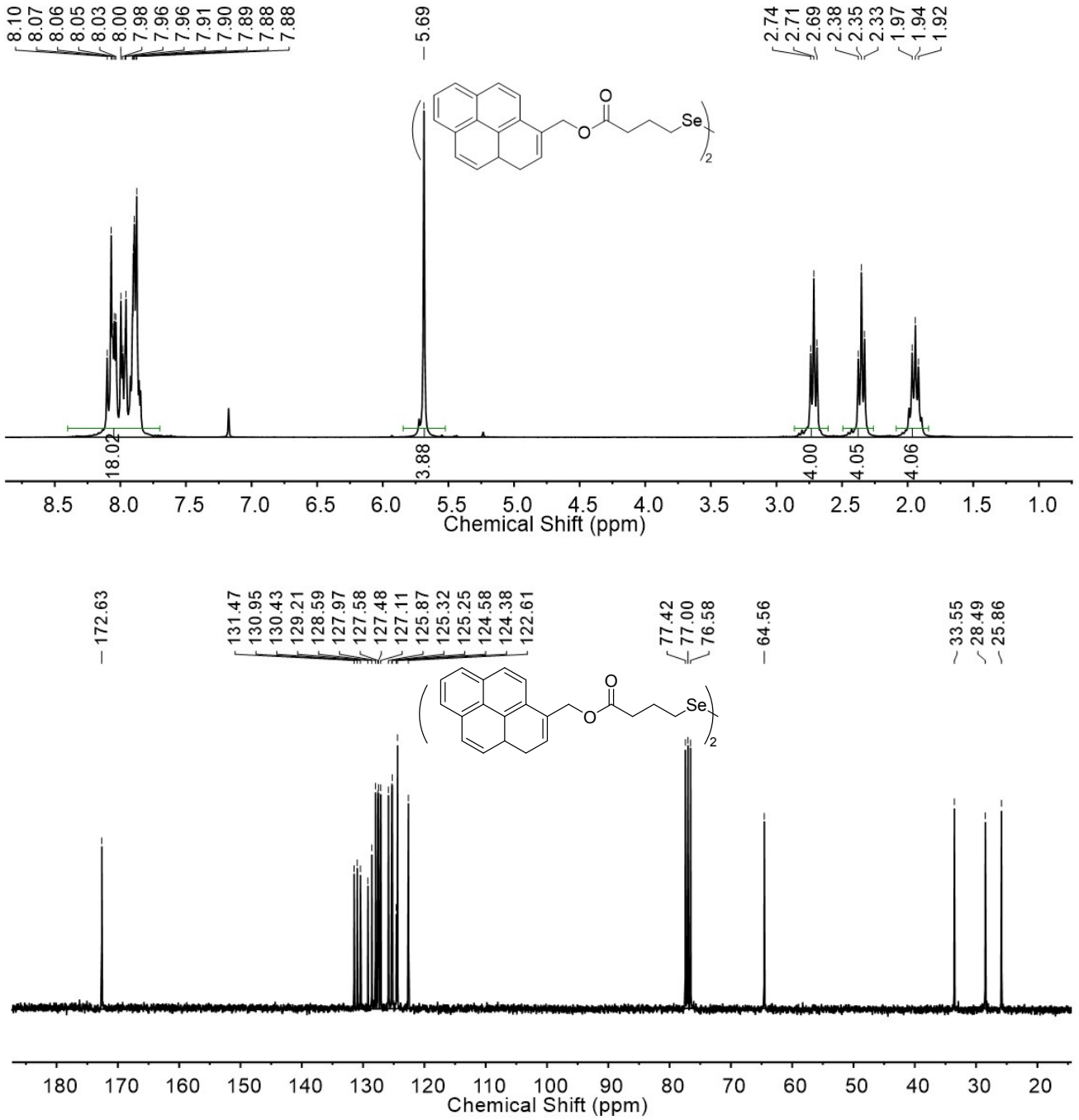

Fig. S8 ^{1}H and ^{13}C NMR spectra of di(pyren-1-ylmethyl) γ, γ'-diselenodibutyrate.

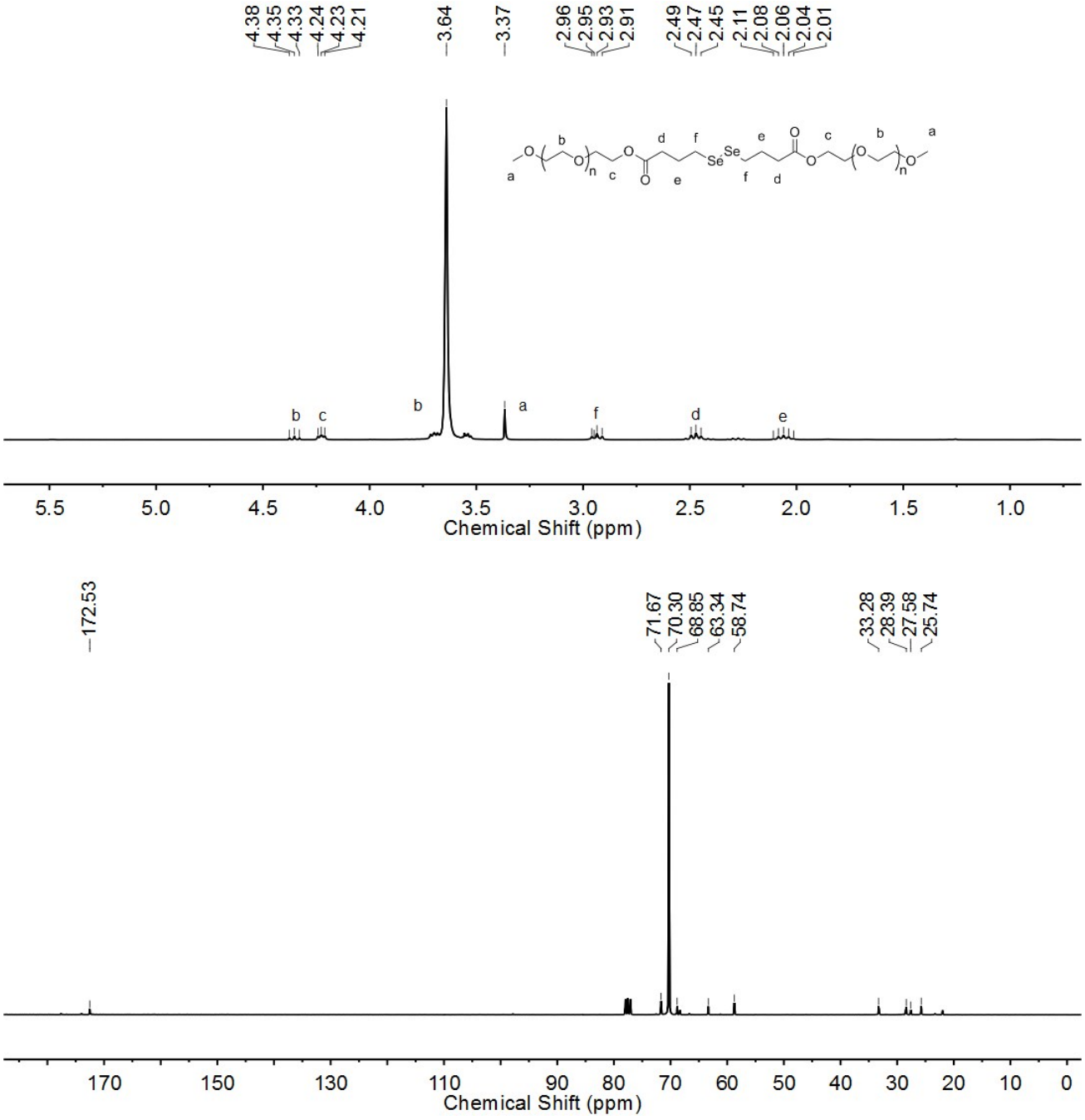

Fig. S9 ^{1}H and ^{13}C NMR spectra of PEG-SeSe-PEG.

Model reaction of electrophilic selenium-promoted additions of nucleophiles to 1-hexene

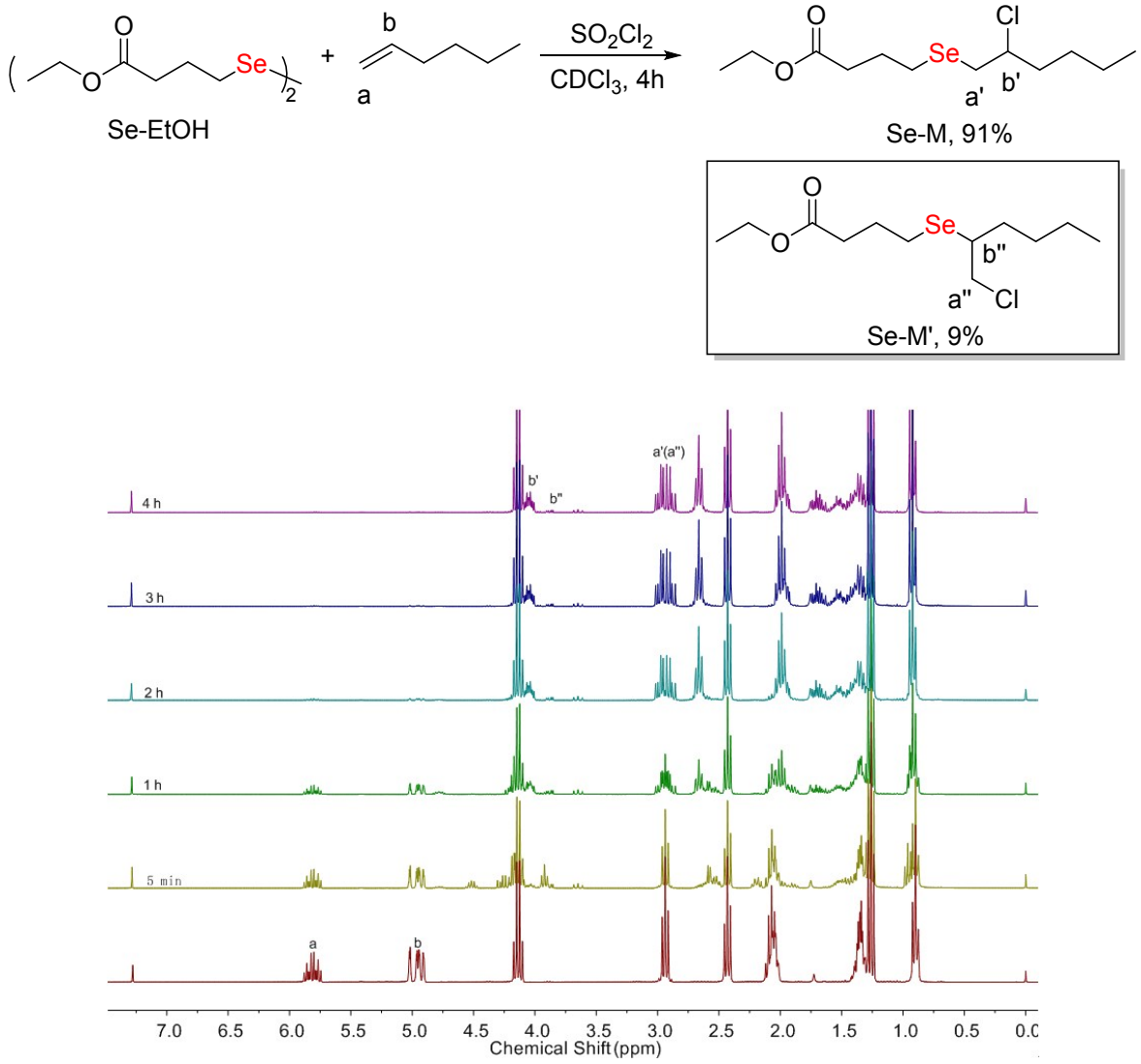

Fig. S10 ^{1}H NMR spectra of the reaction solution with the molar ratio of [diethyl γ, γ'-diselenodibutyrate]$_0$: [1-hexene]$_0$: [sulfonyl chloride]$_0$ = 1:1:1 at room temperature in $CDCl_3$. The chemoselective conversions were determined using ^{1}H NMR spectra by comparing the integrated characteristic signals of proton b' (4.01 ppm) and b''(3.86 ppm).

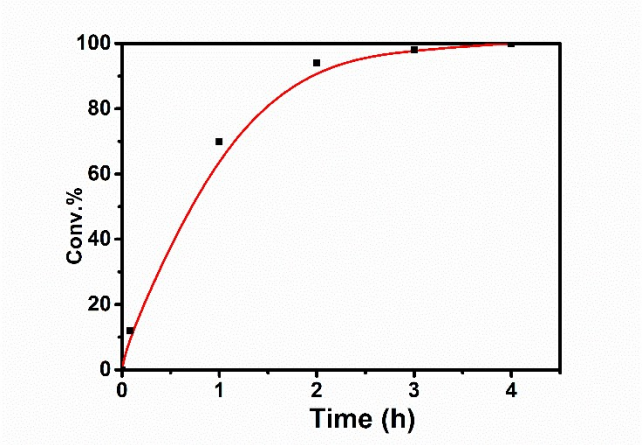

Fig. S11 Plot of conversion versus time for the one pot reaction of diethyl γ, γ'-diselenodibutyrate, 1-hexene, and sulfonyl chloride according to Fig. S10.

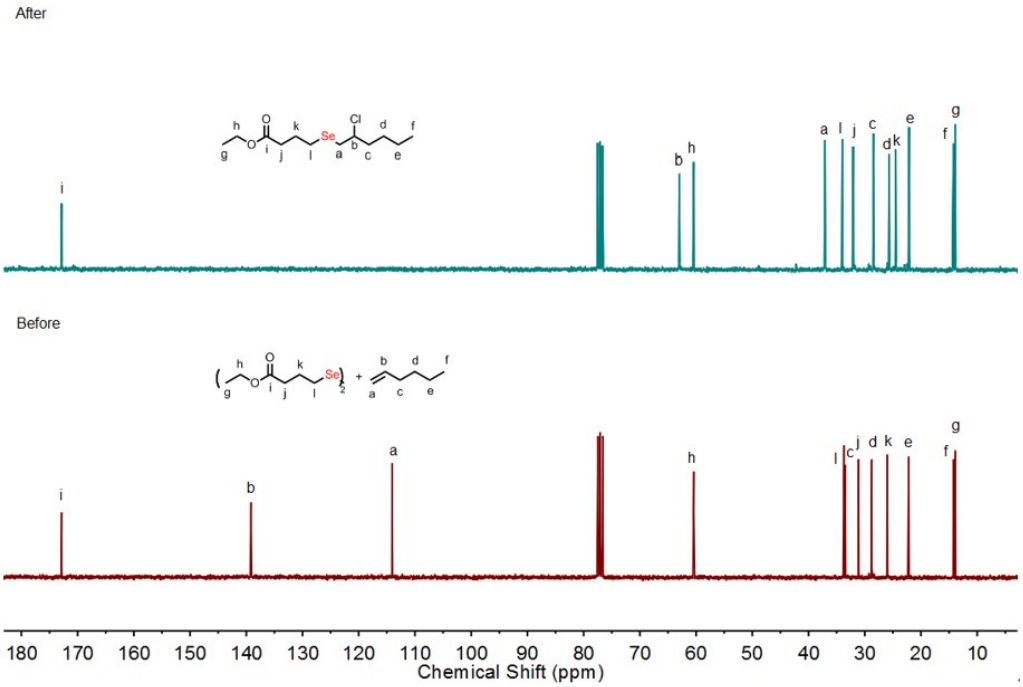

Fig. S12 ^{13}C NMR spectra of the mixture of diethyl γ, γ'-diselenodibutyrate and 1-hexene before and after the addition of sulfonyl chloride in $CDCl_3$.

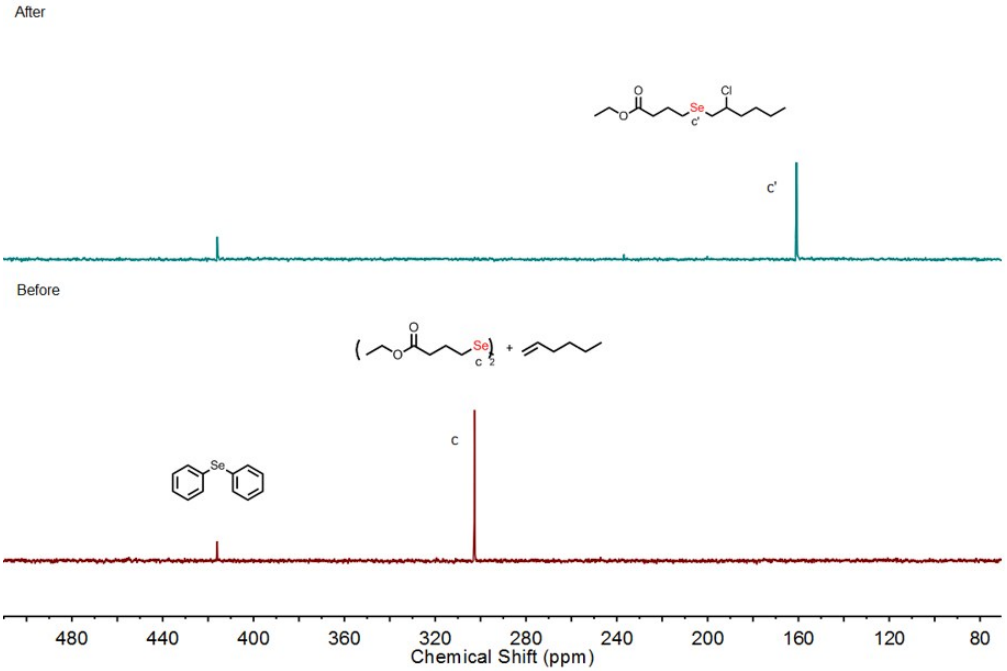

Fig. S13 ^{77}Se NMR spectra of the mixture of diethyl γ, γ'-diselenodibutyrate and 1-hexene before and after the addition of sulfonyl chloride in $CDCl_3$.

One-pot stepwise polymerization of the electrophilic selenium reagents to alkenes

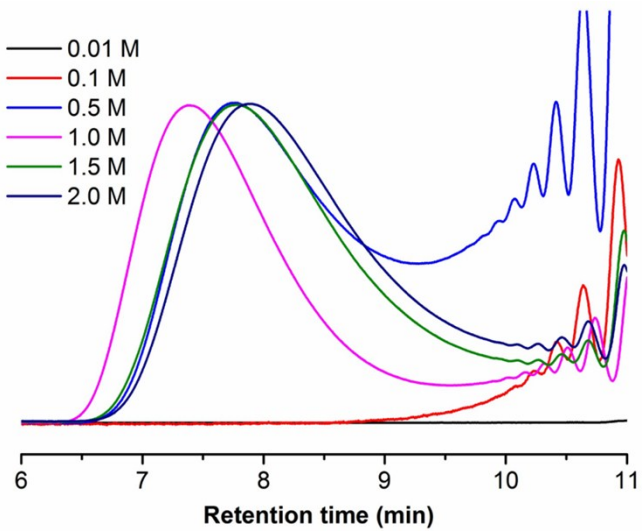

Fig. S14 SEC curves of polymer PSe-2 obtaining in different monomer concentration.

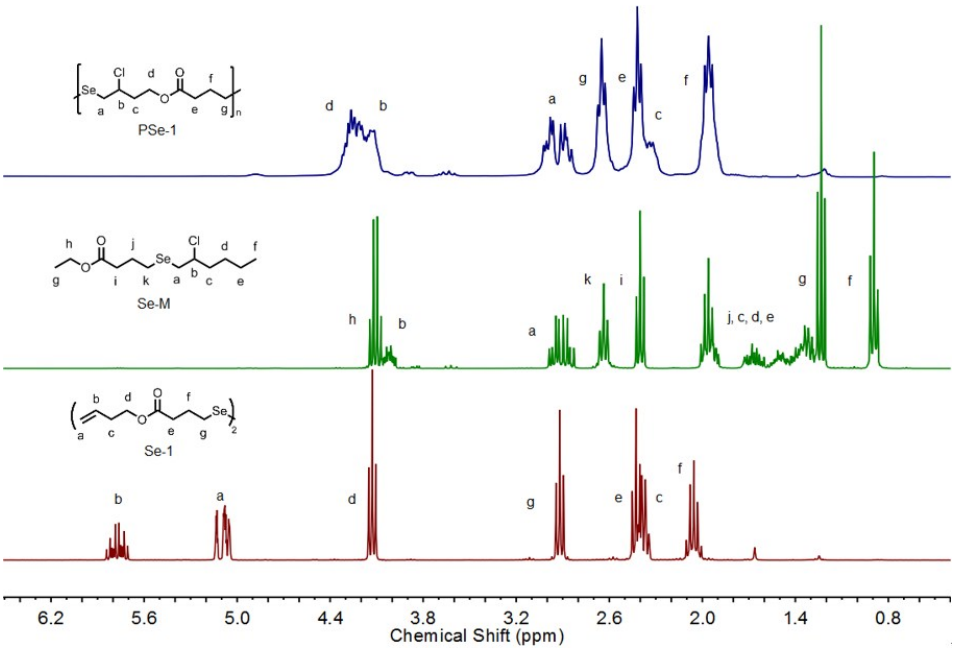

Fig. S15 ^{1}H NMR spectra of polymer PSe-1, model compound Se-M, and monomer Se-1.

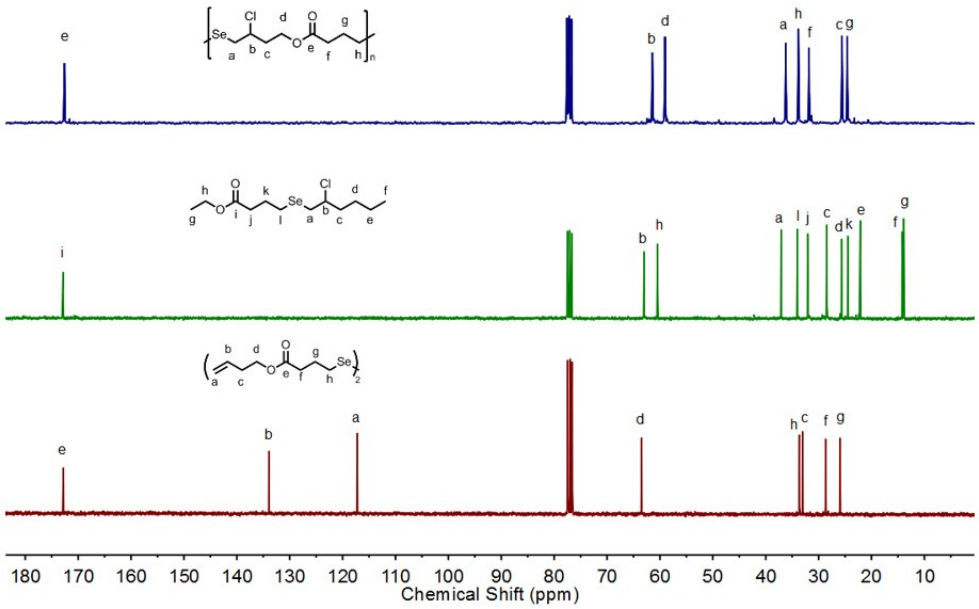

Fig. S16 ^{13}C NMR spectra of polymer PSe-1, model compound Se-M, and monomer Se-1.

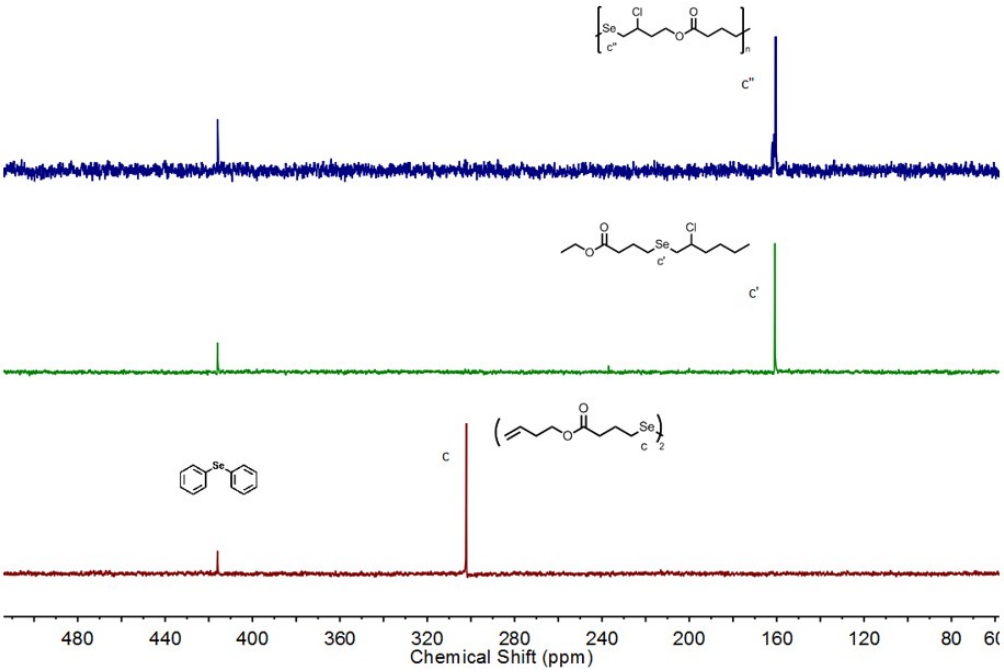

Fig. S17 ^{77}Se NMR spectra of polymer PSe-1, model compound Se-M, and monomer Se-1.

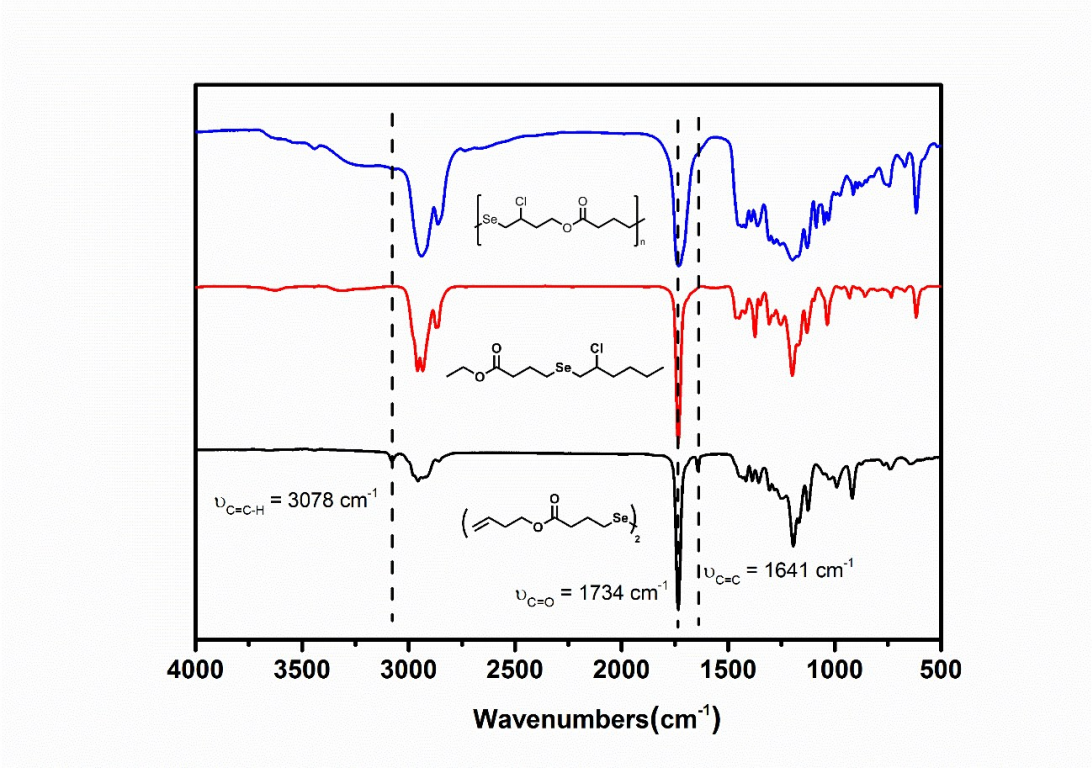

Fig. S18 FTIR spectra of polymer PSe-1, model compound Se-M, and monomer Se-1.

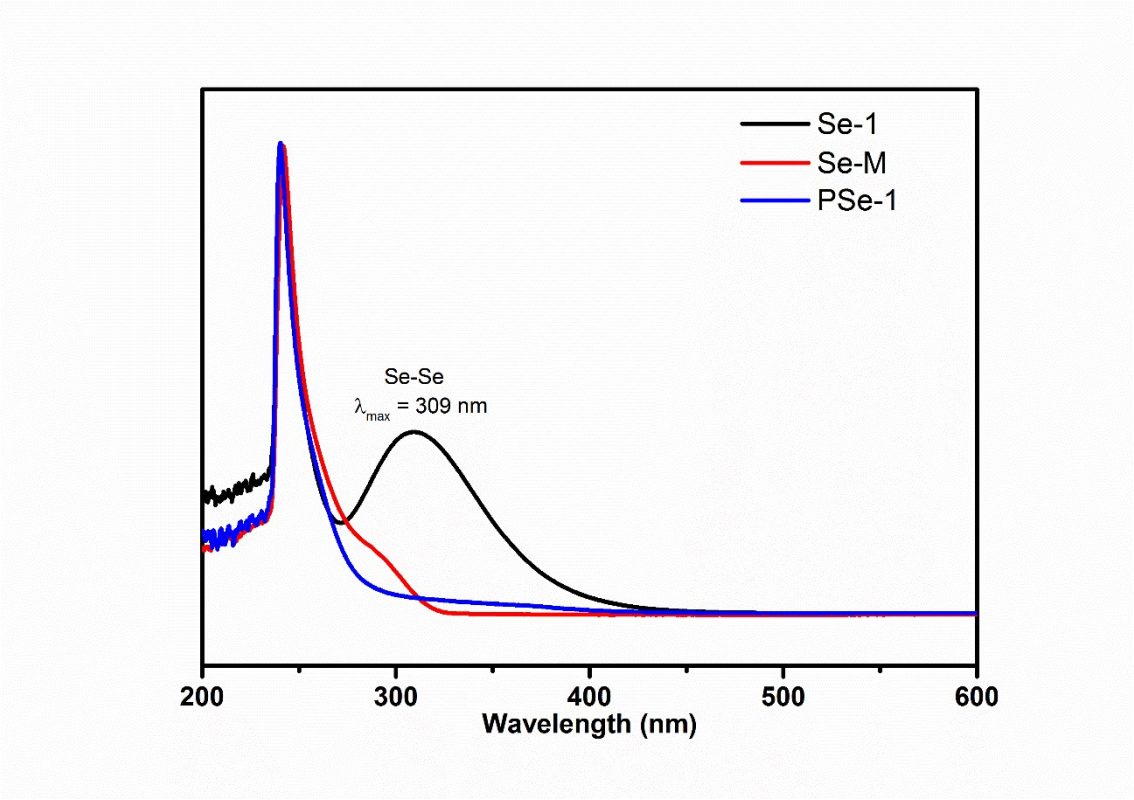

Fig. S19 UV spectra of monomer Se-1, model compound Se-M, and polymer PSe-1.

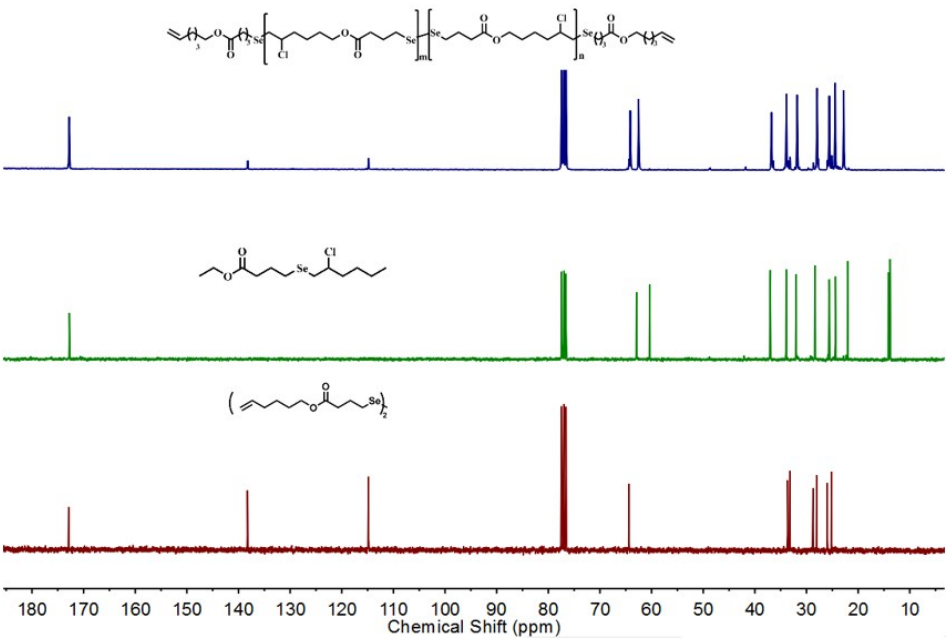

Fig. S20. ^{13}C NMR spectra of polymer PSe-2, model compound Se-M, and monomer Se-2.

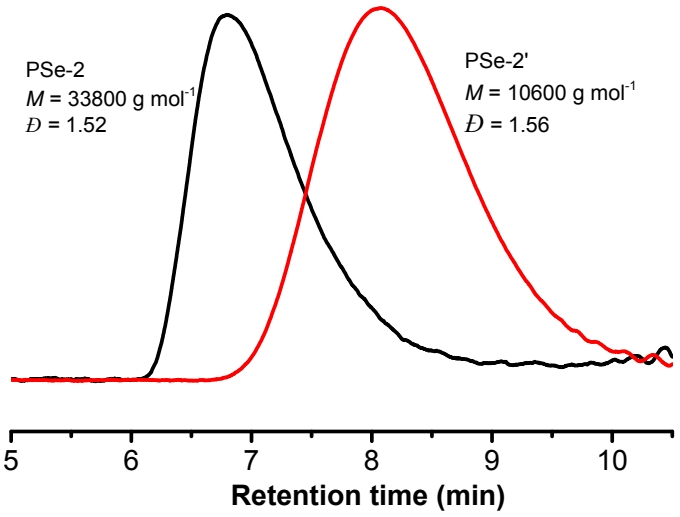

Fig. S21. SEC curves of PSe-2 and PSe-2' obtained with different molar ratio of $[Se\text{-}2]_0$: $[SO_2Cl_2]_0$ (1:1 for PSe-2, 1:0.97 for PSe-2') after 24 hours in $CDCl_3$.

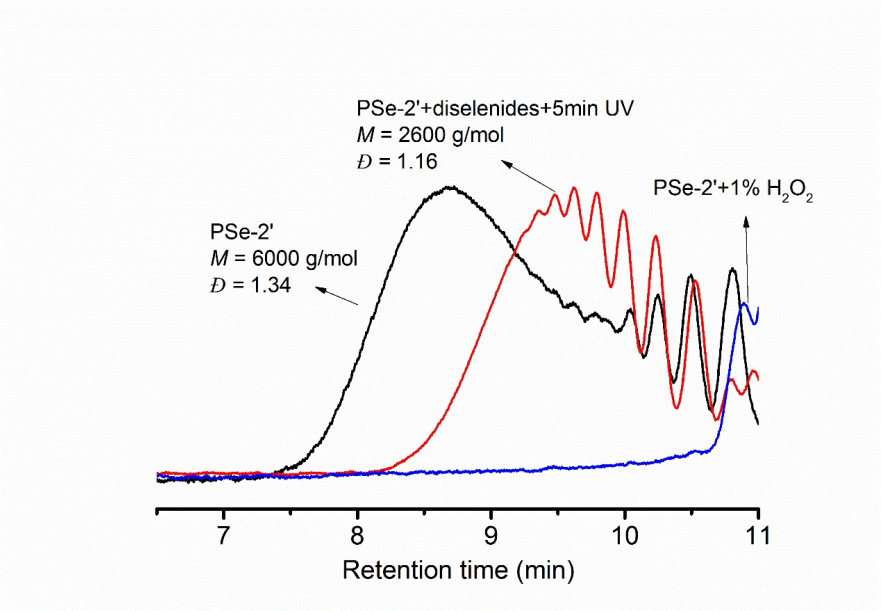

Fig. S22 SEC curves of PSe-2’ before and after treating with diphenyl diselenide under irradiaction for 5 min.

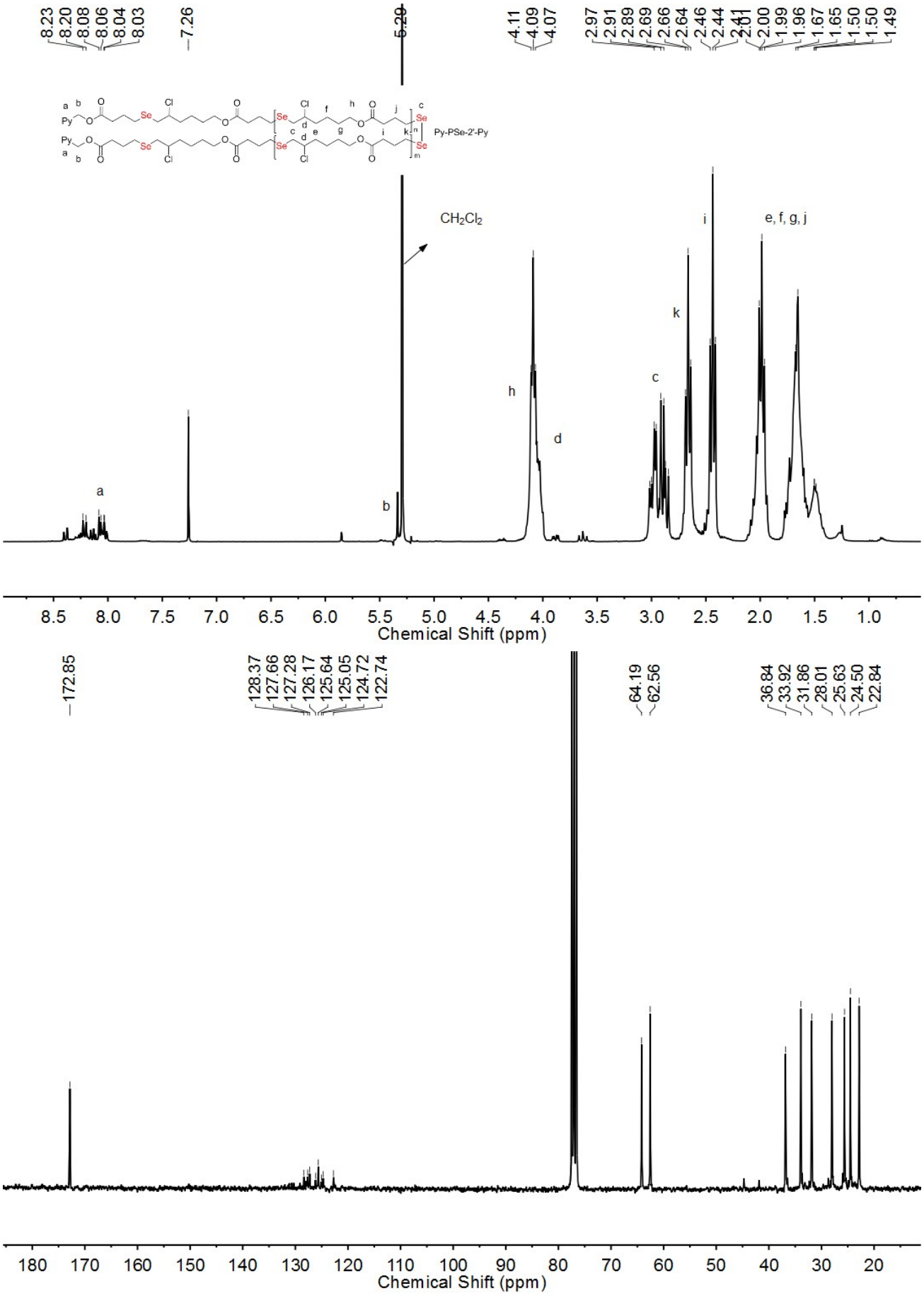

Fig. S23 ^{1}H NMR and ^{13}C NMR spectra of polymer Py-PSe-2'-Py

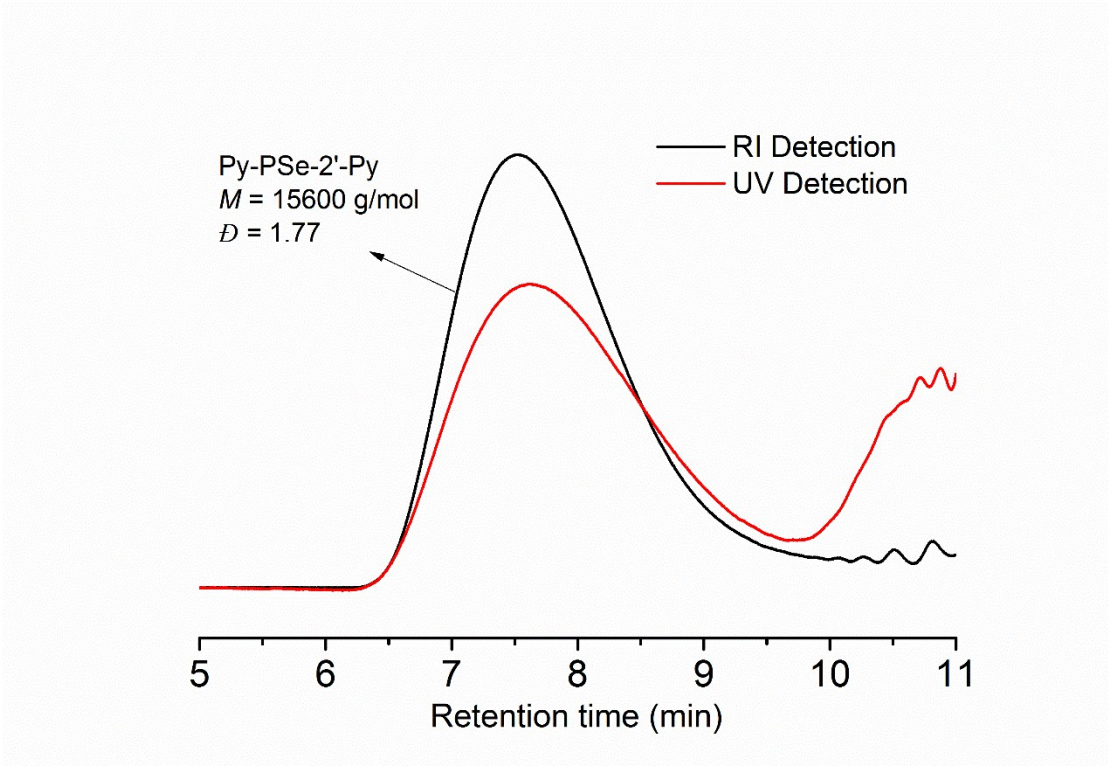

Fig. S24 SEC curves of Py-PSe-2’-Py which was measured by RI detection and UV detection at the wavelength of 340 nm.

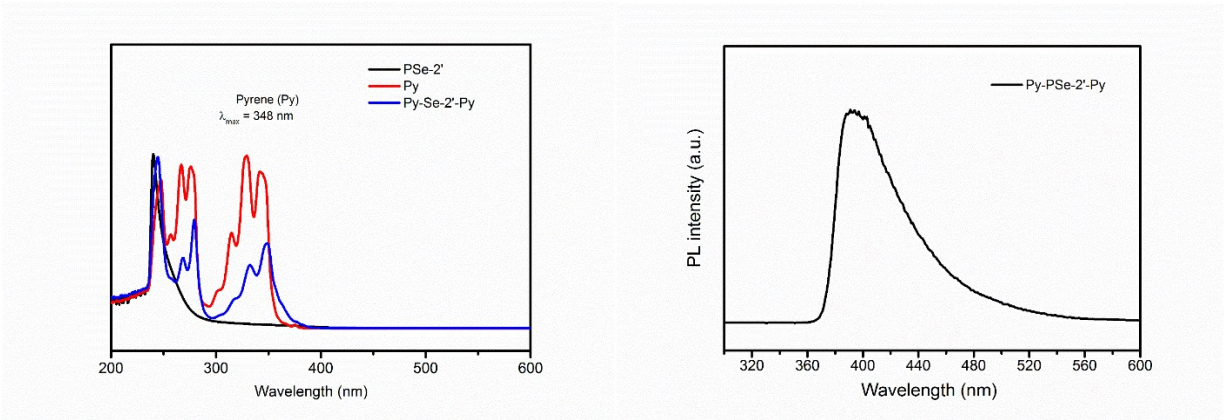

Fig. S25 a) UV spectra of monomer PSe-2’, Py, and Py-PSe-2’-Py. b) Photoluminescence (PL) Properties of Py-PSe-2'-Py in $CHCl_3$. Concentration: 0.5 µM. λ_{ex}= 390 nm.

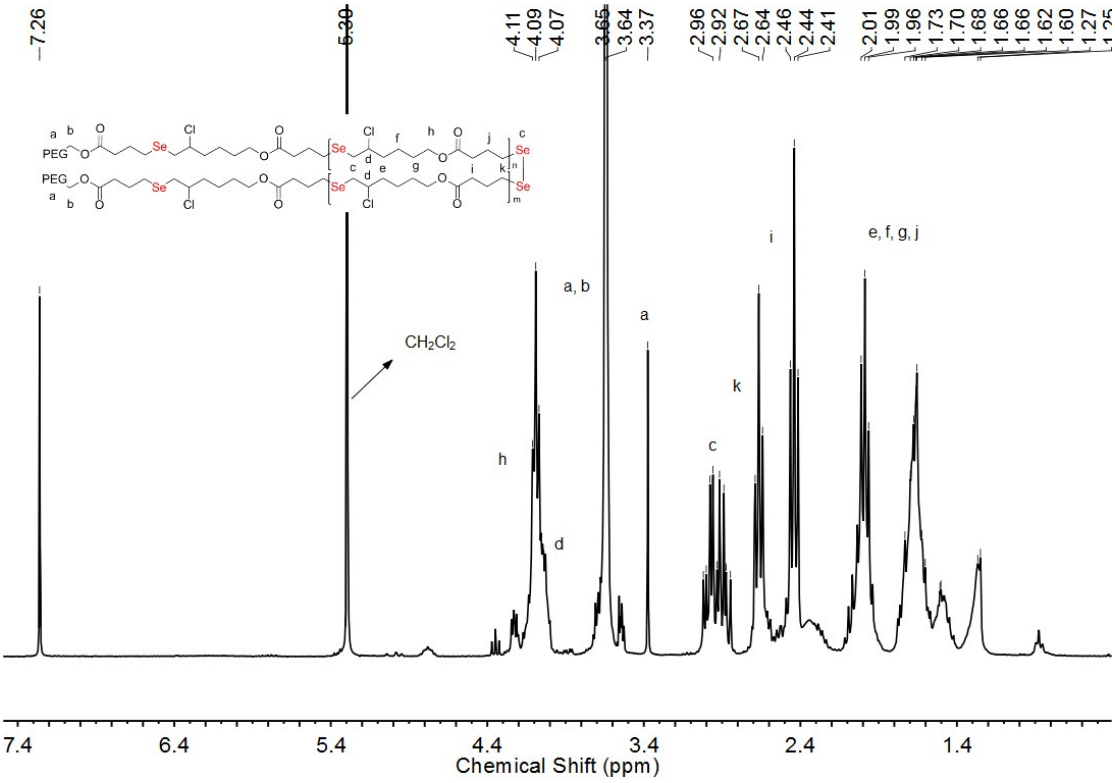

Fig. S26 ^{1}H NMR spectrum of polymer PEG-PSe-2'-PEG in $CDCl_3$

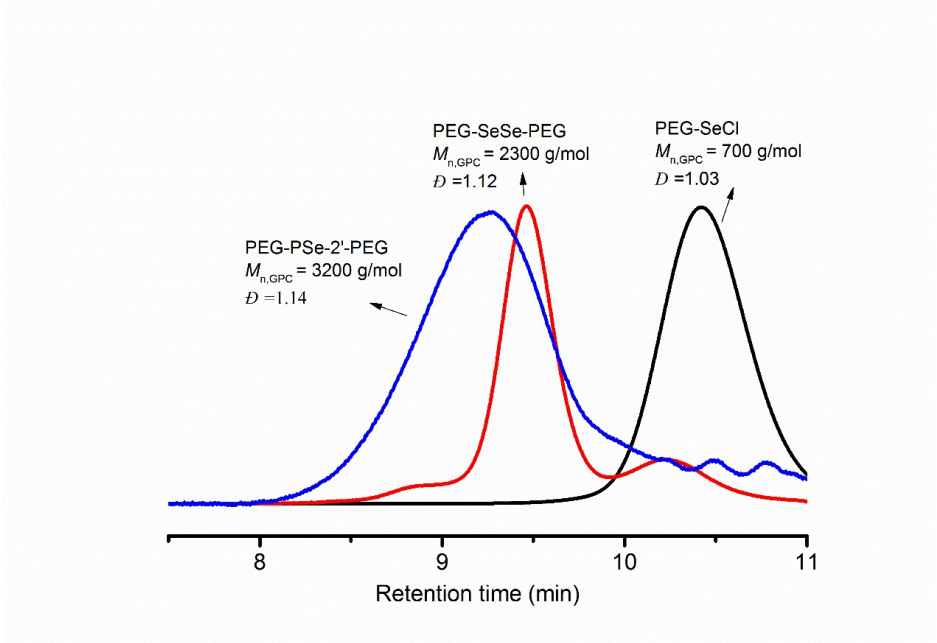

Fig. S27 SEC curves of PEG-SeCl, PEG-SeSe-PEG and PEG-PSe-2'-PEG obtaining with the molar ratio of $[Se\text{-}2]_0$: $[PEG\text{-}SeSe\text{-}PEG]_0$ = 10:1 after 24 hours in CH_2Cl_2.

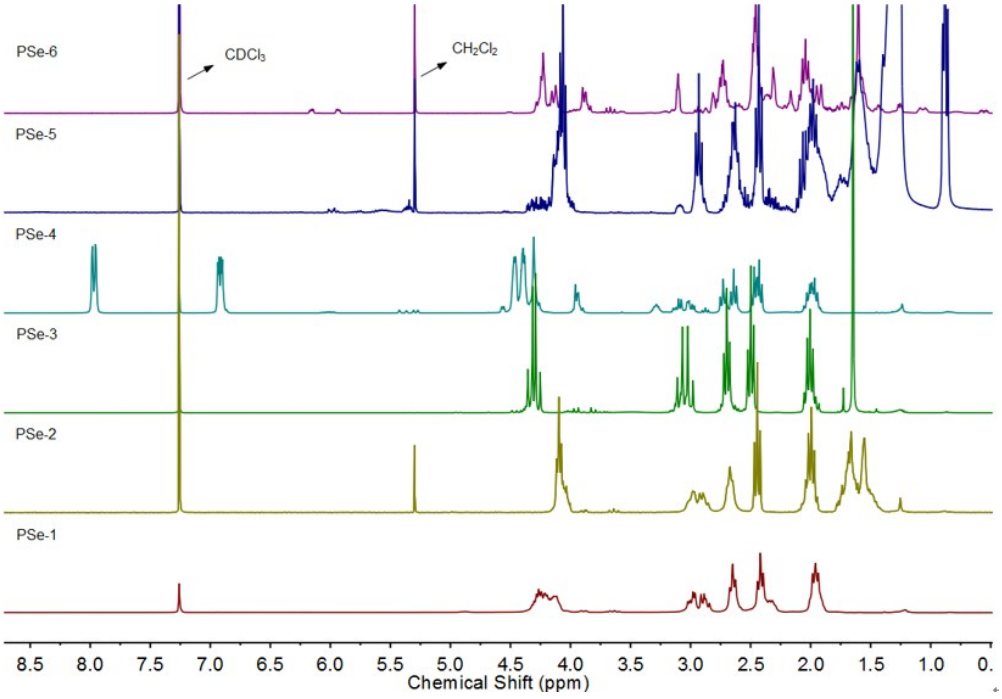

Fig. S28 ^{1}H NMR spectra of PSe-1, PSe-2, PSe-3, PSe-4, PSe-5 and PSe-6.

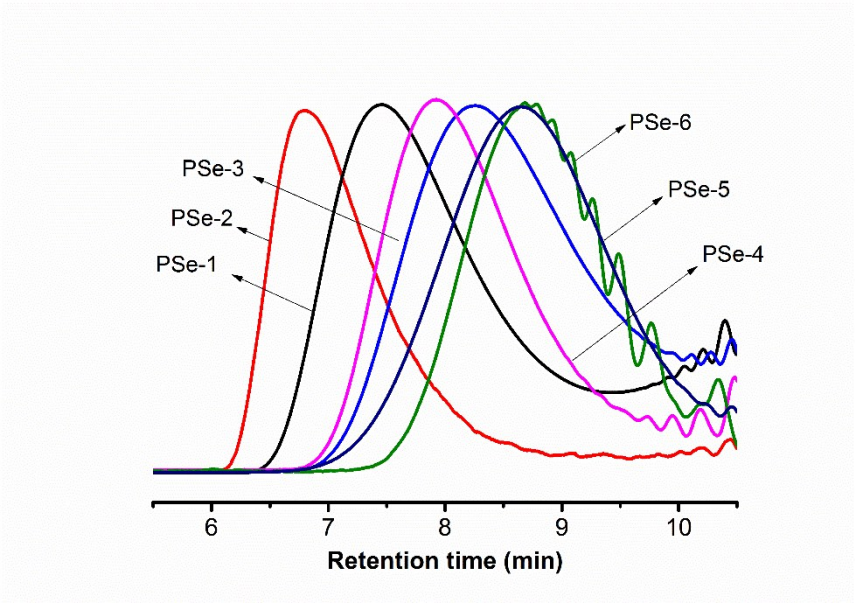

Fig. S29 SEC spectra of PSe-1, PSe-2, PSe-3, PSe-4, PSe-5, PSe-6.

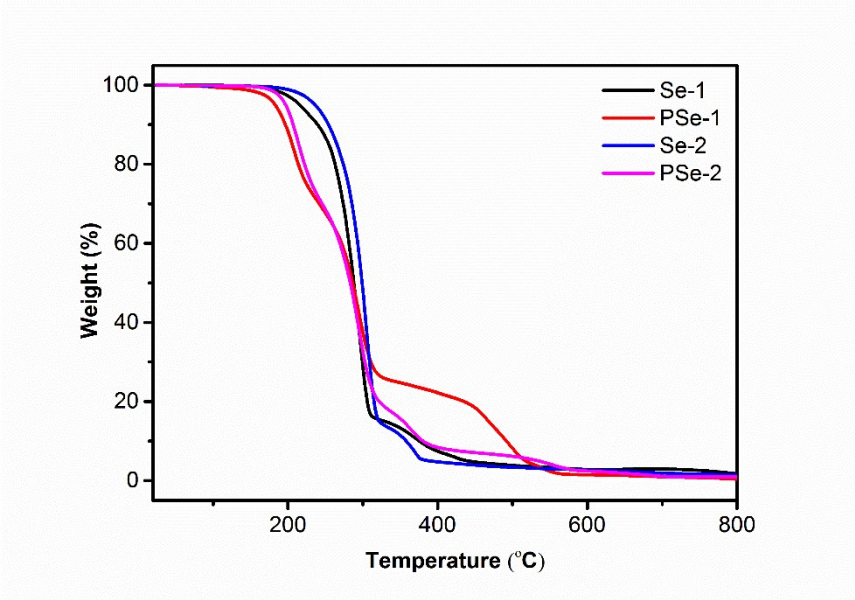

Fig. S30 TGA spectra of Se-1, PSe-1, Se-2, and PSe-2.

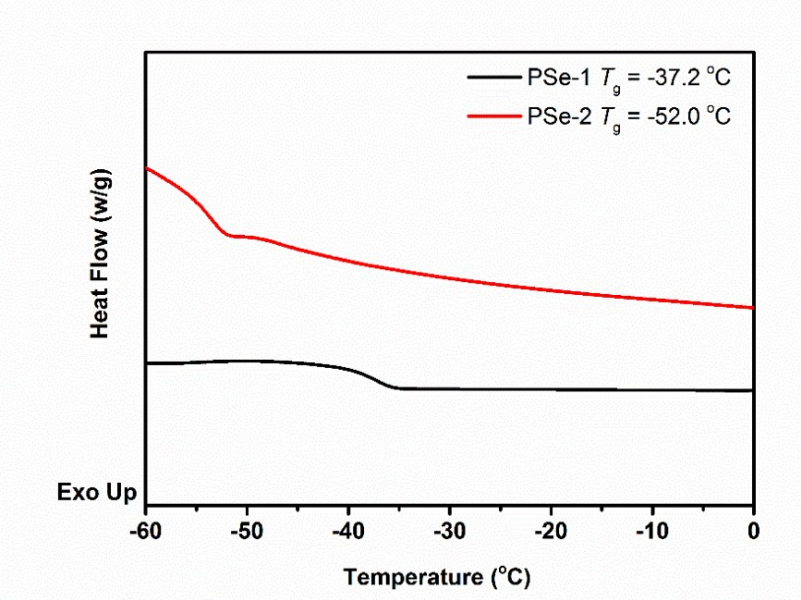

Fig. S31 DSC spectra of PSe-1 and PSe-2 at a ramp rate of 10 °C min^{-1}.