Supporting Information (SI)

Facile and rapid access to hexafluoroisopropanol (HFIP)-group functionalized aniline and indole derivatives using hexafluoroacetone trihydrate in HFIP

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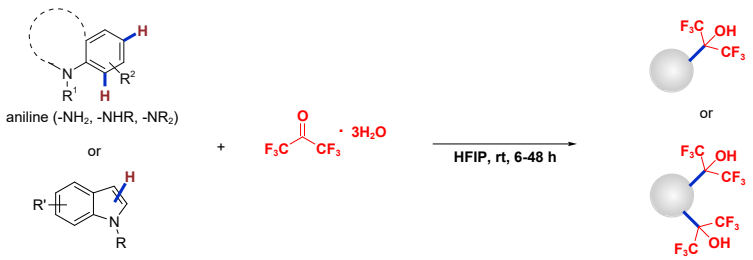
1. General information

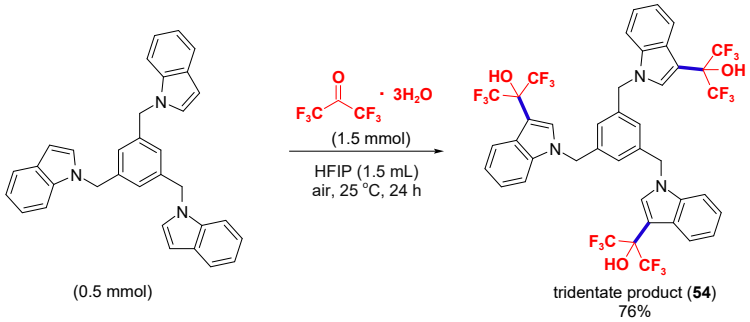
Unless otherwise indicated, all reactions were carried out in air. All reagents and solvents were obtained commercially and used as received without further purification. Analytical thin layer chromatography was performed on 0.20 mm Qingdao Haiyang silica gel plates. Silica gel (200-300 mesh) (from Qingdao Haiyang Chem. Company, Ltd.) was used for flash chromatography. ^{1}H, ^{13}C and ^{19}F were recorded on Bruker AV 400 MHz instrument at 400 MHz (^{1}H NMR), 100 MHz (^{13}C NMR), as well as 376 MHz (^{19}F NMR). $CDCl_3$ (7.26 ppm for ^{1}H NMR, 77.0 ppm for ^{13}C NMR), or DMSO-d_6 (2.50 ppm for ^{1}H NMR, 39.5 ppm for ^{13}C NMR) or acetone-d_6 (2.05 ppm for ^{1}H NMR, 29.8 ppm for ^{13}C NMR) was used as a reference. Data for ^{1}H were reported as follows: chemical shift (ppm), multiplicity (s = singlet, d = doublet, t = triplet, q = quartet, dd = doublet of doublets, m = multiplet, br = broad singlet), coupling constants (Hz), and integration. Data for ^{13}C NMR were reported as ppm. High-resolution mass spectra analyses were performed on a Waters SYNAPT G2-Si Q-TOF mass spectrometer or Bruker ultrafleXtreme MALDI-TOF/TOF mass spectrometer. Melting points were determined using a X-4 digital micro melting point apparatus. Thin-layer chromatography (TLC) was performed, and visualization of the compounds was accomplished with UV light (254 nm). Flash column chromatography was performed on silica gel (200−300 mesh). Tridentate and sexadentate indole-based substrates were prepared according to the reported procedures.[1-2]

2. General procedure for synthesis of HFIP group functionalized aniline and indole derivatives (3–53)



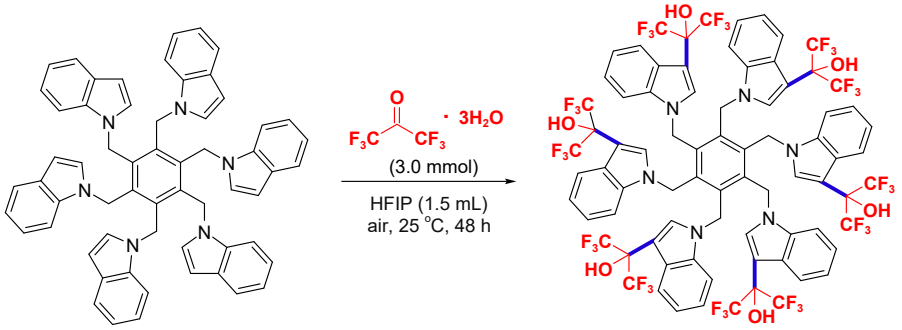
To a solution of aniline or indole derivatives (0.5 mmol, 1.0 equiv.) in HFIP (1.5 mL) in a 5 mL glass vial, hexafluoroacetone trihydrate (0.5 mmol, 1.0 equiv. or 1.0 mmol, 2.0 equiv.) were added and was stirred at room temperature until the completion of the reaction (monitored by TLC, approximately 6–48 hours). Then the mixture was concentrated under reduced pressure. The residue was purified by column chromatography to afford the desired products **3**–**53**, using the indicated eluent.

3. Synthesis of dendritic HFIP-group functionalized derivatives and phenol-based product (54–56)

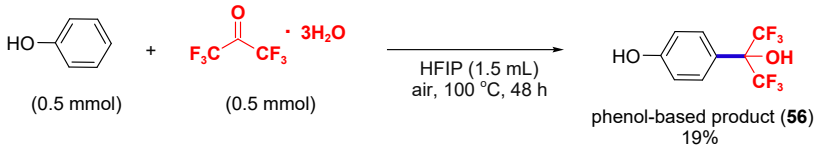


To a solution of tridentate indole-based substrate (232.8 mg, 0.5 mmol, 1.0 equiv.) in HFIP (1.5

mL) in a 5 mL glass vial, hexafluoroacetone trihydrate (330.0 mg, 1.5 mmol, 3.0 equiv.) were added and was stirred at room temperature until the completion of the reaction (monitored by TLC, 24 hours). Then the mixture was concentrated under reduced pressure. The residue was purified by column chromatography to afford the desired product **54** (366.2 mg, 76%) as white solid, using the indicated eluent.

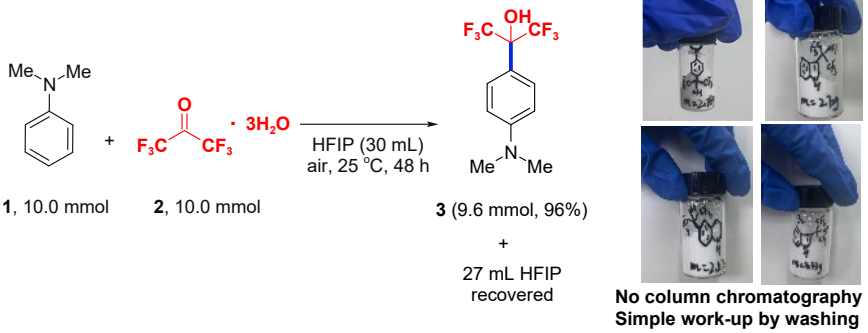


To a solution of sexadentate indole-based substrate (170.6 mg, 0.2 mmol, 1.0 equiv.) in HFIP (1.5 mL) in a 5 mL glass vial, hexafluoroacetone trihydrate (264.0 mg, 1.2 mmol, 6.0 equiv.) were added and was stirred at room temperature until the completion of the reaction (monitored by TLC, 48 hours). Then the mixture was concentrated under reduced pressure. The residue was purified by column chromatography to afford the desired product **55** (177.5 mg, 48%) as white solid, using the indicated eluent.



To a solution of phenol (47.1 mg, 0.5 mmol, 1.0 equiv.) in HFIP (1.5 mL) in a 5 mL glass vial, hexafluoroacetone trihydrate (110.0 mg, 0.5 mmol, 1.0 equiv.) were added and was stirred at 100 °C in an oil bath until the completion of the reaction (monitored by TLC, 48 hours). Then the mixture was concentrated under reduced pressure. The residue was purified by column chromatography to afford the desired product **56** (24.7 mg, 19%) as white solid, using the indicated eluent.

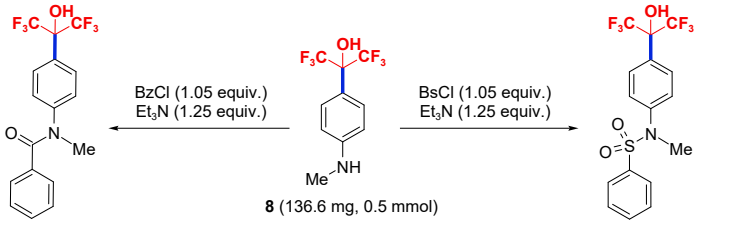
4. Gram-scale synthesis and recovery of the HFIP solvent



To a 50 mL glass vial added *N*,*N*-dimethylaniline **1** (1.21 g, 10.0 mmol, 1.0 equiv.) and hexafluoroacetone trihydrate **2** (2.20 g, 10.0 mmol, 1.0 equiv.) in 30 mL of HFIP. The resulting mixture was stirred at room temperature. After completion of the reaction (monitored by TLC) the HFIP solvent was recovered by distillation directly from the reaction pot (60–70 ˚C, 27 mL, 90%).

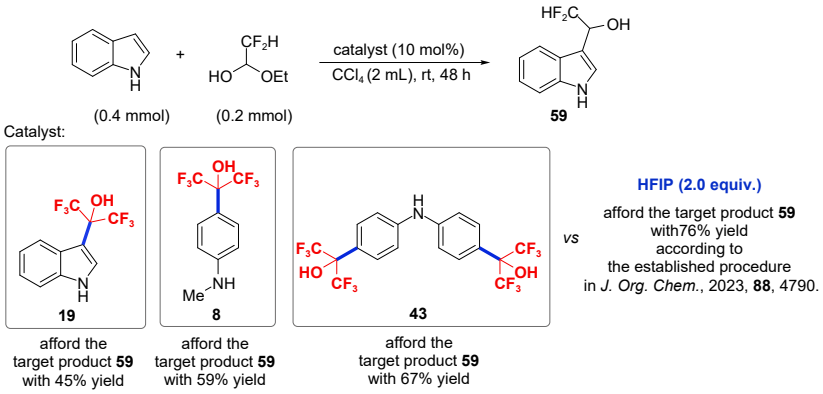
The residue was purified by washing with hexane to give **3** (2.77 g, 96%) as white solid. Compounds **11** (2.57 g, 86%), **19** (2.72 g, 96%) and **24** (3.33 g, 92%) were obtained as white solid according to above washing work-up procedure.

5. Synthesis of bioactive molecules 57 and 58



The corresponding acyl chloride or sulfonyl chloride (0.53 mmol, 1.05 equiv) was dissolved in anhydrous DCM (1.5 mL) under N_2 atmosphere and the resulting mixture was cooled to 0 °C. Then, the HFIP-functionalized aniline **8** (136.6 mg, 0.5 mmol, 1.0 equiv) was added dropwise followed by the slow addition of triethylamine (87.5 μL, 0.63 mmol, 1.25 equiv). After completion of addition, the ice bath was removed and the reaction was stirred for 12 hours at room temperature. After the completion of the reaction, the mixture was concentrated under reduced pressure. Then, the mixture was extracted with ethyl acetate (3×2.0 mL), and the combined organic layers washed with brine (2.0 mL), dried over anhydrous Na_2SO_4, and evaporated. The residue was purified by column chromatography to afford the desired products **57** and **58**, using the indicated eluent.

6. Applications of the obtained HFIP-group functionalized molecules as organocatalysts



To a mixture of indole (46.9 mg, 0.4 mmol, 2.0 equiv.) and diffuoroacetaldehyde ethyl hemiacetal (25.2 mg, 0.2 mmol, 1.0 equiv.) in CCl_4 (2.0 mL) was added the obtained HFIP-group functionalized molecules **19**, **8** or **43** (0.02 mmol) under room temperature. The resulting mixture was stirred at room temperature for 48 h according to the reaction condition reported in *J. Org. Chem.*, 2023, **88**, 4790. Then the mixture was concentrated under reduced pressure. The residue was purified by column chromatography to afford the C3-alkylated product **59** using petroleum ether/ethyl acetate (20/1 to 10/1, v/v) as eluent.

7. ^{1}H NMR study of the multiple interactions in the reaction system

^{1}H NMR of individual species (**1**, **2** and **HFIP**), three binary mixtures (**1** : **2** and **1** : **HFIP** and **2** : **HFIP**), one ternary mixture (**1** : **2** : **HFIP**) were recorded at a 0.06 mmol scale of *N*,*N*-dimethylaniline **1**, 0.06 mmol scale of hexafluoroacetone trihydrate **2**, 0.6 mmol scale of HFIP (10.0 equiv.) and 0.6 mL $CDCl_3$.

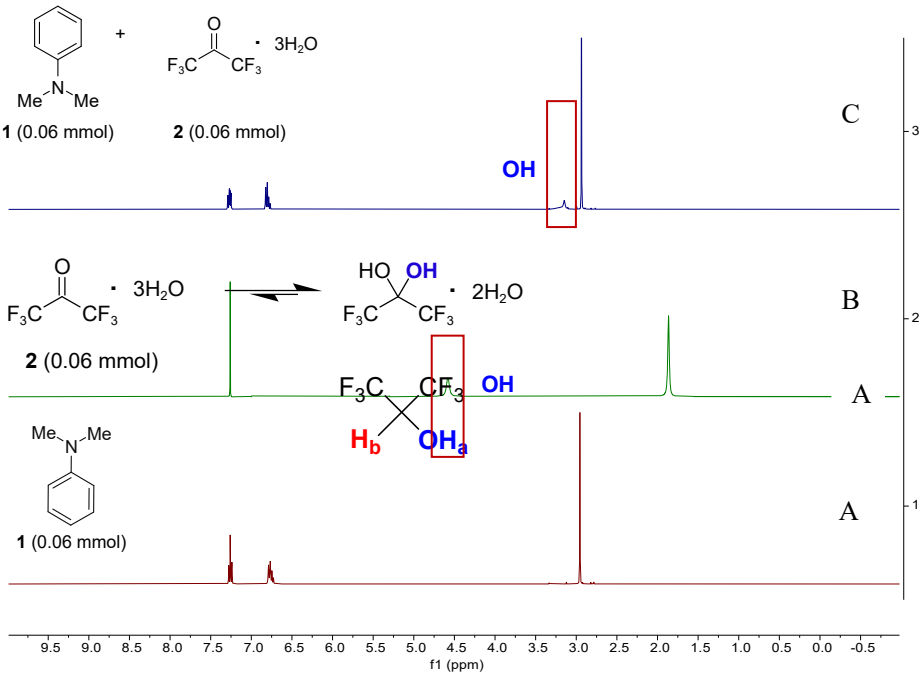


Figure S1 ^{1}H NMR of the individual specie (A–B) and the two binary mixture (C).

Signal	Species	
	2	**Binary mixture (1 : 2)**
OH (*gem*-diol form of 2)	4.58, br s	3.14, br s (-1.44)

Table S1. Significant changes for the binary mixture with respect to individual specie.

The most significant changes found in ^{1}H NMR for the **1** : **2** binary mixture (Figure S1C) compared to the individual specie (Figure S1B) are the upfield shift of the OH (*gem*-diol form of **2**), from a frequency of 4.58 ppm to 3.14 ppm ($\Delta\delta$ = 1.44), supporting the existence of potential interactions between **1** and **2** (Table S1).

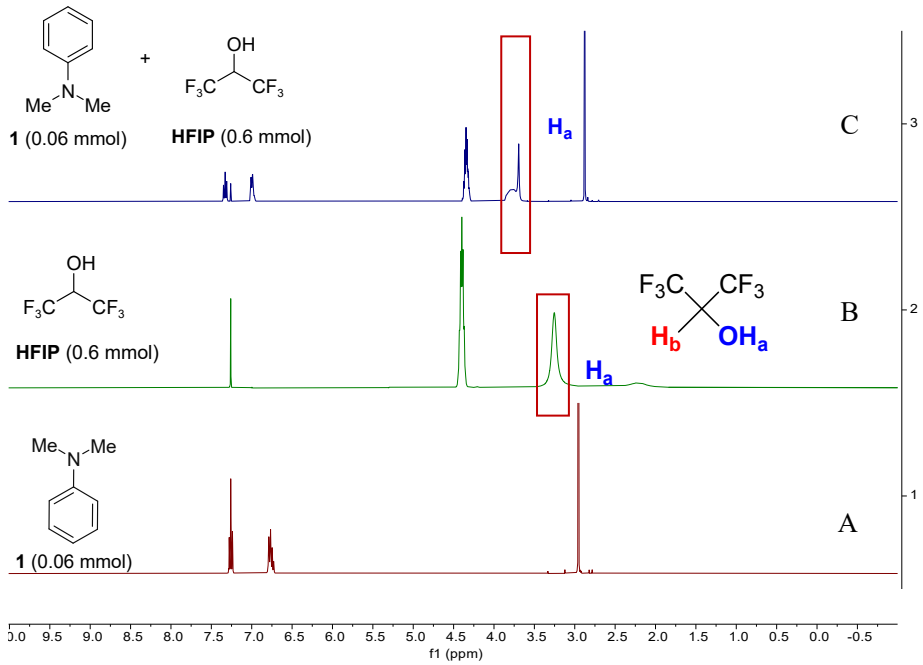


Figure S2 ^{1}H NMR of the individual specie (A–B) and the two binary mixture (C).

Signal	Species	
	HFIP	**Binary mixture (1 : HFIP)**
OHa (HFIP)	3.26, br s	3.69, br s (+0.43)

Table S2. Significant changes for the binary mixture with respect to individual specie.

The most significant changes found in ^{1}H NMR for the **1** : **HFIP** binary mixture (Figure S2C) compared to the individual specie (Figure S2B) are the downfield shift (deshieled) of the OH (**HFIP**), from a frequency of 3.69 ppm to 3.26 ppm (Δδ = 0.43), supporting the existence of potential interactions between **1** and **HFIP** (Table S2).

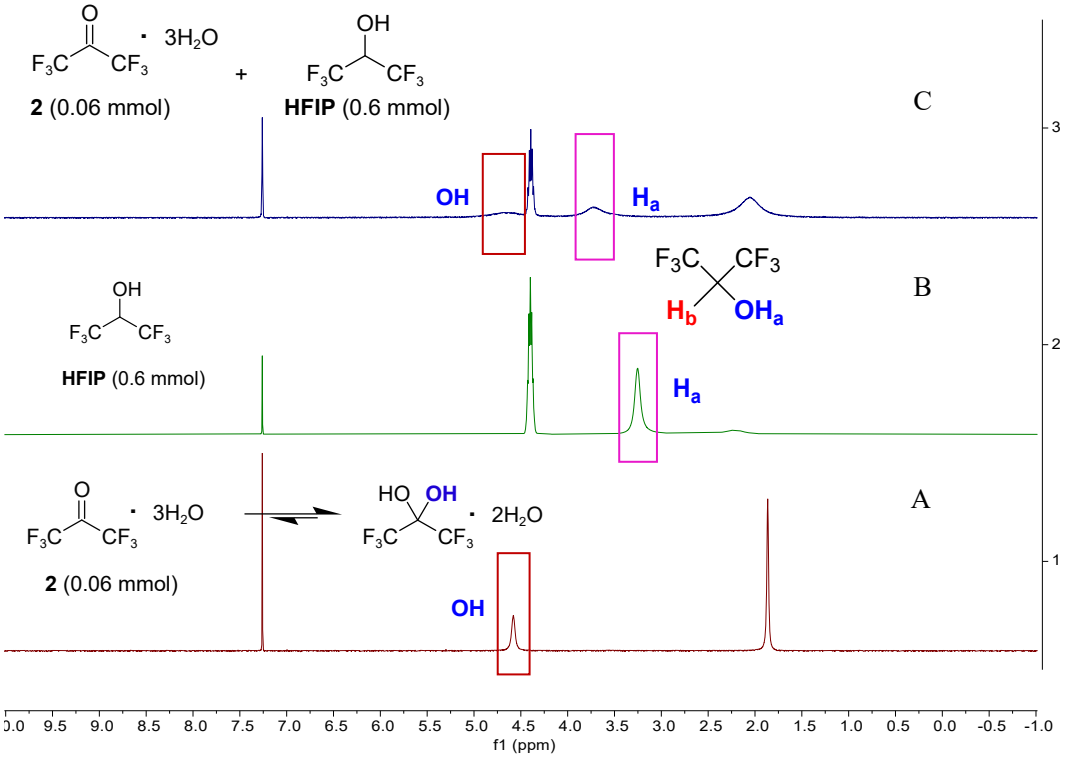


Figure S3 ^{1}H NMR of the individual specie (A–B) and the two binary mixture (C).

Signal	Species		
	2	**HFIP**	**Binary mixture (2 : HFIP)**
OH (*gem*-diol form of 2)	4.58, br s	–	4.64, br s (+0.06)
OHa (HFIP)	–	3.25, br s	3.72, br s (+0.47)

Table S3. Significant changes for the binary mixture with respect to individual specie.

The most significant changes found in ^{1}H NMR for the **2** : **HFIP** binary mixture (Figure S3C) compared to the individual specie (Figure S3A) and (Figure S3B) are the downfield shift (deshieled) of the OH (*gem*-diol form of **2**), from a frequency of 4.58 ppm to 4.64 ppm (Δδ = 0.06) as well as the downfield shift (deshieled) of the OH (**HFIP**), from a frequency of 3.25 ppm to 3.72 ppm (Δδ = 0.47). These data support strong interactions between **2** and **HFIP** (Table S3).

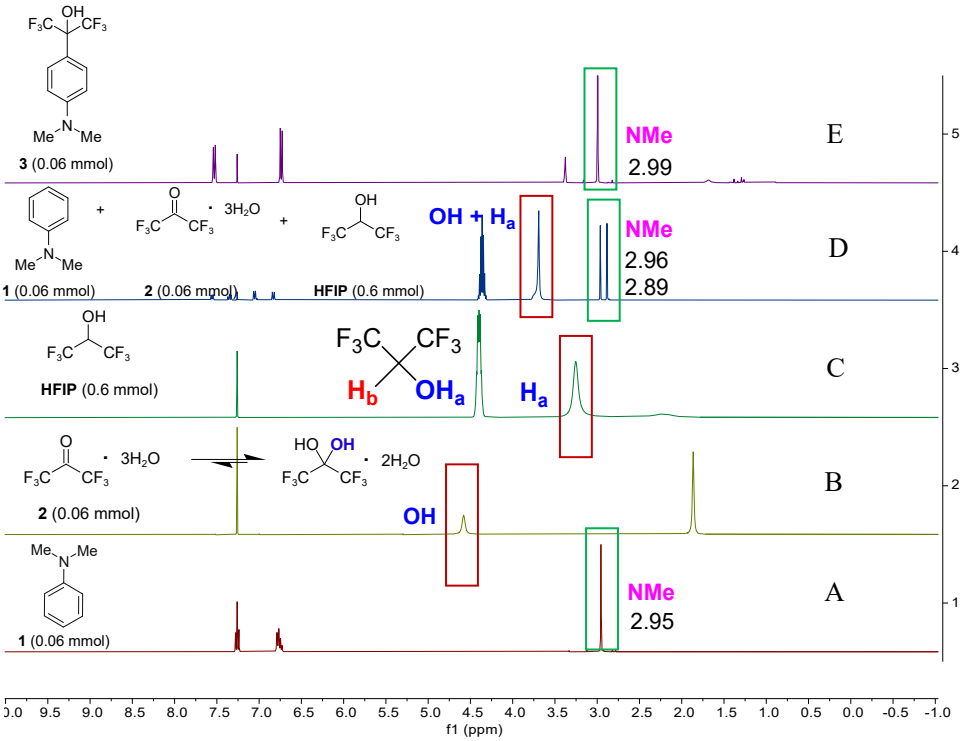


Figure S4 ^{1}H NMR of the individual species (A–C), the ternary mixture (D) and the target product (E).

Signal	**Species**			
	1	**2**	**HFIP**	**Ternary mixture (1 ： 2 : HFIP)**
OH (*gem*-diol form of **2)**	–	4.57, br s	–	3.69, br s (-0.88)
OHa (HFIP)	–	–	3.25, br s	3.69, br s (+0.44)
NMe (one Me of **1)**	2.95, s	–	–	2.89, s (-0.06)

Table S4. Significant changes for the ternary mixture with respect to individual species and the binary mixture.

The most significant changes found in ^{1}H NMR for the **1** : **2** : **HFIP** ternary mixture (Figure S4D) compared to the individual specie (Figure S3B) and (Figure S3C) are the upfield shift of the OH (*gem*-diol form of **2**), from a frequency of 4.57 ppm to 3.69 ppm ($\Delta\delta$ = 0.88) as well as the downfield shift (deshieled) of the OH (**HFIP**), from a frequency of 3.25 ppm to 3.69 ppm ($\Delta\delta$ = 0.44). Further, the chemical shift of one NMe of *N*,*N*-dimethylaniline **1** is found shifted from 2.95 ppm to 2.89 ppm in the ternary mixture. These data support the existence of multiple hydrogen-

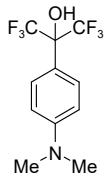
bonding interactions between both the reactants and HFIP (Table S4).

8. Calculation of Green Metrics

	Co-catalyzed CDC reaction (*Org. Lett.*, 2019, **21**, 218–222)	Cu-catalyzed CDC reaction (*Org. Lett.*; 2020, **22**, 3033–3038)	Nucleophilic substitution with arylamine (*Russ. Chem. Bull.*, 1990, **39**, 323−328)	Our Work
Catalyst	Cobalt acetate tetrahydrate	Cupric acetate /4,4'-bis(1,1-dimethylethyl)-2,2'-bipyridine	--	--
T oil bath (℃)	70	90	80	rt
Yield	80%	47%	31%	99%
Atom economy	99.3%	99.3%	75.5%	84.1%
Atom efficiency (Yield*Atom economy)	79.4%	46.7%	23.4%	83.3%
Total mass of starting materials	30.3 (aniline) + 798 (HFIP) + 47.3 (additive) + 1.3 (catalyst) = 876.9 mg	24.2 (aniline) + 3192 (HFIP) + 8.1 (additive) +3.6 (catalyst) = 3227.9 mg	190.2 (materials) + 3566 (solvent) = 3756.2 mg	60.6 (aniline) + 110 (hexafluoroacetone trihydrate) + 2394 (solvent) = 2564.6 mg
Total mass of product + recovered solvent (if any)	50.3 mg (product)	26.8 mg (product)	44.5 mg (product)	142.2 (product) + 2154.6 (recovered 90% solvent) =2296.8 mg
Total mass of waste (Including water)	876.9–50.3 =826.6 mg	3,227.9 – 26.8 = 3201.1 mg	3,756.2 – 44.5 = 3,711.7 mg	2564.6 – 2296.8 mg =267.8 mg
E-factor (waste/product)	826.6/50.3 = 16.4	3201.1/26.8 = 119.4	3711.7/44.5 = 83.4	267.8/142.2 = 1.8 (recovered solvent)
Reaction mass efficiency (RME) (product/ materials)	50.3/(30.3+42) *100% = 69.6%	26.8/(24.2+33.6) *100% = 46.3%	44.5/190.2 * 100% = 23.4%	142.2 / (60.6 + 110) * 100% = 83.3%
Process Mass Intensity (PMI) (Including water) (Total mass of starting	876.9/50.3 = 17.4	3227.9/26.8 = 120.4	3756.2/44.5 = 84.4	(2564.6-2154.6)/142.2 = 2.9 (recovered solvent)

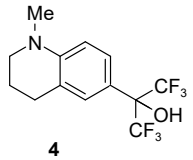
materials/ product)				
Solvent (recovery demonstrated)	1,1,1,3,3,3-Hexafluoroisopropanol （not recovered）	1,1,1,3,3,3-Hexafluoroisopropanol (not recovered)	Diethyl ether （not recovered）	1,1,1,3,3,3-Hexafluoroisopropanol (recovered and recycled)

9. Characterization data of the products



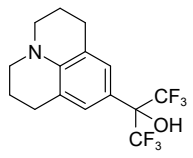
3

2-(4-(dimethylamino)phenyl)-1,1,1,3,3,3-hexafluoropropan-2-ol (3): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (15/1 to 10/1, v/v) as eluent to give compound **3** (white solid, 142.2 mg, 0.495 mmol, 99% yield). M.p.: 72–73 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.53 (d, J = 8.9 Hz, 2H), 6.74 (d, J = 9.1 Hz, 2H), 3.38 (s, 1H), 2.99 (s, 6H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.84 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 151.3, 127.3, 122.9 (q, $^{1}J_{C-F}$ = 286.7 Hz), 116.2, 111.7, 40.1; **HRMS** (ESI) m/z: $[M+H]^+$ Calcd for $C_{11}H_{12}F_6NO$: 288.0818, Found: 288.0826.



4

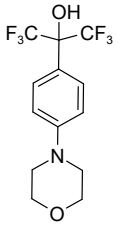
1,1,1,3,3,3-hexafluoro-2-(1-methyl-1,2,3,4-tetrahydroquinolin-6-yl)propan-2-ol (4): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (15/1 to 10/1, v/v) as eluent to give compound **4** (white solid, 303.8 mg, 0.485 mmol, 97% yield). M.p.: 53–55 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.35 (d, J = 8.7 Hz, 1H), 7.24 (d, J = 12.6 Hz, 1H), 6.59 (d, J = 8.8 Hz, 1H), 3.35 (s, 1H), 3.31 – 3.25 (m, 2H), 2.92 (s, 3H), 2.79 (t, J = 6.3 Hz, 2H), 2.03 – 1.94 (m, 2H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.77 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 147.6, 126.6, 125.3, 122.9 (q, $^{1}J_{C-F}$ = 285.7 Hz), 122.4, 115.7, 110.1, 50.9, 38.8, 27.9, 21.9; **HRMS** (ESI) m/z: $[M+H]^+$ Calcd for $C_{13}H_{14}F_6NO$: 314.0975, Found: 314.0976.



5

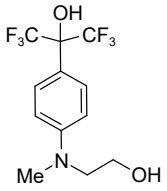
1,1,1,3,3,3-hexafluoro-2-(2,3,6,7-tetrahydro-1H,5H-pyrido[3,2,1-*ij*]quinolin-9-yl)propan-2-ol (5): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (20/1 to 15/1, v/v) as eluent to give compound **5** (white solid, 164.5 mg, 0.485 mmol, 97% yield). M.p.: 95–97 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.04 (s, 2H), 3.29 (s, 1H), 3.21 – 3.14 (m, 4H), 2.76 (t, J = 6.4 Hz, 4H), 2.01 – 1.92 (m, 4H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.52 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 144.0, 124.8, 122.9 (q, $^{1}J_{C-F}$ = 287.7 Hz), 120.9, 115.0, 49.7,

27.9, 21.6; **HRMS** (ESI) m/z: $[M+H]^+$ Calcd for $C_{15}H_{16}F_6NO$: 340.1131, Found: 340.1139.



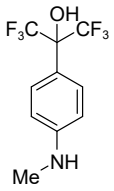
6

1,1,1,3,3,3-hexafluoro-2-(4-morpholinophenyl)propan-2-ol (6): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (15/1 to 10/1, v/v) as eluent to give compound **6** (white solid, 154.7 mg, 0.47 mmol, 94% yield). M.p.: 129–130 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.58 (d, J = 8.5 Hz, 2H), 6.93 (d, J = 8.5 Hz, 2H), 4.05 (s, 1H), 3.90 – 3.82 (m, 4H), 3.25 – 3.18 (m, 4H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.70 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 152.0, 127.6, 122.8 (q, $^1J_{C-F}$ = 288.0 Hz), 120.1, 114.7, 66.7, 48.2; **HRMS** (ESI) m/z: $[M+H]^+$ Calcd for $C_{13}H_{14}F_6NO_2$: 330.0924, Found: 330.0925.



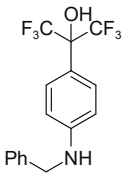
7

1,1,1,3,3,3-hexafluoro-2-(4-((2-hydroxyethyl)(methyl)amino)phenyl)propan-2-ol (7): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (15/1 to 10/1, v/v) as eluent to give compound **7** (colorless liquid, 114.2 mg, 0.445 mmol, 89% yield). **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.54 (d, J = 8.8 Hz, 2H), 6.77 (d, J = 9.1 Hz, 2H), 4.90 (s, 1H), 3.78 (t, J = 5.7 Hz, 2H), 3.48 (t, J = 5.7 Hz, 2H), 2.97 (s, 3H), 2.31 (s, 1H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.76 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 150.6, 127.6, 123.0 (q, $^1J_{C-F}$ = 287.7 Hz), 117.3, 111.9, 60.0, 54.5, 38.5; **HRMS** (ESI) m/z: $[M+H]^+$ Calcd for $C_{12}H_{14}F_6NO_2$: 318.0924, Found: 318.0928.



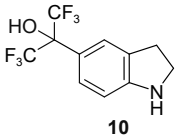
8

1,1,1,3,3,3-hexafluoro-2-(4-(methylamino)phenyl)propan-2-ol (8): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (15/1 to 10/1, v/v) as eluent to give compound **8** (white solid, 133.8 mg, 0.49 mmol, 98% yield). M.p.: 86–87 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.49 (d, J = 8.8 Hz, 2H), 6.81 – 6.39 (m, 2H), 3.74 (s, 2H), 2.85 (s, 3H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.84 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 150.4, 127.5, 122.9 (q, $^1J_{C-F}$ = 288.0 Hz), 117.4, 112.0, 30.4; **HRMS** (ESI) m/z: $[M+H]^+$ Calcd for $C_{10}H_{10}F_6NO$: 274.0662, Found: 274.0661.



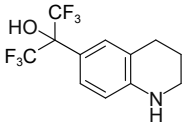
9

2-(4-(benzylamino)phenyl)-1,1,1,3,3,3-hexafluoropropan-2-ol (9): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (15/1 to 10/1, v/v) as eluent to give compound **9** (white solid, 155.4 mg, 0.45 mmol, 89% yield). M.p.: 95–96 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.48 (d, *J* = 8.4 Hz, 2H), 7.37 (d, *J* = 3.9 Hz, 4H), 7.31 (dd, *J* = 10.3, 6.0 Hz, 1H), 6.67 (d, *J* = 8.5 Hz, 2H), 4.36 (s, 2H), 4.28 (s, 1H), 3.42 (s, 1H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.81 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 149.3, 138.7, 128.7, 127.6, 127.5, 122.8 (q, $^1J_{C-F}$ = 287.3 Hz), 117.5, 112.3, 48.0; **HRMS** (ESI) m/z: $[M+H]^+$ Calcd for $C_{16}H_{14}F_6NO$: 350.0975, Found: 350.0971.



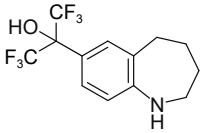
10

1,1,1,3,3,3-hexafluoro-2-(indolin-5-yl)propan-2-ol (10): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (20/1 to 15/1, v/v) as eluent to give compound **10** (brown liquid, 128.3mg, 0.45 mmol, 90% yield). **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.31 (t, *J* = 6.9 Hz, 2H), 7.02 (t, *J* = 7.7 Hz, 1H), 3.60 (t, *J* = 8.1 Hz, 2H), 3.07 (t, *J* = 8.0 Hz, 2H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.36 (s, 6F); **^{13}C NMR** (100 MHz, DMSO-d_6) δ 153.4, 129.6, 126.4, 123.5 (q, $^1J_{C-F}$ = 288.2 Hz), 122.8, 118.9, 108.1, 46.7, 29.2; **HRMS** (ESI) m/z: $[M+H]^+$ Calcd for $C_{11}H_{10}F_6NO$: 286.0662, Found: 286.0666.



11

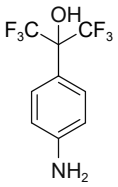
1,1,1,3,3,3-hexafluoro-2-(1,2,3,4-tetrahydroquinolin-6-yl)propan-2-ol (11): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (15/1 to 10/1, v/v) as eluent to give compound **11** (white solid, 145.1 mg, 0.485 mmol, 97% yield). M.p.: 114–115 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.23 (s, 2H), 6.47 (d, *J* = 9.2 Hz, 1H), 3.38 (s, 1H), 3.36 – 3.25 (m, 2H), 2.78 (t, *J* = 6.4 Hz, 2H), 1.99 – 1.90 (m, 2H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.72 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 146.0, 127.5, 125.0, 122.9 (q, $^1J_{C-F}$ = 288.0 Hz), 121.1, 116.9, 113.7, 41.7, 27.1, 21.6; **HRMS** (ESI) m/z: $[M+H]^+$ Calcd for $C_{12}H_{12}F_6NO$: 300.0818, Found: 300.0816.



12

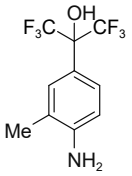
1,1,1,3,3,3-hexafluoro-2-(2,3,4,5-tetrahydro-1H-benzo[b]azepin-7-yl)propan-2-ol (12): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (20/1 to 15/1, v/v) as eluent to give compound **12** (white solid, 126.8 mg, 0.4 mmol, 81% yield). M.p.:

115–116 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.39 (s, 1H), 7.29 (d, *J* = 8.3 Hz, 1H), 6.69 (d, *J* = 8.4 Hz, 1H), 4.08 (s, 1H), 3.13 – 3.03 (m, 2H), 2.82 – 2.75 (m, 2H), 1.88 – 1.78 (m, 2H), 1.71 – 1.62 (m, 2H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.54 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 151.4, 133.2, 129.0, 124.8, 122.8 (q, $^1J_{C-F}$ = 288.0 Hz), 121.5, 119.3, 48.4, 36.1, 31.2, 26.5; **HRMS** (ESI) m/z: $[M+H]^+$ Calcd for $C_{13}H_{14}F_6NO$: 314.0975, Found: 314.0973.



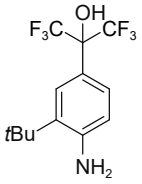
13

2-(4-aminophenyl)-1,1,1,3,3,3-hexafluoropropan-2-ol (13): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (15/1 to 10/1, v/v) as eluent to give compound **13 (**white solid, 126.8 mg, 0.4 mmol, 81% yield). M.p.:124–125 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.46 (d, *J* = 8.5 Hz, 2H), 6.71 (d, *J* = 8.8 Hz, 2H), 3.84 (s, 2H), 3.32 (s, 1H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.86 (s, 6F); **^{13}C NMR** (100 MHz, DMSO-d_6) δ 150.4, 127.8, 123.5 (q, $^1J_{C-F}$ = 288.6 Hz), 116.9, 113.6; **HRMS** (ESI) m/z: $[M+H]^+$ Calcd for $C_9H_8F_6NO$: 260.0505, Found: 260.0503.



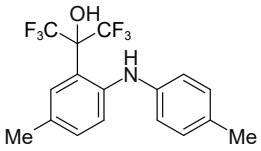
14

2-(4-amino-3-methylphenyl)-1,1,1,3,3,3-hexafluoropropan-2-ol (14): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (15/1 to 10/1, v/v) as eluent to give compound **14** (white solid, 91.5 mg, 0.33 mmol, 67% yield). M.p.: 132–133 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.34 (d, *J* = 12.9 Hz, 2H), 6.69 (d, *J* = 8.3 Hz, 1H), 3.78 (s, 2H), 3.40 (s, 1H), 2.19 (s, 3H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.76 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 146.1, 128.5, 125.3, 122.8 (q, $^1J_{C-F}$ = 286.2 Hz), 122.1, 118.8, 114.6, 17.5; **HRMS** (ESI) m/z: $[M+H]^+$ Calcd for $C_{10}H_{10}F_6NO$: 274.0662, Found: 274.0660.



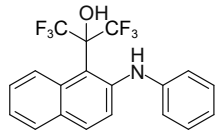
15

2-(4-amino-3-(tert-butyl)phenyl)-1,1,1,3,3,3-hexafluoropropan-2-ol (15): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (15/1 to 10/1, v/v) as eluent to give compound **15** (white solid, 148.1 mg, 0.47 mmol, 97% yield). M.p.:162–163 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.54 (s, 1H), 7.31 (d, *J* = 8.4 Hz, 1H), 6.65 (d, *J* = 8.5 Hz, 1H), 4.00 (s, 2H), 3.43 (s, 1H), 1.42 (s, 9H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.72 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 146.2, 133.3, 125.1, 124.9, 122.9 (q, $^1J_{C-F}$ = 287.8 Hz), 118.6, 117.3, 34.5, 29.4; **HRMS** (ESI) m/z: $[M+H]^+$ Calcd for $C_{13}H_{16}F_6NO$: 316.1131, Found: 316.1141.



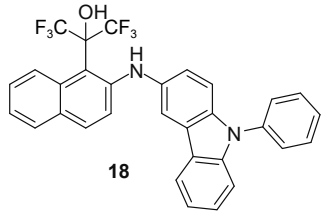
16

1,1,1,3,3,3-hexafluoro-2-(5-methyl-2-(p-tolylamino)phenyl)propan-2-ol (16): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (20/1 to 15/1, v/v) as eluent to give compound **16** (white solid, 167.1 mg, 0.46 mmol, 92% yield). M.p.:141–143 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.49 (s, 1H), 7.23 (d, *J* = 8.1 Hz, 1H), 7.12 – 7.04 (m, 3H), 6.71 (d, *J* = 8.3 Hz, 2H), 2.40 (s, 3H), 2.29 (s, 3H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.28 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 142.8, 141.0, 137.4, 132.4, 131.9, 130.0, 129.9, 128.9, 125.9 (q, $^{1}J_{C-F}$ = 274.8 Hz), 125.9, 118.9, 21.3, 20.6; **HRMS** (ESI) m/z: $[M-H]^-$ Calcd for $C_{17}H_{14}F_6NO$: 362.0985, Found: 362.0983.



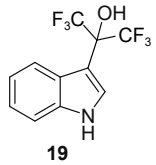
17

1,1,1,3,3,3-hexafluoro-2-(2-(phenylamino)naphthalen-1-yl)propan-2-ol (17): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (20/1 to 15/1, v/v) as eluent to give compound **17** (white solid, 173.3 mg, 0.45 mmol, 90% yield). M.p.:92–93 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.78 (s, 2H), 7.70 (s, 1H), 7.60 (s, 2H), 7.54 (s, 1H), 7.45 (d, *J* = 4.9 Hz, 1H), 7.36 (d, *J* = 4.5 Hz, 1H), 7.32 – 7.24 (m, 2H), 7.17 (dd, *J* = 6.9, 4.2 Hz, 2H), 6.05 (s, 1H), 3.51 (s, 1H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.71 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 145.1, 139.1, 134.4, 129.8, 129.4, 127.8, 127.7, 126.7, 126.6, 124.2, 122.6 (q, $^{1}J_{C-F}$ = 286.6 Hz), 120.8, 120.7, 116.2, 114.2; **HRMS** (ESI) m/z: $[M+H]^+$ Calcd for $C_{19}H_{14}F_6NO$: 386.0975, Found: 386.0973.



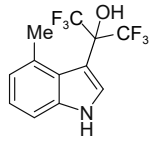
18

1,1,1,3,3,3-hexafluoro-2-(2-((9-phenyl-9H-carbazol-3-yl)amino)naphthalen-1-yl)propan-2-ol (18): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (15/1 to 10/1, v/v) as eluent to give compound **18** (colorless liquid, 156.8mg, 0.28 mmol, 57% yield). **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.53 (s, 1H), 8.29 – 8.19 (m, 1H), 7.74 (t, *J* = 8.0 Hz, 2H), 7.62 (d, *J* = 8.1 Hz, 1H), 7.47 (dt, *J* = 6.7, 4.3 Hz, 3H), 7.44 – 7.33 (m, 7H), 7.24 (s, 1H), 7.11 (d, *J* = 1.9 Hz, 1H), 7.05 (dd, *J* = 8.8, 2.3 Hz, 1H), 2.05 (s, 1H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.23 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 143.3, 142.3, 141.6, 140.8, 136.6, 135.2, 134.1, 130.1, 129.9, 129.6, 128.1, 127.7, 127.3, 126.8, 126.8, 126.7, 125.0, 124.5, 123.5 (q, $^{1}J_{C-F}$ = 288.4 Hz), 123.0, 122.5, 121.0, 120.7, 119.2, 117.3, 114.2, 111.1, 110.2; **HRMS** (ESI) m/z: $[M+H]^+$ Calcd for $C_{31}H_{21}F_6N_2O$: 551.1553, Found: 551.1562.



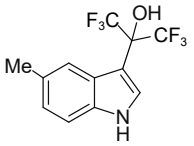
19

1,1,1,3,3,3-hexafluoro-2-(1H-indol-3-yl)propan-2-ol (19): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (20/1 to 15/1, v/v) as eluent to give compound **19** (white solid, 139.2 mg, 0.49 mmol, 98% yield). M.p.:74–75 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.43 (s, 1H), 7.96 (d, *J* = 8.1 Hz, 1H), 7.47 (s, 1H), 7.43 (d, *J* = 8.1 Hz, 1H), 7.29 (d, *J* = 7.2 Hz, 1H), 7.21 (t, *J* = 7.6 Hz, 1H), 3.50 (s, 1H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -76.25 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 136.0, 125.2, 124.6, 123.1, 123.0 (q, $^1J_{C-F}$ = 288.0 Hz), 121.2, 121.1, 111.5, 105.2; **HRMS** (ESI) m/z: $[M-H]^-$ Calcd for $C_{11}H_6F_6NO$: 282.0359, Found: 282.0358.



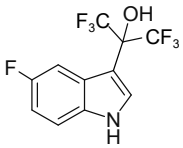
20

1,1,1,3,3,3-hexafluoro-2-(4-methyl-1H-indol-3-yl)propan-2-ol (20): The crude products were purified by column chromat ography with petroleum ether/ethyl acetate (20/1 to 15/1, v/v) as eluent to give compound **20** (white solid, 147.2 mg, 0.495 mmol, 99% yield). M.p.: 111–112 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.48 (s, 1H), 7.54 (d, *J* = 2.7 Hz, 1H), 7.29 (d, *J* = 8.1 Hz, 1H), 7.18 (t, *J* = 7.7 Hz, 1H), 7.06 (d, *J* = 7.2 Hz, 1H), 3.44 (s, 1H), 2.76 (s, 1H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.08 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 136.9, 131.1, 124.8, 124.7, 124.6, 123.1, 122.9 (q, $^1J_{C-F}$ = 287.6 Hz), 109.4, 105.0, 23.7; **HRMS** (ESI) m/z: $[M-H]^-$ Calcd for $C_{12}H_8F_6NO$: 296.0515, Found: 296.0509.



21

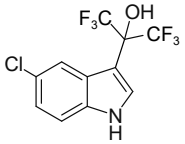
1,1,1,3,3,3-hexafluoro-2-(5-methyl-1H-indol-3-yl)propan-2-ol (21): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (20/1 to 15/1, v/v) as eluent to give compound **21** (white solid, 144.1 mg, 0.485 mmol, 97% yield). M.p.:112–113 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.36 (s, 1H), 7.73 (s, 1H), 7.43 (d, *J* = 2.6 Hz, 1H), 7.32 (d, *J* = 8.3 Hz, 1H), 7.10 (dd, *J* = 8.4, 0.8 Hz, 1H), 3.44 (s, 1H), 2.47 (s, 3H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -76.30 (s, 6F); **^{13}C{^{1}H} NMR** (100 MHz, $CDCl_3$) δ 134.3, 130.5, 125.5, 124.7, 124.6, 123.0 (q, $^1J_{C-F}$ = 288.6 Hz), 120.6, 111.2, 104.6, 21.6; **HRMS** (ESI) m/z: $[M-H]^-$ Calcd for $C_{12}H_8F_6NO$: 296.0515, Found: 296.0510.



22

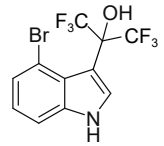
1,1,1,3,3,3-hexafluoro-2-(5-fluoro-1H-indol-3-yl)propan-2-ol (22): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (15/1 to 10/1, v/v) as eluent to give compound **22** (white solid, 106.9 mg, 0.355 mmol, 71% yield). M.p.:82–83 °C; **^{1}H**

NMR (400 MHz, $CDCl_3$) δ 8.46 (s, 1H), 7.62 (d, J = 10.2 Hz, 1H), 7.50 (s, 1H), 7.34 (dd, J = 8.9, 4.4 Hz, 1H), 7.03 (td, J = 8.9, 1.6 Hz, 1H), 3.52 (s, 1H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -76.49 (s, 6F), -122.31 – -122.42 (m, 1F); **^{13}C{^{1}H} NMR** (100 MHz, $CDCl_3$) δ 158.3 (d, $^{1}J_{C-F}$ = 235.6 Hz), 132.5, 126.0, 125.7 (d, $^{2}J_{C-F}$ = 11.0 Hz), 122.9 (q, $^{1}J_{C-F}$ = 288.1 Hz), 112.2, 112.1, 111.9, 111.6, 106.6, 106.4, 105.3, 105.3; **HRMS** (ESI) m/z: $[M-H]^-$ Calcd for $C_{11}H_5F_7NO$: 300.0264, Found: 300.0266.



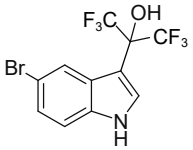
23

2-(5-chloro-1H-indol-3-yl)-1,1,1,3,3,3-hexafluoropropan-2-ol (23): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (15/1 to 10/1, v/v) as eluent to give compound **23** (white solid, 154.3 mg, 0.485 mmol, 97% yield). M.p.:85–87 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.48 (s, 1H), 7.95 (s, 1H), 7.48 (s, 1H), 7.33 (d, J = 8.7 Hz, 1H), 7.22 (d, J = 8.7 Hz, 1H), 3.57 (s, 1H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -76.51 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 134.3, 126.8, 126.3, 125.7, 123.5, 122.7 (q, $^{1}J_{C-F}$ = 287.9 Hz), 120.8, 112.5, 104.9; **HRMS** (ESI) m/z: $[M-H]^-$ Calcd for $C_{11}H_5ClF_6NO$: 315.9969, Found: 315.9959.



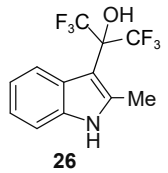
24

2-(4-bromo-1H-indol-3-yl)-1,1,1,3,3,3-hexafluoropropan-2-ol (24): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (15/1 to 10/1, v/v) as eluent to give compound **24** (white solid, 175.5 mg, 0.485 mmol, 97% yield). M.p.:87–88 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.66 (s, 1H), 7.64 (s, 1H), 7.51 (d, J = 7.7 Hz, 1H), 7.46 (d, J = 8.2 Hz, 1H), 7.14 (t, J = 7.9 Hz, 1H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -74.38 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 138.0, 127.2, 126.7, 125.1, 123.8, 123.0 (q, $^{1}J_{C-F}$ = 288.9 Hz), 105.1; **HRMS** (ESI) m/z: $[M-H]^-$ Calcd for $C_{11}H_5BrF_6NO$: 359.9464, Found: 359.9456.



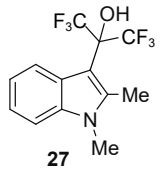
25

2-(5-bromo-1H-indol-3-yl)-1,1,1,3,3,3-hexafluoropropan-2-ol (25): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (20/1 to 15/1, v/v) as eluent to give compound **25** (colorless liquid, 173.7mg, 0.48 mmol, 96% yield). **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.52 (s, 1H), 8.16 (s, 1H), 7.51 (s, 1H), 7.40 (d, J = 8.7 Hz, 1H), 7.38 – 7.23 (m, 1H), 3.54 (d, J = 16.8 Hz, 1H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -76.53 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 134.6, 127.0, 126.1, 125.5, 123.9, 122.8 (q, $^{1}J_{C-F}$ = 287.9 Hz), 114.5, 112.9, 104.8; **HRMS** (ESI) m/z: $[M-H]^-$ Calcd for $C_{11}H_5BrF_6NO$: 359.9464, Found: 359.9459.



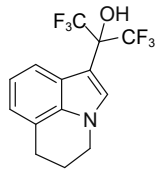
26

1,1,1,3,3,3-hexafluoro-2-(2-methyl-1H-indol-3-yl)propan-2-ol (26): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (20/1 to 15/1, v/v) as eluent to give compound **26** (white solid, 142.6 mg, 0.48 mmol, 96% yield). M.p.:68–69 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.08 (s, 1H), 7.83 (d, J = 6.9 Hz, 1H), 7.30 (d, J = 7.6 Hz, 1H), 7.22 – 7.10 (m, 2H), 3.49 (s, 1H), 2.59 (s, 3H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.45 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 134.5, 123.3 (q, $^1J_{C-F}$ = 288.6 Hz), 121.8, 120.6, 110.4, 15.0; **HRMS** (ESI) m/z: $[M-H]^-$ Calcd for $C_{12}H_8F_6NO$: 296.0515, Found: 296.0513.



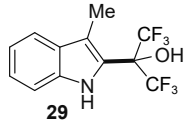
27

2-(1,2-dimethyl-1H-indol-3-yl)-1,1,1,3,3,3-hexafluoropropan-2-ol (27): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (20/1 to 15/1, v/v) as eluent to give compound **27** (white solid, 146.2 mg, 0.47 mmol, 94% yield). M.p.:148–149 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.80 (s, 1H), 7.30 (d, J = 8.2 Hz, 1H), 7.25 – 7.19 (m, 1H), 7.16 – 7.10 (m, 1H), 3.70 (s, 3H), 3.48 (s, 1H), 2.61 (s, 3H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.81 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 136.5, 123.4 (q, $^1J_{C-F}$ = 288.4 Hz), 121.4, 120.4, 109.1, 29.6, 12.4; **HRMS** (ESI) m/z: $[M-H]^-$ Calcd for $C_{13}H_{10}F_6NO$: 310.0672, Found: 310.0678.



28

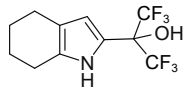
2-(5,6-dihydro-4H-pyrrolo[3,2,1-ij]quinolin-1-yl)-1,1,1,3,3,3-hexafluoropropan-2-ol (28): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (20/1 to 15/1, v/v) as eluent to give compound **28** (white solid, 147 mg, 0.455 mmol, 91% yield). M.p.:68–69 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.68 (d, J = 8.2 Hz, 1H), 7.35 (s, 1H), 7.15 – 7.07 (m, 1H), 7.00 (d, J = 7.1 Hz, 1H), 4.30 – 4.12 (m, 2H), 3.43 (s, 1H), 3.02 (t, J = 6.1 Hz, 2H), 2.27 (dt, J = 11.8, 6.0 Hz, 2H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -76.37 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 134.3, 127.2, 123.5, 123.1 (q, $^1J_{C-F}$ = 288.2 Hz), 120.4, 118.8, 103.4, 44.5, 24.5, 22.5; **HRMS** (ESI) m/z: $[M+H]^+$ Calcd for $C_{14}H_{12}F_6NO$: 324.0818, Found: 324.0824.



29

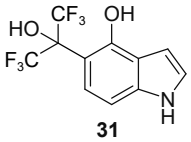
1,1,1,3,3,3-hexafluoro-2-(3-methyl-1H-indol-2-yl)propan-2-ol (29): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (20/1 to 15/1, v/v) as eluent to give compound **29** (white solid, 135 mg, 0.455 mmol, 91% yield). M.p.:91–92 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.42 (s, 1H), 7.65 (d, J = 8.0 Hz, 1H), 7.39 (d, J = 8.2 Hz, 1H), 7.30 (t,

J = 7.5 Hz, 1H), 7.19 (t, *J* = 7.5 Hz, 1H), 3.81 (s, 1H), 2.48 (s, 3H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.51 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 135.1, 129.1, 123.9, 122.5 (q, $^1J_{C-F}$ = 284.5 Hz), 119.9, 119.4, 113.6, 111.1, 9.1; **HRMS** (ESI) m/z: $[M-H]^-$ Calcd for $C_{12}H_8F_6NO$: 296.0515, Found: 296.0509.



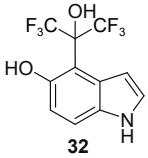
30

1,1,1,3,3,3-hexafluoro-2-(4,5,6,7-tetrahydro-1H-indol-2-yl)propan-2-ol (30): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (30/1 to 20/1, v/v) as eluent to give compound **30** (brown liquid, 126.3 mg, 0.444 mmol, 88% yield). **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.14 (s, 1H), 6.19 (s, 1H), 3.77 (s, 1H), 2.57 (t, *J* = 6.1 Hz, 2H), 2.49 (t, *J* = 6.0 Hz, 2H), 1.86 – 1.78 (m, 2H), 1.75 (ddd, *J* = 10.6, 7.4, 3.7 Hz, 2H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -76.95 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 129.3, 122.3 (q, $^1J_{C-F}$ = 287.6 Hz), 118.1, 116.4, 108.7, 23.4, 23.1, 22.6, 22.5; **HRMS** (ESI) m/z: $[M-H]^-$ Calcd for $C_{11}H_{10}F_6NO$: 286.0672, Found: 286.0671.



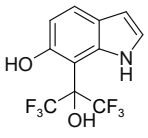
31

5-(1,1,1,3,3,3-hexafluoro-2-hydroxypropan-2-yl)-1H-indol-4-ol (31): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (15/1 to 10/1, v/v) as eluent to give compound **31** (white solid, 143.6 mg, 0.48 mmol, 96% yield). M.p.:123–125 °C. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.52 (s, 1H), 7.74 (s, 1H), 7.41 (s, 1H), 7.14 (t, *J* = 7.9 Hz, 1H), 7.07 (dd, *J* = 8.2, 0.7 Hz, 1H), 6.66 (dd, *J* = 7.5, 0.7 Hz, 1H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -76.42 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 146.4, 138.1, 124.0, 123.7, 123.0 (q, $^1J_{C-F}$ = 287.6 Hz), 114.9, 106.2, 105.2, 105.1; **HRMS** (ESI) m/z: $[M-H]^-$ Calcd for $C_{11}H_6F_6NO_2$: 298.00308, Found: 298.0313.



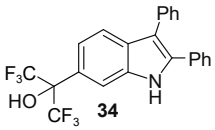
32

4-(1,1,1,3,3,3-hexafluoro-2-hydroxypropan-2-yl)-1H-indol-5-ol (32): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (15/1 to 10/1, v/v) as eluent to give compound **32** (white solid, 145 mg, 0.485 mmol, 97% yield). M.p.:119–122 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.40 (s, 1H), 7.42 (s, 1H), 7.35 (s, 1H), 7.26 (s, 1H), 6.84 (d, *J* = 8.4 Hz, 1H), 3.71 (d, *J* = 6.9 Hz, 2H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.76 (s, 6F); **^{13}C NMR** (100 MHz, DMSO-*d*6) δ 151.3, 131.0, 126.5, 125.8, 123.9 (q, $^1J_{C-F}$ = 289.8 Hz), 112.5, 112.4, 105.4, 103.8; **HRMS** (ESI) m/z: $[M-H]^-$ Calcd for $C_{11}H_6F_6NO_2$: 298.00308, Found: 298.0307.



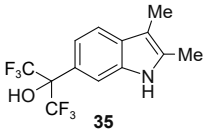
33

7-(1,1,1,3,3,3-hexafluoro-2-hydroxypropan-2-yl)-1H-indol-6-ol (33): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (15/1 to 10/1, v/v) as eluent to give compound **33** (white solid, 140 mg, 0.47 mmol, 94% yield). M.p.:118–119 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.26 (s, 1H), 7.77 (d, *J* = 8.8 Hz, 1H), 7.35 (s, 1H), 6.86 (s, 1H), 6.80 – 6.68 (m, 1H), 4.84 (s, 1H), 3.46 (s, 1H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -76.36 (s, 6F); **^{13}C NMR** (100 MHz, DMSO-*d*6) δ 153.7, 137.9, 124.0, 123.9 (q, $^1J_{C-F}$ = 289.1 Hz), 121.9, 119.1, 110.9, 104.8, 96.9; **HRMS** (ESI) m/z: [M-H]$^-$ Calcd for $C_{11}H_6F_6NO_2$: 298.00308, Found: 298.0306.



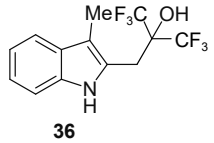
34

2-(2,3-diphenyl-1H-indol-6-yl)-1,1,1,3,3,3-hexafluoropropan-2-ol (34): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (15/1 to 10/1, v/v) as eluent to give compound **34** (white solid, 193.7 mg, 0.445 mmol, 89% yield). M.p.:148–149 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.41 (s, 1H), 7.86 (s, 1H), 7.74 (d, *J* = 8.6 Hz, 1H), 7.45 – 7.38 (m, 6H), 7.38 – 7.30 (m, 5H), 3.61 (s, 1H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.38 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 136.1, 135.4, 134.4, 132.2, 130.0, 129.9, 128.8, 128.6, 128.2, 128.2, 126.5, 123.4, 119.8, 118.2, 115.0, 109.8; **HRMS** (ESI) m/z: [M-H]$^-$ Calcd for $C_{23}H_{14}F_6NO$: 434.0985, Found: 434.0977.



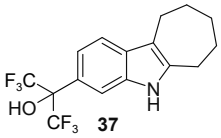
35

2-(2,3-dimethyl-1H-indol-6-yl)-1,1,1,3,3,3-hexafluoropropan-2-ol (35): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (15/1 to 10/1, v/v) as eluent to give compound **35** (white solid, 96.4 mg, 0.31 mmol, 62% yield). M.p.:81–82 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.84 (s, 1H), 7.65 (s, 1H), 7.53 (d, *J* = 8.5 Hz, 1H), 7.40 (d, *J* = 8.5 Hz, 1H), 3.59 (s, 1H), 2.38 (s, 3H), 2.24 (s, 3H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.42 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 134.7, 133.1, 130.6, 123.0 (q, $^1J_{C-F}$ = 286.7 Hz), 117.9, 116.8, 108.8, 107.3, 11.6, 8.3; **HRMS** (ESI) m/z: [M-H]$^-$ Calcd for $C_{13}H_{10}F_6NO$: 310.0672, Found: 310.0671.



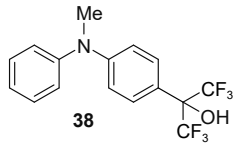
36

1,1,1,3,3,3-hexafluoro-2-((3-methyl-1H-indol-2-yl)methyl)propan-2-ol (36): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (20/1 to 15/1, v/v) as eluent to give compound **36** (colorless liquid, 63 mg, 0.2 mmol, 41% yield). **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.07 (s, 1H), 7.56 (d, *J* = 7.9 Hz, 1H), 7.33 (d, *J* = 8.1 Hz, 1H), 7.25 – 7.19 (m, 1H), 7.17 – 7.11 (m, 1H), 3.45 (s, 1H), 3.44 (s, 2H), 2.29 (s, 3H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -77.07 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 136.2, 128.5, 123.4, 122.9 (q, $^1J_{C-F}$ = 287.4 Hz), 122.8, 119.6, 118.9, 112.7, 110.77, 26.6, 8.5; **HRMS** (ESI) m/z: [M-H]$^-$ Calcd for $C_{13}H_{10}F_6NO$: 310.0672, Found: 310.0679.



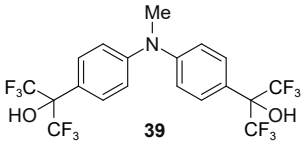
37

1,1,1,3,3,3-hexafluoro-2-(5,6,7,8,9,10-hexahydrocyclohepta[b]indol-3-yl)propan-2-ol (37): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (20/1 to 15/1, v/v) as eluent to give compound **37** (colorless liquid, 126.3 mg, 0.36 mmol, 72% yield). **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.87 (s, 1H), 7.66 (s, 1H), 7.54 (d, J = 8.5 Hz, 1H), 7.40 (d, J = 8.5 Hz, 1H), 3.59 (s, 1H), 2.84 (dd, J = 11.5, 8.1 Hz, 4H), 1.96 – 1.87 (m, 2H), 1.84 – 1.72 (m, 4H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.47 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 139.8, 133.7, 130.4, 123.0 (q, $^1J_{C-F}$ = 287.7 Hz), 121.3, 117.7, 116.8, 113.9, 109.0, 31.7, 29.6, 28.6, 27.3, 24.6; **HRMS** (ESI) m/z: $[M-H]^-$ Calcd for $C_{16}H_{14}F_6NO$: 350.0985, Found: 350.0976.



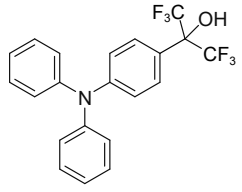
38

1,1,1,3,3,3-hexafluoro-2-(4-(methyl(phenyl)amino)phenyl)propan-2-ol (38): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (20/1 to 15/1, v/v) as eluent to give compound **38** (colorless liquid, 120.4 mg, 0.35 mmol, 69% yield). **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.55 (d, J = 8.8 Hz, 2H), 7.42 – 7.37 (m, 2H), 7.22 (d, J = 7.5 Hz, 2H), 7.18 (dd, J = 11.6, 4.2 Hz, 1H), 6.95 – 6.90 (m, 2H), 3.53 (s, 1H), 3.37 (s, 3H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.80 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 150.2, 147.9, 129.6, 127.3, 124.7, 124.4, 122.8 (q, $^1J_{C-F}$ = 287.6 Hz), 118.8, 115.5, 40.0; **HRMS** (ESI) m/z: $[M+H]^+$ Calcd for $C_{16}H_{14}F_6NO$: 350.0975, Found: 350.0973.



39

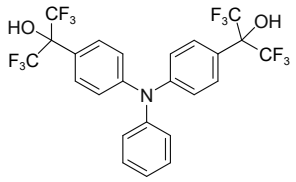
2,2'-((methylazanediyl)bis(4,1-phenylene))bis(1,1,1,3,3,3-hexafluoropropan-2-ol) (39): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (20/1 to 15/1, v/v) as eluent to give compound **39** (colorless liquid, 152 mg, 0.3 mmol, 59% yield). **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.61 (d, J = 8.4 Hz, 4H), 7.12 (d, J = 8.6 Hz, 4H), 3.63 (s, 2H), 3.38 (s, 3H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.68 (s, 12F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 149.5, 127.7, 122.7 (q, $^1J_{C-F}$ = 287.5 Hz), 122.1, 120.1, 39.9; **HRMS** (ESI) m/z: $[M-H]^-$ Calcd for $C_{19}H_{12}F_{12}NO_2$: 514.0681, Found: 514.0686.



40

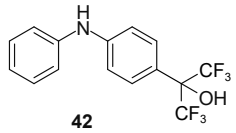
2-(4-(diphenylamino)phenyl)-1,1,1,3,3,3-hexafluoropropan-2-ol (40): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (20/1 to 15/1, v/v) as eluent to give compound **40** (colorless liquid, 148 mg, 0.36 mmol, 72% yield). **^{1}H NMR** (400

MHz, $CDCl_3$) δ 7.50 (d, *J* = 8.7 Hz, 2H), 7.33 – 7.27 (m, 4H), 7.16 – 7.12 (m, 4H), 7.12 – 7.04 (m, 4H), 3.52 (s, 1H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.64 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 149.5, 147.0, 129.5, 127.3, 125.4, 123.9, 122.7 (q, $^{1}J_{C-F}$ = 288.2 Hz), 121.4, 121.2; **HRMS** (ESI) m/z: $[M+H]^+$ Calcd for $C_{21}H_{16}F_6NO$: 412.1131, Found: 412,1130.



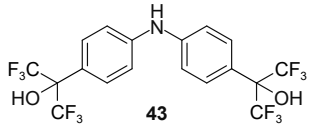
41

2,2'-((phenylazanediyl)bis(4,1-phenylene))bis(1,1,1,3,3,3-hexafluoropropan-2-ol) (41): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (15/1 to 10/1, v/v) as eluent to give compound **41** (white solid, 161.6 mg, 0.28 mmol, 56% yield). M.p.:120–121 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.56 (d, *J* = 8.4 Hz, 4H), 7.34 (t, *J* = 7.6 Hz, 2H), 7.14 (t, *J* = 8.8 Hz, 7H), 3.45 (s, 2H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.64 (s, 12F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 148.8, 146.4, 129.8, 127.6, 126.2, 124.8, 122.9, 122.8, 122.7 (q, $^{1}J_{C-F}$ = 287.8 Hz); **HRMS** (ESI) m/z: $[M-H]^-$ Calcd for $C_{24}H_{14}F_{12}NO_2$: 576.0838, Found: 576.0841.



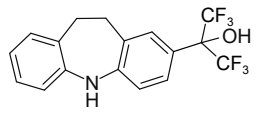
42

1,1,1,3,3,3-hexafluoro-2-(4-(phenylamino)phenyl)propan-2-ol (42): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (20/1 to 15/1, v/v) as eluent to give compound **42** (colorless liquid, 119.1 mg, 0.355 mmol, 71% yield). **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.56 (d, *J* = 8.6 Hz, 2H), 7.32 (dd, *J* = 8.3, 7.5 Hz, 2H), 7.18 – 7.12 (m, 2H), 7.07 (dd, *J* = 9.4, 2.3 Hz, 2H), 7.03 (t, *J* = 7.4 Hz, 1H), 3.60 (s, 1H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.74 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 145.3, 141.5, 129.5, 127.7, 122.8 (q, $^{1}J_{C-F}$ = 287.8 Hz), 122.4, 120.3, 119.5, 115.8; **HRMS** (ESI) m/z: $[M+H]^+$ Calcd for $C_{15}H_{12}F_6NO$: 336.0818, Found: 336.0819.



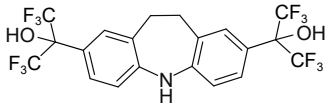
43

2,2'-(azanediylbis(4,1-phenylene))bis(1,1,1,3,3,3-hexafluoropropan-2-ol) (43): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (15/1 to 10/1, v/v) as eluent to give compound **43** (white solid, 170.4 mg, 0.34 mmol, 68% yield). M.p.:59–60 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.62 (d, *J* = 8.4 Hz, 4H), 7.16 (d, *J* = 8.3 Hz, 4H), 6.00 (s, 1H), 3.65 (s, 2H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.73 (s, 12F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 143.8, 127.9, 122.7 (q, $^{1}J_{C-F}$ = 287.7 Hz), 121.8, 117.4; **HRMS** (ESI) m/z: $[M-H]^-$ Calcd for $C_{18}H_{10}F_{12}NO_2$: 500.0525, Found: 500.0520.



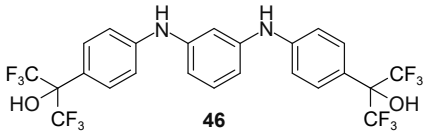
44

2-(10,11-dihydro-5H-dibenzo[b,f]azepin-2-yl)-1,1,1,3,3,3-hexafluoropropan-2-ol (44): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (20/1 to 15/1, v/v) as eluent to give compound **44** (white solid, 140.8 mg, 0.39 mmol, 78% yield). M.p.:130–131 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.37 (d, *J* = 6.4 Hz, 2H), 7.09 (dd, *J* = 16.3, 7.8 Hz, 2H), 6.83 (t, *J* = 7.4 Hz, 1H), 6.77 (d, *J* = 7.1 Hz, 2H), 6.17 (s, 1H), 3.55 (s, 1H), 3.18 – 3.00 (m, 4H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.68 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 143.9, 141.7, 130.5, 129.3, 129.1, 127.8, 127.0, 125.0, 122.8 (q, $^{1}J_{C-F}$ = 288.1 Hz), 120.3, 119.3, 118.2, 117.8, 35.4, 34.6; **HRMS** (ESI) m/z: $[M+H]^+$ Calcd for $C_{17}H_{14}F_6NO$: 362.0975, Found: 362.0975.



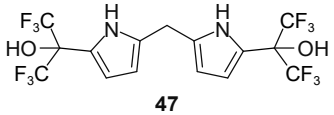
45

2,2'-(10,11-dihydro-5H-dibenzo[b,f]azepine-2,8-diyl)bis(1,1,1,3,3,3-hexafluoropropan-2-ol) (45): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (15/1 to 10/1, v/v) as eluent to give compound **45** (white solid, 176.6 mg, 0.335 mmol, 67% yield). M.p.:128–129 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.40 (d, *J* = 7.4 Hz, 4H), 6.80 (d, *J* = 8.9 Hz, 2H), 6.30 (s, 1H), 3.45 (s, 2H), 3.12 (s, 4H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.73 (s, 12F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 143.2, 129.0, 128.5, 125.2, 122.7 (q, $^{1}J_{C-F}$ = 287.9 Hz), 120.3, 118.2, 35.1; **HRMS** (ESI) m/z: $[M-H]^-$ Calcd for $C_{20}H_{12}F_{12}NO_2$: 562.0681, Found: 562.0679.



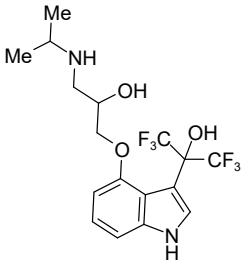
46

2,2'-((1,3-phenylenebis(azanediyl))bis(4,1-phenylene))bis(1,1,1,3,3,3-hexafluoropropan-2-ol) (46): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (15/1 to 10/1, v/v) as eluent to give compound **46** (white solid, 186.6 mg, 0.32 mmol, 63% yield). M.p.:212–213 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.81 (s, 1H), 7.22 (t, *J* = 7.9 Hz, 4H), 7.03 – 6.97 (m, 3H), 6.87 (d, *J* = 7.6 Hz, 4H), 2.96 (s, 1H), 2.88 (s, 1H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -76.95 (s, 12F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 146.8, 142.2, 129.5, 123.6, 122.9 (d, *J* = 287.8 Hz), 120.4, 117.6, 113.9; **HRMS** (ESI) m/z: $[M-H]^-$ Calcd for $C_{24}H_{15}F_{12}N_2O_2$: 591.0947, Found: 591.0939.



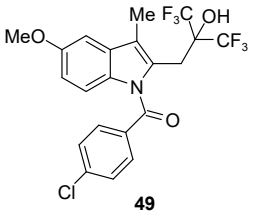
47

2,2'-(methylenebis(1H-pyrrole-5,2-diyl))bis(1,1,1,3,3,3-hexafluoropropan-2-ol) (47): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (15/1 to 10/1, v/v) as eluent to give compound **47** (white solid, 193.6 mg, 0.4 mmol, 81% yield). M.p.:79–80 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.47 (s, 2H), 6.37 (s, 2H), 6.05 (t, *J* = 3.2 Hz, 2H), 3.99 (s, 2H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -77.19 (s, 12F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 130.5, 122.1 (q, $^{1}J_{C-F}$ = 287.4 Hz), 118.4, 109.8, 108.0, 26.2; **HRMS** (ESI) m/z: $[M-H]^-$ Calcd for $C_{15}H_9F_{12}N_2O_2$: 477.0477, Found: 477.0469.



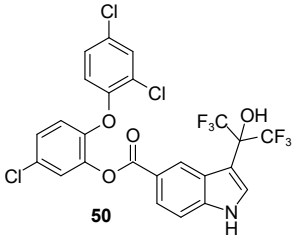
48

1,1,1,3,3,3-hexafluoro-2-(4-(2-hydroxy-3-(isopropylamino)propoxy)-1H-indol-3-yl)propan-2-ol (48): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (10/1 to 6/1, v/v) as eluent to give compound **48** (white solid, 169.7 mg, 0.41 mmol, 81% yield). M.p.:139–140 °C. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.70 (s, 1H), 7.42 (s, 1H), 7.19 (t, *J* = 7.9 Hz, 1H), 7.13 (d, *J* = 8.1 Hz, 1H), 6.70 (d, *J* = 7.6 Hz, 1H), 4.25 (d, *J* = 5.0 Hz, 2H), 4.12 (td, *J* = 8.7, 4.8 Hz, 1H), 2.95 (dd, *J* = 12.3, 3.6 Hz, 1H), 2.84 (dt, *J* = 12.5, 6.2 Hz, 1H), 2.75 (dd, *J* = 12.2, 8.7 Hz, 1H), 2.04 (s, 1H), 1.26 (s, 1H), 1.10 (s, 3H), 1.08 (s, 3H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -76.53 (s, 6F); **^{13}C NMR** (100 MHz, DMSO-*d*6) δ 149.6, 138.1, 124.8, 123.5 (d, *J* = 289.5 Hz), 123.3, 115.2, 106.9, 103.9, 102.1, 71.9, 68.3, 49.8, 48.6, 22.9; **HRMS** (ESI) m/z: $[M-H]^-$ Calcd for $C_{17}H_{19}F_6N_2O_3$: 413.1305, Found: 413.1302.



49

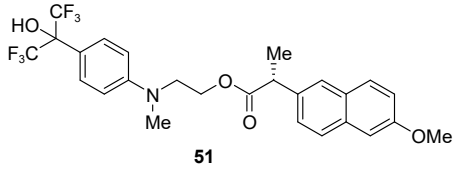
(4-chlorophenyl)(5-methoxy-3-methyl-2-(3,3,3-trifluoro-2-hydroxy-2-(trifluoromethyl)propyl) -1H-indol-1-yl)methanone (49): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (15/1 to 10/1, v/v) as eluent to give compound **49** (white solid, 153.5 mg, 0.32 mmol, 64% yield). M.p.:133–134 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.64 (d, *J* = 8.3 Hz, 2H), 7.48 (d, *J* = 8.3 Hz, 2H), 7.00 (s, 1H), 6.87 (d, *J* = 9.0 Hz, 1H), 6.71 (d, *J* = 9.0 Hz, 1H), 3.83 (s, 3H), 3.40 (s, 2H), 3.14 (s, 1H), 2.37 (s, 3H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -76.86 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 168.3, 156.2, 139.8, 138.4, 133.4, 131.3, 130.9, 130.8, 129.3, 123.1 (q, $^1J_{C-F}$ = 288.1 Hz), 114.9, 112.2, 108.8, 101.5, 55.7, 24.7, 13.6; **HRMS** (ESI) m/z: $[M-H]^-$ Calcd for $C_{21}H_{15}ClF_6NO_3$: 478.0650, Found: 478.0648.



50

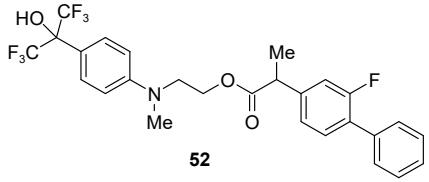
5-chloro-2-(2,4-dichlorophenoxy)phenyl3-(1,1,1,3,3,3-hexafluoro-2-hydroxypropan-2-yl)-1H-indole-5-carboxylate (50): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (15/1 to 10/1, v/v) as eluent to give compound **50** (colorless liquid, 275.4 mg, 0.46 mmol, 92% yield). **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.77 (s, 1H), 8.75 (s, 1H), 7.94 (d, *J* = 8.3 Hz, 1H), 7.54 (s, 1H), 7.44 (d, *J* = 8.4 Hz, 1H), 7.36 (s, 1H), 7.29 (s, 1H), 7.21 (d, *J* = 7.9 Hz, 1H), 7.13 (d, *J* = 8.2 Hz, 1H), 6.91 (t, *J* = 8.2 Hz, 2H), 3.66 (s, 1H); **^{19}F NMR** (376 MHz,

$CDCl_3$) δ -76.62 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 164.9, 151.3, 146.8, 142.3, 139.0, 130.2, 129.4, 129.1, 128.0, 126.9, 126.1, 125.7, 125.4, 125.1, 124.8, 122.8 (q, $^1J_{C-F}$ = 287.3 Hz), 121.3, 120.6, 120.1, 111.5, 106.7; **HRMS** (ESI) m/z: $[M-H]^-$ Calcd for $C_{24}H_{11}Cl_3F_6NO_4$: 595.9663, Found: 595.9655.



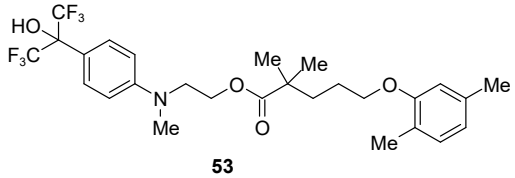
51

2-((4-(1,1,1,3,3,3-hexafluoro-2-hydroxypropan-2-yl)phenyl)(methyl)amino)ethyl(R)-2-(6-methoxynaphthalen-2-yl)propanoate (51): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (15/1 to 10/1, v/v) as eluent to give compound **51** (white solid, 220.2 mg, 0.43 mmol, 87% yield). M.p.:164–165 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.68 (d, *J* = 1.9 Hz, 1H), 7.66 (s, 1H), 7.61 (s, 1H), 7.47 (d, *J* = 8.8 Hz, 2H), 7.32 (dd, *J* = 8.5, 1.8 Hz, 1H), 7.14 (dd, *J* = 8.9, 2.5 Hz, 1H), 7.11 (d, *J* = 2.4 Hz, 1H), 6.66 (d, *J* = 9.1 Hz, 2H), 4.31 – 4.17 (m, 2H), 3.92 (s, 3H), 3.76 (q, *J* = 7.2 Hz, 1H), 3.54 (t, *J* = 5.8 Hz, 2H), 3.44 (s, 1H), 2.82 (s, 3H), 1.51 (d, *J* = 7.2 Hz, 3H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.80 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 174.9, 157.6, 149.8, 135.3, 133.7, 129.2, 128.9, 127.5, 127.2, 126.1, 125.9, 122.9 (q, $^1J_{C-F}$ = 287.6 Hz), 119.0, 116.7, 111.4, 105.6, 61.9, 55.2, 50.5, 45.4, 38.1, 18.1; **HRMS** (ESI) m/z: $[M+H]^+$ Calcd for $C_{26}H_{24}F_6NO_4$: 530.1761, Found: 530.1752.



52

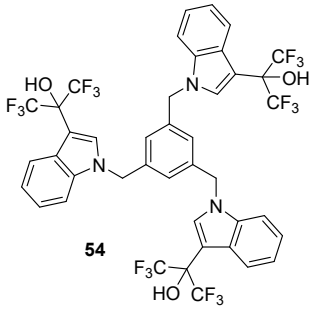
2-((4-(1,1,1,3,3,3-hexafluoro-2-hydroxypropan-2-yl)phenyl)(methyl)amino)ethyl2-(2-fluoro-[1,1'-biphenyl]-4-yl)propanoate (52): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (15/1 to 10/1, v/v) as eluent to give compound **53** (white solid, 247.2 mg, 0.45 mmol, 91% yield). M.p.:98–99 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.53 (d, *J* = 6.4 Hz, 4H), 7.44 (t, *J* = 7.6 Hz, 2H), 7.37 (t, *J* = 8.1 Hz, 2H), 7.06 (t, *J* = 8.2 Hz, 2H), 6.74 (d, *J* = 8.2 Hz, 2H), 4.29 (ddq, *J* = 17.0, 11.4, 5.8 Hz, 2H), 3.68 – 3.62 (m, 1H), 3.61 (t, *J* = 5.7 Hz, 2H), 3.40 (s, 1H), 2.92 (s, 3H), 1.45 (d, *J* = 7.2 Hz, 3H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.78 (s, 6F), -117.48 – -117.56 (m, 1F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 174.0, 159.6 (d, $^1J_{C-F}$ = 248.4 Hz), 149.8, 141.5 (d, $^3J_{C-F}$ = 7.7 Hz), 135.4, 130.8 (d, $^4J_{C-F}$ = 3.8 Hz), 128.9 (d, $^4J_{C-F}$ = 2.7 Hz), 128.5, 127.9 (d, $^3J_{C-F}$ = 13.5 Hz), 127.7, 127.5, 123.5 (d, $^4J_{C-F}$ = 3.2 Hz), 122.9 (q, $^1J_{C-F}$ = 287.5 Hz), 116.7, 115.2 (d, $^2J_{C-F}$ = 23.7 Hz), 111.6, 62.0, 50.6, 45.0, 38.3, 18.0; **HRMS** (ESI) m/z: $[M-H]^-$ Calcd for $C_{27}H_{23}F_7NO_3$: 542.1571, Found: 542.1578.



53

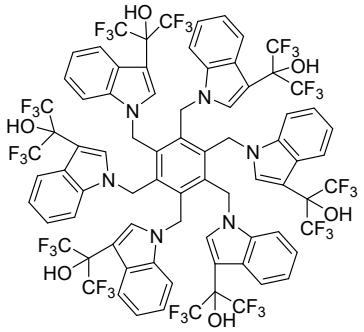
2-((4-(1,1,1,3,3,3-hexafluoro-2-hydroxypropan-2-yl)phenyl)(methyl)amino)ethyl5-(2,5-dimethylphenoxy)-2,2-dimethylpentanoate (53): The crude products were purified by column

chromatography with petroleum ether/ethyl acetate (15/1 to 10/1, v/v) as eluent to give compound **53** (colorless liquid, 244.5 mg, 0.44 mmol, 89% yield). **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.52 (d, *J* = 8.8 Hz, 2H), 7.00 (d, *J* = 7.5 Hz, 1H), 6.80 – 6.73 (m, 2H), 6.66 (d, *J* = 7.5 Hz, 1H), 6.59 (s, 1H), 4.24 (t, *J* = 5.9 Hz, 2H), 3.85 (t, *J* = 5.4 Hz, 2H), 3.63 (t, *J* = 5.9 Hz, 2H), 3.49 (s, 1H), 3.01 (s, 3H), 2.31 (s, 3H), 2.17 (s, 3H), 1.65 (s, 2H), 1.15 (s, 6H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.81 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 178.1, 156.8, 149.9, 136.4, 130.3, 127.5, 123.5, 122.9 (q, $^1J_{C-F}$ = 287.9 Hz), 120.7, 116.8, 112.0, 111.5, 67.8, 61.6, 50.5, 42.0, 38.2, 37.0, 25.0, 24.9, 21.3, 15.7; **HRMS** (ESI) m/z: $[M-H]^-$ Calcd for $C_{27}H_{32}F_6NO_4$: 548.2241, Found: 548.2242.



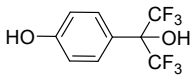
54

2,2',2''-((benzene-1,3,5-triyltris(methylene))tris(1*H*-indole-1,3-diyl))tris(1,1,1,3,3,3-hexafluoropropan-2-ol) (54): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (10/1 to 5/1, v/v) as eluent to give compound **54** (white solid, 366.2 mg, 0.38 mmol, 76% yield). M.p.:81–83 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.93 (d, *J* = 7.8 Hz, 3H), 7.29 (s, 3H), 7.22 – 7.13 (m, 6H), 7.05 (d, *J* = 7.9 Hz, 3H), 6.66 (s, 3H), 5.18 (s, 6H), 3.51 (s, 3H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -76.16 (s, 18F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 138.4, 136.3, 128.3, 126.0, 124.2, 123.0 (q, $^1J_{C-F}$ = 282.9 Hz), 122.9, 121.6, 120.9, 110.0, 104.4, 50.0; **HRMS** (ESI) m/z: $[M-H]^-$ Calcd for $C_{42}H_{26}F_{18}N_3O_3$:962.1692, Found: 962.1691.



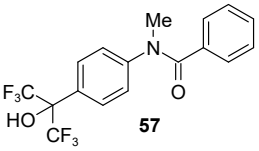
55

2,2',2'',2''',2'''',2'''''-((benzene-1,2,3,4,5,6-hexaylhexakis(methylene))hexakis(1*H*-indole-1,3-diyl))hexakis(1,1,1,3,3,3-hexafluoropropan-2-ol) (55): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (8/1 to 3/1, v/v) as eluent to give compound **55** (white solid, 177.5 mg, 0.096 mmol, 48% yield). M.p.:306–308 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.88 (d, *J* = 8.2 Hz, 6H), 7.22 (t, *J* = 7.6 Hz, 6H), 7.10 (t, *J* = 7.6 Hz, 6H), 6.96 (s, 6H), 6.82 (d, *J* = 8.3 Hz, 6H), 5.19 (s, 12H), 3.85 (s, 6H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -76.37 (s, 36F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 138.8, 137.0, 125.6, 125.0, 123.8, 122.7 (q, $^1J_{C-F}$ = 287.6 Hz), 122.0, 121.8, 109.5, 106.9, 43.9; **HRMS** (MALDI-TOF/TOF) m/z: $[M-H]^-$ Calcd for $C_{78}H_{47}F_{36}N_6O_6$:1847.2987, Found: 1847.9823.



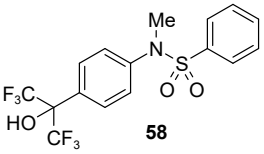
56

4-(1,1,1,3,3,3-hexafluoro-2-hydroxypropan-2-yl)phenol (56): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (10/1 to 5/1, v/v) as eluent to give compound **56** (white solid, 24.7 mg, 0.095 mmol, 19% yield). M.p.:116–118 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.59 (d, *J* = 8.6 Hz, 2H), 6.90 (d, *J* = 9.0 Hz, 2H), 5.17 (s, 1H), 3.48 (s, 1H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -75.84 (s, 6F); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 157.0, 128.2, 122.7 (q, $^1J_{C-F}$ = 287.4 Hz), 121.5, 115.5; **HRMS** (ESI) m/z: $[M+H]^+$ Calcd for $C_9H_7F_6O_2$:261.0345, Found: 261.0342.



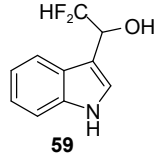
57

***N*-(4-(1,1,1,3,3,3-hexafluoro-2-hydroxypropan-2-yl)phenyl)-*N*-methylbenzamide (57):** The crude products were purified by column chromatography with petroleum ether/ethyl acetate (6/1 to 3/1, v/v) as eluent to give compound **57** (white solid, 181.2 mg, 0.48 mmol, 96% yield). M.p.:156–157 °C; **^{1}H NMR** (400 MHz, acetone-*d*6) δ 7.67 (d, *J* = 8.5 Hz, 2H), 7.52 (s, 1H), 7.30 (ddd, *J* = 9.7, 8.2, 1.7 Hz, 5H), 7.21 (t, *J* = 7.4 Hz, 2H), 3.47 (s, 3H); **^{19}F NMR** (376 MHz, acetone-*d*6) δ -75.66 (s, 6F); **^{13}C NMR** (100 MHz, acetone-*d*6) δ 170.6, 147.7, 137.2, 130.4, 129.4, 129.2, 128.5, 127.7, 123.9 (q, $^1J_{C-F}$ = 287.8 Hz), 38.1; **HRMS** (ESI) m/z: $[M-H]^-$ Calcd for $C_{17}H_{12}F_6NO_2$:376.0777, Found: 376.0768.



58

***N*-(4-(1,1,1,3,3,3-hexafluoro-2-hydroxypropan-2-yl)phenyl)-*N*-methylbenzenesulfonamide (58):** The crude products were purified by column chromatography with petroleum ether/ethyl acetate (6/1 to 2/1, v/v) as eluent to give compound **58** (white solid, 190.3 mg, 0.46 mmol, 92% yield). M.p.:172–173 °C; **^{1}H NMR** (400 MHz, acetone-*d*6) δ 77.75 (d, *J* = 8.5 Hz, 2H), 7.69 (dd, *J* = 8.8, 3.8 Hz, 1H), 7.62 – 7.57 (m, 1H), 7.56 (d, *J* = 4.1 Hz, 4H), 7.34 (d, *J* = 8.9 Hz, 2H), 3.25 (s, 3H); **^{19}F NMR** (376 MHz, acetone-*d*6) δ -75.58 (s, 6F); **^{13}C NMR** (100 MHz, acetone-*d*6) δ 144.3, 137.5, 134.0, 129.9, 128.4, 128.3, 126.7, 123.9 (q, $^1J_{C-F}$ = 288.2 Hz), 38.1; **HRMS** (ESI) m/z: $[M-H]^-$ Calcd for $C_{16}H_{12}F_6NO_3S$:412.0447, Found: 412.0441.



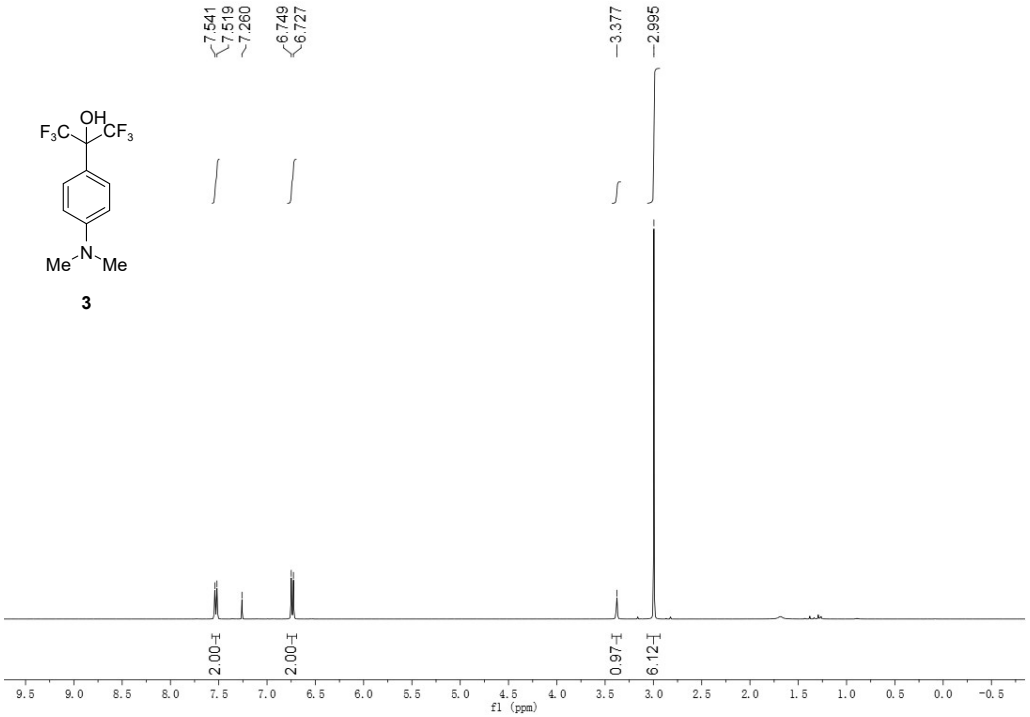
59

2,2-difluoro-1-(1*H*-indol-3-yl)ethan-1-ol (59): The crude products were purified by column chromatography with petroleum ether/ethyl acetate (20/1 to 10/1, v/v) as eluent to give compound **59** (pale yellow oil, 94.1 mg, 0.48 mmol, 95% yield). **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.26 (s, 1H), 7.73 (d, *J* = 7.8 Hz, 1H), 7.39 (d, *J* = 7.4 Hz, 1H), 7.34 – 7.21 (m, 2H), 7.21 – 7.08 (m, 1H), 6.00 (td, *J* = 56.1, 4.3 Hz, 1H), 5.22 – 5.08 (m, 1H), 2.40 (d, *J* = 4.1 Hz, 1H); **^{19}F NMR** (376 MHz, $CDCl_3$) δ -125.98 (ddd, *J* = 281.6, 55.6, 9.7 Hz, 1F), -127.34 (ddd, *J* = 281.9, 56.7, 12.2 Hz, 1F);

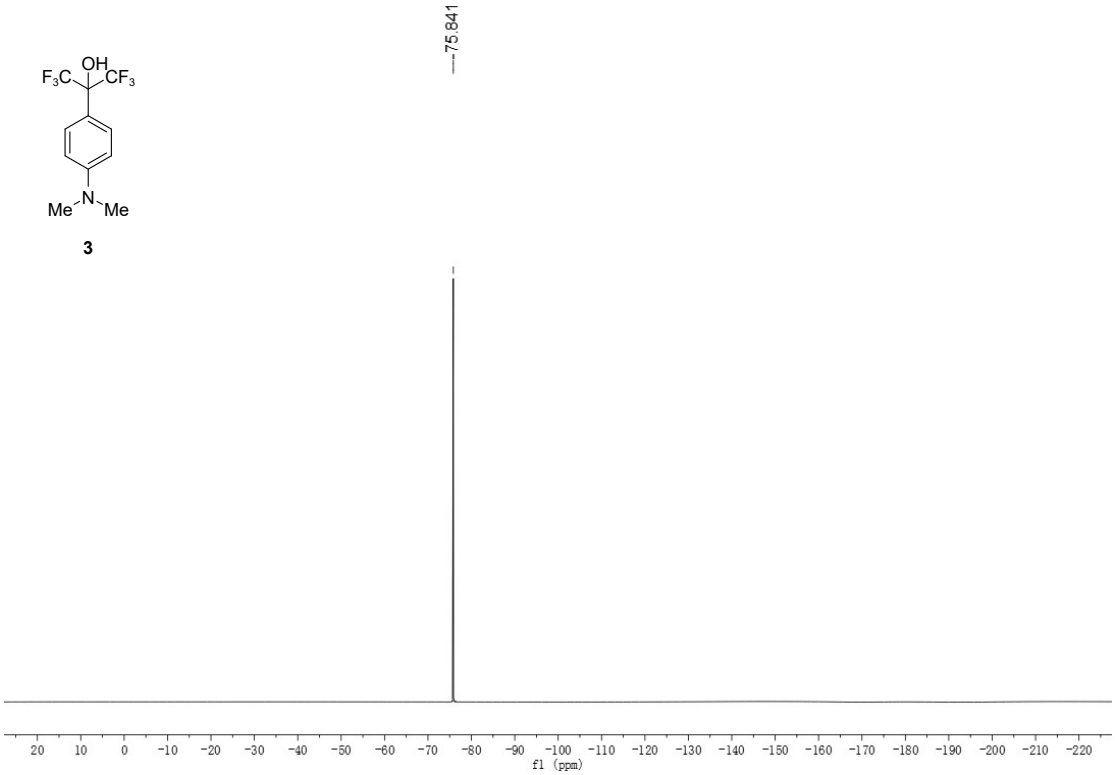
$^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$) δ 136.1, 125.7, 123.4, 122.7, 120.3, 119.2, 115.6 (t, $^1J_{C-F}$ = 245.1 Hz), 111.5, 111.1 (dd, $^3J_{C-F}$ = 4.3, 3.3 Hz), 68.2 (dd, $^2J_{C-F}$ = 26.1, 24.7 Hz); **HRMS** (ESI) m/z: $[M-H]^-$ Calcd for $C_{10}H_8F_2NO$: 196.0579, Found: 196.0583.

10. NMR spectra of the related compounds

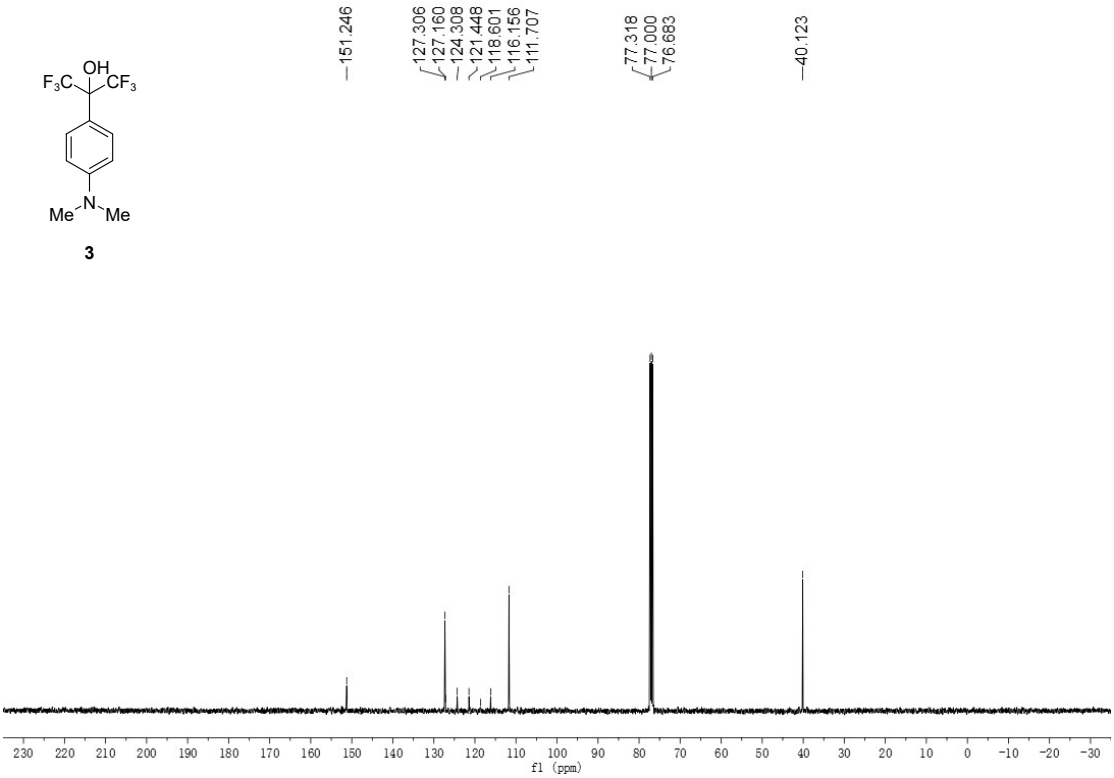
^1H NMR (400 MHz, $CDCl_3$) of **3**



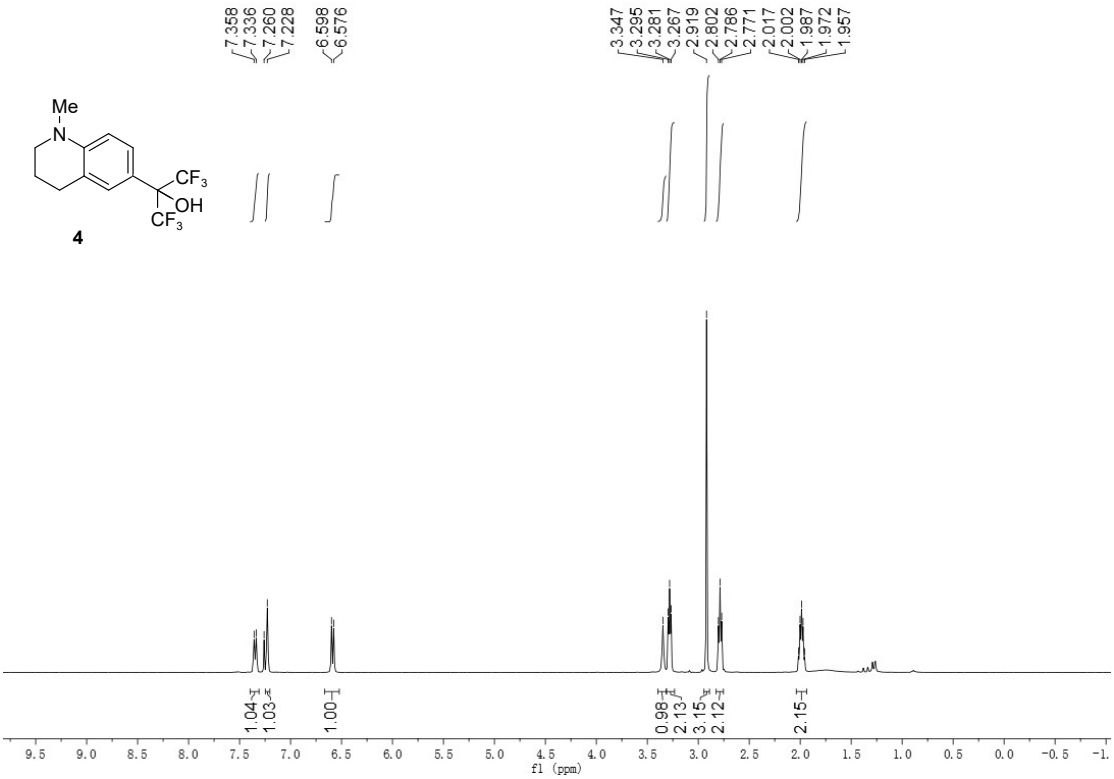
^{19}F NMR (376 MHz, $CDCl_3$) of **3**



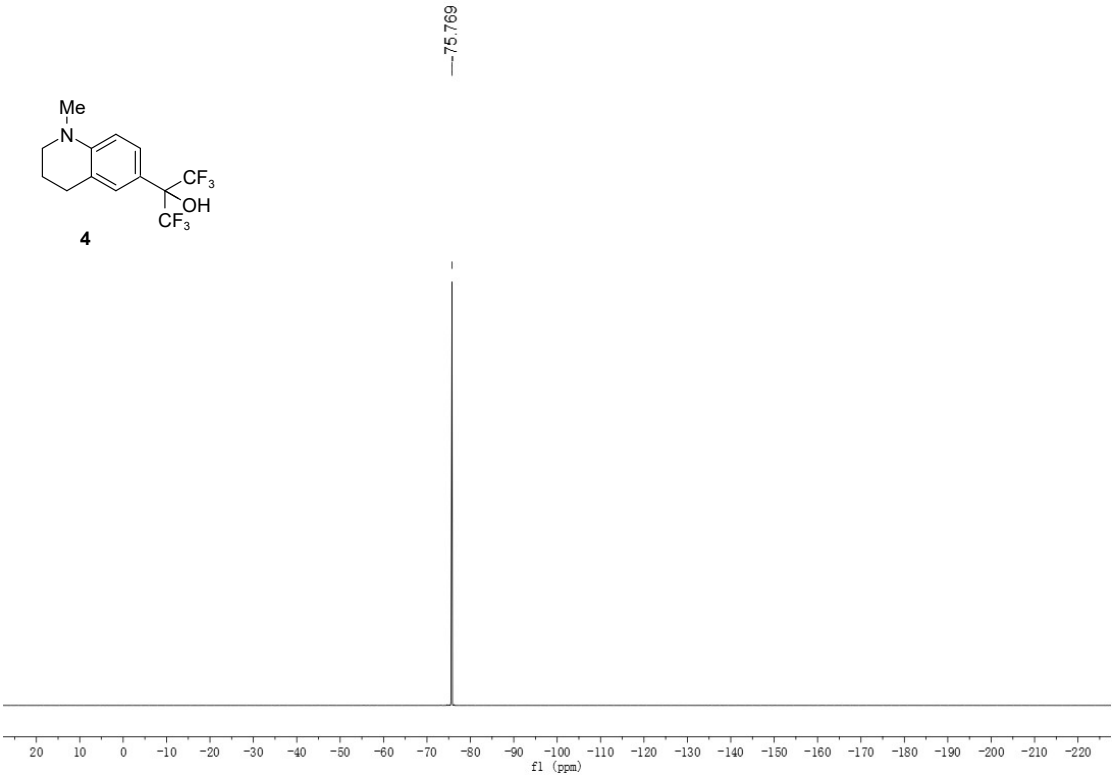
^{13}C NMR (100 MHz, $CDCl_3$) of **3**



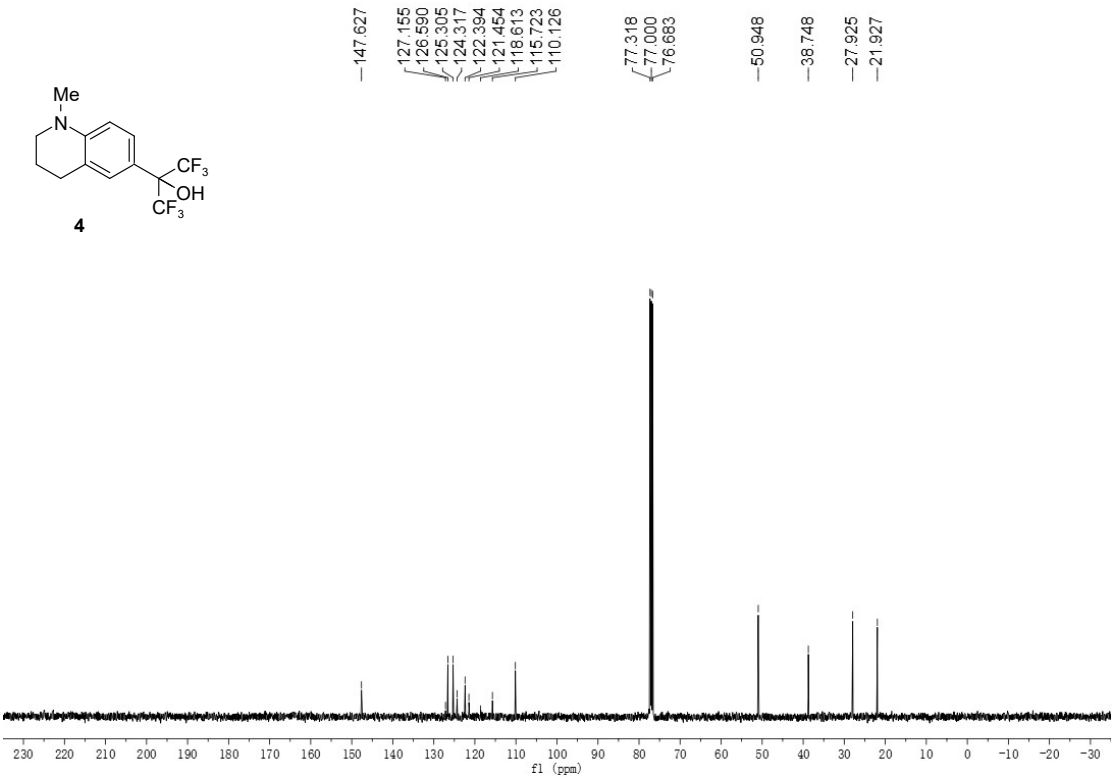
^{1}H NMR (400 MHz, $CDCl_3$) of **4**



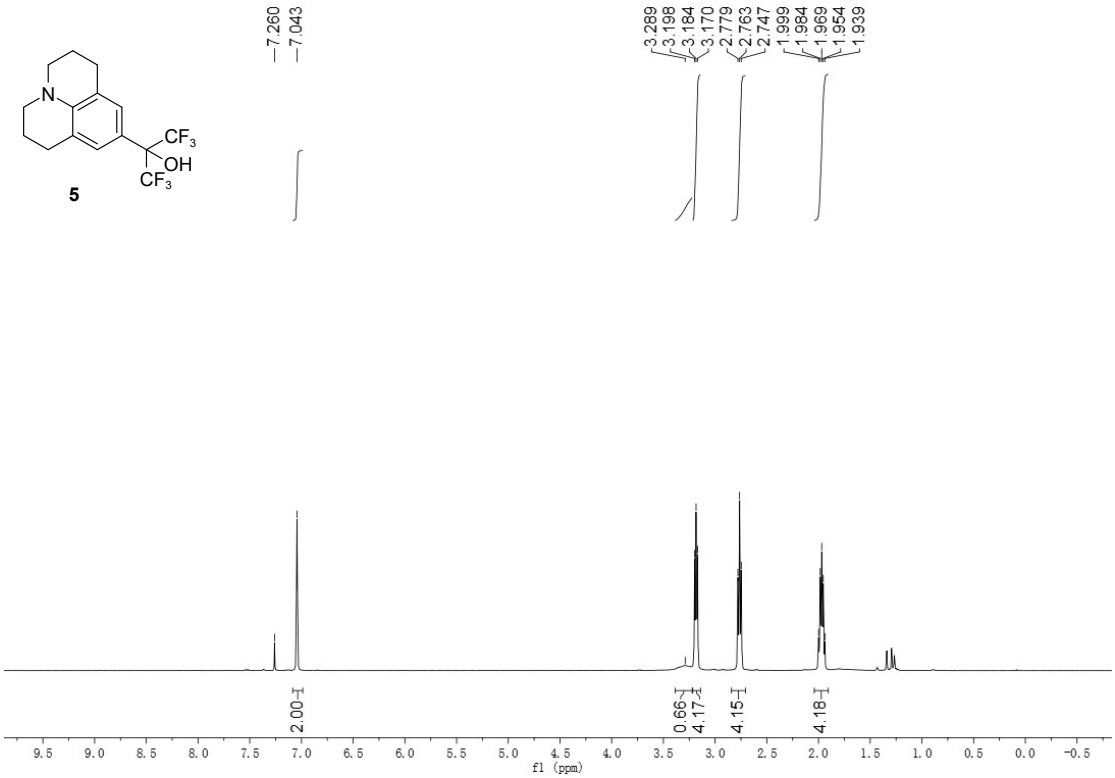
^{19}F NMR (376 MHz, $CDCl_3$) of **4**



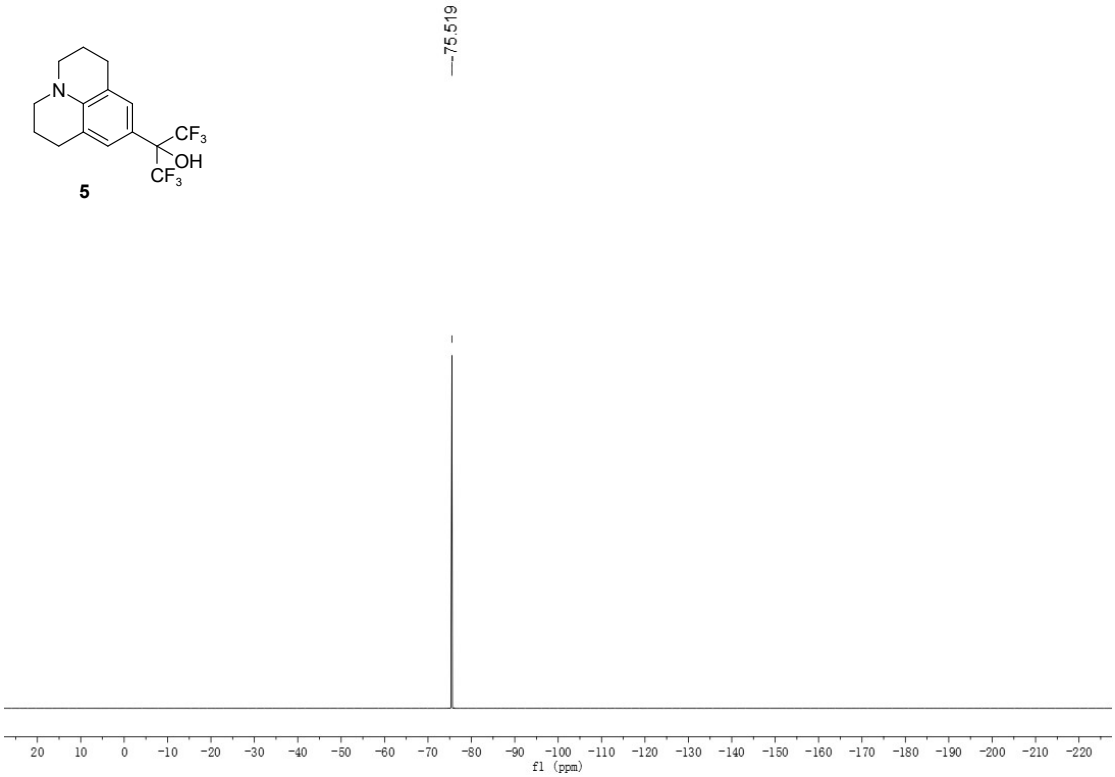
^{13}C NMR (100 MHz, $CDCl_3$) of **4**



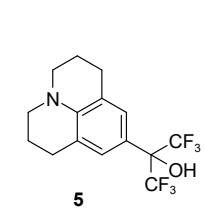
^{1}H NMR (400 MHz, $CDCl_3$) of **5**



^{19}F NMR (376 MHz, $CDCl_3$) of **5**

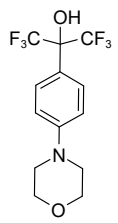


^{13}C NMR (100 MHz, $CDCl_3$) of **5**



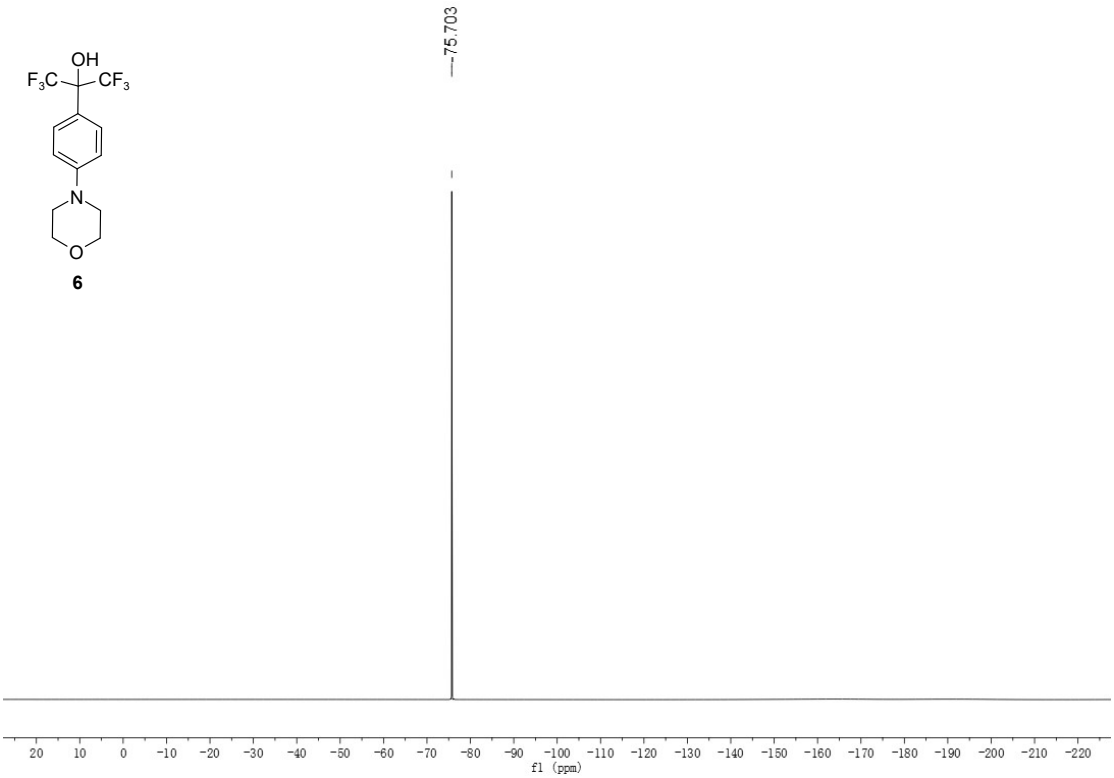
5

^{1}H NMR (400 MHz, $CDCl_3$) of **6**

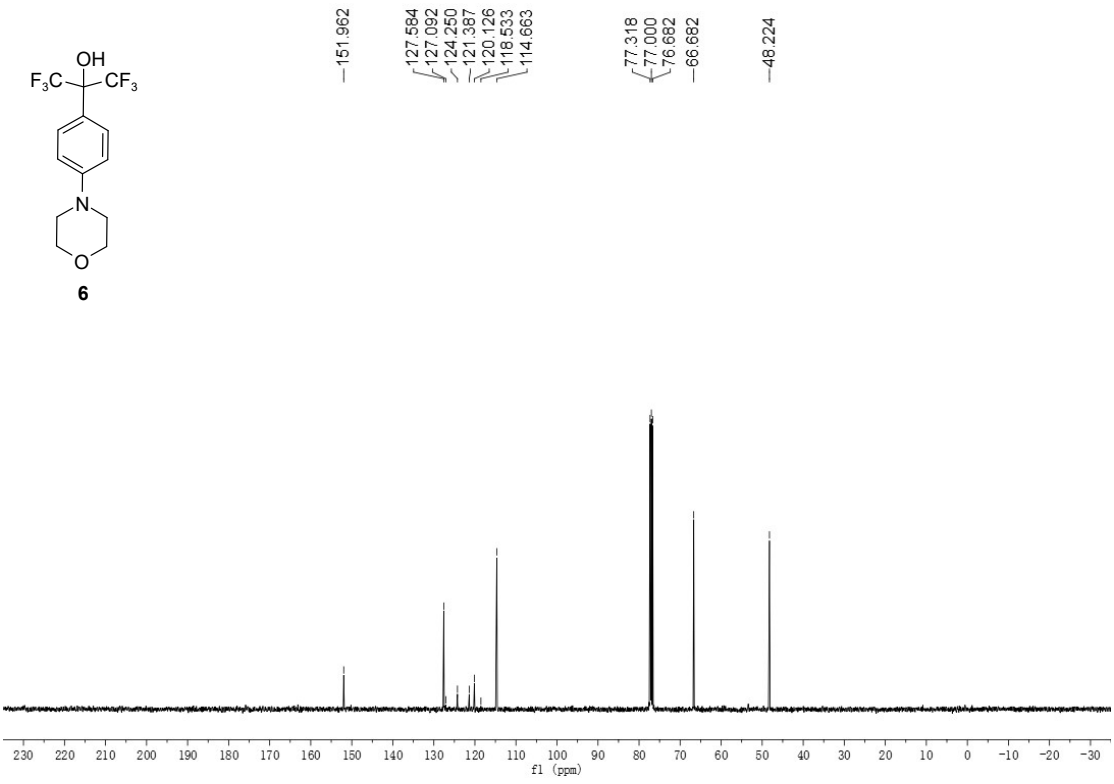


6

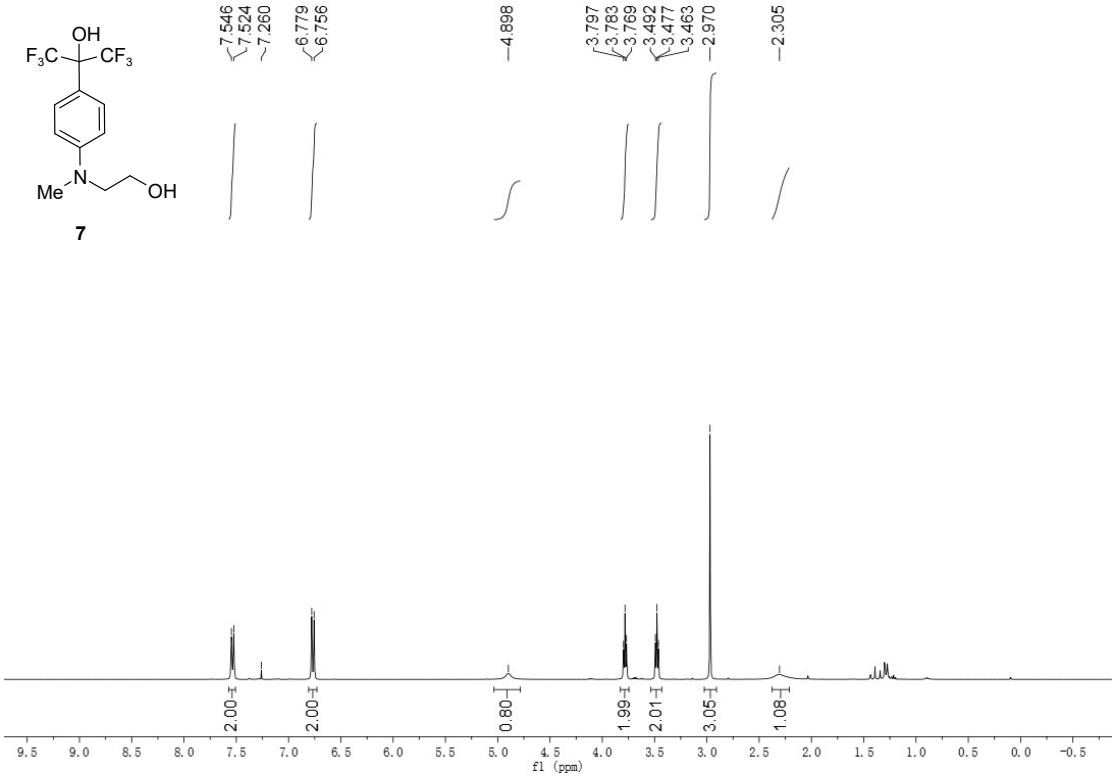
^{19}F NMR (376 MHz, $CDCl_3$) of **6**



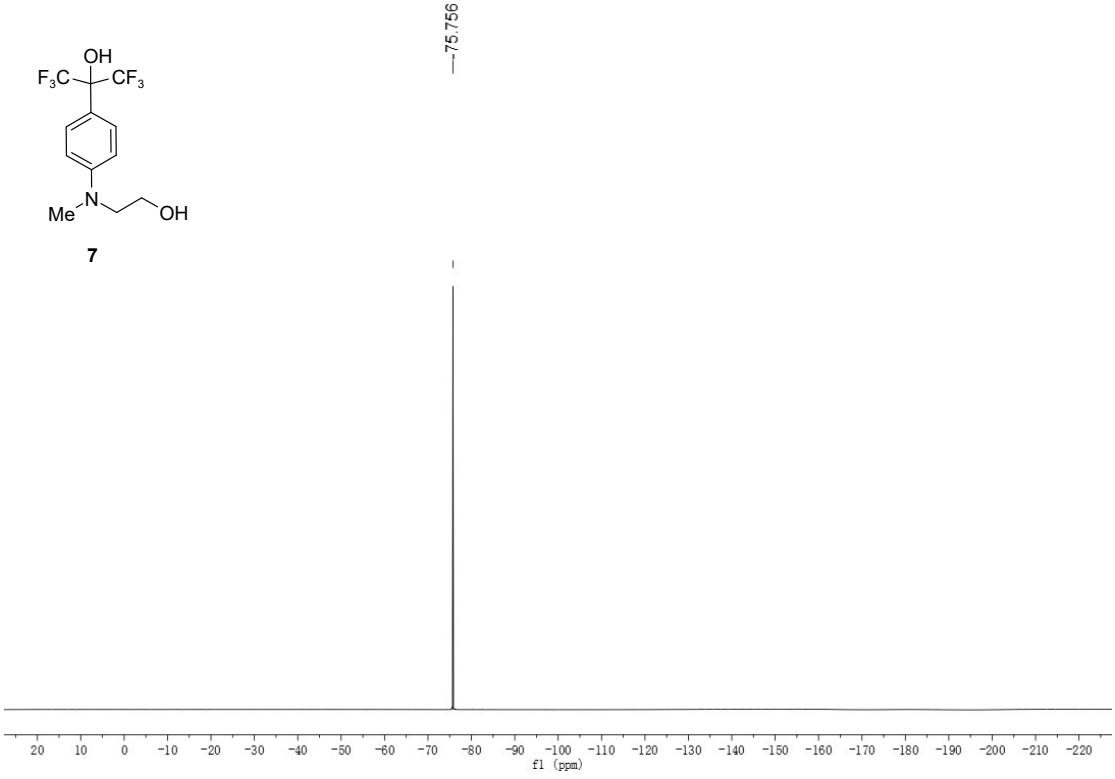
^{13}C NMR (100 MHz, $CDCl_3$) of **6**



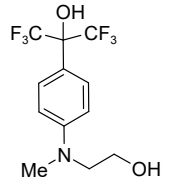
^{1}H NMR (400 MHz, $CDCl_3$) of **7**



^{19}F NMR (376 MHz, $CDCl_3$) of **7**

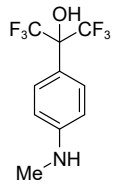


^{13}C NMR (100 MHz, $CDCl_3$) of **7**



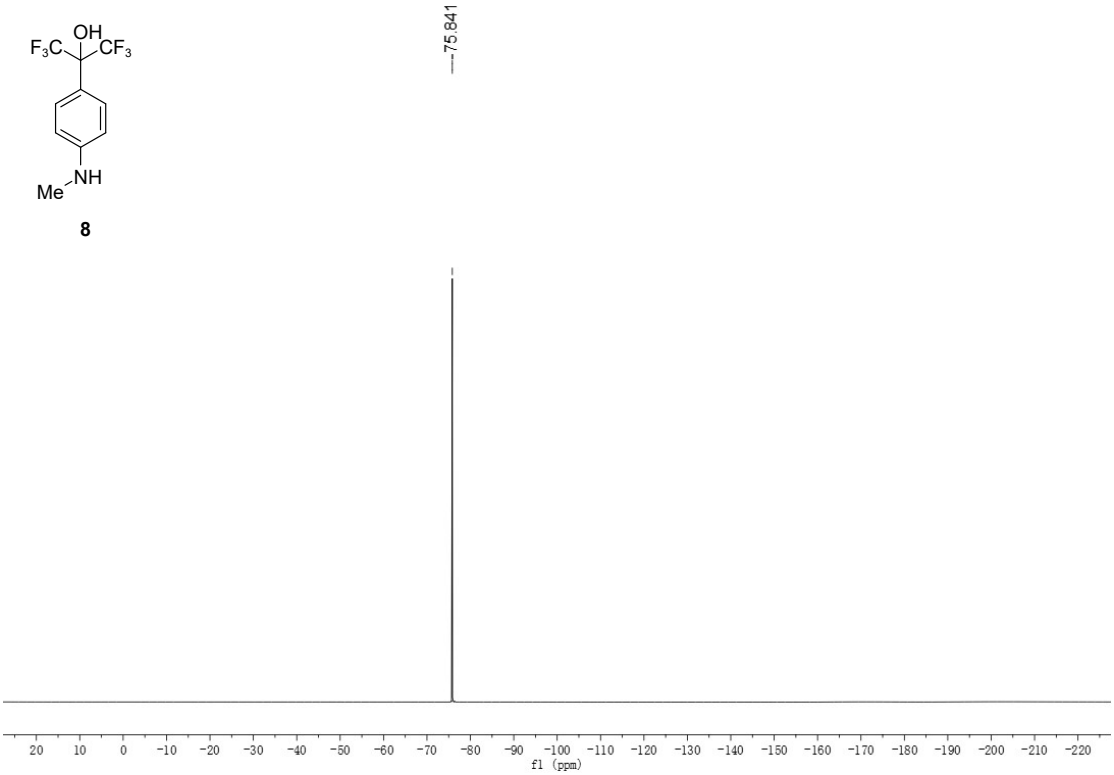
7

^{1}H NMR (400 MHz, $CDCl_3$) of **8**

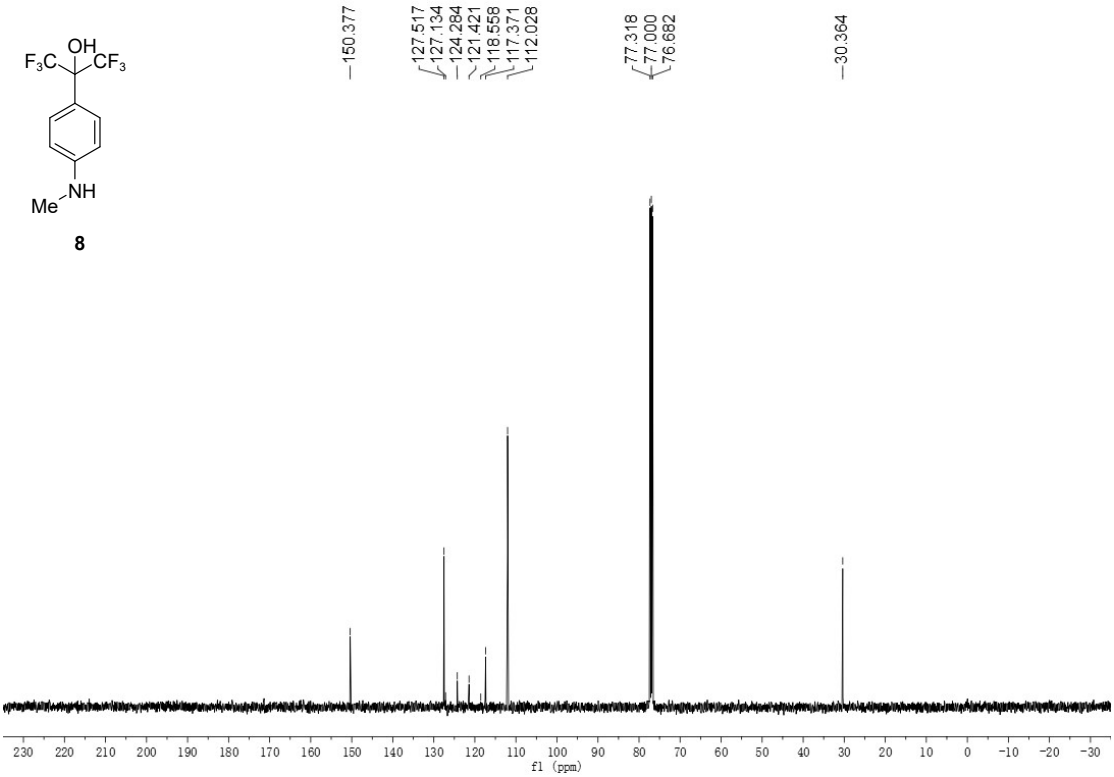


8

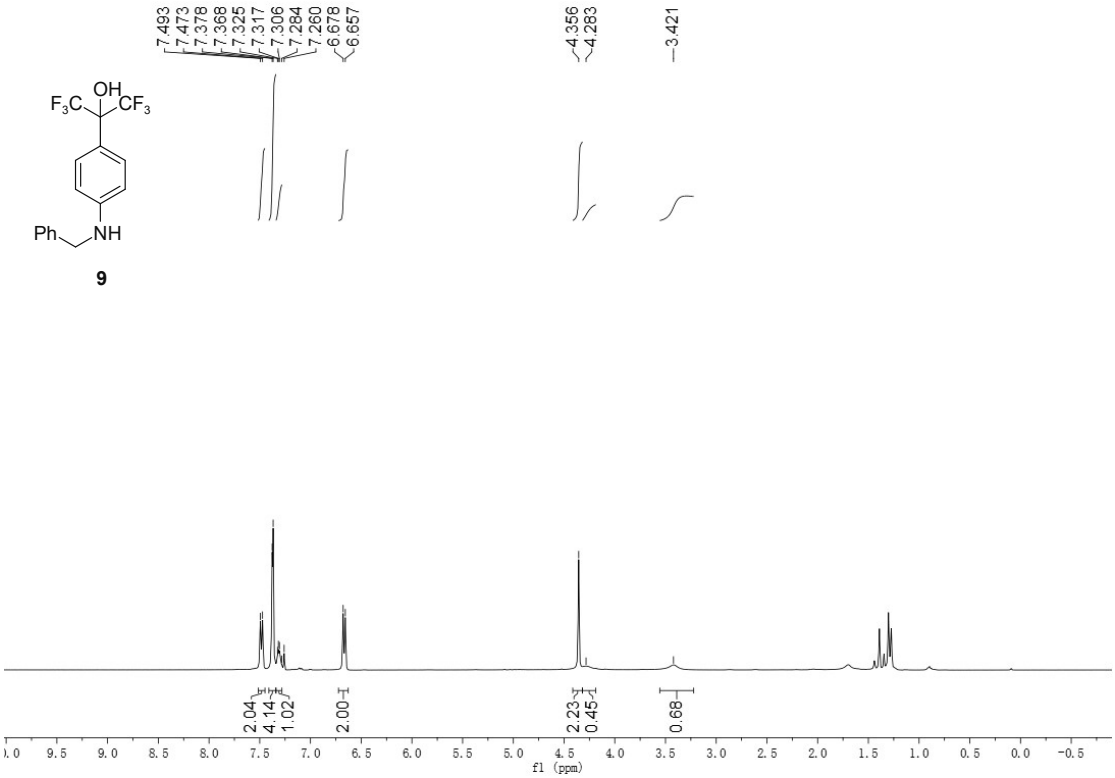
^{19}F NMR (376 MHz, $CDCl_3$) of **8**



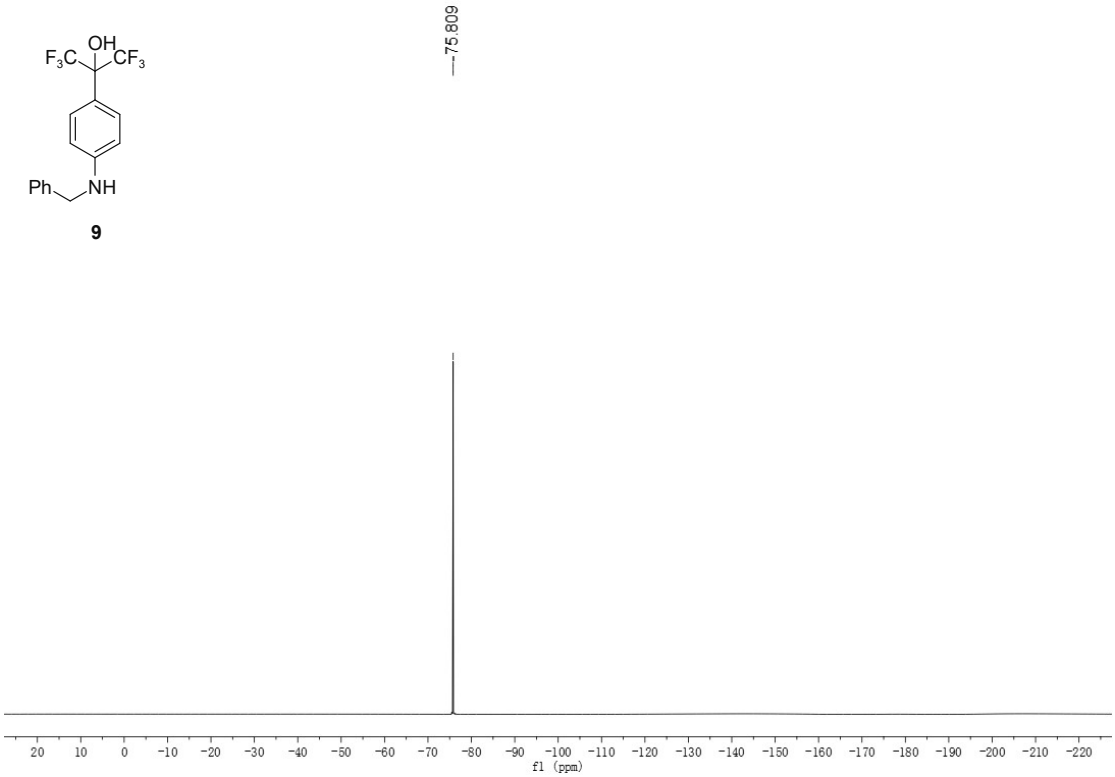
^{13}C NMR (100 MHz, $CDCl_3$) of **8**



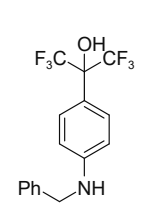
^{1}H NMR (400 MHz, $CDCl_3$) of **9**



^{19}F NMR (376 MHz, $CDCl_3$) of **9**

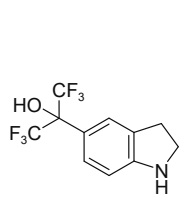


^{13}C NMR (100 MHz, $CDCl_3$) of **9**



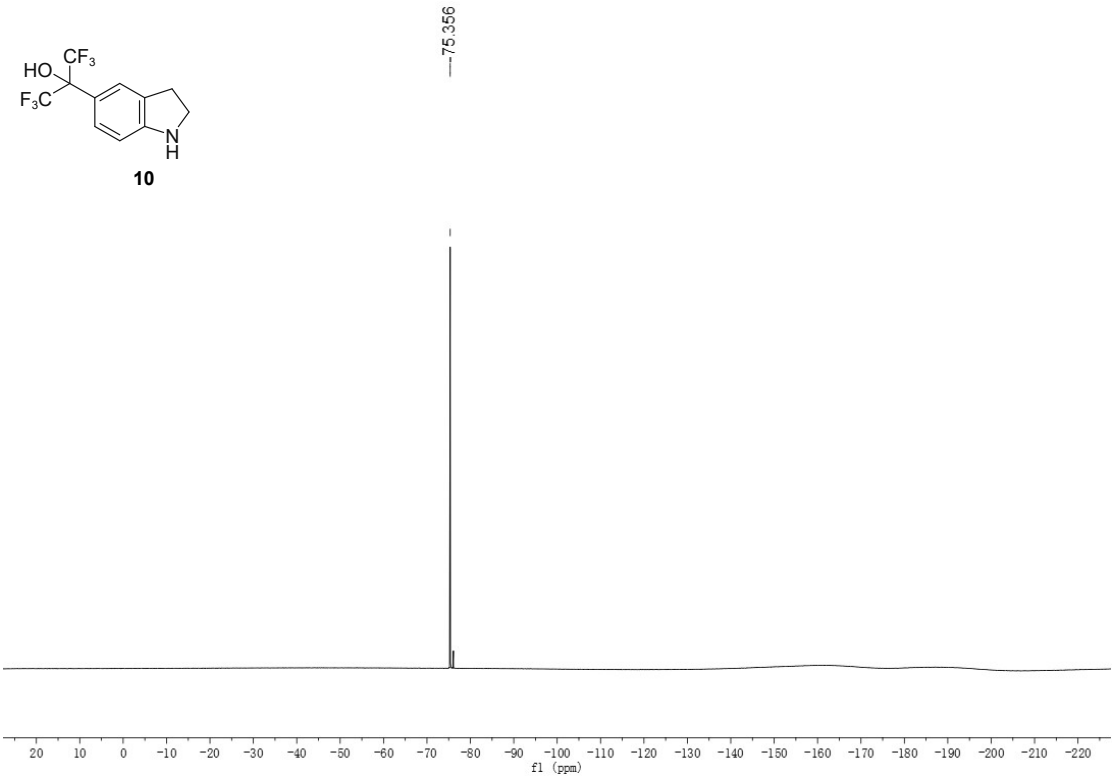
9

^{1}H NMR (400 MHz, $CDCl_3$) of **10**

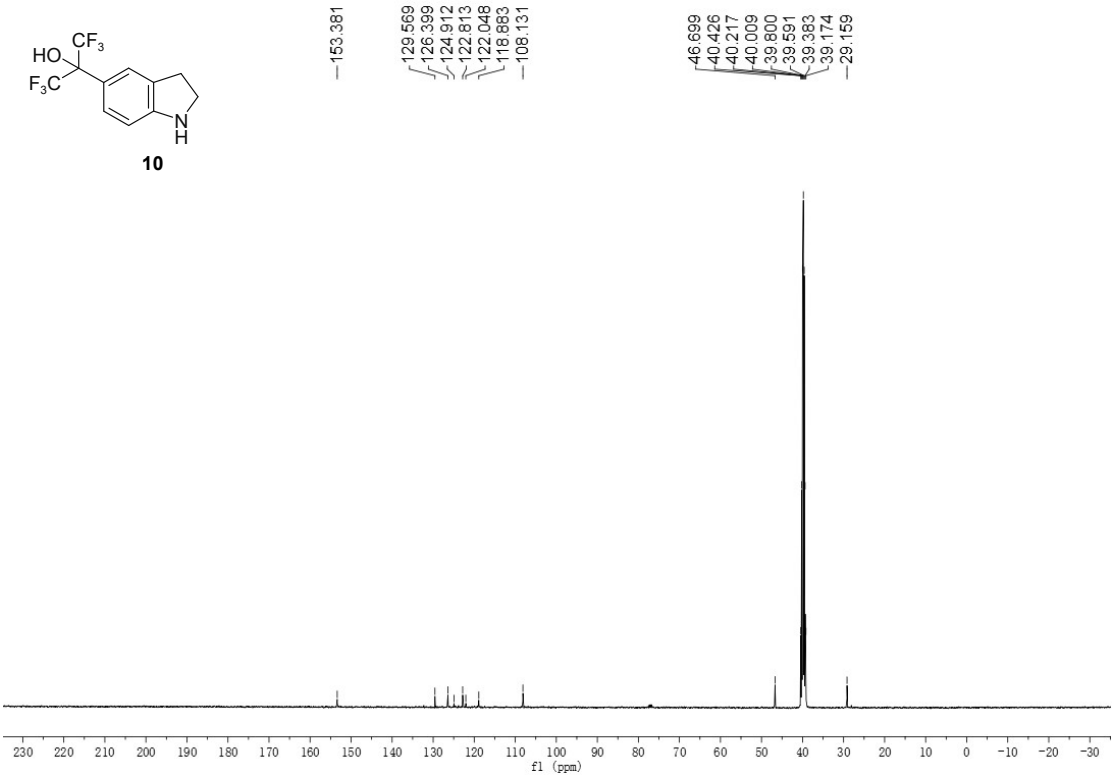


10

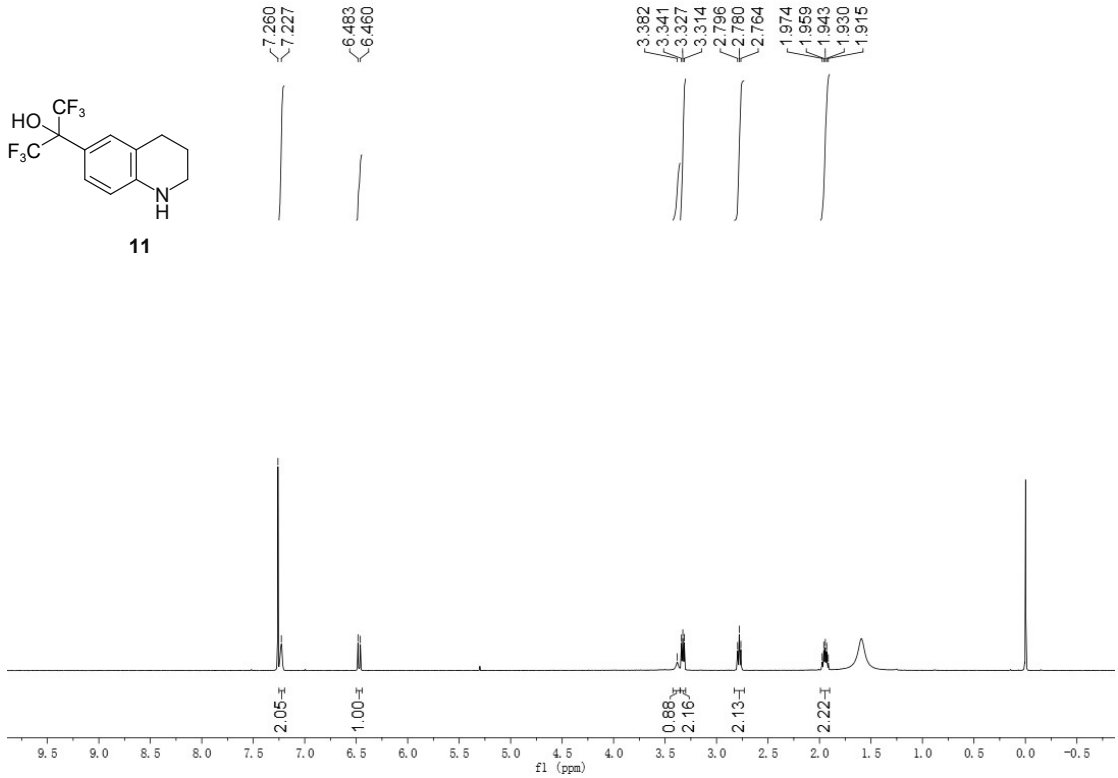
^{19}F NMR (376 MHz, $CDCl_3$) of **10**



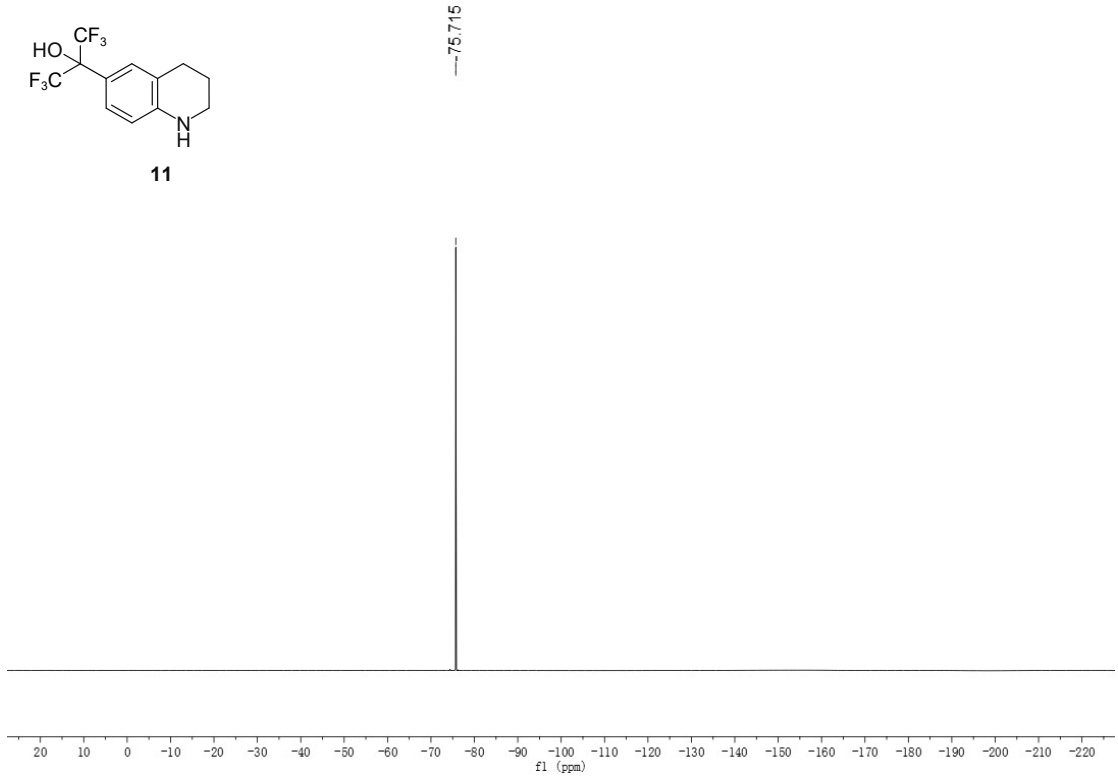
^{13}C NMR (100 MHz, DMSO-*d*6) of **10**



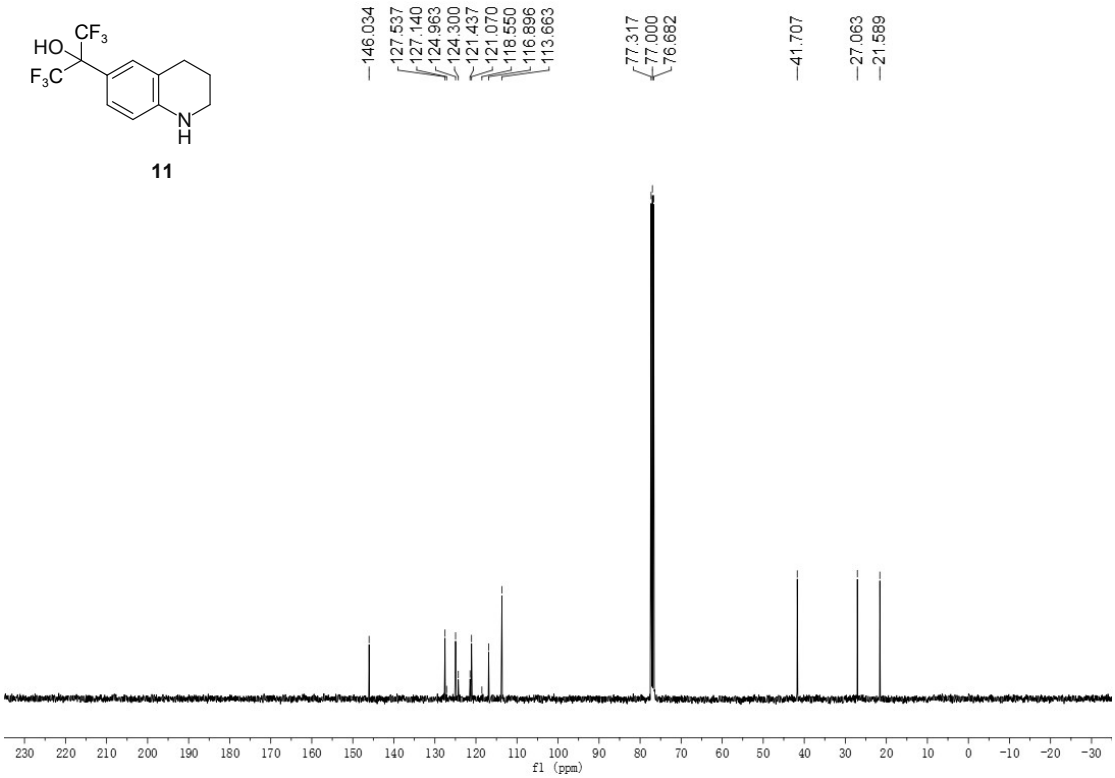
^{1}H NMR (400 MHz, $CDCl_3$) of **11**



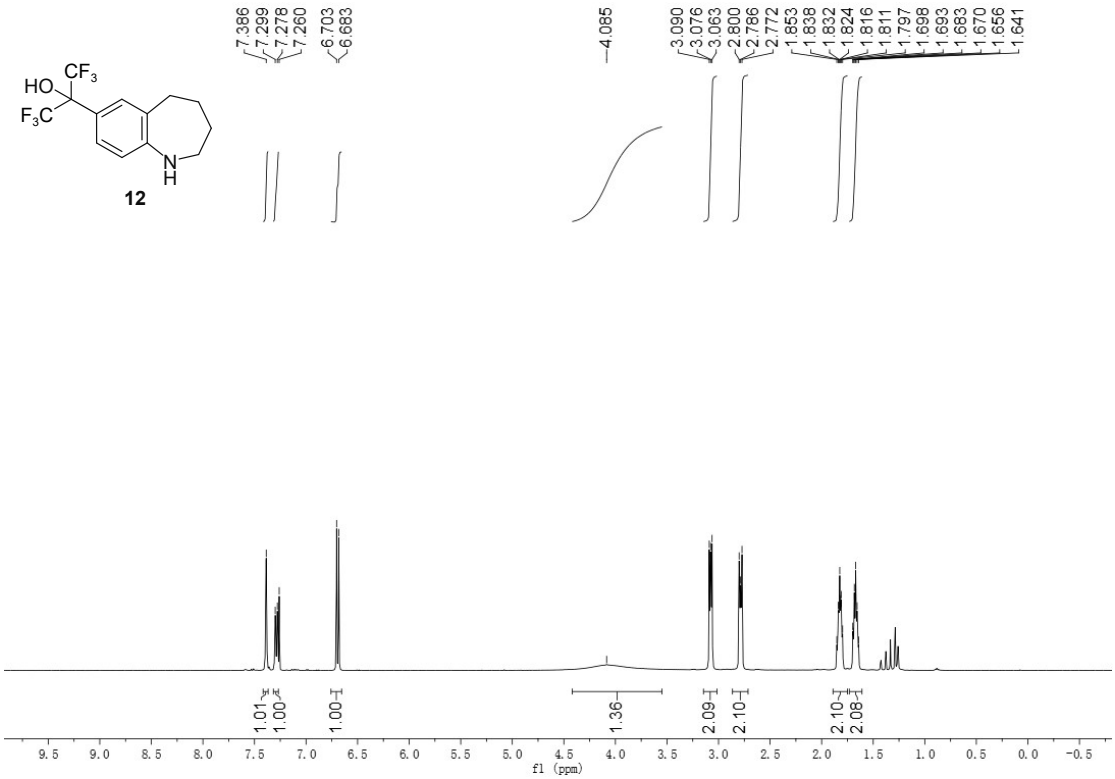
^{19}F NMR (376 MHz, $CDCl_3$) of **11**



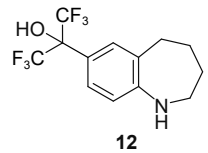
^{13}C NMR (100 MHz, $CDCl_3$) of **11**



^{1}H NMR (400 MHz, $CDCl_3$) of **12**

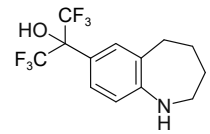


^{19}F NMR (376 MHz, $CDCl_3$) of **12**



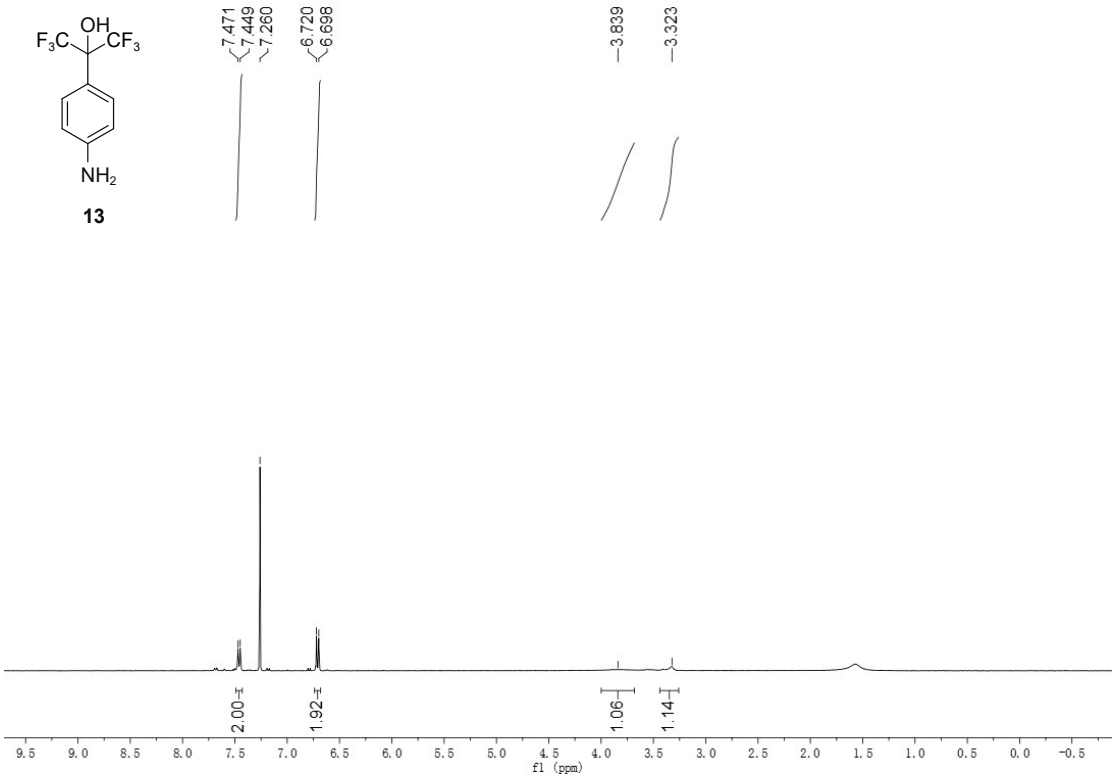
12

^{13}C NMR (100 MHz, $CDCl_3$) of **12**

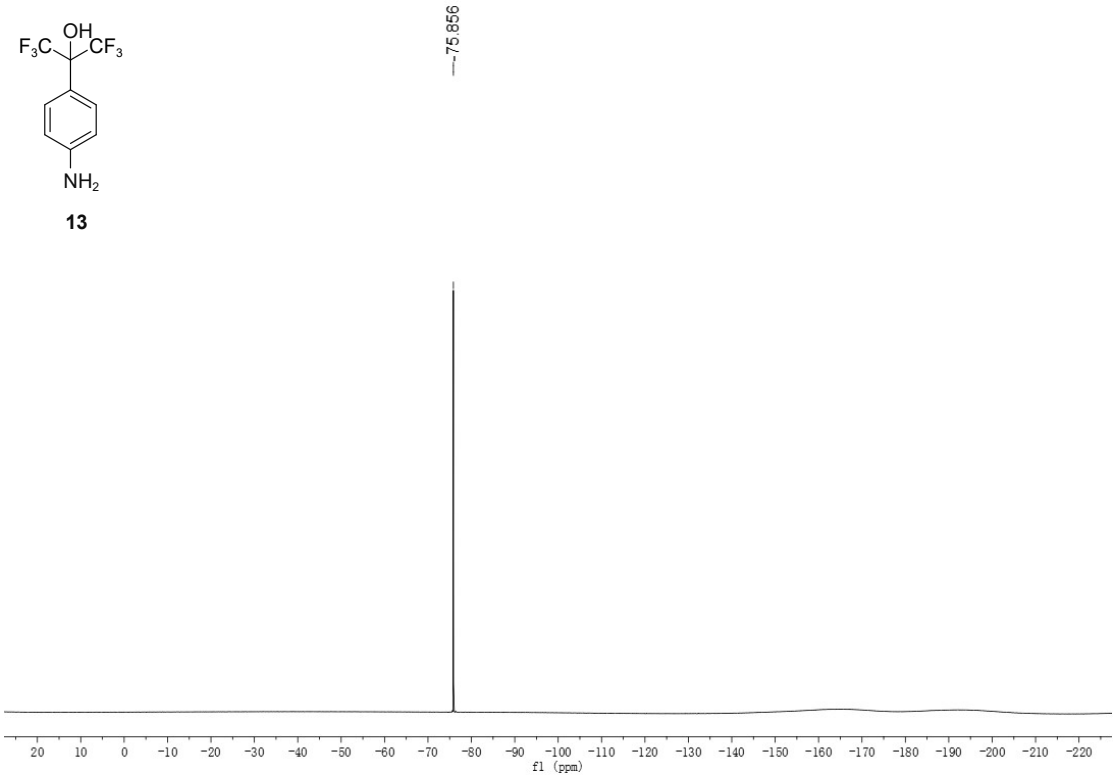


12

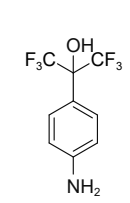
^{1}H NMR (400 MHz, $CDCl_3$) of **13**



^{19}F NMR (376 MHz, $CDCl_3$) of **13**

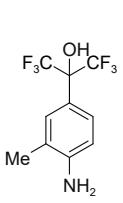


^{13}C NMR (100 MHz, DMSO-*d*6) of **13**



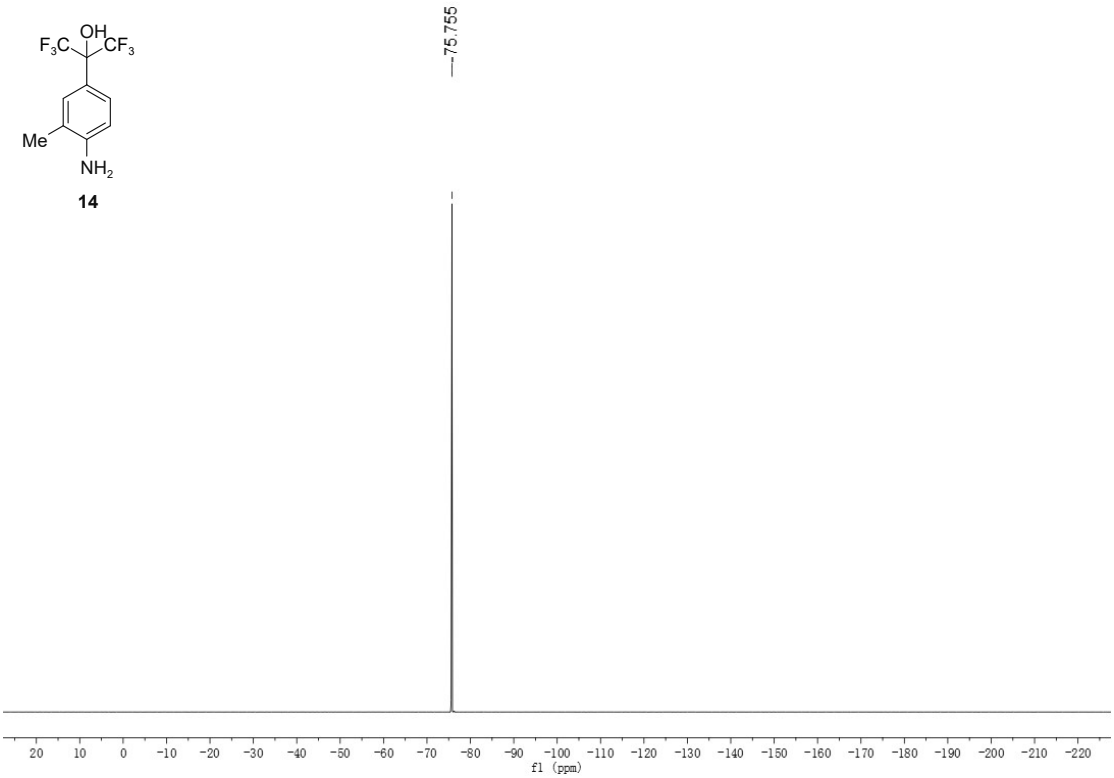
13

^{1}H NMR (400 MHz, $CDCl_3$) of **14**

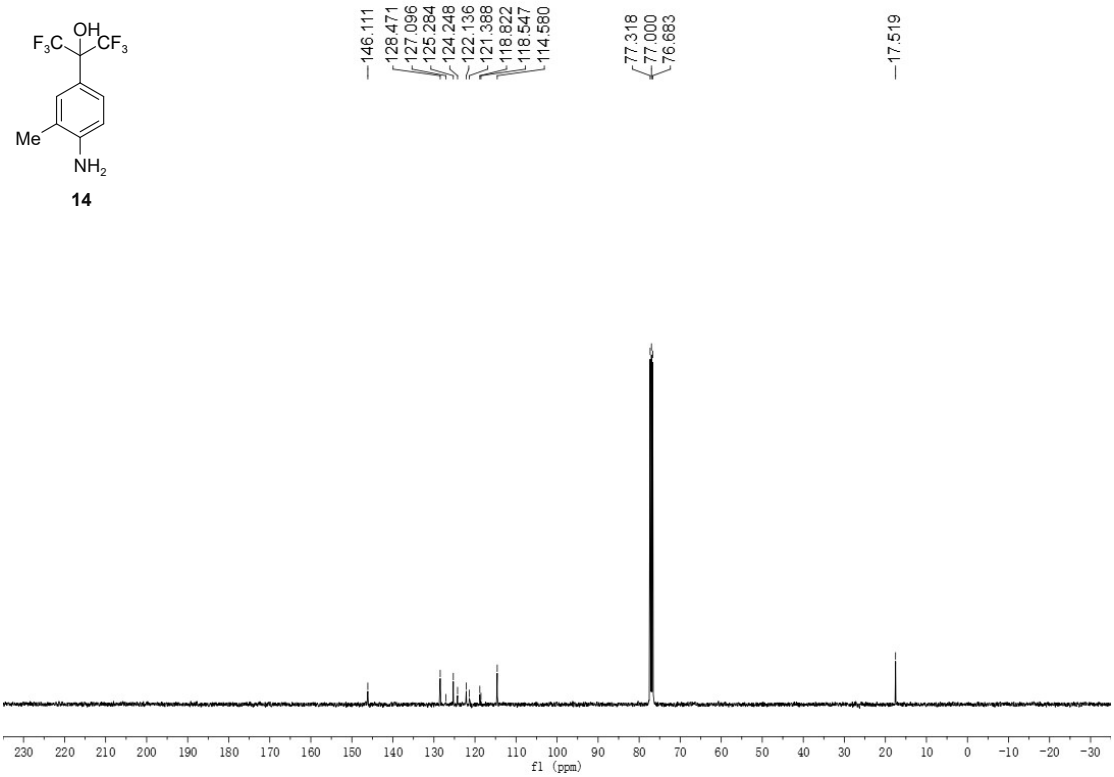


14

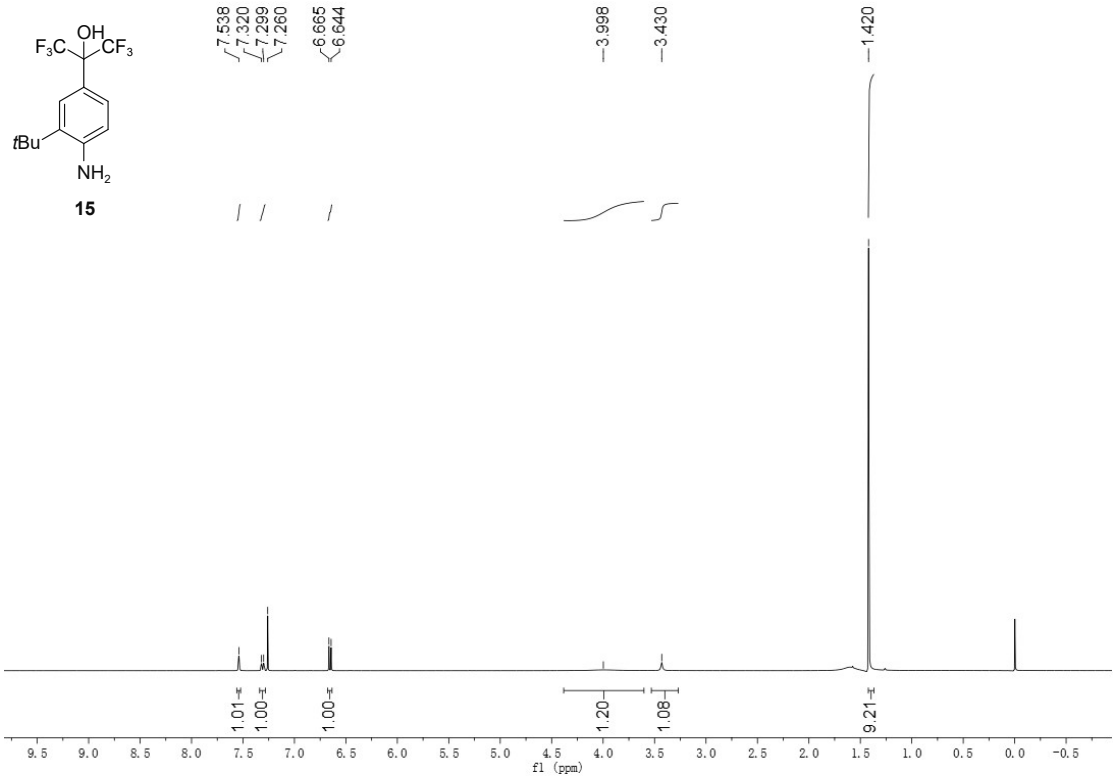
^{19}F NMR (376 MHz, $CDCl_3$) of **14**



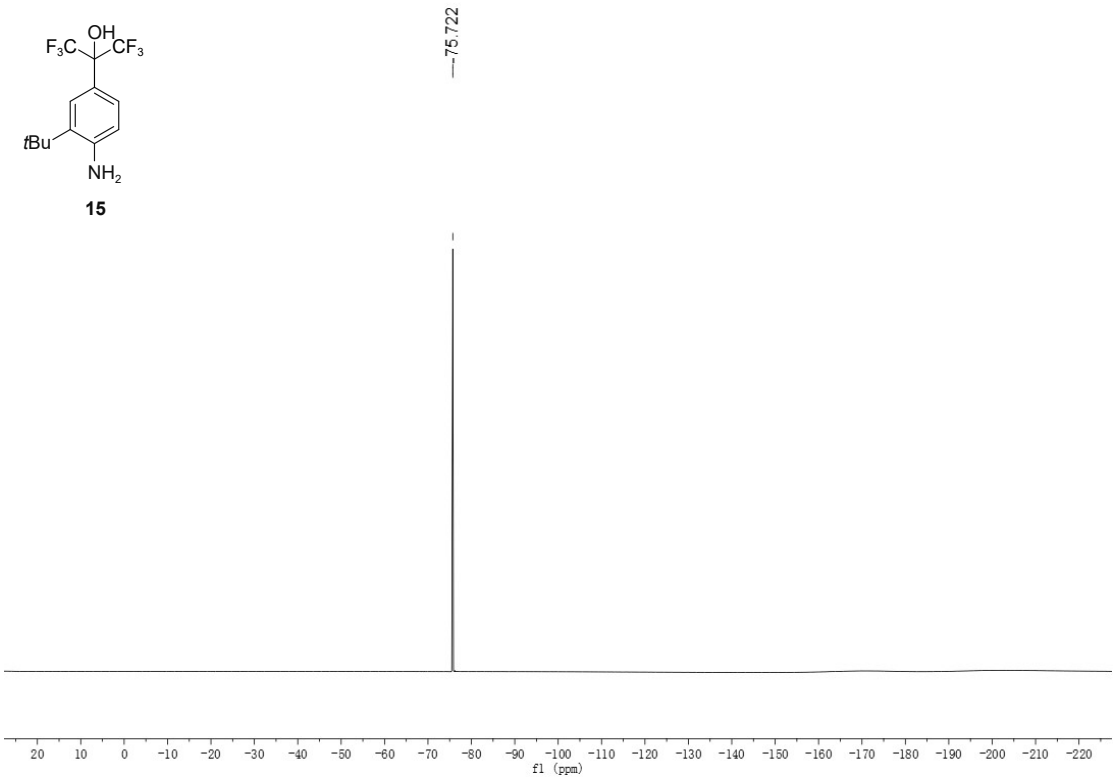
^{13}C NMR (100 MHz, $CDCl_3$) of **14**



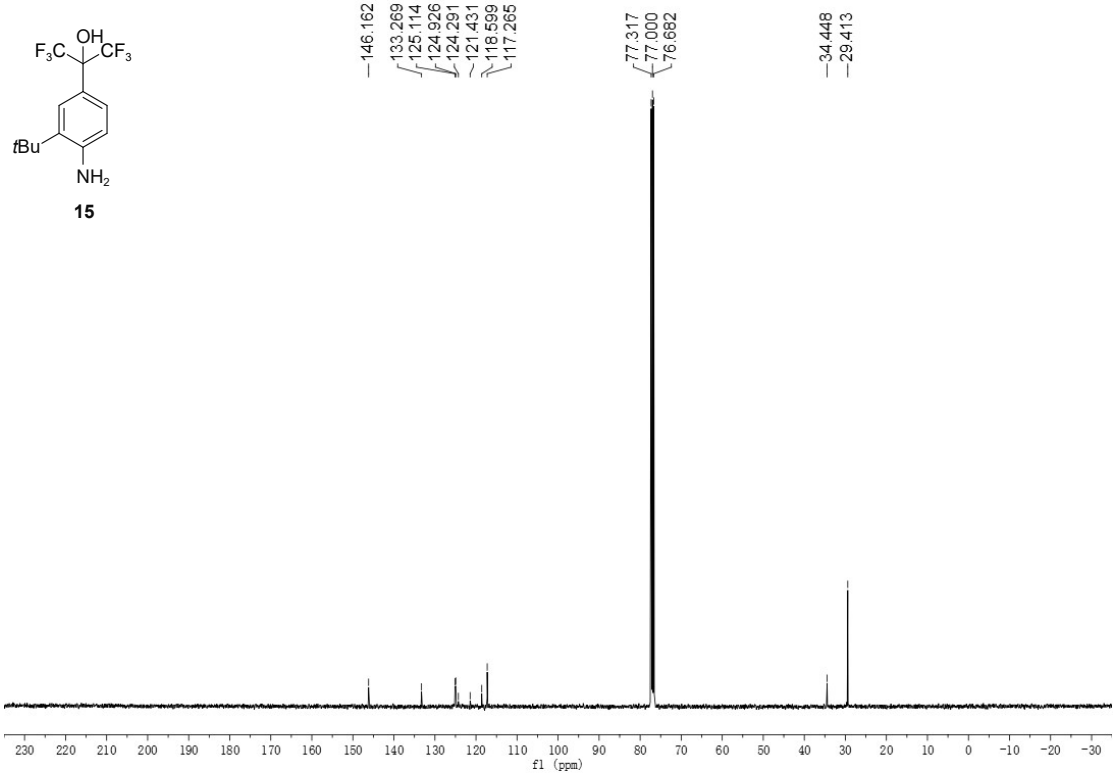
^{1}H NMR (400 MHz, $CDCl_3$) of **15**



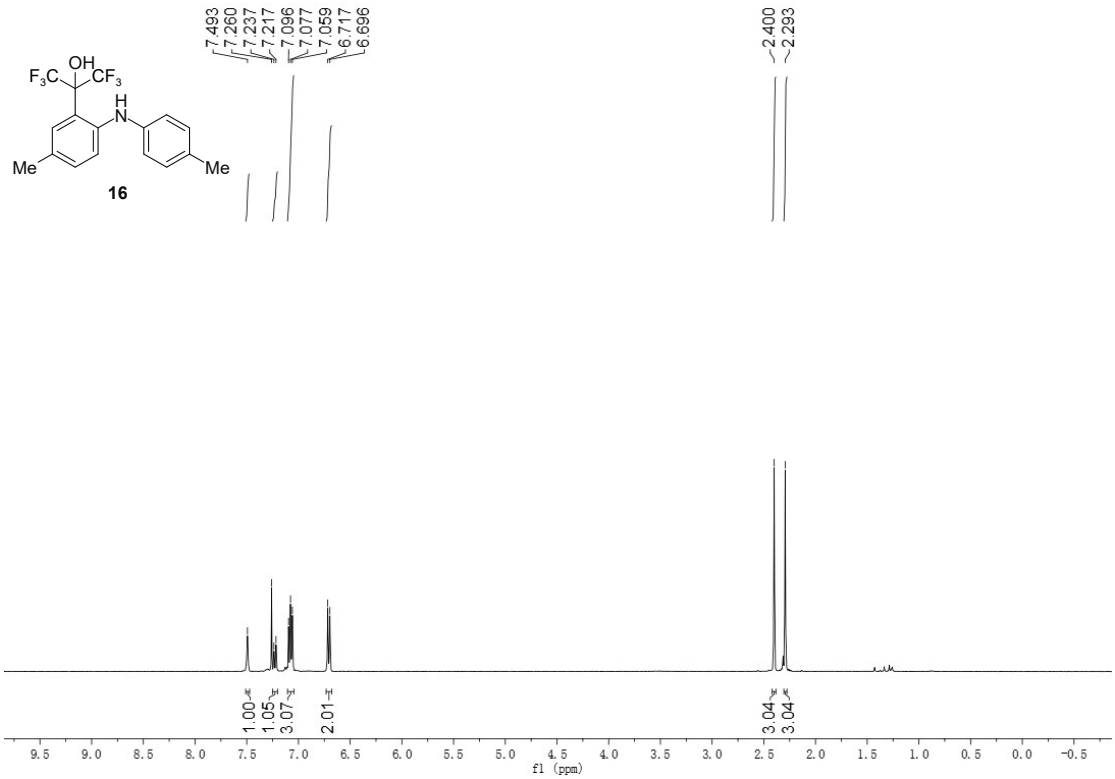
^{19}F NMR (376 MHz, $CDCl_3$) of **15**



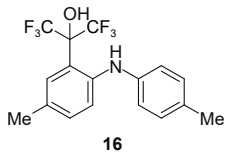
^{13}C NMR (100 MHz, $CDCl_3$) of **15**



^{1}H NMR (400 MHz, $CDCl_3$) of **16**

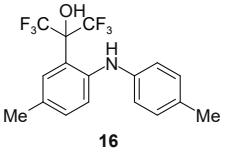


^{19}F NMR (376 MHz, $CDCl_3$) of **16**



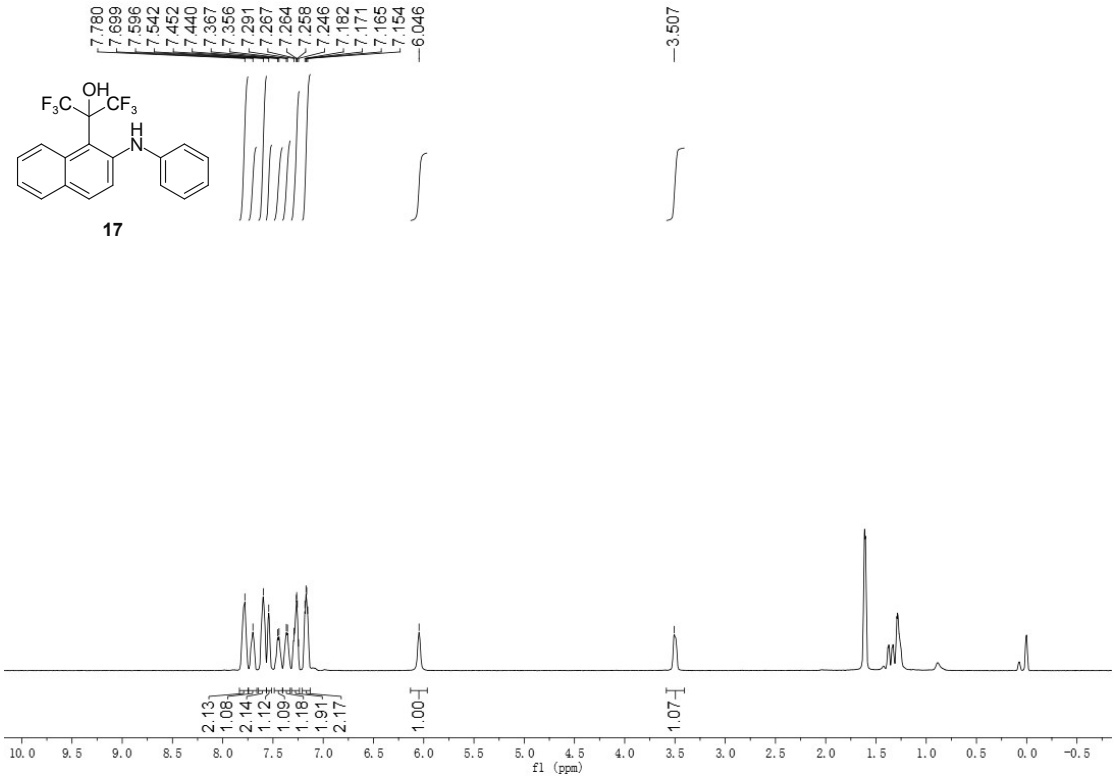
16

^{13}C NMR (100 MHz, $CDCl_3$) of **16**

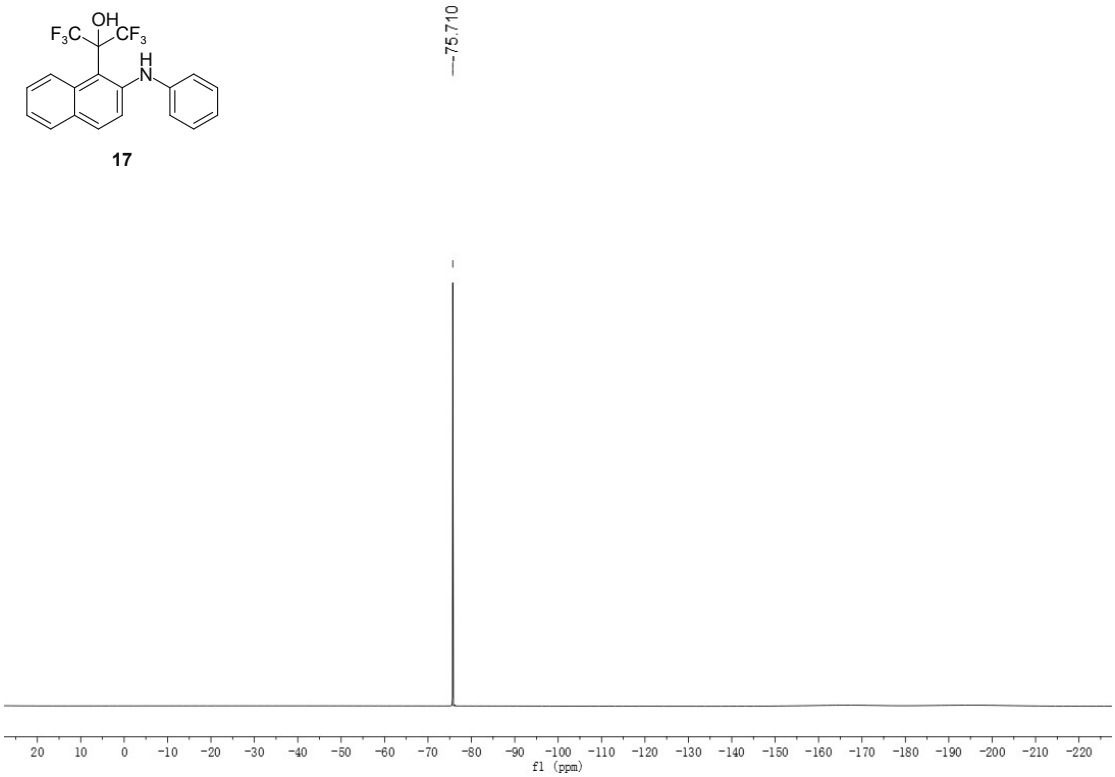


16

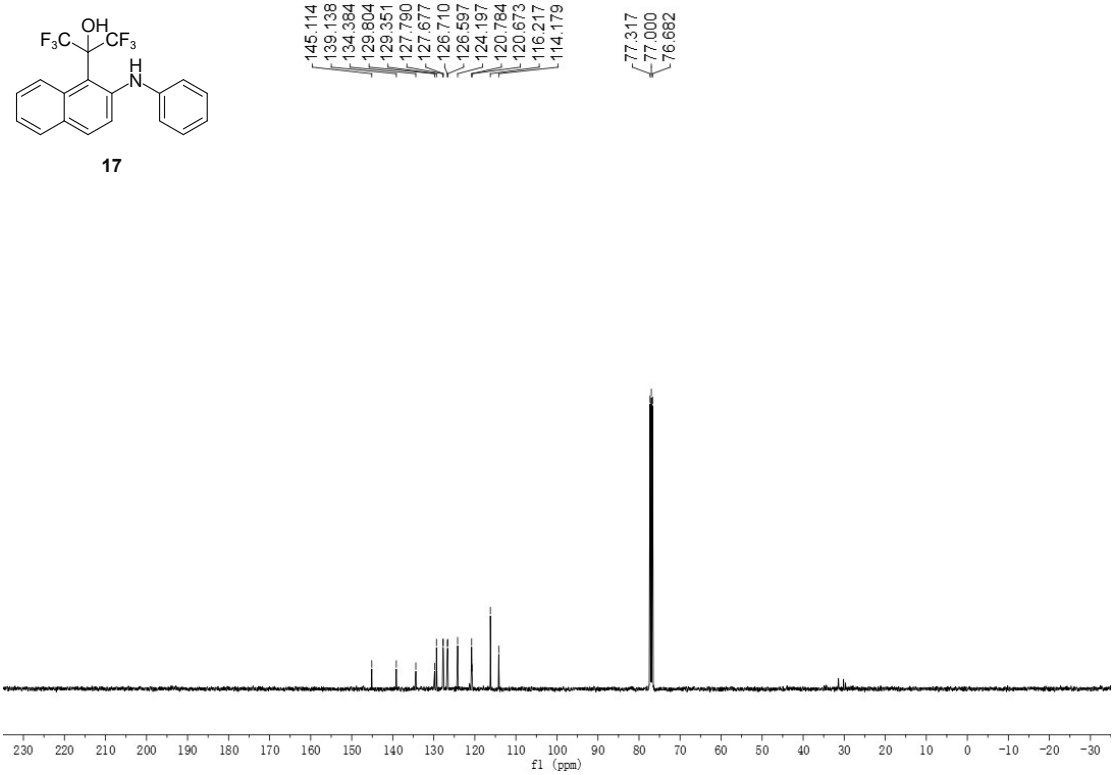
^{1}H NMR (400 MHz, $CDCl_3$) of **17**



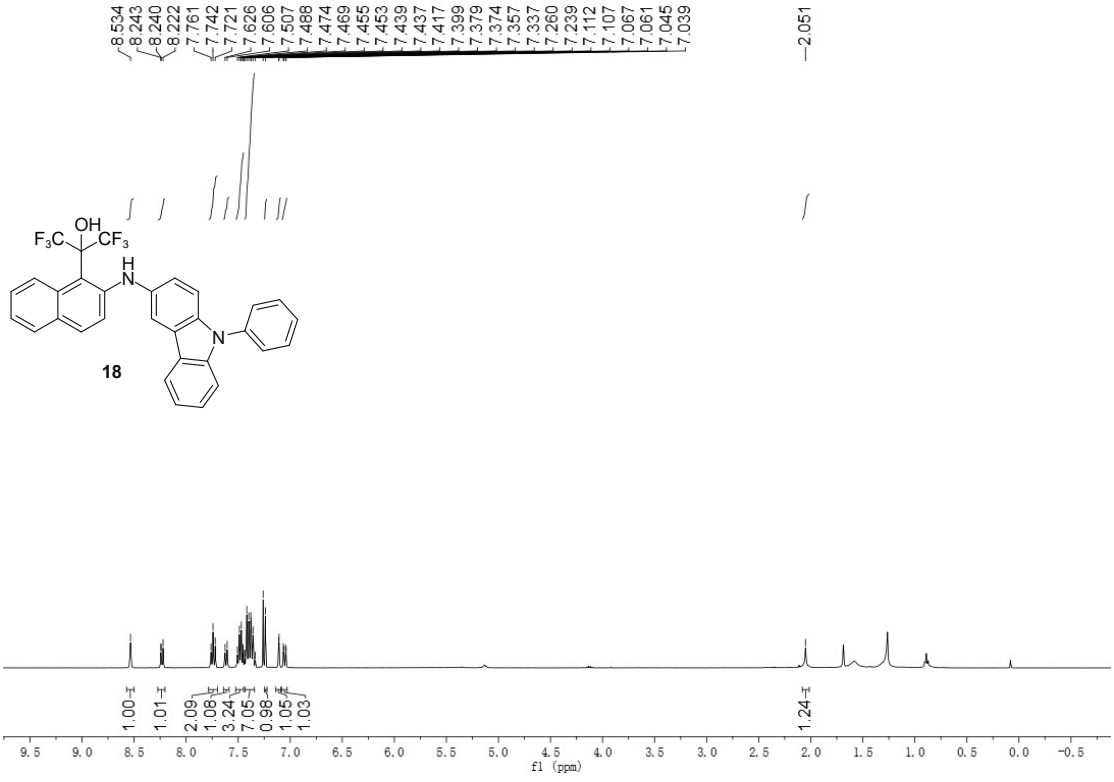
^{19}F NMR (376 MHz, $CDCl_3$) of **17**



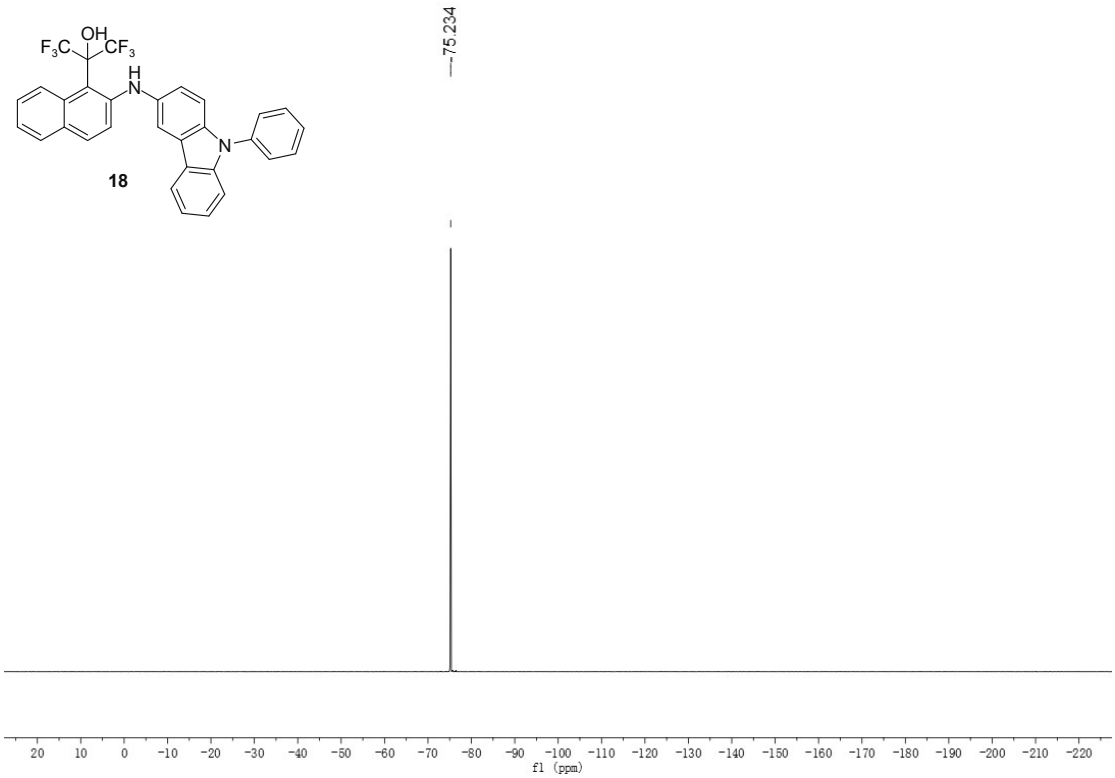
^{13}C NMR (100 MHz, $CDCl_3$) of **17**



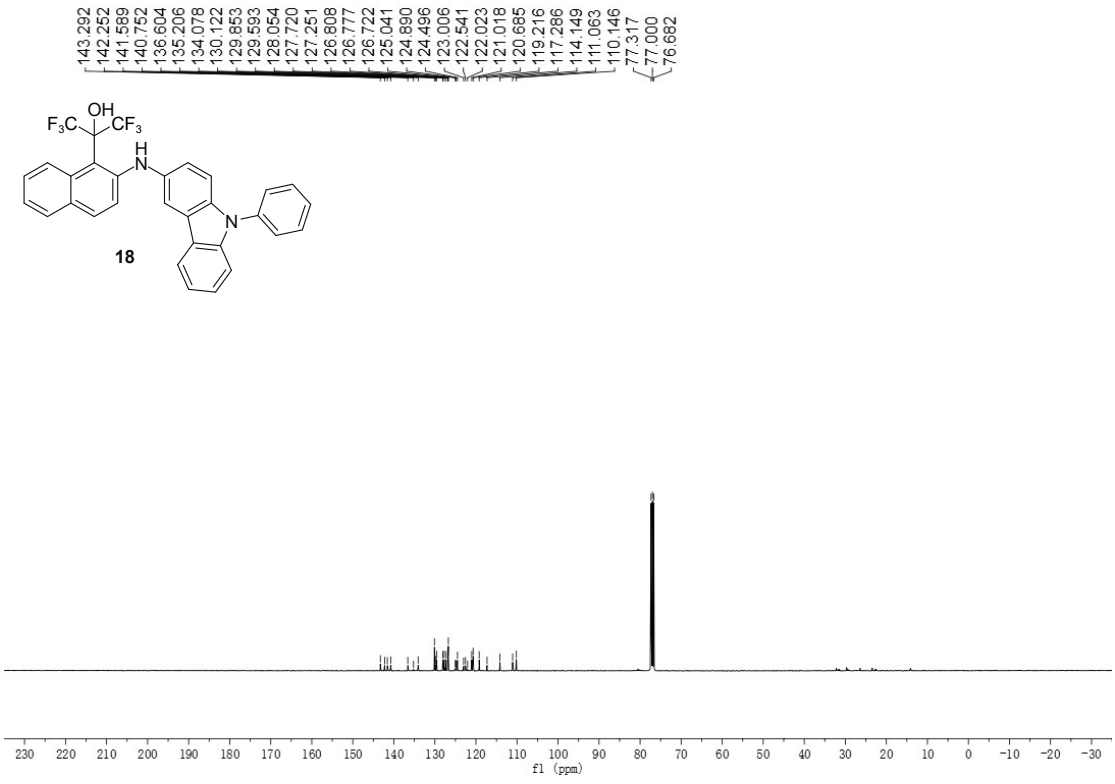
^{1}H NMR (400 MHz, $CDCl_3$) of **18**



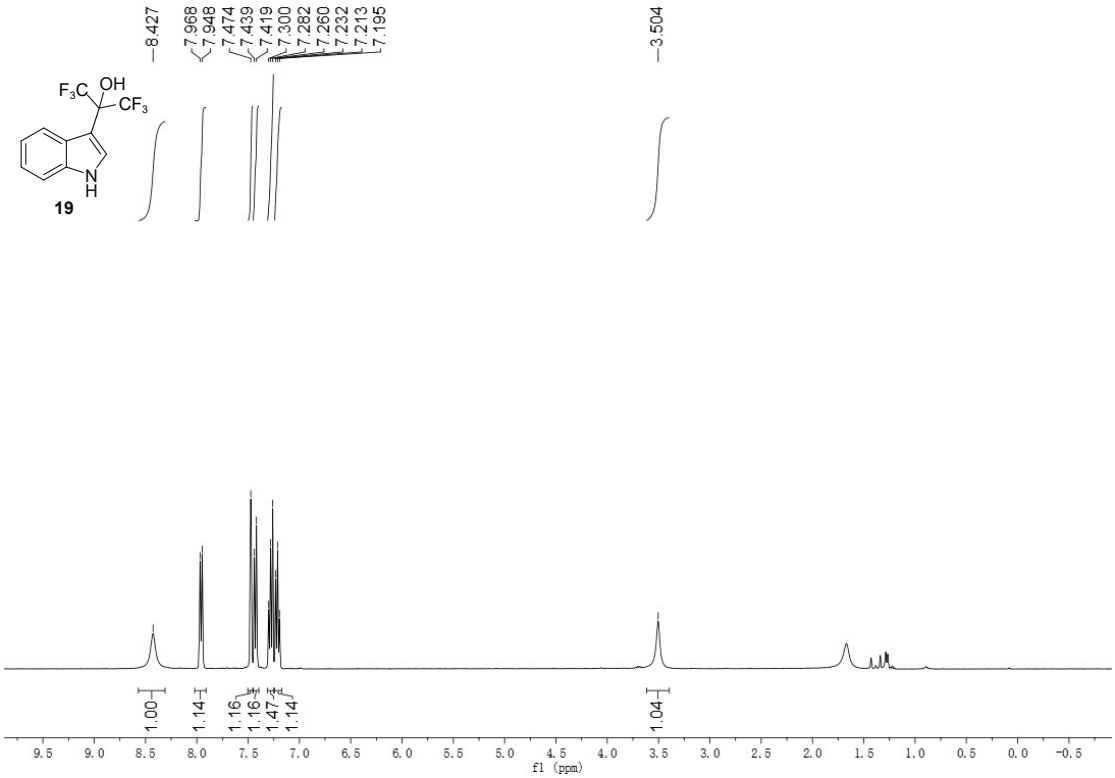
^{19}F NMR (376 MHz, $CDCl_3$) of **18**



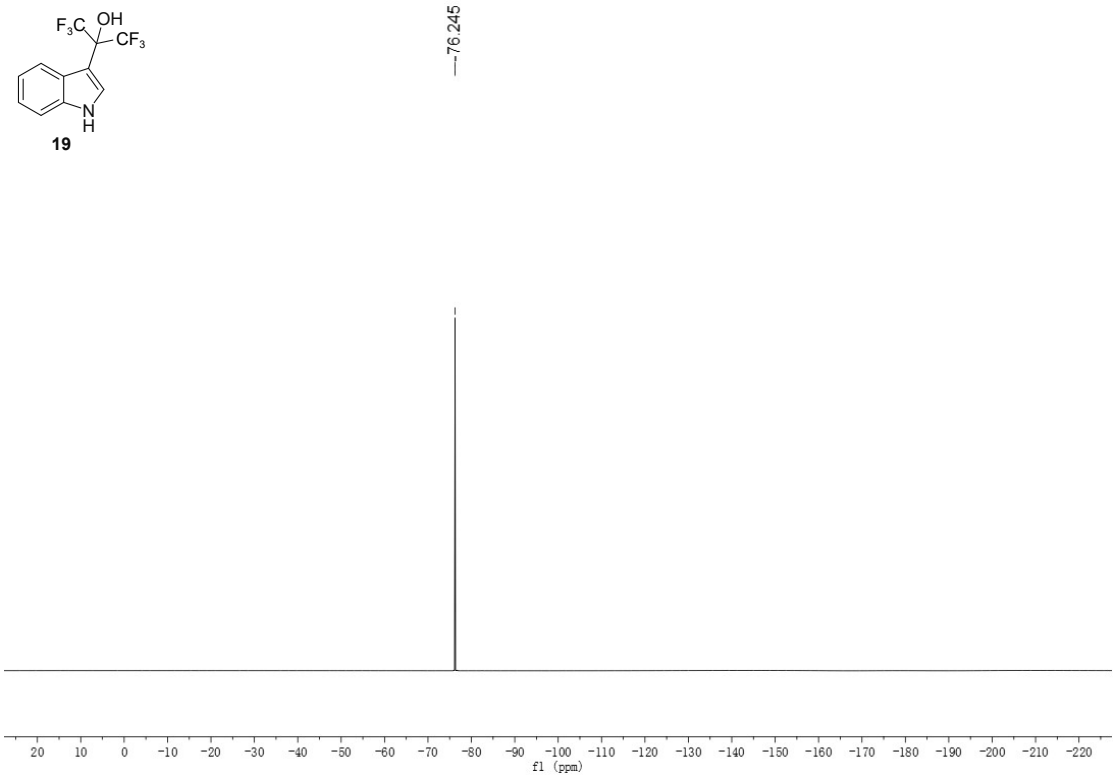
^{13}C NMR (100 MHz, $CDCl_3$) of **18**



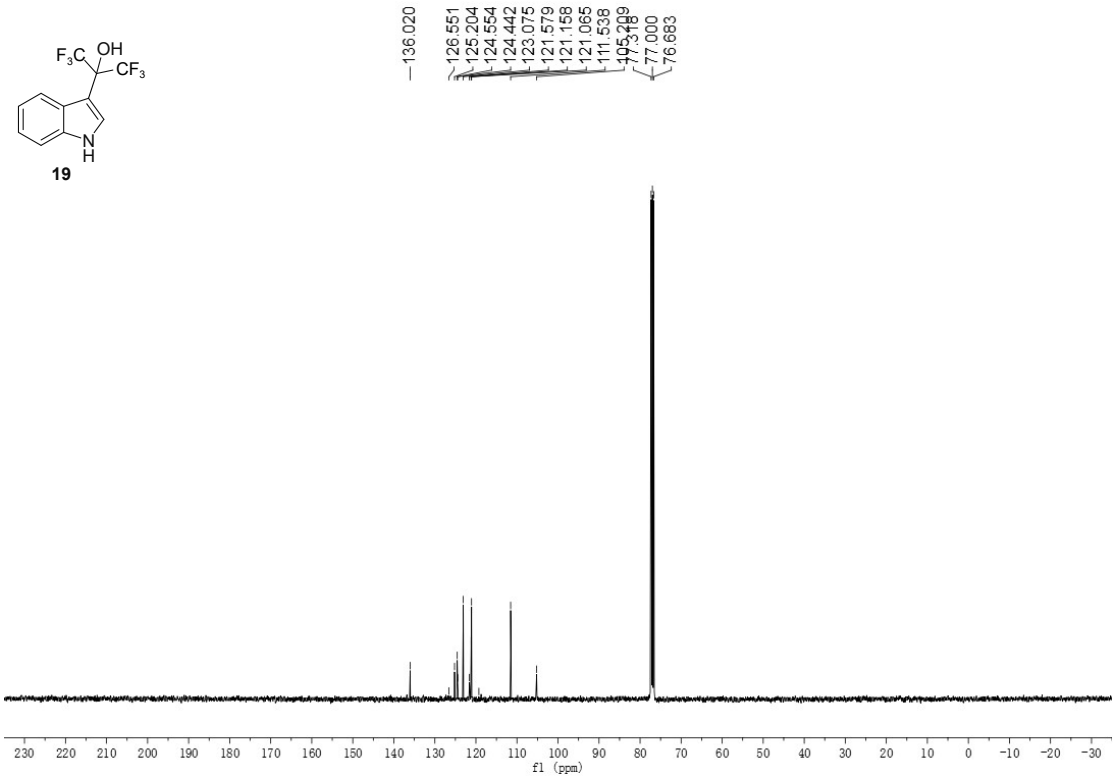
^{1}H NMR (400 MHz, $CDCl_3$) of **19**



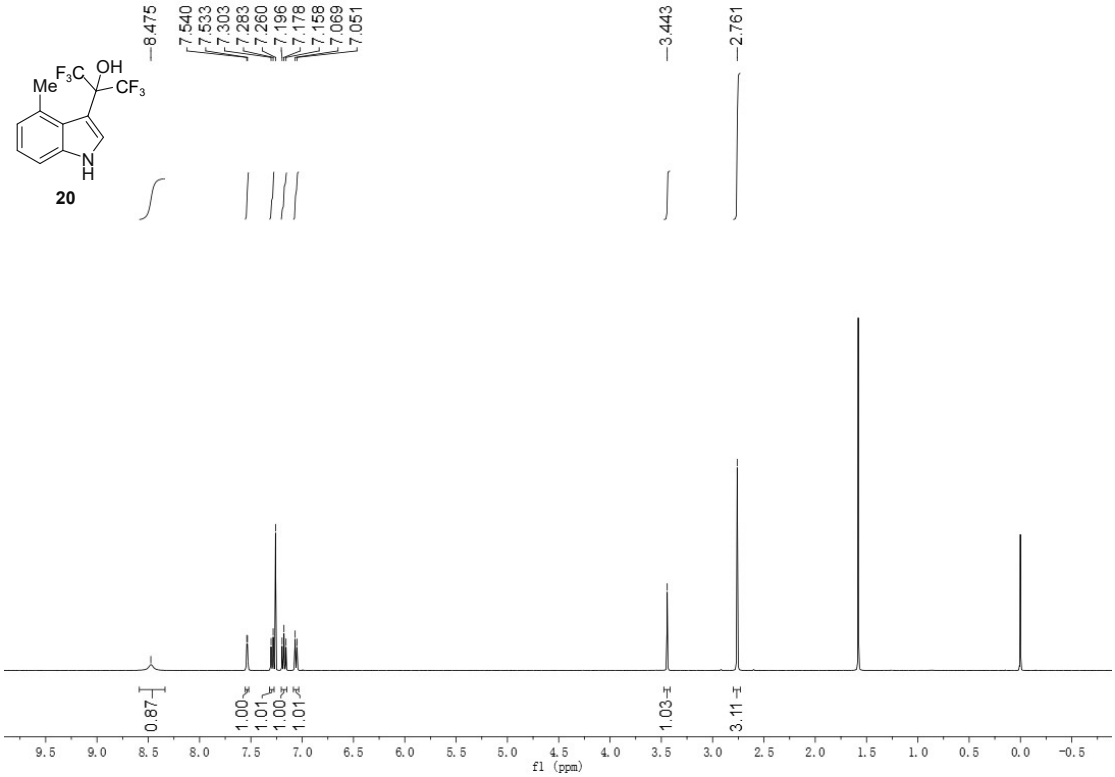
^{19}F NMR (376 MHz, $CDCl_3$) of **19**



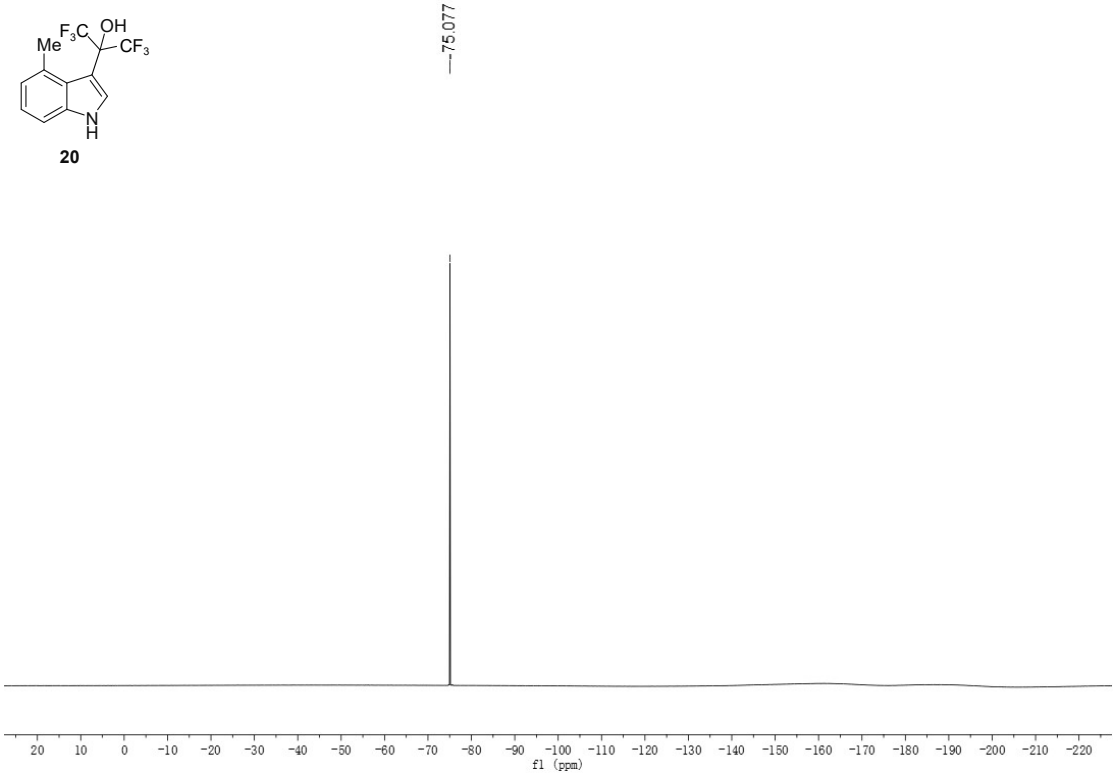
^{13}C NMR (100 MHz, $CDCl_3$) of **19**



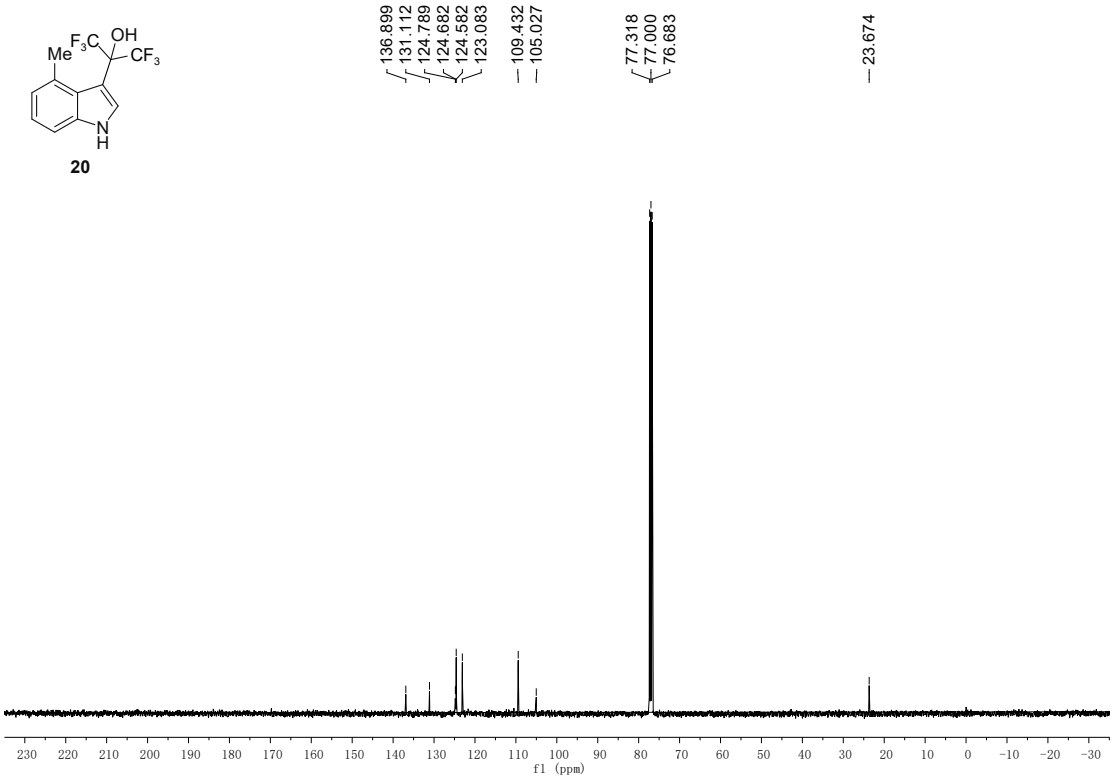
^{1}H NMR (400 MHz, $CDCl_3$) of **20**



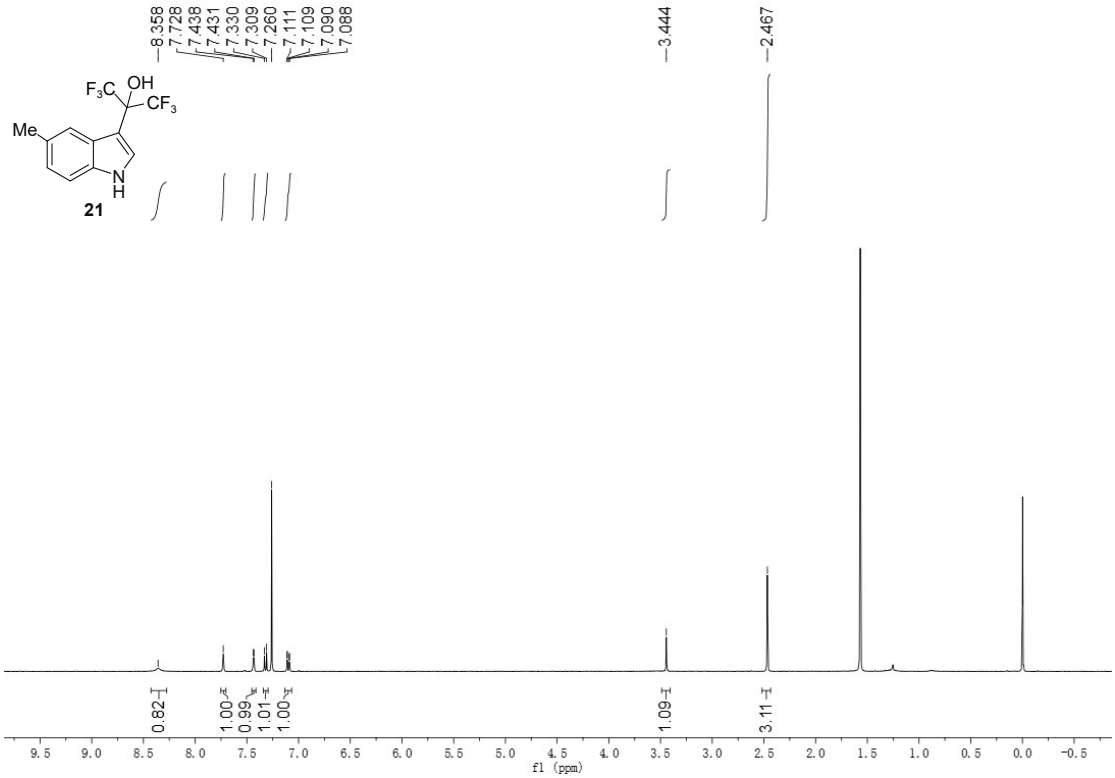
^{19}F NMR (376 MHz, $CDCl_3$) of **20**



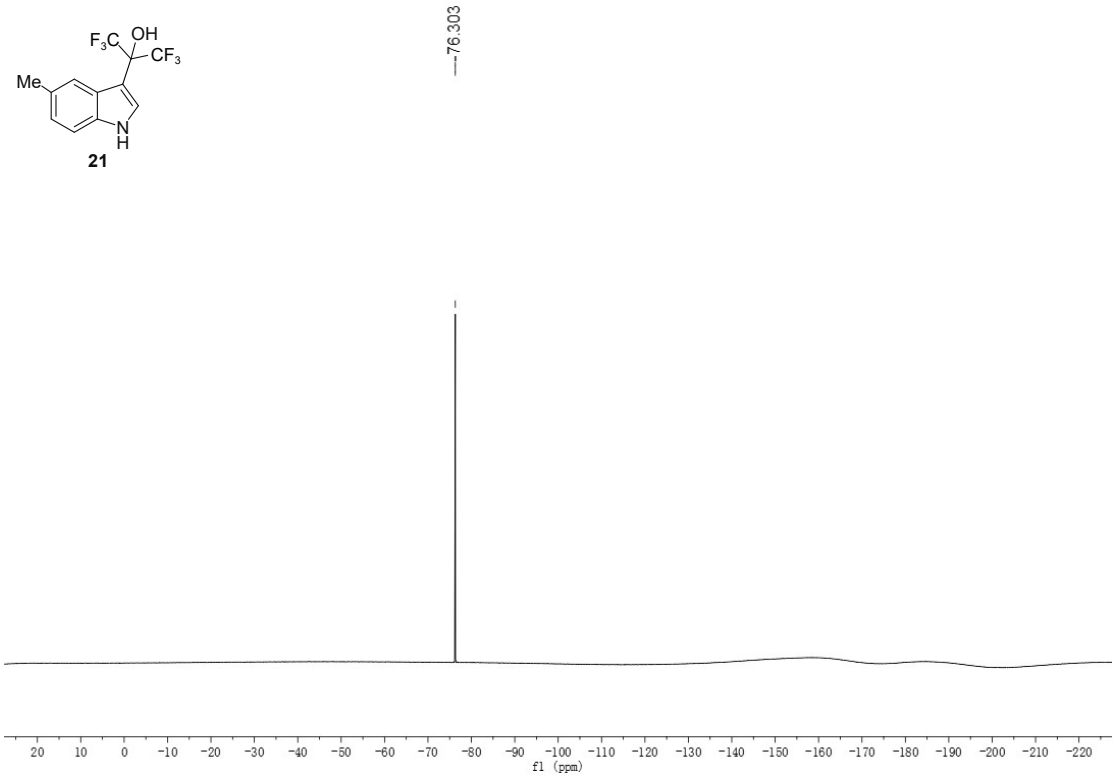
^{13}C NMR (100 MHz, $CDCl_3$) of **20**



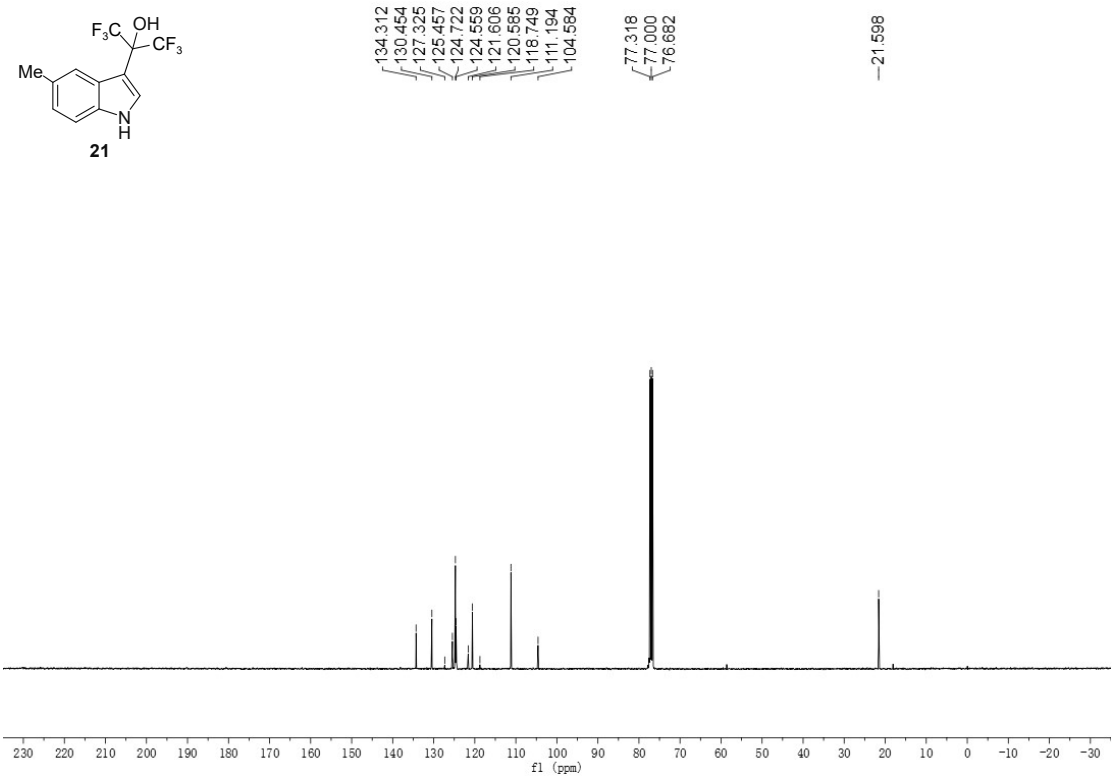
^{1}H NMR (400 MHz, $CDCl_3$) of **21**



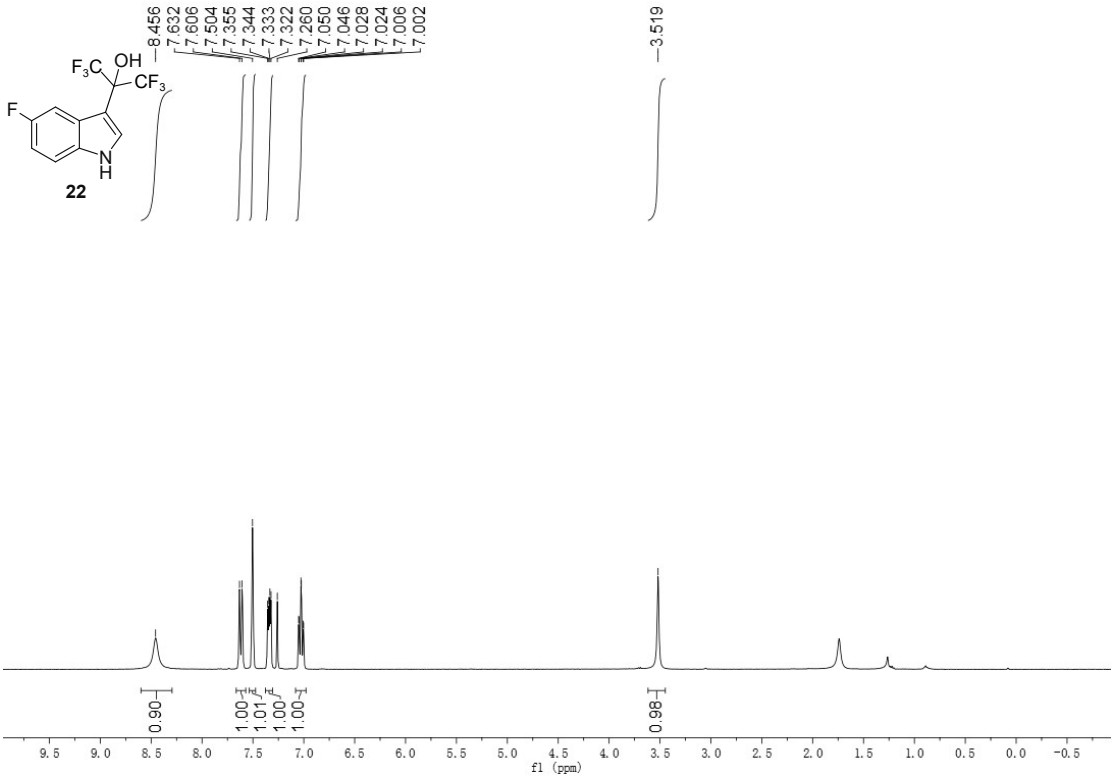
^{19}F NMR (376 MHz, $CDCl_3$) of **21**



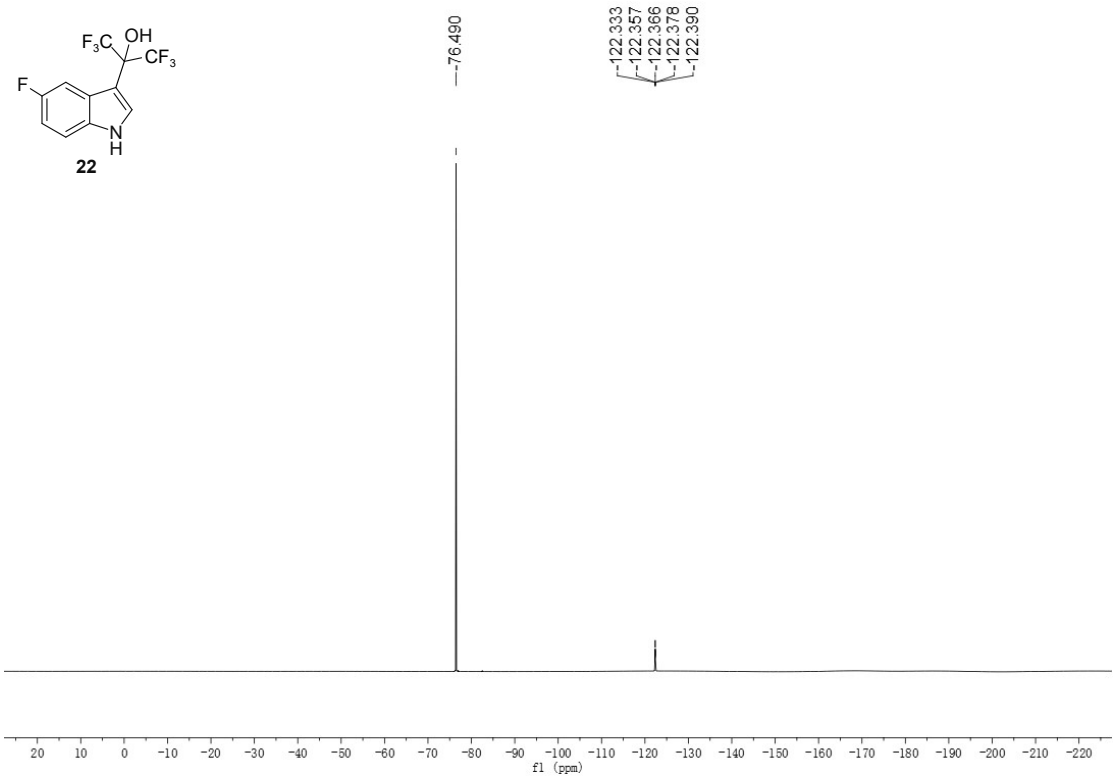
^{13}C NMR (100 MHz, $CDCl_3$) of **21**



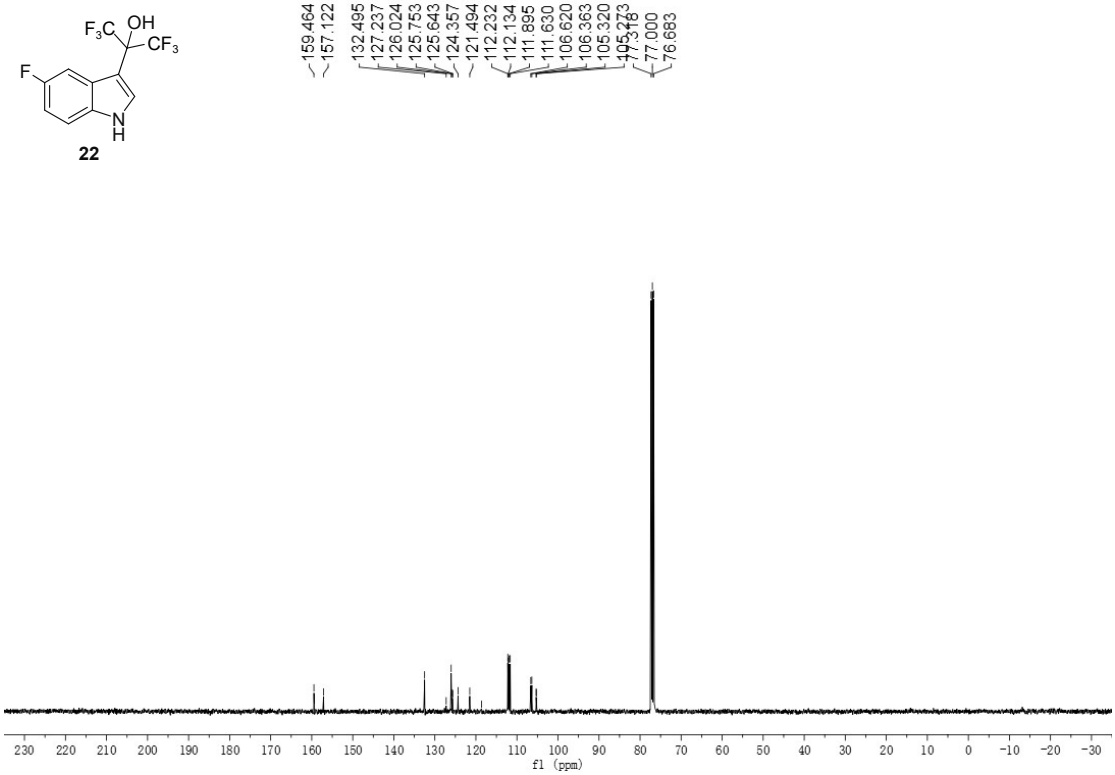
^{1}H NMR (400 MHz, $CDCl_3$) of **22**



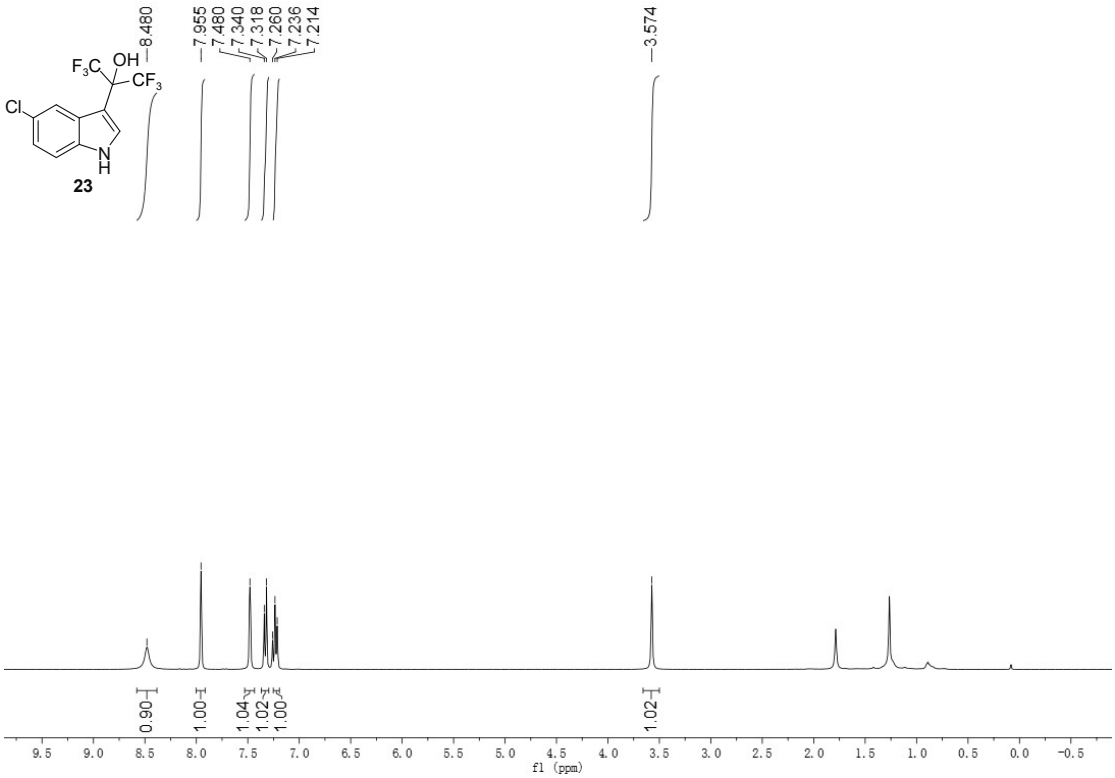
^{19}F NMR (376 MHz, $CDCl_3$) of **22**



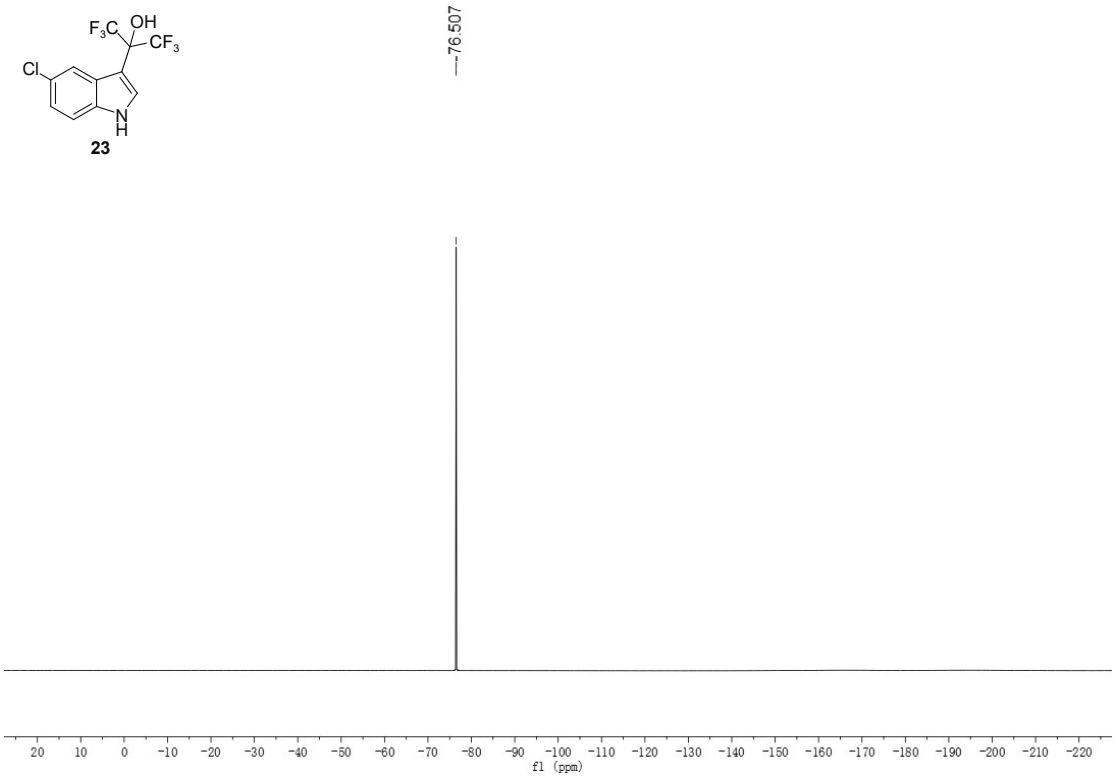
^{13}C NMR (100 MHz, $CDCl_3$) of **22**



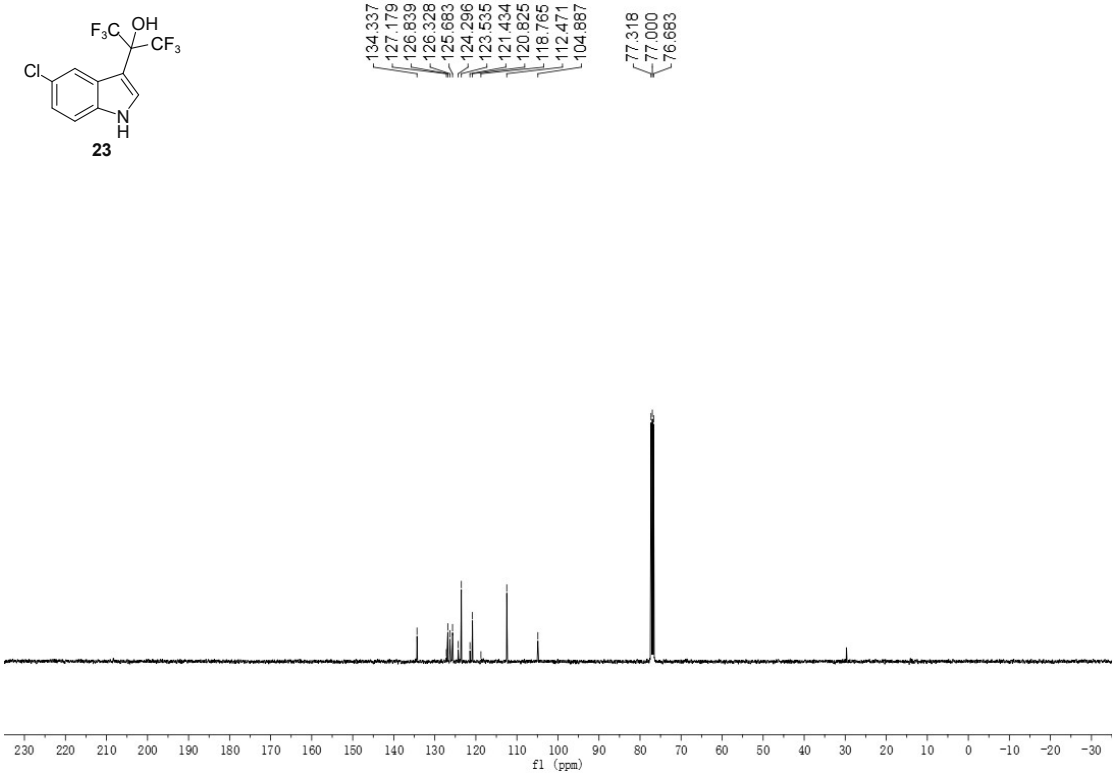
^{1}H NMR (400 MHz, $CDCl_3$) of **23**



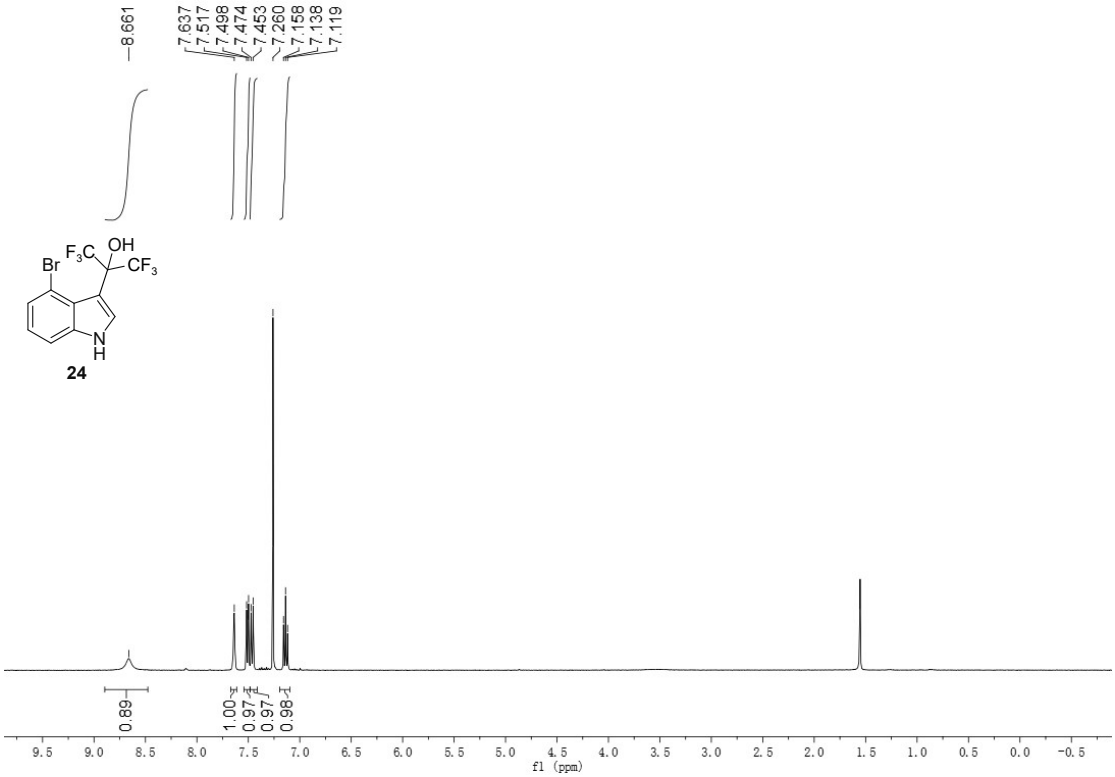
^{19}F NMR (376 MHz, $CDCl_3$) of **23**



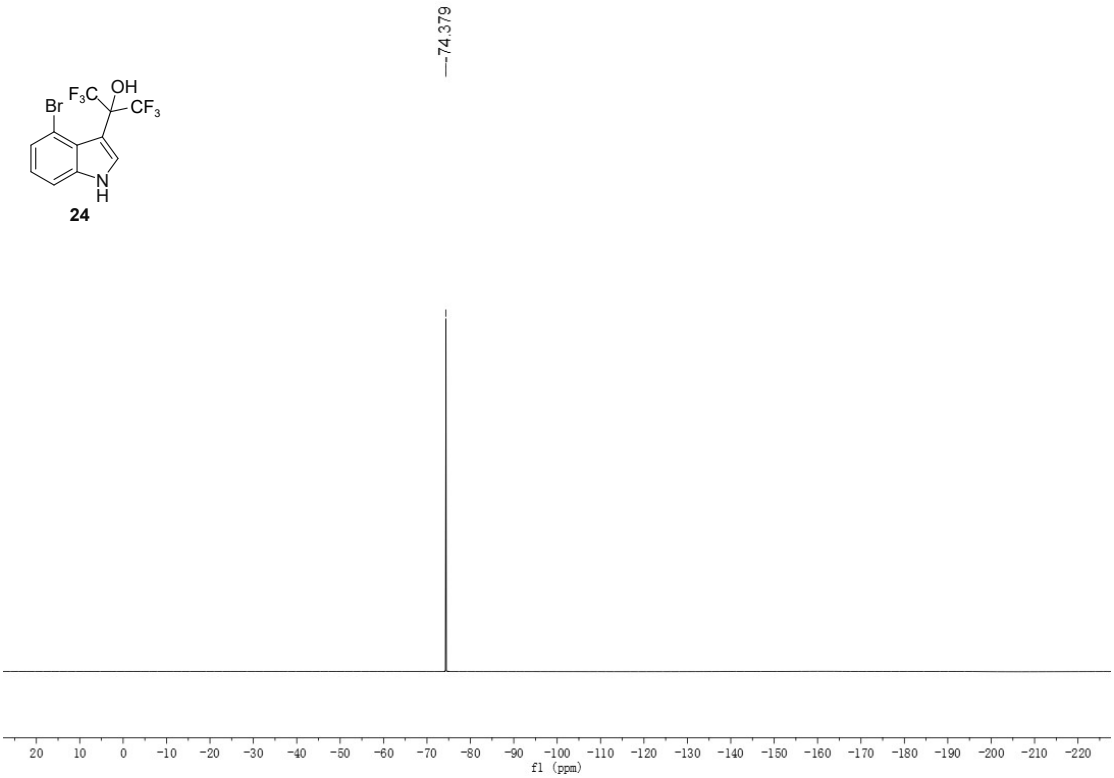
^{13}C NMR (100 MHz, $CDCl_3$) of **23**



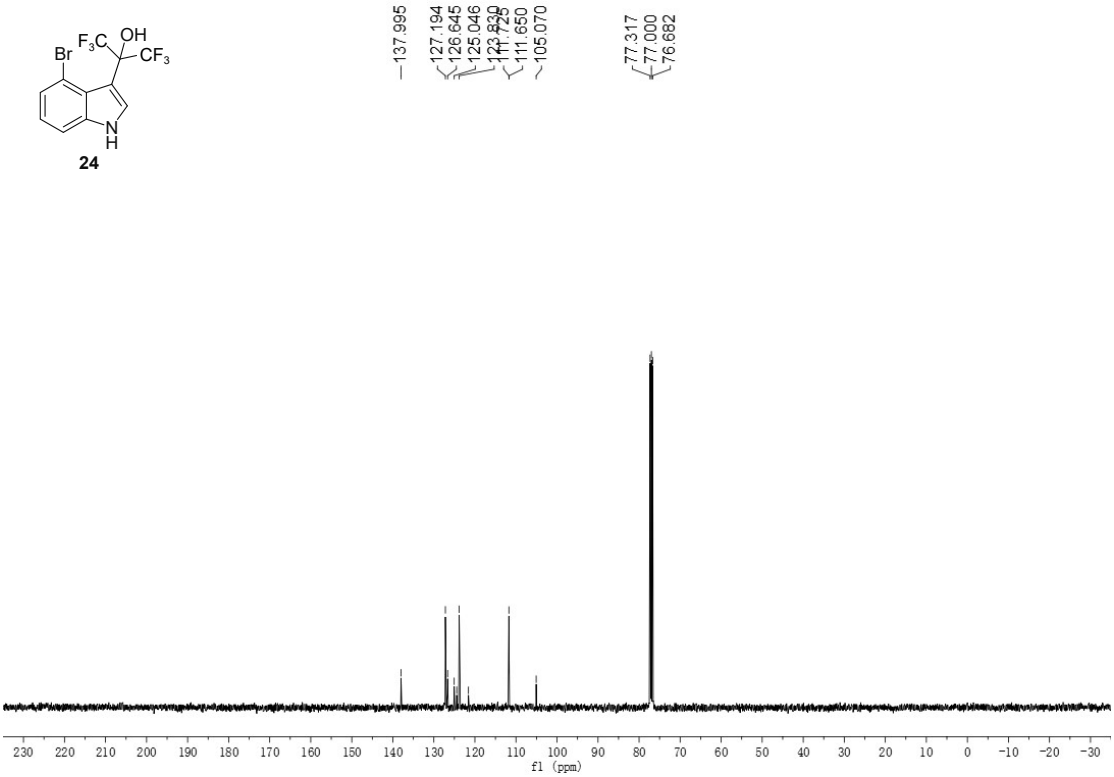
^{1}H NMR (400 MHz, $CDCl_3$) of **24**



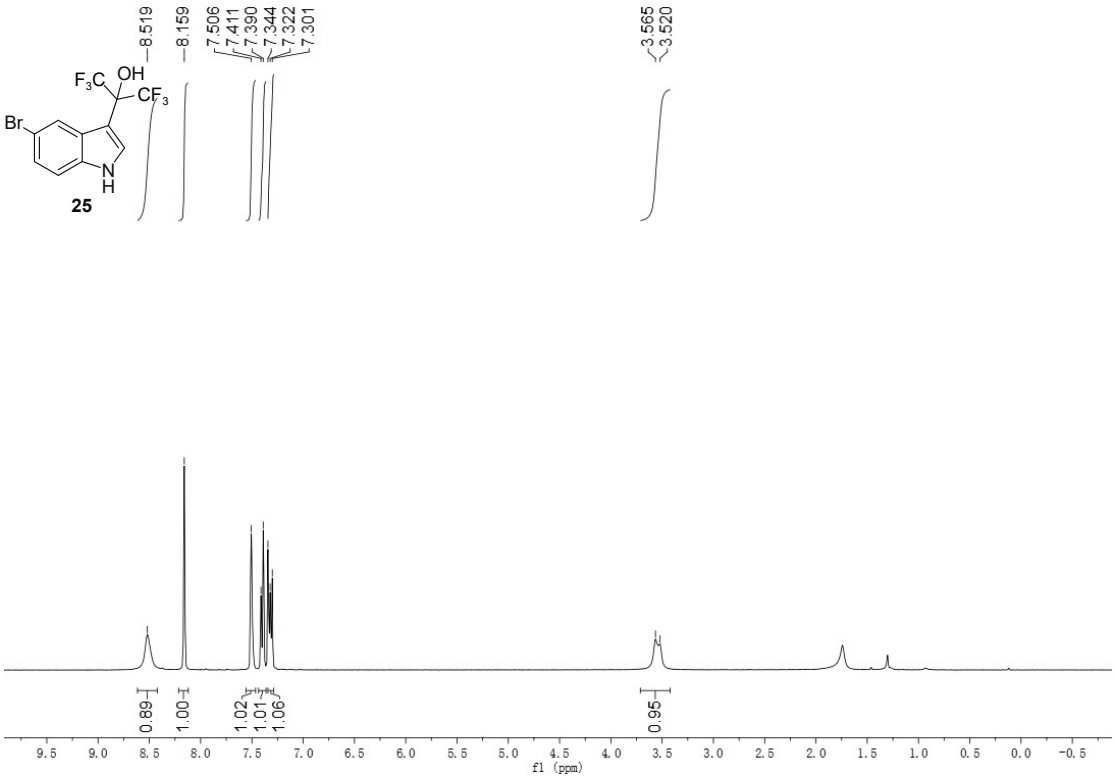
^{19}F NMR (376 MHz, $CDCl_3$) of **24**



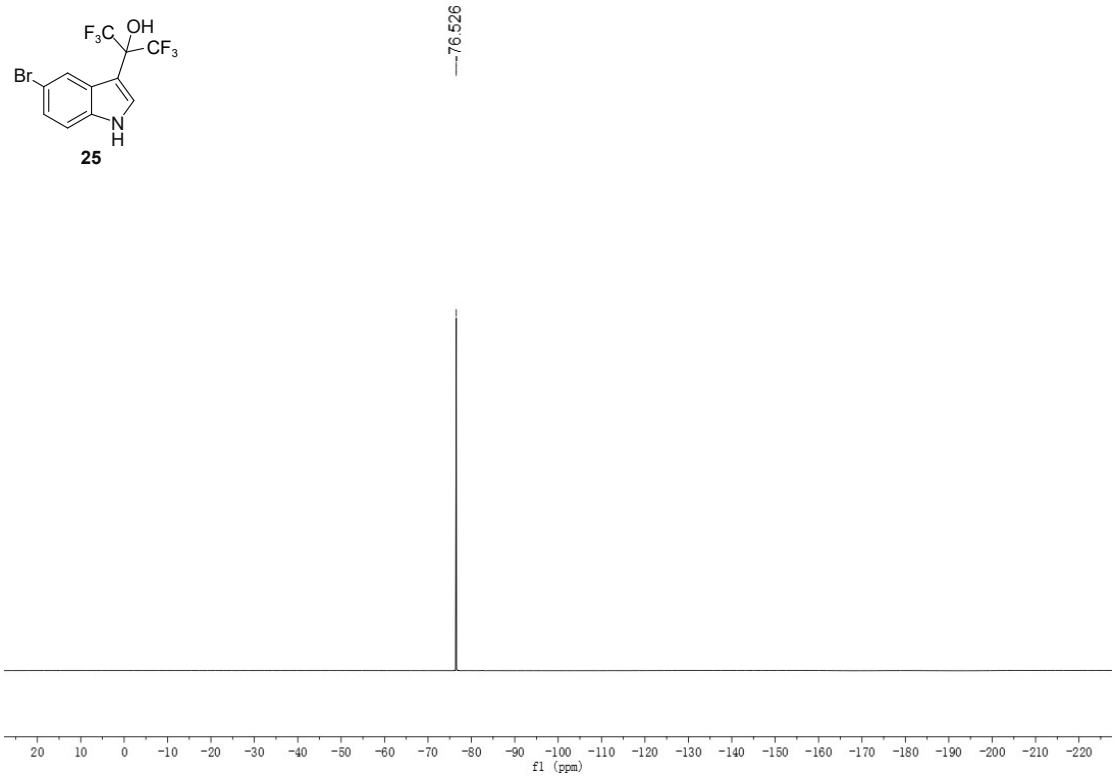
^{13}C NMR (100 MHz, $CDCl_3$) of **24**



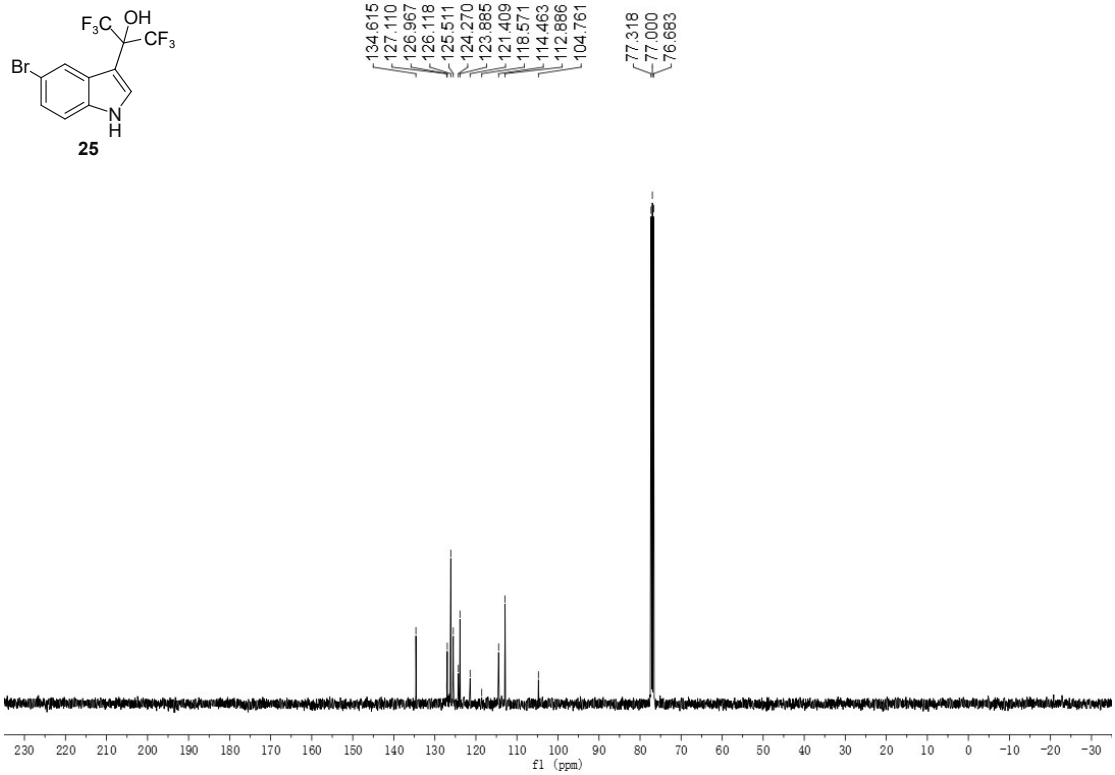
^{1}H NMR (400 MHz, $CDCl_3$) of **25**



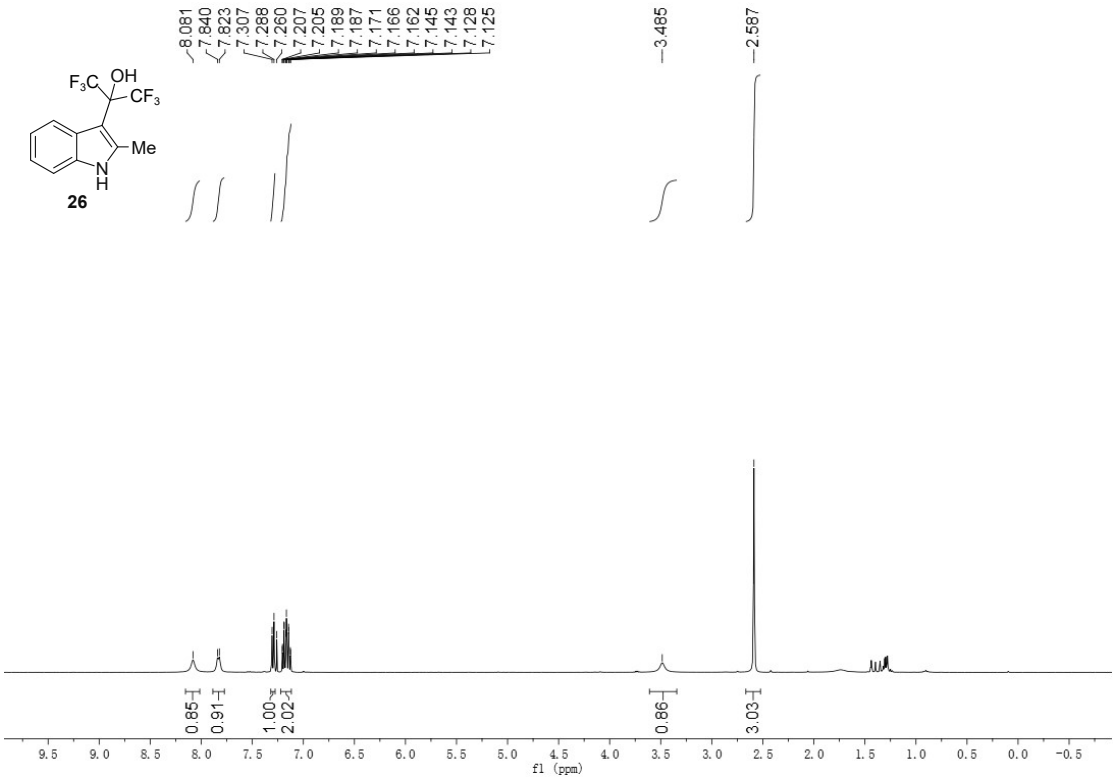
^{19}F NMR (376 MHz, $CDCl_3$) of **25**



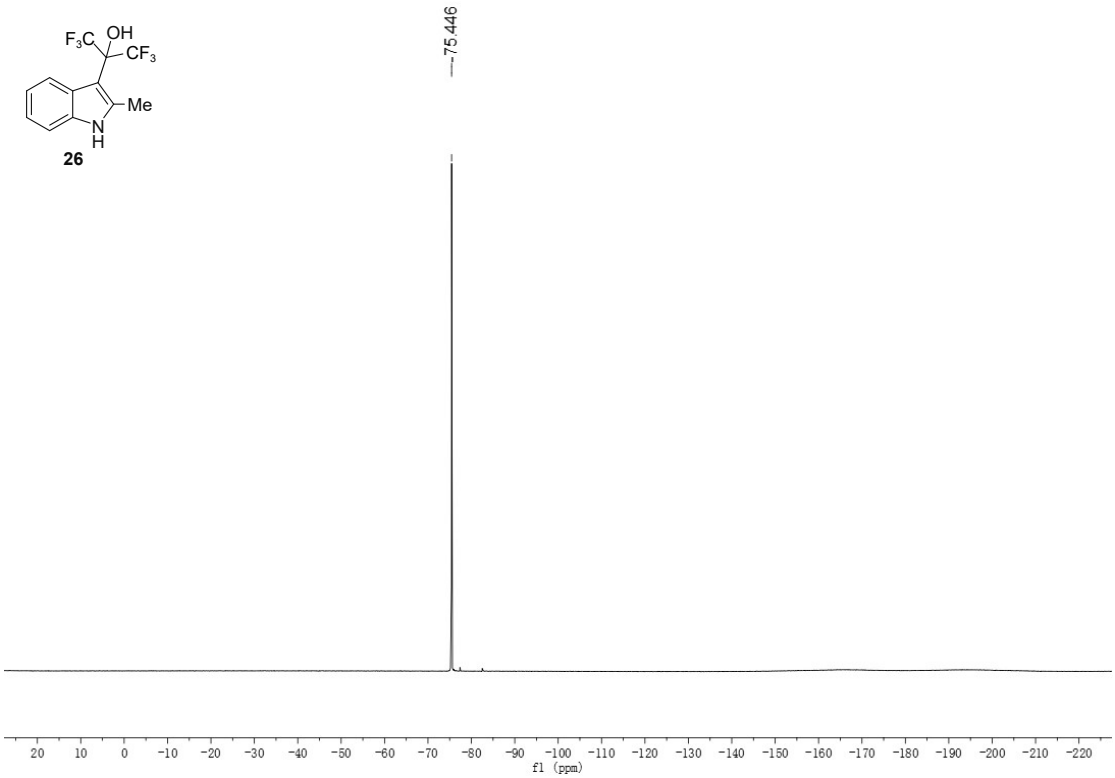
^{13}C NMR (100 MHz, $CDCl_3$) of **25**



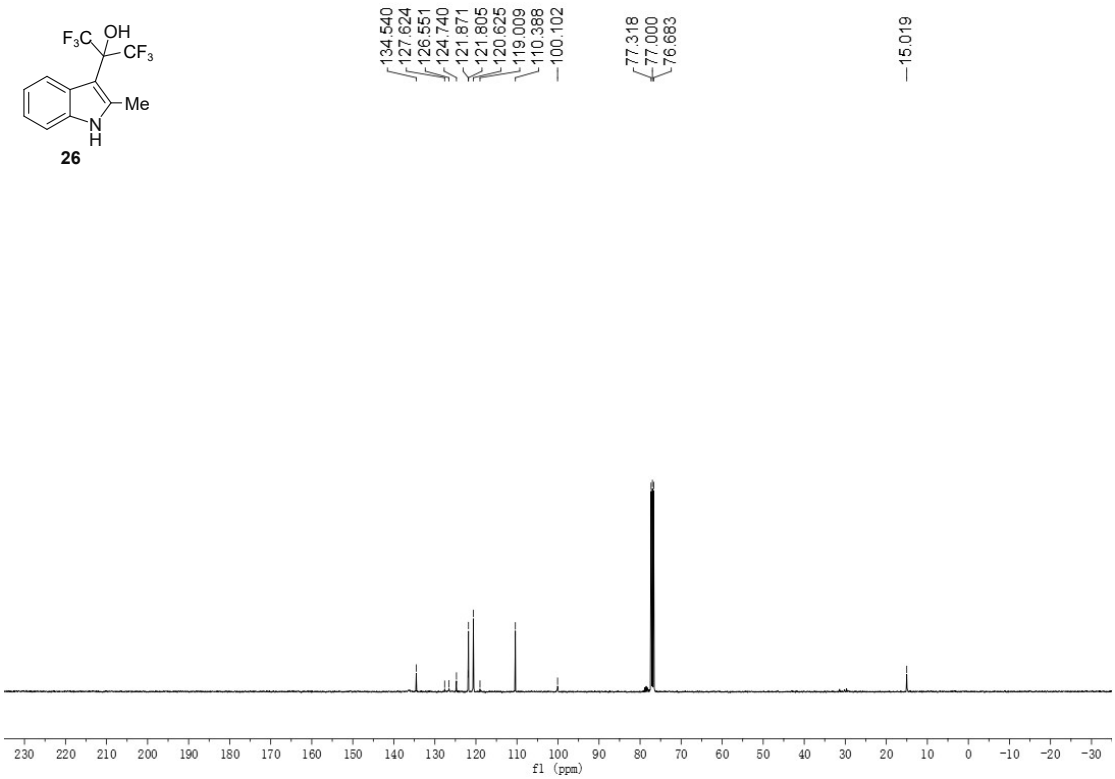
^{1}H NMR (400 MHz, $CDCl_3$) of **26**



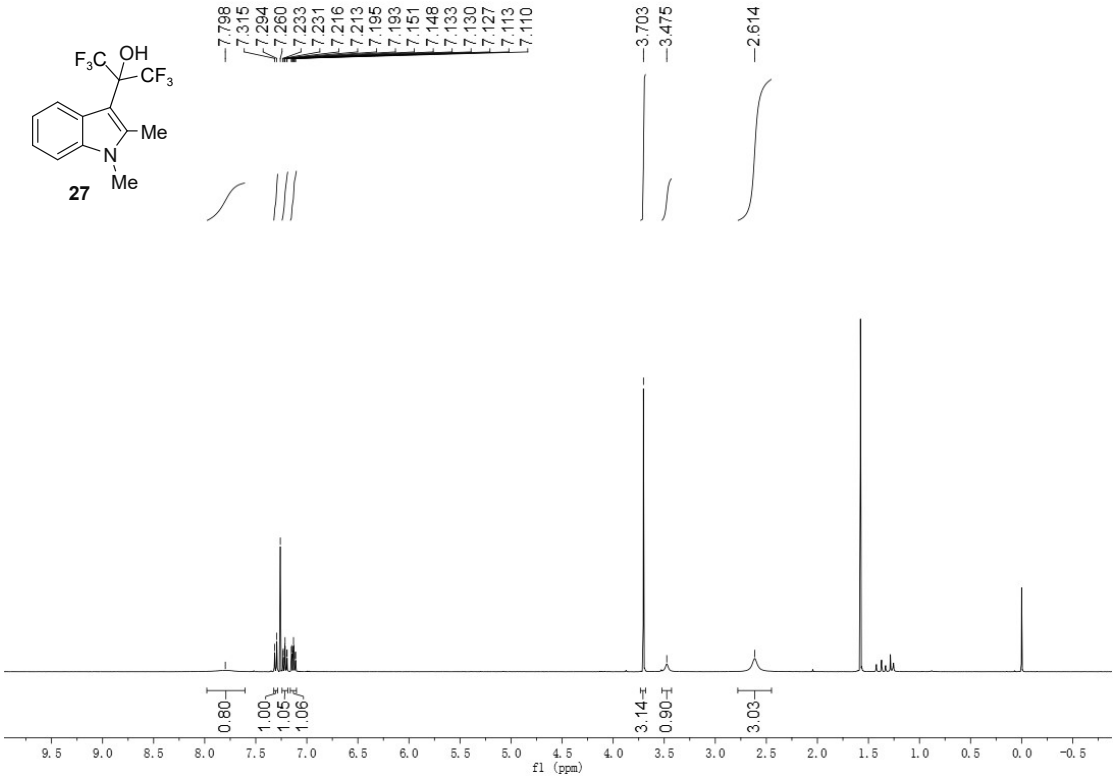
^{19}F NMR (376 MHz, $CDCl_3$) of **26**



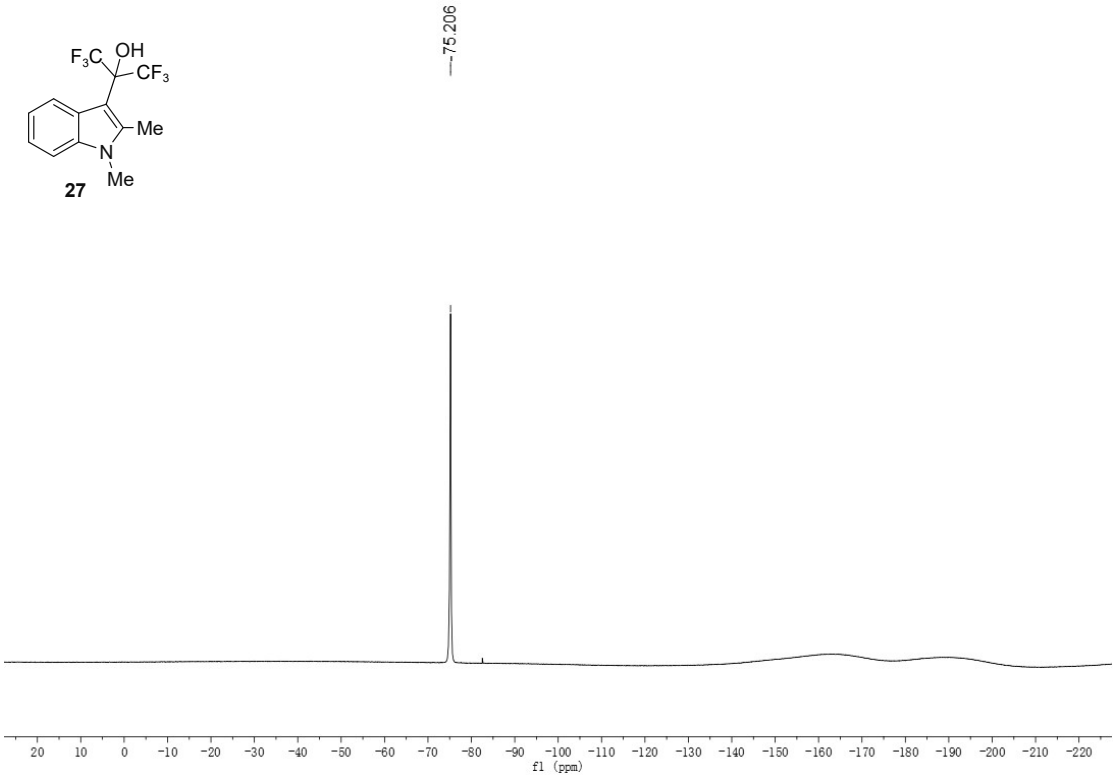
^{13}C NMR (100 MHz, $CDCl_3$) of **26**



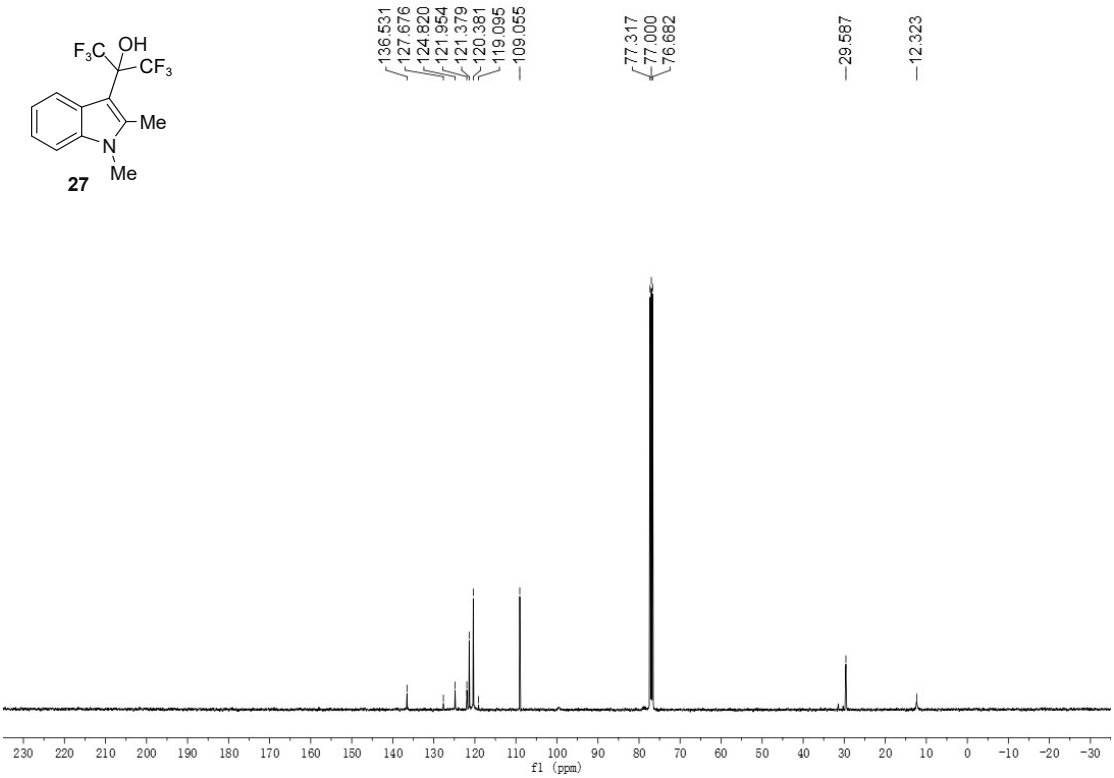
^{1}H NMR (400 MHz, $CDCl_3$) of **27**



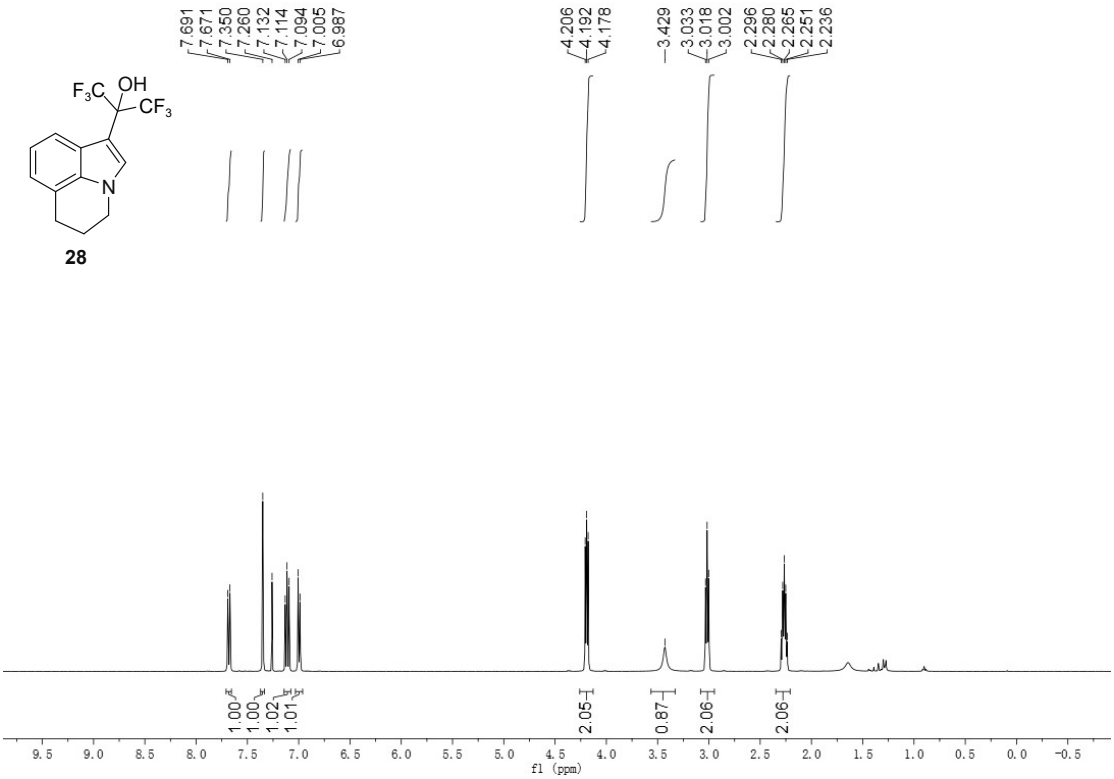
^{19}F NMR (376 MHz, $CDCl_3$) of **27**



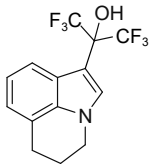
^{13}C NMR (100 MHz, $CDCl_3$) of **27**



^{1}H NMR (400 MHz, $CDCl_3$) of **28**

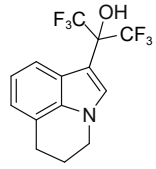


^{19}F NMR (376 MHz, $CDCl_3$) of **28**



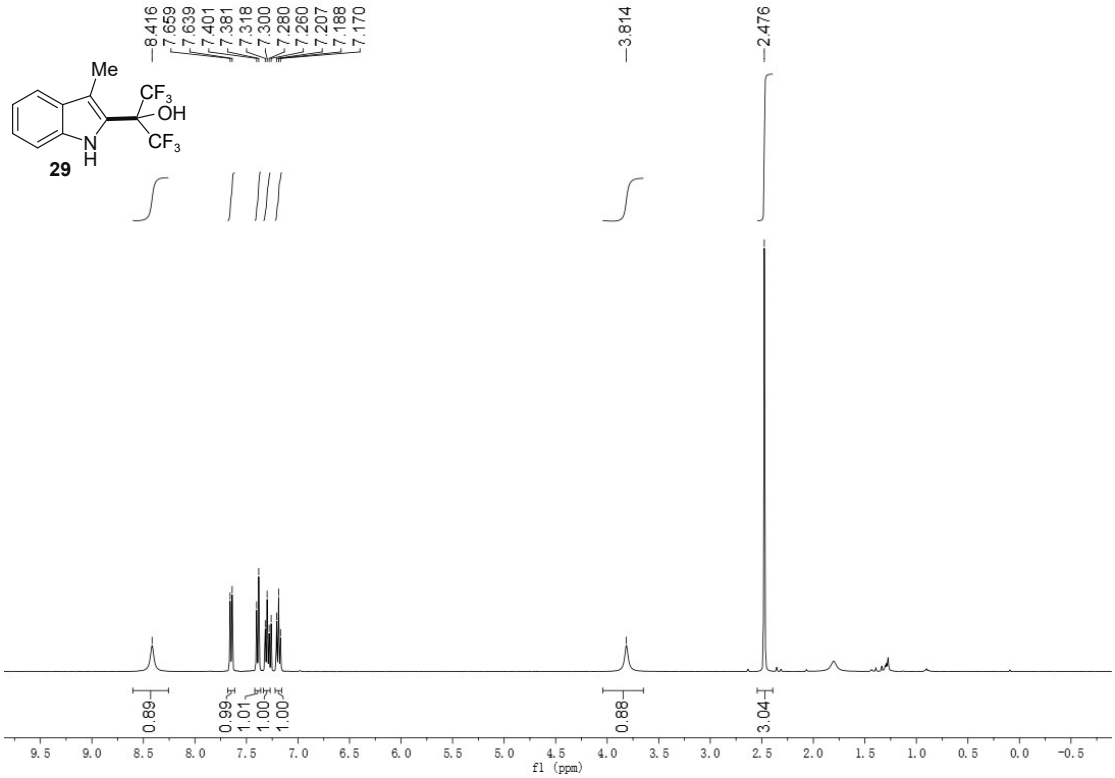
28

^{13}C NMR (100 MHz, $CDCl_3$) of **28**

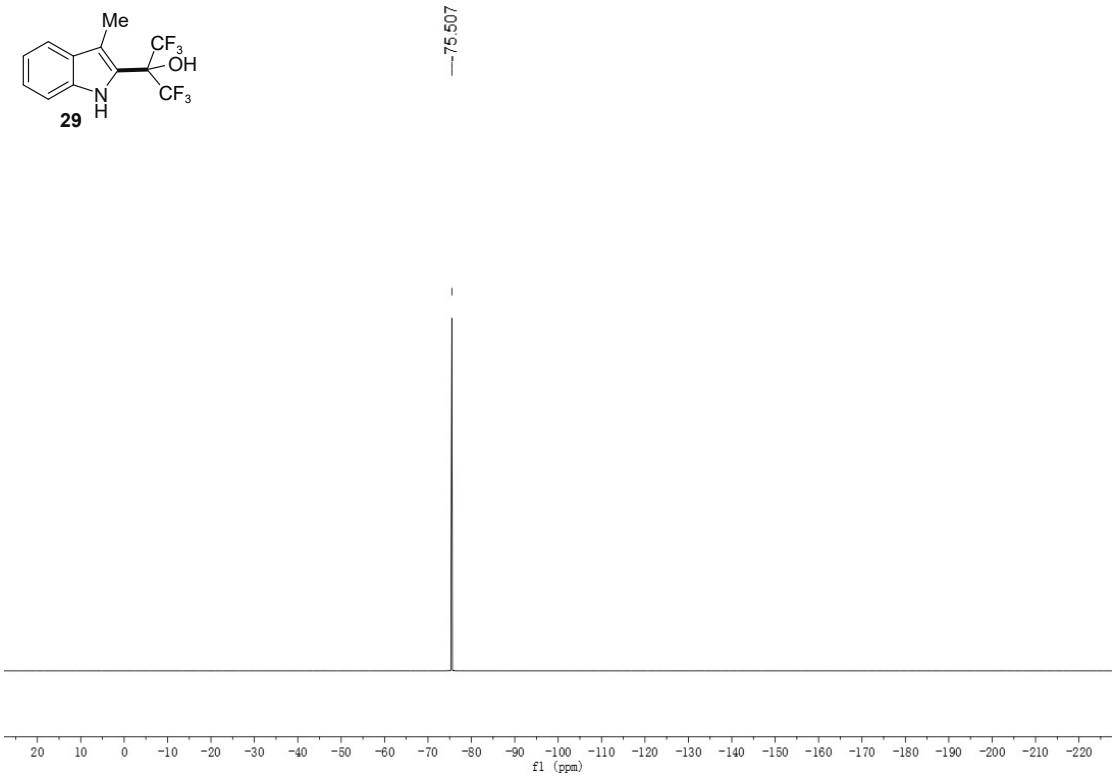


28

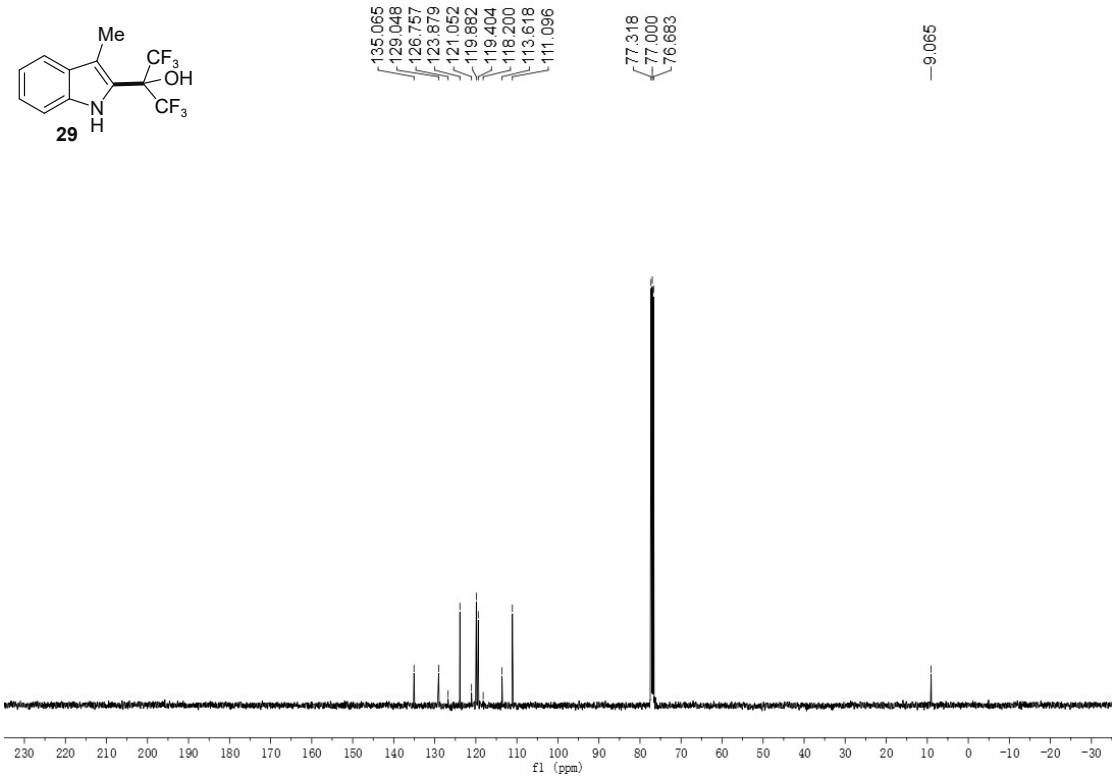
^{1}H NMR (400 MHz, $CDCl_3$) of **29**



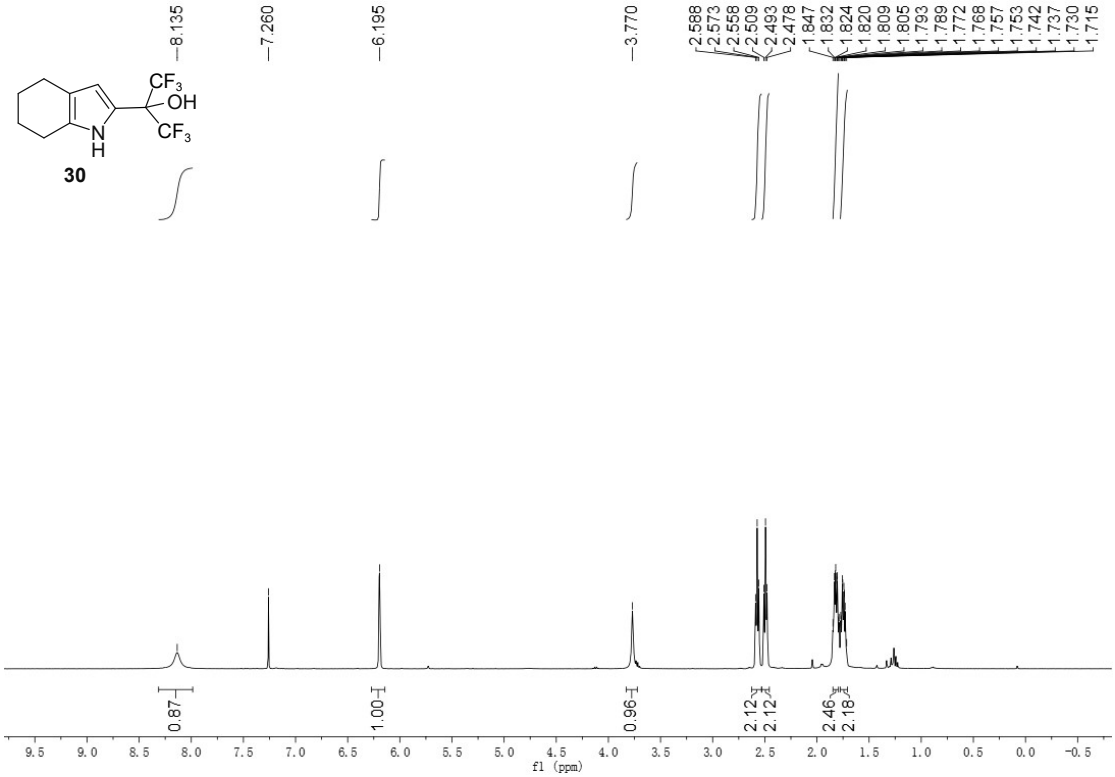
^{19}F NMR (376 MHz, $CDCl_3$) of **29**



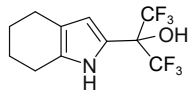
^{13}C NMR (100 MHz, $CDCl_3$) of **29**



^{1}H NMR (400 MHz, $CDCl_3$) of **30**

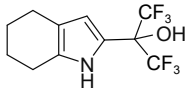


^{19}F NMR (376 MHz, $CDCl_3$) of **30**



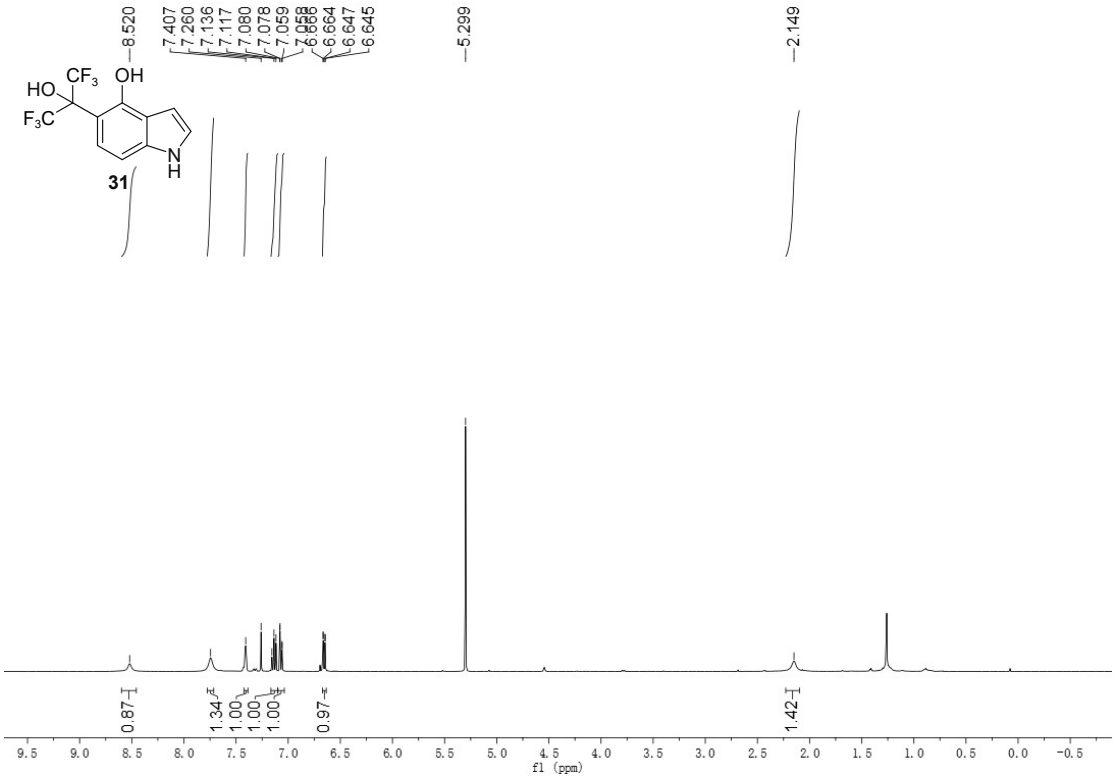
30

^{13}C NMR (100 MHz, $CDCl_3$) of **30**

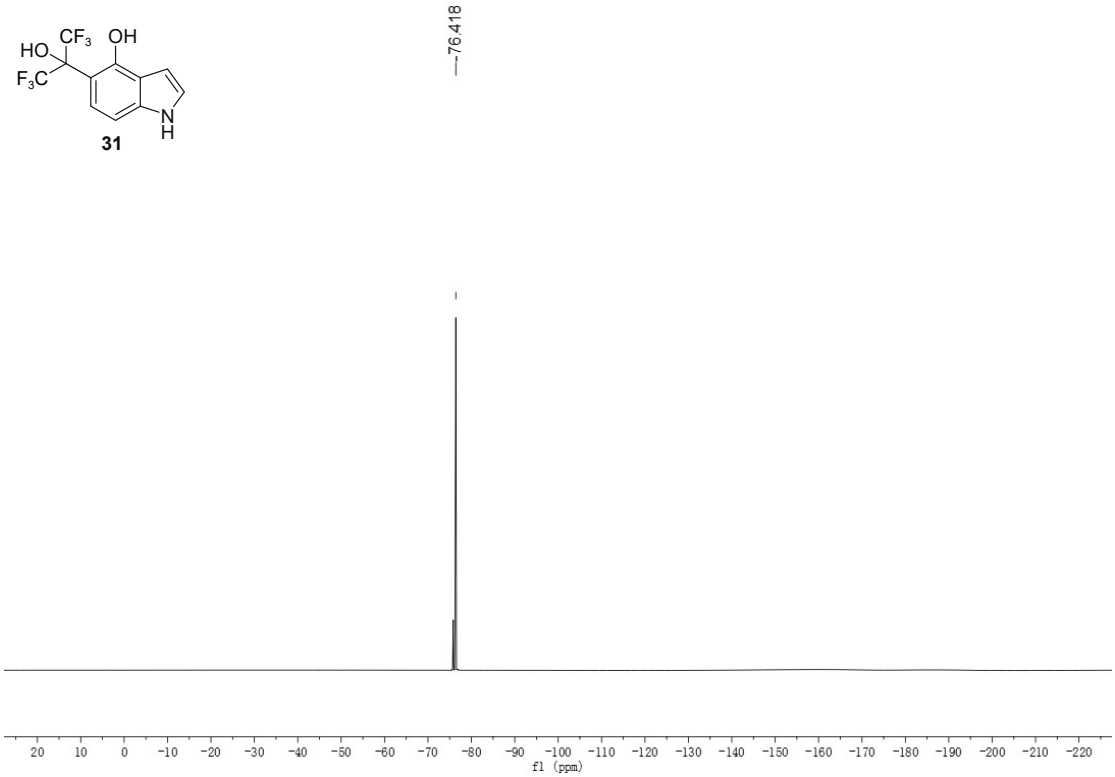


30

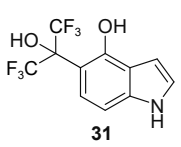
^{1}H NMR (400 MHz, $CDCl_3$) of **31**



^{19}F NMR (376 MHz, $CDCl_3$) of **31**

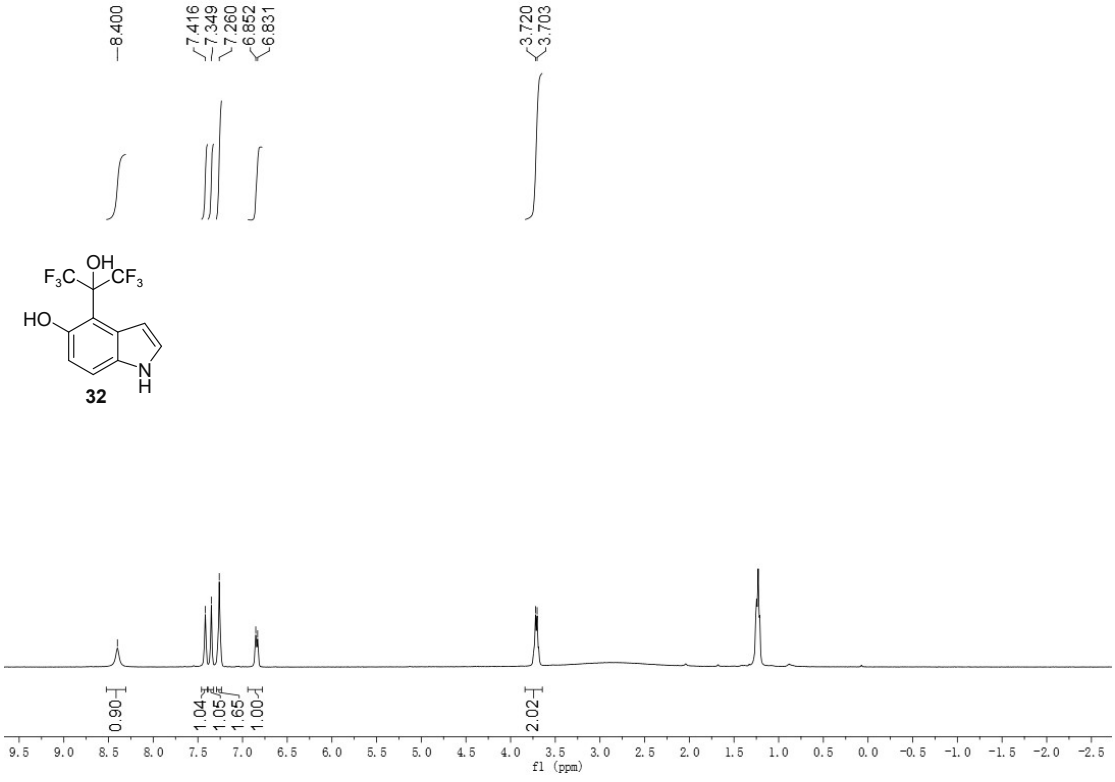


^{13}C NMR (100 MHz, $CDCl_3$) of **31**



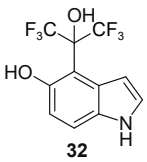
31

^{1}H NMR (400 MHz, $CDCl_3$) of **32**



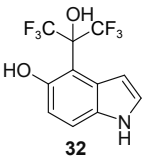
32

^{19}F NMR (376 MHz, $CDCl_3$) of **32**



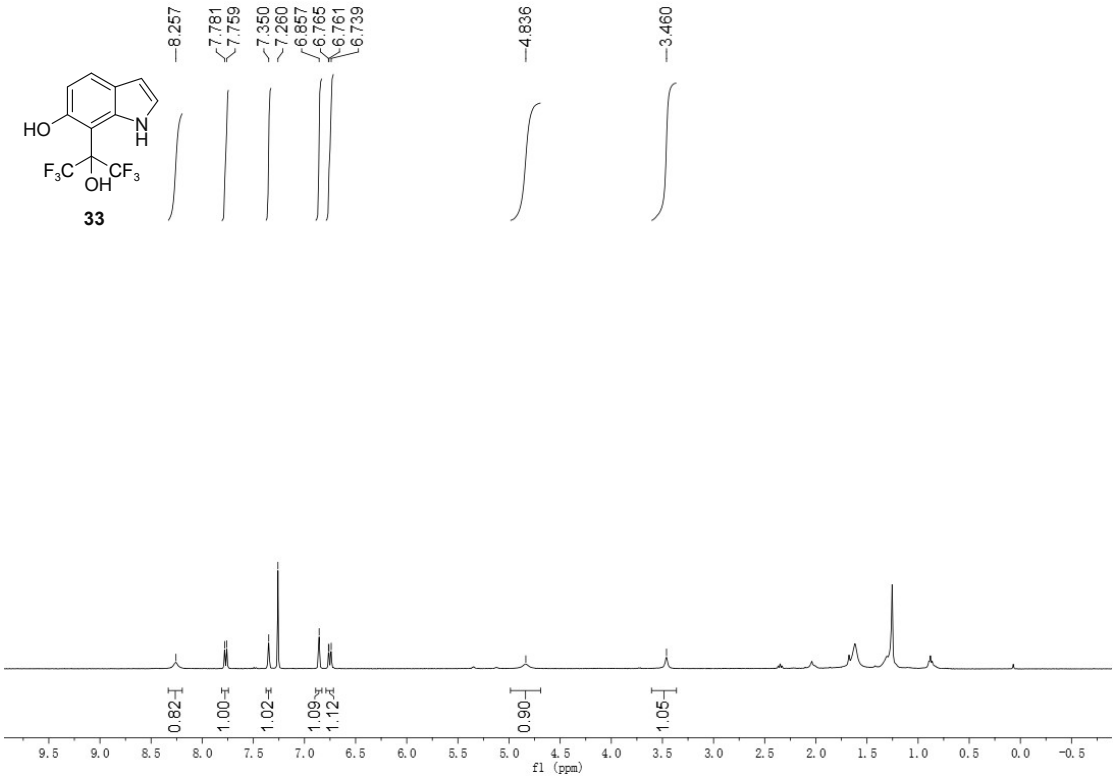
32

^{13}C NMR (100 MHz, DMSO-*d*6) of **32**

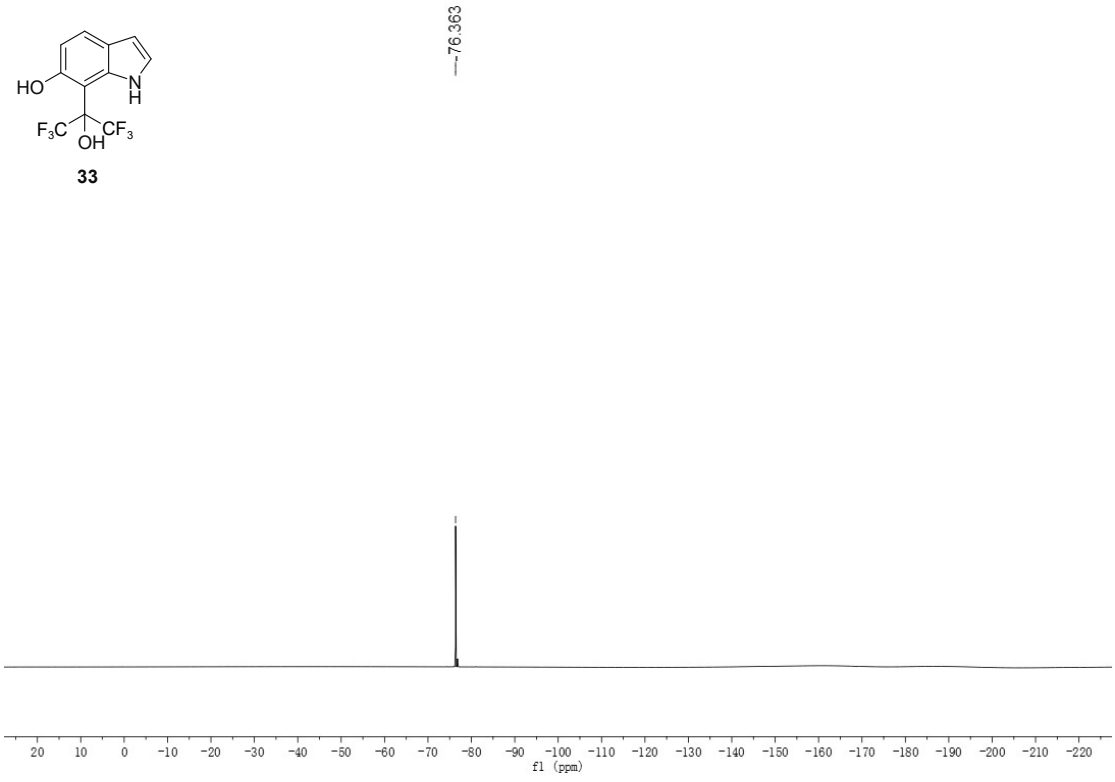


32

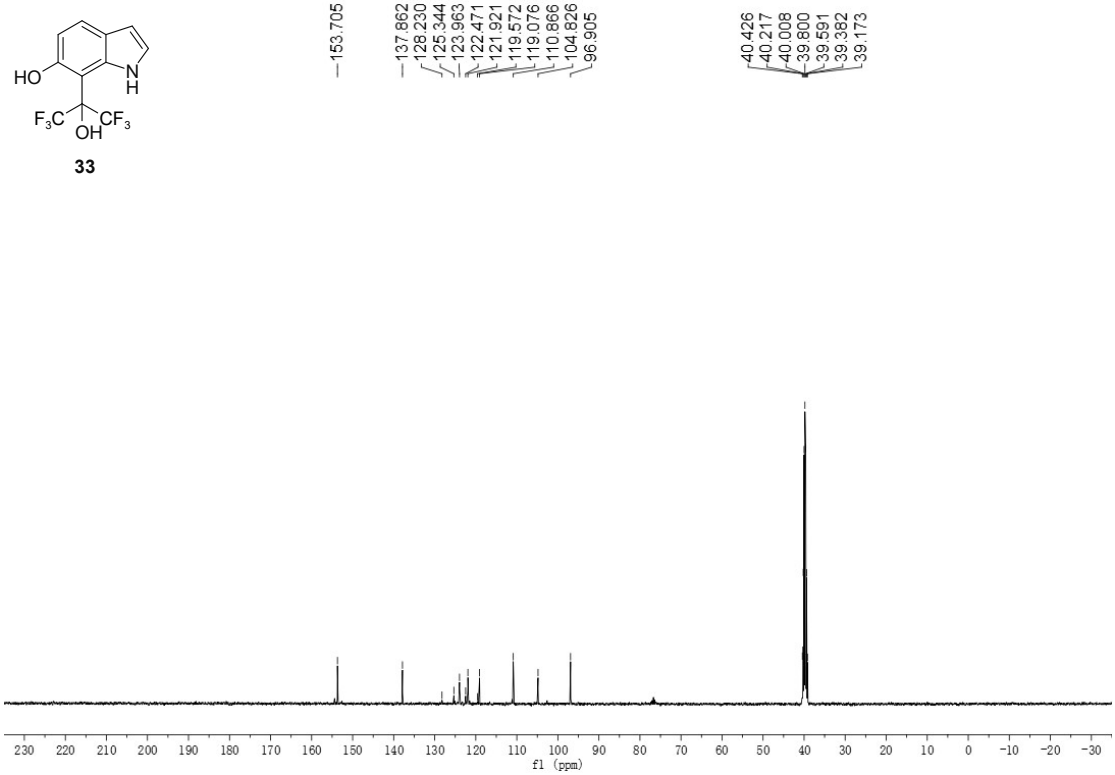
^{1}H NMR (400 MHz, $CDCl_3$) of **33**



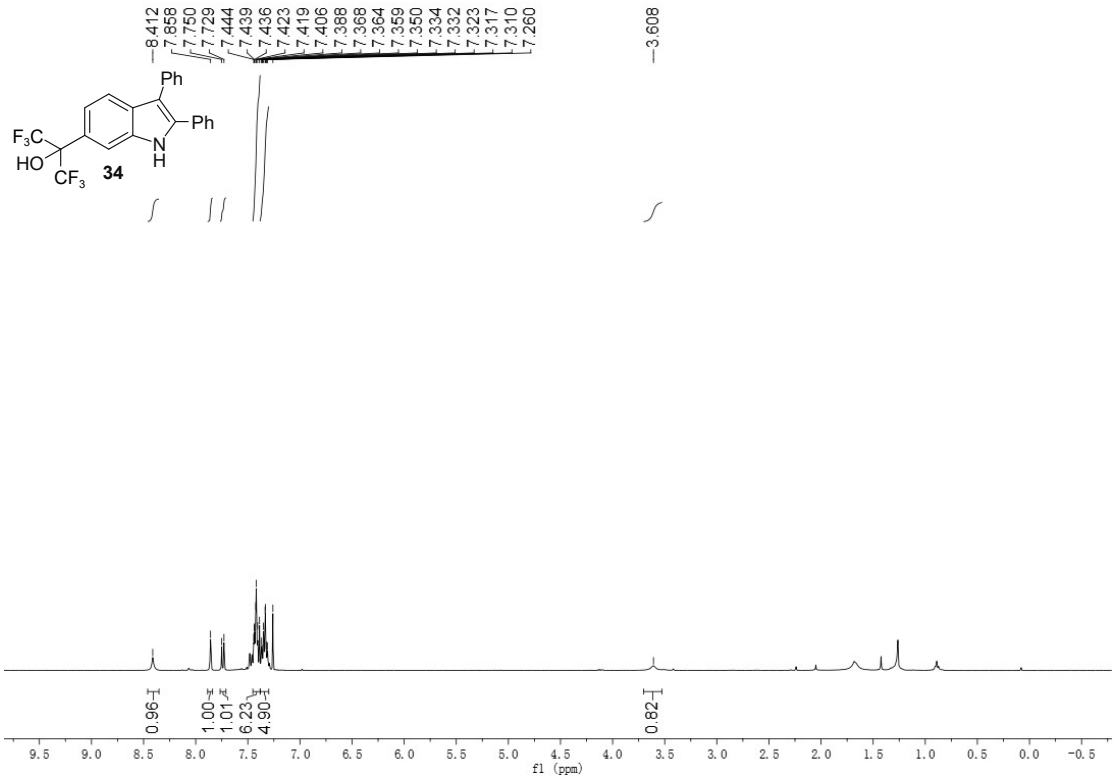
^{19}F NMR (376 MHz, $CDCl_3$) of **33**



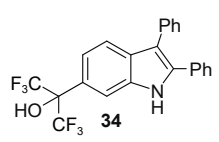
^{13}C NMR (100 MHz, DMSO-*d*6) of **33**



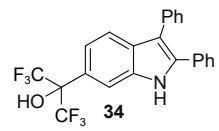
^{1}H NMR (400 MHz, $CDCl_3$) of **34**

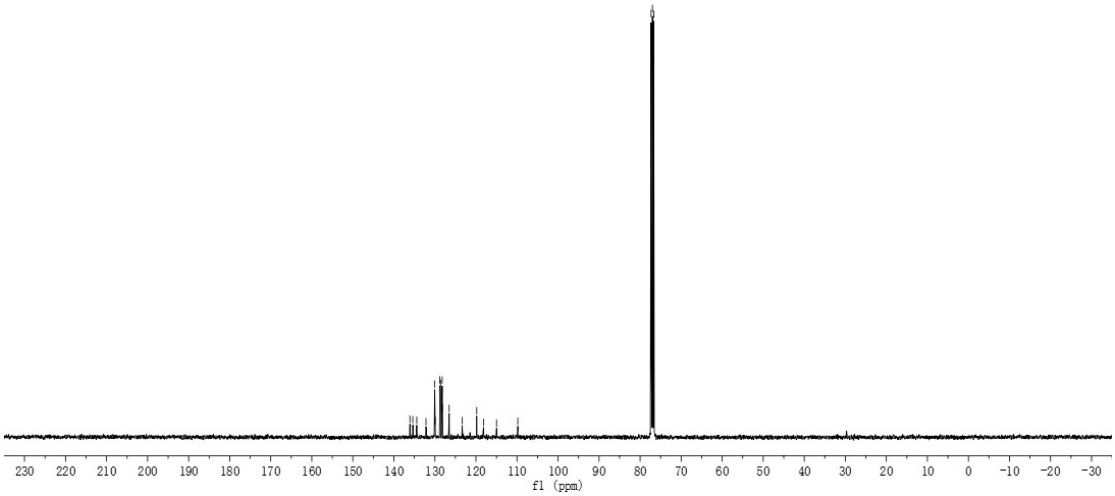


^{19}F NMR (376 MHz, $CDCl_3$) of **34**

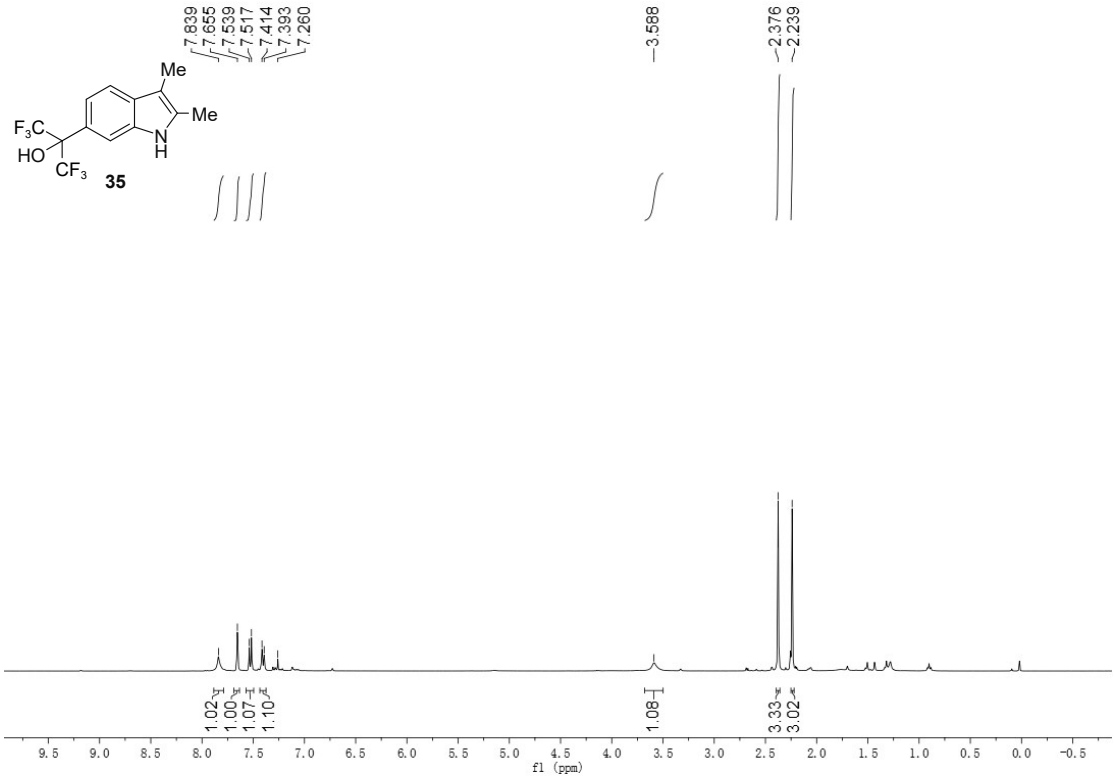


^{13}C NMR (100 MHz, $CDCl_3$) of **34**

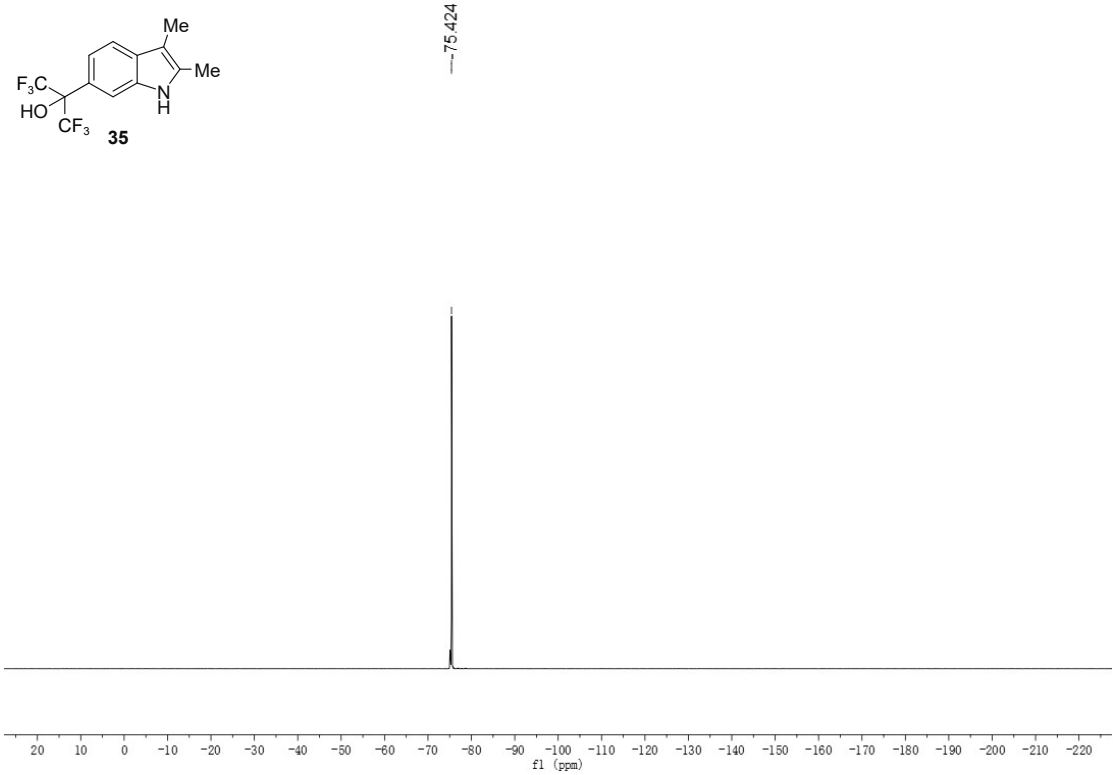




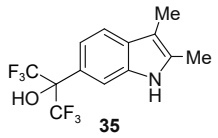
^{1}H NMR (400 MHz, $CDCl_3$) of **35**



^{19}F NMR (376 MHz, $CDCl_3$) of **35**

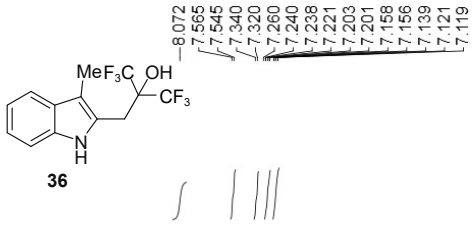


^{13}C NMR (100 MHz, $CDCl_3$) of **35**



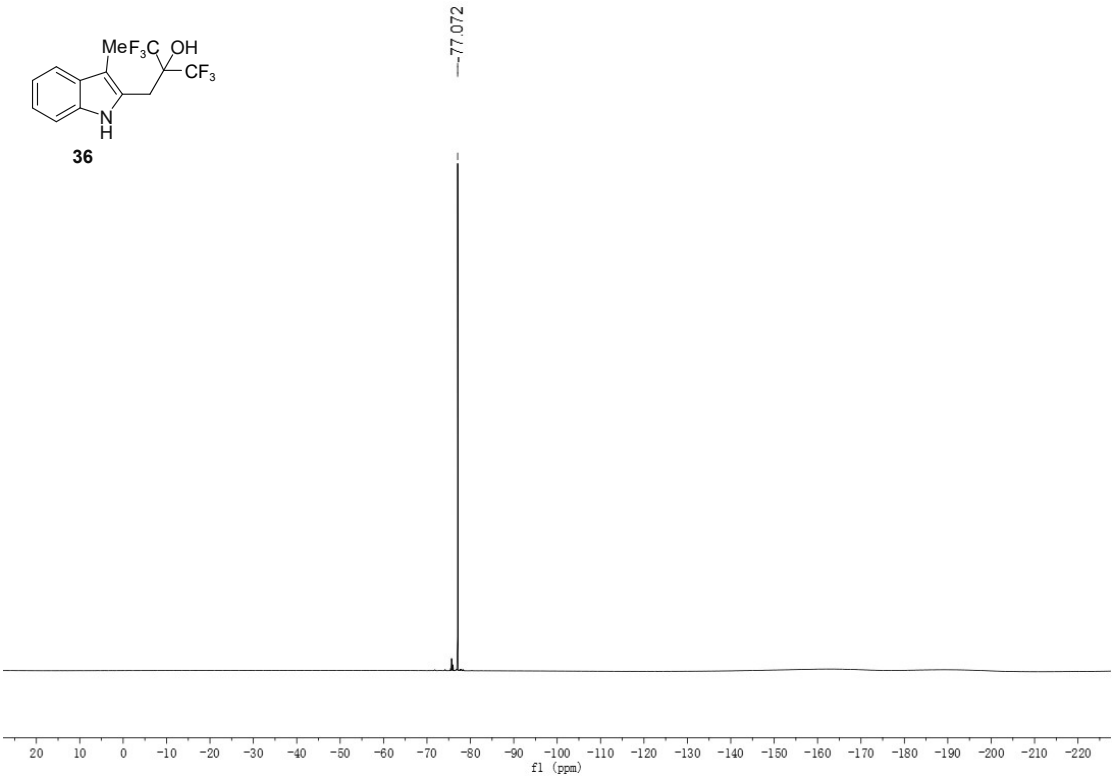
35

^{1}H NMR (400 MHz, $CDCl_3$) of **36**

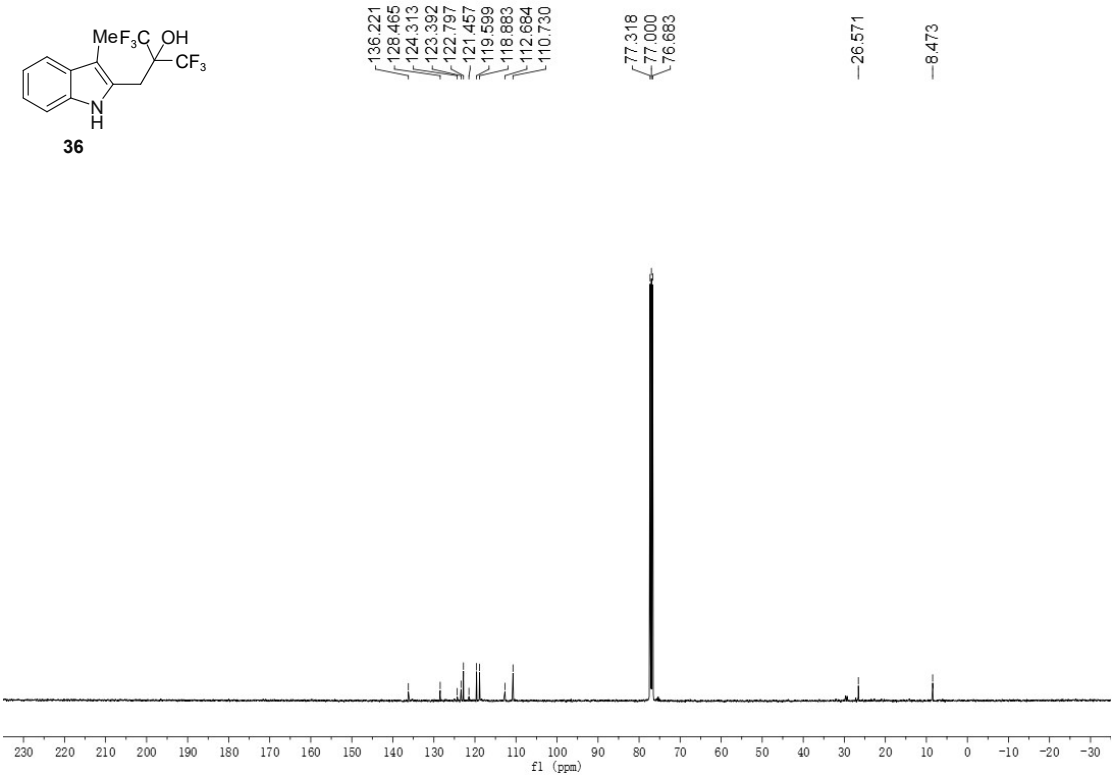


36

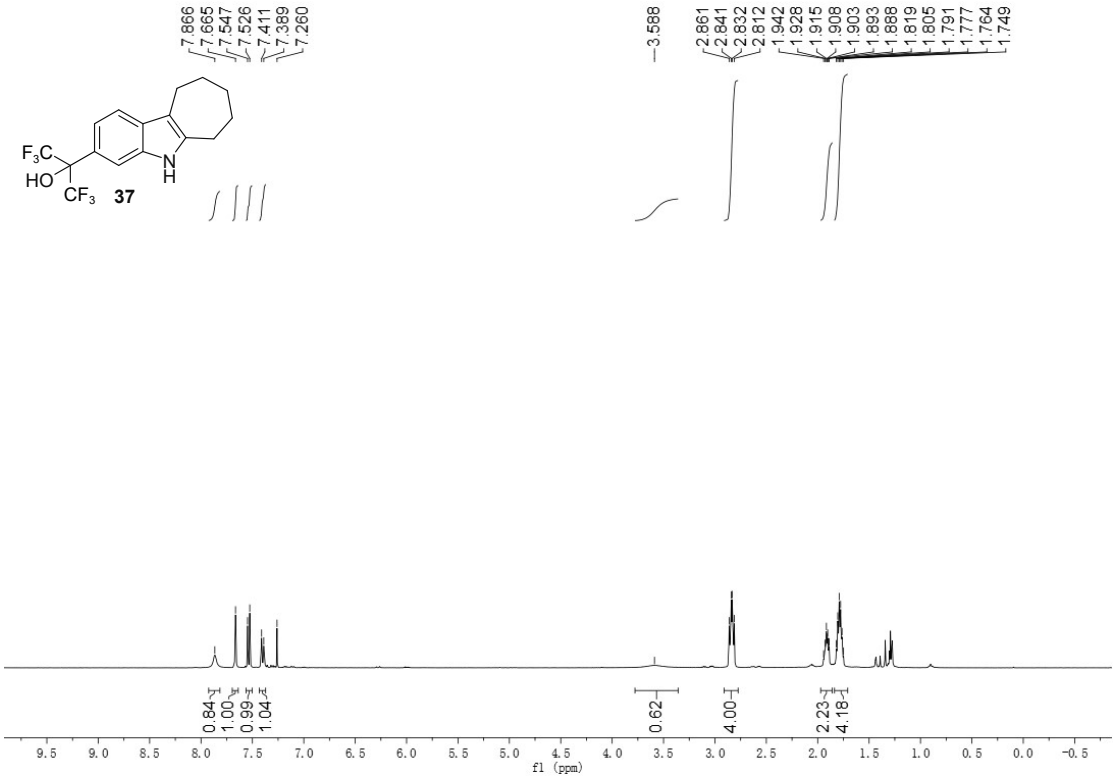
^{19}F NMR (376 MHz, $CDCl_3$) of **36**



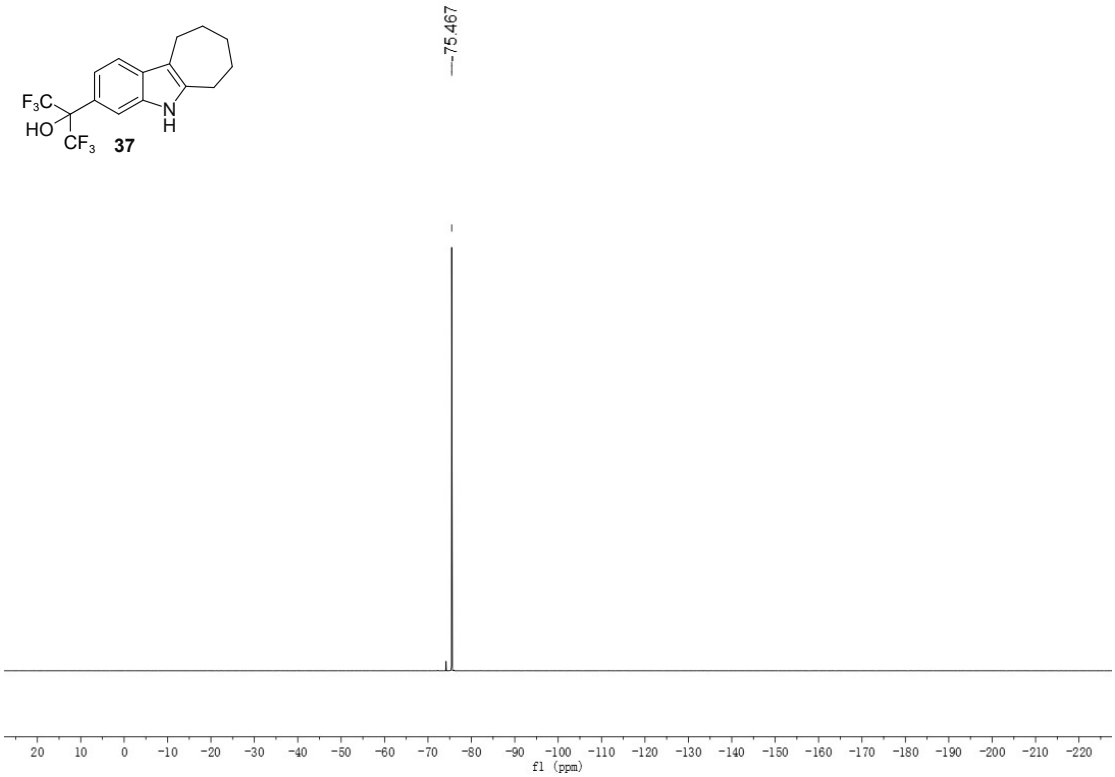
^{13}C NMR (100 MHz, $CDCl_3$) of **36**



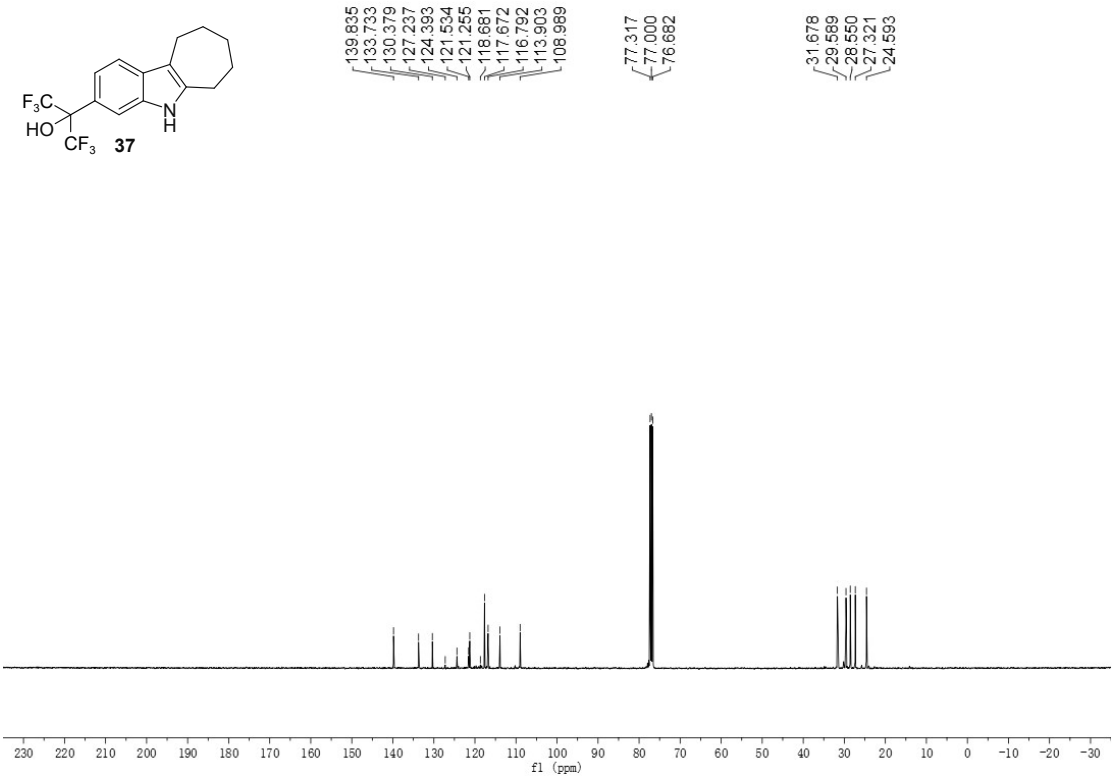
^{1}H NMR (400 MHz, $CDCl_3$) of **37**



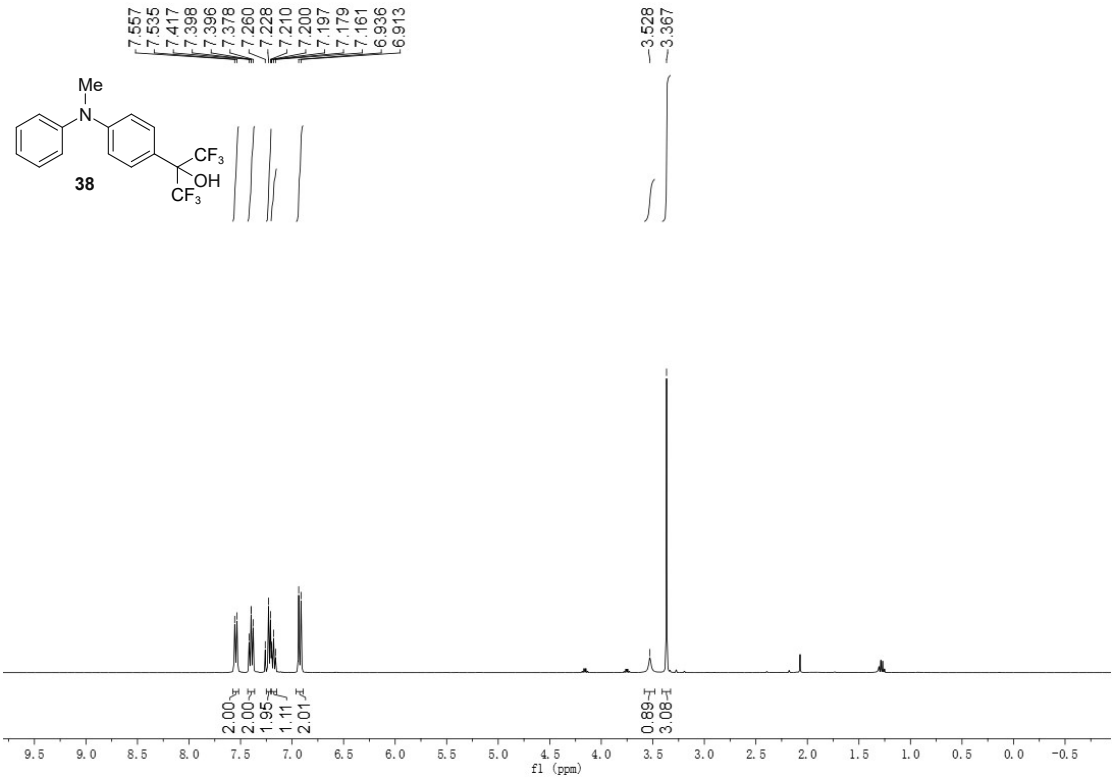
^{19}F NMR (376 MHz, $CDCl_3$) of **37**



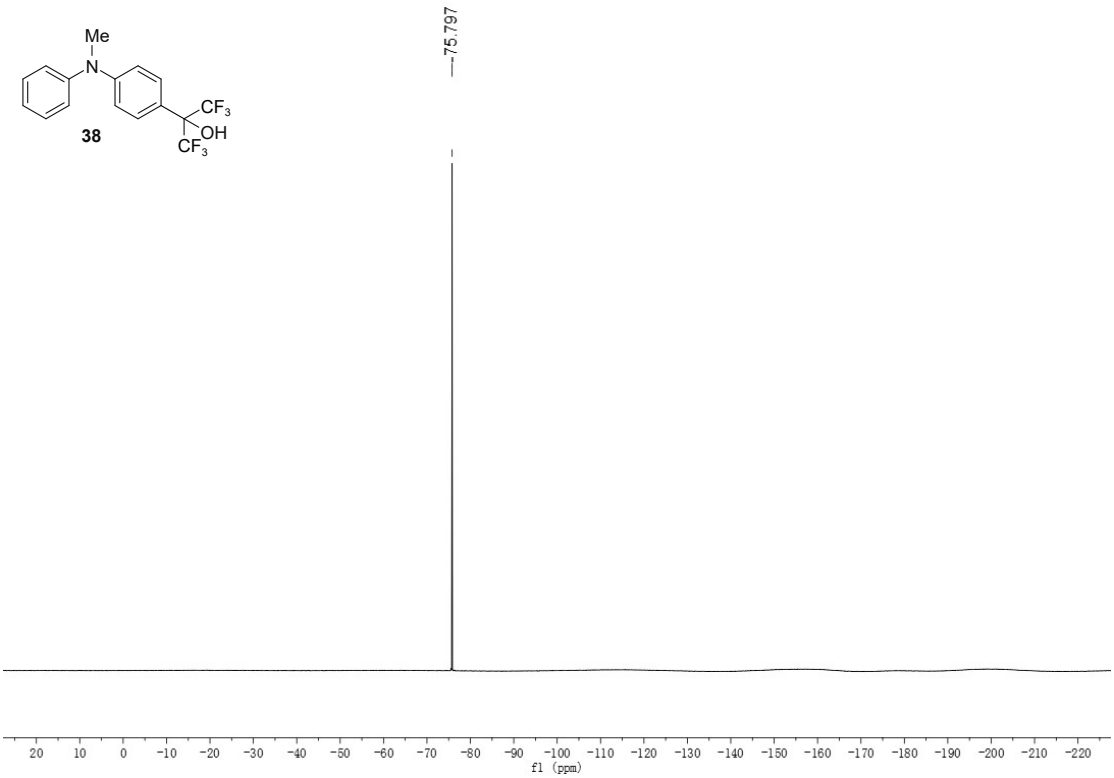
^{13}C NMR (100 MHz, $CDCl_3$) of **37**



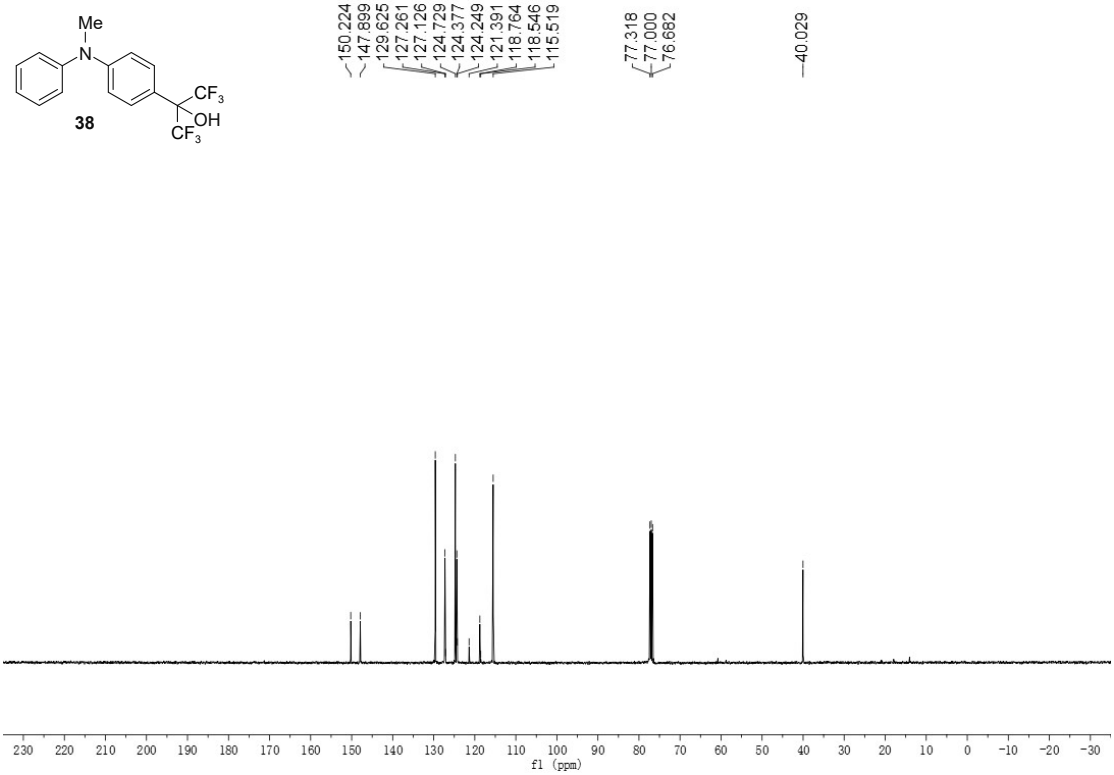
^{1}H NMR (400 MHz, $CDCl_3$) of **38**



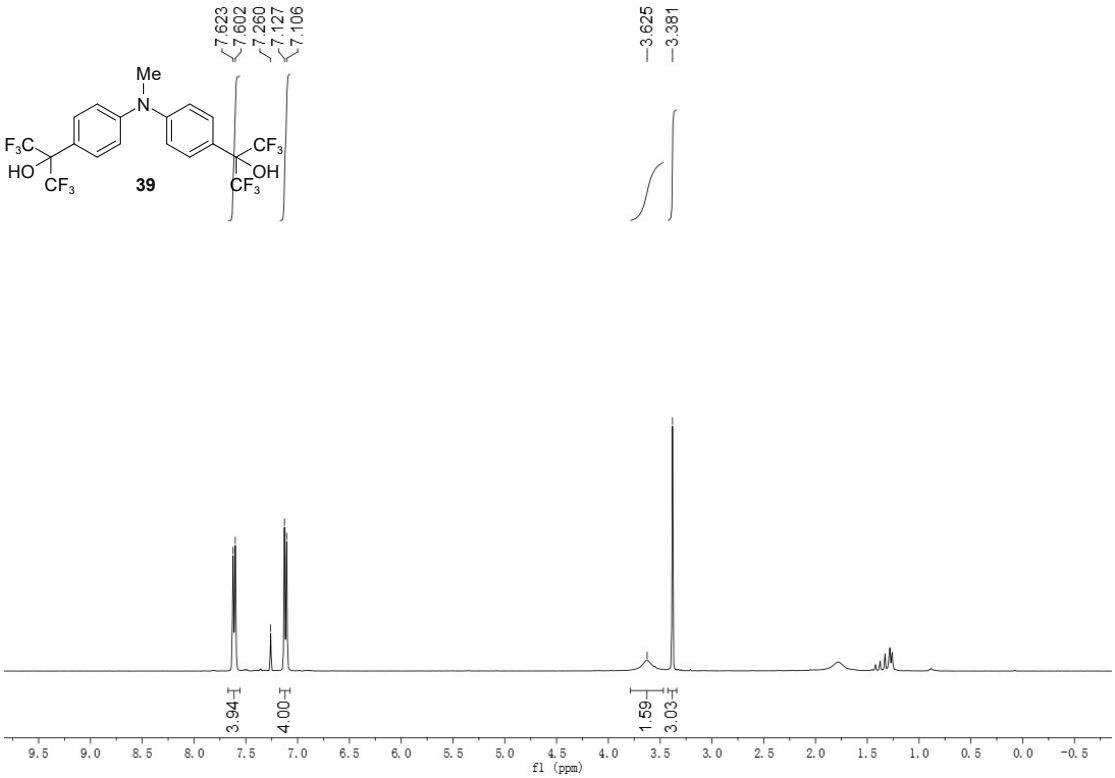
^{19}F NMR (376 MHz, $CDCl_3$) of **38**



^{13}C NMR (100 MHz, $CDCl_3$) of **38**

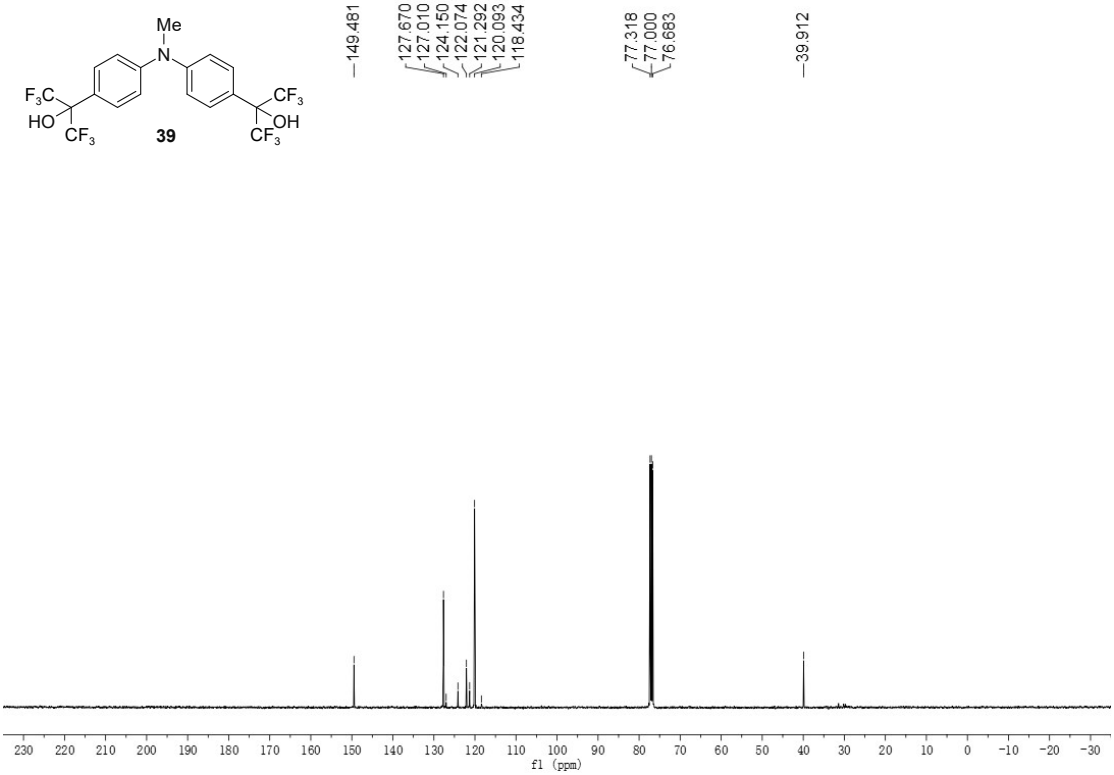


^{1}H NMR (400 MHz, $CDCl_3$) of **39**

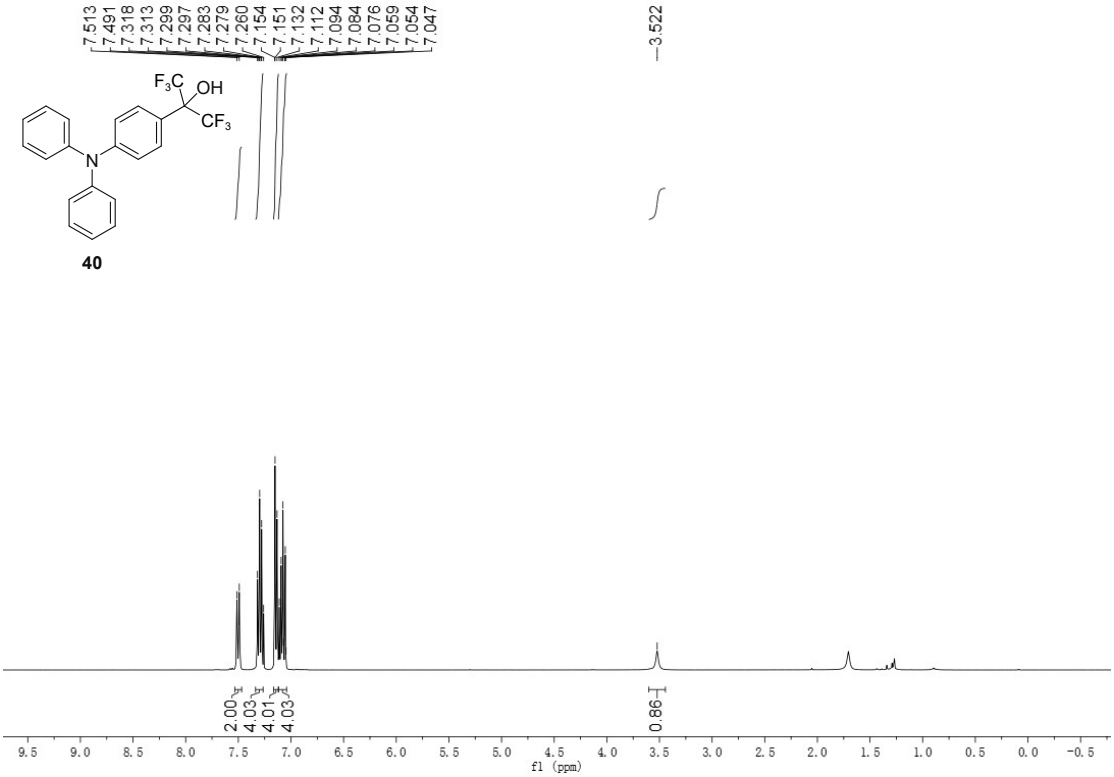


^{19}F NMR (376 MHz, $CDCl_3$) of **39**

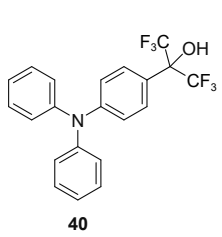
^{13}C NMR (100 MHz, $CDCl_3$) of **39**



^{1}H NMR (400 MHz, $CDCl_3$) of **40**

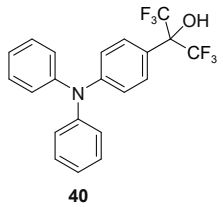


^{19}F NMR (376 MHz, $CDCl_3$) of **40**



40

^{13}C NMR (100 MHz, $CDCl_3$) of **40**



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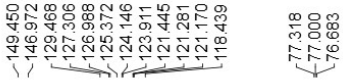
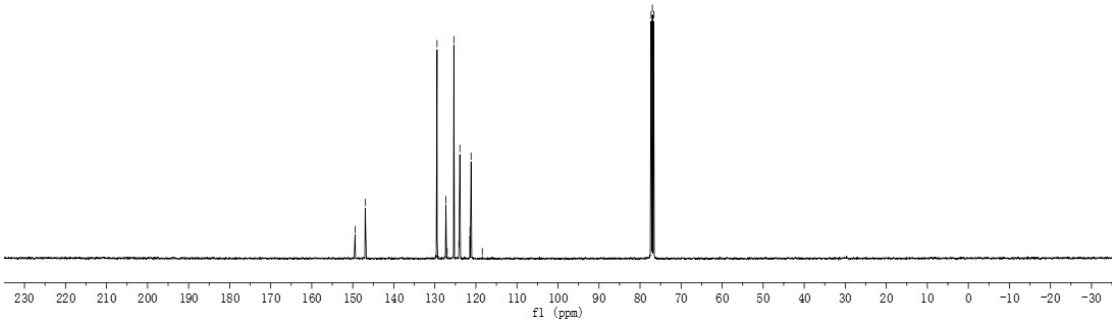
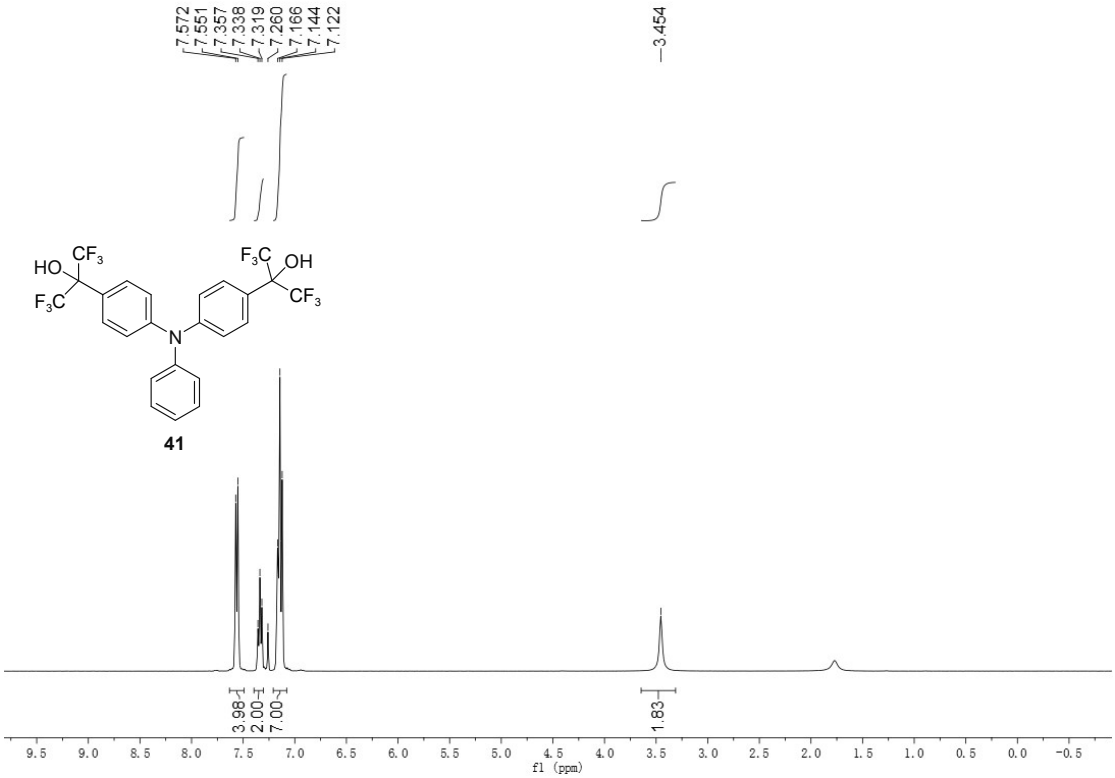
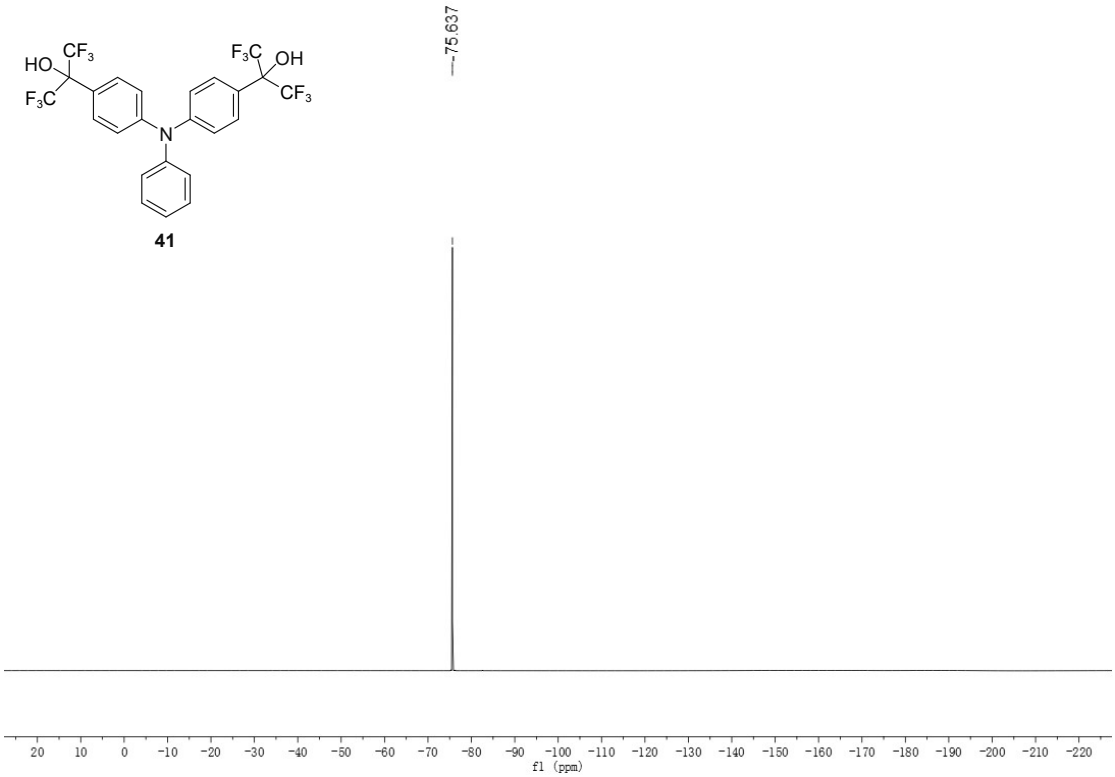




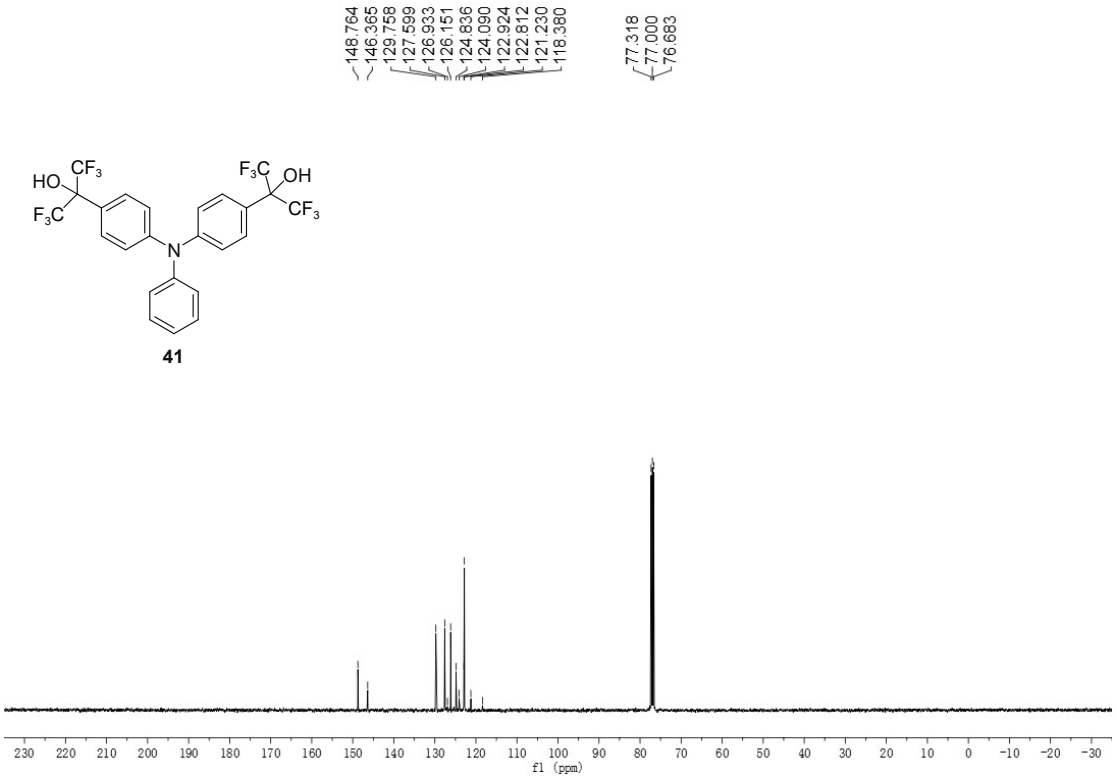
^{1}H NMR (400 MHz, $CDCl_3$) of **41**



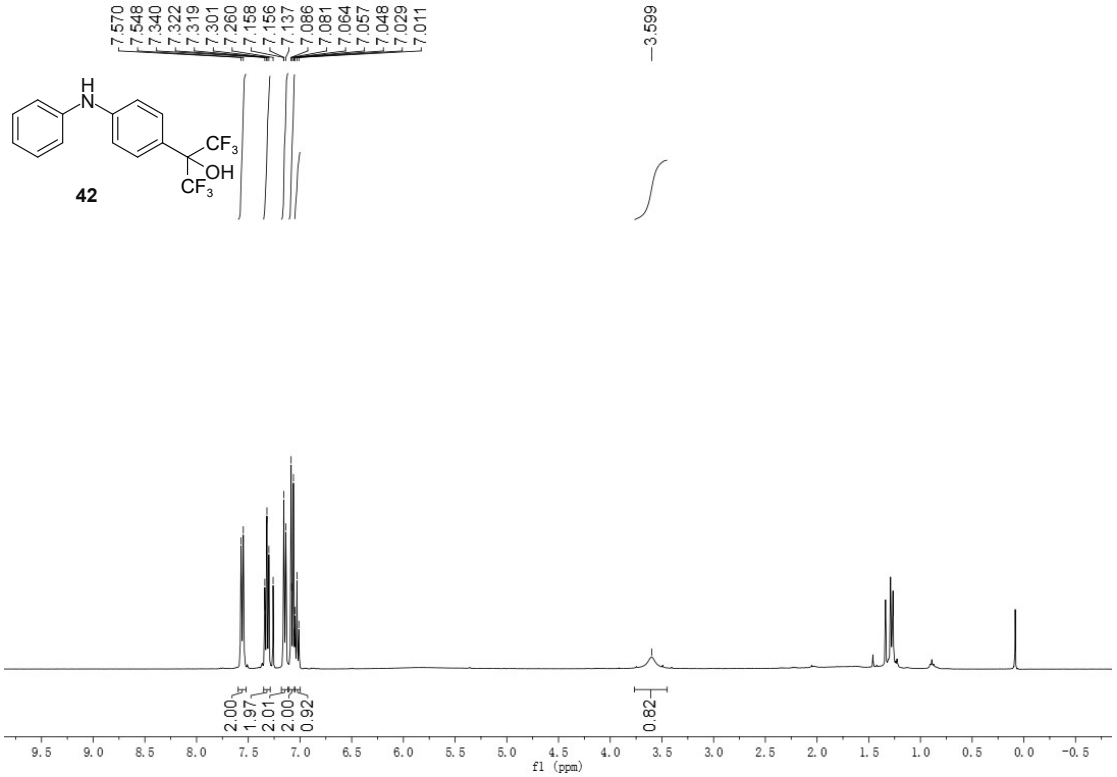
^{19}F NMR (376 MHz, $CDCl_3$) of **41**



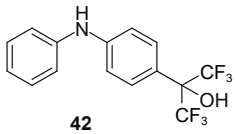
^{13}C NMR (100 MHz, $CDCl_3$) of **41**



^{1}H NMR (400 MHz, $CDCl_3$) of **42**

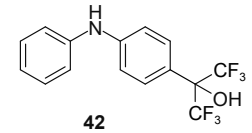


^{19}F NMR (376 MHz, $CDCl_3$) of **42**



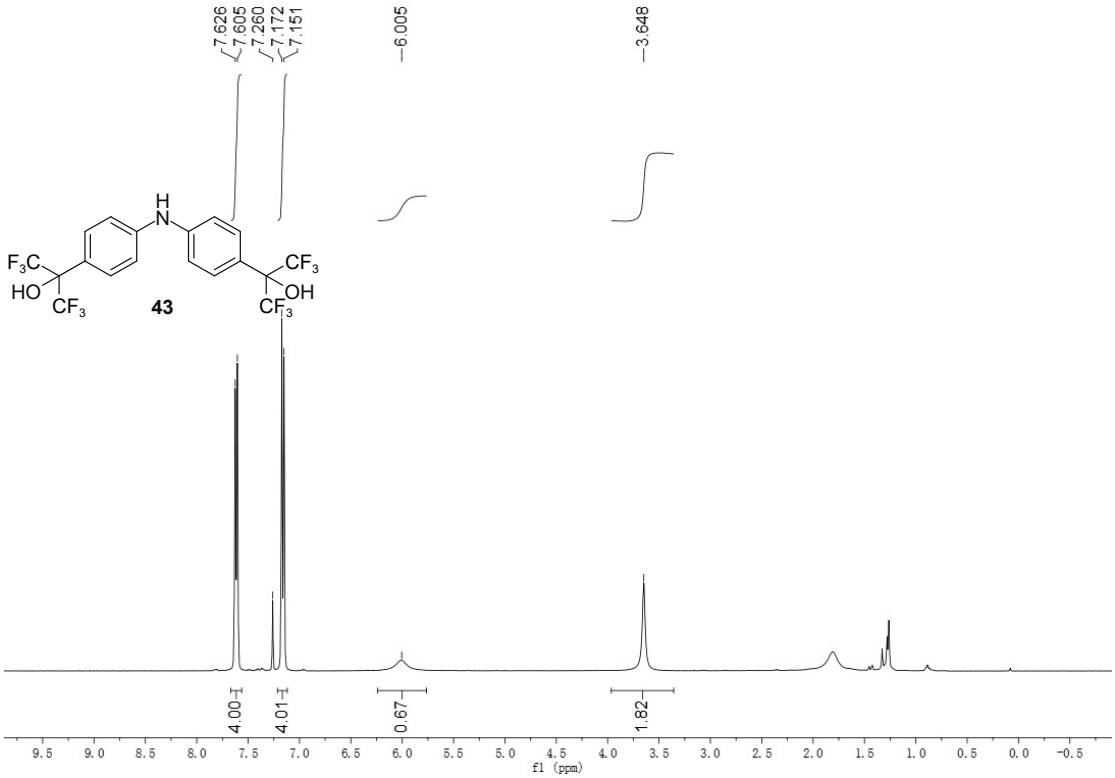
42

^{13}C NMR (100 MHz, $CDCl_3$) of **42**



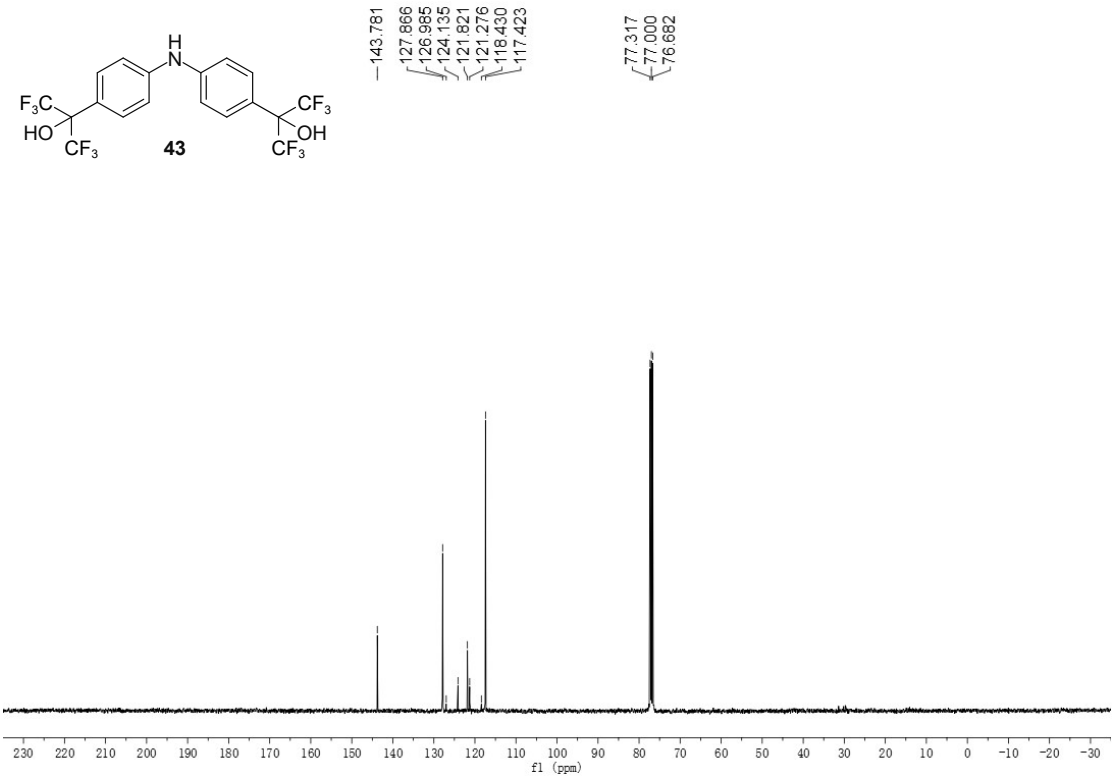
42

^{1}H NMR (400 MHz, $CDCl_3$) of **43**

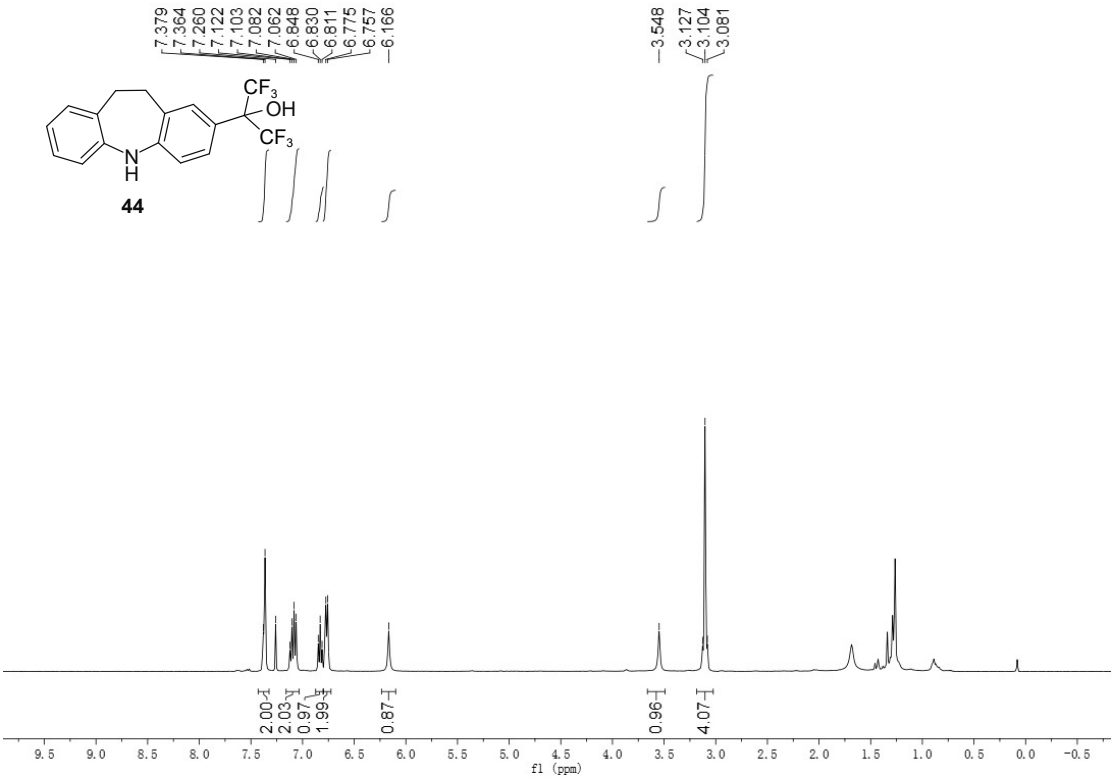


^{19}F NMR (376 MHz, $CDCl_3$) of **43**

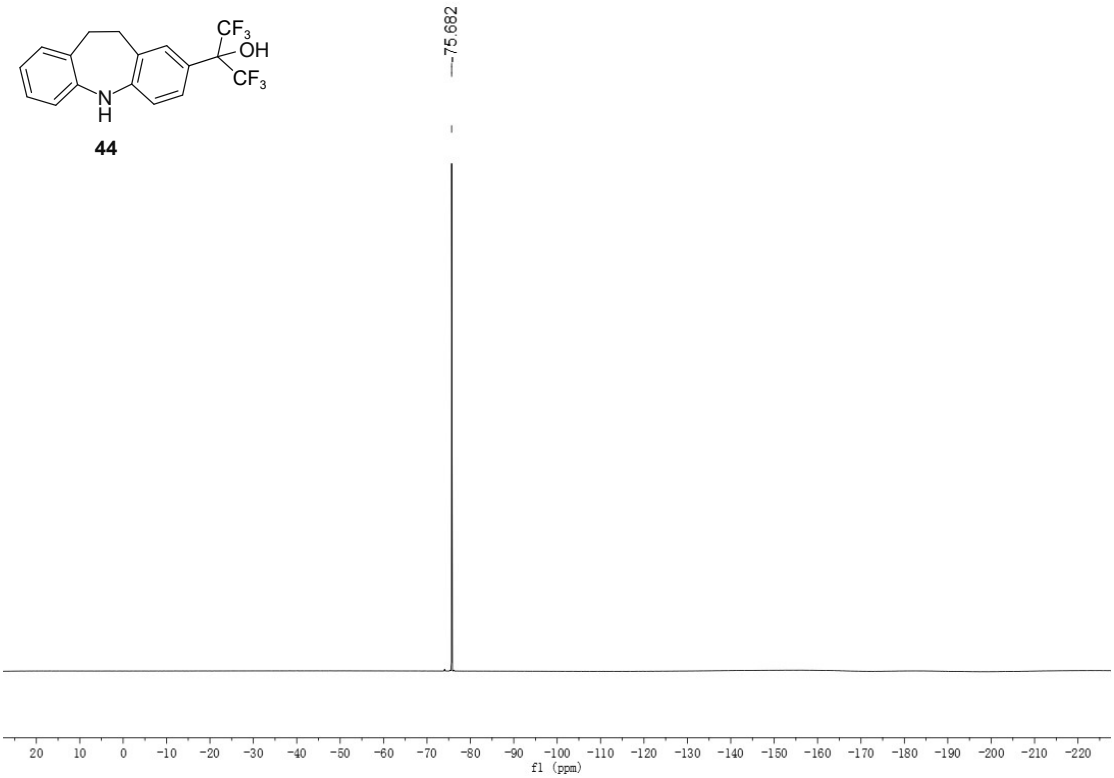
^{13}C NMR (100 MHz, $CDCl_3$) of **43**



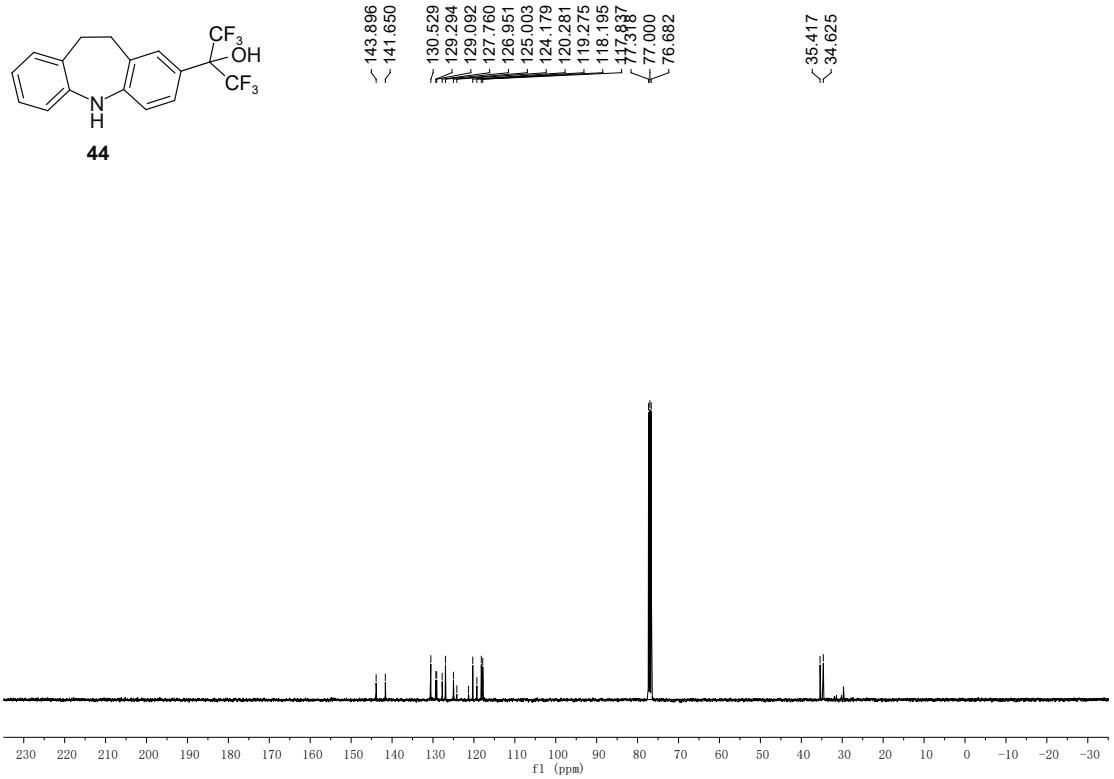
^{1}H NMR (400 MHz, $CDCl_3$) of **44**



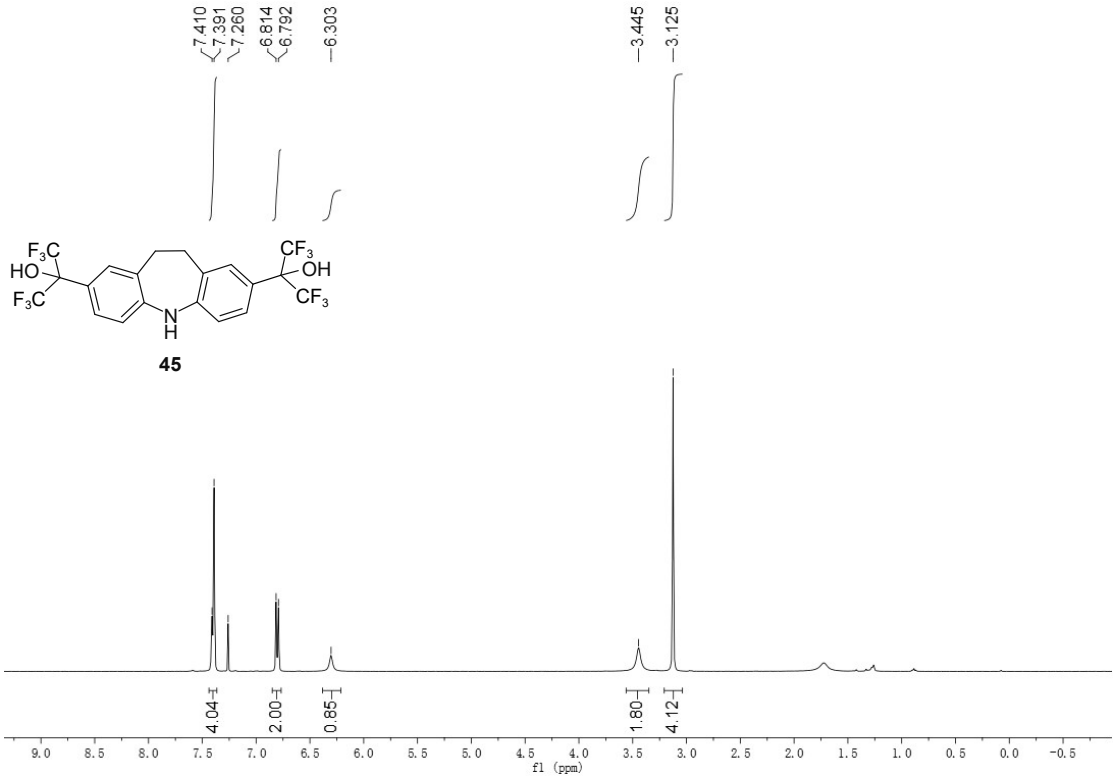
^{19}F NMR (376 MHz, $CDCl_3$) of **44**



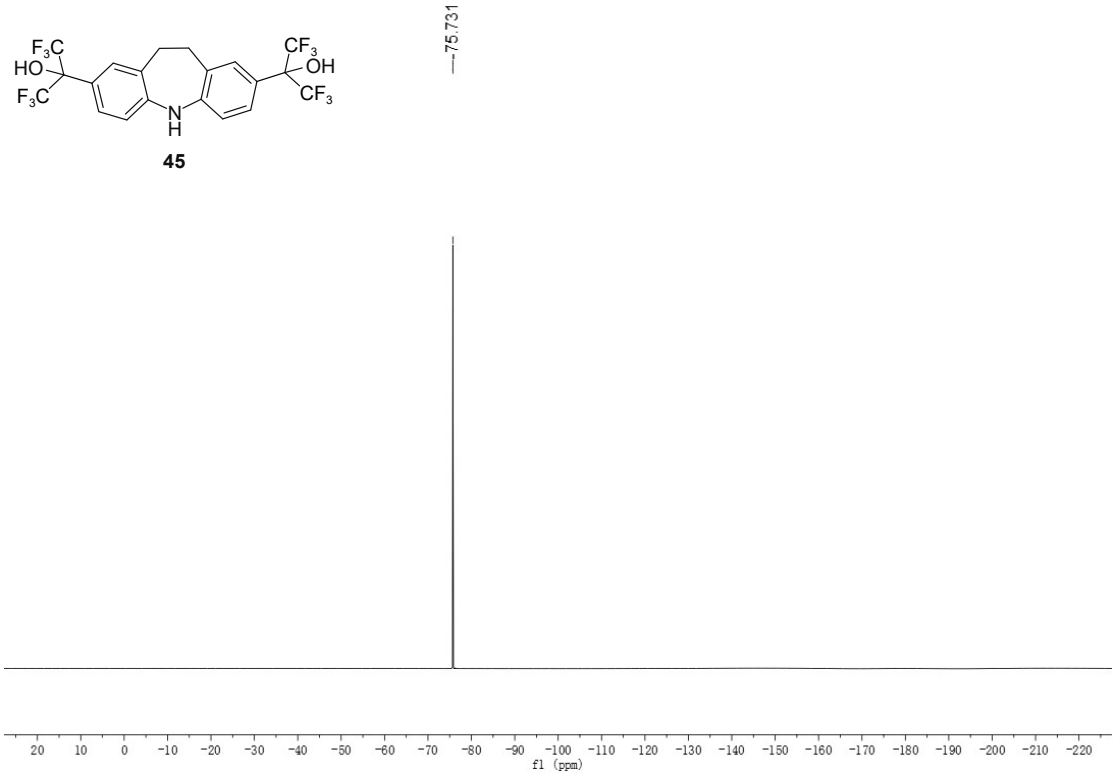
^{13}C NMR (100 MHz, $CDCl_3$) of **44**



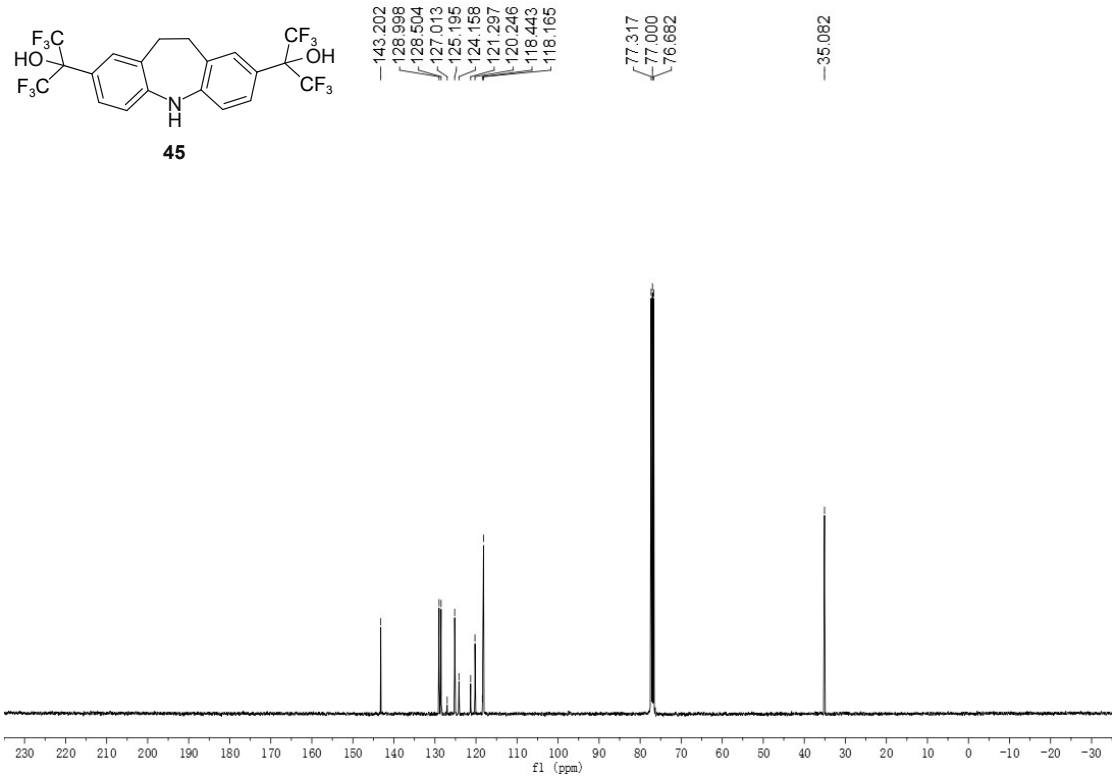
^{1}H NMR (400 MHz, $CDCl_3$) of **45**



^{19}F NMR (376 MHz, $CDCl_3$) of **45**

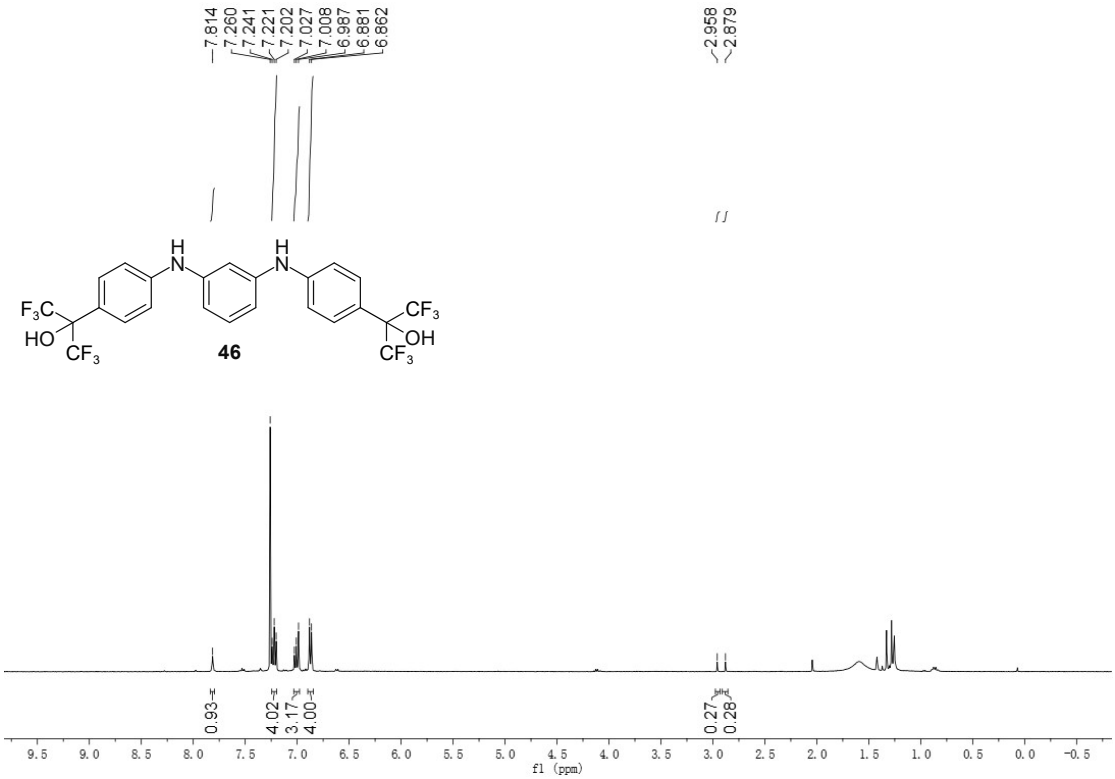


^{13}C NMR (100 MHz, $CDCl_3$) of **45**



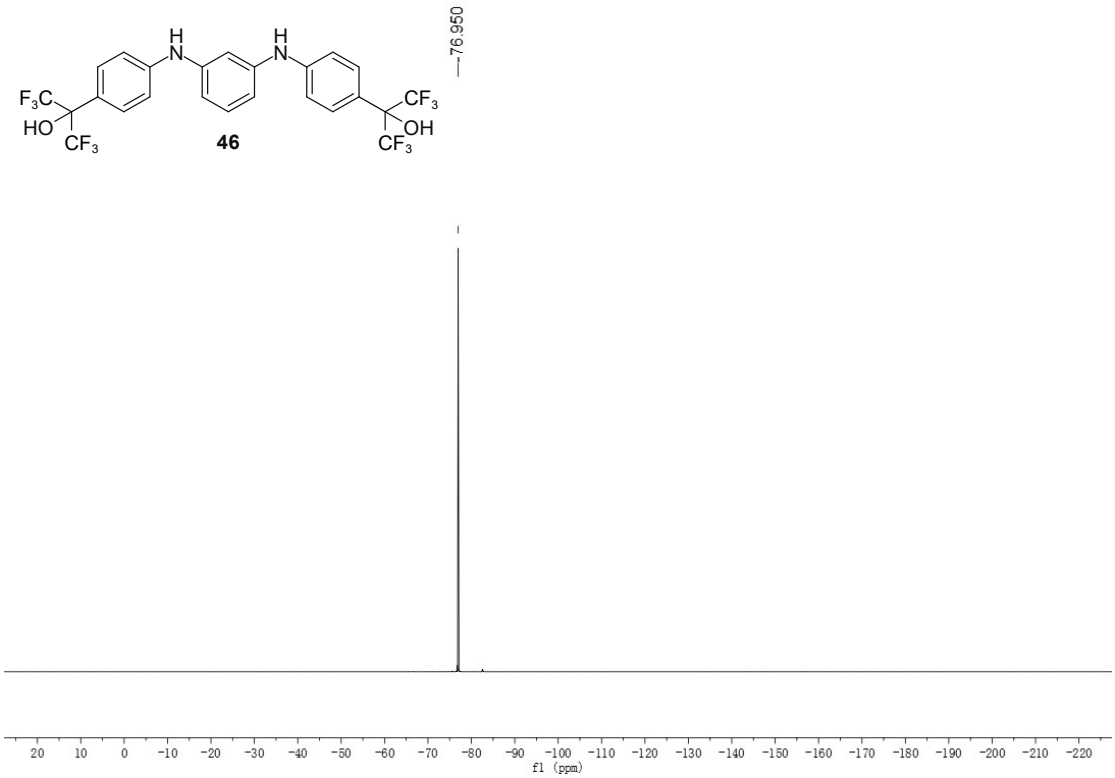
45

^{1}H NMR (400 MHz, $CDCl_3$) of **46**

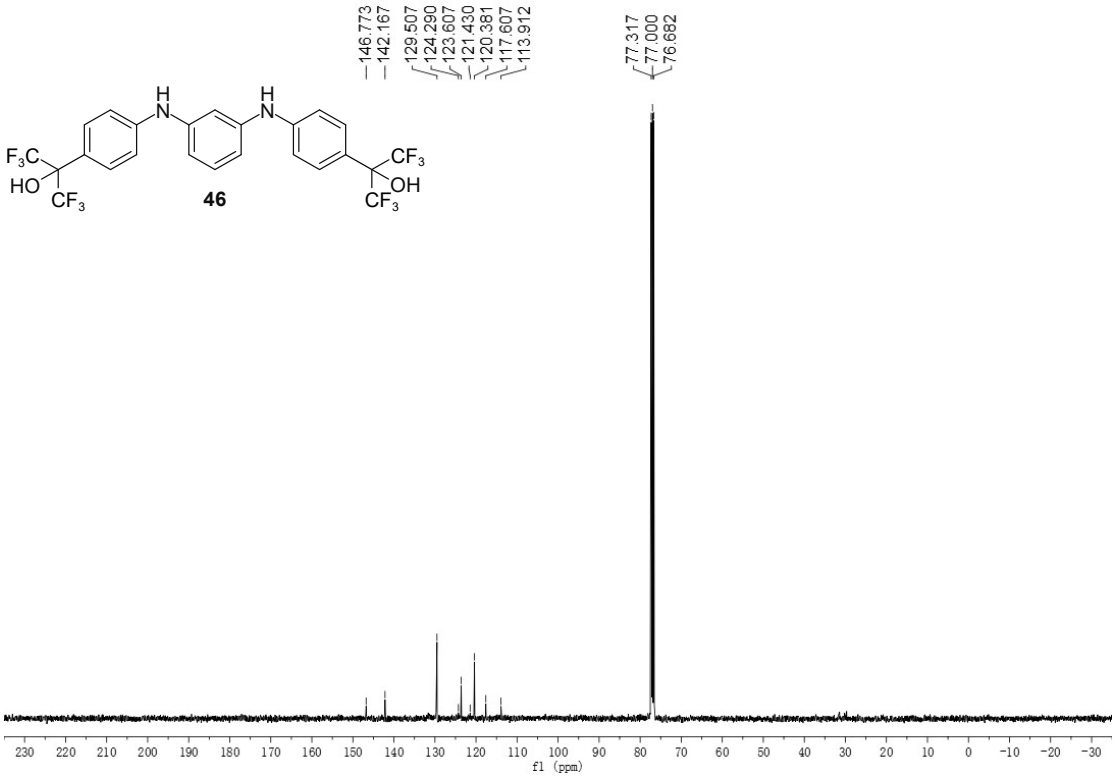


46

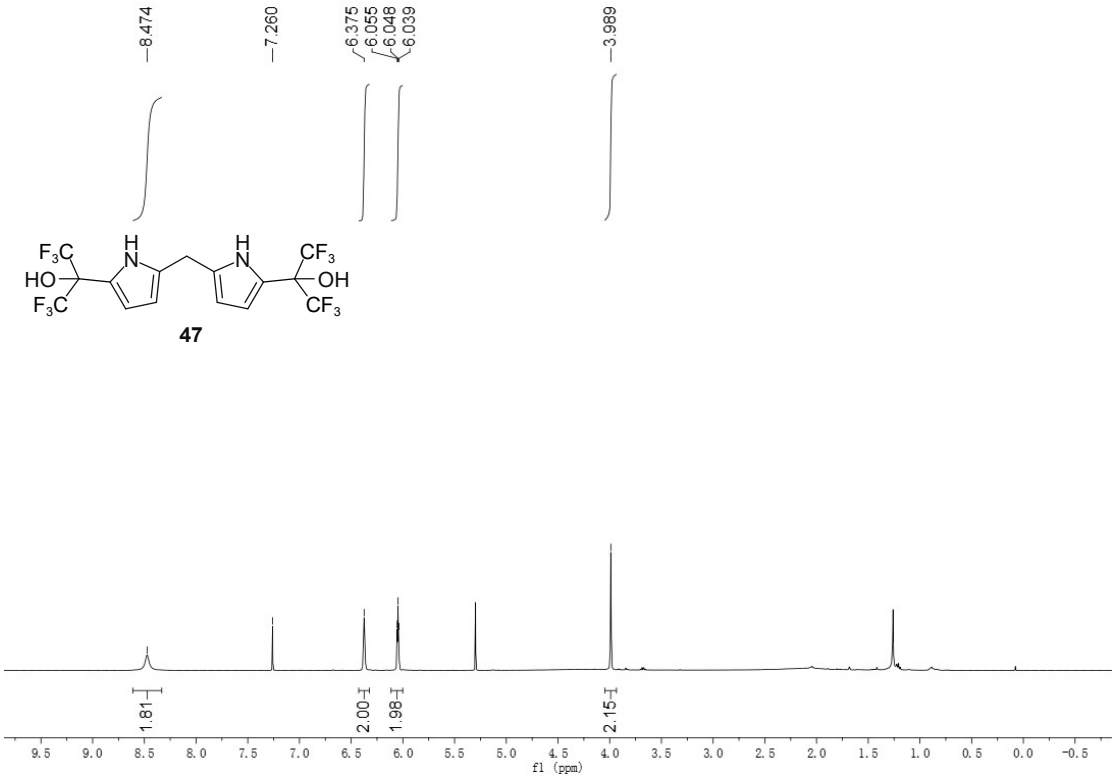
^{19}F NMR (376 MHz, $CDCl_3$) of **46**



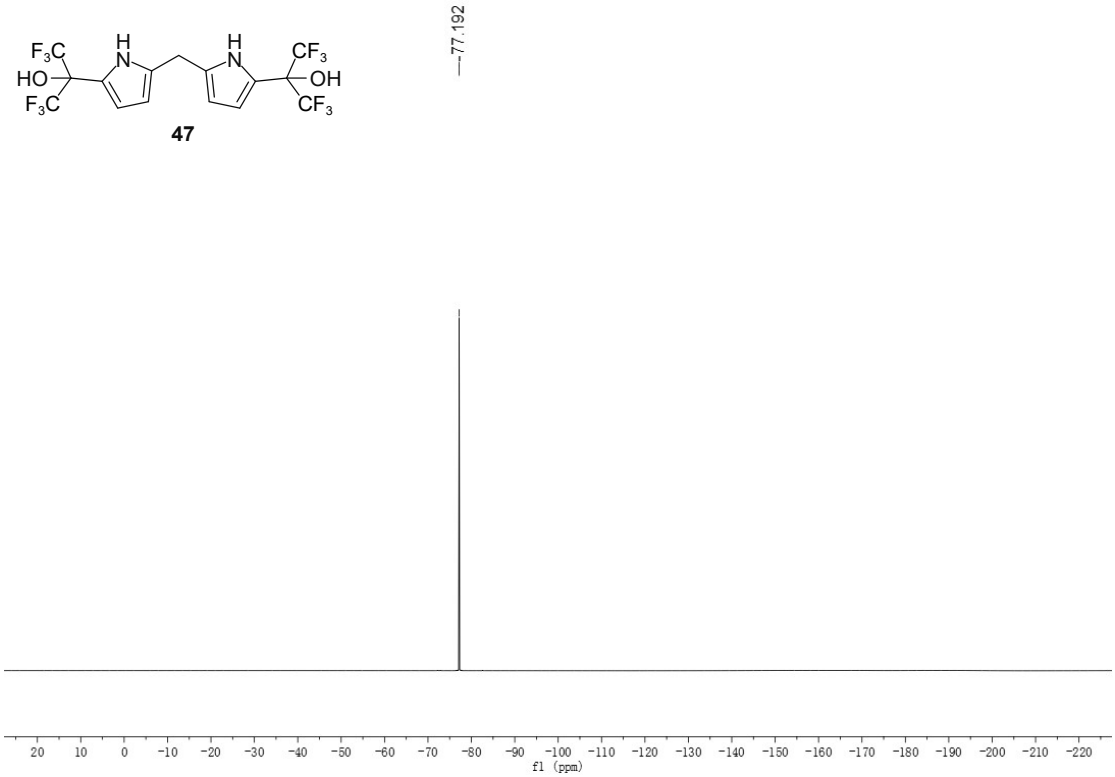
^{13}C NMR (100 MHz, $CDCl_3$) of **46**



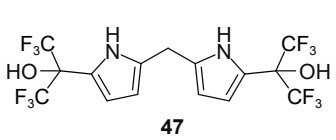
^{1}H NMR (400 MHz, $CDCl_3$) of **47**



^{19}F NMR (376 MHz, $CDCl_3$) of **47**

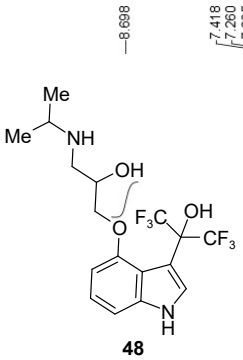


^{13}C NMR (100 MHz, $CDCl_3$) of **47**



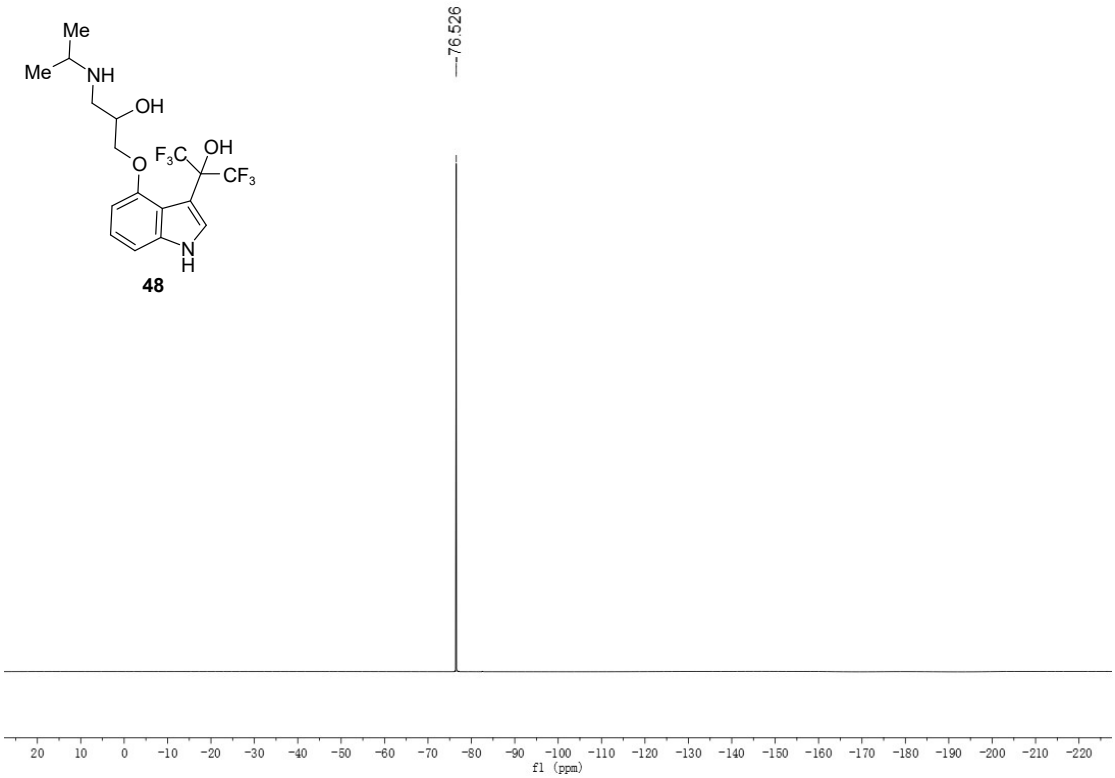
47

^{1}H NMR (400 MHz, $CDCl_3$) of **48**

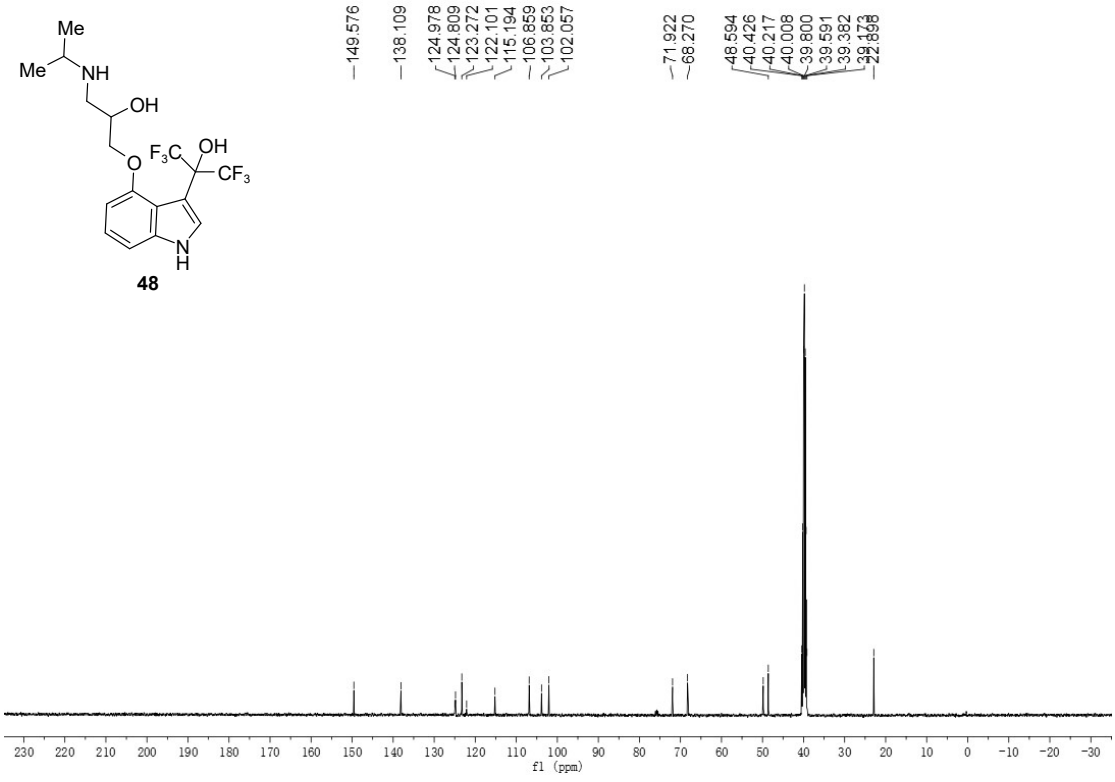


48

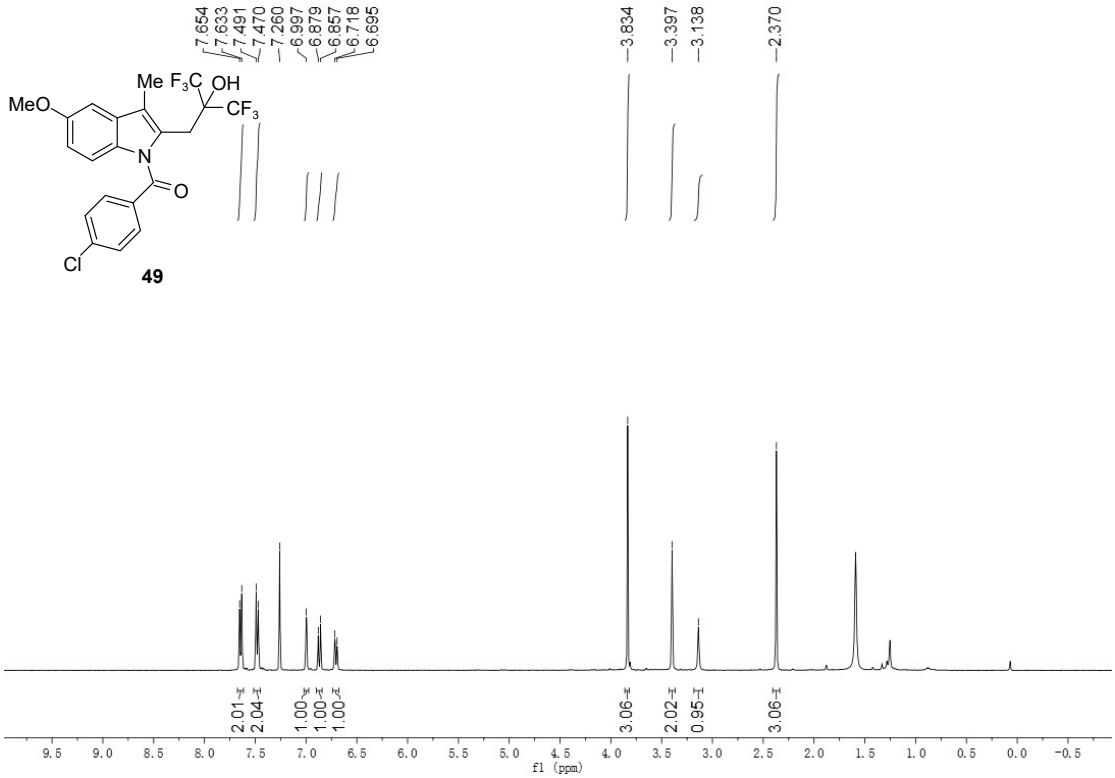
^{19}F NMR (376 MHz, $CDCl_3$) of **48**



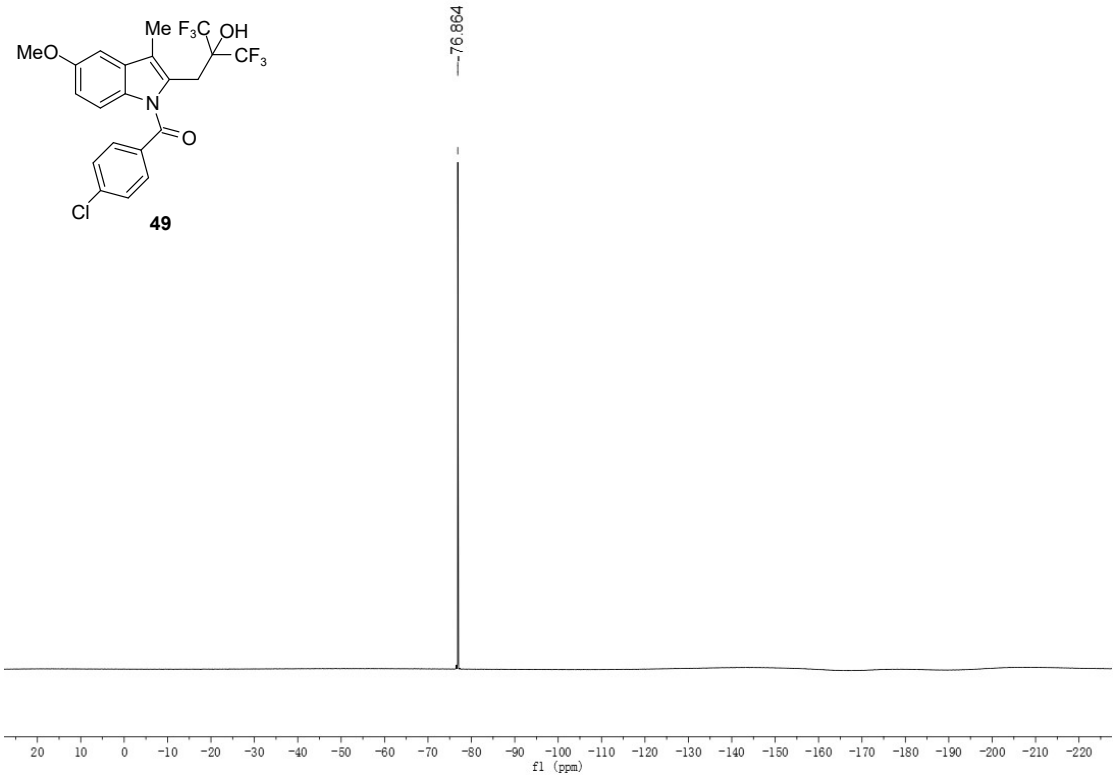
^{13}C NMR (100 MHz, DMSO-*d*6) of **48**



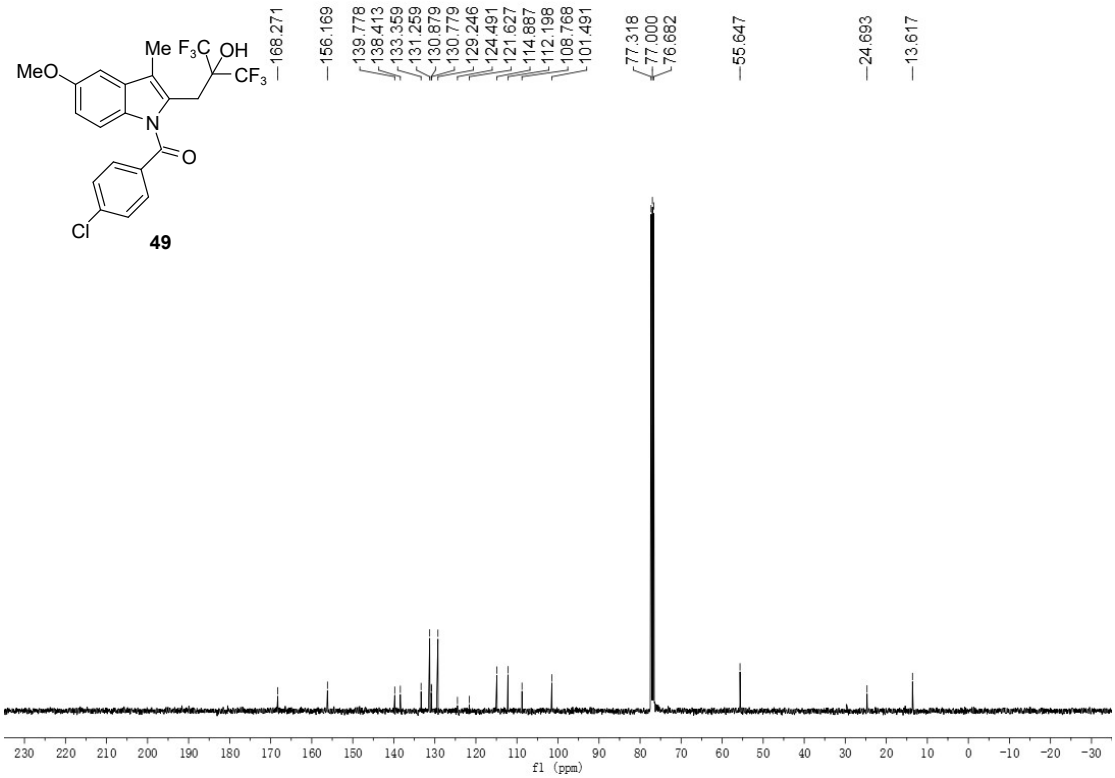
^{1}H NMR (400 MHz, $CDCl_3$) of **49**



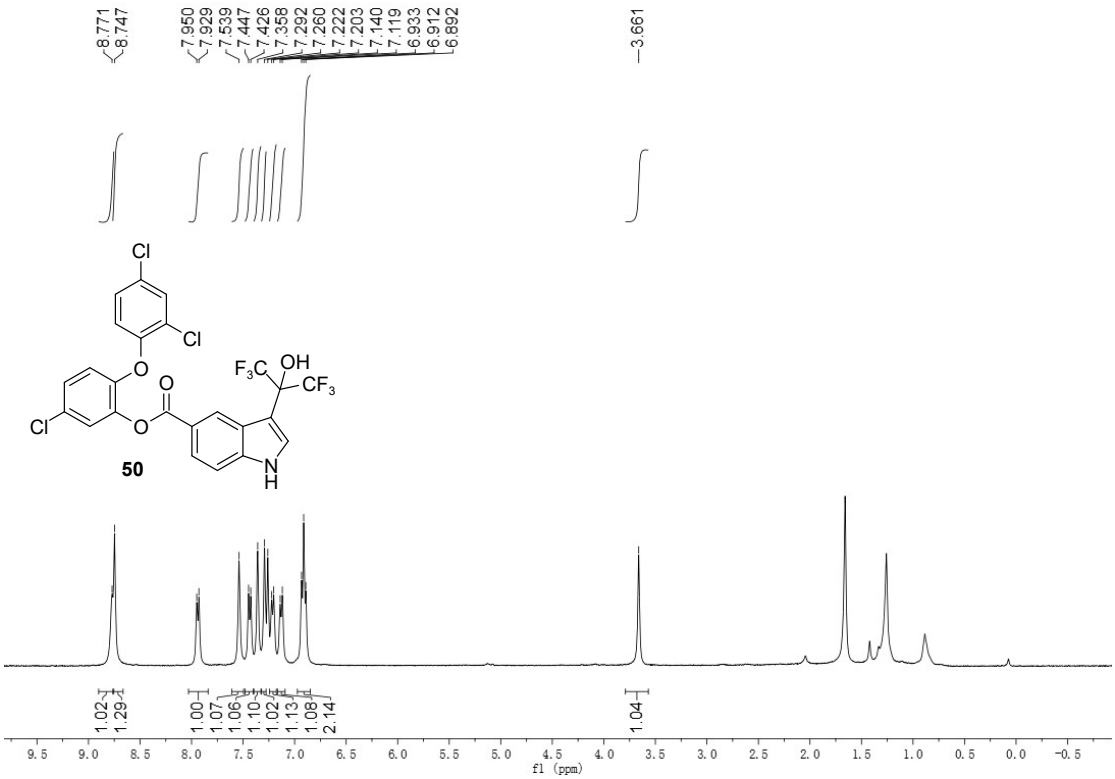
^{19}F NMR (376 MHz, $CDCl_3$) of **49**



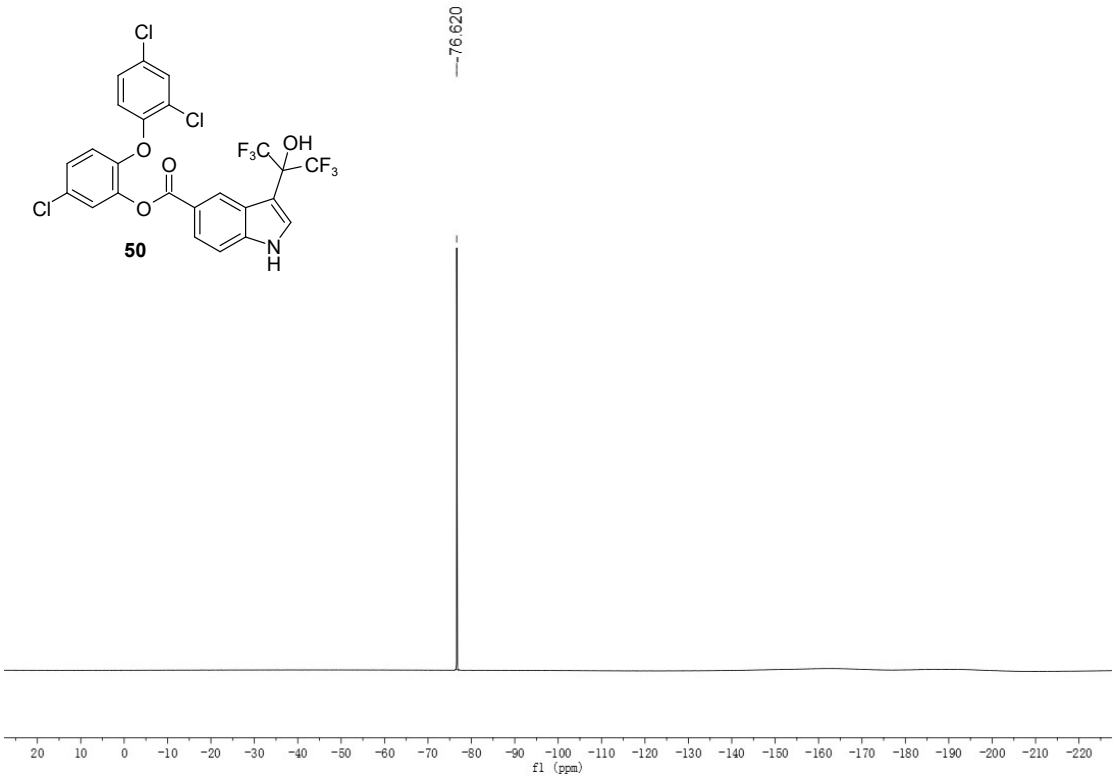
^{13}C NMR (100 MHz, $CDCl_3$) of **49**



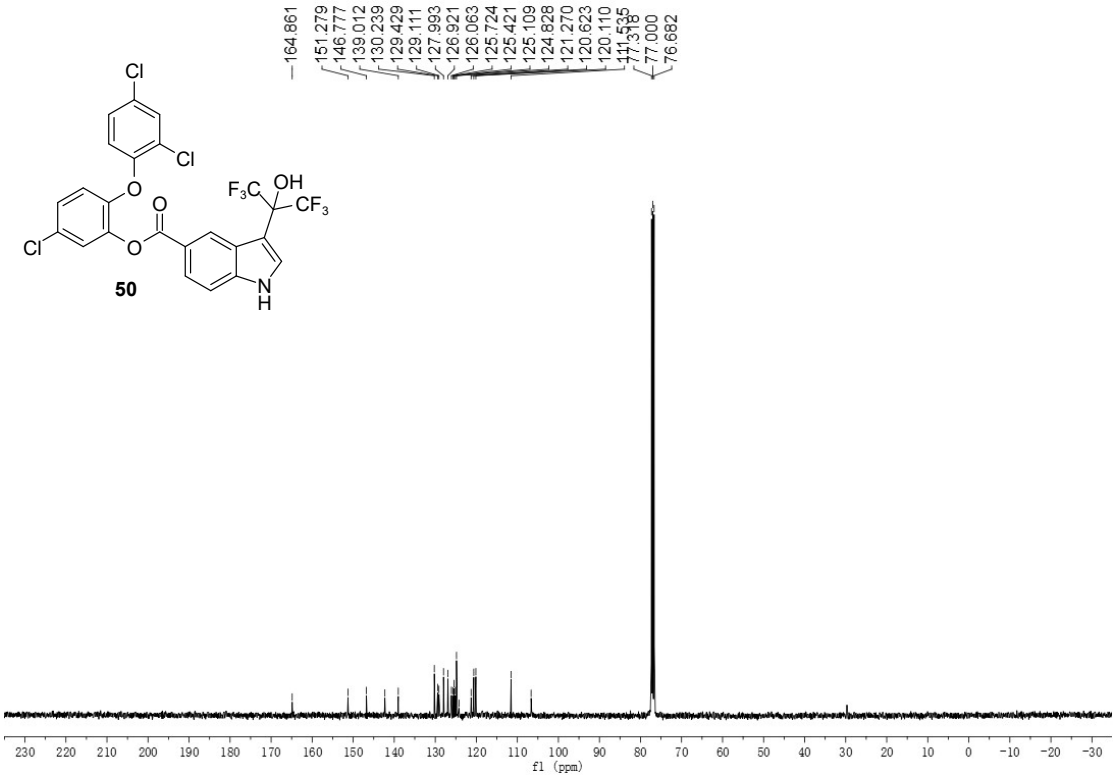
^{1}H NMR (400 MHz, $CDCl_3$) of **50**



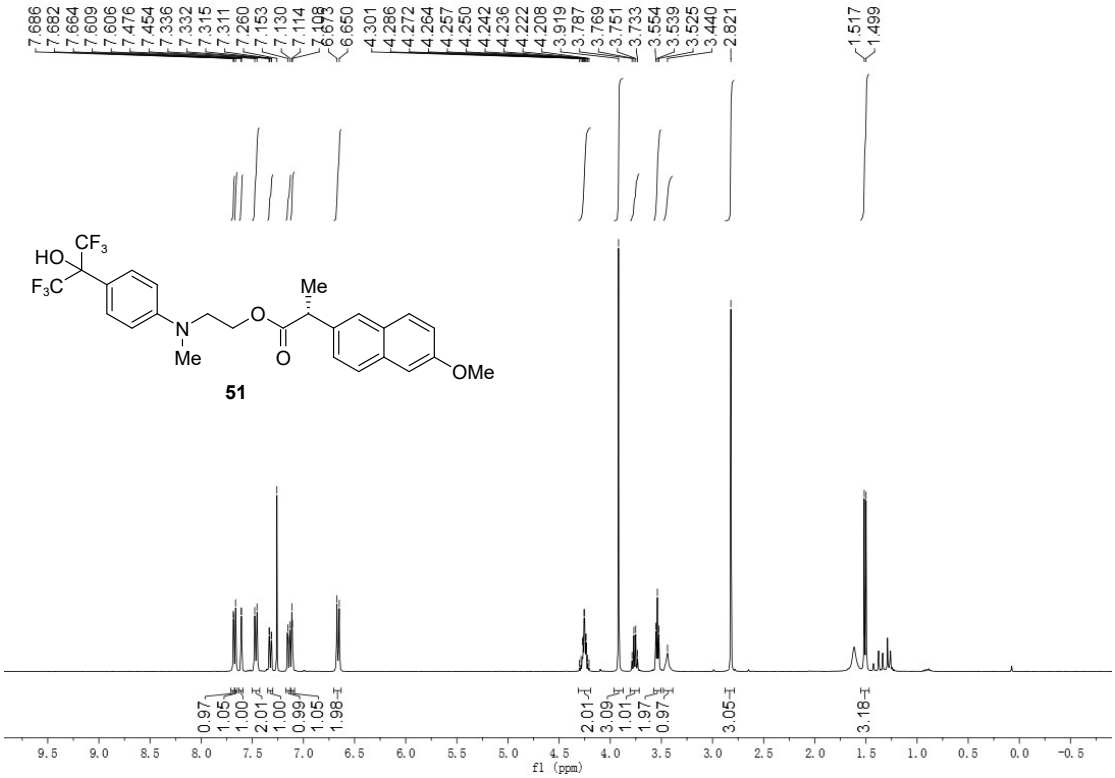
^{19}F NMR (376 MHz, $CDCl_3$) of **50**



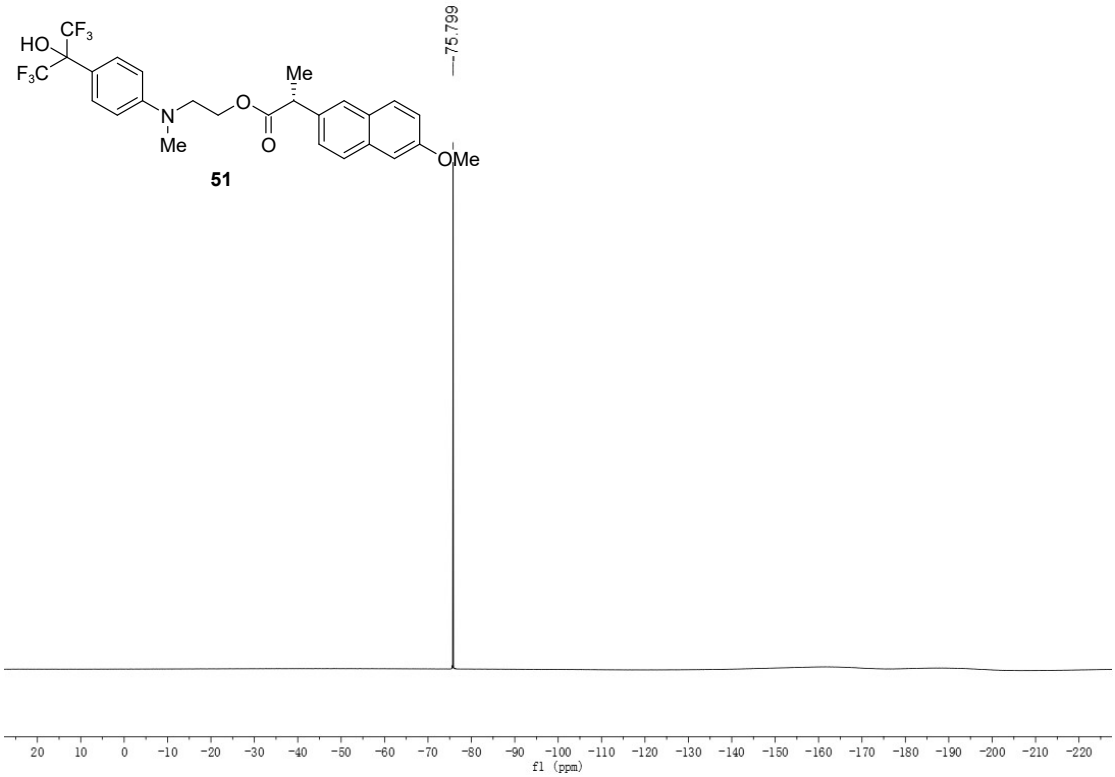
^{13}C NMR (100 MHz, $CDCl_3$) of **50**



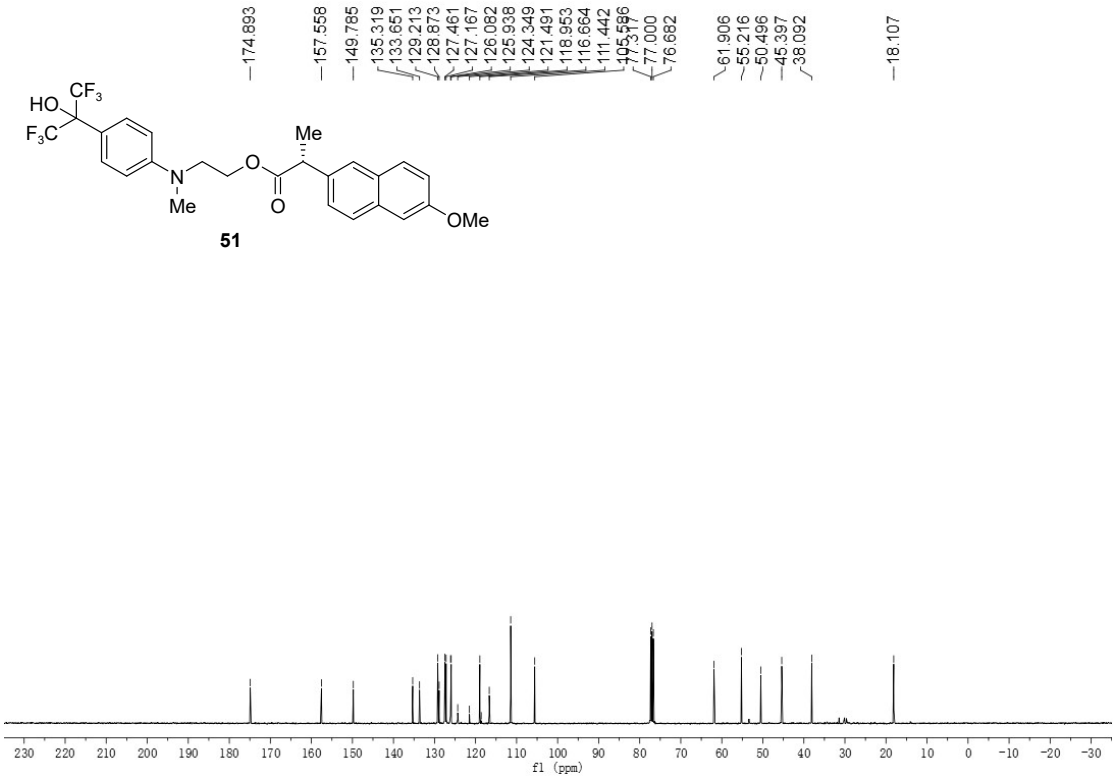
^{1}H NMR (400 MHz, $CDCl_3$) of **51**



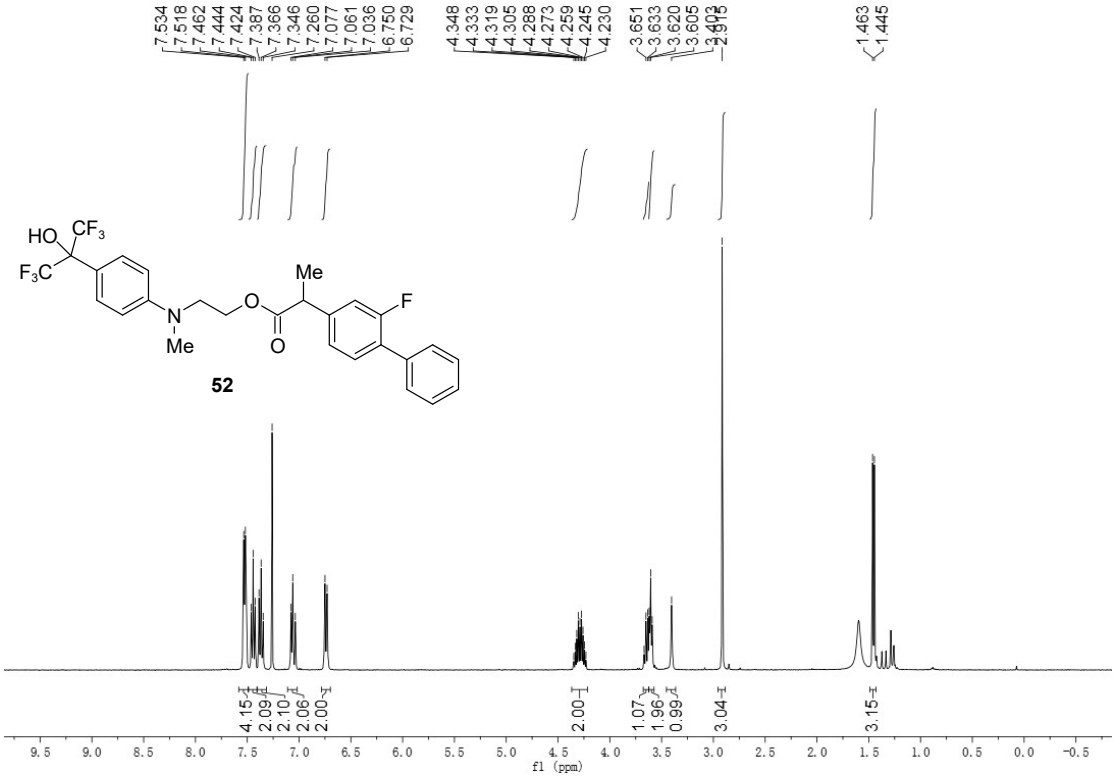
^{19}F NMR (376 MHz, $CDCl_3$) of **51**



^{13}C NMR (100 MHz, $CDCl_3$) of **51**

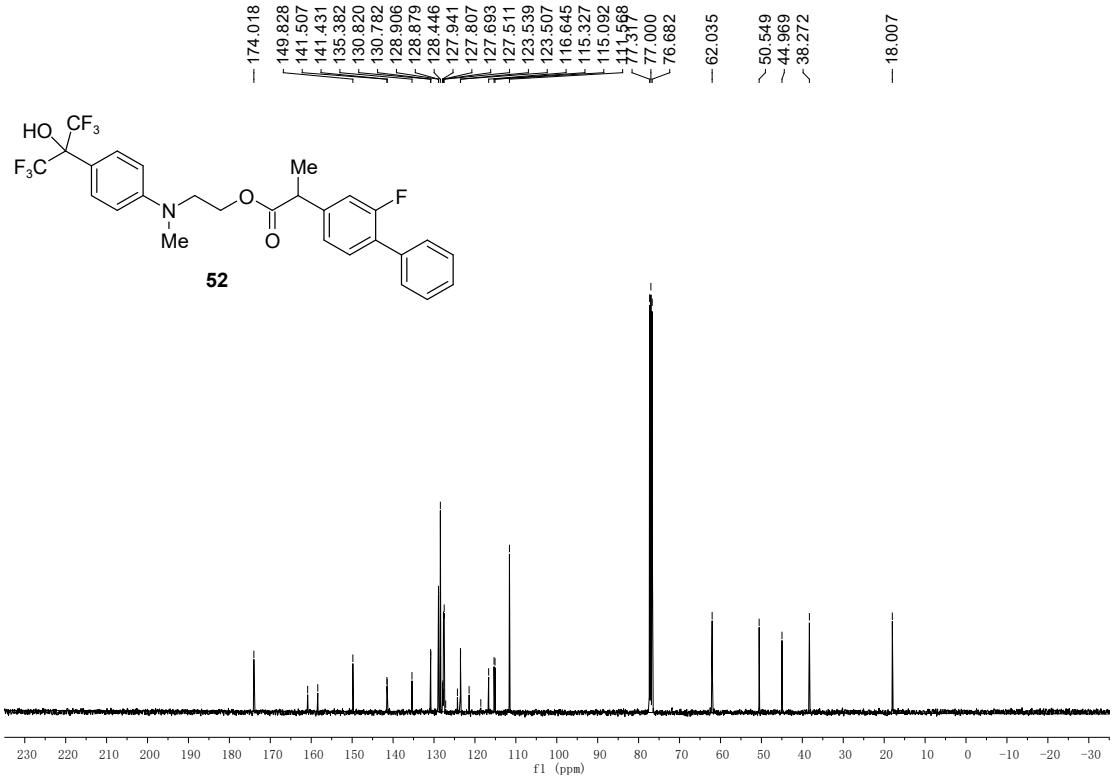


^{1}H NMR (400 MHz, $CDCl_3$) of **52**

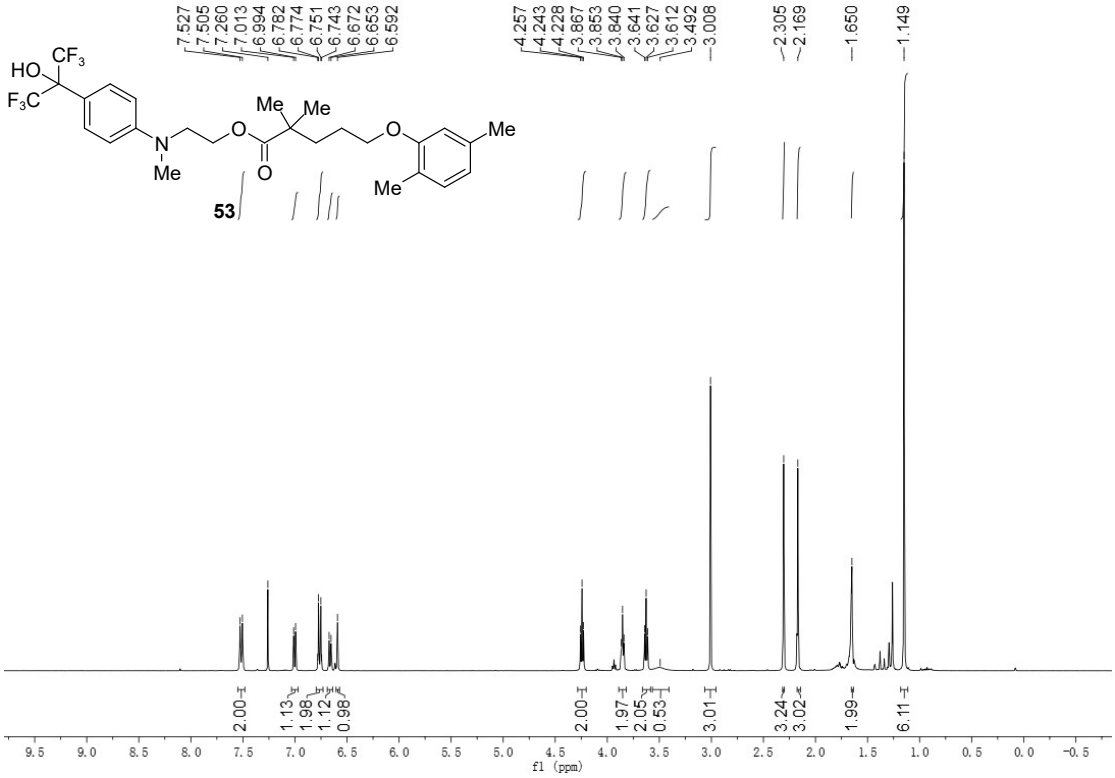


^{19}F NMR (376 MHz, $CDCl_3$) of **52**

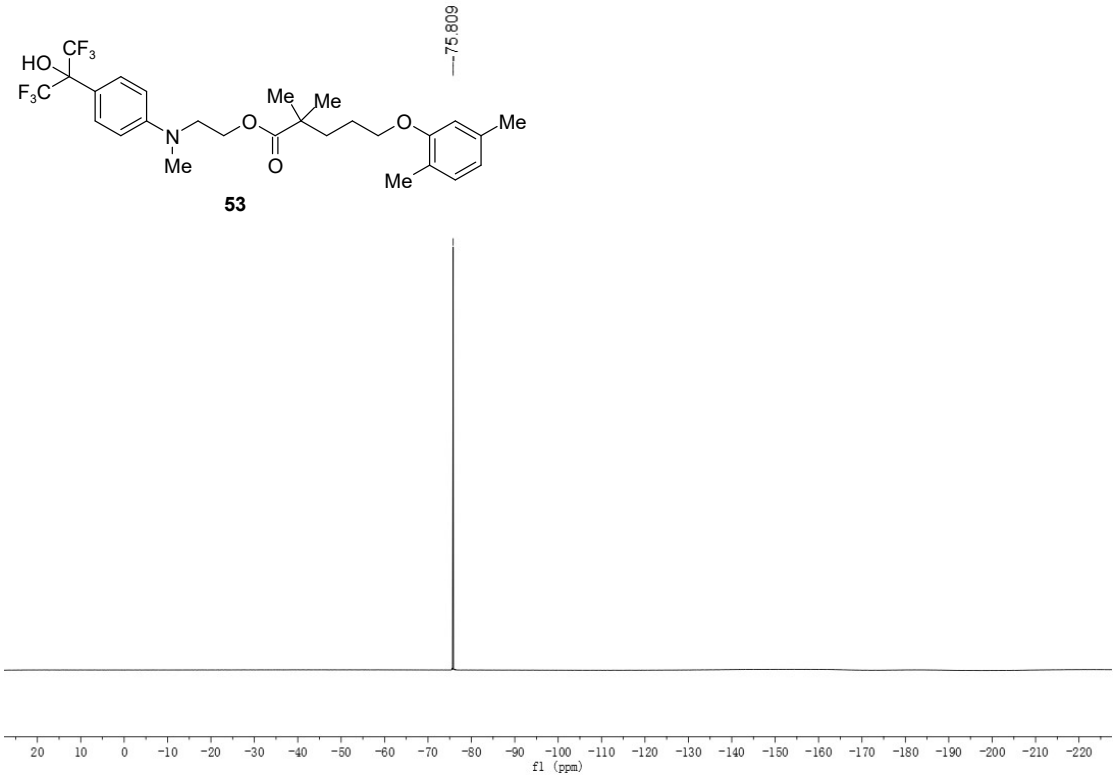
^{13}C NMR (100 MHz, $CDCl_3$) of **52**



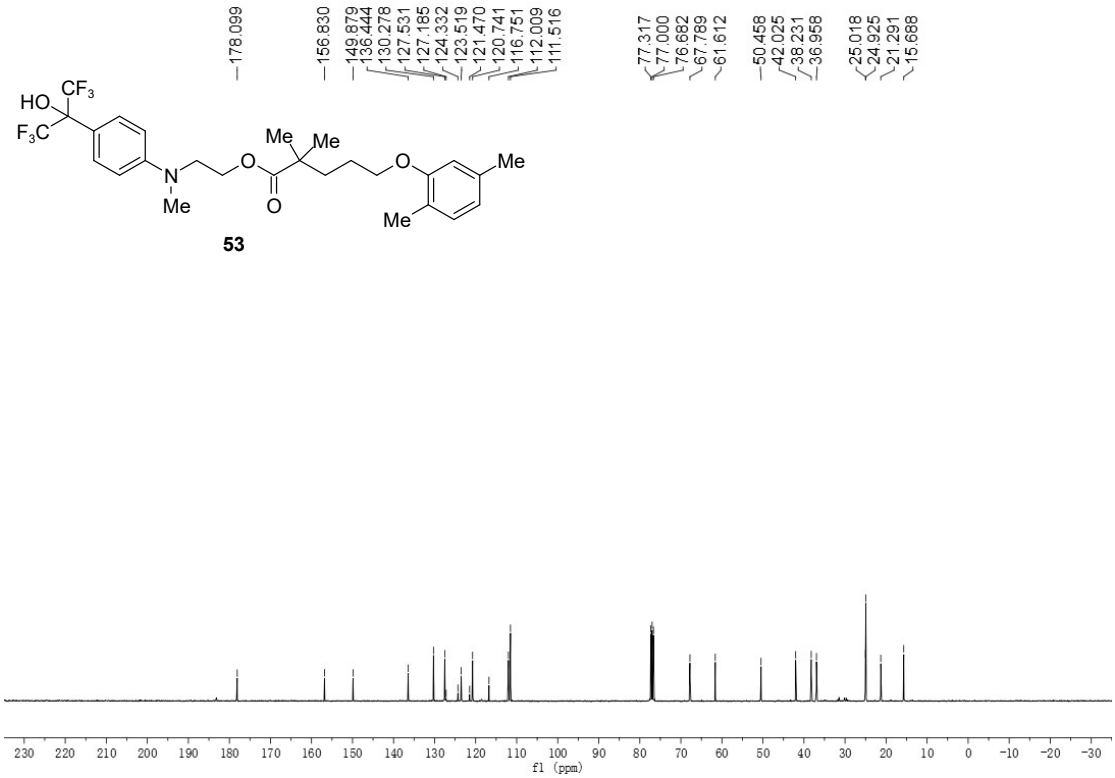
^{1}H NMR (400 MHz, $CDCl_3$) of **53**



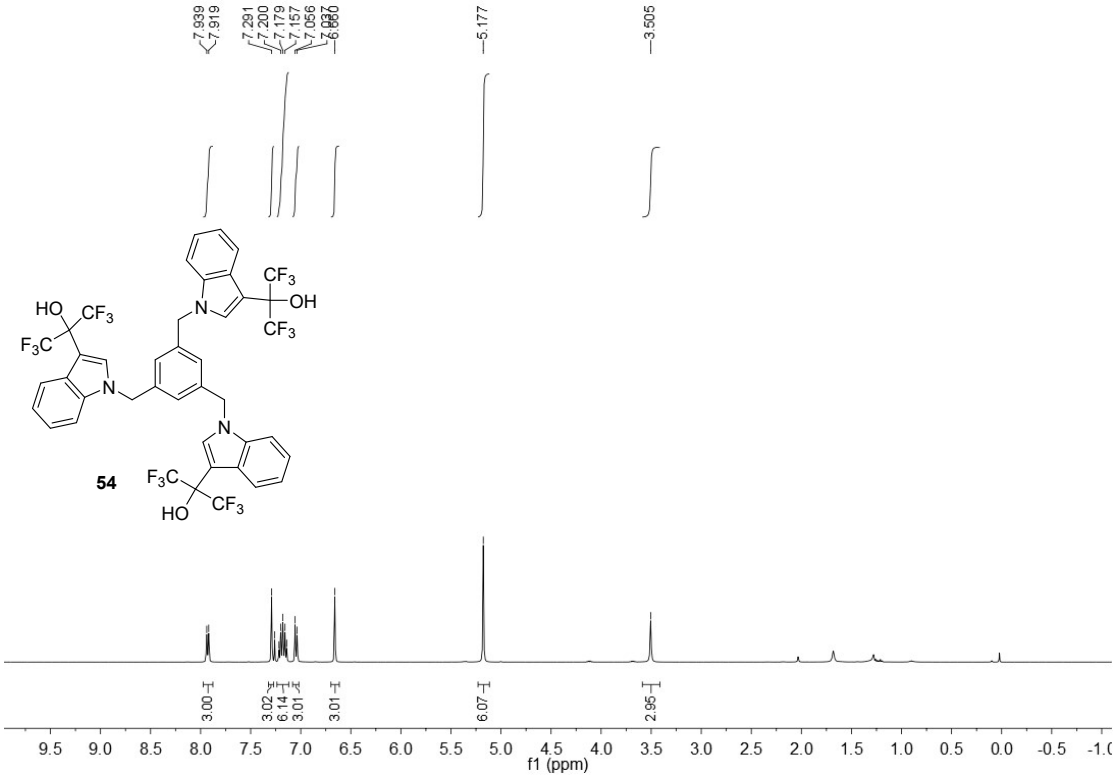
^{19}F NMR (376 MHz, $CDCl_3$) of **53**



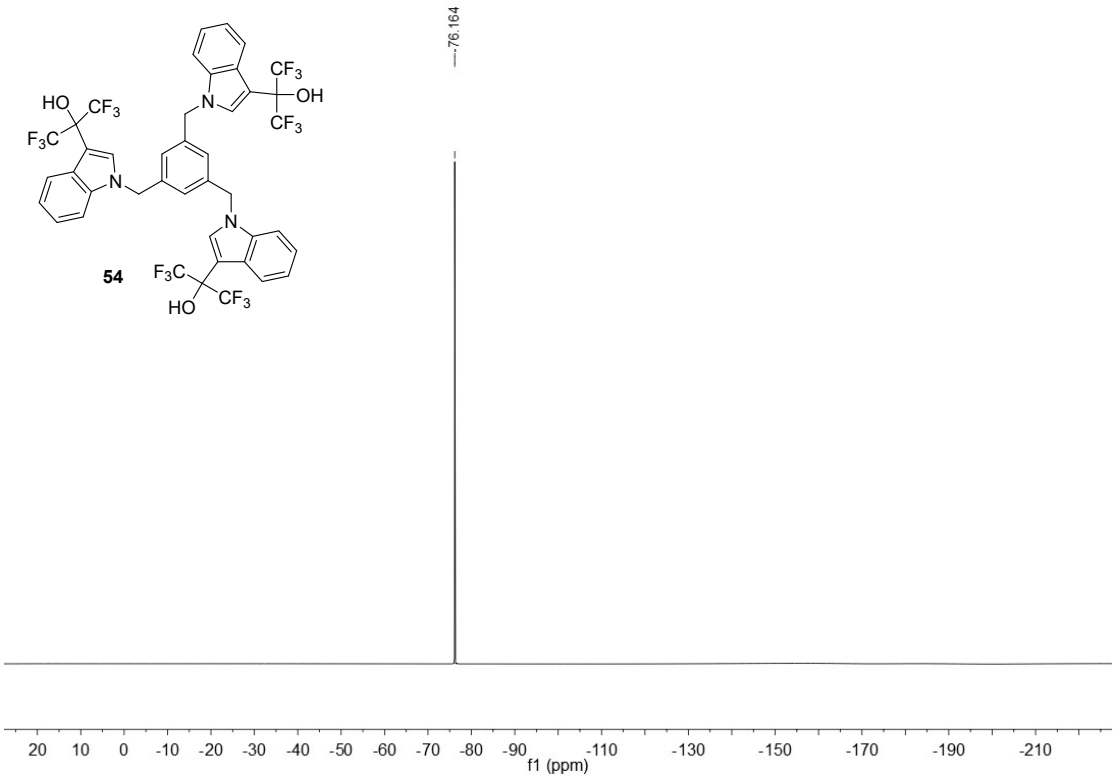
^{13}C NMR (100 MHz, $CDCl_3$) of **53**



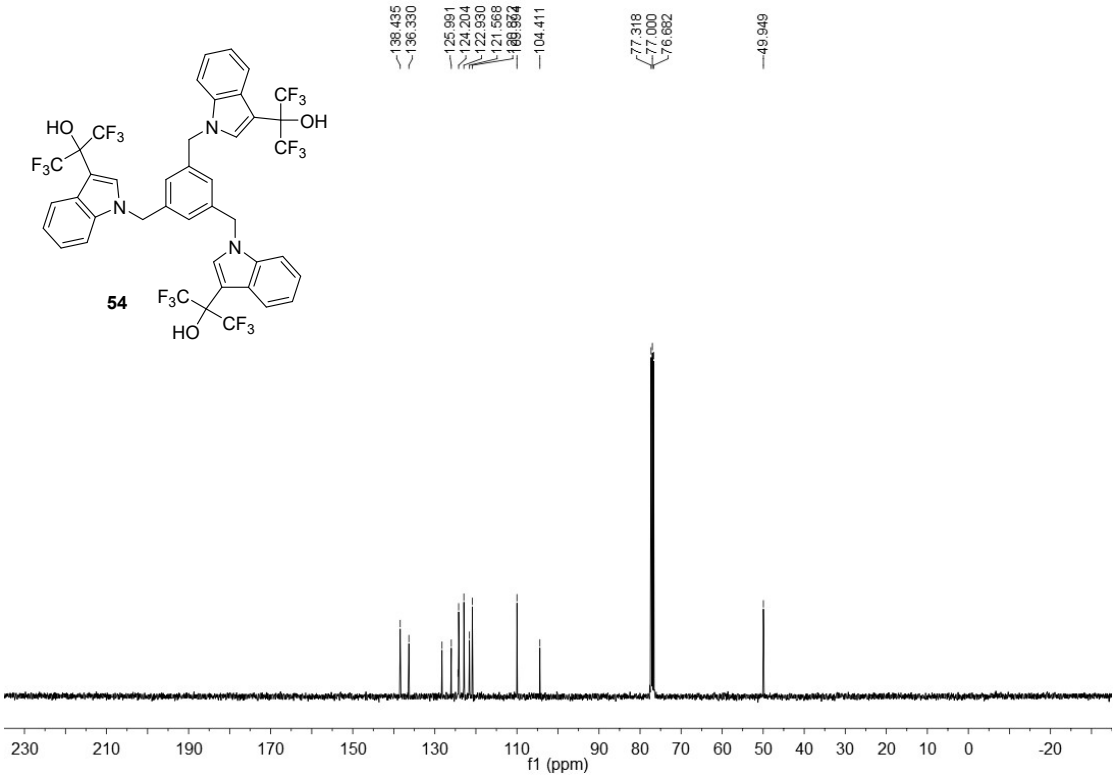
^{1}H NMR (400 MHz, $CDCl_3$) of **54**



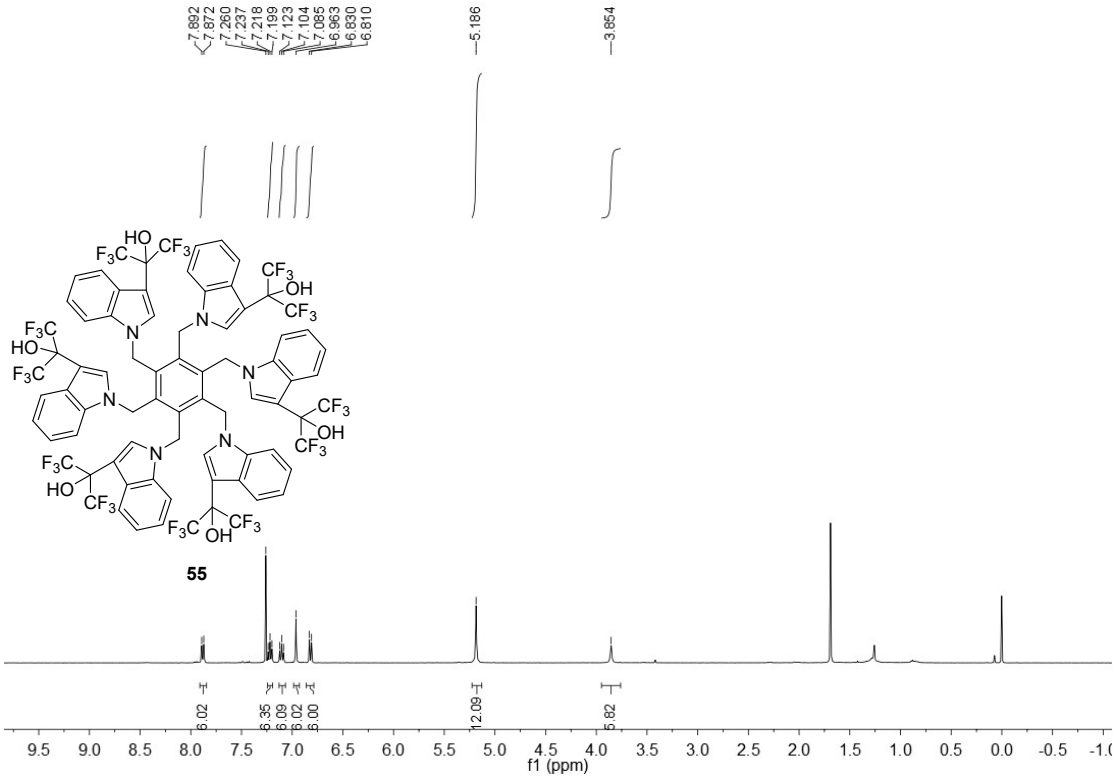
^{19}F NMR (376 MHz, $CDCl_3$) of **54**



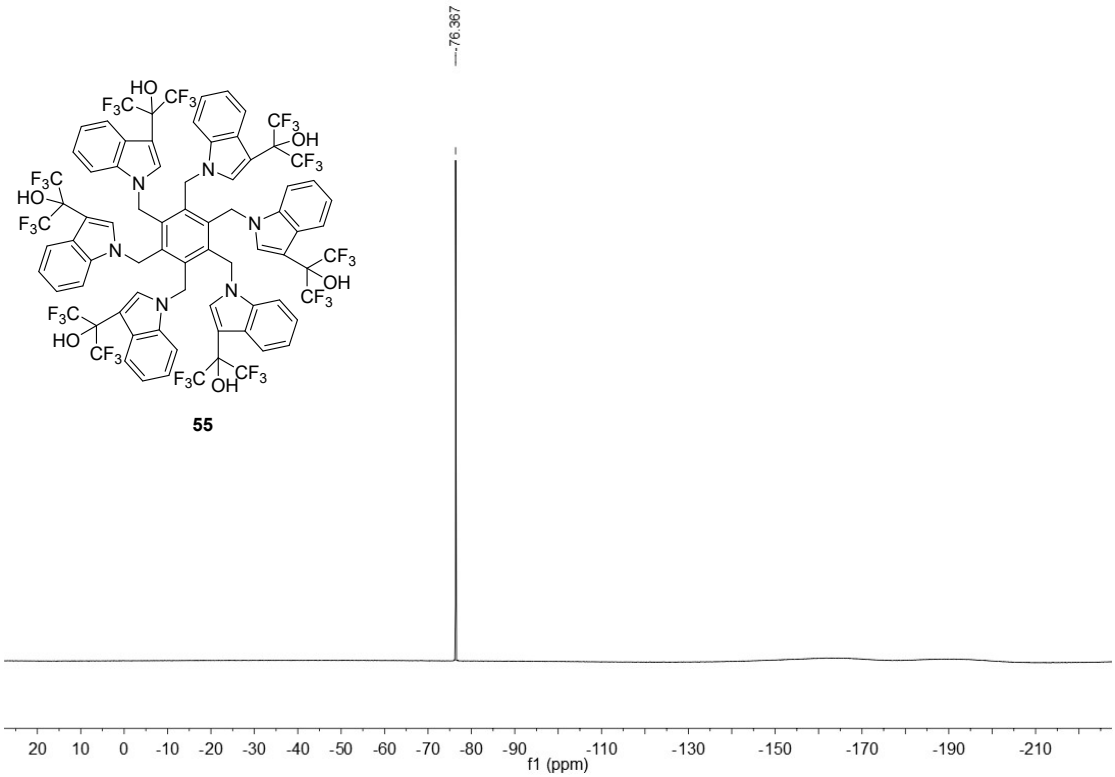
^{13}C NMR (100 MHz, $CDCl_3$) of **54**



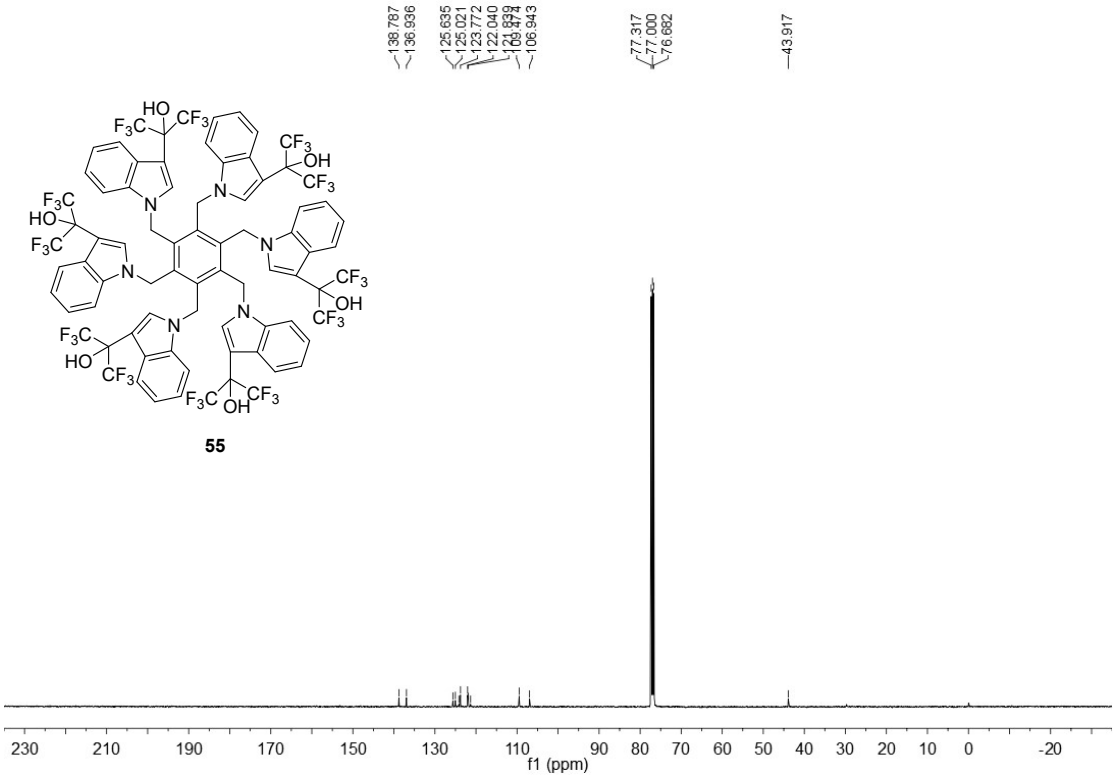
^{1}H NMR (400 MHz, $CDCl_3$) of **55**



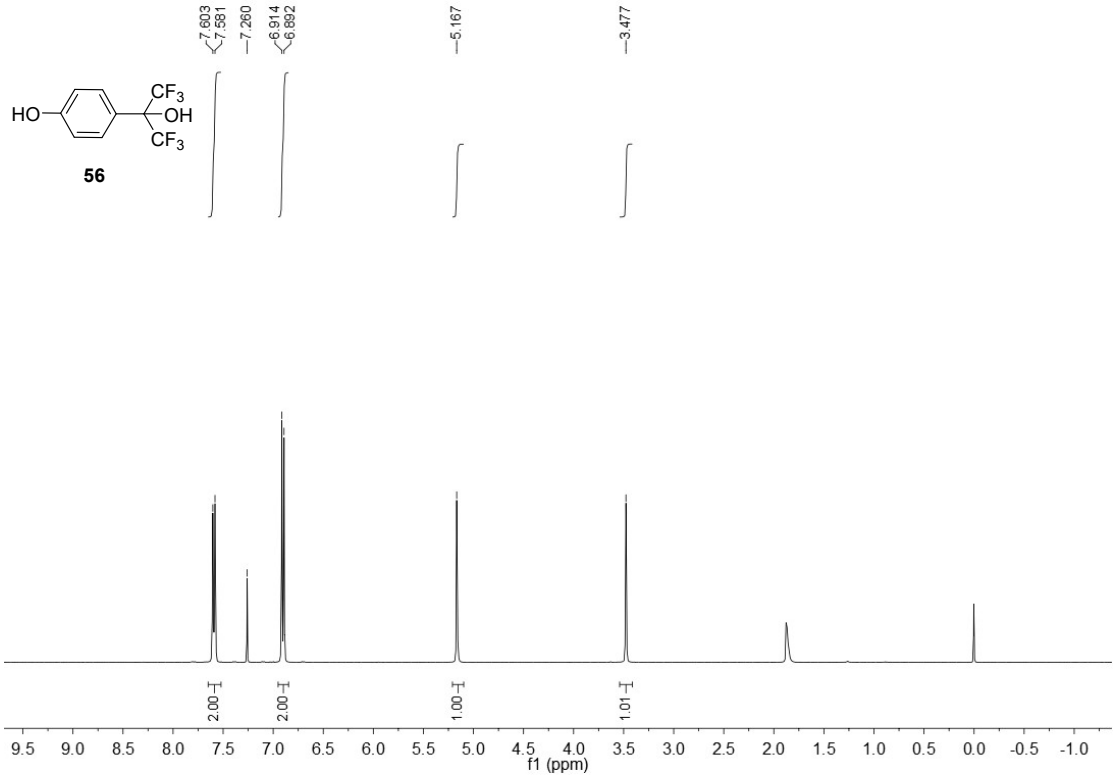
^{19}F NMR (376 MHz, $CDCl_3$) of **55**



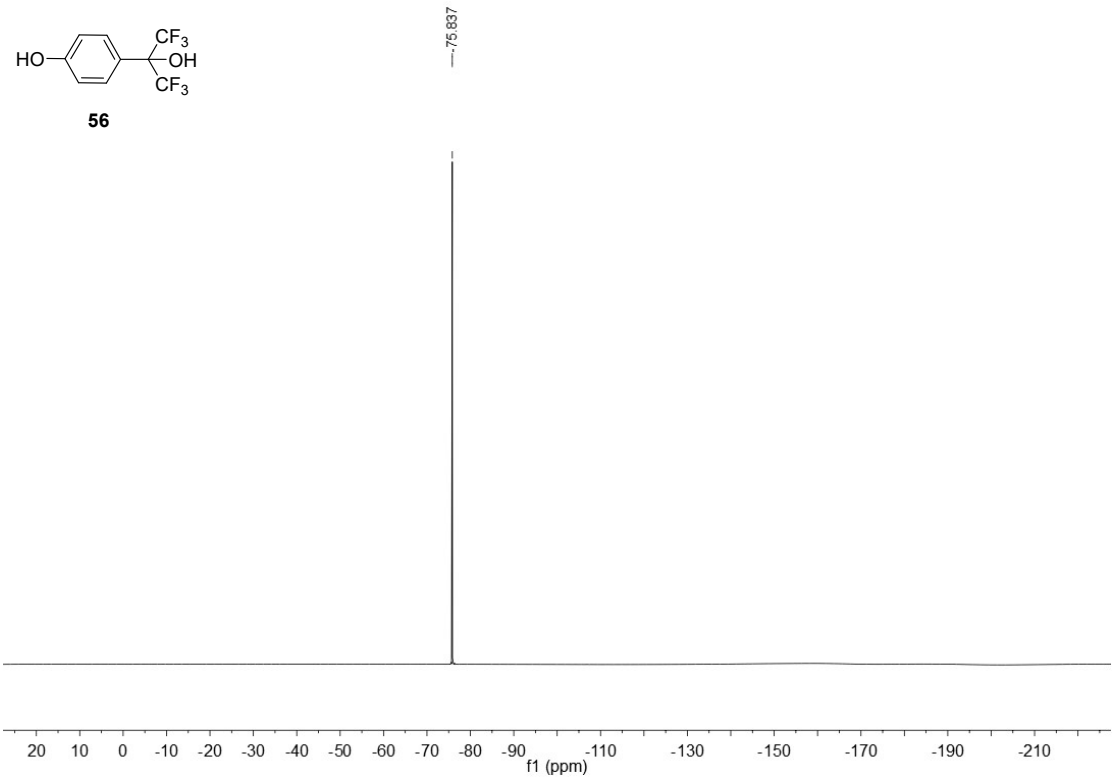
^{13}C NMR (100 MHz, $CDCl_3$) of **55**



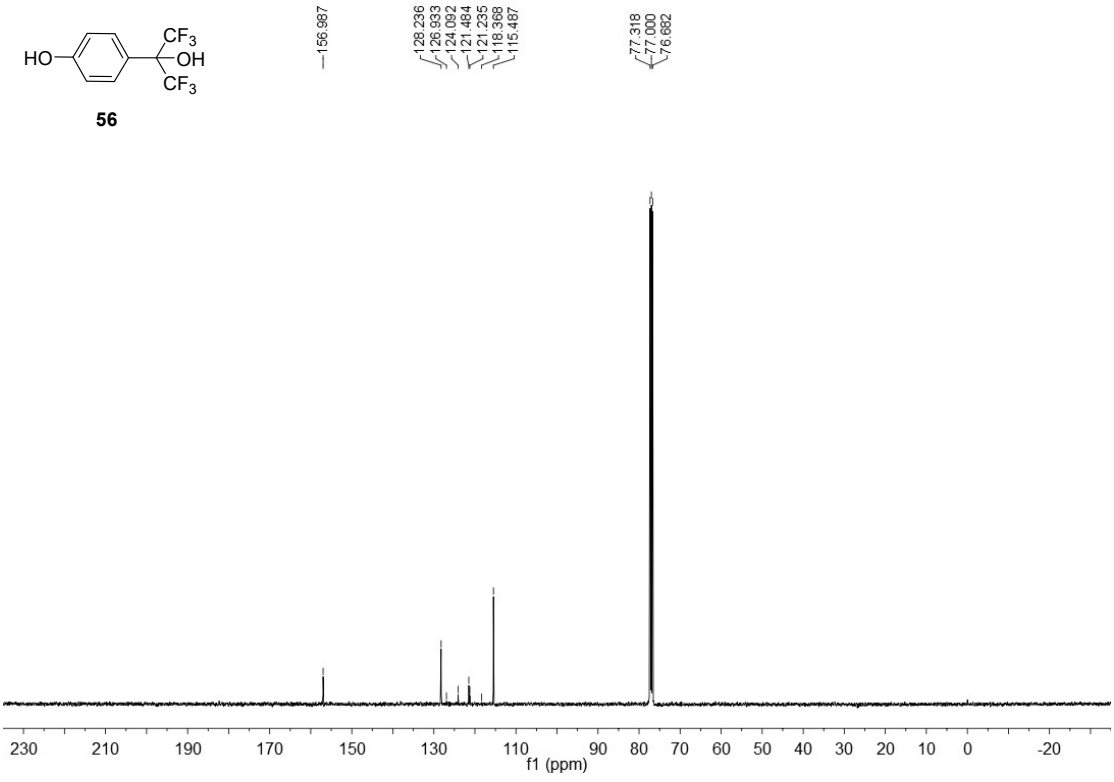
^{1}H NMR (400 MHz, $CDCl_3$) of **56**



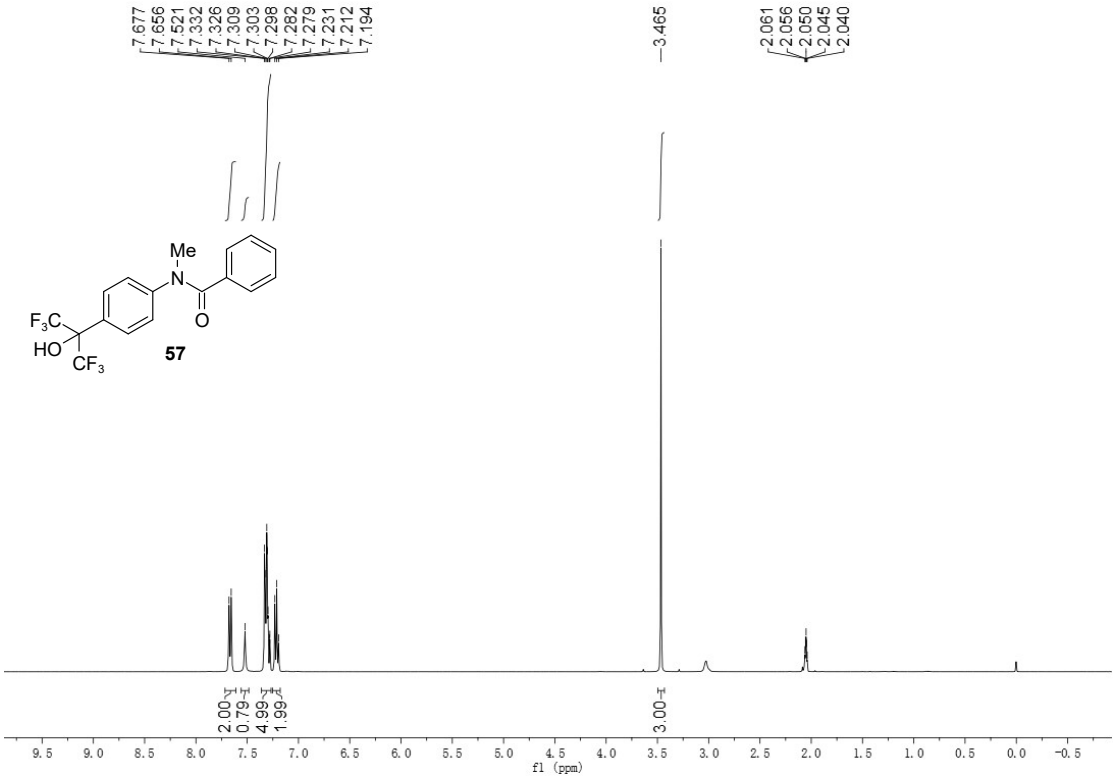
^{19}F NMR (376 MHz, $CDCl_3$) of **56**



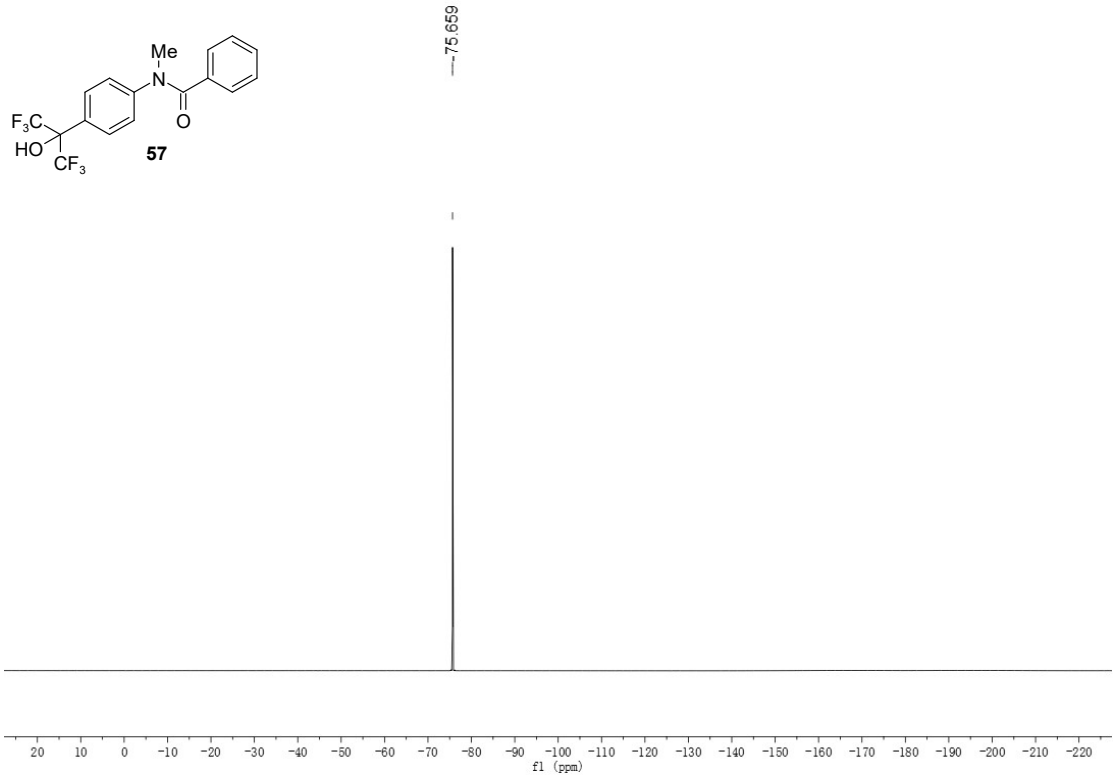
^{13}C NMR (100 MHz, $CDCl_3$) of **56**



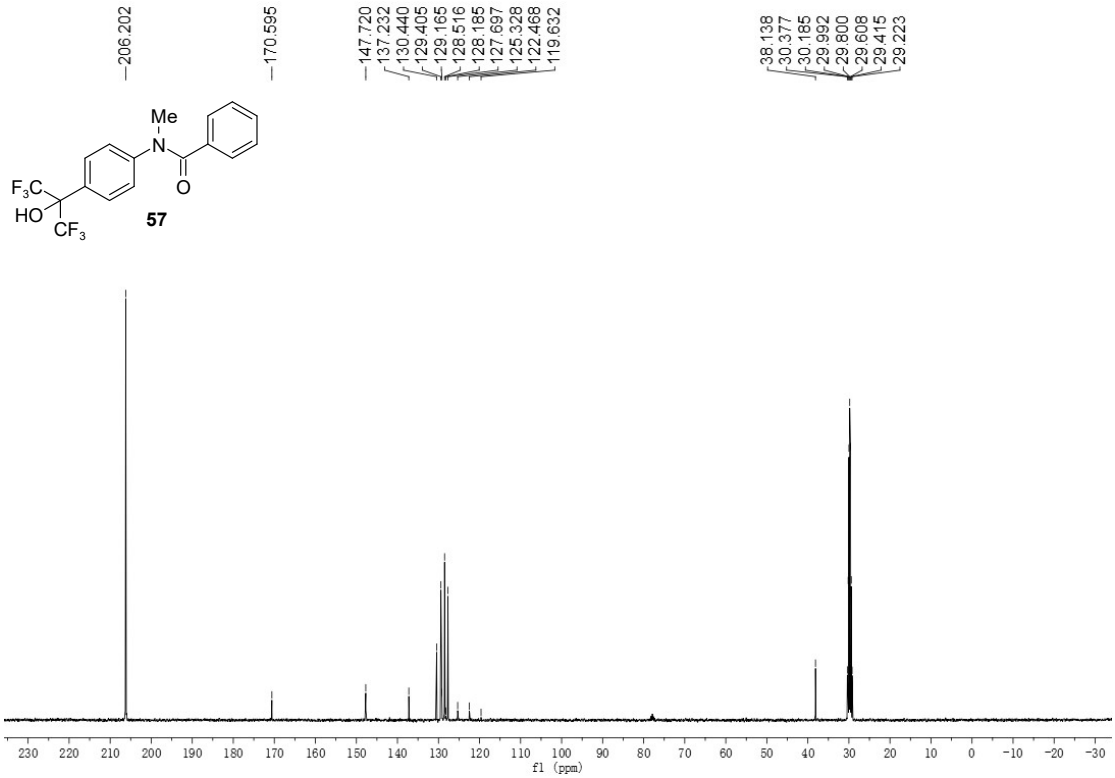
^{1}H NMR (400 MHz, acetone-*d*6) of **57**



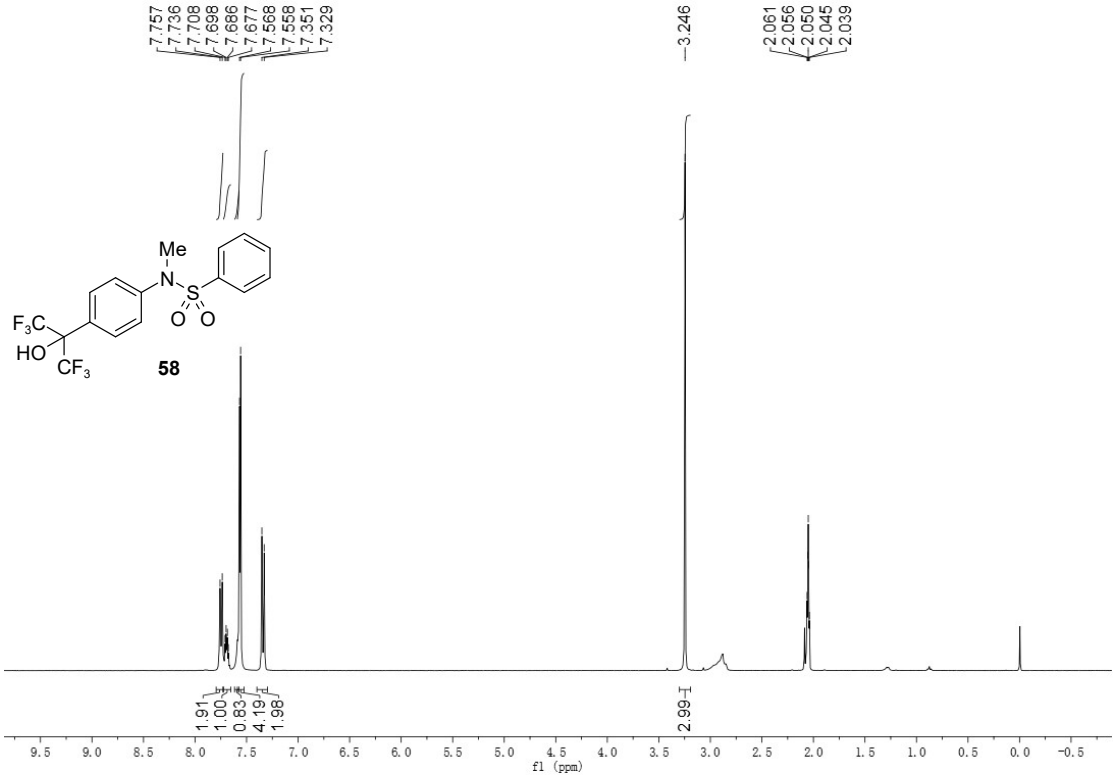
^{19}F NMR (376 MHz, acetone-*d*6) of **57**



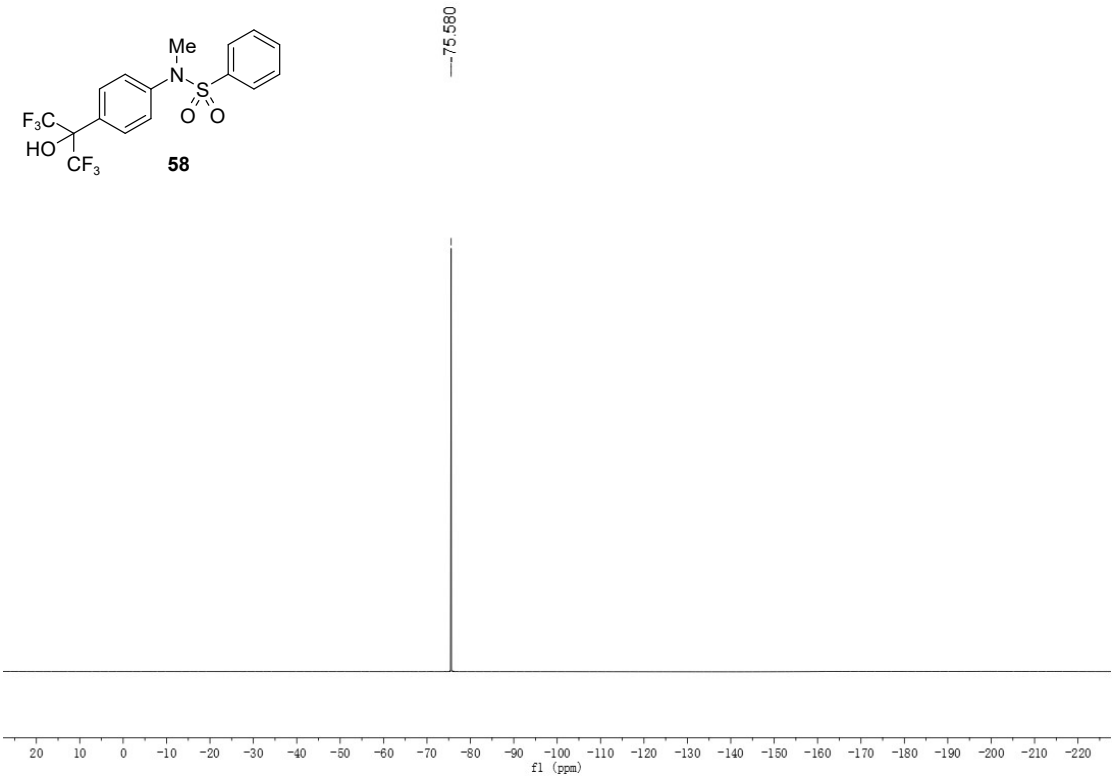
^{13}C NMR (100 MHz, acetone-*d*6) of **57**



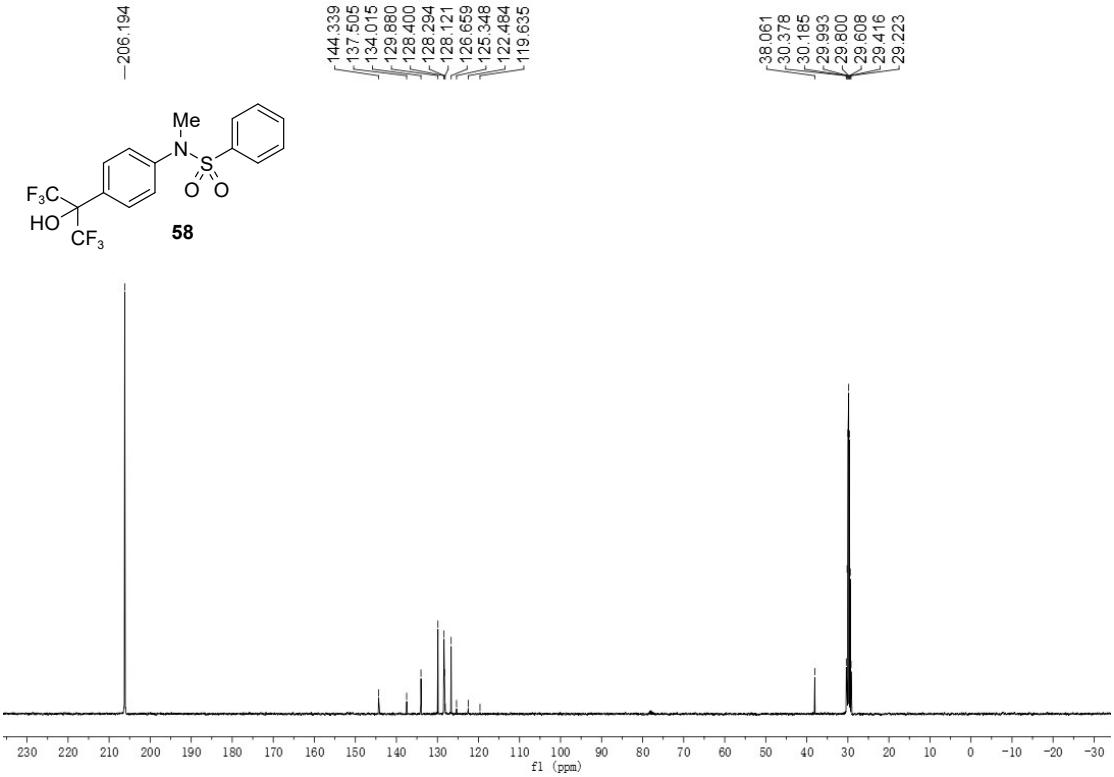
^{1}H NMR (400 MHz, acetone-*d*6) of **58**



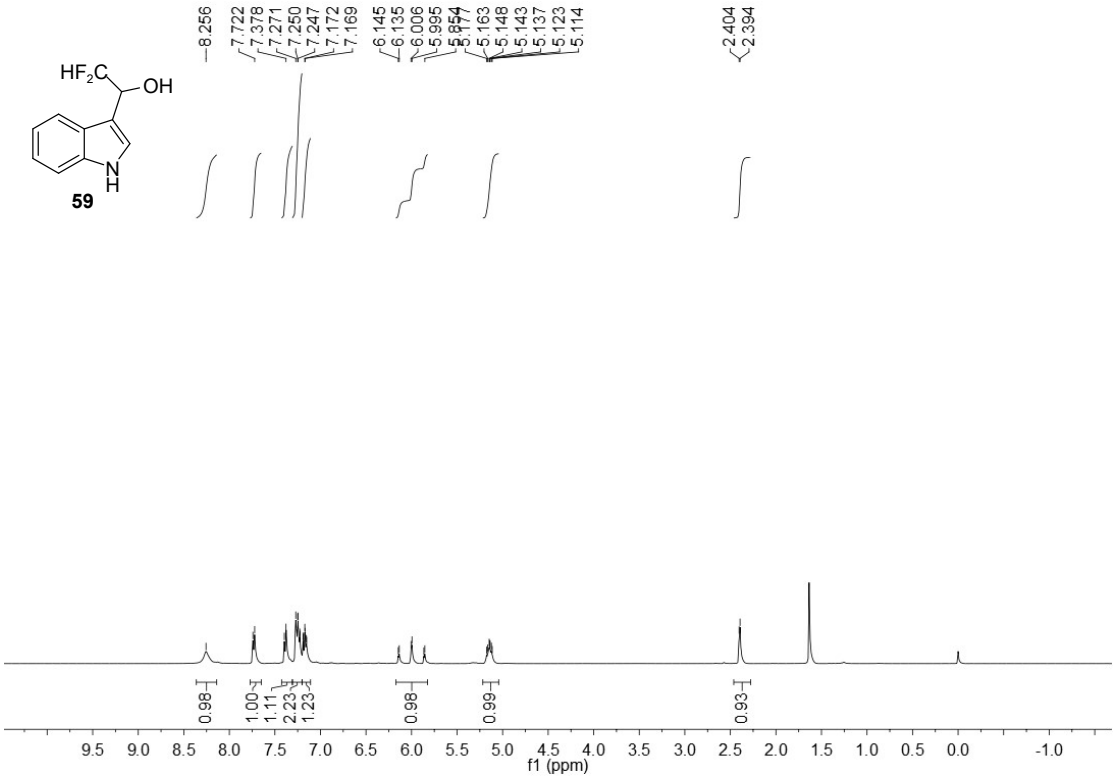
^{19}F NMR (376 MHz, acetone-*d*6) of **58**



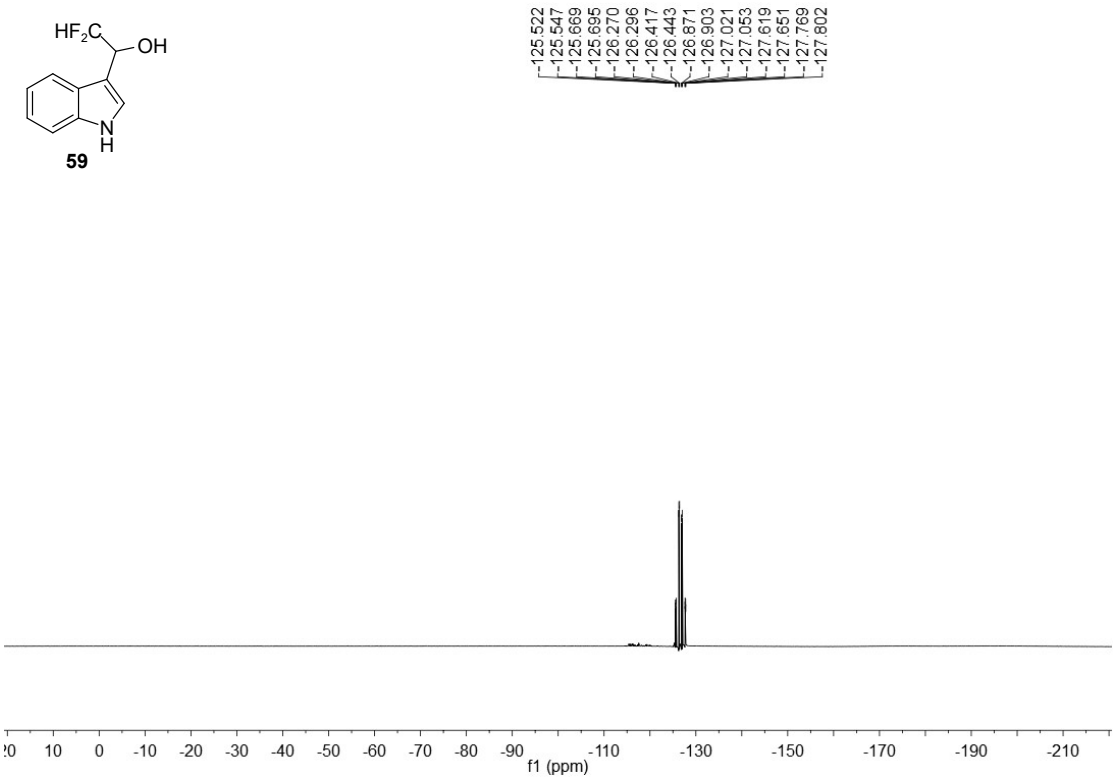
^{13}C NMR (100 MHz, acetone-*d*6) of **58**



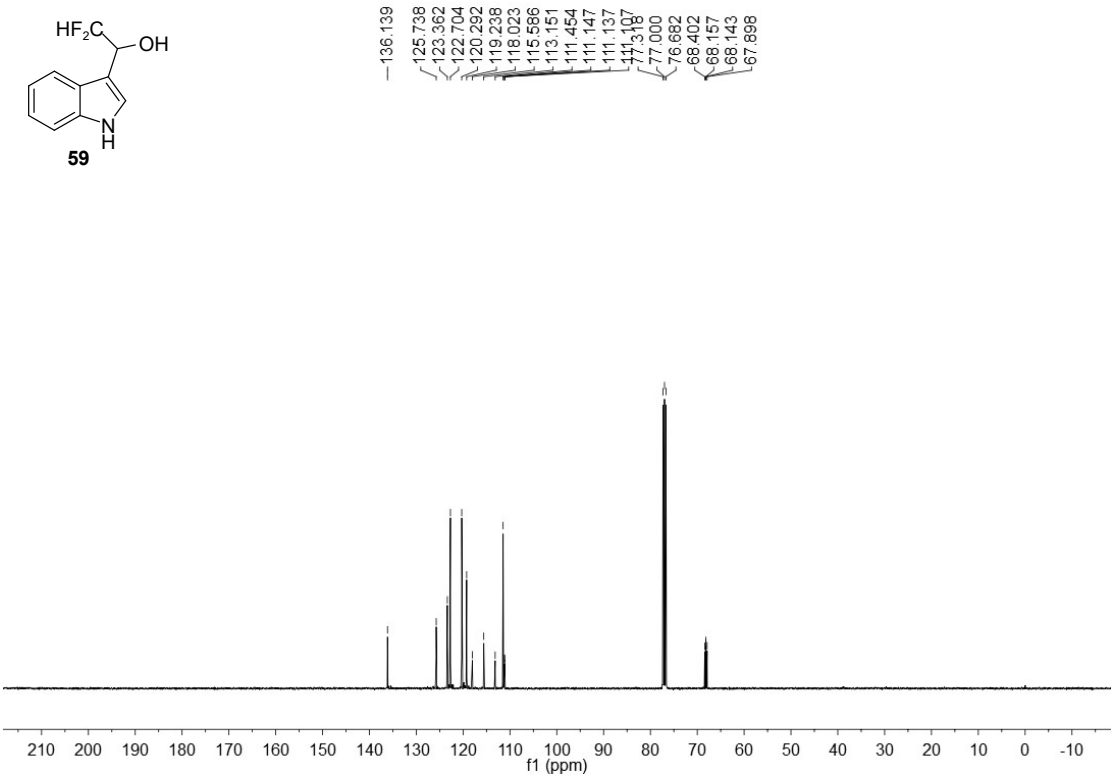
^{1}H NMR (400 MHz, $CDCl_3$) of **59**



^{19}F NMR (376 MHz, $CDCl_3$) of **59**



^{13}C NMR (100 MHz, $CDCl_3$) of **59**



11. References

1. A. L. Whiting, N. M. Neufeld and F. Hof, *Tetrahedron Lett.*, 2009, **50**, 7035–7037.

2. K. Jenett-Siems, I. Köhler, C. Kraft, H. H. Pertz, V. Křen, A. Fišerová, M. Kuzma, J. Ulrichová, U. Bienzle and E. Eich, *Bioorg. Med. Chem.*, 2004, **12**, 817–824.