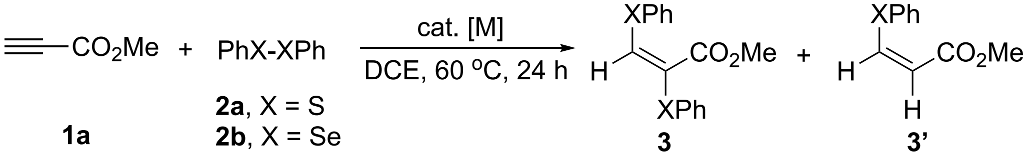
I. General Methods and Materials

All of the reactions dealing with air and/or moisture-sensitive compounds were carried out under an atmosphere of argon using oven/flame-dried glassware and standard syringe/septa techniques. Unless otherwise noted, all commercial reagents and solvents were obtained from the commercial provider and used without further purification. Diselenides and allenes were synthesized according to literature reports.

^1H NMR, ^{13}C NMR and ^{19}F NMR spectra were recorded on a Varian Inova 400 MHz spectrometer. Chemical shifts were reported relative to internal tetramethylsilane (δ 0.00 ppm) for ^1H and $CDCl_3$ (δ 77.0 ppm) for ^{13}C. Flash column chromatography was performed on 230-430 mesh silica gel. Analytical thin layer chromatography was performed with pre-coated glass baked plates (250μ) and visualized by fluorescence and by charring after treatment with potassium permanganate stain. HRMS data for substrates were collected on an Agilent 7890 GC-MS QTOF 7200 and 6540 LC/QTOF spectrometer in the mass-spec facility in the University of South Florida. For mechanistic studies using ESI-MS, the same MS instrument in Ohio University was used, and the samples were infused with a flow rate of 10 μL/min and sprayed at a high voltage of 5 kV. The X-ray diffraction data for **3t, 5i, 6** was measured on Bruker D8 Venture PHOTON 100 CMOS system.

II. General Procedures

2.1 Reaction Optimization



entry	2	catalyst	conv. (%)	yield (%) of **3** (*E*/*Z*)	yield (%) of **3'**
1	**2a**	5% $IPrAuNTf_2$	100%	35% (8:1)	50%
2	**2b**	5% $IPrAuNTf_2$	100%	91% (>100:1)	6%
3	**2b**	5% $tBu_3PAuNTf_2$	100%	77% (>100:1)	11%
4	**2b**	5% $JohnPhosAuNTf_2$	100%	85% (>100:1)	12%
5	**2b**	5% $RuPhosAuNTf_2$	100%	75% (50:1)	13%
6	**2b**	5% $XPhosAuNTf_2$	100%	72% (40:1)	14%
7	**2b**	5% PPh_3AuNTf_2	60%	46%	-
8	**2b**	5% $(PhO)_3PAuNTf_2$	60%	31%	-
9	**2b**	5% $IPrAuNTf_2$ (in toluene)	100%	85% (>100:1)	7%
10	**2b**	5% $IPrAuNTf_2$ (in THF)	100%	50%	3%

11	**2b**	5% IPrAuNTf$_2$ (in CH$_3$CN)	100%	90% (6:1)	<1%
12	**2b**	2% IPrAuNTf$_2$ (0.2 M)	100%	92% (>100:1)	5%
13	**2b**	2% IPrAuNTf$_2$ (0.5 M)	100%	85% (32:1)	7%
14	**2b**	1% IPrAuNTf$_2$ (0.5 M)	100%	85% (20:1)	8%
15	**2b**	10% HOTf	<5%	n.d.	-
16	**2b**	none	<5%	n.d.	-
17	**2b**	5% IPrAuCl	64%	32%	-
18	**2b**	5% JohnPhosAuCl	31%	25%	-
19	**2b**	5% PPh$_3$AuCl	39%	31%	-
20	**2b**	10% PtCl$_2$	80%	67%	-
21	**2b**	10% PtCl$_4$	74%	54%	-
22	**2b**	10% AgOTf	29%	21%	-
23	**2b**	10% Cu(OAc)$_2$	25%	16%	-
24	**2b**	10% Cu(CH$_3$CN)$_4$PF$_6$	50%	<5%	-
25	**2b**	10% FeCl$_3$	20%	15%	-
26	**2b**	10% Pd(OAc)$_2$	<5%	n.d.	-
27	**2b**	10% Ga(OTf)$_3$	40%	24%	-
28	**2b**	10% In(OTf)$_3$	60%	54%	-
29	**2b**	10% Sc(OTf)$_3$	32%	22%	-
30	**2b**	10% Zn(OTf)$_2$	44%	34%	-

Reaction conditions: gold catalyst was added to a solution (1 mL) of alkyne **1a** (0.3 mmol) and disulfide **2a** or diselenide **2b** (0.2 mmol), and reaction was kept at 60 ºC for 24 h. Conversion and yield were determined by ^{1}H NMR spectroscopy using dimethylsulfone as internal standard. [a] reaction at 40 ºC.

In the case of Pt, the lower conversion and yield could due to the inferior π-acidity of platinum compared to gold cation. Other metal catalyst (Ag, Cu and Fe) gave very low conversion because it cannot undergo the proposed catalytic cycle based on our proposed mechanism; the observed small amount of desired products likely involved other pathways such as metal Lewis acid-assisted SePh$^+$ formation.

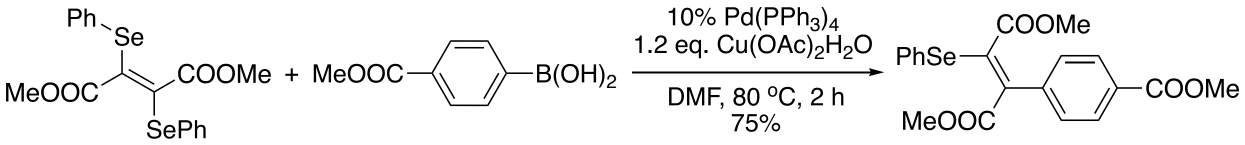
2.2 General Procedure for Diselenation of Alkynes

To a DCE solution (1 mL) of diselenide **2** (0.2 mmol, 1 eq) and alkyne **1** (0.3 mmol, 1.5 eq) was added $IPrAuNTf_2$ catalyst (0.004 mmol, 0.02 eq or 0.01 mmol, 0.05 eq) in one portion. The reaction was flashed with Ar and allowed to stir at 60 °C or rt for 24 h. The reaction mixture was then concentrated by rot-vap, and purified by flash chromatography (20:1 hex/EtOAc) to obtain pure product **3**.

2.3 General Procedure for Diselenation of Allenes

To a DCE solution (1 mL) of diselenide **2** (0.2 mmol, 1eq) and allene **4** (0.6 mmol, 3 eq) was added $IPrAuNTf_2$ catalyst (0.004 mmol, 0.02 eq) in one portion. The reaction was flashed with Ar and allowed to stir at rt for 24 h in dark. The reaction mixture was then concentrated by rot-vap, and purified by flash chromatography (DCM:hexane = 1:10) to obtain pure product **5**.

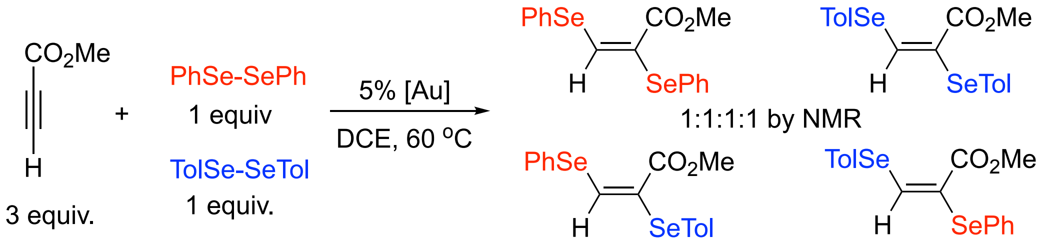
2.4 Synthetic procedure for Suzuki coupling of 6



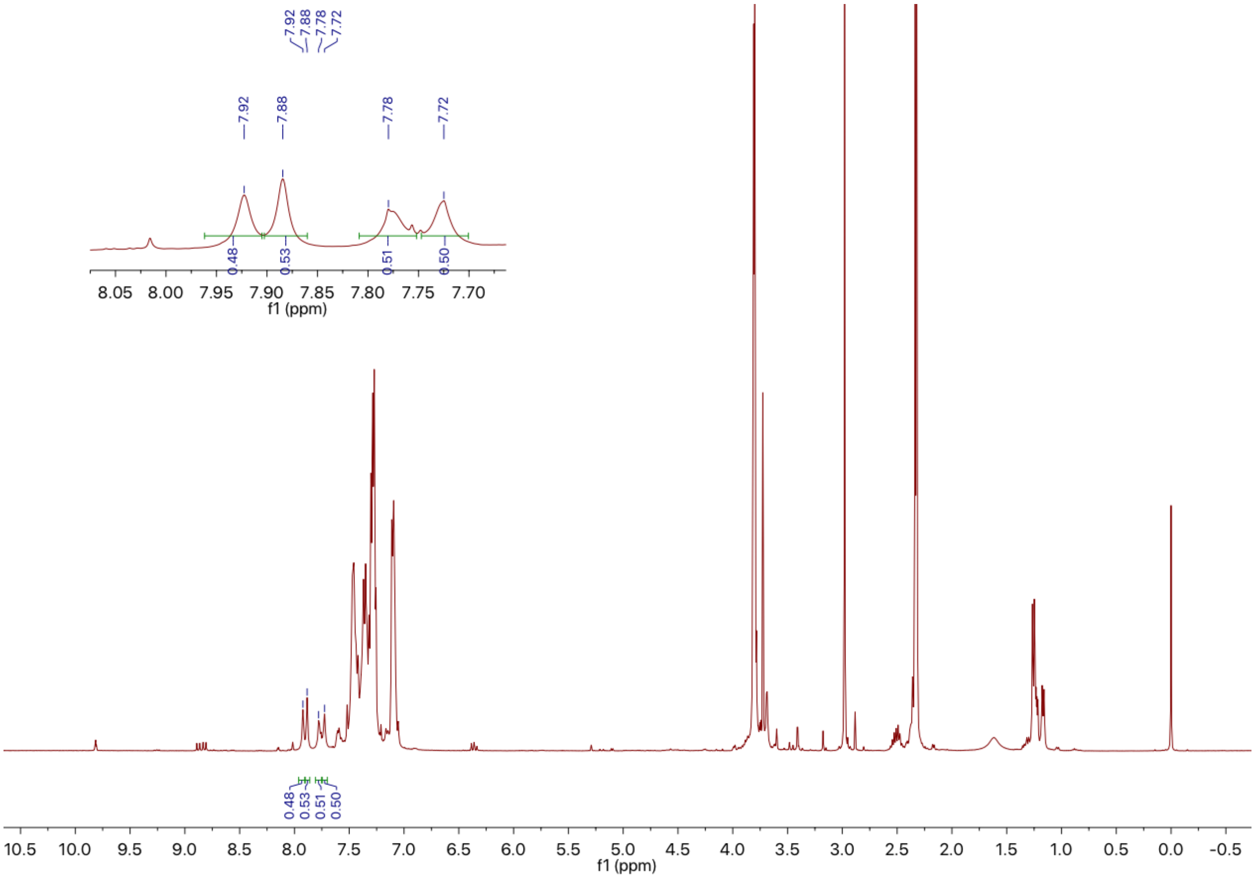
3r **6**

An oven-dried vial was added **3r** (273 mg, 0.6 mmol, 1 eq), boronic acid (324 mg, 1.8 mmol, 1. 3 eq), $Pd(PPh_3)_4$ (70 mg, 0.06 mmol, 0.1 eq) and $Cu(OAc)_2H_2O$ (144 mg, 0.72 mmol, 1.2 eq) sequentially. The reaction mixture was placed under vacuum and recharged with Ar. Then DMF 3 mL was added and the reaction was flashed with Ar. After reacting for 2 h at 80 °C, the reaction was quenched with NH_4Cl (sat.) 20 mL and extracted with DCM 10 mL three times. The three organic layers was combined and washed with H_2O twice. The organic layer was dried with Na_2SO_4 and concentrated under vacuum. Crude mixture was purified by flash chromatography (hexane:DCM = 10:1) to yield the desired product **6** (195 mg, 75%).

2.5 Cross-over experiment.

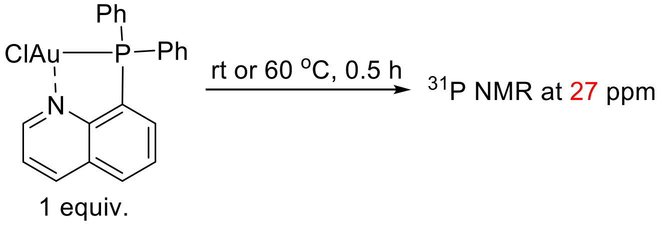


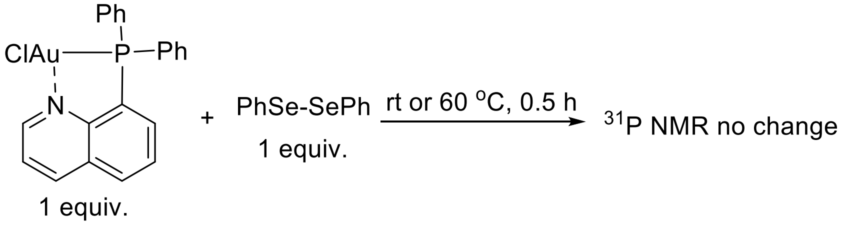
To a DCE solution (0.6 mL) of two different diselenides (0.1 mmol for each, 1 eq) and alkyne **1** (0.6 mmol, 3 eq) was added $IPrAuNTf_2$ catalyst (0.004 mmol, 0.02 eq) in one portion. The reaction was flashed with Ar and allowed to stir at 60 °C for 24 h. The ratio of four different product was determined to be around 1:1:1:1 as assigned by NMR based on the integration of the vinyl proton.

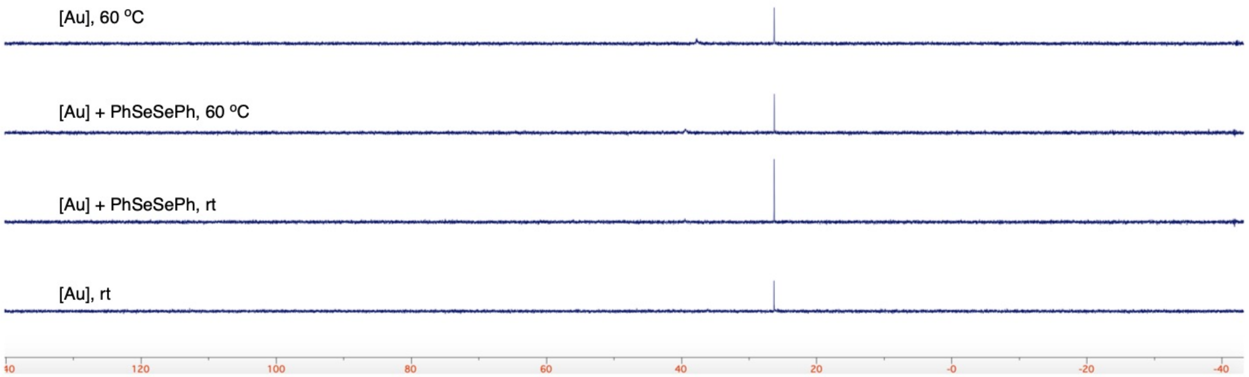


2.6 ^{31}P NMR experiment

A series of control experiments were carried out to investigate if direct oxidative addition occurred with diselenide. First, gold catalyst (5.2 mg, 0.017 mmol) in $CDCl_3$ showed the same ^{31}P NMR peak both at rt and after stirring at 60 ºC for 0.5 h. Next, when treating the gold catalyst (5.2 mg, 0.017 mmol) with equal molar of diselenide (5.2 mg, 0.017 mmol) both at rt and 60 ºC for 0.5 h, no change in ^{31}P NMR was detected, which indicated a direct oxidative addition is unlikely for this system.







III. ORTEP Drawing for Crystal Structures

X-ray Crystallography

X-ray diffraction data were measured on Bruker D8 Venture PHOTON II CPAD diffractometer equipped with a Cu K_α INCOATEC ImuS micro-focus source (λ = 1.54178 Å). Indexing was performed using *APEX3* [1] (Difference Vectors method). Data integration and reduction were performed using SaintPlus [2]. Absorption correction was performed by multi-scan method implemented in SADABS [3]. Space groups were determined using XPREP implemented in APEX3 [1]. Structures were solved using SHELXT [4] and refined using SHELXL-2018 [5] (full-matrix least-squares on F^2) through OLEX2 interface program [6]. Ortep plots were done with PLATON [7]. **WCY-145:** Disordered ester group was refined with restraints. Crystal data and refinement conditions are shown in Tables 1, 2 and 3.

[1] Bruker (2019). *APEX3* Bruker AXS Inc., Madison, Wisconsin, USA.
[2] Bruker (2019) SAINT V8.35A. Data Reduction Software.
[3] Sheldrick, G. M. (1996). *SADABS. Program for Empirical Absorption Correction.* University of Gottingen, Germany.
[4] XT, G.M. Sheldrick, Acta Cryst. (2015). A71, 3-8
[5] XL, Sheldrick, G. M. (2008). Acta Cryst. A64, 112-122.
[6] Dolomanov, O.V.; Bourhis, L.J.; Gildea, R.J.; Howard, J.A.K.; Puschmann, H., OLEX2: A complete structure solution, refinement and analysis program (2009). J. Appl. Cryst., 42, 339-341
[7] A.L.Spek, Acta Cryst. 2009, D65, 148-155.

Table 1 Crystal data and structure refinement for 3u.

Identification code	3u
Empirical formula	$C_{20}H_{14}Br_2Se_2$
Formula weight	572.05
Temperature/K	296.65
Crystal system	triclinic
Space group	P-1

a/Å	10.3424(2)
b/Å	10.8991(2)
c/Å	11.3142(2)
α/°	118.4982(7)
β/°	112.3929(7)
γ/°	94.6421(7)
Volume/Å^3	980.66(3)
Z	2
ρ_{calc}g/cm^3	1.937
μ/mm^{-1}	9.464
F(000)	544.0
Crystal size/mm^3	0.25 × 0.08 × 0.05
Radiation	CuKα (λ = 1.54178)
2Θ range for data collection/°	9.428 to 144.676
Index ranges	-12 ⩽ h ⩽ 12, -12 ⩽ k ⩽ 11, -13 ⩽ l ⩽ 13
Reflections collected	12071
Independent reflections	3701 [R_{int} = 0.0354, R_{sigma} = 0.0341]
Data/restraints/parameters	3701/0/218
Goodness-of-fit on F^2	1.037
Final R indexes [I>=2σ (I)]	R_1 = 0.0385, wR_2 = 0.0953
Final R indexes [all data]	R_1 = 0.0420, wR_2 = 0.0993
Largest diff. peak/hole / e Å^{-3}	0.84/-0.66

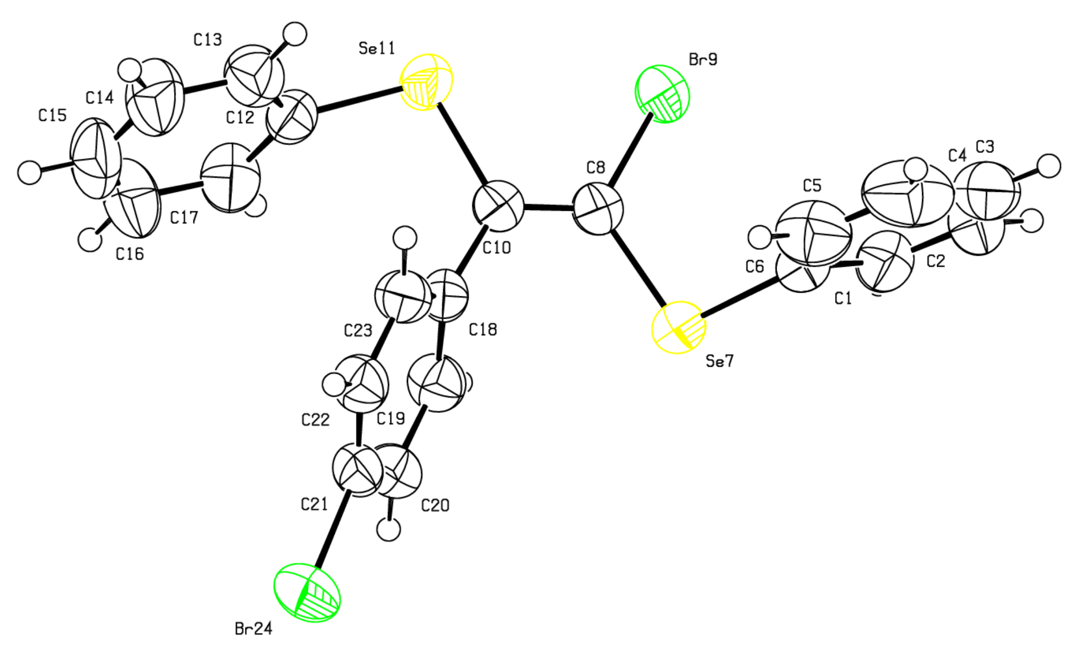


Fig.2. Asymmetric unit of **3u**. Anisotropic displacement parameters were drawn at 50% probability level. CCDC: 1973993

Table 2 Crystal data and structure refinement for WCY-18.	
Identification code	WCY-18
Empirical formula	$C_{23}H_{21}BrSe_2$
Formula weight	535.23
Temperature/K	99.99
Crystal system	triclinic
Space group	P-1
a/Å	5.8168(3)
b/Å	11.2186(5)
c/Å	15.9188(7)
α/°	76.392(1)
β/°	86.334(1)
γ/°	84.372(1)
Volume/Å^3	1003.88(8)
Z	2
ρ_{calc}g/cm^3	1.771
μ/mm^{-1}	6.949
F(000)	524.0
Crystal size/mm^3	0.22 × 0.11 × 0.06
Radiation	CuKα (λ = 1.54178)
2Θ range for data collection/°	5.718 to 144.814
Index ranges	$-7 \leqslant h \leqslant 6, -13 \leqslant k \leqslant 13, -19 \leqslant l \leqslant 19$
Reflections collected	13581

Independent reflections	3834 [R_{int} = 0.0332, R_{sigma} = 0.0311]
Data/restraints/parameters	3834/0/237
Goodness-of-fit on F^2	1.121
Final R indexes [I>=2σ (I)]	R_1 = 0.0265, wR_2 = 0.0670
Final R indexes [all data]	R_1 = 0.0267, wR_2 = 0.0671
Largest diff. peak/hole / e Å^{-3}	0.44/-0.70

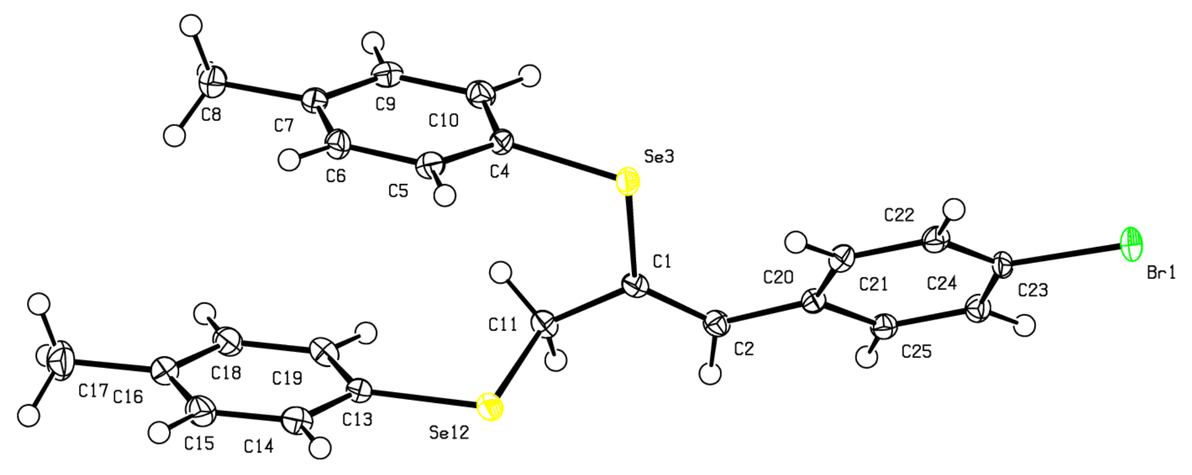


Fig.1. Asymmetric unit of **WCY-18**. Anisotropic displacement parameters were drawn at 50% probability level. CCDC: 1973994

Table 3 Crystal data and structure refinement for WCY-145.

Identification code	WCY-145
Empirical formula	$C_{20}H_{18}O_6Se$
Formula weight	433.30
Temperature/K	100.02
Crystal system	triclinic
Space group	P-1
a/Å	7.5090(3)
b/Å	7.5264(3)
c/Å	17.8407(6)
α/°	79.785(1)
β/°	79.205(1)
γ/°	73.876(1)
Volume/Å^3	943.05(6)
Z	2
ρ_{calc}g/cm^3	1.526
μ/mm^{-1}	2.997
F(000)	440.0
Crystal size/mm^3	0.3 × 0.1 × 0.03
Radiation	CuKα (λ = 1.54178)
2Θ range for data collection/°	5.088 to 144.888

Index ranges	$-9 \leqslant h \leqslant 9$, $-9 \leqslant k \leqslant 9$, $-22 \leqslant l \leqslant 21$
Reflections collected	12230
Independent reflections	3606 [R_{int} = 0.0317, R_{sigma} = 0.0309]
Data/restraints/parameters	3606/55/279
Goodness-of-fit on F^2	1.109
Final R indexes [I>=2σ (I)]	R_1 = 0.0461, wR_2 = 0.1292
Final R indexes [all data]	R_1 = 0.0469, wR_2 = 0.1298
Largest diff. peak/hole / e Å^{-3}	0.69/-0.60

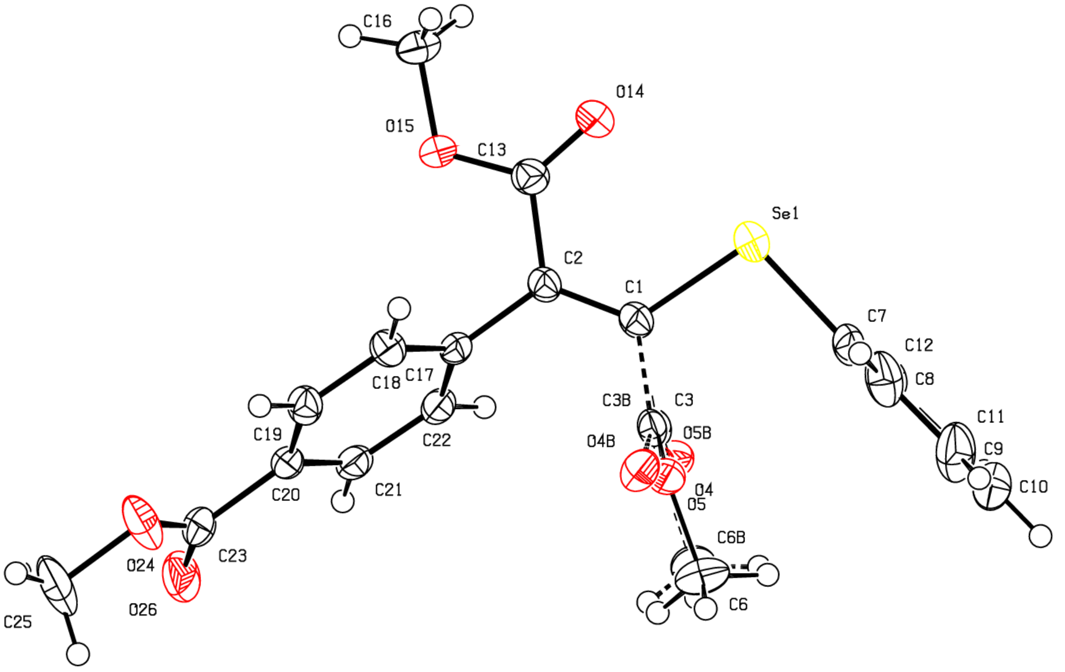
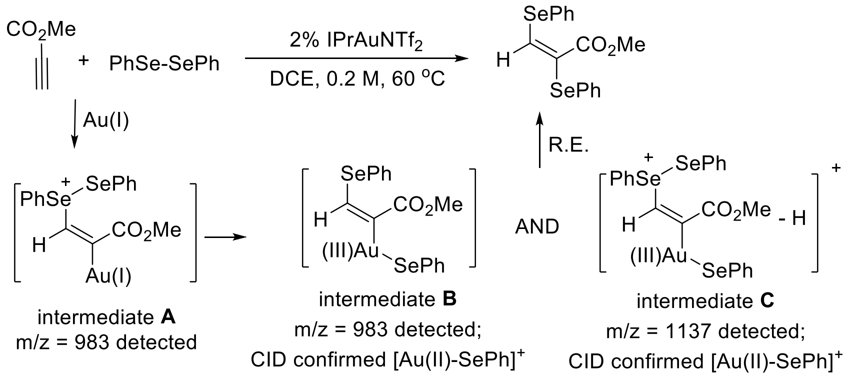


Fig.2. Asymmetric unit of **WCY-145**. Anisotropic displacement parameters were drawn at 50% probability level. CCDC: 1973995

IV. Mass Spectrometry Study

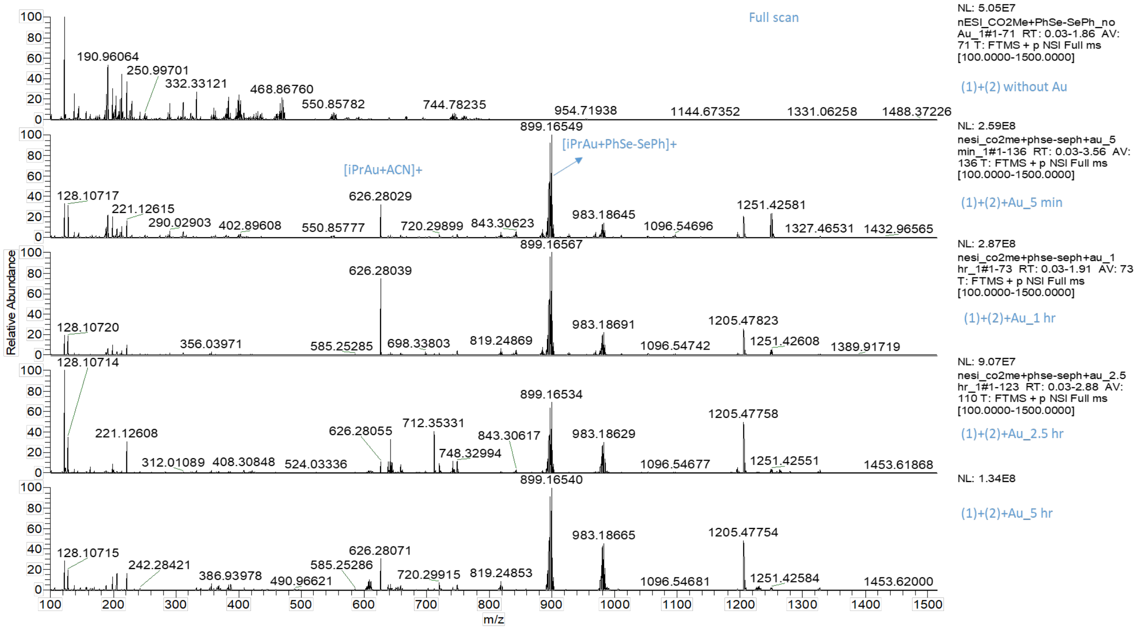
ESI-MS spectra were collected using a Thermo scientific Orbitrap Q Extractive Plus (Bremen, Germany) in the positive ion mode. Samples were infused at a flow rate of 10 µL/min and ionized at a high voltage of +5 kV.

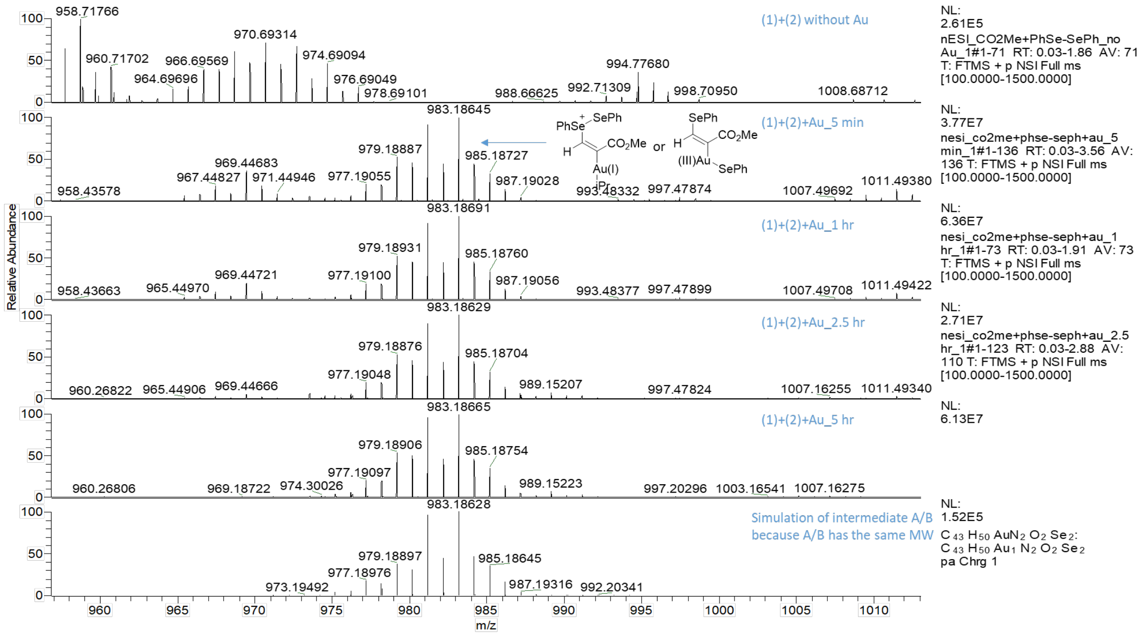
4.1 ESI-MS analysis of 1c and 2a



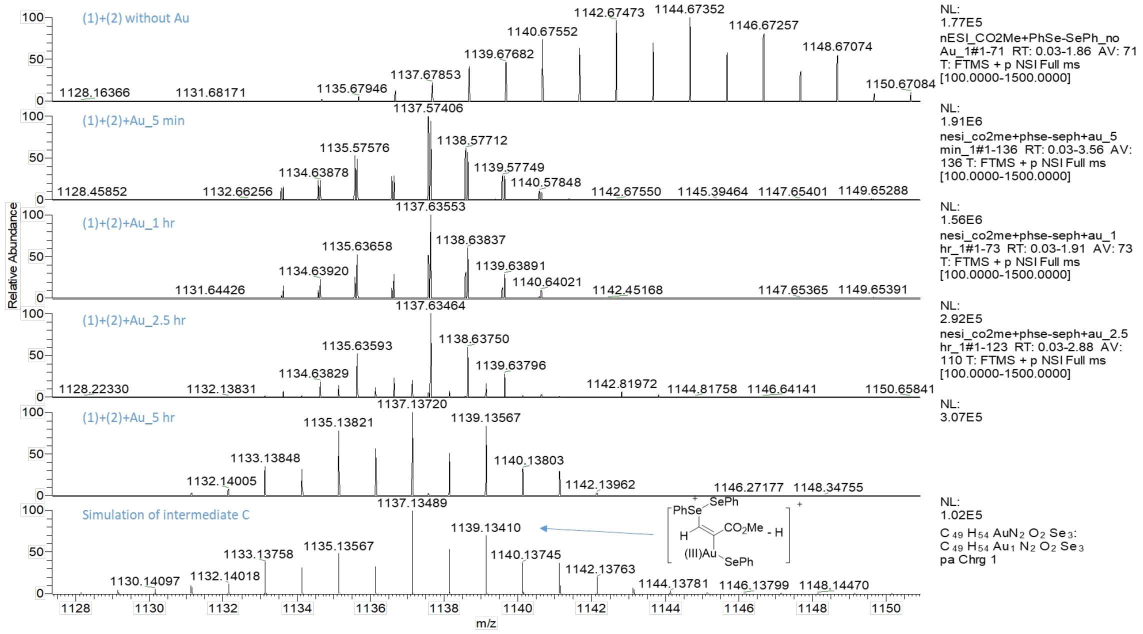
General procedure: 200 µM IPrAuNTf$_2$ was added to 20 mM of diselenide and 30 mM methyl propiolate in 3 mL of DCE, and the reaction mixture was stirred at 60 ºC for 24 h. The reaction mixture was diluted in 1:20 ratio with acetonitrile, and tested on 5 min, 1 h, 2.5 h and 5 h using ESI-MS (2 uL/min, +2.5 kV).

Three key intermediates were detected. Intermediate A (m/z = 983) which represents a vinyl Au(I) complex has the same mass as a possible Au(III) intermediate B. CID experiment at 983 revealed a Au(II)-SePh fragment, which strongly supported the existence of the Au(III) intermediate B. Another intermediate C (m/z = 1137), which had a similar formula as the Au(III) intermediate we observed in the thioallylation studies, provided a Au(II)-SePh fragment in the CID experiment too. All three intermediates existed at a noticeable concentration since 5 min. Thus, we propose a Au(I/III) redox cycle could be viable for this transformation.

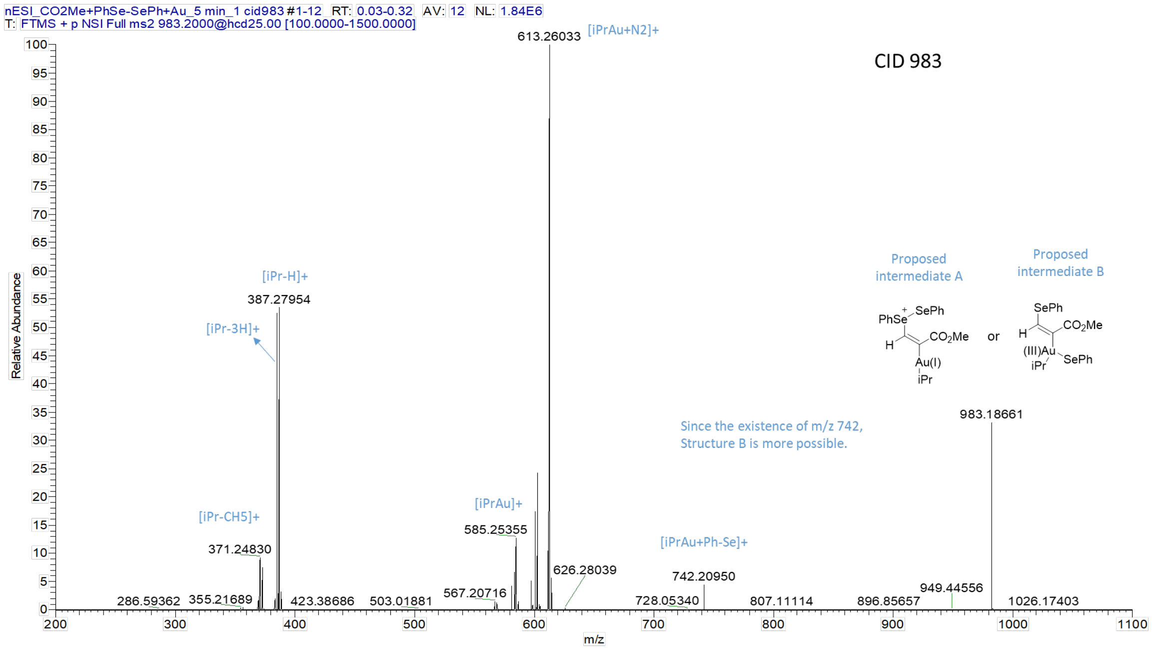




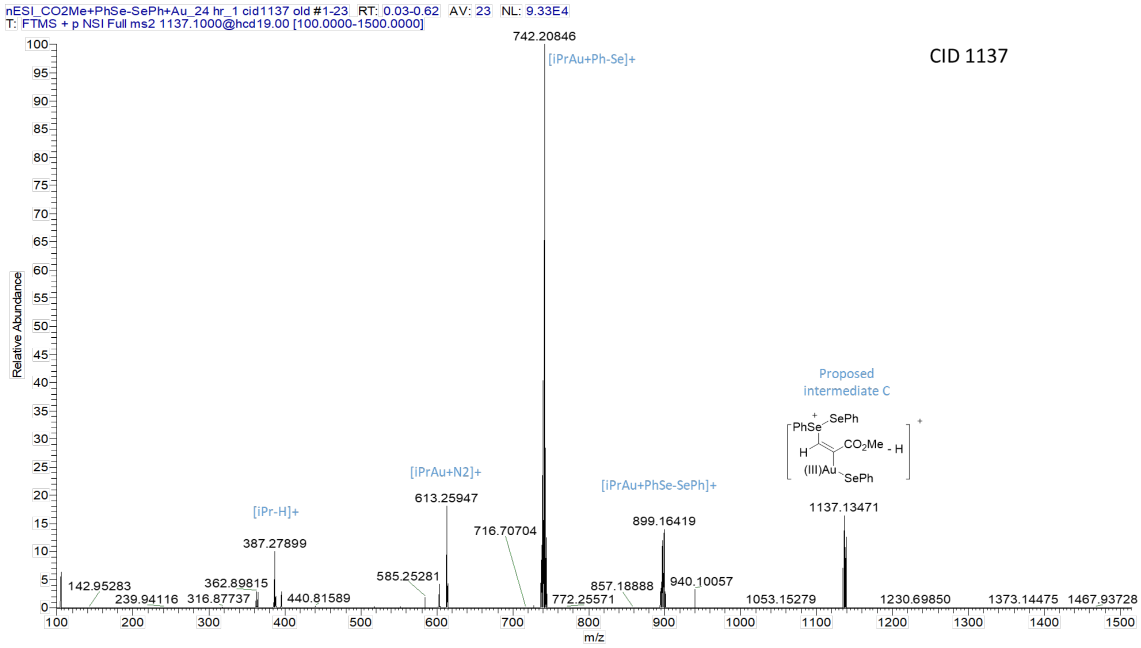
(1)+(2) without Au
(1)+(2)+Au_5 min
(1)+(2)+Au_1 hr
(1)+(2)+Au_2.5 hr
(1)+(2)+Au_5 hr
Simulation of intermediate A/B because A/B has the same MW
958.71766
960.71702
964.69696
966.69569
970.69314
974.69094
976.69049
978.69101
988.66625
992.71309
994.77680
998.70950
1008.68712
983.18645
979.18887
985.18727
987.19028
969.44683
967.44827
971.44946
977.19055
958.43578
993.48332
997.47874
1007.49692
1011.49380
983.18691
979.18931
985.18760
987.19056
958.43663
965.44970
969.44721
977.19100
993.48377
997.47899
1007.49708
1011.49422
983.18629
979.18876
985.18704
977.19048
989.15207
960.26822
965.44906
969.44666
997.47824
1007.16255
1011.49340
983.18665
979.18906
985.18754
977.19097
989.15223
960.26806
969.18722
974.30026
997.20296
1003.16541
1007.16275
983.18628
979.18897
985.18645
977.18976
973.19492
987.19316
992.20341
PhSe
SePh
CO_2Me
H
Au(I)
iPr
or
SePh
CO_2Me
H
(III)Au
SePh
Relative Abundance
m/z
NL: 2.61E5 nESI_CO2Me+PhSe-SePh_no Au_1#1-71 RT: 0.03-1.86 AV: 71 T: FTMS + p NSI Full ms [100.0000-1500.0000]
NL: 3.77E7 nesi_co2me+phse-seph+au_5 min_1#1-136 RT: 0.03-3.56 AV: 136 T: FTMS + p NSI Full ms [100.0000-1500.0000]
NL: 6.36E7 nesi_co2me+phse-seph+au_1 hr_1#1-73 RT: 0.03-1.91 AV: 73 T: FTMS + p NSI Full ms [100.0000-1500.0000]
NL: 2.71E7 nesi_co2me+phse-seph+au_2.5 hr_1#1-123 RT: 0.03-2.88 AV: 110 T: FTMS + p NSI Full ms [100.0000-1500.0000]
NL: 6.13E7
NL: 1.52E5 C 43 H 50 AuN 2 O 2 Se 2: C 43 H 50 Au 1 N 2 O 2 Se 2 pa Chrg 1



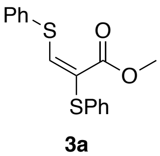
(1)+(2) without Au
(1)+(2)+Au_5 min
(1)+(2)+Au_1 hr
(1)+(2)+Au_2.5 hr
(1)+(2)+Au_5 hr
Simulation of intermediate C
1142.67473
1144.67352
1140.67552
1146.67257
1139.67682
1148.67074
1137.67853
1135.67946
1128.16366
1131.68171
1150.67084
1137.57406
1138.57712
1135.57576
1134.63878
1139.57749
1140.57848
1128.45852
1132.66256
1142.67550
1145.39464
1147.65401
1149.65288
1137.63553
1138.63837
1135.63658
1134.63920
1139.63891
1140.64021
1131.64426
1142.45168
1147.65365
1149.65391
1137.63464
1138.63750
1135.63593
1134.63829
1139.63796
1128.22330
1132.13831
1142.81972
1144.81758
1146.64141
1150.65841
1137.13720
1135.13821
1139.13567
1133.13848
1140.13803
1132.14005
1142.13962
1146.27177
1148.34755
1137.13489
1139.13410
1135.13567
1133.13758
1140.13745
1132.14018
1142.13763
1130.14097
1144.13781
1146.13799
1148.14470
PhSe
SePh
CO_2Me
- H
H
(III)Au
SePh
Relative Abundance
m/z
NL: 1.77E5 nESI_CO2Me+PhSe-SePh_no Au_1#1-71 RT: 0.03-1.86 AV: 71 T: FTMS + p NSI Full ms [100.0000-1500.0000]
NL: 1.91E6 nesi_co2me+phse-seph+au_5 min_1#1-136 RT: 0.03-3.56 AV: 136 T: FTMS + p NSI Full ms [100.0000-1500.0000]
NL: 1.56E6 nesi_co2me+phse-seph+au_1 hr_1#1-73 RT: 0.03-1.91 AV: 73 T: FTMS + p NSI Full ms [100.0000-1500.0000]
NL: 2.92E5 nesi_co2me+phse-seph+au_2.5 hr_1#1-123 RT: 0.03-2.88 AV: 110 T: FTMS + p NSI Full ms [100.0000-1500.0000]
NL: 3.07E5
NL: 1.02E5 C 49 H 54 AuN 2 O 2 Se 3: C 49 H 54 Au 1 N 2 O 2 Se 3 pa Chrg 1



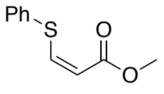
Since the existence of m/z 742, Structure B is more possible.



V. Compound Characterization

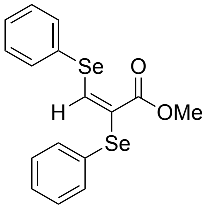

3a

&


3a’

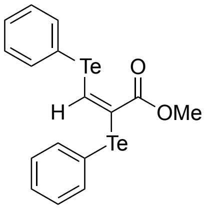
methyl (*E*)-2,3-bis(phenylthio)acrylate (**3a**)
methyl (*Z*)-3-(phenylthio)acrylate (**3a’**)

This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (20:1 hexane/EtOAc) to yield the unseparated mixture products with **3a**/**3a’** = 2.6:1 as colorless oil (80%).
^{1}H NMR (400 MHz; CDCl$_3$): δ 7.81 (s, 1H), 7.50 – 7.41 (m, 3H), 7.38 – 7.29 (m, 4.5H), 7.28 – 7.20 (m, 4.5H), 7.18 – 7.11 (m, 1H), 5.90 (d, J = 10.0 Hz, 0.4H), 3.75 (s, 1.2H), 3.73 (s, 3H).
^{13}C NMR (100 MHz; CDCl$_3$): δ 166.69, 165.71, 156.96, 149.88, 136.34, 135.88, 135.54, 130.89, 130.82, 129.53, 129.32, 129.20, 129.11, 128.89, 128.66, 128.62, 128.42, 128.27, 128.07, 127.84, 126.16, 115.39, 112.75, 77.00, 52.39, 51.25, 29.54.
HRMS: *m*/*z* (ESI) calculated for **3a** $C_{16}H_{14}O_2S_2$ $(M)^+$: 302.0435, found: 302.0434; **3a’** $C_{10}H_{10}O_2S$ $(M)^+$: 194.0402, found: 194.0399.



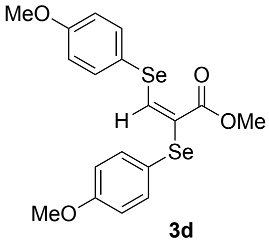
3b

methyl (*E*)-2,3-bis(phenylselanyl)acrylate (**3b**)
This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (20:1 hexane/EtOAc) to yield the desired product as colorless oil (94%).
^{1}H NMR (400 MHz; CDCl$_3$): δ 7.90 (s, 1H), 7.50 – 7.45 (m, 4H), 7.32 – 7.25 (m, 6H), 3.81 (s, 3H).
^{13}C NMR (100 MHz; CDCl$_3$): δ 166.5, 151.9, 132.9, 132.8, 132.8, 130.2, 129.4, 128.2, 127.7, 114.3, 52.8.
HRMS: *m*/*z* (ESI) calculated for $C_{16}H_{14}O_2Se_2$ $(M+H)^+$: 398.9397, found: 398.9392.



3c

methyl (*E*)-2,3-bis(phenyltelluryl)acrylate (**3c**)
This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (20:1 hexane/EtOAc) to yield the desired product as colorless oil (94%).
^{1}H NMR (400 MHz; CDCl$_3$): δ 8.27 (s, 1H), 7.80 (d, 2H, *J* = 7.2 Hz), 7.49 (d, *J* = 6.8 Hz, 2H), 7.33 (t, *J* = 7.2 Hz, 1H)， 7.24 (t, *J* = 7.2 Hz, 3H)
^{13}C NMR (100 MHz; CDCl$_3$): δ 168.4, 140.2, 139.3, 136.9, 129.8, 129.1, 128.7, 127.8, 120.5, 113.9, 102.7, 53.2.
HRMS: *m*/*z* (ESI) calculated for $C_{16}H_{14}O_2Te_2$ $(M)^+$: 493.9089, found: 493.9077.



3d

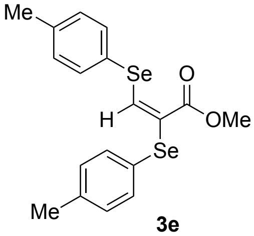
methyl (*E*)-2,3-bis((4-methoxyphenyl)selanyl)acrylate (**3d**)

This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (20:1 hexane/EtOAc) to yield the desired product as colorless oil (92%).

^{1}H NMR (400 MHz; CDCl$_3$): δ 7.56 (s, 1H), 7.45 (d, *J* = 8.8 Hz, 2H), 7.36 (d, *J* = 8.8 Hz, 2H), 6.82 (d, *J* = 8.8 Hz, 2H), 6.80 (d, *J* = 8.8 Hz, 2H), 3.81 (s, 3H), 3.78 (s, 3H), 3.77 (s, 3H).

^{13}C NMR (100 MHz; CDCl$_3$): δ 166.2, 159.8, 159.8, 149.5, 136.1, 134.6, 123.2, 119.3, 115.1, 115.0, 114.8, 55.2, 55.2, 52.6.

HRMS: *m*/*z* (ESI) calculated for $C_{18}H_{18}O_4Se_2$ (M+Na)$^+$: 480.9428, found: 480.9449.



3e

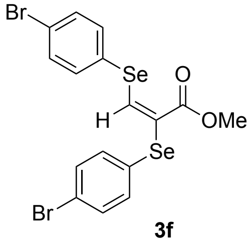
methyl (*E*)-2,3-bis(*p*-tolylselanyl)acrylate (**3e**)

This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (20:1 hexane/EtOAc) to yield the desired product as colorless oil (88%).

^{1}H NMR (400 MHz; CDCl$_3$): δ 7.78 (s, 1H), 7.37 (d, *J* = 8.0 Hz, 2H), 7.33 (d, *J* = 8.0 Hz, 2H), 7.10 – 7.06 (m, 4H), 3.80 (s, 3H), 2.32 (s, 3H), 2.31 (s, 3H).

^{13}C NMR (100 MHz; CDCl$_3$): δ 166.4, 155.1, 138.2, 137.8, 133.4, 132.7, 130.2, 130.0, 129.2, 126.2, 114.5, 52.7, 21.1, 21.1.

HRMS: *m*/*z* (ESI) calculated for $C_{18}H_{18}O_2Se_2$ (M+Na)$^+$: 448.9529, found: 448.9525.



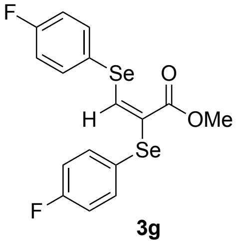
3f

methyl (*E*)-2,3-bis((4-bromophenyl)selanyl)acrylate (**3f**)

This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (20:1 hexane/EtOAc) to yield the desired product as colorless oil (86%).

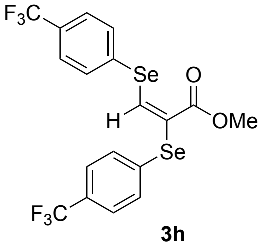
^{1}H NMR (400 MHz; CDCl$_3$): δ 7.88 (s, 1H), 7.44 (d, *J* = 8.4 Hz, 2H), 7.40 (d, *J* = 8.4 Hz, 2H), 7.35 (d, *J* = 8.4 Hz, 2H), 7.31 (d, *J* = 8.4 Hz, 2H), 3.80 (s, 3H).

^{13}C NMR (100 MHz; CDCl$_3$): δ 166.3, 152.4, 134.5, 134.1, 132.5, 132.5, 131.4, 129.2, 122.9, 122.0, 114.3, 53.0.
HRMS: *m*/*z* (ESI) calculated for $C_{16}H_{12}Br_2O_2Se_2$ (M+H)$^+$: 556.7587, found: 556.7589.



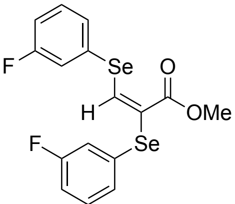
3g

methyl (*E*)-2,3-bis((4-fluorophenyl)selanyl)acrylate (**3g**)
This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (20:1 hexane/EtOAc) to yield the desired product as colorless oil (86%).
^{1}H NMR (400 MHz; CDCl$_3$): δ 7.70 (s, 1H), 7.50 – 7.43 (m, 4H), 7.03 – 6.96 (m, 4H), 3.81 (s, 3H).
^{13}C NMR (100 MHz; CDCl$_3$): δ 166.2, 162.9 (d, *J* = 244 Hz), 162.7 (d, *J* = 247 Hz), 150.8 (d, *J* = 0.9 Hz), 135.7 (d, *J* = 8.0 Hz), 135.2 (d, *J* = 8.0 Hz), 127.4 (d, *J* = 3.5 Hz), 124.2 (d, *J* = 3.5 Hz), 116.6 (d, *J* = 21.5 Hz), 116.5 (d, *J* = 21.5 Hz), 114.8 (d, *J* = 0.7 Hz), 52.8.
^{19}F NMR (376 MHz; CDCl$_3$): δ -112.6, -113.1.
HRMS: *m*/*z* (ESI) calculated for $C_{16}H_{13}F_2O_2Se_2$ (M+H)$^+$: 434.9214, found: 434.9205.



3h

methyl (*E*)-2,3-bis((4-(trifluoromethyl)phenyl)selanyl)acrylate (**3h**)
This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (20:1 hexane/EtOAc) to yield the desired product as colorless oil (66%).
^{1}H NMR (400 MHz; CDCl$_3$): δ 7.70 (s, 1H), 7.58 – 7.36 (m, 4H), 7.03 – 6.96 (m, 4H), 3.81 (s, 3H).
^{13}C NMR (100 MHz; CDCl$_3$): δ 166.4, 154.3, 148.1, 137.2, 136.2, 133.1, 132.9, 131.3, 130.7 (q, *J* = 320 Hz), 129.4 (q, *J* = 325 Hz), 126.2 (d, *J* = 37 Hz), 126.0 (d, *J* = 37 Hz), 125.2 (d, *J* = 152 Hz), 122.5 (d, *J* = 163 Hz), 117.2, 113.8, 53.1.
^{19}F NMR (376 MHz; CDCl$_3$): δ -62.8, -62.9.
HRMS: *m*/*z* (ESI) calculated for $C_{18}H_{12}F_6O_2Se_2$ (M+H)$^+$: 534.9145, found: 534.9148.



3i

methyl (*E*)-2,3-bis((3-fluorophenyl)selanyl)acrylate (**3i**)

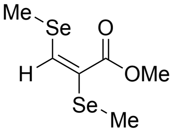
This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (20:1 hexane/EtOAc) to yield the desired product as colorless oil (80%).

^{1}H NMR (400 MHz; CDCl$_3$): δ 7.99 (s, 1H), 7.31 – 7.20 (m, 5H), 7.19 – 7.14 (m, 1H), 7.07 – 7.00 (m, 1H), 6.99 – 6.93 (m, 1H), 3.81 (s, 3H).

^{13}C NMR (100 MHz; CDCl$_3$): δ 166.3, 162.8 (d, *J* = 249 Hz), 162.8 (d, *J* = 249 Hz), 152.9, 134.2 (d, *J* = 6.5 Hz), 132.2 (d, *J* = 6.6 Hz), 130.8 (d, *J* = 8.0 Hz), 130.6 (d, *J* = 8.0 Hz), 128.5 (d, *J* = 3.2 Hz), 127.8 (d, *J* = 3.1 Hz), 119.9 (d, *J* = 21.9 Hz), 119.5 (d, *J* = 22.3 Hz), 115.5 (d, *J* = 20.9 Hz), 114.6 (d, *J* = 21.0 Hz), 114.0, 53.0.

^{19}F NMR (376 MHz; CDCl$_3$): δ -111.0, -111.4.

HRMS: *m*/*z* (ESI) calculated for $C_{16}H_{12}F_2O_2Se_2$ (M+H)$^+$: 734.9209, found: 734.9205.



3j

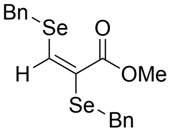
methyl (*E*)-2,3-bis(methylselanyl)acrylate (**3j**)

This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (20:1 hexane/EtOAc) to yield the desired product as colorless oil (86%).

^{1}H NMR (400 MHz; CDCl$_3$): δ 7.66 (s, 1H), 3.83 (s, 3H), 2.24 (s, 3H), 2.21 (s, 3H).

^{13}C NMR (100 MHz; CDCl$_3$): δ 166.5, 147.1, 113.9, 52.6, 9.6, 7.9.

HRMS: *m*/*z* (ESI) calculated for $C_6H_{10}O_2Se_2$ (M+Na)$^+$: 296.8905, found: 296.8895.



3k

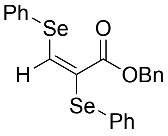
methyl (*E*)-2,3-bis(benzylselanyl)acrylate (**3k**)

This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (20:1 hexane/EtOAc) to yield the desired product as colorless oil (85%).

^{1}H NMR (400 MHz; CDCl$_3$): δ 7.74 (s, 1H), 7.32 – 7.12 (m, 10H), 3.89 (s, 2H), 3.84 (s, 2H), 3.76 (s, 3H).

^{13}C NMR (100 MHz; CDCl$_3$): δ 166.8, 152.1, 138.1, 138.1, 129.0, 128.8, 128.7, 128.4, 127.0, 126.8, 112.9, 52.6, 32.3, 32.0.

HRMS: *m*/*z* (ESI) calculated for $C_{18}H_{18}O_2Se_2$ (M+Na)$^+$: 448.9520, found: 448.9525.



3l

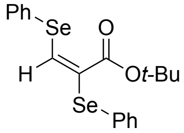
benzyl (*E*)-2,3-bis(phenylselanyl)acrylate (**3l**)

This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (20:1 hexane/EtOAc) to yield the desired product as colorless oil (87%).

^{1}H NMR (400 MHz; CDCl$_3$): δ 7.98 (s, 1H), 7.51 – 7.41 (m, 4H), 7.32 – 7.18 (m, 11H), 5.23 (s, 2H)

^{13}C NMR (100 MHz; CDCl$_3$): δ 165.8, 152.6, 135.4, 132.9, 132.8, 132.8, 130.4, 129.4, 128.4, 128.3, 128.1, 127.9, 127.6, 114.5, 67.4.

HRMS: *m*/*z* (ESI) calculated for $C_{22}H_{18}O_2Se_2$ (M+H)$^+$: 474.9710, found: 474.9707.



3m

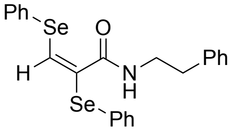
benzyl (*E*)-2,3-bis(phenylselanyl)acrylate (**3m**)

This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (20:1 hexane/EtOAc) to yield the desired product as colorless oil (95%).

^{1}H NMR (400 MHz; CDCl$_3$): δ 7.70 (s, 1H), 7.51 – 7.42 (m, 4H), 7.30 – 7.22 (m, 6H), 1.44 (s, 9H).

^{13}C NMR (100 MHz; CDCl$_3$): δ 164.8, 147.4, 133.2, 133.2, 133.1, 132.6, 130.5, 129.2, 128.0, 127.5, 117.1, 82.7, 27.9.

HRMS: *m*/*z* (ESI) calculated for $C_{19}H_{20}O_2Se_2$ (M+Na)$^+$: 462.9686, found: 462.9675.



3n

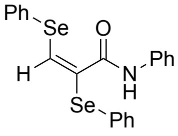
(*E*)-*N*-phenethyl-2,3-bis(phenylselanyl)acrylamide (**3n**)

This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (20:1 hexane/EtOAc) to yield the desired product as colorless oil (82%).

^{1}H NMR (400 MHz; CDCl$_3$): δ 8.31 (s, 1H), 7.66 – 7.60 (m, 2H), 7.38 – 7.32 (m, 3H), 7.28 – 7.18 (m, 8H), 7.12 (br, 1H), 7.07 – 7.01 (m, 2H), 3.54 (q, *J* = 6.8 Hz, 2H), 2.73 (t, *J* = 6.8 Hz, 2H).

^{13}C NMR (100 MHz; CDCl$_3$): δ 165.6, 156.8, 138.5, 134.1, 133.2, 131.3, 129.4, 129.2, 129.1, 128.6, 128.5, 128.1, 126.8, 126.3, 113.5, 41.4, 35.5.

HRMS: *m*/*z* (ESI) calculated for $C_{23}H_{21}NOSe_2$ (M+H)$^+$: 488.0027, found: 488.0029.



3o

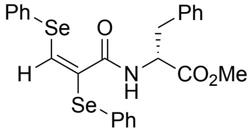
(*E*)-*N*-phenyl-2,3-bis(phenylselanyl)acrylamide (**3o**)

This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (20:1 hexane/EtOAc) to yield the desired product as colorless oil (48%).

^{1}H NMR (400 MHz; CDCl$_3$): δ 8.92 (br, 1H), 8.47 (s, 1H), 7.67 – 7.61 (m, 2H), 7.52 – 7.47 (m, 2H), 7.42 – 7.20 (m, 10H), 7.12 – 7.06 (m, 1H).

^{13}C NMR (100 MHz; CDCl$_3$): δ 163.8, 158.6, 137.5, 134.0, 133.2, 130.9, 129.7, 129.5, 129.4, 128.9, 128.3, 127.3, 124.5, 119.8, 113.7.

HRMS: *m*/*z* (ESI) calculated for $C_{21}H_{17}NOSe_2$ (M+H)$^+$: 459.9687, found: 459.9710.



3p

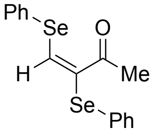
methyl (*E*)-(2,3-bis(phenylselanyl)acryloyl)-*D*-phenylalaninate (**3p**)

This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (20:1 hexane/EtOAc) to yield the desired product as colorless oil (55%).

^{1}H NMR (400 MHz; CDCl$_3$): δ 8.36 (s, 1H), 7.65 – 7.59 (m, 2H), 7.54 (broad d, *J* = 8.0 Hz, 1H), 7.37 – 7.32 (m, 3H), 7.30 – 7.21 (m, 5H), 7.18 – 7.09 (m, 3H), 6.93 – 6.88 (m, 2H), 4.89 (dt, *J* = 8.0, 5.6 Hz, 1H), 3.63 (s, 3H), 3.06 (t, *J* = 5.6 Hz, 2H).

^{13}C NMR (100 MHz; CDCl$_3$): δ 171.3, 165.4, 157.9, 135.5, 133.9, 133.2, 131.2, 129.7, 129.4, 129.3, 129.1, 128.5, 128.3, 127.0, 113.3, 53.9, 52.3, 37.9.

HRMS: *m*/*z* (ESI) calculated for $C_{25}H_{23}NO_3Se_2$ (M+H)$^+$: 546.0081, found: 546.0087.



3q

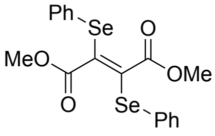
(*E*)-3,4-bis(phenylselanyl)but-3-en-2-one (**3q**)

This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (20:1 hexane/EtOAc) to yield the desired product as colorless oil (85%).

^{1}H NMR (400 MHz; CDCl$_3$): δ 8.46 (s, 1H), 7.62 – 7.57 (m, 2H), 7.37 – 7.30 (m, 5H), 7.30 – 7.19 (m, 3H), 2.42 (m, 3H).

^{13}C NMR (100 MHz; CDCl$_3$): δ 198.8, 159.3, 134.1, 132.9, 132.0, 129.9, 129.5, 129.4, 128.4, 126.8, 119.9, 18.8.

HRMS: *m*/*z* (ESI) calculated for $C_{16}H_{14}OSe_2$ (M+H)$^+$: 382.9446, found: 382.9450.



3r

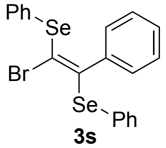
dimethyl 2,3-bis(phenylselanyl)fumarate (**3r**)

This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (20:1 hexane/EtOAc) to yield the desired product as colorless oil (93%).

^{1}H NMR (400 MHz; CDCl$_3$): δ 7.60 – 7.56 (m, 4H), 7.34 – 7.27 (m, 6H), 3.45 (s, 6H).

^{13}C NMR (100 MHz; CDCl$_3$): δ 165.3, 134.9, 134.7, 129.5, 128.9, 128.6, 52.4.

HRMS: *m/z* (ESI) calculated for $C_{18}H_{16}O_4Se_2$ (M+H)$^+$: 456.9452, found: 456.9455.



3s

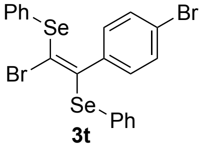
(*Z*)-(1-bromo-2-phenylethene-1,2-diyl)bis(phenylselane) (**3s**)

This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (pure hexane) to yield the desired product as colorless oil (93%).

^{1}H NMR (400 MHz; CDCl$_3$): δ 7.47 – 7.42 (m, 2H), 7.33 – 7.23 (m, 5H), 7.13 – 7.07 (m, 1H), 7.05 – 6.97 (m, 5H), 6.96 – 6.91 (m, 2H).

^{13}C NMR (100 MHz; CDCl$_3$): δ 147.0, 139.1, 136.5, 132.7, 131.6, 129.5, 129.1, 129.0, 128.4, 128.3, 127.8, 127.6, 127.5, 101.5

HRMS: *m/z* (ESI) calculated for $C_{20}H_{15}BrSe_2$ (M+Na)$^+$: 494.8761, found: 494.8748.



3t

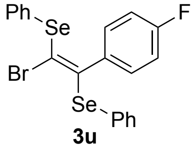
(*Z*)-(1-bromo-2-(4-bromophenyl)ethene-1,2-diyl)bis(phenylselane) (**3t**)

This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (pure hexane) to yield the desired product as colorless oil (93%).

^{1}H NMR (400 MHz; CDCl$_3$): δ 7.45 – 7.40 (m, 2H), 7.32 – 7.28 (m, 3H), 7.27 – 7.23 (m, 2H), 7.18 – 7.12 (m, 3H), 7.07 – 7.01 (m, 2H), 6.82 – 6.77 (d, *J* = 8.4 Hz, 2H).

^{13}C NMR (100 MHz; CDCl$_3$): δ 145.5, 138.2, 136.5, 132.8, 131.3, 130.7, 130.6, 129.2, 129.2, 128.7, 128.7, 128.0, 121.8, 102.5.

HRMS: *m/z* (ESI) calculated for $C_{20}H_{14}Br_2Se_2$ (M+H)$^+$: 572.7848, found: 572.7849.

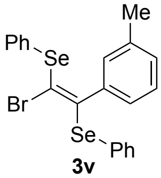


3u

(*Z*)-(1-bromo-2-(4-fluorophenyl)ethene-1,2-diyl)bis(phenylselane) (**3u**)

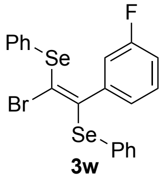
This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (pure hexane) to yield the desired product as colorless oil (93%).

^{1}H NMR (400 MHz; CDCl$_3$): δ 7.45 – 7.40 (m, 2H), 7.32 – 7.27 (m, 3H), 7.27 – 7.23 (m, 2H), 7.15 – 7.10 (m, 1H), 7.04 – 6.99 (m, 2H), 6.91 – 6.86 (m, 2H), 6.73 – 6.68 (m, 2H).
^{13}C NMR (100 MHz; CDCl$_3$): δ 161.8 (d, *J* = 247 Hz), 145.8, 136.6, 135.1 (d, *J* = 3.4 Hz), 132.7, 131.4, 130.7 (d, *J* = 8.3 Hz) 129.3, 129.2, 128.6, 128.5, 127.9, 114.6 (d, *J* = 21.7 Hz) 102.1 (d, *J* = 1.7 Hz).
^{19}F NMR (376 MHz; CDCl$_3$): δ -113.2.
HRMS: *m/z* (ESI) calculated for $C_{20}H_{14}BrFSe_2$ (M+H)$^+$: 512.8666, found: 512.8667.



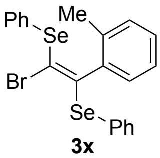
3v

(*Z*)-(1-bromo-5-chloropent-1-ene-1,2-diyl)bis(phenylselane) (**3v**)
This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (pure hexane) to yield the desired product as colorless oil (93%).
^{1}H NMR (400 MHz; CDCl$_3$): δ 7.47 – 7.43 (m, 2H), 7.31 – 7.22 (m, 5H), 7.13 – 7.07 (m, 1H), 7.00 – 6.92 (m, 3H), 6.90 – 6.80 (m, 3H), 2.18 (m, 3H).
^{13}C NMR (100 MHz; CDCl$_3$): δ 145.9, 138.3, 136.8, 135.2, 133.1, 131.1, 129.6, 129.3, 129.1, 128.6, 128.5, 128.2, 128.0, 127.9, 125.0, 100.5, 19.6.
HRMS: *m/z* (ESI) calculated for $C_{21}H_{17}BrSe_2$ (M+H)$^+$: 508.8917, found: 508.8909.



3w

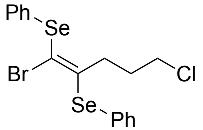
(*Z*)-(1-bromo-2-cyclopropylethene-1,2-diyl)bis(phenylselane) (**3w**)
This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (pure hexane) to yield the desired product as colorless oil (93%).
^{1}H NMR (400 MHz; CDCl$_3$): δ 7.46 – 7.42 (m, 2H), 7.33 – 7.26 (m, 5H), 7.16 – 7.11 (m, 1H), 7.06 – 6.96 (m, 3H), 6.74 – 6.70 (m, 2H), 6.65 – 6.61 (m, 1H)
^{13}C NMR (100 MHz; CDCl$_3$): δ 161.9 (d, *J* = 245 Hz), 145.2 (d, *J* = 2.0 Hz), 141.1 (d, *J* = 8.1 Hz), 136.7, 133.0, 131.3, 129.3, 129.2, 129.1, 128.7, 128.6, 128.0, 124.9 (d, *J* = 3.0 Hz), 116.1 (d, *J* = 22.1 Hz), 114.5 (d, *J* = 20.9 Hz).
^{19}F NMR (376 MHz; CDCl$_3$): δ -131.5.
HRMS: *m/z* (ESI) calculated for $C_{20}H_{14}BrFSe_2$ (M+H)$^+$: 512.8666, found: 512.8675.



3x

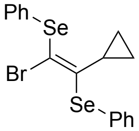
(*Z*)-(1-bromo-2-(*o*-tolyl)ethene-1,2-diyl)bis(phenylselane) (**3x**)
This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (pure hexane) to yield the desired product as colorless oil (93%).

^{1}H NMR (400 MHz; CDCl$_3$): δ 7.47 – 7.42 (m, 2H), 7.31 – 7.26 (m, 3H), 7.26 – 7.22 (n, 2H), 7.12 – 7.07 (m, 1H), 6.99 – 6.91 (m, 3H), 6.90 – 6.80 (m, 3H), 2.18 (s, 3H).
^{13}C NMR (100 MHz; CDCl$_3$): δ 145.8, 138.3, 136.8, 135.2, 133.1, 131.1, 129.6, 129.3, 129.1, 128.6, 128.5, 128.2, 128.0, 127.9, 125.0, 100.5, 19.6.
HRMS: *m*/*z* (ESI) calculated for $C_{21}H_{17}BrSe_2$ (M+H)$^+$: 508.8917, found: 508.8896.



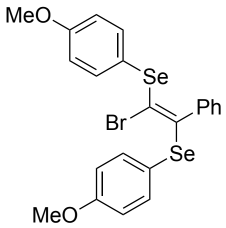
3y

(*Z*)-(1-bromo-5-chloropent-1-ene-1,2-diyl)bis(phenylselane) (**3y**)
This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (pure hexane) to yield the desired product as colorless oil (93%).
^{1}H NMR (400 MHz; CDCl$_3$): δ 7.69 – 7.65 (m, 2H), 7.50 – 7.46 (m, 2H), 7.43 – 7.30 (m, 6H), 3.17 (t, *J* = 6.4 Hz, 2H), 2.64 – 2.58 (m, 2H), 1.81 – 1.73 (m, 2H).
^{13}C NMR (100 MHz; CDCl$_3$): δ 147.7, 126.8, 131.6, 131.2, 129.4, 129.4, 129.4, 128.6, 127.6, 100.2, 43.7, 34.9, 32.0.
HRMS: *m*/*z* (ESI) calculated for $C_{17}H_{16}BrClSe_2$ (M+H)$^+$: 494.8527, found: 494.8516 .



3z

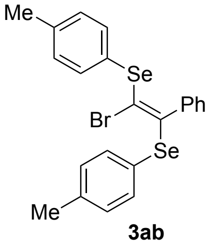
(*Z*)-(1-bromo-2-cyclopropylethene-1,2-diyl)bis(phenylselane) (**3z**)
This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (pure hexane) to yield the desired product as colorless oil (93%).
^{1}H NMR (400 MHz; CDCl$_3$): δ 7.55 – 7.51 (m, 2H), 7.51 – 7.47 (m, 2H), 7.35 – 7.32 (m, 3H), 7.30 – 7.26 (m, 3H), 1.85 – 1.77 (m, 1H), 0.76 – 0.68 (m, 4H).
^{13}C NMR (100 MHz; CDCl$_3$): δ 145.5, 133.0, 131.5, 130.8, 129.2, 129.1, 127.9, 127.4, 109.0, 20.0, 10.4.
HRMS: *m*/*z* (ESI) calculated for $C_{17}H_{15}BrSe_2$ (M+H)$^+$: 458.8761, found: 458.8748.



3aa

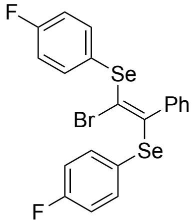
(*Z*)-(1-bromo-2-phenylethene-1,2-diyl)bis((4-methoxyphenyl)selane) (**3aa**)
This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (pure hexane) to yield the desired product as colorless oil (93%).
^{1}H NMR (400 MHz; CDCl$_3$): δ 7.40 (d, *J* = 8.8 Hz, 2H), 7.14 (d, *J* = 8.4 Hz, 2H), 7.10 – 7.04 (m, 3H), 6.95 – 6.90 (m, 2H), 6.83 (d, *J* = 8.8 Hz, 2H), 6.51 (d, *J* = 8.8 Hz, 2H), 3.80 (s, 3H), 3.68 (s, 3H).

^{13}C NMR (100 MHz; CDCl$_3$): δ 159.9, 159.8, 144.6, 139.2, 138.2, 136.0, 129.0, 127.6, 127.5, 127.5, 121.5, 120.1, 114.7, 113.0, 102.8, 55.2, 55.1.
HRMS: *m*/*z* (ESI) calculated for $C_{22}H_{19}BrO_2Se_2$ (M+Na)$^+$: 554.8972, found: 554.8971.



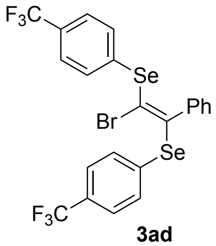
3ab

(*Z*)-(1-bromo-2-phenylethene-1,2-diyl)bis((4-fluorophenyl)selane) (**3ab**)
This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (pure hexane) to yield the desired product as colorless oil (93%).
^{1}H NMR (400 MHz; CDCl$_3$): δ 7.36 – 7.33 (m, 2H), 7.14 – 7.10 (m, 4H), 7.06 – 7.03 (m, 3H), 6.96 – 6.92 (m, 2H), 6.82 – 6.78 (m, 2H).
^{13}C NMR (100 MHz; CDCl$_3$): δ 145.9, 139.2, 138.3, 138.0, 136.4, 133.3, 129.9, 129.2, 129.0, 127.8, 127.5, 125.9, 102.1, 21.2, 21.1.
HRMS: *m*/*z* (ESI) calculated for $C_{22}H_{19}BrSe_2$ (M+H)$^+$: 522.9074, found 522.9057.



3ac

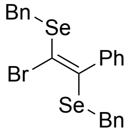
(*Z*)-(1-bromo-2-phenylethene-1,2-diyl)bis(*p*-tolylselane) (**3ac**)
This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (pure hexane) to yield the desired product as colorless oil (93%).
^{1}H NMR (400 MHz; CDCl$_3$): δ 7.45 – 7.41 (m, 2H), 7.23 – 7.18 (m, 2H), 7.09 – 7.09 (m, 3H), 7.03 – 6.98 (m, 2H), 6.92 – 6.99 (m, 2H), 6.69 (t, *J* = 8.8 Hz, 2H).
^{13}C NMR (100 MHz; CDCl$_3$): δ 162.9 (d, *J* = 248 Hz), 145.6, 138.8, 138.7 (d, *J* = 8.2 Hz), 135.8 (d, *J* = 7.5 Hz), 128.9, 127.8, 127.7, 125.8 (d, *J* = 2.2 Hz), 124.3 (d, *J* = 2.2 Hz), 116.3 (d, *J* = 21.7 Hz), 115.6 (d, *J* = 21.5 Hz), 102.0.
^{19}F NMR (376 MHz; CDCl$_3$): δ – 112.1, -112.9.
HRMS: *m*/*z* (ESI) calculated for $C_{20}H_{13}BrF_2Se_2$ (M+H)$^+$: 530.8572, found 530.8563.



3ad

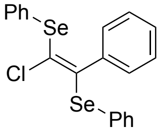
(*Z*)-(1-bromo-2-phenylethene-1,2-diyl)bis((4-(trifluoromethyl)phenyl)selane) (**3ad**)

This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (pure hexane) to yield the desired product as colorless oil (93%).
^{1}H NMR (400 MHz; CDCl$_3$): δ 7.54 (d, J = 8.4 Hz, 2H), 7.51 (d, *J* = 8.0 Hz, 2H), 7.36 (d, *J* = 8.0 Hz, 2H), 7.25 (d, *J* = 8.0 Hz, 2H), 7.07 – 7.00 (m, 3H), 6.93 – 6.89 (m, 2H).
^{13}C NMR (100 MHz; CDCl$_3$): δ 148.5, 138.6, 136.5, 133.9, 131.8, 130.5 (q, *J* = 216 Hz), 130.7 (q, *J* = 217 Hz), 128.8, 128.2, 127.9, 126.0 (q, *J* = 24 Hz), 125.2 (q, *J* = 24 Hz), 124.7 (q, *J* = 267 Hz), 122.9 (q, *J* = 267 Hz), 100.7, 77.0
^{19}F NMR (376 MHz; CDCl$_3$): δ -62.7, -63.0.
HRMS: *m/z* (ESI) calculated for $C_{22}H_{13}BrF_6Se_2$ (M+H)$^+$: 630.8508, found: 630.8507.



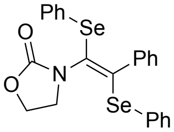
3af

(*Z*)-(1-bromo-2-phenylethene-1,2-diyl)bis(benzylselane) (**3af**)
This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (pure hexane) to yield the desired product as colorless oil (93%).
^{1}H NMR (400 MHz; CDCl$_3$): δ 7.30 – 7.13 (m, 11H), 7.01 – 6.97 (m, 2H), 6.66 – 6.62 (m, 2H), 4.00 (s, 2H), 3.34 (s, 2H).
^{13}C NMR (100 MHz; CDCl$_3$): δ 146.6, 139.5, 138.0, 136.9, 129.0, 128.9, 128.5, 128.4, 128.3, 128.1, 127.8, 126.9, 101.8, 34.0, 32.9.
HRMS: *m/z* (ESI) calculated for $C_{22}H_{19}BrSe_2$ (M+H)$^+$: 522.9074, found 522.9059.



3ag

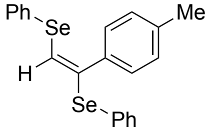
(*E*)-((1-phenyl)-2-chloroethene-1,2-diyl)bis(phenylselane) (**3ag**)
This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (pure hexane) to yield the desired product as colorless oil (93%).
^{1}H NMR (400 MHz; CDCl$_3$): δ 7.48 – 7.45 (m, 2H), 7.32 – 7.29 (m, 3H), 7.28 – 7.24 (m, 2H), 7.14 – 7.08 (m, 1H), 7.07 – 6.94 (m, 7H).
^{13}C NMR (100 MHz; CDCl$_3$): δ 142.4, 138.3, 136.4, 133.1, 130.3, 129.3, 129.1, 128.6, 128.4, 128.2, 127.9, 127.7, 127.5, 113.4.
HRMS: *m/z* (ESI) calculated for $C_{20}H_{14}BrClSe_2$ (M+H)$^+$: 450.9266, found 450.9265.



3ah

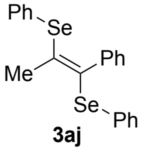
(*E*)-3-(2-phenyl-1,2-bis(phenylselanyl)vinyl)oxazolidin-2-one (**3ah**)
This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (pure hexane) to yield the desired product as colorless oil (93%).
^{1}H NMR (400 MHz; CDCl$_3$): δ 7.94 – 7.91 (m, 2H), 7.50 – 7.46 (m, 2H), 7.41 – 7.33 (m, 3H), 7.27 – 7.22 (m, 6H), 7.22 – 7.18 (m, 2H), 3.91 (t, *J* = 8.0 Hz, 2H), 2.99 (t, *J* = 8.0 Hz, 2H).

^{13}C NMR (100 MHz; CDCl$_3$): δ 154.0, 143.8, 132.7, 129.9, 129.2, 129.1, 129.0, 128.6, 128.5, 127.7, 127.2, 127.1, 125.7, 107.7, 43.2, 24.3.
HRMS: *m*/*z* (ESI) calculated for $C_{23}H_{19}NO_2Se_2$ (M+H)$^+$: 501.9819, found 501.9823.



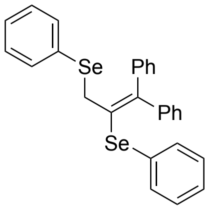
3ai

(*E*)-(1-(*p*-tolyl)ethene-1,2-diyl)bis(phenylselane) (**3ai**)
This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (pure hexane) to yield the desired product as colorless oil (93%).
^{1}H NMR (400 MHz; CDCl$_3$): δ 7.49 – 7.46 (m, 2H), 7.43 – 7.37 (m, 4H), 7.25 – 7.18 (m, 8H), 7.12 (d, *J* = 8.0 Hz, 2H), 2.31 (s, 3H).
^{13}C NMR (100 MHz; CDCl$_3$): δ 138.23, 136.60, 132.94, 132.02, 131.30, 130.84, 130.65, 129.20,129.15, 128.96, 128.51, 127.35, 127.32, 125.31, 21.31.
HRMS: *m*/*z* (ESI) calculated for $C_{21}H_{18}Se_2$ (M+H)$^+$: 430.9812, found: 430.9825.



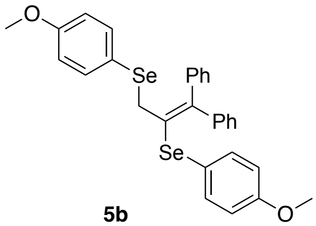
3aj

(*E*)-(1-phenylprop-1-ene-1,2-diyl)bis(phenylselane) (**3aj**)
This compound was prepared following general procedure **2.2**, and crude mixture was purified using flash chromatography (pure hexane) to yield the desired product as colorless oil (93%).
^{1}H NMR (400 MHz; CDCl$_3$): δ 7.52 – 7.48 (m, 2H), 7.32 – 7.22 (m, 5H), 7.18 – 7.07 (m, 8H), 2.30 (s, 3H).
^{13}C NMR (100 MHz; CDCl$_3$): δ 141.9, 135.1, 133.3, 132.4, 130.6, 129.9, 129.6, 129.3, 129.0, 128.7, 127.9, 127.7, 127.3, 127.0, 25.8.
HRMS: *m*/*z* (ESI) calculated for $C_{21}H_{18}Se_2$ (M+H)$^+$: 430.9812, found: 430.9815.



5a

(3,3-diphenylprop-2-ene-1,2-diyl)bis(phenylselane) (**5a**)
This compound was prepared following general procedure **2.3**, and crude mixture was purified using flash chromatography (Hexanes/DCM = 10:1) to yield the desired product as colorless oil (82%).
^{1}H NMR (400 MHz, CDCl$_3$) δ 7.49 – 7.54 (m, 2H), 7.28 – 7.34 (m, 2H), 7.17 – 7.26 (m, 10H), 7.11 – 7.16 (m, 2H), 7.05 – 7.10 (m, 2H), 6.96 – 7.02 (m, 2H), 3.87 (s, 2H).
^{13}C NMR (101 MHz, CDCl$_3$) δ 146.57, 143.01, 141.13, 134.42, 130.95, 130.11, 129.67, 129.26, 129.22, 128.96, 128.75, 128.10, 128.10, 127.84, 127.54, 127.38, 127.28, 127.13, 34.11.
HRMS: *m*/*z* (ESI) calculated for $C_{27}H_{22}Se_2$ (M+H)$^+$: 528.9944, found: 528.9949.



5b

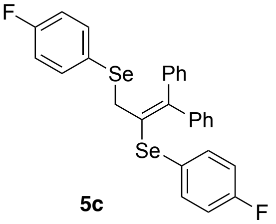
(3,3-diphenylprop-2-ene-1,2-diyl)bis(phenylselane) (**5b**)

This compound was prepared following general procedure **2.3**, and crude mixture was purified using flash chromatography (Hexanes/DCM = 10:1) to yield the desired product as colorless oil (94%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.50 (d, J = 8.7 Hz, 2H), 7.32 – 7.31 (m, 6H), 7.19 – 7.14 (m, 3H), 7.10 (dd, J = 7.9, 1.7 Hz, 2H), 6.90 (dd, J = 6.6, 2.9 Hz, 2H), 6.77 (d, J = 8.7 Hz, 2H), 6.69 (d, J = 8.7 Hz, 2H), 3.79 (s, 3H), 3.77 (s, 3H), 3.70 (s, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 159.73, 159.57, 144.36, 143.04, 141.34, 137.27, 137.01, 131.98, 129.29, 127.95, 127.91, 127.50, 127.36, 126.84, 119.80, 119.59, 114.62, 114.42, 55.26, 33.89.

HRMS: *m*/*z* (ESI) calculated for $C_{29}H_{26}O_2Se_2$ $(M+H)^+$: 567.0336, found: 527.0342.



5c

(3,3-diphenylprop-2-ene-1,2-diyl)bis((4-fluorophenyl)selane) (**5c**)

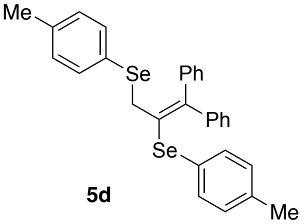
This compound was prepared following general procedure **2.3**, and crude mixture was purified using flash chromatography (Hexanes/DCM = 10:1) to yield the desired product as colorless oil (82%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.48 (dd, J = 8.4, 5.6 Hz, 2H), 7.35 – 7.29 (m, 2H), 7.27 – 7.17 (m, 6H), 7.04 (dd, J = 7.3, 2.2 Hz, 2H), 6.95 – 6.89 (m, 4H), 6.85 (t, J = 8.7 Hz, 2H), 3.79 (s, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 163.9 (d, *J* = 11 Hz), 161.5 (d, *J* = 16 Hz), 147.6, 142.8, 141.0, 137.0 (d, *J* = 37 Hz), 136.9 (d, *J* = 37 Hz), 131.1, 129.24, 129.17, 128.10, 127.94, 127.5, 127.2, 124.4 (d, *J* = 35 Hz), 123.8 (d, *J* = 33 Hz), 116.1 (d, *J* = 217 Hz), 115.9 (d, *J* = 216 Hz), 34.4.

^{19}F NMR (376 MHz, $CDCl_3$) δ -113.40, -113.42, -113.43, -113.43, -113.44, -113.45, -113.46, -113.47, -113.48, -114.00, -114.01, -114.02, -114.03, -114.03, -114.04, -114.05, -114.06, -114.07.

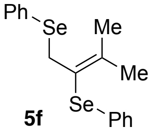
HRMS: *m*/*z* (ESI) calculated for $C_{27}H_{20}F_2Se_2$ $(M+H)^+$: 542.9936, found: 542.9941.



5d

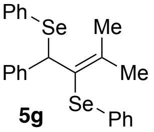
(3,3-diphenylprop-2-ene-1,2-diyl)bis(p-tolylselane) (**5d**)

This compound was prepared following general procedure **2.3**, and crude mixture was purified using flash chromatography (Hexanes/DCM = 10:1) to yield the desired product as colorless oil (91%).
^{1}H NMR (400 MHz, CDCl$_3$) δ 7.46 (d, J = 8.1 Hz, 2H), 7.30 – 7.17 (m, 9H), 7.12 (dd, J = 7.9, 1.8 Hz, 2H), 7.05 (d, J = 7.8 Hz, 2H), 7.01 – 6.91 (m, 4H), 3.81 (s, 2H), 2.32 (s, 3H), 2.30 (s, 3H).
^{13}C NMR (101 MHz, CDCl$_3$) δ 145.42, 143.07, 141.24, 137.73, 137.25, 135.00, 134.75, 131.41, 129.76, 129.48, 129.25, 128.10, 127.96, 127.83, 127.33, 126.93, 126.07, 125.93, 33.88, 21.16, 21.10.
HRMS: *m/z* (ESI) calculated for $C_{29}H_{26}Se_2$ (M+H)$^+$: 535.0438, found: 535.0443.



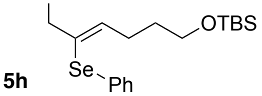
5f

(3-methylbut-2-ene-1,2-diyl)bis(phenylselane) (**5f**)
This compound was prepared following general procedure **2.3**, and crude mixture was purified using flash chromatography (Hexanes/DCM = 10:1) to yield the desired product as colorless oil (84%).
^{1}H NMR (400 MHz, CDCl$_3$) δ 7.52 – 7.46 (m, 2H), 7.44 – 7.37 (m, 2H), 7.28 – 7.17(m, 6H), 3.88 (s, 2H), 1.98 (s, 3H), 1.65 (s, 3H).
^{13}C NMR (101 MHz, CDCl$_3$) δ 141.89, 134.55, 131.57, 131.29, 130.11, 129.05, 128.70, 127.35, 126.46, 122.06, 34.66, 25.78, 20.57.
HRMS: *m/z* (ESI) calculated for $C_{17}H_{18}Se_2$ (M)$^+$: 381.9739, found: 381.9719.



5g

(3-methyl-1-phenylbut-2-ene-1,2-diyl)bis(phenylselane) (**5g**)
This compound was prepared following general procedure **2.3**, and crude mixture was purified using flash chromatography (Hexanes/DCM = 10:1) to yield the desired product as colorless oil (40%).
^{1}H NMR (400 MHz, CDCl$_3$) δ 7.55 – 7.45 (m, 4H), 7.28 – 7.13 (m, 6H), 7.10 – 7.02 (m, 5H), 5.81 (s, 1H), 1.83 (s, 3H), 1.74 (s, 3H).
^{13}C NMR (101 MHz, CDCl$_3$) δ 141.27, 140.42, 135.20, 133.08, 131.50, 130.51, 129.68, 129.16, 128.89, 128.79, 128.66, 128.62, 128.23, 128.09, 127.77, 127.06, 125.53, 54.40, 26.38, 20.99.
HRMS: *m/z* (ESI) calculated for $C_{23}H_{22}Se_2$ (M+H)$^+$: 459.0125, found: 459.0129.



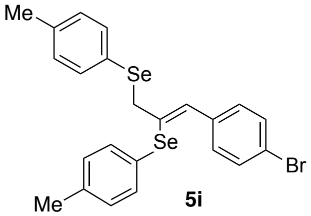
5h

(*Z*)-((5,6-bis(phenylselanyl)hex-4-en-1-yl)oxy)(tert-butyl)dimethylsilane (**5h**)
This compound was prepared following general procedure **2.3**, and crude mixture was purified using flash chromatography (Hexanes/DCM = 10:1) to yield the unseparated mixture products with Z/E = 1.7:1 as colorless oil (96%).
^{1}H NMR (400 MHz, CDCl$_3$) δ 7.55 – 7.51 (m, 1H), 7.50 – 7.46 (m, 1H), 7.46 – 7.40 (m, 2H), 7.31 – 7.14 (m, 6H), 5.94 (t, J = 7.5 Hz, 0.39H), 5.77 (t, J = 7.1 Hz, 0.66H), 3.77 (s, 0.82H), 3.69 (s,

1.34H), 3.51 (t, J = 6.4 Hz, 2H), 2.25 (q, J = 7.4 Hz, 1.28H), 1.92 (q, J = 7.5 Hz, 0.85H), 1.51 – 1.40 (m, 2H), 0.88 (s, 9H), 0.02 (s, 6H).

^{13}C NMR (101 MHz, CDCl$_3$) δ 139.87, 137.61, 134.55, 134.08, 132.82, 132.59, 129.06, 128.77, 127.26, 126.90, 62.42, 37.83, 32.15, 28.48, 25.91, 18.24, -5.30.

HRMS: *m/z* (ESI) calculated for $C_{24}H_{34}OSe_2Si$ $(M+H)^+$: 527.0782, found: 527.0787.



5i

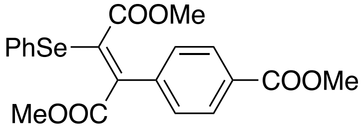
(*Z*)-(3-(4-bromophenyl)prop-2-ene-1,2-diyl)bis(p-tolylselane) (**5i**)

This compound was prepared following general procedure **2.3**, and crude mixture was purified using flash chromatography (Hexanes/DCM = 10:1) to yield the unseparated mixture products with E/Z = 2:1 as white solide (94%).

^{1}H NMR (400 MHz, CDCl$_3$) δ 7.54 (d, *J* = 8.0 Hz, 0.7H), 7.48 (d, *J* = 8.0 Hz, 1.4H), 7.44 (d, *J* = 8.4 Hz, 1.5H), 7.39 (t, *J* = 8.2 Hz, 2.9H), 7.20 (d, *J* = 8.4 Hz, 1.3H), 7.15 (d, *J* = 7.9 Hz, 0.9H), 7.10 (d, *J* = 7.9 Hz, 1.5H), 7.07-7.05 (m, 1.8H), 7.02 (t, *J* = 7.7 Hz, 1.2H), 6.65 (s, 0.33H), 6.52 (s, 0.64H), 3.94 (s, 0.68H), 3.68 (s, 1.3H), 2.37 (s, 1.3H), 2.36 (s, 2.0H), 2.35 (s, 1.2H), 2.34 (s, 2.0H),

^{13}C NMR (101 MHz, CDCl$_3$) δ 138.27, 138.22, 137.68, 137.61, 135.8, 135.5, 135.11, 135.10, 135.04, 134.2, 133.0, 131.9, 131.3, 131.0, 130.7, 130.4, 130.15, 129.99, 129.76, 129.74, 129.61, 125.9, 125.1, 124.1, 121.1, 120.9, 77.0, 38.0, 31.7, 21.16, 21.11

HRMS: *m/z* (ESI) calculated for $C_{23}H_{21}BrSe_2$ $(M+H)^+$: 536.9230, found: 536.9229.



6

Dimethyl 2-(4-(methoxycarbonyl)phenyl)-3-(phenylselanyl)fumarate (**6**)

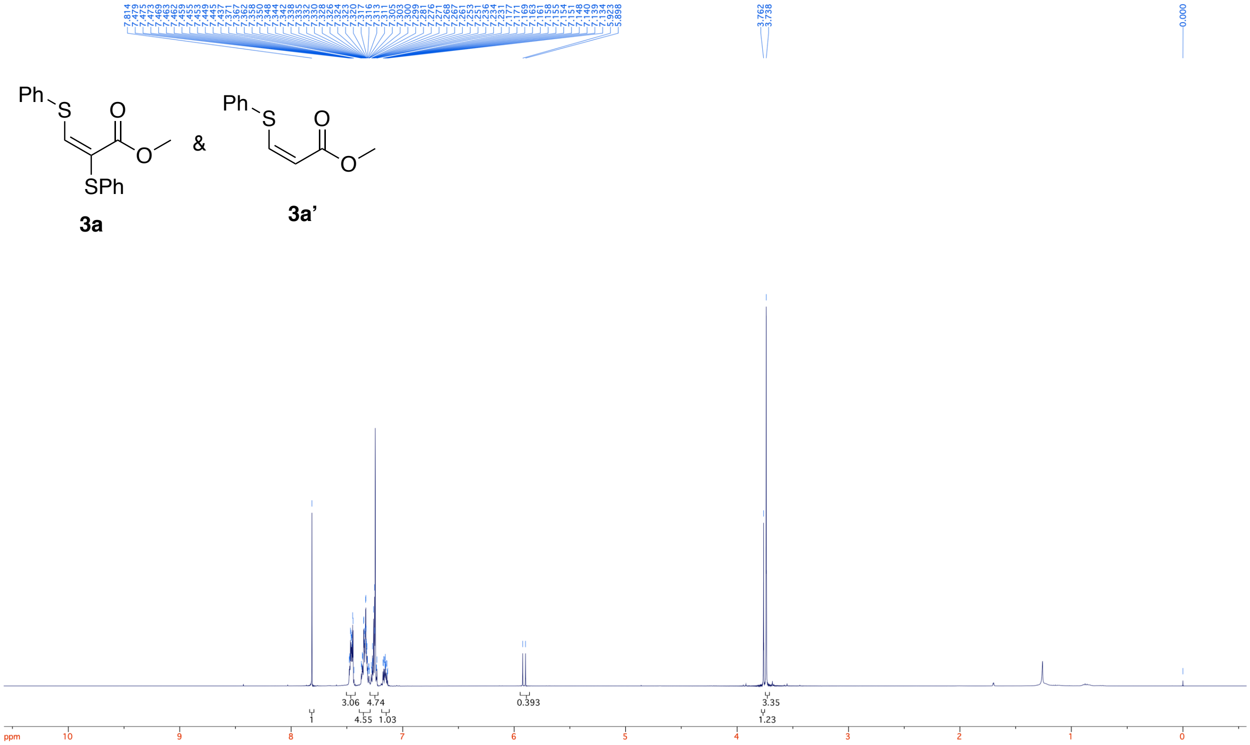
This compound was prepared following general procedure **2.4**, and crude mixture was purified using flash chromatography (Hexanes/DCM = 10:1) to yield the desired product as colorless oil (75%).

^{1}H NMR (400 MHz, CDCl$_3$) δ 7.96 (d, *J* = 8.3 Hz, 2H), 7.67 (d, *J* = 7.0 Hz, 2H), 7.43 – 7.35 (m, 1H), 7.35 – 7.27 (m, 4H), 3.90 (s, 3H), 3.79 (s, 3H), 2.84 (s, 3H).

^{13}C NMR (101 MHz, CDCl$_3$) δ 166.70, 166.51, 164.43, 150.83, 140.53, 137.50, 132.58, 129.69, 129.66, 129.13, 128.78, 128.03, 126.33, 52.72, 52.15, 51.55.

HRMS: *m/z* (ESI) calculated for $C_{20}H_{18}O_6Se$ $(M)^+$: 434.0269, found: 434.0285.

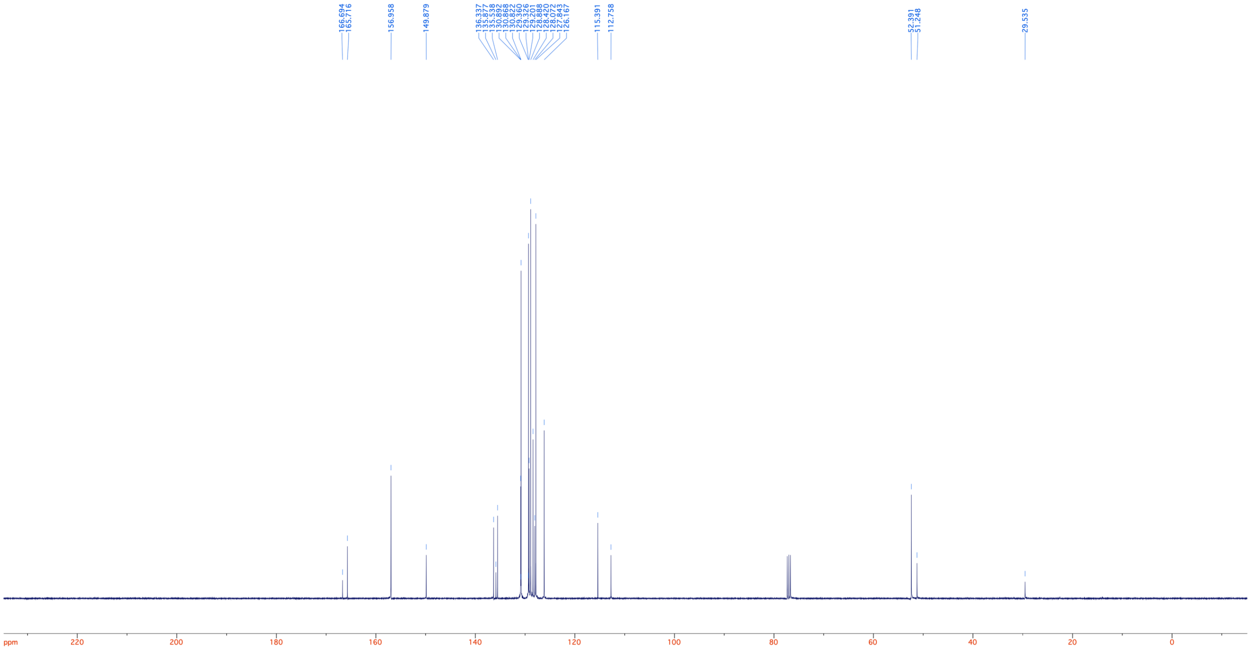
VI. NMR Spectra

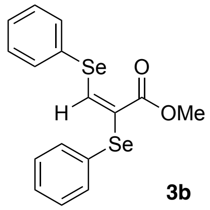


3a

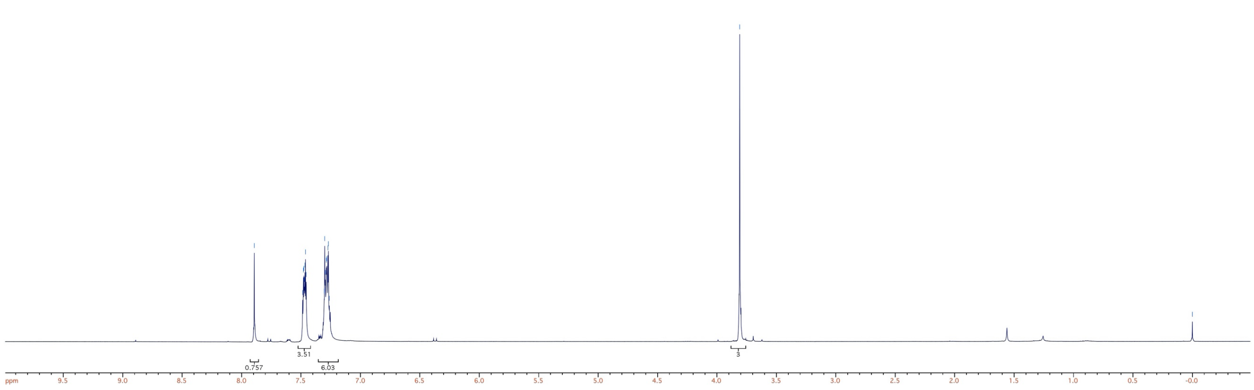
&

3a'




Se
O
H
OMe
Se

3b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7.273
7.269
7.262
3.809
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0.757
3.51
6.03
3
ppm
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7.5
7.0
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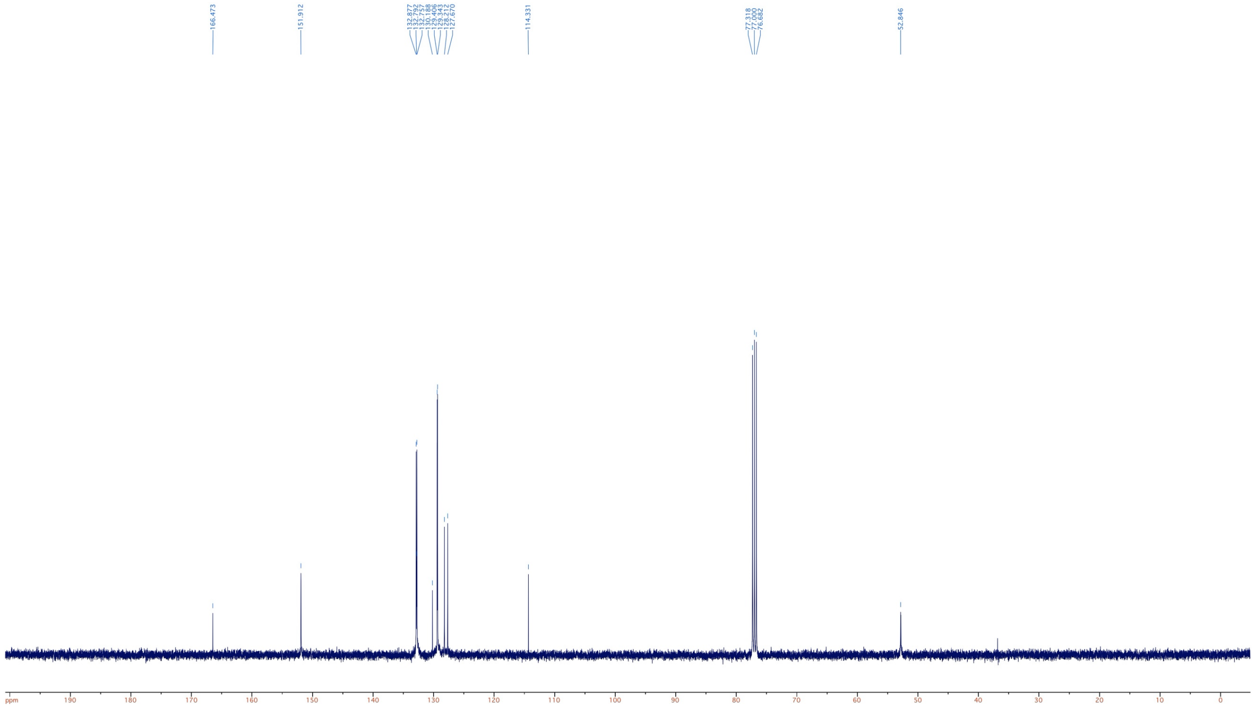
-0.0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77.000
76.682
52.846
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150
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70
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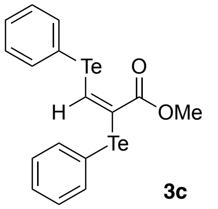
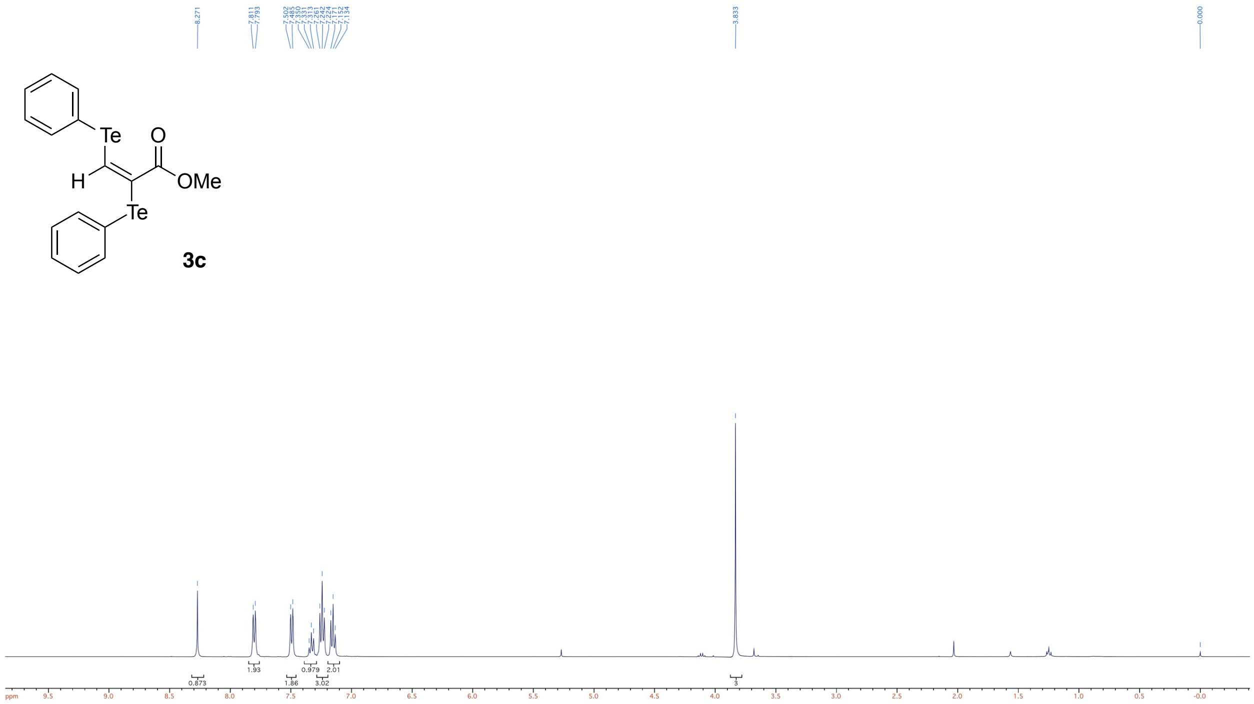
30
20
10
0


Te
O
H
OMe
Te

3c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7.313
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7.152
7.134
3.833
0.000
0.873
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1.86
0.979
3.02
2.01
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ppm
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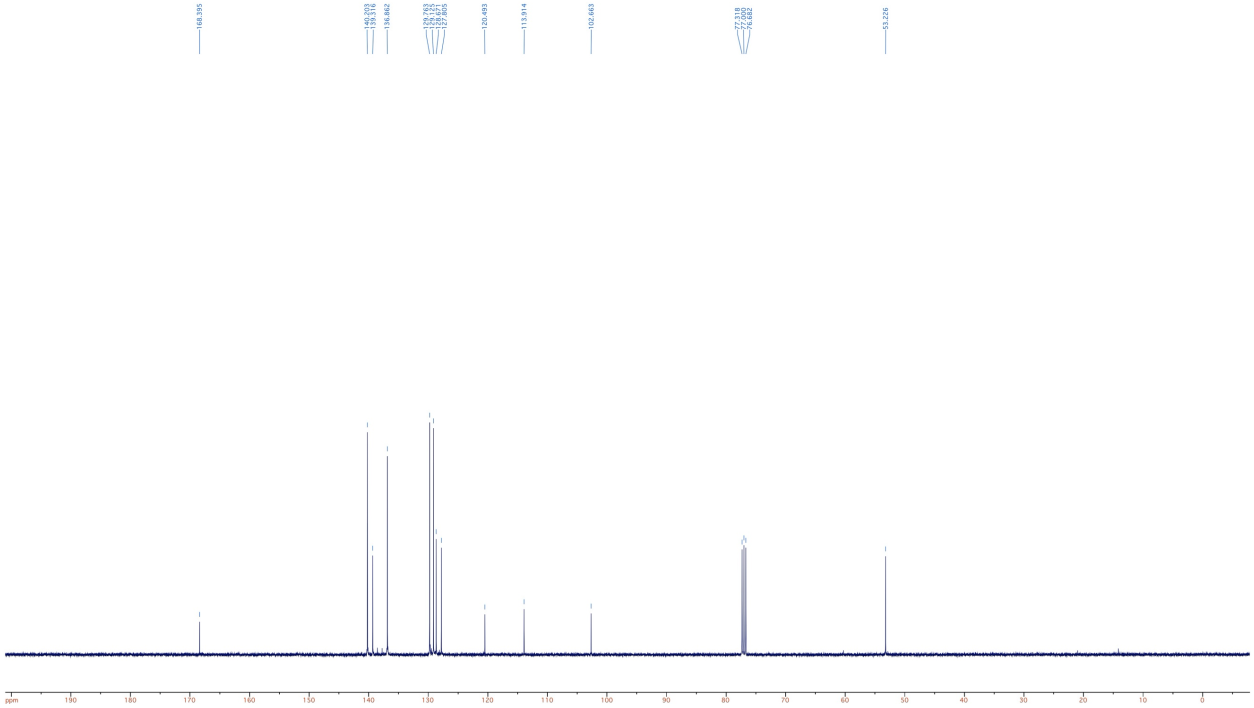
-0.0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77.000
76.682
53.226
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150
140
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70
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50
40
30
20
10
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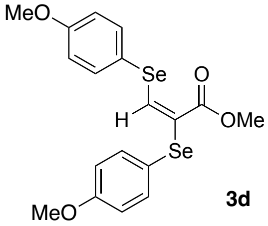
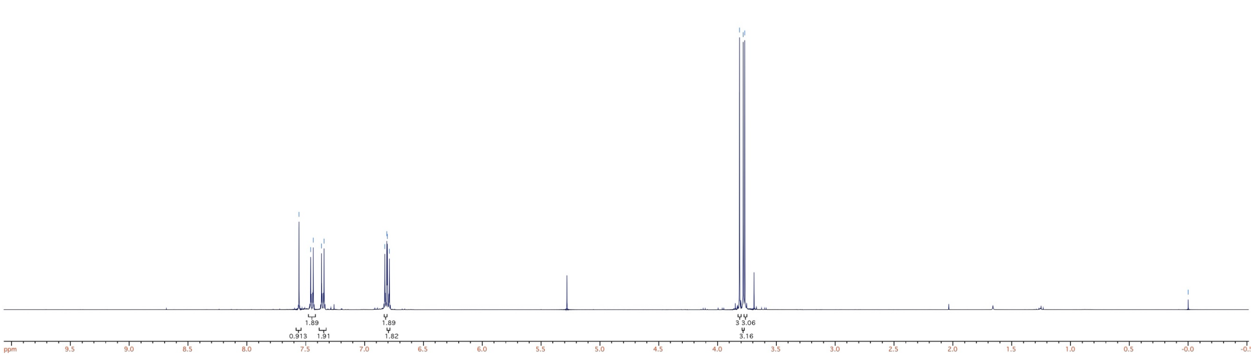

MeO
Se
O
H
OMe
Se
MeO

3d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1.89
1.82
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3.16
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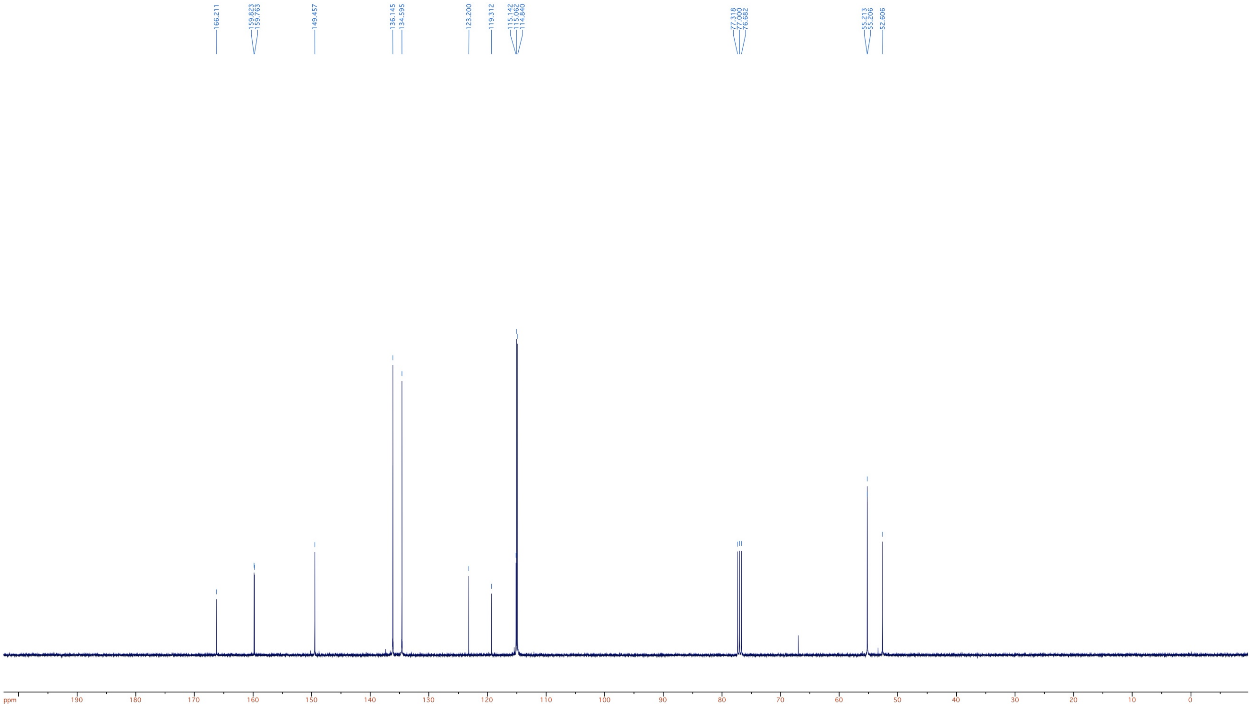
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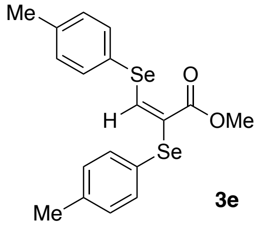
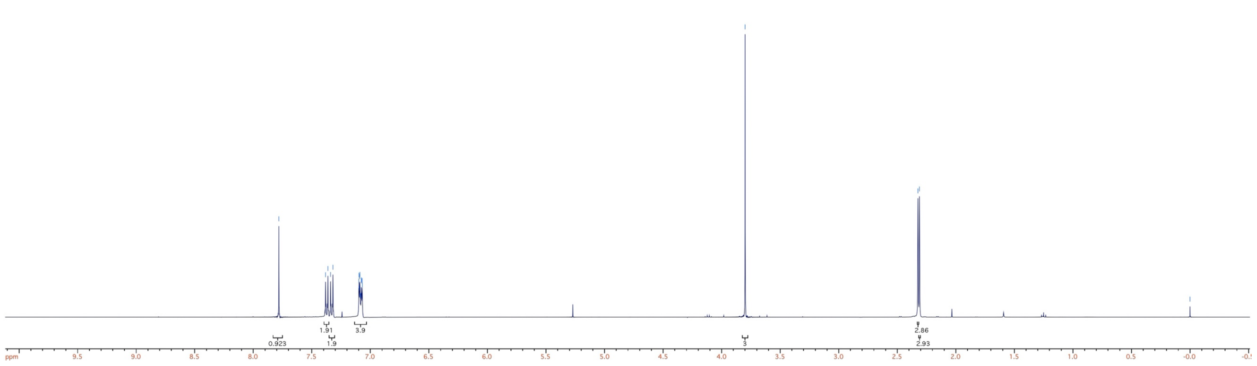

Me
Se
O
H
OMe
Se
Me

3e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7.076
7.070
7.069
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1.9
3.9
3
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2.93
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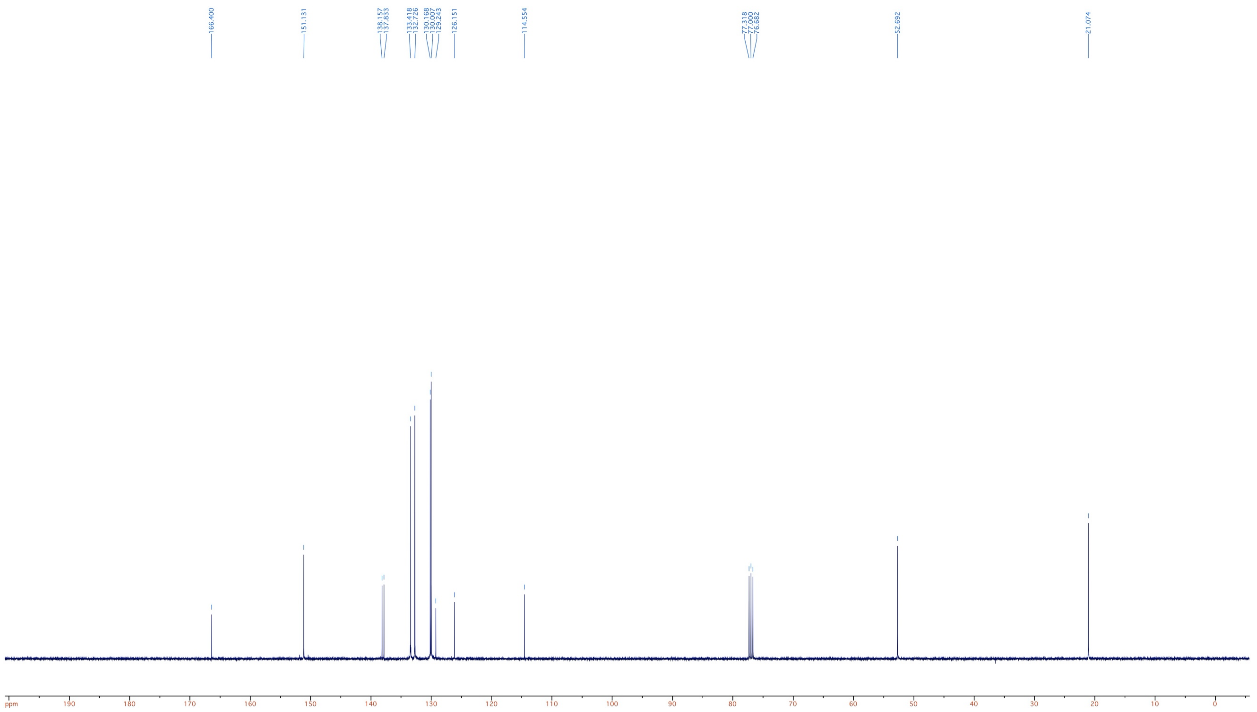
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21.074
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70
60
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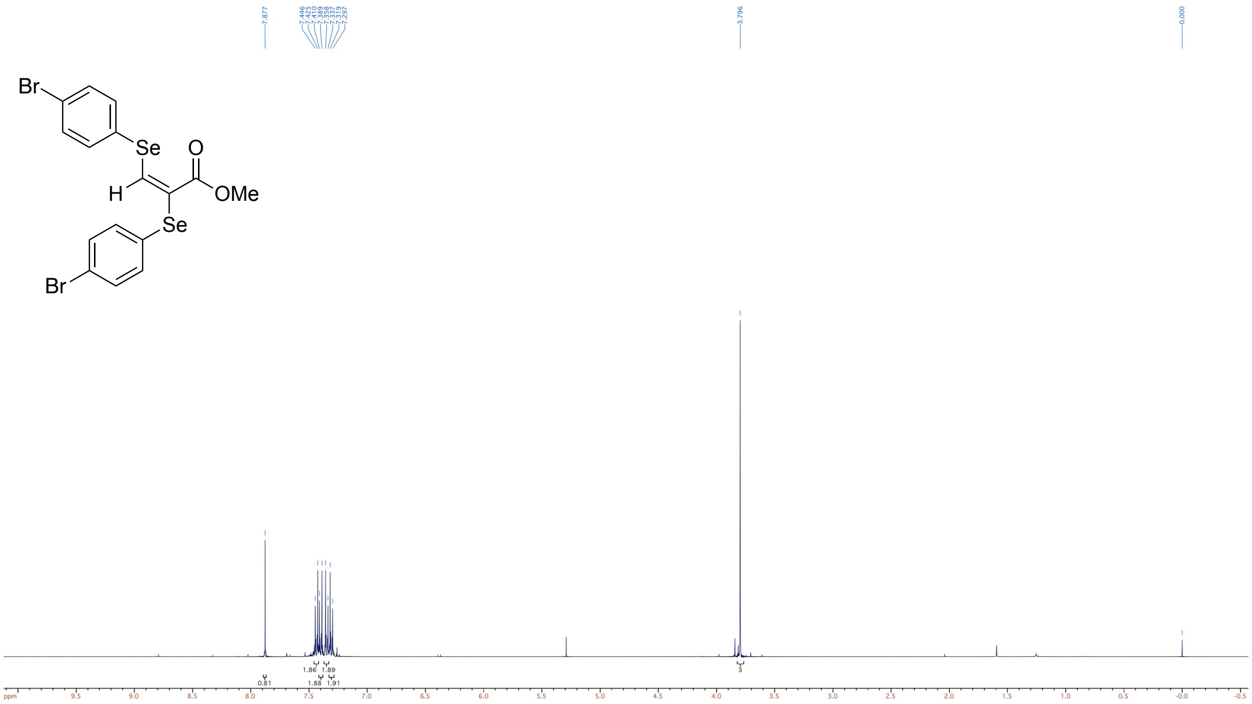
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Se
O
H
OMe
Se
Br
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7.297
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1.89
0.81
1.88
1.91
3
ppm
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9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
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4.5
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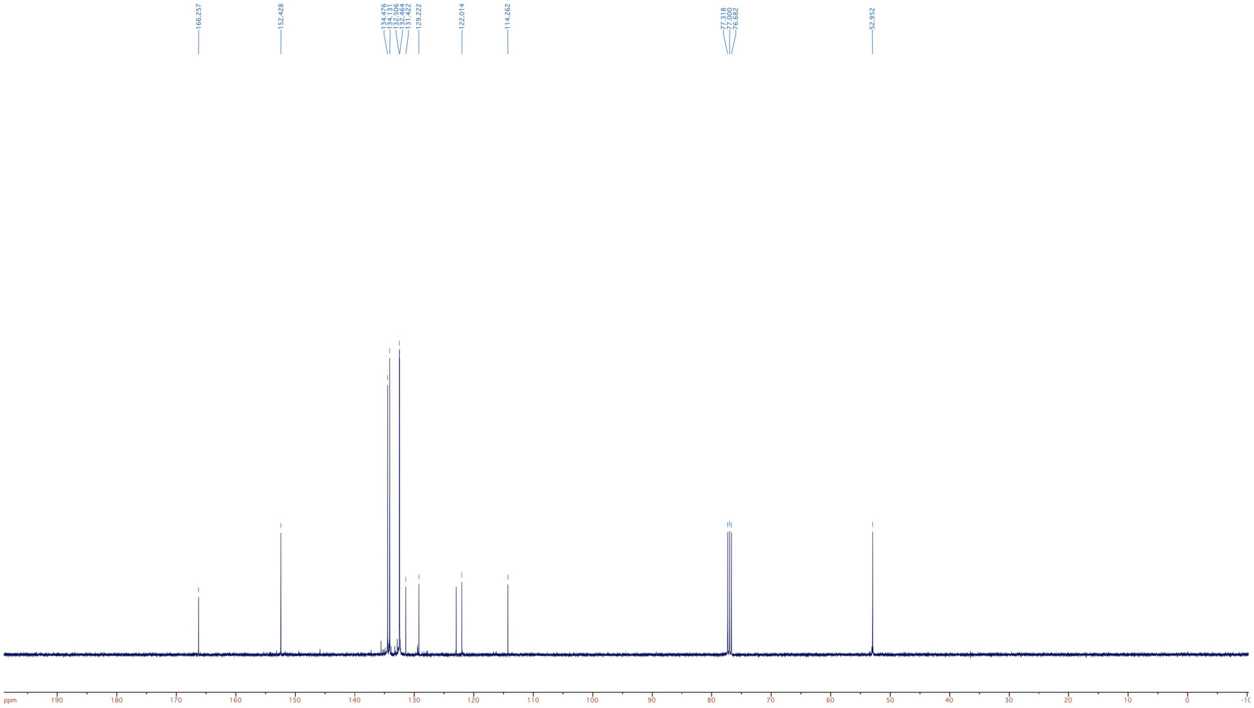
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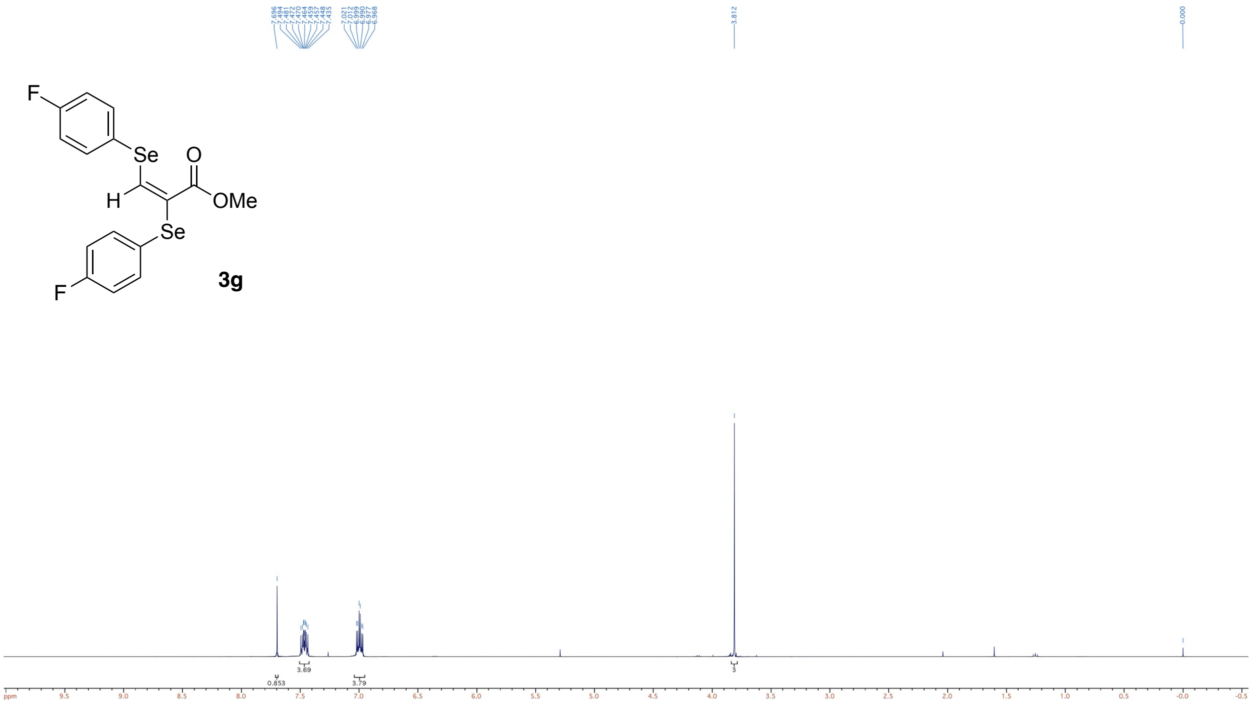
F
Se
O
H
OMe
Se
F

3g

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7.448
7.435
7.021
7.012
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6.990
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5.5
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2.5
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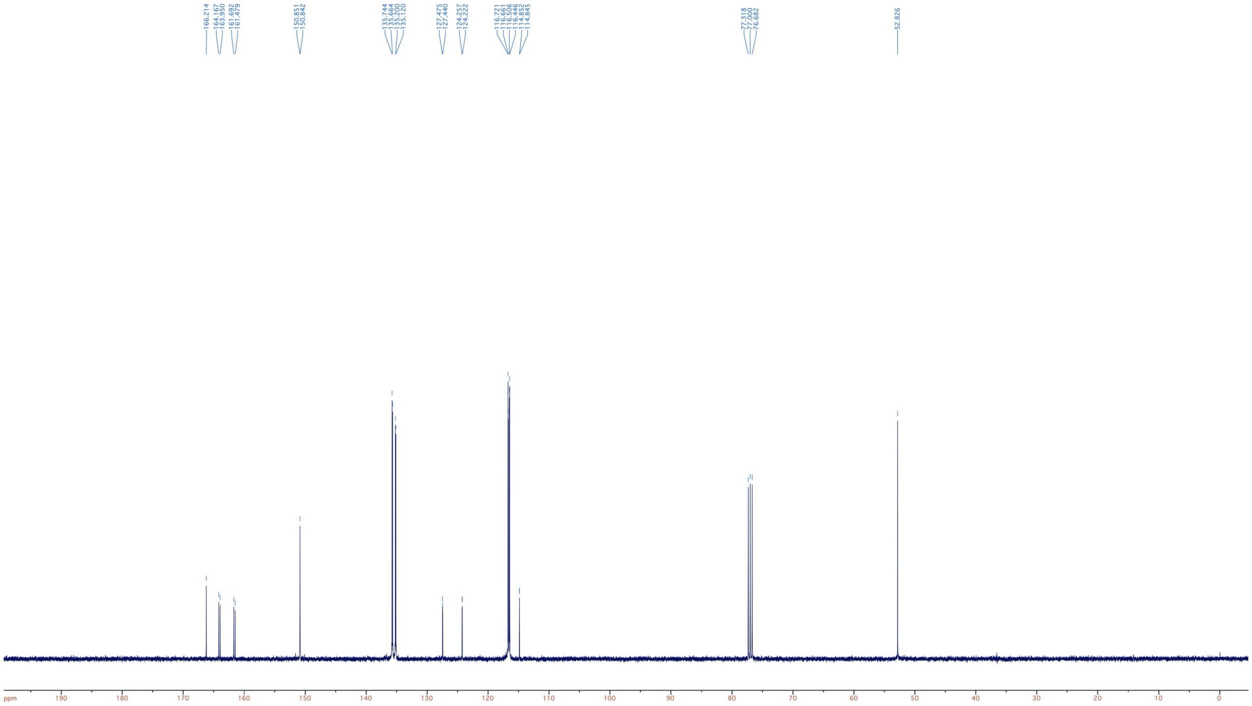
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127.440
124.257
124.222
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114.852
114.845
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77.000
76.682
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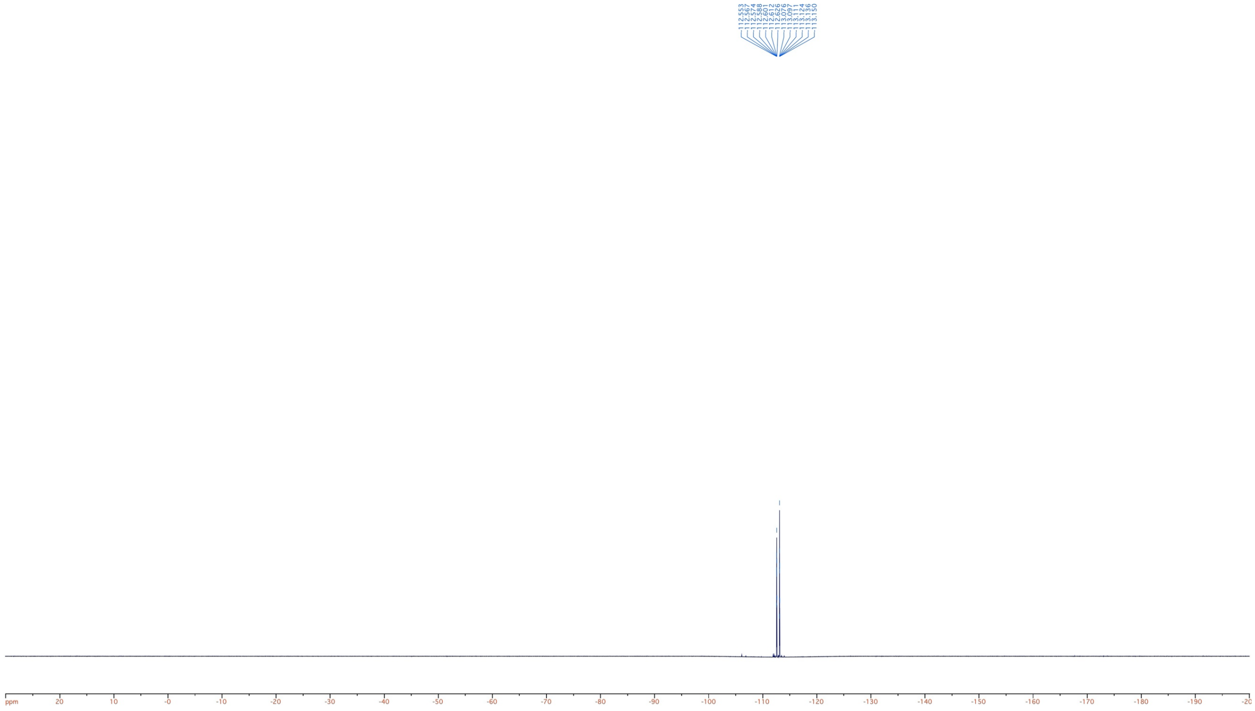
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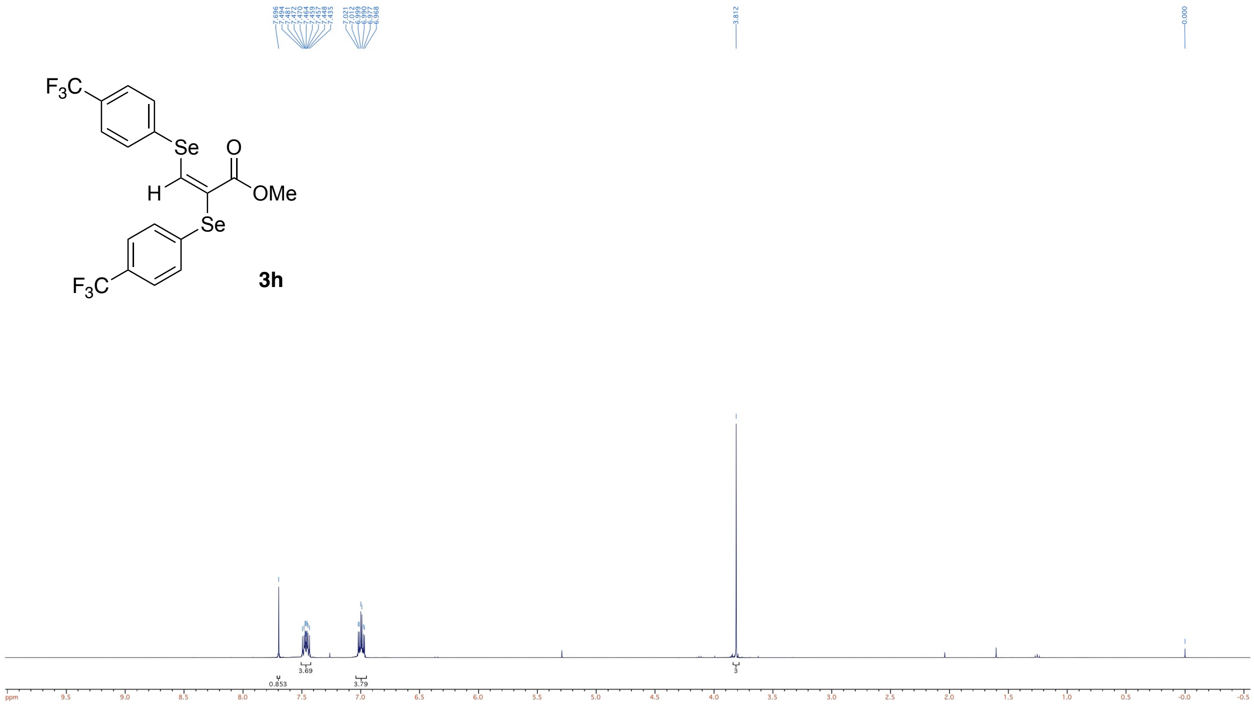
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F_3C
Se
O
H
OMe
Se
F_3C
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3.79
3
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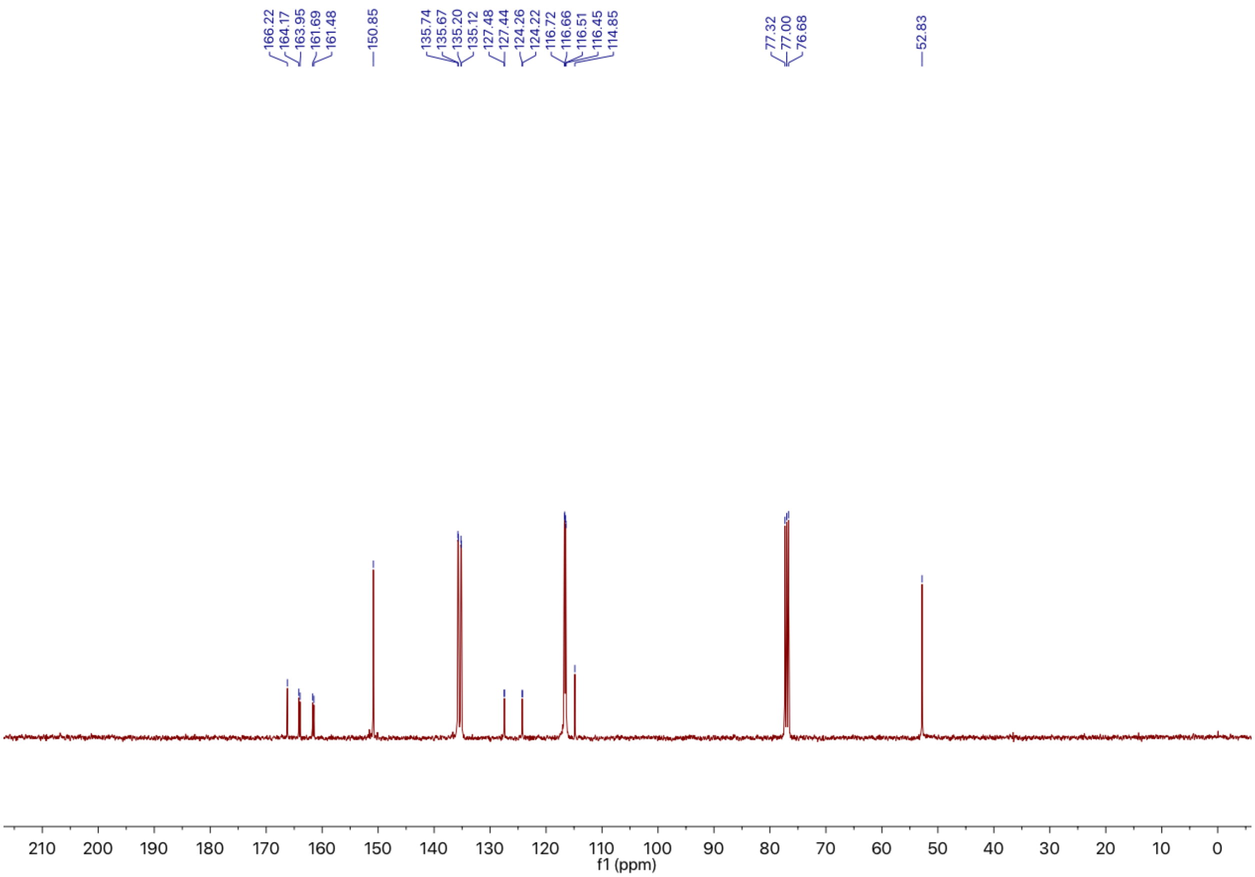
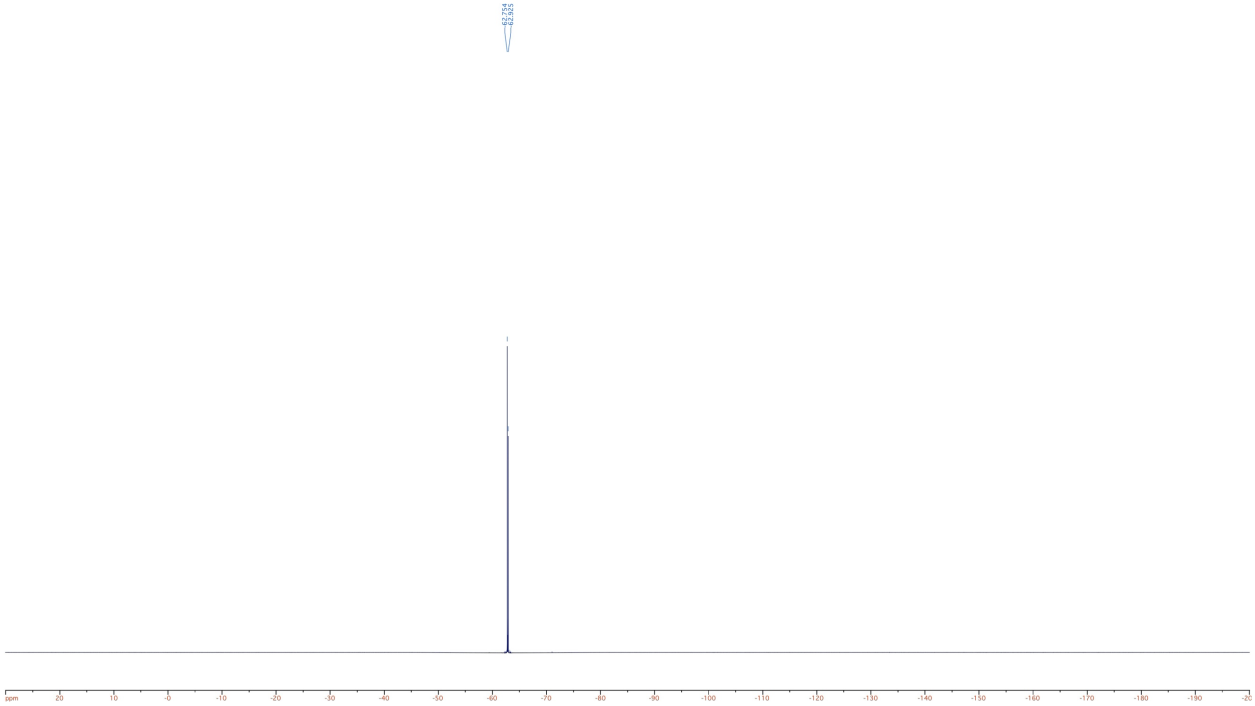
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
-0.0
-0.5

3h


166.22
164.17
163.95
161.69
161.48
150.85
135.74
135.67
135.20
135.12
127.48
127.44
124.26
124.22
116.72
116.66
116.51
116.45
114.85
77.32
77.00
76.68
52.83
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


-62.754
-62.925
ppm
20
10
-0
-10
-20
-30
-40
-50
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-70
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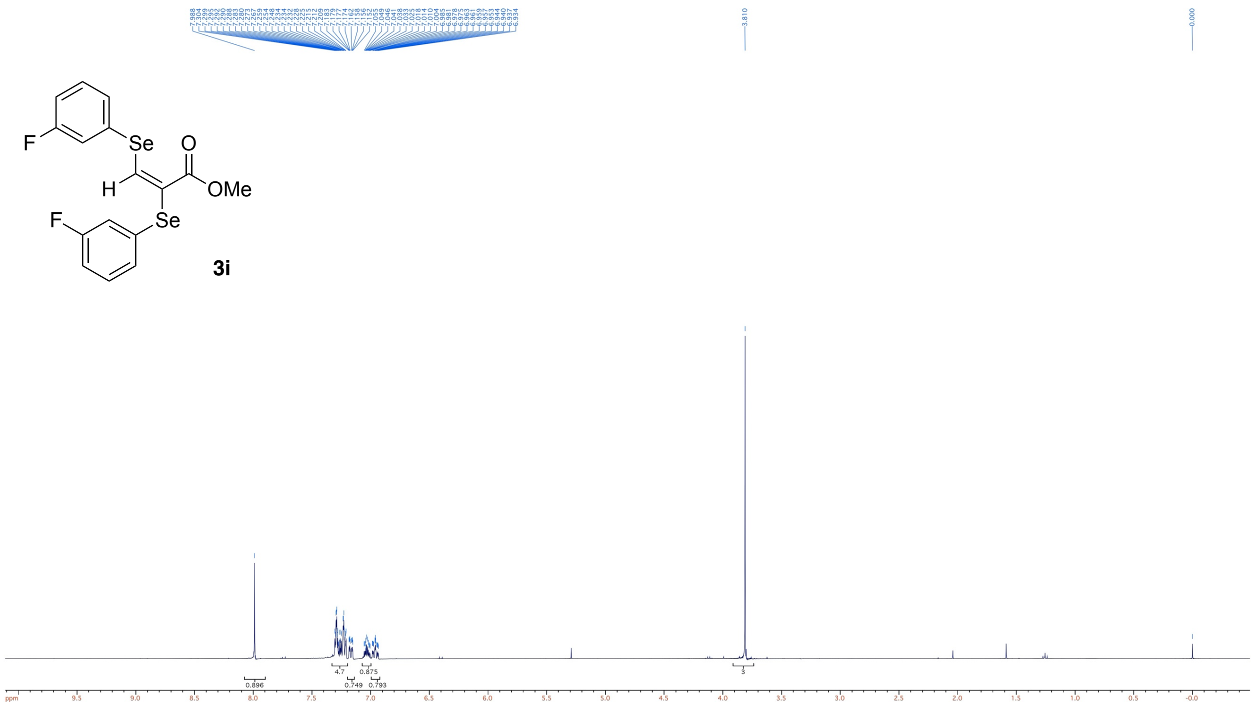
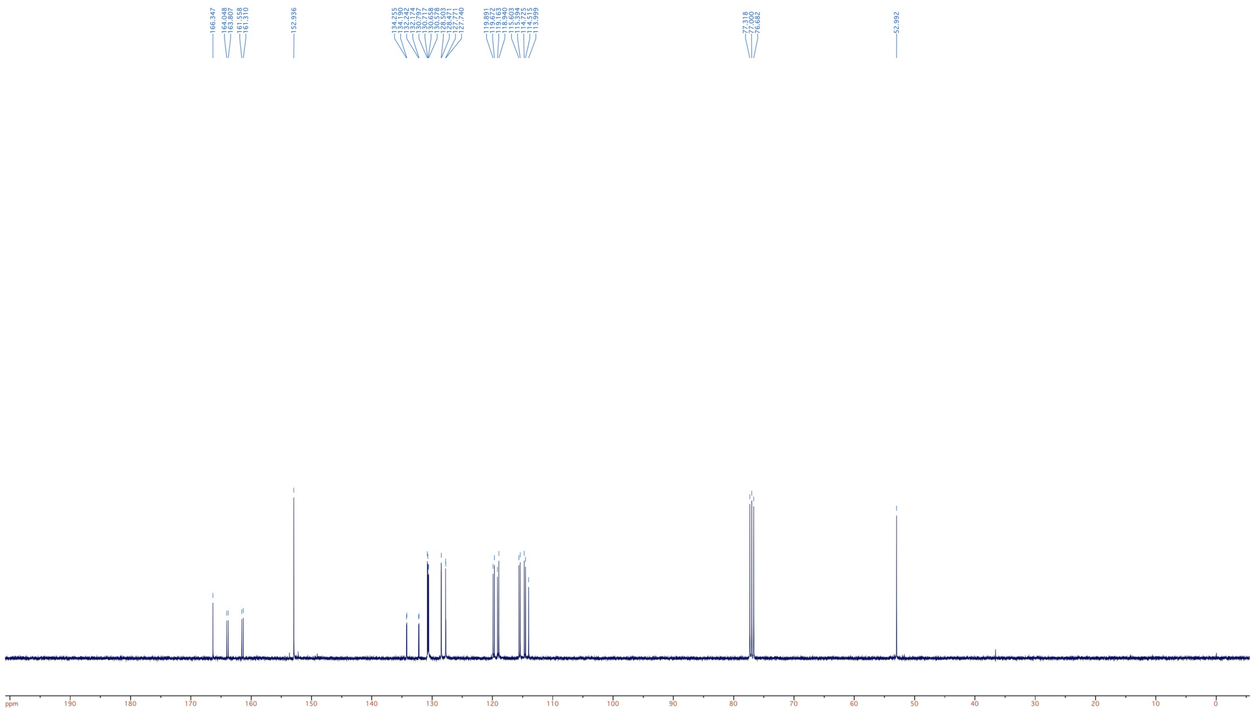
-90
-100
-110
-120
-130
-140
-150
-160
-170
-180
-190
-20


7.988
7.304
7.299
7.295
7.292
7.290
7.288
7.283
7.280
7.273
7.267
7.259
7.254
7.248
7.234
7.232
7.228
7.225
7.215
7.212
7.209
7.183
7.179
7.177
7.174
7.162
7.158
7.156
7.152
7.055
7.049
7.046
7.041
7.038
7.033
7.025
7.018
7.014
7.010
7.004
6.985
6.981
6.978
6.975
6.963
6.961
6.959
6.957
6.953
6.944
6.940
6.937
6.934
3.810
0.000
F
Se
O
H
OMe
F
Se
0.896
4.7
0.749
0.875
0.793
3
ppm
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
-0.0

3i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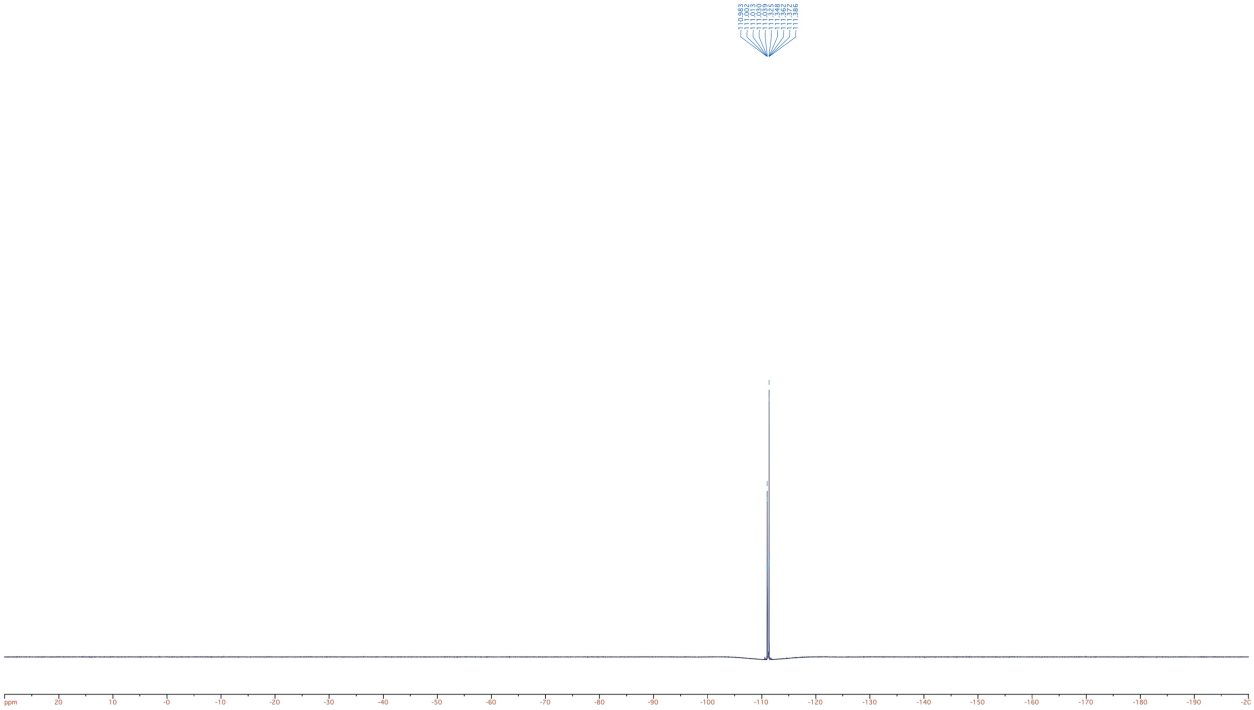
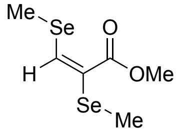
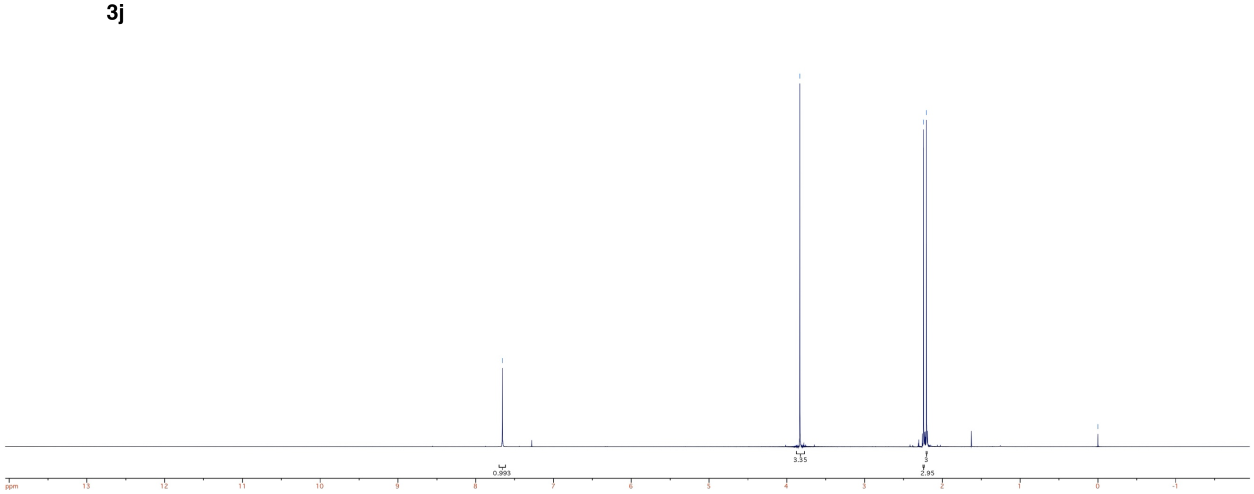
164.048
163.807
161.558
161.310
152.936
134.255
134.190
132.242
132.174
130.797
130.717
130.658
130.578
128.503
128.471
127.771
127.740
119.891
119.672
119.163
118.940
115.603
115.394
114.725
114.515
113.999
77.318
77.000
76.682
52.992
ppm
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0


-110.983
-111.002
-111.013
-111.030
-111.039
-111.325
-111.348
-111.362
-111.372
-111.386
ppm
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
-170
-180
-190
-20

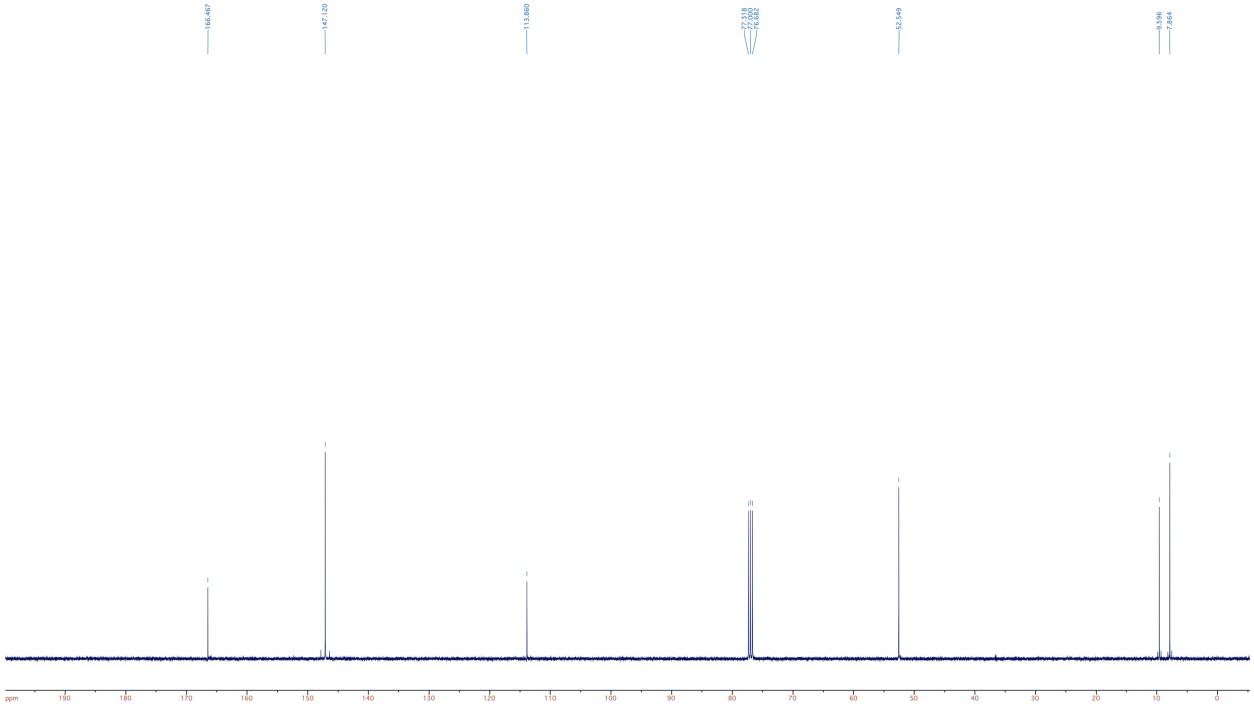


Me
Se
O
H
OMe
Se
Me

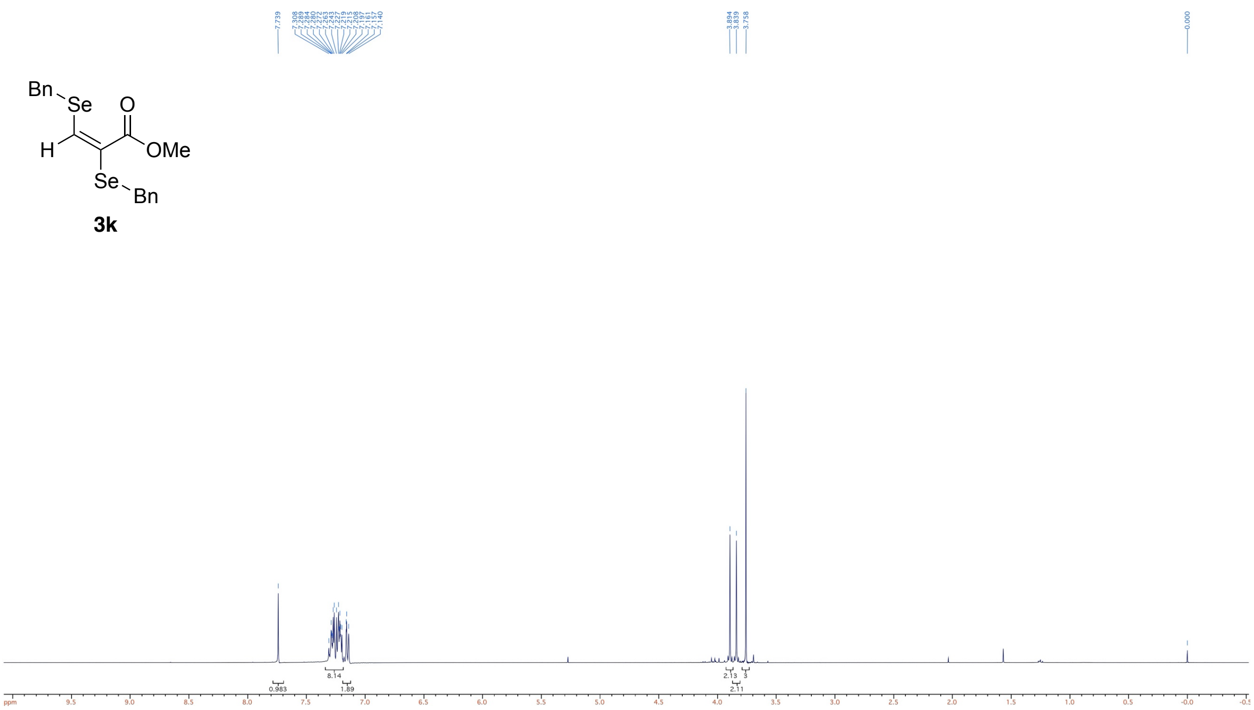
3j



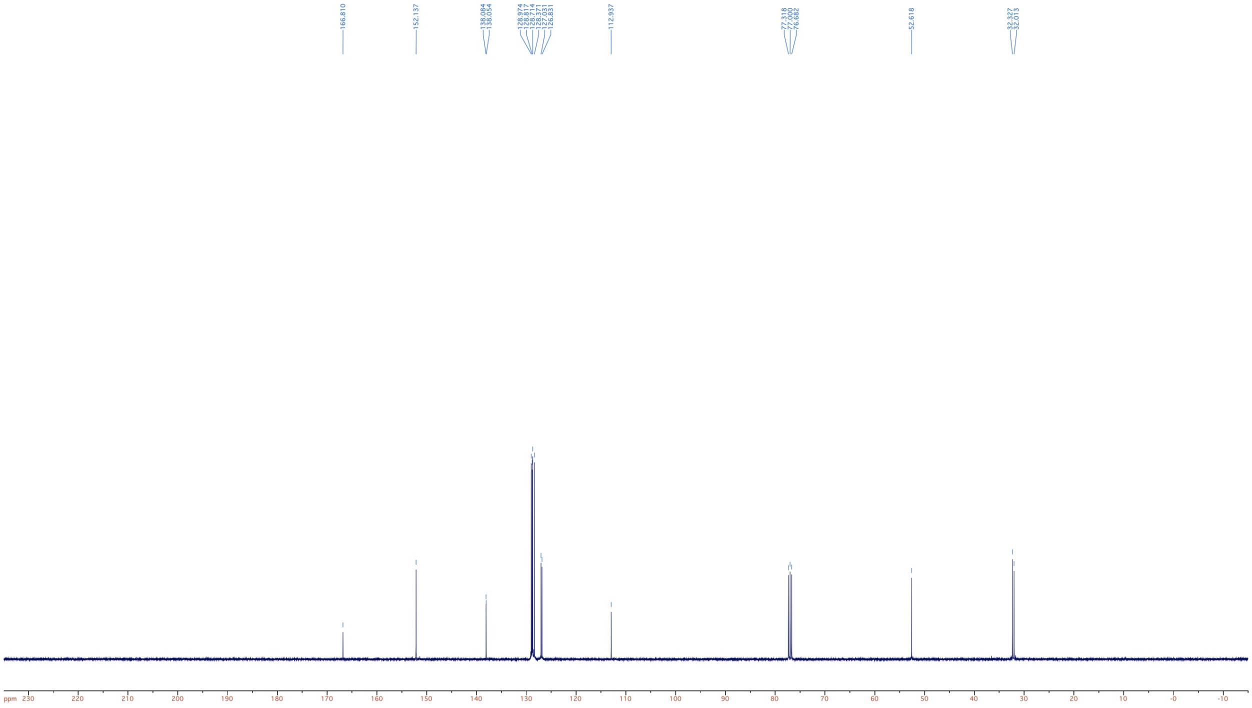
7.658
3.833
2.242
2.206
0.000
0.993
3.35
3
2.95
ppm
13
12
11
10
9
8
7
6
5
4
3
2
1
0
-1

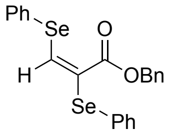


166.467
147.120
113.860
77.318
77.000
76.682
52.549
9.596
7.864
ppm
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0

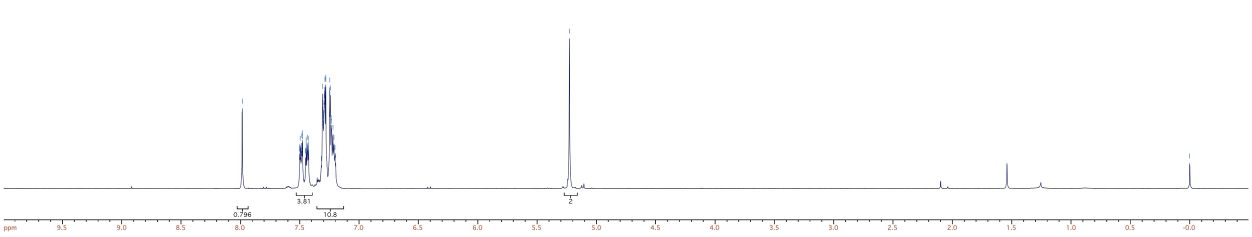

Bn
Se
O
H
OMe
Se
Bn
7.739
7.308
7.289
7.284
7.280
7.272
7.263
7.243
7.227
7.219
7.215
7.208
7.197
7.161
7.157
7.140
3.894
3.839
3.758
0.000
0.983
8.14
1.89
2.13
3
2.11
ppm
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
-0.0
-0.5

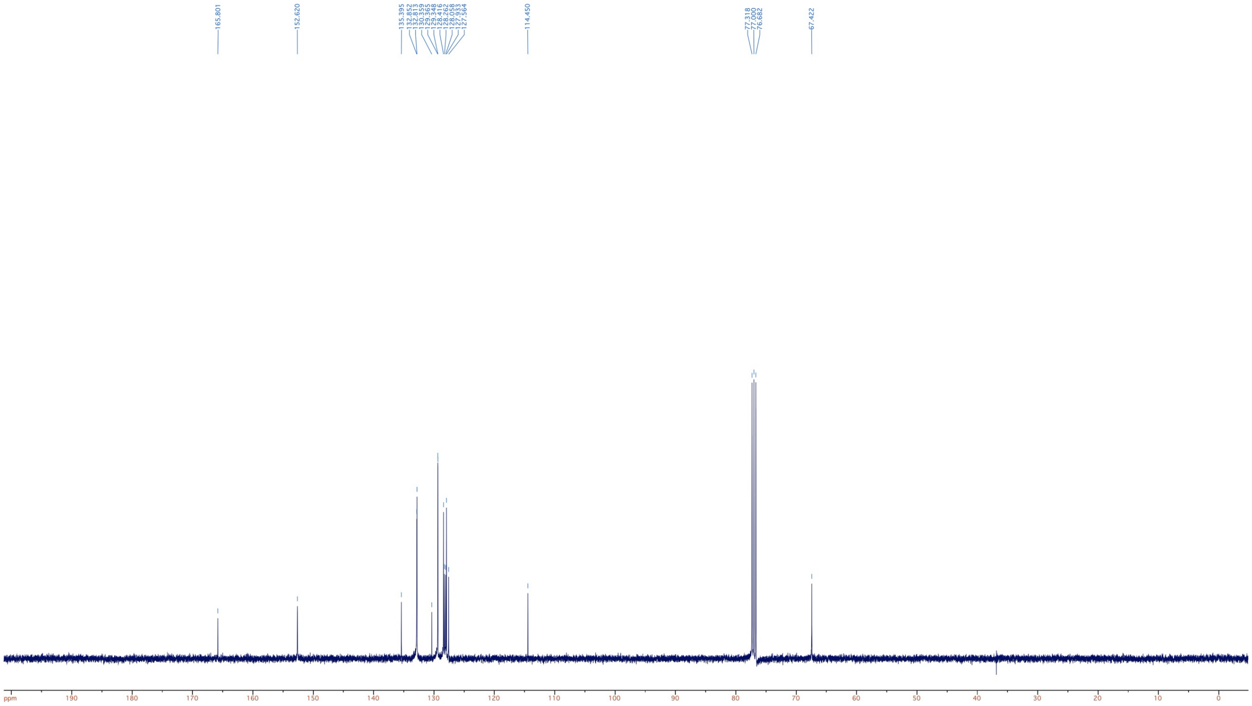
3k

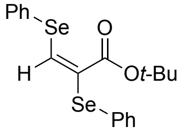

166.810
152.137
138.084
138.054
128.974
128.817
128.714
128.371
127.031
126.831
112.937
77.318
77.000
76.682
52.618
32.327
32.013
ppm
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
-0
-10


Ph
Se
O
H
OBn
Se
Ph

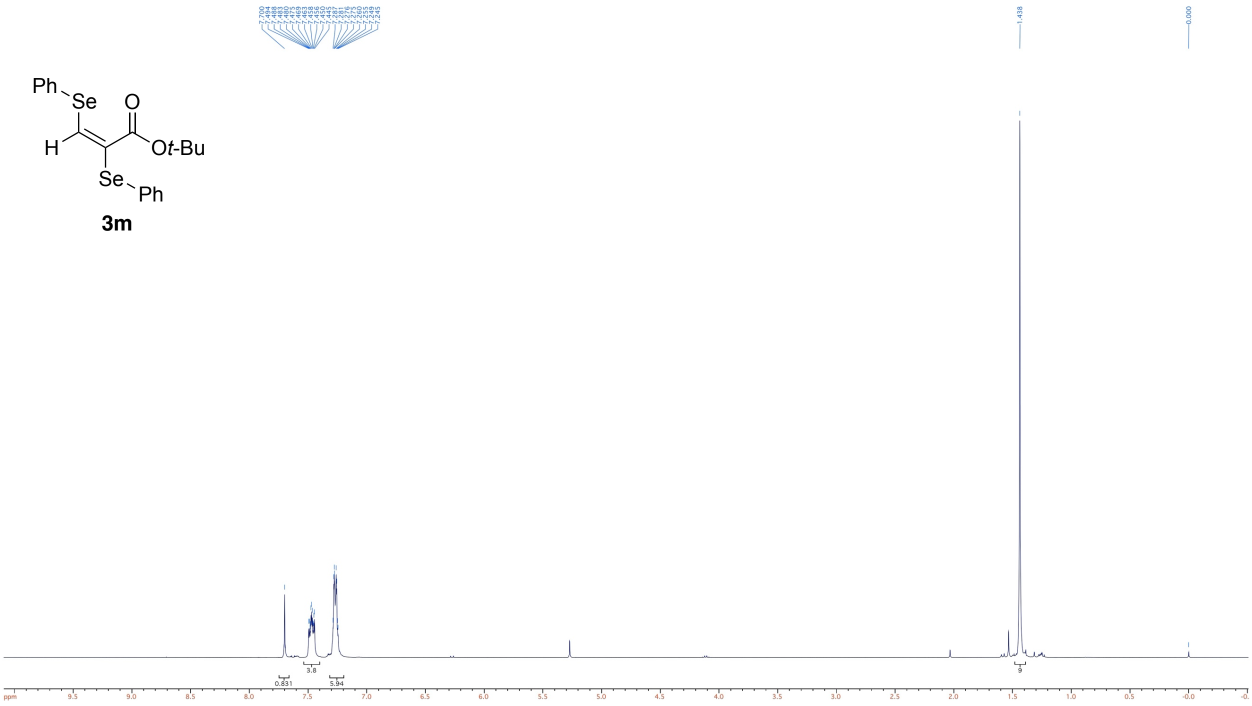
3l

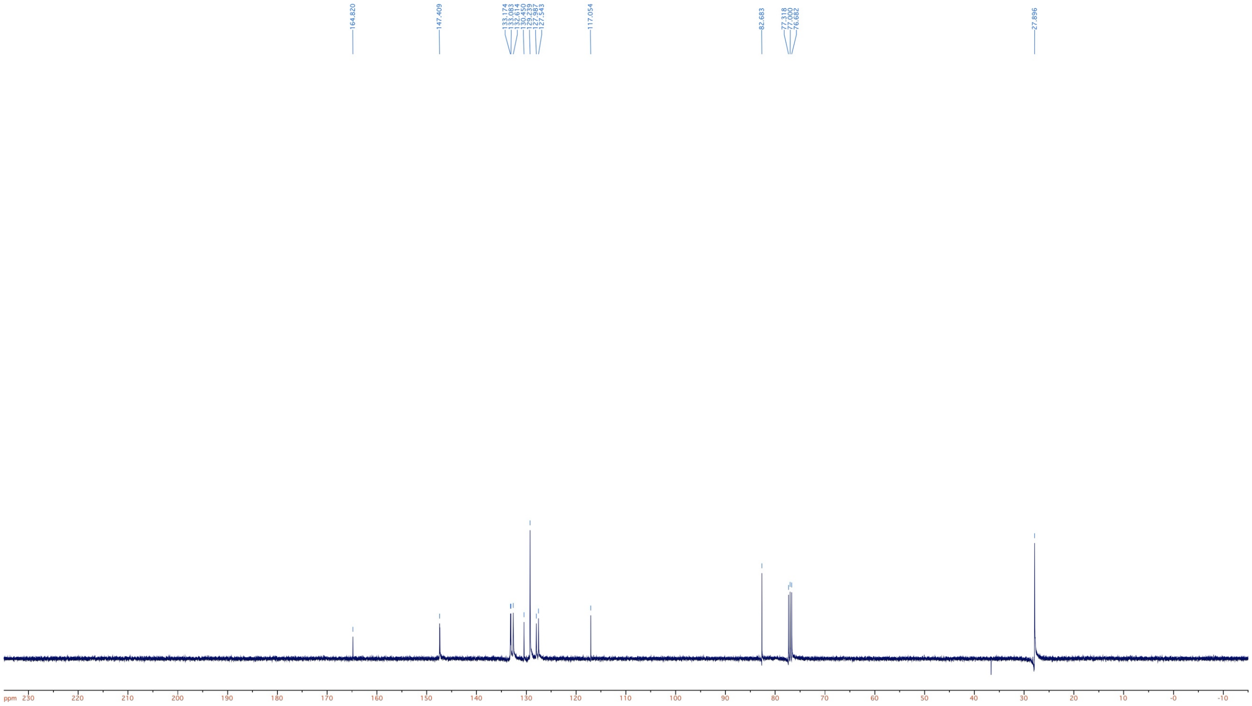

7.984
7.501
7.500
7.496
7.491
7.488
7.483
7.478
7.476
7.451
7.450
7.446
7.444
7.436
7.434
7.431
7.427
7.426
7.318
7.307
7.302
7.299
7.296
7.293
7.291
7.288
7.281
7.280
7.249
7.247
7.242
7.235
7.232
7.221
7.211
7.203
7.198
5.227
0.000
0.796
3.81
10.8
2
ppm
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
-0.0

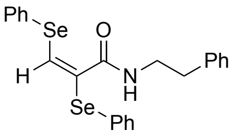

165.801
152.620
135.395
132.852
132.813
130.359
129.365
129.348
128.416
128.262
128.058
127.933
127.564
114.450
77.318
77.000
76.682
67.422
ppm
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0


Ph
Se
O
H
Ot-Bu
Se
Ph

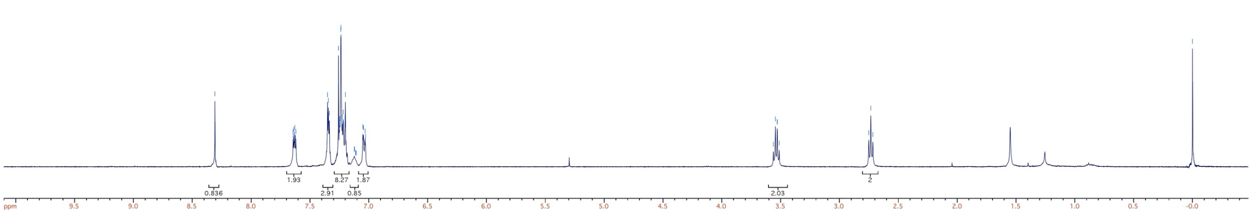
3m

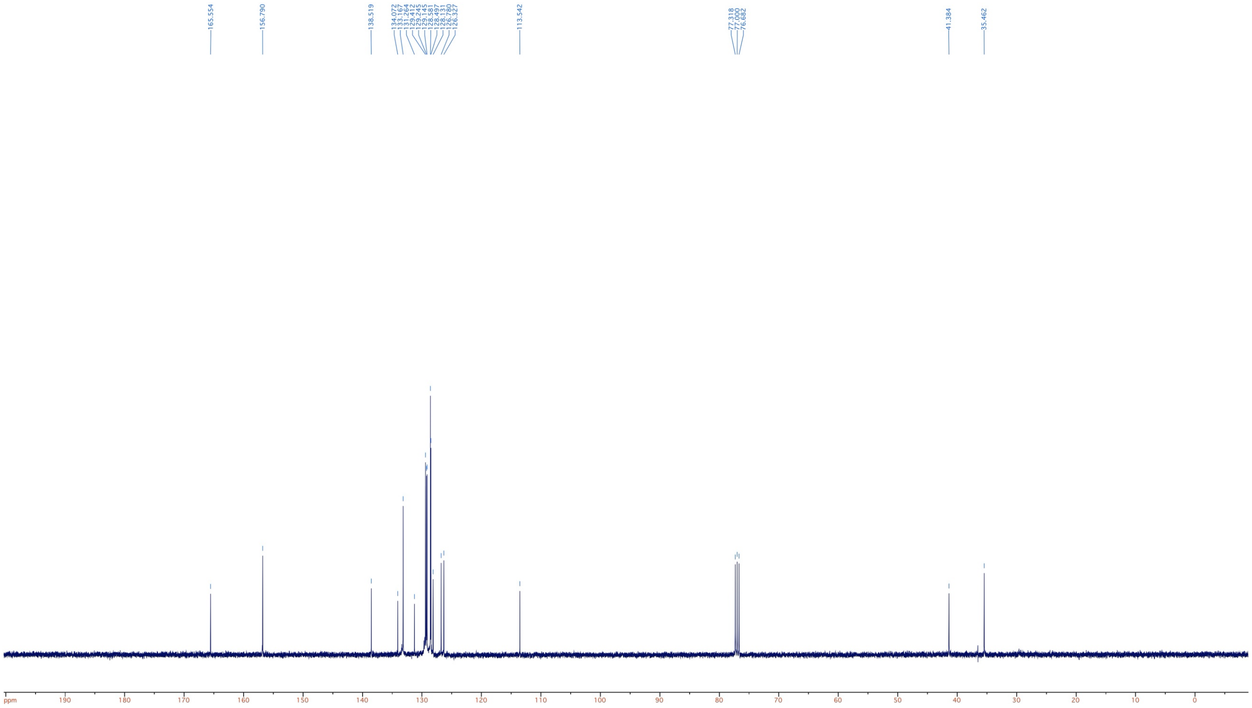

7.700
7.494
7.488
7.483
7.480
7.475
7.469
7.463
7.458
7.456
7.450
7.445
7.287
7.281
7.276
7.275
7.260
7.255
7.249
7.245
1.438
0.000
0.831
3.8
5.94
9
ppm
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
-0.0

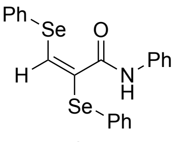

164.820
147.409
133.174
133.083
132.614
130.450
129.239
127.987
127.543
117.054
82.683
77.318
77.000
76.682
27.896
ppm
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
-0
-10


Ph
Se
O
H
N
H
Ph
Se
Ph

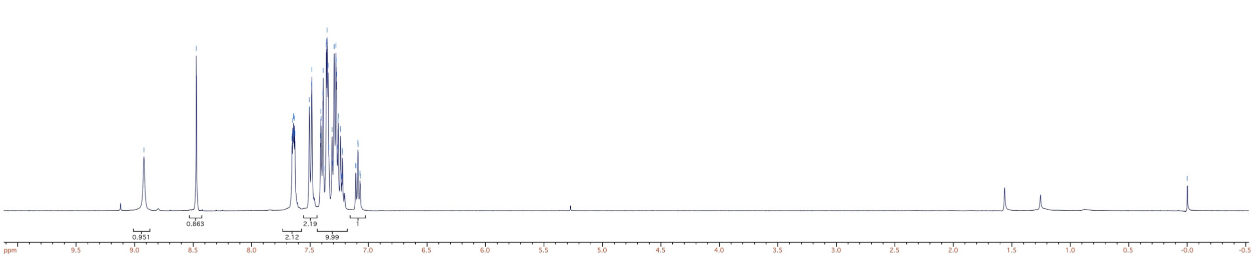
3n

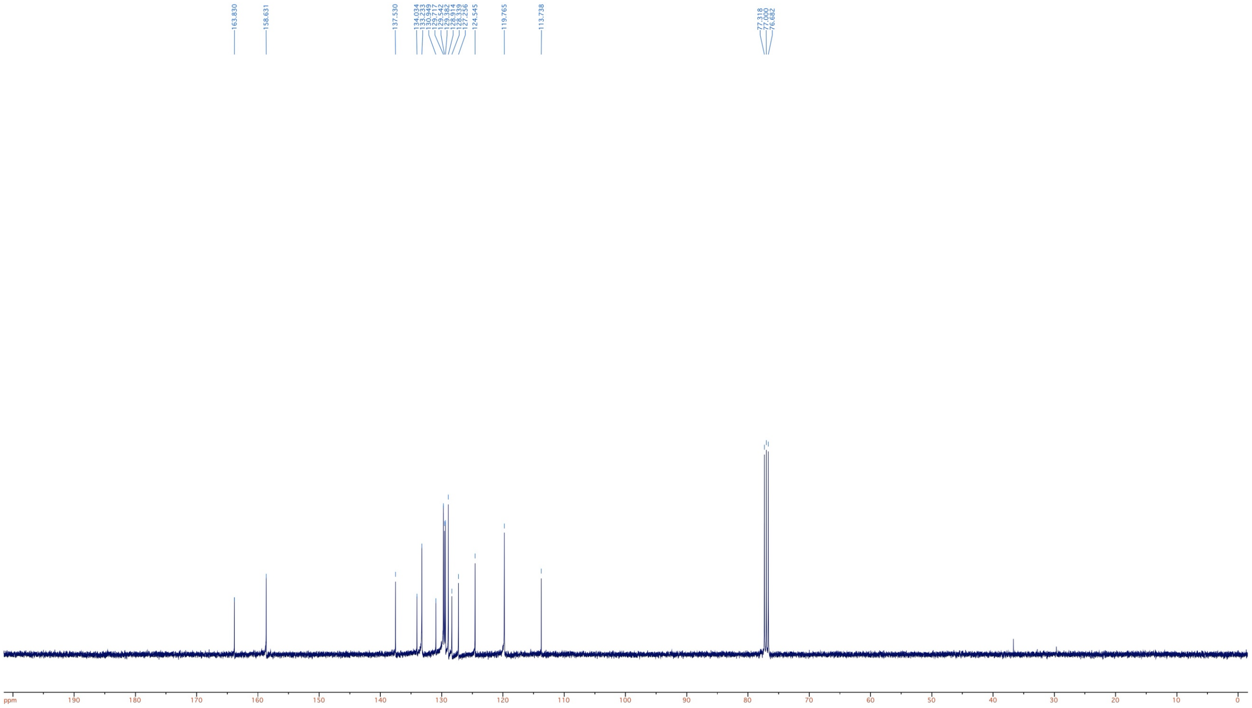

8.308
7.643
7.642
7.637
7.632
7.629
7.623
7.620
7.351
7.349
7.344
7.340
7.338
7.335
7.258
7.256
7.252
7.251
7.248
7.246
7.239
7.237
7.227
7.222
7.218
7.214
7.202
7.199
7.123
7.121
7.112
7.111
7.109
7.108
7.050
7.045
7.040
7.031
7.028
3.562
3.545
3.529
3.512
2.751
2.734
2.717
0.000
0.836
1.93
2.91
8.27
0.85
1.87
2.03
2
ppm
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
-0.0

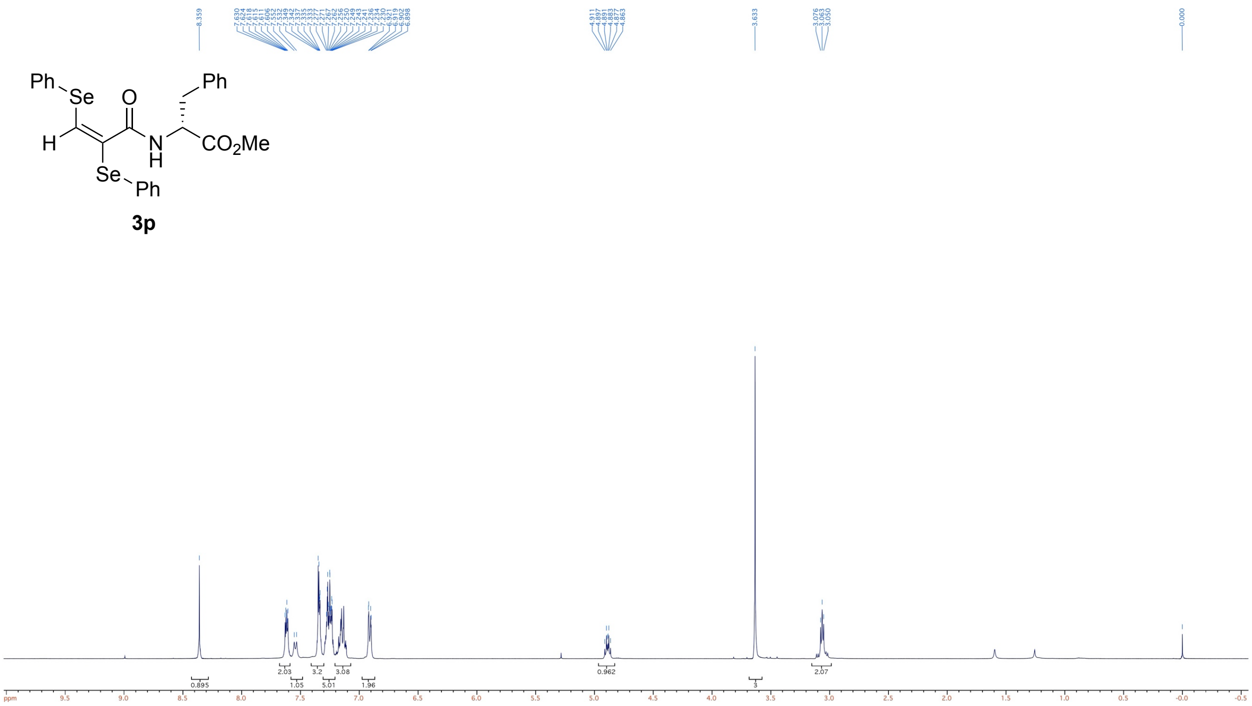

165.554
156.790
138.519
134.072
133.167
131.264
129.412
129.245
129.145
128.581
128.497
128.131
126.780
126.327
113.542
77.318
77.000
76.682
41.384
35.462
ppm
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0


Ph
Se
O
H
N
Ph
H
Se
Ph

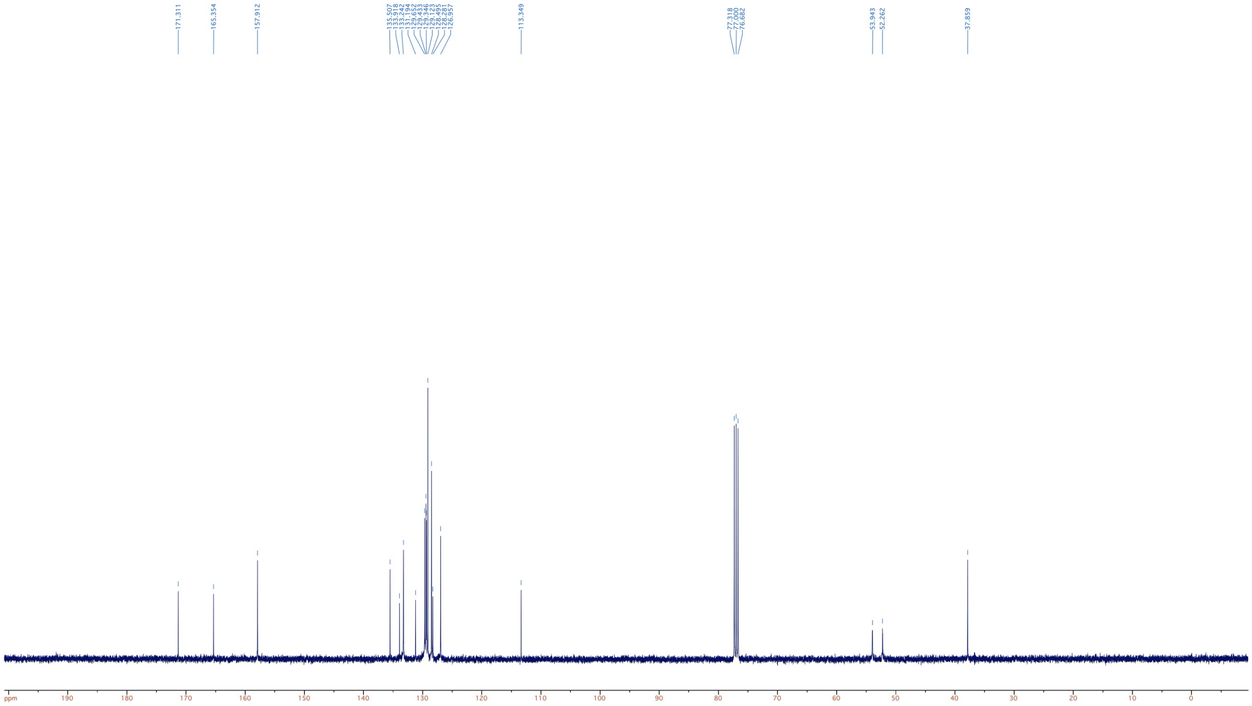
3o

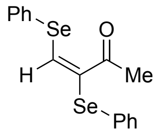

8.920
8.473
7.655
7.652
7.648
7.644
7.641
7.640
7.638
7.635
7.631
7.629
7.506
7.504
7.487
7.485
7.411
7.408
7.406
7.390
7.388
7.382
7.361
7.359
7.354
7.345
7.339
7.312
7.306
7.294
7.293
7.279
7.277
7.274
7.264
7.261
7.259
7.240
7.238
7.229
7.227
7.223
7.222
7.110
7.108
7.091
7.090
7.073
7.070
0.000
0.951
0.863
2.12
2.19
9.99
1
ppm
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
-0.0
-0.5


163.830
158.631
137.530
134.034
133.233
130.949
129.717
129.542
129.382
128.914
128.339
127.256
124.545
119.765
113.738
77.318
77.000
76.682
ppm
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0

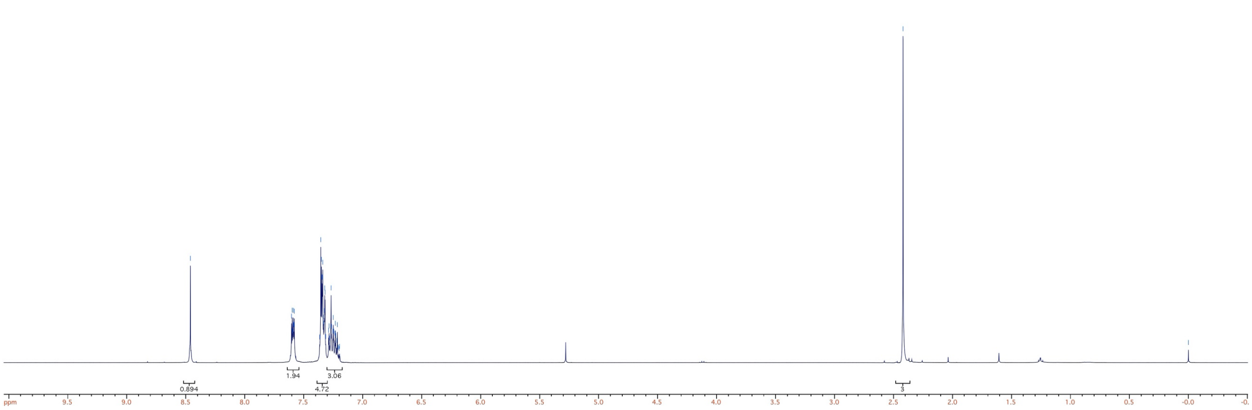

Ph
Se
O
Ph
H
N
H
CO2Me
Se
Ph
8.359
7.630
7.624
7.618
7.615
7.611
7.606
7.552
7.532
7.349
7.342
7.337
7.335
7.333
7.277
7.271
7.267
7.262
7.256
7.250
7.249
7.243
7.241
7.236
7.234
7.230
6.921
6.919
6.902
6.898
4.911
4.897
4.891
4.883
4.877
4.863
3.633
3.076
3.063
3.050
0.000
0.895
2.03
1.05
3.2
5.01
3.08
1.96
0.962
3
2.07
ppm
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
-0.0
-0.5

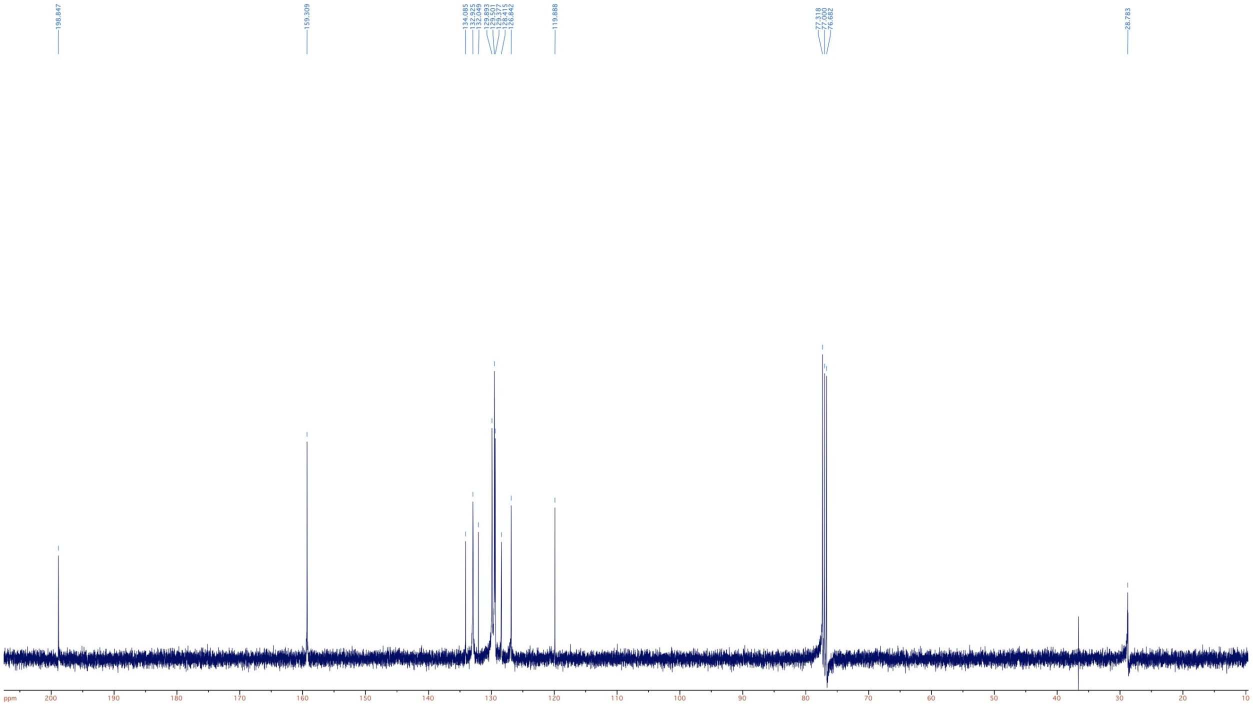
3p

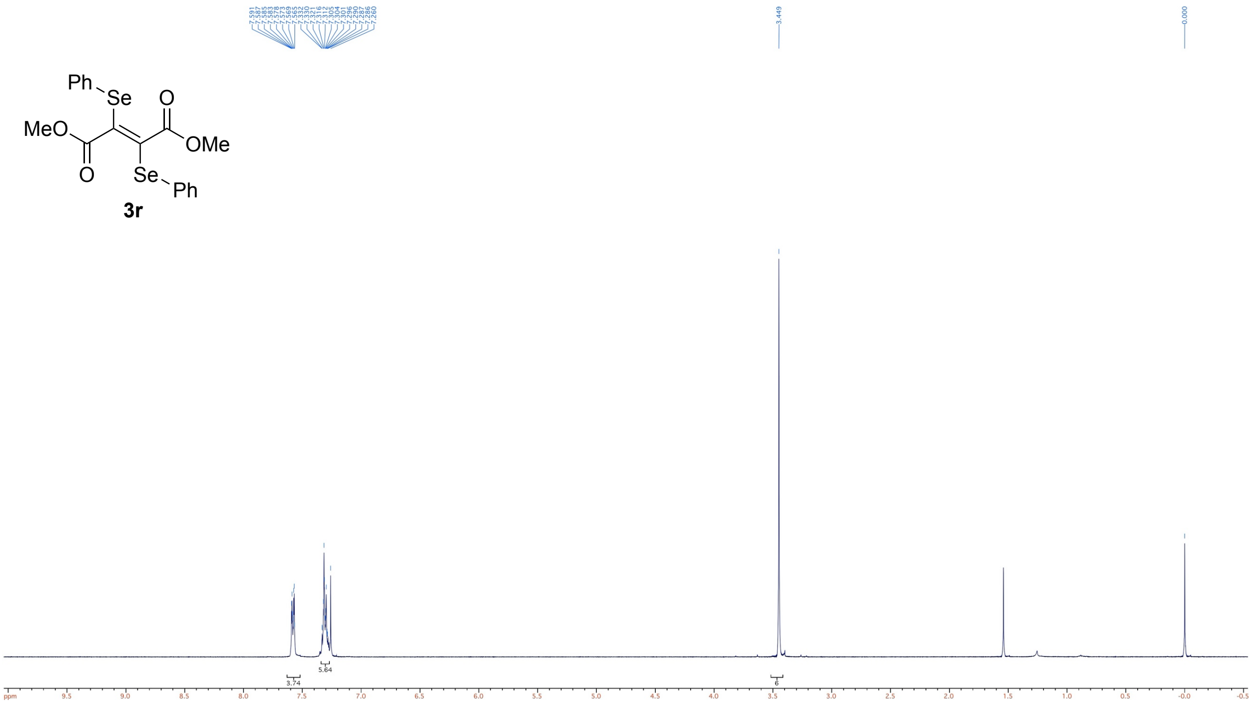

171.311
165.354
157.912
135.507
133.918
133.242
131.194
129.652
129.433
129.346
129.123
128.495
128.281
126.957
113.349
77.318
77.000
76.682
53.943
52.262
37.859
ppm
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0


Ph
Se
O
H
Me
Se
Ph

3q


8.460
7.603
7.597
7.594
7.588
7.585
7.582
7.579
7.365
7.355
7.349
7.343
7.342
7.339
7.333
7.330
7.325
7.322
7.319
7.313
7.289
7.285
7.280
7.268
7.264
7.252
7.249
7.245
7.235
7.232
7.228
7.221
7.214
7.207
7.200
7.196
2.419
0.000
0.894
1.94
4.72
3.06
3
ppm
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
-0.0


198.847
159.309
134.085
132.925
132.049
129.893
129.501
129.377
128.415
126.842
119.888
77.318
77.000
76.682
28.783
ppm
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10



3r

Ph
Se
O
MeO
OMe
O
Se
Ph
7.591
7.587
7.585
7.583
7.578
7.573
7.569
7.565
7.332
7.330
7.321
7.316
7.312
7.305
7.304
7.301
7.296
7.290
7.287
7.286
7.260
3.449
0.000
3.74
5.64
6
ppm
9.5
9.0
8.5
8.0
7.5
7.0
6.5
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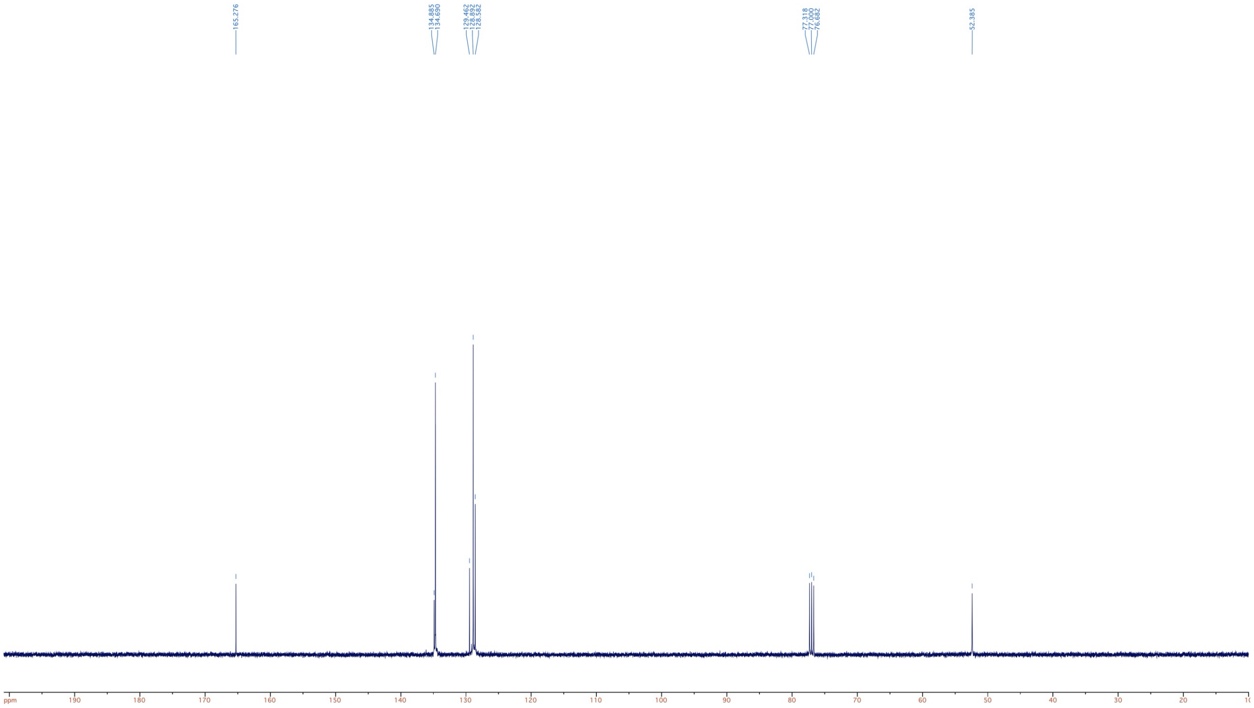

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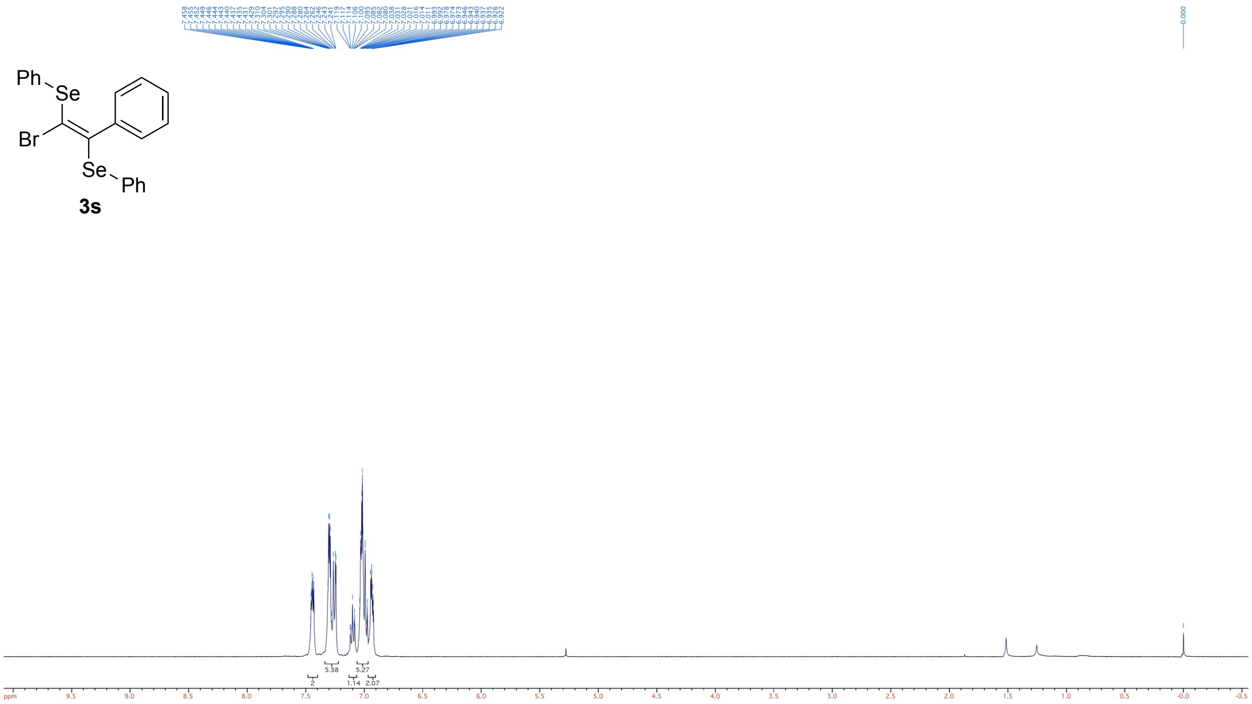
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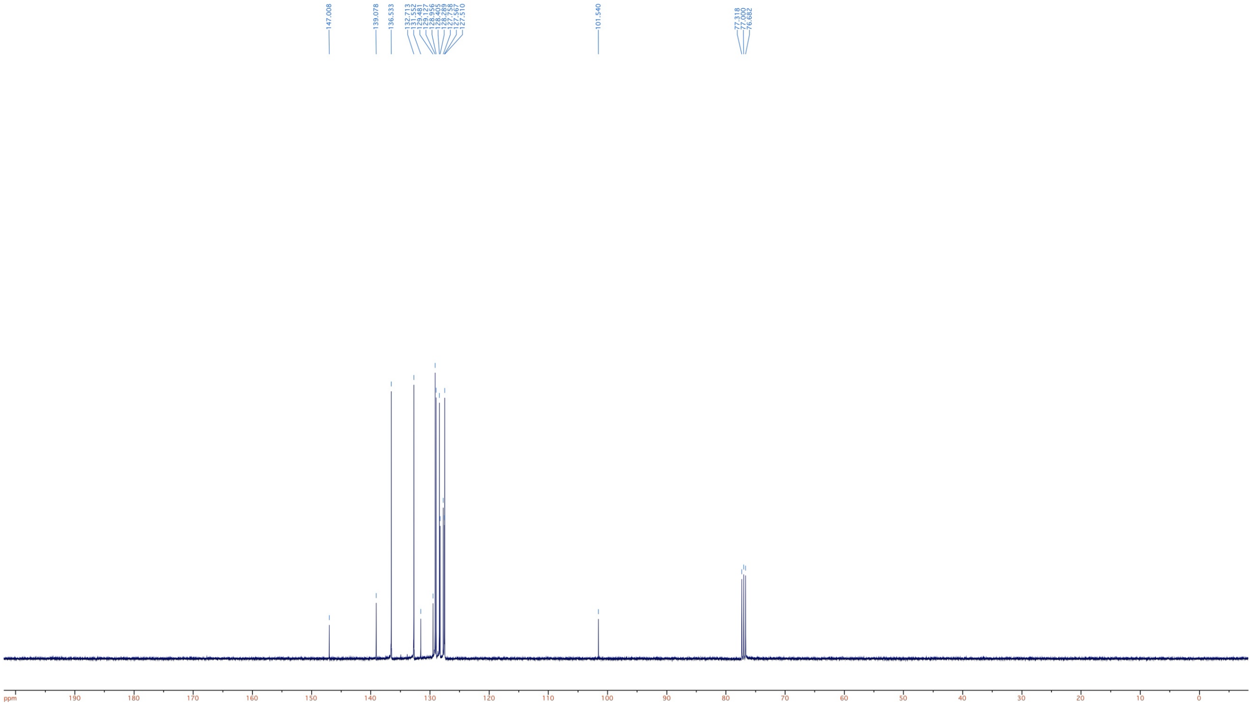
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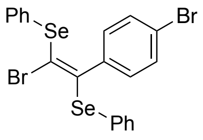
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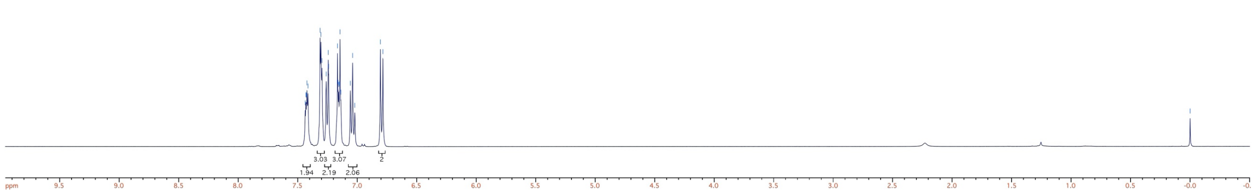
3t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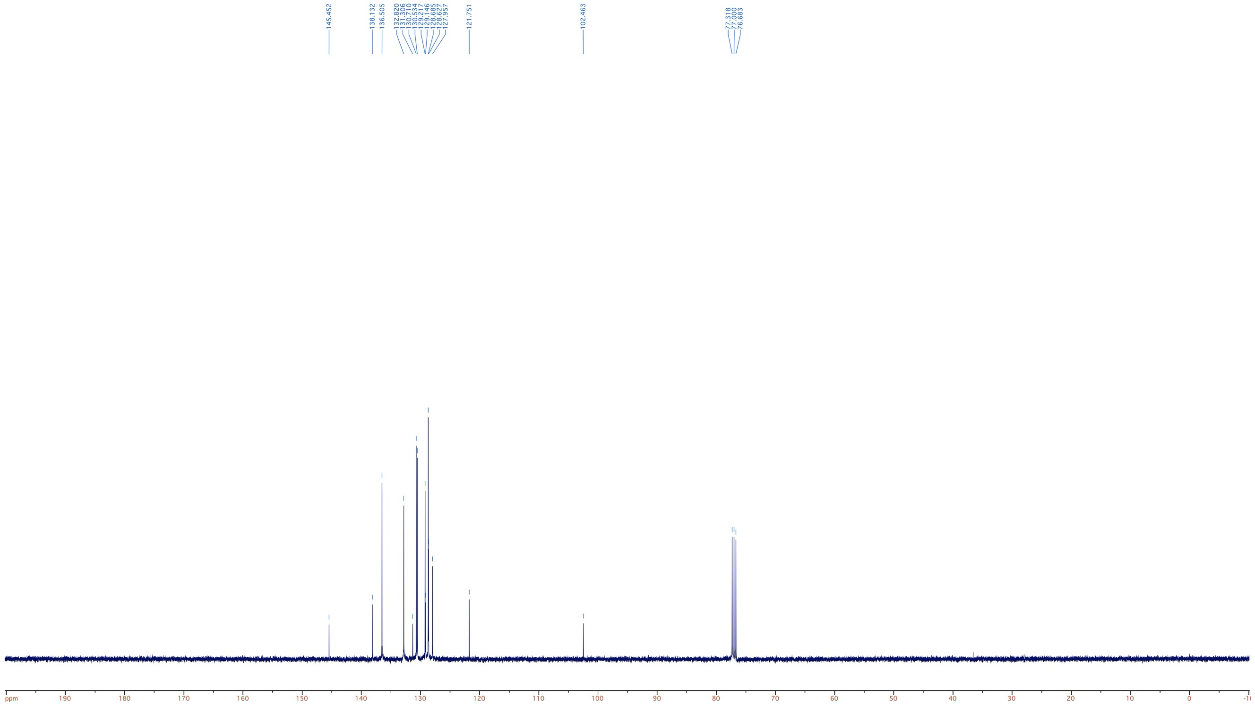
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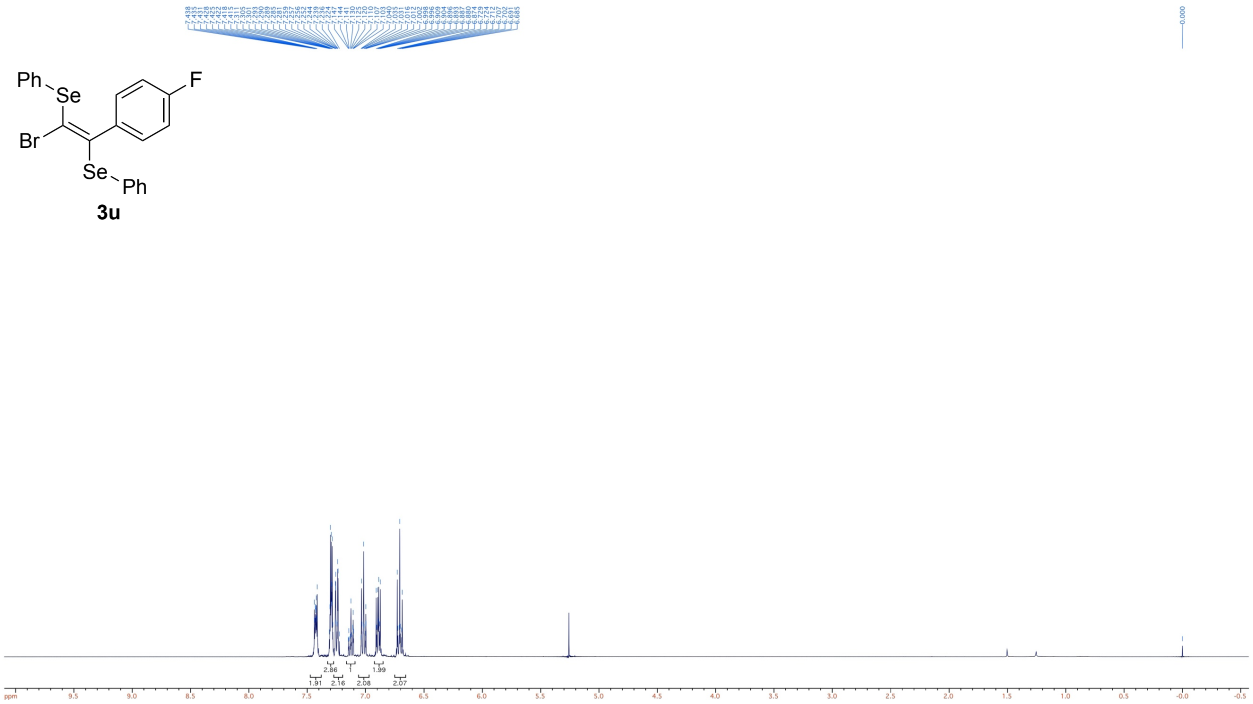

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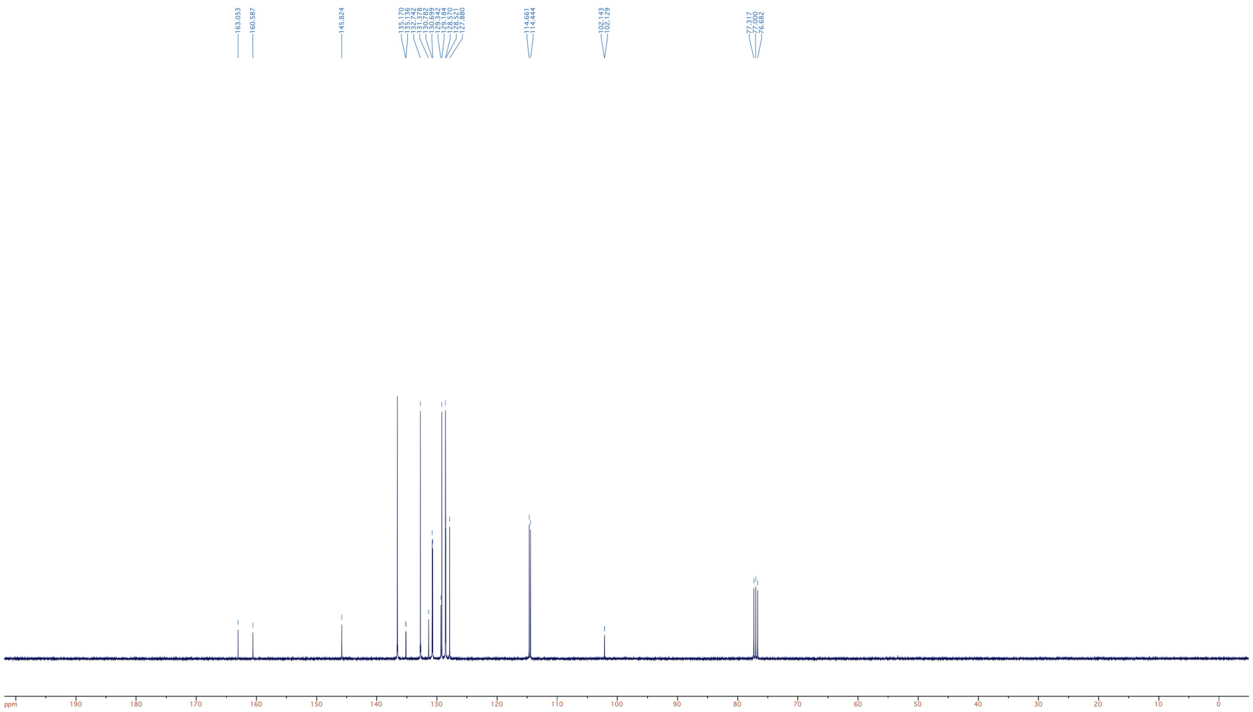
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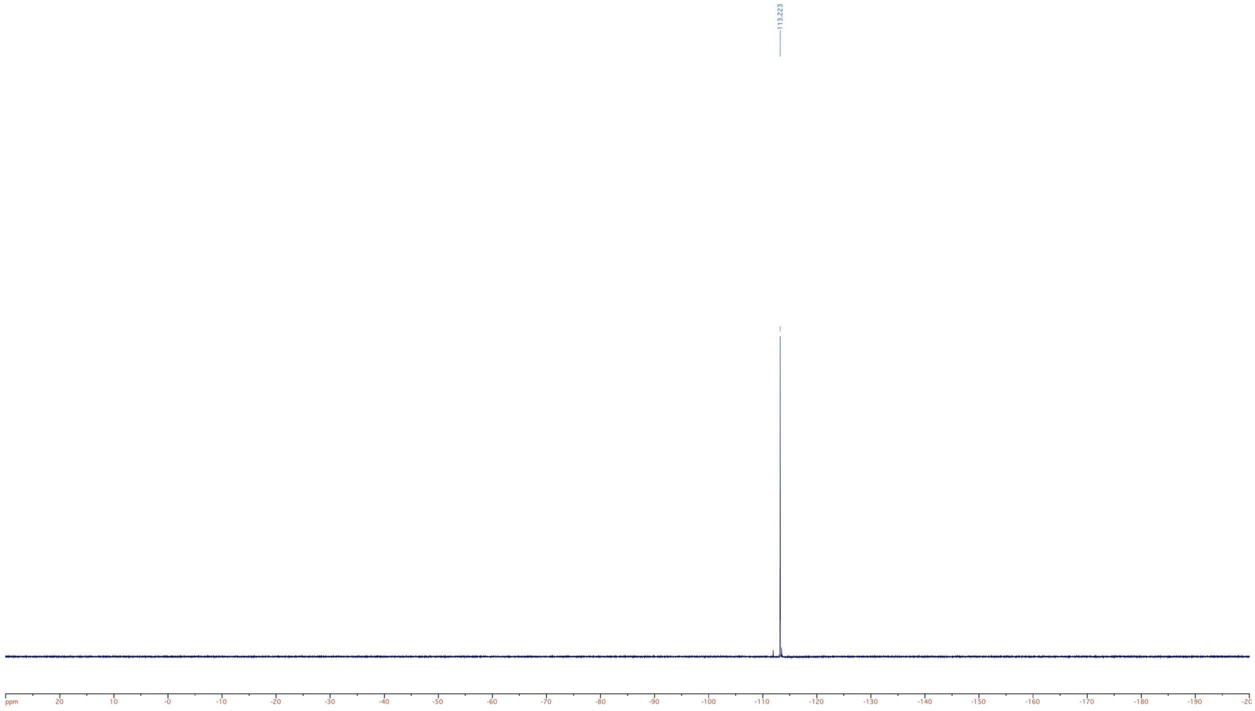
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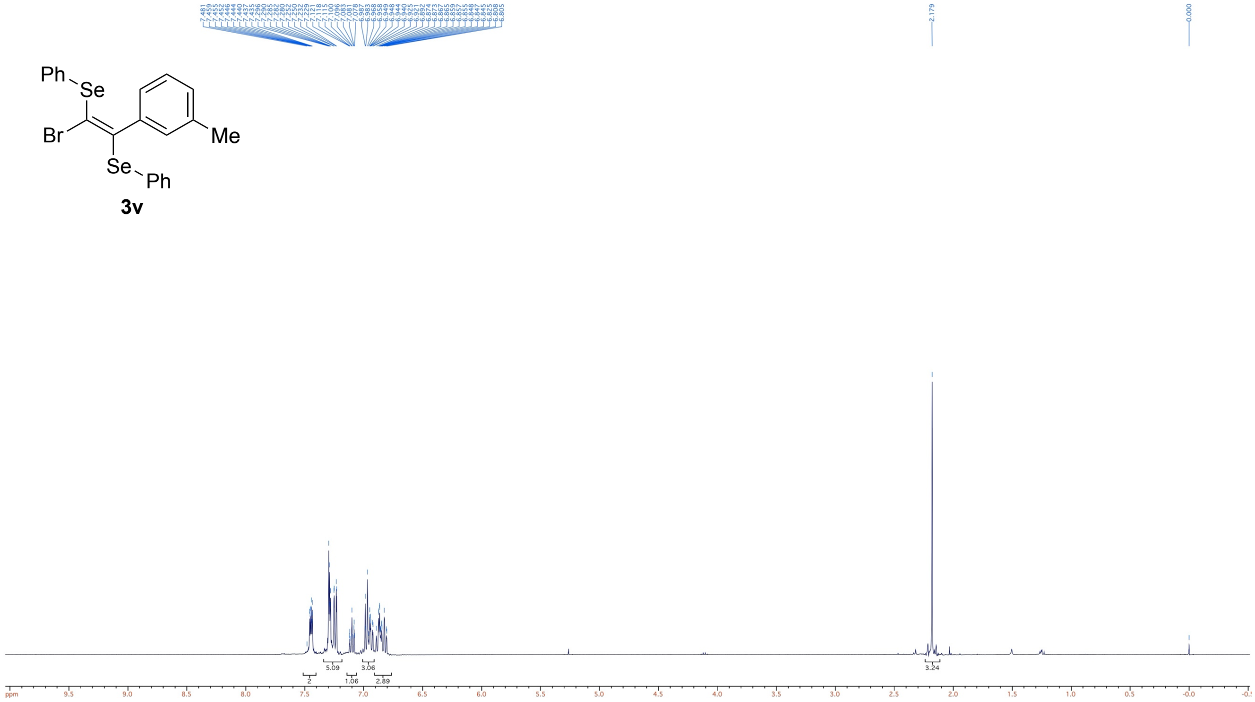
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Br
Se
Ph
Me
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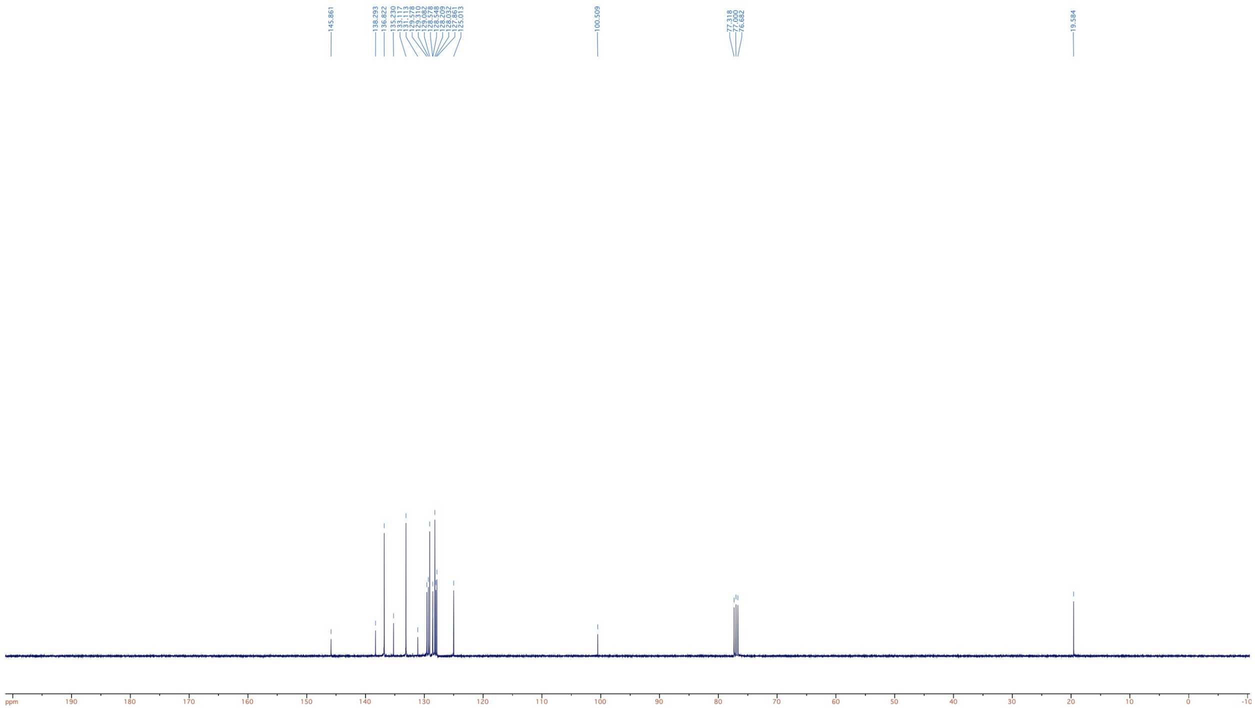
3v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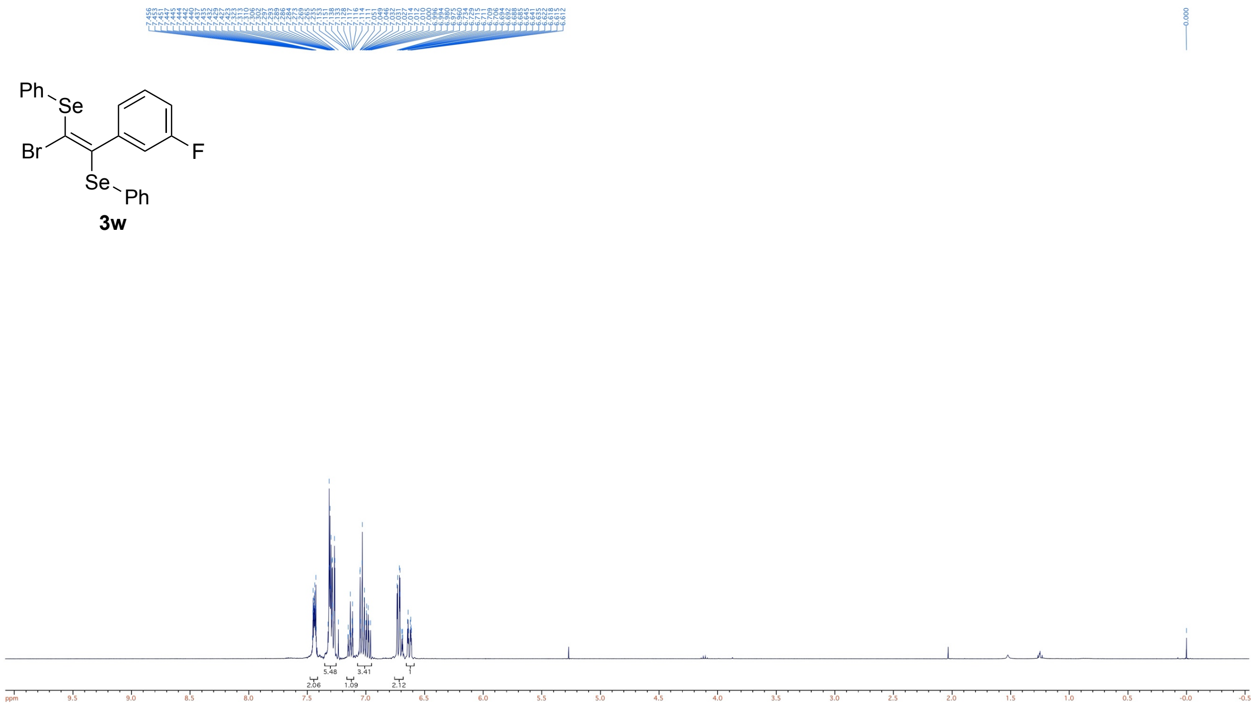
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6.612
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Br
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Se
Ph
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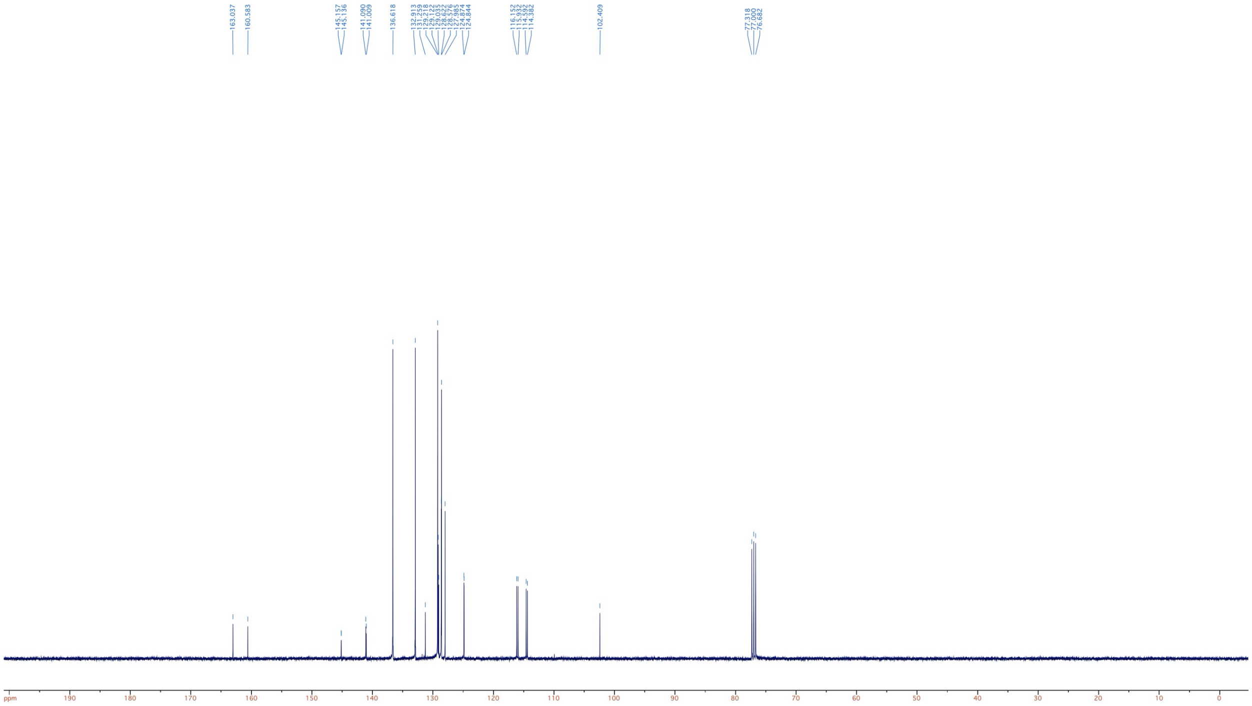
3w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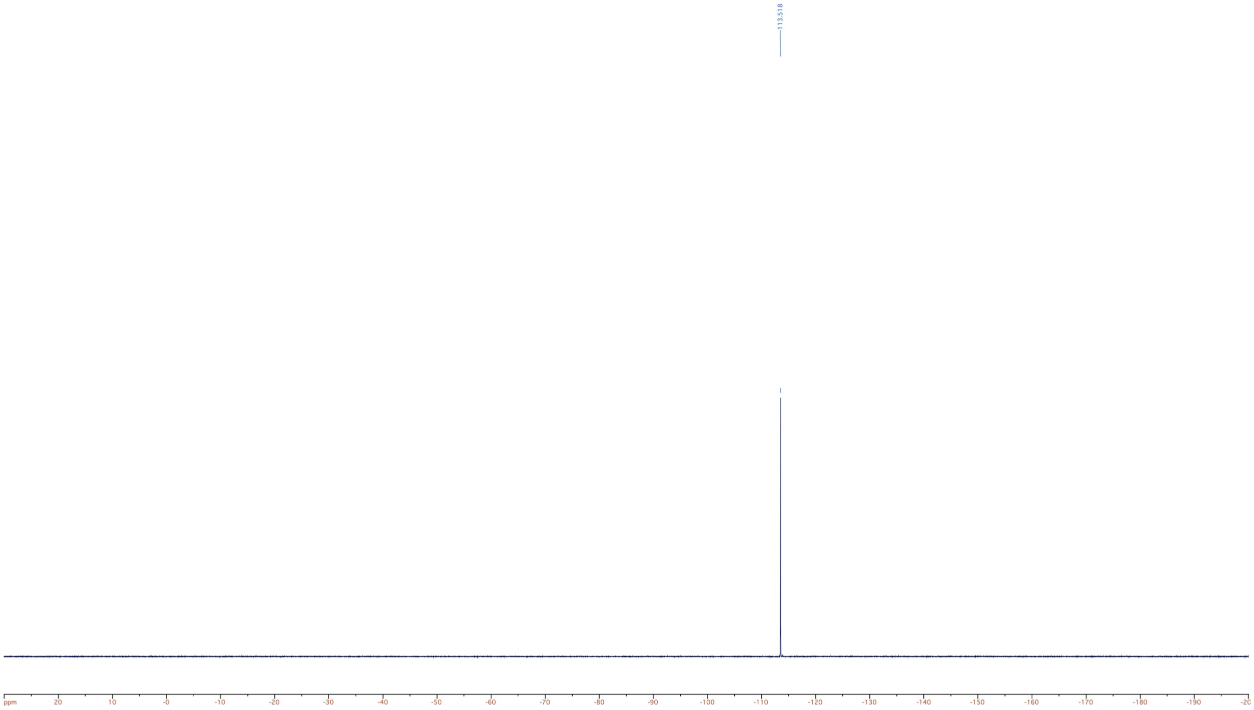
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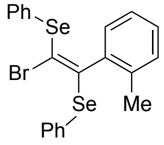
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Br
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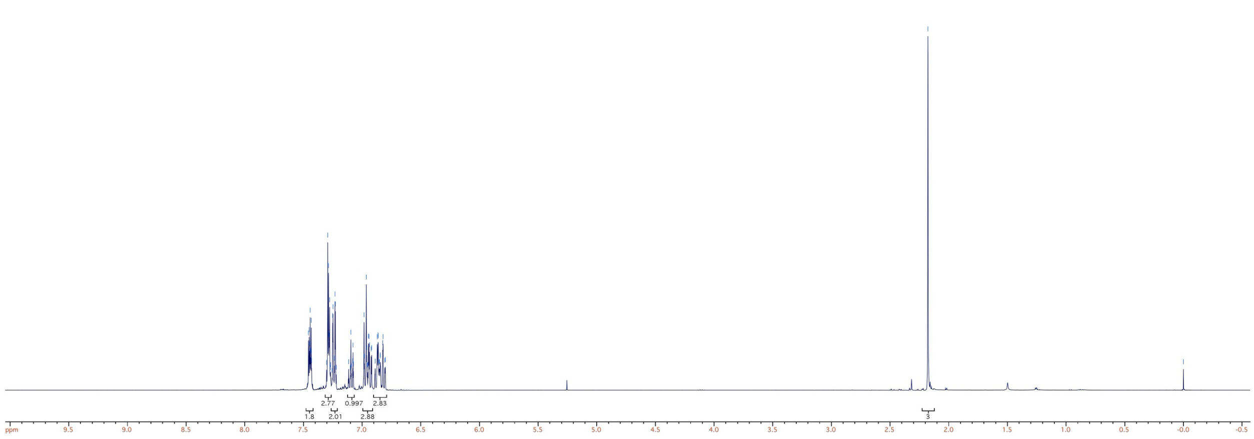
Ph

3x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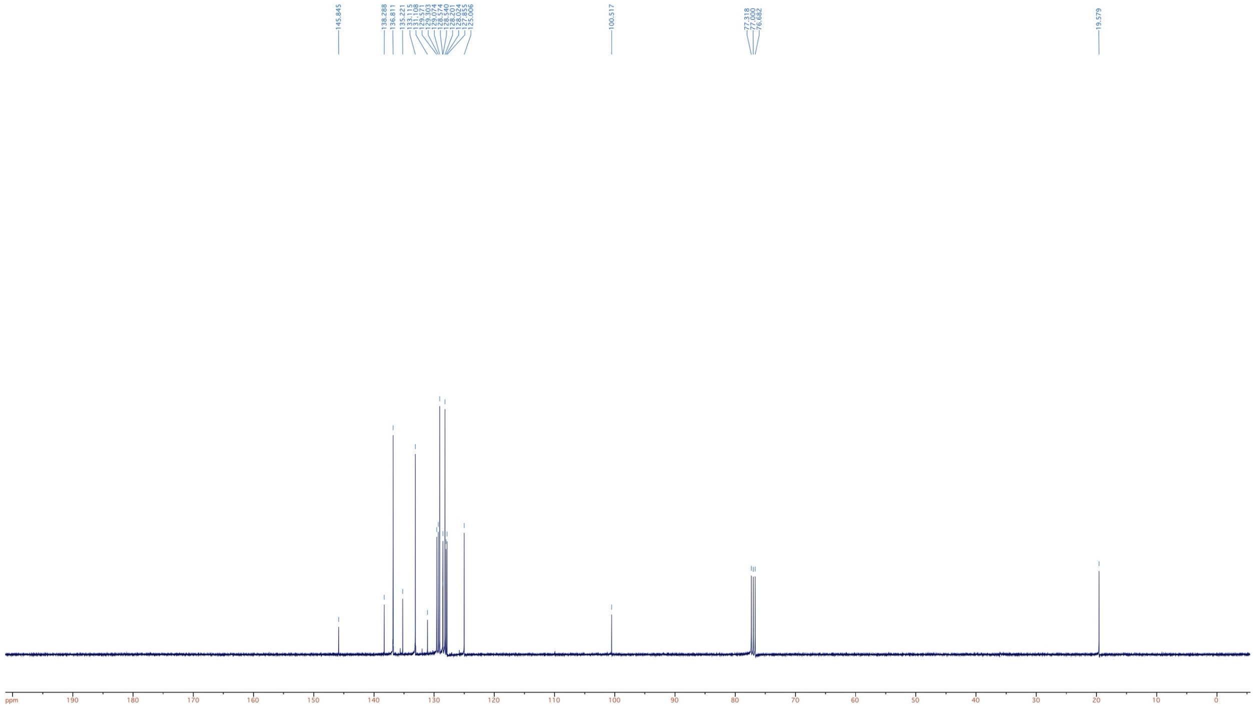
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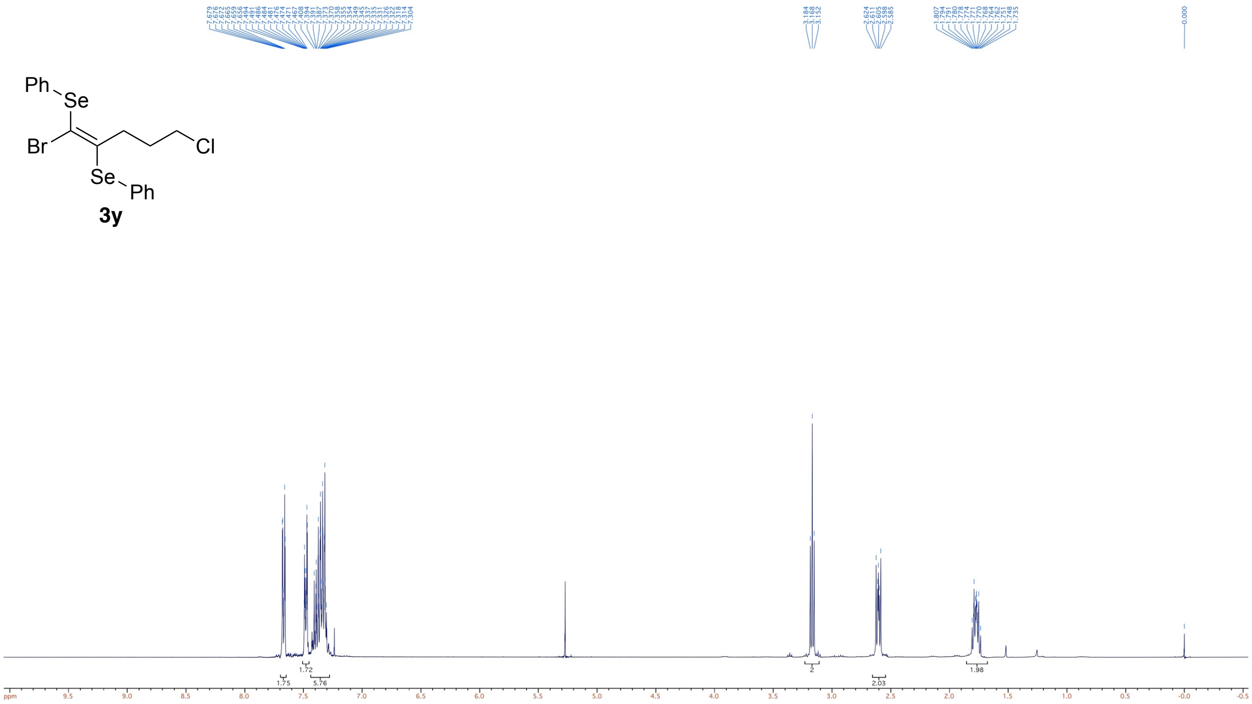
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Br
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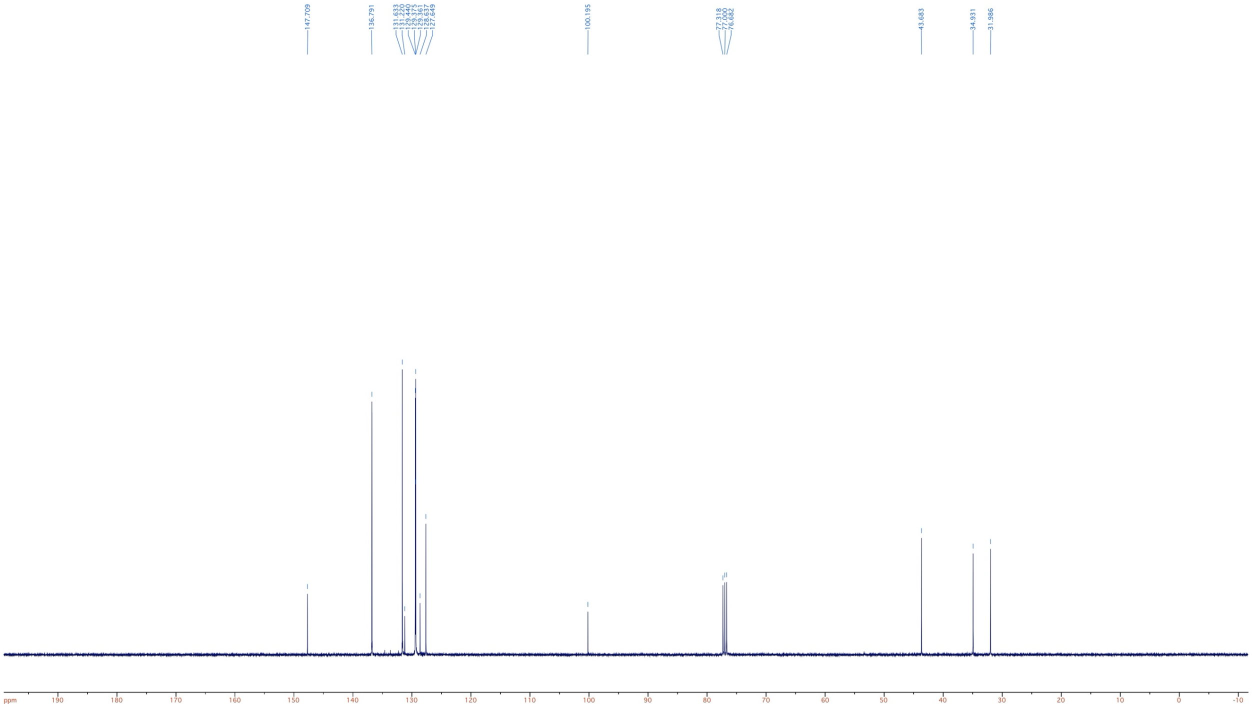
3y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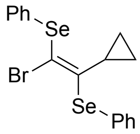
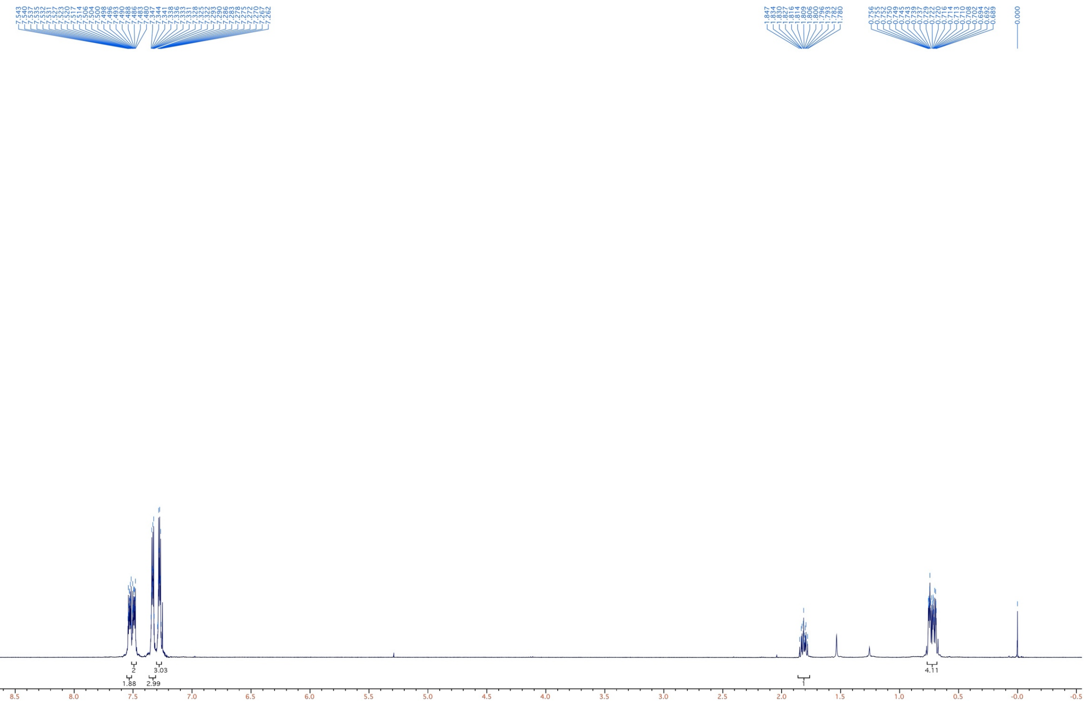


Ph
Se
Br
Se
Ph

3z



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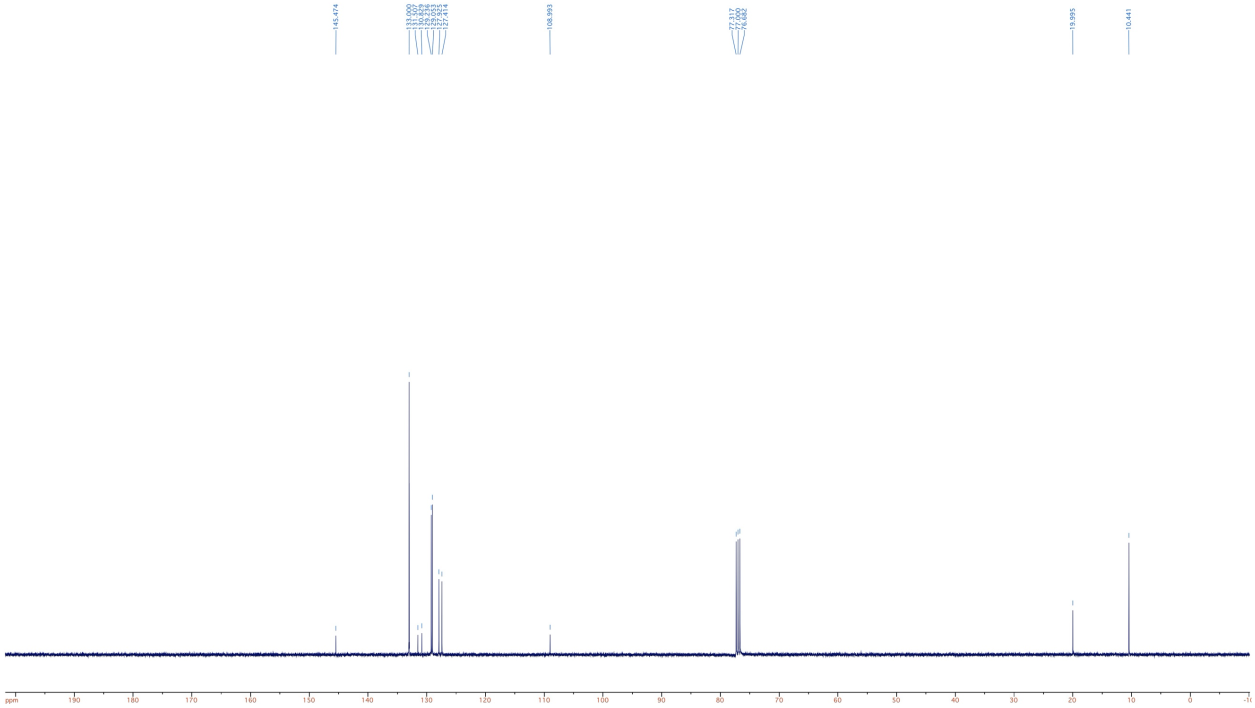

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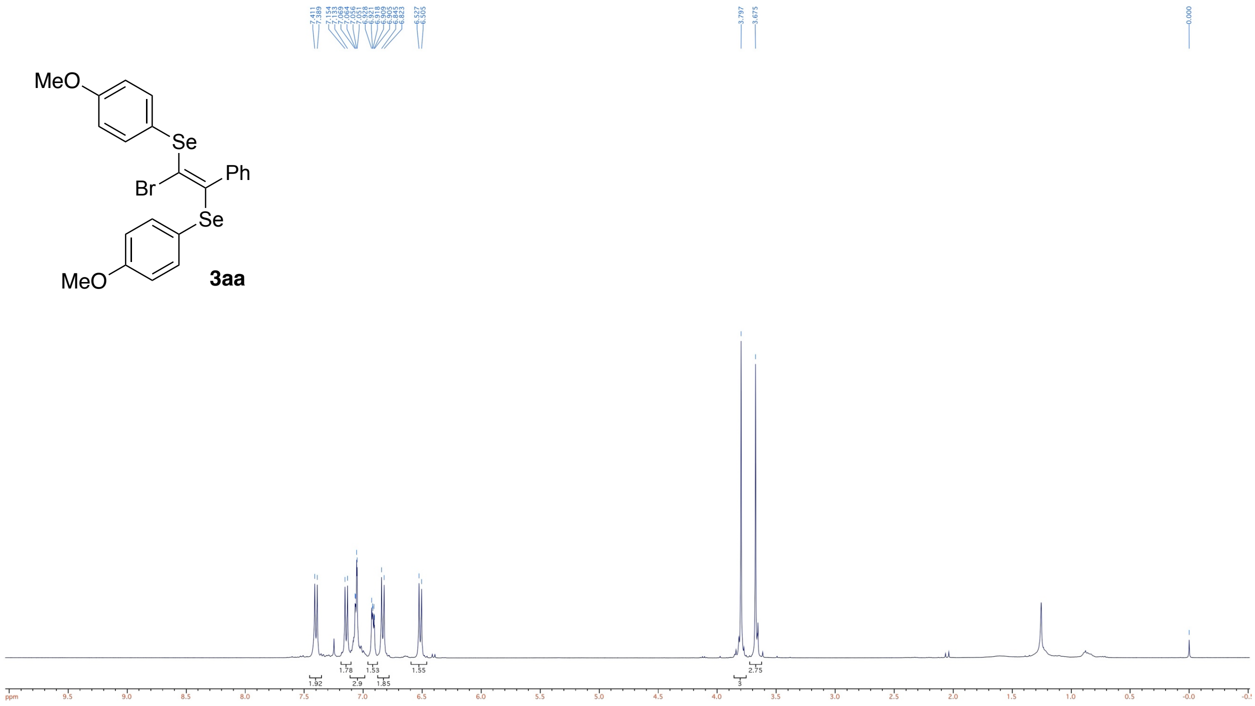
MeO
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Br
Se
MeO

3aa

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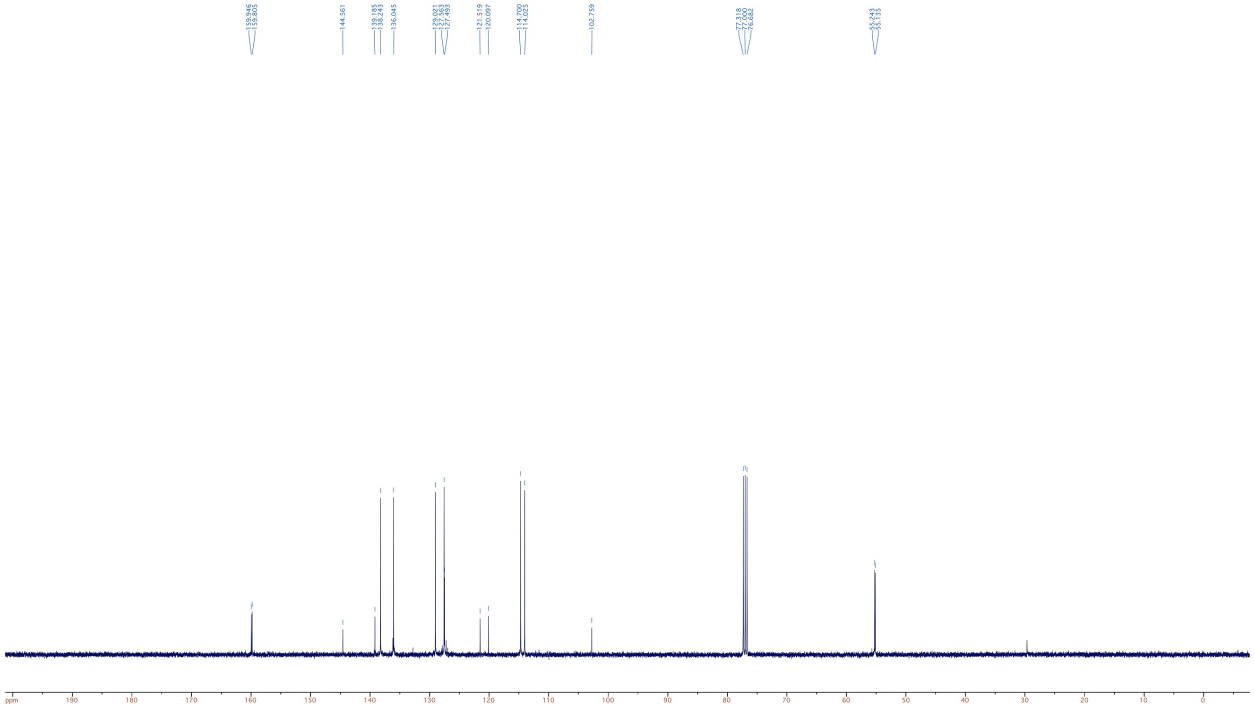
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ppm
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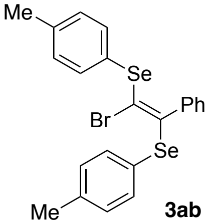
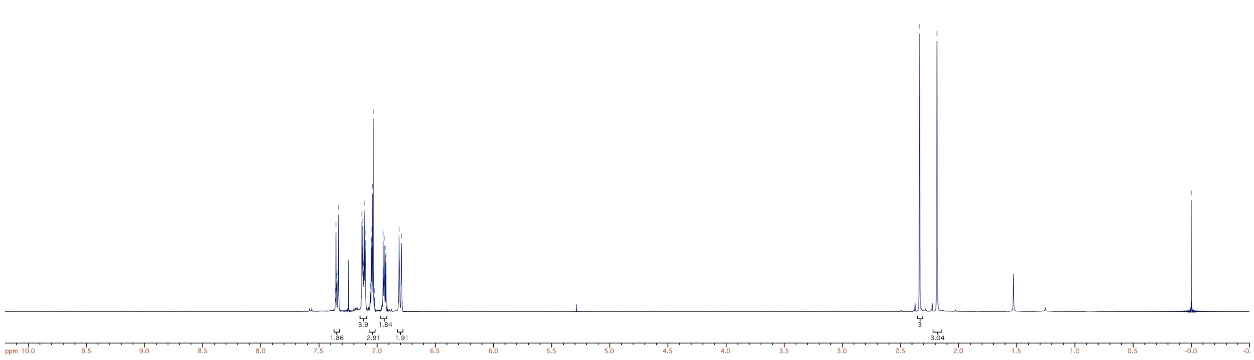

Me
Se
Br
Ph
Se
Me

3ab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7.111
7.105
7.103
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7.060
7.056
7.051
7.048
7.046
7.045
7.040
7.038
7.034
7.032
7.029
7.025
7.024
6.949
6.946
6.943
6.940
6.938
6.937
6.934
6.931
6.929
6.925
6.813
6.811
6.810
6.806
6.797
6.792
6.790
2.336
2.187
0.000
1.86
3.9
2.91
1.84
1.91
3
3.04
ppm 10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
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4.0
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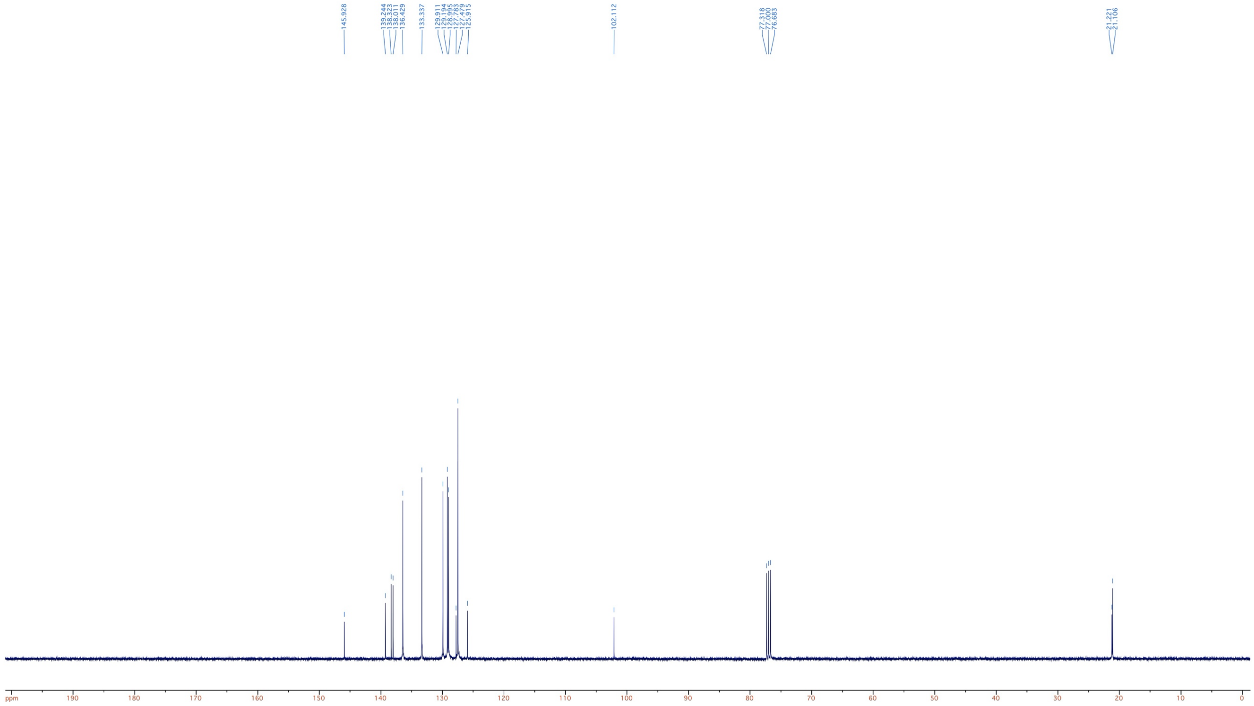
0.0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138.011
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129.194
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125.915
102.112
77.318
77.000
76.683
21.221
21.106
ppm
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180
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150
140
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120
110
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70
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30
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10
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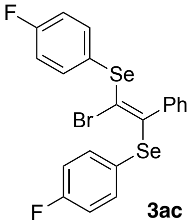
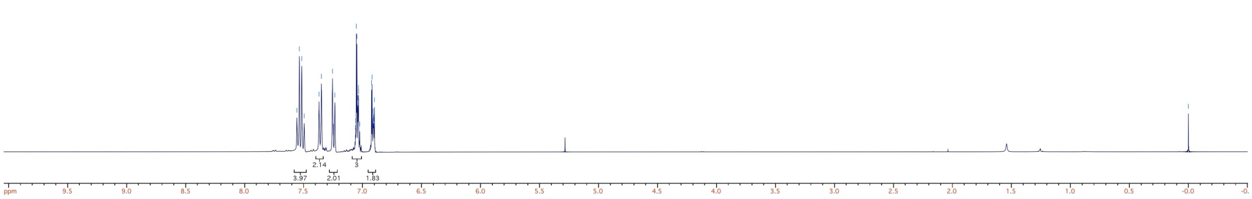

F
Se
Ph
Br
Se
F

3ac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7.235
7.060
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7.053
7.048
7.040
7.037
7.035
7.034
7.024
6.924
6.919
6.916
6.911
6.909
6.907
6.905
6.902
6.900
0.000
3.97
2.14
2.01
3
1.83
ppm
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
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4.0
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3.0
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2.0
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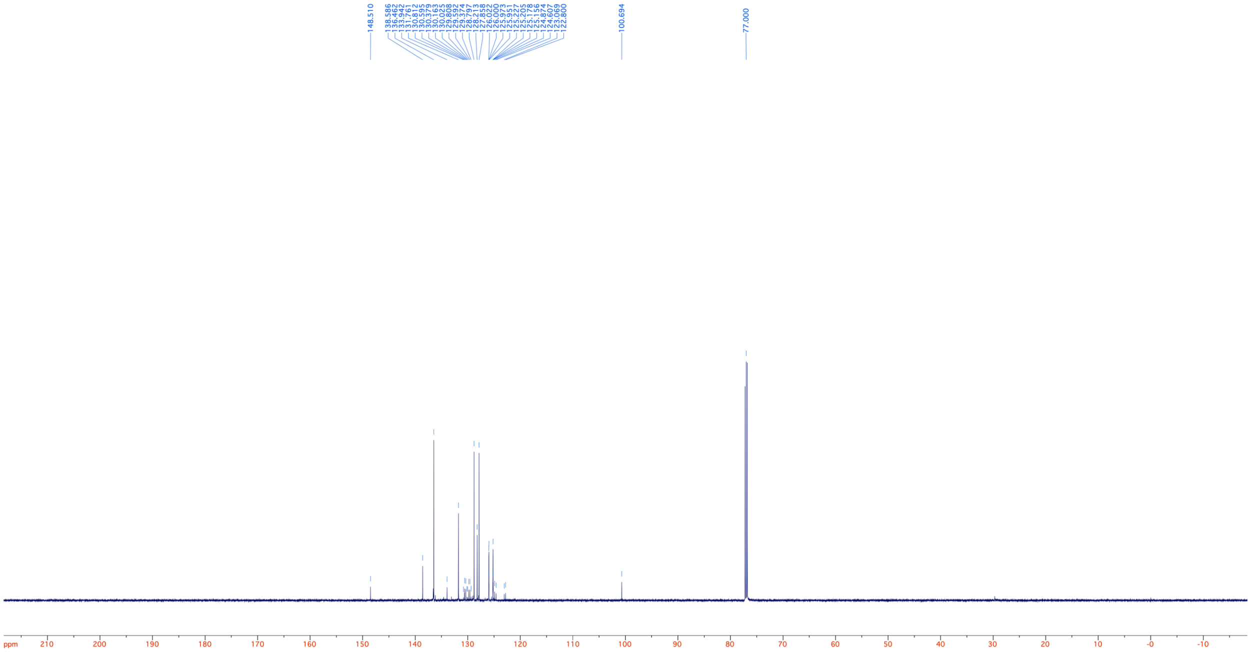
1.0
0.5
-0.0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130.379
130.163
130.025
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129.374
128.797
128.213
127.858
126.022
126.000
125.973
125.951
125.227
125.205
125.178
125.156
124.874
124.607
123.069
122.800
100.694
77.000
ppm
210
200
190
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120
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50
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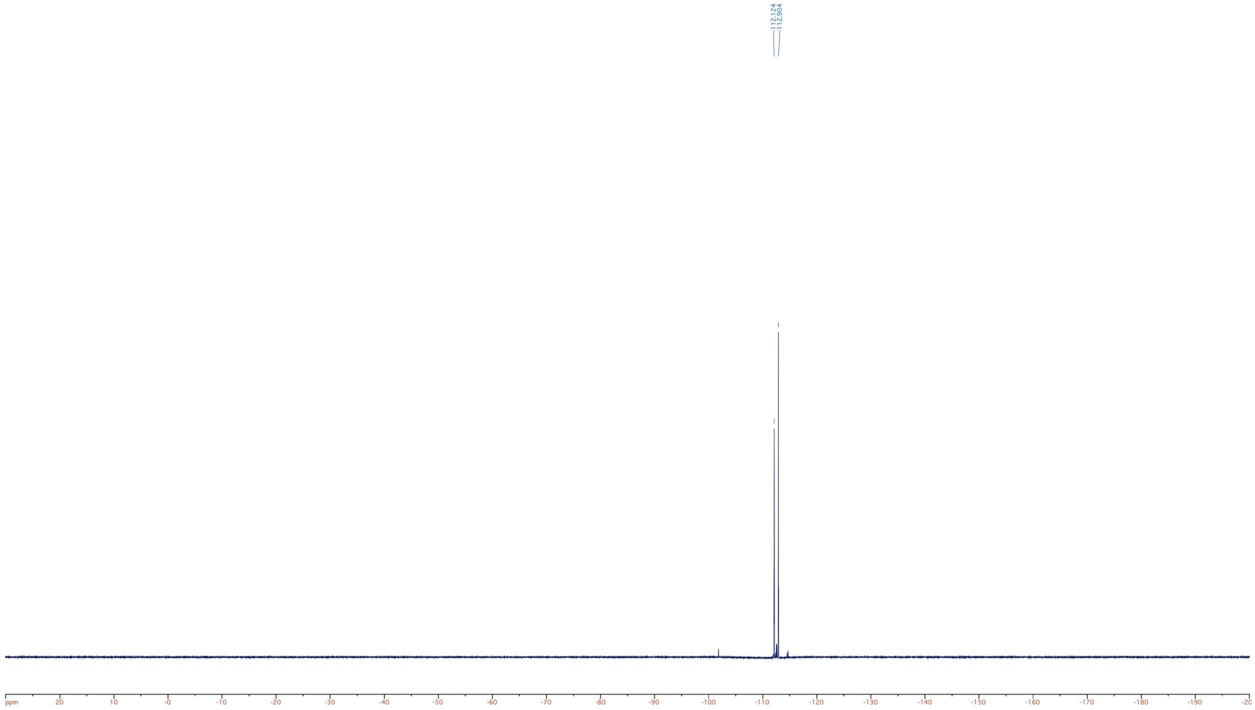
10
-0
-10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-100
-110
-120
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-150
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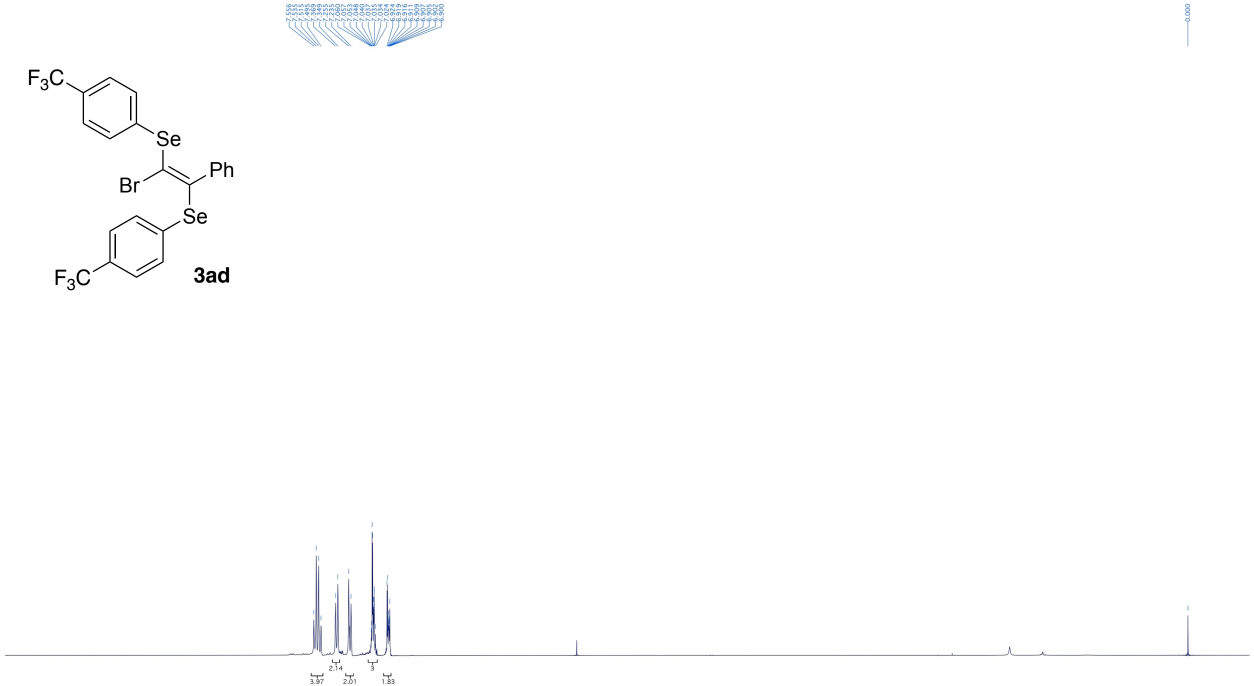
-180
-190
-20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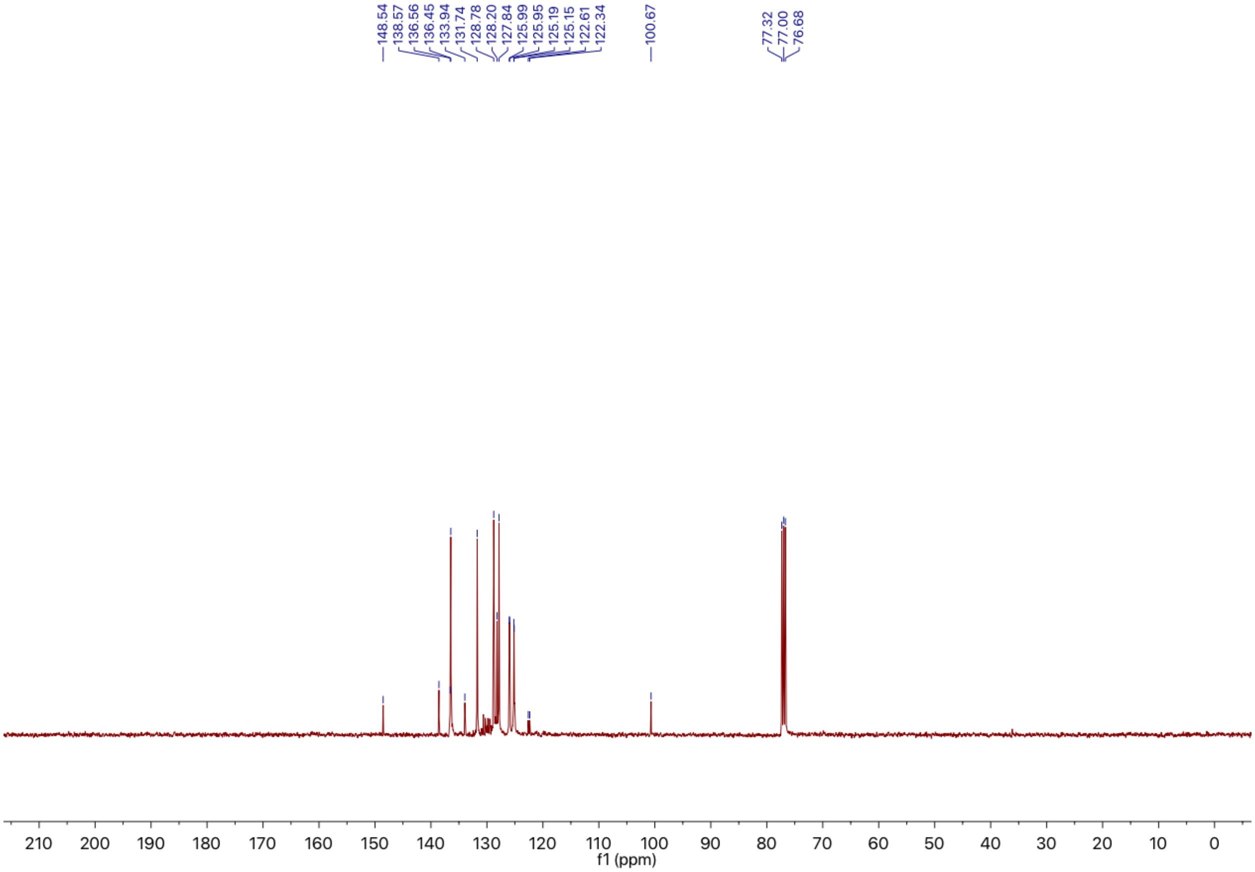
7.057
7.053
7.048
7.040
7.037
7.035
7.034
7.024
6.924
6.919
6.916
6.911
6.909
6.907
6.905
6.902
6.900
0.000
F3C
Se
Br
Ph
Se
F3C
3.97
2.14
2.01
3
1.83
ppm
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
-0.0
-0.5

3ad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136.56
136.45
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131.74
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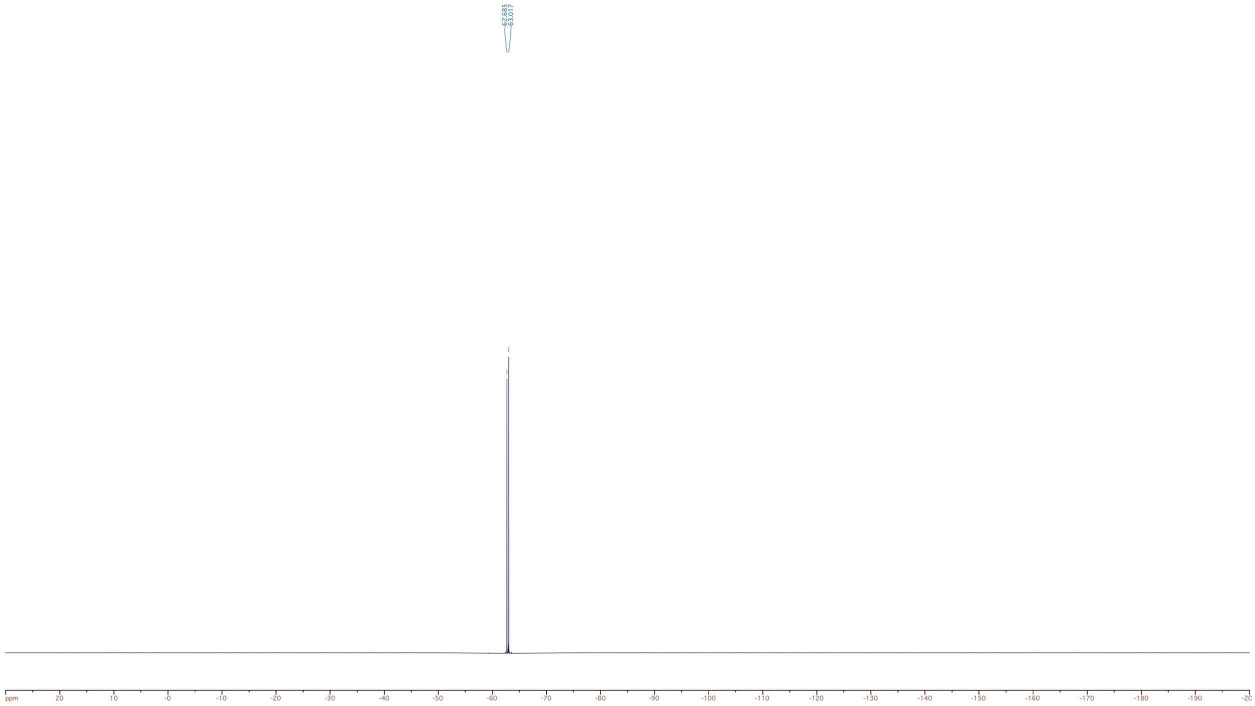
128.20
127.84
125.99
125.95
125.19
125.15
122.61
122.34
100.67
77.32
77.00
76.68
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)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-63.017
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10
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-10
-20
-30
-40
-50
-60
-70
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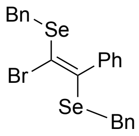
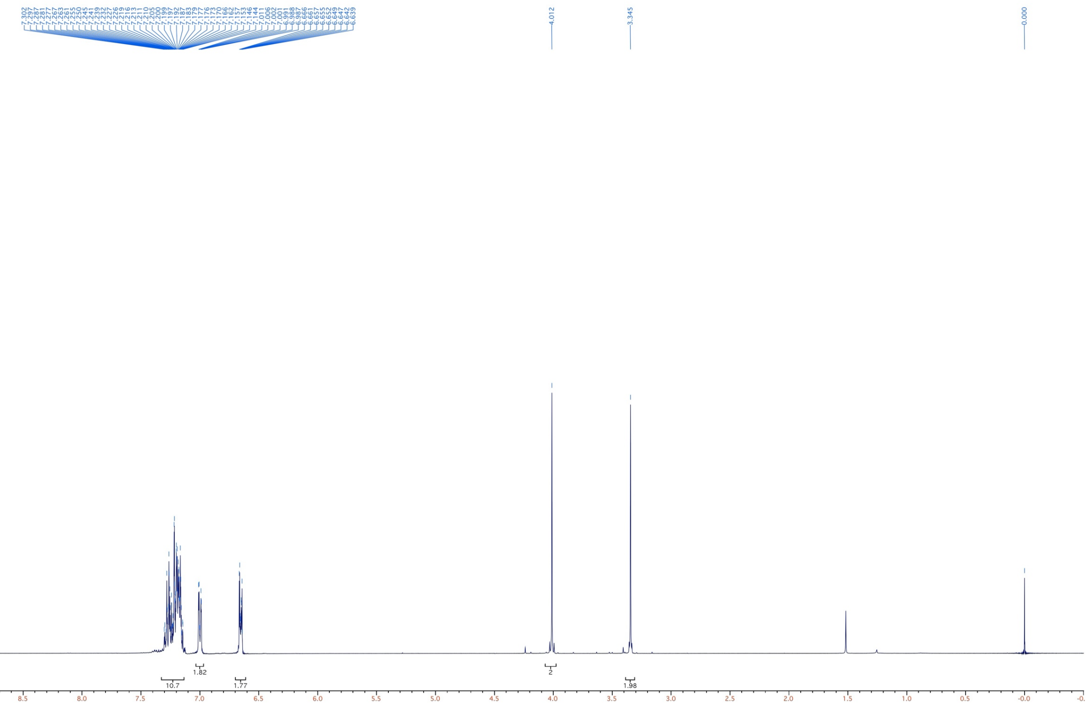
-150
-160
-170
-180
-190
-20


Bn
Se
Ph
Br
Se
Bn

3ae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7.261
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7.250
7.245
7.241
7.239
7.232
7.227
7.226
7.219
7.216
7.213
7.211
7.210
7.205
7.200
7.199
7.197
7.192
7.187
7.183
7.179
7.177
7.176
7.173
7.170
7.166
7.162
7.157
7.153
7.146
7.144
7.011
7.006
7.002
7.001
6.991
6.988
6.987
6.666
6.661
6.657
6.655
6.652
6.649
6.647
6.642
6.639
4.012
3.345
0.000
10.7
1.82
1.77
2
1.98
ppm
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9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
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4.0
3.5
3.0
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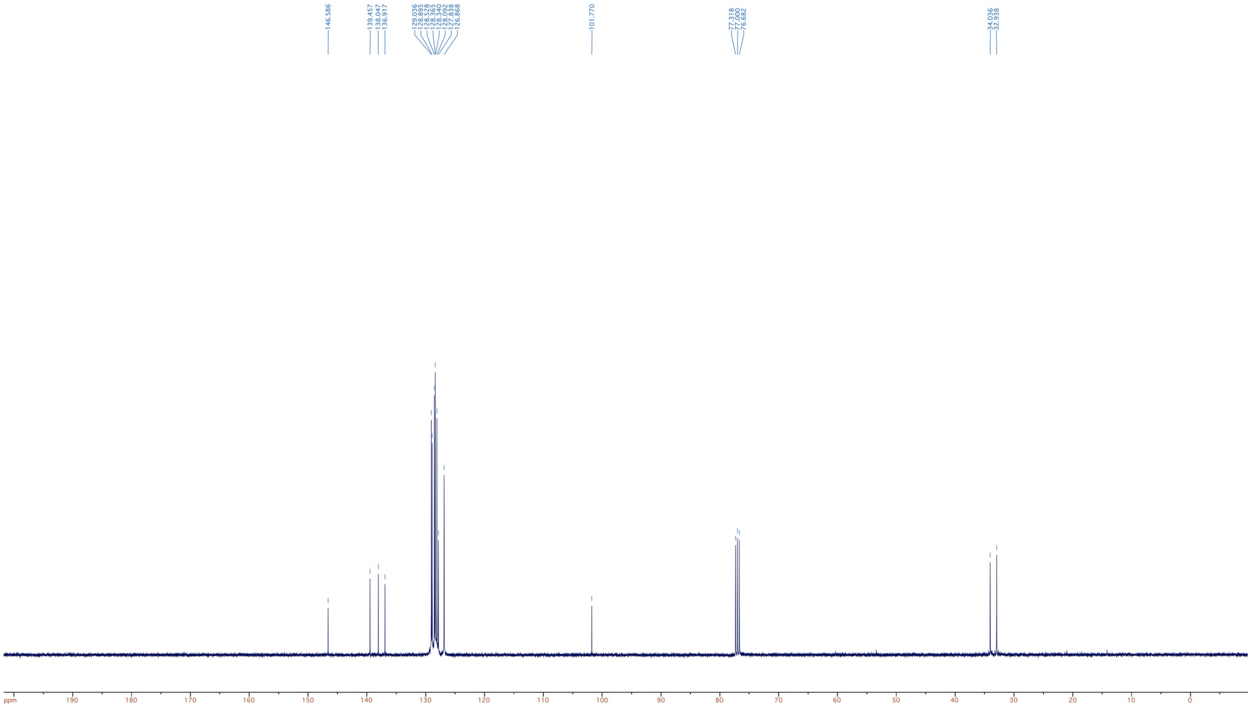
1.5
1.0
0.5
-0.0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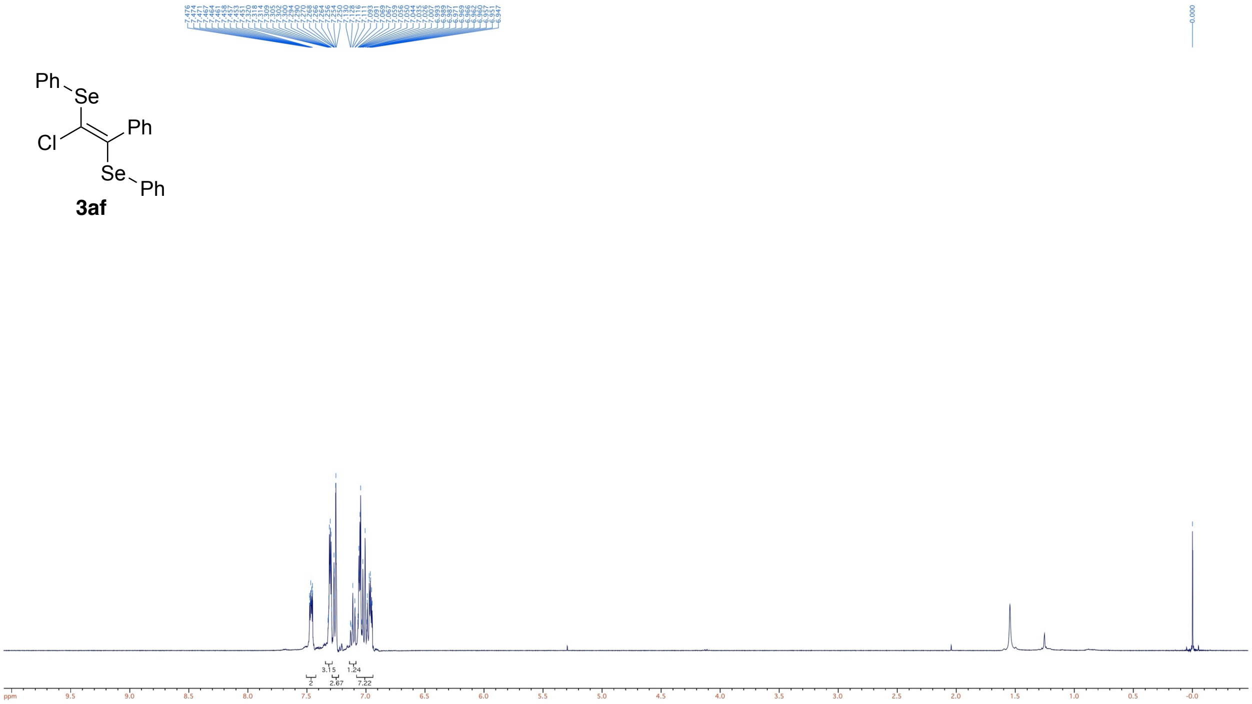
127.838
126.868
101.770
77.318
77.000
76.682
34.036
32.938
ppm
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0

Ph
Se
Cl
Ph
Se
Ph

3af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7.471
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7.461
7.458
7.457
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7.451
7.320
7.318
7.314
7.309
7.305
7.302
7.300
7.294
7.290
7.270
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7.266
7.264
7.256
7.254
7.250
7.130
7.128
7.116
7.111
7.093
7.091
7.069
7.067
7.059
7.056
7.050
7.044
7.035
7.026
7.007
6.993
6.989
6.987
6.971
6.969
6.966
6.962
6.960
6.957
6.951
6.947
0.000
2
3.15
2.67
1.24
7.22
ppm
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9.0
8.5
8.0
7.5
7.0
6.5
6.0
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4.0
3.5
3.0
2.5
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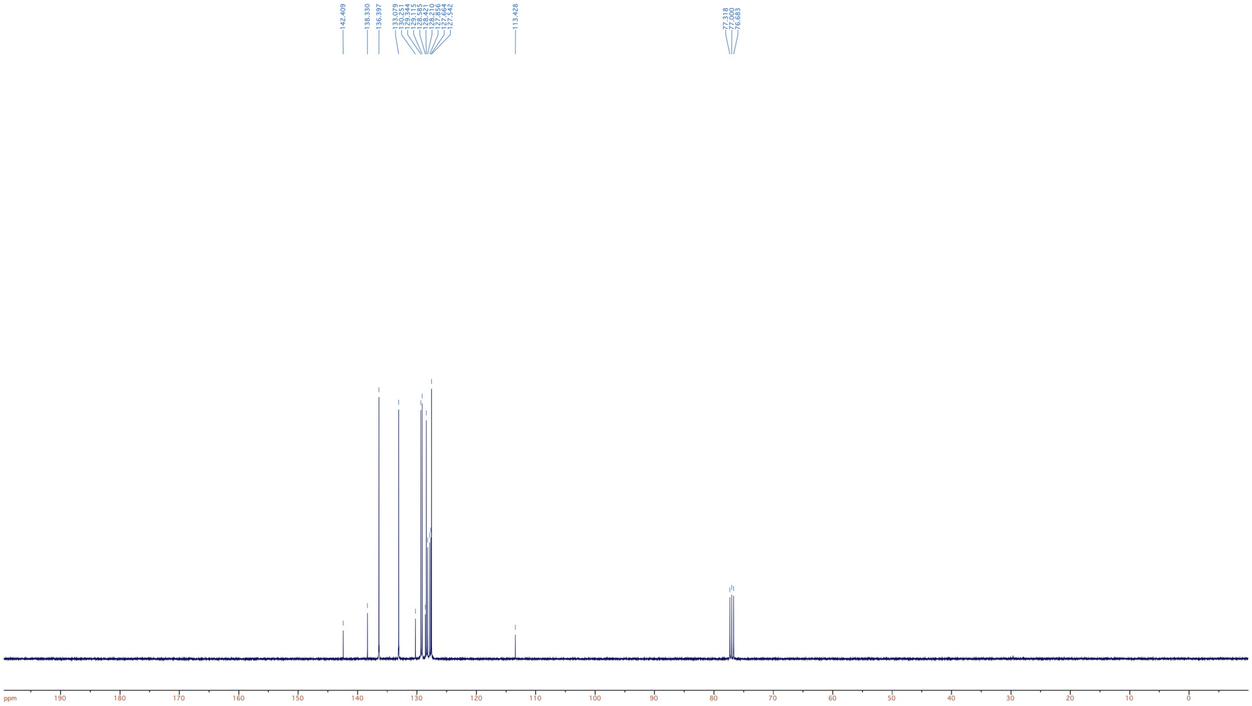
1.5
1.0
0.5
-0.0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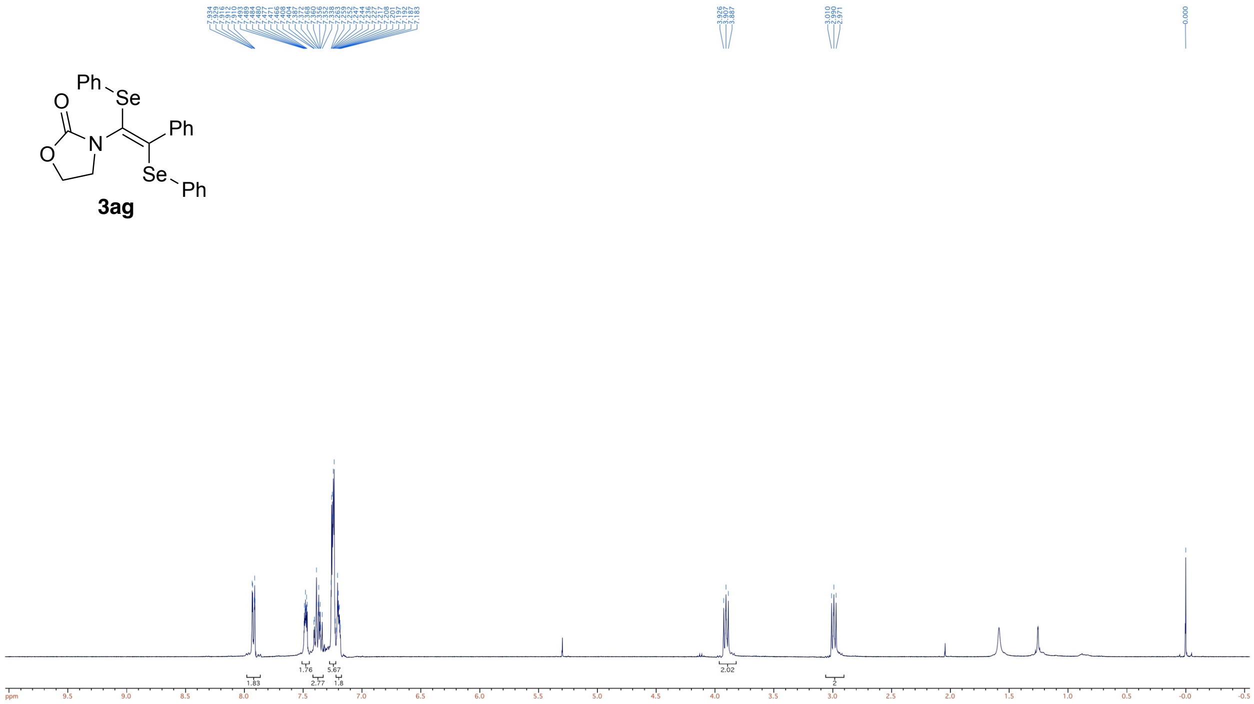
128.421
128.210
127.856
127.664
127.542
113.428
77.318
77.000
76.683
ppm
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0

Ph
Se
O
O
N
Ph
Se
Ph

3ag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7.910
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7.484
7.480
7.477
7.471
7.466
7.408
7.404
7.387
7.372
7.368
7.360
7.356
7.352
7.338
7.263
7.259
7.252
7.247
7.244
7.236
7.227
7.217
7.208
7.201
7.197
7.192
7.187
7.183
3.926
3.907
3.887
3.010
2.990
2.971
0.000
1.83
1.76
2.77
5.67
1.8
2.02
2
ppm
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
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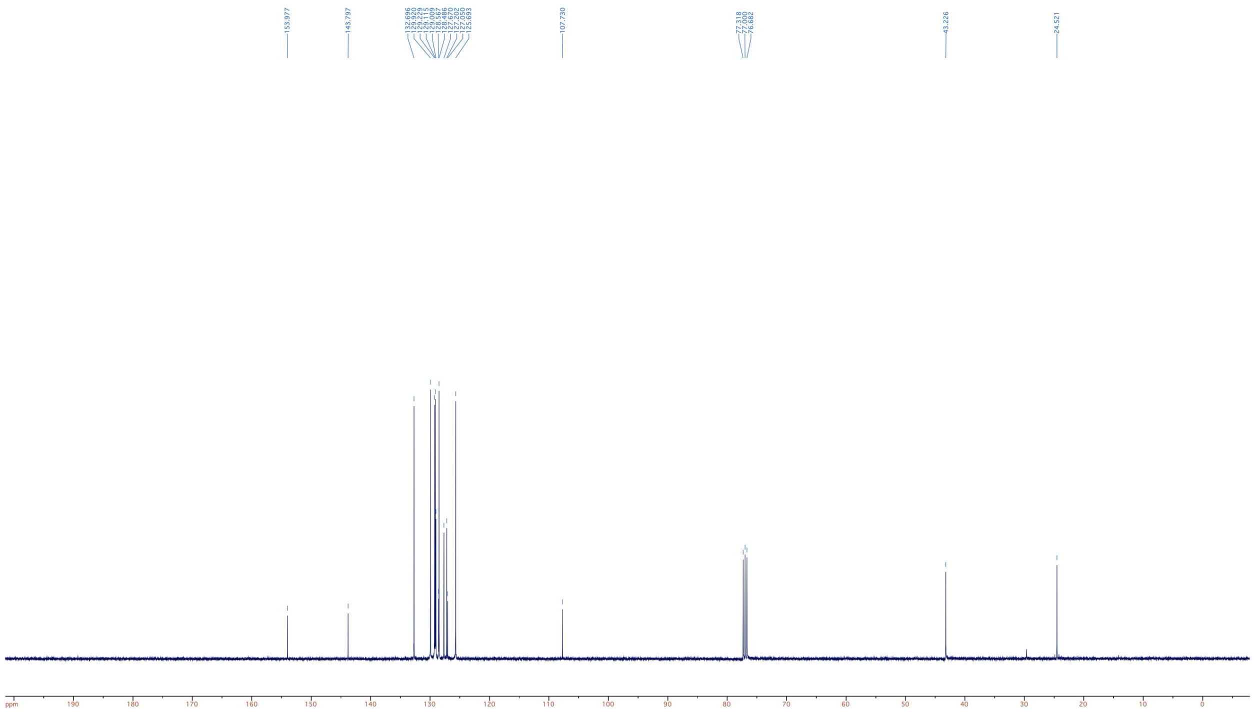
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
-0.0
-0.5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128.567
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127.670
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127.050
125.693
107.730
77.318
77.000
76.682
43.226
24.521
ppm
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150
140
130
120
110
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70
60
50
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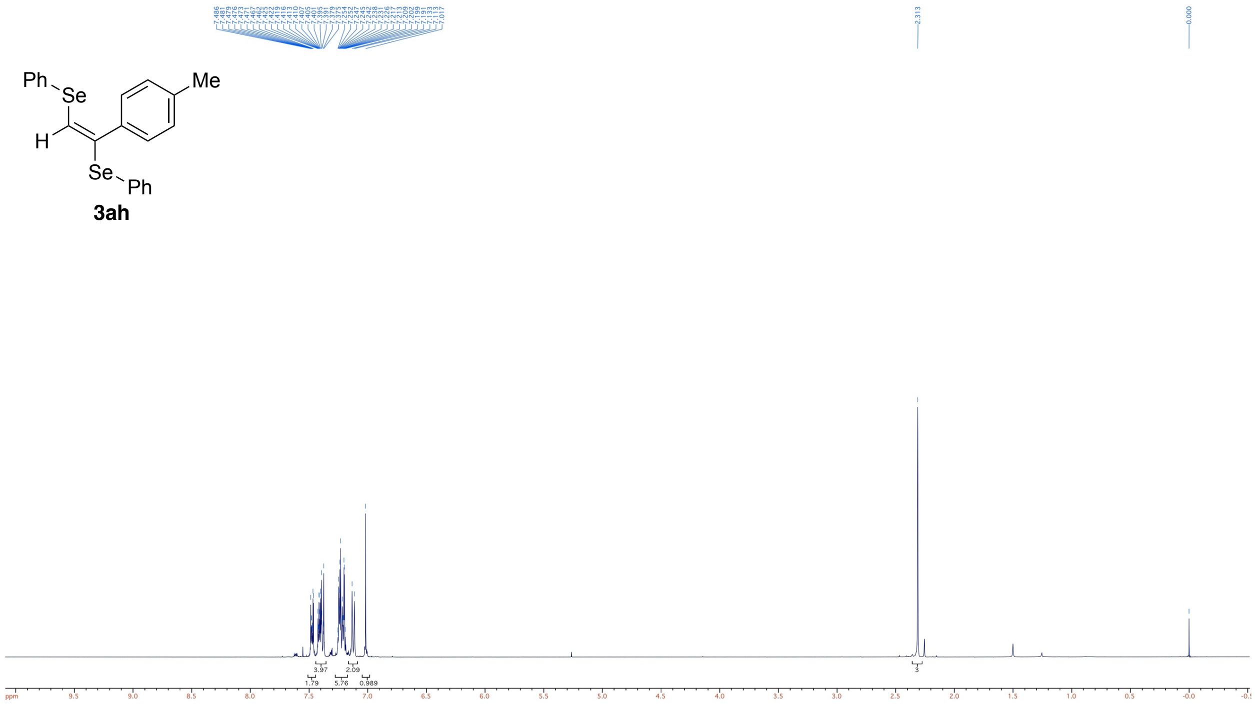
30
20
10
0


Ph
Se
Me
H
Se
Ph
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7.467
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7.422
7.419
7.416
7.413
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7.405
7.401
7.395
7.391
7.379
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7.245
7.242
7.238
7.231
7.226
7.217
7.213
7.209
7.202
7.199
7.191
7.133
7.113
7.017
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0.000
3.97
2.09
1.79
5.76
0.989
3
ppm
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9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
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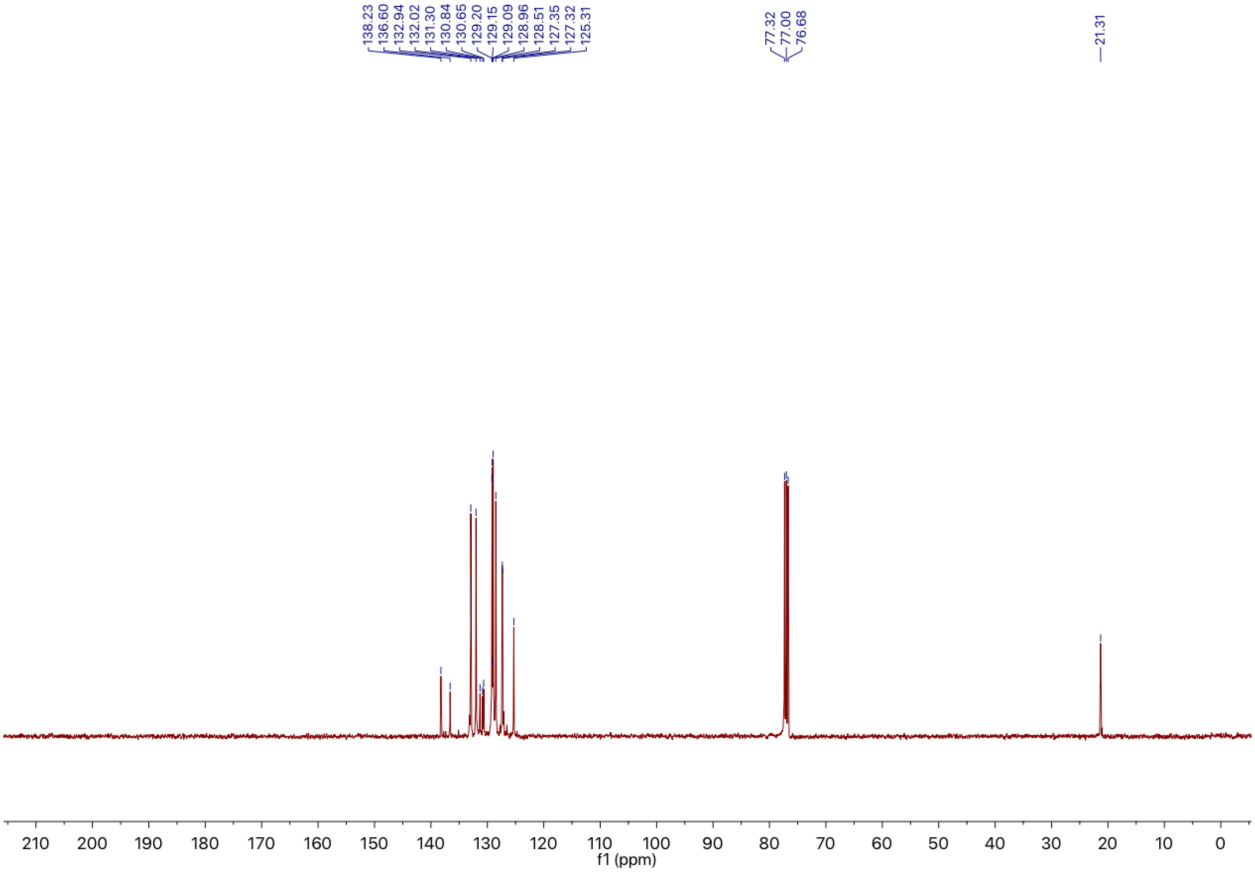
1.5
1.0
0.5
-0.0

3ah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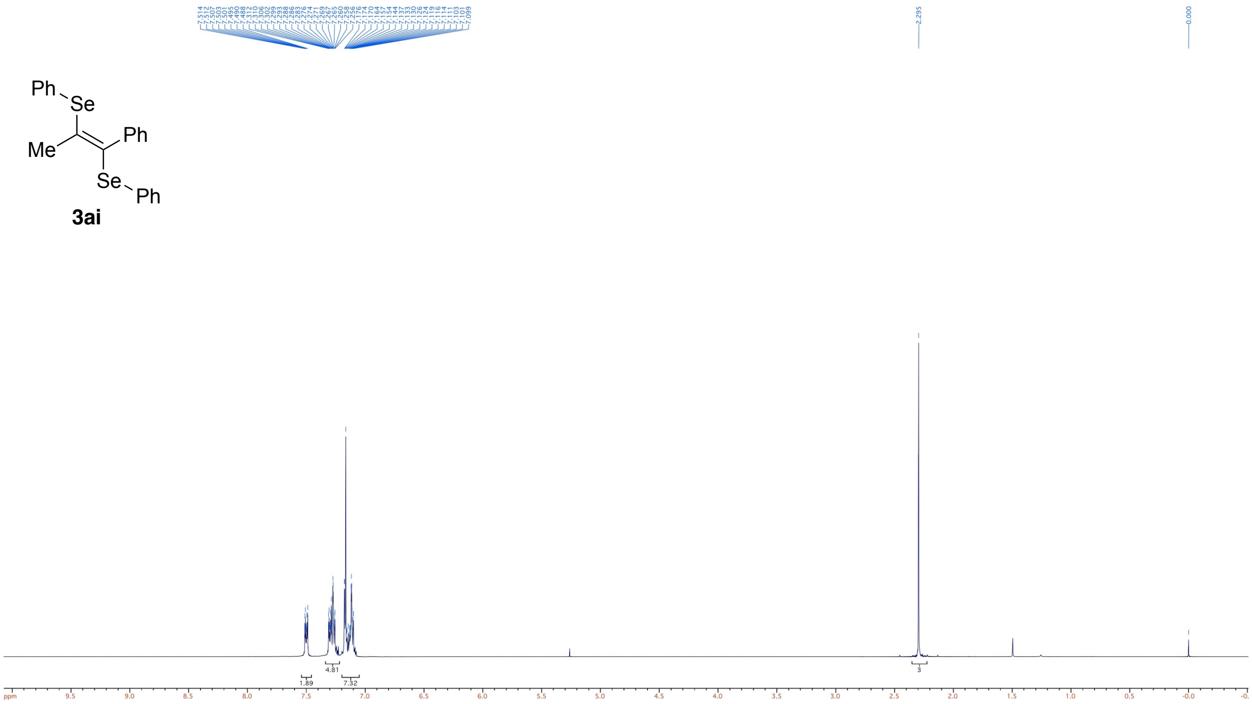
128.96
128.51
127.35
127.32
125.31
77.32
77.00
76.68
21.31
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

Ph
Se
Ph
Me
Se
Ph

3ai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7.306
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7.293
7.288
7.286
7.283
7.276
7.274
7.271
7.269
7.267
7.265
7.260
7.258
7.256
7.176
7.174
7.170
7.164
7.157
7.154
7.144
7.137
7.133
7.130
7.126
7.124
7.119
7.116
7.114
7.111
7.103
7.101
7.099
2.295
0.000
1.89
4.81
7.32
3
ppm
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
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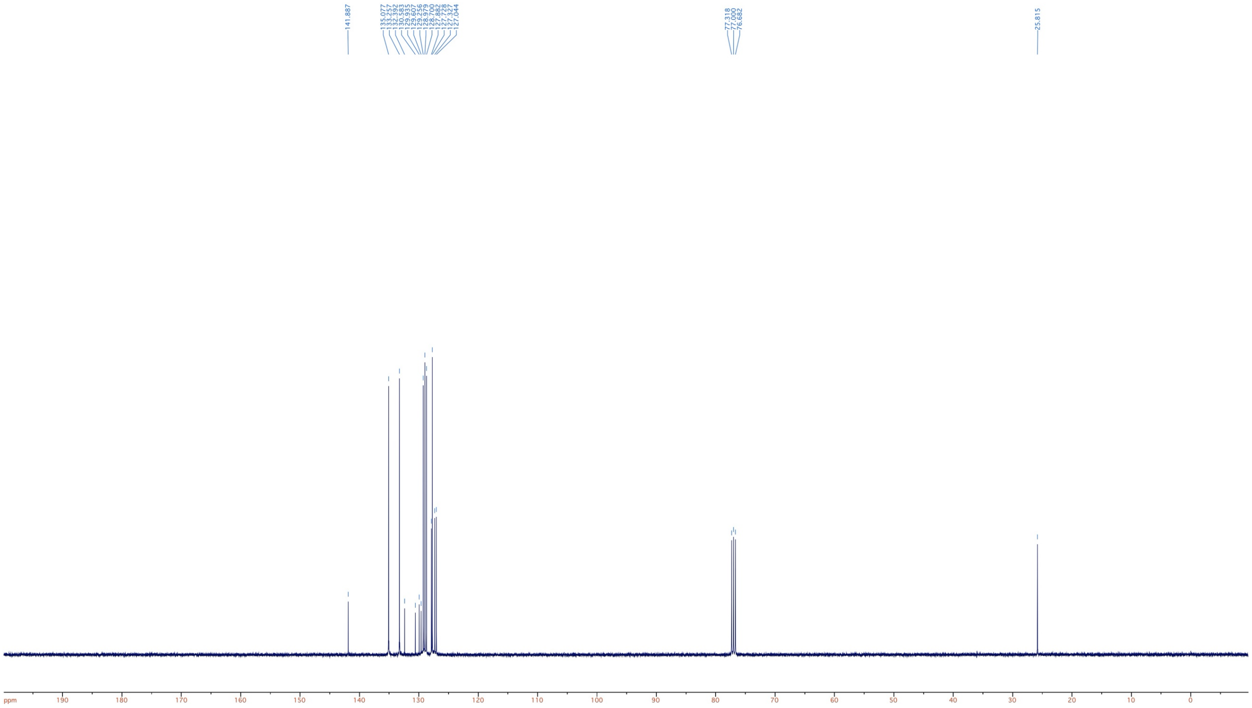
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
-0.0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129.256
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127.728
127.327
127.044
77.318
77.000
76.682
25.815
ppm
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150
140
130
120
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100
90
80
70
60
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40
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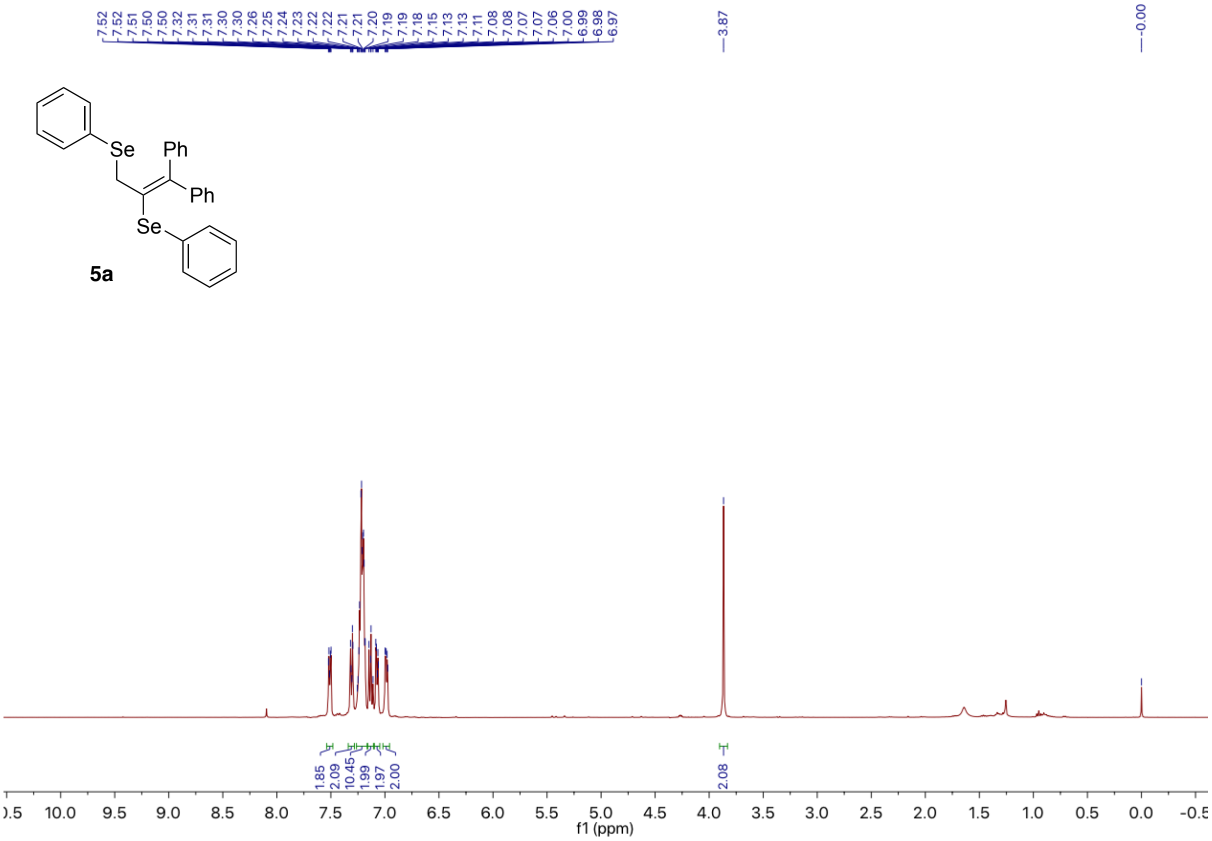
20
10
0



5a
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7.52
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7.50
7.32
7.31
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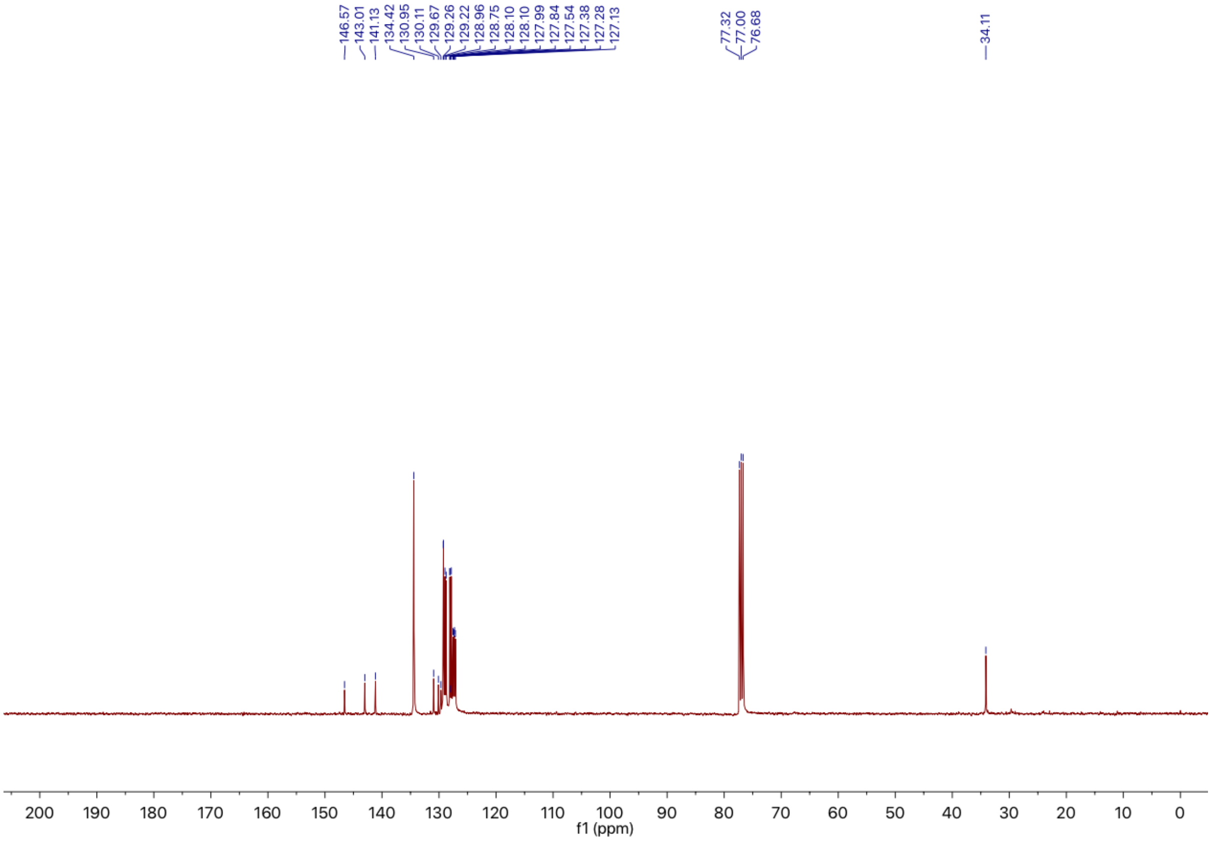
7.30
7.30
7.26
7.25
7.24
7.23
7.22
7.22
7.21
7.21
7.20
7.19
7.19
7.18
7.15
7.13
7.13
7.11
7.08
7.08
7.07
7.07
7.06
7.00
6.99
6.98
6.97
3.87
0.00
1.85
2.09
10.45
1.99
1.97
2.00
2.08
0.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
f1 (ppm)


146.57
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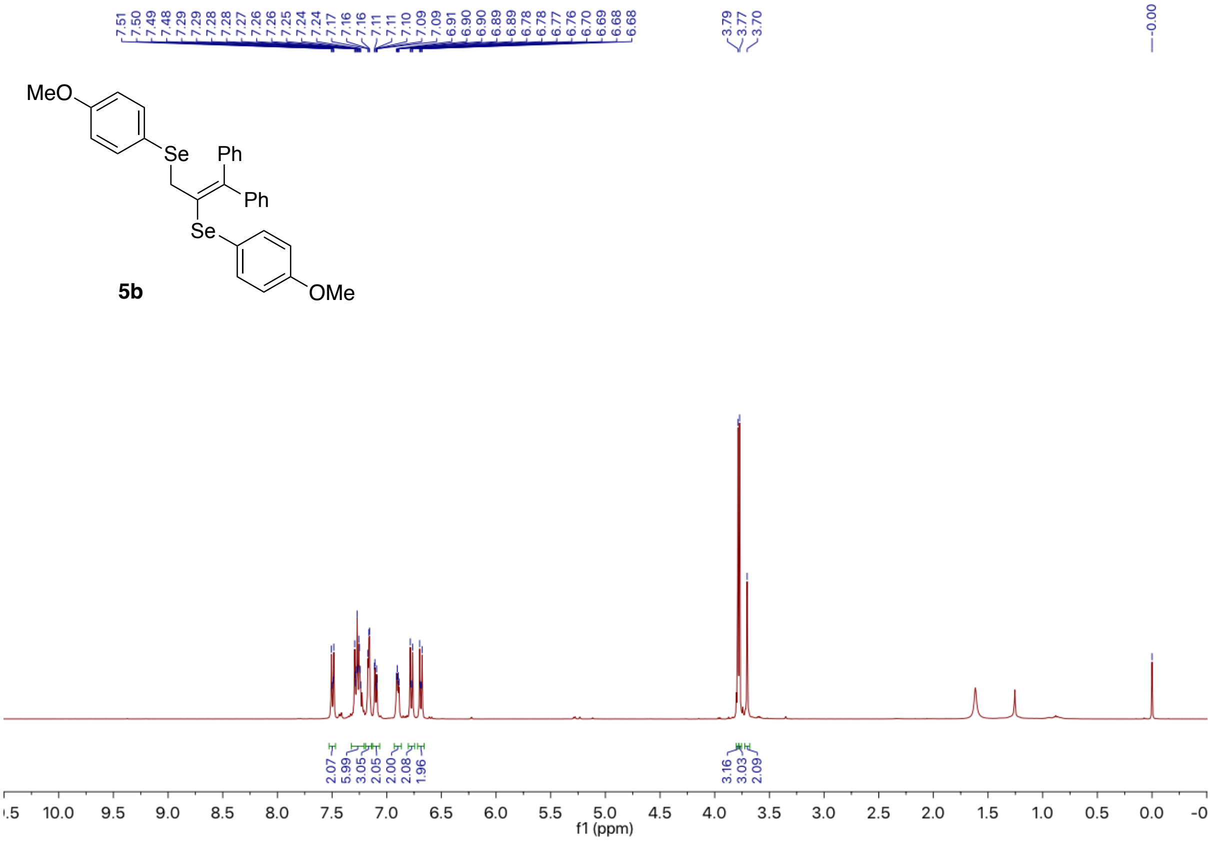
128.96
128.75
128.10
128.10
127.99
127.84
127.54
127.38
127.28
127.13
77.32
77.00
76.68
34.11
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)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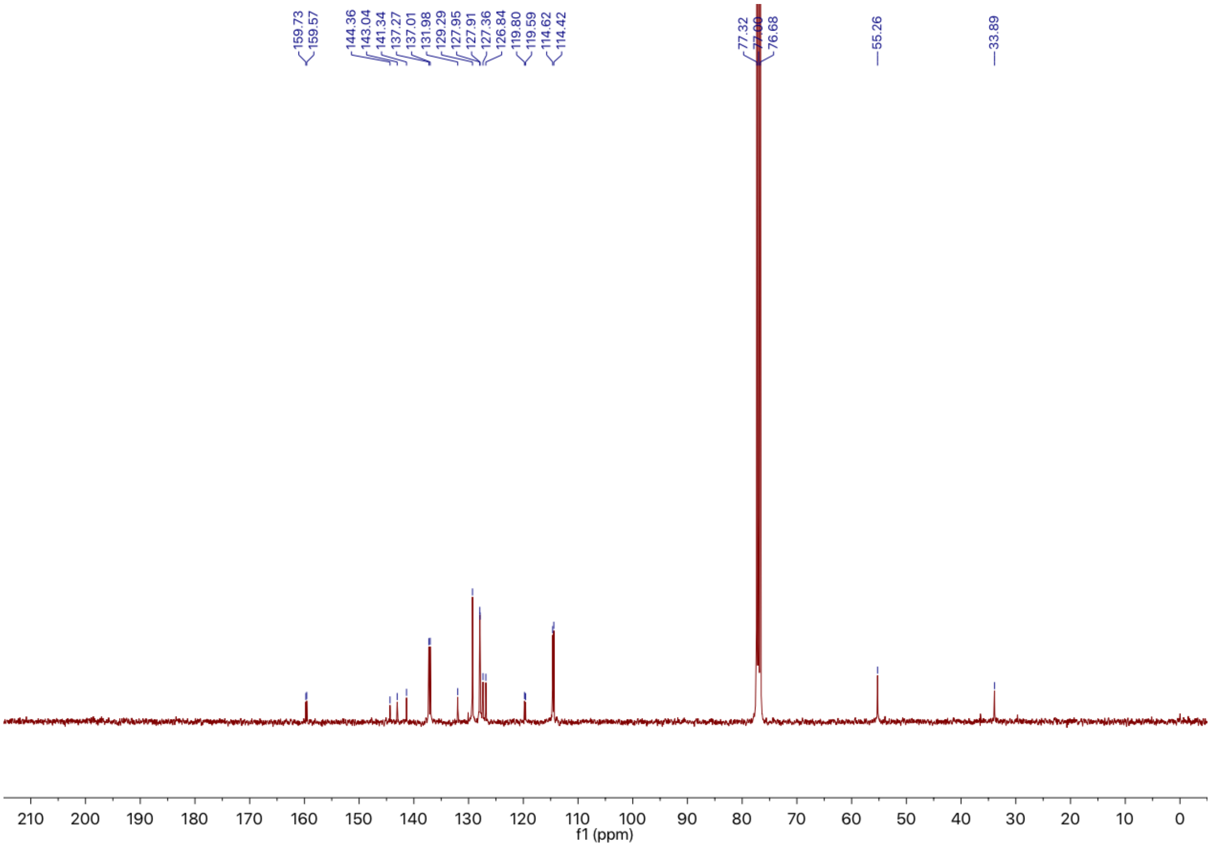
7.24
7.24
7.17
7.16
7.16
7.11
7.11
7.10
7.09
7.09
6.91
6.90
6.90
6.89
6.89
6.78
6.78
6.77
6.76
6.70
6.69
6.68
6.68
3.79
3.77
3.70
0.00
MeO
Se
Ph
Ph
Se
OMe
2.07
5.99
3.05
2.05
2.00
2.08
1.96
3.16
3.03
2.09
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0
f1 (ppm)

5b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127.95
127.91
127.36
126.84
119.80
119.59
114.62
114.42
77.32
77.00
76.68
55.26
33.89
210
200
190
180
170
160
150
140
130
120
110
100
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80
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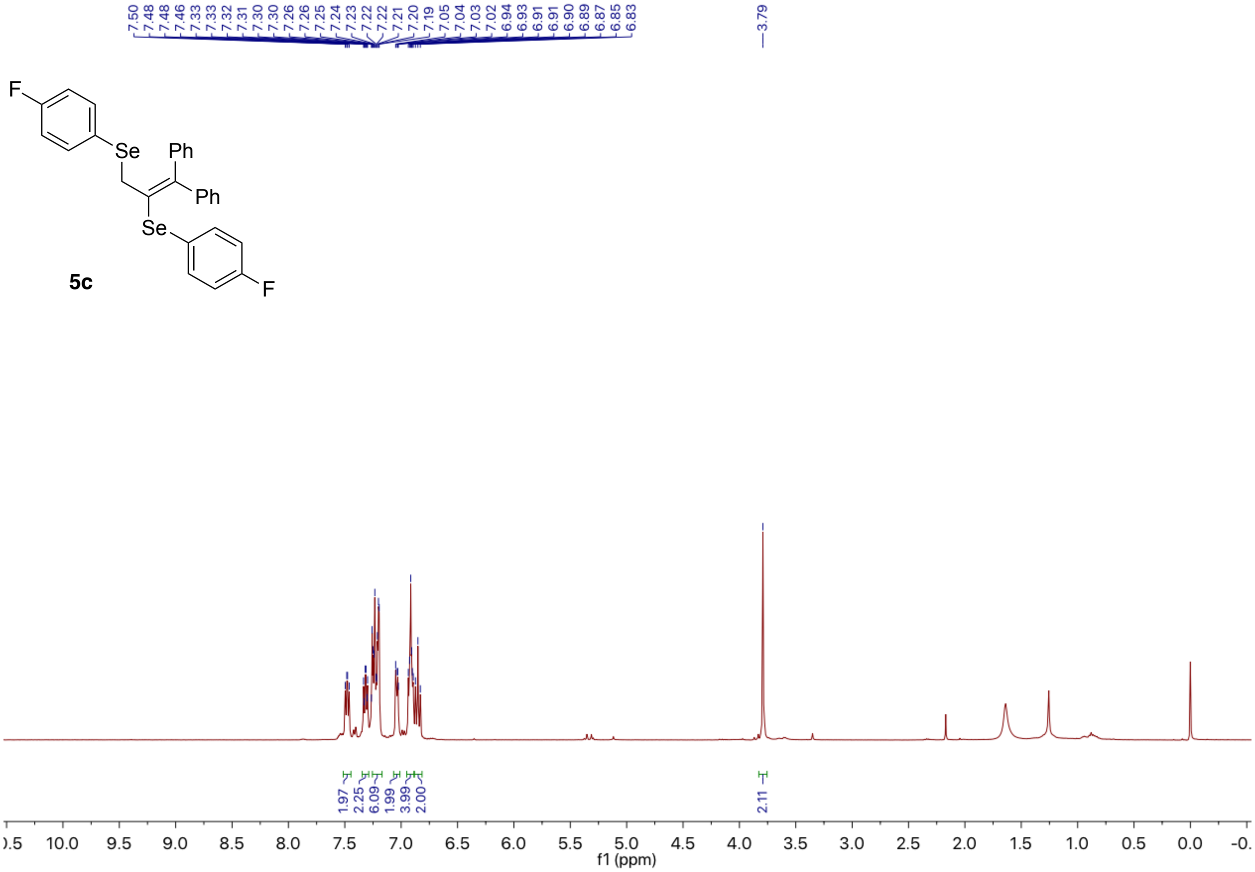
50
40
30
20
10
0
f1 (ppm)

F
Se
Ph
Ph
Se
F

5c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7.25
7.24
7.23
7.22
7.22
7.21
7.20
7.19
7.05
7.04
7.03
7.02
6.94
6.93
6.91
6.91
6.90
6.89
6.87
6.85
6.83
3.79
1.97
2.25
6.09
1.99
3.99
2.00
2.11
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
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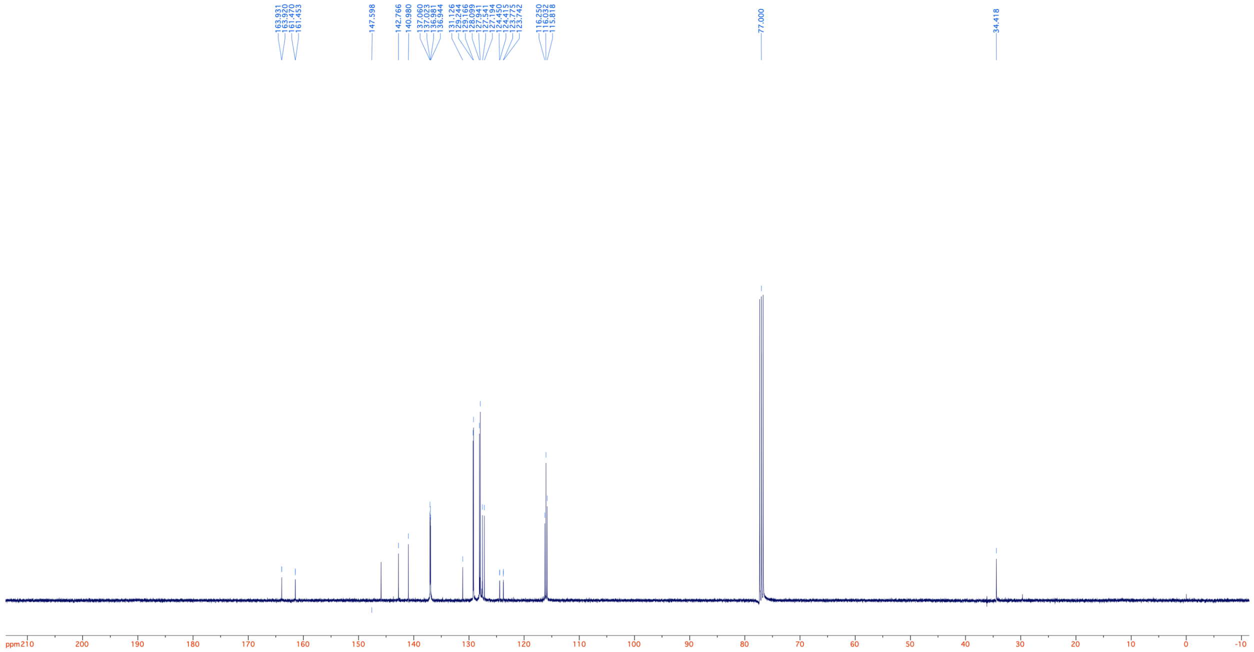
f1 (ppm)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140.980
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136.981
136.944
131.126
129.244
129.166
128.099
127.941
127.541
127.194
124.450
124.415
123.775
123.742
116.250
116.032
115.818
77.000
34.418
ppm 210
200
190
180
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140
130
120
110
100
90
80
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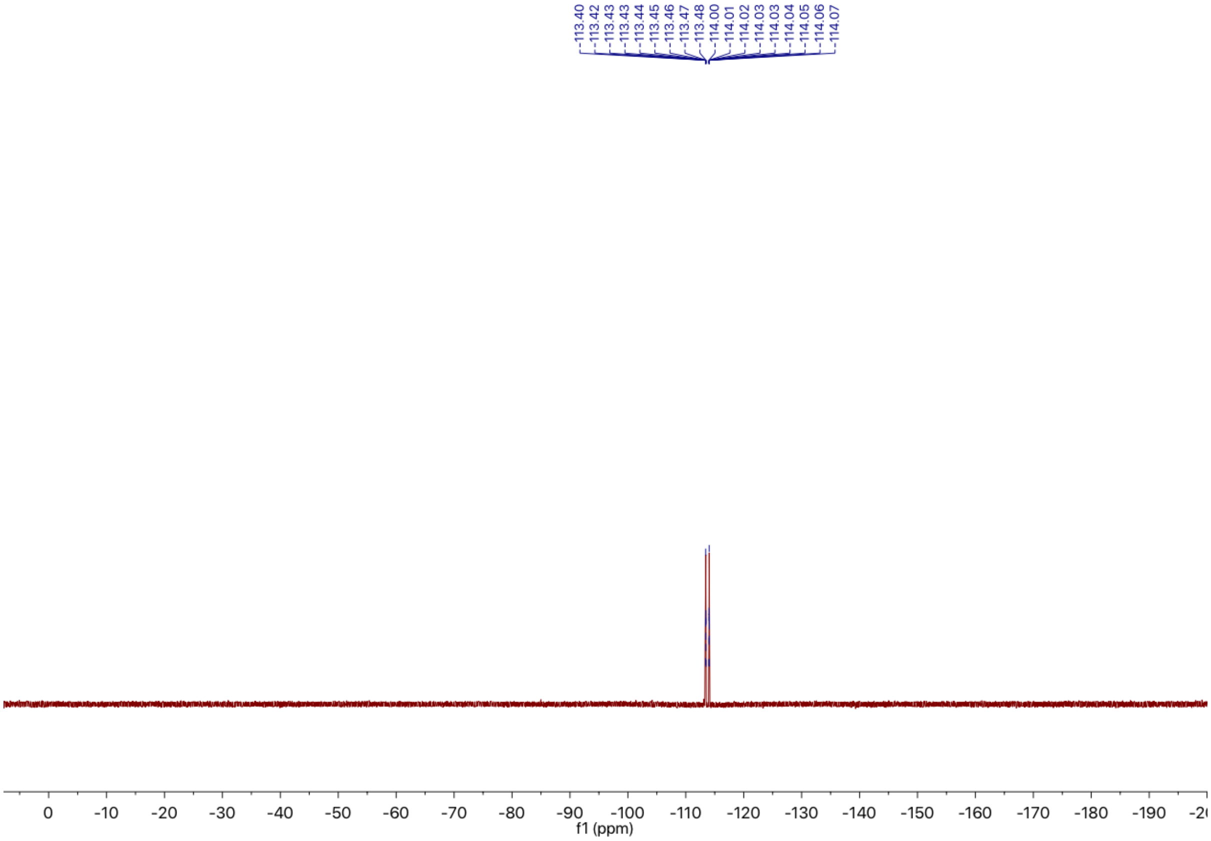
50
40
30
20
10
0
-10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-113.46
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-113.48
-114.00
-114.01
-114.02
-114.03
-114.03
-114.04
-114.05
-114.06
-114.07
0
-10
-20
-30
-40
-50
-60
-70
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-100
-110
-120
-130
-140
-150
-160
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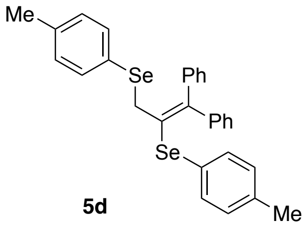
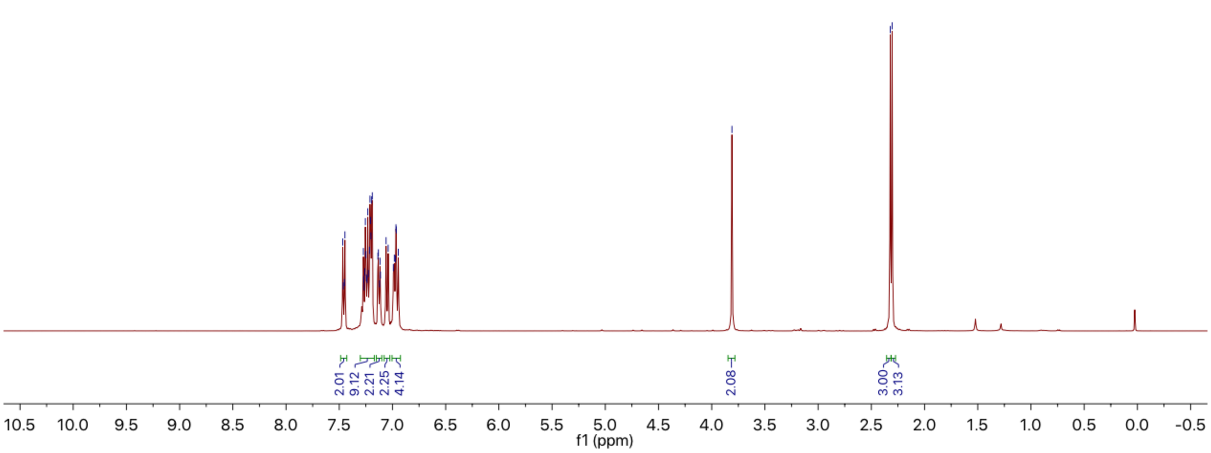
-180
-190
-2
f1 (ppm)


Me
Se
Ph
Ph
Se
Me

5d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7.25
7.24
7.24
7.23
7.23
7.22
7.21
7.21
7.20
7.20
7.19
7.14
7.13
7.12
7.12
7.11
7.06
7.04
6.99
6.98
6.97
6.96
6.94
3.81
2.32
2.30
2.01
9.12
2.21
2.25
4.14
2.08
3.00
3.13
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
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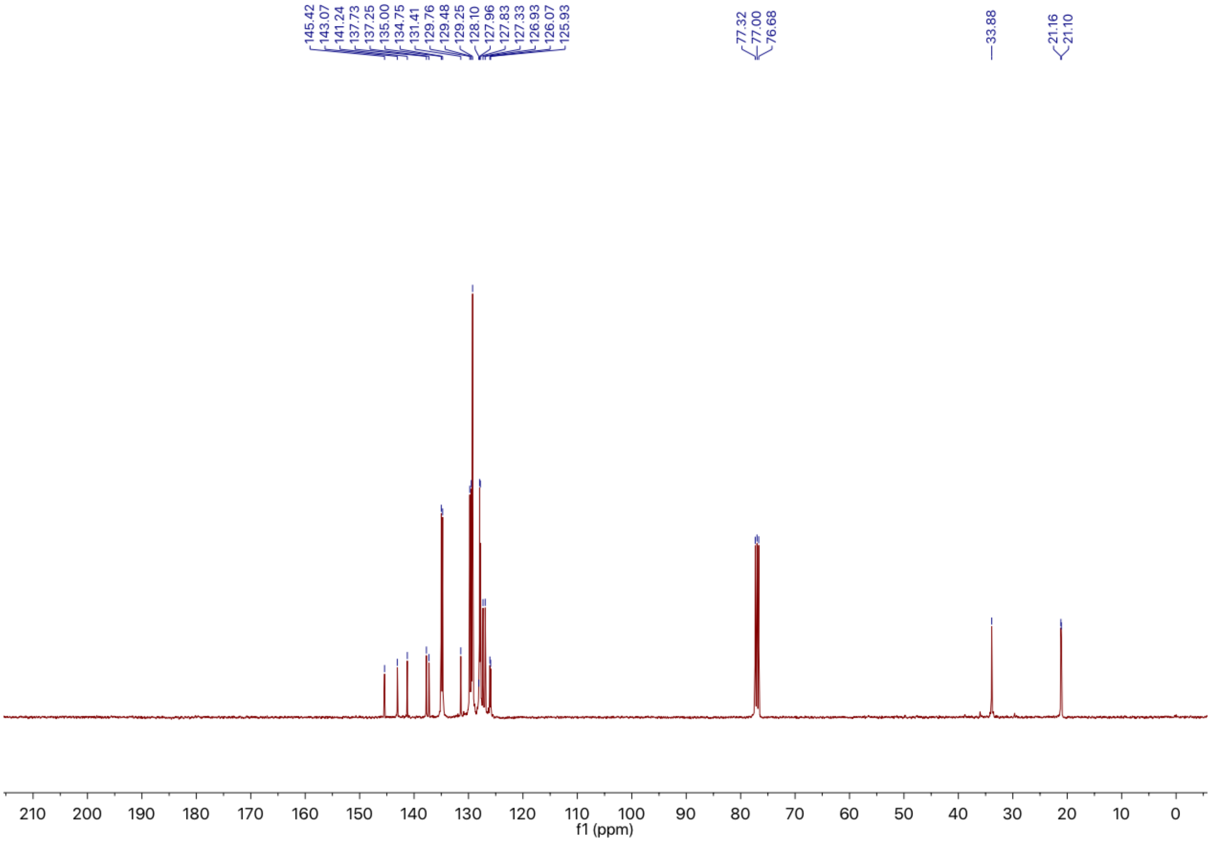
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
f1 (ppm)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141.24
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137.25
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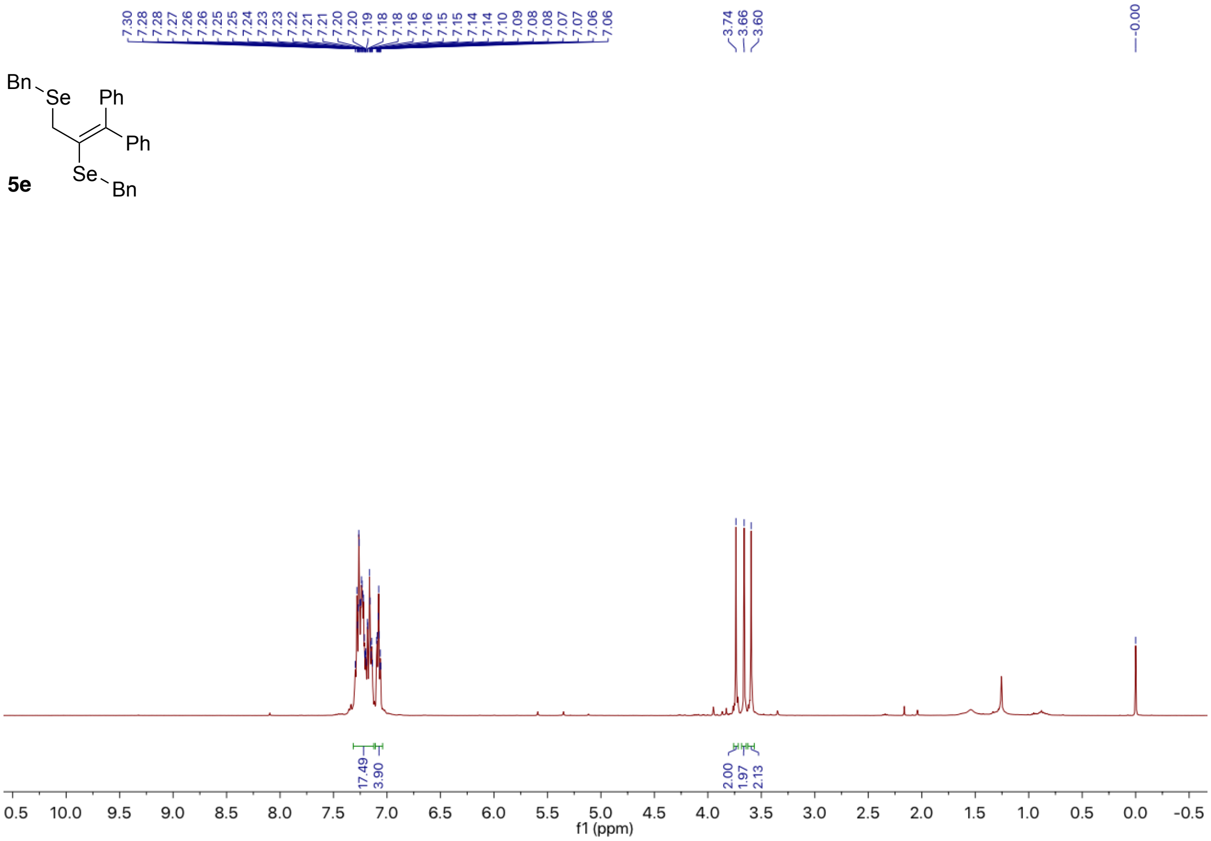
134.75
131.41
129.76
129.48
129.25
128.10
127.96
127.83
127.33
126.93
126.07
125.93
77.32
77.00
76.68
33.88
21.16
21.10
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

Bn
Se
Ph
Ph
Se
Bn

5e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7.25
7.25
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7.23
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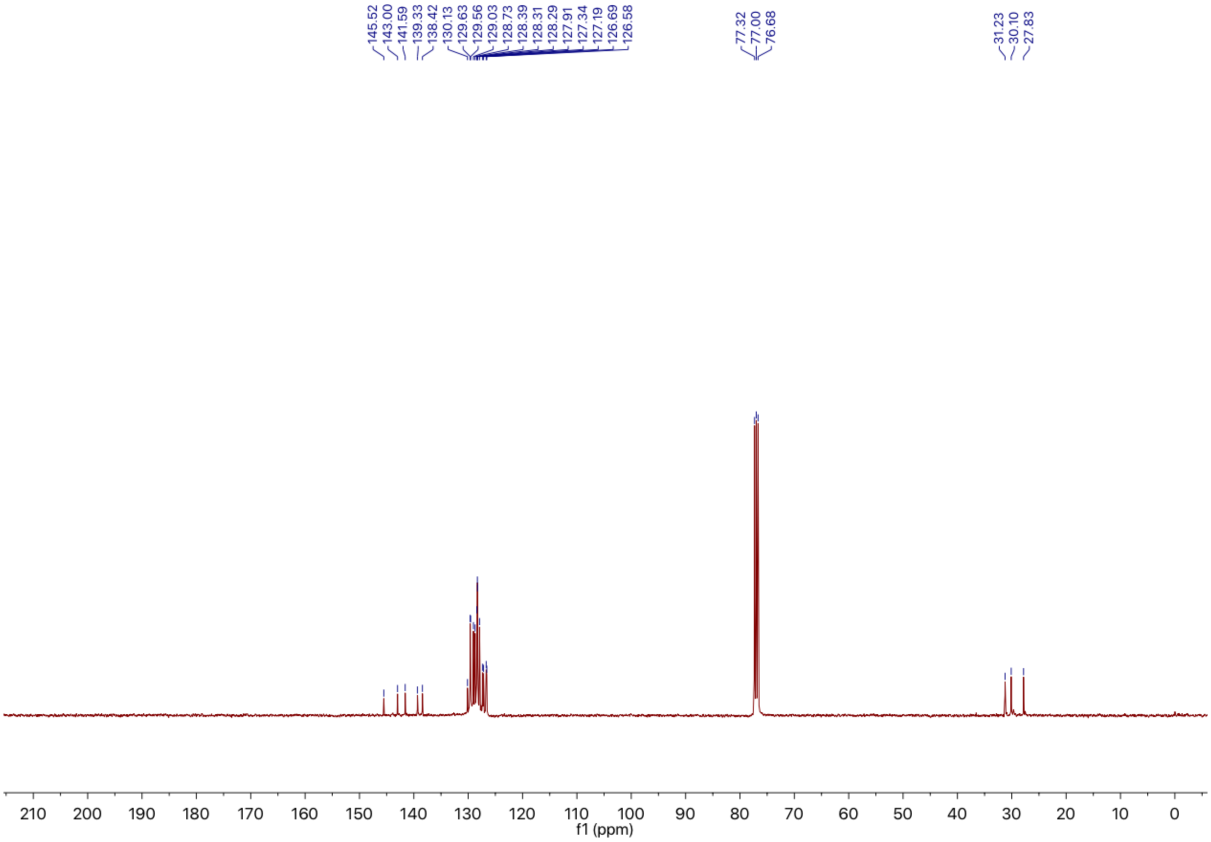
7.22
7.21
7.21
7.20
7.20
7.19
7.18
7.18
7.16
7.16
7.15
7.15
7.14
7.14
7.10
7.09
7.08
7.08
7.07
7.06
7.06
3.74
3.66
3.60
0.00
17.49
3.90
2.00
1.97
2.13
0.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
f1 (ppm)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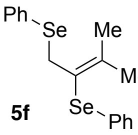
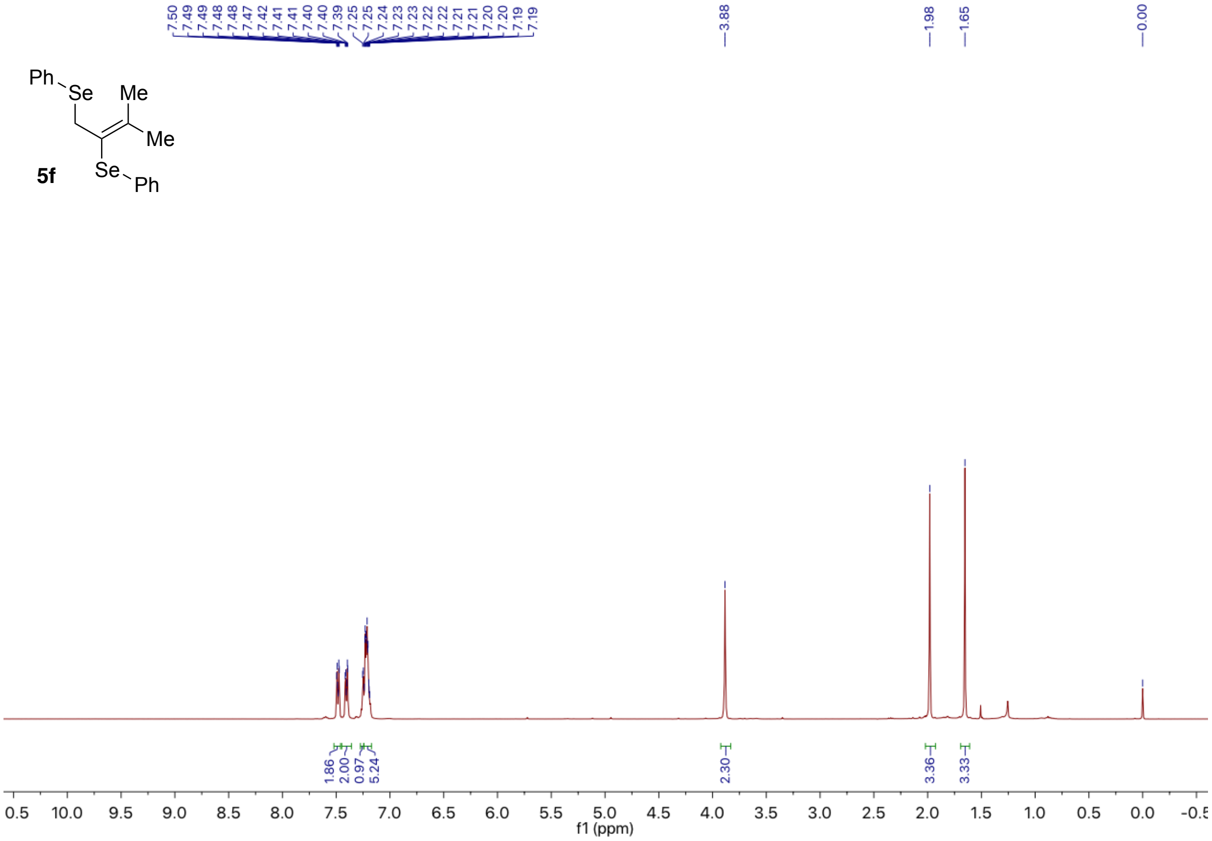
130.13
129.63
129.56
129.03
128.73
128.39
128.31
128.29
127.91
127.34
127.19
126.69
126.58
77.32
77.00
76.68
31.23
30.10
27.83
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)



Ph
Se
Me
Me
Se
Ph

5f



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7.49
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7.48
7.47
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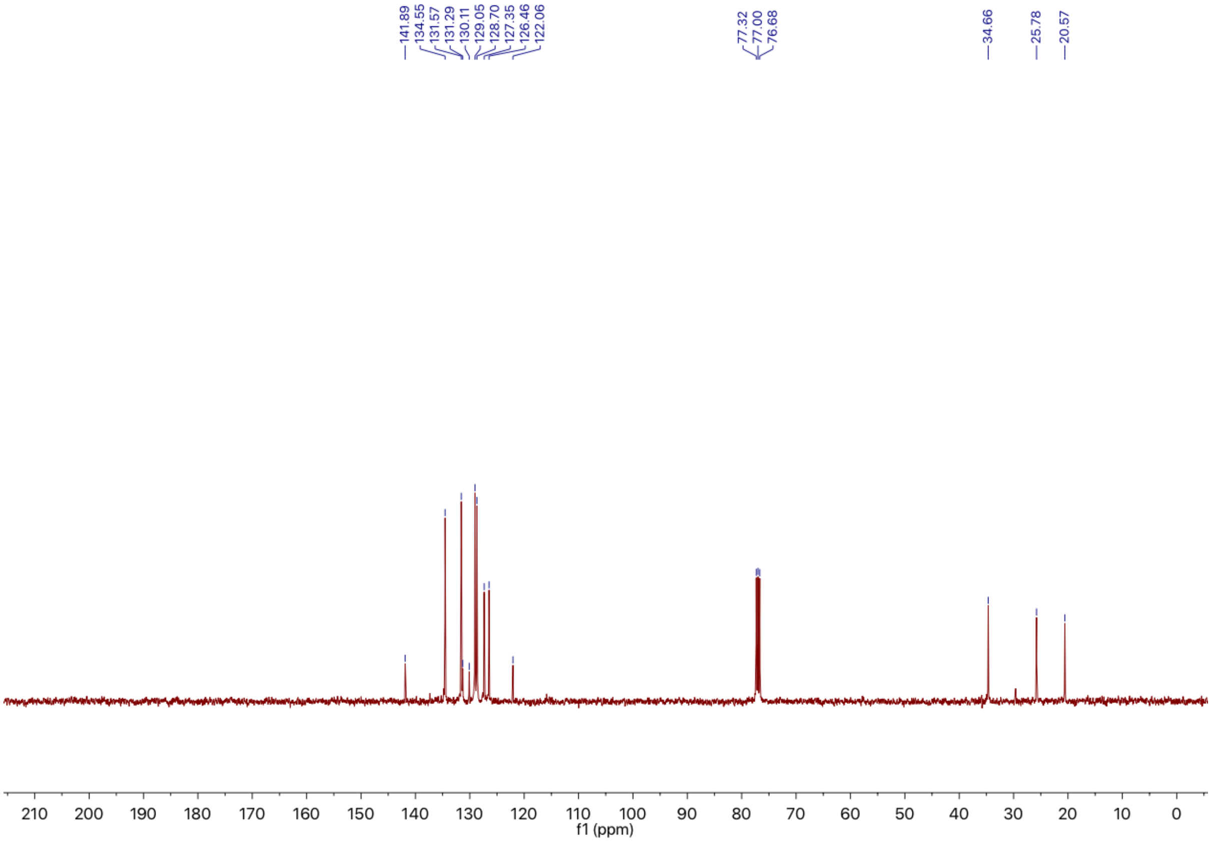
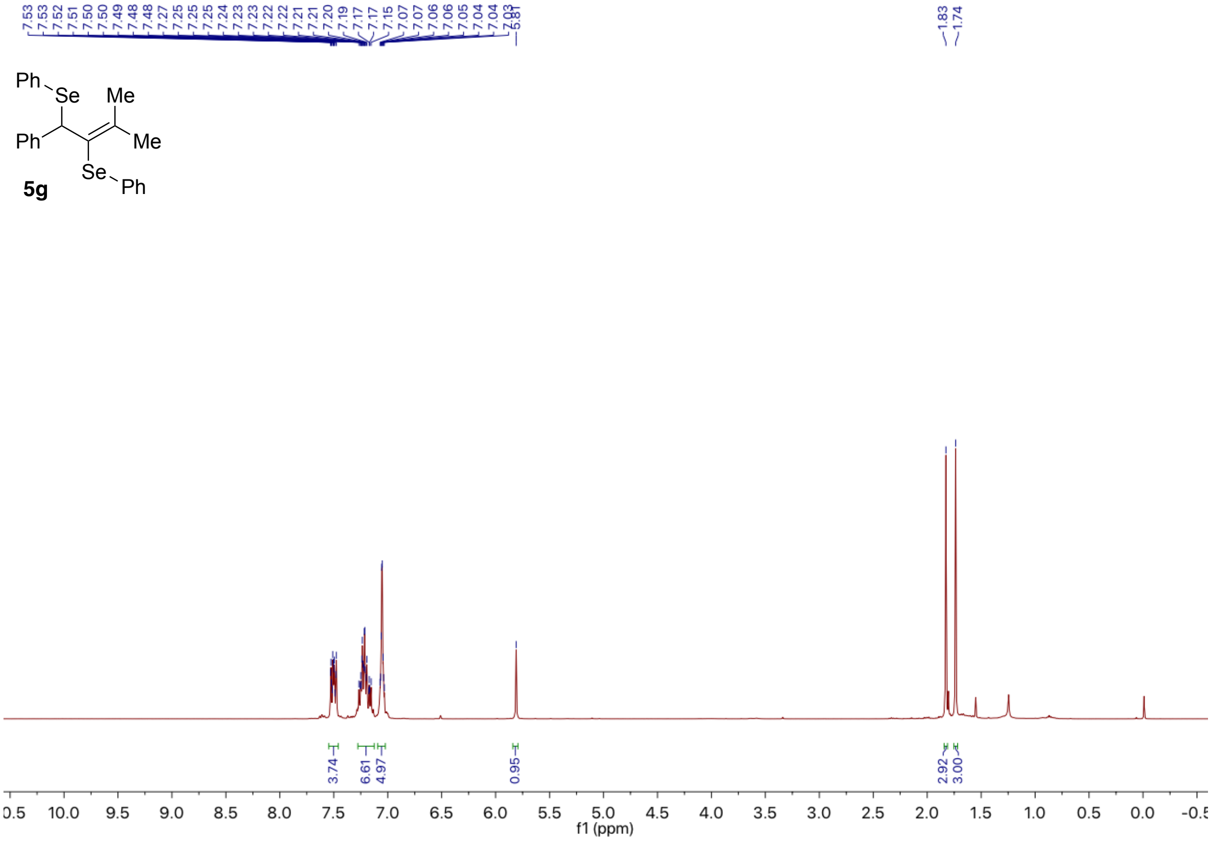
7.41
7.41
7.40
7.40
7.39
7.25
7.25
7.24
7.23
7.23
7.22
7.22
7.21
7.21
7.20
7.20
7.19
7.19
3.88
1.98
1.65
0.00
1.86
2.00
0.97
5.24
2.30
3.36
3.33
0.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
f1 (ppm)



141.89
134.55
131.57
131.29
130.11
129.05
128.70
127.35
126.46
122.06
77.32
77.00
76.68
34.66
25.78
20.57
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

Ph
Se
Me
Ph
Me
Se
Ph

5g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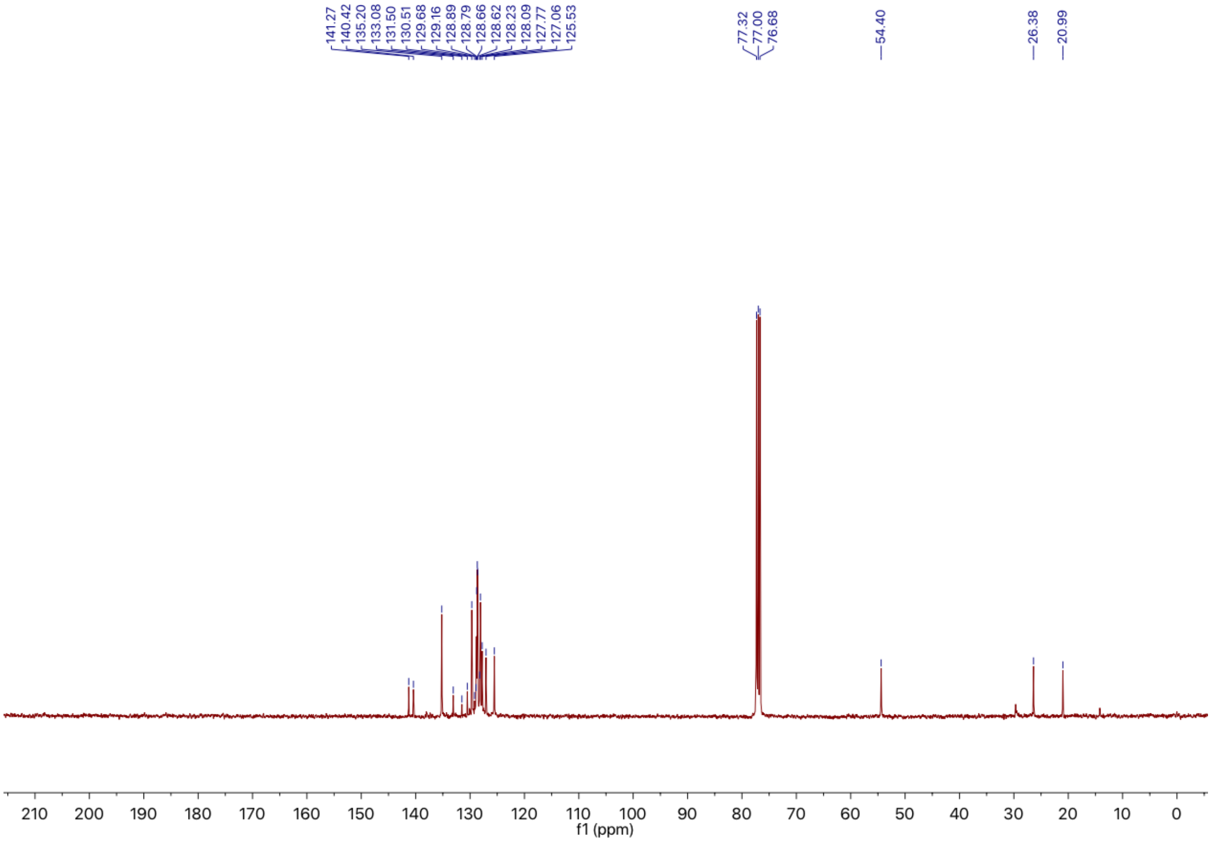
7.49
7.48
7.48
7.27
7.25
7.25
7.25
7.24
7.23
7.23
7.22
7.22
7.21
7.21
7.20
7.19
7.17
7.17
7.15
7.07
7.07
7.06
7.06
7.05
7.04
7.04
7.03
5.81
1.83
1.74
3.74
6.61
4.97
0.95
2.92
3.00
0.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
f1 (ppm)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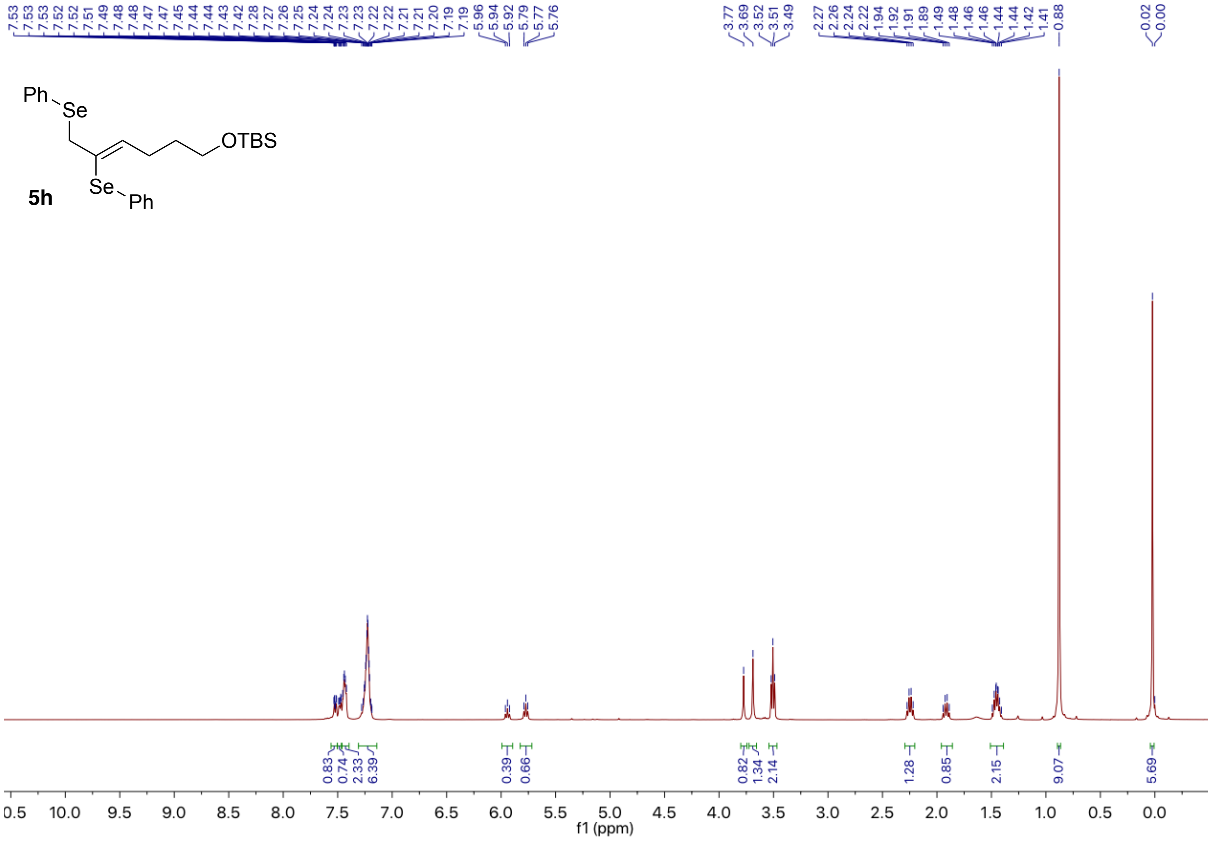
133.08
131.50
130.51
129.68
129.16
128.89
128.79
128.66
128.62
128.23
128.09
127.77
127.06
125.53
77.32
77.00
76.68
54.40
26.38
20.99
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)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7.53
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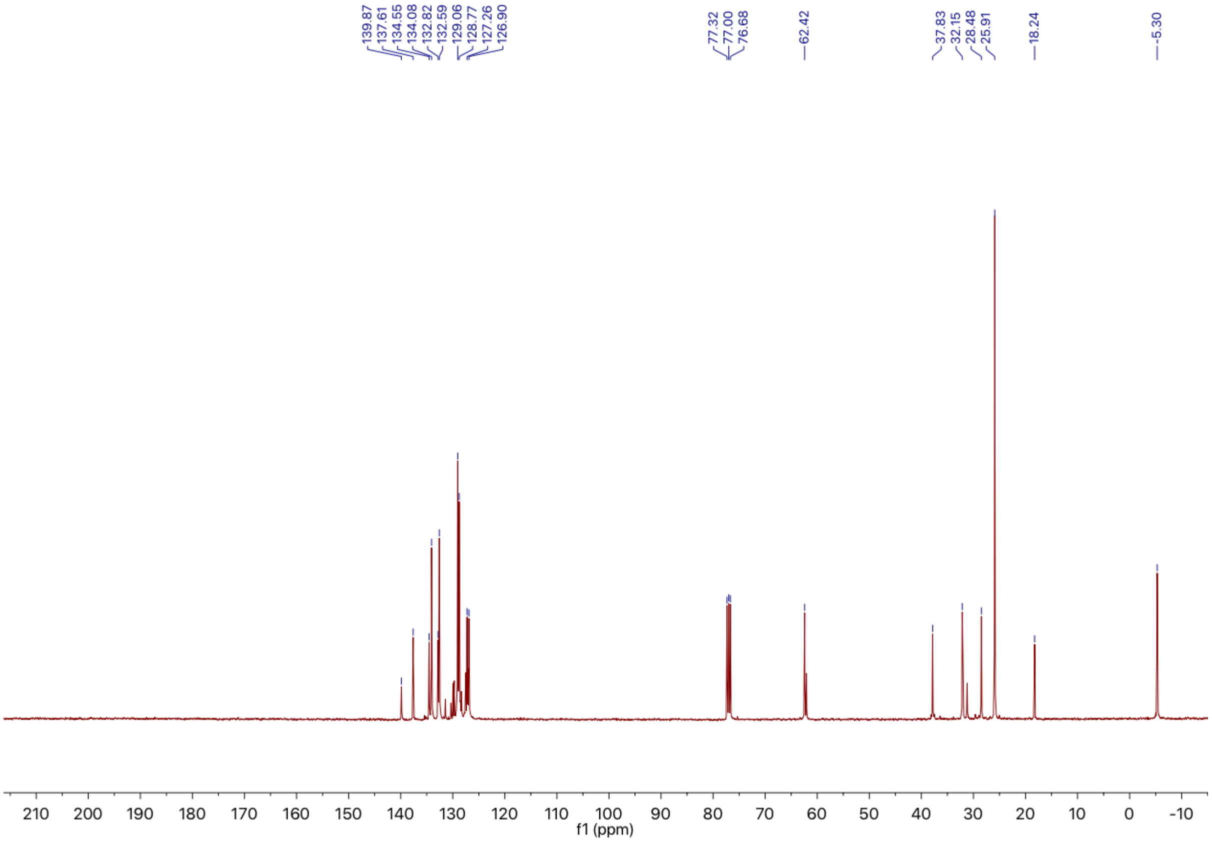
7.48
7.47
7.47
7.45
7.44
7.44
7.43
7.42
7.28
7.27
7.26
7.25
7.24
7.24
7.23
7.23
7.22
7.22
7.21
7.21
7.20
7.19
7.19
5.96
5.94
5.92
5.79
5.77
5.76
3.77
3.69
3.52
3.51
3.49
2.27
2.26
2.24
2.22
1.94
1.92
1.91
1.89
1.49
1.48
1.46
1.44
1.44
1.42
1.41
0.88
0.02
0.00
Ph
Se
OTBS
Se
Ph
0.83
0.74
2.33
6.39
0.39
0.66
0.82
1.34
2.14
1.28
0.85
2.15
9.07
5.69
0.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

5h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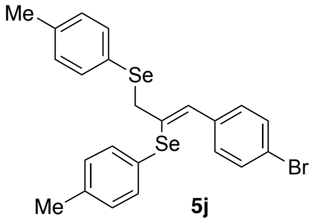
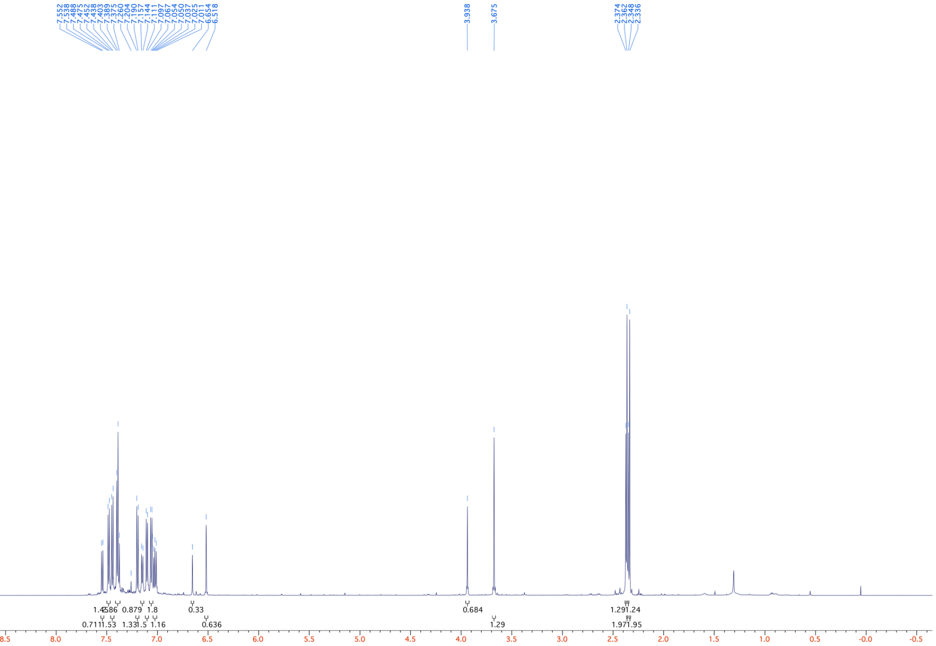
134.08
132.82
132.59
129.06
128.77
127.26
126.90
77.32
77.00
76.68
62.42
37.83
32.15
28.48
25.91
18.24
-5.30
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)


Me
Se
Se
Br
Me

5j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7.389
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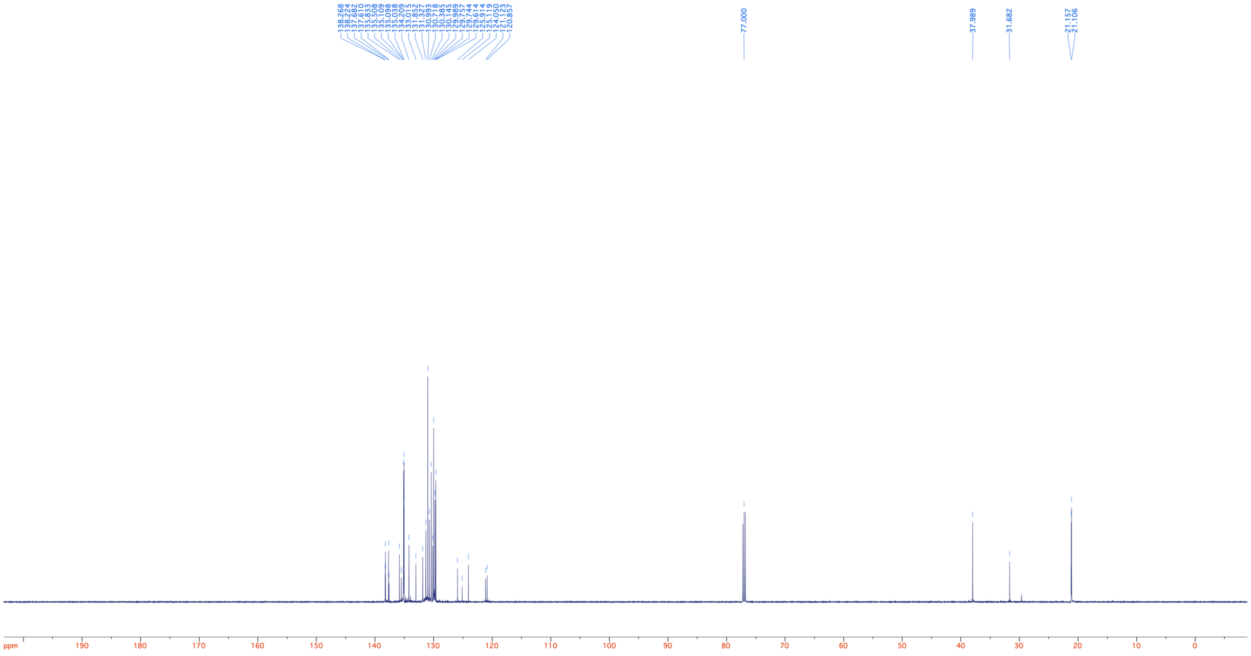
7.260
7.204
7.190
7.157
7.144
7.111
7.097
7.067
7.054
7.050
7.037
7.025
7.011
6.654
6.518
3.938
3.675
2.374
2.362
2.348
2.336
1.4586
0.879
1.8
0.33
0.711
1.53
1.33
1.5
1.16
0.636
0.684
1.29
1.29
1.24
1.97
1.95
ppm
11.0
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
-0.0
-0.5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135.508
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135.098
135.038
134.209
133.015
131.852
131.327
130.993
130.718
130.385
130.145
129.989
129.757
129.744
129.614
125.914
125.119
124.050
121.123
120.857
77.000
37.989
31.682
21.157
21.106
ppm
190
180
170
160
150
140
130
120
110
100
90
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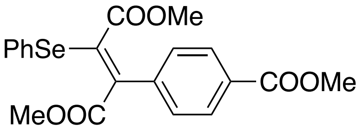
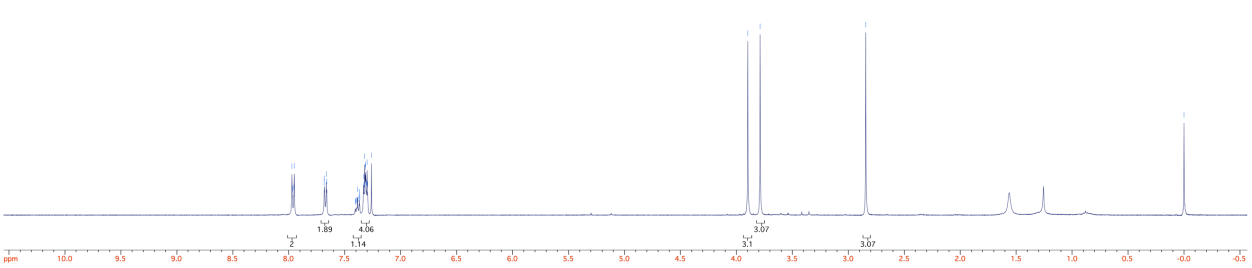
50
40
30
20
10
0


COOMe
PhSe
COOMe
MeOOC

6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7.684
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7.660
7.405
7.402
7.393
7.387
7.382
7.372
7.369
7.365
7.332
7.328
7.326
7.322
7.317
7.313
7.305
7.300
7.295
7.261
3.898
3.788
2.844
0.000
1.89
4.06
3.07
2
1.14
3.1
3.07
ppm
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
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3.0
2.5
2.0
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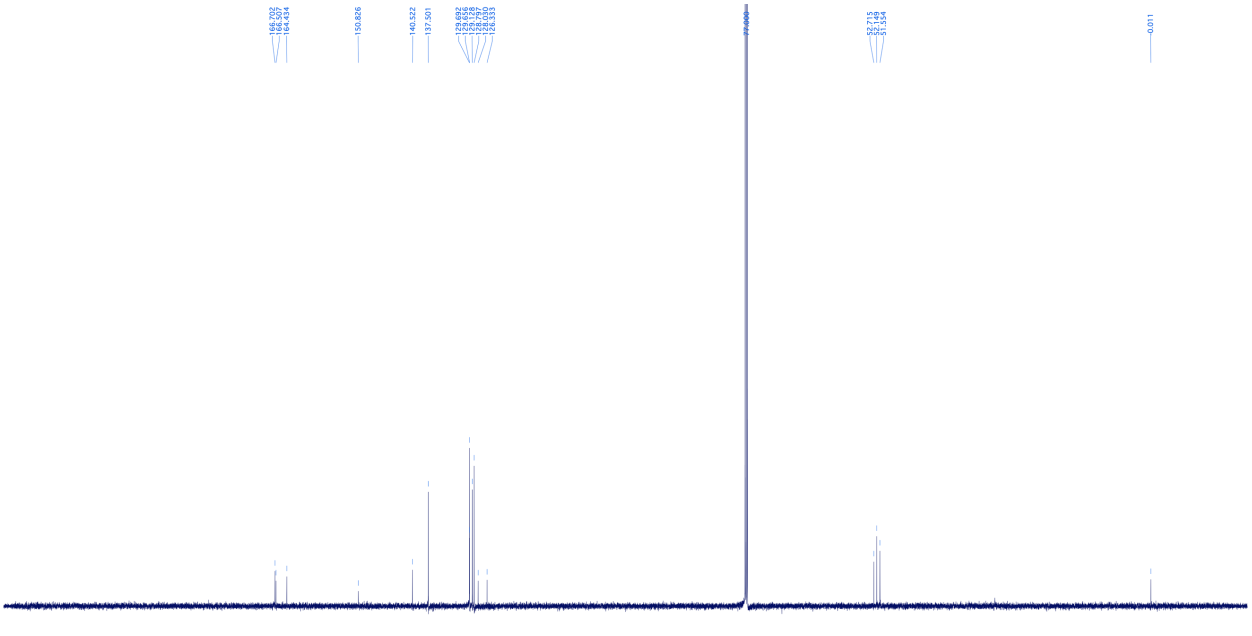
1.0
0.5
-0.0
-0.5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129.656
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77.000
52.715
52.149
51.554
-0.011
ppm
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
-0
-10