Supporting Information

Iron Catalysis Enables Mild C–Se Bond Formation via Decarboxylative Selenylation

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1 General Information.

^{1}H, ^{13}C, and ^{19}F NMR spectra were recorded in $CDCl_3$ on 400 MHz spectrometers. The chemical shifts of ^{1}H NMR spectra in $CDCl_3$ were determined based on the chemical shift of $CDCl_3$ ($\delta = 7.26$ ppm). The chemical shifts in ^{13}C NMR spectra were determined based on the chemical shift of $CDCl_3$ ($\delta = 77.0$ ppm). Multiplicities are given as s (singlet), d (doublet), t (triplet), dd (doublet of doublet), td (triplet of doublet) or m (multiplet). Deuterated solvents were purchased from Cambridge Isotope Laboratories. HRMS spectra were measured using a Q-TOF instrument equipped with an ESI source. Unless otherwise noted, the chemicals are either commercially available or known compounds that can be prepared following reported procedures. All the solvents are anhydrous or analytical grade, and were used without further purification. Analytical TLC was performed with silica gel GF254 plates, and 200-300 mesh silica gel was employed for column chromatography.

The LED light (30 W, emitting area: 30 × 30 mm) was assembled using the 390-395 nm chips purchased from GuangHong Chips. The peak intensity of the LED light corresponds to a wavelength of 390-395 nm. The material used for the reaction vessel is standard borosilicate glass. The distance from the light source to the reaction vessel is 5 centimeters (**Figure S1**).

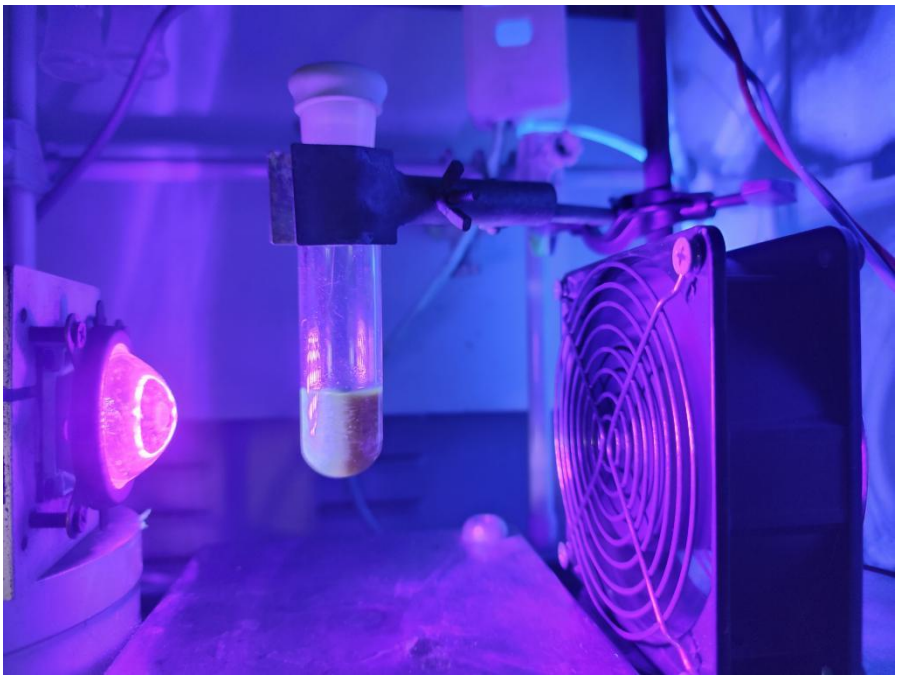
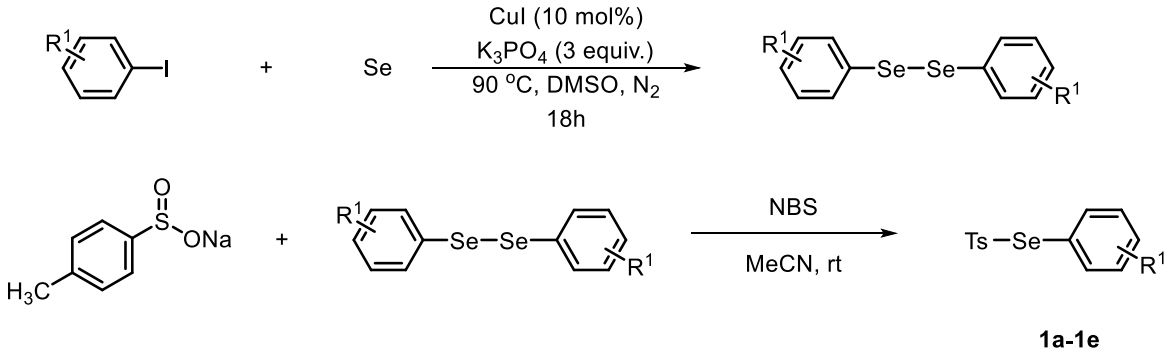


Figure S1. The setting-up reactions.

2 The Synthesis of Starting Materials.

1. Preparation of aryl selenosulfonates (**1a-1e**).[1]

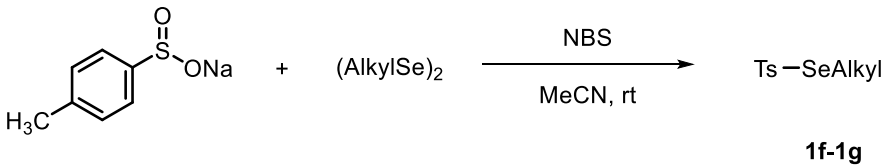


1a-1e

Step 1: Iodobenzene (10 mmol, 1.12 mL), cuprous iodide (10 mol %, 0.18 g), potassium phosphate (3.0 equiv., 6.368 g), and selenium powder (30 mmol, 2.37 g) were weighed in a dry Schlenk reaction tube under argon atmosphere, pumped for three gas changes, and then dimethylsulfoxide (10 mL) was added and the mixture was stirred at 90 °C for 18 hours. At the end of the reaction, the reaction was quenched by slowly adding 30 mL of water dropwise and extracted with ethyl acetate (3×10 mL), the organic phases were combined and washed with saturated brine, partitioned and the organic layer was dried with anhydrous sodium sulfate. The organic layer was dried with anhydrous sodium sulfate. After filtration to remove the desiccant, the organic solvent was removed by spinning under reduced pressure, and the product was purified by silica gel column chromatography (ethyl acetate/petroleum ether = 1:100).

Step 2： Sodium benzenesulfinate (8 mmol, 1.31 g) and diphenyl diselenide (2 mmol, 0.63 g) were dissolved in acetonitrile (30 mL) in a dry Schlenk reaction tube, and N-bromosuccinimide (NBS, 0.71 g) was added at 25 °C, followed by stirring at the same temperature for 15 hours. Upon completion of the reaction, the mixture was carefully quenched by dropwise addition of saturated ammonium chloride solution (30 mL). The aqueous layer was then extracted with ethyl acetate (3 × 50 mL), and the combined organic phases were washed with saturated brine. After phase separation, the organic layer was dried over anhydrous sodium sulfate. Following filtration to remove the drying agent, the solvent was evaporated under reduced pressure. The crude product (aryl selenosulfonates **1a-1e**) was purified by silica gel column chromatography using a gradient elution of ethyl acetate/petroleum ether (1:10 to 1:5, v/v).

2. Preparation of alkyl selenosulfonates (**1f-1g**). [1]



1f-1g

A 50.0 mL round-bottomed flask was charged with the alkyl diselenide (1.0 equiv.) and sodium benzenesulfinate (4.0 equiv.), followed by the addition of acetonitrile (MeCN, 20.0 mL) to dissolve the solids. The flask was then cooled in an ice bath, and N-bromosuccinimide (NBS, 2.0 equiv.) was added portion wise. The reaction progress was monitored by TLC. After completion, the mixture was filtered to remove insoluble solids, and the filtrate was concentrated under reduced pressure. The crude product was purified by column chromatography to afford the desired alkyl selenosulfonates (**1f**–**1g**).

3 General procedure.

General procedure A:

A reaction tube equipped with a magnetic stir bar was charged with **1** (0.5 mmol, 1.0 equiv.), alkyl carboxylic acid **2** (0.75 mmol, 1.5 equiv.), $FeCl_3 \cdot 6H_2O$ (5 mol%), Na_2CO_3 (0.5 mmol, 1.0 equiv.), and solvent. Under stirring, $\mathbf{L_1}$ (10 mol%) was added via syringe. The reaction mixture was irradiated with a 395 nm LED lamp at room temperature for 12 h. Upon completion, the mixture was filtered through a pad of Celite and washed with ethyl acetate (3×5 mL). The combined filtrates were concentrated in vacuo, and the crude residue was purified by flash column chromatography (petroleum ether/ethyl acetate gradient) to afford the desired product **3**.

General procedure B:

A reaction tube equipped with a magnetic stir bar was charged with **1** (0.75 mmol, 1.5 equiv), alkyl carboxylic acid **2** (0.5 mmol, 1 equiv.), $FeCl_3 \cdot 6H_2O$ (5 mol%), Na_2CO_3 (0.5 mmol, 1.0 equiv.), and solvent. Under stirring, $\mathbf{L_1}$ (10 mol%) was added via syringe. The reaction mixture was irradiated with a 395 nm LED lamp at room temperature for 12 h. Upon completion, the mixture was filtered through a pad of Celite and washed with ethyl acetate (3×5 mL). The combined filtrates were concentrated in vacuo, and the crude residue was purified by flash column chromatography (petroleum ether/ethyl acetate gradient) to afford the desired product **3**.

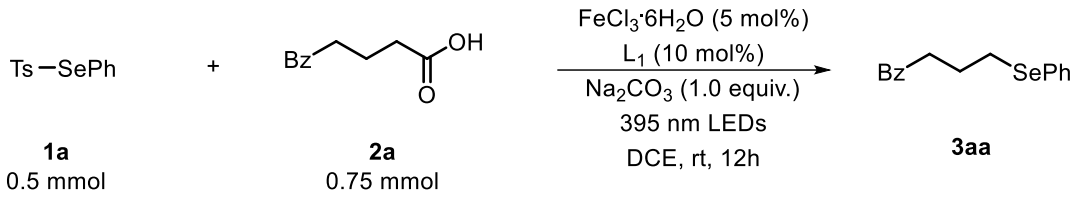
General procedure for scaled up:

A 100 mL round flask equipped with a magnetic stir bar was charged with **1** (7.5 mmol, 1.5 equiv), alkyl carboxylic acid **2a** (5 mmol, 1 equiv.), $FeCl_3 \cdot 6H_2O$ (5 mol%), Na_2CO_3 (5 mmol, 1.0 equiv.), and DCE (50 mL). Under stirring, $\mathbf{L_1}$ (10 mol%) was added via syringe. The reaction mixture was exposed to the reaction for 12 hours at room temperature, with two 395 nm LED lamps shining on both the left and right sides at a 5 cm distance. A fan was used to cool the reaction flask from above. Upon completion,

the mixture was filtered through a pad of Celite and washed with ethyl acetate (3×20 mL). The combined filtrates were concentrated in vacuo, and the crude residue was purified by flash column chromatography (petroleum ether/ethyl acetate gradient) to afford the desired product **3aa**.

4 Modification of the Typical Reaction Conditions.

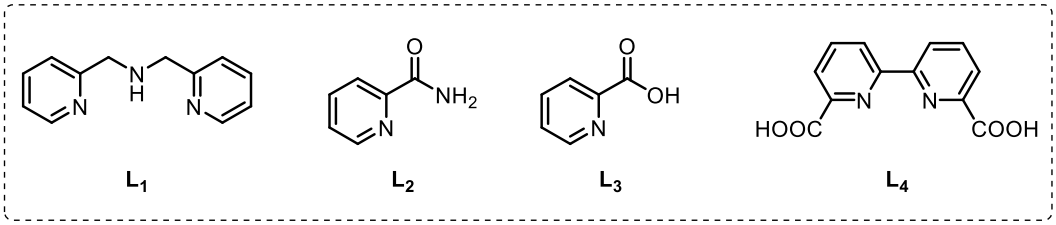
Table S1. Optimization of the Reaction Conditions [a]



1a 0.5 mmol | **2a** 0.75 mmol | **3aa**

Entry	Catalyst (5 mol%)	Solvent (5 mL)	Time (h)	Base (1.0 equiv.)	Ligand (10 mol%)	Yield (%)[b]
1	$Fe(NO_3)_3·9H_2O$	DCE	12	Na_2CO_3	L_1	69
2	$Fe(acac)_3$	DCE	12	Na_2CO_3	L_1	67
3	$Fe(OTf)_3$	DCE	12	Na_2CO_3	L_1	Trace
4	$FeCl_3·6H_2O$	DCE	12	Na_2CO_3	L_1	81
5	$Fe(NO_3)_3·9H_2O$	DCE	6	Na_2CO_3	L_1	61
6	$FeCl_3·6H_2O$	DCE (3 mL)	12	Na_2CO_3	L_1	59
7	$FeCl_3·6H_2O$	DCE (2 mL)	12	Na_2CO_3	L_1	30
8	$FeCl_3·6H_2O$	MeCN	12	Na_2CO_3	L_1	51
9	$FeCl_3·6H_2O$	THF	12	Na_2CO_3	L_1	15
10	$FeCl_3·6H_2O$	Acetone	12	Na_2CO_3	L_1	27
11	$FeCl_3·6H_2O$	$MeNO_2$	12	Na_2CO_3	L_1	33
12	$FeCl_3·6H_2O$	DCE	12	Na_2CO_3 (0.2 equiv.)	L_1	26
13	$FeCl_3·6H_2O$	DCE	12	Na_2CO_3 (0.5 equiv.)	L_1	16
14	$FeCl_3·6H_2O$	DCE	12	Na_2CO_3 (2.0 equiv.)	L_1	64
15	$FeCl_3·6H_2O$	DCE	12	Cs_2CO_3	L_1	26
16	$FeCl_3·6H_2O$	DCE	12	NaOAc	L_1	61
17	$FeCl_3·6H_2O$	DCE	12	DABCO	L_1	64
18	$FeCl_3·6H_2O$	DCE	12	t-BuOK	L_1	59
19	$FeCl_3·6H_2O$	DCE	12	K_2CO_3	L_1	59
20	$FeCl_3·6H_2O$	DCE	12	K_3PO_4	L_1	Trace
21	$FeCl_3·6H_2O$	DCE	12	Na_2CO_3	L_2	39
22	$FeCl_3·6H_2O$	DCE	12	Na_2CO_3	L_3	79

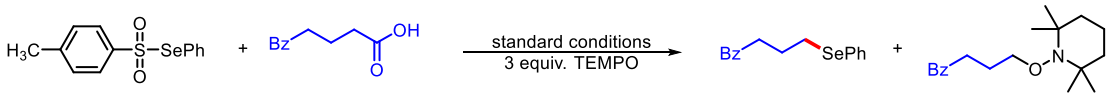
23	$FeCl_3·6H_2O$	DCE	12	Na_2CO_3	L_4	80
24	-	DCE	12	Na_2CO_3	L_1	nd



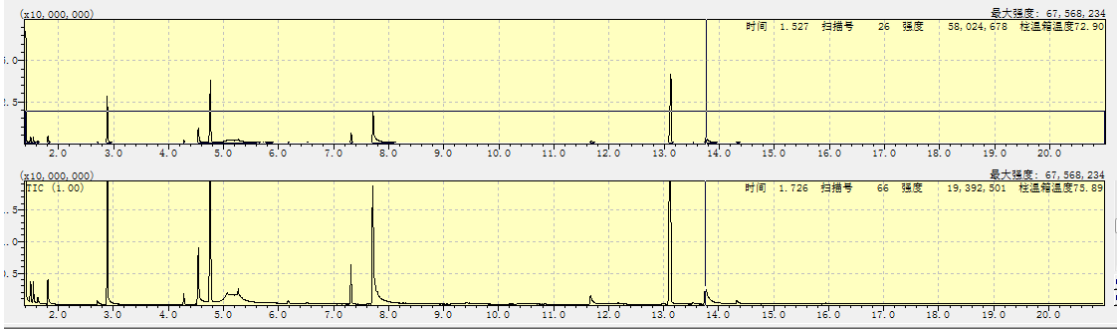
[a] Reaction conditions: **1a** (0.5 mmol), **2a** (0.75 mmol, 1.5 equiv.), $FeCl_3·6H_2O$ (0.025 mmol, 5 mol%), L_1 (0.05 mmol, 10 mol%), Na_2CO_3 (0.5 mmol, 1.0 equiv.), DCE (5 mL), 395 nm LEDs, rt, 12 h. [b] Isolated yield.

5 Mechanistic Studies.

5.1 Trapping experiment with TEMPO.



A reaction tube equipped with a magnetic stir bar was charged with **1a** (0.5 mmol, 1.0 equiv.), **2a** (0.75 mmol, 1.5 equiv.), $FeCl_3·6H_2O$ (5 mol%), Na_2CO_3 (0.5 mmol, 1.0 equiv.), and DCE (5 mL). Under stirring, **L1** (10 mol%) was added via syringe. Then TEMPO (3 equiv., 1.5 mmol) was added. The reaction mixture was irradiated with a 395 nm LED lamp at room temperature for 12 h. Upon completion, the mixture was filtered through a pad of Celite and washed with ethyl acetate (3×5 mL). The combined filtrates were concentrated in vacuo, and the crude residue was detected by GC-MS. The TEMPO-trapped product 4 was detected by GC-MS, and the spectrum is shown below (**Figure S2**). MS(EI): m/z(%) 304(2.67), 303(0.28), 184(3.81), 181(2.04), 157(5.02), 156(1.08), 147(100.00), 105(88.18), 91(10.42), 77(60.25), 51(14.55).



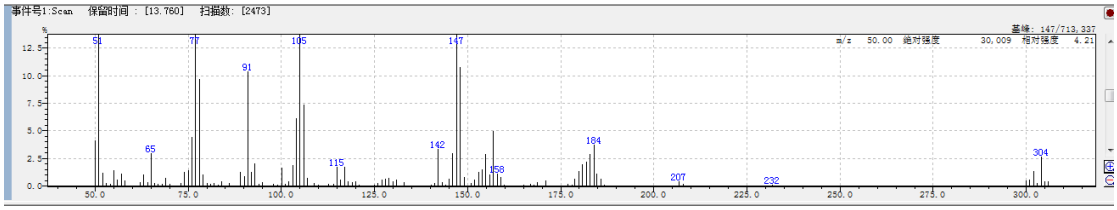


Figure S2. GC-MS of product 4.

5.2 Radical clock experiment.

1a **2y** **3ya**, 70%

A reaction tube equipped with a magnetic stir bar was charged with **1a** (0.5 mmol, 1.0 equiv.), **2y** (0.75 mmol, 1.5 equiv.), $FeCl_3 \cdot 6H_2O$ (5 mol%), Na_2CO_3 (0.5 mmol, 1.0 equiv.), and solvent. Under stirring, **L1** (10 mol%) was added via syringe. The reaction mixture was irradiated with a 395 nm LED lamp at room temperature for 12 h. Upon completion, the mixture was filtered through a pad of Celite and washed with ethyl acetate (3×5 mL). The combined filtrates were concentrated in vacuo, and the crude residue was purified by flash column chromatography (petroleum ether/ethyl acetate gradient) to afford the desired product **3ya** with 70% isolated yield.

5.3 Absorption measurements.

The UV-Vis absorption measurements were carried out on Beijing PuSai TU1901 UV-Vis spectrophotometer (200 nm – 900 nm).

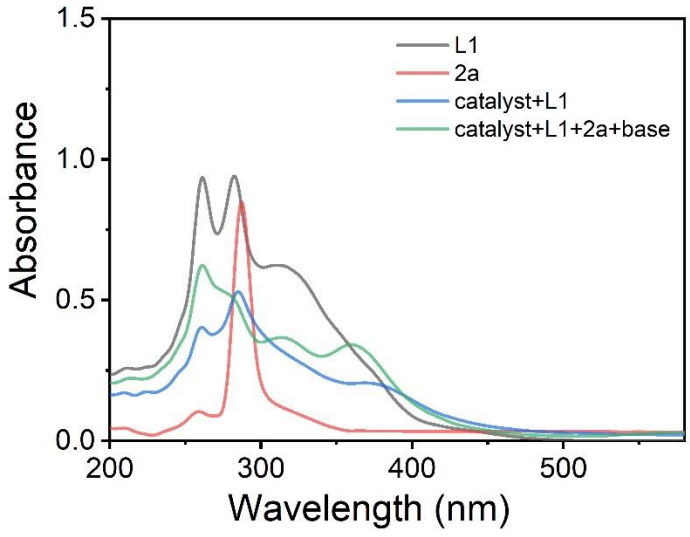


Fig S3. UV-Vis absorption spectra

A: The UV-Vis absorption of L1 and 2a were measured in a DCE solution ($4.0*10^{-5}$ M).

B: The catalyst (0.1 mmol) and ligand L1 (0.1 mmol) were dissolved in DCE (10 mL), and stirred at room temperature for 2 hours. Then, 100 μL of the solution was taken with a micro-syringe, diluted that with DCE to 2 mL, and proceed the measurement.

C: The catalyst (0.1 mmol), ligand L1 (0.1 mmol) and carboxylic acid (2a, 0.1 mmol) were dissolved in DCE (10 mL), then Na_2CO_3 (0.1 mmol) was added to this solution, the mixture was stirred at room temperature for 2 hours, then 100 μL of the solution was taken with a micro-syringe, diluted with DCE to 2 mL, and proceed the measurement.

5.4 Determination of quantum yield.

The quantum yield measurement was performed according to the procedures described by Yoon, [2] Ritter, [3] Aleman [4] and Glorious. [5]

(1) Solution Preparation

Potassium ferrioxalate solution (0.012 M): 59.0 mg of $K_3[Fe(C_2O_4)]\cdot 3H_2O$ and 28 μL of H_2SO_4 were added into a 10 mL brown volumetric flask and filled to the mark with ultra-pure water.

1,10-Phenanthroline solution (0.01 M): 29.0 mg of 1,10-phenantroline monohydrate was added into a 10 mL brown volumetric flask and filled to the mark with ultra-pure water.

NaOAc and HOAc buffer solution: 1.235 g of NaOAc and 250 μL of H_2SO_4 were added into a 25 mL volumetric flask and filled to the mark with ultra-pure water.

All solutions were prepared and stored in the dark.

(2) Determination of the Light Intensity at 395 nm

2.0 mL of 0.012 M Potassium ferrioxalate solution was added into the reaction vial, and irradiated with 30 W 395 nm LEDs for 90 seconds. After that, 0.1 mL of this solution was taken as an aliquot. To each aliquot, 2.0 mL of the buffer solution and 0.5 mL of the 1,10-phenanthroline solution were added with a syringe, and the mixture was stirred in the dark for 1 h. The mixture was then diluted in a 10 mL brown volumetric flask with ultra-pure water. The absorbance of the resulting solution in a quartz cuvette (1×1 cm) was measured with a UV-Vis spectrometer (scanned from 200 nm - 800 nm). A non-irradiated sample was also prepared in the same manner, and the absorbance was

measured. The amount of ferrous ion formed was calculated as following:

$$\text{mol of } Fe^{2+} = \frac{V1 \times V3 \times \Delta A}{V2 \times l \times \varepsilon} = \frac{0.002L*0.002L*0.045}{3*10^{-6}\,L*1\,cm*\,11100L/mol/cm} = 5.41*10^{-6}\,mol$$

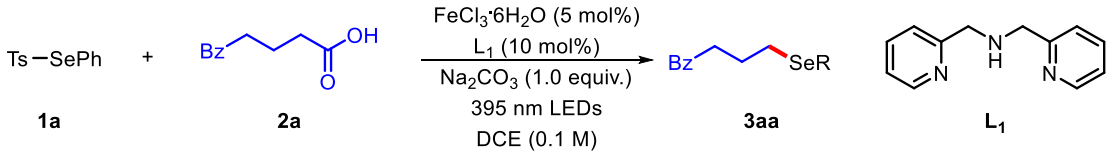
where V1 is the irradiated volume (0.002 L), V2 is the irradiated volume ($3*10^{-6}$ L), V3 is the irradiated volume (0.002 L), ΔA is the difference in absorbance at 395 nm between the irradiated and non-irradiated samples, l is the path length (1.00 cm), and ε is the molar absorptivity at 510 nm (11,100 L/mol·cm).

$$\text{photon flux} = \frac{\text{mol of } Fe^{2+}}{\Phi \times t \times f} = \frac{5.41*10^{-6}\,mol}{1.12*\,90s*\,f} = 3.38*10^{-7}\,einstein/s$$

where Φ is the quantum yield for the ferrioxalate actinometer (approximated as 1.12, which was reported for a 0.01 M solution at λ = 458 nm), t is the time (90.0 s), and f is the fraction of light absorbed at 395 nm. The fraction of light absorbed was determined by the equation below.

$$f = 1-10^{-A} = 1-10^{-0.075} = 0.1586$$

(3) Determination of Quantum Yield



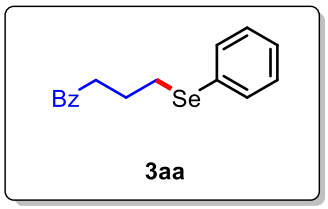
A reaction tube equipped with a magnetic stir bar was charged with **1** (0.5 mmol, 1.0 equiv.), alkyl carboxylic acid **2** (0.75 mmol, 1.5 equiv.), $FeCl_3·6H_2O$ (5 mol%), Na_2CO_3 (0.5 mmol, 1.0 equiv.), and DCE (5 mL). Under stirring, L_1 (10 mol%) was added via syringe. The mixture was irradiated with a 395 nm LED lamp at room temperature and stirred for 1800 second. Upon completion, the mixture was filtered through a pad of Celite and washed with ethyl acetate (3×5 mL). The combined filtrates were concentrated in vacuo. The yield of the product 3aa was determined to be 31% (corresponding to $1.594*10^{-4}$ mol) by 1H NMR based on a TCE (tetrachloroethane) internal standard. A 5×10^{-3} M solution of {[Fe(L)]} in DCE was prepared, and the absorbance of the solution at 395 nm was measured. The fraction of light absorbed at 395 nm was calculated as described above (f = 0.33).

The quantum yield was calculated as follows:

$$\Phi = \frac{\text{mol of 3aa}}{\text{photon flux x t x f}} = \frac{1.594*10^{-4}}{3.38*10^{-7} * 1800* 0.33} = 0.797$$

6 Physical data for the products.

1. 1-phenyl-4-(phenylselanyl)butan-1-one[6]



3aa

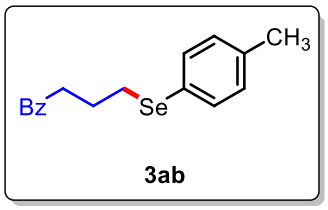
A light yellow oil, 122.8 mg, 81%, purification by flash column chromatography (eluent: petroleum ether/ethyl acetate = 50:1-20:1).

^{1}H NMR (400 MHz, Chloroform-*d*): δ 7.94 – 7.90 (m, 2H), 7.54 (td, *J* = 5.7, 2.7 Hz, 1H), 7.50 (dt, *J* = 7.5, 1.3 Hz, 2H), 7.43 (dd, *J* = 8.4, 7.0 Hz, 2H), 7.22 (ddt, *J* = 6.9, 5.0, 1.8 Hz, 3H), 3.10 (t, *J* = 7.1 Hz, 2H), 3.01 (t, *J* = 7.1 Hz, 2H), 2.14 (p, *J* = 7.1 Hz, 2H).

^{13}C NMR (101 MHz, Chloroform-*d*): δ 199.19, 136.73, 132.91, 132.45, 129.92, 128.97, 128.45, 127.88, 126.72, 37.92, 27.28, 24.35.

MS(EI): m/z(%) 304(15.71), 302(8.81), 184(30.0), 171(4.32), 159(6.36), 148(99.84), 146(19.50), 131(2.11), 128(3.03), 77(99.93), 51(93.28).

2. 1-phenyl-4-(p-tolylselanyl)butan-1-one



3ab

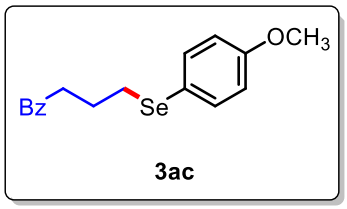
A light yellow oil, 106.3 mg, 67%, purification by flash column chromatography (eluent: petroleum ether/ethyl acetate = 50:1-20:1).

^{1}H NMR (400 MHz, Chloroform-*d*): δ 7.96 – 7.87 (m, 2H), 7.54 (t, *J* = 7.4 Hz, 1H), 7.42 (dd, *J* = 15.0, 7.6 Hz, 4H), 7.05 (d, *J* = 7.7 Hz, 2H), 3.10 (t, *J* = 7.1 Hz, 2H), 2.97 (t, *J* = 7.0 Hz, 2H), 2.29 (s, 3H), 2.11 (p, *J* = 7.1 Hz, 2H).

^{13}C NMR (101 MHz, Chloroform-*d*): δ 199.30, 136.85, 136.73, 133.09, 132.93, 129.82, 128.46, 127.92, 125.89, 37.90, 27.68, 24.35, 20.99.

HRMS-ESI (m/z) [M + H]$^+$ calcd for $C_{17}H_{19}OSe$: 319.0523, found: 319.2996.

3. 4-((4-methoxyphenyl)selanyl)-1-phenylbutan-1-one



3ac

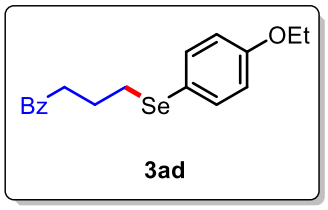
A light yellow oil, 100.0 mg, 60%, purification by flash column chromatography (eluent: petroleum ether/ethyl acetate = 50:1-20:1).

^{1}H NMR (400 MHz, Chloroform-*d*): δ 7.96 – 7.89 (m, 2H), 7.58 – 7.52 (m, 1H), 7.49 – 7.46 (m, 2H), 7.46 – 7.41 (m, 2H), 6.85 – 6.74 (m, 2H), 3.78 (s, 3H), 3.11 (t, *J* = 7.1 Hz, 2H), 2.93 (t, *J* = 7.0 Hz, 2H), 2.10 (p, *J* = 7.1 Hz, 2H).

^{13}C NMR (101 MHz, Chloroform-*d*): δ 199.43, 159.24, 136.80, 135.57, 133.00, 128.52, 127.98, 119.53, 114.75, 55.21, 37.94, 28.50, 24.39.

HRMS-ESI (m/z) [M + H]$^+$ calcd for $C_{17}H_{19}O_2Se$: 335.0388, found: 333.0392.

4. 4-((4-ethoxyphenyl)selanyl)-1-phenylbutan-1-one



3ad

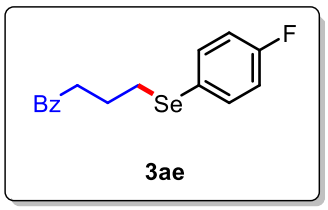
A light yellow oil, 78.1 mg, 45%, purification by flash column chromatography (eluent: petroleum ether/ethyl acetate = 50:1-20:1).

^{1}H NMR (400 MHz, Chloroform-*d*): δ 7.95 – 7.90 (m, 2H), 7.59 – 7.52 (m, 1H), 7.47 (s, 2H), 7.45 – 7.43 (m, 2H), 6.82 – 6.76 (m, 2H), 4.00 (q, *J* = 7.0 Hz, 2H), 3.11 (t, *J* = 7.1 Hz, 2H), 2.92 (t, *J* = 7.0 Hz, 2H), 2.09 (p, *J* = 7.1 Hz, 2H), 1.40 (t, *J* = 7.0 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*): δ 199.48, 158.63, 136.83, 135.60, 133.01, 128.54, 128.00, 119.33, 115.29, 63.42, 37.96, 28.53, 24.40, 14.77.

HRMS-ESI (m/z) [M + H]$^+$ calcd for $C_{18}H_{21}O_2Se$: 349.0544, found: 349.0555.

5. 4-((4-fluorophenyl)selanyl)-1-phenylbutan-1-one[6]



3ae

A colorless oil, 83.5 mg, 52%, purification by flash column chromatography (eluent: petroleum ether/ethyl acetate = 50:1-20:1).

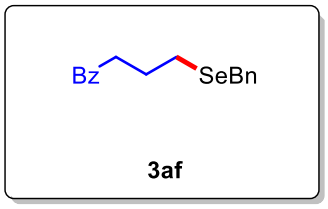
^{1}H NMR (400 MHz, Chloroform-*d*): δ 7.96 – 7.89 (m, 2H), 7.60 – 7.53 (m, 1H), 7.51 – 7.43 (m, 4H), 6.95 (t, *J* = 8.7 Hz, 2H), 3.12 (t, *J* = 7.0 Hz, 2H), 2.97 (t, *J* = 7.1 Hz, 2H), 2.11 (p, *J* = 7.0 Hz, 2H).

^{13}C NMR (101 MHz, Chloroform-*d*): δ 199.24, 163.51, 161.06, 136.75, 135.24 (d, *J* = 7.8 Hz), 133.08, 128.57, 127.96, 124.13 (d, *J* = 3.5 Hz), 116.33, 116.12, 37.88, 28.23, 24.32.

^{19}F NMR (377 MHz, Chloroform-*d*): δ -114.81 (m, *J* = 28.3 Hz).

MS(EI): m/z(%) 322(3.40), 202(5.24), 175(8.03), 155(1.14), 147(99.75), 122(6.00), 105(100.00), 95(5.01), 83(8.45), 77(76.57), 51(16.14).

6. 4-(benzylselanyl)-1-phenylbutan-1-one[6]



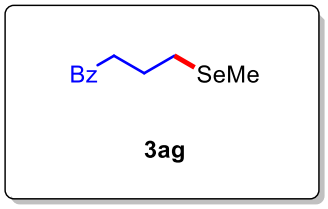
A white solid, 103.1 mg, 65%, purification by flash column chromatography (eluent: petroleum ether/ethyl acetate = 50:1-20:1), M.P.: 68.6.0-68.9 ºC.

^{1}H NMR (400 MHz, Chloroform-*d*): δ 7.97 – 7.89 (m, 2H), 7.56 (t, *J* = 7.4 Hz, 1H), 7.45 (t, *J* = 7.6 Hz, 2H), 7.33 – 7.23 (m, 4H), 7.19 (tt, *J* = 5.6, 3.2 Hz, 1H), 3.78 (s, 2H), 3.05 (t, *J* = 7.1 Hz, 2H), 2.59 (t, *J* = 7.0 Hz, 2H), 2.06 (p, *J* = 7.1 Hz, 2H).

^{13}C NMR (101 MHz, Chloroform-*d*): δ 199.41, 139.31, 136.80, 132.99, 128.77, 128.52, 128.44, 127.99, 126.62, 38.16, 26.89, 24.29, 23.50.

MS(EI): m/z(%) 318(20.72), 227(12.31), 198(11.17), 171(5.67), 147(99.81), 117(25.10), 105(99.82), 91(99.89), 77(100.00), 65(67.99), 51(51.79).

7. 4-(methylselanyl)-1-phenylbutan-1-one[6]



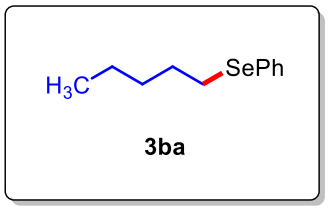
A colorless oil, 98.9 mg, 82%, purification by flash column chromatography (eluent: petroleum ether/ethyl acetate = 50:1-20:1).

^{1}H NMR (400 MHz, Chloroform-*d*): δ 8.02 – 7.92 (m, 2H), 7.59 – 7.50 (m, 1H), 7.45 (dd, *J* = 8.4, 6.9 Hz, 2H), 3.11 (t, *J* = 7.1 Hz, 2H), 2.63 (t, *J* = 7.1 Hz, 2H), 2.10 (p, *J* = 7.2 Hz, 2H), 1.98 (s, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*): δ 199.42, 136.80, 132.95, 128.50, 127.92, 38.00, 24.84, 24.01, 3.86.

MS(EI): m/z(%) 242(27.43), 240(12.58), 147(99.86), 133(6.83), 120(96.09), 106(99.85), 93(18.67), 77(100.00), 65(8.19), 55(13.38), 51(97.98).

8. pentyl(phenyl)selane[7]



3ba

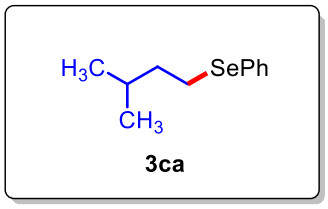
A light yellow oil, 51.1 mg, 49%, purification by flash column chromatography (eluent: petroleum ether/ethyl acetate = 200:1-100:1).

^{1}H NMR (400 MHz, Chloroform-*d*): δ 7.48 (dd, *J* = 7.7, 1.8 Hz, 2H), 7.27 – 7.21 (m, 3H), 2.91 (t, *J* = 7.5 Hz, 2H), 1.71 (p, *J* = 7.4 Hz, 2H), 1.41 – 1.34 (m, 2H), 1.32 – 1.25 (m, 2H), 0.88 (t, *J* = 7.0 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*): δ 132.29, 130.66, 128.95, 126.54, 31.99, 29.81, 27.87, 22.15, 13.96.

MS(EI): m/z(%) 228(83.70), 224(16.08), 171(4.14), 158(100.00), 115(3.87), 105(3.80), 91(32.47), 78(80.69), 71(11.97), 65(9.64), 51(30.16).

9. isopentyl(phenyl)selane



3ca

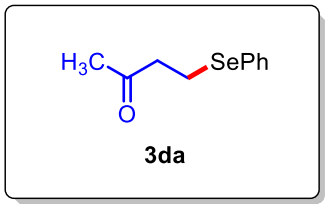
A light yellow oil, 73.8 mg, 65%, purification by flash column chromatography (eluent: petroleum ether/ethyl acetate = 200:1-100:1).

^{1}H NMR (400 MHz, Chloroform-*d*): δ 7.51 – 7.44 (m, 2H), 7.24 (q, *J* = 7.7, 7.0 Hz, 3H), 2.98 – 2.87 (m, 2H), 1.68 (dp, *J* = 13.0, 6.6 Hz, 1H), 1.62 – 1.55 (m, 2H), 0.90 (d, *J* = 6.5 Hz, 6H).

^{13}C NMR (101 MHz, Chloroform-*d*): δ 132.23, 130.63, 128.95, 126.54, 39.07, 28.36, 25.83, 22.15.

HRMS-ESI (m/z) [M + H]$^{+}$ calcd for $C_{11}H_{17}Se$: 229.0344, found: 229.0336.

10. 4-(phenylselanyl)butan-2-one[8]



3da

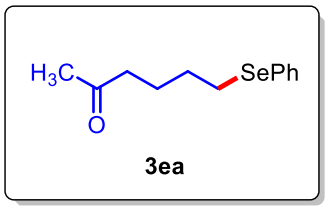
A light yellow oil, 42.0 mg, 37%, purification by flash column chromatography (eluent: petroleum ether/ethyl acetate = 50:1-20:1).

^{1}H NMR (400 MHz, Chloroform-*d*): δ 7.52 – 7.45 (m, 2H), 7.26 (dd, *J* = 5.2, 2.1 Hz, 3H), 3.06 (t, *J* = 7.2 Hz, 2H), 2.85 (t, *J* = 7.2 Hz, 2H), 2.13 (s, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*): δ 207.10, 132.80, 129.61, 129.10, 127.08, 44.05, 29.99, 20.41.

MS(EI): m/z(%) 228(99.45), 183(32.91), 155(63.44), 117(11.64), 105(17.19), 91(24.79), 77(90.65), 71(65.98), 65(13.80), 63(4.89), 51(60.53).

11. 6-(phenylselanyl)hexan-2-one



3ea

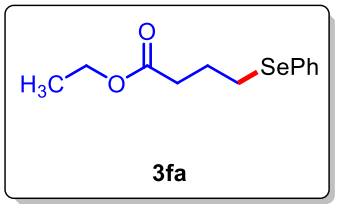
A light yellow oil, 104.6 mg, 82%, purification by flash column chromatography (eluent: petroleum ether/ethyl acetate = 50:1-20:1).

^{1}H NMR (400 MHz, Chloroform-*d*): δ 7.48 (dd, *J* = 7.3, 2.1 Hz, 2H), 7.24 (q, *J* = 6.1, 5.6 Hz, 3H), 2.95 – 2.83 (m, 2H), 2.46 – 2.36 (m, 2H), 2.11 (s, 3H), 1.69 (p, *J* = 3.5 Hz, 4H).

^{13}C NMR (101 MHz, Chloroform-*d*): δ 208.52, 132.42, 130.18, 128.95, 126.68, 42.92, 29.80, 29.49, 27.35, 23.75.

HRMS-ESI (m/z) [M + H]$^{+}$ calcd for $C_{12}H_{17}OSe$: 257.0439, found: 257.0442.

12. ethyl 4-(phenylselanyl)butanoate[9]



3fa

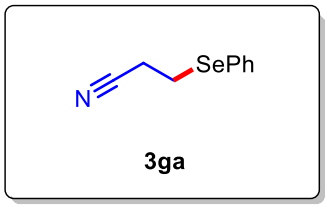
A light yellow oil, 118.0 mg, 87%, purification by flash column chromatography (eluent: petroleum ether/ethyl acetate = 50:1-20:1).

^{1}H NMR (400 MHz, Chloroform-*d*): δ 7.48 (dd, *J* = 7.5, 2.0 Hz, 2H), 7.27 – 7.20 (m, 3H), 4.10 (q, *J* = 7.2 Hz, 2H), 2.93 (t, *J* = 7.2 Hz, 2H), 2.43 (t, *J* = 7.2 Hz, 2H), 2.00 (q, *J* = 7.3 Hz, 2H), 1.23 (td, *J* = 7.2, 1.2 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*): δ 172.75, 132.49, 129.77, 128.94, 126.75, 60.25, 33.81, 26.83, 25.19, 14.10.

MS(EI): m/z(%) 272(45.68), 227(37.94), 181(8.71), 157(58.11), 115(100.00), 91(58.65), 87(99.97), 77(79.49), 69(22.91, 65(18.15), 51(59.83).

13. 3-(phenylselanyl)propanenitrile[8]



3ga

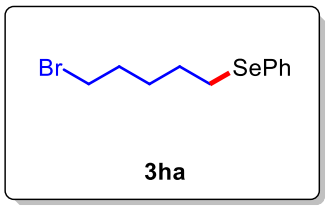
A light yellow oil, 67.2 mg, 64%, purification by flash column chromatography (eluent: petroleum ether/ethyl acetate = 20:1-2:1).

^{1}H NMR (400 MHz, Chloroform-*d*): δ 7.59 – 7.53 (m, 2H), 7.32 (dd, *J* = 5.4, 1.8 Hz, 3H), 3.04 (t, *J* = 7.4 Hz, 2H), 2.67 (t, *J* = 7.4 Hz, 2H).

^{13}C NMR (101 MHz, Chloroform-*d*): δ 134.12, 129.45, 128.20, 127.43, 118.59, 21.70, 18.93.

MS(EI): m/z(%) 211(89.24), 207(16.93), 169(49.26), 157(82.09), 130(7.10), 117(15.32), 103(6.33), 91(100.00), 77(98.75), 65(18.10), 51(82.22).

14. (5-bromopentyl)(phenyl)selane



3ha

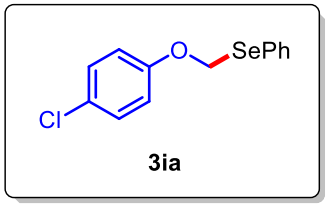
A light yellow oil, 133.2 mg, 87%, purification by flash column chromatography (eluent: petroleum ether/ethyl acetate = 200:1-100:1).

^{1}H NMR (400 MHz, Chloroform-*d*): δ 7.41 (dd, *J* = 7.4, 2.1 Hz, 2H), 7.22 – 7.13 (m, 3H), 3.30 (t, *J* = 6.8 Hz, 2H), 2.83 (t, *J* = 7.3 Hz, 2H), 1.77 (p, *J* = 7.0 Hz, 2H), 1.64 (p, *J* = 7.4 Hz, 2H), 1.47 (dd, *J* = 10.6, 4.9 Hz, 2H).

^{13}C NMR (101 MHz, Chloroform-*d*): δ 132.49, 130.20, 128.98, 126.72, 33.51, 32.12, 29.21, 28.24, 27.46.

HRMS-ESI (m/z) [M + H]$^+$ calcd for $C_{11}H_{16}BrSe$: 306.9516, found: 306.9551.

15. ((4-chlorophenoxy)methyl)(phenyl)selane



3ia

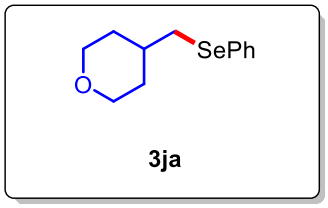
A light yellow oil, 119.1 mg, 80%, purification by flash column chromatography (eluent: petroleum ether/ethyl acetate = 200:1-100:1).

^{1}H NMR (400 MHz, Chloroform-*d*): δ 7.47 (dd, *J* = 6.5, 3.0 Hz, 2H), 7.17 (dd, *J* = 5.0, 2.0 Hz, 3H), 7.15 – 7.09 (m, 2H), 6.76 – 6.69 (m, 2H), 5.51 (s, 2H).

^{13}C NMR (101 MHz, Chloroform-*d*): δ 155.16, 133.30, 129.66, 129.34, 129.14, 127.64, 126.93, 117.21, 67.95.

HRMS-ESI (m/z) [M + H]$^{+}$ calcd for $C_{13}H_{12}ClOSe$: 298.9580, found: 298.9545.

16. 4-((phenylselanyl)methyl)tetrahydro-2H-pyran



3ja

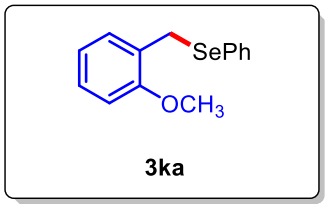
A light yellow oil, 114.9 mg, 90%, purification by flash column chromatography (eluent: petroleum ether/ethyl acetate = 50:1-20:1).

^{1}H NMR (400 MHz, Chloroform-*d*): δ 7.53 – 7.45 (m, 2H), 7.30 – 7.19 (m, 3H), 4.00 – 3.90 (m, 2H), 3.32 (td, *J* = 11.8, 1.9 Hz, 2H), 2.84 (d, *J* = 6.5 Hz, 2H), 1.78 (dd, *J* = 3.6, 2.0 Hz, 1H), 1.77 – 1.67 (m, 2H), 1.38 – 1.26 (m, 2H).

^{13}C NMR (101 MHz, Chloroform-*d*): δ 132.29, 130.54, 128.98, 126.65, 67.72, 35.60, 34.98, 33.20.

HRMS-ESI (m/z) [M + H]$^{+}$ calcd for $C_{12}H_{17}OSe$: 257.0439, found: 257.0440.

17. (2-methoxybenzyl)(phenyl)selane[10]



3ka

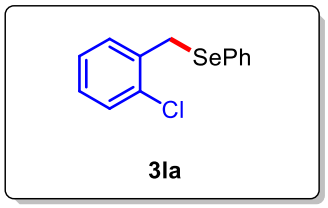
A colorless oil, 106.7 mg, 77%, purification by flash column chromatography (eluent: petroleum ether/ethyl acetate = 200:1-100:1).

^{1}H NMR (400 MHz, Chloroform-*d*): δ 7.47 – 7.35 (m, 2H), 7.15 (td, *J* = 4.1, 1.8 Hz, 3H), 7.10 (td, *J* = 7.8, 1.7 Hz, 1H), 6.95 (dd, *J* = 7.4, 1.7 Hz, 1H), 6.81 – 6.68 (m, 2H), 4.04 (s, 2H), 3.71 (s, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*): δ 157.04, 133.70, 130.95, 130.07, 128.75, 128.23, 127.27, 127.04, 120.22, 110.48, 55.33, 26.87.

MS(EI): m/z(%) 278(16.18), 251(2.85), 192(1.28), 157(20.02), 121(40.64), 112(1.50), 105(8.72), 91(52.10), 77(35.77), 65(15.76), 51(30.42).

18. (2-chlorobenzyl)(phenyl)selane[10-11]



3la

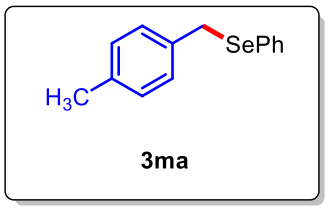
A colorless oil, 101.4 mg, 72%, purification by flash column chromatography (eluent: petroleum ether/ethyl acetate = 200:1-100:1).

^{1}H NMR (400 MHz, Chloroform-*d*): δ 7.47 – 7.43 (m, 2H), 7.31 (dd, *J* = 7.8, 1.4 Hz, 1H), 7.22 (dd, *J* = 8.8, 6.8 Hz, 3H), 7.09 (td, *J* = 7.6, 2.0 Hz, 1H), 7.03 (td, *J* = 7.4, 1.4 Hz, 1H), 6.98 (dd, *J* = 7.5, 1.9 Hz, 1H), 4.14 (s, 2H).

^{13}C NMR (101 MHz, Chloroform-*d*): δ 136.48, 134.29, 133.67, 130.49, 129.65, 129.56, 128.85, 128.15, 127.53, 126.49, 29.90.

MS(EI): m/z(%) 282(9.10), 207(88.51), 147(19.45), 142(100.00), 133(14.98), 100(50.05), 91(11.71), 79(12.92), 77(29.02), 57(32.52), 55(13.13).

19. (4-methylbenzyl)(phenyl)selane[7][10][12]



3ma

A colorless oil, 78.4 mg, 60%, purification by flash column chromatography (eluent: petroleum ether/ethyl acetate = 200:1-100:1).

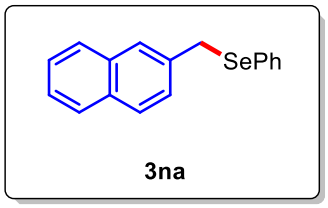
^{1}H NMR (400 MHz, Chloroform-*d*): δ 7.37 (ddd, *J* = 6.5, 3.1, 1.5 Hz, 2H), 7.18 – 7.13 (m, 3H), 7.02 (d, *J* = 8.1 Hz, 2H), 6.96 (d, *J* = 7.9 Hz, 2H), 4.00 (s, 2H), 2.22 (s, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 136.47, 135.39, 133.26, 130.66, 129.09, 128.92, 128.66, 127.11, 31.92, 21.08.

MS(EI): m/z(%) 262(66.68), 179(2.18), 165(9.38), 157(51.58), 129(2.45), 117(8.35),

105(99.87), 91(10.60), 77(100.00), 65(19.72), 51(58.98).

20. (naphthalen-2-ylmethyl)(phenyl)selane[13]



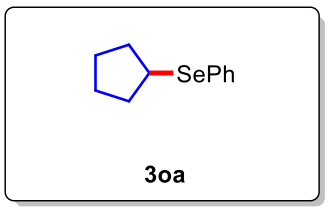
A yellow solid, 133.8 mg, 90%, purification by flash column chromatography (eluent: petroleum ether/ethyl acetate = 200:1-100:1), M.P.: 33.0-35.0 °C.

^{1}H NMR (400 MHz, Chloroform-*d*): δ 7.75 – 7.61 (m, 2H), 7.61 – 7.54 (m, 1H), 7.41 (s, 1H), 7.39 – 7.22 (m, 5H), 7.19 – 7.05 (m, 3H), 4.13 (s, 2H).

^{13}C NMR (101 MHz, Chloroform-*d*): δ 135.93, 133.63, 133.19, 132.30, 130.74, 130.28, 129.58, 128.93, 128.18, 127.57, 127.55, 127.32, 127.16, 127.12, 126.03, 125.64, 32.61.

MS(EI): m/z(%) 298(3.44), 207(8.25), 142(17.99), 141(100.00), 139(9.02), 115(20.57), 91(2.74), 89(2.74), 78(2.89), 77(4.85), 51(3.46).

21. cyclopentyl(phenyl)selane[14]



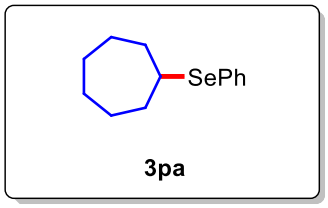
A pale yellow oil, 83.3 mg, 74%, purification by flash column chromatography (eluent: petroleum ether/ethyl acetate = 200:1-100:1).

^{1}H NMR (400 MHz, Chloroform-*d*): δ 7.57 – 7.48 (m, 2H), 7.24 (dd, *J* = 5.1, 2.0 Hz, 3H), 3.63 (p, *J* = 6.6 Hz, 1H), 2.13 – 2.00 (m, 2H), 1.71 (dddq, *J* = 25.3, 12.5, 6.1, 3.1, 2.1 Hz, 4H), 1.58 (dt, *J* = 8.1, 5.9 Hz, 2H).

^{13}C NMR (101 MHz, Chloroform-*d*): δ 133.43, 131.00, 128.83, 126.78, 41.75, 33.99, 24.81.

MS(EI): m/z(%) 226(68.16), 156(99.61), 117(13.34), 104(6.15), 91(10.02), 78(100.00), 69(61.16), 65(20.98), 63(5.31), 53(12.14), 51(55.04).

22. cycloheptyl(phenyl)selane[15]



3pa

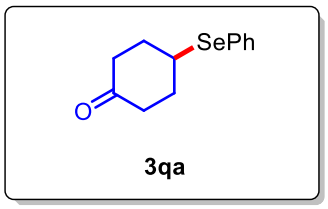
A pale yellow oil, 121.6 mg, 96%, purification by flash column chromatography (eluent: petroleum ether/ethyl acetate = 200:1-100:1).

^{1}H NMR (400 MHz, Chloroform-*d*): δ 7.44 (dd, *J* = 6.6, 3.0 Hz, 2H), 7.21 – 7.12 (m, 3H), 3.35 (tt, *J* = 9.2, 4.3 Hz, 1H), 1.99 (ddt, *J* = 14.0, 7.0, 2.7 Hz, 2H), 1.60 (dddd, *J* = 12.3, 9.0, 5.6, 3.1 Hz, 4H), 1.46 (dt, *J* = 8.1, 4.7 Hz, 4H), 1.34 (qd, *J* = 9.6, 6.0 Hz, 2H).

^{13}C NMR (101 MHz, Chloroform-*d*): δ 134.15, 130.48, 128.83, 127.00, 44.88, 35.46, 28.02, 26.66.

MS(EI): m/z(%) 254(61.64), 183(1.39), 155(64.62), 117(11.98), 104(4.45), 97(97.69), 91(15.55), 77(78.70), 69(27.89), 55(100.00), 51(48.81).

23. 4-(phenylselanyl)cyclohexan-1-one



3qa

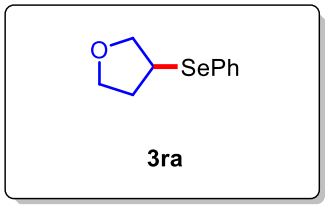
A pale yellow oil, 113.9 mg, 90%, purification by flash column chromatography (eluent: petroleum ether/ethyl acetate = 50:1-20:1).

^{1}H NMR (400 MHz, Chloroform-*d*): δ 7.51 (dd, *J* = 7.3, 2.1 Hz, 2H), 7.30 – 7.14 (m, 3H), 3.54 (tt, *J* = 8.5, 3.6 Hz, 1H), 2.45 (dt, *J* = 13.5, 5.5 Hz, 2H), 2.27 (dt, *J* = 10.3, 5.3 Hz, 2H), 2.23 – 2.15 (m, 2H), 1.90 (dtd, *J* = 14.4, 9.4, 8.7, 4.4 Hz, 2H).

^{13}C NMR (101 MHz, Chloroform-*d*): δ 209.92, 135.12, 129.06, 128.11, 127.90, 40.51, 39.62, 33.05.

HRMS-ESI (m/z) [M + H]$^{+}$ calcd for $C_{12}H_{15}OSe$: 255.0282, found: 255.0285.

24. 3-(phenylselanyl)tetrahydrofuran



3ra

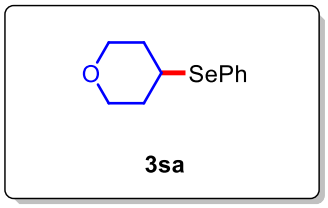
A pale yellow oil, 96.6 mg, 85%, purification by flash column chromatography (eluent: petroleum ether/ethyl acetate = 200:1-100:1).

^{1}H NMR (400 MHz, Chloroform-*d*): δ 7.54 (dd, *J* = 6.6, 3.0 Hz, 2H), 7.30 – 7.23 (m, 3H), 4.14 – 4.06 (m, 1H), 3.89 (td, *J* = 8.0, 6.4 Hz, 1H), 3.82 (td, *J* = 7.9, 5.9 Hz, 1H), 3.77 – 3.70 (m, 2H), 2.32 (dq, *J* = 14.0, 7.4 Hz, 1H), 1.94 (ddt, *J* = 13.4, 7.6, 5.8 Hz, 1H).

^{13}C NMR (101 MHz, Chloroform-*d*): δ 133.92, 129.24, 129.02, 127.45, 73.87, 67.48, 38.80, 33.31.

HRMS-ESI (m/z) [M + H]$^+$ calcd for $C_{10}H_{13}OSe$: 228.9980, found: 228.9973.

25. 4-(phenylselanyl)tetrahydro-2H-pyran[14]



3sa

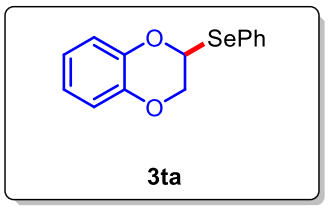
A pale yellow oil, 100.0 mg, 83%, purification by flash column chromatography (eluent: petroleum ether/ethyl acetate = 200:1-100:1).

^{1}H NMR (400 MHz, Chloroform-*d*): δ 7.56 (dd, *J* = 7.2, 2.3 Hz, 2H), 7.33 – 7.23 (m, 3H), 3.92 (dt, *J* = 11.7, 3.8 Hz, 2H), 3.46 – 3.33 (m, 3H), 1.94 (dd, *J* = 13.4, 3.6 Hz, 2H), 1.79 (dtd, *J* = 14.4, 10.7, 4.2 Hz, 2H).

^{13}C NMR (101 MHz, Chloroform-*d*): δ 135.20, 128.92, 127.91, 127.68, 67.97, 38.65, 33.91.

MS(EI): m/z(%) 242(97.27), 158(66.23), 129(6.26), 115(10.54), 104(7.49), 91(15.94), 85(85.14), 77(87.91), 65(15.99), 55(100.00), 51(70.37).

26. 2-(phenylselanyl)-2,3-dihydrobenzo[b][1,4]dioxine



3ta

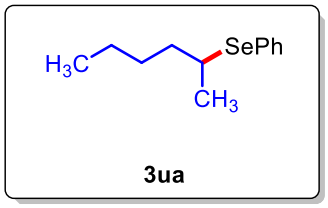
A pale yellow oil, 138.3 mg, 95%, purification by flash column chromatography (eluent: petroleum ether/ethyl acetate = 200:1-100:1).

^{1}H NMR (400 MHz, Chloroform-*d*): δ 7.67 – 7.61 (m, 2H), 7.34 – 7.25 (m, 3H), 6.94 – 6.87 (m, 4H), 5.90 (dd, *J* = 3.5, 2.3 Hz, 1H), 4.46 (dd, *J* = 11.5, 2.3 Hz, 1H), 4.33 (dd, *J* = 11.6, 3.5 Hz, 1H).

^{13}C NMR (101 MHz, Chloroform-*d*): δ 142.81, 141.28, 134.84, 129.13, 128.19, 127.67, 122.35, 122.00, 118.01, 117.28, 76.80, 68.06.

HRMS-ESI (m/z) [M + H]$^+$ calcd for $C_{14}H_{13}O_2Se$: 293.0075, found: 293.0080.

27. hexan-2-yl(phenyl)selane



3ua

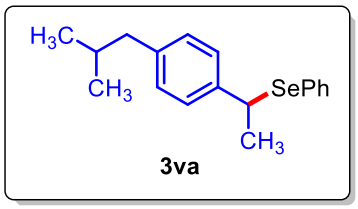
A colorless oil, 88.1 mg, 73%, purification by flash column chromatography (eluent: petroleum ether/ethyl acetate = 200:1-100:1).

^{1}H NMR (400 MHz, Chloroform-*d*): δ 7.54 (dd, *J* = 6.5, 3.0 Hz, 2H), 7.25 (p, *J* = 3.4, 3.0 Hz, 3H), 3.28 (h, *J* = 6.8 Hz, 1H), 1.67 (dtd, *J* = 14.3, 8.0, 6.6 Hz, 1H), 1.56 (ddd, *J* = 15.3, 13.7, 7.1 Hz, 1H), 1.40 (dd, *J* = 10.0, 7.0 Hz, 5H), 1.29 (h, *J* = 6.9 Hz, 2H), 0.88 (t, *J* = 7.3 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*): δ 134.80, 129.45, 128.79, 127.20, 39.73, 37.18, 29.96, 22.44, 22.12, 13.98.

HRMS-ESI (m/z) [M + H]$^{+}$ calcd for $C_{12}H_{19}Se$: 243.0501, found: 243.0496.

28. (1-(4-isobutylphenyl)ethyl)(phenyl)selane[14]



3va

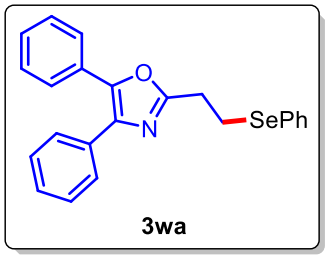
A colorless oil, 100.0 mg, 63%, purification by flash column chromatography (eluent: petroleum ether/ethyl acetate = 200:1-100:1).

^{1}H NMR (400 MHz, Chloroform-*d*): δ 7.45 – 7.39 (m, 2H), 7.27 – 7.24 (m, 1H), 7.20 (t, *J* = 7.1 Hz, 2H), 7.14 (d, *J* = 7.8 Hz, 2H), 7.02 (d, *J* = 7.9 Hz, 2H), 4.45 (q, *J* = 7.1 Hz, 1H), 2.42 (d, *J* = 7.2 Hz, 2H), 1.84 (dq, *J* = 13.5, 6.7 Hz, 1H), 1.74 (d, *J* = 7.0 Hz, 3H), 0.89 (d, *J* = 6.6 Hz, 6H).

^{13}C NMR (101 MHz, Chloroform-*d*): δ 140.63, 140.39, 135.49, 129.94, 128.99, 128.71, 127.69, 126.93, 45.02, 42.34, 30.19, 22.34, 22.32, 22.13.

MS(EI): m/z(%) 318(4.40), 161(100.00), 155(16.64), 145(8.50), 131(7.85), 119(99.28), 105(48.89), 91(82.10), 77(45.77), 65(12.76), 51(17.42).

29. 4,5-diphenyl-2-(2-(phenylselanyl)ethyl)oxazole



3wa

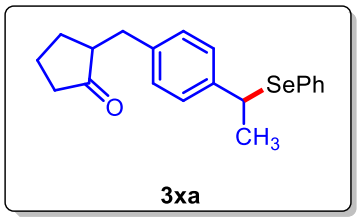
A pale yellow oil, 103.1 mg, 51%, purification by flash column chromatography (eluent: petroleum ether/ethyl acetate = 20:1-10:1).

^{1}H NMR (400 MHz, Chloroform-*d*): δ 7.67 – 7.59 (m, 2H), 7.54 (ddd, *J* = 8.1, 6.1, 2.2 Hz, 4H), 7.40 – 7.28 (m, 6H), 7.24 (dd, *J* = 5.0, 2.0 Hz, 3H), 3.37 – 3.30 (m, 2H), 3.28 – 3.21 (m, 2H).

^{13}C NMR (101 MHz, Chloroform-*d*): δ 161.87, 145.28, 135.08, 133.39, 132.36, 129.10, 129.00, 128.86, 128.55, 128.50, 128.38, 128.01, 127.85, 127.29, 126.39, 29.63, 23.85.

HRMS-ESI (m/z) [M + H]$^{+}$ calcd for $C_{29}H_{20}NOSe$: 406.0632, found: 406.0705.

30. 2-(4-(1-(phenylselanyl)ethyl)benzyl)cyclopentan-1-one[14]



3xa

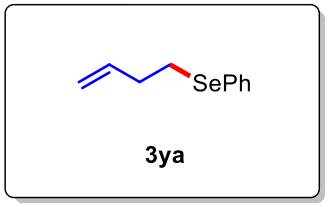
A pale yellow oil, 105.4 mg, 59%, purification by flash column chromatography (eluent: petroleum ether/ethyl acetate = 20:1-10:1).

^{1}H NMR (400 MHz, Chloroform-*d*): δ 7.37 – 7.32 (m, 2H), 7.22 – 7.17 (m, 1H), 7.16 – 7.11 (m, 2H), 7.08 (d, *J* = 7.9 Hz, 2H), 6.97 (d, *J* = 7.8 Hz, 2H), 4.37 (q, *J* = 7.1 Hz, 1H), 3.02 (dd, *J* = 13.8, 4.1 Hz, 1H), 2.43 (dd, *J* = 13.9, 9.4 Hz, 1H), 2.30 – 2.20 (m, 2H), 2.02 (dddd, *J* = 19.0, 10.7, 8.6, 2.3 Hz, 2H), 1.87 (dtt, *J* = 11.9, 6.2, 2.9 Hz, 1H), 1.66 (d, *J* = 7.1 Hz, 3H), 1.50 – 1.41 (m, 1H), 1.18 (s, 1H).

^{13}C NMR (101 MHz, Chloroform-*d*): δ 220.25, 141.30, 138.61, 135.42, 129.85, 128.78, 128.72, 127.72, 127.24, 50.92, 42.16, 42.13, 38.20, 35.14, 29.05, 22.10, 20.52.

MS(EI): m/z(%) 358(5.09), 201(50.37), 157(16.64), 145(6.50), 131(1.85), 115(1.28), 102(3.09), 91(21.10), 77(45.23), 61(2.29), 51(37.75).

31. but-3-en-1-yl(phenyl)selane



3ya

A pale yellow oil, 73.9 mg, 70%, purification by flash column chromatography (eluent: petroleum ether/ethyl acetate = 200:1-100:1).

^{1}H NMR (400 MHz, Chloroform-*d*): δ 7.56 – 7.44 (m, 2H), 7.31 – 7.18 (m, 3H), 5.83 (ddt, *J* = 16.9, 10.2, 6.6 Hz, 1H), 5.05 (t, *J* = 13.4 Hz, 2H), 2.95 (t, *J* = 7.5 Hz, 2H), 2.45 (q, *J* = 7.2 Hz, 2H).

^{13}C NMR (101 MHz, Chloroform-*d*): δ 137.14, 132.62, 130.16, 128.98, 126.76, 115.90, 34.23, 26.68.

HRMS-ESI (m/z) [M + H]$^{+}$ calcd for $C_{10}H_{13}Se$: 213.0098, found: 213.0131.

7 References.

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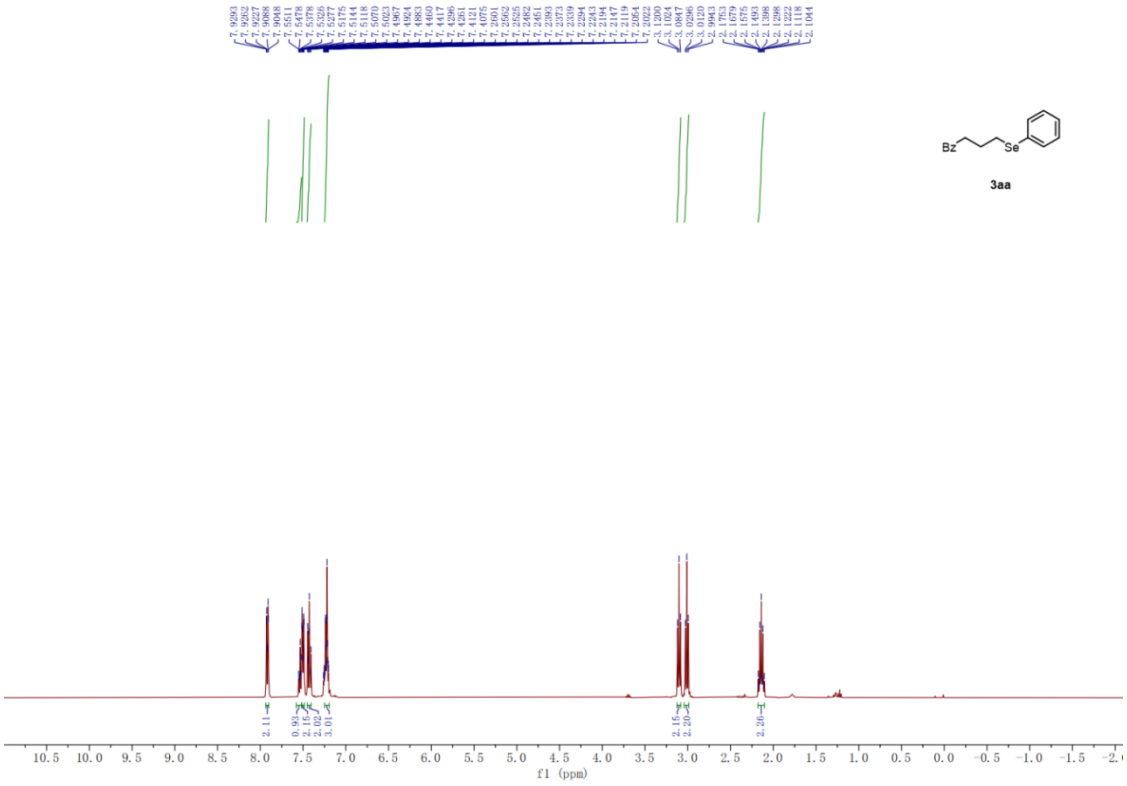
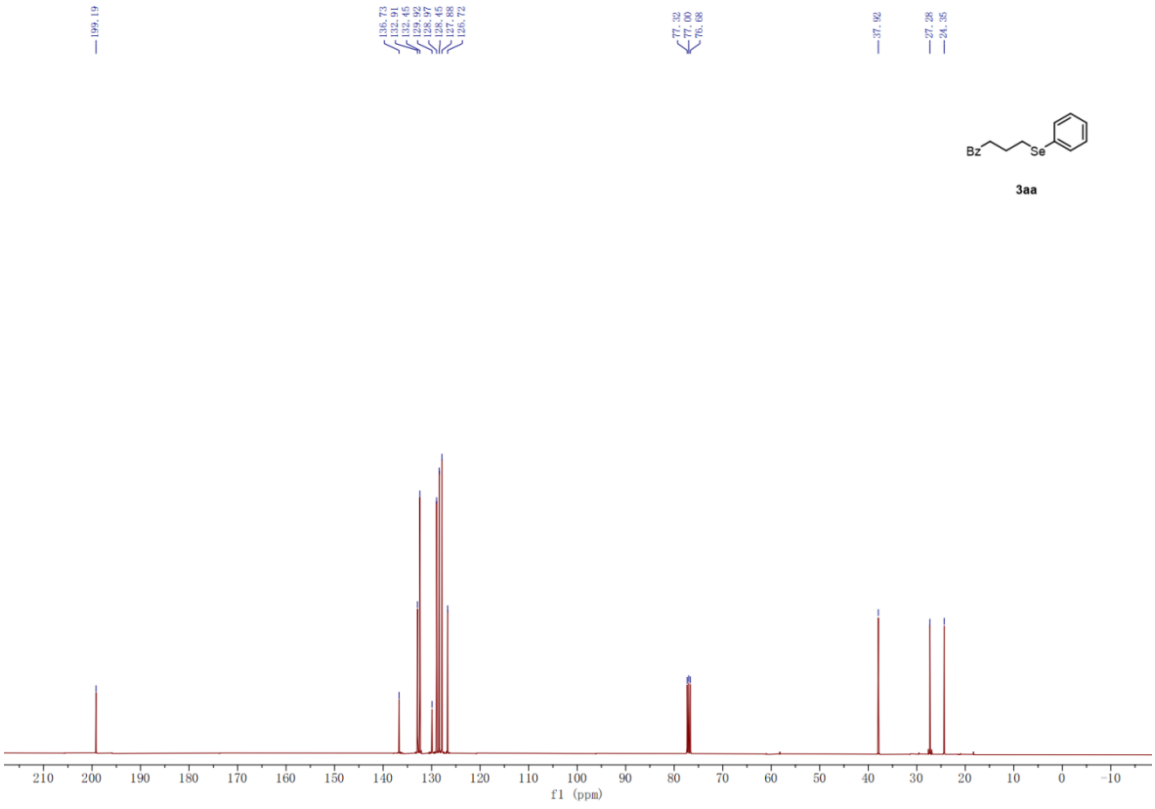
9 Copies of the NMR spectra.

1. 1-phenyl-4-(phenylselanyl)butan-1-one

^{1}H NMR

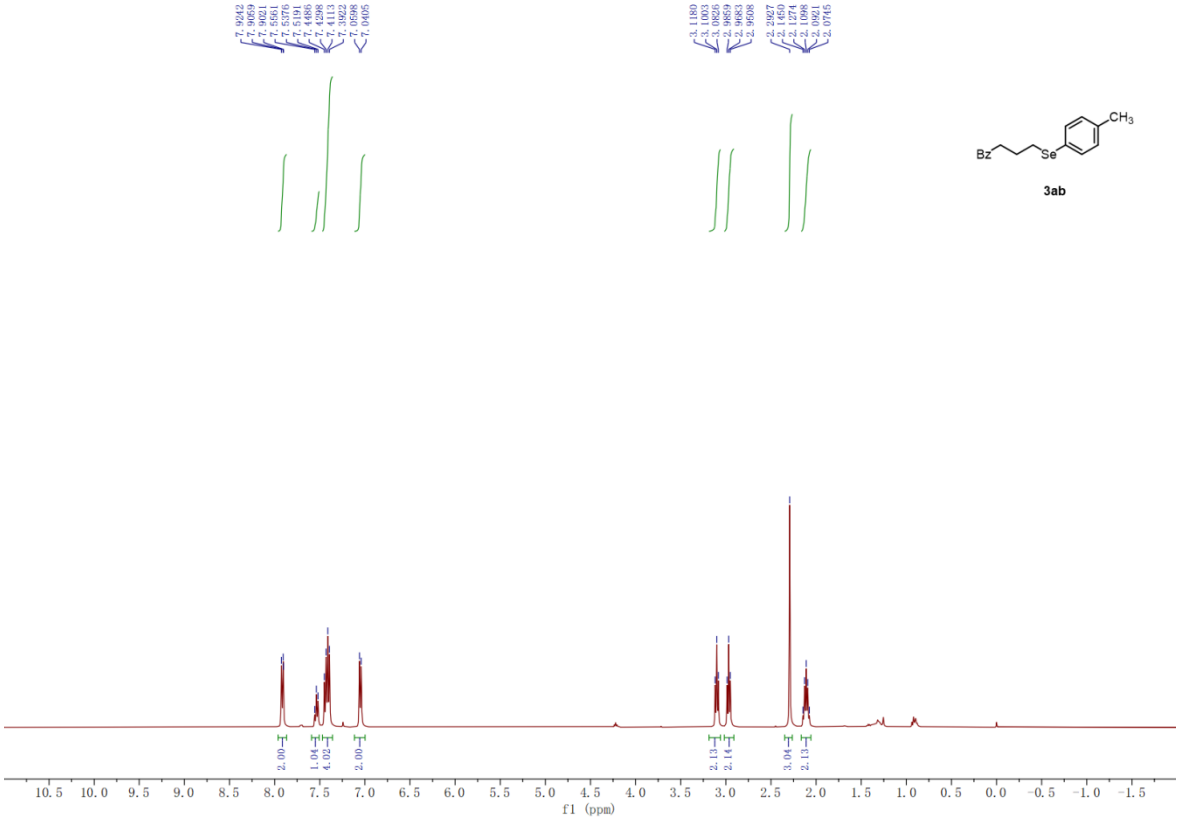


^{13}C NMR

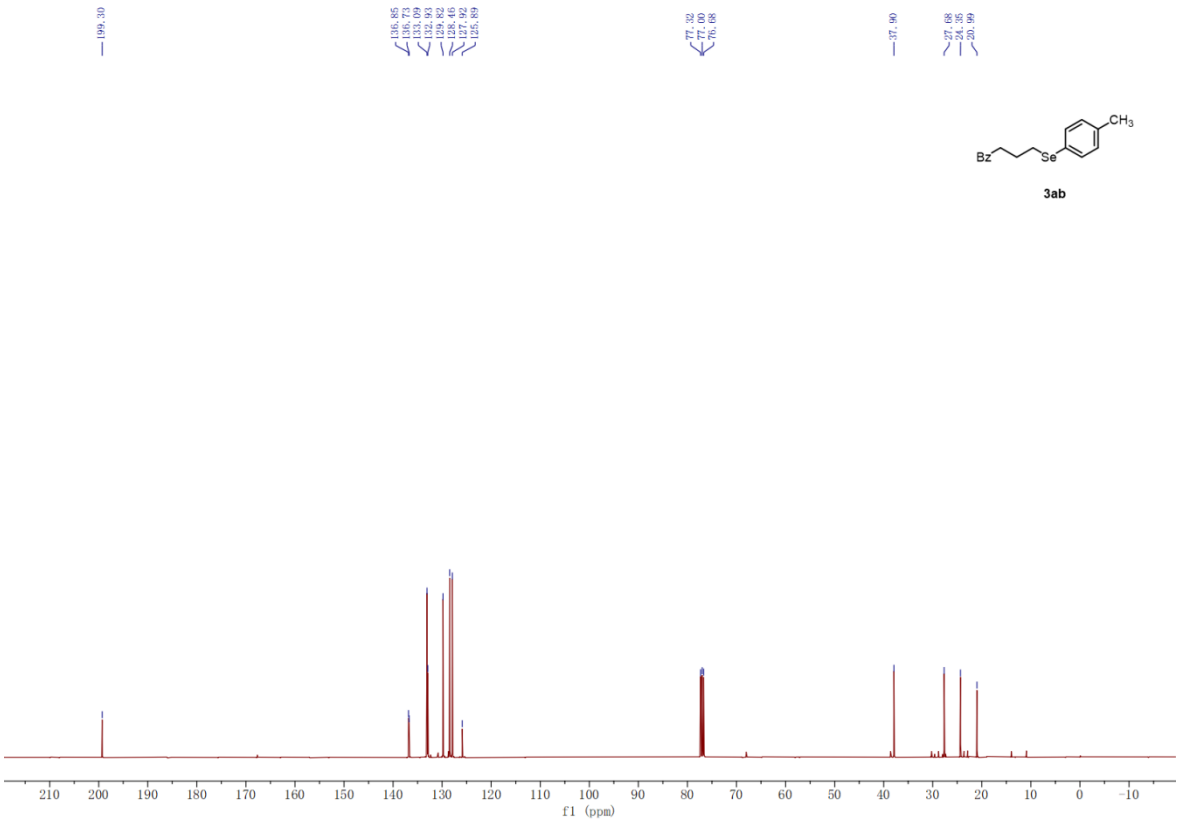


2. 1-phenyl-4-(p-tolylselanyl)butan-1-one

^{1}H NMR

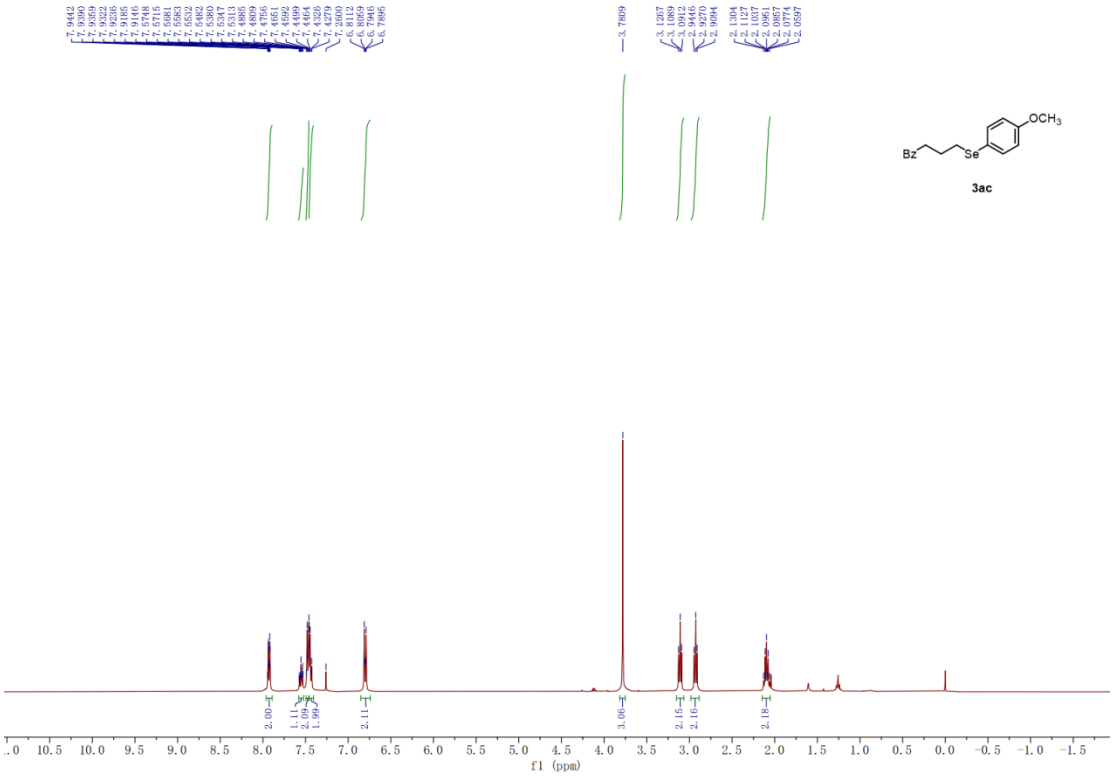


^{13}C NMR



3. 4-((4-methoxyphenyl)selanyl)-1-phenylbutan-1-one

^{1}H NMR



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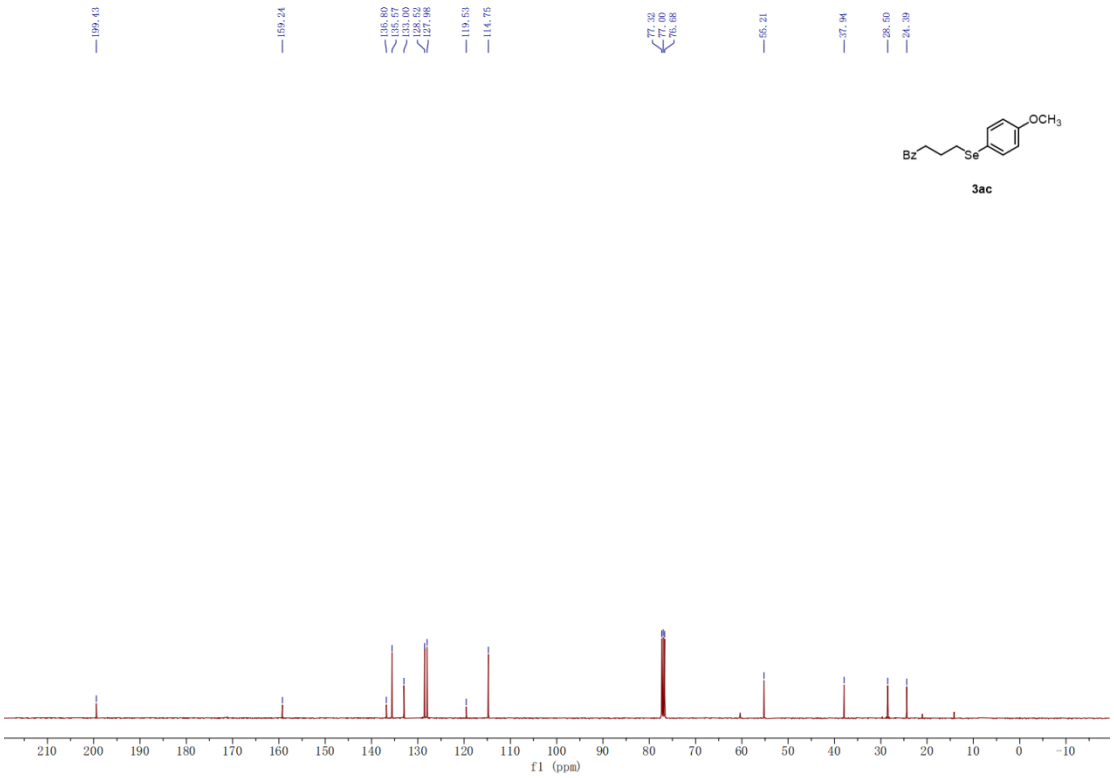
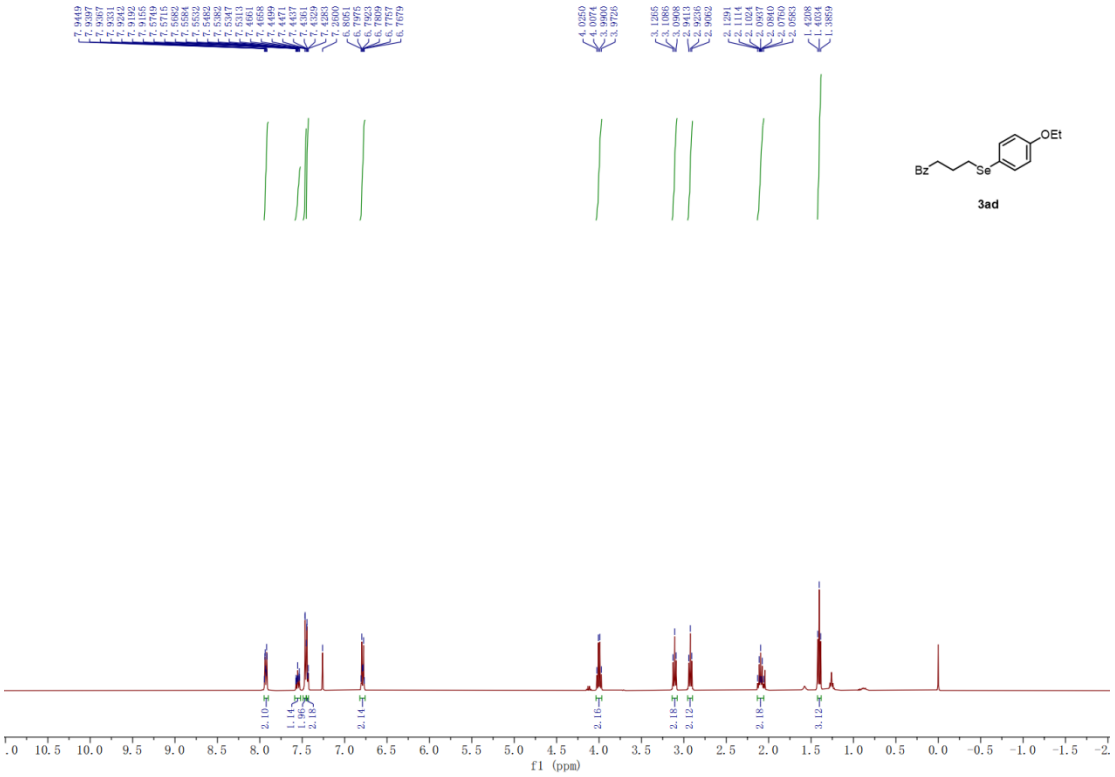
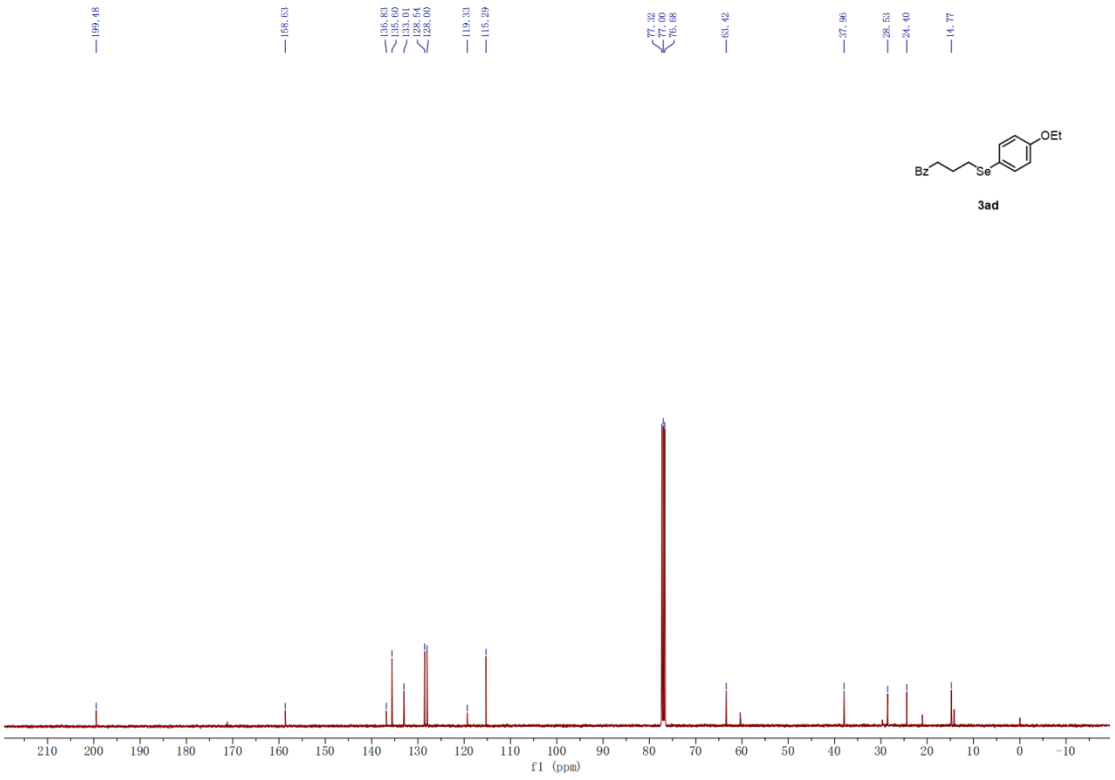


4. 4-((4-ethoxyphenyl)selanyl)-1-phenylbutan-1-one

^{1}H NMR

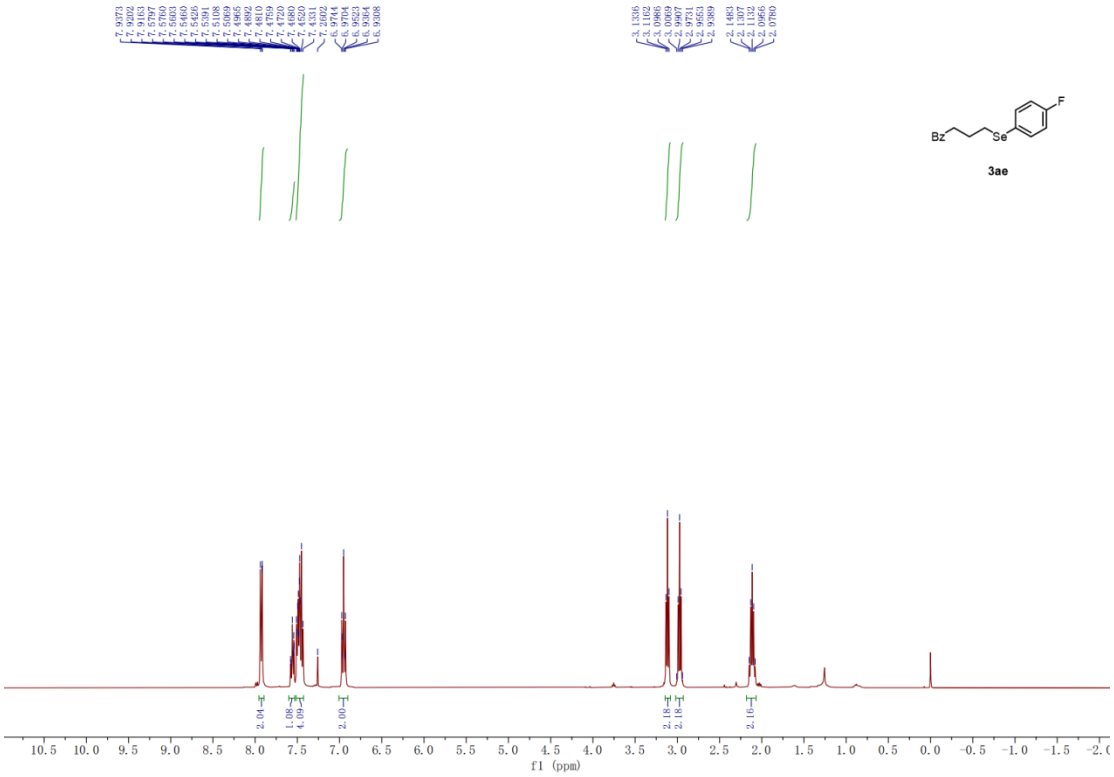


^{13}C NMR

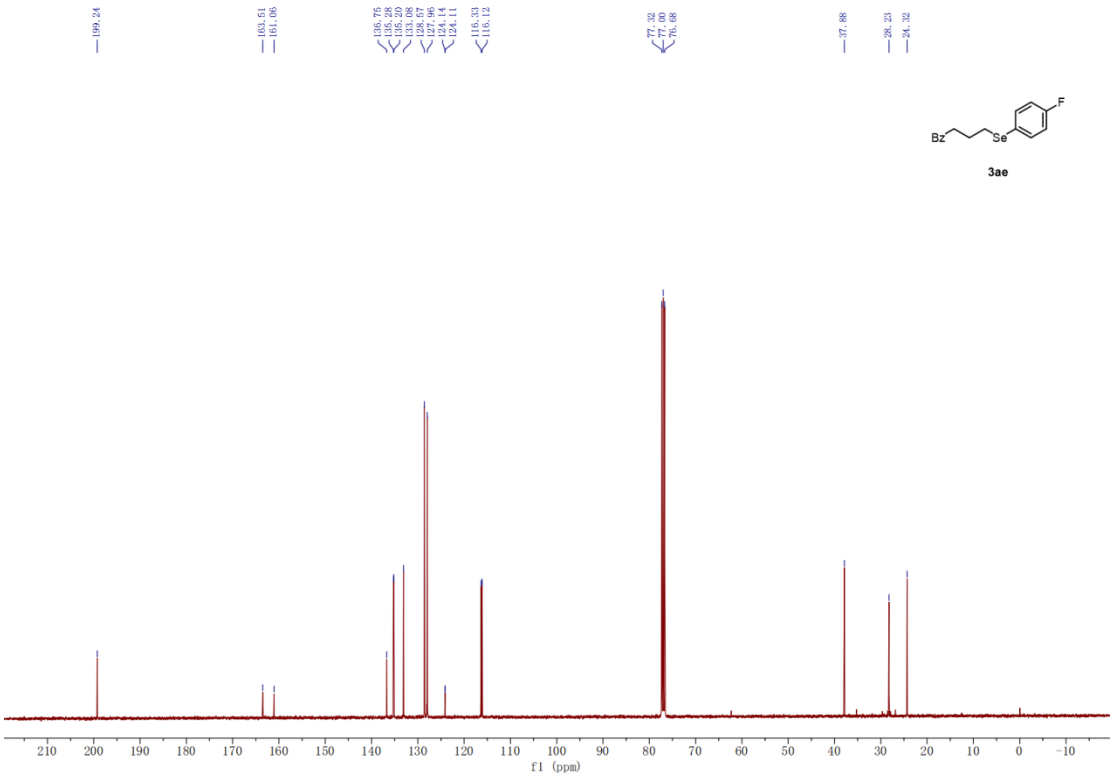


5. 4-((4-fluorophenyl)selanyl)-1-phenylbutan-1-one

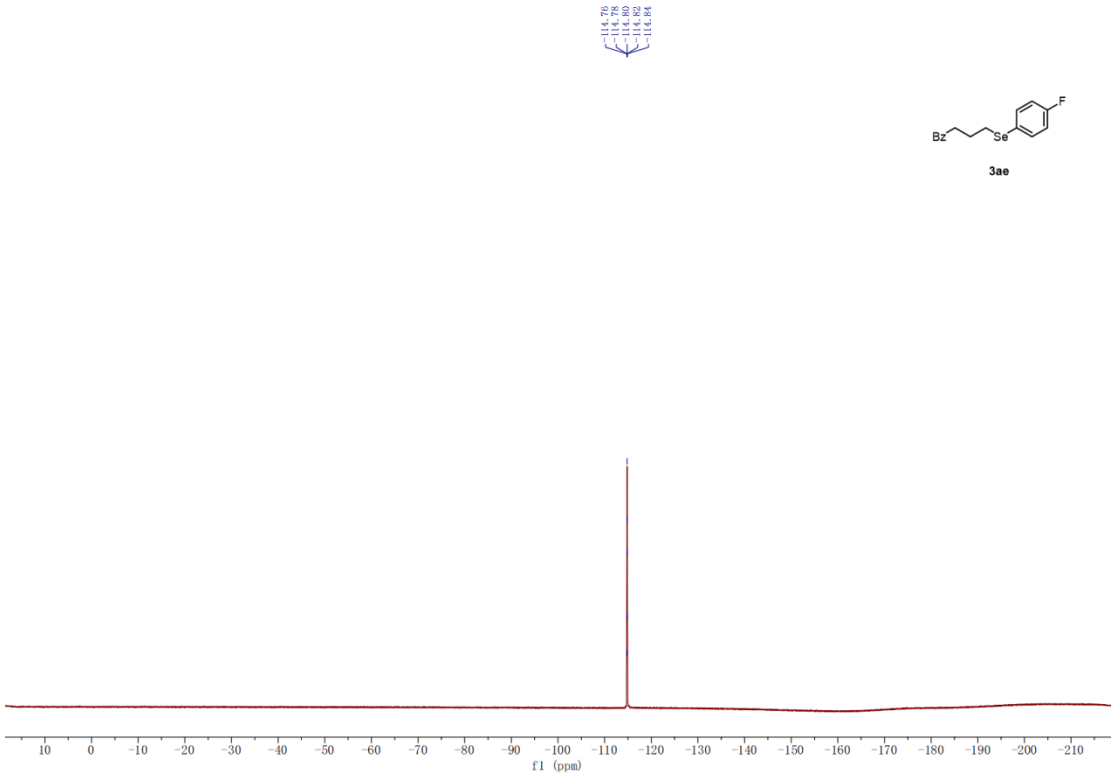
^{1}H NMR



^{13}C NMR

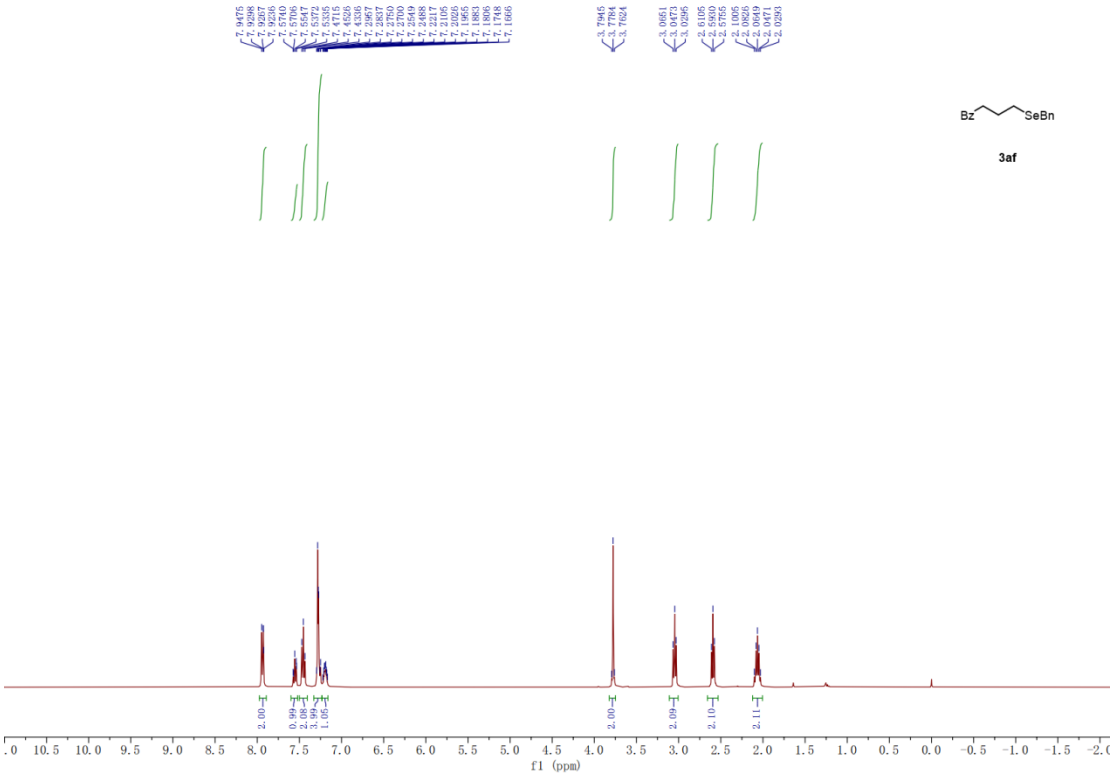


^{19}F NMR

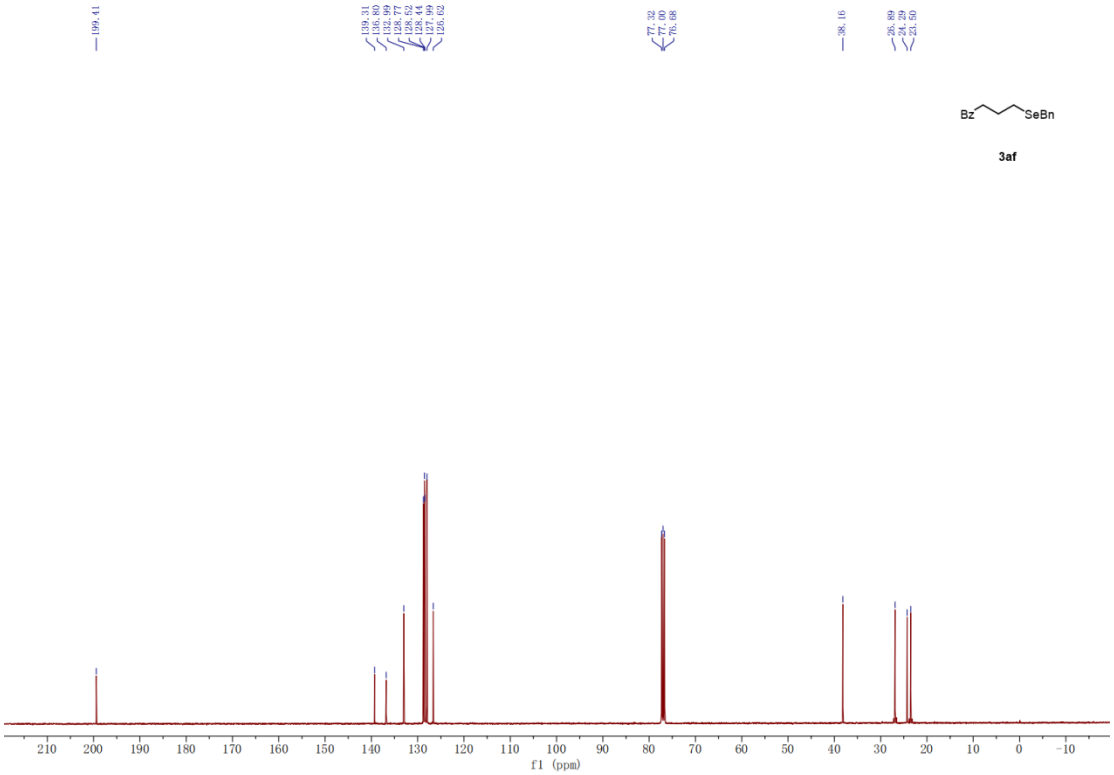

-114.76
-114.78
-114.80
-114.82
-114.84
F
Bz
Se
3ae
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)

6. 4-(benzylselanyl)-1-phenylbutan-1-one

^{1}H NMR

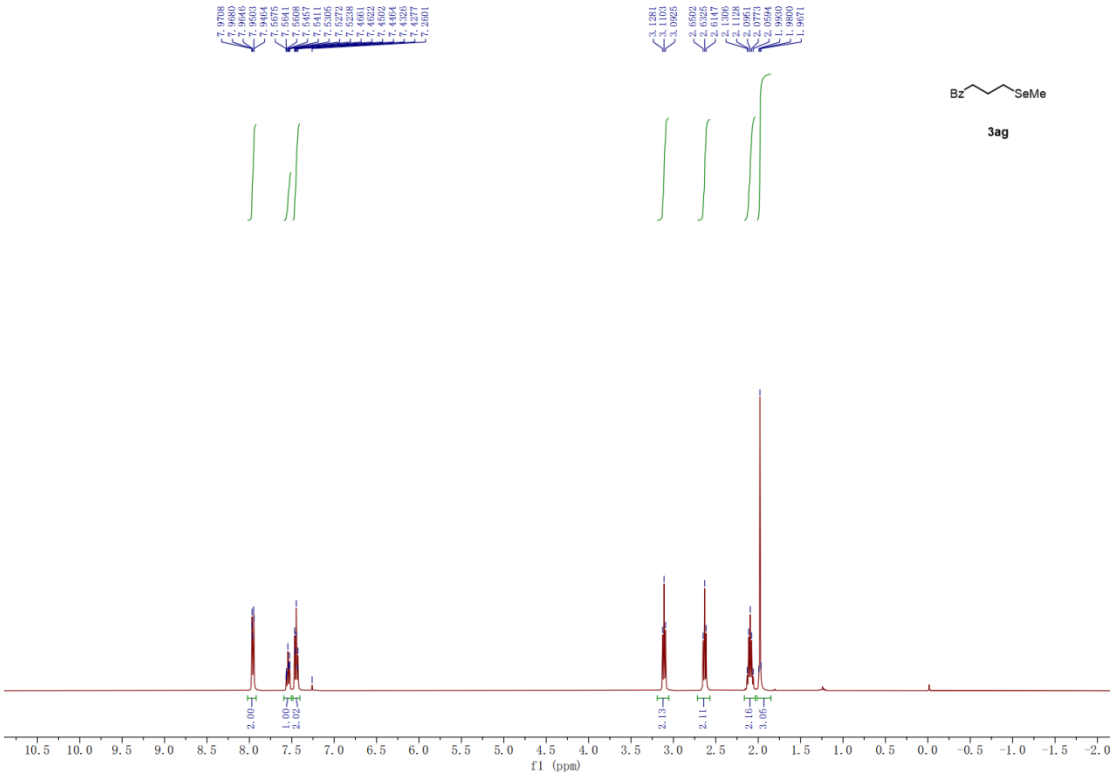


^{13}C NMR

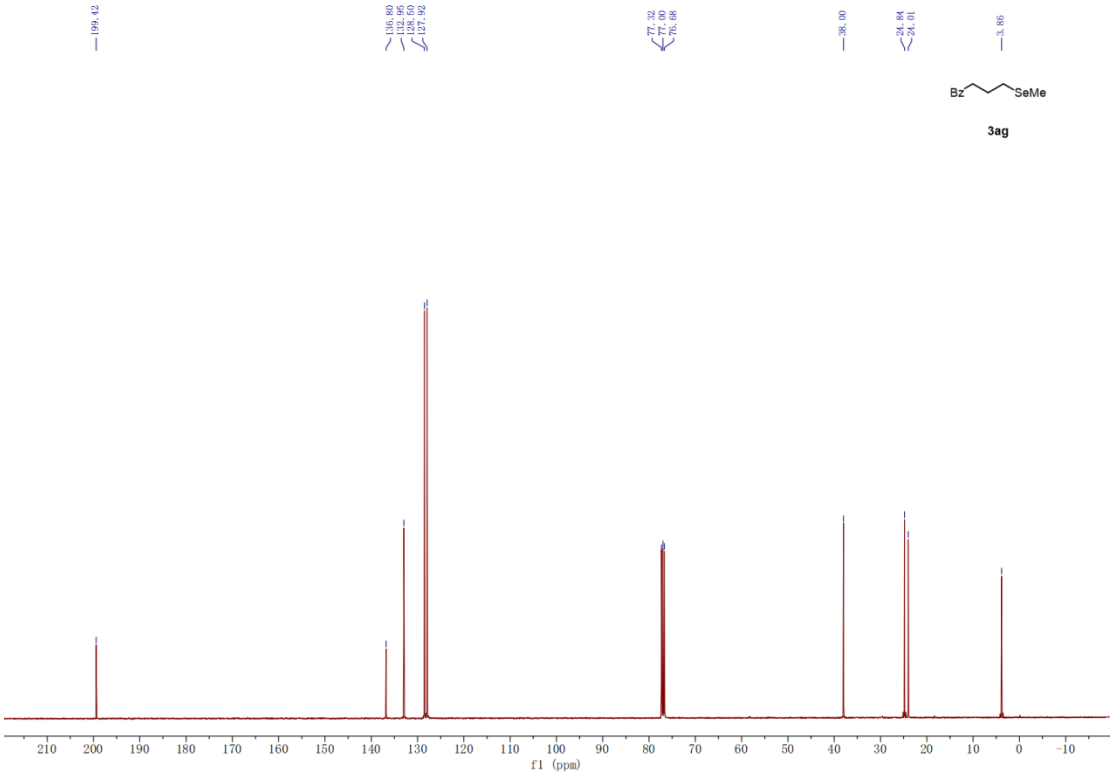


7. 4-(methylselanyl)-1-phenylbutan-1-one

^{1}H NMR

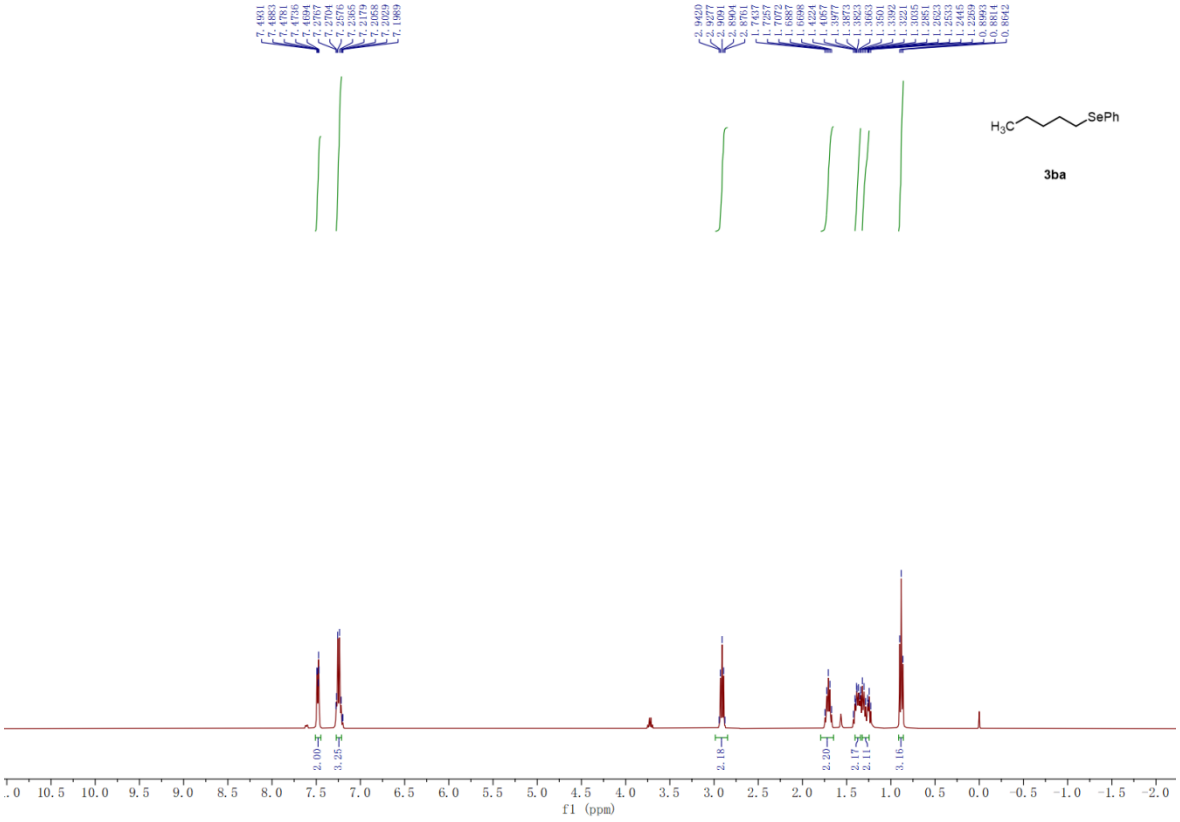


^{13}C NMR

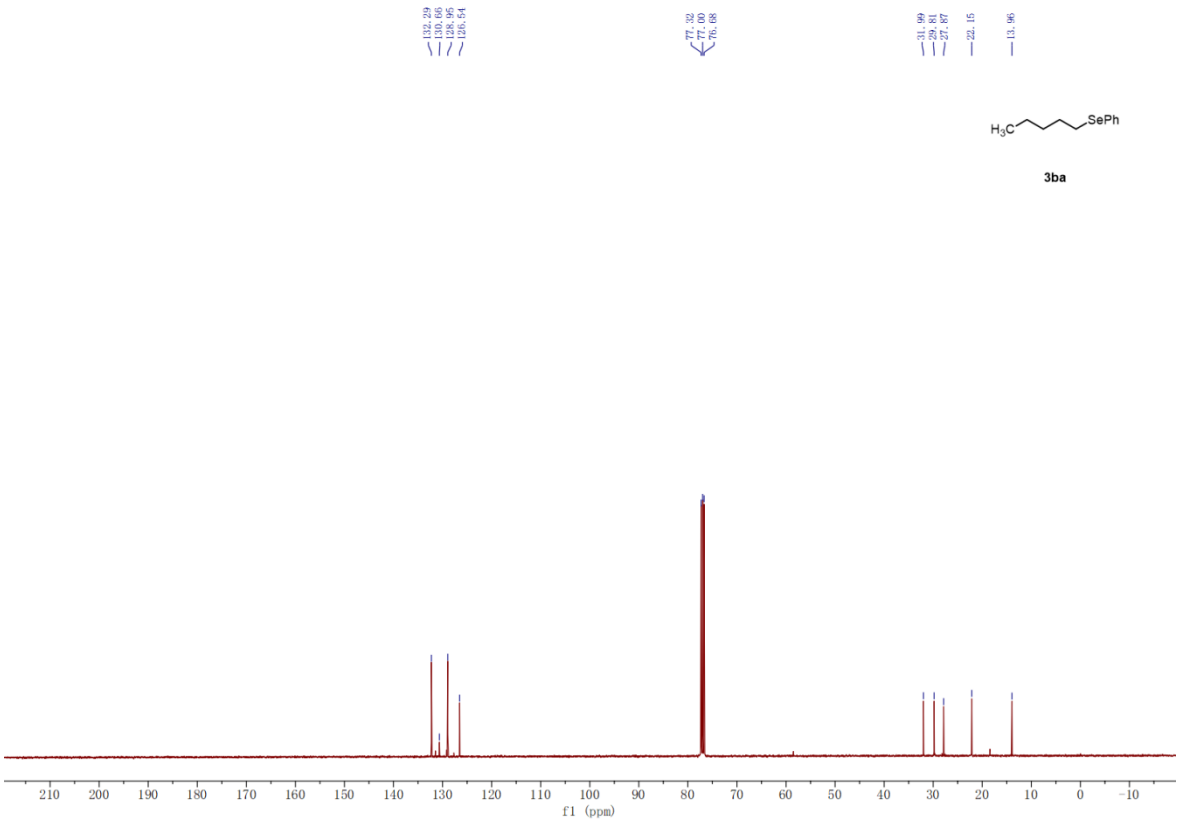


8. pentyl(phenyl)selane

^{1}H NMR

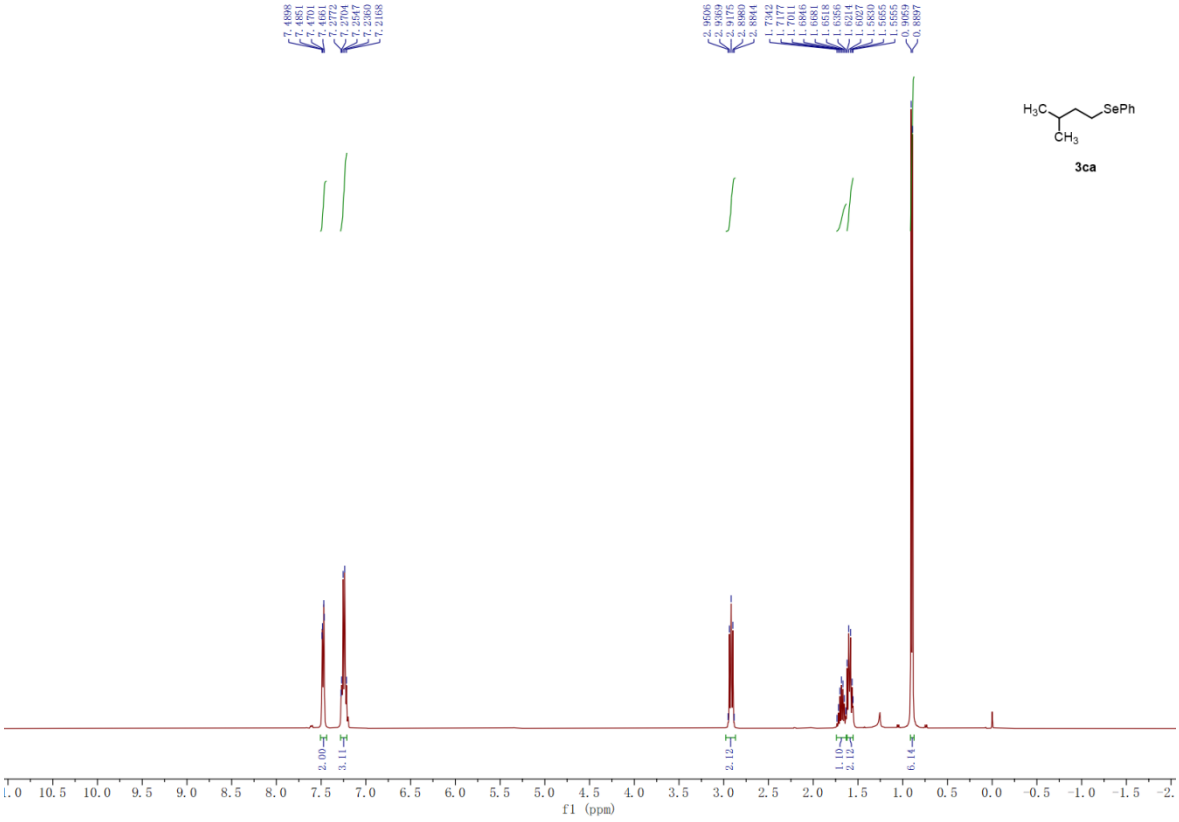


^{13}C NMR

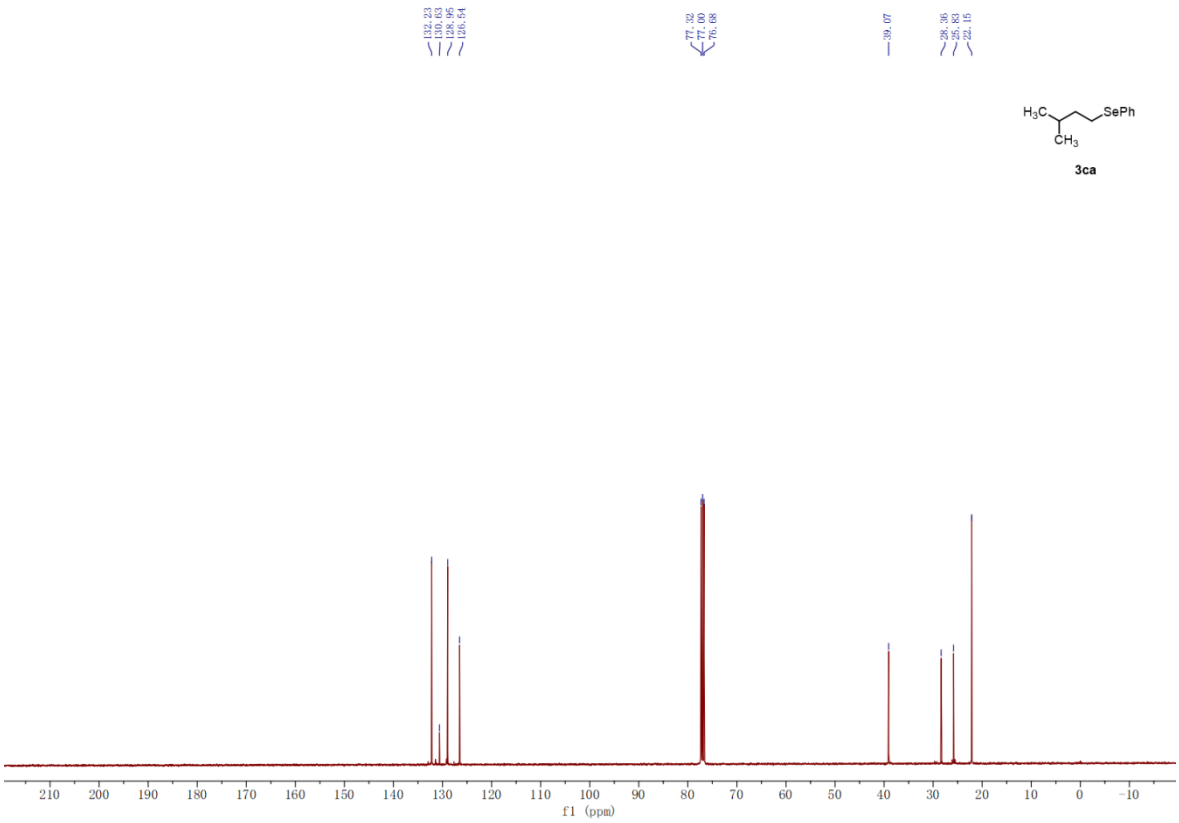


9. isopentyl(phenyl)selane

^{1}H NMR

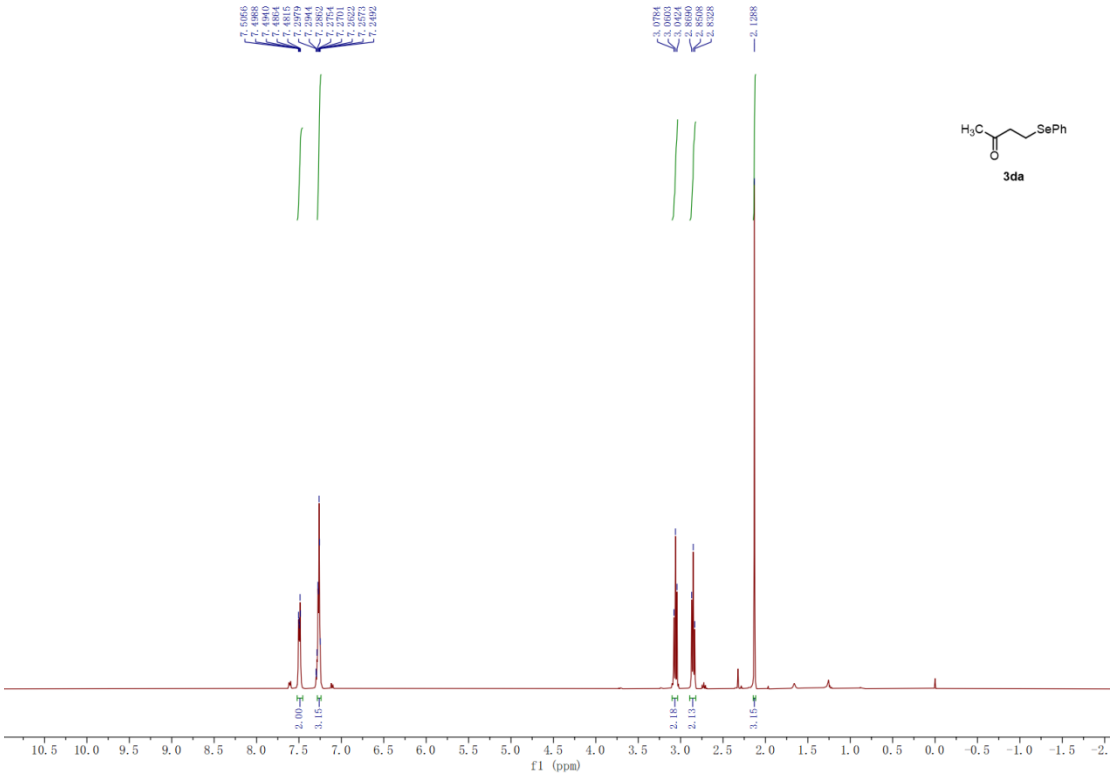


^{13}C NMR

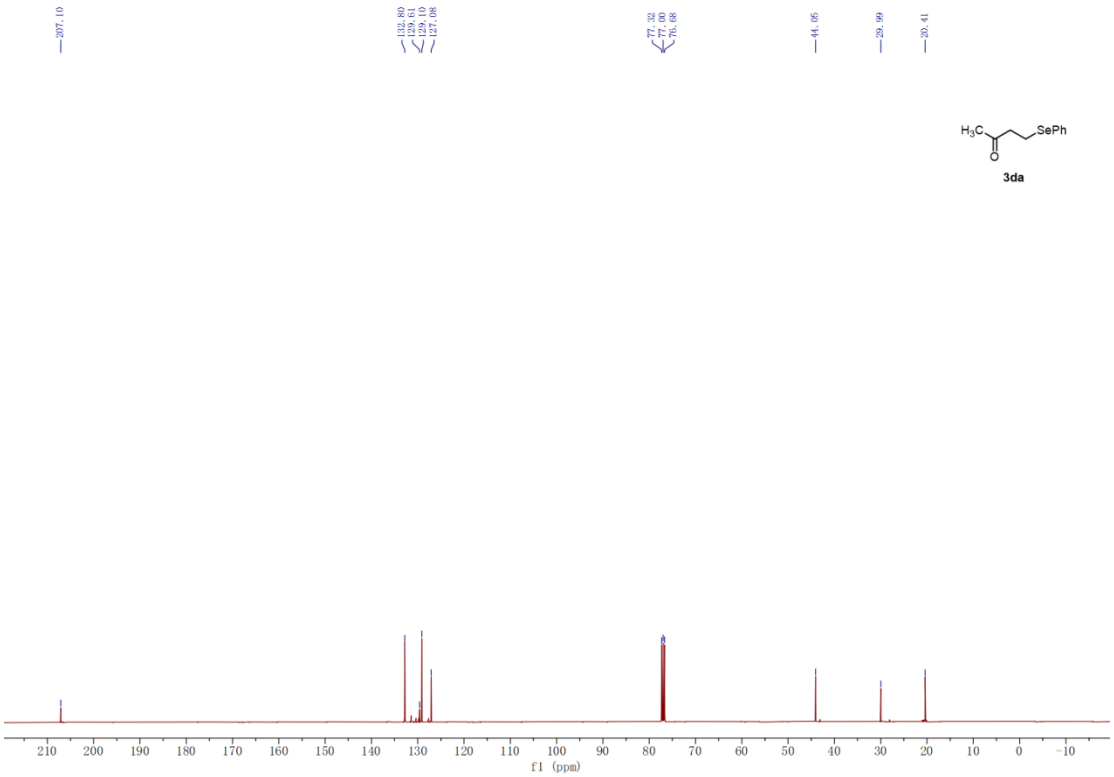


10. 4-(phenylselanyl)butan-2-one

^{1}H NMR

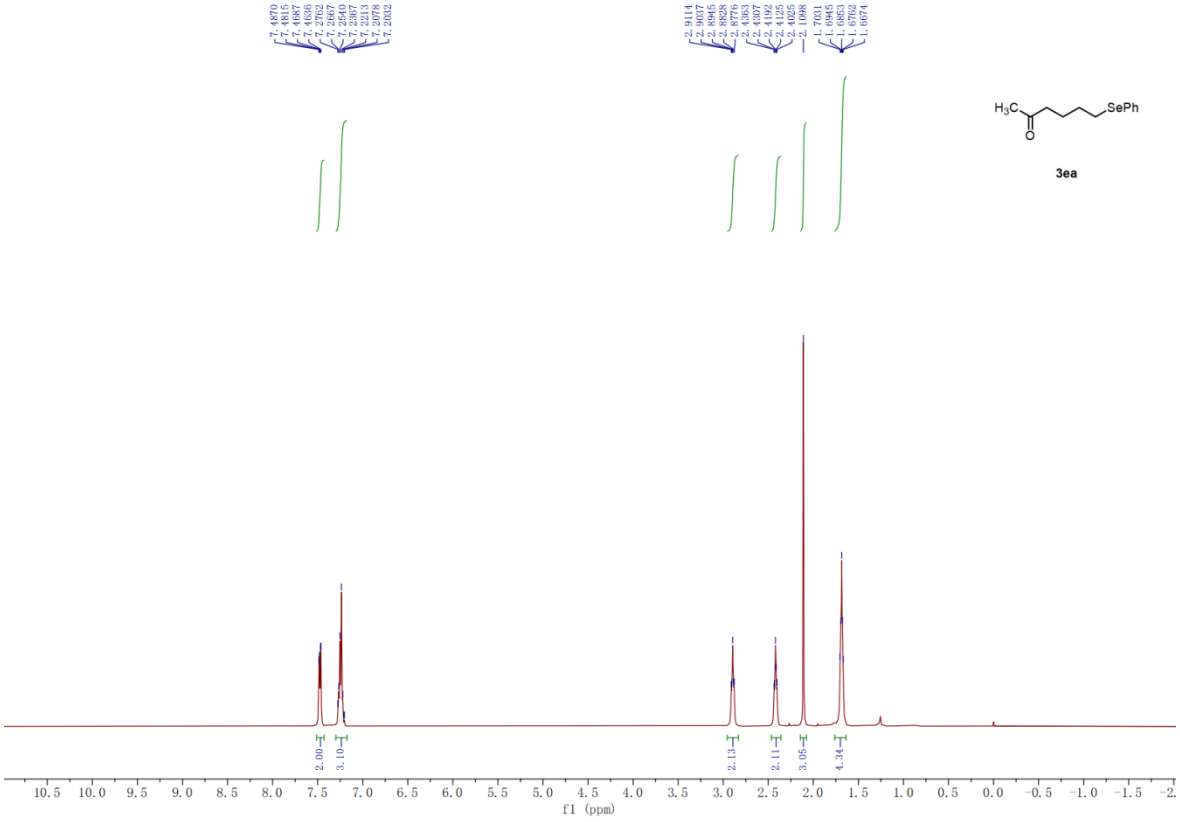


^{13}C NMR

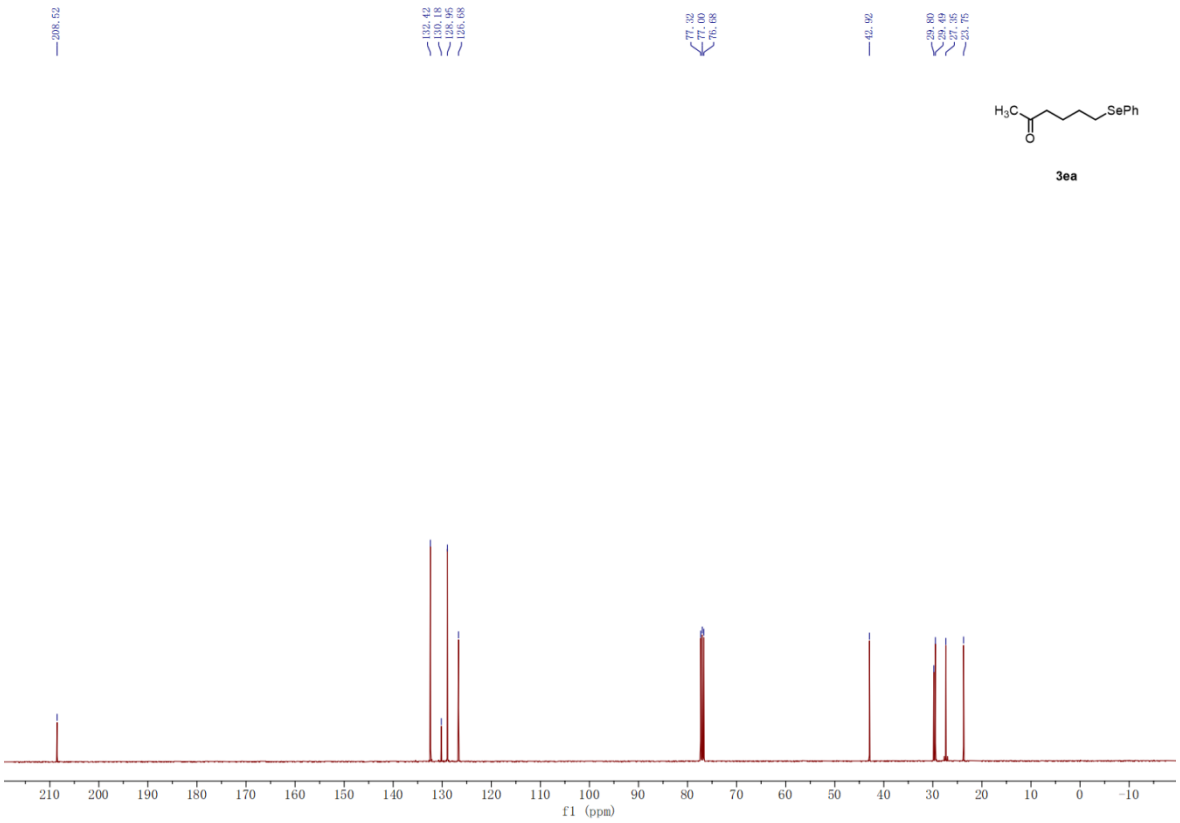


11. 6-(phenylselanyl)hexan-2-one

^{1}H NMR

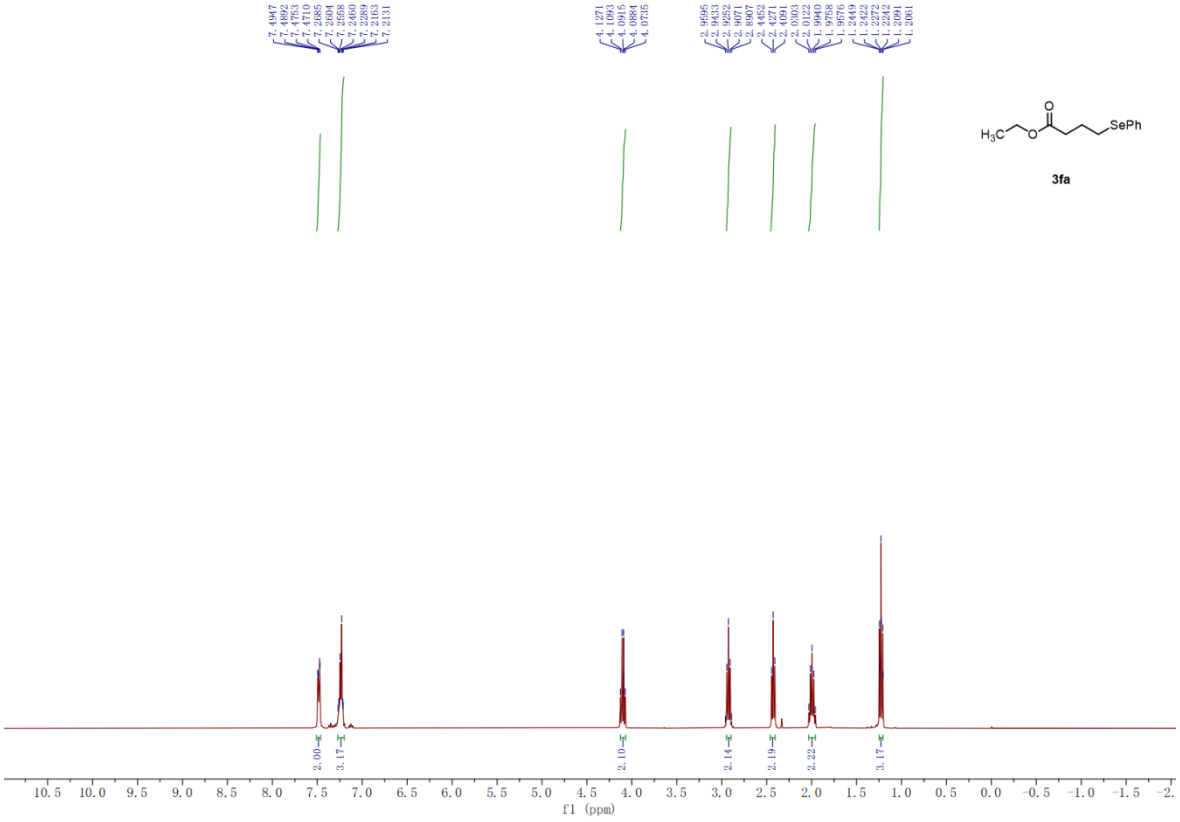


^{13}C NMR

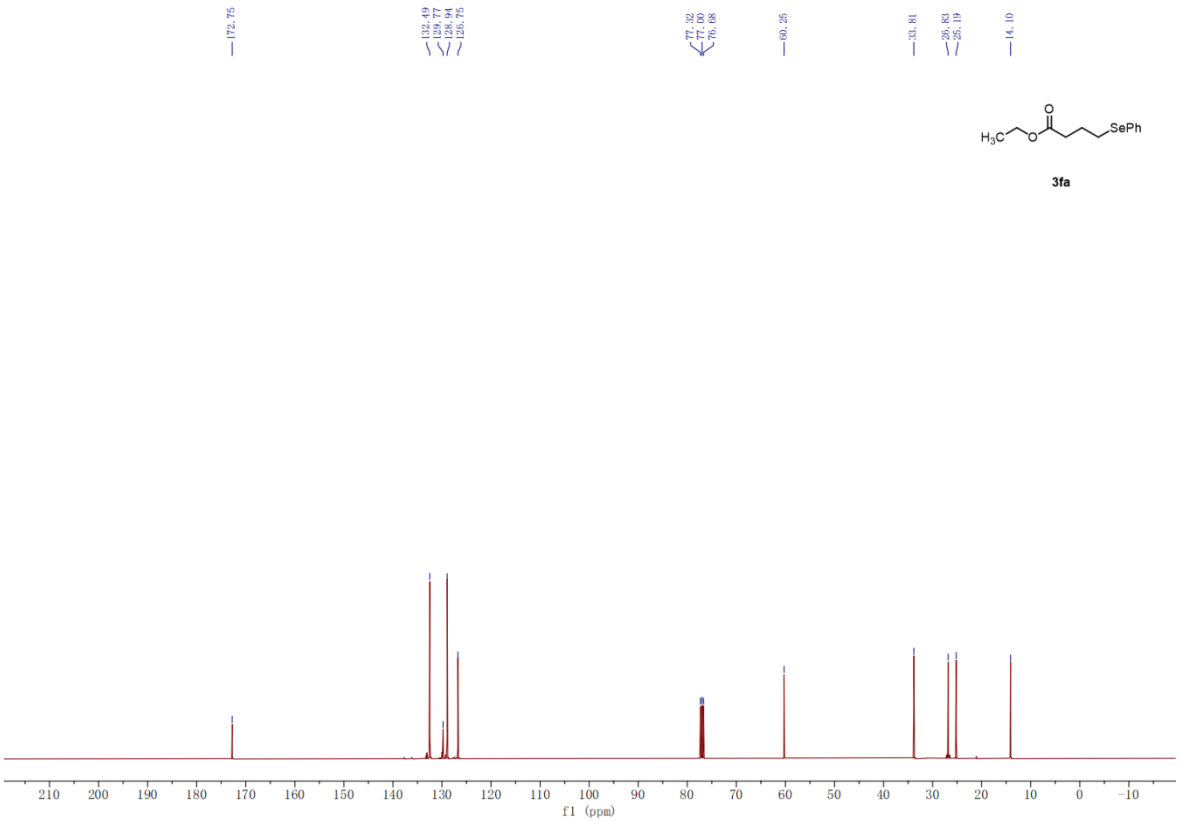


12. ethyl 4-(phenylselanyl)butanoate

^{1}H NMR

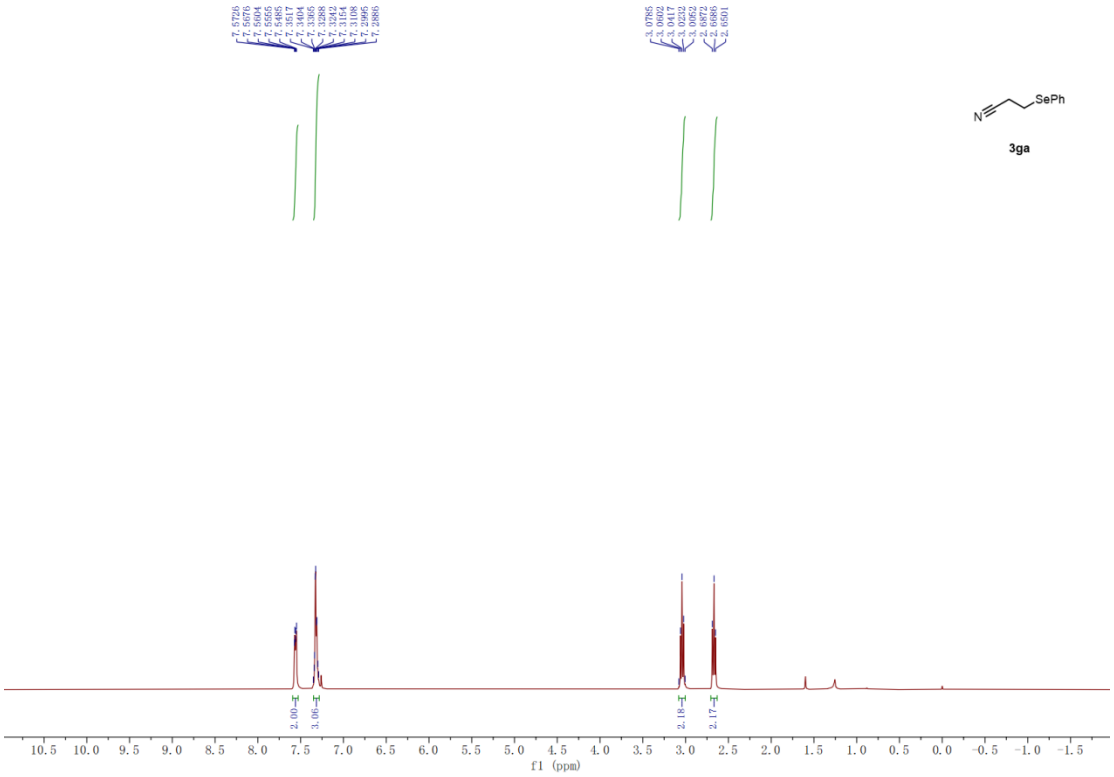


^{13}C NMR

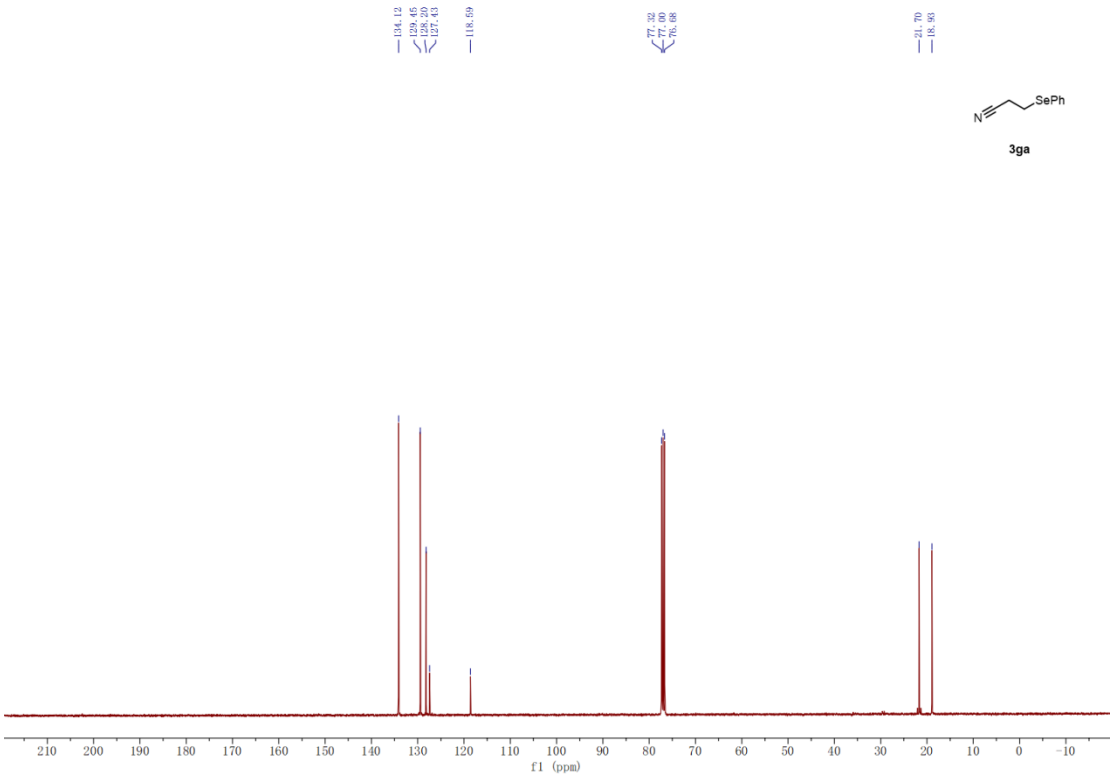


13. 3-(phenylselanyl)propanenitrile

^{1}H NMR

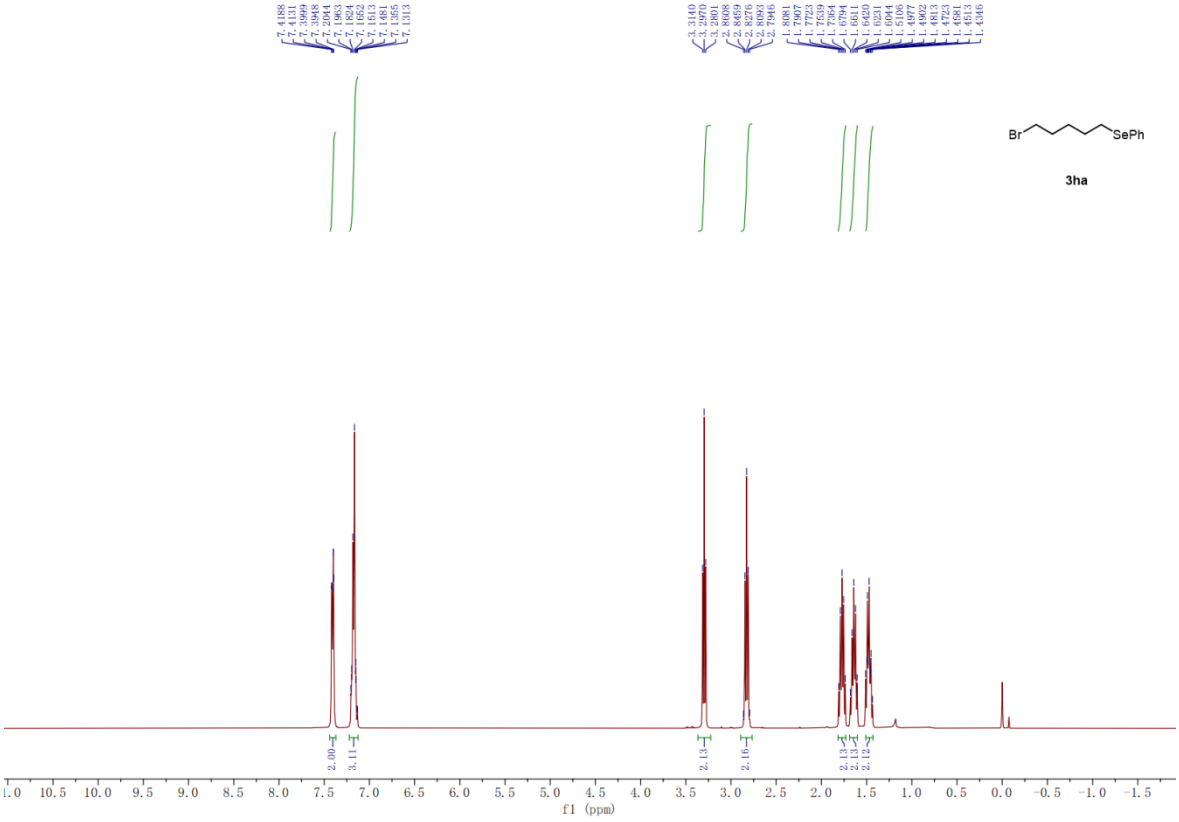


^{13}C NMR

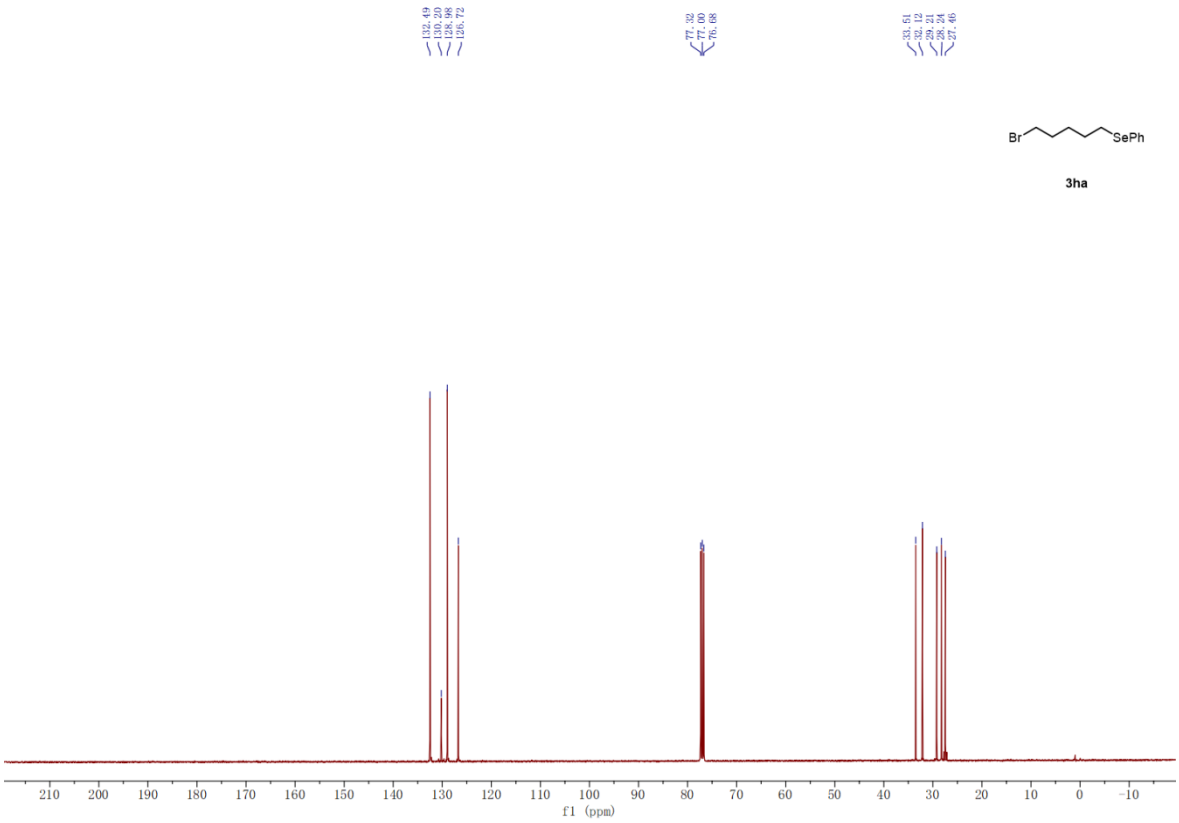


14. (5-bromopentyl)(phenyl)selane

^{1}H NMR

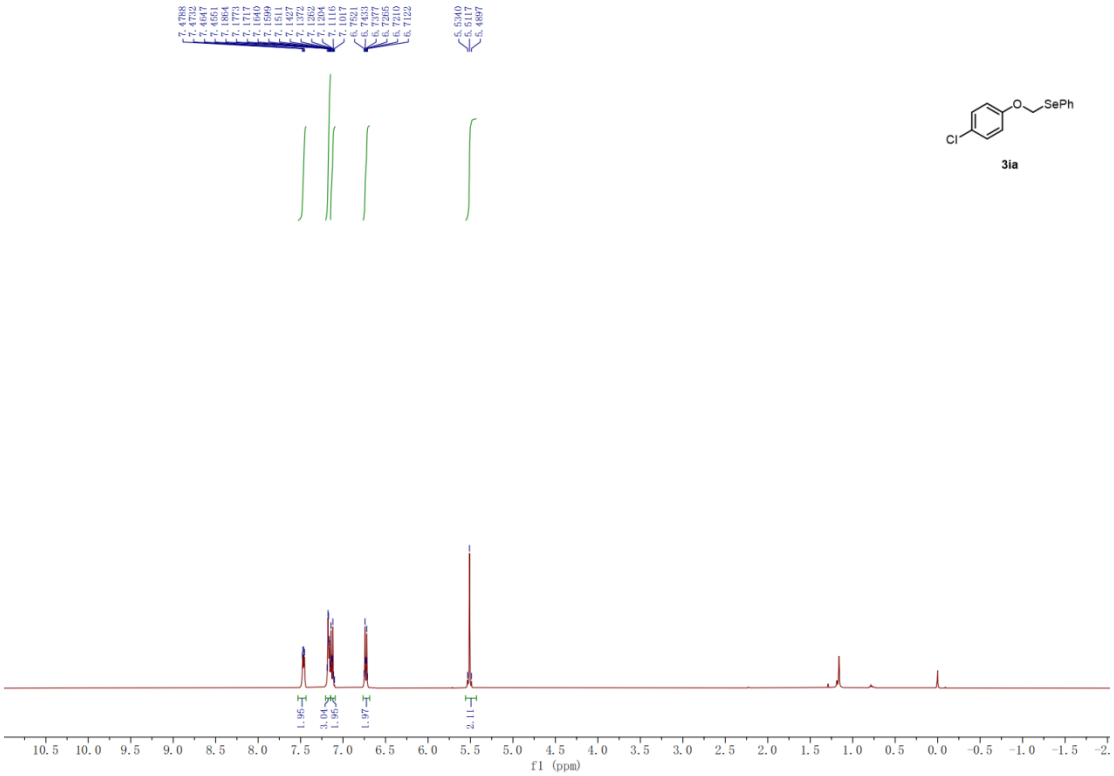


^{13}C NMR

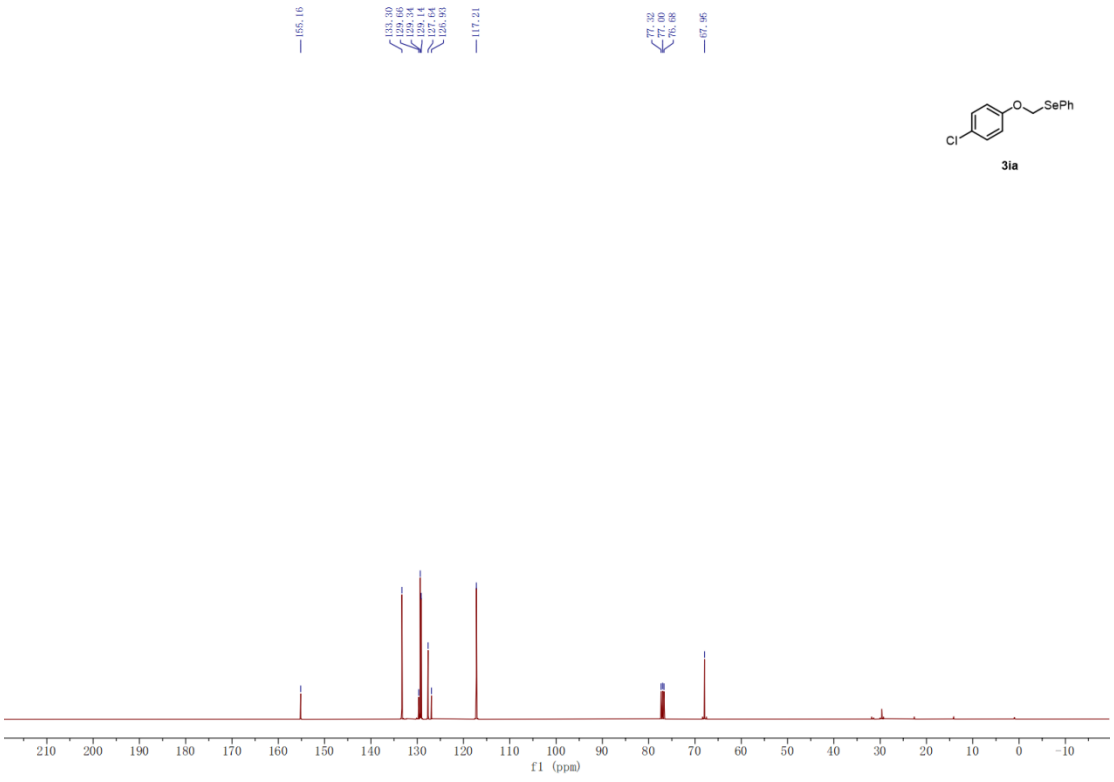


15. ((4-chlorophenoxy)methyl)(phenyl)selane

^{1}H NMR

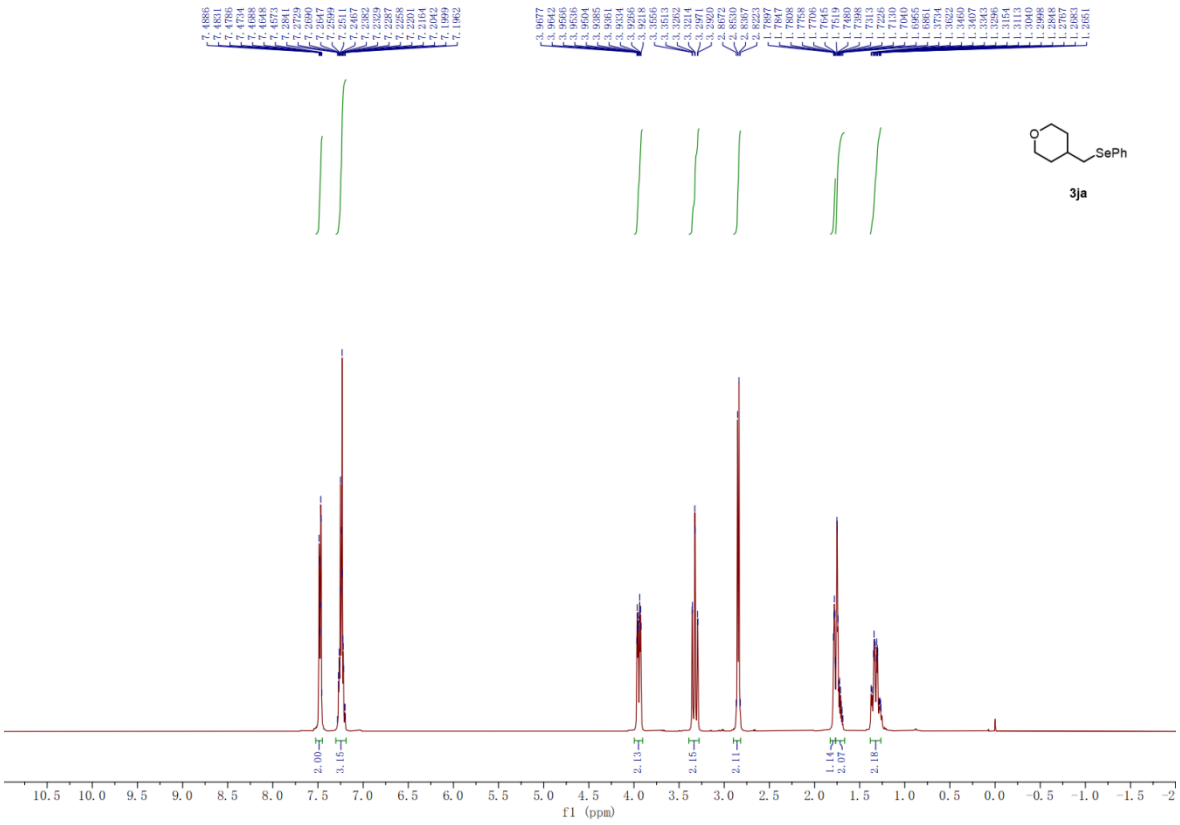


^{13}C NMR

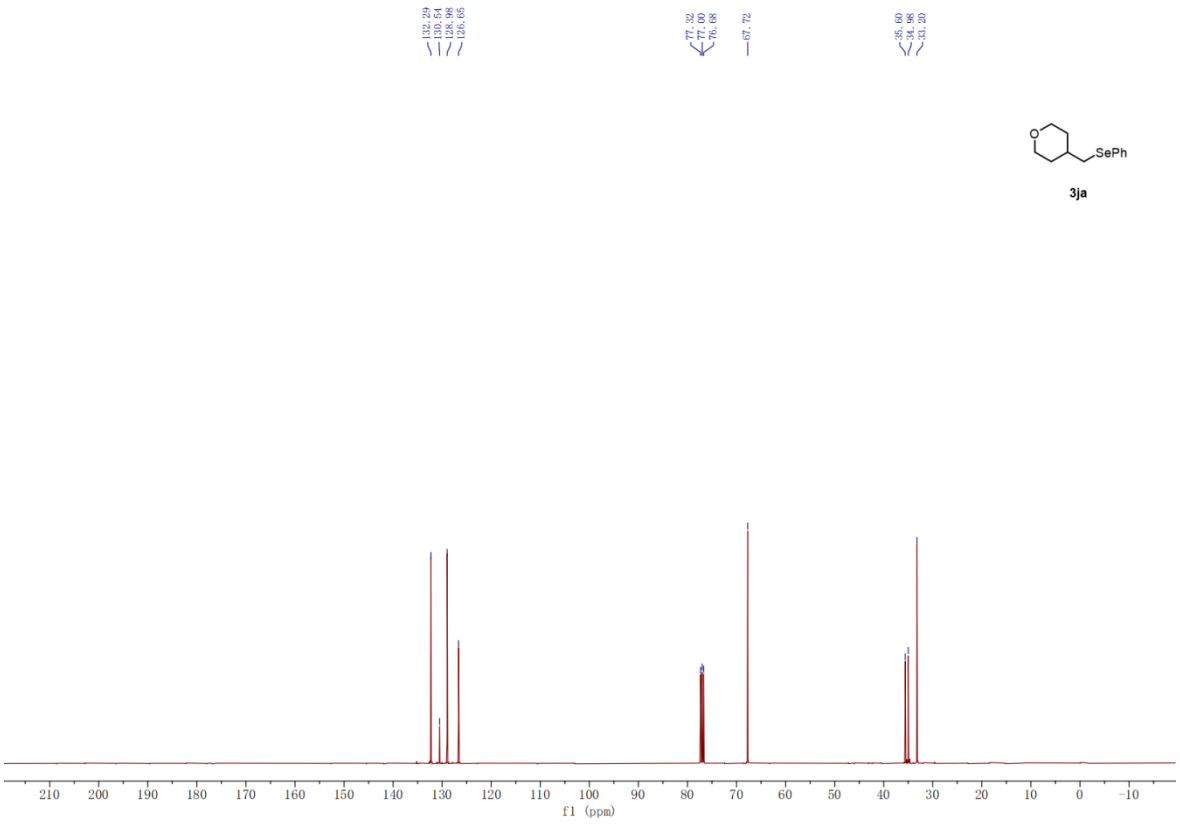


16. 4-((phenylselanyl)methyl)tetrahydro-2H-pyran

^{1}H NMR

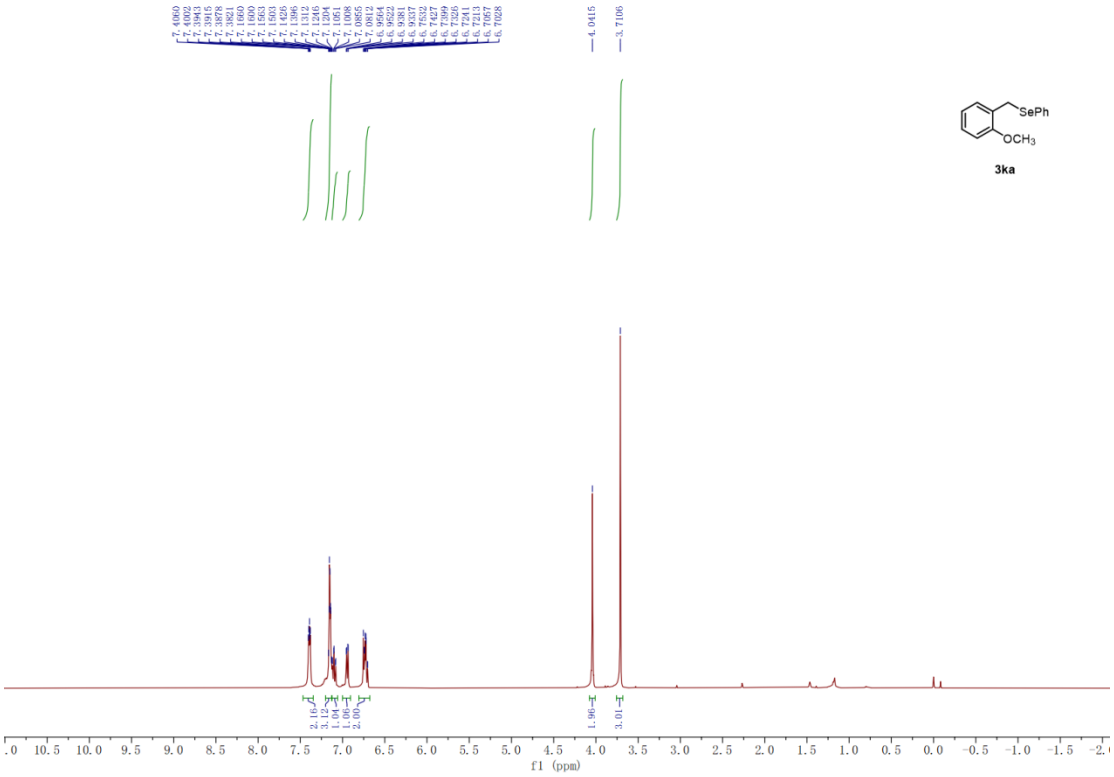


^{13}C NMR

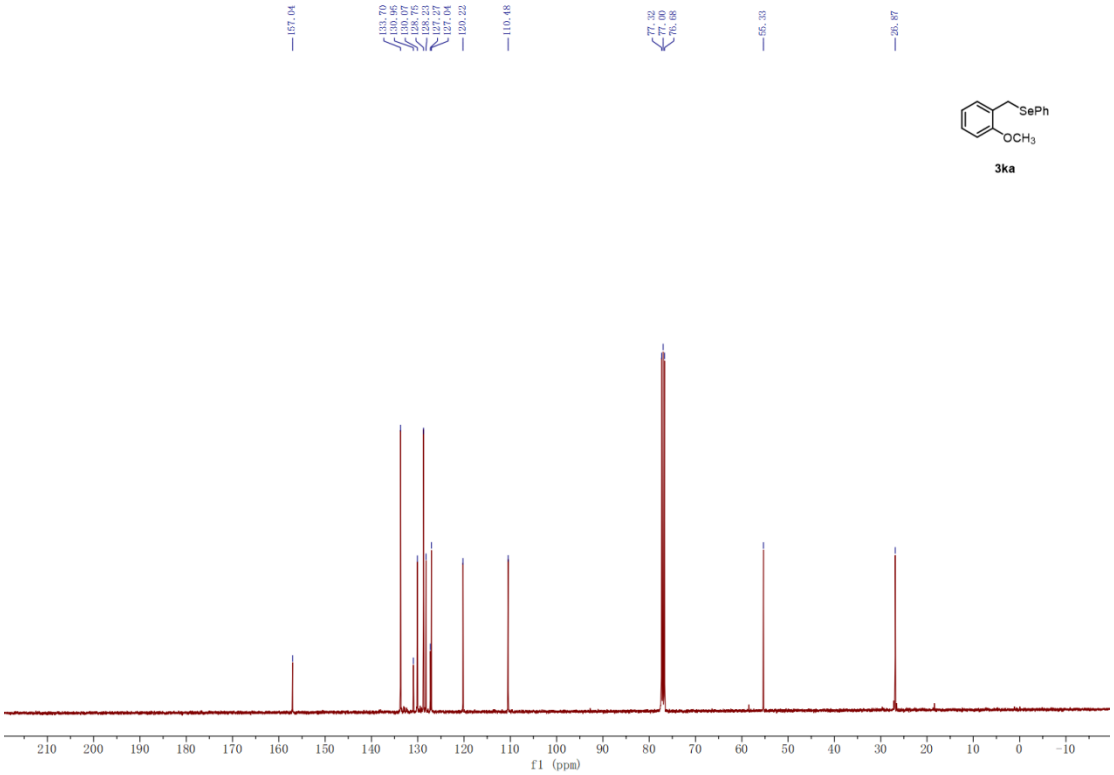


17. (2-methoxybenzyl)(phenyl)selane

^{1}H NMR

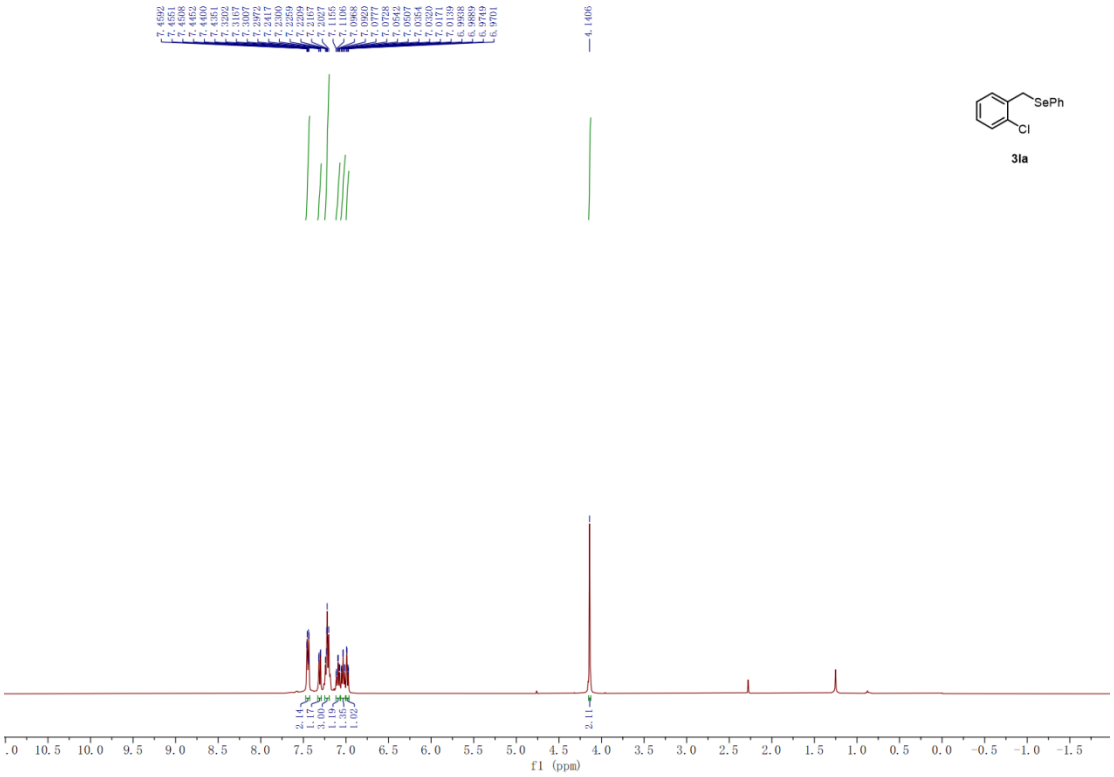


^{13}C NMR

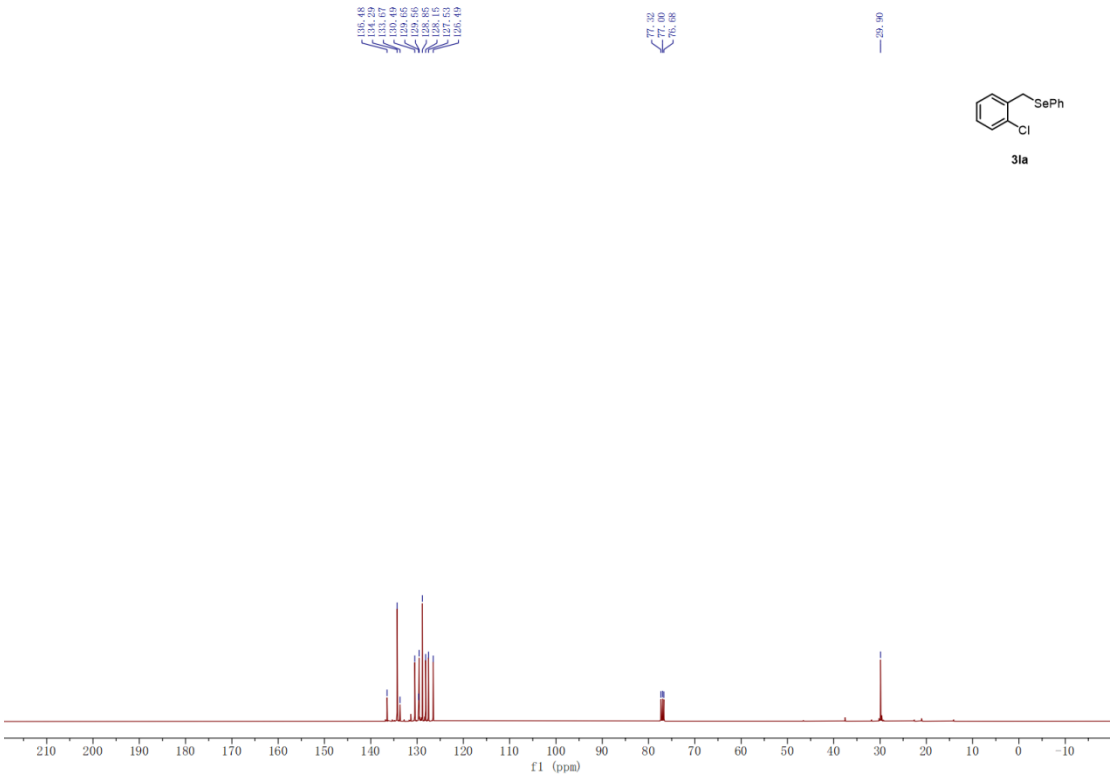


18. (2-chlorobenzyl)(phenyl)selane

^{1}H NMR

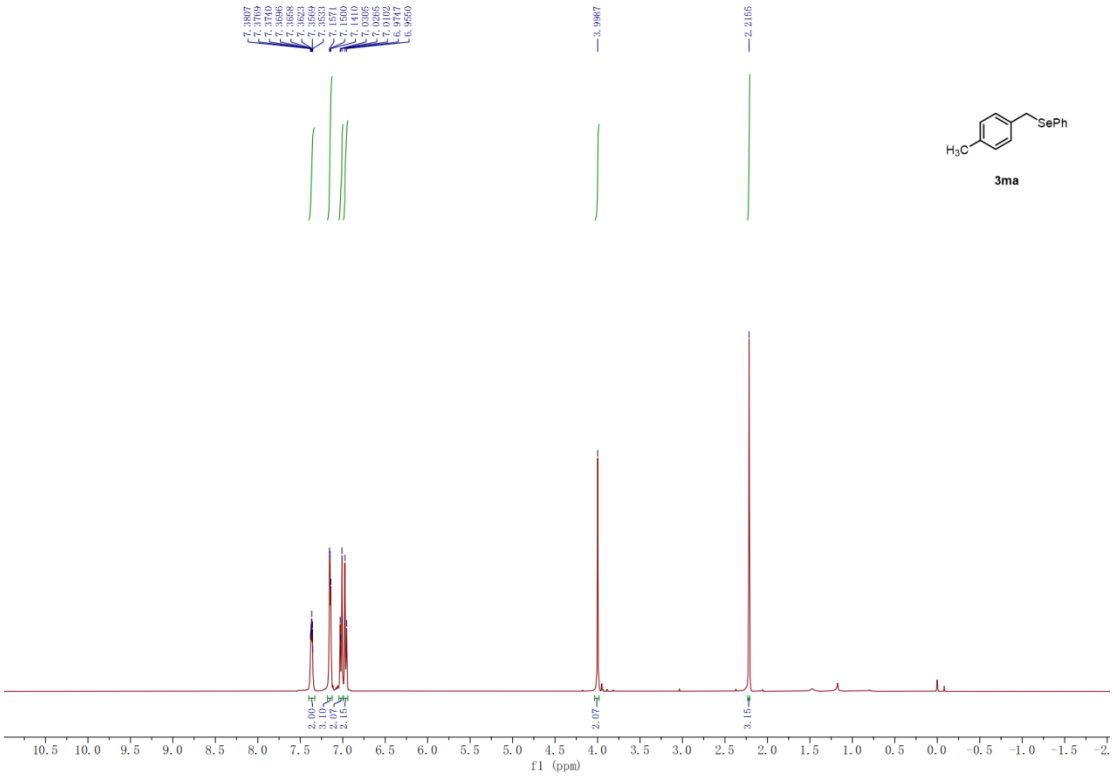


^{13}C NMR

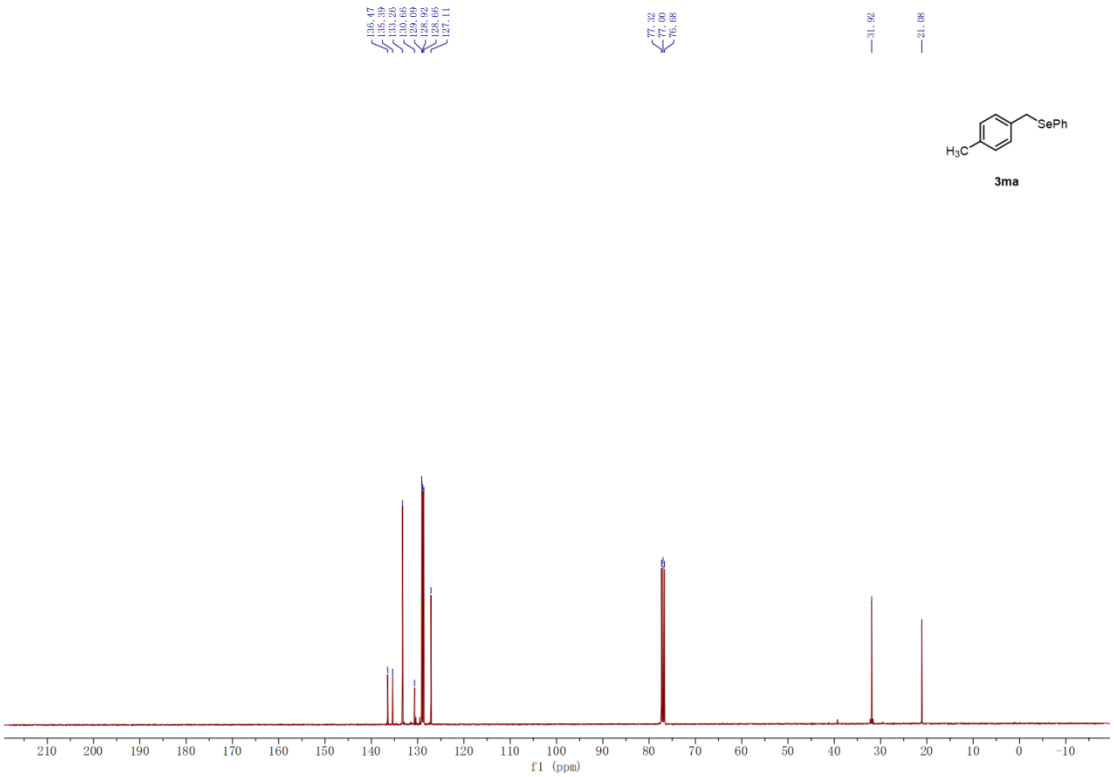


19. (4-methylbenzyl)(phenyl)selane

^{1}H NMR

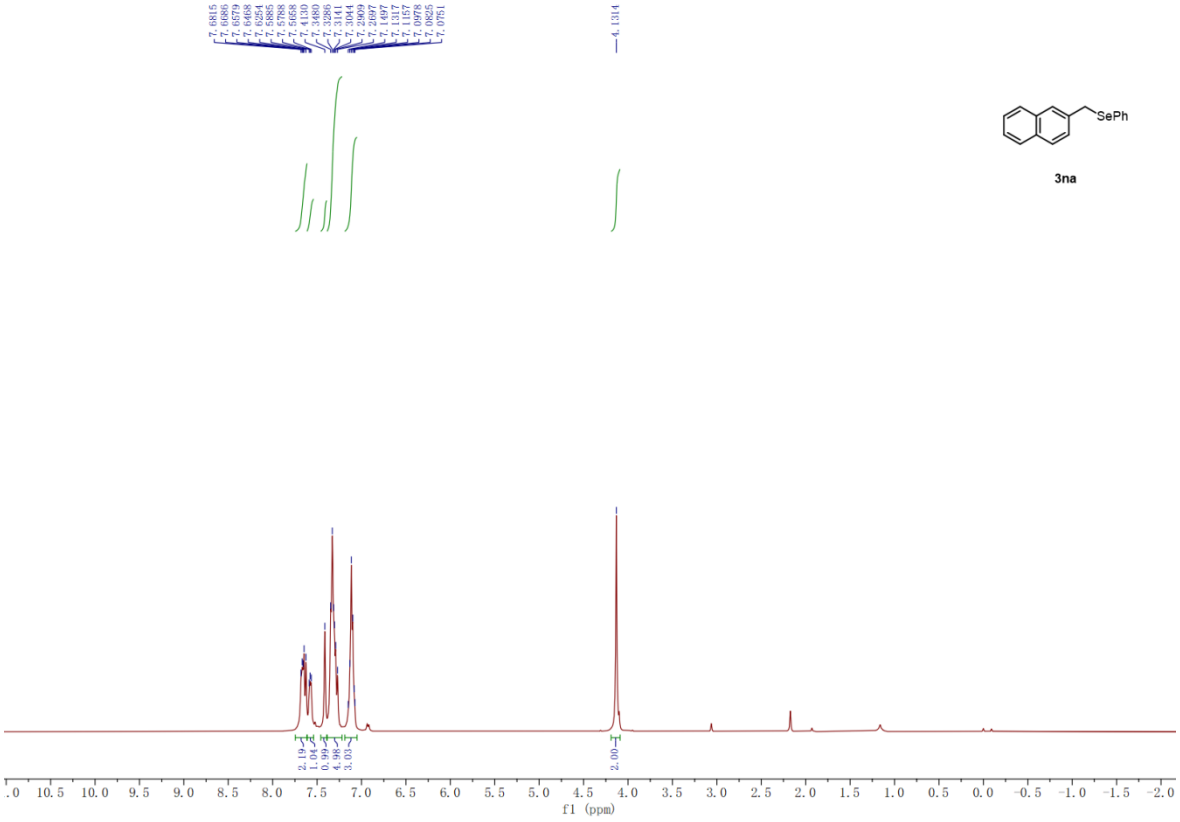


^{13}C NMR

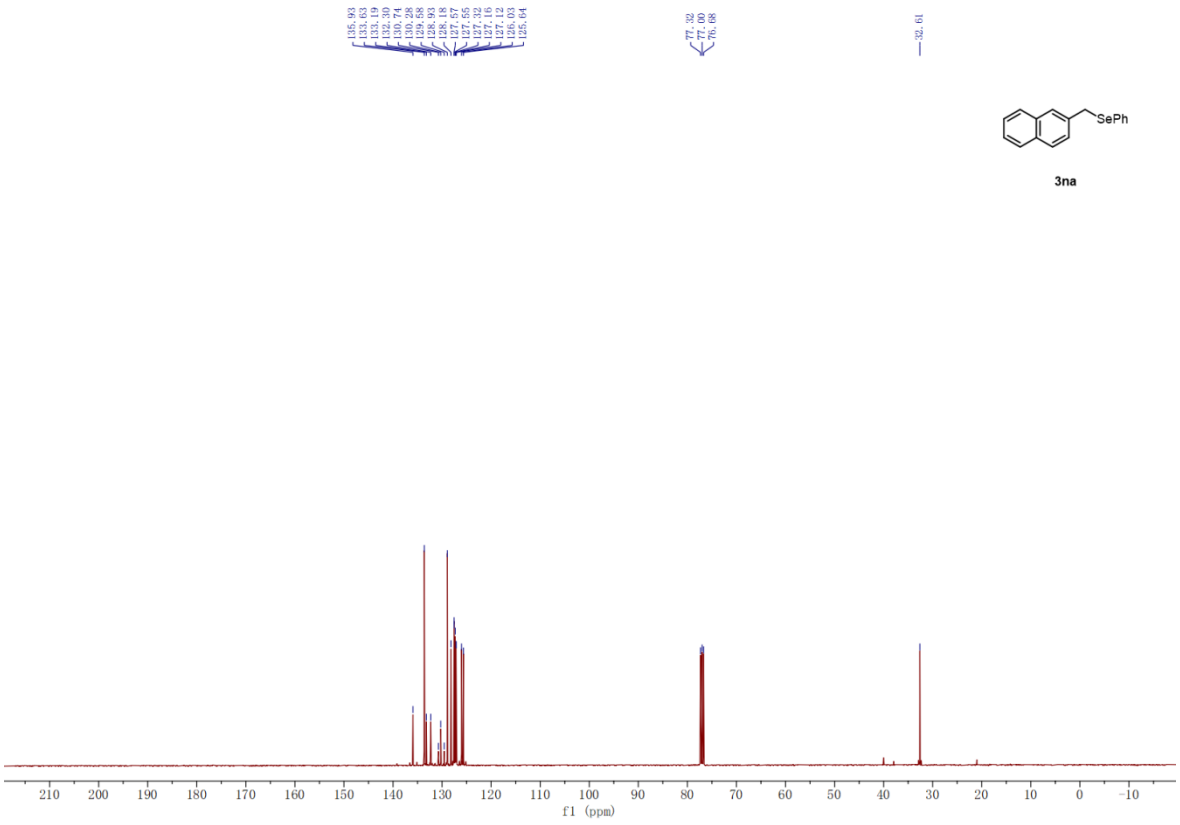


20. (naphthalen-2-ylmethyl)(phenyl)selane

^{1}H NMR

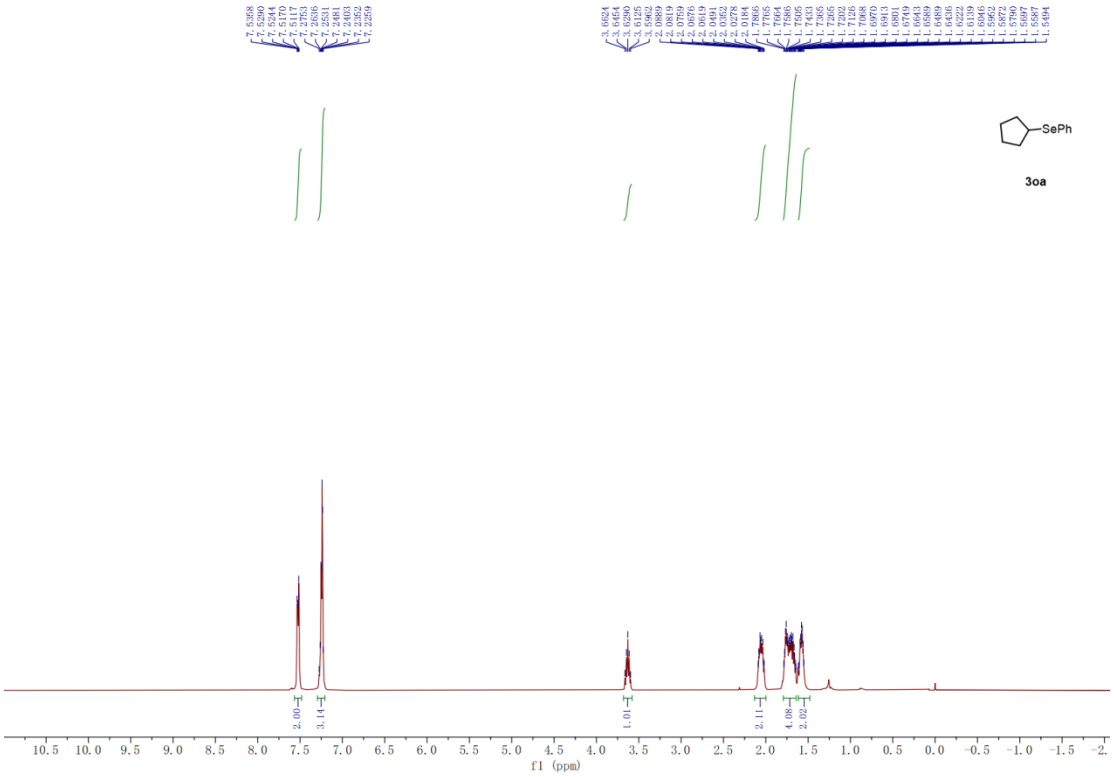


^{13}C NMR

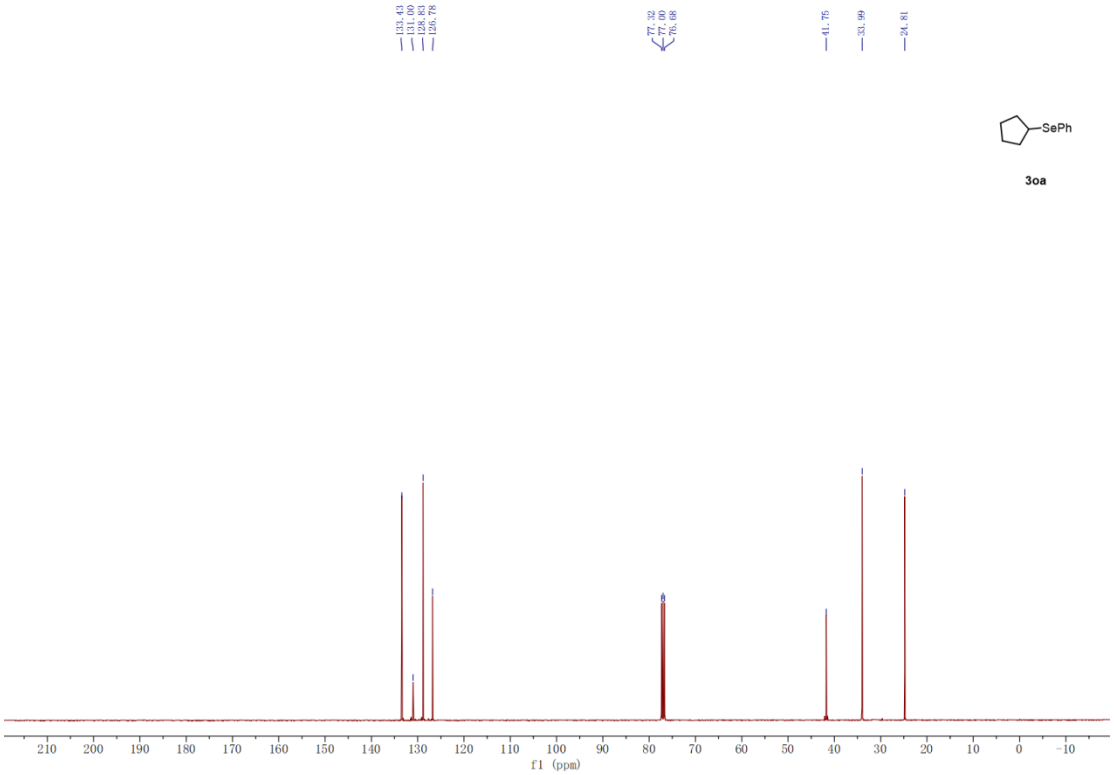


21. cyclopentyl(phenyl)selane

^{1}H NMR

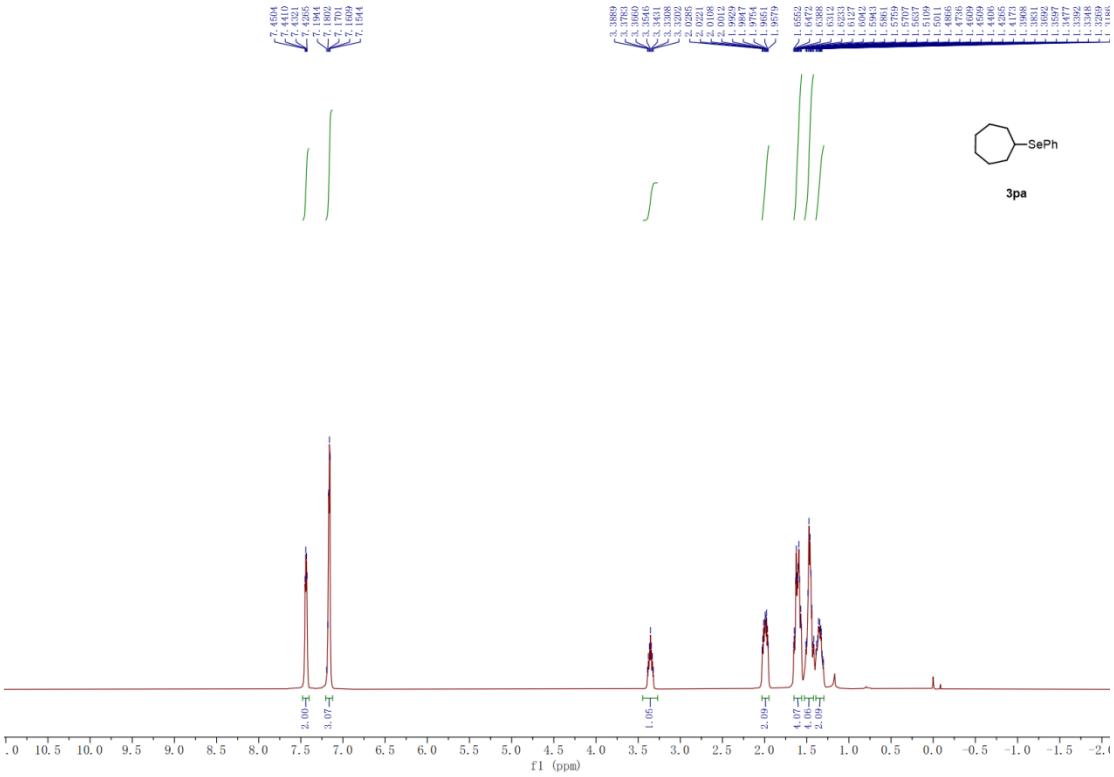


^{13}C NMR

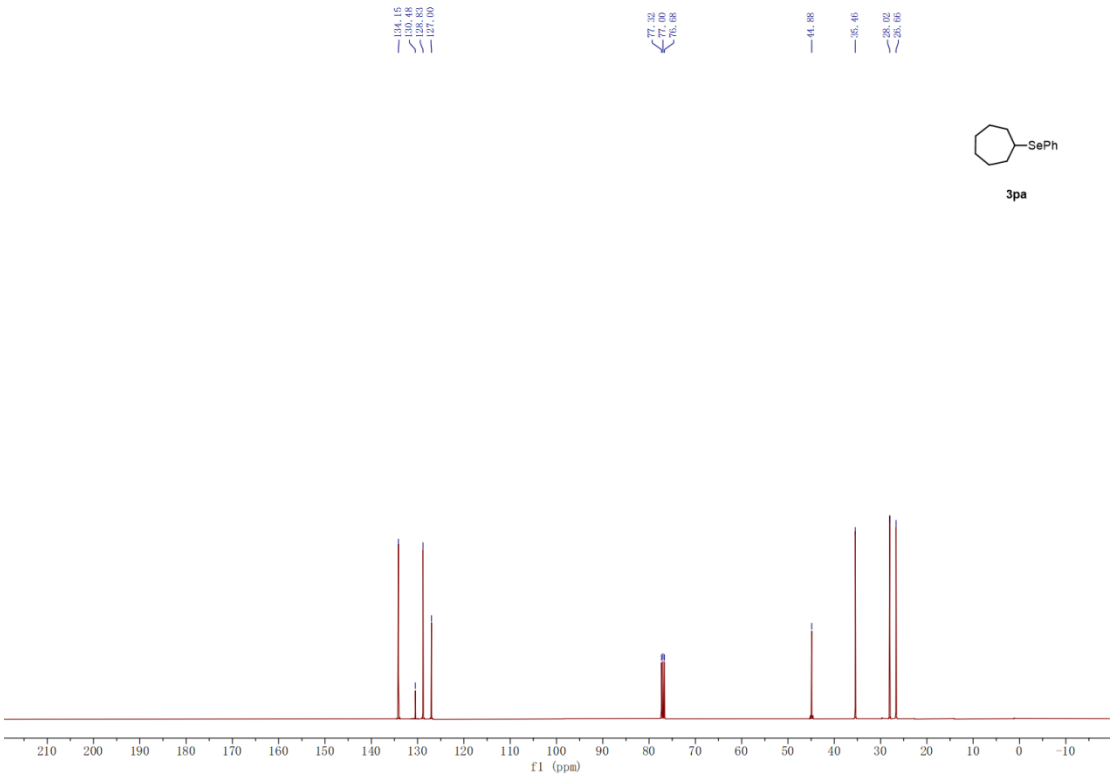


22. cycloheptyl(phenyl)selane

^{1}H NMR

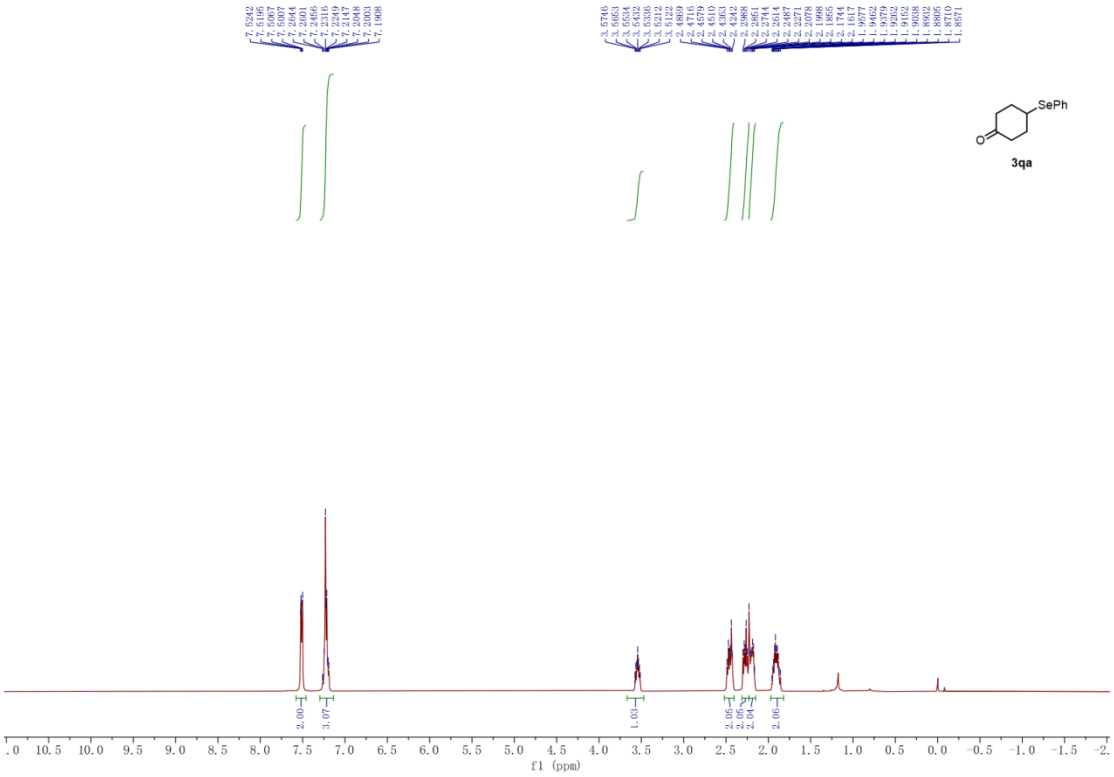


^{13}C NMR

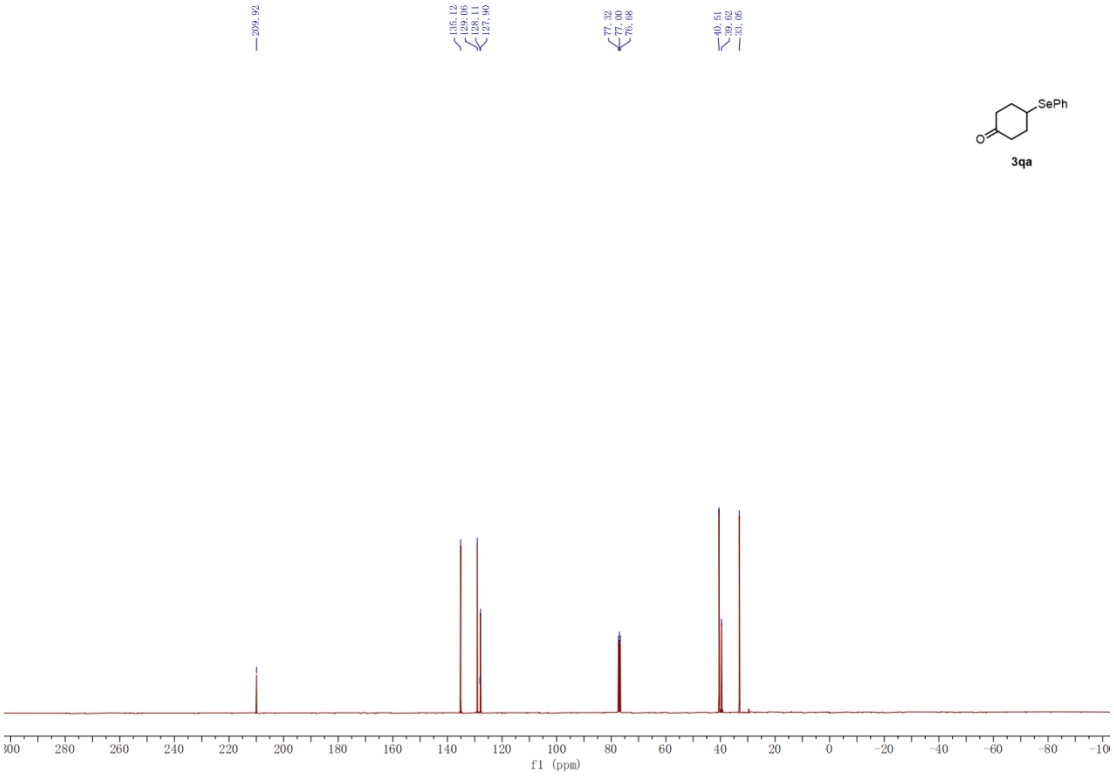


23. 4-(phenylselanyl)cyclohexan-1-one

^{1}H NMR

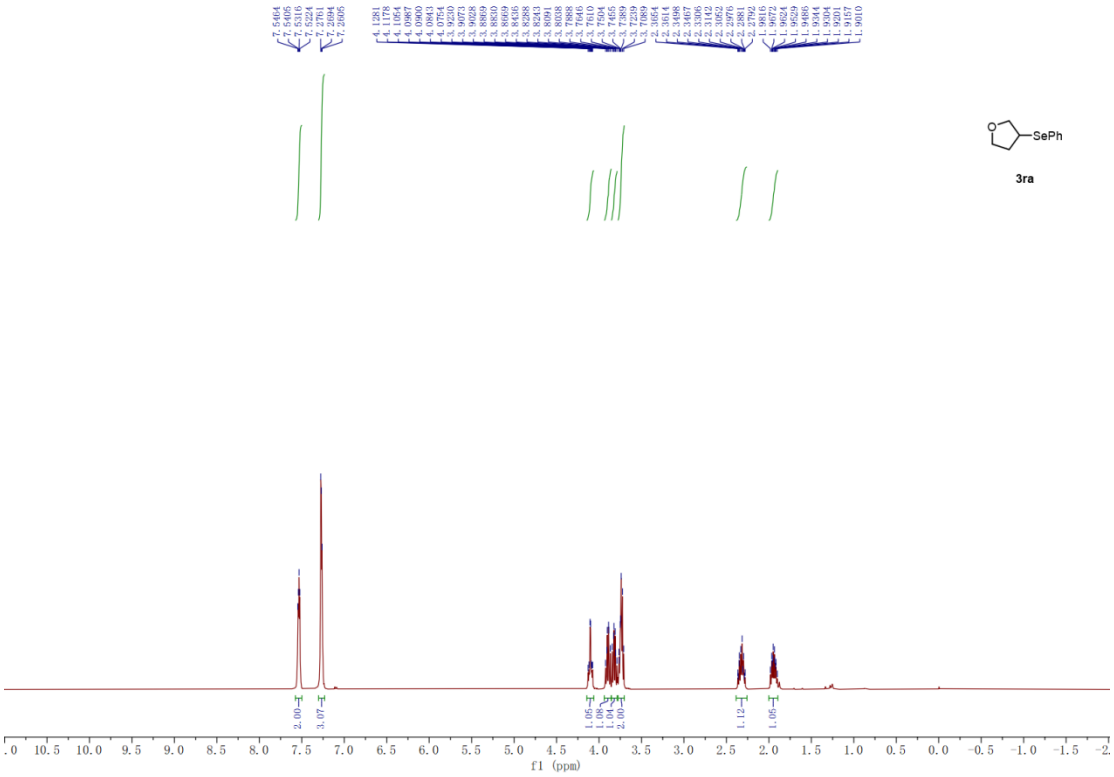


^{13}C NMR

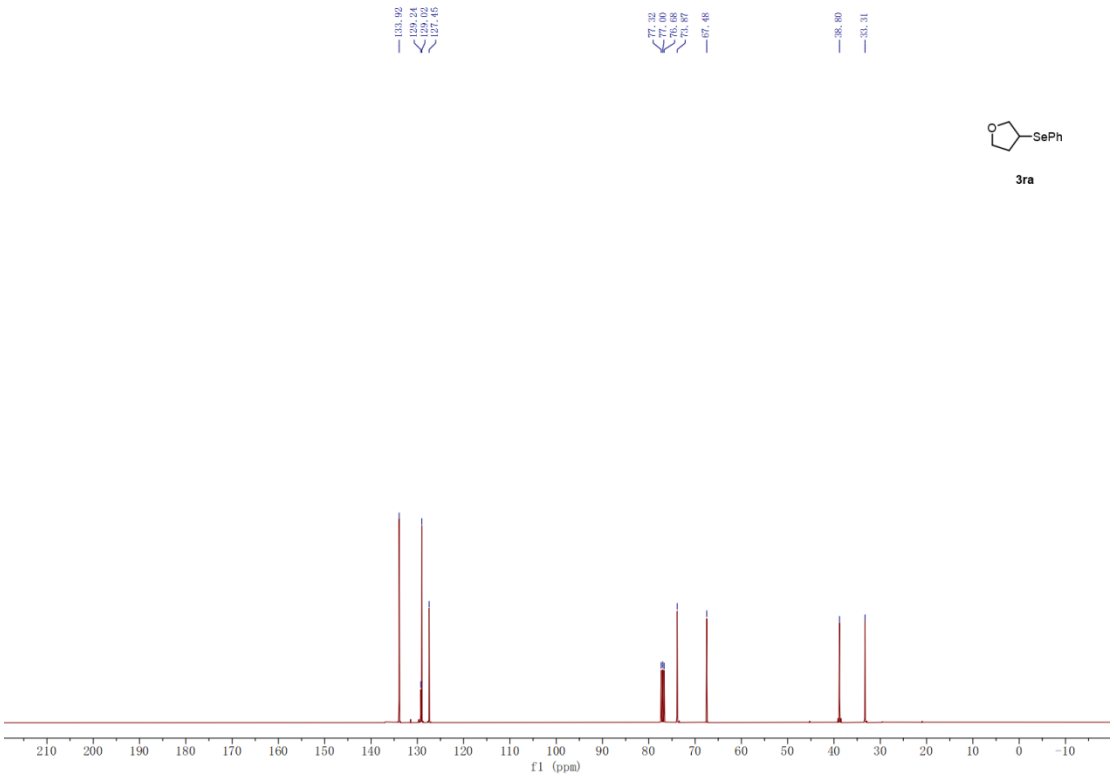


24. 3-(phenylselanyl)tetrahydrofuran

^{1}H NMR

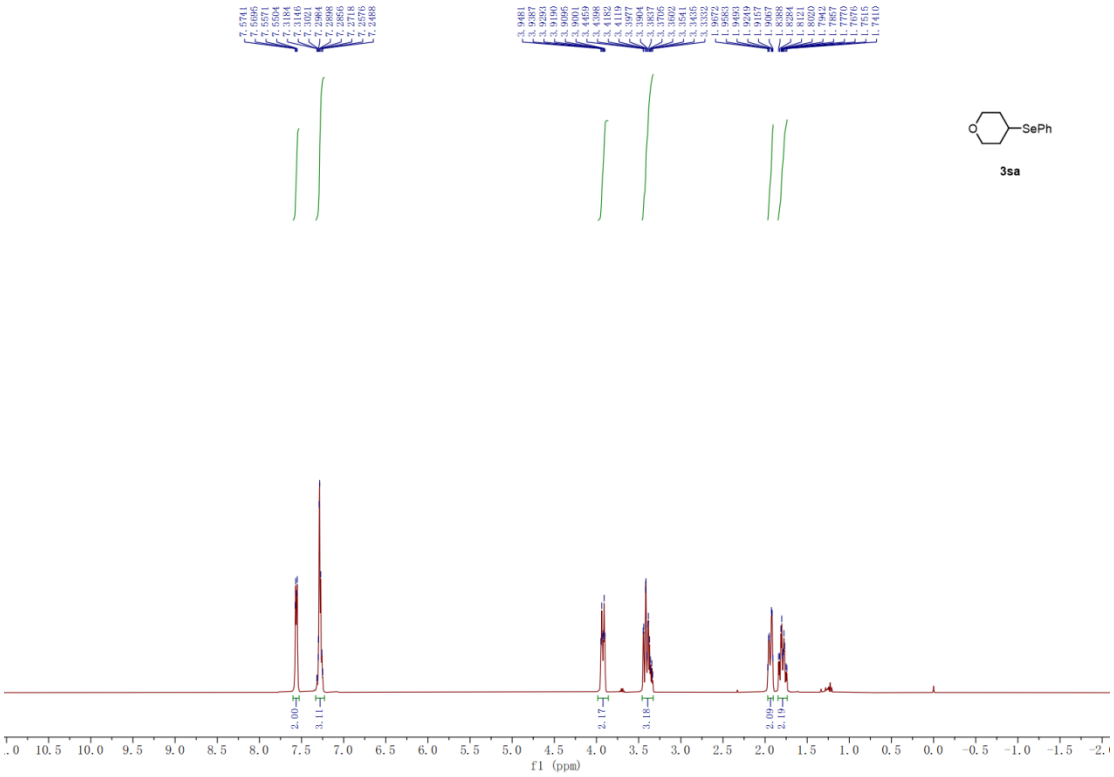


^{13}C NMR

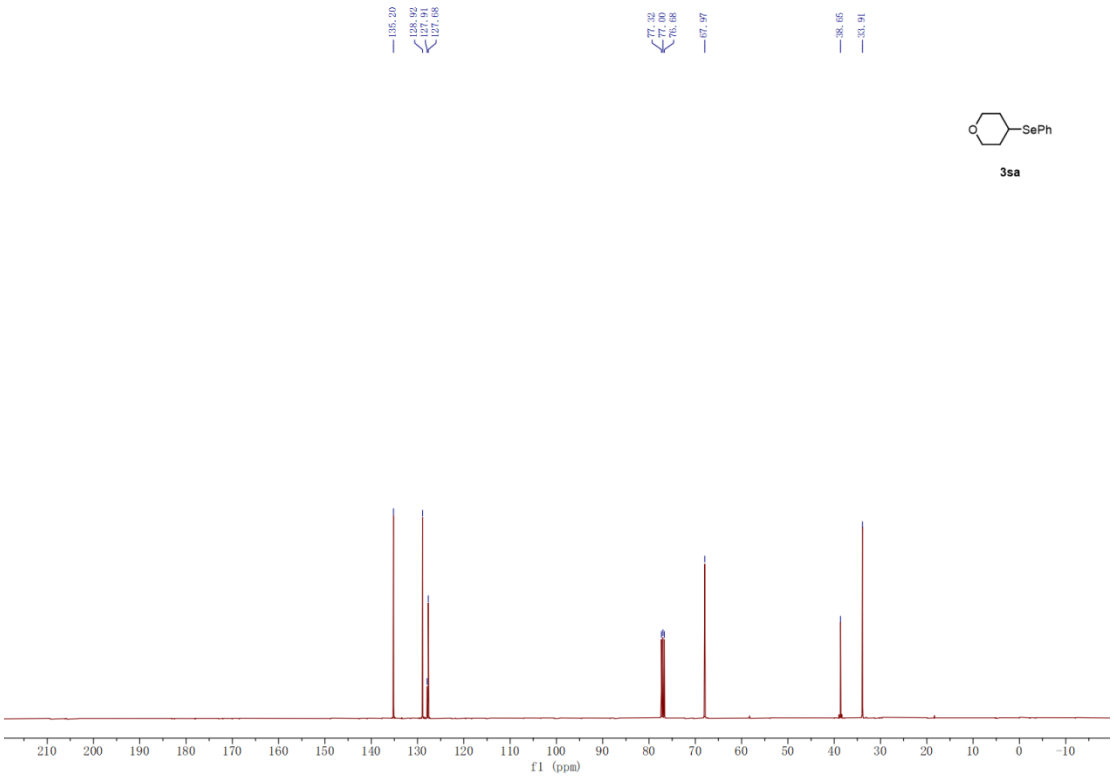


25. 4-(phenylselanyl)tetrahydro-2H-pyran

^{1}H NMR

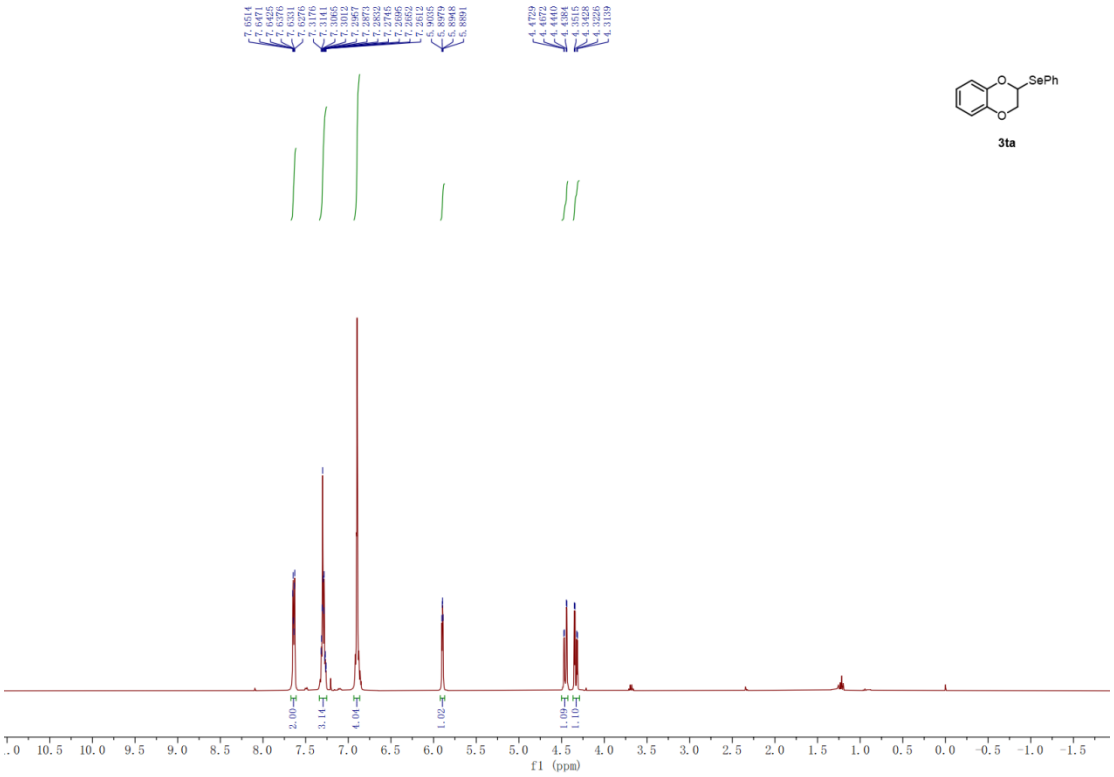


^{13}C NMR

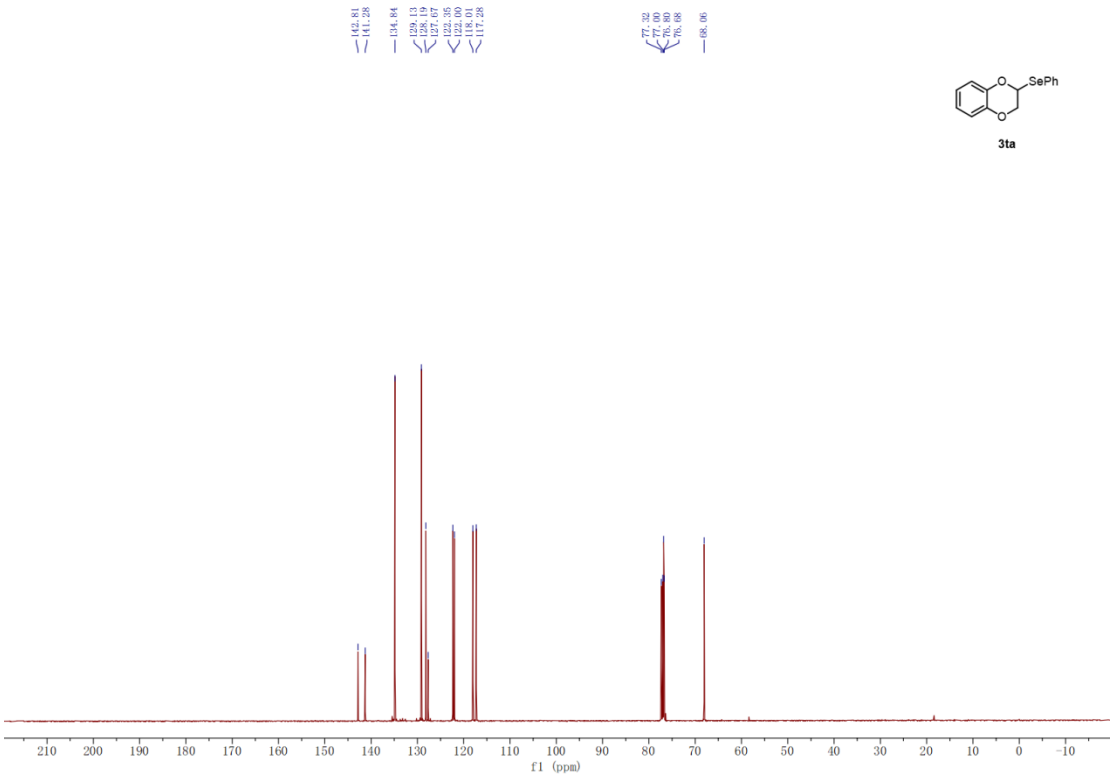


26. 2-(phenylselanyl)-2,3-dihydrobenzo[b][1,4]dioxine

^{1}H NMR

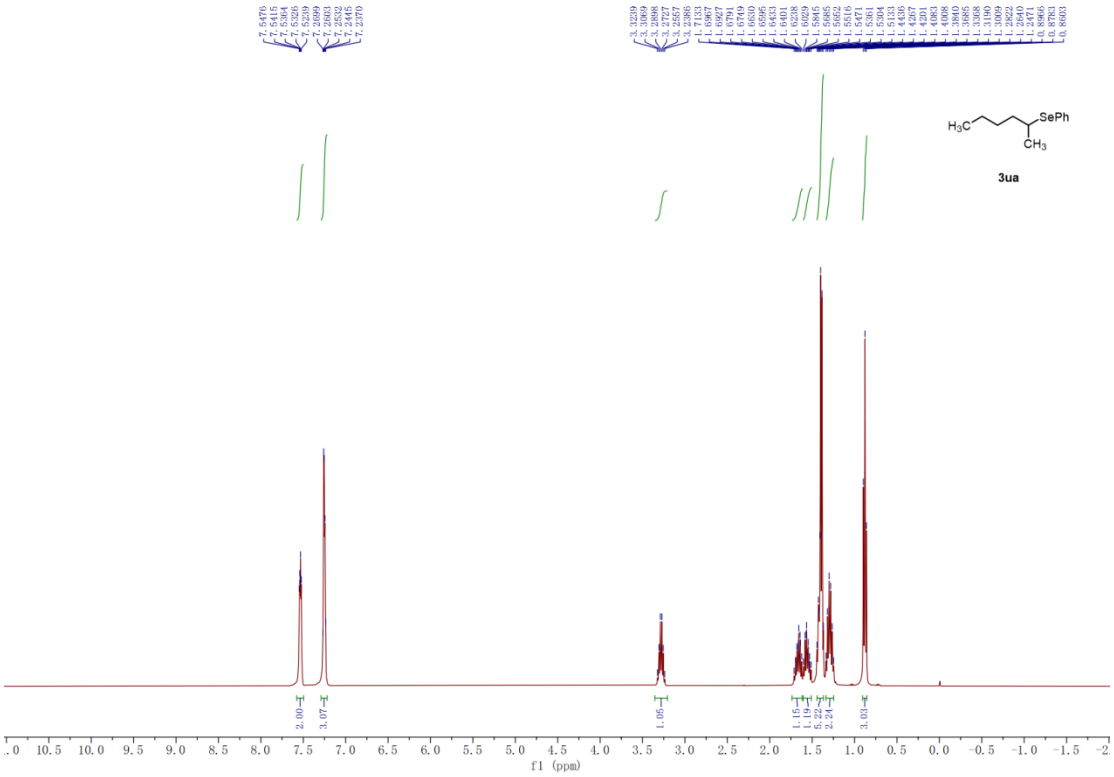


^{13}C NMR

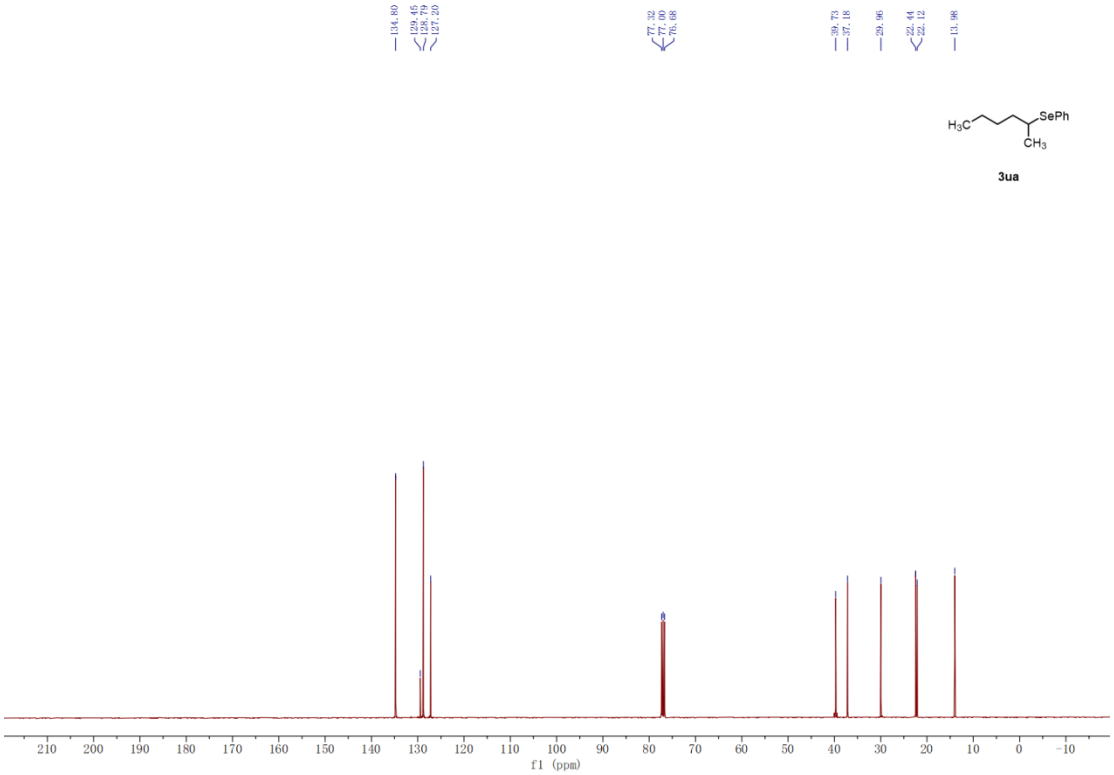


27. hexan-2-yl(phenyl)selane

^{1}H NMR

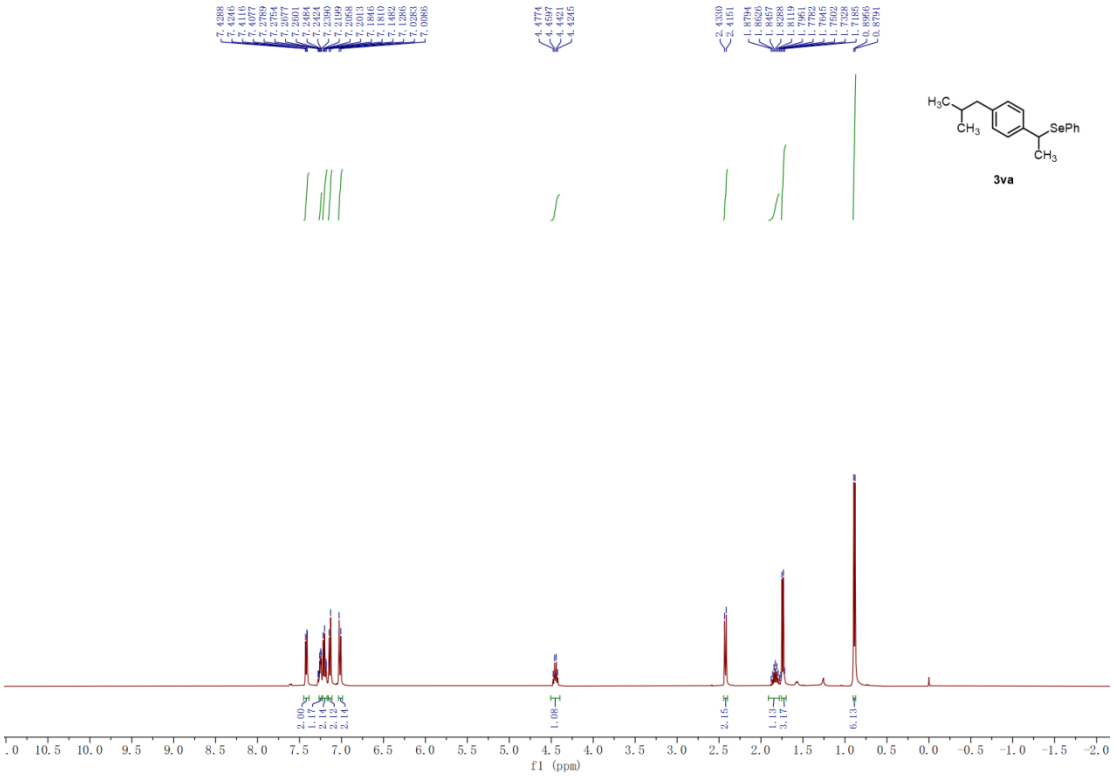


^{13}C NMR

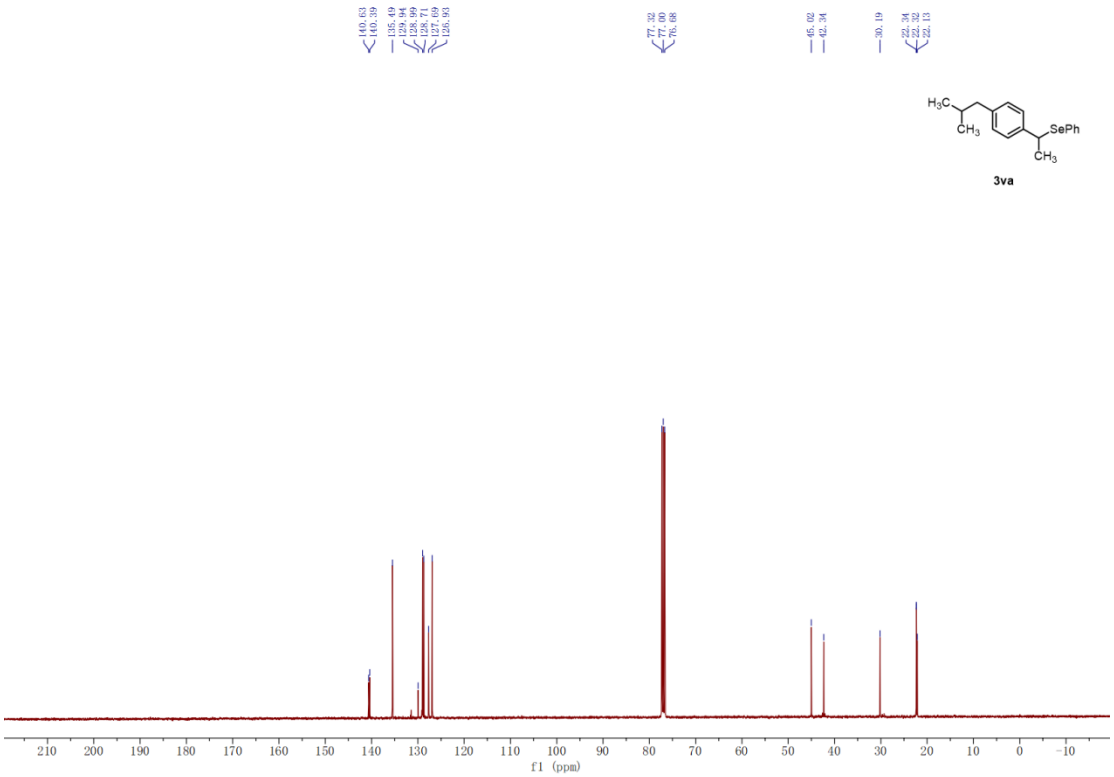


28. (1-(4-isobutylphenyl)ethyl)(phenyl)selane

^{1}H NMR

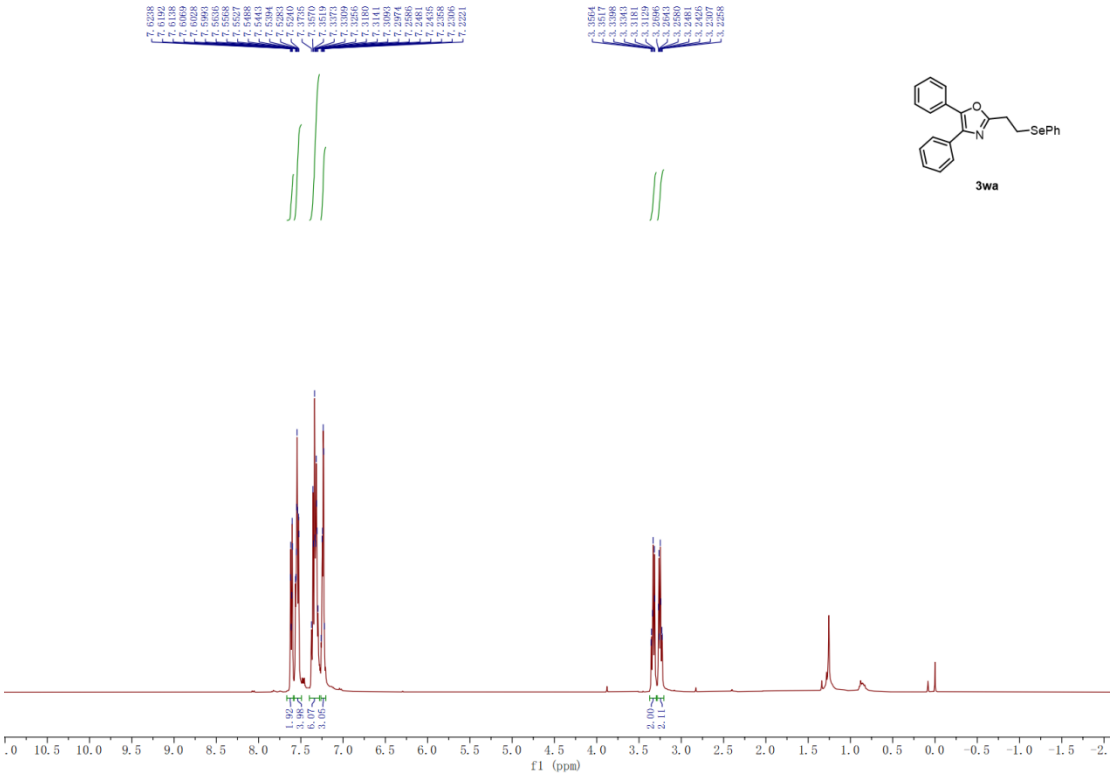


^{13}C NMR

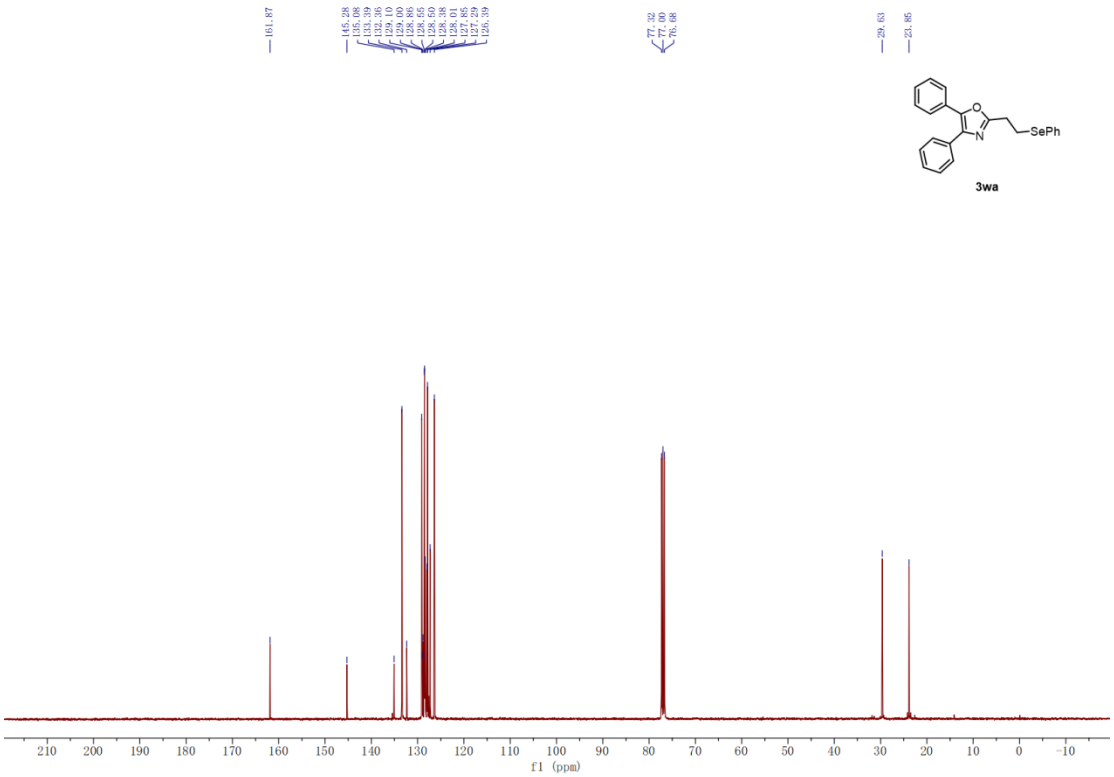


29. 4,5-diphenyl-2-(2-(phenylselanyl)ethyl)oxazole

^{1}H NMR

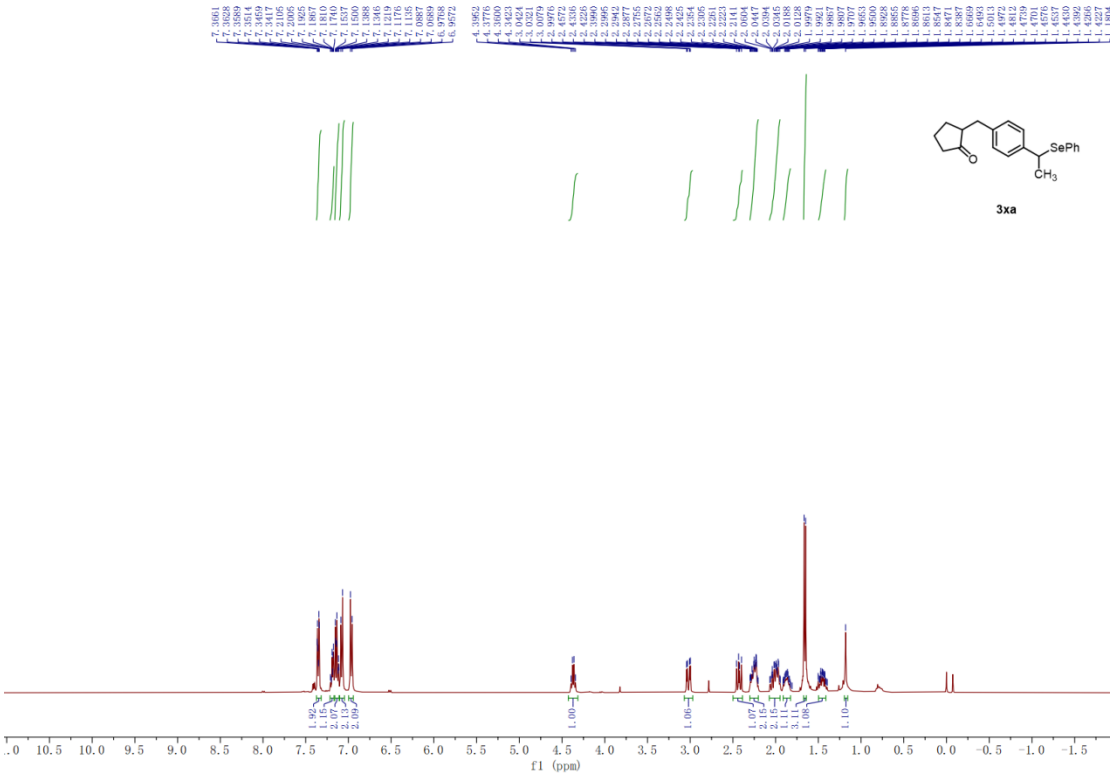


^{13}C NMR

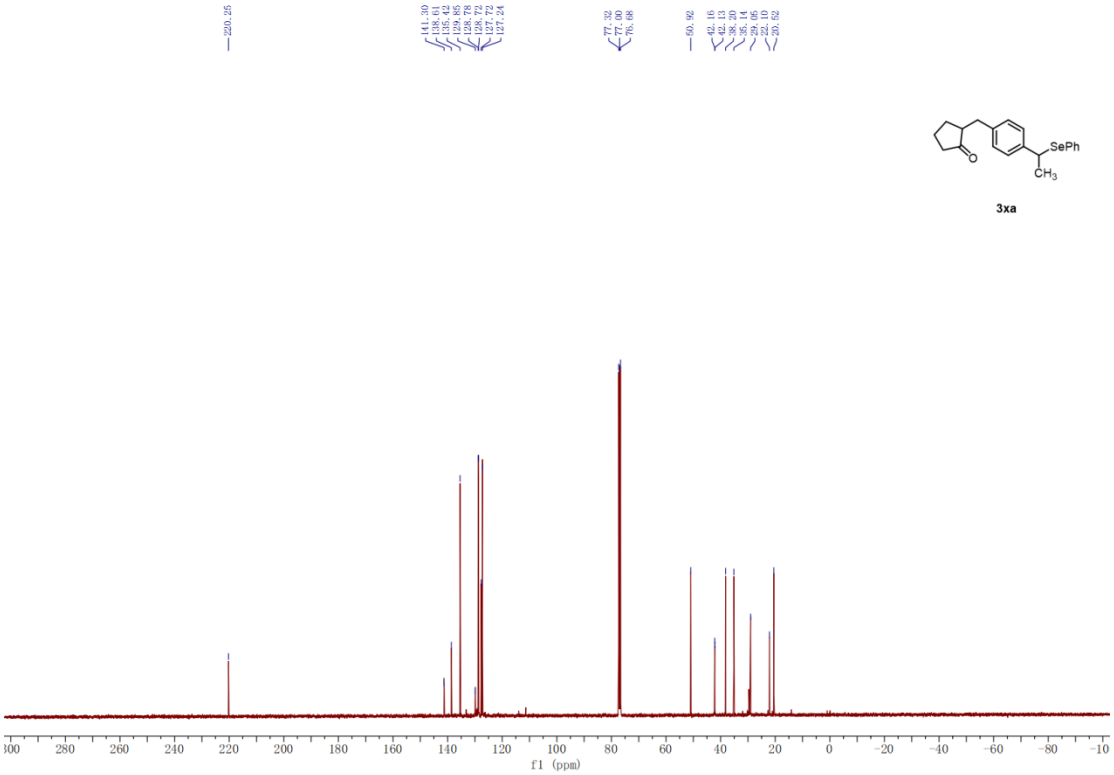


30. 2-(4-(1-(phenylselanyl)ethyl)benzyl)cyclopentan-1-one

^{1}H NMR

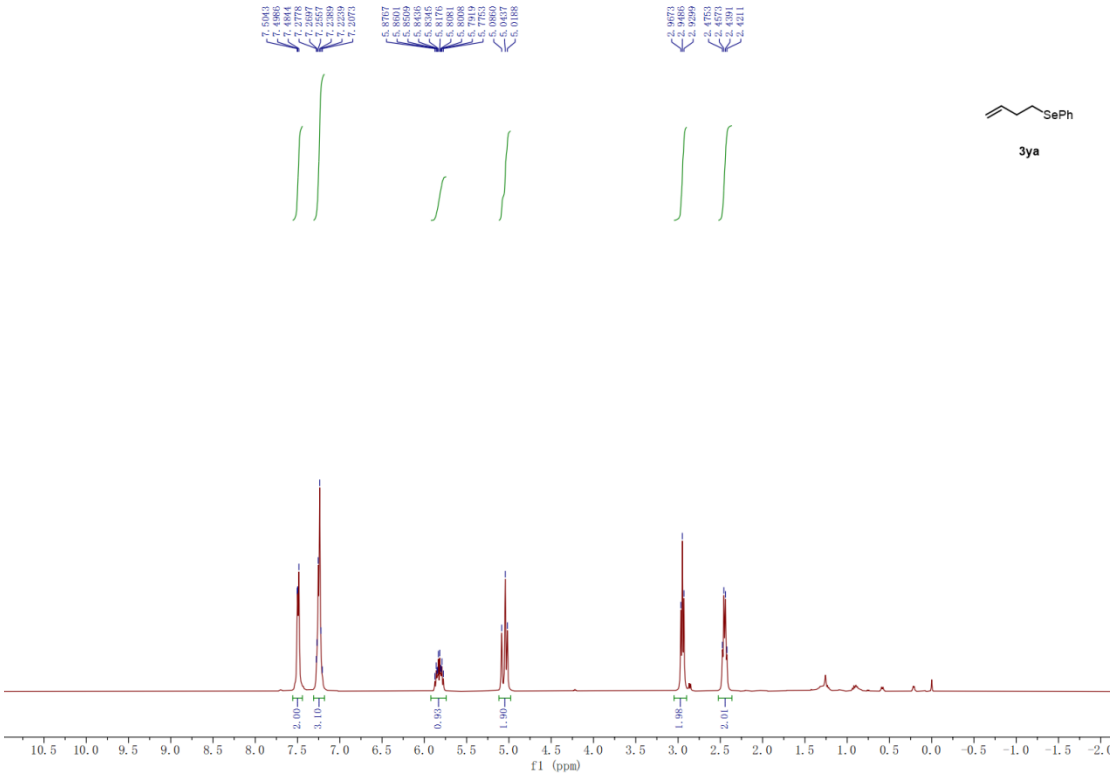


^{13}C NMR



31. but-3-en-1-yl(phenyl)selane

^{1}H NMR



^{13}C NMR