Electronic Supplementary Material (ESI) for ChemComm.

Supporting Information

Three Component Hydroxyletherification and Hydroxylazidation of (Trifluoromethyl)alkenes: Access to α-Trifluoromethyl β-Heteroatom Substituted Tertiary Alcohols

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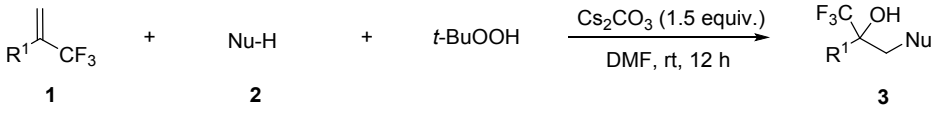
A. General information

Melting points were measured using a melting point instrument and are uncorrected. Chemical shifts were reported in ppm from the solvent resonance as the internal standard ($CDCl_3$ δ_H = 7.26 ppm, δ_C = 77.16 ppm). Multiplicity was indicated as follows: s (singlet), d (doublet), t (triplet), q (quartet), quint (quintet), m (multiplet). Coupling constants were reported in Hertz (Hz). IR spectra were obtained with an infrared spectrometer on either potassium bromide pellets or liquid films between two potassium bromide pellets. GC-MS data were obtained using electron ionization (Thermo Trace DSQ GC-MS). HRMS was carried out on a high-resolution mass spectrometer (Agilent 6210 ESI/TOF MS or Thermo Q Exactive Plus). TLC was performed using commercially available 100−400 mesh silica gel plates (GF_{254}). X-ray structural analyses were conducted on Bruker APEX-II CCD Diffractometer.

Materials. Tetrahydrofuran (THF) and toluene were distilled from sodium/benzophenone; 1,2-dichloroethane (DCE) was distilled from calcium hydride; acetonitrile (CH_3CN) was distilled from phosphorus pentoxide. Other commercially available reagents were purchased and used without further purification. Analytical thin-layer chromatography was performed on 0.20 mm silica gel plates (GF_{254}) using UV light as a visualizing agent. Flash column chromatography was carried out using silica gel (200–300 mesh) with the indicated solvent system. All reactions were conducted in oven-dried Schlenk tubes. All the reaction temperatures reported are oil bath temperatures.

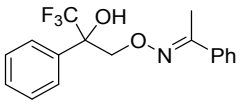
B. General Procedure for Hydroxylfunctionalization of (Trifluoromethyl)alkenes



A 25 mL oven-dried Schlenk tube equipped with a magnetic stirring bar, (trifluoromethyl)alkenes **1** (0.2 mmol), nucleophile **2** (0.3 mmol), TBHP (0.4 mmol, 5 M in decane), Cs_2CO_3 (0.3 mmol), and DMF (2 mL) was vigorously stirred at room temperature for 12 h. Then the mixture was stopped stirring, added water (15 mL), extracted with EtOAc (15 mL × 3). The combined organic phases were dried over anhydrous Na_2SO_4, filtered and concentrated *in vacuo*. Further purification by flash column chromatography on silica gel (eluting with petroleum ether/ethyl acetate) provided the product **3**.

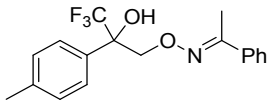
C. Analysis Data for the Products

(*E*)-Acetophenone *O*-(3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropyl) Oxime (3a)



60.7 mg, 89% yield, yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.65 (d, J = 7.2 Hz, 2H), 7.57 (d, J = 6.8 Hz, 2H), 7.34–7.42 (m, 6H), 5.30 (brs, 1H), 4.79 (d, J = 13.2 Hz, 1H), 4.50 (d, J = 12.8 Hz, 1H), 2.19 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 157.9, 135.4, 135.2, 129.9, 128.6, 128.6, 128.3, 126.3, 126.1, 124.9 (q, $^1J_{F\text{-}C}$ = 284.7 Hz), 78.2 (q, $^2J_{F\text{-}C}$ = 27.7 Hz), 75.0, 12.9; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.2 (s, 3F); IR (KBr): 3370, 3061, 2935, 1452, 1174, 1063 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{17}H_{16}F_3NO_2$+H, 324.1206; found, 324.1210.

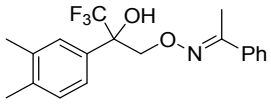
(*E*)-Acetophenone *O*-(3,3,3-Trifluoro-2-Hydroxy-2-(*p*-Tolyl)propyl) Oxime (3b)



54.7 mg, 81% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.58 (d, J = 6.8 Hz, 2H), 7.53 (d, J = 8.0 Hz, 2H), 7.35–7.41 (m, 3H), 7.21 (d, J = 7.6 Hz, 2H), 5.15 (brs, 1H), 4.77 (d, J = 12.8 Hz, 1H), 4.48 (d, J = 12.8 Hz, 1H), 2.35 (s, 3H), 2.21 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 157.8, 138.5, 135.3, 132.5, 129.9, 129.0, 128.6, 126.2, 126.1, 125.0 (q, $^1J_{F\text{-}C}$ = 284.7 Hz), 78.0 (q, $^2J_{F\text{-}C}$ =

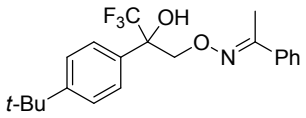
27.7 Hz), 75.0, 21.0, 12.9; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.3 (s, 3F); IR (KBr): 3354, 3070, 2932, 1440, 1170, 1063 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{18}H_{18}F_3NO_2$+H, 338.1362; found, 338.1366.

(*E*)-Acetophenone *O*-(2-(3,4-Dimethylphenyl)-3,3,3-Trifluoro-2-Hydroxypropyl) Oxime (3c)



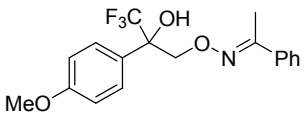
63.3 mg, 90% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.58 (d, J = 7.6 Hz, 2H), 7.42 (s, 1H), 7.34–7.37 (m, 4H), 7.15 (d, J = 8.0 Hz, 1H), 5.16 (brs, 1H), 4.77 (d, J = 12.8 Hz, 1H), 4.45 (d, J = 12.8 Hz, 1H), 2.28 (s, 3H), 2.25 (s, 3H), 2.22 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 157.7, 137.1, 136.6, 135.3, 132.8, 129.9, 129.6, 128.6, 127.4, 126.1, 125.1 (q, $^1J_{F\text{-}C}$ = 284.9 Hz), 123.6, 78.0 (q, $^2J_{F\text{-}C}$ = 27.6 Hz), 75.2, 19.9, 19.4, 12.9; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.0 (s, 3F); IR (KBr): 3370, 3067, 2933, 1450, 1163, 1062 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{19}H_{20}F_3NO_2$+H, 352.1519; found, 352.1520.

(*E*)-Acetophenone *O*-(2-(4-(*tert*-Butyl)phenyl)-3,3,3-Trifluoro-2-Hydroxypropyl) Oxime (3d)



64.5 mg, 85% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.55–7.59 (m, 4H), 7.42 (d, J = 8.4 Hz, 2H), 7.36–7.39 (m, 3H), 5.24 (brs, 1H), 4.78 (d, J = 12.8 Hz, 1H), 4.47 (d, J = 12.8 Hz, 1H), 2.22 (s, 3H), 1.32 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 157.8, 151.6, 135.3, 132.4, 129.9, 128.6, 126.2, 125.9, 125.2, 125.1 (q, $^1J_{F\text{-}C}$ = 284.8 Hz), 78.0 (q, $^2J_{F\text{-}C}$ = 27.7 Hz), 75.1, 34.5, 31.2, 12.9; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.1 (s, 3F); IR (KBr): 3367, 3059, 2957, 1446, 1173, 1064 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{21}H_{24}F_3NO_2$+H, 380.1832; found, 380.1833.

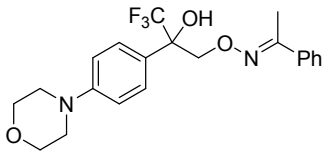
(*E*)-Acetophenone *O*-(3,3,3-Trifluoro-2-Hydroxy-2-(4-Methoxyphenyl)propyl) Oxime (3e)



50.2 mg, 72% yield, white solid, mp: 71–72 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.55–7.59 (m, 4H), 7.35–7.41 (m, 3H), 6.93 (d, J = 8.4 Hz, 2H), 5.26 (brs, 1H), 4.76 (d, J = 13.2 Hz, 1H), 4.48 (d, J =

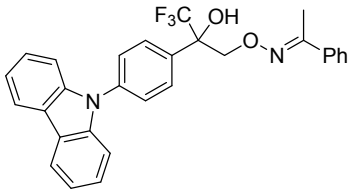
12.8 Hz, 1H), 3.81 (s, 3H), 2.21 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 159.8, 157.8, 135.3, 129.9, 128.6, 127.7, 127.4, 126.1, 125.0 (q, $^1J_{F\text{-}C}$ = 284.5 Hz), 113.7, 77.9 (q, $^2J_{F\text{-}C}$ = 27.7 Hz), 74.9, 55.2, 12.9; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.6 (s, 3F); IR (KBr): 3419, 3072, 2944, 1510, 1169, 1056 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{18}H_{18}F_3NO_3$+H, 354.1312; found, 354.1320.

(*E*)-Acetophenone *O*-(3,3,3-Trifluoro-2-Hydroxy-2-(4-Morpholinophenyl)propyl) Oxime (3f)



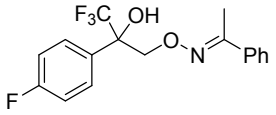
49.0 mg, 60% yield, brown oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.58 (d, *J* = 7.2 Hz, 2H), 7.53 (d, *J* = 8.8 Hz, 2H), 7.35–7.41 (m, 3H), 6.92 (d, *J* = 8.4 Hz, 2H), 5.23 (brs, 1H), 4.75 (d, *J* = 12.8 Hz, 1H), 4.47 (d, *J* = 12.8 Hz, 1H), 3.85 (t, *J* = 4.4 Hz, 4H), 3.18 (t, *J* = 4.4 Hz, 4H), 2.22 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 157.7, 151.1, 135.3, 129.8, 128.6, 127.3, 126.1, 125.0 (q, $^1J_{F\text{-}C}$ = 284.7 Hz), 114.9, 77.8 (q, $^2J_{F\text{-}C}$ = 27.8 Hz), 75.0, 66.8, 48.7, 12.9; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.5 (s, 3F); IR (KBr): 3408, 2908, 2846, 1622, 1163, 1066 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{21}H_{23}F_3N_2O_3$+H, 409.1734; found, 409.1736.

(*E*)-Acetophenone *O*-(2-(4-(9*H*-Carbazol-9-yl)phenyl)-3,3,3-Trifluoro-2-Hydroxypropyl) Oxime (3g)



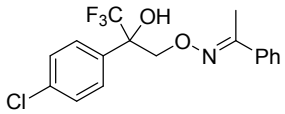
86.0 mg, 88% yield, yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.11 (d, *J* = 7.6 Hz, 2H), 7.86 (d, *J* = 8.4 Hz, 2H), 7.58 (d, *J* = 7.6 Hz, 4H), 7.33–7.43 (m, 8H), 7.25 (d, *J* = 7.2 Hz, 1H), 5.44 (brs, 1H), 4.84 (d, *J* = 13.2 Hz, 1H), 4.60 (d, *J* = 12.8 Hz, 1H), 2.22 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 158.3, 140.7, 138.3, 135.3, 134.6, 130.1, 128.8, 128.2, 126.8, 126.3, 126.1, 125.0 (q, $^1J_{F\text{-}C}$ = 284.3 Hz), 123.6, 120.4, 120.2, 109.9, 78.3 (q, $^2J_{F\text{-}C}$ = 27.8 Hz), 75.0, 13.1; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.2 (s, 3F); IR (KBr): 3353, 3057, 2923, 1450, 1170, 1062 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{29}H_{23}F_3N_2O_2$+H, 489.1784; found, 489.1782.

(*E*)-Acetophenone *O*-(3,3,3-Trifluoro-2-(4-Fluorophenyl)-2-Hydroxypropyl) Oxime (3h)



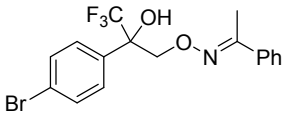
54.6 mg, 80% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.62 (t, J = 6.8 Hz, 2H), 7.57 (d, J = 6.8 Hz, 2H), 7.36–7.42 (m, 3H), 7.08 (t, J = 8.4 Hz, 2H), 5.34 (brs, 1H), 4.76 (d, J = 13.2 Hz, 1H), 4.49 (d, J = 13.2 Hz, 1H), 2.20 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 162.9 (d, $^{1}J_{F\text{-}C}$ = 245.4 Hz), 158.1, 135.2, 131.3 (d, $^{4}J_{F\text{-}C}$ = 3.1 Hz), 130.0, 128.6, 128.4 (d, $^{3}J_{F\text{-}C}$ = 9.0 Hz), 126.1, 124.8 (q, $^{1}J_{F\text{-}C}$ = 284.5 Hz), 115.2 (d, $^{2}J_{F\text{-}C}$ = 21.4 Hz), 77.9 (q, $^{2}J_{F\text{-}C}$ = 27.9 Hz), 74.7, 12.9; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.6 (s, 3F), -110.54 – -110.46(m, 1F); IR (KBr): 3380, 3064, 2956, 1609, 1180, 950 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{17}H_{15}F_4NO_2$+H, 342.1112; found, 342.1110.

(*E*)-Acetophenone *O*-(2-(4-Chlorophenyl)-3,3,3-Trifluoro-2-Hydroxypropyl) Oxime (3i)



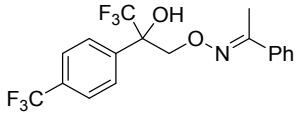
46.5 mg, 65% yield, white solid, mp: 62–63 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.56–7.59 (m, 4H), 7.36–7.39 (m, 5H), 5.37 (brs, 1H), 4.75 (d, J = 12.8 Hz, 1H), 4.49 (d, J = 12.8 Hz, 1H), 2.19 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 158.2, 135.1, 134.8, 134.1, 130.0, 128.6, 128.5, 128.0, 126.1, 124.7 (q, $^{1}J_{F\text{-}C}$ = 284.7 Hz), 78.0 (q, $^{2}J_{F\text{-}C}$ = 28.0 Hz), 74.5, 12.9; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.5 (s, 3F); IR (KBr): 3369, 3077, 2950, 1443, 1179, 1079 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{17}H_{15}ClF_3NO_2$+H, 358.0816; found, 358.0822.

(*E*)-Acetophenone *O*-(2-(4-Bromophenyl)-3,3,3-Trifluoro-2-Hydroxypropyl) Oxime (3j)



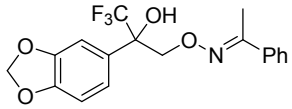
59.4 mg, 74% yield, white solid, mp: 69–70 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.56 (d, J = 8.0 Hz, 2H), 7.50–7.52 (m, 4H), 7.36–7.40 (m, 3H), 5.35 (brs, 1H), 4.74 (d, J = 12.8 Hz, 1H), 4.49 (d, J = 12.8 Hz, 1H), 2.20 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 158.2, 135.1, 134.6, 131.5, 130.0, 128.6, 128.3, 126.1, 124.6 (q, $^{1}J_{F\text{-}C}$ = 284.6 Hz), 123.1, 78.0 (q, $^{2}J_{F\text{-}C}$ = 27.9 Hz), 74.5, 12.9; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.5 (s, 3F); IR (KBr): 3360, 3067, 2933, 1485, 1173, 1070 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{17}H_{15}BrF_3NO_2$+H, 402.0311; found, 402.0309.

(*E*)-Acetophenone *O*-(3,3,3-Trifluoro-2-Hydroxy-2-(4-(Trifluoromethyl)phenyl)propyl) Oxime (3k)



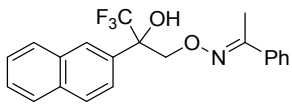
33.0 mg, 42% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.79 (d, J = 8.4 Hz, 2H), 7.67 (d, J = 8.4 Hz, 2H), 7.56 (d, J = 7.2 Hz, 2H), 7.37–7.41 (m, 3H), 5.43 (brs, 1H), 4.78 (d, J = 13.2 Hz, 1H), 4.54 (d, J = 12.8 Hz, 1H), 2.20 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 158.4, 139.6, 135.1, 130.9 ((q, $^2J_{F\text{-}C}$ = 32.4 Hz), 130.1, 128.7, 127.1, 126.2, 125.2(q, $^3J_{F\text{-}C}$ = 3.8 Hz), 124.6 (q, $^1J_{F\text{-}C}$ = 284.5 Hz), 123.9 (q, $^1J_{F\text{-}C}$ = 270.6 Hz), 78.2 (q, $^2J_{F\text{-}C}$ = 28.0 Hz), 74.5, 12.9; ^{19}F NMR (376 MHz, $CDCl_3$) δ -62.8 (s, 3F), -76.4 (s, 3F); IR (KBr): 3383, 3061, 2906, 1324, 1169, 1064 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{18}H_{15}F_6NO_2$+H, 392.1080; found, 392.1081.

(*E*)-Acetophenone *O*-(2-(Benzo[*d*][1,3]dioxol-5-yl)-3,3,3-Trifluoro-2-Hydroxypropyl) Oxime (3l)



69.8 mg, 95% yield, brown oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.58 (d, J = 7.6 Hz, 2H), 7.35–7.41 (m, 3H), 7.16 (s, 1H), 7.10 (d, J = 8.0 Hz, 1H), 6.82 (d, J = 8.4 Hz, 1H), 5.95 (s, 2H), 5.31 (brs, 1H), 4.73 (d, J = 13.2 Hz, 1H), 4.45 (d, J = 12.8 Hz, 1H), 2.22 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 157.9, 147.8, 147.8, 135.2, 129.9, 129.2, 128.6, 126.1, 124.9 (q, $^1J_{F\text{-}C}$ = 284.7 Hz), 120.0, 108.0, 107.2, 101.2, 77.9 (q, $^2J_{F\text{-}C}$ = 27.8 Hz), 74.9, 12.9; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.5 (s, 3F); IR (KBr): 3353, 3072, 2908, 1486, 1171, 1056 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{18}H_{16}F_3NO_4$+H, 368.1104; found, 368.1109.

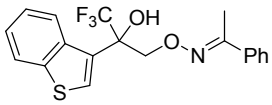
(*E*)-Acetophenone *O*-(3,3,3-Trifluoro-2-Hydroxy-2-(Naphthalen-2-yl)propyl) Oxime (3m)



64.2 mg, 86% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.19 (s, 1H), 7.81–7.89 (m, 3H), 7.71 (d, J = 8.4 Hz, 1H), 7.56 (d, J = 6.0 Hz, 2H), 7.46–7.52 (m, 2H), 7.34–7.40 (m, 3H), 5.44 (brs,

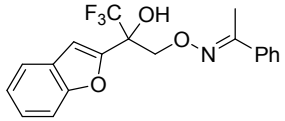
1H), 4.89 (d, J = 12.8 Hz, 1H), 4.61 (d, J = 13.2 Hz, 1H), 2.17 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 158.0, 135.2, 133.2, 133.0, 132.9, 129.9, 128.6, 128.5, 128.0, 127.5, 126.6, 126.4, 126.3, 126.2, 125.0 (q, $^1J_{F\text{-}C}$ = 284.4 Hz), 123.6, 78.4 (q, $^2J_{F\text{-}C}$ = 27.6 Hz), 75.0, 12.9; ^{19}F NMR (376 MHz, $CDCl_3$) δ -75.9 (s, 3F); IR (KBr): 3364, 3058 2936, 1264, 1166, 751 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{21}H_{18}F_3NO_2$+H, 374.1362; found, 374.1368.

(*E*)-Acetophenone *O*-(2-(Benzo[*b*]thiophen-3-yl)-3,3,3-Trifluoro-2-Hydroxypropyl) Oxime (3n)



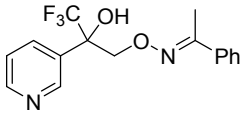
50.8 mg, 67% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.33 (d, J = 8.0 Hz, 1H), 7.85 (d, J = 7.6 Hz, 1H), 7.64 (s, 1H), 7.56 (d, J = 7.2 Hz, 2H), 7.33–7.39 (m, 5H), 5.35 (brs, 1H), 4.94 (d, J = 13.2 Hz, 1H), 4.83 (d, J = 13.2 Hz, 1H), 2.20 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 158.1, 140.7, 135.2, 130.2, 129.9, 128.6, 126.5, 126.5, 126.1, 125.0, 124.9, 124.8 (q, $^1J_{F\text{-}C}$ = 285.2 Hz), 124.2, 122.7, 78.8 (q, $^2J_{F\text{-}C}$ = 28.8 Hz), 74.0, 12.9; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.4 (s, 3F); IR (KBr): 3367, 3059, 2957, 1446, 1173, 1064 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{19}H_{16}F_3NO_2S$+H, 380.0927; found, 380.0931.

(*E*)-Acetophenone *O*-(2-(Benzofuran-2-yl)-3,3,3-Trifluoro-2-Hydroxypropyl) Oxime (3o)



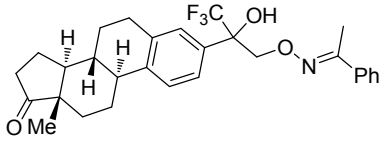
32.7 mg, 45% yield, yellow oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.58 (d, J = 8.0 Hz, 1H), 7.50–7.55 (m, 3H), 7.34–7.40 (m, 3H), 7.31 (t, J = 7.0 Hz, 1H), 7.23–7.26 (m, 1H), 5.54 (brs, 1H), 4.82 (d, J = 12.5 Hz, 1H), 4.77 (d, J = 13.0 Hz, 1H), 2.19 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 158.3, 155.4, 151.7, 135.1, 130.1, 128.7, 127.7, 126.2, 124.8, 123.8 (q, $^1J_{F\text{-}C}$ = 285.3 Hz), 123.1, 121.5, 111.6, 107.1, 76.8 (q, $^2J_{F\text{-}C}$ = 29.3 Hz), 72.9, 13.0; ^{19}F NMR (470 MHz, $CDCl_3$) δ -77.2 (s, 3F); IR (KBr): 3425, 2930, 1630, 1448, 1171 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{19}H_{16}F_3NO_3$+H, 364.1155; found, 364.1159.

(*E*)-Acetophenone *O*-(3,3,3-Trifluoro-2-Hydroxy-2-(Pyridin-3-yl)propyl) Oxime (3p)



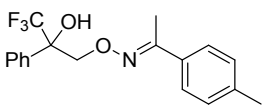
45.4 mg, 70% yield, brown oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.88 (s, 1H), 8.61 (d, J = 4.4 Hz, 1H), 8.00 (d, J = 8.0 Hz, 1H), 7.55 (d, J = 7.6 Hz, 2H), 7.32–7.41 (m, 4H), 5.34 (brs, 1H), 4.79 (d, J = 12.8 Hz, 1H), 4.61 (d, J = 13.2 Hz, 1H), 2.16 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 158.2, 149.7, 148.0, 135.1, 134.7, 131.7, 130.0, 128.6, 126.1, 124.5 (q, $^1J_{F\text{-}C}$ = 284.4 Hz), 123.1, 77.3 (q, $^2J_{F\text{-}C}$ = 28.3 Hz), 74.3, 12.9; ^{19}F NMR (376 MHz, $CDCl_3$) δ -77.0 (s, 3F); IR (KBr): 3560, 3063, 2950, 2348, 1434, 1173, 1069 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{16}H_{15}F_3N_2O_2$+H, 325.1158; found, 325.1158.

(8*R*,9*S*,13*S*,14*S*)-13-Methyl-3-(1,1,1-Trifluoro-2-Hydroxy-3-(((*E*)-(1-Phenylethylidene)amino)oxy)propan-2-yl)-7,8,9,11,12,13,15,16-Octahydro-6*H*-Cyclopenta[*a*]phenanthren-17(14*H*)-one (3q)



61.9 mg, 62% yield, yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.60 (d, J = 7.2 Hz, 2H), 7.35–7.39 (m, 5H), 7.32 (d, J = 8.0 Hz, 1H), 5.32 (brs, 1H), 4.77 (d, J = 13.2 Hz, 1H), 4.45 (d, J = 13.2 Hz, 1H), 2.95 (d, J = 5.2 Hz, 2H), 2.40–2.54 (m, 2H), 2.31 (t, J = 8.4 Hz, 1H), 2.25 (s, 3H), 1.96–2.18 (m, 4H), 1.41–1.64 (m, 6H), 0.91 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 157.7, 140.2, 136.5, 135.2, 132.7, 129.8, 128.5, 126.8, 126.1, 125.3, 125.0 (q, $^1J_{F\text{-}C}$ = 284.3 Hz), 123.4, 77.8 (q, $^2J_{F\text{-}C}$ = 27.9 Hz), 75.1, 50.5, 47.9, 44.3, 37.9, 35.8, 31.5, 29.5, 26.4, 25.5, 21.5, 13.8, 12.9; ^{19}F NMR (376 MHz, $CDCl_3$) δ -75.9 (s, 3F); IR (KBr): 3357, 3060, 2944, 1718, 1168, 1064 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{29}H_{32}F_3NO_3$+H, 500.2407; found, 500.2408.

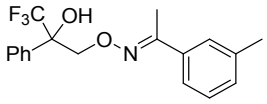
(*E*)-1-(*p*-Tolyl)ethanone *O*-(3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropyl) Oxime (3r)



51.9 mg, 77% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.64 (d, J = 7.2 Hz, 2H), 7.47 (d, J = 7.6 Hz, 2H), 7.38 (m, 3H), 7.17 (d, J = 7.6 Hz, 2H), 5.39 (brs, 1H), 4.77 (d, J = 13.2 Hz, 1H),

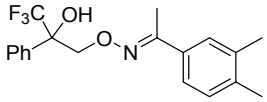
4.49 (d, J = 12.8 Hz, 1H), 2.35 (s, 3H), 2.17 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 157.8, 140.1, 135.5, 132.4, 129.3, 128.6, 128.3, 126.4, 126.0, 124.9 (q, $^1J_{F\text{-}C}$ = 284.4 Hz), 78.2 (q, $^2J_{F\text{-}C}$ = 27.7 Hz), 74.8, 21.2, 12.8; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.2 (s, 3F); IR (KBr): 3361, 3051, 2934, 1441, 1171, 1062 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{18}H_{18}F_3NO_2$+H, 338.1362; found, 338.1361.

(*E*)-1-(*m*-Tolyl)ethanone *O*-(3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropyl) Oxime (3s)



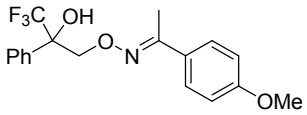
58.7 mg, 87% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.65 (d, J = 7.6 Hz, 2H), 7.36–7.42 (m, 5H), 7.20–7.28 (m, 2H), 5.32 (brs, 1H), 4.78 (d, J = 12.8 Hz, 1H), 4.50 (d, J = 13.2 Hz, 1H), 2.37 (s, 3H), 2.18 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 158.1, 138.3, 135.5, 135.2, 130.7, 128.6, 128.5, 128.3, 126.7, 126.4, 124.9 (q, $^1J_{F\text{-}C}$ = 284.7 Hz), 123.4, 78.2 (q, $^2J_{F\text{-}C}$ = 27.7 Hz), 74.9, 21.4, 13.0; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.2 (s, 3F); IR (KBr): 3371, 3053, 2934, 1452, 1171, 1065 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{18}H_{18}F_3NO_2$+H, 338.1362; found, 338.1363.

(*E*)-1-(3,4-Dimethylphenyl)ethanone *O*-(3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropyl) Oxime (3t)



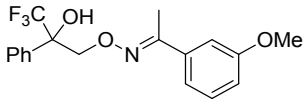
54.2 mg, 77% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.65 (d, J = 7.6 Hz, 2H), 7.35–7.41 (m, 4H), 7.30 (d, J = 8.0 Hz, 1H), 7.12 (d, J = 8.0 Hz, 1H), 5.35 (brs, 1H), 4.77 (d, J = 13.2 Hz, 1H), 4.49 (d, J = 13.2 Hz, 1H), 2.27 (s, 3H), 2.26 (s, 3H), 2.16 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 158.0, 138.8, 136.9, 135.5, 132.8, 129.8, 128.6, 128.3, 127.2, 126.4, 125.0 (q, $^1J_{F\text{-}C}$ = 284.7 Hz), 123.7, 78.2(q, $^2J_{F\text{-}C}$ = 27.8 Hz), 74.8, 19.8, 19.6, 12.8; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.2 (s, 3F); IR (KBr):3372, 3059, 2935, 1450, 1171, 1059 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{19}H_{20}F_3NO_2$+H, 352.1519; found, 352.1517.

(*E*)-1-(4-Methoxyphenyl)ethanone *O*-(3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropyl) Oxime (3u)



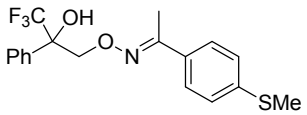
55.2 mg, 78% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.65 (d, J = 7.2 Hz, 2H), 7.53 (d, J = 8.4 Hz, 2H), 7.34–7.42 (m, 3H), 6.89 (d, J = 8.4 Hz, 2H), 5.40 (brs, 1H), 4.76 (d, J = 12.8 Hz, 1H), 4.48 (d, J = 12.8 Hz, 1H), 3.81 (s, 3H), 2.17 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.1, 157.5, 135.6, 128.7, 128.3, 127.7, 127.6, 126.4, 125.0 (q, $^1J_{F\text{-}C}$ = 284.4 Hz), 114.0, 78.2(q, $^2J_{F\text{-}C}$ = 27.7 Hz), 74.9, 55.4, 12.8; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.2 (s, 3F); IR (KBr):3370, 3062, 2939, 1471, 1171, 1054 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{18}H_{18}F_3NO_3$+H, 354.1312; found, 354.1321.

(*E*)-1-(3-Methoxyphenyl)ethanone *O*-(3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropyl) Oxime (3v)



50.2 mg, 71% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.64 (d, J = 7.6 Hz, 2H), 7.36–7.42 (m, 3H), 7.29 (t, J = 7.6 Hz, 1H), 7.15 (d, J = 8.0 Hz, 1H), 7.12 (s, 1H), 6.94 (d, J = 8.4 Hz, 1H), 5.17 (brs, 1H), 4.79 (d, J = 13.2 Hz, 1H), 4.51 (d, J = 13.2 Hz, 1H), 3.81 (s, 3H), 2.18 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 159.7, 157.8, 136.6, 135.4, 129.6, 128.6, 128.3, 126.3, 124.8 (q, $^1J_{F\text{-}C}$ = 284.6 Hz), 118.7, 115.4, 111.7, 78.1 (q, $^2J_{F\text{-}C}$ = 27.8 Hz), 75.0, 55.3, 13.0; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.2 (s, 3F); IR (KBr): 3381, 3066, 2942, 1456, 1188, 1062 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{18}H_{18}F_3NO_3$+H, 354.1312; found, 354.1314.

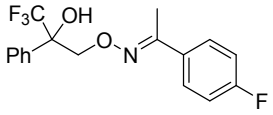
(*E*)-1-(4-(Methylthio)phenyl)ethanone *O*-(3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropyl) Oxime (3w)



66.5 mg, 90% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.04 (d, J = 8.0 Hz, 2H), 7.65 (d, J = 8.0 Hz, 4H), 7.37–7.43 (m, 3H), 4.95 (brs, 1H), 4.83 (d, J = 12.8 Hz, 1H), 4.54 (d, J = 12.8 Hz, 1H), 3.92 (s, 3H), 2.22 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.4, 157.0, 139.4, 135.2, 131.2, 129.8, 128.7, 128.3, 126.3, 126.1, 124.9 (q, $^1J_{F\text{-}C}$ = 284.8 Hz), 77.9(q, $^2J_{F\text{-}C}$ = 27.8 Hz), 75.3, 52.2, 12.8; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.3 (s, 3F); IR (KBr):3449, 3052, 2946, 1715, 1436, 1284,

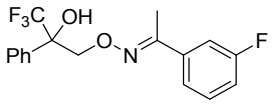
1166 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{18}H_{18}F_3NO_2S$+H, 370.1083; found, 370.1085.

(*E*)-1-(4-Fluorophenyl)ethanone *O*-(3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropyl) Oxime (3x)



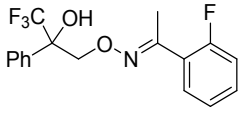
43.0 mg, 80% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.64 (d, J = 7.2 Hz, 2H), 7.57 (dd, J = 8.4, 5.6 Hz, 2H), 7.33–7.42 (m, 3H), 7.06 (t, J = 8.4 Hz, 2H), 5.05 (brs, 1H), 4.79 (d, J = 13.2 Hz, 1H), 4.50 (d, J = 12.8 Hz, 1H), 2.18 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 163.8 (d, $^1J_{F\text{-}C}$ = 248.8 Hz), 156.9, 135.4, 131.4 (d, $^4J_{F\text{-}C}$ = 3.4 Hz), 128.7, 128.3, 128.1 (d, $^3J_{F\text{-}C}$ = 8.4 Hz), 126.3, 124.9 (q, $^1J_{F\text{-}C}$ = 284.5 Hz), 115.6 (d, $^2J_{F\text{-}C}$ = 21.7 Hz), 78.1 (q, $^2J_{F\text{-}C}$ = 27.7 Hz), 75.1, 12.9; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.2 (s, 3F), -110.7 – -110.8 (m, 1F); IR (KBr): 3380, 3064, 2936, 1609, 1180, 1064 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{17}H_{15}F_4NO_2$+H, 342.1112; found, 342.1113.

(*E*)-1-(3-Fluorophenyl)ethanone *O*-(3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropyl) Oxime (3y)



64.8 mg, 93% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.64 (d, J = 7.2 Hz, 2H), 7.28–7.43 (m, 6H), 7.09 (t, J = 7.6 Hz, 1H), 4.97 (brs, 1H), 4.80 (d, J = 12.8 Hz, 1H), 4.51 (d, J = 12.8 Hz, 1H), 2.19 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 162.8 (d, $^1J_{F\text{-}C}$ = 244.9 Hz), 156.7 (d, $^4J_{F\text{-}C}$ = 2.6 Hz), 137.4 (d, $^3J_{F\text{-}C}$ = 7.7 Hz), 135.3, 130.2 (d, $^3J_{F\text{-}C}$ = 8.2 Hz), 128.7, 128.3, 126.3, 124.9 (q, $^1J_{F\text{-}C}$ = 284.5 Hz), 121.8 (d, $^4J_{F\text{-}C}$ = 2.9 Hz), 116.8 (d, $^2J_{F\text{-}C}$ = 21.2 Hz), 113.1 (d, $^2J_{F\text{-}C}$ = 23.0 Hz), 78.0 (q, $^2J_{F\text{-}C}$ = 27.8 Hz), 75.2, 12.8; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.2 (s, 3F), -112.2 – -112.3 (m, 1F); IR (KBr):3406, 3069, 2937, 1451, 1176, 1064 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{17}H_{15}F_4NO_2$+H, 342.1112; found, 342.1114.

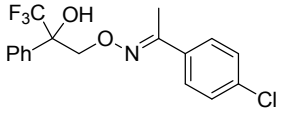
(*E*)-1-(2-Fluorophenyl)ethanone *O*-(3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropyl) Oxime (3z)



61.4 mg, 90% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.65 (d, J = 7.6 Hz, 2H), 7.34–7.42

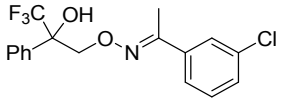
(m, 5H), 7.06–7.16 (m, 2H), 5.23 (brs, 1H), 4.78 (d, J = 12.8 Hz, 1H), 4.50 (d, J = 12.8 Hz, 1H), 2.20 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 160.3 (d, $^1J_{F\text{-}C}$ = 249.7 Hz), 156.0 (d, $^3J_{F\text{-}C}$ = 2.0 Hz), 135.4, 131.2 (d, $^3J_{F\text{-}C}$ = 8.5 Hz), 129.3 (d, $^4J_{F\text{-}C}$ = 2.9 Hz), 128.7, 128.3, 126.4, 124.9 (q, $^1J_{F\text{-}C}$ = 284.5 Hz), 124.3 (d, $^3J_{F\text{-}C}$ = 3.4 Hz), 124.0 (d, $^2J_{F\text{-}C}$ = 11.9 Hz), 116.4 (d, $^2J_{F\text{-}C}$ = 22.0 Hz), 78.2 (q, $^2J_{F\text{-}C}$ = 27.7 Hz), 75.1, 15.2; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.2 (s, 3F), -113.9 – -114.0 (s, 1F); IR (KBr): 3404, 3064, 2936, 1461, 1172, 1064 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{17}H_{15}F_4NO_2$+H, 342.1112; found, 342.1113.

(*E*)-1-(4-Chlorophenyl)ethanone *O*-(3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropyl) Oxime (3aa)



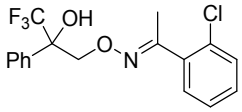
60.9 mg, 85% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.64 (d, J = 7.2 Hz, 2H), 7.51 (d, J = 8.0 Hz, 2H), 7.32–7.42 (m, 5H), 5.00 (brs, 1H), 4.79 (d, J = 12.8 Hz, 1H), 4.50 (d, J = 12.8 Hz, 1H), 2.17 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 156.8, 136.0, 135.3, 133.7, 128.8, 128.7, 128.3, 127.4, 126.3, 124.9 (q, $^1J_{F\text{-}C}$ = 284.7 Hz), 77.9 (q, $^2J_{F\text{-}C}$ = 27.8 Hz), 75.1, 12.7; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.2 (s, 3F); IR (KBr):3397, 3063, 2936, 1488, 1171, 1070 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{17}H_{15}ClF_3NO_2$+H, 358.0816; found, 358.0819.

(*E*)-1-(3-Chlorophenyl)ethanone *O*-(3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropyl) Oxime (3ab)



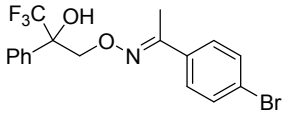
64.3 mg, 90% yield, yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.64 (d, J = 7.6 Hz, 2H), 7.55 (s, 1H), 7.35–7.46 (m, 5H), 7.30 (d, J = 7.6 Hz, 1H), 4.92 (brs, 1H), 4.80 (d, J = 12.8 Hz, 1H), 4.52 (d, J = 12.8 Hz, 1H), 2.17 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 156.7, 137.0, 135.2, 134.7, 129.9, 129.8, 128.7, 128.3, 126.3, 124.9 (q, $^1J_{F\text{-}C}$ = 284.8 Hz), 124.3, 78.0(q, $^2J_{F\text{-}C}$ = 27.7 Hz), 75.2, 12.8; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.2 (s, 3F); IR (KBr):3415, 3067, 2938, 1455, 1171, 1066 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{17}H_{15}ClF_3NO_2$+H, 358.0816; found, 358.0822.

(*E*)-1-(2-Chlorophenyl)ethanone *O*-(3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropyl) Oxime (3ac)



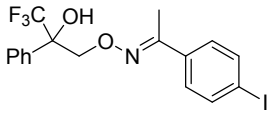
48.6 mg, 68% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.64 (d, J = 7.6 Hz, 2H), 7.23–7.42 (m, 7H), 5.05 (brs, 1H), 4.77 (d, J = 12.8 Hz, 1H), 4.49 (d, J = 13.2 Hz, 1H), 2.18 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 158.9, 135.7, 135.3, 132.4, 130.4, 130.1, 129.8, 128.7, 128.3, 126.9, 126.3, 124.9 (q, $^1J_{F\text{-}C}$ = 284.6 Hz), 78.2 (q, $^2J_{F\text{-}C}$ = 27.7 Hz), 75.2, 16.5; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.1 (s, 3F); IR (KBr): 3409, 3063, 2934, 1443, 1169, 1060 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{17}H_{15}ClF_3NO_2$+H, 358.0816; found, 358.0818.

(*E*)-1-(4-Bromophenyl)ethanone *O*-(3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropyl) Oxime (3ad)



66.8 mg, 83% yield, yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.64 (d, J = 7.6 Hz, 2H), 7.50 (d, J = 8.0 Hz, 2H), 7.36–7.46 (m, 5H), 5.00 (brs, 1H), 4.79 (d, J = 12.8 Hz, 1H), 4.50 (d, J = 12.8 Hz, 1H), 2.17 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 156.9, 135.3, 134.1, 131.8, 128.7, 128.3, 127.6, 126.3, 124.3, 124.9 (q, $^1J_{F\text{-}C}$ = 284.3 Hz), 78.0 (q, $^2J_{F\text{-}C}$ = 27.8 Hz), 75.2, 12.7; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.2 (s, 3F); IR (KBr):3453, 2930, 1640, 1382, 1189, 1069 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{17}H_{15}BrF_3NO_2$+H, 402.0311; found, 402.0312.

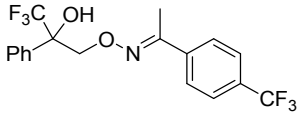
(*E*)-1-(4-Iodophenyl)ethanone *O*-(3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropyl) Oxime (3ae)



72.8 mg, 81% yield, yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.70 (d, J = 7.6 Hz, 2H), 7.63 (d, J = 7.2 Hz, 2H), 7.35–7.42 (m, 3H), 7.30 (d, J = 7.6 Hz, 2H), 4.99 (brs, 1H), 4.79 (d, J = 12.8 Hz, 1H), 4.50 (d, J = 12.8 Hz, 1H), 2.16 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 157.0, 137.7, 135.3, 134.7, 128.7, 128.3, 127.7, 126.3, 124.9 (q, $^1J_{F\text{-}C}$ = 284.3 Hz), 96.2, 78.0 (q, $^2J_{F\text{-}C}$ = 27.7 Hz), 75.2, 12.6; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.2 (s, 3F); IR (KBr):3391, 3062, 2933, 1472, 1171, 1062 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{17}H_{15}F_3INO_2$+H, 450.0172; found, 450.0173.

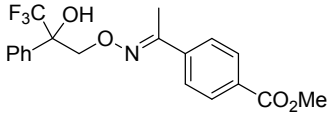
(*E*)-1-(4-(Trifluoromethyl)phenyl)ethanone *O*-(3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropyl)

Oxime (3af)



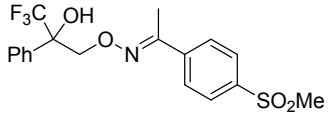
69.7 mg, 88% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.62–7.70 (m, 6H), 7.35–7.43 (m, 3H), 4.83 (brs, 1H), 4.83 (d, J = 12.8 Hz, 1H), 4.54 (d, J = 12.8 Hz, 1H), 2.22 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 156.7, 138.7, 135.2, 131.7 (q, $^{2}J_{F\text{-}C}$ = 32.5 Hz), 128.8, 128.4, 126.5, 126.3, 125.5 (q, $^{3}J_{F\text{-}C}$ = 3.7 Hz), 124.9 (q, $^{1}J_{F\text{-}C}$ = 285.0 Hz), 123.9 (q, $^{1}J_{F\text{-}C}$ = 270.5 Hz), 77.9 (q, $^{2}J_{F\text{-}C}$ = 27.8 Hz), 75.4, 12.8; ^{19}F NMR (376 MHz, $CDCl_3$) δ -62.9 (s, 3F), -76.3 (s, 3F); IR (KBr): 3416, 3066, 2939, 1324, 1158 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{18}H_{15}F_6NO_2$+H, 392.1080; found, 392.1078.

(*E*)-Methyl 4-(1-((3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropoxy)imino)ethyl)benzoate (3ag)



54.2 mg, 70% yield, white solid, mp: 60–61 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.64 (d, J = 7.4 Hz, 2H), 7.50 (d, J = 8.0 Hz, 2H), 7.35–7.43 (m, 3H), 7.23 (d, J = 8.4 Hz, 2H), 5.20 (brs, 1H), 4.78 (d, J = 13.2 Hz, 1H), 4.49 (d, J = 13.2 Hz, 1H), 2.48 (s, 3H), 2.17 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 141.3, 135.4, 131.6, 128.6, 128.3, 126.4, 126.3, 125.9, 124.9 (q, $^{1}J_{F\text{-}C}$ = 284.8 Hz), 78.1 (q, $^{2}J_{F\text{-}C}$ = 27.7 Hz), 74.9, 15.3, 12.6; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.2 (s, 3F); IR (KBr):3372, 3061, 2930, 1438, 1169, 1067 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{19}H_{18}F_3NO_4$+H, 382.1261; found, 382.1267.

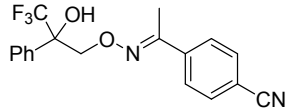
(*E*)-1-(4-(Methylsulfonyl)phenyl)ethanone *O*-(3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropyl) Oxime (3ah)



70.6 mg, 88% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.94 (d, J = 8.4 Hz, 2H), 7.76 (d, J = 8.4 Hz, 2H), 7.64 (d, J = 7.6 Hz, 2H), 7.36–7.43 (m, 3H), 4.85 (d, J = 12.8 Hz, 1H), 4.68 (brs, 1H), 4.57 (d, J = 12.8 Hz, 1H), 3.05 (s, 3H), 2.23 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 156.1, 141.3, 140.5, 135.0, 128.7, 128.3, 127.6, 127.0, 126.1, 124.8 (q, $^{1}J_{F\text{-}C}$ = 284.4 Hz), 77.6 (q, $^{2}J_{F\text{-}C}$ =

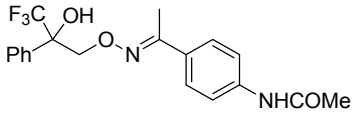
27.8 Hz), 75.6, 44.3, 12.8; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.2 (s, 3F); IR (KBr): 3457, 3051, 2935, 1301, 1161, 1074 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{18}H_{18}F_3NO_4S$+H, 402.0981; found, 402.0988.

(*E*)-4-(1-((3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropoxy)imino)ethyl)benzonitrile (3ai)



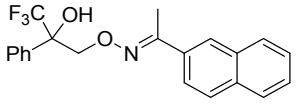
60.6 mg, 87% yield, yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.63–7.69 (m, 6H), 7.36–7.43 (m, 3H), 4.84 (d, J = 12.8 Hz, 1H), 4.66 (brs, 1H), 4.55 (d, J = 12.8 Hz, 1H), 2.21 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 156.0, 139.4, 135.0, 132.3, 128.8, 128.3, 126.6, 126.1, 124.8 (q, $^1J_{F\text{-}C}$ = 284.5 Hz), 118.3, 113.2, 77.6 (q, $^2J_{F\text{-}C}$ = 27.7 Hz), 75.6, 12.6; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.2 (s, 3F); IR (KBr): 3428, 3063, 2944, 2232, 1606, 1171, 1067 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{18}H_{15}F_3N_2O_2$+H, 349.1158; found, 349.1163.

(*E*)-*N*-(4-(1-((3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropoxy)imino)ethyl)phenyl)acetamide (3aj)



68.5 mg, 90% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.17 (s, 1H), 7.71 (s, 1H), 7.62 (d, J = 7.2 Hz, 3H), 7.35–7.42 (m, 3H), 7.27 (s, 1H), 5.23 (brs, 1H), 4.76 (d, J = 13.2 Hz, 1H), 4.48 (d, J = 13.2 Hz, 1H), 2.90 (d, J = 23.6 Hz, 1H), 2.14 (s, 3H), 2.13 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 169.1, 157.5, 138.4, 135.9, 135.3, 129.1, 128.6, 128.3, 126.3, 124.9 (q, $^1J_{F\text{-}C}$ = 284.5 Hz), 121.9, 121.5, 117.5, 78.1 (q, $^2J_{F\text{-}C}$ = 27.7 Hz), 74.9, 24.3, 12.8; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.2 (s, 3F); IR (KBr): 3302, 3060, 2947, 1670, 1168, 1062 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{19}H_{19}F_3N_2O_3$+H, 381.1421; found, 381.1426.

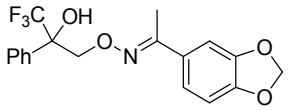
(*E*)-1-(Naphthalen-2-yl)ethanone *O*-(3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropyl) Oxime (3ak)



61.3 mg, 82% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.95 (s, 1H), 7.75–7.81 (m, 4H),

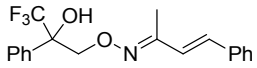
7.67 (d, J = 6.8 Hz, 2H), 7.49 (d, J = 4.8 Hz, 2H), 7.34–7.43 (m, 3H), 5.27 (brs, 1H), 4.83 (d, J = 13.2 Hz, 1H), 4.55 (d, J = 13.2 Hz, 1H), 2.29 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 157.7, 135.4, 133.9, 132.9, 132.4, 128.7, 128.5, 128.3, 127.6, 127.0, 126.6, 126.4, 126.3, 124.9 (q, $^1J_{F\text{-}C}$ = 284.4 Hz), 122.9, 78.1 (q, $^2J_{F\text{-}C}$ = 27.7 Hz), 75.0, 12.7; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.1 (s, 3F); IR (KBr): 3395, 3055, 2933, 1452, 1170, 1064 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{21}H_{18}F_3NO_2$+H, 374.1362; found, 374.1366.

(*E*)-1-(Benzo[*d*][1,3]dioxol-5-yl)ethanone *O*-(3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropyl) Oxime (3al)



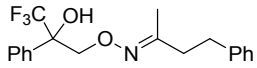
60.2 mg, 82% yield, brown oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.64 (d, J = 7.6 Hz, 2H), 7.34–7.42 (m, 3H), 7.10 (s, 1H), 7.06 (d, J = 8.0 Hz, 1H), 6.78 (d, J = 8.0 Hz, 1H), 5.96 (s, 2H), 5.26 (brs, 1H), 4.76 (d, J = 12.8 Hz, 1H), 4.48 (d, J = 12.8 Hz, 1H), 2.14 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 157.3, 149.2, 148.0, 135.5, 129.3, 128.6, 128.3, 126.3, 124.9 (q, $^1J_{F\text{-}C}$ = 284.7 Hz), 120.7, 108.1, 106.1, 101.4, 78.1 (q, $^2J_{F\text{-}C}$ = 27.6 Hz), 74.9, 12.8; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.2 (s, 3F); IR (KBr):3372, 3067, 2911, 1470, 1170, 1054 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{18}H_{16}F_3NO_4$+H, 368.1104; found, 368.1106.

(2*E*,3*E*)-4-Phenylbut-3-en-2-one *O*-(3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropyl) Oxime (3am)



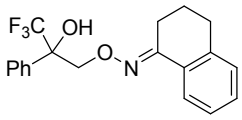
59.4 mg, 85% yield, white solid, mp: 67–68 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.64 (d, J = 7.6 Hz, 2H), 7.29–7.45 (m, 8H), 6.91 (d, J = 16.4 Hz, 1H), 6.75 (d, J = 16.4 Hz, 1H), 5.25 (brs, 1H), 4.74 (d, J = 12.8 Hz, 1H), 4.44 (d, J = 12.8 Hz, 1H), 2.03 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 158.3, 135.8, 135.4, 135.0, 128.8, 128.8, 128.6, 128.3, 127.0, 126.3, 124.9 (q, $^1J_{F\text{-}C}$ = 284.8 Hz), 124.4, 78.2 (q, $^2J_{F\text{-}C}$ = 27.7 Hz), 74.9, 10.3; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.1 (s, 3F); IR (KBr):3386, 3053, 2931, 1457, 1169, 1065 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{19}H_{18}F_3NO_2$+H, 350.1362; found, 350.1365.

(*E*)-4-Phenylbutan-2-one *O*-(3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropyl) Oxime (3an)



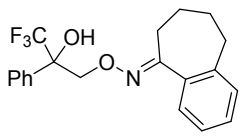
21.1 mg, 30% yield (*E*/*Z* = 2.6/1), colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.59 (d, *J* = 7.2 Hz, 2H), 7.15–7.40 (m, 8H), 5.27 (brs, 1H), 4.61 (d, *J* = 13.2 Hz, 1H), 4.34 (t, *J* = 13.2 Hz, 1H), 2.81 (t, *J* = 8.0 Hz, 2H), 2.50 (t, *J* = 8.0 Hz, 2H), 1.81 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 160.4, 140.5, 135.7, 128.6, 128.5, 128.3, 128.3, 126.5, 126.4, 126.3, 125.0 (q, $^{1}J_{F\text{-}C}$ = 284.5 Hz), 78.3 (q, $^{2}J_{F\text{-}C}$ = 27.6 Hz), 74.4, 37.5, 32.3, 14.6; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.3 (s, 3F); IR (KBr):3363, 3050, 2931, 1448, 1170, 1067 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{19}H_{20}F_3NO_2$+H, 352.1519; found, 352.1523.

(*E*)-3,4-Dihydronaphthalen-1(2*H*)-one *O*-(3,3,3-Trifluoro-2-Hydroxy-2Phenylpropyl) Oxime (3ao)



55.9 mg, 80% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.84 (d, *J* = 8.0 Hz, 1H), 7.65 (d, *J* = 7.2 Hz, 2H), 7.34–7.42 (m, 3H), 7.28 (t, *J* = 7.6 Hz, 1H), 7.20 (t, *J* = 7.6 Hz, 1H), 7.13 (d, *J* = 7.2 Hz, 1H), 5.33 (brs, 1H), 4.78 (d, *J* = 13.2 Hz, 1H), 4.49 (d, *J* = 13.2 Hz, 1H), 2.57–2.76 (m, 4H), 1.73–1.85 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 157.2, 140.2, 135.5, 129.9, 129.3, 128.8, 128.6, 128.3, 126.5, 126.3, 124.9 (q, $^{1}J_{F\text{-}C}$ = 284.7 Hz), 124.2, 78.2 (q, $^{2}J_{F\text{-}C}$ = 27.8 Hz), 74.9, 29.5, 24.3, 21.0; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.2 (s, 3F); IR (KBr):3376, 3060, 2937, 1452, 1170, 1064 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{19}H_{18}F_3NO_2$+H, 350.1362; found, 350.1368.

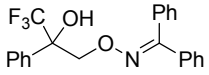
(*E*)-6,7,8,9-Tetrahydro-5*H*-Benzo[*7*]annulen-5-one *O*-(3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropyl) Oxime (3ap)



56.7 mg, 78% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.64 (d, *J* = 7.2 Hz, 2H), 7.34–7.42 (m, 3H), 7.31 (t, *J* = 7.2 Hz, 2H), 7.22 (t, *J* = 7.2 Hz, 1H), 7.13 (d, *J* = 7.6 Hz, 1H), 5.43 (brs, 1H), 4.76 (d, *J* = 13.2 Hz, 1H), 4.49 (d, *J* = 13.2 Hz, 1H), 2.50–2.75 (m, 4H), 1.65–1.77 (m, 2H), 1.51–

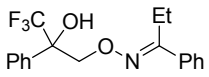
1.60 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 165.1, 139.6, 135.5, 135.0, 129.8, 129.0, 128.6, 128.3, 127.4, 126.5, 126.4, 124.9 (q, $^1J_{F\text{-}C}$ = 284.8 Hz), 78.4 (q, $^2J_{F\text{-}C}$ = 27.8 Hz), 74.8, 31.7, 26.6, 25.8, 21.4; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.2 (s); IR (KBr): 3375, 3057, 2934, 1449, 1170, 1065 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{20}H_{20}F_3NO_2$+H, 364.1519; found, 364.1527.

Benzophenone *O*-(3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropyl) Oxime (3aq)



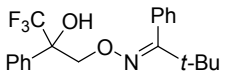
67.1 mg, 87% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.62 (d, *J* = 6.8 Hz, 2H), 7.32–7.42 (m, 11H), 7.10 (d, *J* = 6.8 Hz, 2H), 5.11 (brs, 1H), 4.75 (d, *J* = 13.2 Hz, 1H), 4.51 (d, *J* = 13.2 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 159.4, 135.5, 135.2, 132.0, 130.1, 129.3, 129.0, 128.6, 128.4, 128.3, 128.1, 128.1, 126.5, 124.8 (q, $^1J_{F\text{-}C}$ = 284.5 Hz), 78.1 (q, $^2J_{F\text{-}C}$ = 27.8 Hz), 75.1; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.5 (s, 3F); IR (KBr):3392, 3058, 2930, 1449, 1168, 1064 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{22}H_{18}F_3NO_2$+H, 386.1362; found, 386.1364.

(*E*)-Propiophenone *O*-(3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropyl) Oxime (3ar)



53.3 mg, 80% yield, white solid, mp: 71–72 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.65 (d, *J* = 7.2 Hz, 2H), 7.57 (d, *J* = 4.4 Hz, 2H), 7.33–7.43 (m, 6H), 5.27 (brs, 1H), 4.78 (d, *J* = 13.2 Hz, 1H), 4.51 (d, *J* = 12.8 Hz, 1H), 2.69 (q, *J* = 7.2 Hz, 2H), 1.01 (t, *J* = 7.2 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 162.6, 135.5, 134.3, 129.9, 128.7, 128.6, 128.3, 126.4, 126.3, 124.9 (q, $^1J_{F\text{-}C}$ = 284.4 Hz), 78.2 (q, $^2J_{F\text{-}C}$ = 27.6 Hz), 74.8, 20.3, 10.6; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.3 (s, 3F); IR (KBr): 3389, 3070, 2950, 1456, 1169, 1063 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{18}H_{18}F_3NO_2$+H, 338.1362; found, 338.1365.

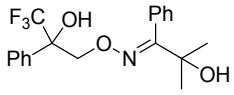
(*Z*)-2,2-Dimethyl-1-Phenylpropan-1-one *O*-(3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropyl) Oxime (3as)



36.5 mg, 50% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.56 (d, *J* = 4.8 Hz, 2H), 7.35–7.41 (m, 3H), 7.31 (s, 3H), 6.75 (d, *J* = 3.6 Hz, 2H), 5.37 (brs, 1H), 4.54 (d, *J* = 12.8 Hz, 1H), 4.32 (d, *J*

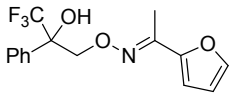
= 12.8 Hz, 1H), 1.12 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 168.5, 135.7, 132.8, 128.5, 128.2, 128.0, 127.8, 127.1, 126.7, 124.7 (q, $^1J_{F\text{-}C}$ = 284.3 Hz), 78.3 (q, $^2J_{F\text{-}C}$ = 27.8 Hz), 74.3, 37.5, 27.9; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.7 (s, 3F); IR (KBr):3377, 3065, 2958, 1462, 1171, 1073 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{20}H_{22}F_3NO_2$+H, 366.1675; found, 366.1676.

(*E*)-2-Hydroxy-2-Methyl-1-Phenylpropan-1-one *O*-(3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropyl) Oxime (3at)



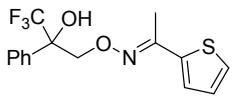
54.4 mg, 74% yield, white solid, mp: 97–98 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.55 (d, *J* = 4.8 Hz, 2H), 7.34–7.41 (m, 6H), 6.92–6.98 (m, 2H), 4.62 (d, *J* = 12.8 Hz, 1H), 4.39 (d, *J* = 12.8 Hz, 1H), 4.37 (brs, 1H), 2.38 (brs, 1H), 1.38 (s, 3H), 1.36 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 165.4, 135.4, 131.4, 128.7, 128.6, 128.3, 128.1, 127.3, 126.4, 124.6 (q, $^1J_{F\text{-}C}$ = 284.5 Hz), 77.5 (q, $^2J_{F\text{-}C}$ = 28.0 Hz), 75.1, 72.9, 28.1; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.8 (s, 3F); IR (KBr): 3410, 3060, 2977, 1456, 1169, 1075 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{19}H_{20}F_3NO_3$+H, 368.1468; found, 368.1474.

(*E*)-1-(Furan-2-yl)ethanone *O*-(3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropyl) Oxime (3au)



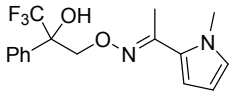
56.4 mg, 90% yield, black oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.65 (d, *J* = 7.2 Hz, 2H), 7.46 (s, 1H), 7.34–7.42 (m, 3H), 6.66 (s, 1H), 6.43 (s, 1H), 5.24 (brs, 1H), 4.77 (d, *J* = 12.8 Hz, 1H), 4.49 (d, *J* = 12.8 Hz, 1H), 2.10 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 149.3, 148.9, 144.3, 135.4, 128.6, 128.3, 126.3, 124.9 (q, $^1J_{F\text{-}C}$ = 285.2 Hz), 111.5, 111.4, 78.1 (q, $^2J_{F\text{-}C}$ = 27.8 Hz), 75.1, 11.7; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.2 (s, 3F); IR (KBr): 3364, 2937, 1449, 1401, 1170, 1074 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{15}H_{14}F_3NO_3$+H, 314.0999; found, 314.0999.

(*E*)-1-(Thiophen-2-yl)ethanone *O*-(3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropyl) Oxime (3av)



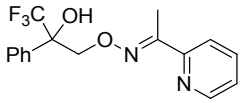
52.7 mg, 80% yield, white solid, mp: 86–87 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.64 (d, J = 7.6 Hz, 2H), 7.34–7.42 (m, 3H), 7.32 (d, J = 5.2 Hz, 1H), 7.24–7.26 (m, 1H), 7.02 (t, J = 4.4 Hz, 1H), 5.10 (brs, 1H), 4.75 (d, J = 12.8 Hz, 1H), 4.48 (d, J = 12.8 Hz, 1H), 2.20 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 153.5, 138.7, 135.3, 128.7, 128.3, 127.9, 127.5, 127.3, 126.4, 124.9 (q, $^1J_{F\text{-}C}$ = 284.6 Hz), 78.1 (q, $^2J_{F\text{-}C}$ = 27.8 Hz), 75.0, 13.0; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.3 (s, 3F); IR (KBr): 3391, 3081, 2934, 1438, 1168, 1067 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{15}H_{14}F_3NO_2S$+H, 330.0770; found, 330.0769.

(*E*)-1-(1-Methyl-1*H*-Pyrrol-2-yl)ethanone *O*-(3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropyl) Oxime (3aw)



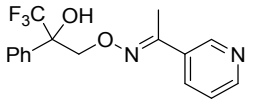
45.7 mg, 70% yield, brown oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.63 (d, J = 7.2 Hz, 2H), 7.36–7.42 (m, 3H), 6.67 (s, 1H), 6.48 (d, J = 1.6 Hz, 1H), 6.12 (d, J = 1.2 Hz, 1H), 4.98 (brs, 1H), 4.75 (d, J = 12.8 Hz, 1H), 4.43 (d, J = 12.8 Hz, 1H), 3.78 (s, 3H), 2.15 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.8, 135.5, 128.6, 128.3, 128.1, 127.2, 126.3, 124.9 (q, $^1J_{F\text{-}C}$ = 284.7 Hz), 114.2, 107.7, 78.0 (q, $^2J_{F\text{-}C}$ = 27.7 Hz), 74.9, 38.1, 13.7; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.3 (s, 3F); IR (KBr): 3400, 2939, 1445, 1170, 1069 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{16}H_{17}F_3N_2O_2$+H, 327.1315; found, 327.1315.

(*E*)-1-(Pyridin-2-yl)ethanone *O*-(3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropyl) Oxime (3ax)



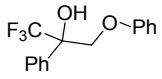
58.4 mg, 90% yield, white solid, mp: 67–68 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.61 (d, J = 4.0 Hz, 1H), 7.77 (d, J = 8.0 Hz, 1H), 7.64–7.70 (m, 3H), 7.35–7.43 (m, 3H), 7.25–7.29 (m, 1H), 4.99 (brs, 1H), 4.84 (d, J = 12.8 Hz, 1H), 4.56 (d, J = 12.8 Hz, 1H), 2.31 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 158.8, 153.0, 149.1, 136.4, 135.3, 128.7, 128.3, 126.3, 124.9 (q, $^1J_{F\text{-}C}$ = 284.3 Hz), 124.2, 120.6, 77.9 (q, $^2J_{F\text{-}C}$ = 27.8 Hz), 75.4, 11.4; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.3 (s, 3F); IR (KBr): 3405, 3065, 2937, 1455, 1169, 1070 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{16}H_{15}F_3N_2O_2$+H, 325.1158; found, 325.1162.

(*E*)-1-(Pyridin-3-yl)ethanone *O*-(3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropyl) Oxime (3ay)



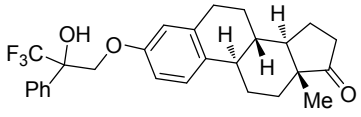
57.1 mg, 88% yield, white solid, mp: 93–94 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.75 (s, 1H), 8.58 (d, J = 4.0 Hz, 1H), 7.88 (d, J = 8.0 Hz, 1H), 7.66 (d, J = 7.2 Hz, 2H), 7.37–7.43 (m, 3H), 7.30 (dd, J = 7.6 Hz, 5.2 Hz, 1H), 5.33 (brs, 1H), 4.83 (d, J = 12.8 Hz, 1H), 4.58 (d, J = 12.8 Hz, 1H), 2.15 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 154.8, 150.2, 147.0, 135.4, 133.5, 131.3, 128.7, 128.3, 126.3, 124.9 (q, $^1J_{F\text{-}C}$ = 284.5 Hz), 123.4, 77.5 (q, $^2J_{F\text{-}C}$ = 27.8 Hz), 75.7, 12.5; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.3 (s, 3F); IR (KBr): 3413, 3070, 2941, 1436, 1166, 1065 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{16}H_{15}F_3N_2O_2$+H, 325.1158; found, 325.1158.

1,1,1-Trifluoro-3-Phenoxy-2-Phenylpropan-2-ol (3az)



50.8 mg, 90% yield, yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.63 (d, J = 7.2 Hz, 2H), 7.40–7.45 (m, 3H), 7.29 (t, J = 8.0 Hz, 2H), 7.01 (t, J = 7.2 Hz, 1H), 6.92 (d, J = 8.0 Hz, 2H), 4.59 (d, J = 9.6 Hz, 1H), 4.22 (d, J = 9.6 Hz, 1H), 3.52 (brs, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 157.7, 135.1, 129.7, 129.0, 128.5, 125.9, 124.8 (q, $^1J_{F\text{-}C}$ = 284.8 Hz), 122.2, 114.9, 75.9 (q, $^2J_{F\text{-}C}$ = 28.3 Hz), 70.1; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.7 (s, 3F); IR (KBr): 3560, 3055, 2943, 2348, 1485, 1172, 1066 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{15}H_{13}F_3O_2$+Na, 305.0760; found, 305.0766.

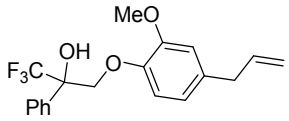
(8*S*,9*R*,13*R*,14*R*)-13-Methyl-3-(3,3,3-Trifluoro-2-Hydroxy-2-Phenylpropoxy)-7,8,9,11,12,13,15,16-Octahydro-6*H*-Cyclopenta[*a*]phenanthren-17(14*H*)-one (3ba)



78.0 mg, 85% yield, yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.63 (d, J = 6.0 Hz, 2H), 7.38–7.43 (m, 3H), 7.21 (d, J = 8.4 Hz, 1H), 6.73 (d, J = 8.8 Hz, 1H), 6.67 (s, 1H), 4.56 (d, J = 9.6 Hz, 1H), 4.20 (d, J = 8.4 Hz, 1H), 3.63 (brs, 1H), 2.88 (d, J = 6.0 Hz, 2H), 2.50 (dd, J = 19.2, 8.4 Hz, 1H), 2.38 (d, J = 10.0 Hz, 1H), 2.25 (t, J = 9.2 Hz, 1H), 1.94–2.18(m, 4H), 1.38–1.67 (m, 6H), 0.90 (s,

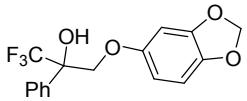
3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 155.8, 138.1, 135.1, 133.6, 129.0, 128.5, 126.5, 125.9, 124.9 (q, $^1J_{F\text{-}C}$ = 285.9 Hz), 114.9, 112.4, 75.8 (q, $^2J_{F\text{-}C}$ = 28.9 Hz), 70.0, 50.4, 48.0, 43.9, 38.2, 35.8, 31.5, 29.6, 26.4, 25.9, 21.5, 13.8; ^{19}F NMR (376 MHz, $CDCl_3$) δ -76.7 (s, 3F); IR (KBr): 3563, 3043, 2933, 1730, 1494, 1168 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{27}H_{29}F_3O_3$+H, 459.2142; found, 459.2145.

3-(4-Allyl-2-Methoxyphenoxy)-1,1,1-Trifluoro-2-Phenylpropan-2-ol (3bb)



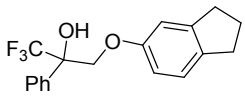
56.4 mg, 80% yield, colorless oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.62 (d, *J* = 7.5 Hz, 2H), 7.34–7.40 (m, 3H), 6.88 (d, *J* = 8.0 Hz, 1H), 6.68–6.71 (m, 2H), 5.88–5.96 (m, 1H), 5.04–5.08 (m, 2H), 4.65 (d, *J* = 10.5 Hz, 1H), 4.20 (dd, *J* = 10.5, 1.0 Hz, 1H), 3.82 (s, 3H), 3.31 (d, *J* = 6.5 Hz, 2H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 150.4, 146.5, 137.3, 136.2, 135.6, 128.8, 128.4, 126.1, 125.0 (q, $^1J_{F\text{-}C}$ = 284.1 Hz), 121.2, 118.6, 116.0, 112.9, 75.9 (q, $^2J_{F\text{-}C}$ = 28.1 Hz), 74.4, 56.0, 39.9; ^{19}F NMR (470 MHz, $CDCl_3$) δ -76.9 (s, 3F); IR (KBr): 3454, 2929, 1634, 1508, 1165 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{19}H_{19}F_3O_3$+H, 353.1359; found, 353.1363

3-(Benzo[*d*][1,3]dioxol-5-yloxy)-1,1,1-Trifluoro-2-Phenylpropan-2-ol (3bc)



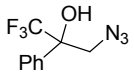
55.5 mg, 85% yield, brown oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.60 (d, *J* = 7.0 Hz, 2H), 7.38–7.42 (m, 3H), 6.67 (d, *J* = 8.5 Hz, 1H), 6.47 (d, *J* = 2.5 Hz, 1H), 6.32 (dd, *J* = 8.5, 2.5 Hz, 1H), 5.87 (s, 2H), 4.50 (d, *J* = 10.0 Hz, 1H), 4.14 (dd, *J* = 10.0, 1.5 Hz, 1H), 3.80 (s, 1H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 153.2, 148.4, 142.8, 135.1, 129.1, 128.6, 126.0, 124.8 (q, $^1J_{F\text{-}C}$ = 284.5 Hz), 108.0, 106.5, 101.4, 98.8, 75.9 (q, $^2J_{F\text{-}C}$ = 28.3 Hz), 71.3; ^{19}F NMR (470 MHz, $CDCl_3$) δ -76.7 (s, 3F); IR (KBr): 3524, 3066, 2900, 1622, 1481, 1173 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{16}H_{13}F_3O_4$+H, 327.0839; found, 327.0836.

3-((2,3-Dihydro-1*H*-Inden-5-yl)oxy)-1,1,1-Trifluoro-2-Phenylpropan-2-ol (3bd)



56.7 mg, 88% yield, yellow oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.62 (d, J = 7.0 Hz, 2H), 7.35–7.42 (m, 3H), 7.10 (d, J = 8.0 Hz, 1H), 6.80 (d, J = 2.0 Hz, 1H), 6.69 (dd, J = 8.0 Hz, 2.5 Hz, 1H), 4.56 (d, J = 10.0 Hz, 1H), 4.19 (dq, J = 10.0 Hz, 1.5 Hz, 1H), 3.76 (brs, 1H), 2.81–2.86 (m, 4H), 2.05 (quint, J = 7.5 Hz, 2H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 156.8, 146.1, 137.9, 135.3, 129.0, 128.5, 126.0, 125.0, 124.9 (q, $^{1}J_{F\text{-}C}$ = 284.9 Hz), 113.0, 111.2, 76.0 (q, $^{2}J_{F\text{-}C}$ = 28.3 Hz), 70.5, 33.1, 32.0, 25.9; ^{19}F NMR (470 MHz, $CDCl_3$) δ -76.7 (s, 3F); IR (KBr): 3555, 2944, 2855, 1483, 1170 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{18}H_{17}F_3O_2$+Na, 345.1073; found, 345.1075.

3-Azido-1,1,1-Trifluoro-2-Phenylpropan-2-ol (3be)

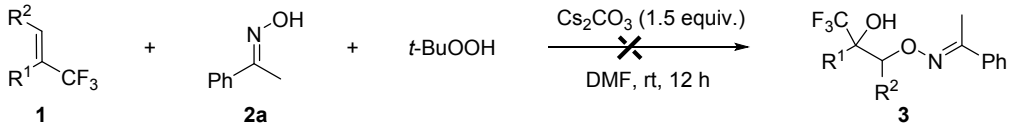


41.6 mg, 90% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.55 (d, J = 6.8 Hz, 2H), 7.38–7.46 (m, 3H), 3.98 (d, J = 13.2 Hz, 1H), 3.80 (d, J = 12.8 Hz, 1H), 3.13 (brs, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 134.8, 129.3, 128.6, 126.0, 124.5 (q, $^{1}J_{F\text{-}C}$ = 284.5 Hz), 76.3 (q, $^{2}J_{F\text{-}C}$ = 28.1 Hz), 55.3; ^{19}F NMR (376 MHz, $CDCl_3$) δ -77.7 (s, 3F); IR (KBr): 3152, 3063, 2950, 1452, 1270, 1163 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_9H_8F_3N_3O$+Na, 254.0512; found, 254.0519.

2-Phenyl-2-(Trifluoromethyl)oxirane (8)

11.0 mg, 29% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.52 (s, 2H), 7.41 (s, 3H), 3.40 (d, J = 4.8 Hz, 1H), 2.92 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 131.1, 129.6, 128.5, 127.7, 123.4 (q, $^{1}J_{F\text{-}C}$ = 276.6 Hz), 58.0 (q, $^{2}J_{F\text{-}C}$ = 36.6 Hz), 50.9 (q, $^{3}J_{F\text{-}C}$ = 2.2 Hz); ^{19}F NMR (376 MHz, $CDCl_3$) δ -74.5 (s, 3F); IR (KBr): 3069, 2906, 1720, 1334, 1174, 954 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_9H_7F_3O$+Na, 211.0341; found, 211.0345.

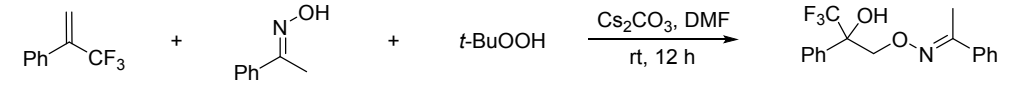
D. Other (Trifluoromethyl)alkenes in this Hydroxyletherification Reaction



Failed (Trifluoromethyl)alkenes:

When these four (trifluoromethyl)alkenes were used as the substrates under our standard reaction conditions, no desired hydroxyletherification products were detected.

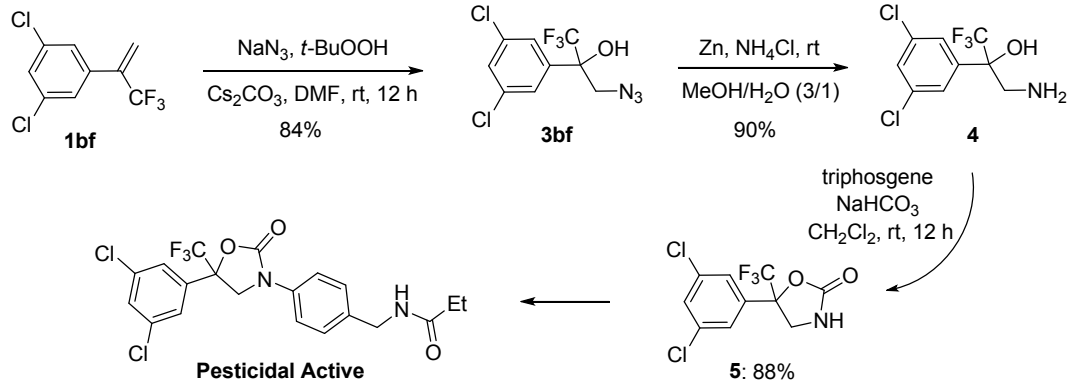
E. Procedure for the Gram-Scale Synthesis and Transformation of the Products



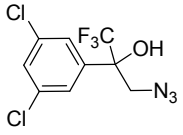
1a (1.291 g, 7.5 mmol) **2a** (0.675 g, 5 mmol) (2 equiv.) **3a** (1.374 g, 85%)

A 250 mL round-bottom flask equipped with a magnetic stirring bar, 2-trifluoromethyl-1-alkene **1a** (1.291 g, 7.5 mmol), oxime **2a** (0.675 g, 5 mmol), TBHP (10 mmol, 5 M in decane), Cs_2CO_3 (7.5 mmol), and DMF (100 mL) was vigorously stirred at room temperature for 12 h. Then added distilled water (150 mL), extracted with EtOAc (150 mL × 3). The combined organic phases were washed with brine (150 mL × 3), dried over anhydrous Na_2SO_4, filtered and concentrated *in vacuo*. Further purification by flash column chromatography on silica gel (eluting with petroleum ether/ethyl acetate) provided the product **3a** in 85% isolated yield.

Synthesis of product 5



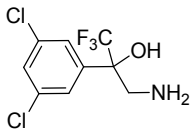
Procedure 1 for **Synthesis of 3-Azido-2-(3,5-Dichlorophenyl)-1,1,1-Trifluoropropan-2-ol (3bf):** To a 25 mL round bottom flask equipped with a magnetic stirring bar was added trifluoromethyl alkene **1bf** (0.2 mmol), NaN_3 (0.6 mmol), TBHP (0.4 mmol, 5 M in decane), Cs_2CO_3 (0.3 mmol), and DMF (2 mL) at room temperature. The mixture was vigorously stirred at the same temperature for 12 h. Then added distilled water (10 mL), and extracted with EtOAc (15 mL × 3). The combined organic layers were dried over Na_2SO_4, and concentrated *in vacuo*. Further purification by flash column chromatography on silica gel (eluting with petroleum ether/ethyl acetate) provided the product **3bf** in 84% isolated yield.



50.4 mg, 84% yield, colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.46 (s, 2H), 7.42 (s, 1H), 4.00 (d, J = 13.2 Hz, 1H), 3.75 (d, J = 13.2 Hz, 1H), 3.34 (brs, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 138.2, 135.5, 129.6, 124.9, 124.0 (q, $^1J_{F\text{-}C}$ = 284.6 Hz), 75.7 (q, $^2J_{F\text{-}C}$ = 28.7 Hz), 55.1; ^{19}F NMR (376 MHz, $CDCl_3$) δ -77.6 (s, 3F); IR (KBr): 3532, 3064, 2113, 1271, 1168 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_9H_6Cl_2F_3N_3O$+Na, 321.9732; found, 321.9739.

Procedure 2 for **Synthesis of 3-Amino-2-(3,5-Dichlorophenyl)-1,1,1-Trifluoropropan-2-ol (4)**

To a 25 mL round bottom flask equipped with a magnetic stirring bar was added 3-azido-2-(3,5-dichlorophenyl)-1,1,1-trifluoropropan-2-ol **3bf** (0.2 mmol), Zn (0.3 mmol), NH_4Cl (0.3 mmol), MeOH/H_2O (4 mL, v/v = 3/1) at room temperature. The mixture was vigorously stirred at the same temperature for 12 h. Then added distilled water (10 mL), and extracted with EtOAc (15 mL × 3). The combined organic layers were dried over Na_2SO_4, and concentrated *in vacuo*. Further purification by flash column chromatography on silica gel (eluting with petroleum ether/ethyl acetate) provided the product **4** in 90% isolated yield.

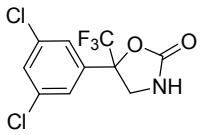


49.4 mg, 90% yield, yellow oil; ^{1}H NMR (400 MHz, d_6-DMSO) δ 7.63 (s, 1H), 7.58 (s, 2H), 3.38 (brs, 1H), 3.25 (d, J = 13.6 Hz, 1H), 3.17 (d, J = 13.6 Hz, 1H); ^{13}C NMR (100 MHz, d_6-DMSO) δ 142.1, 134.5, 128.4, 126.4, 125.8 (q, $^1J_{F\text{-}C}$ = 282.1 Hz), 76.7 (q, $^2J_{F\text{-}C}$ = 25.8 Hz), 45.5; ^{19}F NMR (376 MHz, d_6-DMSO) δ -77.0 (s, 3F); IR (KBr): 3376, 3091, 2931, 1577, 1169, 753 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_9H_8Cl_2F_3NO$+H, 274.0008; found, 274.0013.

Procedure 3 for **Synthesis of 5-(3,5-Dichlorophenyl)-5-(Trifluoromethyl)oxazolidin-2-one (5):**

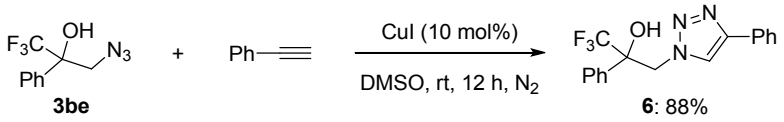
To a 25 mL round bottom flask equipped with a magnetic stirring bar was added 3-amino-2-(3,5-dichlorophenyl)-1,1,1-trifluoropropan-2-ol **4** (0.2 mmol), triphosgene (0.3 mmol), $NaHCO_3$ (0.3 mmol), CH_2Cl_2 (4 mL) was vigorously stirred at room temperature for 12 h under Air. Then added distilled water (10 mL), and extracted with EtOAc (15 mL × 3). The combined organic layers were dried over Na_2SO_4, and concentrated *in vacuo*. Further purification by flash column chromatography on silica gel (eluting with petroleum ether/ethyl acetate) provided the product **5** in 88% isolated

yield.

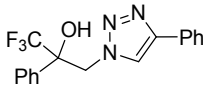


52.6 mg, 88% yield, white solid, mp: 100–101 °C; ^{1}H NMR (400 MHz, d_6-DMSO) δ 7.78 (s, 1H), 7.59 (s, 2H), 4.22 (d, J = 10.8 Hz, 1H), 3.99 (d, J = 10.8 Hz, 1H); ^{13}C NMR (100 MHz, d_6-DMSO) δ 155.7, 138.4, 135.2, 130.1, 125.4, 123.8 (q, $^1J_{F\text{-}C}$ = 283.0 Hz), 80.2 (q, $^2J_{F\text{-}C}$ = 30.6 Hz), 47.4; ^{19}F NMR (376 MHz, d_6-DMSO) δ -80.4 (s, 3F); IR (KBr): 3300, 3086, 2920, 1779, 1191, 1072 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{10}H_6Cl_2F_3NO_2$+H, 299.9800; found, 299.9808.

Synthesis of product 6



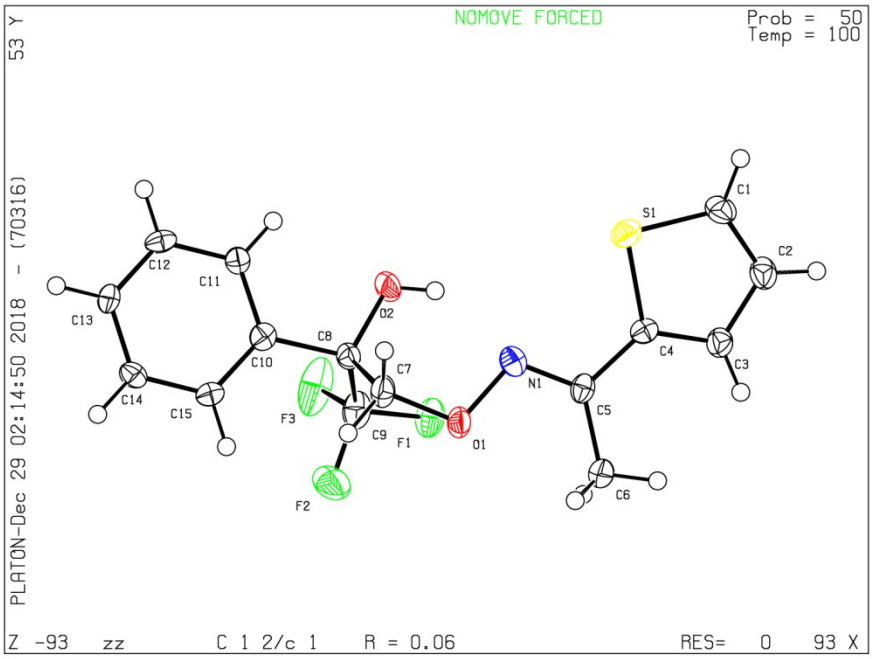
To a 25 mL round bottom flask equipped with a magnetic stirring bar was added 3-azido-1,1,1-trifluoro-2-phenylpropan-2-ol **3be** (0.2 mmol), phenylacetylene (0.3 mmol), CuI (0.02 mmol), DMSO (2 mL) at room temperature. The mixture was vigorously stirred at the same temperature for 12 h under N_2. Then added distilled water (10 mL), and extracted with EtOAc (15 mL × 3). The combined organic layers were dried over Na_2SO_4, and concentrated *in vacuo*. Further purification by flash column chromatography on silica gel (eluting with petroleum ether/ethyl acetate) provided the product **6** in 88% isolated yield.



58.7 mg, 88%, white solid, mp: 154–155 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.69 (d, J = 7.6 Hz, 2H), 7.63 (s, 1H), 7.59 (d, J = 4.8 Hz, 2H), 7.29–7.41 (m, 6H), 5.04 (d, J = 14.4 Hz, 1H), 4.96 (d, J = 14.4 Hz, 1H), 4.78 (brs, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 147.6, 133.8, 129.7, 129.4, 128.9, 128.7, 128.5, 126.2, 125.8, 124.4 (q, $^1J_{F\text{-}C}$ = 284.5 Hz), 121.5, 76.7 (q, $^2J_{F\text{-}C}$ = 28.1 Hz), 54.4; ^{19}F NMR (376 MHz, $CDCl_3$) δ -77.5 (s, 3F); IR (KBr): 3148, 3053, 2915, 1450, 1270, 1160 cm^{-1}; HRMS (ESI, m/z): $[M+H]^+$ Calcd. for $C_{17}H_{14}F_3N_3O$+H, 334.1162; found, 334.1165.

F. X-ray Crystallographic Data

The X-ray crystallographic structures for **3av**. ORTEP representation with 50% probability thermal ellipsoids. Solvent and hydrogen are omitted for clarity. Crystal data have been deposited to CCDC, number 1956248.

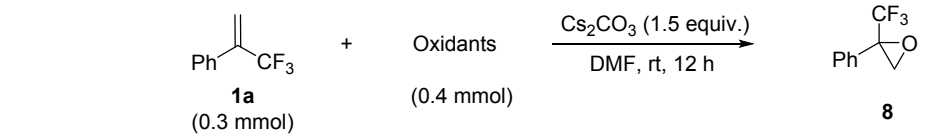


Empirical formula	$C_{15}H_{14}F_3NO_2S$
Formula weight	329.33
Temperature	100.00 (10) K
Crystal system, Space group	Monoclinic, C12/c1
Unit cell dimensions	a = 25.516(3) Å α = 90 deg. b = 5.6738(5) Å beta = 110.176(6) deg. c = 21.937(2) Å gamma = 90 deg.
Volume	2981.0(5) $Å^3$
Z	8
ρ_{calc}g/cm3	1.468
μ/mm 1	0.256 mm^{1}
F(000)	1360
Crystal size	0.12 × 0.06 × 0.03 mm^3
Radiation	MoK\a (λ = 0.71073)
Theta range for data collection	3.022 to 25.012 deg.
Index ranges	-25 ≤ h ≤ 31, -6 ≤ k ≤ 6, -26 ≤ l ≤ 26

Reflections collected	10820
Independent reflections	2829 [R_{int} = 0.1086, R_{sigma} = 0.1074]
Data/restraints/parameters	2829/0/201
Goodness-of-fit on F^2	1.026
Final R indexes [I>=2σ (I)]	R_1 = 0.0621, wR_2 = 0.1020
Final R indexes [all data]	R_1 = 0.1356, wR_2 = 0.1313

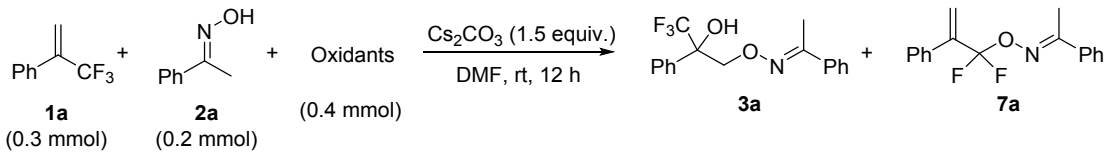
G. Mechanistic Studies

The screen of oxidants



Entry	Oxidants	Yield of **8** (%)[a]
1	AgOAc	0
2	$PhI(OAc)_2$	0
3	*m*-CPBA	0
4	BPO	0
5	H_2O_2	4
6	$K_2S_2O_8$	0
7	BQ	0
8	$(t\text{-BuO})_2$	0
9	TBHP	29

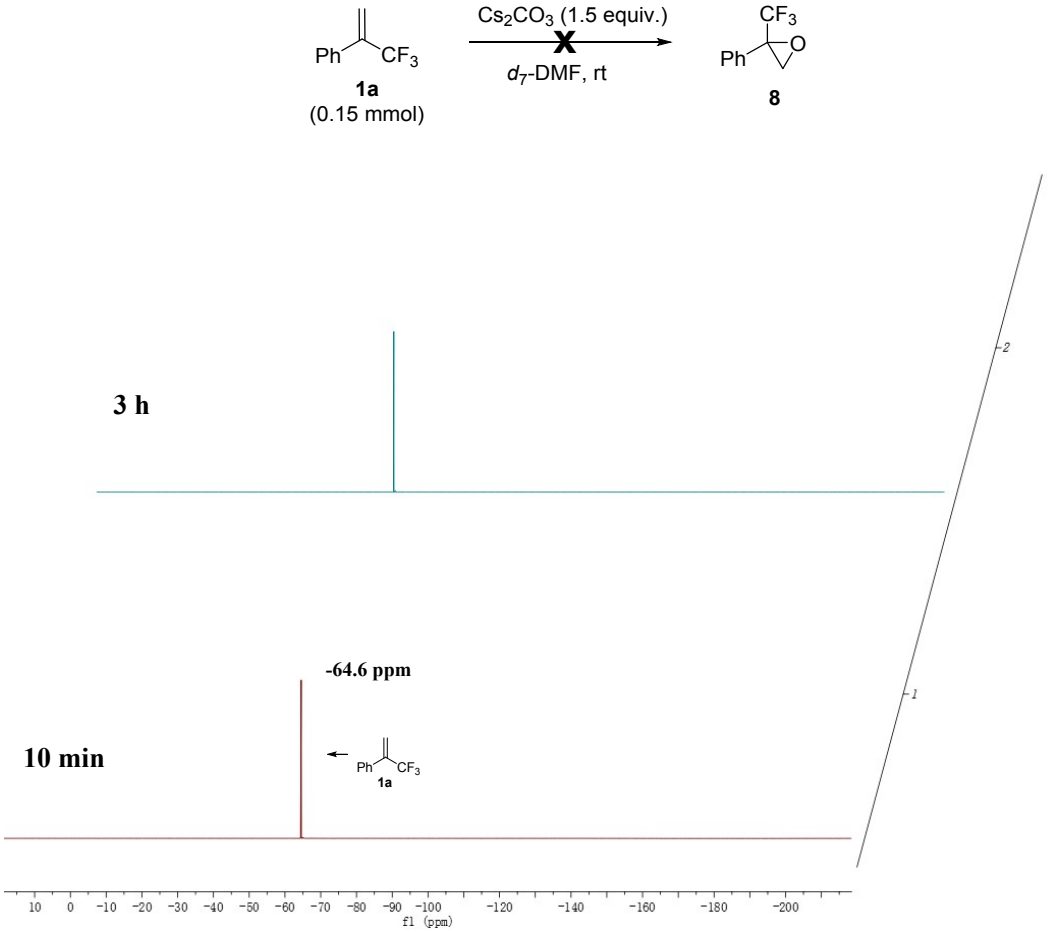
[a]The yields were determined by ^{19}F NMR spectroscopy of the crude product with $PhCF_3$ as an internal standard. *m*-CPBA = 3-Chloroperbenzoic acid. BPO = Benzoyl peroxide. BQ = 1,4-Benzoquinone. TBHP = *tert*-butyl hydroperoxide.



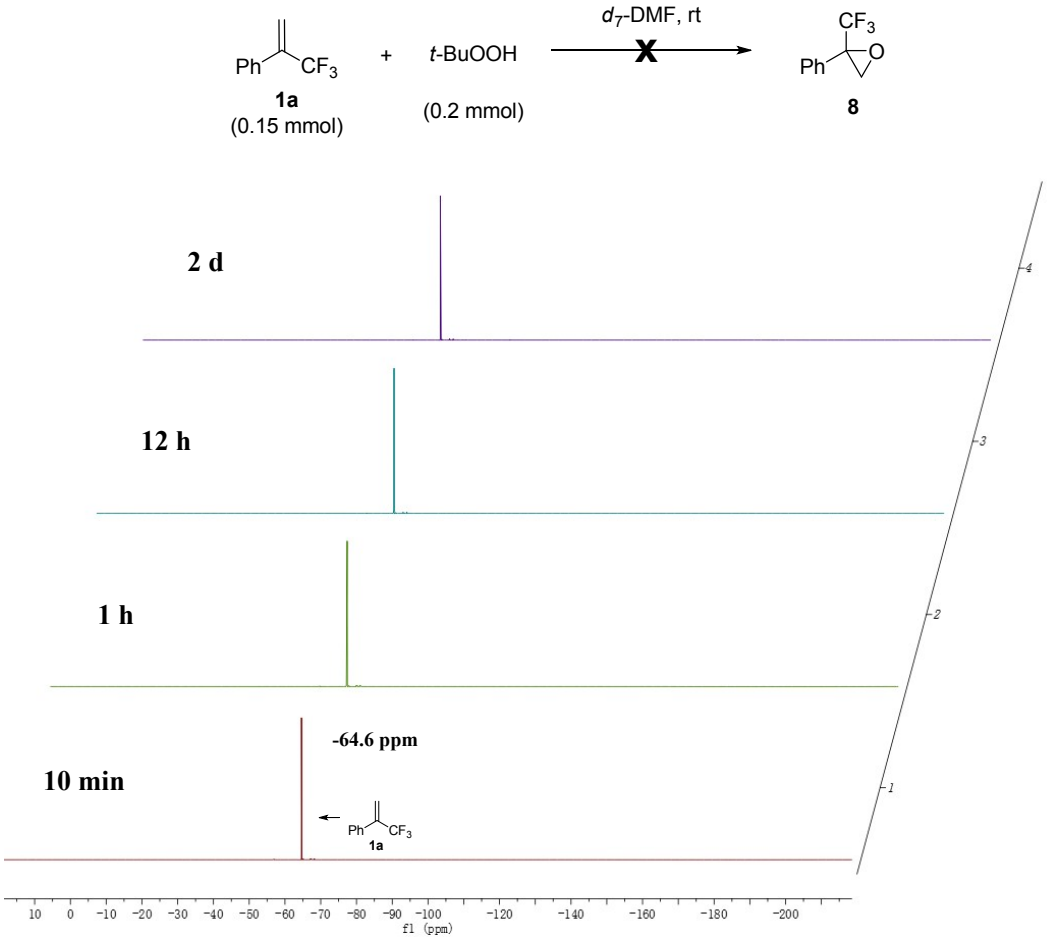
Entry	Oxidants	Yield of (**3a**/**7a**) (%)[a]
1	AgOAc	0/0
2	$PhI(OAc)_2$	0/0
3	*m*-CPBA	0/0
4	BPO	0/0
5	H_2O_2	0/0
6	$K_2S_2O_8$	0/0
7	BQ	0/0
8	DTBP	0/37
9	TBHP	90/0

[a]The yields were determined by ^{19}F NMR spectroscopy of the crude product with $PhCF_3$ as an internal standard. *m*-CPBA = 3-Chloroperbenzoic acid. BPO = Benzoyl peroxide. BQ = 1,4-Benzoquinone. TBHP = *tert*-butyl hydroperoxide.

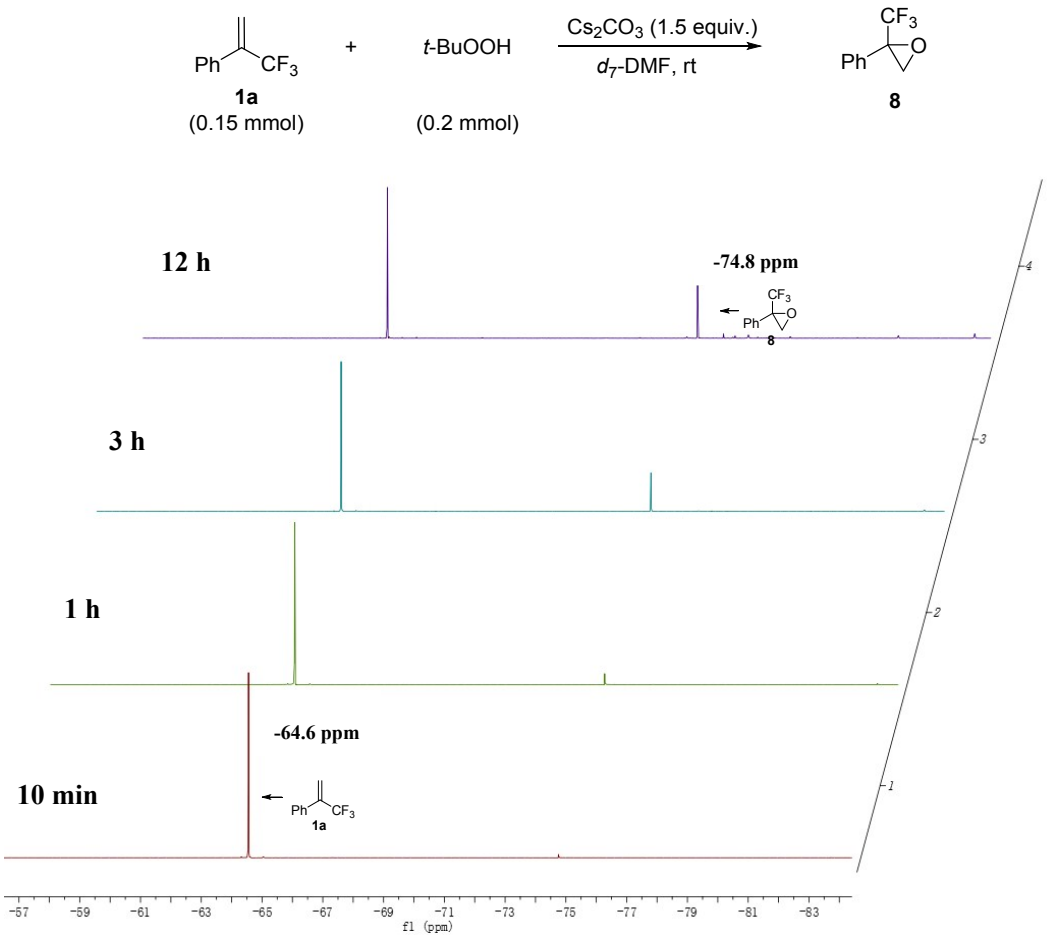
^{19}F NMR (376 MHz, d_7-DMF) Spectrum for the Reaction Mixture (25 ^{o}C)



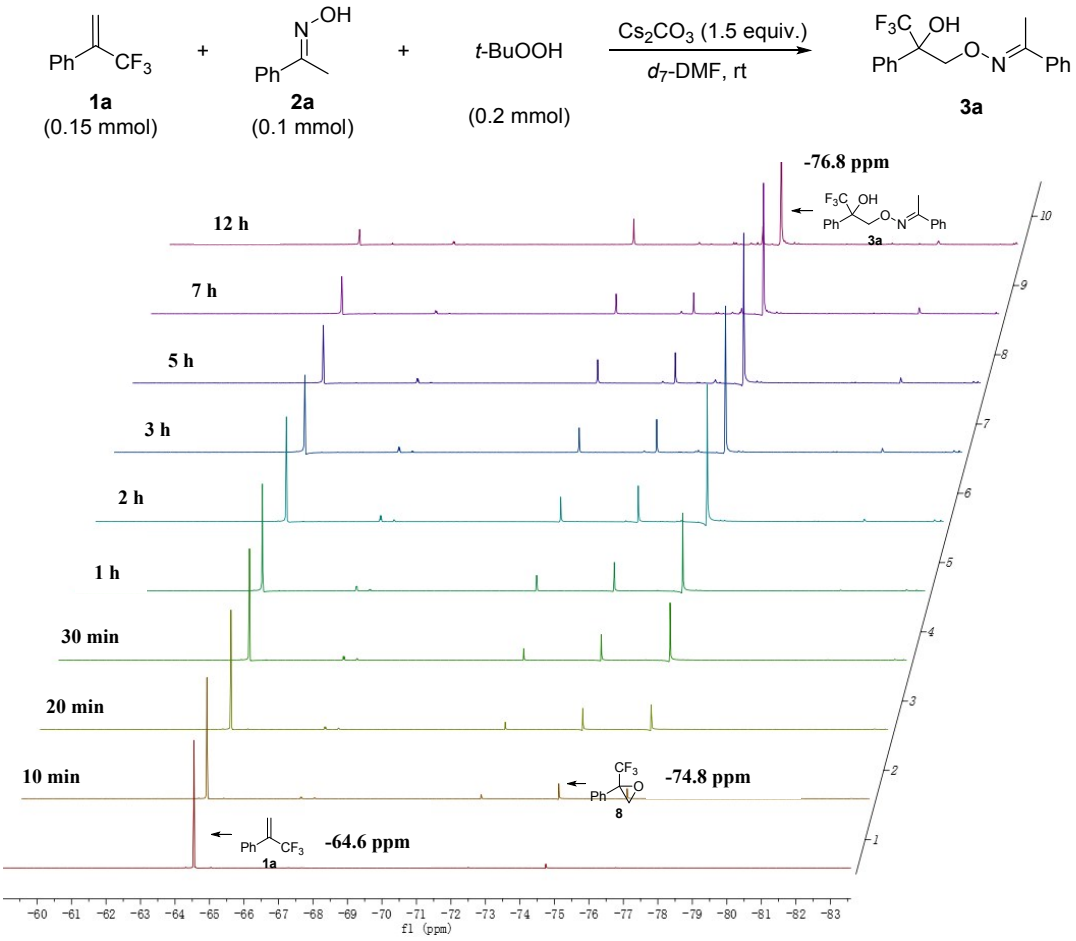
To a nuclear magnetic tube was only added 2-trifluoromethyl-1-alkene **1a** (0.15 mmol), Cs_2CO_3 (1.5 equiv.), and d_7-DMF (1 mL) at room temperature. Shake the NMR tube quickly. After 10 minutes, 2-trifluoromethyl-1-alkene **1a** had no conversion and 2-phenyl-2-(trifluoromethyl)oxirane (**8**) was not detected through ^{19}F NMR spectroscopy. The result was the same after 3 hour.



To a nuclear magnetic tube was only added 2-trifluoromethyl-1-alkene **1a** (0.15 mmol), TBHP (0.2 mmol, 5 M in decane), and d_7-DMF (1 mL) at room temperature. Shake the NMR tube quickly. After 10 minutes, 2-trifluoromethyl-1-alkene **1a** had no conversion and 2-phenyl-2-(trifluoromethyl)oxirane (**8**) was not detected through ^{19}F NMR spectroscopy. The result was the same after 2 days.

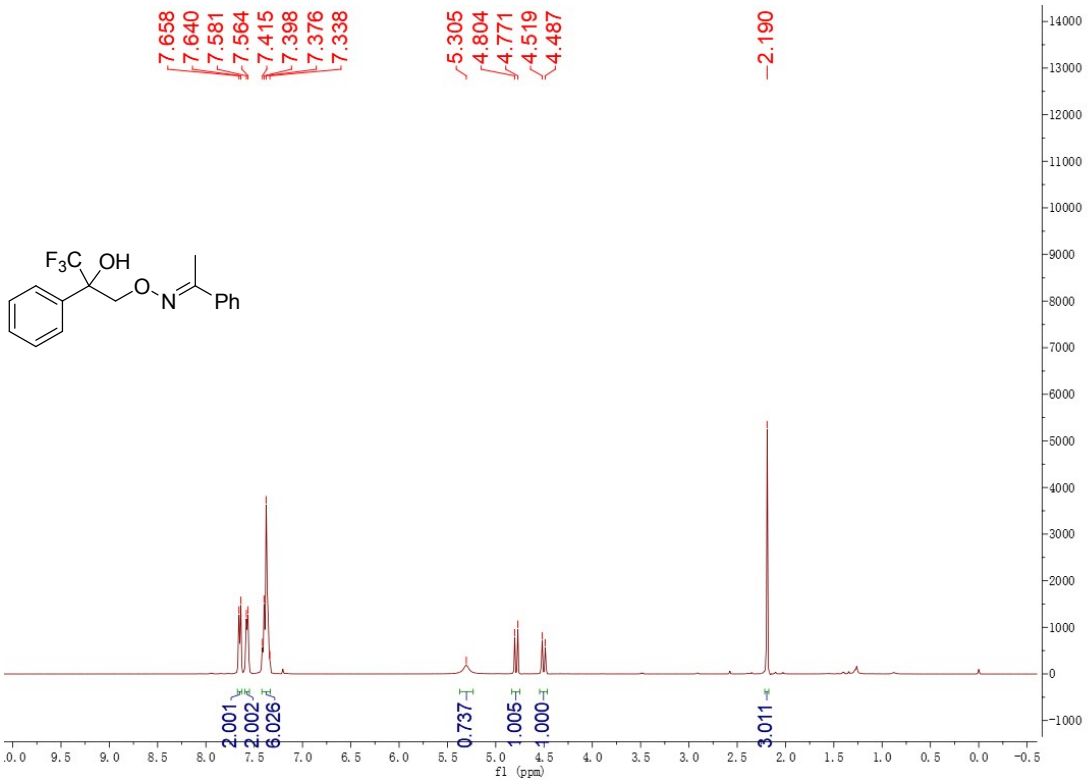


To a nuclear magnetic tube was added 2-trifluoromethyl-1-alkene **1a** (0.15 mmol), TBHP (0.2 mmol, 5 M in decane), Cs_2CO_3 (1.5 equiv.), and d_7-DMF (1 mL) at room temperature. Shake the NMR tube quickly. After 1 hour, 2-phenyl-2-(trifluoromethyl)oxirane (**8**) was detected by ^{19}F NMR spectroscopy with a single peak at δ = -74.8 ppm. The reaction time was extended to 12 hours, 2-trifluoromethyl-1-alkene **1a** could not be completely converted to 2-phenyl-2-(trifluoromethyl)oxirane (**8**).

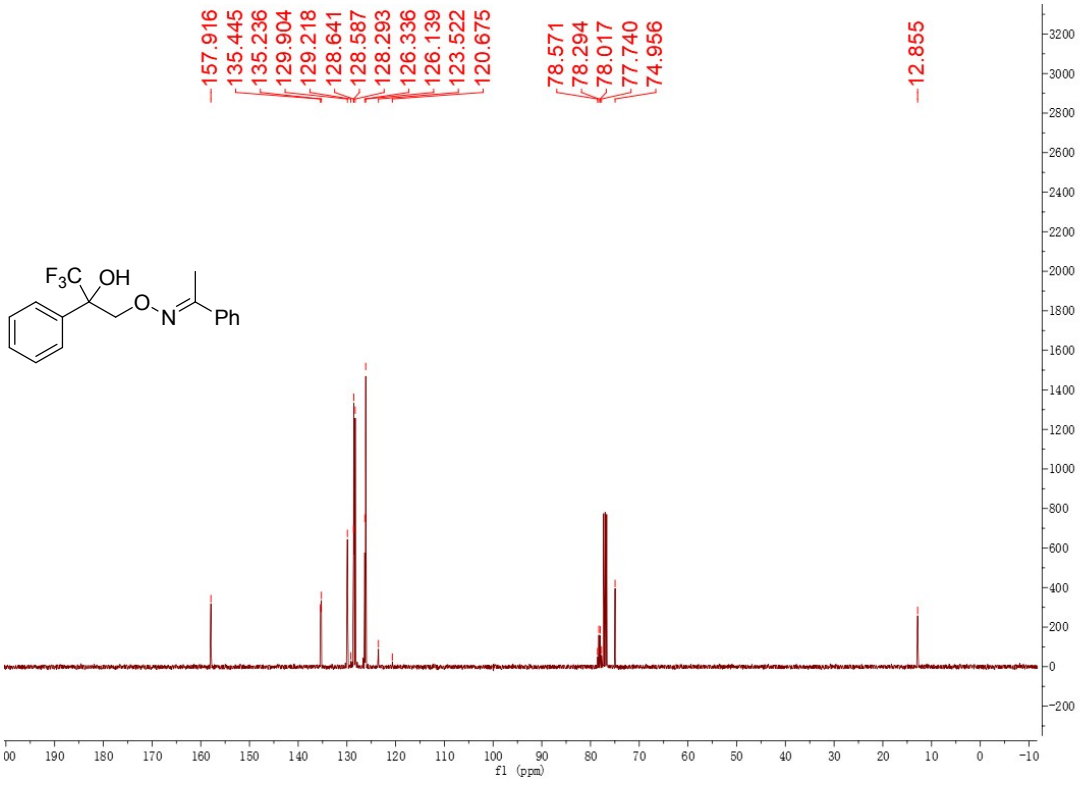

Ph
CF3
1a
(0.15 mmol)
+
N
OH
Ph
2a
(0.1 mmol)
+
t-BuOOH
(0.2 mmol)
Cs2CO3 (1.5 equiv.)
d7-DMF, rt
F3C
OH
Ph
O
N
Ph
3a
-76.8 ppm
12 h
7 h
5 h
3 h
2 h
1 h
30 min
20 min
10 min
-74.8 ppm
8
-64.6 ppm
1a
f1 (ppm)

H. NMR Spectra of New Compounds

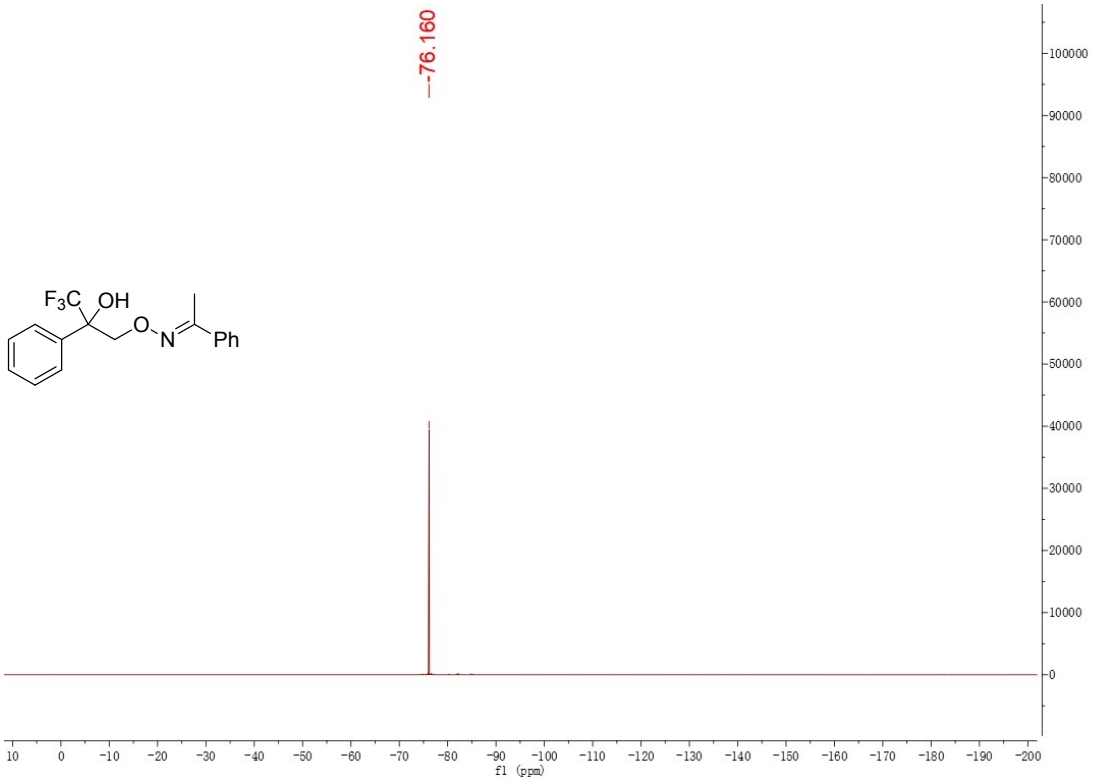
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3a



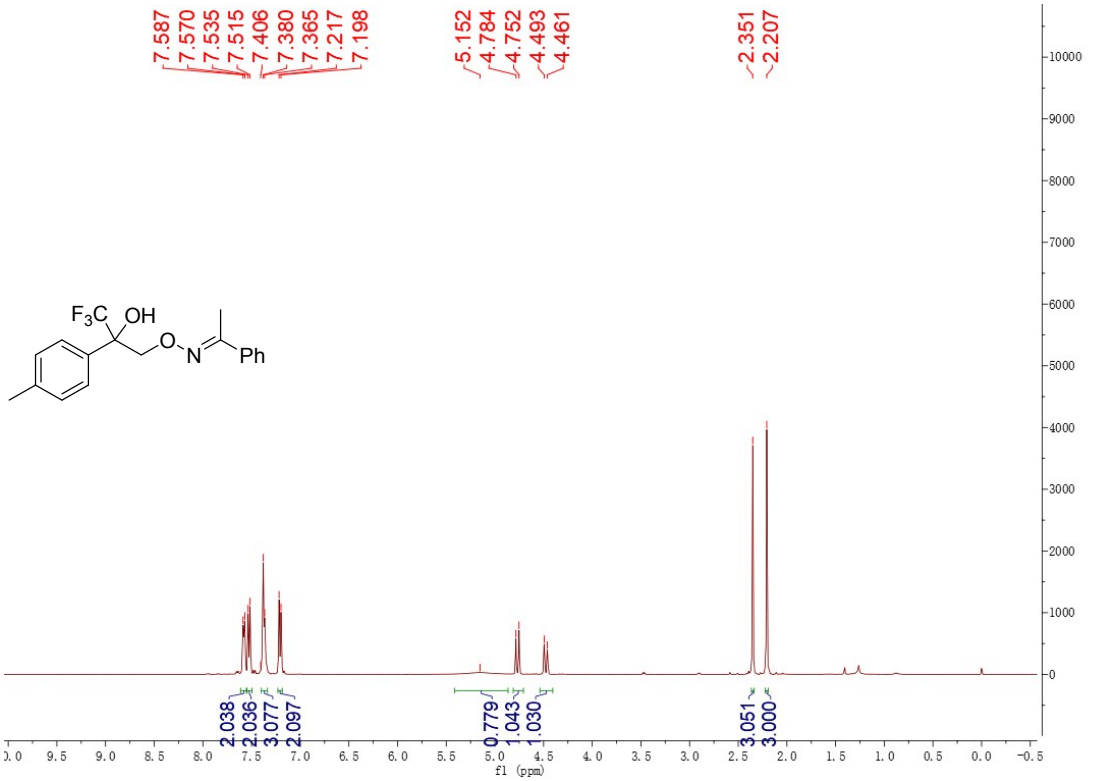
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3a



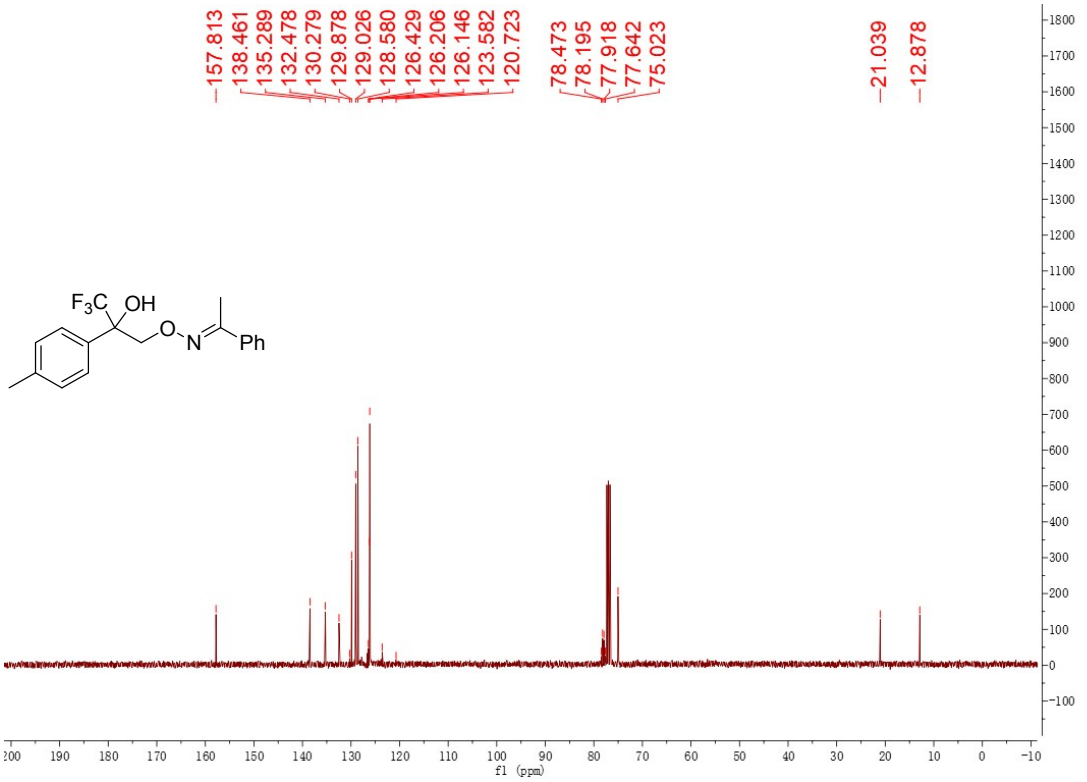
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3a



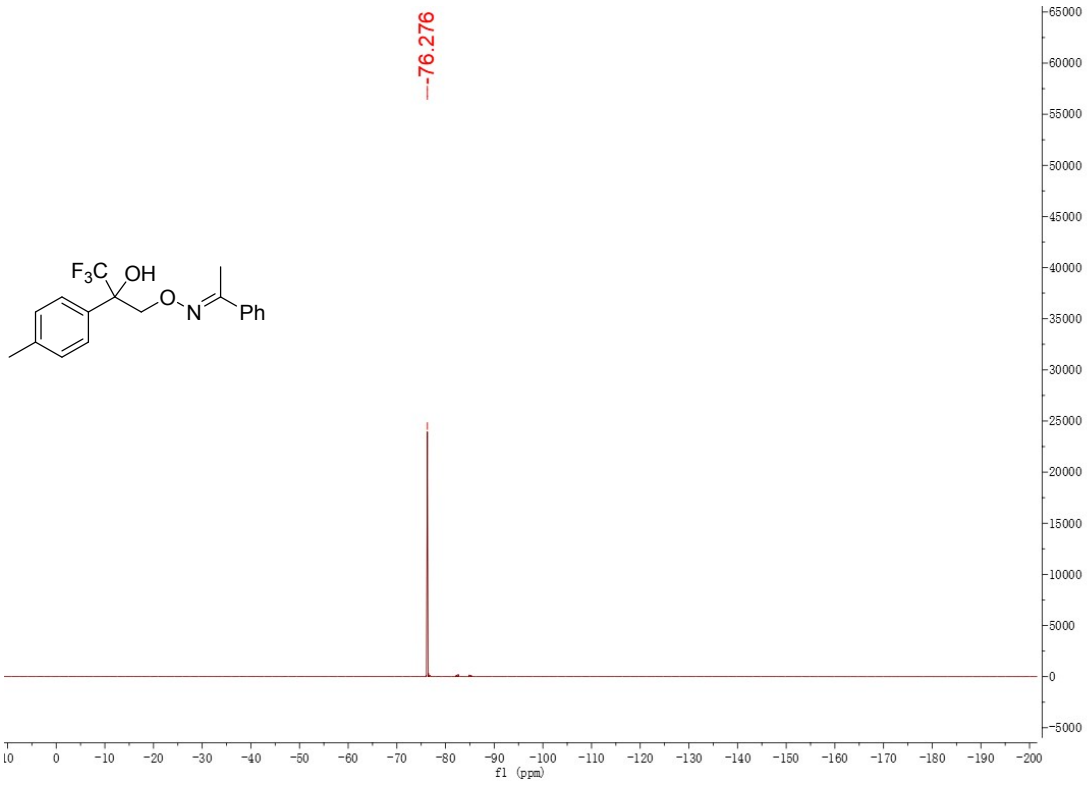
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3b



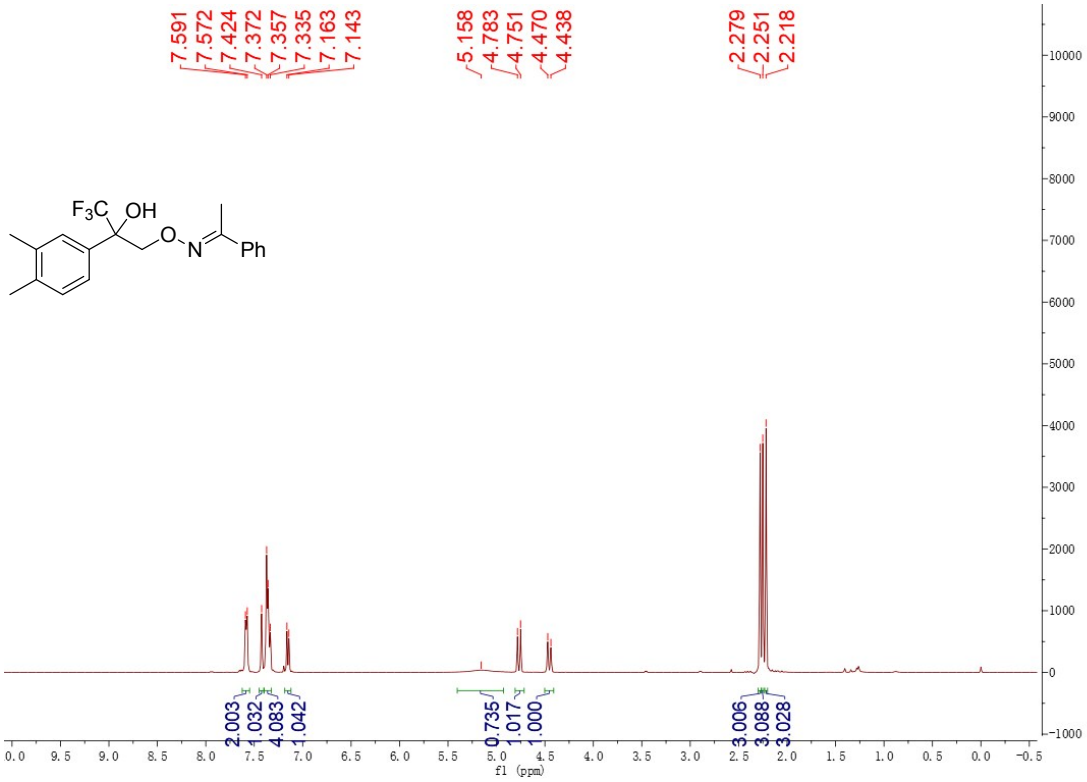
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3b



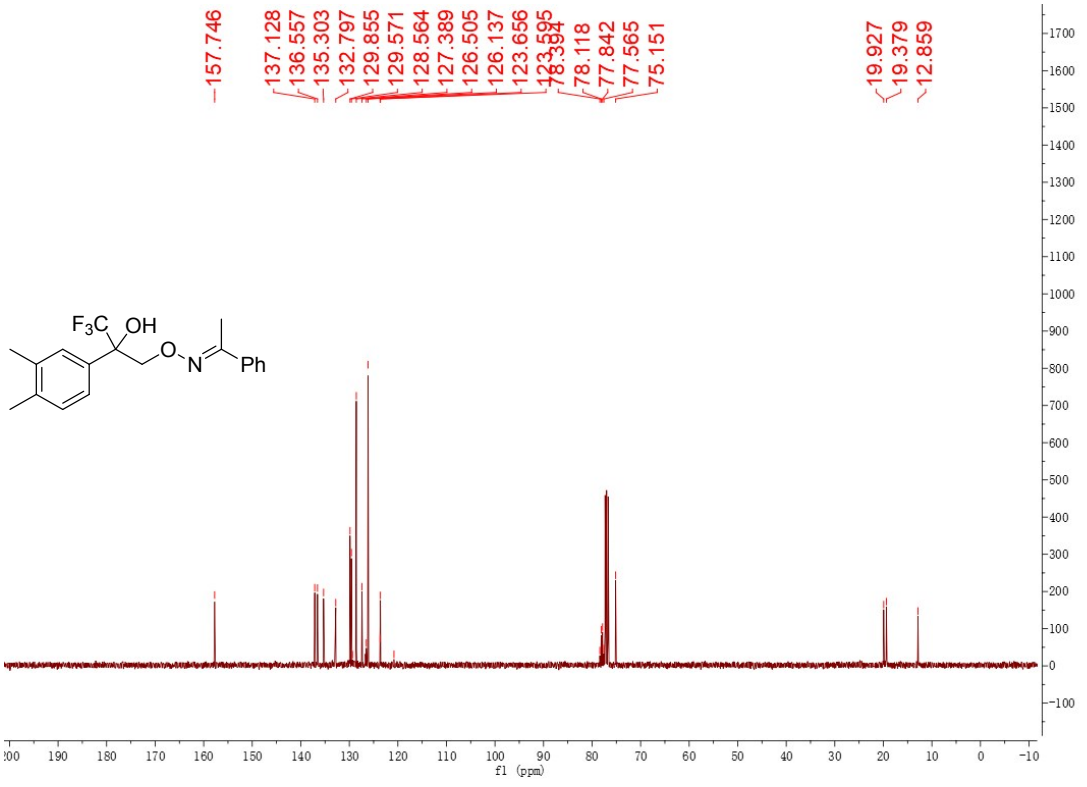
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3b



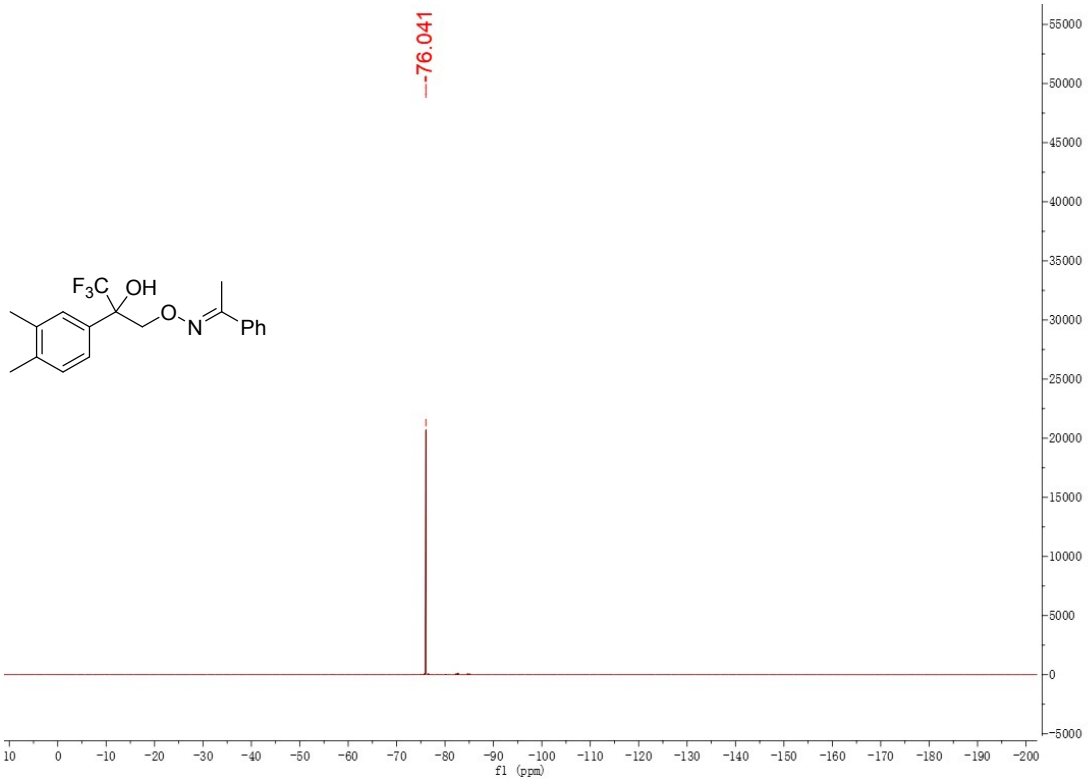
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3c



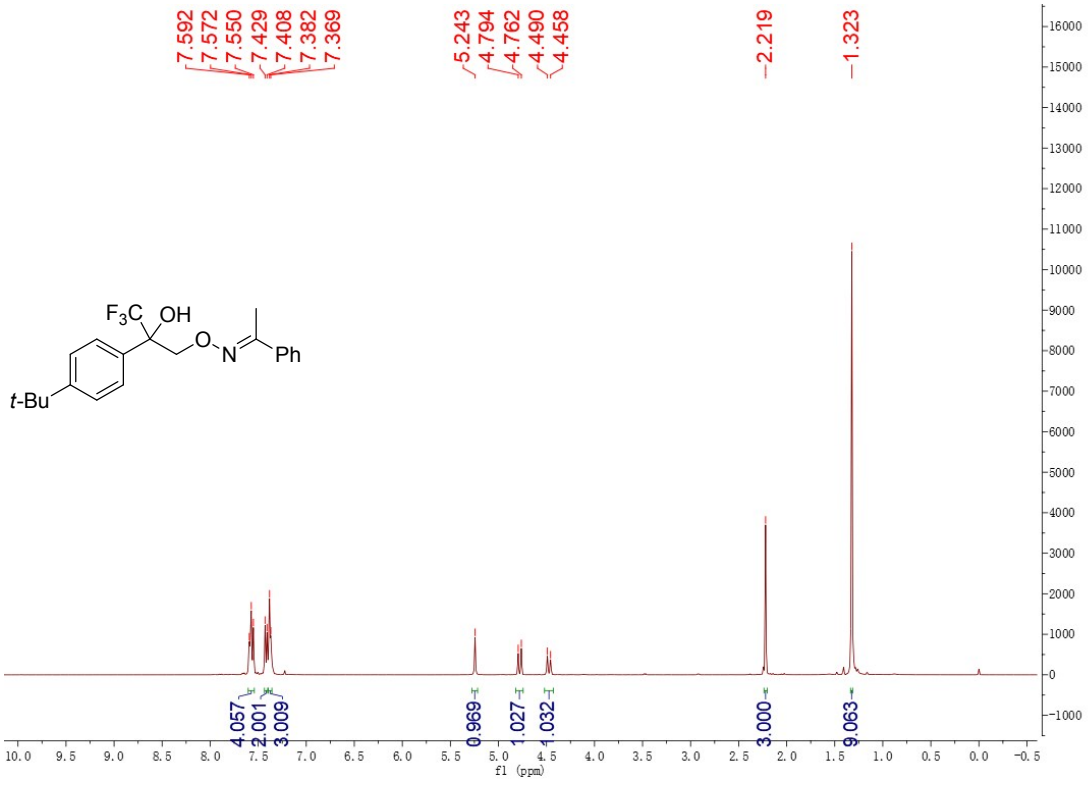
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3c



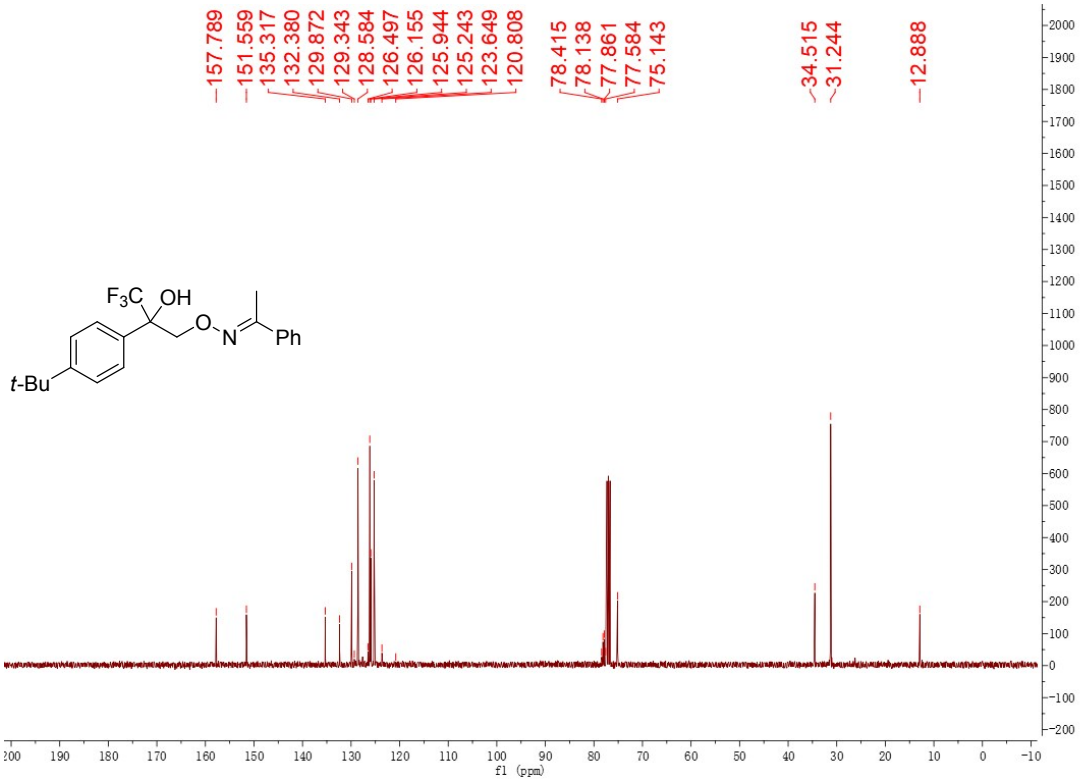
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3c



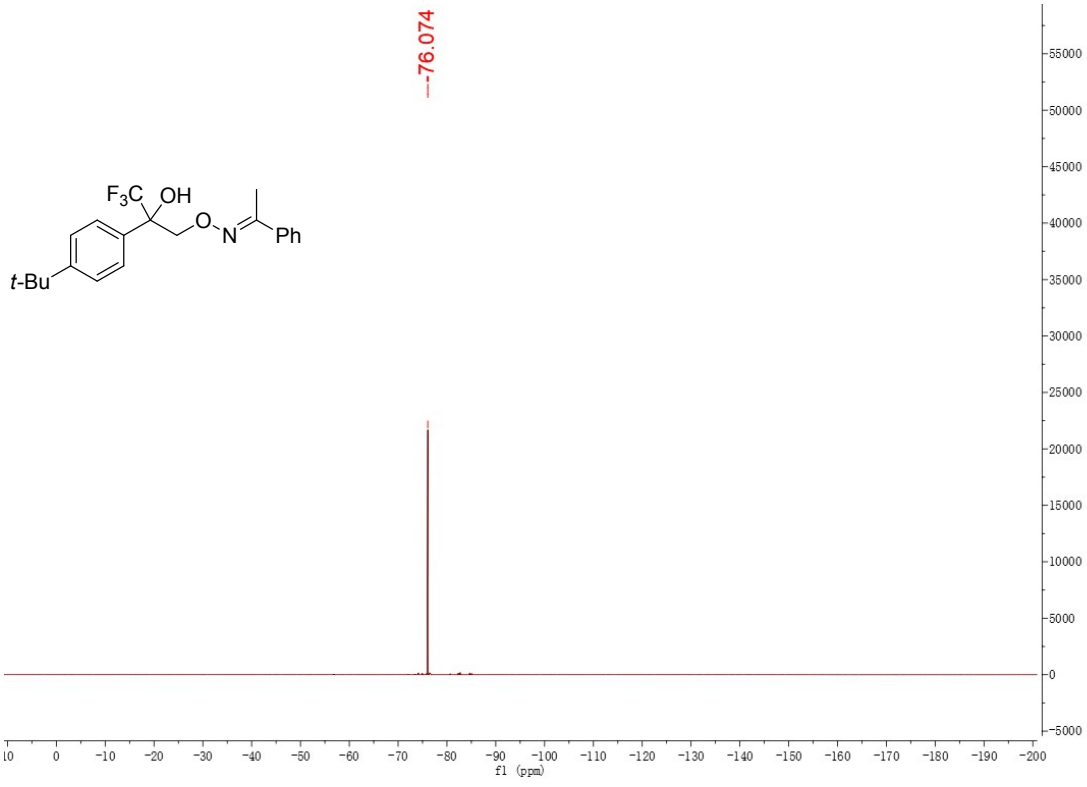
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3d



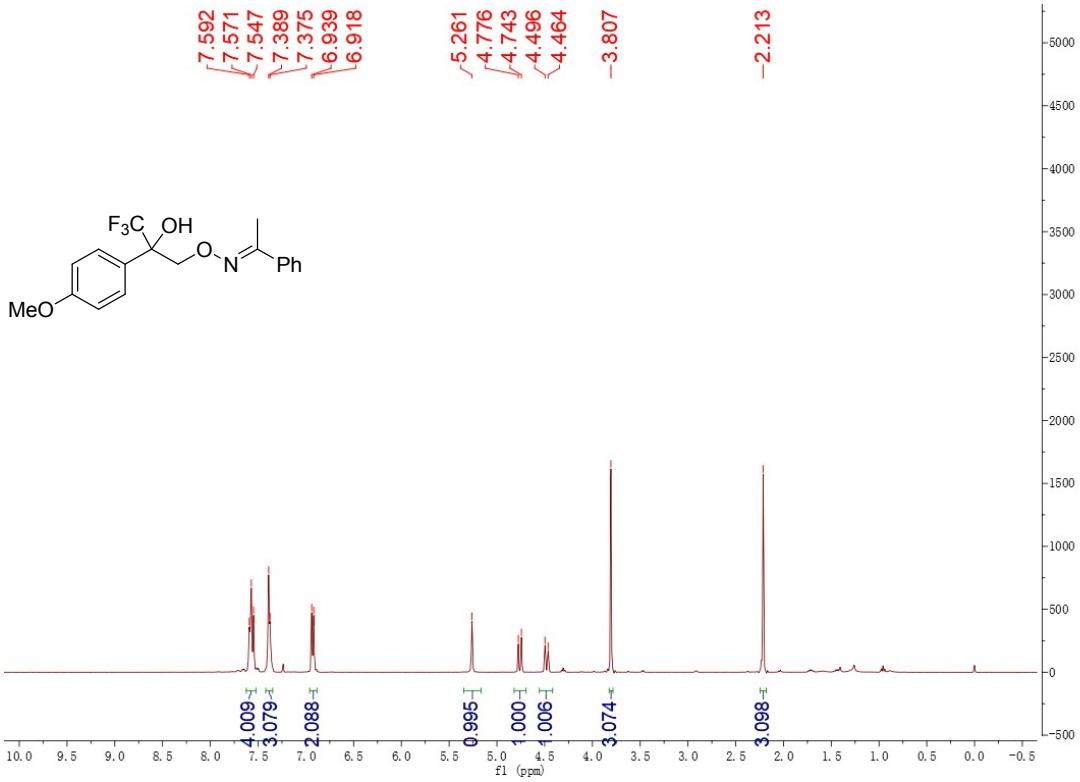
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3d



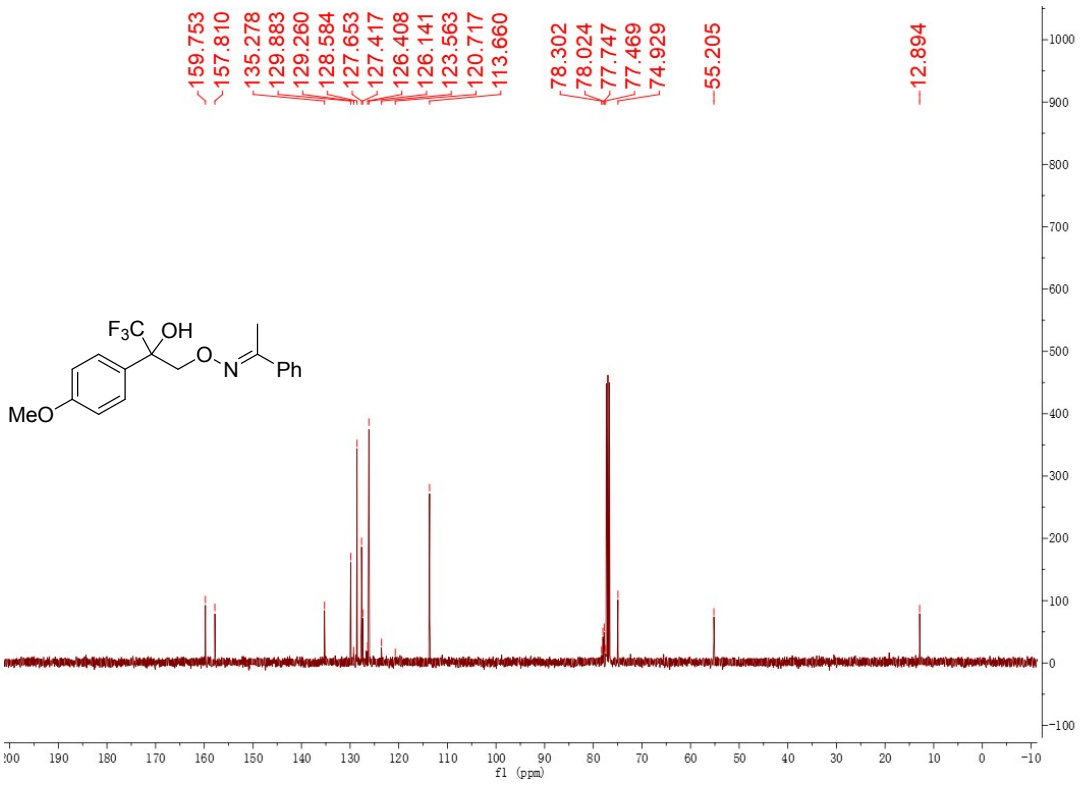
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3d



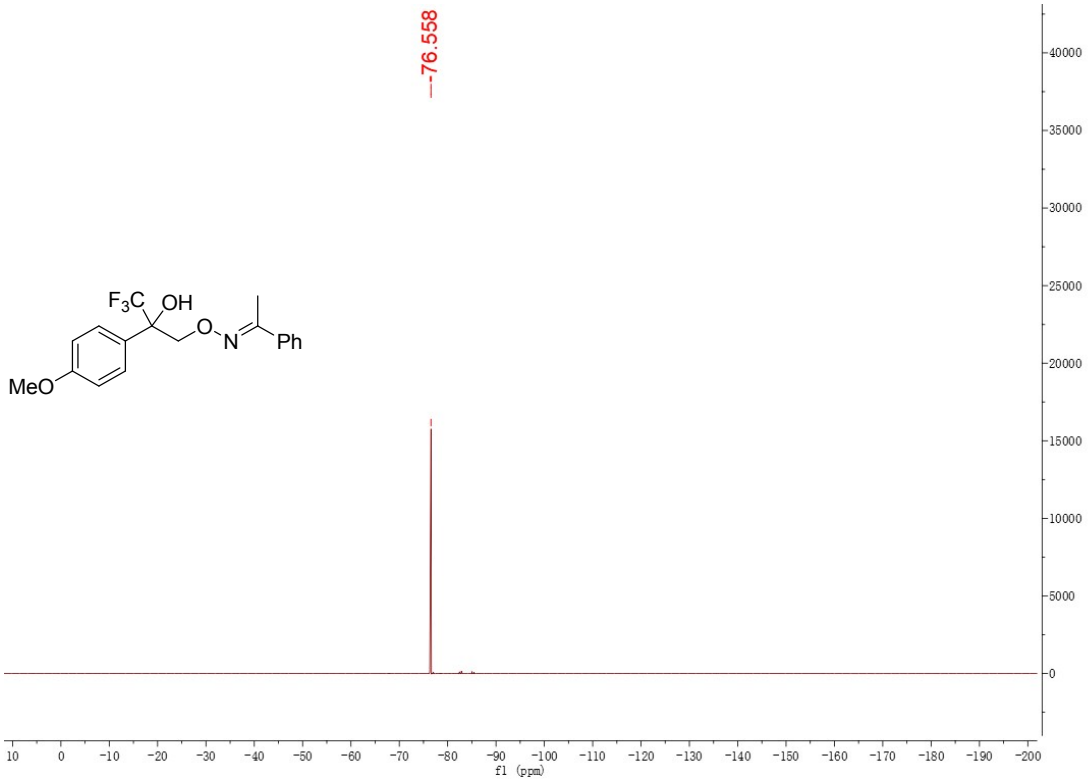
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3e



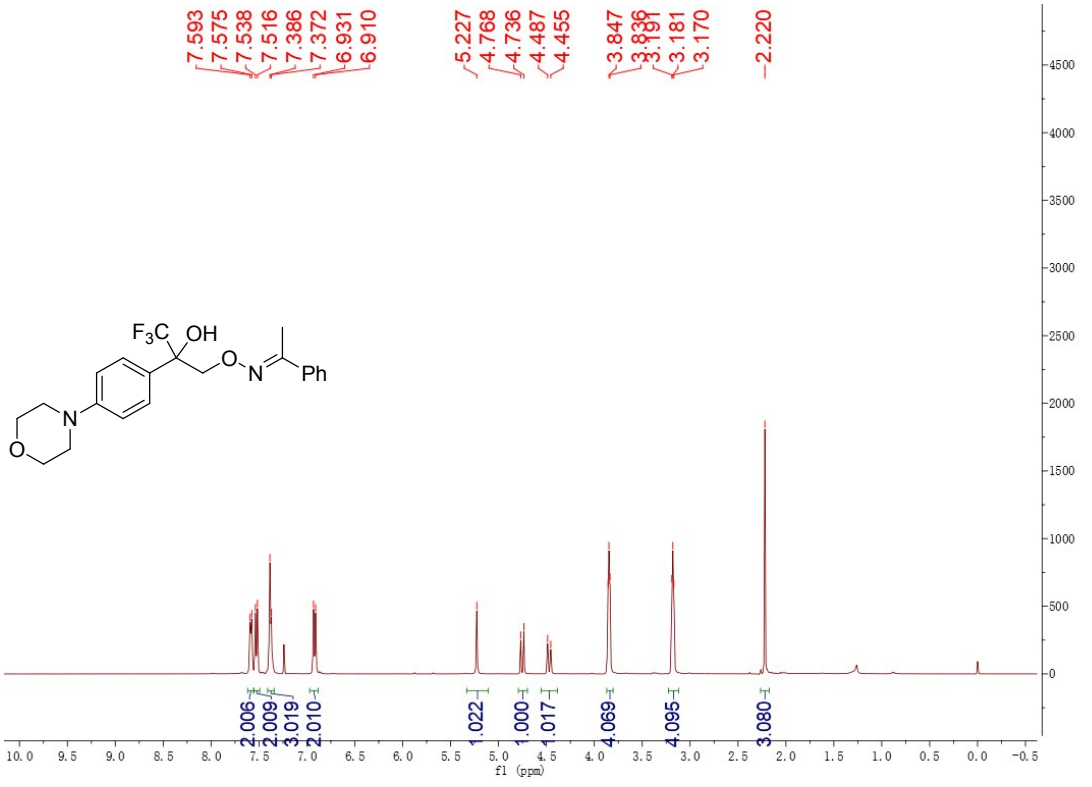
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3e



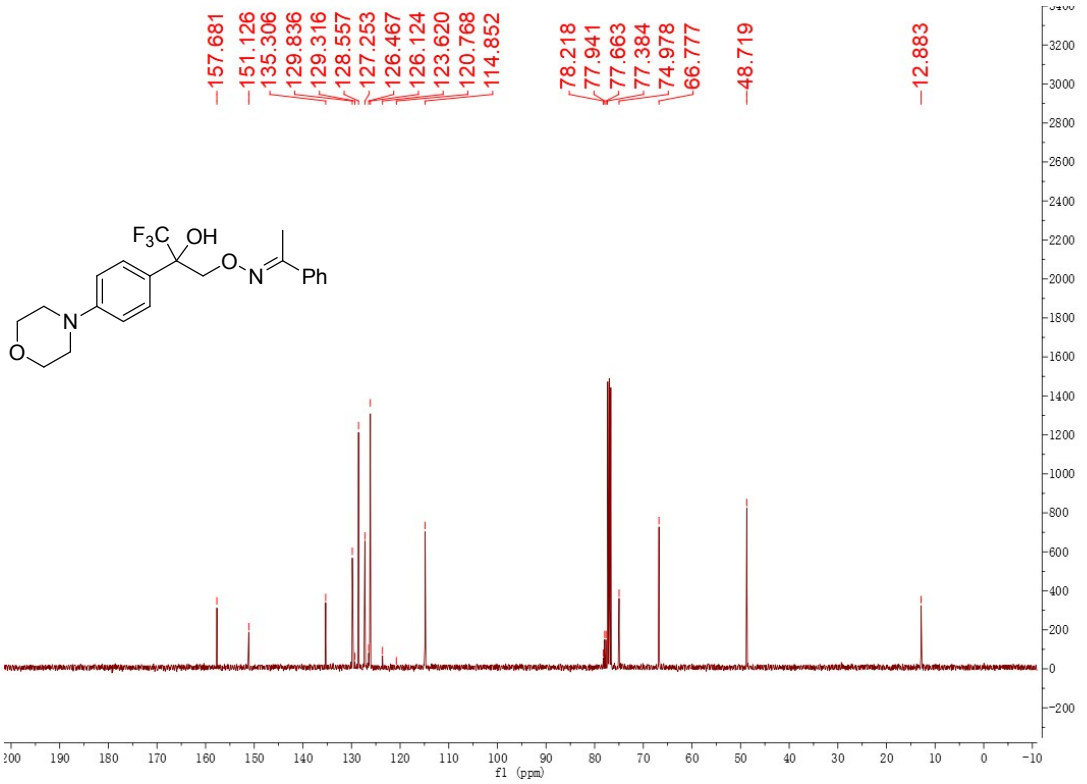
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3e



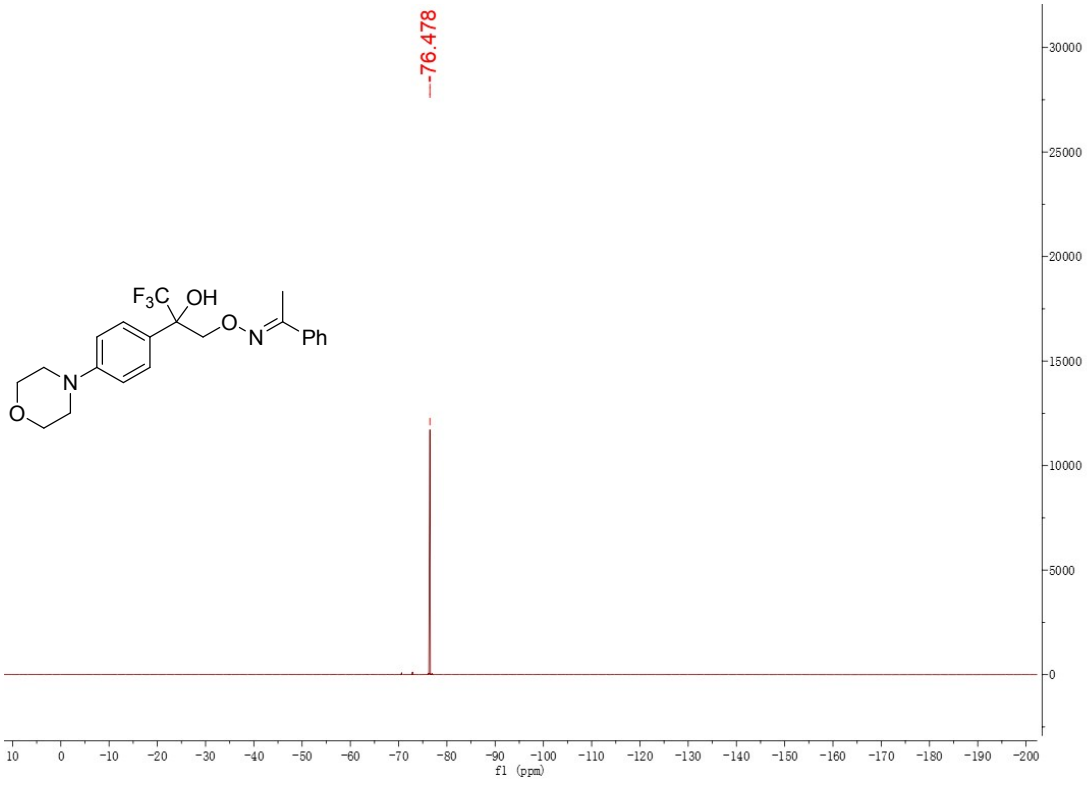
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3f



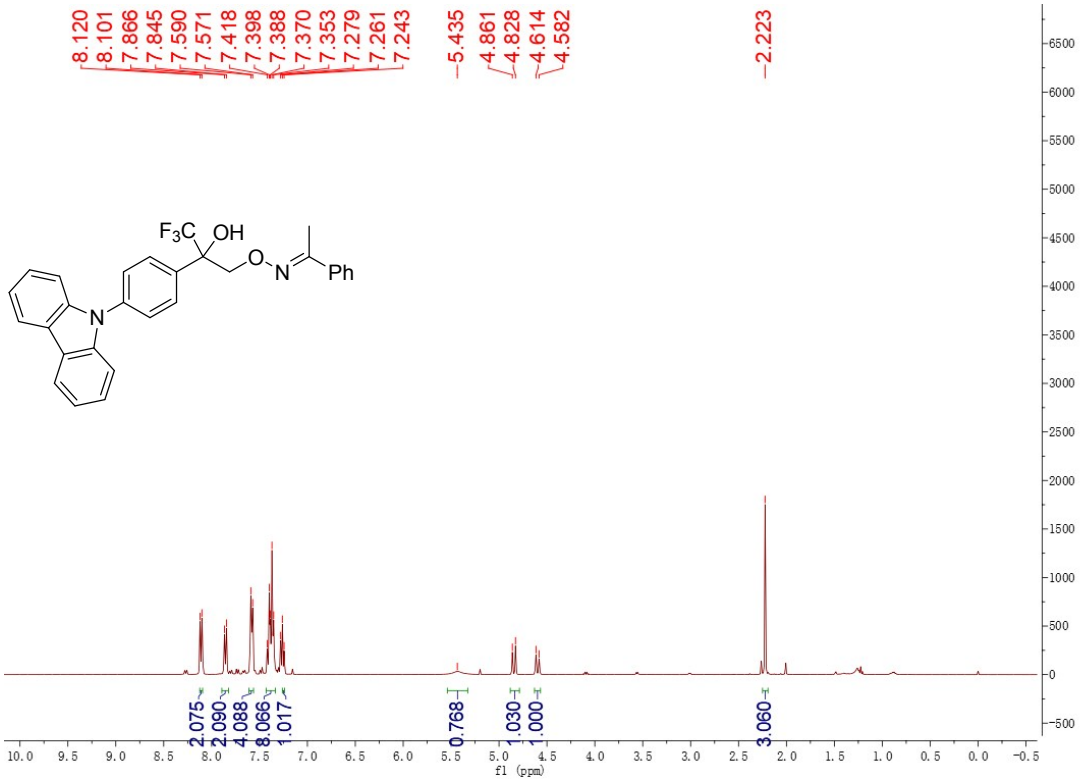
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3f



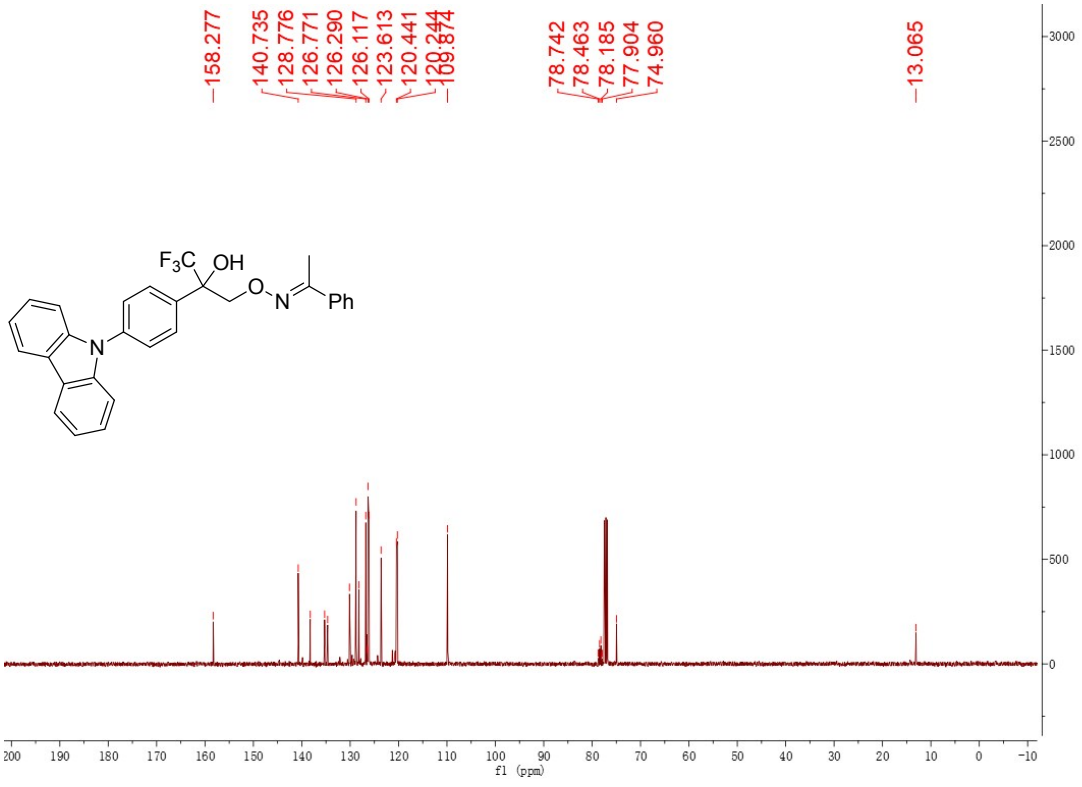
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3r



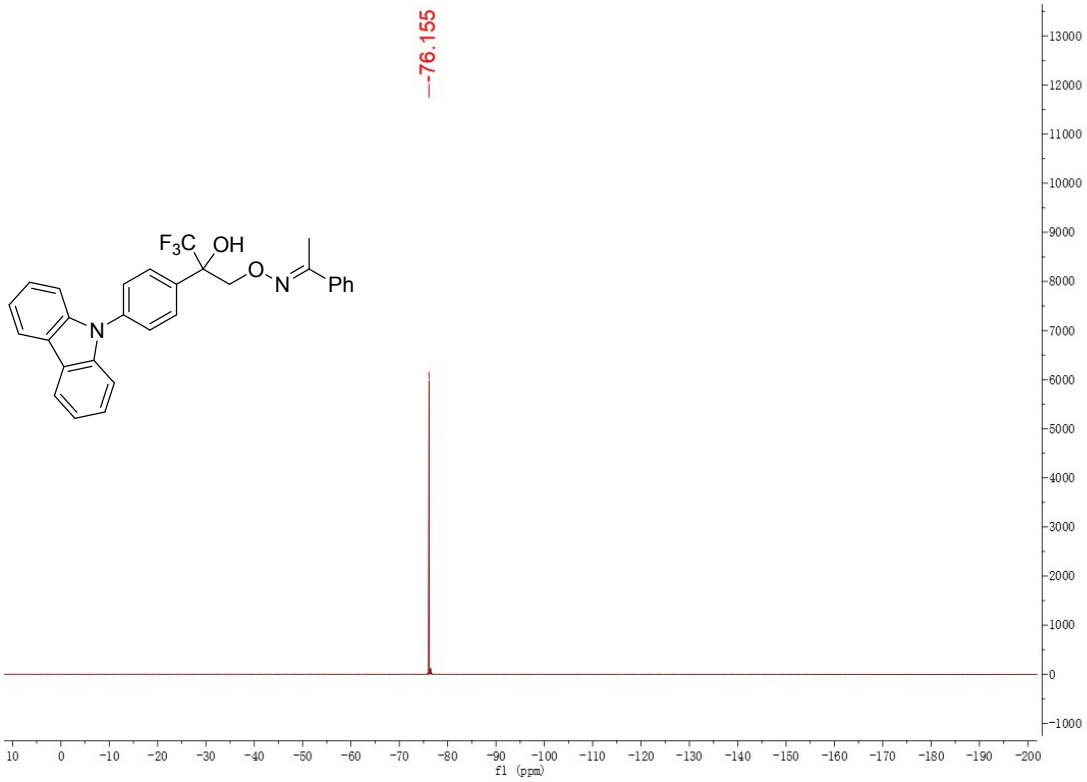
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3g



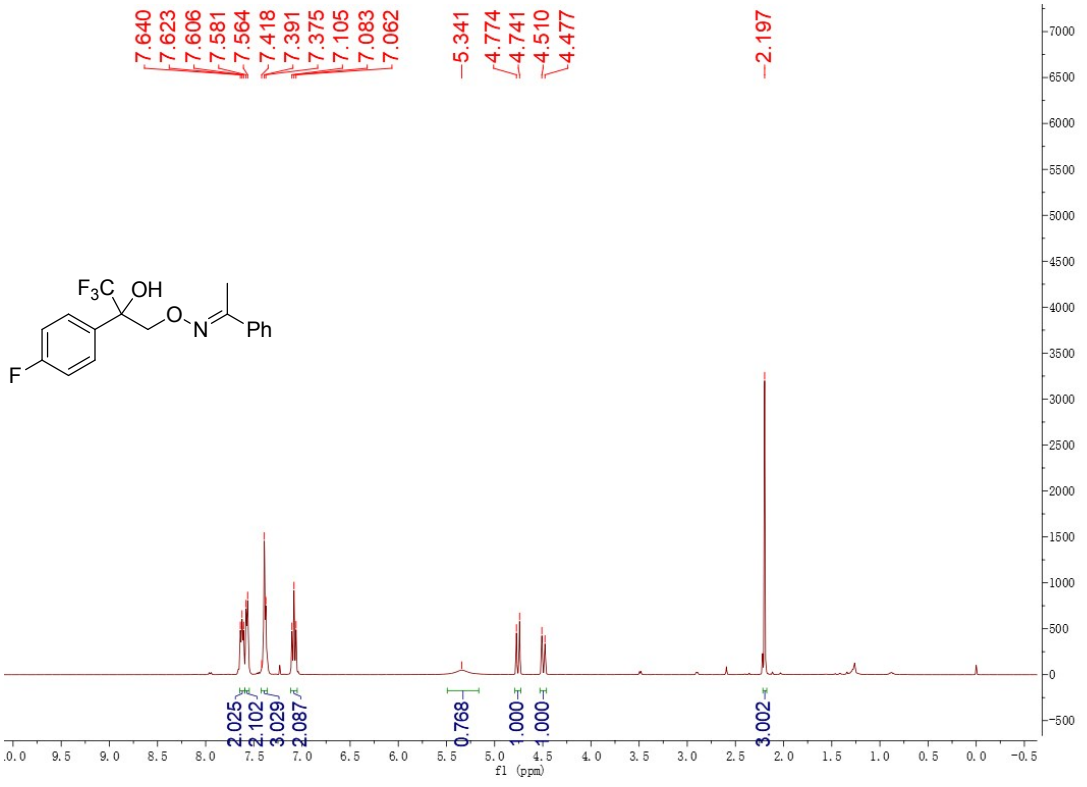
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3g



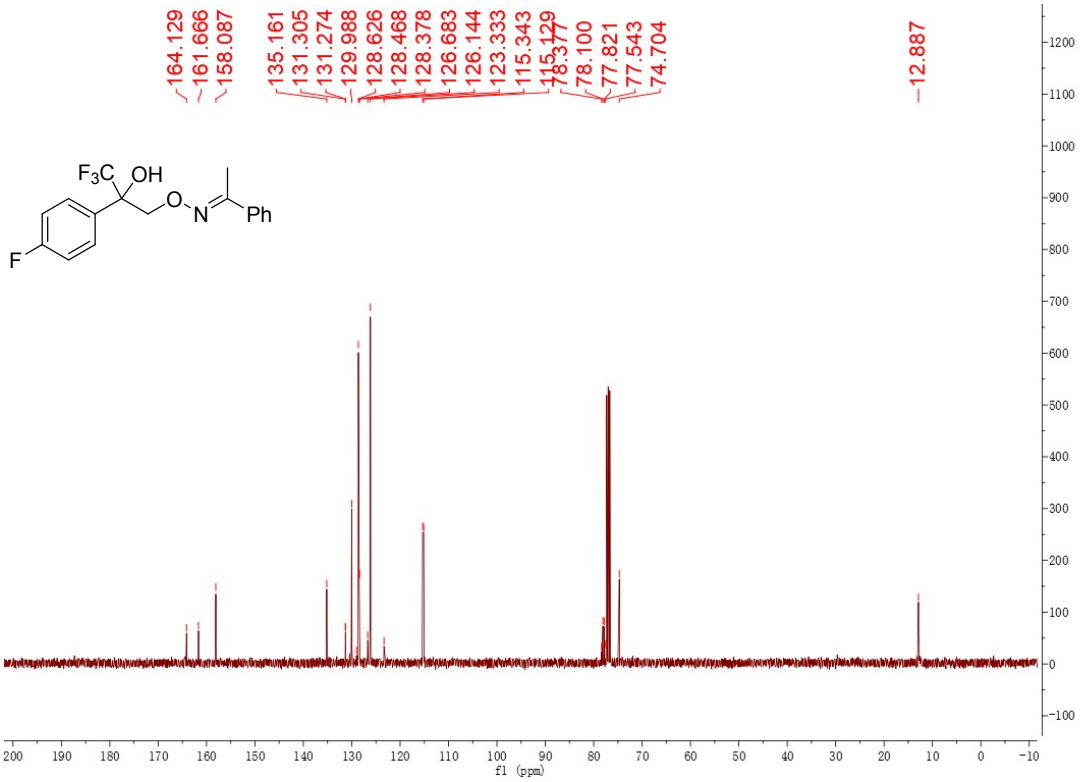
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3g



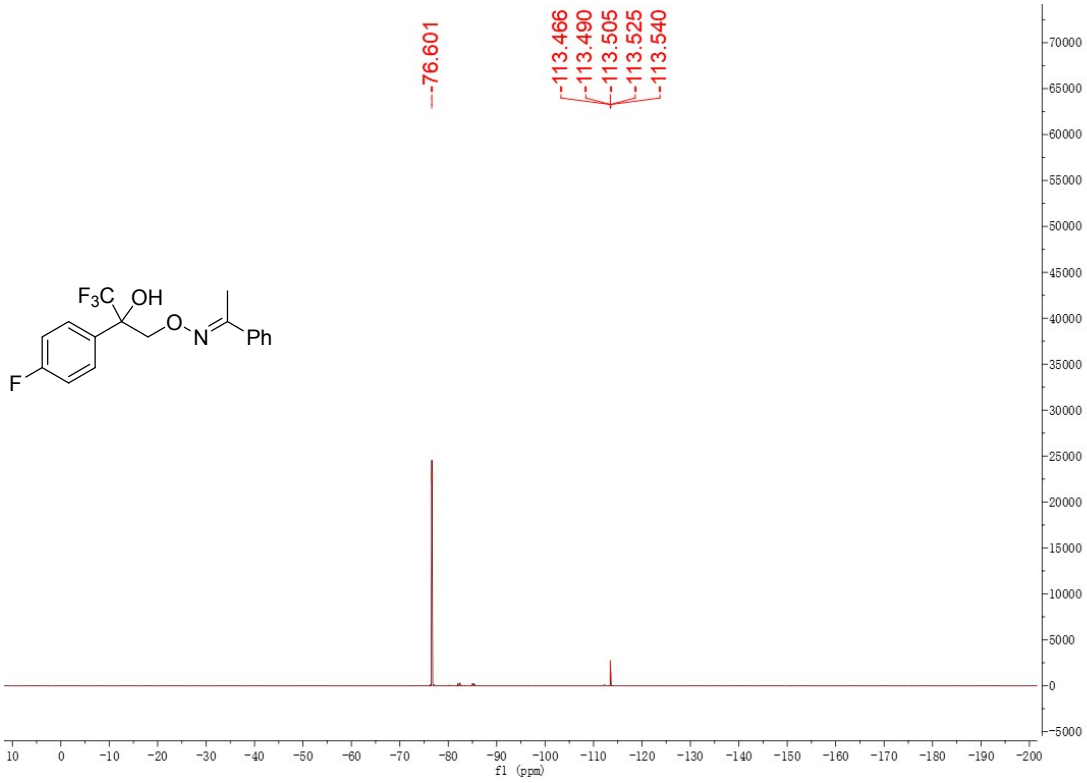
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3h



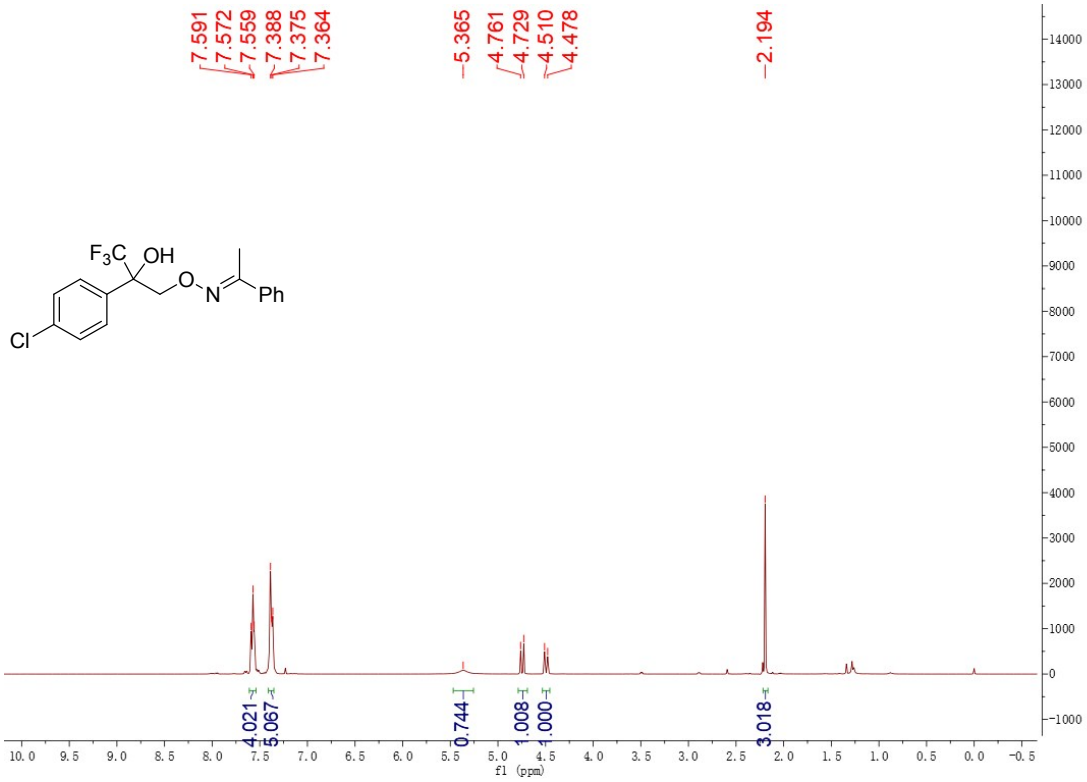
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3h



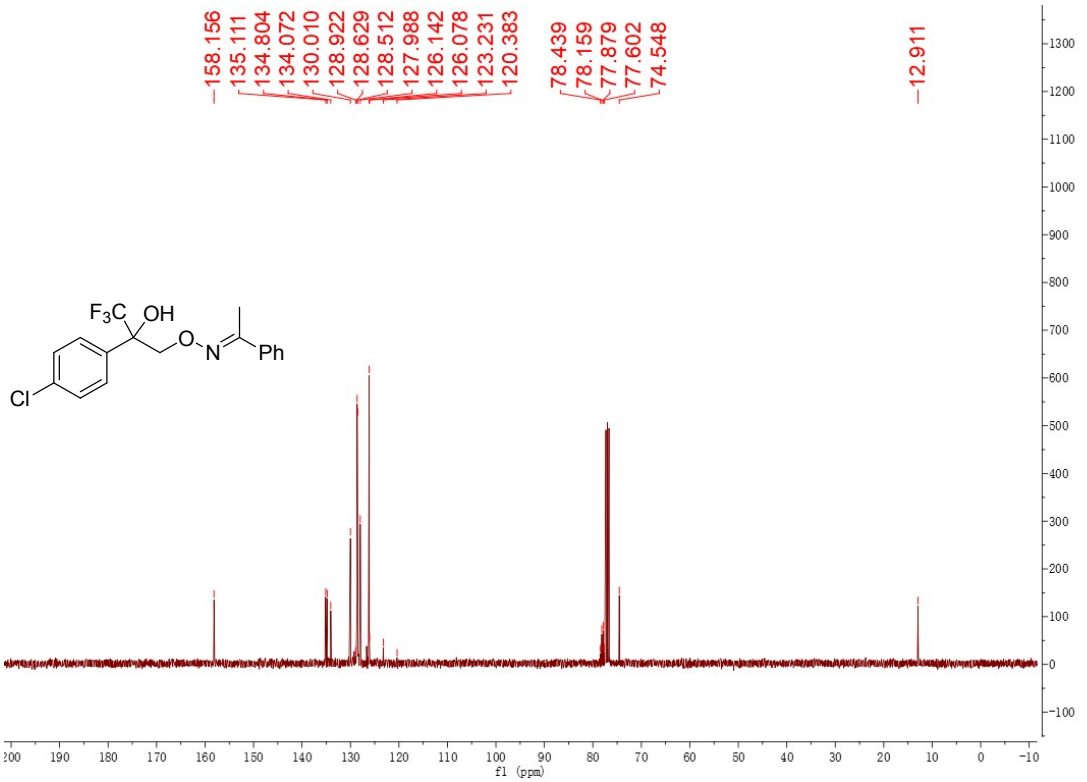
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3h



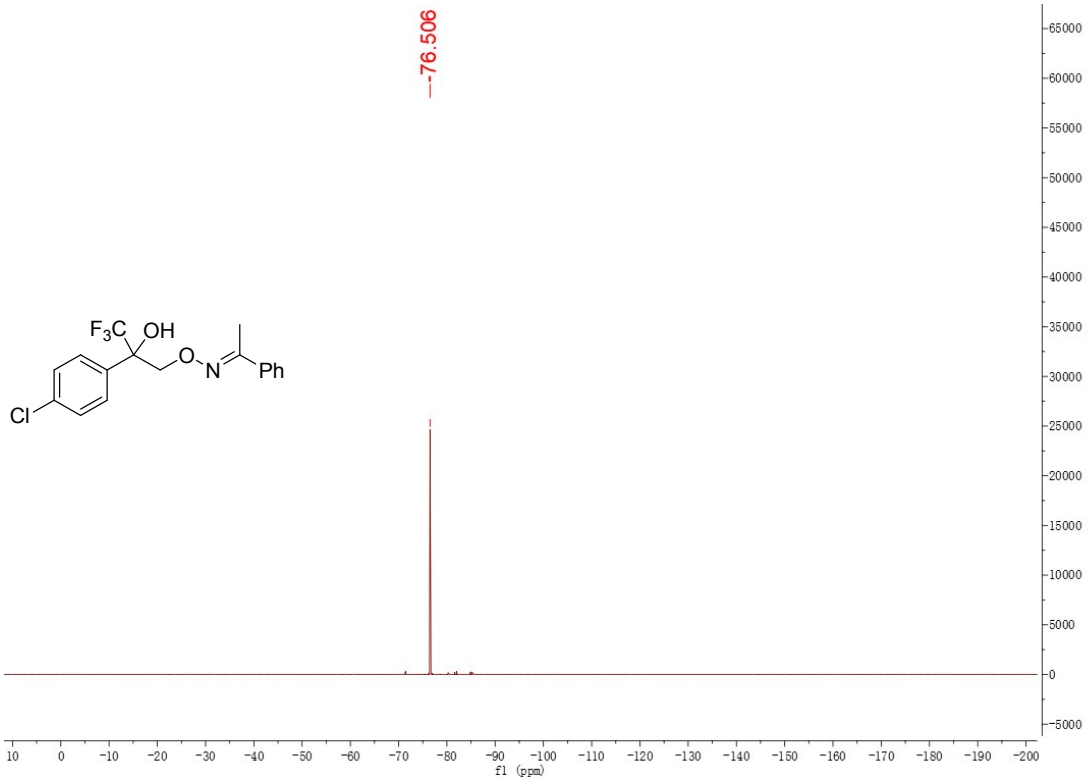
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3i



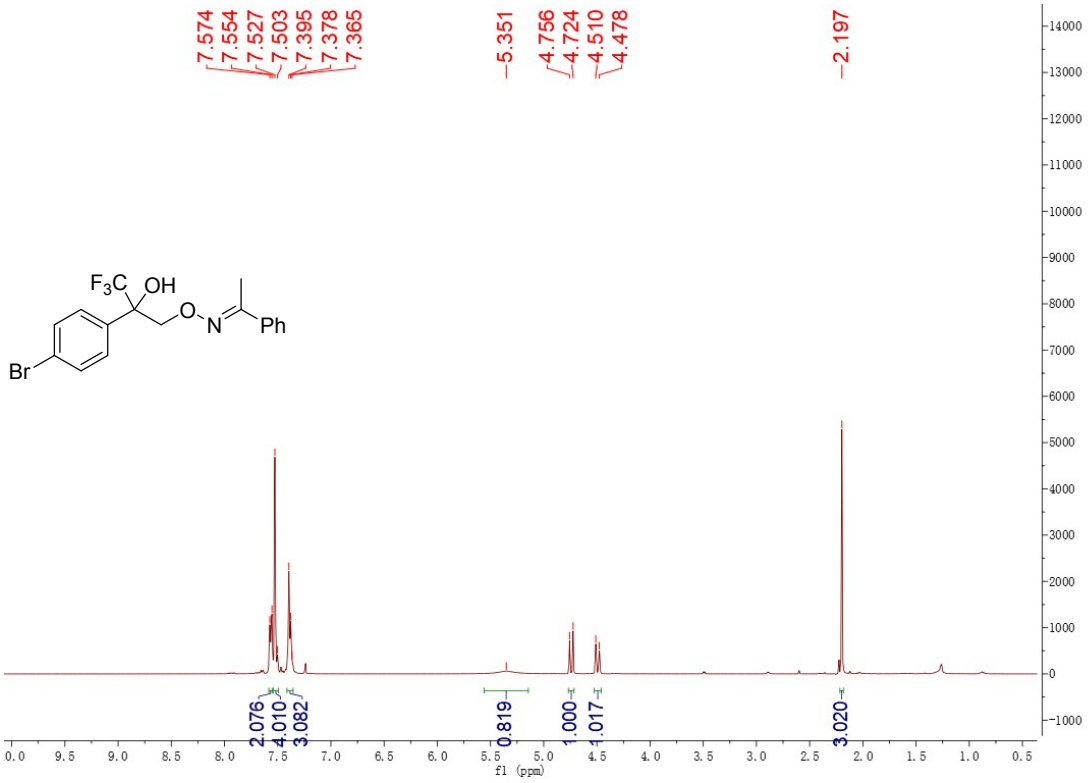
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3i



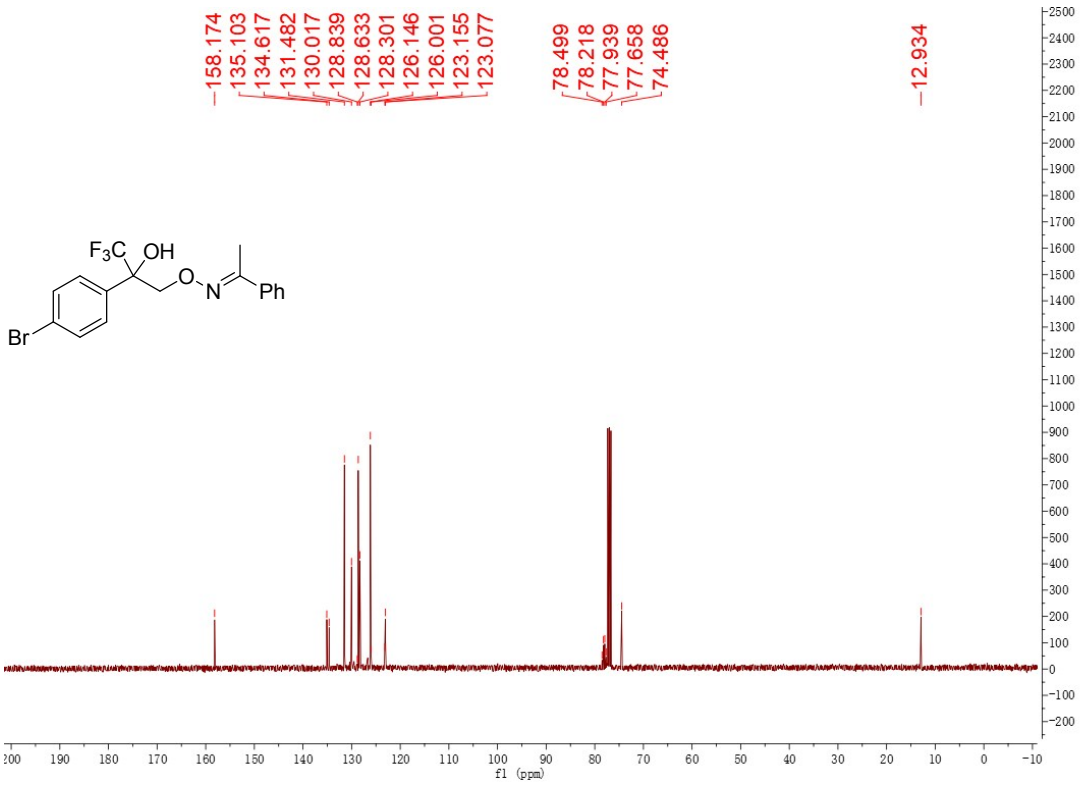
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3r



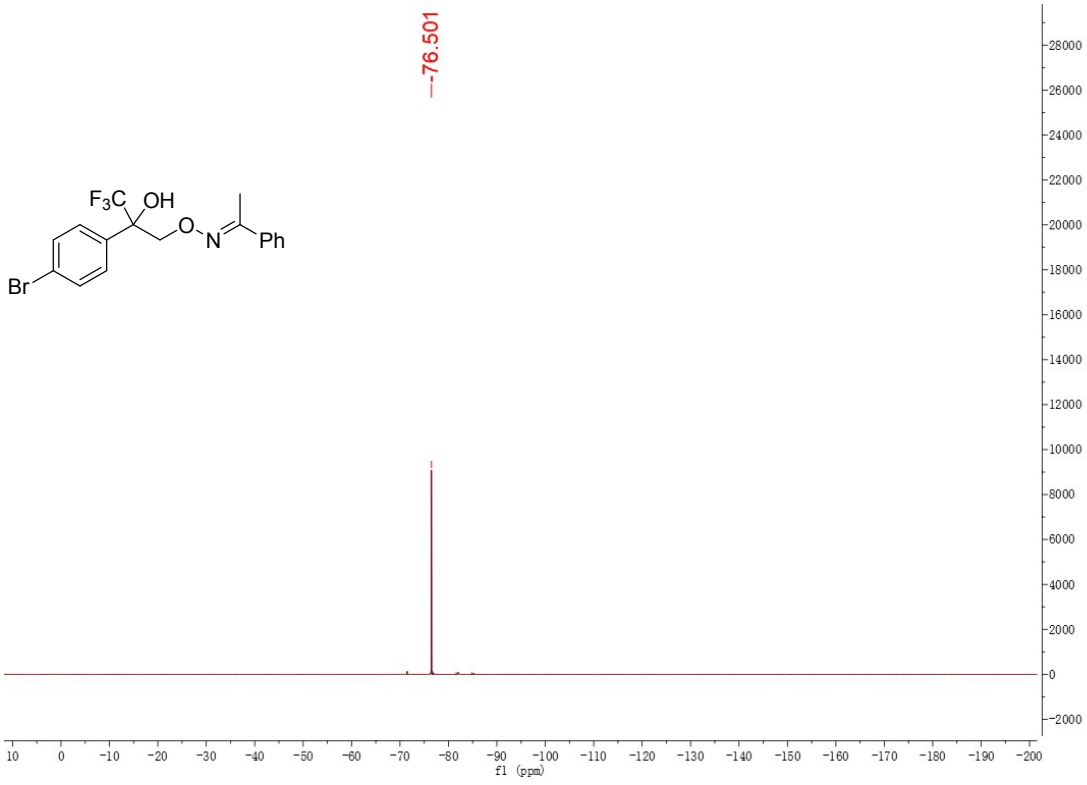
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3j



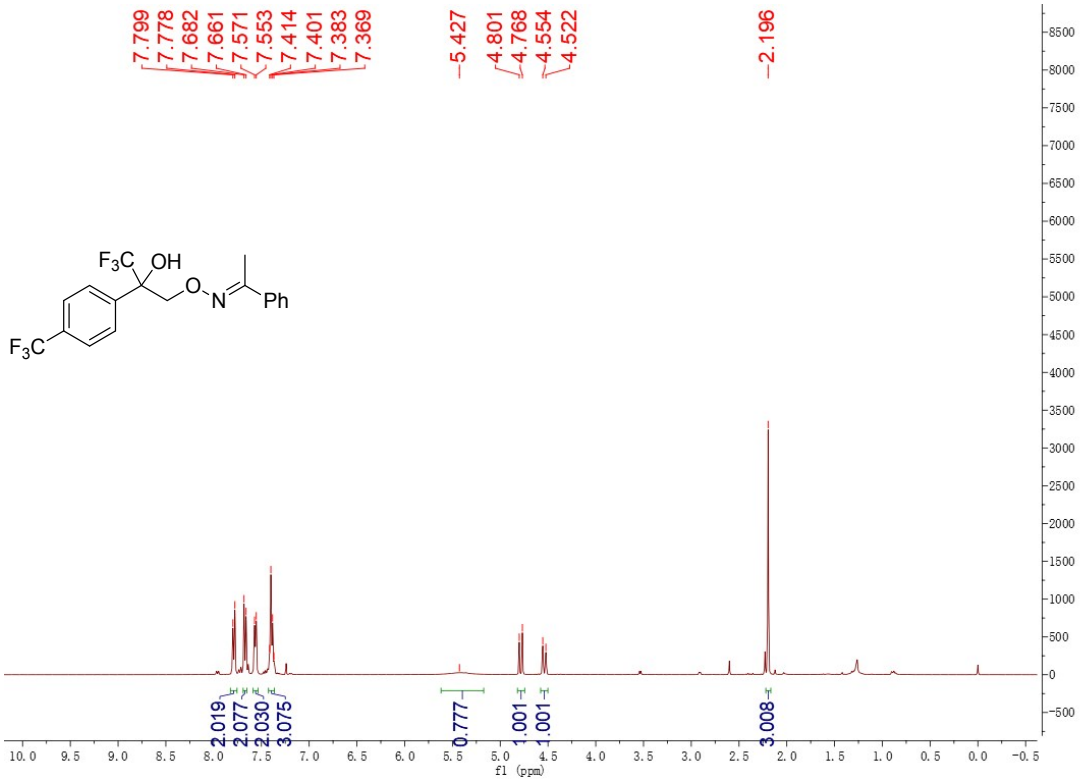
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3j



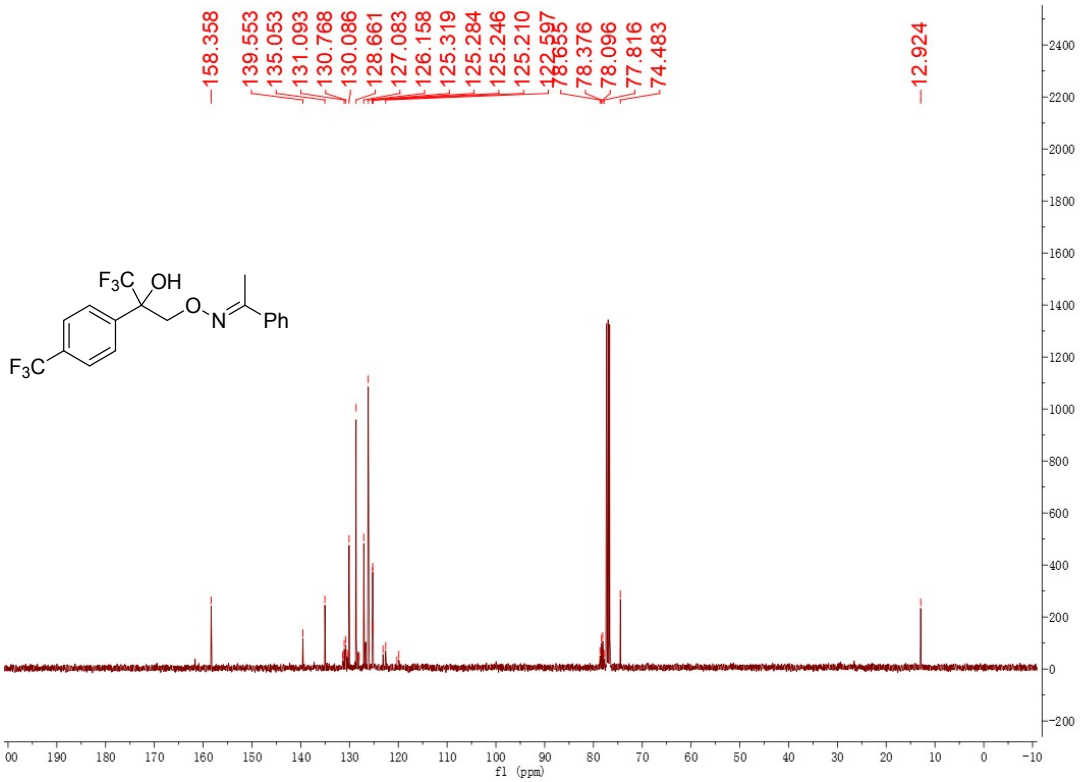
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3j



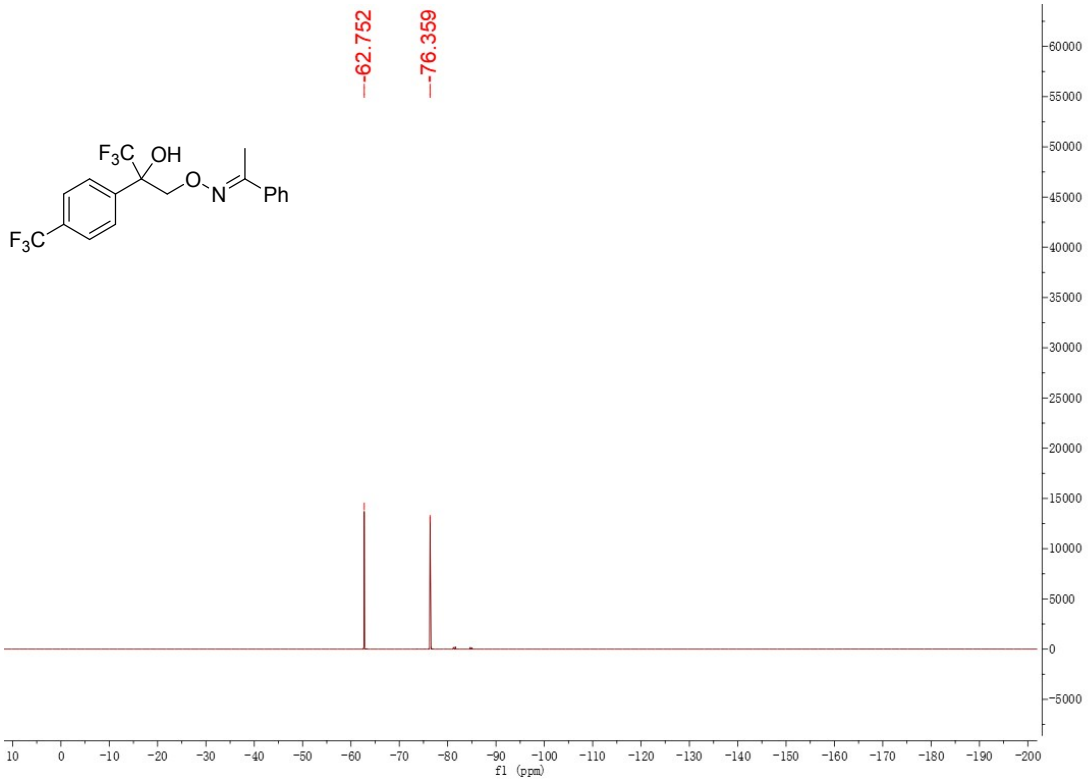
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3k



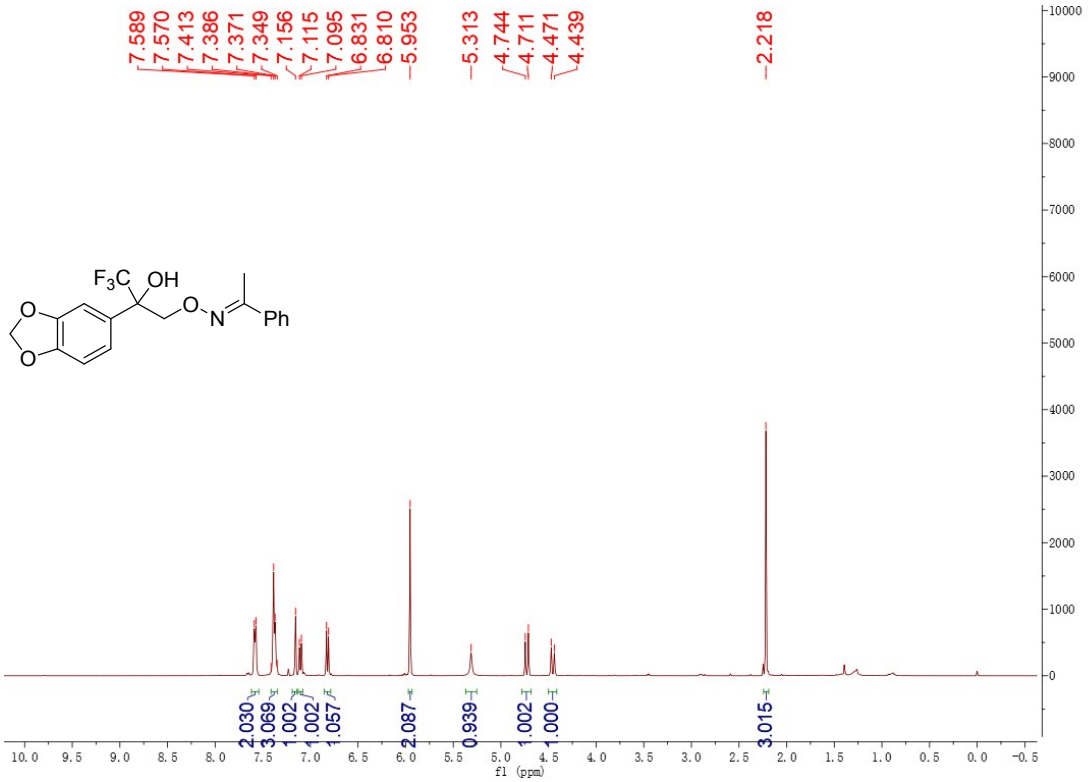
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3k



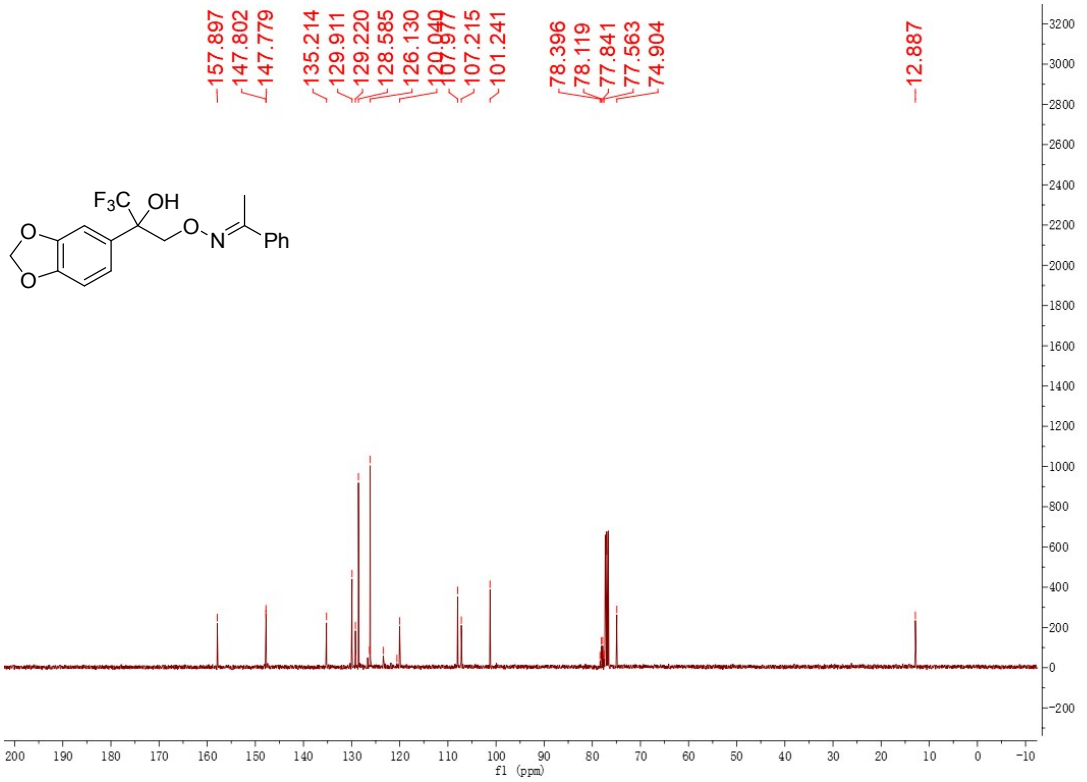
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3k



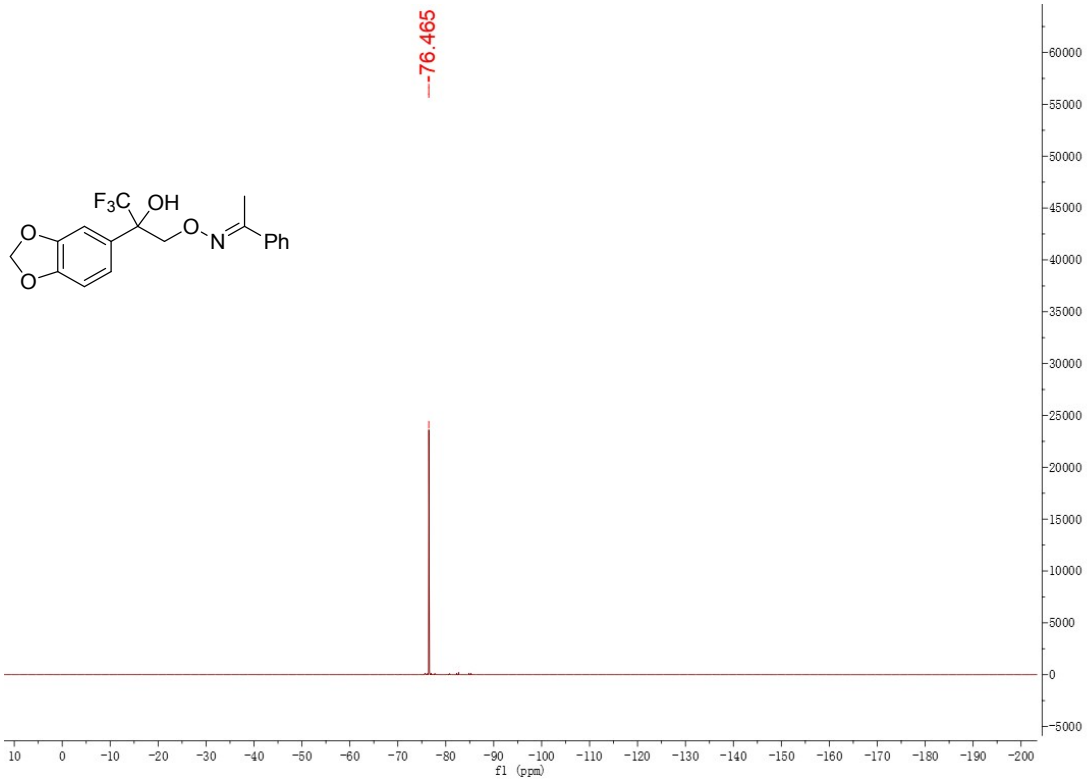
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3l



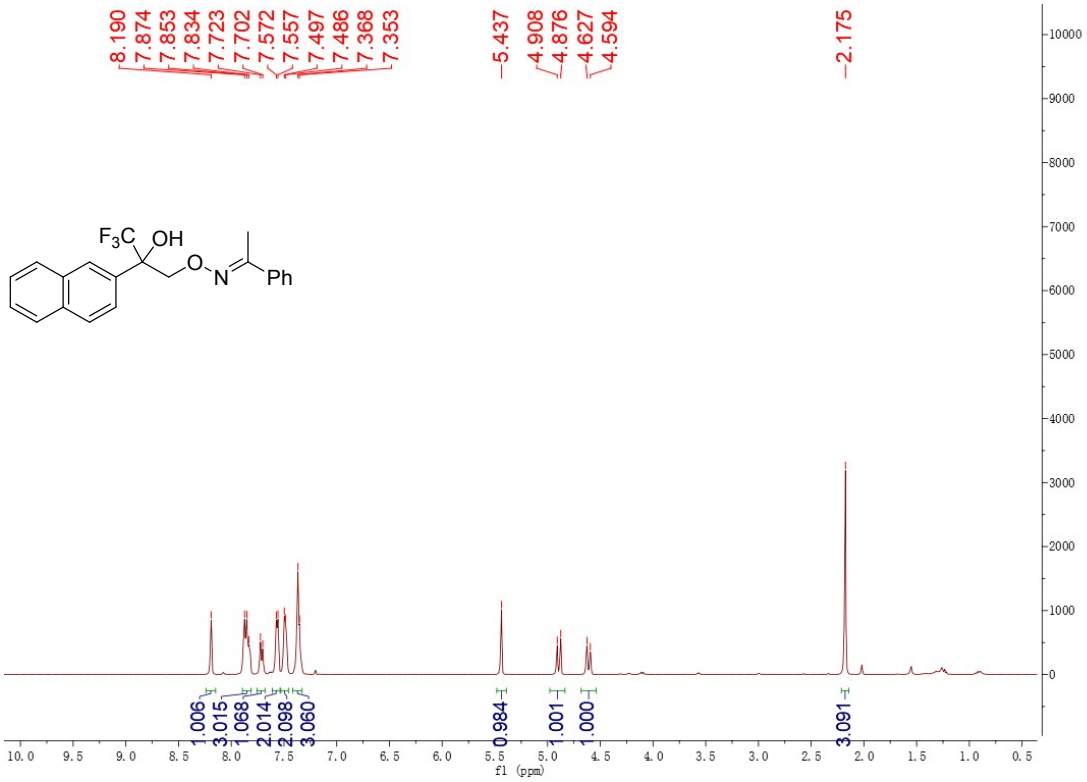
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3l



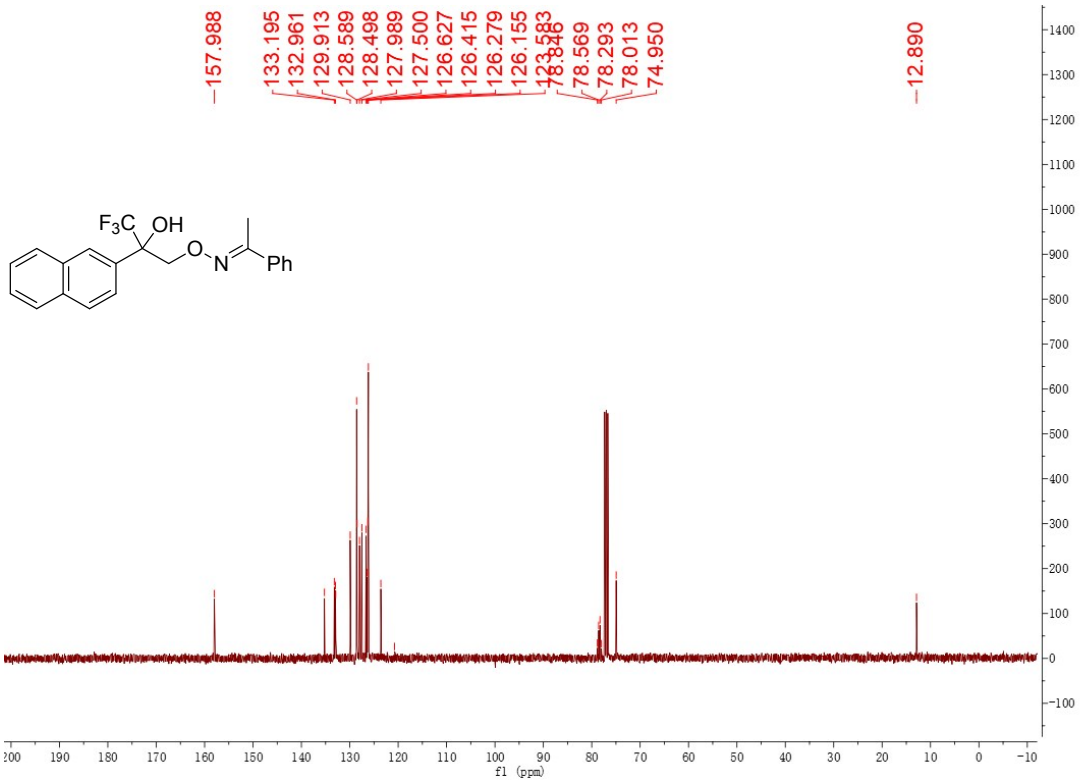
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3l



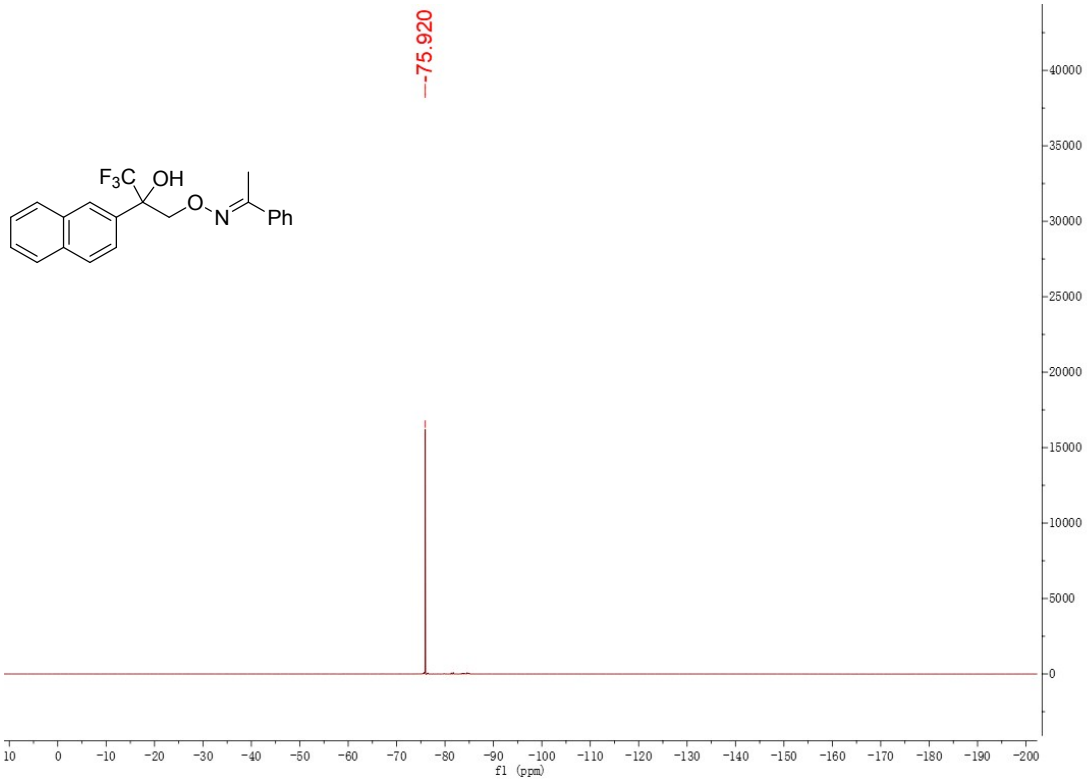
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3m



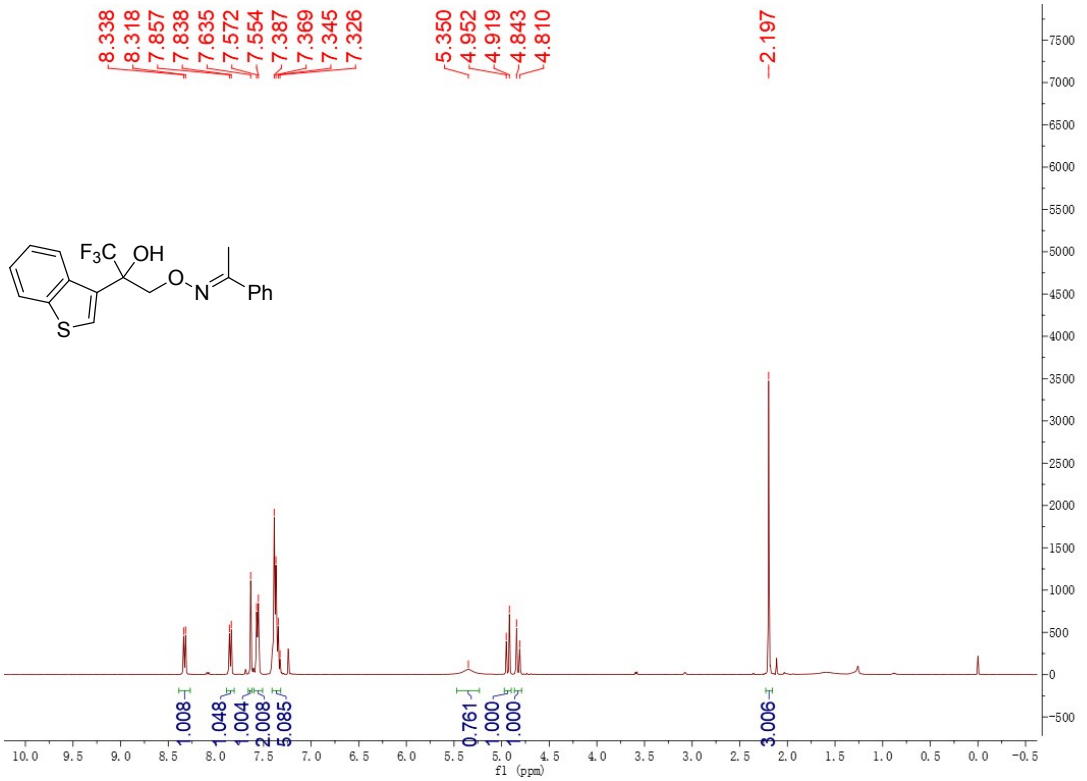
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3m



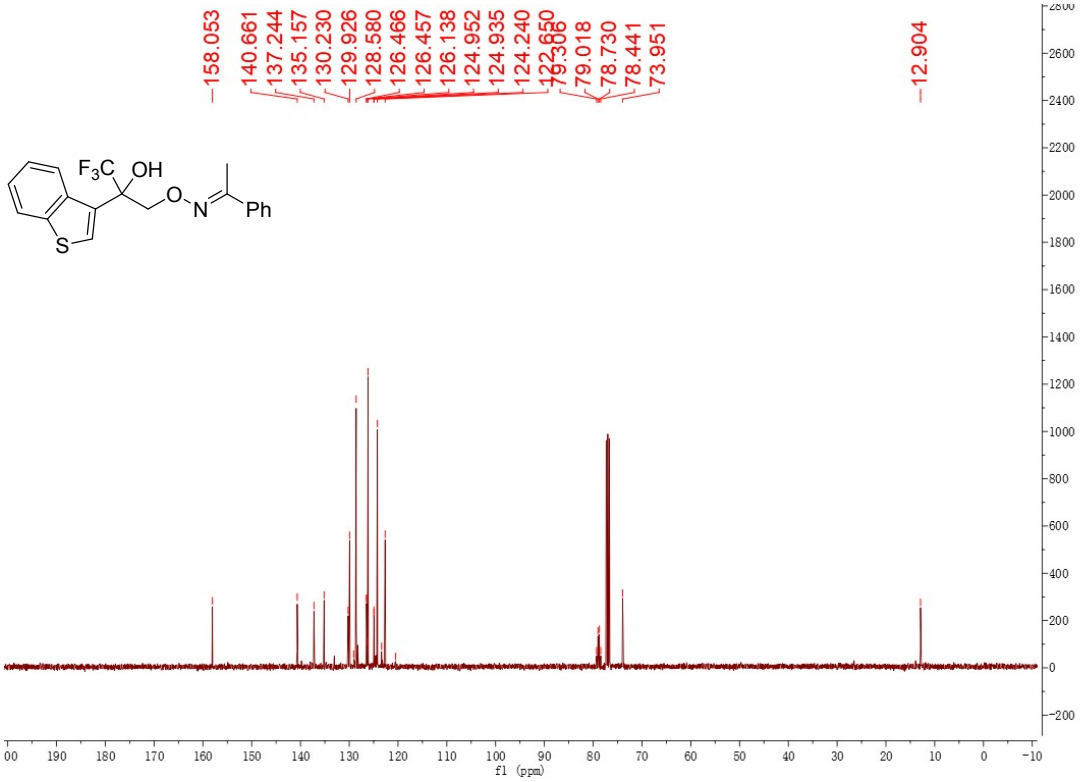
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3m



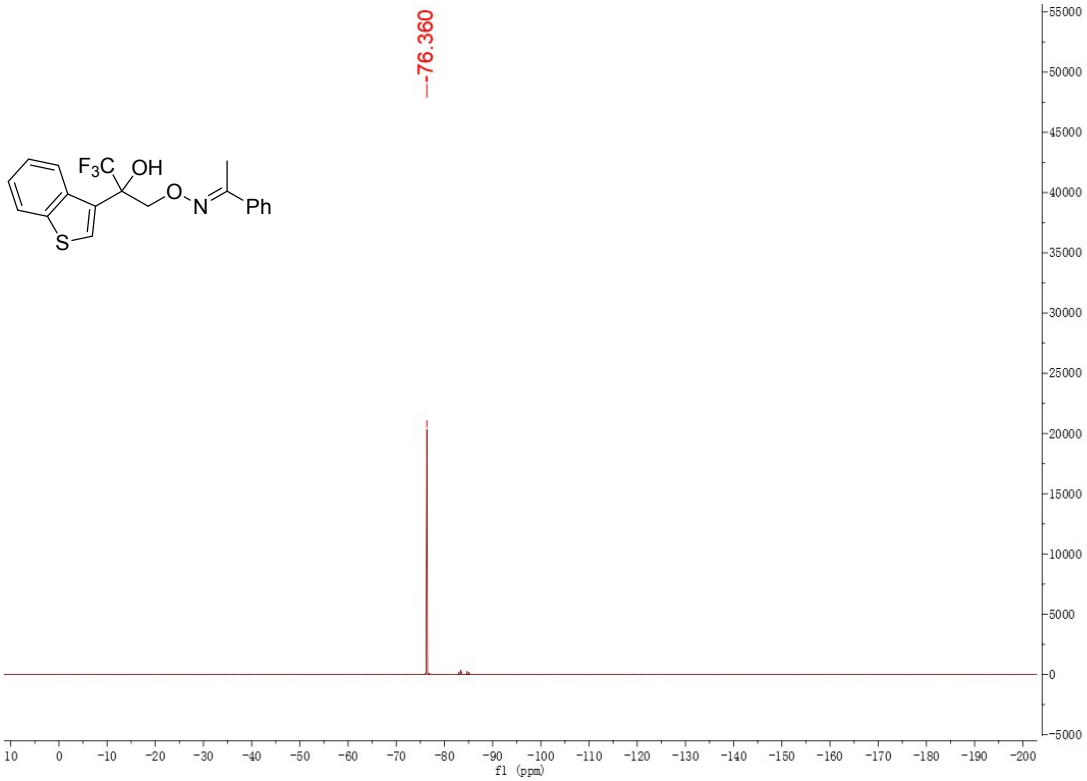
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3n



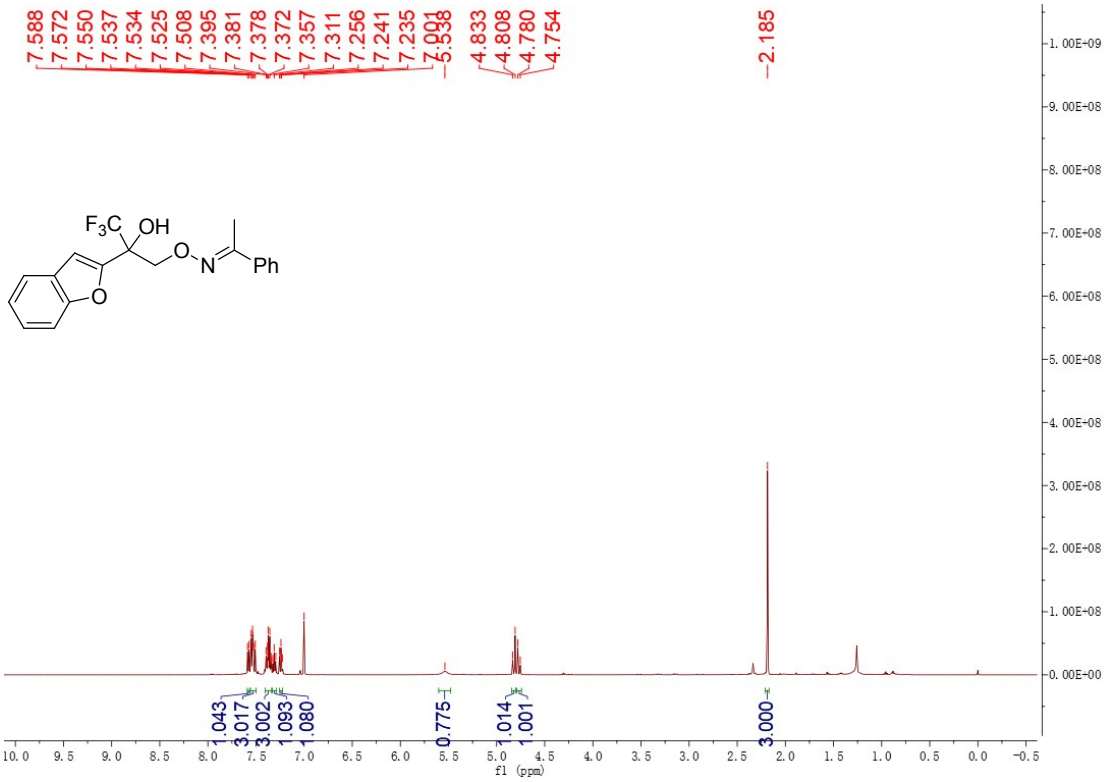
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3n



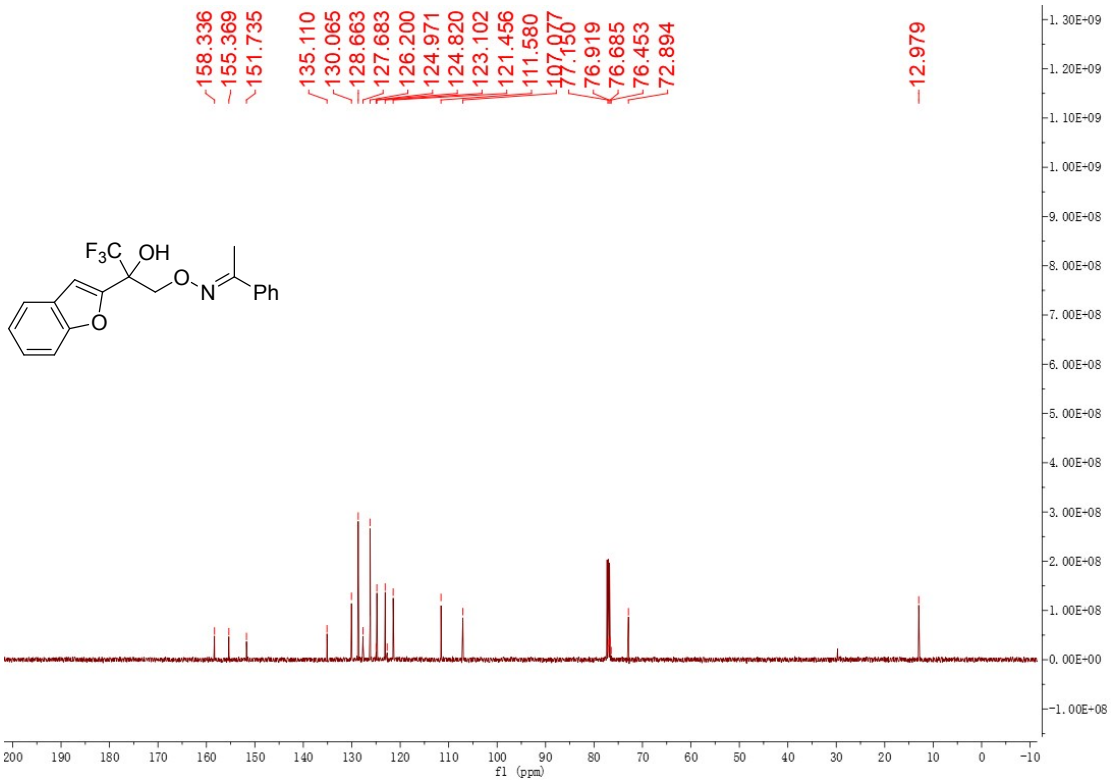
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3n



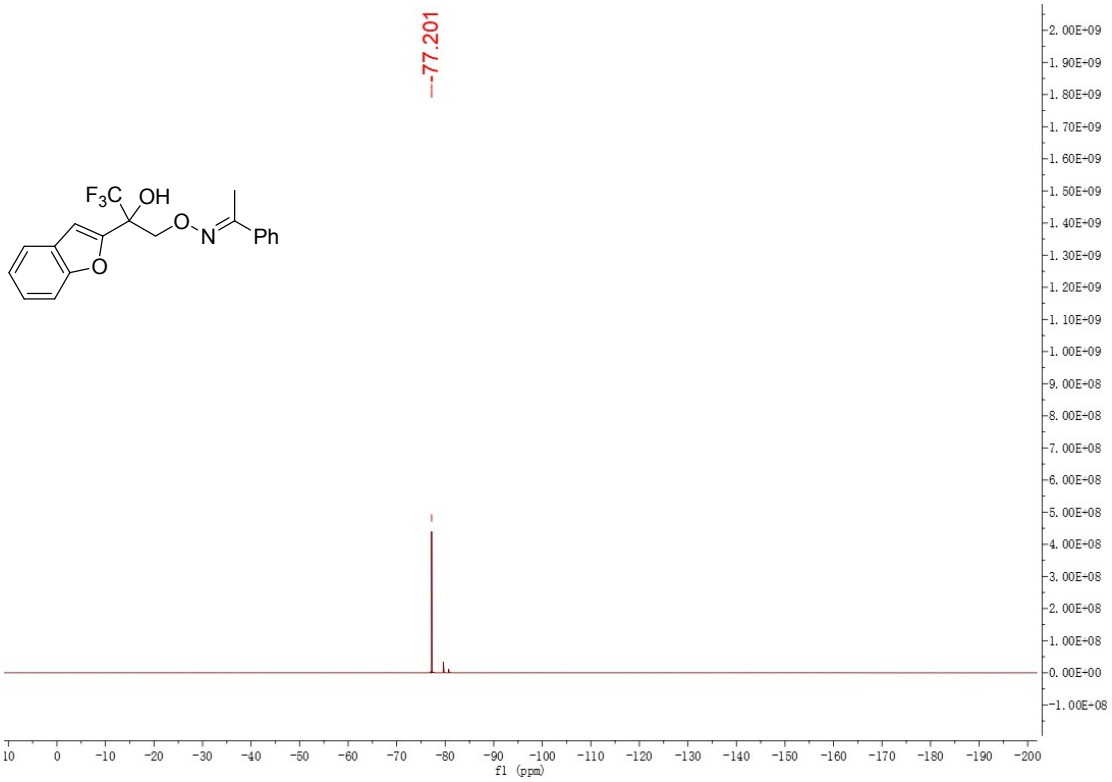
^{1}H NMR (500 MHz, $CDCl_3$) spectrum for 3o



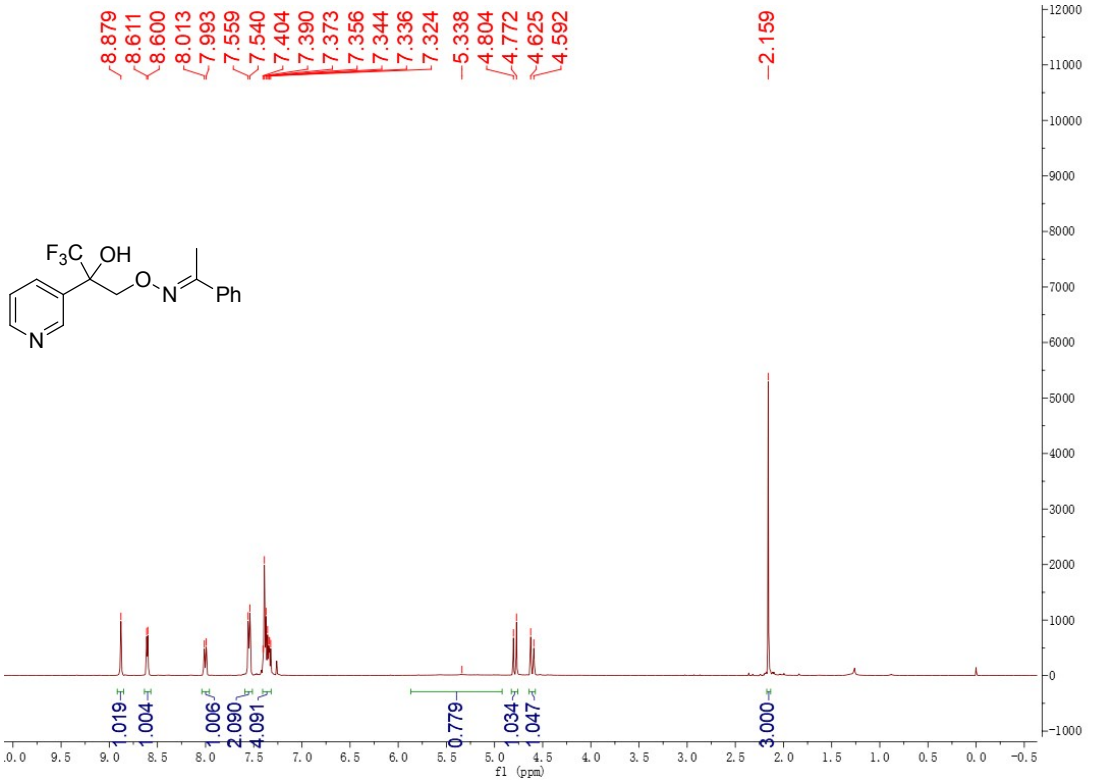
^{13}C NMR (125 MHz, $CDCl_3$) spectrum for 3o



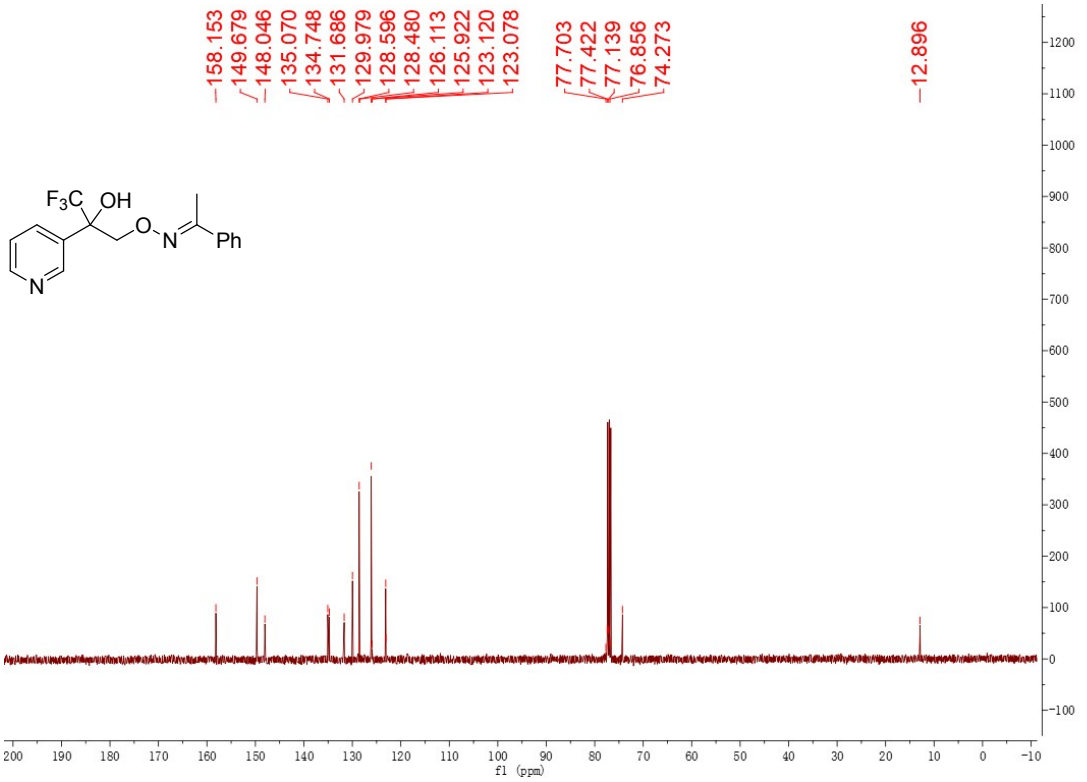
^{19}F NMR (470 MHz, $CDCl_3$) spectrum for 3o



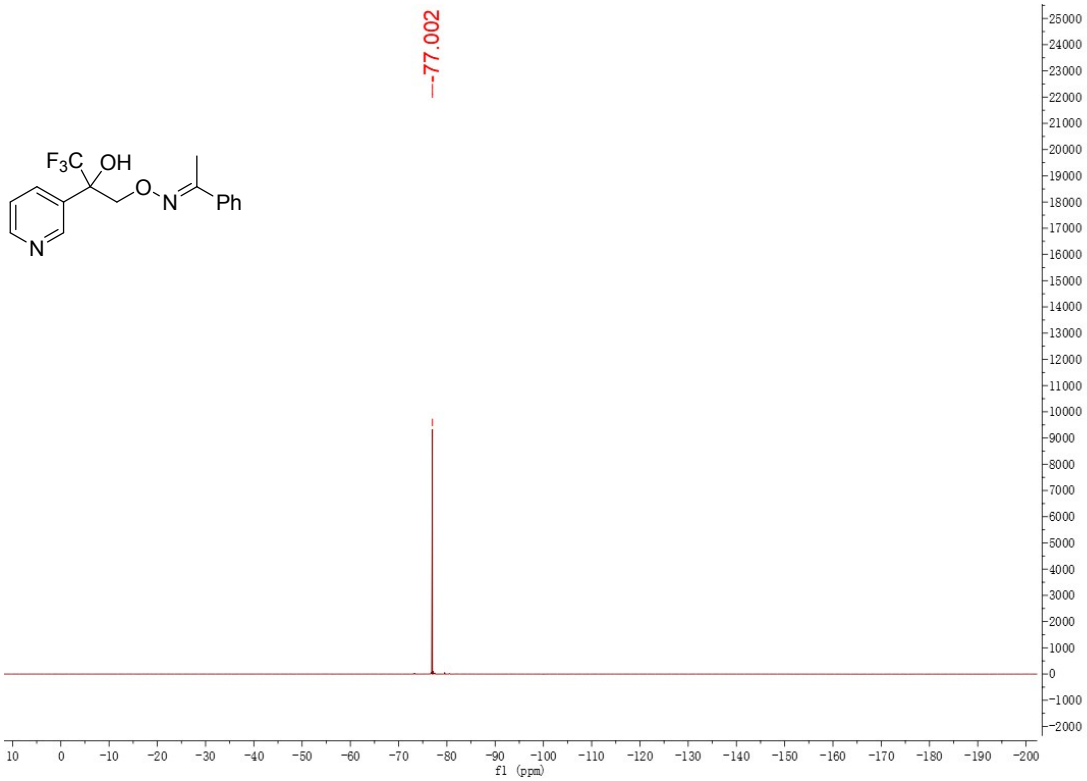
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3p



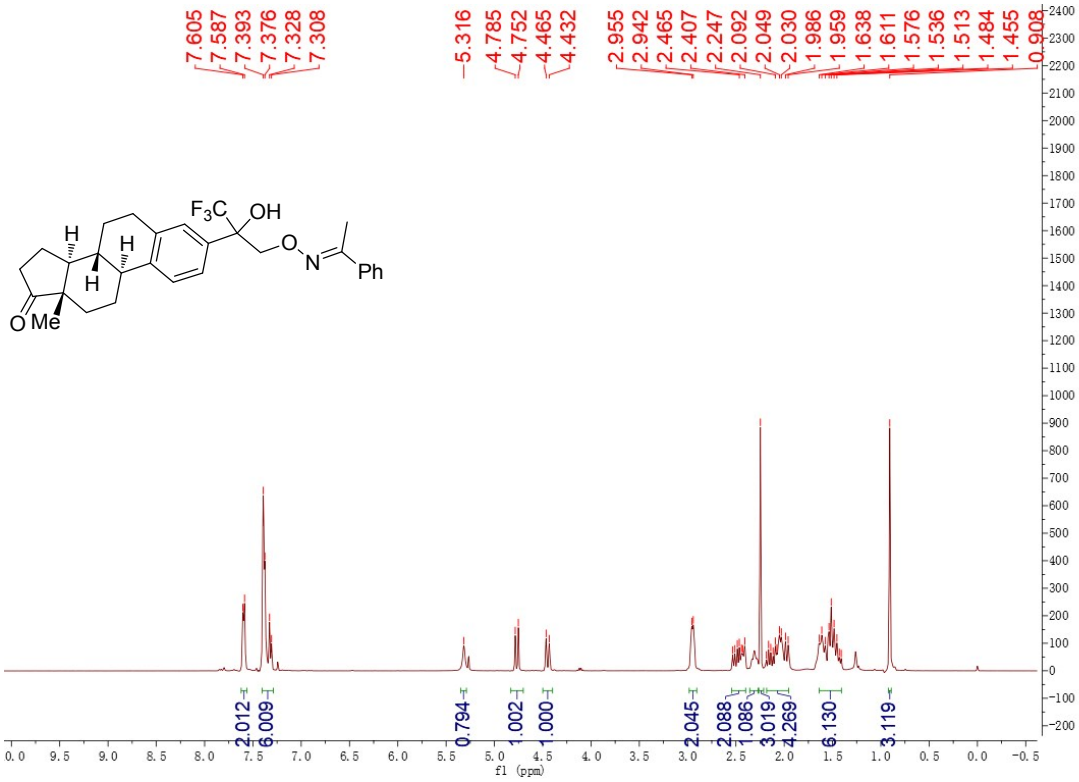
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3p



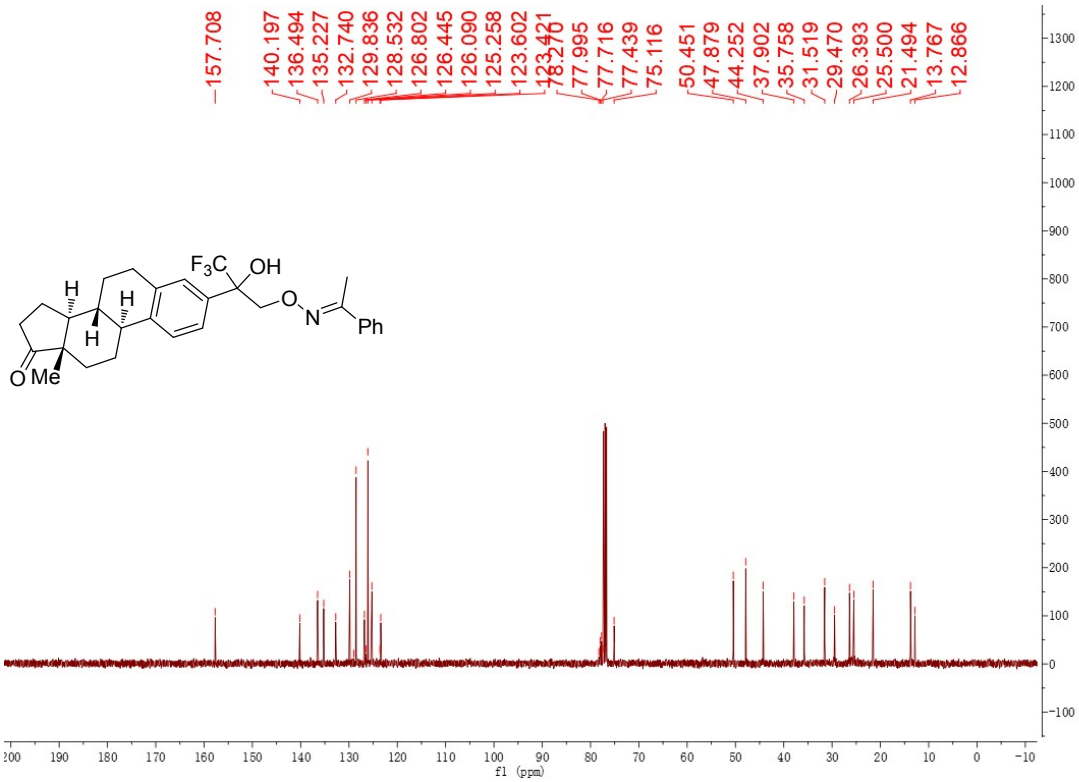
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3p



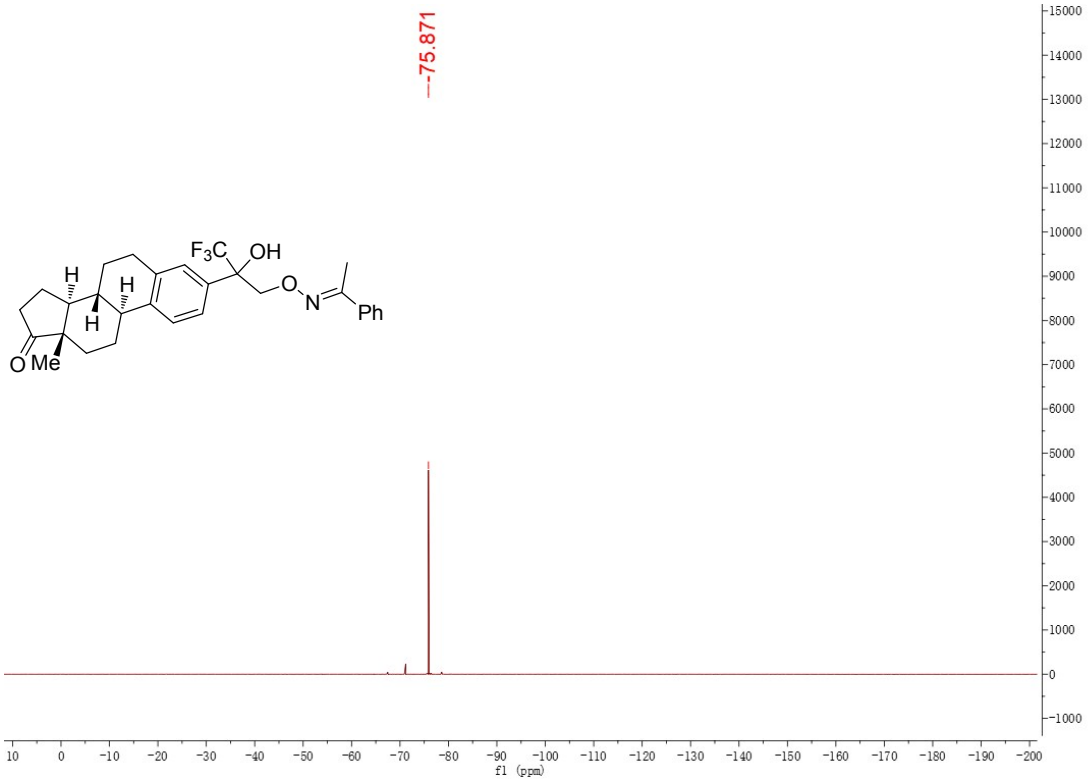
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3q



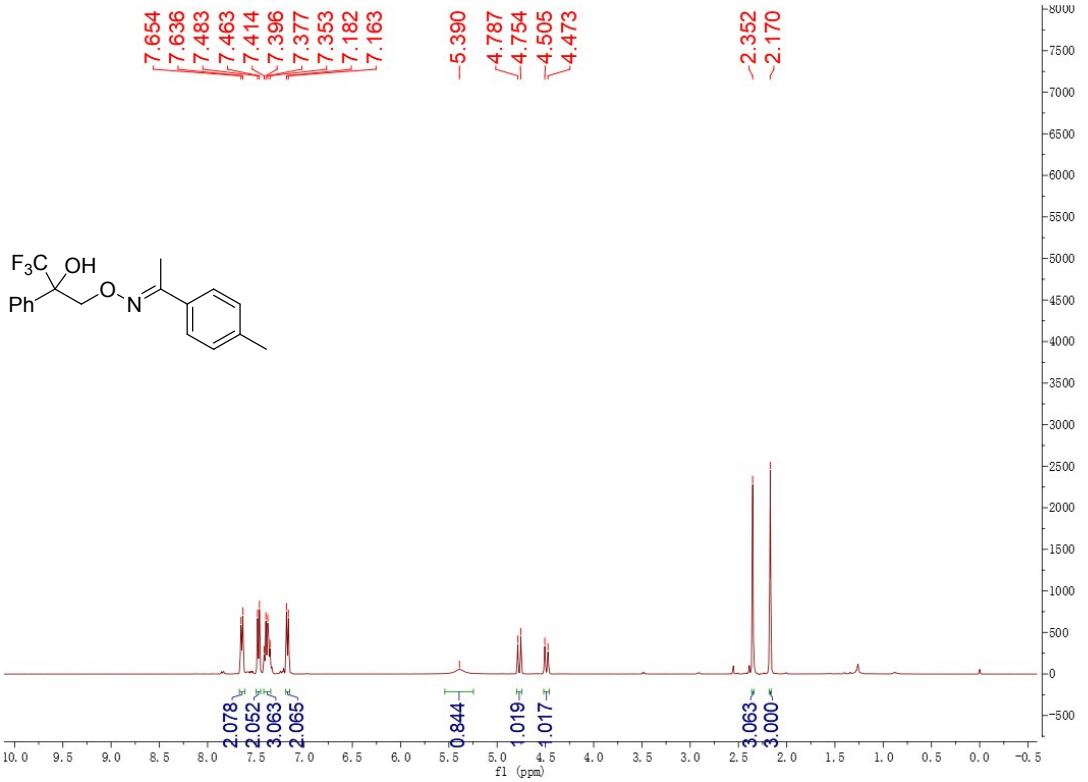
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3q



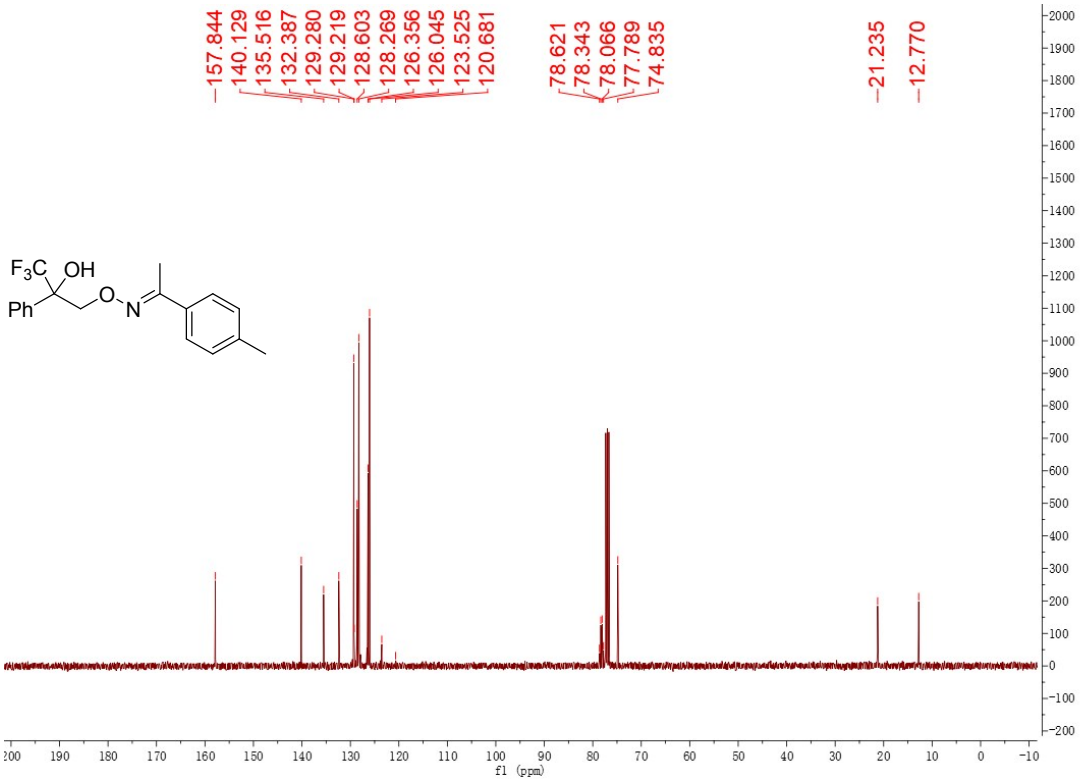
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3q



^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3r

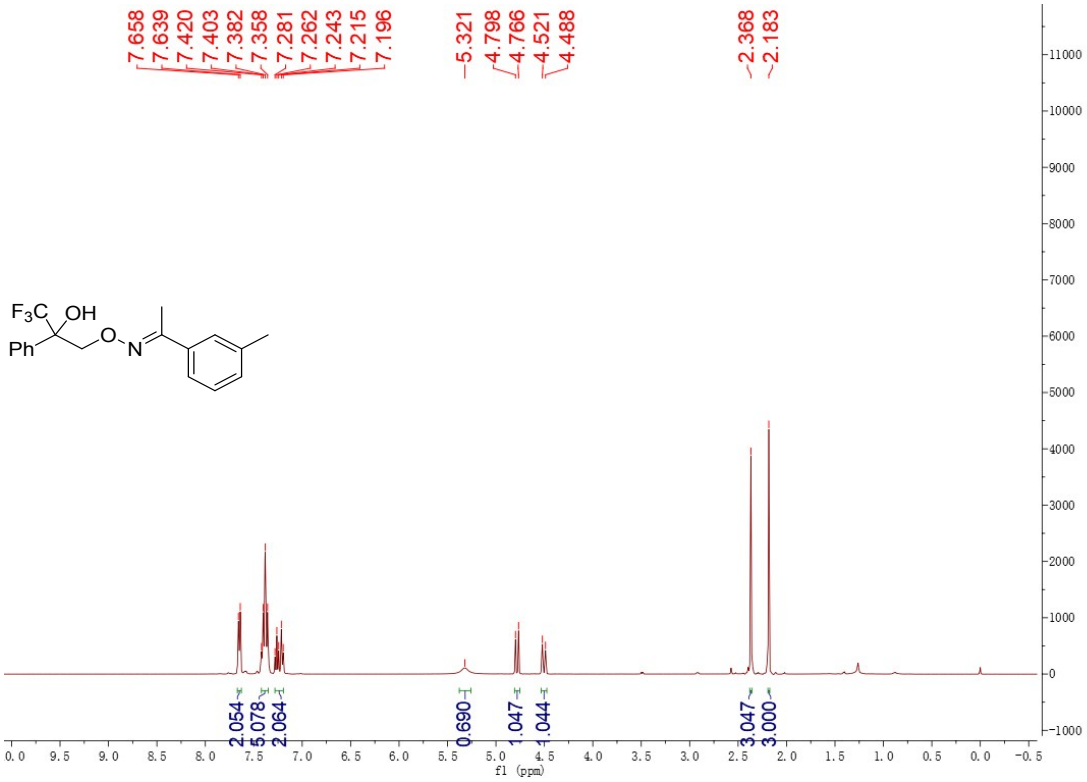


^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3r

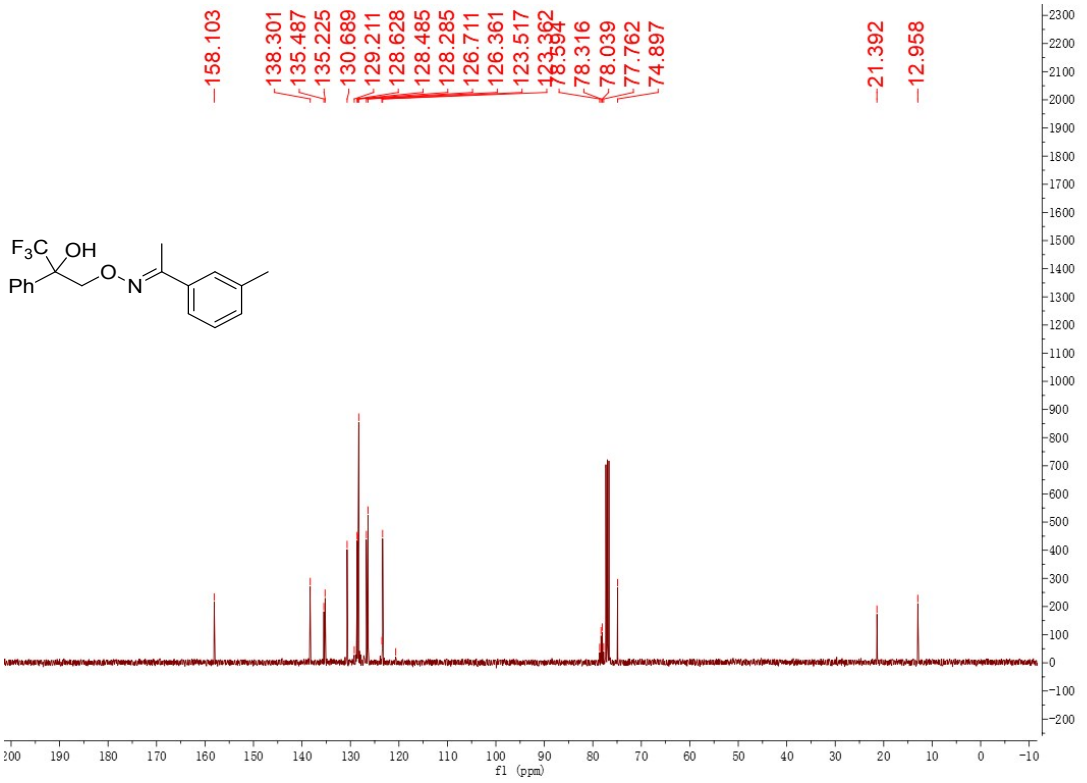


^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3r

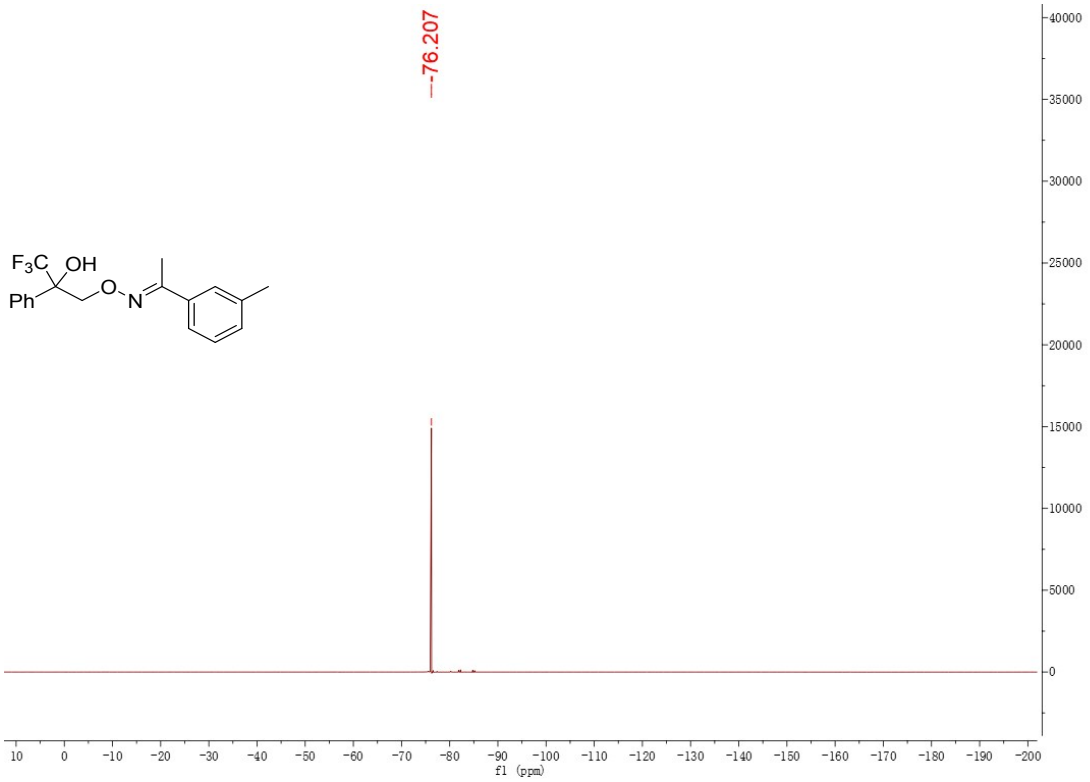
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3s



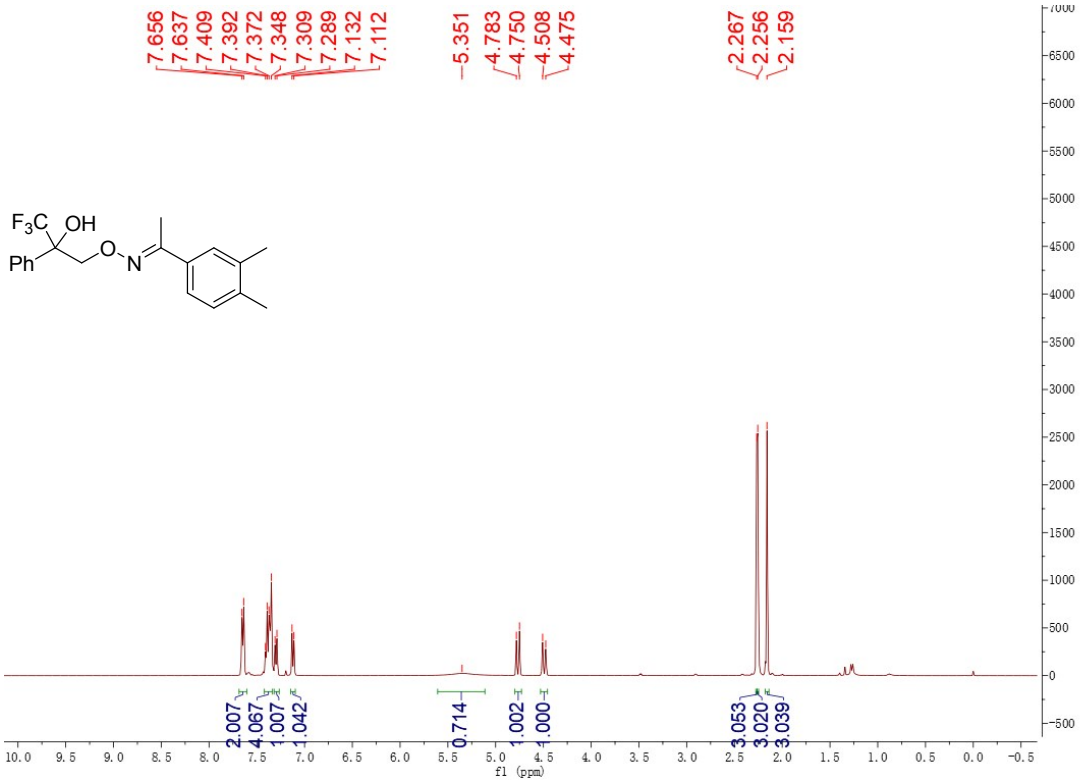
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3s



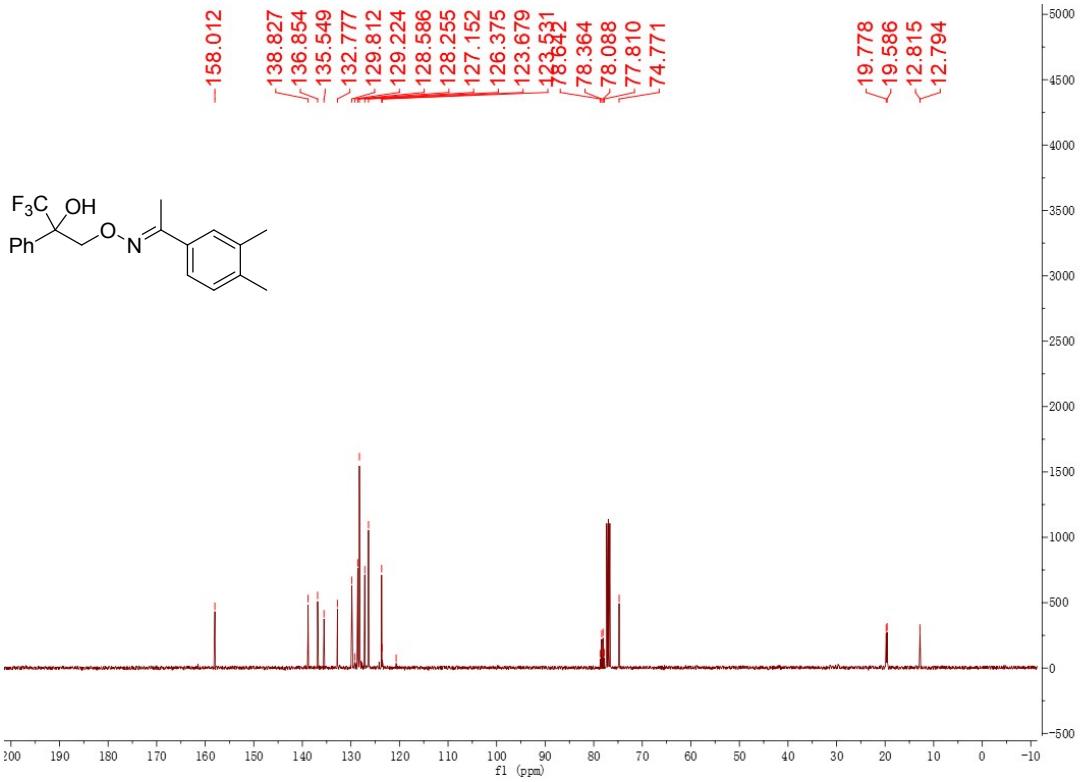
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3s



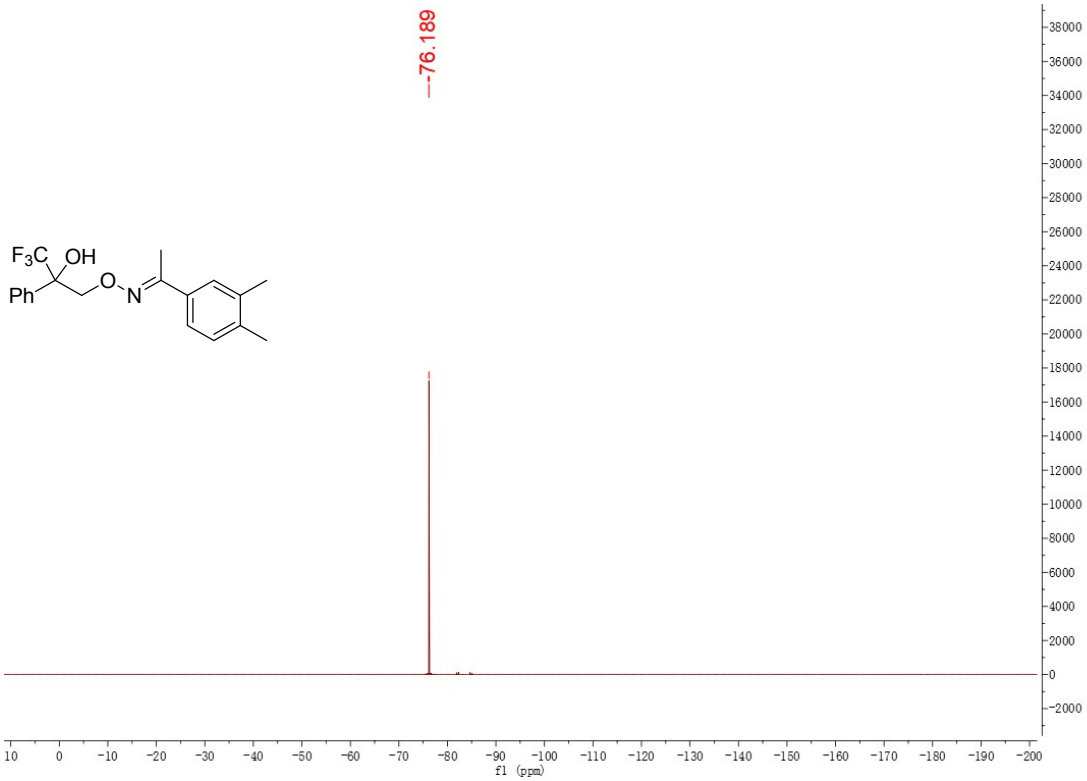
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3t



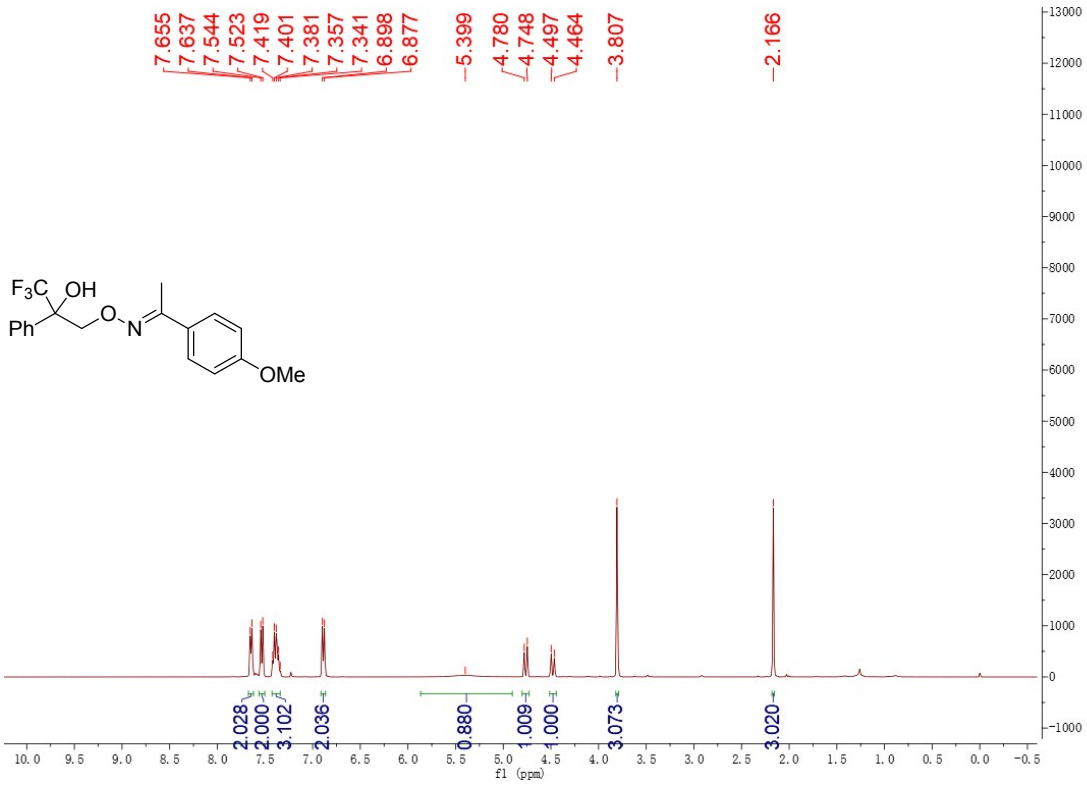
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3t



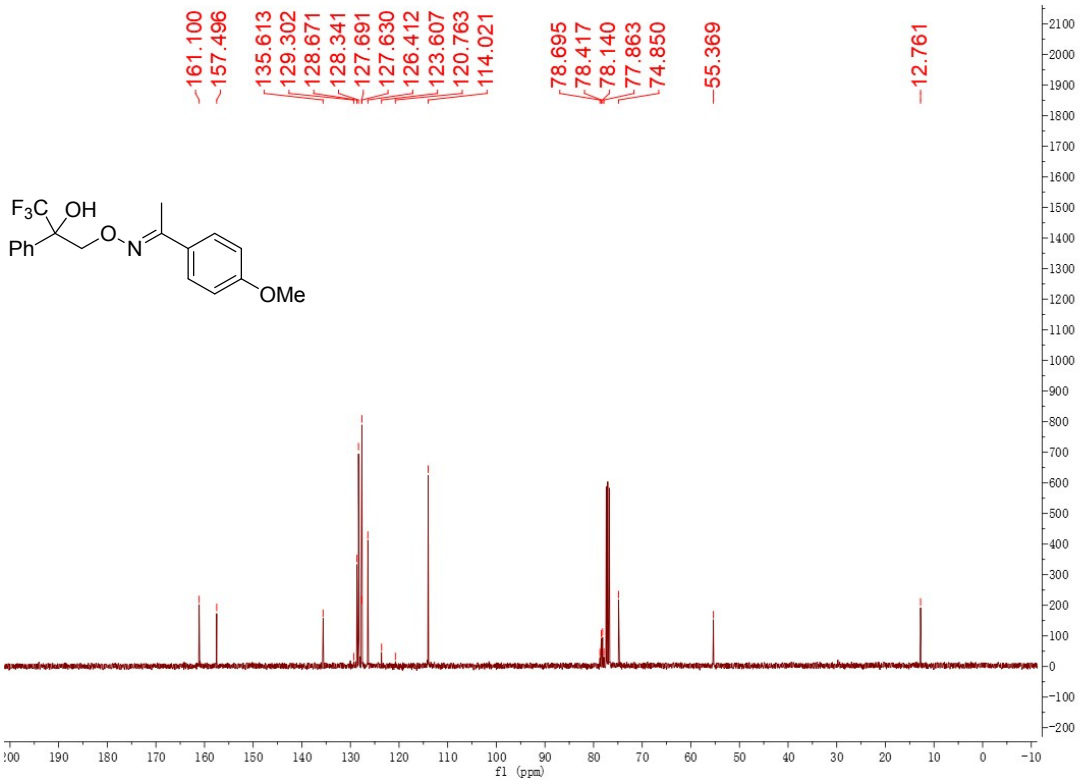
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3t



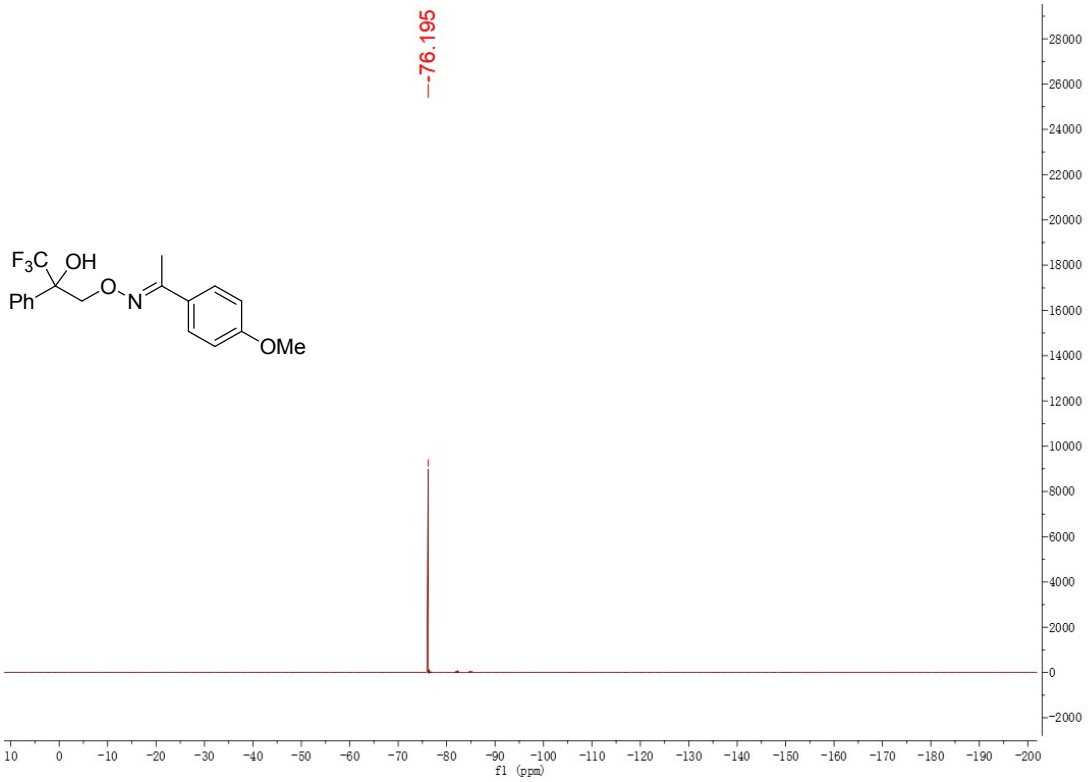
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3u



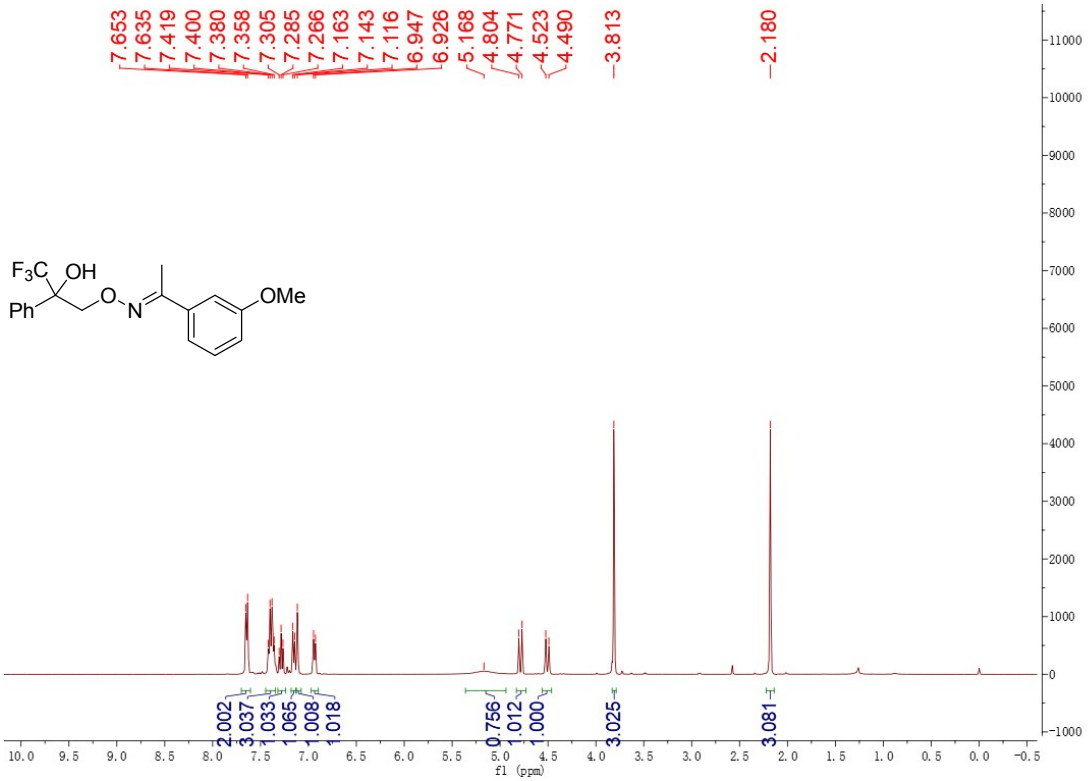
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3u



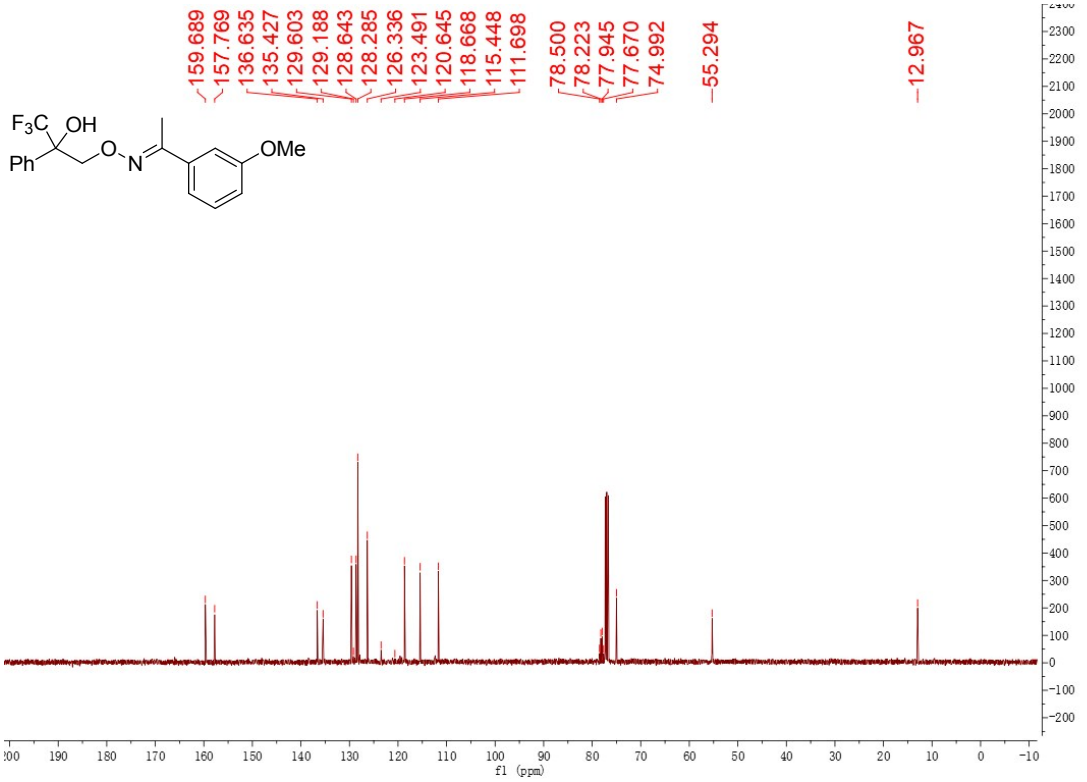
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3u



^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3v

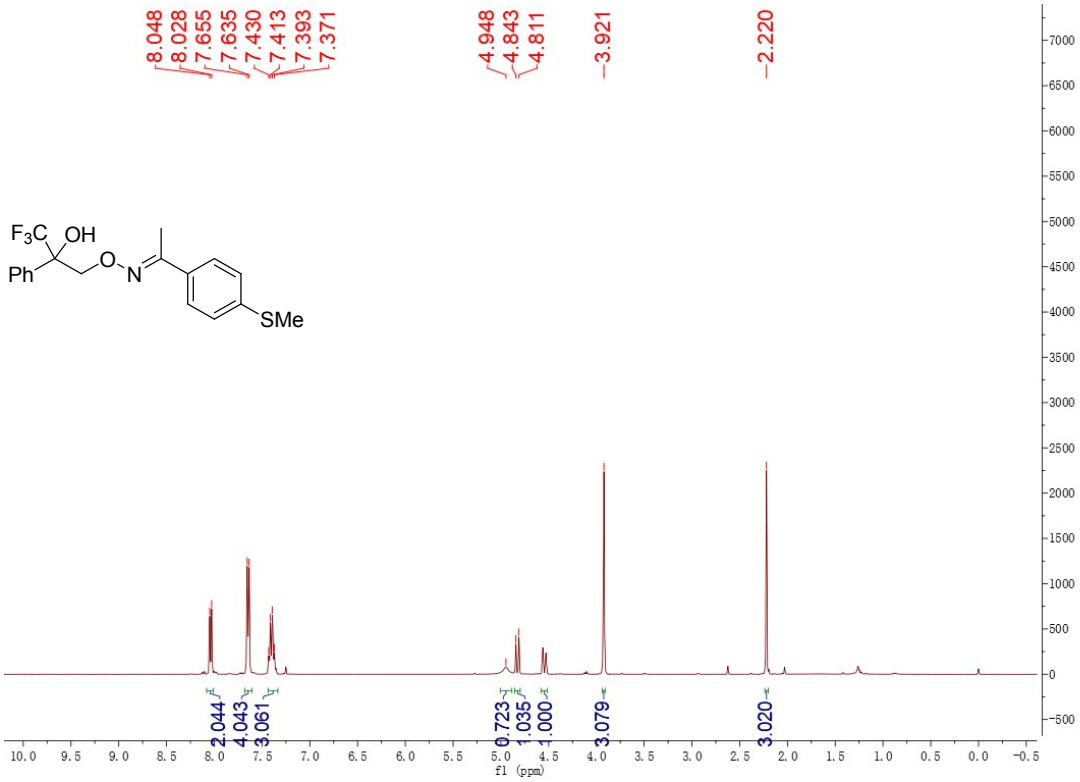


^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3v

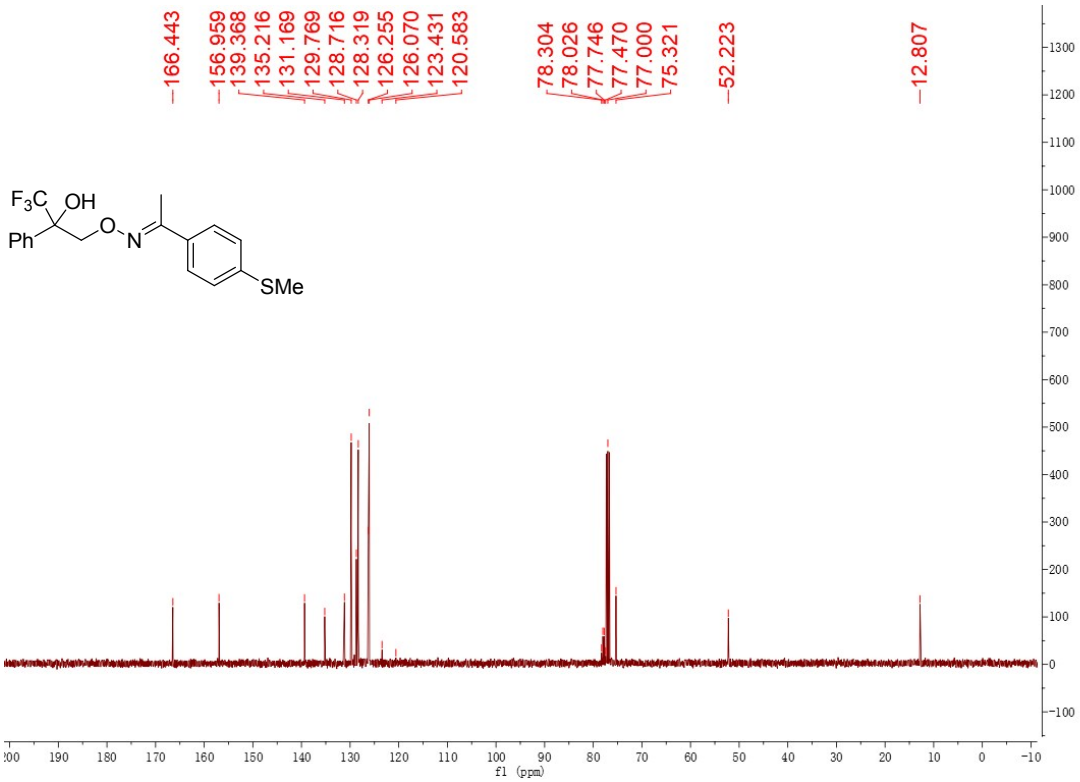


^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3v

^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3w

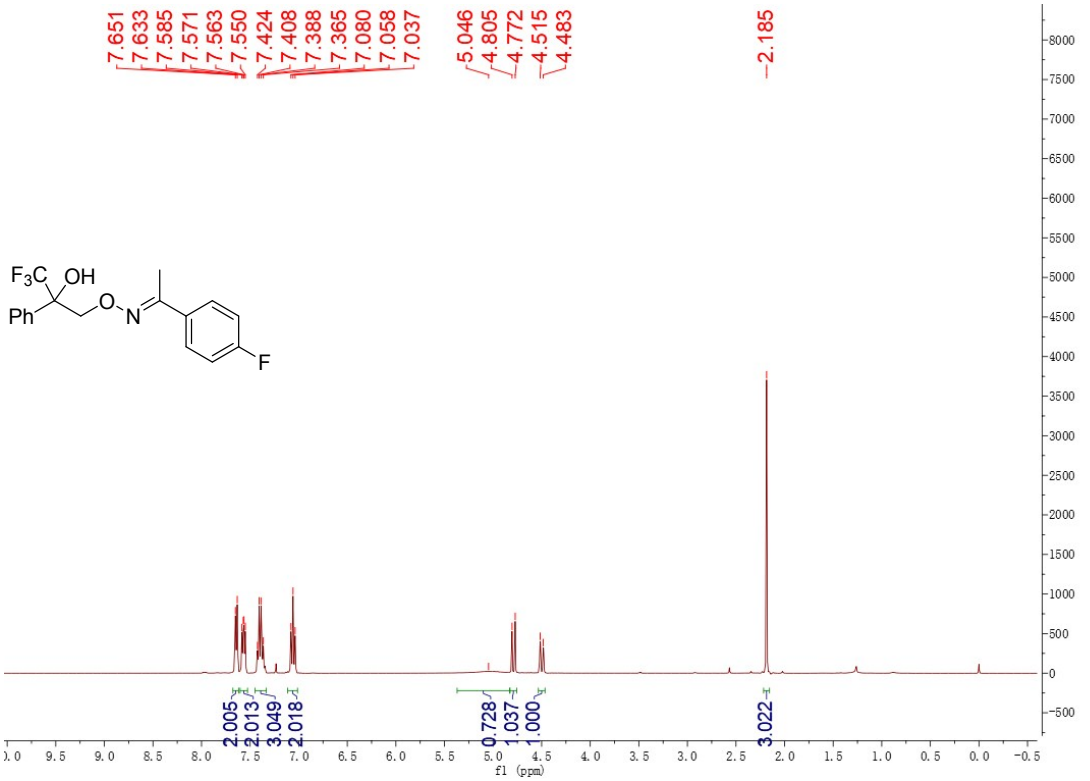


^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3w

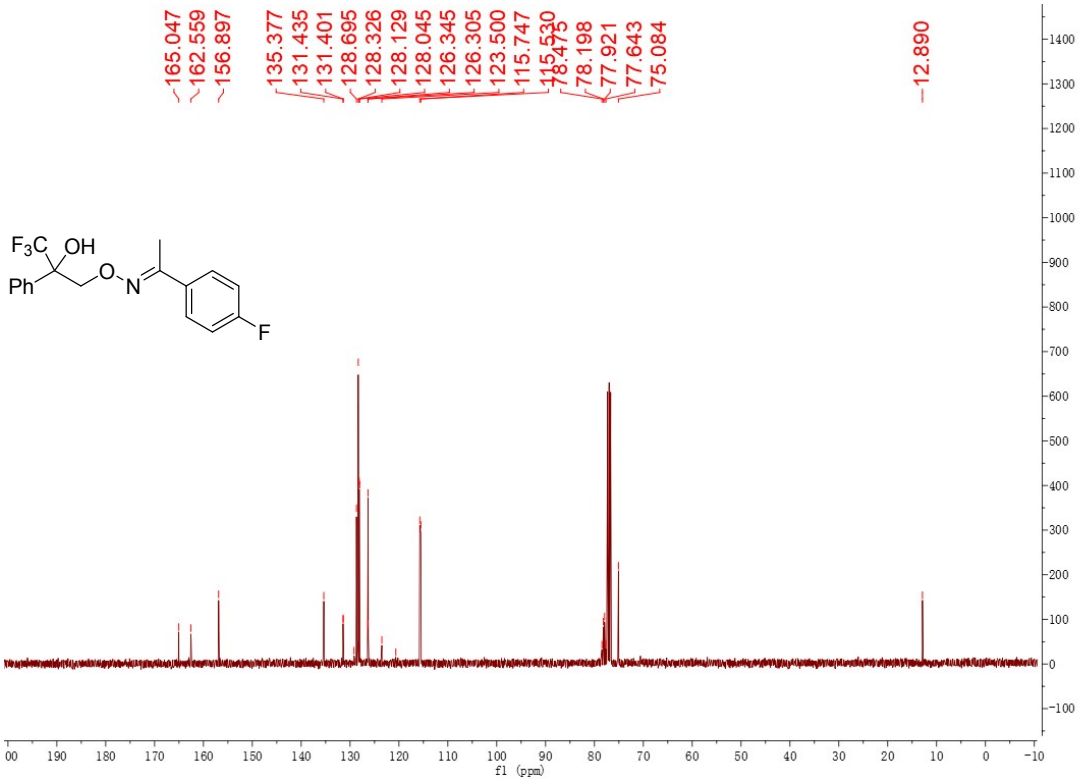


^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3w

^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3x

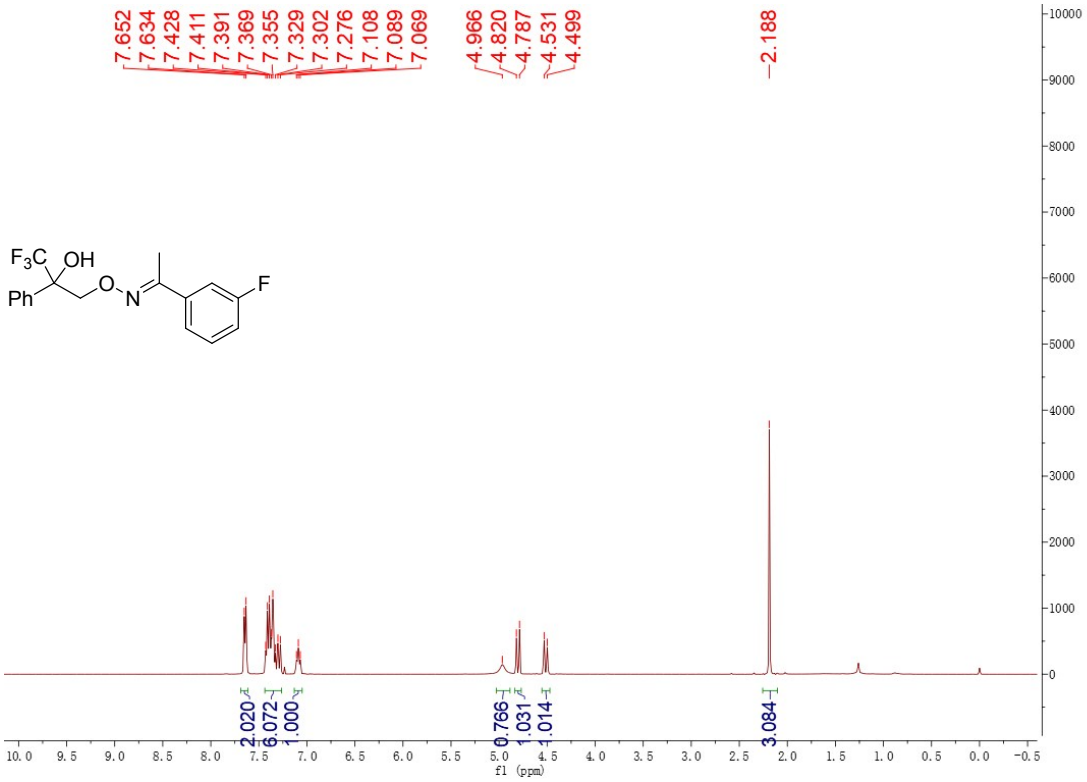


^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3x

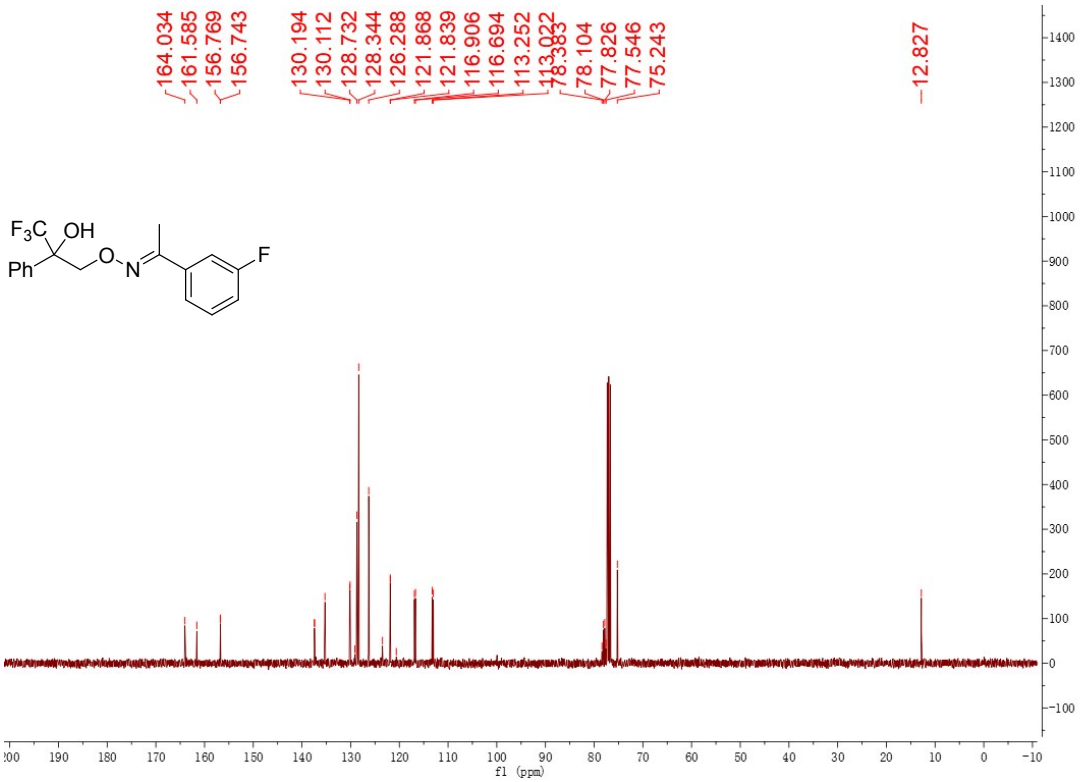


^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3x

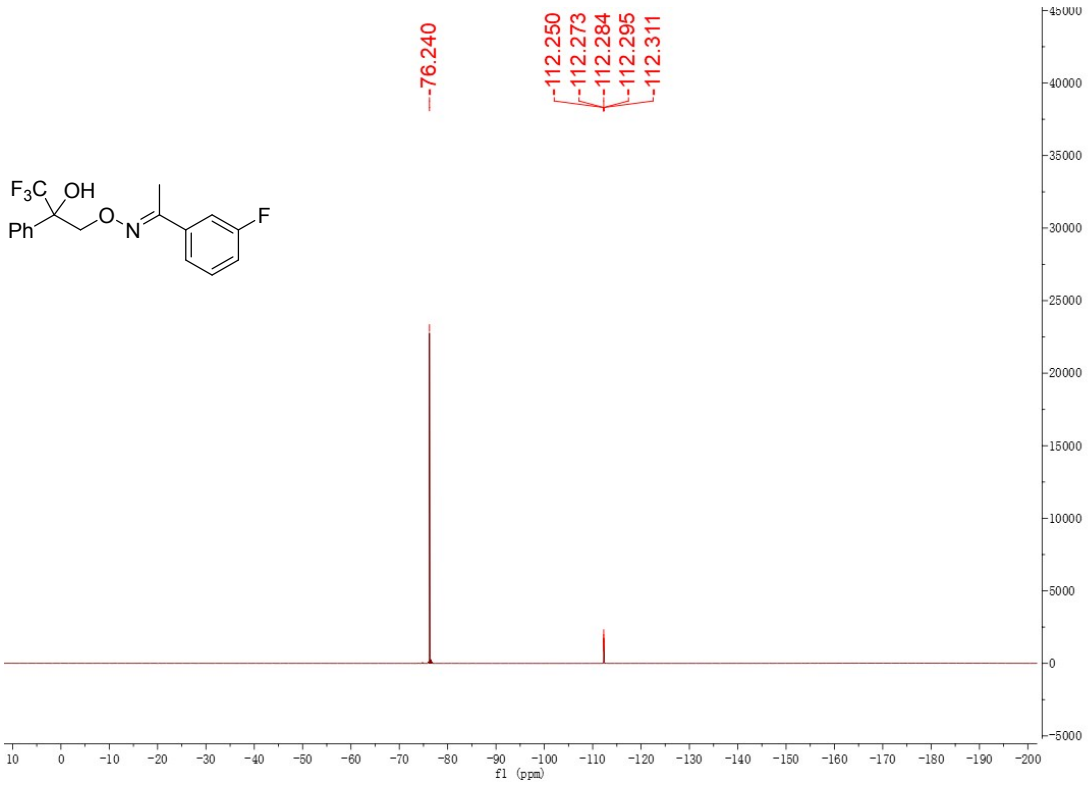
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3y



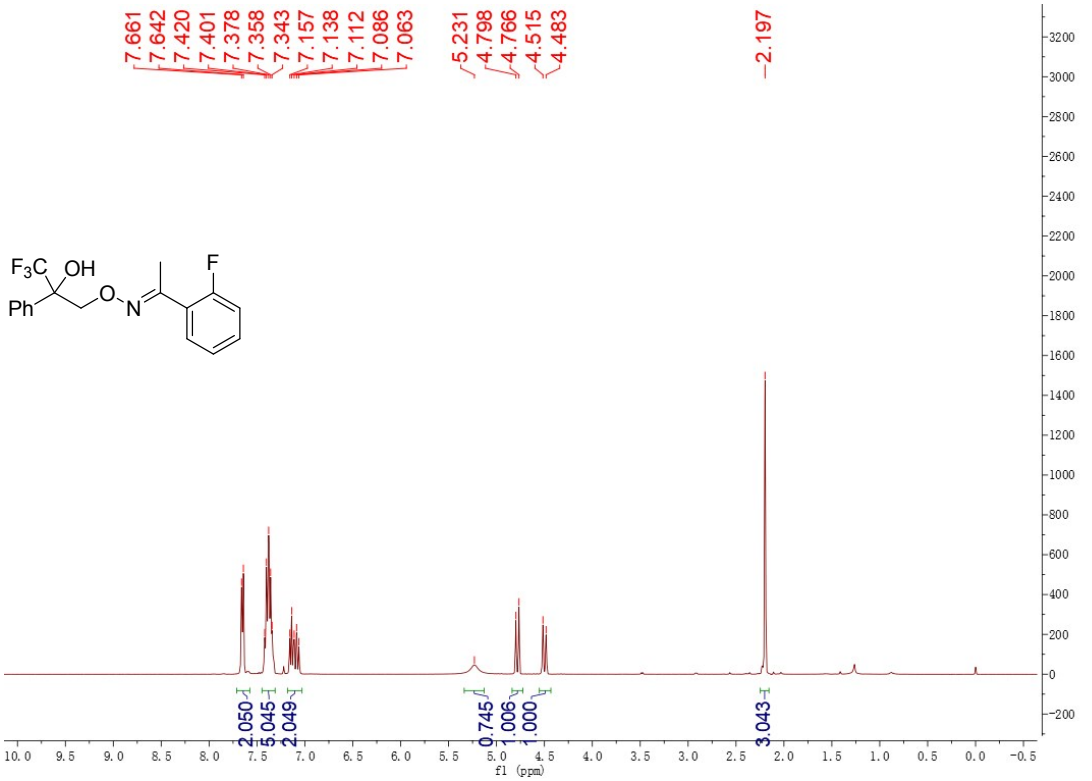
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3y



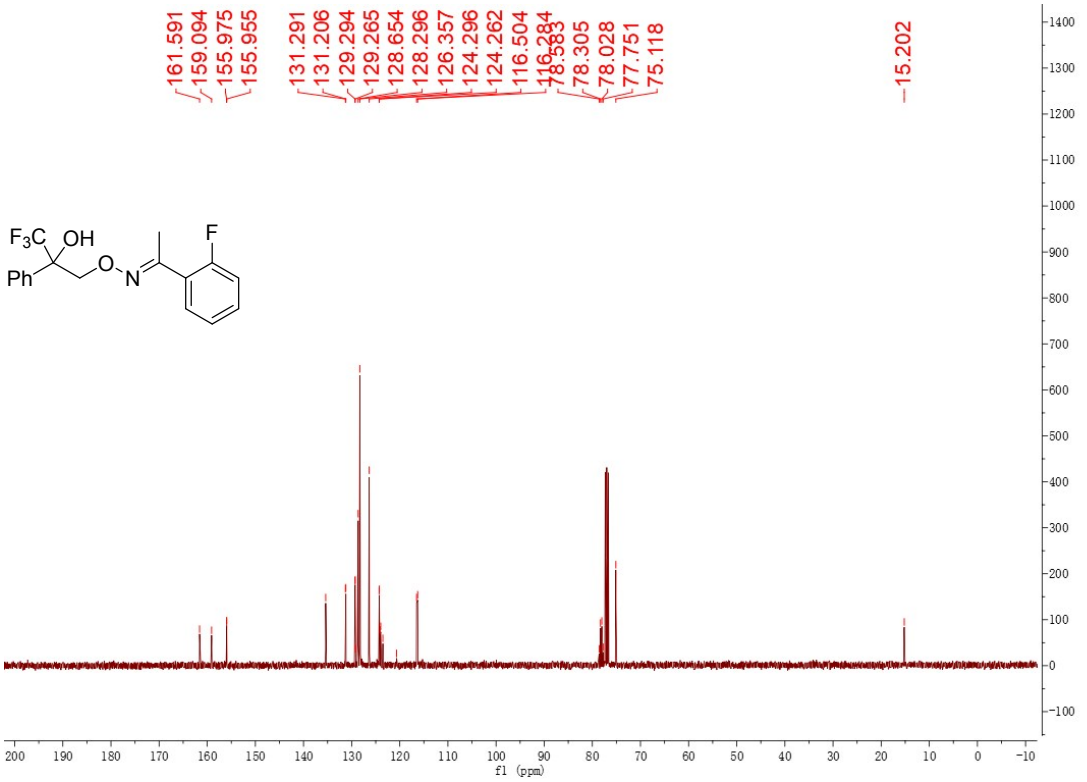
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3y



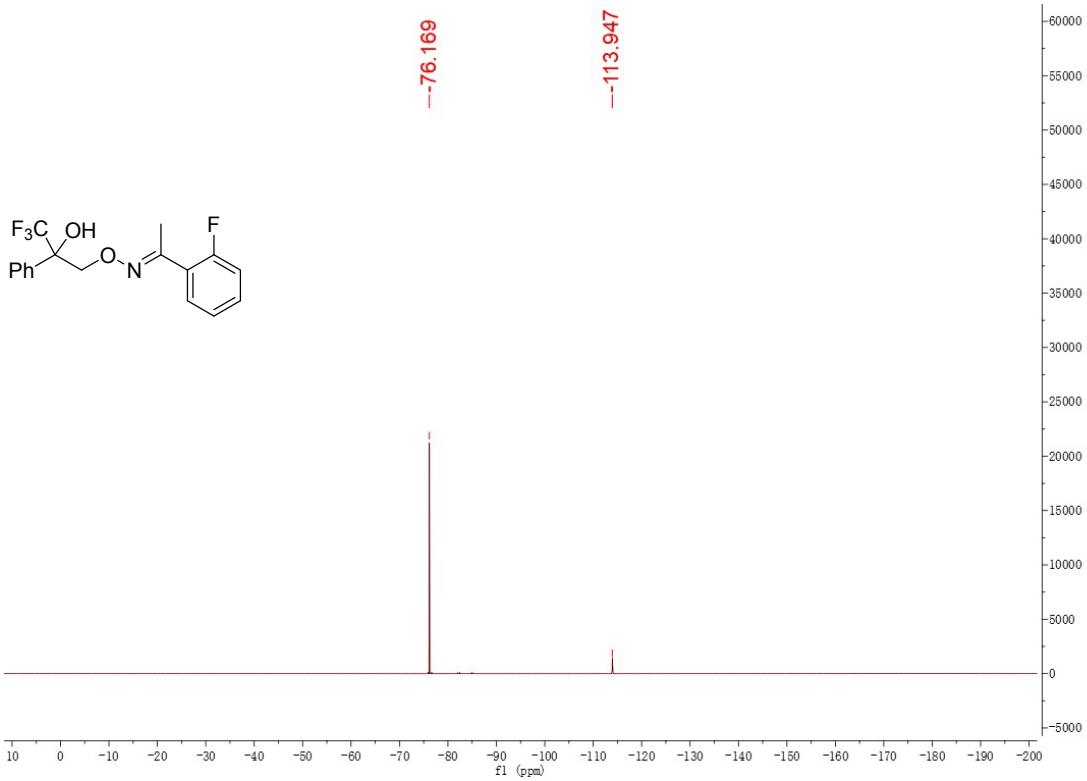
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3z



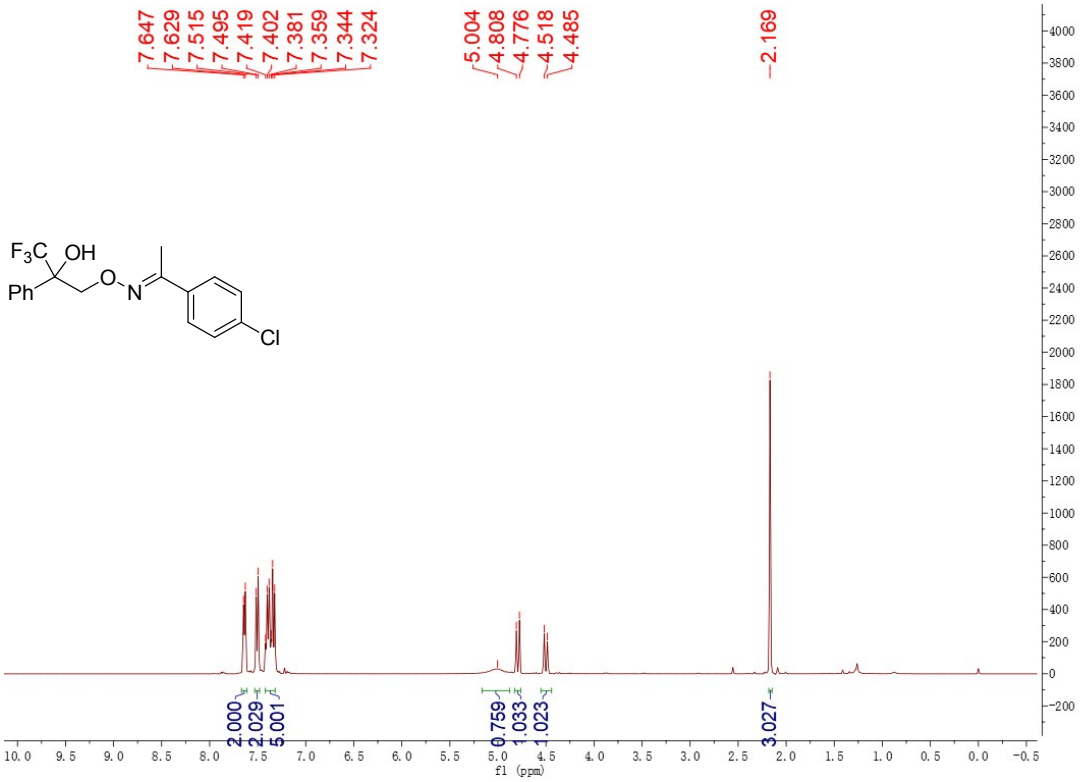
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3z



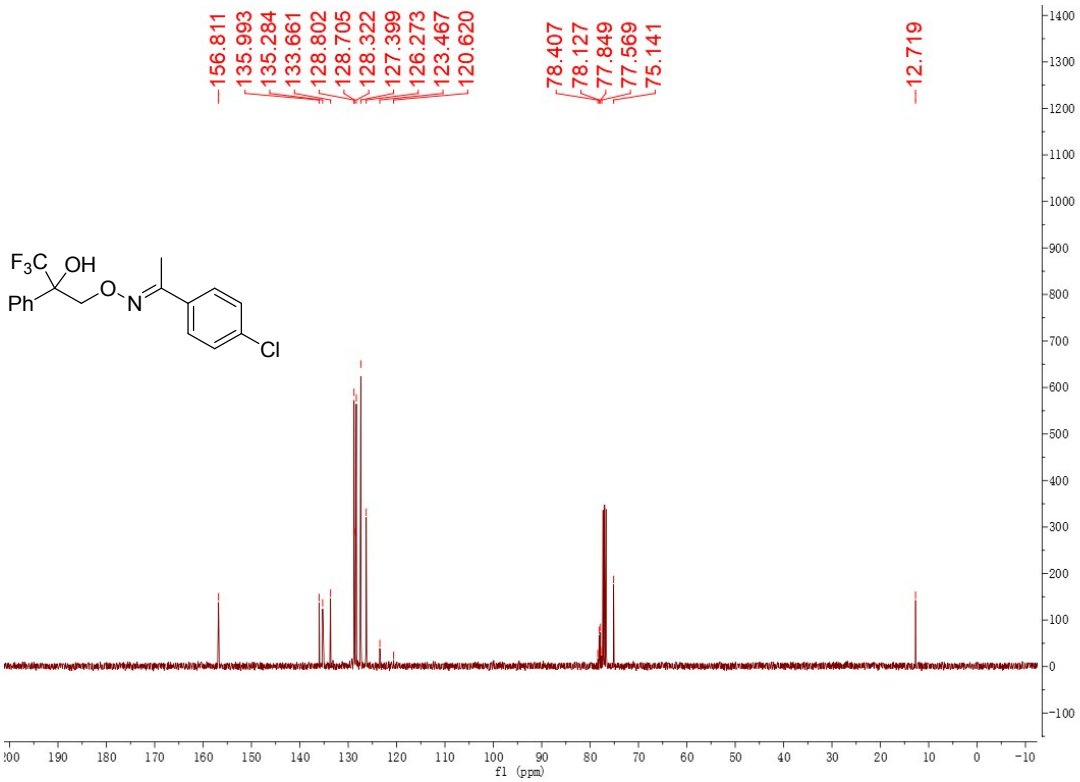
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3z



^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3aa

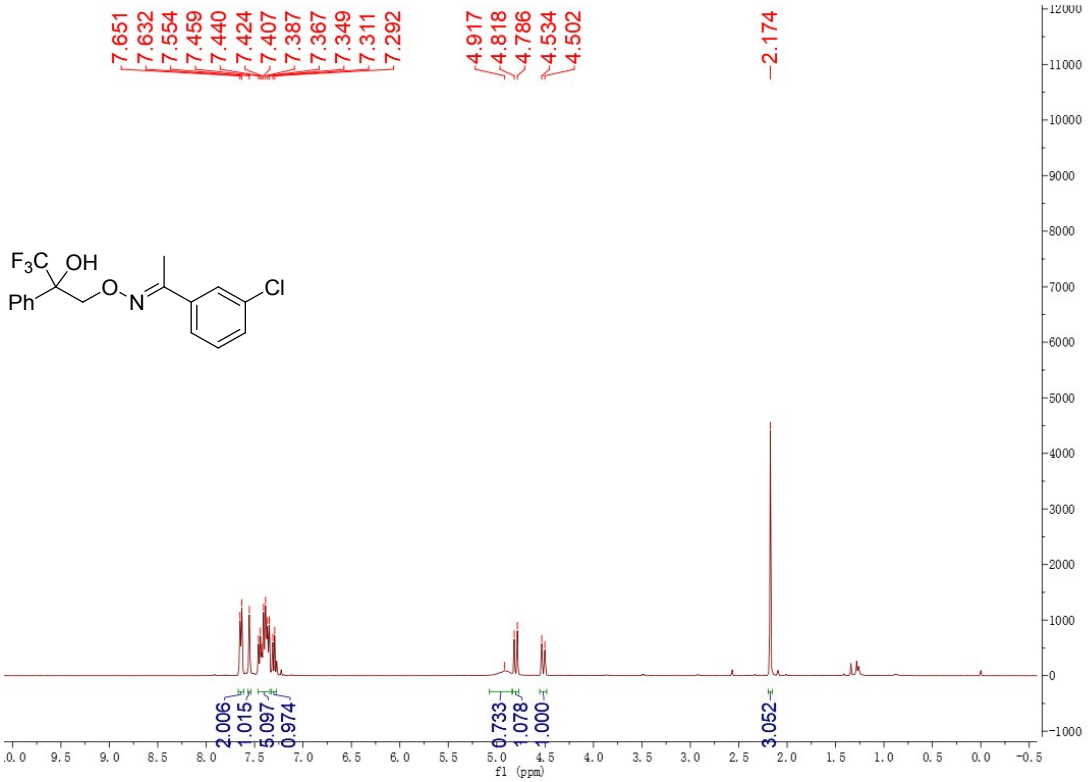


^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3aa

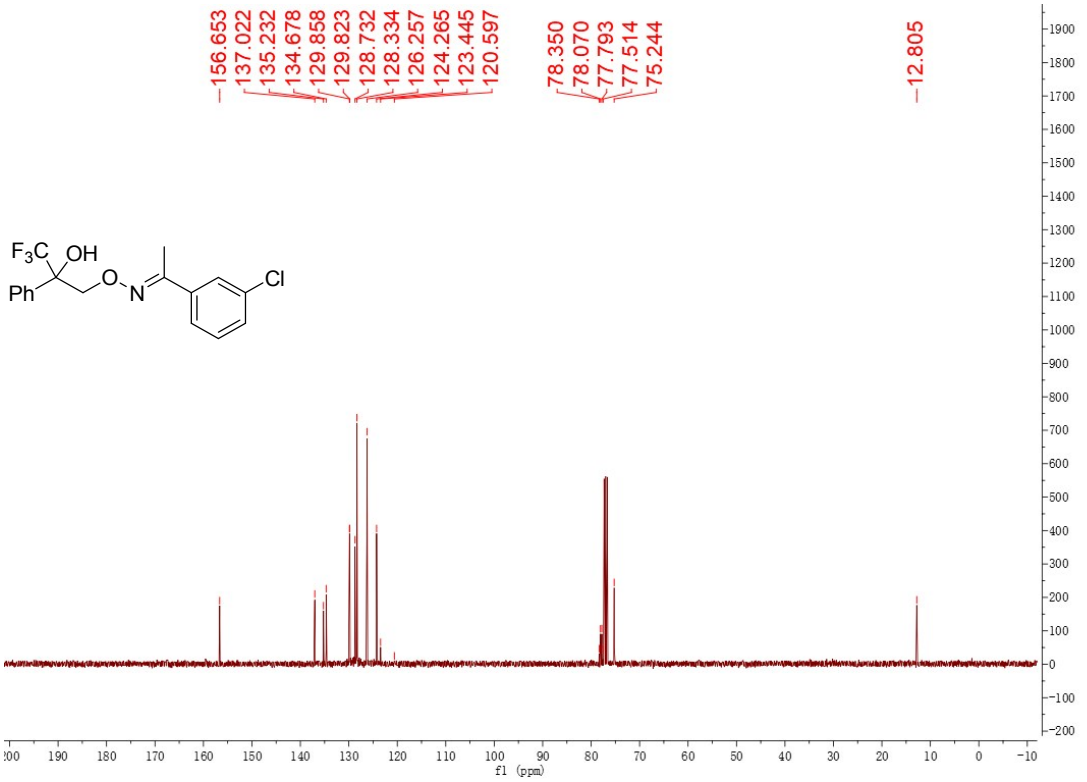


^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3aa

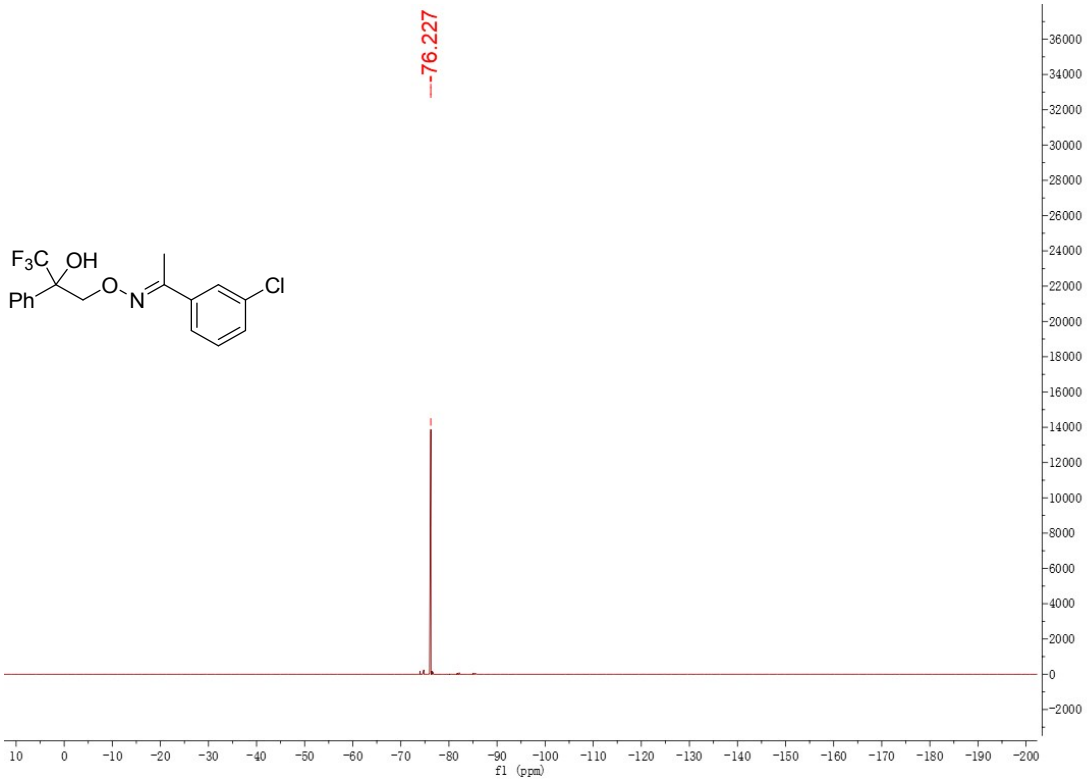
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3ab



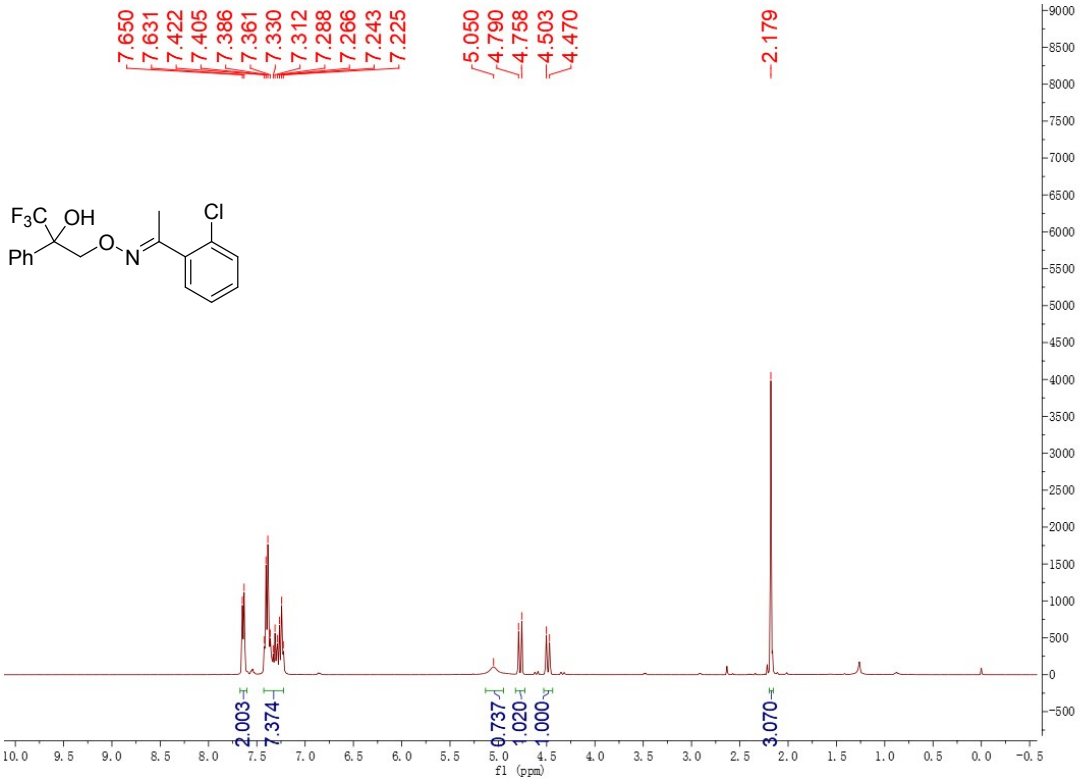
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3ab



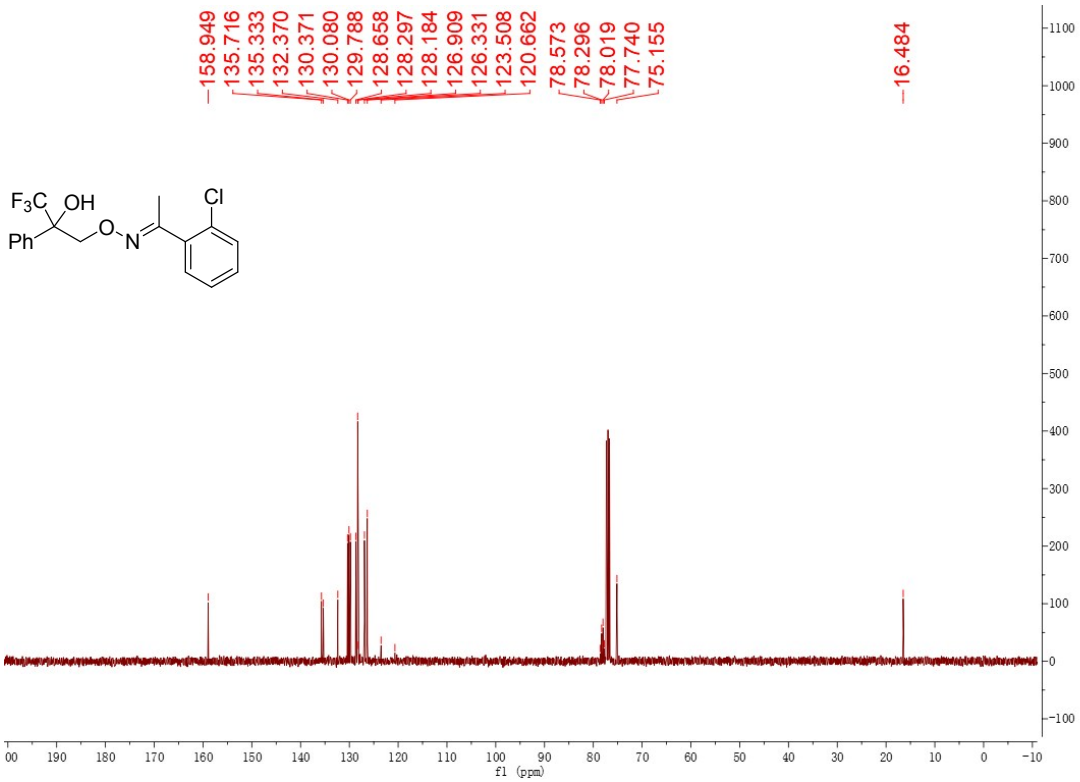
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3ab



^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3ac

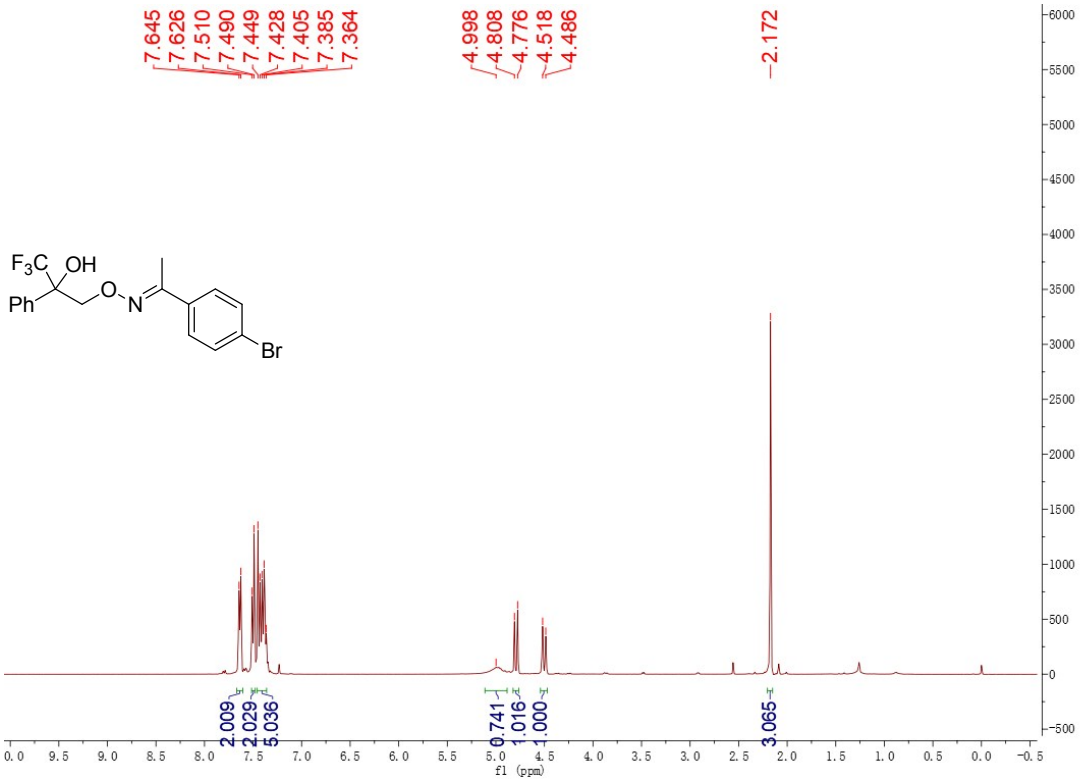


^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3ac

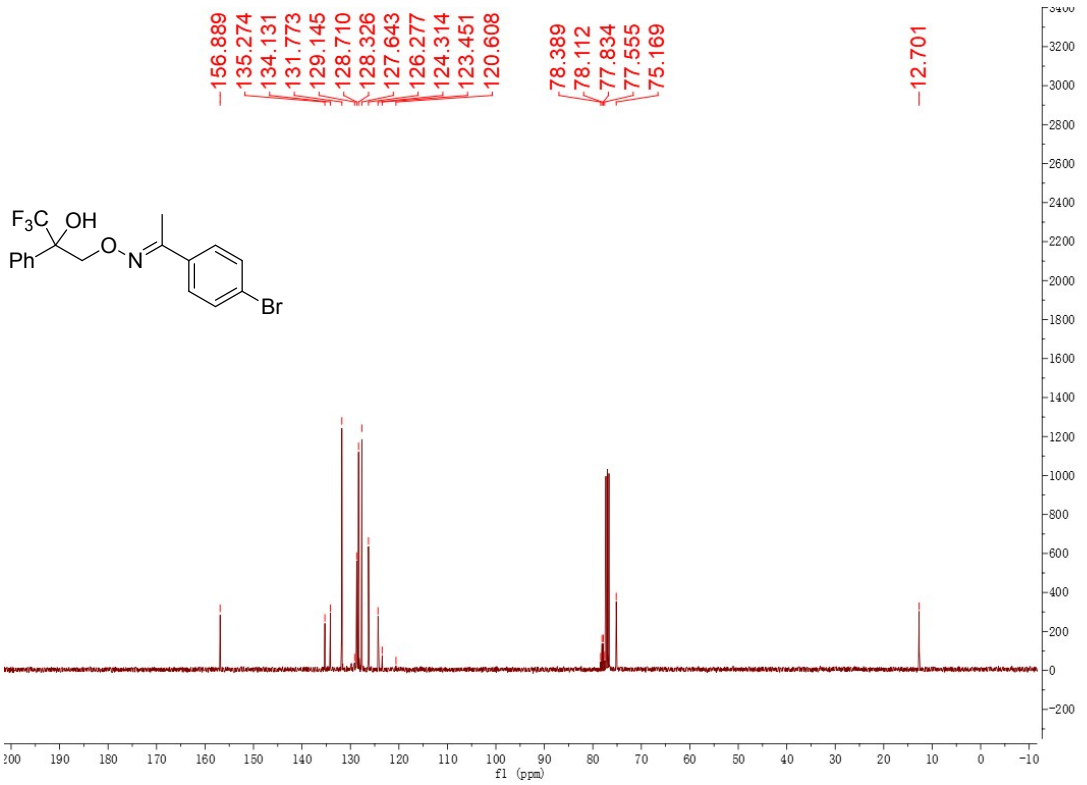


^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3ac

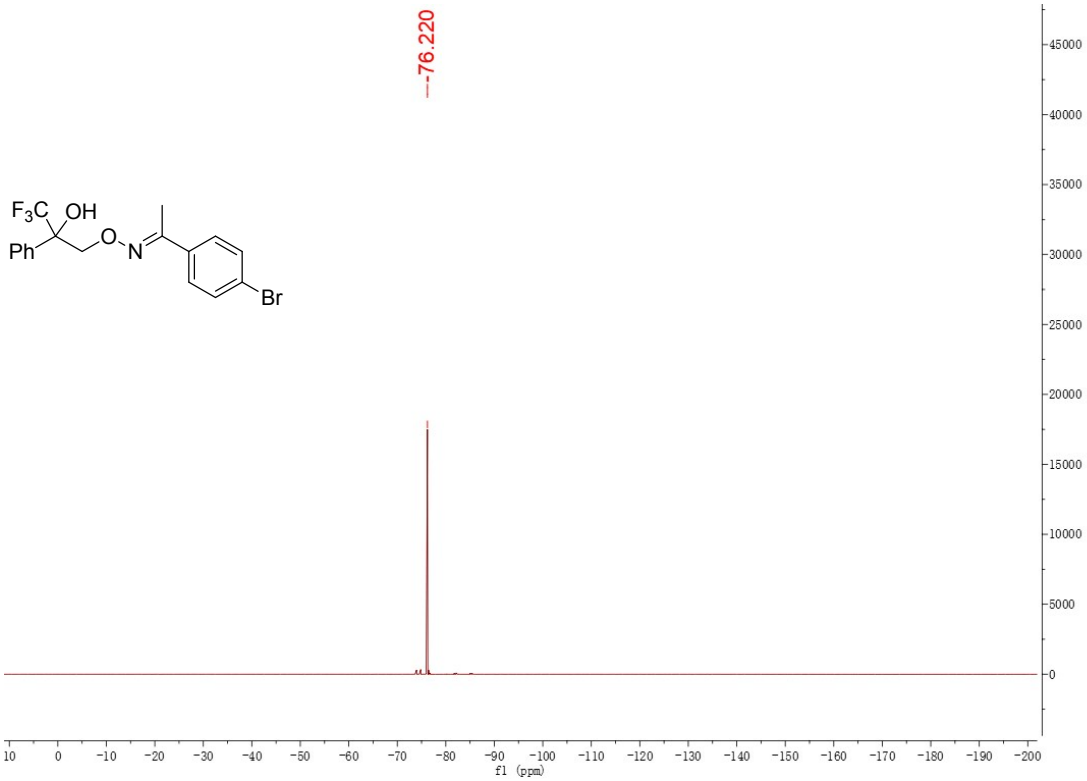
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3ad



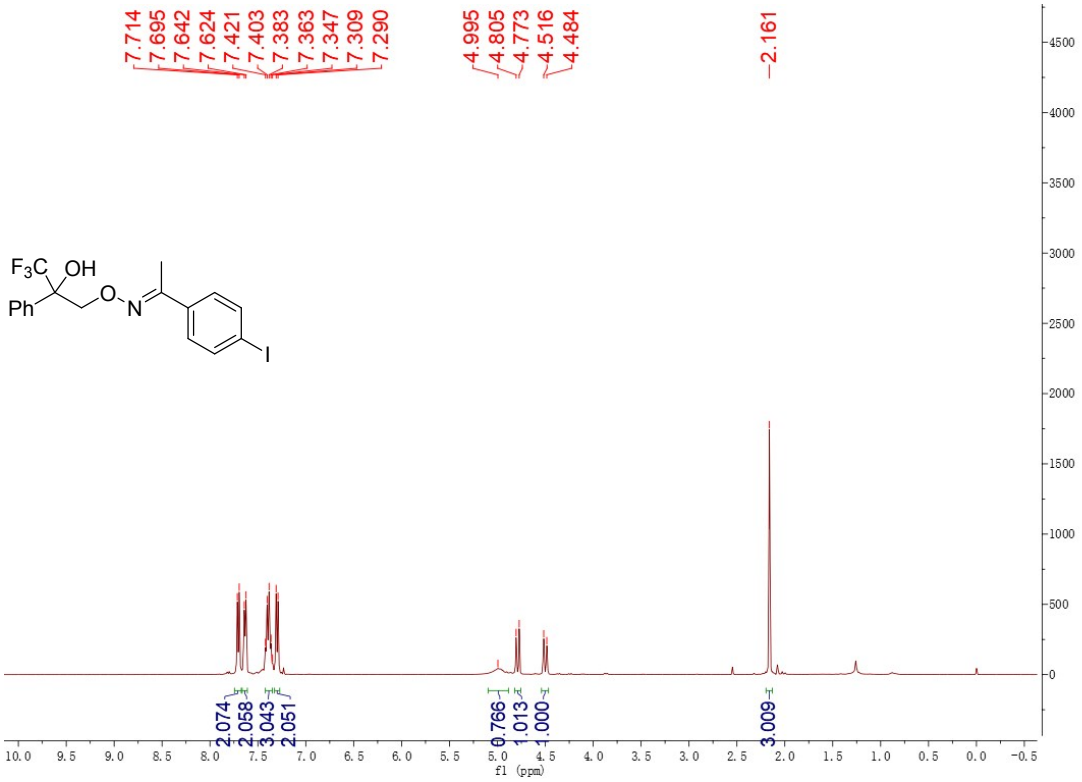
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3ad



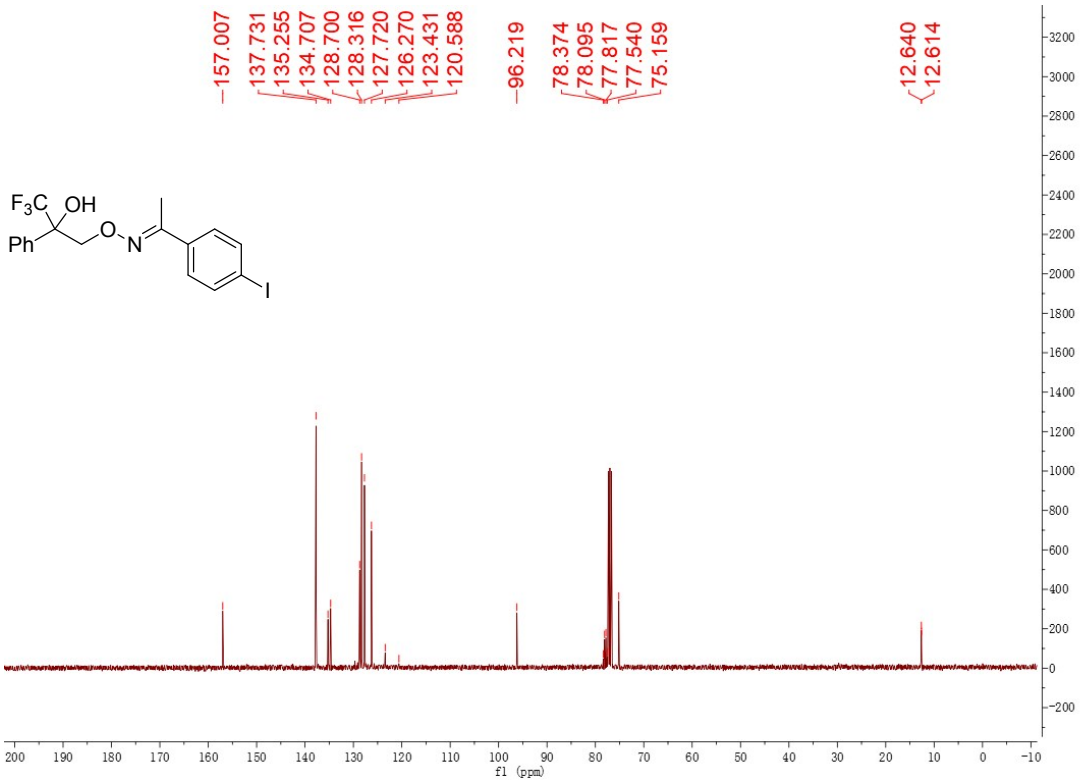
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3ad



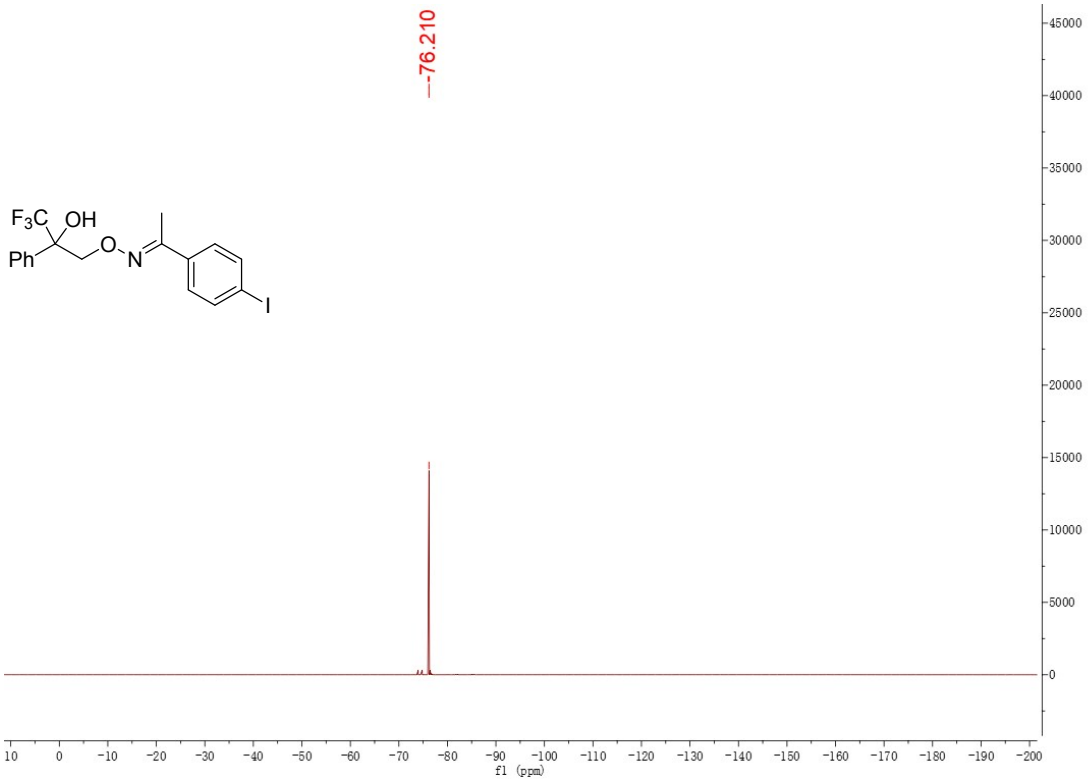
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3ae



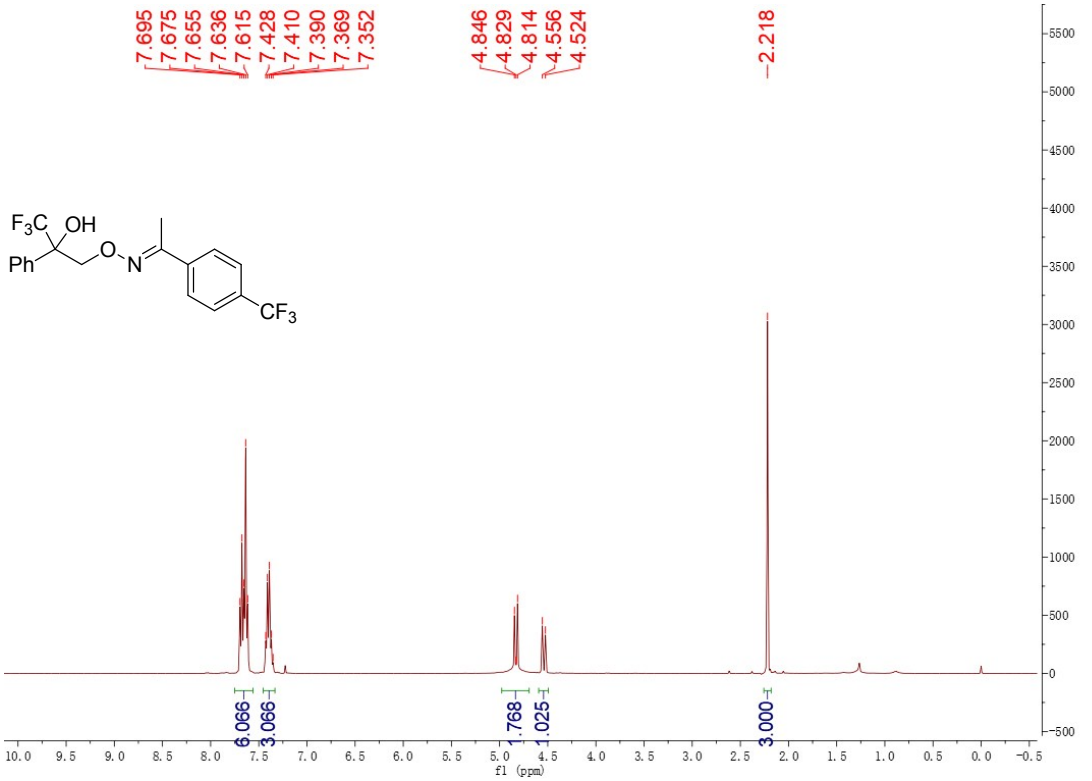
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3ae



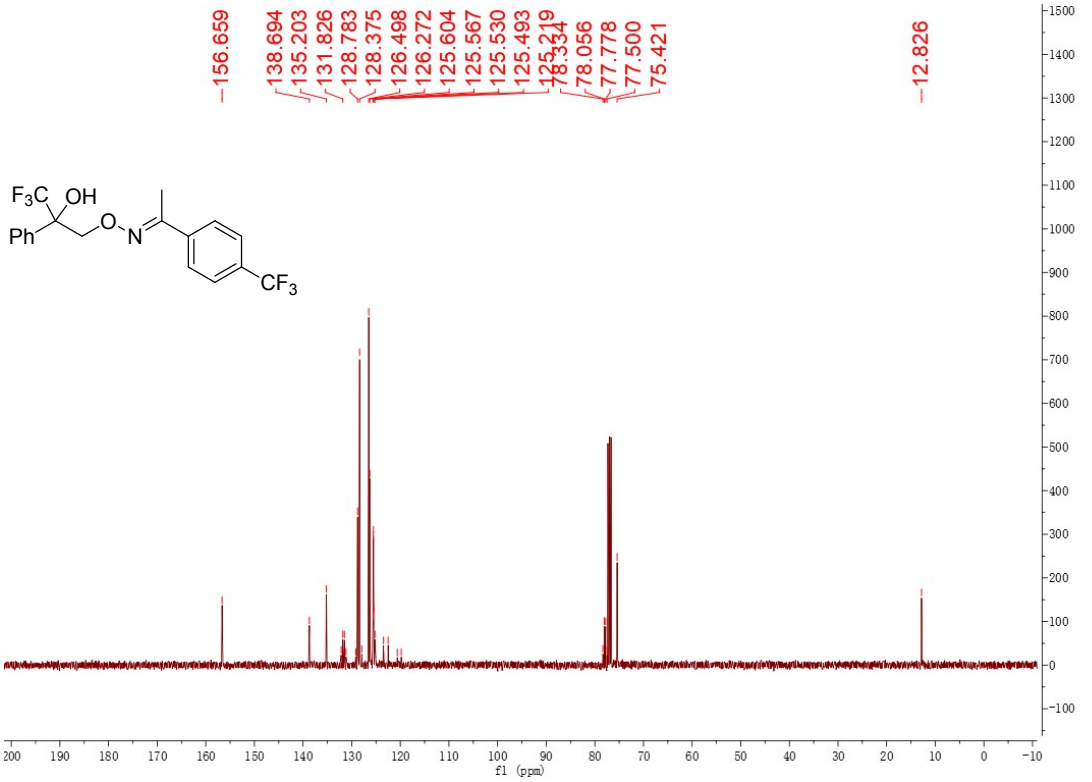
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3ae



^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3af

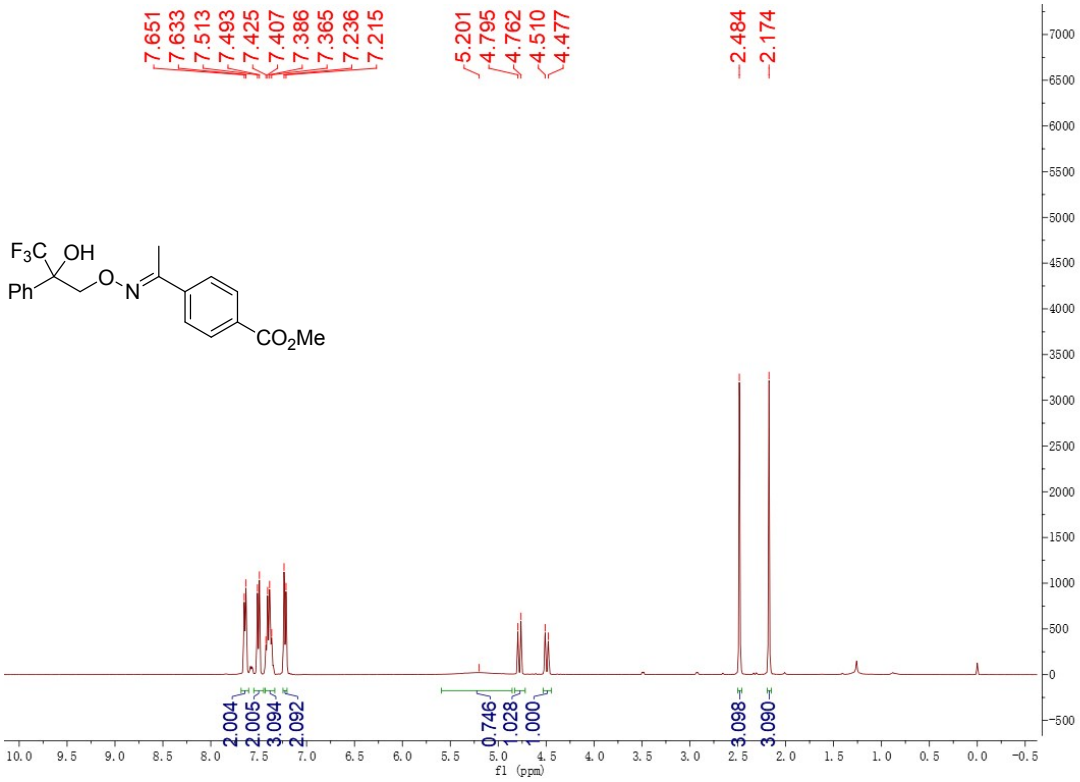


^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3af

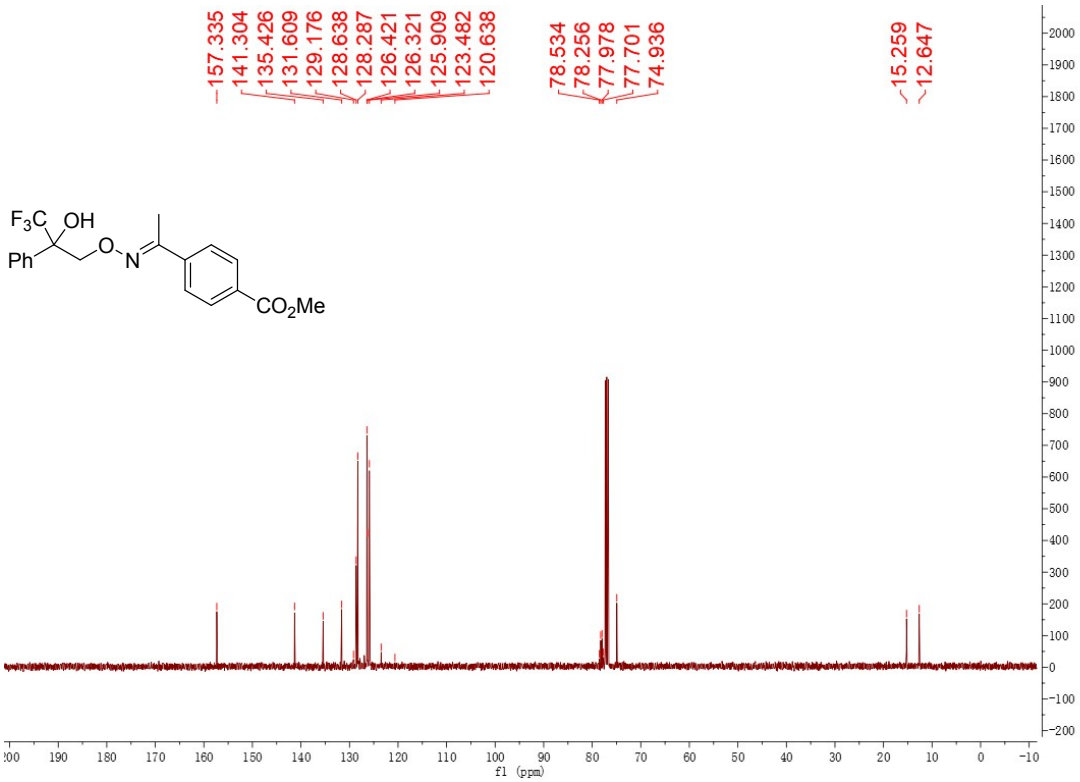


^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3af

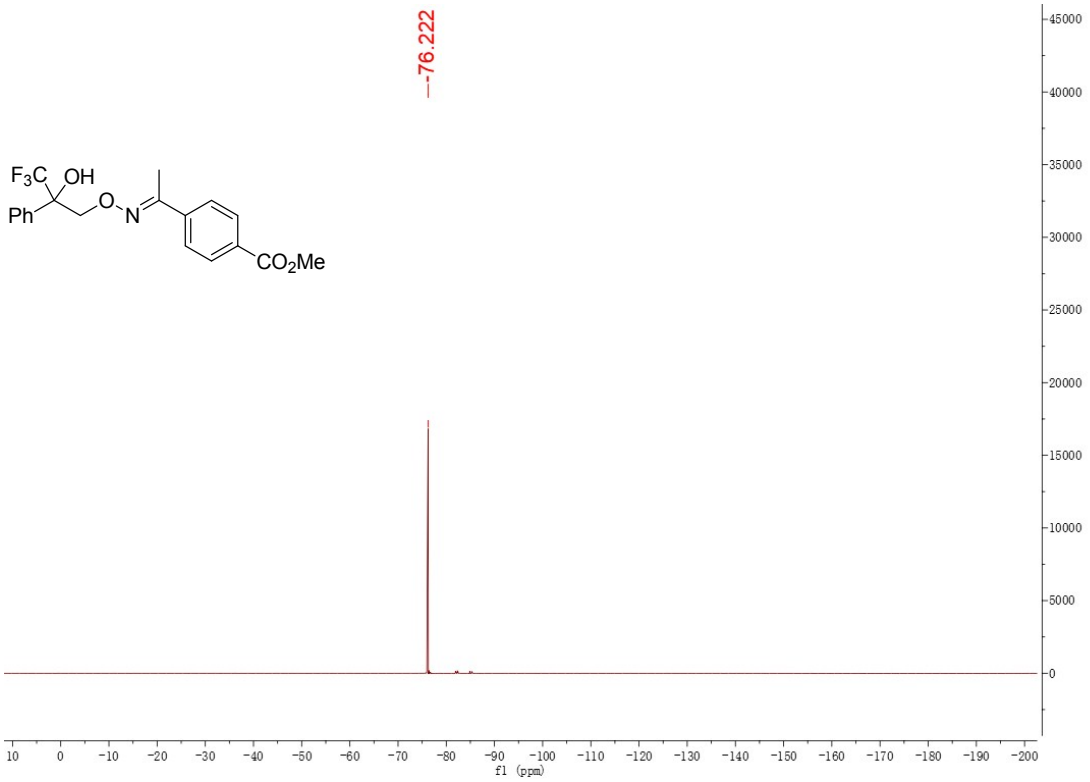
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3ag



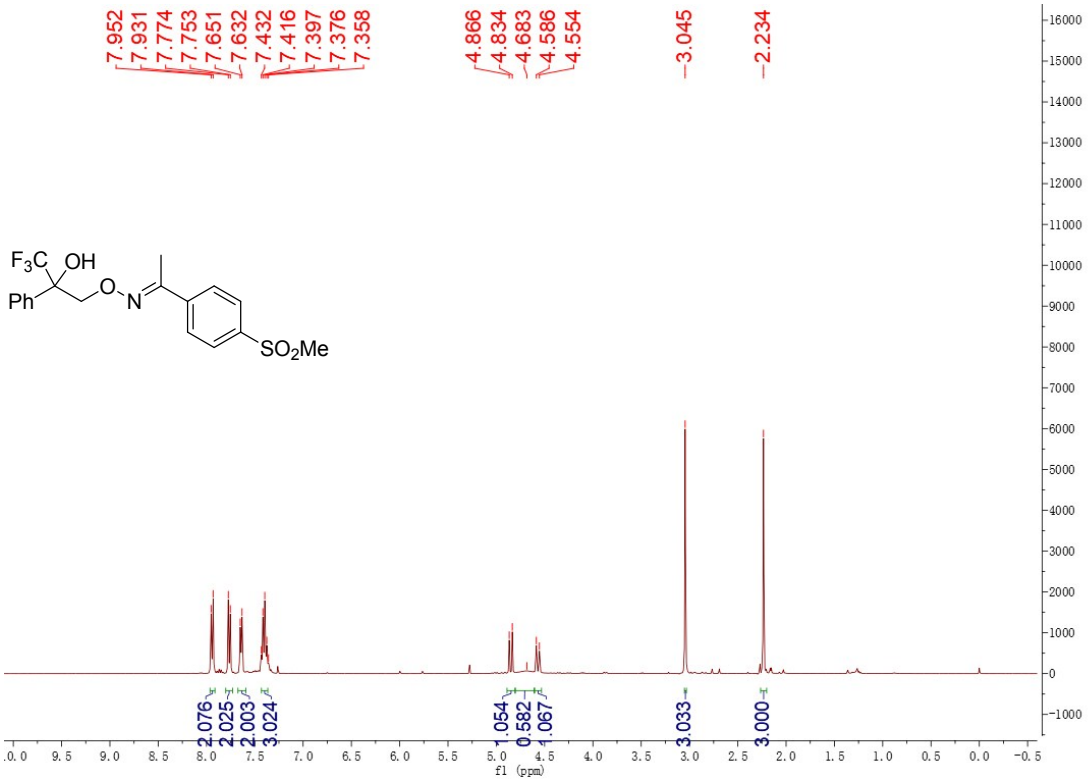
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3ag



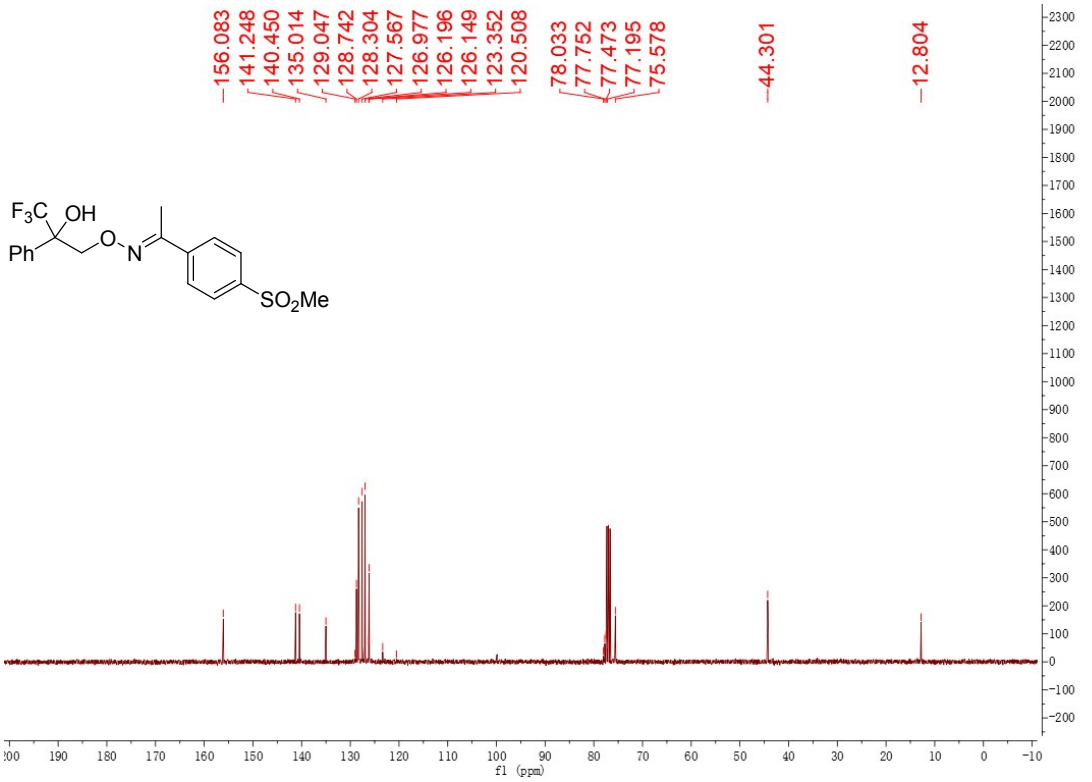
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3ag



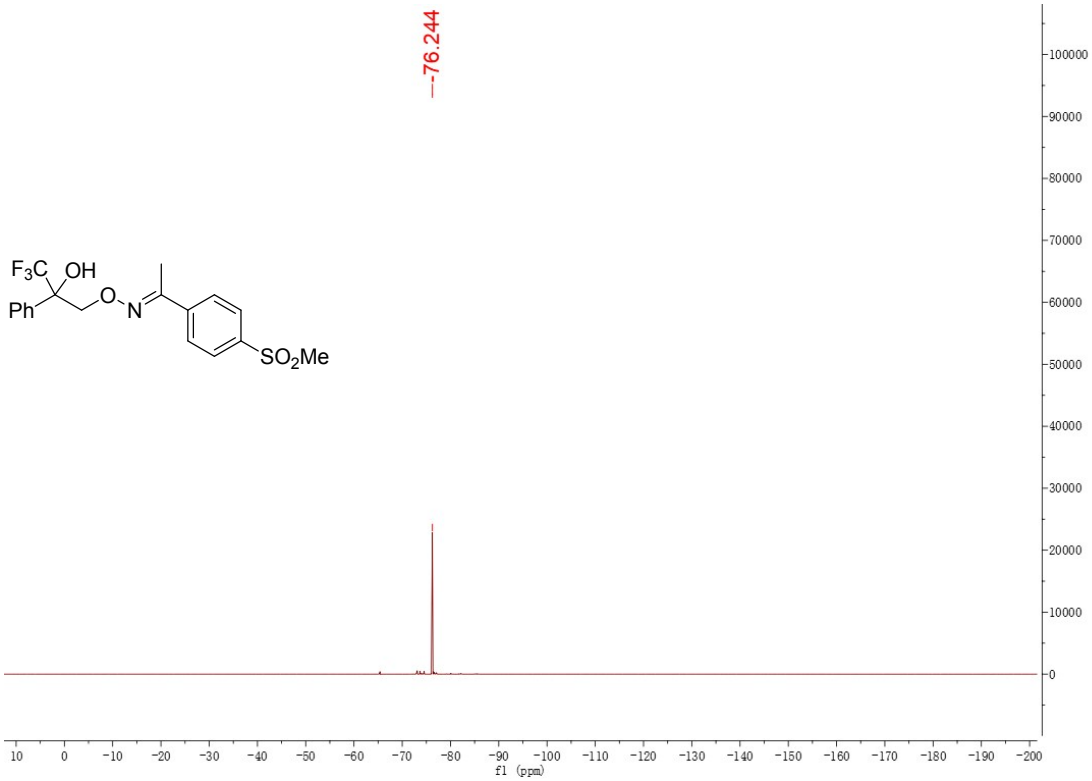
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3ah



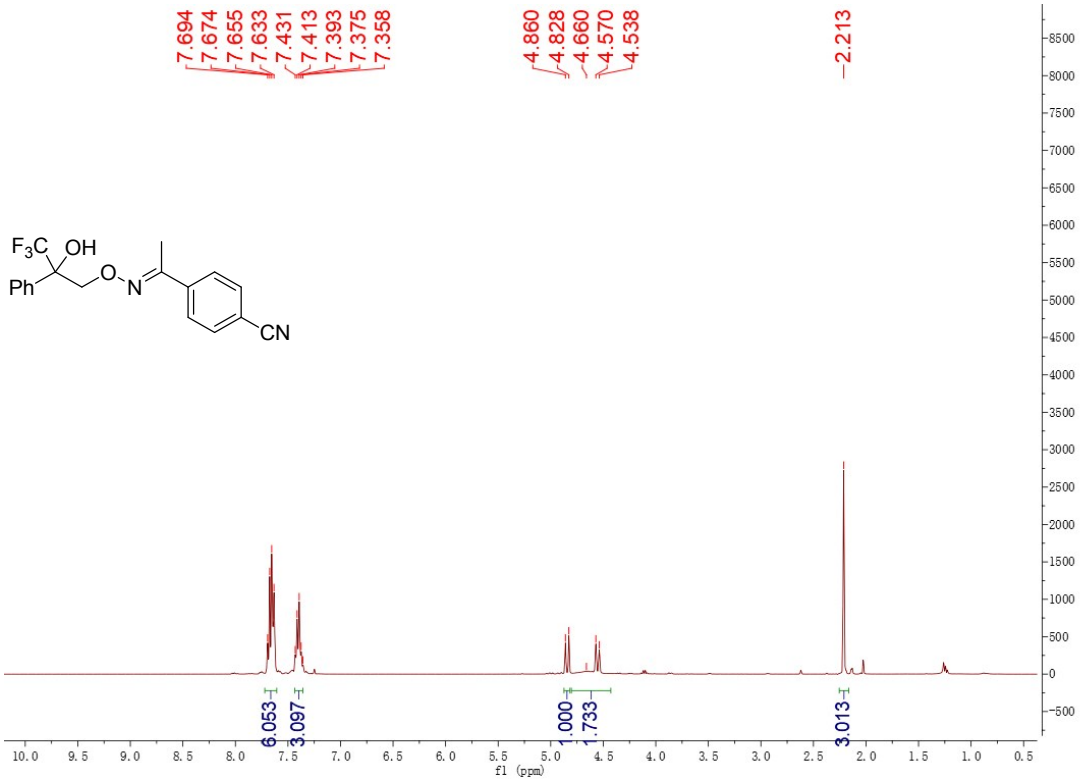
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3ah



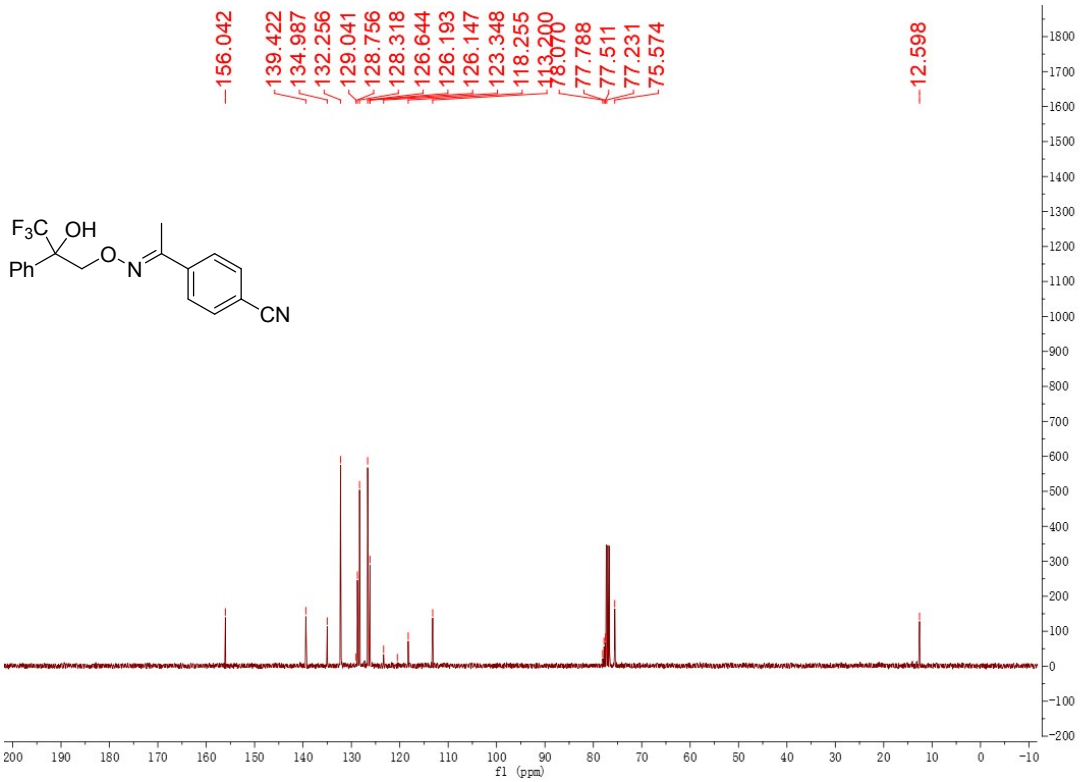
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3ah



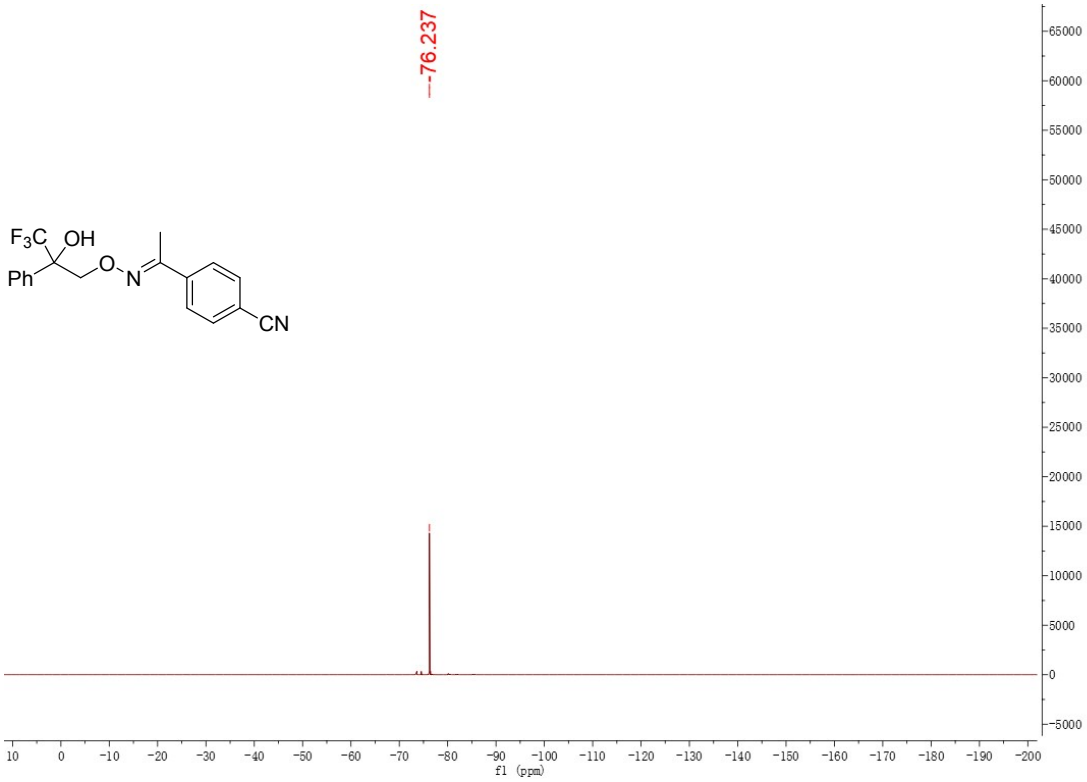
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3ai



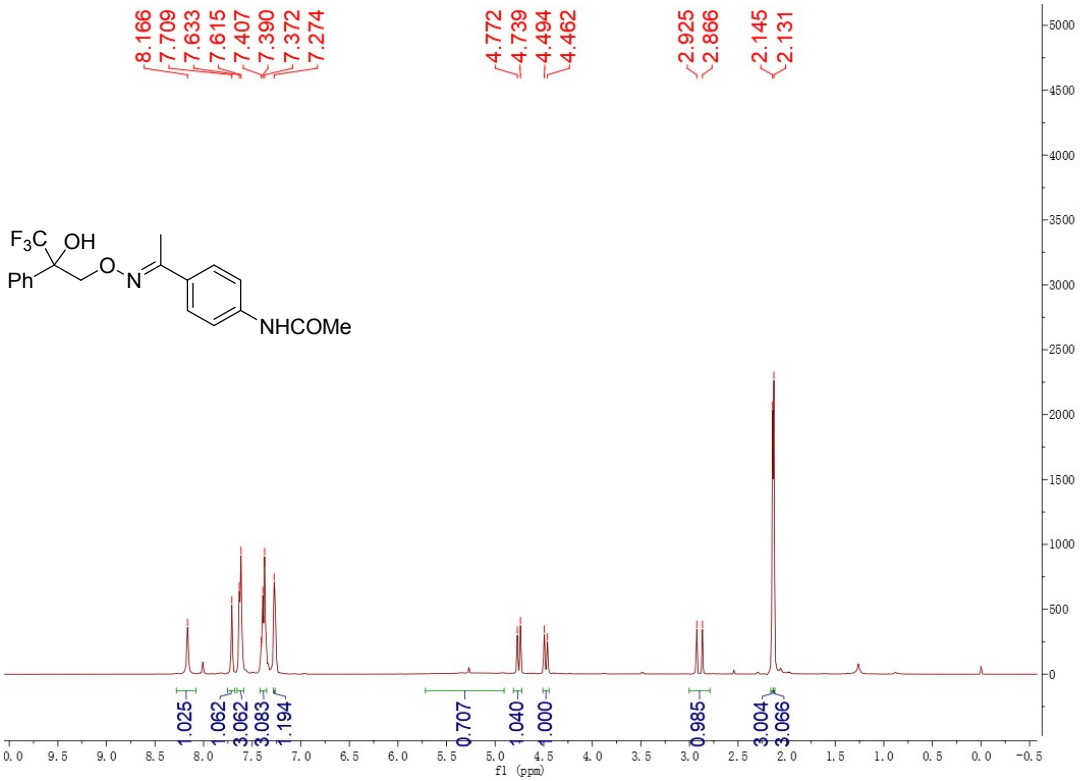
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3ai



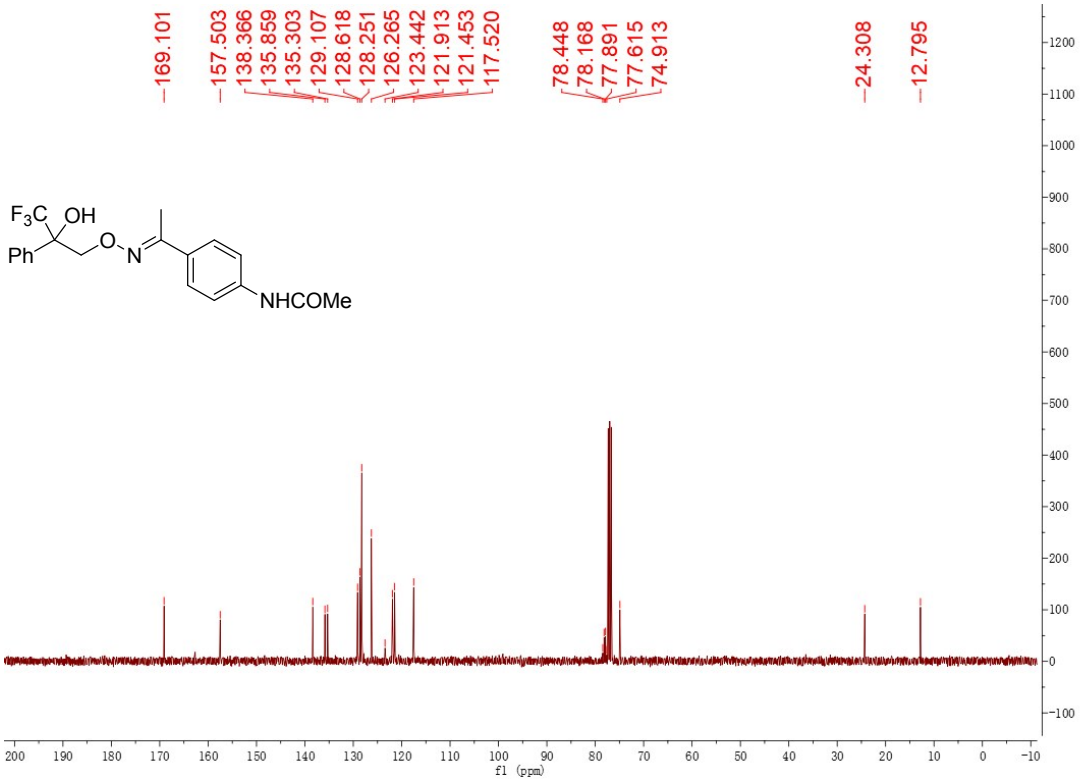
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3ai



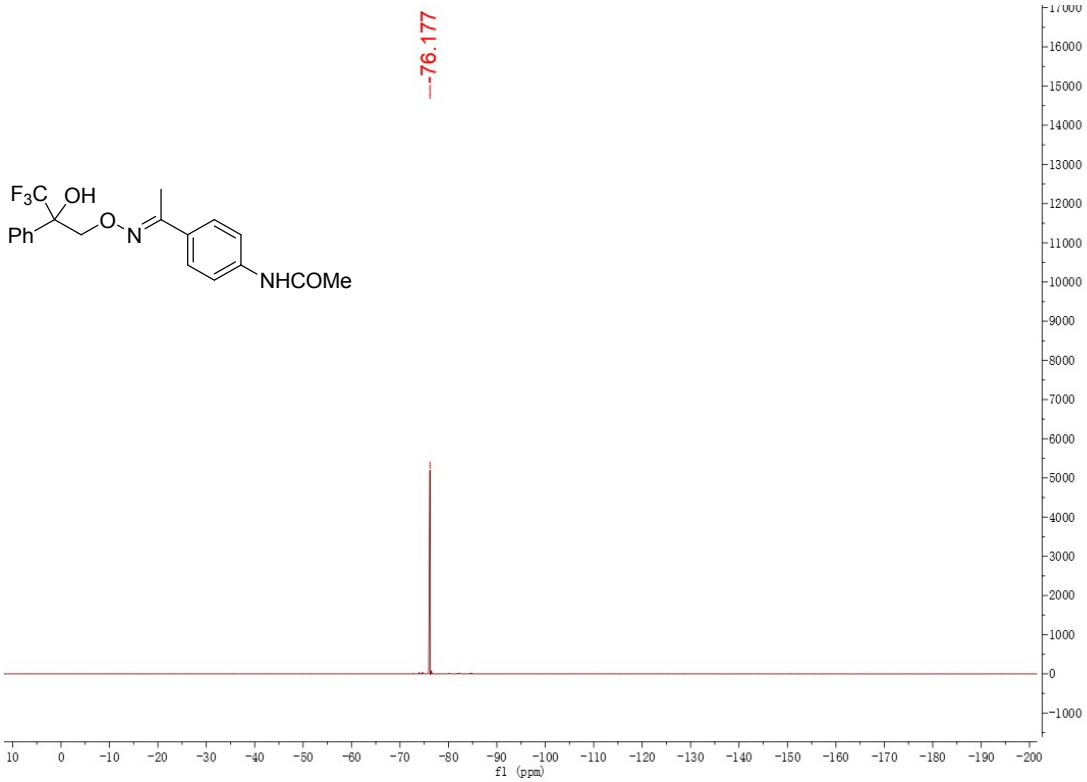
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3aj



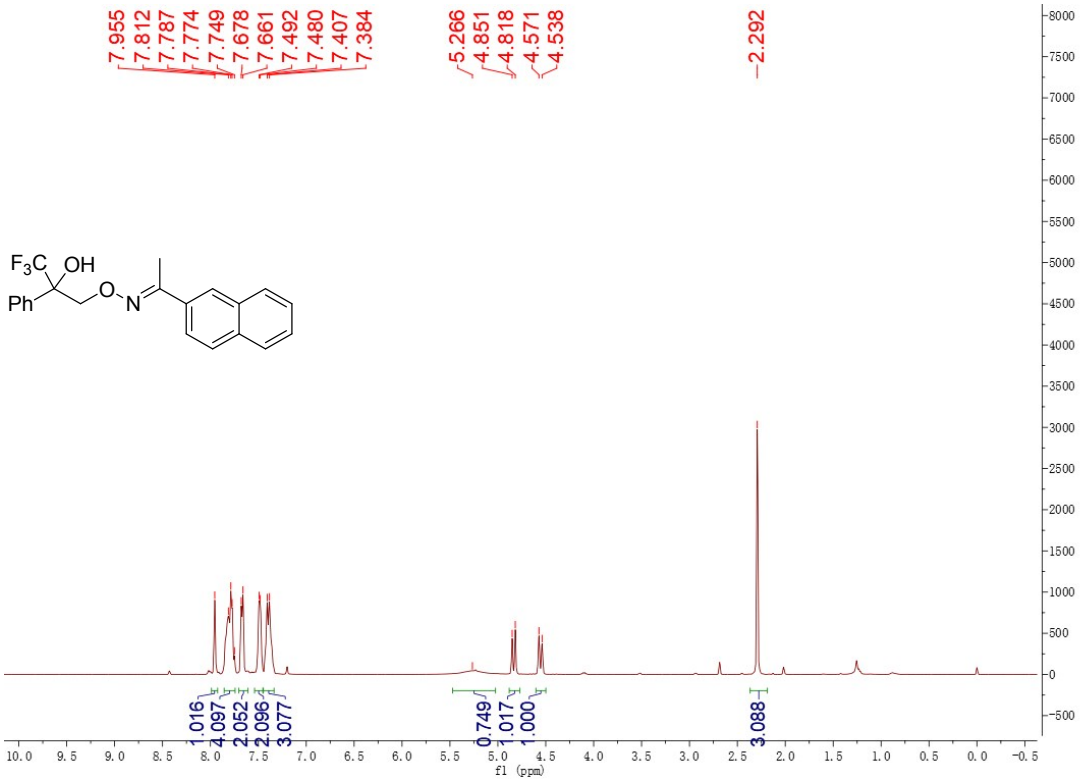
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3aj



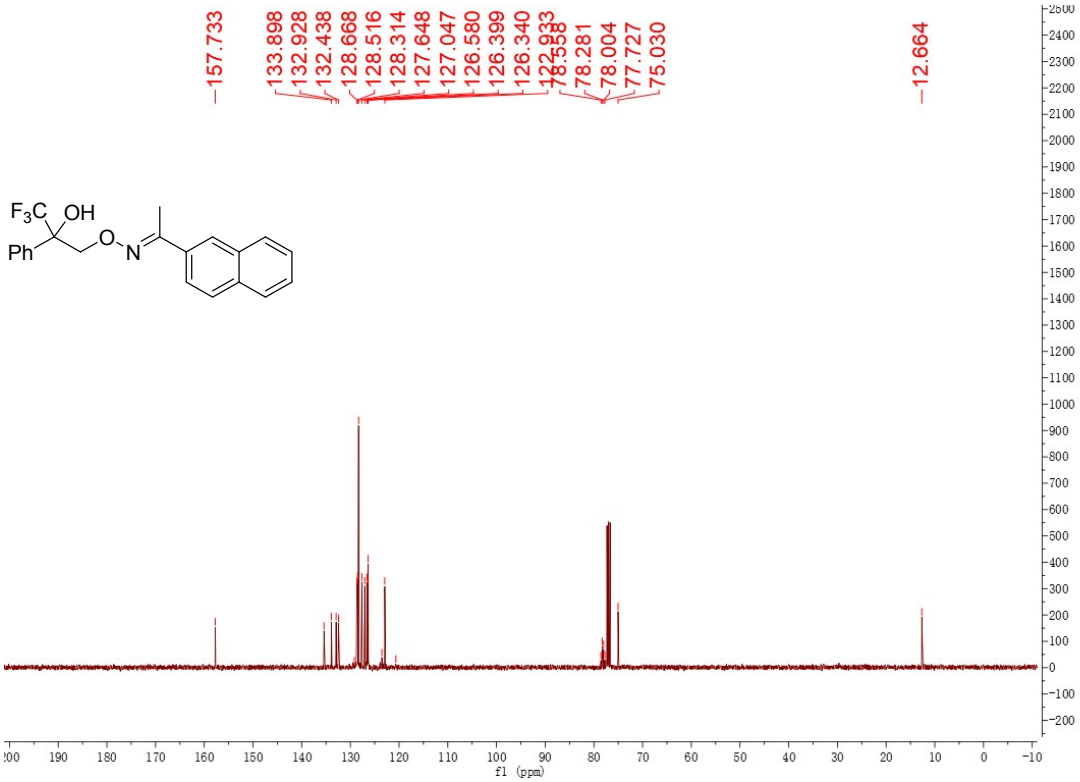
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3aj



^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3ak

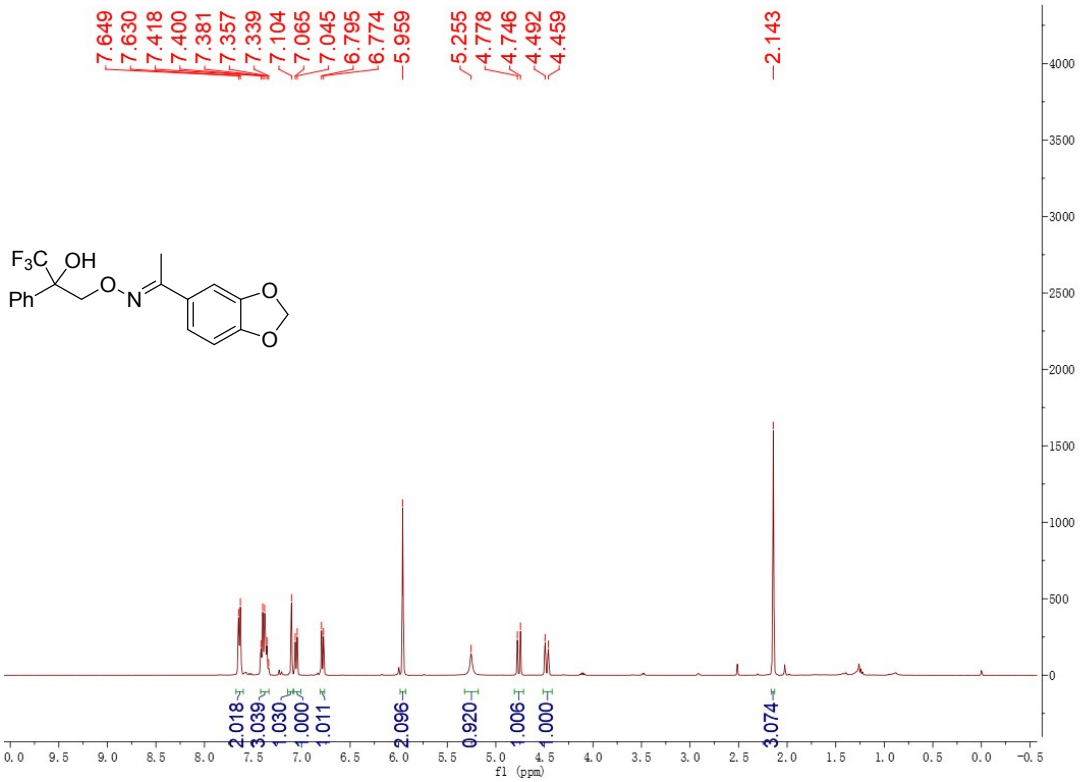


^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3ak

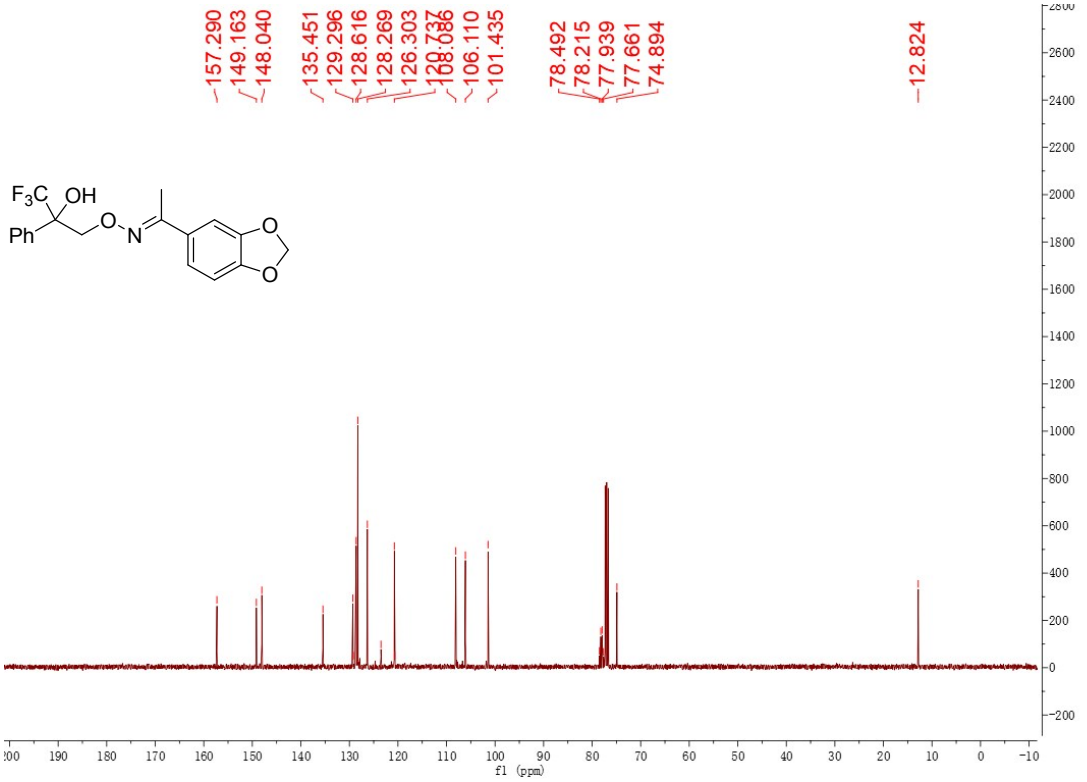


^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3ak

^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3al

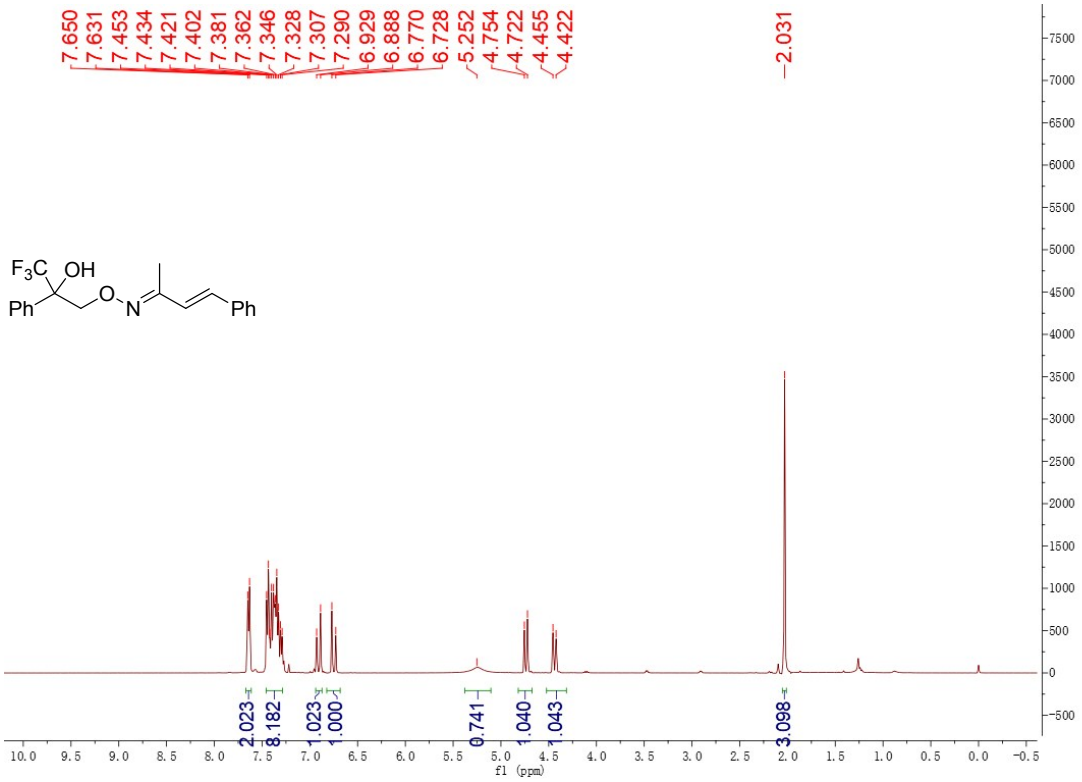


^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3al

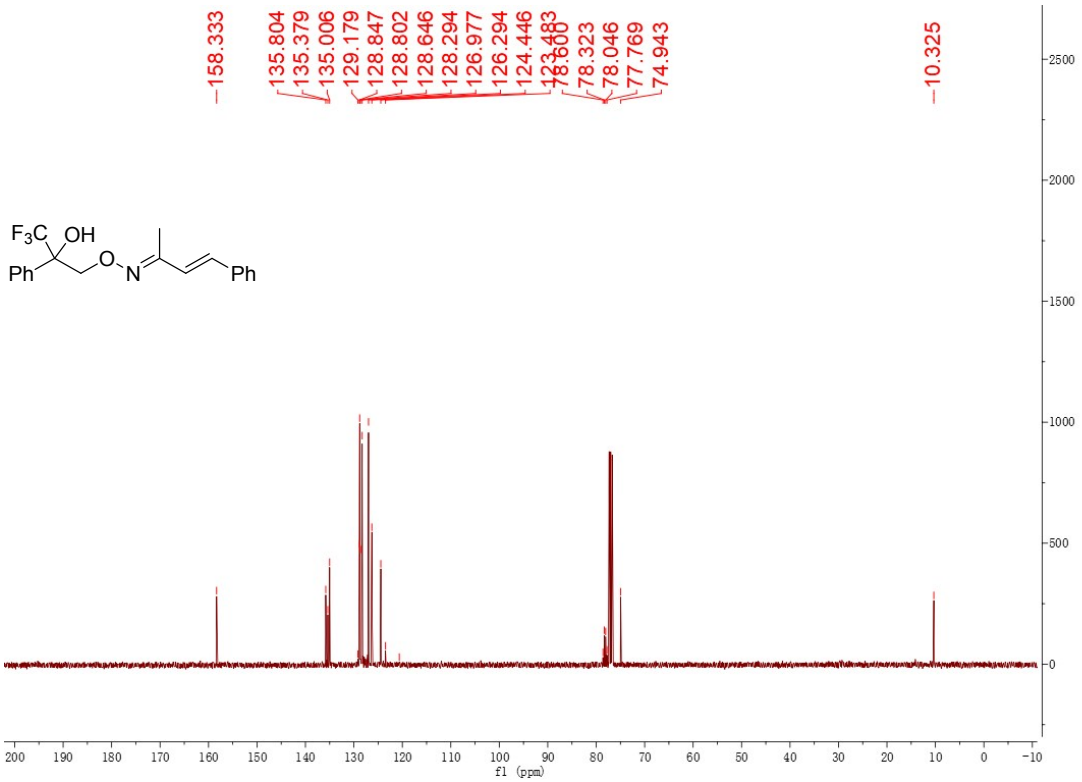


^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3al

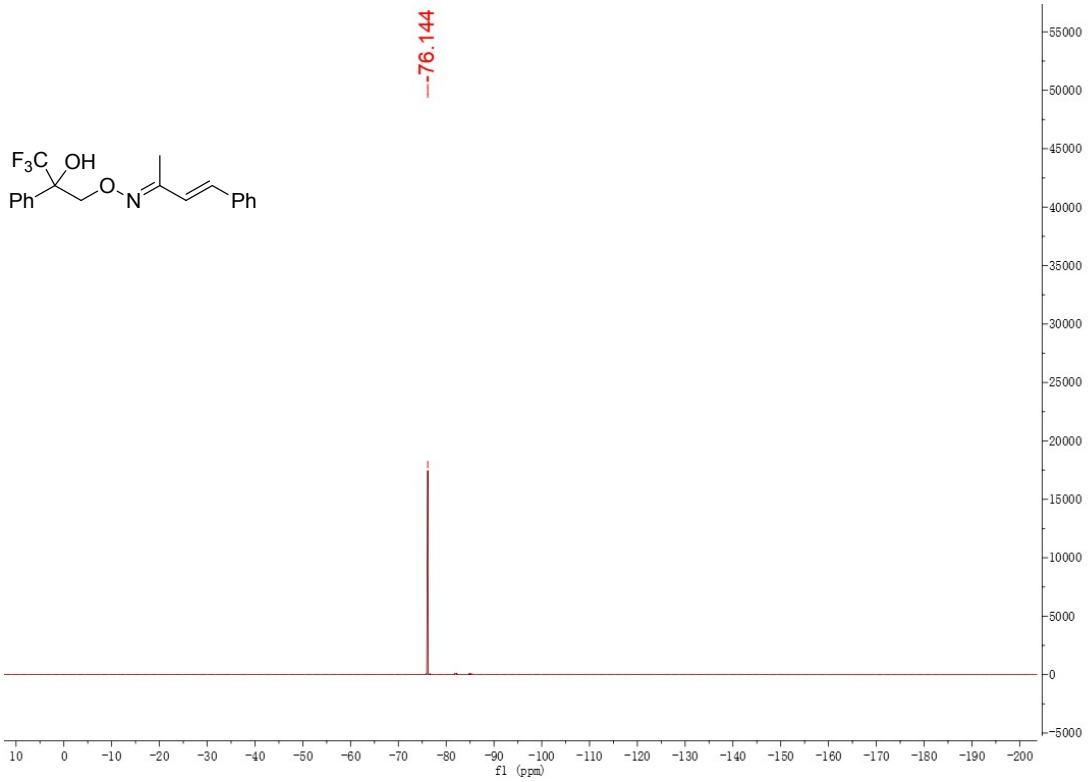
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3am



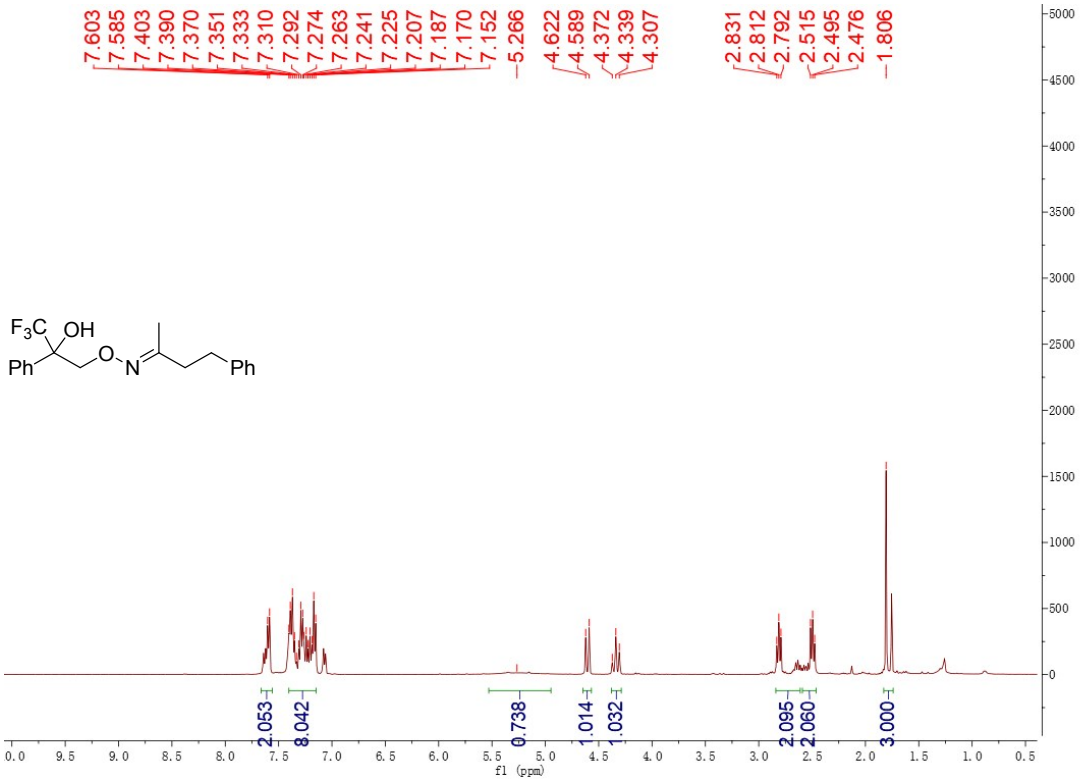
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3am



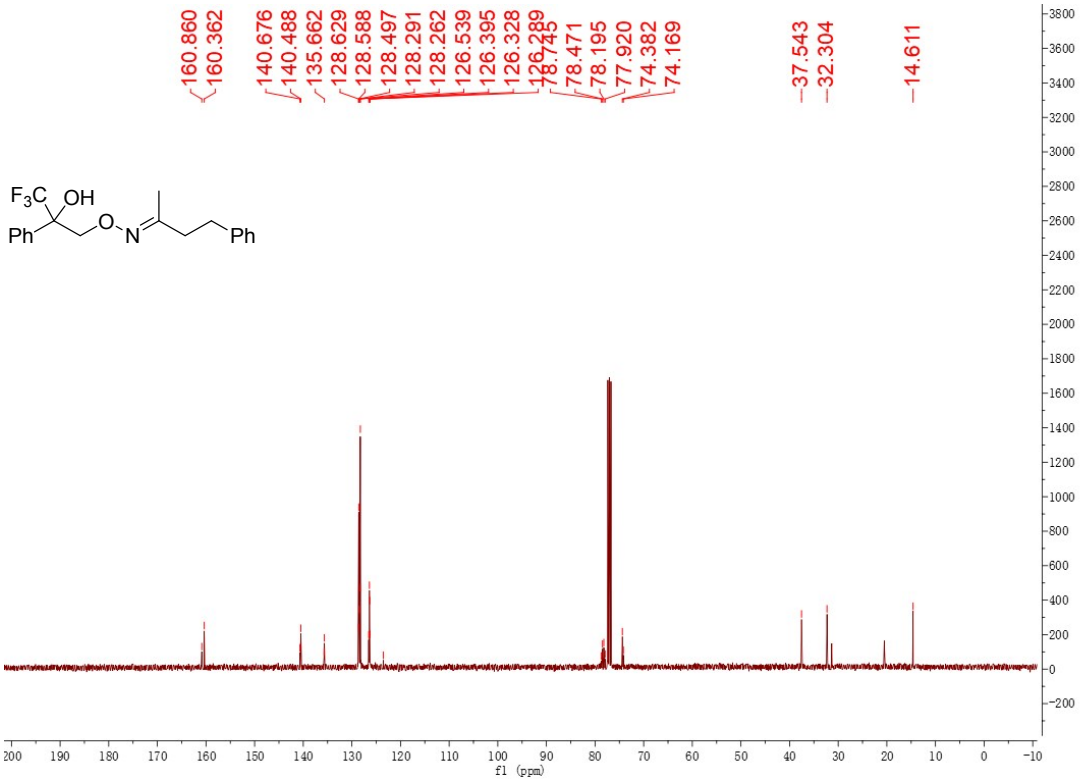
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3am



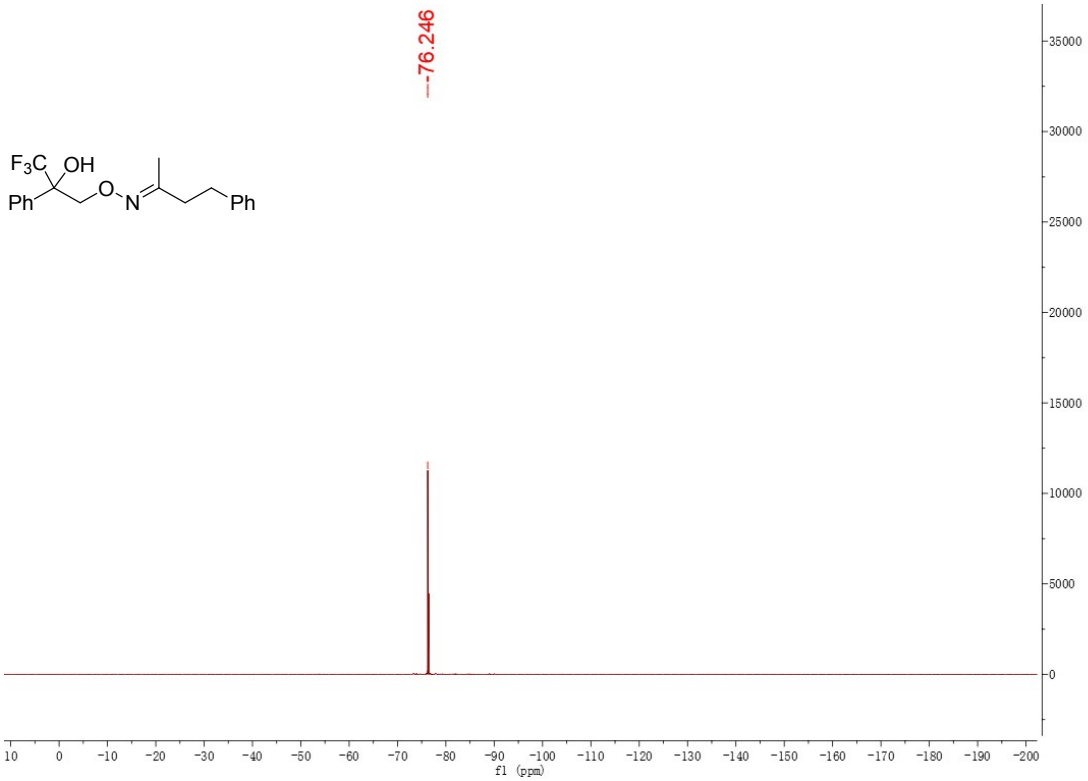
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3an



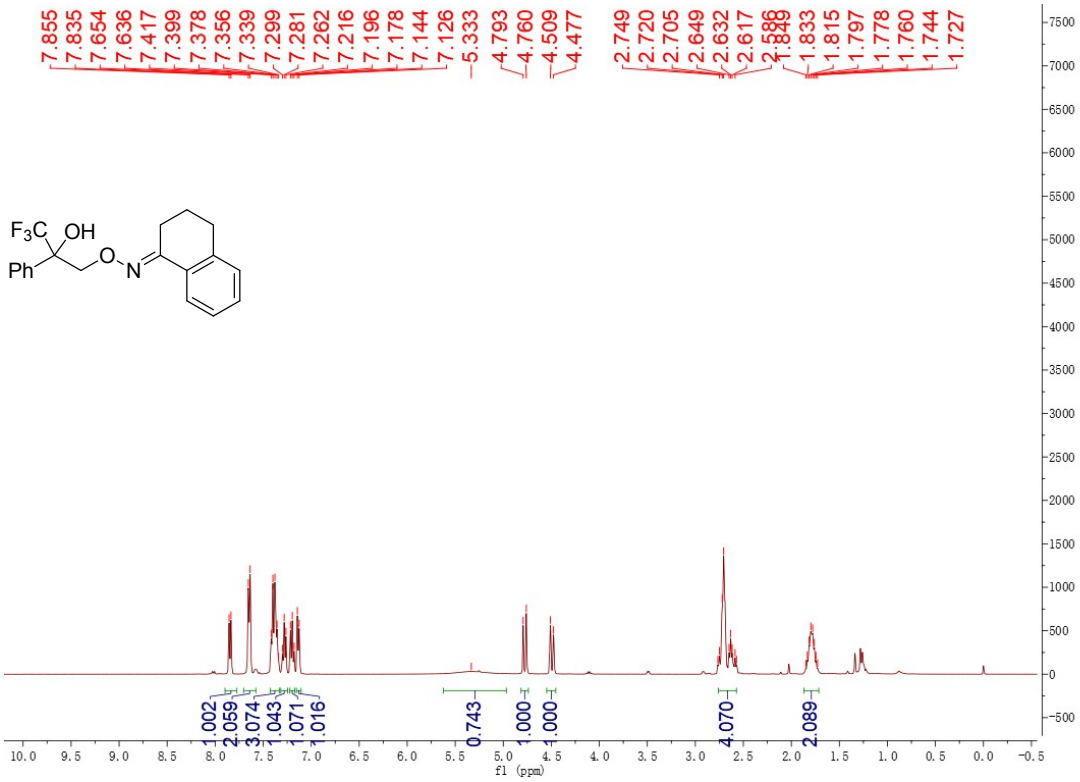
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3an



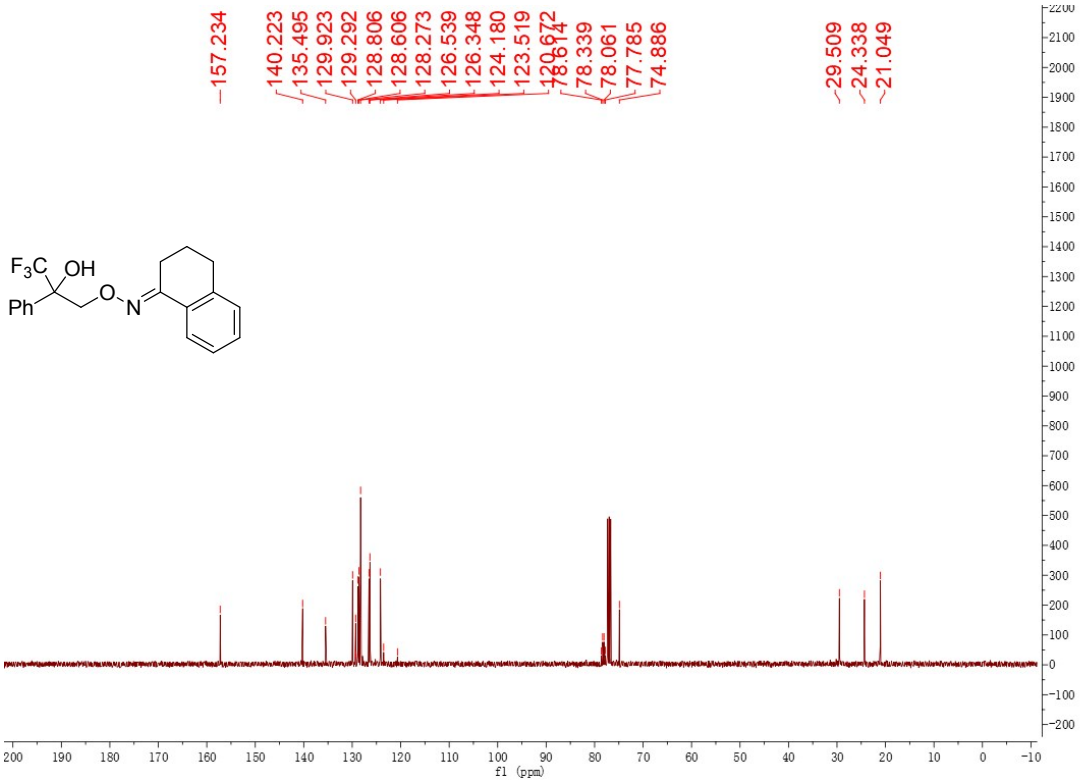
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3an



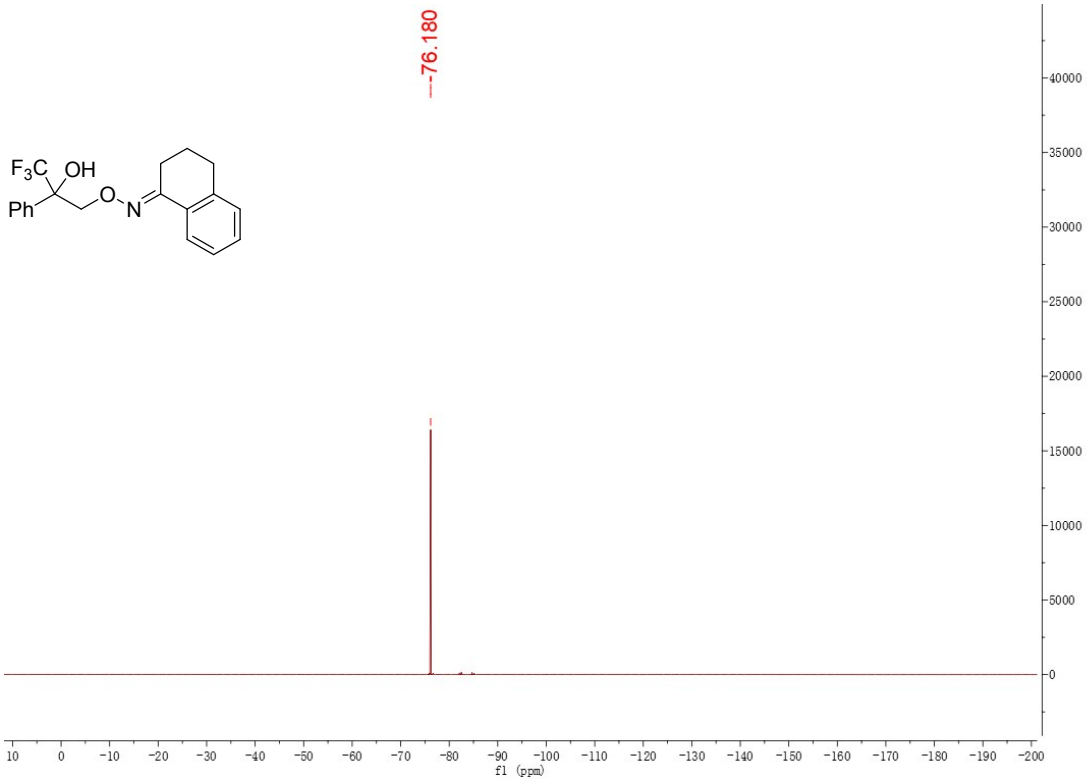
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3ao



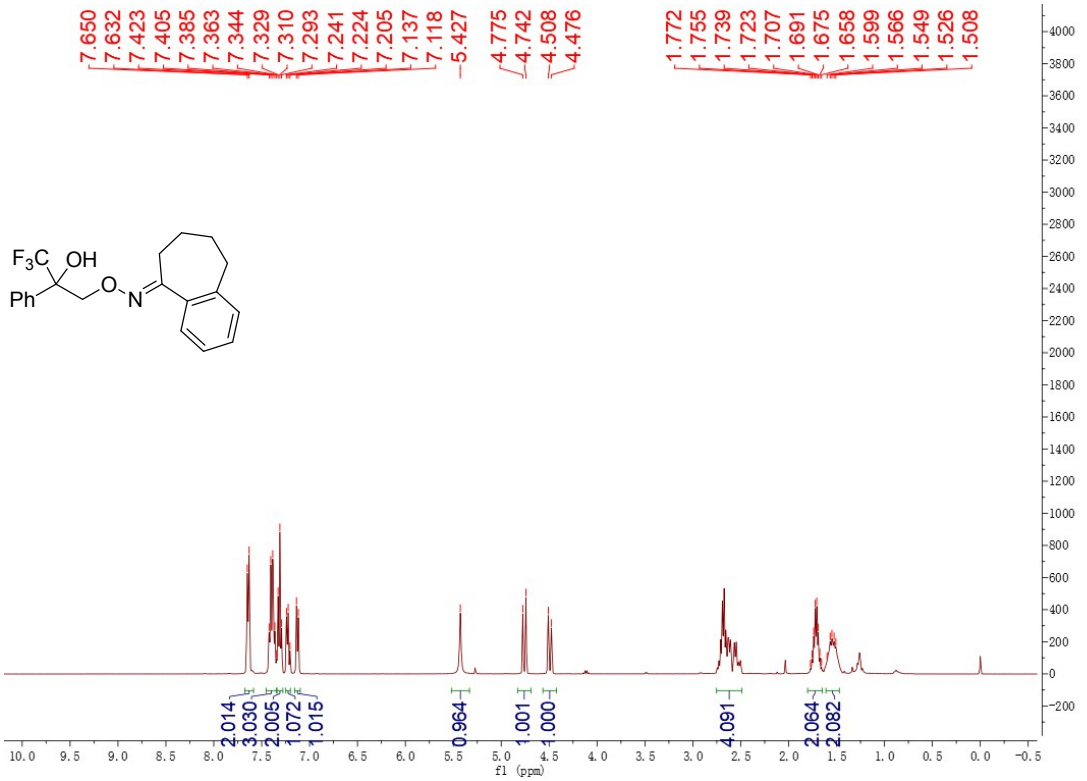
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3ao



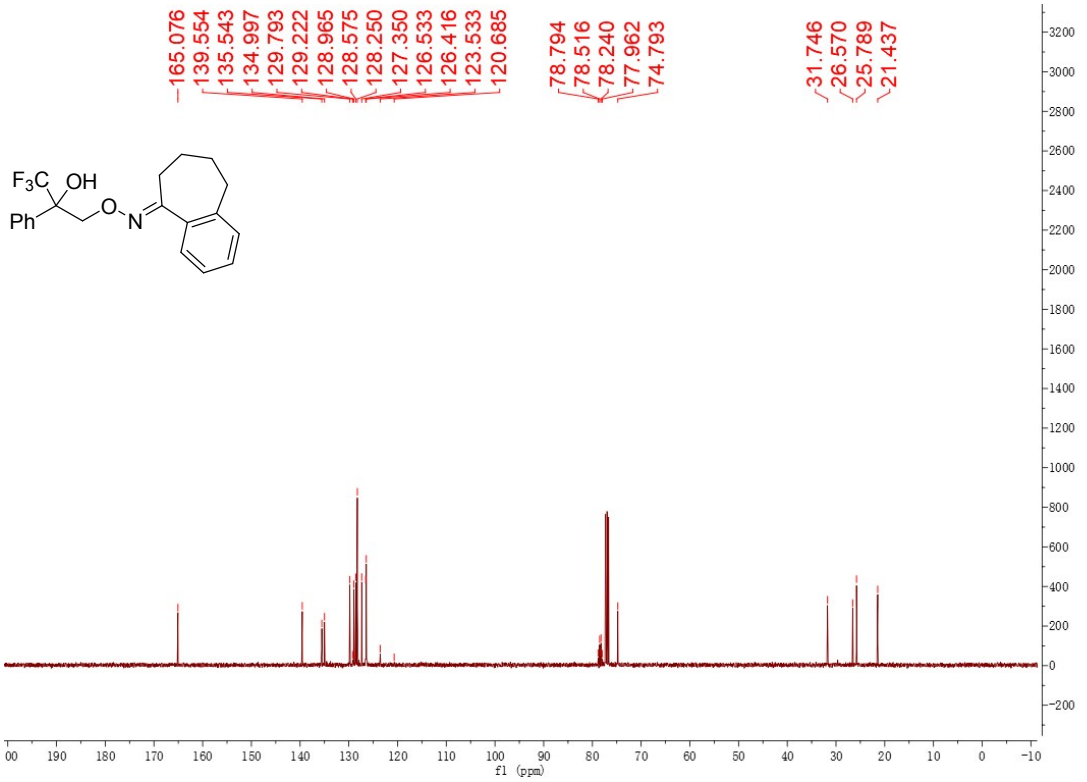
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3ao



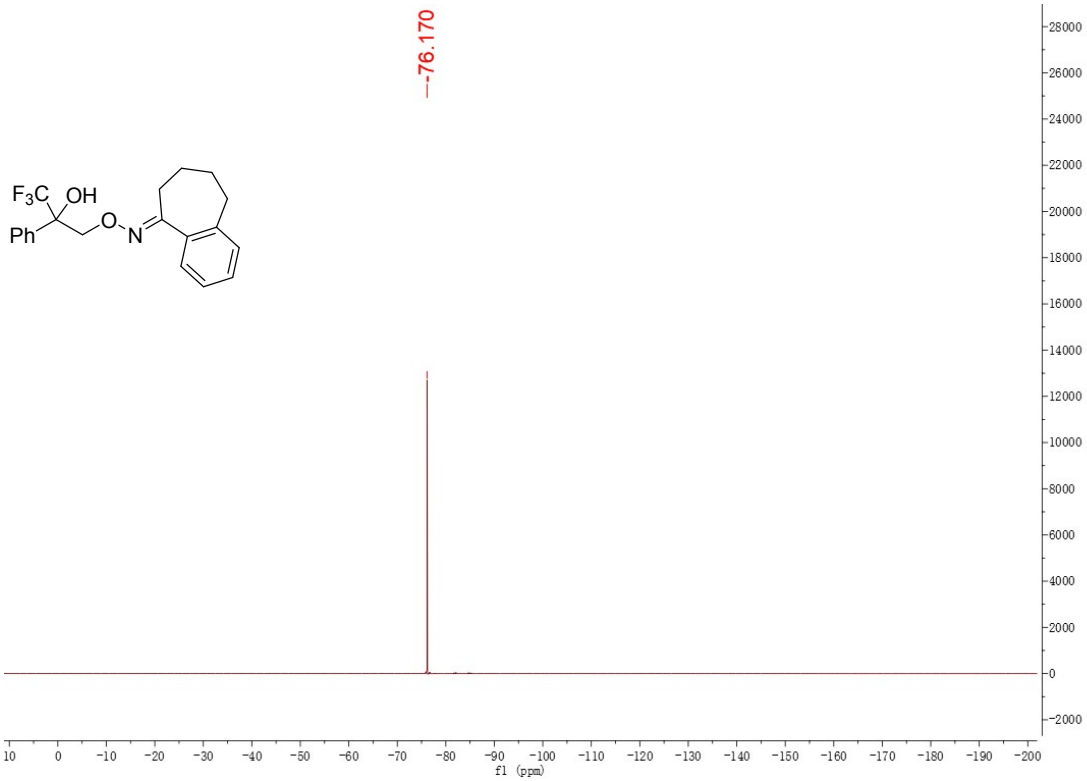
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3ap



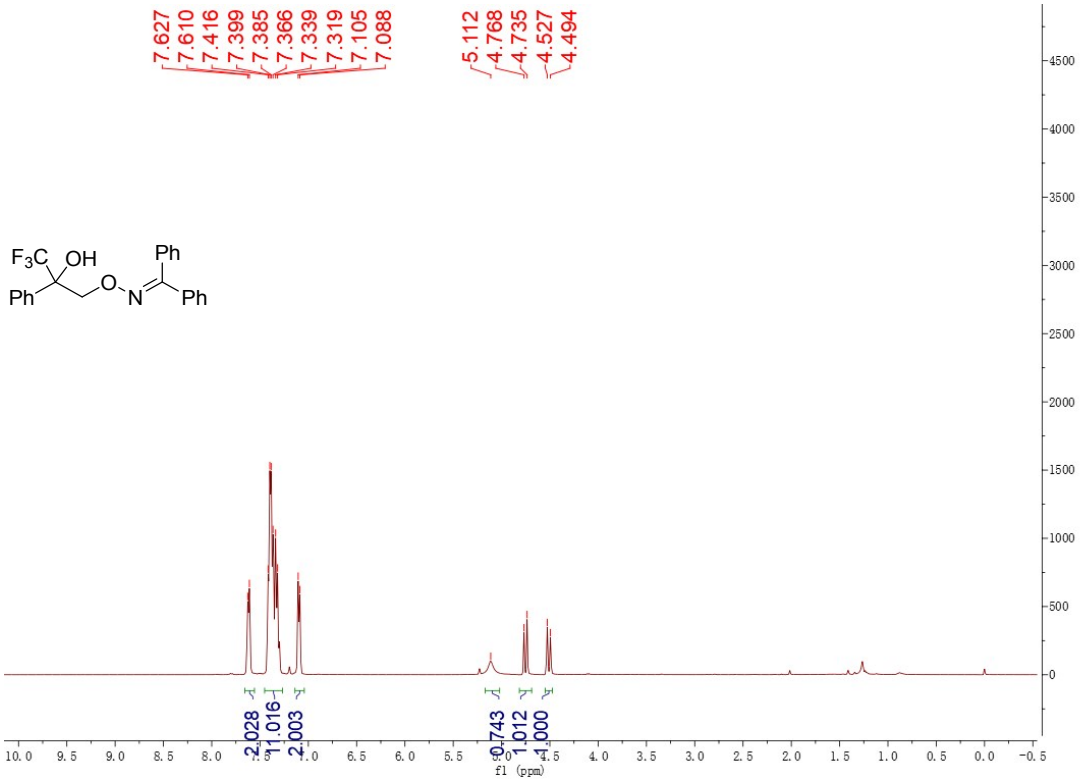
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3ap



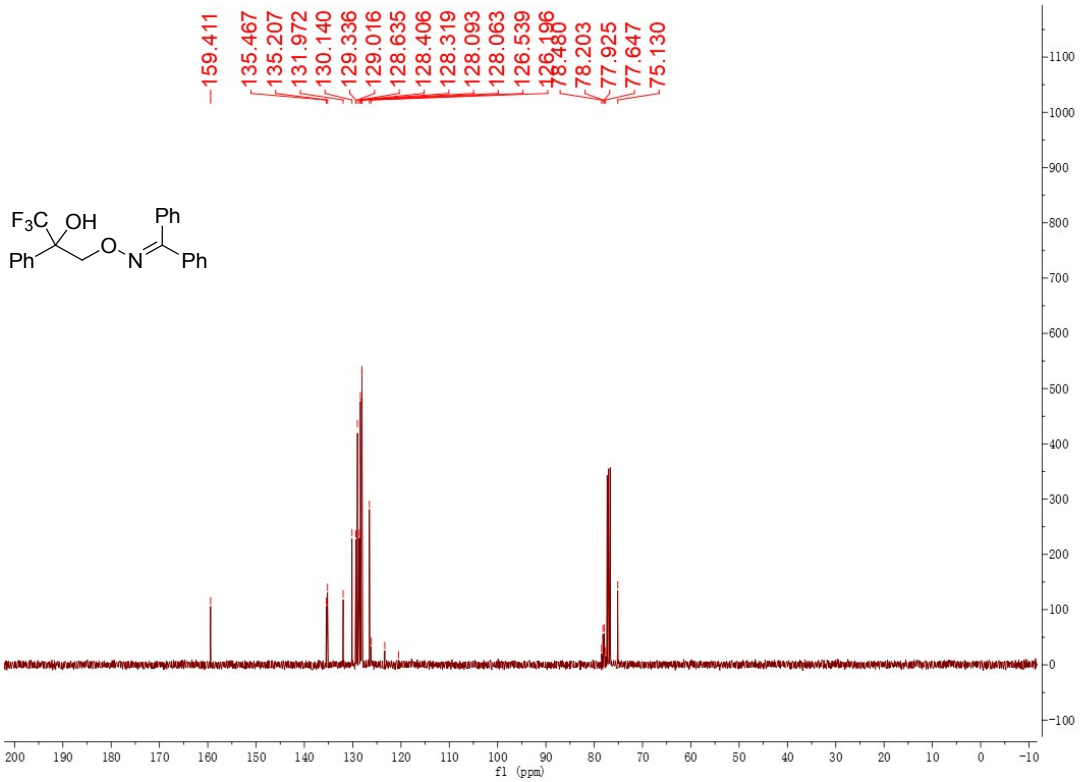
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3ap



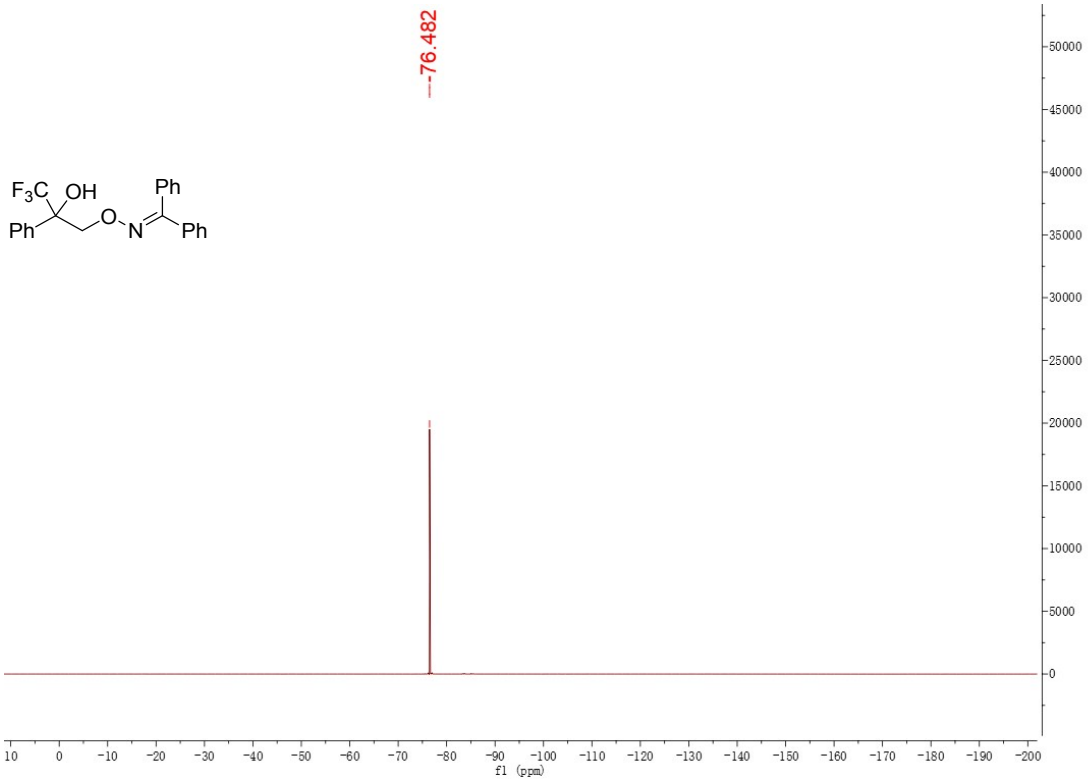
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3aq



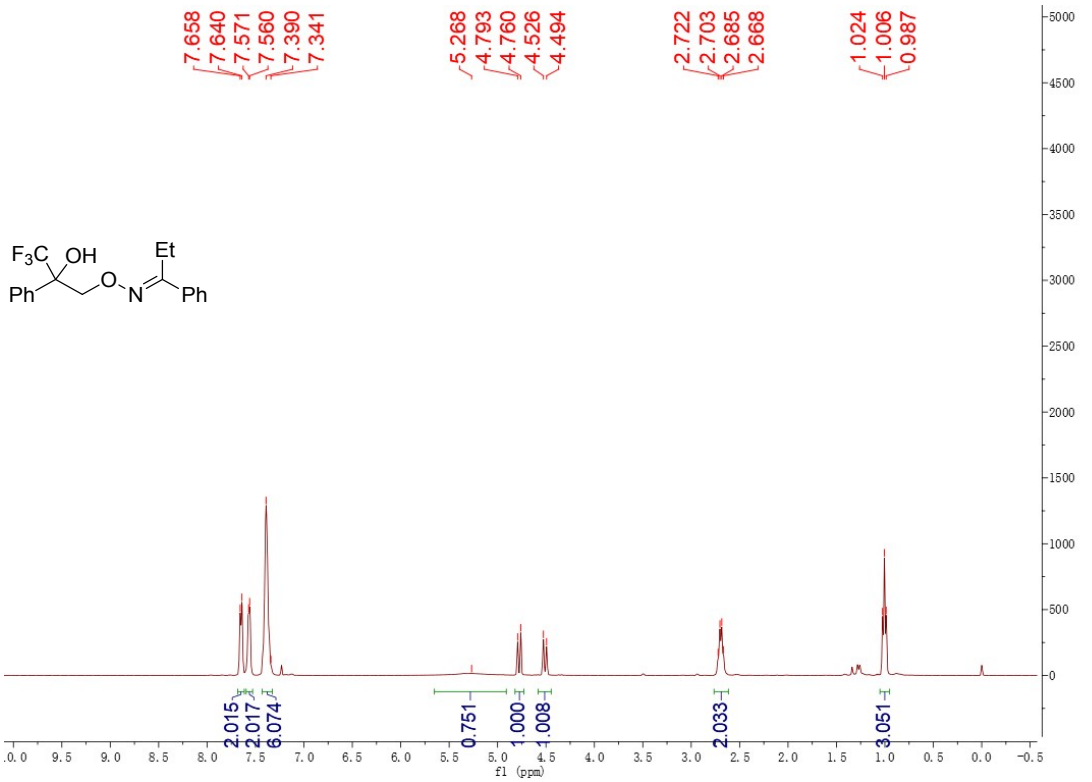
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3aq



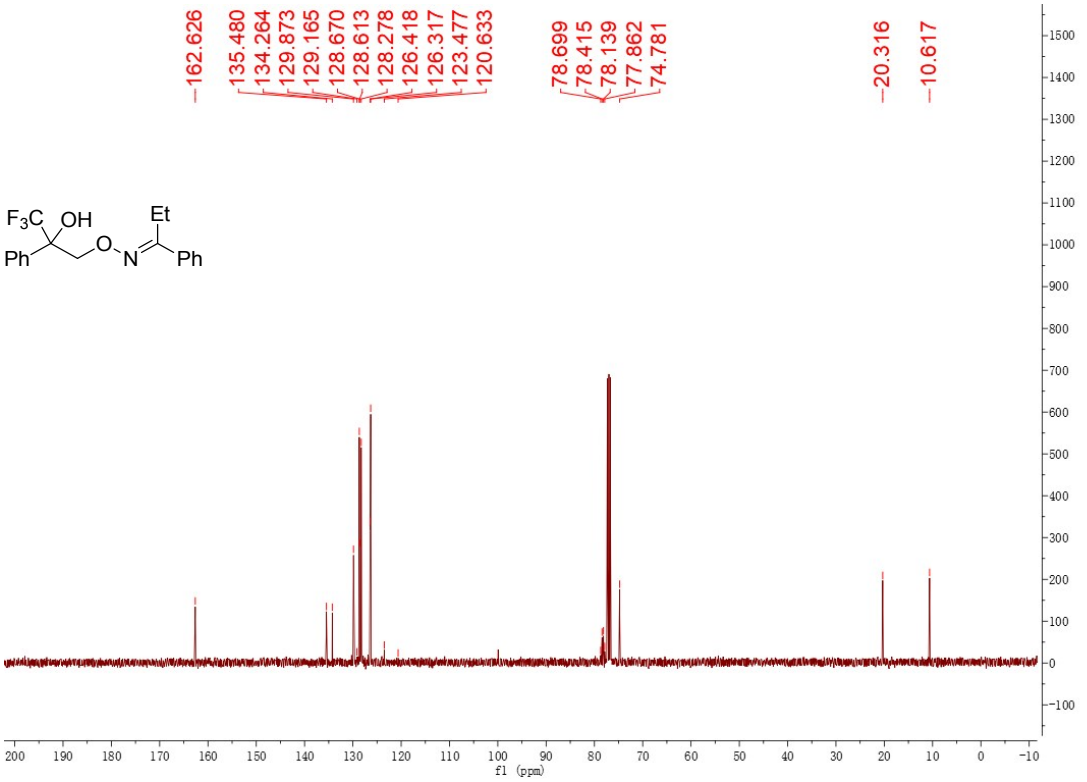
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3aq



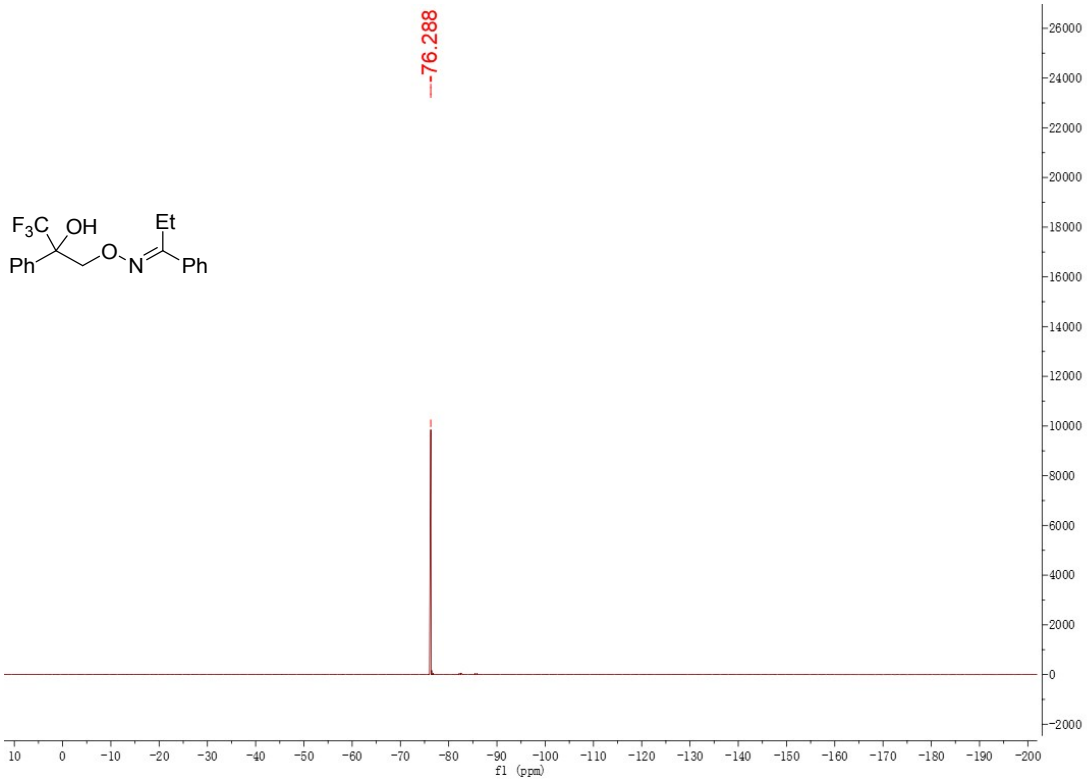
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3ar



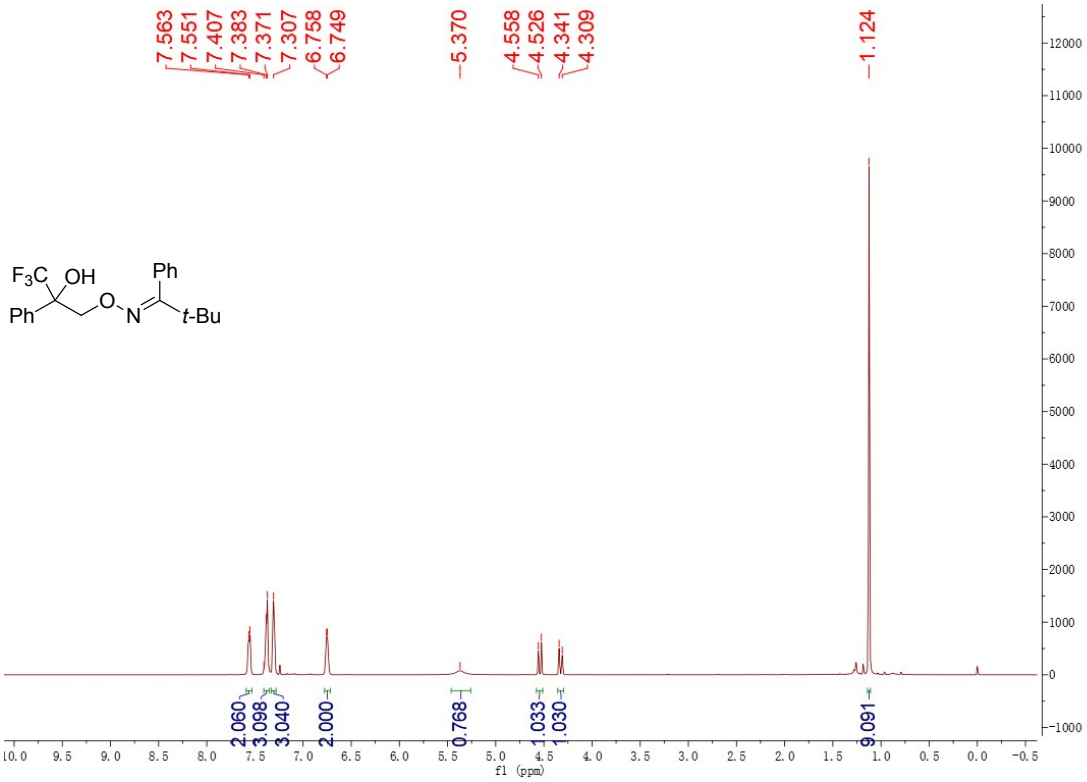
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3ar



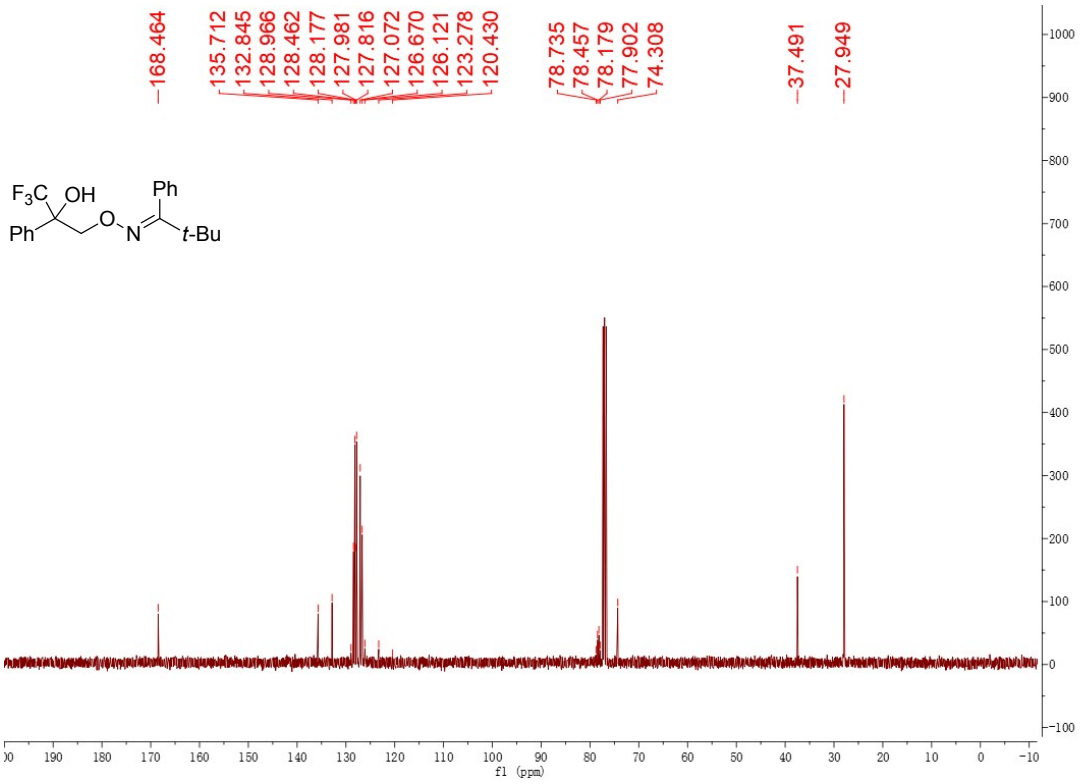
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3ar



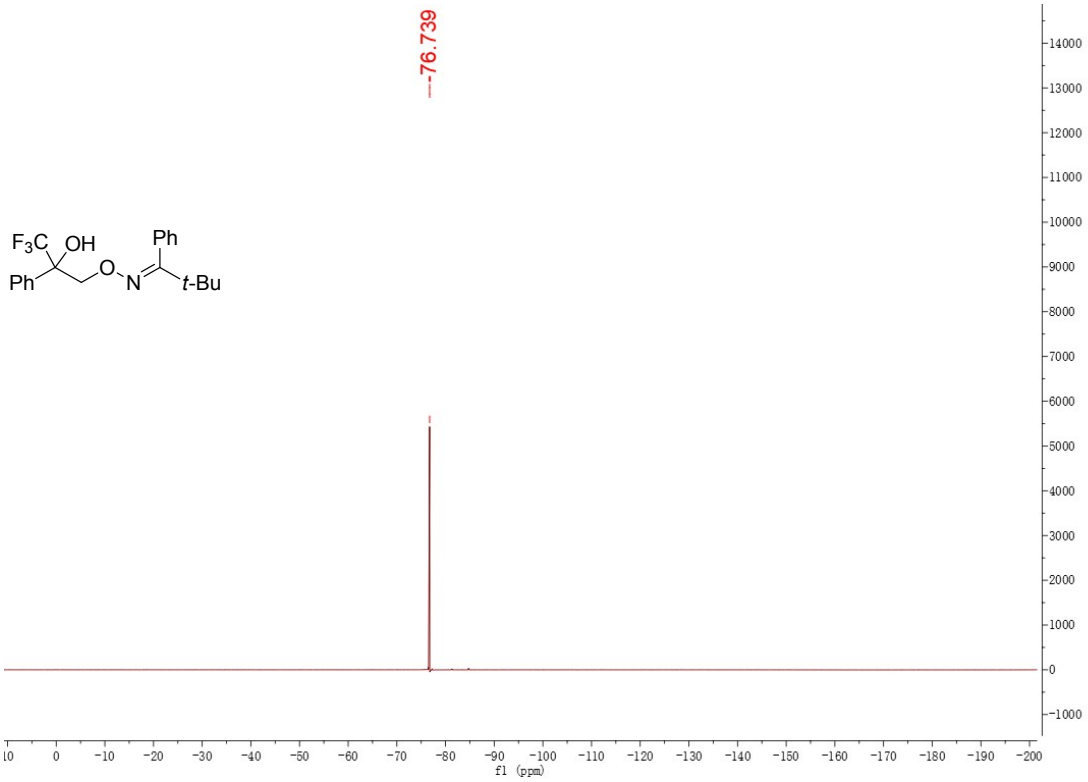
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3as



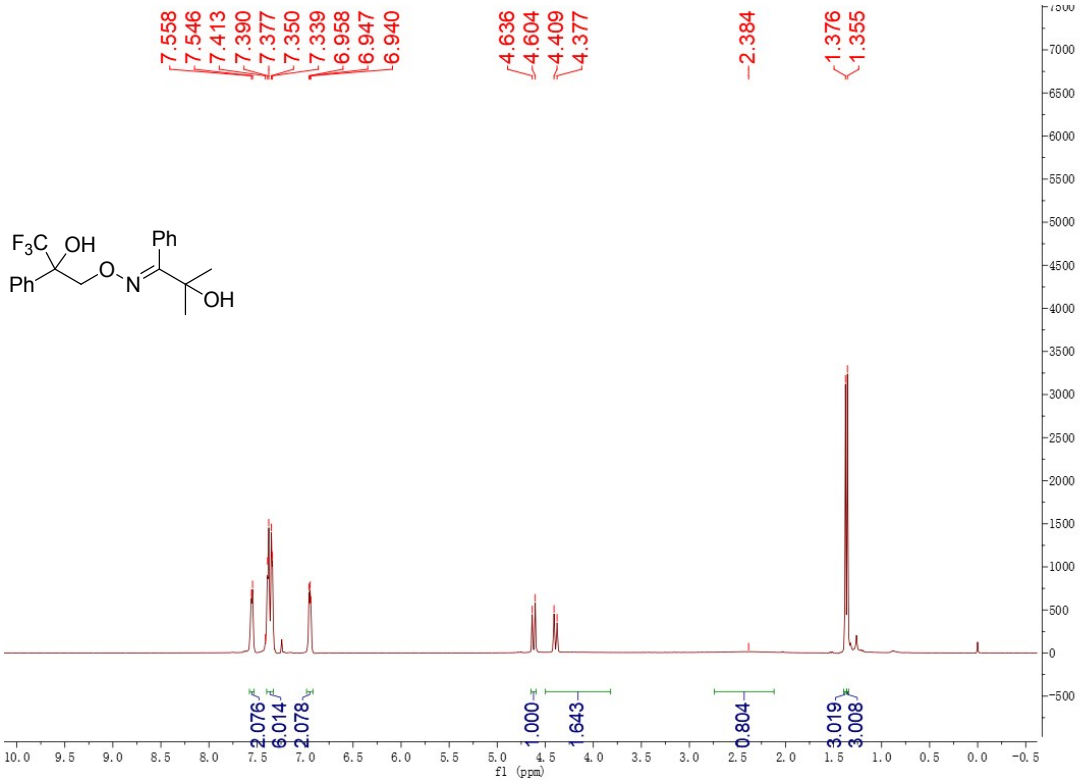
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3as



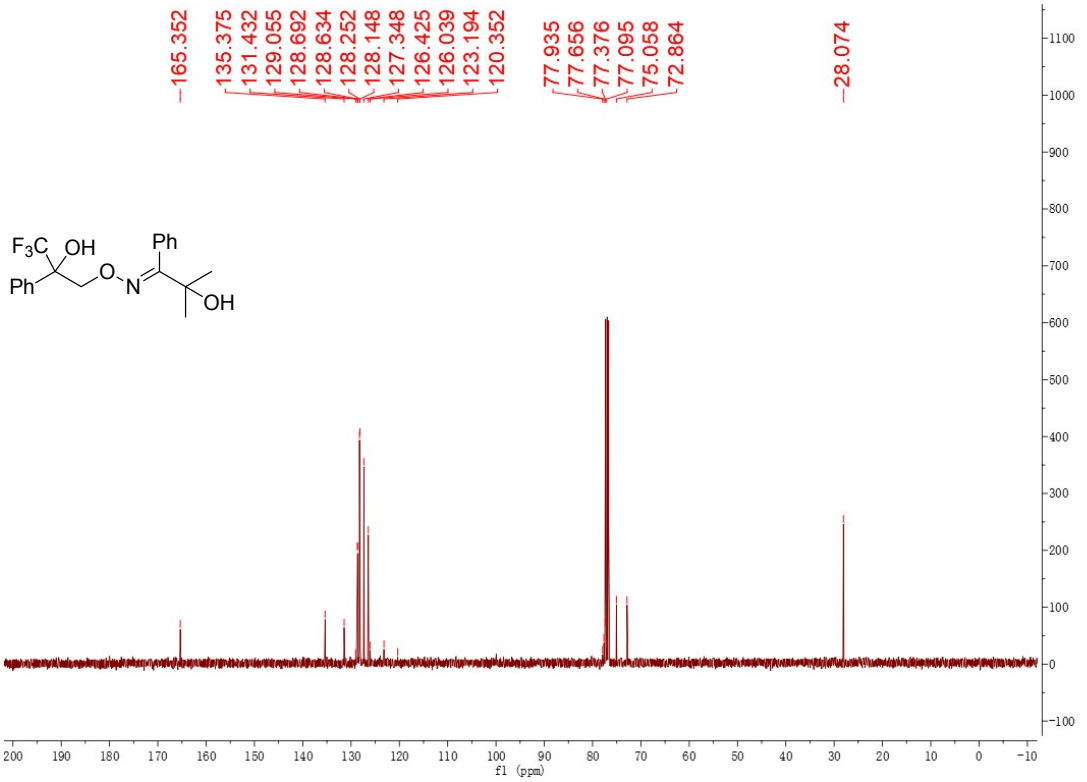
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3as



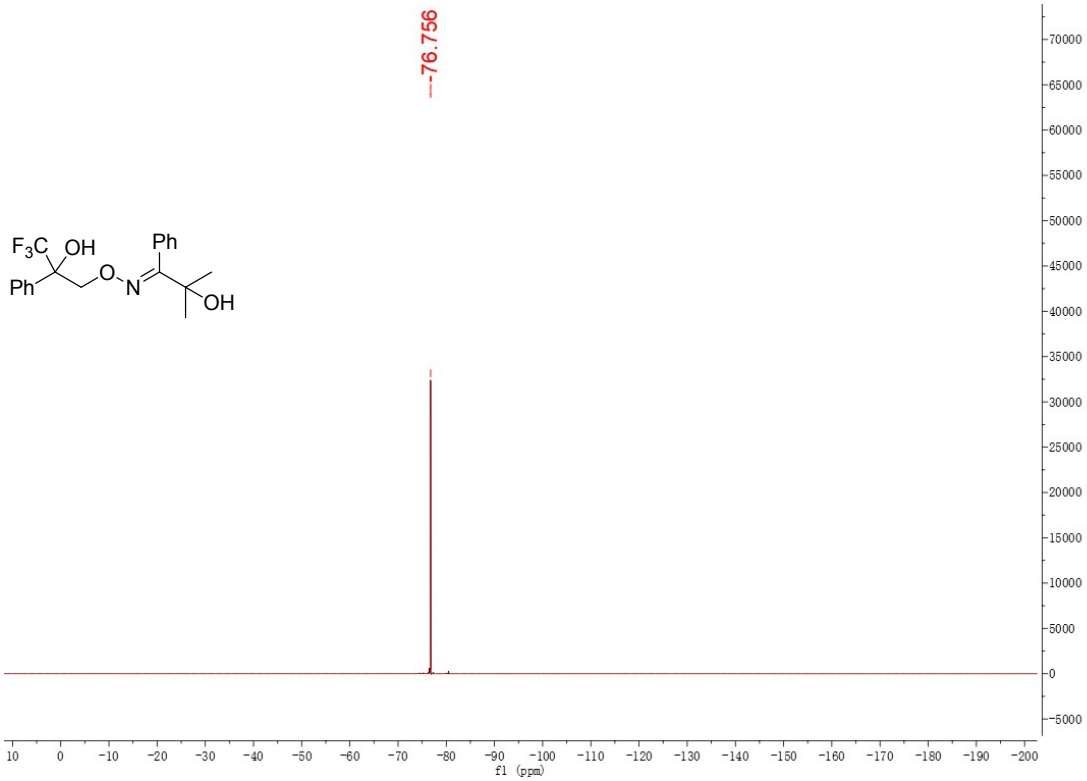
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3at



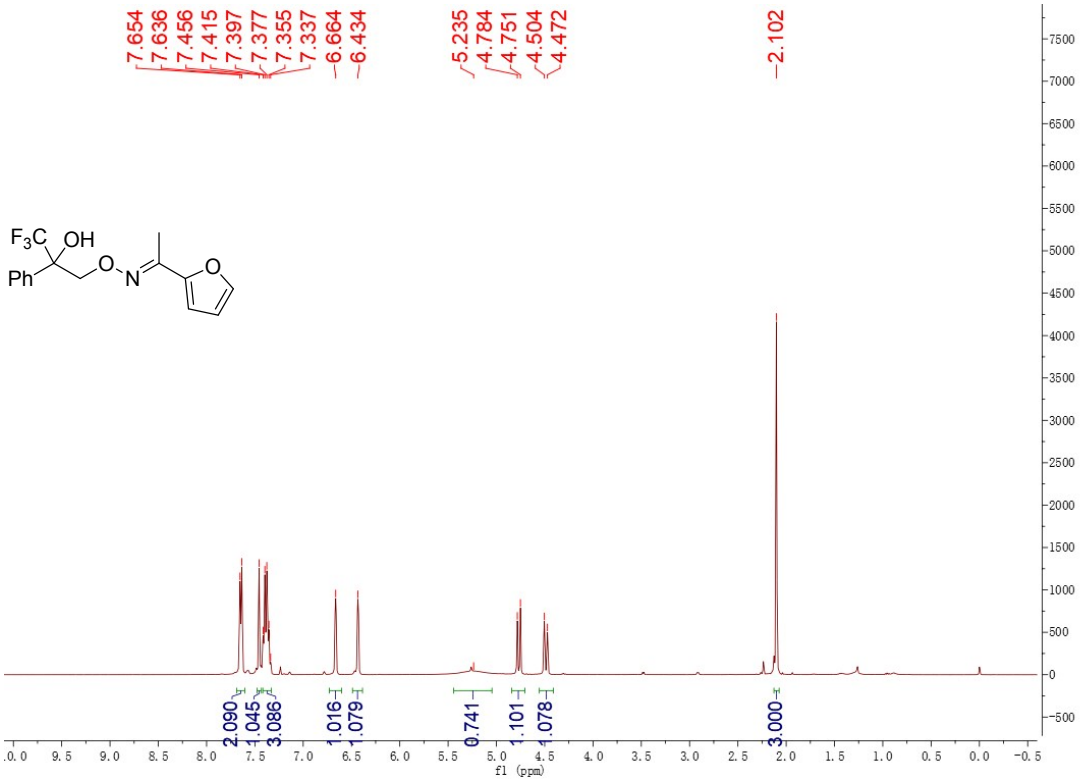
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3at



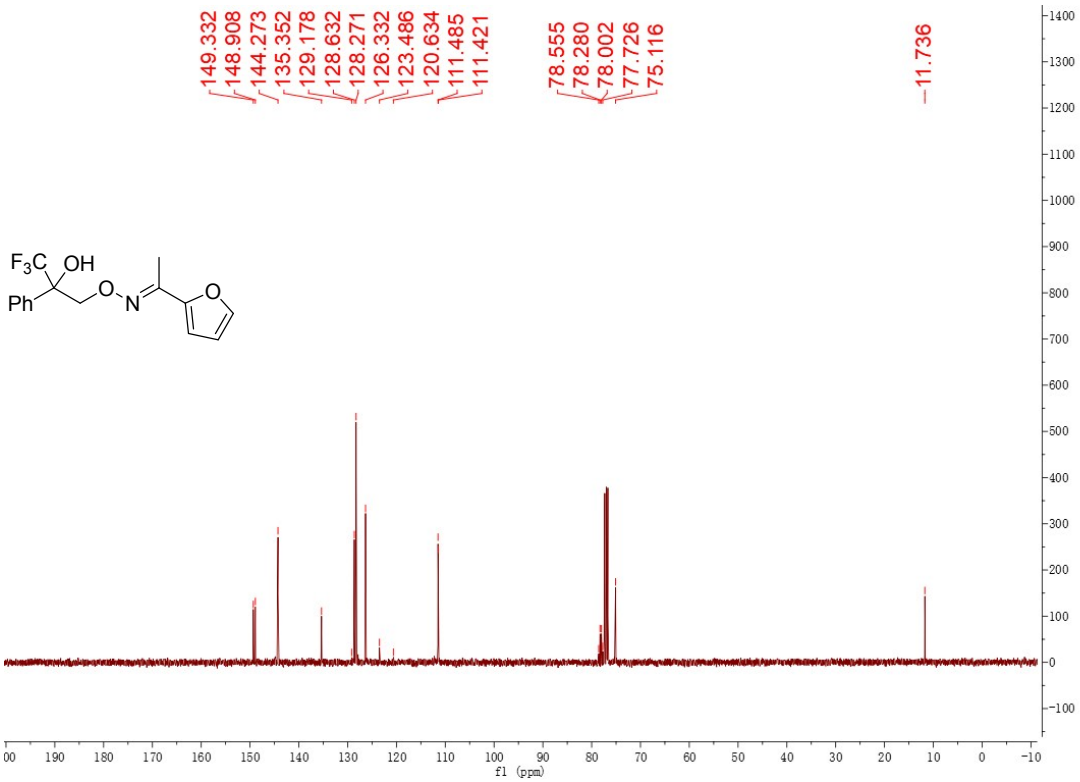
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3at



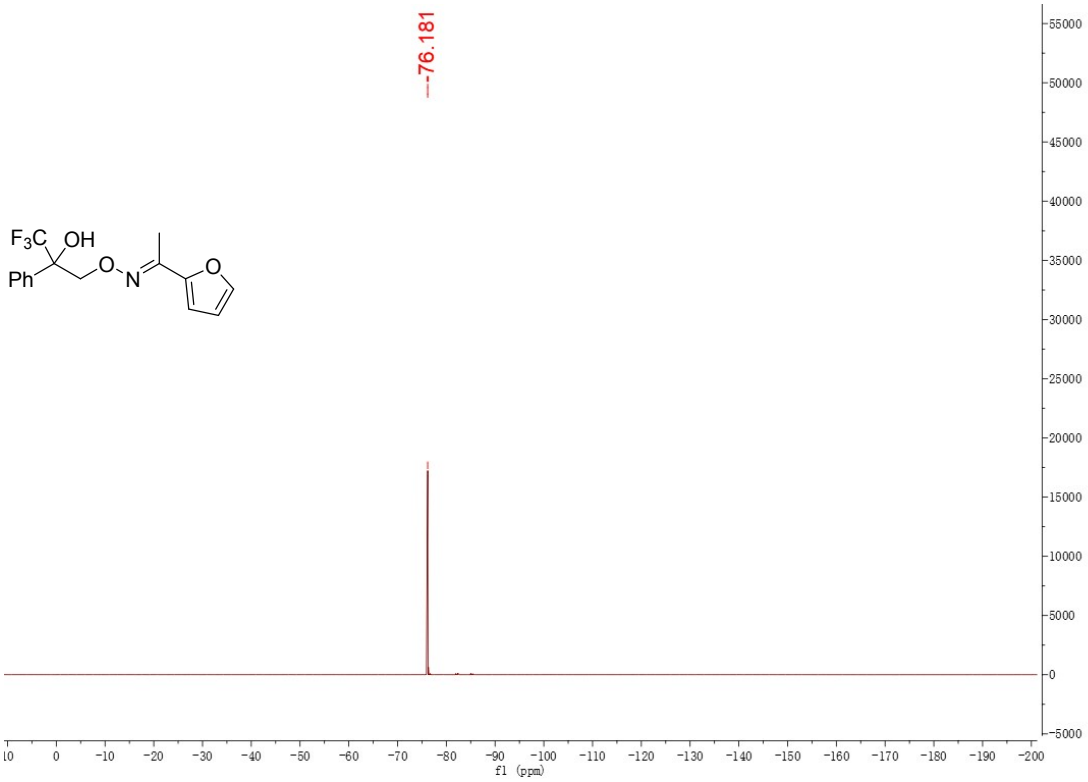
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3au



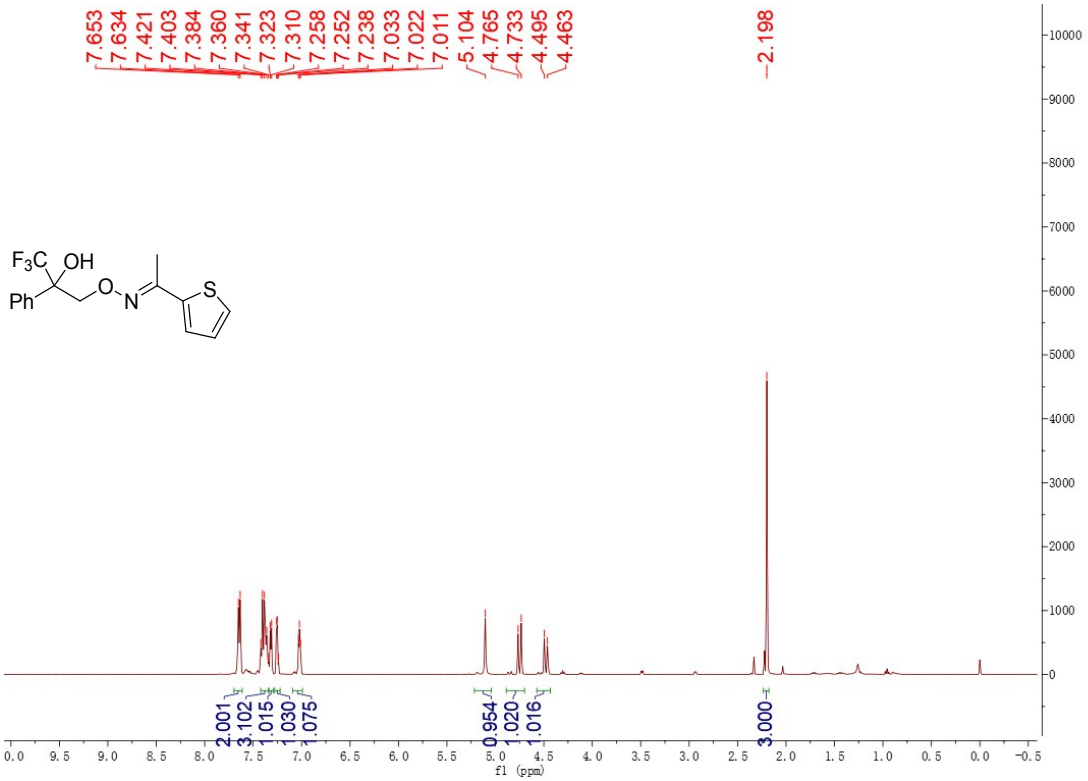
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3au



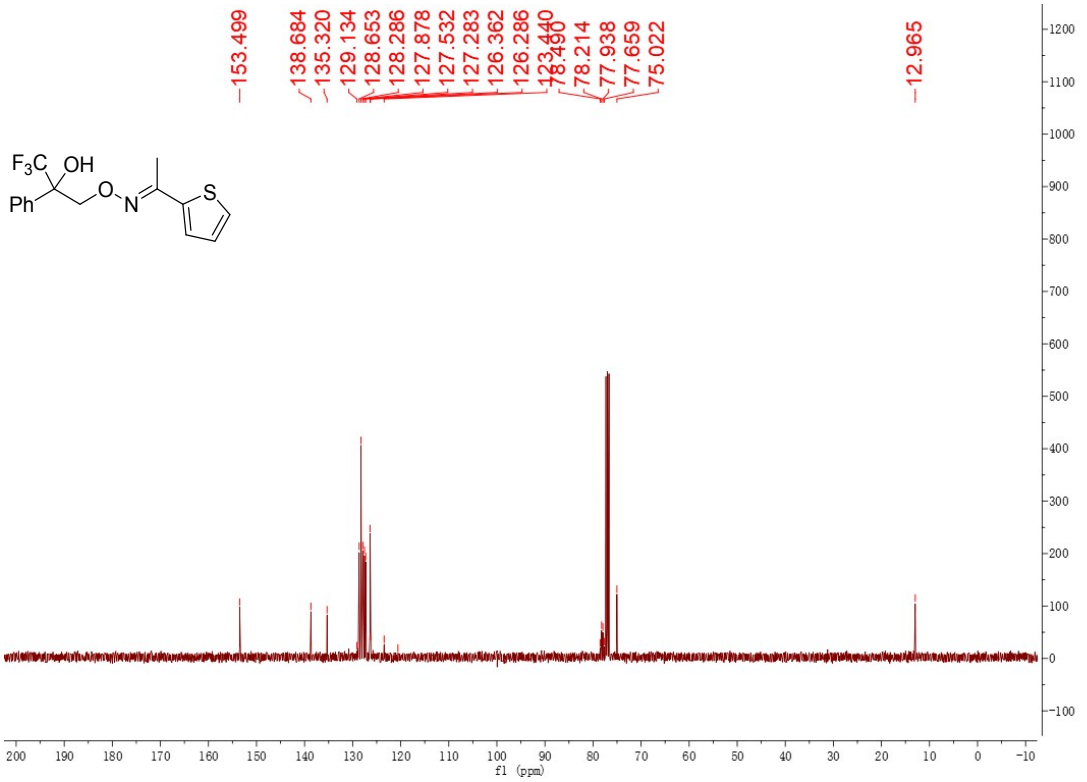
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3au



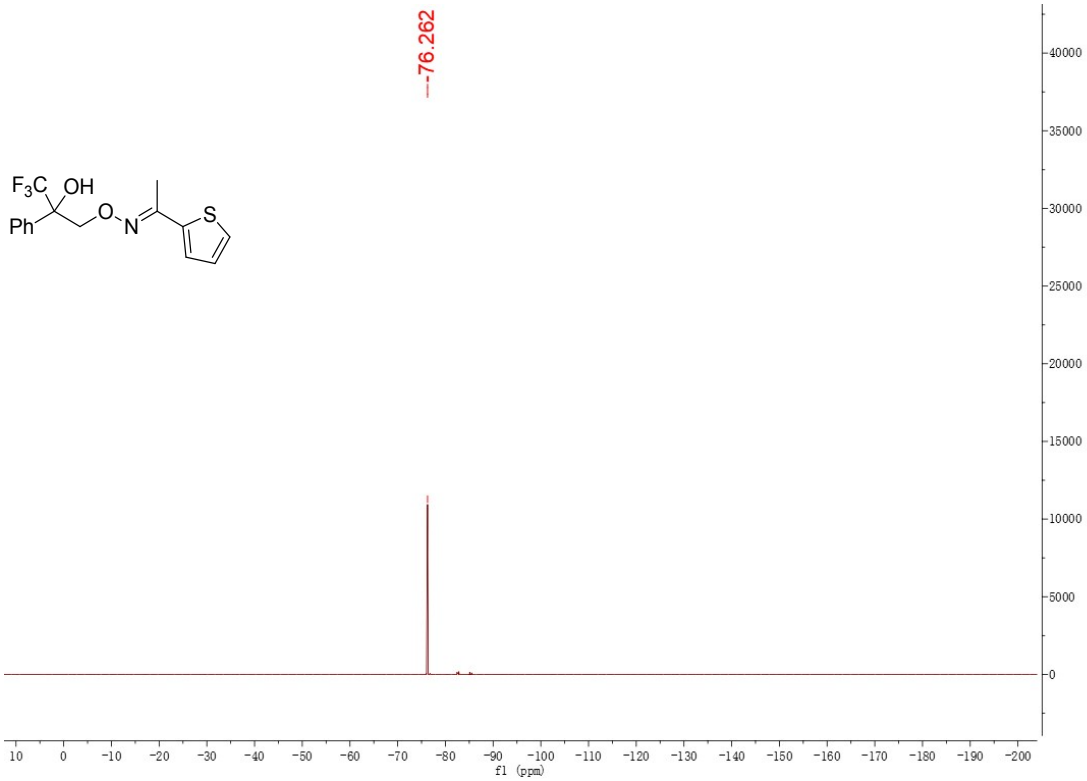
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3av



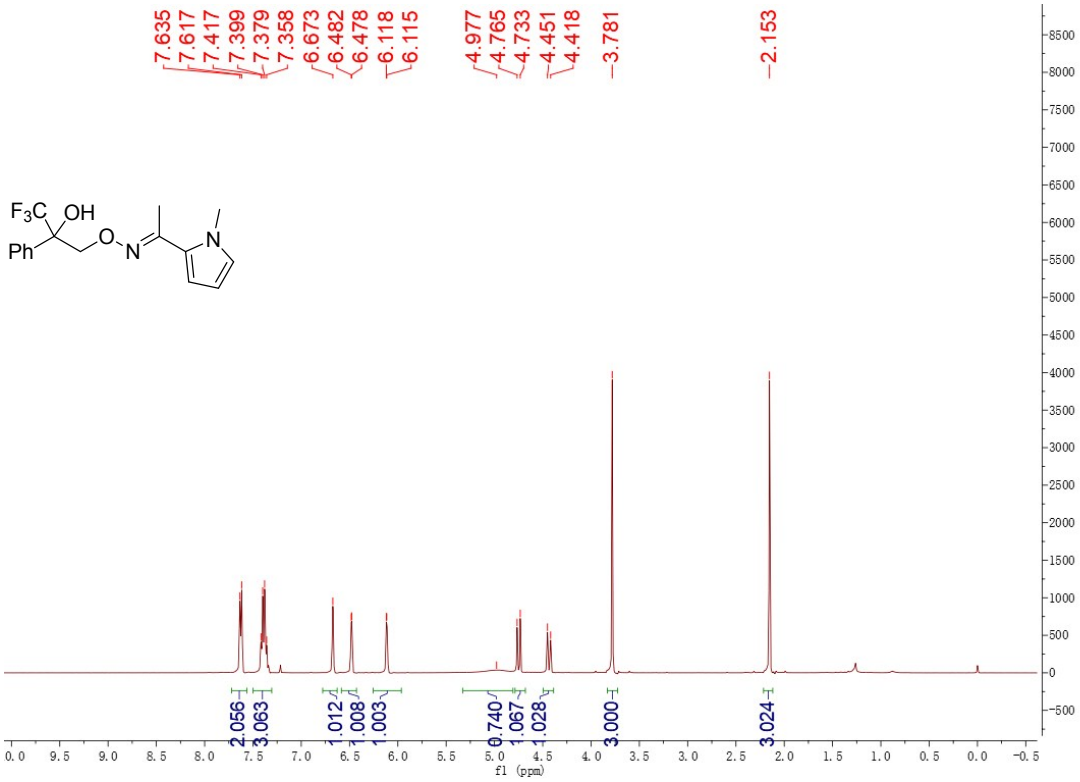
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3av



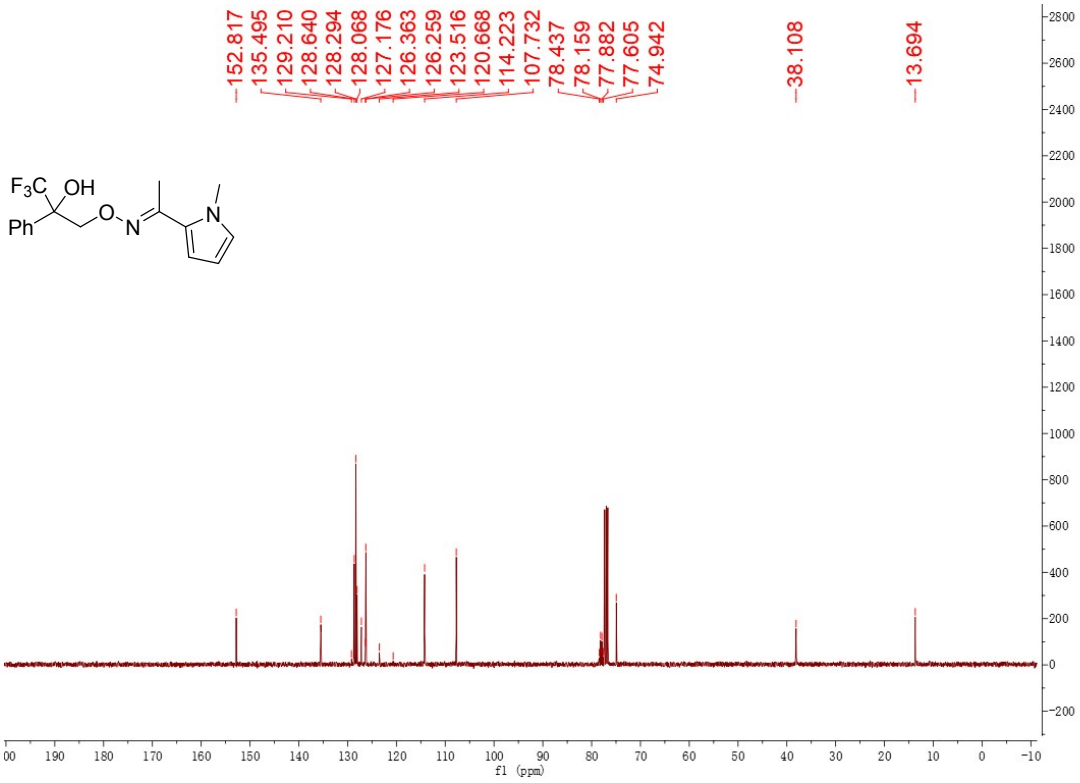
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3av



^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3aw

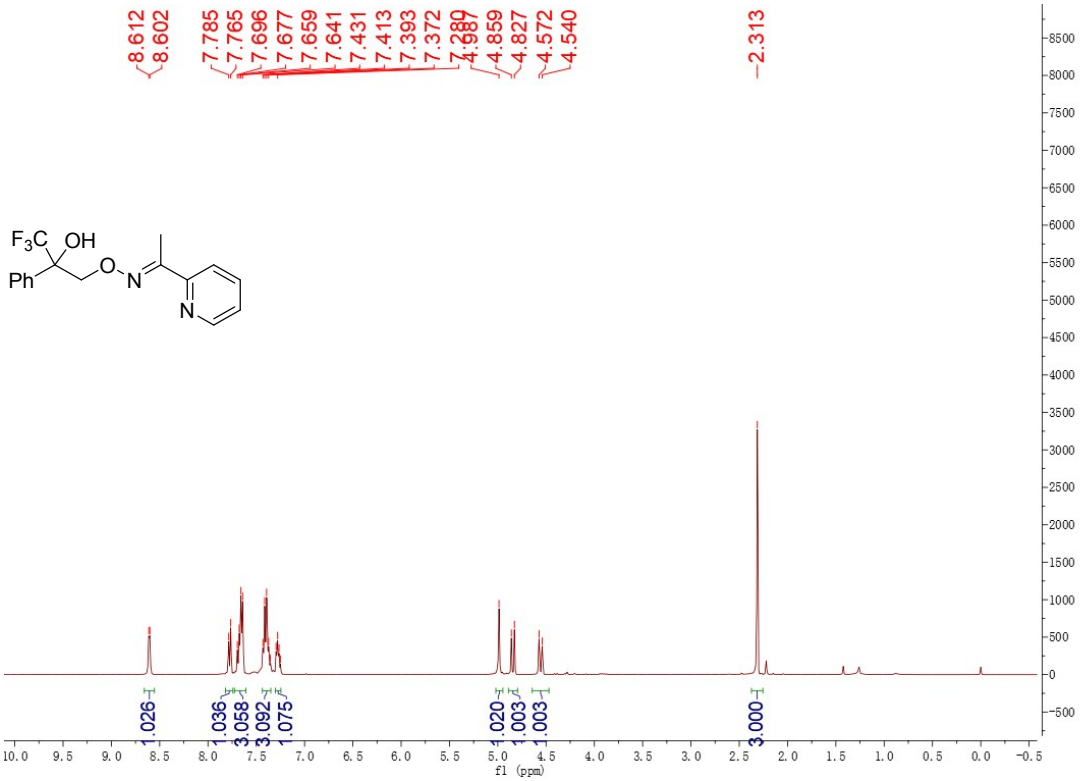


^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3aw

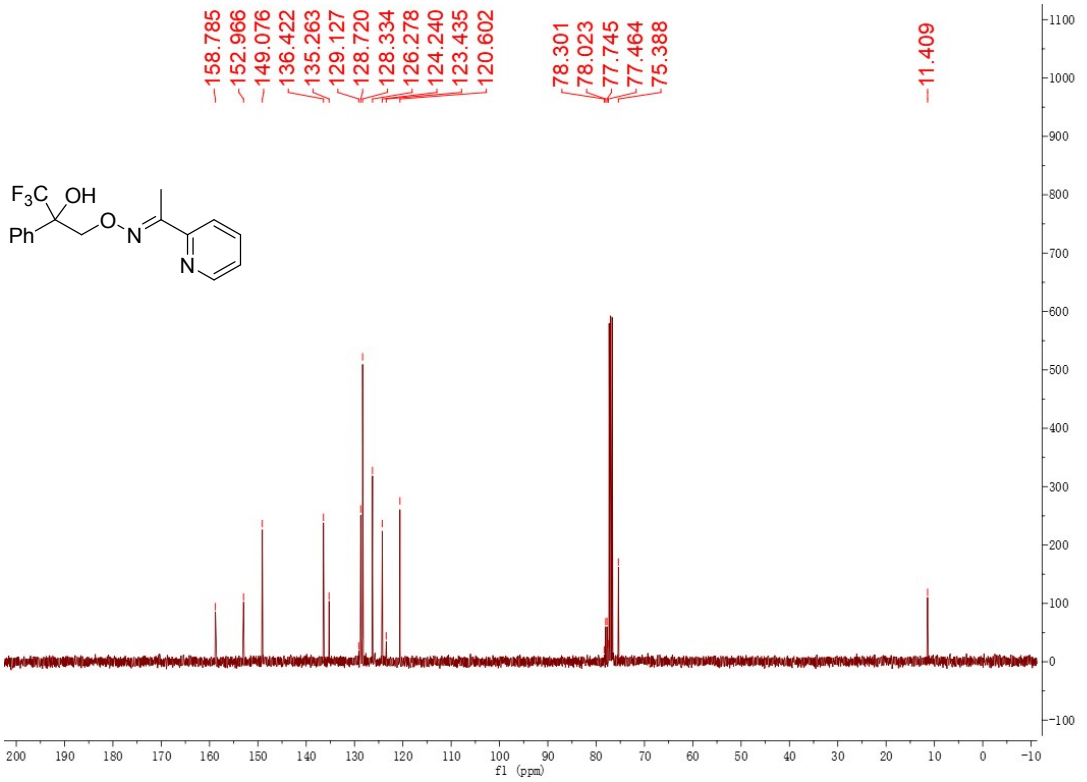


^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3aw

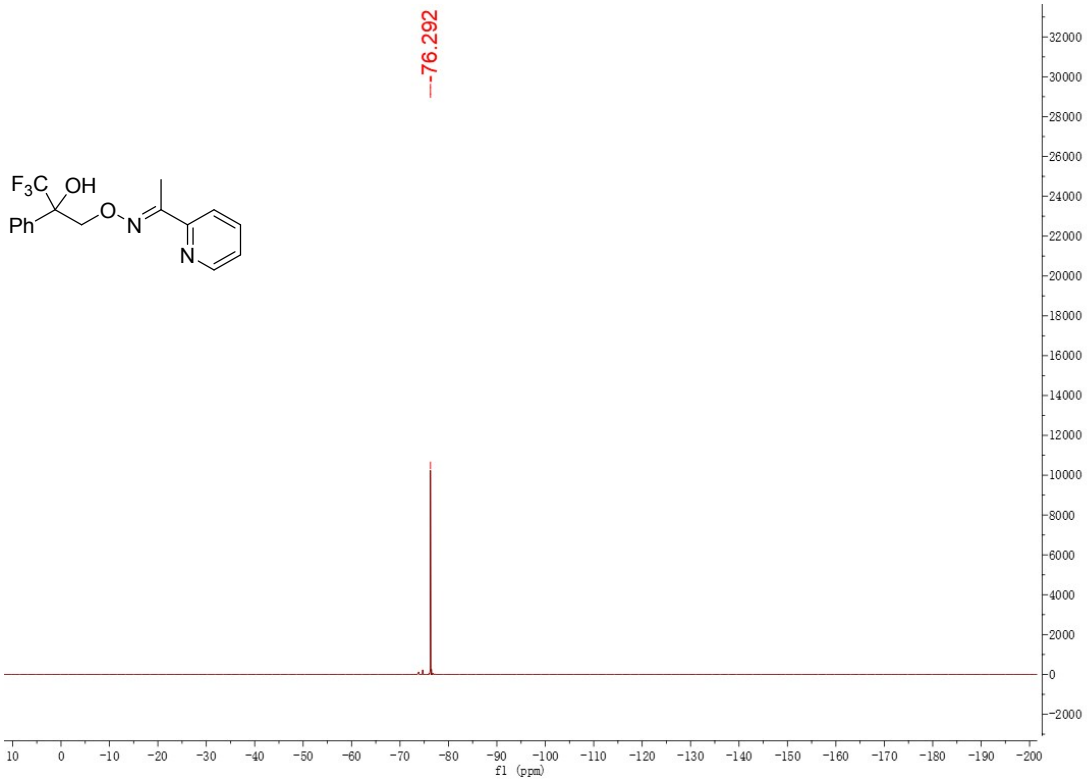
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3ax



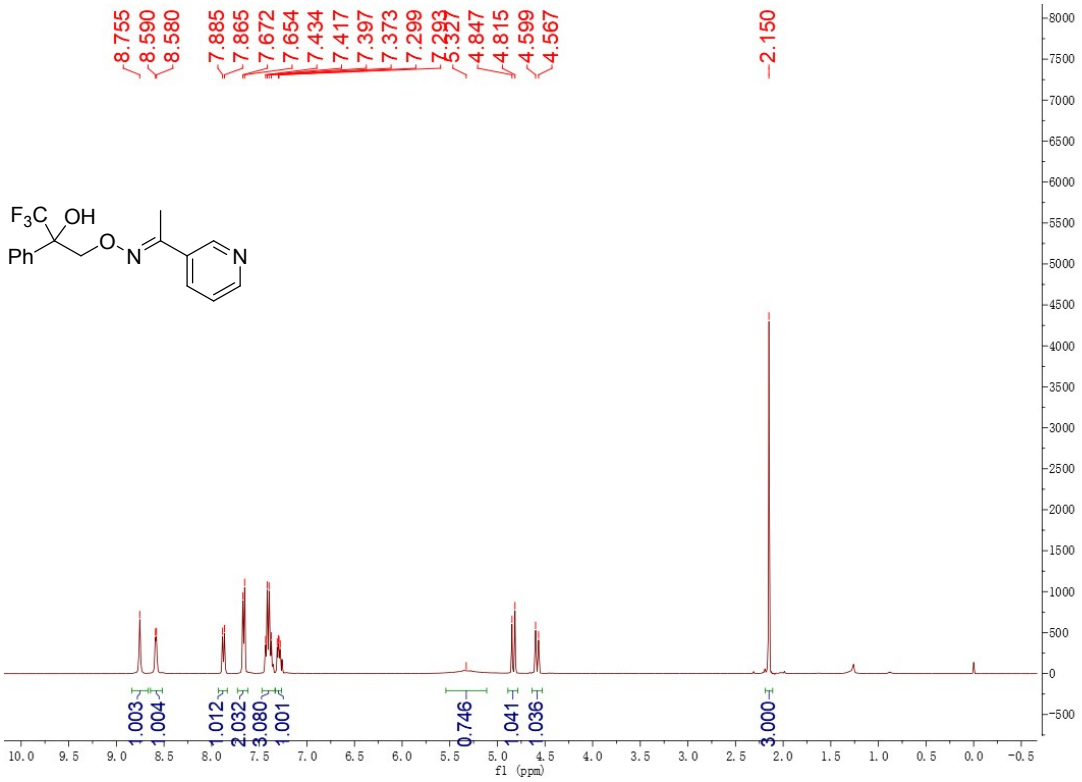
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3ax



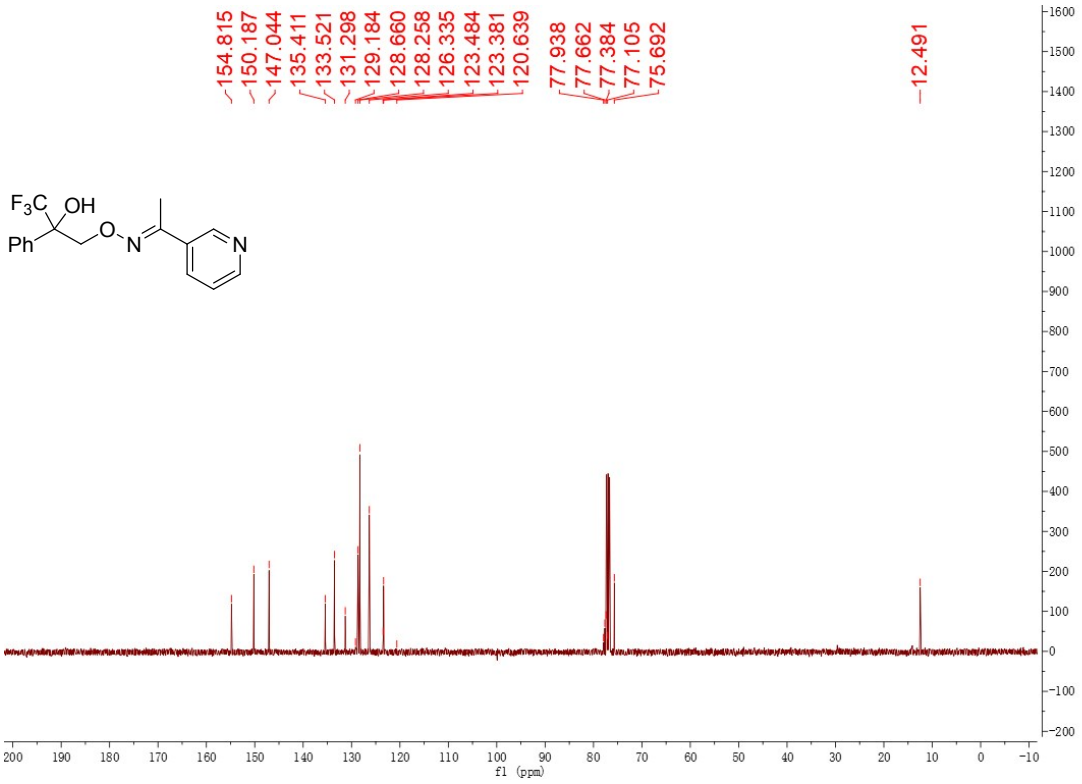
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3ax



^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3ay

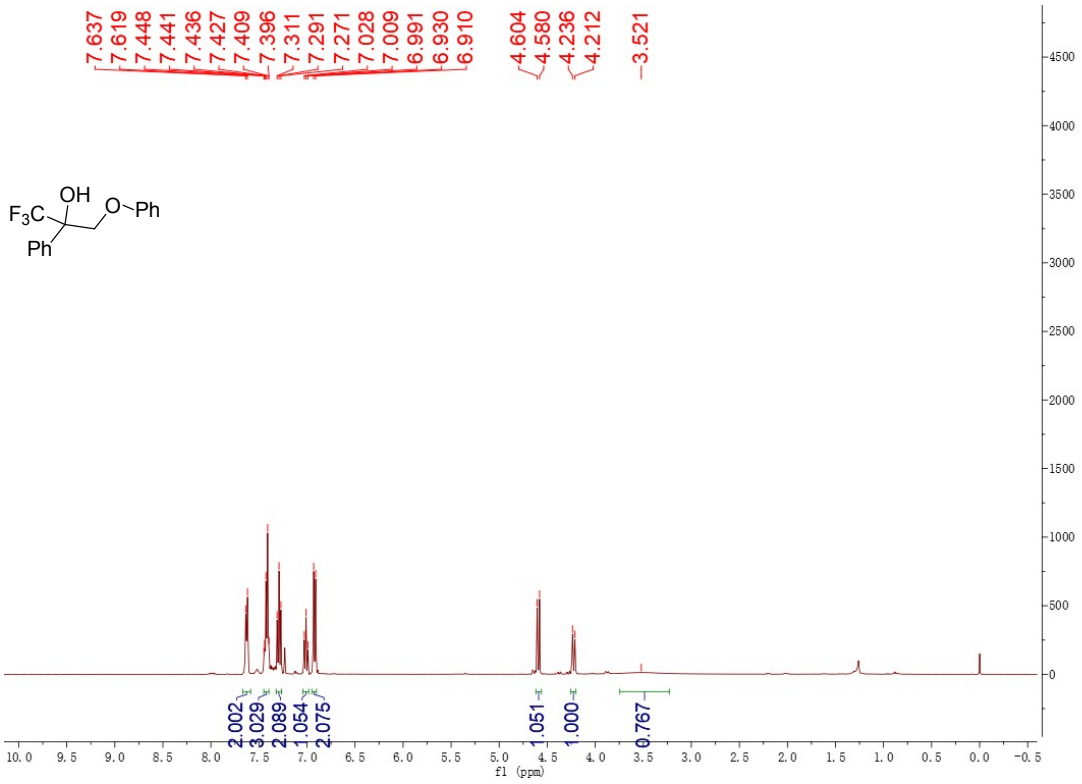


^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3ay

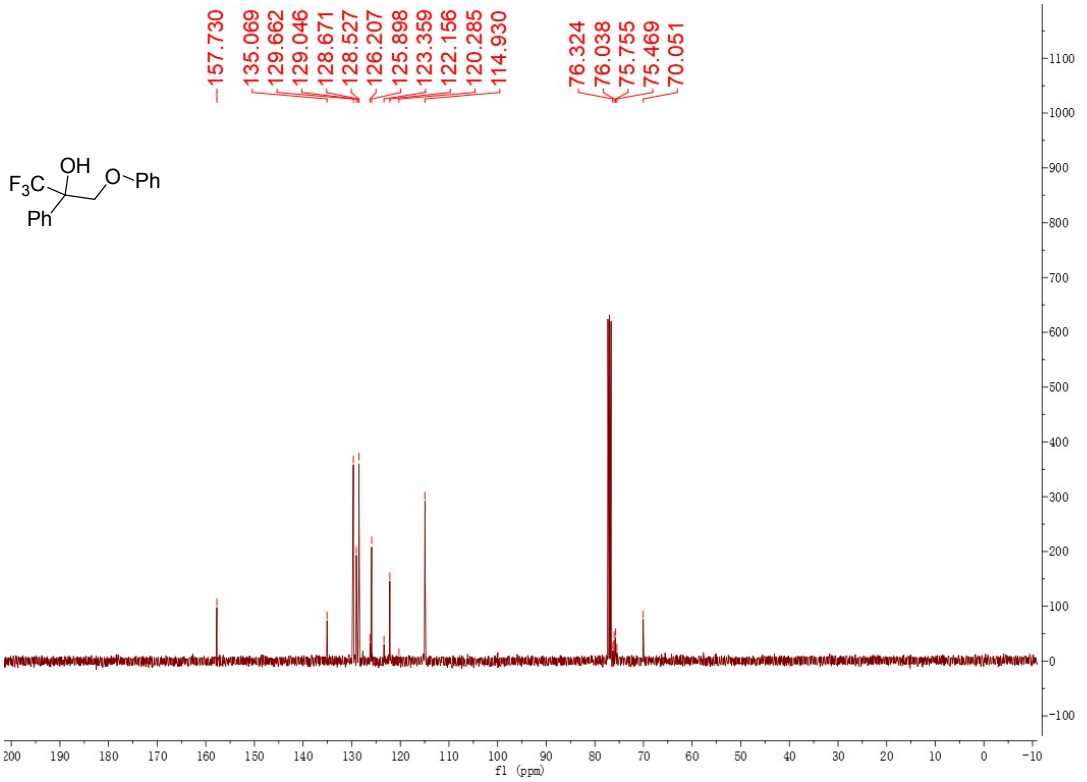


^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3ay

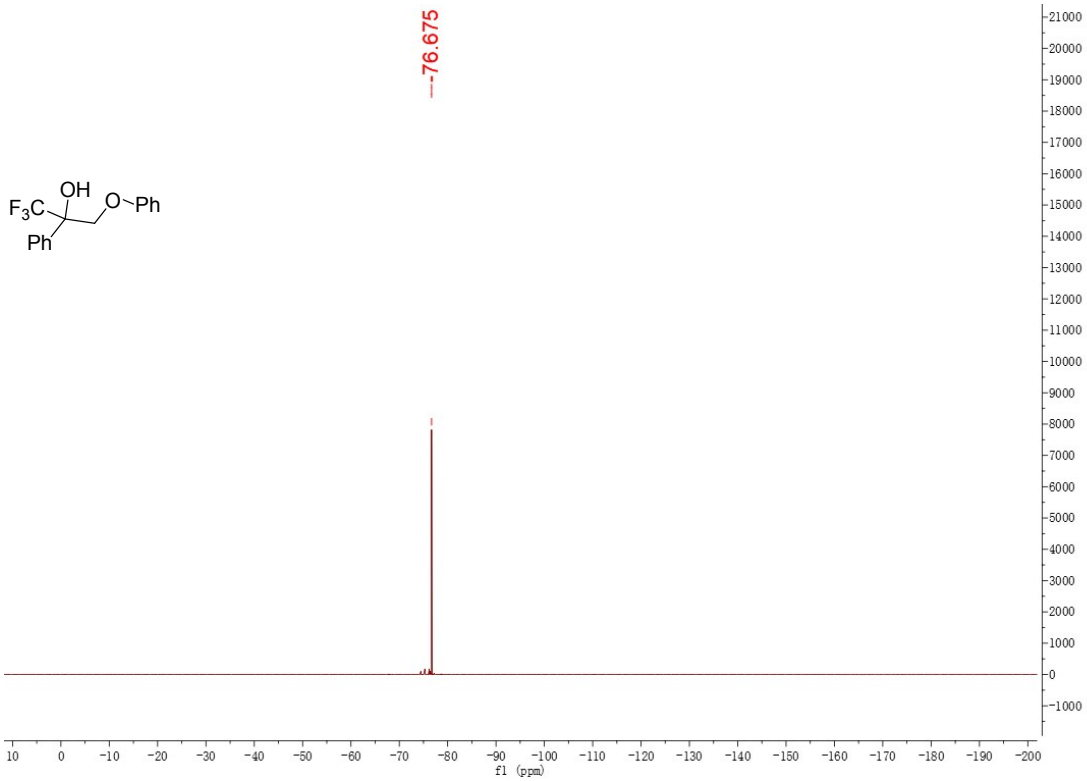
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3az



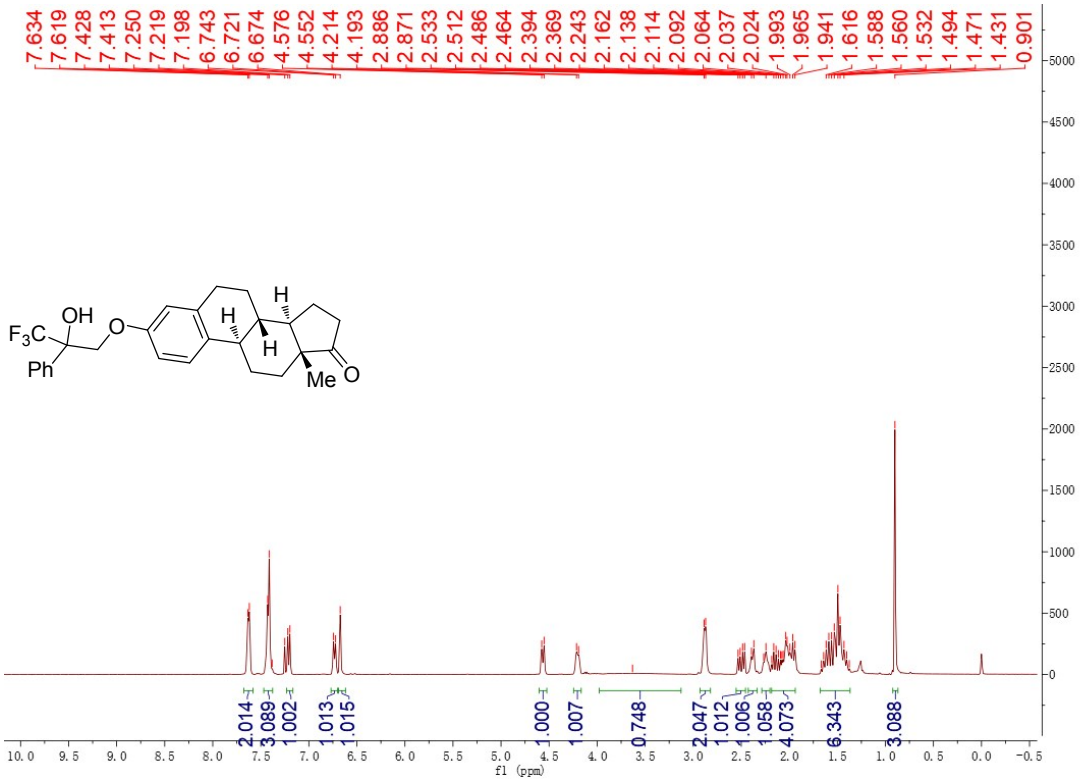
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3az



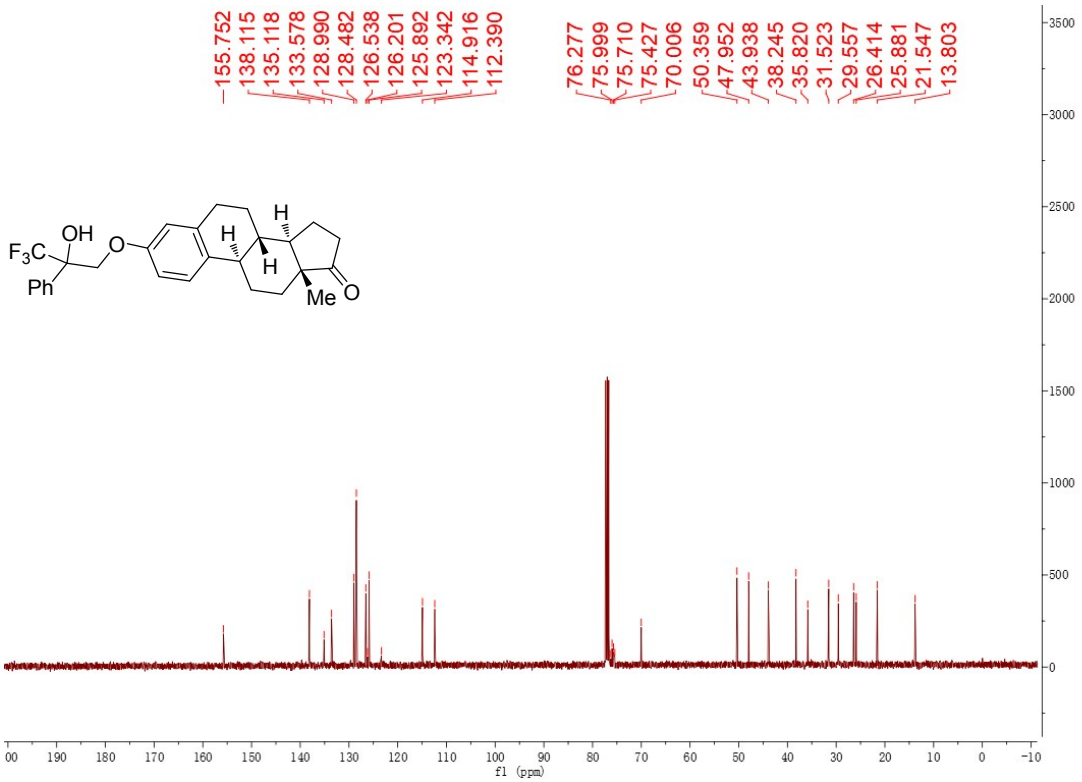
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3az



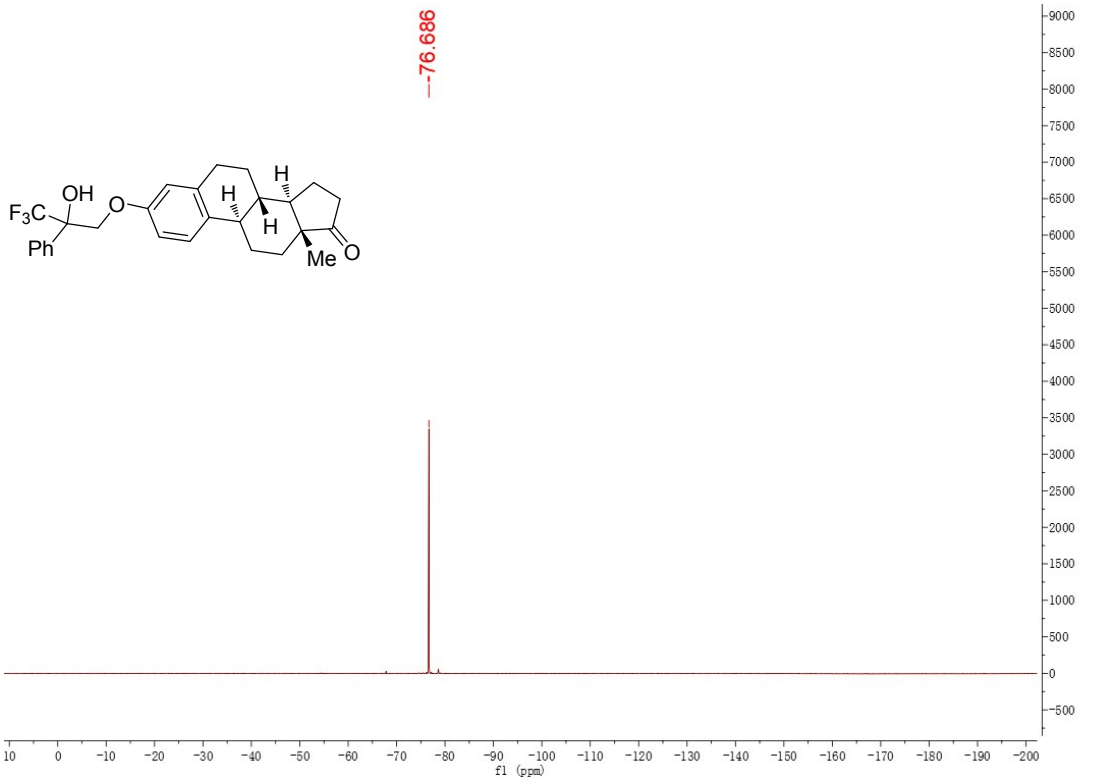
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3ba



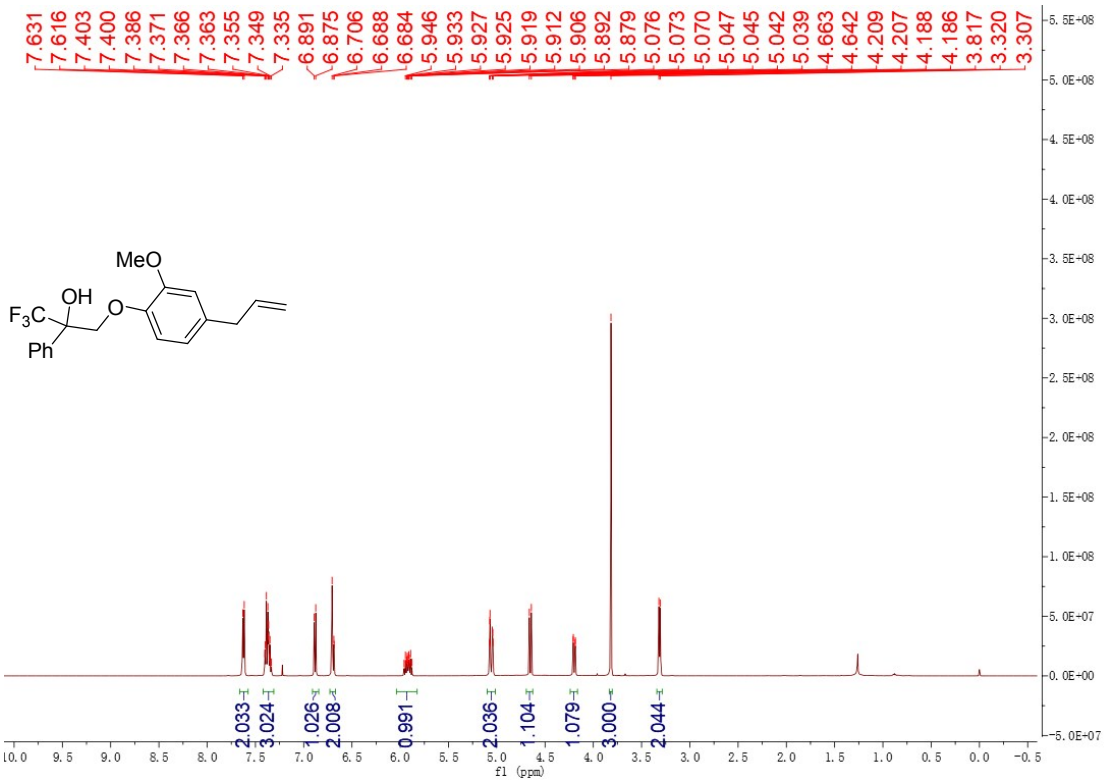
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3ba



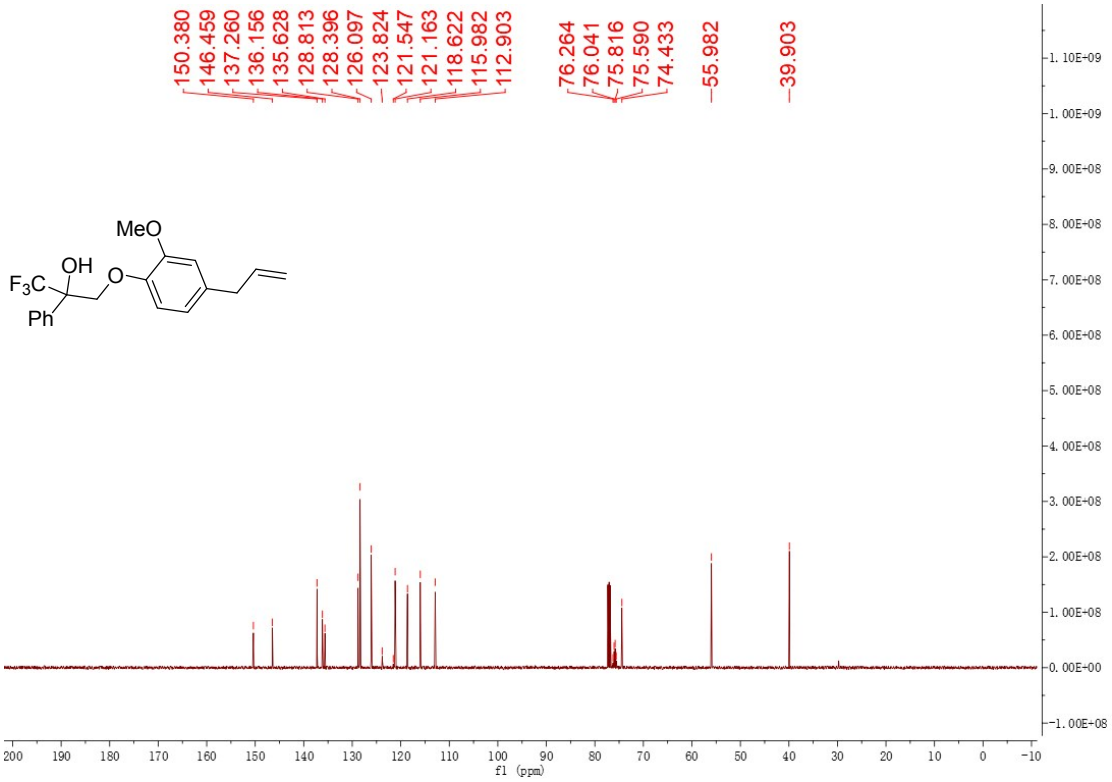
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3ba



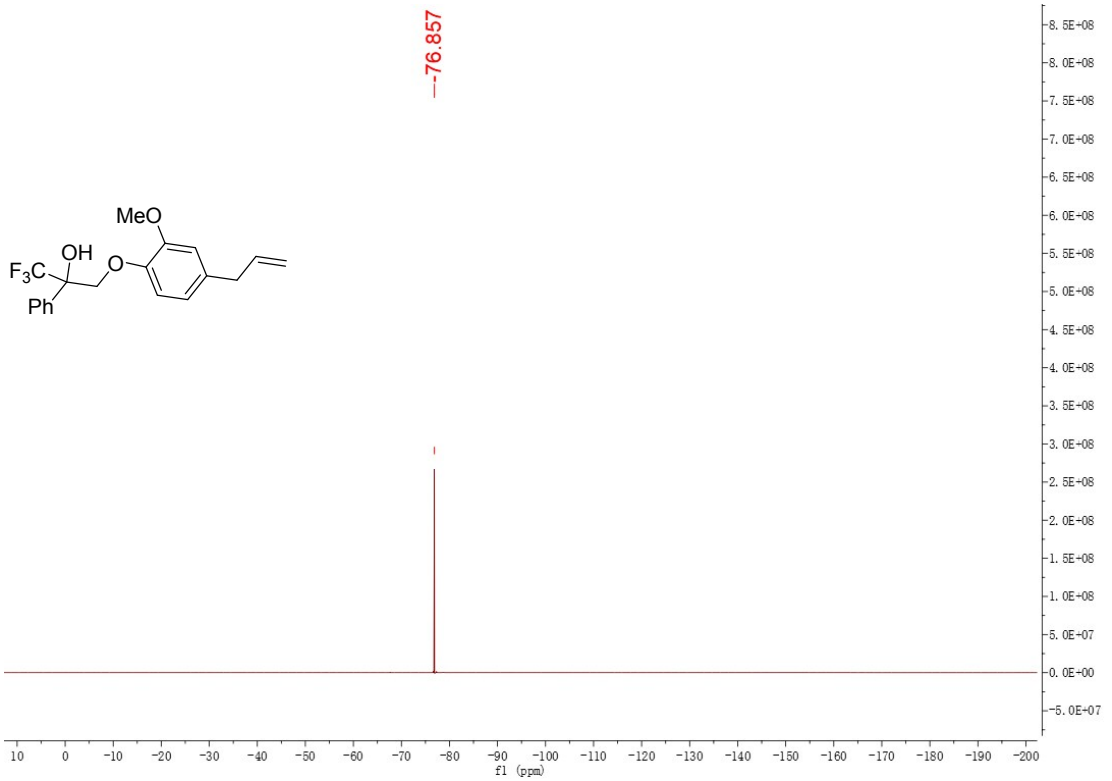
^{1}H NMR (500 MHz, $CDCl_3$) spectrum for 3bb



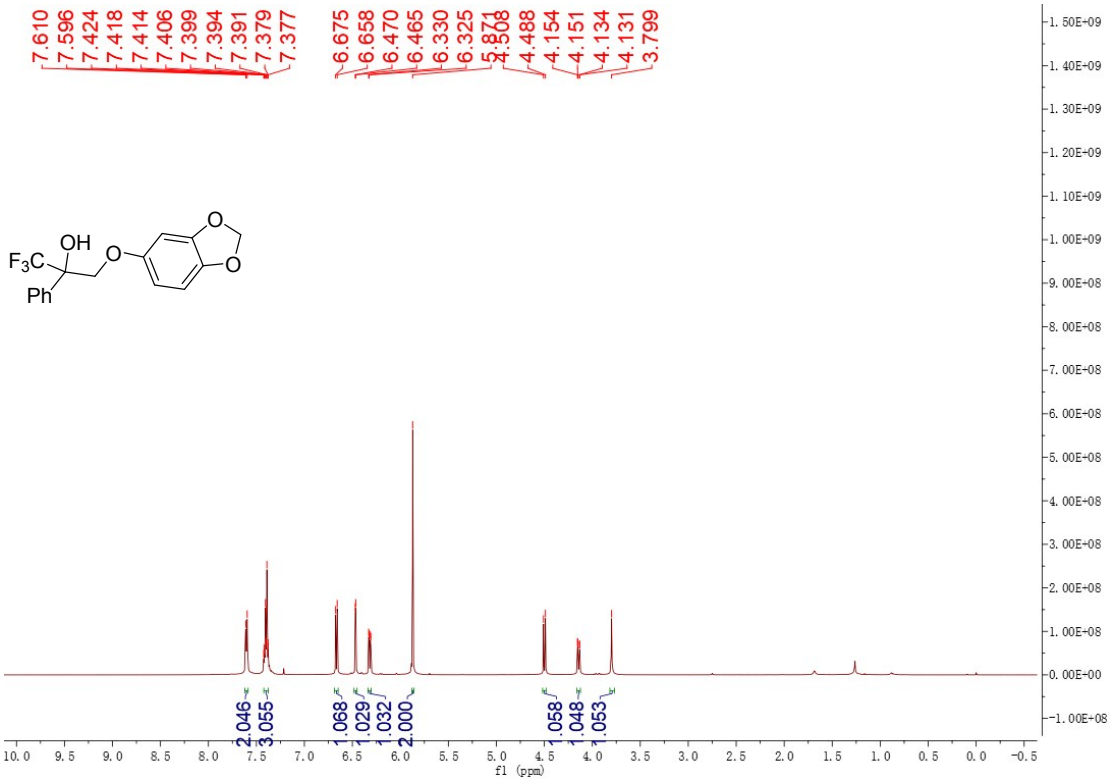
^{13}C NMR (125 MHz, $CDCl_3$) spectrum for 3bb



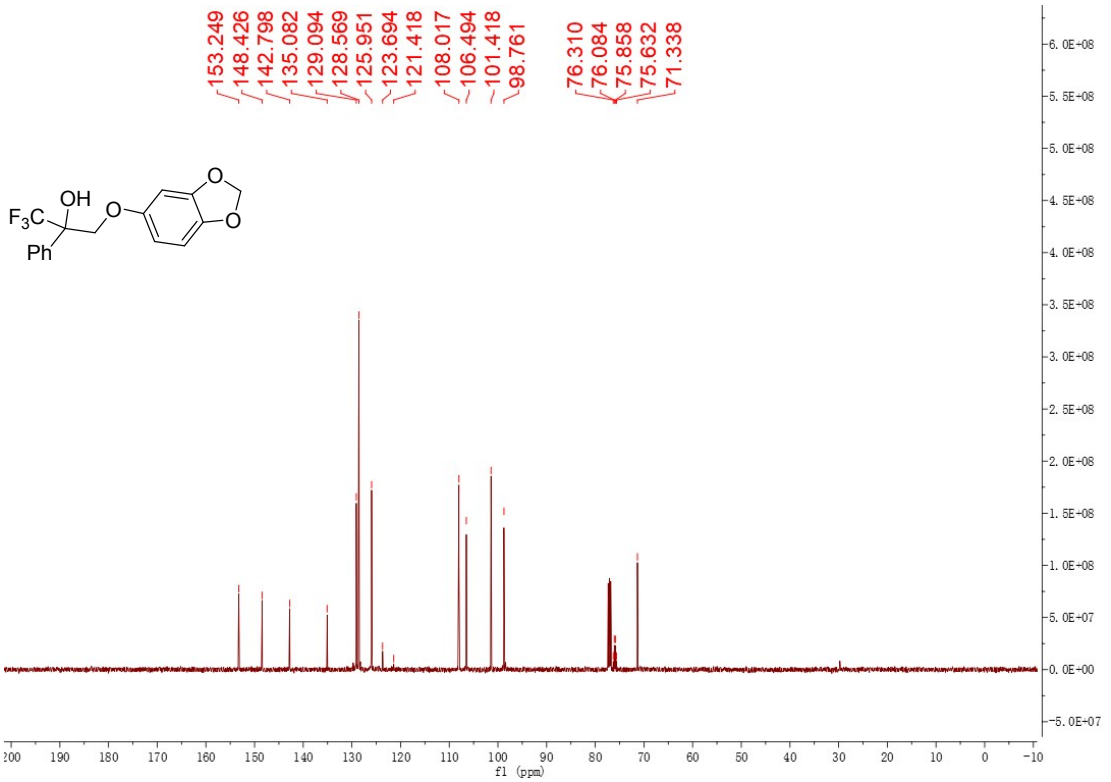
^{19}F NMR (470 MHz, $CDCl_3$) spectrum for 3bb



^{1}H NMR (500 MHz, $CDCl_3$) spectrum for 3bc

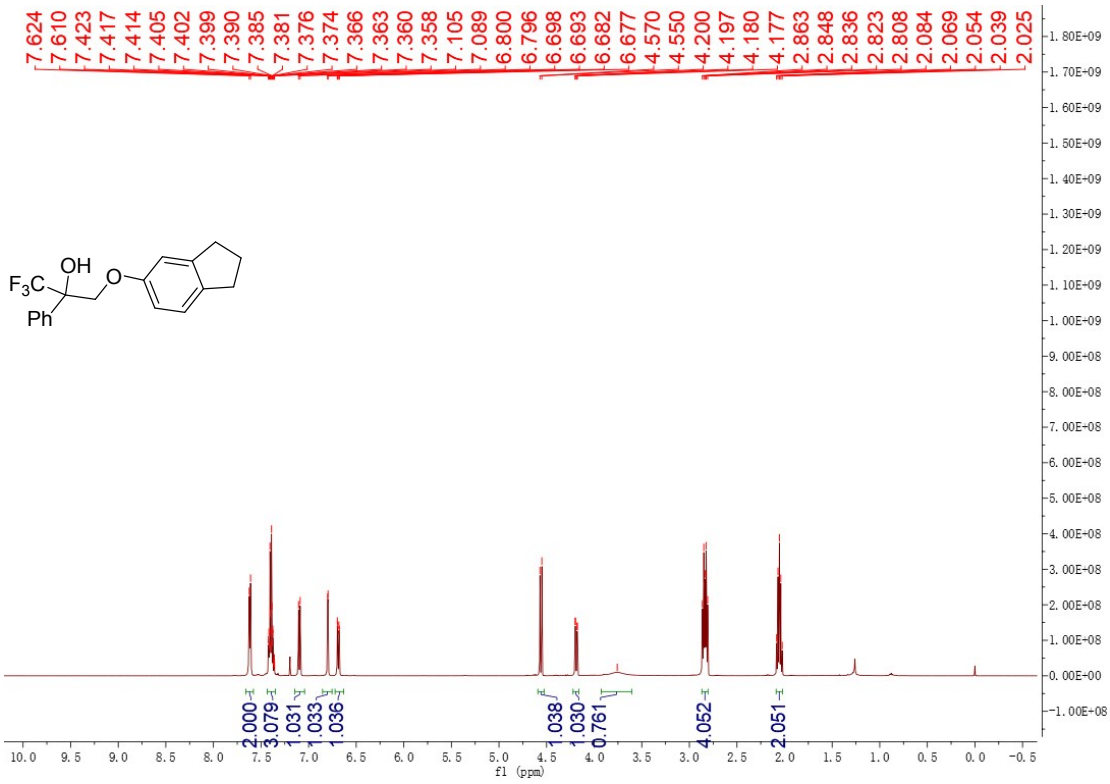


^{13}C NMR (125 MHz, $CDCl_3$) spectrum for 3bc

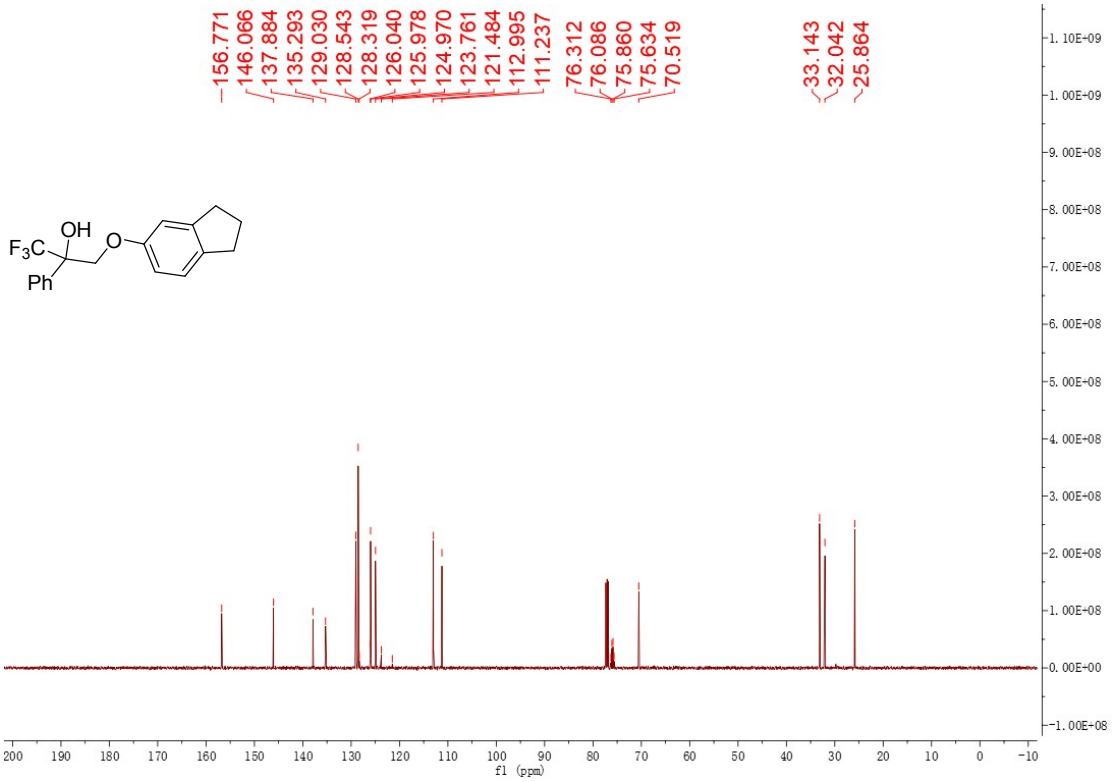


^{19}F NMR (470 MHz, $CDCl_3$) spectrum for 3bc

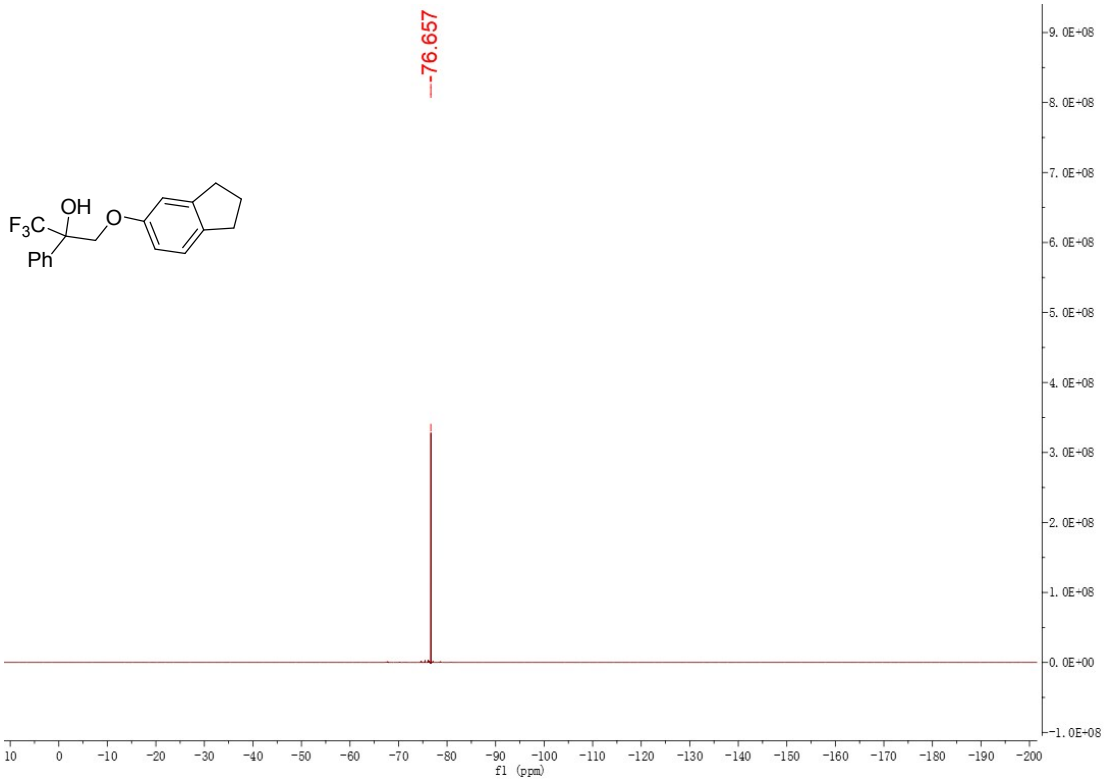
^{1}H NMR (500 MHz, $CDCl_3$) spectrum for 3bd



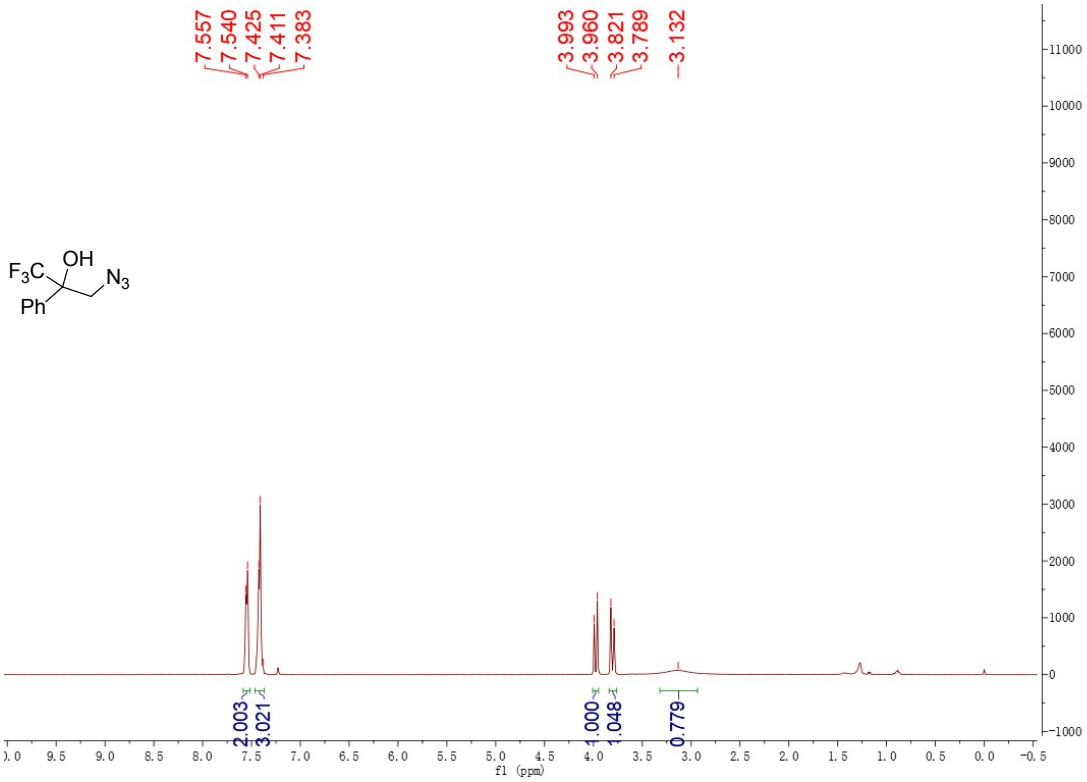
^{13}C NMR (125 MHz, $CDCl_3$) spectrum for 3bd



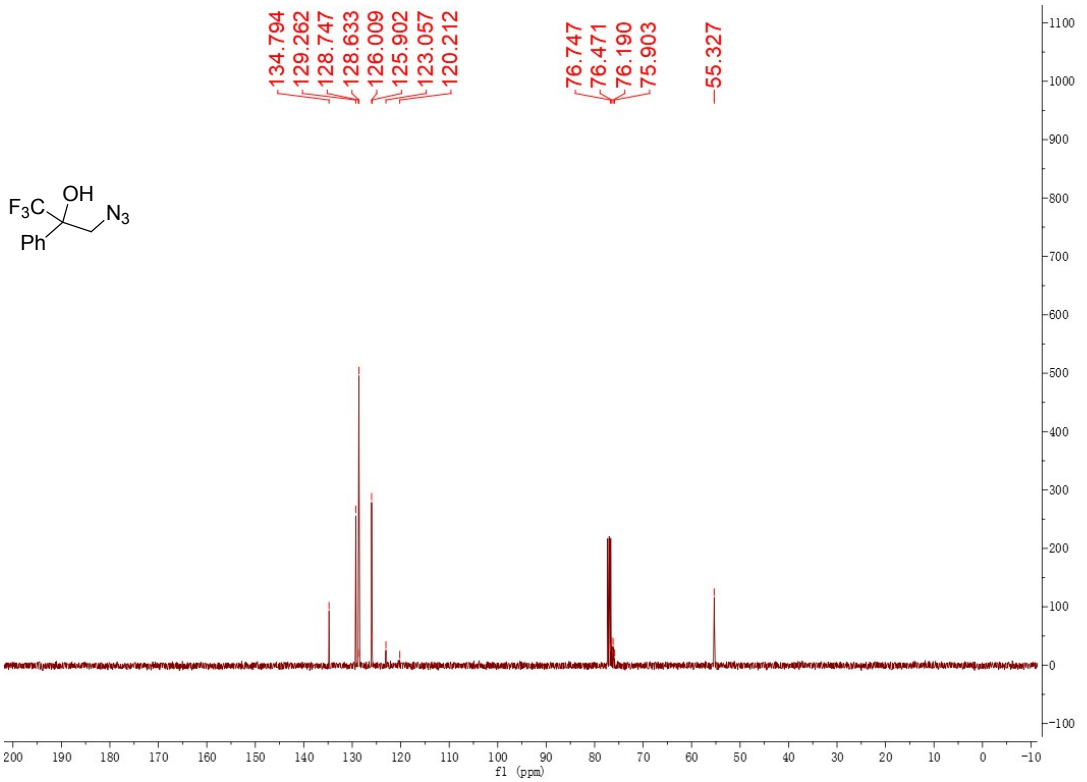
^{19}F NMR (470 MHz, $CDCl_3$) spectrum for 3bd



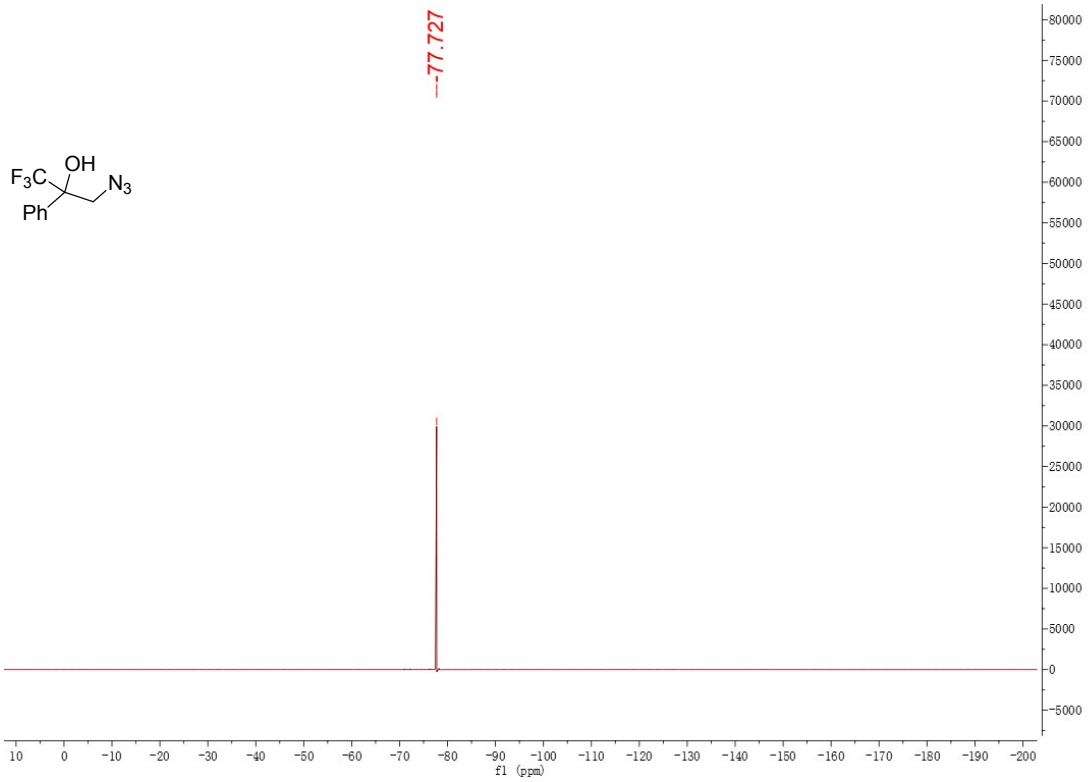
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3be



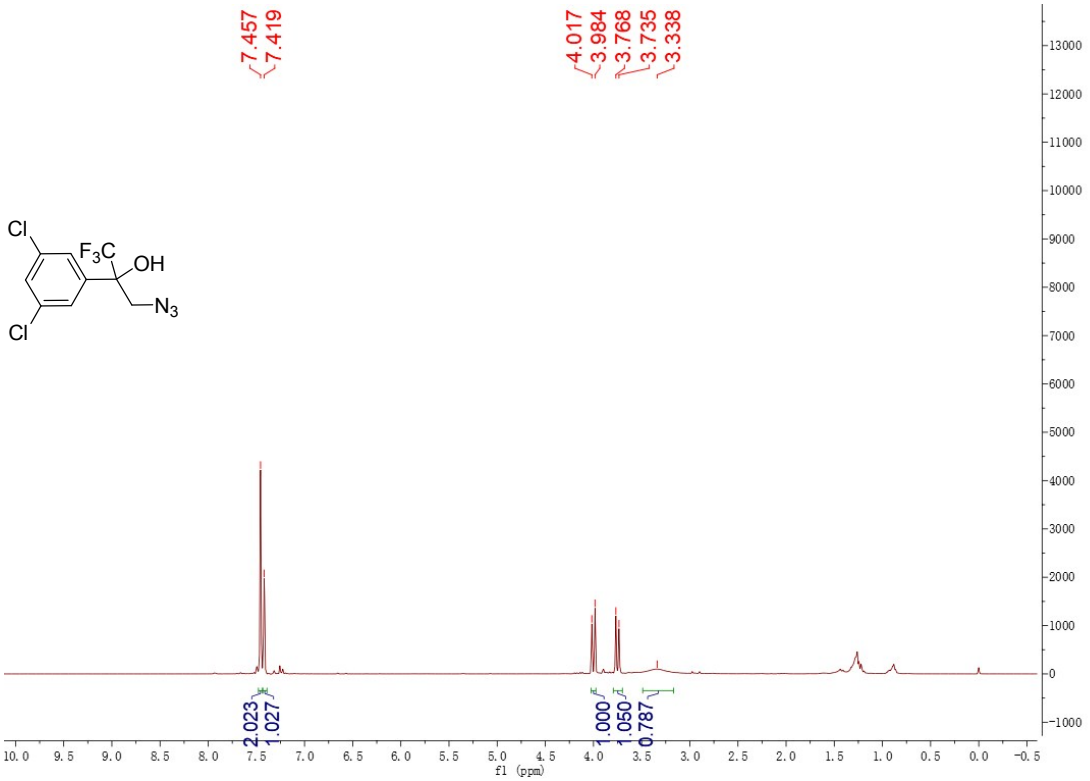
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3be



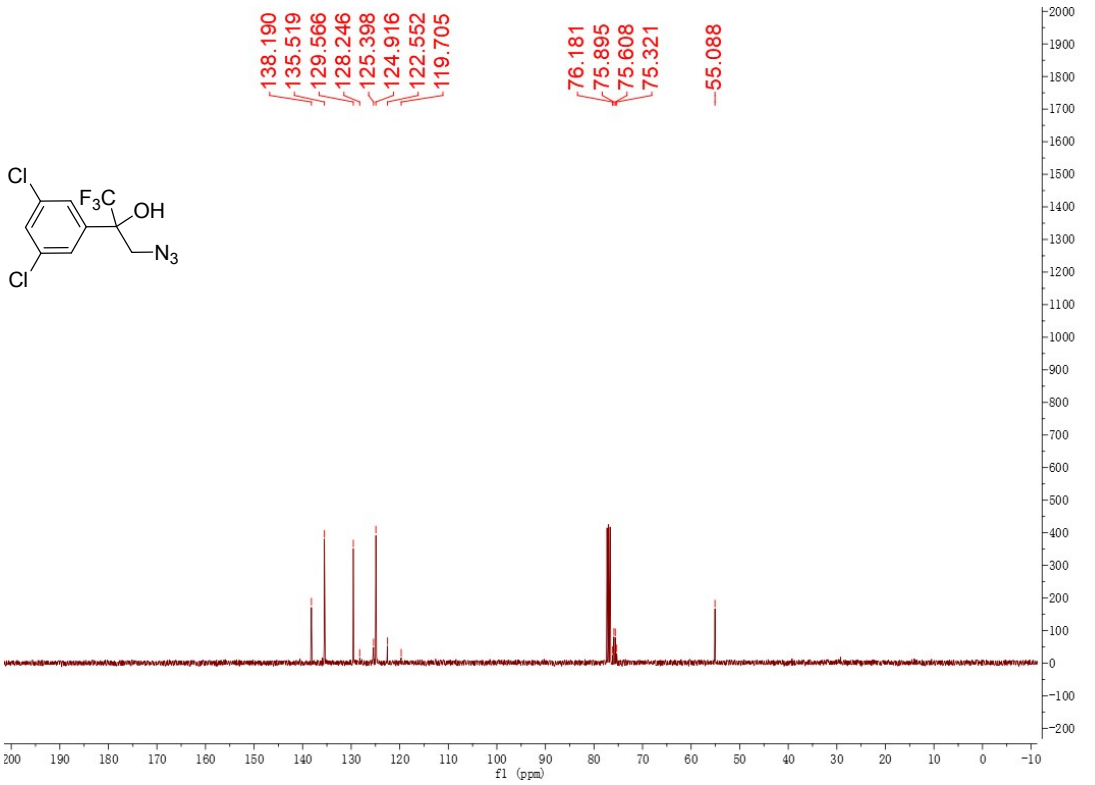
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3be



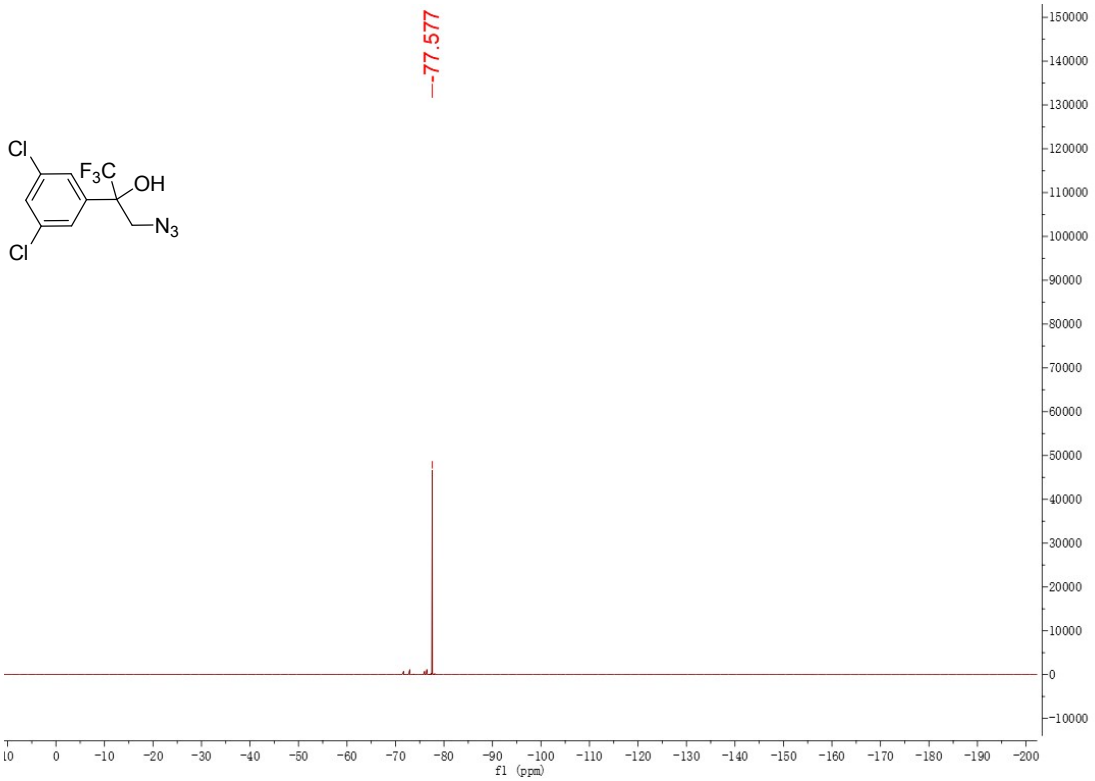
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 3bf



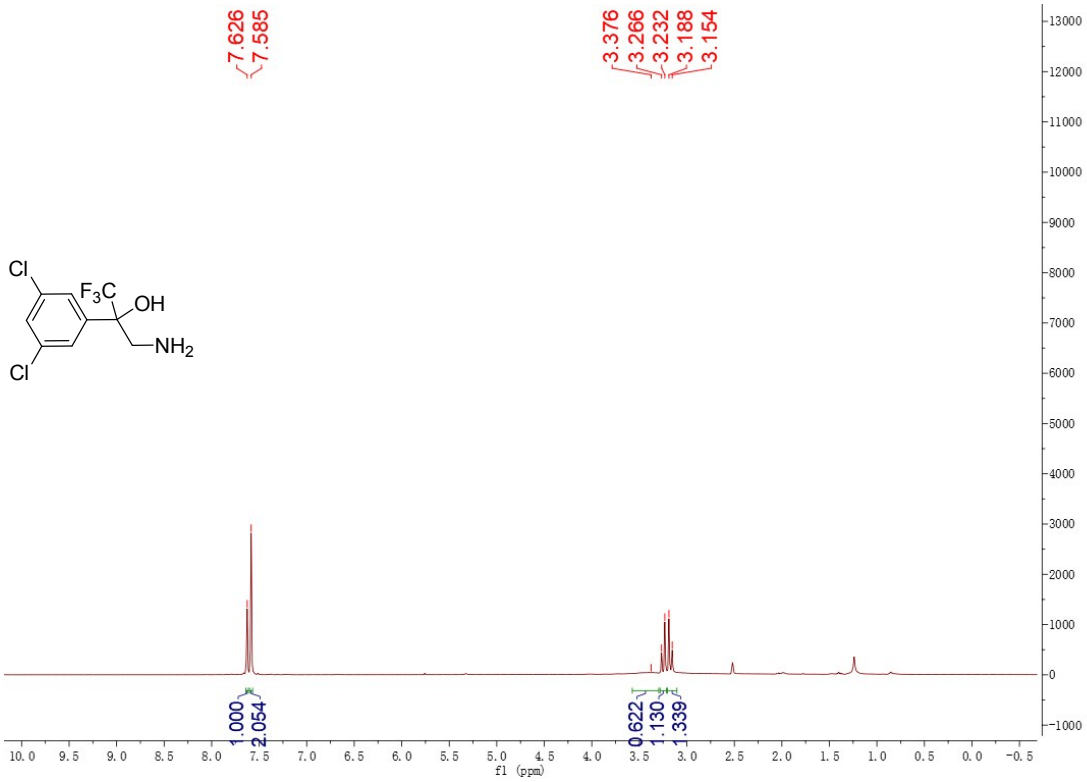
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 3bf



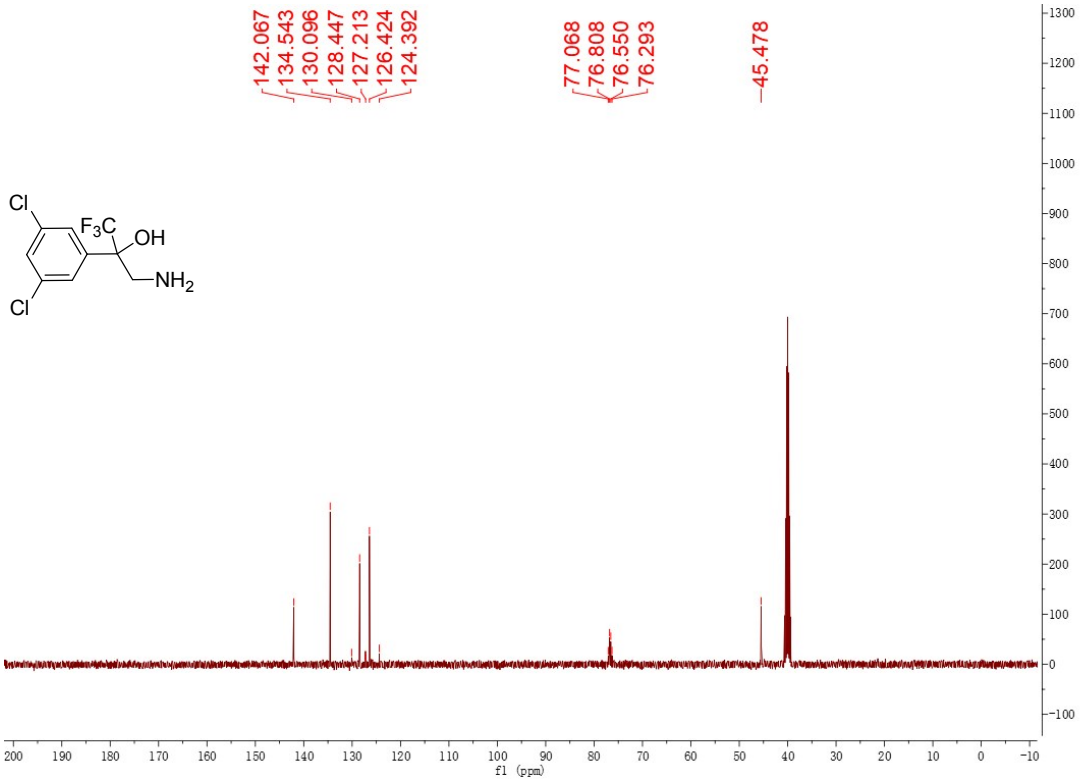
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 3bf



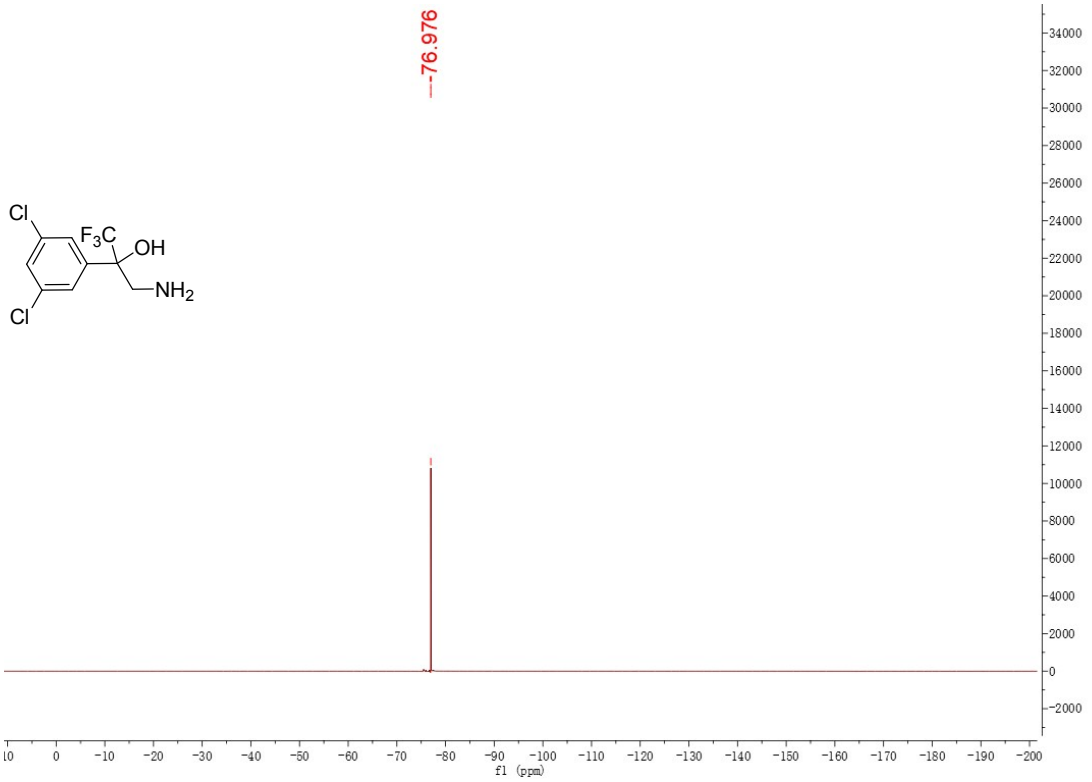
^{1}H NMR (400 MHz, d_6-DMSO) spectrum for 4



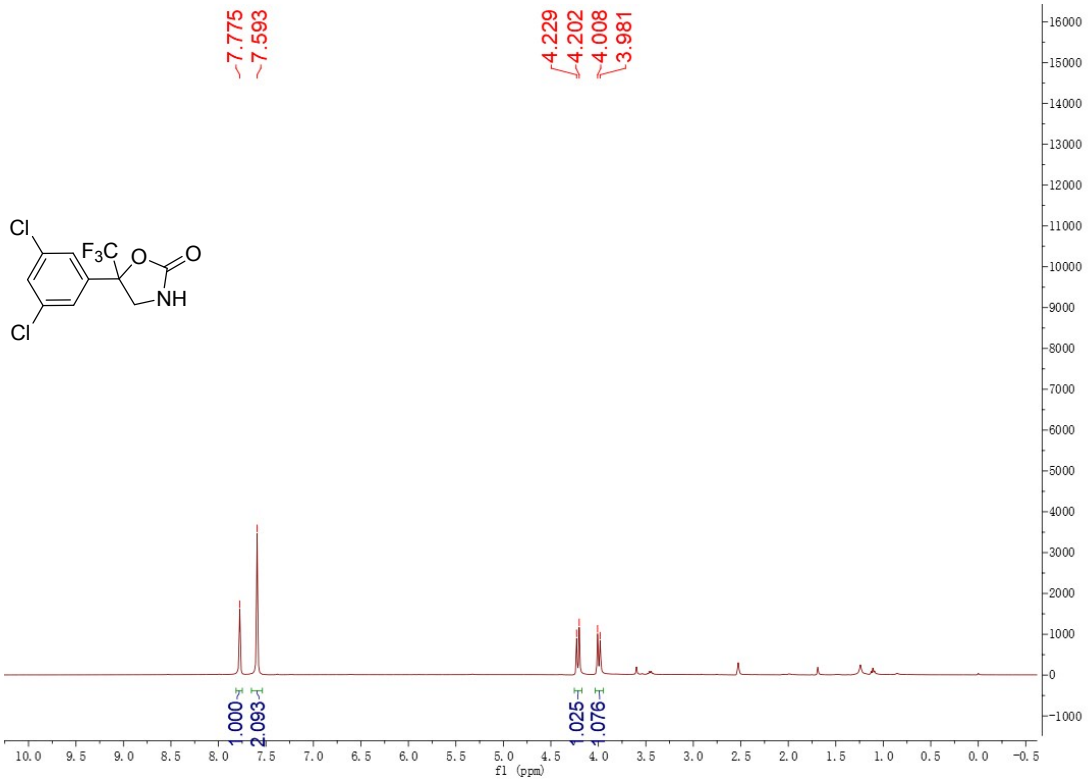
^{13}C NMR (100 MHz, d_6-DMSO) spectrum for 4



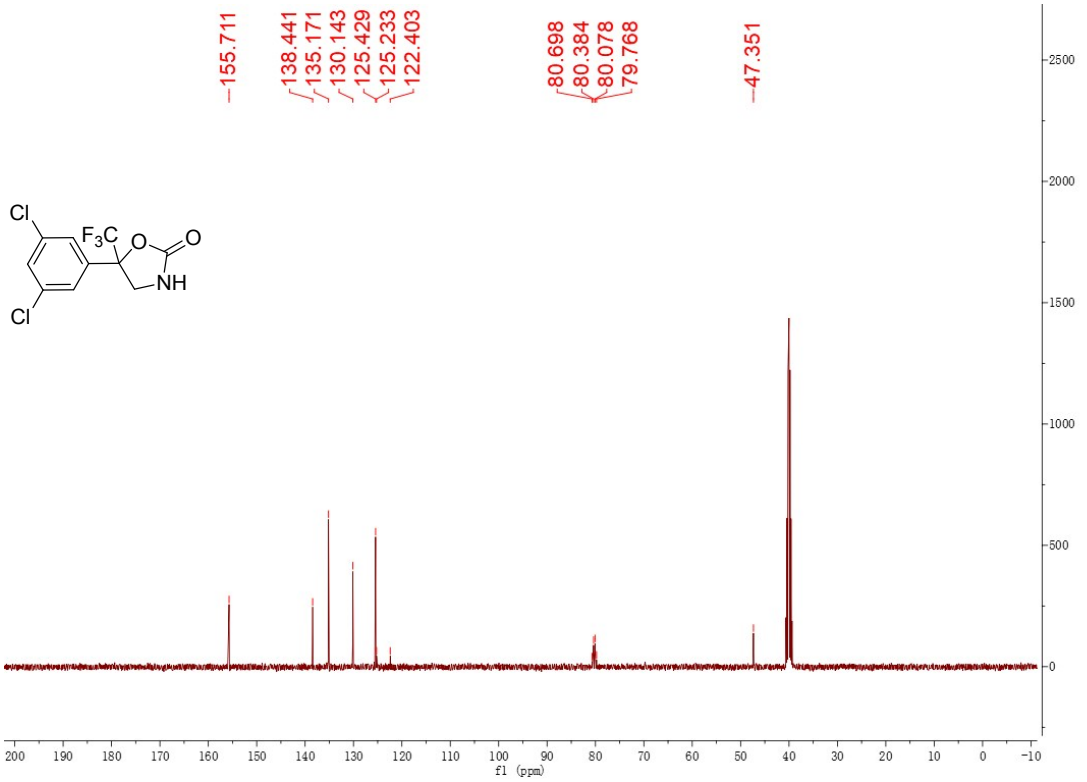
^{19}F NMR (376 MHz, d_6-DMSO) spectrum for 4



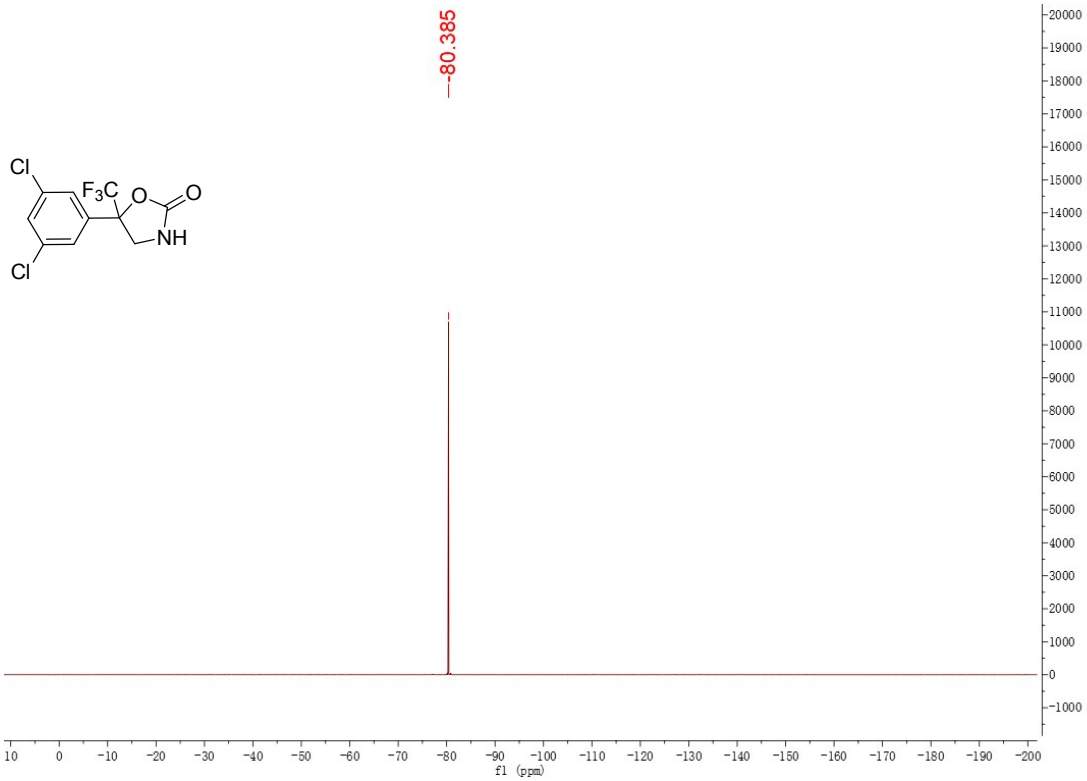
^{1}H NMR (400 MHz, d_6-DMSO) spectrum for 5



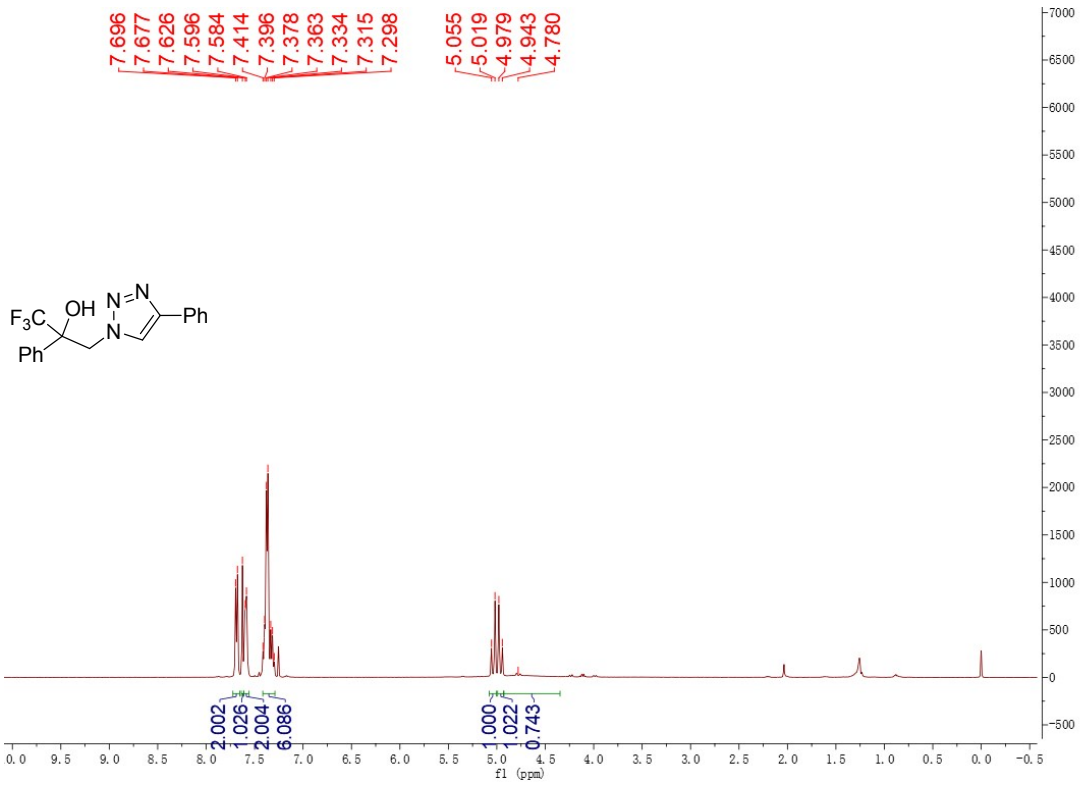
^{13}C NMR (100 MHz, d_6-DMSO) spectrum for 5



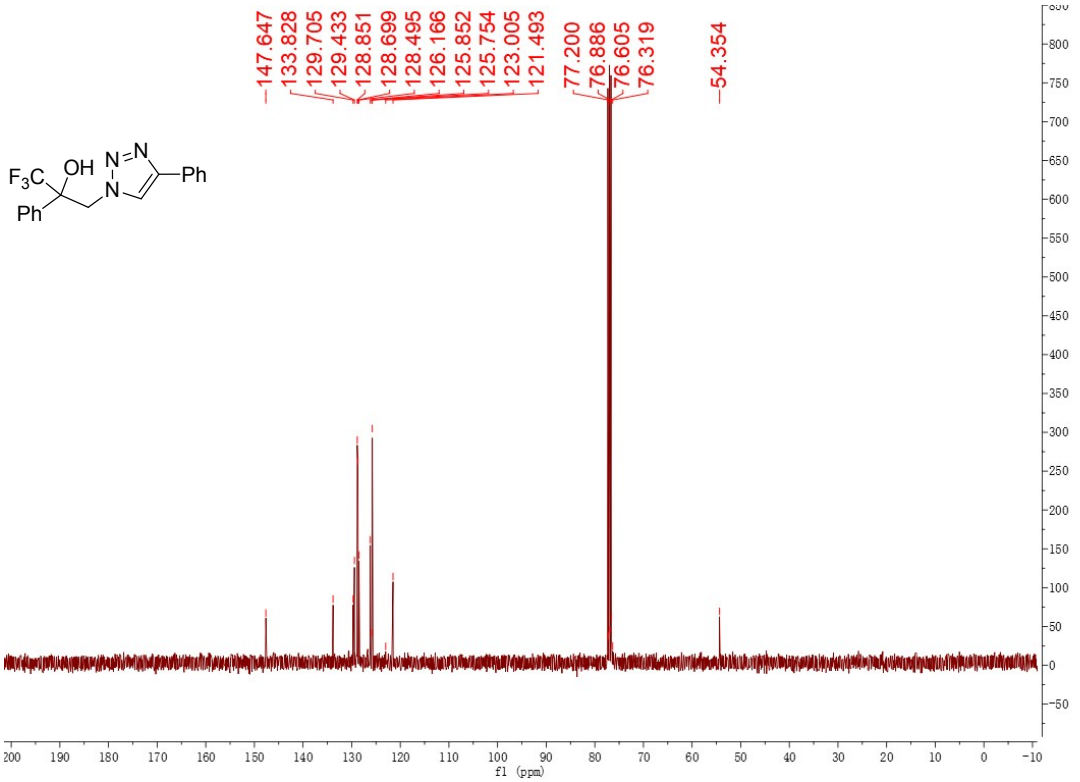
^{19}F NMR (376 MHz, d_6-DMSO) spectrum for 5



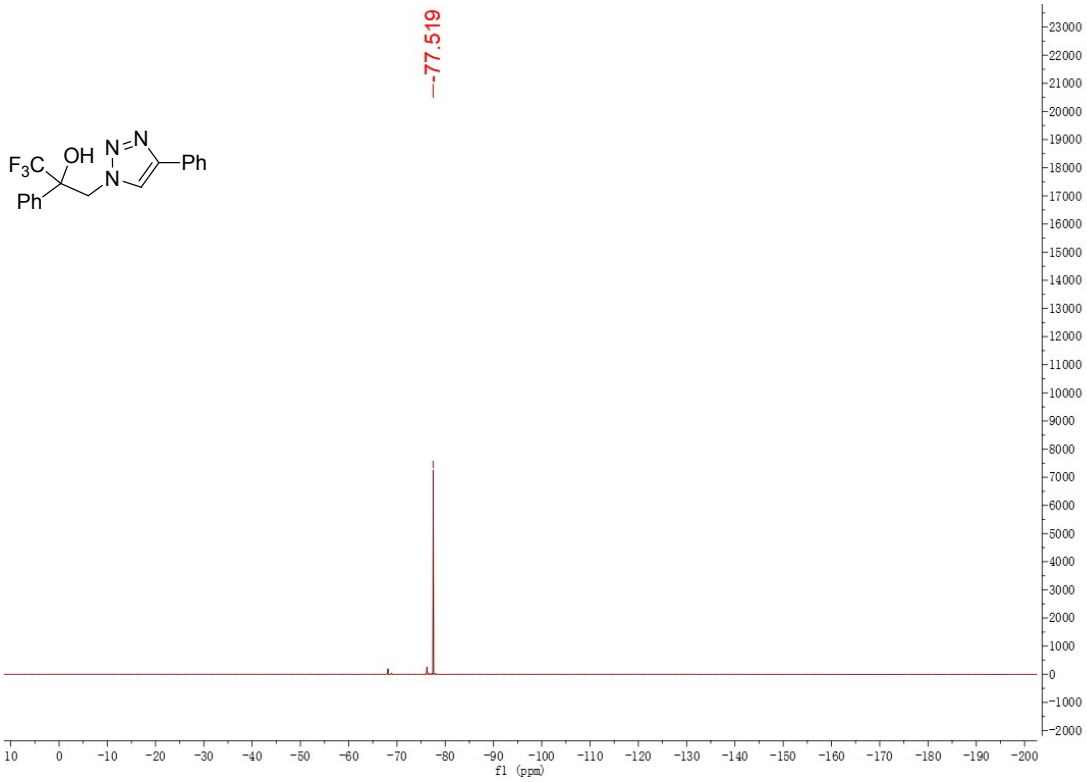
^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 6



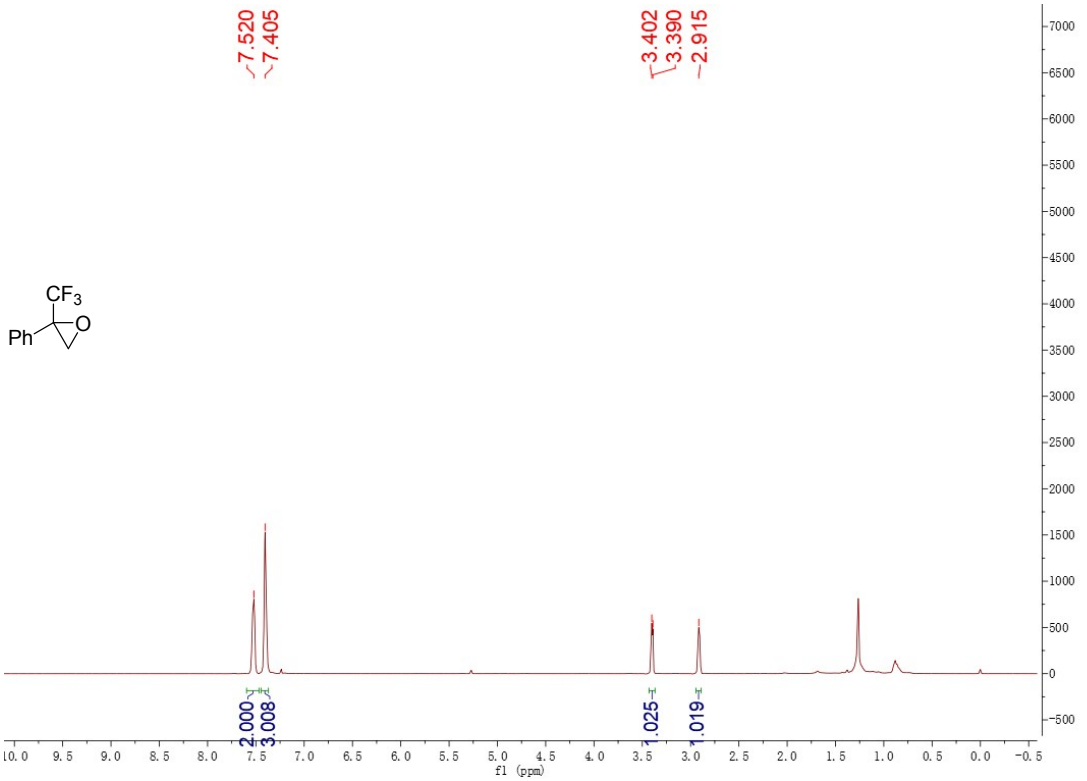
^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 6



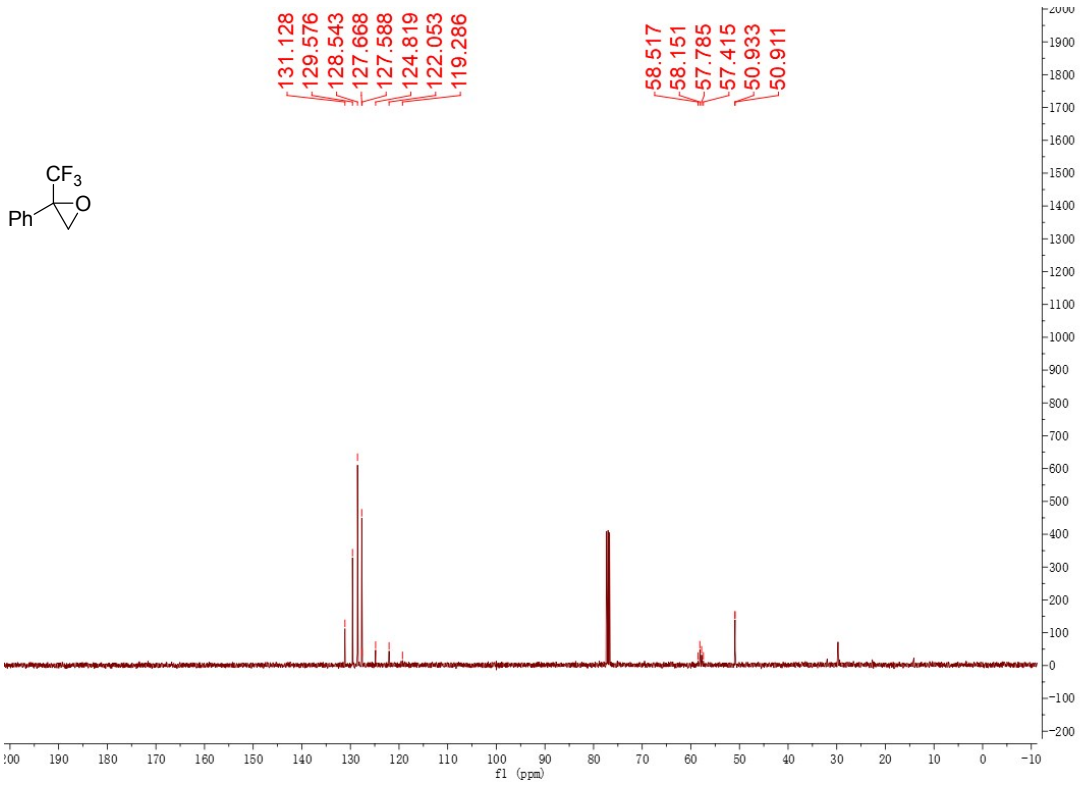
^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 6



^{1}H NMR (400 MHz, $CDCl_3$) spectrum for 8



^{13}C NMR (100 MHz, $CDCl_3$) spectrum for 8



^{19}F NMR (376 MHz, $CDCl_3$) spectrum for 8