^{t}BuONa/DMSO-mediated C-O bond cleavage of phenethyl ether derivatives

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Table of Contents

1. General Information 1

2. Optimization of the reaction conditions 1

3. Experimental procedures.....2

4. Mechanistic Studies 15

5. References.....18

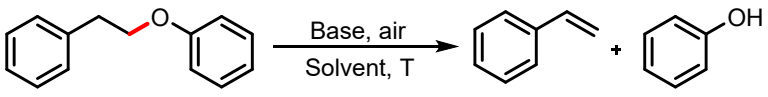
6. NMR spectra of substrates and products 20

1. General Information

Starting materials and reagents were purchased from commercial sources and used as received unless stated otherwise. All reactions under standard conditions were carried out under nitrogen and monitored by thin-layer chromatography (TLC) on gel F254 plates. Purification of reaction products was carried out by flash column chromatography using silica gel 300-400 mesh. Melting points were recorded on a micro melting point apparatus. Proton nuclear magnetic resonance spectra (**^{1}H NMR**) were recorded on a Bruker 400 MHz instrument and chemical shifts are reported in ppm using the solvent as an internal standard ($CDCl_3$ at 7.26 ppm, DMSO-d_6 at 2.50 ppm). Data are reported as app = apparent, s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet; coupling constant(s) in Hz. Proton-decoupled carbon nuclear magnetic resonance spectra (**^{13}C NMR** and **^{19}F NMR**) spectra were recorded on a Bruker 400 MHz and Bruker 600 MHz instrument and chemical shifts are reported in ppm using the solvent as an internal standard ($CDCl_3$ at 77.0 ppm). High-resolution mass spectral analysis (**HRMS**) data were measured on an *Agilent* 7890-5975C spectrometer using the **ESI** technique.

2. Optimization of the reaction conditions

Table 1. Optimization of the reaction conditions[a]



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

Entry	Base(equiv.)	Solvent	T/°C	t/h	Conv.	Yield/%[b]	
						2a	3a
1	K_2CO_3 (4.0)	DMSO	30	4	0	N.R.	N.R.
2	KOH (4.0)	DMSO	30	4	20	17	15
3	NaOH (4.0)	DMSO	30	4	19	17	16
4	MeOK (4.0)	DMSO	30	4	99	79	75
5	^{t}BuOK (4.0)	DMSO	30	4	99	82	81
6	^{t}BuONa (4.0)	DMSO	30	4	99	89	82
7	^{t}BuONa (0.5)	DMSO	30	4	25	25	19
8	^{t}BuONa (1.0)	DMSO	30	4	48	40	36

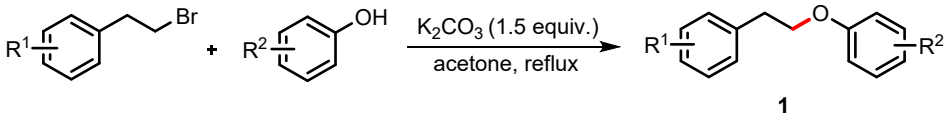
9	^{t}BuONa (2.0)	DMSO	30	4	99	88	83
10	^{t}BuONa (3.0)	DMSO	30	4	99	87	80
11	^{t}BuONa (2.0)	Toluene	30	4	0	N.R.	N.R.
12	^{t}BuONa (2.0)	THF	30	4	0	N.R.	N.R.
13	^{t}BuONa (2.0)	1,4-Dioxane	30	4	0	N.R.	N.R.
14	^{t}BuONa (2.0)	CH_2Cl_2	30	4	0	N.R.	N.R.
15	^{t}BuONa (2.0)	$CHCl_3$	30	4	0	N.R.	N.R.
16	^{t}BuONa (2.0)	Acetone	30	4	0	N.R.	N.R.
17	^{t}BuONa (2.0)	Ethyl ether	30	4	0	N.R.	N.R.
18	^{t}BuONa (2.0)	DMSO	60	4	99	89	80
19	^{t}BuONa (2.0)	DMSO	90	4	99	86	82
20	^{t}BuONa (2.0)	DMSO	120	4	99	58	76
21	^{t}BuONa (2.0)	DMSO	30	1	81	74	66
22	^{t}BuONa (2.0)	DMSO	30	2	99	87	82
23	^{t}BuONa (2.0)	DMSO	30	3	99	89	81

[a]Reaction conditions: **1a** (0.2 mmol, 1.0 equiv.), ^{t}BuONa (0.4 mmol, 2.0 equiv.), DMSO (2.0 mL); [b]GC yields using naphthalene as an internal standard.

3. Experimental procedures

3.1 Preparation of phenethoxybenzene Substrates

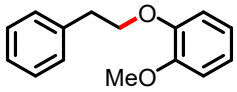
Phenethoxybenzene substrates **1b-1w** were prepared according to literature procedures, as described below.[1]



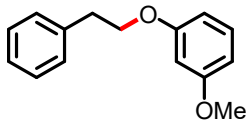
1

Phenol (5.94 mmol, 0.594 g), K_2CO_3 (1.120 g, 8.11 mmol), and acetone (30 mL) were added to a dry 100 mL round bottom flask filled with magnetons, and then the acetone solution containing (2-bromoethyl)benzene (1.00 g, 5.40 mmol) was dissolved, slowly add flask to round bottom. The mixture was stirred at 70 ℃ for 5 h and cooled to room temperature. The reaction mixture was filtered with a silica gel pad, washed with ethyl acetate (20 mL × 3). The combined organic phase was dried with anhydrous Na_2SO_4, filtered and the solvent was evaporated under vacuum. The residues were purified by silica gel column chromatography.

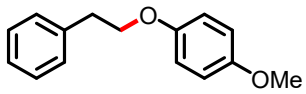
Characterization data for products 1



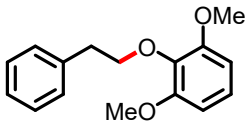
1-methoxy-2-phenethoxybenzene (1b)[2]**:** The title compound was obtained in 68% yield according to reported Procedures, colorless oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.32-7.18 (m, 5H), 6.90-6.85 (m, 4H), 4.19 (t, J = 8.0 Hz, 2H), 3.83 (s, 3H), 3.15 (t, J = 8.0 Hz, 2H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 149.6, 148.4, 138.1, 129.2, 128.6, 126.6, 121.3, 121.0, 113.5, 112.2, 69.9, 56.1, 35.9.



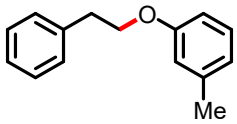
1-methoxy-3-phenethoxybenzene (1c): The title compound was obtained in 72% yield according to reported Procedures, colorless oil. **^{1}H NMR** (600 MHz, $CDCl_3$) δ: 7.31-7.24 (m, 4H), 7.23-7.19 (m, 1H), 7.14 (t, J = 8.2 Hz, 1H), 6.48 (d, J = 2.4 Hz, 1H), 6.47 (d, J = 2.4 Hz, 1H), 6.44 (t, J = 2.4 Hz, 1H), 4.13 (t, J = 7.2 Hz, 2H), 3.74 (s, 2H), 3.06 (t, J = 7.1 Hz, 2H); **^{13}C NMR** (151 MHz, $CDCl_3$) δ: 160.8, 160.0, 138.2, 129.8, 129.0, 128.5, 126.5, 106.7, 106.4, 101.0, 68.6, 55.2, 35.7.



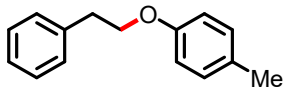
1-methoxy-4-phenethoxybenzene (1d)[3]**:** The title compound was obtained in 66% yield according to reported Procedures, white solid. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.33-7.21 (m, 5H), 6.85-6.79 (m, 4H), 4.12 (t, J = 8.0 Hz, 2H), 3.75 (s, 3H), 3.07 (t, J = 8.0 Hz, 2H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 153.9, 153.0, 138.4, 129.0, 128.5, 126.5, 115.6, 114.7, 69.4, 55.8, 35.9.



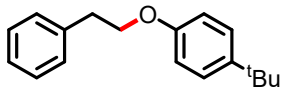
1,3-dimethoxy-2-phenethoxybenzene (1e): The title compound was obtained in 59% yield according to reported Procedures, colorless oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.29-7.15 (m, 5H), 6.95 (t, J = 8.0 Hz, 1H), 6.54 (d, J = 8.0 Hz, 2H), 4.19 (t, J = 8.0 Hz, 2H), 3.78 (s, 3H), 3.10 (t, J = 8.0 Hz, 2H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 153.8, 138.6, 137.3, 129.1, 128.4, 126.2, 123.7, 105.5, 74.0, 56.1, 36.7.



1-methyl-3-phenethoxybenzene (1f): The title compound was obtained in 71% yield according to reported Procedures, colorless oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.29-7.09 (m, 6H), 6.73-6.66 (m, 3H), 4.09 (t, J = 8.0 Hz, 2H), 3.04 (t, J = 8.0 Hz, 2H), 2.27 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 159.1, 139.6, 138.6, 129.4, 129.2, 128.7, 126.7, 121.8, 115.7, 111.6, 68.7, 36.1, 21.7.

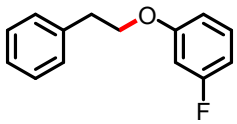


1-methyl-4-phenethoxybenzene (1g)[4]**:** The title compound was obtained in 51% yield according to reported Procedures, colorless oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.31-7.18 (m, 5H), 7.04 (d, J = 8.0 Hz, 2H), 6.79-6.76 (m, 2H), 4.11 (t, J = 8.0 Hz, 2H), 3.06 (t, J = 8.0 Hz, 2H), 2.26 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 156.8, 138.5, 130.0, 129.1, 128.6, 126.6, 114.6, 68.9, 36.0, 20.6.



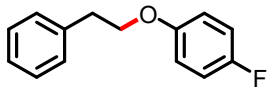
1-(*tert*-butyl)-4-phenethoxybenzene (1h): The title compound was obtained in 48% yield according to reported Procedures, colorless oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.32-7.16 (m, 7H), 6.83 (d, J = 8.0 Hz, 2H), 4.14 (t, J = 8.0 Hz, 2H), 3.07 (t, J = 8.0 Hz, 2H), 1.28 (s, 9H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 156.7, 143.5, 138.5, 129.1, 128.6, 126.6, 126.3, 114.1, 68.7, 36.0, 34.2, 31.6.

1-fluoro-2-phenethoxybenzene (1i): The title compound was obtained in 57% yield according to reported Procedures, colorless oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.33-7.20 (m, 5H), 7.08-6.98 (m, 2H), 6.93-6.83 (m, 2H), 4.20 (t, J = 8.0 Hz, 2H), 3.12 (t, J = 8.0 Hz, 2H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 152.9 (d, J = 246.4 Hz), 146.9 (d, J = 11.1 Hz), 138.0, 129.2, 128.6, 126.7, 124.3 (d, J = 4.0 Hz), 121.2 (d, J = 7.0 Hz), 116.3 (d, J = 18.2 Hz), 115.1, 70.2, 35.9. **HRMS-ESI** (m/z): $[M+Na]^+$ calcd for $C_{14}H_{13}OF$, 239.0848; found, 239.0850.

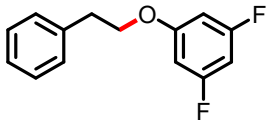


1-fluoro-3-phenethoxybenzene (1j): The title compound was obtained in 62% yield according to reported Procedures, colorless oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.30-7.10 (m, 6H), 6.64-6.55 (m, 3H), 6.07 (t, J = 8.0 Hz, 2H), 3.03 (t, J = 8.0 Hz, 2H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 163.8

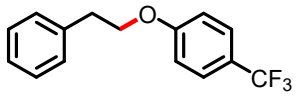
(d, J = 246.4 Hz), 160.4 (d, J = 11.1 Hz), 138.2, 130.3 (d, J = 10.1 Hz), 129.2, 128.7, 126.8, 110.5 (d, J = 3.0 Hz), 107.6 (d, J = 21.2 Hz), 102.4 (d, J = 24.2 Hz), 69.0, 39.8. **HRMS-ESI** (m/z): $[M+Na]^+$ calcd for $C_{14}H_{13}OF$, 239.0848; found, 239.0854.



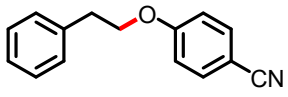
1-fluoro-4-phenethoxybenzene (1k): The title compound was obtained in 60% yield according to reported Procedures, colorless oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.33-7.19 (m, 5H), 6.96-6.90 (m, 2H), 6.82-6.78 (m, 2H), 4.10 (t, J = 8.0 Hz, 2H), 3.06 (t, J = 8.0 Hz, 2H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 157.3 (d, J = 239.4 Hz), 155.0 (d, J = 3.0 Hz), 138.2, 129.1, 128.6, 126.6, 115.8 (d, J = 23.2 Hz), 115.5 (d, J = 8.1 Hz), 69.4, 35.9. **HRMS-ESI** (m/z): $[M+Na]^+$ calcd for $C_{14}H_{13}OF$, 239.0848; found, 239.0850.



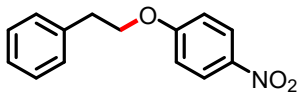
1,3-difluoro-5-phenethoxybenzene (1l): The title compound was obtained in 62% yield according to reported Procedures, colorless oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.32-7.16 (m, 5H), 6.41-6.33 (m, 3H), 4.07 (t, J = 8.0 Hz, 2H), 3.04 (t, J = 8.0 Hz, 2H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 163.8 (dd, J_1 = 247.0 Hz, J_2 = 15.2 Hz), 160.9 (t, J = 13.6 Hz), 137.8, 129.1, 128.7, 126.8, 98.4 (dd, J_1 = 21.2 Hz, J_2 = 8.0 Hz), 96.4 (t, J = 26.3 Hz), 69.3, 35.6. **HRMS-ESI** (m/z): $[M+H]^+$ calcd for $C_{14}H_{12}OF_2$, 235.0934; found, 235.0935.



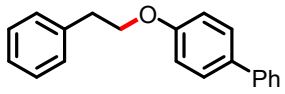
1-phenethoxy-4-(trifluoromethyl)benzene (1m)[4]**:** The title compound was obtained in 68% yield according to reported Procedures, colorless oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.49 (d, J = 8.0 Hz, 2H), 7.32-7.20 (m, 5H), 6.90 (d, J = 8.0 Hz, 2H), 4.15 (t, J = 8.0 Hz, 2H), 3.08 (t, J = 8.0 Hz, 2H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 161.2, 137.8, 129.0, 128.6, 126.9 (q, J = 4.0 Hz), 126.7, 124.4 (q, J = 271.7. Hz), 122.9 (q, J = 32.3 Hz), 114.5, 68.8, 35.6.



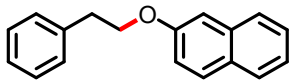
4-phenethoxybenzonitrile (1n)[5]**:** The title compound was obtained in 74% yield according to reported Procedures, white solid. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.57-7.54 (m, 2H), 7.35-7.23 (m, 5H), 6.94-6.91 (m, 2H), 4.21 (t, J = 8.0 Hz, 2H), 3.11 (t, J = 8.0 Hz, 2H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 162.1, 137.6, 134.0, 129.0, 128.7, 126.8, 119.3, 115.3, 104.0, 69.0, 35.5.



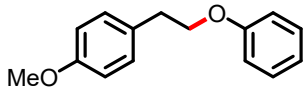
1-nitro-4-phenethoxybenzene (1o)[6]**:** The title compound was obtained in 78% yield according to reported Procedures, yellow solid. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 8.18-8.15 (m, 2H), 7.35-7.24 (m, 5H), 6.94-6.91 (m, 2H), 4.26 (t, J = 8.0 Hz, 2H), 3.13 (t, J = 8.0 Hz, 2H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 163.9, 141.5, 137.5, 129.0, 128.7, 126.9, 126.0, 114.5, 69.5, 35.5.



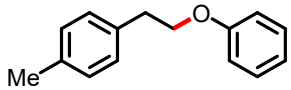
4-phenethoxy-1,1'-biphenyl (1p): The title compound was obtained in 65% yield according to reported Procedures, colorless oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.55-7.49 (m, 4H), 7.41 (t, J = 8.0 Hz, 2H), 7.35-7.23 (m, 6H), 6.97 (d, J = 8.0Hz, 2H), 4.21 (t, J = 8.0 Hz, 2H), 3.12 (t, J = 8.0 Hz, 2H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 158.4, 140.9, 138.3, 133.9, 129.1, 128.8, 128.6, 128.2, 126.8, 126.7, 126.6, 114.9, 68.8, 35.8.



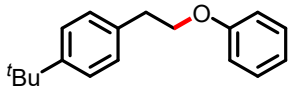
2-phenethoxynaphthalene (1q)[4]**:** The title compound was obtained in 75% yield according to reported Procedures, colorless oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.76-7.68 (m, 3H), 7.44-7.39 (m, 1H), 7.36-7.23 (m, 6H), 7.16-7.12 (m, 2H), 4.28 (t, J = 8.0 Hz, 2H), 3.16 (t, J = 8.0 Hz, 2H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 156.8, 138.3, 134.6, 129.4, 129.1, 128.6, 127.7, 126.8, 126.6, 126.4, 123.6, 119.0, 106.8, 68.7, 35.8.



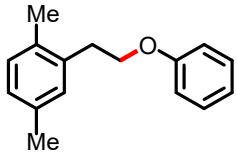
1-methoxy-4-(2-phenoxyethyl)benzene (1r)[7]**:** The title compound was obtained in 44% yield according to reported Procedures, colorless oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.26-7.15 (m, 4H), 6.92-6.81 (m, 5H), 4.08 (t, J = 8.0 Hz, 2H), 3.73 (s, 3H), 3.00 (t, J = 8.0 Hz, 2H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 159.0, 158.4, 130.4, 130.1, 129.6, 120.8, 114.7, 114.1, 68.9, 55.3, 35.0.



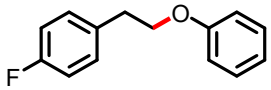
1-methyl-4-(2-phenoxyethyl)benzene (1s)[8]**:** The title compound was obtained in 52% yield according to reported Procedures, colorless oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.23 (t, J = 8.0 Hz, 2H), 7.12 (dd, J = 8.0, 20.0 Hz, 4H), 6.91-6.85 (m, 3H), 4.09 (t, J = 8.0 Hz, 2H), 3.02 (t, J = 8.0 Hz, 2H), 2.30 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 159.0, 136.1, 135.3, 129.6, 129.4, 129.1, 120.9, 114.7, 68.9, 35.5, 21.2.



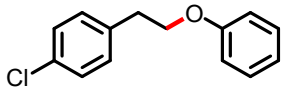
1-(*tert*-butyl)-4-(2-phenoxyethyl)benzene (1t)[9]**:** The title compound was obtained in 49% yield according to reported Procedures, colorless oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.32 (d, J = 8.0 Hz, 2H), 7.26-7.19 (m, 4H), 6.92-6.87 (m, 3H), 4.12 (t, J = 8.0 Hz, 2H), 3.05 (t, J = 8.0 Hz, 2H), 1.30 (s, 9H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 159.0, 149.4, 135.3, 129.6, 128.9, 125.6, 120.8, 114.7, 68.8, 35.4, 34.6, 31.6.



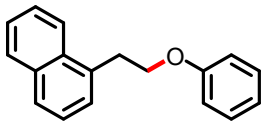
1,4-dimethyl-2-(2-phenoxyethyl)benzene (1u): The title compound was obtained in 22% yield according to reported Procedures, colorless oil. **^{1}H NMR** (600 MHz, $CDCl_3$) δ: 7.17 (dd, J = 8.7, 7.2 Hz, 2H), 6.96 (d, J = 7.7 Hz, 1H), 6.94 (s, 1H), 6.89-6.77 (m, 4H), 4.02 (t, J = 7.6 Hz, 2H), 2.98 (t, J = 7.5 Hz, 2H), 2.23 (s, 3H), 2.21 (s, 3H); **^{13}C NMR** (151 MHz, $CDCl_3$) δ: 158.8, 136.0, 135.5, 133.3, 130.3, 130.2, 129.4, 127.3, 120.6, 114.5, 67.7, 33.1, 20.9, 18.9. **HRMS-ESI** (m/z): $[M+H]^+$ calcd for $C_{16}H_{18}O$, 227.1430; found, 227.1421.



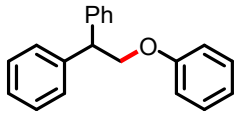
1-fluoro-4-(2-phenoxyethyl)benzene (1v)[9]**:** The title compound was obtained in 41% yield according to reported Procedures, colorless oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.22-7.13 (m, 4H), 6.91 (t, J = 8.7 Hz, 2H), 6.86 (t, J = 7.3 Hz, 1H), 6.81 (d, J = 7.5 Hz, 2H), 4.06 (t, J = 6.9 Hz, 2H), 2.98 (t, J = 6.9 Hz, 2H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 161.7 (d, J = 244.4 Hz), 158.7, 134.0 (d, J = 3.2 Hz), 130.4 (d, J = 7.7 Hz), 129.4, 120.8, 115.2 (d, J = 21.2 Hz), 114.5, 68.5, 35.0.



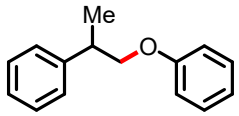
1-chloro-4-(2-phenoxyethyl)benzene (1w): The title compound was obtained in 38% yield according to reported Procedures, colorless oil. **^{1}H NMR** (600 MHz, $CDCl_3$) δ: 7.22-7.17 (m, 4H), 7.14 (d, J = 8.4 Hz, 2H), 6.86 (t, J = 7.4 Hz, 1H), 6.81 (d, J = 7.7 Hz, 2H), 4.07 (t, J = 6.8 Hz, 2H), 2.98 (t, J = 6.8 Hz, 2H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 158.7, 136.9, 132.3, 130.4, 129.5, 128.6, 120.9, 114.6, 68.2, 35.2. **HRMS-ESI** (m/z): $[M+H]^+$ calcd for $C_{14}H_{13}OCl$, 233.0733; found, 233.0730.



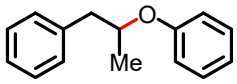
1-(2-phenoxyethyl)naphthalene (1x)[9]**:** The title compound was obtained in 46% yield according to reported Procedures, colorless oil. **^{1}H NMR** (600 MHz, $CDCl_3$) δ: 8.03 (d, J = 8.3 Hz, 1H), 7.80 (d, J = 8.0 Hz, 1H), 7.69 (dd, J = 6.6, 2.8 Hz, 1H), 7.49-7.39 (m, 2H), 7.38-7.33 (m, 2H), 7.23-7.15 (m, 2H), 6.86 (t, J = 7.4 Hz, 1H), 6.84-6.81 (m, 2H), 4.23 (t, J = 7.5 Hz, 2H), 3.51 (t, J = 7.4 Hz, 2H); **^{13}C NMR** (151 MHz, $CDCl_3$) δ: 158.7, 134.1, 133.9, 132.1, 129.5, 128.8, 127.3, 127.0, 126.1, 125.6, 125.5, 123.6, 120.7, 114.5, 67.9, 32.9.



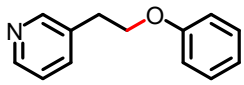
(2-phenoxyethane-1,1-diyl)dibenzene (1y): The title compound was obtained in 35% yield according to reported Procedures, colorless oil. **^{1}H NMR** (600 MHz, $CDCl_3$) δ: 7.25-7.11 (m, 12H), 6.85 (t, J = 7.3 Hz, 1H), 6.80 (d, J = 8.1 Hz, 2H), 4.42 (dd, J = 8.3, 5.8 Hz, 1H), 4.40-4.38 (m, 2H); **^{13}C NMR** (151 MHz, $CDCl_3$) δ: 158.7, 141.6, 129.4, 128.5, 128.4, 126.6, 120.9, 114.7, 70., 50.4. **HRMS-ESI** (m/z): $[M+H]^+$ calcd for $C_{20}H_{18}O$, 275.1430; found, 275.1445.



(1-phenoxypropan-2-yl)benzene (1z): The title compound was obtained in 57% yield according to reported Procedures, colorless oil. **^{1}H NMR** (600 MHz, $CDCl_3$) δ: 7.28-7.10 (m, 7H), 6.84 (t, J = 7.3 Hz, 1H), 6.80 (d, J = 7.6 Hz, 2H), 4.00 (dd, J = 9.1, 5.9 Hz, 1H), 3.86 (dd, J = 9.1, 7.9 Hz, 1H), 3.15 (h, J = 7.0 Hz, 1H), 1.33 (d, J = 7.0 Hz, 3H); **^{13}C NMR** (151 MHz, $CDCl_3$) δ: 158.9, 143.6, 129.4, 128.4, 127.4, 126.6, 120.6, 114.6, 73.3, 39.5, 18.2.**HRMS-ESI** (m/z): $[M+H]^+$ calcd for $C_{15}H_{16}O$, 213.1274; found, 213.1281.

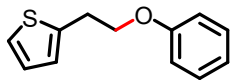


(2-phenoxypropyl)benzene (1aa): The title compound was obtained in 44% yield according to reported Procedures, colorless oil. **^{1}H NMR** (600 MHz, $CDCl_3$) δ: 7.26-7.11 (m, 7H), 6.88-6.79 (m, 3H), 4.50 (h, J = 6.1 Hz, 1H), 3.03 (dd, J = 13.6, 5.9 Hz, 1H), 2.74 (dd, J = 13.7, 6.8 Hz, 1H), 1.22 (d, J = 6.1 Hz, 3H); **^{13}C NMR** (151 MHz, $CDCl_3$) δ: 157.8, 138.2, 129.5, 129.5, 128.3, 126.3, 120.7, 116.0, 74.7, 42.6, 19.4. **HRMS-ESI** (m/z): $[M+H]^+$ calcd for $C_{15}H_{16}O$, 213.1274; found, 213.1280.

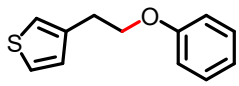


3-(2-phenoxyethyl)pyridine (1ab): The title compound was obtained in 16% yield according to

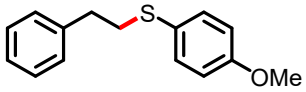
reported Procedures, colorless oil. **^{1}H NMR** (600 MHz, $CDCl_3$) δ: 8.46 (d, J = 2.3 Hz, 1H), 8.39 (dd, J = 4.9, 1.7 Hz, 1H), 7.53 (dt, J = 7.8, 2.0 Hz, 1H), 7.20-7.16 (m, 2H), 7.14 (dd, J = 7.8, 4.8 Hz, 1H), 6.85 (tt, J = 7.4, 1.1 Hz, 1H), 6.80-6.77 (m, 2H), 4.07 (t, J = 6.6 Hz, 2H), 2.98 (t, J = 6.6 Hz, 2H); **^{13}C NMR** (151 MHz, $CDCl_3$) δ: 158.4, 150.2, 147.8, 136.4, 133.9, 129.4, 123.2, 120.8, 114.4, 67.6, 32.9. **HRMS-ESI** (m/z): $[M+H]^+$ calcd for $C_{13}H_{13}ON$, 200.1070; found, 200.1076.



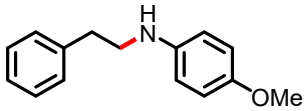
2-(2-phenoxyethyl)thiophene (1ac): The title compound was obtained in 36% yield according to reported Procedures, colorless oil. **^{1}H NMR** (600 MHz, $CDCl_3$) δ: 7.36-7.30 (m, 2H), 7.20 (dd, J = 5.2, 1.2 Hz, 1H), 7.02-6.93 (m, 5H), 4.23 (t, J = 6.8 Hz, 2H), 3.35 (t, J = 6.8 Hz, 2H); **^{13}C NMR** (151 MHz, $CDCl_3$) δ: 158.6, 140.4, 129.4, 126.8, 125.4, 123.9, 120.9, 114.6, 68.3, 30.0. **HRMS-ESI** (m/z): $[M+H]^+$ calcd for $C_{12}H_{12}OS$, 205.0682; found, 205.0669.



3-(2-phenoxyethyl)thiophene (1ad): The title compound was obtained in 32% yield according to reported Procedures, colorless oil. **^{1}H NMR** (600 MHz, $CDCl_3$) δ: 7.37-7.30 (m, 3H), 7.14 (dd, J = 2.9, 1.2 Hz, 1H), 7.09 (dd, J = 4.9, 1.4 Hz, 1H), 7.01 (t, J = 7.3 Hz, 1H), 6.99-6.95 (m, 2H), 4.22 (t, J = 6.9 Hz, 2H), 3.18 (t, J = 6.9 Hz, 2H); **^{13}C NMR** (151 MHz, $CDCl_3$) δ: 158.7, 138.5, 129.4, 128.4, 125.4, 121.5, 120.7, 114.5, 67.8, 30.2. **HRMS-ESI** (m/z): $[M+H]^+$ calcd for $C_{12}H_{12}OS$, 205.0682; found, 205.0672.



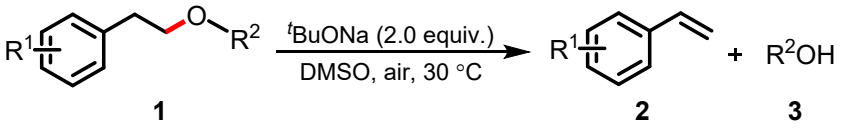
(4-methoxyphenyl)(phenethyl)sulfane (1ae)[25]: The title compound was obtained in 46% yield according to reported Procedures, colorless oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.37 (d, J = 8.0, 2H), 7.28 (t, d, J = 8.0, 2H), 7.22 (t, J = 8.0, 1H), 7.16 (d, J = 8.0, 2H), 6.86 (d, J = 8.0, 2H), 3.80 (s, 3H), 3.06 (t, J = 8.0 Hz, 2H), 2.86 (t, J = 8.0 Hz, 2H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 158.9, 140.3, 133.2, 128.5, 128.4, 125.4, 114.6, 55.3, 37.2, 35.9.



4-methoxy-N-phenethylaniline (1af)[26]: The title compound was obtained in 46% yield according to reported Procedures, gray oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.25 (t, J = 7.3, 2H), 7.20-7.13 (m, 3H), 7.72 (d, J = 8.0, 2H), 6.51 (d, J = 8.0, 2H), 3.68 (s, 3H), 3.28 (t, d, J = 6.9, 2H),

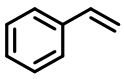
3.14 (s, 1H), 2.83 (t, J = 6.9 Hz, 2H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 152.1, 142.2, 139.4, 128.7, 128.5, 126.3, 114.9, 114.3, 55.7, 45.6, 36.8.

3.2 The cleavage C-O bonds of phenethyl ether derivatives

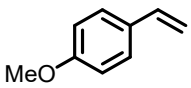


An oven-dried Schlenk tube was charged with ^{t}BuONa (38.5 mg, 0.4 mmol, 2.0 equiv.), phenethyl ether derivatives (0.2 mmol, 1.0 equiv.), and DMSO (2.0 mL). The tube was sealed, and the reaction mixture was heated in a 30 ℃ oil bath while stirring for 1-4 hours. Upon completion of the reaction, the mixture was cooled to room temperature. Subsequently, the mixture was acidified to a pH of 1.0 using a 1 M HCl solution and extracted with ethyl acetate (5 mL × 3). The combined organic layer was dried over anhydrous Na_2SO_4, and few samples were taken for gas chromatography (GC) detection. The mixture was then filtered, and the solvent was evaporated under vacuum. The residues were purified by chromatography on silica gel to yield target compounds **3**.

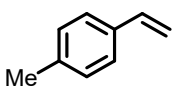
Characterization data for products 2/3



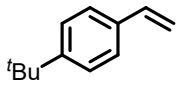
Styrene (2a)[10]**:** The title compound was obtained in 88% yield according to general Procedure, colorless liquid. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.39 (d, J = 8.0 Hz, 2H), 7.30 (t, J = 8.0 Hz, 2H), 7.22 (t, J = 8.0 Hz, 2H), 6.70 (dd, J_1 = 20.0 Hz, J_2 = 12.0 Hz, 1H), 5.73 (d, J = 16.0 Hz, 1H), 5.22 (d, J = 16.0 Hz, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 137.7, 137.0, 128.6, 127.9, 126.3, 113.9.



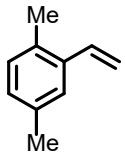
1-methoxy-4-vinylbenzene (2r)[10]**:** The title compound was obtained in 93% yield according to general Procedure, colorless liquid. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.32 (d, J = 8.0 Hz, 2H), 6.83 (d, J = 12.0 Hz, 2H), 6.64 (dd, J = 20.0, 12.0 Hz, 1H), 6.60 (d, J = 20.0 Hz, 1H), 5.10 (d, J = 12.0 Hz, 1H), 3.76 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 159.5, 136.3, 130.5, 127.5, 114.0, 111.6, 55.3.



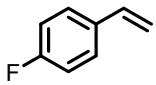
1-methyl-4-vinylbenzene (2s)[10]**:** The title compound was obtained in 91% yield according to general Procedure, colorless liquid. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.29 (d, J = 8.0 Hz, 2H), 7.11 (d, J = 8.0 Hz, 2H), 6.67 (dd, J_1 = 20.0 Hz, J_2 = 12.0 Hz, 1H), 5.68 (d, J = 20.0 Hz, 1H), 5.16 (d, J = 12.0 Hz, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 137.7, 136.8, 134.9, 129.3, 126.6, 112.8, 21.3.



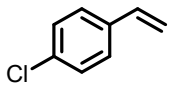
1-(*tert*-butyl)-4-vinylbenzene (2t)[11]**:** The title compound was obtained in 92% yield according to general Procedure, colorless liquid.**^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.34 (s, 4H), 6.69 (dd, J_1 = 16.0 Hz, J_2 = 8.0 Hz, 1H), 5.70 (d, J = 16.0 Hz, 1H), 5.18 (d, J = 8.0 Hz, 1H), 1.31 (s, 9H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 151.0, 136.7, 134.9, 126.0, 125.5, 113.1, 34.7, 31.4.



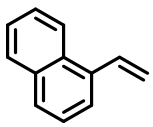
1,4-dimethyl-2-vinylbenzene (2u) : The title compound was obtained in 90% yield according to general Procedure, colorless liquid. **^{1}H NMR** (600 MHz,$CDCl_3$) δ: 7.45 (s, 1H), 7.18 (d, J = 7.7 Hz, 1H), 7.13 (d, J = 7.8 Hz, 1H), 7.07 (dd, J = 17.4, 11.0 Hz, 1H), 5.78 (dd, J = 17.5, 1.5 Hz, 1H), 5.41 (dd, J = 10.9, 1.5 Hz, 1H), 2.47 (s, 3H), 2.45 (s, 3H); **^{13}C NMR** (151 MHz, $CDCl_3$) δ: 136.5, 135.3, 134.9, 132.3, 130.1, 130.1, 128.4, 125.9, 114.7, 20.9, 19.1.



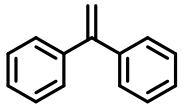
1-fluoro-4-vinylbenzene (2v)[10]**:** The title compound was obtained in 94% yield according to general Procedure, colorless liquid. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.37-7.34 (m, 2H), 7.00 (t, J = 8.0 Hz, 2H), 6.66 (dd, J_1 = 20.0 Hz, J_2 = 12.0 Hz, 1H), 5.65 (d, J = 16.0 Hz, 1H), 5.21 (d, J = 16.0 Hz, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 162.5 (d, J = 247.5 Hz), 135.7, 133.8 (d, J = 4.0 Hz), 127.8 (d, J = 8.0 Hz), 115.4 (d, J = 21.2 Hz), 113.5 (d, J = 2.0 Hz).



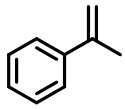
1-chloro-4-vinylbenzene (2w)[10]**:** The title compound was obtained in 95% yield according to general Procedure, colorless liquid. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.31-7.25 (m, 4H), 6.63 (dd, J_1 = 20.0 Hz, J_2 = 12.0 Hz, 1H), 5.69 (d, J = 20.0 Hz, 1H), 5.24 (d, J = 8.0 Hz, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 136.1, 135.7, 133.5, 128.7, 127.5, 114.5.



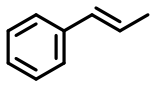
1-vinylnaphthalene (2x)[10]**:** The title compound was obtained in 92% yield according to general Procedure, colorless liquid. **^{1}H NMR** (600 MHz, $CDCl_3$) δ: 7.99 (dd, J = 8.4, 1.5 Hz, 1H), 7.71 (dd, J = 7.7, 1.7 Hz, 1H), 7.65 (d, J = 8.2 Hz, 1H), 7.49 (d, J = 7.1 Hz, 1H), 7.42-7.29 (m, 4H), 5.66 (dd, J = 17.3, 1.6 Hz, 1H), 5.34 (dd, J = 10.9, 1.6 Hz, 1H); **^{13}C NMR** (151 MHz, $CDCl_3$) δ: 135.6, 134.3, 133.6, 131.1, 128.5, 128.1, 126.0, 125.7, 125.6, 123.7, 123.6, 117.0.



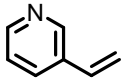
1,1-Diphenylethylene (2y): The title compound was obtained in 85% yield according to general Procedure, colorless liquid. **^{1}H NMR** (600 MHz, $CDCl_3$) δ: 7.29-7.18 (m, 10H), 5.37 (s, 2H); **^{13}C NMR** (151 MHz, $CDCl_3$) δ: 150.1, 141.5, 128.2, 128.1, 127.7, 114.3.



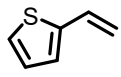
α-Methylstyrene (2z): The title compound was obtained in 85% yield according to general Procedure, colorless liquid. **^{1}H NMR** (600 MHz, $CDCl_3$) δ: 7.59 (d, J = 7.0 Hz, 1H), 7.44 (t, J = 7.8 Hz, 2H), 7.38 (t, J = 7.3 Hz, 1H), 5.50 (d, J = 1.6 Hz, 1H), 5.21 (p, J = 1.6 Hz, 1H), 2.28 (s, 1H); **^{13}C NMR** (151 MHz, $CDCl_3$) δ: 143.2, 141.2, 128.2, 127.4, 125.5, 112.4, 21.8.



β-Methylstyrene (2aa): The title compound was obtained in 79% yield according to general Procedure, colorless liquid. **^{1}H NMR** (600 MHz, $CDCl_3$) δ: 7.20 (d, J = 6.6 Hz, 2H), 7.16 (t, J = 7.7 Hz, 2H), 7.06 (t, J = 7.3 Hz, 1H), 6.28 (dq, J = 15.7, 1.8 Hz, 1H), 6.11 (dq, J = 15.7, 6.6 Hz, 1H), 1.75 (dd, J = 6.7, 1.8 Hz, 3H).; **^{13}C NMR** (151 MHz, $CDCl_3$) δ: 137.9, 131.0, 128.4, 126.7, 125.8, 125.6, 18.4, 18.4.

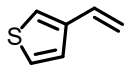


3-vinylpyridine (2ab): The title compound was obtained in 90% yield according to general Procedure, colorless liquid. **^{1}H NMR** (600 MHz, $CDCl_3$) δ: 8.59 (d, J = 2.3 Hz, 1H), 8.46 (dd, J = 4.8, 1.7 Hz, 1H), 7.71 (dt, J = 8.0, 2.0 Hz, 1H), 7.23 (dd, J = 7.9, 4.8 Hz, 1H), 6.68 (dd, J = 17.7, 11.0 Hz, 1H), 5.81 (d, J = 17.5 Hz, 1H), 5.36 (d, J = 11.0 Hz, 1H); **^{13}C NMR** (151 MHz, $CDCl_3$) δ: 148.8, 148.2, 133.4, 133.0, 132.6, 123.4, 116.2.

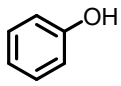


2-vinylthiophene (2ac) : The title compound was obtained in 88% yield according to general Procedure, colorless liquid. **^{1}H NMR** (600 MHz, $CDCl_3$) δ: 7.03 (dd, J = 5.0, 1.4 Hz, 1H), 6.89-

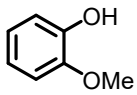
6.79 (m, 2H), 6.69 (dd, *J* = 17.4, 10.9 Hz, 1H), 5.45 (d, *J* = 17.4 Hz, 1H), 5.02 (d, *J* = 10.8 Hz, 1H); **^{13}C NMR** (151 MHz, $CDCl_3$) *δ*: 143.0, 129.8, 127.2, 125.7, 124.2, 113.2.



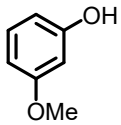
3-vinylthiophene (2ad) : The title compound was obtained in 88% yield according to general Procedure, colorless liquid. **^{1}H NMR** (600 MHz, $CDCl_3$) *δ*: 7.18-7.10 (m, 2H), 7.05 (dd, *J* = 3.0, 1.4 Hz, 1H), 6.60 (dd, *J* = 17.6, 10.8 Hz, 1H), 5.47 (dd, *J* = 17.5, 1.2 Hz, 1H), 5.08 (dd, *J* = 10.9, 1.2 Hz, 1H); **^{13}C NMR** (151 MHz, $CDCl_3$) *δ*: 140.5, 130.9, 125.9, 124.7, 122.3, 113.5.



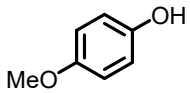
Phenol (3a)[12]**:** The title compound was obtained in 83% yield (15.6 mg) according to general Procedure, clear crystal. **^{1}H NMR** (400 MHz, $CDCl_3$) *δ*: 7.24 (d, *J* = 8.0 Hz, 2H), 6.93 (t, *J* = 8.0 Hz, 1H), 6.83 (d, *J* = 8.0 Hz, 2H), 5.17 (s, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) *δ*: 155.4, 129.7, 120.9, 115.4.



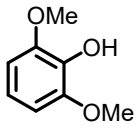
2-methoxyphenol (3b)[13]**:** The title compound was obtained in 72% yield (17.9 mg) according to general Procedure, colorless liquid. **^{1}H NMR** (400 MHz, $CDCl_3$) *δ*: 6.94-6.91 (m, 1H), 6.88-6.82 (m, 3H), 5.75 (s, 1H), 3.83 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) *δ*: 146.7, 145.7, 121.5, 120.2, 114.7, 110.8, 55.9.



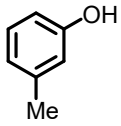
3-methoxyphenol (3c)[14]**:** The title compound was obtained in 70% yield (17.4 mg) according to general Procedure, colorless liquid. **^{1}H NMR** (400 MHz, $CDCl_3$) *δ*: 7.13 (t, *J* = 8.0 Hz, 1H), 6.50 (d, *J* = 8.0 Hz, 2H), 6.43 (d, *J* = 8.0 Hz, 2H), 5.32 (s, 1H), 3.77 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) *δ*: 160.8, 156.7, 130.2, 107.9, 106.5, 101.6, 55.3.



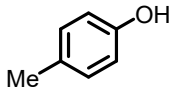
4-methoxyphenol (3d)[12]**:** The title compound was obtained in 62% yield (15.4 mg) according to general Procedure, clear crystal. **^{1}H NMR** (400 MHz, $CDCl_3$) *δ*: 6.81-6.75 (m, 4H), 3.76 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) *δ*: 153.8, 149.5, 116.1, 114.9, 55.8.



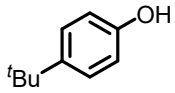
2,6-dimethoxyphenol (3e)[13]**:** The title compound was obtained in 70% yield (21.6 mg) according to general Procedure, clear crystal. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 6.80 (t, J = 8.0 Hz, 1H), 6.58 (d, J = 8.0 Hz, 2H), 5.51 (s, 1H), 3.88 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 147.3, 134.9, 119.1, 104.9, 56.3.



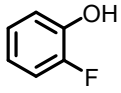
***m*-cresol (3f)**[15]**:** The title compound was obtained in 75% yield (16.2 mg) according to general Procedure, colorless liquid. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.10 (t, J = 8.0 Hz, 1H), 6.74 (d, J = 8.0 Hz, 2H), 6.64 (d, J = 8.0 Hz, 2H), 5.55 (s, 1H), 2.27 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 155.3, 140.0, 129.5, 121.8, 116.2, 112.4, 21.4.



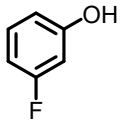
***p*-cresol (3g)**[1]**:** The title compound was obtained in 70% yield (15.1 mg) according to general Procedure, clear crystal. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.08 (d, J = 8.0 Hz, 2H), 6.82 (d, J = 8.0 Hz, 2H), 6.23 (s, 1H), 2.34 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 152.9, 130.2, 115.3, 20.5.



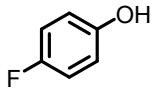
4-(*tert*-butyl)phenol (3h)[14]**:** The title compound was obtained in 78% yield (23.4 mg) according to general Procedure, white solid. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.25 (t, J = 4.0 Hz, 2H), 6.76 (d, J = 8.0 Hz, 2H), 4.63 (s, 1H), 1.28 (s, 9H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 153.1, 143.5, 126.4, 114.7, 34.1, 31.5.



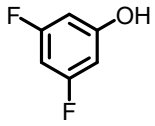
2-fluorophenol (3i)[16]**:** The title compound was obtained in 71% yield (16.0 mg) according to general Procedure, colorless liquid. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.08-6.98 (m, 3H), 6.86-6.81 (m, 1H), 5.51 (s, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 151.2 (d, J = 238.4 Hz), 143.5 (d, J = 14.1 Hz), 124.9 (d, J = 3.0 Hz), 120.9 (d, J = 7.0 Hz), 117.4 (d, J = 2.0 Hz), 115.6 (d, J = 18.2 Hz).



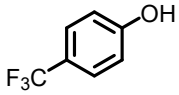
3-fluorophenol (3j)[17]**:** The title compound was obtained in 69% yield (15.5 mg) according to general Procedure, colorless liquid. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.21-7.15 (m, 1H), 6.69-6.57 (m, 3H), 5.57 (s, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 163.6 (d, J = 246.4 Hz), 156.5 (d, J = 11.1 Hz), 130.6 (d, J = 10.1 Hz), 111.2 (d, J = 3.0 Hz), 108.0 (d, J = 22.2 Hz), 103.3 (d, J = 25.3 Hz).



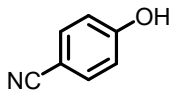
4-fluorophenol (3k)[12]**:** The title compound was obtained in 83% yield (18.5 mg) according to general Procedure, white solid. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 6.94-6.90 (m, 2H), 6.78-6.74 (m, 2H),4.80 (s, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 157.3 (d, J = 238.4 Hz), 151.4 (d, J = 2.0 Hz), 116.3 (d, J = 8.0 Hz), 116.0 (d, J = 23.2 Hz).



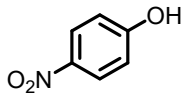
3,5-difluorophenol (3l)[16]**:** The title compound was obtained in 83% yield (21.6 mg) according to general Procedure, white solid. **^{1}H NMR** (600 MHz, $CDCl_3$) δ: 6.43 (dt, J = 9.2, 2.2 Hz, 1H), 6.41-6.36 (m, 2H), 5.56 (s, H); **^{13}C NMR** (151 MHz, $CDCl_3$) δ: 163.7 (dd, J = 246.9, 15.5 Hz), 157.2 (t, J = 14.1 Hz), 99.4 (dd, J = 28.8 Hz, 15.7 Hz), 96.7 (t, J = 25.7 Hz).



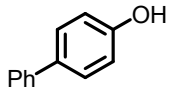
4-(trifluoromethyl)phenol (3m)[15]**:** The title compound was obtained in 71% yield (23.1 mg) according to general Procedure, yellow crystal. **^{1}H NMR** (400 MHz, DMSO-d_6) δ: 10.29 (s, 1H), 7.52 (d, J = 8.0 Hz, 2H), 6.92 (d, J = 8.0 Hz, 2H); **^{13}C NMR** (101 MHz, DMSO-d_6) δ: 161.2, 132.0, 127.4 (q, J = 4.0 Hz), 125.3 (q, J = 271.7 Hz), 116.1.



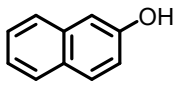
4-hydroxybenzonitrile (3n)[12]**:** The title compound was obtained in 87% yield (20.6 mg) according to general Procedure, white crystal. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.55 (d, J = 8.0 Hz, 2H), 6.93 (d, J = 8.0 Hz, 2H), 6.50 (s, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 160.2, 134.3, 119.3, 116.5, 103.0.



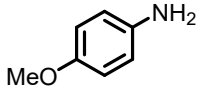
4-nitrophenol (3o)[15]**:** The title compound was obtained in 86% yield (23.9 mg) according to general Procedure, yellow crystal. **^{1}H NMR** (400 MHz, DMSO-d_6) δ: 10.99 (s, 1H), 8.07 (d, J = 8.0 Hz, 2H), 6.90 (d, J = 8.0 Hz, 2H); **^{13}C NMR** (101 MHz, DMSO-d_6) δ: 164.3, 140.0, 126.5, 116.1.



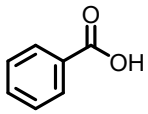
[1,1'-biphenyl]-4-ol (3p)[1]**:** The title compound was obtained in 82% yield (27.9 mg) according to general Procedure, white solid. **^{1}H NMR** (600 MHz, $CDCl_3$) δ: 7.55 (d, J = 6.8 Hz, 1H), 7.49 (d, J = 8.6 Hz, 2H), 7.42 (t, J = 7.8 Hz, 2H), 7.31 (t, J = 7.4 Hz, 1H), 6.91 (d, J = 8.6 Hz, 2H), 4.85 (s, 1H); **^{13}C NMR** (151 MHz, $CDCl_3$) δ : 155.0, 140.7, 134.1, 128.7, 128.4, 126.7, 115.6.



naphthalen-2-ol (3q)[12]**:** The title compound was obtained in 84% yield (24.2 mg) according to general Procedure, white solid. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.76 (t, J = 8.0 Hz, 2H), 6.68 (d, J = 8.0 Hz, 1H), 7.43(t, J = 8.0 Hz, 1H), 7.32 (t, J = 8.0 Hz, 1H), 7.15-7.08 (m, 2H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 153.3, 134.6, 129.9, 128.9, 127.8, 126.5, 126.3, 123.6, 117.7, 109.5.

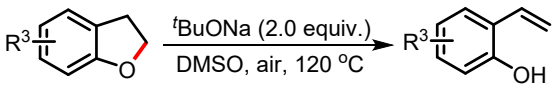


4-methoxyaniline (3af)[27]**:** The title compound was obtained in 77% yield (23.5 mg) according to general Procedure, white solid. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 6.74 (d, J = 8.0 Hz, 2H), 6.64 (d, J = 8.0 Hz, 2H), 3.73(s, 3H), 3.27 (s, *2*H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 152.7, 139.9, 116.4, 114.8, 56.3.



benzoic acid (3am)[18]**:** The title compound was obtained in 80% yield (19.5 mg) according to general Procedure, white solid. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 8.13 (d, J = 8.0 Hz, 2H), 7.62 (t, J = 8.0 Hz, 1H), 7.49 (t, J = 8.0 Hz, 2H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 172.3, 133.8, 130.2, 129.3, 128.5.

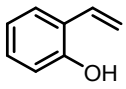
3.3 The cleavage C-O bonds of of 2,3-dihydrobenzofuran Derivatives



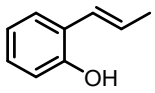
4 **5**

An oven-dried Schlenk tube was charged with ^{t}BuONa (0.4 mmol, 2.0 equiv.), 2,3-dihydrobenzofuran (0.2 mmol, 1.0 equiv.) and DMSO (2.0 mL). The tube was sealed, and the reaction mixture was heated in an oil bath at 120 ℃ while stirring for 4 hours. Upon completion of the reaction, the mixture was cooled to room temperature. The mixture was then acidified to a pH of 1.0 using a 1 M HCl solution, extracted with ethyl acetate (5 mL × 3), and the combined organic layer was dried over anhydrous Na_2SO_4. After filtration, the solvent was evaporated under vacuum. The residue was purified by flash chromatography on silica gel to yield the target compounds.

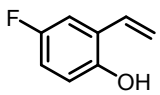
Characterization data for products 5



2-vinylphenol (5a)[19]**:** The title compound was obtained in 80% yield (19.2 mg) according to general Procedure, colorless oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.40 (d, J = 8.0 Hz, 1H), 7.15 (t, J = 8.0 Hz, 1H), 6.99-6.91 (m, 2H), 6.80 (d, J = 8.0 Hz, 1H), 5.75 (d, J = 20.0 Hz, 1H), 5.37 (d, J = 8.0 Hz, 1H), 5.17 (s, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 152.8, 131.5, 128.9, 127.3, 124.8, 120.9, 115.8.

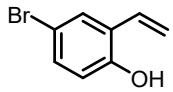


(*E*)-2-(prop-1-en-1-yl)phenol (5b)[20]**:** The title compound was obtained in 81% yield (21.7 mg) according to general Procedure, colorless oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.35 (d, J = 8.0 Hz, 1H), 7.12 (t, J = 8.0 Hz, 1H), 6.92 (t, J = 8.0 Hz, 1H), 6.81 (d, J = 8.0 Hz, 1H), 6.63 (d, J = 16.0 Hz, 1H), 6.28-6.20 (m, 1H), 5.35 (s, 1H), 1.94 (d, J = 8.0 Hz, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 152.3, 128.3, 128.0, 127.4, 125.3, 125.2, 121.0, 115.7, 19.0.

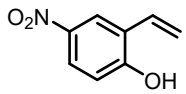


4-fluoro-2-vinylphenol (5c)[21]**:** The title compound was obtained in 68% yield (18.8 mg) according to general Procedure, colorless oil. **^{1}H NMR** (600 MHz, $CDCl_3$) δ: 7.08 (dd, J = 9.4, 3.1

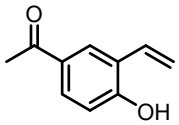
Hz, 1H), 6.89 (dd, J = 17.6, 11.1 Hz, 1H), 6.83 (td, J = 8.3, 3.1 Hz, 1H), 6.72 (dd, J = 8.8, 4.6 Hz, 1H), 5.72 (d, J = 17.7 Hz, 1H), 5.39 (d, J = 11.1 Hz, 1H), 4.93 (s, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 157.3 (d, J = 239.4 Hz), 148.8 (d, J = 2.0 Hz), 130.5 (d, J = 2.0 Hz), 126.0 (d, J = 8.0 Hz), 116.8 (d, J = 8.0 Hz), 116.7, 115.2 (d, J = 23.2 Hz), 113.0 (d, J = 24.2 Hz).



4-bromo-2-vinylphenol (5d)[22]**:** The title compound was obtained in 75% yield (29.7 mg) according to general Procedure, colorless oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 7.49 (s, 1H), 7.22 (d, J = 8.0 Hz, 1H), 6.85 (dd, J_1 = 20.0 Hz, J_2 = 12.0 Hz, 1H), 6.68 (d, J = 12.0 Hz, 1H), 5.74 (d, J = 20.0 Hz, 1H), 5.40 (d, J = 12.0 Hz, 1H), 5.20 (s, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 151.9, 131.4, 130.3, 129.9, 127.0, 117.6, 117.1, 113.2.



4-nitro-2-vinylphenol (5e)[23]**:** The title compound was obtained in 74% yield (24.4 mg) according to general Procedure, green crystal. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 8.31 (s, 1H), 8.04 (d, J = 8.0 Hz, 1H), 6.96-6.89 (m, 2H), 6.57 (s, 1H), 5.88 (d, J = 20.0 Hz, 1H), 5.50 (d, J = 12.0 Hz, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 158.6, 141.5, 129.6, 125.7, 124.7, 123.3, 118.4, 116.1.



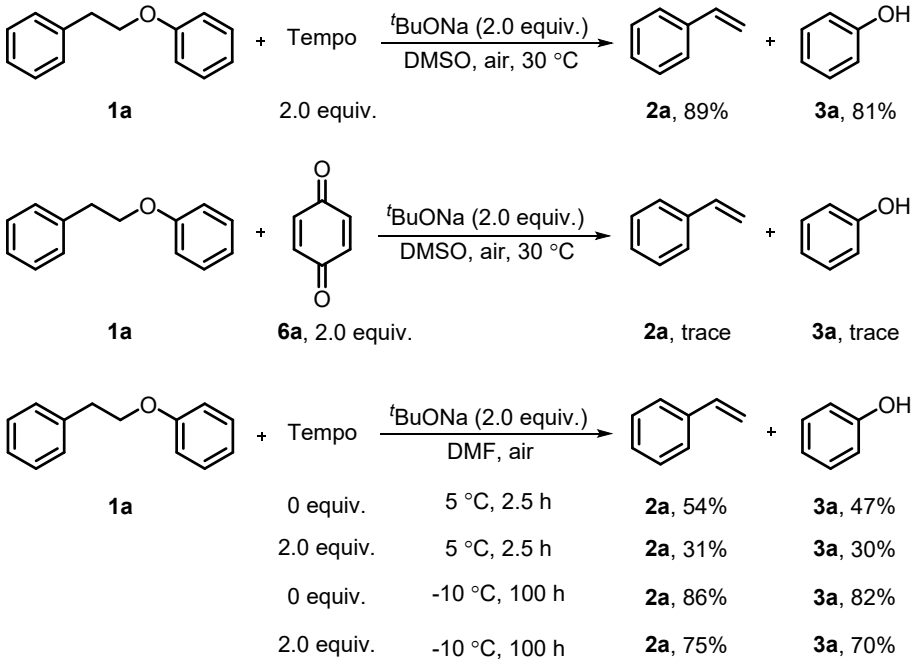
1-(4-hydroxy-3-vinylphenyl)ethan-1-one (5f)[24]**:** The title compound was obtained in 65% yield (21.1 mg) according to general Procedure, colorless oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ: 8.07(s, 1H), 7.79 (d, J = 8.0 Hz, 1H), 7.37 (s, 1H), 5.85 (d, J = 20.0 Hz, 1H), 5.42 (d, J = 12.0 Hz, 1H), 2.60 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ: 158.2, 130.8, 129.9, 128.5, 125.0, 116.7, 115.9, 26.4.

4. Mechanistic Studies

4.1 Controlled experiment

An oven-dried Schlenk tube was charged with ^{t}BuONa (38.5 mg, 0.4 mmol, 2.0 equiv.), compound **1a** (40.0 mg, 0.2 mmol, 1.0 equiv.), DMSO (2.0 mL), and a free radical scavenger (2.0 equiv.). The tube was sealed, and the reaction mixture was heated in a 30 ℃ oil bath with stirring for 2 hours. Upon completion of the reaction, the mixture was acidified to pH 1.0 using a 1 M HCl solution, and extracted with ethyl acetate (5 mL × 3). The combined organic layer was dried over

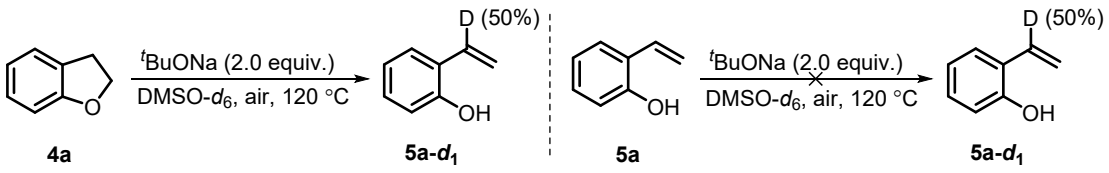
anhydrous Na_2SO_4, and few samples were taken for GC detection.



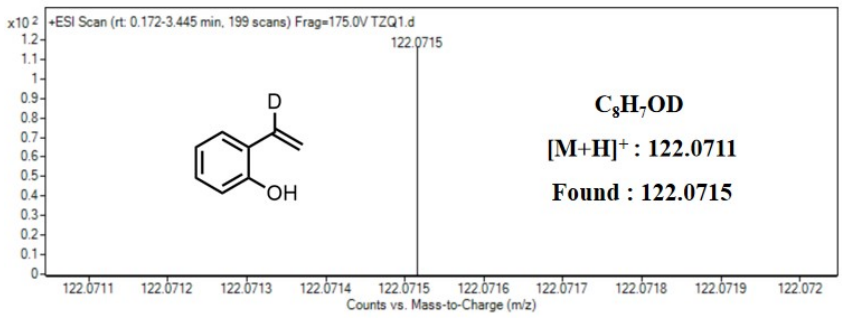
Scheme 1 Control experiments.

4.2 Deuterium experiment

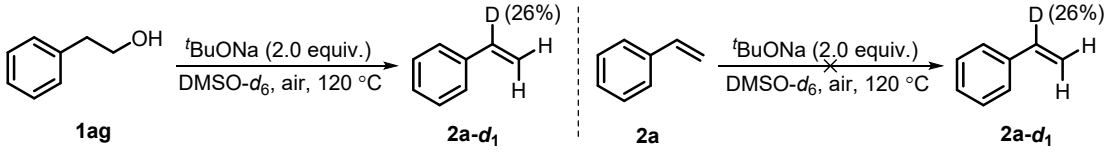
An oven-dried Schlenk tube was charged with ^{t}BuONa (0.4 mmol, 2.0 equiv.), 2,3-dihydrobenzofuran **4a** (0.2 mmol, 1.0 equiv.) and DMSO-d_6 (2.0 mL). The tube was sealed, and the reaction mixture was heated in a 120 ℃ oil bath while stirring for 2 hours. Upon completion of the reaction, the mixture was cooled to room temperature. The reaction mixture was then acidified to pH 1.0 using 1 M HCl solution, extracted with ethyl acetate (5 mL × 3), and the combined organic layer was dried over anhydrous Na_2SO_4. The solution was filtered, and the solvent was evaporated under vacuum. The residue was purified by flash chromatography on silica gel to yield the target compounds.



Scheme 2 Deuterium experiment.



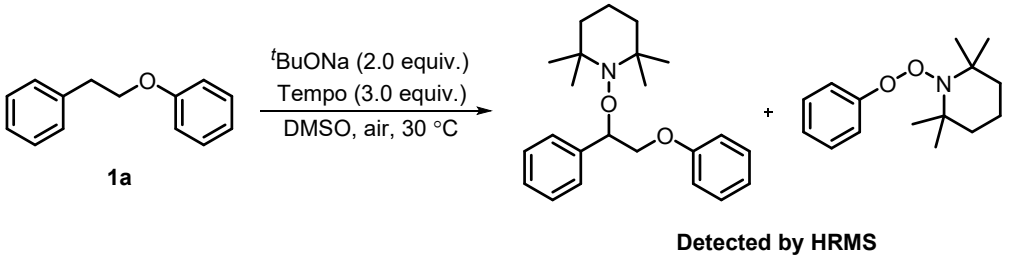
1ag (0.2 mmol, 1.0 equiv.) were added to a oven-dried Schlenk tube equipped with a stir bar along with ^{t}BuONa (0.4 mmol, 2.0 equiv.) and DMSO-d_6 (2.0 mL). The reaction mixture was stirred at 120 ℃ under air atmosphere for 2 hours. Then, the reaction mixture was cooled to the room temperature. The mixture was directly sampled for NMR analysis.



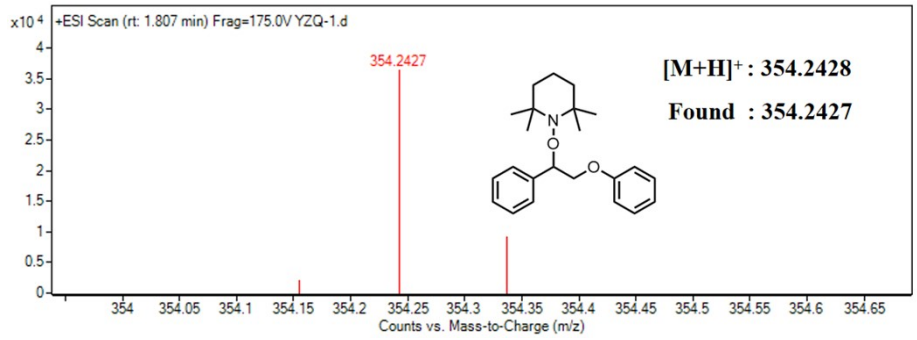
Scheme 3 Deuterium experiment.

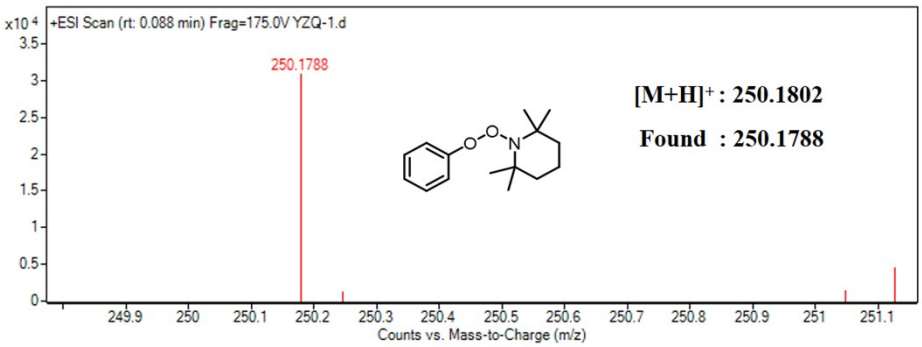
4.3 Radical trapping

A total of 40.0 mg (0.2 mmol, 1.0 equiv.) of **1a** was added to an oven-dried Schlenk tube equipped with a stir bar, along with 38.5 mg (0.4 mmol, 2.0 equiv.) of ^{t}BuONa, 117.0 mg (0.75 mmol, 3.0 equiv.) of Tempo, and 2.0 mL of DMSO. The reaction mixture was stirred at 30 ℃ under an air atmosphere for 1 hour. Subsequently, the mixture was allowed to cool to room temperature. Saturated NaCl aqueous solution (5 mL) was then added, and the mixture was extracted with ethyl acetate (5 mL × 3). The organic phase was collected for HRMS analysis.



Scheme 4 Radical trapping.


x10 4
+ESI Scan (rt: 1.807 min) Frag=175.0V YZQ-1.d
354.2427
[M+H]+ : 354.2428
Found : 354.2427
Counts vs. Mass-to-Charge (m/z)


x10 4
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250.1788
[M+H]+ : 250.1802
Found : 250.1788
Counts vs. Mass-to-Charge (m/z)

5. References

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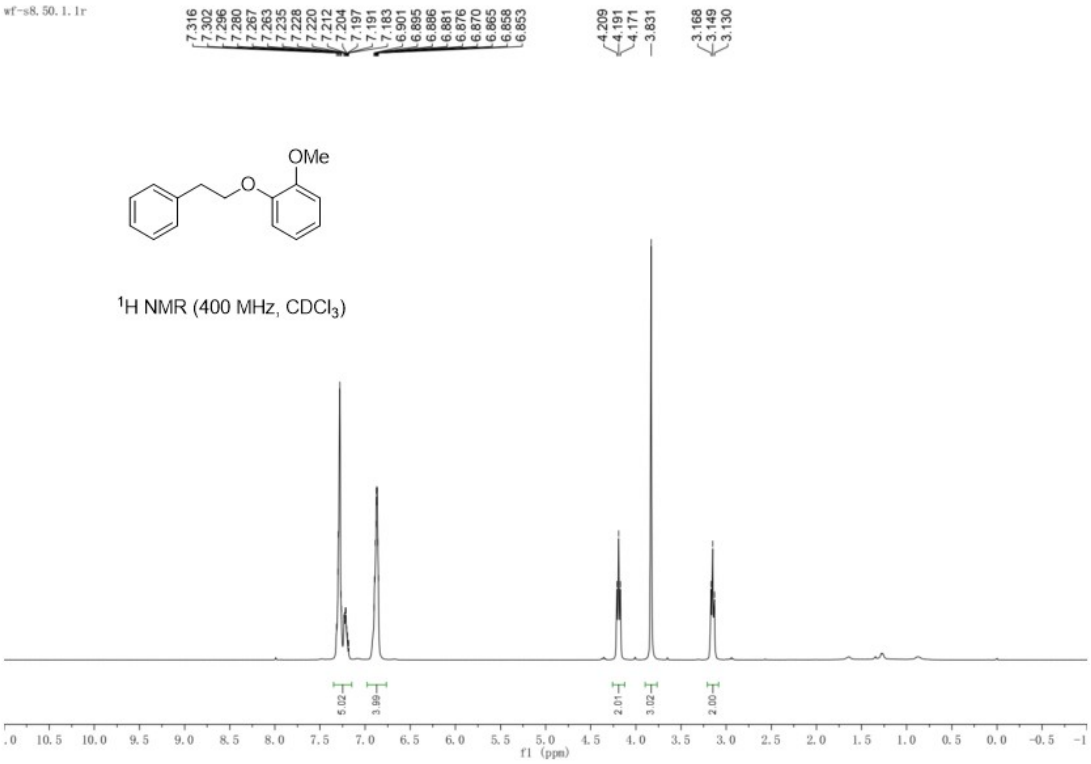
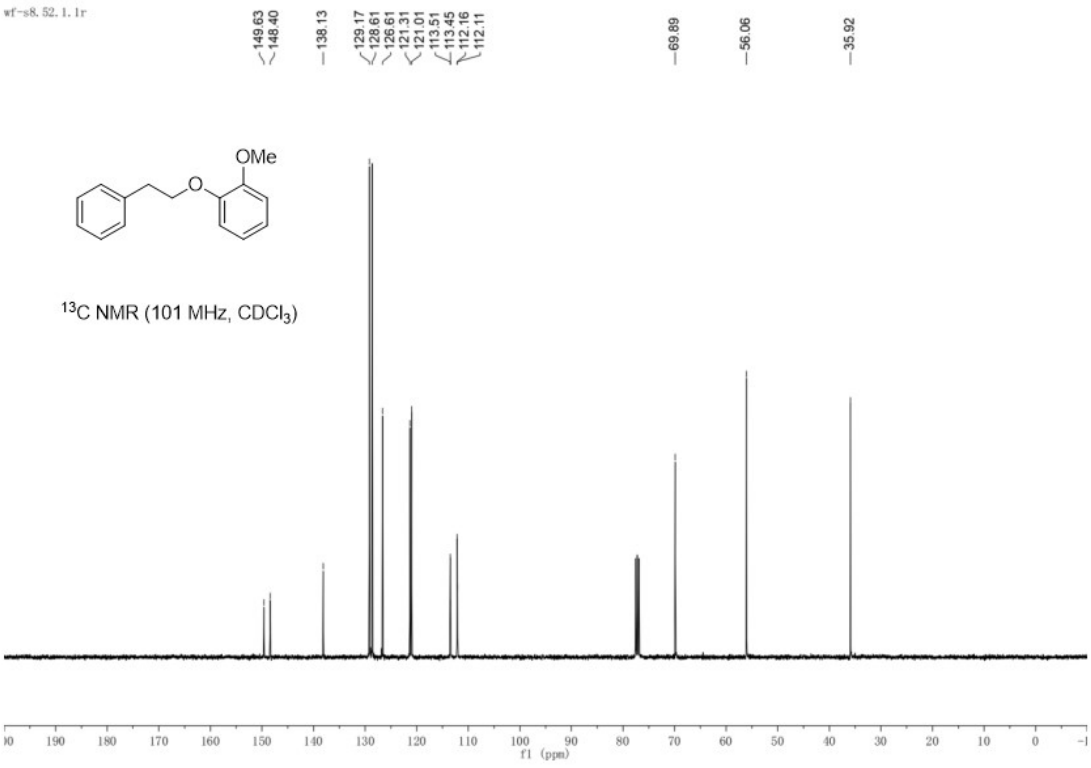
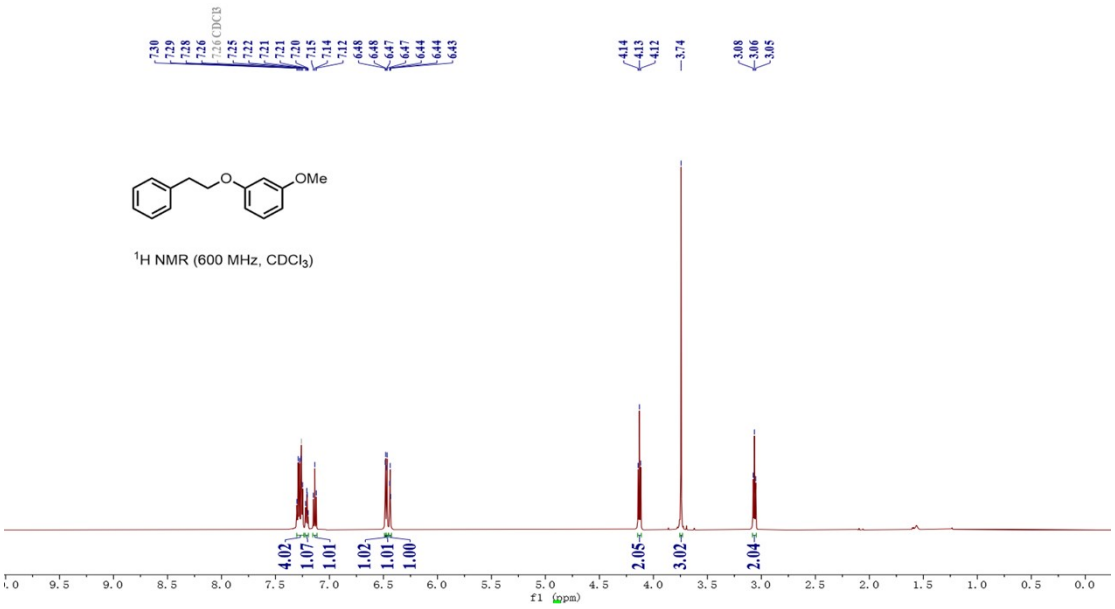
6. NMR spectra of substrates and products

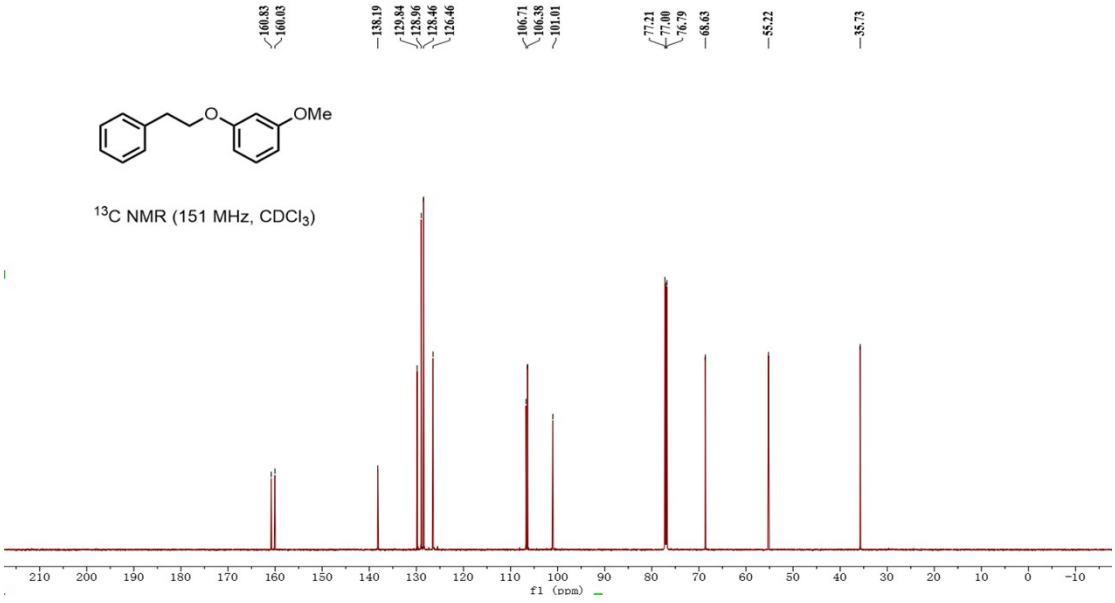
1-methoxy-2-phenethoxybenzene (1b)



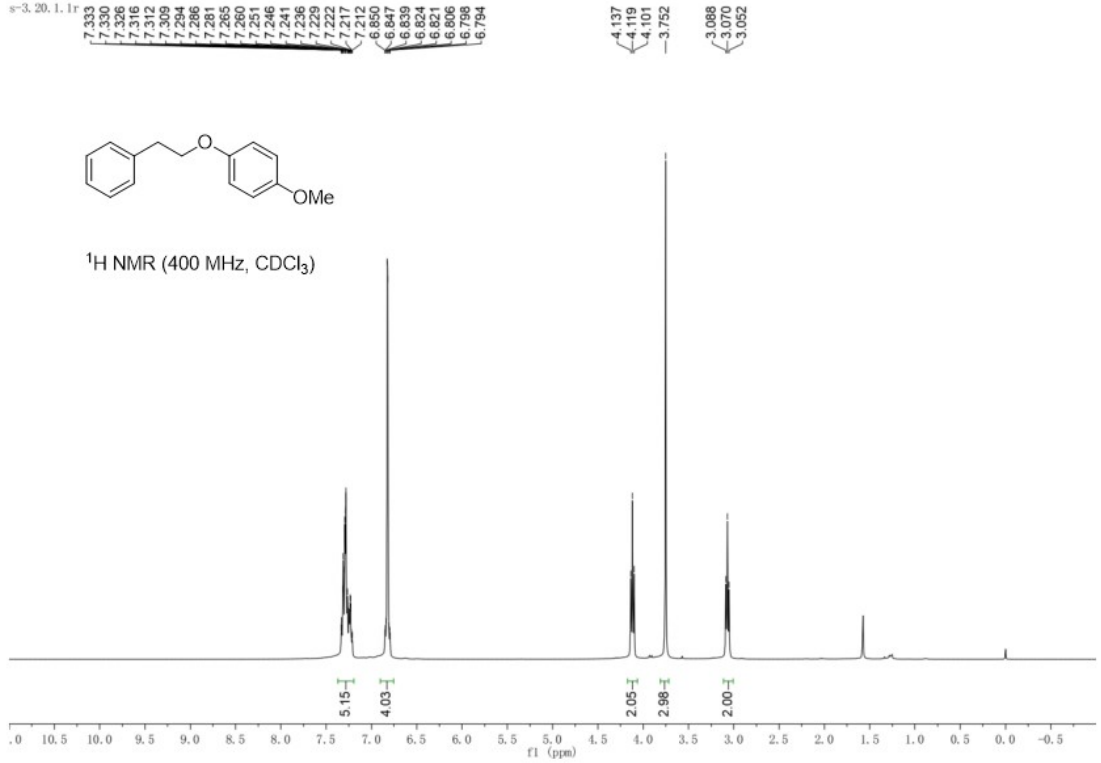


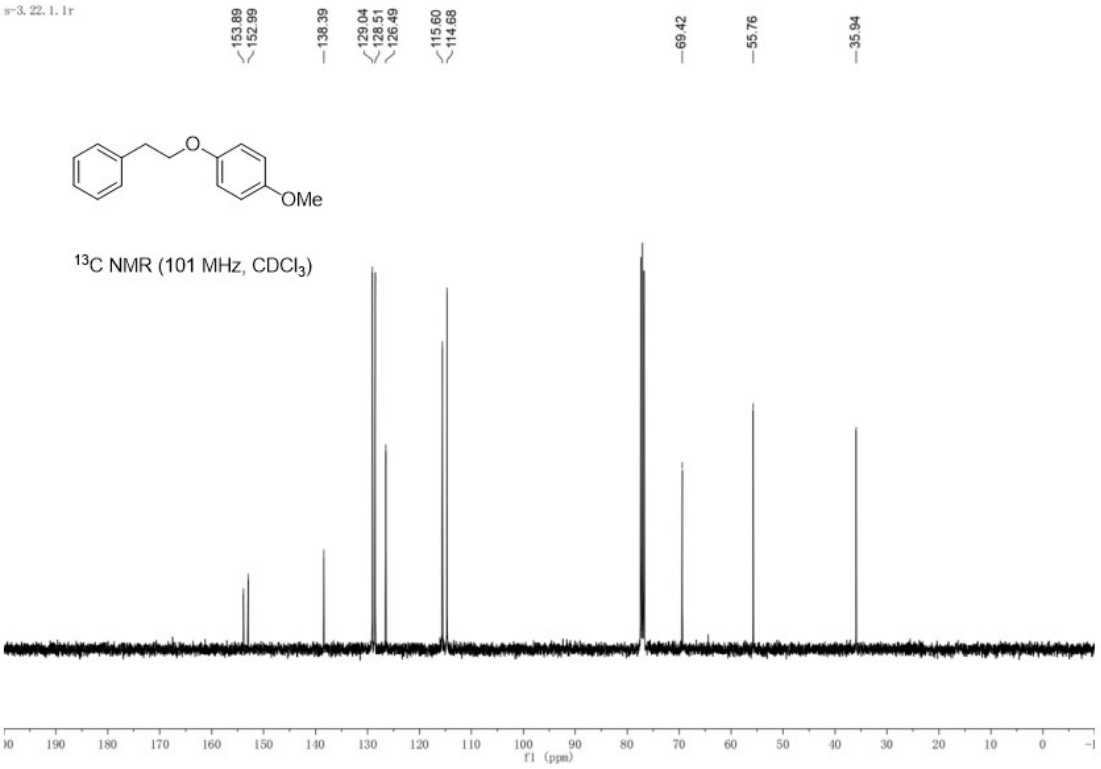
1-methoxy-3-phenethoxybenzene (1c)



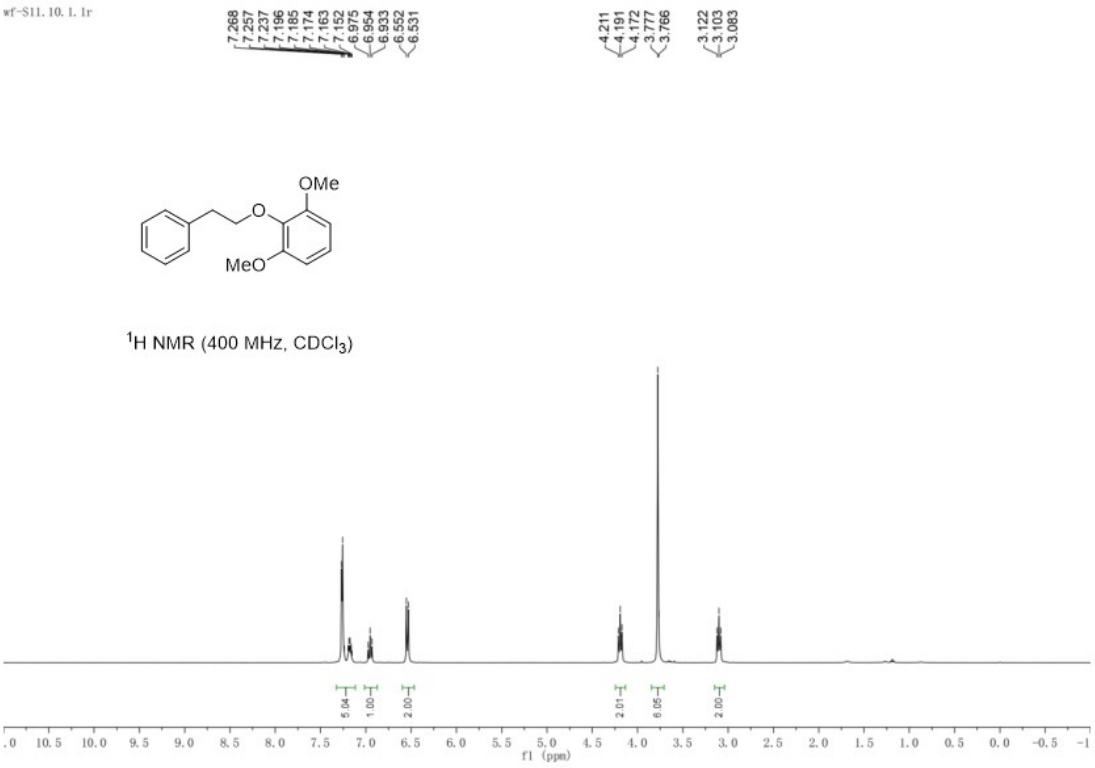


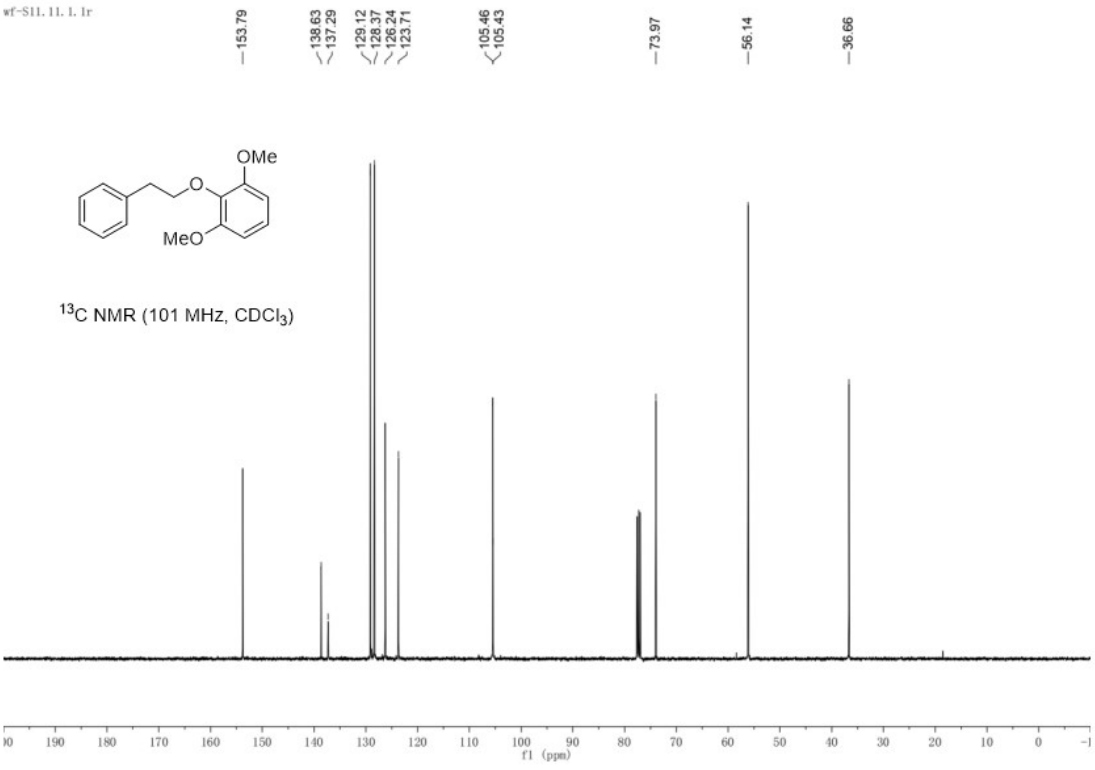
1-methoxy-4-phenethoxybenzene (1d)



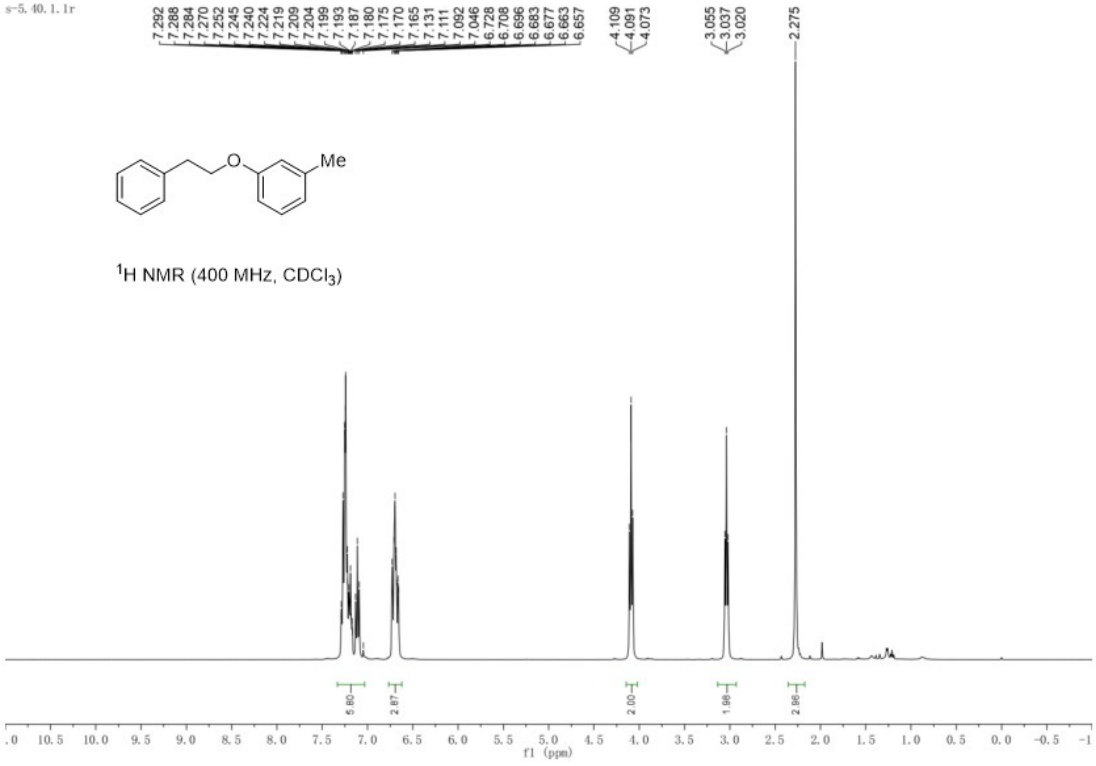


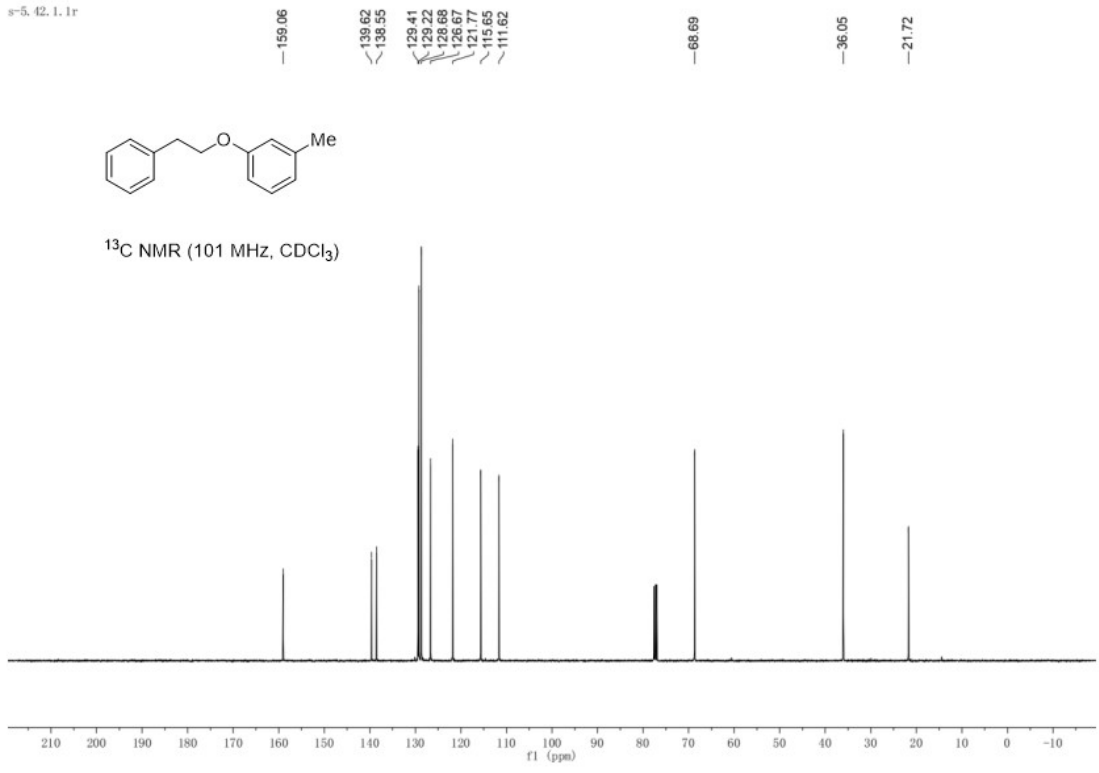
1,3-dimethoxy-2-phenethoxybenzene (1e)





1-methyl-3-phenethoxybenzene (1f)





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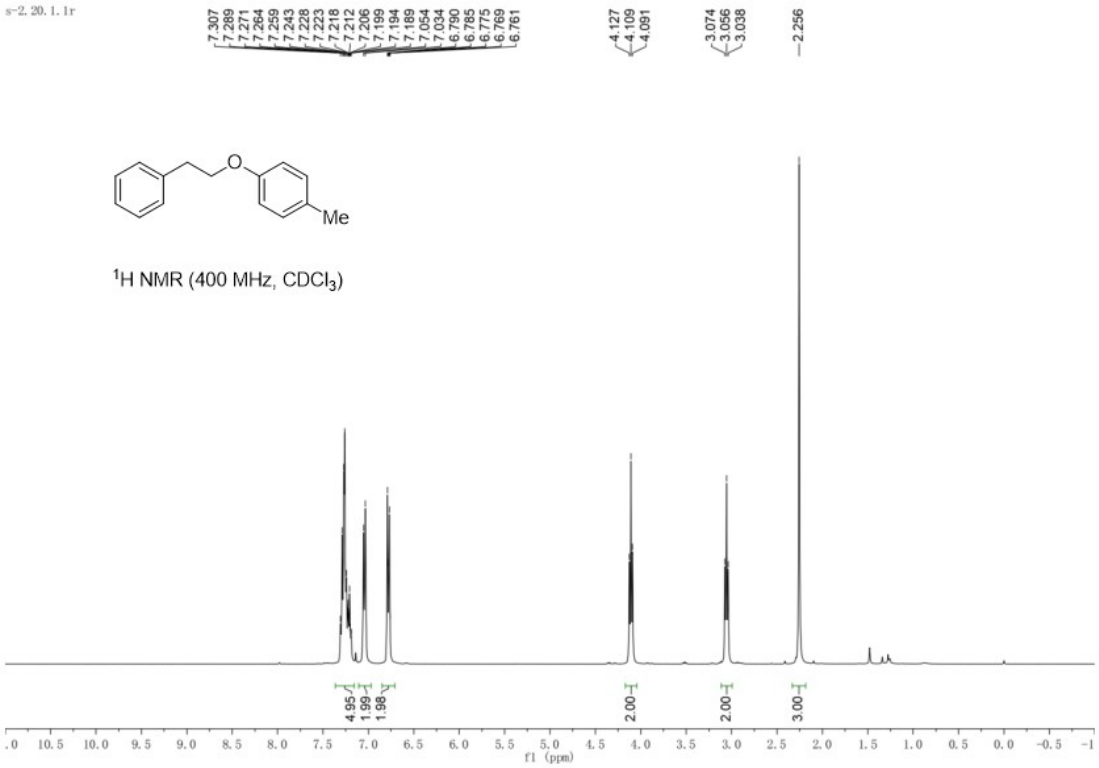
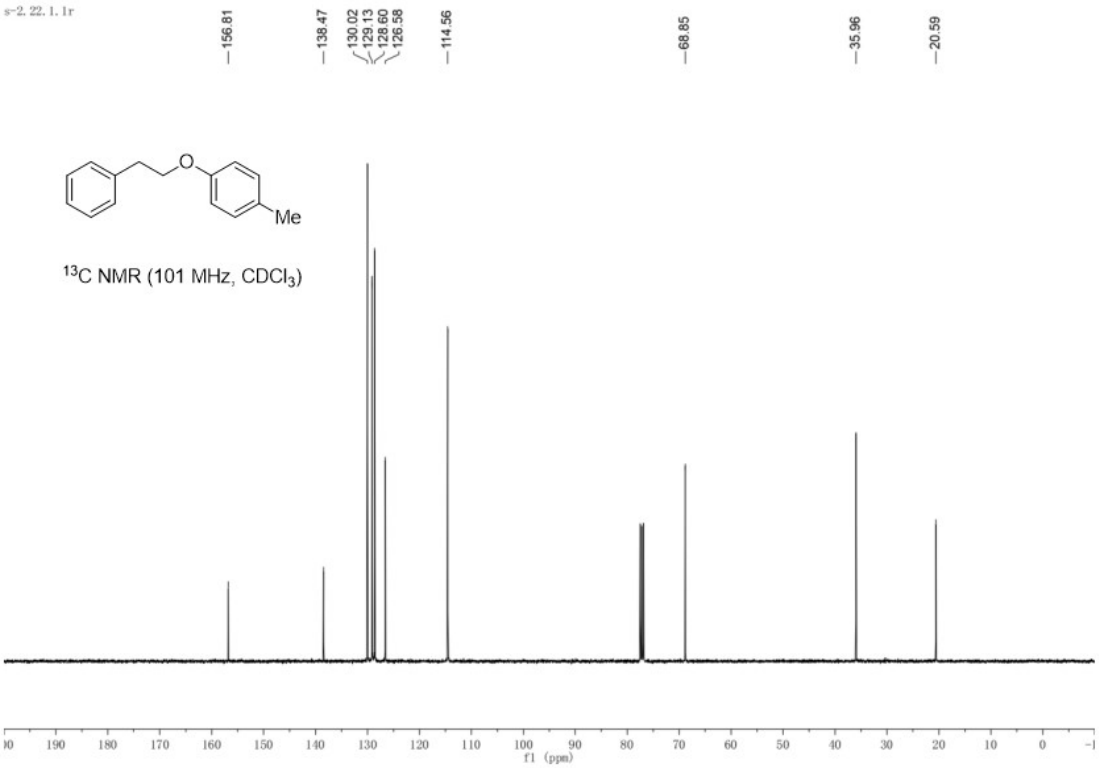
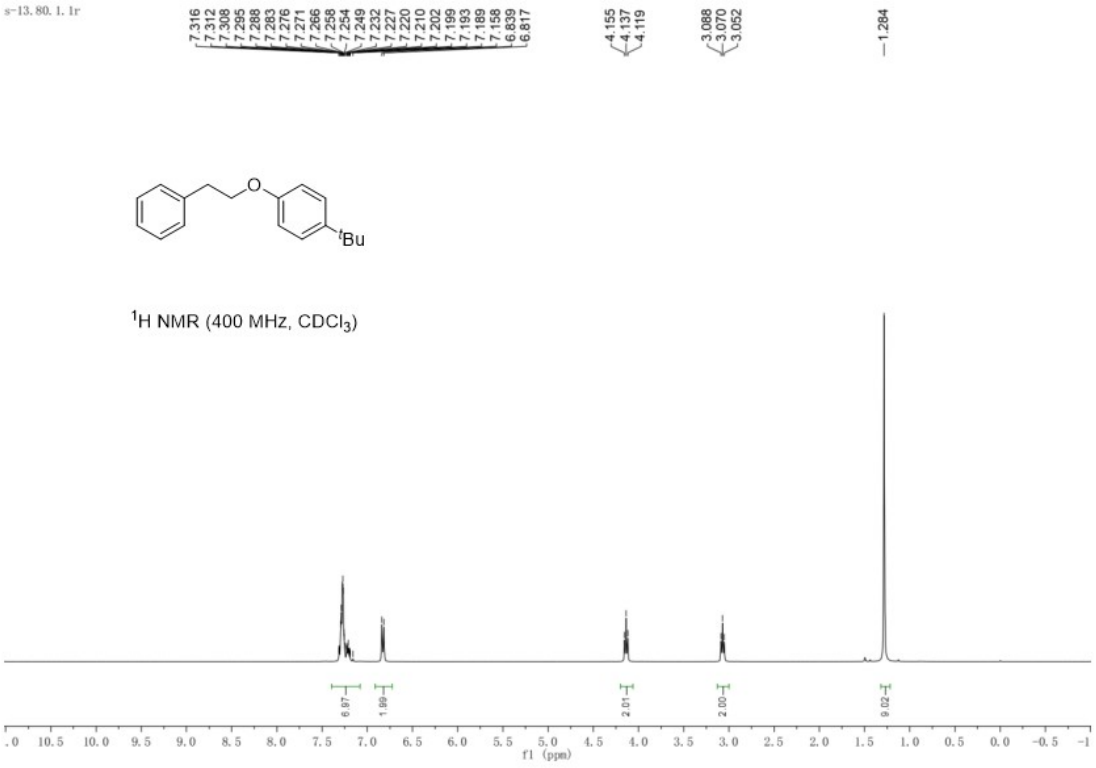
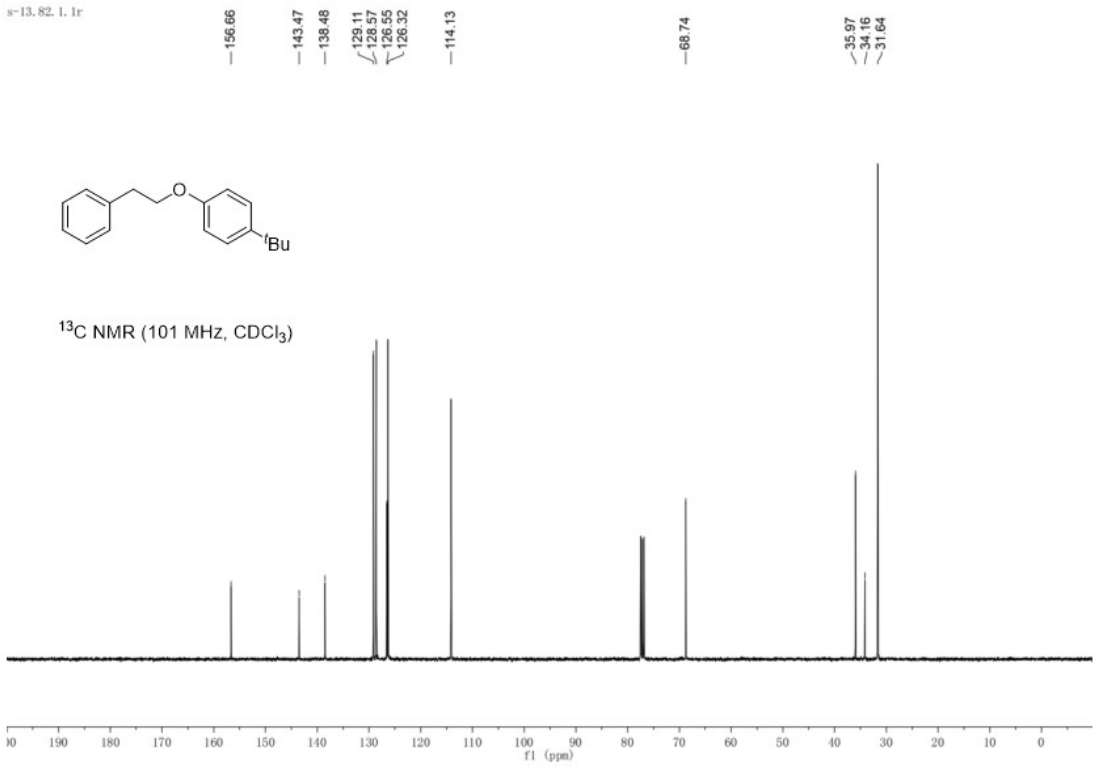




1-(*tert*-butyl)-4-phenethoxybenzene (1h)





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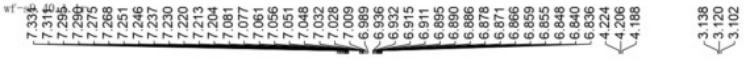
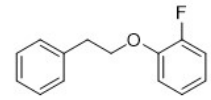
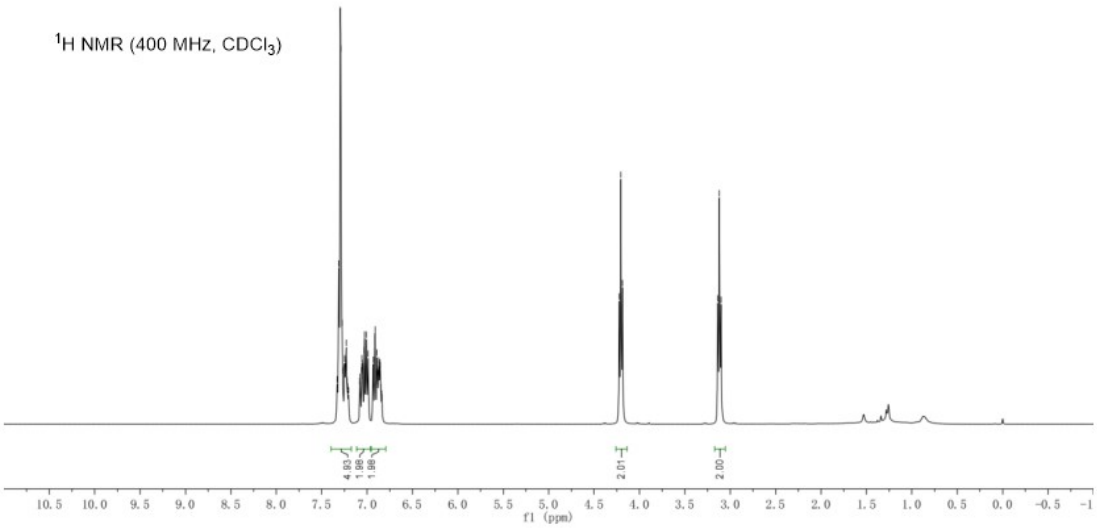
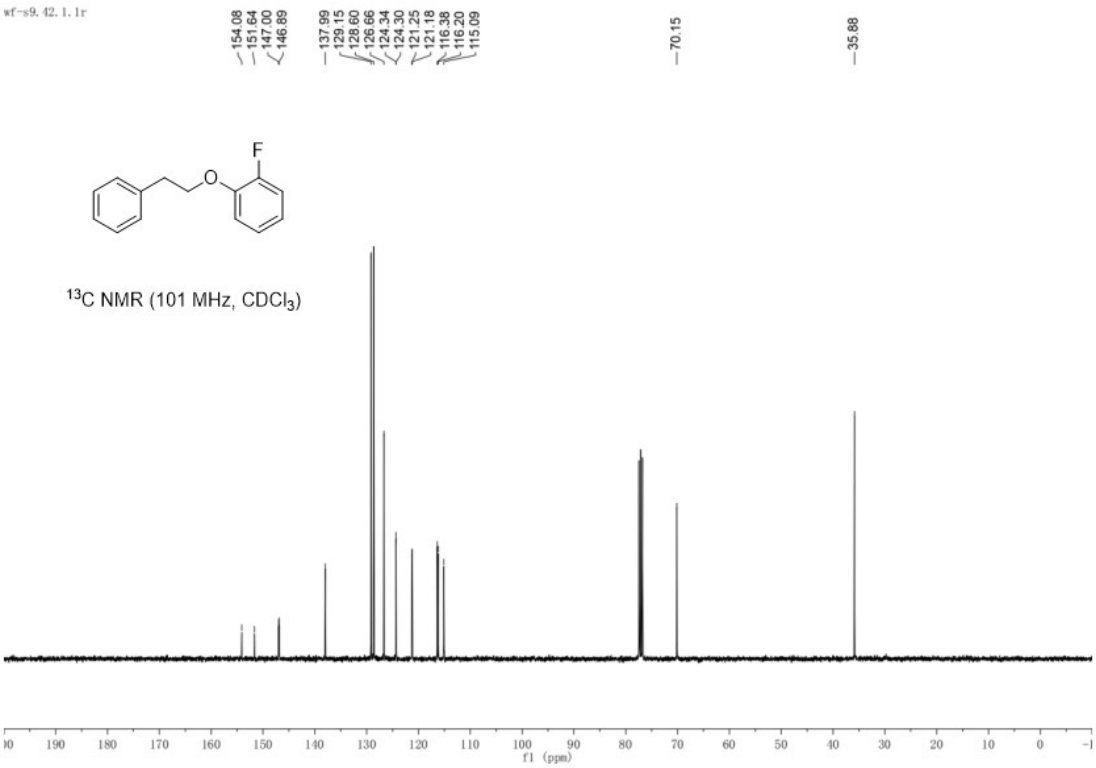




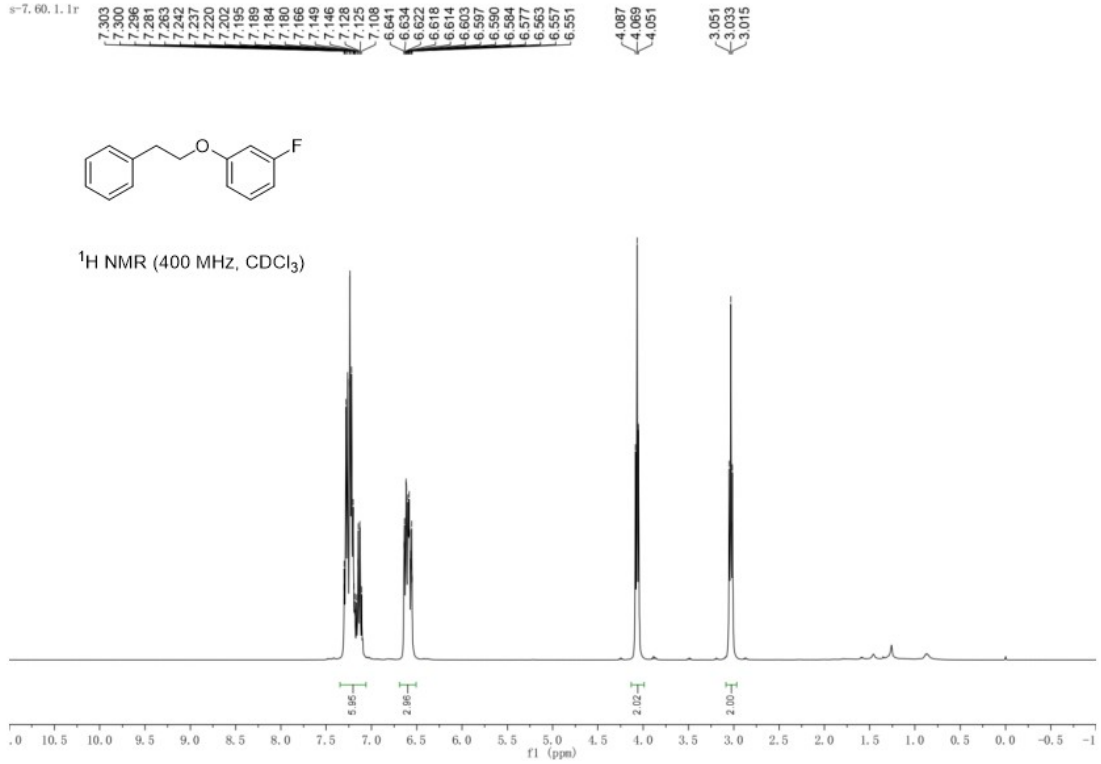
^{1}H NMR (400 MHz, $CDCl_3$)

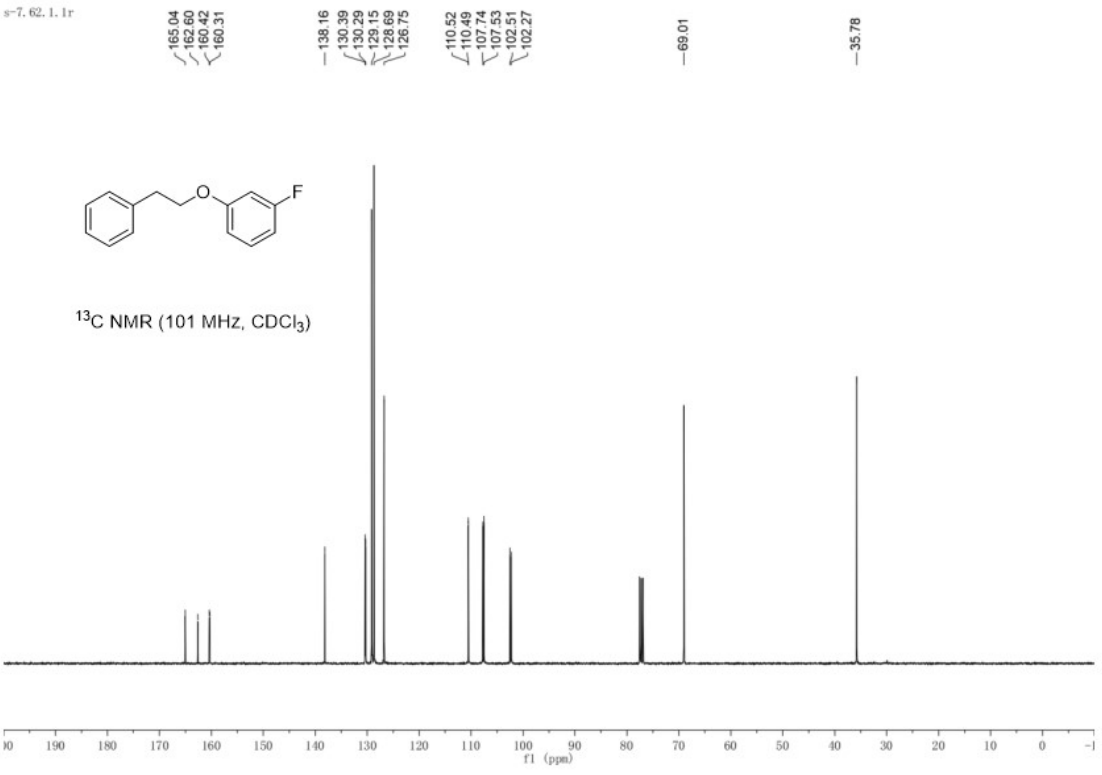




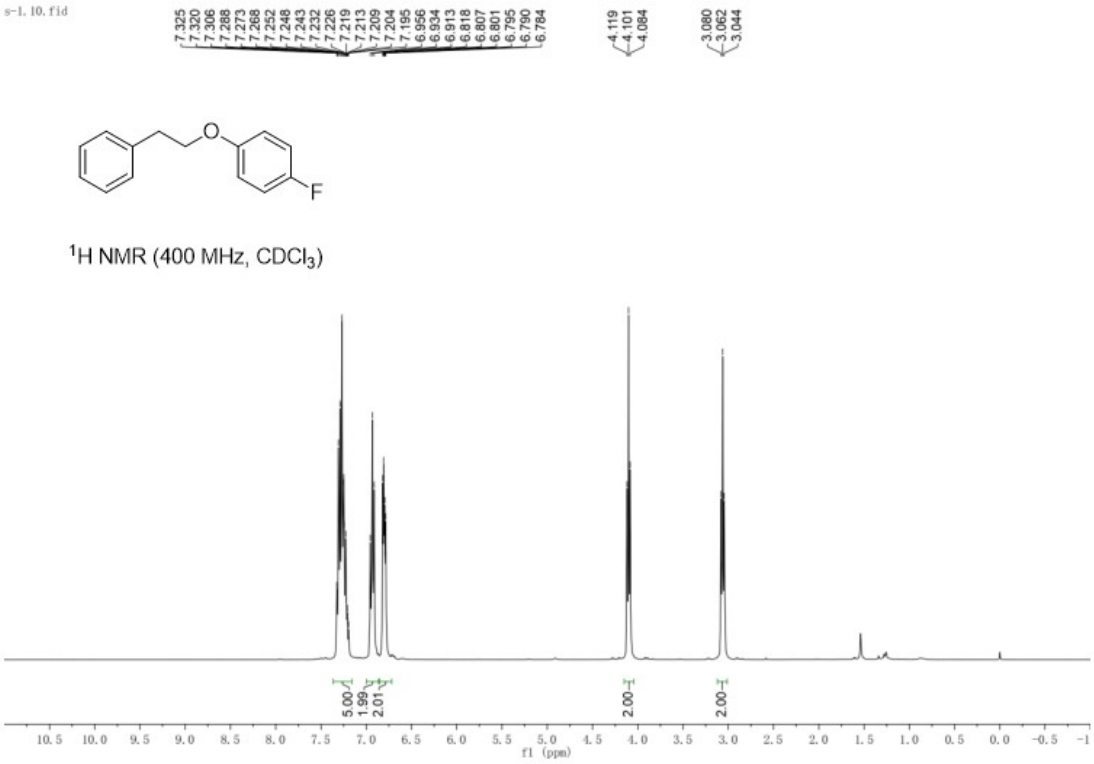
^{13}C NMR (101 MHz, $CDCl_3$)

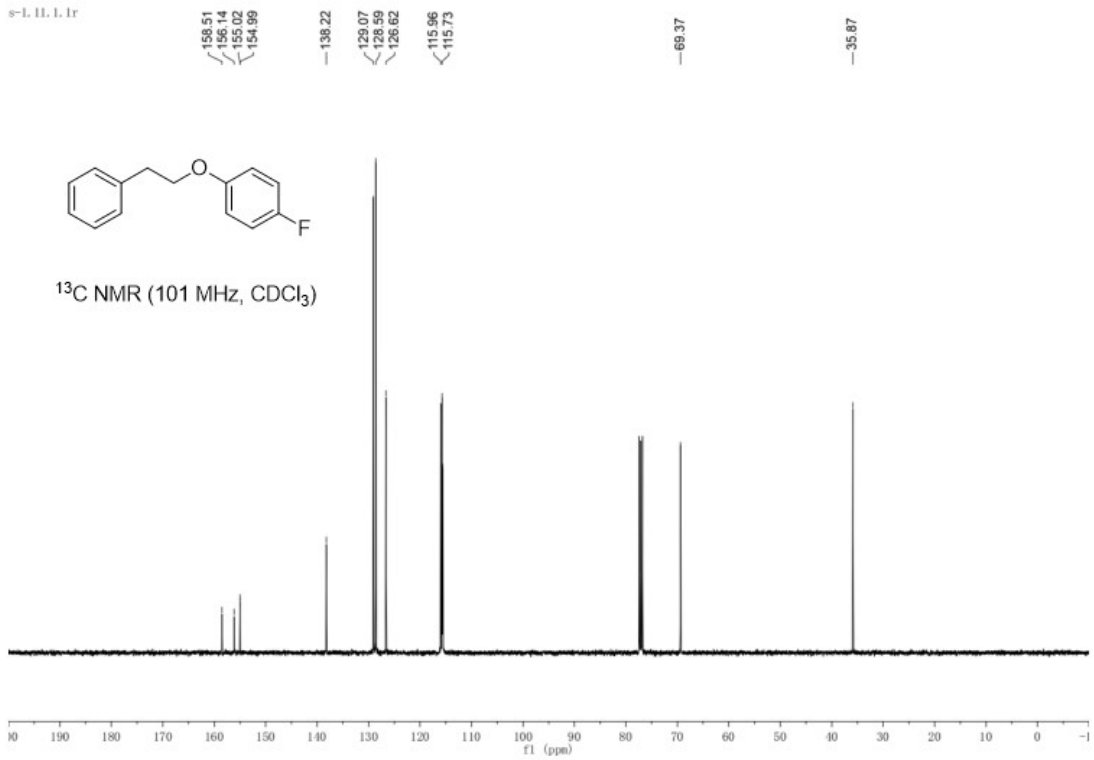
1-fluoro-3-phenethoxybenzene (1j)



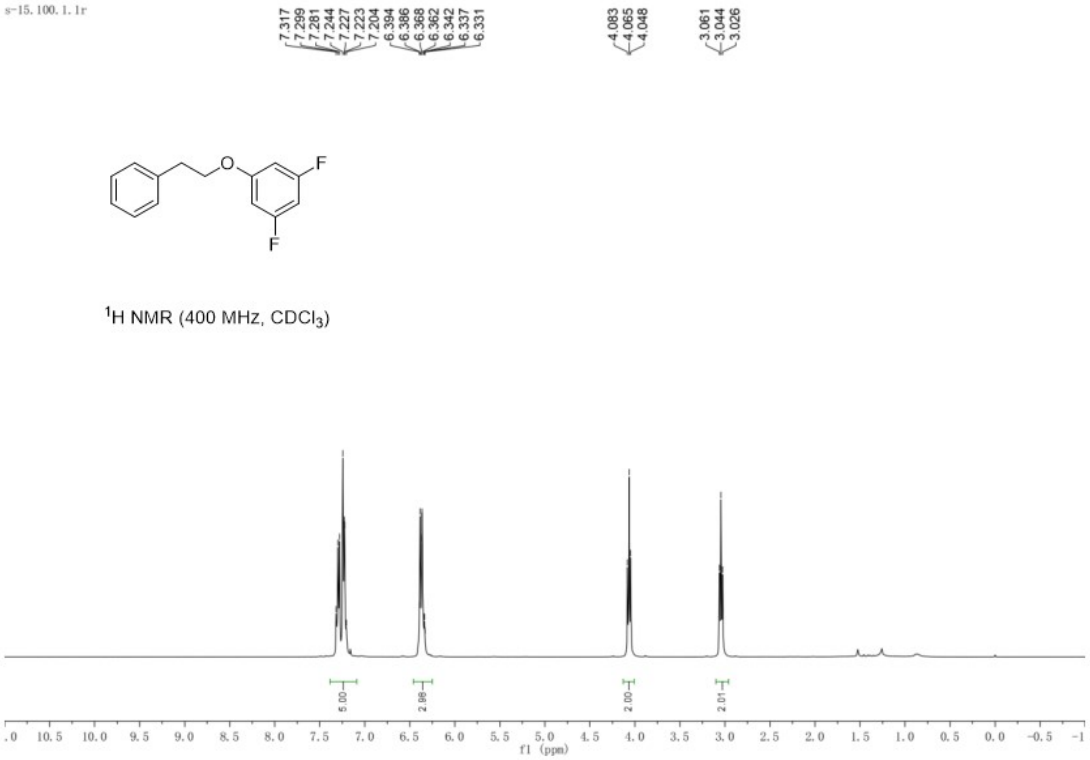


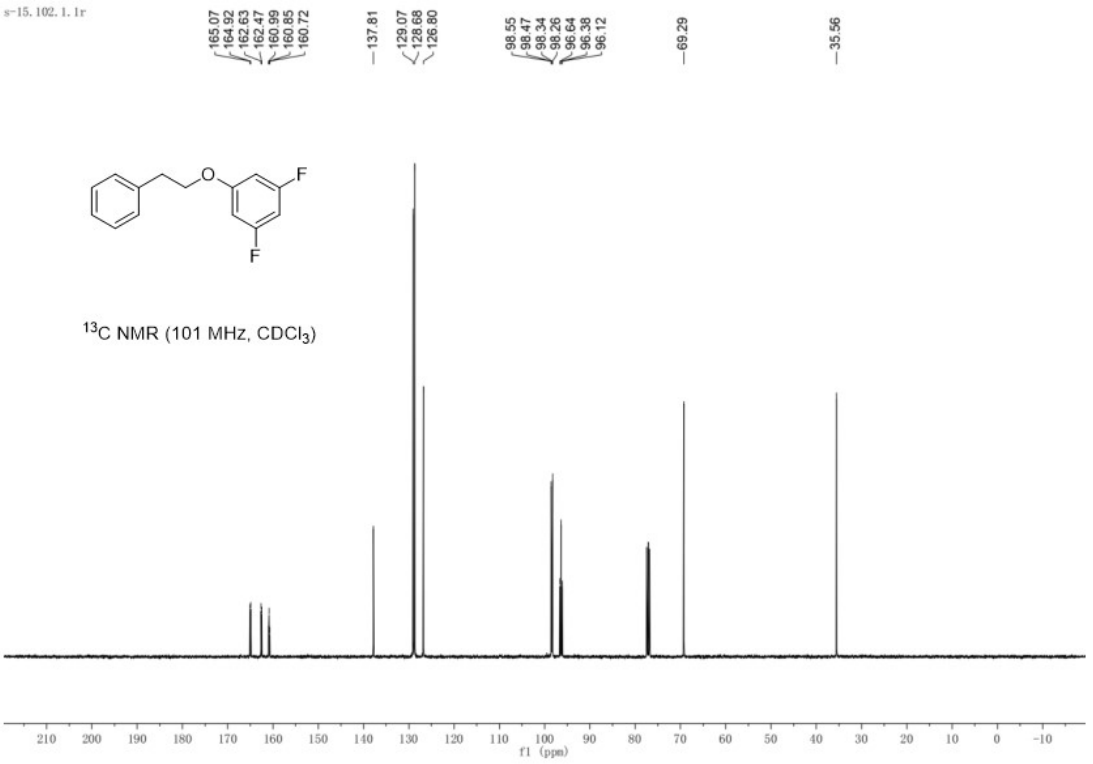
1-fluoro-4-phenethoxybenzene (1k)



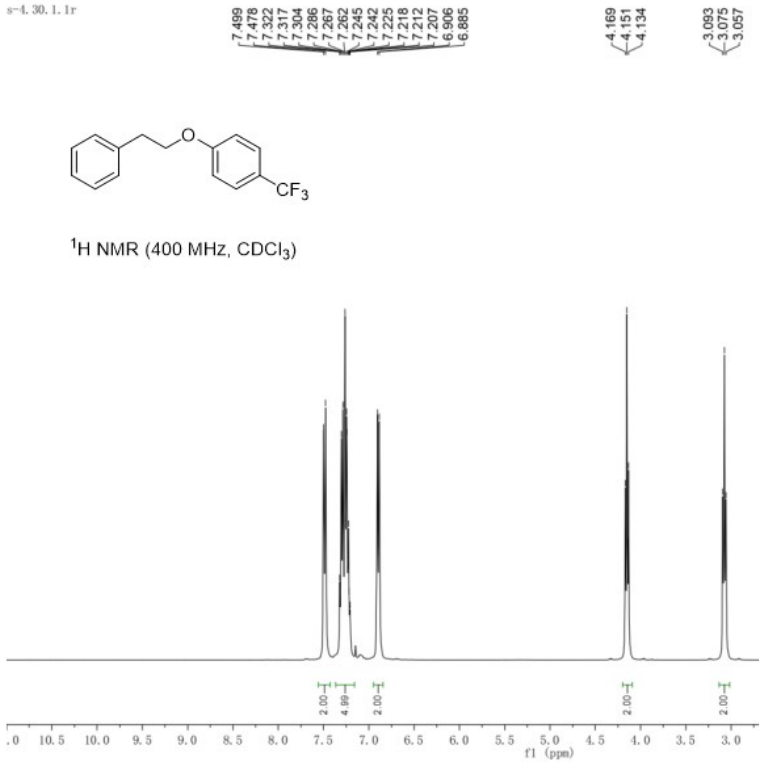


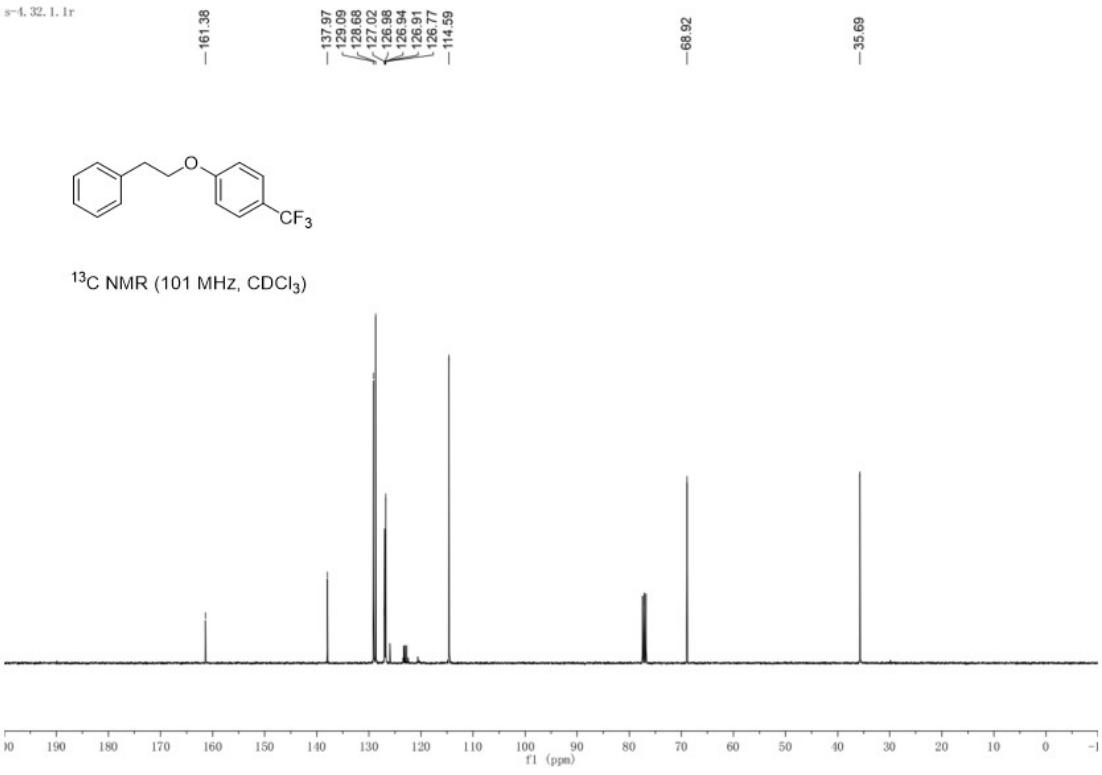
1,3-difluoro-5-phenethoxybenzene (1l)



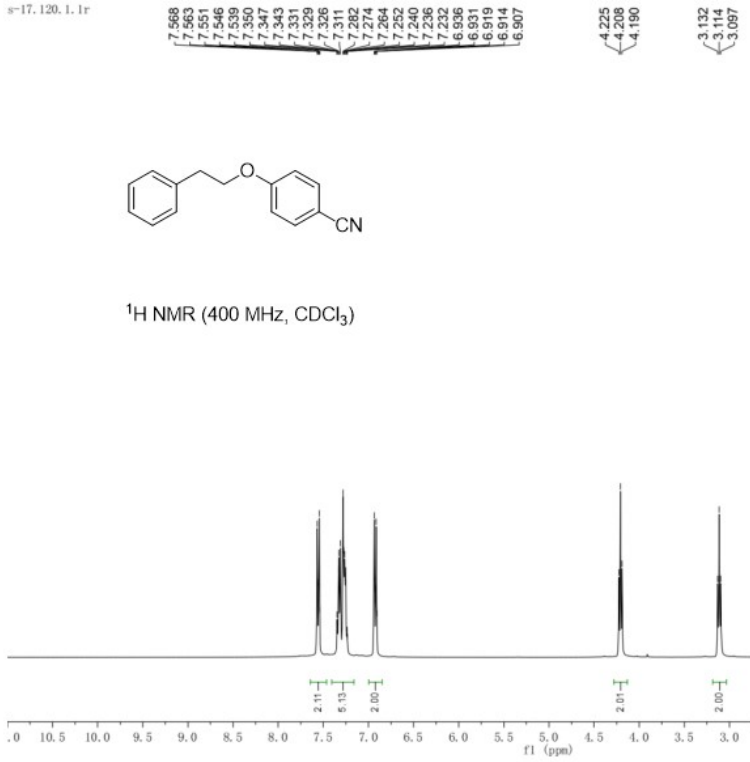


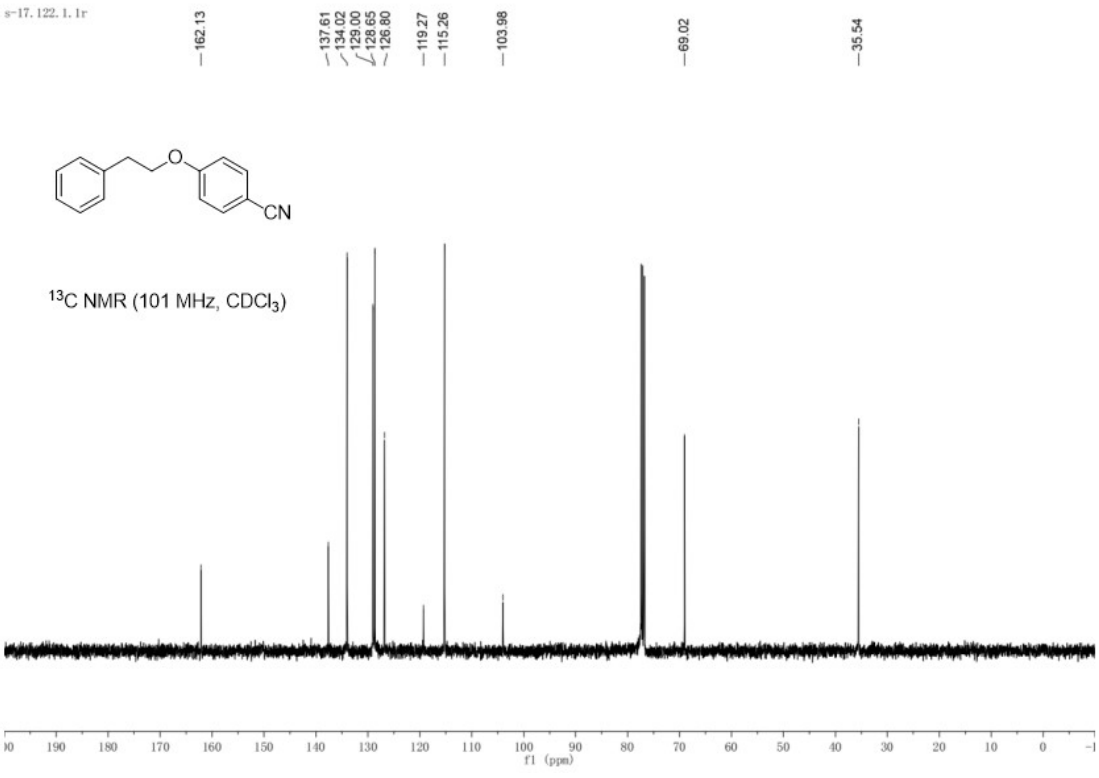
1-phenethoxy-4-(trifluoromethyl)benzene (1m)



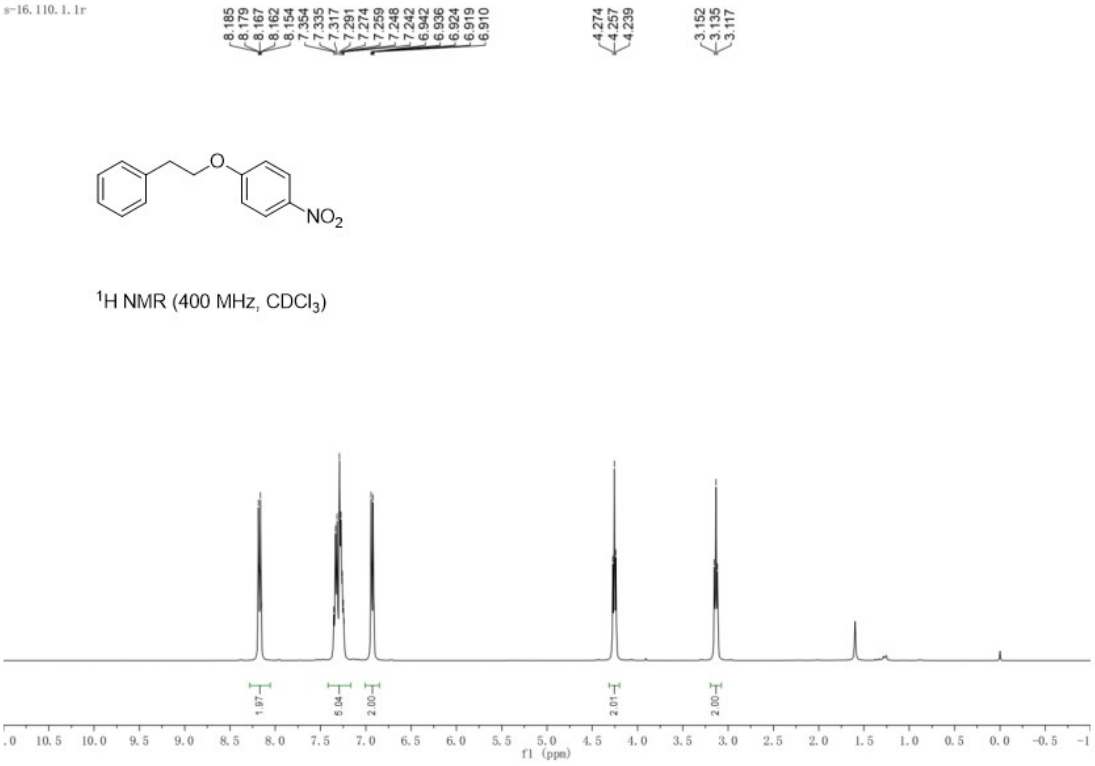


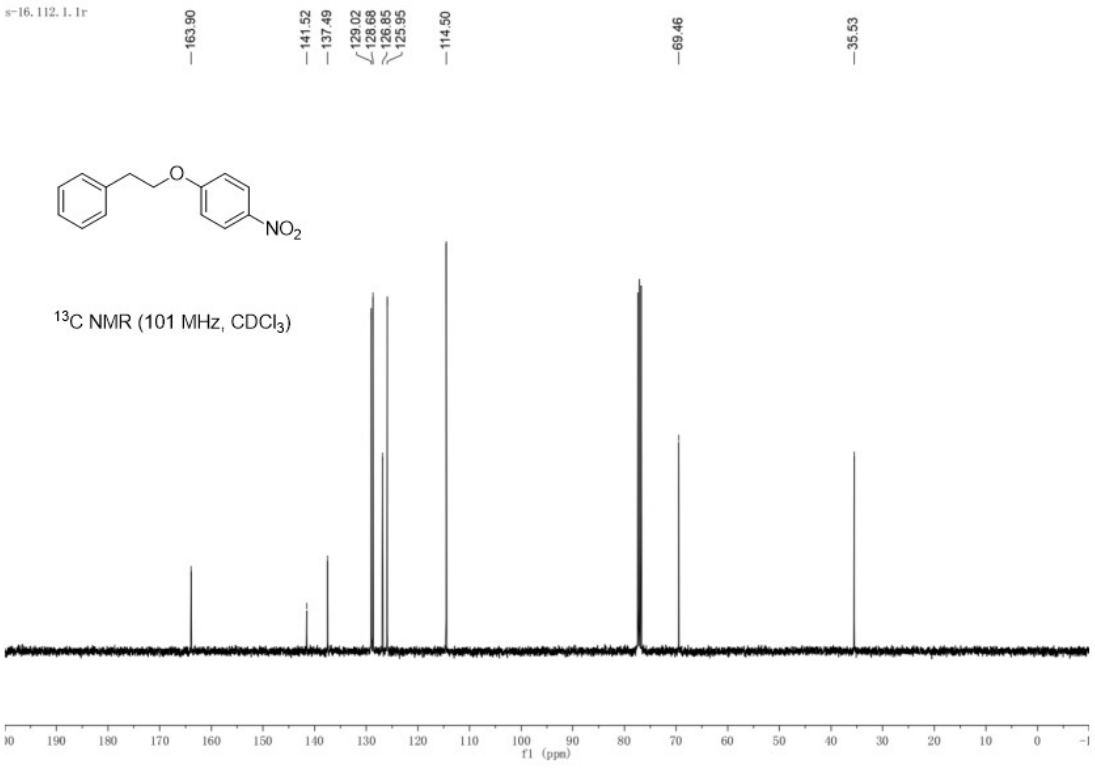
4-phenethoxybenzonitrile (1n)



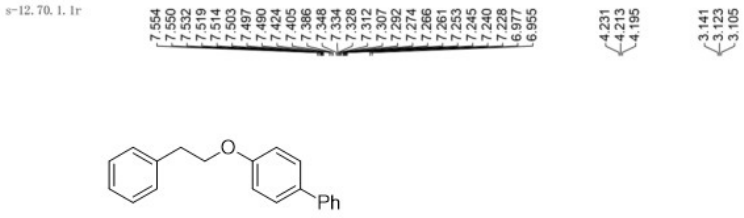


1-nitro-4-phenethoxybenzene (1o)

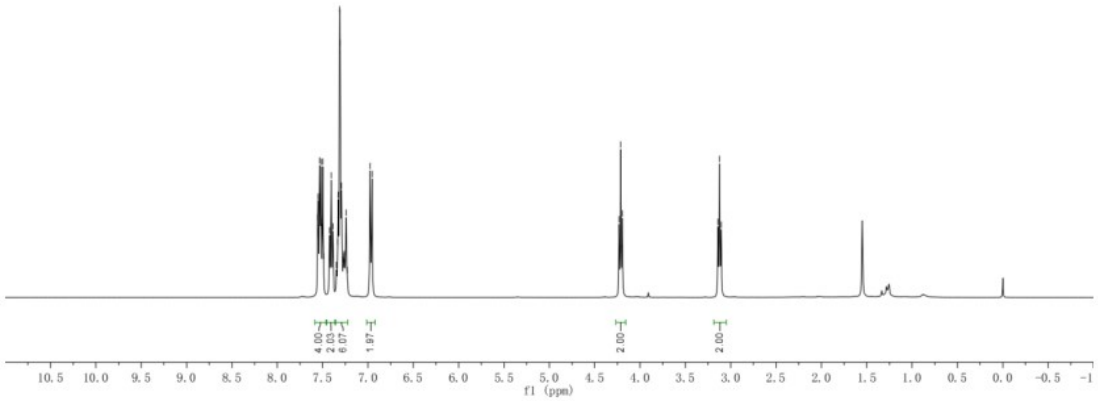


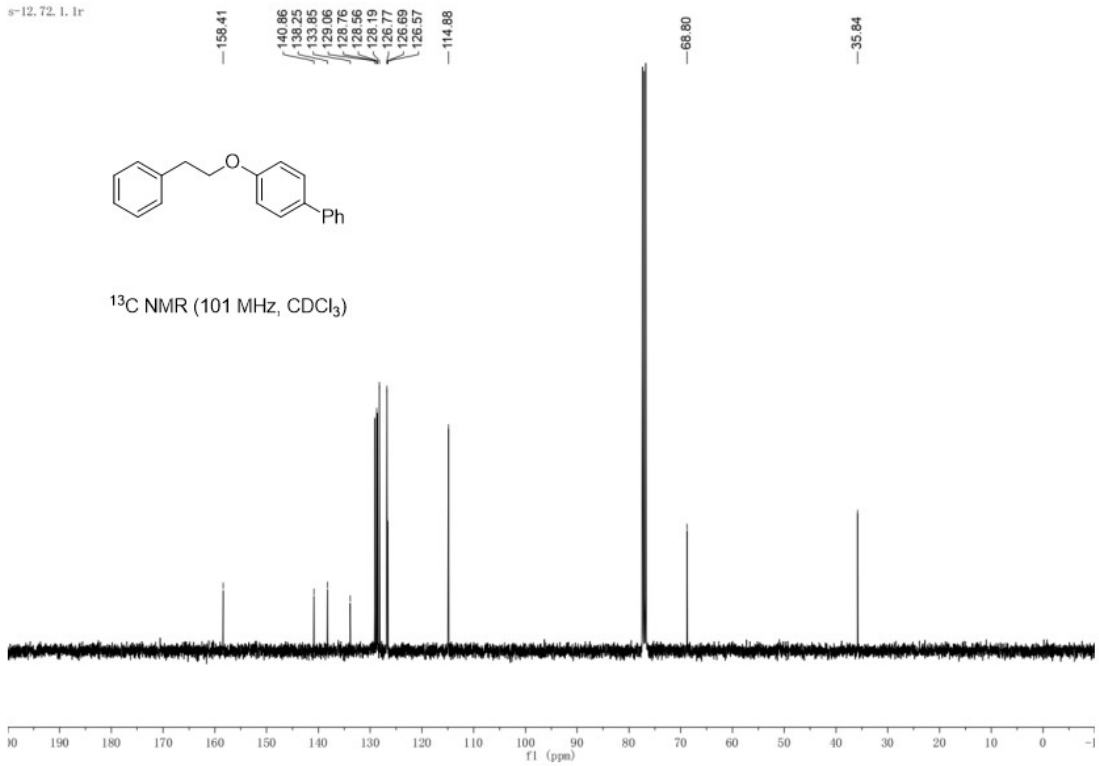


4-phenethoxy-1,1'-biphenyl (1p)



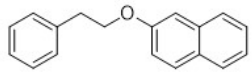
^{1}H NMR (400 MHz, $CDCl_3$)



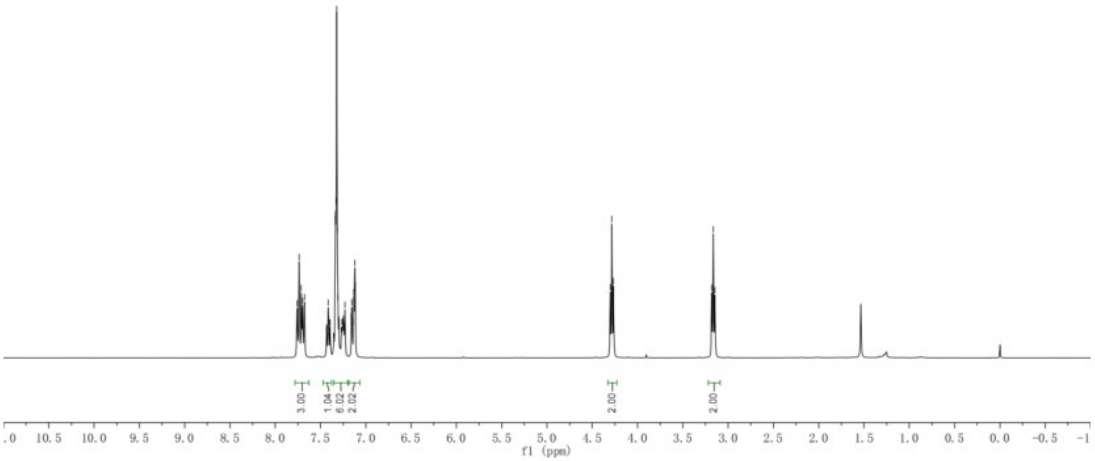


^{13}C NMR (101 MHz, $CDCl_3$)

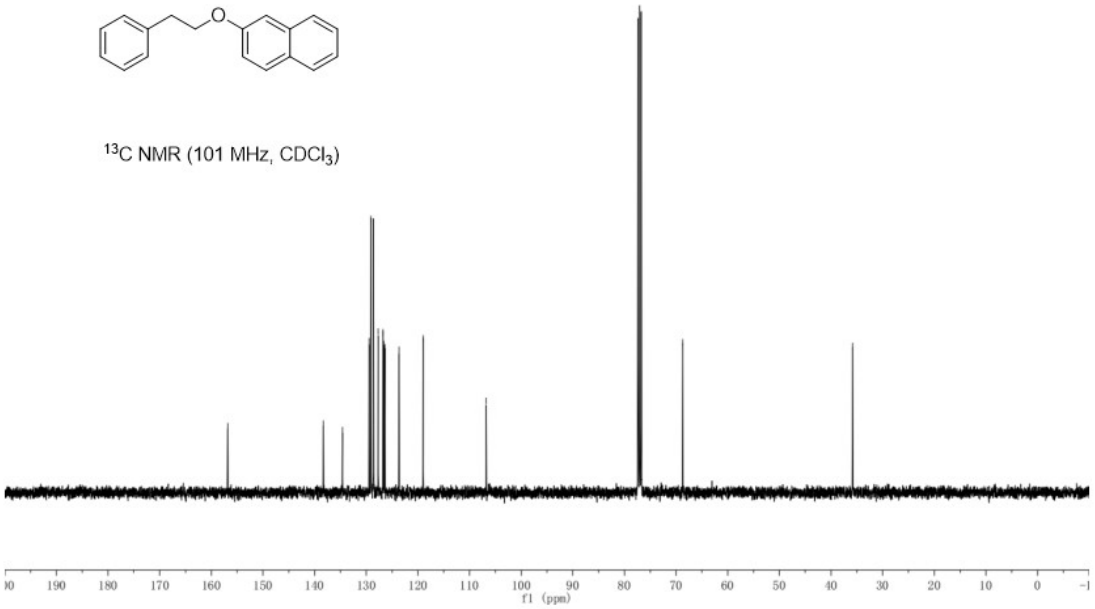
2-phenethoxynaphthalene (1q)



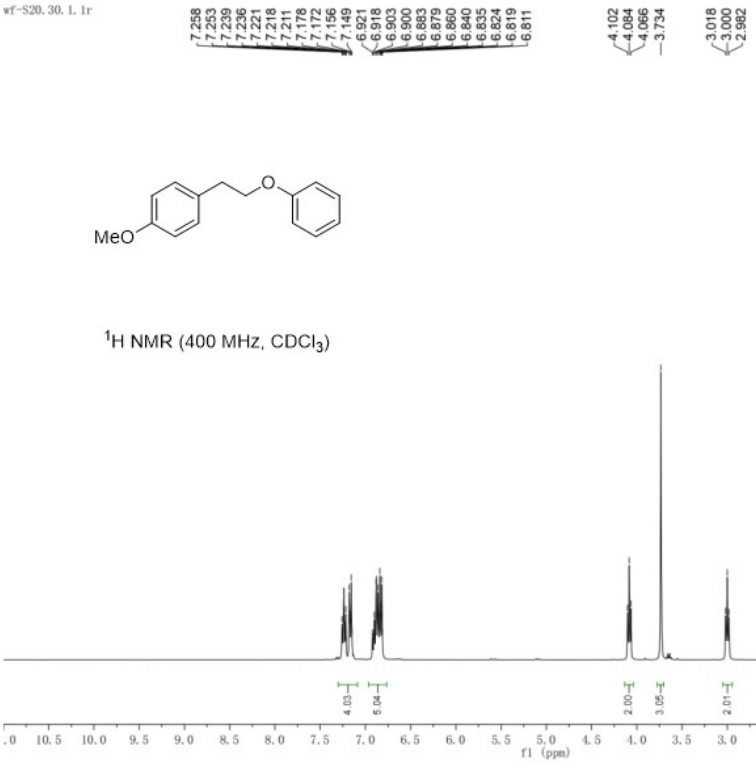
^{1}H NMR (400 MHz, $CDCl_3$)

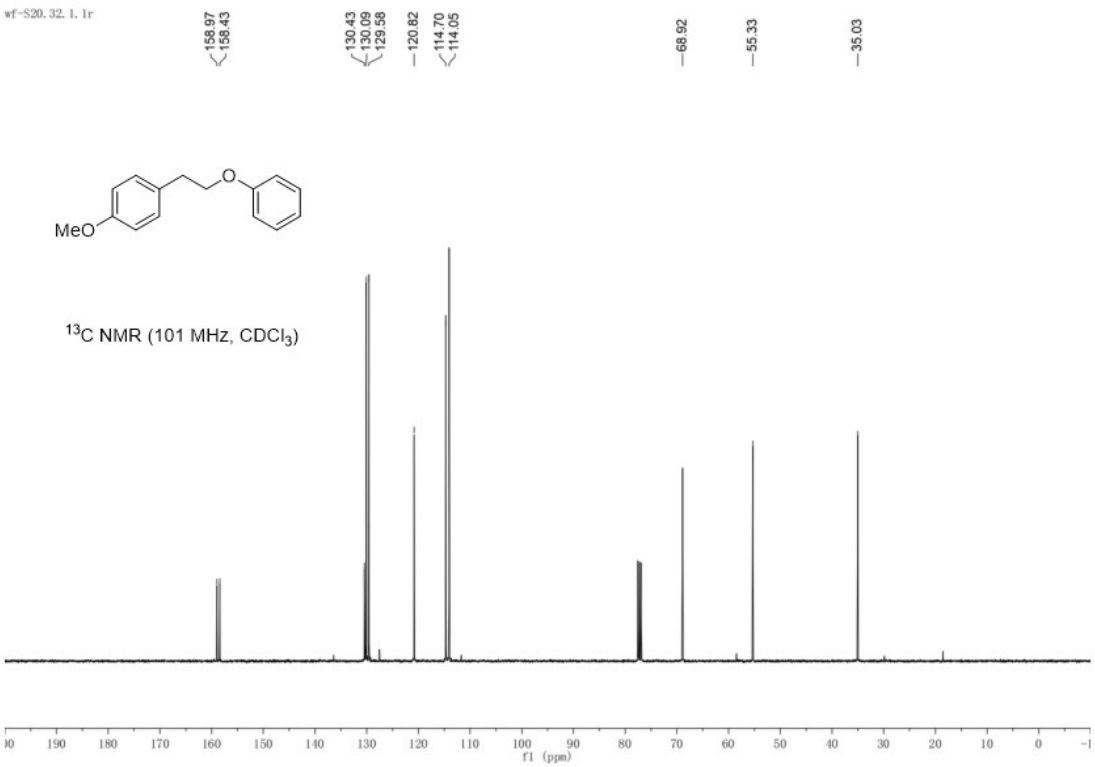


^{13}C NMR (101 MHz, $CDCl_3$)

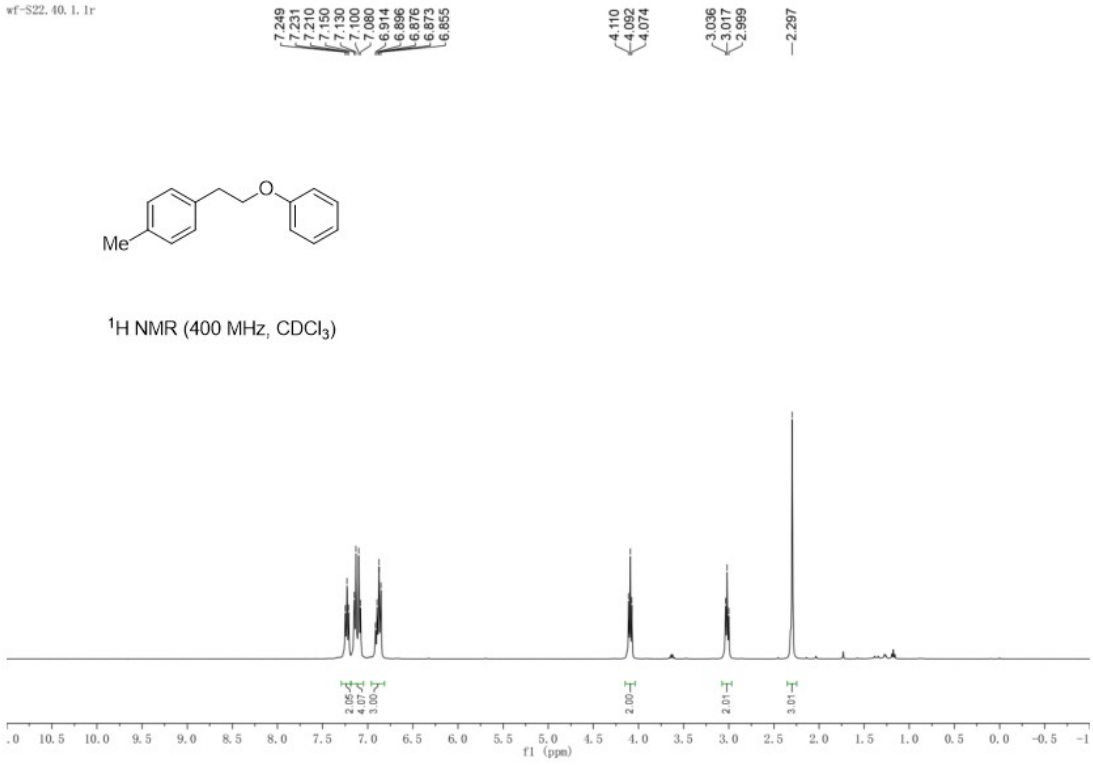


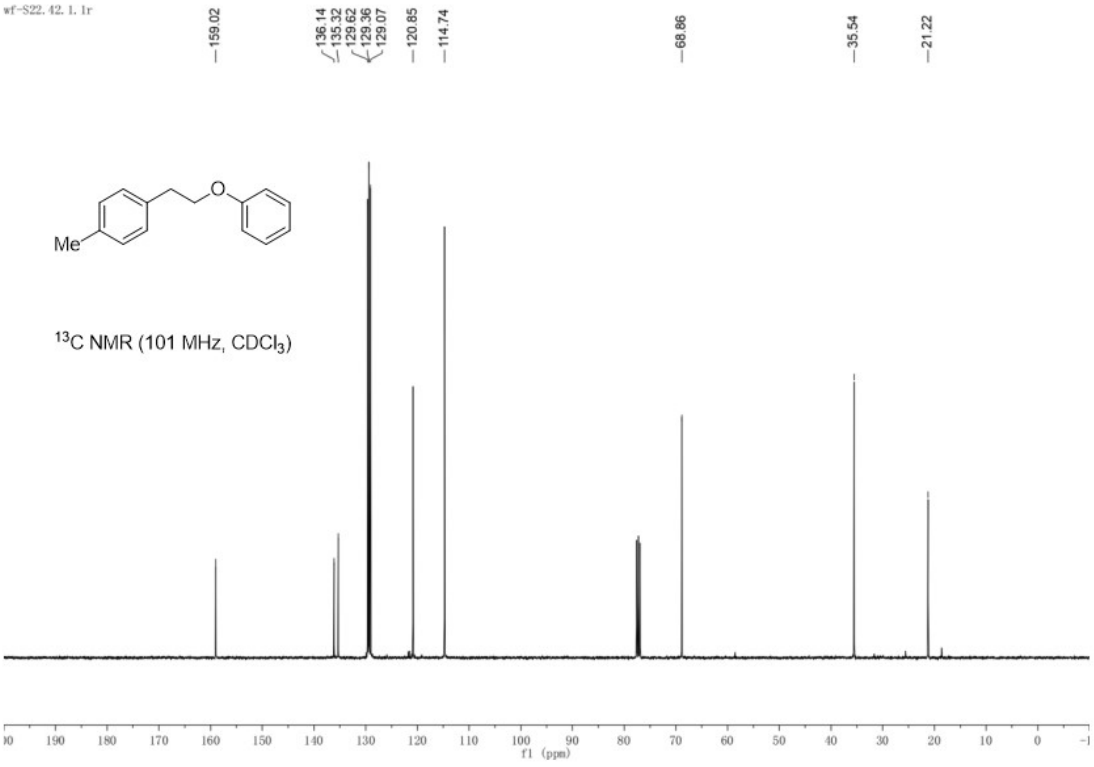
1-methoxy-4-(2-phenoxyethyl)benzene (1r)



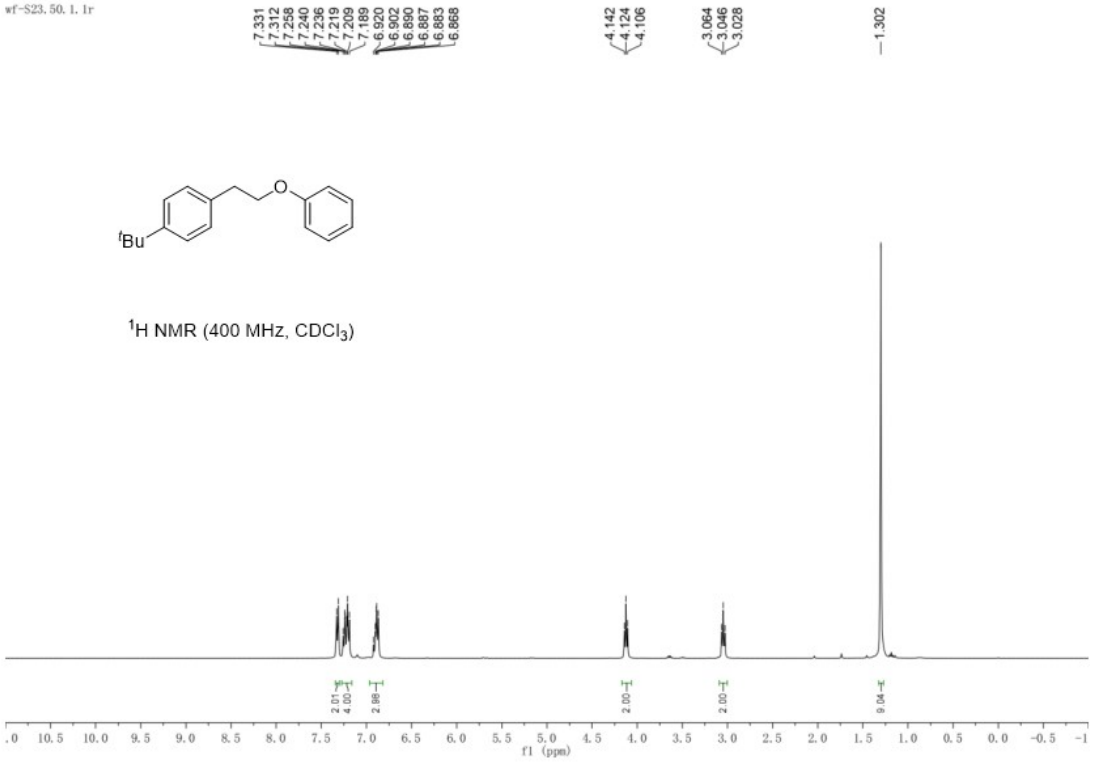


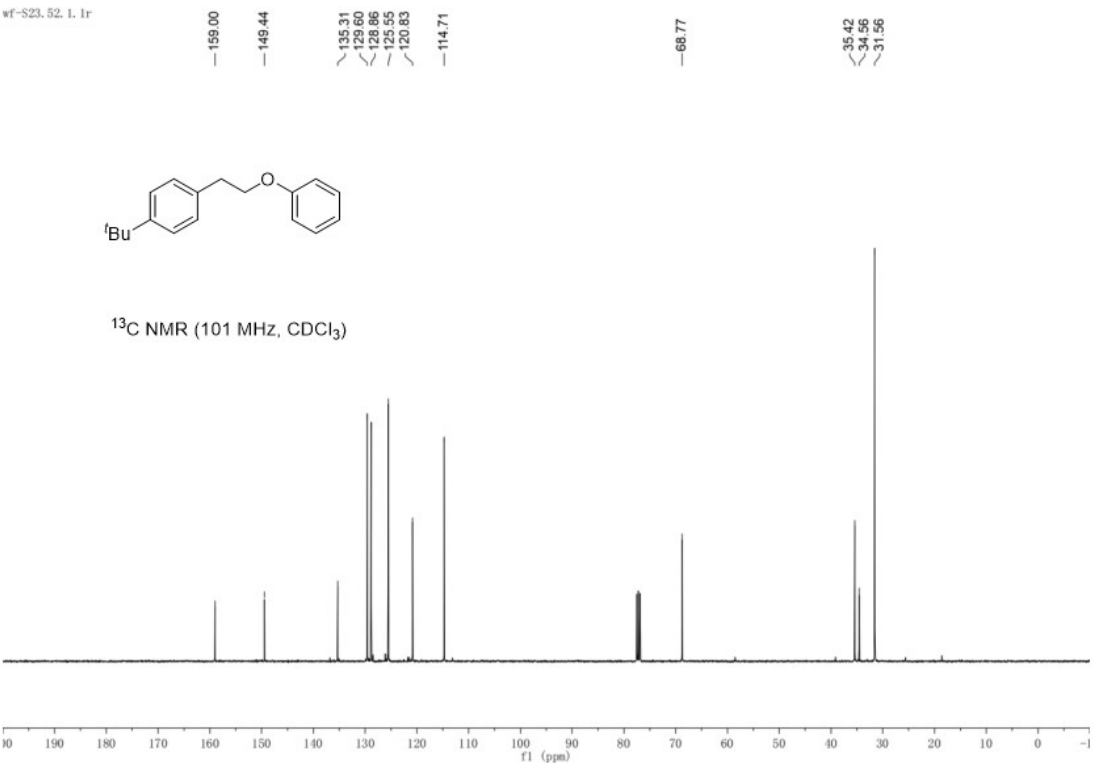
1-methyl-4-(2-phenoxyethyl)benzene (1s)



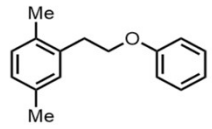


1-(*tert*-butyl)-4-(2-phenoxyethyl)benzene (1t)

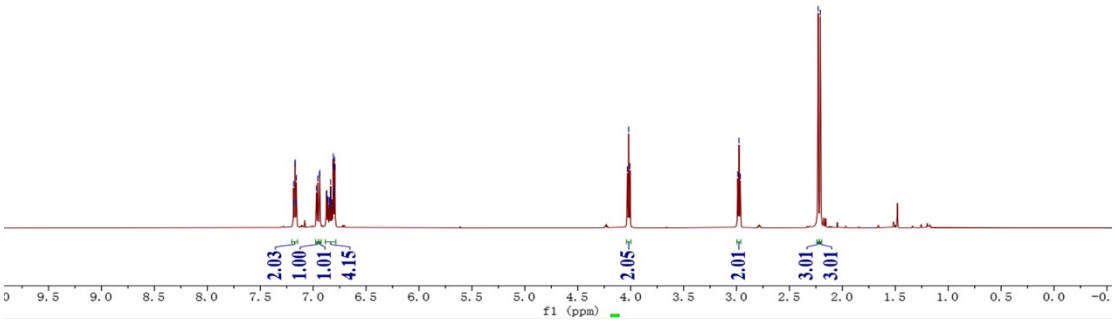


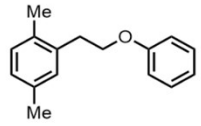


1,4-dimethyl-2-(2-phenoxyethyl)benzene (1u)

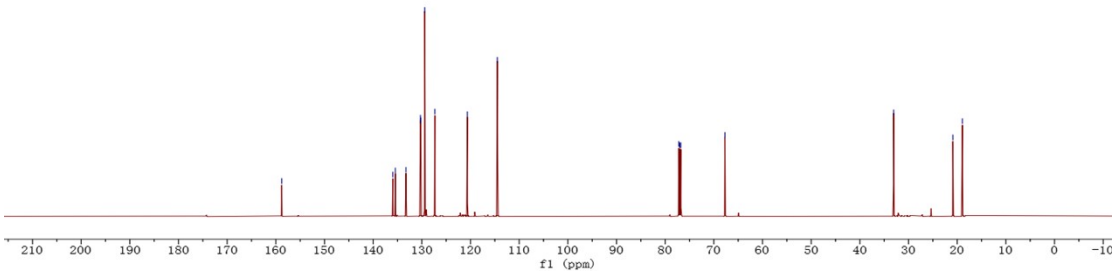


^{1}H NMR (600 MHz, $CDCl_3$)

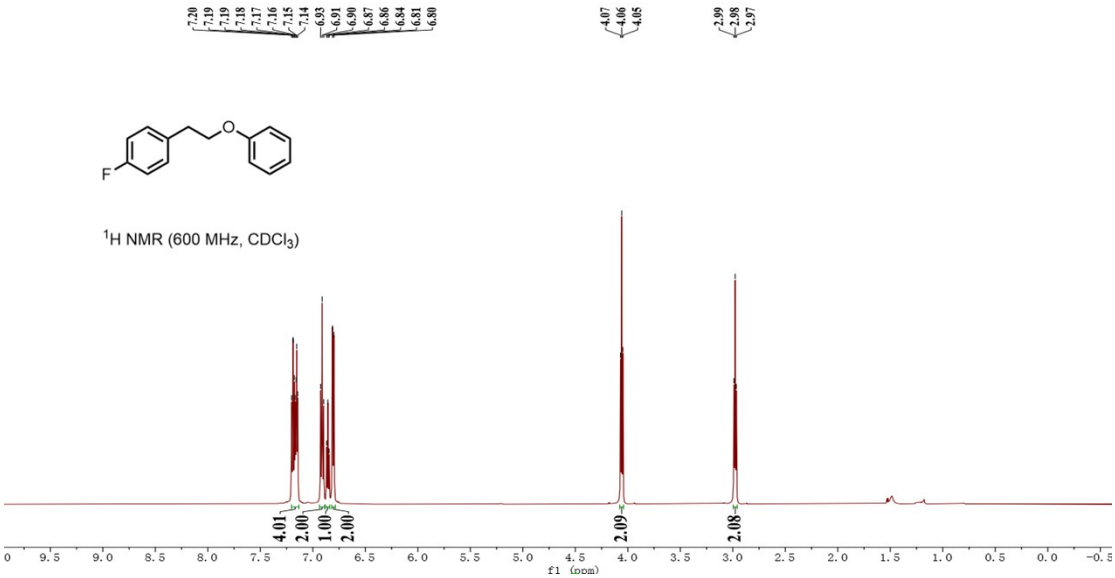


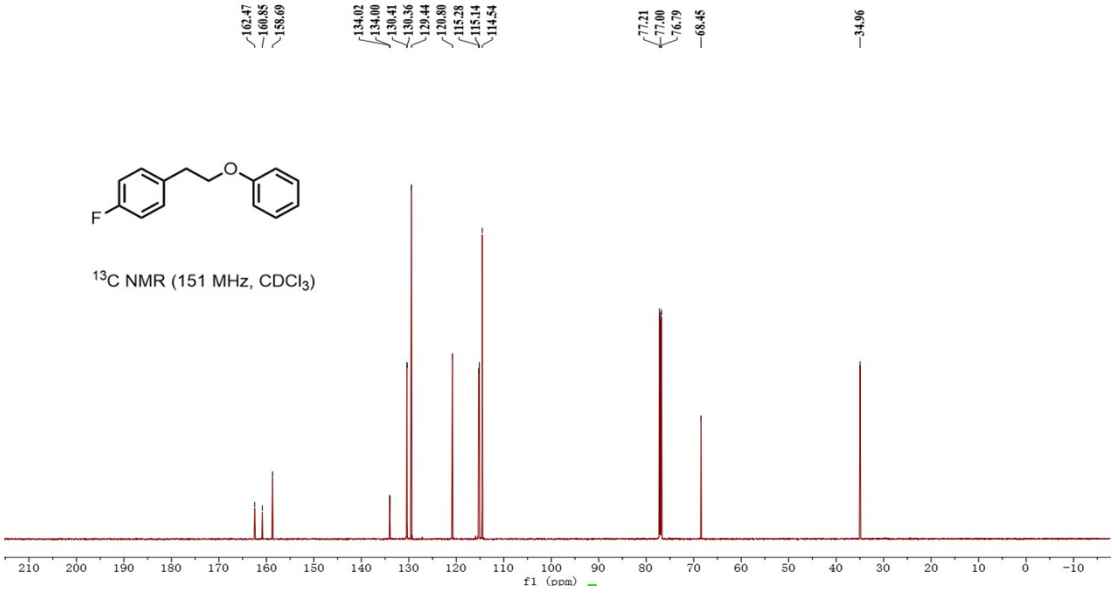


^{13}C NMR (151 MHz, $CDCl_3$)

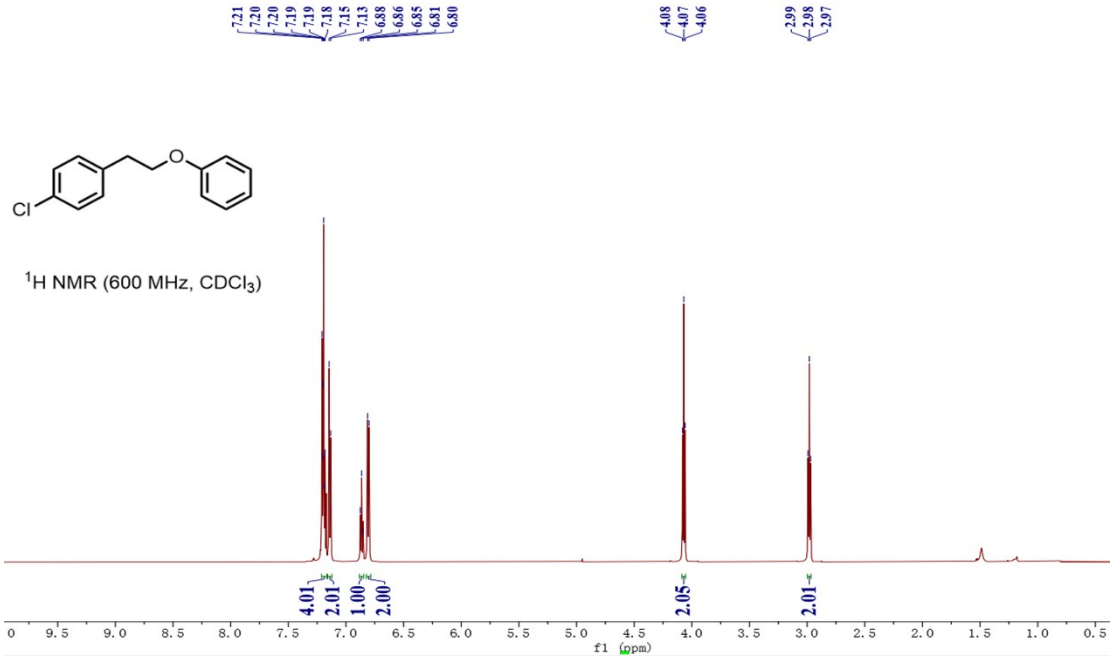


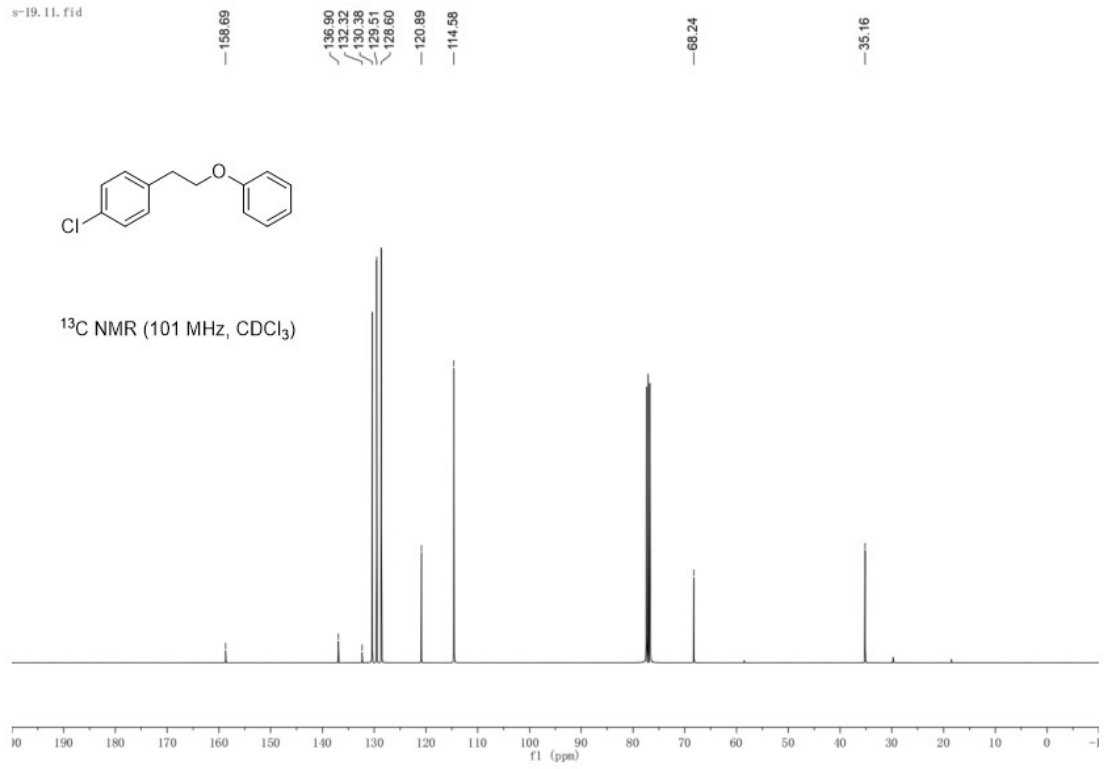
1-fluoro-4-(2-phenoxyethyl)benzene (1v)



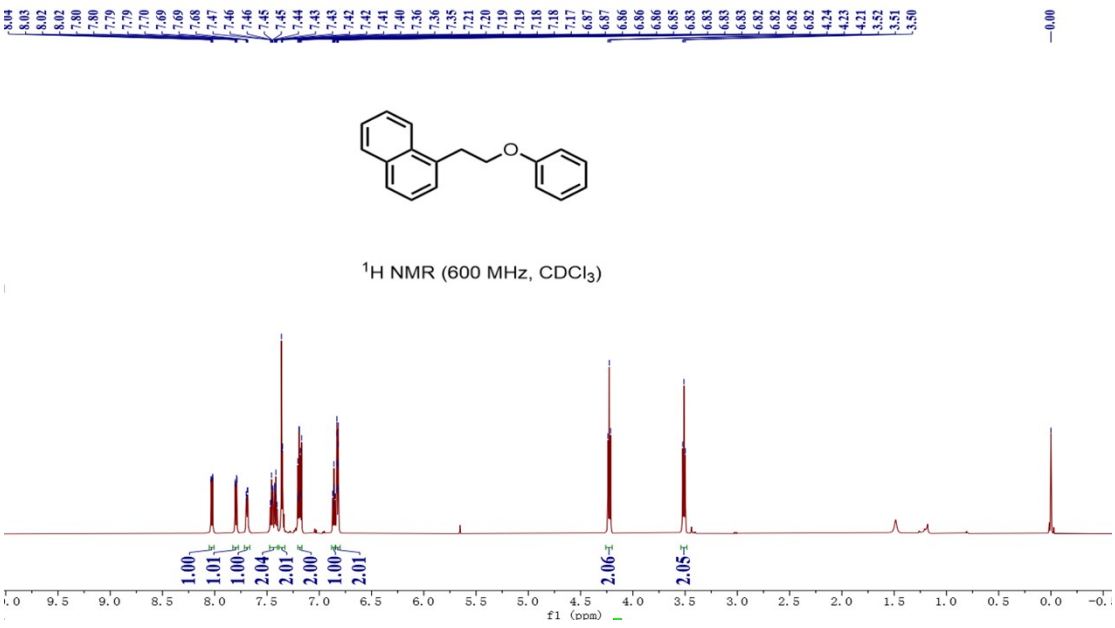


1-chloro-4-(2-phenoxyethyl)benzene (1w)

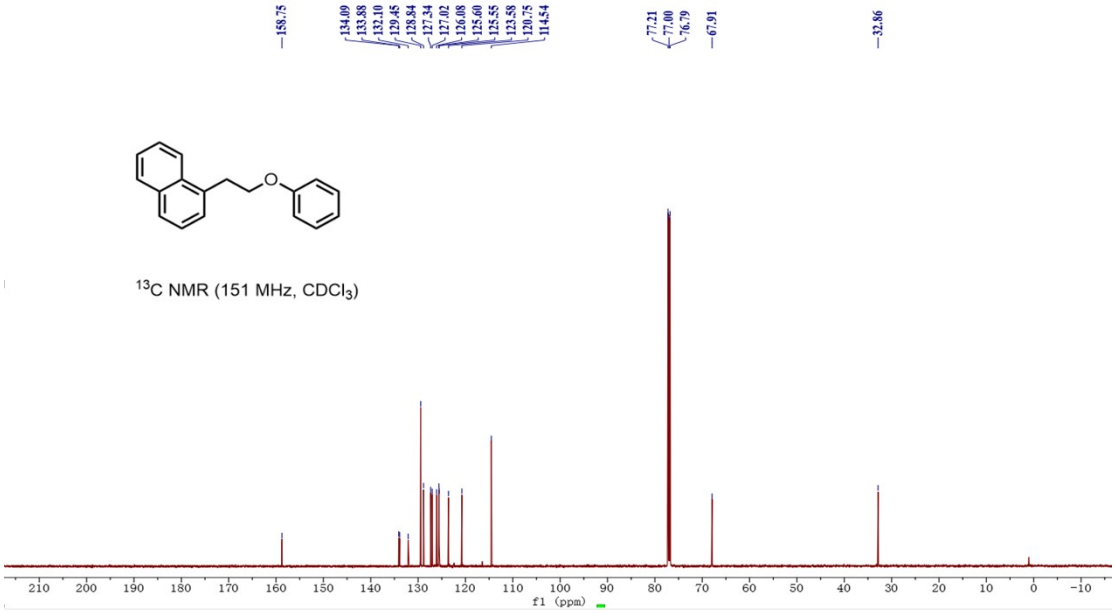




1-(2-phenoxyethyl)naphthalene (1x)

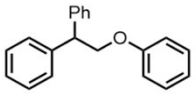


^{1}H NMR (600 MHz, $CDCl_3$)

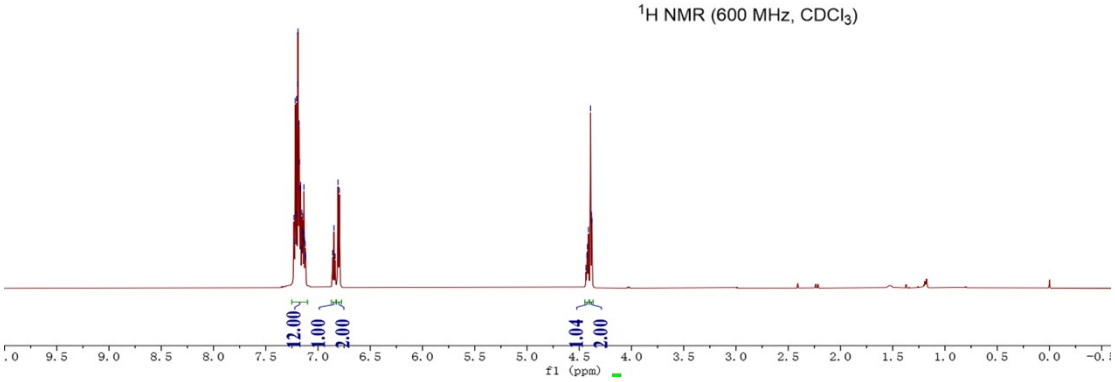


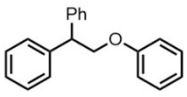
^{13}C NMR (151 MHz, $CDCl_3$)

(2-phenoxyethane-1,1-diyl)dibenzene (1y)

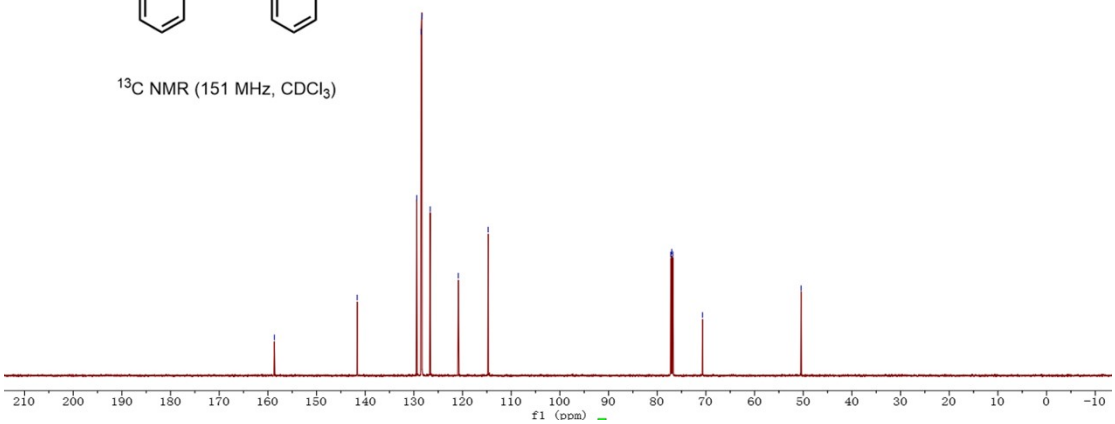


^{1}H NMR (600 MHz, $CDCl_3$)

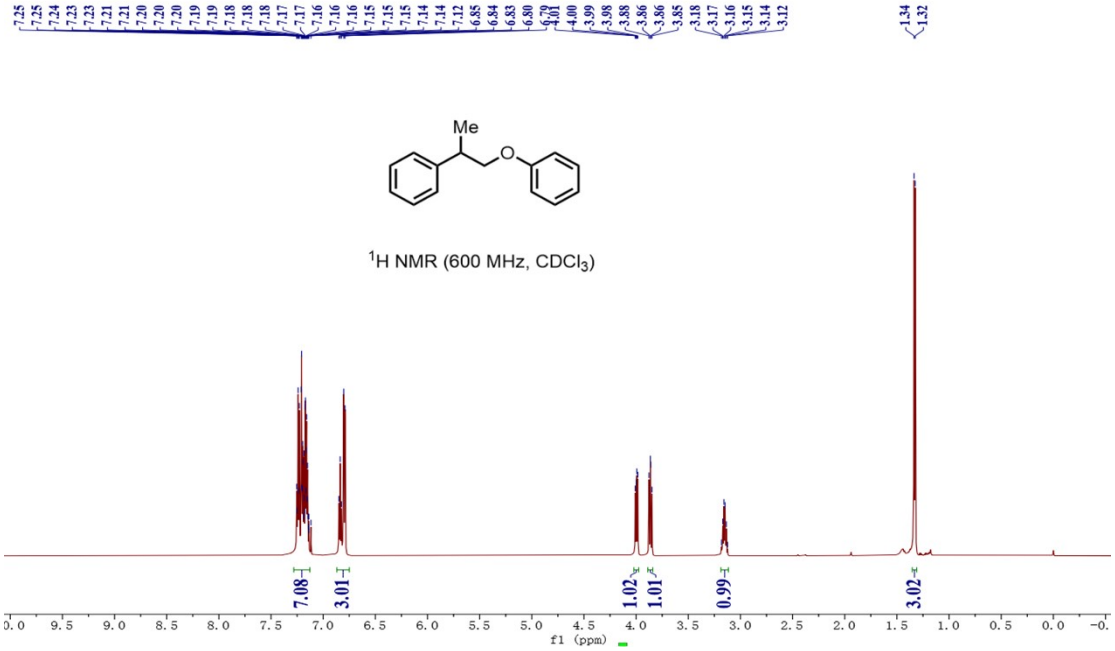


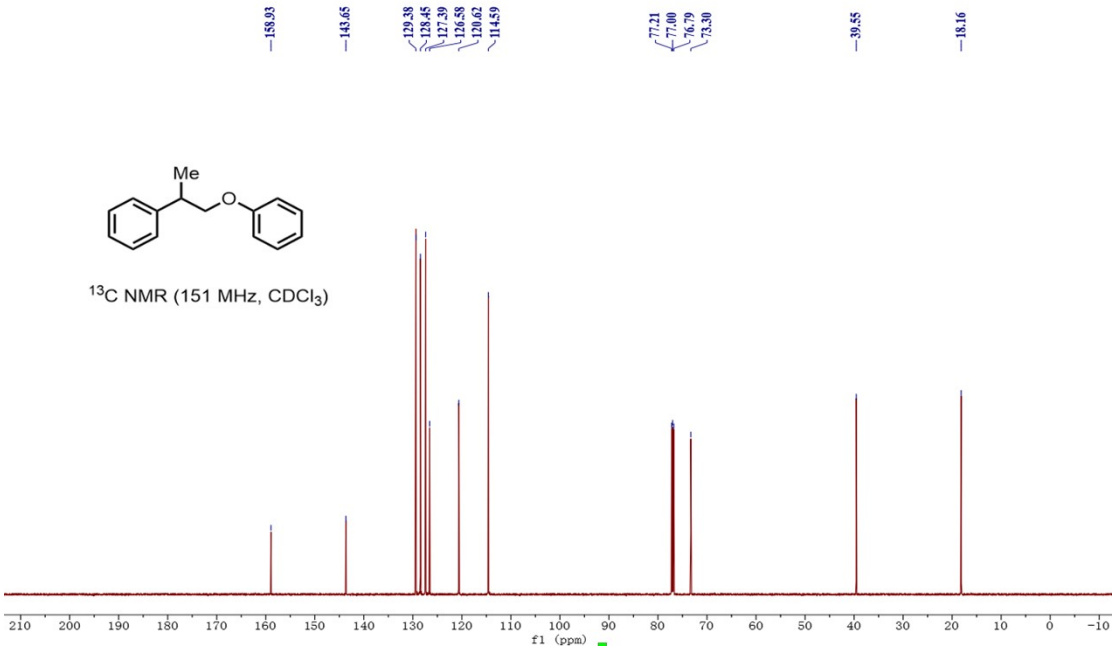


^{13}C NMR (151 MHz, $CDCl_3$)

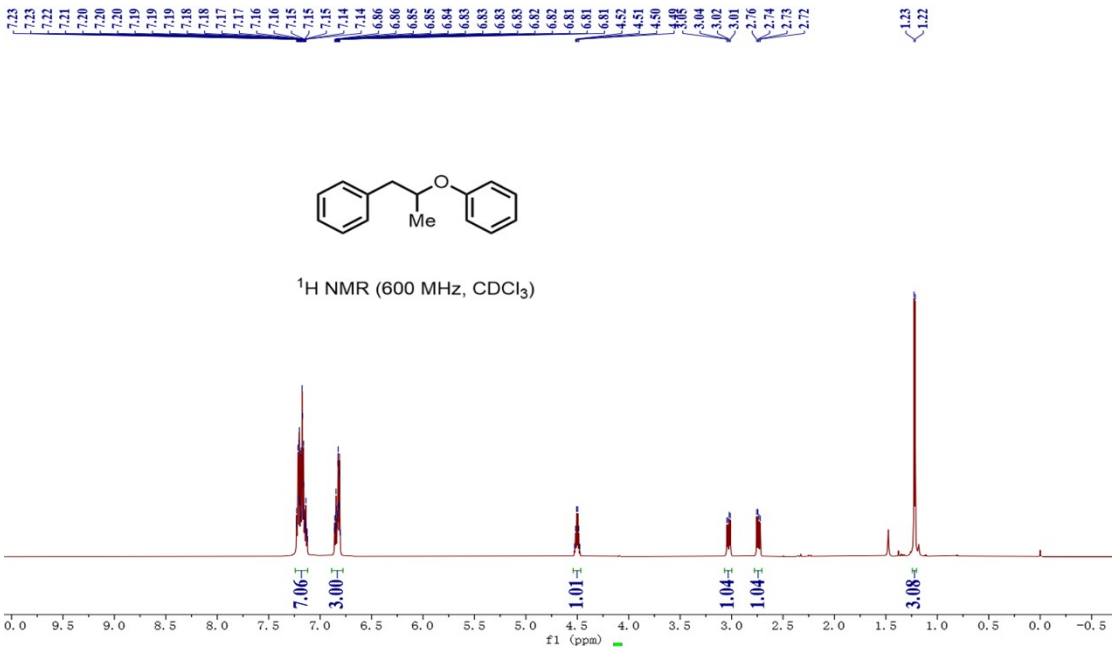


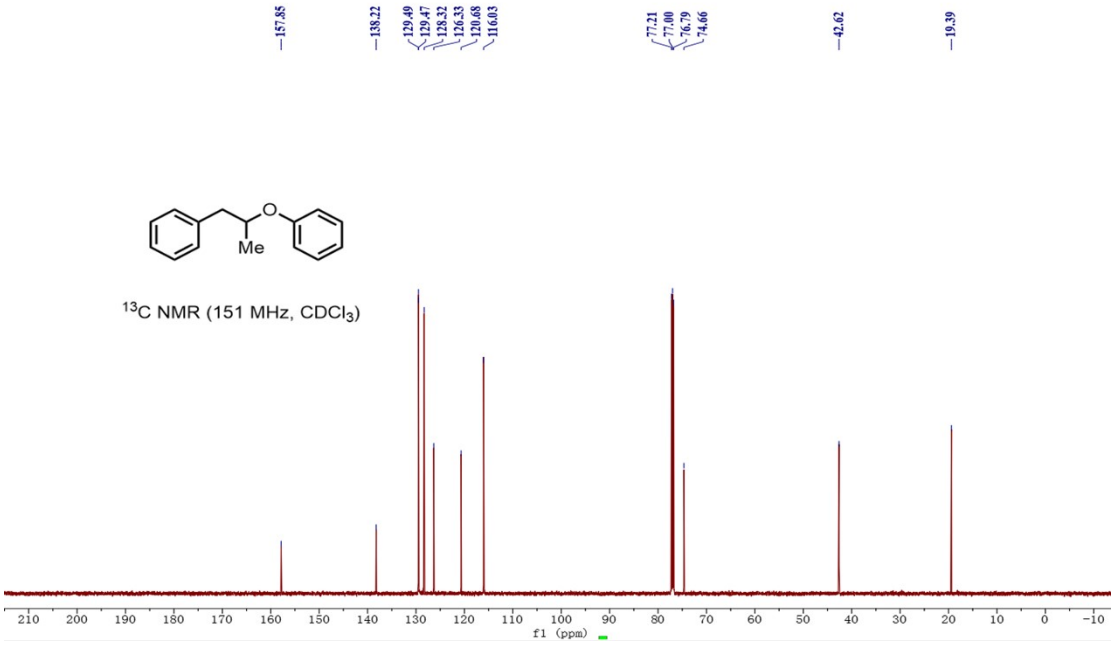
(1-phenoxypropan-2-yl)benzene (1z)



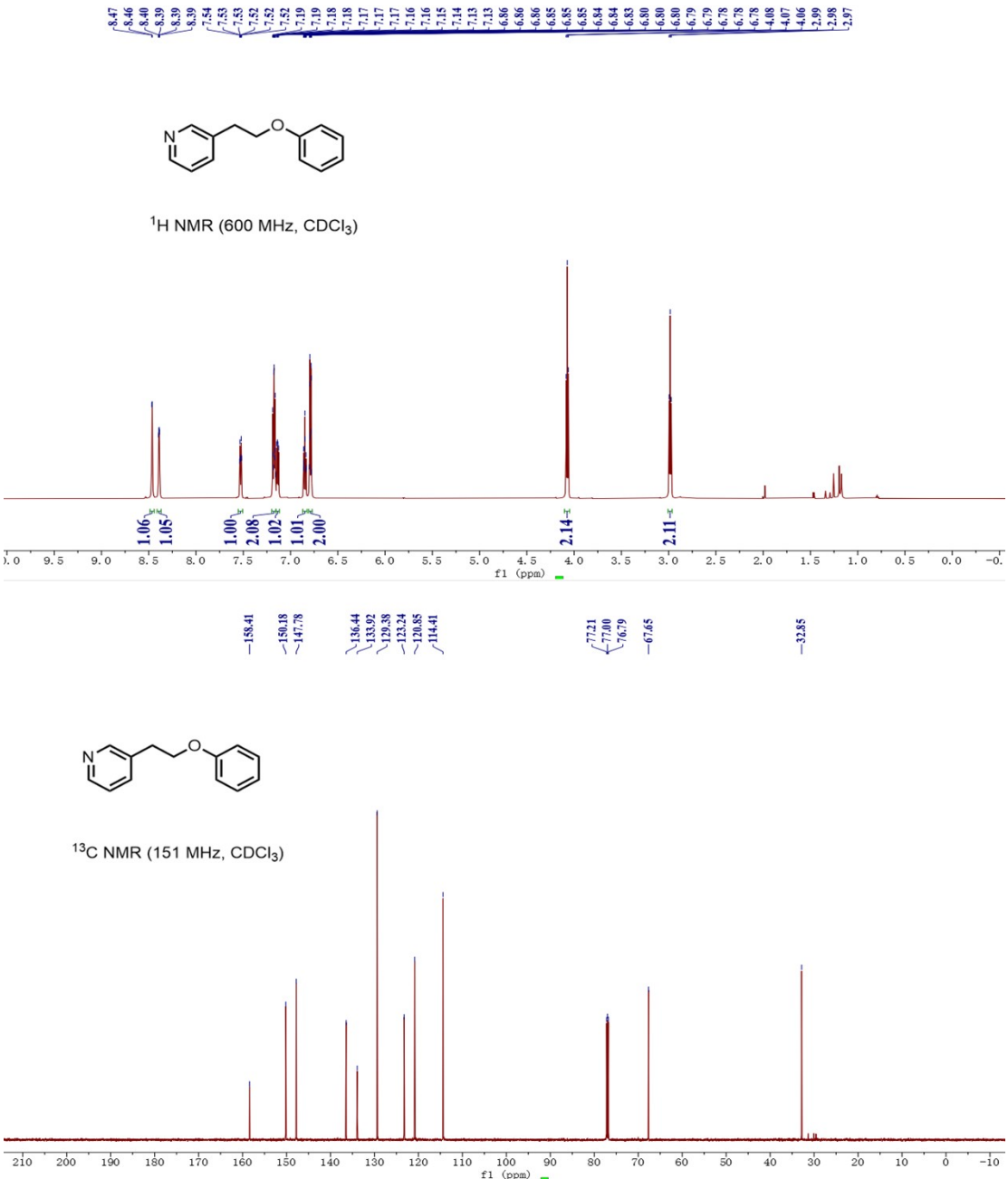


(2-phenoxypropyl)benzene (1aa)

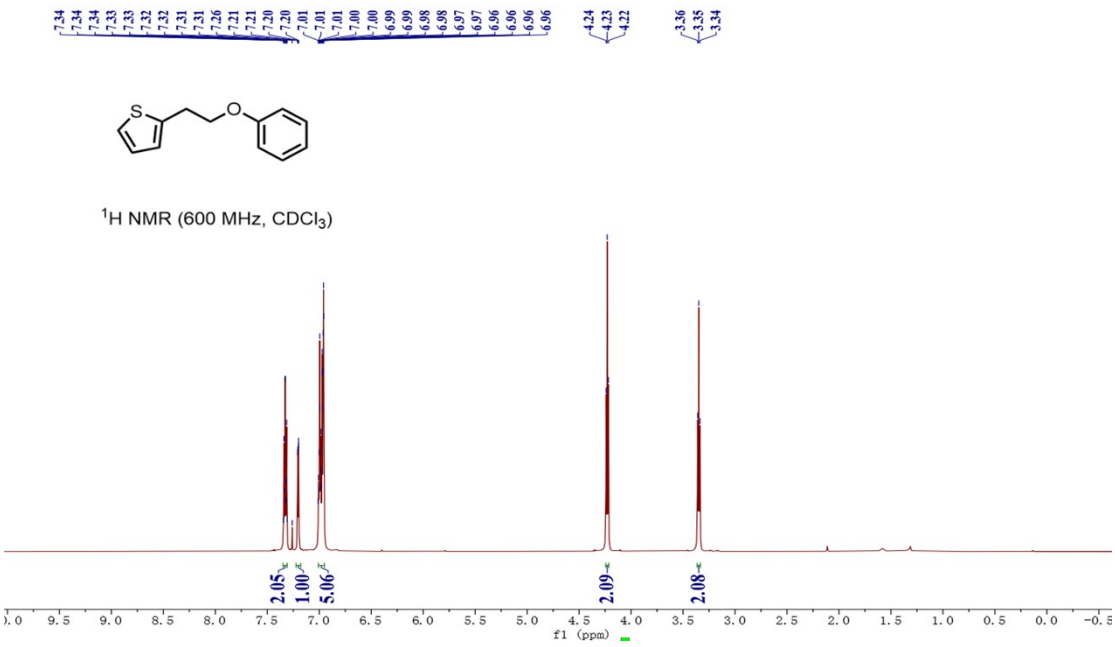


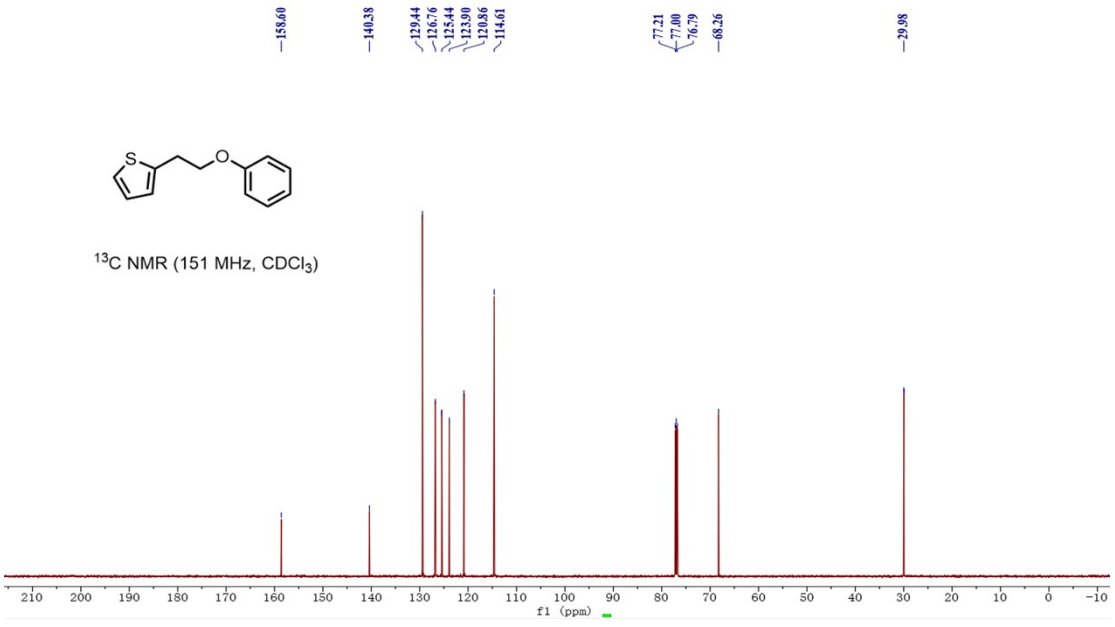


3-(2-phenoxyethyl)pyridine (1ab)

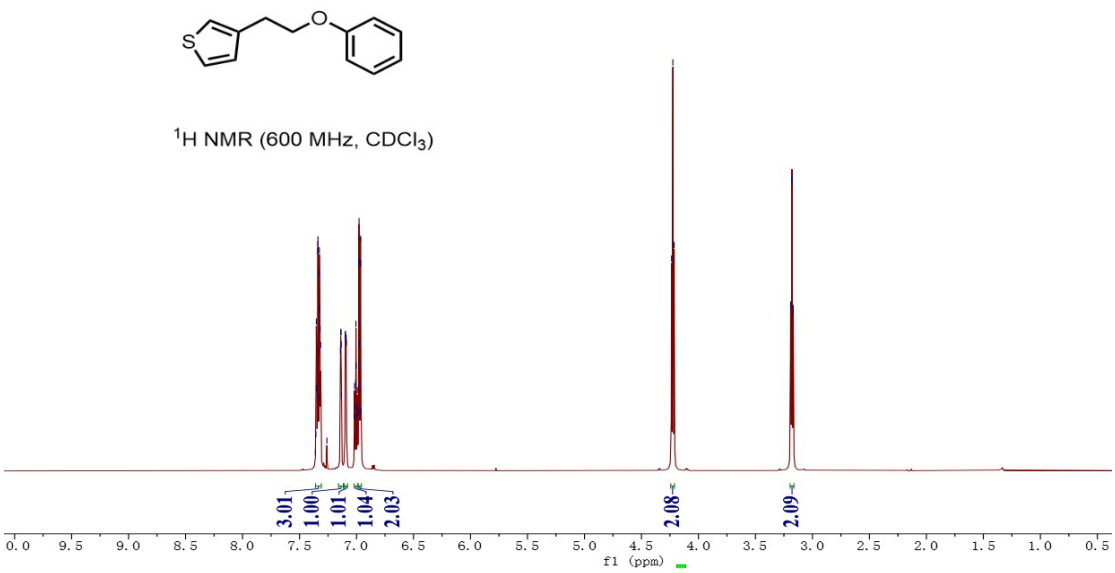


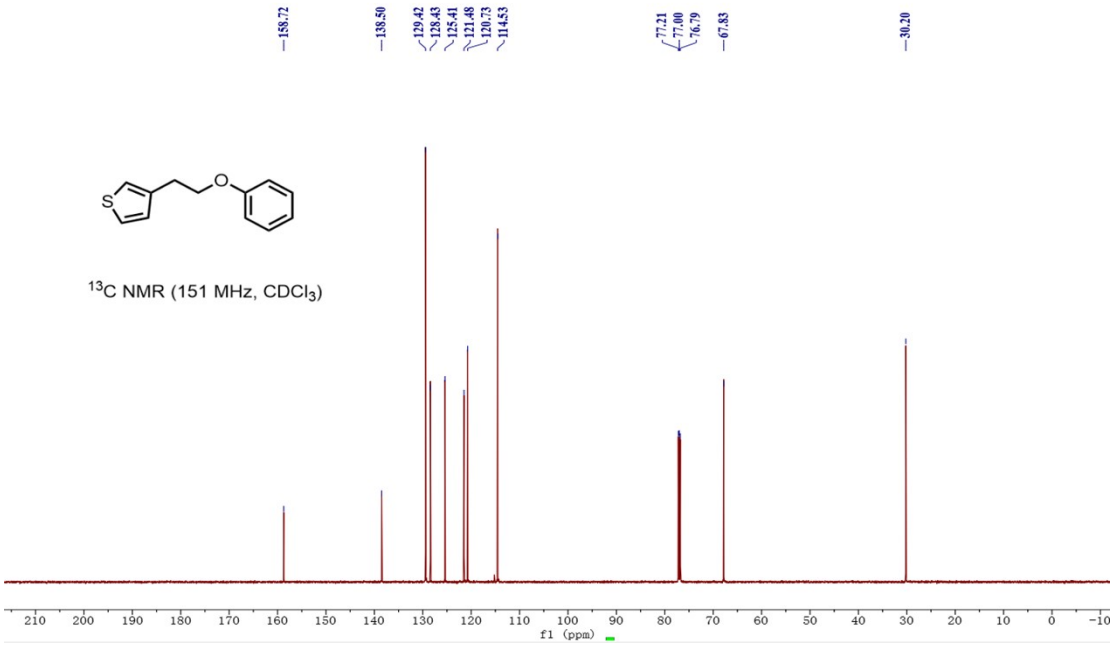
2-(2-phenoxyethyl)thiophene (1ac)



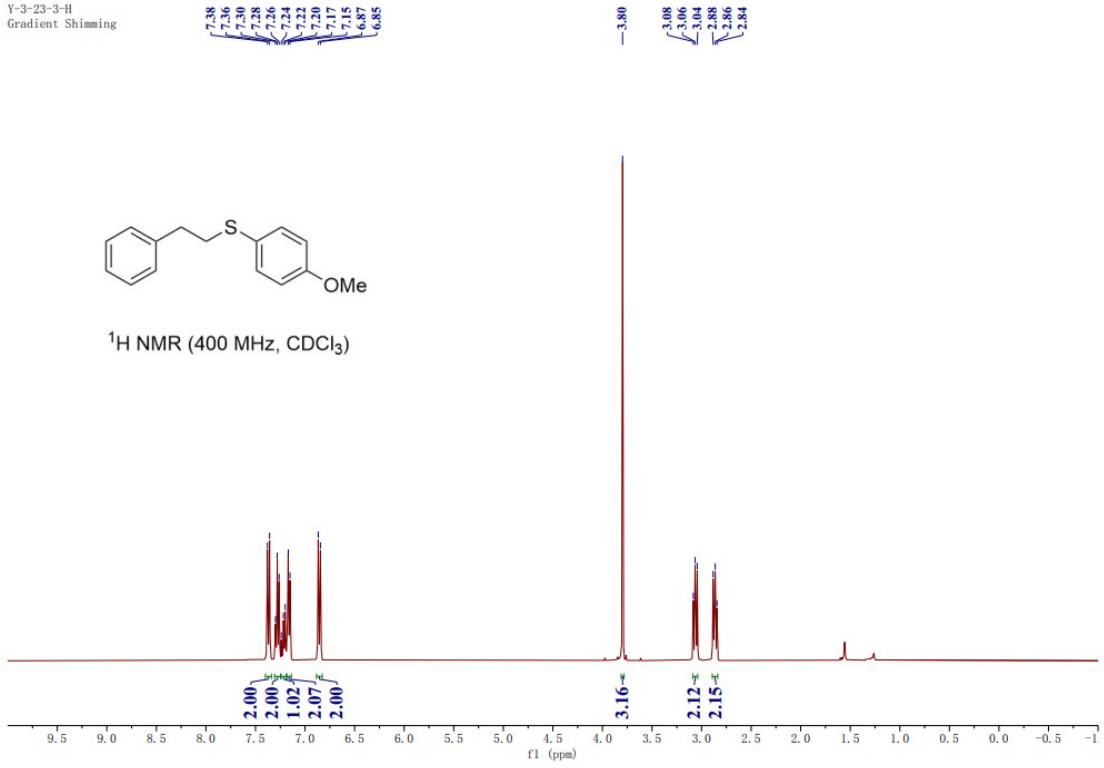


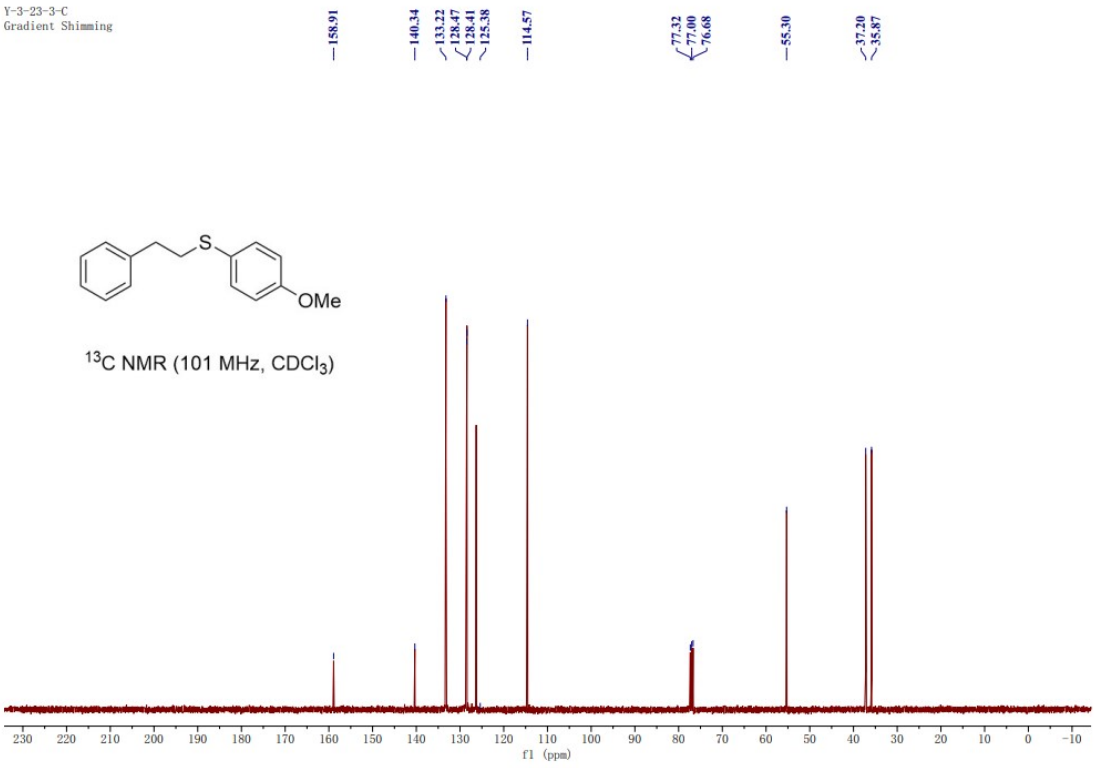
3-(2-phenoxyethyl)thiophene (1ad)



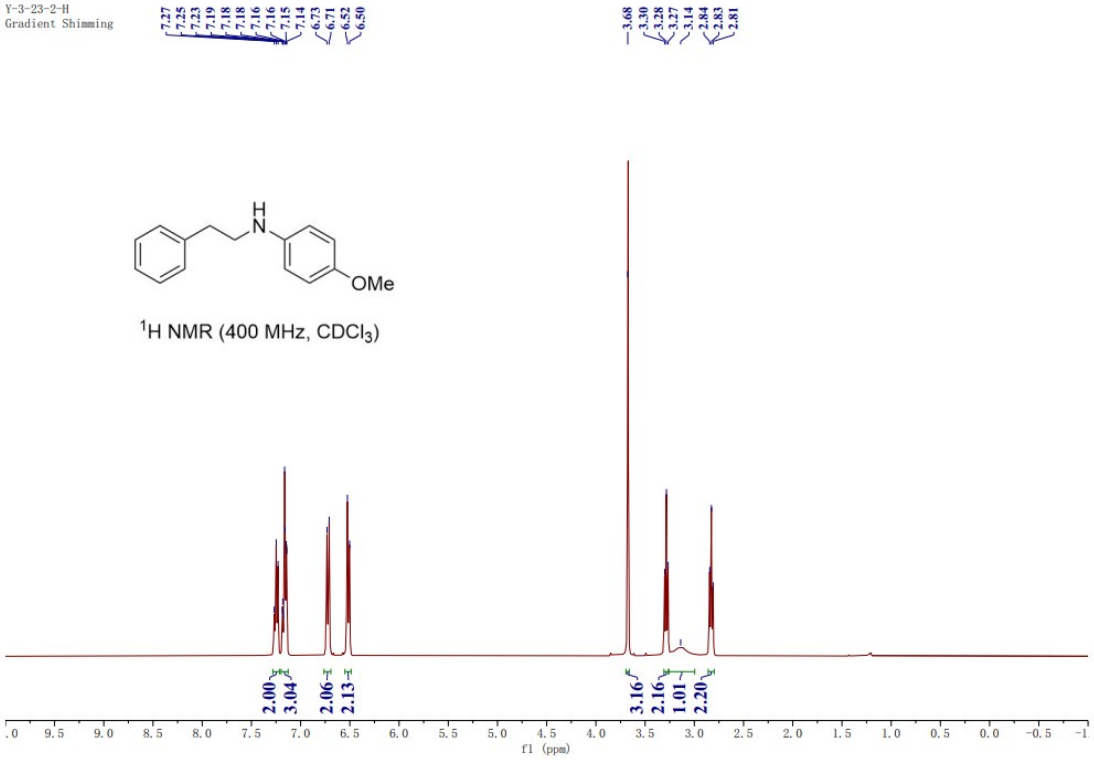


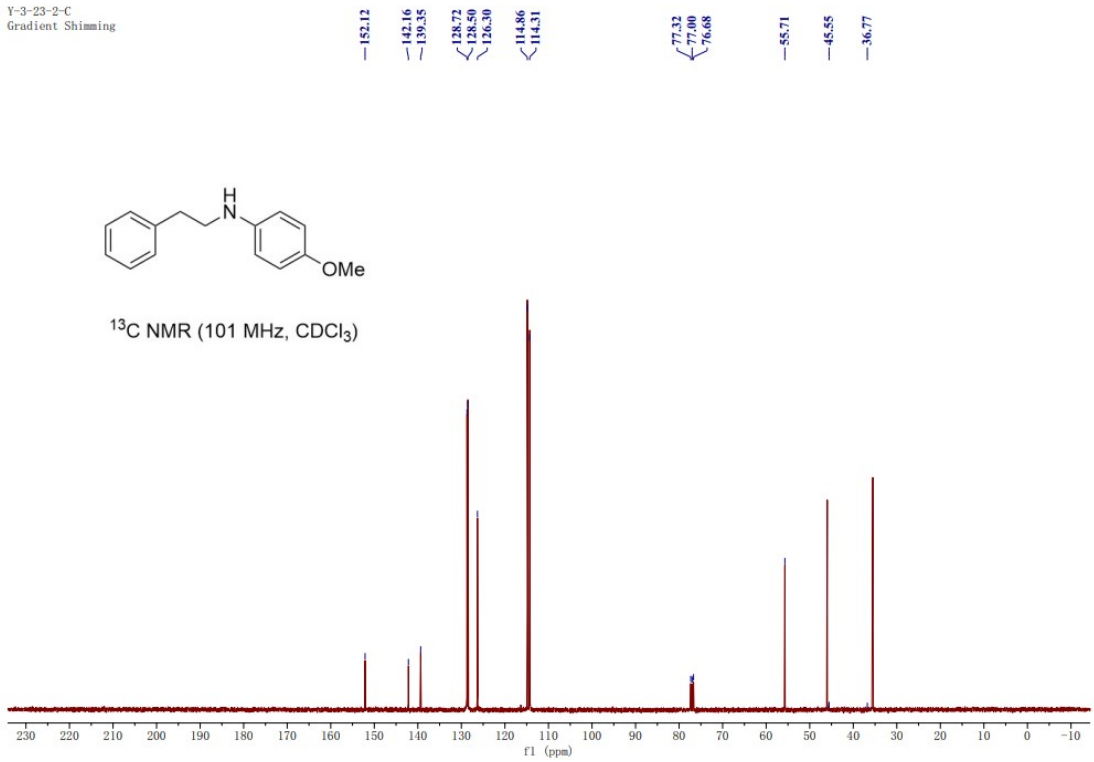
(4-methoxyphenyl)(phenethyl)sulfane (1ae)



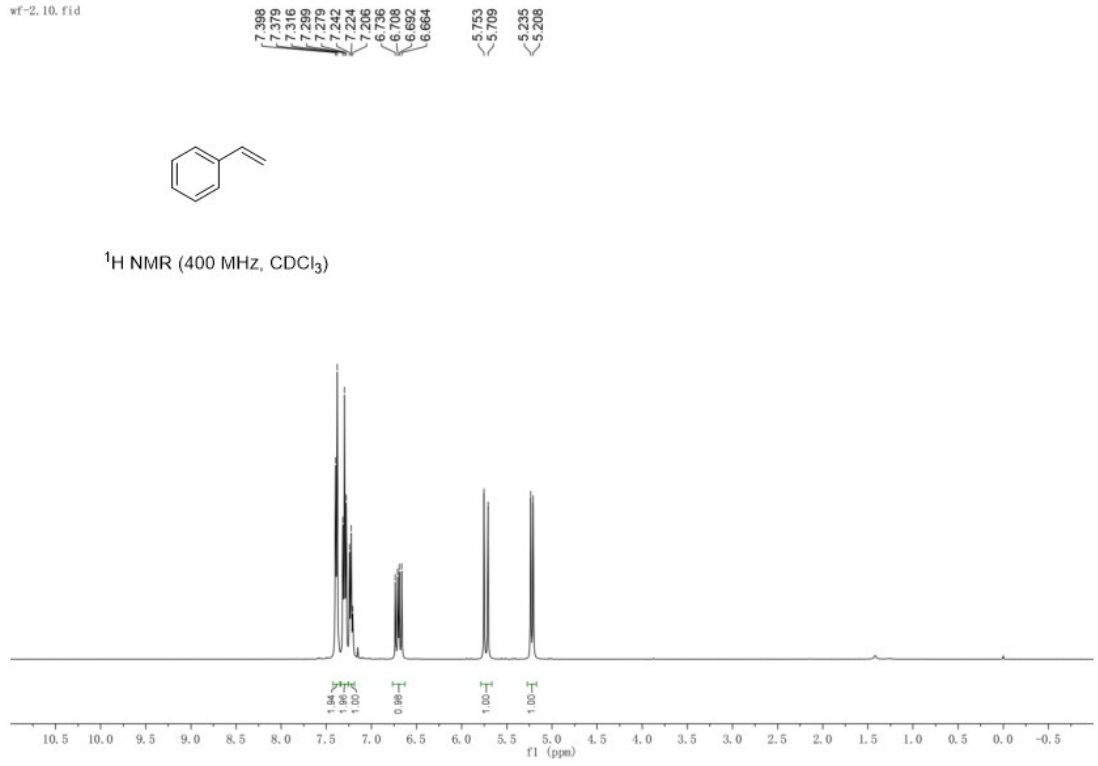


4-methoxy-*N*-phenethylaniline (1af)





Styrene (2a)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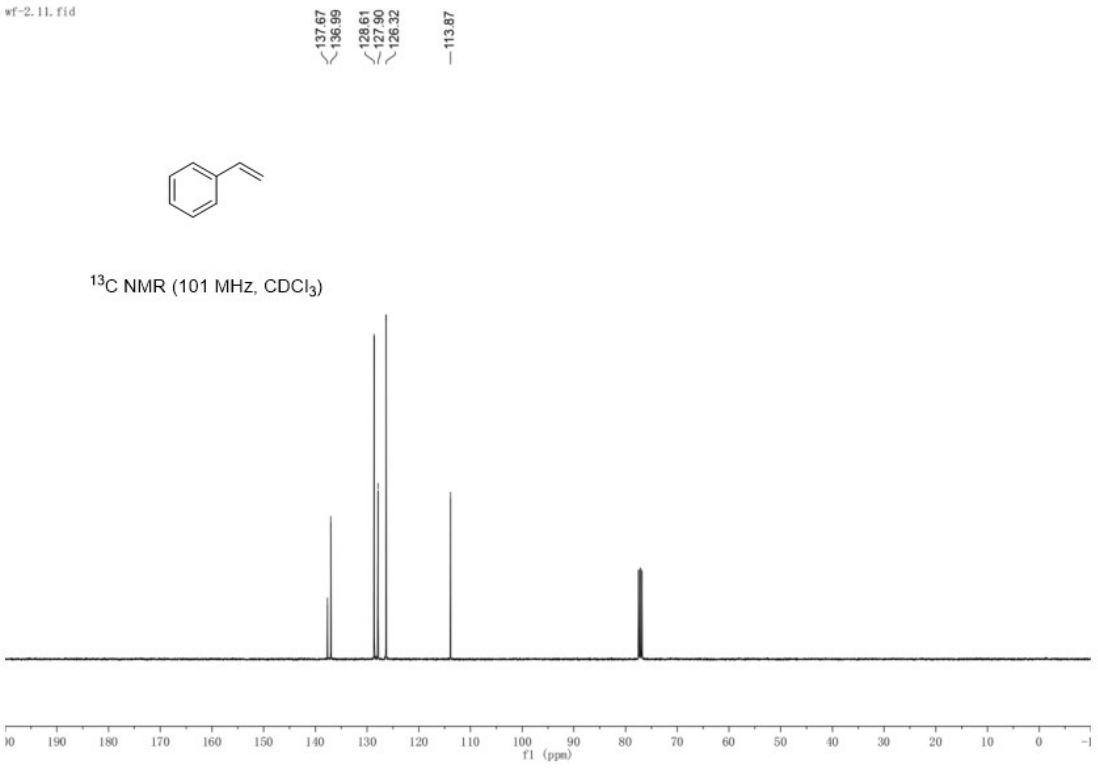
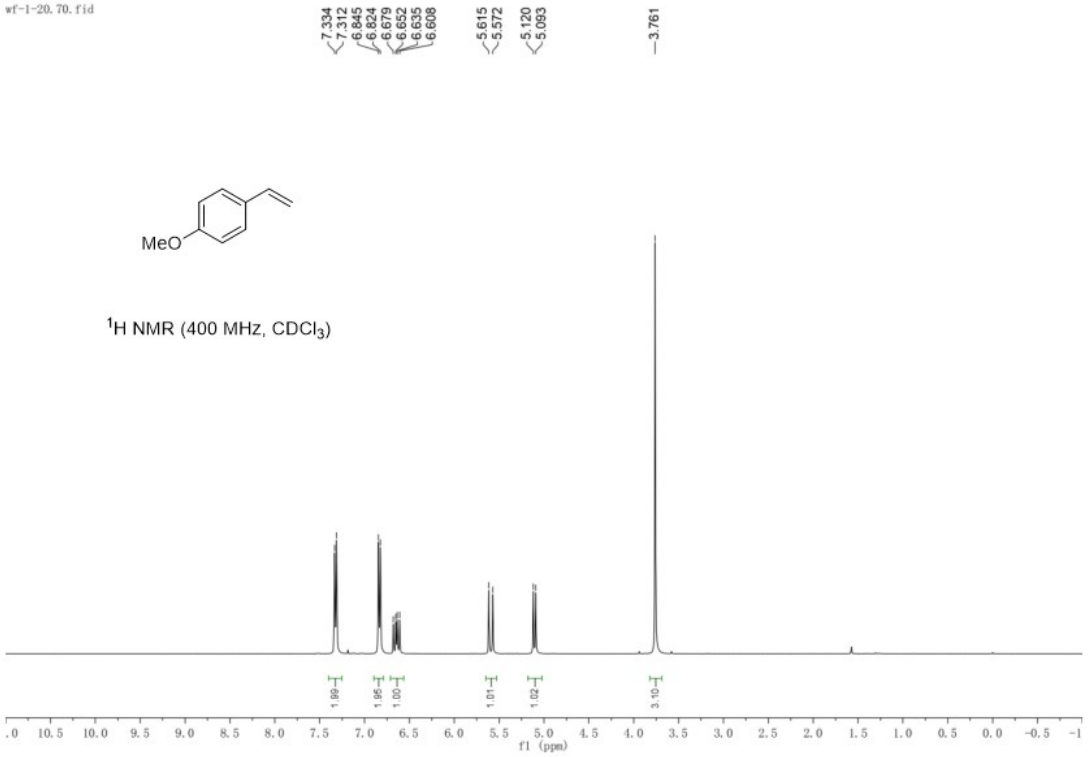
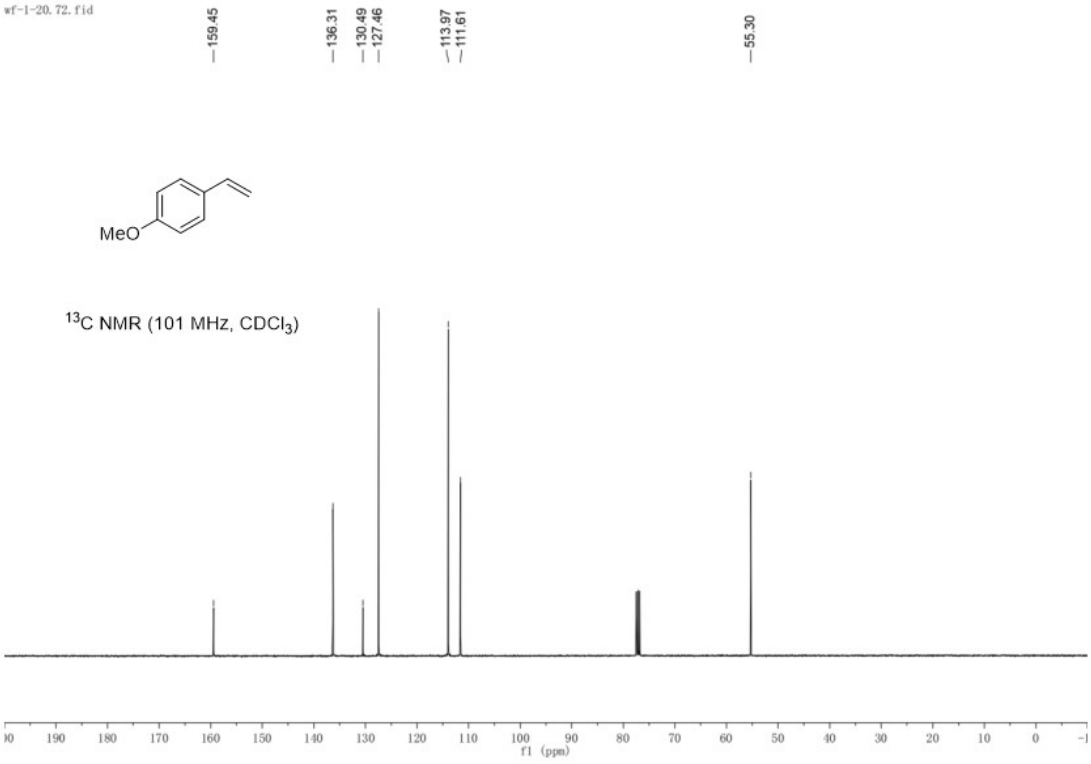
6.664
5.753
5.709
5.235
5.208
1H NMR (400 MHz, CDCl3)
1.94
1.94
1.00
0.98
1.00
1.00
10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5
f1 (ppm)

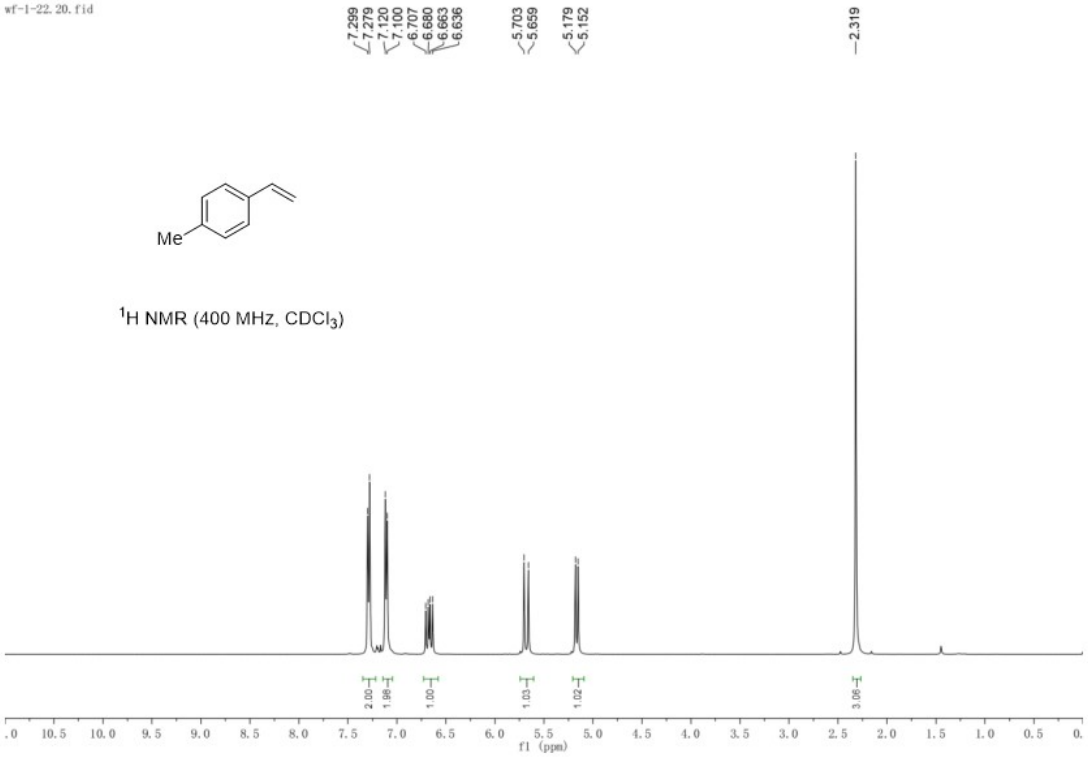

wf-2.11.fid
137.67
136.99
128.61
127.90
126.32
113.87
13C NMR (101 MHz, CDCl3)
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

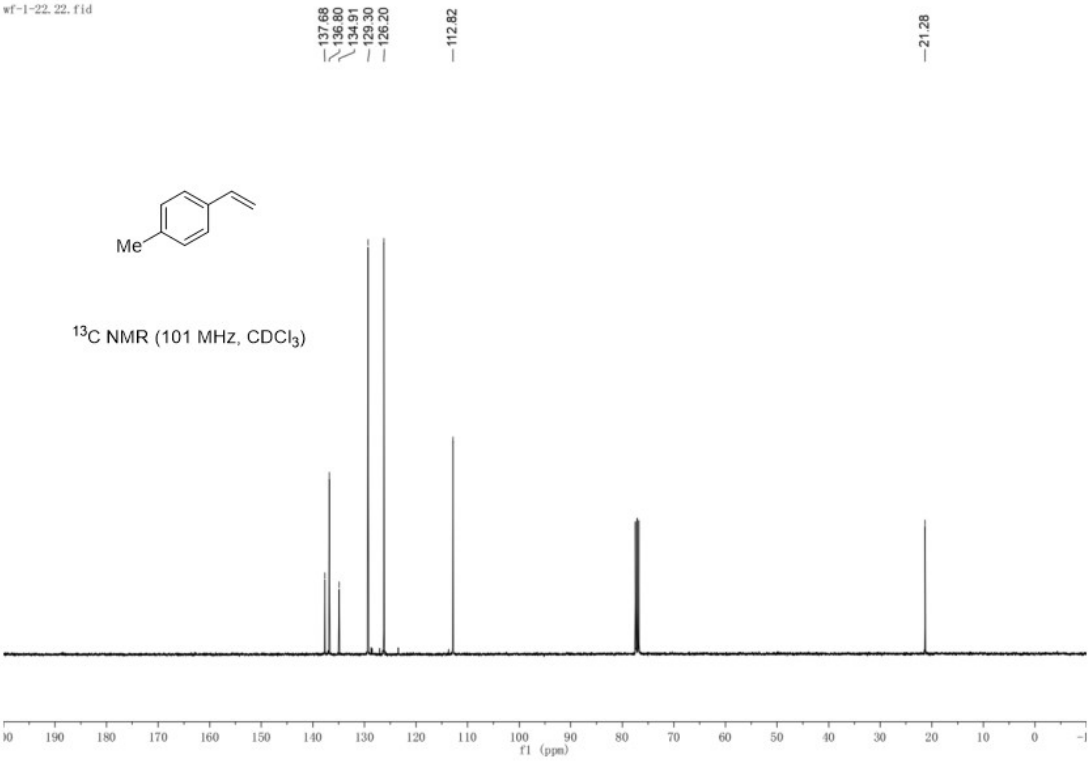
1-methoxy-4-vinylbenzene (2r)



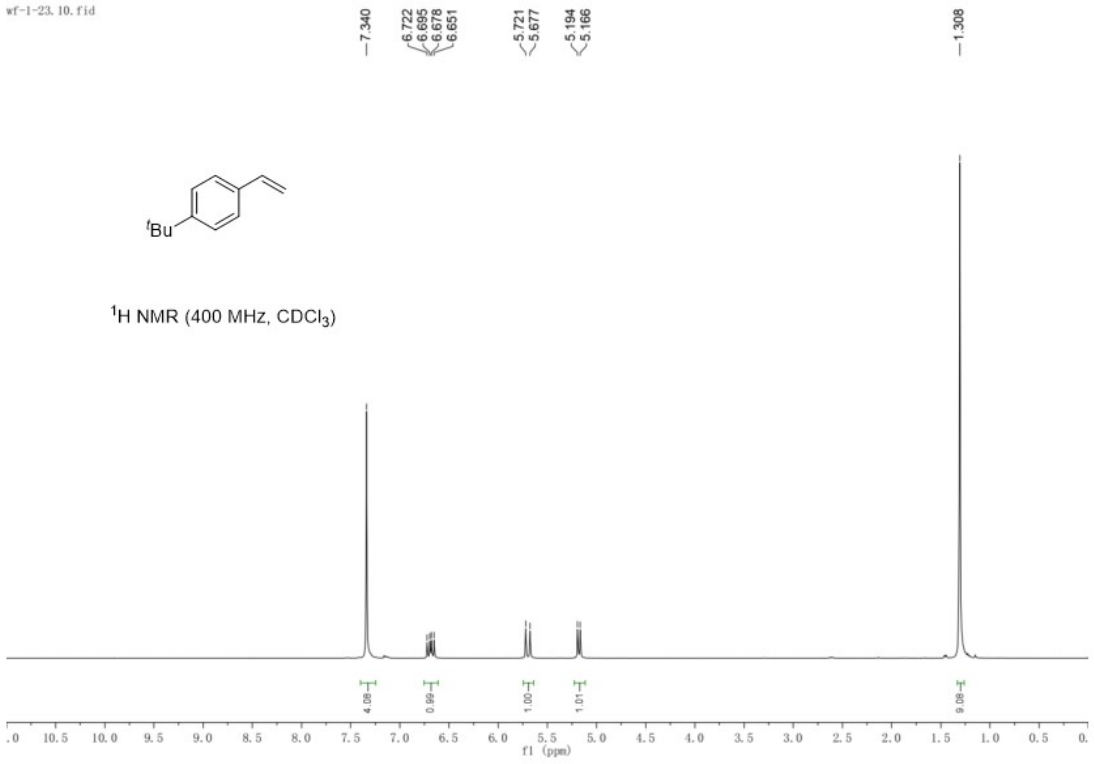


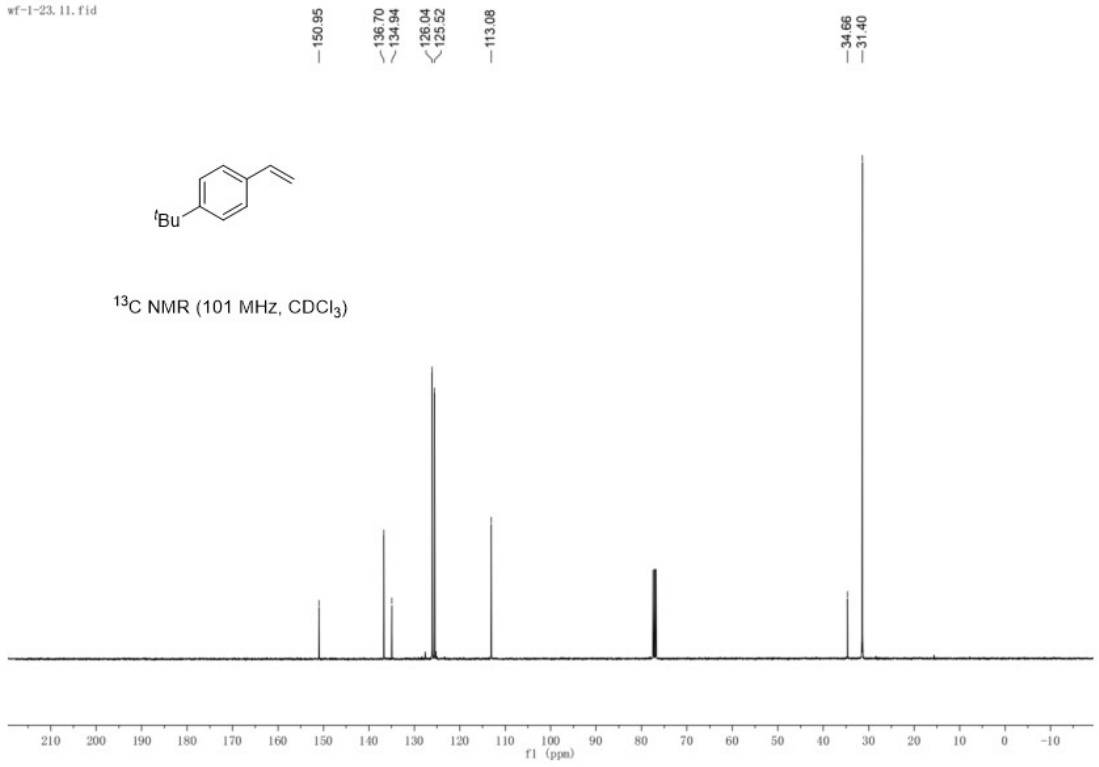
1-methyl-4-vinylbenzene (2s)



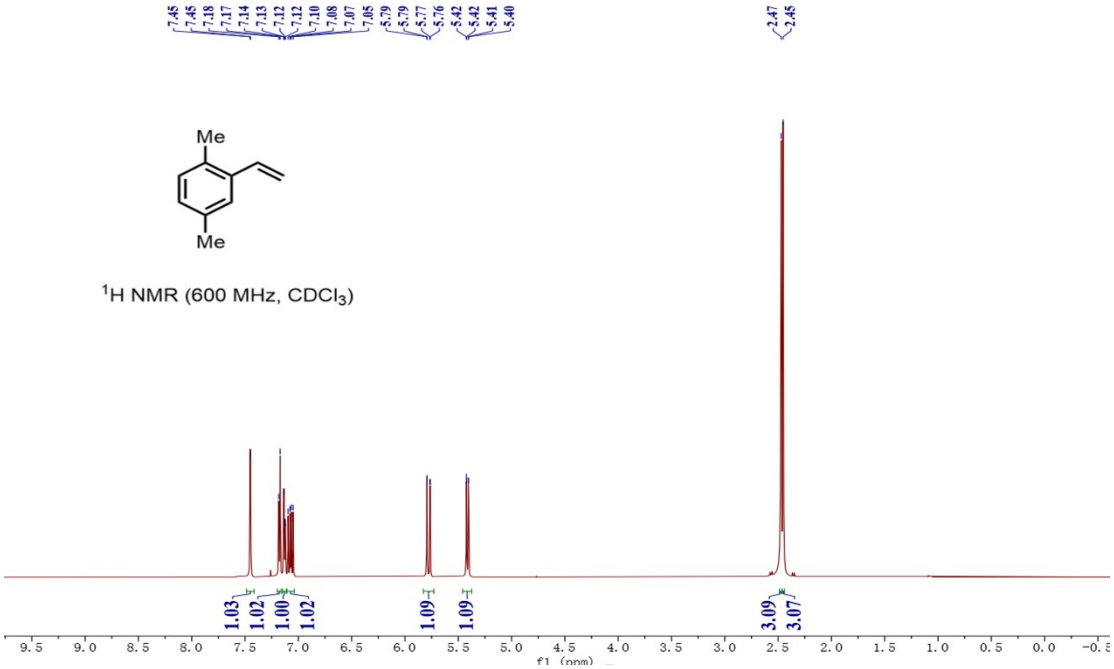


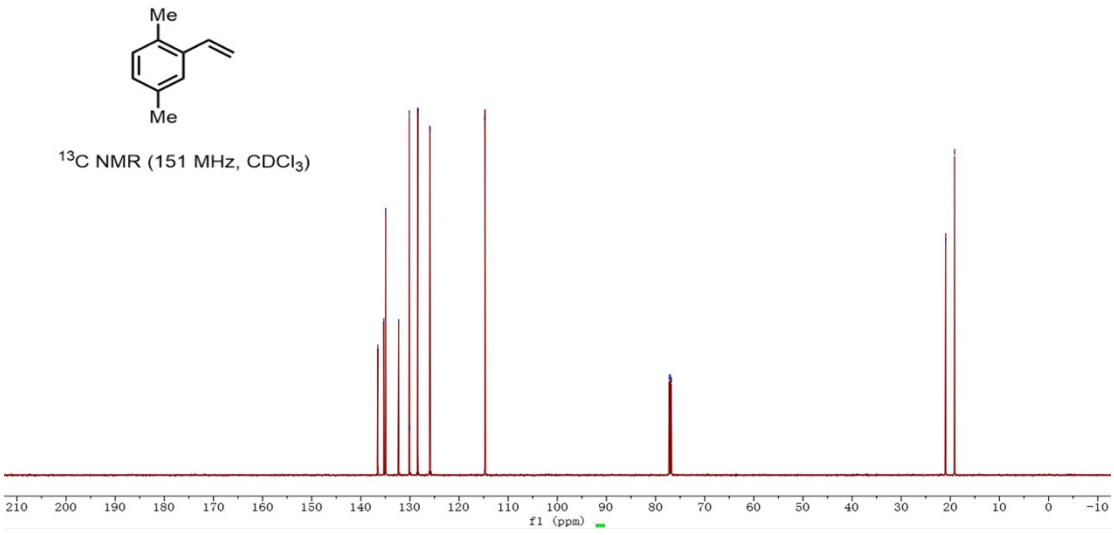
1-(*tert*-butyl)-4-vinylbenzene (2t)



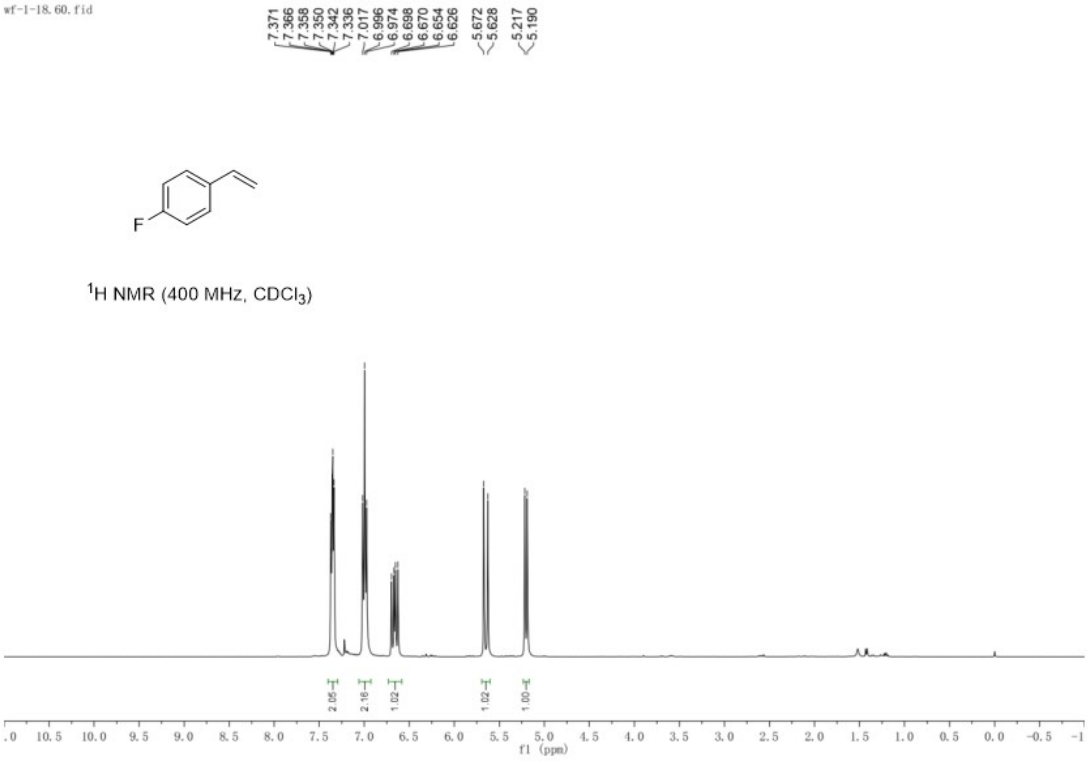


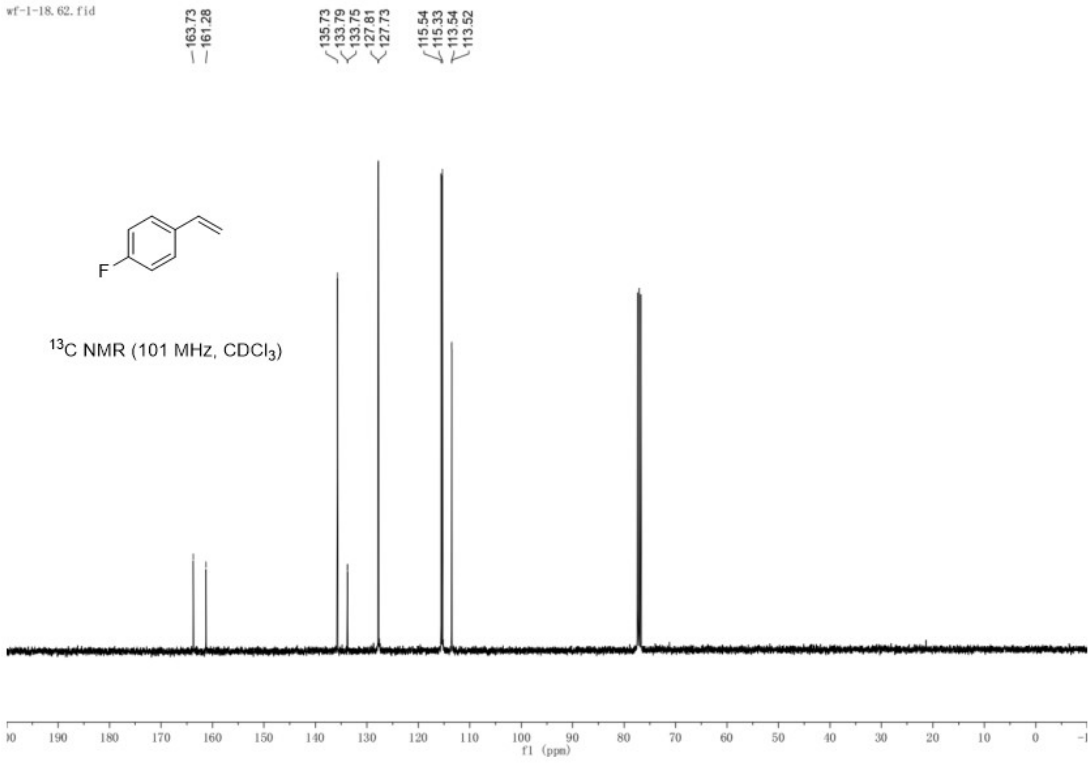
1,4-dimethyl-2-vinylbenzene (2u)



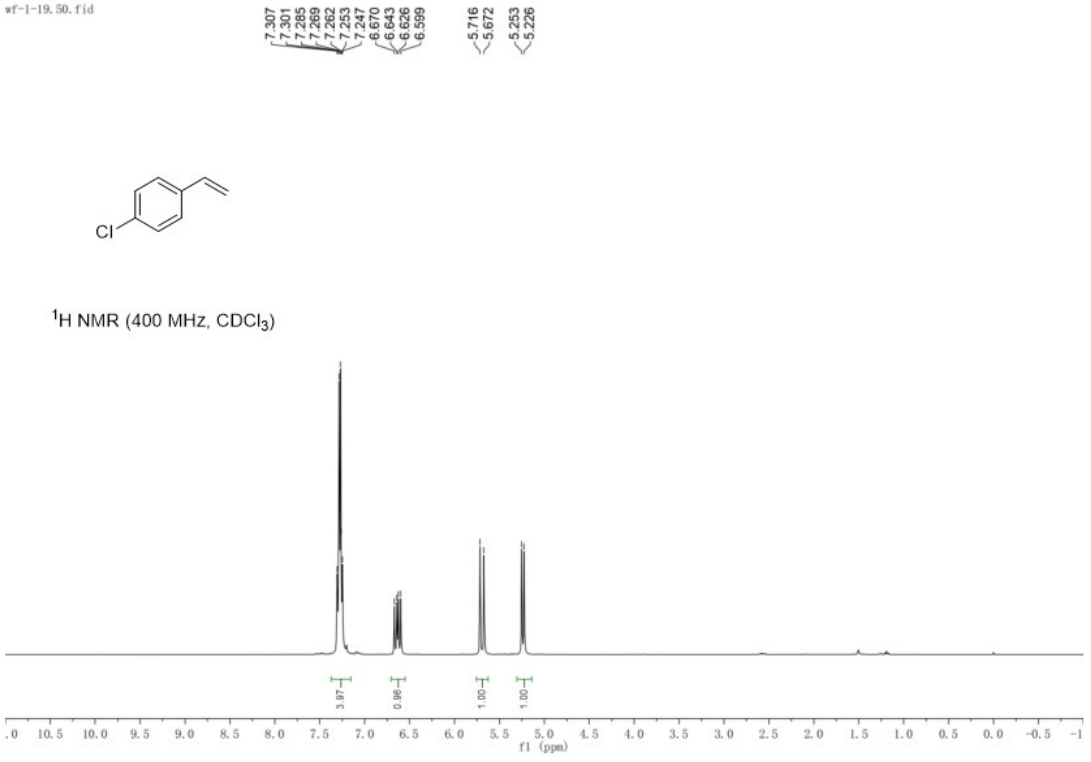


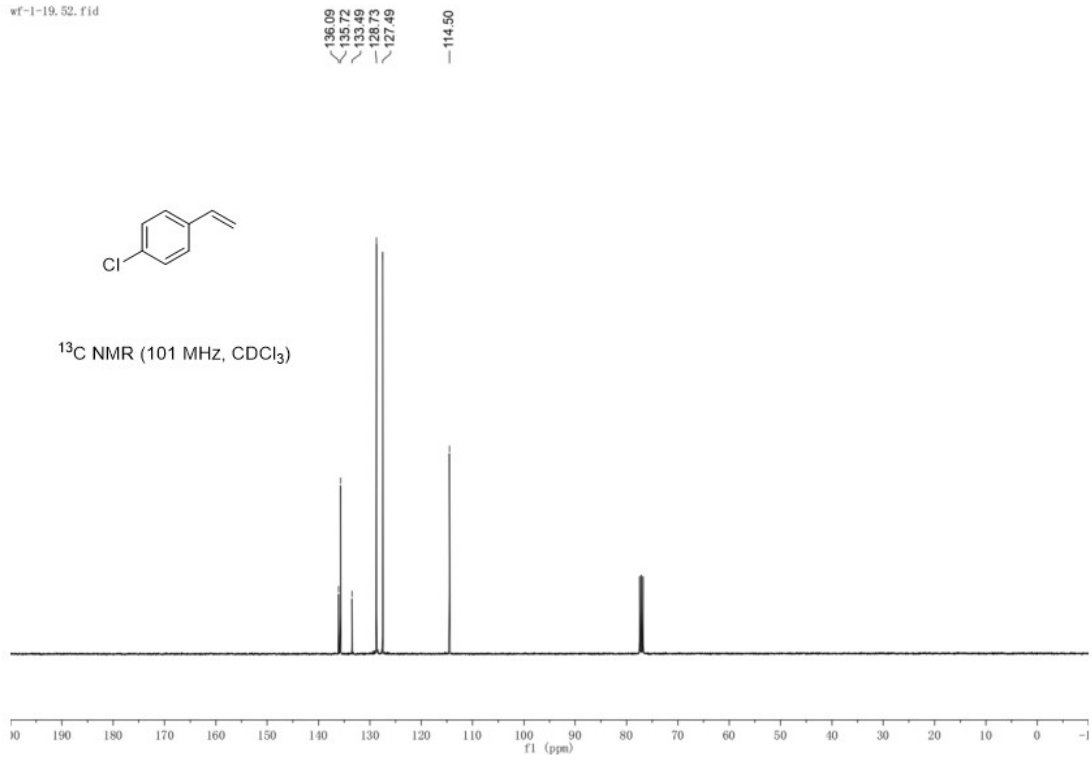
1-fluoro-4-vinylbenzene (2v)



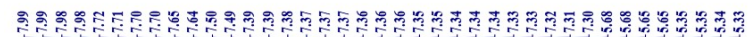


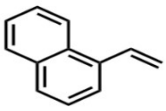
1-chloro-4-vinylbenzene (2w)



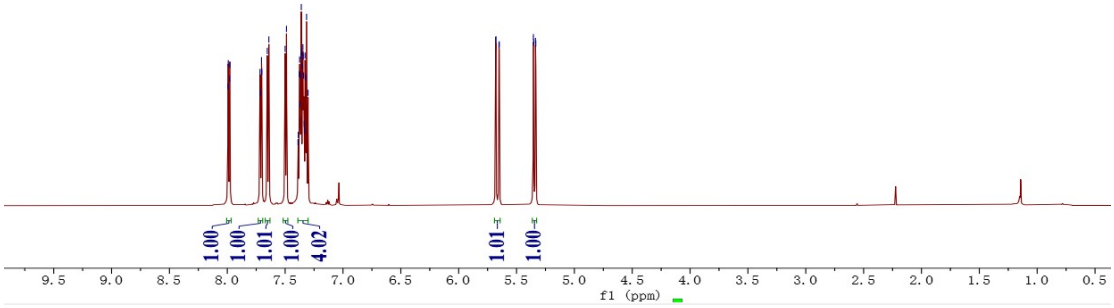


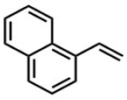
1-vinylnaphthalene (2x)



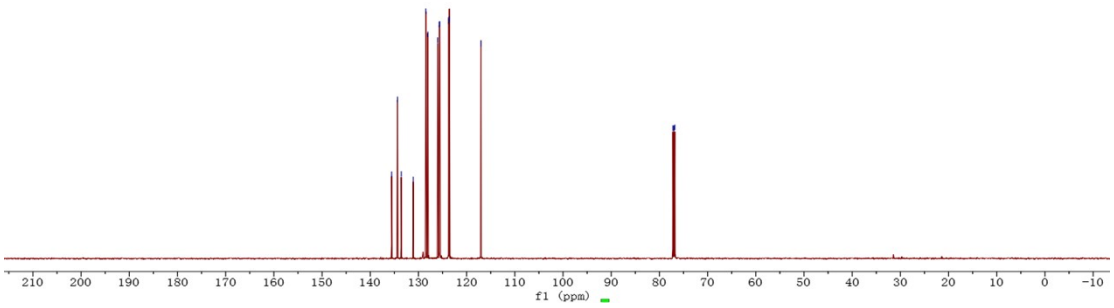


^{1}H NMR (600 MHz, $CDCl_3$)

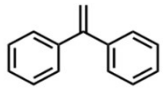




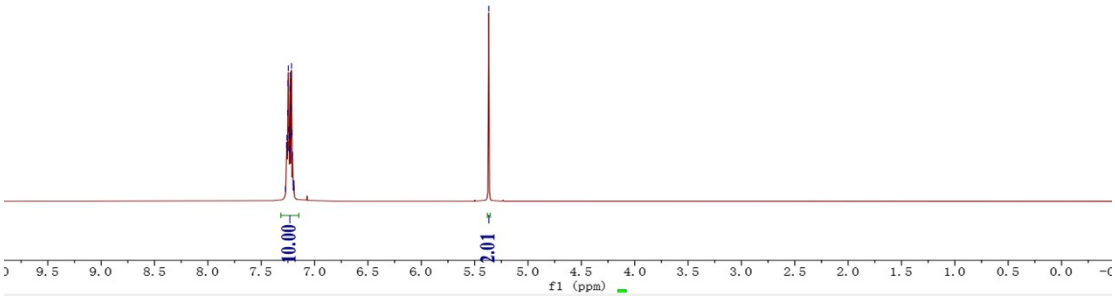
^{13}C NMR (151 MHz, $CDCl_3$)

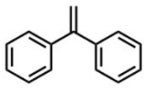


1,1-Diphenylethylene (2y)

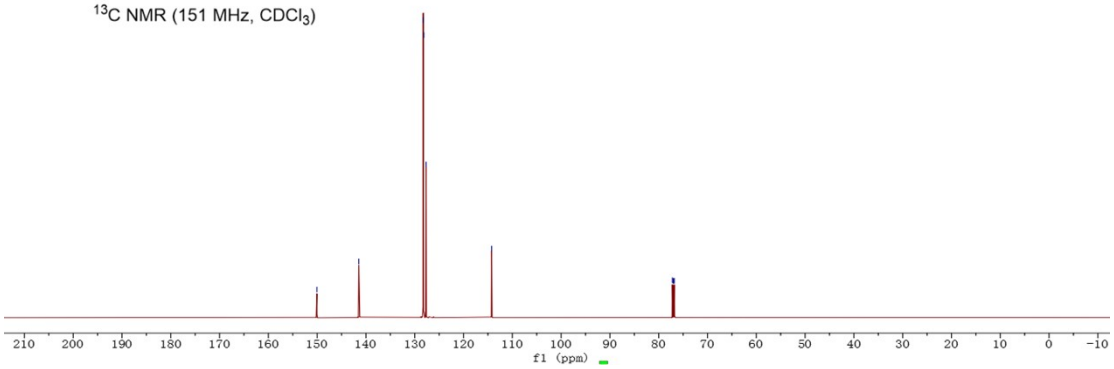


^{1}H NMR (600 MHz, $CDCl_3$)

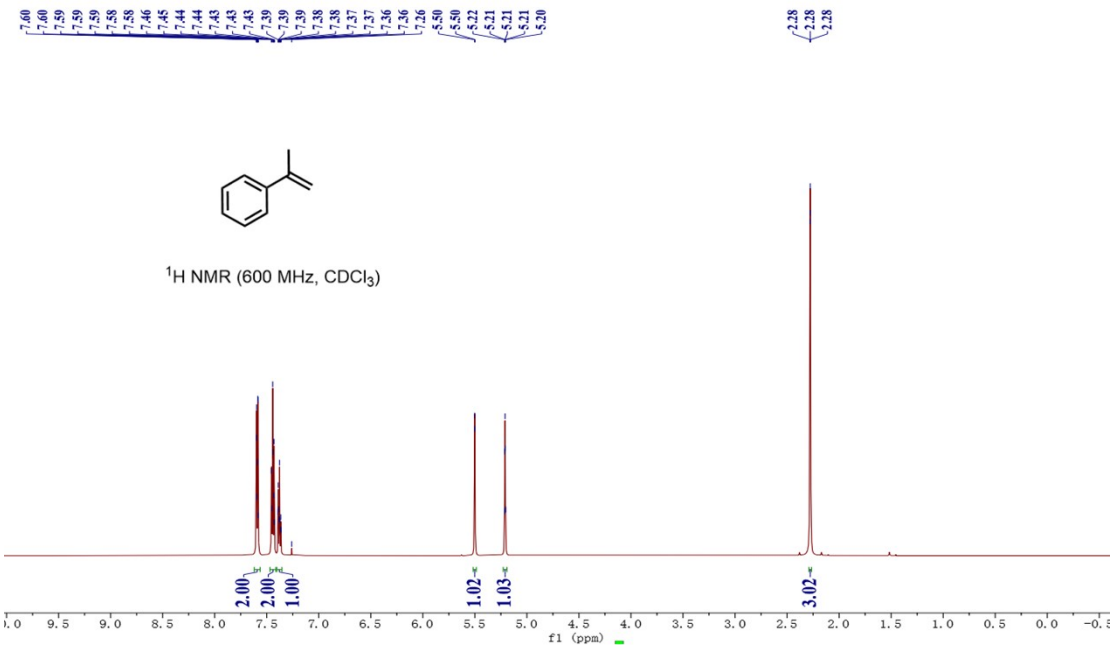


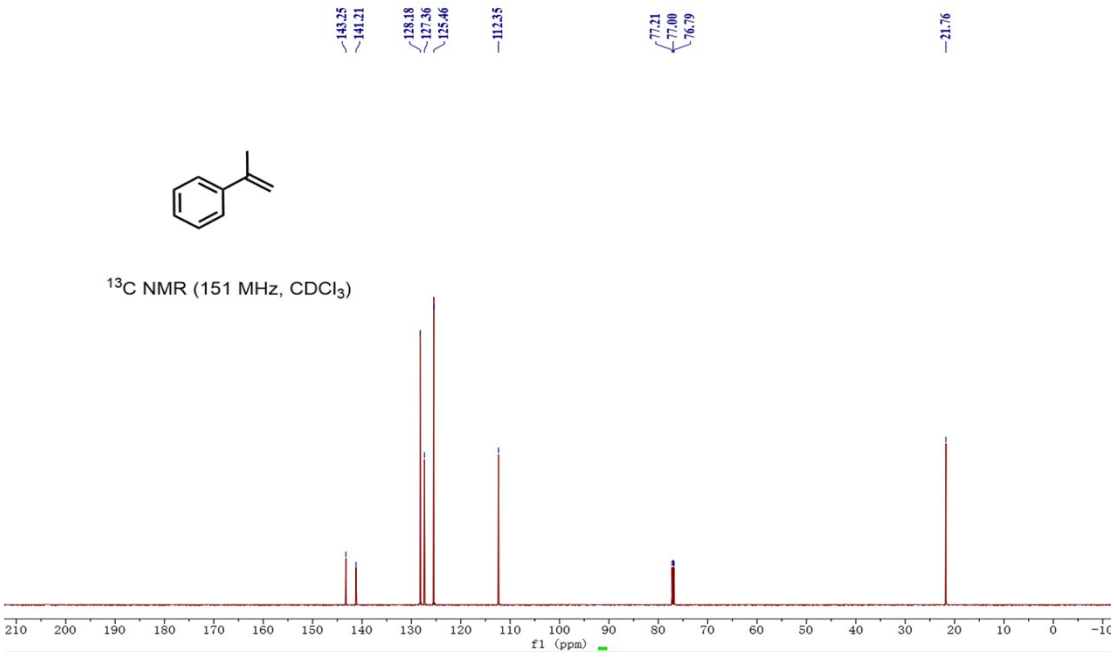


^{13}C NMR (151 MHz, $CDCl_3$)

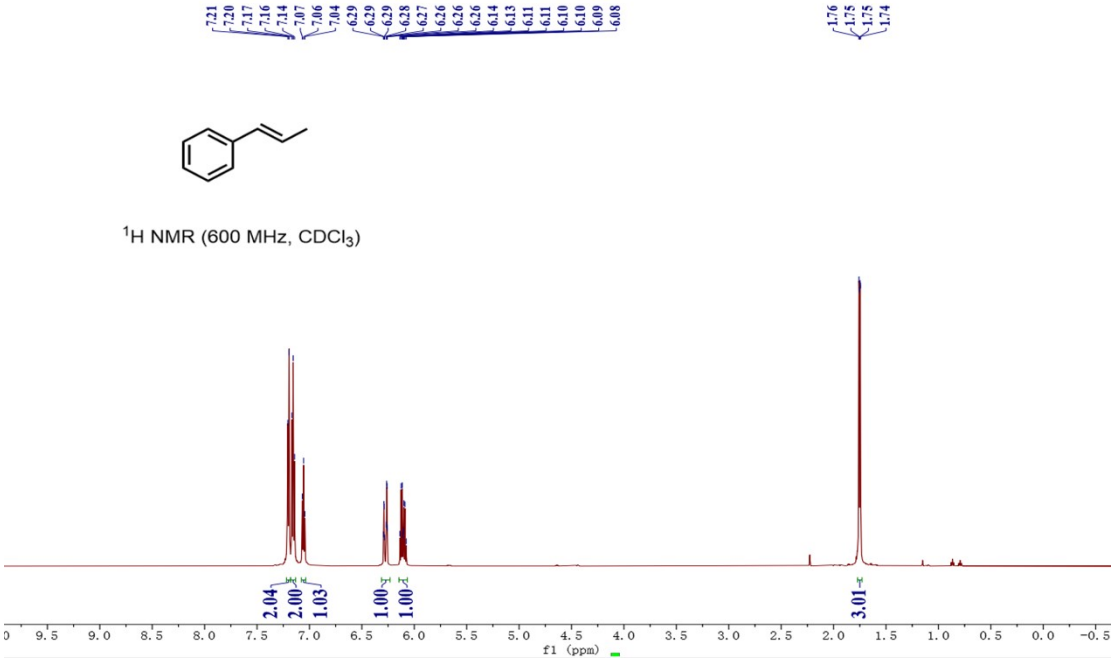


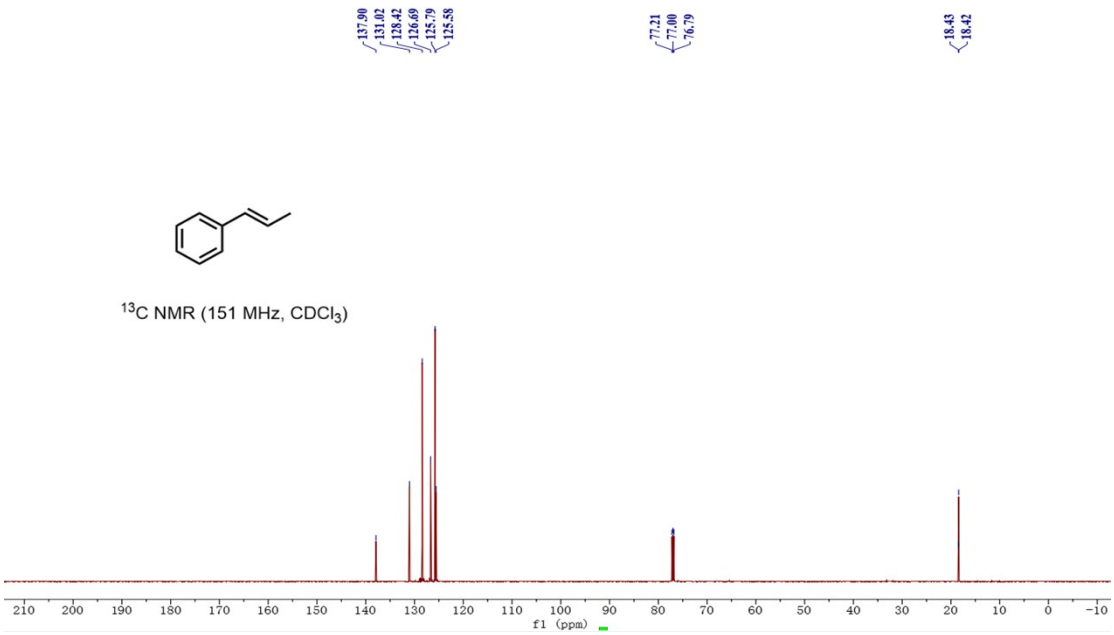
α-Methylstyrene (2z)



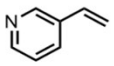


β-Methylstyrene (2aa)

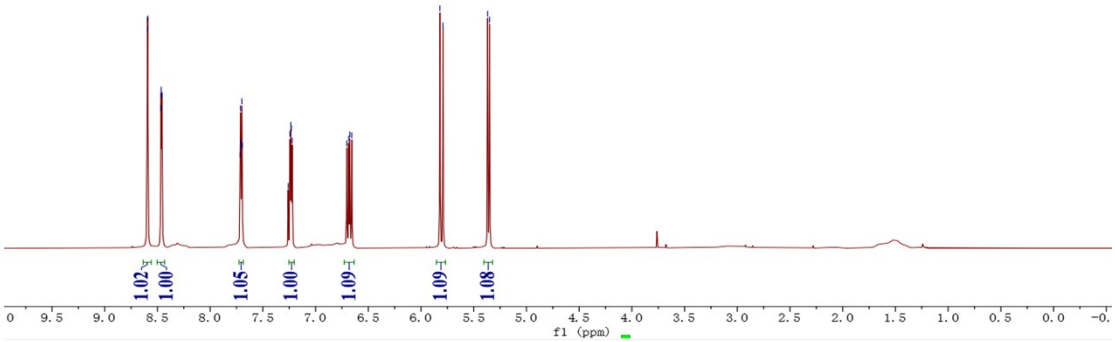


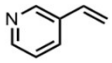


3-vinylpyridine (2ab)

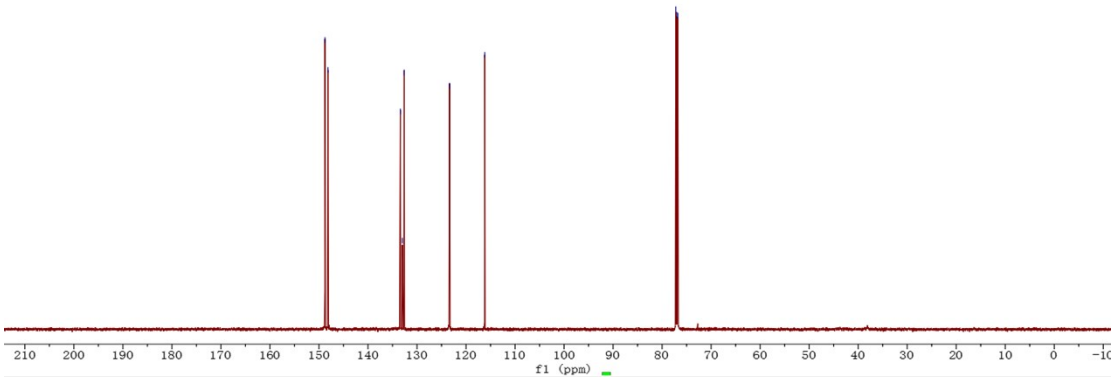


^{1}H NMR (600 MHz, $CDCl_3$)

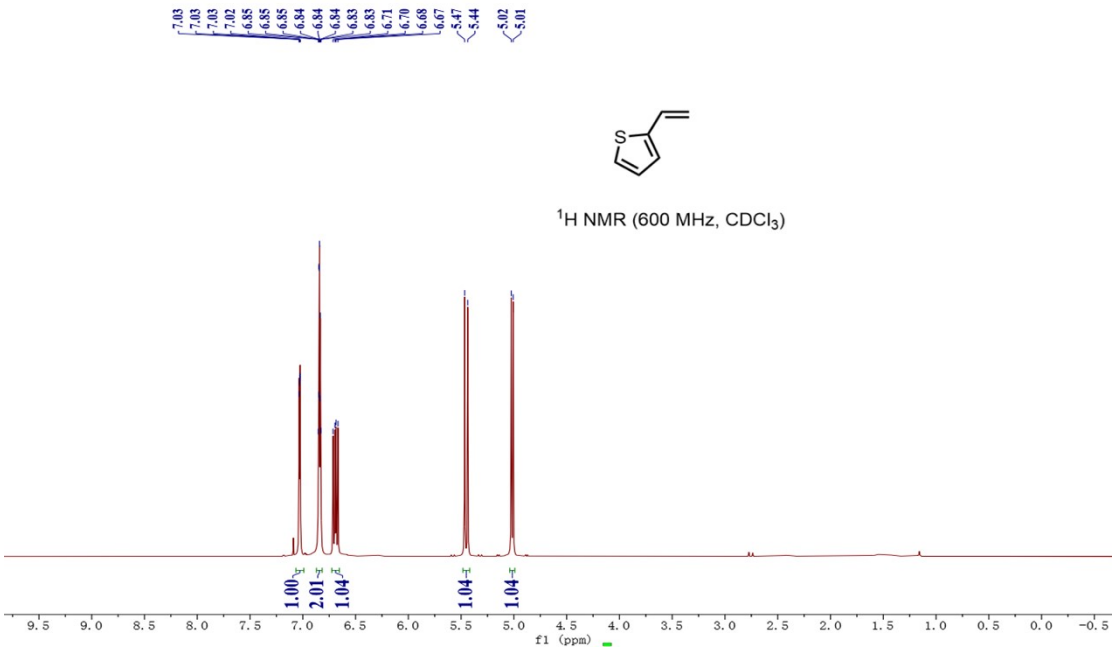


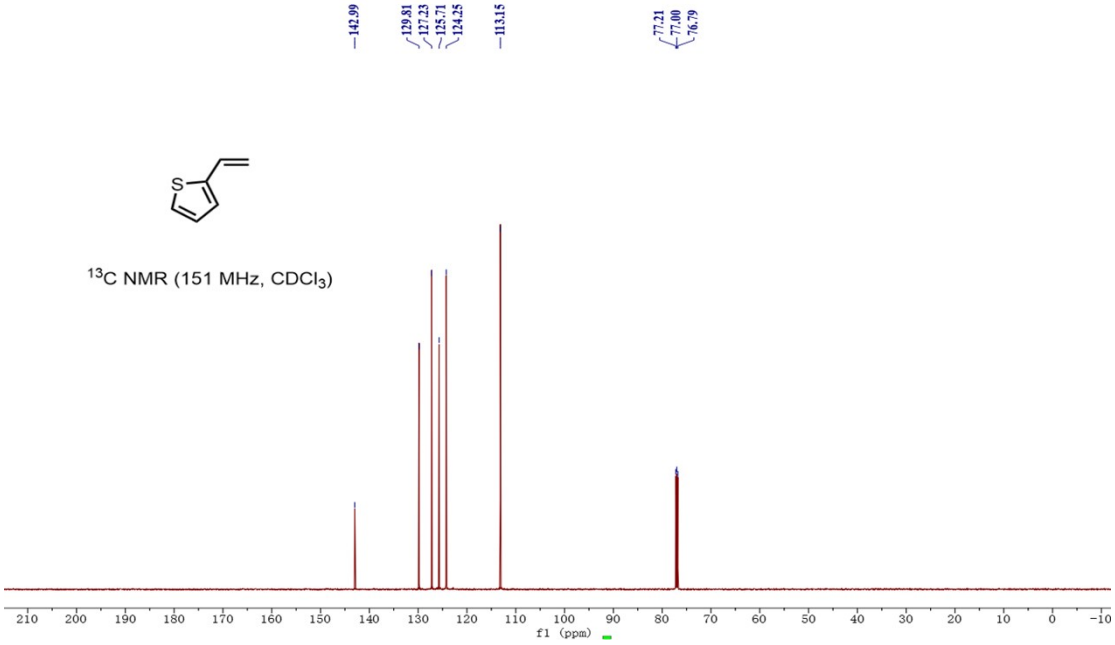


^{13}C NMR (151 MHz, $CDCl_3$)

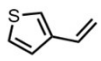


2-vinylthiophene(2ac)

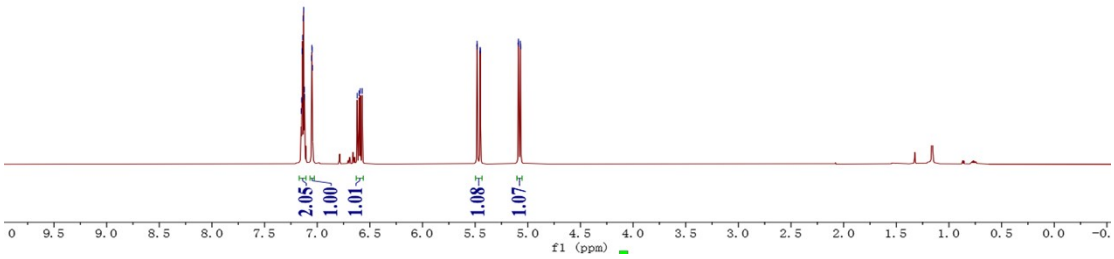




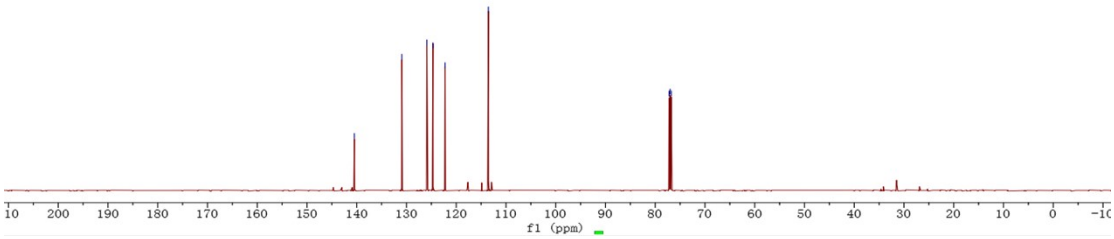
3-vinylthiophene (2ad)



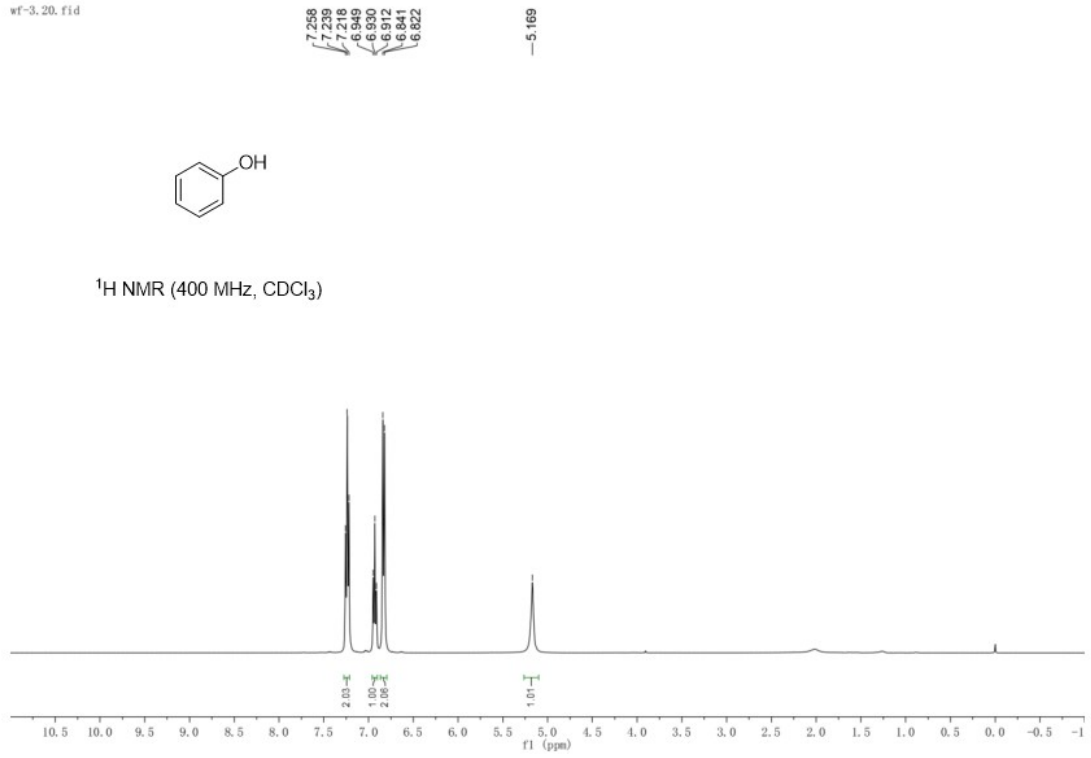
^{1}H NMR (600 MHz, $CDCl_3$)

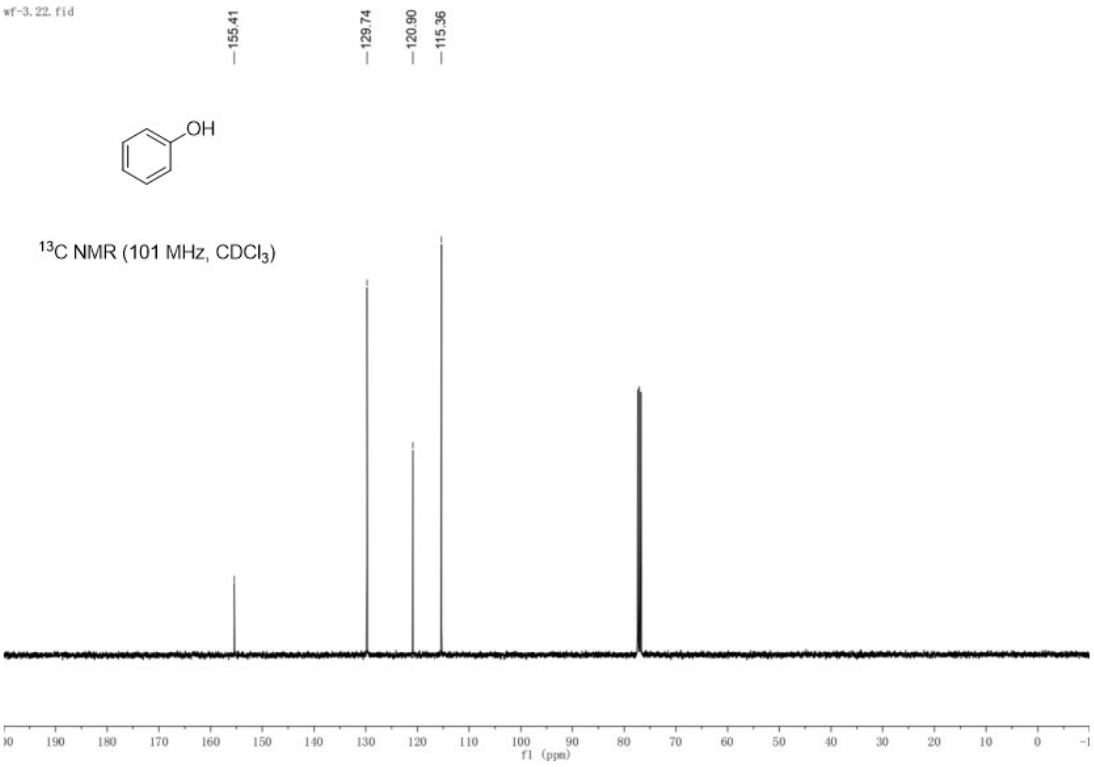


^{13}C NMR (151 MHz, $CDCl_3$)

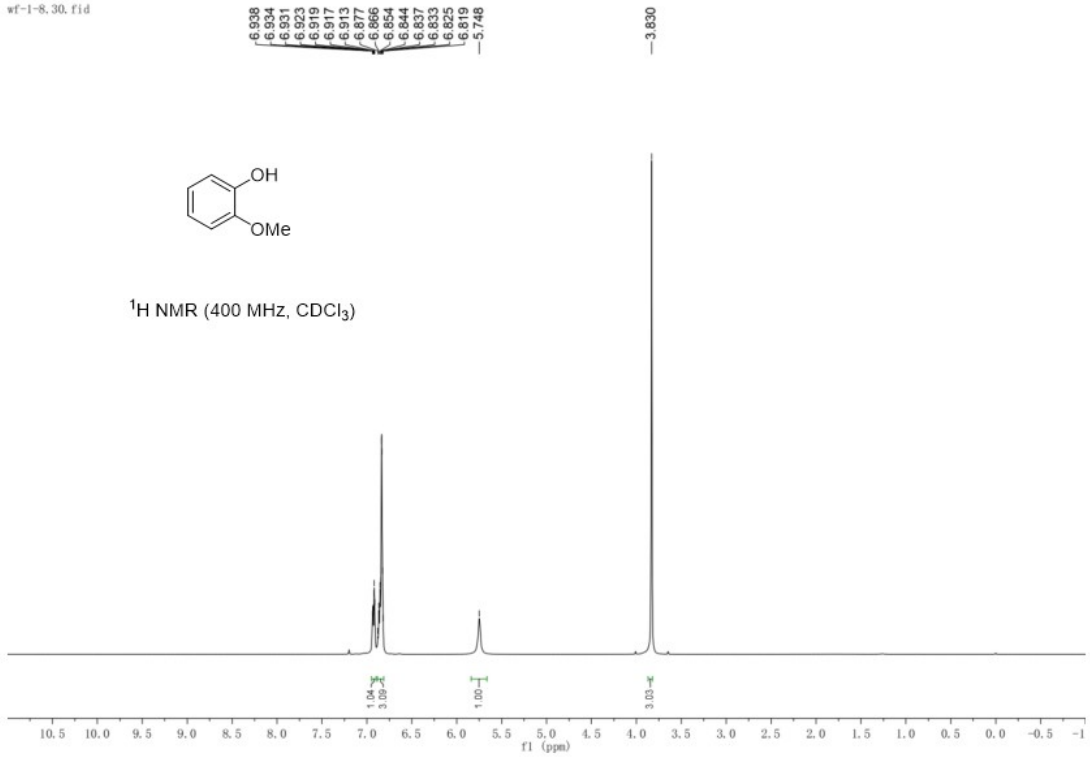


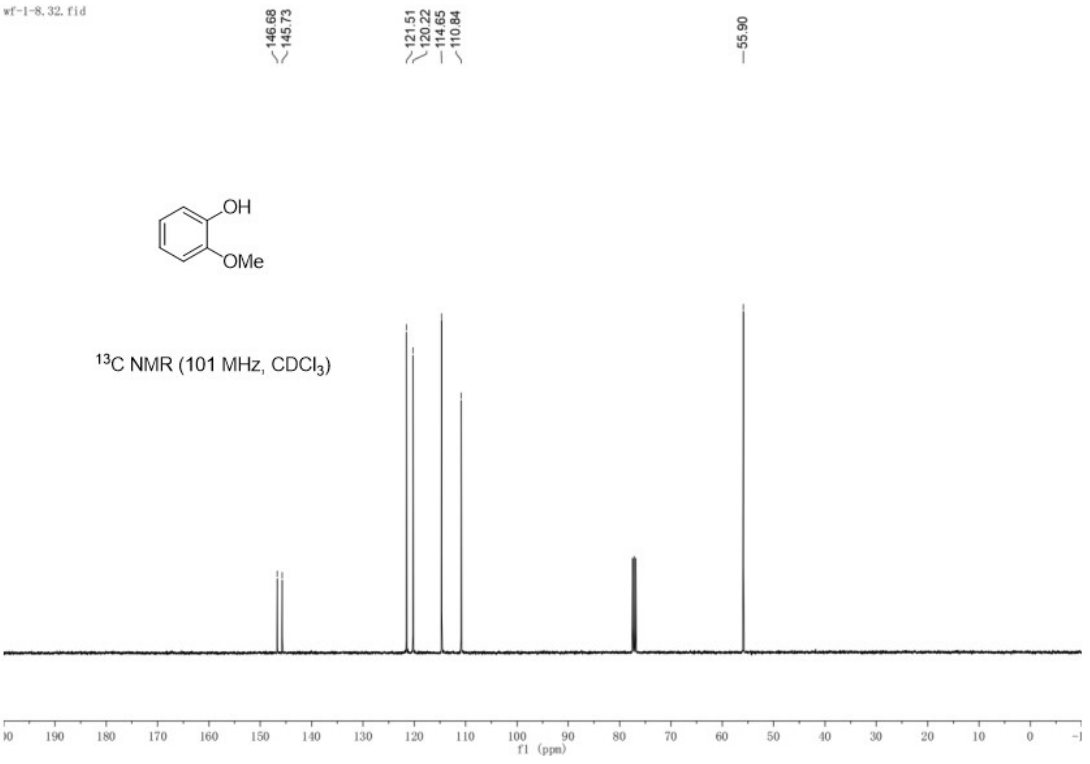
Phenol (3a)


wf-3.20.fid
7.258
7.239
7.218
6.949
6.930
6.912
6.841
6.822
5.169
OH
1H NMR (400 MHz, CDCl3)
2.03
1.00
2.06
1.01
10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5 -1
f1 (ppm)

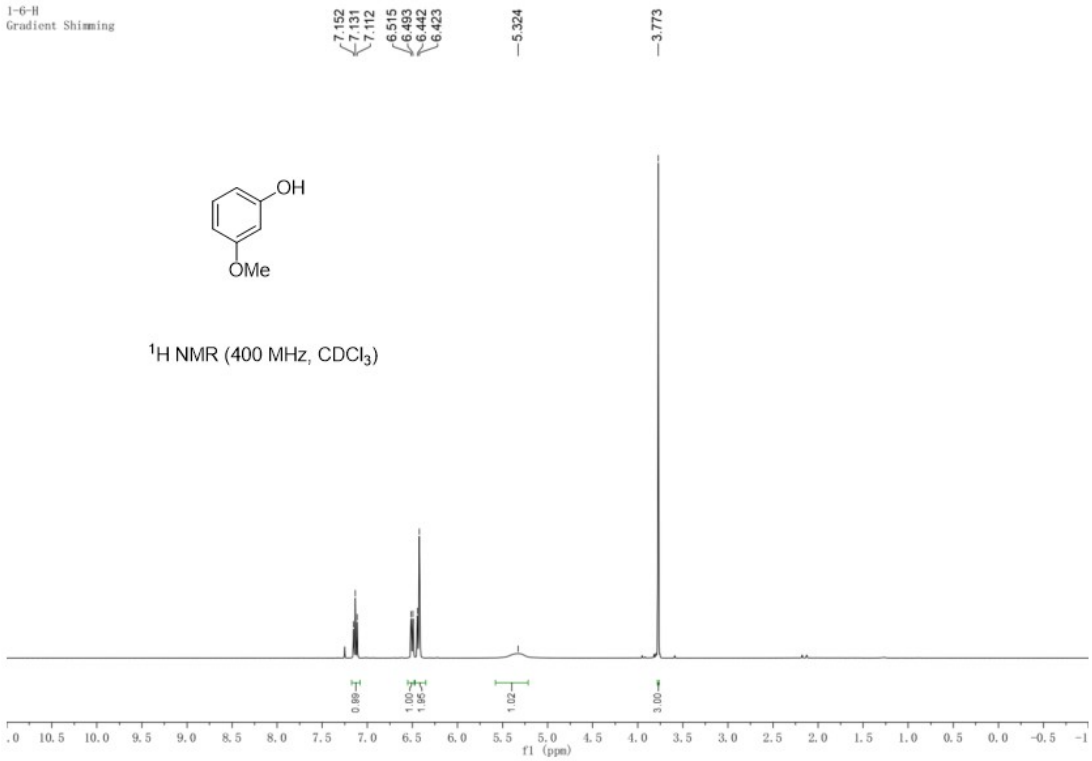

wf-3.22.fid
155.41
129.74
120.90
115.36
OH
13C NMR (101 MHz, CDCl3)
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -1
f1 (ppm)

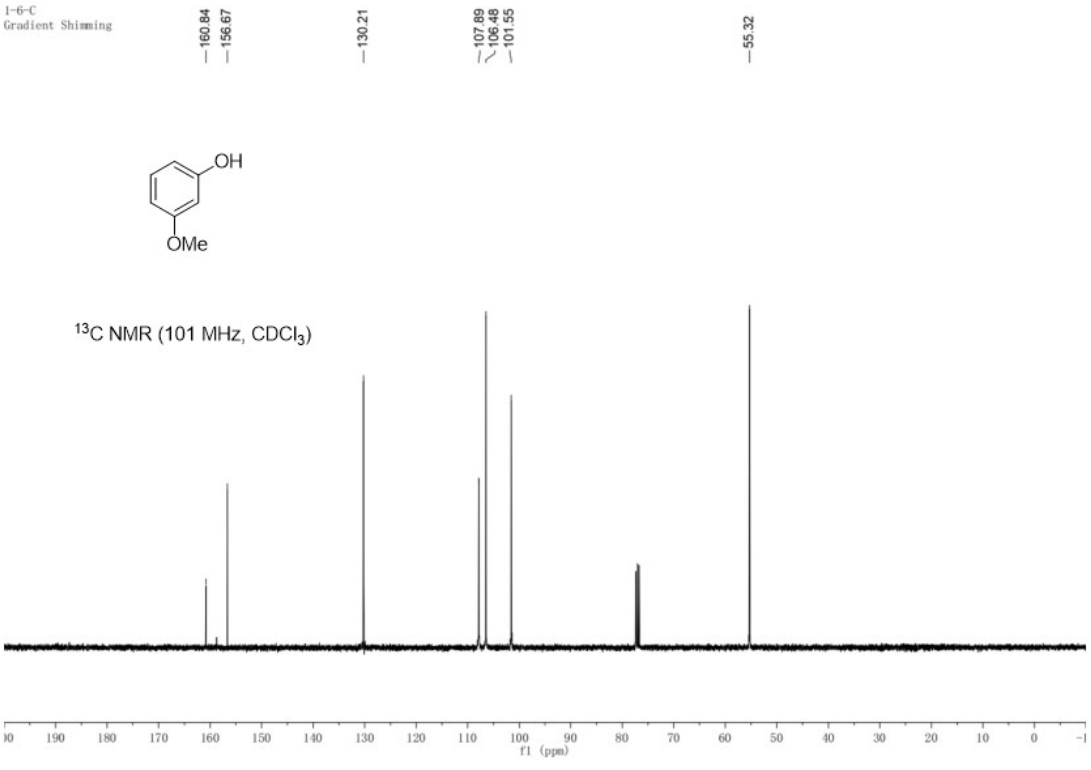
2-methoxyphenol (3b)



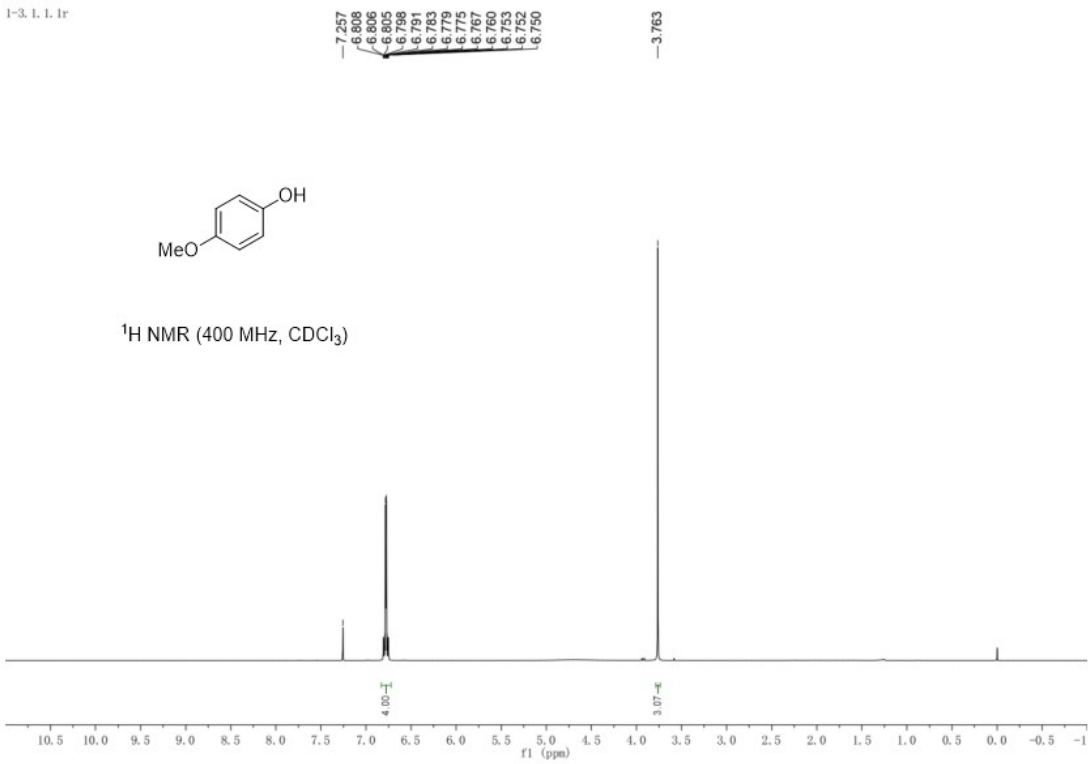


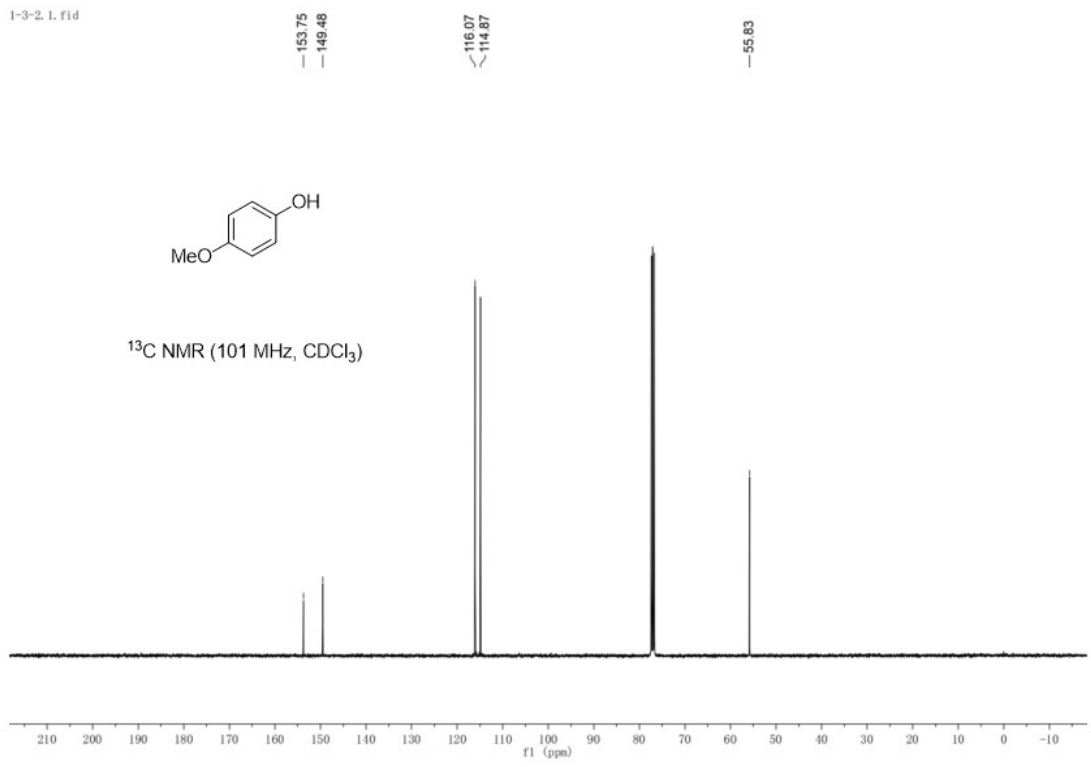
3-methoxyphenol (3c)



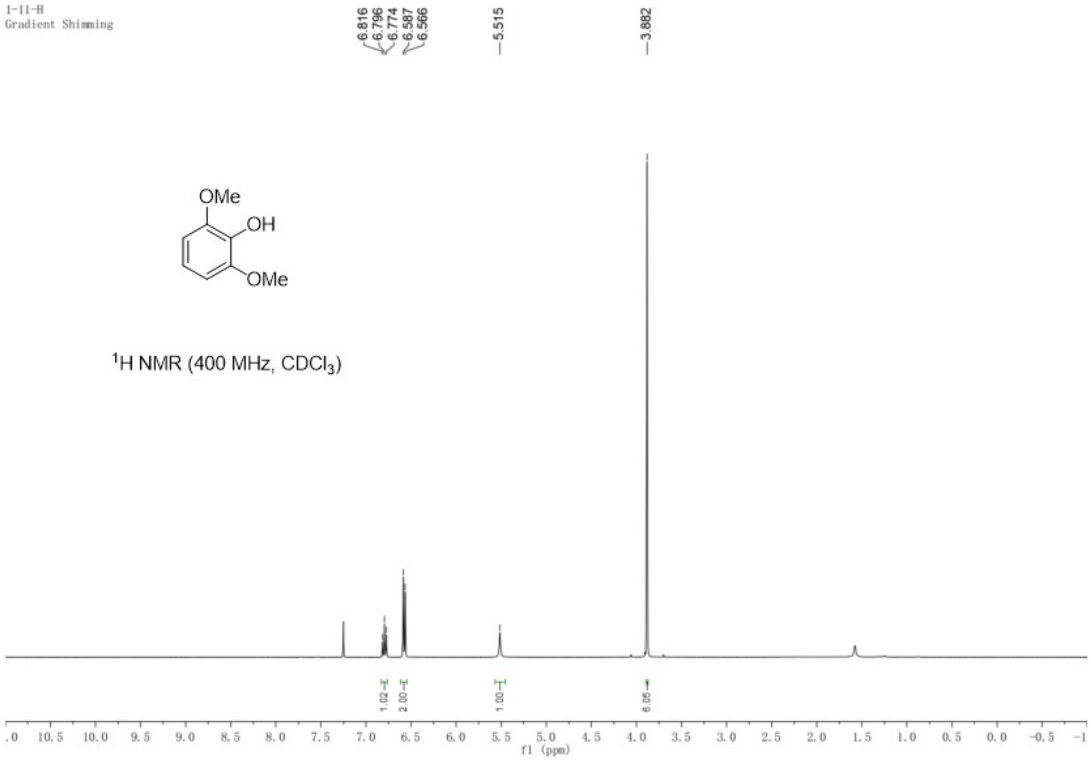


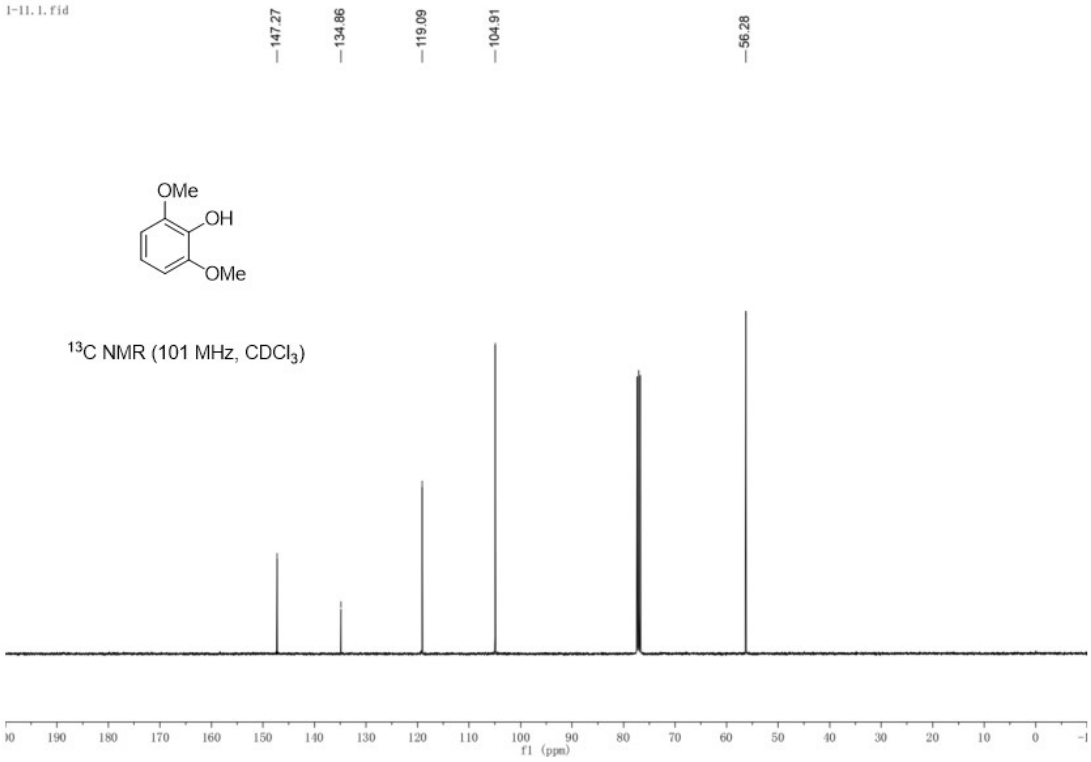
4-methoxyphenol (3d)



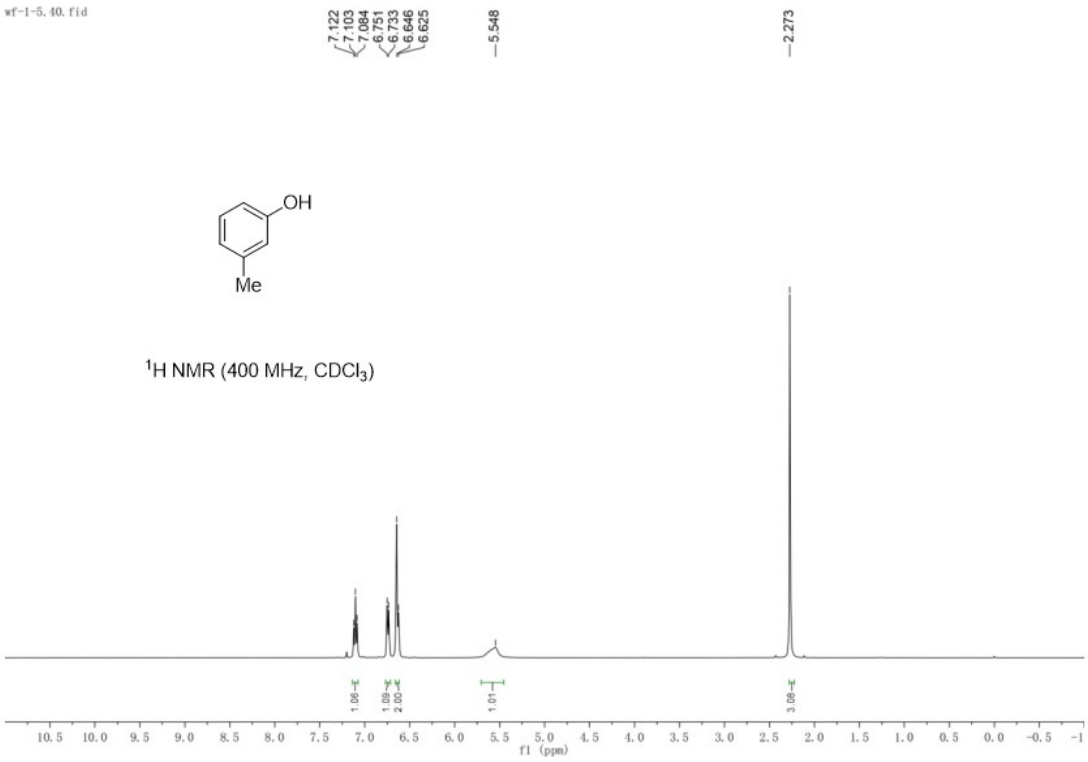


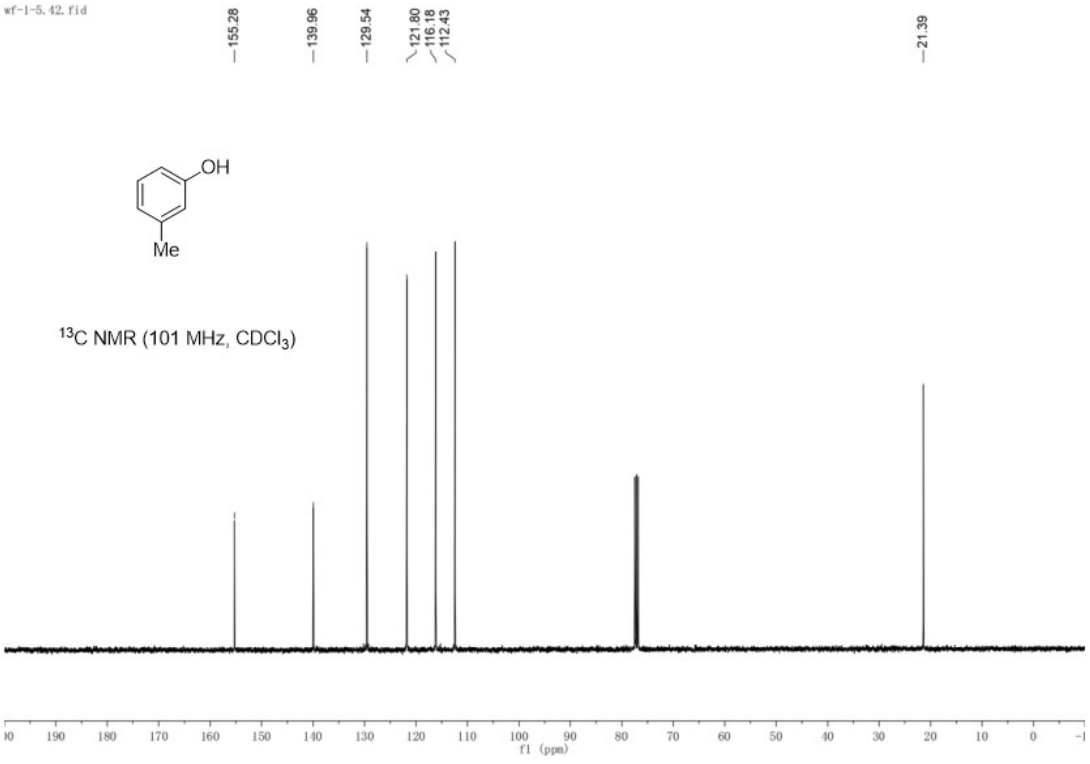
2,6-dimethoxyphenol (3e)



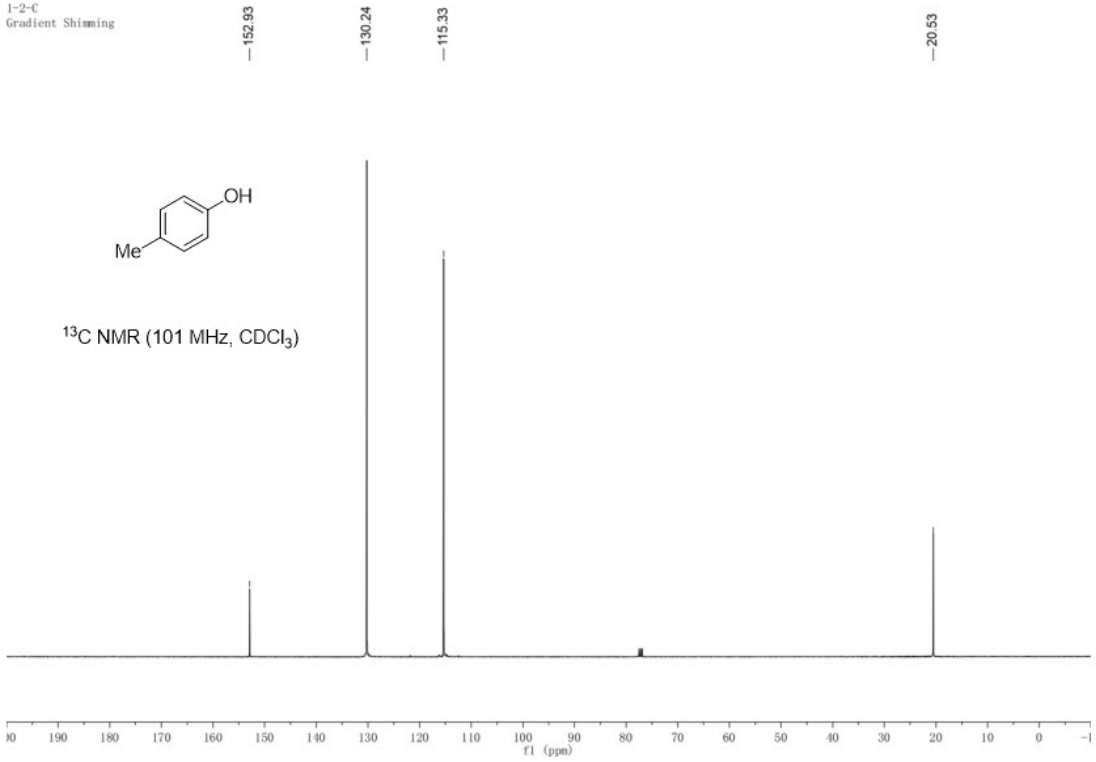


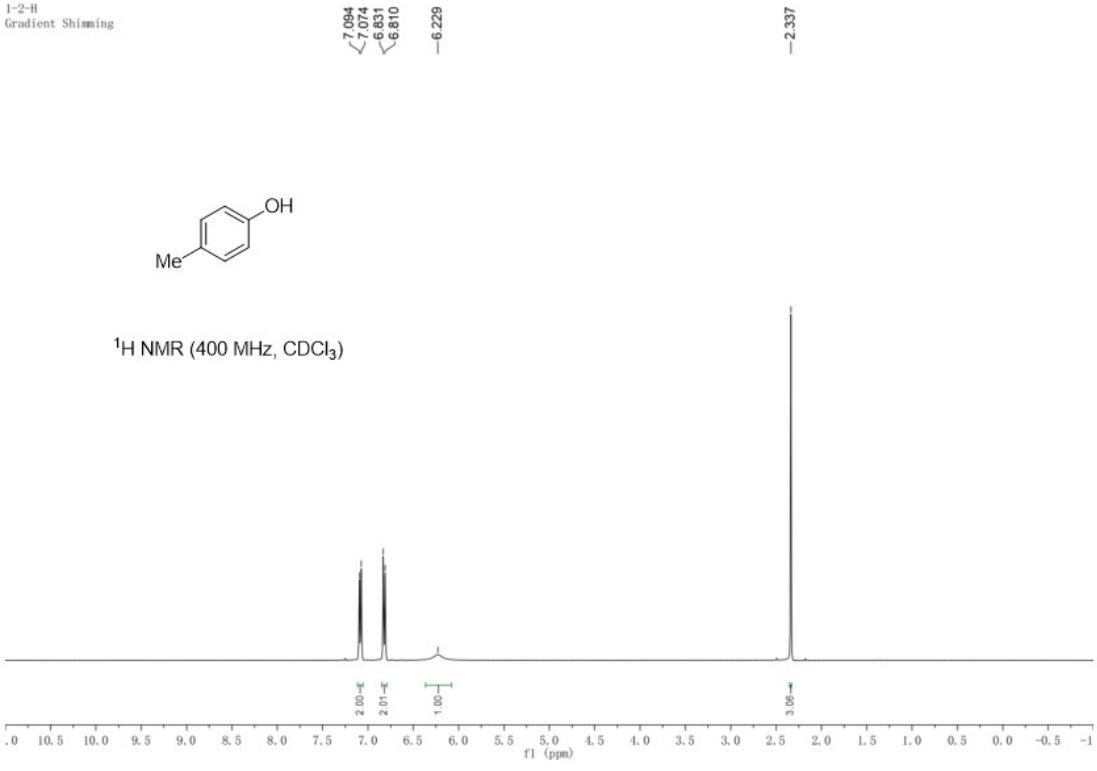
m-cresol (3f)


wf-1-5.40.fid
7.122
7.103
7.084
6.751
6.733
6.646
6.625
5.548
2.273
OH
Me
1H NMR (400 MHz, CDCl3)
1.06
1.08
2.00
1.01
3.08
f1 (ppm)

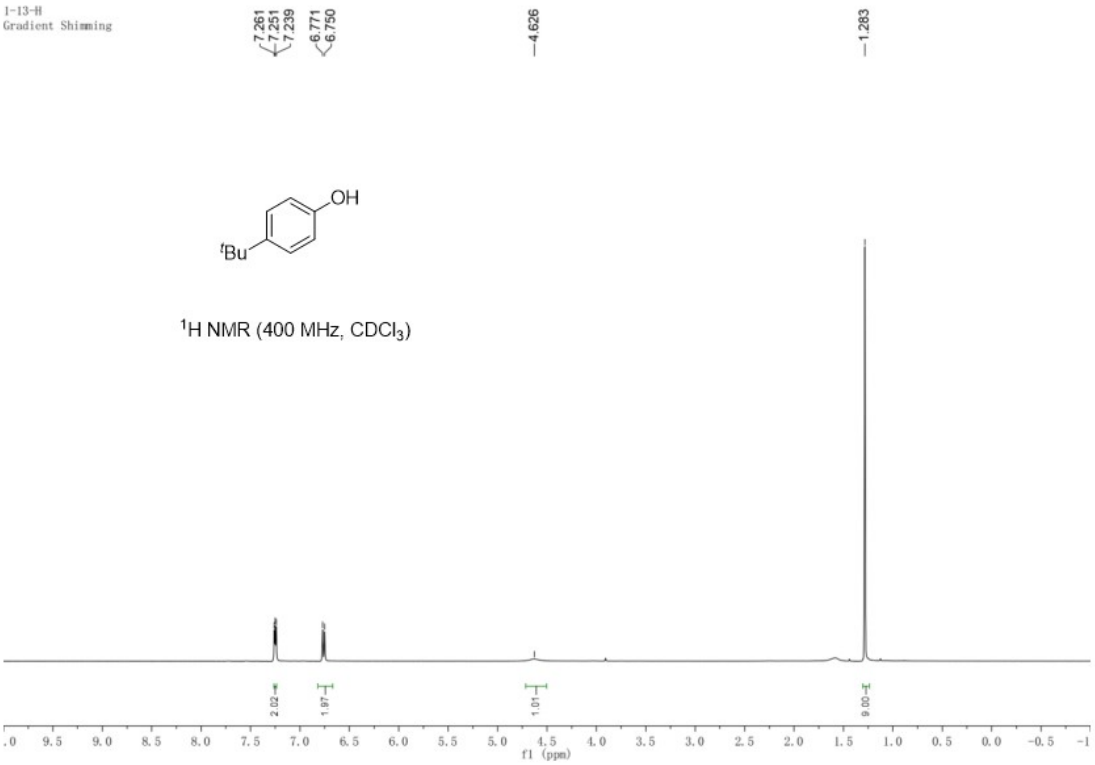

wf-1-5.42.fid
155.28
139.96
129.54
121.80
116.18
112.43
21.39
OH
Me
13C NMR (101 MHz, CDCl3)
f1 (ppm)

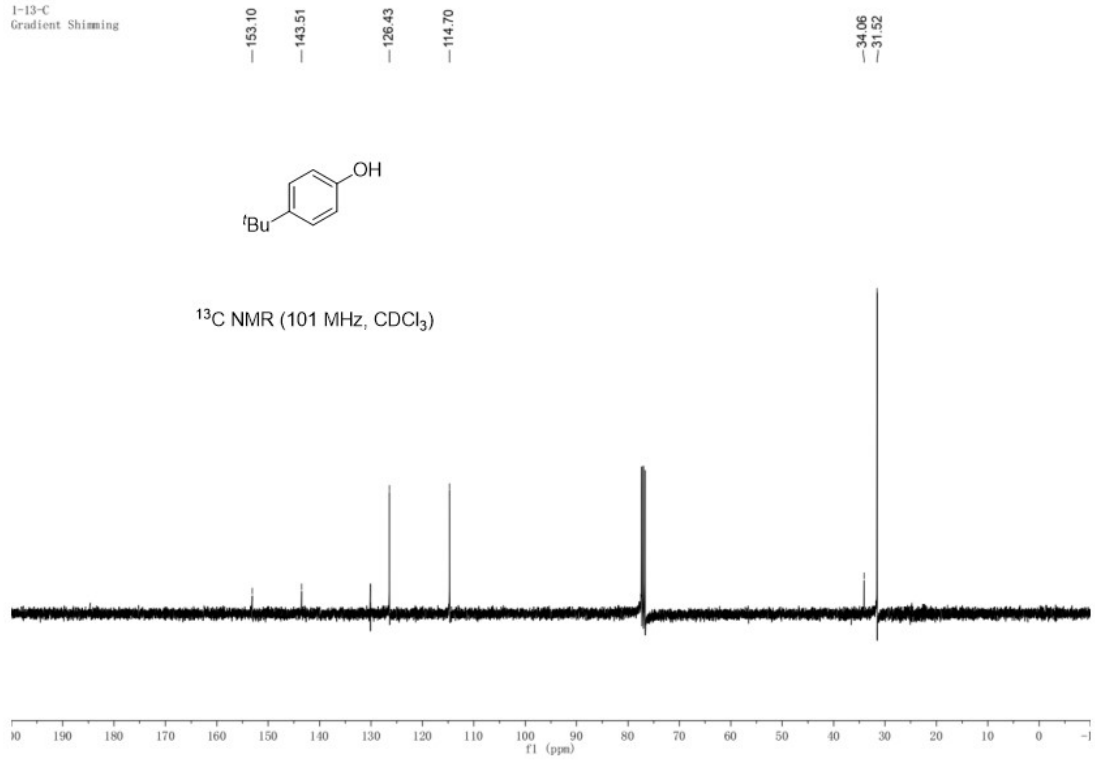
p-cresol (3g)


1-2-C
Gradient Shimming
152.93
130.24
115.33
20.53
OH
Me
^{13}C NMR (101 MHz, CDCl$_3$)
f1 (ppm)

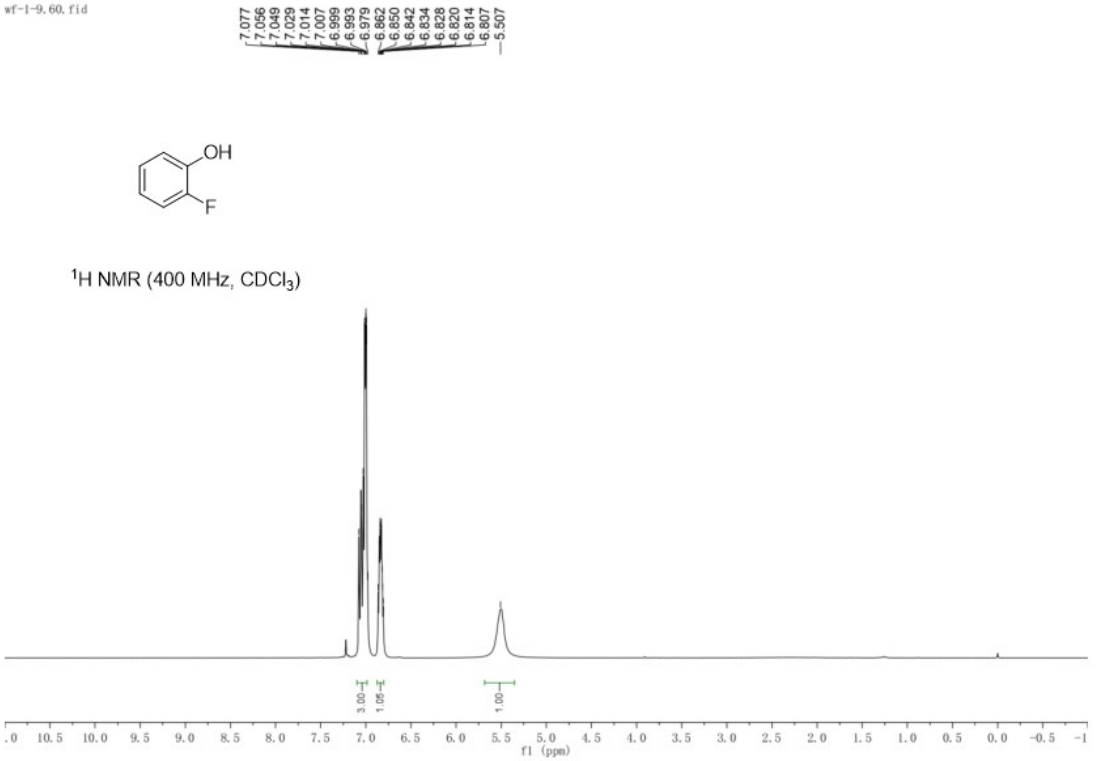

1-2-H
Gradient Shimming
7.094
7.074
6.831
6.810
6.229
2.337
OH
Me
^{1}H NMR (400 MHz, CDCl$_3$)
2.00
2.01
1.00
3.06
f1 (ppm)

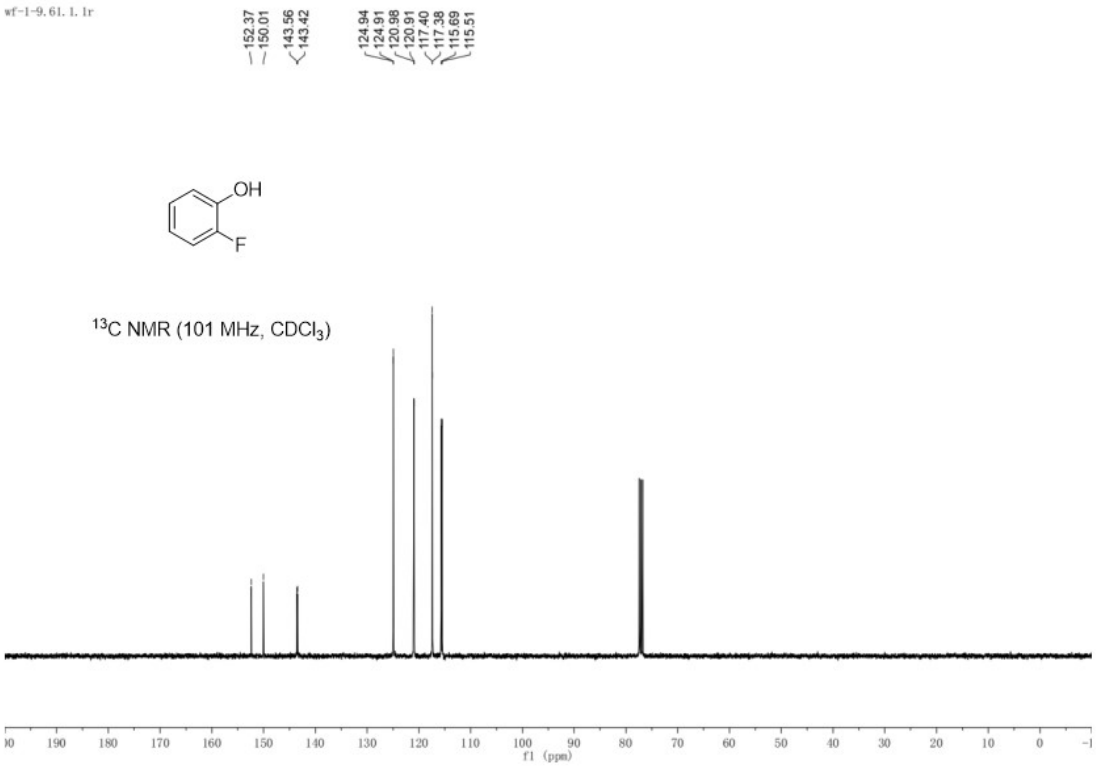
4-(*tert*-butyl)phenol (3h)



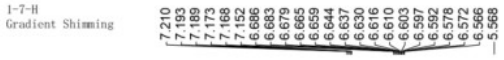


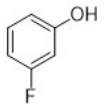
2-fluorophenol (3i)



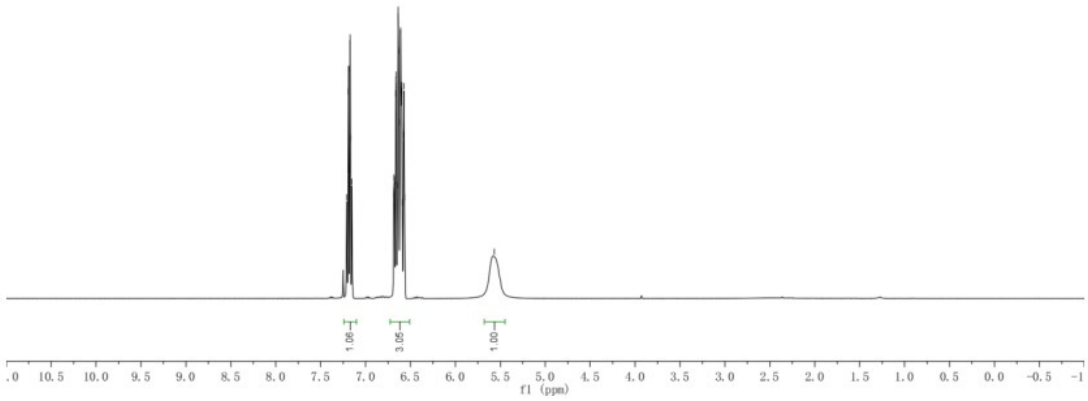


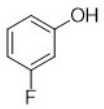
3-fluorophenol (3j)



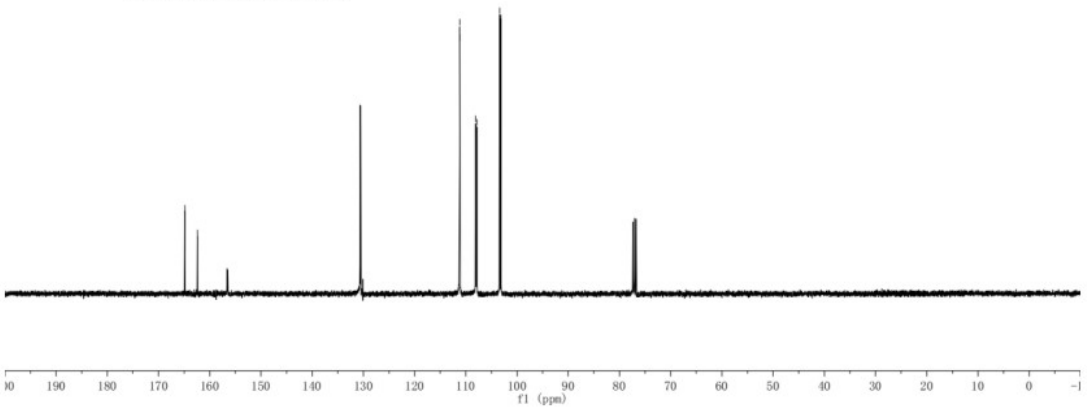


^{1}H NMR (400 MHz, $CDCl_3$)

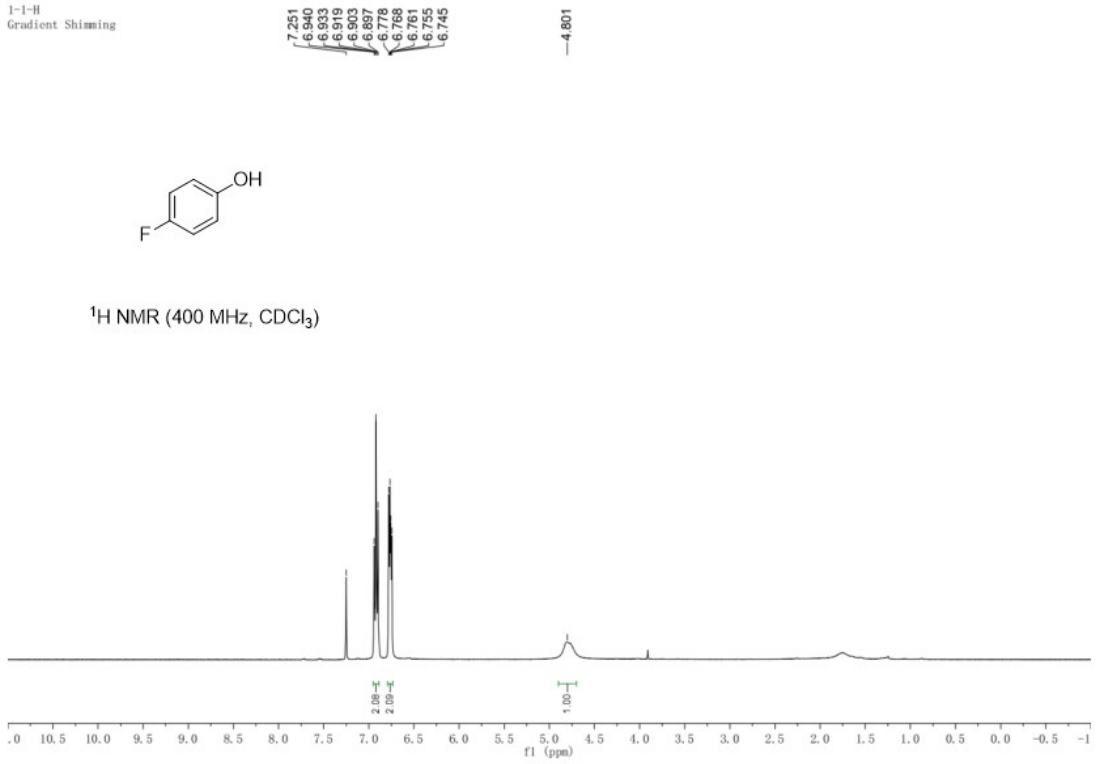




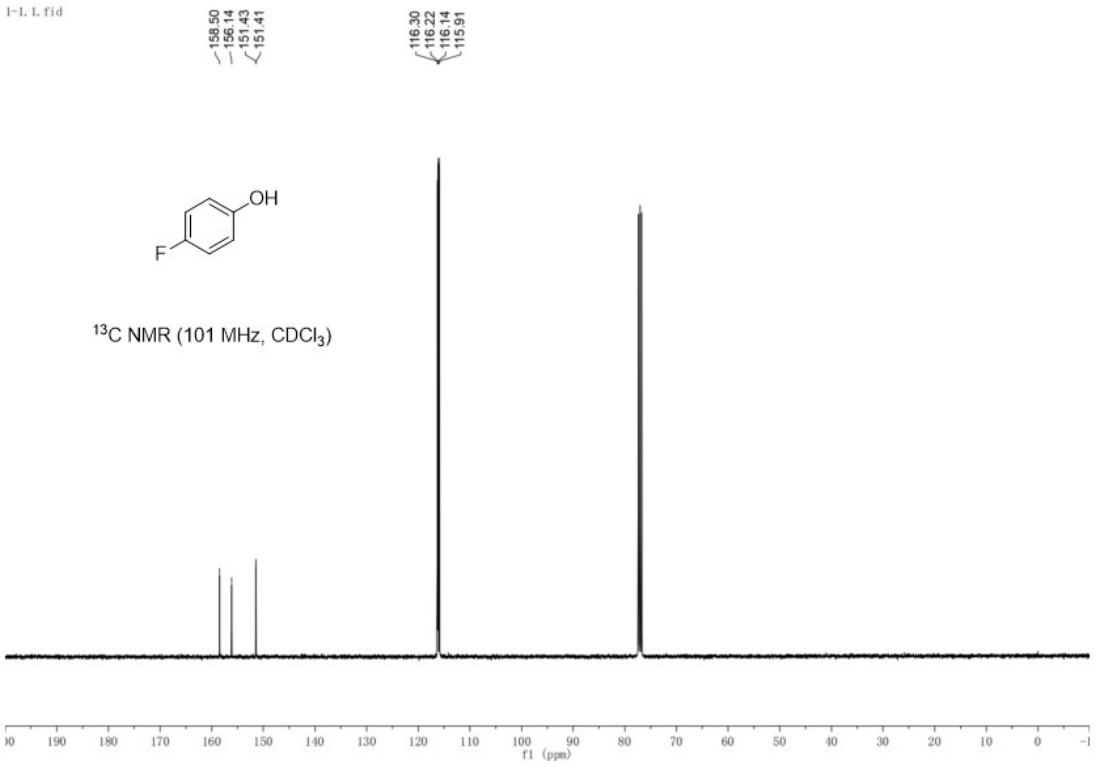
^{13}C NMR (101 MHz, $CDCl_3$)



4-fluorophenol (3k)

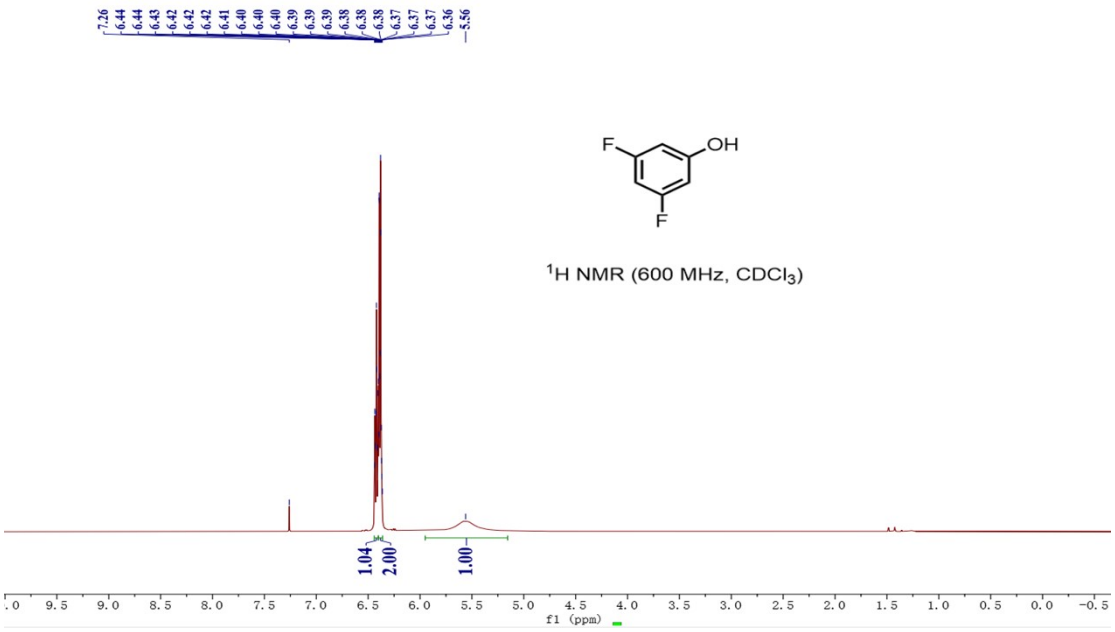


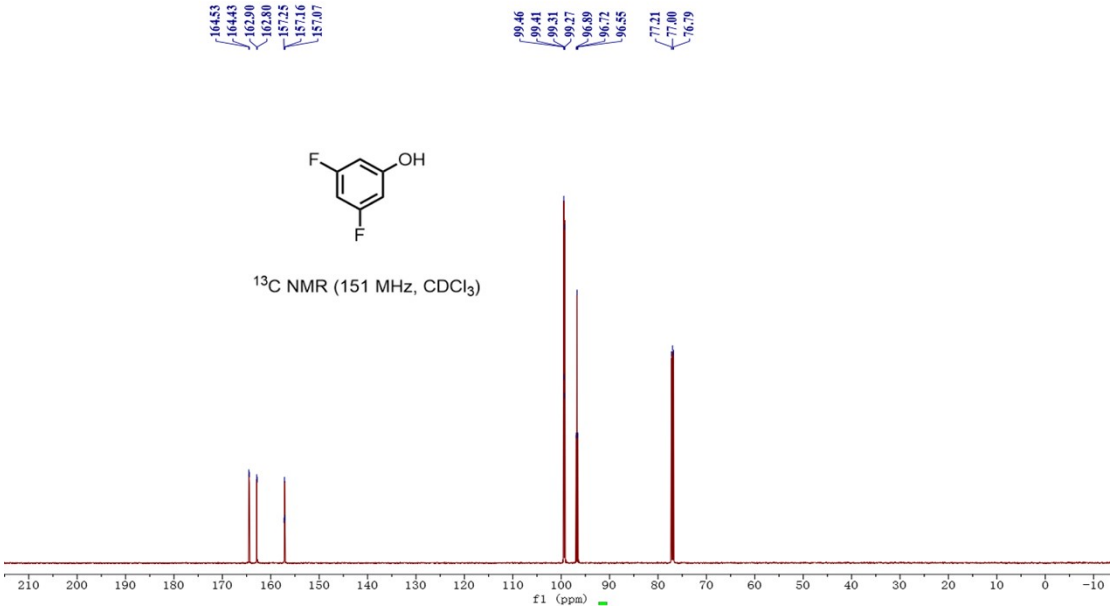
^{1}H NMR (400 MHz, $CDCl_3$)



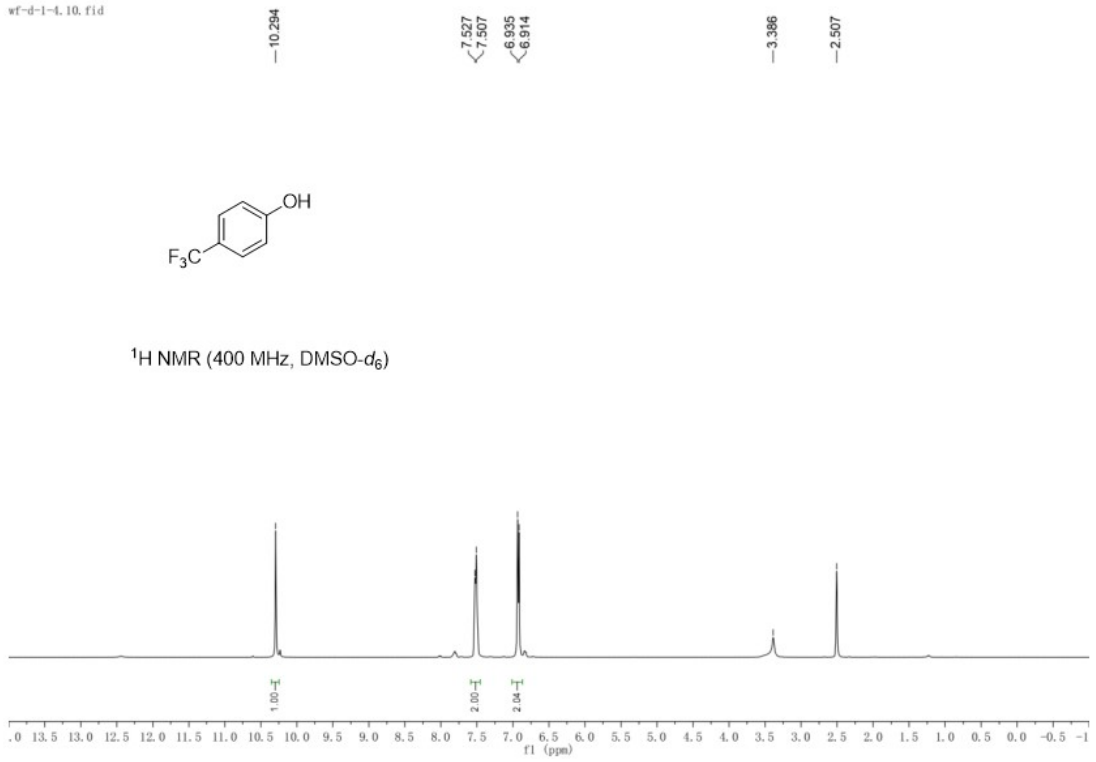
^{13}C NMR (101 MHz, $CDCl_3$)

3,5-difluorophenol (3l)

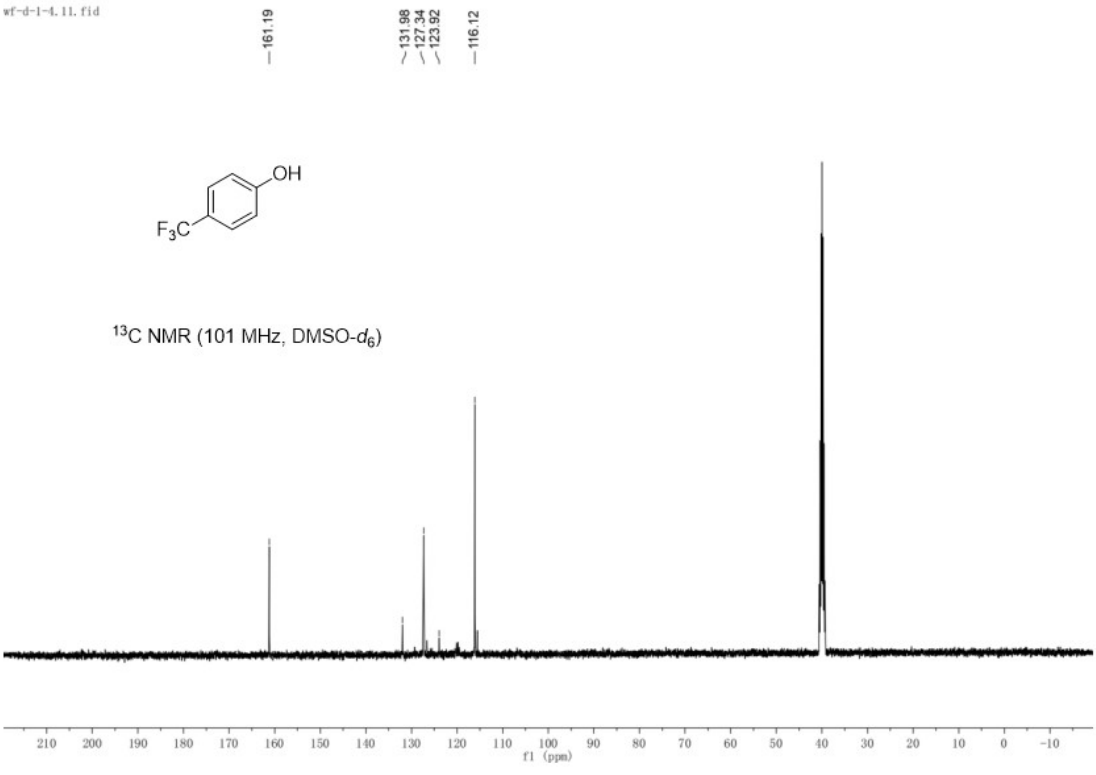




4-(trifluoromethyl)phenol (3m)

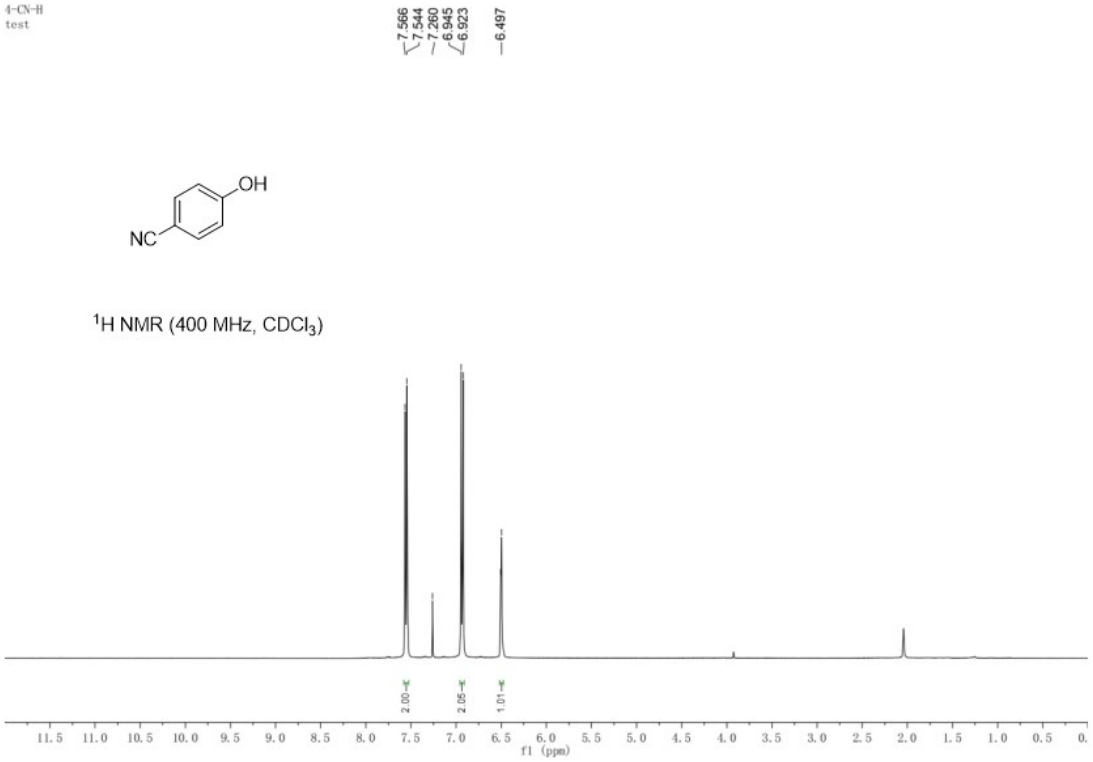


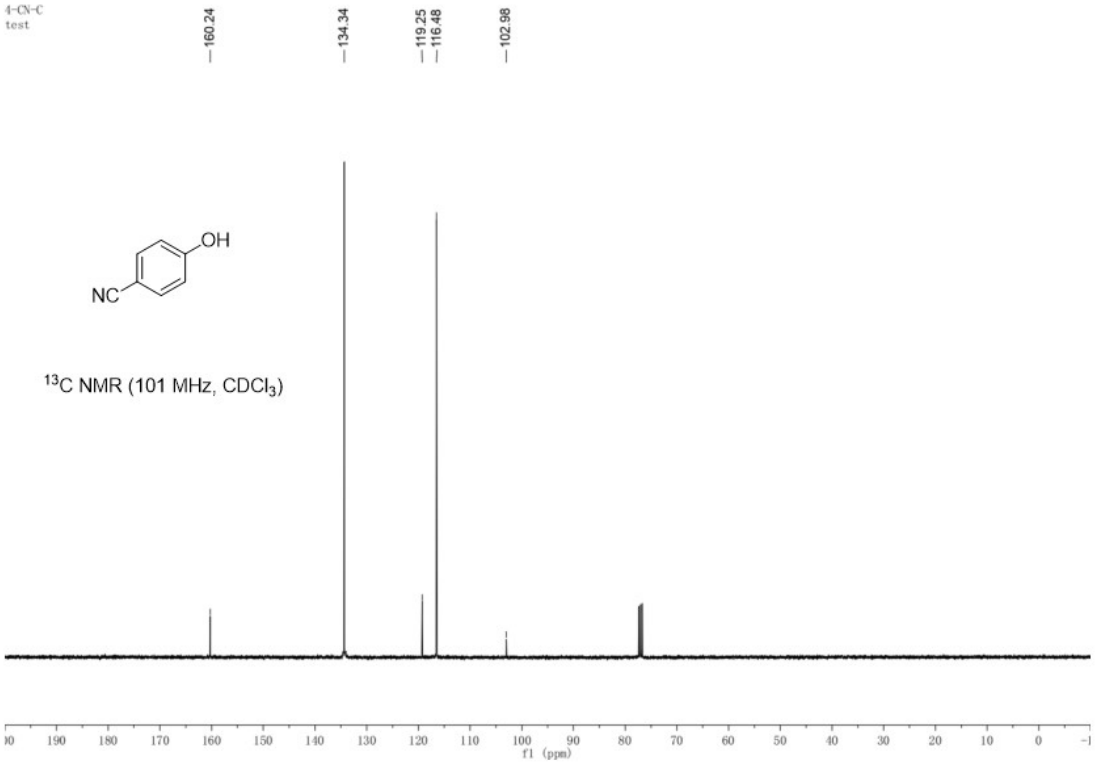
^{1}H NMR (400 MHz, DMSO-d_6)



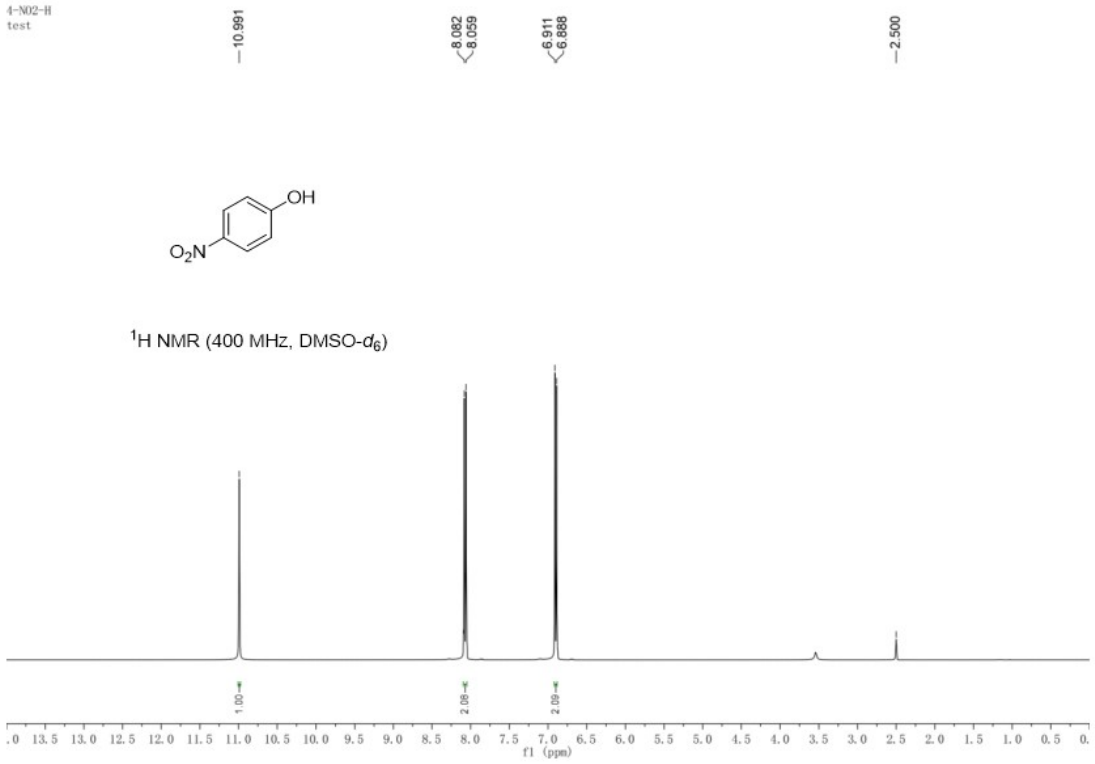
^{13}C NMR (101 MHz, DMSO-d_6)

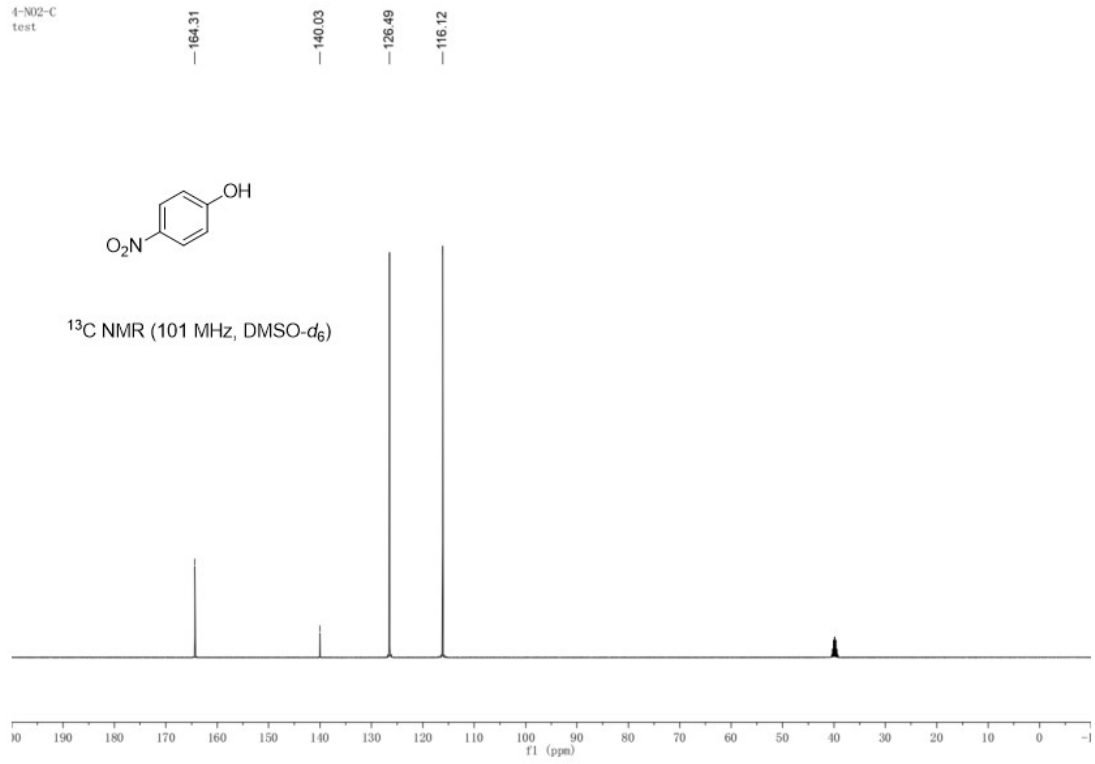
4-hydroxybenzonitrile (3n)



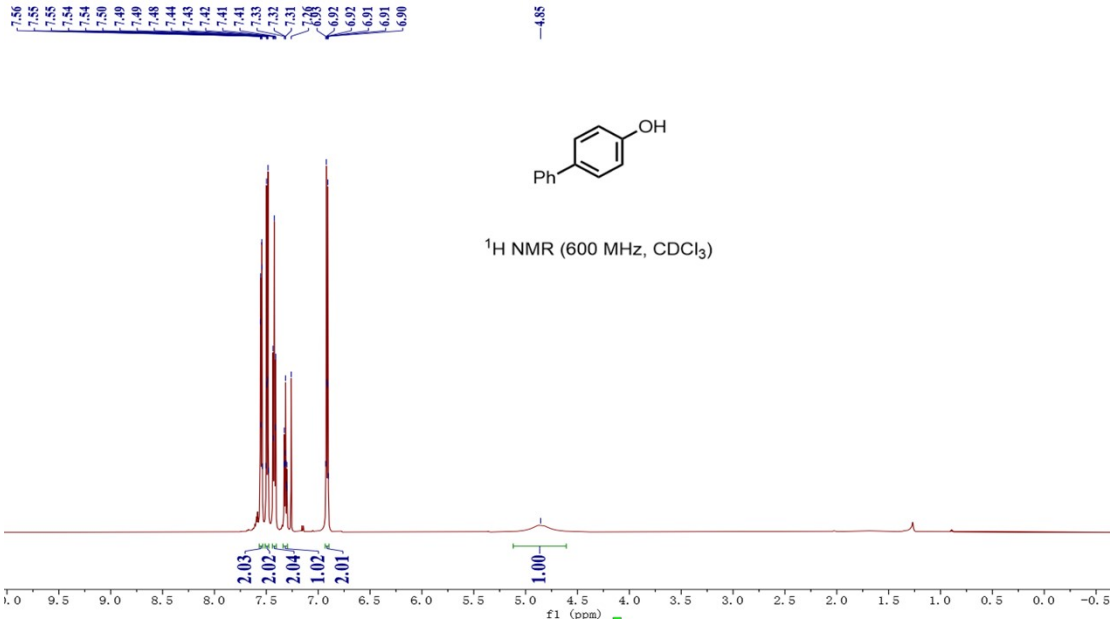


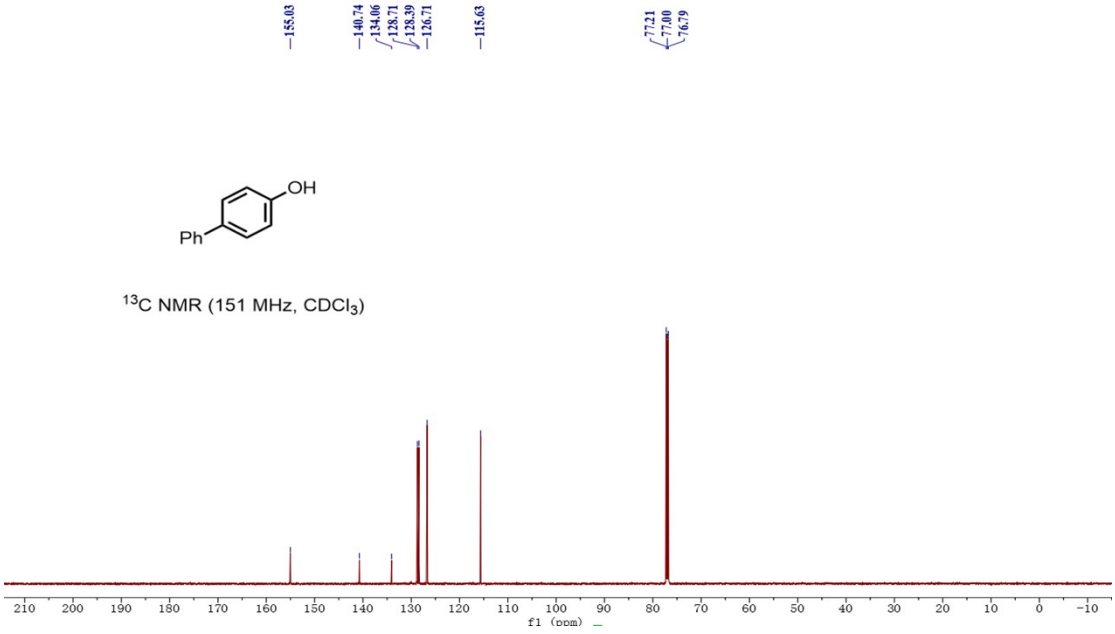
4-nitrophenol (3o)



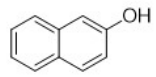


[1,1'-biphenyl]-4-ol (3p)

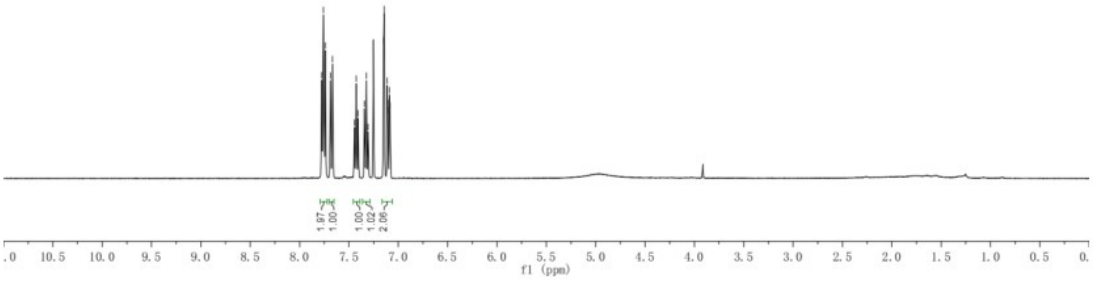


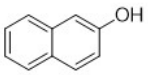


naphthalen-2-ol (3q)

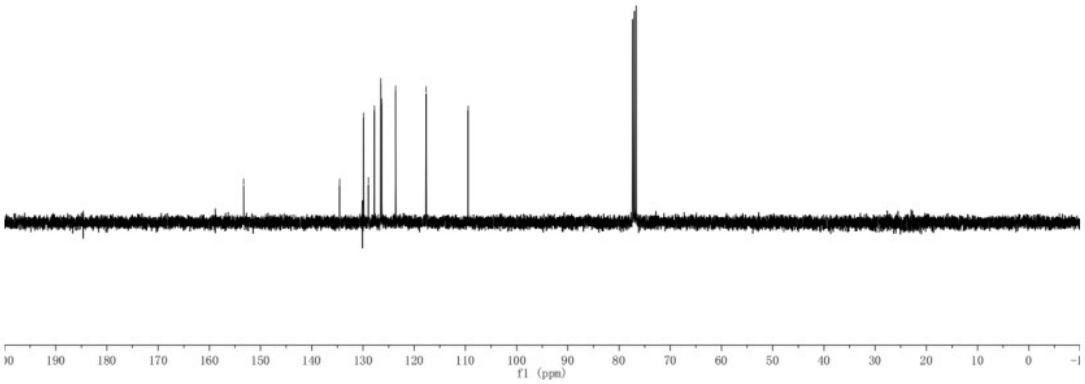


^{1}H NMR (400 MHz, $CDCl_3$)

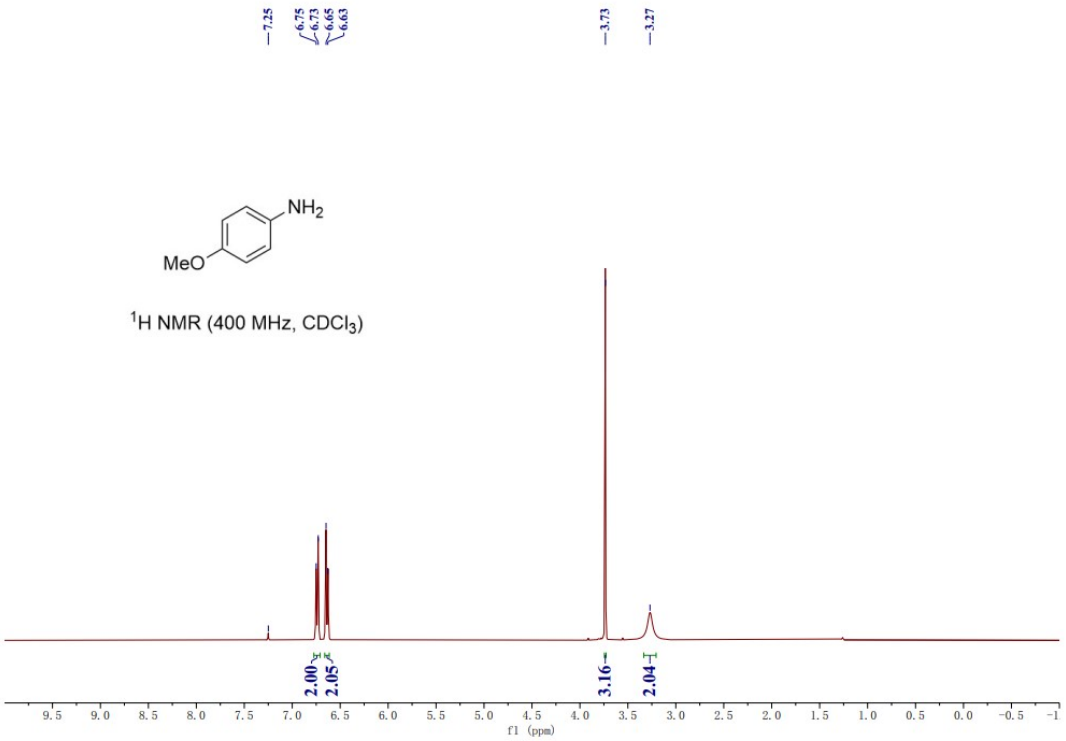


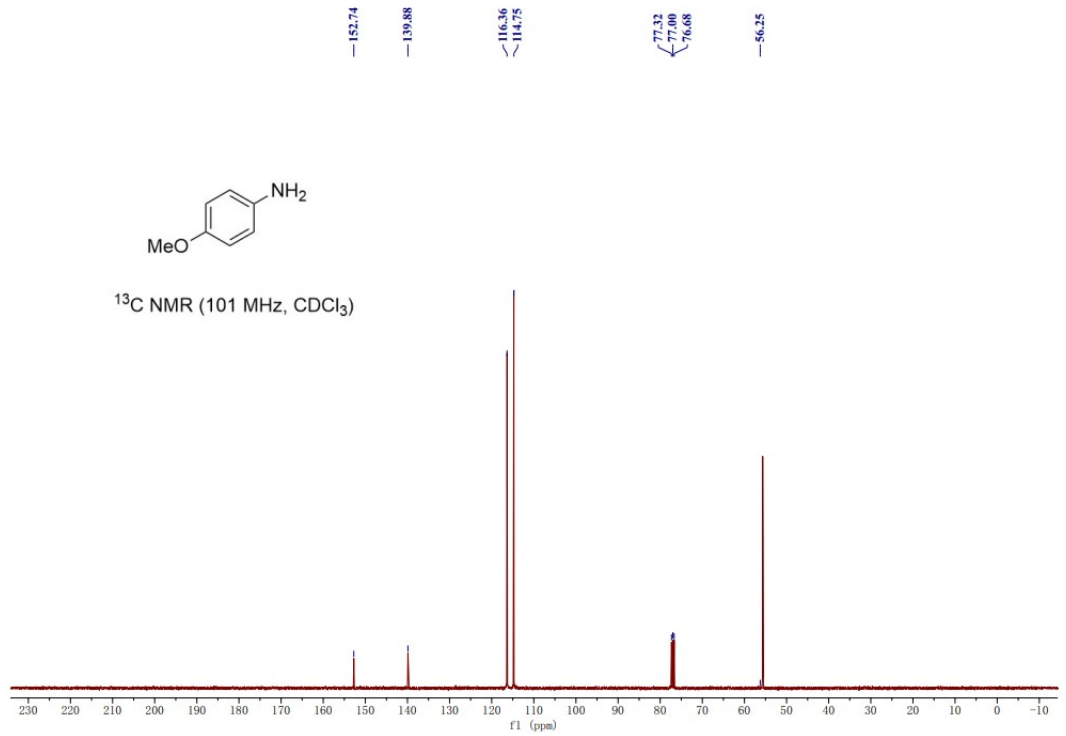


^{13}C NMR (101 MHz, $CDCl_3$)

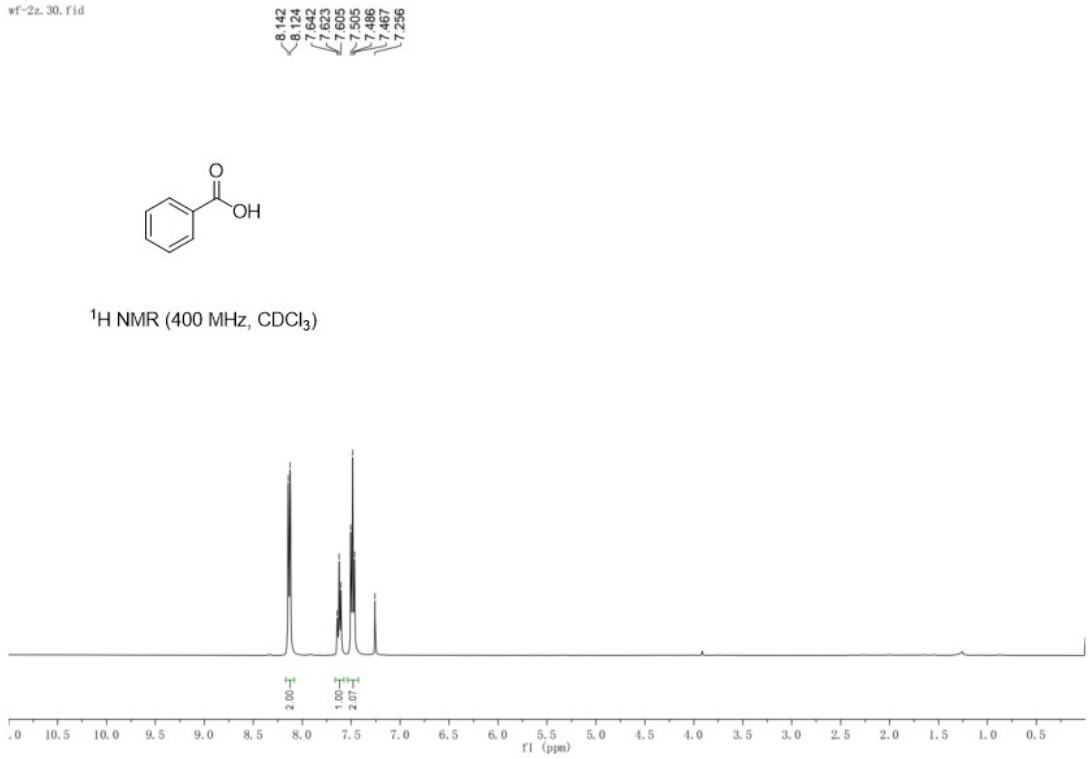


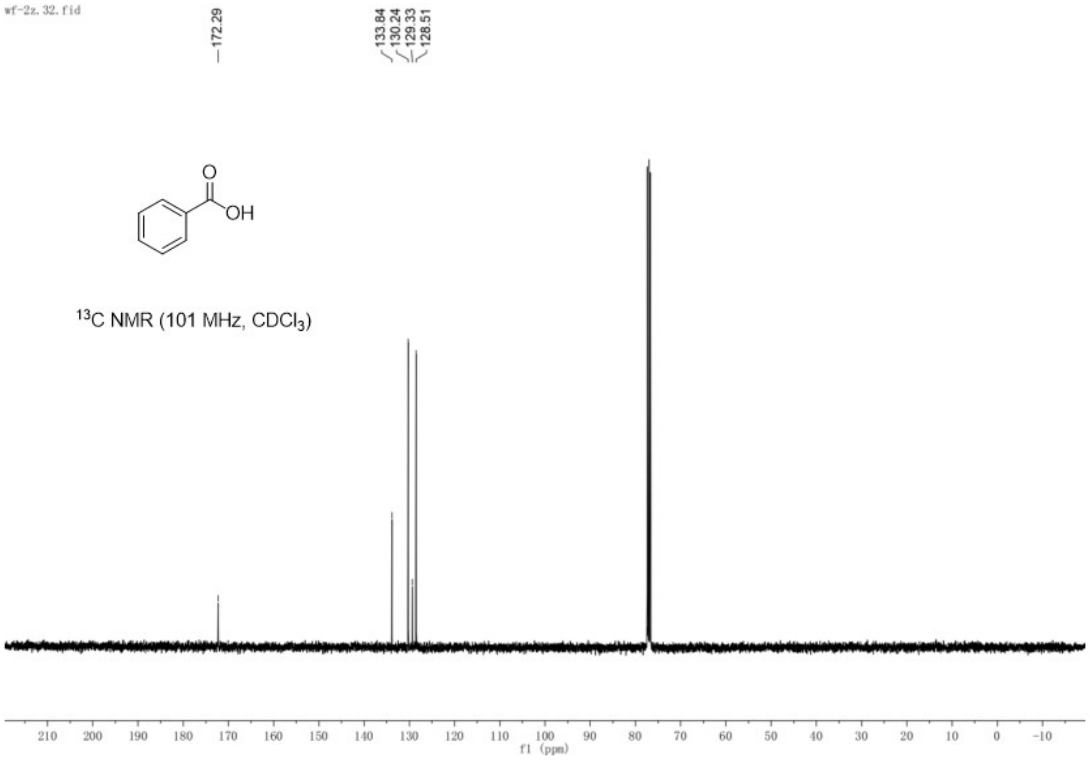
4-methoxyaniline (3af)



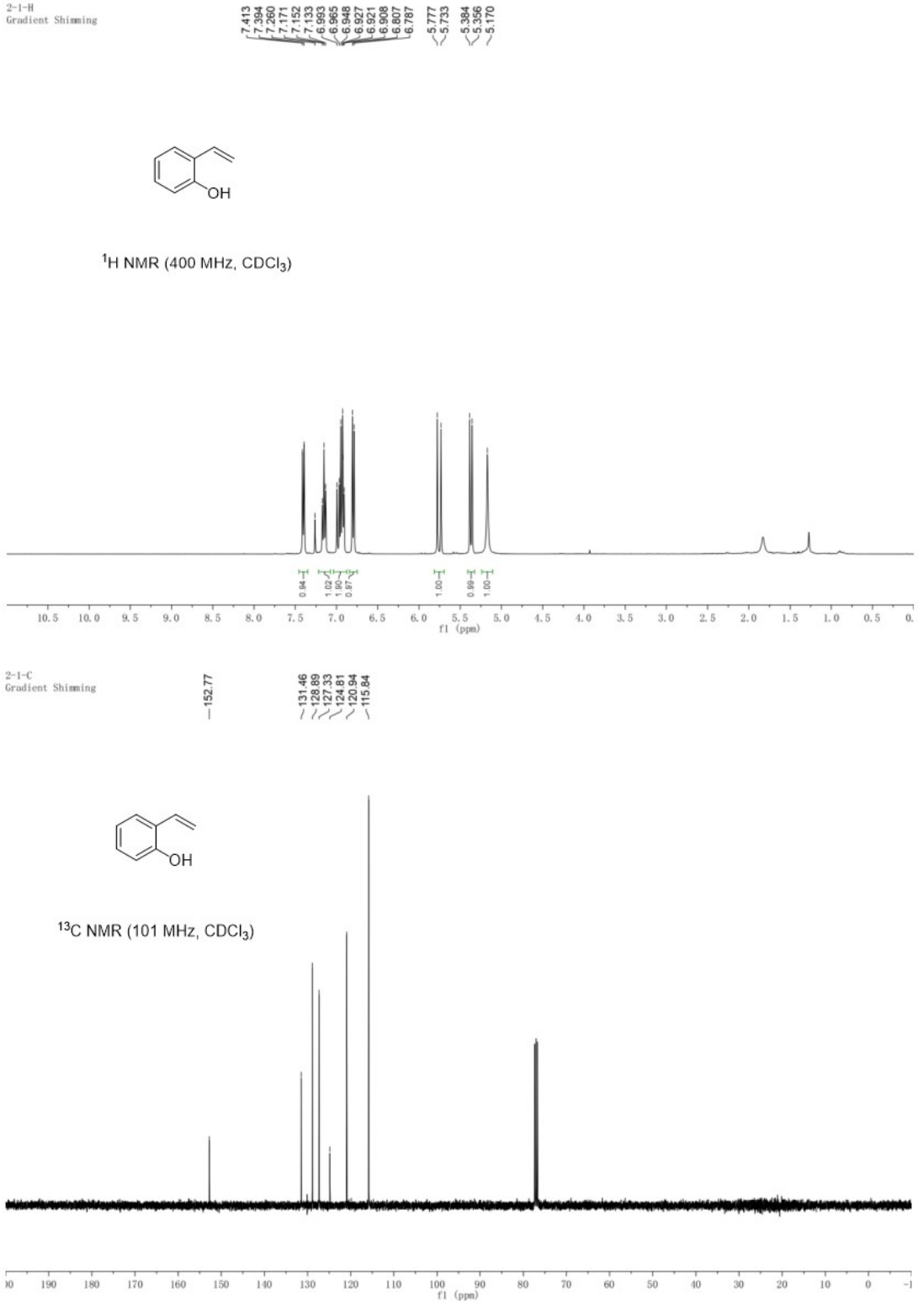


benzoic acid (3am)

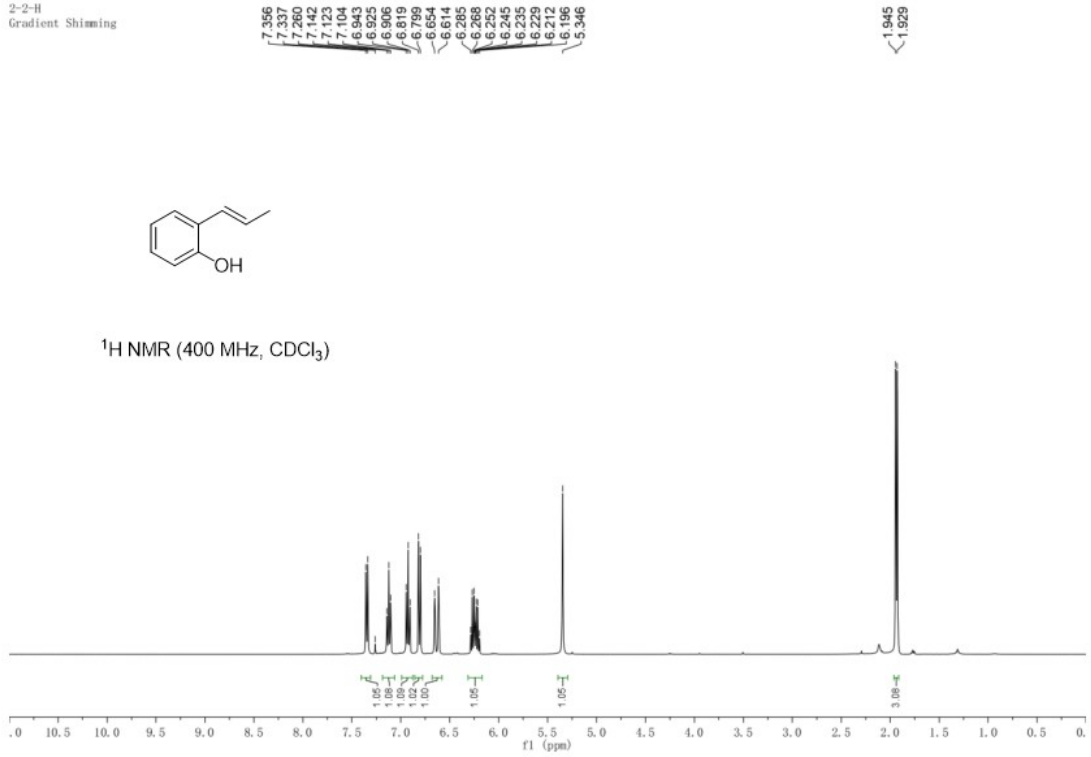


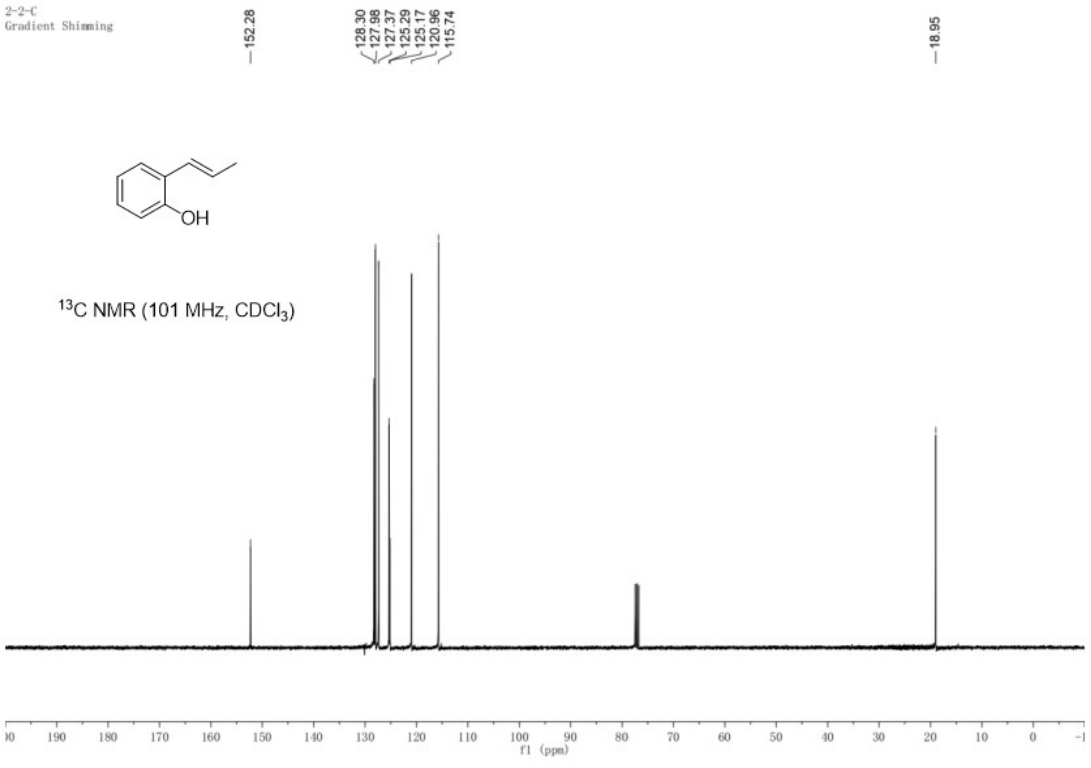


2-vinylphenol (5a)

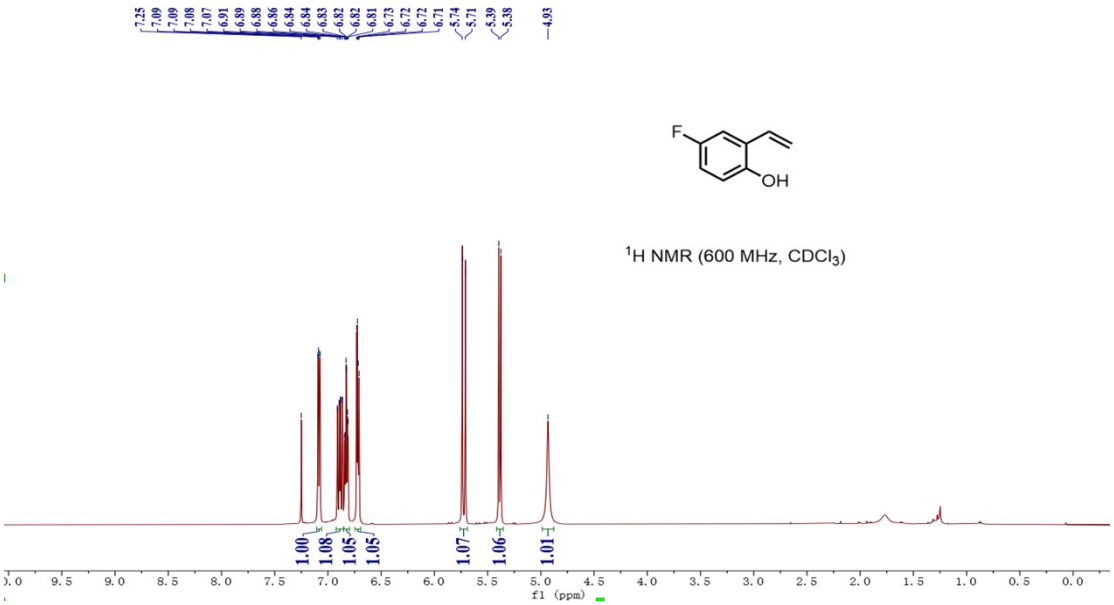


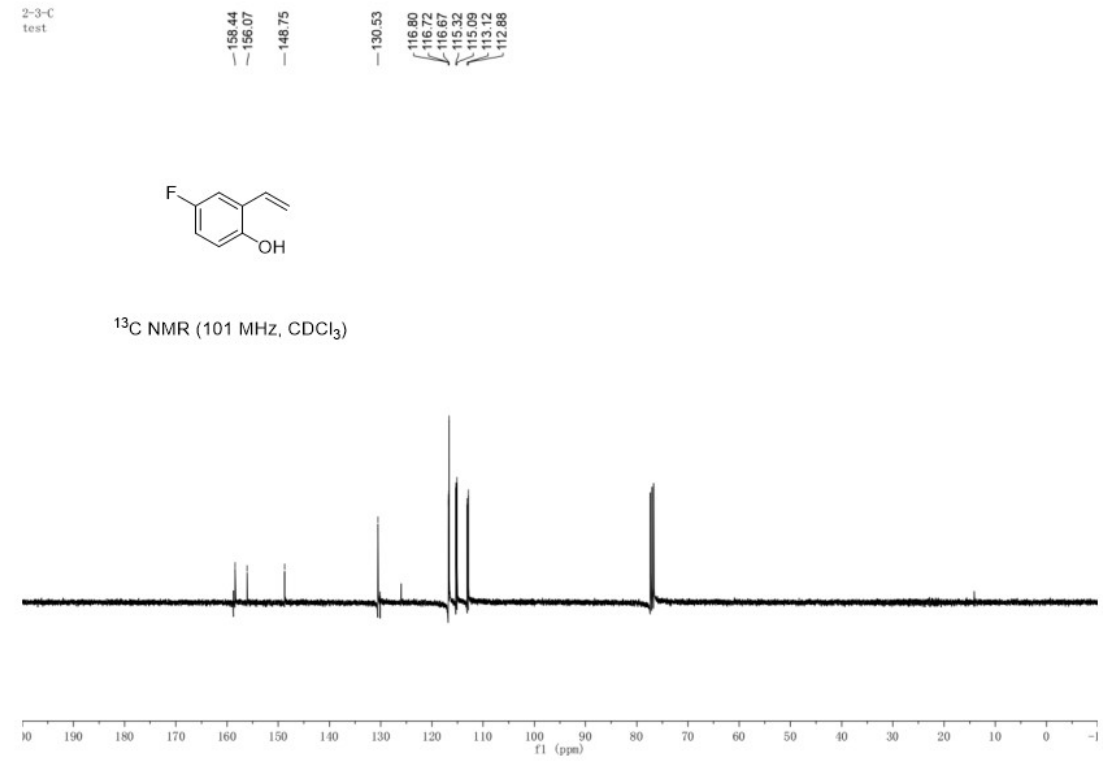
(*E*)-2-(prop-1-en-1-yl)phenol (5b)



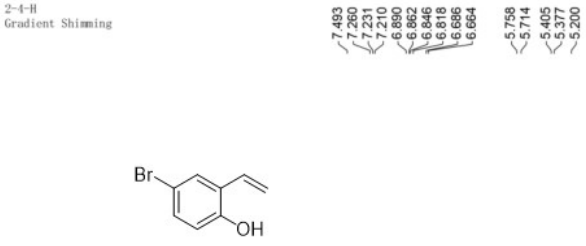


4-fluoro-2-vinylphenol (5c)

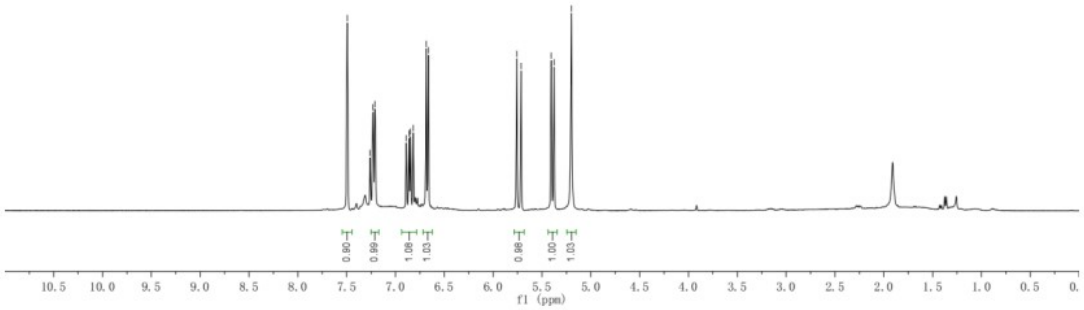


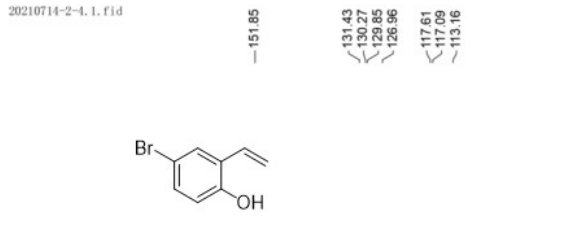


4-bromo-2-vinylphenol (5d)

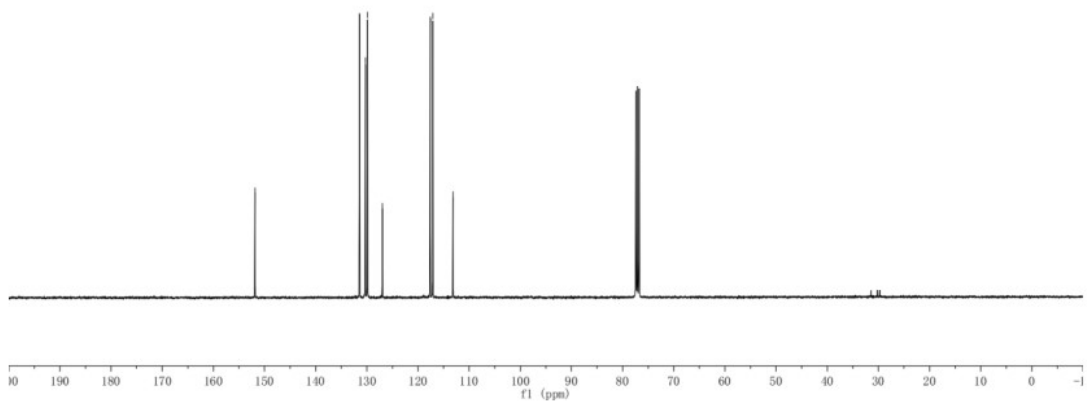


^{1}H NMR (400 MHz, $CDCl_3$)

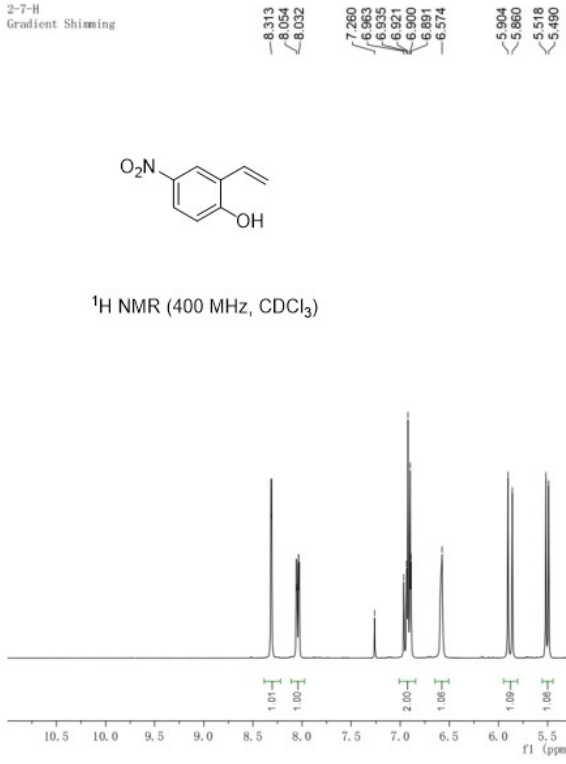


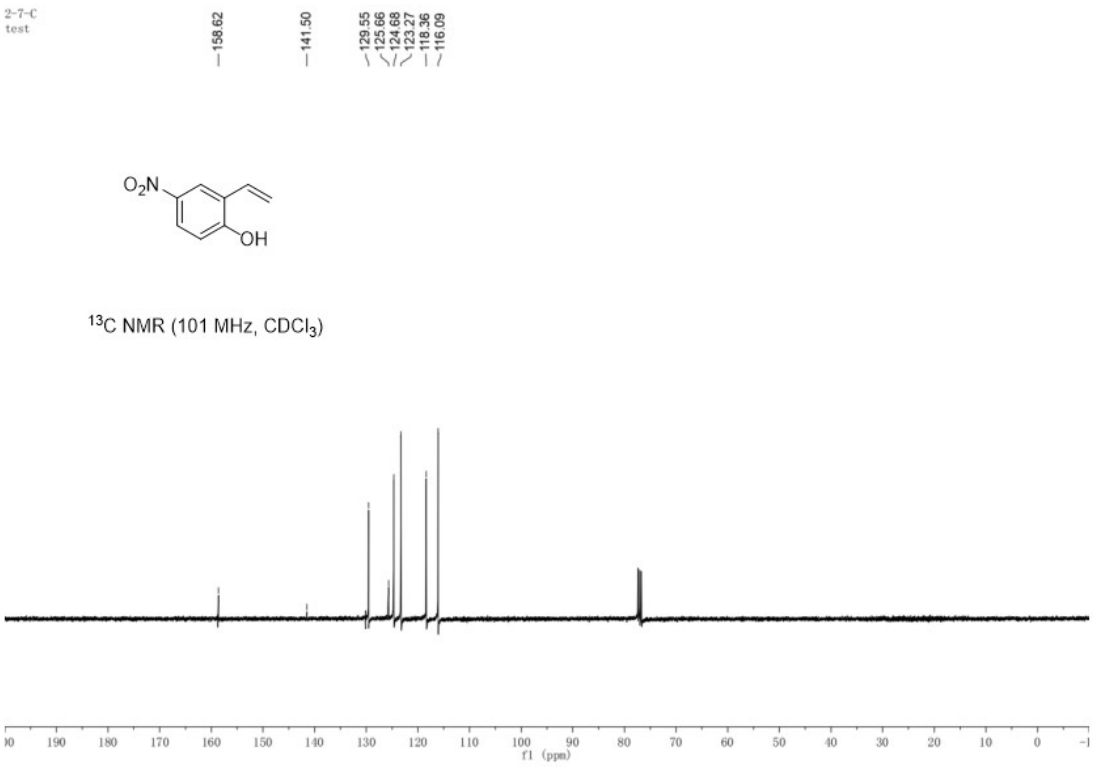


^{13}C NMR (101 MHz, $CDCl_3$)

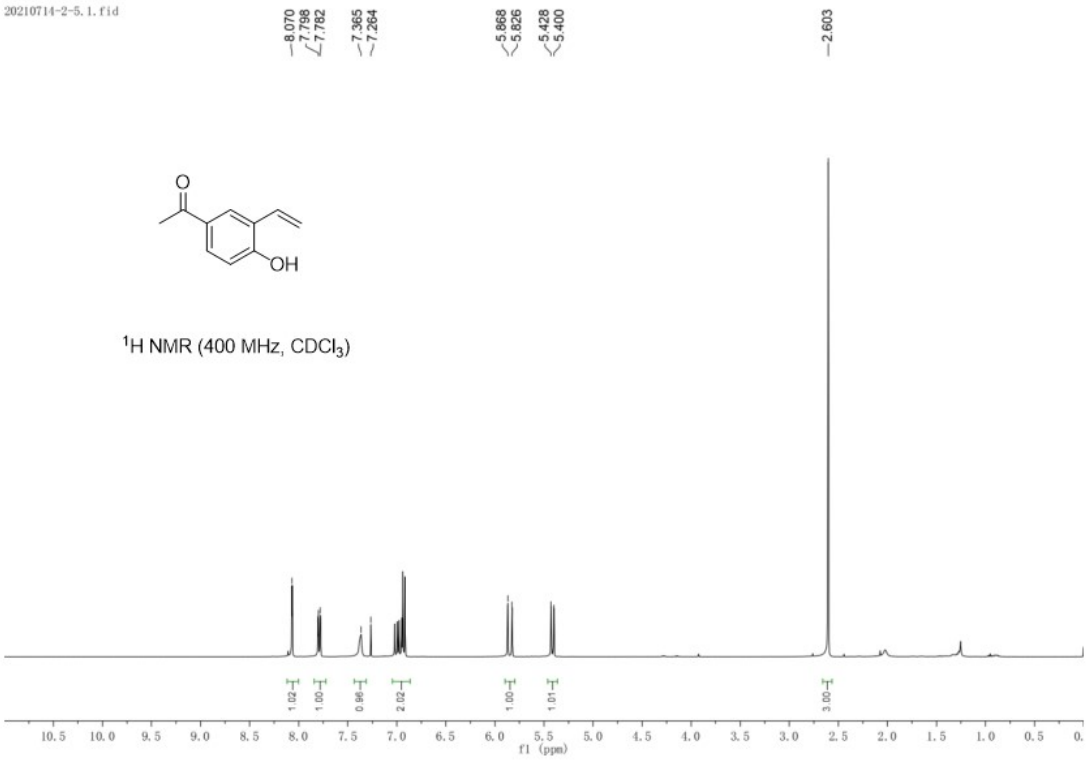


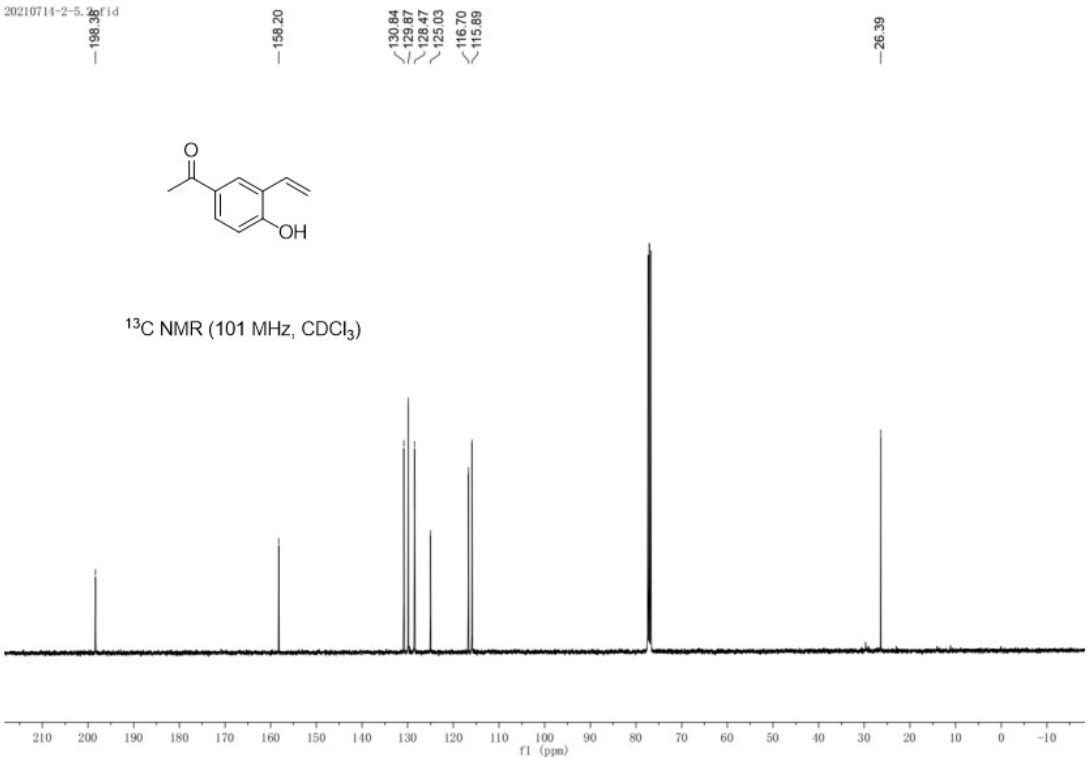
4-nitro-2-vinylphenol (5e)



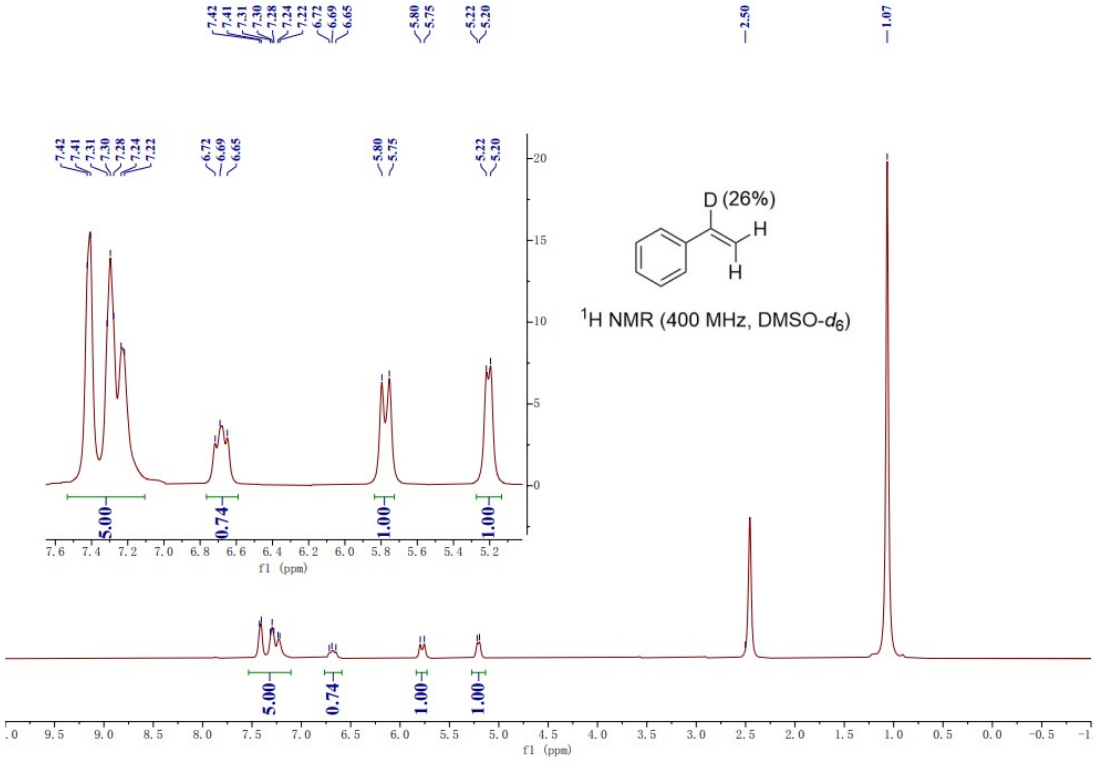


1-(4-hydroxy-3-vinylphenyl)ethan-1-one (5f)





Deuterated styrene (2ag-d_1)



Deuterated 2-vinylphenol (5a-d_1)