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1. General experimental information

1.1 General

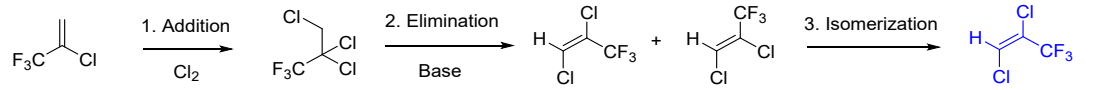
Melting points (M.p.) were determined using a WRS-1B melting point apparatus and were uncorrected. ^{1}H, ^{13}C and ^{19}F NMR spectra were recorded on a Bruker AVANCE 500 spectrometer. ^{1}H NMR chemical shifts were determined relative to internal $(CH_3)_4Si$ (TMS) at δ 0.0 or to the signal of the residual protonated solvent: $CDCl_3$ δ 7.26. ^{13}C NMR chemical shifts were determined relative to internal TMS at δ 0.0. For the isolated compounds, ^{19}F NMR chemical shifts were determined relative to $CFCl_3$ at δ 0.0. Data for ^{1}H, ^{13}C and ^{19}F NMR were recorded as follows: chemical shift (δ, ppm), multiplicity (s = singlet, d = doublet, t = triplet, m = multiplet, q = quartet, br = broad). High resolution mass spectra were recorded on an HRMS-TOF instrument using EI ionization. IR spectra were collected on a Nicolet IN10 FT-IR spectrometer, and reported in terms of frequency of absorption (cm^{-1}).

1.2 Reagents

All substrates and reagents were commercially available and used without further purification. TLC analysis was performed using pre-coated glass plates. Column chromatography was performed using silica gel (200–300 mesh) with hexane/ethyl acetate as the eluent.

1.3 (*E*)-1,2-dichloro-3,3,3-trifluoroprop-1-ene

The key fluorinated building block of (*E*)-1,2-dichloro-3,3,3-trifluoroprop-1-ene ((*E*)-HCFO-1223xd, **1**) is synthesized by 2-chloro-3,3,3-trifluoroprop-1-ene (HCFO-1233xf, purchased from Beijing Yuji Science & Technology Co., Ltd. and used as received.) via 3 steps (**Scheme S1**). This work has been completed in our laboratory.[1]

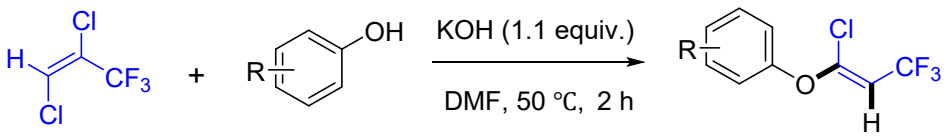


Scheme S1. Synthetic route of the key fluorinated building block of (*E*)-1,2-dichloro-3,3,3-trifluoroprop-1-ene ((*E*)-HCFO-1223xd, **1**).

2. Details of experimental procedures

2.1 General procedure for the synthesis of *α*-chloro-*β*-trifluoromethyl vinyl ethers **3a-3t** (**3a** as an example):

The reaction was carried out in a 25 mL Schlenk tube. A mixture of (*E*)-1,2-dichloro-3,3,3-trifluoroprop-1-ene (**1**) (0.181 g, 1.1 mmol), 4-chlorophenol **2a** (0.129 g, 1 mmol), and potassium hydroxide (0.062 g, 1.1 mmol) in dry DMF (2 mL) was stirred at 50 °C for 2 h. After cooling, the mixture was diluted with water and extracted with ether (3 × 10 mL). The organic extract was washed with brine, dried with $MgSO_4$, and then evaporated. The crude product was purified by column chromatography to afford the desired product **3a** (**Scheme S2**).



1
1.1 equiv.

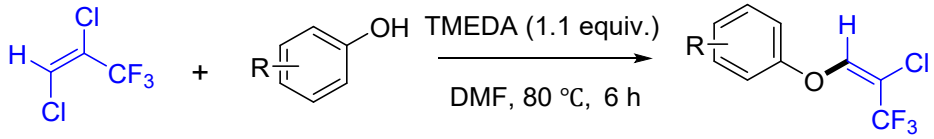
2a-2t
1 mmol

3a-3t

Scheme S2. General procedure for the synthesis of *α*-chloro-*β*-trifluoromethyl vinyl ethers **3a-3t.**

2.2 General procedure for the synthesis of *β*-chloro-*β*-trifluoromethyl vinyl ethers **4a-4t** (**4a** as an example):

The reaction was carried out in a 25 mL Schlenk tube. A mixture of (*E*)-1,2-dichloro-3,3,3-trifluoroprop-1-ene (**1**) (0.362 g, 2.2 mmol), 4-chlorophenol **2a** (0.258 g, 2 mmol), and tetramethylethylenediamine (0.256 g, 2.2 mmol) in dry DMF (2 mL) was stirred at 80 °C for 6 h. After cooling, the mixture was diluted with water and extracted with ether (3 × 10 mL). The organic extract was washed with brine, dried with $MgSO_4$, and then evaporated. The crude product was purified by column chromatography to afford the desired product **4a** (**Scheme S3**).



1
1.1 equiv.

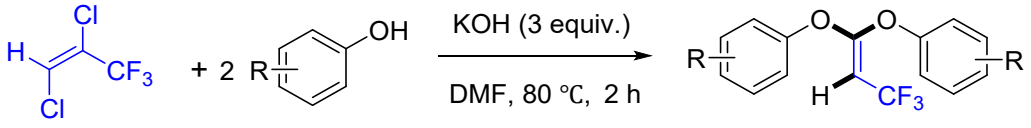
2a-2t
2 mmol

4a-4t

Scheme S3. General procedure for the synthesis of *β*-chloro-*β*-trifluoromethyl vinyl ethers **4a-4t**.

2.3 General procedure for the synthesis of *β*-trifluoromethyl vinyl diethers **5aa-5tt** (**5aa** as an example):

The reaction was carried out in a 25 mL Schlenk tube. A mixture of (*E*)-1,2-dichloro-3,3,3-trifluoroprop-1-ene (**1**) (0.165 g, 1 mmol), 4-chlorophenol **2a** (0.386 g, 3 mmol), and potassium hydroxide (0.168 g, 3 mmol) in dry DMF (2 mL) was stirred at 80 °C for 2 h. After cooling, the mixture was diluted with water and extracted with ether (3 × 10 mL). The organic extract was washed with brine, dried with $MgSO_4$, and then evaporated. The crude product was purified by column chromatography to afford the desired product **5aa** (**Scheme S4**).



1
1 mmol

2a-2t
3 equiv.

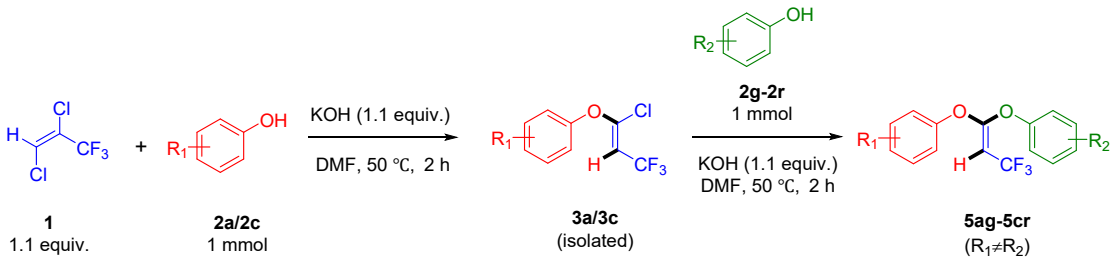
5aa-5tt

Scheme S4. General procedure for the synthesis of *β*-trifluoromethyl vinyl diethers **5aa-5tt**.

2.4 General procedure for the synthesis of *β*-trifluoromethyl vinyl diethers **5ag-5cr** (**5ag** as an example):

Step 1: *α*-Chloro-*β*-trifluoromethyl vinyl ether **3a** was synthesized and purified according to general procedure in 2.1.

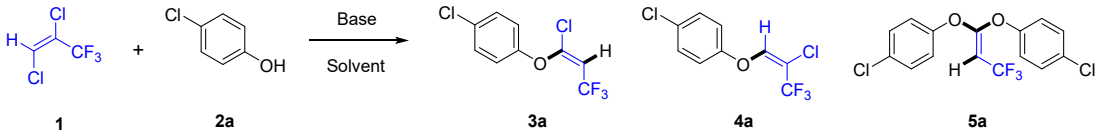
Step 2: The reaction was carried out in a 25 mL Schlenk tube. A mixture of *α*-chloro-*β*-trifluoromethyl vinyl ether **3a**, 4-isopropyl phenol **2g** (0.139 g, 1 mmol), and potassium hydroxide (0.062 g, 1.1 mmol) in dry DMF (2 mL) was stirred at 50 °C for 2 h. After cooling, the mixture was diluted with water and extracted with ether (3 × 10 mL). The organic extract was washed with brine, dried with $MgSO_4$, and then evaporated. The crude product was purified by column chromatography to afford the desired product **5ag** (**Scheme S5**).



Scheme S5. General procedure for the synthesis of *β*-trifluoromethyl vinyl diethers **5ag-5cr**.

3. Optimization of reaction conditions

Table S1 Optimization of the reaction conditions. [a]



Entry	**1 : 2a** (equiv.)	Base (equiv.)	Solvent	T (°C)	*t* (h)	**3a** yield (%)[b]	**4a** yield (%)[b]	**5a** yield (%)[b]
1	1:1	KOH (1.1)	DMF	25	2	48	0	0
2	1:1	KOH (1.1)	DMF	50	2	75	5	5
3	1:1	KOH (1.1)	DMF	80	2	71	3	12
4	1.1:1	KOH (1.1)	DMF	50	2	89 (85 [c])	0	6
5	1.5:1	KOH (1.1)	DMF	50	2	89	0	6
6	1.1:1	KOH (0.1)	DMF	50	2	8	0	0
7	1.1:1	KOH (1.1)	MeCN	50	2	84	0	4
8	1.1:1	KOH (1.1)	THF	50	2	0	0	0
9	1.1:1	KOH (1.1)	DCM	50	2	0	0	0
10	1.1:1	KOH (1.1)	Acetone	50	2	86	0	5
11	1.1:1	NaOH (1.1)	DMF	50	2	78	0	5
12	1.1:1	Na_2CO_3 (1.1)	DMF	50	2	54	10	0
13	1.1:1	$NaHCO_3$ (1.1)	DMF	50	2	40	12	0
14	1.1:1	K_2CO_3 (1.1)	DMF	50	2	72	5	4

15	1.1:1	Cs_2CO_3 (1.1)	DMF	50	2	78	3	5
16	1.1:1	K_3PO_4 (1.1)	DMF	50	2	52	11	0
17	1.1:1	TEA (1.1)	DMF	50	2	0	34	0
18	1.1:1	TMEDA (1.1)	DMF	50	2	15	61	0
19	1.1:1	DBU (1.1)	DMF	50	2	10	40	0
20	1.1:1	Pyridine (1.1)	DMF	50	2	8	45	0
21	1.1:1	4-DMAP (1.1)	DMF	50	2	10	54	0
22	1.1:1	TMEDA (1.5)	DMF	50	2	16	60	0
23	1.1:1	TMEDA (1.1)	DMF	80	2	14	65	0
24	1.1:1	TMEDA (1.1)	DMF	120	2	12	57	0
25	1.1:1	TMEDA (1.1)	DMF	80	6	10	76 (71 [c])	0
26	1.1:1	TMEDA (1.1)	DMF	80	12	13	74	0
27	1:2.2	KOH (2.2)	DMF	50	2	10	0	78
28	1:2.2	KOH (2.2)	DMF	80	2	11	0	74
29	1:2.2	KOH (2.2)	DMF	120	2	8	0	70
30	1:2.5	KOH (2.5)	DMF	80	2	Trace	0	84
31	1:3	KOH (3)	DMF	80	2	Trace	0	93 (90 [c])

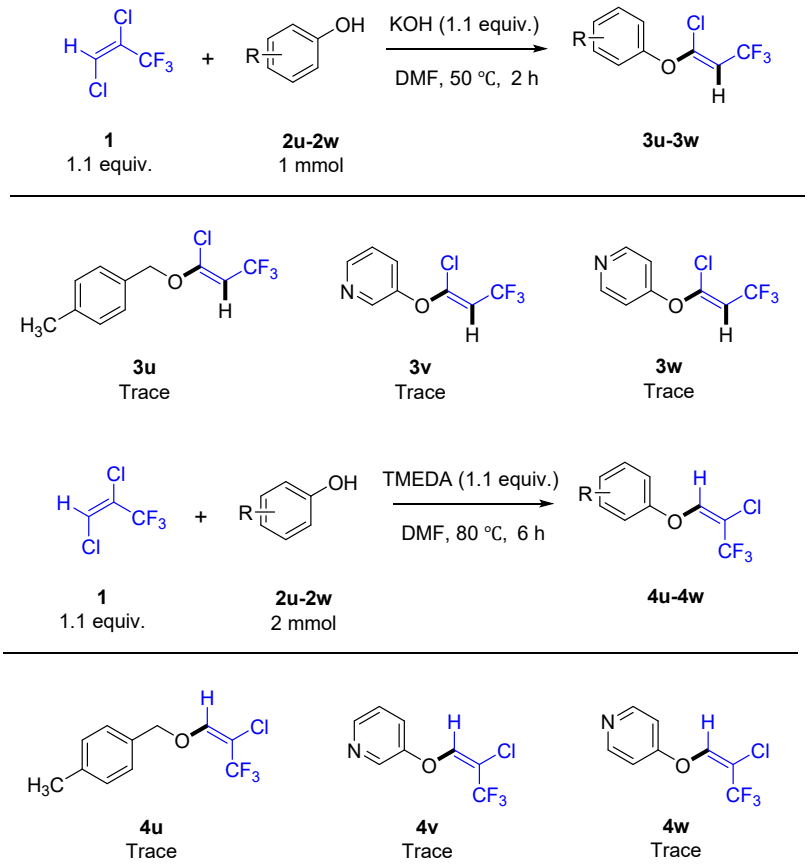
[a] Reaction conditions: **1** (1-3 mmol), **2a** (1 mmol), base (1-3 mmol), and solvent (5 mL), *t* at T °C in a 25 mL Schlenk tube.

[b] Yield was determined by ^{1}H NMR and ^{19}F NMR analysis with 4'-(trifluoromethyl)acetophenone as an internal standard.

[c] Isolated yield.

4. Failed substrates

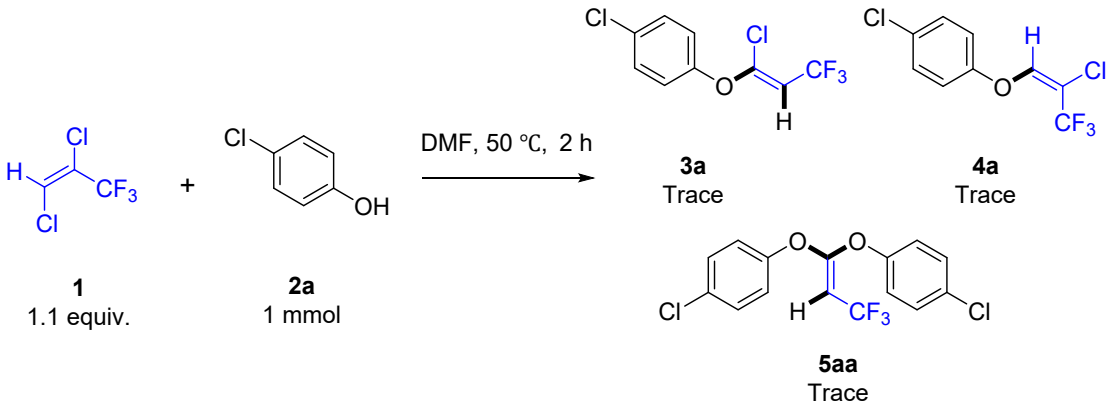
Benzyl alcohol (**2u**) and some other heterocycle-based hydroxy compounds such as pyridin-3-ol (**2v**) and pyridin-4-ol (**2w**) were tried but no corresponding products were obtained for vinyl ethers **3** and **4** (**Scheme S6**). This suggests that the phenol structure of substrate did significantly influence the reaction outcome.



Scheme S6. Scope of benzyl alcohol and heterocycle-based hydroxy compounds for the synthesis of vinyl ethers **3** and **4**.

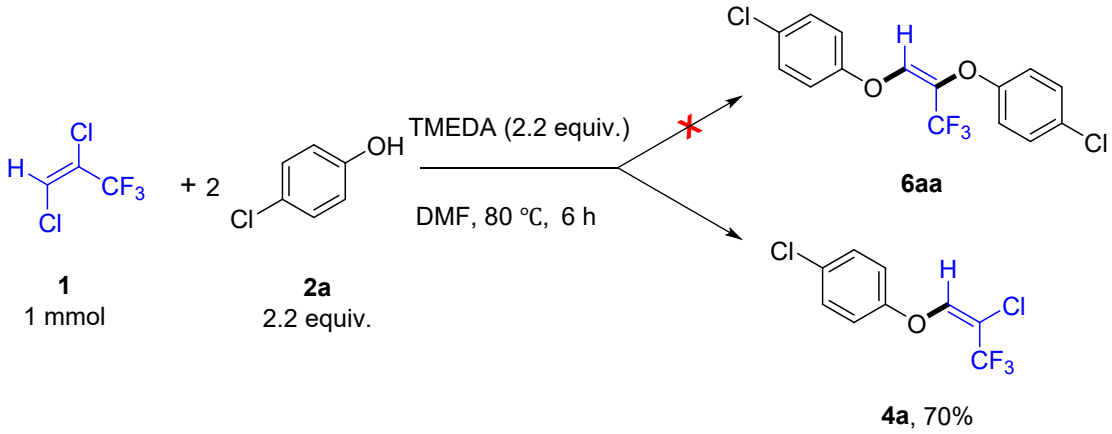
5. Control Experiments

5.1 Reaction without any base:



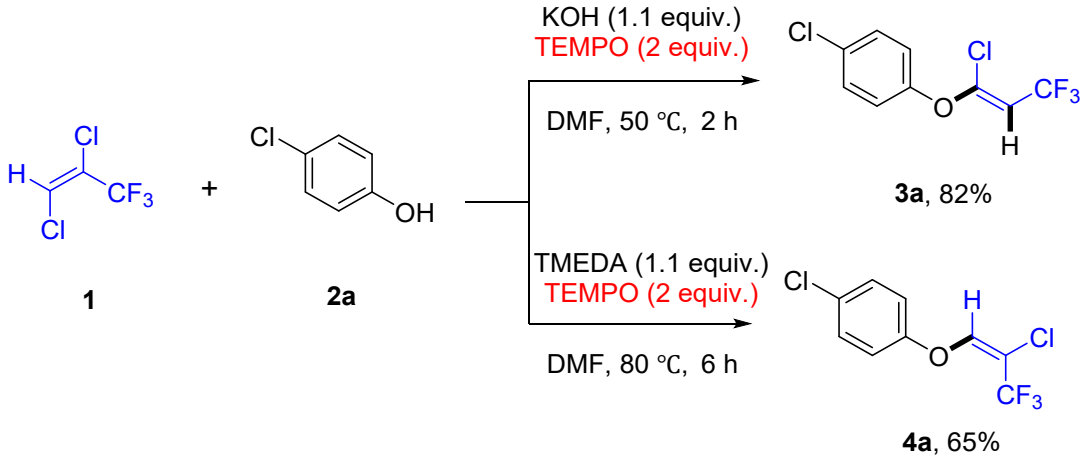
Scheme S7. Reaction without any base.

5.2 Attempted reaction of **1** with 2.2 equivalents of phenol and TMEDA:



Scheme S8. Treatment of **1** with 2 molar phenol and TMEDA.

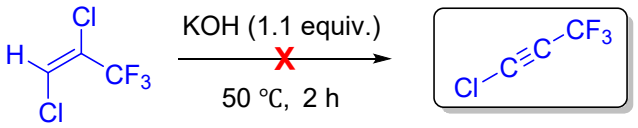
5.3 Radical scavenger experiment:



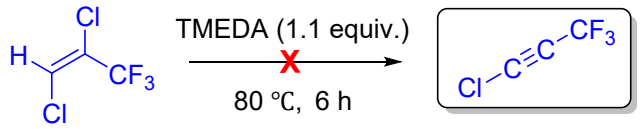
Scheme S9. Reaction in the presence of TEMPO.

5.4 Proposed reaction pathways and intermediate:

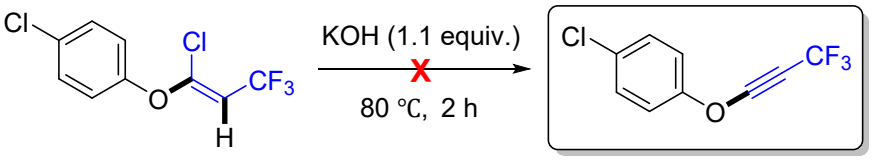
The reaction pathways were determined by comparison of the vinylic proton in the ^{1}H NMR. When the mixture of **1** and KOH was treated according to the general procedure for the synthesis of **3a** without phenol and solvent, the peak of vinylic proton of **1** in ^{1}H NMR spectra has been unchanged, indicating no elimination product was formed. Comparatively, when the mixture of **1** and TMEDA was treated according to the general procedure for the synthesis of **4a** without phenol and solvent, the ^{1}H NMR spectra did not provide any intermediates, only **1** and TMEDA were detected. Additionally, the mixture of **3a** and KOH was treated according to the general procedure for the synthesis of **5aa** without phenol and solvent, no elimination product was found either (**Scheme S10**). Based on the above observations, we have ruled out the presence of alkyne intermediate during all reaction pathways. Correspondingly, the correct mechanism for synthesizing **3a** and **5aa** should be nucleophilic addition-elimination. Phenol can only be converted to nucleophilic intermediate **A** in the presence of KOH, followed by addition to **1**/**3a** and the elimination of HCl to give **3a**/**5aa** as the product. However, the alkalinity of TMEDA is insufficient to capture the proton of phenol. Therefore, we believe that the synthesis of **4a** follows a nucleophilic substitution pathway.



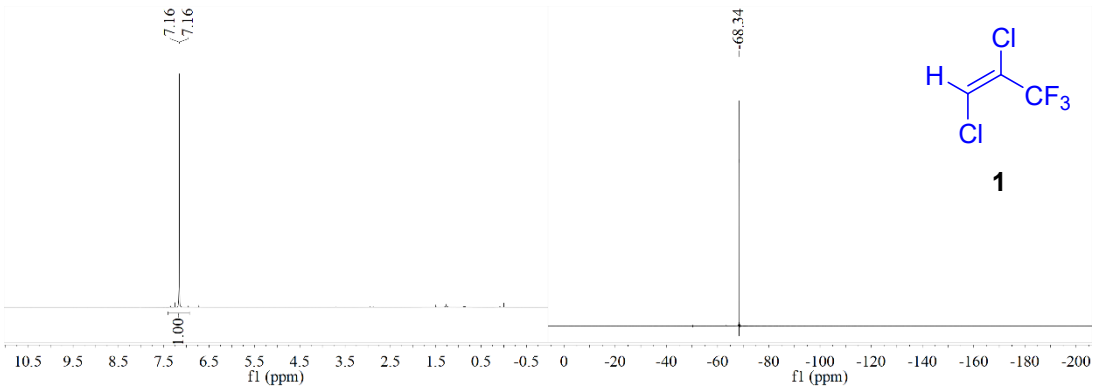
1
1 mmol



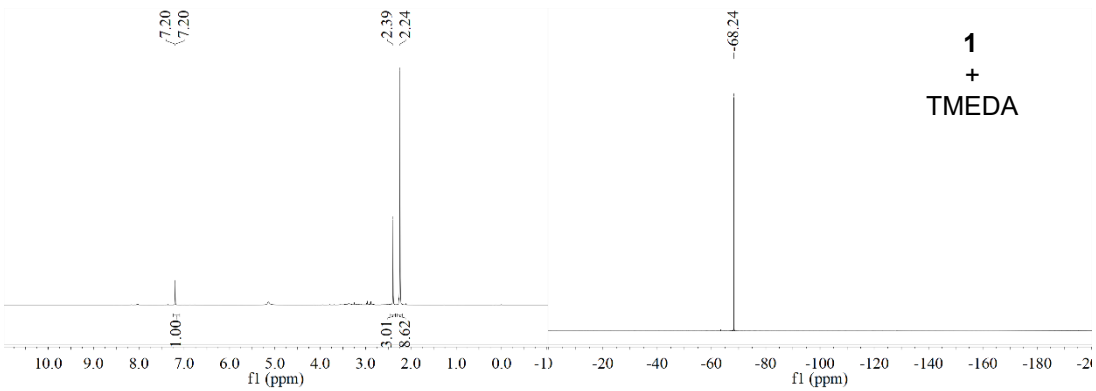
1
1 mmol



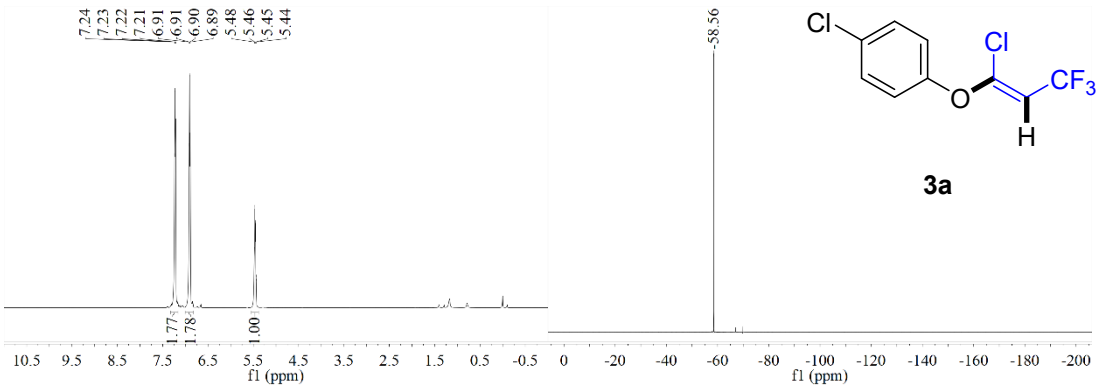
3a
1 mmol



1



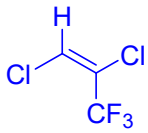
1
+
TMEDA



^{1}H NMR **^{19}F NMR**

Scheme S10. Additional control experiments for the exploration of reaction pathways and intermediate.

6. Characterization data



(*E*)-1,2-dichloro-3,3,3-trifluoroprop-1-ene (1)

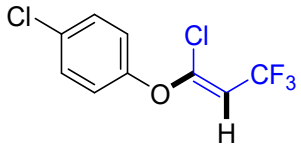
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.16 (d, *J* = 1.2 Hz, 1H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 125.65 (q, *J* = 5.6 Hz), 124.68 (q, *J* = 38.0 Hz), 119.87 (q, *J* = 272.5 Hz).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -68.31.

IR (KBr): 1624, 1304, 1287, 1262, 1192 –1157, 975, 858 cm^{-1}

EI-HRMS cacld for $C_3HCl_2F_3$ (M^+) 163.9407, found 163.9405.



(*Z*)-1-chloro-4-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzene (3a)

Purified by using a flash column chromatography (PE); isolated yield 85 %, 218 mg. Colorless oil.

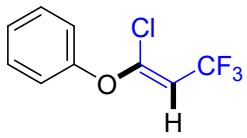
^{1}H NMR (800 MHz, Chloroform-*d*) δ 7.26 – 7.20 (m, 2H), 6.94 – 6.88 (m, 2H), 5.47 (q, *J* = 6.8 Hz, 1H).

^{13}C NMR (201 MHz, Chloroform-*d*) δ 152.09, 148.61 (q, *J* = 6.3 Hz), 130.98, 129.87, 121.48 (q, *J* = 270.2 Hz), 119.87, 104.69 (q, *J* = 36.8 Hz).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -58.56.

IR (KBr): 1670, 1487, 1346, 1256, 1207, 1166 –1132, 1092, 1054, 1014, 853, 829, 661 cm^{-1}

EI-HRMS cacld for $C_9H_5Cl_2F_3O$ (M^+) 255.9670, found 255.9668.



(*Z*)-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzene (3b)

Purified by using a flash column chromatography (PE); isolated yield 79 %, 176 mg. Colorless oil.

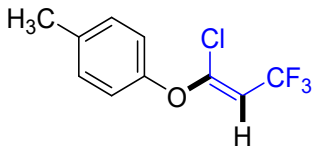
^{1}H NMR (800 MHz, Chloroform-*d*) δ 7.37 (t, *J* = 7.8 Hz, 2H), 7.21 (t, *J* = 7.4 Hz, 1H), 7.07 (d, *J* = 8.1 Hz, 2H), 5.54 (q, *J* = 6.9 Hz, 1H).

^{13}C NMR (201 MHz, Chloroform-*d*) δ 153.64, 148.98 (q, *J* = 6.5 Hz), 129.81, 125.47, 121.63 (q, *J* = 270.0 Hz), 118.57, 104.15 (q, *J* = 36.6 Hz).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -58.45.

IR (KBr): 1670, 1593, 1490, 1349, 1256, 1197, 1165 –1130, 850, 751, 663 cm^{-1}

EI-HRMS cacld for $C_9H_6ClF_3O$ (M^+) 222.0059, found 222.0053.



(*Z*)-1-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-4-methylbenzene (3c)

Purified by using a flash column chromatography (PE); isolated yield 82 %, 194 mg. Colorless oil.

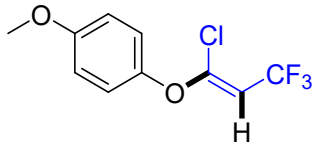
^{1}H NMR (800 MHz, Chloroform-*d*) δ 7.18 – 7.12 (m, 2H), 6.95 (dd, *J* = 8.6, 2.0 Hz, 2H), 5.50 (qd, *J* = 6.9, 1.6 Hz, 1H), 2.33 (s, 3H).

^{13}C NMR (201 MHz, Chloroform-*d*) δ 151.53, 149.29 (q, *J* = 6.3 Hz), 135.30, 130.26, 121.70 (q, *J* = 269.8 Hz), 118.48, 103.55 (q, *J* = 36.6 Hz), 20.72.

^{19}F NMR (471 MHz, Chloroform-*d*) δ -58.35.

IR (KBr): 1667, 1505, 1349, 1256, 1201, 1164 –1130, 1057, 853, 662 cm^{-1}

EI-HRMS cacld for $C_{10}H_8ClF_3O$ (M^+) 236.0216, found 236.0212.



(*Z*)-1-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-4-methoxybenzene (3d)

Purified by using a flash column chromatography (PE/EA 10:1); isolated yield 90 %, 227 mg. Pale yellowish oil.

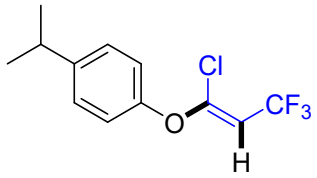
^{1}H NMR (800 MHz, Chloroform-*d*) δ 7.00 (dd, *J* = 8.9, 2.0 Hz, 2H), 6.88 (dd, *J* = 8.9, 1.9 Hz, 2H), 5.46 (qd, *J* = 6.9, 1.8 Hz, 1H), 3.79 (s, 3H).

^{13}C NMR (201 MHz, Chloroform-*d*) δ 157.29, 149.66 (q, *J* = 6.6 Hz), 147.25, 121.75 (q, *J* = 269.9 Hz), 120.00, 114.73, 102.78 (q, *J* = 36.6 Hz), 55.60.

^{19}F NMR (471 MHz, Chloroform-*d*) δ -58.23 (d, *J* = 6.2 Hz).

IR (KBr): 1666, 1505, 1350, 1252, 1197, 1165 –1128, 1058, 1035, 854, 662 cm^{-1}

EI-HRMS cacld for $C_{10}H_8ClF_3O_2$ (M^+) 252.0165, found 252.0159.



(*Z*)-1-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-4-isopropylbenzene (3e)

Purified by using a flash column chromatography (PE); isolated yield 73 %, 193 mg. Colorless oil.

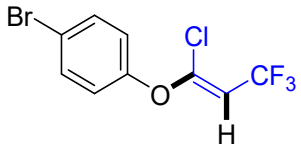
^{1}H NMR (800 MHz, Chloroform-*d*) δ 7.24 – 7.19 (m, 2H), 7.02 – 6.96 (m, 2H), 5.51 (q, *J* = 6.9 Hz, 1H), 2.90 (hept, *J* = 6.9 Hz, 1H), 1.24 (d, *J* = 7.0 Hz, 6H).

^{13}C NMR (201 MHz, Chloroform-*d*) δ 151.63, 149.25 (q, *J* = 6.5 Hz), 146.22, 127.66, 121.70 (q, *J* = 269.9 Hz), 118.41, 103.61 (q, *J* = 36.6 Hz), 33.57, 24.00.

^{19}F NMR (471 MHz, Chloroform-*d*) δ -58.36.

IR (KBr): 2965, 1665, 1506, 1349, 1256, 1201, 1166 –1131, 1051, 853, 662 cm^{-1}

EI-HRMS cacld for $C_{12}H_{12}ClF_3O$ (M^+) 264.0529, found 264.0526.



(*Z*)-1-bromo-4-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzene (3f)

Purified by using a flash column chromatography (PE); isolated yield 69 %, 208 mg. Colorless oil.

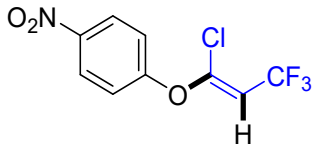
^{1}H NMR (800 MHz, Chloroform-*d*) δ 7.53 – 7.45 (m, 2H), 6.99 – 6.93 (m, 2H), 5.58 (q, *J* = 6.8 Hz, 1H).

^{13}C NMR (201 MHz, Chloroform-*d*) δ 152.62, 148.45 (q, *J* = 6.3 Hz), 132.87, 121.43 (q, *J* = 270.3 Hz), 120.25, 118.49, 104.84 (q, *J* = 36.8 Hz).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -58.54 (d, *J* = 7.4 Hz).

IR (KBr): 1671, 1483, 1346, 1255, 1204, 1167 –1132, 1071, 1053, 1012, 852, 662 cm^{-1}

EI-HRMS cacld for $C_9H_5BrClF_3O$ (M^+) 299.9164, found 299.9158.



(*Z*)-1-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-4-nitrobenzene (3g)

Purified by using a flash column chromatography (PE/EA 10:1); isolated yield 85 %, 227 mg. Pale yellowish oil.

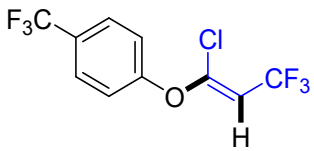
^{1}H NMR (500 MHz, Chloroform-*d*) δ 8.41 – 8.22 (m, 2H), 7.31 – 7.18 (m, 2H), 5.78 (q, *J* = 6.8 Hz, 1H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 157.91, 147.35 (q, *J* = 6.4 Hz), 144.90, 125.85, 121.10 (q, *J* = 270.5 Hz), 118.32, 107.02 (q, *J* = 36.9 Hz).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -58.96.

IR (KBr): 1672, 1617, 1593, 1528, 1492, 1347, 1257, 1217, 1163 –1133, 1052, 890, 859, 750, 664 cm^{-1}

EI-HRMS cacld for $C_9H_5ClF_3NO_3$ (M^+) 266.9910, found 266.9902.



(*Z*)-1-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-4-(trifluoromethyl)benzene (3h)

Purified by using a flash column chromatography (PE/EA 5:1); isolated yield 69 %, 201 mg. Colorless oil.

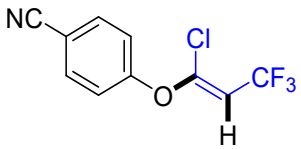
^{1}H NMR (800 MHz, Chloroform-*d*) δ 7.67 (d, *J* = 8.5 Hz, 2H), 7.18 (d, *J* = 8.5 Hz, 2H), 5.67 (q, *J* = 6.8 Hz, 1H).

^{13}C NMR (201 MHz, Chloroform-*d*) δ 155.87, 147.93 (q, *J* = 6.5 Hz), 127.69 (q, *J* = 33.1 Hz), 127.31 (q, *J* = 3.8 Hz), 123.75 (q, *J* = 272.0 Hz), 121.27 (q, *J* = 270.4 Hz), 118.40, 106.00 (q, *J* = 36.9 Hz).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -58.81 (d, *J* = 5.0 Hz), -62.27.

IR (KBr): 1670, 1613, 1513, 1346 –1328, 1257, 1214, 1168 –1130, 1107, 1071, 1050, 1016, 854, 663 cm^{-1}

EI-HRMS cacld for $C_{10}H_5ClF_6O$ (M^+) 289.9933, found 289.9927.



(*Z*)-4-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzonitrile (3i)

Purified by using a flash column chromatography (PE/EA 4:1); isolated yield 84 %, 208 mg. Pale yellowish oil.

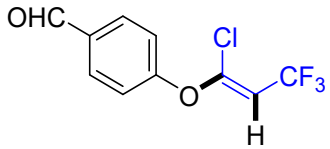
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.78 – 7.68 (m, 2H), 7.23 – 7.16 (m, 2H), 5.75 (q, *J* = 6.8 Hz, 1H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 156.51, 147.42 (q, *J* = 6.4 Hz), 134.22, 121.15 (d, *J* = 270.3 Hz), 118.79, 117.92, 109.26, 106.70 (q, *J* = 36.9 Hz).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -58.87 (d, *J* = 8.0 Hz).

IR (KBr): 3104, 2233, 1667, 1602, 1503, 1343, 1257, 1216, 1166 –1133, 1052, 853, 663 cm^{-1}

EI-HRMS cacld for $C_{10}H_5ClF_3NO$ (M^+) 247.0012, found 247.0008.



(*Z*)-4-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzaldehyde (3j)

Purified by using a flash column chromatography (PE/EA 4:1); isolated yield 79 %, 198 mg. Yellowish oil.

^{1}H NMR (800 MHz, Chloroform-*d*) δ 9.99 (s, 1H), 8.03 – 7.89 (m, 2H), 7.27 – 7.17 (m, 2H), 5.72 (q, *J* = 6.8 Hz, 1H).

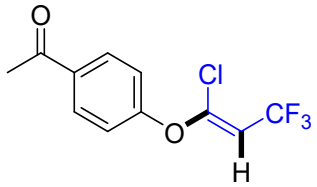
^{13}C NMR (201 MHz, Chloroform-*d*) δ 190.46, 157.91, 147.68 (q, *J* = 6.3 Hz), 133.52, 131.74, 123.72 – 118.99 (m), 118.43, 106.37 (q, *J* = 36.9 Hz).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -58.81.

IR (KBr): 3103, 1704 –1671, 1598, 1503, 1344, 1257, 1213, 1158 –1131, 1053, 890, 855 –832, 663

cm^{-1}

EI-HRMS cacld for $C_{10}H_6ClF_3O_2$ (M^+) 250.0008, found 250.0006.



(*Z*)-1-(4-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)phenyl)ethan-1-one (3k)

Purified by using a flash column chromatography (PE/EA 4:1); isolated yield 72 %, 191 mg. Yellowish oil.

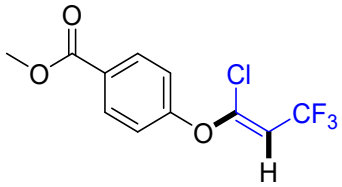
^1H NMR (500 MHz, Chloroform-*d*) δ 8.06 – 7.98 (m, 2H), 7.20 – 7.11 (m, 2H), 5.70 (qd, *J* = 6.8, 0.9 Hz, 1H), 2.59 (d, *J* = 0.9 Hz, 3H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 196.30, 156.93, 147.93 (d, *J* = 6.4 Hz), 134.25, 130.43, 121.30 (q, *J* = 270.2 Hz), 117.90, 105.85 (q, *J* = 36.9 Hz), 26.31.

^{19}F NMR (471 MHz, Chloroform-*d*) δ -58.81 (d, *J* = 6.6 Hz).

IR (KBr): 3102, 1687 –1667, 1598, 1502, 1415, 1345, 1266, 1210, 1162 –1131, 1052, 1013, 959, 889, 853, 663 cm^{-1}

EI-HRMS cacld for $C_{11}H_8ClF_3O_2$ (M^+) 264.0165, found 264.0162.



Methyl (*Z*)-4-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzoate (3l)

Purified by using a flash column chromatography (PE/EA 4:1); isolated yield 70 %, 182 mg. Colorless oil.

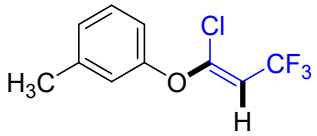
^1H NMR (800 MHz, Chloroform-*d*) δ 8.12 – 8.06 (m, 2H), 7.16 – 7.07 (m, 2H), 5.67 (q, *J* = 6.8 Hz, 1H), 3.92 (s, 3H).

^{13}C NMR (201 MHz, Chloroform-*d*) δ 166.01, 156.93, 147.99 (q, *J* = 6.5 Hz), 131.66, 127.28, 124.61 – 118.50 (m), 117.88, 105.80 (q, *J* = 36.9 Hz), 52.19.

^{19}F NMR (471 MHz, Chloroform-*d*) δ -58.77 (d, *J* = 8.2 Hz).

IR (KBr): 3103, 2956, 1727, 1671, 1604, 1504, 1438, 1346, 1310, 1283, 1209, 1163 –1116, 1054, 1016, 857, 764, 662 cm^{-1}

EI-HRMS cacld for $C_{11}H_8ClF_3O_3$ (M^+) 280.0114, found 280.0106.



(*Z*)-1-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-3-methylbenzene (3m)

Purified by using a flash column chromatography (PE); isolated yield 72 %, 170 mg. Colorless oil.

^1H NMR (800 MHz, Chloroform-*d*) δ 7.26 – 7.21 (m, 1H), 7.02 (d, *J* = 7.6 Hz, 1H), 6.92 – 6.83 (m,

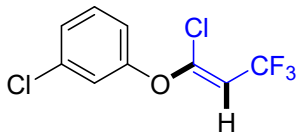
2H), 5.52 (qd, *J* = 6.9, 1.9 Hz, 1H), 2.35 (d, *J* = 2.0 Hz, 3H).

^{13}C NMR (201 MHz, Chloroform-*d*) δ 153.62, 149.06 (q, *J* = 6.3 Hz), 140.22, 129.47, 126.27, 121.66 (q, *J* = 270.0 Hz), 119.16, 115.50, 103.94 (q, *J* = 36.6 Hz), 21.28.

^{19}F NMR (471 MHz, Chloroform-*d*) δ -58.41 (d, *J* = 8.2 Hz).

IR (KBr): 1671, 1614, 1588, 1489, 1349, 1256 –1242, 1167 –1140, 1060, 932, 829, 782, 665 cm^{-1}

EI-HRMS cacld for $C_{10}H_8ClF_3O$ (M^+) 236.0216, found 236.0212.



(*Z*)-1-chloro-3-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzene (3n)

Purified by using a flash column chromatography (PE); isolated yield 65 %, 167 mg. Colorless oil.

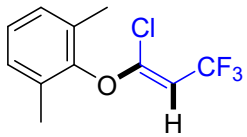
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.28 (td, *J* = 8.2, 1.3 Hz, 1H), 7.22 – 7.16 (m, 1H), 7.09 (t, *J* = 2.1 Hz, 1H), 7.01 – 6.92 (m, 1H), 5.58 (qd, *J* = 6.9, 1.3 Hz, 1H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 154.03, 148.37 (q, *J* = 6.4 Hz), 135.34, 130.57, 125.75, 121.43 (q, *J* = 270.2 Hz), 119.09, 116.67, 105.15 (q, *J* = 36.6 Hz).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -58.59.

IR (KBr): 1669, 1591, 1475, 1346, 1255, 1204, 1168 –1133, 1057, 912, 855, 779, 675 –664 cm^{-1}

EI-HRMS cacld for $C_9H_5Cl_2F_3O$ (M^+) 255.9670, found 255.9662.



(*Z*)-2-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-1,3-dimethylbenzene (3o)

Purified by using a flash column chromatography (PE); isolated yield 53 %, 133 mg. Colorless oil.

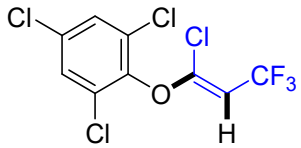
^{1}H NMR (800 MHz, Chloroform-*d*) δ 7.07 (dd, *J* = 8.6, 6.2 Hz, 1H), 7.04 (d, *J* = 7.4 Hz, 2H), 5.19 (q, *J* = 7.3 Hz, 1H), 2.24 (s, 6H).

^{13}C NMR (201 MHz, Chloroform-*d*) δ 150.28 (q, *J* = 7.0 Hz), 131.39, 128.84, 126.48, 122.36 (q, *J* = 269.3 Hz), 118.00, 95.32 (q, *J* = 36.9 Hz), 16.08.

^{19}F NMR (471 MHz, Chloroform-*d*) δ -57.55.

IR (KBr): 1660, 1590, 1475, 1353, 1252, 1164 –1122, 1096, 1058, 903, 856, 772, 669 –656 cm^{-1}

EI-HRMS cacld for $C_{11}H_{10}ClF_3O$ (M^+) 250.0372, found 250.0369.



(*Z*)-1,3,5-trichloro-2-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzene (3p)

Purified by using a flash column chromatography (PE); isolated yield 61 %, 199 mg. Colorless oil.

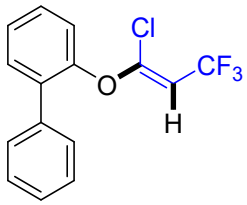
^{1}H NMR (800 MHz, Chloroform-*d*) δ 7.38 (s, 2H), 5.35 (qd, *J* = 7.1, 1.4 Hz, 1H).

^{13}C NMR (201 MHz, Chloroform-*d*) δ 148.21 (q, *J* = 6.3 Hz), 144.11, 132.78, 130.53, 128.84, 121.67 (q, *J* = 270.0 Hz), 98.31 (q, *J* = 37.7 Hz).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -57.93.

IR (KBr): 1671, 1563, 1445, 1343, 1246, 1169 –1139, 1049, 860, 829, 665 cm^{-1}

EI-HRMS cacld for $C_9H_3Cl_4F_3O$ (M^+) 325.8861, found 325.8853.



(*Z*)-2-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-1,1'-biphenyl (3q)

Purified by using a flash column chromatography (PE/EA 25:1); isolated yield 54 %, 161 mg. White solid.

M.p.: 36.1-36.9 ℃.

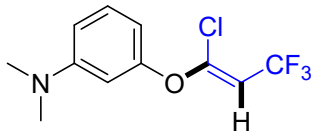
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.50 (t, *J* = 8.4 Hz, 2H), 7.41 (d, *J* = 6.8 Hz, 3H), 7.39 – 7.33 (m, 2H), 7.30 (q, *J* = 8.1, 7.4 Hz, 1H), 7.20 – 7.02 (m, 1H), 5.39 (p, *J* = 7.9, 7.2 Hz, 1H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 150.33, 148.74 (q, *J* = 6.1 Hz), 136.52, 133.77, 131.44, 129.41, 128.58, 128.29, 127.68, 125.94, 121.71 (q, *J* = 270.0 Hz), 118.96, 102.47 (q, *J* = 36.5, 36.0 Hz).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -58.21.

IR (KBr): 3442, 3098, 1664, 1583, 1504, 1479, 1435, 1346, 1252, 1194, 1167 –1128, 1057, 888, 847, 761, 742, 702, 664 –657 cm^{-1}

EI-HRMS cacld for $C_{15}H_{10}ClF_3O$ (M^+) 298.0372, found 298.0364.



(*Z*)-3-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-*N*,*N*-dimethylaniline (3r)

Purified by using a flash column chromatography (PE/EA 10:1); isolated yield 53 %, 141 mg.

Colorless oil.

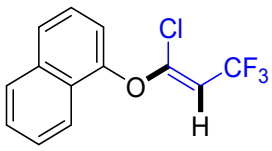
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.19 (td, *J* = 8.2, 1.4 Hz, 1H), 6.54 (ddt, *J* = 8.5, 2.2, 1.1 Hz, 1H), 6.42 – 6.36 (m, 2H), 5.50 (qd, *J* = 6.9, 1.5 Hz, 1H), 2.95 (d, *J* = 0.9 Hz, 6H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 154.81, 151.84, 149.29 (q, *J* = 6.4 Hz), 129.90, 121.74 (q, *J* = 269.9 Hz), 109.38, 105.79, 103.56 (q, *J* = 36.5 Hz), 102.52, 40.31.

^{19}F NMR (471 MHz, Chloroform-*d*) δ -58.27.

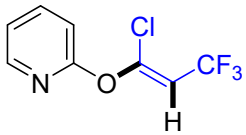
IR (KBr): 3100, 2892, 2812, 1667, 1615, 1573, 1506, 1451, 1350, 1255, 1165 –1141, 1061, 1000, 858, 826, 761, 684, 661 cm^{-1}

EI-HRMS cacld for $C_{11}H_{11}ClF_3NO$ (M^+) 265.0481, found 265.0476.

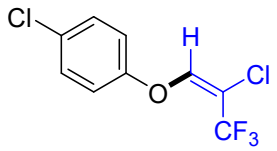


(*Z*)-1-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)naphthalene (3s)

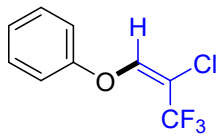
Purified by using a flash column chromatography (PE/EA 25:1); isolated yield 58 %, 158 mg.
Colorless oil.
^{1}H NMR (500 MHz, Chloroform-*d*) δ 8.16 – 8.08 (m, 1H), 7.91 – 7.80 (m, 1H), 7.69 (d, *J* = 8.3 Hz, 1H), 7.59 – 7.48 (m, 2H), 7.42 (td, *J* = 7.9, 1.3 Hz, 1H), 7.10 (dd, *J* = 7.7, 1.8 Hz, 1H), 5.62 (qd, *J* = 6.9, 1.9 Hz, 1H).
^{13}C NMR (126 MHz, Chloroform-*d*) δ 149.54, 149.40 (q, *J* = 6.5 Hz), 134.72, 127.79, 127.03, 126.75, 126.13, 125.51, 125.20, 121.79 (q, *J* = 270.1 Hz), 121.29, 113.29, 103.79 (q, *J* = 36.7 Hz).
^{19}F NMR (471 MHz, Chloroform-*d*) δ -58.25.
IR (KBr): 3105, 3060, 1667, 1599, 1576, 1509, 1464, 1447, 1394, 1347, 1259, 1228, 1168 –1128, 1093, 1011, 893, 854, 823, 794, 770, 662 cm^{-1}
EI-HRMS cacld for $C_{13}H_8ClF_3O$ (M^+) 272.0216, found 272.0209.



(*Z*)-2-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)pyridine (3t)
Purified by using a flash column chromatography (PE/EA 5:1); isolated yield 15 %, 33 mg. Greenish oil.
^{1}H NMR (500 MHz, Chloroform-*d*) δ 8.30 (dd, *J* = 4.9, 1.9 Hz, 1H), 7.77 (ddd, *J* = 8.3, 7.2, 2.0 Hz, 1H), 7.15 (ddd, *J* = 7.3, 4.9, 0.9 Hz, 1H), 7.00 (dd, *J* = 8.2, 1.0 Hz, 1H), 5.75 (q, *J* = 6.9 Hz, 1H).
^{13}C NMR (126 MHz, Chloroform-*d*) δ 159.91, 147.78, 147.47 (q, *J* = 6.5 Hz), 140.03, 121.34 (q, *J* = 270.4 Hz), 120.59, 111.94, 107.15 (q, *J* = 36.5 Hz).
^{19}F NMR (471 MHz, Chloroform-*d*) δ -59.07.
IR (KBr): 1672, 1596, 1577, 1469, 1434, 1341, 1258, 1227, 1160 –1130, 1057, 893, 852, 773, 663 cm^{-1}
EI-HRMS cacld for $C_8H_5ClF_3NO$ (M^+) 223.0012, found 223.0016.



(*E*)-1-chloro-4-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzene (4a)
Purified by using a flash column chromatography (PE); isolated yield 71 %, 365 mg. Colorless oil.
^{1}H NMR (800 MHz, Chloroform-*d*) δ 7.43 – 7.40 (m, 1H), 7.35 – 7.32 (m, 2H), 7.04 – 7.00 (m, 2H).
^{13}C NMR (201 MHz, Chloroform-*d*) δ 154.64, 144.80 (q, *J* = 5.7 Hz), 130.56, 130.08, 121.43 (q, *J* = 269.5 Hz), 118.61, 105.23 (q, *J* = 37.9 Hz).
^{19}F NMR (471 MHz, Chloroform-*d*) δ -66.90.
IR (KBr): 1674, 1489, 1328, 1226, 1193, 1167 –1137, 1092, 1013, 982, 831, 820, 720 cm^{-1}
EI-HRMS cacld for $C_9H_5Cl_2F_3O$ (M^+) 255.9670, found 255.9664.



(*E*)-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzene (4b)

Purified by using a flash column chromatography (PE); isolated yield 60 %, 267 mg. Colorless oil.

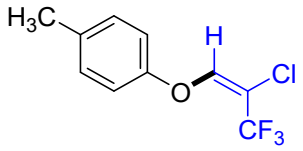
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.48 (q, *J* = 1.4 Hz, 1H), 7.38 (ddt, *J* = 7.9, 4.9, 2.3 Hz, 2H), 7.24 – 7.17 (m, 1H), 7.12 – 7.03 (m, 2H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 156.20, 145.27 (q, *J* = 5.6 Hz), 130.09, 125.23, 121.58 (q, *J* = 269.5 Hz), 117.33, 104.42 (q, *J* = 37.9 Hz).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -66.82.

IR (KBr): 1674, 1595, 1489, 1328, 1223, 1190, 1168 –1138, 981, 762, 697, 687 cm^{-1}

EI-HRMS cacld for $C_9H_6ClF_3O$ (M^+) 222.0059, found 222.0053.



(*E*)-1-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-4-methylbenzene (4c)

Purified by using a flash column chromatography (PE); isolated yield 62 %, 293 mg. Colorless oil.

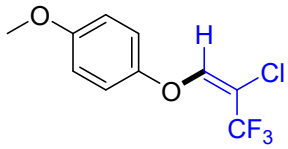
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.43 (d, *J* = 1.7 Hz, 1H), 7.16 (d, *J* = 8.4 Hz, 2H), 6.99 – 6.93 (m, 2H), 2.33 (s, 3H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 154.26, 145.71 (q, *J* = 5.6 Hz), 134.96, 130.48, 121.65 (q, *J* = 269.4 Hz), 117.15, 103.82 (q, *J* = 37.8 Hz), 20.65.

^{19}F NMR (471 MHz, Chloroform-*d*) δ -66.74.

IR (KBr): 1673, 1508, 1330, 1225, 1209, 1192, 1170 –1138, 879, 846, 818 cm^{-1}

EI-HRMS cacld for $C_{10}H_8ClF_3O$ (M^+) 236.0216, found 236.0213.



(*E*)-1-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-4-methoxybenzene (4d)

Purified by using a flash column chromatography (PE/EA 10:1); isolated yield 62 %, 313 mg. White solid.

M.p.: 56.5-56.6 °C.

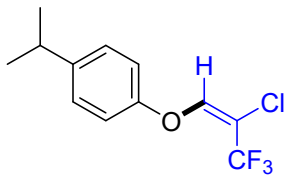
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.39 (s, 1H), 7.02 (d, *J* = 8.6 Hz, 2H), 6.88 (d, *J* = 8.8 Hz, 2H), 3.80 (s, 3H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 157.00, 150.29, 146.29 (q, *J* = 5.6 Hz), 121.65 (q, *J* = 269.3 Hz), 118.59, 114.97, 103.40 (q, *J* = 37.9 Hz), 55.68.

^{19}F NMR (471 MHz, Chloroform-*d*) δ -66.67.

IR (KBr): 3442, 1674, 1507, 1336, 1260, 1217, 1187, 1139 –1110, 1030, 980, 881, 839, 826, 764 cm^{-1}

EI-HRMS cacld for $C_{10}H_8ClF_3O_2$ (M^+) 252.0165, found 252.0167.



(*E*)-1-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-4-isopropylbenzene (4e)

Purified by using a flash column chromatography (PE); isolated yield 55 %, 291 mg. Colorless oil.

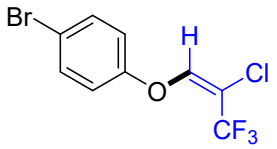
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.45 (q, *J* = 1.2 Hz, 1H), 7.24 – 7.19 (m, 2H), 7.03 – 6.97 (m, 2H), 2.91 (hept, *J* = 6.9 Hz, 1H), 1.24 (dd, *J* = 6.8, 1.5 Hz, 6H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 154.37, 146.02, 145.74 (q, *J* = 5.6 Hz), 127.89, 121.64 (q, *J* = 269.4 Hz), 117.24, 103.81 (q, *J* = 37.8 Hz), 33.53, 24.02.

^{19}F NMR (471 MHz, Chloroform-*d*) δ -66.70.

IR (KBr): 2965, 1674, 1509, 1329, 1225, 1195, 1172 –1138, 982, 844, 832 cm^{-1}

EI-HRMS cacld for $C_{12}H_{12}ClF_3O$ (M^+) 264.0529, found 264.0524.



(*E*)-1-bromo-4-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzene (4f)

Purified by using a flash column chromatography (PE); isolated yield 62 %, 374 mg. Colorless oil.

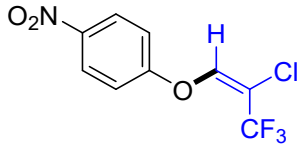
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.45 – 7.37 (m, 2H), 7.34 (q, *J* = 1.3 Hz, 1H), 6.94 – 6.84 (m, 2H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 155.15, 144.65 (q, *J* = 5.6 Hz), 133.07, 121.40 (q, *J* = 269.7 Hz), 119.02, 118.03, 105.37 (q, *J* = 37.9 Hz).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -66.88.

IR (KBr): 1674, 1586, 1485, 1323, 1226, 1192, 1169 –1137, 1072, 1010, 982, 827, 712 cm^{-1}

EI-HRMS cacld for $C_9H_5BrClF_3O$ (M^+) 299.9164, found 299.9162.



(*E*)-1-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-4-nitrobenzene (4g)

Purified by using a flash column chromatography (PE/EA 5:1); isolated yield 63 %, 337 mg. White solid.

M.p.: 44.0-44.3 °C.

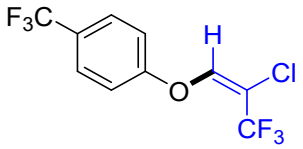
^{1}H NMR (500 MHz, Chloroform-*d*) δ 8.47 – 8.08 (m, 2H), 7.59 (s, 1H), 7.37 – 7.13 (m, 2H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 159.88, 144.63, 143.00 (q, *J* = 5.8 Hz), 126.15, 121.09 (q, *J* = 270.3 Hz), 117.28, 107.91 (q, *J* = 38.1 Hz).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -67.15.

IR (KBr): 1681, 1615, 1592, 1526, 1515, 1491, 1348, 1229, 1186, 1170 –1128, 982, 859, 757, 711, 687 cm^{-1}

EI-HRMS cacld for $C_9H_5ClF_3NO_3$ (M^+) 266.9910, found 266.9913.



(*E*)-1-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-4-(trifluoromethyl)benzene (4h)

Purified by using a flash column chromatography (PE/EA 10:1); isolated yield 60 %, 349 mg. Colorless oil.

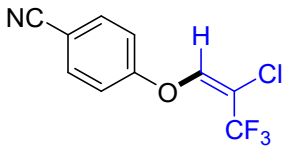
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.63 – 7.52 (m, 2H), 7.42 (d, *J* = 1.4 Hz, 1H), 7.14 – 7.04 (m, 2H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 158.12, 143.85 (q, *J* = 5.8 Hz), 127.97 – 127.02 (m), 127.57 (q, *J* = 3.8 Hz), 123.72 (q, *J* = 271.8 Hz), 121.28 (q, *J* = 269.8 Hz), 117.33, 106.50 (q, *J* = 38.1 Hz).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -62.24, -67.10.

IR (KBr): 1674, 1614, 1515, 1326, 1232, 1198, 1175 –1135, 1109, 1067, 1015, 983, 848, 696 cm^{-1}

EI-HRMS cacld for $C_{10}H_5ClF_6O$ (M^+) 289.9933, found 289.9929.



(*E*)-4-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzonitrile (4i)

Purified by using a flash column chromatography (PE/EA 5:1); isolated yield 67 %, 332 mg. Colorless oil.

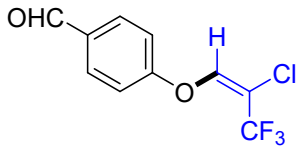
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.70 – 7.56 (m, 2H), 7.46 (d, *J* = 1.4 Hz, 1H), 7.17 – 7.06 (m, 2H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 158.52, 143.21 (q, *J* = 5.7 Hz), 134.48, 121.15 (q, *J* = 270.1 Hz), 117.93, 117.78, 108.91, 107.35 (q, *J* = 38.2 Hz).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -67.09.

IR (KBr): 3069, 2233, 1676, 1603, 1504, 1333, 1236, 1195, 1173 –1134, 983, 851, 835, 556 cm^{-1}

EI-HRMS cacld for $C_{10}H_5ClF_3NO$ (M^+) 247.0012, found 247.0009.



(*E*)-4-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzaldehyde (4j)

Purified by using a flash column chromatography (PE/EA 5:1); isolated yield 65 %, 326 mg. Colorless oil.

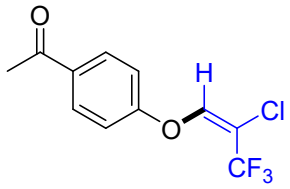
^{1}H NMR (500 MHz, Chloroform-*d*) δ 9.98 (s, 1H), 8.01 – 7.87 (m, 2H), 7.59 (q, *J* = 1.3 Hz, 1H), 7.36 – 7.13 (m, 2H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 190.34, 159.94, 143.45 (q, *J* = 5.7 Hz), 133.34, 132.03, 121.24 (q, *J* = 270.0 Hz), 117.35, 106.88 (q, *J* = 38.0 Hz).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -67.03.

IR (KBr): 3082, 1696, 1674, 1601, 1588, 1508, 1345, 1304, 1235, 1196, 1165 –1137, 983, 860, 836, 694 cm^{-1}

EI-HRMS cacld for $C_{10}H_6ClF_3O_2$ (M^+) 250.0008, found 250.0006.



(*E*)-1-(4-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)phenyl)ethan-1-one (4k)

Purified by using a flash column chromatography (PE/EA 5:1); isolated yield 63 %, 333 mg. Colorless oil.

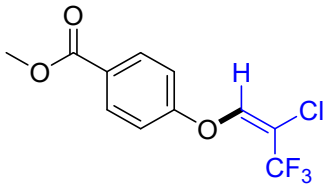
^{1}H NMR (500 MHz, Chloroform-*d*) δ 8.17 – 7.88 (m, 2H), 7.57 (q, *J* = 1.3 Hz, 1H), 7.23 – 7.06 (m, 2H), 2.60 (s, 3H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 196.30, 159.07, 143.76 (q, *J* = 5.7 Hz), 134.04, 130.75, 121.30 (q, *J* = 269.9 Hz), 116.82, 106.31 (q, *J* = 38.0 Hz), 26.45.

^{19}F NMR (471 MHz, Chloroform-*d*) δ -66.98.

IR (KBr): 3444, 3079, 1683, 1598, 1508, 1422, 1362, 1331, 1310, 1270, 1227, 1195, 1172 –1135, 1012, 980, 958, 835, 820 cm^{-1}

EI-HRMS cacld for $C_{11}H_8ClF_3O_2$ (M^+) 264.0165, found 264.0159.



Methyl (*E*)-4-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzoate (4l)

Purified by using a flash column chromatography (PE/EA 5:1); isolated yield 64 %, 359 mg. White solid.

M.p.: 56.6 °C.

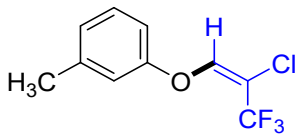
^{1}H NMR (500 MHz, Chloroform-*d*) δ 8.00 (d, *J* = 8.5 Hz, 2H), 7.46 (s, 1H), 7.05 (d, *J* = 8.3 Hz, 2H), 3.84 (s, 3H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 165.97, 159.07, 143.83 (q, *J* = 5.7 Hz), 131.96, 127.04, 121.32 (q, *J* = 269.8 Hz), 116.73, 106.25 (q, *J* = 38.0 Hz), 52.22.

^{19}F NMR (471 MHz, Chloroform-*d*) δ -66.97.

IR (KBr): 3441, 3074, 2959, 1717, 1675, 1604, 1508, 1439, 1330, 1312, 1287, 1230, 1209, 1171, 1130 –1117, 982, 854, 770 cm^{-1}

EI-HRMS cacld for $C_{11}H_8ClF_3O_3$ (M^+) 280.0114, found 280.0117.



(*E*)-1-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-3-methylbenzene (4m)

Purified by using a flash column chromatography (PE); isolated yield 53 %, 251 mg. Colorless oil.

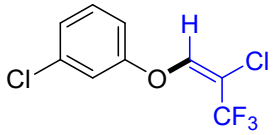
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.46 (q, *J* = 1.3 Hz, 1H), 7.24 (d, *J* = 7.8 Hz, 1H), 7.04 – 6.98 (m, 1H), 6.93 – 6.83 (m, 2H), 2.37 (s, 3H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 156.22, 145.39 (q, *J* = 5.5 Hz), 140.51, 129.76, 125.99, 121.63 (q, *J* = 269.3 Hz), 118.00, 114.21, 104.12 (q, *J* = 37.7 Hz), 21.31.

^{19}F NMR (471 MHz, Chloroform-*d*) δ -66.72.

IR (KBr): 1674, 1613, 1589, 1490, 1331, 1247, 1209, 1159 –1133, 983, 786 cm^{-1}

EI-HRMS cacld for $C_{10}H_8ClF_3O$ (M^+) 236.0216, found 236.0218.



(*E*)-1-chloro-3-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzene (4n)

Purified by using a flash column chromatography (PE); isolated yield 60 %, 308 mg. Pale greenish oil.

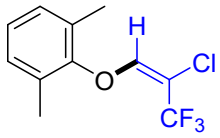
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.48 – 7.40 (m, 1H), 7.31 (d, *J* = 16.3 Hz, 1H), 7.23 – 7.16 (m, 1H), 7.10 (t, *J* = 2.2 Hz, 1H), 6.98 (dd, *J* = 8.3, 2.4 Hz, 1H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 156.45, 144.43 (q, *J* = 5.6 Hz), 135.53, 130.88, 125.46, 121.38 (q, *J* = 269.8 Hz), 117.96, 115.43, 105.66 (q, *J* = 38.0 Hz).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -66.92.

IR (KBr): 1675, 1591, 1475, 1330, 1267, 1227, 1191, 1139, 986, 869, 780, 678 cm^{-1}

EI-HRMS cacld for $C_9H_5Cl_2F_3O$ (M^+) 255.9670, found 255.9674.



(*E*)-2-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-1,3-dimethylbenzene (4o)

Purified by using a flash column chromatography (PE); isolated yield 51 %, 256 mg. Colorless oil.

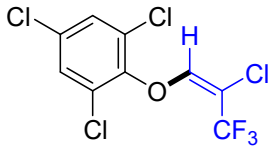
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.09 (q, *J* = 1.3 Hz, 1H), 7.06 (s, 3H), 2.24 (s, 6H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 153.75, 147.82 (q, *J* = 5.5 Hz), 129.83, 129.16, 126.15, 121.70 (q, *J* = 269.1 Hz), 102.15 (q, *J* = 38.0 Hz), 15.98.

^{19}F NMR (471 MHz, Chloroform-*d*) δ -66.54.

IR (KBr): 1670, 1476, 1325, 1265, 1209, 1175, 1141, 982, 835, 774, 730 cm^{-1}

EI-HRMS cacld for $C_{11}H_{10}ClF_3O$ (M^+) 250.0372, found 250.0375.



(*E*)-1,3,5-trichloro-2-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzene (4p)

Purified by using a flash column chromatography (PE); isolated yield 82 %, 535 mg. White solid.

M.p.: 37.9 °C.

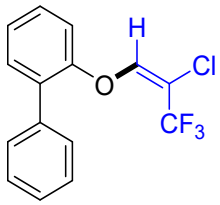
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.38 (s, 2H), 7.12 (q, *J* = 1.3 Hz, 1H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 147.42, 146.23 (q, *J* = 5.8 Hz), 132.37, 129.08, 129.01, 121.18 (q, *J* = 270.0 Hz), 105.44 (q, *J* = 38.3 Hz).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -67.13.

IR (KBr): 3442, 3088, 1675, 1562, 1451, 1434, 1389, 1324, 1246, 1194, 1132, 1076, 981, 861, 785, 743 cm^{-1}

EI-HRMS cacld for $C_9H_3Cl_4F_3O$ (M^+) 325.8861, found 325.8851.



(*E*)-2-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-1,1'-biphenyl (4q)

Purified by using a flash column chromatography (PE/EA 25:1); isolated yield 60 %, 358 mg.

Colorless oil.

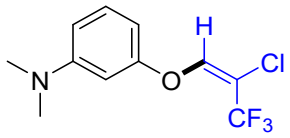
^1H NMR (500 MHz, Chloroform-*d*) δ 7.66 – 7.60 (m, 2H), 7.59 – 7.50 (m, 3H), 7.50 – 7.42 (m, 2H), 7.42 – 7.34 (m, 2H), 7.21 (dd, *J* = 8.1, 1.3 Hz, 1H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 153.32, 146.17 (q, *J* = 5.7 Hz), 136.36, 132.78, 131.55, 129.49, 129.02, 128.45, 127.84, 125.86, 121.60 (q, *J* = 269.4 Hz), 118.08, 104.13 (q, *J* = 37.9 Hz).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -66.71.

IR (KBr): 3066, 1672, 1583, 1504, 1480, 1435, 1326, 1252, 1218, 1188, 1140, 981, 770, 743, 699 cm^{-1}

EI-HRMS cacld for $C_{15}H_{10}ClF_3O$ (M^+) 298.0372, found 298.0365.



(*E*)-3-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-*N*,*N*-dimethylaniline (4r)

Purified by using a flash column chromatography (PE/EA 10:1); isolated yield 52 %, 276 mg.

Colorless oil.

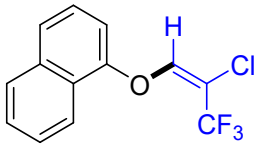
^1H NMR (500 MHz, Chloroform-*d*) δ 7.49 (q, *J* = 1.2 Hz, 1H), 7.19 (ddd, *J* = 8.4, 7.2, 1.0 Hz, 1H), 6.57 – 6.49 (m, 1H), 6.38 (dq, *J* = 7.9, 1.5, 0.8 Hz, 2H), 2.96 (s, 6H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 157.53, 152.02, 145.80 (q, *J* = 5.6 Hz), 130.25, 121.72 (q, *J* = 269.2 Hz), 109.21, 104.19, 103.39 (q, *J* = 37.8 Hz), 101.51, 40.36.

^{19}F NMR (471 MHz, Chloroform-*d*) δ -66.61.

IR (KBr): 3102, 2894, 2810, 1665, 1610, 1571, 1502, 1450, 1350, 1251, 1175 –1138, 1064, 999, 858, 825, 759, 660 cm^{-1}

EI-HRMS cacld for $C_{11}H_{11}ClF_3NO$ (M^+) 265.0481, found 265.0477.

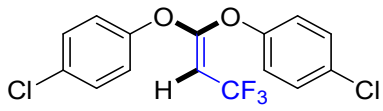


(*E*)-1-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)naphthalene (4s)

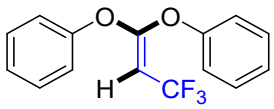
Purified by using a flash column chromatography (PE/EA 25:1); isolated yield 58 %, 316 mg. Pale yellowish solid.

M.p.: 46.9-47.3 ℃.

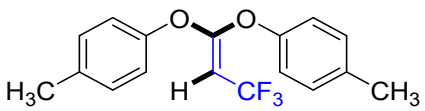
^{1}H NMR (500 MHz, Chloroform-*d*) δ 8.24 – 8.11 (m, 1H), 7.84 (dt, *J* = 7.7, 2.5 Hz, 1H), 7.66 (d, *J* = 8.3 Hz, 1H), 7.60 (s, 1H), 7.58 – 7.48 (m, 2H), 7.39 (t, *J* = 7.9 Hz, 1H), 7.04 (d, *J* = 7.6 Hz, 1H).
^{13}C NMR (126 MHz, Chloroform-*d*) δ 152.18, 145.73 (q, *J* = 5.6 Hz), 134.72, 127.78, 127.23, 126.74, 125.47, 125.32, 125.21, 121.64 (q, *J* = 269.5 Hz), 121.33, 111.12, 105.03 (q, *J* = 37.9 Hz).
^{19}F NMR (471 MHz, Chloroform-*d*) δ -66.67.
IR (KBr): 3064, 1672, 1599, 1577, 1508, 1463, 1394, 1334, 1264, 1236, 1221, 1176 –1144, 1119, 1079, 1039, 1015, 974, 797, 772, 758, 733 cm^{-1}
EI-HRMS cacld for $C_{13}H_8ClF_3O$ (M^+) 272.0216, found 272.0214.



4,4'-((3,3,3-Trifluoroprop-1-ene-1,1-diyl)bis(oxy))bis(chlorobenzene) (5aa)
Purified by using a flash column chromatography (PE/EA 10:1); isolated yield 90 %, 314 mg.
Colorless oil.
^{1}H NMR (800 MHz, Chloroform-*d*) δ 7.36 – 7.25 (m, 4H), 7.04 (dt, *J* = 8.9, 2.6 Hz, 2H), 6.96 (dd, *J* = 8.7, 1.6 Hz, 2H), 4.51 (qd, *J* = 6.9, 2.8 Hz, 1H).
^{13}C NMR (201 MHz, Chloroform-*d*) δ 160.19 (q, *J* = 5.3 Hz), 151.94, 150.86, 131.61, 130.35, 130.22, 129.76, 123.88 (q, *J* = 267.1 Hz), 121.27, 119.84, 82.65 (q, *J* = 37.4 Hz).
^{19}F NMR (471 MHz, Chloroform-*d*) δ -55.49 (d, *J* = 7.9 Hz).
IR (KBr): 1684, 1487, 1373, 1274, 1230 –1198, 1163, 1099, 1014, 986, 826 cm^{-1}
EI-HRMS cacld for $C_{15}H_9Cl_2F_3O_2$ (M^+) 347.9932, found 347.9927.



((3,3,3-Trifluoroprop-1-ene-1,1-diyl)bis(oxy))dibenzene (5bb)
Purified by using a flash column chromatography (PE/EA 10:1); isolated yield 68 %, 191 mg.
Colorless oil.
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.30 – 7.19 (m, 4H), 7.14 – 7.00 (m, 4H), 6.96 – 6.89 (m, 2H), 4.33 (q, *J* = 6.9 Hz, 1H).
^{13}C NMR (126 MHz, Chloroform-*d*) δ 161.23 (q, *J* = 5.8 Hz), 153.69, 152.57, 130.08, 129.67, 126.12, 124.84, 124.37 (q, *J* = 267.0 Hz), 120.18, 118.56, 81.33 (q, *J* = 37.3 Hz).
^{19}F NMR (471 MHz, Chloroform-*d*) δ -55.20 (d, *J* = 6.3 Hz).
IR (KBr): 1682, 1593, 1490, 1372, 1275, 1232 –1193, 1163, 1099, 983, 765, 752, 691 cm^{-1}
EI-HRMS cacld for $C_{15}H_{11}F_3O_2$ (M^+) 280.0711, found 280.0709.



4,4'-((3,3,3-Trifluoroprop-1-ene-1,1-diyl)bis(oxy))bis(methylbenzene) (5cc)
Purified by using a flash column chromatography (PE/EA 10:1); isolated yield 92 %, 284 mg.
Colorless oil.

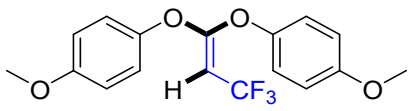
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.01 (dd, *J* = 8.4, 5.3 Hz, 4H), 6.95 – 6.90 (m, 2H), 6.83 – 6.77 (m, 2H), 4.22 (q, *J* = 6.9 Hz, 1H), 2.18 (s, 6H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 162.04 (q, *J* = 5.8 Hz), 151.63, 150.43, 135.95, 134.44, 130.55, 130.14, 124.63 (q, *J* = 266.8 Hz), 120.09, 118.48, 80.11 (q, *J* = 37.4 Hz), 20.73 (d, *J* = 9.1 Hz).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -54.90.

IR (KBr): 3036, 2958, 2927, 1681, 1608, 1595, 1506, 1373, 1276, 1232 –1194, 1165, 1097, 1046, 1018, 987, 889, 820, 698, 506 cm^{-1}

EI-HRMS cacld for $C_{17}H_{15}F_3O_2$ (M^+) 308.1024, found 308.1029.



4,4'-((3,3,3-Trifluoroprop-1-ene-1,1-diyl)bis(oxy))bis(methoxybenzene) (5dd)

Purified by using a flash column chromatography (PE/EA 5:1); isolated yield 86 %, 293 mg. Colorless oil.

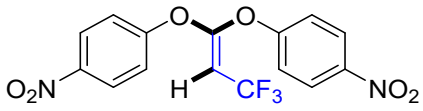
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.01 – 6.91 (m, 2H), 6.87 – 6.78 (m, 2H), 6.78 – 6.67 (m, 4H), 4.14 (q, *J* = 7.0 Hz, 1H), 3.63 (d, *J* = 1.5 Hz, 6H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 162.69 (q, *J* = 5.6 Hz), 157.59, 156.79, 147.20, 145.95, 124.73 (q, *J* = 266.7 Hz), 121.36, 119.97, 114.99, 114.63, 78.97 (q, *J* = 37.3 Hz), 55.52 (d, *J* = 1.5 Hz).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -54.69.

IR (KBr): 1677, 1505, 1375, 1279, 1231 –1181, 1098, 1035, 986, 888, 830 cm^{-1}

EI-HRMS cacld for $C_{17}H_{15}F_3O_4$ (M^+) 340.0922, found 340.0918.



4,4'-((3,3,3-Trifluoroprop-1-ene-1,1-diyl)bis(oxy))bis(nitrobenzene) (5gg)

Purified by using a flash column chromatography (PE/EA 5:1); isolated yield 34 %, 126 mg. White solid.

M.p.: 95.8-96.5 °C.

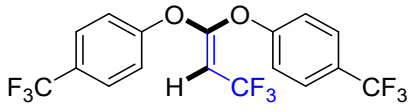
^{1}H NMR (500 MHz, Chloroform-*d*) δ 8.22 – 8.15 (m, 4H), 7.17 – 7.11 (m, 4H), 4.99 (q, *J* = 6.6 Hz, 1H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 160.69, 157.58, 156.87, 145.21, 144.71, 126.14, 125.95, 125.98 – 119.49 (m), 119.36, 118.04, 88.84 (q, *J* = 37.8 Hz).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -56.72 (d, *J* = 8.3 Hz).

IR (KBr): 3443, 3113, 1687, 1618, 1592, 1532, 1488, 1381, 1346, 1278, 1240 –1206, 1161, 1097, 1012, 987, 892, 859 cm^{-1}

EI-HRMS cacld for $C_{15}H_9F_3N_2O_6$ (M^+) 370.0413, found 370.0419.



4,4'-((3,3,3-Trifluoroprop-1-ene-1,1-diyl)bis(oxy))bis((trifluoromethyl)benzene) (5hh)

Purified by using a flash column chromatography (PE/EA 25:1); isolated yield 68 %, 283 mg. Colorless oil.

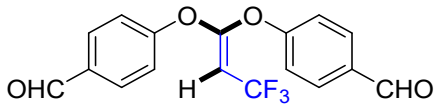
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.69 – 7.49 (m, 4H), 7.26 – 7.06 (m, 4H), 4.76 (q, *J* = 6.7 Hz, 1H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 158.59 (q, *J* = 5.8 Hz), 155.77, 154.89, 128.37 (q, *J* = 33.1 Hz), 127.57 (q, *J* = 3.8 Hz), 127.23 (q, *J* = 3.7 Hz), 123.79 (q, *J* = 271.8 Hz), 123.60 (q, *J* = 272.0 Hz), 123.41 (q, *J* = 267.7 Hz), 121.57 – 116.82 (m), 119.75, 118.22, 85.53 (q, *J* = 37.7 Hz).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -56.28 (d, *J* = 8.2 Hz), -62.28, -62.45.

IR (KBr): 1688, 1614, 1514, 1421, 1374, 1326, 1272, 1232 –1207, 1170, 1126 –1104, 1066, 1016, 987, 976, 891, 840 cm^{-1}

EI-HRMS cacld for $C_{17}H_9F_9O_2$ (M^+) 416.0459, found 416.0463.



4,4'-((3,3,3-Trifluoroprop-1-ene-1,1-diyl)bis(oxy))dibenzaldehyde (5jj)

Purified by using a flash column chromatography (PE/EA 2:1); isolated yield 70 %, 235 mg. Pale yellowish oil.

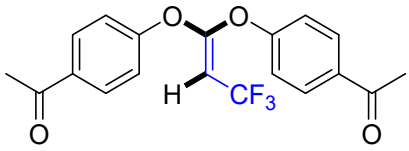
^{1}H NMR (500 MHz, Chloroform-*d*) δ 9.86 (d, *J* = 8.9 Hz, 2H), 7.80 (tt, *J* = 9.1, 2.2 Hz, 4H), 7.13 (ddd, *J* = 9.4, 4.8, 2.1 Hz, 4H), 4.82 (q, *J* = 6.8 Hz, 1H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 190.39 (d, *J* = 13.2 Hz), 157.72, 157.70 (q, *J* = 5.4 Hz), 156.85, 133.93, 133.24, 131.87, 131.71, 123.23 (q, *J* = 267.9 Hz), 119.67, 118.23, 86.73 (q, *J* = 37.5 Hz).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -56.31.

IR (KBr): 3375, 3108, 2844, 2748, 1703 –1683, 1599, 1503, 1422, 1371, 1302, 1272, 1236 –1208, 1156, 1098, 1011, 985, 890, 869, 843, 809, 774 cm^{-1}

EI-HRMS cacld for $C_{17}H_{11}F_3O_4$ (M^+) 336.0609, found 336.0607.



1,1'-(((3,3,3-Trifluoroprop-1-ene-1,1-diyl)bis(oxy))bis(4,1-phenylene))bis(ethan-1-one) (5kk)

Purified by using a flash column chromatography (PE/EA 1:1); isolated yield 78 %, 284 mg. Yellowish oil.

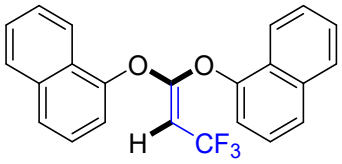
^{1}H NMR (500 MHz, Chloroform-*d*) δ 8.07 – 7.82 (m, 4H), 7.29 – 7.00 (m, 4H), 4.81 (q, *J* = 6.7 Hz, 1H), 2.58 (d, *J* = 4.6 Hz, 6H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 196.38 (d, *J* = 13.5 Hz), 158.30 (q, *J* = 5.8 Hz), 156.87, 155.94, 134.73, 133.90, 130.63, 130.43, 123.39 (q, *J* = 267.6 Hz), 119.29, 117.77, 85.76 (q, *J* = 37.5 Hz), 26.49 (d, *J* = 5.0 Hz).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -56.17 (d, *J* = 5.9 Hz).

IR (KBr): 3449, 3347, 3084, 1680, 1598, 1501, 1413, 1364, 1305, 1272, 1235 –1198, 1166, 1103, 1014, 987, 960, 888, 858, 839 cm^{-1}

EI-HRMS cacld for $C_{19}H_{15}F_3O_4$ (M^+) 364.0922, found 364.0919.



1,1'-((3,3,3-Trifluoroprop-1-ene-1,1-diyl)bis(oxy))dinaphthalene (5ss)

Purified by using a flash column chromatography (PE/EA 4:1); isolated yield 74 %, 281 mg. Yellowish oil.

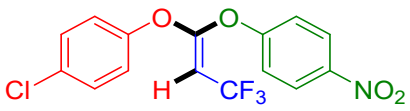
^{1}H NMR (500 MHz, Chloroform-*d*) δ 8.29 (d, *J* = 8.4 Hz, 1H), 7.79 (d, *J* = 8.1 Hz, 1H), 7.73 (ddd, *J* = 15.2, 6.9, 2.8 Hz, 2H), 7.63 (dt, *J* = 7.3, 3.5 Hz, 1H), 7.58 (d, *J* = 8.2 Hz, 1H), 7.54 (ddd, *J* = 8.4, 6.8, 1.4 Hz, 1H), 7.49 – 7.34 (m, 5H), 7.31 (t, *J* = 7.9 Hz, 1H), 7.16 (d, *J* = 7.5 Hz, 1H), 4.39 (q, *J* = 6.9 Hz, 1H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 162.24 (q, *J* = 5.7 Hz), 149.48, 148.32, 134.88 (d, *J* = 5.0 Hz), 128.03, 127.88, 126.94, 126.86, 126.79, 126.62, 126.42, 126.07, 125.85, 125.46, 125.39, 125.35, 123.73, 123.32 (q, *J* = 70.4 Hz), 121.57, 120.96, 116.47, 114.11, 79.46 (q, *J* = 37.5 Hz).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -54.62 (d, *J* = 6.2 Hz).

IR (KBr): 3444, 3125, 3057, 1671, 1635, 1598, 1575, 1509, 1392, 1372, 1278, 1259, 1229, 1154, 1100 –1086, 1071, 1046 –1037, 1011, 965, 891, 884, 799, 771, 693 cm^{-1}

EI-HRMS cacld for $C_{23}H_{15}F_3O_2$ (M^+) 380.1024, found 380.1021.



(*E*)-1-chloro-4-((3,3,3-trifluoro-1-(4-nitrophenoxy)prop-1-en-1-yl)oxy)benzene (5ag)

Purified by using a flash column chromatography (PE/EA 5:1); isolated yield 38 %, 137 mg. Colorless oil.

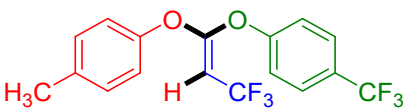
^{1}H NMR (500 MHz, Chloroform-*d*) δ 8.36 – 8.23 (m, 2H), 7.41 – 7.32 (m, 2H), 7.27 – 7.19 (m, 2H), 7.08 – 6.98 (m, 2H), 4.69 (q, *J* = 6.7 Hz, 1H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 159.10 (q, *J* = 5.6 Hz), 158.15, 150.52, 144.56, 132.01, 130.41, 125.83, 123.41 (q, *J* = 267.7 Hz), 121.16, 118.20, 84.55 (q, *J* = 37.7 Hz).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -55.98 (d, *J* = 6.1 Hz).

IR (KBr): 3445, 3112, 1684, 1615, 1590, 1532, 1488, 1380, 1346, 1277, 1235 –1202, 1161, 1097, 1012, 986, 893, 860 cm^{-1}

EI-HRMS cacld for $C_{15}H_9ClF_3NO_4$ (M^+) 359.0172, found 359.0176.



(*Z*)-1-methyl-4-((3,3,3-trifluoro-1-(4-(trifluoromethyl)phenoxy)prop-1-en-1-yl)oxy)benzene (5ch)

Purified by using a flash column chromatography (PE/EA 10:1); isolated yield 62 %, 225 mg. Colorless oil.

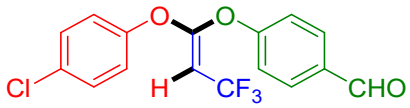
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.62 (d, *J* = 8.5 Hz, 2H), 7.23 (d, *J* = 8.4 Hz, 2H), 7.16 (d, *J* = 8.2 Hz, 2H), 6.97 – 6.91 (m, 2H), 4.49 (q, *J* = 6.8 Hz, 1H), 2.31 (s, 3H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 160.82 (q, *J* = 5.7 Hz), 156.32, 150.05, 136.34, 130.68, 127.12 (q, *J* = 3.8 Hz), 124.13 (q, *J* = 267.2 Hz), 123.96 (q, *J* = 271.8 Hz), 119.86, 119.03 (q, *J* = 193.7 Hz), 118.37, 81.97 (q, *J* = 37.5 Hz), 20.67.

^{19}F NMR (471 MHz, Chloroform-*d*) δ -55.46 (d, *J* = 10.5 Hz), -62.11.

IR (KBr): 1684, 1613, 1507, 1370, 1327, 1275, 1232, 1198, 1167, 1124 –1102, 1067, 1017, 986, 889, 844, 828 cm^{-1}

EI-HRMS cacld for $C_{17}H_{12}F_6O_2$ (M^+) 362.0741, found 362.0743.



(*E*)-4-((1-(4-chlorophenoxy)-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzaldehyde (5aj)

Purified by using a flash column chromatography (PE/EA 5:1); isolated yield 54 %, 185 mg. Pale yellowish oil.

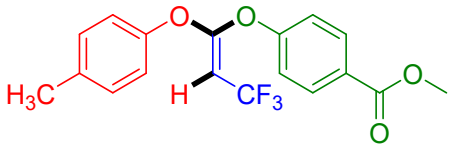
^{1}H NMR (500 MHz, Chloroform-*d*) δ 9.85 (s, 1H), 7.84 – 7.78 (m, 2H), 7.27 – 7.20 (m, 2H), 7.16 – 7.11 (m, 2H), 6.95 – 6.88 (m, 2H), 4.55 (q, *J* = 6.8 Hz, 1H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 190.44, 159.44 (q, *J* = 5.8 Hz), 158.10, 150.66, 133.19, 131.77, 131.69, 130.29, 123.61 (q, *J* = 267.6 Hz), 121.24, 118.29, 84.02 (q, *J* = 37.6 Hz).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -55.83.

IR (KBr): 3109, 2832, 2738, 1687, 1599, 1503, 1487, 1370, 1275, 1214, 1158, 1101, 1014, 986, 889, 830 cm^{-1}

EI-HRMS cacld for $C_{16}H_{10}ClF_3O_3$ (M^+) 342.0271, found 342.0276.



Methyl (*Z*)-4-((3,3,3-trifluoro-1-(*p*-tolyloxy)prop-1-en-1-yl)oxy)benzoate (5cl)

Purified by using a flash column chromatography (PE/EA 5:1); isolated yield 43 %, 151 mg. Colorless oil.

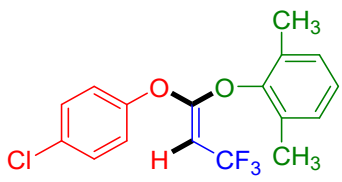
^{1}H NMR (500 MHz, Chloroform-*d*) δ 8.11 – 8.04 (m, 2H), 7.23 – 7.17 (m, 2H), 7.15 (d, *J* = 8.1 Hz, 2H), 6.99 – 6.91 (m, 2H), 4.50 (qd, *J* = 6.9, 0.9 Hz, 1H), 3.89 (s, 3H), 2.32 (s, 3H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 166.19, 160.76 (q, *J* = 5.6 Hz), 157.41, 150.05, 136.19, 131.55, 130.63, 126.59, 124.09 (q, *J* = 267.1 Hz), 119.85, 117.81, 82.02 (q, *J* = 37.6 Hz), 52.07, 20.74.

^{19}F NMR (471 MHz, Chloroform-*d*) δ -55.44.

IR (KBr): 3112, 3036, 2954, 1725, 1683, 1604, 1505, 1437, 1369, 1280, 1132 –1195, 1163, 1101, 1016, 987, 889, 853, 824, 767 cm^{-1}

EI-HRMS cacld for $C_{18}H_{15}F_3O_4$ (M^+) 352.0922, found 352.0915.



(*Z*)-2-((1-(4-chlorophenoxy)-3,3,3-trifluoroprop-1-en-1-yl)oxy)-1,3-dimethylbenzene (5ao)

Purified by using a flash column chromatography (PE/EA 10:1); isolated yield 76 %, 260 mg. Colorless oil.

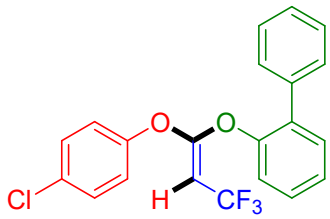
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.15 (dd, *J* = 9.4, 2.6 Hz, 2H), 6.90 (d, *J* = 2.2 Hz, 3H), 6.80 – 6.75 (m, 2H), 3.79 (q, *J* = 7.1 Hz, 1H), 2.20 (s, 6H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 162.46 (q, *J* = 5.7 Hz), 150.86, 148.84, 131.93, 130.89, 130.18, 128.72, 125.96, 125.12 (q, *J* = 266.5 Hz), 122.22, 73.05 (q, *J* = 38.1 Hz), 16.19.

^{19}F NMR (471 MHz, Chloroform-*d*) δ -54.23 (d, *J* = 7.8 Hz).

IR (KBr): 1672, 1487, 1380, 1278, 1236, 1206, 1174, 1092, 987, 889, 836, 773, 710 cm^{-1}

EI-HRMS cacld for $C_{17}H_{14}ClF_3O_2$ (M^+) 342.0634, found 342.0629.



(*Z*)-2-((1-(4-chlorophenoxy)-3,3,3-trifluoroprop-1-en-1-yl)oxy)-1,1'-biphenyl (5aq)

Purified by using a flash column chromatography (PE/EA 10:1); isolated yield 75 %, 293 mg. Colorless oil.

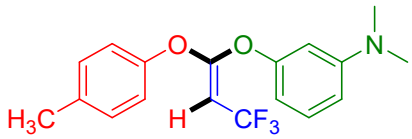
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.39 – 7.32 (m, 2H), 7.31 – 7.26 (m, 2H), 7.23 (tt, *J* = 6.6, 2.2 Hz, 3H), 7.13 – 7.10 (m, 2H), 6.98 (ddd, *J* = 8.8, 4.1, 2.0 Hz, 2H), 6.45 – 6.32 (m, 2H), 4.02 (qd, *J* = 7.0, 2.1 Hz, 1H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 160.36 (q, *J* = 5.8 Hz), 150.78, 149.49, 136.91, 133.78, 131.18, 129.87, 129.42, 128.60, 128.37, 127.66, 125.82, 124.48 (q, *J* = 267.0 Hz), 121.39, 120.16, 119.71, 79.18 (q, *J* = 37.6 Hz).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -54.90.

IR (KBr): 1679, 1486, 1376, 1277, 1231 –1196, 1098, 986, 740, 700 cm^{-1}

EI-HRMS cacld for $C_{21}H_{14}ClF_3O_2$ (M^+) 390.0634, found 390.0629.



(*Z*)-*N*,*N*-dimethyl-3-((3,3,3-trifluoro-1-(*p*-tolyloxy)prop-1-en-1-yl)oxy)aniline (5cr)

Purified by using a flash column chromatography (PE/EA 5:1); isolated yield 61 %, 206 mg. Colorless oil.

^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.12 – 7.04 (m, 2H), 7.02 (dd, *J* = 8.5, 4.1 Hz, 3H), 6.97 – 6.93 (m, 1H), 6.87 – 6.80 (m, 2H), 4.22 (q, *J* = 6.9 Hz, 1H), 2.79 (s, 6H), 2.19 (s, 3H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 162.10 (q, *J* = 5.8 Hz), 151.93, 135.90, 130.54, 130.11, 129.83, 124.68 (q, *J* = 266.8 Hz), 120.17, 118.57, 108.89, 105.82, 102.75, 80.34 (q, *J* = 37.3 Hz), 40.34, 20.79.

^{19}F NMR (471 MHz, Chloroform-*d*) δ -54.83 (d, *J* = 8.1 Hz).

IR (KBr): 2925, 2811, 1680, 1614, 1574, 1506, 1373, 1274, 1231 –1198, 1166, 1144, 1097, 1010, 992, 894, 828, 685 cm^{-1}

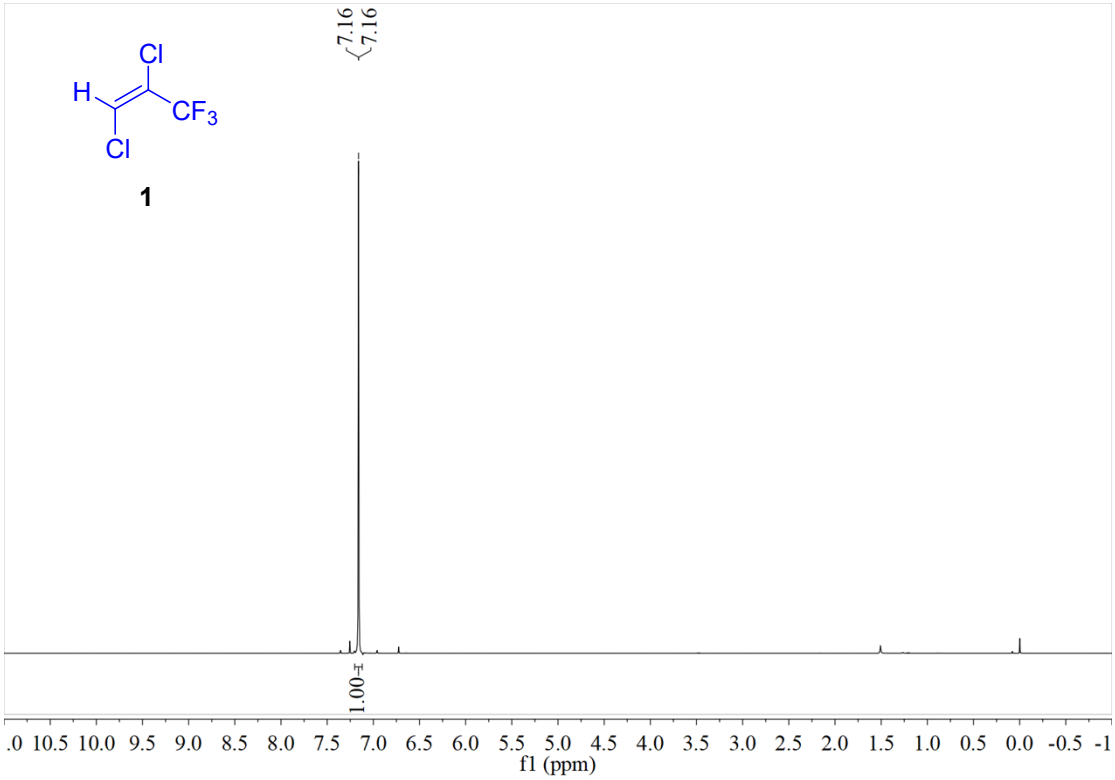
EI-HRMS cacld for $C_{18}H_{18}F_3NO_2$ (M^+) 337.1290, found 337.1287.

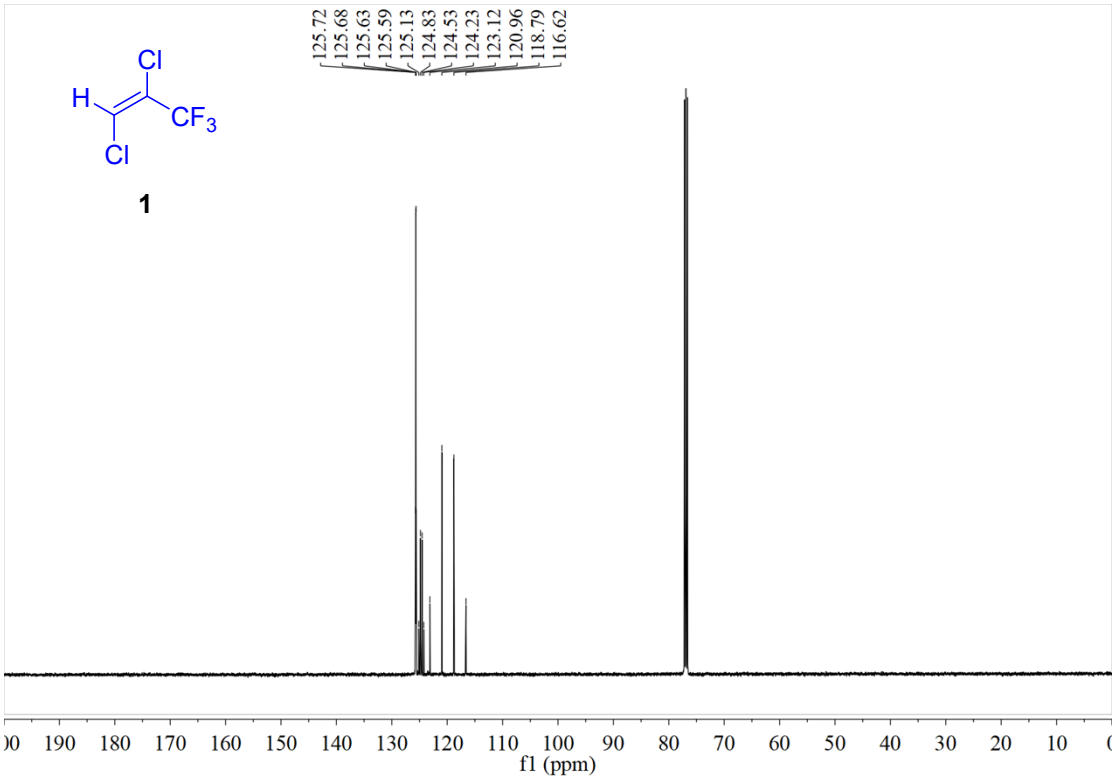
7. References

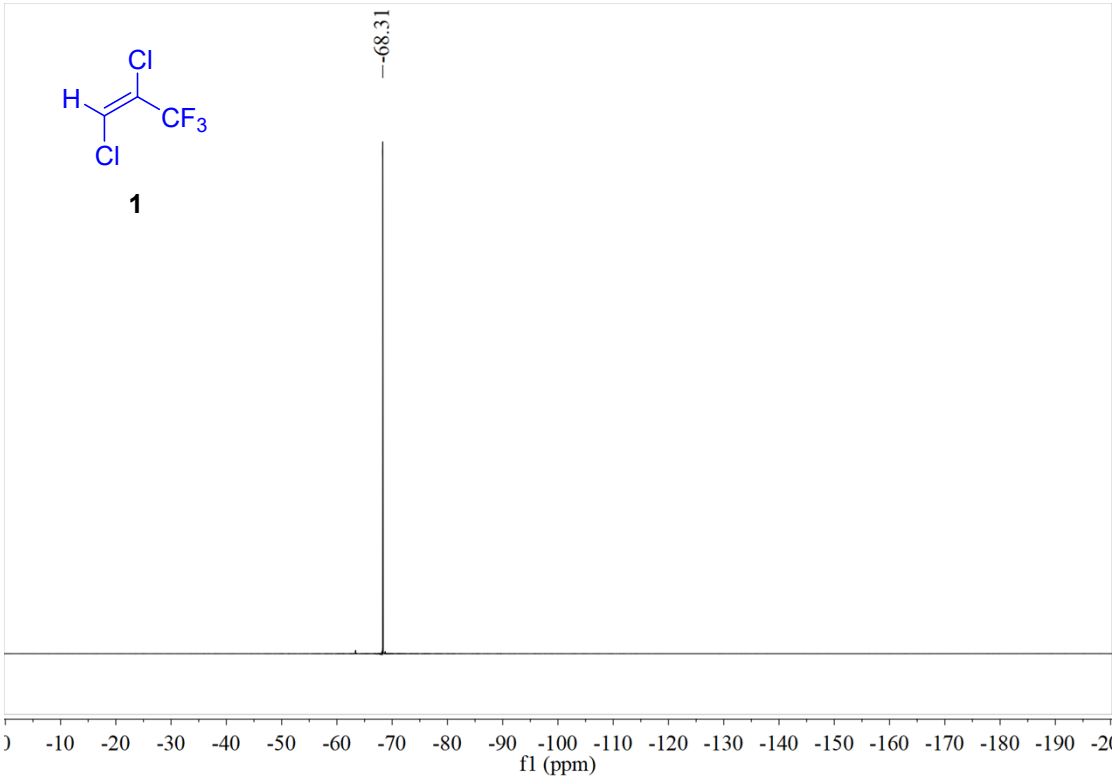
[1] S. Han, J. Lu, J.-J. Zeng, B. Zhao, X.-B. Tang, W. Zhang, Y. An, Z.-Q. Yang, Z.-J. Hao, and F.-X. Li, CN 117466704A, 2024.

8. NMR spectra

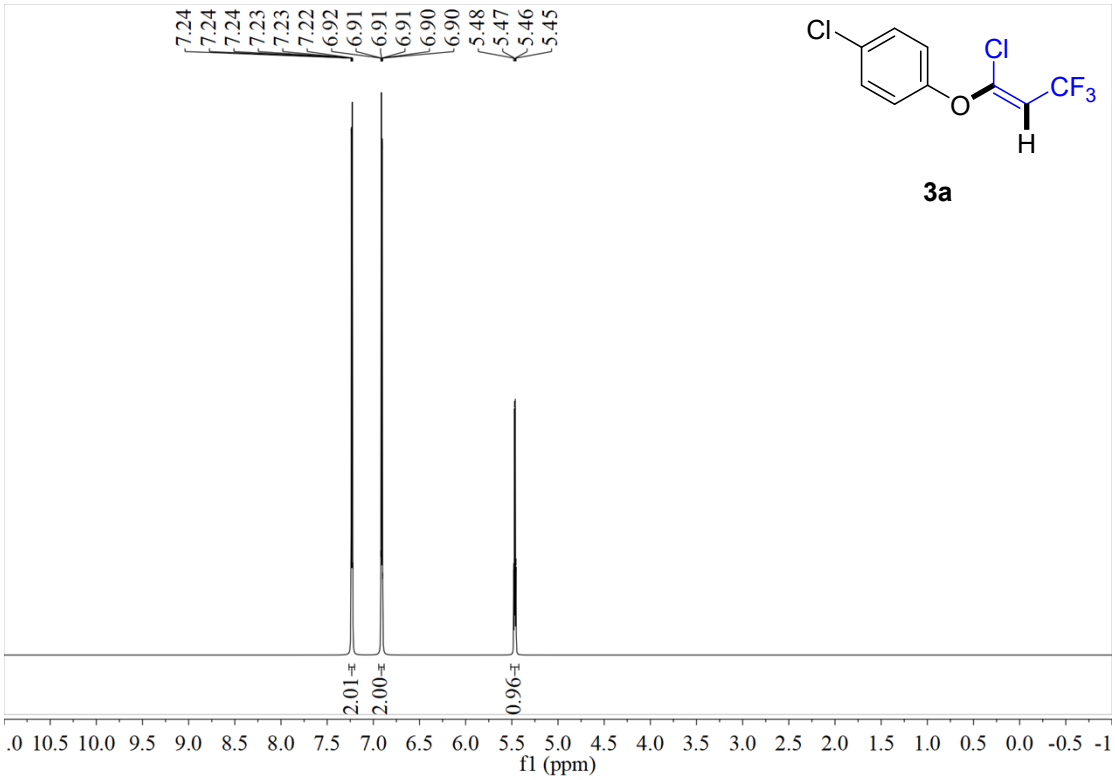
(*E*)-1,2-dichloro-3,3,3-trifluoroprop-1-ene (1)





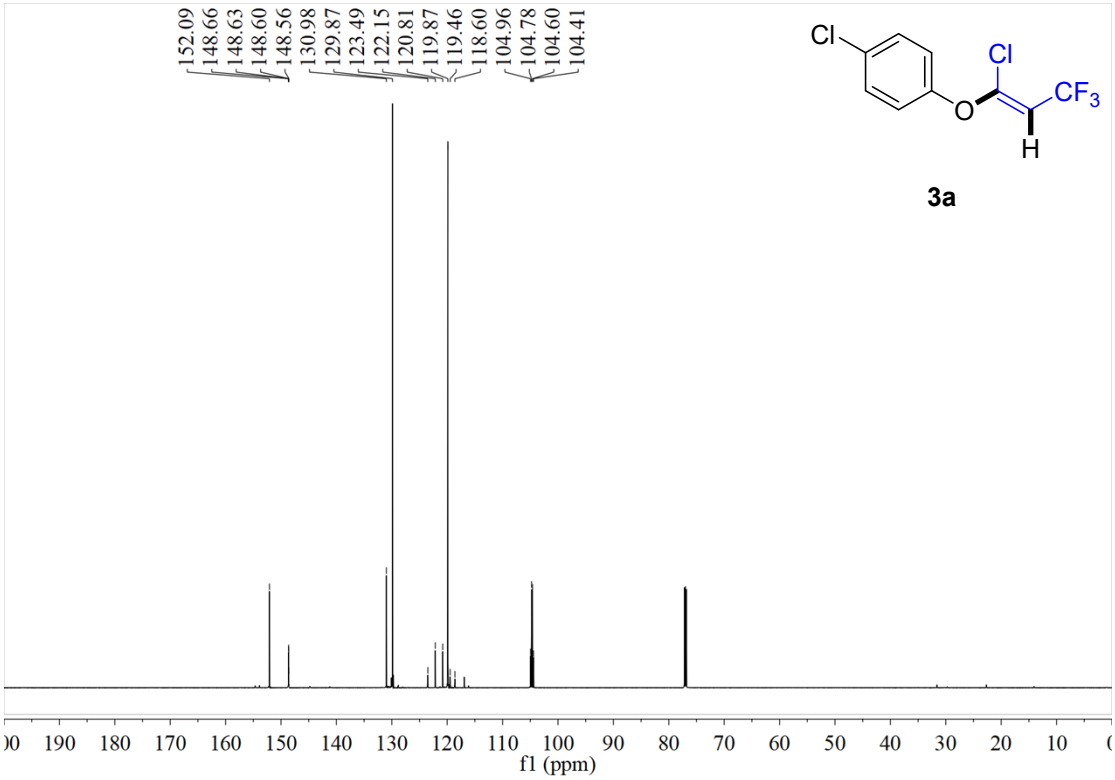


(*Z*)-1-chloro-4-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzene (3a)


7.24
7.24
7.24
7.23
7.23
7.22
6.92
6.91
6.91
6.91
6.90
6.90
5.48
5.47
5.46
5.45
2.01
2.00
0.96
f1 (ppm)

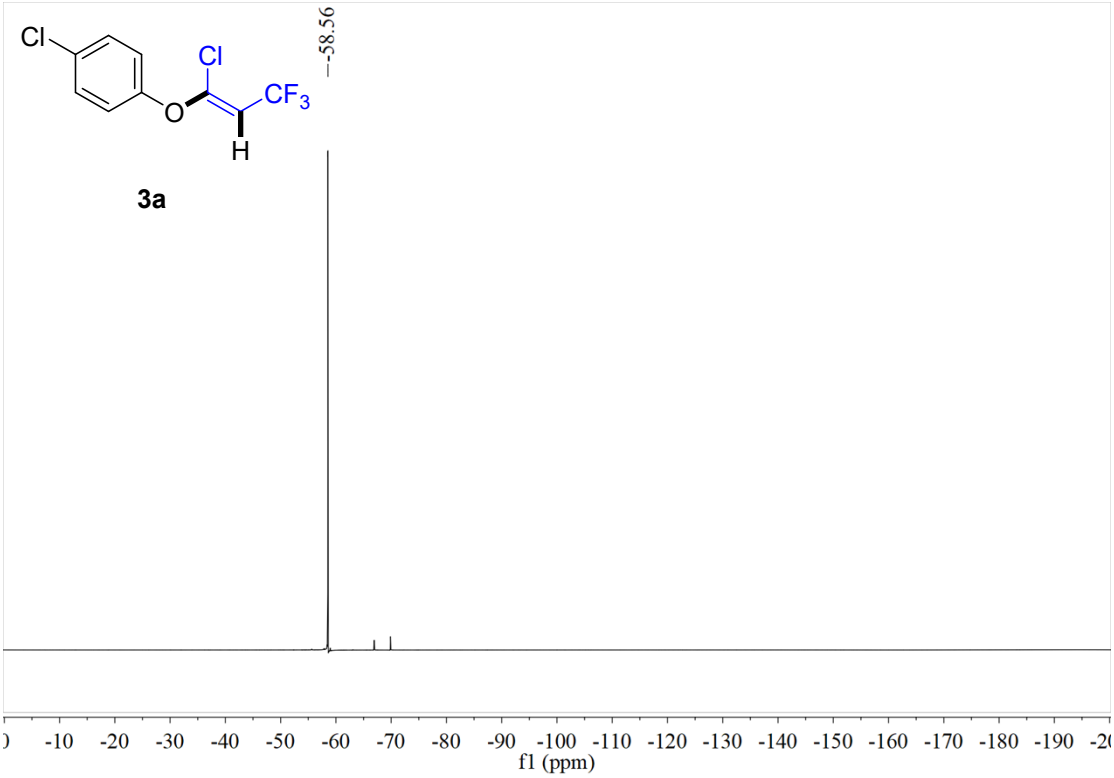
Cl
Cl
O
CF3
H

3a

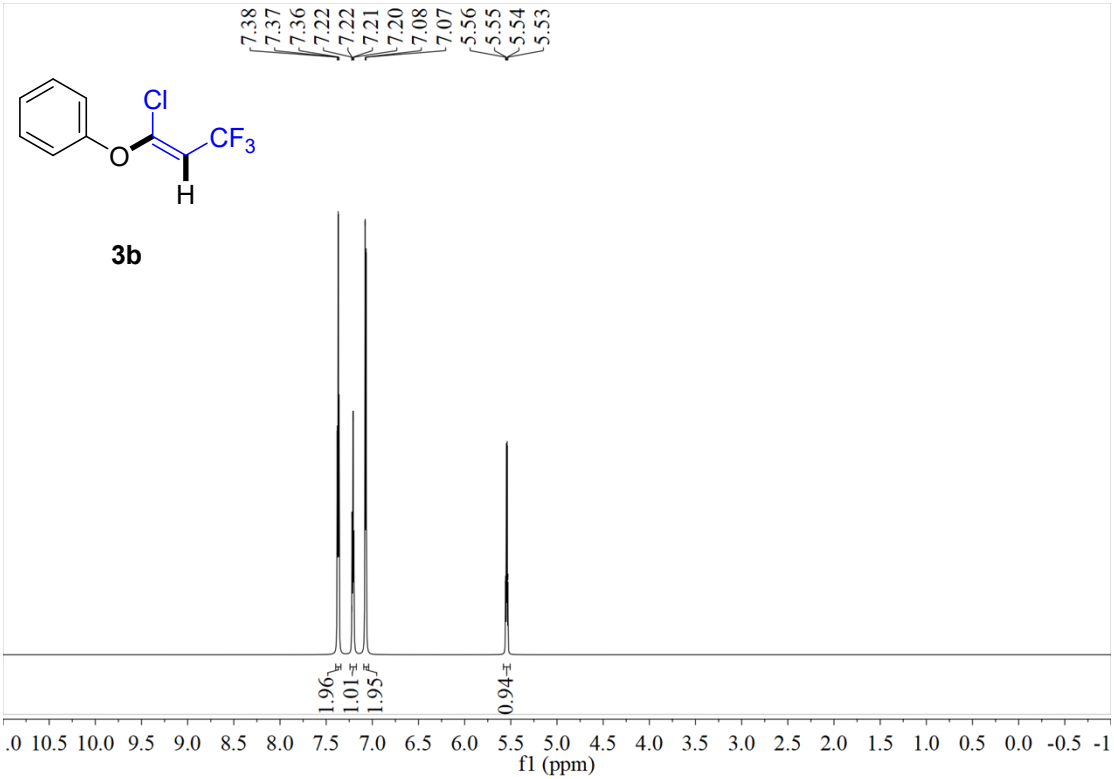

152.09
148.66
148.63
148.60
148.56
130.98
129.87
123.49
122.15
120.81
119.87
119.46
118.60
104.96
104.78
104.60
104.41
f1 (ppm)

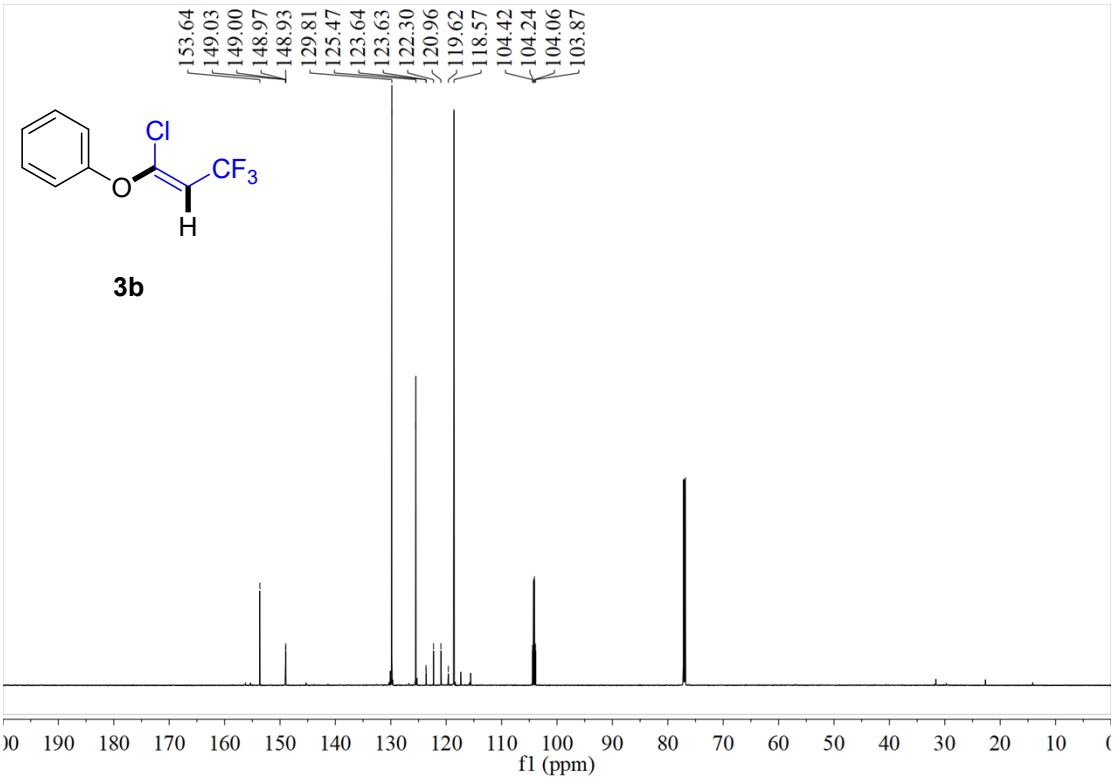
Cl
Cl
O
CF3
H

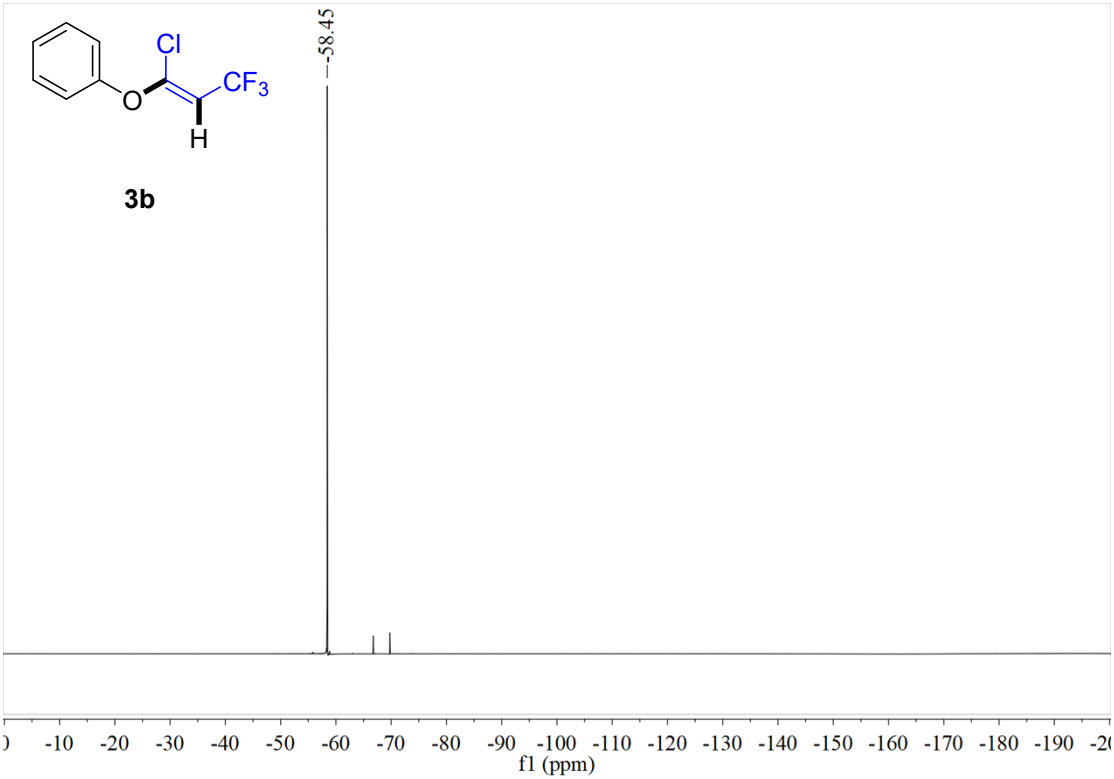
3a



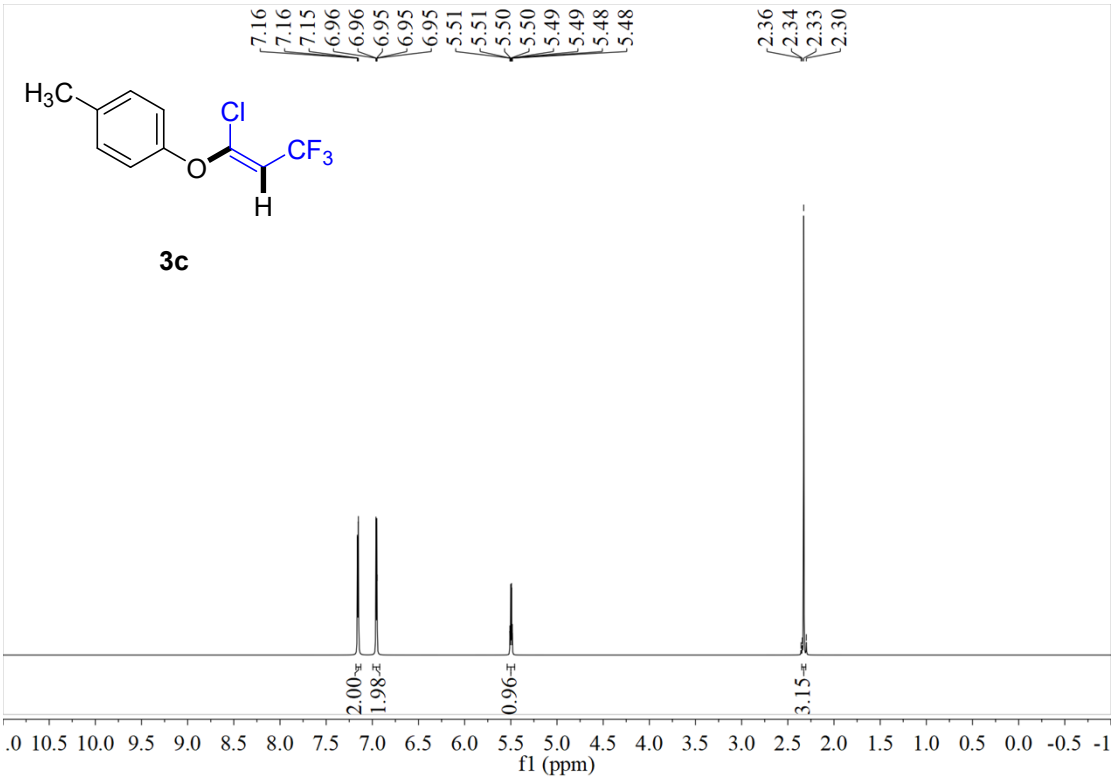
(*Z*)-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzene (3b)

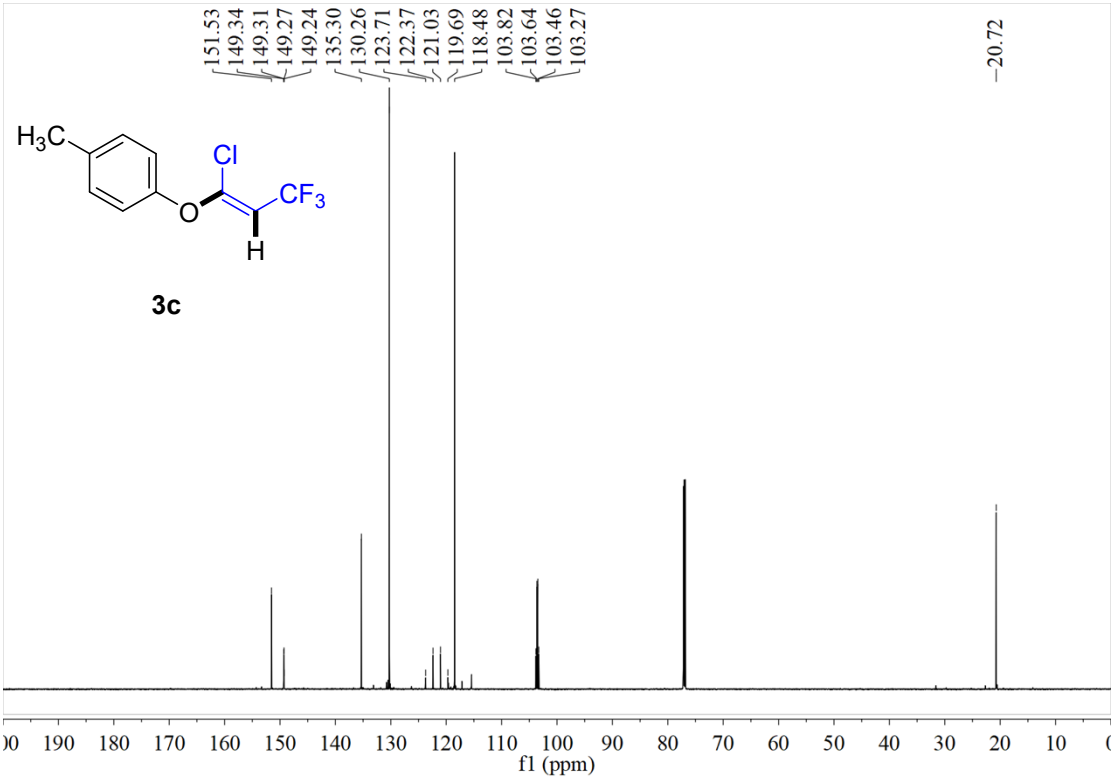


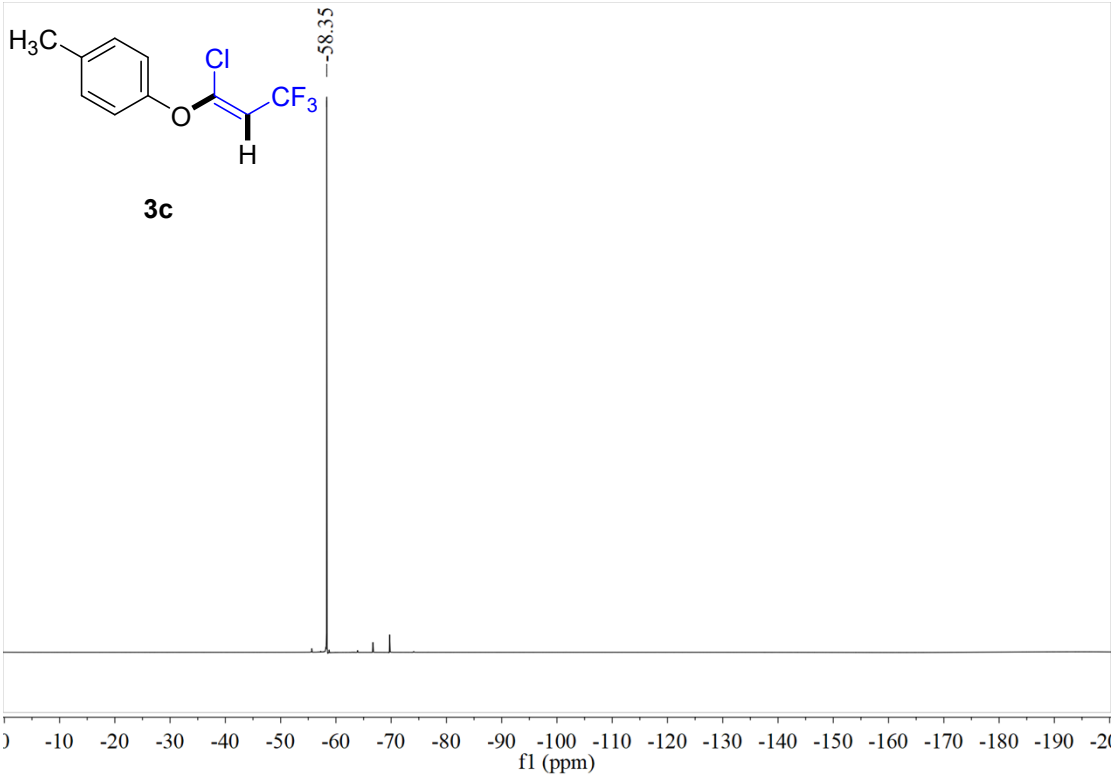




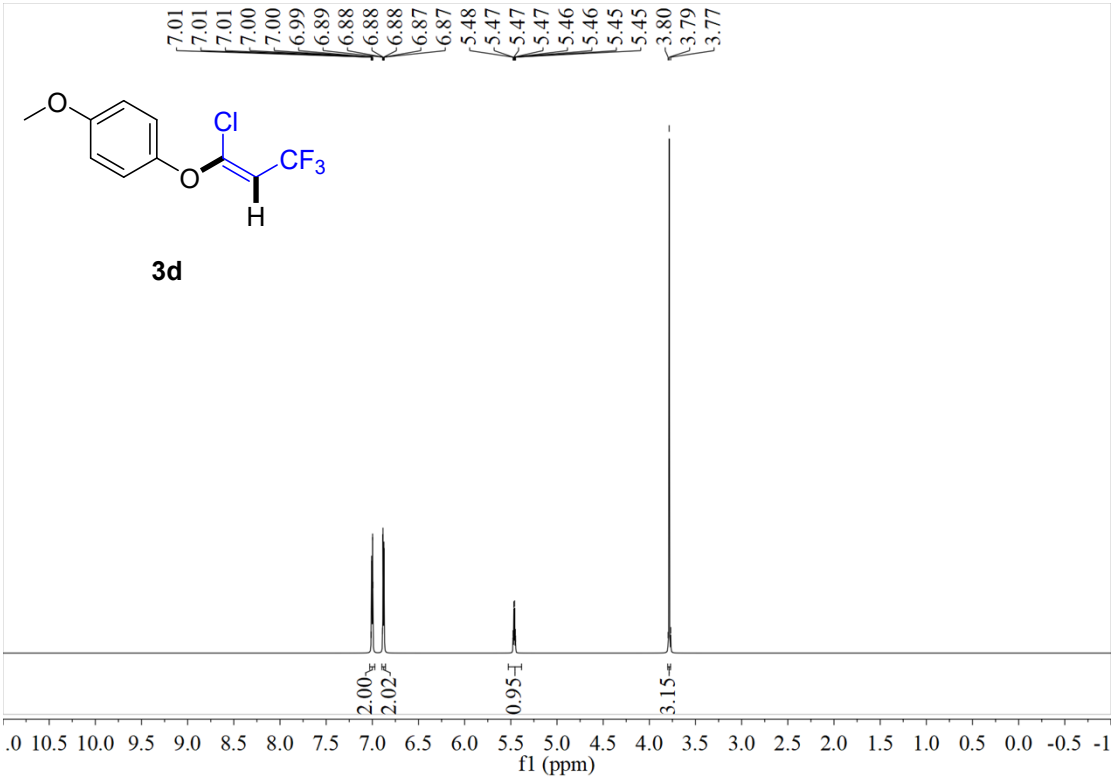
(*Z*)-1-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-4-methylbenzene (3c)

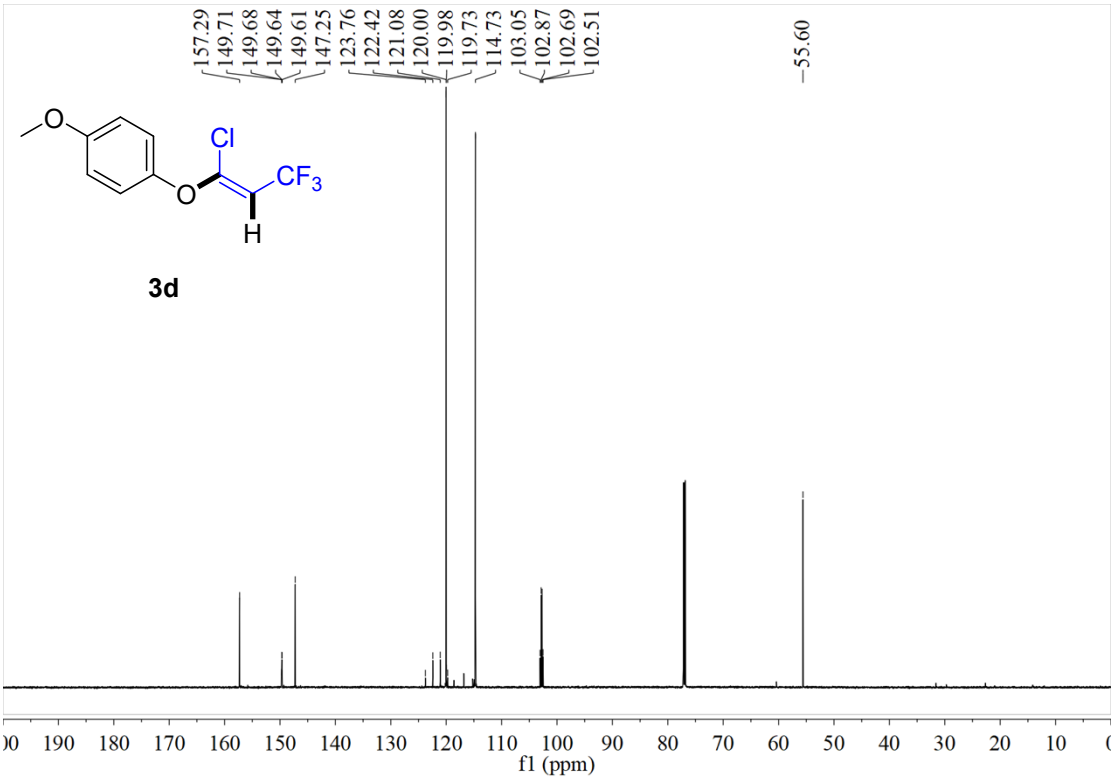

7.16
7.16
7.15
6.96
6.96
6.95
6.95
6.95
5.51
5.51
5.50
5.50
5.49
5.49
5.48
5.48
2.36
2.34
2.33
2.30
H3C
Cl
CF3
O
H
3c
2.00
1.98
0.96
3.15
f1 (ppm)

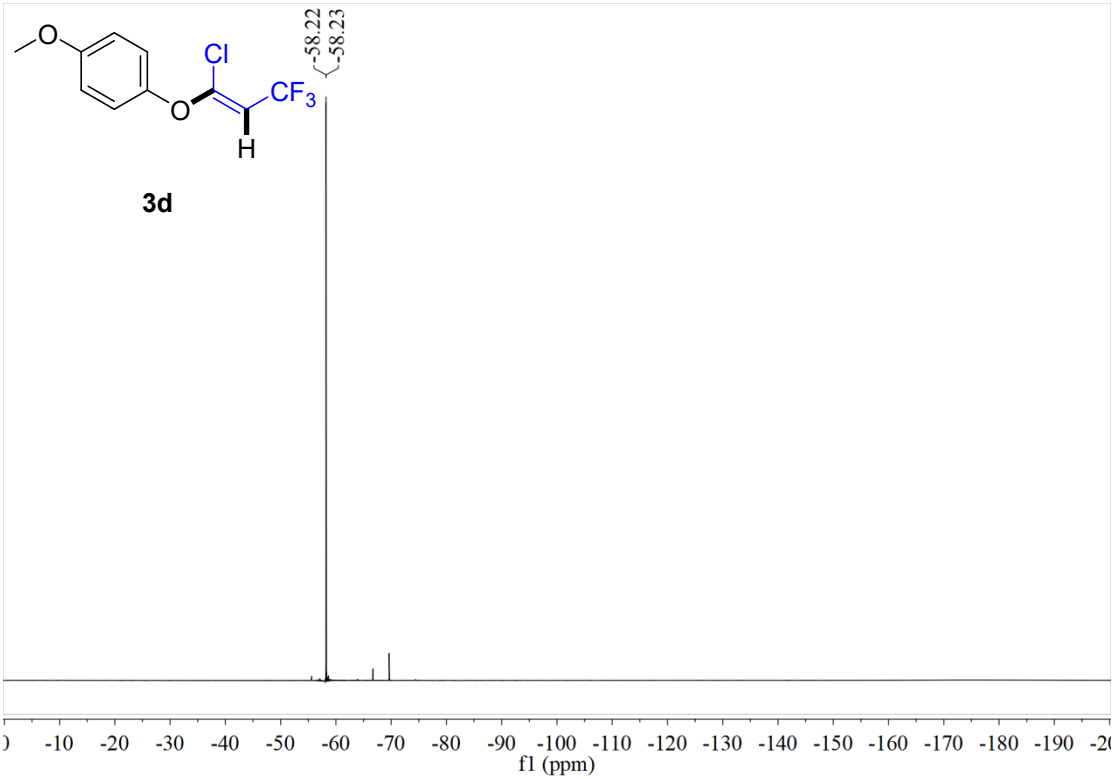

151.53
149.34
149.31
149.27
149.24
135.30
130.26
123.71
122.37
121.03
119.69
118.48
103.82
103.64
103.46
103.27
20.72
H3C
Cl
CF3
O
H
3c
f1 (ppm)



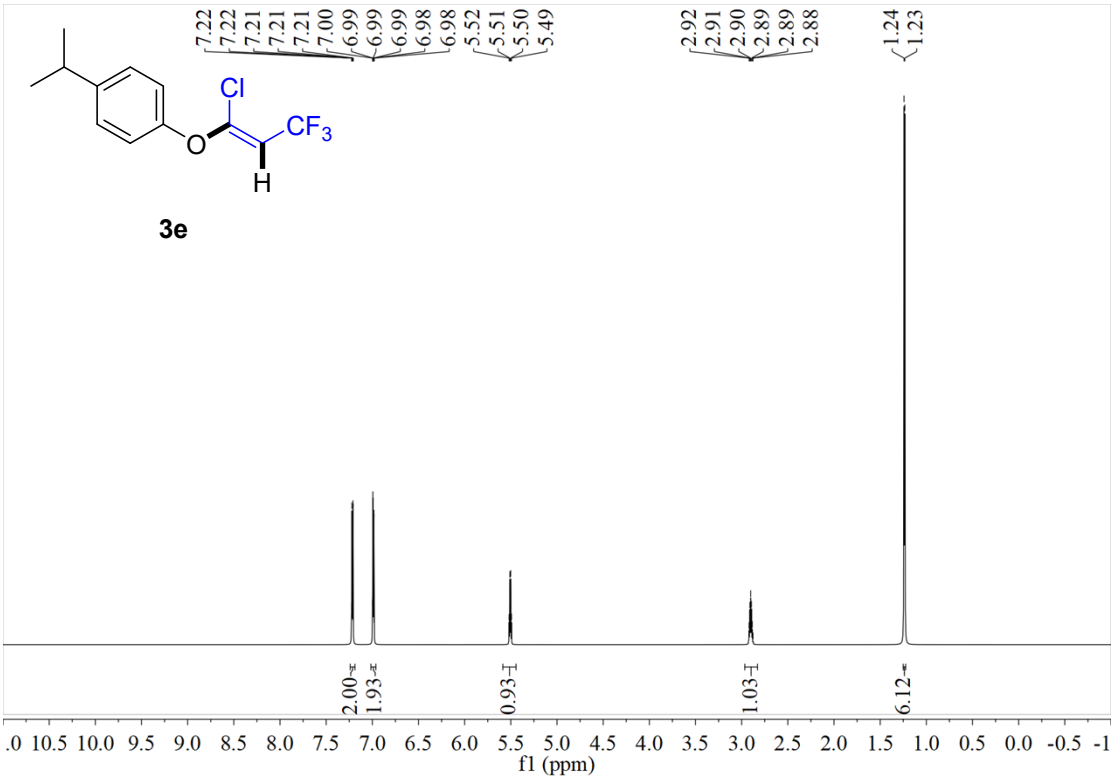
(*Z*)-1-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-4-methoxybenzene (3d)

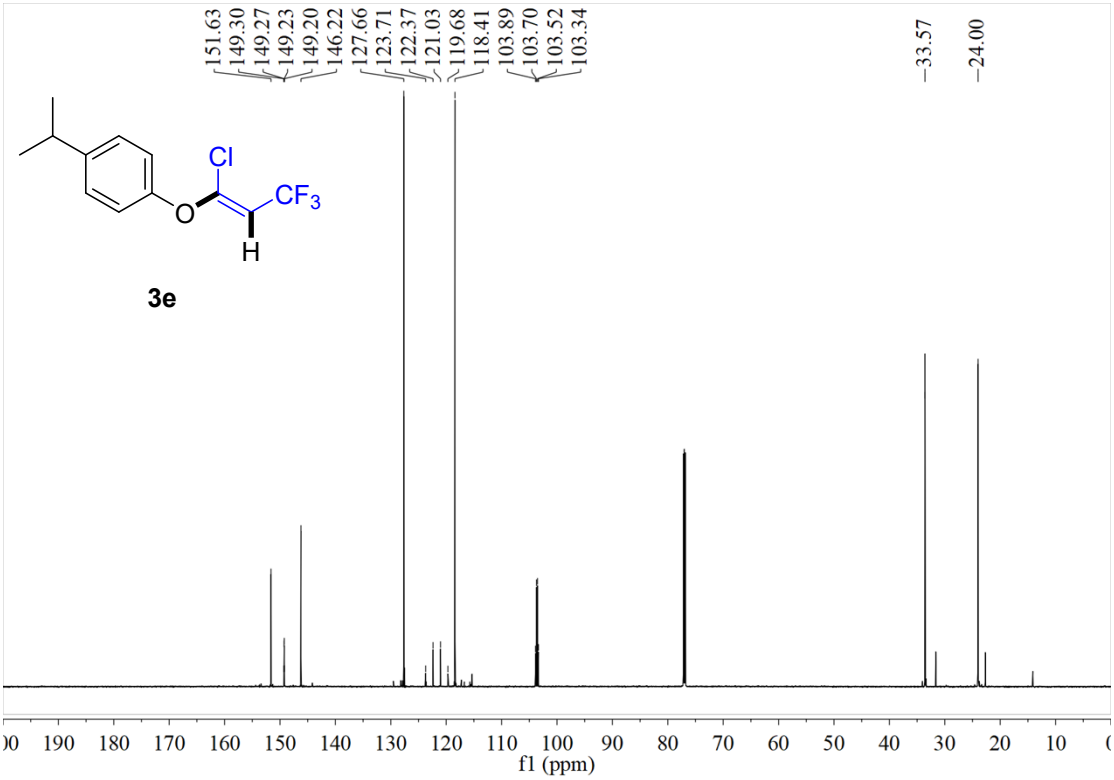


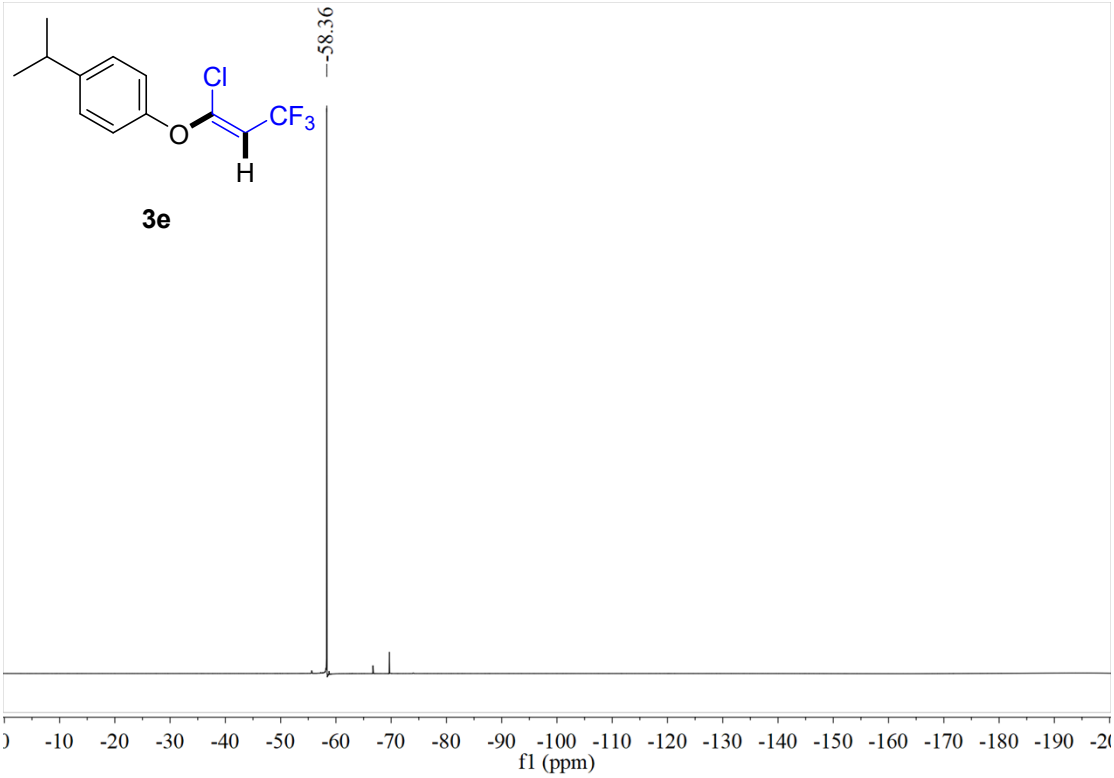




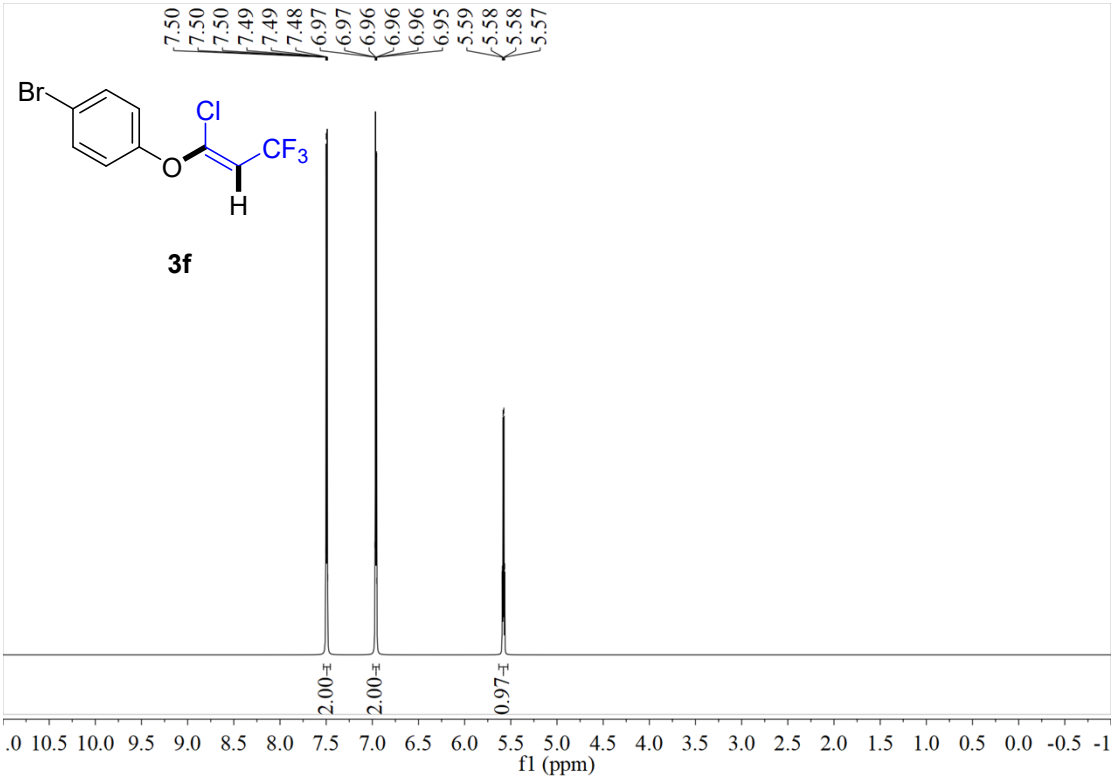
(*Z*)-1-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-4-isopropylbenzene (3e)

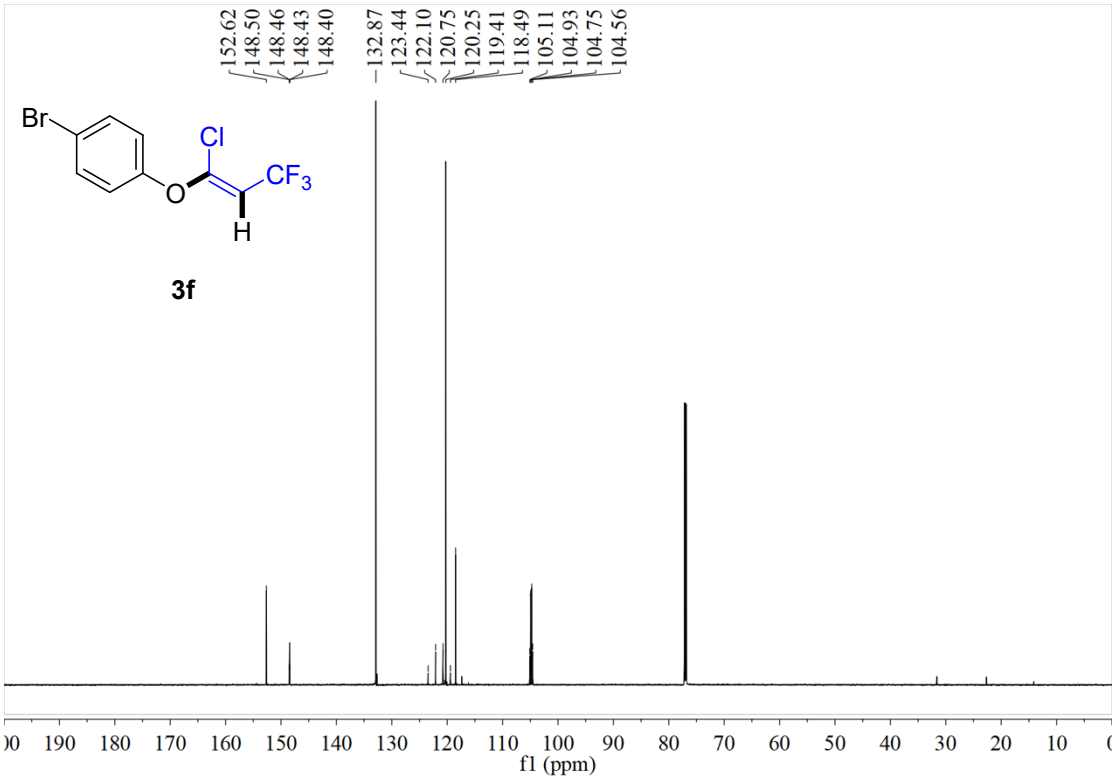

7.22
7.22
7.21
7.21
7.21
7.00
6.99
6.99
6.99
6.98
6.98
5.52
5.51
5.50
5.49
2.92
2.91
2.90
2.89
2.89
2.88
1.24
1.23
Cl
CF3
O
H
3e
2.00
1.93
0.93
1.03
6.12
f1 (ppm)

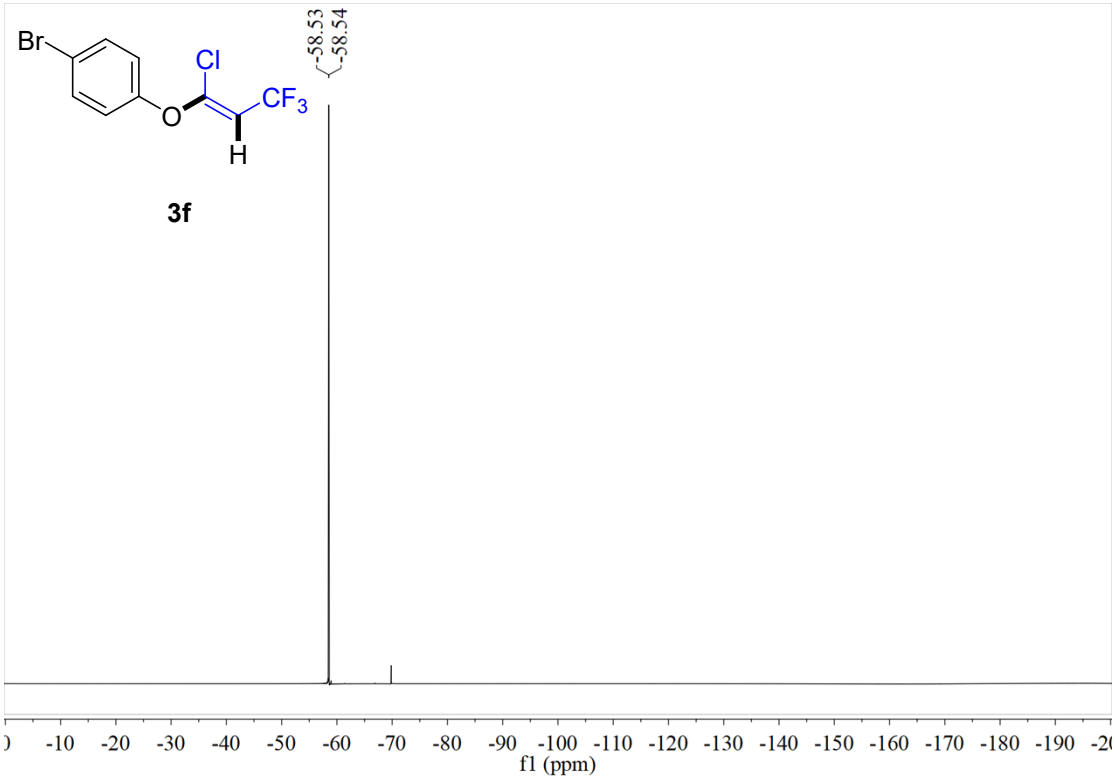

151.63
149.30
149.27
149.23
149.20
146.22
127.66
123.71
122.37
121.03
119.68
118.41
103.89
103.70
103.52
103.34
33.57
24.00
Cl
CF3
O
H
3e
f1 (ppm)



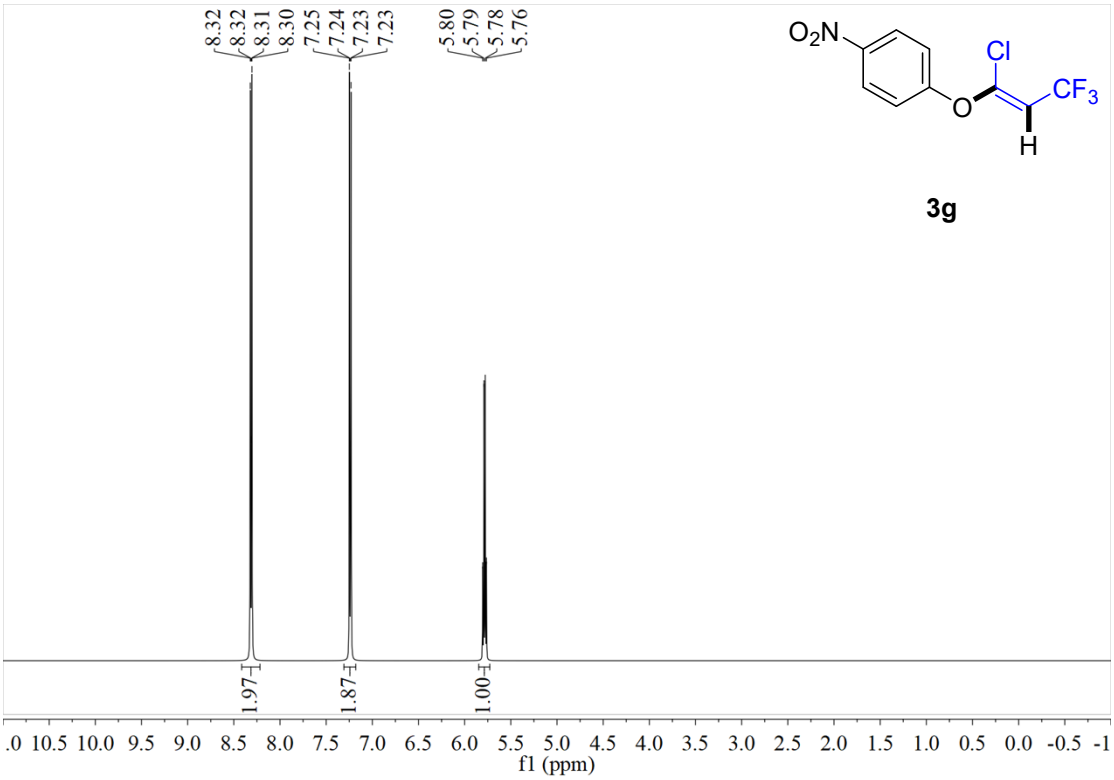
(*Z*)-1-bromo-4-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzene (3f)



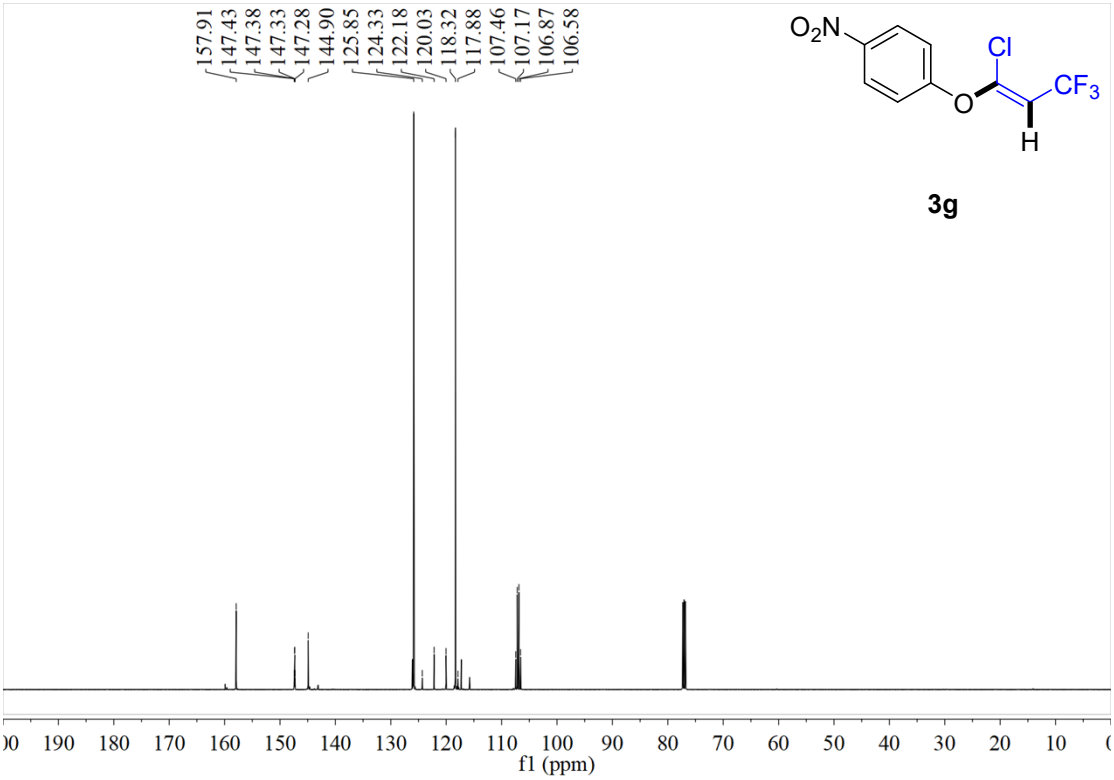




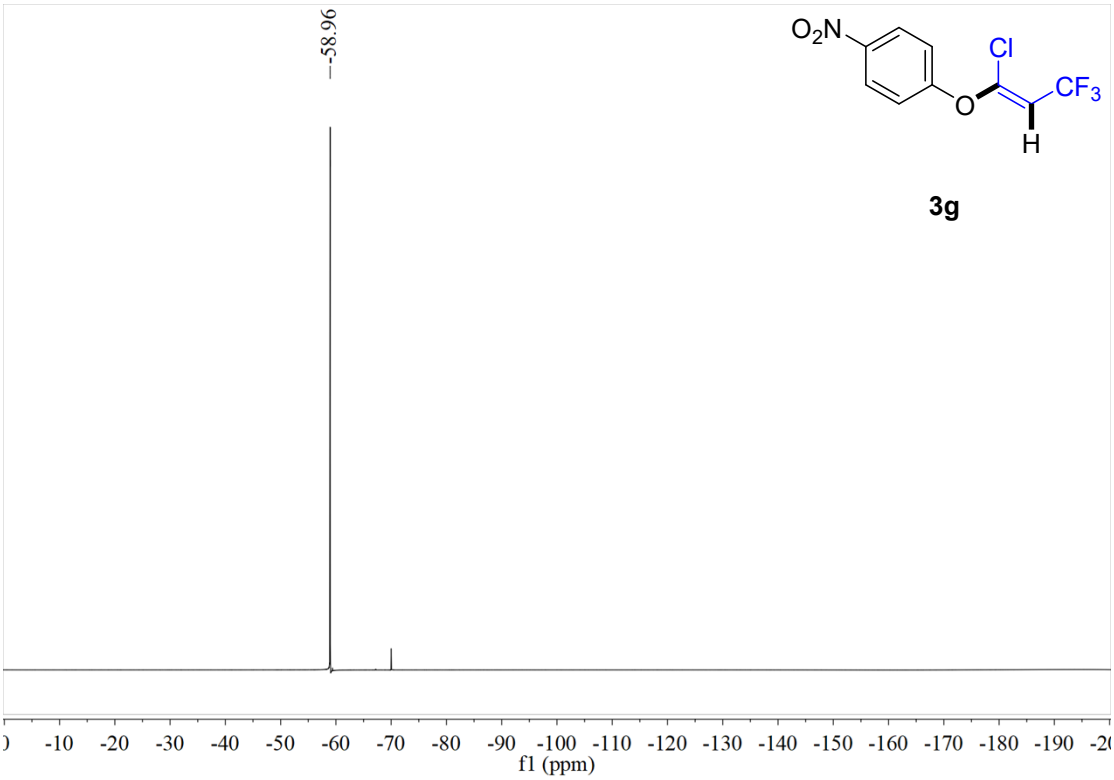
(*Z*)-1-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-4-nitrobenzene (3g)


8.32
8.32
8.31
8.30
7.25
7.24
7.23
7.23
5.80
5.79
5.78
5.76
1.97
1.87
1.00
f1 (ppm)
O2N
Cl
CF3
O
H

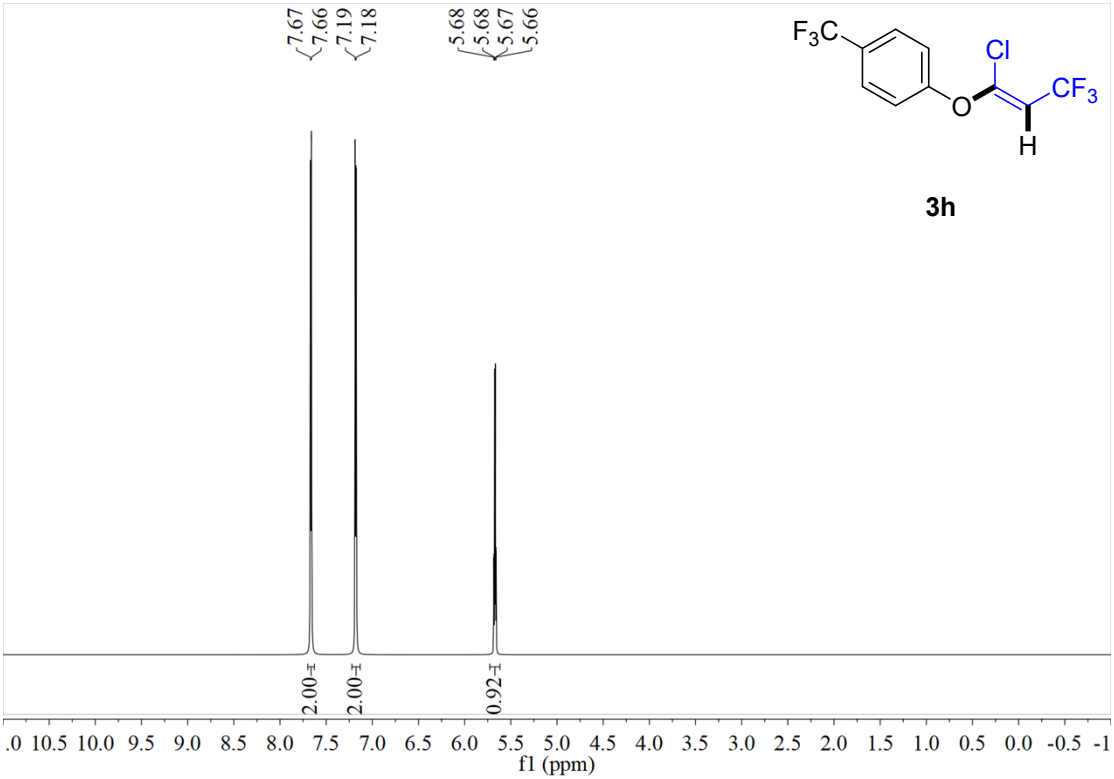
3g

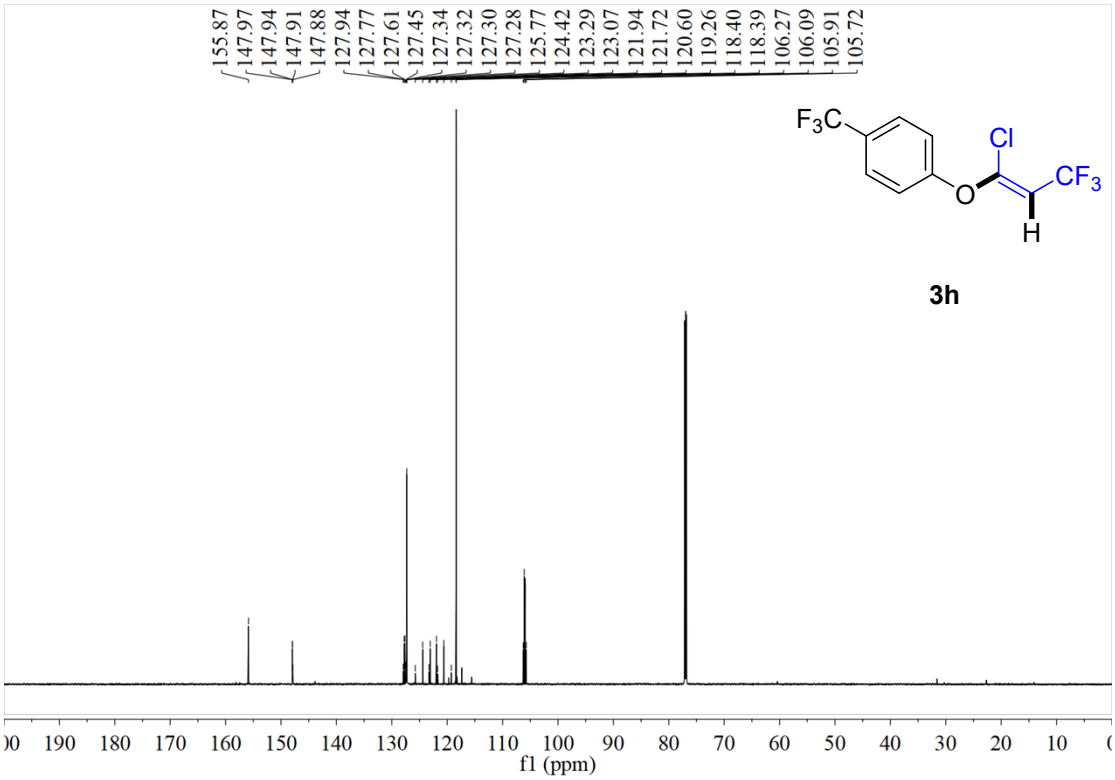

157.91
147.43
147.38
147.33
147.28
144.90
125.85
124.33
122.18
120.03
118.32
117.88
107.46
107.17
106.87
106.58
f1 (ppm)
O2N
Cl
CF3
O
H

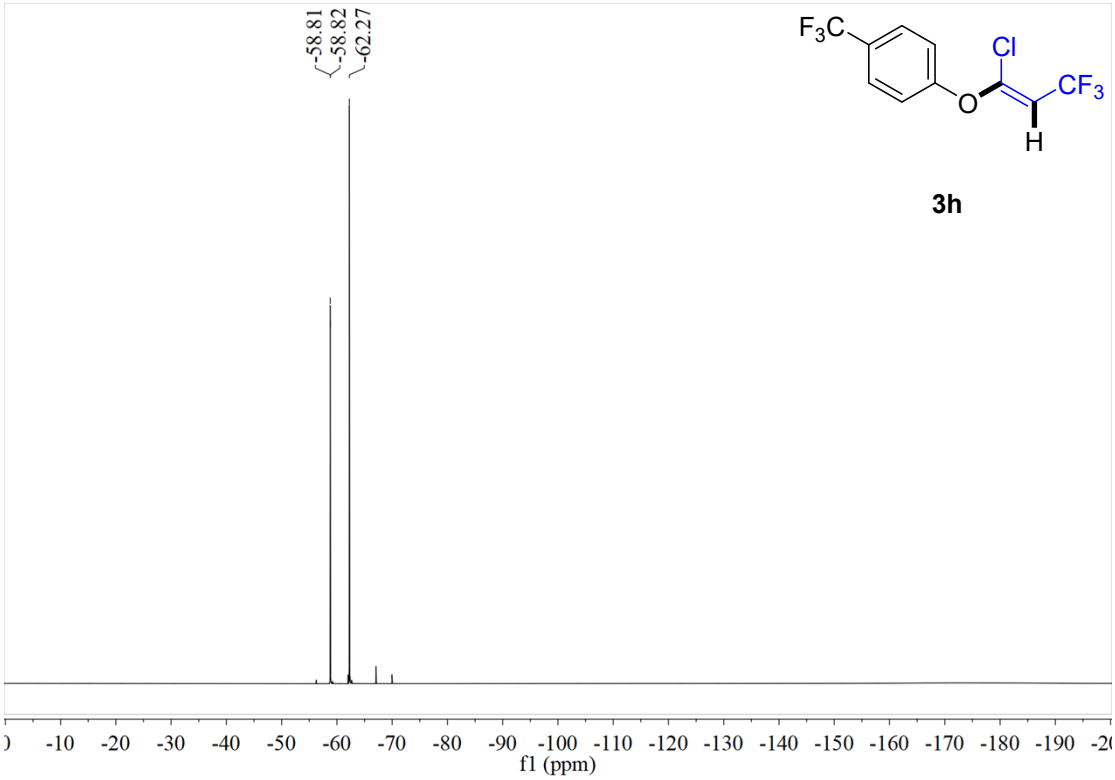
3g



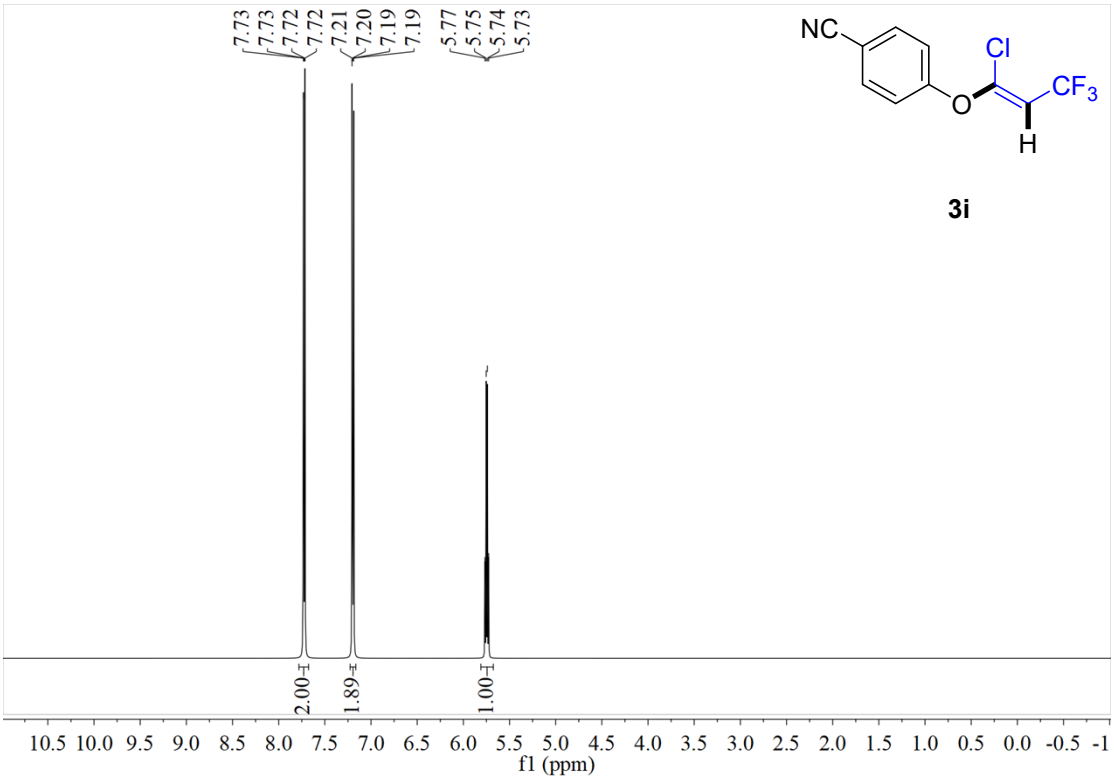
(*Z*)-1-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-4-(trifluoromethyl)benzene (3h)



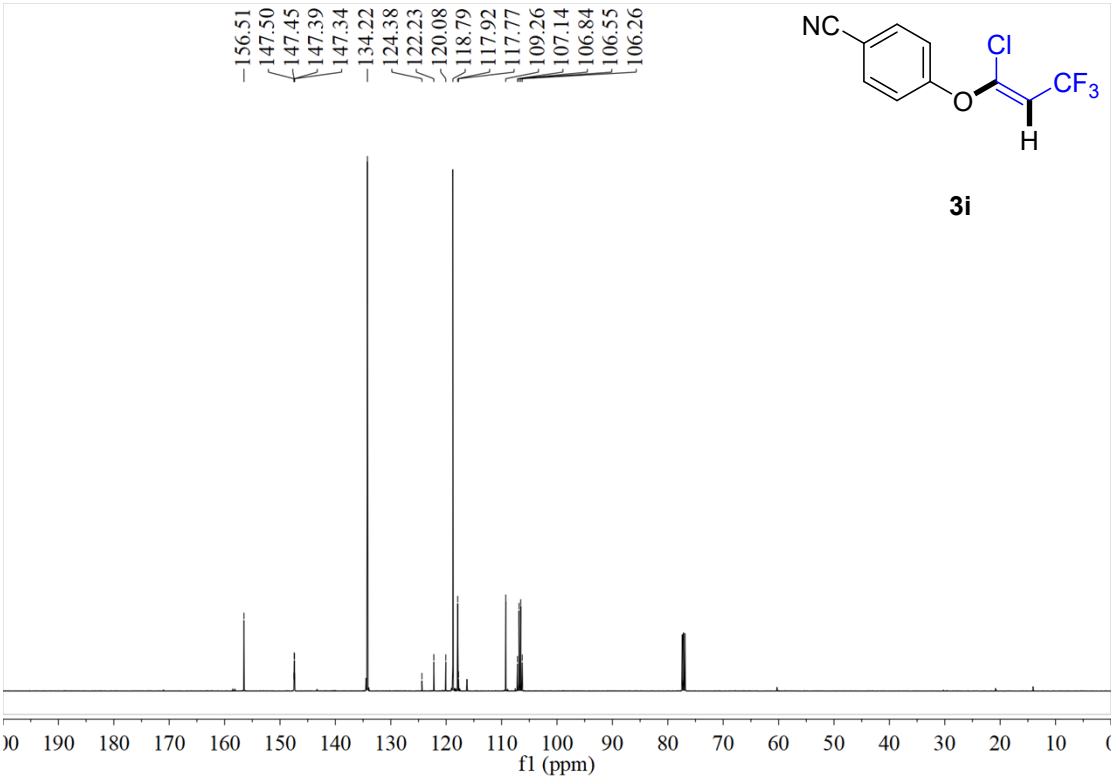




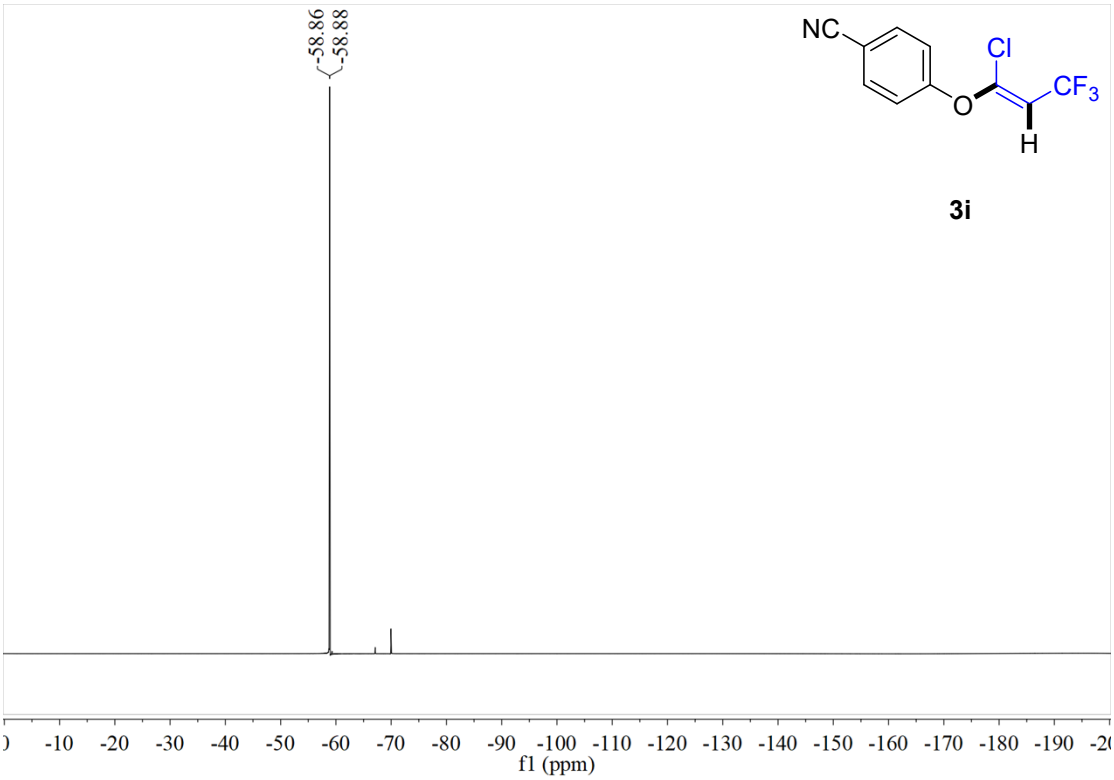
(*Z*)-4-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzonitrile (3i)


7.73
7.73
7.72
7.72
7.21
7.20
7.19
7.19
5.77
5.75
5.74
5.73
2.00
1.89
1.00
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 -1
f1 (ppm)
NC
Cl
O
CF3
H

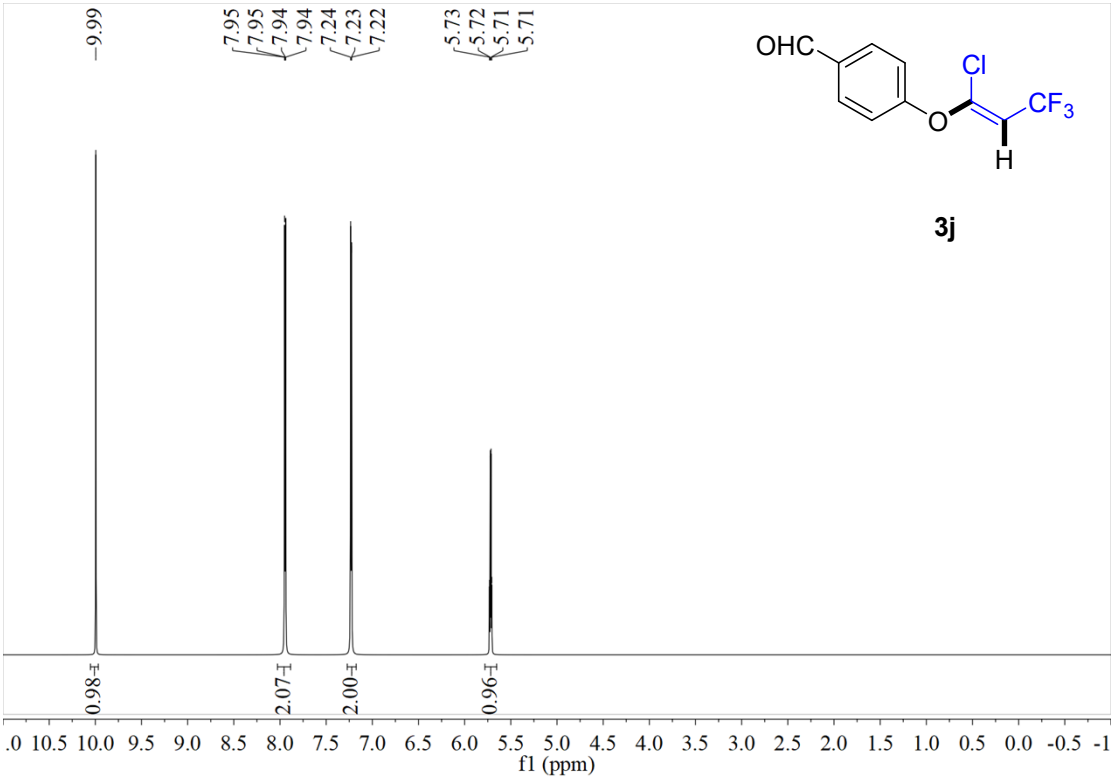
3i

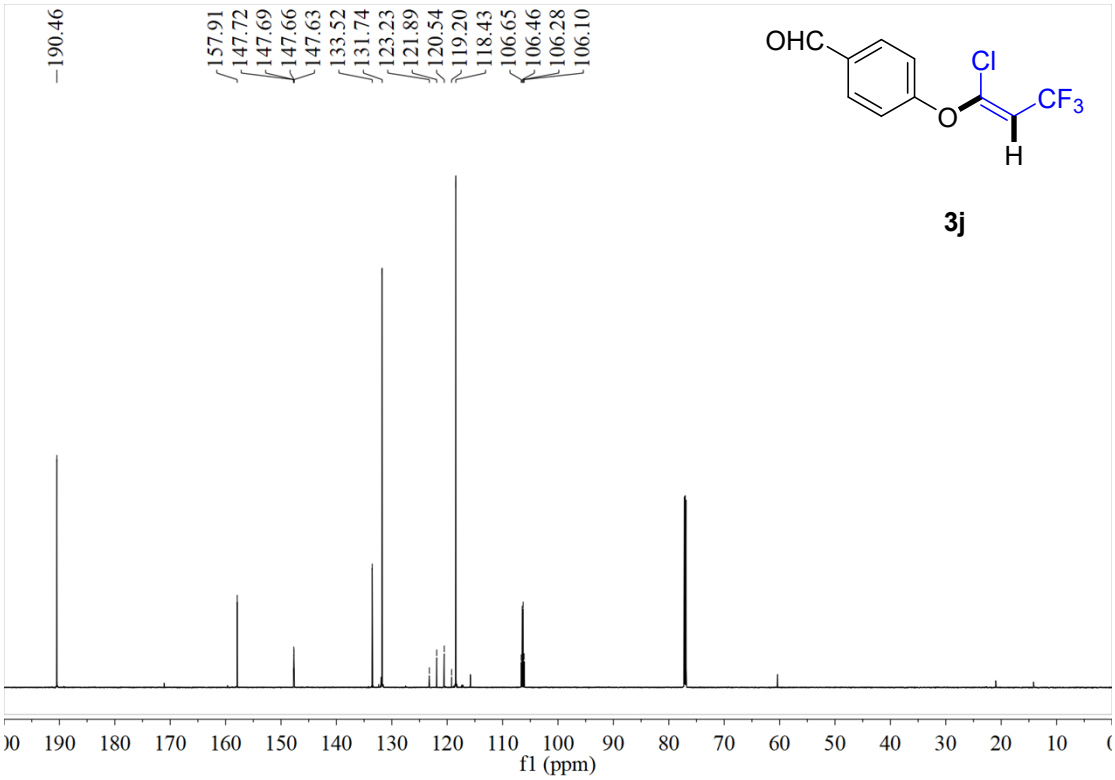

156.51
147.50
147.45
147.39
147.34
134.22
124.38
122.23
120.08
118.79
117.92
117.77
109.26
107.14
106.84
106.55
106.26
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
f1 (ppm)
NC
Cl
O
CF3
H

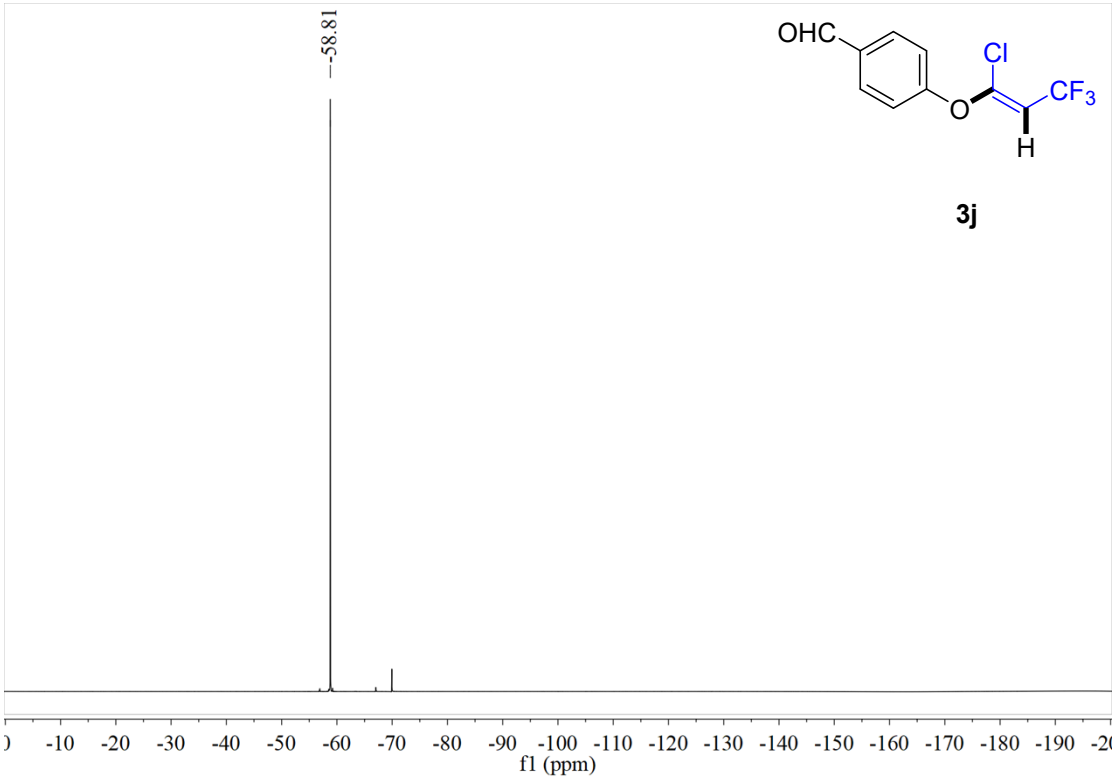
3i



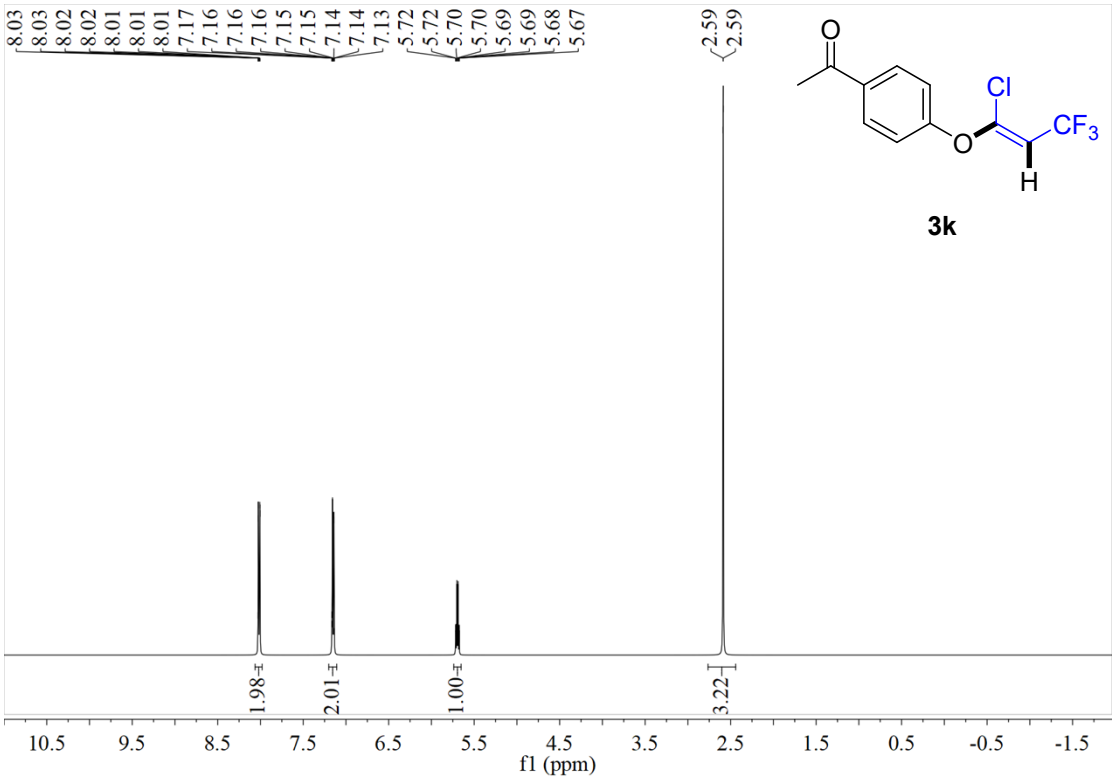
(*Z*)-4-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzaldehyde (3j)

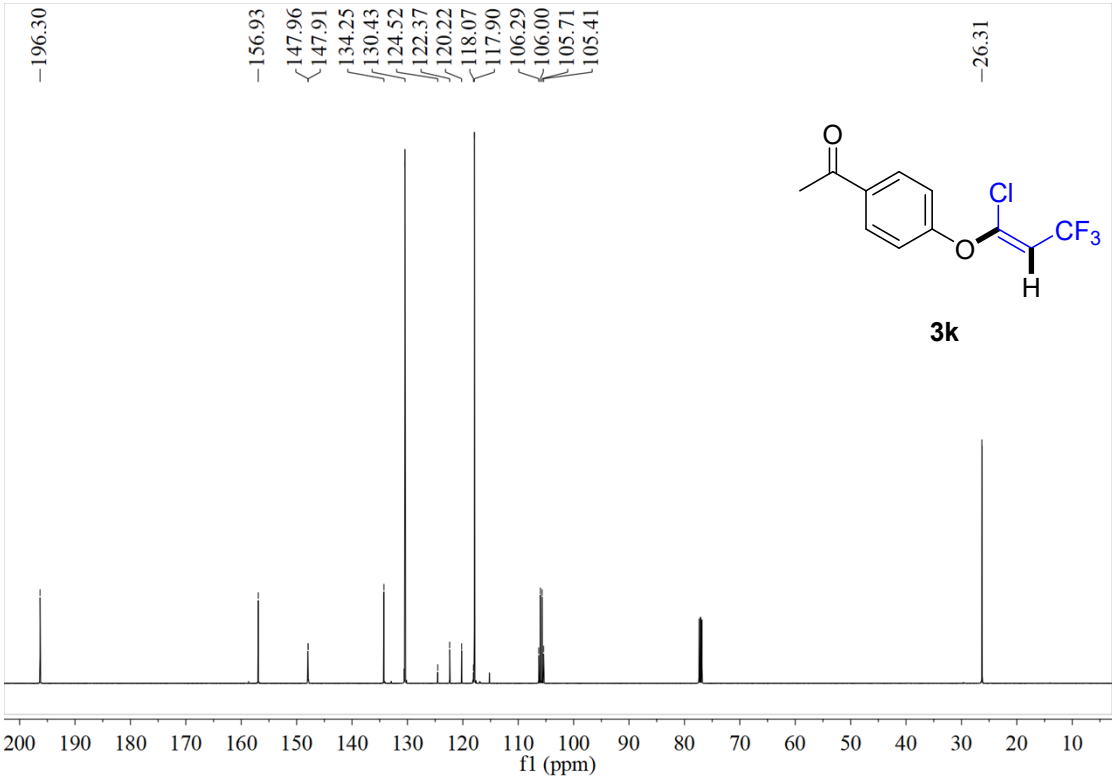


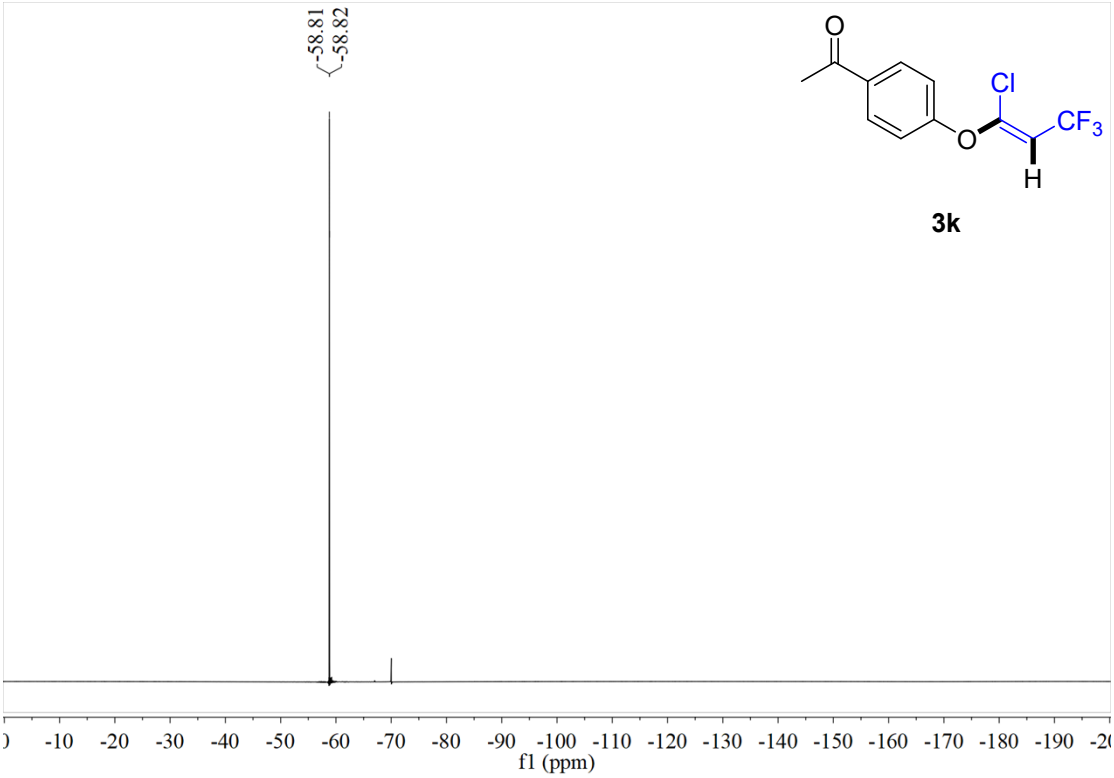




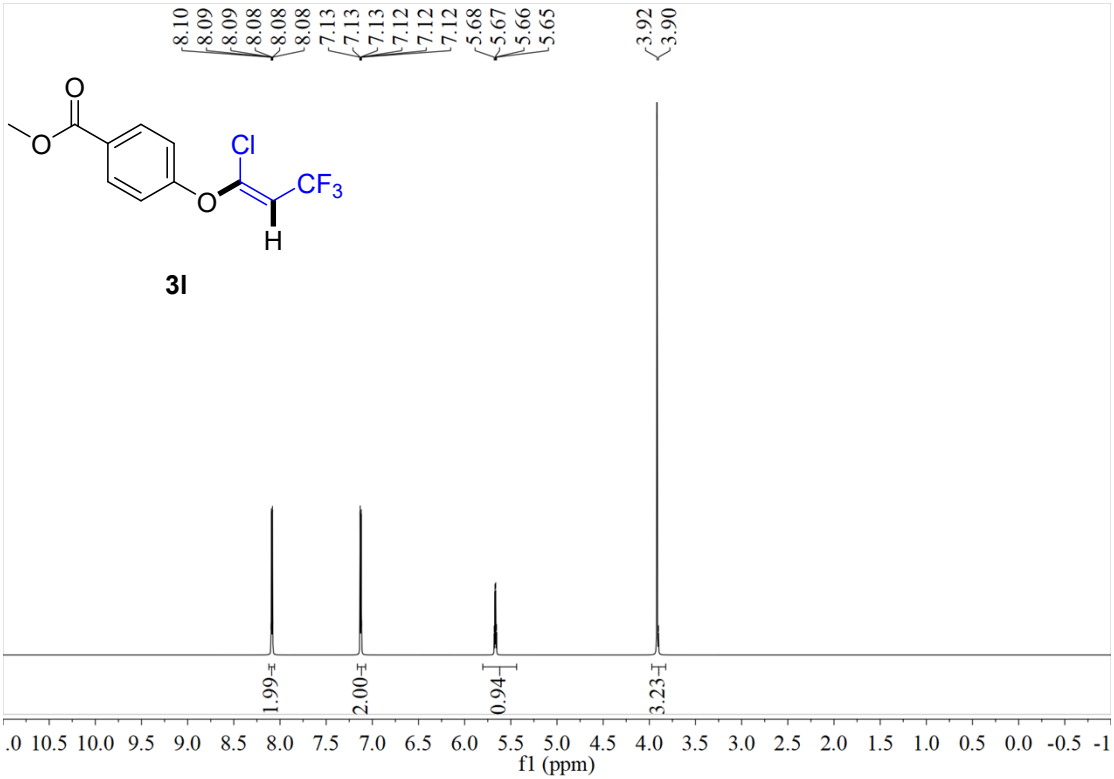
(*Z*)-1-(4-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)phenyl)ethan-1-one (3k)

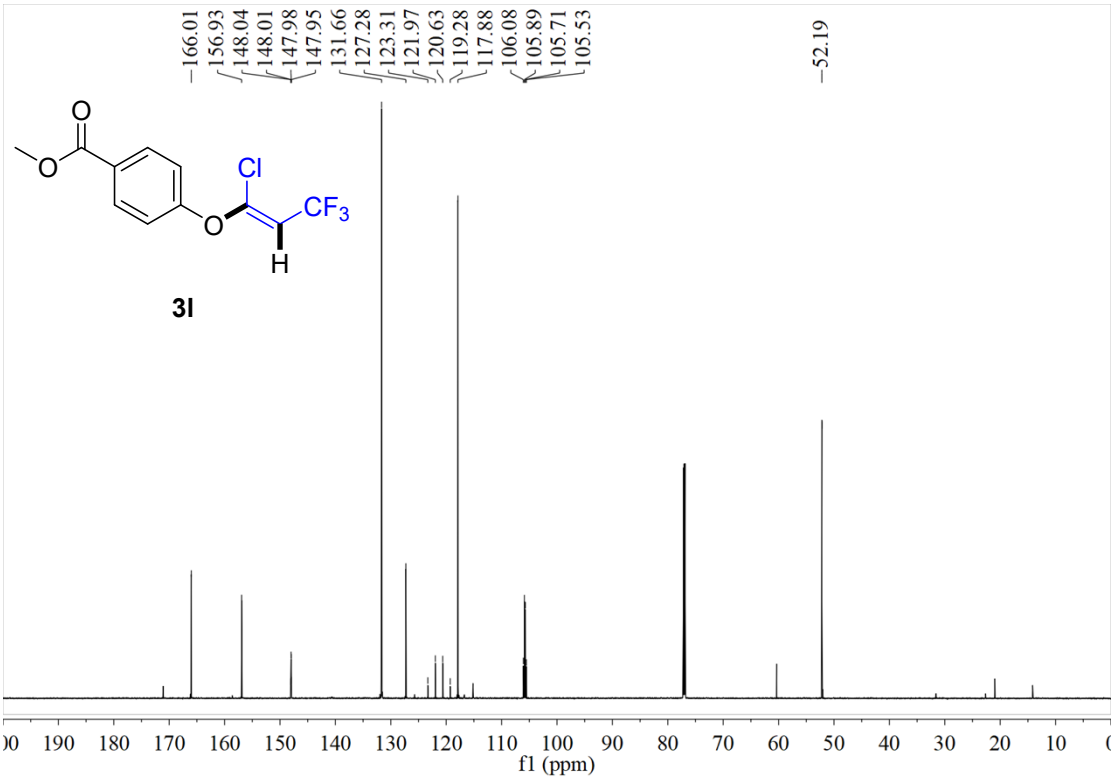

8.03
8.03
8.02
8.02
8.01
8.01
8.01
7.17
7.16
7.16
7.16
7.15
7.15
7.14
7.14
7.13
5.72
5.72
5.70
5.70
5.69
5.69
5.68
5.67
2.59
2.59
1.98
2.01
1.00
3.22
10.5
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.5
-1.5
f1 (ppm)
O
Cl
CF3
O
H
3k


196.30
156.93
147.96
147.91
134.25
130.43
124.52
122.37
120.22
118.07
117.90
106.29
106.00
105.71
105.41
26.31
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)
O
Cl
CF3
O
H
3k

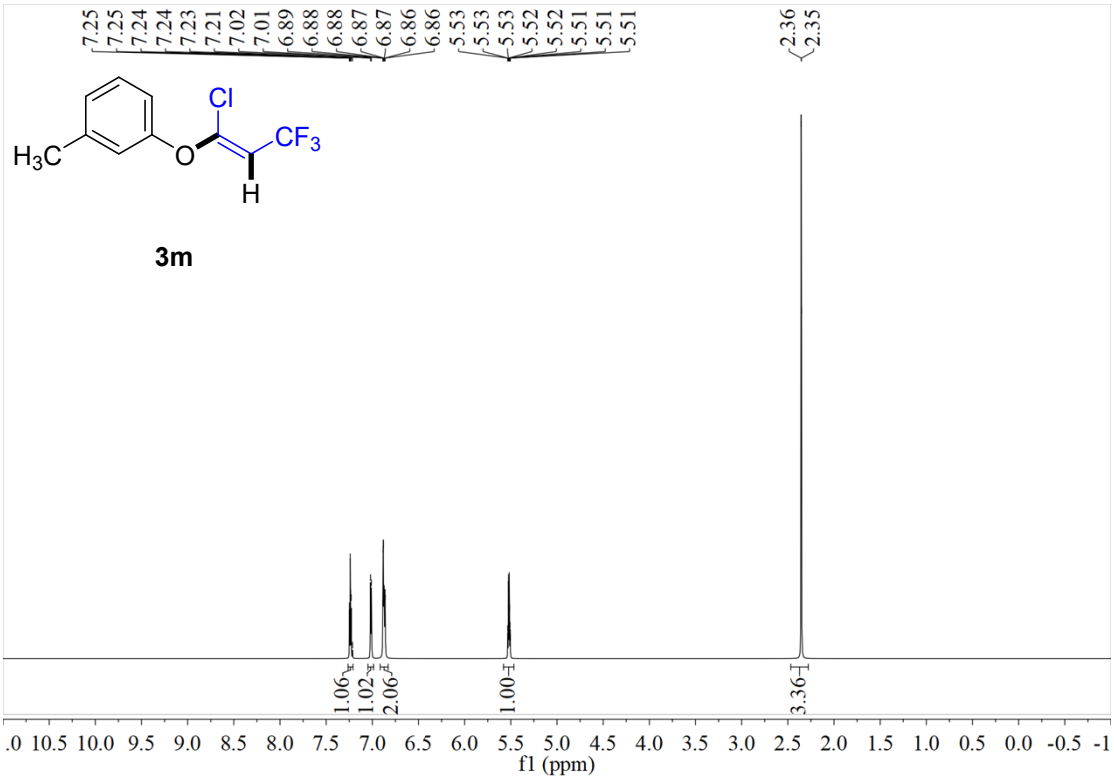


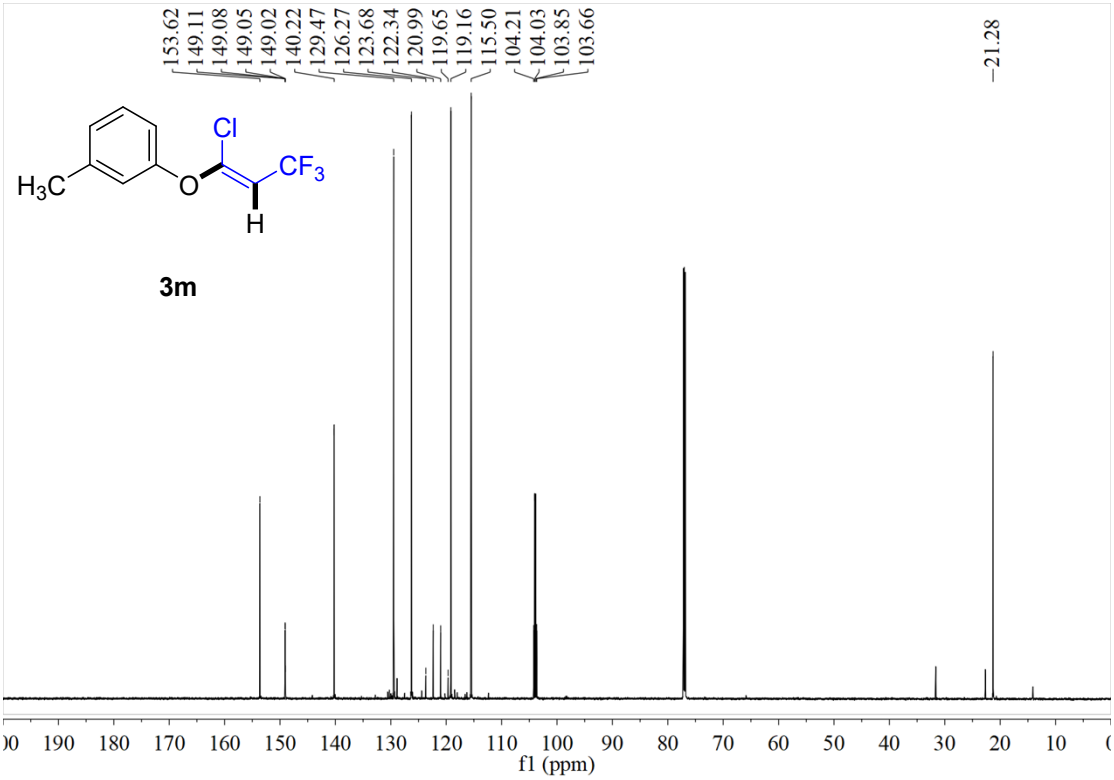
Methyl (*Z*)-4-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzoate (3l)

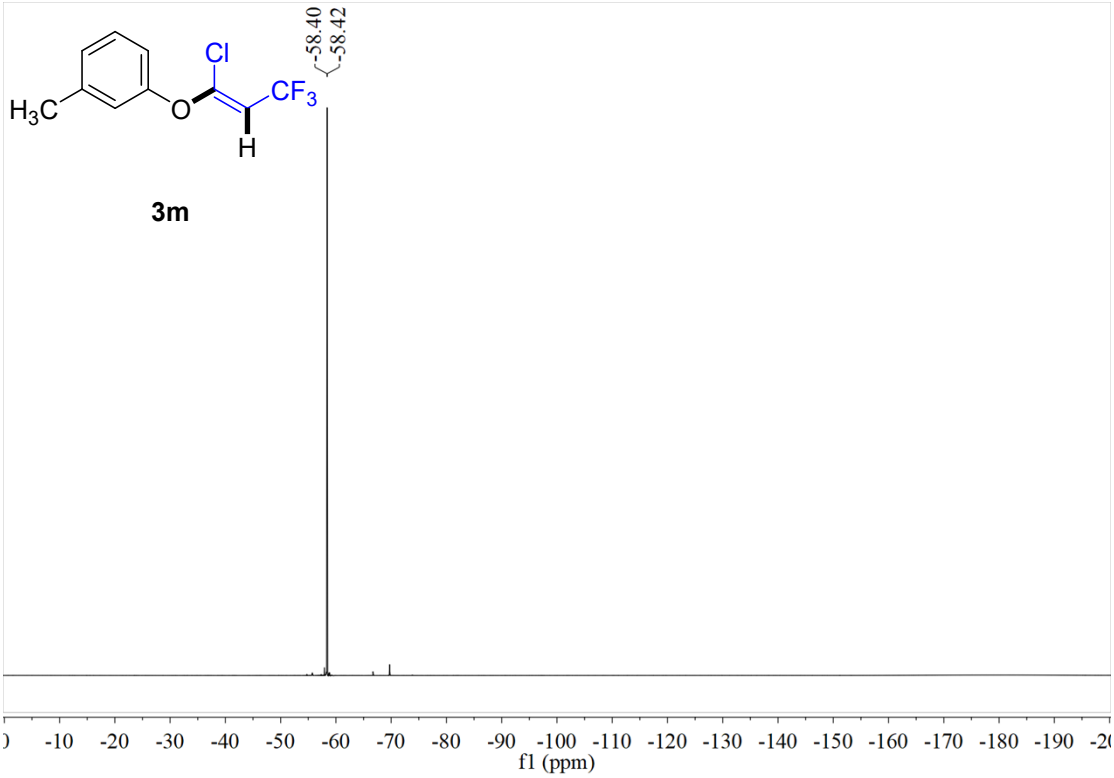




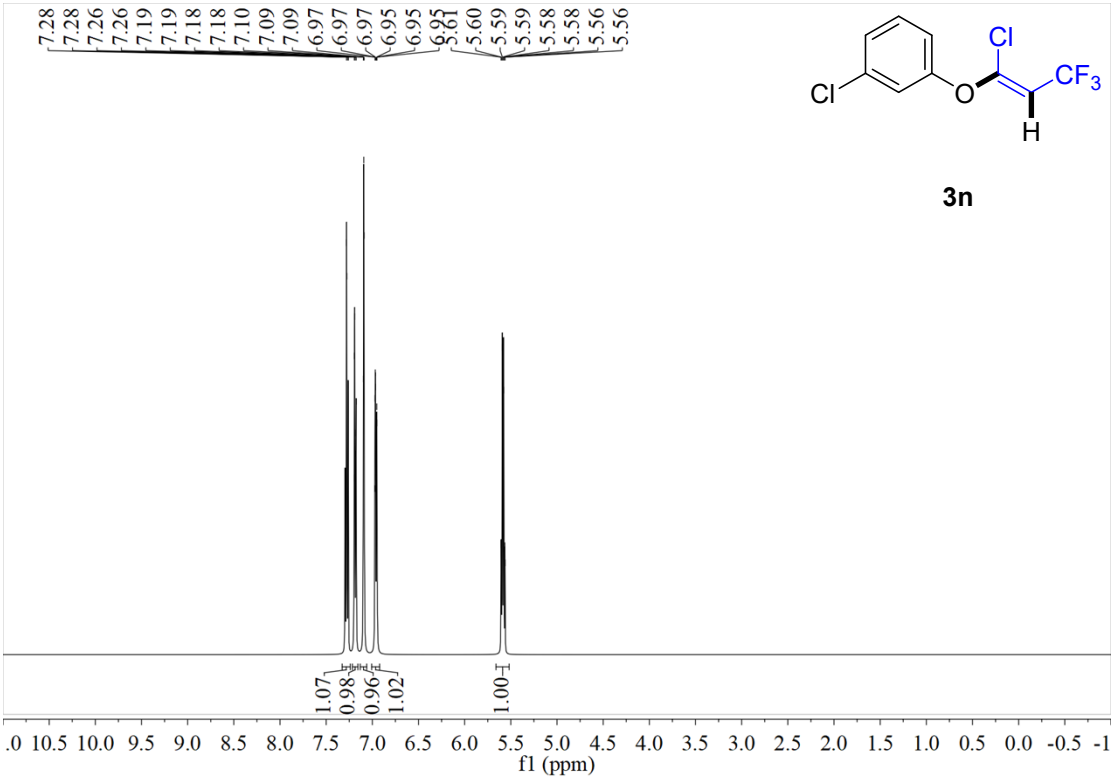
(*Z*)-1-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-3-methylbenzene (3m)

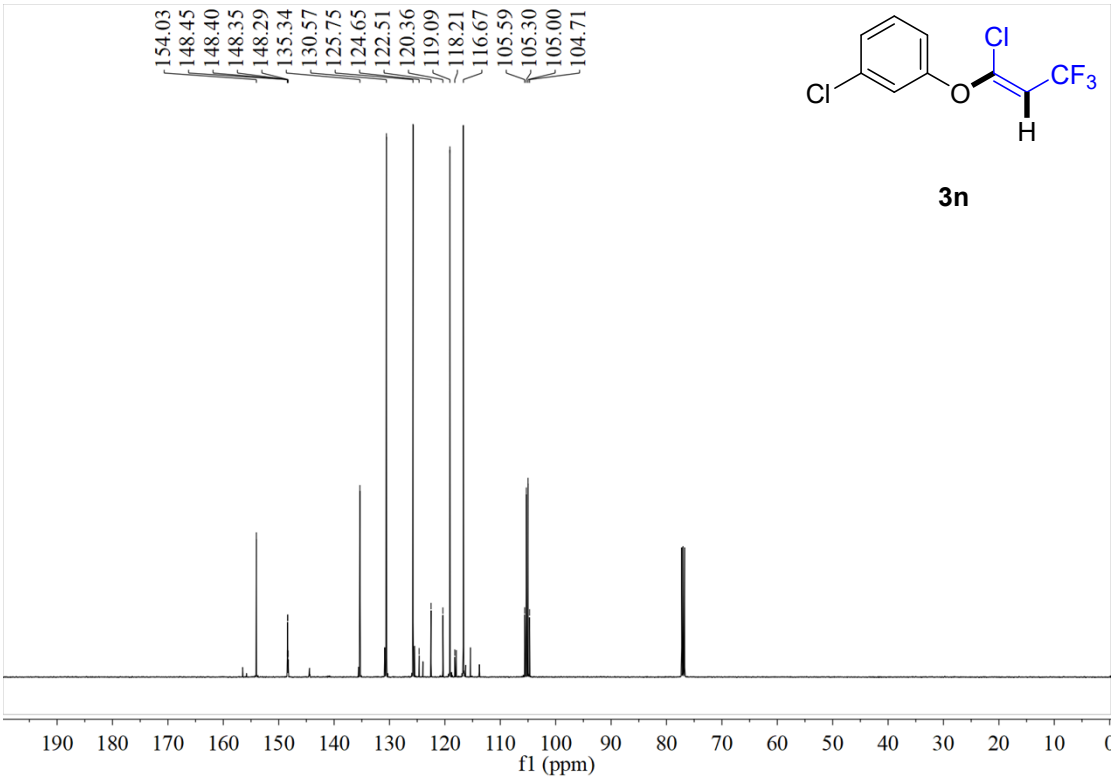

7.25
7.25
7.24
7.24
7.23
7.21
7.02
7.01
6.89
6.88
6.88
6.87
6.87
6.86
6.86
5.53
5.53
5.53
5.52
5.52
5.51
5.51
5.51
2.36
2.35
Cl
CF3
H3C
O
H
3m
1.06
1.02
2.06
1.00
3.36
f1 (ppm)

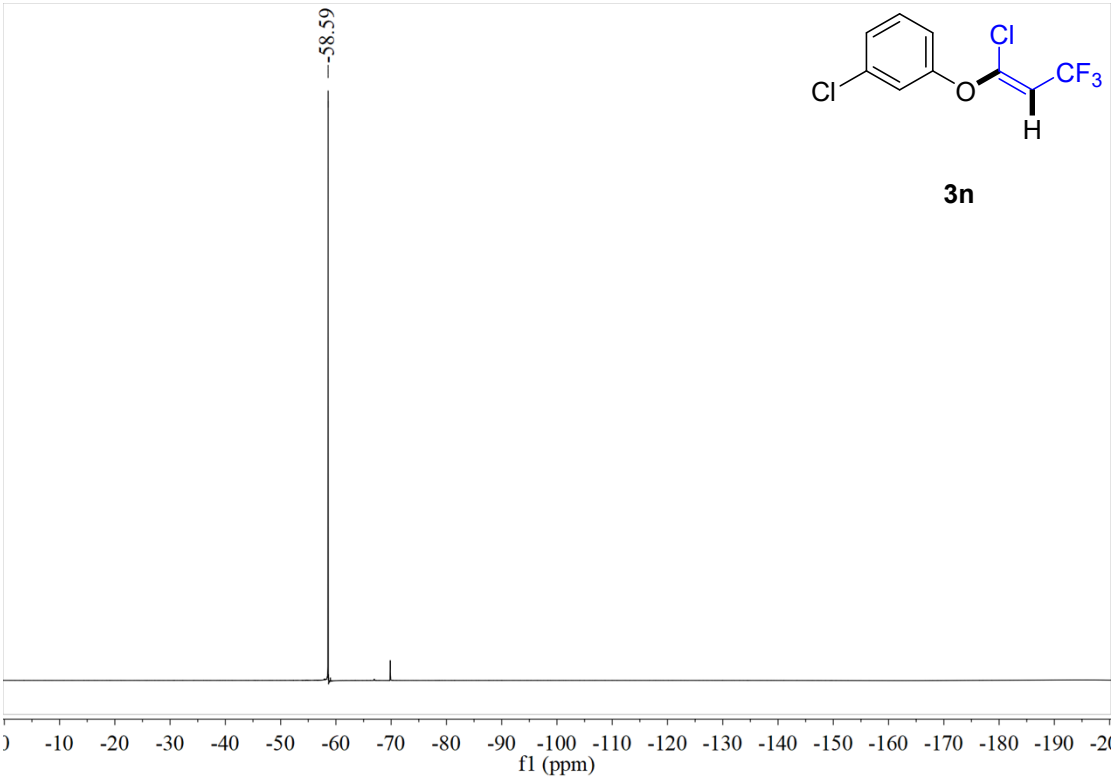

153.62
149.11
149.08
149.05
149.02
140.22
129.47
126.27
123.68
122.34
120.99
119.65
119.16
115.50
104.21
104.03
103.85
103.66
21.28
Cl
CF3
H3C
O
H
3m
f1 (ppm)



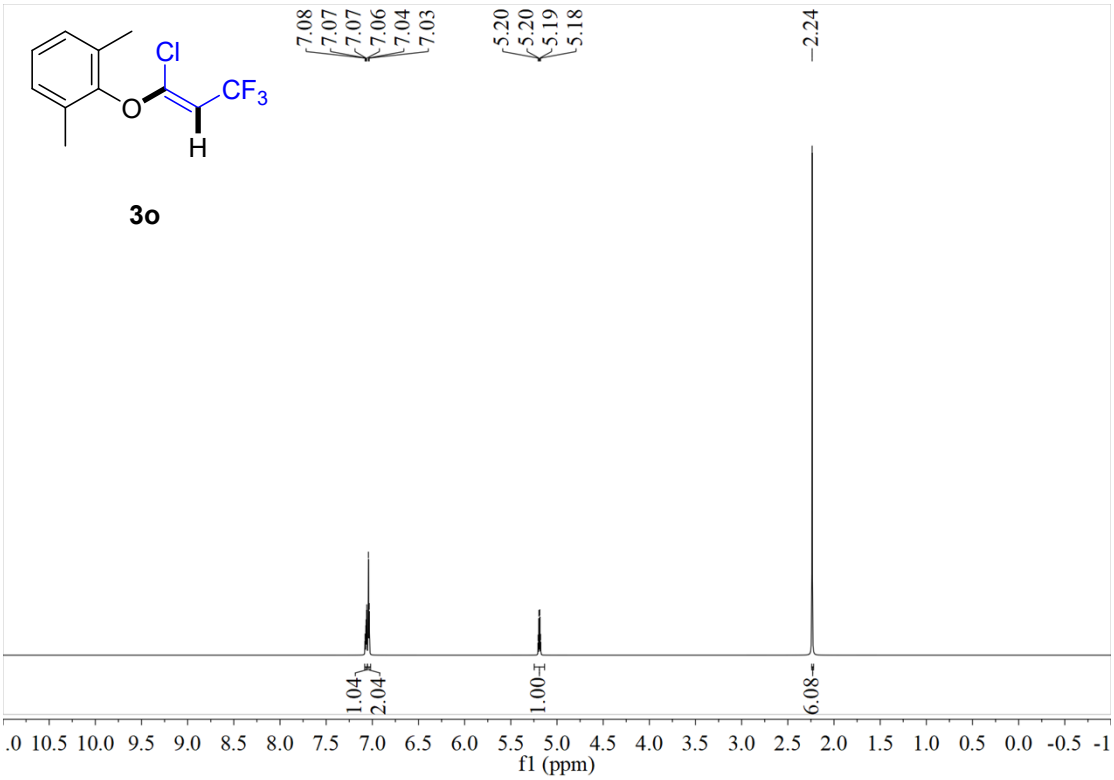
(*Z*)-1-chloro-3-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzene (3n)

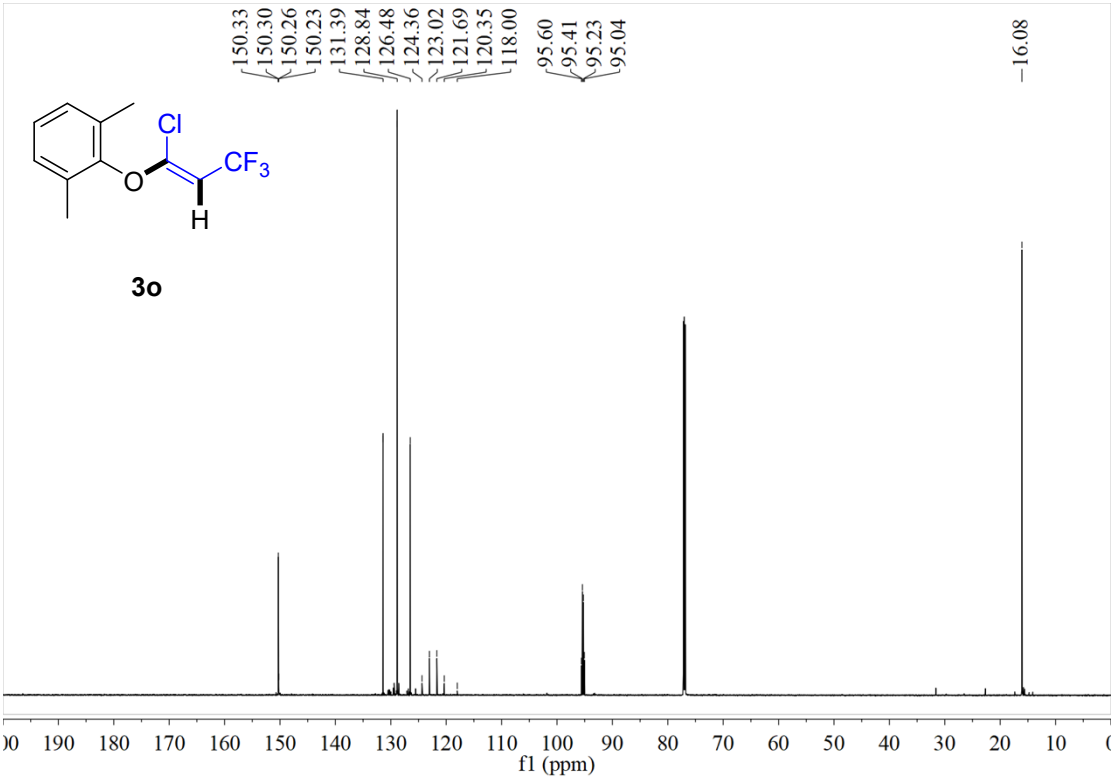






(*Z*)-2-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-1,3-dimethylbenzene (3o)


Cl
CF3
O
H
3o
7.08
7.07
7.07
7.06
7.04
7.03
5.20
5.20
5.19
5.18
2.24
1.04
2.04
1.00
6.08
f1 (ppm)


Cl
CF3
O
H
3o
150.33
150.30
150.26
150.23
131.39
128.84
126.48
124.36
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121.69
120.35
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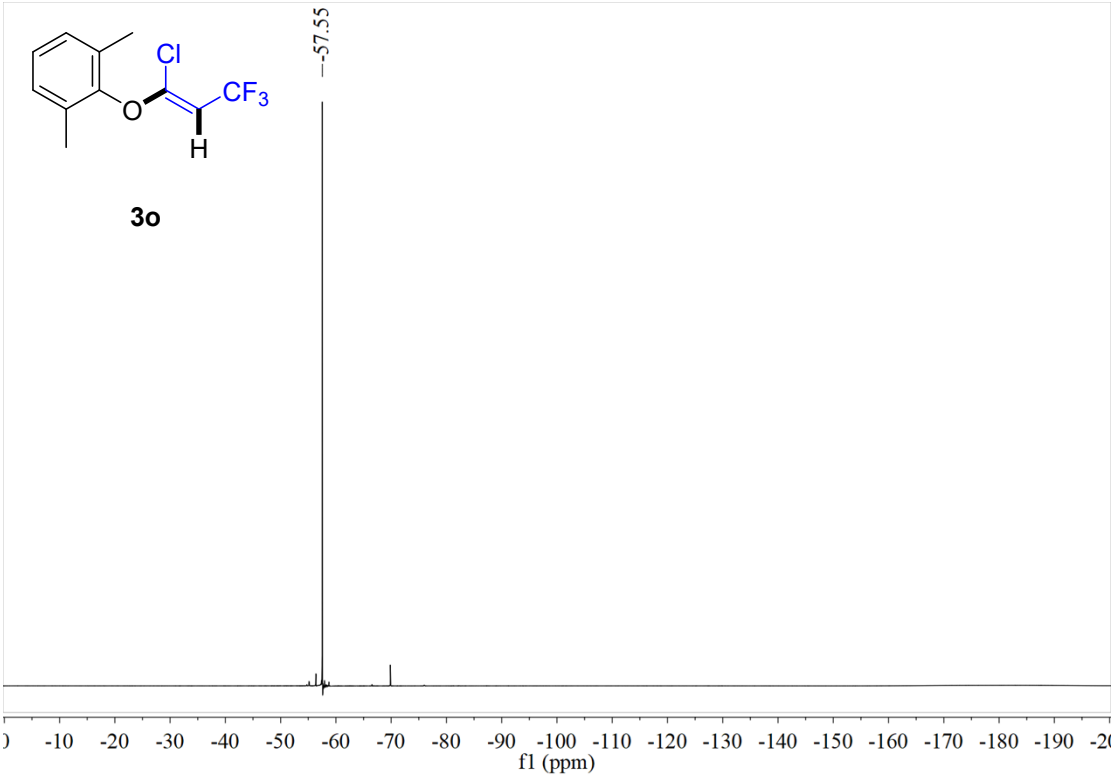
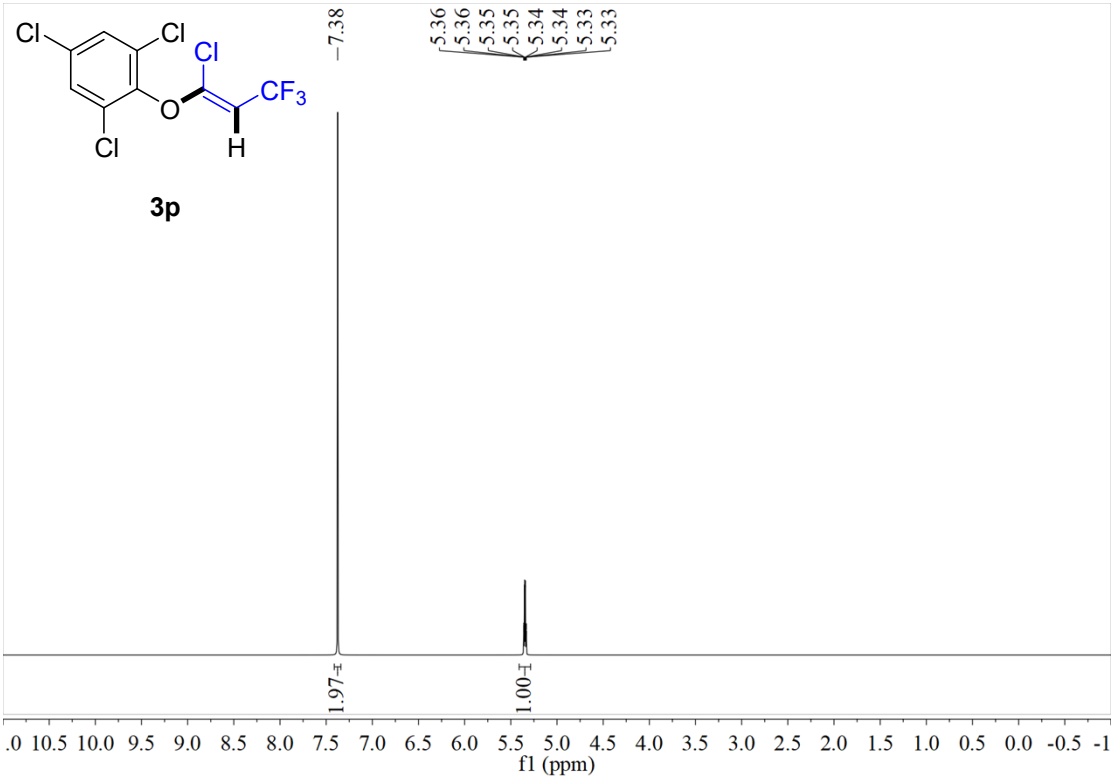
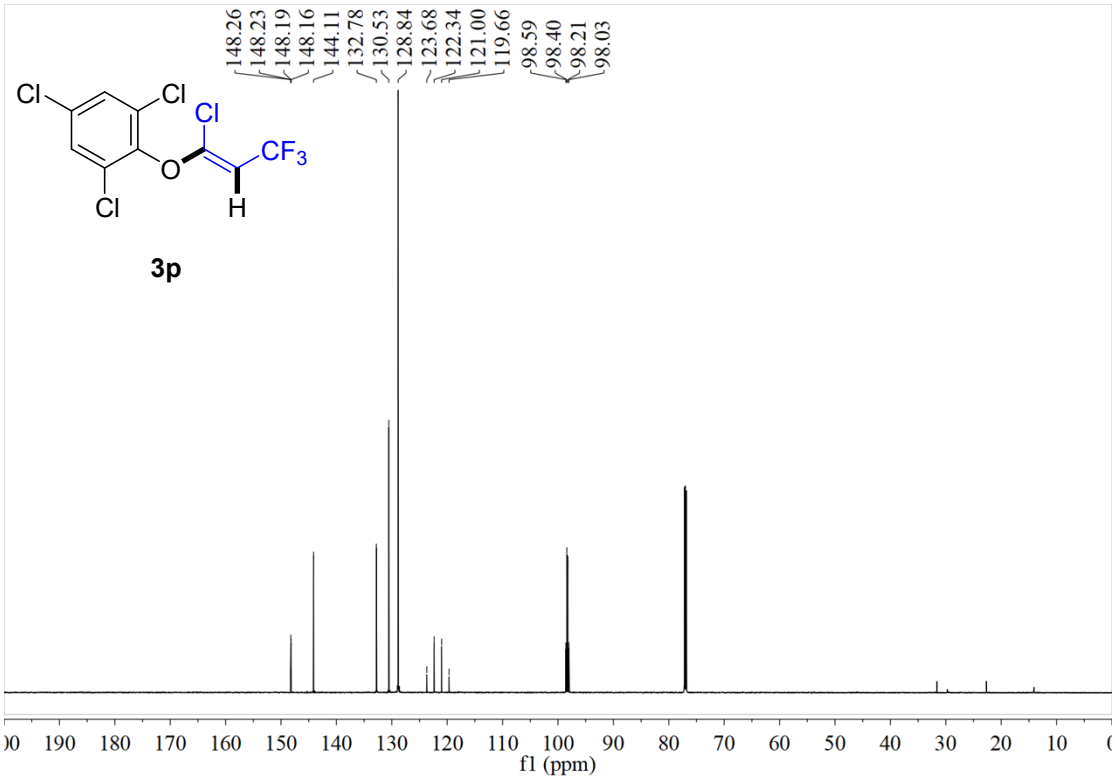
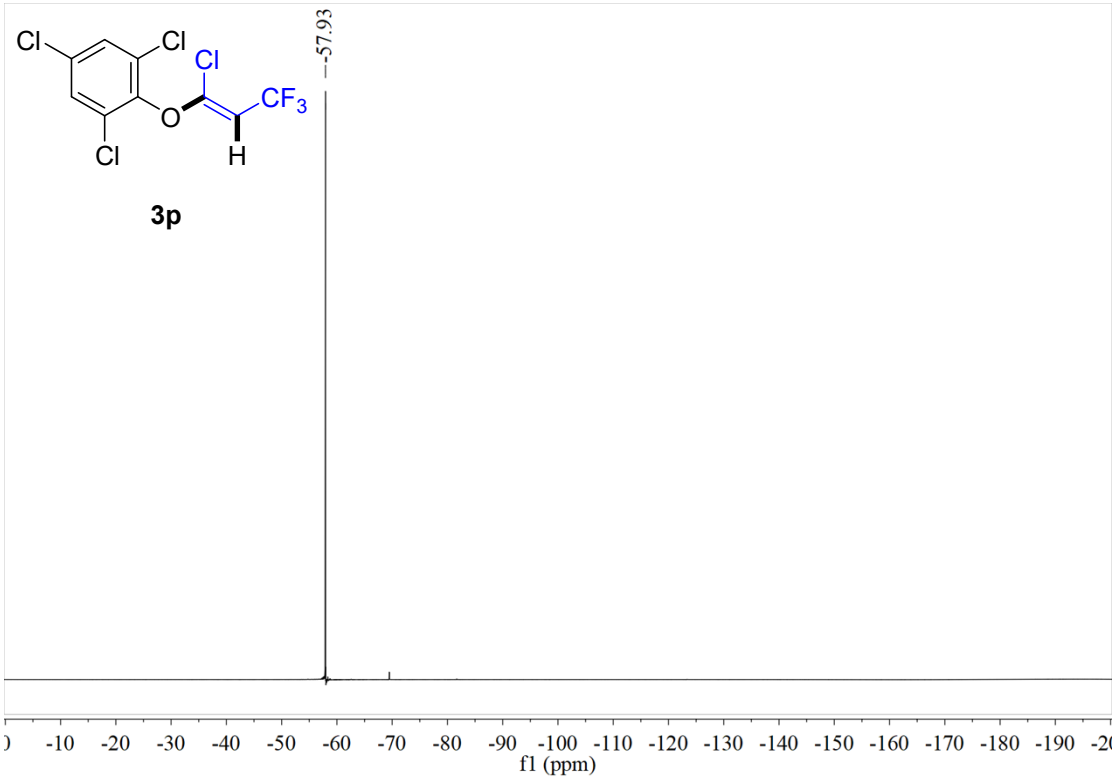
95.41
95.23
95.04
16.08
f1 (ppm)



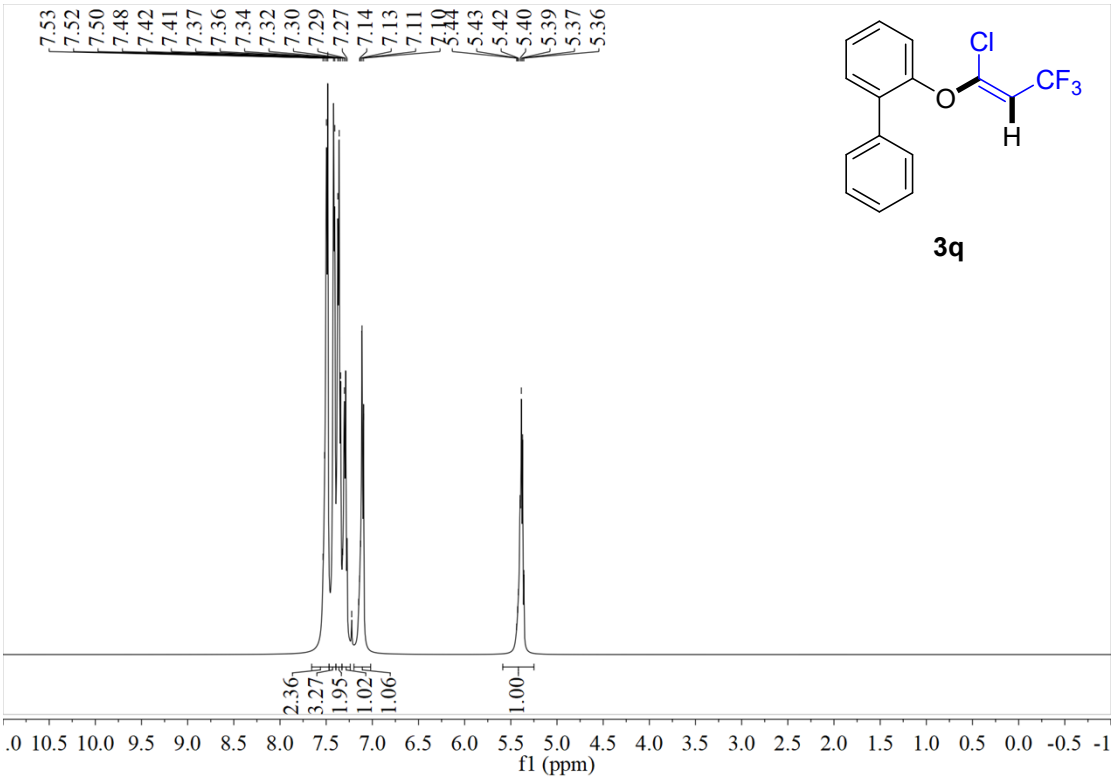
(*Z*)-1,3,5-trichloro-2-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzene (3p)

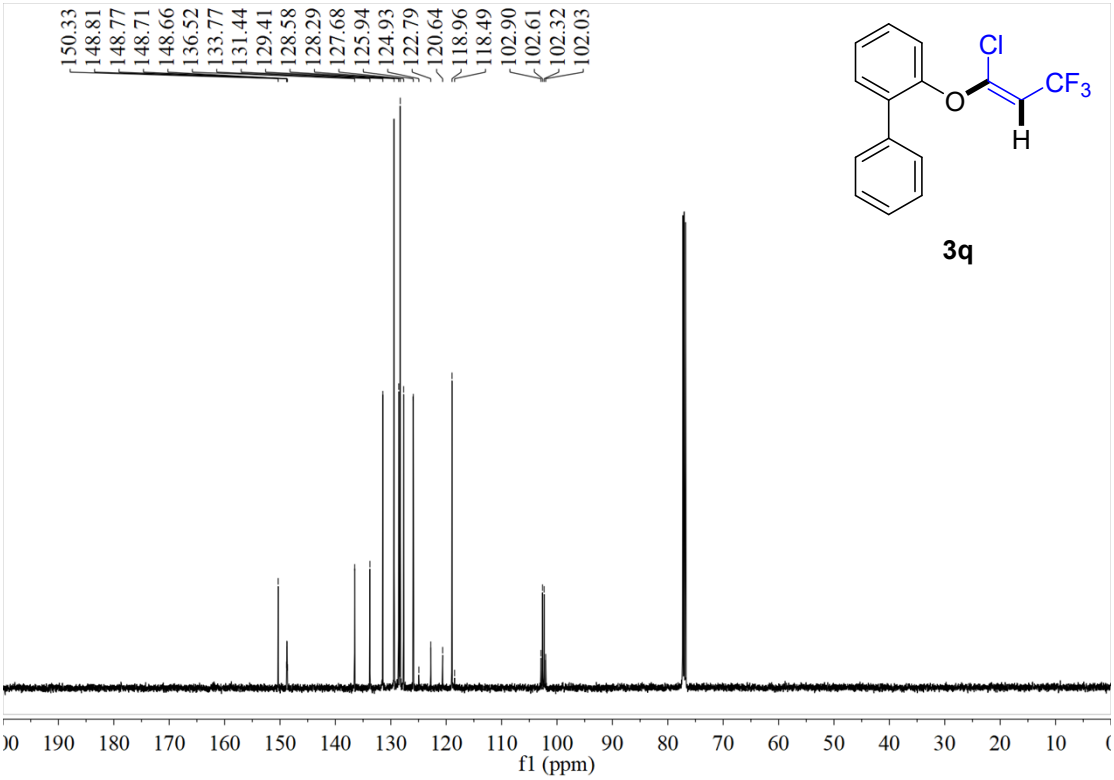


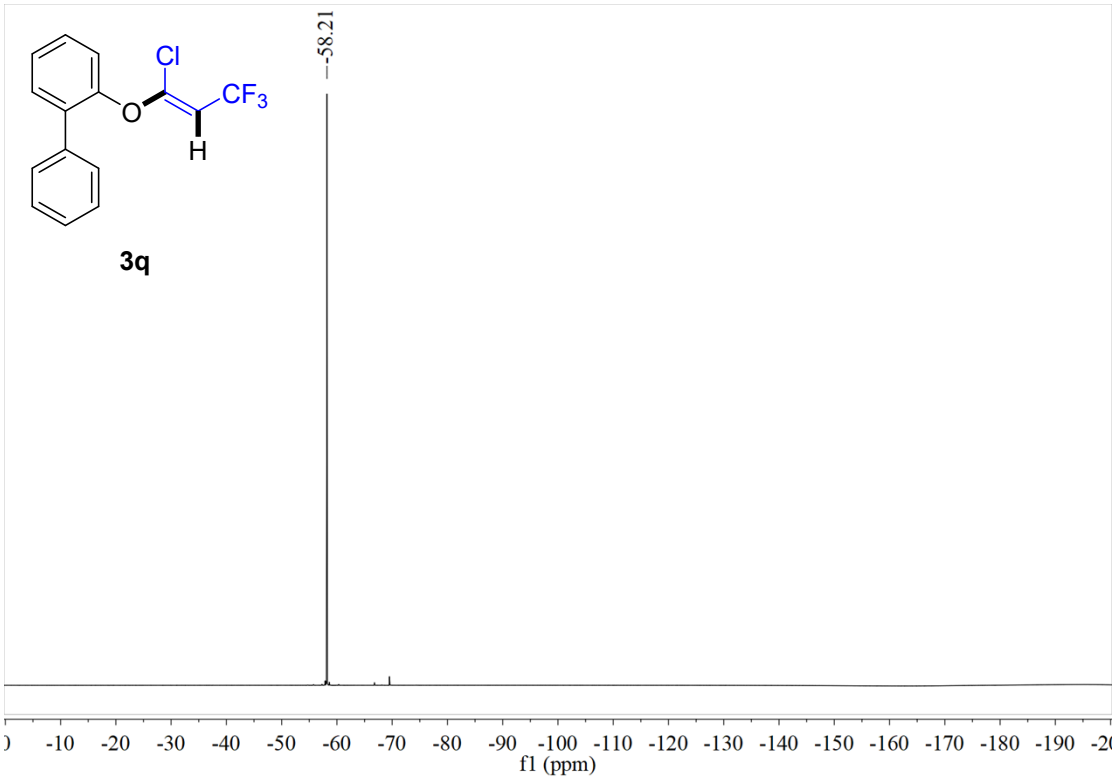




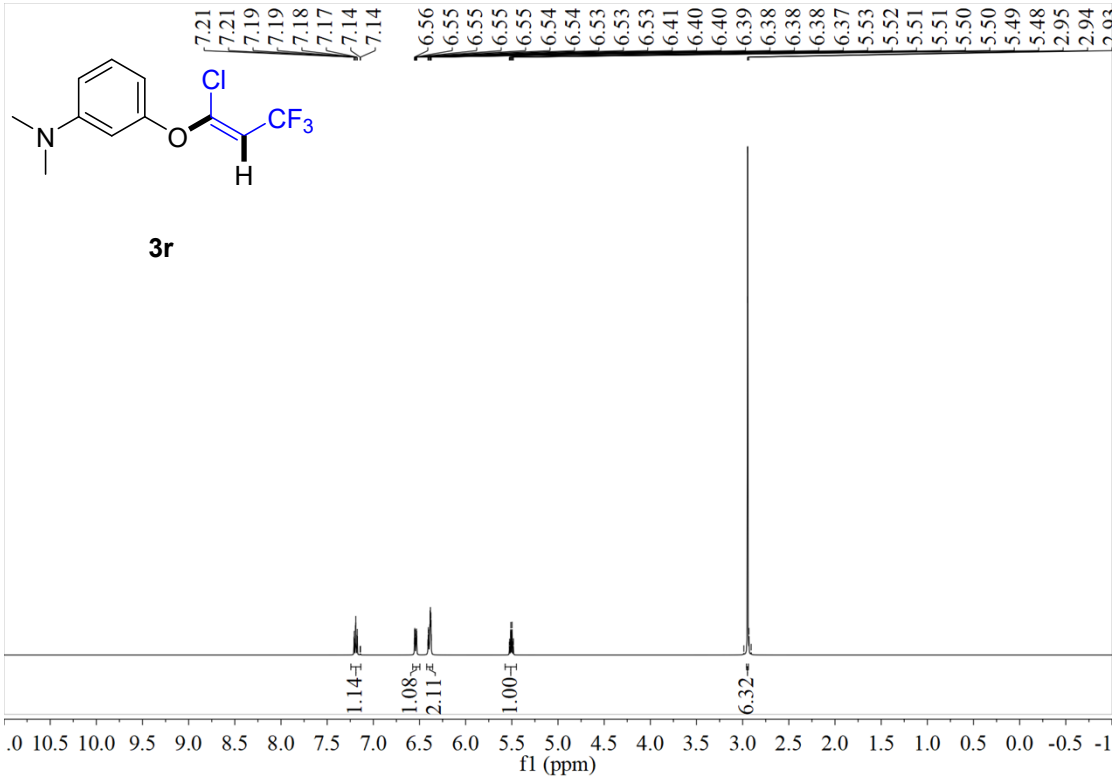
(*Z*)-2-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-1,1'-biphenyl (3q)

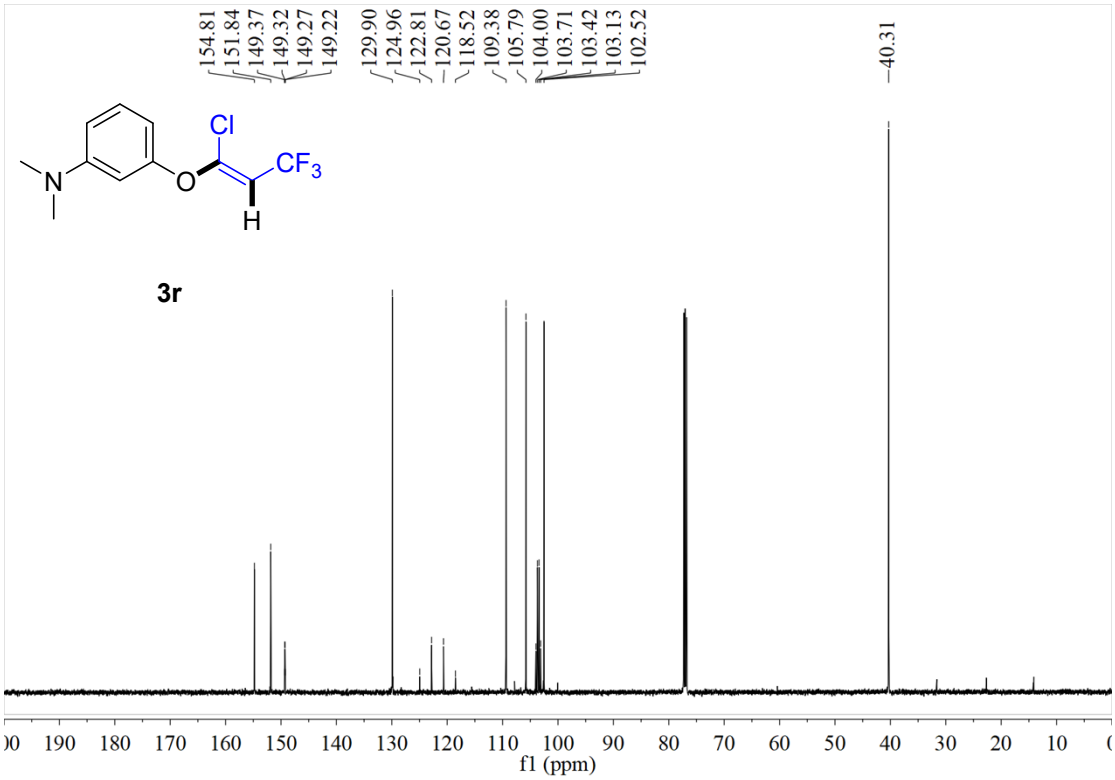

7.53
7.52
7.50
7.48
7.42
7.41
7.37
7.36
7.34
7.32
7.30
7.29
7.27
7.14
7.13
7.11
7.10
5.44
5.43
5.42
5.40
5.39
5.37
5.36
2.36
3.27
1.95
1.02
1.06
1.00
f1 (ppm)
Cl
CF3
O
H
3q

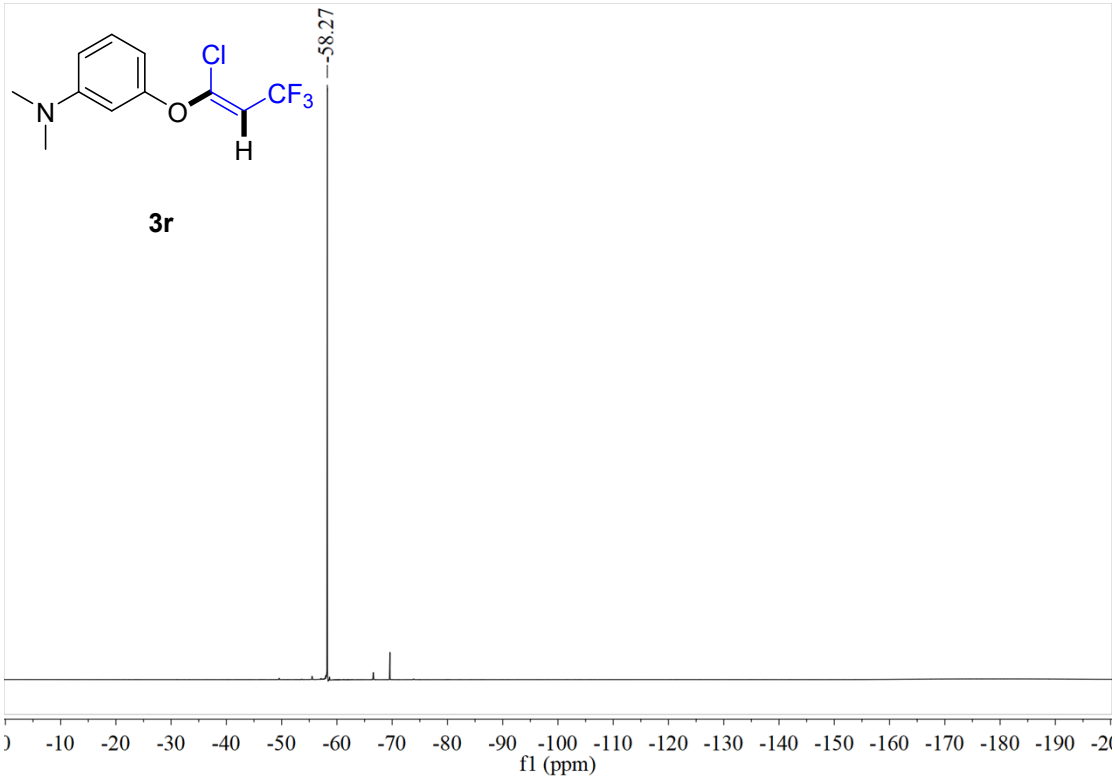

150.33
148.81
148.77
148.71
148.66
136.52
133.77
131.44
129.41
128.58
128.29
127.68
125.94
124.93
122.79
120.64
118.96
118.49
102.90
102.61
102.32
102.03
f1 (ppm)
Cl
CF3
O
H
3q



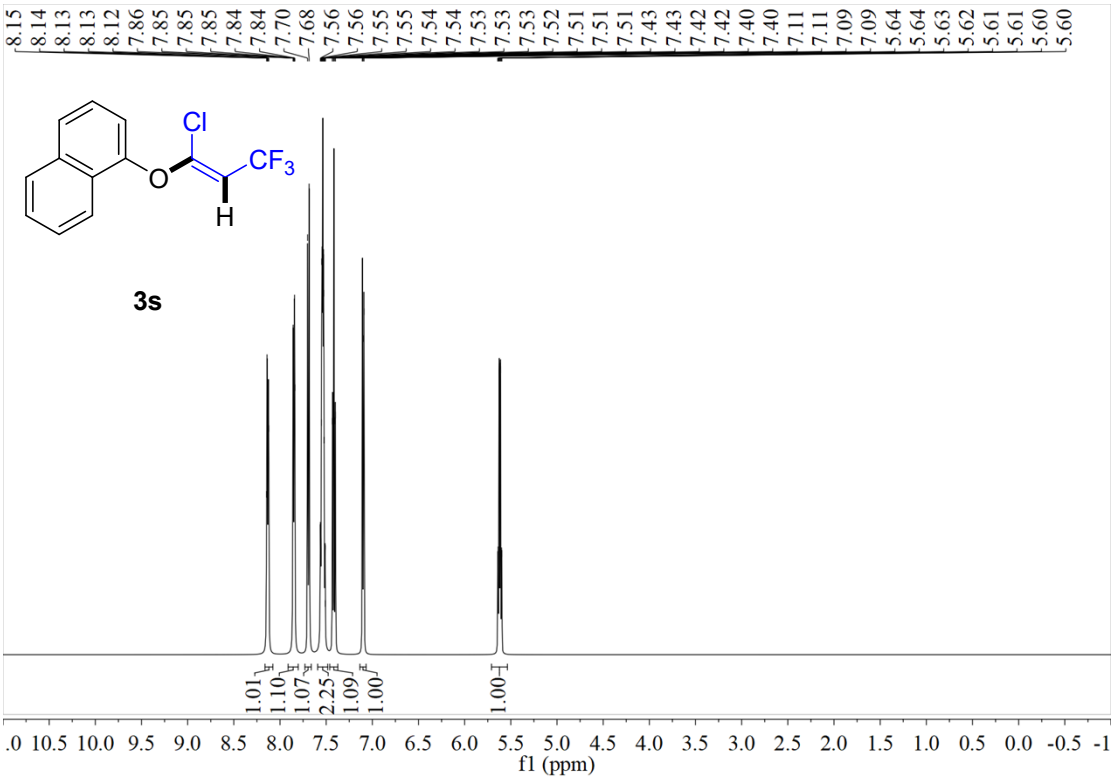
(*Z*)-3-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-*N*,*N*-dimethylaniline (3r)

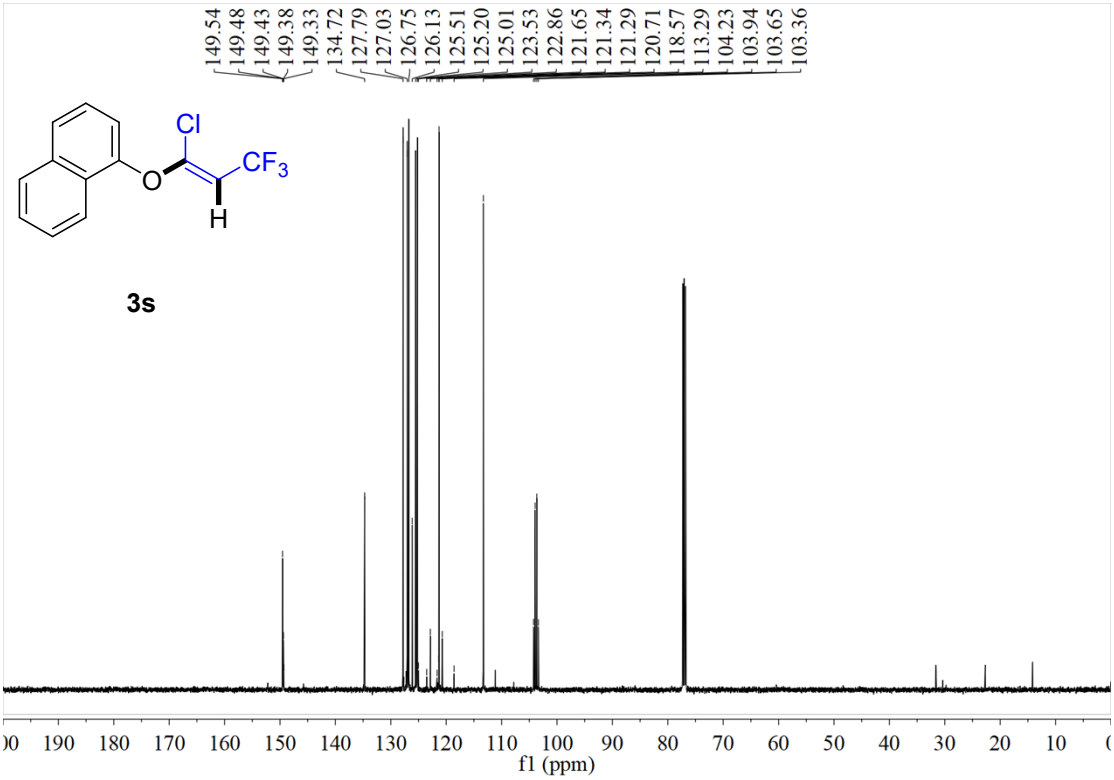


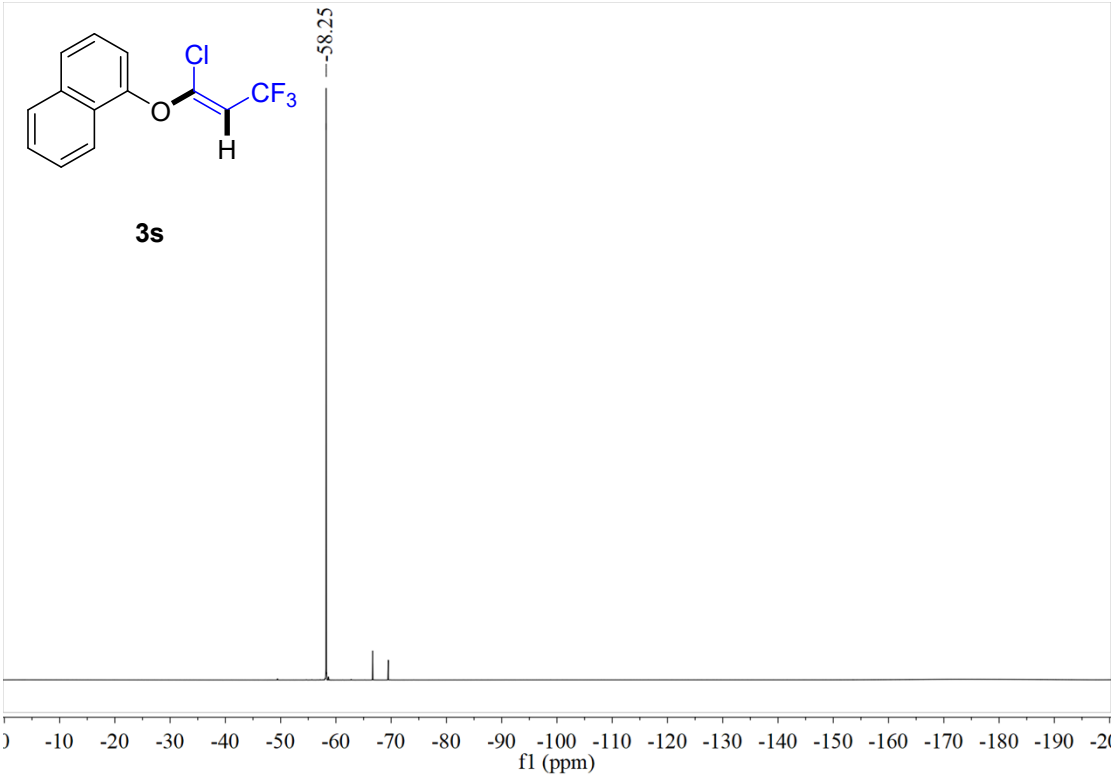




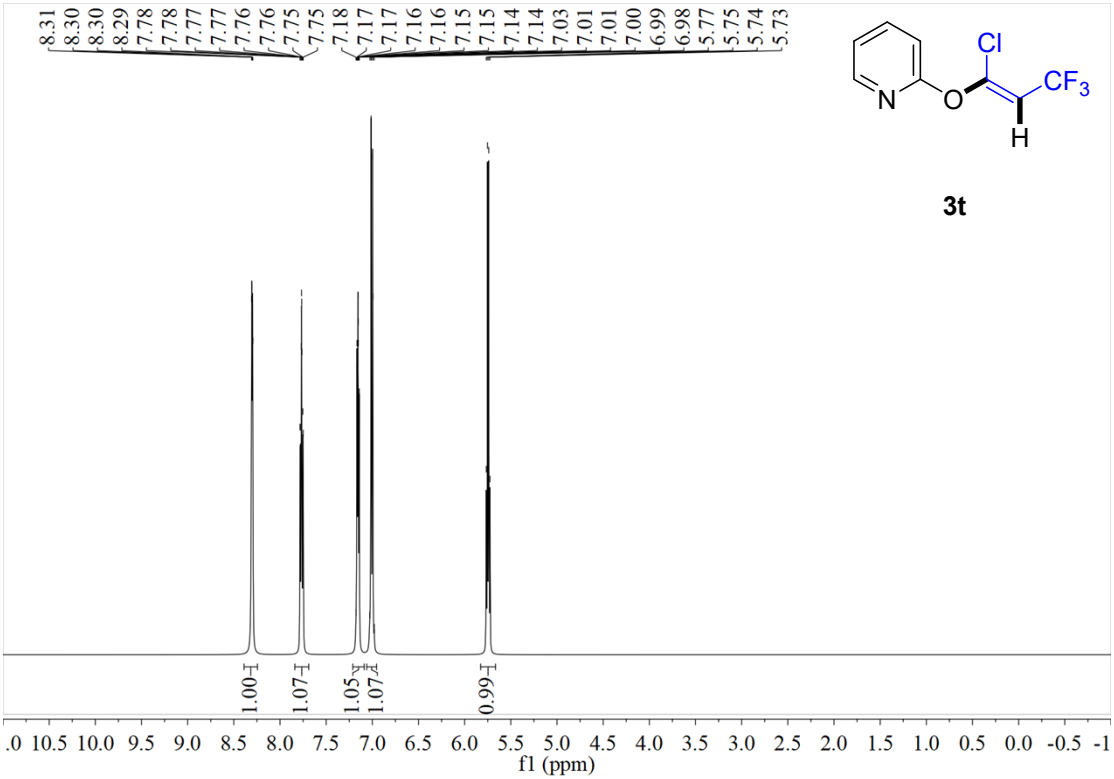
(*Z*)-1-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)naphthalene (3s)

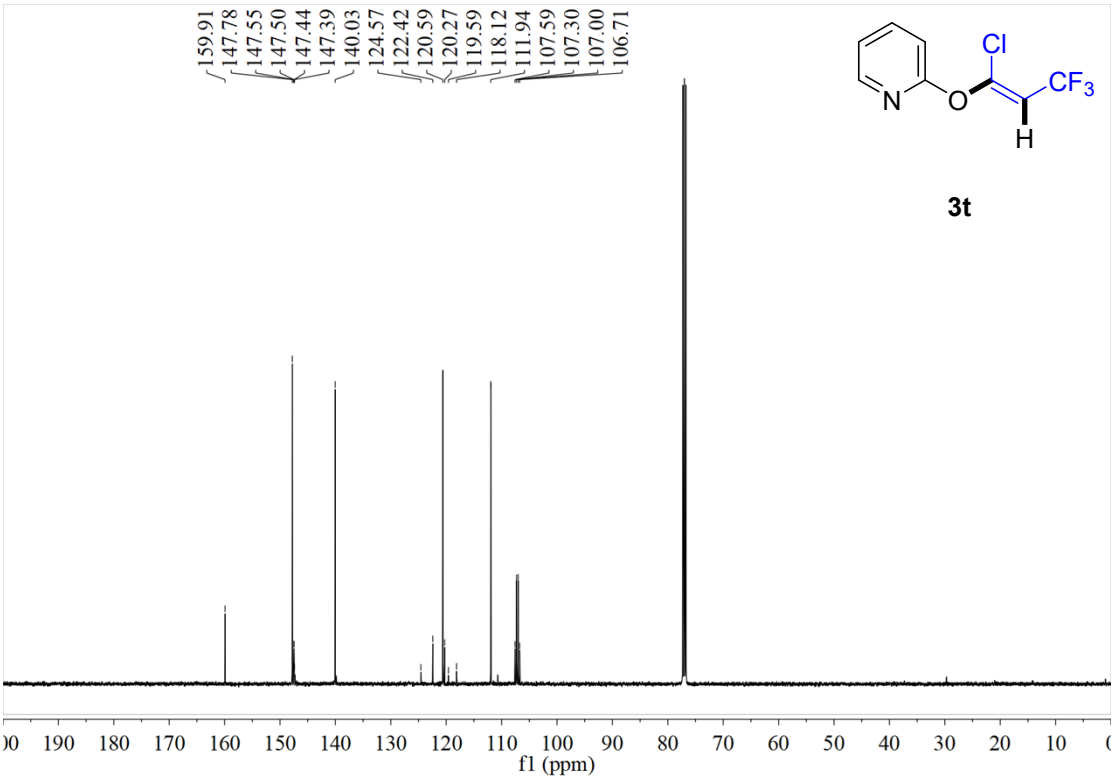

8.15
8.14
8.13
8.13
8.12
7.86
7.85
7.85
7.85
7.84
7.84
7.70
7.68
7.56
7.56
7.55
7.55
7.54
7.54
7.53
7.53
7.53
7.52
7.51
7.51
7.51
7.43
7.43
7.42
7.42
7.40
7.40
7.11
7.11
7.09
7.09
5.64
5.64
5.63
5.62
5.61
5.61
5.60
5.60
Cl
CF3
O
H
3s
1.01
1.10
1.07
2.25
1.09
1.00
1.00
f1 (ppm)

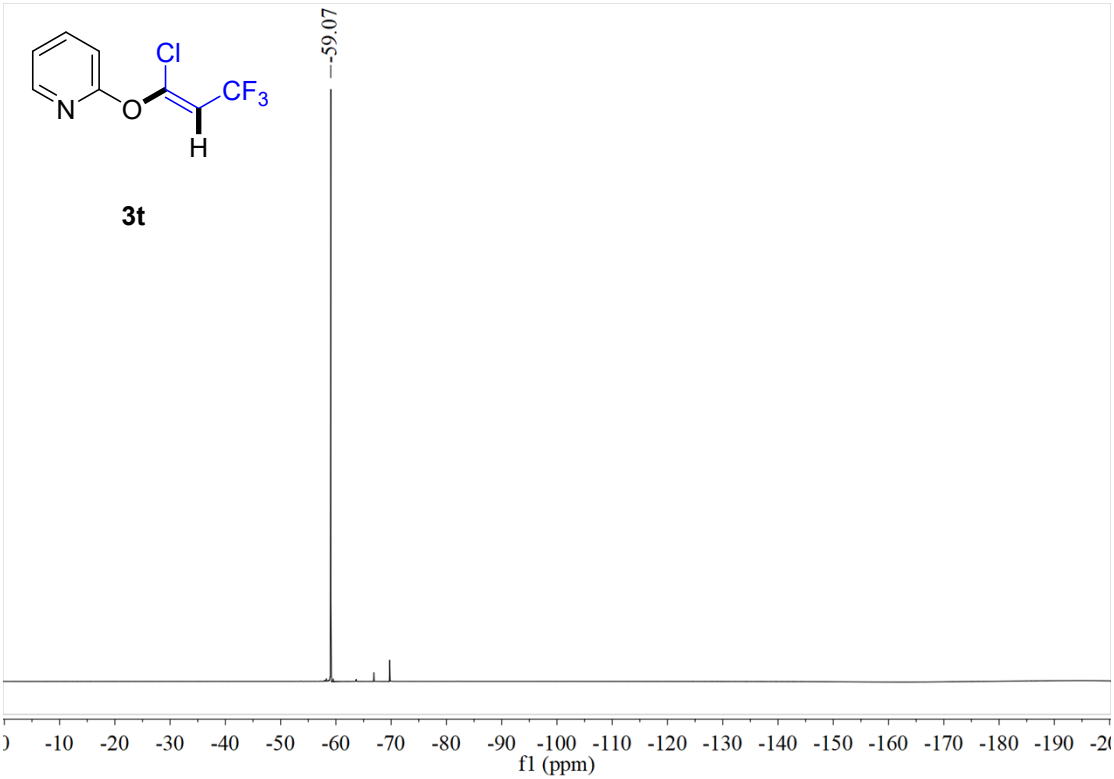

149.54
149.48
149.43
149.38
149.33
134.72
127.79
127.03
126.75
126.13
125.51
125.20
125.01
123.53
122.86
121.65
121.34
121.29
120.71
118.57
113.29
104.23
103.94
103.65
103.36
Cl
CF3
O
H
3s
f1 (ppm)



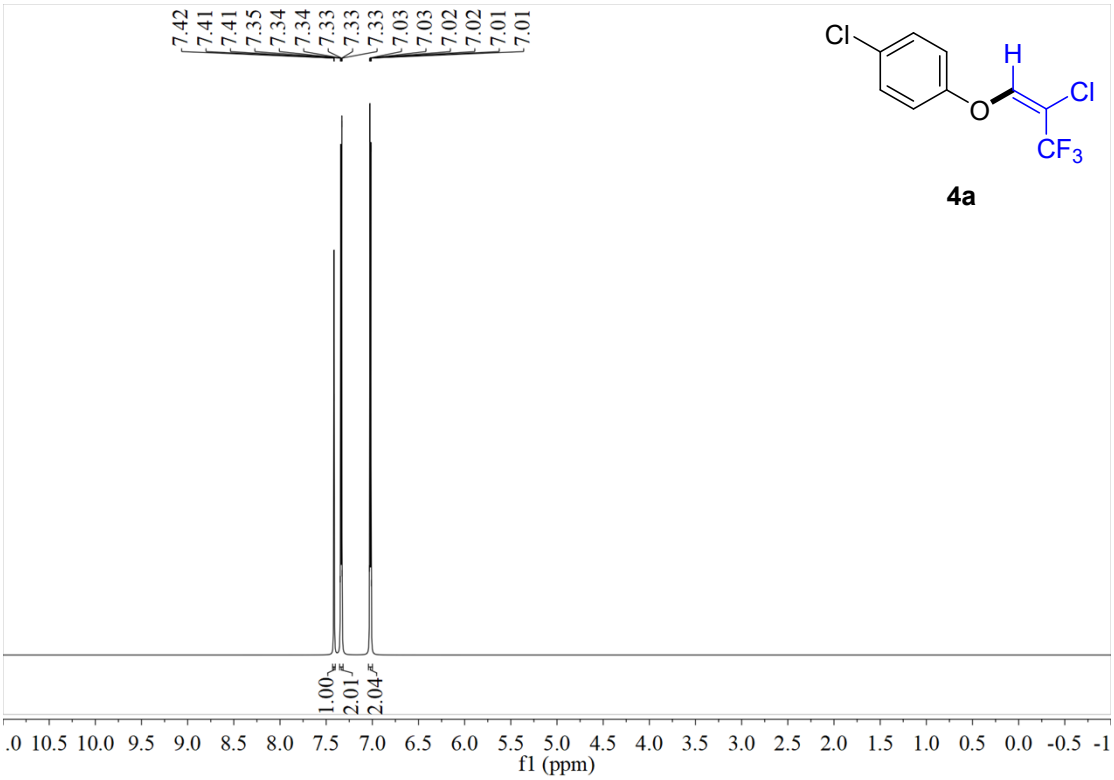
(*Z*)-2-((1-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)pyridine (3t)

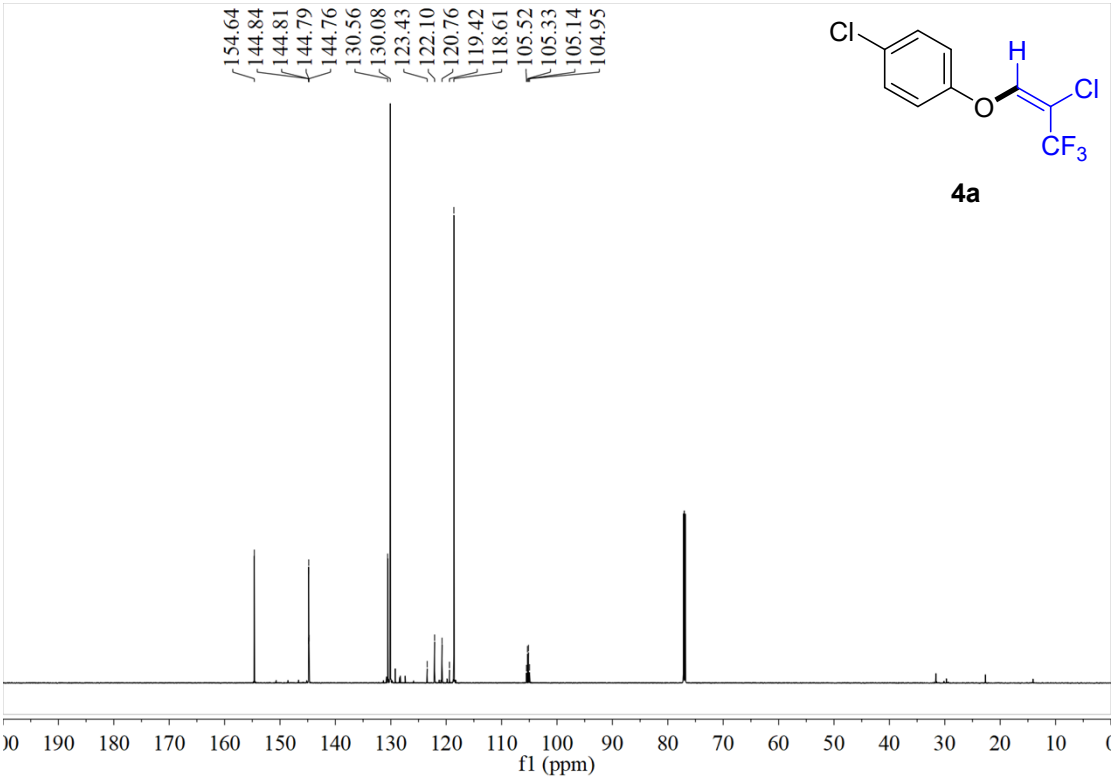


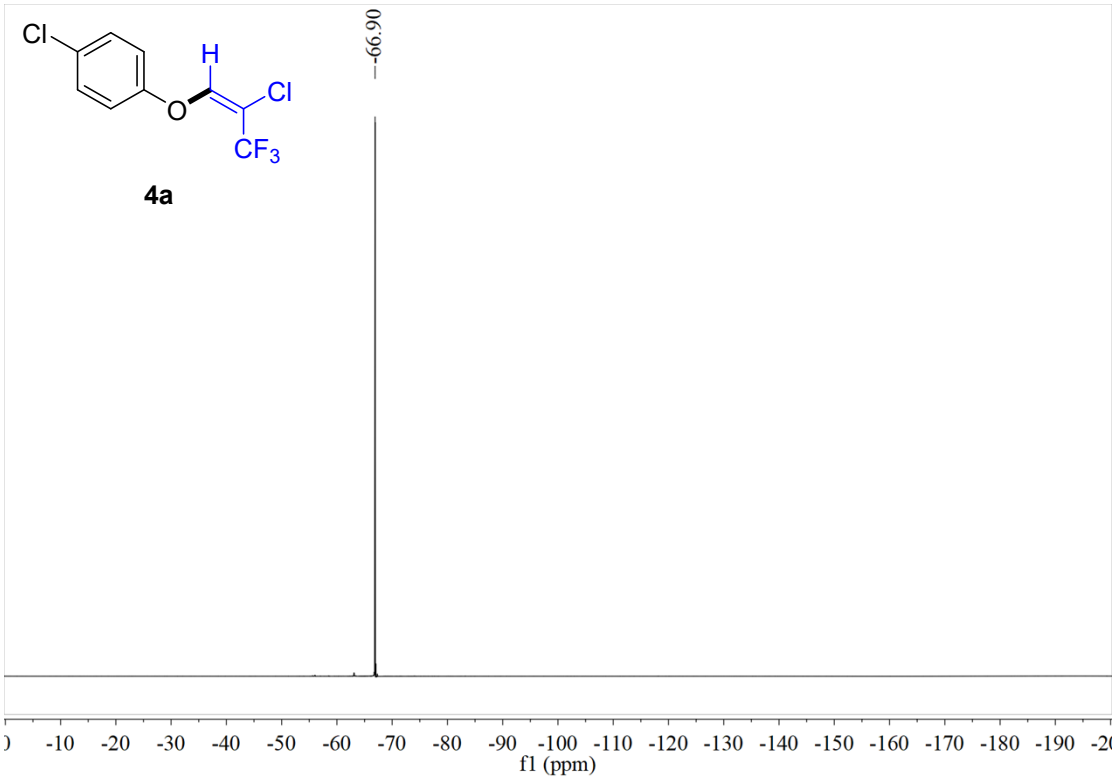




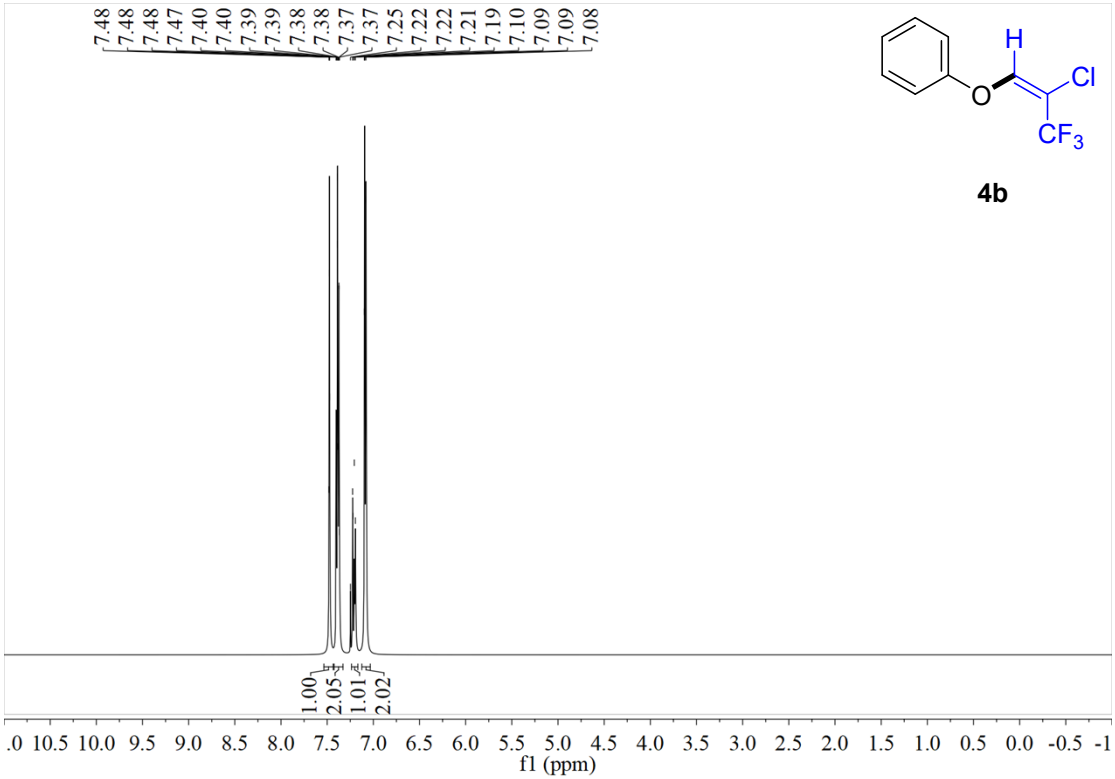
(*E*)-1-chloro-4-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzene (4a)

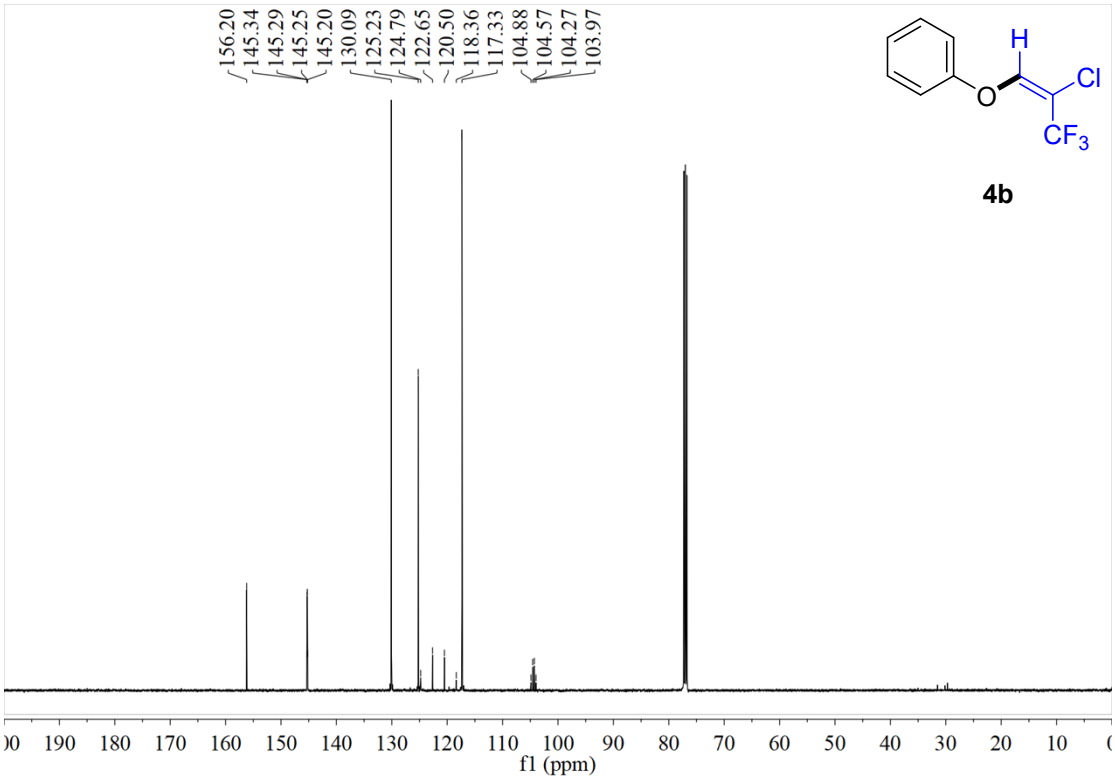

7.42
7.41
7.41
7.35
7.34
7.34
7.33
7.33
7.33
7.03
7.03
7.02
7.02
7.01
7.01
Cl
H
Cl
O
CF3
4a
1.00
2.01
2.04
f1 (ppm)

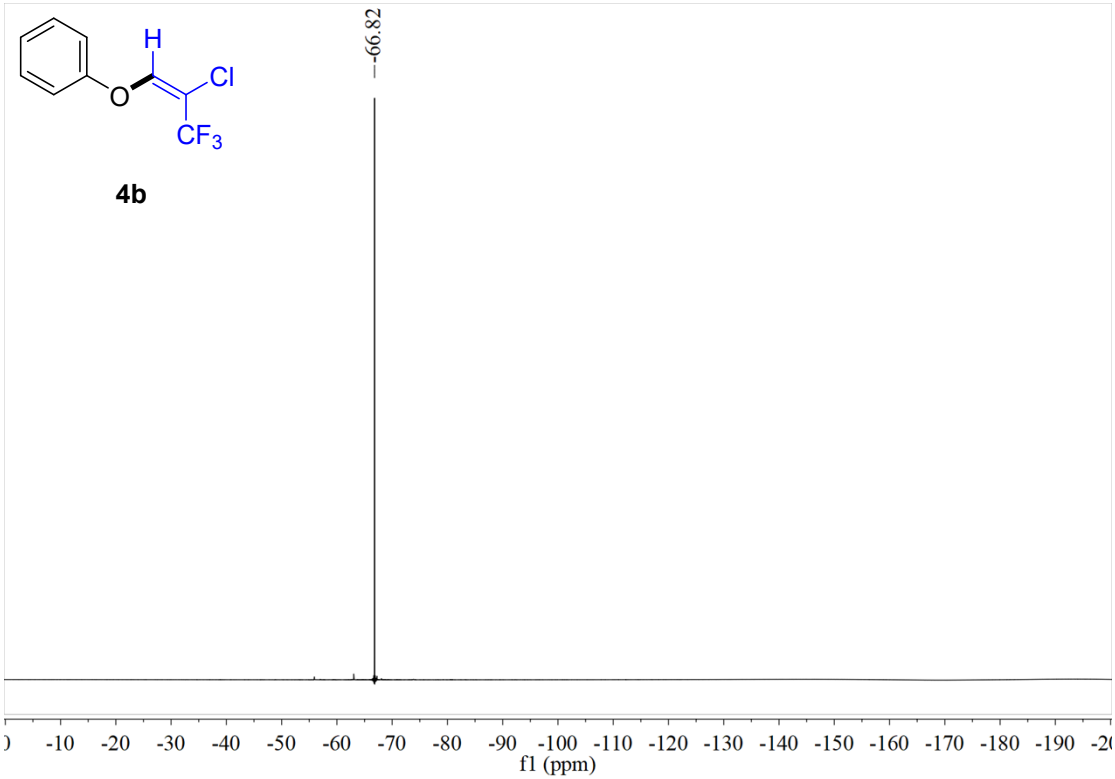

154.64
144.84
144.81
144.79
144.76
130.56
130.08
123.43
122.10
120.76
119.42
118.61
105.52
105.33
105.14
104.95
Cl
H
Cl
O
CF3
4a
f1 (ppm)



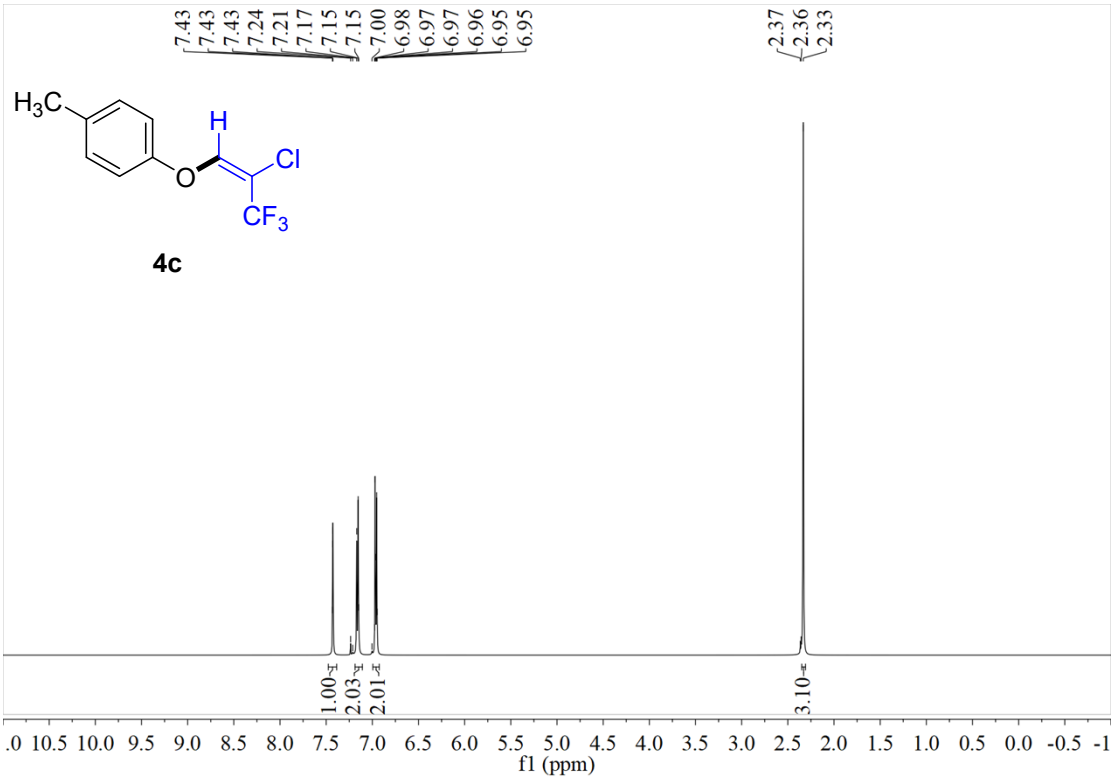
(*E*)-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzene (4b)

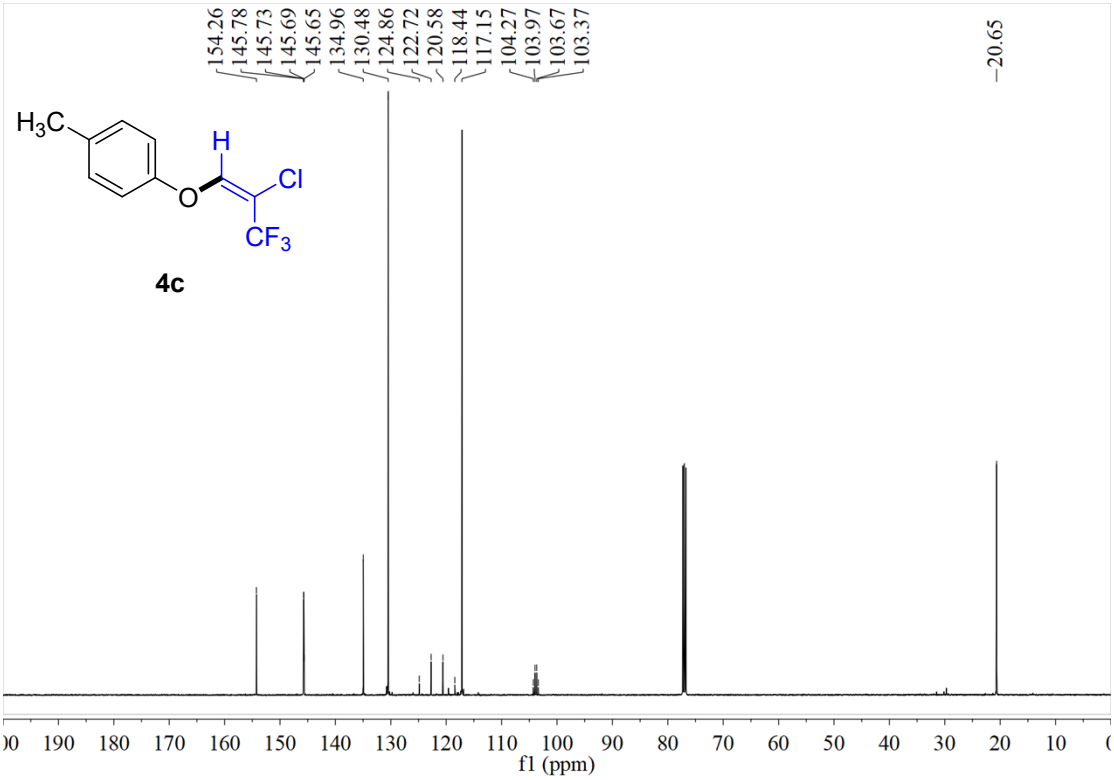


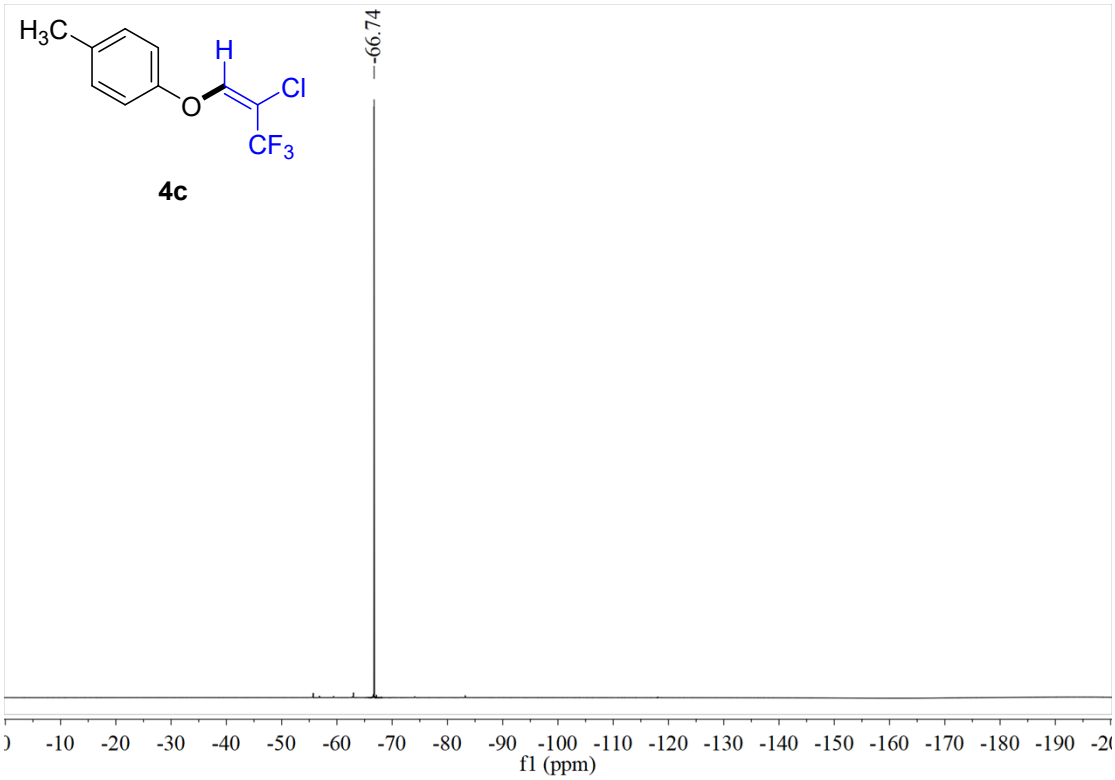




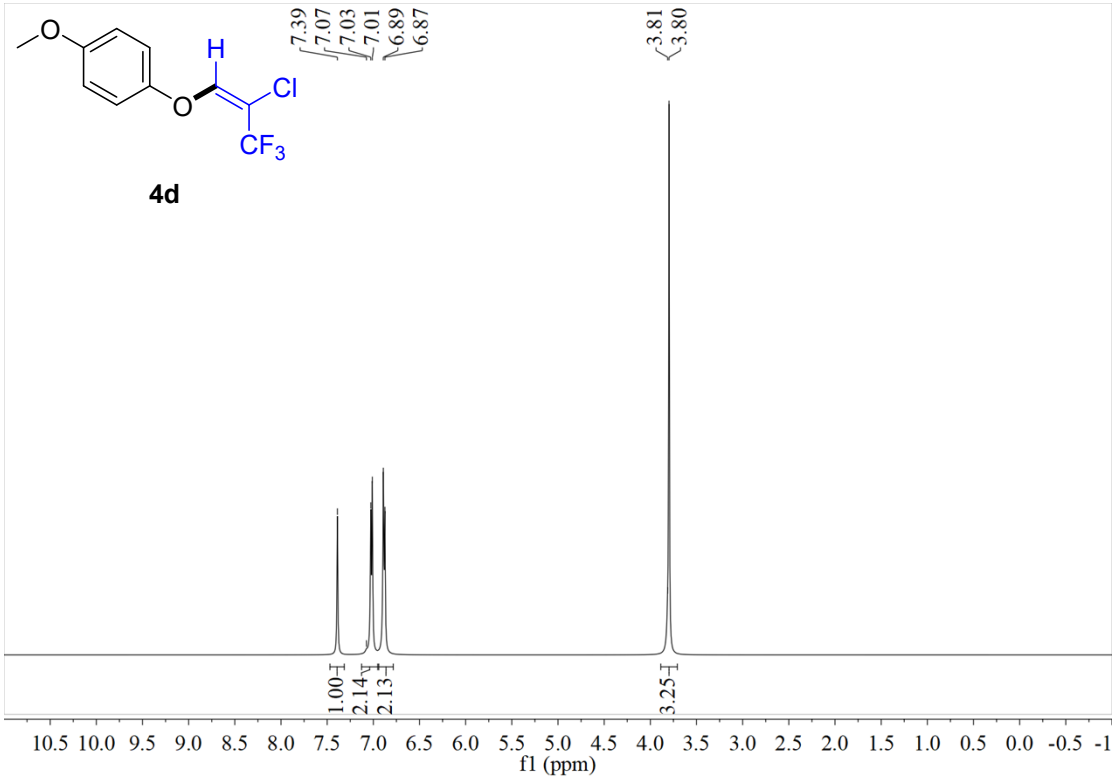
(*E*)-1-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-4-methylbenzene (4c)

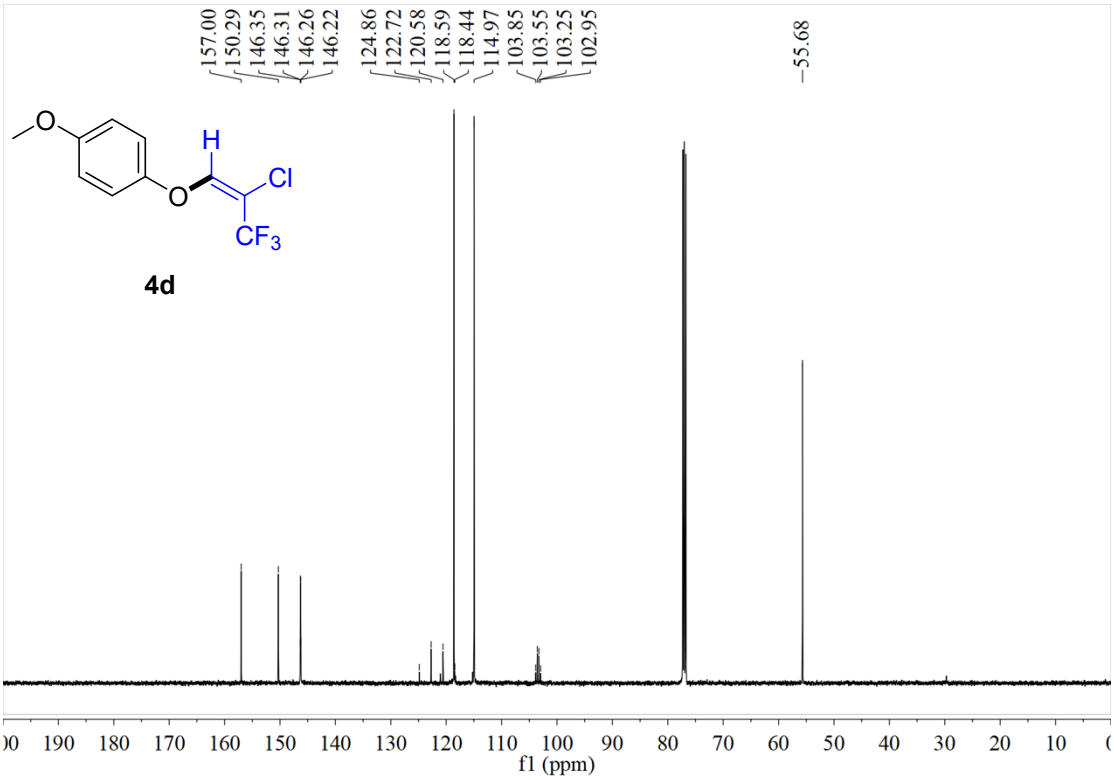

7.43
7.43
7.43
7.24
7.21
7.17
7.15
7.15
7.00
6.98
6.97
6.97
6.96
6.95
6.95
2.37
2.36
2.33
H3C
O
H
Cl
CF3
4c
1.00
2.03
2.01
3.10
f1 (ppm)

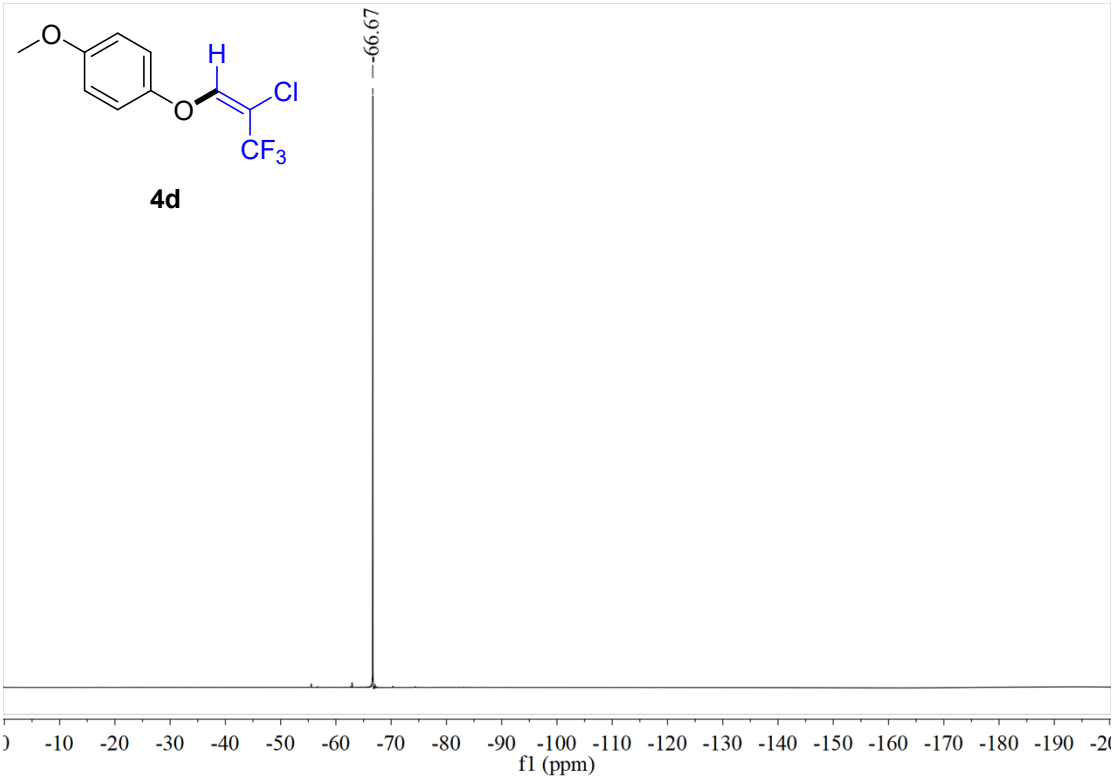

154.26
145.78
145.73
145.69
145.65
134.96
130.48
124.86
122.72
120.58
118.44
117.15
104.27
103.97
103.67
103.37
20.65
H3C
O
H
Cl
CF3
4c
f1 (ppm)



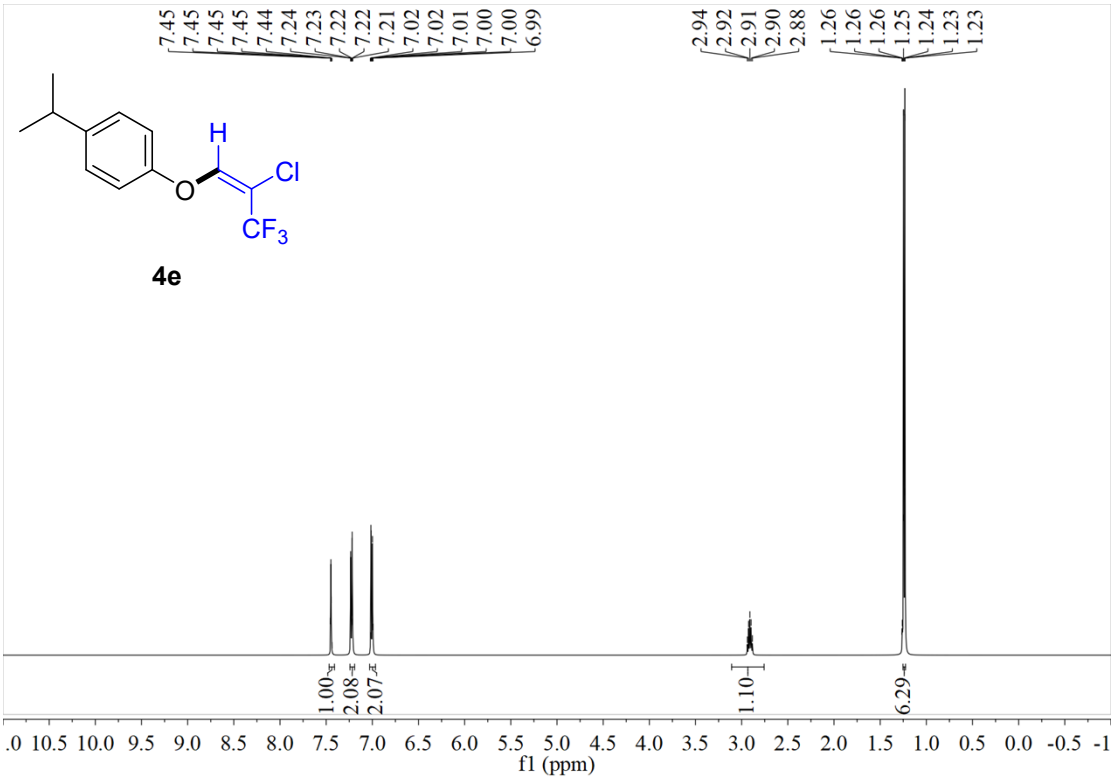
(*E*)-1-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-4-methoxybenzene (4d)

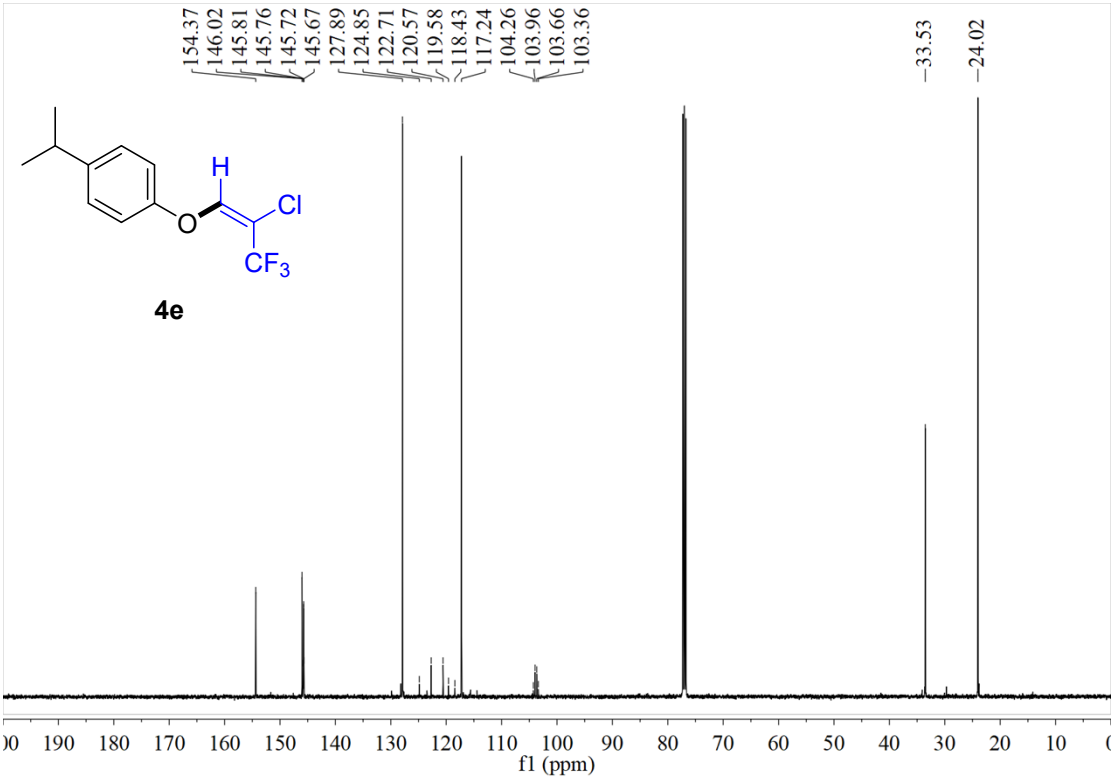


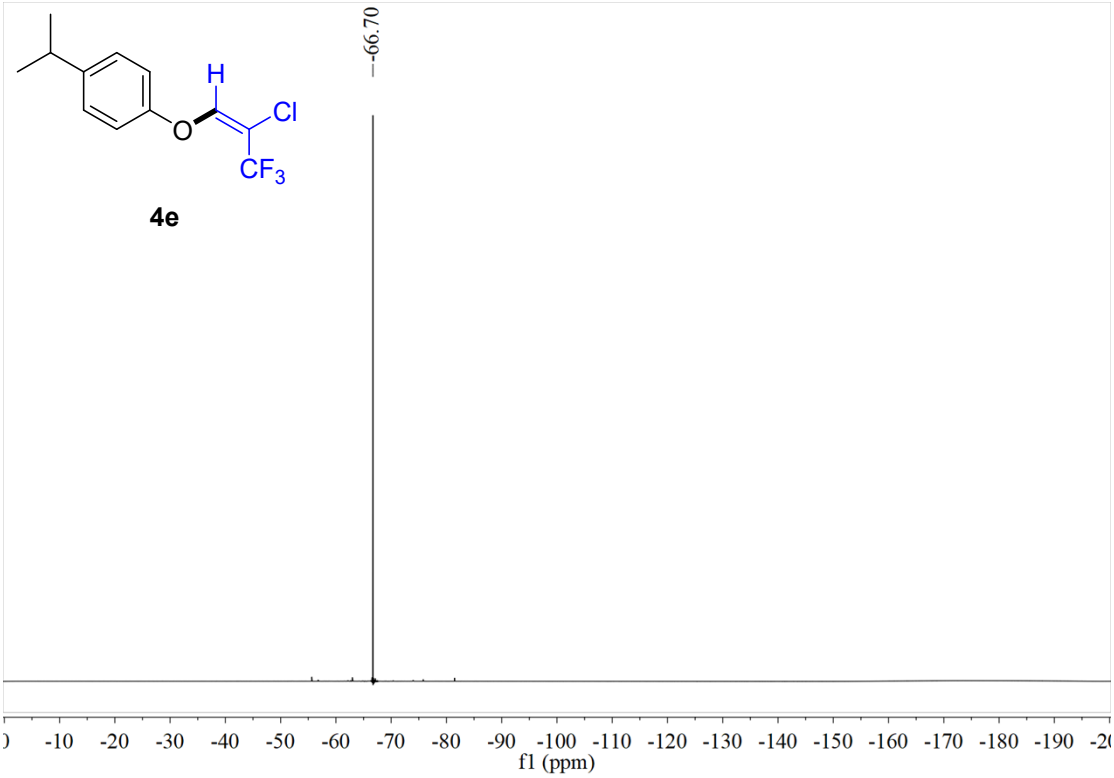




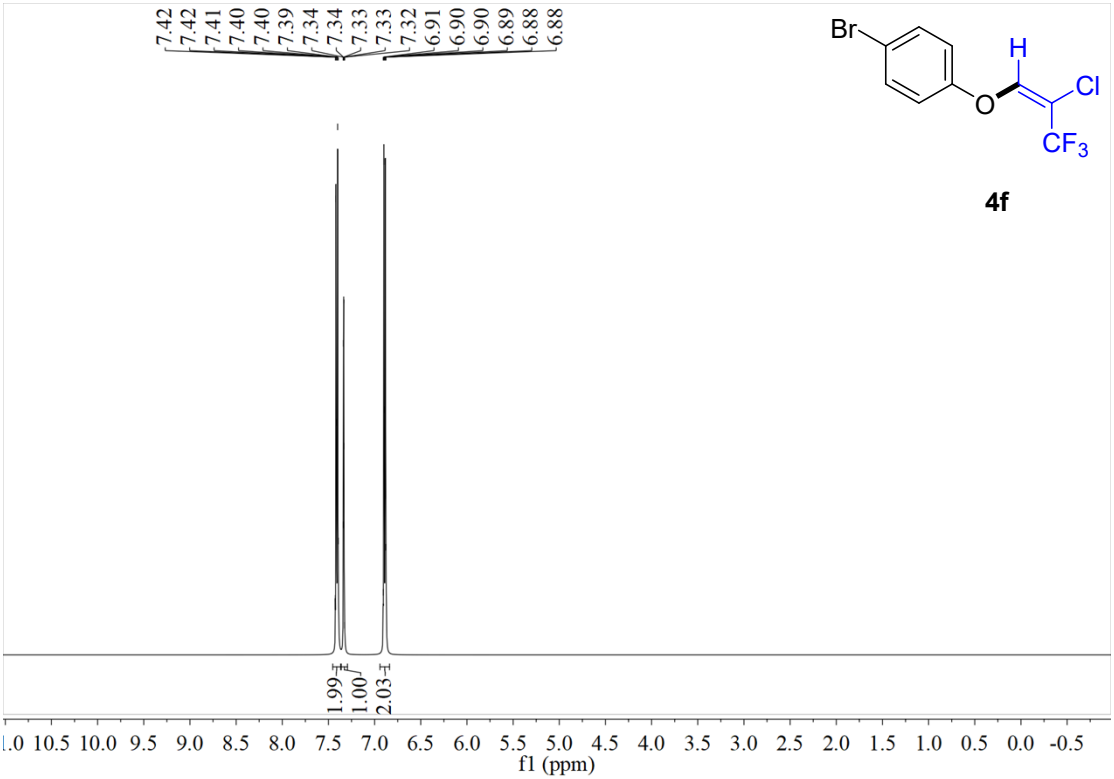
(*E*)-1-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-4-isopropylbenzene (4e)

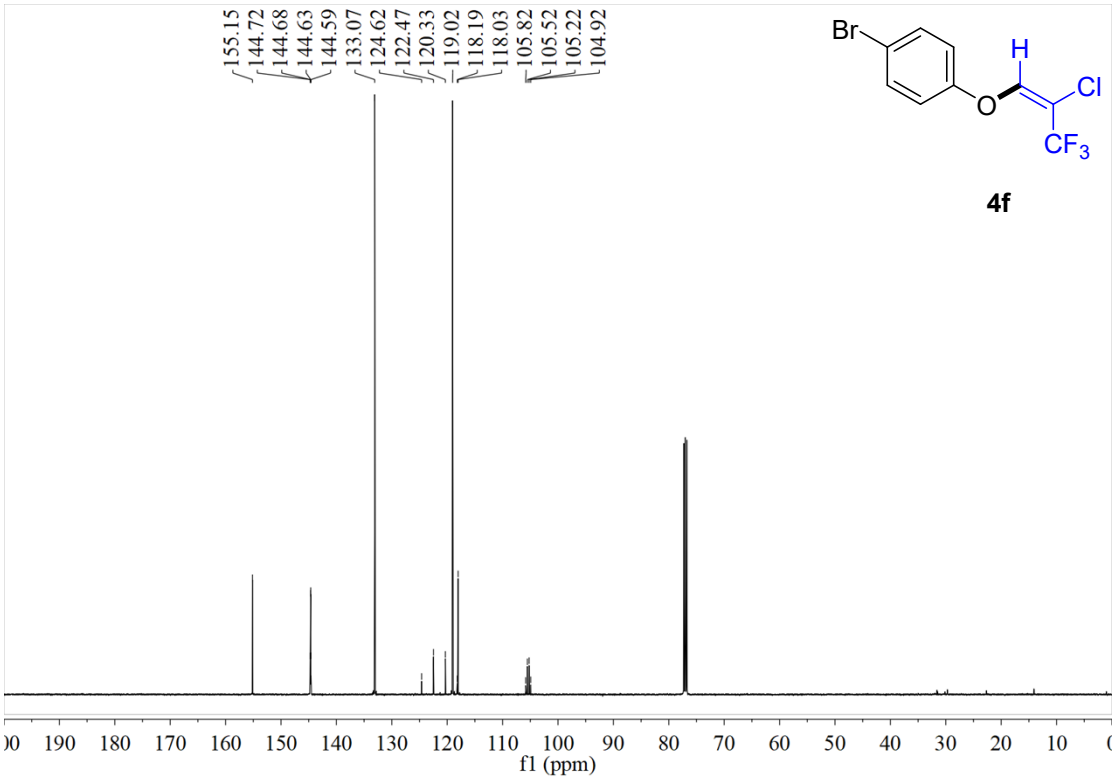

7.45
7.45
7.45
7.45
7.44
7.24
7.23
7.22
7.22
7.21
7.02
7.02
7.01
7.00
7.00
6.99
2.94
2.92
2.91
2.90
2.88
1.26
1.26
1.26
1.25
1.24
1.23
1.23
H
Cl
O
CF3
4e
1.00
2.08
2.07
1.10
6.29
f1 (ppm)

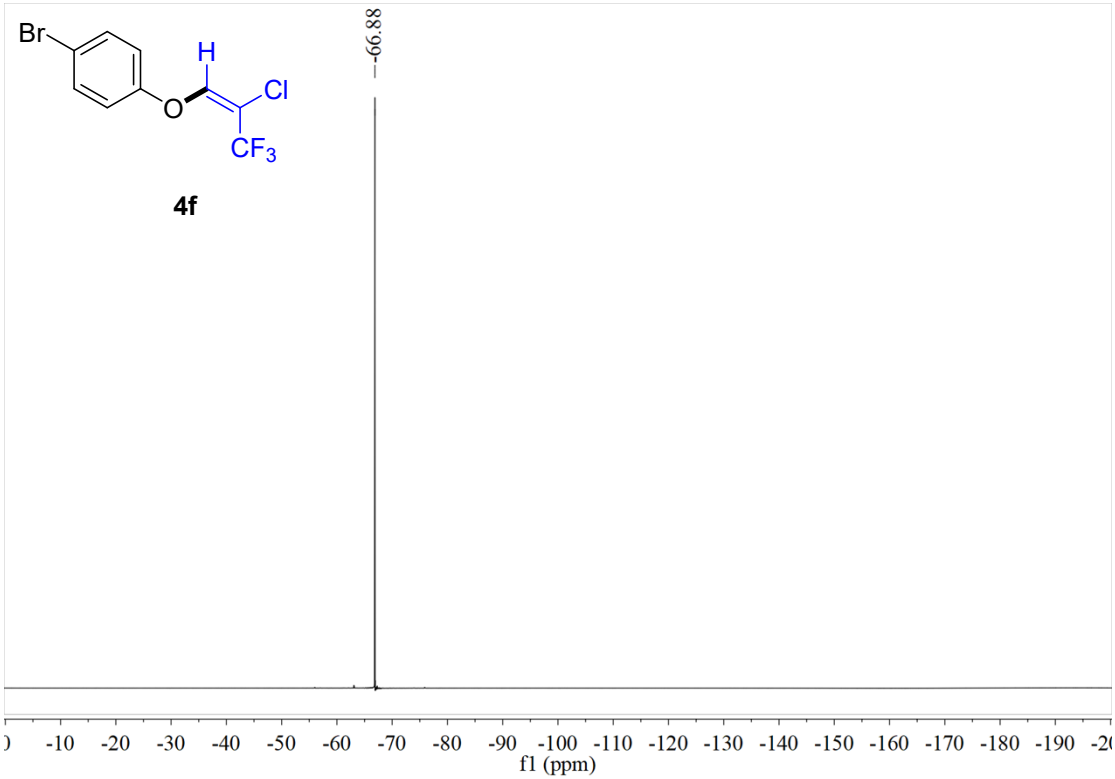

154.37
146.02
145.81
145.76
145.72
145.67
127.89
124.85
122.71
120.57
119.58
118.43
117.24
104.26
103.96
103.66
103.36
33.53
24.02
H
Cl
O
CF3
4e
f1 (ppm)



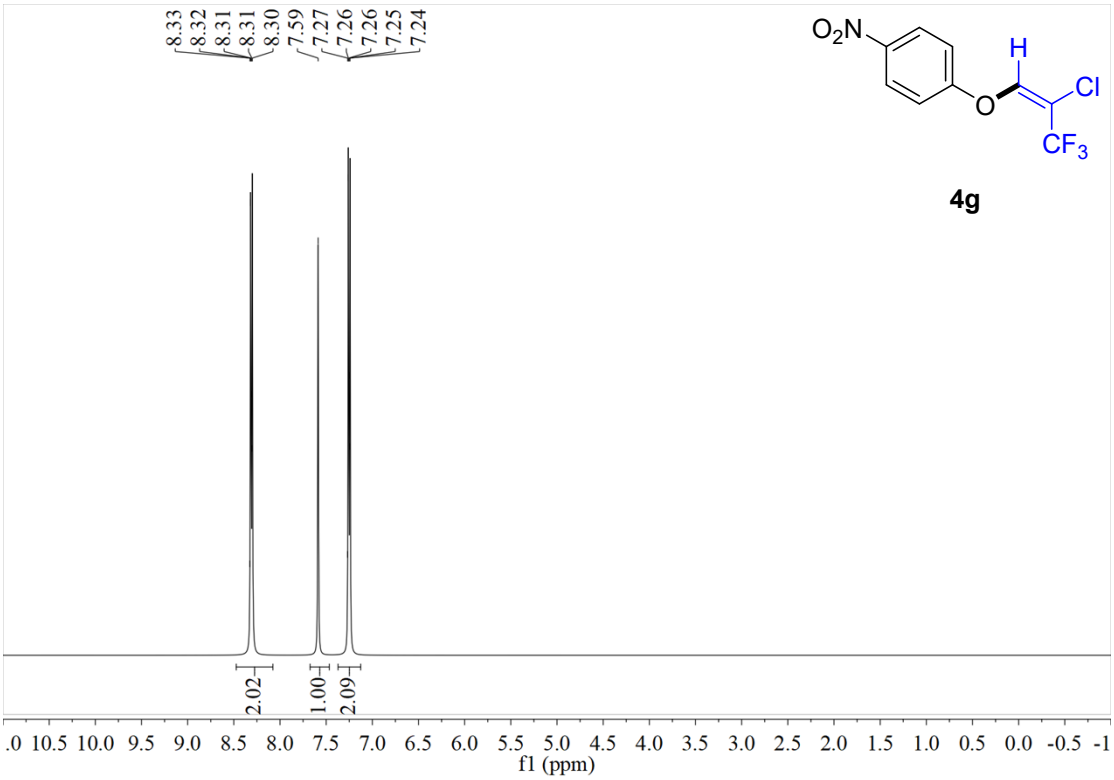
(*E*)-1-bromo-4-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzene (4f)

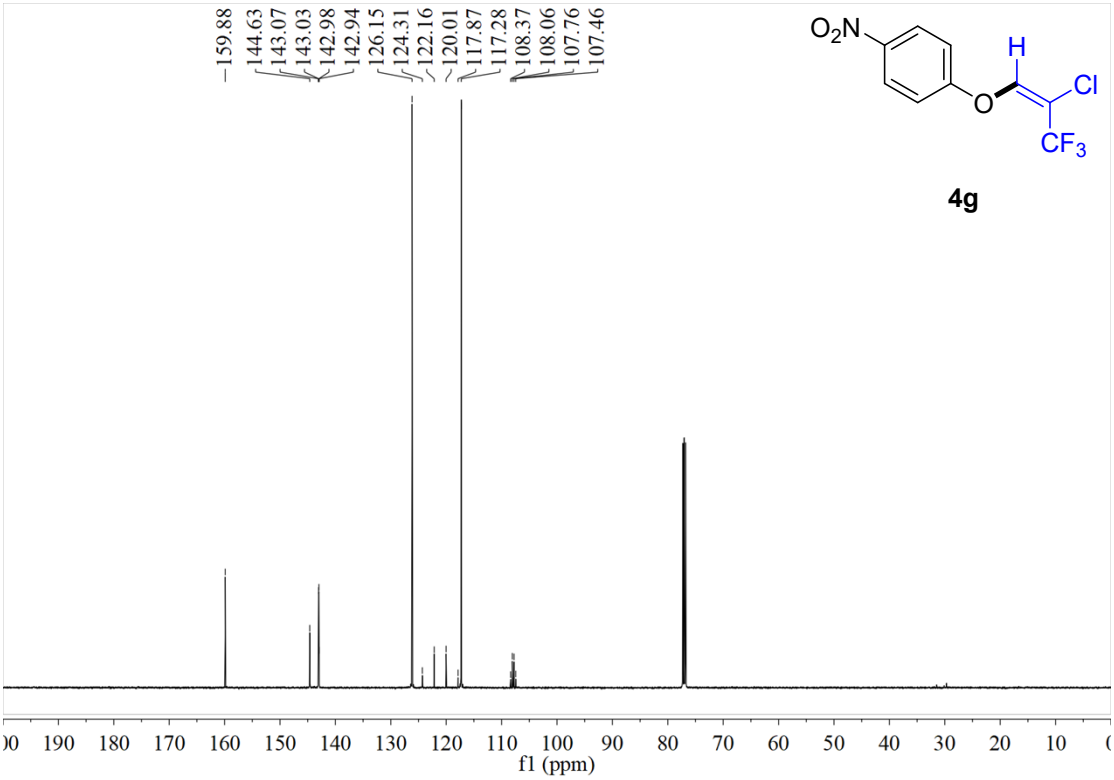


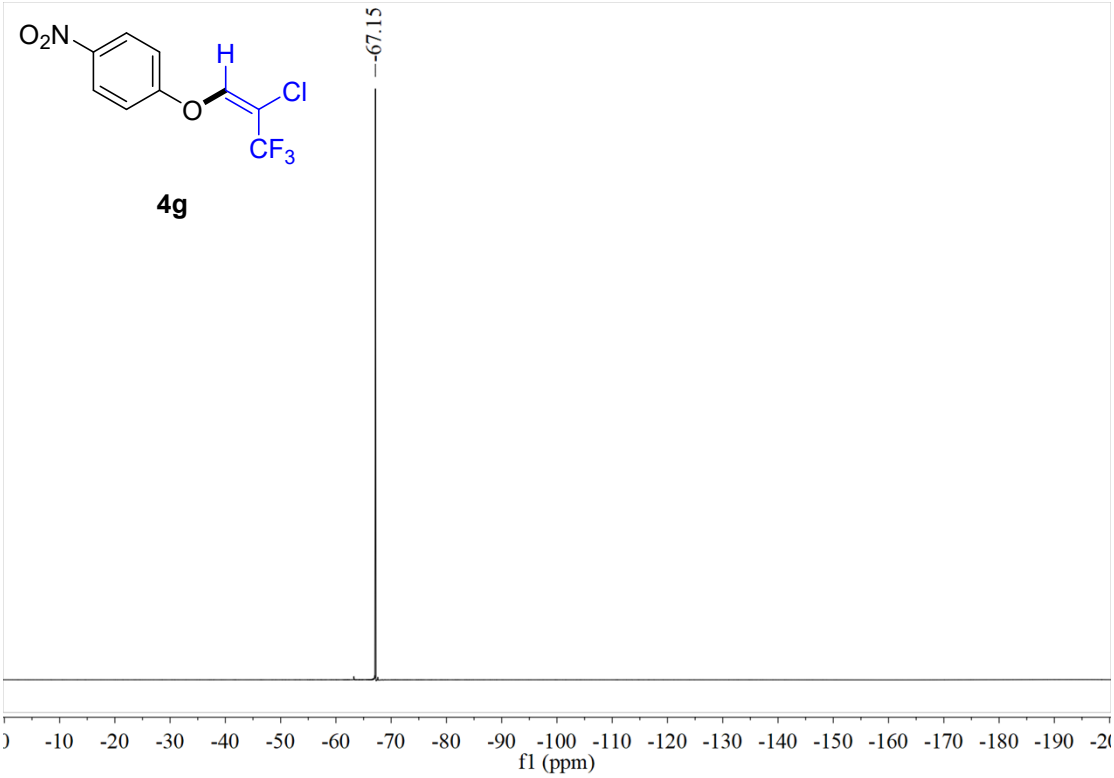




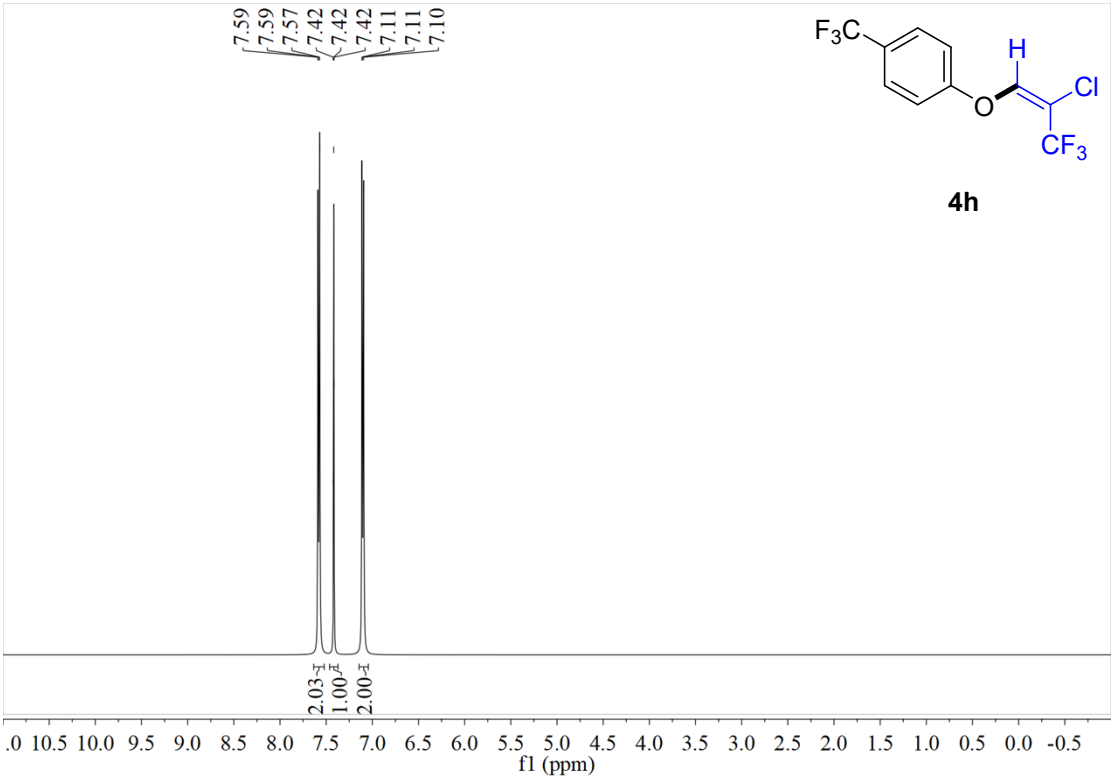
(*E*)-1-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-4-nitrobenzene (4g)

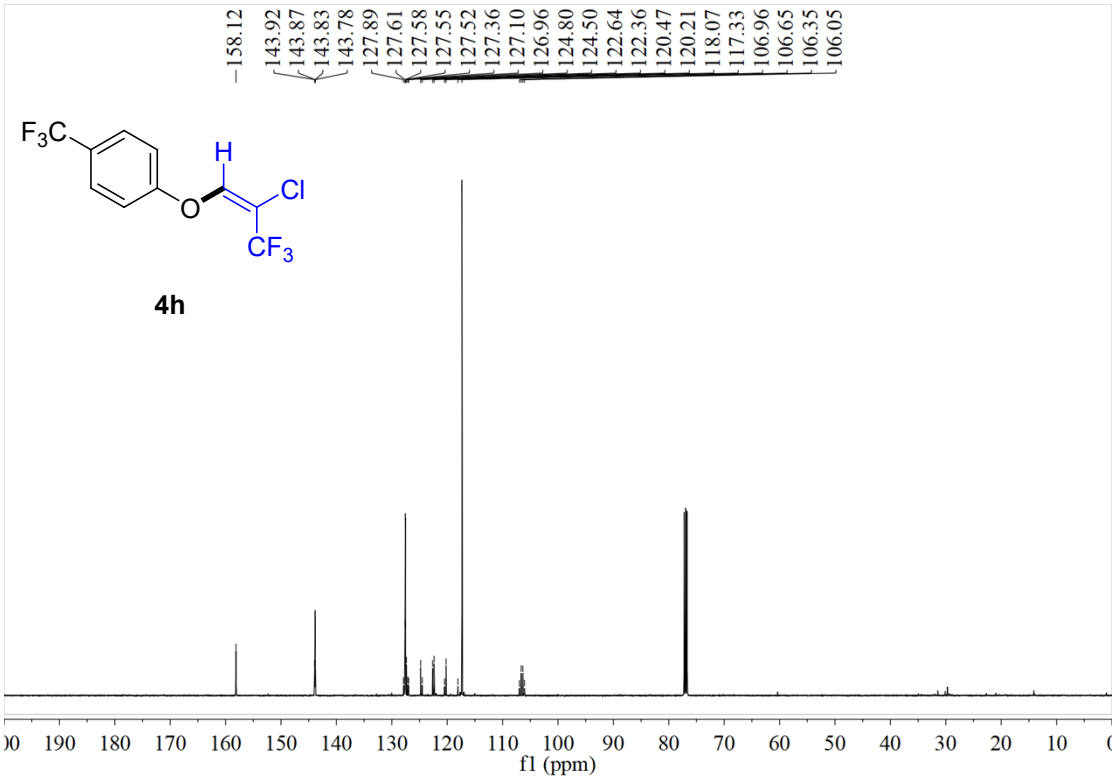

8.33
8.32
8.31
8.31
8.30
7.59
7.27
7.26
7.26
7.25
7.24
2.02
1.00
2.09
f1 (ppm)
O2N
H
Cl
CF3
O
4g

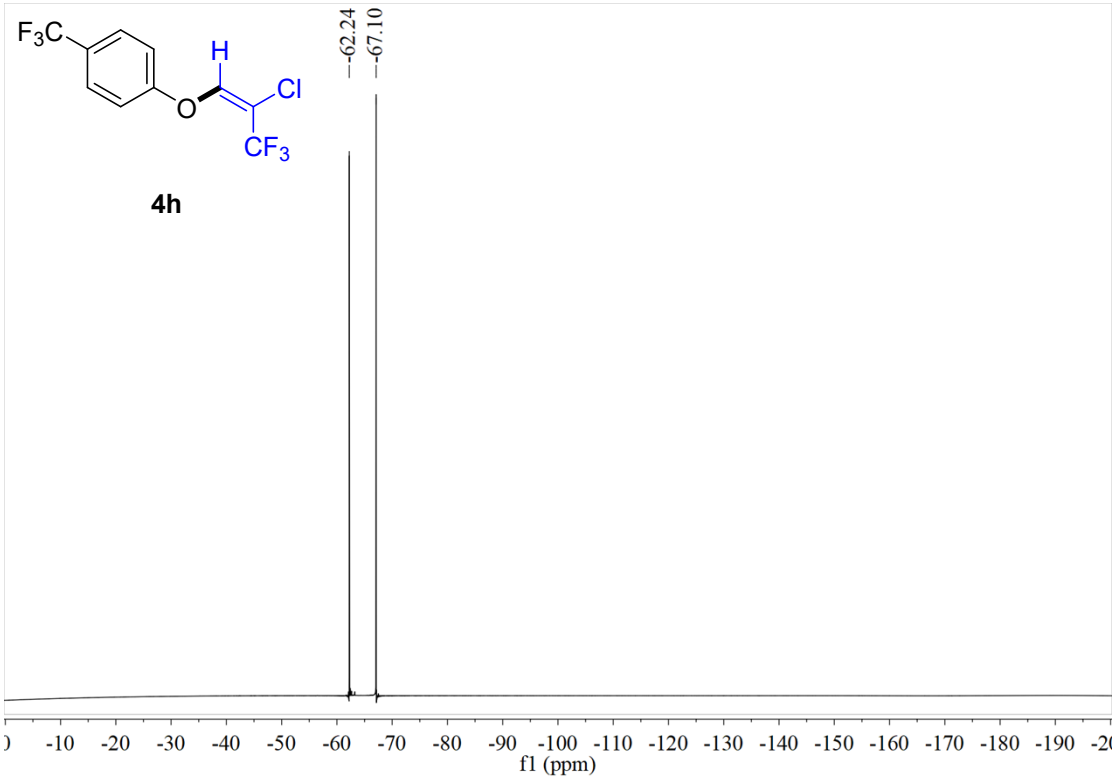

159.88
144.63
143.07
143.03
142.98
142.94
126.15
124.31
122.16
120.01
117.87
117.28
108.37
108.06
107.76
107.46
f1 (ppm)
O2N
H
Cl
CF3
O
4g



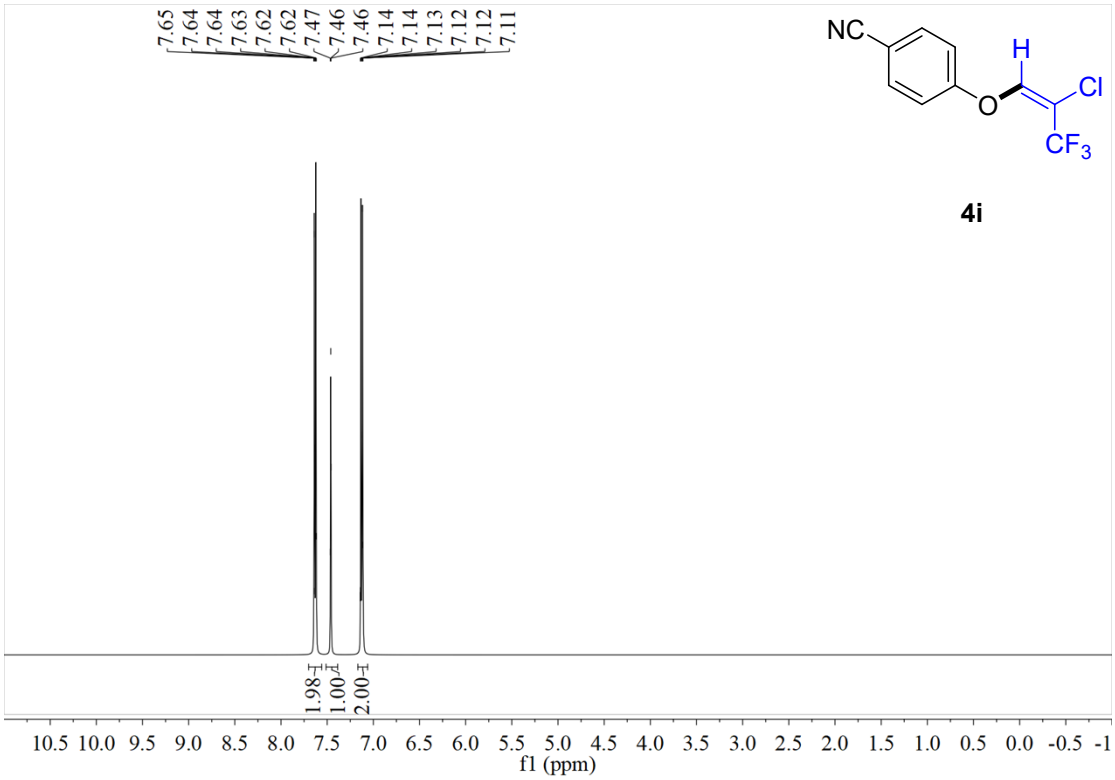
(*E*)-1-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-4-(trifluoromethyl)benzene (4h)

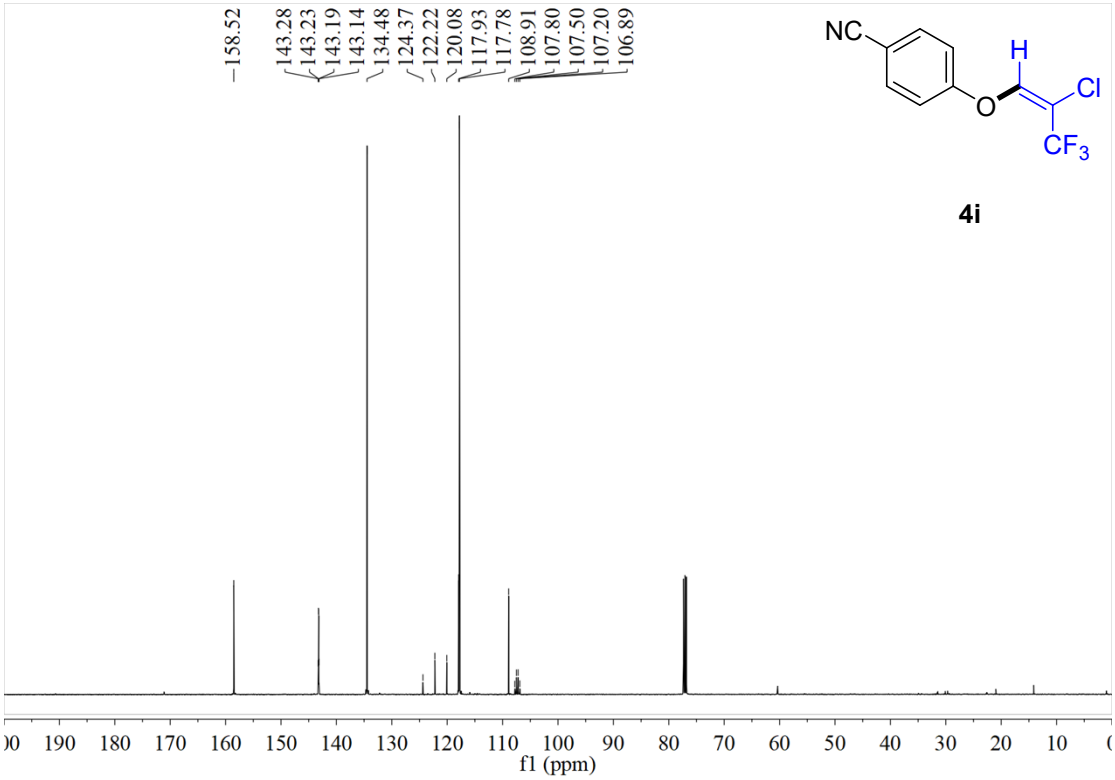


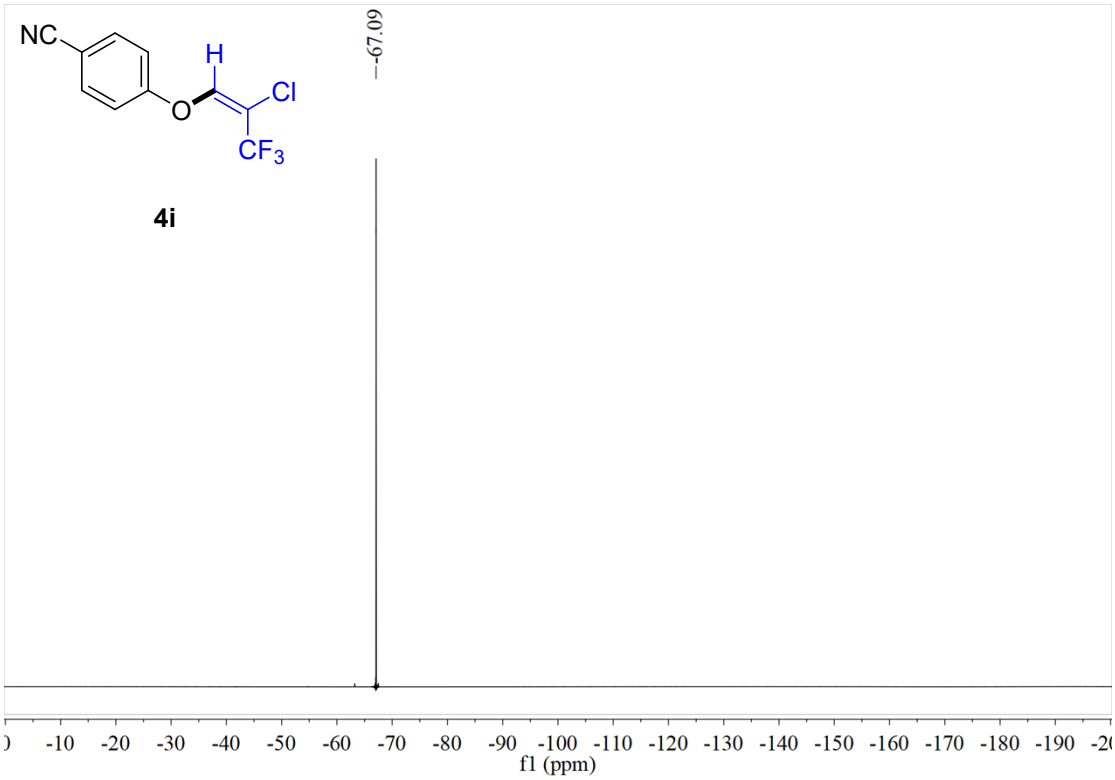




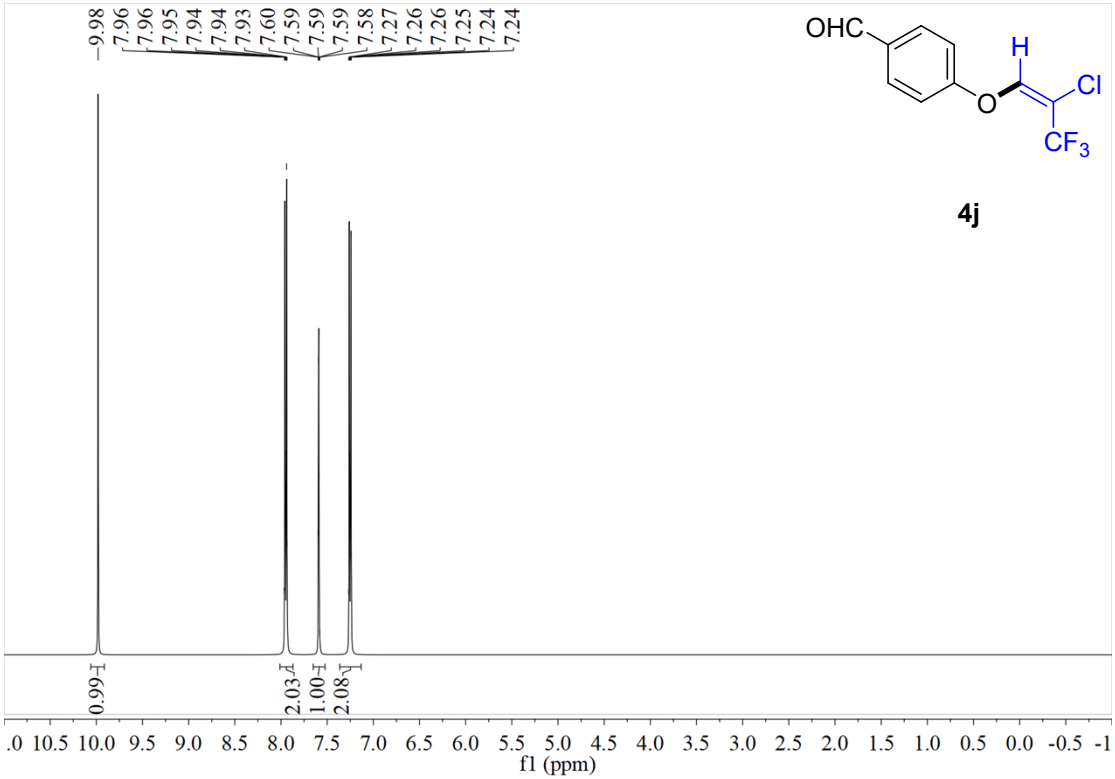
(*E*)-4-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzonitrile (4i)

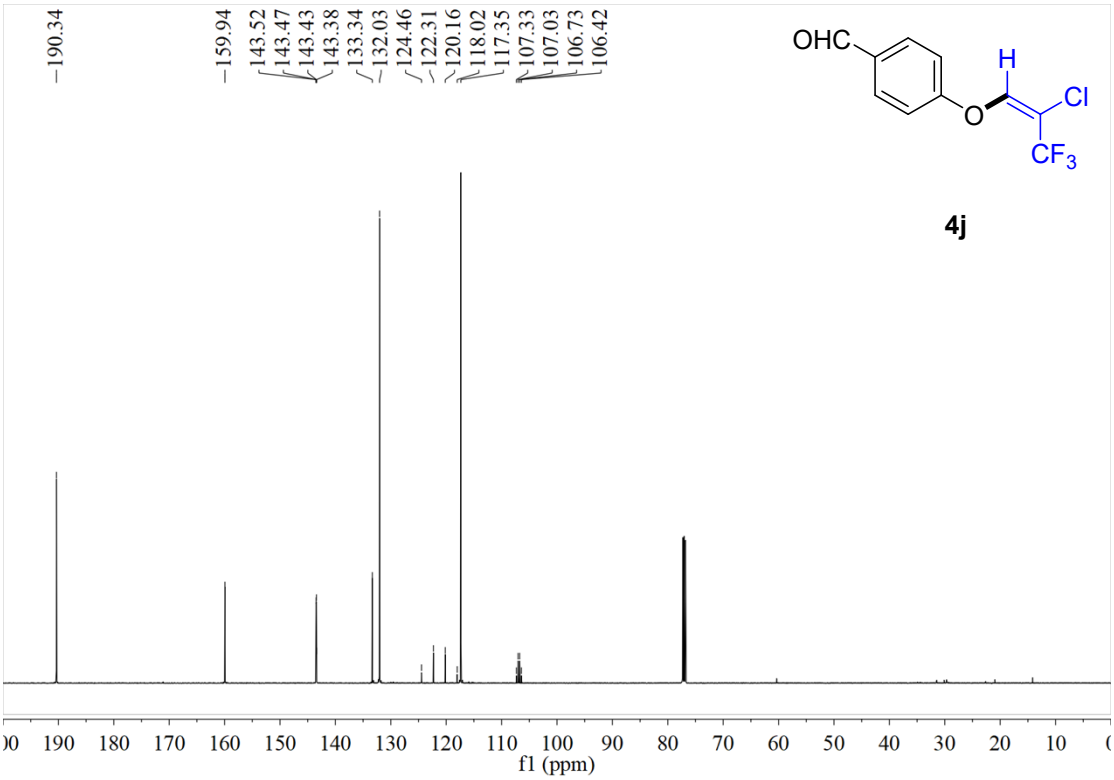

7.65
7.64
7.64
7.63
7.62
7.62
7.47
7.46
7.46
7.14
7.14
7.13
7.12
7.12
7.11
NC
H
O
Cl
CF3
4i
1.98
1.00
2.00
10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5 -1
f1 (ppm)

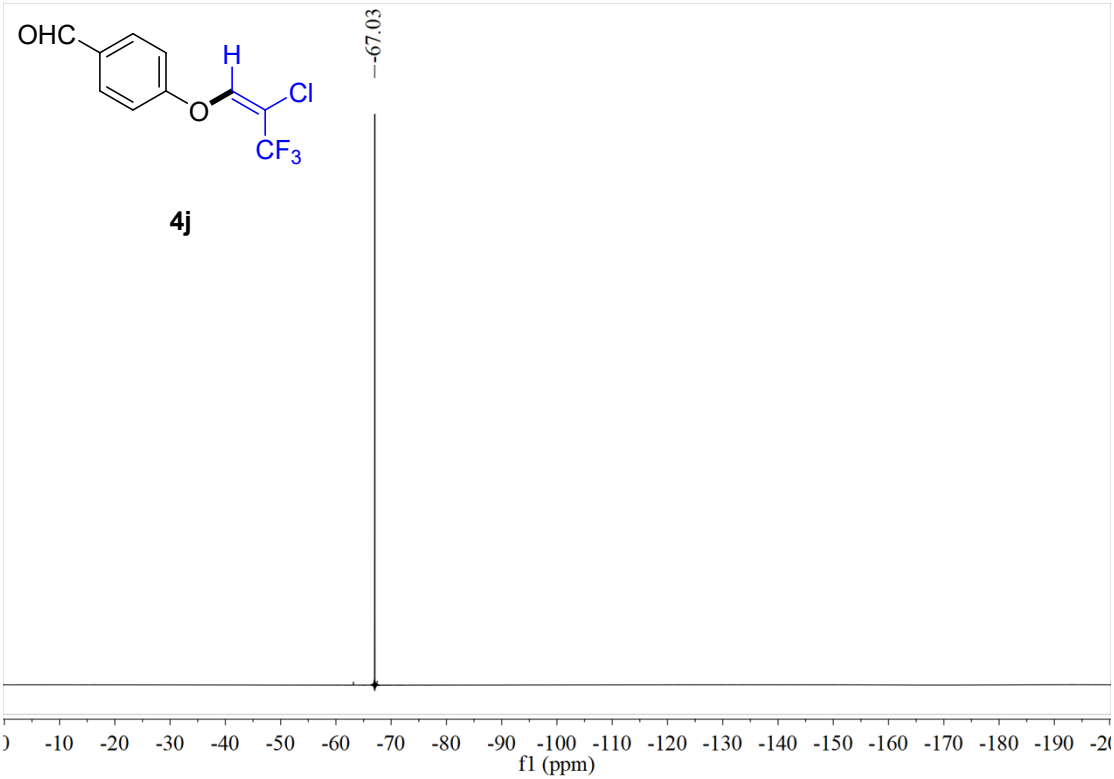

158.52
143.28
143.23
143.19
143.14
134.48
124.37
122.22
120.08
117.93
117.78
108.91
107.80
107.50
107.20
106.89
NC
H
O
Cl
CF3
4i
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
f1 (ppm)



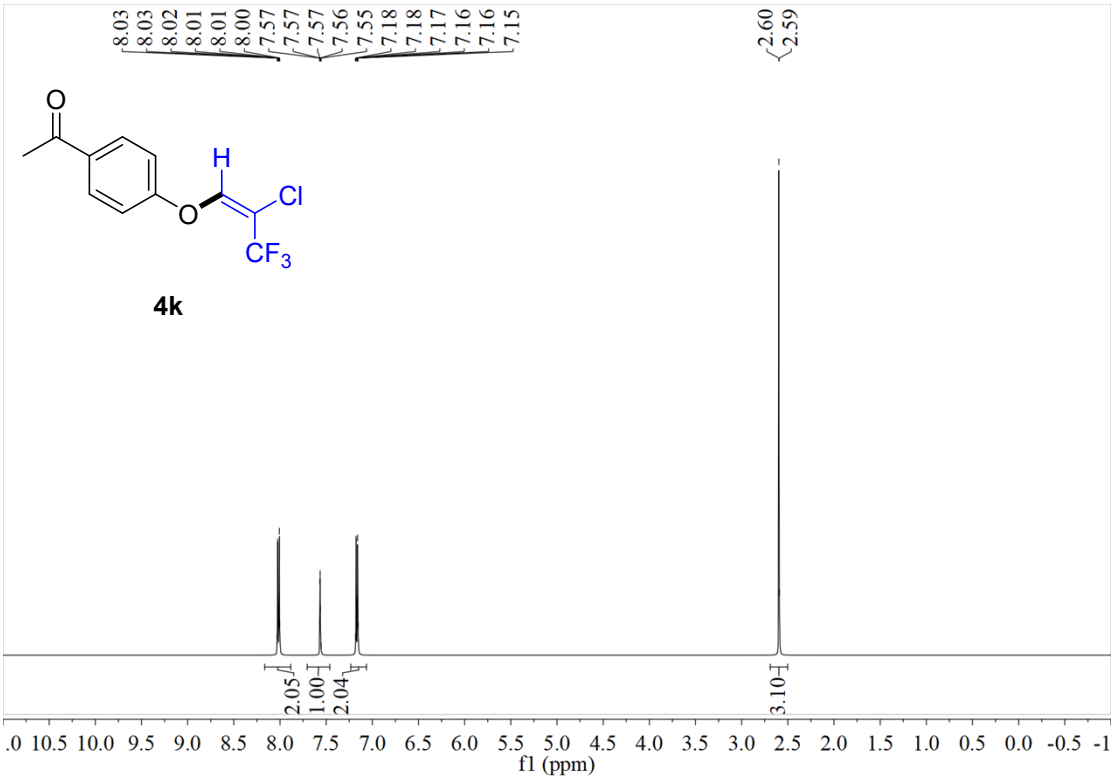
(*E*)-4-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzaldehyde (4j)

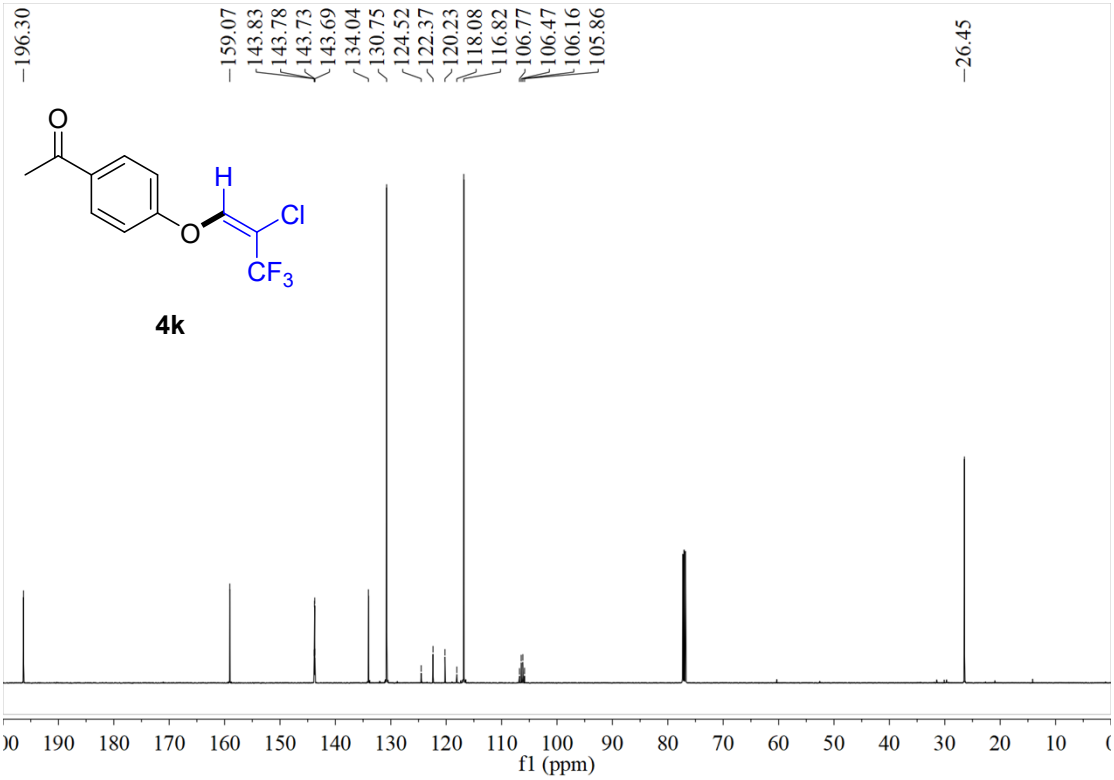


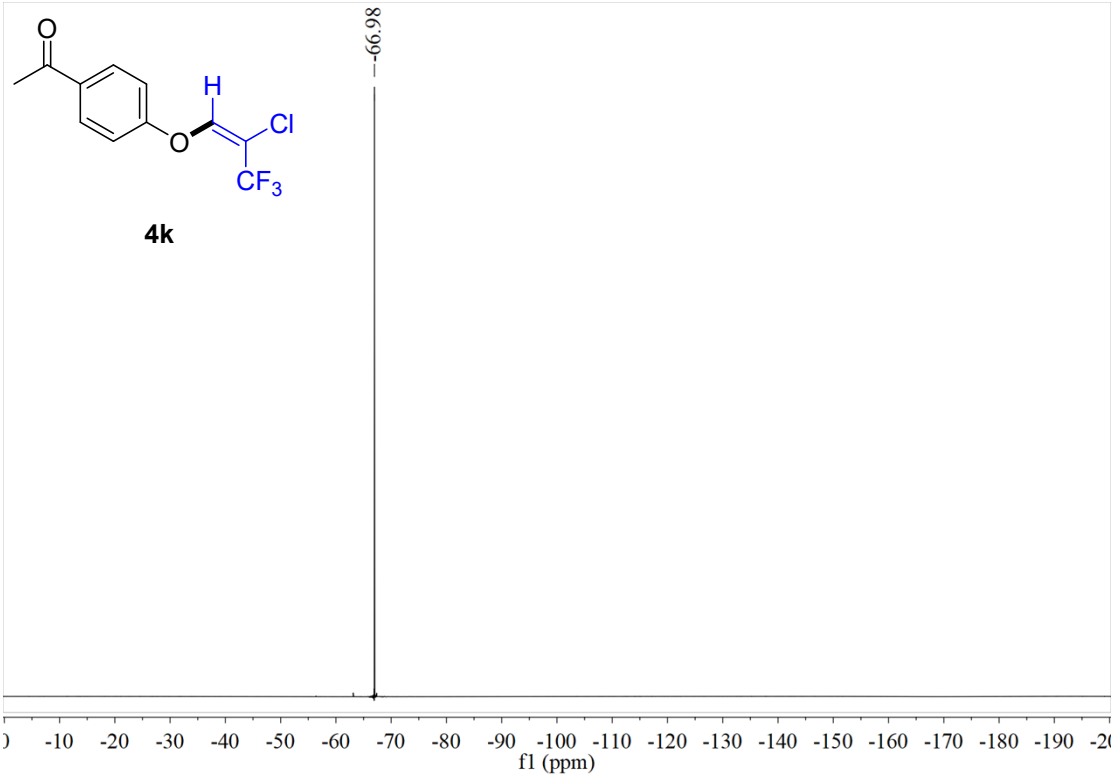




(*E*)-1-(4-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)phenyl)ethan-1-one (4k)

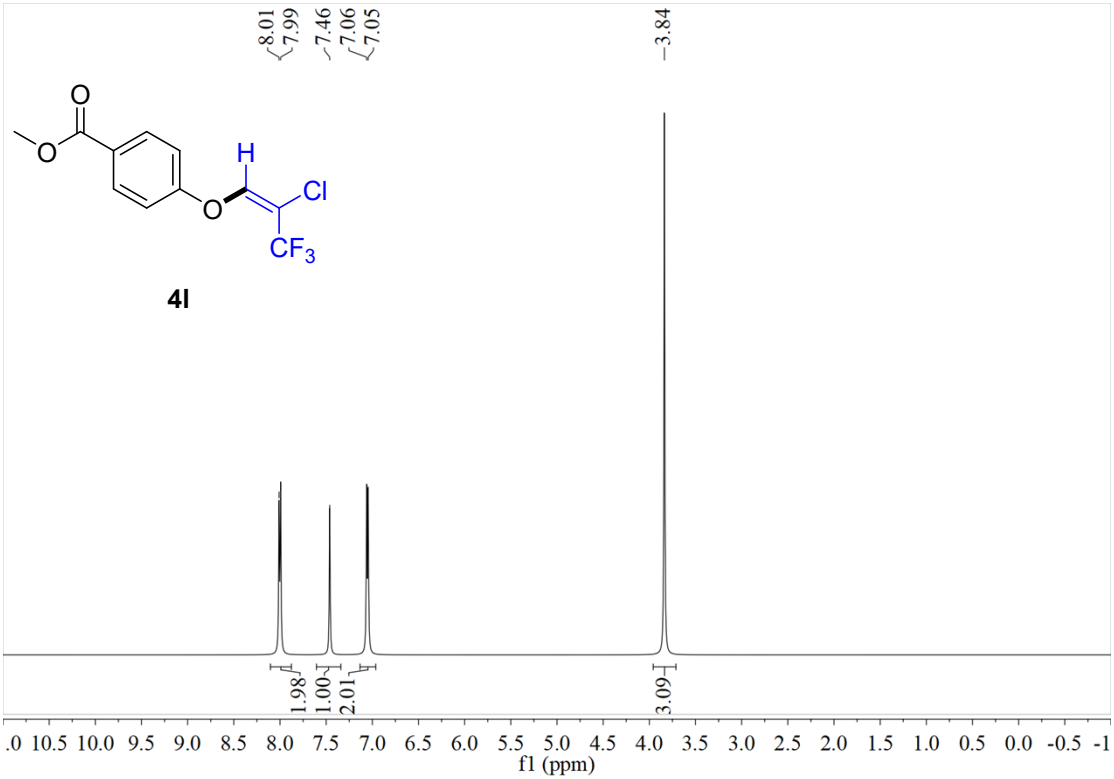

8.03
8.03
8.02
8.01
8.01
8.00
7.57
7.57
7.57
7.56
7.55
7.18
7.17
7.16
7.16
7.15
2.60
2.59
O
H
Cl
O
CF3
4k
2.05
1.00
2.04
3.10
f1 (ppm)


196.30
159.07
143.83
143.78
143.73
143.69
134.04
130.75
124.52
122.37
120.23
118.08
116.82
106.77
106.47
106.16
105.86
26.45
O
H
Cl
O
CF3
4k
f1 (ppm)

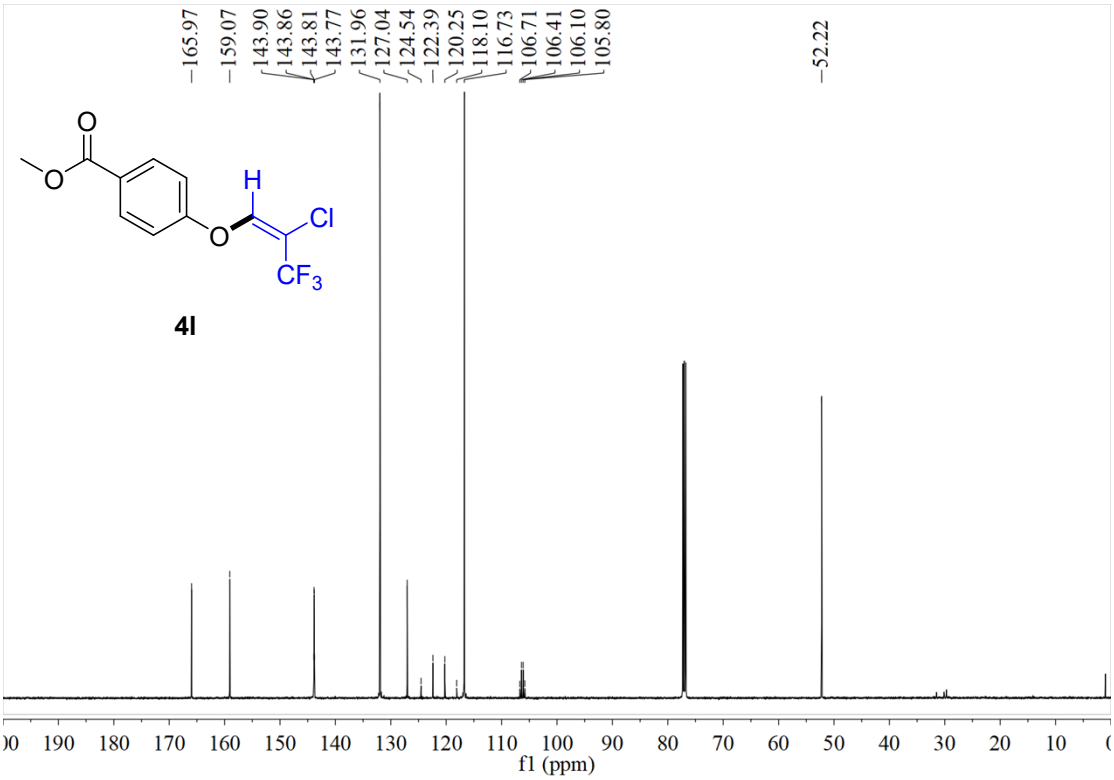


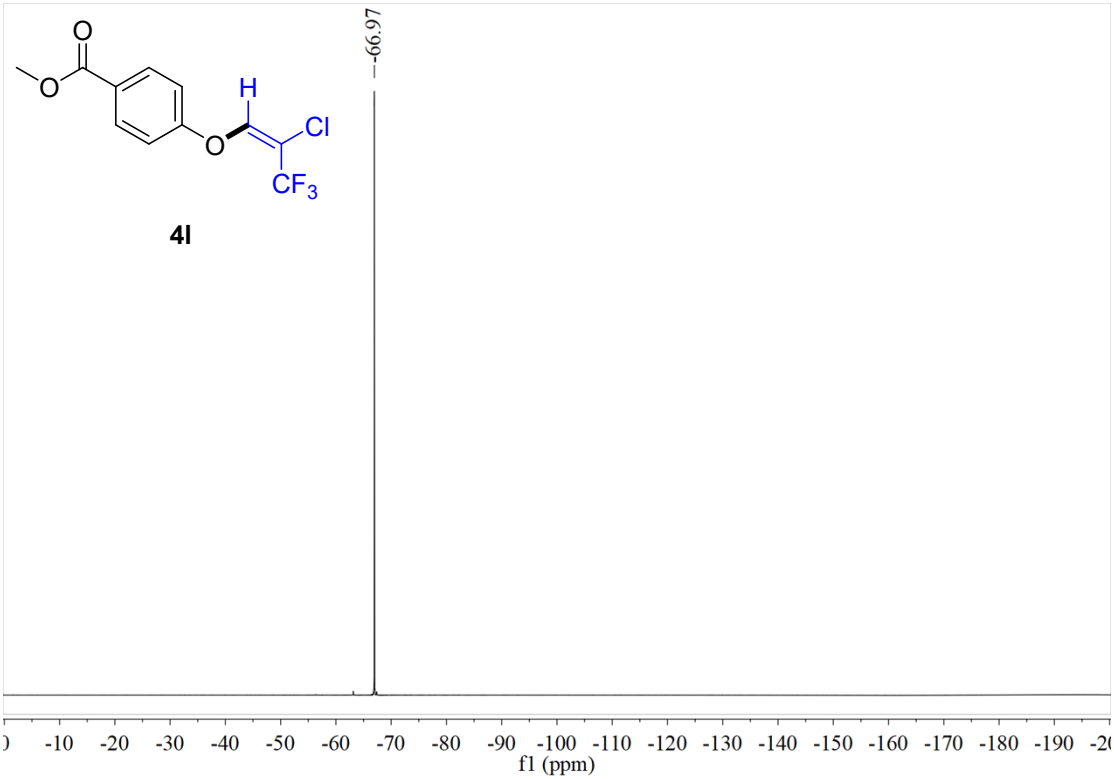
4k

Methyl (*E*)-4-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzoate (4l)

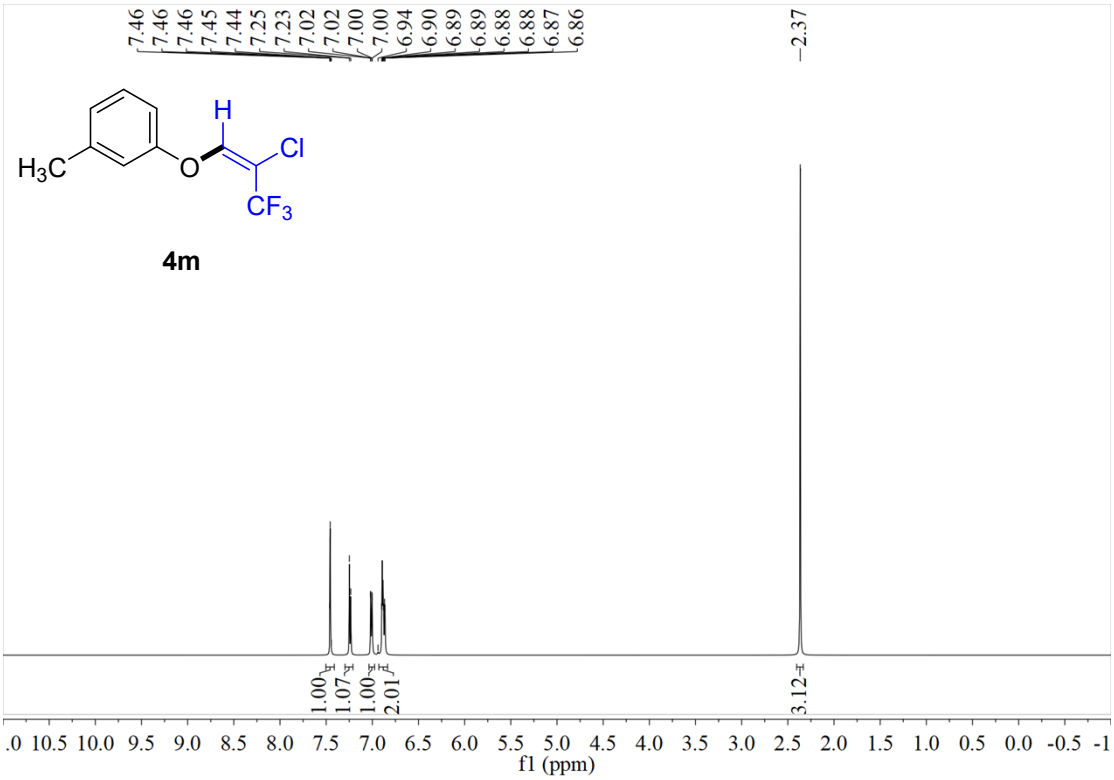


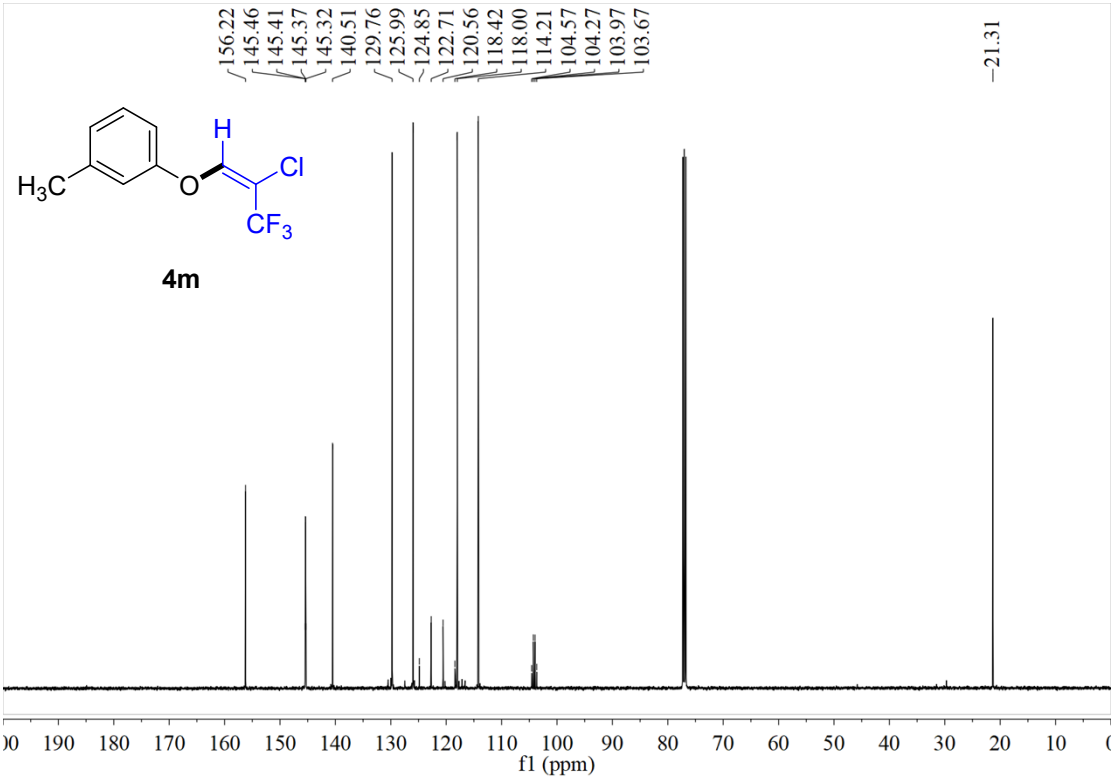
4l

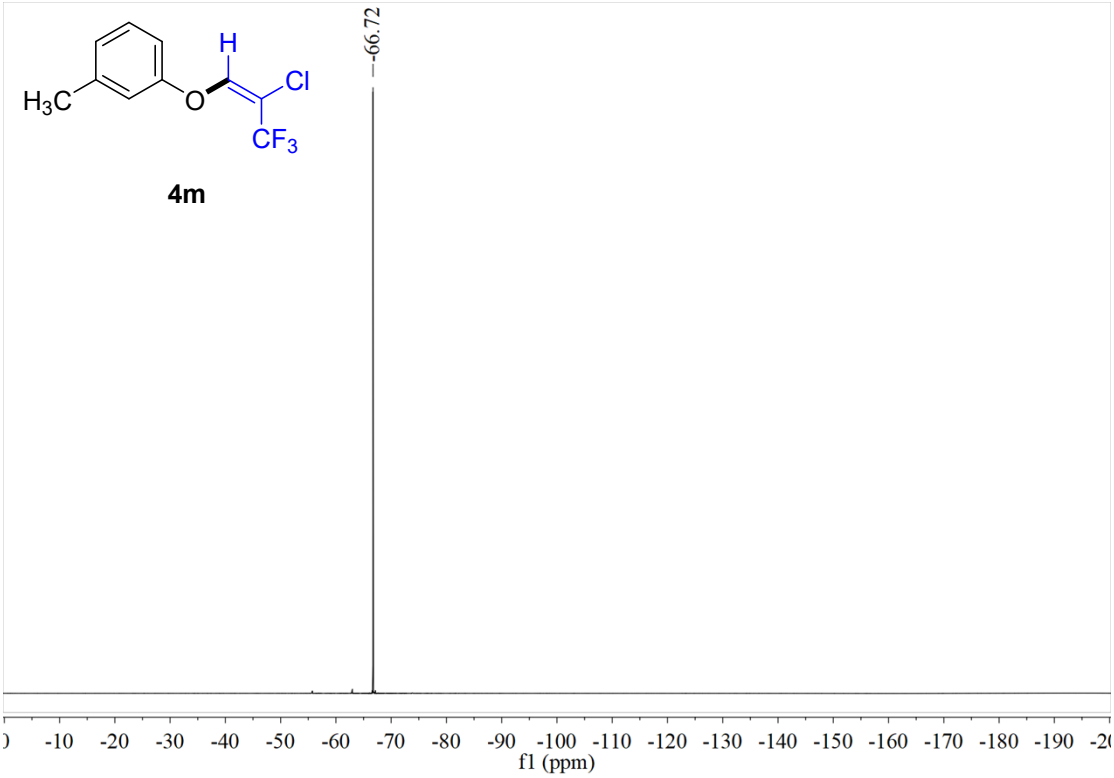




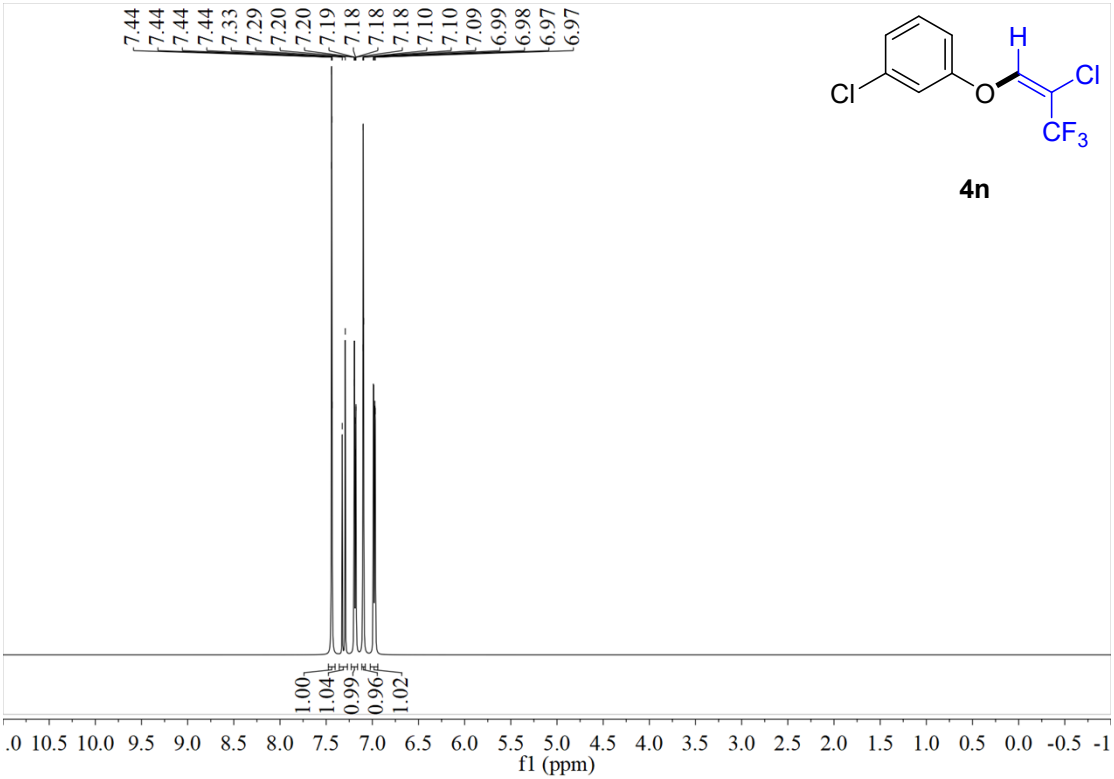
(*E*)-1-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-3-methylbenzene (4m)

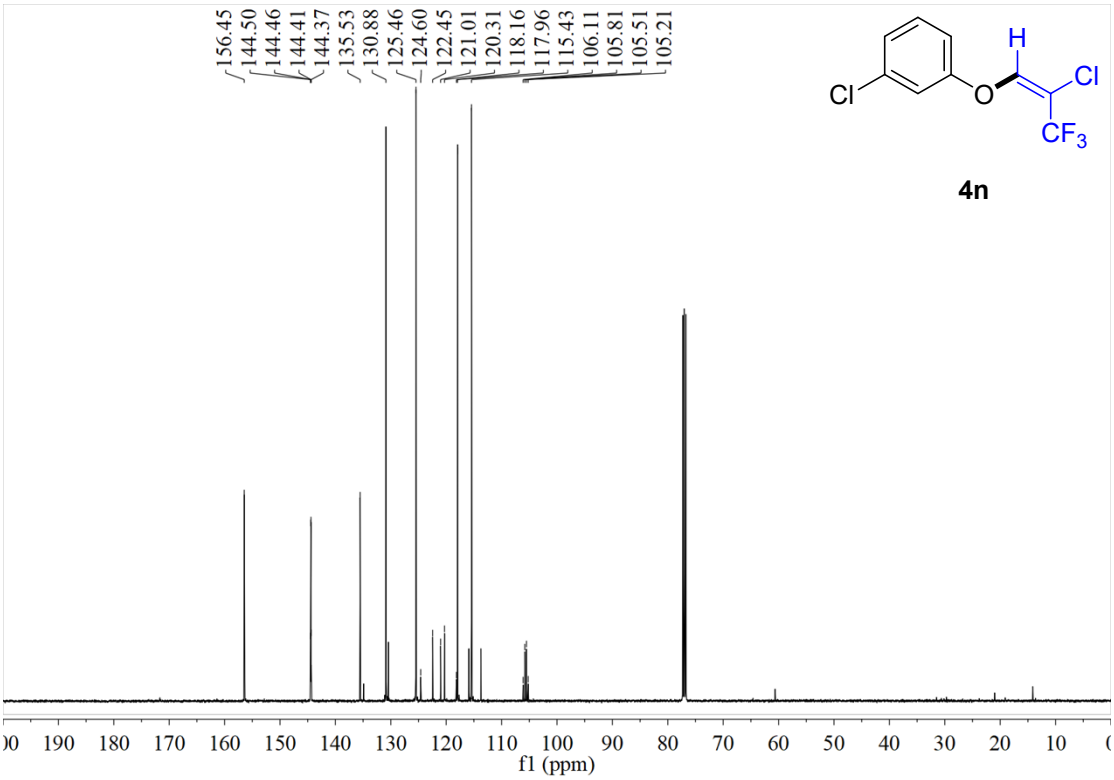

7.46
7.46
7.46
7.45
7.44
7.25
7.23
7.02
7.02
7.00
7.00
6.94
6.90
6.89
6.89
6.88
6.88
6.87
6.86
2.37
H
Cl
H3C
O
CF3
4m
1.00
1.07
1.00
2.01
3.12
f1 (ppm)

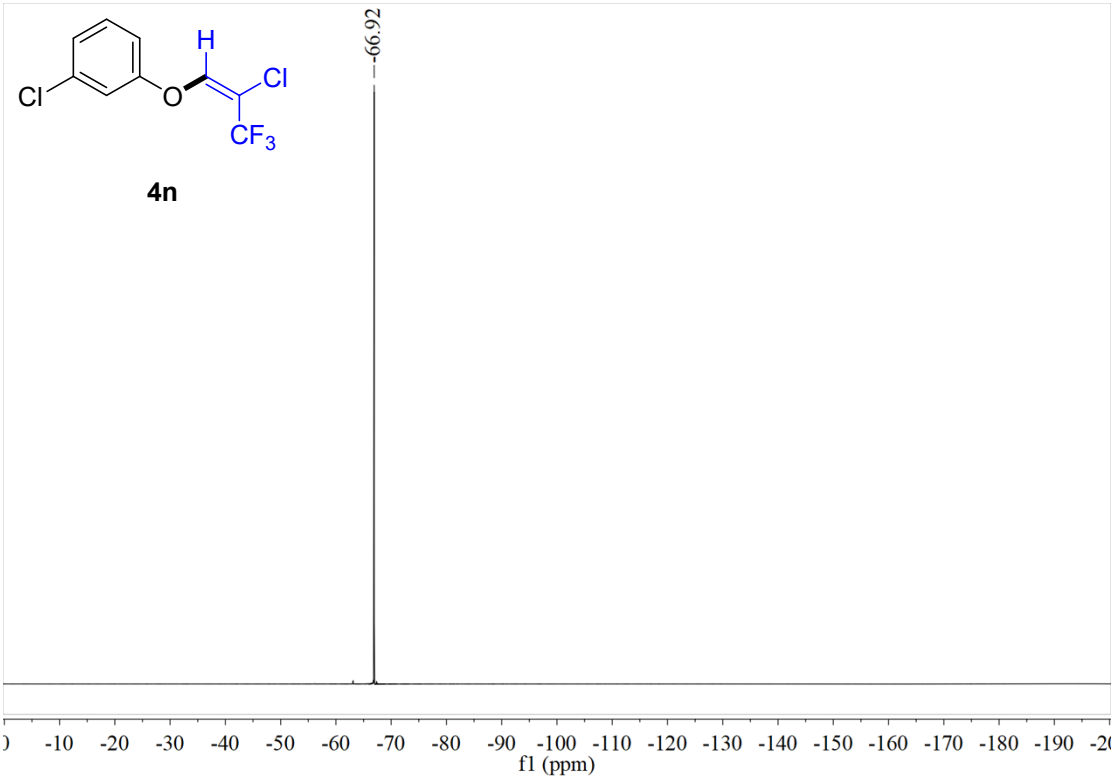

156.22
145.46
145.41
145.37
145.32
140.51
129.76
125.99
124.85
122.71
120.56
118.42
118.00
114.21
104.57
104.27
103.97
103.67
21.31
H
Cl
H3C
O
CF3
4m
f1 (ppm)



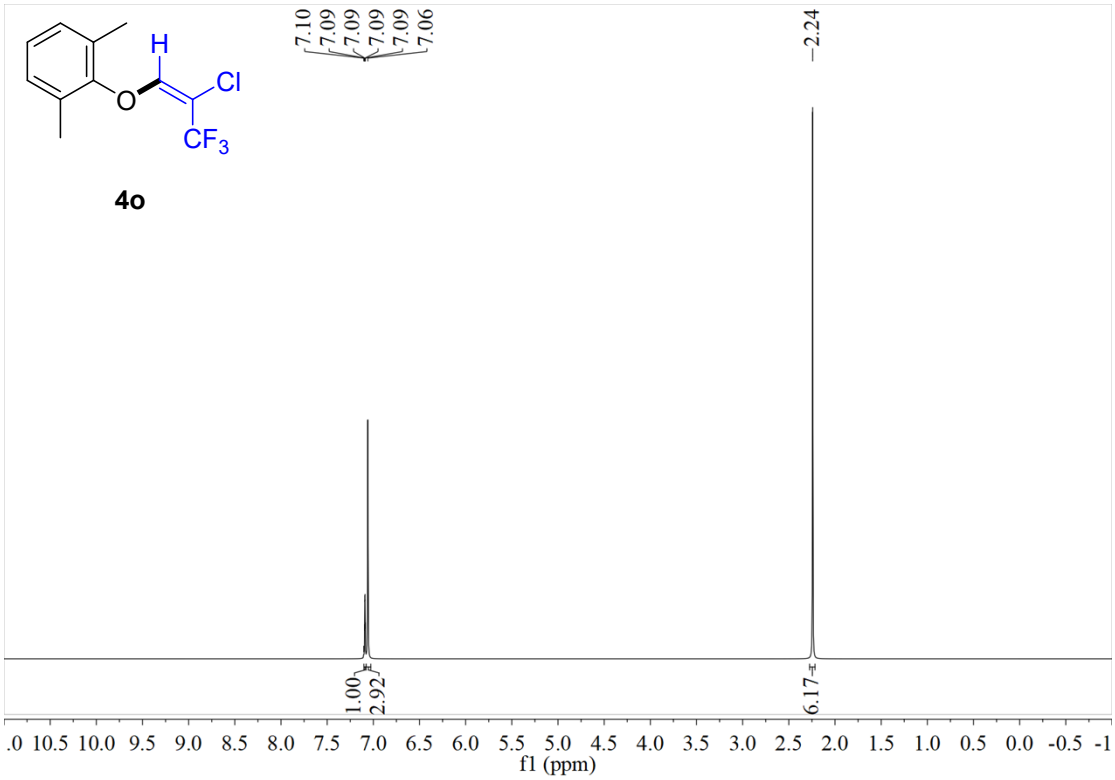
(*E*)-1-chloro-3-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzene (4n)

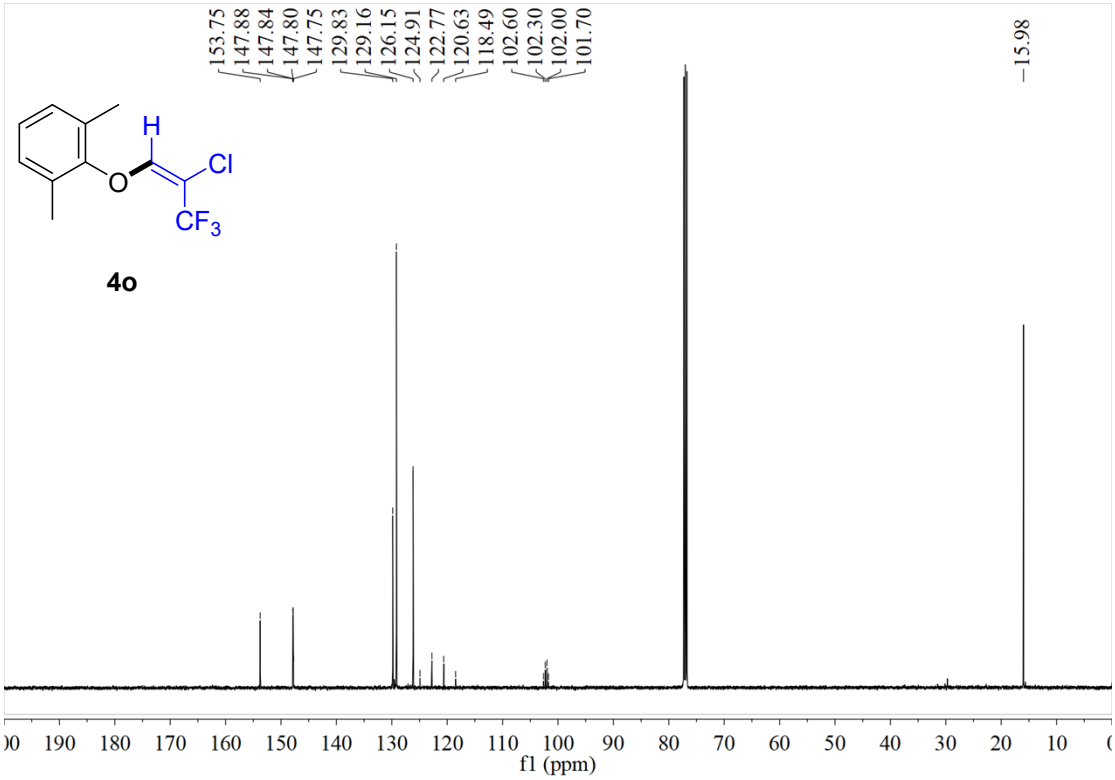


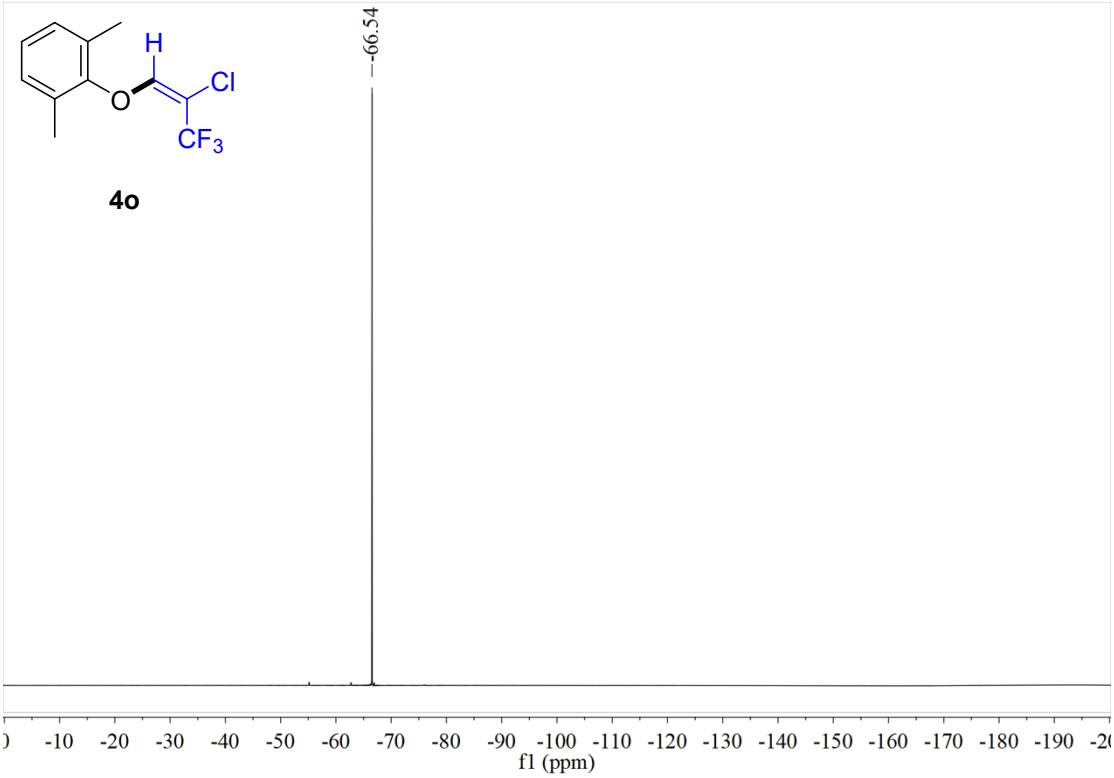




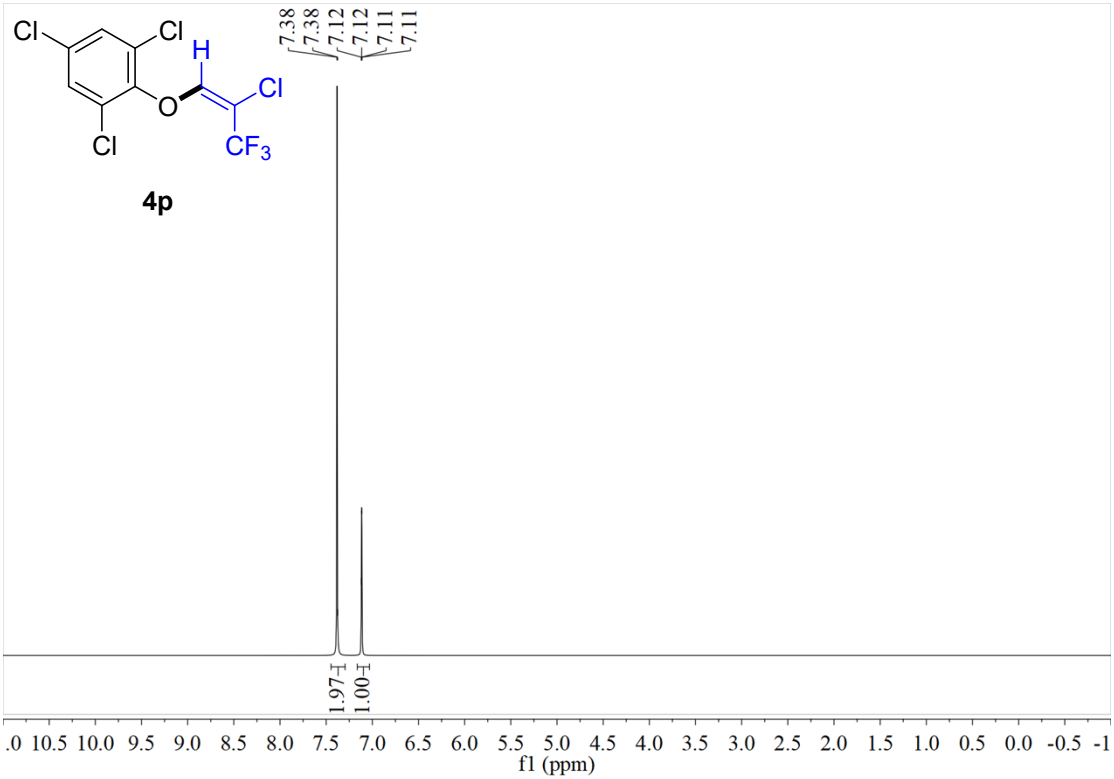
(*E*)-2-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-1,3-dimethylbenzene (4o)

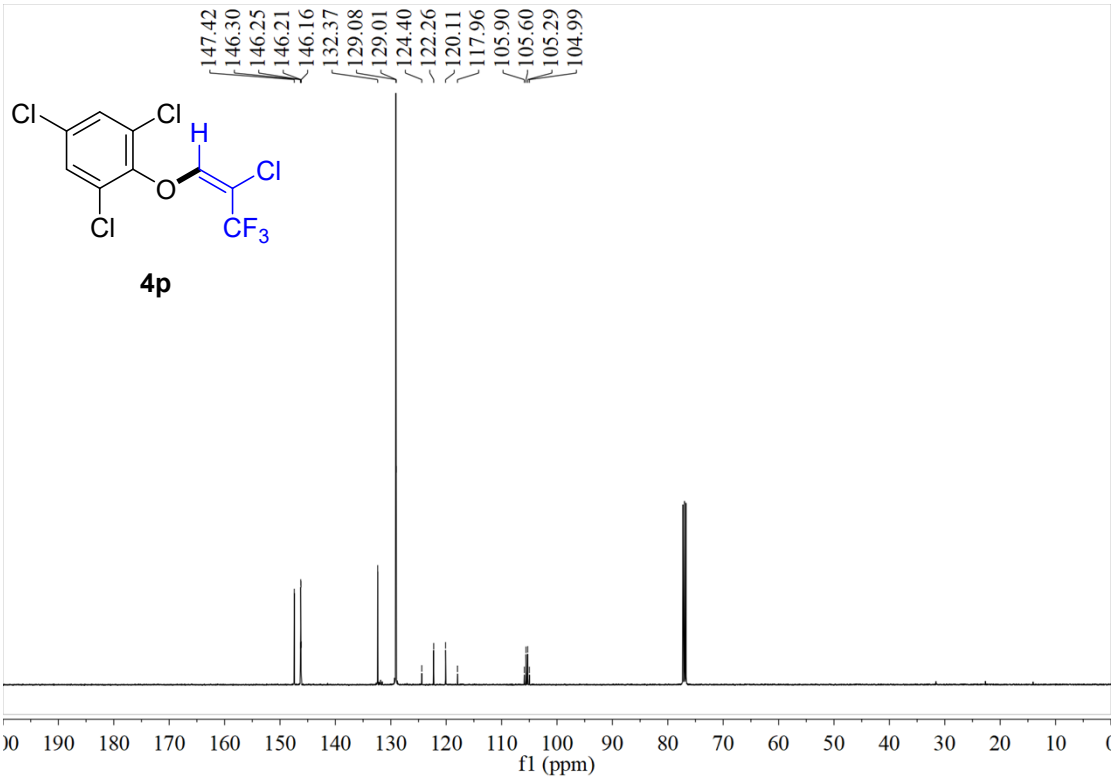

H
O
Cl
CF3
4o
7.10
7.09
7.09
7.09
7.09
7.06
2.24
1.00
2.92
6.17
f1 (ppm)

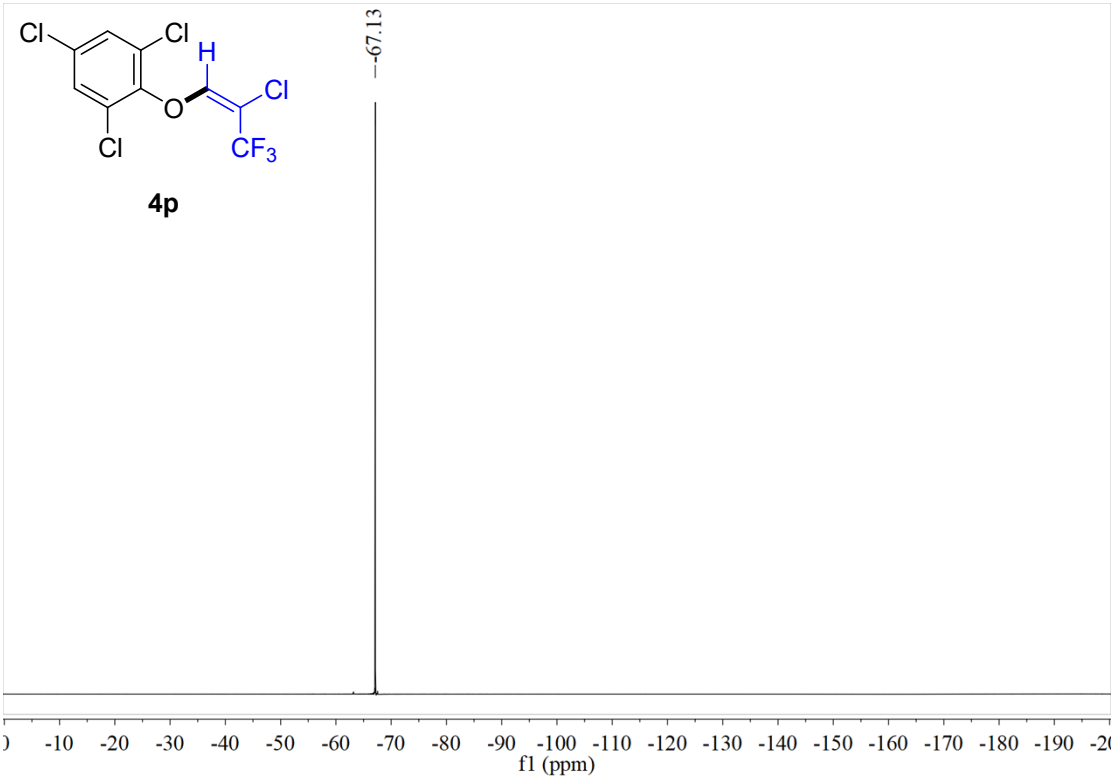

H
O
Cl
CF3
4o
153.75
147.88
147.84
147.80
147.75
129.83
129.16
126.15
124.91
122.77
120.63
118.49
102.60
102.30
102.00
101.70
15.98
f1 (ppm)



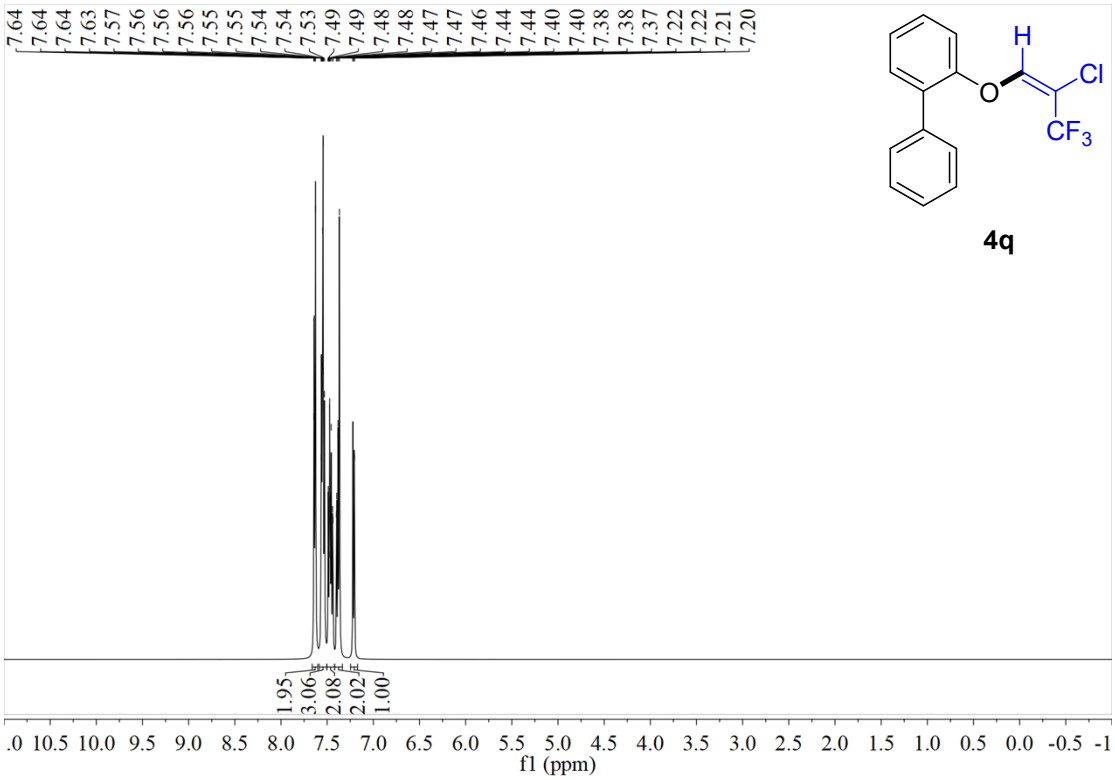
(*E*)-1,3,5-trichloro-2-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzene (4p)

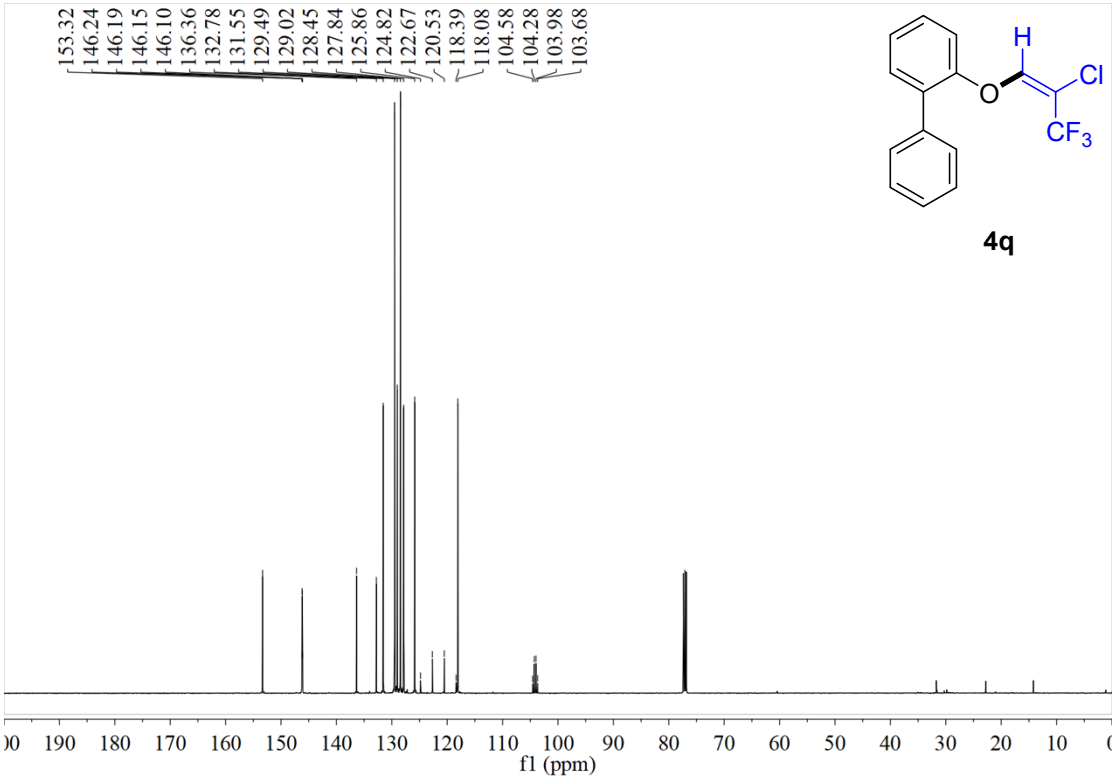


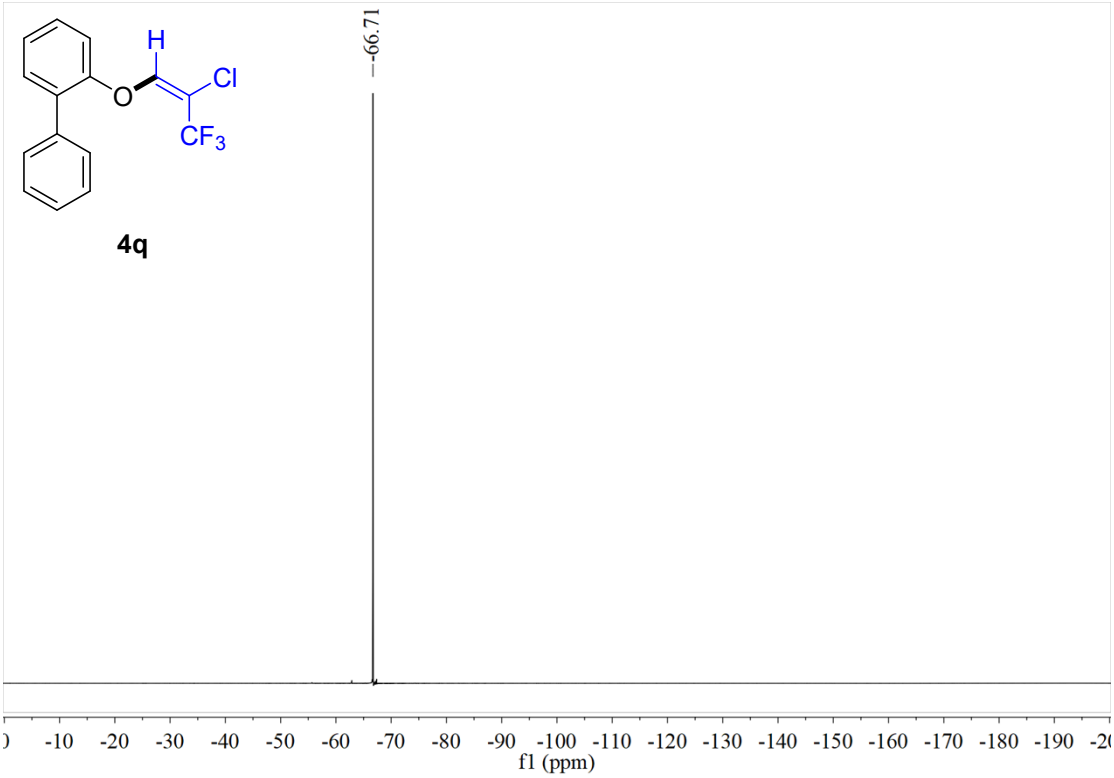




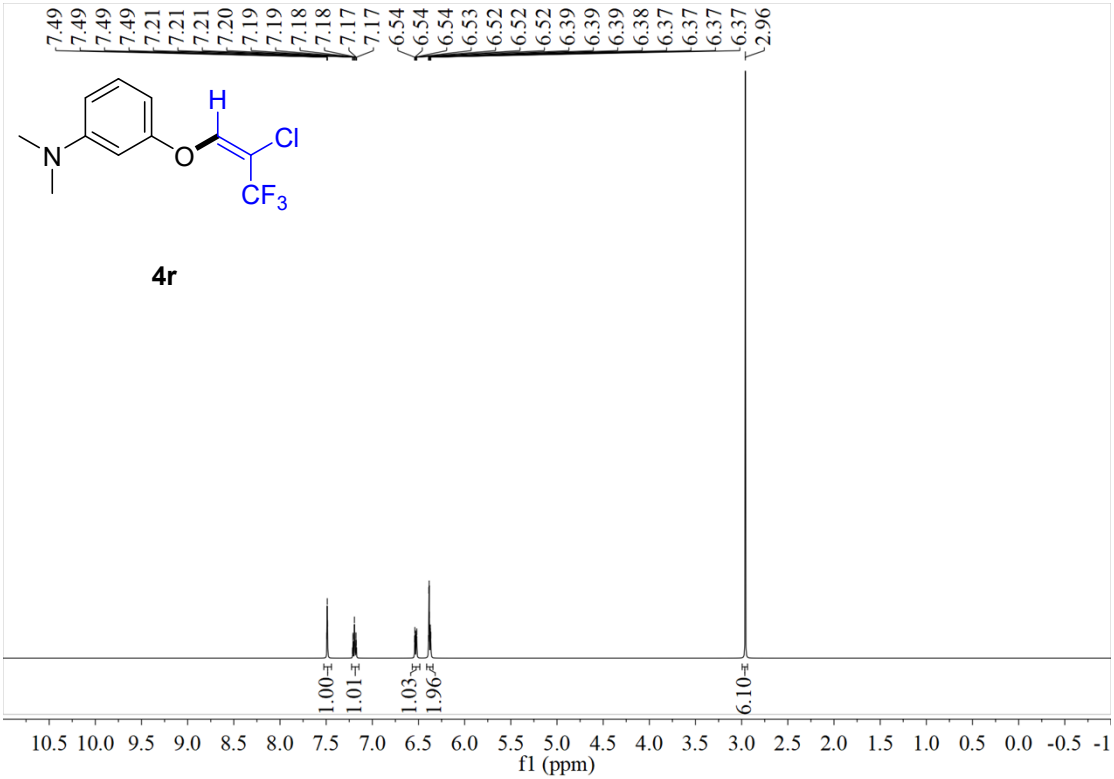
(*E*)-2-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-1,1'-biphenyl (4q)

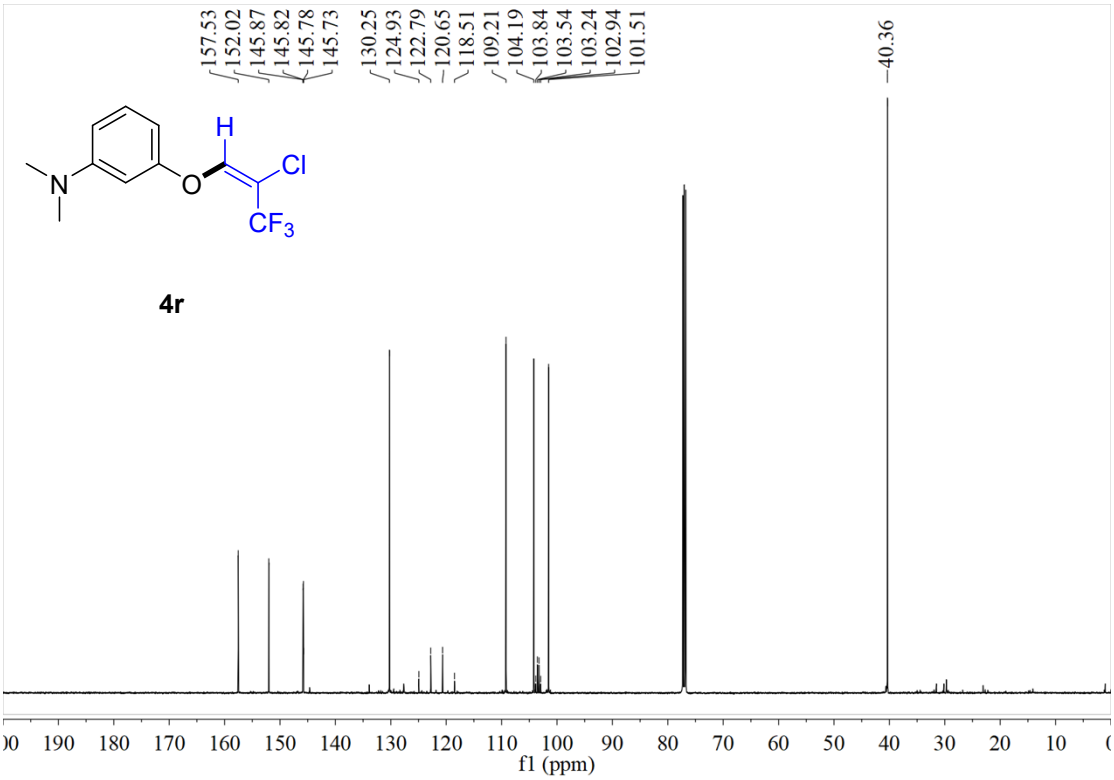

7.64
7.64
7.64
7.63
7.57
7.56
7.56
7.56
7.55
7.55
7.54
7.54
7.53
7.49
7.49
7.48
7.48
7.47
7.47
7.46
7.44
7.44
7.40
7.40
7.38
7.38
7.37
7.22
7.22
7.21
7.20
1.95
3.06
2.08
2.02
1.00
f1 (ppm)
H
Cl
O
CF3
4q

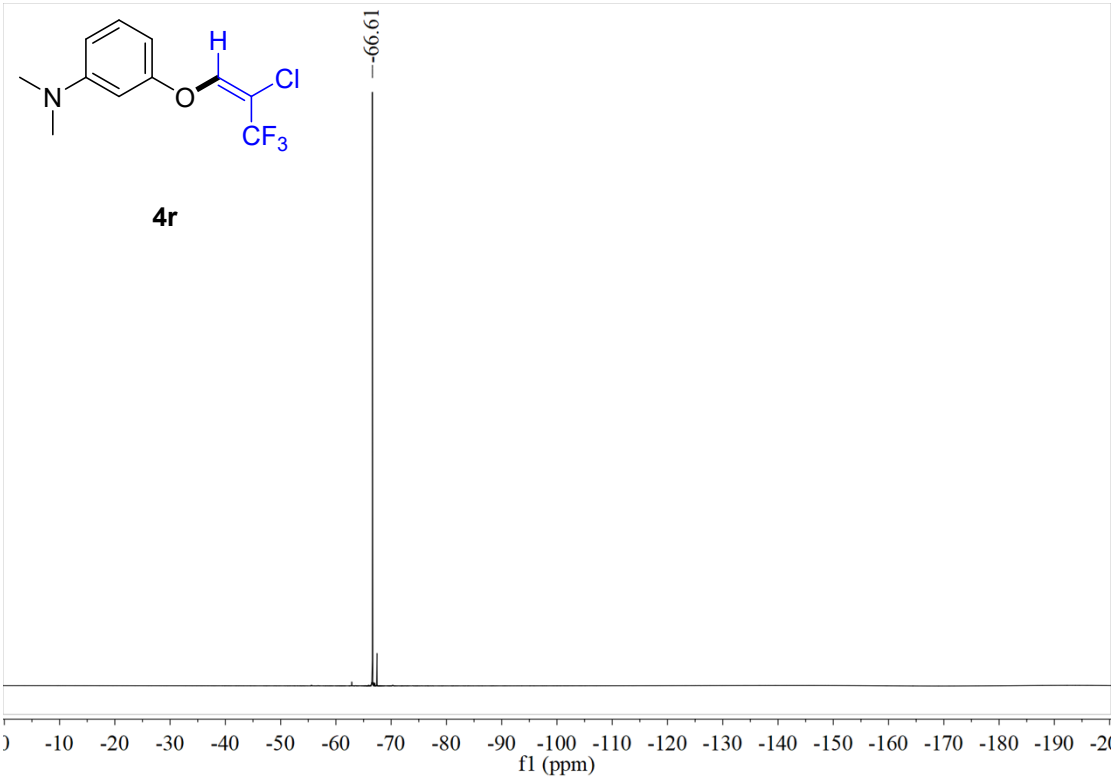

153.32
146.24
146.19
146.15
146.10
136.36
132.78
131.55
129.49
129.02
128.45
127.84
125.86
124.82
122.67
120.53
118.39
118.08
104.58
104.28
103.98
103.68
f1 (ppm)
H
Cl
O
CF3
4q



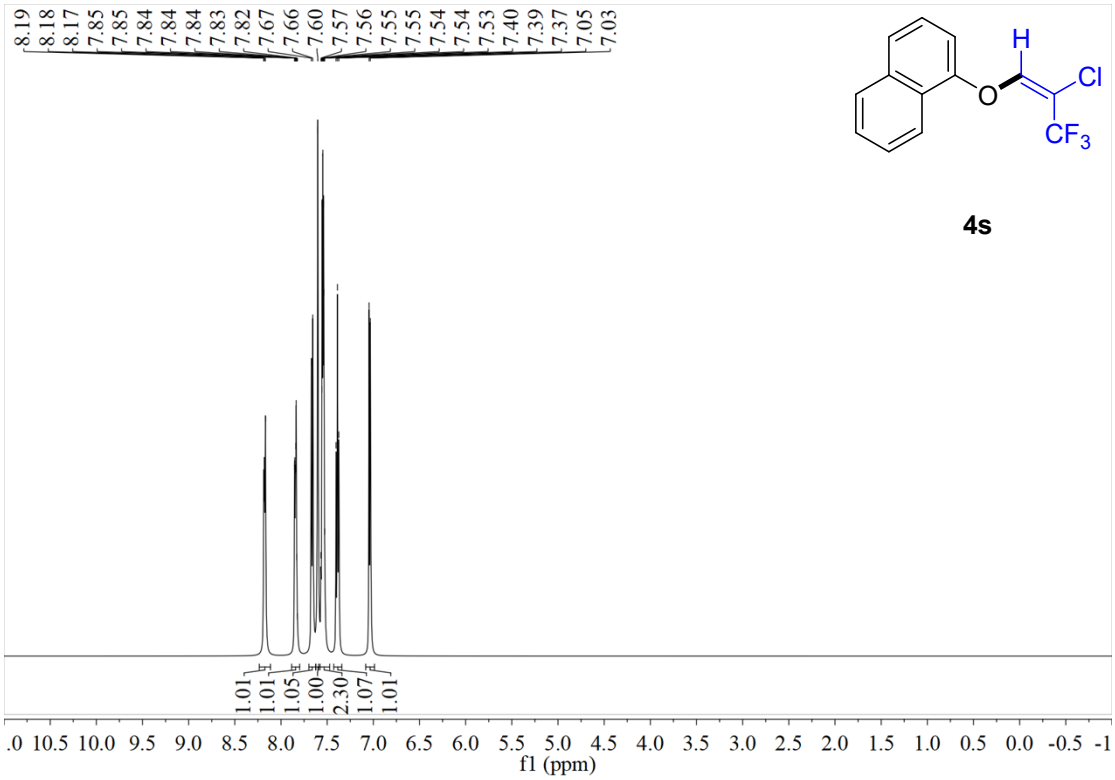
(*E*)-3-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)-*N*,*N*-dimethylaniline (4r)

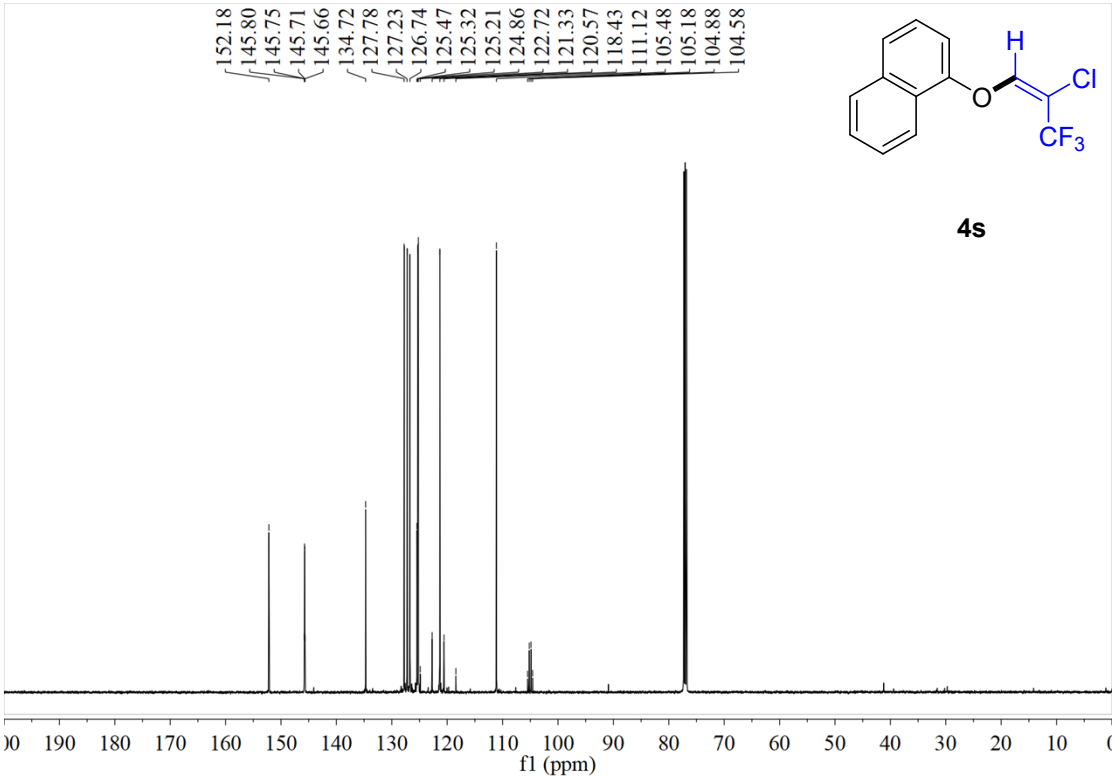


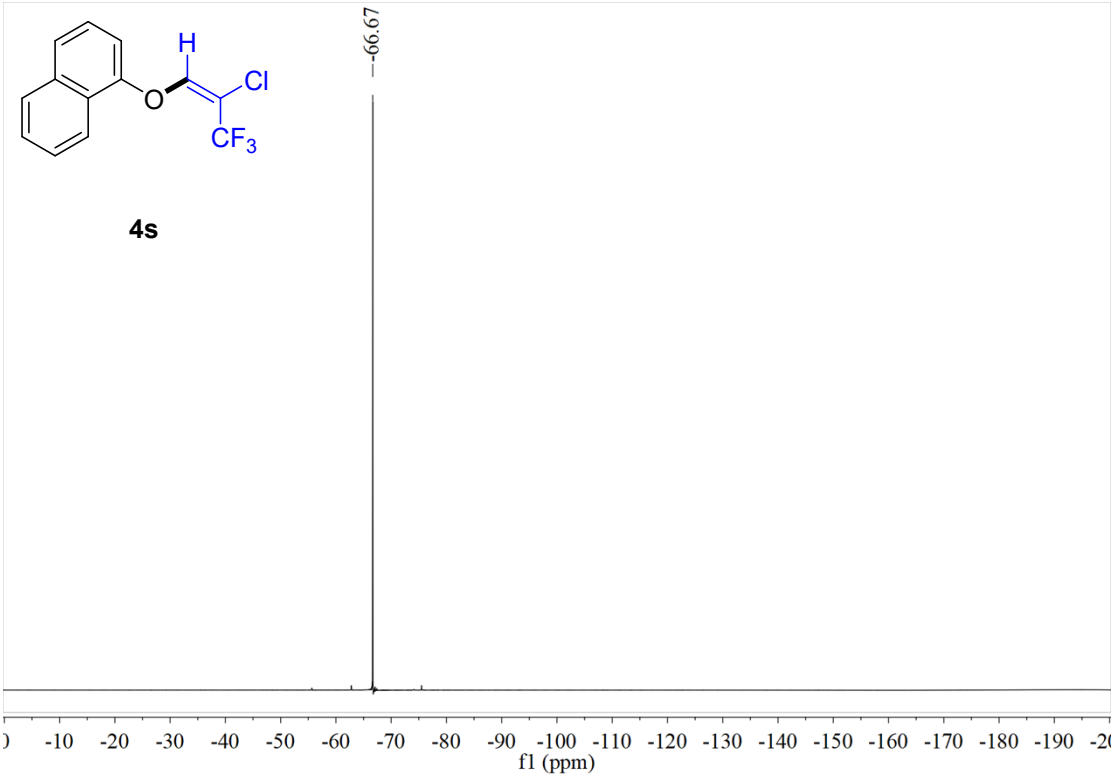




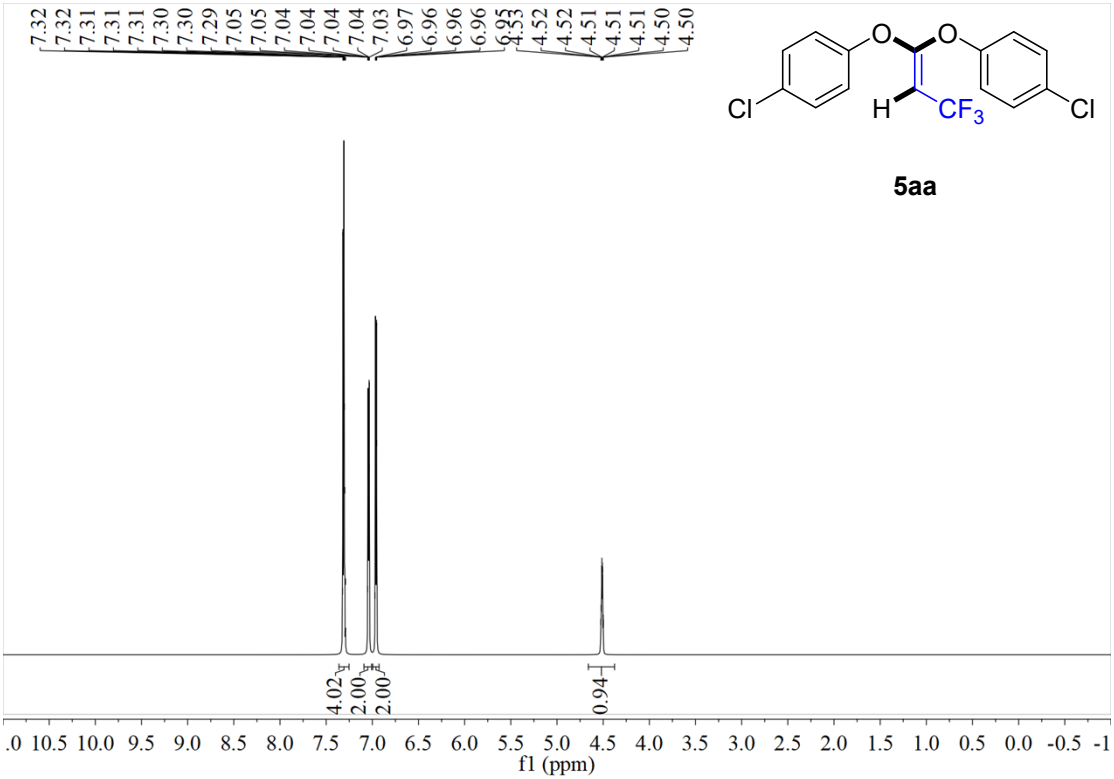
(*E*)-1-((2-chloro-3,3,3-trifluoroprop-1-en-1-yl)oxy)naphthalene (4s)

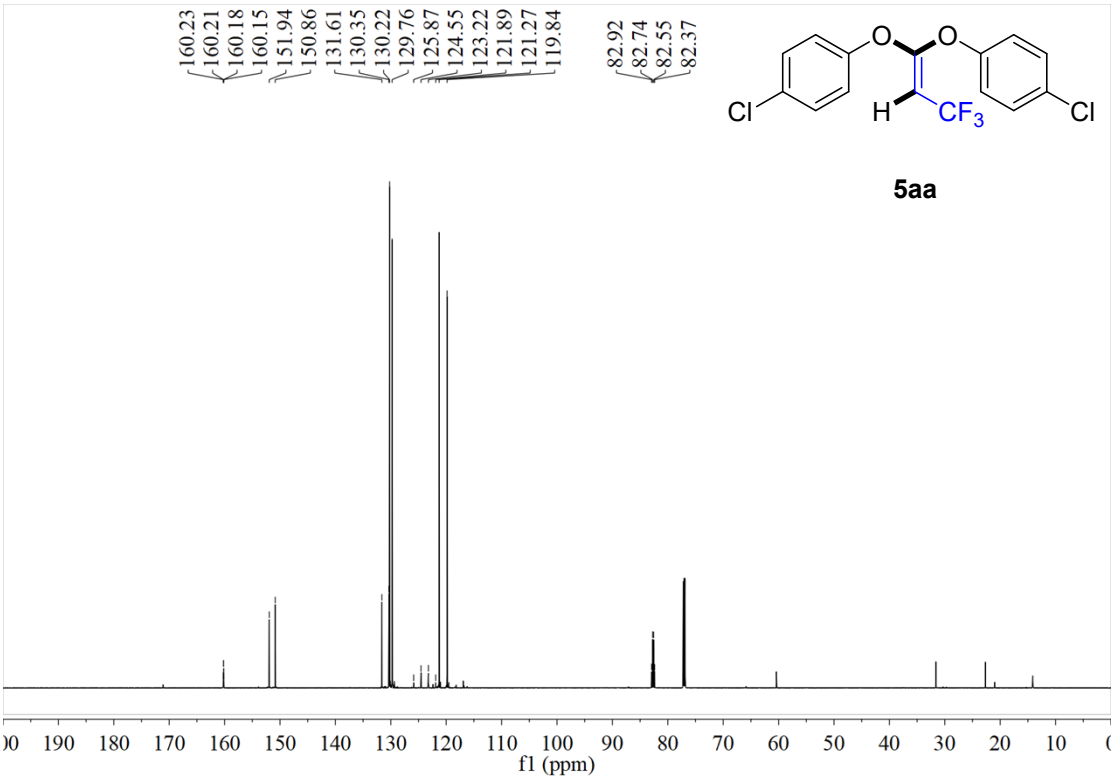

8.19
8.18
8.17
7.85
7.85
7.84
7.84
7.84
7.83
7.82
7.67
7.66
7.60
7.57
7.56
7.55
7.55
7.54
7.54
7.53
7.40
7.39
7.37
7.05
7.03
1.01
1.01
1.05
1.00
2.30
1.07
1.01
H
Cl
O
CF3
4s
f1 (ppm)

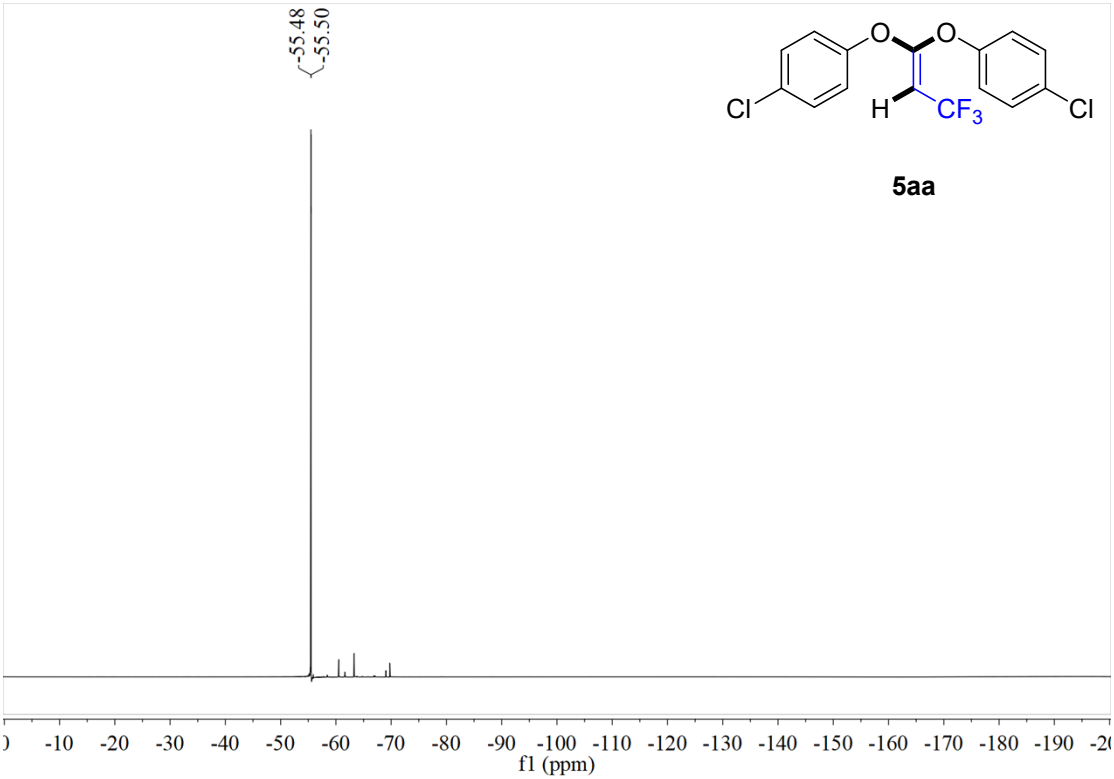

152.18
145.80
145.75
145.71
145.66
134.72
127.78
127.23
126.74
125.47
125.32
125.21
124.86
122.72
121.33
120.57
118.43
111.12
105.48
105.18
104.88
104.58
H
Cl
O
CF3
4s
f1 (ppm)



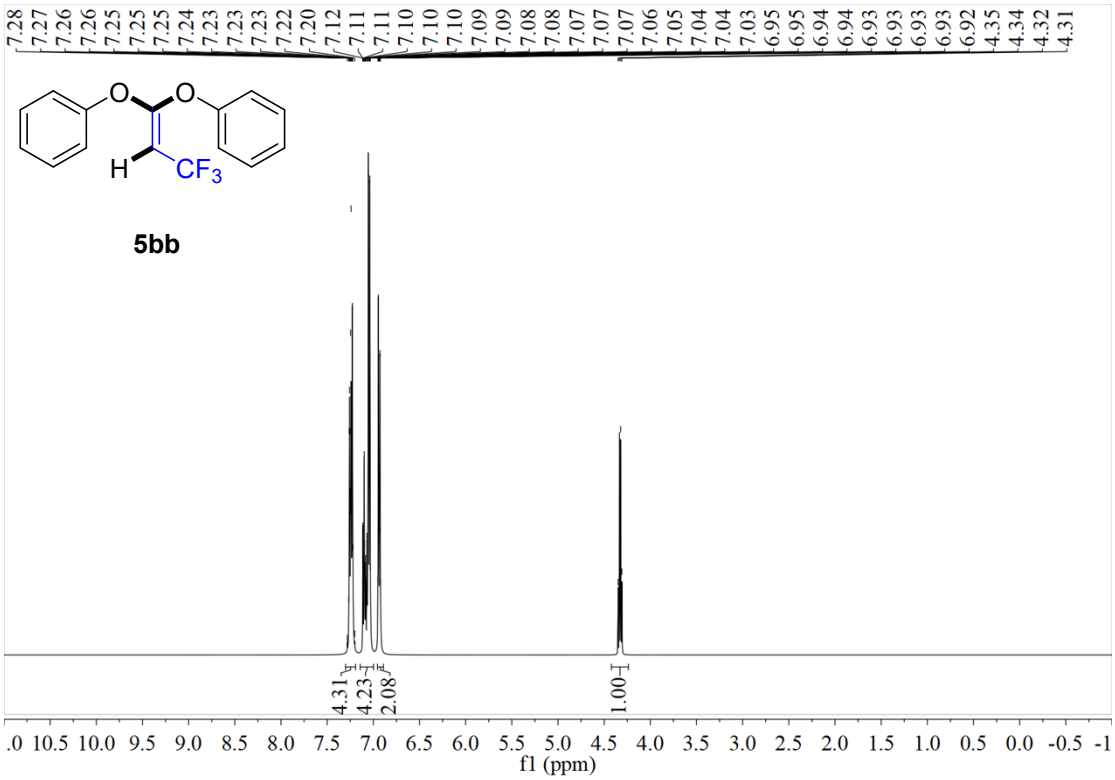
4,4'-((3,3,3-Trifluoroprop-1-ene-1,1-diyl)bis(oxy))bis(chlorobenzene) (5aa)

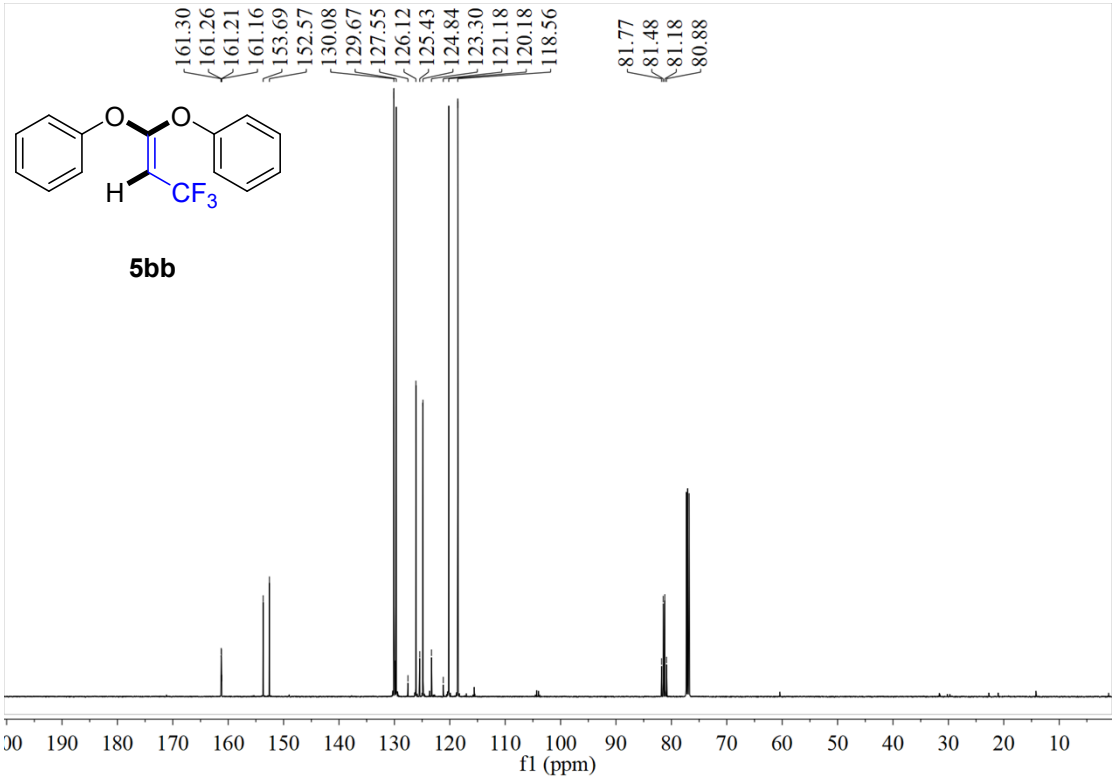


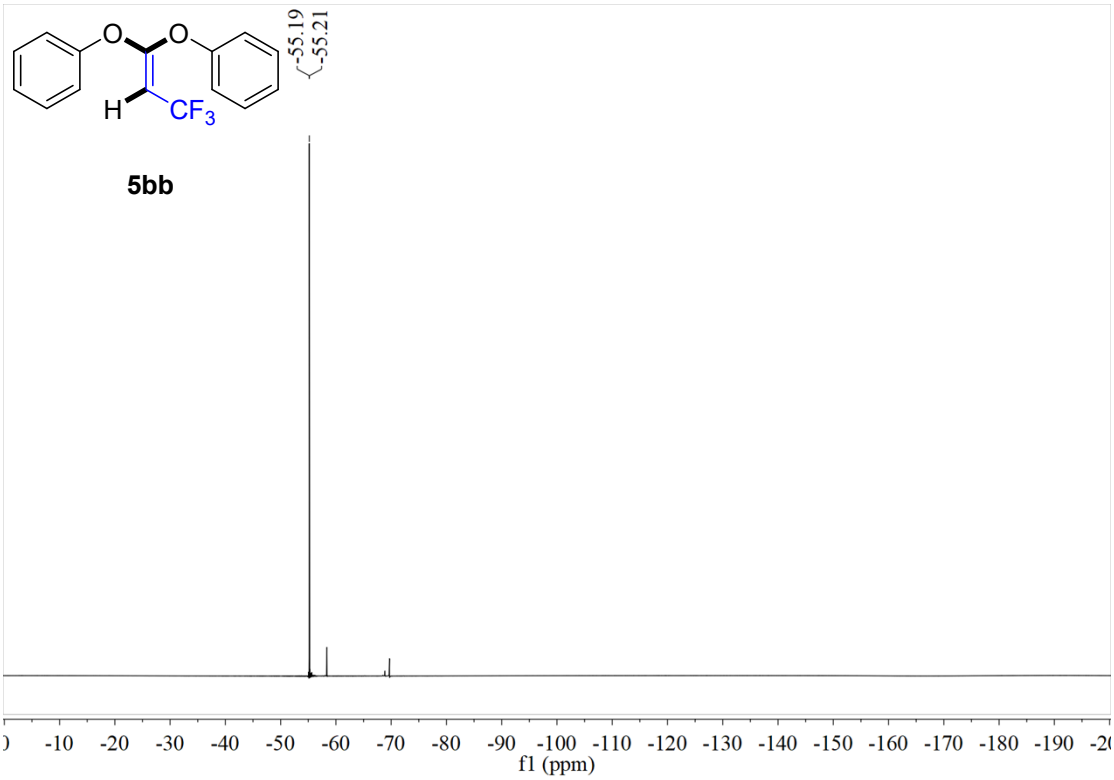




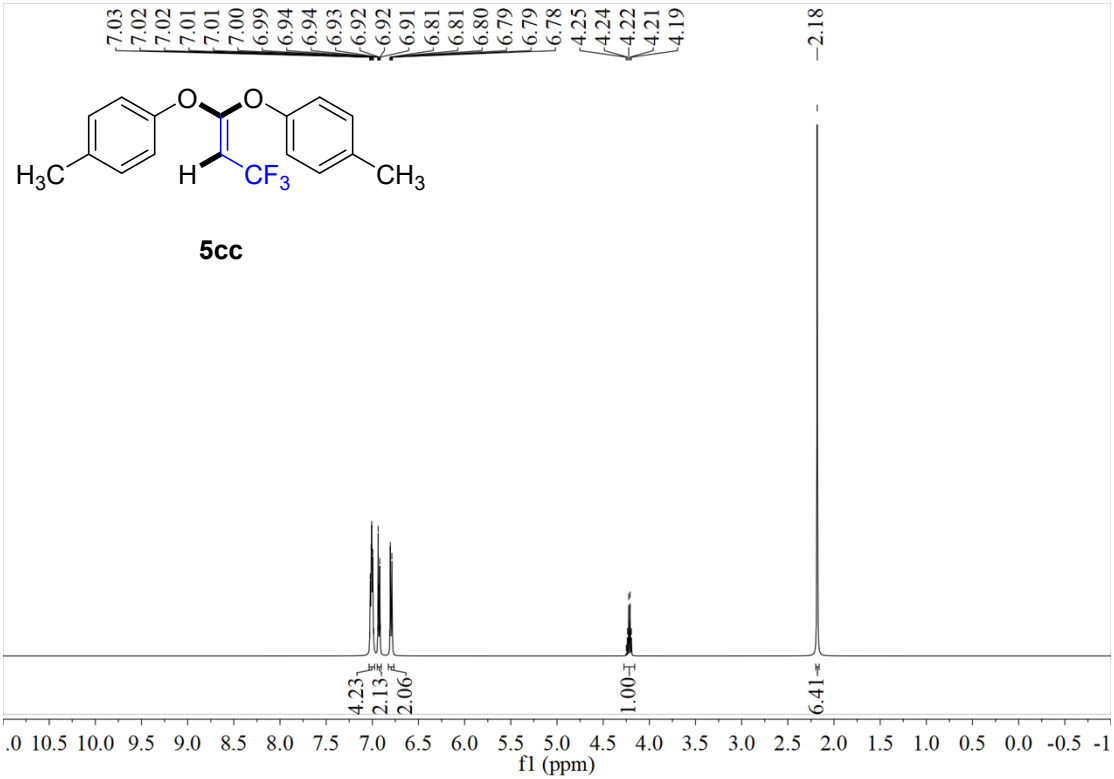
((3,3,3-Trifluoroprop-1-ene-1,1-diyl)bis(oxy))dibenzene (5bb)

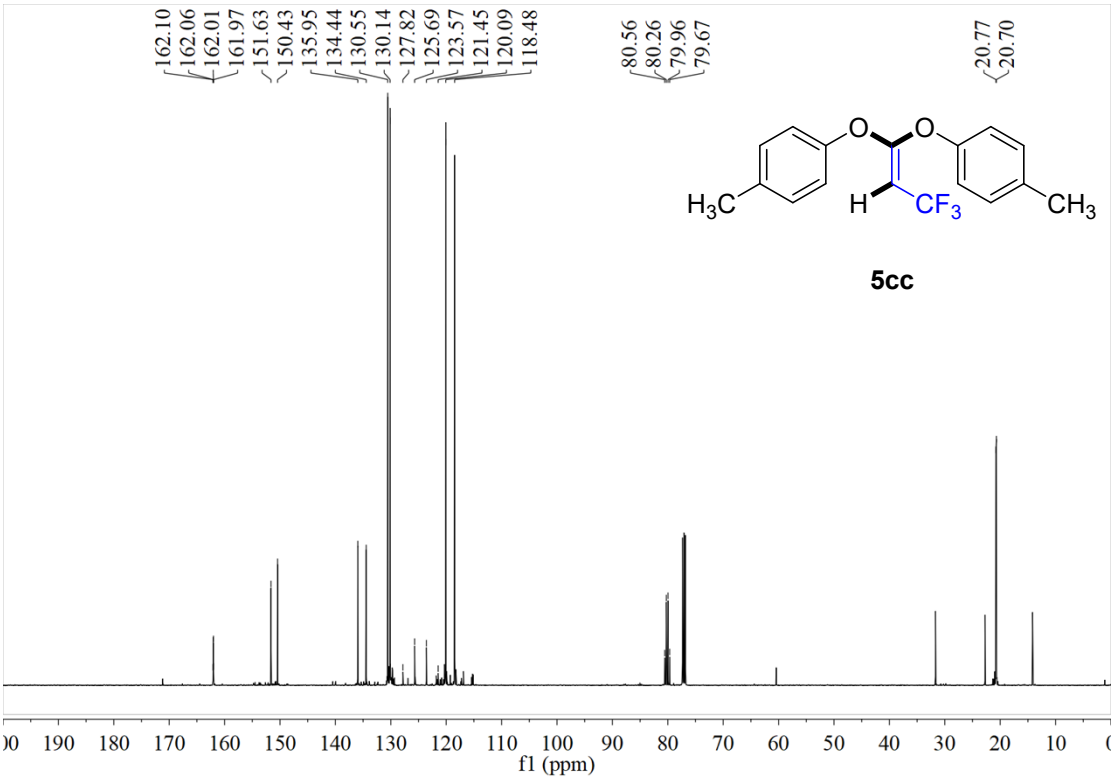

7.28 7.27 7.26 7.26 7.25 7.25 7.25 7.24 7.23 7.23 7.23 7.22 7.20 7.12 7.11 7.11 7.10 7.10 7.10 7.09 7.09 7.08 7.08 7.07 7.07 7.07 7.06 7.05 7.04 7.04 7.03 6.95 6.95 6.94 6.94 6.93 6.93 6.93 6.92 4.35 4.34 4.32 4.31
O
O
H
CF3
5bb
4.31
4.23
2.08
1.00
.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5 -1
f1 (ppm)

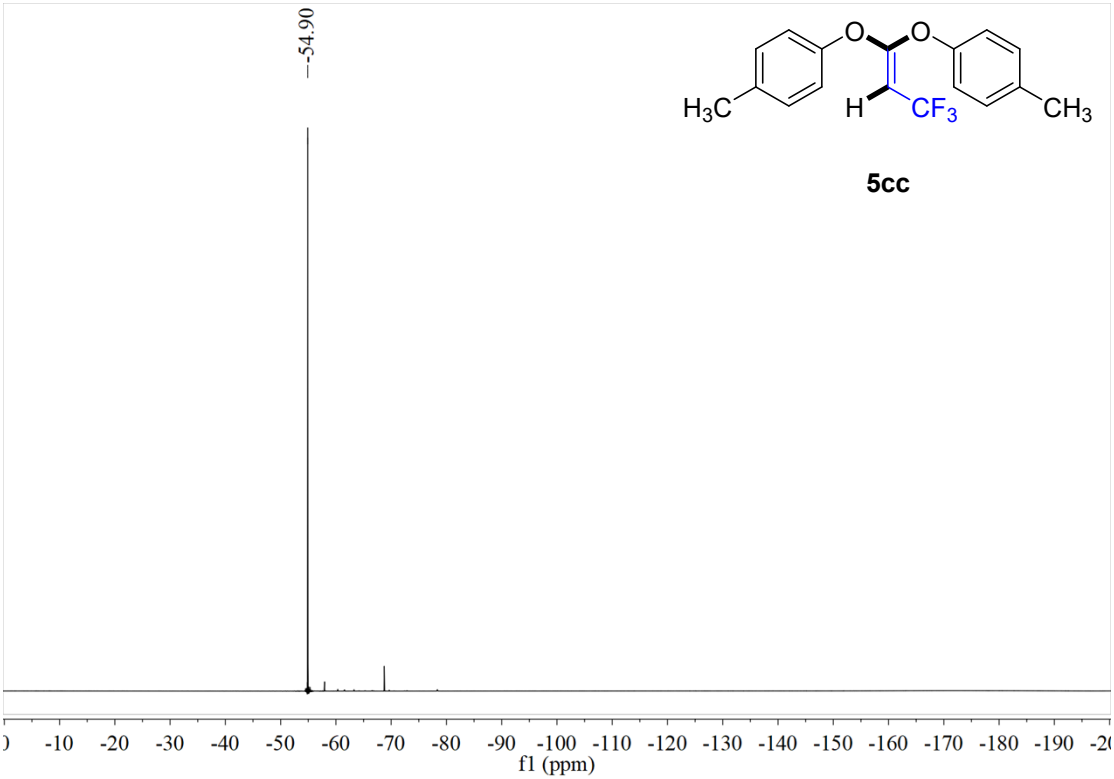

161.30 161.26 161.21 161.16 153.69 152.57 130.08 129.67 127.55 126.12 125.43 124.84 123.30 121.18 120.18 118.56 81.77 81.48 81.18 80.88
O
O
H
CF3
5bb
00 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
f1 (ppm)



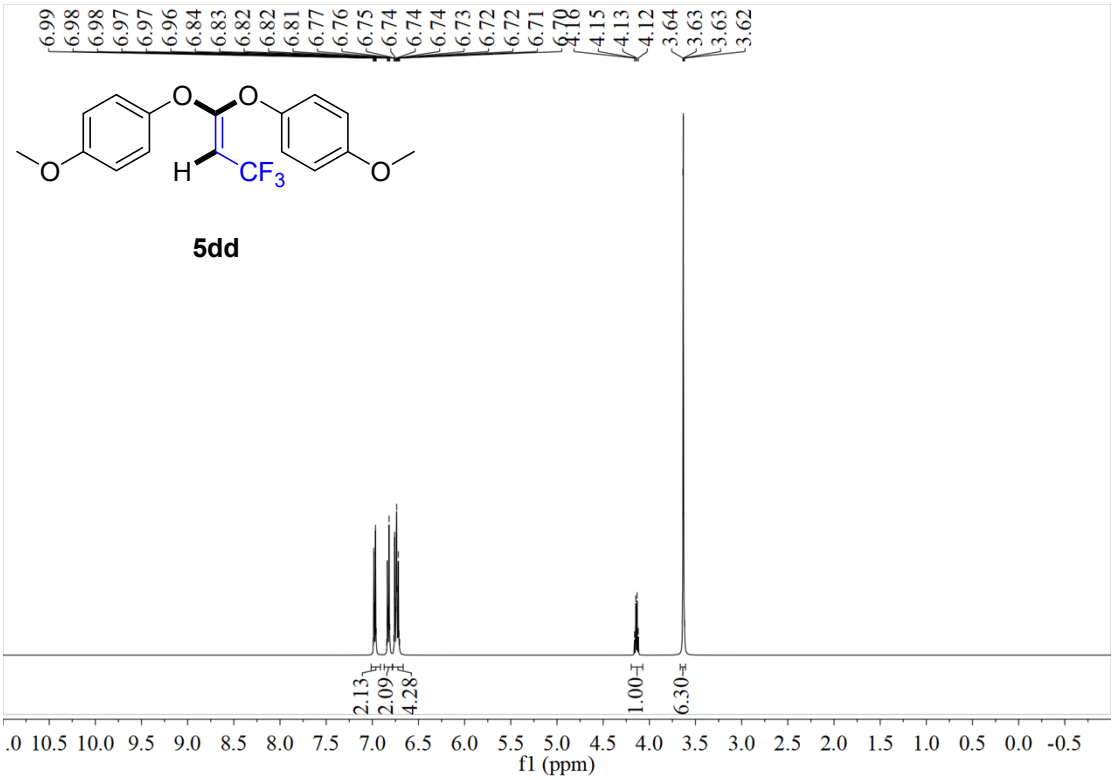
4,4'-((3,3,3-Trifluoroprop-1-ene-1,1-diyl)bis(oxy))bis(methylbenzene) (5cc)

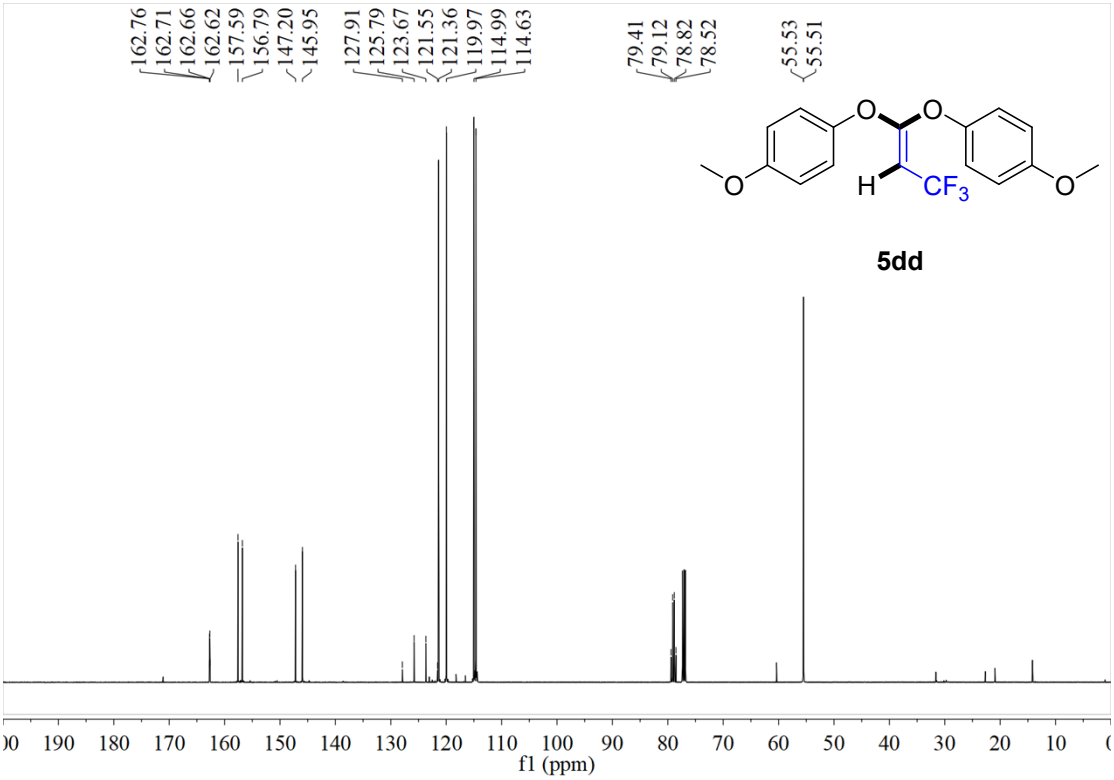






4,4'-((3,3,3-Trifluoroprop-1-ene-1,1-diyl)bis(oxy))bis(methoxybenzene) (5dd)


6.99
6.98
6.98
6.97
6.97
6.96
6.84
6.83
6.82
6.82
6.81
6.77
6.76
6.75
6.74
6.74
6.74
6.73
6.72
6.72
6.71
6.70
4.16
4.15
4.13
4.12
3.64
3.63
3.63
3.62
O
O
H
CF3
O
O
5dd
2.13
2.09
4.28
1.00
6.30
.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
f1 (ppm)


162.76
162.71
162.66
162.62
157.59
156.79
147.20
145.95
127.91
125.79
123.67
121.55
121.36
119.97
114.99
114.63
79.41
79.12
78.82
78.52
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55.51
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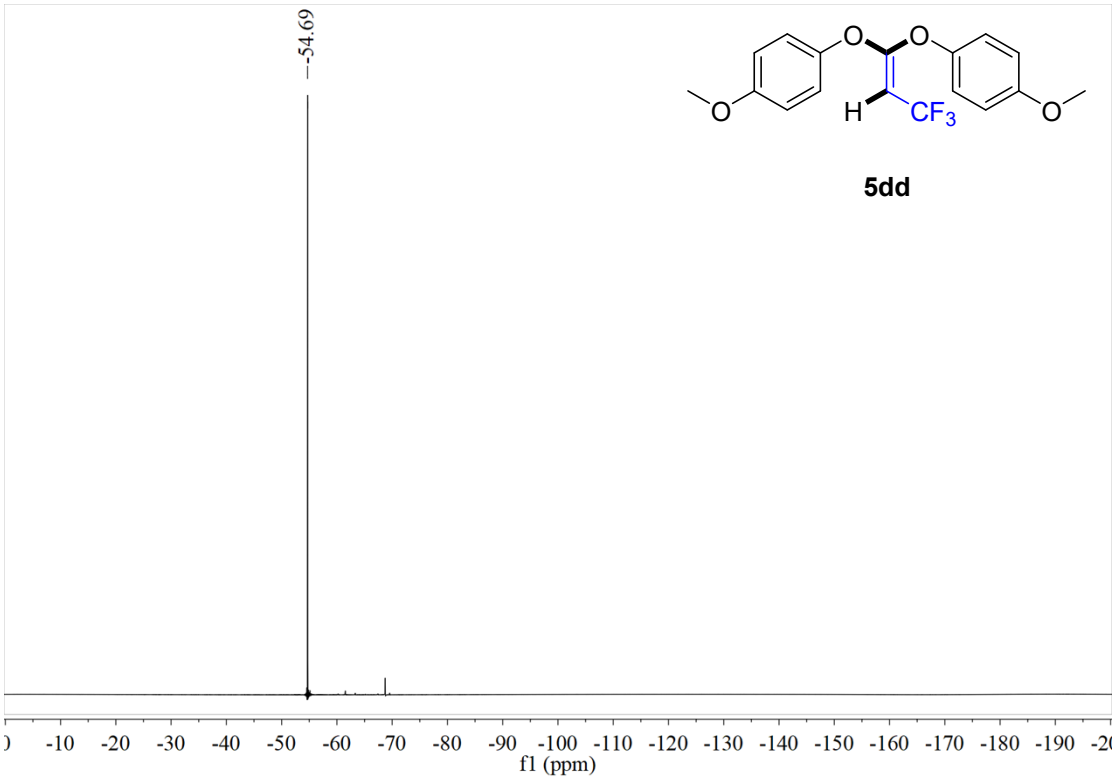
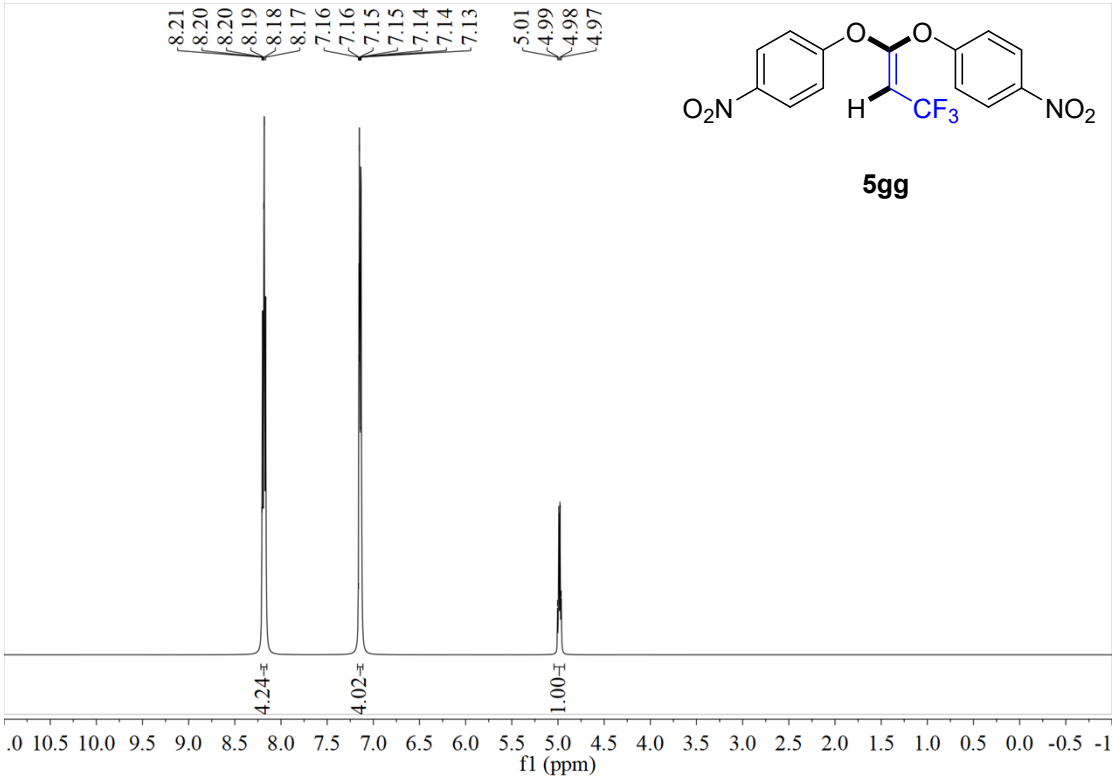
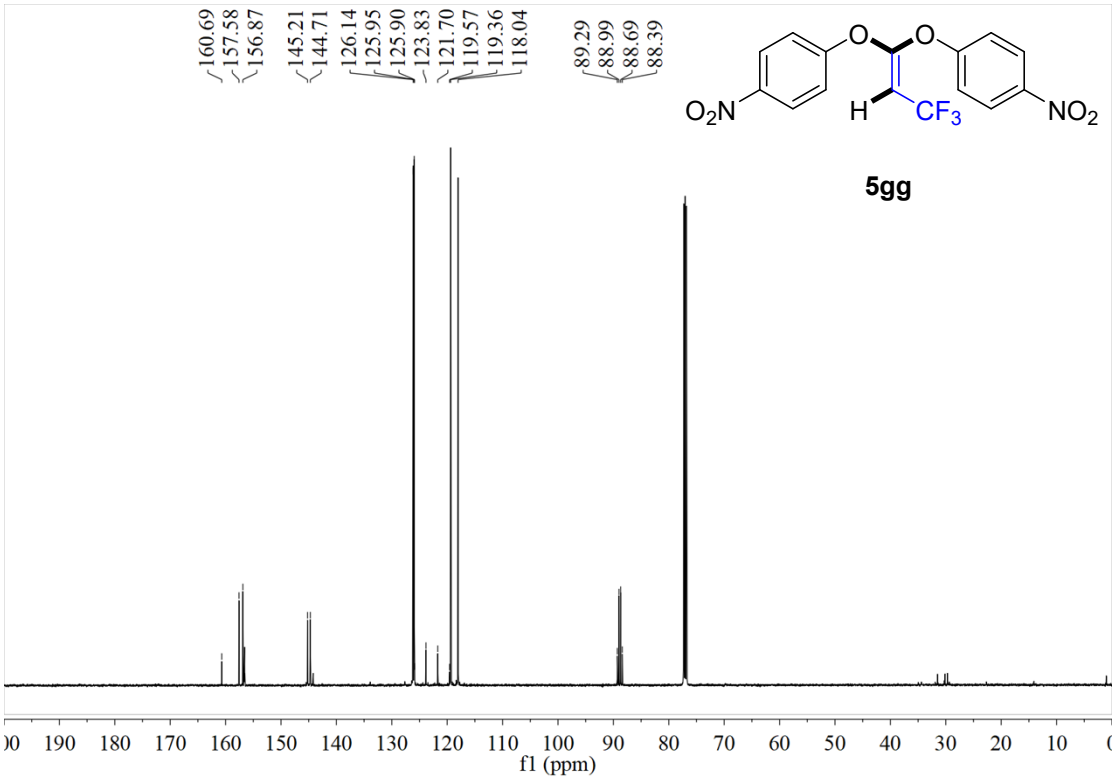
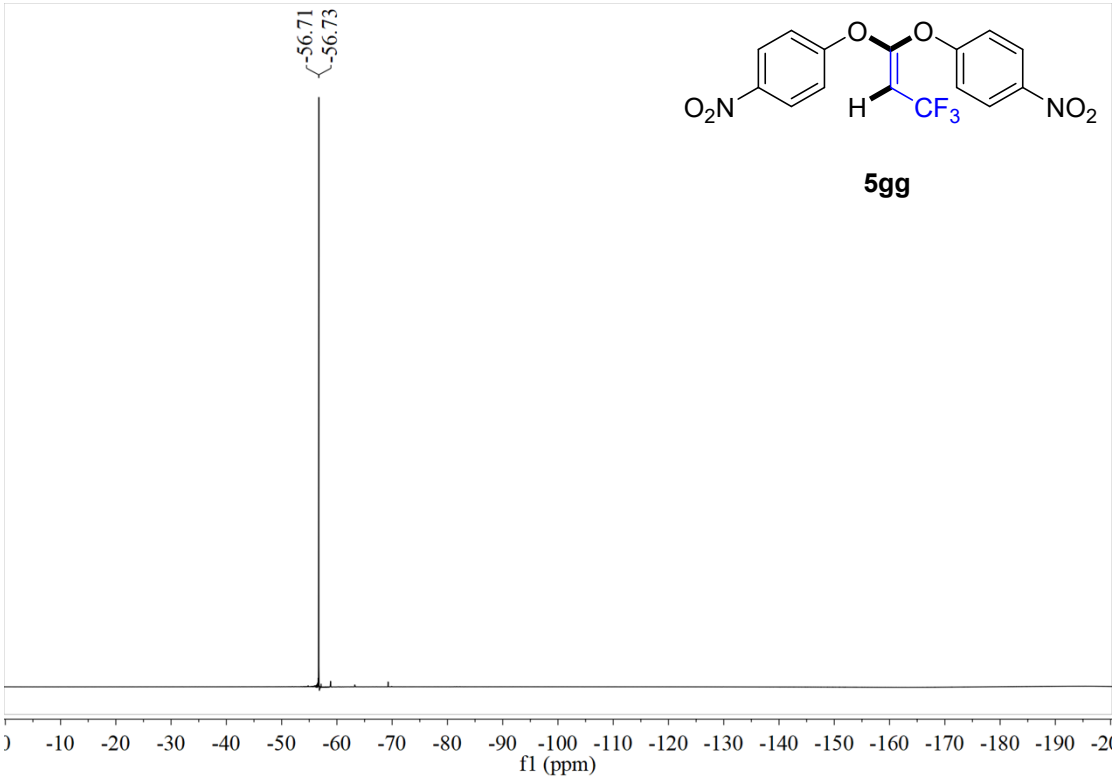
O
H
CF3
O
5dd
)0 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
f1 (ppm)



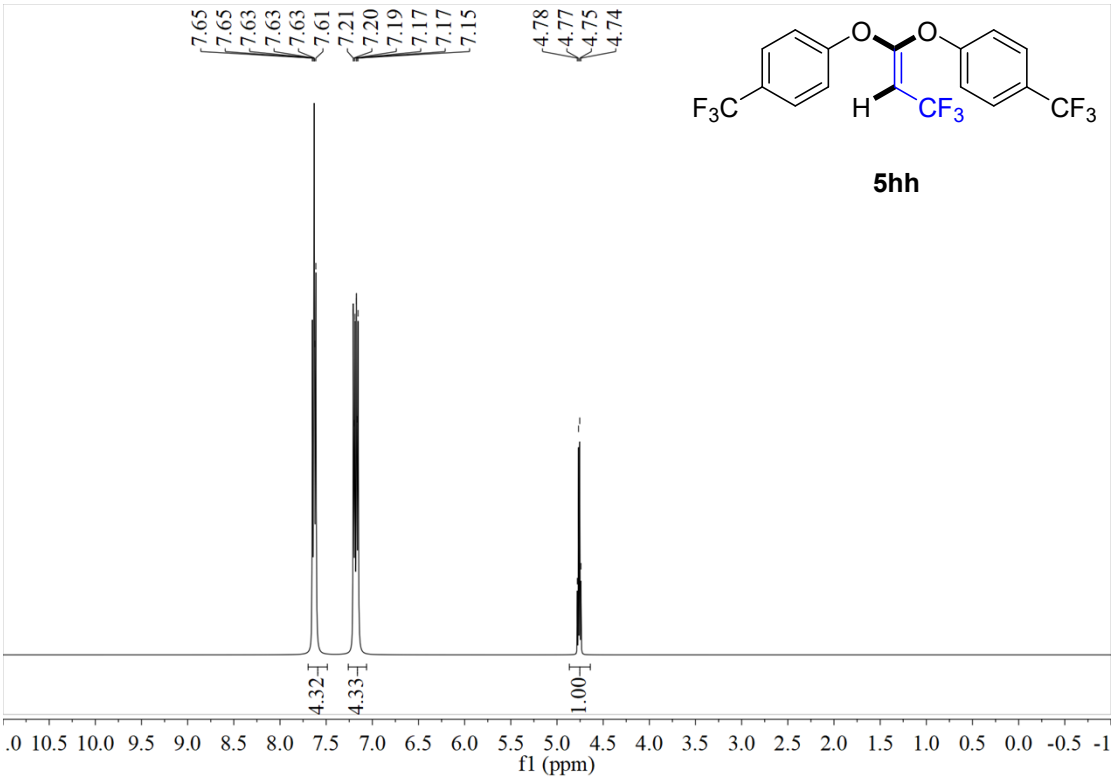
4,4'-((3,3,3-Trifluoroprop-1-ene-1,1-diyl)bis(oxy))bis(nitrobenzene) (5gg)





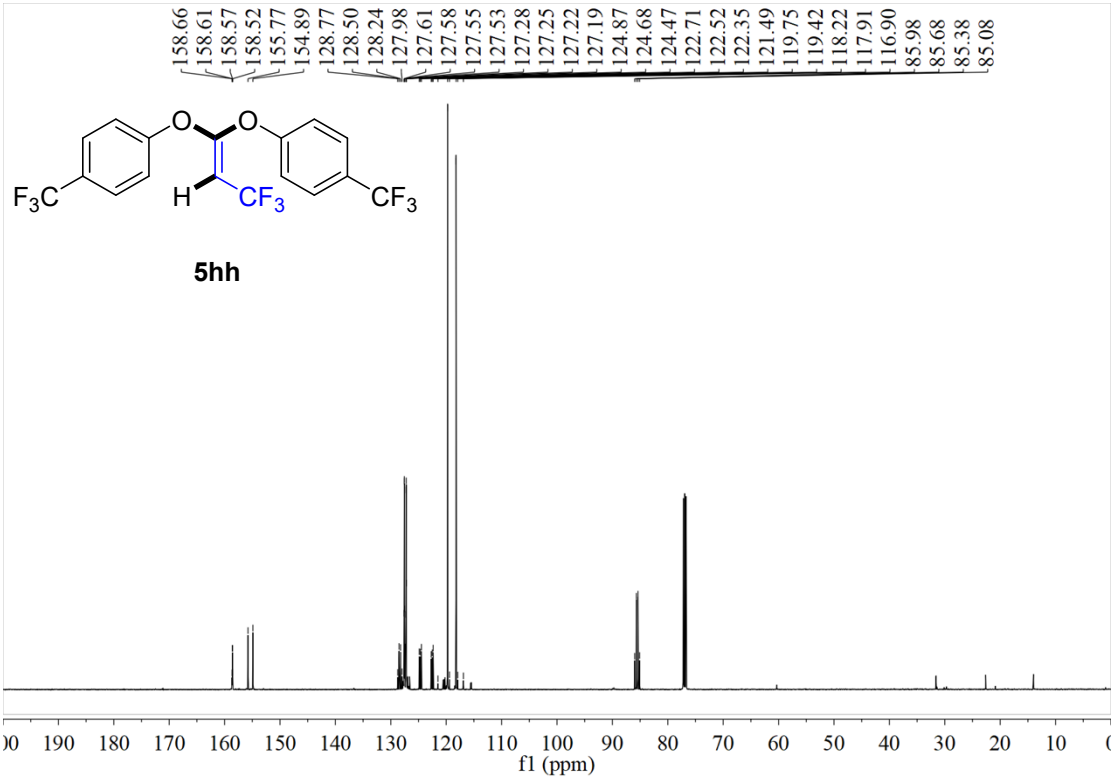


4,4'-((3,3,3-Trifluoroprop-1-ene-1,1-diyl)bis(oxy))bis((trifluoromethyl)benzene) (5hh)


7.65
7.65
7.63
7.63
7.63
7.61
7.21
7.20
7.19
7.17
7.17
7.15
4.78
4.77
4.75
4.74
4.32
4.33
1.00
f1 (ppm)

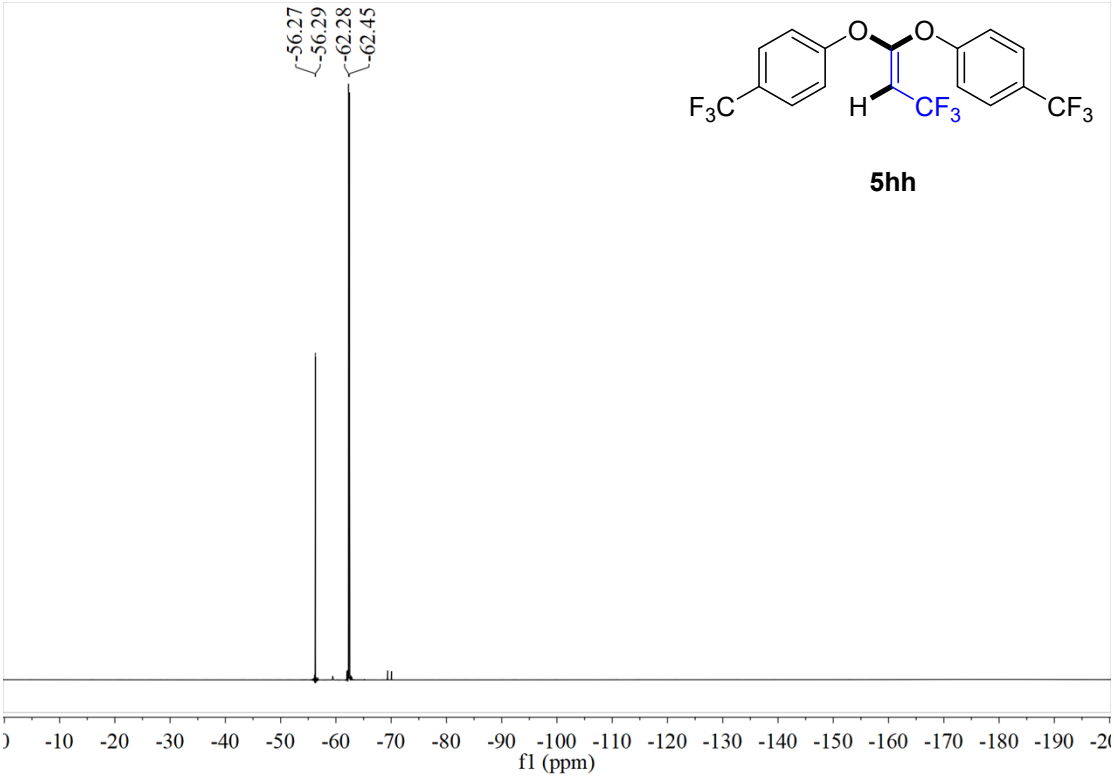
O
O
F3C
H
CF3
CF3

5hh

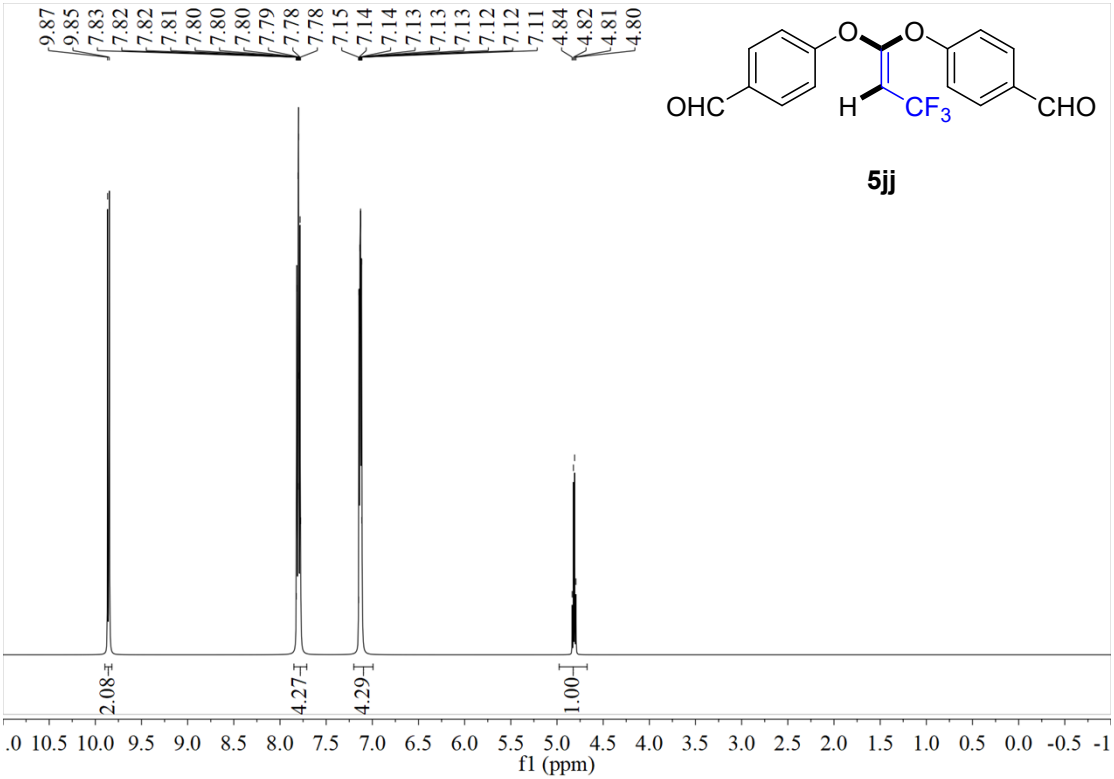

158.66
158.61
158.57
158.52
155.77
154.89
128.77
128.50
128.24
127.98
127.61
127.58
127.55
127.53
127.28
127.25
127.22
127.19
124.87
124.68
124.47
122.71
122.52
122.35
121.49
119.75
119.42
118.22
117.91
116.90
85.98
85.68
85.38
85.08
f1 (ppm)

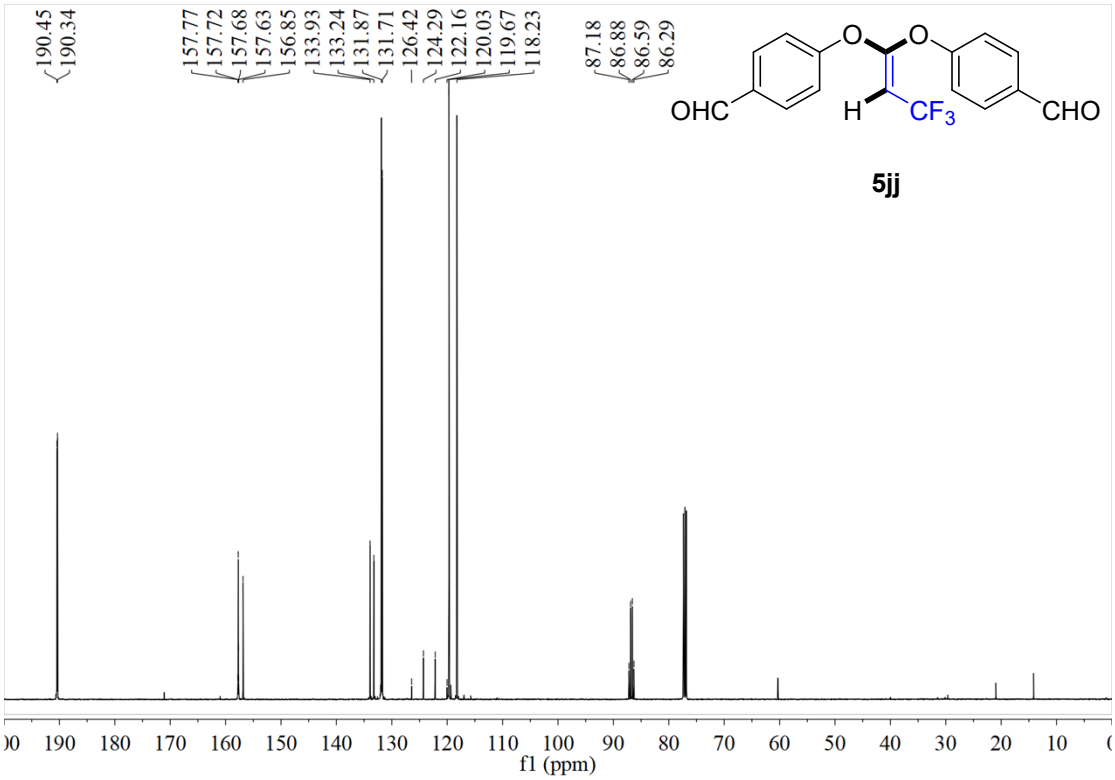
O
O
F3C
H
CF3
CF3

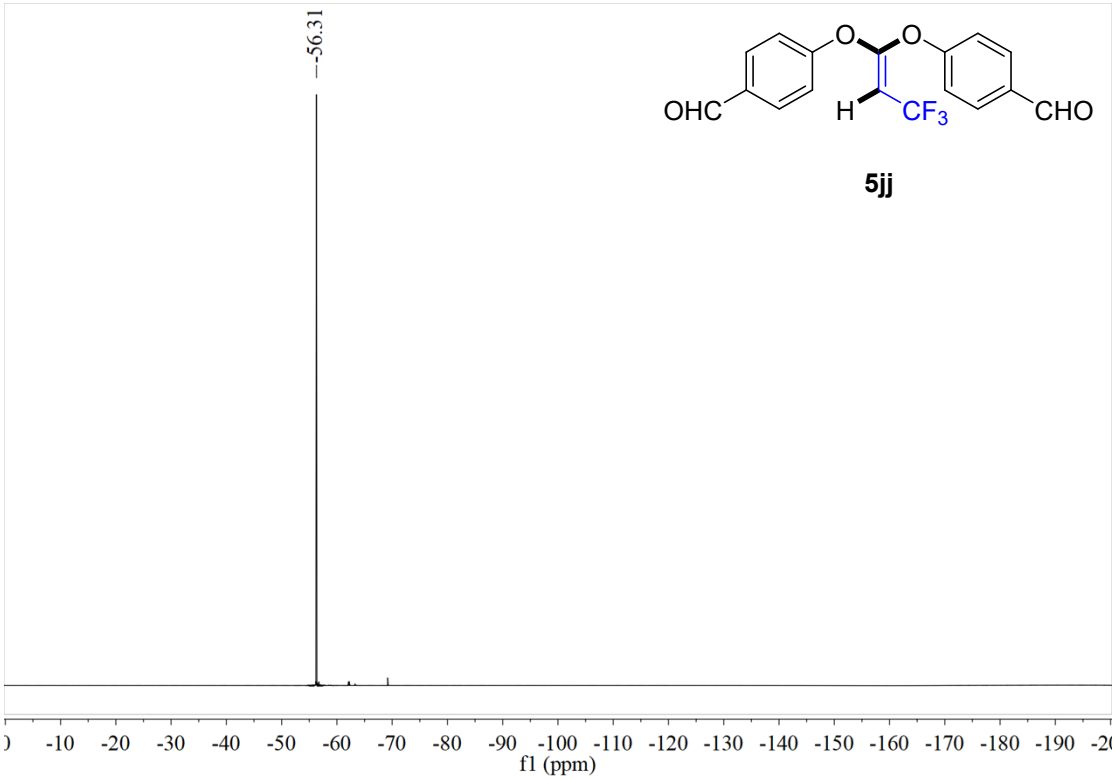
5hh



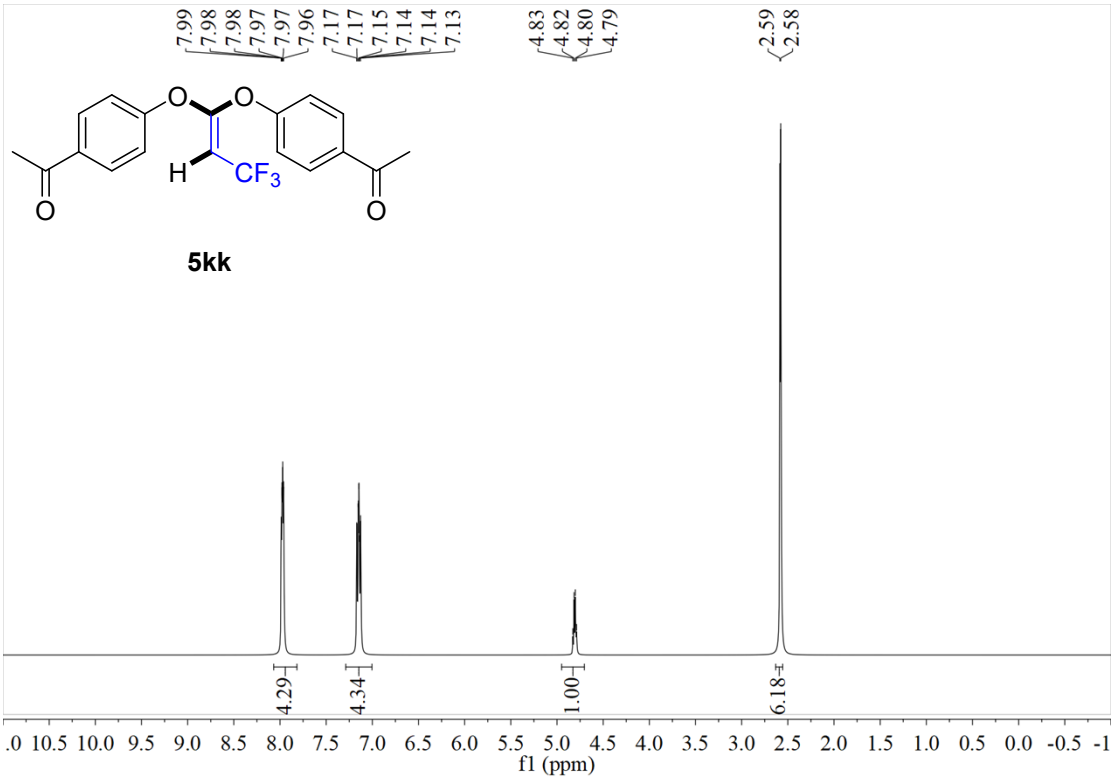
4,4'-((3,3,3-Trifluoroprop-1-ene-1,1-diyl)bis(oxy))dibenzaldehyde (5jj)

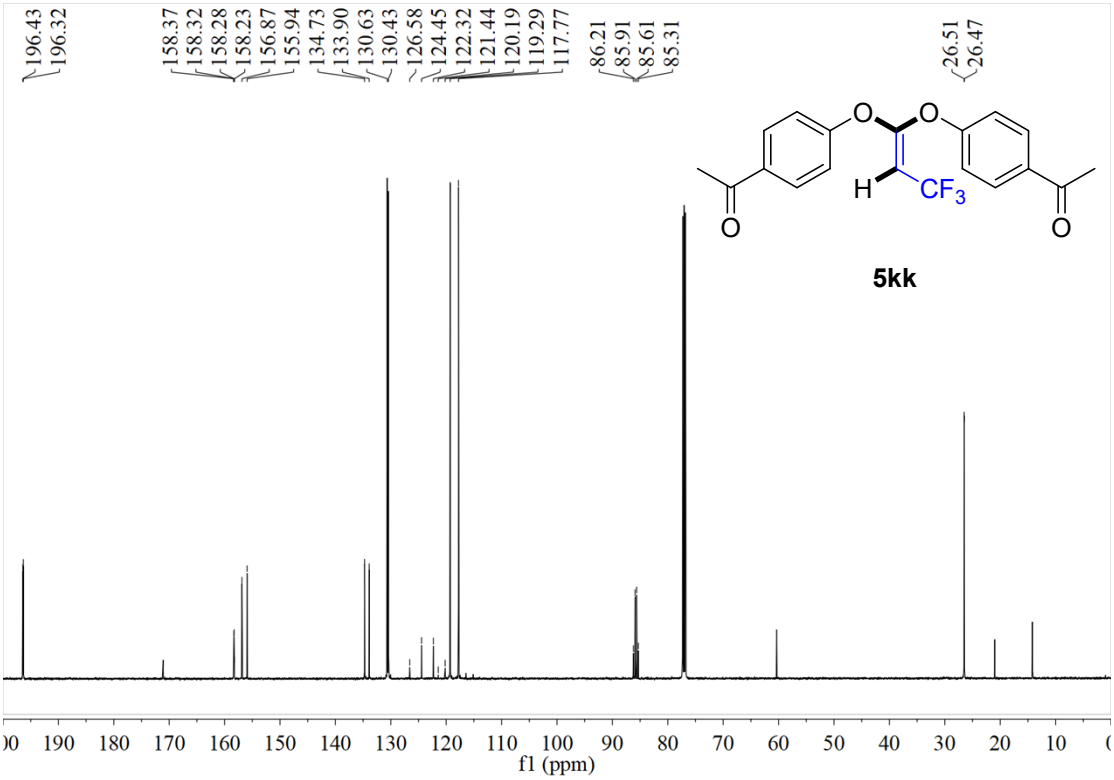


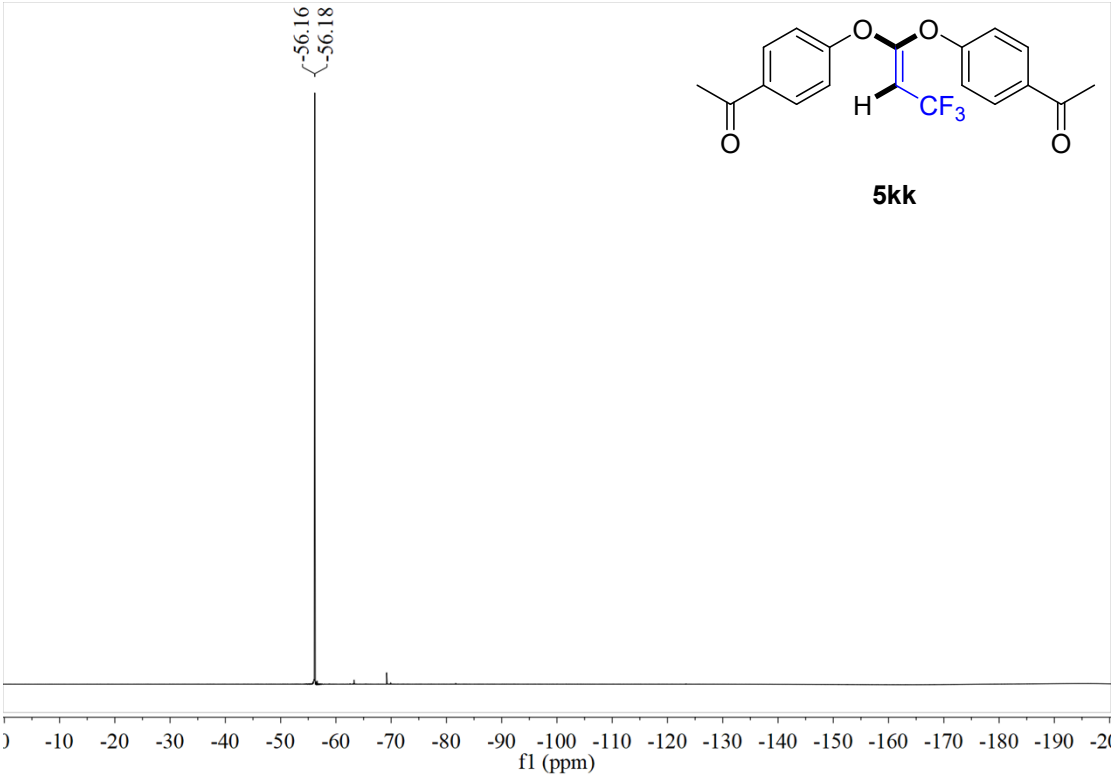




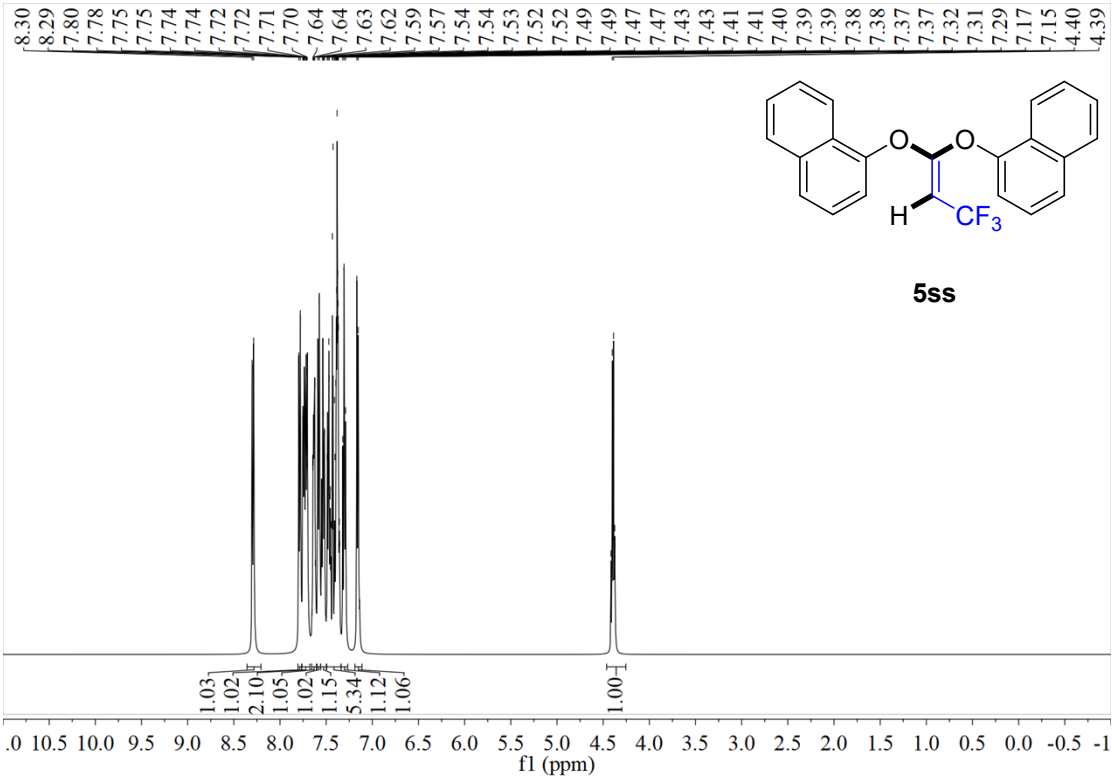
1,1'-(((3,3,3-Trifluoroprop-1-ene-1,1-diyl)bis(oxy))bis(4,1-phenylene))bis(ethan-1-one) (5kk)

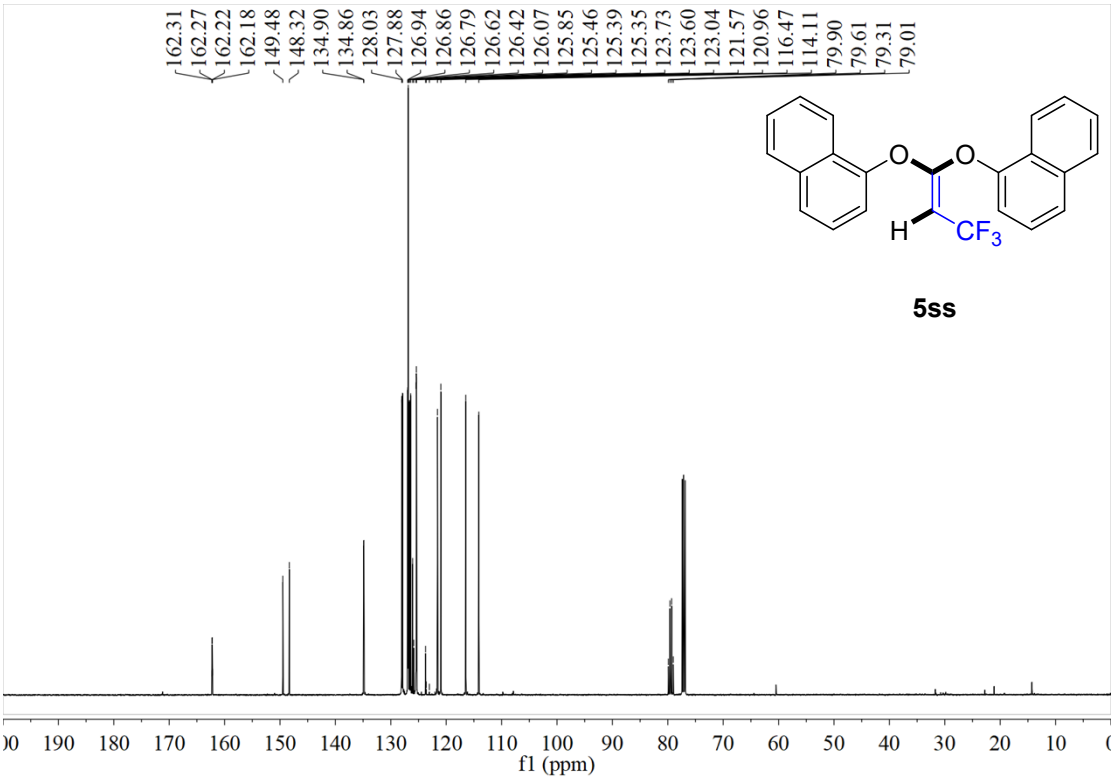

7.99
7.98
7.98
7.97
7.97
7.96
7.17
7.17
7.15
7.14
7.14
7.13
4.83
4.82
4.80
4.79
2.59
2.58
O
O
H
CF3
O
O
5kk
4.29
4.34
1.00
6.18
.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5 -1
f1 (ppm)

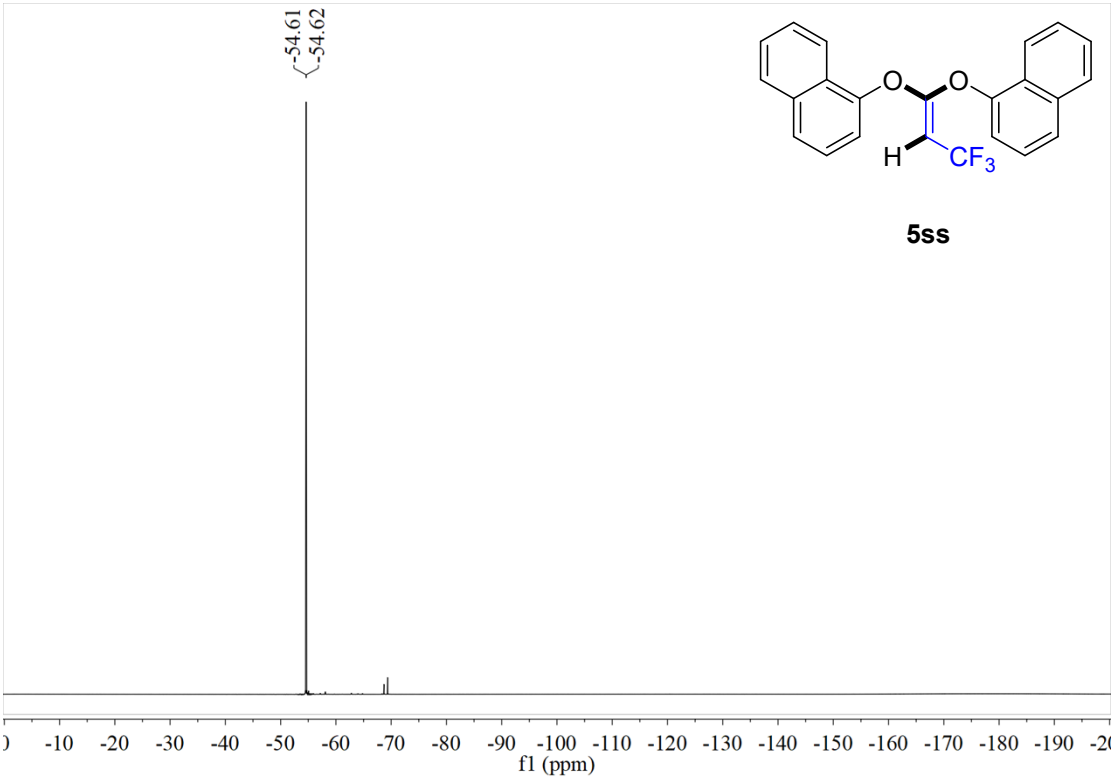

196.43
196.32
158.37
158.32
158.28
158.23
156.87
155.94
134.73
133.90
130.63
130.43
126.58
124.45
122.32
121.44
120.19
119.29
117.77
86.21
85.91
85.61
85.31
26.51
26.47
O
O
H
CF3
O
O
5kk
)0 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 (
f1 (ppm)



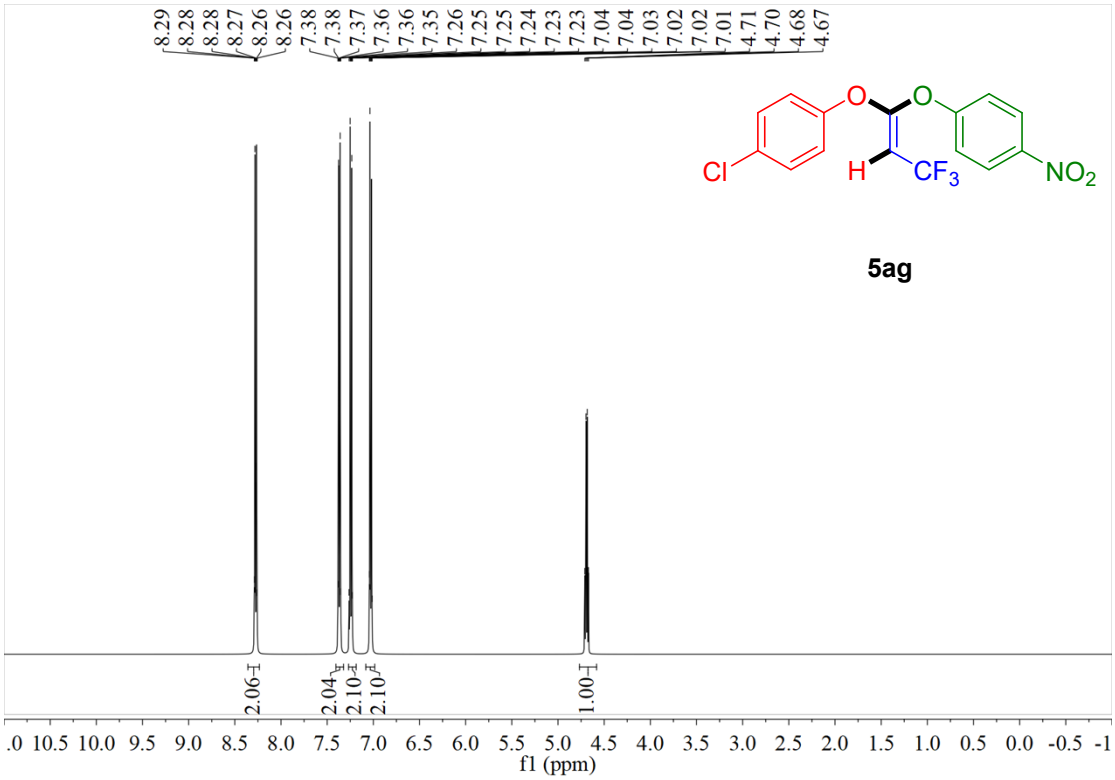
1,1'-((3,3,3-Trifluoroprop-1-ene-1,1-diyl)bis(oxy))dinaphthalene (5ss)

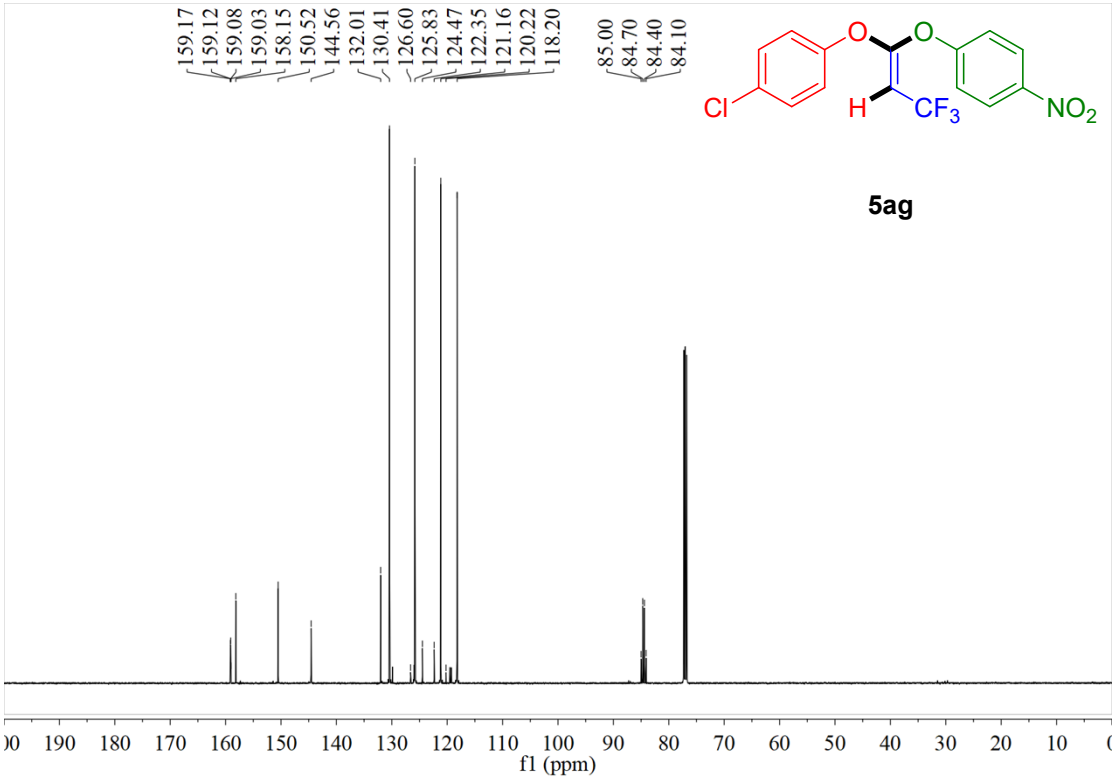


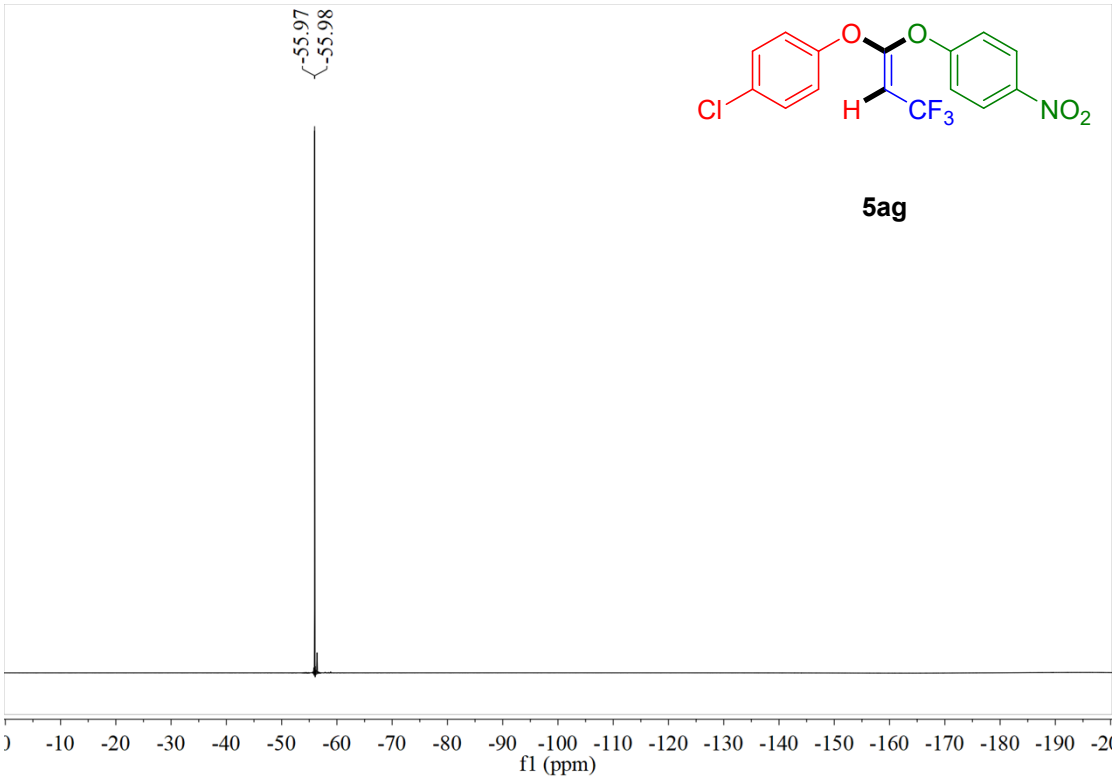




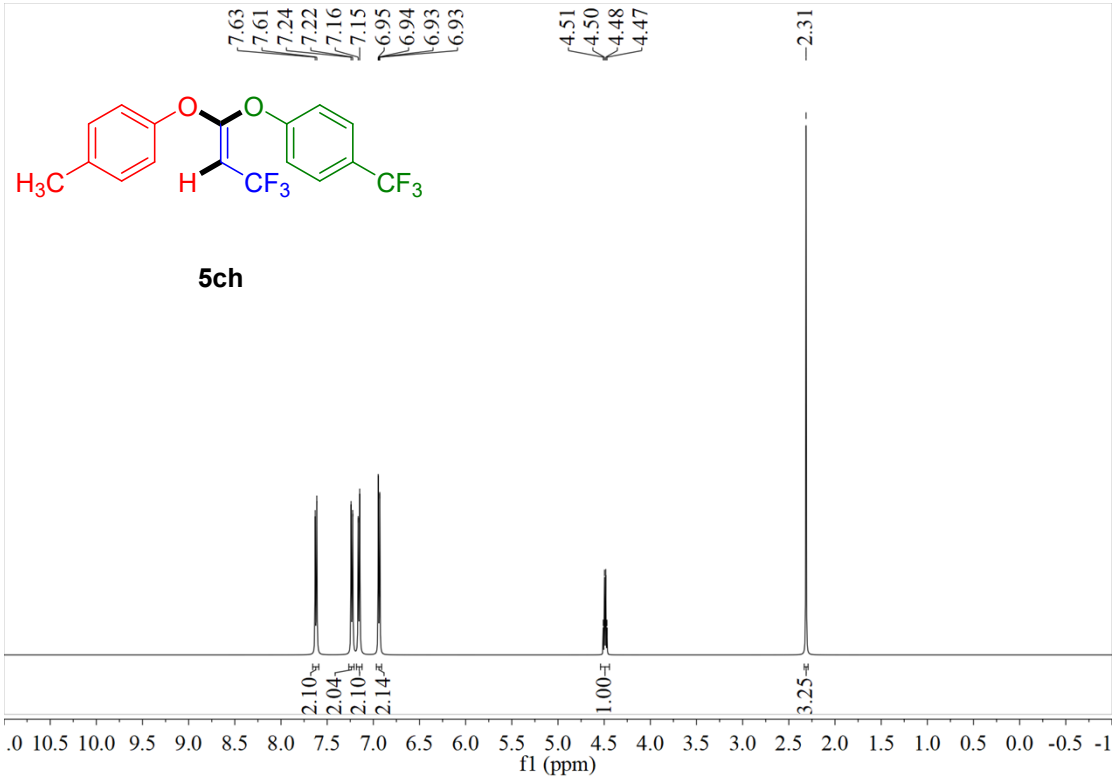
(*E*)-1-chloro-4-((3,3,3-trifluoro-1-(4-nitrophenoxy)prop-1-en-1-yl)oxy)benzene (5ag)

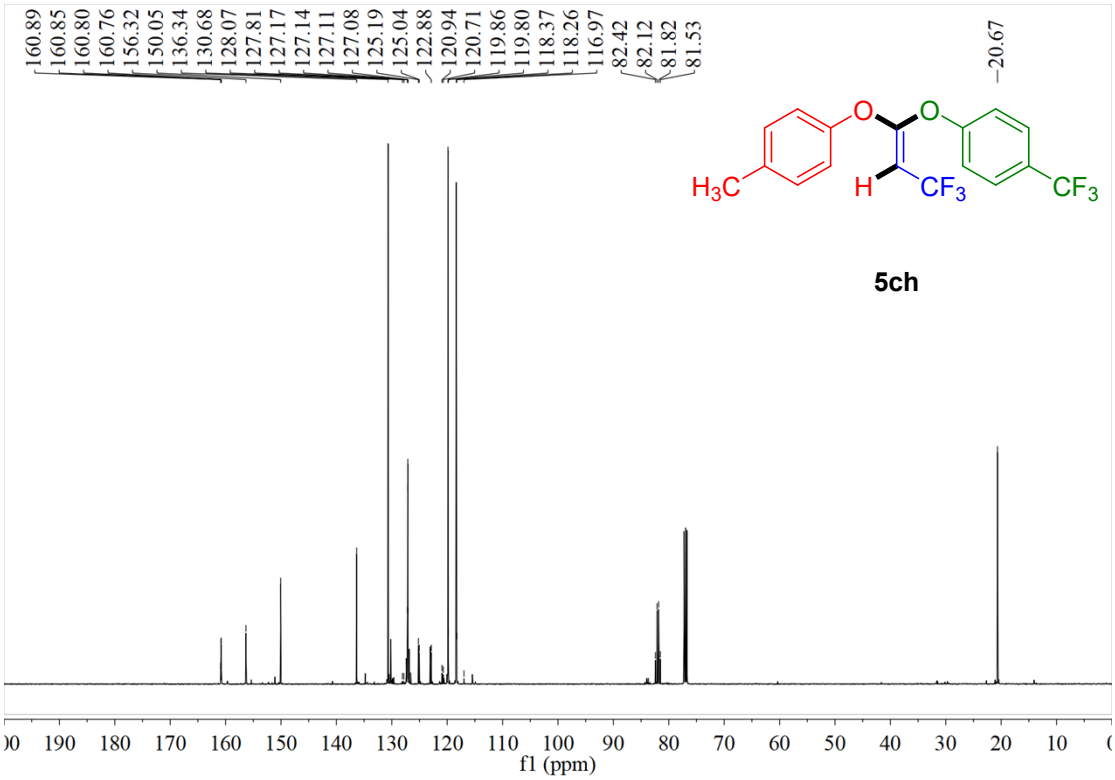

8.29
8.28
8.28
8.27
8.26
8.26
7.38
7.38
7.37
7.36
7.36
7.35
7.26
7.25
7.25
7.24
7.23
7.23
7.04
7.04
7.03
7.02
7.02
7.01
4.71
4.70
4.68
4.67
Cl
O
O
H
CF3
NO2
5ag
2.06
2.04
2.10
2.10
1.00
f1 (ppm)

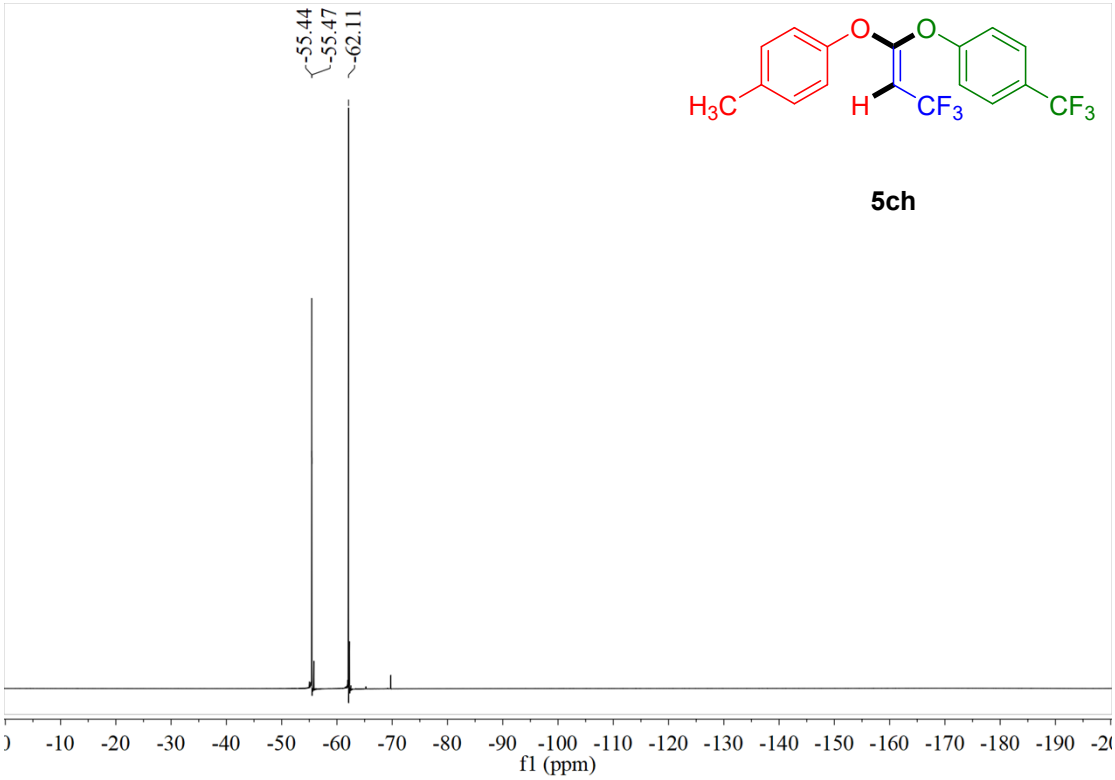

159.17
159.12
159.08
159.03
158.15
150.52
144.56
132.01
130.41
126.60
125.83
124.47
122.35
121.16
120.22
118.20
85.00
84.70
84.40
84.10
Cl
O
O
H
CF3
NO2
5ag
f1 (ppm)



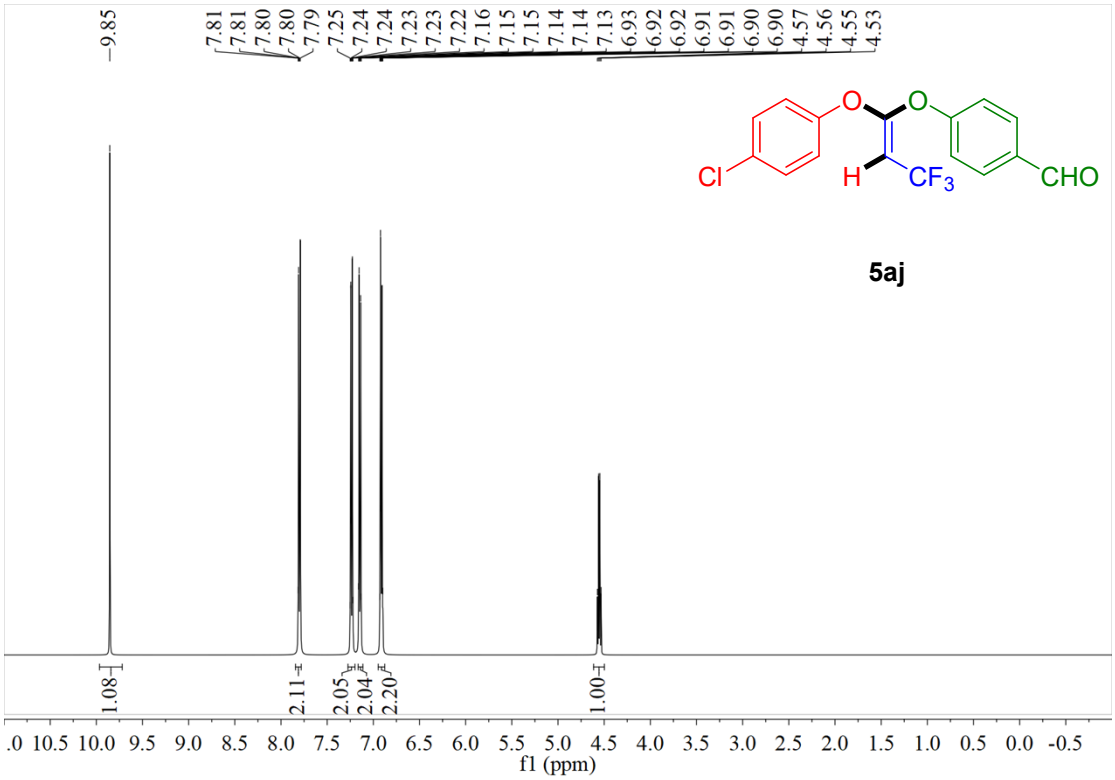
(*Z*)-1-methyl-4-((3,3,3-trifluoro-1-(4-(trifluoromethyl)phenoxy)prop-1-en-1-yl)oxy)benzene (5ch)

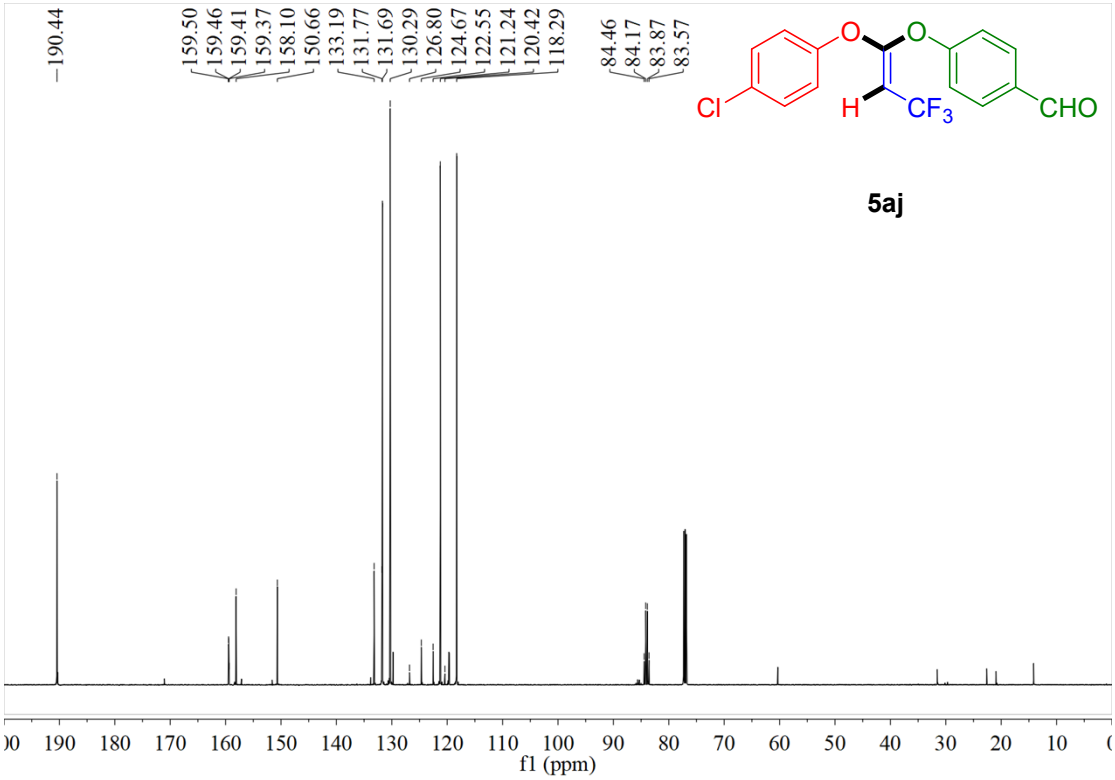


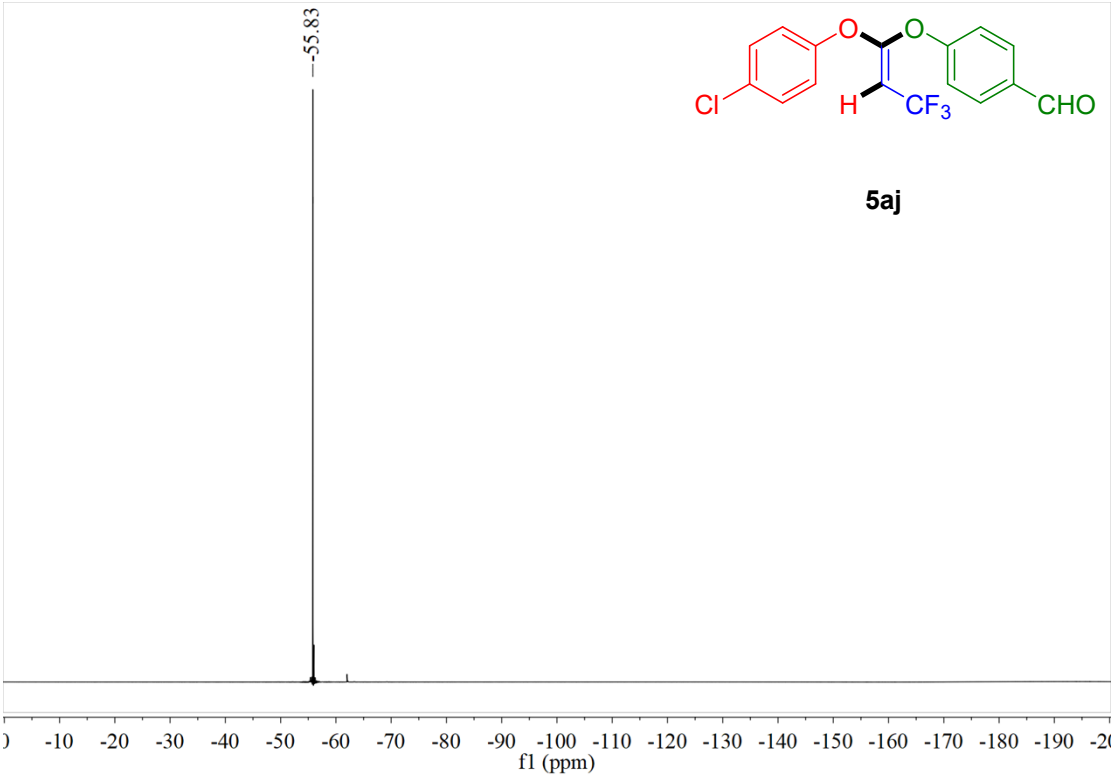




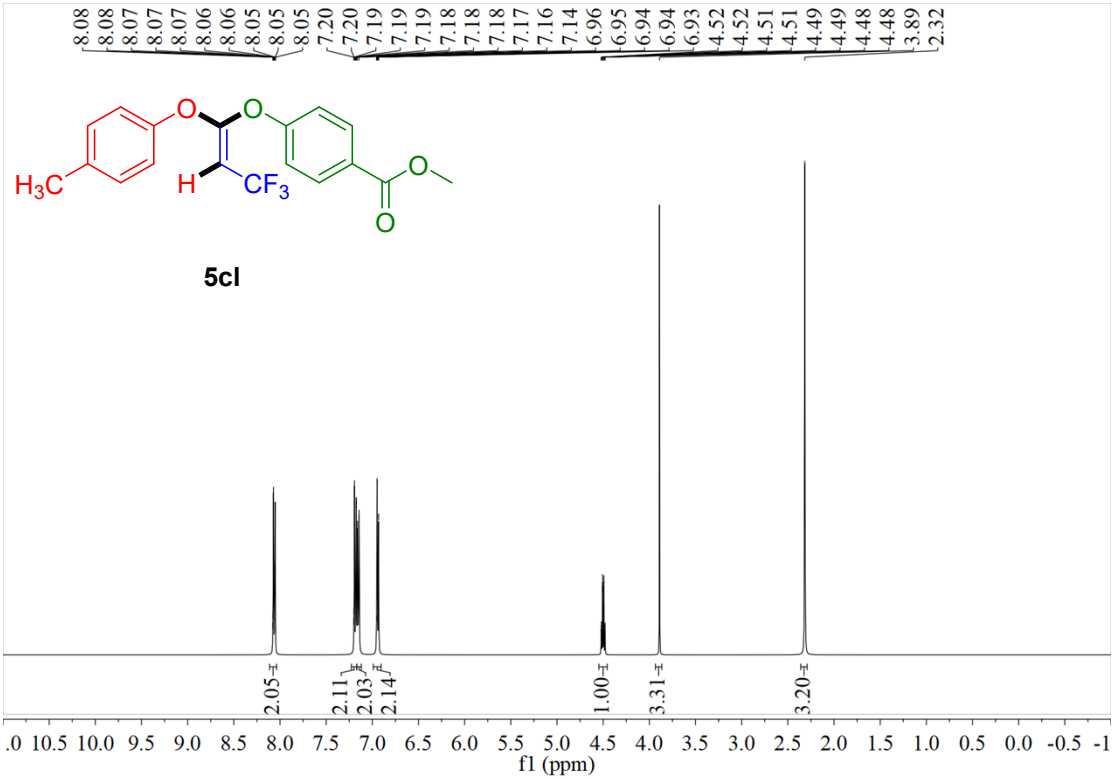
(*E*)-4-((1-(4-chlorophenoxy)-3,3,3-trifluoroprop-1-en-1-yl)oxy)benzaldehyde (5aj)

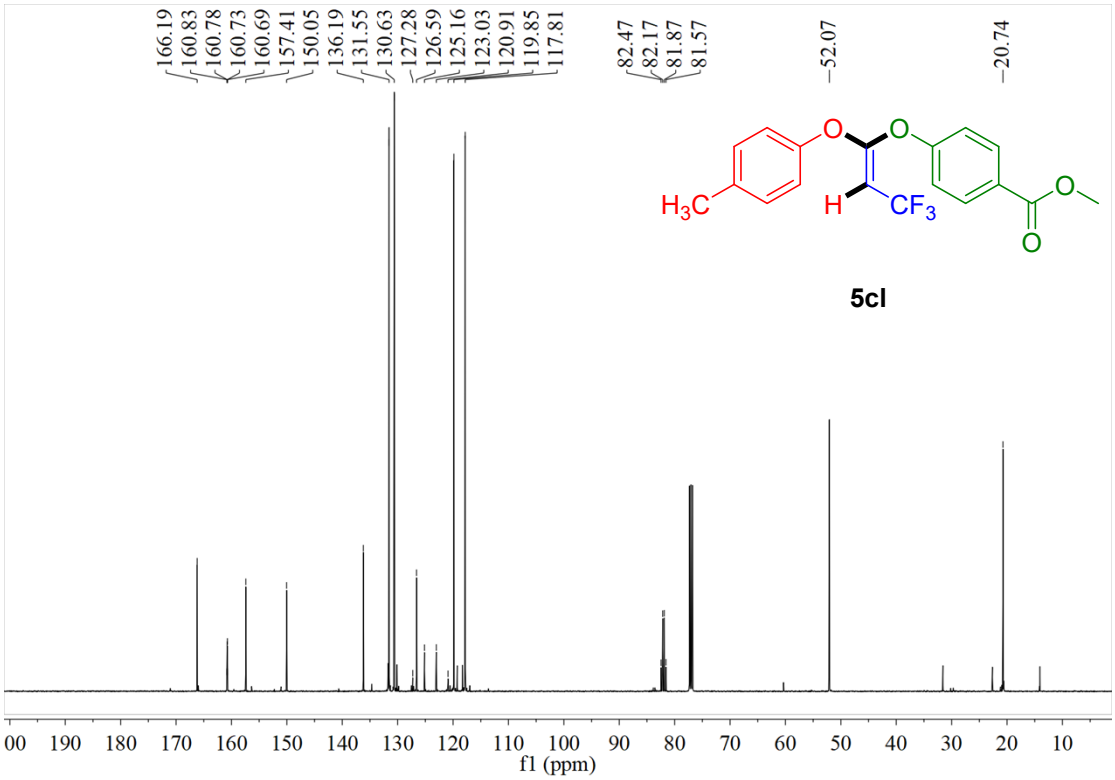

9.85
7.81
7.81
7.80
7.80
7.79
7.25
7.24
7.24
7.23
7.23
7.22
7.16
7.15
7.15
7.14
7.14
7.13
6.93
6.92
6.92
6.91
6.91
6.90
6.90
4.57
4.56
4.55
4.53
Cl
O
O
H
CF3
CHO
5aj
1.08
2.11
2.05
2.04
2.20
1.00
f1 (ppm)

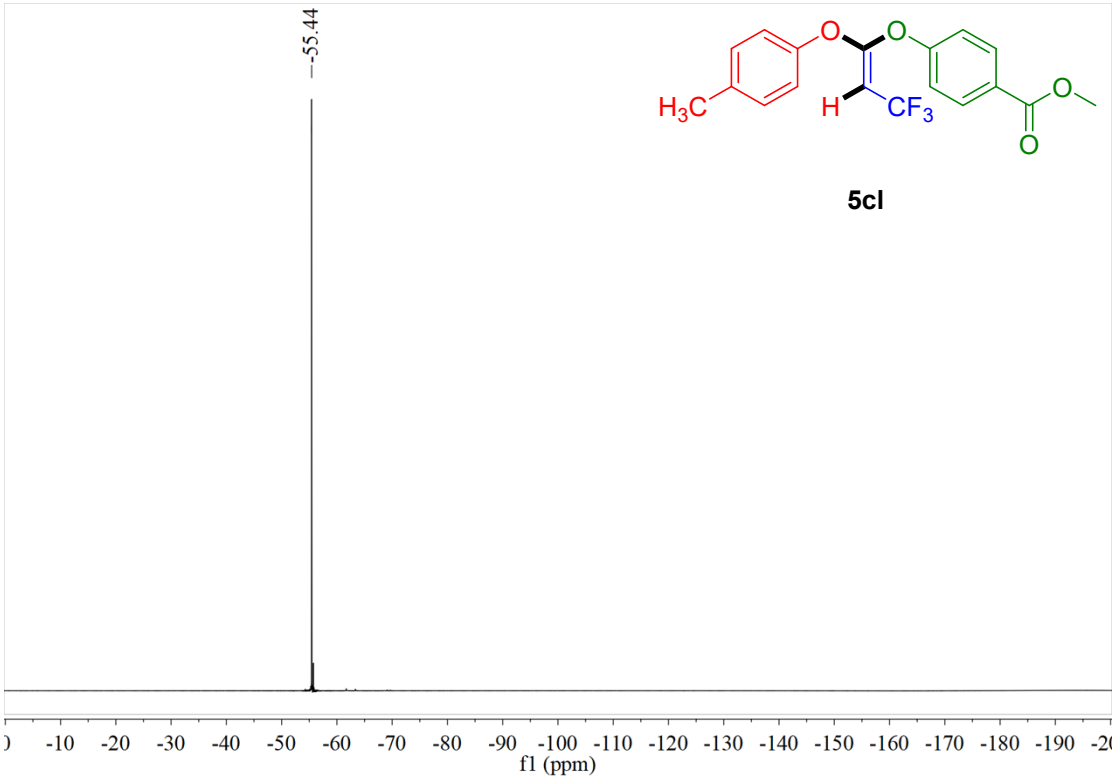

190.44
159.50
159.46
159.41
159.37
158.10
150.66
133.19
131.77
131.69
130.29
126.80
124.67
122.55
121.24
120.42
118.29
84.46
84.17
83.87
83.57
Cl
O
O
H
CF3
CHO
5aj
f1 (ppm)



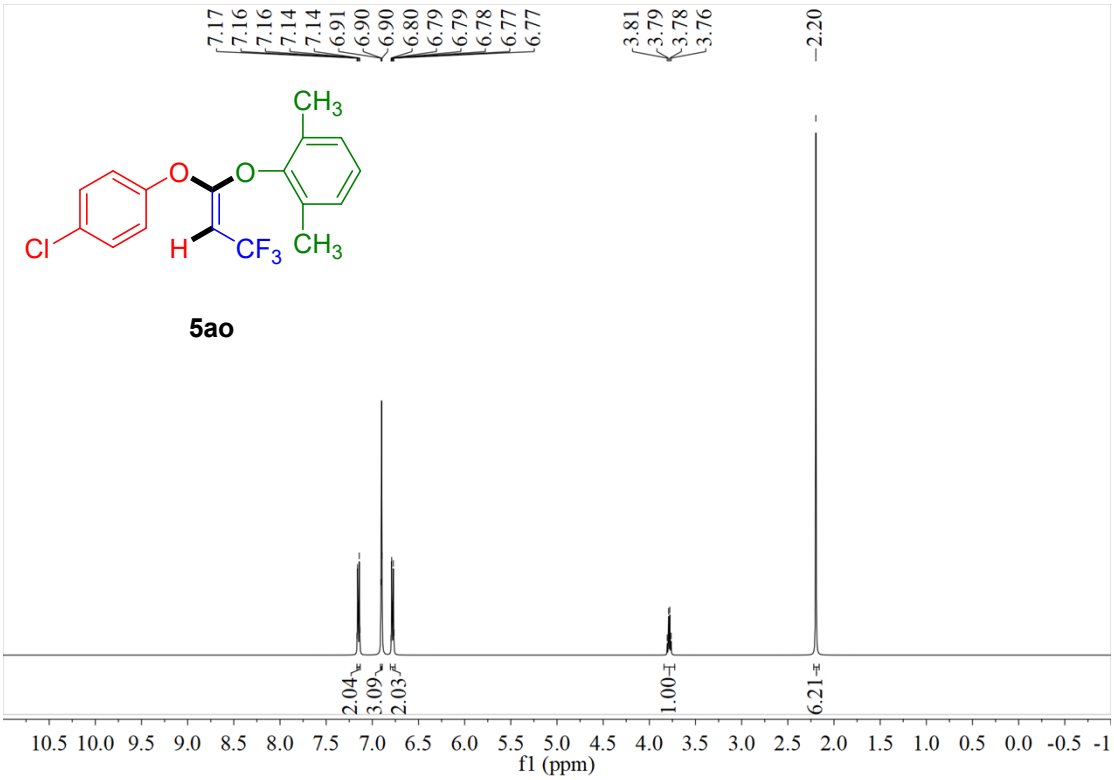
Methyl (*Z*)-4-((3,3,3-trifluoro-1-(*p*-tolyloxy)prop-1-en-1-yl)oxy)benzoate (5cl)

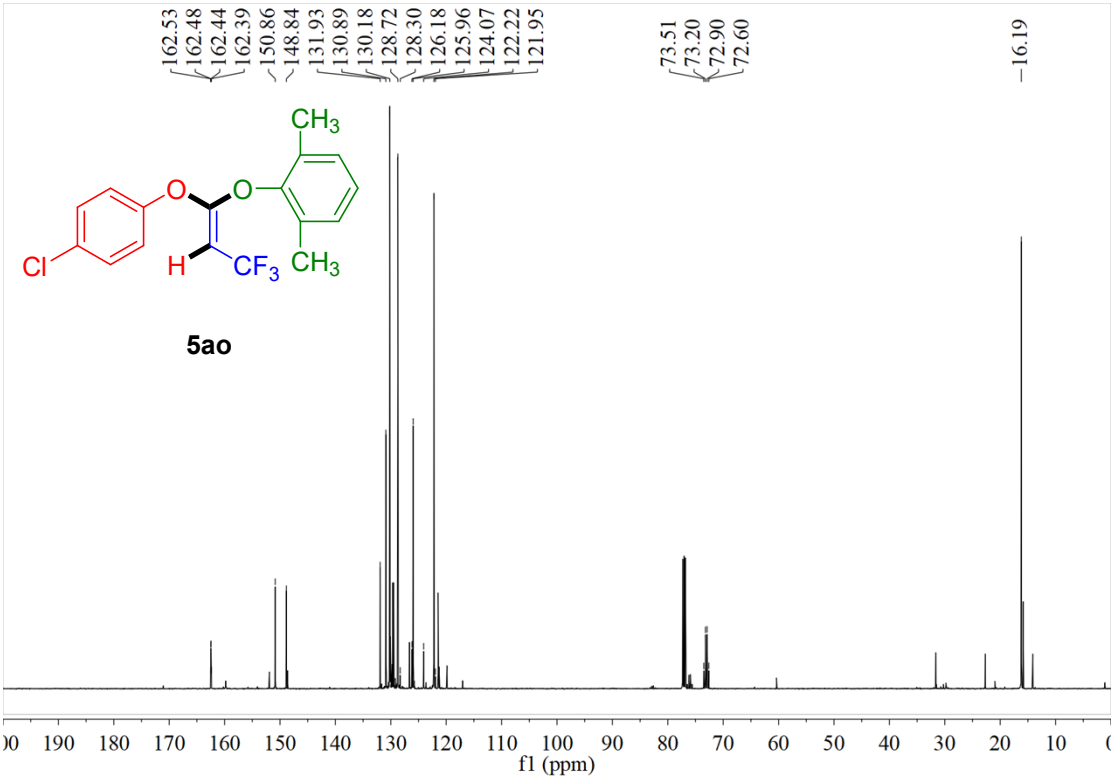


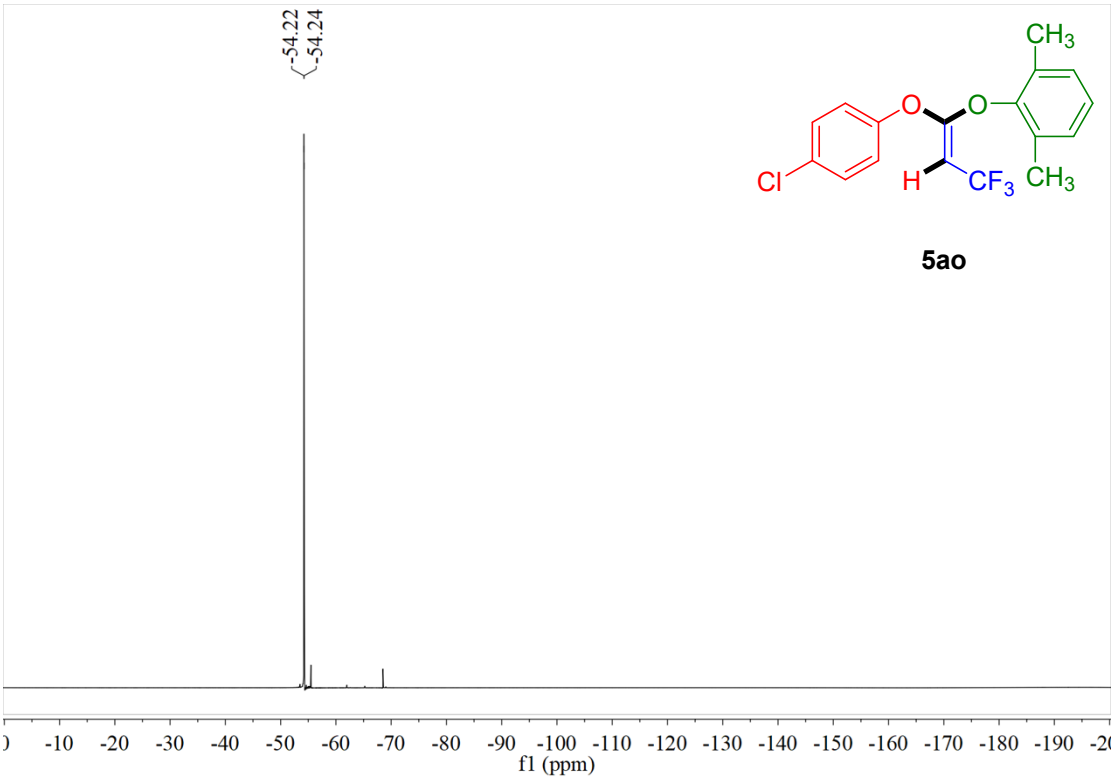




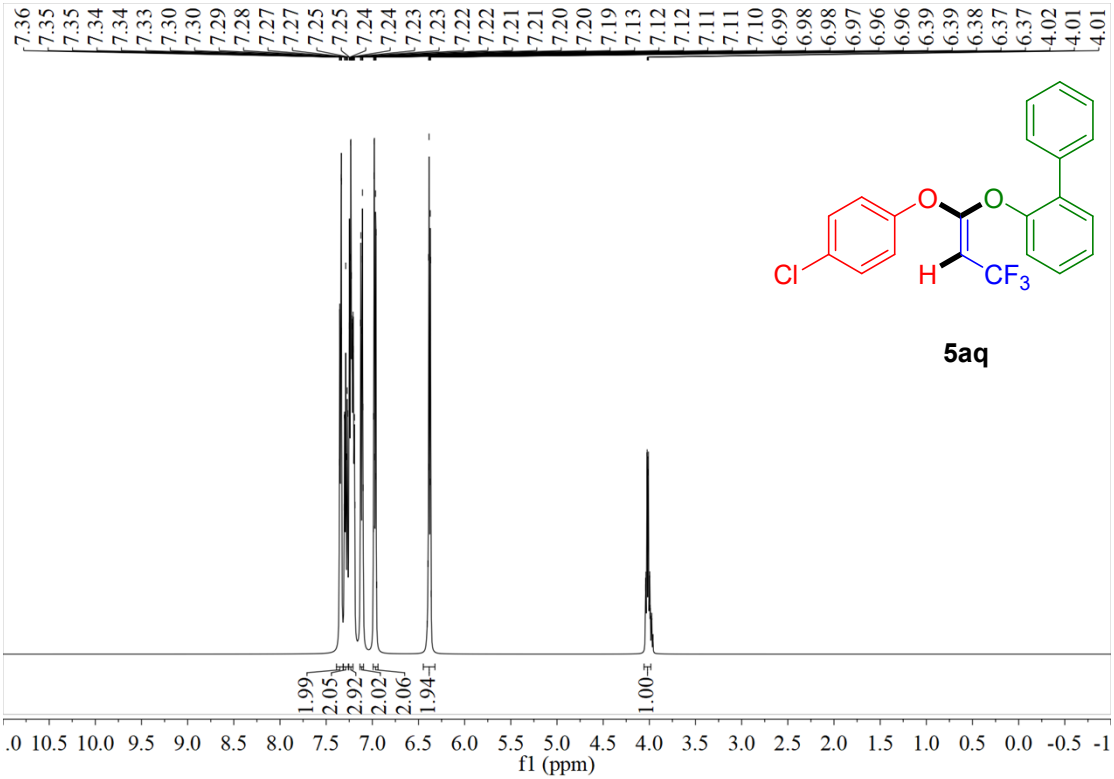
(*Z*)-2-((1-(4-chlorophenoxy)-3,3,3-trifluoroprop-1-en-1-yl)oxy)-1,3-dimethylbenzene (5ao)

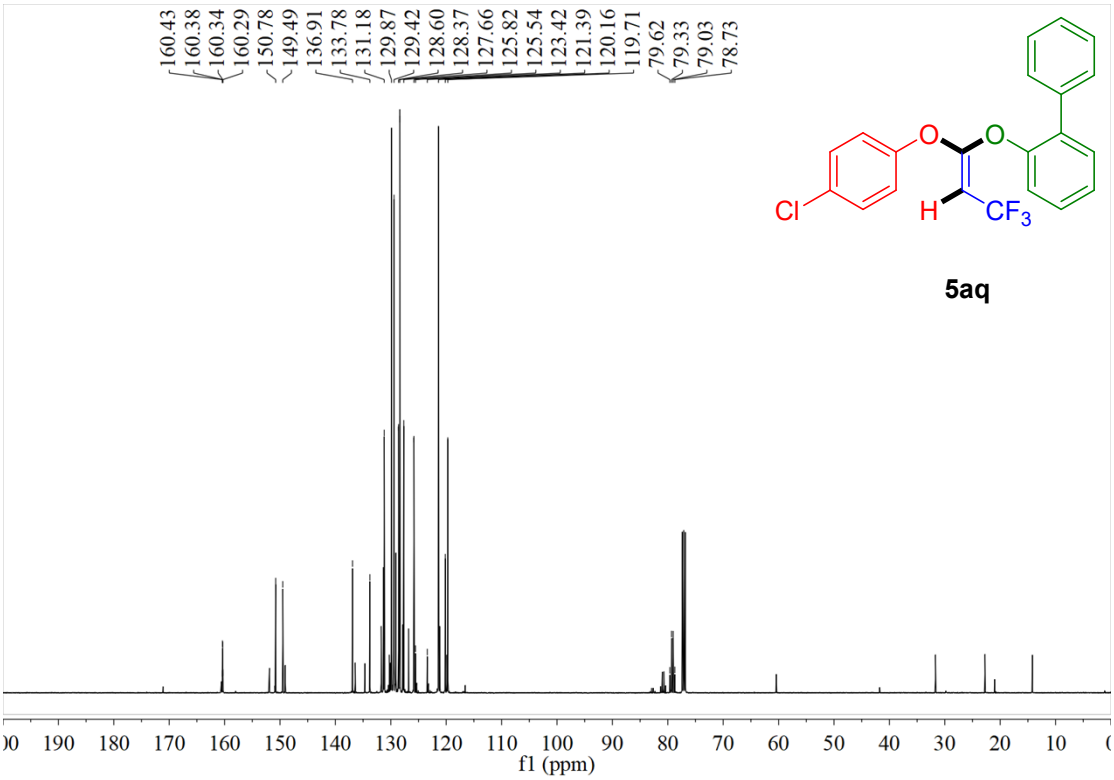

7.17
7.16
7.16
7.14
7.14
6.91
6.90
6.90
6.80
6.79
6.79
6.78
6.77
6.77
3.81
3.79
3.78
3.76
2.20
CH3
O
O
Cl
H
CF3
CH3
5ao
2.04
3.09
2.03
1.00
6.21
10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5 -1
f1 (ppm)

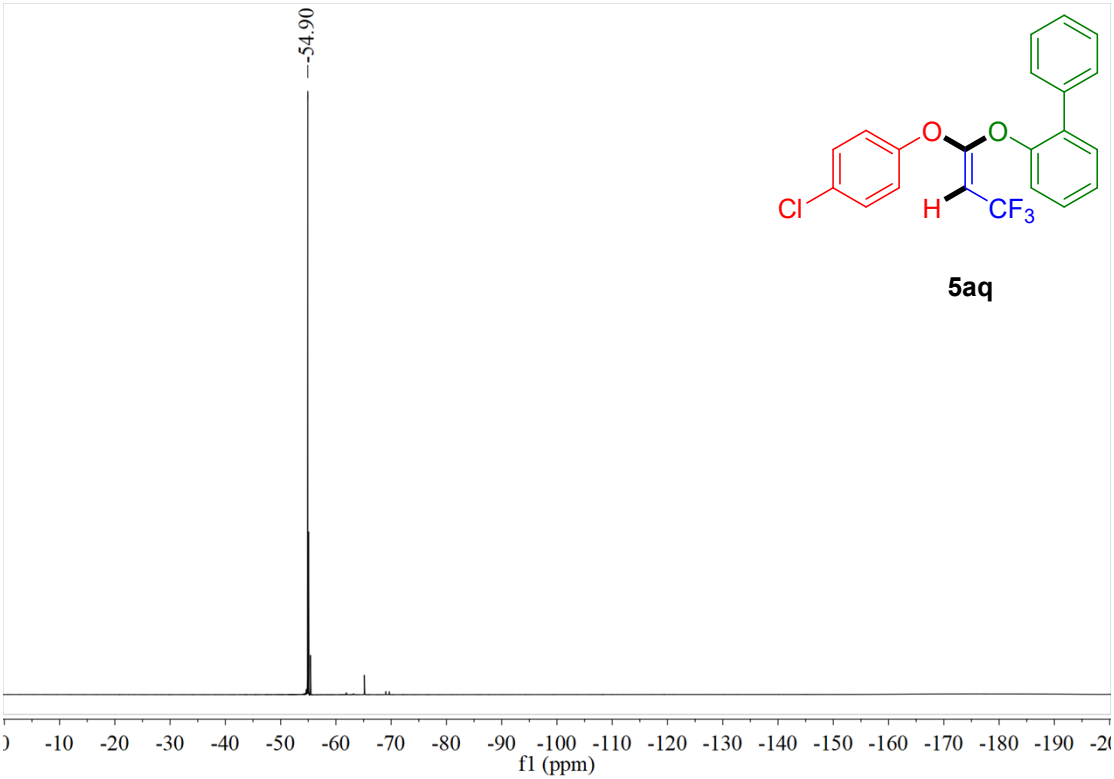

162.53
162.48
162.44
162.39
150.86
148.84
131.93
130.89
130.18
128.72
128.30
126.18
125.96
124.07
122.22
121.95
73.51
73.20
72.90
72.60
16.19
CH3
O
O
Cl
H
CF3
CH3
5ao
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
f1 (ppm)



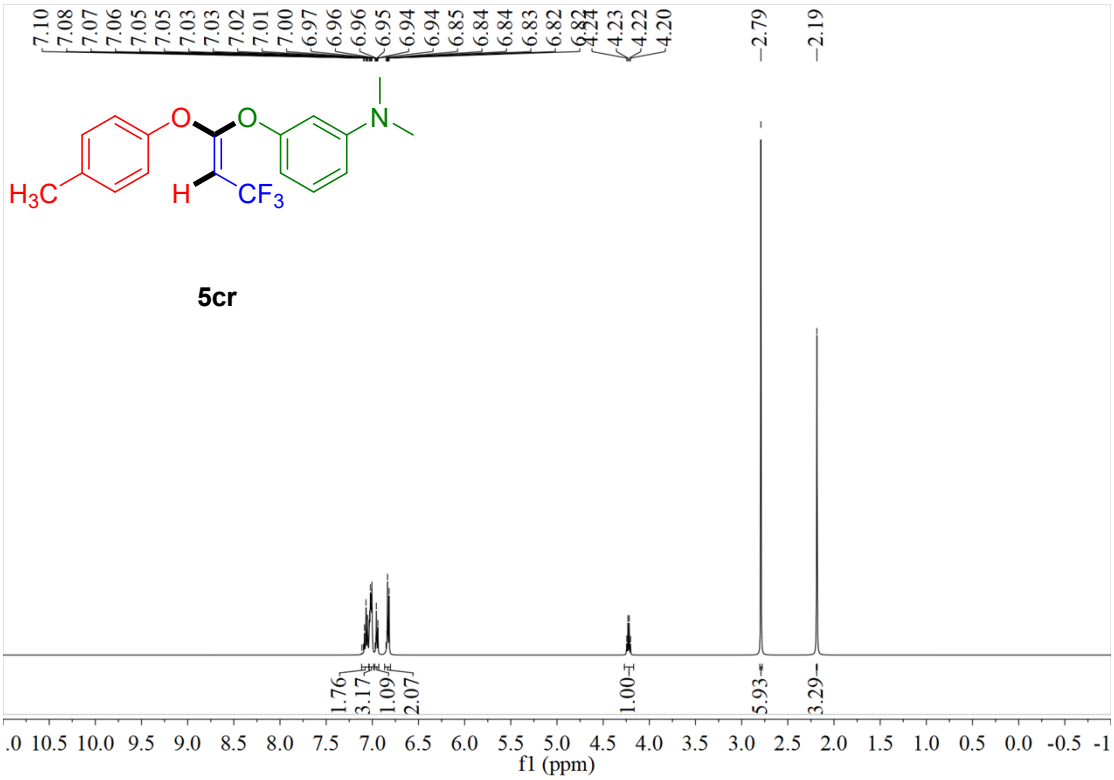
(*Z*)-2-((1-(4-chlorophenoxy)-3,3,3-trifluoroprop-1-en-1-yl)oxy)-1,1'-biphenyl (5aq)

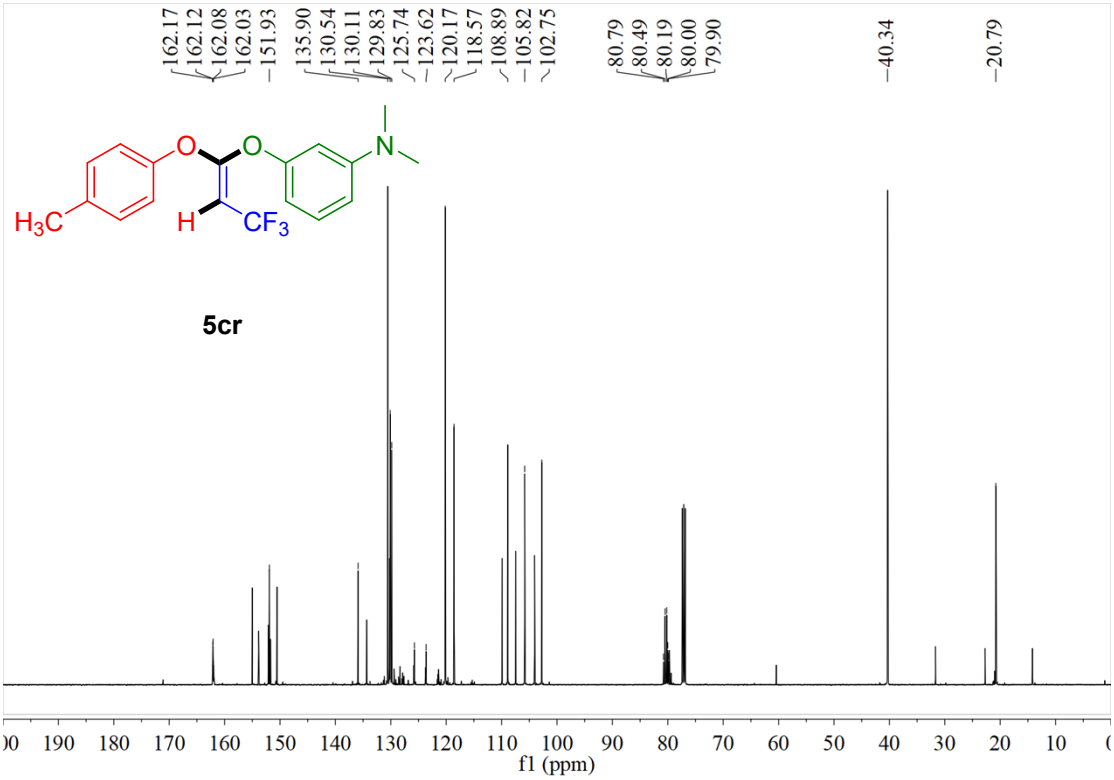


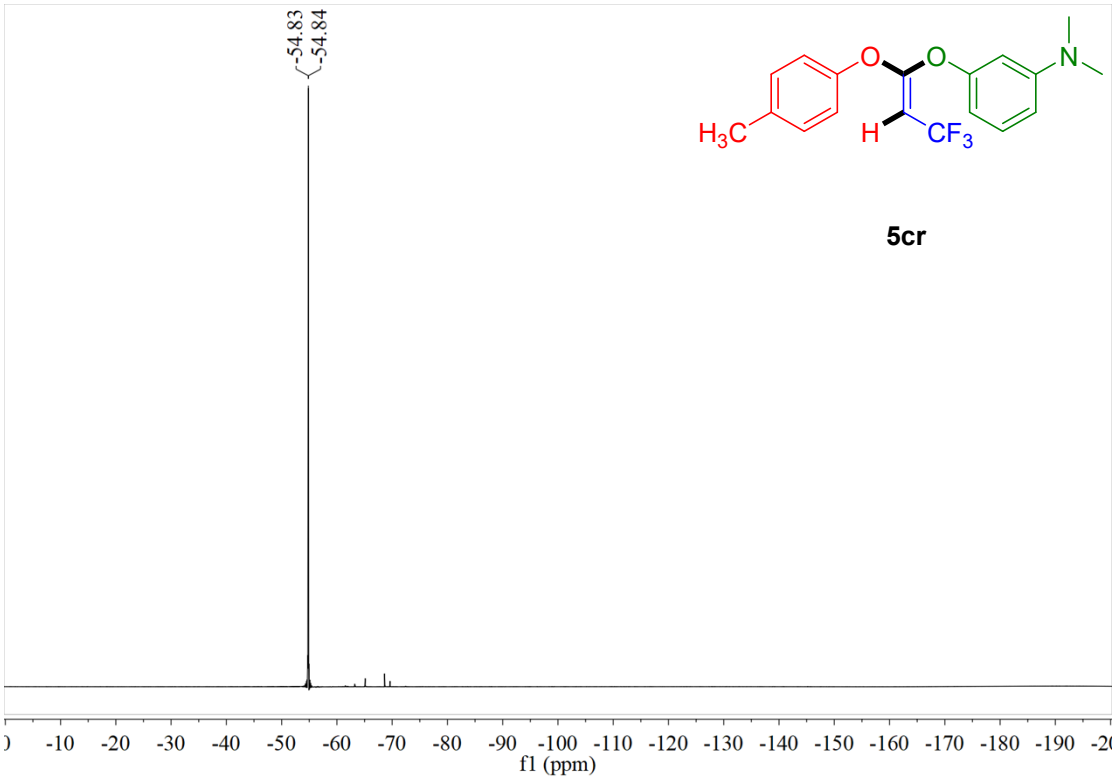




(*Z*)-*N*,*N*-dimethyl-3-((3,3,3-trifluoro-1-(*p*-tolyloxy)prop-1-en-1-yl)oxy)aniline (5cr)


7.10
7.08
7.07
7.06
7.05
7.05
7.03
7.03
7.02
7.01
7.00
6.97
6.96
6.96
6.95
6.94
6.94
6.85
6.84
6.84
6.83
6.82
4.23
4.22
4.20
2.79
2.19
O
O
N
H3C
H
CF3
5cr
1.76
3.17
1.09
2.07
1.00
5.93
3.29
f1 (ppm)


162.17
162.12
162.08
162.03
151.93
135.90
130.54
130.11
129.83
125.74
123.62
120.17
118.57
108.89
105.82
102.75
80.79
80.49
80.19
80.00
79.90
40.34
20.79
O
O
N
H3C
H
CF3
5cr
f1 (ppm)


-54.83
-54.84
O
O
N
H3C
H
CF3
5cr
-10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190
f1 (ppm)