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Supporting Information to

Visible-light induced three-component alkynyl-difluoroalkylation of unactivated alkenes

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General information

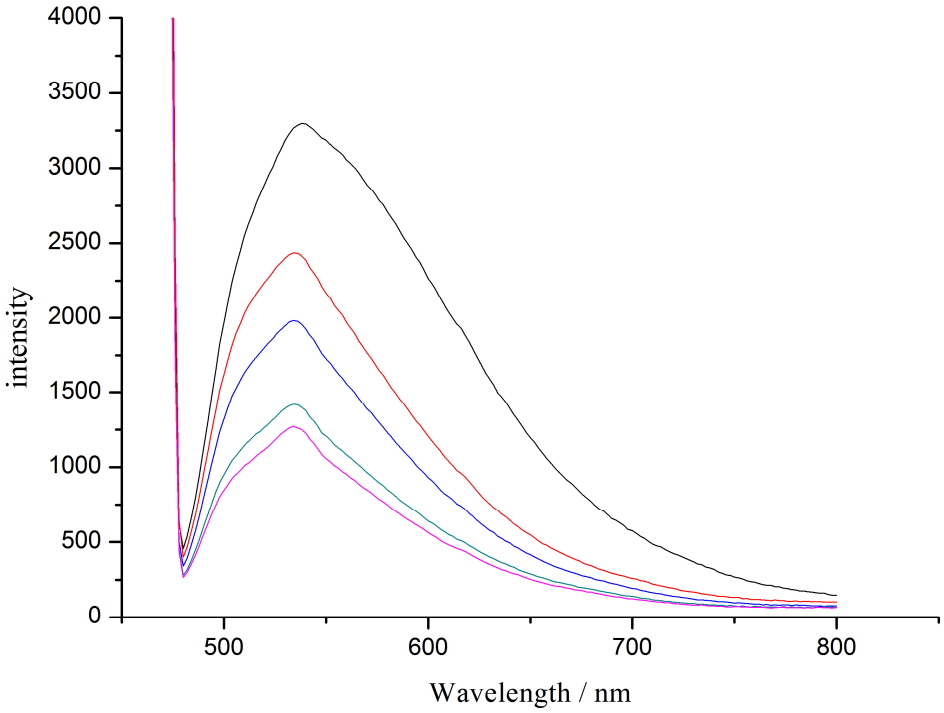
Unless otherwise noted, starting materials **1-3** were used directly from commercial suppliers without further purification. ^{1}H, ^{13}C, and ^{19}F NMR spectra were measured on a 600 or 400 MHz NMR spectrometer using $CDCl_3$ as the solvent with tetramethylsilane (TMS) as the internal standard. Chemical shifts (δ) are given in parts per million relative to TMS, and the coupling constants are given in hertz. High-resolution mass spectrometry (HRMS) analyses were carried out using a TOF MS instrument with an ESI source. Infrared (IR) spectra were recorded on a Nicolet 670 spectrophotometer and reported as wavenumber (cm^{-1}). Column chromatography was performed using silica gel (300−400 mesh). Compounds **1d**[1], **1r**[2], **2a-i**[3], **2j**[4], and **3b-f**[5] were prepared according to the methods reported in the literature.

Quenching experiments

A Hitachi RF-6000 fluorescence spectrometer was used to record the emission intensities. All the solutions were excited at 463 nm and emission intensity at 534 nm was observed. DMF was degassed with a stream of N_2 for 30 min. In a typical experiment, the emission spectrum of a $1x10^{-5}$ M solution of $Ir(ppy)_3$ in DMF was collected. Then, $BrCF_2CO_2Et$ or NEt_3 was added to the measured solution in a quartz cuvette and the emission spectrum of the sample was collected. I_0 and I represent the intensities of the emission in the absence and presence of the quencher at 534 nm. (a) Emission spectra of 1 x 10^{-5} $Ir(ppy)_3$ at λ_{ex} = 463 nm showing the quenching effect of increasing $BrCF_2CO_2Et$ or NEt_3, respectively. (b) The Stern-Volmer plot.

[1] S. L. Rossler, B. S. Schreib, M. Ginterseder, J. Y. Hamilton and E. M. Carreira, *Org. Lett*., 2017, **19**, 5533.
[2] X. Wang and Y. Wu, *Chem. Commun*., 2018, **54**, 1877.
[3] J. Meesin, P. Kattun, C. Pareseecharoen, M. Pomakotr, V. Reutralul, D. Soorukram and C. Kuhakarn, *J. Org. Chem*., 2016, **81**, 2744.
[4] C. C. Chen and J. Waser, *Org. Lett*., 2015, **17**, 736.
[5] L. Wang, X.-L. Jia, J.-J. Zhong, L.-Z. Wu and Q. Liu, *Org. Lett*., 2014, **15**, 5842.

(a)



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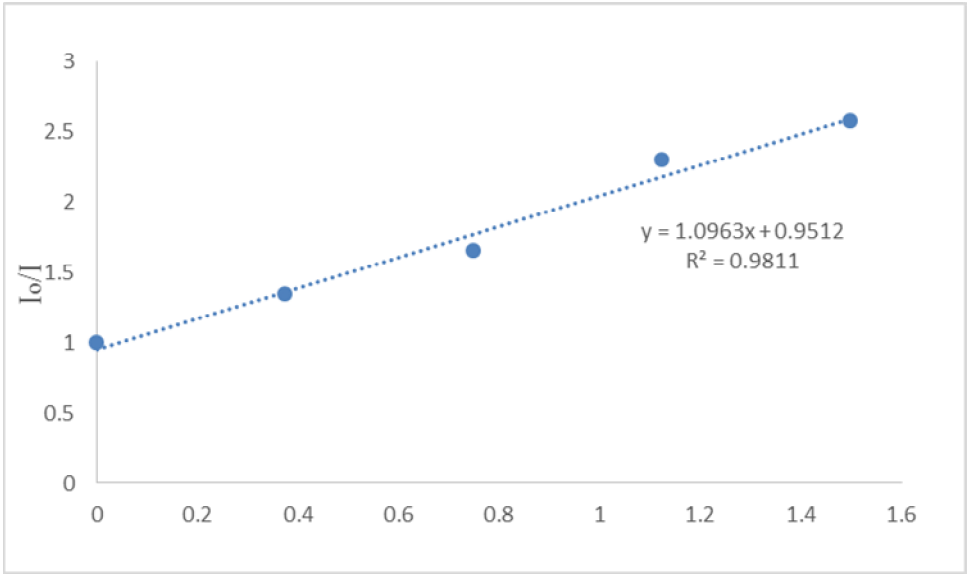
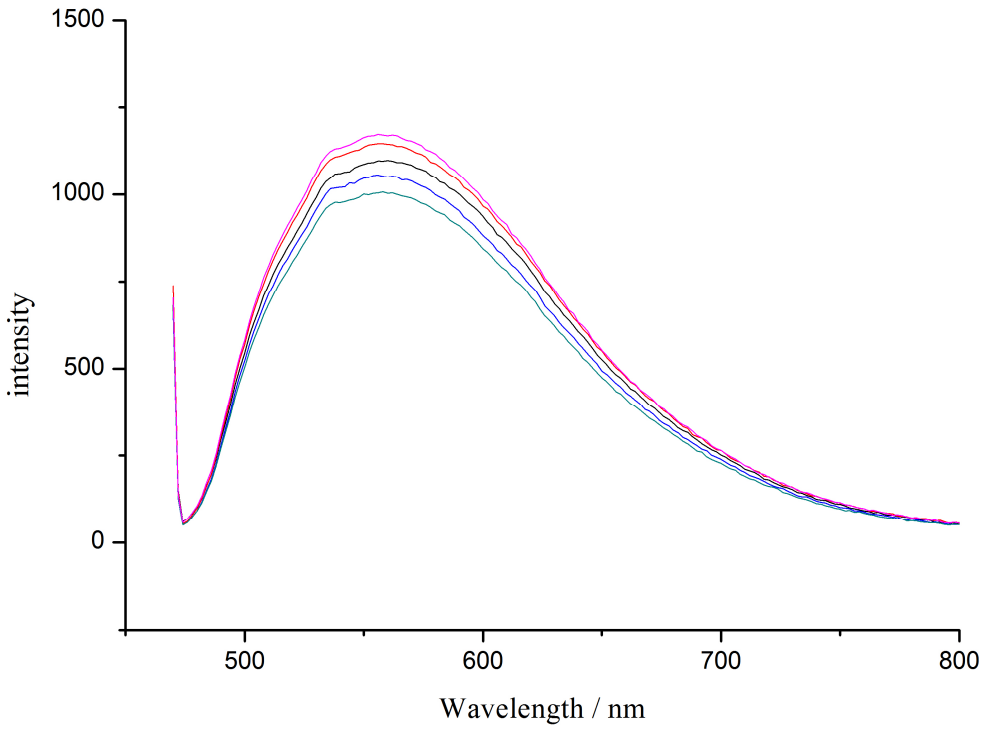


$BrCF_2CO_2Et$ (10^{-3} mol/L)

(a)



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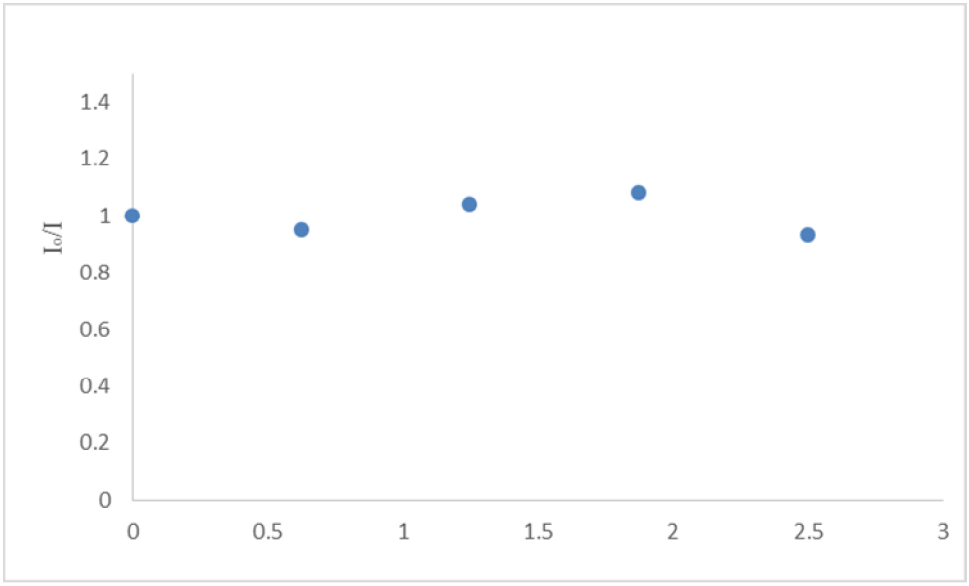
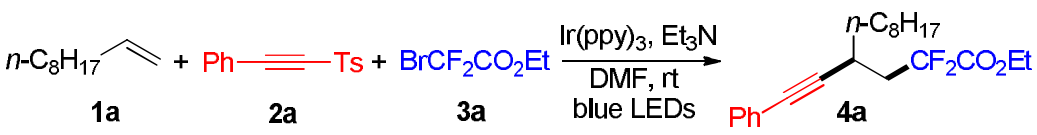


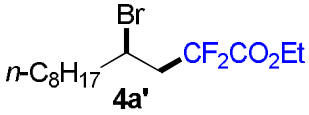
NEt_3 (10^{-3} mol/L)

General procedure for the visible-light induced three-component alkynyl-difluoroalkylation of unactivated alkenes



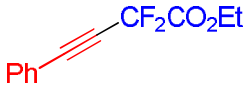
1a **2a** **3a** **4a**

To a mixture of $Ir(ppy)_3$ (2.6 mg, 0.02 mmol), **1a** (28.0 mg, 0.2 mmol), **2a** (102.4 mg, 0.4 mmol), and Et_3N (139 mg, 1.0 mmol) in 2 mL of DMF was added **3a** (151.2 mg, 0.6 mmol) under a nitrogen atmosphere. After 36 h of irradiation with 15 W of blue LEDs at 25°C, the reaction mixture was quenched with water, extracted with EtOAc, washed with brine, dried over anhydrous Na_2SO_4, and concentrated. Column chromatography on silica gel (petroleum ethers/EtOAc = 20:1) gave 55 mg of **4a** (75% yield) as a colorless oil. ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.39–7.38 (m, 2H), 7.28–7.27 (m, 3H), 4.21 (q, J = 7.1 Hz, 2H), 2.89–2.84 (m, 1H), 2.51–2.41 (m, 1H), 2.30–2.22 (m, 1H), 1.60–1.53 (m, 3H), 1.47–1.44 (m, 1H), 1.30–1.26 (m, 13H), 0.88 (t, J = 7.1 Hz, 3H); ^{13}C NMR (151 MHz, $CDCl_3$) δ 164.0 (t, J = 31.3 Hz), 131.5, 128.2, 127.9, 123.4, 115.6 (t, J = 249.2 Hz), 90.6, 82.7, 62.9, 39.8 (t, J = 22.8 Hz), 35.4, 31.8, 29.4, 29.2, 29.2, 26.9, 26.1 (dd, J = 6.1, 3.2 Hz), 22.6, 14.1, 13.8; ^{19}F NMR (565 MHz, $CDCl_3$) δ -100.8 (d, J = 261.8 Hz), -107.0 (d, J = 261.8 Hz); IR (KBr) ν: 2925, 2855, 1768, 1599, 1490, 1089, 756, 691 cm^{-1}; HRMS (ESI) calcd for $C_{22}H_{30}F_2NaO_2$ $(M+Na)^+$ 387.2106 found 387.2105.



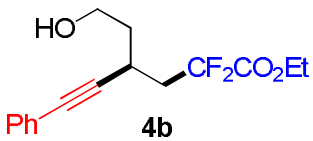
4a'

Compound ***4a'***[6]: It was obtained in 28% yield (13 mg) as a colorless oil using 3 equiv of K_2HPO_4 instead of Et_3N; ^{1}H NMR (600 MHz, $CDCl_3$) δ 4.35 (q, J = 7.1 Hz, 2H), 4.19–4.14(m, 1H), 2.86–2.77 (m, 1H), 2.68–2.60 (m, 1H), 1.89–1.83 (m, 2H), 1.56–1.50 (m, 1H), 1.47–1.42 (m, 1H), 1.37 (t, J = 7.2 Hz, 3H), 1.31–1.28 (m, 10H), 0.88 (t, J = 7.0 Hz, 3H); ^{19}F NMR (565 MHz, $CDCl_3$) δ -101.4 (d, J = 264.4 Hz), -107.3 (d, J = 264.4 Hz).



4a"

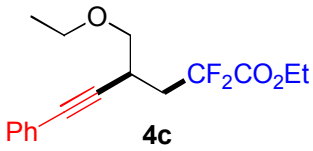
Compound ***4a"***[7]: 7 mg, 15% yield, colorless oil; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.54 (d, J = 7.3 Hz, 2H), 7.45 (t, J = 7.6 Hz, 1H), 7.38 (t, J = 7.4 Hz, 2H), 4.41 (q, J = 7.1 Hz, 2H), 1.40 (t, J = 7.1 Hz, 3H); ^{19}F NMR (565 MHz, $CDCl_3$) δ -90.0.



4b

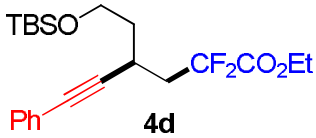
[6] C. Yu, N. Lqbal, S. Park and E. J. Cho, *Chem. Commun*., 2014, **50**, 12884.
[7] T. Besset, T. Poisson and X. Pannecoucke. *Eur. J. Org. Chem*., 2014, **32**, 7220.

Compound ***4b***: 31 mg, 52% yield, colorless oil; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.40–7.38 (m, 2H), 7.30–7.27 (m, 3H), 4.22 (q, J = 7.1 Hz, 2H), 3.90–3.88 (m, 2H), 3.15–3.10 (m, 1H), 2.57–2.47 (m, 1H), 2.36–2.28 (m, 1H), 1.93–1.88 (m, 1H), 1.85–1.80 (m, 1H), 1.77 (s, 1H), 1.27 (t, J = 7.1 Hz, 3H); ^{13}C NMR (151 MHz, $CDCl_3$) δ 163.9 (t, J = 32.7 Hz), 131.5, 128.2, 128.1, 122.9, 115.4 (t, J = 249.5 Hz), 89.5, 83.3, 63.0, 60.4, 39.7 (t, J = 23.2 Hz), 37.8, 23.1 (dd, J = 6.3, 3.8 Hz), 13.8; ^{19}F NMR (565 MHz, $CDCl_3$) δ -101.1 (d, J = 262.8 Hz), -106.6 (d, J = 262.8 Hz); IR (KBr) v: 3500, 2935, 2213, 1760, 1598, 1491, 1442, 1095, 756, 691 cm^{-1}; HRMS (ESI) calcd for $C_{16}H_{19}F_2O_3$ $(M+H)^+$ 297.1297 found 297.1297.



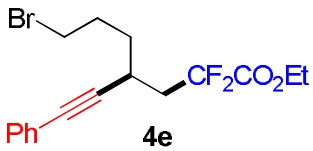
4c

Compound ***4c***: 29 mg, 47% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.43–7.40 (m, 2H), 7.32–7.29 (m, 3H), 4.25 (q, J = 7.1 Hz, 2H), 3.69–3.49 (m, 4H), 3.19–3.12 (m, 1H), 2.65–2.53 (m, 1H), 2.49–2.35 (m, 1H), 1.30 (t, J = 6.9 Hz, 3H), 1.24 (t, J = 7.0 Hz, 3H); ^{13}C NMR (151 MHz, $CDCl_3$) δ 164.0 (t, J = 32.9 Hz), 131.6, 128.2, 128.1, 123.0, 115.6 (t, J = 249.3 Hz), 87.8, 83.0, 72.3, 66.5, 62.9, 36.5 (t, J = 23.4 Hz), 26.9 (dd, J = 5.9, 3.3 Hz), 15.0, 13.8; ^{19}F NMR (565 MHz, $CDCl_3$) δ -101.8 (d, J = 262.0 Hz), -106.1 (d, J = 262.2 Hz); IR (KBr) v: 2959, 2362, 1755, 1599, 1490, 1095, 756, 690 cm^{-1}; HRMS (ESI) calcd for $C_{17}H_{21}F_2O_3$ $(M+H)^+$ 311.1453 found 311.1448.



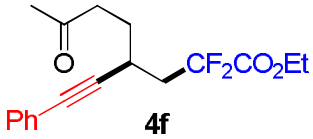
4d

Compound ***4d***: 38 mg, 46% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.39–7.37 (m, 2H), 7.29–7.27 (m, 3H), 4.21 (q, J = 7.2 Hz, 2H), 3.85–3.80 (m, 2H), 3.15–3.08 (m, 1H), 2.53–2.45 (m, 1H), 2.38–2.26 (m, 1H), 1.87–1.74 (m, 2H), 1.27 (t, J = 7.2 Hz, 3H), 0.90 (s, 9H), 0.08 (s, 3H), 0.07 (s, 3H); ^{13}C NMR (151 MHz, $CDCl_3$) δ 164.0 (t, J = 32.4 Hz), 131.5, 128.2, 127.9, 123.3, 115.5 (t, J = 246.3 Hz), 89.9, 82.9, 62.9, 60.3, 39.8 (t, J = 23.4 Hz), 38.2, 25.9, 22.9 (dd, J = 6.0, 3.4 Hz), 18.3, 13.8, -5.4, -5.4; ^{19}F NMR (565 MHz, $CDCl_3$) δ -101.0 (d, J = 262.0 Hz), -106.8 (d, J = 262.0 Hz); IR (KBr) v: 2953, 2928, 2240, 1769, 1491, 1091, 755, 691 cm^{-1}; HRMS (ESI) calcd for $C_{22}H_{32}F_2NaO_3Si$ $(M+Na)^+$ 433.1981 found 433.1975.



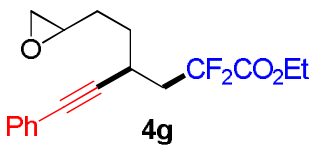
4e

*Compound **4e***: 49 mg, 66% yield, colorless oil; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.40–7.38 (m, 2H), 7.30–7.28 (m, 3H), 4.23 (q, J = 7.2 Hz, 2H), 3.49–3.46 (m, 2H), 2.95–2.91 (m, 1H), 2.55–2.46 (m, 1H), 2.32–2.24 (m, 1H), 2.18–2.15 (m, 1H), 2.09–2.02 (m, 1H), 1.85–1.79 (m, 1H), 1.74–1.68 (m, 1H), 1.28 (t, J = 7.1 Hz, 3H); ^{13}C NMR (151 MHz, $CDCl_3$) δ 163.8 (t, J = 32.1 Hz), 131.5, 128.2, 128.1, 122.9, 115.3 (t, J = 251.9 Hz), 89.4, 83.3, 63.0, 39.8 (t, J = 23.1 Hz), 33.8, 33.2, 30.2, 25.6 (dd, J = 6.1, 3.5 Hz), 13.8; ^{19}F NMR (565 MHz, $CDCl_3$) δ -101.1 (d, J = 262.7 Hz), -106.9 (d, J = 262.7 Hz); IR (KBr) ν: 2953, 2928, 2240, 1769, 1598, 1493, 1012, 755, 693 cm^{-1}; HRMS (ESI) calcd for $C_{17}H_{19}BrF_2NaO_2$ $(M+Na)^+$ 395.0429 found 395.0429.



4f

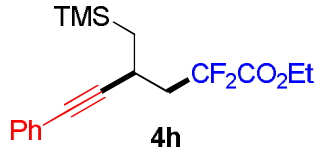
*Compound **4f***: 50 mg, 78% yield, colorless oil; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.39–7.38 (m, 2H), 7.30–7.29 (m, 3H), 4.22 (q, J = 7.1 Hz, 2H), 2.95–2.91 (m, 1H), 2.75–2.66 (m, 2H), 2.52–2.44 (m, 1H), 2.32–2.24 (m, 1H), 2.18 (s, 3H), 1.99–1.93 (m, 1H), 1.81–1.75 (m, 1H), 1.27 (t, J = 7.2 Hz, 3H); ^{13}C NMR (151 MHz, $CDCl_3$) δ 207.7, 163.8 (t, J = 32.5 Hz), 131.5, 128.2, 128.1, 122.9, 115.3 (t, J = 252.8 Hz), 89.3, 83.5, 62.9, 40.9, 39.8 (t, J = 23.3 Hz), 30.1, 29.0, 25.5 (dd, J = 6.1, 3.5 Hz), 13.8; ^{19}F NMR (565 MHz, $CDCl_3$) δ -101.2 (d, J = 263.1 Hz), -106.7 (d, J = 263.0 Hz); IR (KBr) ν: 2925, 2240, 1761, 1710, 1599, 1091, 753, 694 cm^{-1}; HRMS (ESI) calcd for $C_{18}H_{21}F_2O_3$ $(M+H)^+$ 323.1453 found 323.1453.



4g

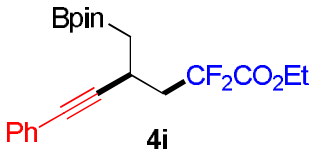
*Compound **4g***: 46 mg, 72% yield, colorless oil; dr = 1:1; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.39–7.38 (m, 2H), 7.29–7.28 (m, 3H), 4.22 (q, J = 7.2 Hz, 2H), 2.99–2.92 (m, 2H), 2.80–2.77 (m, 1H), 2.55–2.45 (m, 2H), 2.33–2.24 (m, 1H), 1.94–1.66 (m, 4H), 1.28 (t, J = 7.1 Hz, 3H); ^{13}C NMR (151 MHz, $CDCl_3$) δ 163.8 (t, J = 32.3 Hz), 131.5, 128.2, 128.0, 128.0, 123.0, 123.0, 115.3 (t, J = 252.7 Hz), 89.6, 89.4, 83.3, 83.2, 62.9, 51.8, 51.5, 47.1, 47.0, 39.8 (t, J = 23.1 Hz), 39.7 (t, J = 23.1 Hz), 31.8, 31.4, 30.2, 29.7, 26.1 (dd, J = 6.0, 3.4 Hz), 25.7 (dd, J = 6.1, 3.5 Hz), 13.7; ^{19}F

NMR (565 MHz, $CDCl_3$) δ -101.0 (dd, J = 262.5, 5.9 Hz), -107.0 (dd, J = 262.6, 29.6 Hz); IR (KBr) v: 2983, 2931, 1762, 1598, 1490, 1095, 757, 692 cm^{-1}; HRMS (ESI) calcd for $C_{18}H_{21}F_2O_3$ $(M+H)^+$ 323.1453 found 323.1449.



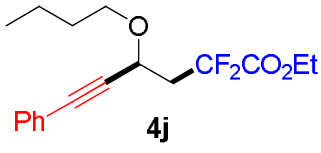
4h

Compound ***4h***: 47 mg, 70% yield, colorless oil; ^1H NMR (600 MHz, $CDCl_3$) δ 7.38–7.36 (m, 2H), 7.29–7.27 (m, 3H), 4.23–4.19 (m, 2H), 3.00–2.96 (m, 1H), 2.59–2.49 (m, 1H), 2.30–2.23 (m, 1H), 1.27 (t, J = 7.1 Hz, 3H), 1.03–0.99 (m, 1H), 0.90–0.87 (m, 1H), 0.11 (s, 9H); ^{13}C NMR (151 MHz, $CDCl_3$) δ 164.0 (t, J = 32.0 Hz), 131.4, 128.2, 127.9, 123.4, 115.4 (t, J = 249.1 Hz), 91.9, 82.4, 62.7, 43.4 (t, J = 22.8 Hz), 24.0, 22.3 (dd, J = 6.6, 3.9 Hz), 13.8, -0.9; ^{19}F NMR (565 MHz, $CDCl_3$) δ -100.6 (d, J = 262.8 Hz), -107.1 (d, J = 262.8 Hz); IR (KBr) v: 2951, 2891, 2175, 1743, 1599, 1491, 1077, 753, 715, 688 cm^{-1}; HRMS (ESI) calcd for $C_{18}H_{24}F_2NaO_2Si$ $(M+Na)^+$ 361.1406 found 361.1398.



4i

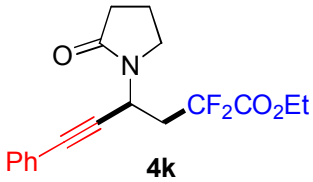
Compound ***4i***: 49 mg, 63% yield, colorless oil; ^1H NMR (400 MHz, $CDCl_3$) δ 7.38–7.35 (m, 2H), 7.27–7.25 (m, 3H), 4.20 (q, J = 7.2 Hz, 2H), 3.16–3.08 (m, 1H), 2.61–2.47 (m, 1H), 2.38–2.26 (m, 1H), 1.28–1.20 (m, 17H); ^{13}C NMR (151 MHz, $CDCl_3$) δ 164.0 (t, J = 33.2 Hz), 131.5, 128.1, 127.7, 123.4, 115.5 (t, J = 252.6 Hz), 91.7, 83.5, 81.8, 62.8, 41.4 (t, J = 22.9 Hz), 24.8, 24.7, 22.0 (dd, J = 6.7, 3.7 Hz), 13.8; ^{19}F NMR (565 MHz, $CDCl_3$) δ -100.9 (d, J = 262.6 Hz), -107.0 (d, J = 262.3 Hz); IR (KBr) v: 2989, 2325, 1765, 1598, 1493, 1086, 756, 696 cm^{-1}; HRMS (ESI) calcd for $C_{21}H_{28}BF_2O_4$ $(M+H)^+$ 393.2043 found 393.2042.



4j

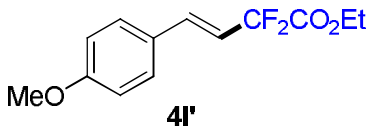
Compound ***4j***: 43 mg, 67% yield, colorless oil; ^1H NMR (600 MHz, $CDCl_3$) δ 7.44–7.42 (m, 2H), 7.34–7.30 (m, 3H), 4.49–4.47 (m, 1H), 4.30–4.25 (m, 2H), 3.77–3.74 (m, 1H), 3.39–3.36 (m, 1H), 2.85–2.76 (m, 1H), 2.57–2.50 (m, 1H), 1.56–1.51 (m, 2H), 1.38–1.33 (m, 5H), 0.92 (t, J = 7.4 Hz); ^{13}C NMR (151 MHz, $CDCl_3$) δ 163.6 (t, J = 31.1 Hz), 131.7, 128.6, 128.3, 122.2, 114.4 (t, J =

248.5 Hz), 86.2, 86.2, 69.2, 64.4 (dd, J = 10.2, 4.6 Hz), 62.6, 41.1 (t, J = 23.5 Hz), 31.4, 19.1, 13.9, 13.8; ^{19}F NMR (565 MHz, $CDCl_3$) δ -101.9 (d, J = 264.0 Hz), -108.7 (d, J = 264.2 Hz); IR (KBr) v: 2959, 2872, 2362, 1754, 1599, 1490, 1098, 755, 715, 690 cm^{-1}; HRMS (ESI) calcd for $C_{18}H_{23}F_2O_3$ $(M+H)^+$ 325.1610 found 325.1607.



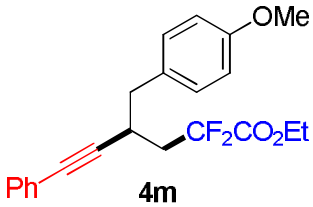
4k

Compound ***4k***: 48 mg, 72% yield, colorless oil; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.42–7.41 (m, 2H), 7.35–7.30 (m, 3H), 5.55–5.52 (m, 1H), 4.28 (q, J = 7.1 Hz, 2H), 3.63–3.59 (m, 1H), 3.48–3.44 (m, 1H), 2.71–2.57 (m, 2H), 2.42–2.39 (m, 2H), 2.10–2.03 (m, 2H), 1.33 (t, J = 7.2 Hz, 3H); ^{13}C NMR (151 MHz, $CDCl_3$) δ 174.2, 163.3 (t, J = 32.2 Hz), 131.7, 128.8, 128.3, 121.9, 114.3 (t, J = 251.4 Hz), 85.2, 84.1, 63.2, 43.1, 38.6 (t, J = 5.8 Hz), 37.7 (t, J = 23.4 Hz), 30.8, 17.8, 13.8; ^{19}F NMR (565 MHz, $CDCl_3$) δ -103.3 (d, J = 271.0 Hz), -105.3 (d, J = 271.0 Hz); IR (KBr) v: 2932, 2221, 1743, 1675, 1599, 1492, 1085, 754, 692 cm^{-1}; HRMS (ESI) calcd for $C_{18}H_{20}F_2NO_3$ $(M+H)^+$ 336.1406 found 336.1405.



4l'

Compound ***4l'***:[8] 26 mg, 51% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.39 (d, J = 8.7 Hz, 2H), 7.03-6.99 (m, 1H), 6.89 (d, J = 8.7 Hz, 2H), 6.20-6.11 (m, 1H), 4.34 (q, J = 7.1 Hz, 2H), 3.82 (s, 3H), 1.36 (t, J = 7.1 Hz, 3H).

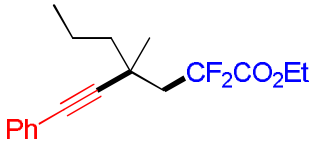


4m

Compound ***4m***: 37 mg, 50% yield, colorless oil; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.36–7.33 (m, 2H), 7.28–7.26 (m, 3H), 7.19 (d, J = 8.5 Hz, 2H), 6.86 (d, J = 8.6 Hz, 2H), 4.19 (q, J = 7.1 Hz, 2H), 3.80 (s, 3H), 3.11–3.07 (m, 1H), 2.92–2.83 (m, 2H), 2.47–2.37 (m, 1H), 2.33–2.25 (m, 1H), 1.24 (t, J = 7.1 Hz, 3H); ^{13}C NMR (151 MHz, $CDCl_3$) δ 163.9 (t, J = 32.7 Hz), 158.4, 131.5, 130.4, 130.1,

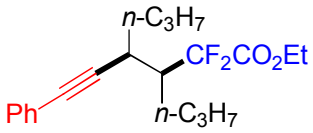
[8] X. Wang, S. Zhao, J. Liu, D. Zhu, M. Guo, X. Tang and G. Wang, *Org. Lett.*, 2017, **19**, 4187.

128.2, 128.0, 123.2, 115.5 (t, J = 252.8 Hz), 113.7, 90.1, 83.51, 62.9, 55.2, 40.6, 38.8 (t, J = 23.2 Hz), 28.2 (dd, J = 6.0, 3.2 Hz), 13.8; ^{19}F NMR (565 MHz, $CDCl_3$) δ -100.7 (d, J = 262.1 Hz), -106.7 (d, J = 262.3 Hz); IR (KBr) v: 2934, 2836, 2364, 1762, 1611, 1245, 1086, 755, 691 cm^{-1}; HRMS (ESI) calcd for $C_{22}H_{23}F_2O_3$ $(M+H)^+$ 373.1610 found 373.1609.



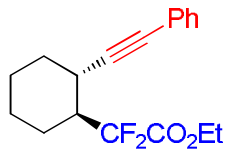
4n

*Compound **4n***: 29 mg, 47% yield, colorless oil; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.39–7.38 (m, 2H), 7.28–7.27 (m, 3H), 4.14 (q, J = 7.1 Hz, 2H), 2.53–2.45 (m, 1H), 2.30–2.20 (m, 1H), 1.64–1.61 (m, 1H), 1.55–1.50 (m, 3H), 1.40 (s, 3H), 1.22 (t, J = 7.1 Hz, 3H), 0.96 (t, J = 7.1 Hz, 3H); ^{13}C NMR (151 MHz, $CDCl_3$) δ 164.1 (t, J = 32.4 Hz), 131.5, 128.1, 127.8, 123.4, 116.0 (t, J = 249.0 Hz), 93.4, 82.7, 62.8, 45.2, 44.4 (t, J = 22.2 Hz), 32.5 (dd, J = 4.7, 1.7 Hz), 27.2 (d, J = 2.7 Hz), 17.9, 14.3, 13.7; ^{19}F NMR (565 MHz, $CDCl_3$) δ -97.6 (d, J = 264.9 Hz), -101.8 (d, J = 264.9 Hz); IR (KBr) v: 2960, 2933, 1767, 1598, 1491, 1056, 755, 715, 691 cm^{-1}; HRMS (ESI) calcd for $C_{18}H_{22}F_2NaO_2$ $(M+Na)^+$ 331.1480 found 331.1488.



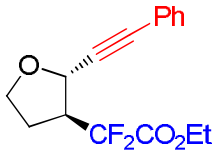
4o

*Compound **4o***: 10 mg, 15% yield, colorless oil; dr = 3:1; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.40–7.38(m, 2H), 7.29–7.27 (m, 3H), 4.27–4.23 (m, 2H), 2.90–2.87 (m, 1H), 2.55–2.47 (m, 1H), 1.71–1.64 (m, 3H), 1.58–1.53 (m, 2H), 1.51–1.40 (m, 3H), 1.30 (t, J = 7.2 Hz, 3H), 0.97–0.94 (m, 6H); ^{13}C NMR (151 MHz, $CDCl_3$) of major isomer δ 164.8 (t, J = 32.9 Hz), 131.5, 128.2, 127.8, 123.6, 117.6 (t, J = 254.0 Hz), 90.5, 83.0, 62.8, 45.8 (t, J = 20.4 Hz), 36.6, 33.2, 31.3 (t, J = 3.7 Hz), 27.8 (t, J = 3.8 Hz), 21.2, 14.2, 13.9, 13.8; ^{19}F NMR (565 MHz, $CDCl_3$) δ -105.6 (d, J = 260.0 Hz), -107.8 (d, J = 260.0 Hz); IR (KBr) v: 2935, 2845, 1760, 1599, 1492, 756, 691 cm^{-1}; HRMS (ESI) calcd for $C_{20}H_{27}F_2O_2$ $(M+H)^+$ 337.1974 found 337.1973.



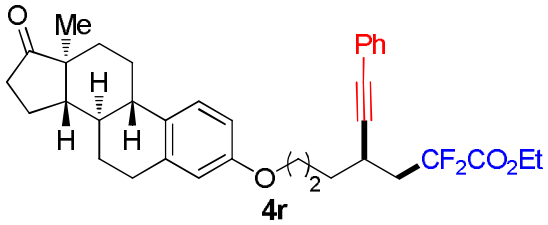
4p

*Compound **4p:*** 24 mg, 40% yield, colorless oil; dr > 20:1; ^{1}H NMR (600 MHz, $CDCl_3$) ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.39–7.38 (m, 2H), 7.28–7.26 (m, 3H), 4.09 (q, J = 7.1 Hz, 2H), 2.58–2.54 (m, 1H), 2.45–2.39 (m, 1H), 2.15–2.12 (m, 1H), 2.03–2.02 (m, 1H), 1.85–1.84 (m, 1H), 1.79–1.76 (m, 1H), 1.57–1.51 (m, 1H), 1.33–1.28 (m, 3H), 1.20 (t, J = 7.2 Hz, 3H); ^{13}C NMR (151 MHz, $CDCl_3$) δ 164.4 (t, J = 33.7 Hz), 131.5, 128.1, 127.9, 123.3, 116.4 (t, J = 248.1 Hz), 90.6, 82.8, 62.7, 45.5 (t, J = 21.5 Hz), 33.3, 29.6 (dd, J = 5.2, 2.5 Hz), 25.1, 24.5, 23.5 (dd, J = 6.4, 2.3 Hz), 13.7; ^{19}F NMR (565 MHz, $CDCl_3$) δ -105.8, -106.2; IR (KBr) ν: 2957, 2933, 2355, 1745, 1599, 1495, 1056, 755, 698 cm^{-1}; HRMS (ESI) calcd for $C_{18}H_{20}F_2NaO_2$ $(M+Na)^+$ 329.1324 found 329.1321.



4q

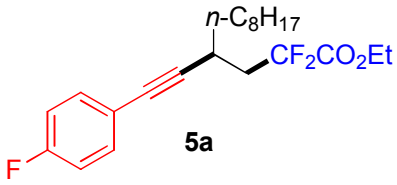
*Compound **4q***: 30 mg, 51% yield, colorless oil; dr > 20:1; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.44–7.42 (m, 3H), 7.34–7.28 (m, 3H), 4.95 (d, J = 5.4 Hz, 1H), 4.34 (q, J = 7.2 Hz, 2H), 4.08–3.94 (m, 2H), 3.23–3.10 (m, 1H), 2.31–2.22 (m, 1H), 2.18–2.11 (m, 1H), 1.35 (t, J = 7.2 Hz, 3H); ^{13}C NMR (151 MHz, $CDCl_3$) δ 163.4 (t, J = 32.5 Hz), 131.7, 128.7, 128.3, 122.1, 115.1 (t, J = 253.5 Hz), 86.7, 85.7, 68.2 (t, J = 4.8 Hz), 67.6, 63.2 , 51.2 (t, J = 22.6 Hz), 26.0, 13.9; ^{19}F NMR (565 MHz, $CDCl_3$) δ -110.3 (d, J = 258.4 Hz), -111.5 (d, J = 258.5 Hz); IR (KBr) ν: 2945, 1767, 1598, 1491, 1150, 1056, cm^{-1}; HRMS (ESI) calcd for $C_{16}H_{16}F_2NaO_3$ $(M+Na)^+$ 317.0960 found 317.0954.



4r

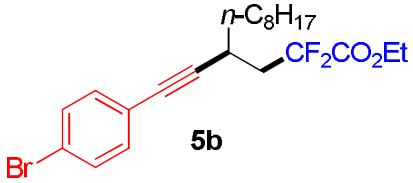
*Compound **4r***: 74 mg, 66% yield, colorless oil; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.39–7.38 (m, 2H), 7.29–7.28 (m, 3H), 7.19 (d, J = 8.6 Hz, 1H), 6.72–6.71 (m, 1H), 6.65 (d, J = 2.5 Hz, 1H), 4.22 (q,

J = 7.1 Hz, 2H), 4.00 (t, J = 6.2 Hz, 2H), 2.99–2.94 (m, 1H), 2.90–2.87 (m, 2H), 2.54–2.48 (m, 2H), 2.40–2.37 (m, 1H), 2.31–2.22 (m, 2H), 2.17–2.11 (m, 1H), 2.07–2.04 (m, 2H), 2.02–1.93 (m, 3H), 1.86–1.81 (m, 1H), 1.75–1.73 (m, 1H), 1.62–1.55 (m, 2H) 1.52–1.48 (m, 3H), 1.45–1.41 (m, 1H), 1.27 (t, J = 7.2 Hz, 3H), 0.90 (s, 3H); ^{13}C NMR (151 MHz, $CDCl_3$) δ 220.9, 163.9 (t, J = 32.6 Hz), 156.9, 137.7, 132.0, 131.5, 128.4, 128.0, 126.3, 123.1, 115.4 (t, J = 252.5 Hz), 114.5, 112.1, 89.9, 83.1, 67.2, 62.9, 50.3, 47.9, 43.9, 39.8 (t, J = 23.0 Hz), 38.3, 35.8, 32.0, 31.5, 29.6, 26.9, 26.5, 25.9, 21.5, 13.8, 13.8; ^{19}F NMR (565 MHz, $CDCl_3$) δ -100.9 (d, J = 262.0 Hz), -106.9 (d, J = 262.3 Hz); IR (KBr) ν: 2950, 2933, 2295, 1745, 1700, 1597, 1500, 1140, 860, 698 cm^{-1}; HRMS (ESI) calcd for $C_{35}H_{40}F_2NaO_4$ $(M+Na)^+$ 585.2787 found 585.2790.



5a

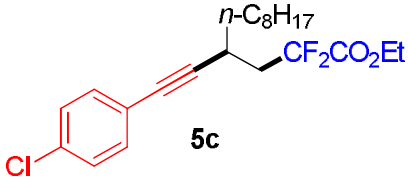
Compound ***5a***: 55 mg, 72% yield, colorless oil; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.38–7.35 (m, 2H), 6.99–6.96 (m, 2H), 4.23–4.20 (m, 2H), 2.87–2.83 (m, 1H), 2.49–2.40 (m, 1H), 2.29–2.21 (m, 1H), 1.58–1.52 (m, 3H), 1.46–1.43 (m, 1H), 1.32–1.25 (m, 13H), 0.88 (t, J = 7.1 Hz, 3H); ^{13}C NMR (151 MHz, $CDCl_3$) δ 164.0 (t, J = 32.4 Hz), 162.3 (d, J = 249.0 Hz), 133.4 (d, J = 8.3 Hz), 119.5 (d, J = 3.5 Hz), 115.5 (t, J = 249.0 Hz), 115.4 (d, J = 22.0 Hz), 90.3, 81.6, 62.9, 39.8 (t, J = 23.1 Hz), 35.4, 31.9, 29.5, 29.2, 29.2, 26.9, 26.0 (dd, J = 5.9, 3.3 Hz), 22.7, 14.1, 13.8; ^{19}F NMR (565 MHz, $CDCl_3$) δ -101.1 (d, J = 262.0 Hz), -106.9 (d, J = 262.0 Hz); IR (KBr) ν: 2927, 2855, 1765, 1489, 1089, 827, 775, 722 cm^{-1}; HRMS (ESI) calcd for $C_{22}H_{30}F_3O_2$ $(M+H)^+$ 383.2192 found 383.2191.



5b

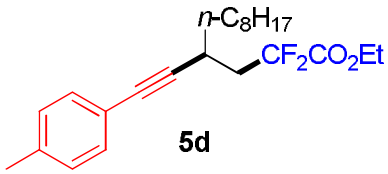
Compound ***5b***: 54 mg, 61% yield, colorless oil; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.42 (d, J = 8.4 Hz, 2H), 7.25 (d, J = 8.4 Hz, 2H), 4.23–4.20 (m, 2H), 2.87–2.83 (m, 1H), 2.49–2.40 (m, 1H), 2.29–2.21 (m, 1H), 1.58–1.51 (m, 3H), 1.45–1.42 (m, 1H), 1.34–1.27 (m, 13H), 0.88 (t, J = 7.1 Hz, 3H); ^{13}C NMR (151 MHz, $CDCl_3$) δ 164.0 (t, J = 32.8 Hz), 133.0, 131.4, 122.3, 122.0, 115.5 (t, J = 249.0 Hz), 91.8, 81.7, 62.9, 39.7 (t, J = 23.1 Hz), 35.3, 31.8, 29.4, 29.2, 29.2, 26.9, 26.1 (dd, J =

6.0, 3.4 Hz), 22.6, 14.1, 13.8; ^{19}F NMR (565 MHz, $CDCl_3$) δ -101.1 (d, J = 262.0 Hz), -106.9 (d, J = 262.0 Hz); IR (KBr) ν: 2926, 1764, 1491, 1088, 828, 775, 723 cm^{-1}HRMS (ESI) calcd for $C_{22}H_{29}BrF_2NaO_2$ $(M+Na)^+$ 465.1211 found 465.1211.



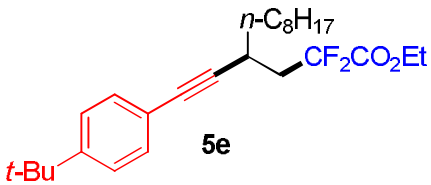
5c

Compound ***5c***: 54 mg, 68% yield, colorless oil; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.31 (d, J = 8.5 Hz, 2H), 7.26 (d, J = 8.3 Hz, 2H), 4.22 (q, J = 7.1 Hz, 2H), 2.88–2.84 (m, 1H), 2.49–2.40 (m, 1H), 2.29–2.21 (m, 1H), 1.60–1.52 (m, 3H), 1.47–1.43 (m, 1H), 1.29–1.27 (m, 13H), 0.88 (t, J = 7.1 Hz, 3H); ^{13}C NMR (151 MHz, $CDCl_3$) δ 164.0 (t, J = 32.8 Hz), 133.9, 132.8, 128.5, 121.9, 115.5 (t, J = 252.5 Hz), 91.7, 81.6, 62.9, 39.7 (t, J = 23.1 Hz), 35.4, 31.9, 29.7, 29.5, 29.3, 29.2, 27.0, 26.1 (dd, J = 6.0, 3.3 Hz), 22.7, 14.1, 13.9; ^{19}F NMR (565 MHz, $CDCl_3$) δ -101.2 (d, J = 262.3 Hz), -106.8 (d, J = 262.3 Hz); IR (KBr) ν: 2925, 1763, 1489, 1466, 1089, 828, 775, 723 cm^{-1}HRMS (ESI) calcd for $C_{22}H_{30}ClF_2O_2$ $(M+H)^+$ 399.1897 found 399.1897.



5d

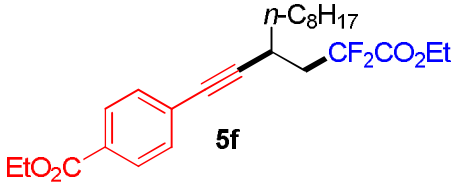
Compound ***5d***: 49 mg, 65% yield, colorless oil; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.27 (d, J = 8.0 Hz, 2H), 7.08 (d, J = 7.9 Hz, 2H), 4.21 (q, J = 7.1 Hz, 2H), 2.86–2.83 (m, 1H), 2.49–2.46 (m, 1H), 2.33 (s, 3H), 2.28–2.23 (m, 1H), 1.59–1.53 (m, 3H), 1.46–1.43 (m, 1H), 1.29–1.26 (m, 13H), 0.88 (t, J = 7.1 Hz, 3H); ^{13}C NMR (151 MHz, $CDCl_3$) δ 164.0 (t, J = 32.0 Hz), 137.9, 131.4, 128.9, 120.3, 115.59 (d, J = 248.8 Hz), 89.7, 82.7, 62.9, 39.9 (t, J = 23.1 Hz), 35.5, 31.8, 29.4, 29.2, 26.9, 26.1 (dd, J = 6.3, 3.3 Hz), 22.7, 21.4, 14.1, 13.8; ^{19}F NMR (565 MHz, $CDCl_3$) δ -100.6 (d, J = 261.4 Hz), -107.1 (d, J = 261.5 Hz); IR (KBr) ν: 2924, 2854, 1761, 1509, 1464, 1089, 815, 774, 723 cm^{-1}; HRMS (ESI) calcd for $C_{23}H_{32}F_2NaO_2$ $(M+Na)^+$ 401.2263 found 401.2260.



5e

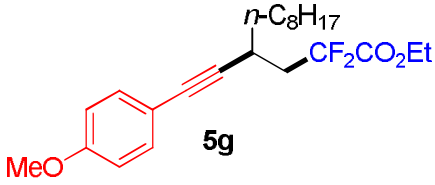
Compound ***5e***: 61 mg, 73% yield, colorless oil; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.33–7.29 (m, 4H),

4.22 (q, J = 7.1 Hz, 2H), 2.88–2.83 (m, 1H), 2.50–2.41 (m, 1H), 2.29–2.21 (m, 1H), 1.59–1.53 (m, 3H), 1.48–1.44 (m, 1H), 1.30–1.26 (m, 22H), 0.88 (t, J = 7.1 Hz, 3H); ^{13}C NMR (151 MHz, $CDCl_3$) δ 164.0 (t, J = 32.9 Hz), 151.1, 131.2, 125.1, 120.4, 115.6 (t, J = 248.9 Hz), 89.8, 82.7, 62.9, 39.9 (t, J = 22.9 Hz), 35.5, 34.7, 31.8, 31.2, 29.5, 29.2, 26.9, 26.1 (dd, J = 6.2, 3.1 Hz), 22.6, 14.1, 13.8; ^{19}F NMR (565 MHz, $CDCl_3$) δ -100.9 (d, J = 261.5 Hz), -107. 0 (d, J = 261.4 Hz); IR (KBr) v: 2923, 2851, 1760, 1501, 1466, 1089, 813, 773, 722 cm^{-1}; HRMS (ESI) calcd for $C_{26}H_{38}F_2NaO_2$ $(M+Na)^+$ 443.2732 found 443.2726.



5f

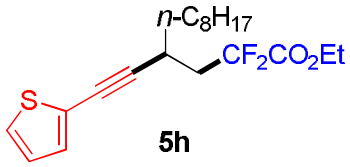
Compound ***5f***: 39 mg, 45% yield, colorless oil; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.96 (d, J = 8.3 Hz, 2H), 7.44 (d, J = 8.3 Hz, 2H), 4.37 (q, J = 7.0 Hz, 2H), 4.24–4.20 (m, 2H), 2.92–2.87 (m, 1H), 2.52–2.42 (m, 1H), 2.31–2.23 (m, 1H), 1.63–1.53 (m, 3H), 1.48–1.45 (m, 1H), 1.39 (t, J = 7.1 Hz, 3H), 1.30–1.26 (m, 13H), 0.88 (t, J = 7.1 Hz, 3H); ^{13}C NMR (151 MHz, $CDCl_3$) δ 166.1, 163.9 (t, J = 32.8 Hz), 131.4, 129.6, 129.3, 128.0, 115.4 (t, J = 249.7 Hz), 93.8, 82.1, 62.9, 61.1, 39.6 (t, J = 23.0 Hz), 35.3, 31.8, 29.4, 29.2, 29.2, 26.9, 26.1 (dd, J = 5.5, 2.9 Hz), 22.6, 14.3, 14.1, 13.8; ^{19}F NMR (565 MHz, $CDCl_3$) δ -101.2 (d, J = 262.0 Hz), -106.9 (d, J = 262.1 Hz); IR (KBr) v: 2931, 2854, 1761, 1725, 1499, 1466, 1089, 822, 773, 722 cm^{-1}; HRMS (ESI) calcd for $C_{25}H_{34}F_2NaO_4$ $(M+Na)^+$ 459.2317 found 459.2305.



5g

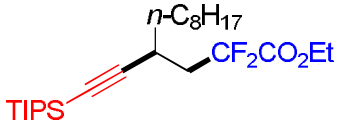
Compound ***5g***: 58 mg, 74% yield, colorless oil; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.32 (d, J = 8.8 Hz, 2H), 6.81 (d, J = 8.8 Hz, 2H), 4.22–4.19 (m, 2H), 3.80 (s, 3H), 2.86–2.82 (m, 1H), 2.50–2.40 (m, 1H), 2.28–2.20 (m, 1H), 1.58–1.52 (m, 3H), 1.46–1.44 (m, 1H), 1.31–1.26 (m, 13H), 0.88 (t, J = 7.1 Hz, 3H); ^{13}C NMR (151 MHz, $CDCl_3$) δ 164.0 (t, J = 32.2 Hz), 159.3, 132.9, 115.6 (t, J = 248.8 Hz), 115.6, 113.8, 89.0, 82.5, 62.9, 55.2, 39.9 (t, J = 23.1 Hz), 35.5, 31.8, 29.5, 29.2, 26.9, 26.1 (dd, J = 6.1, 3.3 Hz), 22.7, 14.1, 13.8; ^{19}F NMR (565 MHz, $CDCl_3$) δ -100.6 (d, J = 261.5 Hz), -107.1 (d, J = 261.5 Hz); IR (KBr) v: 2935, 2854, 1762, 1511, 1245, 1086, 820, 777, 755 cm^{-1};

HRMS (ESI) calcd for $C_{23}H_{33}F_2O_3$ $(M+H)^+$ 395.2392 found 395.2393.



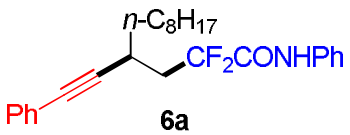
5h

Compound ***5h***: 34 mg, 46% yield, colorless oil; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.20–7.19 (m, 1H), 7.13–7.13 (m, 1H), 6.94–6.93 (m, 1H), 4.26 (q, J = 7.2 Hz, 2H), 2.91–2.86 (m, 1H), 2.50–2.39 (m, 1H), 2.29–2.21 (m, 1H), 1.60–1.49 (m, 3H), 1.46–1.43 (m, 1H), 1.32–1.27 (m, 13H), 0.88 (t, J = 7.0 Hz, 3H); ^{13}C NMR (151 MHz, $CDCl_3$) δ 163.9 (t, J = 32.8Hz), 131.5, 126.8, 126.4, 123.4, 115.4 (t, J = 249.2 Hz), 94.5, 75.9, 63.0, 39.6 (t, J = 23.1 Hz), 35.3, 31.8, 29.4, 29.2, 29.2, 26.9, 26.3 (dd, J = 6.2, 3.3 Hz), 22.6, 14.1, 13.8; ^{19}F NMR (565 MHz, $CDCl_3$) δ -101.0 (d, J = 261.8 Hz), -107.1 (d, J = 261.9 Hz); IR (KBr) v: 2923, 2854, 1754, 1642, 1413, 1190, 1082, 722, 697 cm^{-1}; HRMS (ESI) calcd for $C_{20}H_{28}F_2NaO_2S$ $(M+Na)^+$ 393.1670 found 393.1670.



5i

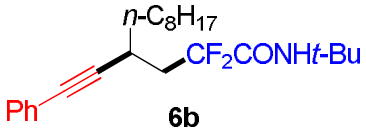
Compound ***5i***: 47 mg, 53% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 4.32 (q, J = 7.1 Hz, 2H), 2.72 (brs, 1H), 2.43–2.30 (m, 1H), 2.25–2.12 (m, 1H), 1.54–1.44 (m, 4H), 1.36 (t, J = 7.2 Hz, 3H), 1.27 (brs, 10H), 1.08–1.00 (m, 21H), 0.88 (t, J = 6.8 Hz, 3H); ^{13}C NMR (151 MHz, $CDCl_3$) δ 164.1 (t, J = 32.8 Hz), 115.4 (t, J = 251.6 Hz), 109.7, 82.1, 62.8, 39.9 (t, J = 22.6 Hz), 35.5, 31.9, 29.5, 29.2, 29.1, 26.8, 26.3 (t, J = 4.1 Hz), 22.7, 18.6, 14.1, 13.9, 11.2; ^{19}F NMR (565 MHz, $CDCl_3$) δ -103.7 (d, J = 261.4 Hz), 104.7 (d, J = 261.4 Hz); IR (KBr) v: 2924, 2863, 2167, 1770, 1375, 1192, 777, 723 cm^{-1}; HRMS (ESI) calcd for $C_{25}H_{46}F_2NaO_2Si$ $(M+Na)^+$ 467.3127 found 467.3117.



6a

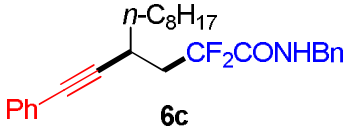
Compound ***6a***: 42 mg, 61% yield, colorless oil; ^{1}H NMR (600 MHz, $CDCl_3$) δ 8.05 (s, 1H), 7.53–7.51 (m, 2H), 7.31–7.25 (m, 4H), 7.22–7.13 (m, 4H), 2.91–2.87 (m, 1H), 2.58–2.53 (m, 1H), 2.44–2.36 (m, 1H), 1.61–1.56 (m, 3H), 1.48–1.45 (m, 1H), 1.29–1.26 (m, 10H), 0.87 (t, J = 7.1 Hz, 3H); ^{13}C NMR (151 MHz, $CDCl_3$) δ 161.8 (t, J = 28.0 Hz), 136.0, 131.5, 129.1, 128.0, 127.7, 125.4, 123.2, 120.2, 117.6 (t, J = 254.2 Hz), 90.5, 82.9, 38.9 (t, J = 22.7 Hz), 35.6, 31.8, 29.4, 29.3,

29.2, 26.9, 26.2 (t, J = 4.8 Hz), 22.6, 14.0; ^{19}F NMR (565 MHz, $CDCl_3$) δ -101.2 (d, J = 256.3 Hz), -105.0 (d, J = 256.3 Hz); IR (KBr) v: 3305, 2919, 2852, 2361, 1686, 1600, 1541, 1446, 1117, 745, 686 cm^{-1}; HRMS (ESI) calcd for $C_{26}H_{32}F_2NO$ $(M+H)^+$ 412.2446 found 412.2439.



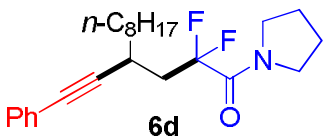
6b

Compound ***6b***: 41 mg, 52% yield, colorless oil; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.40–7.38 (m, 2H), 7.29–7.27 (m, 3H), 6.23 (s, 1H), 2.85–2.80 (m, 1H), 2.39–2.31 (m, 2H), 1.61–1.54 (m, 3H), 1.47–1.44 (m, 1H), 1.37 (s, 9H), 1.30–1.26 (m, 10H), 0.88 (t, J = 7.1 Hz, 3H); ^{13}C NMR (151 MHz, $CDCl_3$) δ 163.0 (t, J = 27.1 Hz), 131.5, 128.2, 127.7, 123.6, 117.4 (t, J = 254.3 Hz), 91.3, 82.2, 51.8, 38.9 (t, J = 22.8 Hz), 35.4, 31.8, 29.4, 29.2, 29.2, 28.3, 26.9, 26.2 (dd, J = 5.3, 3.1 Hz), 22.6, 14.0; ^{19}F NMR (565 MHz, $CDCl_3$) δ 102.7 (d, J = 253.1 Hz), 104.0 (d, J = 253.1 Hz); IR (KBr) v: 3470, 2925, 2854, 2345, 1704, 1490, 1457, 1226, 1082, 755, 691 cm^{-1}; HRMS (ESI) calcd for $C_{24}H_{36}F_2NO$ $(M+H)^+$ 392.2759 found 392.2757.



6c

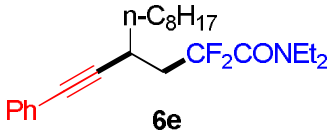
Compound ***6c***: 56 mg, 66% yield, colorless oil; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.31–7.30 (m, 2H), 7.25–7.19 (m, 6H), 7.16–7.15 (m, 2H), 6.60 (s, 1H), 4.47–4.43 (m, 1H), 4.29–4.25 (m, 1H), 2.78–2.74 (m, 1H), 2.46–2.36 (m, 1H), 2.32–2.24 (m, 1H), 1.53–1.47 (m, 3H), 1.39–1.35 (m, 1H), 1.26–1.19 (m, 10H), 0.81 (t, J = 7.0 Hz, 3H); ^{13}C NMR (151 MHz, $CDCl_3$) δ 163.9 (t, J = 28.3 Hz), 136.6, 131.6, 128.8, 128.2, 127.9, 127.8, 127.8, 123.5, 115.9 (t, J = 253.2 Hz), 90.8, 82.6, 43.6, 39.0 (t, J = 22.8 Hz), 35.5, 31.8, 29.5, 29.2, 29.2, 26.9, 26.2 (t, J = 4.7 Hz), 22.6, 14.1; ^{19}F NMR (565 MHz, $CDCl_3$) δ -102.5 (d, J = 256.7 Hz), -104.8 (d, J = 256.9 Hz); IR (KBr) v: 3310, 2914, 2849, 2359, 1674, 1597, 1552, 1185, 1050, 758, 692 cm^{-1}; HRMS (ESI) calcd for $C_{27}H_{33}F_2NONa$ $(M+Na)^+$ 448.2422 found 448.2420.



6d

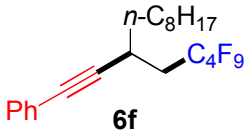
Compound ***6d***: 44 mg, 51% yield, colorless oil; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.39–7.38 (m, 2H), 7.28–7.27 (m, 3H), 3.72 (t, J = 6.8 Hz, 2H), 3.50–3.48 (m, 2H), 2.97–2.92 (m, 1H), 2.52–2.35 (m,

2H), 1.96–1.89 (m, 2H), 1.81–1.76 (m, 2H), 1.64–1.55 (m, 3H), 1.50–1.45 (m, 1H), 1.30–1.25 (m, 10H), 0.88 (t, J = 7.1 Hz, 3H); ^{13}C NMR (151 MHz, $CDCl_3$) δ 162.2 (t, J = 29.0 Hz), 131.6, 128.1, 127.6, 123.8, 118.5 (t, J = 253.5 Hz), 91.9, 81.8, 47.5, 46.7 (t, J = 6.5 Hz), 39.6 (t, J = 22.5 Hz), 35.7, 31.9, 29.5, 29.3, 29.3, 27.0, 26.5, 26.0 (t, J = 4.2 Hz), 23.2, 22.7, 14.1; ^{19}F NMR (565 MHz, $CDCl_3$) δ -101.4, -101.4; IR (KBr) ν: 2924, 2854, 1659, 1598, 1489, 1203, 755, 691 cm^{-1}; HRMS (ESI) calcd for $C_{24}H_{34}F_2NO$ $(M+H)^+$ 390.2603 found 390.2599.



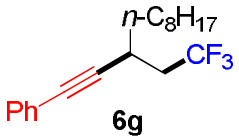
6e

Compound ***6e***: 36 mg, 46% yield, colorless oil; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.39–7.38 (m, 2H), 7.28–7.26 (m, 3H), 3.58–3.50 (m, 2H), 3.41–3.35 (m, 2H), 2.98–2.97 (m, 1H), 2.51–2.38 (m, 2H), 1.63–1.58 (m, 3H), 1.48 (brs, 1H), 1.30–1.27 (m, 10H), 1.21 (t, J = 6.7 Hz, 3H), 1.16–1.13 (m, 3H), 0.89–0.87 (m, 3H); ^{13}C NMR (151 MHz, $CDCl_3$) δ 162.8 (t, J = 29.1 Hz), 131.5, 128.1, 127.5, 123.9, 119.0 (t, J = 255.6 Hz), 92.3, 81.7, 41.9 (t, J = 6.3 Hz), 41.6, 40.1 (t, J = 22.4 Hz), 35.7, 31.9, 29.5, 29.3, 29.3, 27.0, 26.0 (t, J = 3.9 Hz), 22.7, 14.3, 14.1, 12.3; ^{19}F NMR (565 MHz, $CDCl_3$) δ -98.2 (d, J = 278.1 Hz), -99.9 (d, J = 278.1 Hz); IR (KBr) ν: 2924, 2855, 1670, 1489, 1463, 1194, 1070, 755, 691 cm^{-1}; HRMS (ESI) calcd for $C_{24}H_{36}F_2NO$ $(M+H)^+$ 392.2759 found 392.2755.



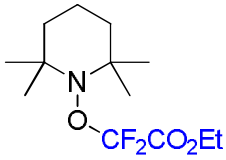
6f

Compound ***6f***: It was prepared according the general procedure from C_4F_9I (**3g**) using 1.5 equiv of **1a** and 2.0 equiv of **2a** in 64 mg (70% yield, based on **3g**) as a colorless oil; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.41–7.39 (m, 2H), 7.29–7.28 (m, 3H), 3.06–3.01 (m, 1H), 2.47–2.40 (m, 1H), 2.30–2.21 (m, 1H), 1.68–1.57 (m, 3H), 1.50–1.49 (m, 1H), 1.31–1.26 (m, 10H), 0.88 (t, J = 7.1 Hz, 3H); ^{13}C NMR (151 MHz, $CDCl_3$) δ 131.6, 128.1, 127.9, 123.5, 117.9, 110.5, 108.9, 90.6, 82.5, 36.1, 35.5, 31.9, 29.7, 29.4, 29.2, 27.0, 25.2, 22.7, 14.0; ^{19}F NMR (565 MHz, $CDCl_3$) δ -81.0 (t, J = 9.3 Hz), -113.5–113.6 (m), -124.5–124.6 (m), -125.9 (t, J = 11.5 Hz); IR (KBr) ν: 2927, 2857, 2359, 1599, 1490, 1218, 1132, 755, 722, 690 cm^{-1}; HRMS (ESI) calcd for $C_{22}H_{26}F_5$ $(M+H)^+$ 461.1885 found 461.1886.



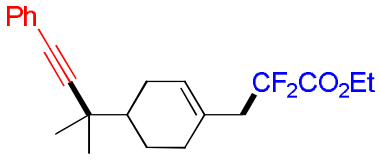
6g

Compound ***6g***: 36 mg, 59% yield, colorless oil; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.40–7.39 (m, 2H), 7.29–7.28 (m, 3H), 2.94–2.90 (m, 1H), 2.47–2.38 (m, 1H), 2.32–2.24 (m, 1H), 1.64–1.55 (m, 3H), 1.49–1.45 (m, 1H), 1.35–1.27 (m, 10H), 0.88 (t, J = 6.9 Hz, 3H); ^{13}C NMR (151 MHz, $CDCl_3$) δ 131.6, 128.2, 127.9, 126.3 (q, J = 277.6 Hz), 123.4, 90.2, 82.5, 39.2 (q, J = 27.4 Hz), 34.8, 31.8, 29.4, 29.2, 29.2, 26.9, 26.5 (q, J = 3.0 Hz), 22.7, 14.0; ^{19}F NMR (565 MHz, $CDCl_3$) δ -64.1; IR (KBr) v: 2927, 2228, 1598, 1218, 1140, 757, 690 cm^{-1}; HRMS (ESI) calcd for $C_{17}H_{26}F_3$ $(M+H)^+$ 311.1981 found 311.1980.



7

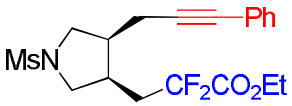
Compound 7:[9] 31 mg, 55% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 4.36 (q, J = 7.1 Hz, 2H), 1.62–1.55 (m, 6H), 1.37 (t, J = 7.2 Hz, 3H), 1.20–1.17 (m, 12H); ^{19}F NMR (565 MHz, $CDCl_3$) δ -74.4; HRMS (ESI) calcd for $C_{13}H_{24}F_2NO_3$ $(M+H)^+$ 280.1719 found 280.1722.



9

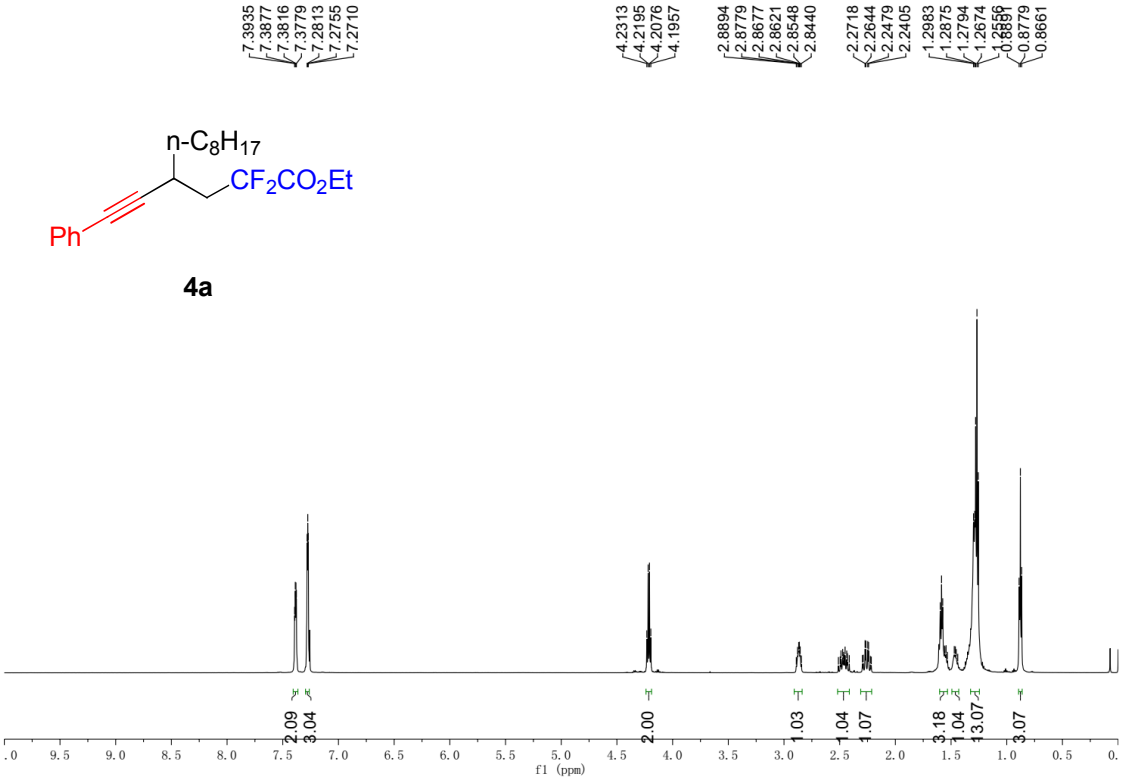
Compound ***9***: 37 mg, 52% yield, colorless oil; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.38–7.36 (m, 2H), 7.28–7.25 (m, 3H), 5.63 (d, J = 2.2 Hz, 1H), 4.30 (q, J = 7.1 Hz, 2H), 2.77–2.70 (m, 2H), 2.23–2.09 (m, 3H), 2.03–1.99 (m, 2H), 1.49–1.39 (m, 2H), 1.33 (t, J = 7.1 Hz, 3H), 1.29 (s, 3H), 1.26 (s, 3H); ^{13}C NMR (151 MHz, $CDCl_3$) δ 164.2 (t, J = 32.8 Hz), 131.6, 128.5, 128.3 (t, J = 3.9 Hz), 128.1, 127.4, 124.0, 116.1 (t, J = 252.5 Hz), 96.1, 81.1, 62.6, 43.3, 42.6 (t, J = 23.1Hz), 34.6, 30.0, 27.8, 27.2, 27.0, 24.7, 14.0; ^{19}F NMR (565 MHz, $CDCl_3$) δ -102.8 (d, J = 253.7 Hz), -103.6 (d, J = 253.7 Hz); IR (KBr) v: 2924, 1762, 1598, 1219, 1183, 1059, 755, 691 cm^{-1}; HRMS (ESI) calcd for $C_{22}H_{26}F_2NaO_2$ $(M+Na)^+$ 383.1793 found 383.1795.

[9] G. Ma, W. Wan, J. Li, Q. Hu, H. Jiang, S. Zhu, J. Wang and J. Hao, *Chem. Commun.*, 2014, **50**, 9749.



11

Compound ***11***: 36 mg, 45% yield, colorless oil; dr > 20:1; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.39–7.37 (m, 2H), 7.31–7.29 (m, 3H), 4.34 (q, J = 7.1 Hz, 2H), 3.64–3.61 (m, 1H), 3.55–3.54 (m, 2H), 3.26 (t, J = 9.6 Hz, 1H), 2.86 (s, 3H), 2.72–2.69 (m, 1H), 2.66–2.62 (m, 1H), 2.58–2.54 (m, 1H), 2.46–2.37 (m, 2H), 2.25–2.17 (m, 1H), 1.36 (t, J = 7.1 Hz, 3H); ^{13}C NMR (151 MHz, $CDCl_3$) δ 163.7 (t, J = 32.6 Hz), 131.5, 128.3, 128.1, 122.9, 115.5 (t, J = 251.8 Hz), 86.4, 82.6, 63.3, 51.8, 51.0, 40.7, 35.3, 35.3 (t, J = 2.8 Hz), 32.6 (t, J = 23.4 Hz), 18.9, 13.9; ^{19}F NMR (565 MHz, $CDCl_3$) δ -104.5 (d, J = 262.5 Hz), -106.0 (d, J = 262.6 Hz); IR (KBr) v: 2933, 2860, 1760, 1597, 1490, 1328, 757, 693 cm^{-1}; HRMS (ESI) calcd for $C_{19}H_{23}F_2NO_4SNa$ $(M+Na)^+$ 422.1208 found 422.1208.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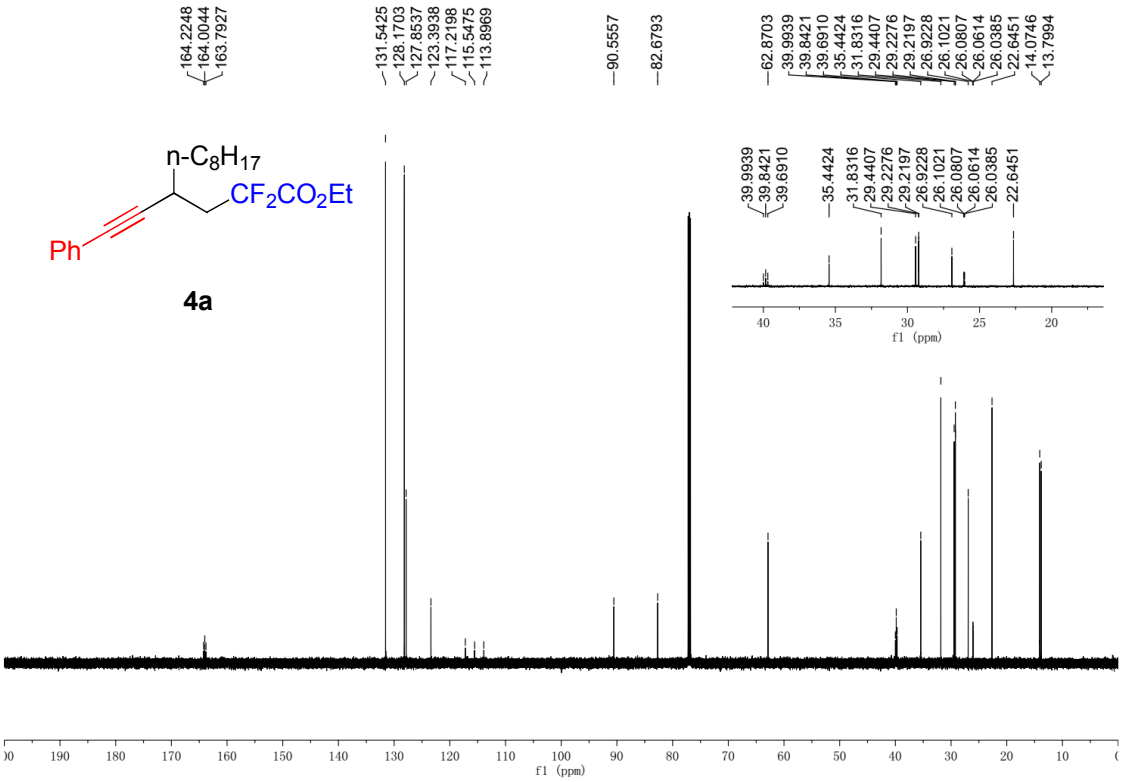
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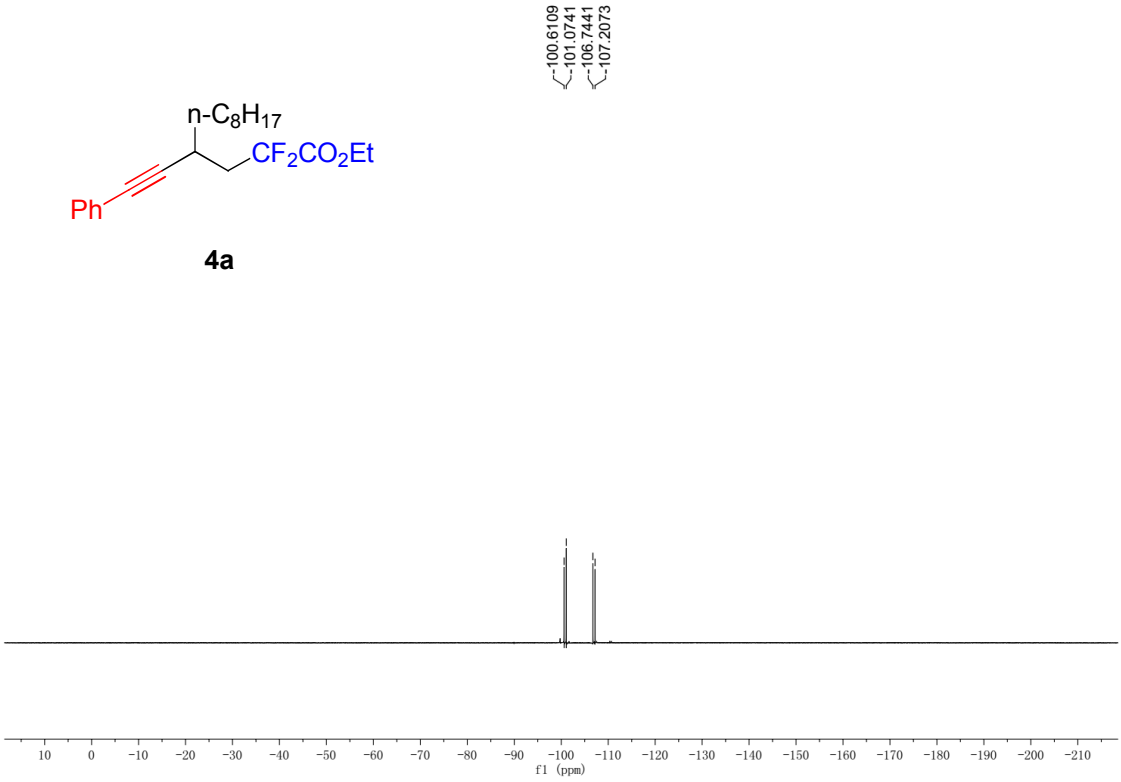
4a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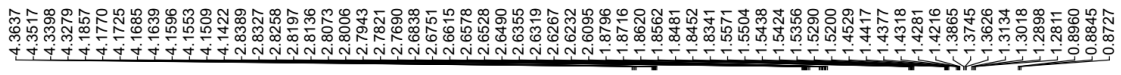
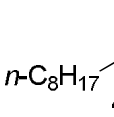
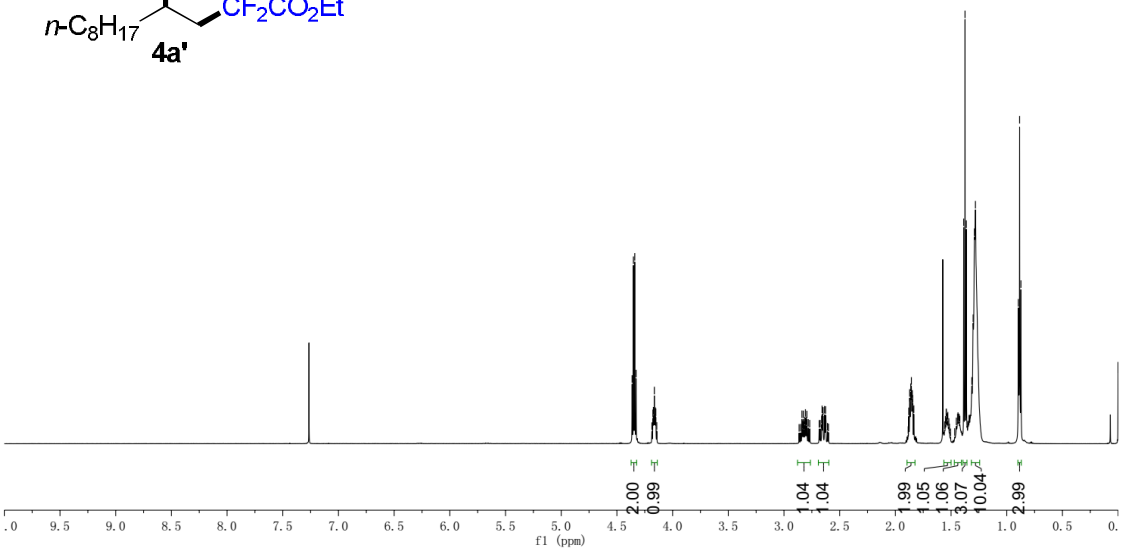
107.2073
f1 (ppm)


4.3637
4.3517
4.3398
4.3279
4.1857
4.1770
4.1725
4.1685
4.1639
4.1596
4.1553
4.1509
4.1422
2.8389
2.8327
2.8258
2.8197
2.8136
2.8073
2.8006
2.7943
2.7821
2.7690
2.6838
2.6751
2.6615
2.6578
2.6528
2.6490
2.6355
2.6319
2.6267
2.6232
2.6095
1.8796
1.8716
1.8620
1.8562
1.8481
1.8452
1.8341
1.5571
1.5504
1.5438
1.5424
1.5356
1.5290
1.5200
1.4529
1.4417
1.4377
1.4318
1.4281
1.4216
1.3865
1.3745
1.3626
1.3134
1.3018
1.2898
1.2811
0.8960
0.8845
0.8727

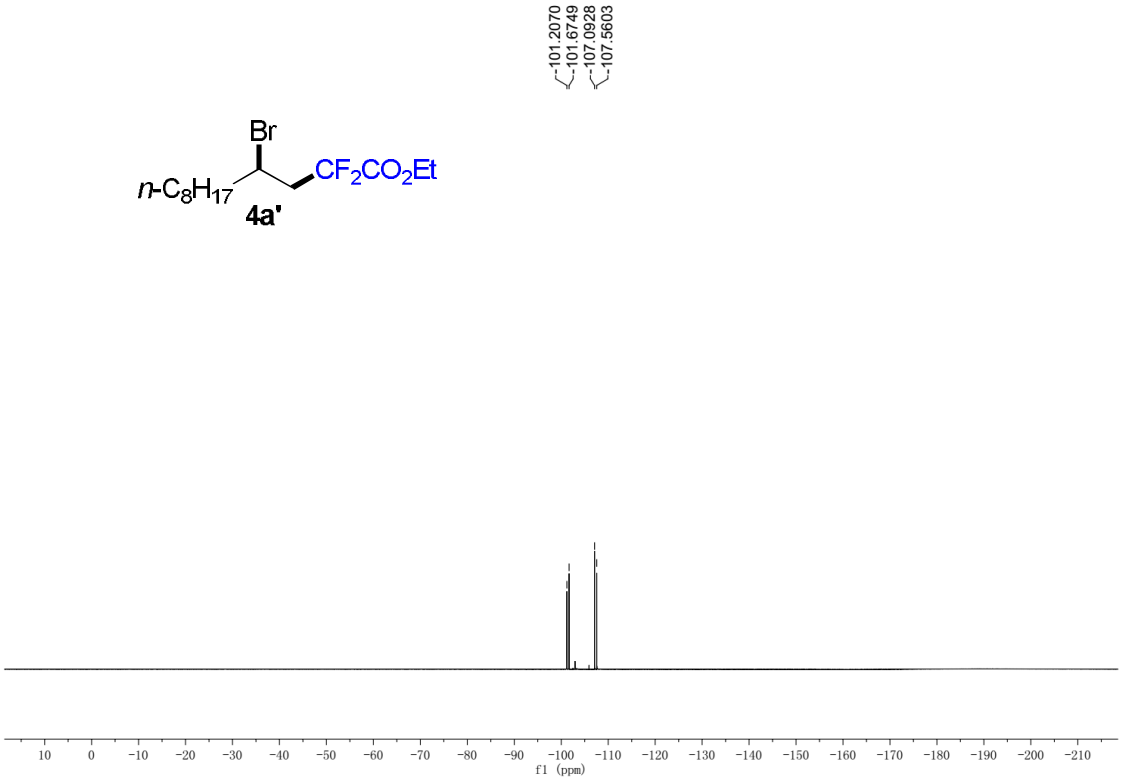

Br
n-C8H17
CF2CO2Et

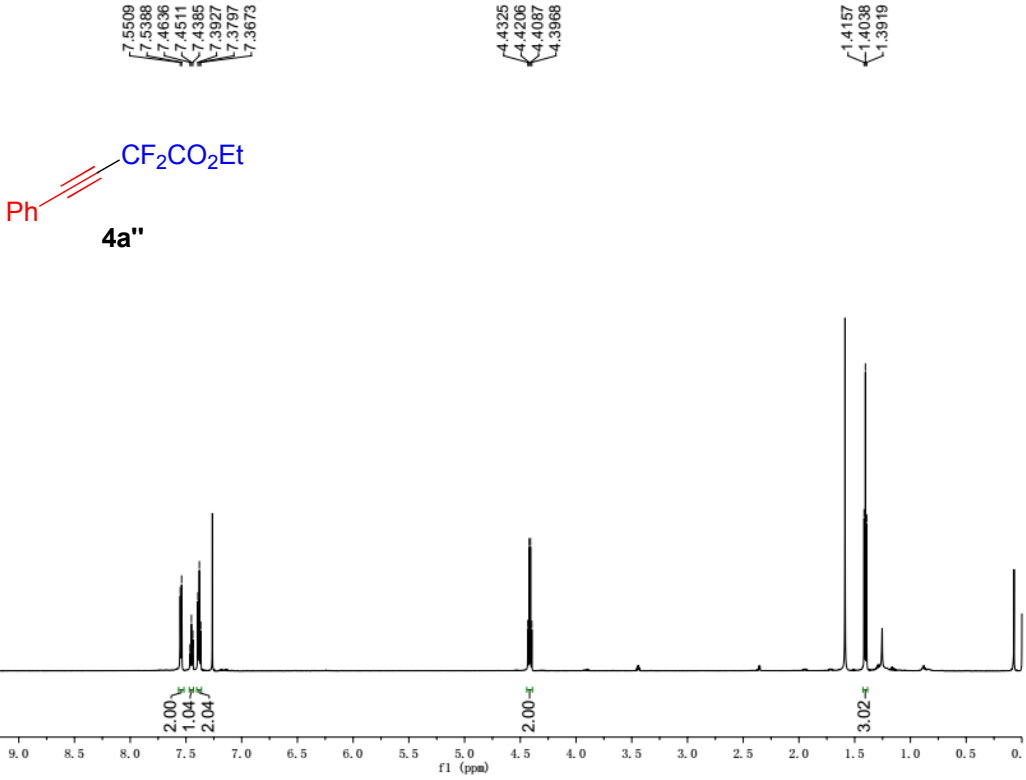
4a'


2.00
0.99
1.04
1.04
1.99
1.05
1.06
3.07
10.04
2.99
f1 (ppm)

Br
n-C8H17
CF2CO2Et

4a'

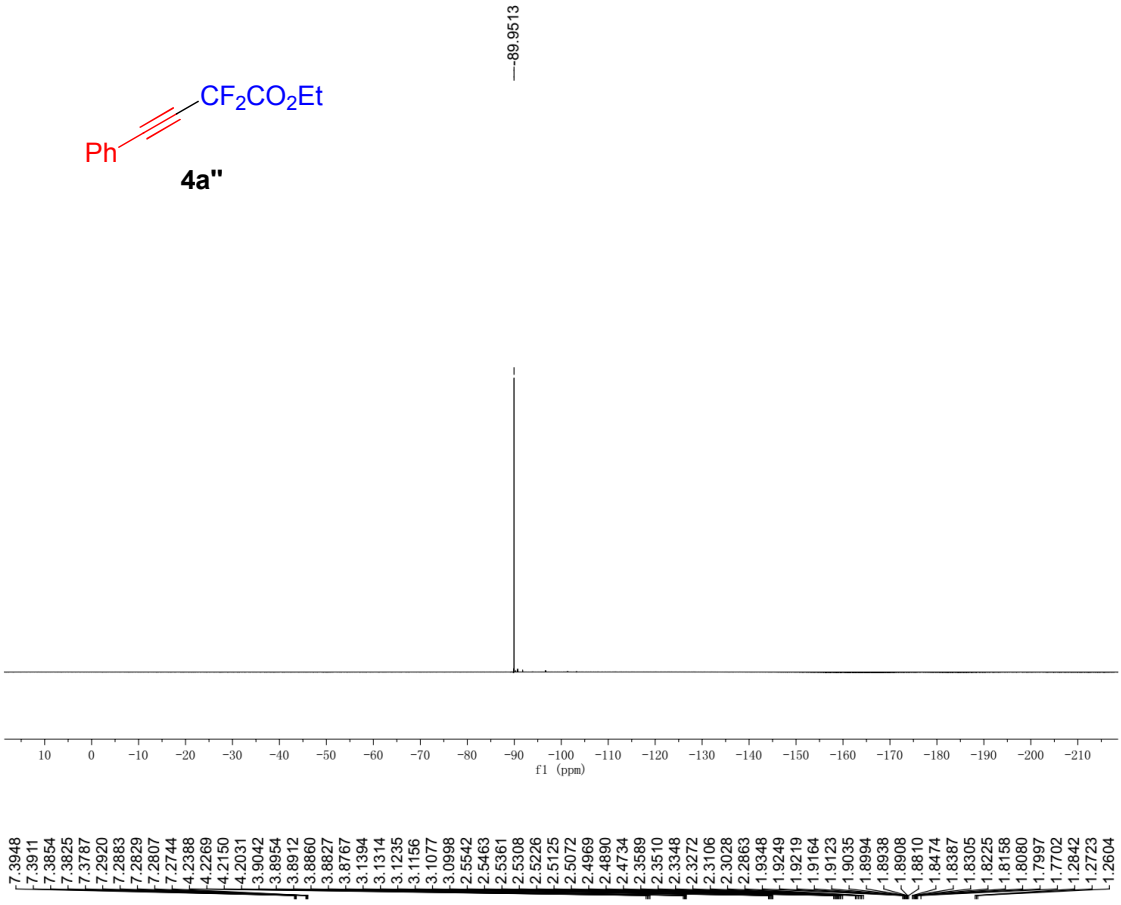

-101.2070
-101.6749
-107.0928
-107.5603
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)


7.5509
7.5388
7.4636
7.4511
7.4385
7.3927
7.3797
7.3673
4.4325
4.4206
4.4087
4.3968
1.4157
1.4038
1.3919
CF2CO2Et
Ph
2.00
1.04
2.04
2.00
3.02
f1 (ppm)

4a''

CF2CO2Et
Ph

4a"


-89.9513
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)

7.3948
7.3911
7.3854
7.3825
7.3787
7.2920
7.2883
7.2829
7.2807
7.2744
4.2388
4.2269
4.2150
4.2031
3.9042
3.8954
3.8912
3.8860
3.8827
3.8767
3.1394
3.1314
3.1235
3.1156
3.1077
3.0998
2.5542
2.5463
2.5361
2.5308
2.5226
2.5125
2.5072
2.4969
2.4890
2.4734
2.3589
2.3510
2.3348
2.3272
2.3106
2.3028
2.2863
1.9348
1.9249
1.9219
1.9164
1.9123
1.9035
1.8994
1.8938
1.8908
1.8810
1.8474
1.8387
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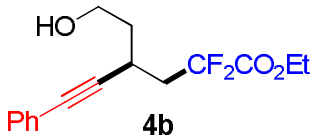
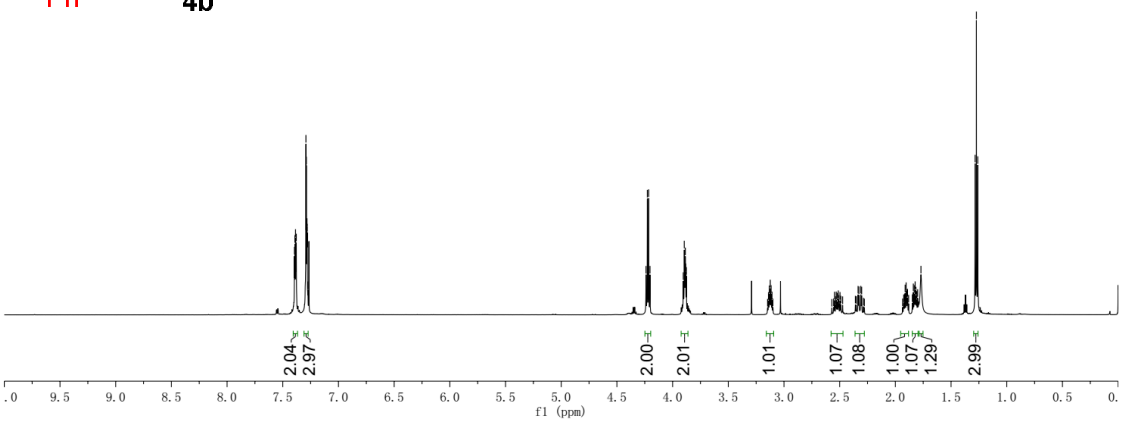
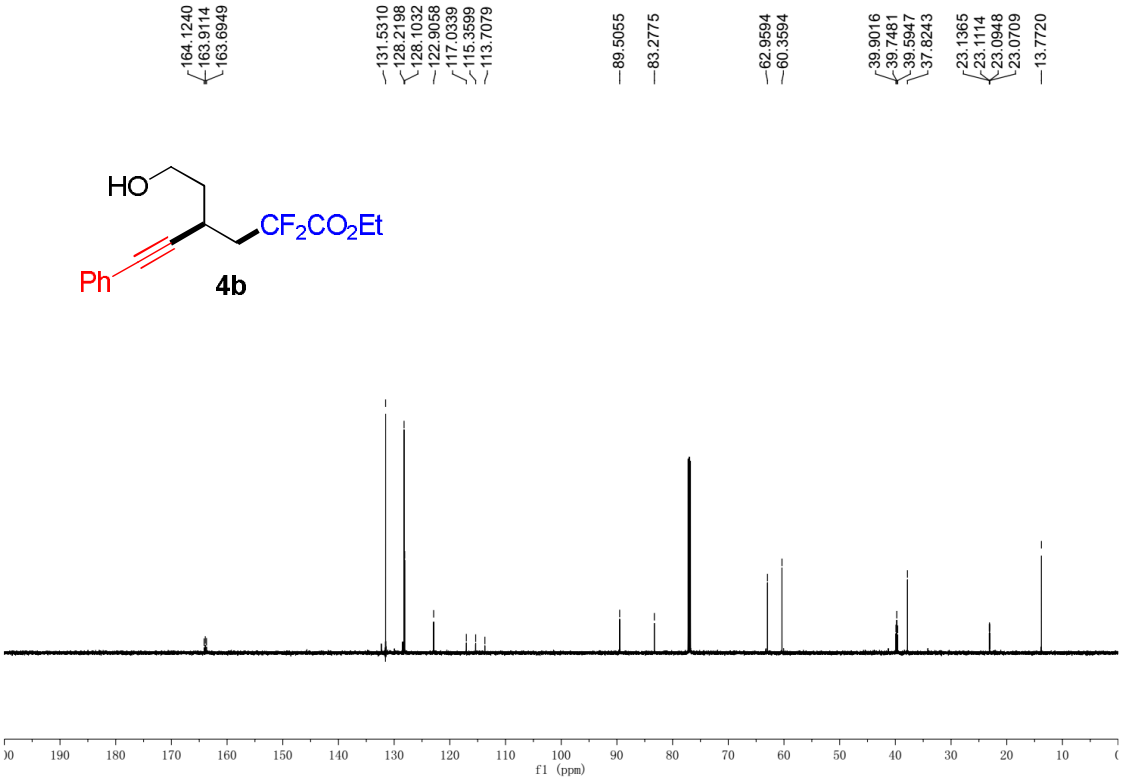
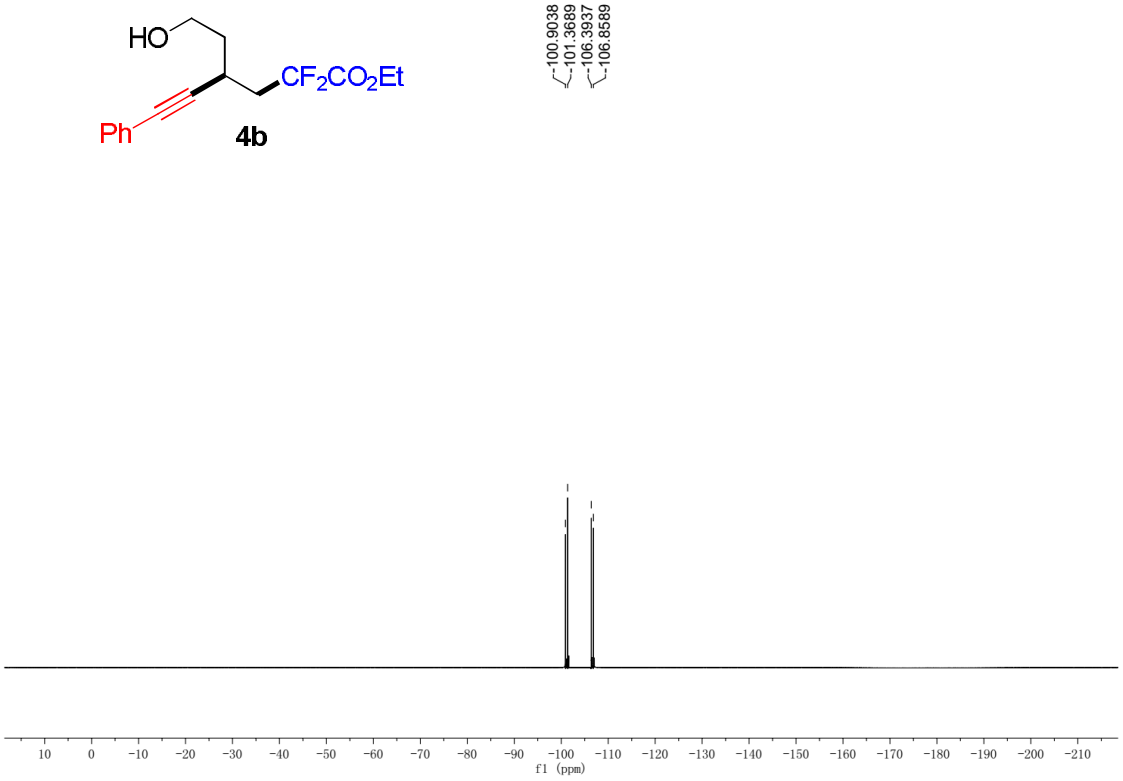
1.8225
1.8158
1.8080
1.7997
1.7702
1.2842
1.2723
1.2604

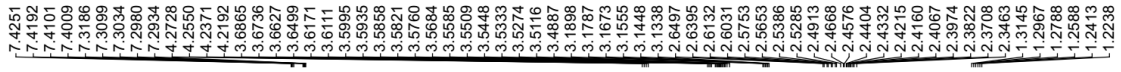

HO
CF2CO2Et
Ph

4b


2.04
2.97
2.00
2.01
1.01
1.07
1.08
1.00
1.07
1.29
2.99
.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.
f1 (ppm)


164.1240
163.9114
163.6949
131.5310
128.2198
128.1032
122.9058
117.0339
115.3599
113.7079
89.5055
83.2775
62.9594
60.3594
39.9016
39.7481
39.5947
37.8243
23.1365
23.1114
23.0948
23.0709
13.7720
HO
CF2CO2Et
Ph
4b
f1 (ppm)


100.9038
101.3689
106.3937
106.8589
HO
CF2CO2Et
Ph
4b
f1 (ppm)


7.4251
7.4192
7.4101
7.4009
7.3186
7.3099
7.3034
7.2980
7.2934
4.2728
4.2550
4.2371
4.2192
3.6865
3.6736
3.6627
3.6499
3.6171
3.6111
3.5995
3.5935
3.5858
3.5821
3.5760
3.5684
3.5585
3.5509
3.5448
3.5333
3.5274
3.5116
3.4887
3.1898
3.1787
3.1673
3.1555
3.1448
3.1338
2.6497
2.6395
2.6132
2.6031
2.5753
2.5653
2.5386
2.5285
2.4913
2.4668
2.4576
2.4404
2.4332
2.4215
2.4160
2.4067
2.3974
2.3822
2.3708
2.3463
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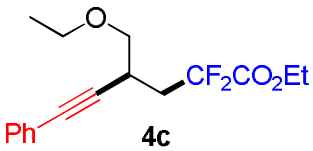
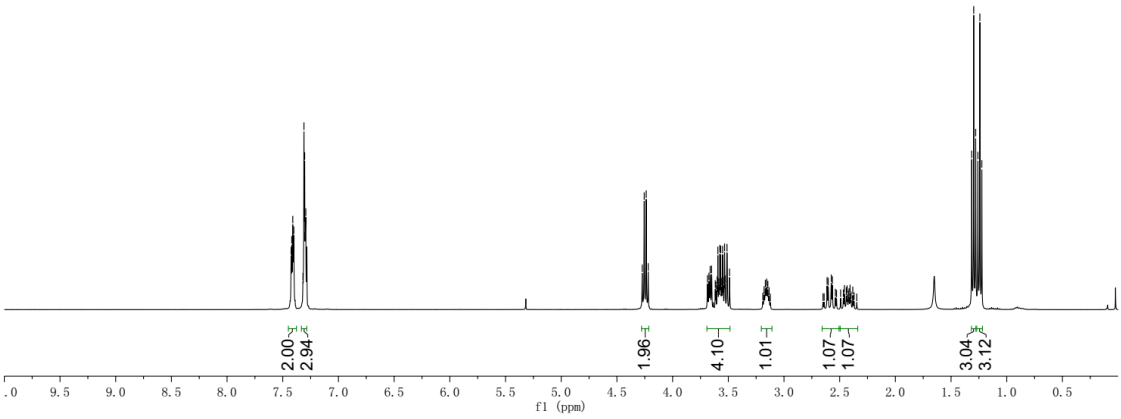
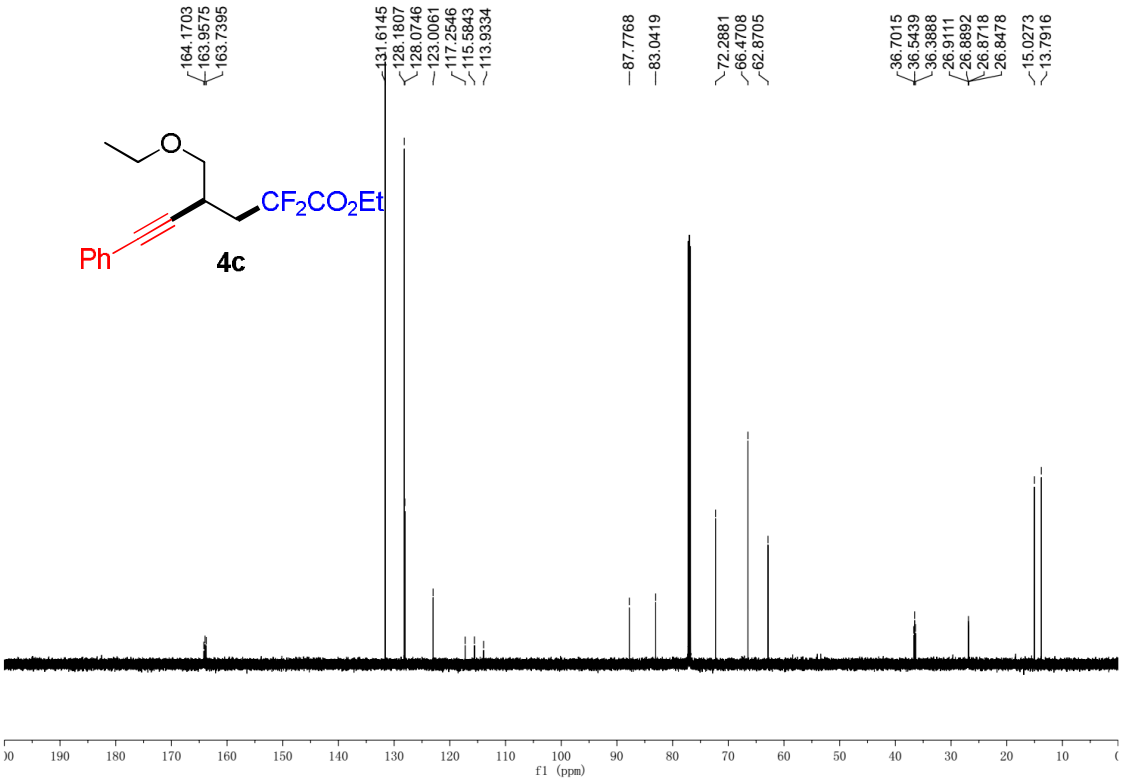
1.2588
1.2413
1.2238


O
CF2CO2Et
Ph

4c

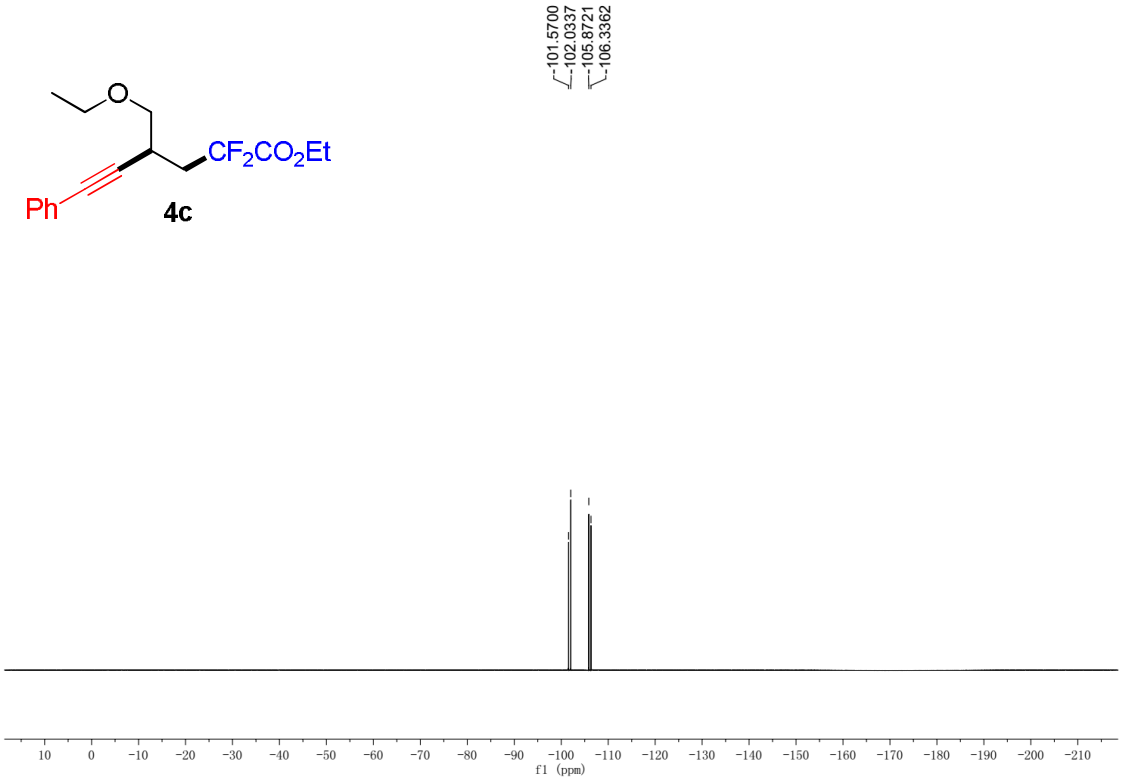

2.00
2.94
1.96
4.10
1.01
1.07
1.07
3.04
3.12
f1 (ppm)

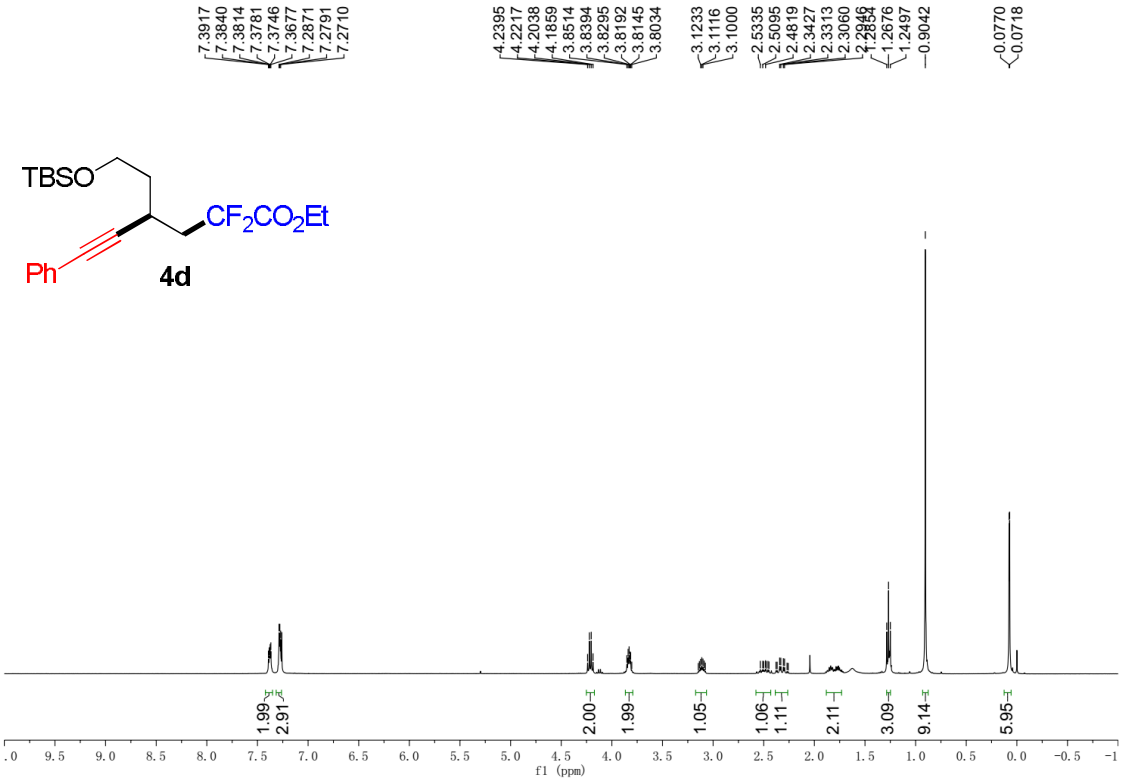

164.1703
163.9575
163.7395
131.6145
128.1807
128.0746
123.0061
117.2546
115.5843
113.9334
87.7768
83.0419
72.2881
66.4708
62.8705
36.7015
36.5439
36.3888
26.9111
26.8892
26.8718
26.8478
15.0273
13.7916
O
CF2CO2Et
Ph
f1 (ppm)

4c

O
CF2CO2Et
Ph

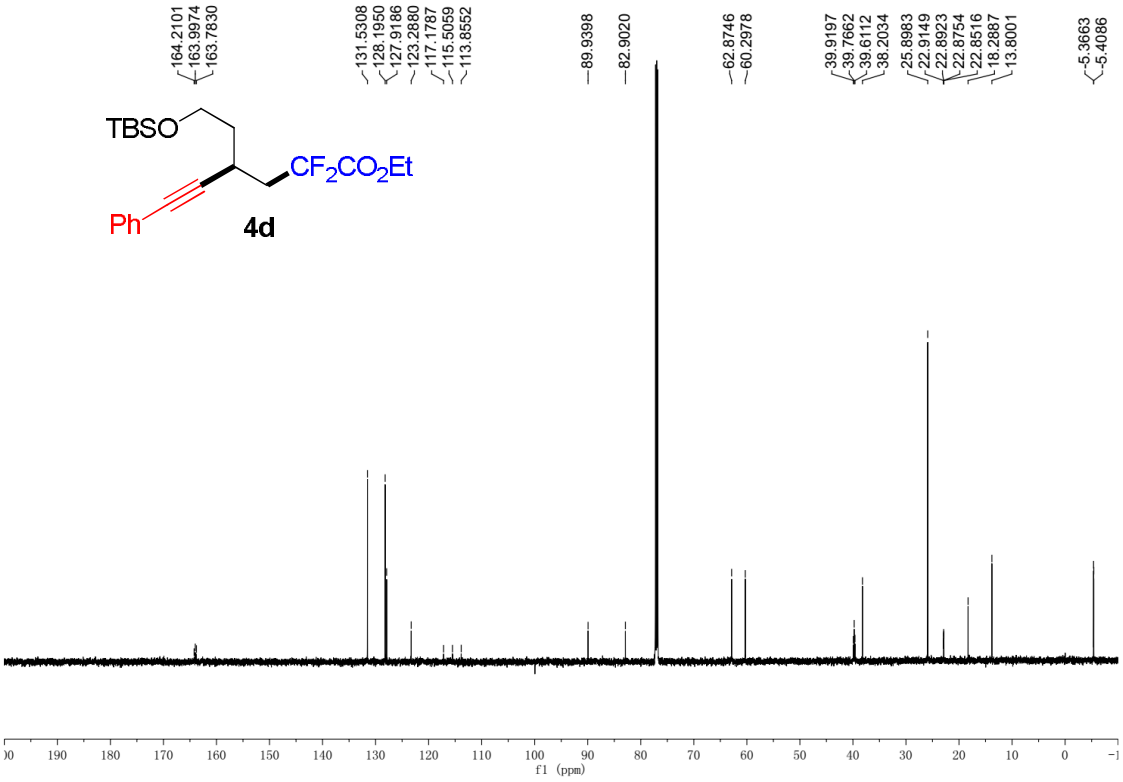
4c

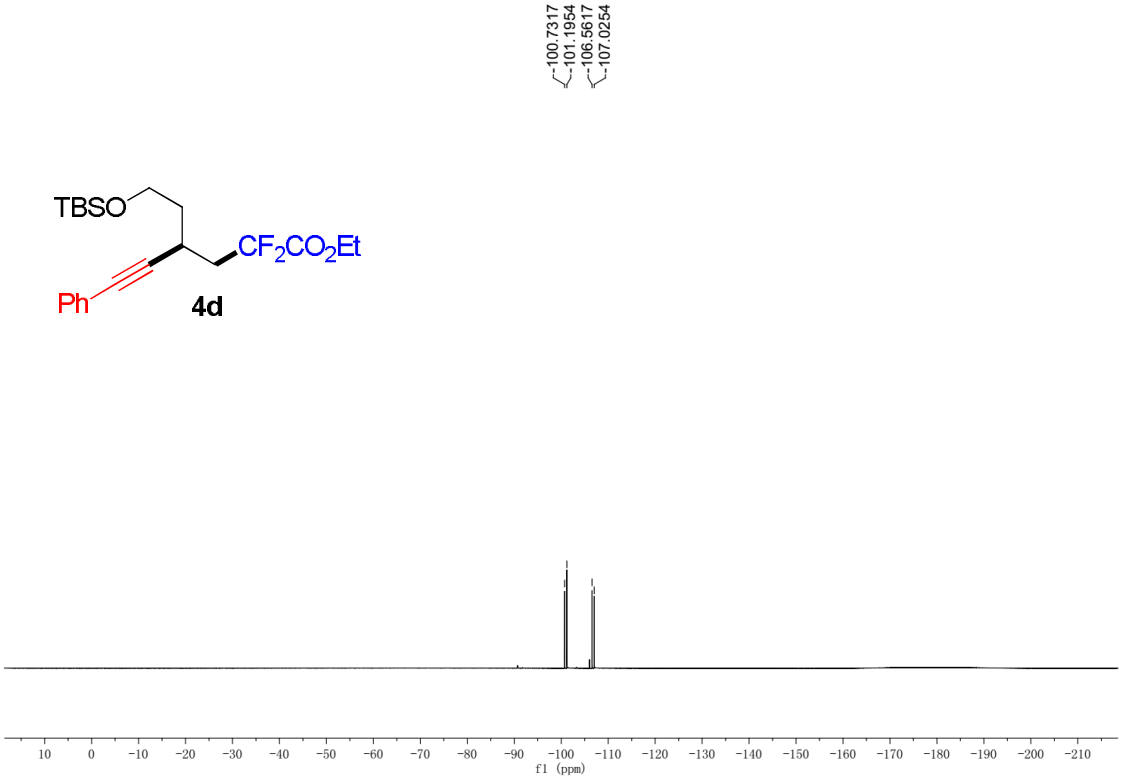

-101.5700
-102.0337
-105.8721
-106.3362
f1 (ppm)


7.3917
7.3840
7.3814
7.3781
7.3746
7.3677
7.2871
7.2791
7.2710
4.2395
4.2217
4.2038
4.1859
3.8514
3.8394
3.8295
3.8192
3.8145
3.8034
3.1233
3.1116
3.1000
2.5335
2.5095
2.4819
2.3427
2.3313
2.3060
1.2676
1.2497
0.9042
0.0770
0.0718
1.99
2.91
2.00
1.99
1.05
1.06
1.11
2.11
3.09
9.14
5.95
f1 (ppm)

TBSO
CF2CO2Et
Ph

4d


164.2101
163.9974
163.7830
131.5308
128.1950
127.9186
123.2880
117.1787
115.5059
113.8552
89.9398
82.9020
62.8746
60.2978
39.9197
39.7662
39.6112
38.2034
25.8983
22.9149
22.8923
22.8754
22.8516
18.2887
13.8001
-5.3663
-5.4086
TBSO
CF2CO2Et
Ph
4d
f1 (ppm)


100.7317
101.1954
106.5617
107.0254
TBSO
CF2CO2Et
Ph
4d
f1 (ppm)


7.3963
7.3924
7.3863
7.3839
7.3801
7.3014
7.2954
7.2912
7.2873
7.2859
7.2843
7.2806
7.2787
4.2433
4.2315
4.2196
4.2076
3.4859
3.4833
3.4750
3.4729
3.4642
3.4612
2.9471
2.9393
2.9314
2.9236
2.9158
2.5301
2.5147
2.5063
2.4960
2.4806
2.2988
2.2913
2.2753
2.2675
2.1730
2.1679
2.1657
2.1610
2.1565
2.0779
2.0676
2.0608
2.0538
2.0506
2.0437
2.0370
1.8394
1.8309
1.8262
1.8228
1.8175
1.8091
1.8008
1.7259
1.7182
1.7096
1.7037
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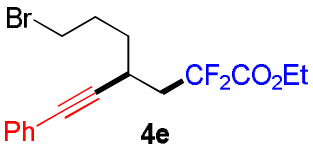
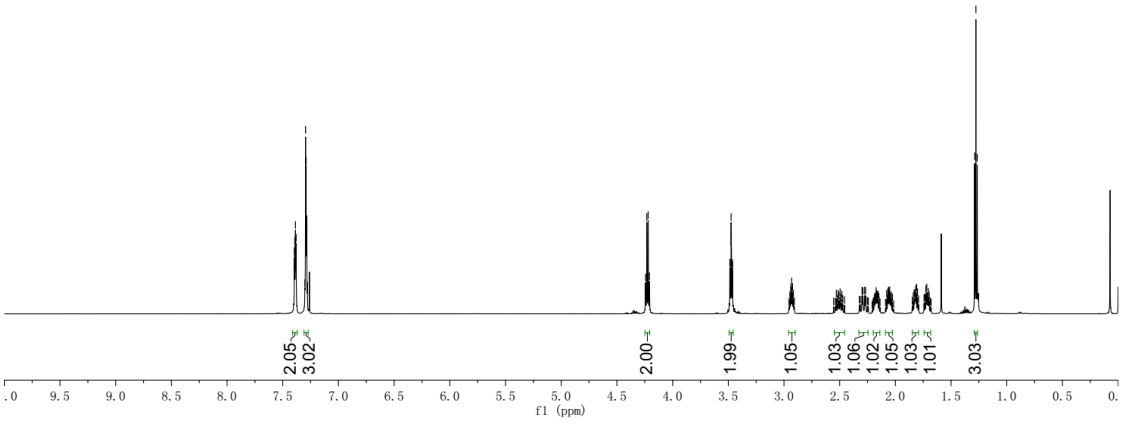
1.2889
1.2769
1.2650


Br
CF2CO2Et
Ph

4e


2.05
3.02
2.00
1.99
1.05
1.03
1.06
1.02
1.05
1.03
1.01
3.03
f1 (ppm)


164.0987
163.8818
163.6691
131.5968
128.2818
128.1548
123.0150
117.0374
115.3860
113.7131
89.4969
83.3976
63.0267
39.9819
39.8282
39.6749
33.8107
33.1642
30.1881
25.5870
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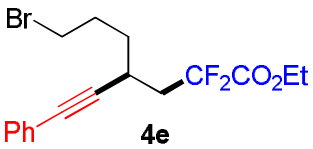
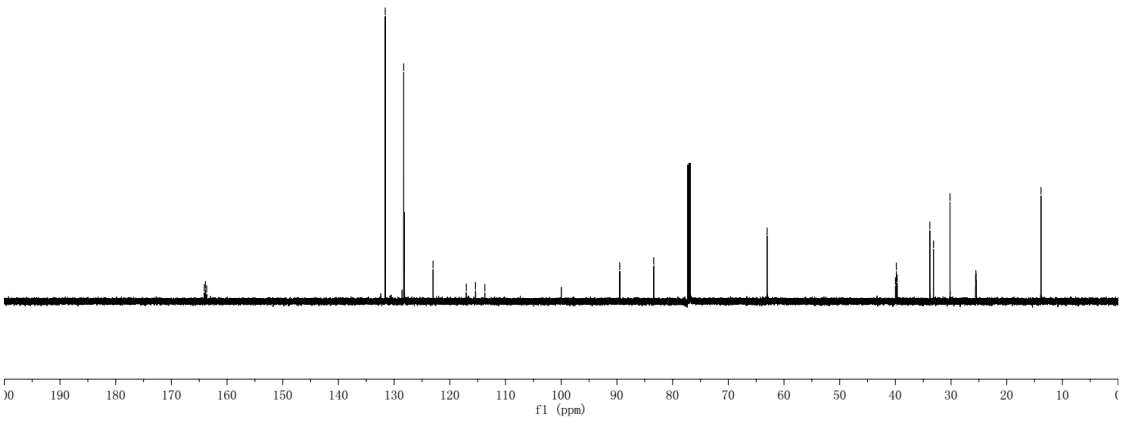
25.5465
25.5236
13.8482

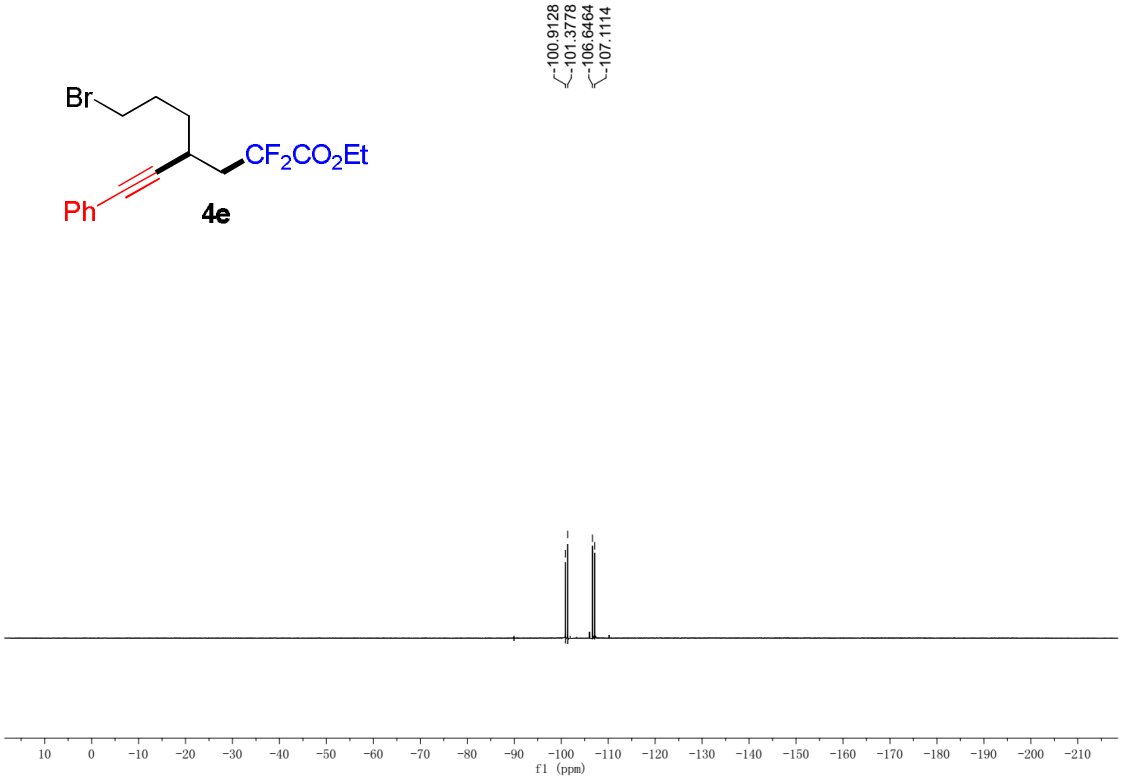

Br
CF2CO2Et
Ph

4e


f1 (ppm)

Br
CF2CO2Et
Ph

4e


100.9128
101.3778
106.6464
107.1114
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)


7.3935
7.3898
7.3837
7.3774
7.2993
7.2955
7.2903
7.2883
4.2332
4.2213
4.2094
4.1976
2.9468
2.9386
2.9307
2.9228
2.9146
2.7494
2.7443
2.7349
2.7288
2.7196
2.7145
2.7050
2.7016
2.6898
2.6760
2.6599
2.6577
2.5135
2.5026
2.4978
2.4899
2.4789
2.4747
2.4637
2.4563
2.3222
2.2981
2.2905
2.2743
2.2666
2.1775
1.9792
1.9759
1.9728
1.9678
1.9648
1.9566
1.9535
1.9506
1.9455
1.9426
1.9392
1.8146
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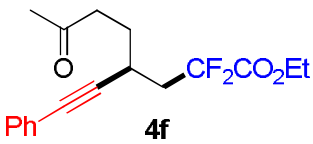
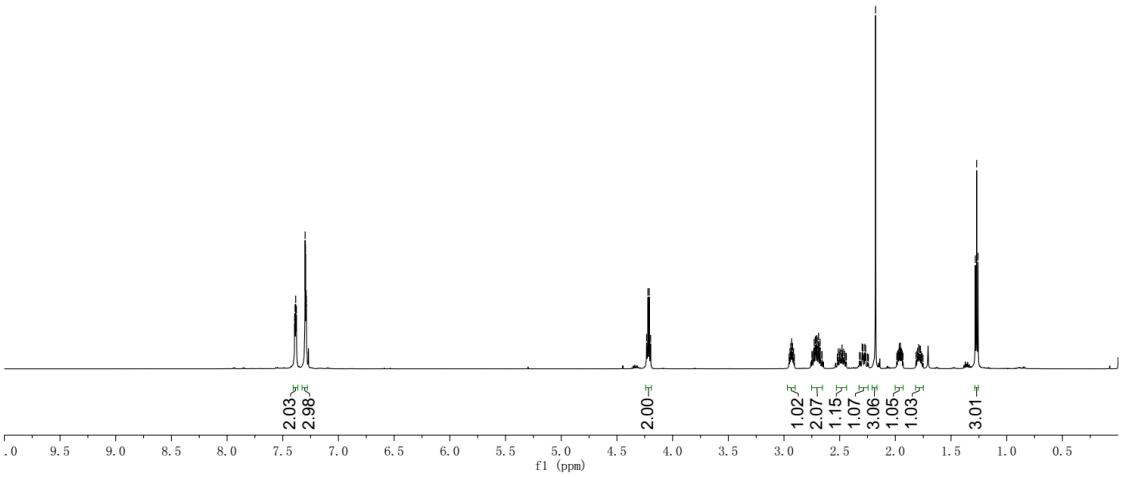
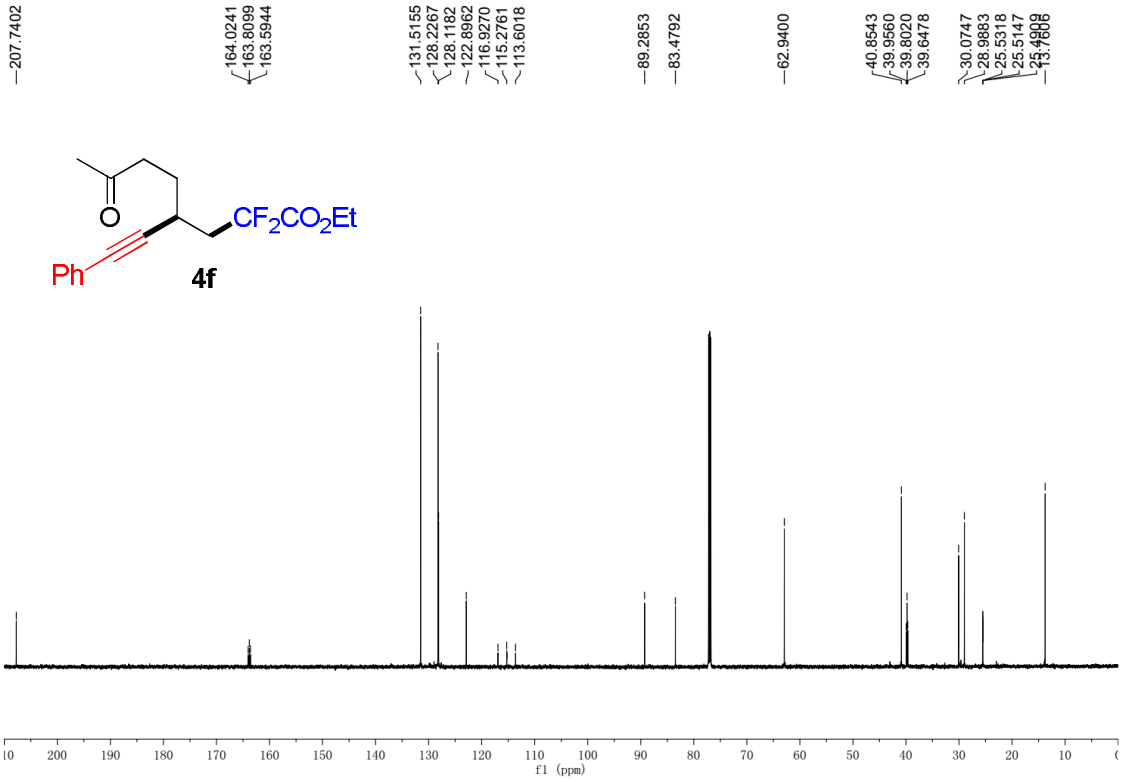
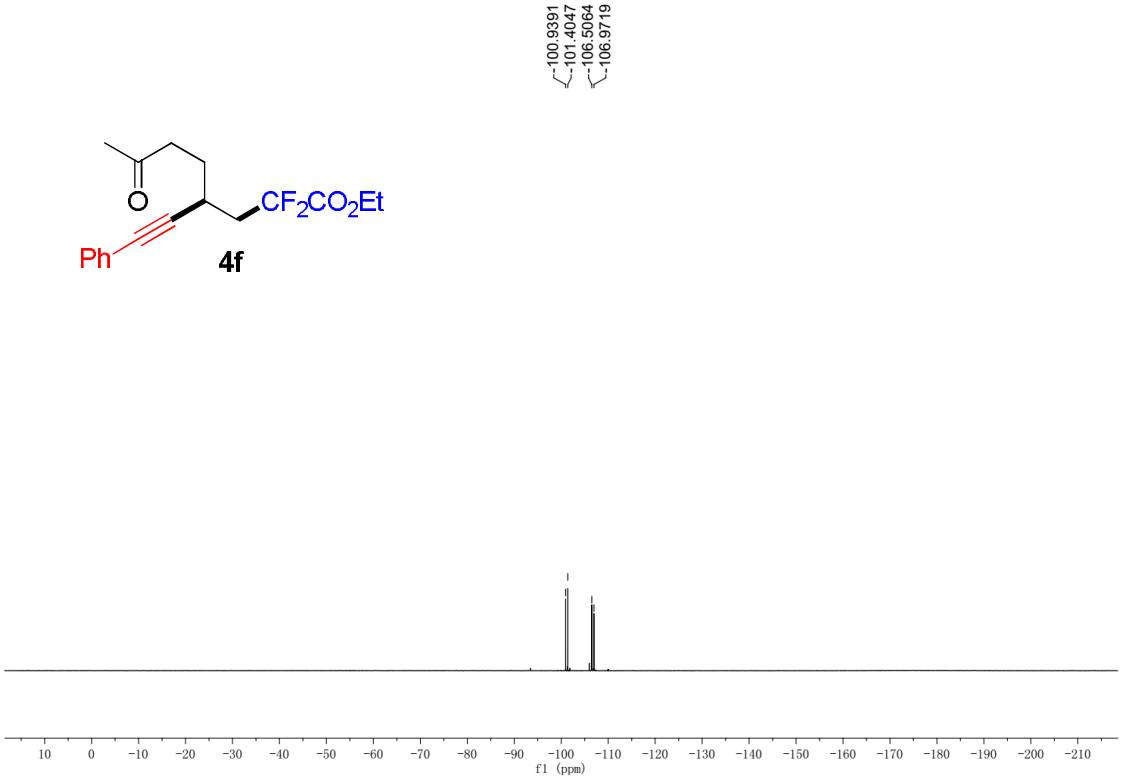
1.7999
1.7914
1.7834
1.7750
1.7680
1.2820
1.2701
1.2581

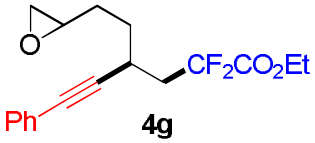

O
CF2CO2Et
Ph

4f

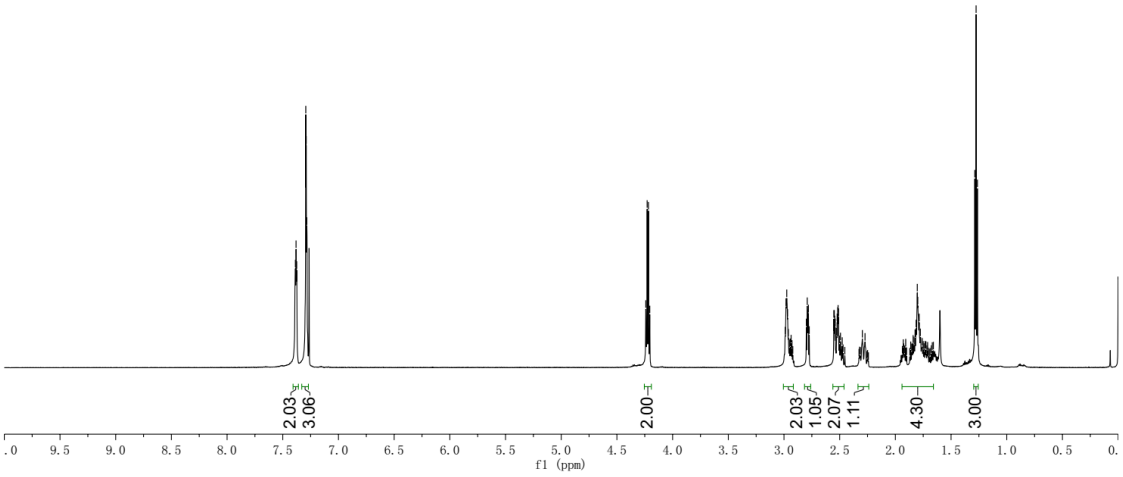

2.03
2.98
2.00
1.02
2.07
1.15
1.07
3.06
1.05
1.03
3.01
.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5
f1 (ppm)

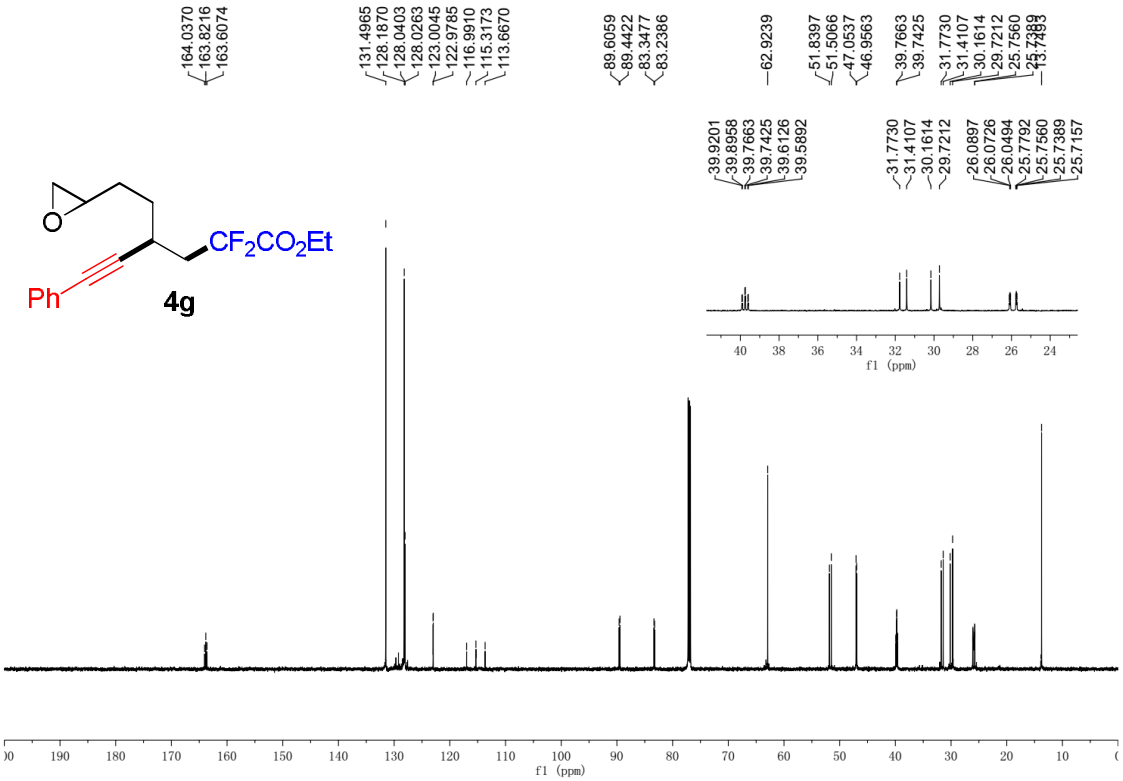

207.7402
164.0241
163.8099
163.5944
131.5155
128.2267
128.1182
122.8962
116.9270
115.2761
113.6018
89.2853
83.4792
62.9400
40.8543
39.9560
39.8020
39.6478
30.0747
28.9883
25.5318
25.5147
13.7606
O
CF2CO2Et
Ph
4f
f1 (ppm)


100.9391
101.4047
106.5064
106.9719
O
CF2CO2Et
Ph
4f
f1 (ppm)


CF2CO2Et
Ph

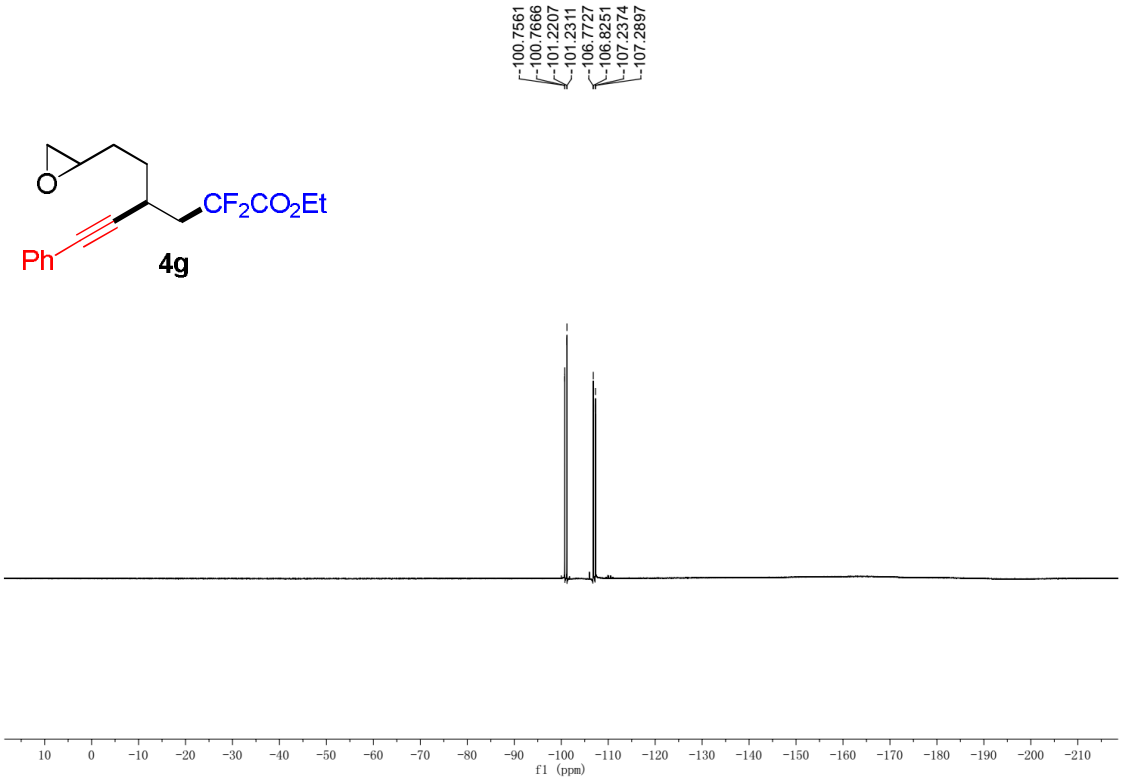
4g

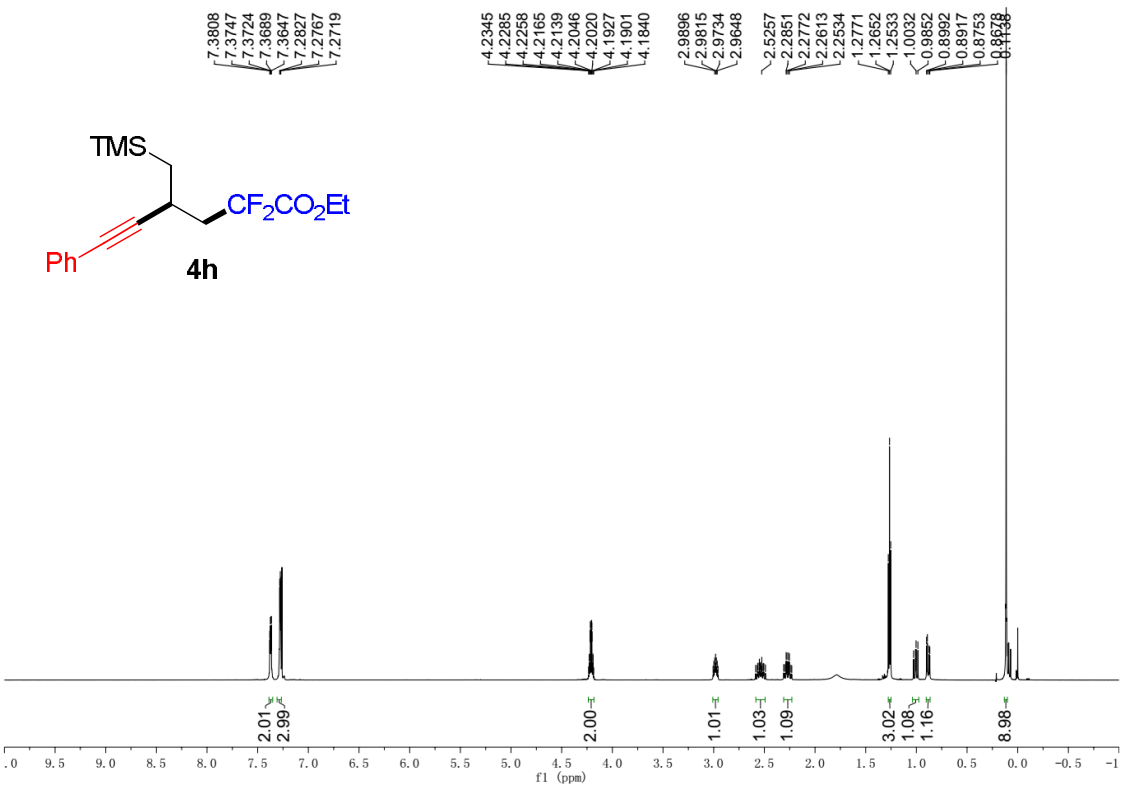

2.03
3.06
2.00
2.03
1.05
2.07
1.11
4.30
3.00
f1 (ppm)

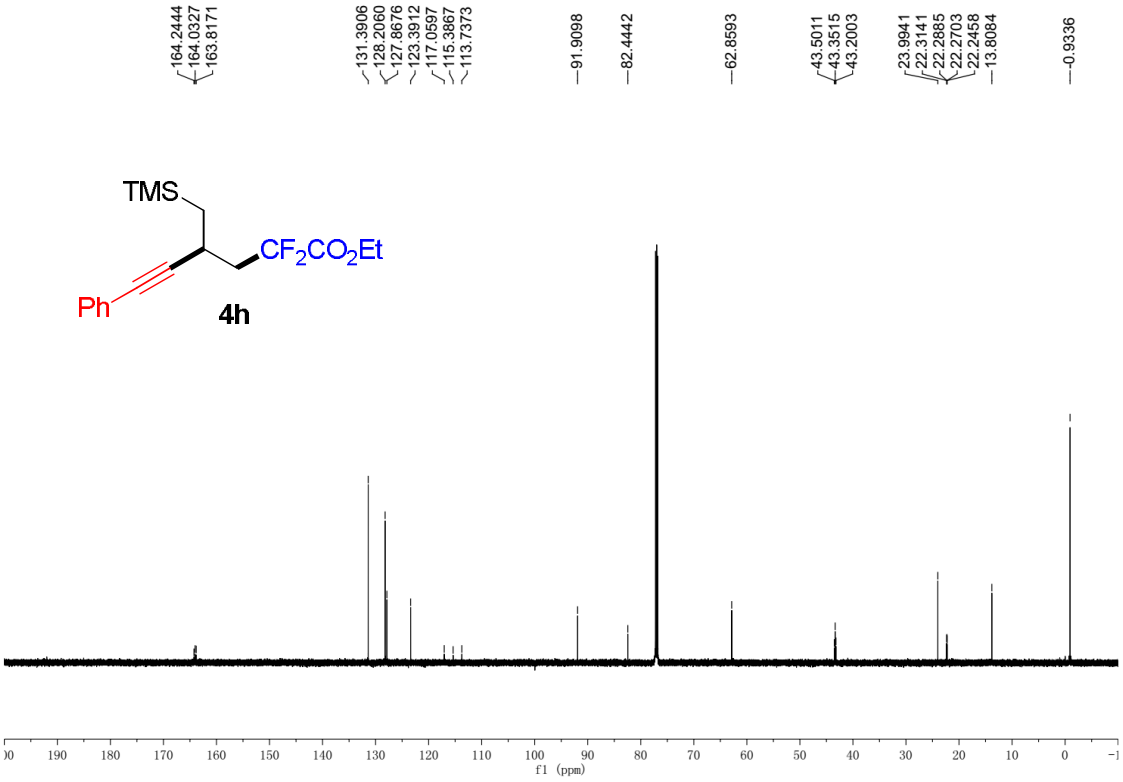

f1 (ppm)

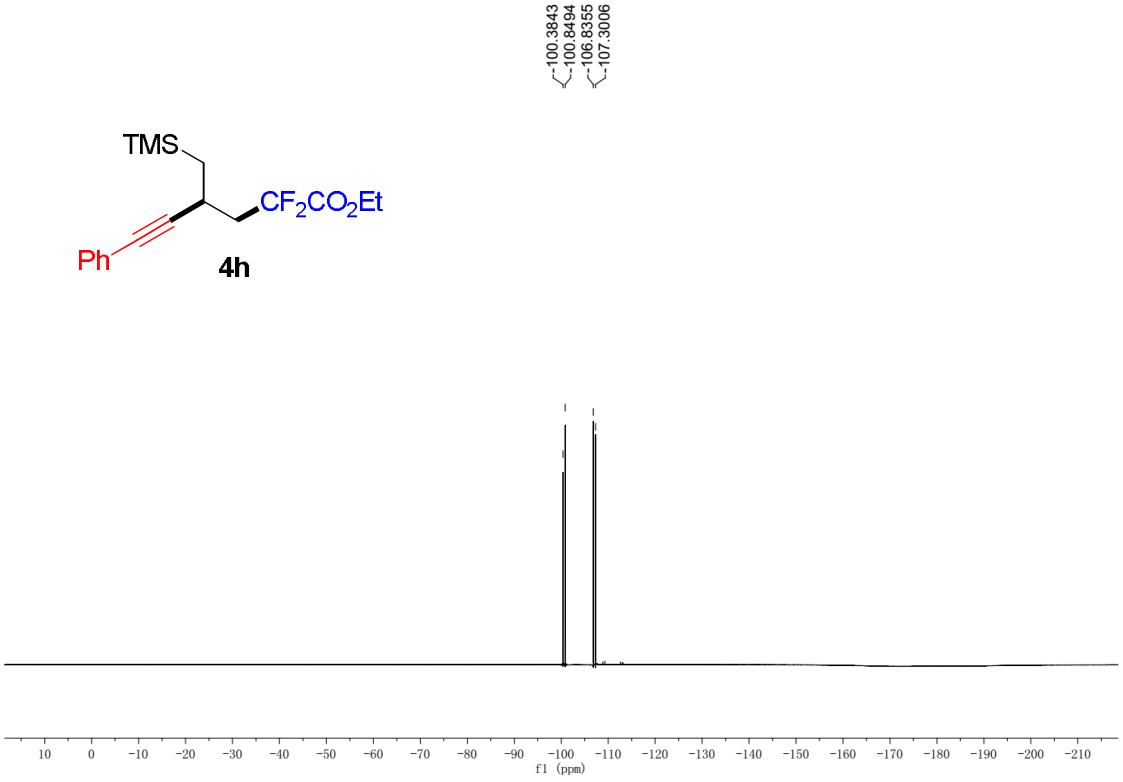
CF2CO2Et
Ph

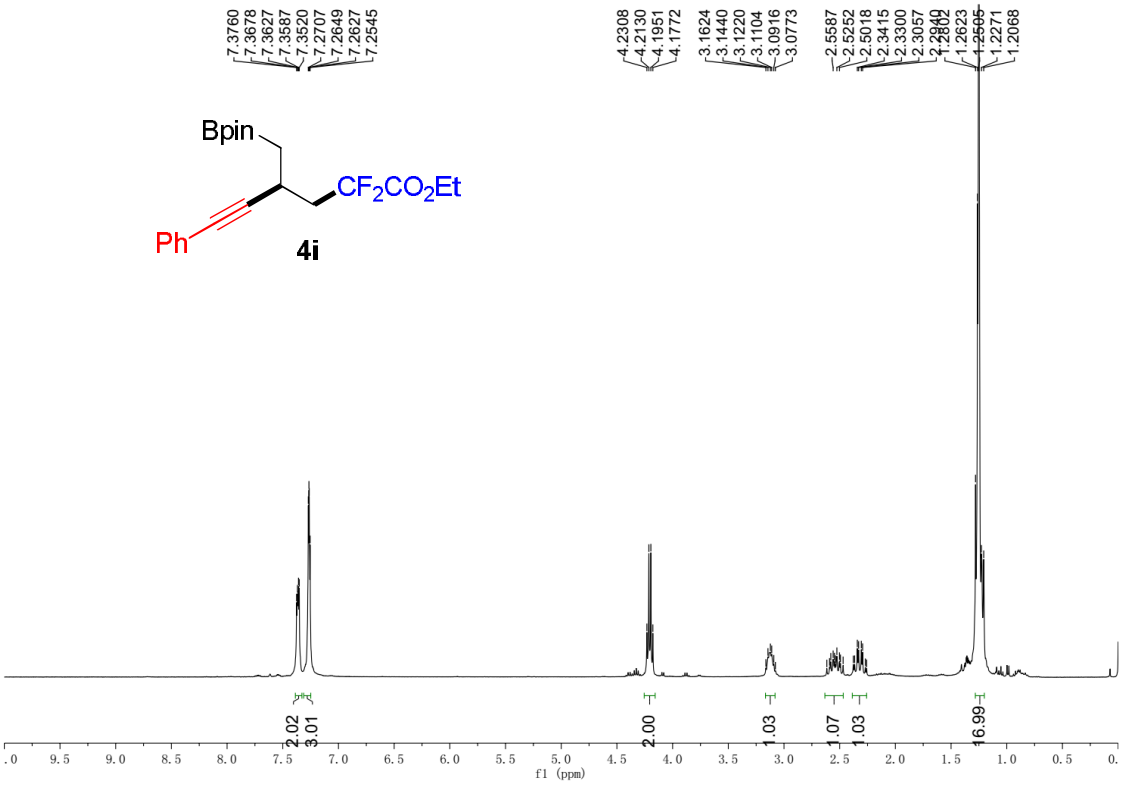
4g

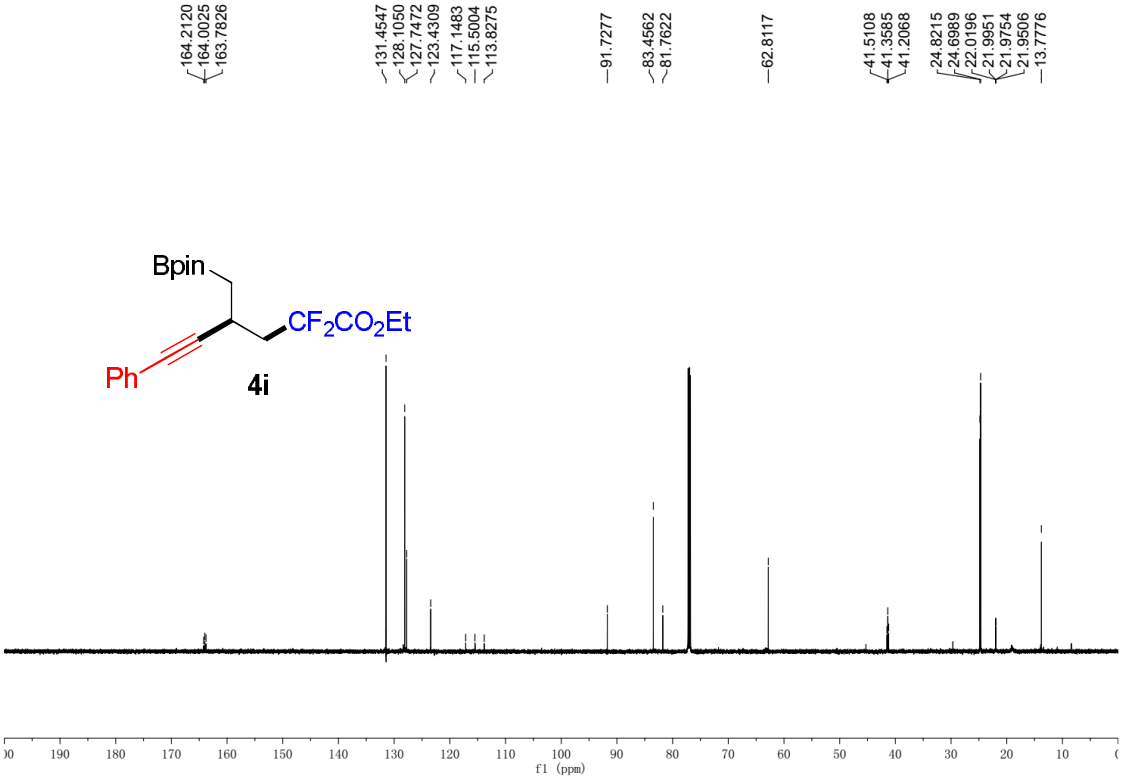

100.7561
100.7666
101.2207
101.2311
106.7727
106.8251
107.2374
107.2897
O
CF2CO2Et
Ph
4g
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)


7.3808
7.3747
7.3724
7.3689
7.3647
7.2827
7.2767
7.2719
4.2345
4.2285
4.2258
4.2165
4.2139
4.2046
4.2020
4.1927
4.1901
4.1840
2.9896
2.9815
2.9734
2.9648
2.5257
2.2851
2.2772
2.2613
2.2534
1.2771
1.2652
1.2533
1.0032
0.9852
0.8992
0.8917
0.8753
TMS
CF2CO2Et
Ph
4h
2.01
2.99
2.00
1.01
1.03
1.09
3.02
1.08
1.16
8.98
f1 (ppm)


164.2444
164.0327
163.8171
131.3906
128.2060
127.8676
123.3912
117.0597
115.3867
113.7373
91.9098
82.4442
62.8593
43.5011
43.3515
43.2003
23.9941
22.3141
22.2885
22.2703
22.2458
13.8084
0.9336
TMS
CF2CO2Et
Ph
4h
f1 (ppm)

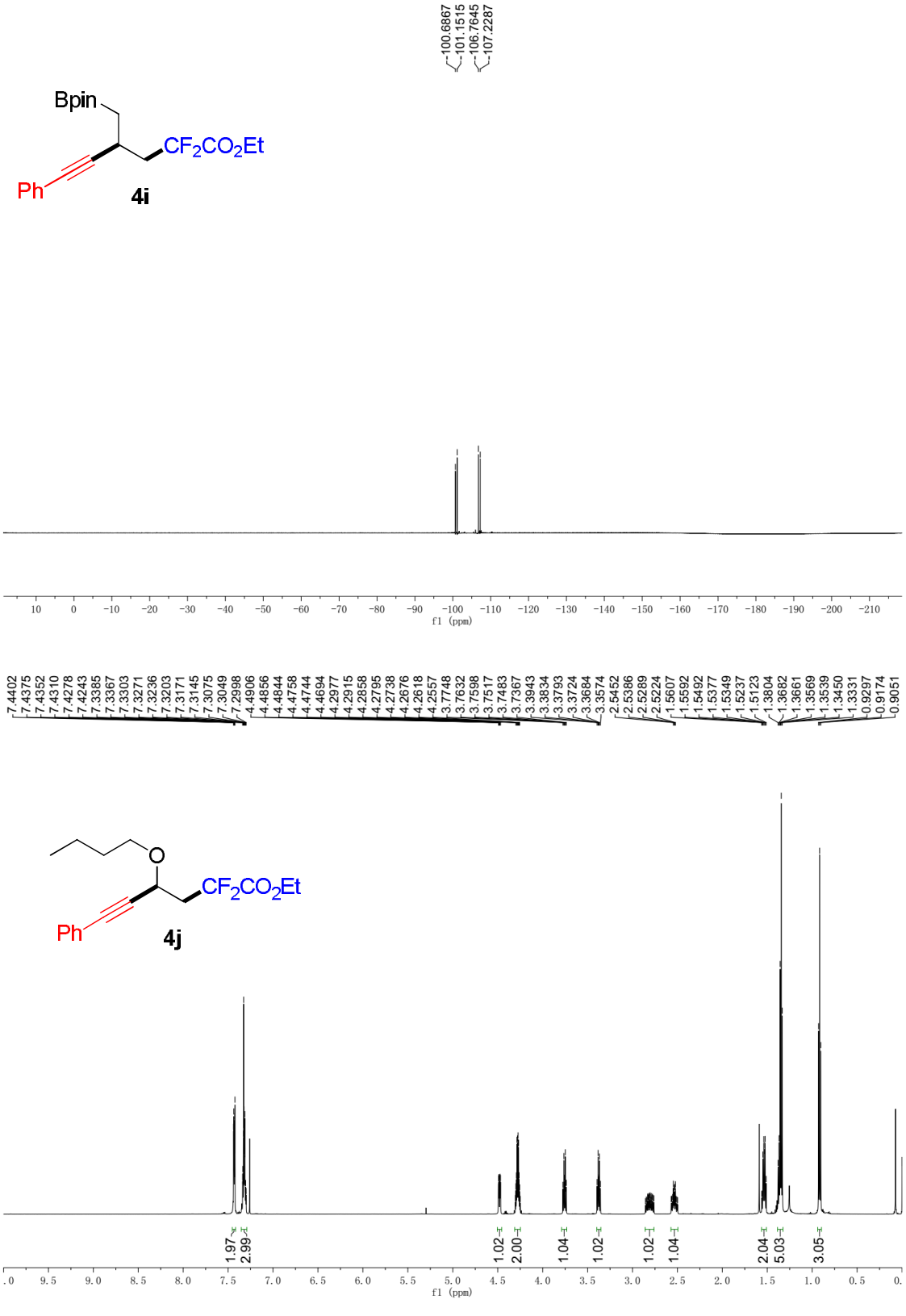

100.3843
100.8494
106.8355
107.3006
TMS
CF2CO2Et
Ph
4h
f1 (ppm)


Bpin
CF2CO2Et
Ph
4i
7.3760
7.3678
7.3627
7.3587
7.3520
7.2707
7.2649
7.2627
7.2545
4.2308
4.2130
4.1951
4.1772
3.1624
3.1440
3.1220
3.1104
3.0916
3.0773
2.5587
2.5252
2.5018
2.3415
2.3300
2.3057
1.2623
1.2565
1.2271
1.2068
2.02
3.01
2.00
1.03
1.07
1.03
16.99
f1 (ppm)

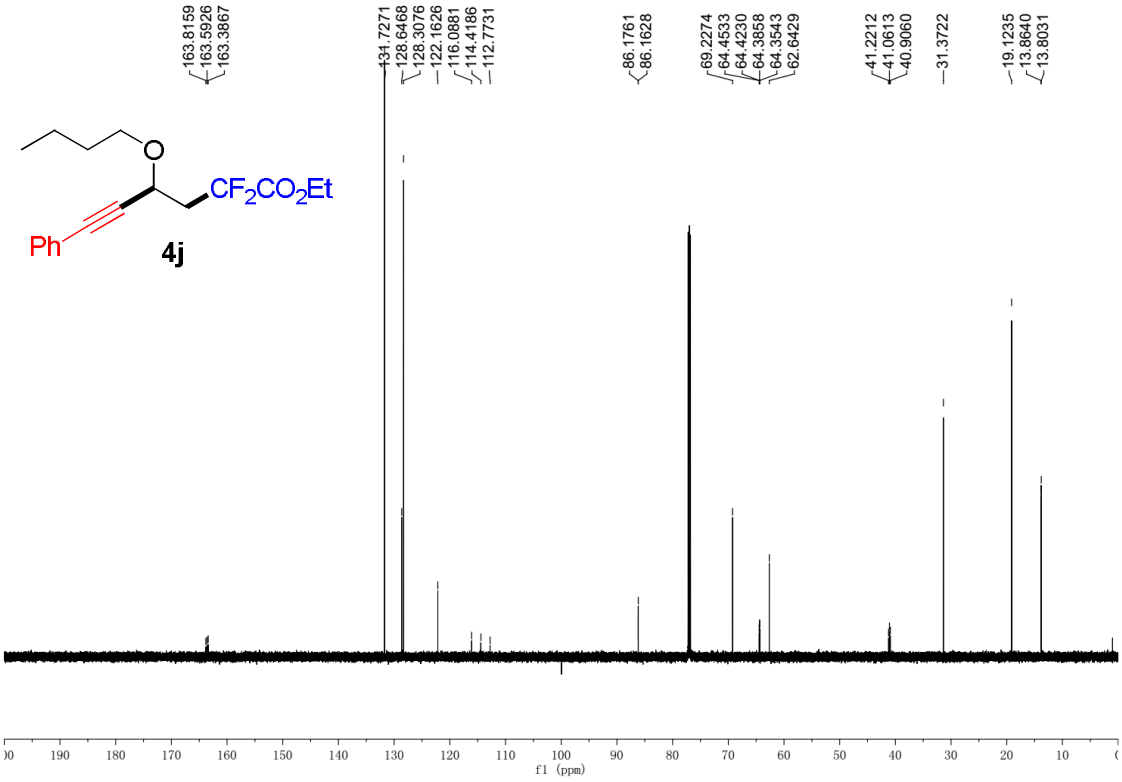

164.2120
164.0025
163.7826
131.4547
128.1050
127.7472
123.4309
117.1483
115.5004
113.8275
91.7277
83.4562
81.7622
62.8117
41.5108
41.3585
41.2068
24.8215
24.6989
22.0196
21.9951
21.9754
21.9506
13.7776
Bpin
CF2CO2Et
Ph
4i
f1 (ppm)

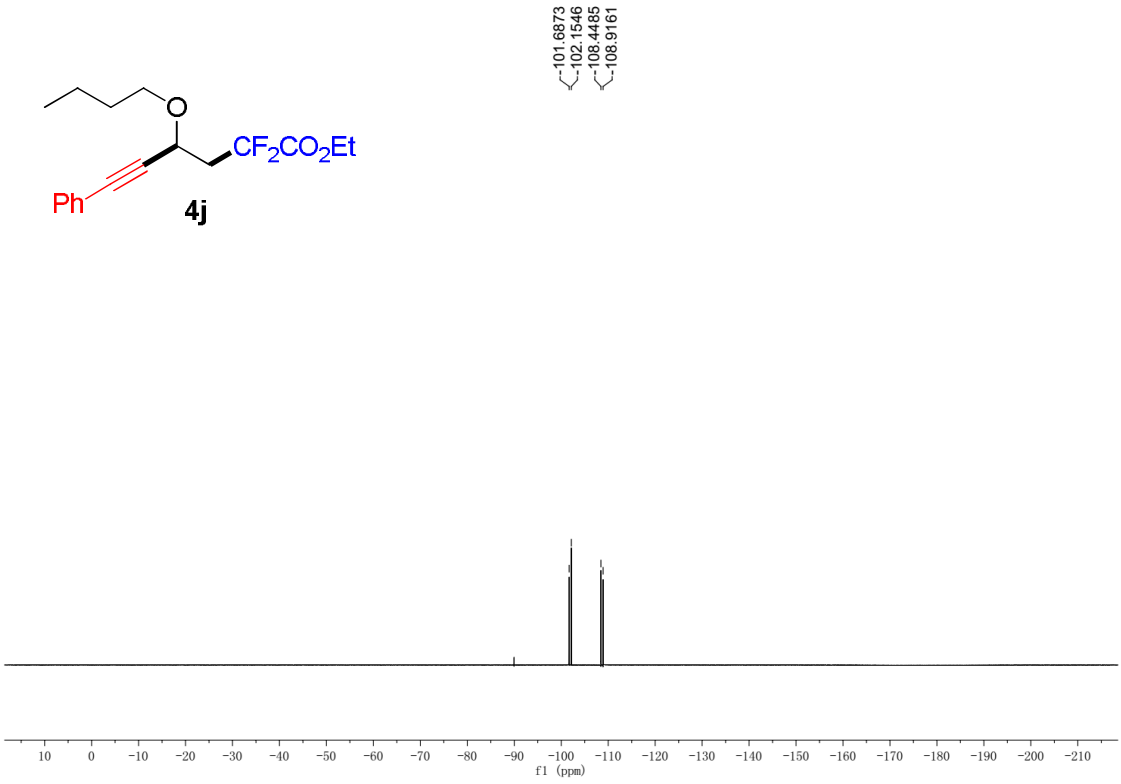
Bpin
CF2CO2Et
Ph

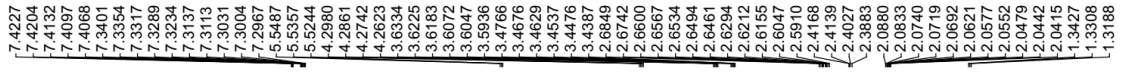
4i

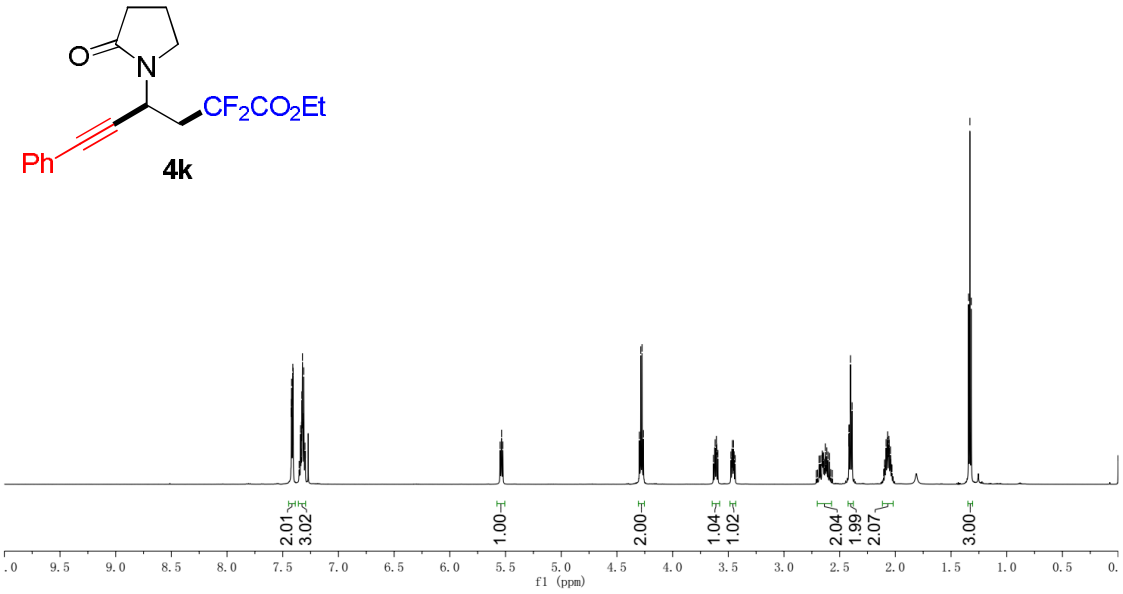

100.6867
101.1515
106.7645
107.2287
f1 (ppm)
7.4402
7.4375
7.4352
7.4310
7.4278
7.4243
7.3385
7.3367
7.3303
7.3271
7.3236
7.3203
7.3171
7.3145
7.3075
7.3049
7.2998
4.4906
4.4856
4.4844
4.4758
4.4744
4.4694
4.2977
4.2915
4.2858
4.2795
4.2738
4.2676
4.2618
4.2557
3.7748
3.7632
3.7598
3.7517
3.7483
3.7367
3.3943
3.3834
3.3793
3.3724
3.3684
3.3574
2.5452
2.5386
2.5289
2.5224
1.5607
1.5592
1.5492
1.5377
1.5349
1.5237
1.5123
1.3804
1.3682
1.3661
1.3569
1.3539
1.3450
1.3331
0.9297
0.9174
0.9051
CF2CO2Et
Ph
1.97
2.99
1.02
2.00
1.04
1.02
1.02
1.04
2.04
5.03
3.05
f1 (ppm)

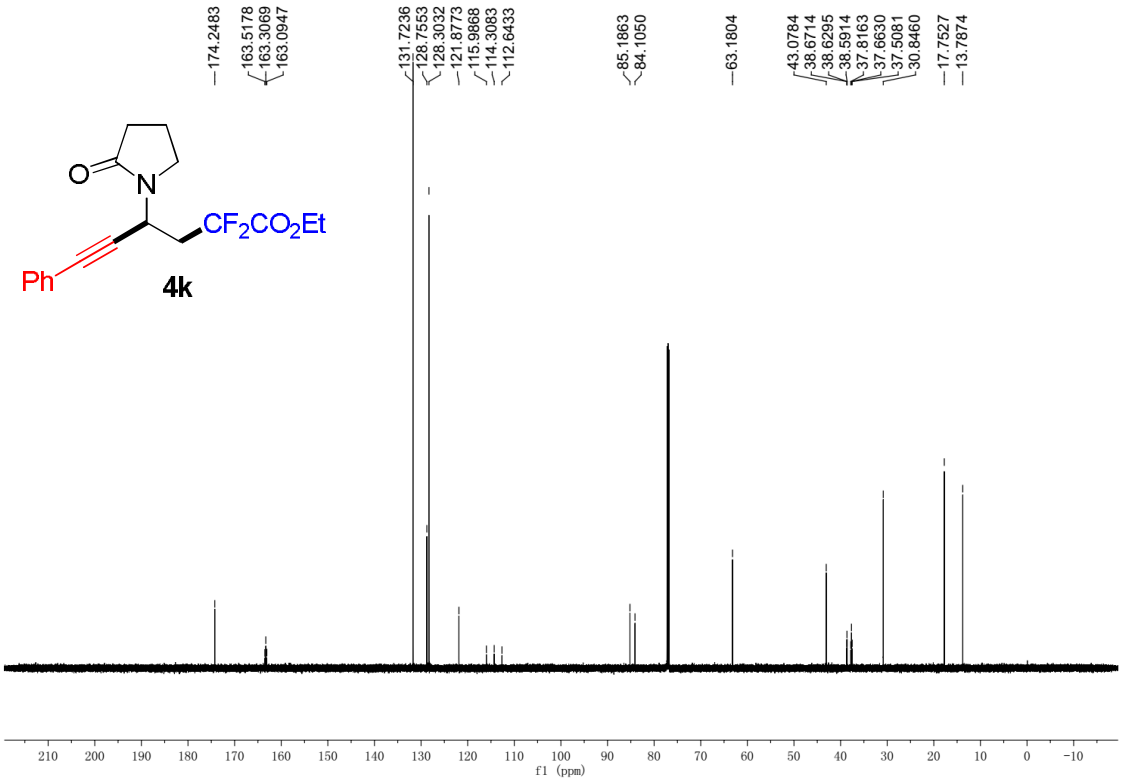
4j


163.8159
163.5926
163.3867
131.7271
128.6468
128.3076
122.1626
116.0881
114.4186
112.7731
86.1761
86.1628
69.2274
64.4533
64.4230
64.3858
64.3543
62.6429
41.2212
41.0613
40.9060
31.3722
19.1235
13.8640
13.8031
CF2CO2Et
Ph
4j
f1 (ppm)


101.6873
102.1546
108.4485
108.9161
CF2CO2Et
Ph
4j
f1 (ppm)

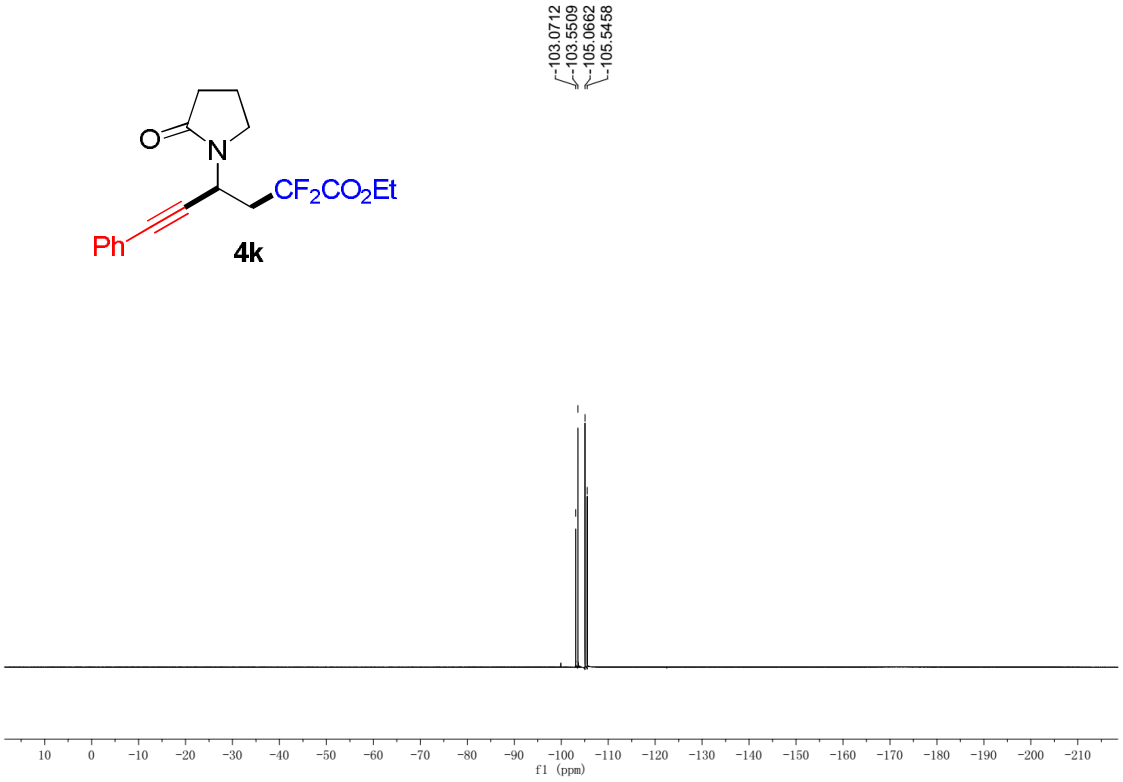

7.4227
7.4204
7.4132
7.4097
7.4068
7.3401
7.3354
7.3317
7.3289
7.3234
7.3137
7.3113
7.3031
7.3004
7.2967
5.5487
5.5357
5.5244
4.2980
4.2861
4.2742
4.2623
3.6334
3.6225
3.6183
3.6072
3.6047
3.5936
3.4766
3.4676
3.4629
3.4537
3.4476
3.4387
2.6849
2.6742
2.6600
2.6567
2.6534
2.6494
2.6461
2.6294
2.6212
2.6155
2.6047
2.5910
2.4168
2.4139
2.4027
2.3883
2.0880
2.0833
2.0740
2.0719
2.0692
2.0621
2.0577
2.0552
2.0479
2.0442
2.0415
1.3427
1.3308
1.3188

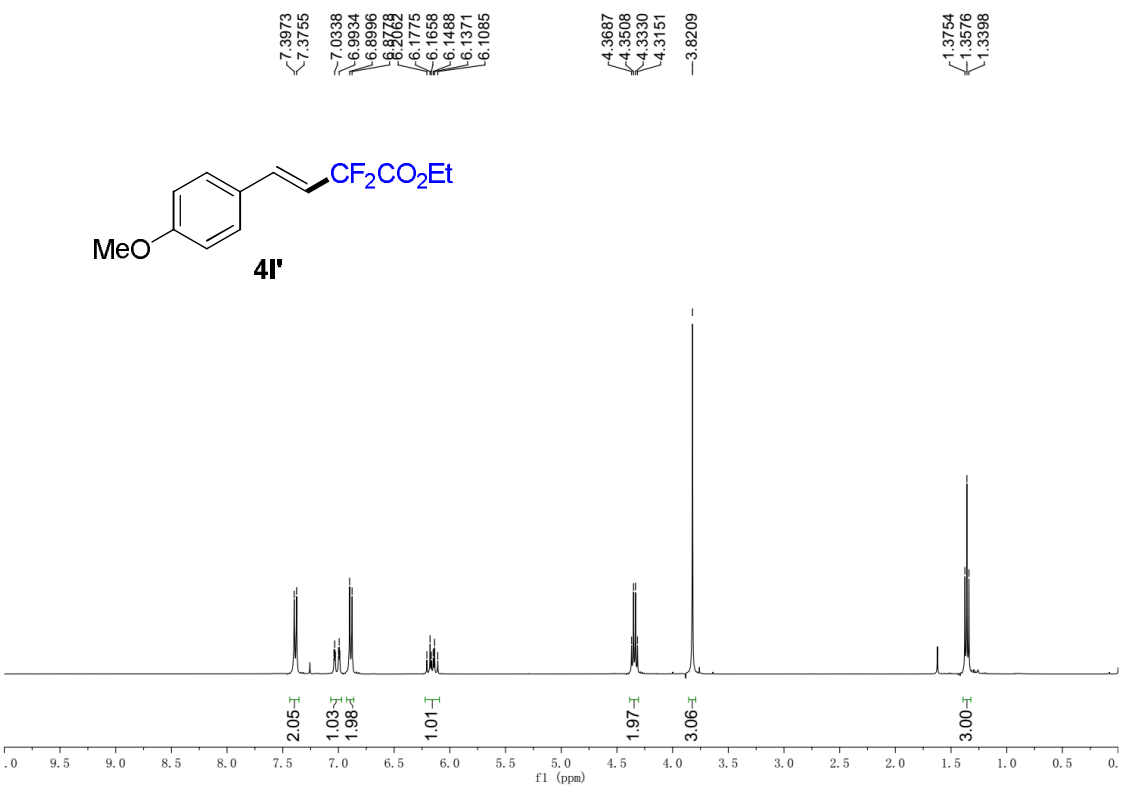

O
N
CF2CO2Et
Ph
4k
2.01
3.02
1.00
2.00
1.04
1.02
2.04
1.99
2.07
3.00
f1 (ppm)


174.2483
163.5178
163.3069
163.0947
131.7236
128.7553
128.3032
121.8773
115.9868
114.3083
112.6433
85.1863
84.1050
63.1804
43.0784
38.6714
38.6295
38.5914
37.8163
37.6630
37.5081
30.8460
17.7527
13.7874
O
N
CF2CO2Et
Ph
4k
f1 (ppm)

O
N
CF2CO2Et
Ph

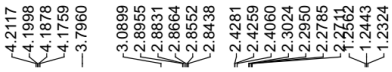
4k

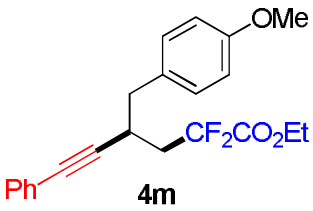

-103.0712
-103.5509
-105.0662
-105.5458
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)


7.3973
7.3755
7.0338
6.9934
6.8996
6.1775
6.1658
6.1488
6.1371
6.1085
4.3687
4.3508
4.3330
4.3151
3.8209
1.3754
1.3576
1.3398
CF2CO2Et
MeO
2.05
1.03
1.98
1.01
1.97
3.06
3.00
f1 (ppm)

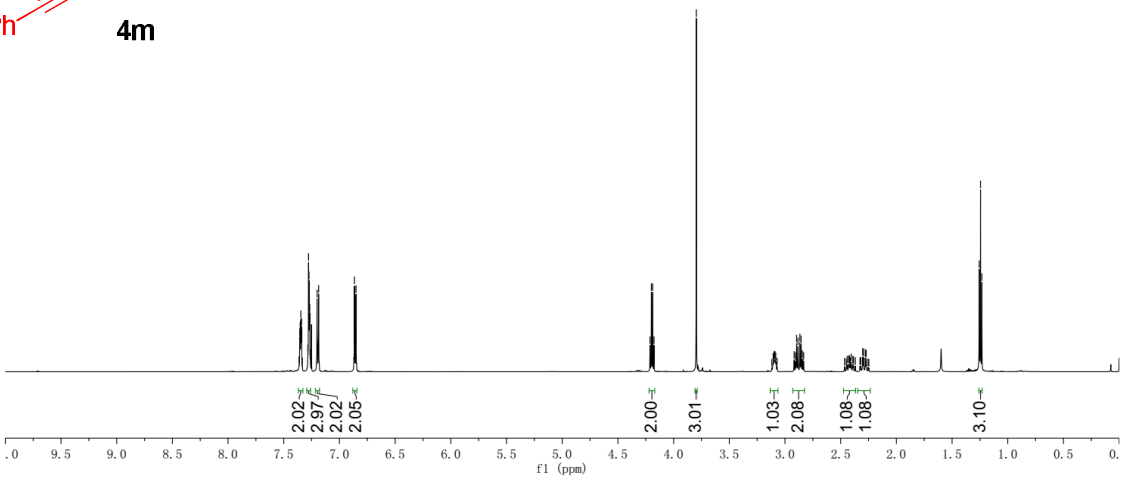
4l'


7.3623
7.3566
7.3527
7.3467
7.3406
7.3335
7.2835
7.2775
7.2732
7.2694
7.2669
7.2621
7.2009
7.1867
6.8656
6.8513


4.2117
4.1998
4.1878
4.1759
3.7960
3.0899
2.8955
2.8831
2.8664
2.8552
2.8438
2.4281
2.4259
2.4060
2.3024
2.2950
2.2785
1.2502
1.2443
1.2324


OMe
CF2CO2Et
Ph

4m


2.02
2.97
2.02
2.05
2.00
3.01
1.03
2.08
1.08
1.08
3.10
f1 (ppm)


164.1021
163.8885
163.6718
158.4434
131.4677
130.3804
130.0837
128.1780
127.9572
123.1982
117.2032
115.5287
113.8802
113.7390
90.0608
83.5425
62.8926
55.2160
40.5854
38.9136
38.7589
38.6050
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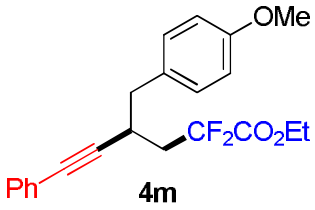
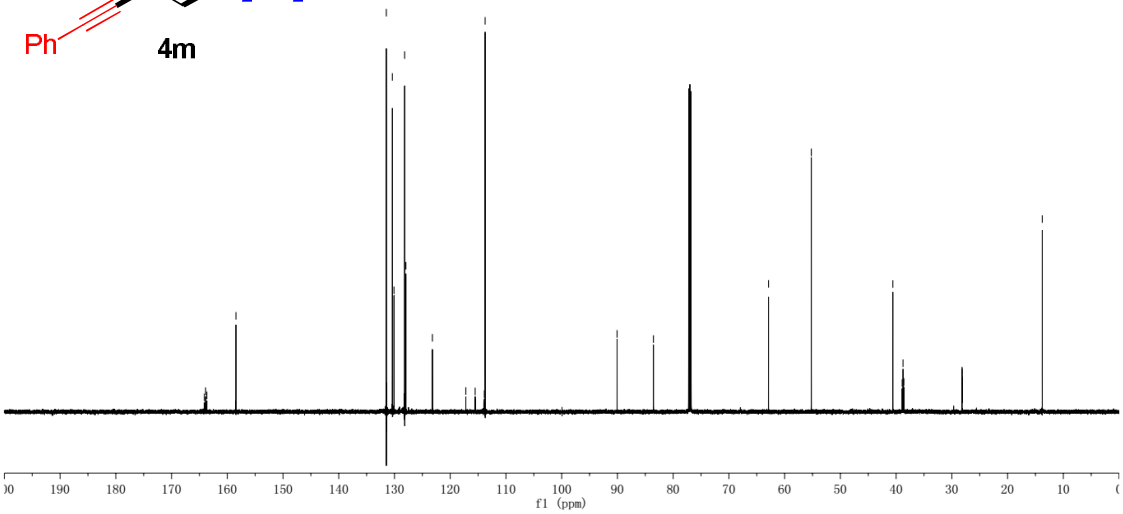
28.1699
28.1484
13.7724

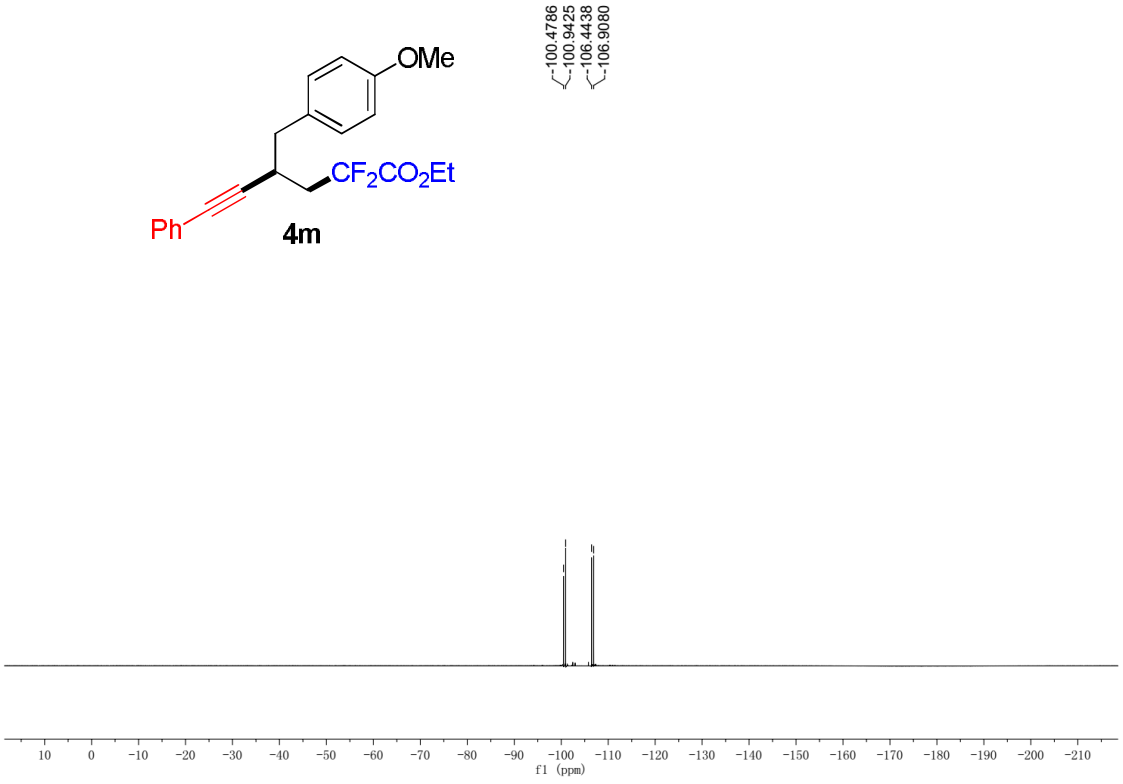

OMe
CF2CO2Et
Ph

4m


f1 (ppm)

OMe
CF2CO2Et
Ph

4m


100.4786
100.9425
106.4438
106.9080
f1 (ppm)


7.3934
7.3914
7.3897
7.3870
7.3811
7.3772
7.2837
7.2819
7.2783
7.2764
7.2748
7.2712
7.2670
4.1608
4.1489
4.1370
4.1251
2.5079
2.4869
2.4735
2.4700
2.4491
2.2773
2.2551
2.2529
2.2495
2.2305
2.2272
2.2250
1.5390
1.5361
1.5306
1.5236
1.5174
1.3950
1.2364
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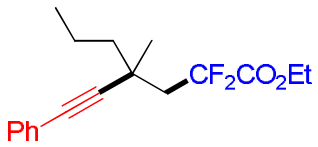
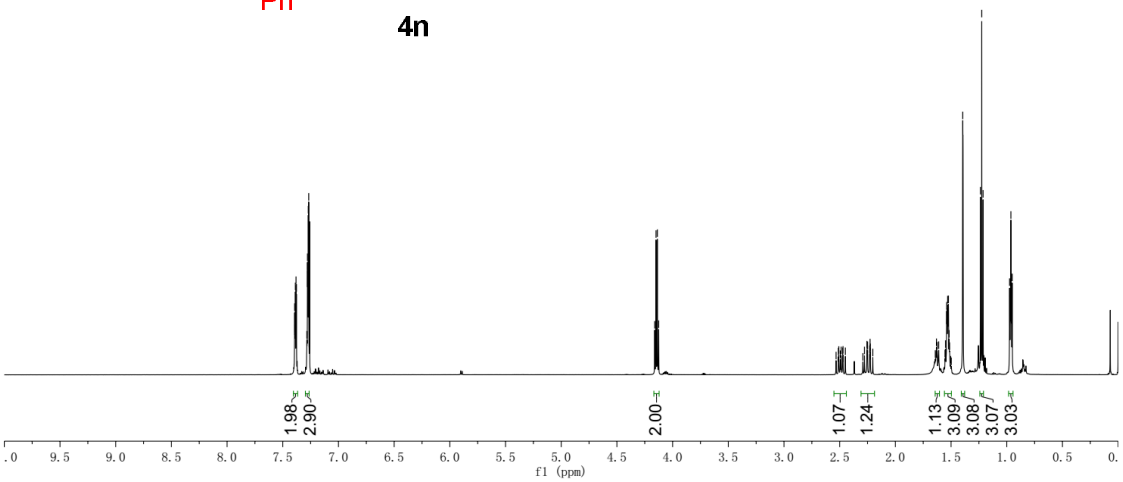
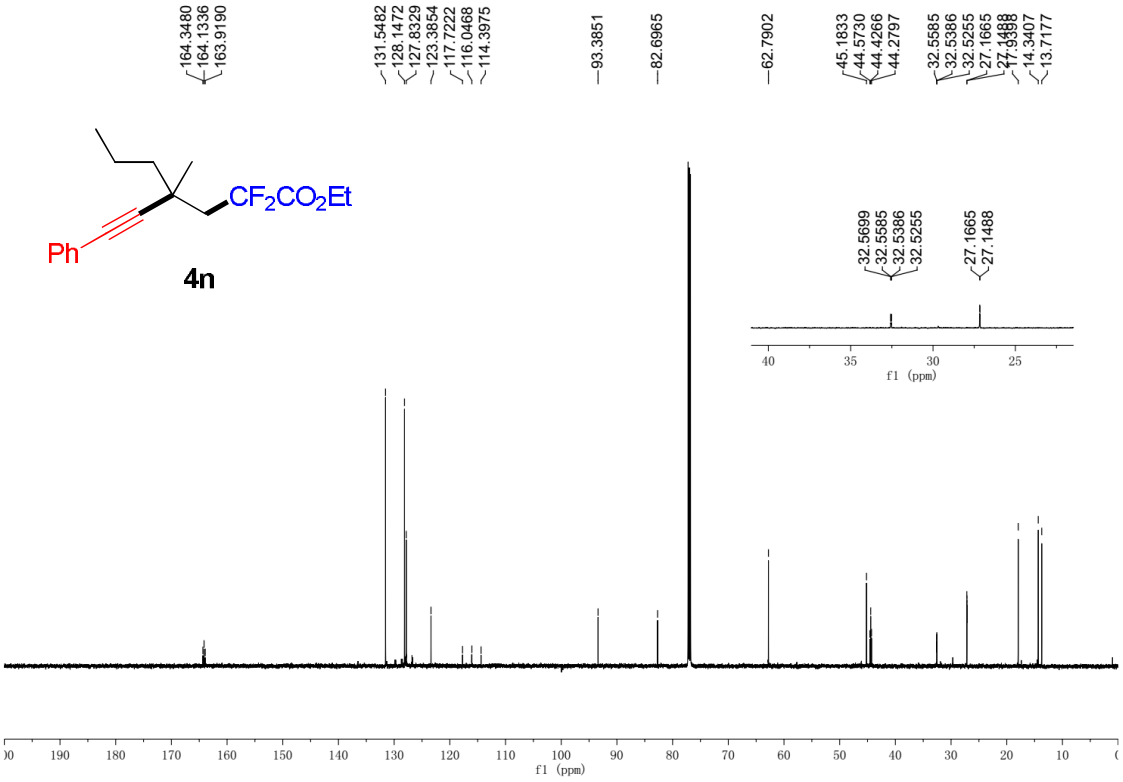
1.2126
0.9746
0.9628


CF2CO2Et
Ph

4n


1.98
2.90
2.00
1.07
1.24
1.13
3.09
3.08
3.07
3.03
f1 (ppm)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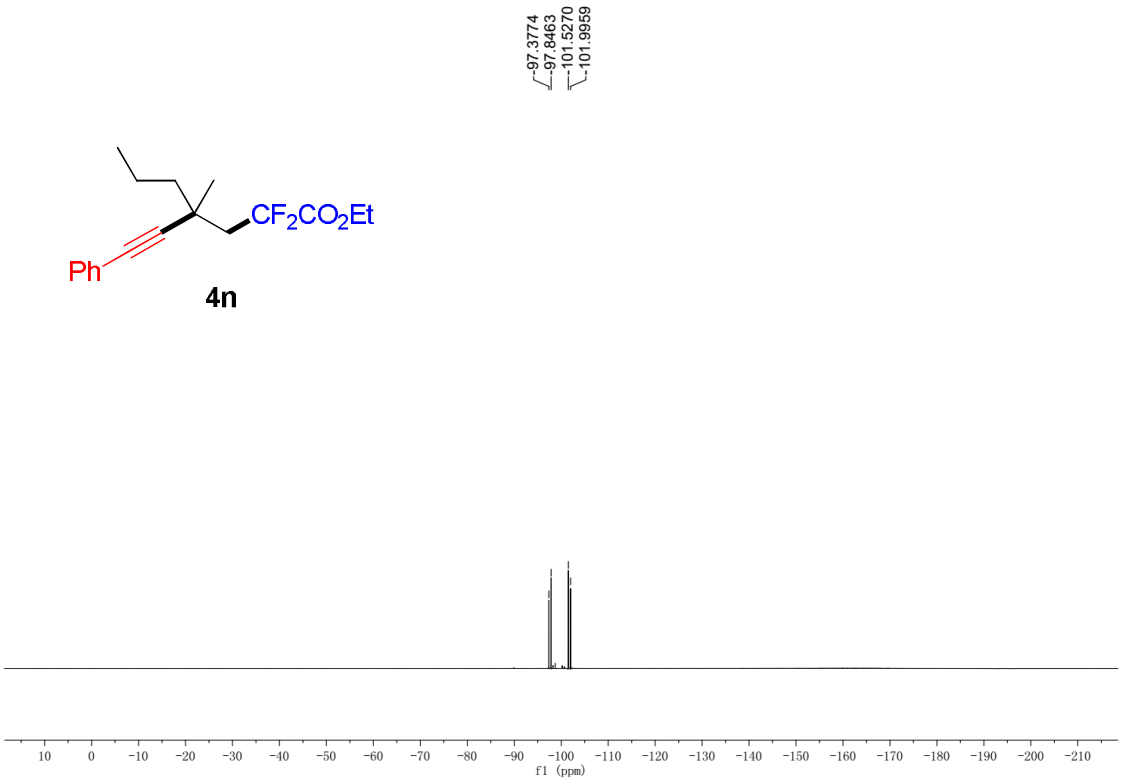
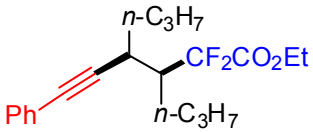
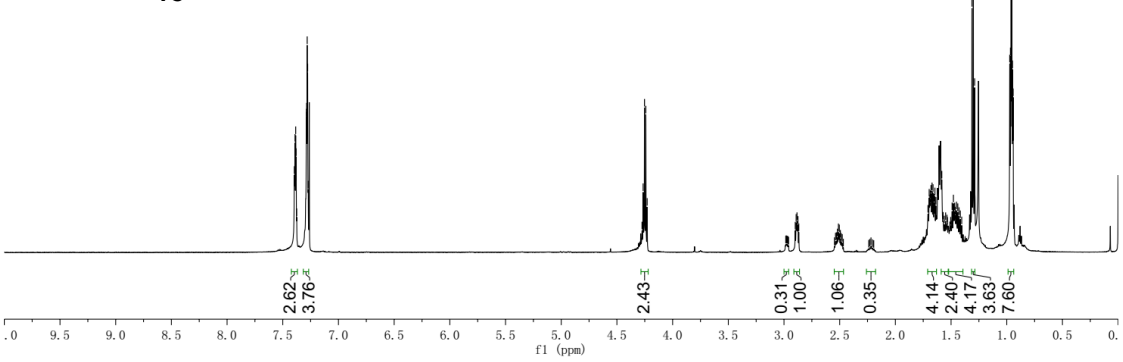
163.9190
131.5482
128.1472
127.8329
123.3854
117.7222
116.0468
114.3975
93.3851
82.6965
62.7902
45.1833
44.5730
44.4266
44.2797
32.5585
32.5386
32.5255
27.1665
27.1488
14.3407
13.7177
CF2CO2Et
Ph
4n
32.5699
32.5585
32.5386
32.5255
27.1665
27.1488
40
35
30
25
f1 (ppm)
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

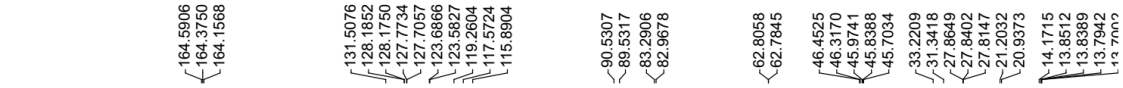

97.3774
97.8463
101.5270
101.9959
CF2CO2Et
Ph
4n
10
0
−10
−20
−30
−40
−50
−60
−70
−80
−90
−100
−110
−120
−130
−140
−150
−160
−170
−180
−190
−200
−210
f1 (ppm)


7.3960
7.3899
7.3840
7.3801
7.3753
7.2879
7.2857
7.2808
7.2767
7.2725
4.2745
4.2646
4.2526
4.2406
4.2287
2.8989
2.8910
2.8830
2.8748
2.8669
2.5371
2.5289
2.5205
2.5113
2.5033
2.4939
1.7072
1.6964
1.6901
1.6862
1.6800
1.6708
1.6617
1.6513
1.6451
1.6362
1.5831
1.5713
1.5606
1.5488
1.5368
1.5326
1.5104
1.5031
1.4985
1.4905
1.4790
1.4675
1.4630
1.4559
1.4510
1.4395
1.4285
1.4169
1.4045
1.3123
1.3004
1.2884
0.9730
0.9667
0.9610
0.9546
0.9485
0.9426


n-C3H7
CF2CO2Et
Ph
n-C3H7

4o


2.62
3.76
2.43
0.31
1.00
1.06
0.35
4.14
2.40
4.17
3.63
7.60
f1 (ppm)


164.5906
164.3750
164.1568
131.5076
128.1852
128.1750
127.7734
127.7057
123.6866
123.5827
119.2604
117.5724
115.8904
90.5307
89.5317
83.2906
82.9678
62.8058
62.7845
46.4525
46.3170
45.9741
45.8388
45.7034
33.2209
31.3418
27.8649
27.8402
27.8147
21.2032
20.9373
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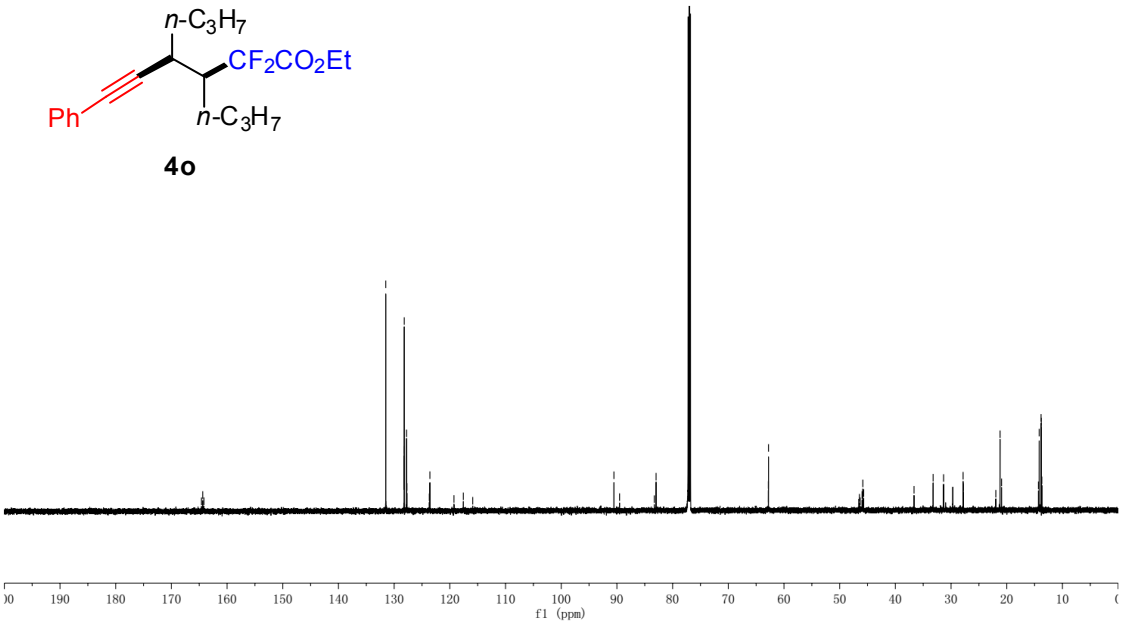
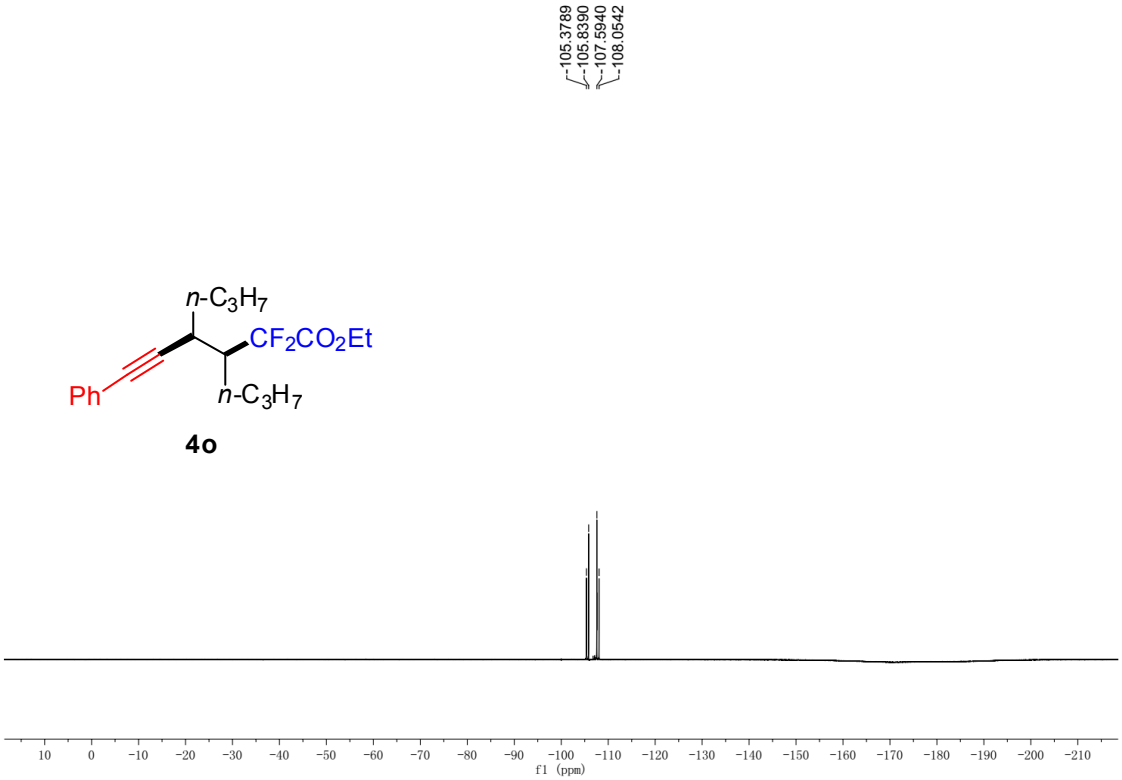
13.8389
13.7942

n-C3H7
CF2CO2Et
Ph
n-C3H7

4o


f1 (ppm)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-107.5940
-108.0542
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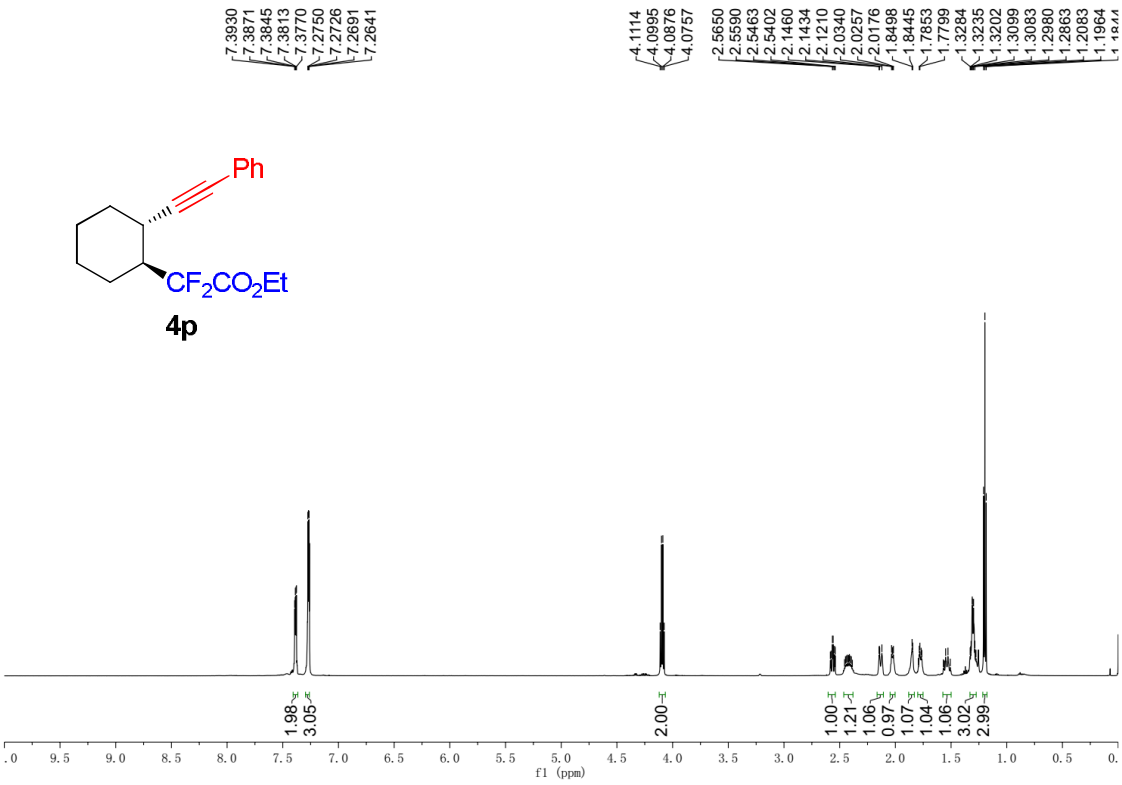
CF2CO2Et
Ph
n-C3H7
4o
f1 (ppm)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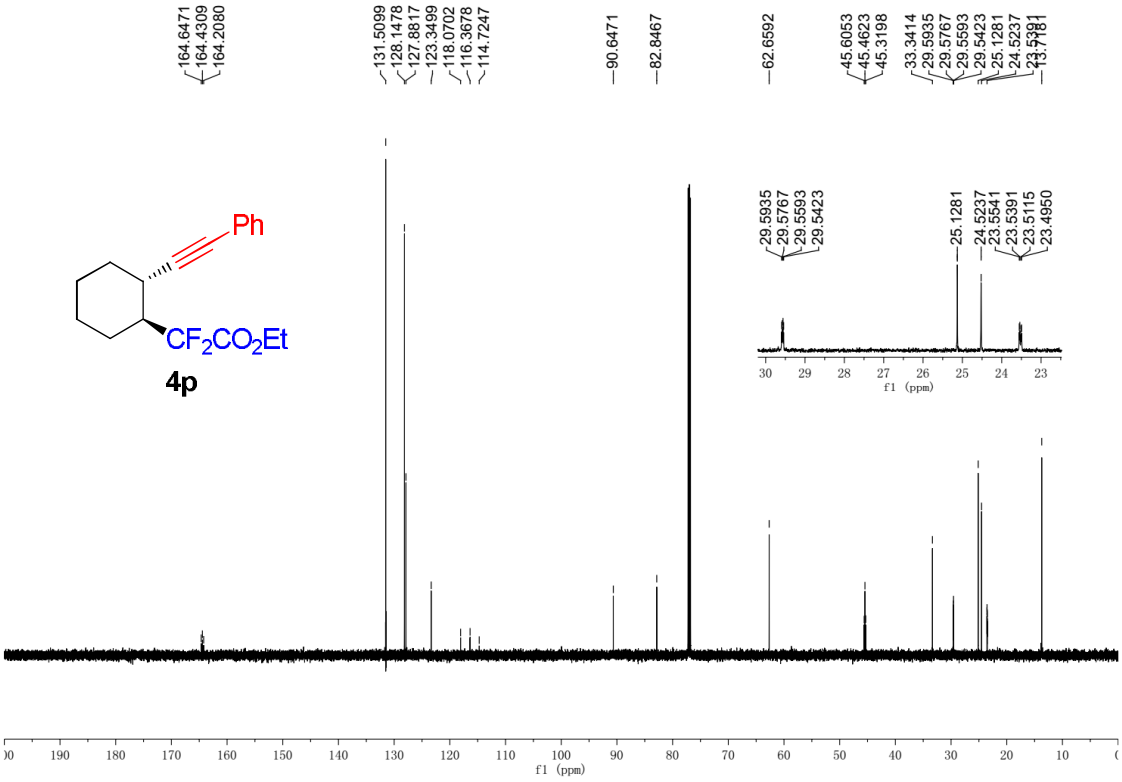
7.2726
7.2691
7.2641
4.1114
4.0995
4.0876
4.0757
2.5650
2.5590
2.5463
2.5402
2.1460
2.1434
2.1210
2.0340
2.0257
2.0176
1.8498
1.8445
1.7853
1.7799
1.3284
1.3235
1.3202
1.3099
1.3083
1.2980
1.2863
1.2083
1.1964
Ph
CF2CO2Et
4p
1.98
3.05
2.00
1.00
1.21
1.06
0.97
1.07
1.04
1.06
3.02
2.99
f1 (ppm)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45.4623
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33.3414
29.5935
29.5767
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24.5237
23.5391
23.5115
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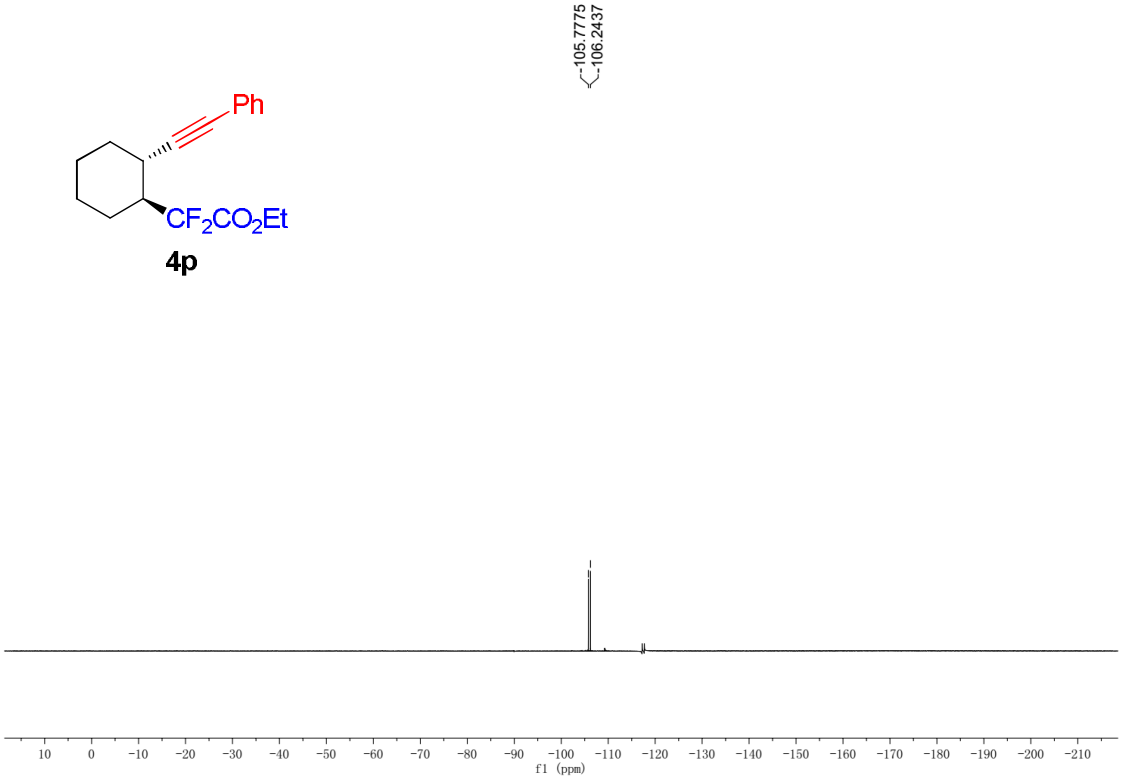
Ph
CF2CO2Et
4p
f1 (ppm)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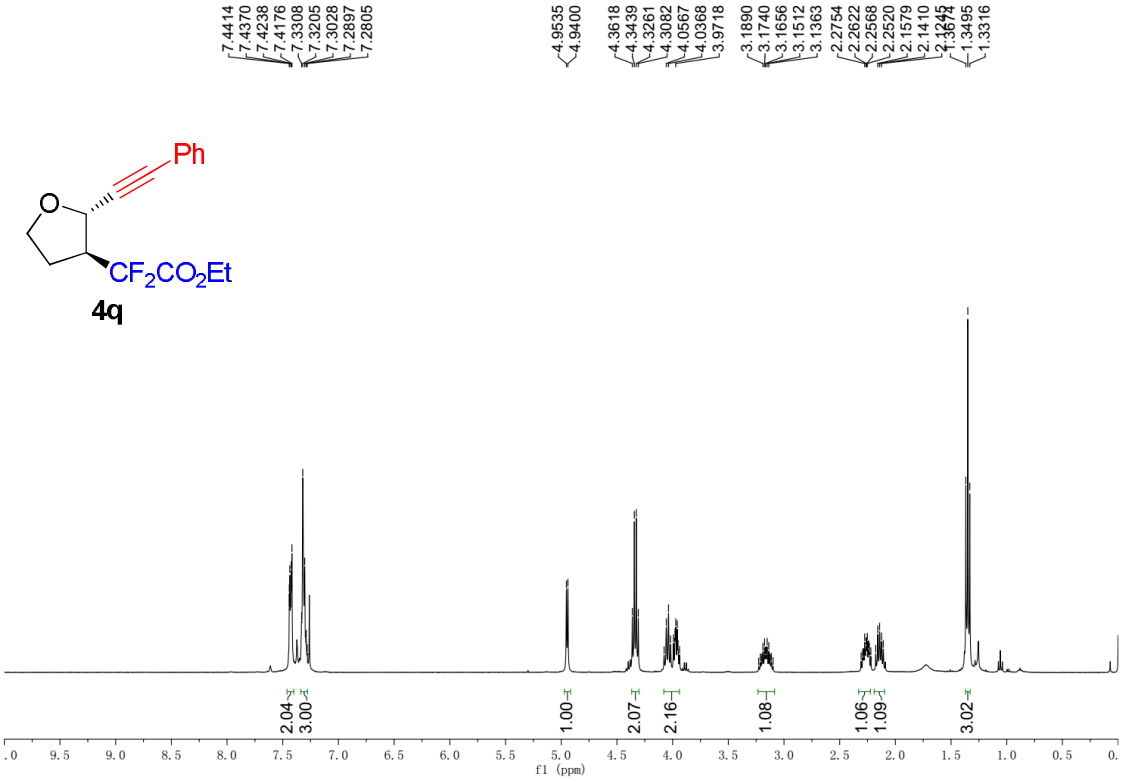
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7.3205
7.3028
7.2897
7.2805
4.9535
4.9400
4.3618
4.3439
4.3261
4.3082
4.0567
4.0368
3.9718
3.1890
3.1740
3.1656
3.1512
3.1363
2.2754
2.2622
2.2568
2.2520
2.1579
2.1410
1.3495
1.3316
Ph
CF2CO2Et
4q
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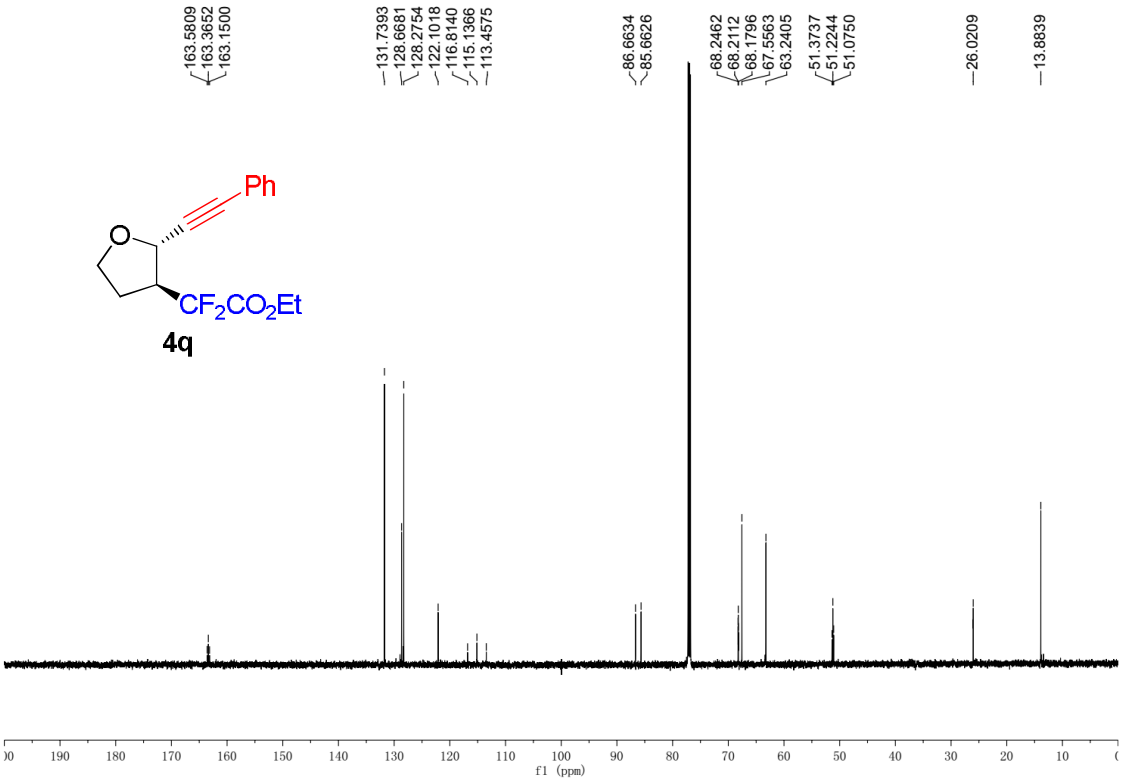
3.00
1.00
2.07
2.16
1.08
1.06
1.09
3.02
f1 (ppm)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122.1018
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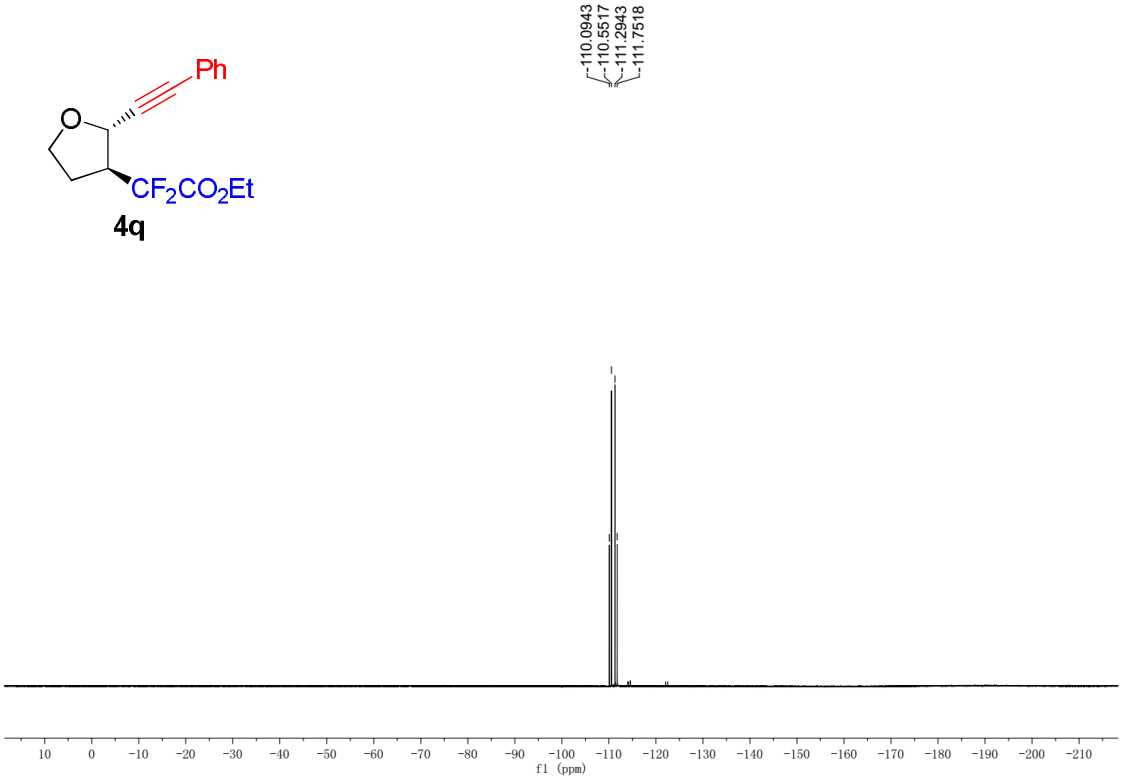
86.6634
85.6626
68.2462
68.2112
68.1796
67.5563
63.2405
51.3737
51.2244
51.0750
26.0209
13.8839
Ph
CF2CO2Et
4q
f1 (ppm)

Ph
O
CF2CO2Et

4q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-111.7518
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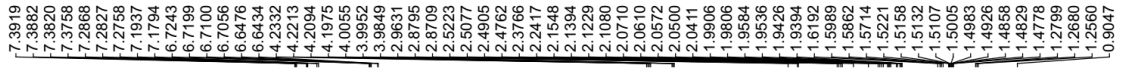
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7.2827
7.2758
7.1937
7.1794
6.7243
6.7199
6.7100
6.7056
6.6476
6.6434
4.2332
4.2213
4.2094
4.1975
4.0055
3.9952
3.9849
2.9631
2.8795
2.8709
2.5223
2.5077
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2.4762
2.3766
2.2417
2.1548
2.1394
2.1229
2.1080
2.0710
2.0610
2.0572
2.0500
2.0411
1.9906
1.9806
1.9584
1.9536
1.9426
1.9334
1.6192
1.5989
1.5862
1.5714
1.5221
1.5158
1.5132
1.5107
1.5005
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1.4926
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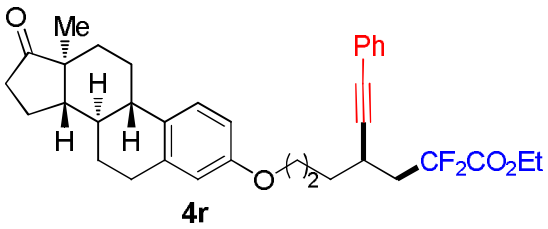
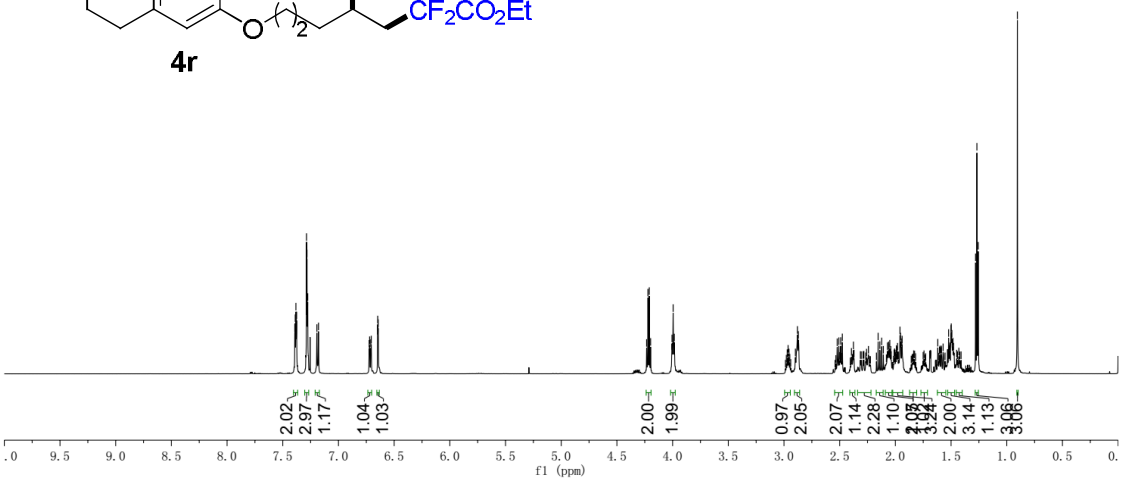
1.2680
1.2560
0.9047


O
Me
H
H
H
Ph
O
2
CF2CO2Et

4r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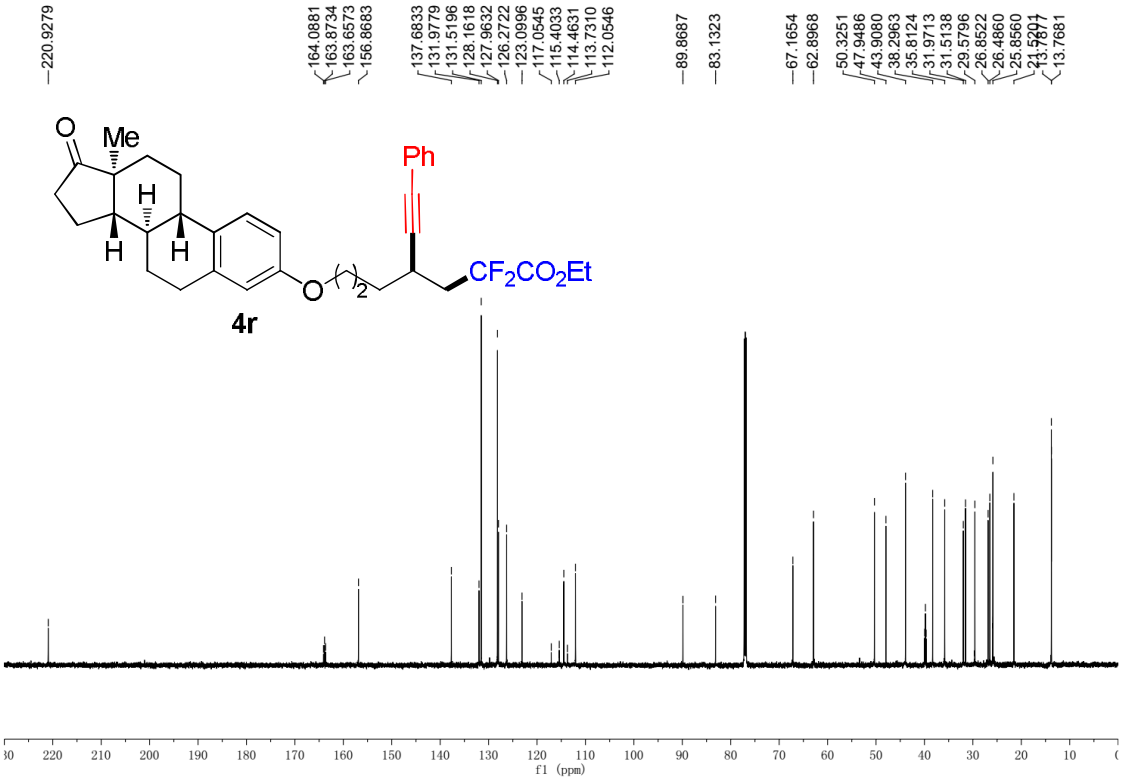
2.97
1.17
1.04
1.03
2.00
1.99
0.97
2.05
2.07
1.14
2.28
1.10
2.00
3.14
1.13
3.06
3.08
f1 (ppm)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117.0545
115.4033
114.4631
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112.0546
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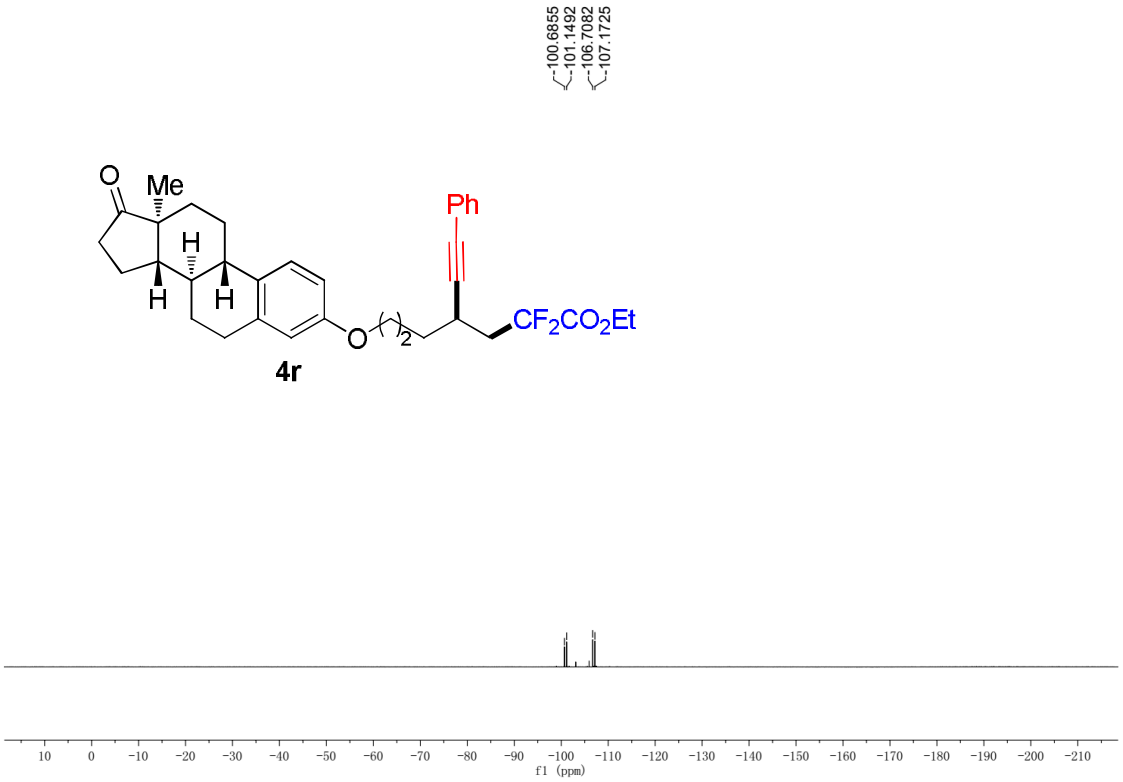
67.1654
62.8968
50.3251
47.9486
43.9080
38.2963
35.8124
31.9713
31.5138
29.5796
26.8522
26.4860
25.8560
13.7681
Me
H
H
H
O
Ph
CF2CO2Et
2
4r
f1 (ppm)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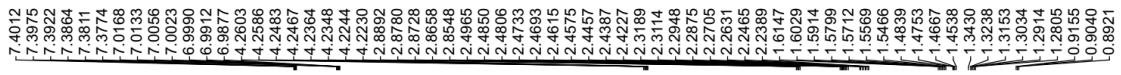
107.1725
Me
H
H
H
O
Ph
CF2CO2Et
2
4r
f1 (ppm)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7.3864
7.3811
7.3774
7.0168
7.0133
7.0056
7.0023
6.9990
6.9912
6.9877
4.2603
4.2586
4.2483
4.2467
4.2364
4.2348
4.2244
4.2230
2.8892
2.8780
2.8728
2.8658
2.8548
2.4965
2.4850
2.4806
2.4733
2.4693
2.4615
2.4575
2.4457
2.4387
2.4227
2.3189
2.3114
2.2948
2.2875
2.2705
2.2631
2.2465
2.2389
1.6147
1.6029
1.5914
1.5799
1.5712
1.5569
1.5466
1.4839
1.4753
1.4667
1.4538
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1.3238
1.3153
1.3034
1.2914
1.2805
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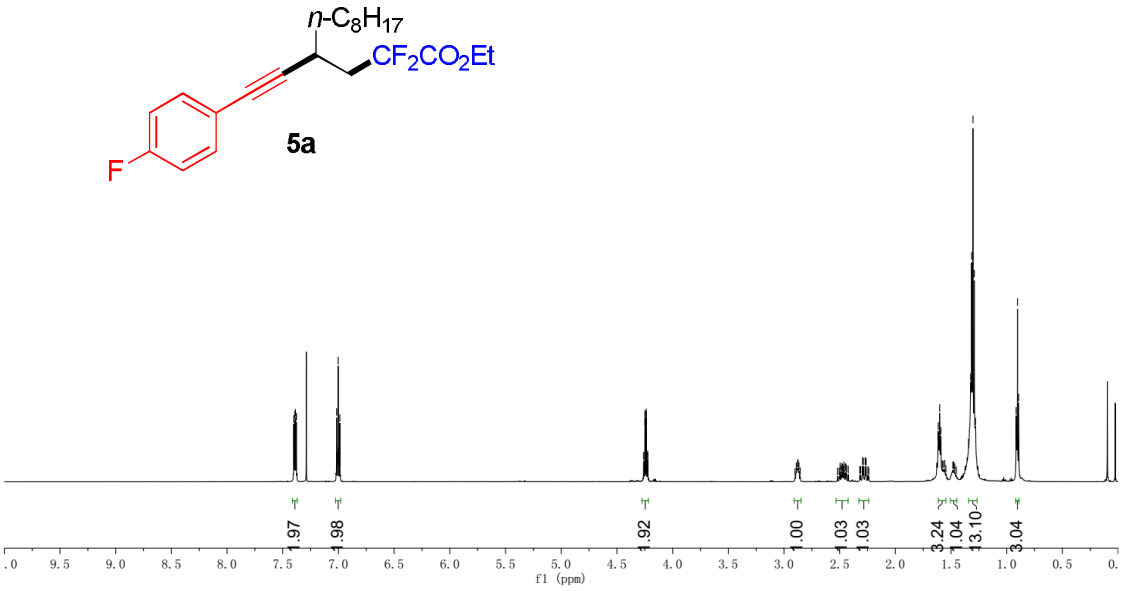
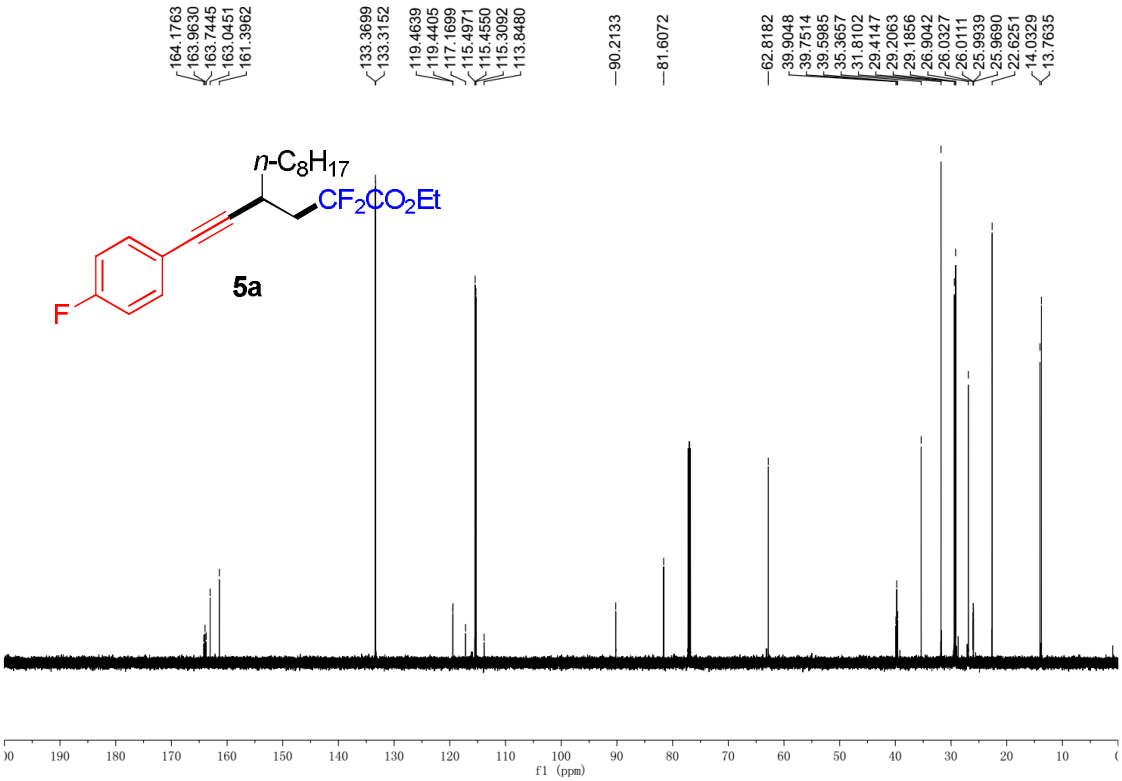
0.9040
0.8921


n-C8H17
CF2CO2Et
F
5a
1.97
1.98
1.92
1.00
1.03
1.03
3.24
1.04
13.10
3.04
f1 (ppm)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161.3962
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113.8480
90.2133
81.6072
62.8182
39.9048
39.7514
39.5985
35.3657
31.8102
29.4147
29.2063
29.1856
26.9042
26.0327
26.0111
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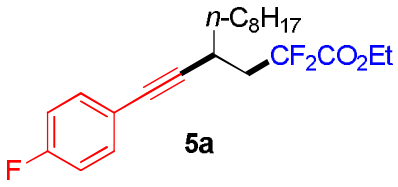
22.6251
14.0329
13.7635
n-C8H17
CF2CO2Et
F
5a
f1 (ppm)


n-C8H17
CF2CO2Et
F

5a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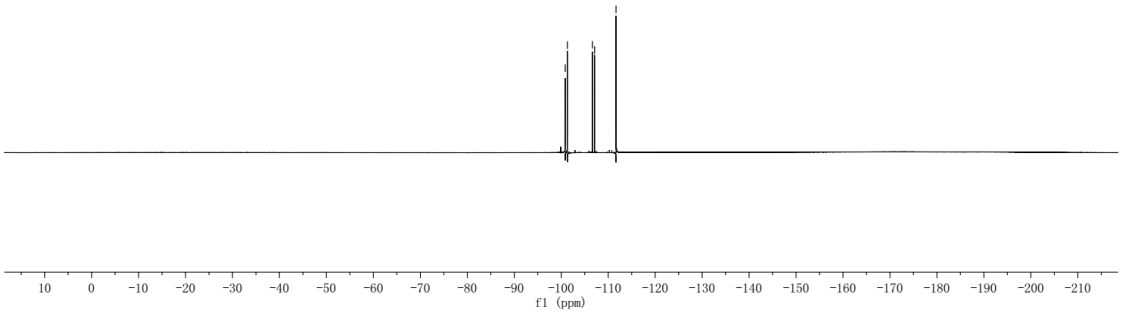
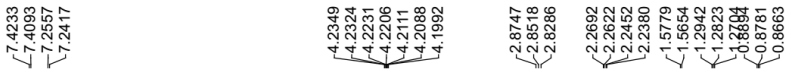
111.6638


10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)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7.2557
7.2417
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4.2324
4.2231
4.2206
4.2111
4.2088
4.1992
2.8747
2.8518
2.8286
2.2692
2.2622
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2.2380
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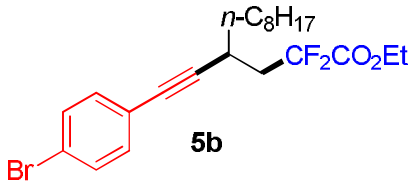
1.5654
1.2942
1.2823
0.8894
0.8781
0.8663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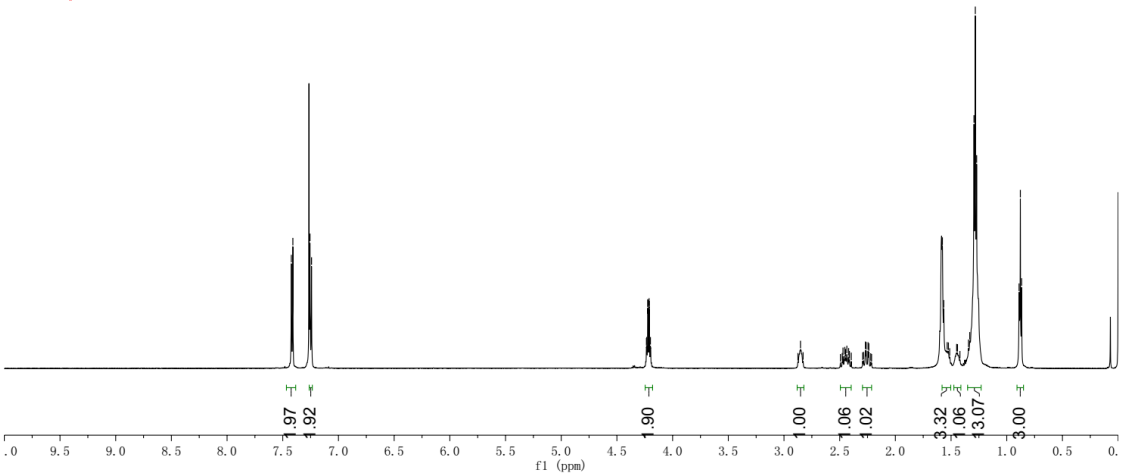
CF2CO2Et
Br

5b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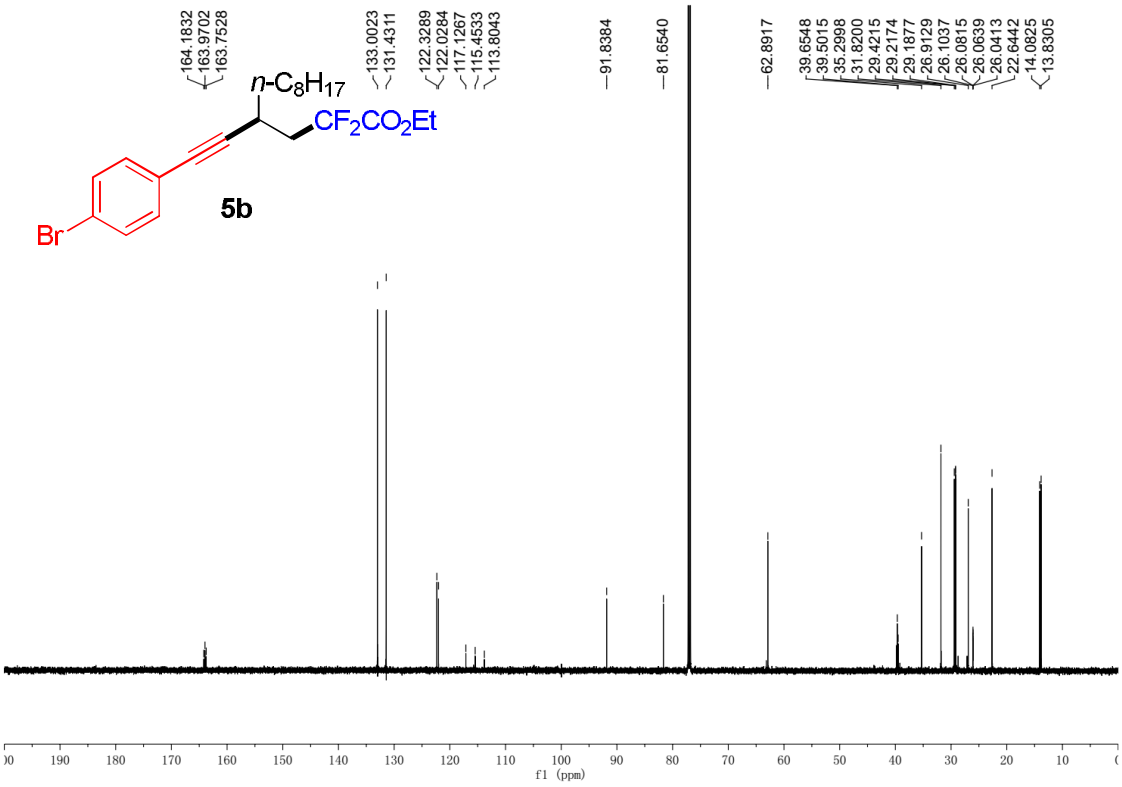
1.92
1.90
1.00
1.06
1.02
3.32
1.06
13.07
3.00
f1 (ppm)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133.0023
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122.0284
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115.4533
113.8043
91.8384
81.6540
62.8917
39.6548
39.5015
35.2998
31.8200
29.4215
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29.1877
26.9129
26.1037
26.0815
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22.6442
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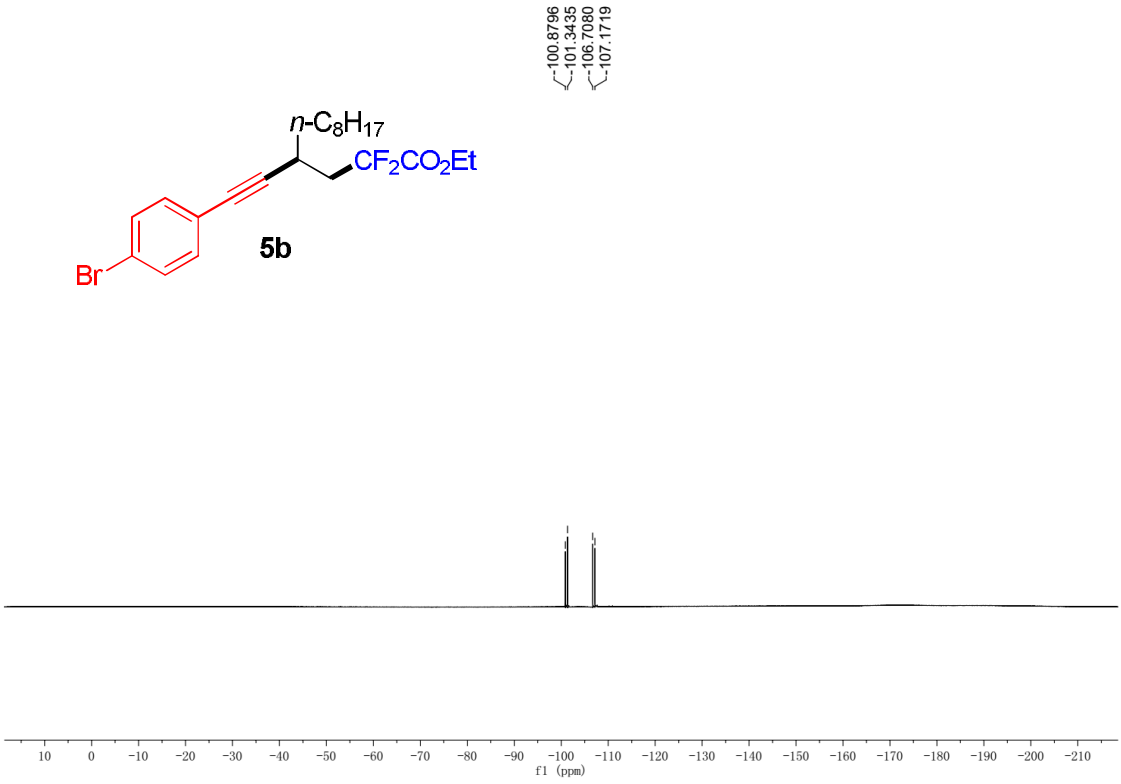
CF2CO2Et
Br
5b
f1 (ppm)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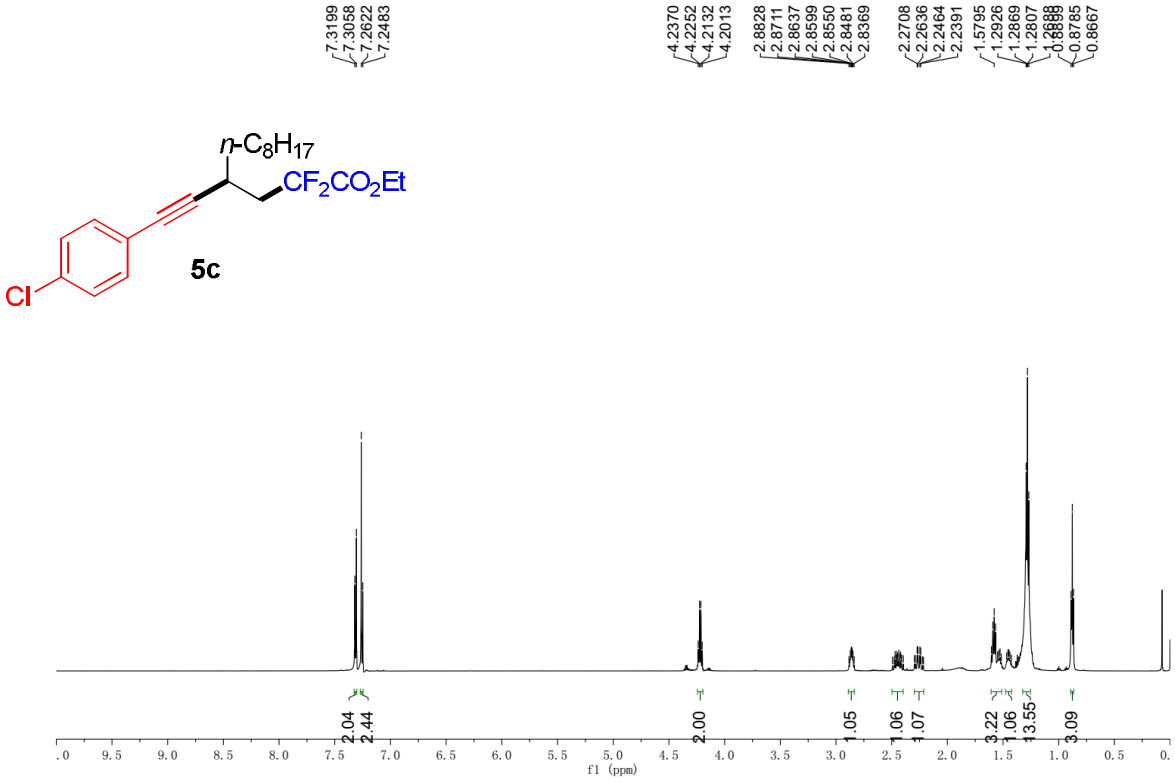
Br
5b
f1 (ppm)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7.2622
7.2483
4.2370
4.2252
4.2132
4.2013
2.8828
2.8711
2.8637
2.8599
2.8550
2.8481
2.8369
2.2708
2.2636
2.2464
2.2391
1.5795
1.2926
1.2869
1.2807
0.8785
0.8667
n-C8H17
CF2CO2Et
Cl
5c
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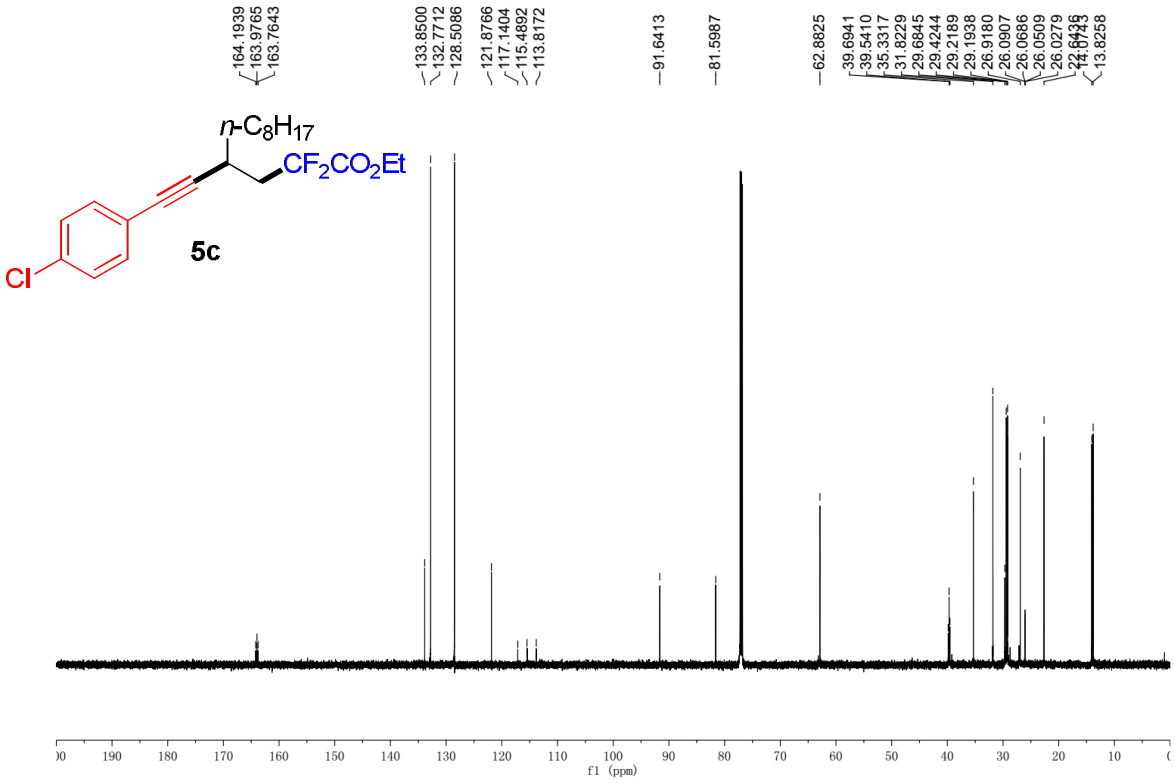
1.06
1.07
3.22
1.06
13.55
3.09
f1 (ppm)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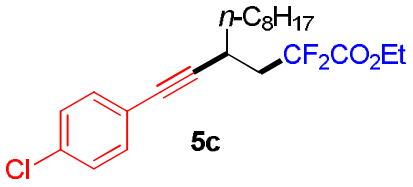
n-C8H17
CF2CO2Et
Cl
5c
f1 (ppm)


n-C8H17
CF2CO2Et
Cl

5c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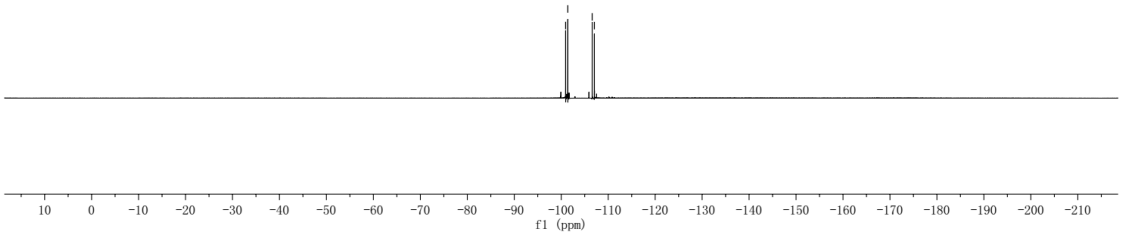
107.0523


10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)


7.2814
7.2680
7.0893
7.0761
4.2277
4.2171
4.2051
4.1932
2.8612
2.8529
2.8455
2.8381
2.8274
2.3292
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1.2682
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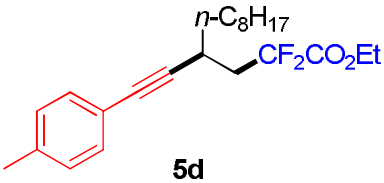
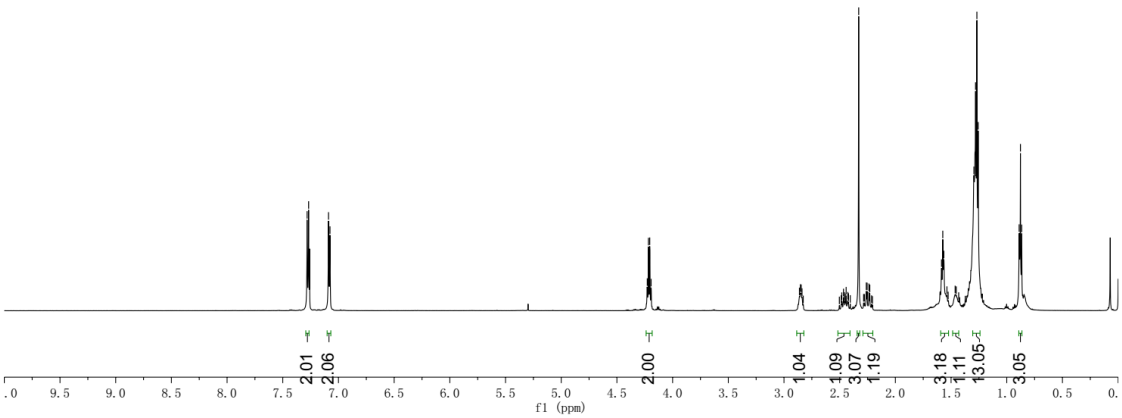
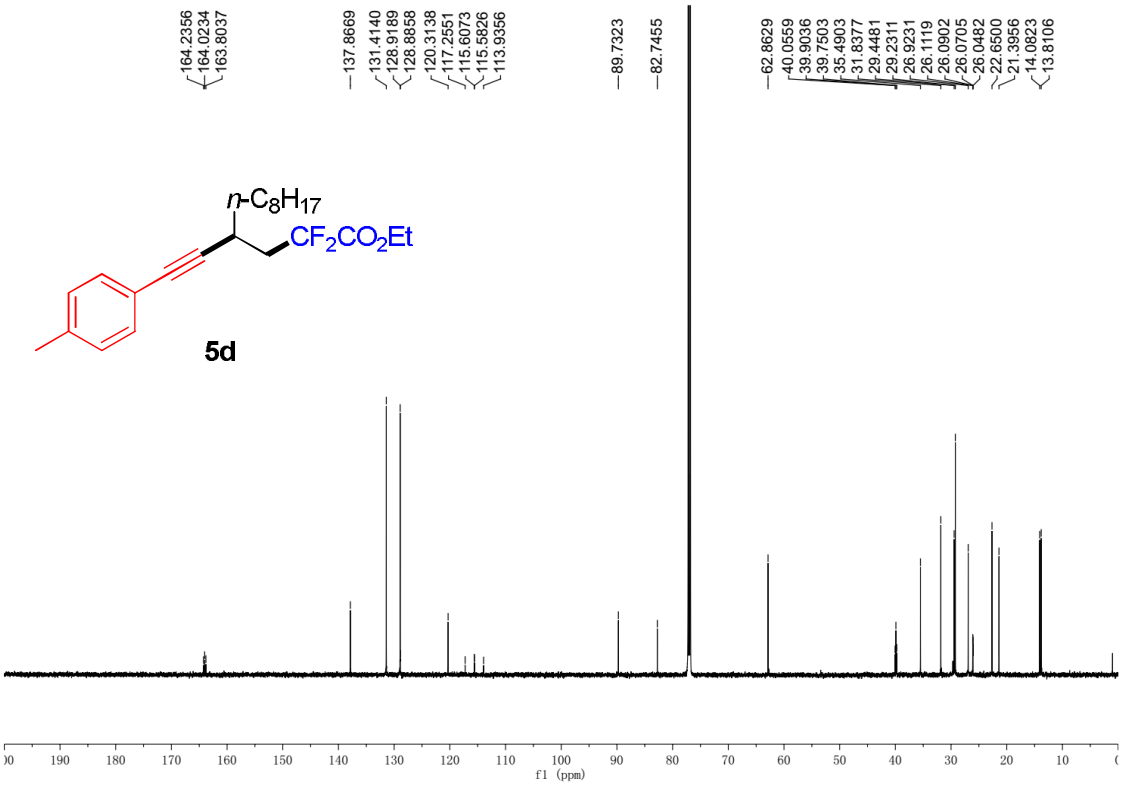
0.8656


n-C8H17
CF2CO2Et

5d


2.01
2.06
2.00
1.04
1.09
3.07
1.19
3.18
1.11
13.05
3.05
.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.
f1 (ppm)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113.9356
89.7323
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35.4903
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29.2311
26.9231
26.1119
26.0902
26.0705
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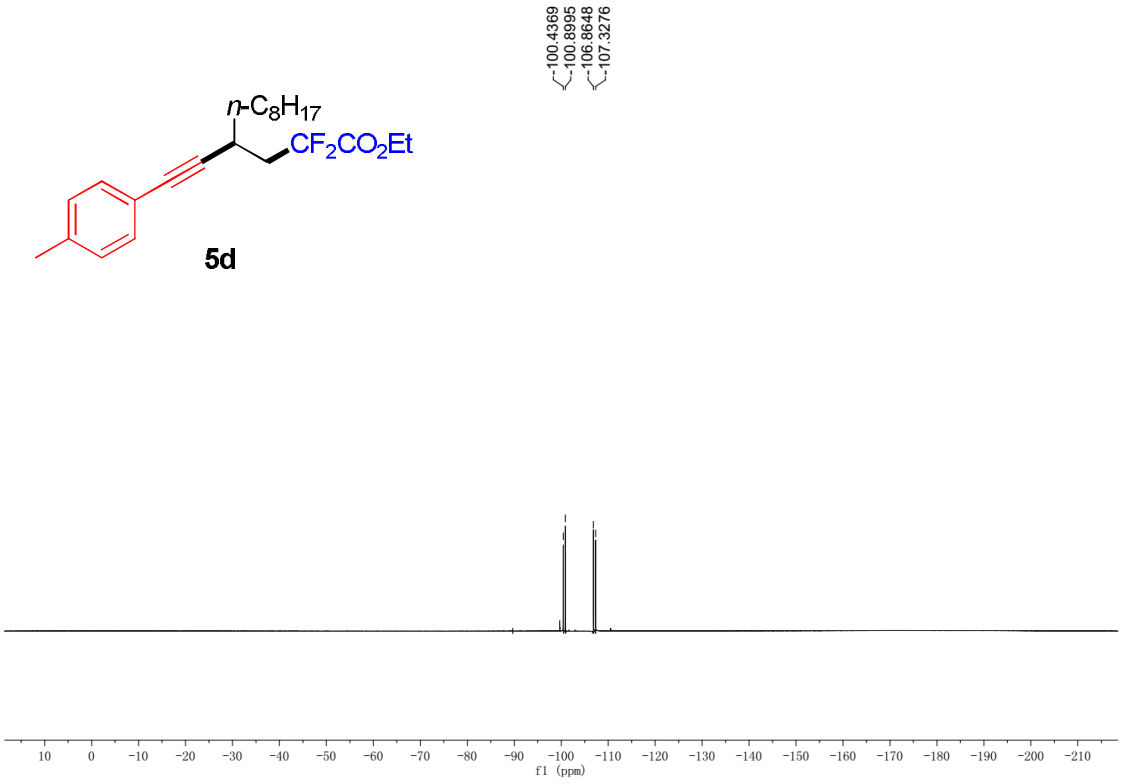
n-C8H17
CF2CO2Et
5d
f1 (ppm)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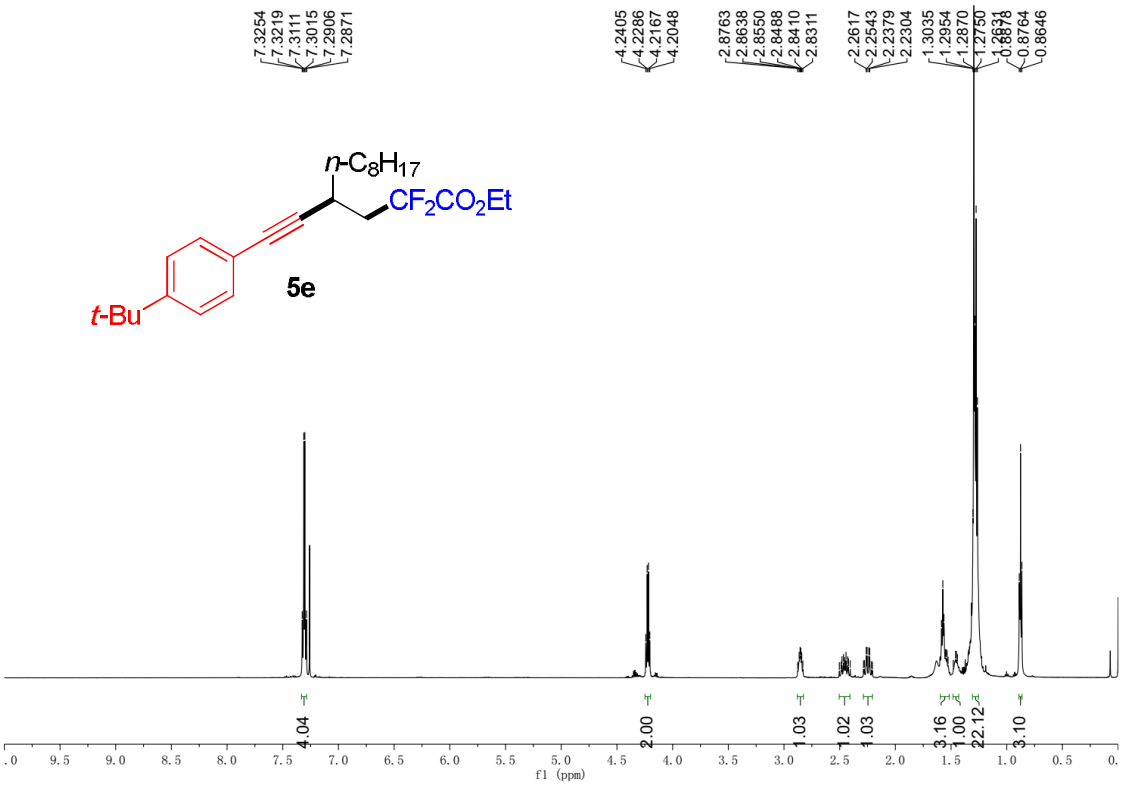
f1 (ppm)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2.8488
2.8410
2.8311
2.2617
2.2543
2.2379
2.2304
1.3035
1.2954
1.2870
1.2750
0.8878
0.8764
0.8646
n-C8H17
CF2CO2Et
t-Bu
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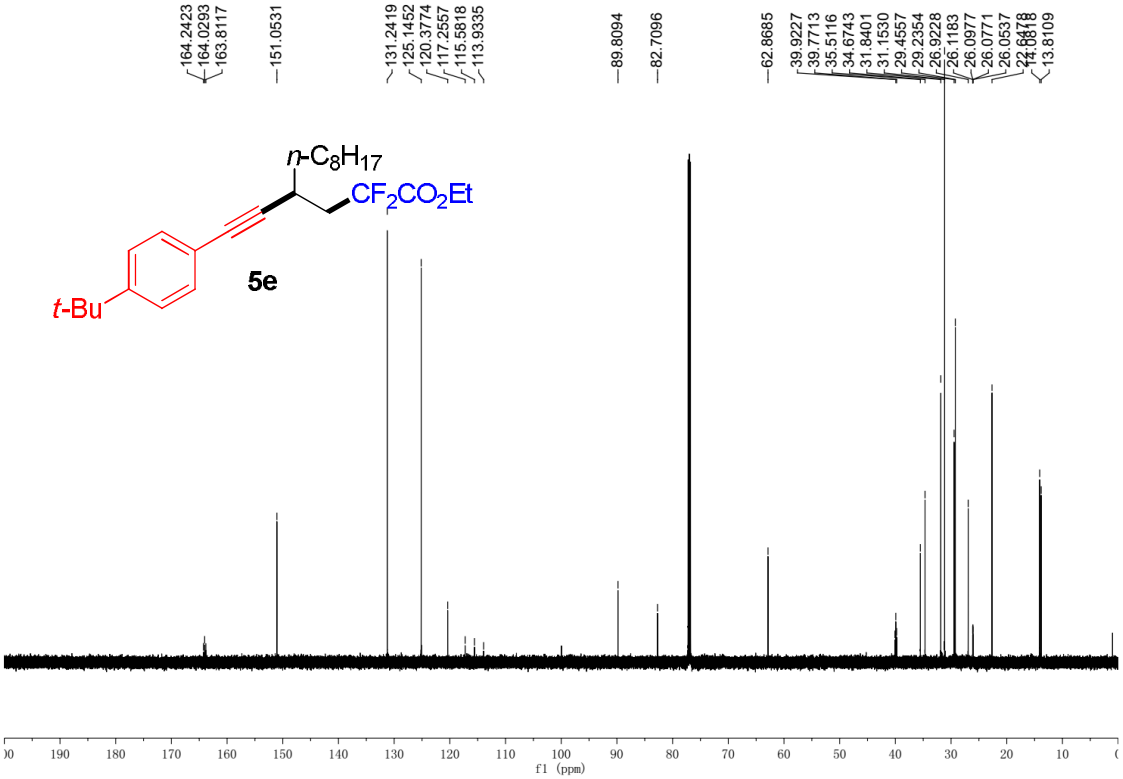
1.03
1.02
1.03
3.16
1.00
22.12
3.10
f1 (ppm)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82.7096
62.8685
39.9227
39.7713
35.5116
34.6743
31.8401
31.1530
29.4557
29.2354
26.9228
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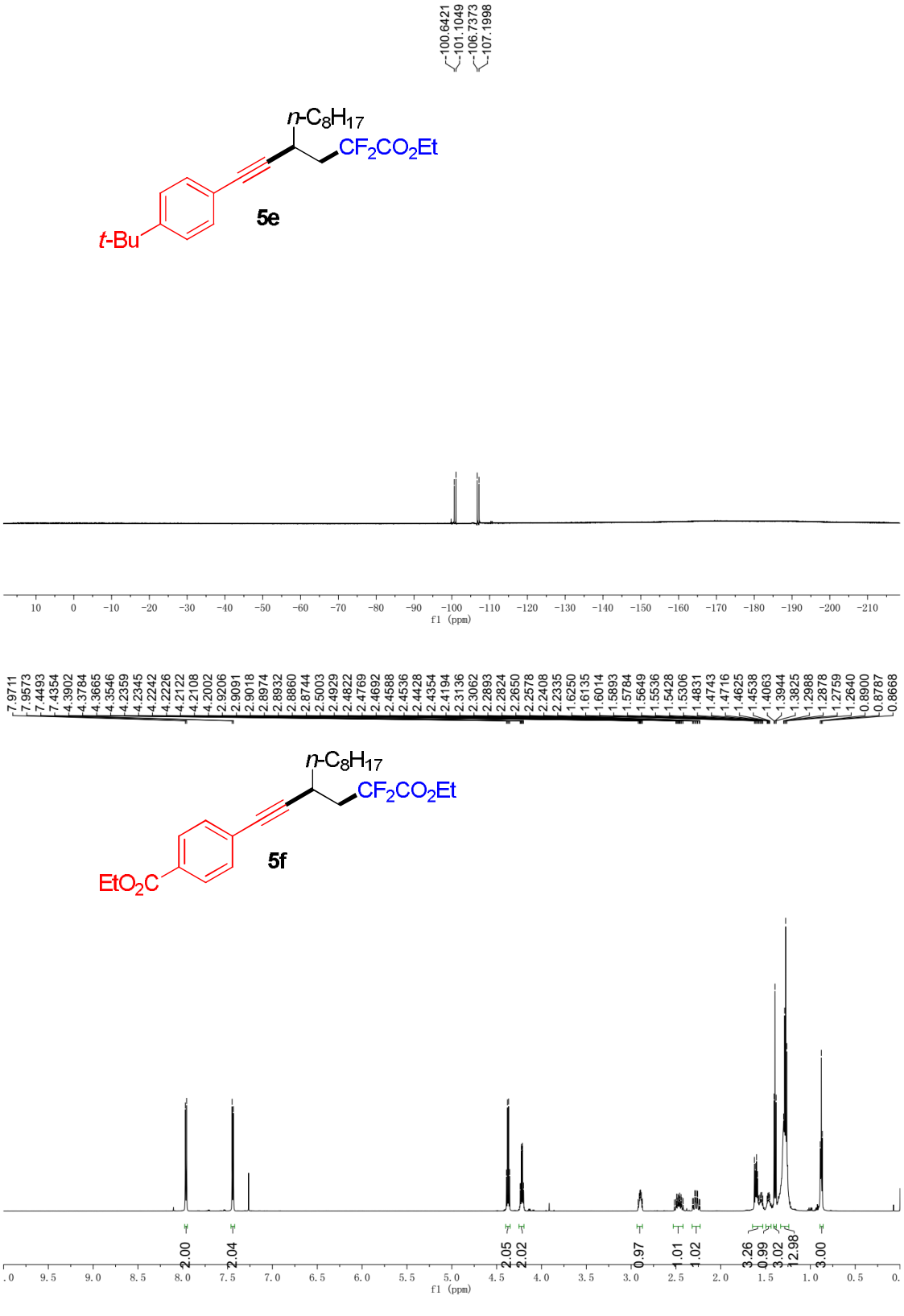
26.0977
26.0771
26.0537
13.8109
n-C8H17
CF2CO2Et
t-Bu
5e
f1 (ppm)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4.3665
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4.2359
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4.2122
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4.2002
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2.8932
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2.4536
2.4428
2.4354
2.4194
2.3136
2.3062
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1.6014
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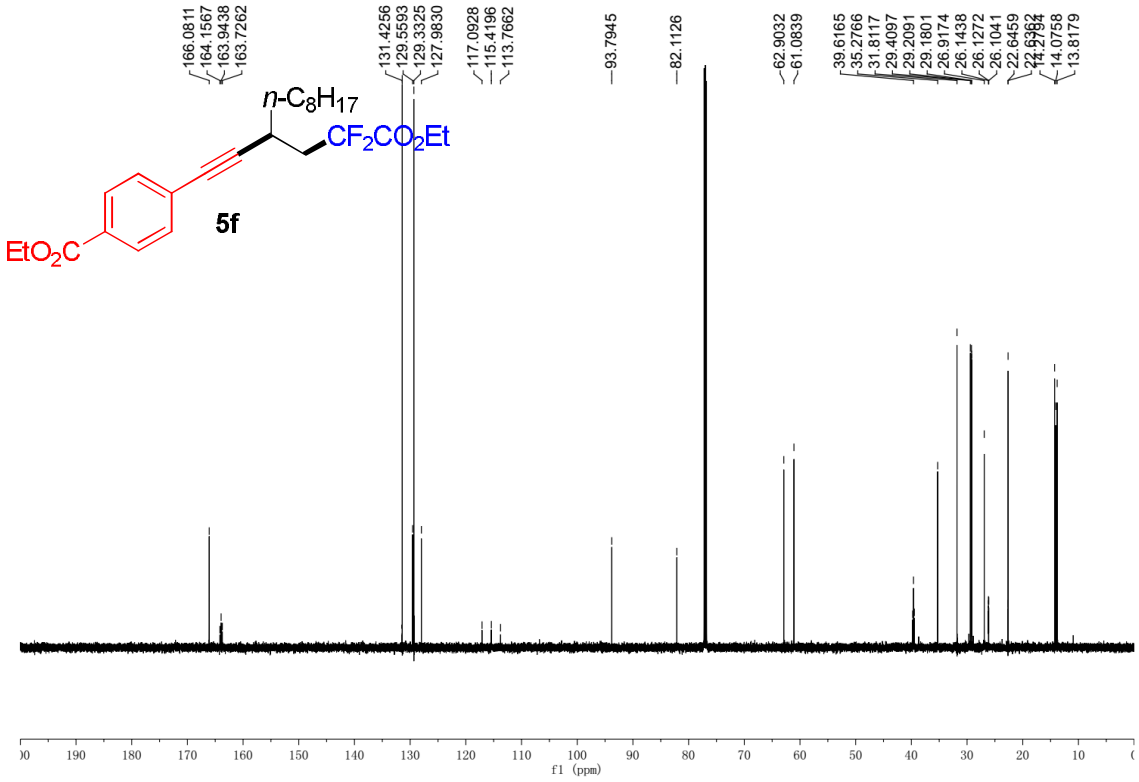
1.5784
1.5649
1.5536
1.5428
1.5306
1.4831
1.4743
1.4716
1.4625
1.4538
1.4063
1.3944
1.3825
1.2988
1.2878
1.2759
1.2640
1.0900
0.8787
0.8668
n-C8H17
CF2CO2Et
EtO2C
5f
2.00
2.04
2.05
2.02
0.97
1.01
1.02
3.26
0.99
3.02
12.98
3.00
f1 (ppm)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82.1126
62.9032
61.0839
39.6165
35.2766
31.8117
29.4097
29.2091
29.1801
26.9174
26.1438
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14.0758
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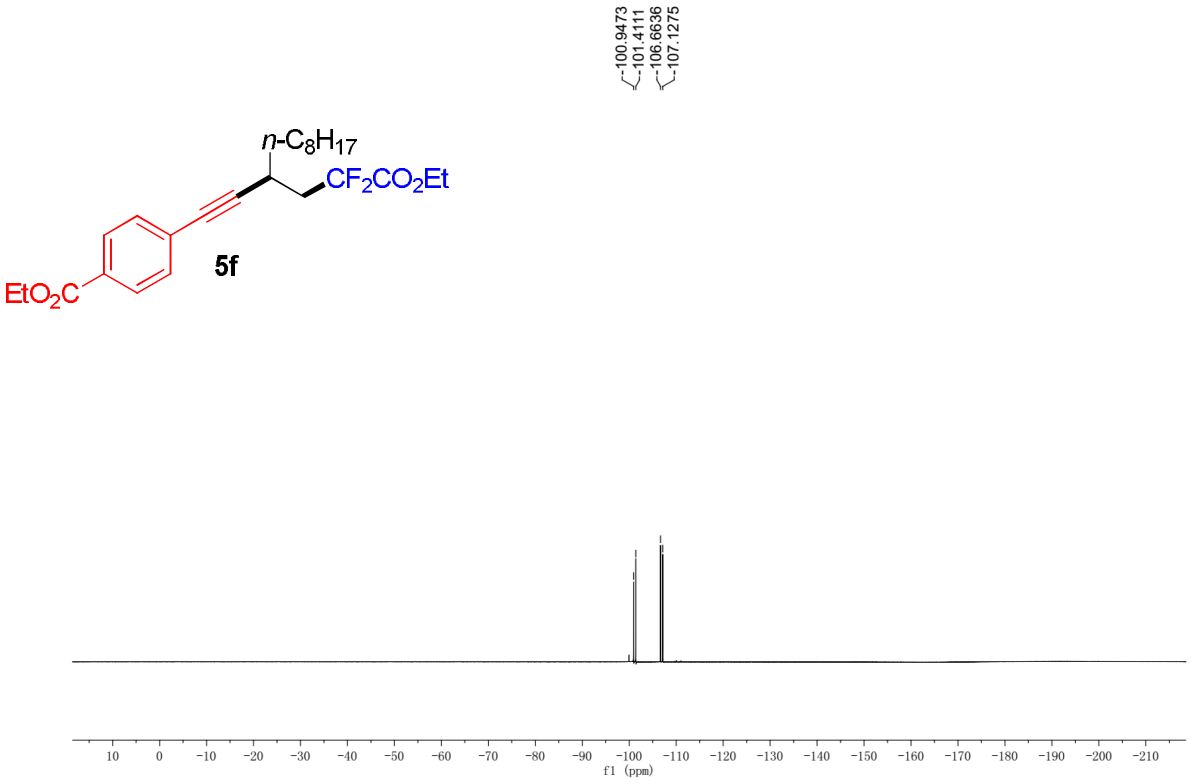
CF2CO2Et
EtO2C
5f
f1 (ppm)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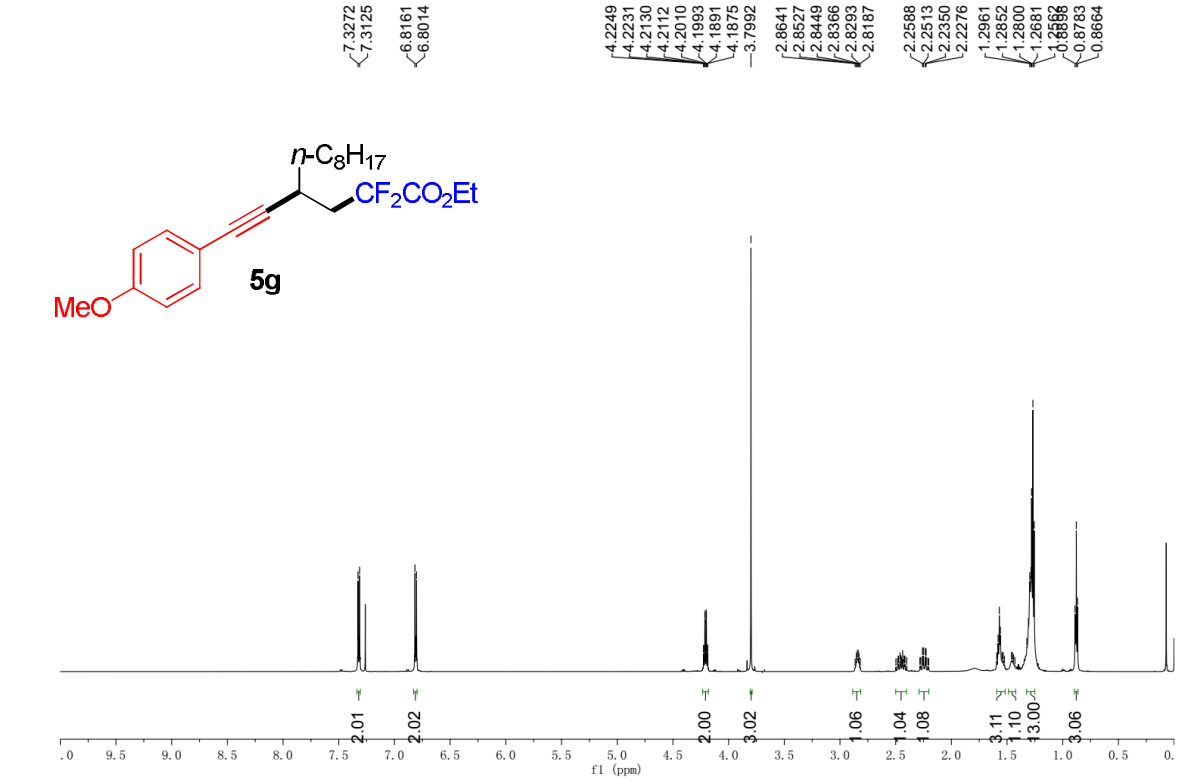
EtO2C
5f
f1 (ppm)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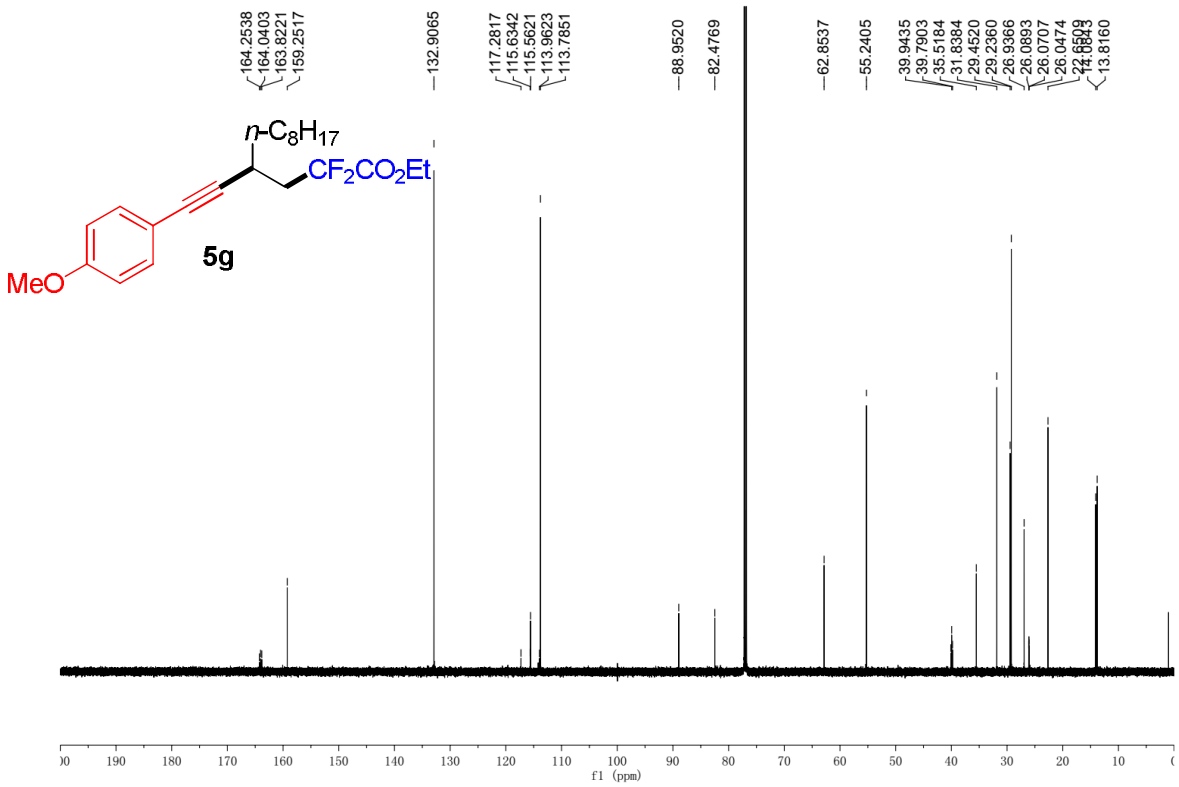
4.2130
4.2112
4.2010
4.1993
4.1891
4.1875
3.7992
2.8641
2.8527
2.8449
2.8366
2.8293
2.8187
2.2588
2.2513
2.2350
2.2276
1.2961
1.2852
1.2800
1.2681
0.8898
0.8783
0.8664
n-C8H17
CF2CO2Et
MeO
5g
2.01
2.02
2.00
3.02
1.06
1.04
1.08
3.11
1.10
13.00
3.06
f1 (ppm)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113.9623
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88.9520
82.4769
62.8537
55.2405
39.9435
39.7903
35.5184
31.8384
29.4520
29.2360
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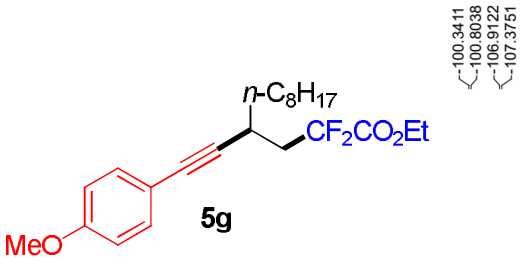
26.0707
26.0474
13.8160
n-C8H17
CF2CO2Et
MeO
5g
f1 (ppm)


n-C8H17
CF2CO2Et
MeO

5g

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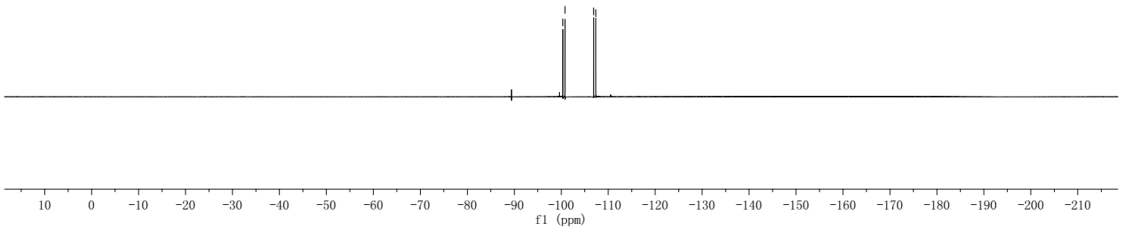
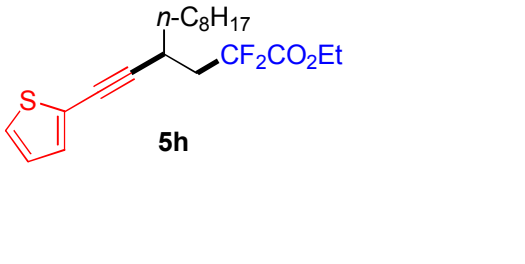
106.9122
107.3751


10 0 −10 −20 −30 −40 −50 −60 −70 −80 −90 −100 −110 −120 −130 −140 −150 −160 −170 −180 −190 −200 −210
f1 (ppm)


n-C8H17
CF2CO2Et
S

5h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7.1863
7.1343
7.1330
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6.9442
6.9381
6.9356
6.9295
4.2742
4.2623
4.2505
4.2385
2.9069
2.8953
2.8837
2.8726
2.8610
2.4452
2.2656
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2.2346
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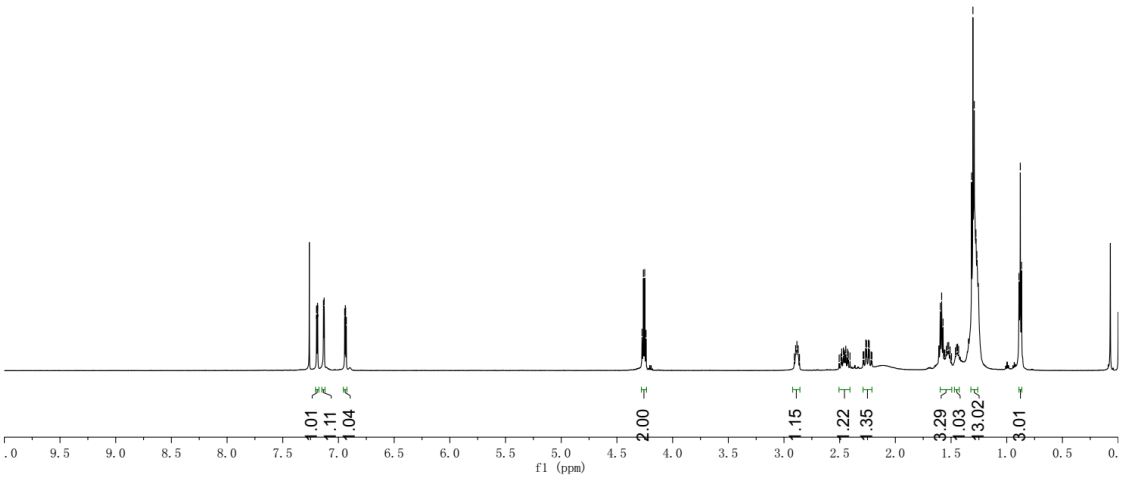
1.2767
0.8800
0.8785
0.8668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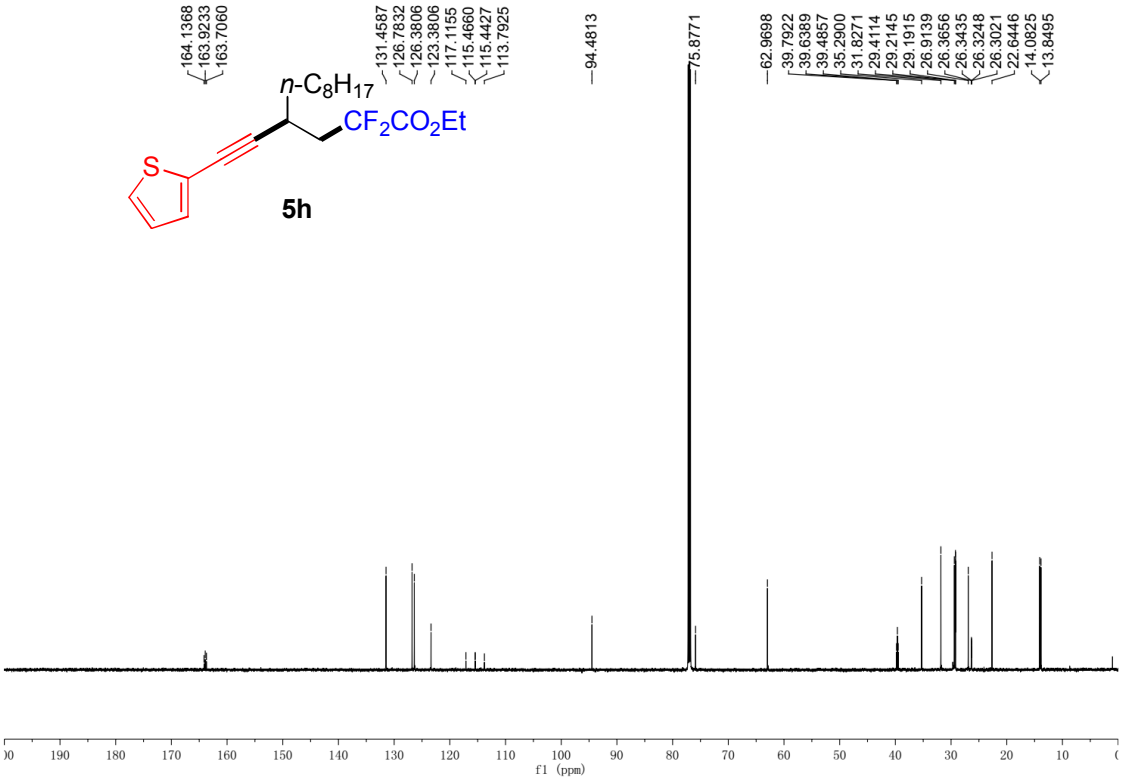
1.22
1.35
3.29
1.03
13.02
3.01
f1 (ppm)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123.3806
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94.4813
75.8771
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39.6389
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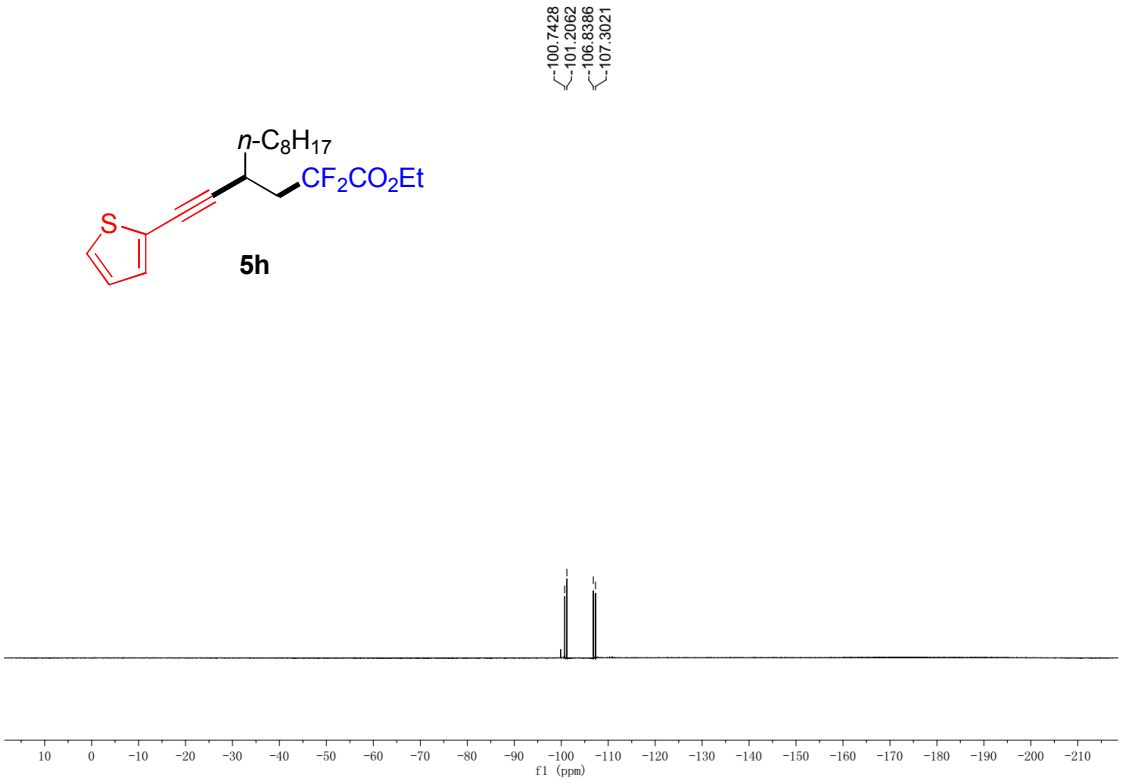
35.2900
31.8271
29.4114
29.2145
29.1915
26.9139
26.3656
26.3435
26.3248
26.3021
22.6446
14.0825
13.8495
n-C8H17
CF2CO2Et
S
5h
f1 (ppm)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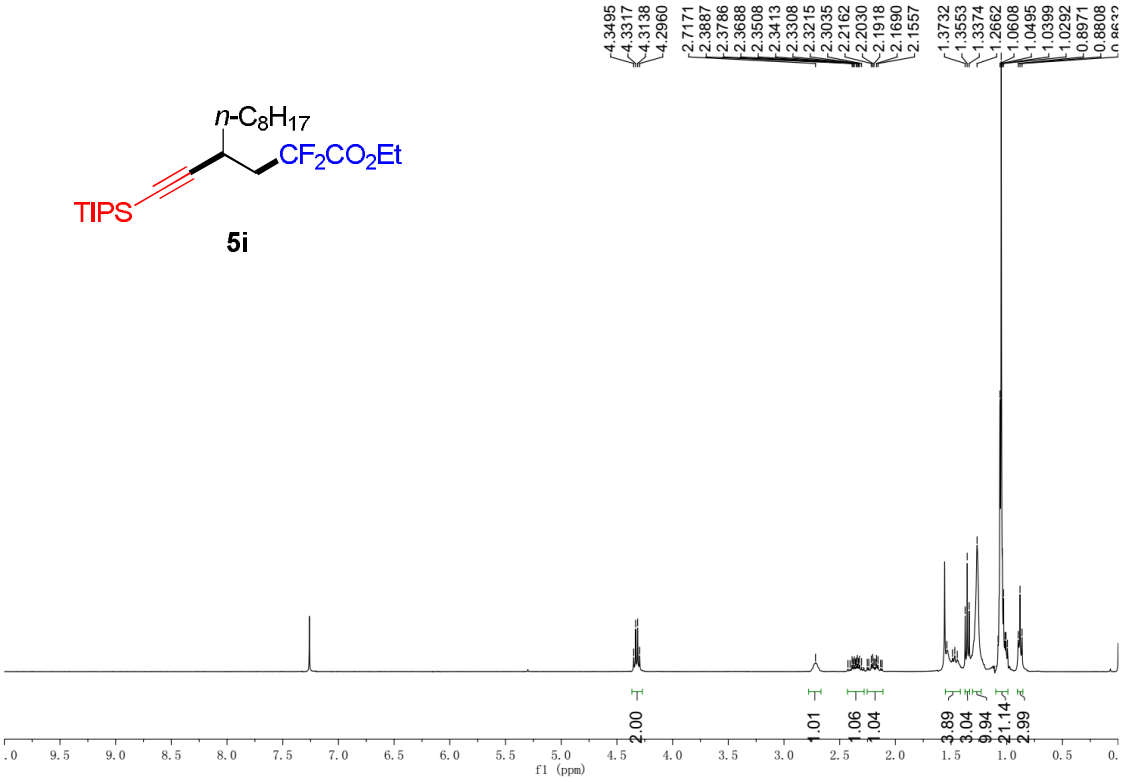
S
5h
f1 (ppm)


n-C8H17
CF2CO2Et
TIPS
5i
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2.3786
2.3688
2.3508
2.3413
2.3308
2.3215
2.3035
2.2162
2.2030
2.1918
2.1690
2.1557
1.3732
1.3553
1.3374
1.2662
1.0608
1.0495
1.0399
1.0292
0.8971
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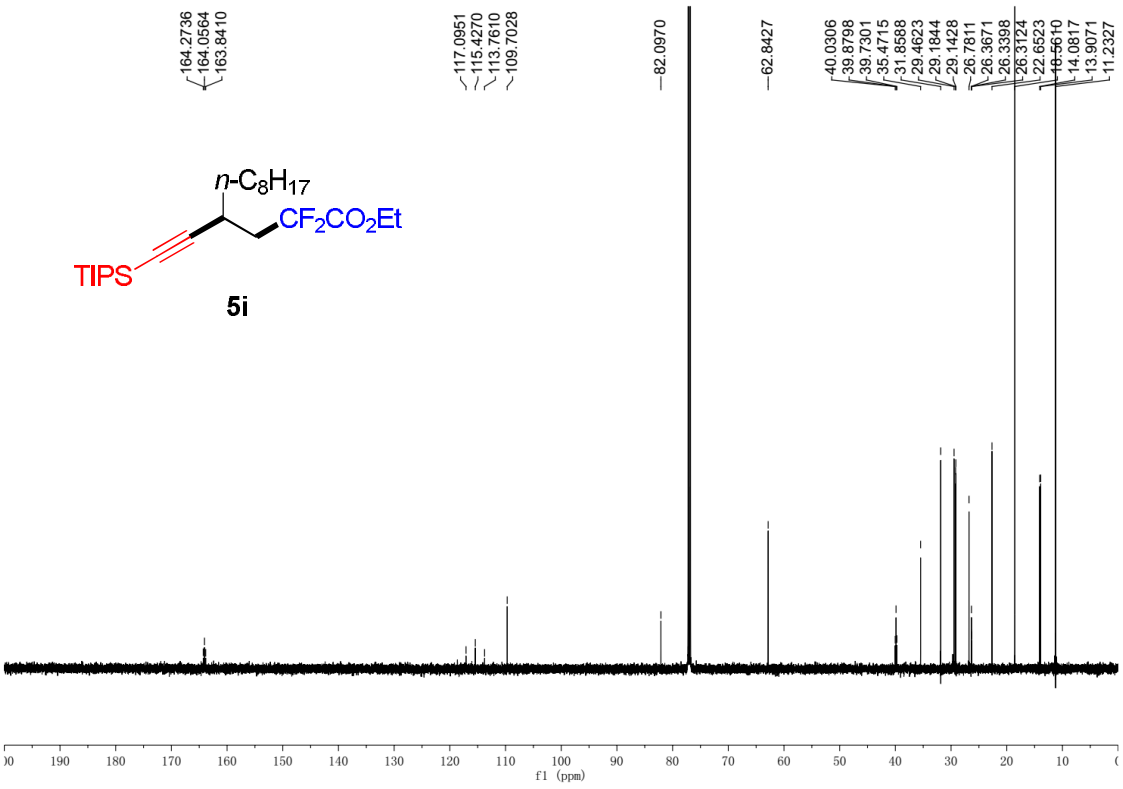
1.06
1.04
3.89
3.04
9.94
21.14
2.99
f1 (ppm)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31.8588
29.4623
29.1844
29.1428
26.7811
26.3671
26.3398
26.3124
22.6523
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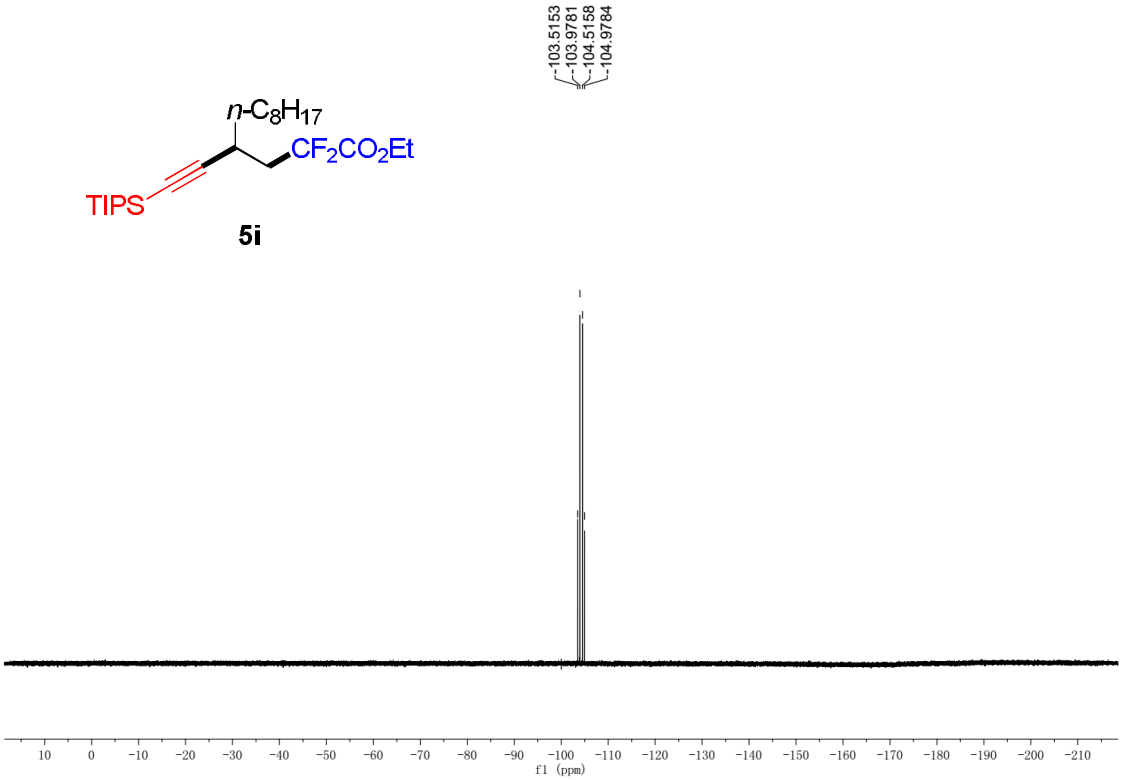
TIPS
5i
f1 (ppm)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TIPS
5i
f1 (ppm)
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7.5259
7.5132
7.3102
7.3070
7.2977
7.2864
7.2836
7.2673
7.2653
7.2627
7.2578
7.2540
7.2514
7.2210
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7.2115
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7.1835
7.1810
7.1720
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7.1668
7.1595
7.1579
7.1456
7.1331
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2.8892
2.8842
2.8772
2.5834
2.5666
2.5584
2.5548
2.5416
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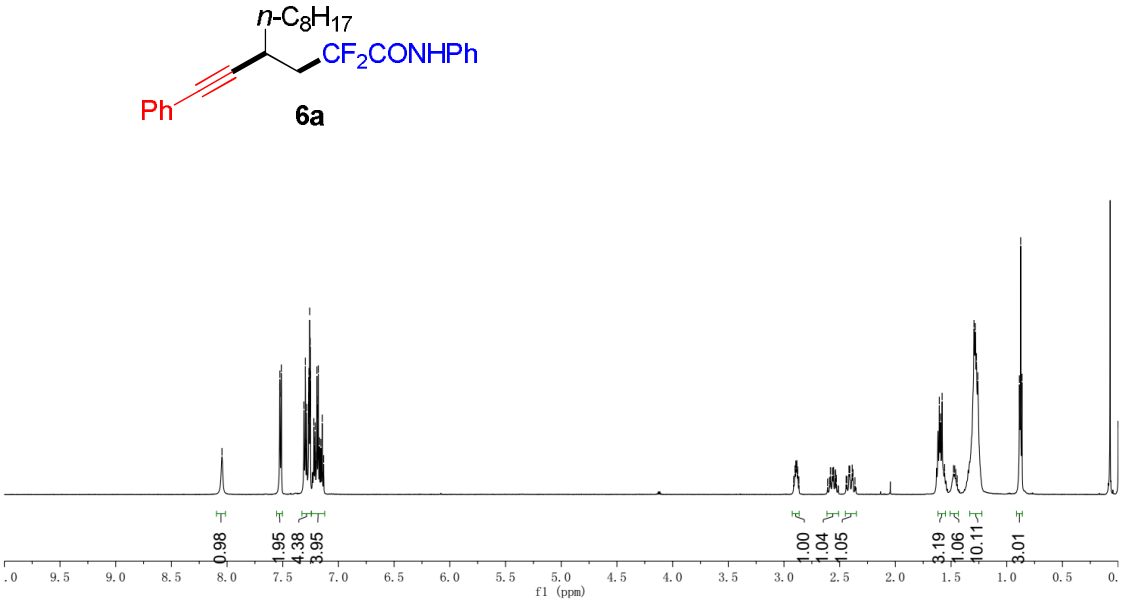
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CF2CONHPh
Ph
6a
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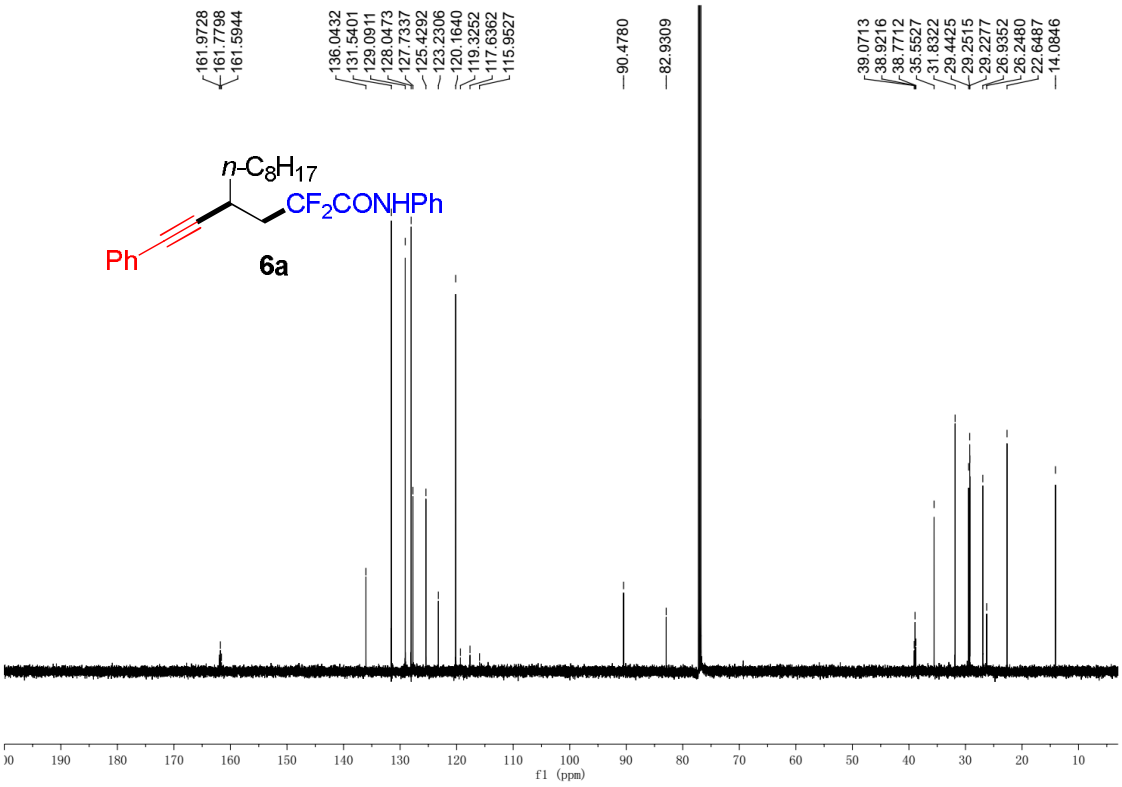
1.05
3.19
1.06
10.11
3.01
f1 (ppm)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38.9216
38.7712
35.5527
31.8322
29.4425
29.2515
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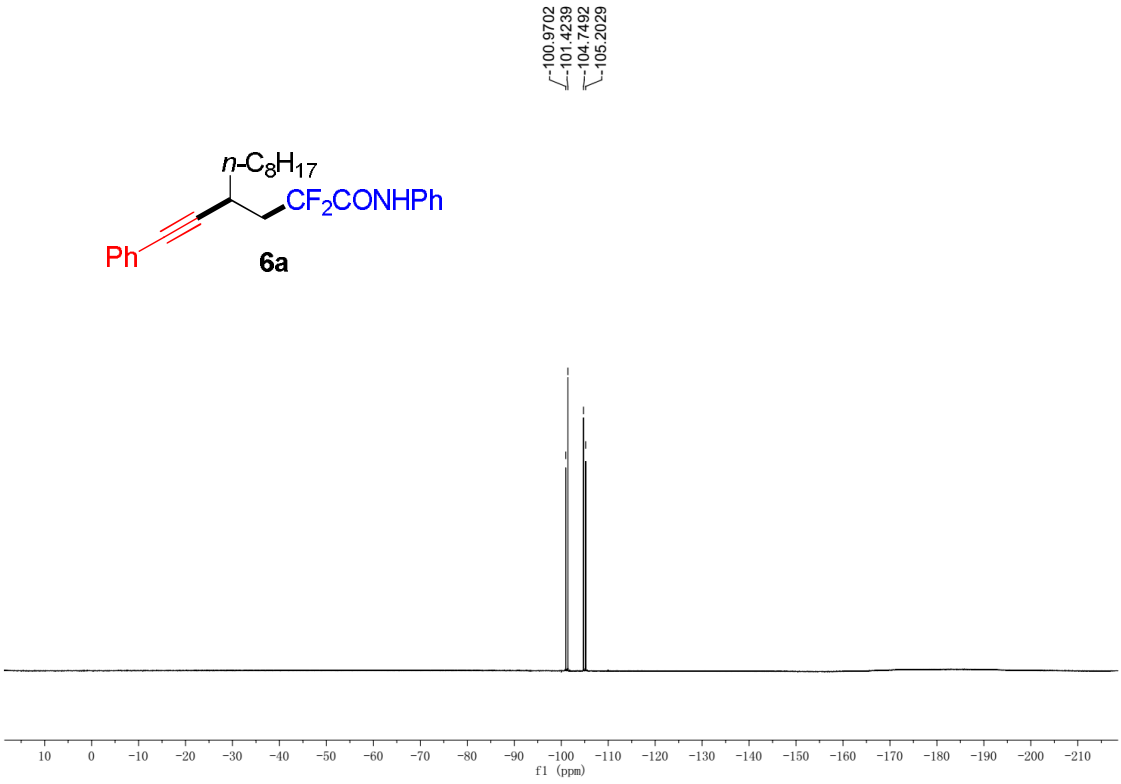
14.0846
n-C8H17
CF2CONHPh
Ph
6a
f1 (ppm)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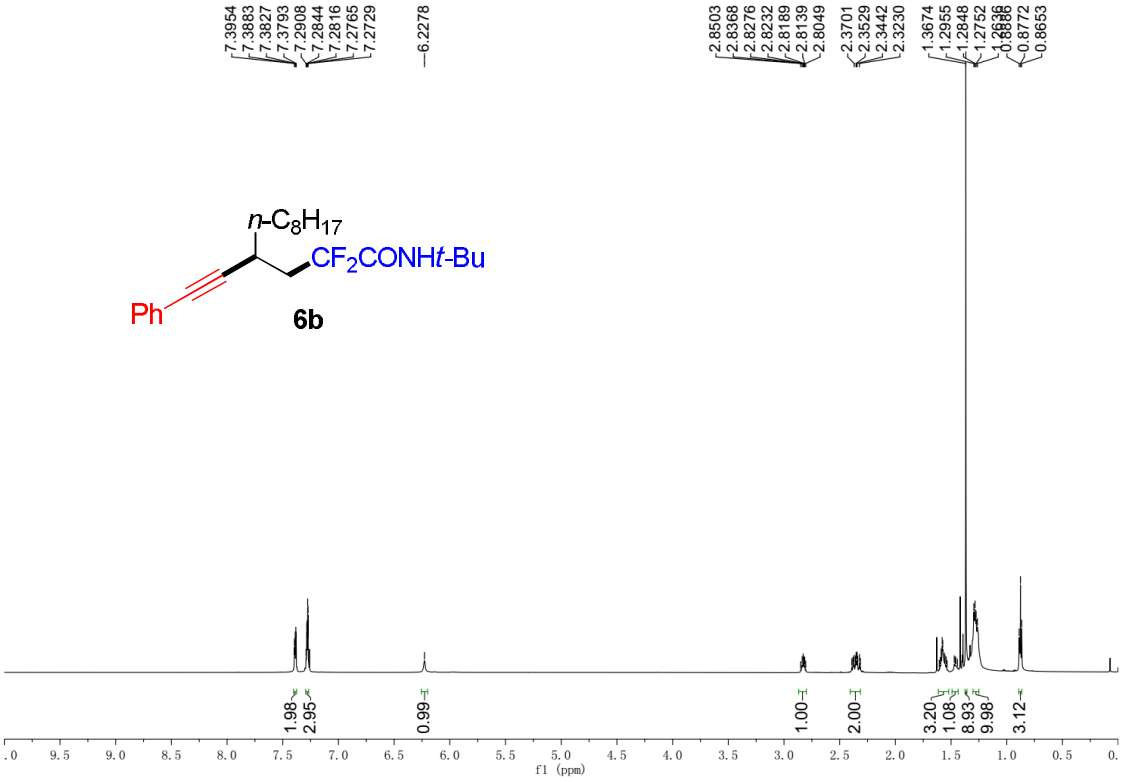
Ph
6a
f1 (ppm)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7.2816
7.2765
7.2729
6.2278
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2.8368
2.8276
2.8232
2.8189
2.8139
2.8049
2.3701
2.3529
2.3442
2.3230
1.3674
1.2955
1.2848
1.2752
0.8772
0.8653
n-C8H17
CF2CONHt-Bu
Ph
6b
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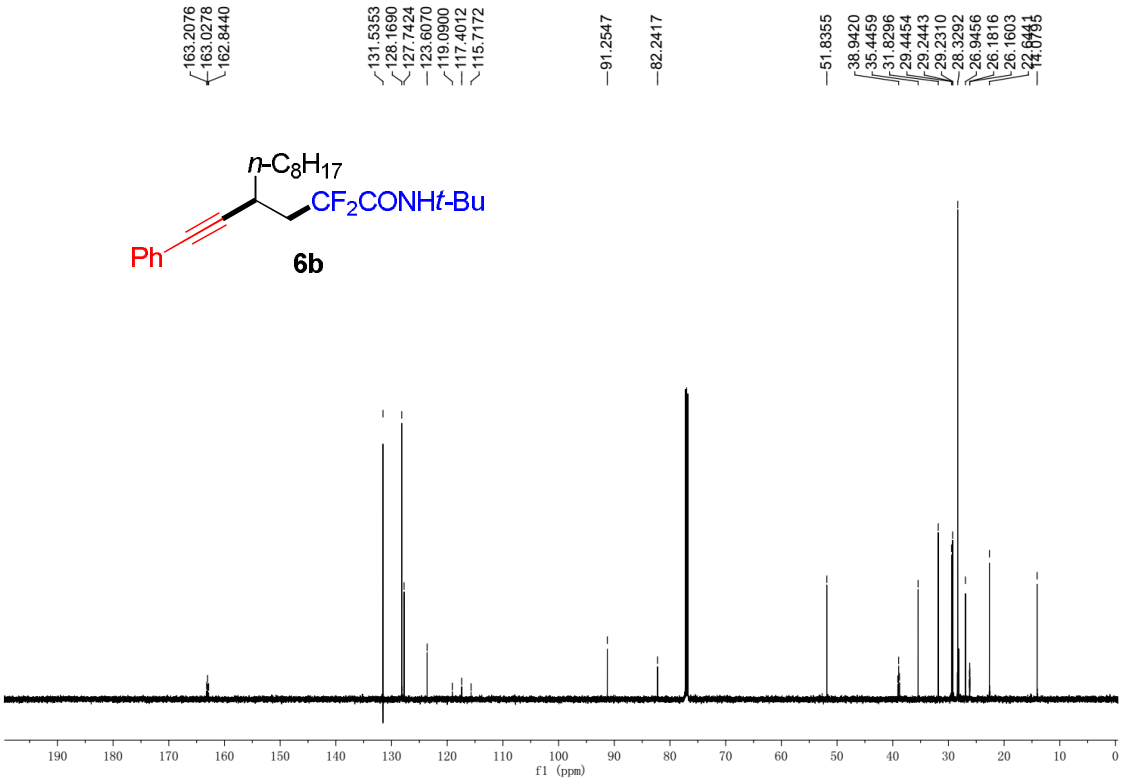
0.99
1.00
2.00
3.20
1.08
8.93
9.98
3.12
f1 (ppm)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31.8296
29.4454
29.2443
29.2310
28.3292
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26.1603
22.6441
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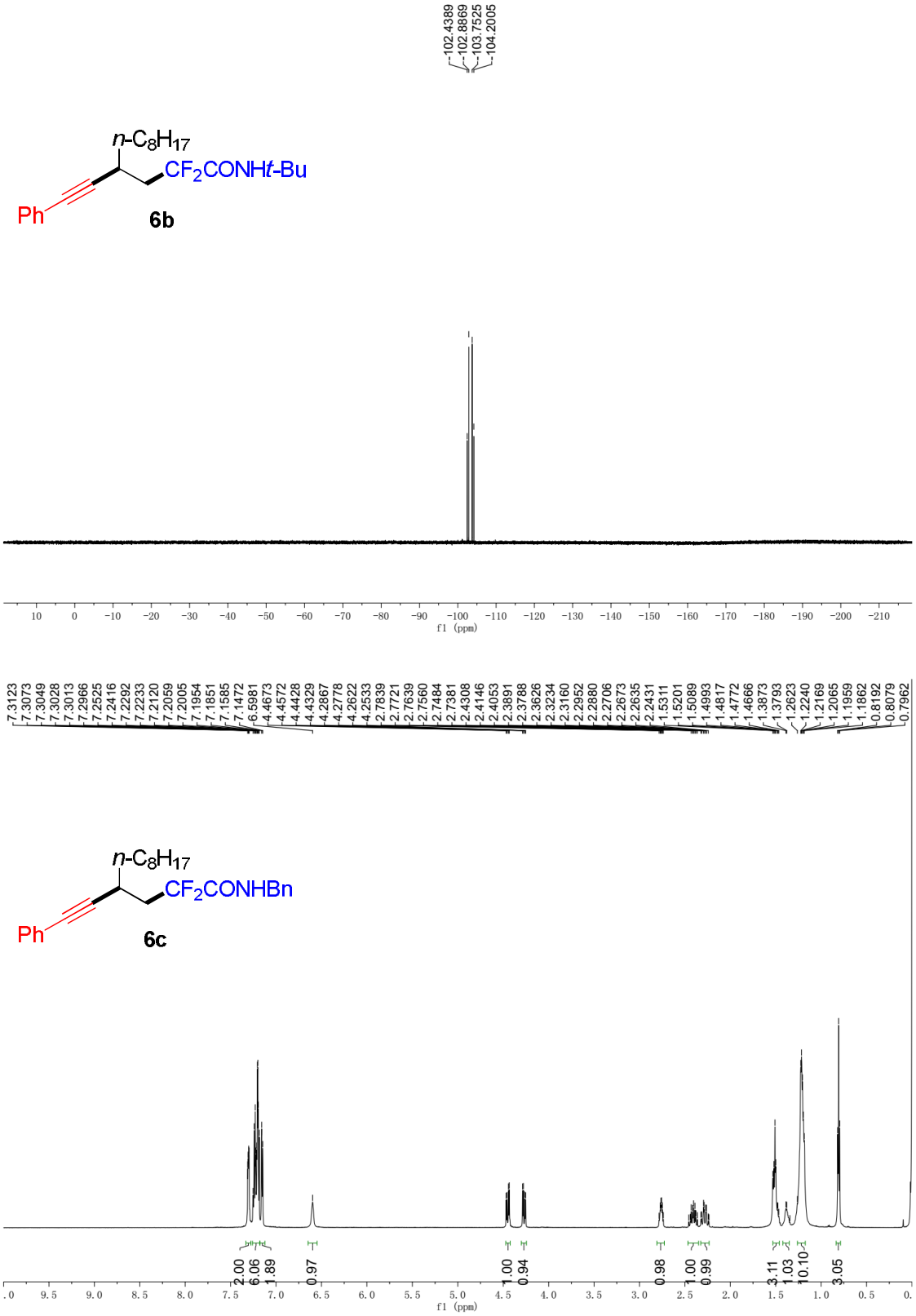
n-C8H17
CF2CONHt-Bu
Ph
6b
f1 (ppm)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Ph
6b
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7.3049
7.3028
7.3013
7.2966
7.2525
7.2416
7.2292
7.2233
7.2120
7.2059
7.2005
7.1954
7.1851
7.1585
7.1472
6.5981
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1.2065
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1.1862
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0.8079
0.7962
n-C8H17
CF2CONHBn
Ph
6c
2.00
6.06
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0.94
0.98
1.00
0.99
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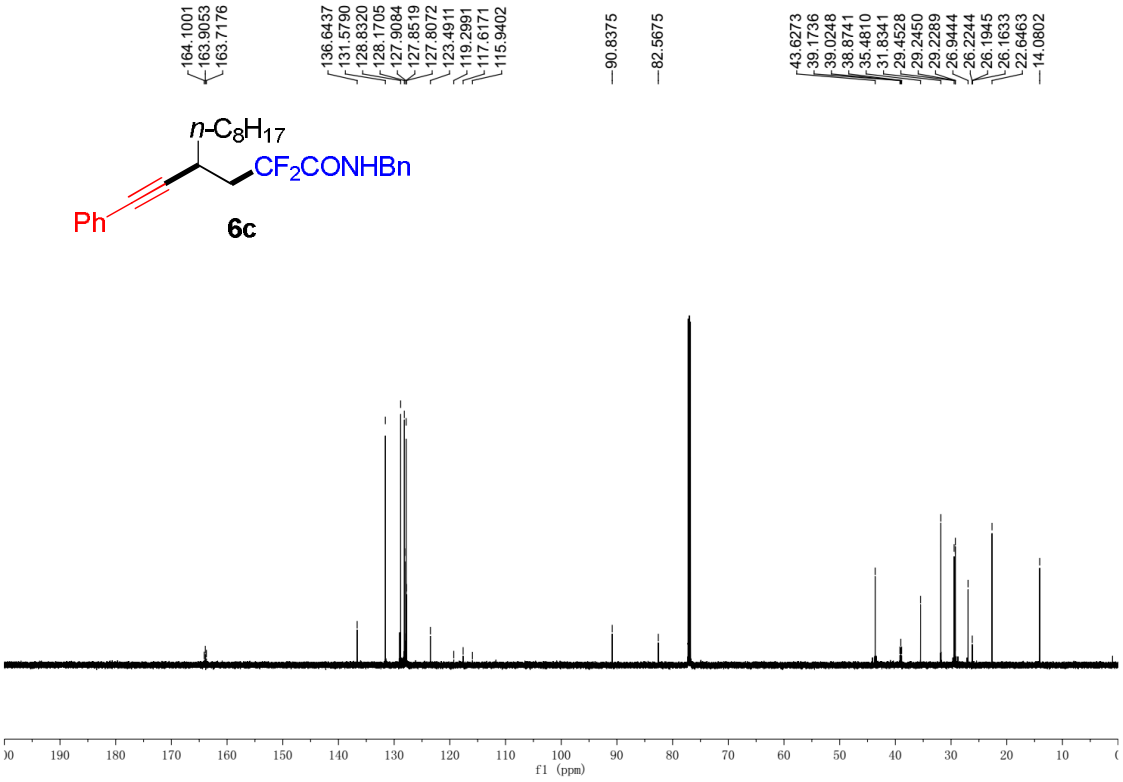
1.03
10.10
3.05
f1 (ppm)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82.5675
43.6273
39.1736
39.0248
38.8741
35.4810
31.8341
29.4528
29.2450
29.2289
26.9444
26.2244
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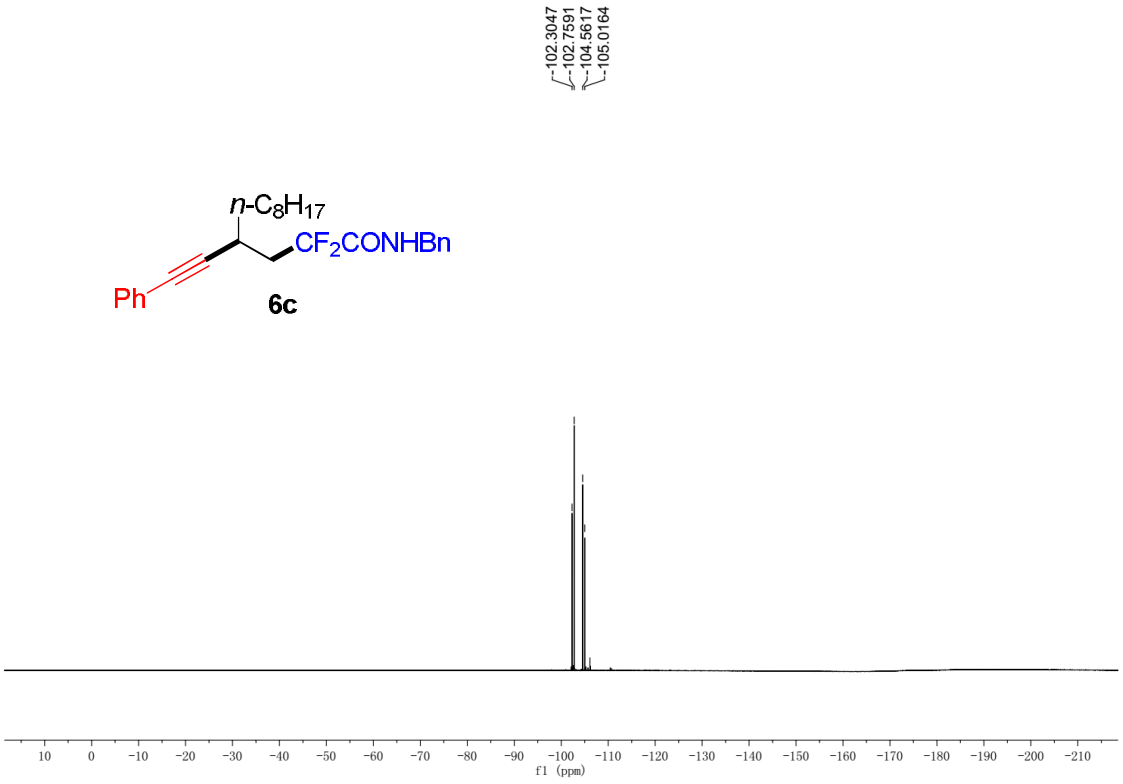
26.1633
22.6463
14.0802
n-C8H17
CF2CONHBn
Ph
6c
f1 (ppm)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104.5617
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CF2CONHBn
Ph
6c
f1 (ppm)


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7.3864
7.3809
7.3776
7.2752
7.2720
7.2669
3.7358
3.7244
3.7130
3.5038
3.4952
3.4920
3.4836
2.9534
2.9459
2.9386
2.9314
2.4831
2.4680
2.3908
2.3834
2.3662
2.3590
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1.9398
1.9360
1.9283
1.9247
1.9167
1.9135
1.9050
1.9024
1.8097
1.8078
1.7982
1.7962
1.7870
1.7844
1.7756
1.7728
1.7643
1.6256
1.6187
1.6147
1.6085
1.5997
1.5922
1.5857
1.5787
1.5710
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1.4842
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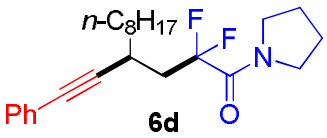
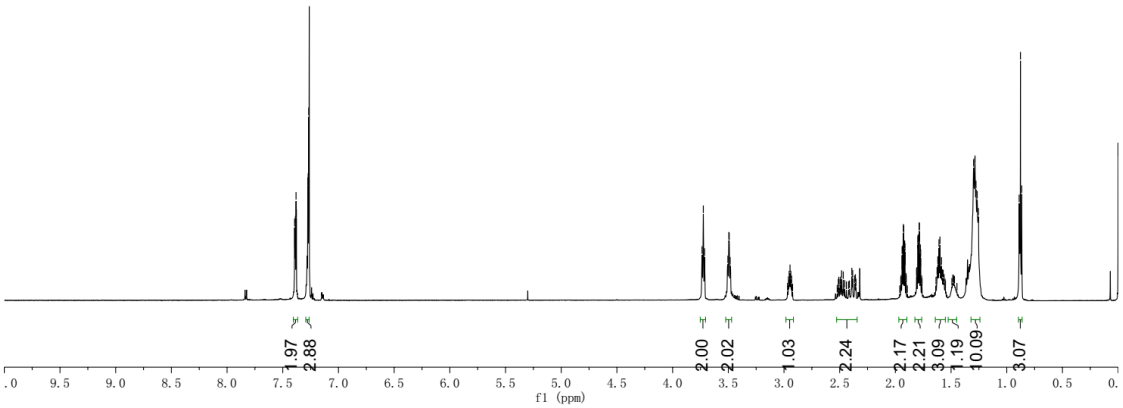
0.8772
0.8653


n-C8H17
F
F
N
Ph
O

6d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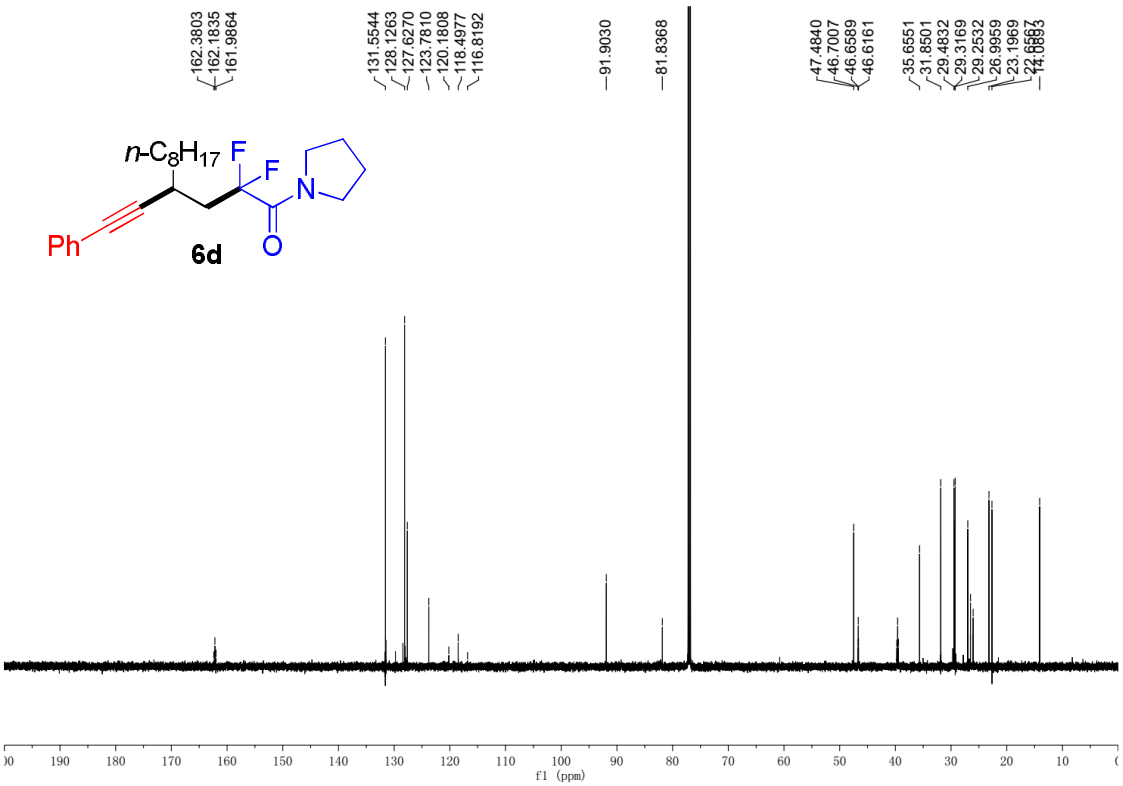
2.88
2.00
2.02
1.03
2.24
2.17
2.21
3.09
1.19
10.09
3.07
f1 (ppm)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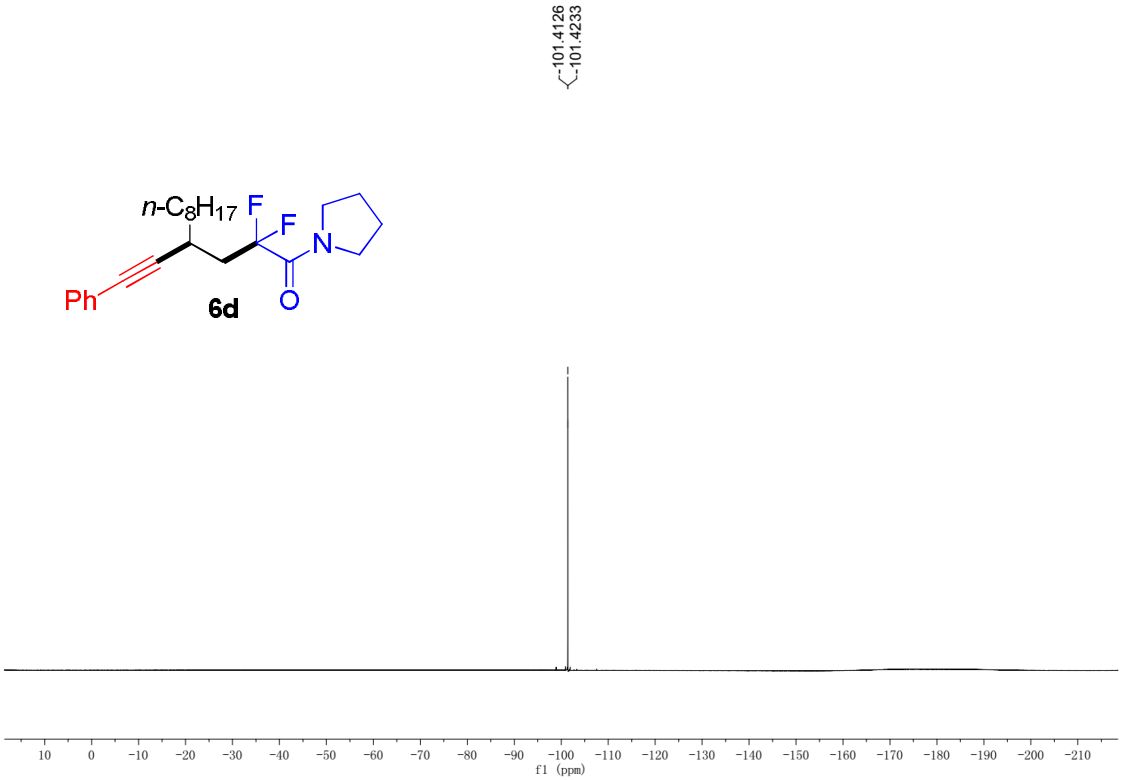
162.1835
161.9864
131.5544
128.1263
127.6270
123.7810
120.1808
118.4977
116.8192
91.9030
81.8368
47.4840
46.7007
46.6589
46.6161
35.6551
31.8501
29.4832
29.3169
29.2532
26.9959
23.1969
22.6567
14.0883
f1 (ppm)

n-C8H17
F
F
N
Ph
O

6d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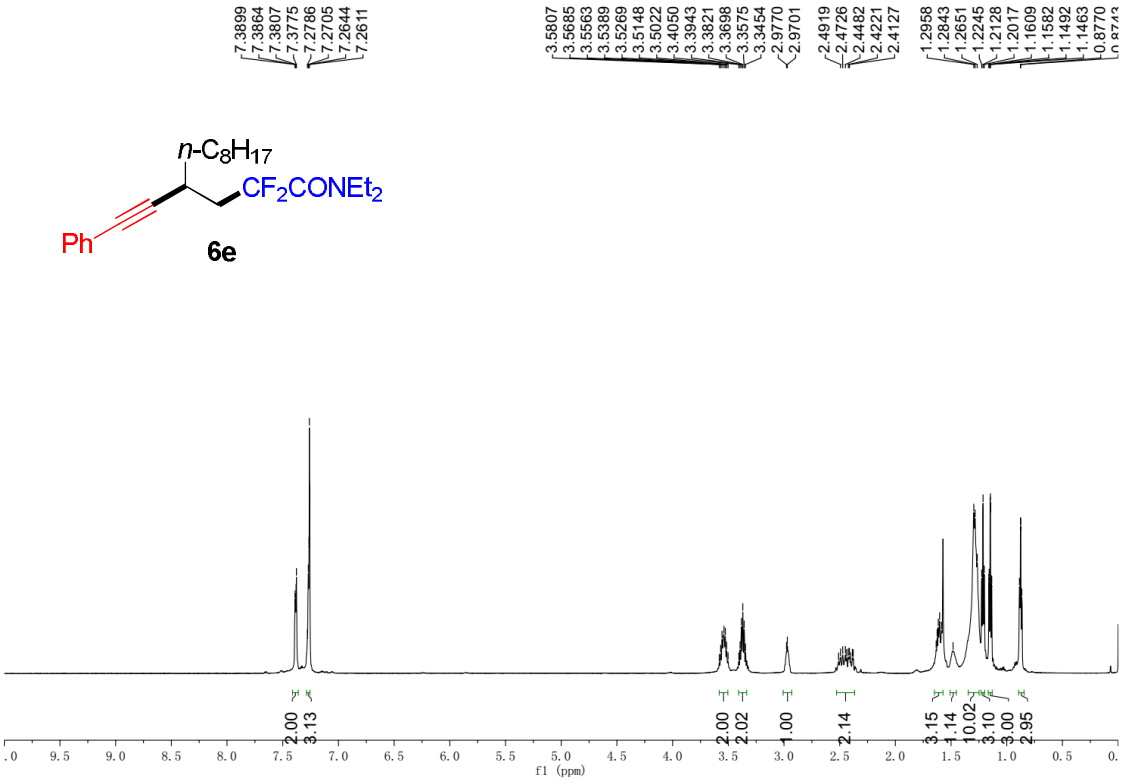
n-C8H17
F
F
N
Ph
O
6d
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)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7.2786
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7.2644
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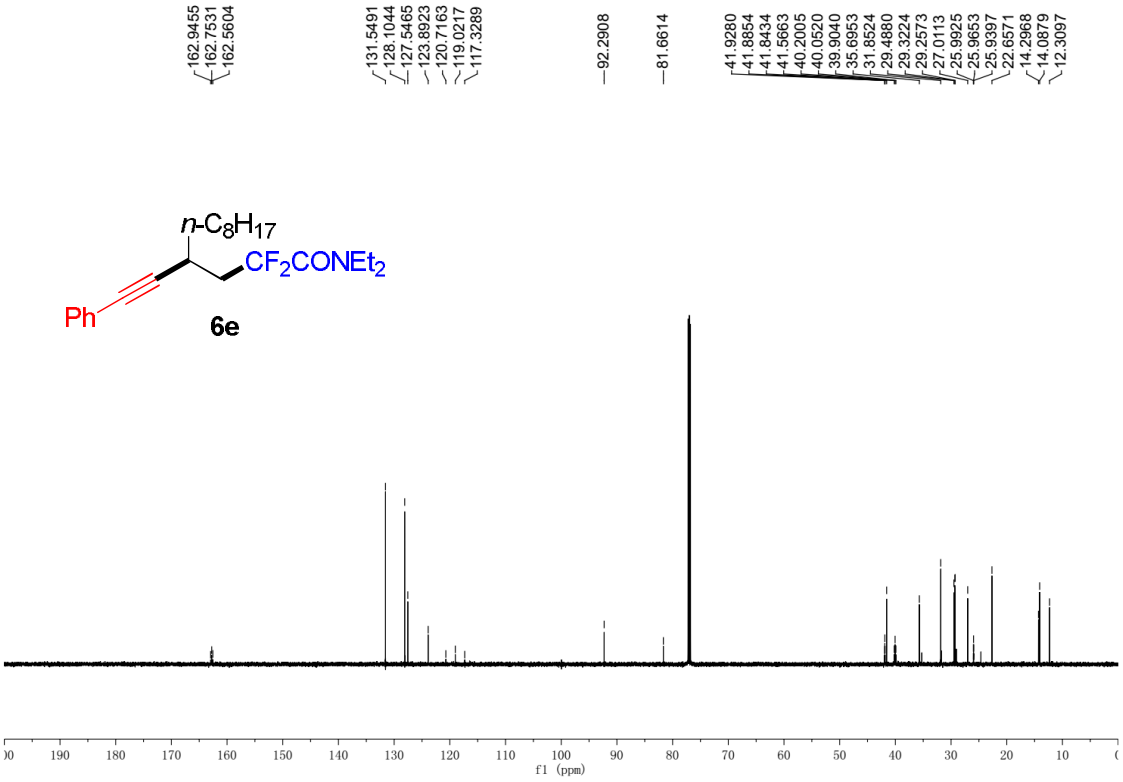
3.5807
3.5685
3.5563
3.5389
3.5269
3.5148
3.5022
3.4050
3.3943
3.3821
3.3698
3.3575
3.3454
2.9770
2.9701
2.4919
2.4726
2.4482
2.4221
2.4127
1.2958
1.2843
1.2651
1.2245
1.2128
1.2017
1.1609
1.1582
1.1492
1.1463
0.8770
n-C8H17
CF2CONEt2
Ph
6e
2.00
3.13
2.00
2.02
1.00
2.14
3.15
1.14
10.02
3.10
3.00
2.95
f1 (ppm)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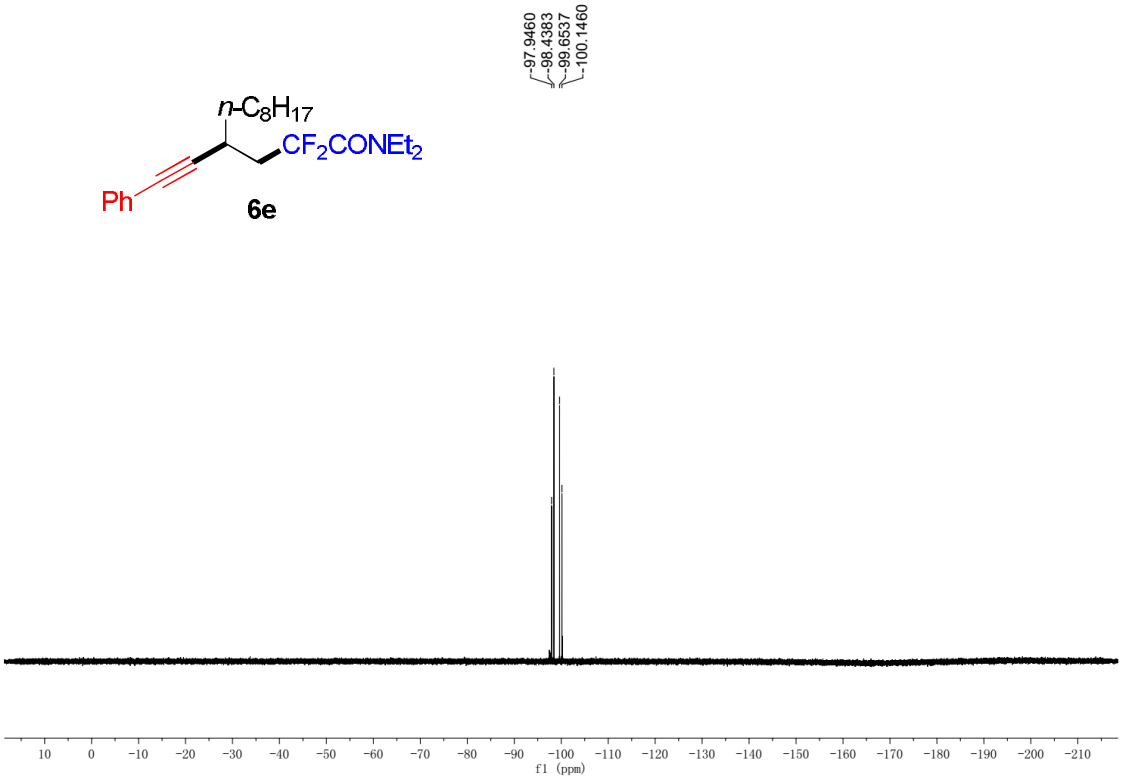
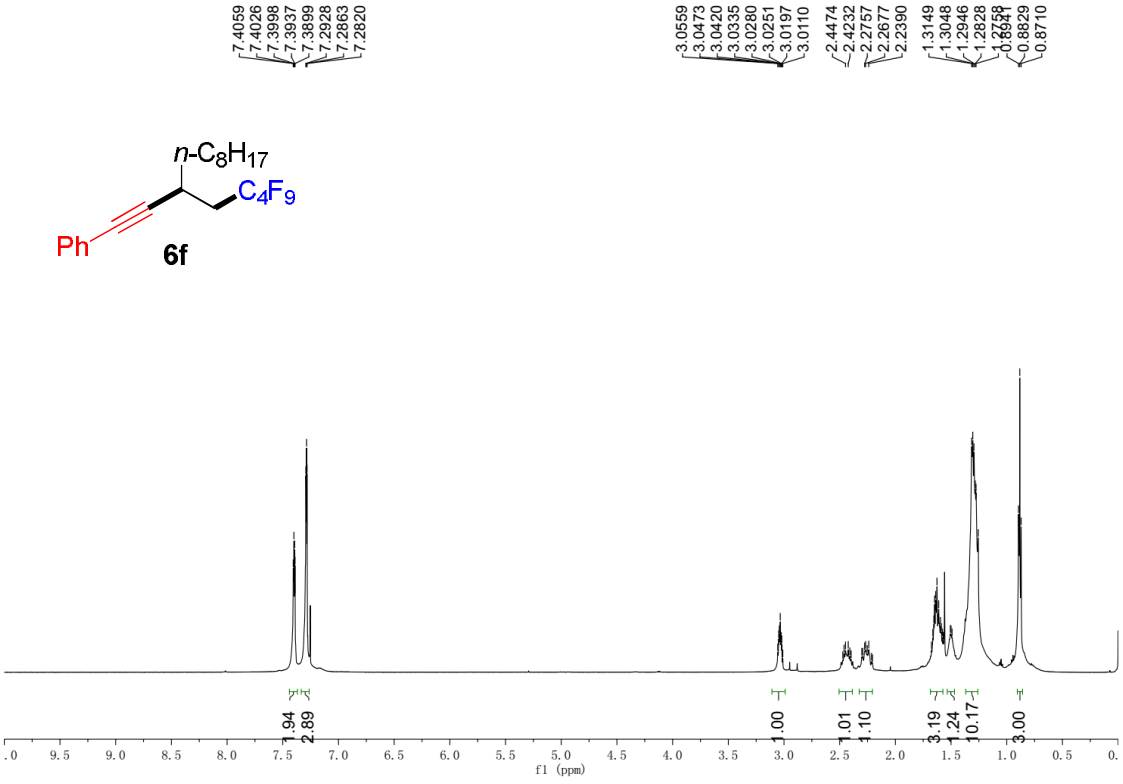
162.7531
162.5604
131.5491
128.1044
127.5465
123.8923
120.7163
119.0217
117.3289
92.2908
81.6614
41.9280
41.8854
41.8434
41.5663
40.2005
40.0520
39.9040
35.6953
31.8524
29.4880
29.3224
29.2573
27.0113
25.9925
25.9653
25.9397
22.6571
14.2968
14.0879
12.3097
n-C8H17
CF2CONEt2
Ph
6e
f1 (ppm)


97.9460
98.4383
99.6537
100.1460
n-C8H17
CF2CONEt2
Ph
6e
f1 (ppm)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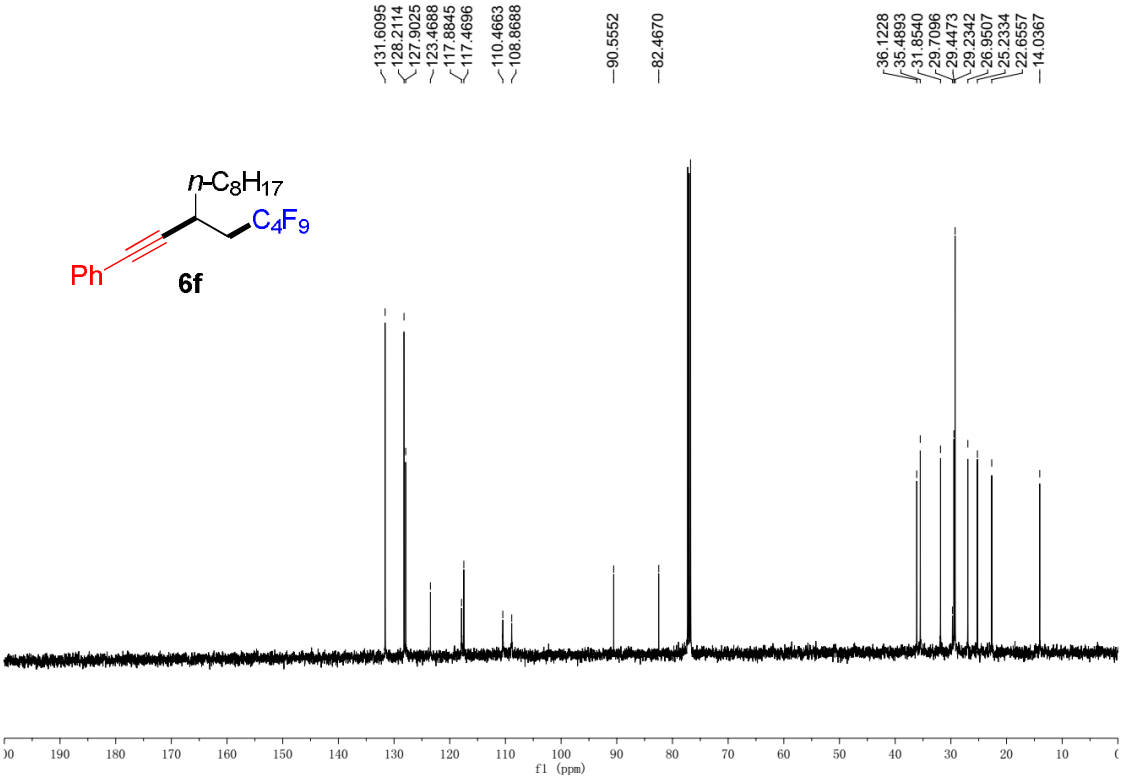
7.3998
7.3937
7.3899
7.2928
7.2863
7.2820
3.0559
3.0473
3.0420
3.0335
3.0280
3.0251
3.0197
3.0110
2.4474
2.4232
2.2757
2.2677
2.2390
1.3149
1.3048
1.2946
1.2828
0.8941
0.8829
0.8710
n-C8H17
C4F9
Ph
6f
1.94
2.89
1.00
1.01
1.10
3.19
1.24
10.17
3.00
f1 (ppm)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127.9025
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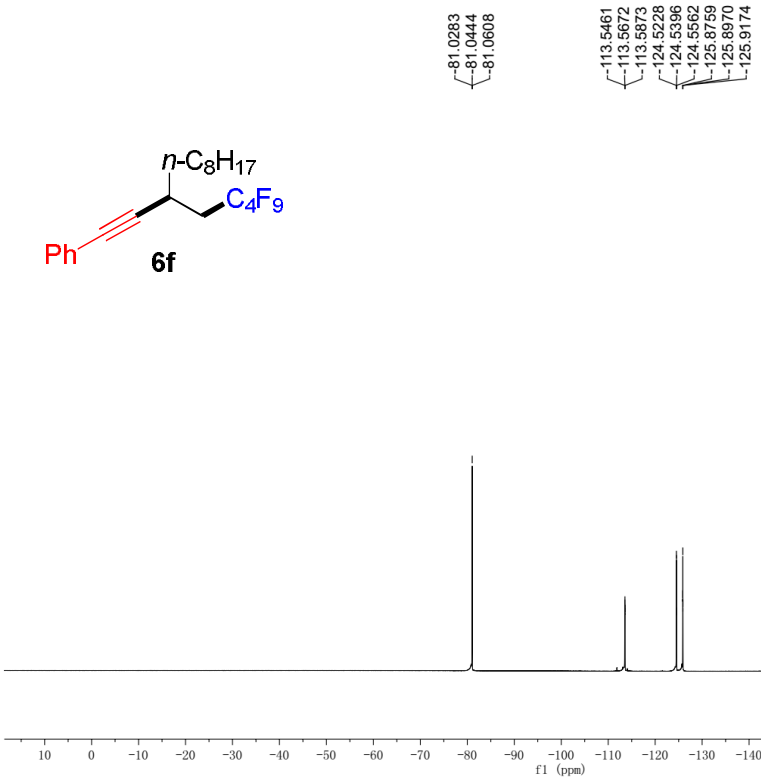
117.4696
110.4663
108.8688
90.5552
82.4670
36.1228
35.4893
31.8540
29.7096
29.4473
29.2342
26.9507
25.2334
22.6557
14.0367
n-C8H17
C4F9
Ph
6f
f1 (ppm)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-81.0444
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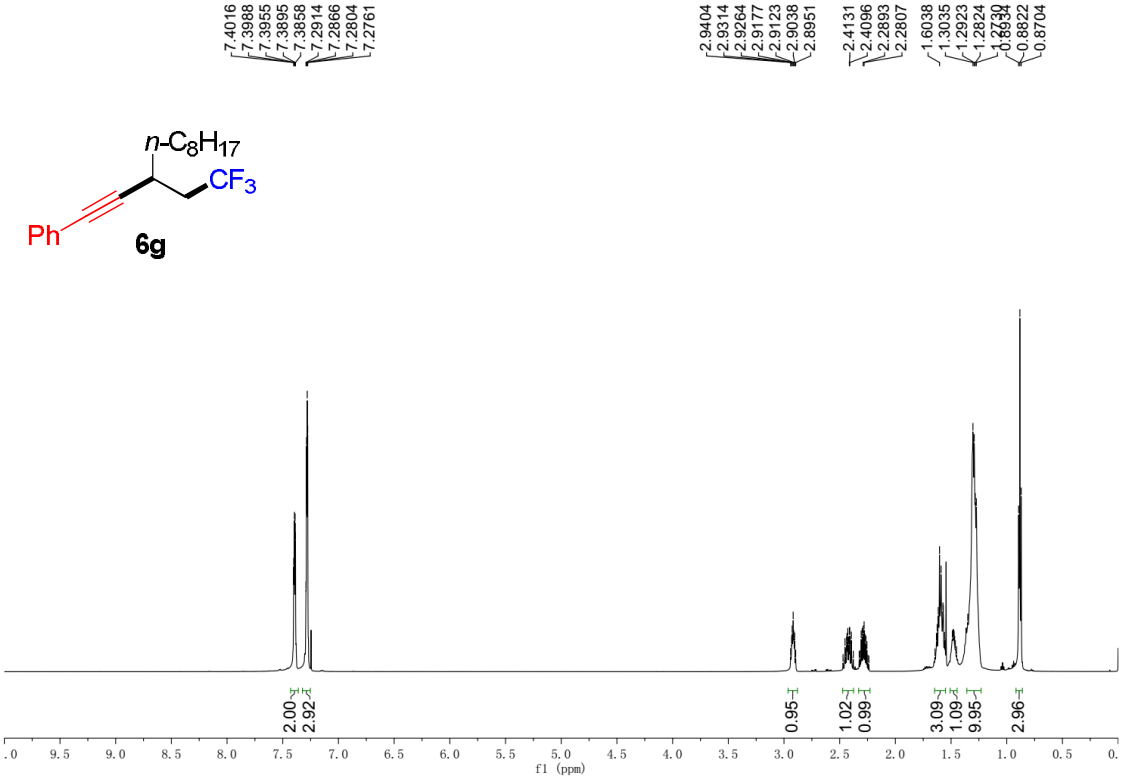
-113.5672
-113.5873
-124.5228
-124.5396
-124.5562
-125.8759
-125.8970
-125.9174
n-C8H17
C4F9
Ph
6f
f1 (ppm)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7.3955
7.3895
7.3858
7.2914
7.2866
7.2804
7.2761
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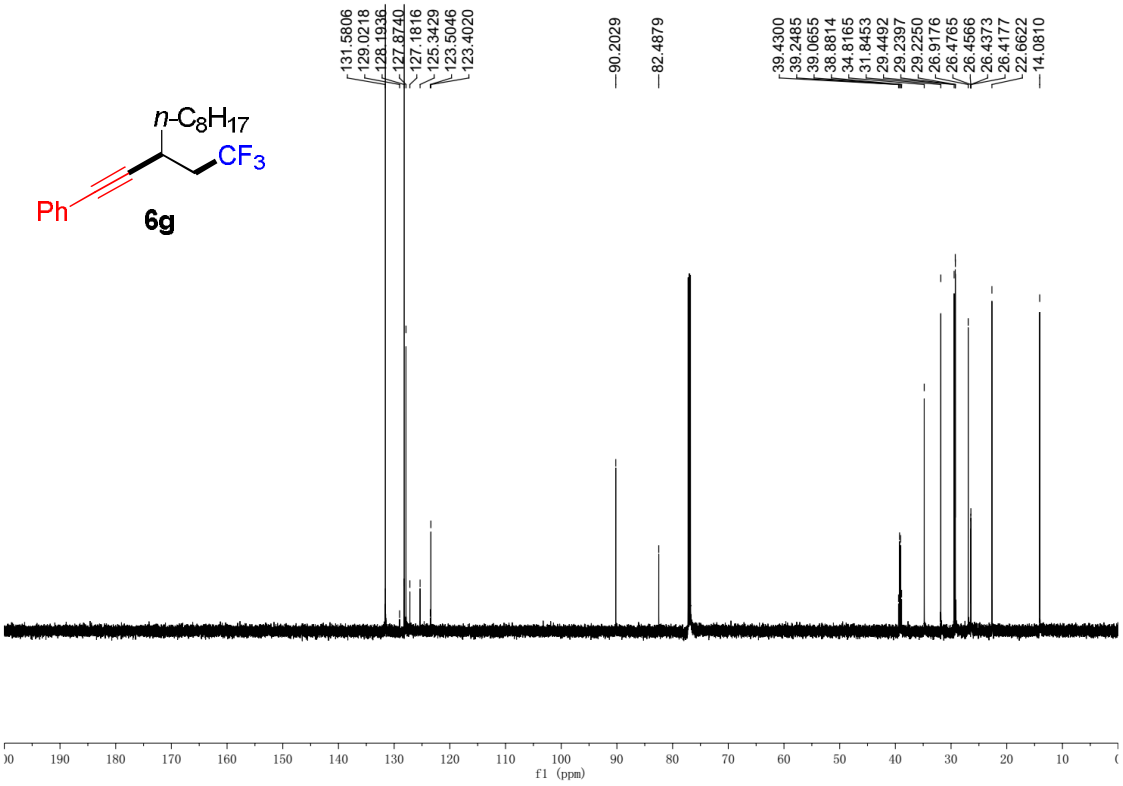
2.9314
2.9264
2.9177
2.9123
2.9038
2.8951
2.4131
2.4096
2.2893
2.2807
1.6038
1.3035
1.2923
1.2824
0.8822
0.8704
n-C8H17
CF3
Ph
6g
2.00
2.92
0.95
1.02
0.99
3.09
1.09
9.95
2.96
f1 (ppm)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128.1936
127.8740
127.1816
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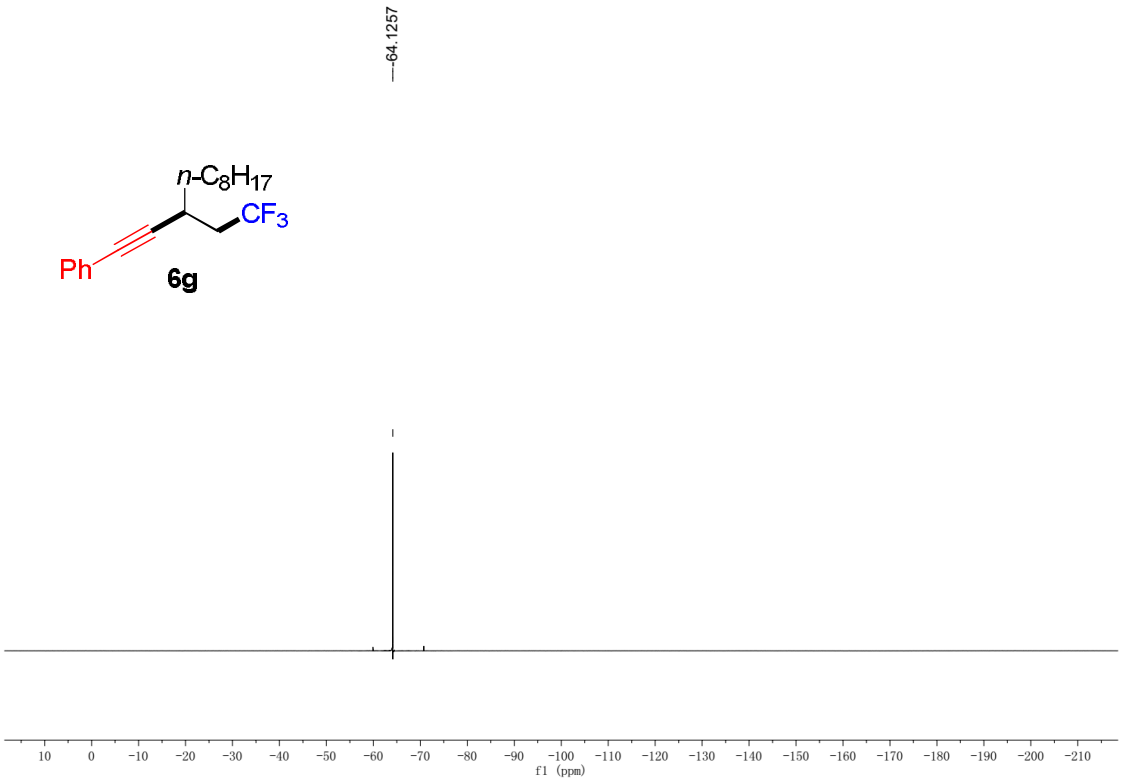
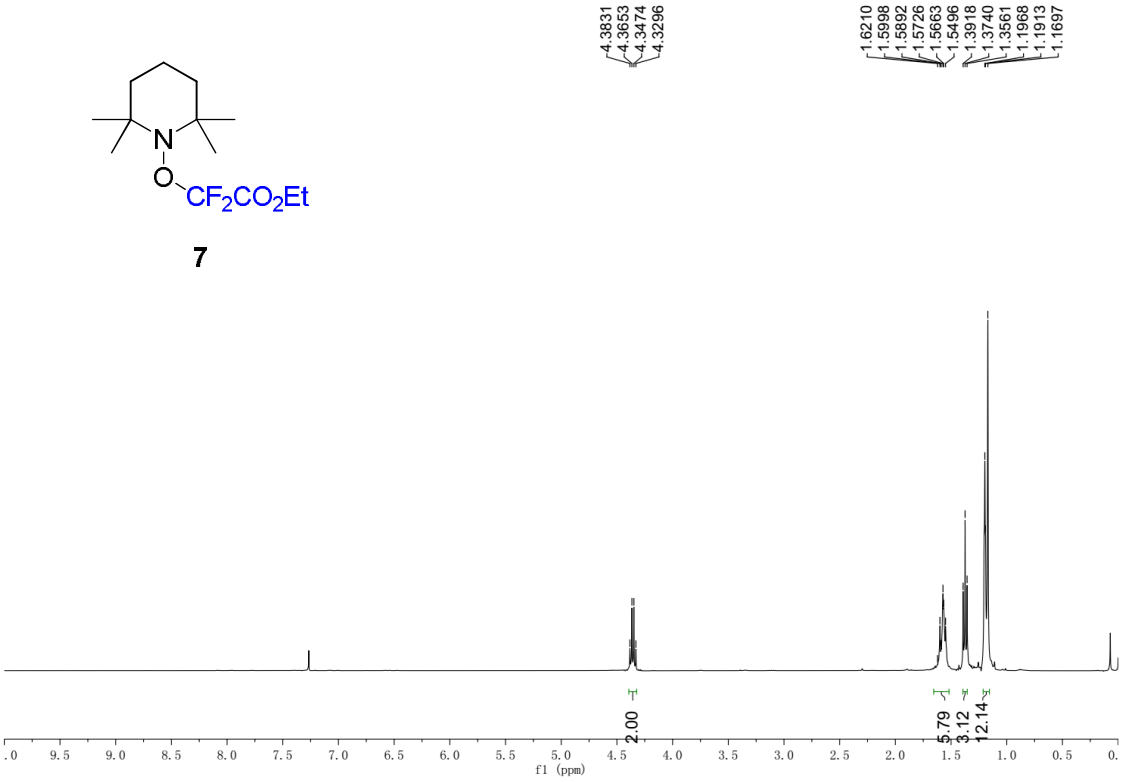
123.5046
123.4020
90.2029
82.4879
39.4300
39.2485
39.0655
38.8814
34.8165
31.8453
29.4492
29.2397
29.2250
26.9176
26.4765
26.4566
26.4373
26.4177
22.6622
14.0810
n-C8H17
CF3
Ph
6g
f1 (ppm)


64.1257
n-C8H17
CF3
Ph
6g
f1 (ppm)

N
O
CF2CO2Et

7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4.3653
4.3474
4.3296
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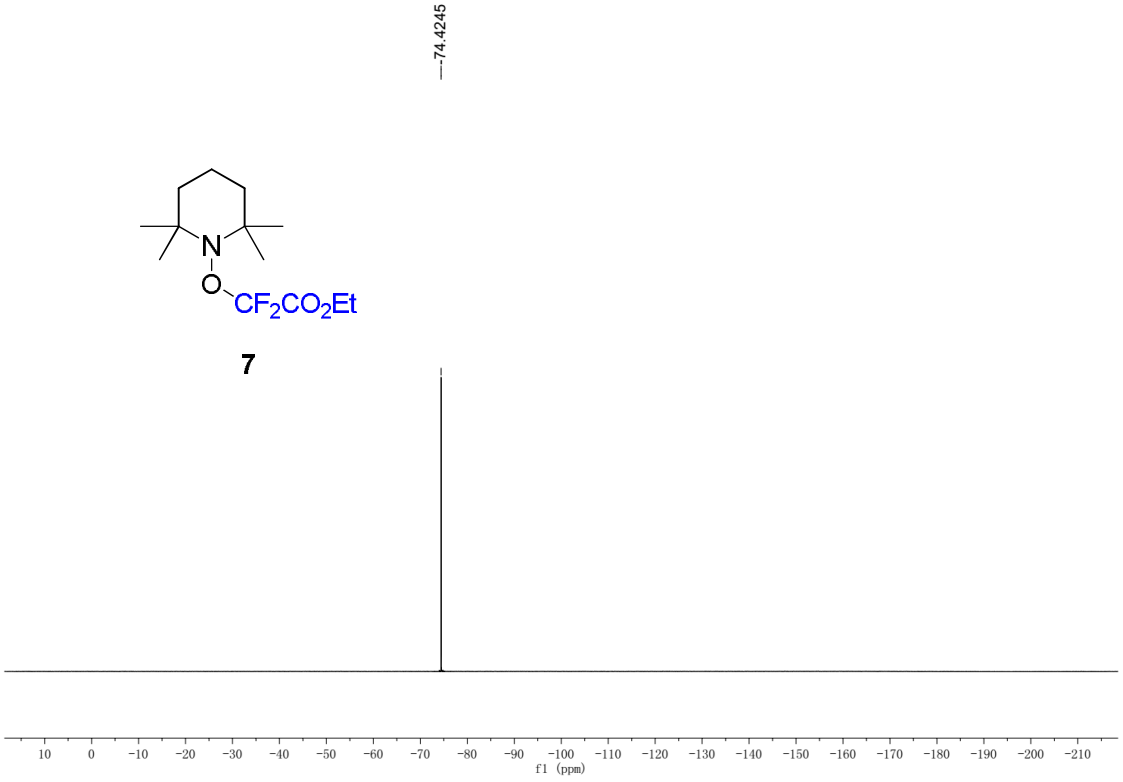
1.5892
1.5726
1.5663
1.5496
1.3918
1.3740
1.3561
1.1968
1.1913
1.1697
2.00
5.79
3.12
12.14
f1 (ppm)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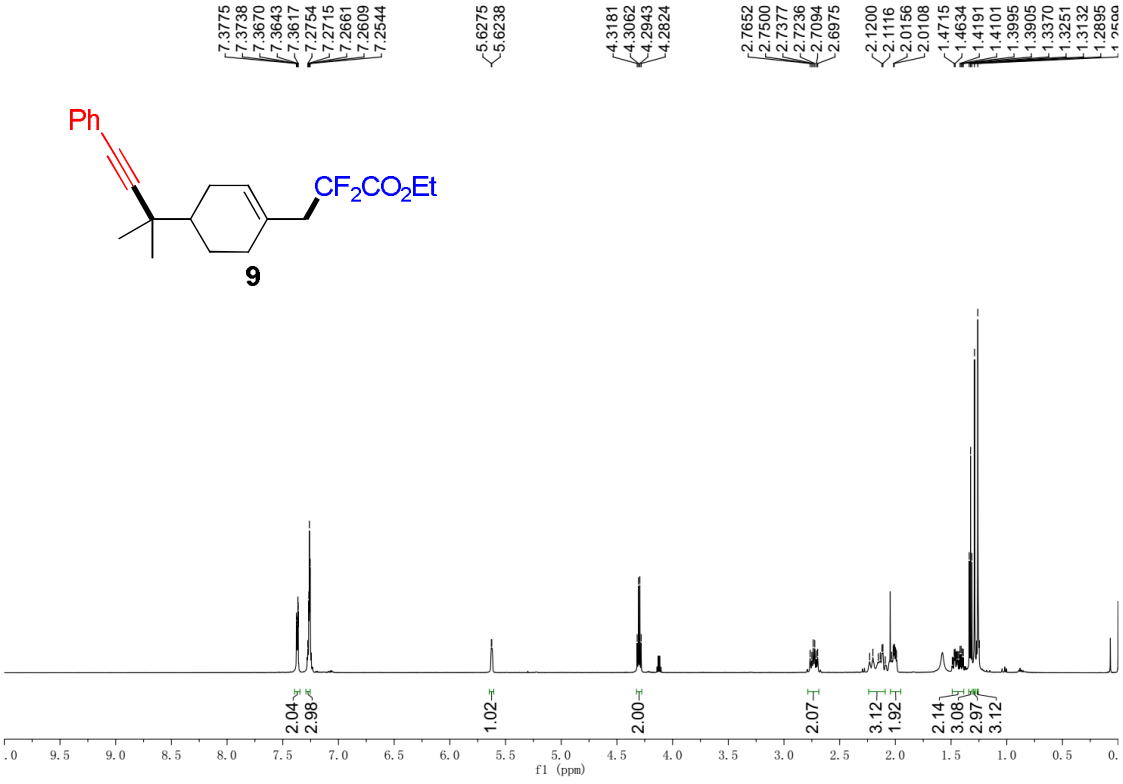
N
O
CF2CO2Et

7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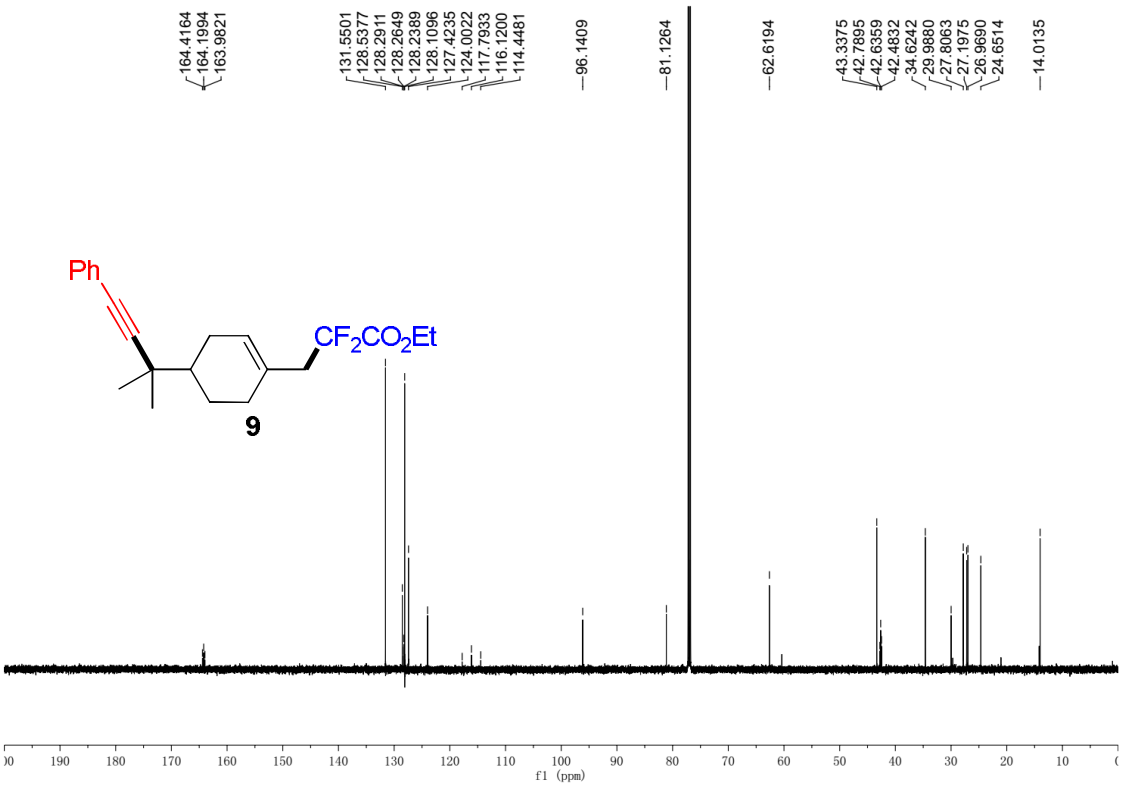
7.3738
7.3670
7.3643
7.3617
7.2754
7.2715
7.2661
7.2609
7.2544
5.6275
5.6238
4.3181
4.3062
4.2943
4.2824
2.7652
2.7500
2.7377
2.7236
2.7094
2.6975
2.1200
2.1116
2.0156
2.0108
1.4715
1.4634
1.4191
1.4101
1.3995
1.3905
1.3370
1.3251
1.3132
1.2895
Ph
CF2CO2Et
9
2.04
2.98
1.02
2.00
2.07
3.12
1.92
2.14
3.08
2.97
3.12
f1 (ppm)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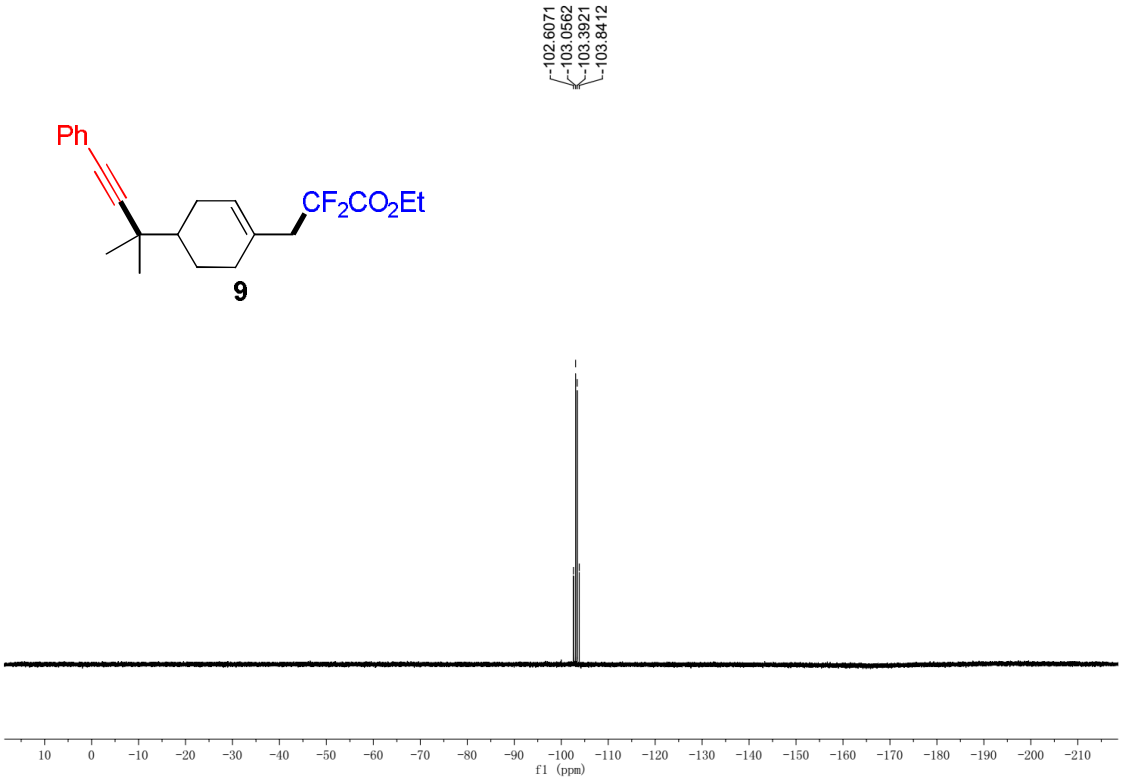
163.9821
131.5501
128.5377
128.2911
128.2649
128.2389
128.1096
127.4235
124.0022
117.7933
116.1200
114.4481
96.1409
81.1264
62.6194
43.3375
42.7895
42.6359
42.4832
34.6242
29.9880
27.8063
27.1975
26.9690
24.6514
14.0135
Ph
CF2CO2Et
9
f1 (ppm)

Ph
CF2CO2Et

9


102.6071
103.0562
103.3921
103.8412
10 0 −10 −20 −30 −40 −50 −60 −70 −80 −90 −100 −110 −120 −130 −140 −150 −160 −170 −180 −190 −200 −210
f1 (ppm)


7.3908
7.3872
7.3814
7.3746
7.3076
7.3039
7.2986
7.2962
7.2898
4.3566
4.3447
4.3328
4.3209
3.6372
3.6240
3.6214
3.6080
3.5462
3.5386
3.2787
3.2629
3.2469
2.8579
2.7193
2.7110
2.7034
2.7005
2.6963
2.6880
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2.6399
2.6338
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2.5393
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2.4539
2.4446
2.4308
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2.3992
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2.3656
2.2470
2.2289
2.2222
2.2136
2.2091
2.2041
2.1910
2.1848
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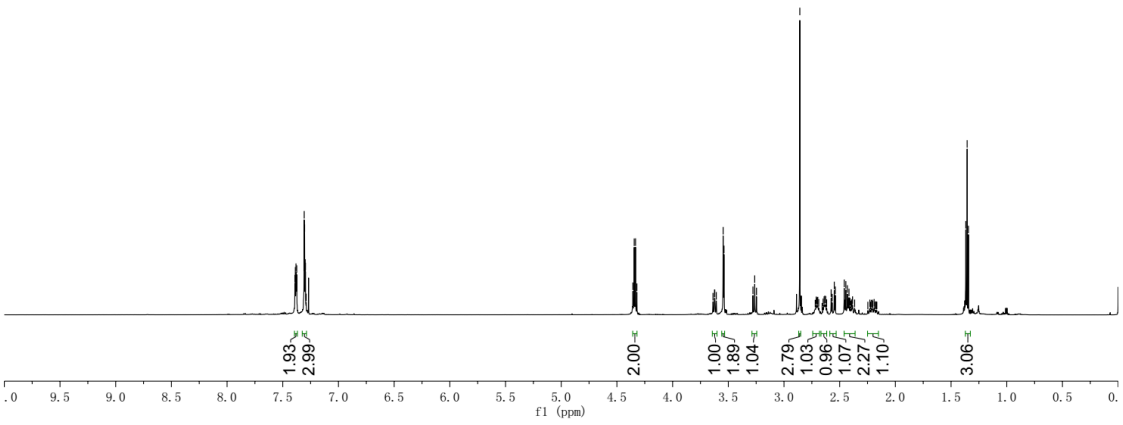
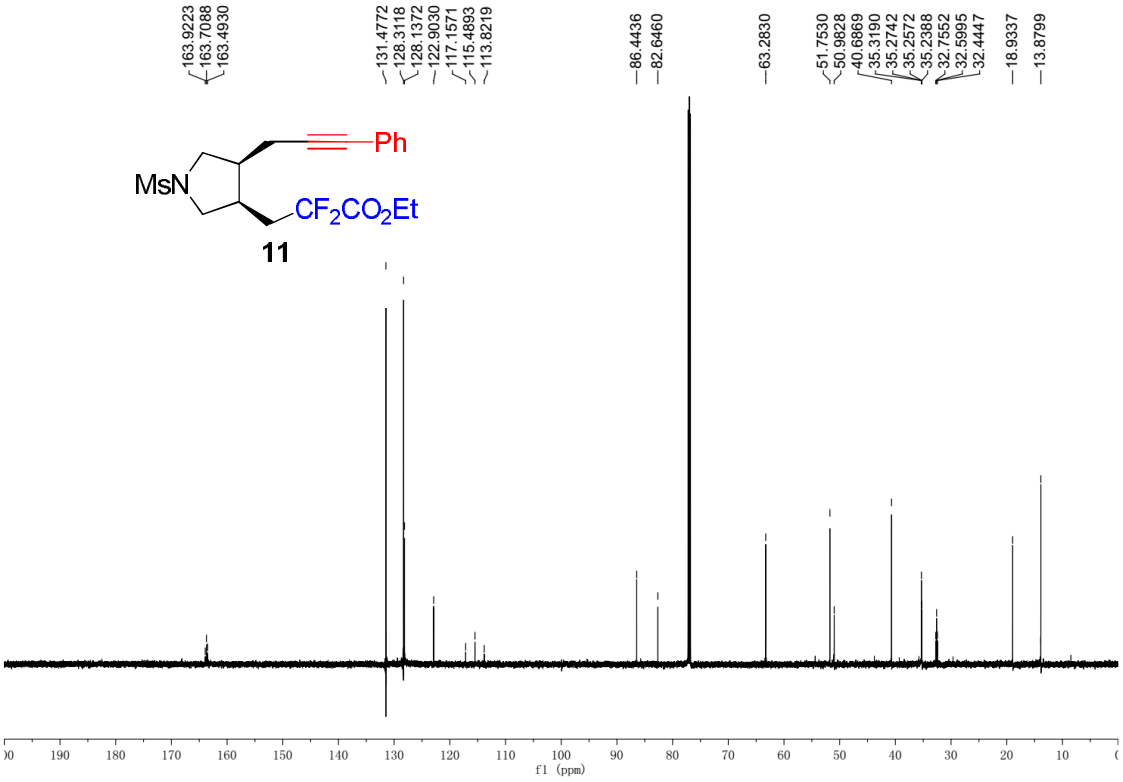
2.1691
2.1665
1.3676
1.3557
1.3438


Ph
MsN
CF2CO2Et

11


1.93
2.99
2.00
1.00
1.89
1.04
2.79
1.03
0.96
1.07
2.27
1.10
3.06
.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.
f1 (ppm)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163.4930
131.4772
128.3118
128.1372
122.9030
117.1571
115.4893
113.8219
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82.6460
63.2830
51.7530
50.9828
40.6869
35.3190
35.2742
35.2572
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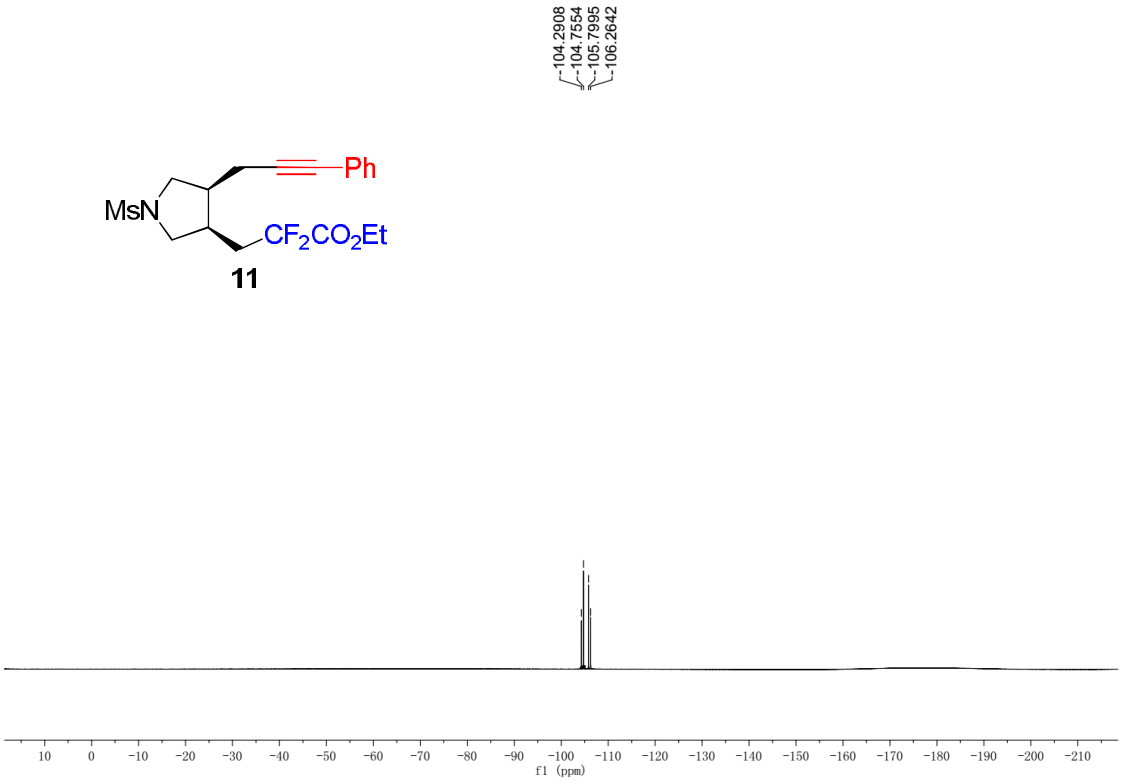
13.8799
Ph
MsN
CF2CO2Et
11
f1 (ppm)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105.7995
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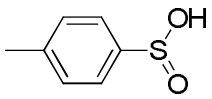
Ph
MsN
CF2CO2Et
11
f1 (ppm)



HRMS (ESI) calcd for $C_7H_8SO_2$ $(M-H)^-$ 155.0172 found 155.0172.