

Copper catalysed controllable hydrodefluorination of trifluoromethylated alkenes

Chong Lian,^{a,b,§} Longlong Xi,^{b,§} Yu Yuan,^{a,*} Zhuangzhi Shi,^{a,b,*} and Minyan Wang^{b,*}

^{a.} College of Chemistry and Chemical Engineering, Yangzhou University, Yangzhou 225002, China

^{b.} State Key Laboratory of Coordination Chemistry, Chemistry and Biomedicine Innovation Center (ChemBIC), School of Chemistry and Chemical Engineering, Nanjing University, Nanjing, China

[§] C.L. and L.X. contributed equally to this work

* Corresponding Authors: M. Wang: wangmy@nju.edu.cn

Z. Shi: shiz@nju.edu.cn;

Y. Yuan: yyuan@yzu.edu.cn

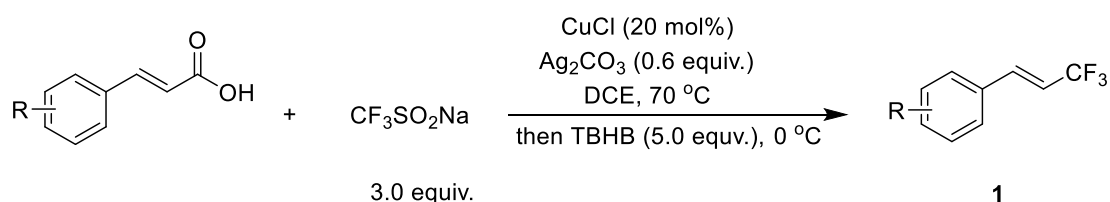
Table of Contents

1. General Information.....	2
2. General Procedure for Synthesis of Starting Materials.....	2
3. Experimental Procedures and Characterization of Products.....	4
4. Gram-Sale Synthesis.....	18
5. Synthetic Application.....	18
6. Control Experiments.....	22
7. DFT Calculations.....	24
8. References.....	55
9. Copies of ¹ H, ¹³ C and ¹⁹ F NMR Spectra.....	57

1. General Information

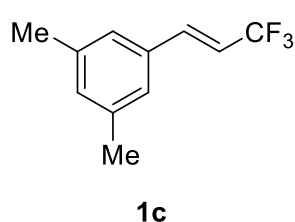
All new compounds were fully characterized. All reactions and manipulations involving air-sensitive compounds were performed using standard Schlenk techniques or in a glovebox. Anhydrous CH₃CN and anhydrous MeOH were purchased from J&K Chemical and were used as received. ¹H, ¹³C and ¹⁹F NMR spectra were recorded on a Bruker AVANCE III 400 MHz or 500 MHz spectrometer. Chemical shifts (δ values) were reported δ values in ppm relative to chloroform (δ = 7.26 for ¹H NMR and δ = 77.00 for ¹³C NMR, respectively). Mass spectra were conducted at Micromass Q-ToF instrument (ESI) and Agilent Technologies 5973N (EI). IR spectra were recorded on a FT-IR spectrometer. Unless otherwise noted, materials obtained from commercial suppliers were used without further purification. The preparation of the **1a-1b**, **1d-1e** **1g-1x** were described according to the reported literatures.¹⁻²

2. General Procedure for Synthesis of Starting Materials



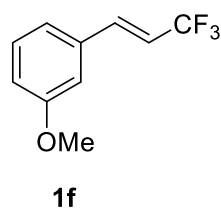
According to the literatures^{1a,2}, to a reaction flask equipped with a reflux condenser was added α,β -unsaturated carboxylic acid (5.0 mol, 1.0 equiv.), CF₃SO₂Na (2.34 g, 15.0 mol, 3.0 equiv.), CuCl (0.01 g, 1.0 mol, 0.2 equiv.), Ag₂CO₃ (0.83 g, 3 mol, 0.6 equiv.), and DCE (50 mL). Then aqueous TBHP (70 wt. % in H₂O) (3.2 mL, 25 mmol, 5 equiv.) was added at 0 °C with stirring. The reaction was heated at 70 °C and stirring for 24 h. The resulting mixture was filtered through a pad of celite and washed with CH₂Cl₂ (20 mL). After concentrated in vacuum, the residue was purified by column chromatography to afford the corresponding product **1**.

(E)-1,3-Dimethyl-5-(3,3,3-trifluoroprop-1-en-1-yl)benzene



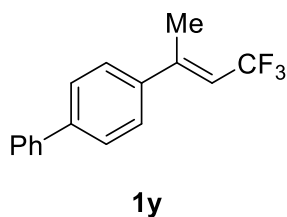
Following the general procedure, after column chromatography on silica afford **1c** as a colorless oil: $^1\text{H NMR}$ (500 MHz, CDCl_3) δ 7.24 – 7.00 (m, 4H), 6.37 – 6.08 (m, 1H), 2.39 (s, 6H). $^{13}\text{C NMR}$ (126 MHz, CDCl_3) δ 138.6, 138.1 (q, $J = 7.1$ Hz), 133.5, 131.9, 125.6, 115.5 (q, $J = 33.8$ Hz), 21.2. $^{19}\text{F NMR}$ (471 MHz, CDCl_3) δ -63.23. ATR-FTIR (cm^{-1}): 3008, 2695, 2156, 1666, 1472, 1265, 937, 726; HRMS m/z (ESI) calculated for $\text{C}_{11}\text{H}_{12}\text{F}_3$ ($\text{M} + \text{H}$) $^+$ 201.0886, found 201.0879.

(E)-1-Methoxy-3-(3,3,3-trifluoroprop-1-en-1-yl)benzene



Following the general procedure, after column chromatography on silica afford **1f** as a colorless oil: $^1\text{H NMR}$ (500 MHz, CDCl_3) δ 7.31 (t, $J = 7.9$ Hz, 1H), 7.16 – 7.09 (m, 1H), 7.05 (t, $J = 6.2$ Hz, 1H), 6.98 (s, 1H), 6.94 (dd, $J = 8.2, 2.3$ Hz, 1H), 6.20 (dq, $J = 16.1, 6.5$ Hz, 1H), 3.84 (s, 3H). $^{13}\text{C NMR}$ (126 MHz, CDCl_3) δ 160.1, 137.8 (q, $J = 6.8$ Hz), 134.9, 130.1, 123.7 (q, $J = 268.9$ Hz), 120.2, 116.3 (q, $J = 33.8$ Hz), 115.8, 112.9, 55.4. $^{19}\text{F NMR}$ (471 MHz, CDCl_3) δ -63.34. ATR-FTIR (cm^{-1}): 3008, 2694, 2155, 1667, 1462, 1265, 1044, 763; HRMS m/z (ESI) calculated for $\text{C}_{10}\text{H}_{10}\text{F}_3\text{O}$ ($\text{M} + \text{H}$) $^+$ 203.0678, found 203.0674.

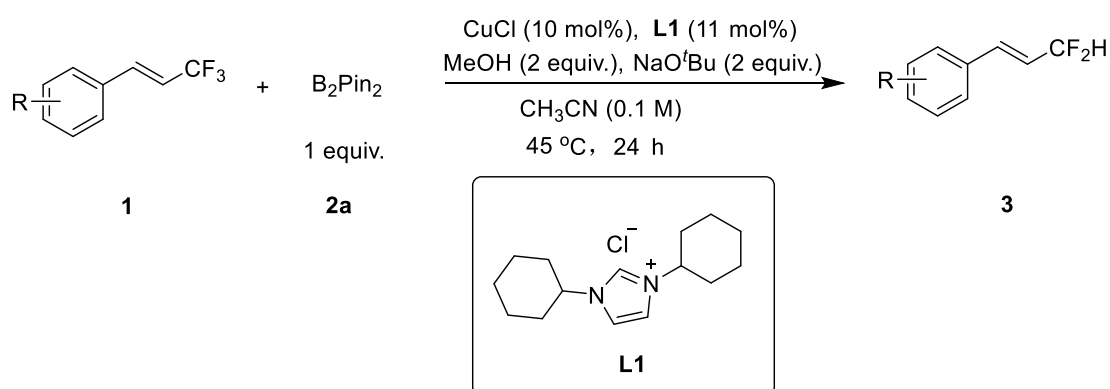
(E)-4-(4,4,4-Trifluorobut-2-en-2-yl)-1,1'-biphenyl



Following the general procedure, after column chromatography on silica afford **1y** as a colorless oil: $^1\text{H NMR}$ (400 MHz, CDCl_3) δ 7.65 – 7.57 (m, 4H), 7.54 – 7.43 (m, 4H), 7.42 – 7.34 (m, 1H), 6.03 – 5.88 (m, 1H), 2.36 – 2.31 (m, 3H). $^{13}\text{C NMR}$ (101 MHz, CDCl_3) δ 148.7, 142.1, 140.4, 139.7, 129.0,

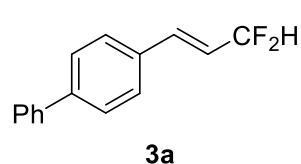
127.8, 127.4, 127.2, 126.7, 115.9 (q, $J = 33.8$ Hz), 17.5. ^{19}F NMR (377 MHz, CDCl_3) δ -56.89. ATR-FTIR (cm^{-1}): 3008, 2692, 2156, 1470, 1265, 963, 763, 698; HRMS m/z (ESI) calculated for $\text{C}_{15}\text{H}_{14}\text{F}_3$ ($\text{M} + \text{H}$) $^+$ 263.1042, found 263.1040.

3. Experimental Procedures and Characterization of Products



To a 25 mL Schlenk tube was added trifluoromethyl alkenes **1** (0.20 mmol, 1.0 equiv.), CuCl (2.0 mg, 0.02 mmol, 10 mol%), **L1** (5.6 mg, 0.024 mmol, 12 mol%), NaO^tBu (38.4 mg, 0.4 mmol, 2.0 equiv.), B_2pin_2 **2a** (50.8 mg, 0.2 mmol, 1.0 equiv.), MeOH (12.8 mg, 0.4 mmol, 2.0 equiv.), and MeCN (2 mL) under Ar atmosphere. The reaction mixture was stirred at $45\text{ }^\circ\text{C}$ for 24 hours. The solution was then cooled to room temperature and the solvent was removed under vacuum directly. The crude products were purified by column chromatography on silica gel to afford the pure products.

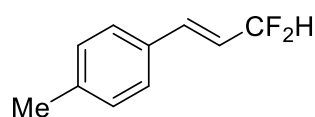
(*E*)-4-(3,3-Difluoroprop-1-en-1-yl)-1,1'-biphenyl



Following the general procedure, the reaction of **1a** (50.0 mg, 0.20 mmol, 1.0 equiv.), CuCl (2.0 mg, 0.02 mmol, 10 mol%), **L1** (5.6 mg, 0.024 mmol, 12 mol%), NaO^tBu (38.4 mg, 0.4 mmol, 2.0 equiv.), B_2pin_2 **2a** (50.8 mg, 0.2 mmol, 1.0 equiv.), MeOH (12.8 mg, 0.4 mmol, 2.0 equiv.), and MeCN (2 mL) under Ar atmosphere. The reaction mixture was stirred at $45\text{ }^\circ\text{C}$ for 24 hours after column chromatography on silica afford **3a** (41.9 mg,

91%) as a white solid: $^1\text{H NMR}$ (400 MHz, CDCl_3) δ 7.67 – 7.60 (m, 4H), 7.56 – 7.44 (m, 4H), 7.43 – 7.36 (m, 1H), 6.99 – 6.89 (m, 1H), 6.45 – 6.13 (m, 2H). $^{13}\text{C NMR}$ (126 MHz, CDCl_3) δ 142.4, 140.4, 136.8 (t, $J = 12.1$ Hz), 133.5, 129.0, 127.9, 127.6, 127.2, 121.0 (t, $J = 23.9$ Hz), 115.5 (t, $J = 233.6$ Hz). $^{19}\text{F NMR}$ (471 MHz, CDCl_3) δ -109.60. **ATR-FTIR** (cm^{-1}): 3007, 2692, 2156, 1970, 1265, 1137, 970, 731; **HRMS m/z (ESI)** calculated for $\text{C}_{15}\text{H}_{13}\text{F}_2$ ($\text{M} + \text{H}$) $^+$ 231.0980, found 231.0970.

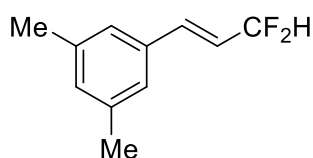
(E)-1-(3,3-Difluoroprop-1-en-1-yl)-4-methylbenzene



3b

Following the general procedure, the reaction of **1b** (37.2 mg, 0.20 mmol, 1.0 equiv.), CuCl (2.0 mg, 0.02 mmol, 10 mol%), **L1** (5.6 mg, 0.024 mmol, 12 mol%), NaO^tBu (38.4 mg, 0.4 mmol, 2.0 equiv.), B_2pin_2 **2a** (50.8 mg, 0.2 mmol, 1.0 equiv.), MeOH (12.8 mg, 0.4 mmol, 2.0 equiv.), and MeCN (2 mL) under Ar atmosphere. The reaction mixture was stirred at 45 °C for 24 hours after column chromatography on silica afford **3b** (23.5 mg, 70%) as a colorless oil: $^1\text{H NMR}$ (400 MHz, CDCl_3) δ 7.34 (d, $J = 8.0$ Hz, 2H), 7.18 (d, $J = 8.0$ Hz, 2H), 6.89 – 6.80 (m, 1H), 6.41 – 6.07 (m, 2H), 2.37 (s, 3H). $^{13}\text{C NMR}$ (101 MHz, CDCl_3) δ 139.7, 137.2 (t, $J = 12.3$ Hz), 131.8, 129.6 127.3, 120.1 (t, $J = 24.0$ Hz), 115.8 (t, $J = 234.2$ Hz), 21.5. $^{19}\text{F NMR}$ (377 MHz, CDCl_3) δ -109.20. **ATR-FTIR** (cm^{-1}): 3009, 2698, 1971, 1465, 1269, 1134, 967, 755; **HRMS m/z (ESI)** calculated for $\text{C}_{10}\text{H}_{11}\text{F}_2$ ($\text{M} + \text{H}$) $^+$ 169.0823, found 169.0804.

(E)-1-(3,3-Difluoroprop-1-en-1-yl)-3,5-dimethylbenzene

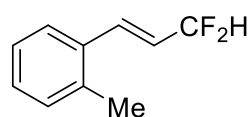


3c

Following the general procedure, the reaction of **1c** (40 mg, 0.20 mmol, 1.0 equiv.), CuCl (2.0 mg, 0.02 mmol, 10 mol%), **L1** (5.6 mg, 0.024 mmol, 12 mol%), NaO^tBu (38.4 mg, 0.4 mmol, 2.0 equiv.), B_2pin_2 **2a** (50.8 mg, 0.2 mmol, 1.0 equiv.), MeOH (12.8 mg, 0.4 mmol, 2.0 equiv.), and MeCN (2 mL) under Ar atmosphere. The reaction mixture was stirred at 45 °C for 24 hours after column chromatography on

silica afford **3c** (27.0 mg, 74%) as a colorless oil: $^1\text{H NMR}$ (500 MHz, CDCl_3) δ 7.07 (s, 2H), 7.00 (s, 1H), 6.86 – 6.79 (m, 1H), 6.37 – 6.09 (m, 2H), 2.33 (s, 6H). $^{13}\text{C NMR}$ (126 MHz, CDCl_3) δ 138.3, 137.4 (t, $J = 12.3$ Hz), 134.4, 131.1, 125.1, 120.6 (t, $J = 24.0$ Hz), 115.6 (t, $J = 233.4$ Hz), 21.2. $^{19}\text{F NMR}$ (471 MHz, CDCl_3) δ -109.37. ATR-FTIR (cm^{-1}): 3009, 2695, 2157, 1663, 1267, 1137, 969, 763; HRMS m/z (ESI) calculated for $\text{C}_{11}\text{H}_{13}\text{F}_2$ ($\text{M} + \text{H}$) $^+$ 183.0980, found 183.0975.

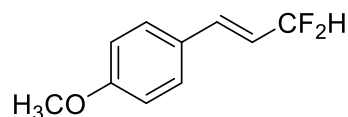
(E)-1-(3,3-Difluoroprop-1-en-1-yl)-2-methylbenzene



3d

Following the general procedure, the reaction of **1d** (37.2 mg, 0.20 mmol, 1.0 equiv.), CuCl (2.0 mg, 0.02 mmol, 10 mol%), **L1** (5.6 mg, 0.024 mmol, 12 mol%), NaO^tBu (38.4 mg, 0.4 mmol, 2.0 equiv.), B₂pin₂ **2a** (50.8 mg, 0.2 mmol, 1.0 equiv.), MeOH (12.8 mg, 0.4 mmol, 2.0 equiv.), and MeCN (2 mL) under Ar atmosphere. The reaction mixture was stirred at 45 °C for 24 hours after column chromatography on silica afford **3d** (23.3 mg, 69%) as a white solid: $^1\text{H NMR}$ (400 MHz, CDCl_3) δ 7.49 – 7.43 (m, 1H), 7.26 – 7.08 (m, 4H), 6.42 – 6.11 (m, 2H), 2.37 (s, 3H). $^{13}\text{C NMR}$ (101 MHz, CDCl_3) δ 136.6, 135.1 (t, $J = 12.2$ Hz), 133.7, 130.7, 129.3, 126.5, 126.3, 122.4 (t, $J = 24.0$ Hz), 115.5 (t, $J = 233.5$ Hz), 19.8. $^{19}\text{F NMR}$ (377 MHz, CDCl_3) δ -109.53. ATR-FTIR (cm^{-1}): 3009, 2698, 1973, 1550, 1269, 1133, 970, 755; HRMS m/z (ESI) calculated for $\text{C}_{10}\text{H}_{11}\text{F}_2$ ($\text{M} + \text{H}$) $^+$ 169.0833, found 169.0823.

(E)-1-(Difluoromethyl)-4-(3,3-difluoroprop-1-en-1-yl)benzene

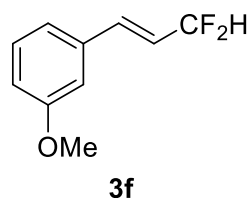


3e

Following the general procedure, the reaction of **1e** (40.4 mg, 0.20 mmol, 1.0 equiv.), CuCl (2.0 mg, 0.02 mmol, 10 mol%), **L1** (5.6 mg, 0.024 mmol, 12 mol%), NaO^tBu (38.4 mg, 0.4 mmol, 2.0 equiv.), B₂pin₂ **2a** (50.8 mg, 0.2 mmol, 1.0 equiv.), MeOH (12.8 mg, 0.4 mmol, 2.0 equiv.), and MeCN (2 mL) under Ar atmosphere. The reaction

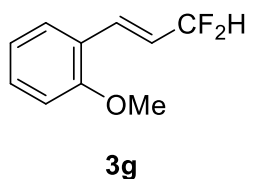
mixture was stirred at 45 °C for 24 hours after column chromatography on silica afford **3e** (33.2 mg, 90%) as a colorless oil: **¹H NMR (500 MHz, CDCl₃)** δ 7.38 (d, *J* = 8.5 Hz, 2H), 6.90 (d, *J* = 8.7 Hz, 2H), 6.86 – 6.78 (m, 1H), 6.36 – 6.07 (m, 2H), 3.83 (s, 3H). **¹³C NMR (126 MHz, CDCl₃)** δ 160.7, 136.8 (t, *J* = 12.2 Hz), 128.8, 127.2, 118.8 (t, *J* = 23.9 Hz), 116.0 (t, *J* = 233.5 Hz), 114.3, 55.5. **¹⁹F NMR (471 MHz, CDCl₃)** δ -108.67. **ATR-FTIR (cm⁻¹):** 3009, 2698, 2577, 1584, 1461, 1272, 1125, 754; **HRMS m/z (ESI)** calculated for C₁₀H₁₁F₂O (M + H)⁺ 185.0772, found 185.0770.

(E)-1-(3,3-Difluoroprop-1-en-1-yl)-3-methoxybenzene



Following the general procedure, the reaction of **1f** (40.4 mg, 0.20 mmol, 1.0 equiv.), CuCl (2.0 mg, 0.02 mmol, 10 mol%), **L1** (5.6 mg, 0.024 mmol, 12 mol%), NaO^tBu (38.4 mg, 0.4 mmol, 2.0 equiv.), B₂pin₂ **2a** (50.8 mg, 0.2 mmol, 1.0 equiv.), MeOH (12.8 mg, 0.4 mmol, 2.0 equiv.), and MeCN (2 mL) under Ar atmosphere. The reaction mixture was stirred at 45 °C for 24 hours after column chromatography on silica afford **3f** (22.8 mg, 62%) as a colorless oil: **¹H NMR (500 MHz, CDCl₃)** δ 7.29 (t, *J* = 7.9 Hz, 1H), 7.04 (d, *J* = 7.6 Hz, 1H), 6.97 (s, 1H), 6.90 (dd, *J* = 8.2, 2.4 Hz, 1H), 6.88 – 6.82 (m, 1H), 6.38 – 6.11 (m, 2H), 3.83 (s, 3H). **¹³C NMR (126 MHz, CDCl₃)** δ 160.0, 137.2 (t, *J* = 12.1 Hz), 136.0, 130.0, 121.4 (t, *J* = 23.9 Hz), 120.0, 115.4 (t, *J* = 234.2 Hz), 115.2, 112.6, 55.4. **¹⁹F NMR (471 MHz, CDCl₃)** δ -109.81. **ATR-FTIR (cm⁻¹):** 3782, 3008, 2851, 2155, 1266, 1014, 763, 649; **HRMS m/z (ESI)** calculated for C₁₀H₁₁F₂O (M + H)⁺ 185.0772, found 185.0770.

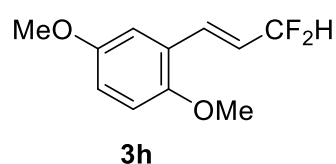
(E)-1-(3,3-Difluoroprop-1-en-1-yl)-2-methoxybenzene



Following the general procedure, the reaction of **1g** (40.4 mg, 0.20 mmol, 1.0 equiv.), CuCl (2.0 mg, 0.02 mmol, 10 mol%), **L1** (5.6 mg, 0.024 mmol, 12 mol%), NaO^tBu (38.4 mg, 0.4 mmol, 2.0

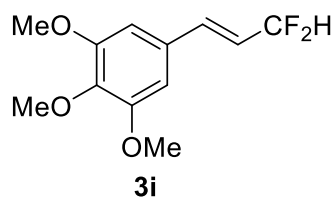
equiv.), B₂pin₂ **2a** (50.8 mg, 0.2 mmol, 1.0 equiv.), MeOH (12.8 mg, 0.4 mmol, 2.0 equiv.), and MeCN (2 mL) under Ar atmosphere. The reaction mixture was stirred at 45 °C for 24 hours after column chromatography on silica afford **3g** (19.3 mg, 53%) as a colorless oil: ¹H NMR (500 MHz, CDCl₃) δ 7.48 (d, *J* = 7.5 Hz, 2H), 7.35 (t, *J* = 8.0 Hz, 1H), 7.26 – 7.16 (m, 1H), 6.99 (t, *J* = 7.5 Hz, 1H), 6.93 (d, *J* = 8.5 Hz, 1H), 6.42 – 5.95 (m, 1H), 3.90 (s, 3H). ¹³C NMR (126 MHz, CDCl₃) δ 157.6, 132.6 (t, *J* = 12.7 Hz), 130.7, 128.1, 123.5, 121.6 (t, *J* = 24.2 Hz), 120.8, 116.3 (t, *J* = 233.5 Hz), 111.1, 55.6. ¹⁹F NMR (377 MHz, CDCl₃) δ -108.77. ATR-FTIR (cm⁻¹): 3007, 2692, 1469, 1265, 1150, 763, 731, 698; HRMS *m/z* (ESI) calculated for C₁₀H₁₁F₂O (M + H)⁺ 185.0772, found 185.0772.

(E)-2-(3,3-Difluoroprop-1-en-1-yl)-1,4-dimethoxybenzene



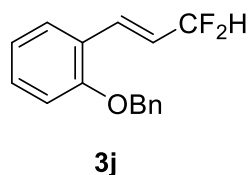
Following the general procedure, the reaction of **1h** (46.4 mg, 0.20 mmol, 1.0 equiv.), CuCl (2.0 mg, 0.02 mmol, 10 mol%), **L1** (5.6 mg, 0.024 mmol, 12 mol%), NaO^tBu (38.4 mg, 0.4 mmol, 2.0 equiv.), B₂pin₂ **2a** (50.8 mg, 0.2 mmol, 1.0 equiv.), MeOH (12.8 mg, 0.4 mmol, 2.0 equiv.), and MeCN (2 mL) under Ar. The reaction mixture was stirred at 45 °C for 24 hours after column chromatography on silica afford **3h** (24.5 mg, 57%) as a colorless oil: ¹H NMR (400 MHz, CDCl₃) δ 7.17 (dt, *J* = 16.0, 4.0 Hz, 1H), 6.99 (d, *J* = 2.8 Hz, 1H), 6.92 – 6.80 (m, 2H), 6.40 – 6.06 (m, 2H), 3.83 (s, 3H), 3.79 (s, 3H). ¹³C NMR (101 MHz, CDCl₃) δ 153.6, 152.0, 132.3 (t, *J* = 12.7 Hz), 121.7 (t, *J* = 24.2 Hz), 116.0 (t, *J* = 234.0 Hz), 115.8, 112.8, 112.3, 56.1, 55.8. ¹⁹F NMR (377 MHz, CDCl₃) δ -108.88. ATR-FTIR (cm⁻¹): 3380, 3254, 2985, 2606, 1452, 1117, 1022, 755; HRMS *m/z* (ESI) calculated for C₁₁H₁₃F₂O₂ (M + H)⁺ 215.0878, found 215.0877.

(E)-5-(3,3-Difluoroprop-1-en-1-yl)-1,2,3-trimethoxybenzene



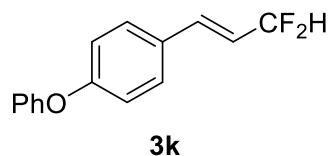
Following the general procedure, the reaction of **1i** (52.4 mg, 0.20 mmol, 1.0 equiv.), CuCl (2.0 mg, 0.02 mmol, 10 mol%), **L1** (5.6 mg, 0.024 mmol, 12 mol%), NaO^tBu (38.4 mg, 0.4 mmol, 2.0 equiv.), B₂pin₂ **2a** (50.8 mg, 0.2 mmol, 1.0 equiv.), MeOH (12.8 mg, 0.4 mmol, 2.0 equiv.), and MeCN (2 mL) under Ar atmosphere. The reaction mixture was stirred at 45 °C for 24 hours after column chromatography on silica afford **3i** (33.1 mg, 68%) as a white solid: **¹H NMR (400 MHz, CDCl₃)** δ 6.85 – 6.75 (m, 1H), 6.65 (s, 2H), 6.47 – 6.07 (m, 2H), 3.87 (s, 6H), 3.86 (s, 3H). **¹³C NMR (101 MHz, CDCl₃)** δ 153.6, 137.2 (t, *J* = 12.3 Hz), 130.2, 120.5 (t, *J* = 24.0 Hz), 115.5 (t, *J* = 234.5 Hz), 113.1, 104.6, 61.1, 56.3. **¹⁹F NMR (377 MHz, CDCl₃)** δ -109.43. **ATR-FTIR (cm⁻¹):** 3773, 3009, 2698, 2577, 1584, 1272, 1125, 754; **HRMS m/z (ESI)** calculated for C₁₂H₁₅F₂O₃ (M + H)⁺ 245.0984, found 245.0984.

(E)-1-(Benzyloxy)-2-(3,3-difluoroprop-1-en-1-yl)benzene



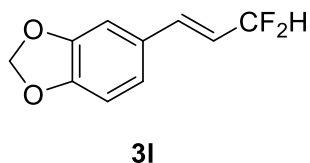
Following the general procedure, the reaction of **1j** (55.6 mg, 0.20 mmol, 1.0 equiv.), CuCl (2.0 mg, 0.02 mmol, 10 mol%), **L1** (5.6 mg, 0.024 mmol, 12 mol%), NaO^tBu (38.4 mg, 0.4 mmol, 2.0 equiv.), B₂pin₂ **2a** (50.8 mg, 0.2 mmol, 1.0 equiv.), MeOH (12.8 mg, 0.4 mmol, 2.0 equiv.), and MeCN (2 mL) under Ar atmosphere. The reaction mixture was stirred at 45 °C for 24 hours after column chromatography on silica afford **3j** (39.4 mg, 76%) as a yellow oil: **¹H NMR (400 MHz, CDCl₃)** δ 7.58 – 7.16 (m, 8H), 7.06 – 6.89 (m, 2H), 6.45 – 6.02 (m, 2H), 5.11 (s, 2H). **¹³C NMR (101 MHz, CDCl₃)** δ 156.8, 136.8, 132.5 (t, *J* = 12.7 Hz), 130.7, 128.8, 128.2, 128.0, 127.5, 123.9, 121.7 (t, *J* = 24.2 Hz), 116.2 (t, *J* = 232.9 Hz), 112.7, 111.8, 70.6. **¹⁹F NMR (377 MHz, CDCl₃)** δ -108.66. **ATR-FTIR (cm⁻¹):** 3354, 2985, 2600, 1452, 1280, 1116, 874, 754; **HRMS m/z (ESI)** calculated for C₁₆H₁₅F₂O (M + H)⁺ 261.1085, found 261.1080.

(E)-1-(3,3-Difluoroprop-1-en-1-yl)-4-phenoxybenzene



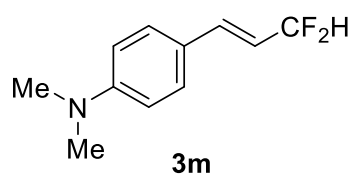
Following the general procedure, the reaction of **1k** (52.8 mg, 0.20 mmol, 1.0 equiv.), CuCl (2.0 mg, 0.02 mmol, 10 mol%), **L1** (5.6 mg, 0.024 mmol, 12 mol%), NaO^tBu (38.4 mg, 0.4 mmol, 2.0 equiv.), B₂pin₂ **2a** (50.8 mg, 0.2 mmol, 1.0 equiv.), MeOH (12.8 mg, 0.4 mmol, 2.0 equiv.), and MeCN (2 mL) under Ar atmosphere. The reaction mixture was stirred at 45 °C for 24 hours after column chromatography on silica afford **3k** (40.6 mg, 83%) as a white solid: ¹H NMR (400 MHz, CDCl₃) δ 7.52 – 7.32 (m, 4H), 7.20 – 7.12 (m, 1H), 7.12 – 6.92 (m, 4H), 6.89 – 6.80 (m, 1H), 6.42 – 6.04 (m, 2H). ¹³C NMR (101 MHz, CDCl₃) δ 158.7, 156.6, 136.5 (t, *J* = 12.2 Hz), 130.0, 129.4, 128.9, 124.0, 120.0 (t, *J* = 24.0 Hz), 119.6, 118.7, 115.7 (t, *J* = 234.0 Hz). ¹⁹F NMR (377 MHz, CDCl₃) δ -109.20. ATR-FTIR (cm⁻¹): 3321, 2986, 2604, 1970, 1452, 1281, 1116, 714; HRMS *m/z* (ESI) calculated for C₁₅H₁₃F₂O (M + H)⁺ 247.0929, found 247.0929.

(E)-5-(3,3-Difluoroprop-1-en-1-yl)benzo[d][1,3]dioxole



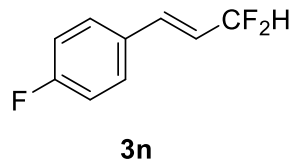
Following the general procedure, the reaction of **1l** (43.2 mg, 0.20 mmol, 1.0 equiv.), CuCl (2.0 mg, 0.02 mmol, 10 mol%), **L1** (5.6 mg, 0.024 mmol, 12 mol%), NaO^tBu (38.4 mg, 0.4 mmol, 2.0 equiv.), B₂pin₂ **2a** (50.8 mg, 0.2 mmol, 1.0 equiv.), MeOH (12.8 mg, 0.4 mmol, 2.0 equiv.), and MeCN (2 mL) under Ar atmosphere. The reaction mixture was stirred at 45 °C for 24 hours after column chromatography on silica afford **3l** (35.6 mg, 92%) as a colorless oil: ¹H NMR (500 MHz, CDCl₃) δ 6.96 (d, *J* = 1.5 Hz, 1H), 6.89 (d, *J* = 8.0 Hz, 1H), 6.82 – 6.74 (m, 2H), 6.35 – 6.03 (m, 2H), 5.99 (s, 2H). ¹³C NMR (126 MHz, CDCl₃) δ 148.9, 148.4, 136.9 (t, *J* = 12.3 Hz), 128.9, 122.9, 119.2 (t, *J* = 24.0 Hz), 115.7 (t, *J* = 233.7 Hz), 108.6, 106.2, 101.6. ¹⁹F NMR (471 MHz, CDCl₃) δ -108.98. ATR-FTIR (cm⁻¹): 3009, 2697, 2155, 1550, 1268, 1137, 967, 755; HRMS *m/z* (ESI) calculated for C₁₀H₉F₂O₂ (M + H)⁺ 199.0565, found 199.0564.

(E)-4-(3,3-Difluoroprop-1-en-1-yl)-N,N-dimethylaniline



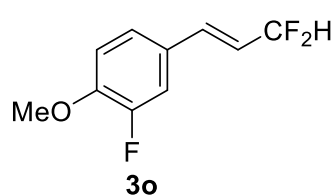
Following the general procedure, the reaction of **1m** (43.0 mg, 0.20 mmol, 1.0 equiv.), CuCl (2.0 mg, 0.02 mmol, 10 mol%), **L1** (5.6 mg, 0.024 mmol, 12 mol%), NaO^tBu (38.4 mg, 0.4 mmol, 2.0 equiv.), B₂pin₂ **2a** (50.8 mg, 0.2 mmol, 1.0 equiv.), MeOH (12.8 mg, 0.4 mmol, 2.0 equiv.), and MeCN (2 mL) under Ar atmosphere. The reaction mixture was stirred at 45 °C for 24 hours after column chromatography on silica afford **3m** (15.4 mg, 39%) as a yellow solid: **¹H NMR (400 MHz, CDCl₃)** δ 7.34 (d, *J* = 9.6 Hz, 2H), 6.77 (dt, *J* = 16.0, 3.2 Hz, 1H), 6.73 – 6.64 (m, 2H), 6.42 – 5.91 (m, 2H), 3.00 (s, 6H). **¹³C NMR (101 MHz, CDCl₃)** δ 151.2, 137.4 (t, *J* = 12.4 Hz), 128.5, 114.2, 118.8 (t, *J* = 358.0 Hz), 116.1 (t, *J* = 23.9 Hz), 112.0, 40.3. **¹⁹F NMR (376 MHz, CDCl₃)** δ -107.30. **ATR-FTIR (cm⁻¹):** 3781, 3008, 2694, 2128, 1468, 1265, 964, 731; **HRMS m/z (ESI)** calculated for C₁₁H₁₄F₂N (M + H)⁺ 198.1089, found 198.1084.

(E)-1-(3,3-Difluoroprop-1-en-1-yl)-4-fluorobenzene



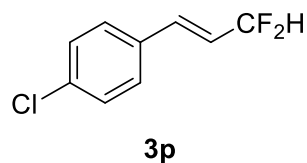
Following the general procedure, the reaction of **1n** (38 mg, 0.20 mmol, 1.0 equiv.), CuCl (2.0 mg, 0.02 mmol, 10 mol%), **L1** (5.6 mg, 0.024 mmol, 12 mol%), NaO^tBu (38.4 mg, 0.4 mmol, 2.0 equiv.), B₂pin₂ **2a** (50.8 mg, 0.2 mmol, 1.0 equiv.), MeOH (12.8 mg, 0.4 mmol, 2.0 equiv.), and MeCN (2 mL) under Ar atmosphere. The reaction mixture was stirred at 45 °C for 24 hours after column chromatography on silica afford **3n** (14.6 mg, 42%) as a colorless oil: **¹H NMR (500 MHz, CDCl₃)** δ 7.51 – 7.37 (m, 2H), 7.19 – 7.02 (m, 2H), 6.85 (dt, *J* = 16.2, 3.5 Hz, 1H), 6.38 – 6.09 (m, 2H). **¹³C NMR (126 MHz, CDCl₃)** δ 163.5 (d, *J* = 249.6 Hz), 136.0 (t, *J* = 12.2 Hz), 130.8, 129.1 (d, *J* = 8.2 Hz), 120.9 (td, *J* = 24.0, 2.3 Hz), 116.0 (d, *J* = 21.9 Hz), 115.4 (t, *J* = 234.2 Hz). **¹⁹F NMR (471 MHz, CDCl₃)** δ -109.77, -111.37. **ATR-FTIR (cm⁻¹):** 3066, 2574, 2154, 1733, 1474, 1277, 938, 734; **HRMS m/z (ESI)** calculated for C₉H₈F₃ (M + H)⁺ 173.0573, found 173.0573.

(E)-4-(3,3-Difluoroprop-1-en-1-yl)-2-fluoro-1-methoxybenzene



Following the general procedure, the reaction of **1o** (44.0 mg, 0.20 mmol, 1.0 equiv.), CuCl (2.0 mg, 0.02 mmol, 10 mol%), **L1** (5.6 mg, 0.024 mmol, 12 mol%), NaO^tBu (38.4 mg, 0.4 mmol, 2.0 equiv.), B₂pin₂ **2a** (50.8 mg, 0.2 mmol, 1.0 equiv.), MeOH (12.8 mg, 0.4 mmol, 2.0 equiv.), and MeCN (2 mL) under Ar atmosphere. The reaction mixture was stirred at 45 °C for 24 hours after column chromatography on silica afford **3o** (33.0 mg, 82%) as a yellow soild: **¹H NMR (400 MHz, CDCl₃)** δ 7.25 – 7.17 (m, 1H), 7.14 (d, *J* = 8.8 Hz, 1H), 6.94 (t, *J* = 8.4 Hz, 1H), 6.84 – 6.69 (m, 1H), 6.38 – 6.05 (m, 2H), 3.91 (s, 3H). **¹³C NMR (101 MHz, CDCl₃)** δ 152.6 (d, *J* = 248.5 Hz), 148.8 (d, *J* = 11.2 Hz), 135.8 (td, *J* = 12.2, 2.2 Hz), 127.9 (d, *J* = 6.4 Hz), 124.2 (d, *J* = 3.3 Hz), 120.2 (t, *J* = 24.0 Hz), 115.4 (t, *J* = 234.5 Hz) 114.3 (d, *J* = 18.9 Hz), 113.37 (d, *J* = 2.0 Hz), 56.4. **¹⁹F NMR (377 MHz, CDCl₃)** δ -109.54, -134.58. **ATR-FTIR (cm⁻¹):** 3361, 3074, 2590, 1972, 1518, 1315, 1062, 755; **HRMS m/z (ESI)** calculated for C₁₀H₁₀F₃O (M + H)⁺ 203.0678, found 203.0678.

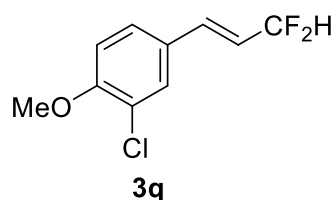
(E)-1-Chloro-4-(3,3-difluoroprop-1-en-1-yl)benzene



Following the general procedure, the reaction of **1p** (41.2 mg, 0.20 mmol, 1.0 equiv.), CuCl (2.0 mg, 0.02 mmol, 10 mol%), **L1** (5.6 mg, 0.024 mmol, 12 mol%), NaO^tBu (38.4 mg, 0.4 mmol, 2.0 equiv.), B₂pin₂ **2a** (50.8 mg, 0.2 mmol, 1.0 equiv.), MeOH (12.8 mg, 0.4 mmol, 2.0 equiv.), and MeCN (2 mL) under Ar atmosphere. The reaction mixture was stirred at 45 °C for 24 hours after column chromatography on silica afford **3p** (17.5 mg, 47%) as a colorless oil: **¹H NMR (400 MHz, CDCl₃)** δ 7.43 – 7.32 (m, 4H), 6.90 – 6.76 (m, 1H), 6.45 – 6.07 (m, 2H). **¹³C NMR (101 MHz, CDCl₃)** δ 135.9 (t, *J* = 12.0 Hz), 135.4, 133.1, 129.2, 128.6, 121.7 (t, *J* = 24.0 Hz), 115.2 (t, *J* = 235.0 Hz). **¹⁹F NMR (377 MHz, CDCl₃)** δ -110.17. **ATR-FTIR (cm⁻¹):** 3008, 2696, 2155, 1971, 1467, 1266, 908, 697; **HRMS m/z (ESI)** calculated for C₉H₈ClF₂ (M + H)⁺ 245.1136, found

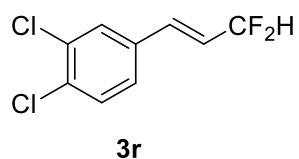
245.1136.

(E)-2-Chloro-4-(3,3-difluoroprop-1-en-1-yl)-1-methoxybenzene



Following the general procedure, the reaction of **1q** (47.2 mg, 0.20 mmol, 1.0 equiv.), CuCl (2.0 mg, 0.02 mmol, 10 mol%), **L1** (5.6 mg, 0.024 mmol, 12 mol%), NaO^tBu (38.4 mg, 0.4 mmol, 2.0 equiv.), B₂pin₂ **2a** (50.8 mg, 0.2 mmol, 1.0 equiv.), MeOH (12.8 mg, 0.4 mmol, 2.0 equiv.), and MeCN (2 mL) under Ar atmosphere. The reaction mixture was stirred at 45 °C for 24 hours after column chromatography on silica afford **3q** (28.8 mg, 66%) as a white solid: **¹H NMR (400 MHz, CDCl₃)** δ 7.47 (d, *J* = 2.4 Hz, 1H), 7.29 (dd, *J* = 8.5, 2.0 Hz, 1H), 6.91 (d, *J* = 8.4 Hz, 1H), 6.76 (dt, *J* = 7.7, 3.2 Hz, 1H), 6.38 – 6.05 (m, 2H), 3.92 (s, 3H). **¹³C NMR (101 MHz, CDCl₃)** δ 156.0, 135.5 (t, *J* = 12.3 Hz), 128.9, 128.1, 127.2, 123.1, 120.2 (t, *J* = 24.0 Hz), 115.4 (t, *J* = 234.6 Hz), 112.1, 56.4. **¹⁹F NMR (377 MHz, CDCl₃)** δ -109.53. **ATR-FTIR (cm⁻¹):** 3361, 3012, 2433, 1502, 1269, 1063, 1014, 755; **HRMS m/z (ESI)** calculated for C₁₀H₁₀ClF₂O (M + H)⁺ 219.0383, found 213.0377.

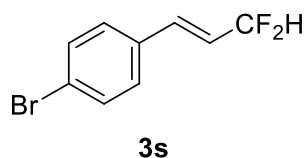
(E)-1,2-Dichloro-4-(3,3-difluoroprop-1-en-1-yl)benzene



Following the general procedure, the reaction of **1r** (48.0 mg, 0.20 mmol, 1.0 equiv.), CuCl (2.0 mg, 0.02 mmol, 10 mol%), **L1** (5.6 mg, 0.024 mmol, 12 mol%), NaO^tBu (38.4 mg, 0.4 mmol, 2.0 equiv.), B₂pin₂ **2a** (50.8 mg, 0.2 mmol, 1.0 equiv.), MeOH (12.8 mg, 0.4 mmol, 2.0 equiv.), and MeCN (2 mL) under Ar atmosphere. The reaction mixture was stirred at 45 °C for 24 hours after column chromatography on silica afford **3r** (20.8 mg, 47%) as a colorless oil: **¹H NMR (500 MHz, CDCl₃)** δ 7.47 (s, 1H), 7.39 (d, *J* = 8.5 Hz, 1H), 7.22 (d, *J* = 8.5 Hz, 1H), 6.77 – 6.71 (m, 1H), 6.32 – 6.07 (m, 2H). **¹³C NMR (126 MHz, CDCl₃)** δ 134.6 (t, *J* = 12.0 Hz), 131.0, 129.1, 126.4, 123.0 (t, *J* = 24.0 Hz), 114.7 (t, *J* = 235.1 Hz), 100.1. **¹⁹F NMR (471 MHz, CDCl₃)** δ -110.87. **ATR-FTIR (cm⁻¹):** 3009, 2698, 1973, 1550, 1269, 1133, 970, 755; **HRMS m/z (ESI)** calculated

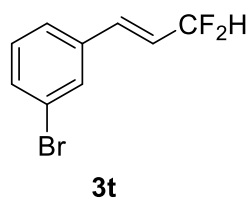
for $C_9H_7Cl_2F_2$ ($M + H$)⁺ 222.9887, found 222.9890.

(*E*)-1-Bromo-4-(3,3-difluoroprop-1-en-1-yl)benzene



Following the general procedure, the reaction of **1s** (50.0 mg, 0.20 mmol, 1.0 equiv.), CuCl (2.0 mg, 0.02 mmol, 10 mol%), **L1** (5.6 mg, 0.024 mmol, 12 mol%), NaO^tBu (38.4 mg, 0.4 mmol, 2.0 equiv.), B₂pin₂ **2a** (50.8 mg, 0.2 mmol, 1.0 equiv.), MeOH (12.8 mg, 0.4 mmol, 2.0 equiv.), and MeCN (2 mL) under Ar atmosphere. The reaction mixture was stirred at 45 °C for 24 hours after column chromatography on silica afford **3s** (26.1 mg, 56%) as a white solid: ¹H NMR (500 MHz, CDCl₃) δ 7.50 (d, *J* = 8.5 Hz, 2H), 7.30 (d, *J* = 8.5 Hz, 2H), 6.99 – 6.63 (m, 1H), 6.48 – 5.94 (m, 2H). ¹³C NMR (126 MHz, CDCl₃) δ 135.9 (t, *J* = 12.1 Hz), 133.5, 132.2, 128.9, 123.7, 121.8 (t, *J* = 24.0 Hz), 115.1 (t, *J* = 234.2 Hz). ¹⁹F NMR (471 MHz, CDCl₃) δ -110.28. ATR-FTIR (cm⁻¹): 3008, 2693, 2156, 1465, 1265, 1139, 967, 731; HRMS *m/z* (ESI) calculated for C₉H₈BrF₂ ($M + H$)⁺ 232.9772, found 232.9771.

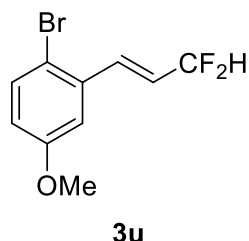
(*E*)-1-Bromo-3-(3,3-difluoroprop-1-en-1-yl)benzene



Following the general procedure, the reaction of **1t** (50 mg, 0.20 mmol, 1.0 equiv.), CuCl (2.0 mg, 0.02 mmol, 10 mol%), **L1** (5.6 mg, 0.024 mmol, 12 mol%), NaO^tBu (38.4 mg, 0.4 mmol, 2.0 equiv.), B₂pin₂ **2a** (50.8 mg, 0.2 mmol, 1.0 equiv.), MeOH (12.8 mg, 0.4 mmol, 2.0 equiv.), and MeCN (2 mL) under Ar atmosphere. The reaction mixture was stirred at 45 °C for 24 hours after column chromatography on silica afford **3t** (34.8 mg, 75%) as a colorless oil: ¹H NMR (500 MHz, CDCl₃) δ 7.59 (s, 1H), 7.47 (d, *J* = 8.0 Hz, 1H), 7.36 (d, *J* = 8.0 Hz, 1H), 7.24 (t, *J* = 8.0 Hz, 1H), 6.88 – 6.76 (m, 1H), 6.41 – 6.06 (m, 2H). ¹³C NMR (126 MHz, CDCl₃) δ 136.7, 135.6 (t, *J* = 12.1 Hz), 132.4, 130.5, 130.2, 126.0, 122.8 (t, *J* = 38.6 Hz), 122.6, 114.9 (t, *J* = 234.9 Hz). ¹⁹F NMR (471 MHz, CDCl₃) δ -110.58. ATR-FTIR (cm⁻¹): 3008, 2573, 2155, 1471, 1265,

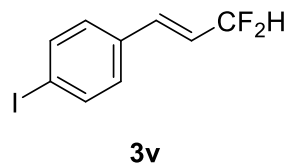
967, 763, 698; **HRMS m/z (ESI)** calculated for C₉H₈BrF₂ (M + H)⁺ 232.9772, found 232.9767.

(E)-1-Bromo-2-(3,3-difluoroprop-1-en-1-yl)-4-methoxybenzene



Following the general procedure, the reaction of **1u** (56.0 mg, 0.20 mmol, 1.0 equiv.), CuCl (2.0 mg, 0.02 mmol, 10 mol%), **L1** (5.6 mg, 0.024 mmol, 12 mol%), NaO^tBu (38.4 mg, 0.4 mmol, 2.0 equiv.), B₂pin₂ **2a** (50.8 mg, 0.2 mmol, 1.0 equiv.), MeOH (12.8 mg, 0.4 mmol, 2.0 equiv.), and MeCN (2 mL) under Ar atmosphere. The reaction mixture was stirred at 45 °C for 24 hours after column chromatography on silica afford **3u** (17.8 mg, 34%) as a colorless oil: **¹H NMR (400 MHz, CDCl₃)** δ 7.54 (d, *J* = 2.4 Hz, 1H), 7.40 (dd, *J* = 8.8, 2.4 Hz, 1H), 7.10 (dt, *J* = 15.8, 3.6 Hz, 1H), 6.78 (d, *J* = 8.8 Hz, 1H), 6.48 – 6.00 (m, 2H), 3.85 (s, 3H). **¹³C NMR (101 MHz, CDCl₃)** δ 156.7, 133.1, 131.2 (t, *J* = 12.6 Hz), 130.6, 125.5, 122.9 (t, *J* = 24.1 Hz), 115.7 (t, *J* = 233.7 Hz), 113.2, 112.9, 55.9. **¹⁹F NMR (377 MHz, CDCl₃)** δ -109.58. **ATR-FTIR (cm⁻¹):** 3009, 2699, 1552, 1465, 1269, 1145, 972, 755; **HRMS m/z (ESI)** calculated for C₁₀H₁₀BrF₂O (M + H)⁺ 262.9878 found 262.9876.

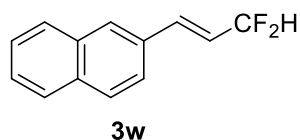
(E)-1-(3,3-Difluoroprop-1-en-1-yl)-4-iodobenzene



Following the general procedure, the reaction of **1v** (59.6 mg, 0.20 mmol, 1.0 equiv.), CuCl (2.0 mg, 0.02 mmol, 10 mol%), **L1** (5.6 mg, 0.024 mmol, 12 mol%), NaO^tBu (38.4 mg, 0.4 mmol, 2.0 equiv.), B₂pin₂ **2a** (50.8 mg, 0.2 mmol, 1.0 equiv.), MeOH (12.8 mg, 0.4 mmol, 2.0 equiv.), and MeCN (2 mL) under Ar atmosphere. The reaction mixture was stirred at 45 °C for 24 hours after column chromatography on silica afford **3v** (24.9 mg, 44%) as a white solid: **¹H NMR (400 MHz, CDCl₃)** δ 7.71 (d, *J* = 8.4 Hz, 2H), 7.17 (d, *J* = 8.4 Hz, 2H), 6.86 – 6.72 (m, 1H), 6.48 – 6.02 (m, 2H). **¹³C NMR (101 MHz, CDCl₃)** δ 138.0, 135.9 (t, *J* = 12.1 Hz), 133.9, 128.8, 121.8 (t, *J* = 24.0 Hz), 115.0 (t, *J*

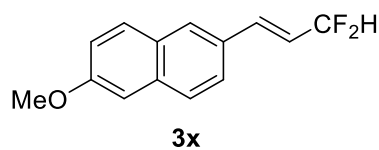
= 235.1 Hz), 95.3. ^{19}F NMR (377 MHz, CDCl_3) δ -110.33. ATR-FTIR (cm^{-1}): 3073, 2701, 2155, 1910, 1662, 1401, 1137, 756; HRMS m/z (ESI) calculated for $\text{C}_9\text{H}_8\text{F}_2\text{I}$ ($\text{M} + \text{H}$) $^+$ 280.9633, found 280.9625.

(E)-2-(3,3-Difluoroprop-1-en-1-yl)naphthalene



Following the general procedure, the reaction of **1w** (44.4 mg, 0.20 mmol, 1.0 equiv.), CuCl (2.0 mg, 0.02 mmol, 10 mol%), **L1** (5.6 mg, 0.024 mmol, 12 mol%), NaO^tBu (38.4 mg, 0.4 mmol, 2.0 equiv.), B_2pin_2 **2a** (50.8 mg, 0.2 mmol, 1.0 equiv.), MeOH (12.8 mg, 0.4 mmol, 2.0 equiv.), and MeCN (2 mL) under Ar atmosphere. The reaction mixture was stirred at 45 °C for 24 hours after column chromatography on silica afford **3w** (20.7 mg, 51%) as a white solid: ^1H NMR (400 MHz, CDCl_3) δ 7.90 – 7.81 (m, 4H), 7.66 – 7.60 (m, 1H), 7.57 – 7.48 (m, 2H), 7.04 (m, 1H), 6.52 – 6.08 (m, 2H). ^{13}C NMR (101 MHz, CDCl_3) δ 137.3 (t, J = 12.4 Hz), 133.9, 133.4, 132.0, 128.8, 128.5, 128.4, 127.9, 127.0, 126.8, 123.4, 121.3 (t, J = 24.1 Hz), 115.6 (t, J = 234.4 Hz). ^{19}F NMR (376 MHz, CDCl_3) δ -109.54. ATR-FTIR (cm^{-1}): 3008, 2694, 2155, 1971, 1549, 1265, 1147, 963; HRMS m/z (ESI) calculated for $\text{C}_{13}\text{H}_{11}\text{F}_2$ ($\text{M} + \text{H}$) $^+$ 205.0823, found 205.0823.

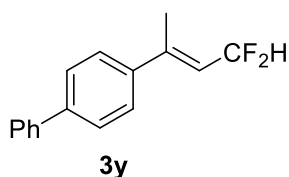
(E)-2-(3,3-Difluoroprop-1-en-1-yl)-6-methoxynaphthalene



Following the general procedure, the reaction of **1x** (50.4 mg, 0.20 mmol, 1.0 equiv.), CuCl (2.0 mg, 0.02 mmol, 10 mol%), **L1** (5.6 mg, 0.024 mmol, 12 mol%), NaO^tBu (38.4 mg, 0.4 mmol, 2.0 equiv.), B_2pin_2 **2a** (50.8 mg, 0.2 mmol, 1.0 equiv.), MeOH (12.8 mg, 0.4 mmol, 2.0 equiv.), and MeCN (2 mL) under Ar atmosphere. The reaction mixture was stirred at 45 °C for 24 hours after column chromatography on silica afford **3x** (35.6 mg, 76%) as a white solid: ^1H NMR (400 MHz, CDCl_3) δ 7.83 – 7.69 (m, 3H), 7.57 (dd, J = 8.6, 1.7 Hz, 1H), 7.17 (dd, J = 8.9, 2.5 Hz, 1H), 7.13 (d, J = 2.4 Hz, 1H), 7.00 (dt, J = 7.0, 4.3 Hz, 1H), 6.50 – 6.05 (m, 2H), 3.93 (s, 3H). ^{13}C NMR (101 MHz, CDCl_3) δ 158.6, 137.4 (t, J = 12.2 Hz), 135.3, 130.0, 129.9, 128.8,

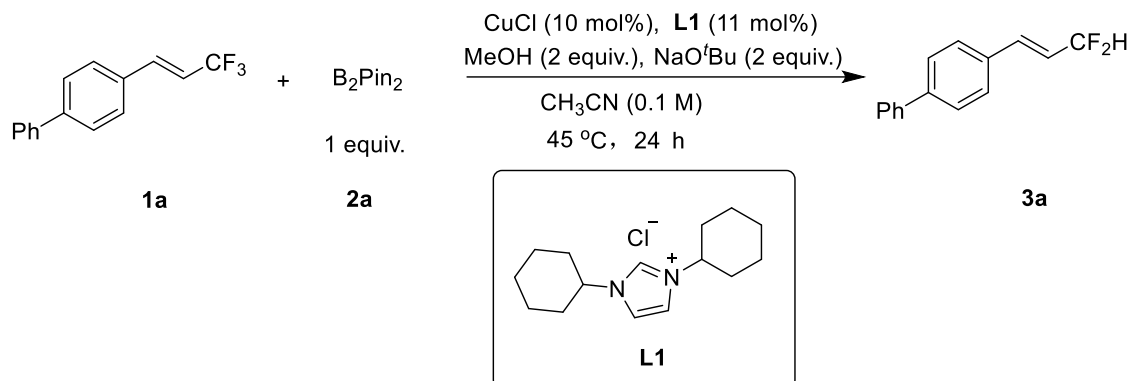
128.3, 127.6, 124.1, 120.3 (t, $J = 23.9$ Hz), 119.6, 115.8 (t, $J = 233.4$ Hz), 106.1, 55.5. ^{19}F NMR (377 MHz, CDCl_3) δ -109.10. ATR-FTIR (cm^{-1}): 3008, 2694, 2155, 1549, 1265, 1147, 963, 731; HRMS m/z (ESI) calculated for $\text{C}_{14}\text{H}_{13}\text{F}_2\text{O}$ ($\text{M} + \text{H}$) $^+$ 235.0929, found 235.0924.

(E)-4-(4,4-Difluorobut-2-en-2-yl)-1,1'-biphenyl



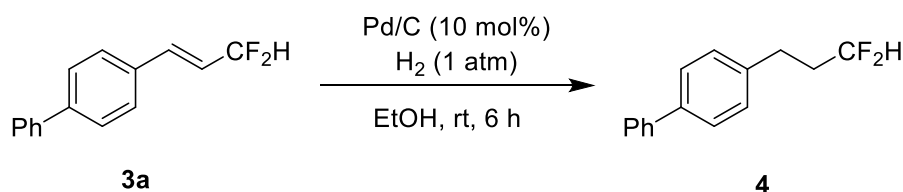
Following the general procedure, the reaction of **1y** (52.4 mg, 0.20 mmol, 1.0 equiv.), CuCl (2.0 mg, 0.02 mmol, 10 mol%), **L1** (5.6 mg, 0.024 mmol, 12 mol%), NaO^tBu (38.4 mg, 0.4 mmol, 2.0 equiv.), B_2pin_2 **2a** (50.8 mg, 0.2 mmol, 1.0 equiv.), MeOH (12.8 mg, 0.4 mmol, 2.0 equiv.), and MeCN (2 mL) under Ar atmosphere. The reaction mixture was stirred at 45 °C for 24 hours after column chromatography on silica afford **3y** (18.9 mg, 39%) as a white solid: ^1H NMR (400 MHz, CDCl_3) δ 7.64 – 7.59 (m, 4H), 7.55 – 7.50 (m, 2H), 7.49 – 7.44 (m, 2H), 7.41 – 7.35 (m, 1H), 6.56 (td, $J = 56.0, 6.5$ Hz, 1H), 6.03 – 5.95 (m, 1H), 2.24 (td, $J = 2.9, 1.2$ Hz, 3H). ^{13}C NMR (101 MHz, CDCl_3) δ 144.7 (t, $J = 12.6$ Hz), 141.6, 140.5, 139.9, 129.0, 127.7, 127.3, 127.2, 126.5, 120.2 (t, $J = 25.9$ Hz), 113.1 (t, $J = 231.8$ Hz), 16.6. ^{19}F NMR (377 MHz, CDCl_3) δ -109.37. ATR-FTIR (cm^{-1}): 3008, 2697, 2155, 1549, 1265, 1149, 763, 698; HRMS m/z (ESI) calculated for $\text{C}_{16}\text{H}_{15}\text{F}_2$ ($\text{M} + \text{H}$) $^+$ 245.1136, found 245.0037.

4. Gram-Sale Synthesis



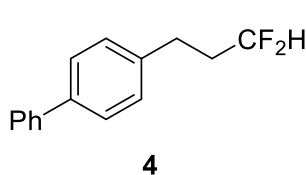
To a 200 mL Schlenk tube was added trifluoromethyl alkenes **1a** (2.48 g, 10 mmol, 1.0 equiv.), CuCl (99.0 mg, 1.0 mmol, 10 mol%), **L1** (295.0 mg, 1.1 mmol, 11 mol%), NaO^tBu (1.92 g, 20 mmol, 2.0 equiv.), B₂pin₂ **2a** (2.54 g, 10 mmol, 1.0 equiv.), MeOH (810 μ l, 20 mmol, 2.0 equiv), and MeCN (50 mL) under Ar atmosphere. The reaction mixture was stirred at 45 °C for 48 hours. The solution was then cooled to room temperature and the solvent was removed under vacuum directly. The crude products were purified by column chromatography on silica gel to afford the pure products **3a** as a white solid (74%, 1.70 g).

5. Synthetic Application.

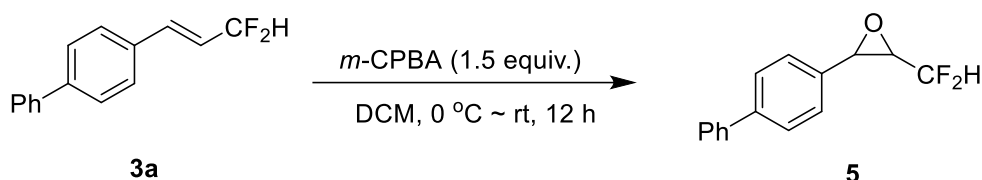


To the difluoromethyl compounds **3a** (46.0 mg, 0.2 mmol, 1.0 equiv.) in ethanol (5 mL), was added palladium on activated carbon (5%, 0.1 equiv., 42.4 mg). The reaction solution was purged with hydrogen balloon for 15 minutes and then stirred for 6 hours under hydrogen balloon. The reaction was filtered over a short path of celite, concentrated in vacuum. The obtained crude mixture was purified by flash column chromatography to afford the final product **4** (44.1 mg, 95%) as a colorless liquid.²

4-(3,3-Difluoropropyl)-1,1'-biphenyl

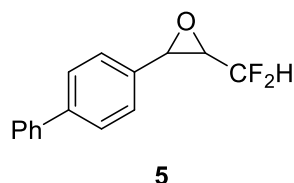


¹H NMR (500 MHz, CDCl₃) δ 7.68 – 7.51 (m, 4H), 7.51 – 7.44 (m, 2H), 7.41 – 7.35 (m, 1H), 7.30 (d, *J* = 8.0 Hz, 2H), 5.87 (tt, *J* = 56.5, 4.5 Hz, 1H), 2.90 – 2.82 (m, 2H), 2.29 – 2.15 (m, 2H). **¹³C NMR (126 MHz, CDCl₃)** δ 141.0, 139.6, 139.1, 128.9, 128.9, 127.5, 127.3, 127.1, 116.8 (t, *J* = 239.1 Hz), 35.8 (t, *J* = 21.2 Hz), 28.2 (t, *J* = 6.2 Hz). **¹⁹F NMR (471 MHz, CDCl₃)** δ -117.03. **ATR-FTIR (cm⁻¹):** 3008, 2692, 2493, 1968, 1265, 1121, 908, 697; **HRMS m/z (ESI)** calculated for C₁₅H₁₄F₂ (M + H)⁺ 233.1136, found 233.1136.



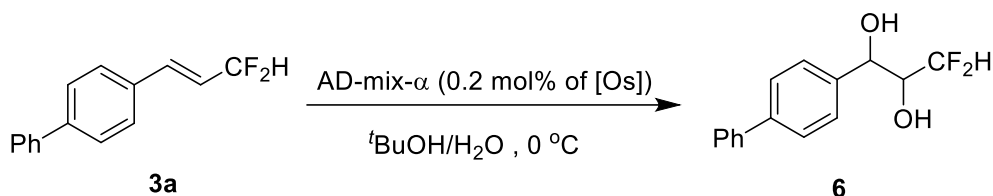
A solution of *m*-chloroperbenzoic acid (0.8 mmol, 4.0 equiv.) in DCM (2.0 mL) was added dropwise to a solution of product **3a** (0.2 mmol) in DCM (0.6 mL) at 0 °C. The solution was warmed to room temperature. After the reaction solution was stirred for 12 h, the reaction mixture was washed with 2.5 M NaOH for three times. The organic phase was dried over anhydrous sodium sulfate, concentrated under reduced pressure, and purified by column chromatography on silica gel to afford **5** (26.2 mg, 53%) as a colorless liquid.

2-([1,1'-Biphenyl]-4-yl)-3-(difluoromethyl)oxirane



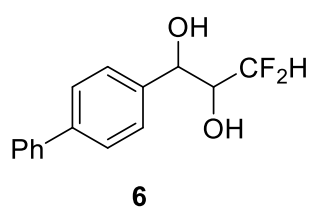
¹H NMR (500 MHz, CDCl₃) δ 7.68 – 7.53 (m, 4H), 7.51 – 7.42 (m, 2H), 7.40 – 7.32 (m, 3H), 5.77 (td, *J* = 55.0, 4.0 Hz, 1H), 4.07 (s, 1H), 3.55 – 3.24 (m, 1H). **¹³C NMR (126 MHz, CDCl₃)** δ 142.1, 140.4, 133.5, 128.9, 127.6, 127.5, 127.1, 126.3, 113.7 (t, *J* = 242.0 Hz), 58.8 (t, *J* = 32.4 Hz), 54.7 (dd, *J* = 5.2, 3.8 Hz). **¹⁹F NMR (471 MHz, CDCl₃)** δ -122.50, -123.14, -124.21, -124.85. **ATR-FTIR (cm⁻¹):** 3015,

2694, 2155, 1971, 1459, 908, 763, 697; **HRMS m/z (ESI)** calculated for C₁₅H₁₄F₂O₂ (M + H)⁺ 265.1035, found 265.1027.

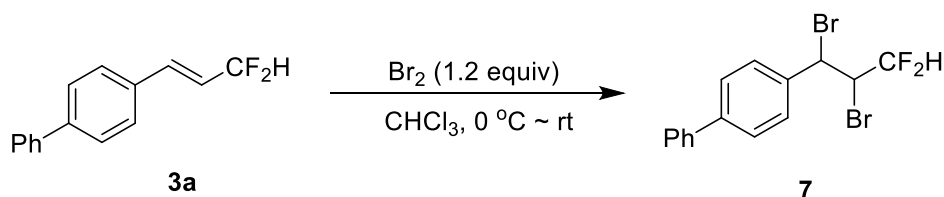


A solution of AD-mix- α (0.2 mol% of [Os]) in *t*BuOH and water mixture (2.5 mL, 1:1) was cooled to 0 °C and stirred for 5 min. The, **3a** (0.2 mmol) was added and the reaction mixture was stirred at 0 °C for 6 days. Solid sodium metabisulfite was added in 3 portions and stirred for 10 min. Water (50 mL) was then added to the above reaction and the mixture was extracted with Et₂O (3 × 18 mL). The organic layer was combined and dried over Na₂SO₄. After concentration under vacuum, the residue was purified by flash chromatography on silica gel to get **6** (30.1 mg, 57%) as a colorless liquid.³

1-([1,1'-Biphenyl]-4-yl)-3,3-difluoropropane-1,2-diol

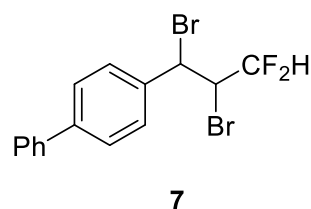


¹H NMR (500 MHz, CDCl₃) δ 7.65 – 7.57 (m, 4H), 7.50 – 7.41 (m, 4H), 7.41 – 7.31 (m, 1H), 5.96 – 5.56 (m, 1H), 4.94 (d, J = 4.0 Hz, 1H), 3.92 (ddd, J = 17.4, 8.1, 4.1 Hz, 1H), 2.81 (d, J = 28.5 Hz, 2H). **¹³C NMR (126 MHz, CDCl₃)** δ 141.6, 140.6, 138.5, 129.0, 127.7, 127.6, 127.2, 127.0, 114.9 (t, J = 243.6 Hz), 74.9 (dd, J = 23.7, 21.4 Hz), 71.7 (t, J = 4.2 Hz). **¹⁹F NMR (471 MHz, CDCl₃)** δ -128.72, -129.33, -131.61, -132.23. **ATR-FTIR (cm⁻¹):** 3015, 2694, 2155, 1971, 1459, 908, 763, 697; **HRMS m/z (ESI)** calculated for C₁₅H₁₄F₂O₂ (M + H)⁺ 265.1035, found 265.1024.

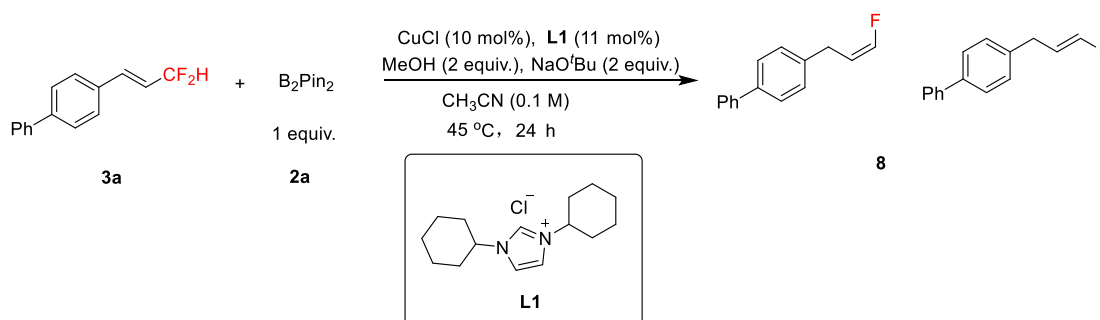


Bromine (160 mL, 3.05 mmol, 1.2 equiv.) was added dropwise to a stirred solution of t **3a** (300 mg, 2.54 mmol, 1 equiv) in CHCl₃ (8.5 mL, 0.5 M) at 0 °C under N₂ atmosphere. The reaction mixture was allowed to warm to room temperature after 5 minutes and then stirred for 2 hours. The reaction was quenched with saturated aqueous Na₂S₂O₃ (15 mL) and diluted with DCM (20 mL). After separation the organic phase, the residue was washed with H₂O (20 mL) and brine (20 mL), dried over Na₂SO₄, and then concentrated under reduced pressure. Product **7** (49.7 mg, 64%) was obtained as a colorless liquid.⁴

4-(1,2-Dibromo-3,3-difluoropropyl)-1,1'-biphenyl



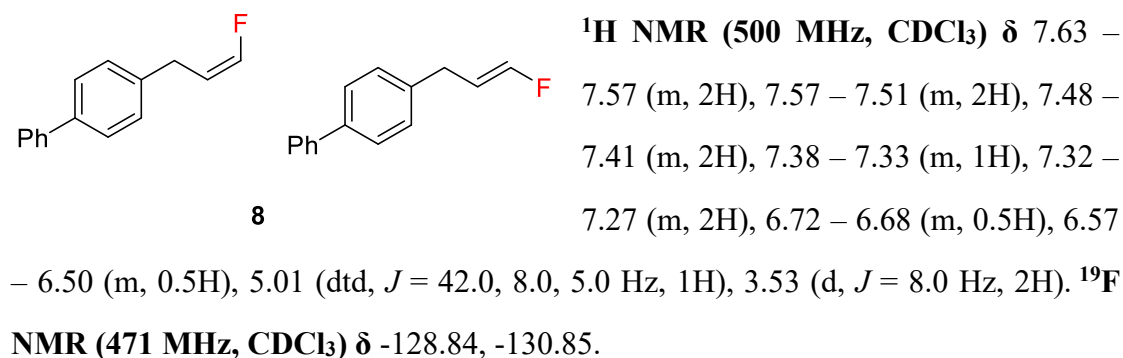
¹H NMR (500 MHz, CDCl₃) δ 7.65 – 7.59 (m, 4H), 7.49 – 7.43 (m, 4H), 7.41 – 7.35 (m, 1H), 6.39 (td, *J* = 55.6, 1.5 Hz, 1H), 5.15 (d, *J* = 11.1 Hz, 1H), 4.70 (dddd, *J* = 22.2, 11.1, 2.5, 1.6 Hz, 1H). ¹³C NMR (126 MHz, CDCl₃) δ 142.4, 140.2, 137.3, 129.0, 128.5, 128.0, 127.8, 127.3, 112.9 (t, *J* = 246.3 Hz), 53.1 (t, *J* = 22.3 Hz), 49.3 (d, *J* = 4.9 Hz). ¹⁹F NMR (471 MHz, CDCl₃) δ -116.97, -117.57, -128.98, -129.58. ATR-FTIR (cm⁻¹): 3731, 3008, 1972, 1462, 1244, 914, 874, 684; HRMS *m/z* (ESI) calculated for C₁₅H₁₂Br₂F₂ (M + H)⁺ 388.9347, found 388.9359.



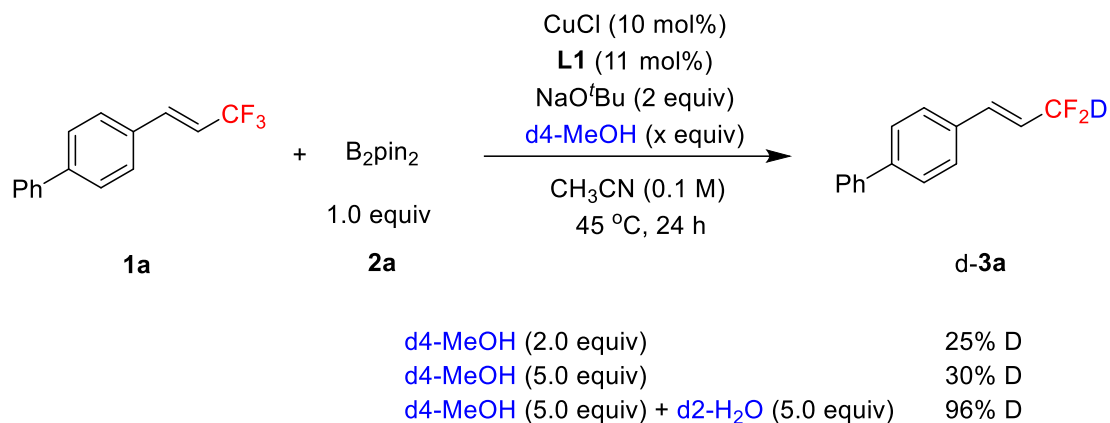
To a 25 mL Schlenk tube was added trifluoromethyl alkenes **3a** (0.20 mmol, 1.0 equiv), CuCl (2.0 mg, 0.02 mmol, 10 mol%), **L1** (63.4 mg, 0.024 mmol, 12 mol%), NaO'Bu (38.4 mg, 0.4 mmol, 2.0 equiv), B₂pin₂ **2a** (157.2 mg, 0.2 mmol, 1.0 equiv), MeOH (8 mg, 0.4 mmol, 2.0 equiv), and MeCN (2 mL) under Ar atmosphere. The

reaction mixture was stirred at 45 °C for 24 hours. The solution was then cooled to rt and the solvent was removed under vacuum directly. The crude products were purified by column chromatography on silica gel to afford **8** (34.4 mg, 81%, *E/Z*=3:1) as a colorless liquid.

(Z)-4-(3-Fluoroallyl)-1,1'-biphenyl and (E)-4-(3-fluoroallyl)-1,1'-biphenyl

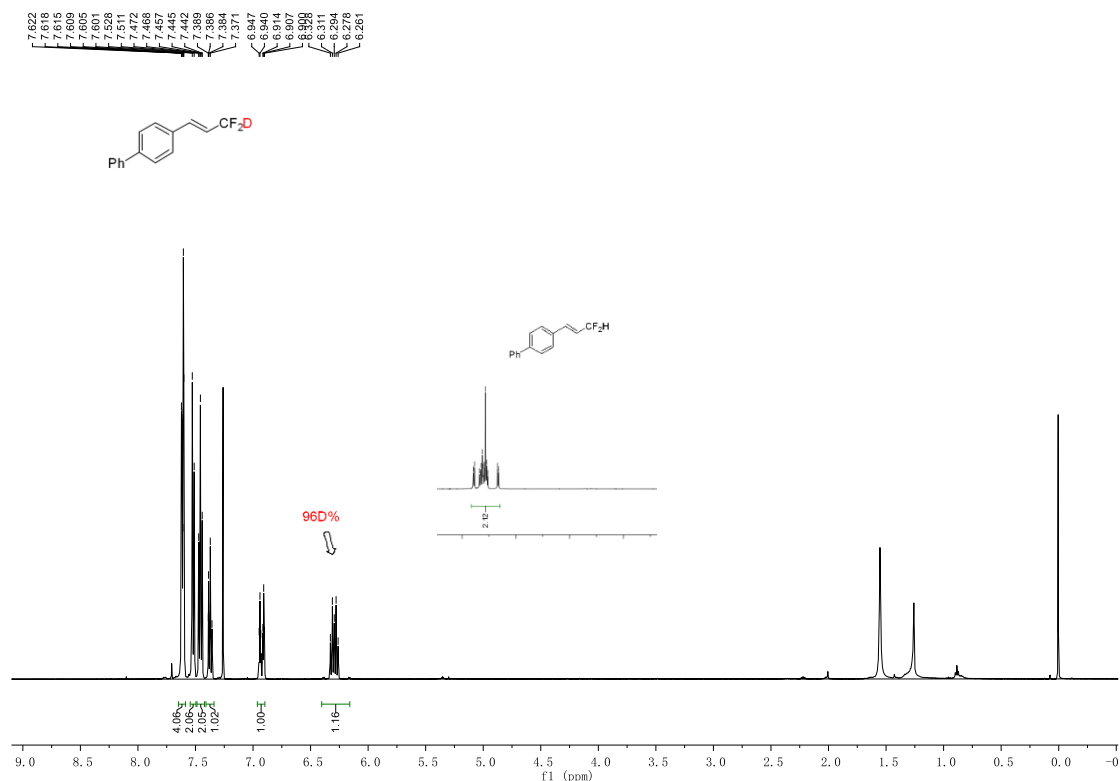


6. Control Experiments

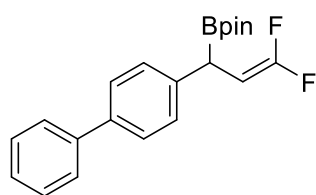


To a 25 mL Schlenk tube was added trifluoromethyl alkenes **3a** (0.20 mmol, 1.0 equiv.), CuCl (2.0 mg, 0.02 mmol, 10 mol%), **L1** (63.4 mg, 0.024 mmol, 12 mol%), NaO'Bu (38.4 mg, 0.4 mmol, 2.0 equiv.), B₂pin₂ **2a** (157.2 mg, 0.2 mmol, 1.0 equiv.) d₄-MeOH (8 mg, 0.4 mmol, 5.0 equiv.), d₂-H₂O (1.0 mmol, 5.0 equiv), and MeCN (2 mL) under Ar atmosphere. The reaction mixture was stirred at 45 °C for 24 hours. The solution was then cooled to room temperature and the solvent was removed under

vacuum directly. The crude products were purified by column chromatography on silica gel to afford **d-3a**.



2-(1-([1,1'-Biphenyl]-4-yl)-3,3-difluoroallyl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane **9**



9

According to the reported literature,⁵ intermediate **9** was synthesized. ¹H NMR (400 MHz, CDCl₃) δ 7.60 – 7.55 (m, 1H), 7.54 – 7.49 (m, 1H), 7.46 – 7.38 (m, 1H), 7.35 – 7.27 (m, 1H), 4.61 (ddd, *J* = 25.2, 10.1, 2.3 Hz, 1H), 3.29 (d, *J* = 10.1 Hz, 1H), 1.23 (d, *J* = 4.1 Hz, 1H). ¹³C NMR (126 MHz, CDCl₃) δ 156.1 (t, *J* = 287.6 Hz), 141.1 (s), 140.1 (t, *J* = 2.1 Hz), 138.9 (s), 128.9 (s), 128.3 (s), 127.5 (s), 127.2 (s), 127.1 (s), 84.2 (s), 79.1 (dd, *J* = 23.1, 20.3 Hz), 24.7 (d, *J* = 1.6 Hz). ¹⁹F NMR (377 MHz, CDCl₃) δ -89.02 (d, *J* = 46.0 Hz), -90.37 (d, *J* = 46.0 Hz). ATR-FTIR (cm⁻¹): 3840, 3014, 2814, 2148, 1964, 1275, 999, 649; HRMS *m/z* (ESI) calculated for C₂₁H₂₄BF₂O₂ (M + H)⁺ 357.1832, found 357.1832.

7. DFT Calculations

DFT calculations were conducted to elaborate the detailed mechanism of the Cu-catalyzed hydrodefluorination reaction with the Gaussian 09 package⁶. We optimized the geometries with B3LYP-D3⁷ functional and a mixed basis set of SDD⁸ for Cu atom and 6-31G(d)⁹ for all other atoms in gas phase. Frequency computations were performed at the same level to determine the structures to be minima (no imaginary frequency) or transition states (only one imaginary frequency) and to obtain the thermal correction to free energies at 298.15 K and 1 atm pressure. Single-point solvation energies were calculated with B3LYP-D3 functional and a mixed basis set of SDD for Cu and 6-311+G(d,p)¹⁰ for all other atoms with continuum model SMD¹¹ in acetonitrile solvent. A correction factor which consists on using an entropic term that is half (0.5) of the entropy in vacuum with the opposite sign was applied.¹²

Table S1. The calculated energies of stationary points (in Hartree/Particle).

Structure	E _{ele}	H _{corr}	G _{corr}	-0.5TS	G _{sol}
1a	-878.038158	0.236279	0.176070	-0.0301	-877.831984
B ₂ pin ₂	-822.841156	0.386623	0.318831	-0.0339	-822.488429
INT1A	-1126.396358	0.529063	0.445568	-0.04175	-1125.909042
TS2A	-1949.235581	0.917603	0.799067	-0.05927	-1948.377246
INT2A	-1304.615794	0.588890	0.500323	-0.04428	-1304.071188
pinB-O ^t Bu	-644.638829	0.328257	0.270224	-0.02902	-644.339589
TS3A	-2182.660408	0.825615	0.703185	-0.06122	-2181.896008
INT3A	-2182.721473	0.828211	0.704359	-0.06193	-2181.955188
TS3B	-2182.659172	0.825853	0.705820	-0.06002	-2181.893335
INT3B	-2182.718958	0.828207	0.706260	-0.06097	-2181.951725
TS4A	-2182.691255	0.826400	0.701414	-0.06249	-2181.927348

INT4A	-993.145617	0.399152	0.331106	-0.03402	-992.780488
9	-1189.570246	0.426455	0.346018	-0.04022	-1189.184009
⁻ O ^t Bu	-233.244704	0.127890	0.091836	-0.01803	-233.134841
F ⁻	-100.028418	0.002360	-0.014159	-0.00826	-100.034318
TS5A	-2315.968084	0.956549	0.822635	-0.06696	-2315.078492
INT5A	-1671.352984	0.627929	0.526423	-0.05075	-1670.775808
TS6A	-1671.343047	0.626567	0.529418	-0.04857	-1670.765055
INT6A	-1671.373569	0.627898	0.526735	-0.05058	-1670.796253
TS6B	-1671.338963	0.627025	0.530317	-0.04835	-1670.760292
INT6B	-1671.373402	0.628276	0.529858	-0.04921	-1670.794335
H ₂ O	-115.771971	0.055660	0.028711	-0.01347	-115.729786
TS7A	-1787.119398	0.682979	0.576537	-0.05322	-1786.489640
INT7A	-1008.394298	0.440409	0.364160	-0.03812	-1007.992014
MeOH	-76.467297	0.024945	0.003499	-0.01072	-76.453075
TS7B	-1747.812012	0.652634	0.550454	-0.05109	-1747.210468
INT7B	-969.091919	0.410312	0.340106	-0.0351	-968.716710
⁻ OMe	-115.246719	0.038476	0.013448	-0.01251	-115.220757
3a	-778.759811	0.243864	0.185074	-0.0294	-778.545342

Notes: E_{ele} (electronic energies in solvent), H_{corr} (the thermal correction to enthalpy in gas), G_{corr} (the thermal correction to Gibbs free energy in gas), -0.5TS (half the gas phase entropy) and G_{sol} (the thermal correction to Gibbs free energy in solvent).

Cartesian Coordinate (unit:angstrom)

1a

				C	1.025949	0.994967	0.301022
C	1.220825	-1.298550	-0.402289	C	1.848098	-0.097614	-0.034100
C	-0.165775	-1.401401	-0.432926	H	-0.625211	-2.341212	-0.730225
C	-0.987189	-0.311092	-0.098853	H	-0.955153	1.757039	0.544113
C	-0.357834	0.892556	0.269467	H	1.483562	1.928435	0.615749

C	-2.441753	-0.480008	-0.149784	H	3.819624	2.634906	0.619202
H	-2.785311	-1.465347	-0.458181	H	3.623164	1.411346	1.880487
C	-3.375158	0.435866	0.139532	C	3.262709	1.189905	-1.561776
H	-3.143828	1.447688	0.457155	H	3.039508	2.255038	-1.673847
C	-4.837859	0.156622	0.055475	H	4.306207	1.019353	-1.846680
F	-5.447701	0.996865	-0.817021	H	2.616383	0.635332	-2.249008
F	-5.442033	0.345230	1.254860	C	3.262944	-1.189806	1.561812
F	-5.114940	-1.105193	-0.340789	H	3.039980	-2.254990	1.673879
H	1.826763	-2.151736	-0.693003	H	4.306396	-1.019019	1.846738
C	3.325477	0.017035	0.001637	H	2.616473	-0.635380	2.249026
C	3.967952	1.195688	-0.414390	C	3.903038	-1.565067	-0.836054
C	4.120411	-1.050837	0.452120	H	4.950053	-1.268466	-0.704840
C	5.357352	1.302711	-0.381470	H	3.820283	-2.634678	-0.619129
H	3.373969	2.022960	-0.792799	H	3.623523	-1.411192	-1.880439
C	5.509753	-0.943931	0.485247	C	-2.998403	-0.778842	-0.108222
H	3.642332	-1.960535	0.804730	C	-2.998222	0.778878	0.108197
C	6.134486	0.233392	0.068548	B	-0.852048	-0.000227	-0.000017
H	5.834105	2.220093	-0.716411	O	-1.613595	1.131146	-0.172928
H	6.104913	-1.778774	0.845655	O	-1.613844	-1.131430	0.172876
H	7.217512	0.316832	0.094357	C	-3.902677	1.565318	-0.836071
				H	-4.949766	1.268994	-0.704827
B ₂ pin ₂				H	-3.819637	2.634911	-0.619167
C	2.998402	-0.778841	0.108220	H	-3.623225	1.411354	-1.880461
C	2.998220	0.778878	-0.108190	C	-3.262674	1.189896	1.561792
B	0.852048	-0.000238	-0.000016	H	-3.039491	2.255034	1.673860
O	1.613586	1.131140	0.172904	H	-4.306159	1.019322	1.846723
O	1.613850	-1.131433	-0.172911	H	-2.616313	0.635337	2.249003
C	3.902651	1.565313	0.836107	C	-3.262970	-1.189804	-1.561811
H	4.949742	1.268980	0.704896	H	-3.040000	-2.254986	-1.673882

H	-4.306429	-1.019028	-1.846722	H	6.144292	0.446382	-0.000095
H	-2.616515	-0.635372	-2.249035	H	4.558742	1.221456	-0.000228
C	-3.903017	-1.565076	0.836066	C	-2.179574	-1.232399	0.000049
H	-4.950033	-1.268462	0.704891	C	-2.949204	-1.614587	-1.271770
H	-3.820280	-2.634684	0.619121	C	-2.949352	-1.614630	1.271766
H	-3.623466	-1.411221	1.880445	H	-2.032034	-0.147194	0.000077
				C	-4.340051	-0.959567	-1.268256
INT1A				H	-3.057074	-2.707972	-1.320580
C	0.834457	-3.242907	0.000172	H	-2.372001	-1.306064	-2.151425
C	-0.520584	-3.148981	0.000124	C	-4.340198	-0.959606	1.268104
C	0.312007	-1.035536	0.000018	H	-3.057238	-2.708015	1.320530
N	1.327776	-1.947530	0.000073	H	-2.372256	-1.306138	2.151502
H	1.483108	-4.105403	0.000240	C	-5.127331	-1.324646	-0.000127
H	-1.280635	-3.913682	0.000148	H	-4.894442	-1.258410	-2.165798
C	2.765340	-1.611320	0.000061	H	-4.219919	0.132122	-1.320429
C	3.165374	-0.846839	-1.272302	H	-4.894696	-1.258473	2.165572
C	3.165311	-0.846548	1.272268	H	-4.220070	0.132081	1.320322
H	3.286363	-2.577374	0.000181	H	-6.100596	-0.819227	-0.000174
C	4.668411	-0.528553	-1.265773	H	-5.332489	-2.405678	-0.000156
H	2.591558	0.087765	-1.315525	N	-0.820889	-1.795914	0.000100
H	2.888622	-1.436169	-2.155291	Cu	0.367321	0.847913	-0.000065
C	4.668347	-0.528255	1.265737	O	0.450790	2.648840	-0.000109
H	2.591482	0.088061	1.315245	C	-0.679537	3.479760	0.000024
H	2.888523	-1.435678	2.155379	C	-1.537335	3.228371	-1.259028
C	5.065833	0.246420	-0.000099	C	-1.537005	3.228417	1.259310
H	4.925572	0.043886	-2.164654	C	-0.179209	4.936773	-0.000067
H	5.242624	-1.466370	-1.313559	H	-0.924351	3.369583	-2.156081
H	4.925465	0.044395	2.164496	H	-1.894792	2.189076	-1.258219
H	5.242559	-1.466060	1.313771	H	-2.407851	3.895954	-1.316110

H	-0.923788	3.369667	2.156197	H	3.748144	3.776751	-1.284153
H	-2.407507	3.896000	1.316592	H	2.906909	2.293191	-0.809708
H	-1.894457	2.189121	1.258635	C	-3.896894	0.372816	0.126359
H	-1.005237	5.659771	0.000031	C	-5.051167	0.640016	1.100209
H	0.440865	5.112174	0.885980	C	-4.370685	-0.338975	-1.151155
H	0.440628	5.112145	-0.886286	H	-3.166257	-0.265616	0.628706
				C	-5.767348	-0.675691	1.445640
TS2A				H	-5.777651	1.326852	0.643408
C	-2.694264	3.642487	-0.861669	H	-4.666131	1.129204	2.003132
C	-3.722766	2.813200	-0.546741	C	-5.127371	-1.633346	-0.812563
C	-1.793516	1.637422	-0.311103	H	-5.025848	0.341744	-1.714128
N	-1.526482	2.914667	-0.712176	H	-3.498345	-0.550251	-1.780952
H	-2.690359	4.676898	-1.168878	C	-6.274519	-1.378493	0.176610
H	-4.786210	2.986624	-0.533844	H	-6.597349	-0.475191	2.133578
C	-0.182976	3.484984	-0.960631	H	-5.069402	-1.338934	1.976298
C	0.668585	3.475620	0.316779	H	-5.507632	-2.089282	-1.734416
C	0.516795	2.787850	-2.136898	H	-4.425938	-2.355725	-0.374689
H	-0.370016	4.529929	-1.240866	H	-6.765803	-2.323556	0.437901
C	2.057664	4.074926	0.051717	H	-7.037454	-0.747664	-0.303698
H	0.790383	2.442792	0.654083	N	-3.153123	1.598288	-0.203107
H	0.142455	4.025821	1.108271	O	-0.299389	-2.055581	-0.617708
C	1.905502	3.398935	-2.377490	C	-0.758240	-3.169254	0.168049
H	0.630765	1.720260	-1.921549	C	-1.667379	-2.654527	1.296080
H	-0.112221	2.874010	-3.032547	C	-1.573499	-4.033211	-0.805285
C	2.757916	3.340745	-1.101167	C	0.385558	-3.996135	0.774492
H	2.658831	4.015126	0.965678	H	-1.112155	-1.974200	1.946501
H	1.961177	5.143394	-0.196357	H	-2.520105	-2.119947	0.867501
H	2.398278	2.862257	-3.195809	H	-2.056189	-3.483500	1.900612
H	1.803786	4.446592	-2.701500	H	-0.926644	-4.420744	-1.599514

H	-2.042162	-4.881425	-0.291092	C	2.709297	-0.181418	-3.532696
H	-2.358904	-3.428792	-1.273343	H	3.484003	-0.649536	-4.151654
H	-0.035448	-4.858244	1.307283	H	1.955613	0.253093	-4.199177
H	1.065134	-4.351159	-0.002250	H	3.161089	0.630179	-2.958246
H	0.965585	-3.396224	1.479412	C	1.252468	-2.221196	-3.444173
C	1.614079	-0.148770	3.320146	H	0.457038	-1.687101	-3.974568
C	2.799928	0.499744	2.526208	H	1.884615	-2.729822	-4.181529
O	2.243193	0.606299	1.186522	H	0.779697	-2.963850	-2.798356
O	0.944978	-0.915813	2.287474	C	4.156023	-0.950164	-1.127829
C	3.209606	1.891157	2.997733	H	4.694324	-1.425564	-0.302351
H	3.575357	1.858505	4.030701	H	4.871121	-0.748771	-1.933587
H	4.015408	2.271402	2.361538	H	3.745463	-0.007159	-0.760984
H	2.376578	2.595486	2.944311	C	3.625007	-3.214194	-2.060148
C	4.024927	-0.416337	2.425828	H	4.228767	-3.071607	-2.965004
H	4.737441	0.021435	1.721075	H	4.272096	-3.627672	-1.278998
H	4.520992	-0.534633	3.395152	H	2.843541	-3.947586	-2.271970
H	3.738268	-1.399875	2.042589	Cu	-0.567323	0.174574	-0.090134
C	0.593142	0.878492	3.829200	B	0.996133	-1.333299	-0.534372
H	-0.296062	0.345716	4.180793	B	1.251367	-0.358577	1.050937
H	0.992066	1.474986	4.656822				
H	0.286695	1.550007	3.020923	INT2A			
C	2.023509	-1.098075	4.441754	C	-2.820553	2.870321	-0.115113
H	2.611409	-0.572751	5.203499	C	-3.714772	1.846570	-0.114539
H	1.128970	-1.508244	4.921803	C	-1.633273	0.937541	-0.031741
H	2.611592	-1.933260	4.056019	N	-1.558512	2.301243	-0.064958
C	3.029145	-1.887919	-1.582647	H	-2.971205	3.938618	-0.147355
C	2.049587	-1.205215	-2.609193	H	-4.792635	1.851754	-0.144908
O	1.150351	-0.511396	-1.735520	C	-0.298359	3.075770	-0.023024
O	2.183882	-2.164902	-0.454058	C	0.451375	2.837178	1.298957

C	0.585854	2.782693	-1.247924	H	-4.034247	-3.129246	-1.273565
H	-0.605811	4.129042	-0.062346	H	-6.023995	-3.736145	0.089141
C	1.768964	3.624724	1.340191	H	-6.590559	-2.067414	0.052054
H	0.672690	1.766352	1.387449	N	-2.968863	0.678271	-0.064555
H	-0.200904	3.106494	2.139479	Cu	-0.096013	-0.297239	0.021733
C	1.904214	3.568806	-1.179932	C	3.540522	-2.551678	0.032151
H	0.812238	1.709276	-1.268643	C	4.022585	-1.065297	-0.075782
H	0.028281	3.016752	-2.163739	B	1.702548	-1.140422	0.029602
C	2.650928	3.278894	0.130799	O	2.825195	-0.332729	0.283468
H	2.294856	3.402416	2.276301	O	2.122436	-2.438421	-0.249006
H	1.556397	4.705260	1.345229	C	5.147083	-0.672786	0.879854
H	2.526083	3.305549	-2.044082	H	6.048748	-1.267803	0.690150
H	1.698269	4.647867	-1.256094	H	5.399778	0.383552	0.737619
H	3.586673	3.851030	0.167606	H	4.850644	-0.808882	1.922263
H	2.911165	2.212640	0.170417	C	4.381602	-0.649094	-1.510014
C	-3.522016	-0.682672	-0.025335	H	4.501302	0.438902	-1.542183
C	-4.321527	-0.924928	1.263540	H	5.314633	-1.112372	-1.849996
C	-4.355701	-0.991613	-1.277296	H	3.579129	-0.921557	-2.202278
H	-2.642331	-1.336099	-0.019749	C	3.667080	-3.124365	1.451421
C	-4.852466	-2.366483	1.306085	H	3.118929	-4.070479	1.498373
H	-5.165626	-0.221012	1.305447	H	4.711282	-3.311731	1.726696
H	-3.683054	-0.715265	2.129834	H	3.225372	-2.441438	2.183485
C	-4.884756	-2.433925	-1.228255	C	4.166838	-3.511562	-0.977307
H	-5.204119	-0.294002	-1.333106	H	5.254638	-3.562608	-0.845571
H	-3.743192	-0.827806	-2.171687	H	3.757579	-4.516827	-0.832046
C	-5.685610	-2.693405	0.057116	H	3.951501	-3.207710	-2.004250
H	-5.445998	-2.517309	2.215697				
H	-4.001181	-3.059692	1.366730	pinB-O'Bu			
H	-5.501181	-2.633597	-2.112870	C	1.590153	0.809577	0.070601

C	1.979248	-0.710701	-0.058597	H	-3.607157	1.825663	-0.668261
B	-0.275198	-0.471749	-0.181580	H	-1.830525	1.856106	-0.600942
O	0.757312	-1.299588	-0.569105	H	-4.856342	-0.385834	-0.137234
O	0.164861	0.734303	0.341311	H	-3.897448	-1.170722	-1.415151
C	3.110802	-1.004981	-1.038560	H	-3.897078	-1.839929	0.227612
H	4.032268	-0.498467	-0.729490				
H	3.304134	-2.082011	-1.064232	TS3A			
H	2.855488	-0.684957	-2.050930	C	3.071107	3.593781	0.640069
C	2.262575	-1.369915	1.297127	C	4.040644	2.643502	0.602732
H	2.310058	-2.454067	1.158773	C	2.118836	1.686092	-0.120842
H	3.212177	-1.029237	1.722720	N	1.900140	2.994048	0.194502
H	1.461495	-1.153126	2.011011	H	3.106164	4.630079	0.938979
C	1.753795	1.582554	-1.243668	H	5.087387	2.695722	0.854525
H	1.271102	2.559599	-1.143762	C	0.580951	3.652503	0.176866
H	2.808692	1.739111	-1.491384	C	-0.071993	3.584485	-1.211133
H	1.276412	1.049519	-2.071967	C	-0.330451	3.066259	1.267190
C	2.264600	1.557805	1.215783	H	0.777812	4.706379	0.412356
H	3.352959	1.559953	1.087699	C	-1.452748	4.259153	-1.201303
H	1.920328	2.596916	1.230999	H	-0.177835	2.531696	-1.501201
H	2.025581	1.109026	2.182308	H	0.590859	4.046056	-1.952859
O	-1.563969	-0.855815	-0.320373	C	-1.704121	3.752016	1.267947
C	-2.714815	-0.036701	0.004783	H	-0.451415	1.991318	1.089952
C	-2.704370	0.287190	1.504130	H	0.162082	3.171463	2.241872
C	-2.698839	1.239305	-0.845941	C	-2.363992	3.664823	-0.115585
C	-3.919441	-0.911223	-0.351749	H	-1.915912	4.157321	-2.190205
H	-2.669647	-0.639944	2.086615	H	-1.330972	5.338104	-1.022009
H	-1.835006	0.897139	1.763117	H	-2.344277	3.287459	2.027392
H	-3.611707	0.835137	1.781854	H	-1.589529	4.809102	1.552705
H	-2.657671	0.980207	-1.909570	H	-3.331309	4.182759	-0.110108

H	-2.566853	2.610699	-0.344343	H	0.859527	0.168701	4.722653
C	4.106576	0.187474	-0.084048	H	1.376434	0.706288	3.103124
C	4.934646	0.212477	-1.376558	C	0.259766	-3.374517	2.541361
C	4.927891	-0.250508	1.133863	H	0.990189	-4.053288	2.090529
H	3.298548	-0.536458	-0.212028	H	-0.069353	-3.798122	3.496140
C	5.590630	-1.156148	-1.619929	H	-0.603579	-3.309619	1.872526
H	5.704110	0.994948	-1.298266	C	2.103802	-2.092083	3.667023
H	4.276226	0.471143	-2.213194	H	1.777428	-2.327097	4.686765
C	5.549982	-1.630964	0.872659	H	2.776046	-2.887934	3.330354
H	5.728851	0.476452	1.332241	H	2.671101	-1.158745	3.688160
H	4.277212	-0.274993	2.015746	Cu	0.976201	0.327375	-0.762740
C	6.407120	-1.619280	-0.403253	C	0.472694	-0.792658	-2.325870
H	6.226440	-1.106650	-2.512124	H	-0.195065	-0.437354	-3.105866
H	4.799771	-1.884586	-1.833699	C	-0.178254	-1.317700	-1.076009
H	6.149761	-1.938226	1.738252	H	0.156779	-2.317064	-0.791062
H	4.741945	-2.368112	0.765805	B	0.413830	-0.777854	0.844262
H	6.826281	-2.616419	-0.586090	C	-1.661093	-1.161032	-0.962150
H	7.260338	-0.939812	-0.255701	C	-2.318442	0.000714	-1.395573
N	3.437990	1.479866	0.147074	C	-2.442543	-2.172397	-0.386513
C	0.909078	-1.998124	2.723698	C	-3.692439	0.152502	-1.240708
C	-0.127013	-0.867223	3.064593	H	-1.741185	0.796026	-1.858526
O	-0.586109	-0.465924	1.742469	C	-3.818042	-2.024663	-0.231608
O	1.388404	-1.583724	1.412108	H	-1.961190	-3.086514	-0.046774
C	-1.338084	-1.316042	3.875493	C	-4.473287	-0.853893	-0.647225
H	-1.030813	-1.713946	4.849786	H	-4.173444	1.056105	-1.605561
H	-2.001569	-0.462509	4.047379	H	-4.390099	-2.817106	0.243669
H	-1.908792	-2.080501	3.344315	C	1.582541	-1.592369	-2.865230
C	0.523125	0.368247	3.699842	F	1.209589	-2.699489	-3.585719
H	-0.211320	1.178445	3.727118	F	2.399173	-0.889489	-3.699772

F	2.393054	-2.092356	-1.863773	H	-4.433305	-1.770583	2.445353
C	-5.934926	-0.683047	-0.467501	C	-3.431244	-4.843844	1.115701
C	-6.819554	-1.758854	-0.657191	H	-3.687071	-5.323727	-0.993021
C	-6.474881	0.562087	-0.100395	H	-5.191675	-4.992970	-0.136782
C	-8.193786	-1.596463	-0.484776	H	-3.496287	-4.005650	3.126020
H	-6.425646	-2.722675	-0.967819	H	-5.074975	-4.189205	2.365409
C	-7.849182	0.726138	0.069102	H	-3.496099	-5.885481	1.452706
H	-5.805746	1.399762	0.077194	H	-2.363494	-4.613465	0.991135
C	-8.715661	-0.352801	-0.121512	C	-2.939561	2.089943	-1.171472
H	-8.859305	-2.440911	-0.644749	C	-2.411621	1.817294	-2.589295
H	-8.243404	1.696535	0.360024	C	-3.501737	3.508455	-1.044806
H	-9.786685	-0.225679	0.011338	H	-2.101127	1.995899	-0.475979
				C	-1.323947	2.841415	-2.947741
INT3A				H	-3.245414	1.874912	-3.304293
C	-5.748278	-0.094166	-0.387921	H	-2.001850	0.802001	-2.635189
C	-5.287623	1.117567	-0.802156	C	-2.398586	4.525026	-1.387989
C	-3.486836	-0.174449	-0.328827	H	-4.343828	3.647314	-1.738362
N	-4.634834	-0.868276	-0.102587	H	-3.881439	3.674026	-0.029130
H	-6.754880	-0.464110	-0.267067	C	-1.835183	4.282279	-2.797311
H	-5.821375	2.001817	-1.108857	H	-0.966637	2.661377	-3.968250
C	-4.676291	-2.271744	0.351076	H	-0.465682	2.689174	-2.278648
C	-4.089355	-3.216155	-0.711989	H	-2.793168	5.544493	-1.299500
C	-3.974338	-2.440990	1.708016	H	-1.586048	4.427230	-0.655133
H	-5.740806	-2.506832	0.478381	H	-1.029831	4.996402	-3.008268
C	-4.142442	-4.675444	-0.235570	H	-2.625860	4.468218	-3.539545
H	-3.046382	-2.930165	-0.901888	N	-3.905239	1.051622	-0.750871
H	-4.633628	-3.087270	-1.655671	C	-0.507661	2.577307	2.226588
C	-4.029548	-3.903734	2.173401	C	-0.262550	1.263847	3.060151
H	-2.927033	-2.130766	1.600233	O	0.664880	0.532973	2.218381

O	-0.255989	2.134256	0.863878	H	2.991465	1.101071	-2.128633
C	0.385854	1.477800	4.425213	C	5.434185	-0.257319	-0.168301
H	-0.251822	2.097910	5.065690	H	5.044419	-1.302547	1.678688
H	0.528103	0.510669	4.917682	H	5.438502	0.834304	-2.029203
H	1.364036	1.955132	4.334072	C	0.479101	-1.699733	-1.809895
C	-1.517865	0.392550	3.197726	F	1.764716	-2.038259	-2.111641
H	-1.226516	-0.583621	3.597518	F	-0.239844	-2.858837	-1.938471
H	-2.251693	0.843534	3.874403	F	0.073472	-0.886719	-2.840929
H	-1.989464	0.225889	2.223936	C	6.905471	-0.438710	-0.115339
C	0.515802	3.680062	2.517114	C	7.642916	-0.715990	-1.279830
H	0.405105	4.472095	1.769927	C	7.604374	-0.340450	1.100698
H	0.371677	4.115623	3.511298	C	9.026094	-0.886699	-1.231083
H	1.535855	3.290182	2.447848	H	7.119614	-0.824094	-2.225830
C	-1.928029	3.130978	2.310075	C	8.987008	-0.514922	1.151449
H	-2.179094	3.392298	3.344199	H	7.058222	-0.101727	2.009216
H	-2.009849	4.037115	1.701520	C	9.705653	-0.788123	-0.014702
H	-2.661958	2.408647	1.945010	H	9.572936	-1.107986	-2.144265
Cu	-1.641422	-0.715841	-0.297173	H	9.505563	-0.427884	2.103066
C	0.274919	-1.062594	-0.473909	H	10.783344	-0.923207	0.024116
H	0.621559	-1.785520	0.275668				
C	1.101975	0.259202	-0.334338	TS3B			
H	0.861950	0.885151	-1.202633	C	-1.736732	3.907148	1.352601
B	0.518278	0.988564	0.928596	C	-0.483005	3.637174	1.798883
C	2.610723	0.080621	-0.272535	C	-1.070295	1.981601	0.368597
C	3.222079	-0.587684	0.799542	N	-2.083209	2.888803	0.476575
C	3.439305	0.579708	-1.285362	H	-2.401157	4.730314	1.565235
C	4.602884	-0.755186	0.849776	H	0.151898	4.181545	2.477831
H	2.603643	-0.979159	1.601911	C	-3.403696	2.780474	-0.173511
C	4.822093	0.416071	-1.237547	C	-3.290056	2.642774	-1.698719

C	-4.220639	1.634469	0.441920	H	2.436463	-0.695631	1.998030
H	-3.909735	3.729622	0.045677	H	4.424570	0.286855	3.115199
C	-4.684498	2.544231	-2.337120	H	3.414441	1.477230	3.930570
H	-2.721434	1.736613	-1.938669	N	-0.085248	2.463008	1.178170
H	-2.725068	3.490947	-2.103986	C	-1.593362	-2.840805	2.020146
C	-5.608628	1.534558	-0.207032	C	-3.011962	-2.180178	1.909976
H	-3.678899	0.694772	0.295834	O	-2.943026	-1.540684	0.599536
H	-4.303185	1.791754	1.525206	O	-0.773959	-1.919411	1.237683
C	-5.496615	1.388067	-1.731993	C	-4.184562	-3.154363	1.905524
H	-4.580323	2.413557	-3.420643	H	-4.215316	-3.728444	2.838956
H	-5.225406	3.490578	-2.183936	H	-5.123585	-2.599086	1.814250
H	-6.150397	0.682582	0.221217	H	-4.121378	-3.848070	1.064802
H	-6.194890	2.435115	0.031983	C	-3.236846	-1.064164	2.937294
H	-6.495151	1.350638	-2.184664	H	-4.146268	-0.516590	2.672966
H	-4.999601	0.438477	-1.966686	H	-3.354636	-1.467111	3.948580
C	1.170008	1.727912	1.427280	H	-2.402581	-0.355554	2.932392
C	2.368622	2.665873	1.608376	C	-1.509518	-4.199054	1.313908
C	1.002084	0.776570	2.622907	H	-0.458135	-4.494023	1.239185
H	1.341370	1.130076	0.525913	H	-2.049776	-4.975669	1.865135
C	3.650128	1.840717	1.808978	H	-1.920653	-4.135963	0.301432
H	2.215284	3.305005	2.490247	C	-1.017954	-2.920096	3.428778
H	2.459066	3.324194	0.736140	H	-1.655315	-3.535279	4.074223
C	2.288118	-0.029282	2.855853	H	-0.023261	-3.375788	3.394903
H	0.756811	1.371111	3.515833	H	-0.919565	-1.927924	3.874672
H	0.163577	0.100990	2.424101	Cu	-0.954824	0.387641	-0.636350
C	3.512547	0.887054	3.006660	C	0.013074	-0.460180	-2.215419
H	4.504744	2.512663	1.950733	H	-0.283859	-0.092929	-3.192863
H	3.849085	1.263885	0.897975	C	-0.912173	-1.422884	-1.545481
H	2.170616	-0.666805	3.740959	H	-0.425233	-2.345017	-1.216699

B	-1.615231	-1.302096	0.326378	C	0.598458	4.252482	-0.789679
C	-2.103000	-1.797167	-2.397077	C	0.307293	2.289311	0.308201
F	-2.823241	-2.813497	-1.864606	N	-0.642639	3.187206	0.689345
F	-2.957431	-0.749742	-2.579140	H	-1.130171	5.236836	0.198045
F	-1.730026	-2.203578	-3.631633	H	1.064056	4.955675	-1.460081
C	1.428429	-0.474519	-1.909240	C	-1.800189	2.877651	1.554301
C	2.340006	0.316277	-2.656910	C	-2.795410	1.955636	0.827123
C	1.988598	-1.229420	-0.844149	C	-1.373451	2.295919	2.908992
C	3.691663	0.355865	-2.360500	H	-2.288104	3.843787	1.737477
H	1.953088	0.922724	-3.473316	C	-4.020578	1.669051	1.707427
C	3.351133	-1.193982	-0.565033	H	-2.294450	1.012032	0.580194
H	1.347216	-1.842764	-0.217732	H	-3.094332	2.417394	-0.122156
C	4.245322	-0.399672	-1.302690	C	-2.606200	2.017764	3.784006
H	4.337506	1.007177	-2.944230	H	-0.828170	1.358386	2.738733
H	3.733728	-1.820482	0.237126	H	-0.680185	2.986371	3.405429
C	5.687669	-0.347222	-0.981084	C	-3.599250	1.090503	3.066146
C	6.654671	-0.144326	-1.984739	H	-4.684677	0.975152	1.181604
C	6.147609	-0.491127	0.342860	H	-4.587803	2.599079	1.865638
C	8.012983	-0.077001	-1.678668	H	-2.286929	1.577698	4.736432
H	6.336982	-0.064482	-3.020490	H	-3.102985	2.969044	4.028059
C	7.505980	-0.430996	0.649162	H	-4.480524	0.917785	3.696114
H	5.428980	-0.630041	1.144978	H	-3.124677	0.114735	2.900018
C	8.449181	-0.219451	-0.359188	C	2.104436	2.278294	-1.402116
H	8.735192	0.075399	-2.477104	C	1.450155	1.528503	-2.575491
H	7.827686	-0.538543	1.682362	C	3.208057	3.225122	-1.884481
H	9.508205	-0.168522	-0.120810	H	2.546530	1.533148	-0.736108
				C	2.508239	0.751977	-3.372435
INT3B				H	0.936866	2.253212	-3.224607
C	-0.480084	4.392805	0.025865	H	0.686309	0.850528	-2.175898

C	4.261063	2.445211	-2.692525	H	5.222568	1.562687	0.084537
H	2.780250	4.003719	-2.532006	H	3.984724	1.532753	1.350997
H	3.669307	3.730999	-1.026952	Cu	0.431519	0.397465	0.639735
C	3.622775	1.686228	-3.865969	C	0.313293	-1.566744	0.508249
H	2.034876	0.236044	-4.216336	H	0.434920	-2.071597	1.472083
H	2.942521	-0.018360	-2.722075	C	1.401641	-2.089089	-0.461199
H	5.034002	3.135532	-3.051331	H	1.321924	-1.606288	-1.441605
H	4.758741	1.722388	-2.033191	B	2.753936	-1.646680	0.212055
H	4.388782	1.115191	-4.404597	C	1.319275	-3.576688	-0.723558
H	3.204486	2.409478	-4.581915	F	2.371043	-3.998682	-1.485390
N	1.072509	2.964613	-0.597285	F	1.341479	-4.306518	0.413483
C	4.638209	-0.433290	0.683499	F	0.193739	-3.923148	-1.394111
C	4.194920	-1.284979	1.931249	C	-1.112978	-1.616256	0.076669
O	3.256338	-2.225495	1.346972	C	-2.130362	-1.853915	1.027254
O	3.480646	-0.543680	-0.195033	C	-1.544336	-1.304724	-1.232593
C	5.315548	-2.067099	2.608093	C	-3.477501	-1.717269	0.713683
H	6.083123	-1.387517	2.995896	H	-1.842779	-2.113275	2.044260
H	4.907405	-2.637980	3.447767	C	-2.890888	-1.155925	-1.543072
H	5.784469	-2.772040	1.918297	H	-0.804003	-1.158662	-2.014799
C	3.402805	-0.472916	2.965297	C	-3.894525	-1.336666	-0.573726
H	2.972151	-1.163444	3.696626	H	-4.220707	-1.866922	1.493166
H	4.038849	0.245011	3.493368	H	-3.175798	-0.911892	-2.563719
H	2.574774	0.063961	2.487793	C	-5.323445	-1.106359	-0.882474
C	5.819951	-1.037194	-0.082028	C	-6.331992	-1.916857	-0.329566
H	5.934264	-0.506935	-1.033006	C	-5.717536	-0.049722	-1.724622
H	6.754711	-0.947437	0.480967	C	-7.677828	-1.680268	-0.606212
H	5.641487	-2.093843	-0.302947	H	-6.051520	-2.754948	0.302461
C	4.890357	1.041514	0.987276	C	-7.063038	0.183529	-2.007071
H	5.675072	1.146873	1.744798	H	-4.957775	0.607134	-2.139917

C	-8.051599	-0.629701	-1.448009	C	-2.472269	2.198275	-1.383217
H	-8.437020	-2.326122	-0.172034	C	-2.127527	1.752372	-2.813852
H	-7.340729	1.009667	-2.657185	C	-2.755753	3.702121	-1.332939
H	-9.100586	-0.447348	-1.665690	H	-1.611311	1.996842	-0.740593
				C	-0.894926	2.519294	-3.317589
TS4A				H	-2.990750	1.944704	-3.467656
C	-5.538789	0.642555	-0.190403	H	-1.942209	0.672001	-2.827659
C	-4.902760	1.729152	-0.703608	C	-1.505514	4.464529	-1.804701
C	-3.345141	0.106026	-0.394033	H	-3.600398	3.949606	-1.992488
N	-4.574945	-0.337458	-0.006640	H	-3.033802	4.003933	-0.316943
H	-6.576144	0.484618	0.061926	C	-1.098974	4.039733	-3.225228
H	-5.283303	2.698638	-0.979874	H	-0.666759	2.222470	-4.347989
C	-4.854591	-1.710771	0.456506	H	-0.026416	2.232864	-2.706889
C	-4.653895	-2.729235	-0.681022	H	-1.690797	5.544907	-1.765714
C	-4.023318	-2.065989	1.699503	H	-0.681932	4.251211	-1.109098
H	-5.914529	-1.711213	0.742419	H	-0.185650	4.565662	-3.529347
C	-4.948343	-4.155883	-0.193046	H	-1.887683	4.342068	-3.930209
H	-3.620854	-2.671782	-1.047143	N	-3.564007	1.385585	-0.814171
H	-5.304421	-2.460041	-1.522760	C	-0.247988	2.678817	2.183954
C	-4.320184	-3.498138	2.167817	C	-0.353208	1.361266	3.039170
H	-2.958489	-1.980025	1.448217	O	0.490568	0.445028	2.289528
H	-4.222153	-1.336536	2.494568	O	0.014990	2.160277	0.846696
C	-4.092870	-4.508475	1.032899	C	0.186673	1.472042	4.460977
H	-4.761352	-4.864822	-1.007819	H	-0.381211	2.214103	5.033726
H	-6.013693	-4.247758	0.069217	H	0.091571	0.505264	4.965303
H	-3.689581	-3.739039	3.032277	H	1.241469	1.754737	4.467871
H	-5.363806	-3.564700	2.511230	C	-1.759294	0.748558	3.038688
H	-4.319316	-5.524760	1.378041	H	-1.707572	-0.247149	3.490214
H	-3.031979	-4.495247	0.744805	H	-2.467054	1.355072	3.613647

H	-2.132936	0.627302	2.017188	C	6.873459	-0.572794	-0.131533
C	0.957330	3.548908	2.553606	C	7.564212	-1.064712	-1.252620
H	1.077453	4.329305	1.795848	C	7.621681	-0.222931	1.005954
H	0.825122	4.027596	3.529279	C	8.952087	-1.199871	-1.237809
H	1.875349	2.953456	2.574635	H	7.002896	-1.367354	-2.132291
C	-1.523112	3.513876	2.138230	C	9.009245	-0.360568	1.022954
H	-1.794678	3.858663	3.142294	H	7.109864	0.183079	1.874253
H	-1.365610	4.393694	1.506162	C	9.681730	-0.848949	-0.099631
H	-2.357710	2.942118	1.726506	H	9.463641	-1.589861	-2.114086
Cu	-1.726169	-0.873486	-0.562474	H	9.567178	-0.076862	1.911766
C	0.314286	-1.343864	-0.107778	H	10.763151	-0.955508	-0.087424
H	0.252093	-1.809125	0.873035				
C	1.051372	0.002051	-0.198800	INT4A			
H	0.772595	0.502933	-1.133671	C	1.049840	-2.280184	0.000227
B	0.525007	0.890345	0.989918	C	-0.282631	-2.542153	0.000194
C	2.569964	-0.139287	-0.175320	C	-0.038695	-0.287567	0.000091
C	3.239738	-0.585862	0.974525	N	1.179567	-0.900286	0.000086
C	3.337301	0.159512	-1.307627	H	1.898397	-2.945076	0.000274
C	4.624465	-0.727284	0.987240	H	-0.818308	-3.478958	0.000217
H	2.664315	-0.826718	1.864084	C	2.460844	-0.177847	-0.000011
C	4.723994	0.020189	-1.296351	C	3.270464	-0.472248	1.271582
H	2.840745	0.507225	-2.210655	C	3.270457	-0.472538	-1.271542
C	5.397194	-0.426031	-0.147859	H	2.184487	0.881863	-0.000131
H	5.115629	-1.098892	1.882791	C	4.585443	0.323181	1.267691
H	5.295371	0.283304	-2.182609	H	3.493650	-1.547964	1.321210
C	0.373952	-2.242313	-1.159053	H	2.665082	-0.227024	2.152189
F	0.998301	-1.944294	-2.283609	C	4.585434	0.322896	-1.267838
F	0.333829	-3.546410	-0.956446	H	3.493652	-1.548263	-1.320929
F	-1.373645	-2.244614	-2.007541	H	2.665071	-0.227517	-2.152202

C	5.406876	0.041231	-0.000045	C	-3.029995	-1.536576	-0.764966
H	5.167169	0.082311	2.165393	C	-2.661677	-2.105276	0.655312
H	4.354910	1.396821	1.320586	O	-2.378456	-0.888247	1.409911
H	5.167155	0.081828	-2.165491	O	-2.264415	-0.298161	-0.805444
H	4.354897	1.396523	-1.320970	C	-3.781097	-2.865794	1.356903
H	6.322982	0.644090	-0.000117	H	-4.077202	-3.742602	0.769871
H	5.721991	-1.012996	0.000072	H	-3.435563	-3.210785	2.336432
C	-2.405379	-1.177068	0.000053	H	-4.658615	-2.234258	1.510804
C	-2.907853	-0.478069	1.273795	C	-1.365063	-2.923280	0.660941
C	-2.907592	-0.477623	-1.273542	H	-1.066373	-3.104447	1.697714
H	-2.789429	-2.205413	-0.000145	H	-1.494908	-3.888823	0.161577
C	-4.440210	-0.369792	1.265816	H	-0.555042	-2.376934	0.167461
H	-2.470362	0.527180	1.321724	C	-4.505980	-1.144302	-0.897239
H	-2.553873	-1.026817	2.155383	H	-4.633610	-0.558280	-1.812090
C	-4.439952	-0.369319	-1.265835	H	-5.152341	-2.026231	-0.952927
H	-2.470051	0.527630	-1.321018	H	-4.824944	-0.523445	-0.055725
H	-2.553445	-1.026071	-2.155251	C	-2.600132	-2.408479	-1.939916
C	-4.939361	0.343598	0.000074	H	-3.089746	-3.387854	-1.893918
H	-4.773398	0.162403	2.164436	H	-2.887279	-1.926568	-2.879740
H	-4.881032	-1.377264	1.314258	H	-1.518129	-2.556052	-1.952906
H	-4.772949	0.163217	-2.164325	C	-1.277953	1.406374	0.881602
H	-4.880780	-1.376765	-1.314746	H	-1.416646	1.576810	1.957933
H	-6.035019	0.394155	-0.000028	B	-2.024817	0.065077	0.493186
H	-4.570229	1.378829	0.000306	C	0.195090	1.093411	0.640646
N	-0.934044	-1.319651	0.000139	C	0.712528	1.029489	-0.661865
Cu	-0.403269	1.551763	-0.000142	C	1.054120	0.797645	1.705971
F	-0.838950	3.260303	-0.000269	C	2.045447	0.698834	-0.886399
				H	0.056134	1.237225	-1.502333
9				C	2.387503	0.461742	1.481736

H	0.671098	0.822050	2.723485	H	-1.526481	-0.020891	-1.542075
C	2.912499	0.408142	0.180692	H	1.742696	1.308284	-0.055027
H	2.427744	0.685840	-1.903451	H	0.745105	1.334682	-1.540180
H	3.025667	0.215667	2.326101	H	0.196217	2.170185	-0.056113
C	4.332988	0.054217	-0.060172	H	0.785088	-1.308424	-1.542187
C	5.348029	0.517302	0.794162	H	1.780761	-1.255603	-0.056200
C	4.700791	-0.753473	-1.149771	H	0.260883	-2.163263	-0.060043
C	6.682802	0.184272	0.567927				
H	5.088463	1.165494	1.626640	TS5A			
C	6.035489	-1.084902	-1.378296	C	-3.302389	0.579449	2.348230
H	3.928985	-1.144021	-1.807364	C	-3.362644	1.790889	1.734709
C	7.033094	-0.617970	-0.520011	C	-1.287611	0.944802	1.381736
H	7.451895	0.560592	1.237527	N	-2.028434	0.081114	2.132650
H	6.295692	-1.716880	-2.223522	H	-4.047986	0.030366	2.902064
H	8.073532	-0.876529	-0.697401	H	-4.168479	2.502659	1.663618
C	-1.740283	2.621440	0.111148	C	-1.549581	-1.216551	2.655976
H	-1.028319	3.404039	-0.129560	C	-1.235643	-2.191555	1.514856
C	-2.989500	2.822038	-0.280087	C	-0.354337	-1.021928	3.603592
F	-4.003887	1.982905	-0.056407	H	-2.388608	-1.617894	3.238392
F	-3.423406	3.888512	-0.943167	C	-0.707272	-3.528193	2.050793
				H	-0.474889	-1.752326	0.861155
^t O'Bu				H	-2.130053	-2.327796	0.899227
O	-0.000769	-0.001528	1.484366	C	0.156344	-2.372444	4.126915
C	-0.000108	-0.000190	0.160491	H	0.452122	-0.524074	3.051537
C	-1.461287	-0.021421	-0.437820	H	-0.642581	-0.355918	4.427056
C	0.712037	1.276900	-0.435971	C	0.509365	-3.308156	2.961479
C	0.749918	-1.254164	-0.437911	H	-0.441078	-4.171069	1.203089
H	-1.977757	-0.914869	-0.059272	H	-1.498597	-4.049983	2.610412
H	-2.003715	0.855367	-0.056559	H	1.029654	-2.208411	4.770213

H	-0.614797	-2.842011	4.756210	H	2.277839	1.191433	3.278475
H	0.884526	-4.266566	3.342508	H	3.437695	2.537025	3.137123
H	1.309206	-2.852254	2.364658	H	1.938201	2.542025	2.180523
C	-1.691798	3.201658	0.431528	H	5.264810	0.829161	2.593026
C	-2.786348	3.770545	-0.477534	H	4.087464	-0.500474	2.681142
C	-1.144038	4.265762	1.393831	H	5.062103	-0.263736	1.209031
H	-0.866525	2.863086	-0.200239	C	4.037418	-1.998107	-1.388687
C	-2.232169	4.961084	-1.277171	C	3.129937	-2.871305	-0.427979
H	-3.635376	4.114577	0.130172	O	2.111350	-1.935883	-0.000729
H	-3.158362	2.984525	-1.143180	O	3.802357	-0.654737	-0.912288
C	-0.599193	5.464173	0.600473	C	2.456945	-4.070573	-1.095013
H	-1.949285	4.590361	2.068440	H	3.205751	-4.801526	-1.421232
H	-0.359494	3.816679	2.014784	H	1.792384	-4.559414	-0.374691
C	-1.664558	6.042809	-0.344274	H	1.859029	-3.780530	-1.960032
H	-3.020011	5.377867	-1.915343	C	3.868929	-3.352365	0.830196
H	-1.438356	4.604782	-1.949537	H	3.151515	-3.830830	1.503076
H	-0.235994	6.235571	1.289798	H	4.649529	-4.081071	0.586929
H	0.268683	5.135356	0.009799	H	4.325660	-2.517261	1.365701
H	-1.241901	6.865952	-0.932621	C	3.630937	-2.074956	-2.868470
H	-2.484050	6.468821	0.253484	H	4.097166	-1.239111	-3.398070
N	-2.122910	1.995506	1.150127	H	3.964426	-3.015503	-3.320251
O	2.415489	0.354769	0.813234	H	2.551210	-1.996750	-3.009191
C	3.453452	1.169712	1.452820	C	5.538424	-2.269784	-1.275387
C	4.027601	2.158949	0.437532	H	5.772170	-3.304062	-1.552372
C	2.733995	1.905412	2.584523	H	6.078591	-1.602856	-1.955006
C	4.536240	0.246837	2.018014	H	5.905236	-2.087560	-0.262909
H	4.461670	1.629337	-0.412652	Cu	0.460990	0.677870	0.694488
H	3.242093	2.820831	0.063506	B	2.603453	-0.632319	-0.204928
H	4.803828	2.770880	0.911593	C	1.081103	0.236706	-1.762800

H	1.769688	-0.370632	-2.337205	C	2.822410	-3.402467	0.367719
C	-0.300075	-0.257366	-1.871364	C	1.478878	-3.568663	0.488683
C	-1.441690	0.578506	-1.961263	C	1.850426	-1.403277	-0.073745
C	-0.562940	-1.649728	-1.849829	N	3.031659	-2.076732	0.023581
C	-2.731429	0.072056	-1.867107	H	3.635583	-4.101045	0.492411
H	-1.311324	1.647586	-2.096907	H	0.897521	-4.440298	0.742330
C	-1.852960	-2.155010	-1.796588	C	4.361851	-1.469048	-0.174707
H	0.277874	-2.330878	-1.789970	C	4.523490	-0.921496	-1.601804
C	-2.976438	-1.306768	-1.748110	C	4.646454	-0.391839	0.885369
H	-3.576405	0.755410	-1.921714	H	5.078359	-2.289032	-0.036635
H	-1.994972	-3.230876	-1.718693	C	5.914857	-0.299991	-1.795244
C	-4.341304	-1.832221	-1.541424	H	3.752721	-0.158135	-1.771808
C	-4.765073	-3.040828	-2.124856	H	4.344290	-1.726375	-2.325415
C	-5.258001	-1.141341	-0.724522	C	6.036731	0.227178	0.677460
C	-6.049066	-3.536876	-1.903236	H	3.881075	0.390057	0.813200
H	-4.084246	-3.580529	-2.777596	H	4.557216	-0.833366	1.885747
C	-6.544844	-1.633275	-0.509502	C	6.188069	0.787458	-0.744902
H	-4.939250	-0.225954	-0.232148	H	5.994302	0.113064	-2.807809
C	-6.948703	-2.835239	-1.096228	H	6.682738	-1.084229	-1.714243
H	-6.352777	-4.469719	-2.372149	H	6.200351	1.015719	1.421288
H	-7.231889	-1.082466	0.129080	H	6.810474	-0.536024	0.851333
H	-7.950464	-3.220849	-0.926232	H	7.191771	1.207214	-0.884222
C	1.346311	1.667788	-1.946181	H	5.474151	1.611804	-0.885256
H	0.628900	2.402784	-1.592387	C	-0.541180	-2.047335	0.288870
C	2.458750	2.210036	-2.437949	C	-1.356631	-2.943013	-0.653525
F	3.509402	1.535502	-2.917947	C	-1.042647	-2.140878	1.737534
F	2.721121	3.529167	-2.438779	H	-0.643887	-1.010302	-0.047363
				C	-2.847780	-2.575320	-0.576317
INT5A				H	-1.223430	-3.996995	-0.368002

H	-0.978218	-2.834019	-1.677211	H	-5.376305	1.320833	-2.367533
C	-2.532636	-1.776307	1.807060	C	-6.693812	0.024903	1.031169
H	-0.888454	-3.164628	2.109391	H	-4.708010	0.358468	1.770175
H	-0.445266	-1.471489	2.368381	C	-7.550266	0.070209	-0.071155
C	-3.374261	-2.650903	0.865216	H	-7.717654	0.585575	-2.159243
H	-3.426411	-3.237208	-1.231877	H	-7.058816	-0.332401	1.990993
H	-2.983675	-1.553723	-0.952052	H	-8.585847	-0.245116	0.023367
H	-2.889982	-1.867280	2.840285	C	1.346510	3.374284	-0.006419
H	-2.644897	-0.723885	1.519247	H	1.171157	4.409512	-0.303843
H	-4.421491	-2.329729	0.894930	C	2.013974	3.255475	1.133753
H	-3.344336	-3.694993	1.212760	F	2.465371	4.275898	1.866247
N	0.902651	-2.339224	0.212453	F	2.350527	2.105278	1.738399
Cu	1.491426	0.443049	-0.474191				
C	0.814083	2.253713	-0.851588	TS6A			
H	1.031223	2.484310	-1.904212	C	2.871758	3.350061	0.275365
C	-0.652847	1.987660	-0.712267	C	1.525567	3.537148	0.237857
C	-1.367943	2.201740	0.485186	C	1.910450	1.310104	0.090701
C	-1.385220	1.426949	-1.784125	N	3.091204	1.985715	0.184237
C	-2.713063	1.863535	0.605637	H	3.681478	4.058499	0.360215
H	-0.852146	2.649283	1.330534	H	0.938832	4.440472	0.280661
C	-2.725004	1.083421	-1.660612	C	4.431813	1.361144	0.163230
H	-0.869345	1.236334	-2.723630	C	4.618409	0.384859	1.335998
C	-3.430271	1.286409	-0.457724	C	4.713449	0.692418	-1.192630
H	-3.225286	2.075630	1.541071	H	5.136627	2.192347	0.292778
H	-3.230240	0.622857	-2.506103	C	6.014084	-0.257184	1.299036
C	-4.849549	0.885891	-0.319868	H	3.863650	-0.405711	1.267712
C	-5.731536	0.935984	-1.415940	H	4.449975	0.914603	2.281866
C	-5.363784	0.425349	0.907639	C	6.109065	0.050582	-1.209275
C	-7.059946	0.530763	-1.295269	H	3.954894	-0.081561	-1.361507

H	4.608329	1.434923	-1.993734	C	0.419524	-2.263664	0.548878
C	6.273860	-0.944311	-0.050299	H	0.749694	-2.463993	1.566565
H	6.103062	-0.977387	2.120643	C	2.713294	-2.594725	-0.433833
H	6.780168	0.514464	1.469867	F	3.491191	-3.058403	-1.433997
H	6.267918	-0.450034	-2.171640	F	3.359879	-2.748443	0.753432
H	6.877491	0.834738	-1.130188	C	-0.995367	-2.001122	0.361350
H	7.280377	-1.379987	-0.065456	C	-1.839527	-1.848369	1.490354
H	5.562716	-1.770101	-0.177779	C	-1.619442	-1.839643	-0.902264
C	-0.493545	2.010869	0.046662	C	-3.184739	-1.533855	1.366886
C	-1.247113	2.571934	1.260297	H	-1.408150	-1.959867	2.483067
C	-1.078042	2.529062	-1.275185	C	-2.968034	-1.528898	-1.018864
H	-0.582724	0.919506	0.063735	H	-1.034842	-1.955873	-1.811383
C	-2.740772	2.220634	1.163343	C	-3.792818	-1.350970	0.108374
H	-1.127361	3.664752	1.296695	H	-3.774086	-1.388978	2.269119
H	-0.807901	2.165562	2.179385	H	-3.399131	-1.437961	-2.013073
C	-2.572220	2.182105	-1.364949	C	-5.212312	-0.958058	-0.016445
H	-0.942097	3.619344	-1.330684	C	-6.179170	-1.406381	0.903773
H	-0.522168	2.089993	-2.112954	C	-5.644346	-0.104757	-1.051102
C	-3.352450	2.718497	-0.155027	C	-7.512674	-1.013616	0.800410
H	-3.276527	2.647483	2.019745	H	-5.883332	-2.091317	1.693422
H	-2.855663	1.131521	1.225322	C	-6.979268	0.283104	-1.159003
H	-2.989576	2.577056	-2.299553	H	-4.919404	0.277926	-1.763508
H	-2.674424	1.090448	-1.401022	C	-7.922673	-0.166186	-0.231847
H	-4.400575	2.404967	-0.219817	H	-8.237299	-1.380913	1.523050
H	-3.341398	3.819029	-0.172464	H	-7.281129	0.947742	-1.964897
N	0.954619	2.280403	0.130071	H	-8.962585	0.138366	-0.313430
Cu	1.573558	-0.550859	-0.065369				
C	1.330681	-2.573353	-0.514163	INT6A			
H	0.966933	-2.670931	-1.535910	C	3.507157	3.180831	0.388983

C	2.156271	3.327953	0.356198	C	-1.911051	2.084372	-1.325493
C	2.609974	1.125465	0.068530	H	-0.295866	3.518900	-1.125704
N	3.766441	1.831951	0.212146	H	0.136868	2.101486	-2.087970
H	4.294373	3.907164	0.521222	C	-2.685974	2.465897	-0.054901
H	1.541516	4.208072	0.454319	H	-2.600873	2.120404	2.092681
C	5.119780	1.241476	0.182526	H	-2.178922	0.721294	1.114246
C	5.326034	0.251733	1.341001	H	-2.333241	2.590602	-2.202445
C	5.417667	0.594776	-1.180115	H	-2.018923	1.005824	-1.496455
H	5.806604	2.085948	0.322607	H	-3.735964	2.165071	-0.147828
C	6.740777	-0.345862	1.303366	H	-2.675357	3.560134	0.063792
H	4.586264	-0.554696	1.250451	N	1.625931	2.062808	0.161386
H	5.133903	0.758882	2.294552	Cu	2.341851	-0.770422	-0.176623
C	6.831504	-0.005535	-1.203127	C	0.324603	-2.492175	-0.587051
H	4.679833	-0.198352	-1.360266	H	0.099031	-2.228438	-1.619050
H	5.289534	1.340317	-1.974659	C	-0.626072	-2.472913	0.372225
C	7.026957	-1.006133	-0.053880	H	-0.315109	-2.724930	1.384430
H	6.852649	-1.072228	2.116677	C	1.777567	-2.627046	-0.327327
H	7.480496	0.448477	1.485361	F	2.377414	-3.377295	-1.344230
H	7.007495	-0.490170	-2.170516	F	1.993538	-3.348409	0.852857
H	7.574795	0.801190	-1.114226	C	-2.012693	-2.039258	0.220191
H	8.045871	-1.411365	-0.072114	C	-2.830265	-1.921187	1.361960
H	6.342196	-1.854551	-0.193693	C	-2.583652	-1.662158	-1.013968
C	0.184779	1.764996	0.047366	C	-4.120779	-1.406503	1.286894
C	-0.574503	2.157597	1.323060	H	-2.425709	-2.207131	2.330267
C	-0.418200	2.428365	-1.200079	C	-3.872460	-1.151118	-1.088912
H	0.124913	0.677796	-0.069756	H	-2.007577	-1.767776	-1.928695
C	-2.065822	1.809429	1.187418	C	-4.668001	-0.990752	0.061579
H	-0.462929	3.238019	1.496734	H	-4.698605	-1.284610	2.199110
H	-0.127721	1.643974	2.182984	H	-4.280131	-0.882059	-2.059719

C	-6.018128	-0.386493	-0.016249	C	-6.189239	-1.115610	-0.038203
C	-7.067401	-0.838627	0.803394	H	-5.952237	-1.075276	-2.201536
C	-6.283433	0.670215	-0.906374	H	-6.723988	0.361577	-1.530487
C	-8.331501	-0.253905	0.739133	H	-6.293314	-0.673986	2.094886
H	-6.894606	-1.673071	1.477324	H	-6.921304	0.602778	1.056728
C	-7.548058	1.253828	-0.972859	H	-7.167292	-1.611103	-0.065539
H	-5.483036	1.050156	-1.535302	H	-5.431104	-1.902078	0.081064
C	-8.578689	0.795616	-0.149061	C	0.464384	1.989025	-0.039107
H	-9.128601	-0.625966	1.377669	C	1.104554	2.200817	-1.419899
H	-7.726105	2.074144	-1.663493	C	1.140736	2.843250	1.042096
H	-9.564245	1.250451	-0.199422	H	0.564947	0.934077	0.236703
				C	2.615301	1.927666	-1.367994
TS6B				H	0.927496	3.236859	-1.744692
C	-2.911157	3.261062	-0.423921	H	0.612438	1.544685	-2.148041
C	-1.566918	3.457356	-0.422886	C	2.649078	2.549452	1.085682
C	-1.937286	1.286423	0.108283	H	0.980707	3.908854	0.820968
N	-3.123251	1.931128	-0.097707	H	0.670843	2.638663	2.011693
H	-3.725151	3.940951	-0.623558	C	3.304063	2.772311	-0.286022
H	-0.984624	4.342723	-0.620546	H	3.060259	2.124392	-2.350820
C	-4.448319	1.277101	-0.118582	H	2.778272	0.865813	-1.150888
C	-4.562149	0.327986	-1.325041	H	3.125667	3.177638	1.848456
C	-4.758782	0.567027	1.208604	H	2.794720	1.505130	1.390497
H	-5.172223	2.092202	-0.245032	H	4.368667	2.517023	-0.239667
C	-5.925606	-0.376189	-1.357776	H	3.237644	3.838375	-0.552329
H	-3.768778	-0.424175	-1.249291	N	-0.988377	2.240850	-0.096036
H	-4.385808	0.895192	-2.247572	Cu	-1.647218	-0.531259	0.563801
C	-6.118995	-0.144640	1.150485	C	-1.656866	-2.612032	0.656563
H	-3.974783	-0.175585	1.406382	H	-2.496307	-2.923960	1.278932
H	-4.722150	1.292794	2.030202	C	-0.518315	-2.139623	1.406776

C	-2.077445	-2.503203	-0.659958	C	1.817304	1.375895	-0.050249
F	-3.286216	-3.020245	-1.008197	N	2.966744	2.112331	-0.090748
F	-1.292197	-2.463600	-1.763188	H	3.464914	4.204100	-0.321220
C	0.860811	-1.902783	1.007181	H	0.709951	4.440729	-0.465372
C	1.376263	-2.053625	-0.302483	C	4.334878	1.563582	0.033760
C	1.783222	-1.465029	1.993565	C	4.550792	0.894189	1.401548
C	2.701616	-1.752865	-0.599614	C	4.671206	0.617688	-1.131339
H	0.729262	-2.406548	-1.093510	H	4.998042	2.435916	-0.029989
C	3.103347	-1.175029	1.690660	C	5.975884	0.333140	1.519250
H	1.436487	-1.353696	3.019003	H	3.832931	0.071853	1.511304
C	3.603630	-1.295716	0.377236	H	4.339511	1.618125	2.198501
H	3.036429	-1.850456	-1.629451	C	6.095734	0.060396	-0.990461
H	3.772251	-0.867622	2.490709	H	3.959011	-0.216763	-1.127515
C	4.995773	-0.929397	0.039317	H	4.543289	1.150770	-2.081839
C	5.704491	-1.600519	-0.975328	C	6.281052	-0.635249	0.366569
C	5.656091	0.118081	0.711362	H	6.088140	-0.171373	2.485996
C	7.007520	-1.235324	-1.309645	H	6.701952	1.160654	1.507586
H	5.235142	-2.434337	-1.489726	H	6.295585	-0.637579	-1.811972
C	6.961609	0.480011	0.381543	H	6.824761	0.879742	-1.086961
H	5.130705	0.671247	1.484528	H	7.302610	-1.024184	0.457587
C	7.645679	-0.192370	-0.633930	H	5.596478	-1.491439	0.427121
H	7.531091	-1.776304	-2.094056	C	-0.611641	1.957695	-0.224153
H	7.442225	1.297013	0.914268	C	-1.362390	2.680524	0.905590
H	8.662271	0.090608	-0.893250	C	-1.219174	2.259674	-1.602822
H	-0.664573	-2.227880	2.479633	H	-0.657420	0.877692	-0.047898
				C	-2.862534	2.352437	0.866996
INT6B				H	-1.227993	3.766115	0.793665
C	2.688017	3.457145	-0.264652	H	-0.920592	2.400653	1.869784
C	1.336100	3.573221	-0.334095	C	-2.718554	1.925325	-1.622125

H	-1.078135	3.325762	-1.833654	C	-5.563527	-0.184150	-0.709735
H	-0.677575	1.689225	-2.366963	C	-5.195753	-0.754747	1.601993
C	-3.469460	2.669204	-0.507448	C	-6.749176	0.462672	-0.362968
H	-3.383081	2.908706	1.655662	H	-5.239064	-0.181093	-1.746118
H	-3.009713	1.288045	1.083743	C	-6.377627	-0.102641	1.950885
H	-3.138971	2.175160	-2.604053	H	-4.614427	-1.253778	2.371681
H	-2.845299	0.843786	-1.487105	C	-7.160979	0.511092	0.970762
H	-4.529065	2.394528	-0.517279	H	-7.346548	0.939261	-1.136006
H	-3.412847	3.753153	-0.691045	H	-6.692543	-0.083285	2.990979
N	0.823691	2.292304	-0.198662	H	-8.082702	1.018084	1.242673
Cu	1.720327	-0.539851	0.141089				
C	1.457872	-3.302946	-0.814821	MeOH			
H	2.236265	-3.840563	-1.356183	C	0.662744	-0.019540	0.000000
C	0.194878	-3.402582	-1.282438	H	1.080118	0.991444	-0.000001
H	0.059189	-4.020443	-2.169977	H	1.039188	-0.543379	-0.893349
C	1.976589	-2.462451	0.303991	H	1.039188	-0.543378	0.893350
F	3.377856	-2.696492	0.342321	O	-0.749920	0.122365	0.000000
F	1.523754	-2.989469	1.538654	H	-1.135593	-0.766367	0.000000
C	-1.033389	-2.749741	-0.824819				
C	-2.142918	-2.731378	-1.695409	TS7A			
C	-1.193766	-2.126214	0.431147	C	-0.591592	-1.971441	-2.242866
C	-3.336823	-2.112014	-1.349318	C	0.380400	-1.022149	-2.236101
H	-2.062011	-3.222314	-2.662803	C	-1.421649	-0.161360	-1.167483
C	-2.389407	-1.497327	0.769974	N	-1.687508	-1.428600	-1.589991
H	-0.394033	-2.174494	1.157188	H	-0.599353	-2.972217	-2.645983
C	-3.489627	-1.472315	-0.104946	H	1.385048	-1.049218	-2.621346
H	-4.174828	-2.153014	-2.039464	C	-2.934834	-2.171276	-1.320153
H	-2.463547	-1.013605	1.740264	C	-3.082945	-2.470169	0.180640
C	-4.760104	-0.803667	0.265198	C	-4.163773	-1.446737	-1.891102

H	-2.823884	-3.123280	-1.854707	H	2.630710	4.688862	-1.549945
C	-4.379391	-3.242240	0.465723	H	2.417288	3.638349	-2.949171
H	-3.088430	-1.529776	0.741772	N	-0.144219	0.076579	-1.576667
H	-2.207033	-3.035223	0.523723	C	-0.783584	0.901743	2.399894
C	-5.450412	-2.230444	-1.591345	H	-0.210303	1.799485	2.627644
H	-4.229775	-0.450153	-1.436303	C	-0.171355	-0.228996	1.968926
H	-4.031205	-1.294872	-2.969355	H	-0.806829	-1.076596	1.724321
C	-5.601944	-2.493497	-0.085309	C	-2.225282	1.126654	2.408573
H	-4.478296	-3.399125	1.545853	F	-2.603453	1.870723	3.534521
H	-4.327621	-4.239645	0.003412	F	-2.922003	-0.111130	2.531109
H	-6.314922	-1.676719	-1.976900	C	1.247454	-0.404600	1.693174
H	-5.428811	-3.191311	-2.127099	C	1.684633	-1.567530	1.023997
H	-6.518857	-3.062357	0.110763	C	2.238352	0.544942	2.027334
H	-5.703432	-1.533180	0.440955	C	3.018385	-1.757639	0.680022
C	0.553241	1.349262	-1.288651	H	0.948825	-2.317140	0.741636
C	2.066486	1.243556	-1.501226	C	3.569723	0.355742	1.681837
C	-0.035144	2.504681	-2.114130	H	1.960329	1.440245	2.576007
H	0.365346	1.538779	-0.225916	C	3.994912	-0.793549	0.987651
C	2.743705	2.562905	-1.100775	H	3.304287	-2.649510	0.128039
H	2.275309	1.046927	-2.563205	H	4.303912	1.102825	1.971518
H	2.475036	0.414966	-0.917867	C	5.407165	-0.965184	0.578469
C	0.640406	3.829937	-1.729688	C	6.026492	-2.227456	0.607028
H	0.119923	2.292200	-3.181789	C	6.166967	0.133602	0.137242
H	-1.117402	2.563071	-1.948214	C	7.353422	-2.385226	0.208856
C	2.167579	3.752200	-1.883850	H	5.468309	-3.085535	0.971344
H	3.825504	2.479556	-1.262262	C	7.495189	-0.022680	-0.256701
H	2.599404	2.719756	-0.023534	H	5.700763	1.113859	0.081129
H	0.232213	4.645022	-2.338917	C	8.095420	-1.283672	-0.224106
H	0.391500	4.063799	-0.684222	H	7.812865	-3.369643	0.248030

H	8.059819	0.840787	-0.599266	H	-4.901962	-1.554781	1.314399
H	9.130282	-1.406560	-0.531886	H	-4.774855	-0.019152	-2.164651
Cu	-2.500778	1.007617	-0.138747	H	-4.902229	-1.556583	-1.312897
C	-5.211234	1.739686	0.793540	H	-6.033006	0.230551	-0.000348
H	-5.681741	1.544126	-0.174081	H	-4.555487	1.196297	-0.001169
H	-5.130049	0.803775	1.359277	C	2.444777	-0.408490	0.000001
H	-5.824706	2.453161	1.355168	C	3.254368	-0.702868	1.271520
O	-3.909061	2.295390	0.549473	C	3.254191	-0.703527	-1.271476
H	-3.318522	2.121919	1.378669	H	2.170297	0.651985	-0.000255
				C	4.569268	0.092700	1.267614
INT7A				H	3.477434	-1.778586	1.321461
C	-0.306220	-2.763586	0.000856	H	2.648755	-0.457428	2.151913
C	1.027159	-2.506988	0.000626	C	4.569088	0.092046	-1.268172
C	-0.054019	-0.508333	0.000104	H	3.477251	-1.779271	-1.320889
N	-0.952686	-1.538035	0.000368	H	2.648453	-0.458545	-2.151910
H	-0.845647	-3.698285	0.001222	C	5.390717	-0.188726	-0.000264
H	1.873097	-3.175269	0.000783	H	5.151454	-0.147685	2.165183
C	-2.422295	-1.386247	0.000361	H	4.338548	1.166439	1.320485
C	-2.917354	-0.681506	1.273778	H	5.151146	-0.148803	-2.165698
C	-2.917634	-0.683210	-1.273898	H	4.338359	1.165757	-1.321562
H	-2.814706	-2.411526	0.001059	H	6.306616	0.414546	-0.000484
C	-4.448043	-0.553092	1.265649	H	5.706317	-1.242778	-0.000014
H	-2.465963	0.317532	1.323280	N	1.162107	-1.127102	0.000258
H	-2.571066	-1.235573	2.155163	Cu	-0.394762	1.345935	-0.000222
C	-4.448319	-0.554819	-1.265616	O	-0.876557	3.074821	-0.000640
H	-2.466308	0.315778	-1.324864	C	0.028952	4.138105	0.000309
H	-2.571521	-1.238449	-2.154613	H	-0.515901	5.099470	-0.001211
C	-4.938014	0.165989	-0.000422	H	0.688523	4.151078	0.889891
H	-4.774375	-0.016195	2.164023	H	0.691659	4.150059	-0.886953

			H	-5.837466	-1.490897	0.557100	
H ₂ O			C	0.428331	1.474962	-1.183527	
O	0.000000	0.000000	0.119712	C	1.934205	1.322889	-1.417847
H	0.000000	0.761608	-0.478849	C	-0.115729	2.718381	-1.905186
H	0.000000	-0.761608	-0.478849	H	0.257303	1.584983	-0.106701
			C	2.670089	2.575240	-0.918206	
TS7B			H	2.128642	1.204063	-2.493973	
C	-0.859714	-1.703170	-2.400935	H	2.308983	0.432874	-0.906885
C	0.147903	-0.795070	-2.329591	C	0.620559	3.977711	-1.421960
C	-1.603285	0.033376	-1.154362	H	0.020907	2.587491	-2.988328
N	-1.924383	-1.179572	-1.683375	H	-1.192611	2.809975	-1.721119
H	-0.912604	-2.663348	-2.890198	C	2.141656	3.847311	-1.597513
H	1.143352	-0.823809	-2.737894	H	3.746367	2.458836	-1.095276
C	-3.178520	-1.916665	-1.433572	H	2.537900	2.650251	0.169317
C	-3.246321	-2.399533	0.023822	H	0.243895	4.856162	-1.959080
C	-4.419276	-1.101239	-1.825839	H	0.388757	4.136731	-0.358703
H	-3.130414	-2.794513	-2.090732	H	2.647356	4.733216	-1.194037
C	-4.535767	-3.193076	0.279819	H	2.379412	3.809218	-2.670964
H	-3.208727	-1.533400	0.693301	N	-0.323589	0.259380	-1.566239
H	-2.361266	-3.010508	0.242748	C	-0.936231	0.733908	2.490484
C	-5.701494	-1.905836	-1.562951	H	-0.344607	1.600245	2.783529
H	-4.440853	-0.179768	-1.229551	C	-0.348608	-0.367641	1.962003
H	-4.344625	-0.798865	-2.877506	H	-1.000961	-1.182855	1.659267
C	-5.776040	-2.370400	-0.100139	C	-2.376230	0.980853	2.536500
H	-4.578693	-3.488445	1.334284	F	-2.722702	1.633214	3.728993
H	-4.522659	-4.121989	-0.310478	F	-3.092044	-0.242427	2.558359
H	-6.576120	-1.296516	-1.820512	C	1.064635	-0.545521	1.657327
H	-5.725454	-2.784293	-2.225265	C	1.472969	-1.657145	0.890339
H	-6.688284	-2.956276	0.065506	C	2.076429	0.352943	2.061951

C	2.801241	-1.847200	0.525363	H	1.906282	-2.952375	-0.000219
H	0.719518	-2.364040	0.550213	C	-2.399955	-1.190509	-0.000054
C	3.402266	0.163969	1.695508	C	-2.900990	-0.491118	1.274023
H	1.819284	1.205940	2.683471	C	-2.901040	-0.490969	-1.274029
C	3.799744	-0.933898	0.908023	H	-2.784467	-2.218821	-0.000107
H	3.065864	-2.695668	-0.100538	C	-4.432751	-0.376087	1.265618
H	4.153781	0.868345	2.041979	H	-2.459122	0.511931	1.325049
C	5.207110	-1.102760	0.480800	H	-2.550028	-1.043259	2.154806
C	5.798276	-2.376482	0.405316	C	-4.432801	-0.375938	-1.265550
C	5.990244	0.011233	0.127489	H	-2.459173	0.512085	-1.324948
C	7.121034	-2.530523	-0.008001	H	-2.550111	-1.043005	-2.154891
H	5.221601	-3.248879	0.700353	C	-4.928192	0.340224	0.000086
C	7.314292	-0.141733	-0.281600	H	-4.763719	0.157404	2.164350
H	5.545817	1.002760	0.152535	H	-4.878374	-1.381609	1.313363
C	7.886645	-1.414022	-0.352465	H	-4.763805	0.157657	-2.164206
H	7.558711	-3.524679	-0.049888	H	-4.878425	-1.381456	-1.313395
H	7.897408	0.734030	-0.554992	H	-6.023692	0.396463	0.000111
H	8.918261	-1.534143	-0.671980	H	-4.553059	1.373186	0.000140
Cu	-2.583880	1.174605	-0.000298	C	2.460885	-0.182731	-0.000016
O	-3.698331	2.699479	0.782323	C	3.272055	-0.473535	1.271470
H	-3.279507	2.226635	1.608002	C	3.272134	-0.473396	-1.271483
H	-4.653074	2.510870	0.817875	H	2.180089	0.876009	0.000033
				C	4.583663	0.327315	1.267954
INT7B				H	3.499827	-1.548254	1.321270
C	-0.275354	-2.553584	-0.000160	H	2.665290	-0.231078	2.151877
C	1.056338	-2.289178	-0.000175	C	4.583741	0.327455	-1.267795
C	-0.036706	-0.296267	-0.000062	H	3.499912	-1.548110	-1.321387
N	-0.929031	-1.331829	-0.000094	H	2.665425	-0.230844	-2.151903
H	-0.809217	-3.491474	-0.000195	C	5.406466	0.049707	0.000089

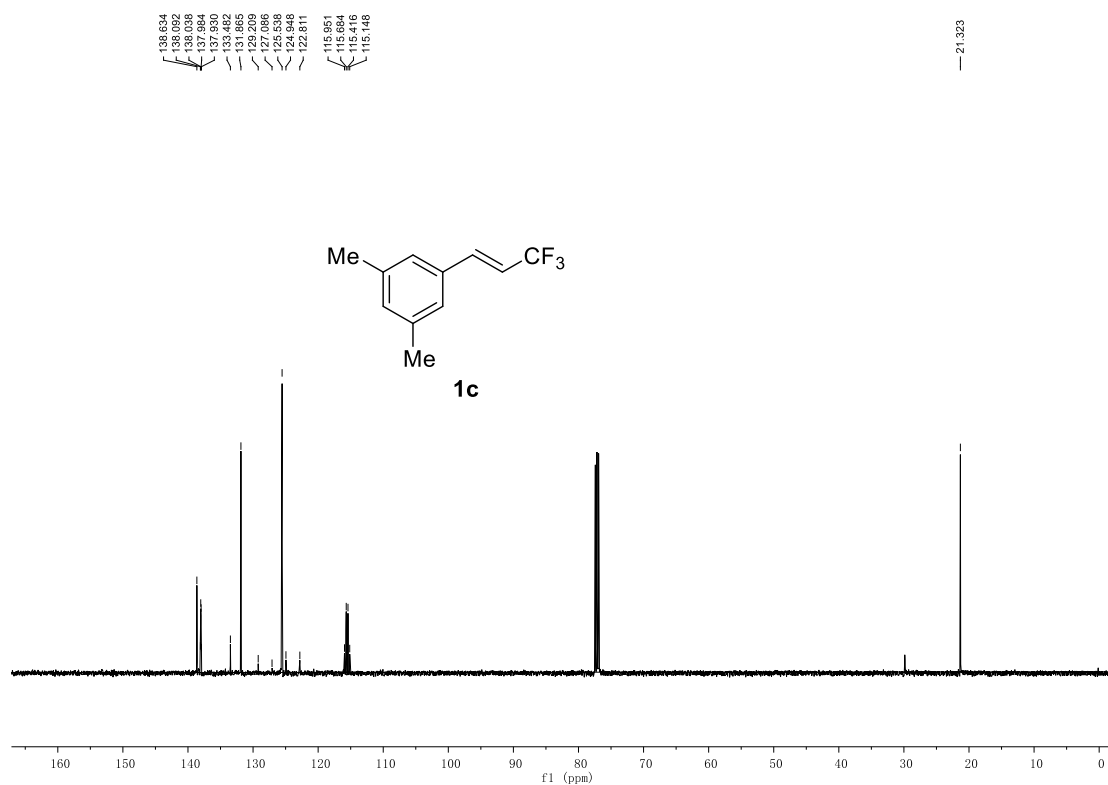
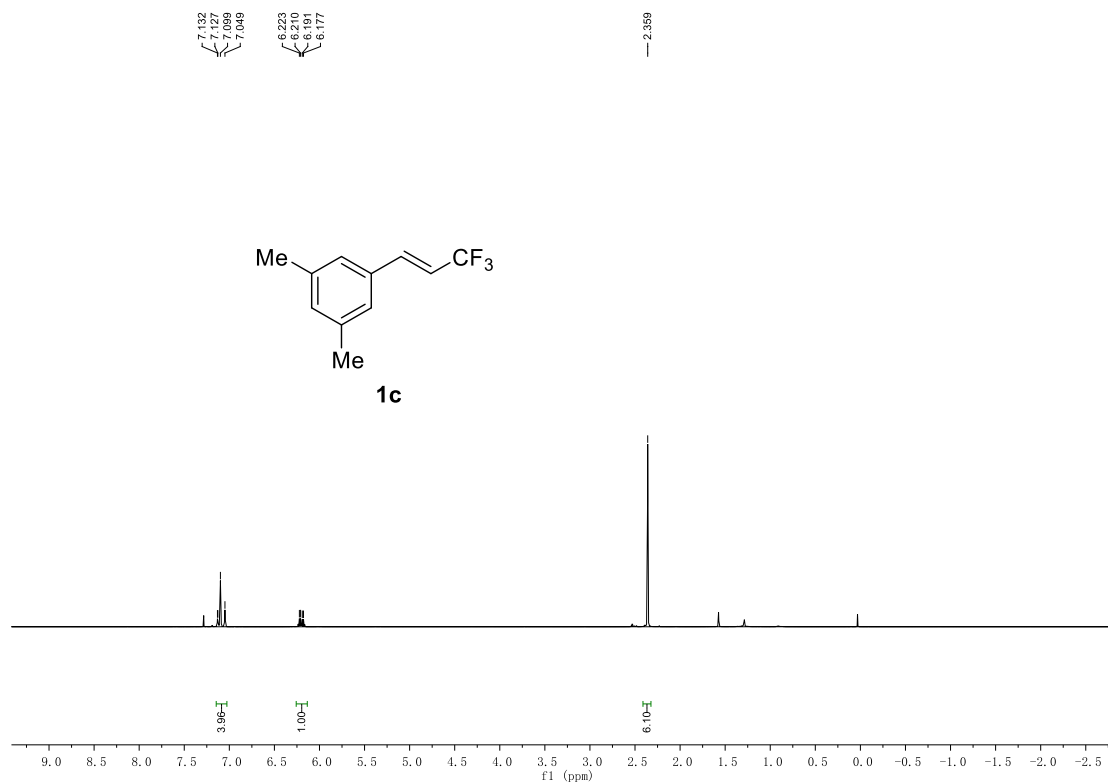
H	5.166841	0.089228	2.165518	H	-0.891520	2.391215	0.911675
H	4.348616	1.400152	1.321071	H	-1.349660	-1.625558	-0.564235
H	5.166974	0.089469	-2.165350	H	1.083102	-1.855321	-0.685749
H	4.348695	1.400298	-1.320808	C	-2.767986	0.606963	0.257253
H	6.320101	0.656483	0.000150	H	-3.073792	1.574907	0.657778
H	5.726176	-1.003091	0.000040	C	-3.733272	-0.248618	-0.106747
N	1.182748	-0.908262	-0.000088	H	-3.527645	-1.232090	-0.521747
Cu	-0.409612	1.554088	0.000054	C	-5.178921	0.080147	0.021872
O	-0.959318	3.260275	-0.000010	H	1.553146	2.141314	0.824758
H	-0.208709	3.874573	-0.000090	C	2.984146	-0.025675	-0.005548
				C	3.601472	-1.239796	0.340802
OMe				C	3.800588	1.042696	-0.414448
O	0.000000	0.000000	0.789093	C	4.986955	-1.380636	0.280479
C	0.000000	0.000000	-0.521019	H	2.991299	-2.069599	0.686485
H	0.000000	1.029892	-1.062210	C	5.186074	0.902199	-0.474596
H	0.891912	-0.514946	-1.062210	H	3.341527	1.980927	-0.713542
H	-0.891912	-0.514946	-1.062210	C	5.785573	-0.310243	-0.127383
				H	5.444110	-2.325781	0.561269
3a				H	5.797759	1.738723	-0.802026
C	0.920739	1.320325	0.499485	H	6.865548	-0.420050	-0.174424
C	-0.462191	1.456455	0.558114	F	-5.806686	-0.853279	0.811526
C	-1.317402	0.407595	0.179449	H	-5.365561	1.072867	0.449995
C	-0.725066	-0.791265	-0.259052	F	-5.787635	0.022344	-1.209041
C	0.655152	-0.927204	-0.317742				
C	1.510901	0.124869	0.059294				

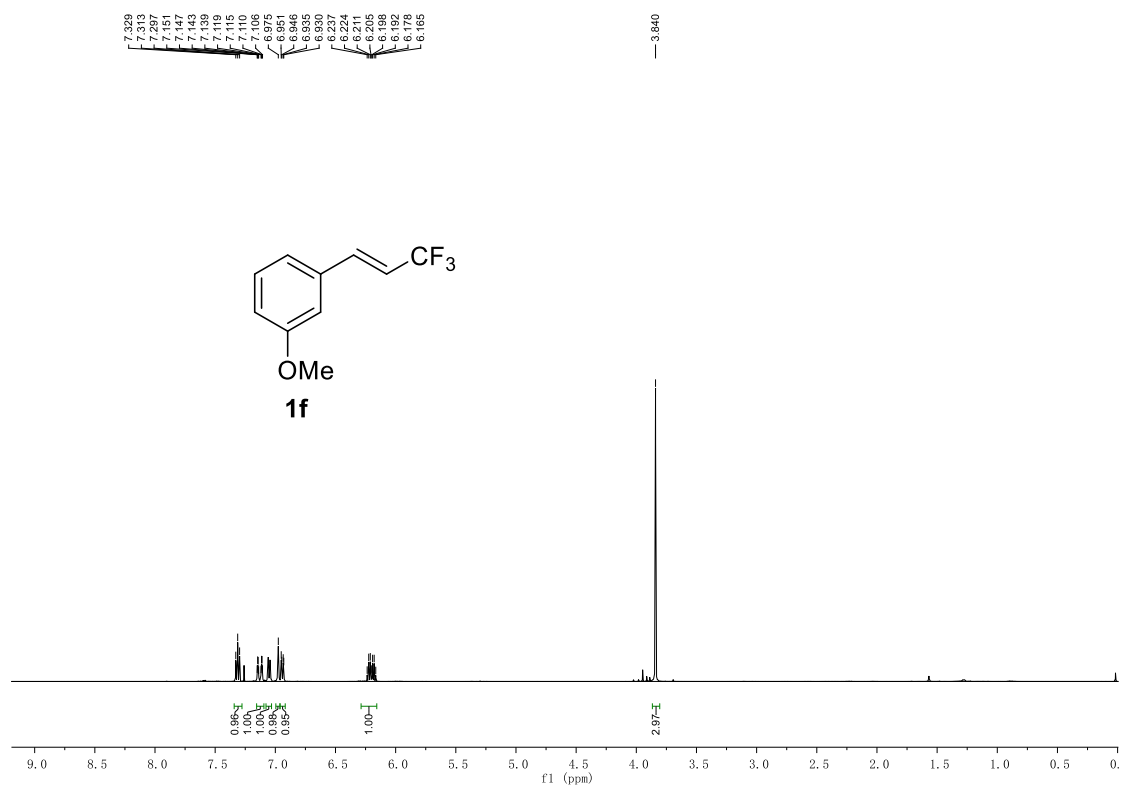
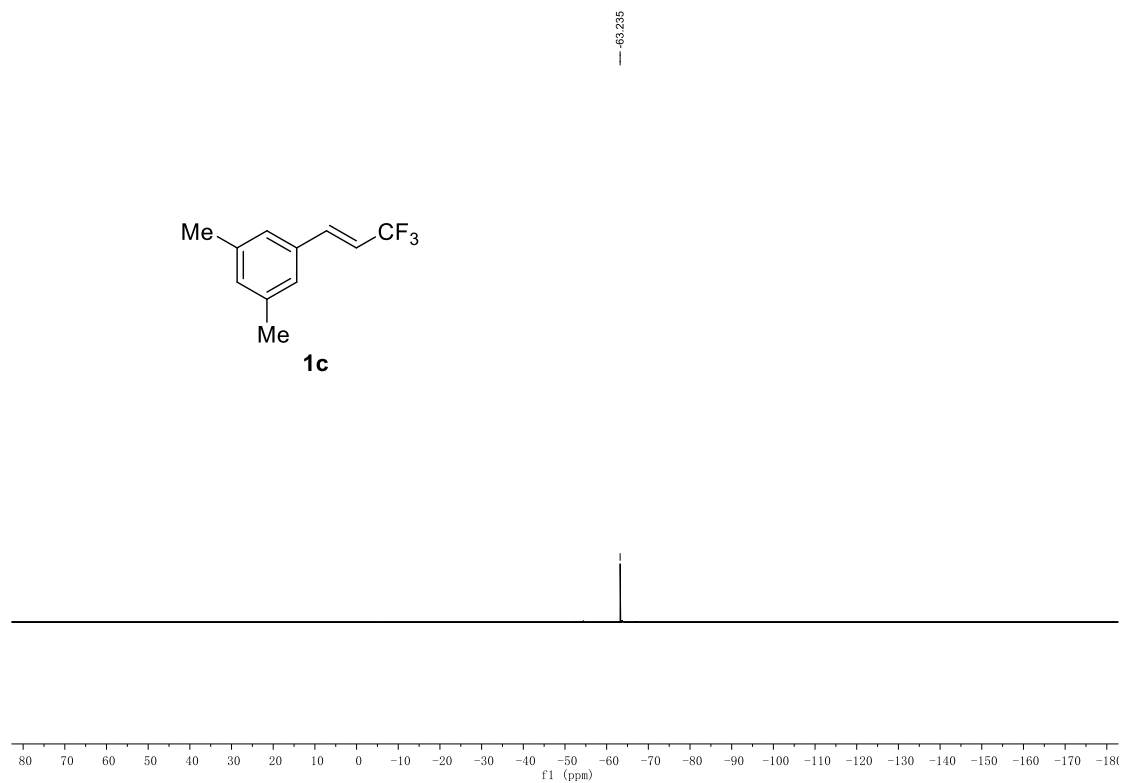
8. References

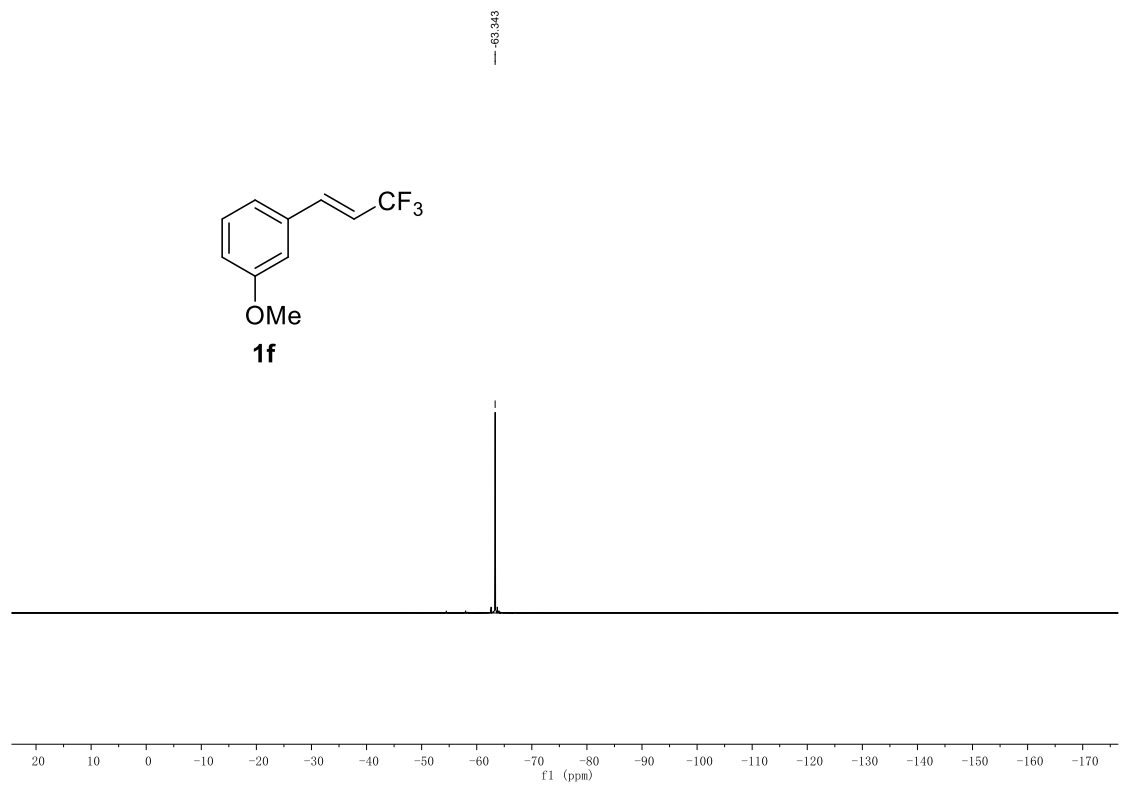
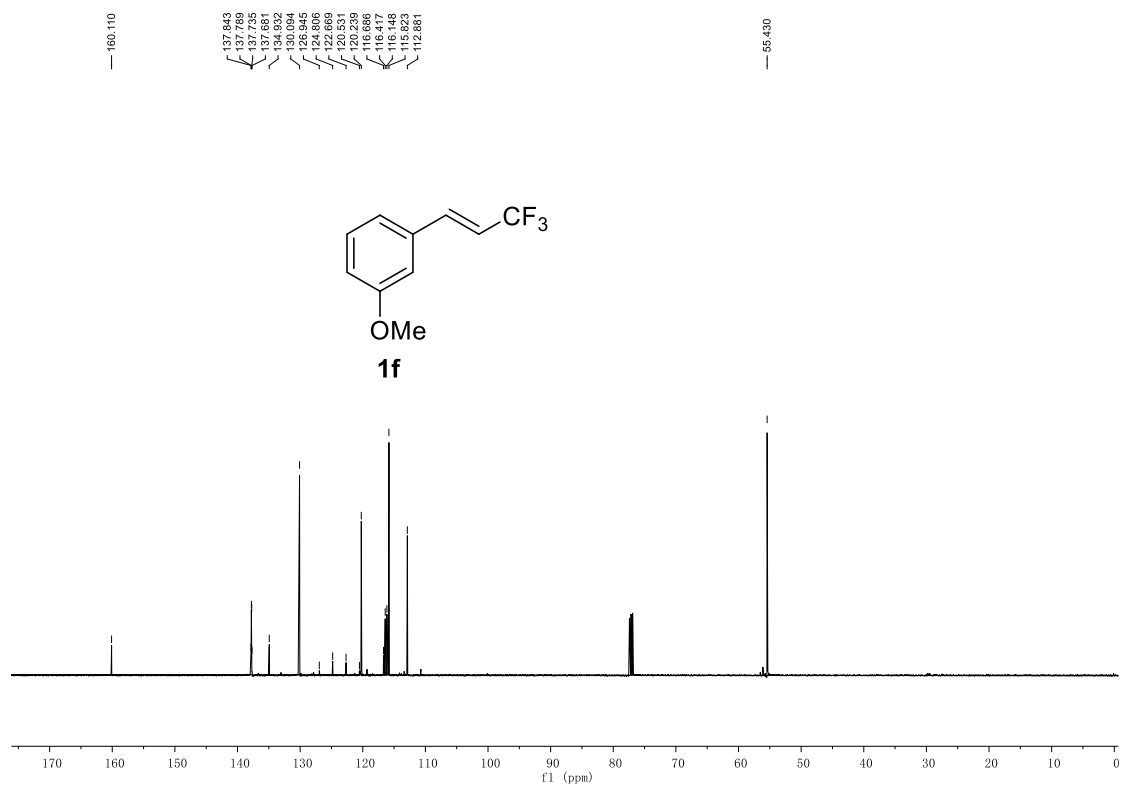
1. (a) Wang, M.; Pu, X.; Zhao, Y.; Wang, P.; Li, Z.; Zhu, C.; Shi, Z. *J. Am. Chem. Soc.* **2018**, *140*, 9061; b) Mirabdolbaghi, R.; Dudding, T.; Stamatatos, T. *Org. Lett.* **2014**, *16*, 2790; c) Xu, J.; Wang, Y.-L.; Gong, T.-J.; Xiao, B.; Fu, Y. *Chem. Commun.* **2014**, *50*, 12915.
2. Gao, P.; Gao, L.; Xi, L.; Zhang, Z.; Li, S.; Shi, Z. *Org. Chem. Front.* **2020**, *7*, 2618.
3. Huang, W.; Delcourt, M.; Pannecoucke, X.; Charette, A.; Poisson, T.; Jubault, P. *Org. Lett.* **2019**, *21*, 18, 7509.
4. Cain, D. L.; McLaughlin, C.; Molloy, J. J.; Carpenter-Warren, C.; Anderson, N. A.; Watson, A. J. B. *Synlett* **2019**, *30*, 787.
5. Paioti, P. H. S.; J. del Pozo, M. S. Mikus, J. Lee, M. J. Koh, F. Romiti, S. Torker, A. H. Hoveyda, *J. Am. Chem. Soc.* **2019**, *141*, 19917.
6. Gaussian 09, Revision E.01, Frisch, M. J.; Trucks, G. W.; Schlegel, H. B.; Scuseria, G. E.; Robb, M. A.; Cheeseman, J. R.; Scalmani, G.; Barone, V.; Mennucci, B.; Petersson, G. A.; Nakatsuji, H.; Caricato, M.; Li, X.; Hratchian, H. P.; Izmaylov, A. F.; Bloino, J.; Zheng, G.; Sonnenberg, J. L.; Hada, M.; Ehara, M.; Toyota, K.; Fukuda, R.; Hasegawa, J.; Ishida, M.; Nakajima, T.; Honda, Y.; Kitao, O.; Nakai, H.; Vreven, T.; Montgomery, J. A.; Peralta, Jr., J. E.; Ogliaro, F.; Bearpark, M.; Heyd, J. J.; Brothers, E.; Kudin, K. N.; Staroverov, V. N.; Keith, T.; Kobayashi, R.; Normand, J.; Raghavachari, K.; Rendell, A.; Burant, J. C.; Iyengar, S. S.; Tomasi, J.; Cossi, M.; Rega, N.; Millam, J. M.; Klene, M.; Knox, J. E.; Cross, J. B.; Bakken, V.; Adamo, C.; Jaramillo, J.; Gomperts, R.; Stratmann, R. E.; Yazyev, O.; Austin, A. J.; Cammi, R.; Pomelli, C.; Ochterski, J. W.; Martin, R. L.; Morokuma, K.; Zakrzewski, V. G.; Voth, G. A.; Salvador, P.; Dannenberg, J. J.; Dapprich, S.; Daniels, A. D.; Farkas, O.; Foresman, J. B.; Ortiz, J. V.; Cioslowski, J.; and Fox, D. J. Gaussian, Inc., Wallingford CT, 2013.
7. a) Becke, A. D. *J. Chem. Phys.* 1993, *98*, 5648. b) Lee, C.; Yang, W.; Parr, R. G. *Phys. Rev. B*, 1988, *37*, 785.

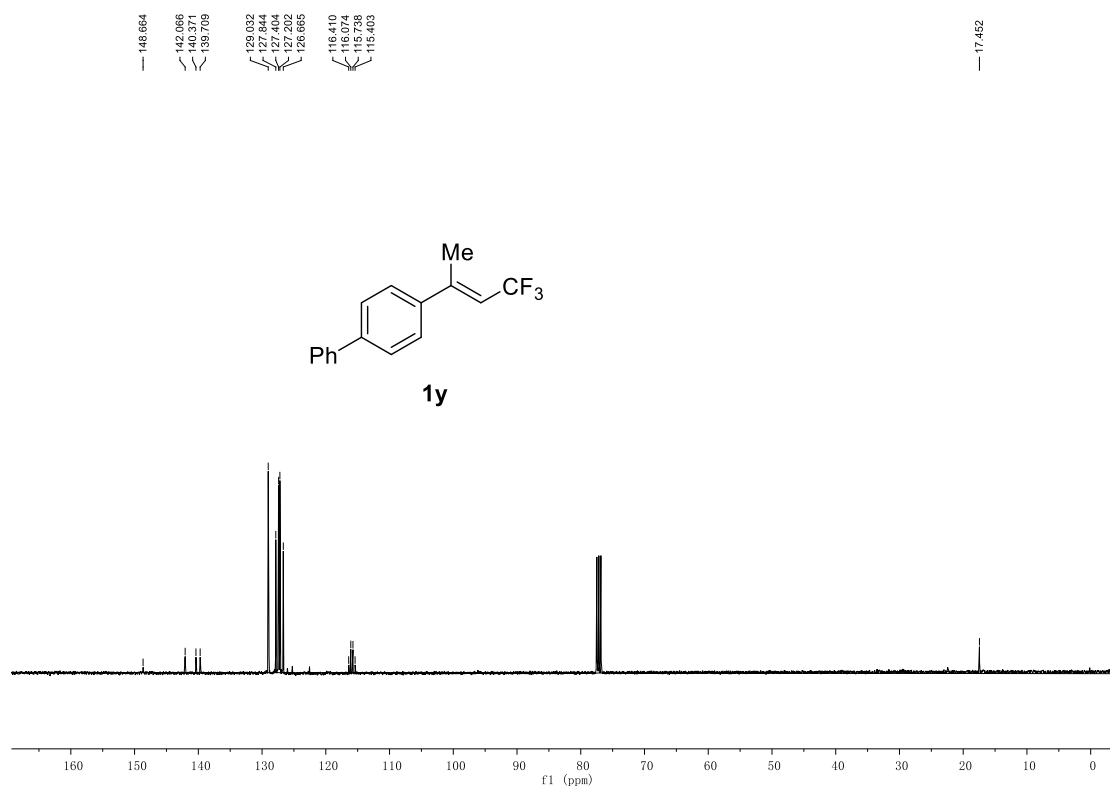
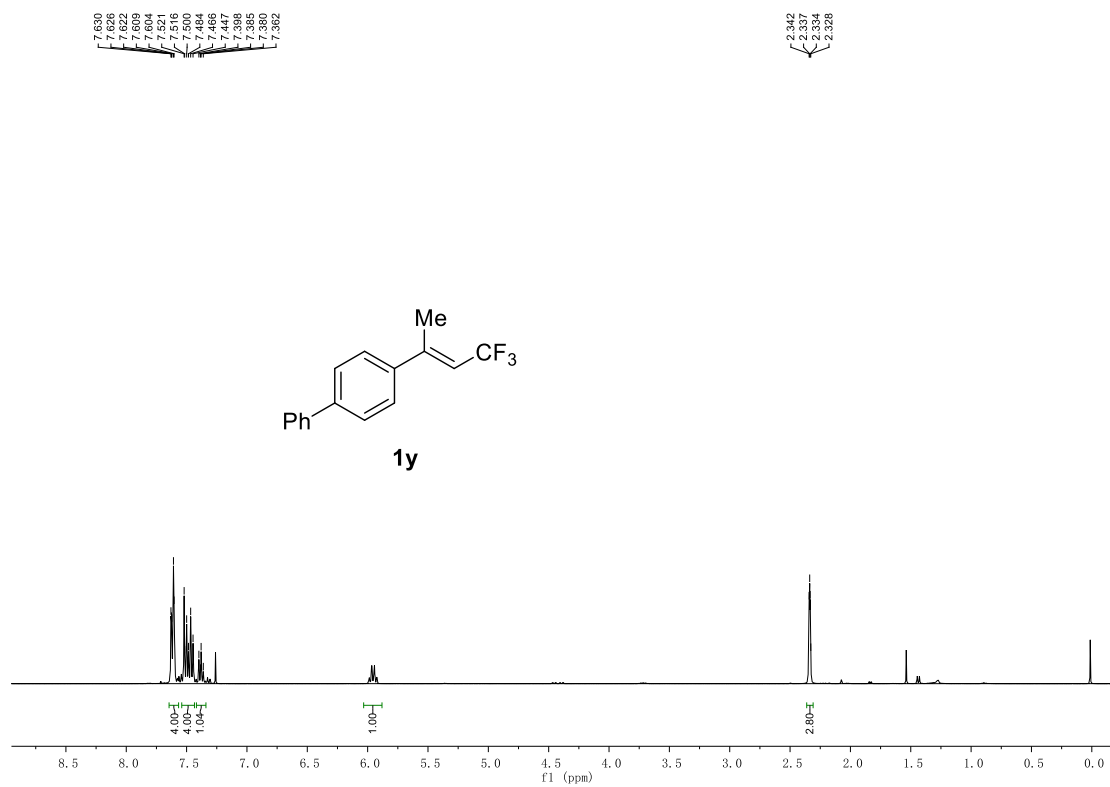
8. a) Dolg, M.; Wedig, U.; Stoll, H.; Preuss, H. *J. Chem. Phys.* 1987, 86, 866. b) Nicklass, A.; Dolg, M.; Stoll, H.; Preuss, H. *J. Chem. Phys.* 1995, 102, 8942.
9. a) Ditchfield, R.; Hehre, W. J.; Pople, J. A. *J. Chem. Phys.* 1971, 54, 724. b) Hehre, W. J.; Ditchfield, R.; Pople, J. A. *J. Chem. Phys.* 1972, 56, 2257. c) Hariharan, P. C.; Pople, J. A. *Theor. Chem. Acc.* 1973, 28, 213.
10. a) Clark, T.; Chandrasekhar, J.; Spitznagel, G. W.; Schleyer, P. Von R. *J. Comput. Chem.* 1983, 4, 294. b) Krishnan, R.; Binkley, J. S.; Seeger, R.; Pople, J. A. *J. Chem. Phys.* 1980, 72, 650.
11. Marenich, A. V.; Cramer, C. J.; Truhlar, D. G. *J. Phys. Chem. B.* 2009, 113, 6378.
12. a) Deubel, D. V.; Lau, J. K. C. *Chem. Commun.* **2006**, 2451. b) Deubel, D. V. *J. Am. Chem. Soc.* **2008**, 130, 665. c) Lau, J. K. C.; Deubel, D. V. *J. Chem. Theory Comput.* **2006**, 2, 103. d) Plata, R. E.; Singleton, D. A. *J. Am. Chem. Soc.* **2015**, 137, 3811. e) Kua, J.; Krizner, H. E.; De Haan, D. O. *J. Phys. Chem. A* **2011**, 115, 1667.

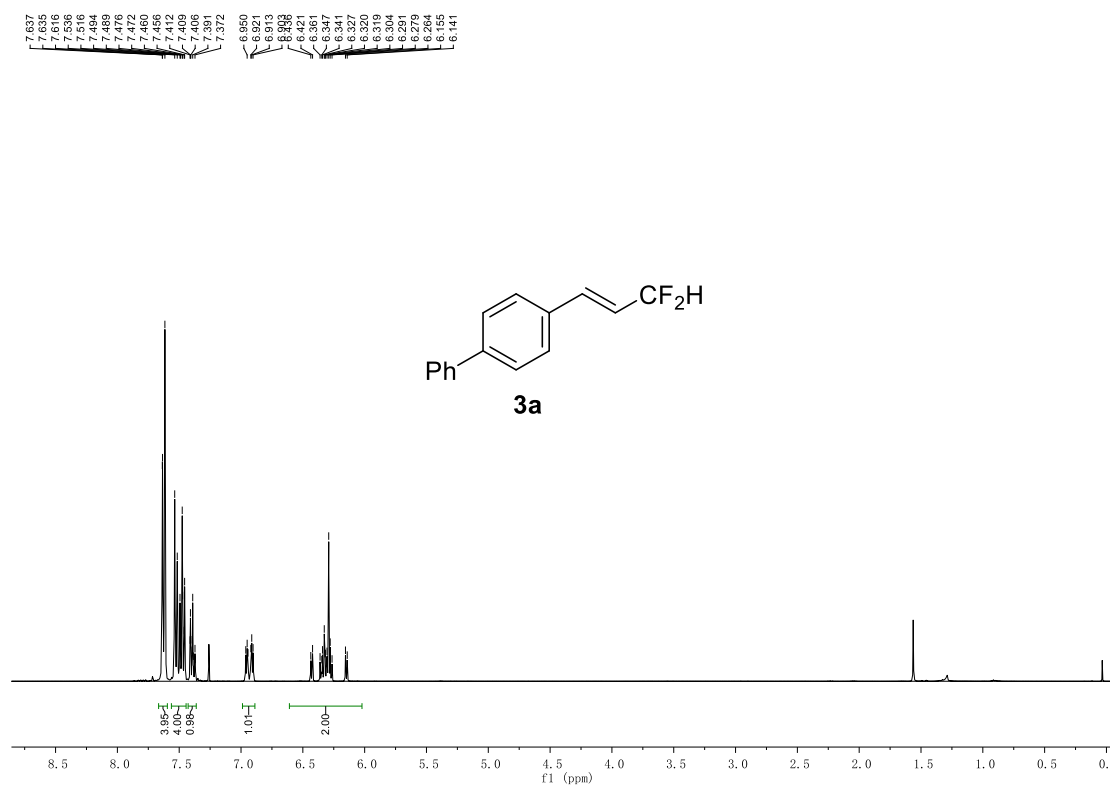
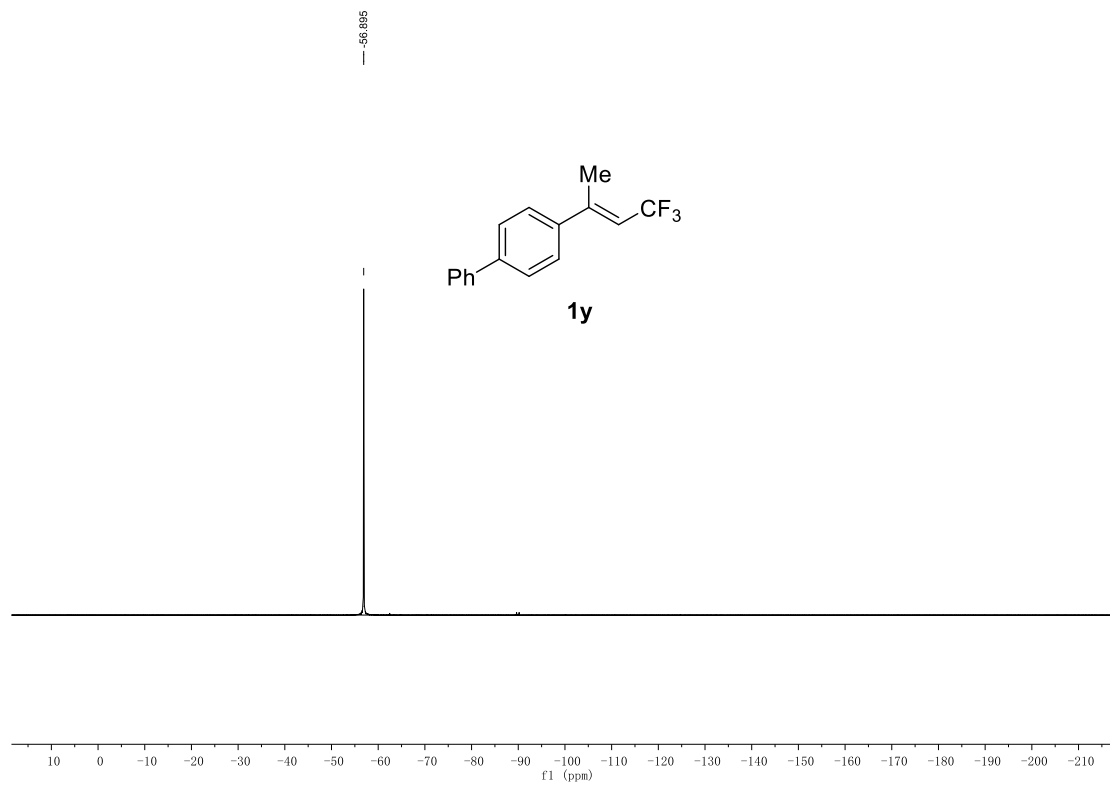
9. Copies of ^1H , ^{13}C and ^{19}F NMR Spectra



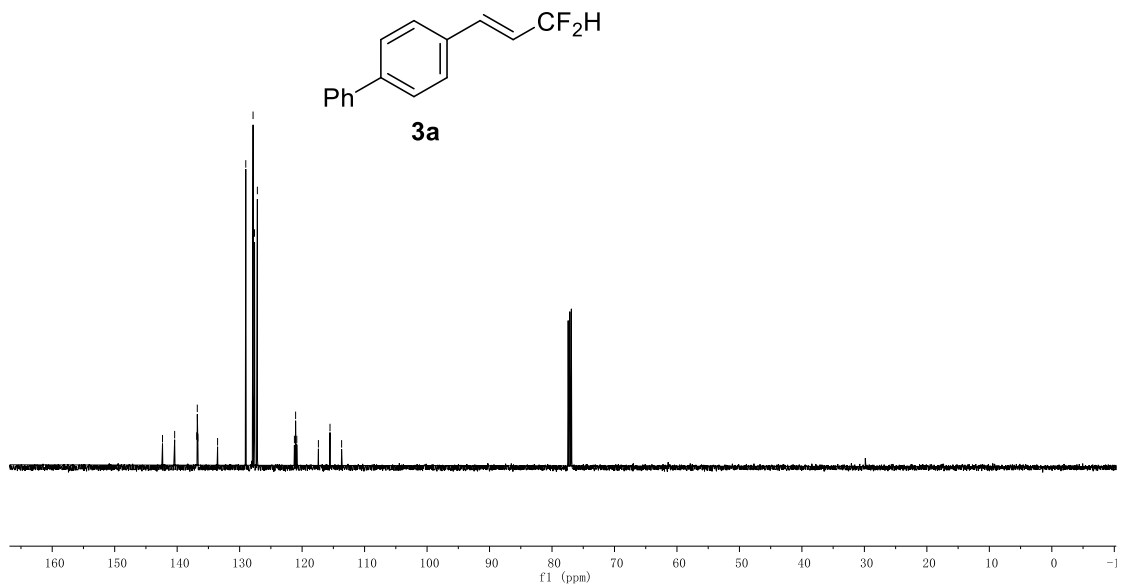




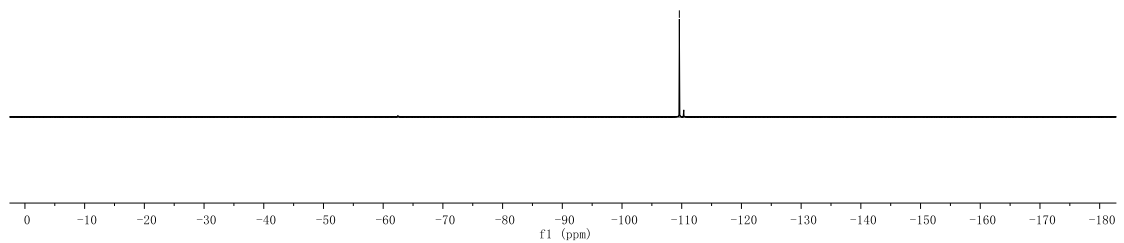
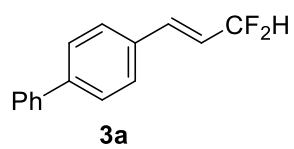


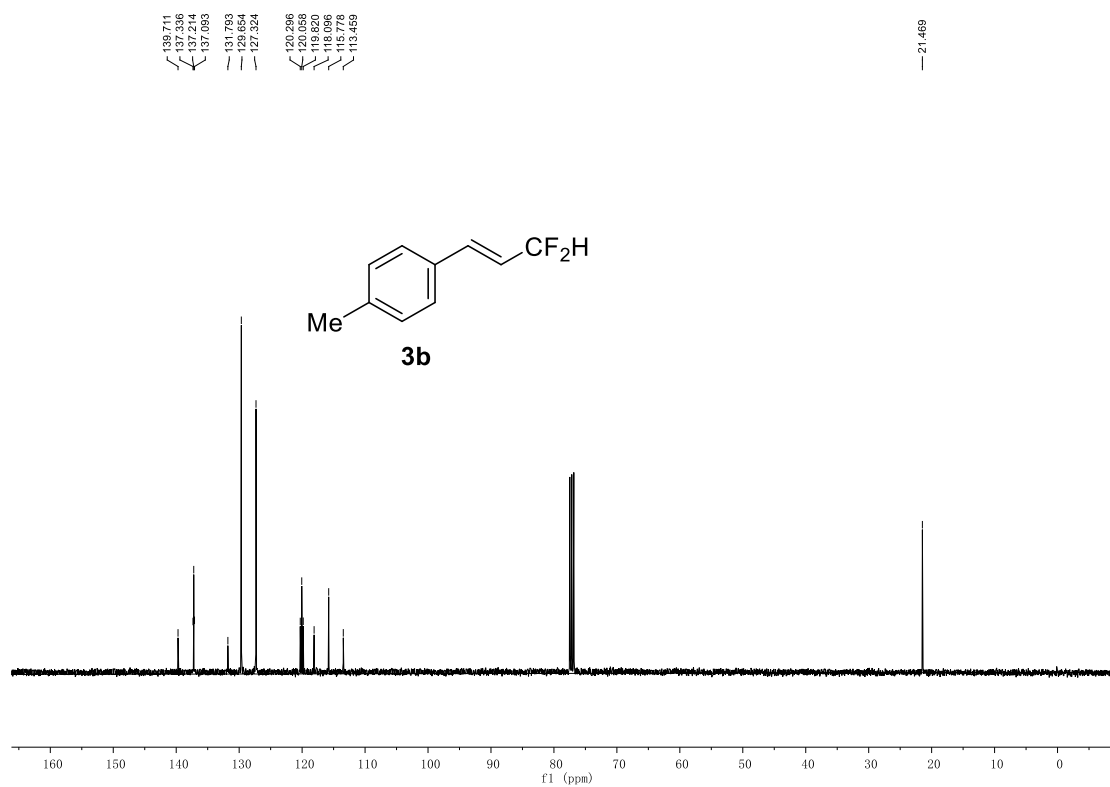
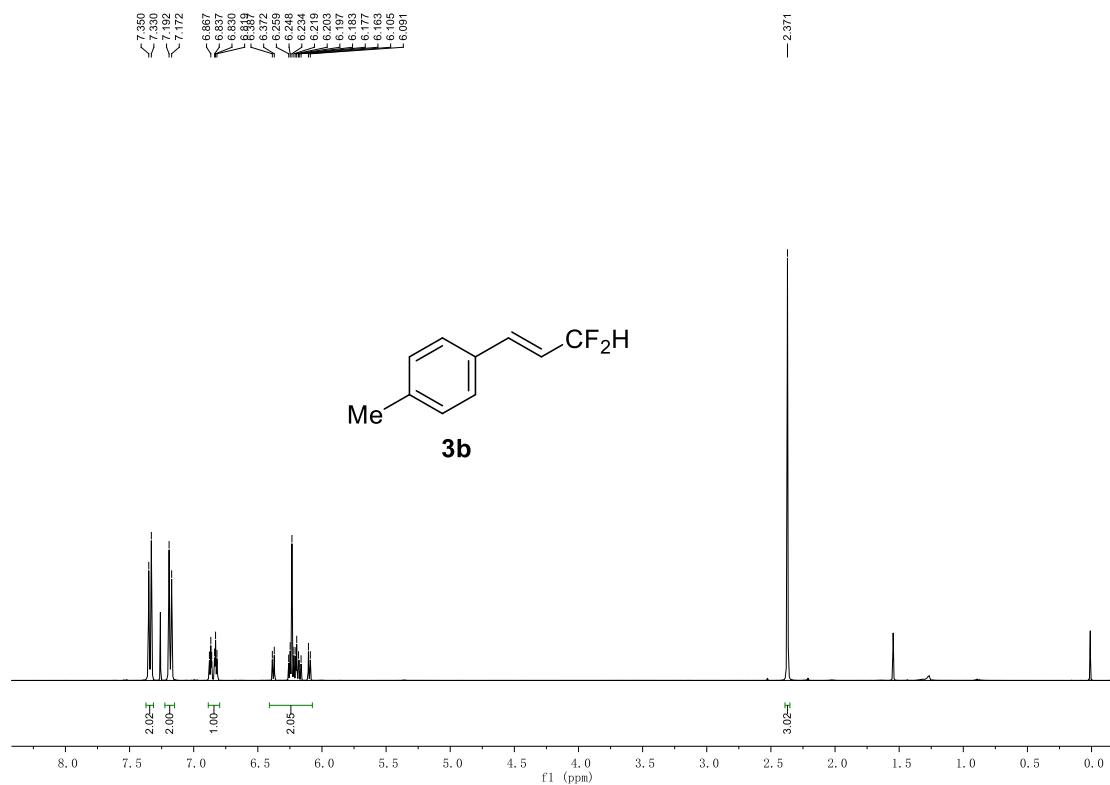


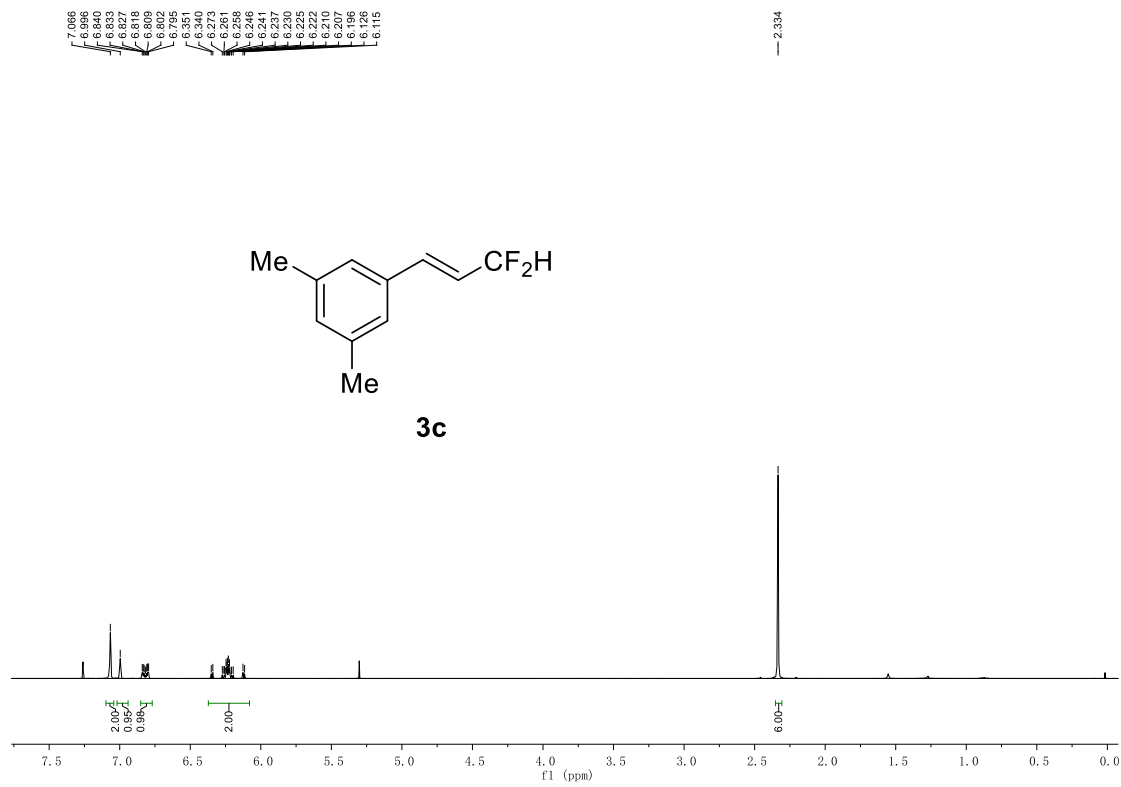
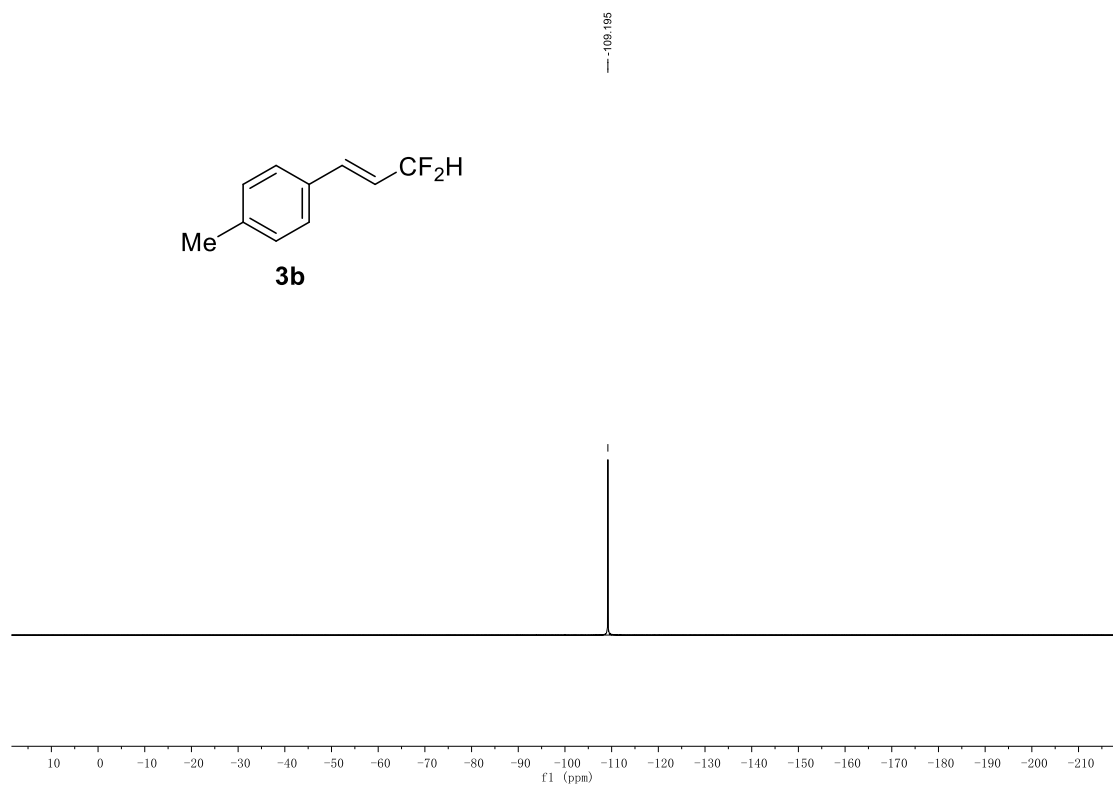
142.346
140.402
138.772
136.772
136.681
133.531
128.018
127.618
127.163
121.232
121.041
119.951
115.595
113.677



-109.602

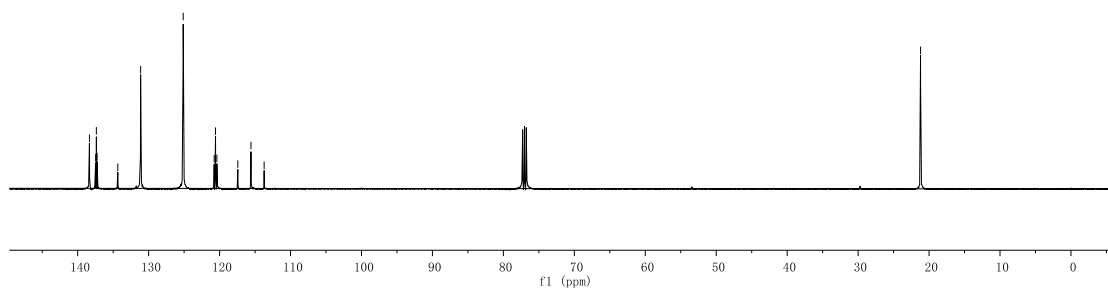
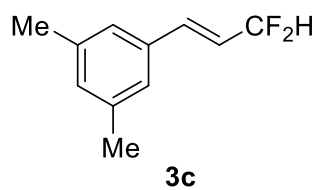




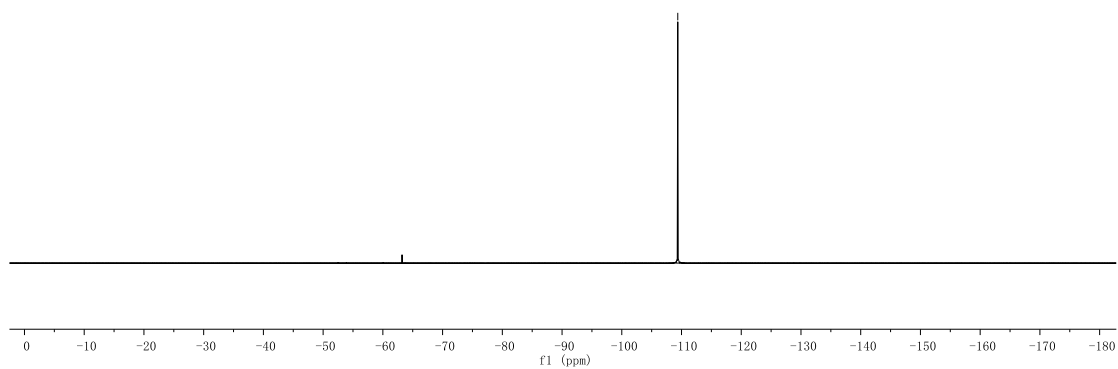
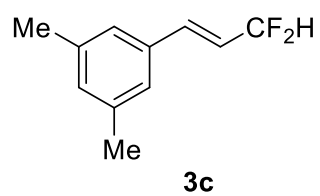


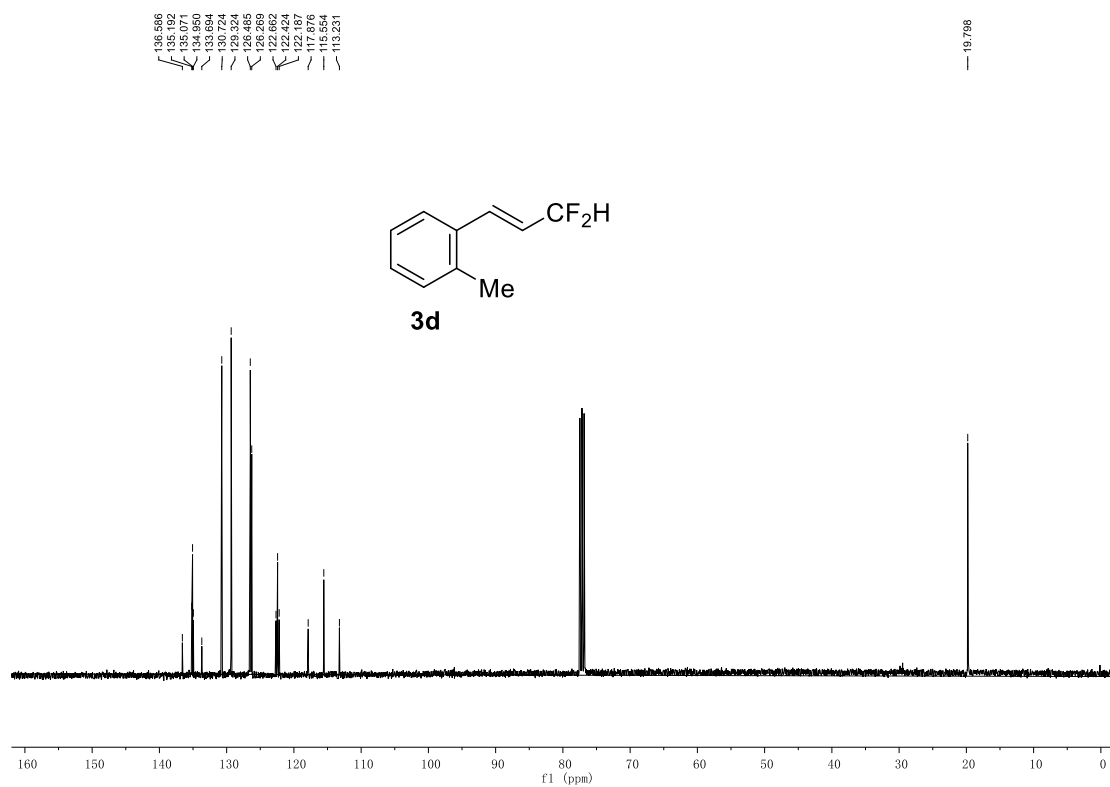
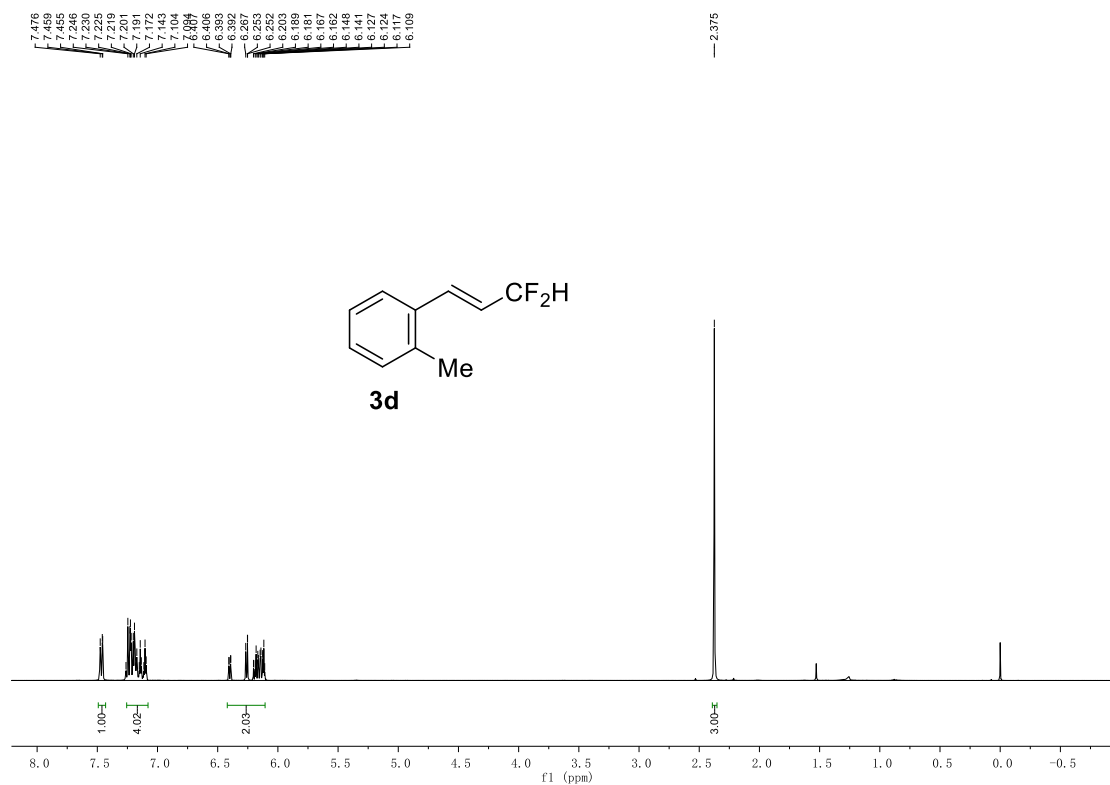
138.345
137.466
137.367
137.269
131.129
125.126
120.764
120.573
120.382
117.777
115.576
113.720

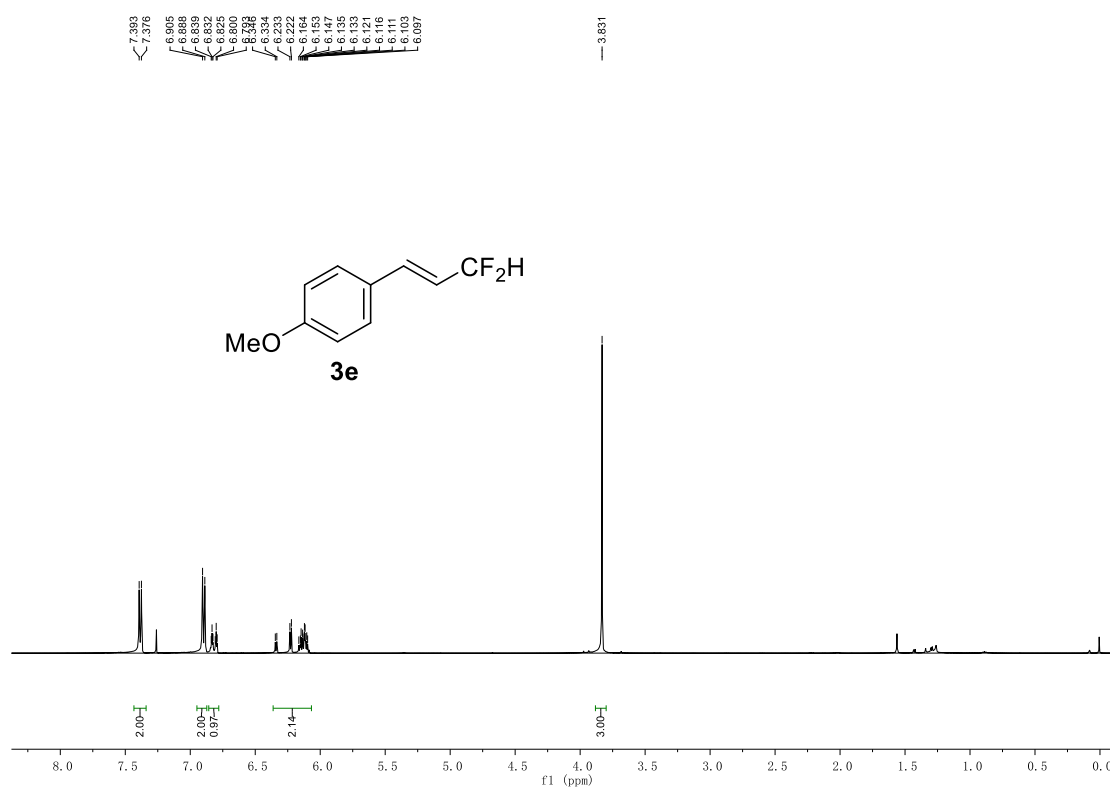
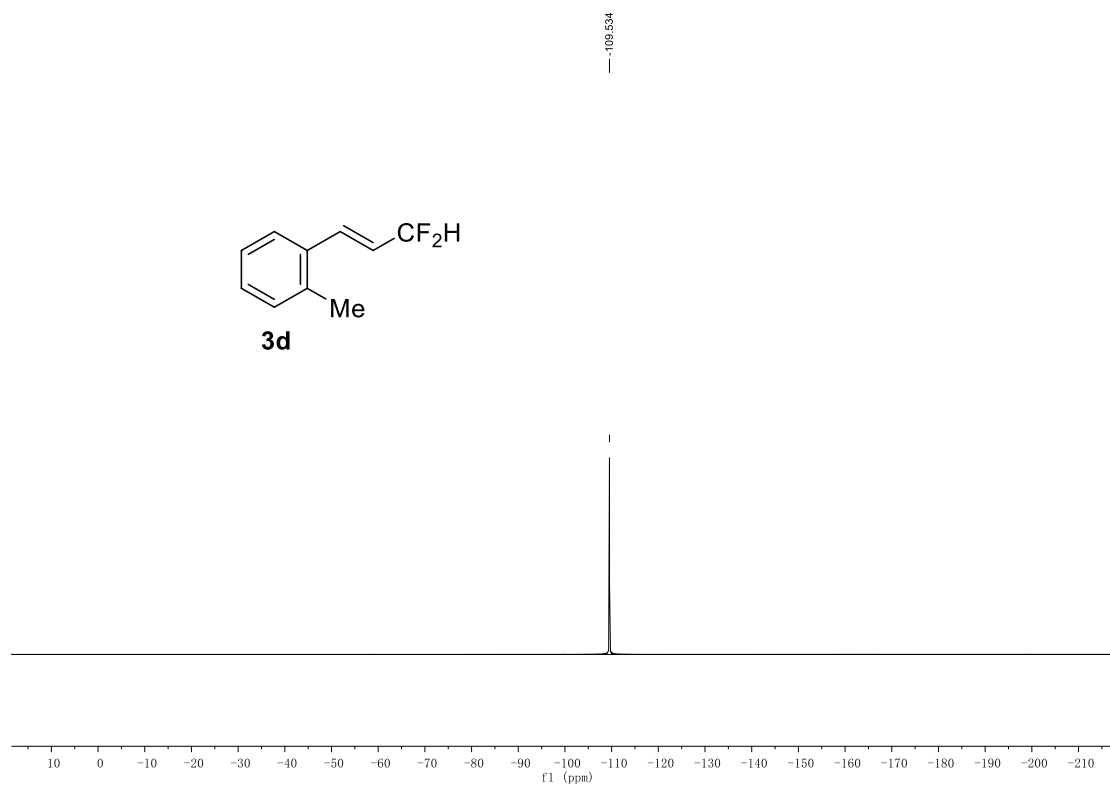
21.199

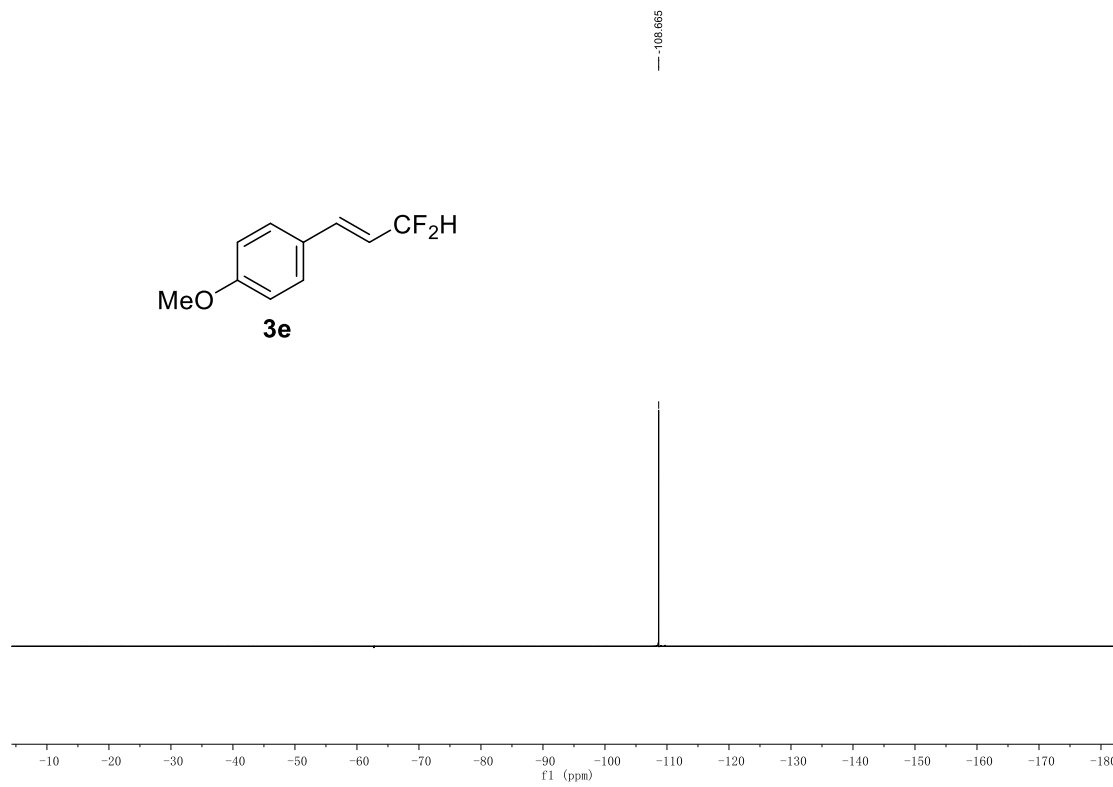
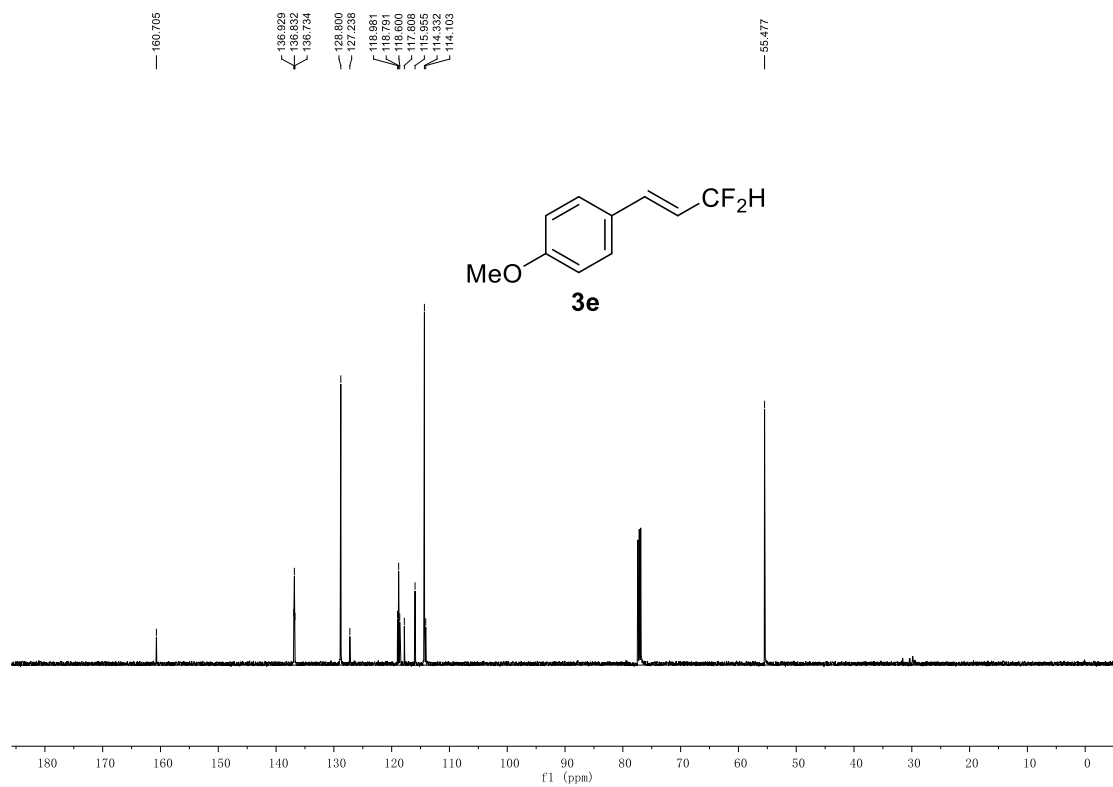


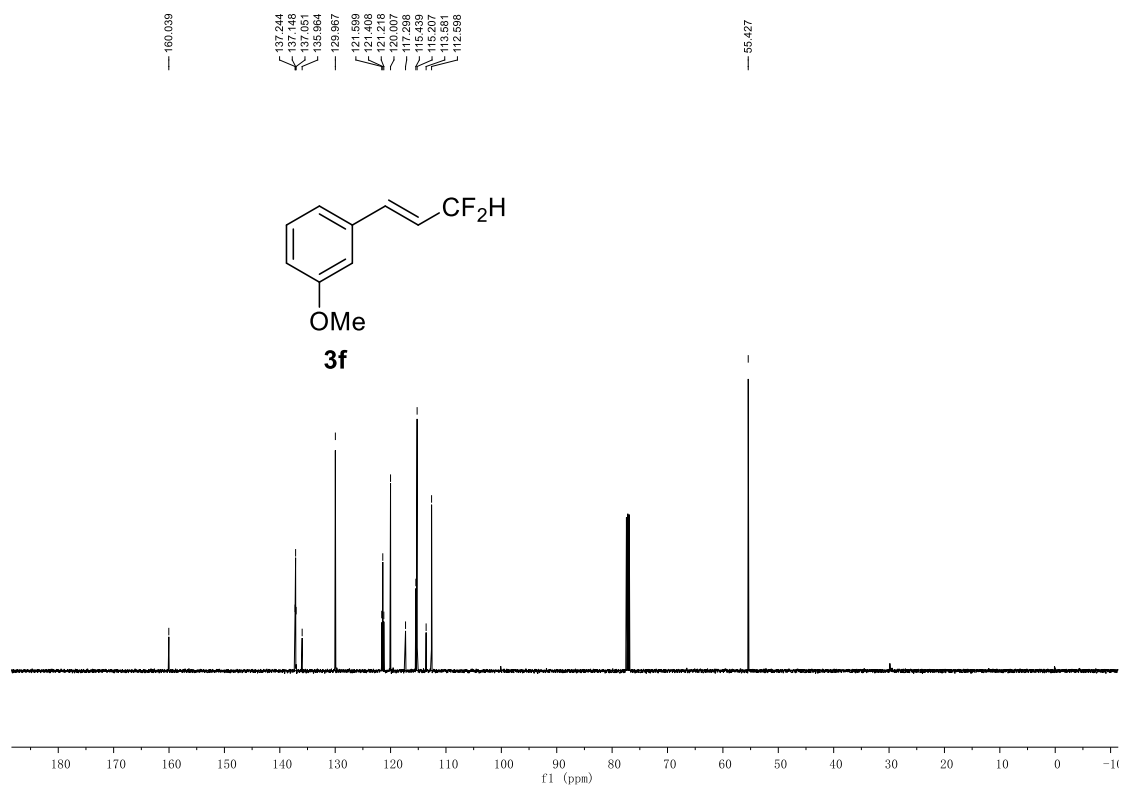
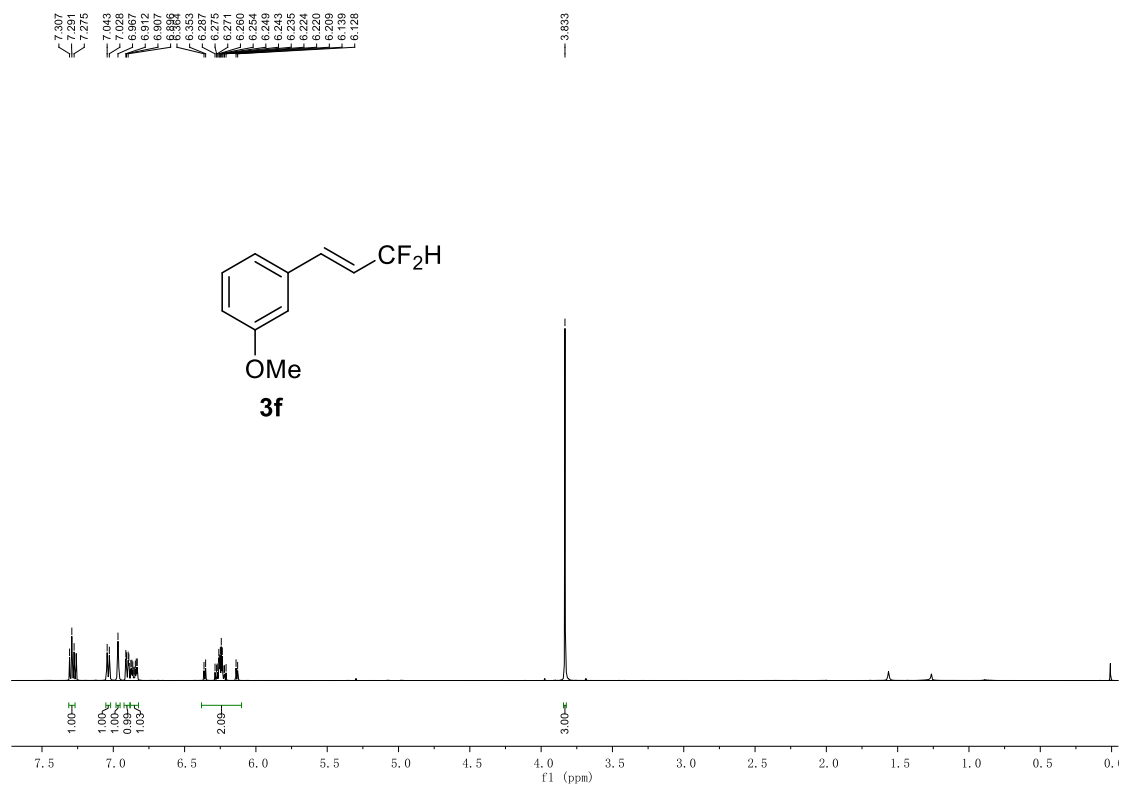
-109.373

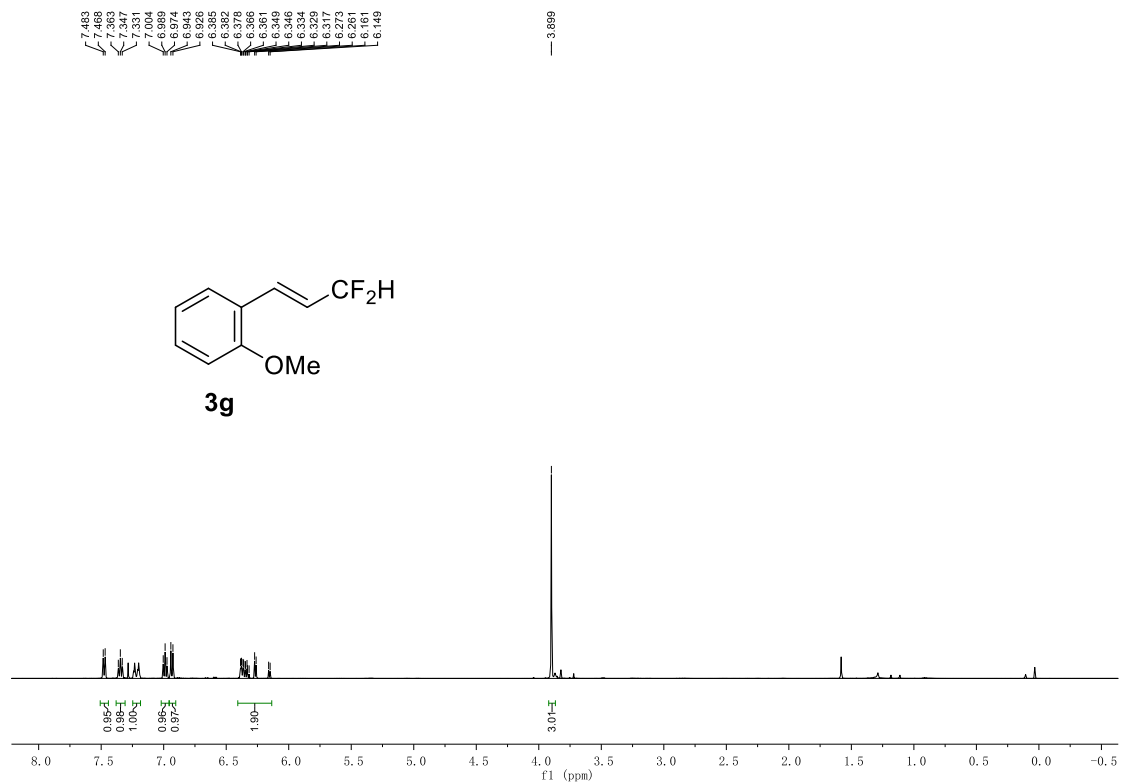
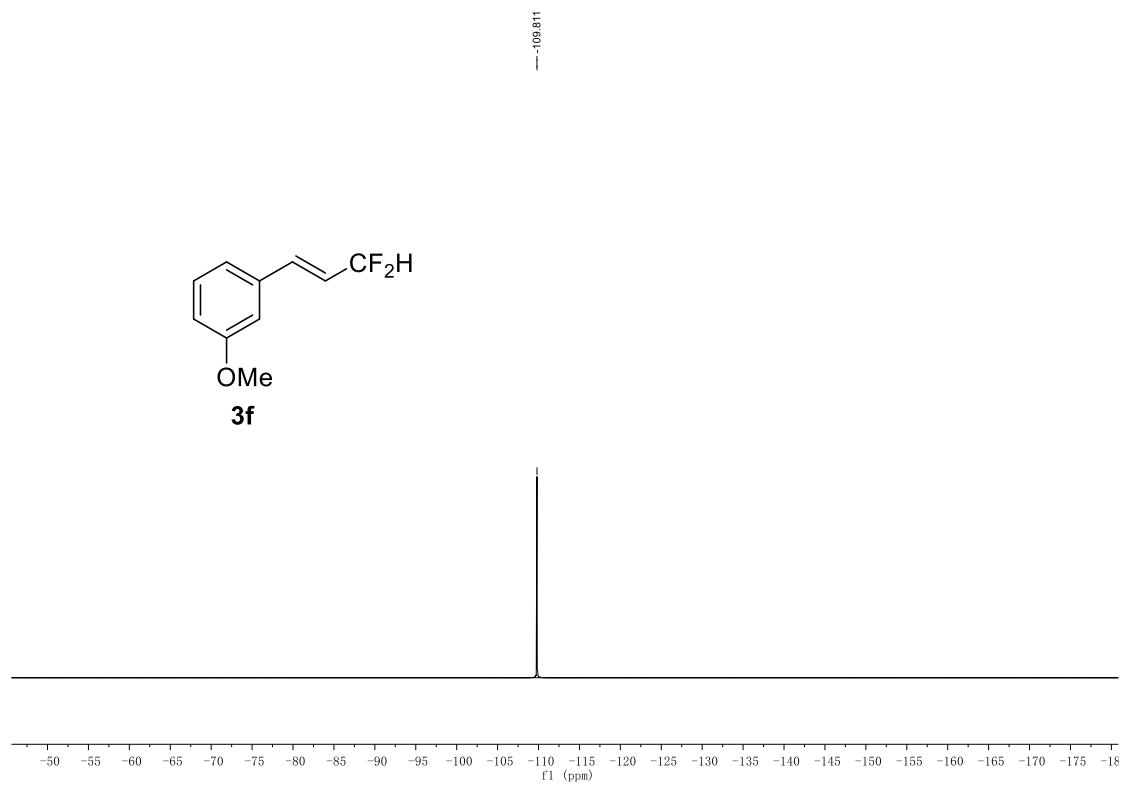








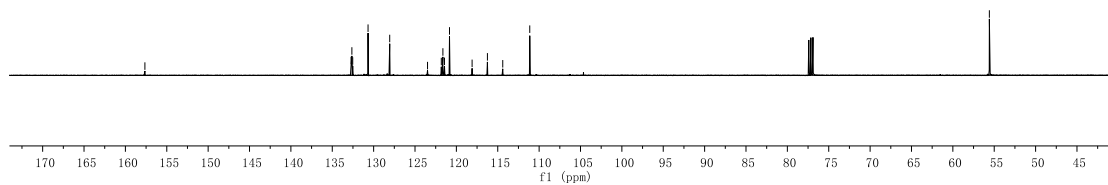
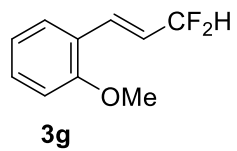




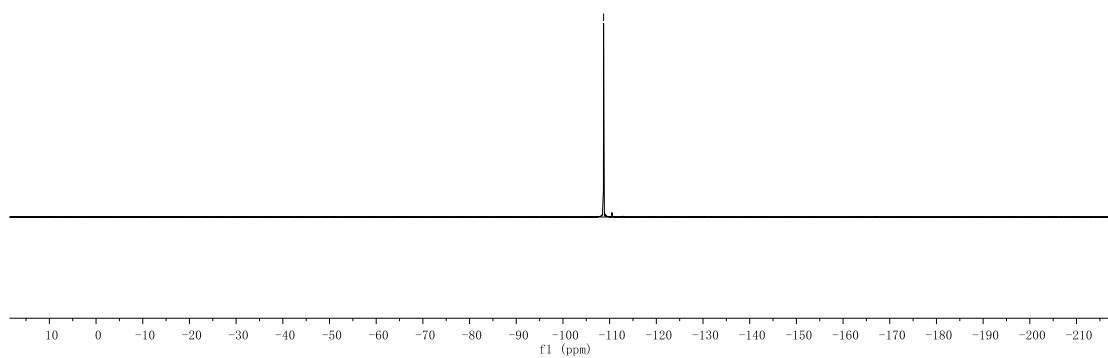
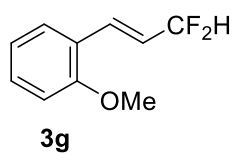
157.643

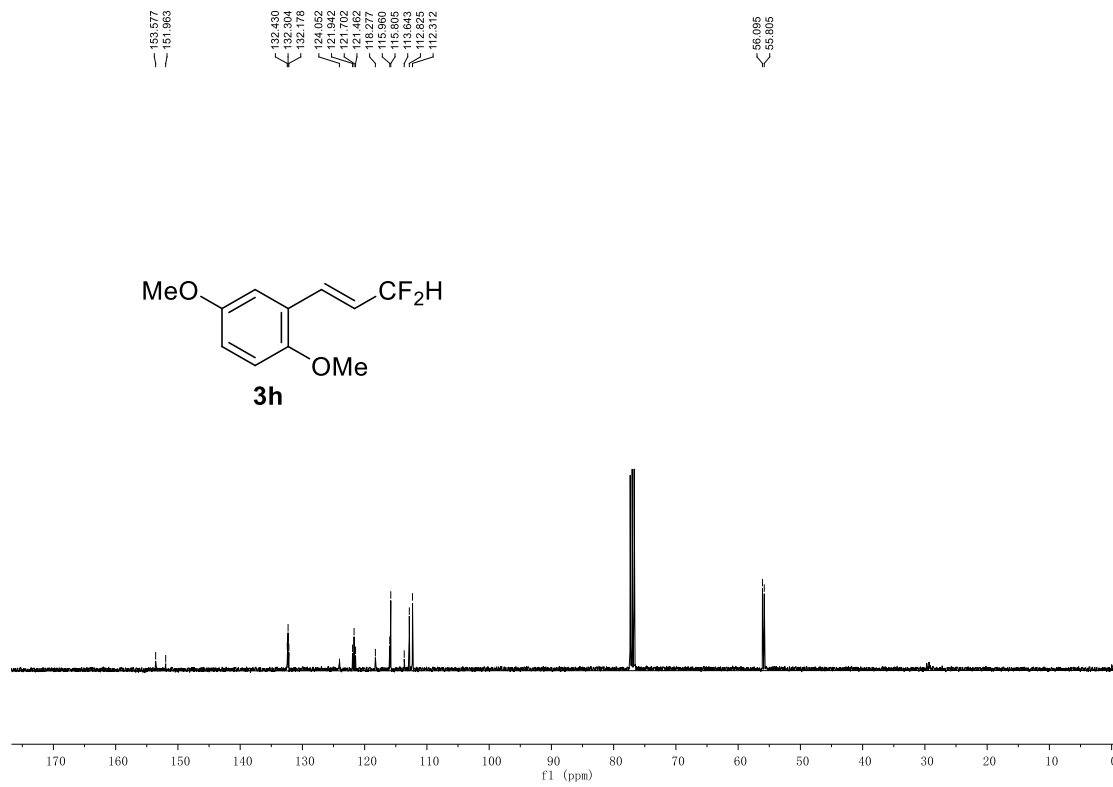
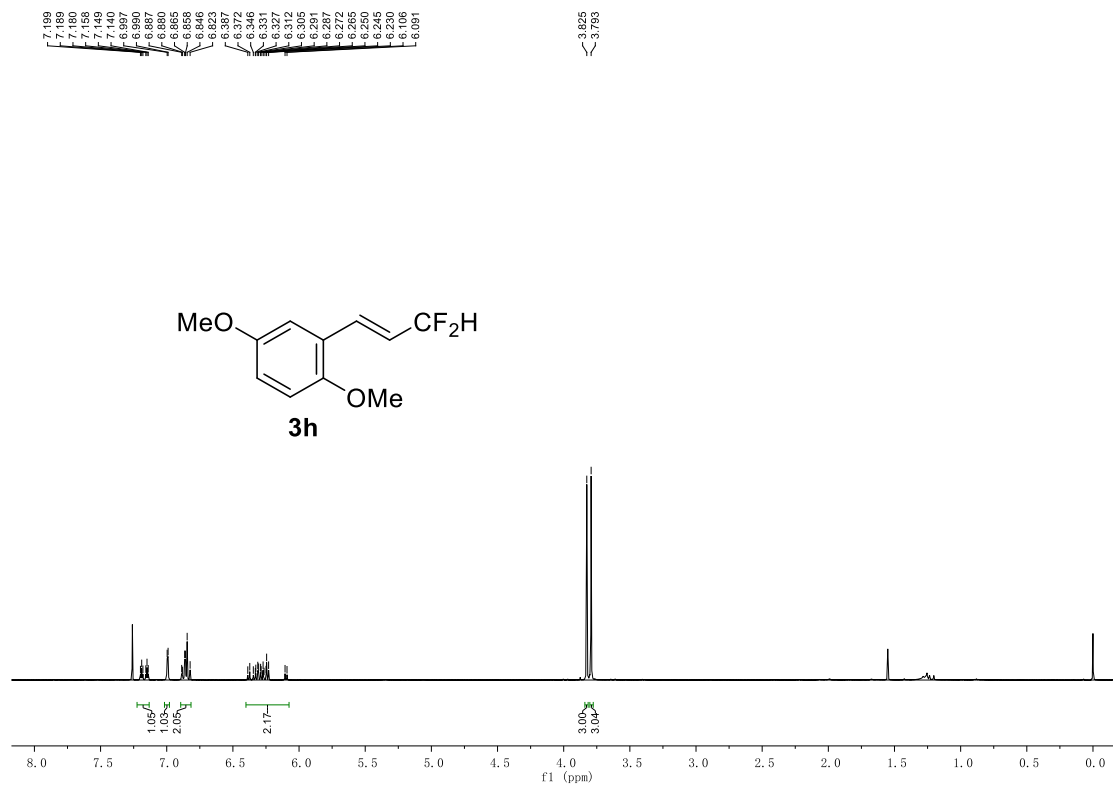
132.729
129.252
132.627
130.675
128.056
123.487
121.822
121.630
121.439
120.882
118.248
114.396
111.132

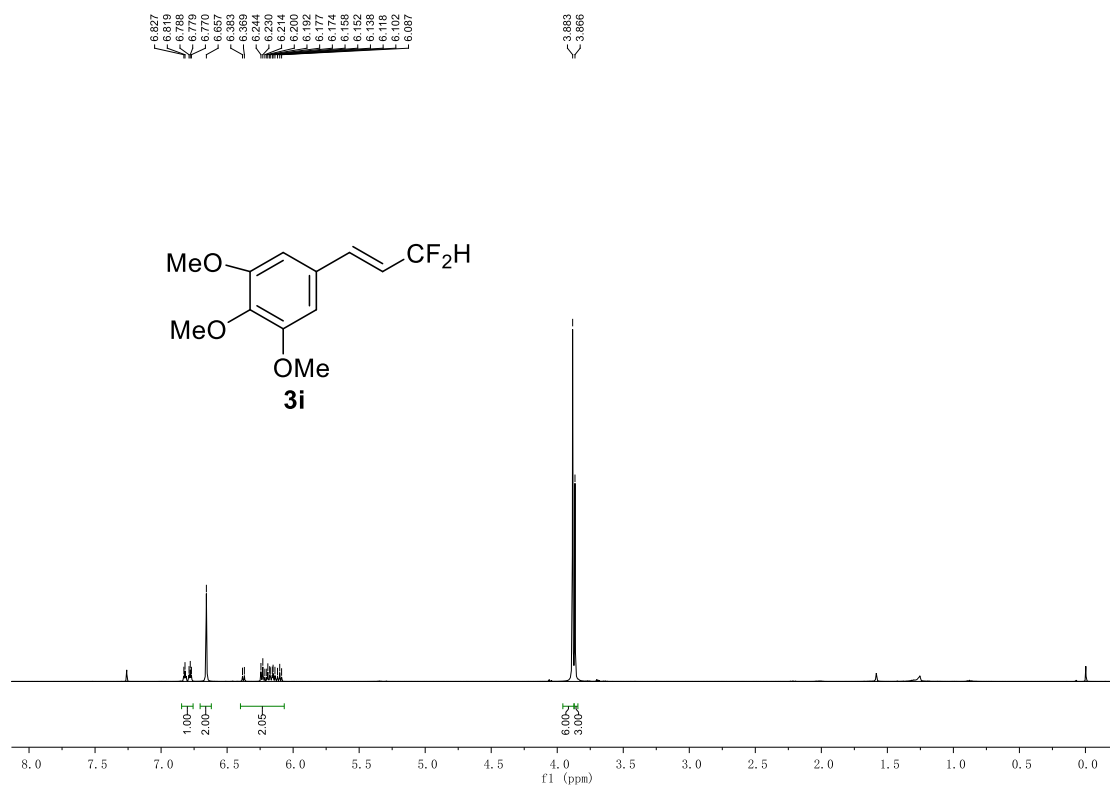
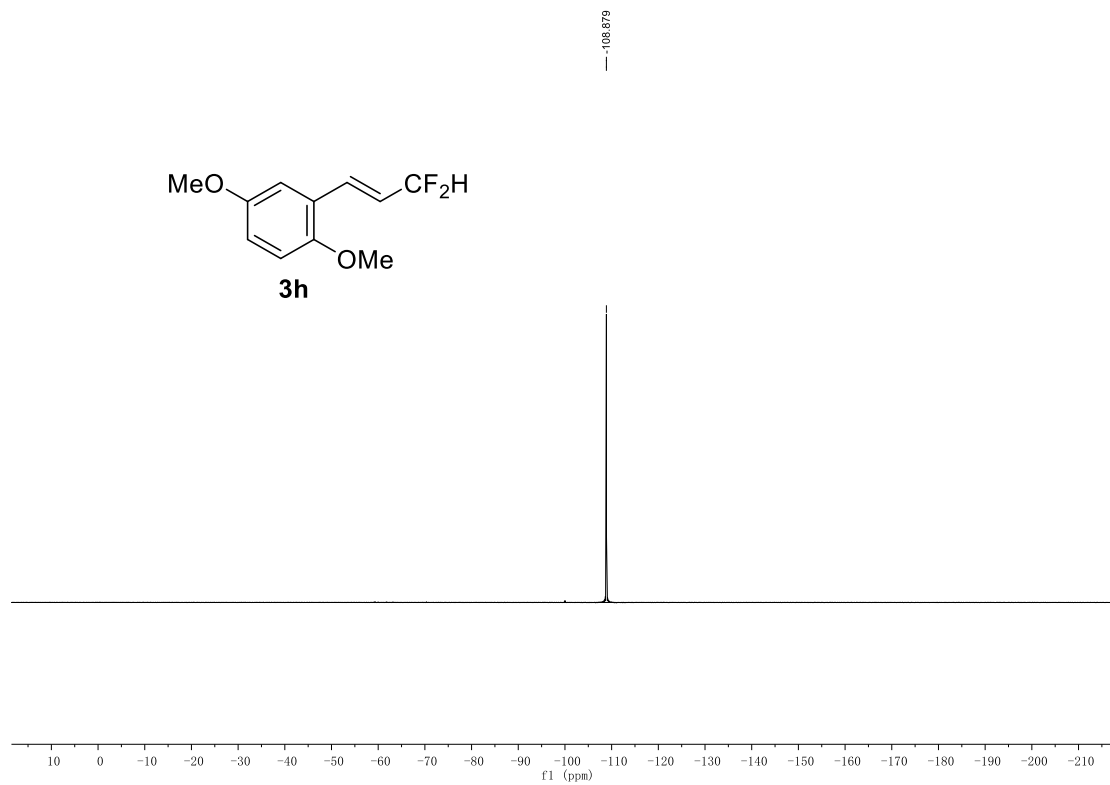
55.688



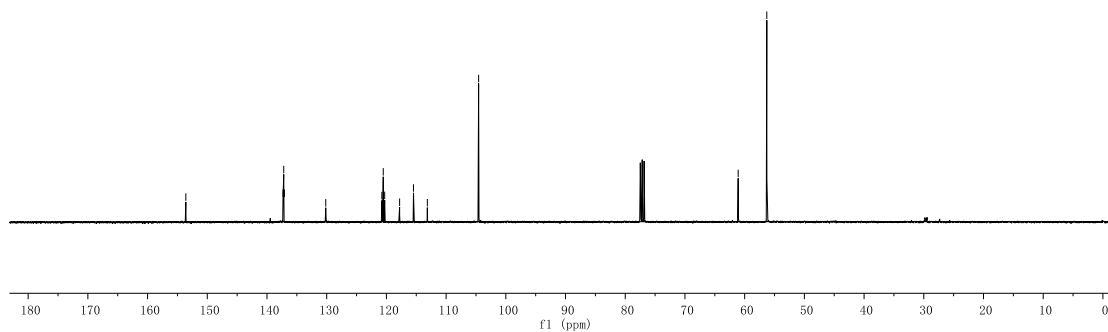
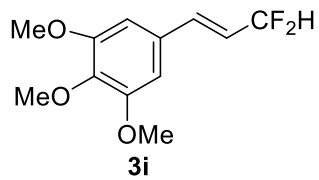
-108.705



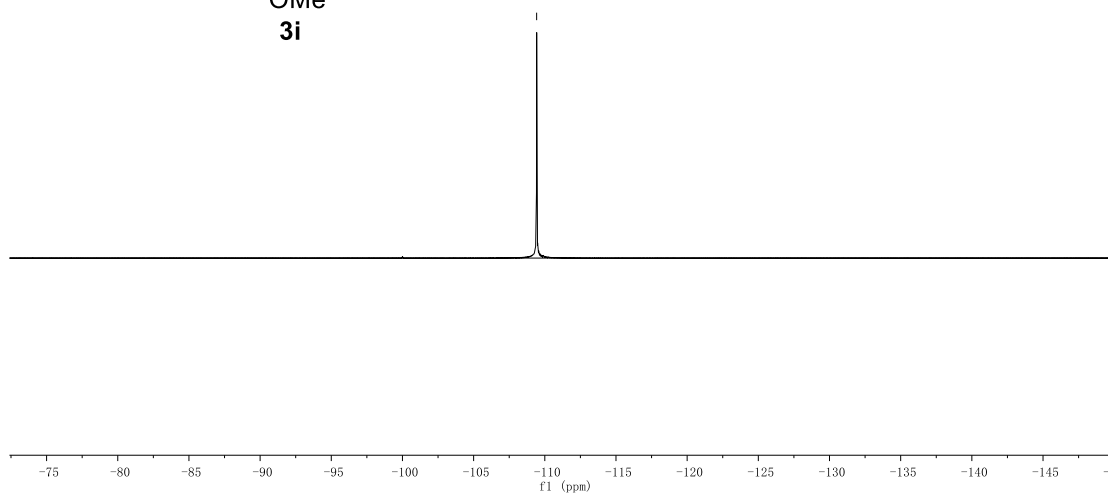
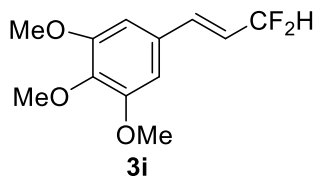


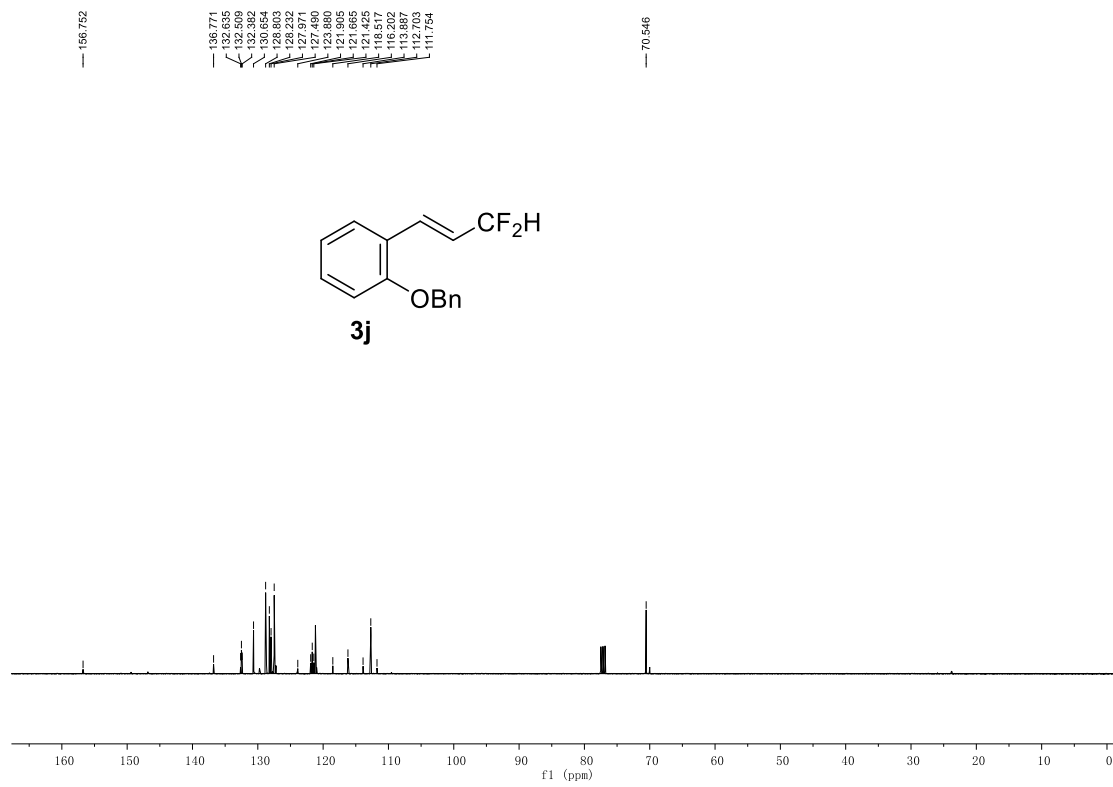
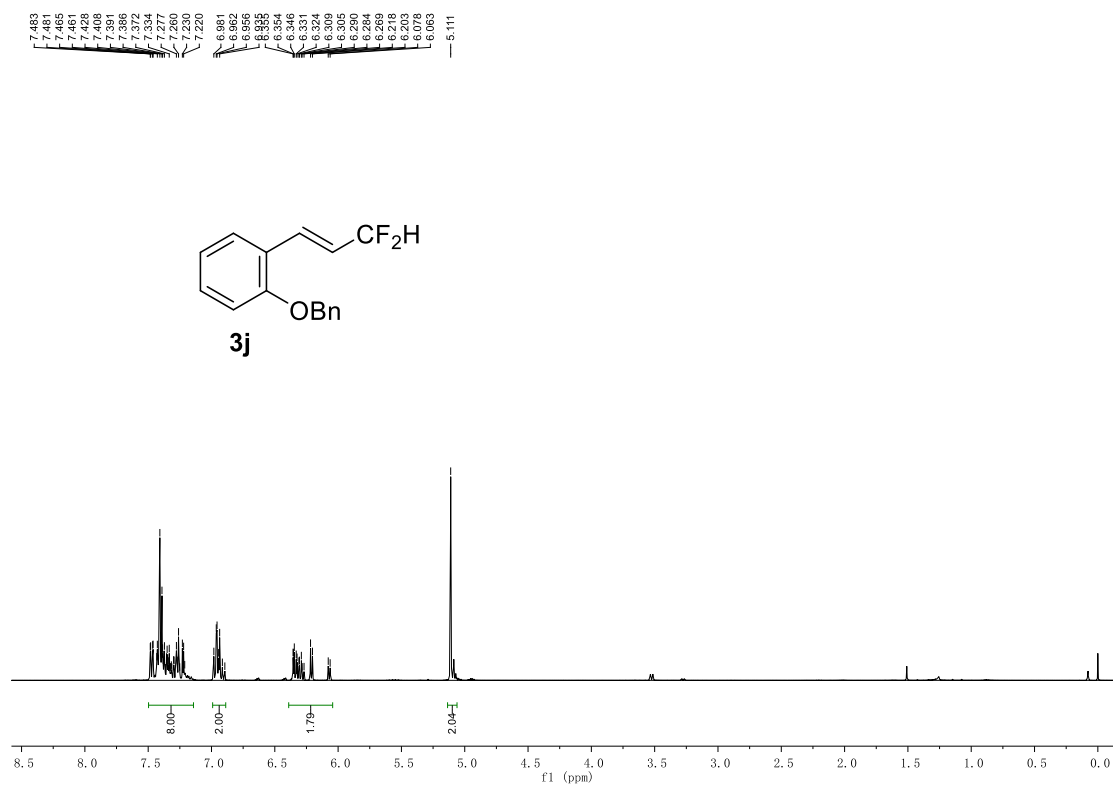


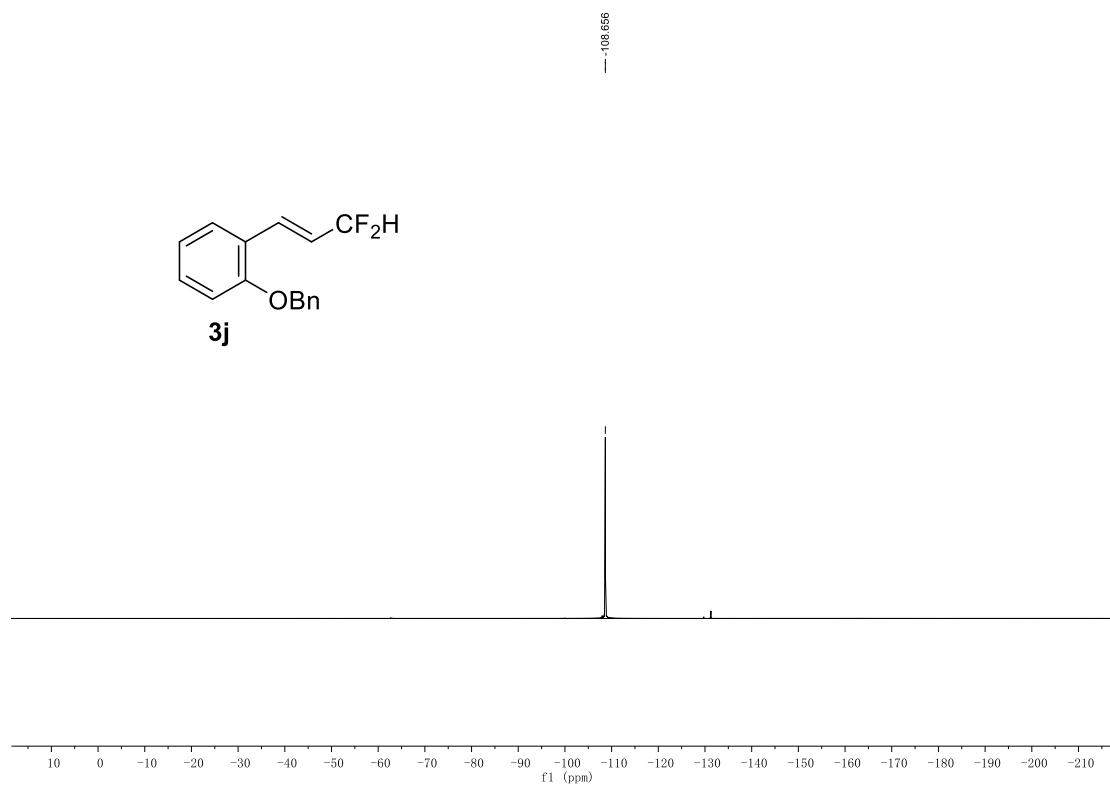
153.690
137.317
137.196
137.075
130.159
120.766
120.528
120.290
117.789
115.486
113.144
104.555
61.085
56.293



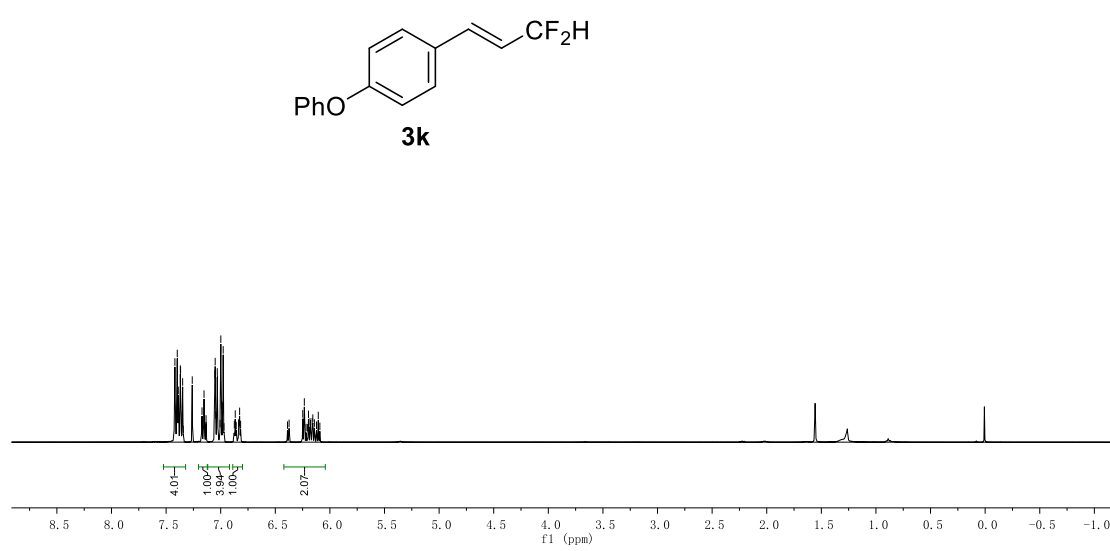
-109.426



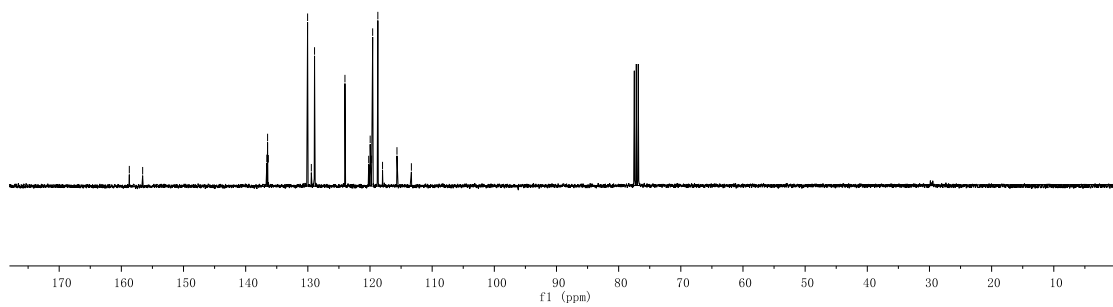
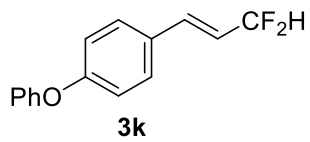




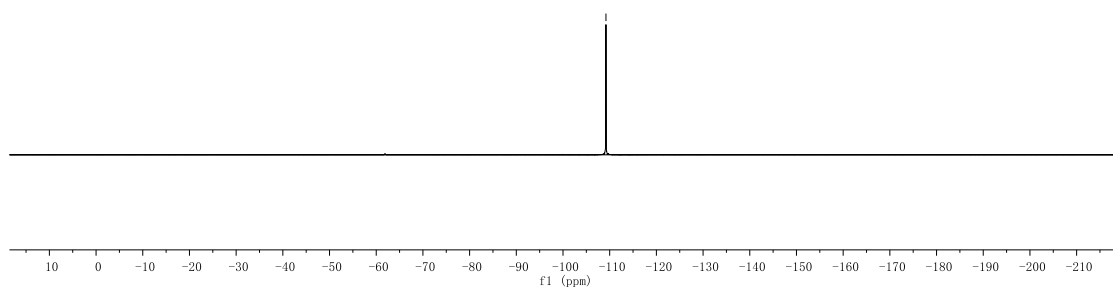
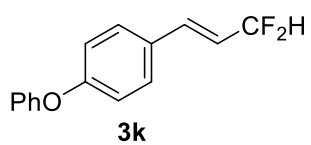
7.419
7.388
7.389
7.367
7.349
7.280
7.171
7.152
7.063
7.050
7.031
7.029
6.994
6.984
6.982
6.977
6.857
6.856
6.856
6.374
6.234
6.218
6.204
6.196
6.182
6.177
6.163
6.156
6.142
6.128
6.106
6.092

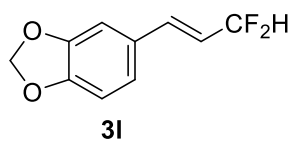
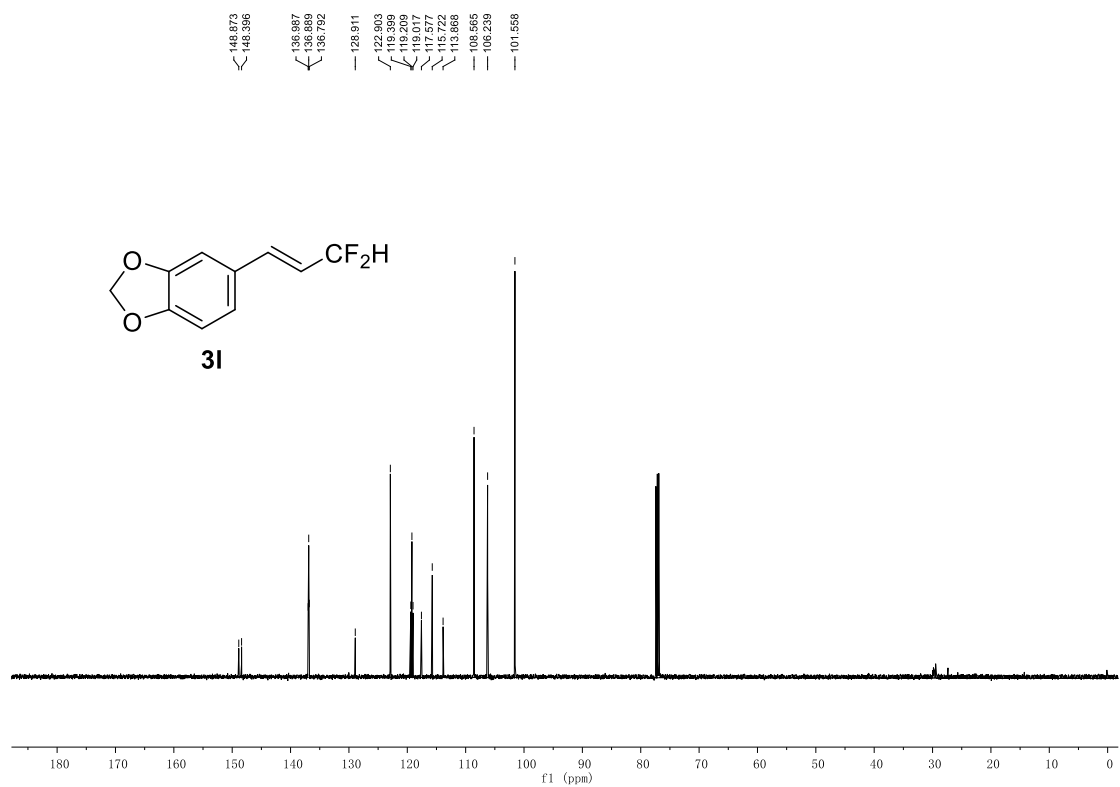
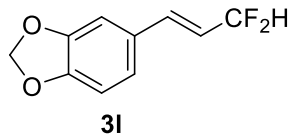
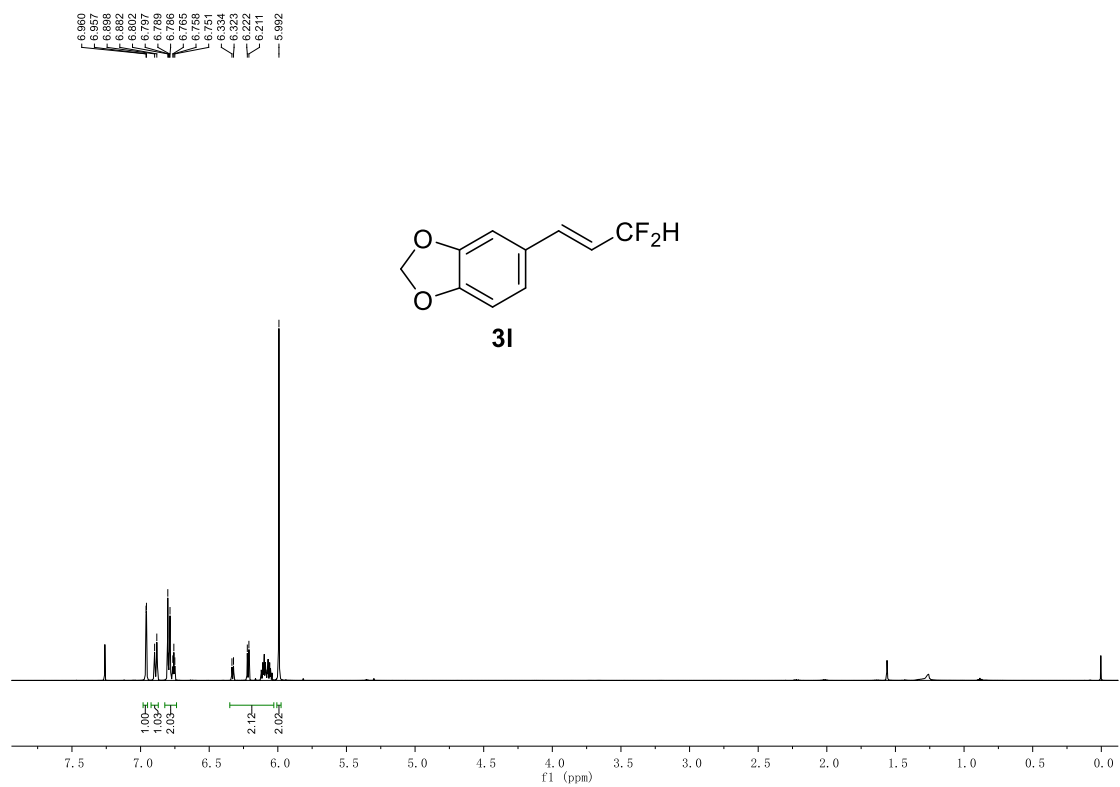


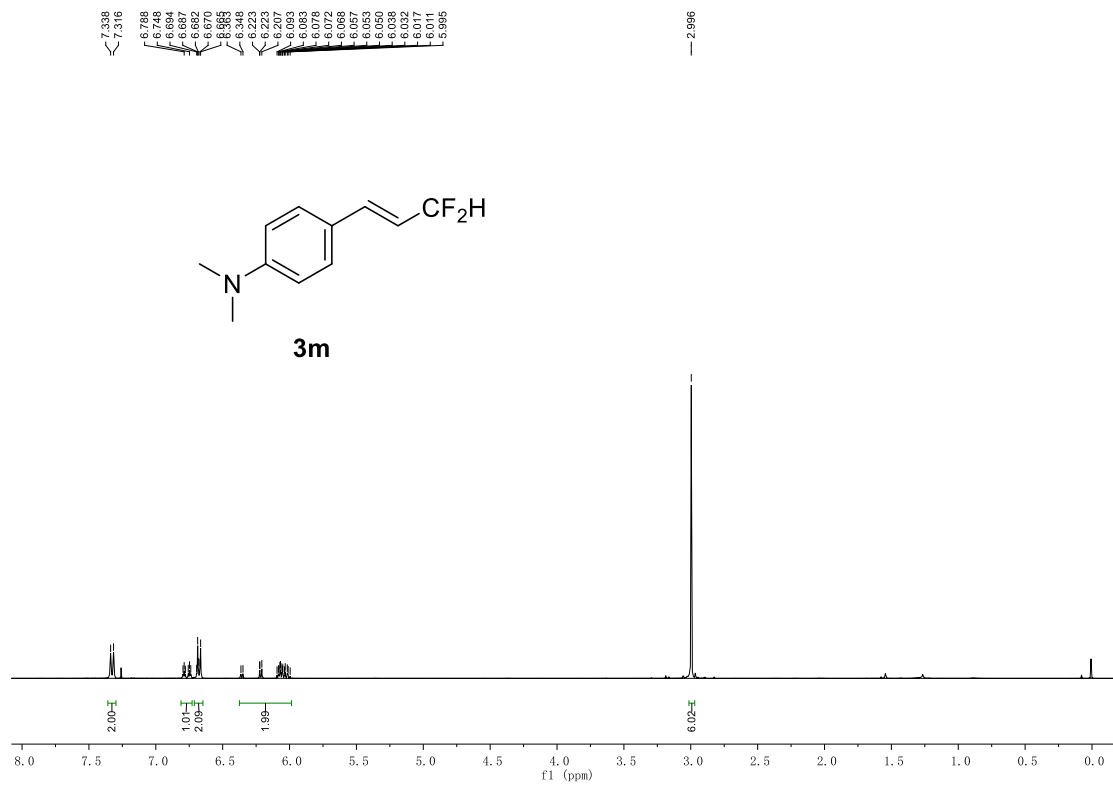
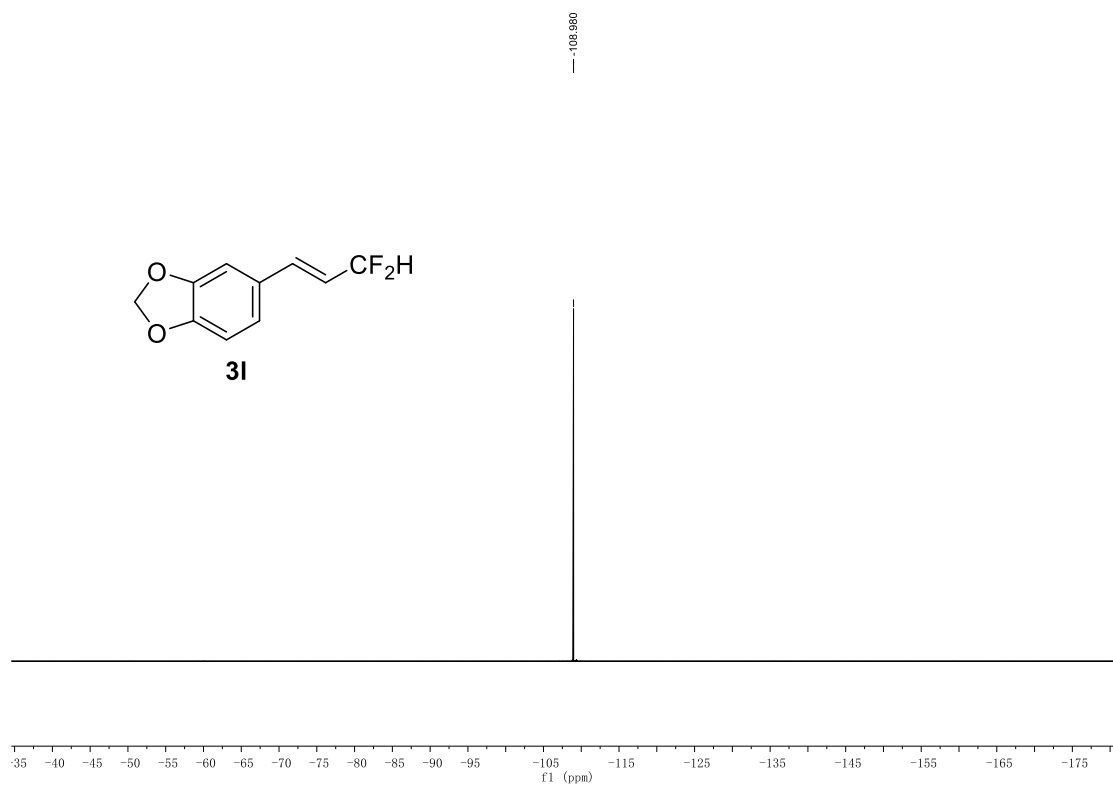
158.718
 156.573
 136.597
 136.476
 136.354
 130.039
 128.971
 128.921
 124.030
 120.209
 119.971
 118.972
 118.738
 117.882
 115.662
 113.342

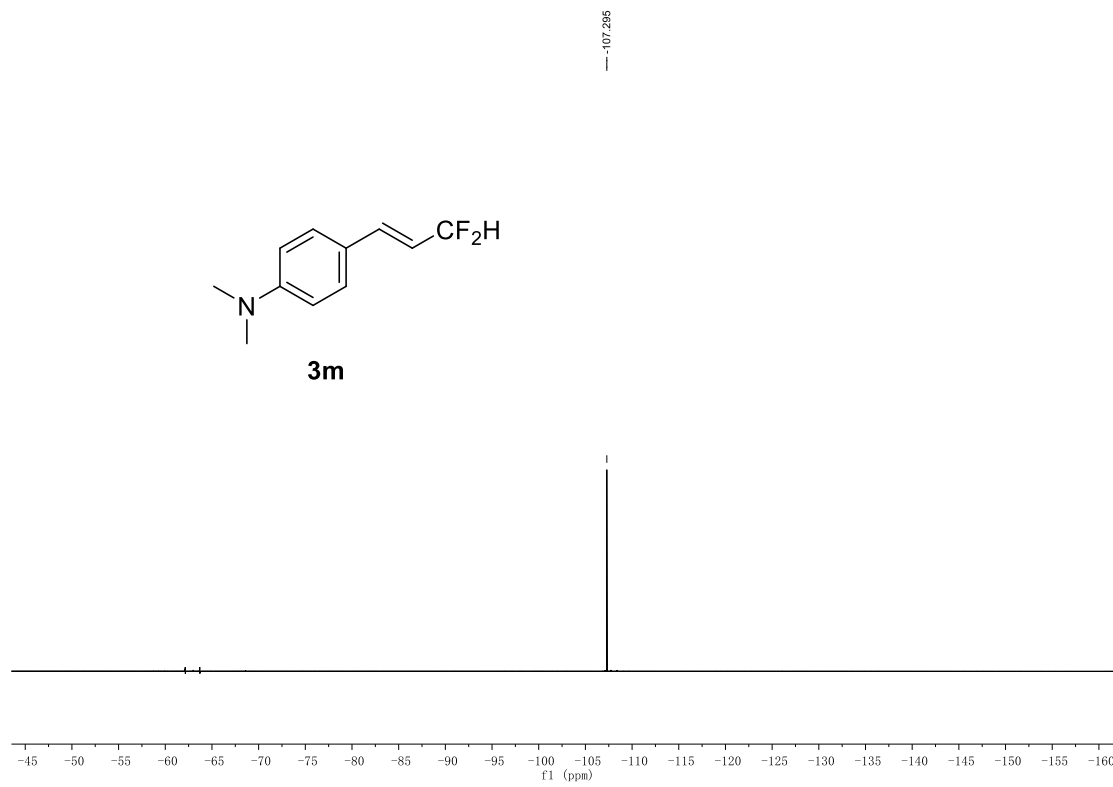
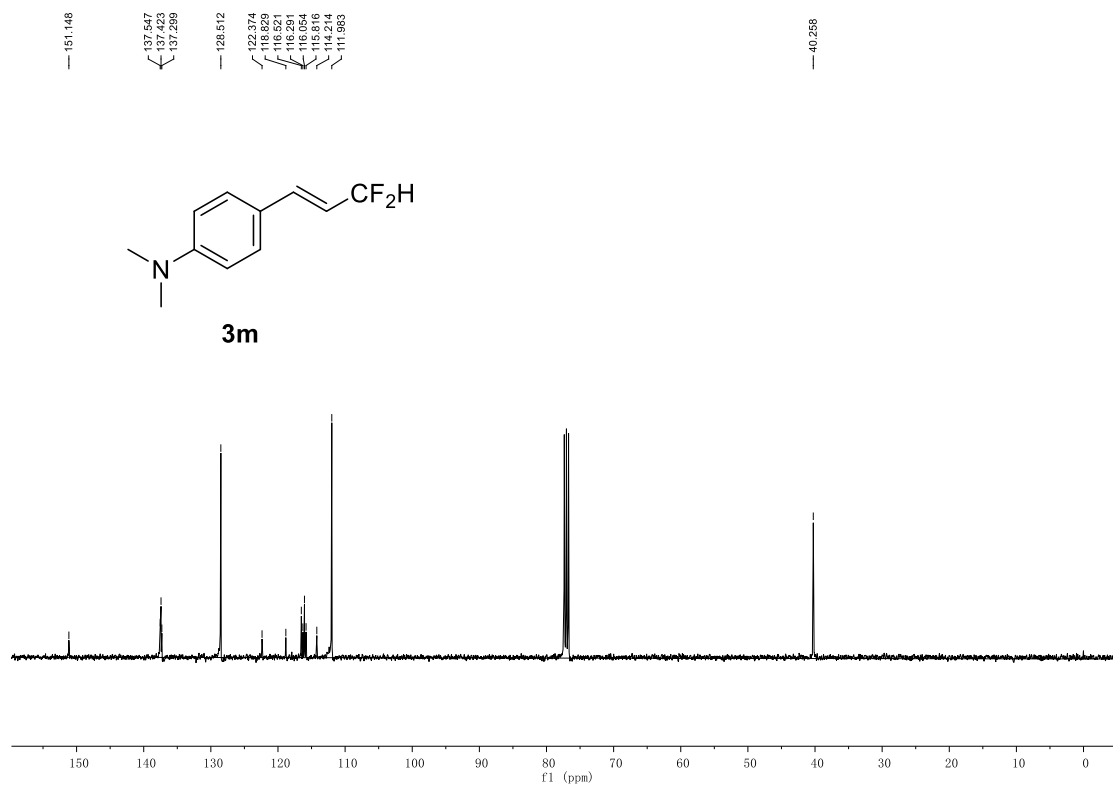


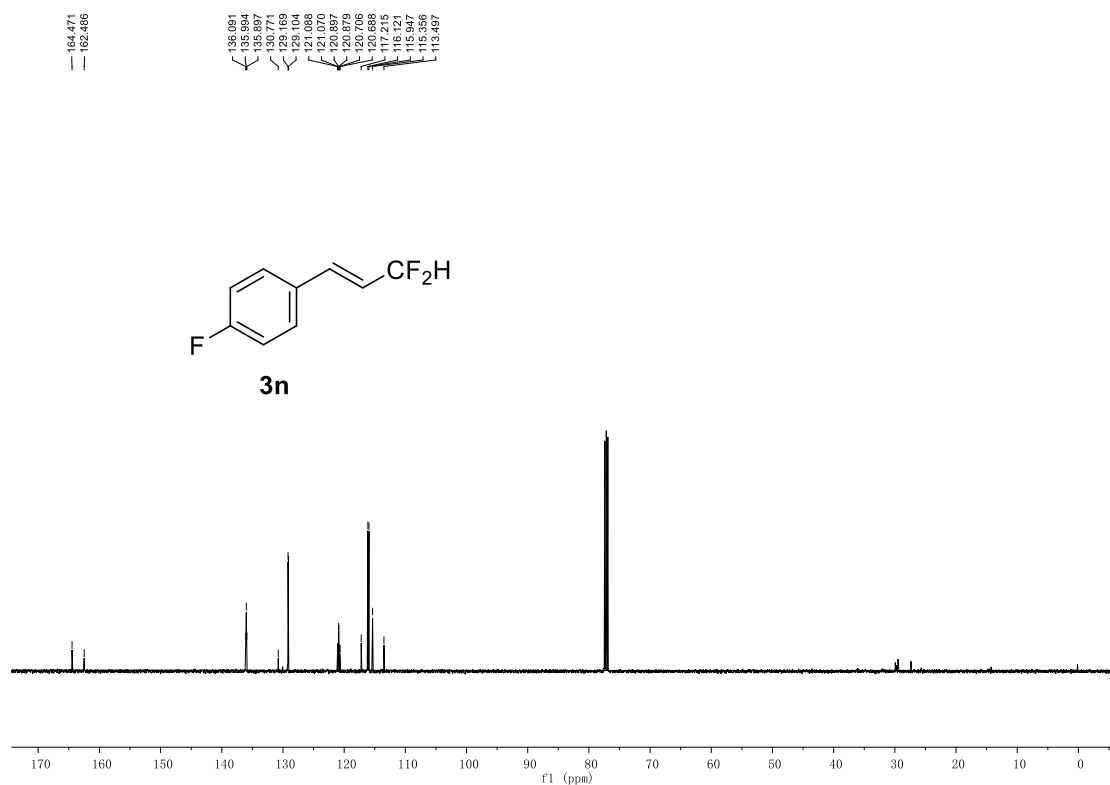
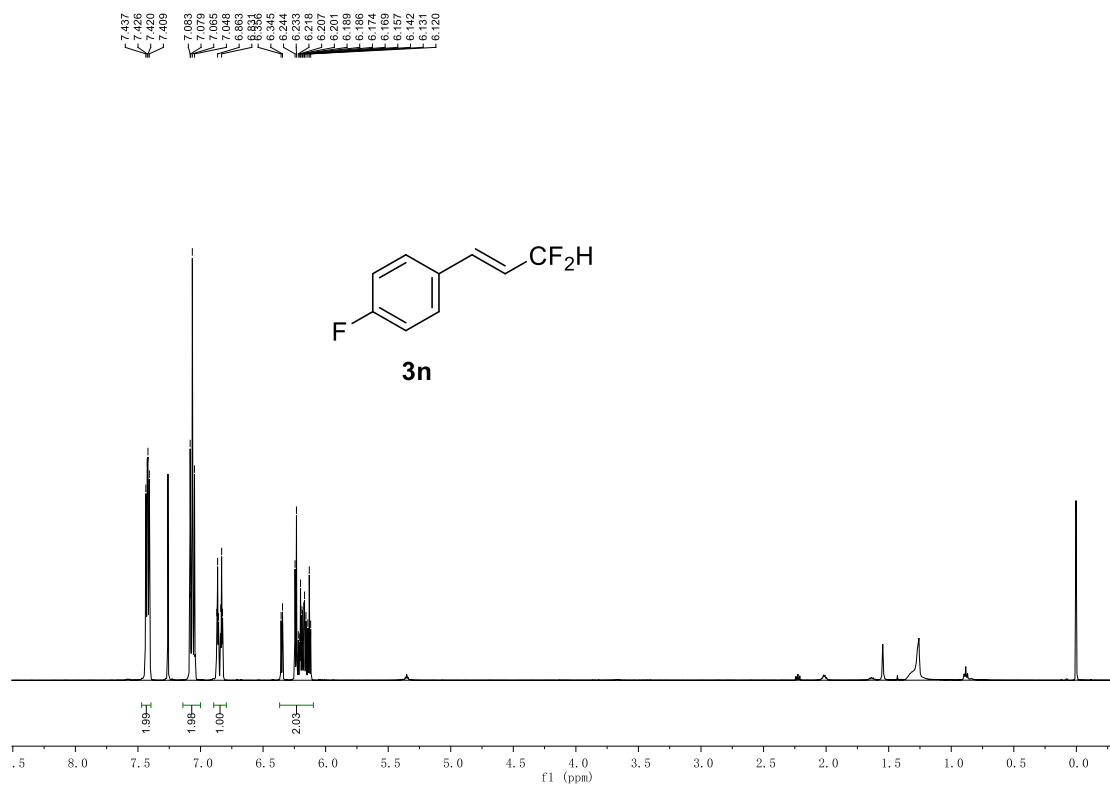
-109.199

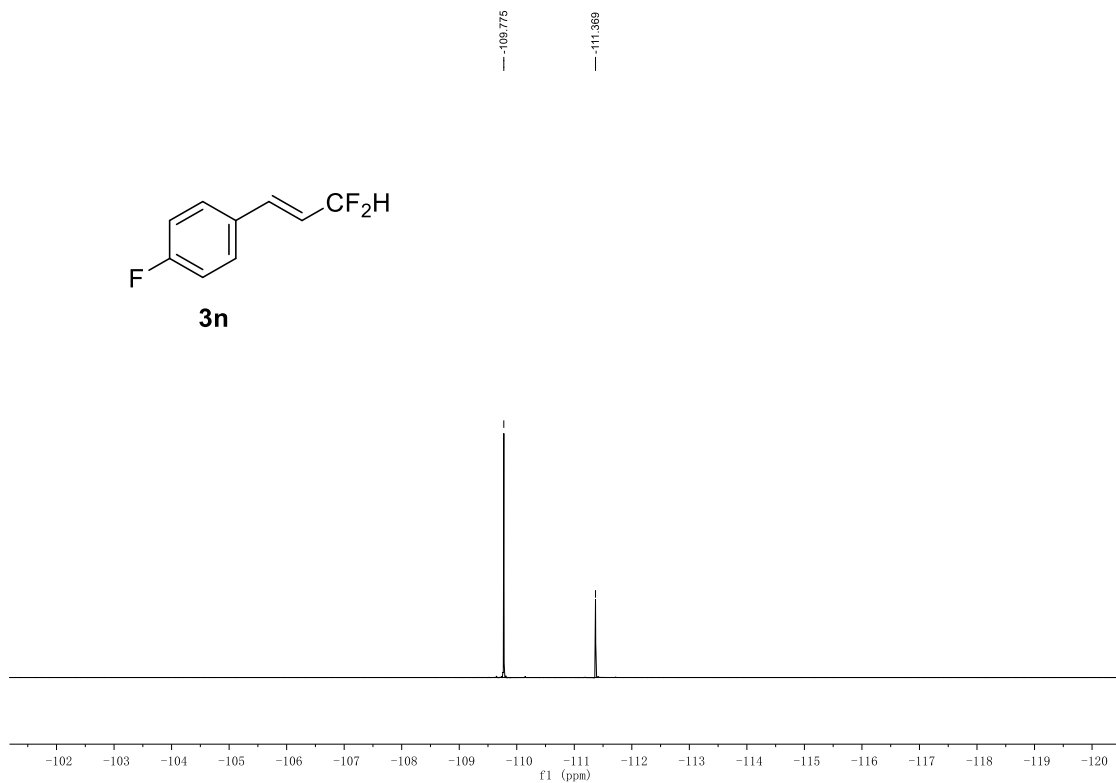
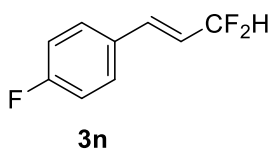






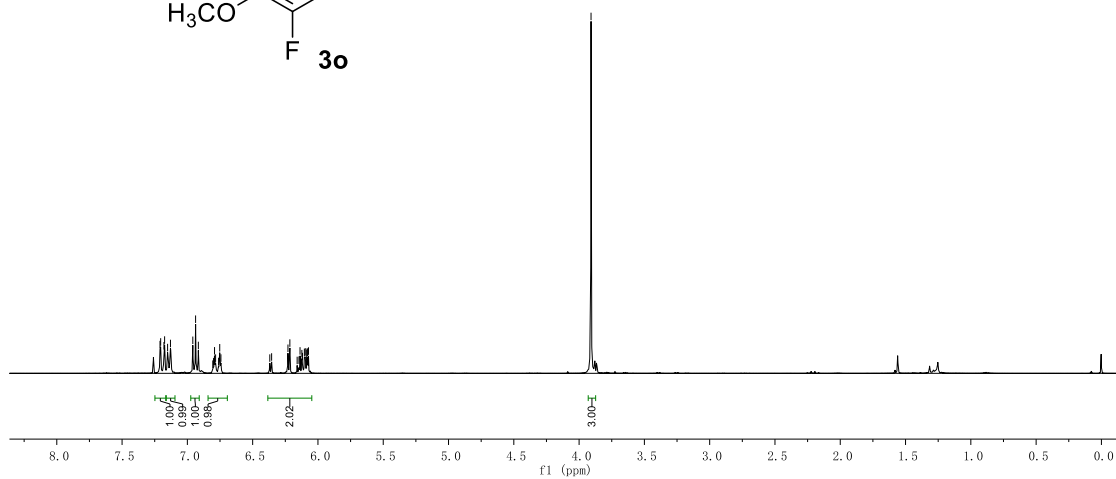
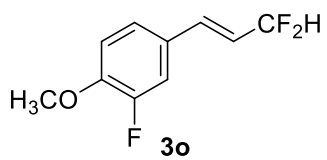


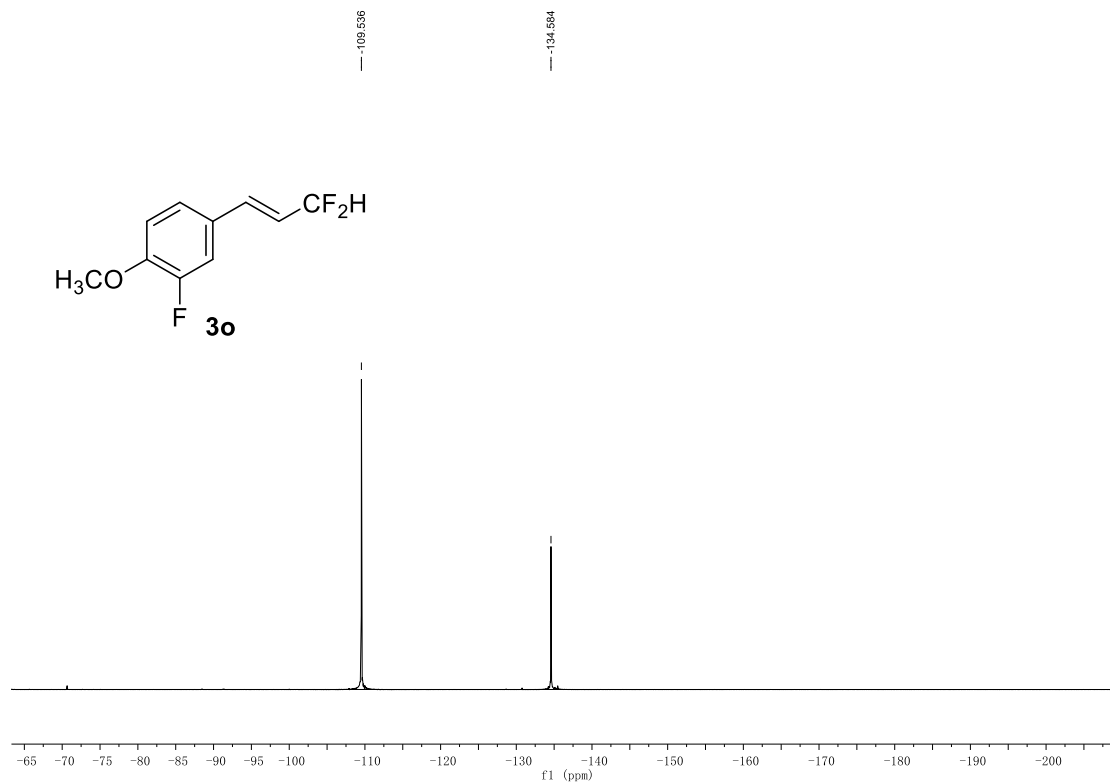
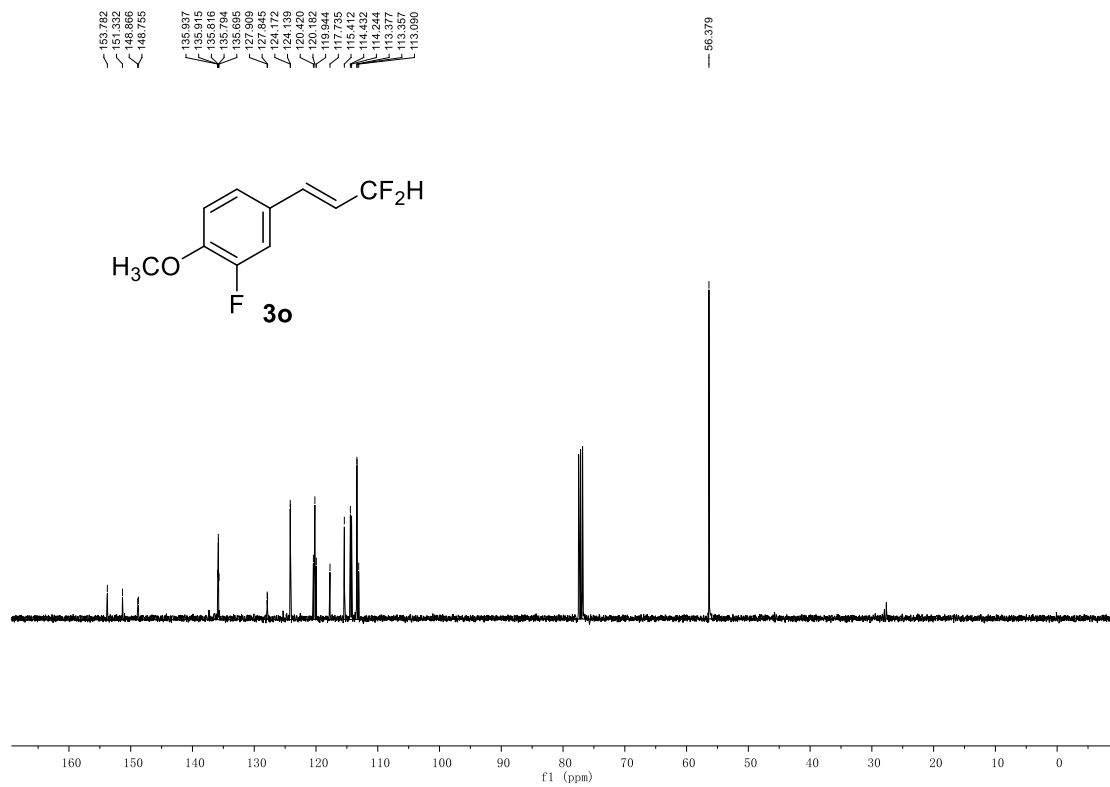


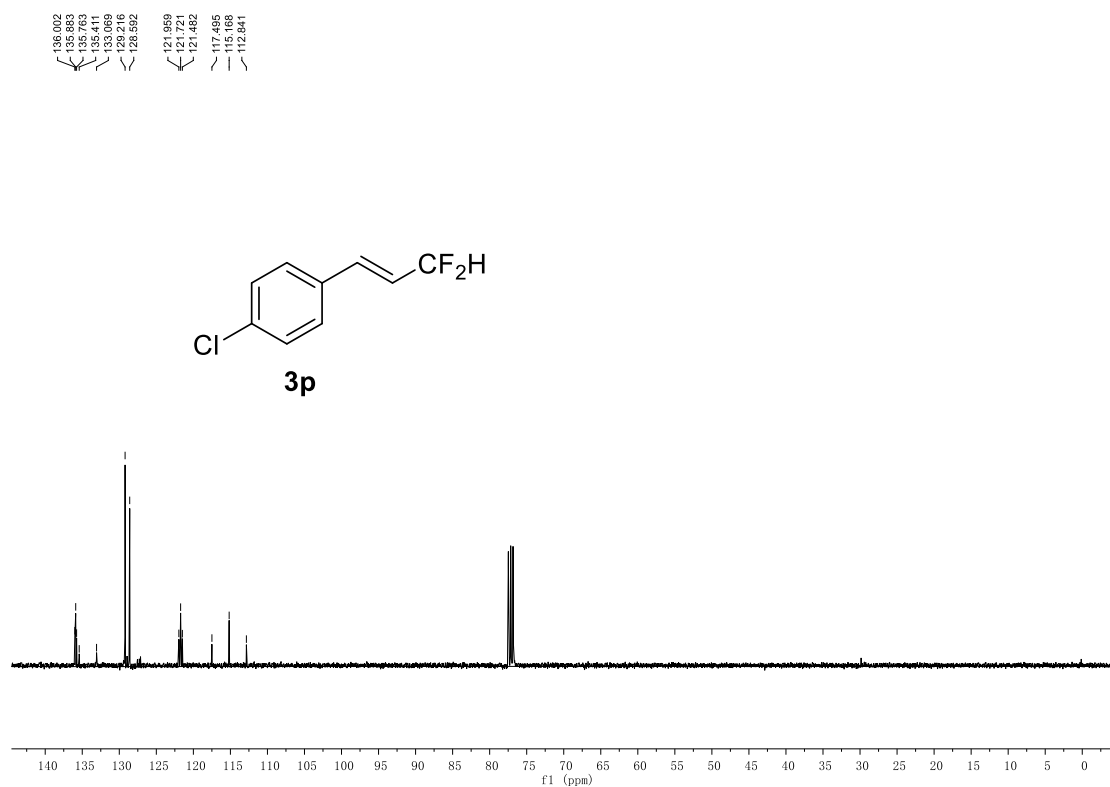
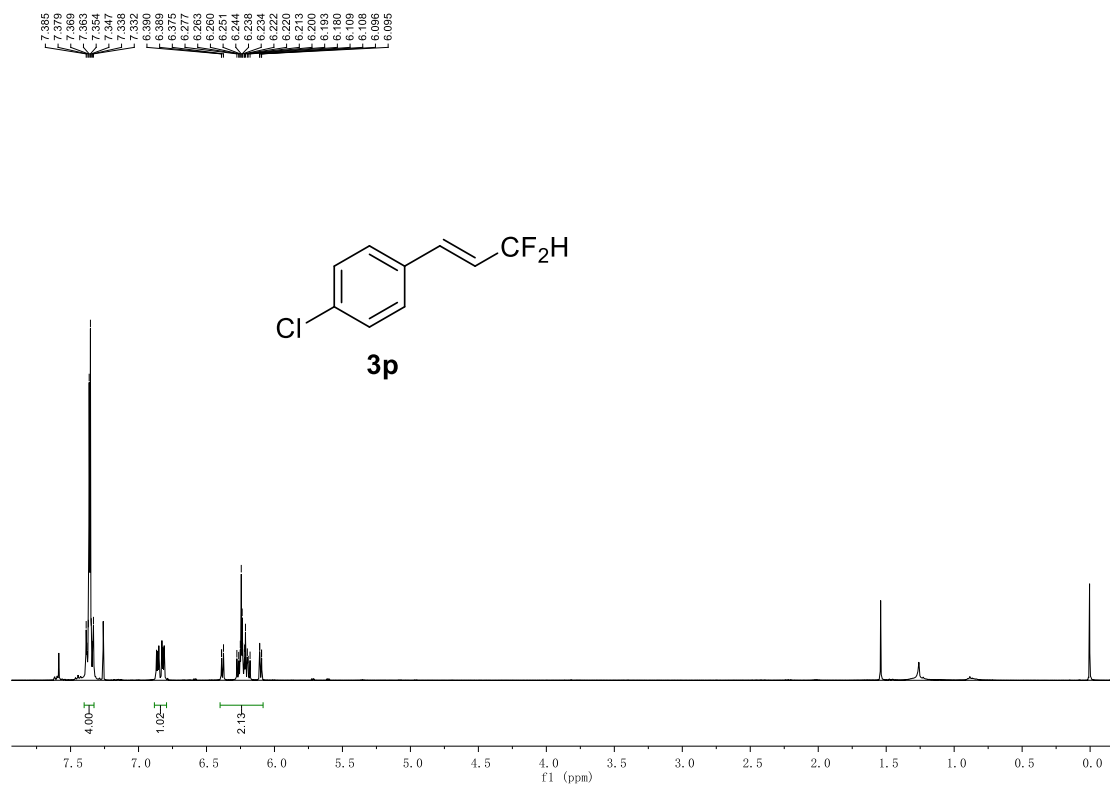


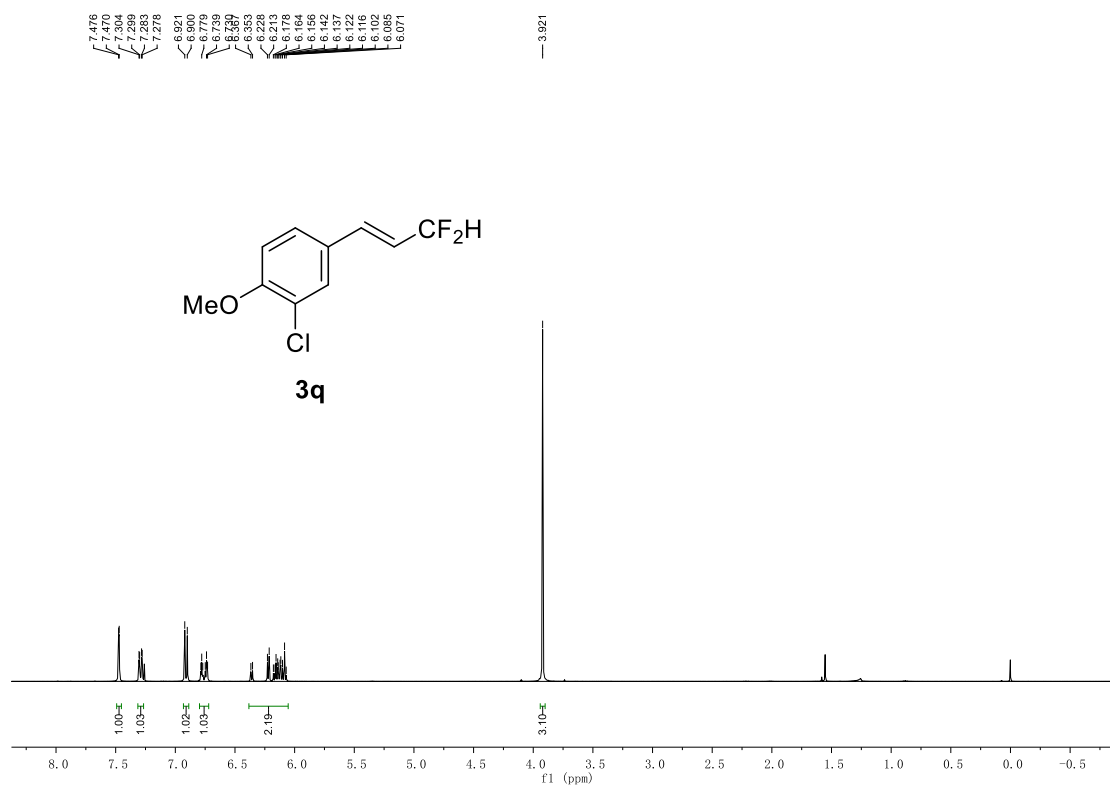
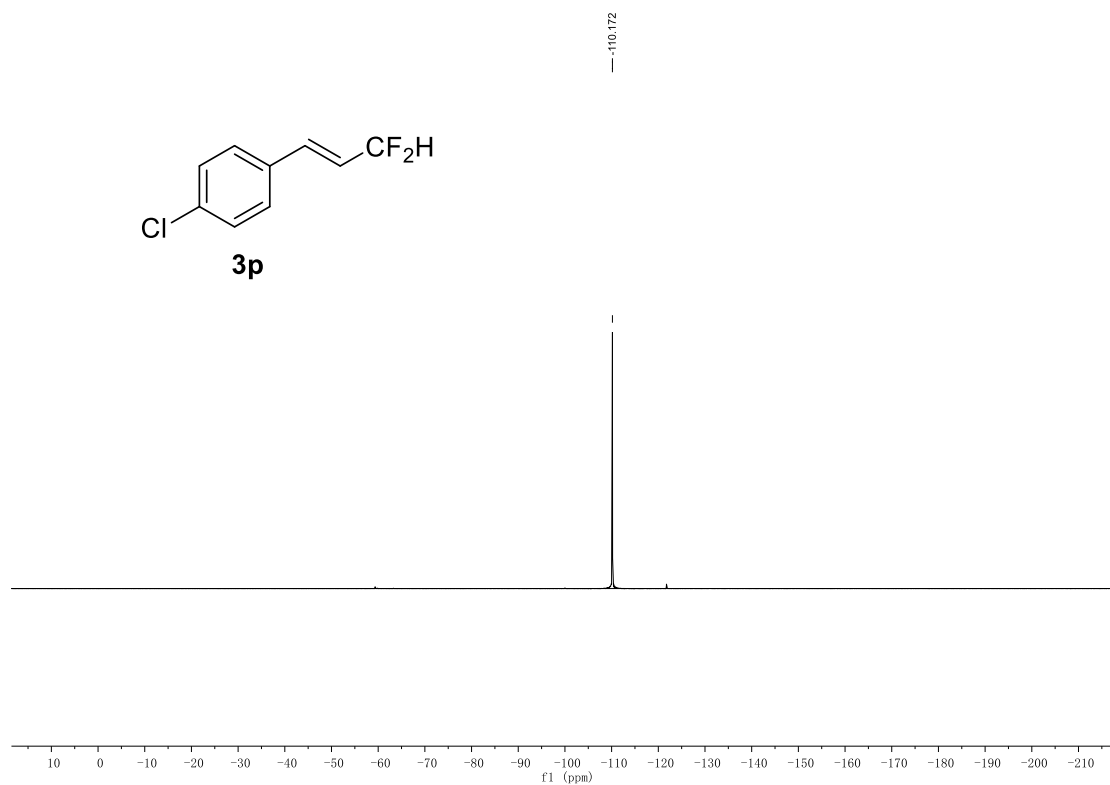
7.210
 7.204
 7.179
 7.174
 7.151
 7.129
 6.959
 6.937
 6.915
 6.895
 6.799
 6.792
 6.784
 6.769
 6.752
 6.743
 6.589
 6.595
 6.572
 6.215
 6.159
 6.145
 6.137
 6.127
 6.119
 6.104
 6.097
 6.088
 6.079
 6.073

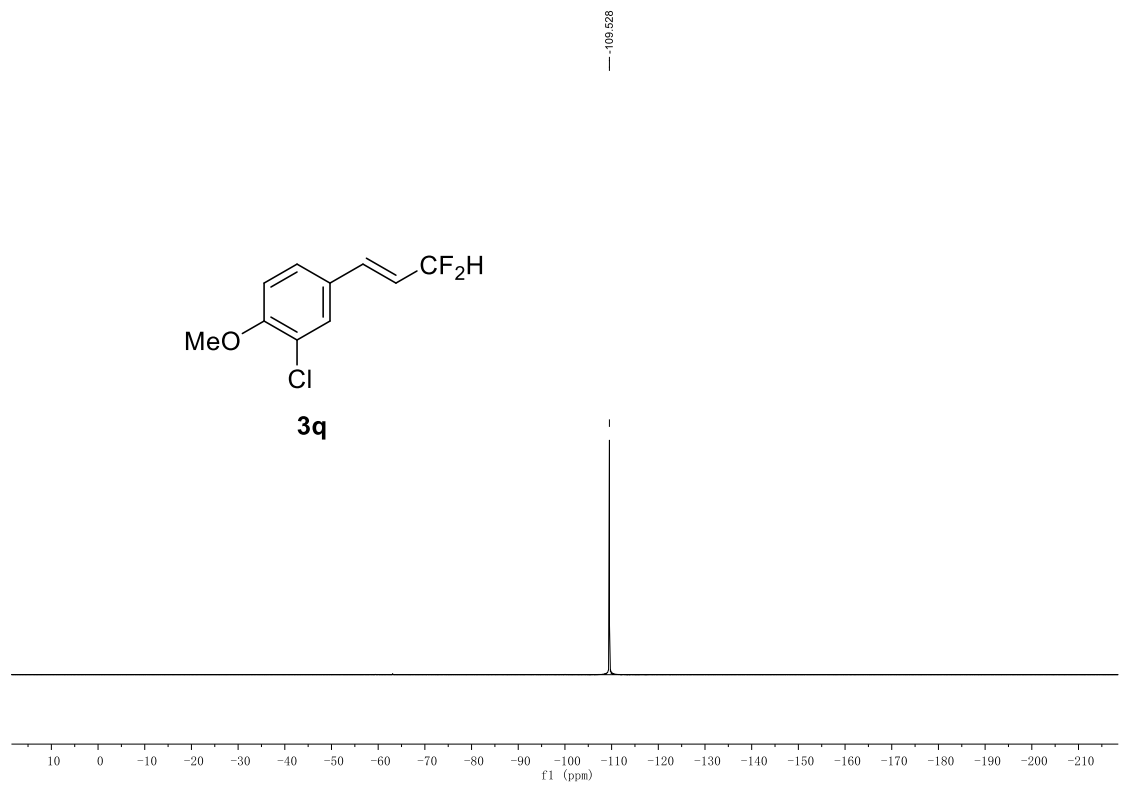
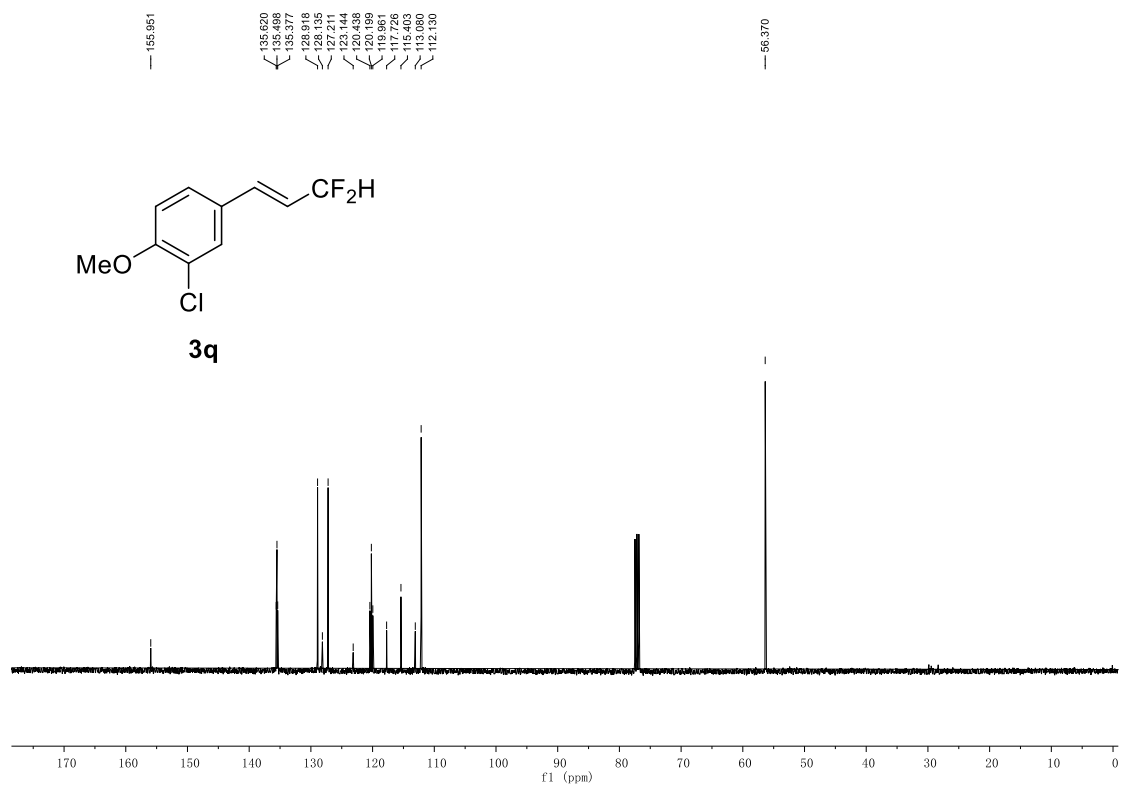
3.909



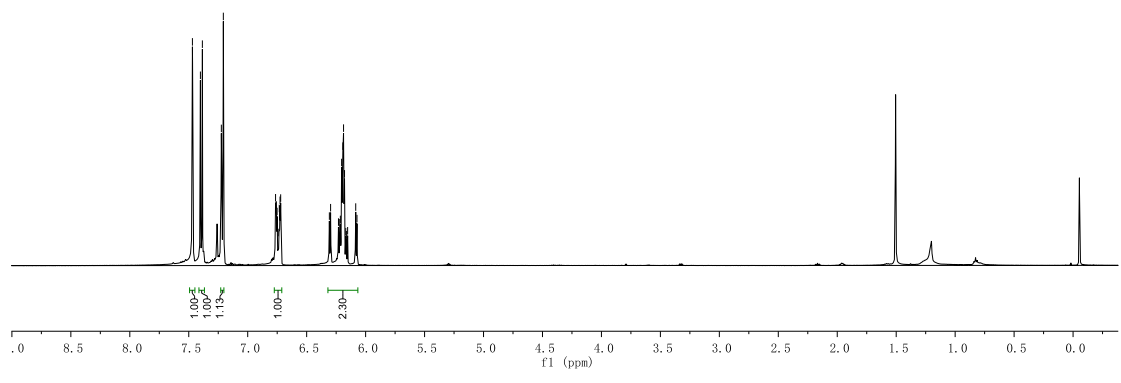
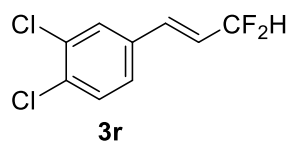




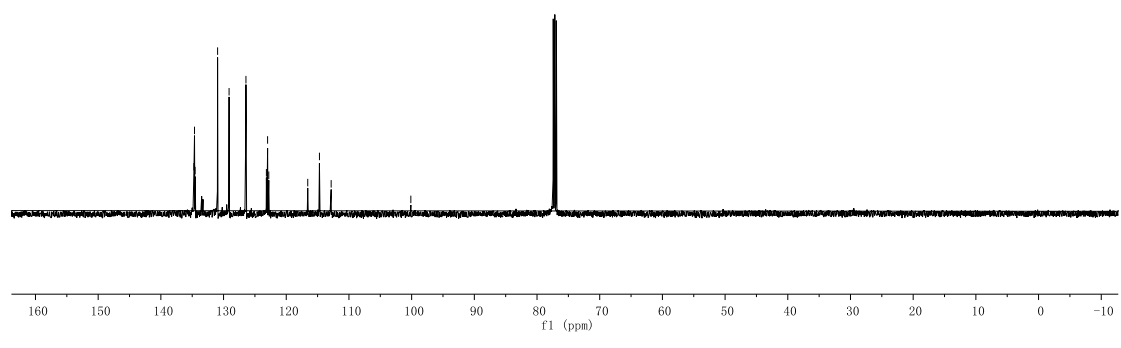
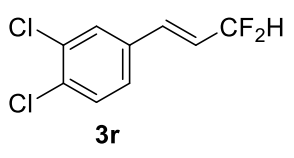




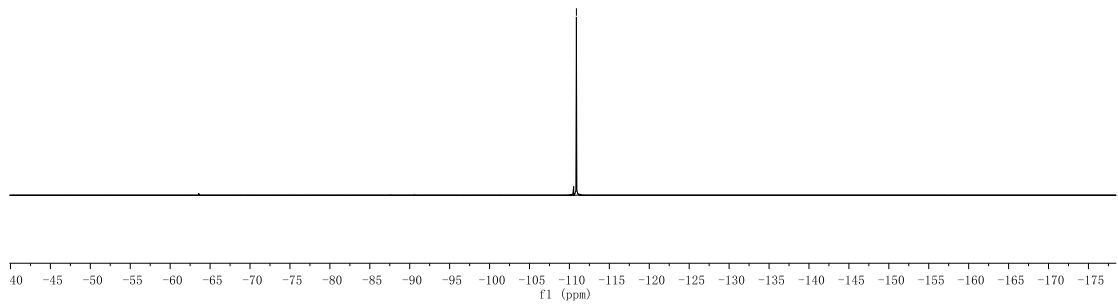
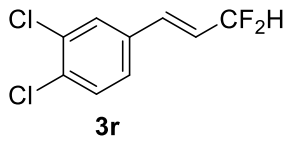
7.489
7.401
7.385
7.224
7.207
6.764
6.757
6.746
6.726
6.728
6.728
6.297
6.230
6.220
6.214
6.204
6.197
6.193
6.187
6.179
6.163
6.153
6.084
6.073



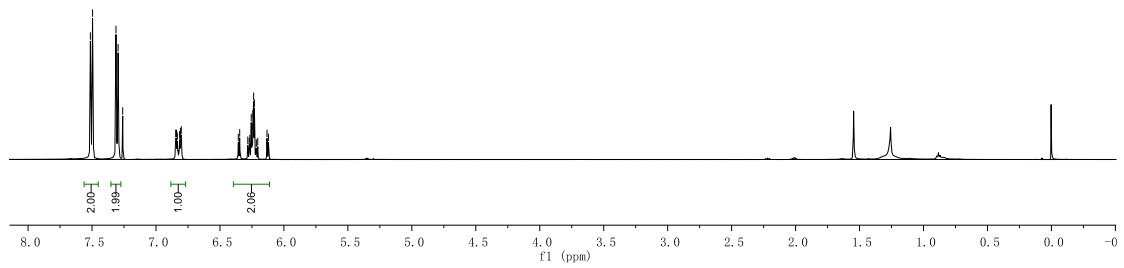
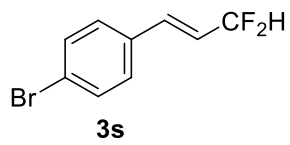
134.729
134.634
134.634
130.894
128.493
126.430
123.167
122.576
122.765
116.571
114.705
112.838
100.127



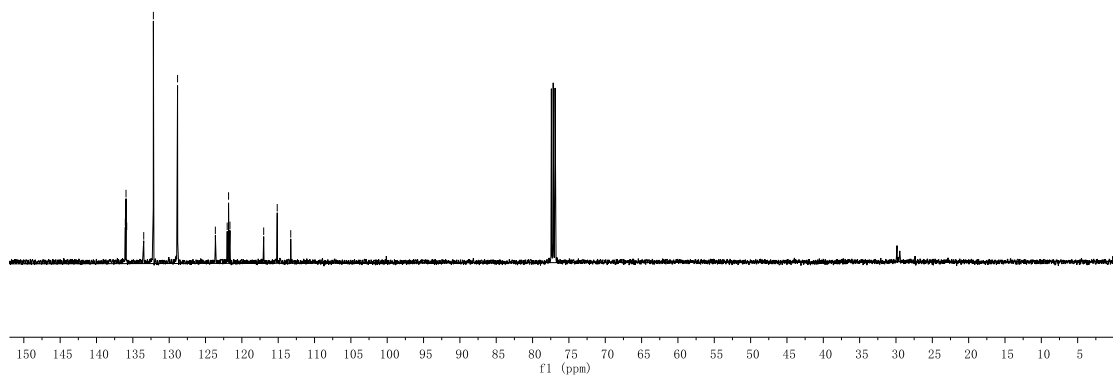
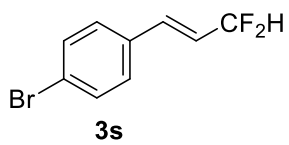
-110.875



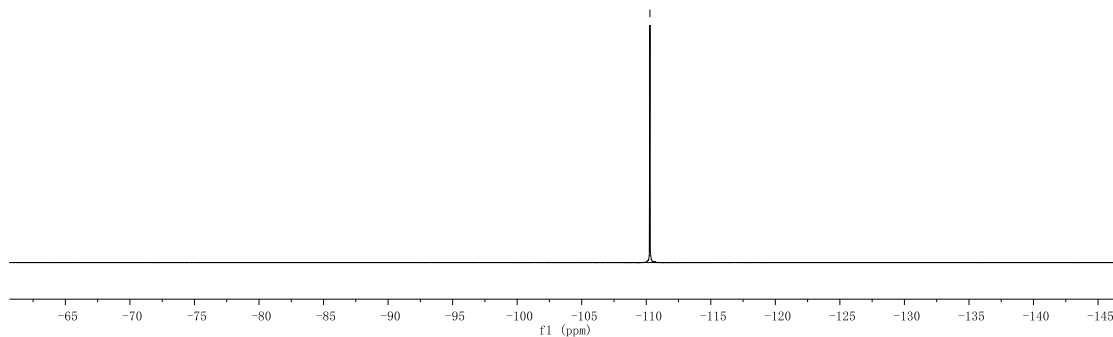
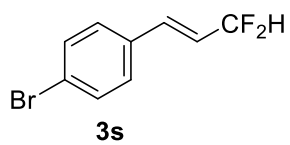
7.513
7.468
7.513
7.285
7.289
6.846
6.840
6.840
6.840
6.840
6.846
6.282
6.271
6.266
6.266
6.266
6.242
6.237
6.231
6.205
6.132
6.121



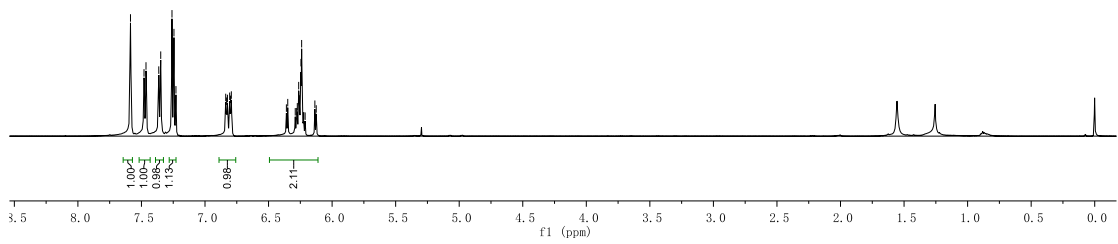
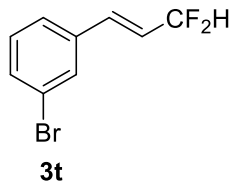
136.034
135.938
135.842
133.502
132.174
126.846
123.645
122.718
121.821
121.837
116.996
113.272



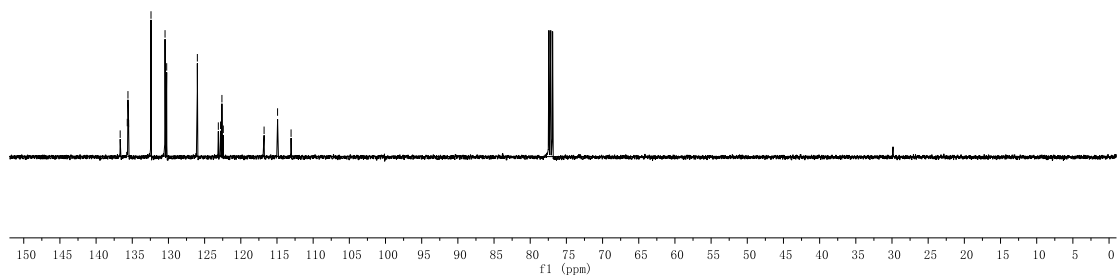
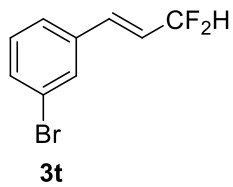
110.284

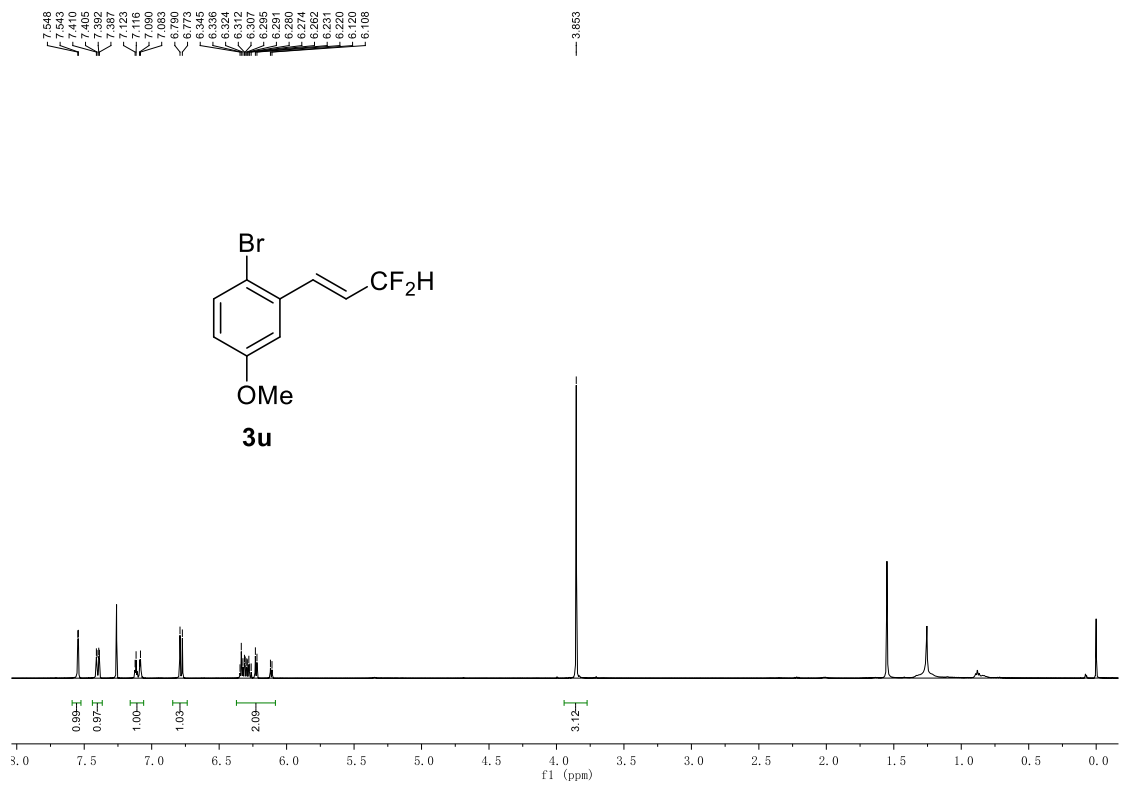
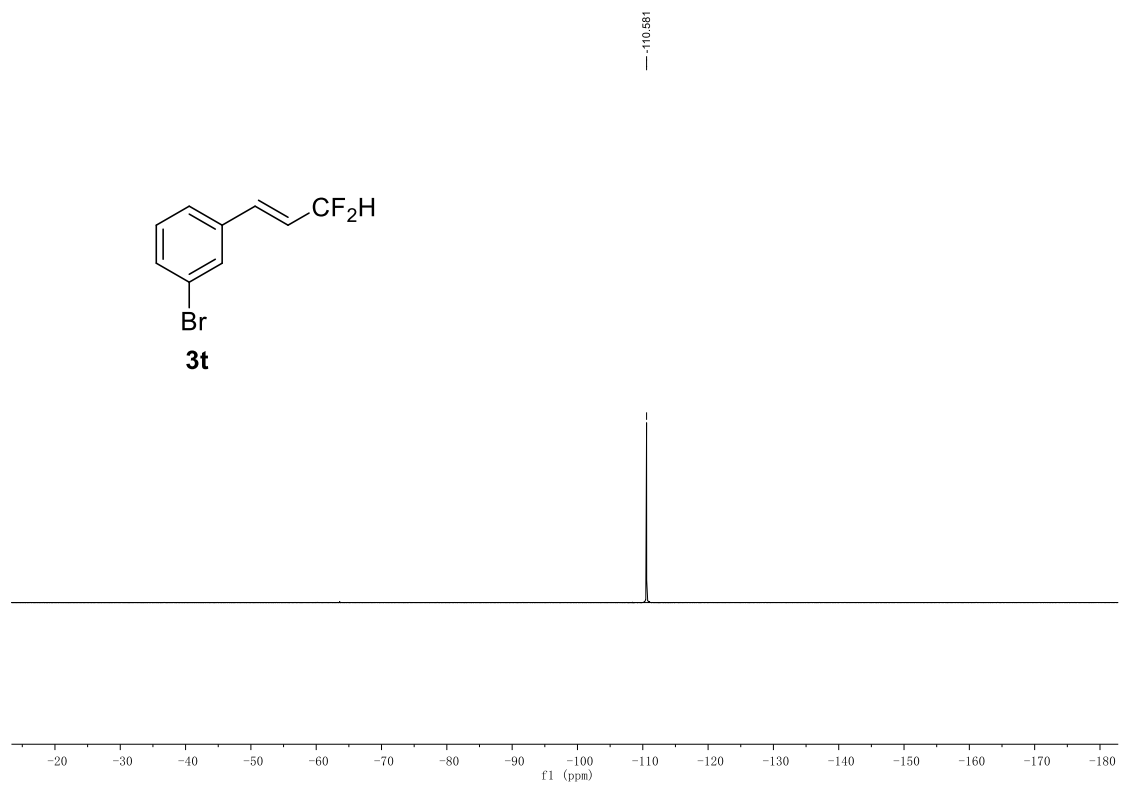


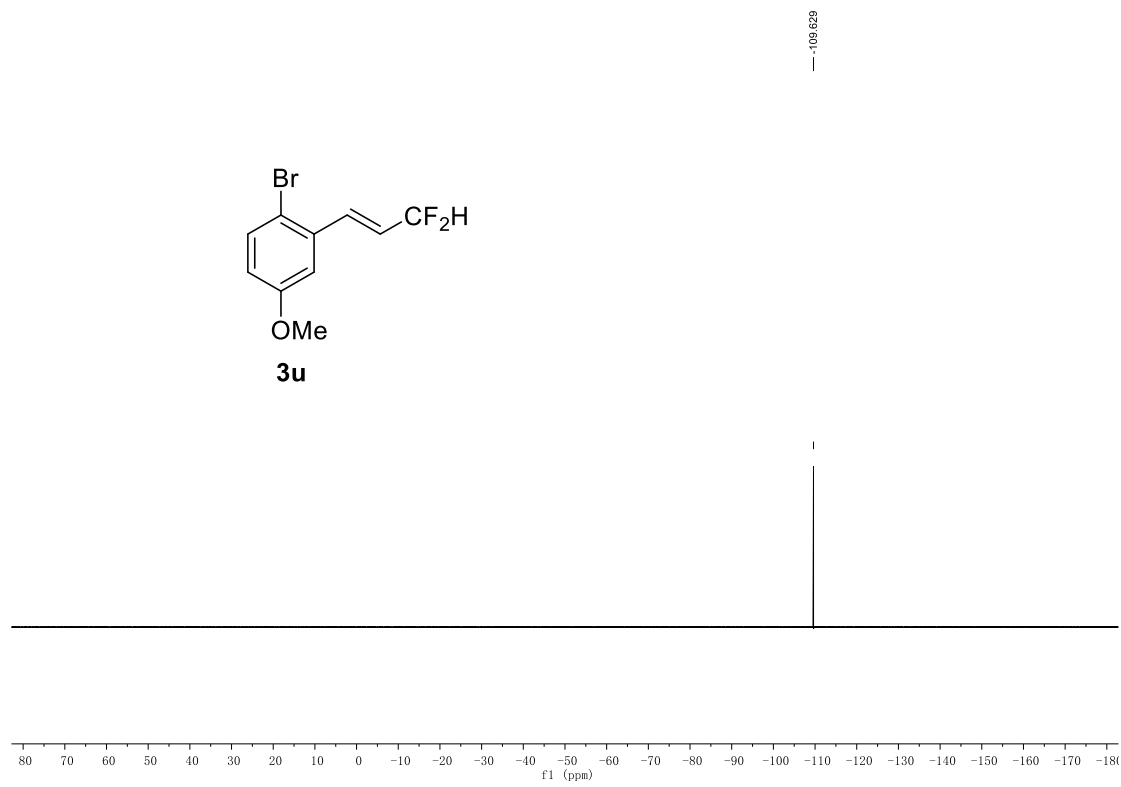
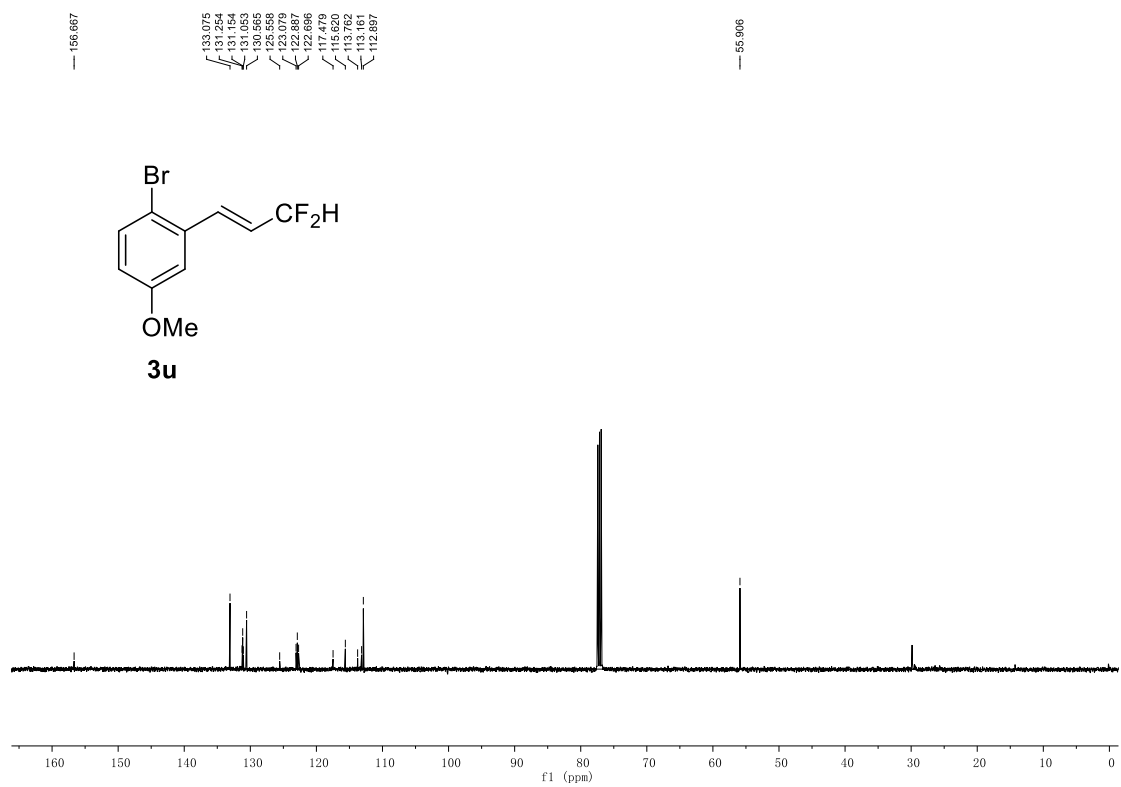
7.586
7.582
7.464
7.384
7.348
7.280
7.229
6.837
6.824
6.808
6.780
6.760
6.740
6.290
6.279
6.274
6.263
6.246
6.245
6.240
6.225
6.223
6.196
6.125

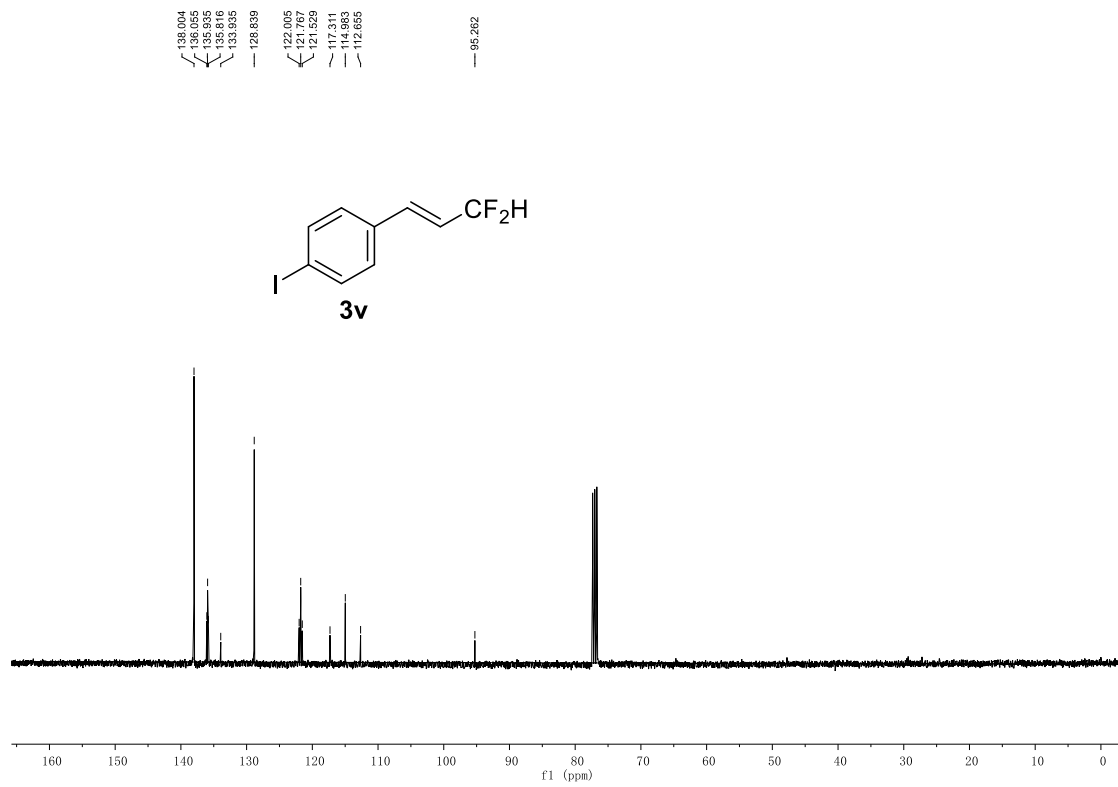
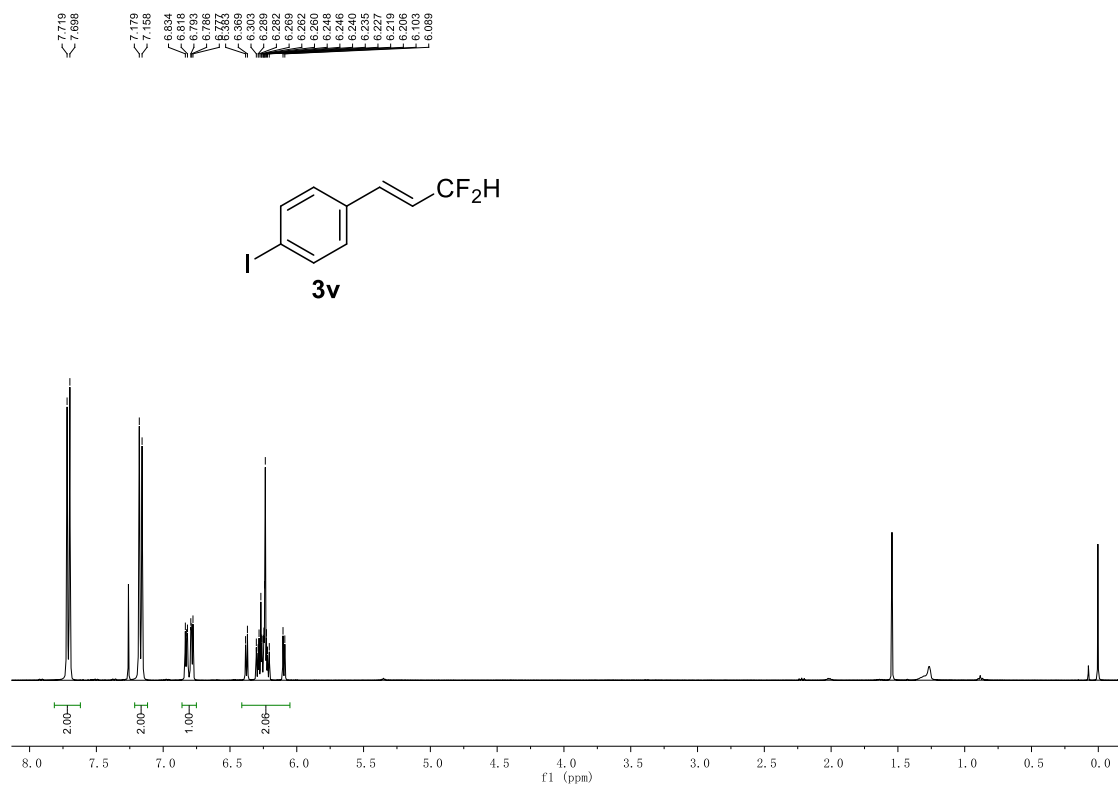


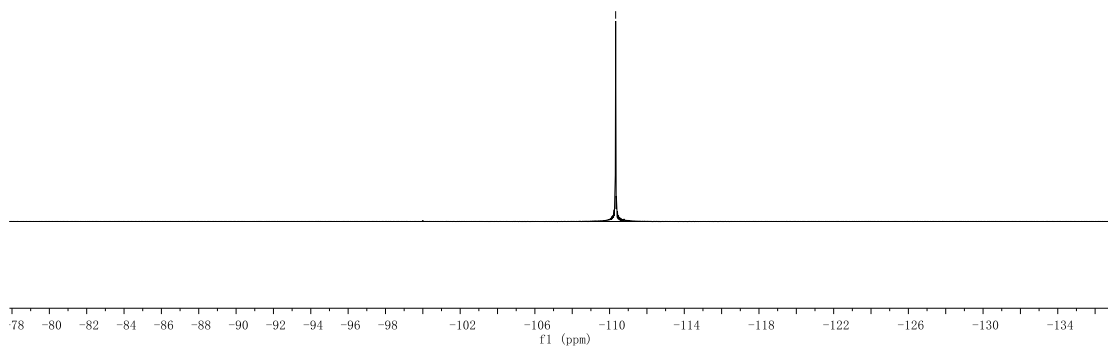
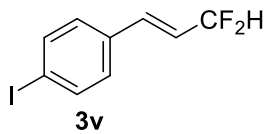
136.672
135.682
135.586
135.500
135.471
130.471
126.004
123.108
122.809
122.418
116.822
116.785
113.054



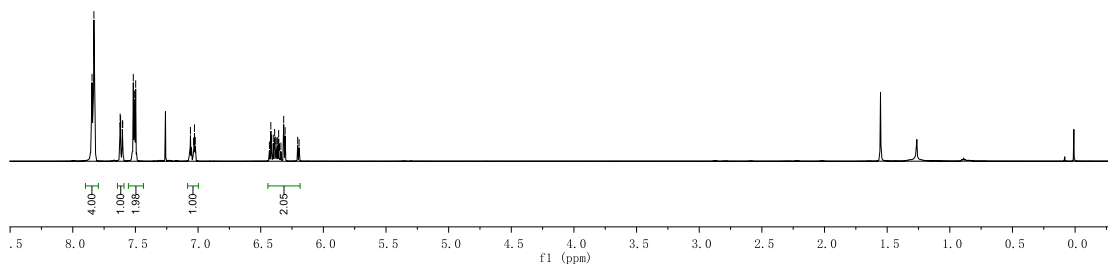
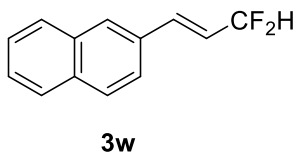




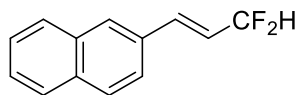




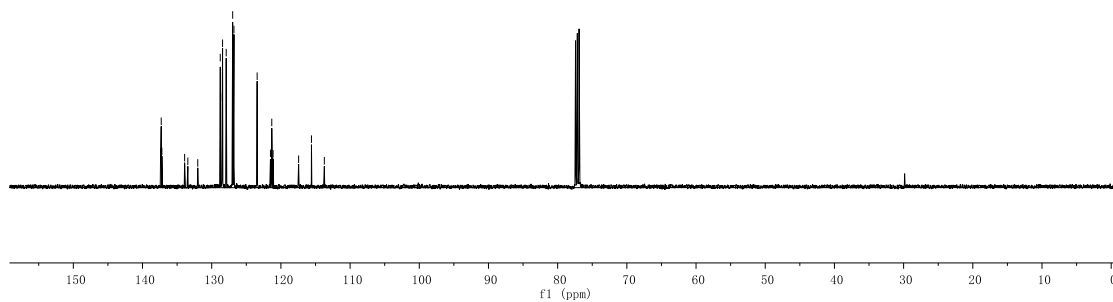
7.846
 7.831
 7.517
 7.511
 7.505
 7.487
 7.085
 7.079
 7.022
 6.430
 6.419
 6.415
 6.407
 6.389
 6.384
 6.371
 6.369
 6.367
 6.350
 6.339
 6.317
 6.305
 6.292
 6.194



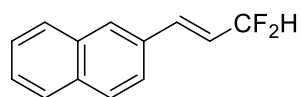
137.393
137.296
137.190
133.410
133.450
132.016
128.764
128.465
128.435
127.903
126.969
126.786
126.781
124.498
121.318
121.128
117.439
115.951
113.722



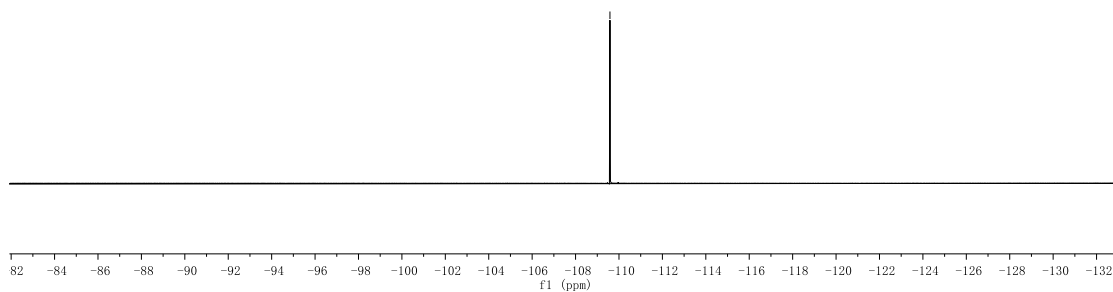
3w



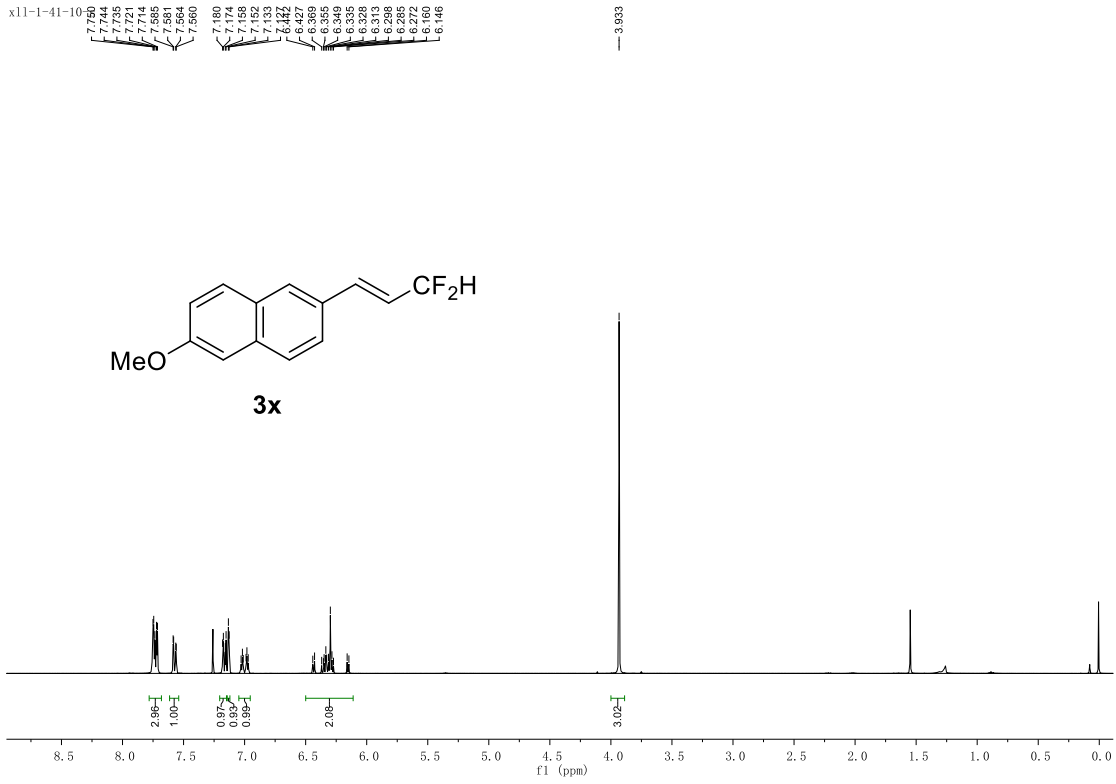
-109.584



3w



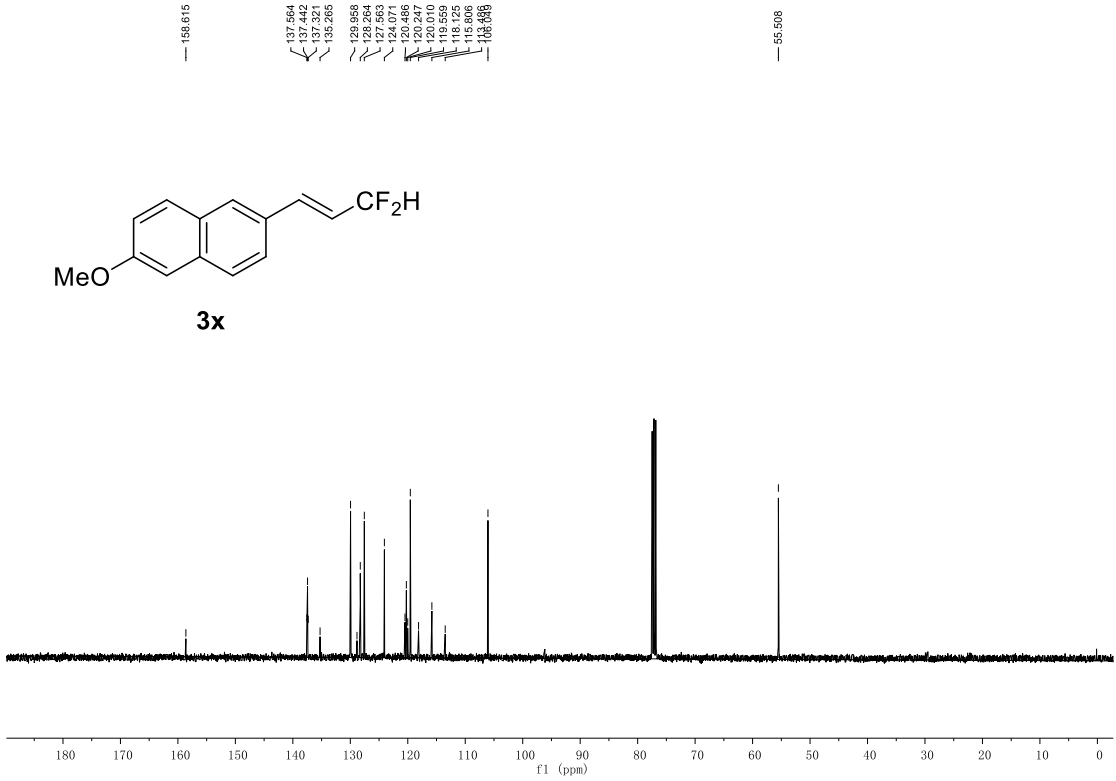
x11-1-41-10

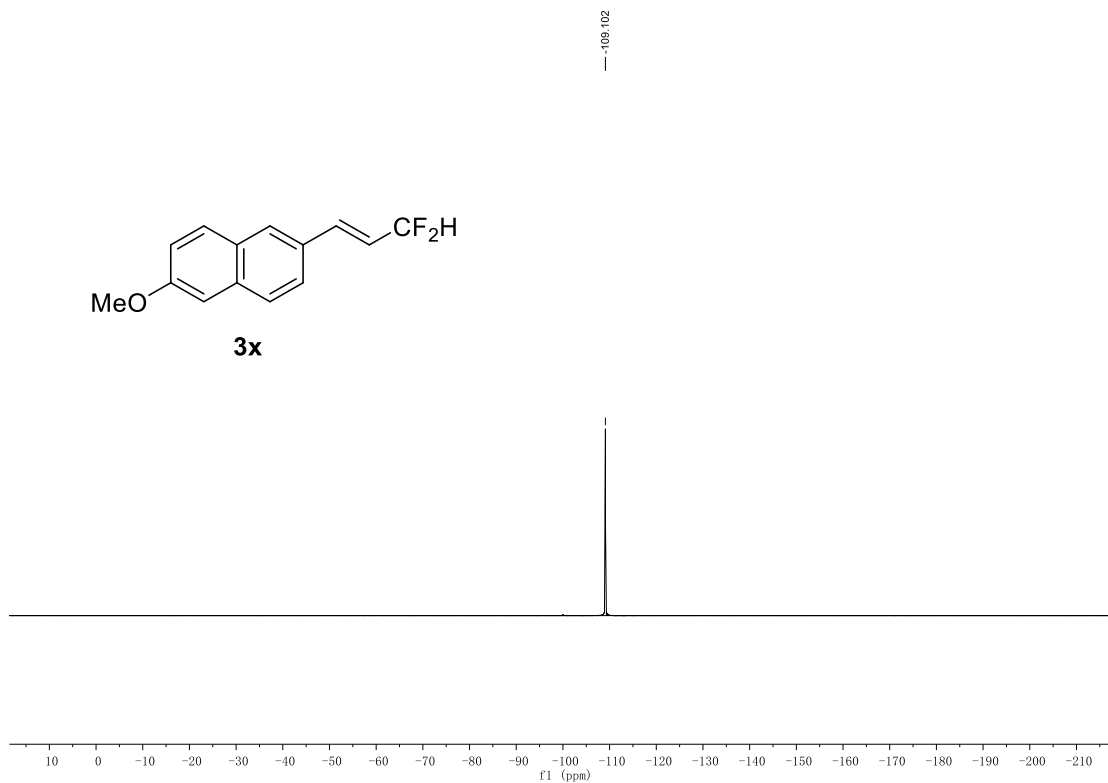
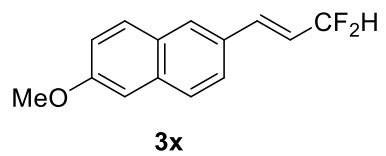


158.615

137.564, 137.442, 137.321, 135.265, 129.668, 128.264, 127.563, 124.071, 120.685, 119.559, 120.010, 118.125, 115.808, 108.689

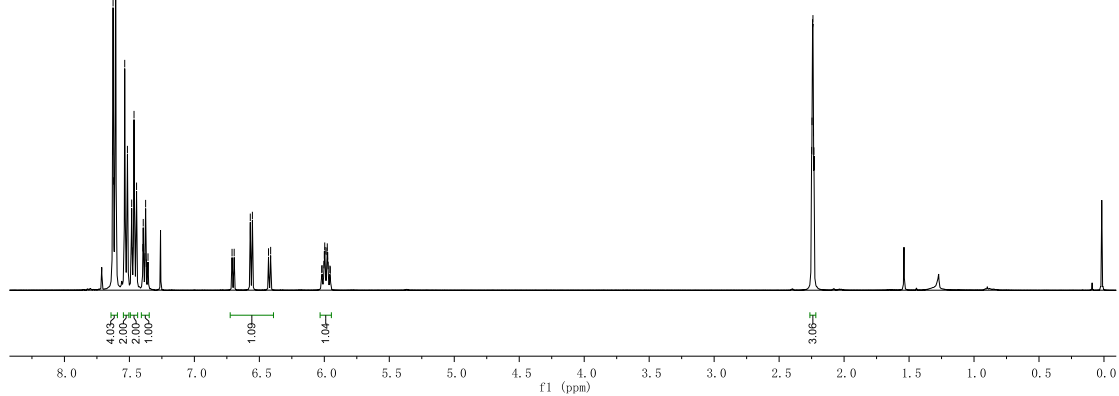
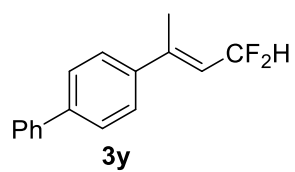
55.508

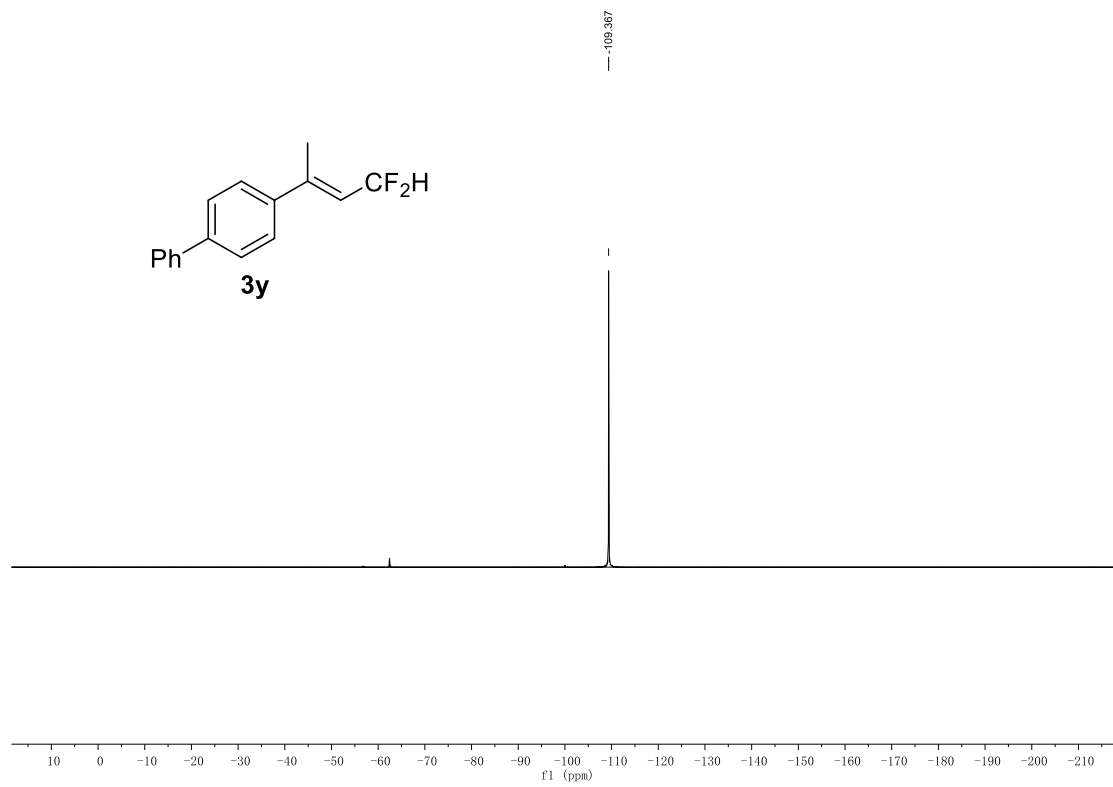
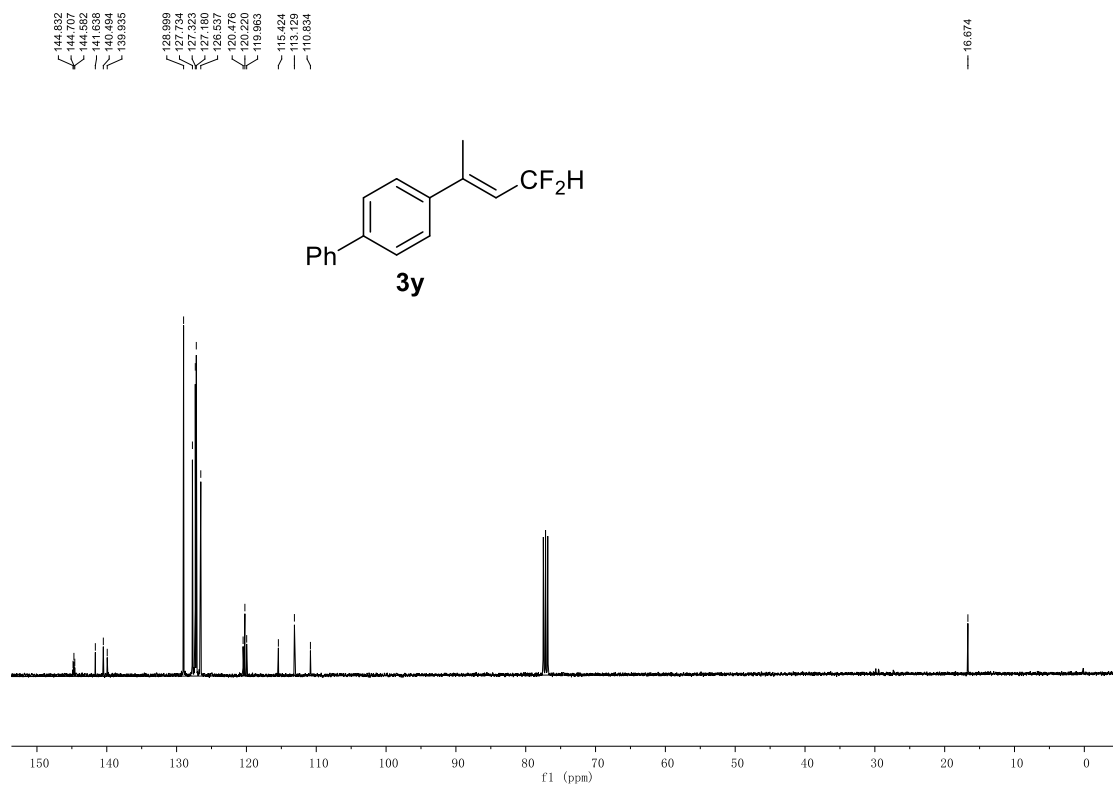




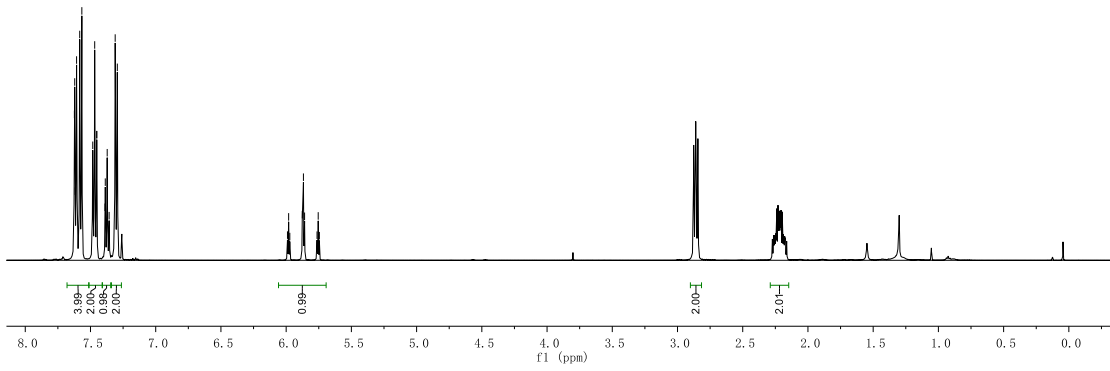
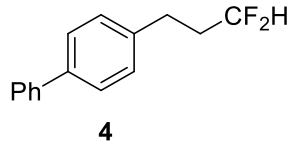
7.629
 7.626
 7.621
 7.605
 7.595
 7.585
 7.483
 7.478
 7.464
 7.460
 7.458
 7.394
 7.391
 7.380
 7.365
 6.976
 6.624
 6.621
 6.553
 6.429
 6.413
 6.007
 6.007
 6.003
 6.000
 5.997
 5.984
 5.984
 5.977
 5.974
 5.971
 5.967
 5.954

2.250
 2.247
 2.243
 2.240
 2.235
 2.232

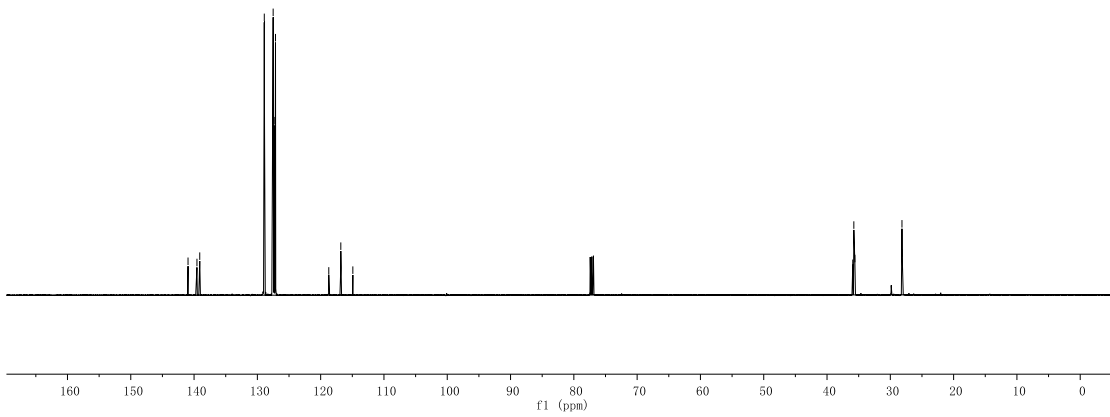
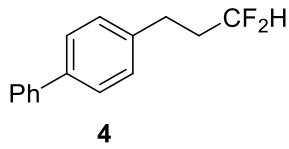


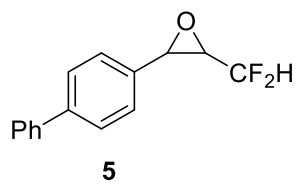
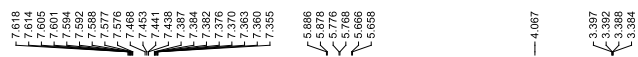
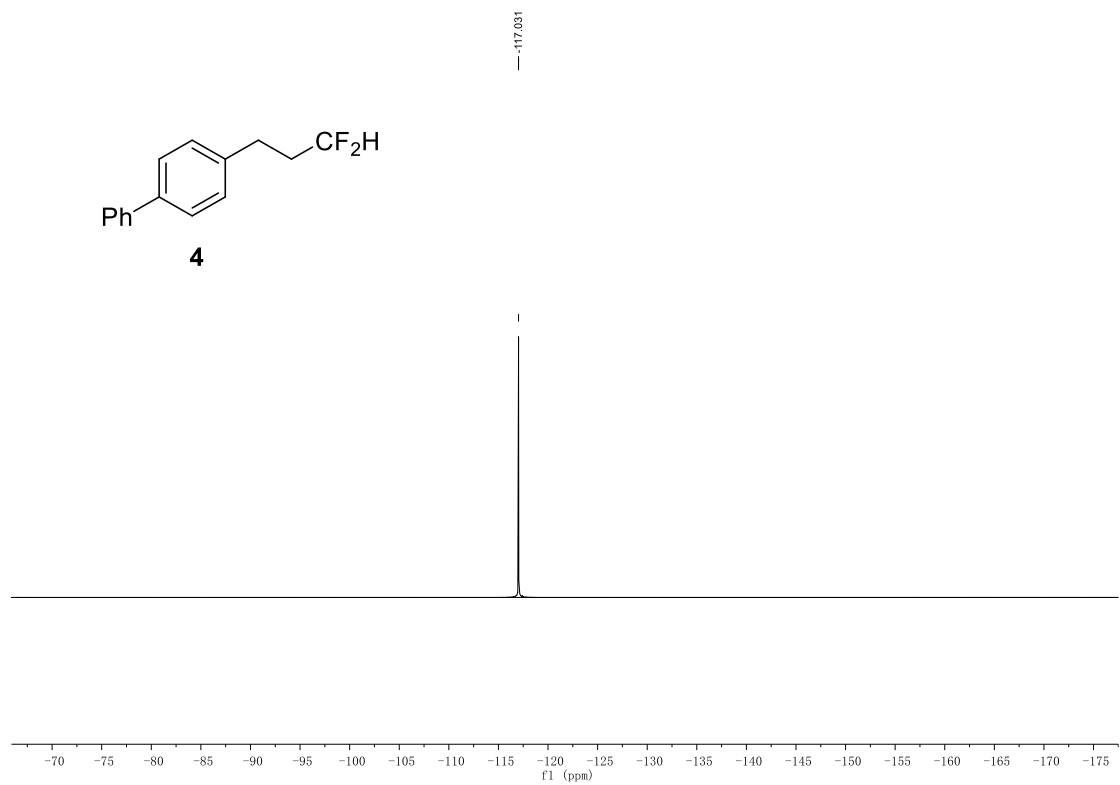


7.623
7.621
7.617
7.607
7.593
7.586
7.483
7.482
7.452
7.389
7.384
7.372
7.357
7.311
7.294
5.990
5.991
5.972
5.971
5.868
5.859
5.763
5.754
5.745



140.564
139.565
139.102
129.608
128.870
127.506
127.342
127.135
118.717
118.616
114.915
35.933
35.765
35.596
28.211
28.161
28.112



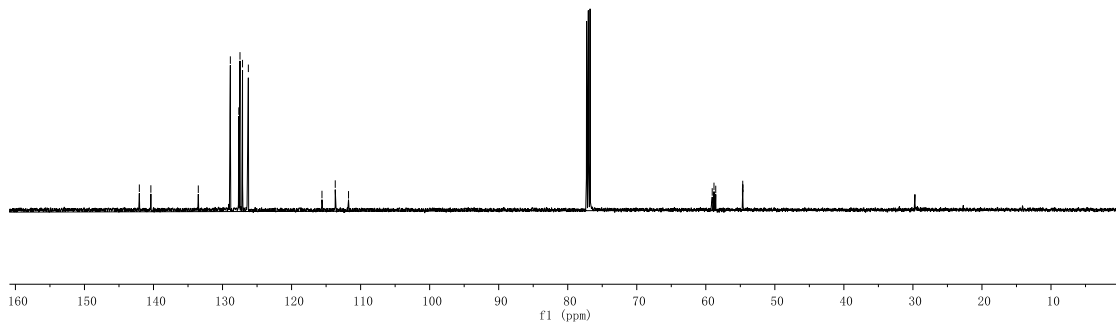
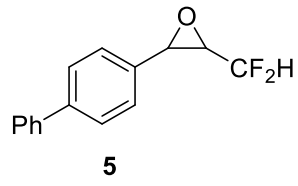


142.052
140.360

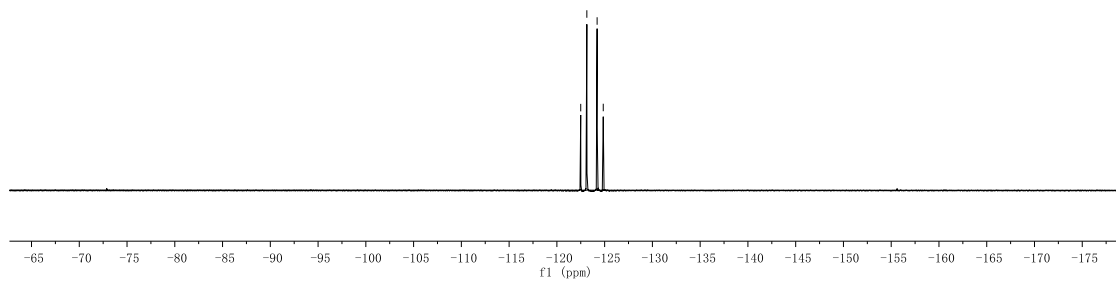
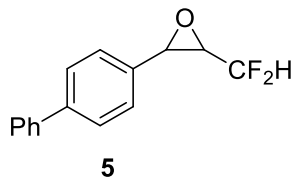
133.510
128.868
127.642
127.471
127.105
126.261

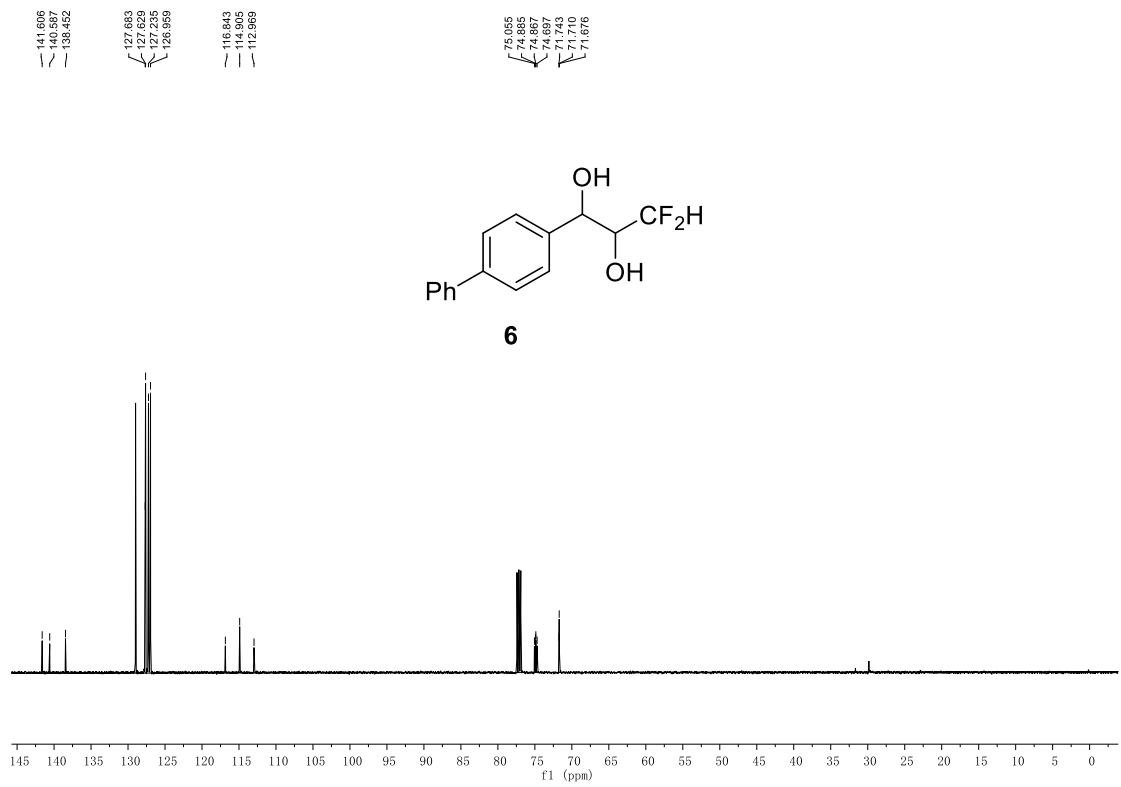
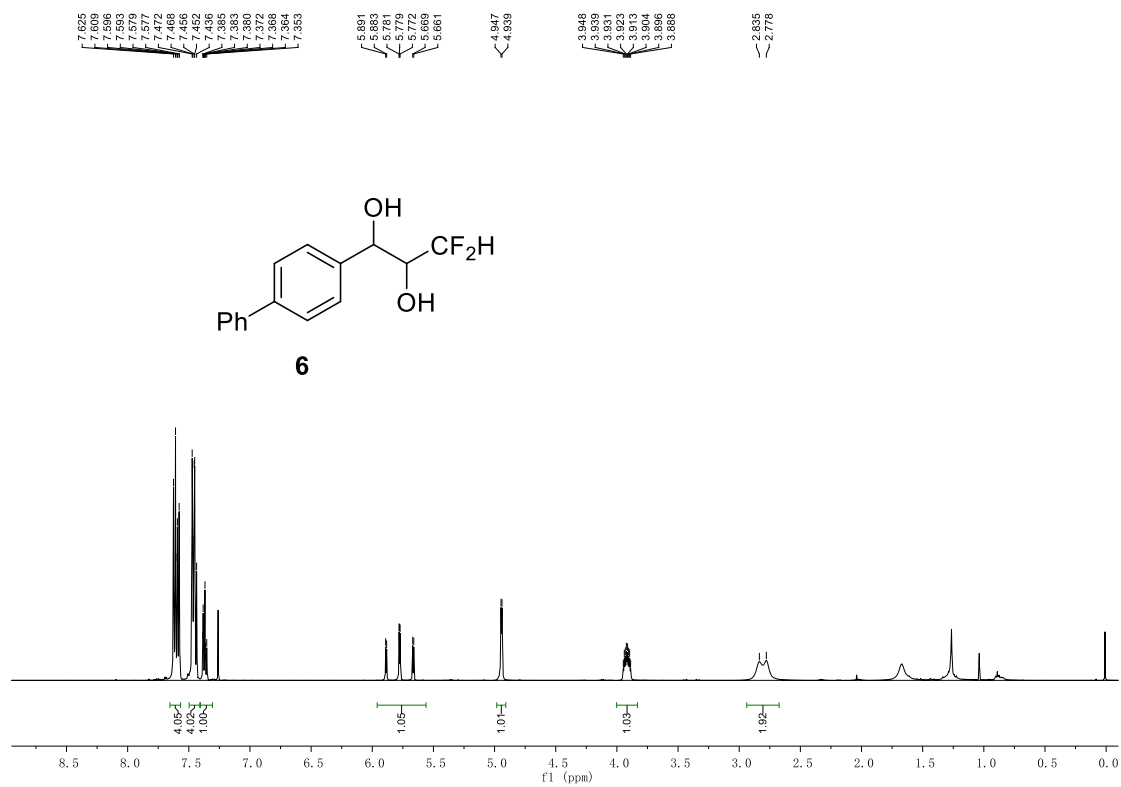
115.598
113.674
111.750

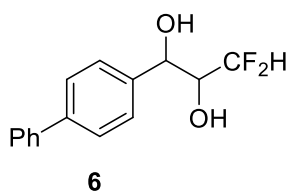
59.072
58.815
58.558
54.892
54.632
54.651
54.621



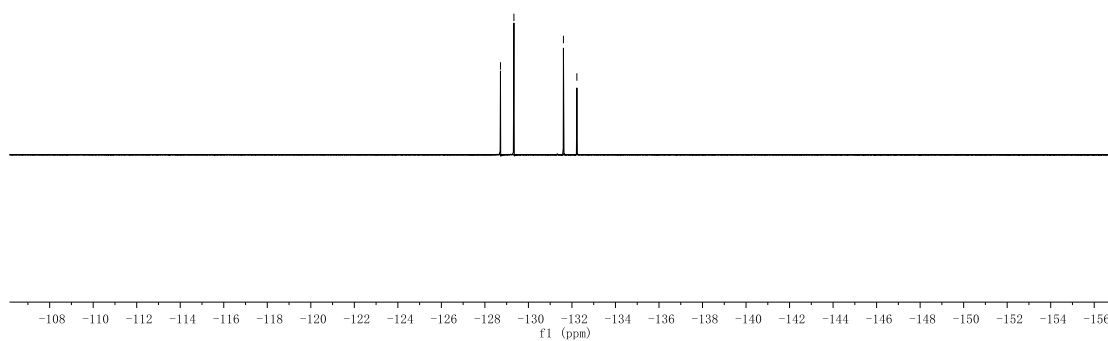
-122.495
-123.137
-124.413
-124.654



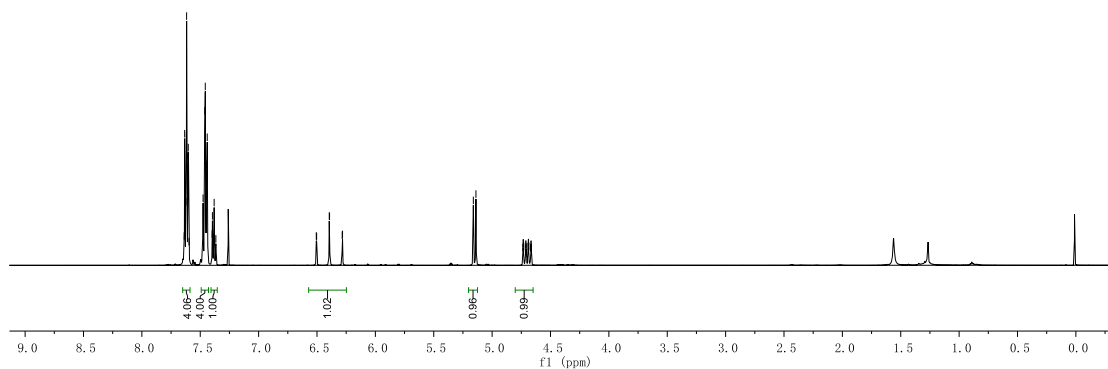
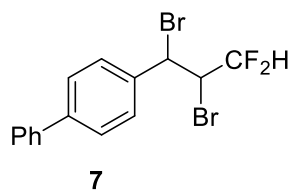


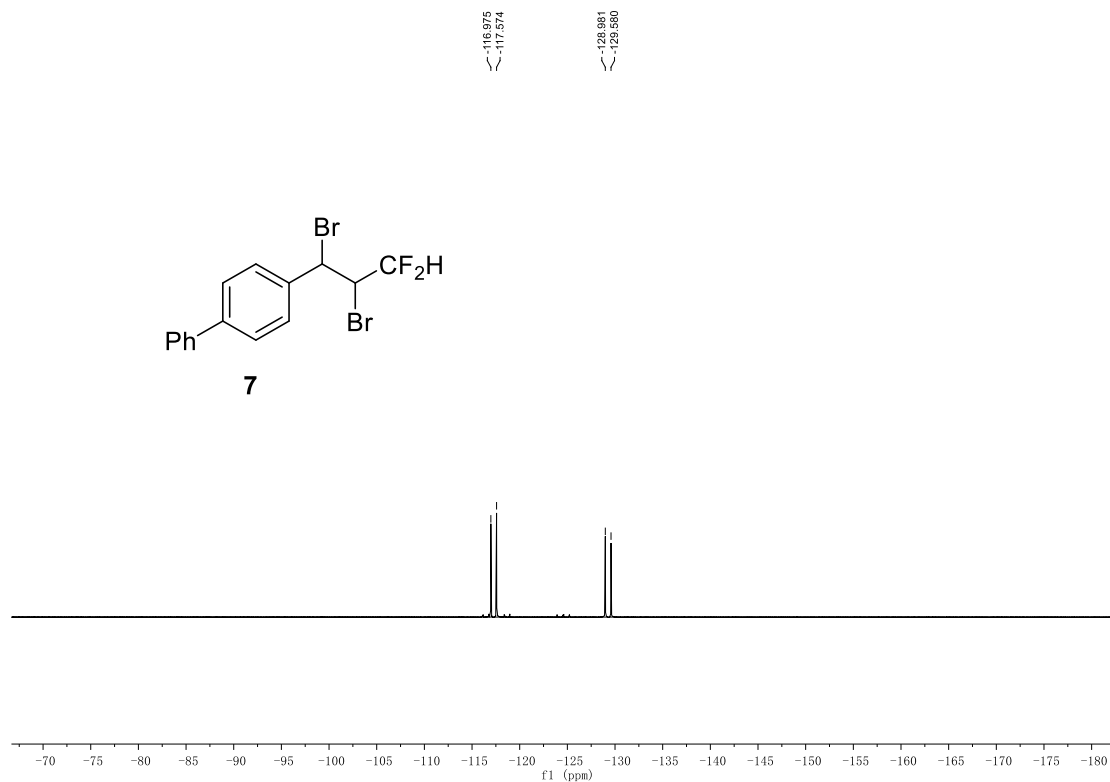
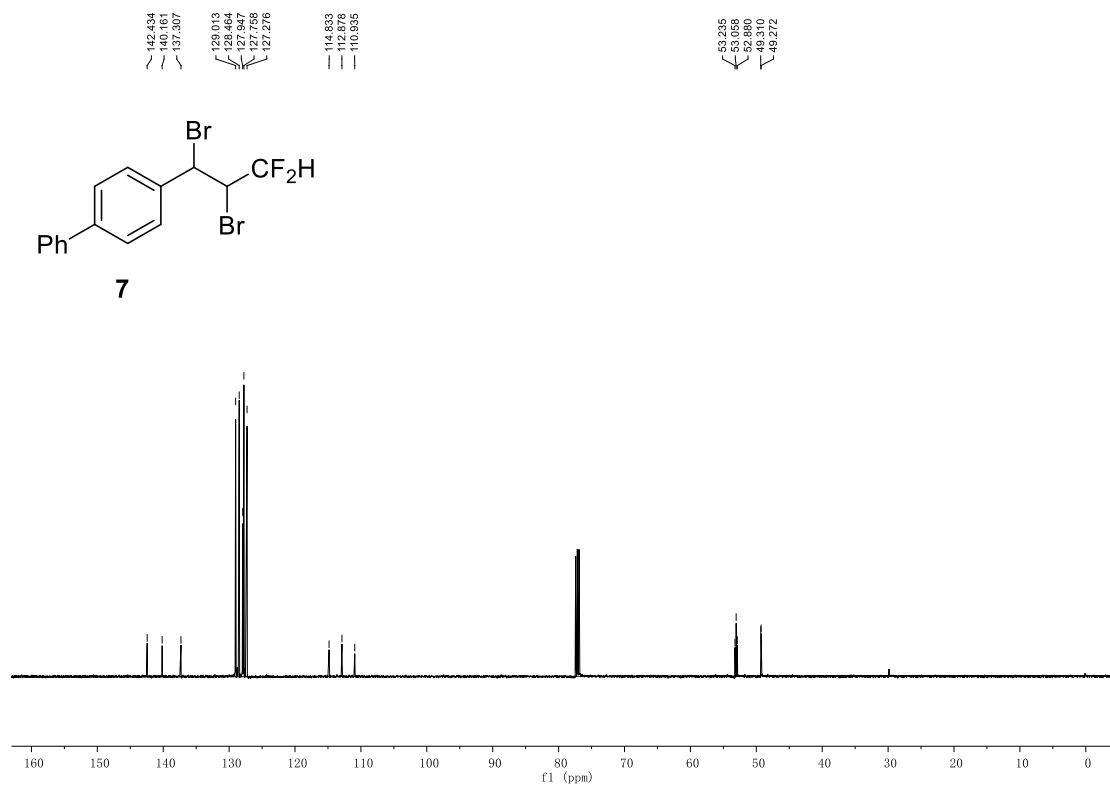


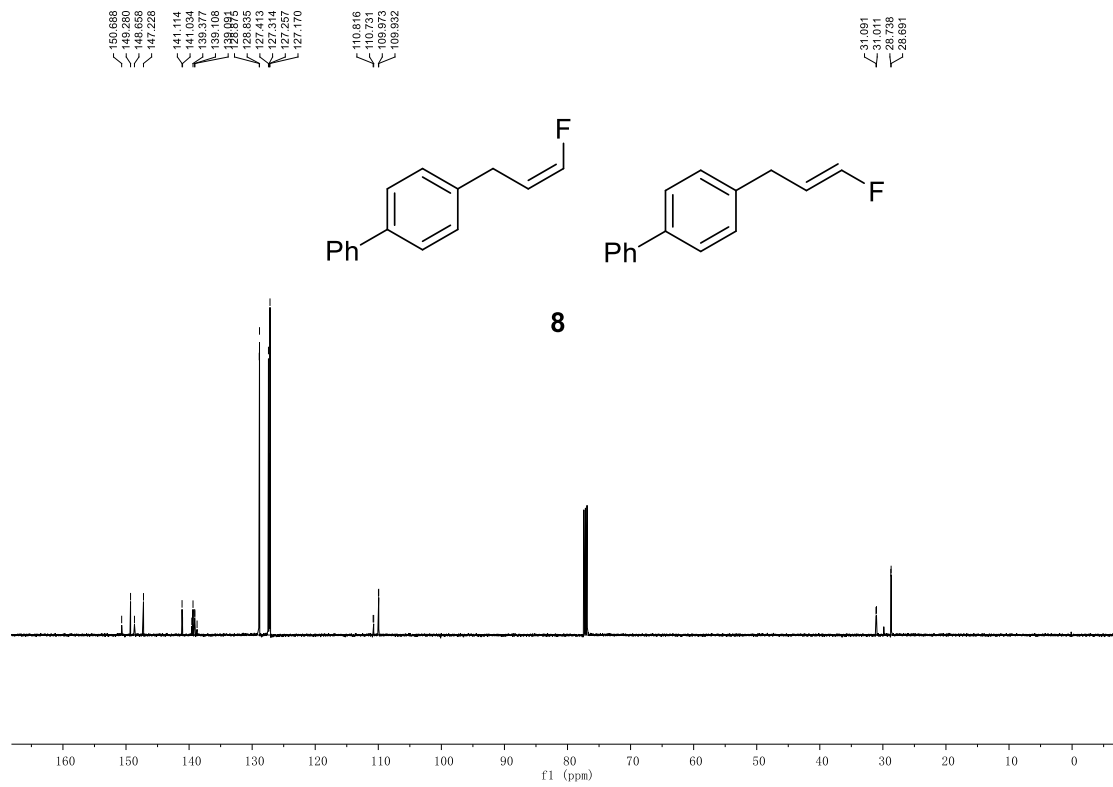
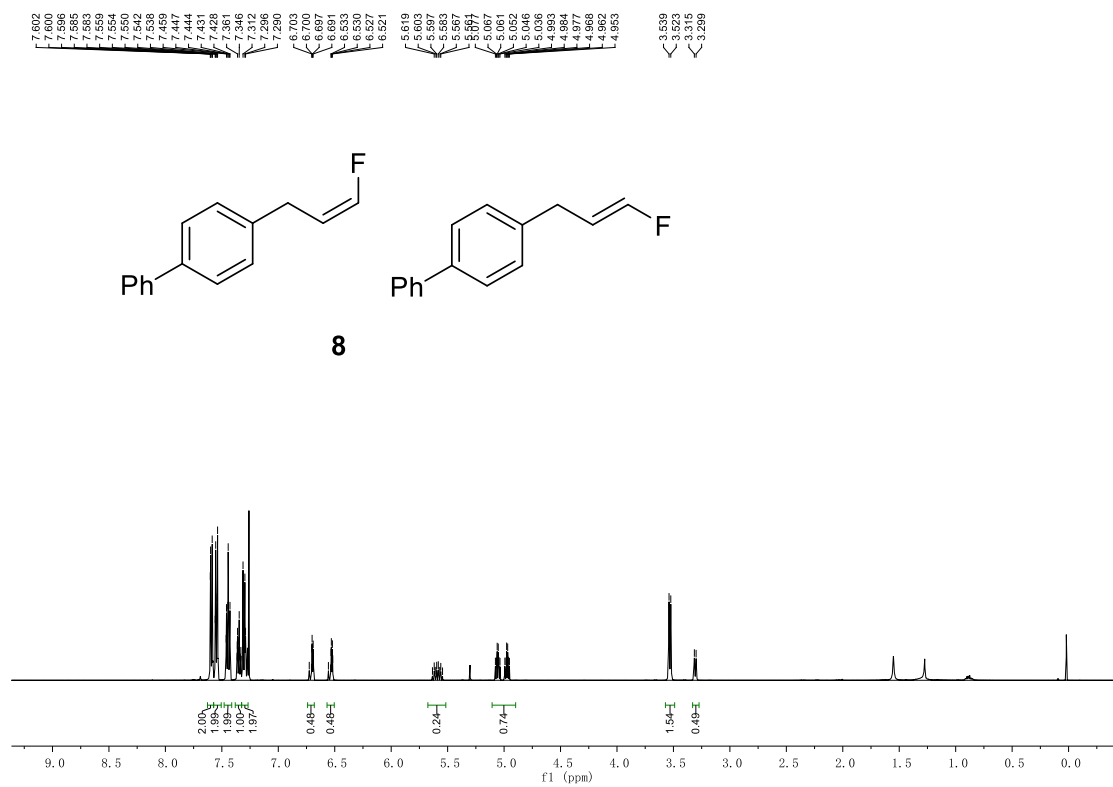
--- 128.715
 --- 129.333
 --- 131.609
 --- 132.226

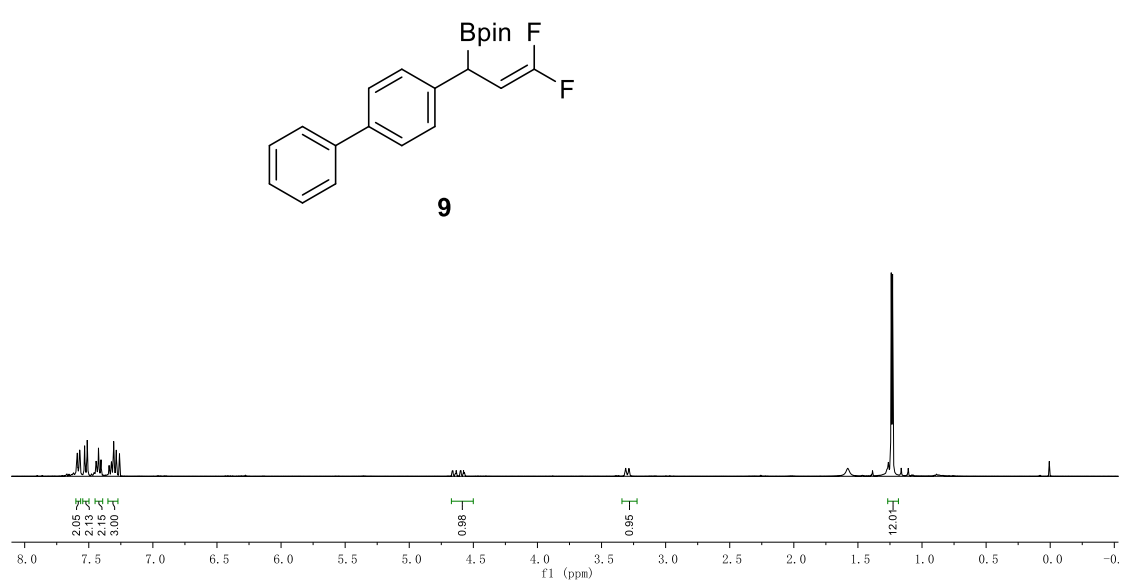
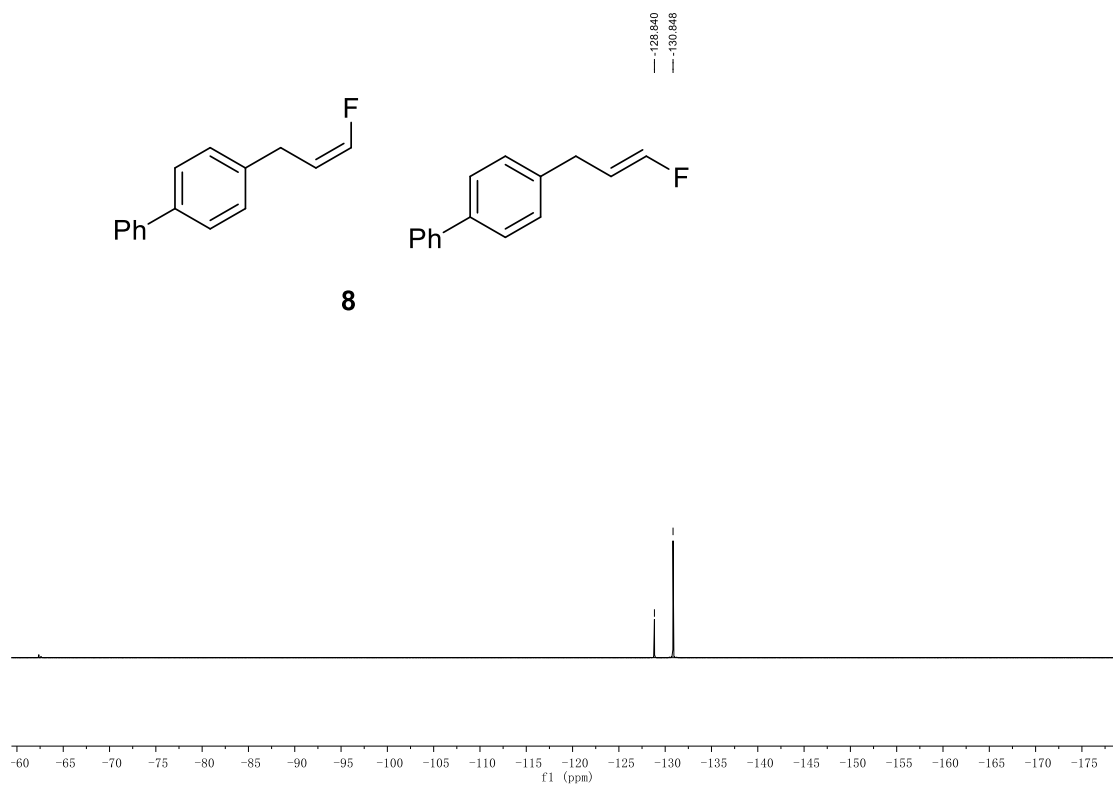


7.639
 7.634
 7.630
 7.619
 7.617
 7.615
 7.604
 7.602
 7.601
 7.601
 7.595
 7.472
 7.461
 7.457
 7.453
 7.448
 7.445
 7.440
 7.388
 7.388
 7.385
 6.988
 6.985
 6.985
 6.392
 6.284
 6.281
 5.161
 5.139
 4.737
 4.734
 4.733
 4.732
 4.715
 4.712
 4.710
 4.707
 4.699
 4.690
 4.688
 4.685
 4.671
 4.668
 4.666
 4.663







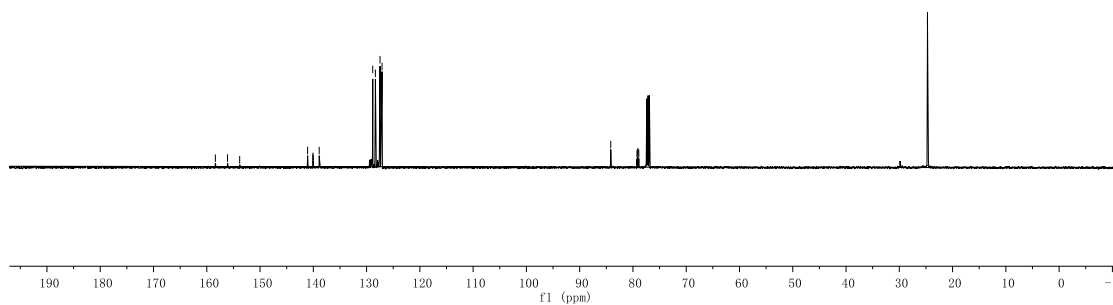
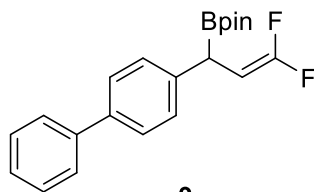


159.385
156.106
153.823

141.070
140.069
140.053
138.886
138.886
128.846
128.345
127.474
127.102
127.102

84.168
79.245
79.083
79.082
78.900

24.723
24.710



88.563
89.085
90.313
90.435

