

Electronic Supplementary Material (ESI)

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Supporting Information

Base-promoted synthesis of diarylsulfones from sulfonyl hydrazines and diaryliodonium salts

Bozhen Gong,^a Haibo Zhu,^{*a} Liu Yang,^a Haifeng Wang,^{*a,b} Qiangwen Fan,^{a,c} Zongbo Xie,^a Zhang-Gao Le^{*a}

^a *Jiangxi Province Key Laboratory of Synthetic Chemistry, School of Chemistry, Biology and Material Science, East China University of Technology, 330013, Nanchang, China.*

^b *Pharmaceutical Research Institute, Wuhan Institute of Technology, Wuhan 430205, China.*

^c *Jiangxi Key Laboratory for Mass Spectrometry and Instrumentation, East China University of Technology, Nanchang, 330013.*

E-mail: hbzhu@ecut.edu.cn, fanqw2019@ecut.edu.cn, zbxie@ecut.edu.cn

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1. General

All commercial reagents were used directly without further purification, unless otherwise stated. CDCl_3 was purchased from Shanghai aladdin Biochemical Technology Co., Ltd. All Schlenk tubes and sealed vessels (50 mL) were purchased from Beijing Synthware Glass. The following abbreviations were used to describe NMR signals: s = singlet, d = doublet, t = triplet, m = multiplet, dd = doublet of doublets, q = quartet.

2. Experimental sections

2.1 The synthesis of sulfonyl hydrazides¹

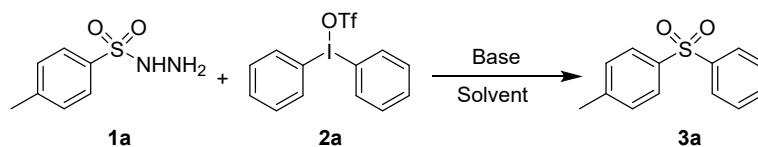
Hydrazine monohydrochloride (6.0 mmol) and NaOH (6.6 mmol) was added to water (30 mL) and was cooled to 0 °C. A solution of arylsulfonyl chloride (3.0 mmol) in THF (10 mL) was added by dropwise at 0 °C. The mixture was further stirred at 0 °C for 30 min, followed by addition of EtOAc (20 mL). The mixture was extracted with water (3×10 mL). The combined organic extract was concentrated and concentrated by silica gel column chromatography to provide the desired product.

2.2 General procedure for diphenyliodonium triflate²

Various symmetrical and unsymmetrical diphenyliodonium triflates were synthesized by us according to published methods.

2.3 Optimization of reaction conditions

Table S1. Base and Solvents Screening^a

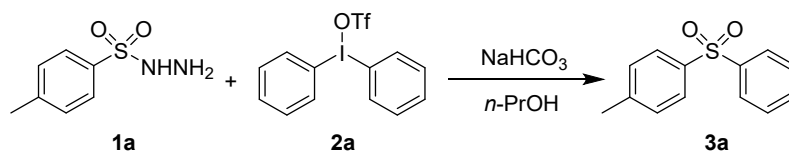


| Entry | Base | Solvent | Yield(%) ^b |
|----------------|-----------------------------------|------------------------|-----------------------|
| 1 ^c | Na_2CO_3 (1.0 eq) | CH_3CN | trace |
| 2 | Na_2CO_3 (1.0 eq) | CH_3CN | 37 |

| | | | |
|----|---|--------------------|----|
| 3 | K ₂ CO ₃ (1.0 eq) | CH ₃ CN | 30 |
| 4 | NaHCO ₃ (1.0 eq) | CH ₃ CN | 55 |
| 5 | DABCO (1.0 eq) | CH ₃ CN | 31 |
| 6 | Et ₃ N (1.0 eq) | CH ₃ CN | 35 |
| 7 | - | CH ₃ CN | 20 |
| 8 | NaHCO ₃ (0.5 eq) | CH ₃ CN | 43 |
| 9 | NaHCO ₃ (1.5 eq) | CH ₃ CN | 37 |
| 10 | NaHCO ₃ (1.0 eq) | DMSO | 51 |
| 11 | NaHCO ₃ (1.0 eq) | DMF | 39 |
| 12 | NaHCO ₃ (1.0 eq) | Dioxane | 56 |
| 13 | NaHCO ₃ (1.0 eq) | DCE | 23 |
| 14 | NaHCO ₃ (1.0 eq) | H ₂ O | 48 |
| 15 | NaHCO ₃ (1.0 eq) | EtOH | 64 |
| 16 | NaHCO ₃ (1.0 eq) | <i>i</i> -PrOH | 40 |
| 17 | NaHCO ₃ (1.0 eq) | <i>n</i> -PrOH | 65 |
| 18 | NaHCO ₃ (1.0 eq) | glycol | 20 |
| 19 | NaHCO ₃ (1.0 eq) | glycerol | 35 |
| 20 | NaHCO ₃ (1.0 eq) | TFE | 39 |
| 21 | NaHCO ₃ (1.0 eq) | HFIP | 35 |

^a Reaction conditions: **1a** (0.2 mmol), **2a** (0.2 mmol, 1.0 equiv.), solvent (2 mL), 100 °C under an atmosphere of N₂ for 24 h. ^b Isolated yield. ^c CuI (10 mol%).

Table S2. Variation of temperature, time and molar ratio in optimization of reaction conditions^a



| Entry | 1a /mmol | 2a /mmol | T/°C | Time/h | Yield (%) ^b |
|-------|-----------------|-----------------|------|--------|------------------------|
| 1 | 0.2 | 0.2 | 100 | 6 | 56 |
| 2 | 0.2 | 0.2 | 100 | 12 | 70 |
| 3 | 0.2 | 0.2 | 100 | 18 | 75 |
| 4 | 0.2 | 0.2 | 80 | 18 | 66 |
| 5 | 0.2 | 0.2 | 90 | 18 | 73 |
| 6 | 0.2 | 0.2 | 110 | 18 | 64 |
| 7 | 0.2 | 0.2 | 120 | 18 | 64 |
| 8 | 0.2 | 0.3 | 100 | 18 | 90 |
| 9 | 0.2 | 0.4 | 100 | 18 | 83 |
| 10 | 0.3 | 0.2 | 100 | 18 | 74 |

^a Reaction conditions: NaHCO₃ (1.0 equiv.), *n*-PrOH (2 mL), under N₂. ^b Isolated yield.

^c Under air.

3. GC-MS analysis of reaction mixture.

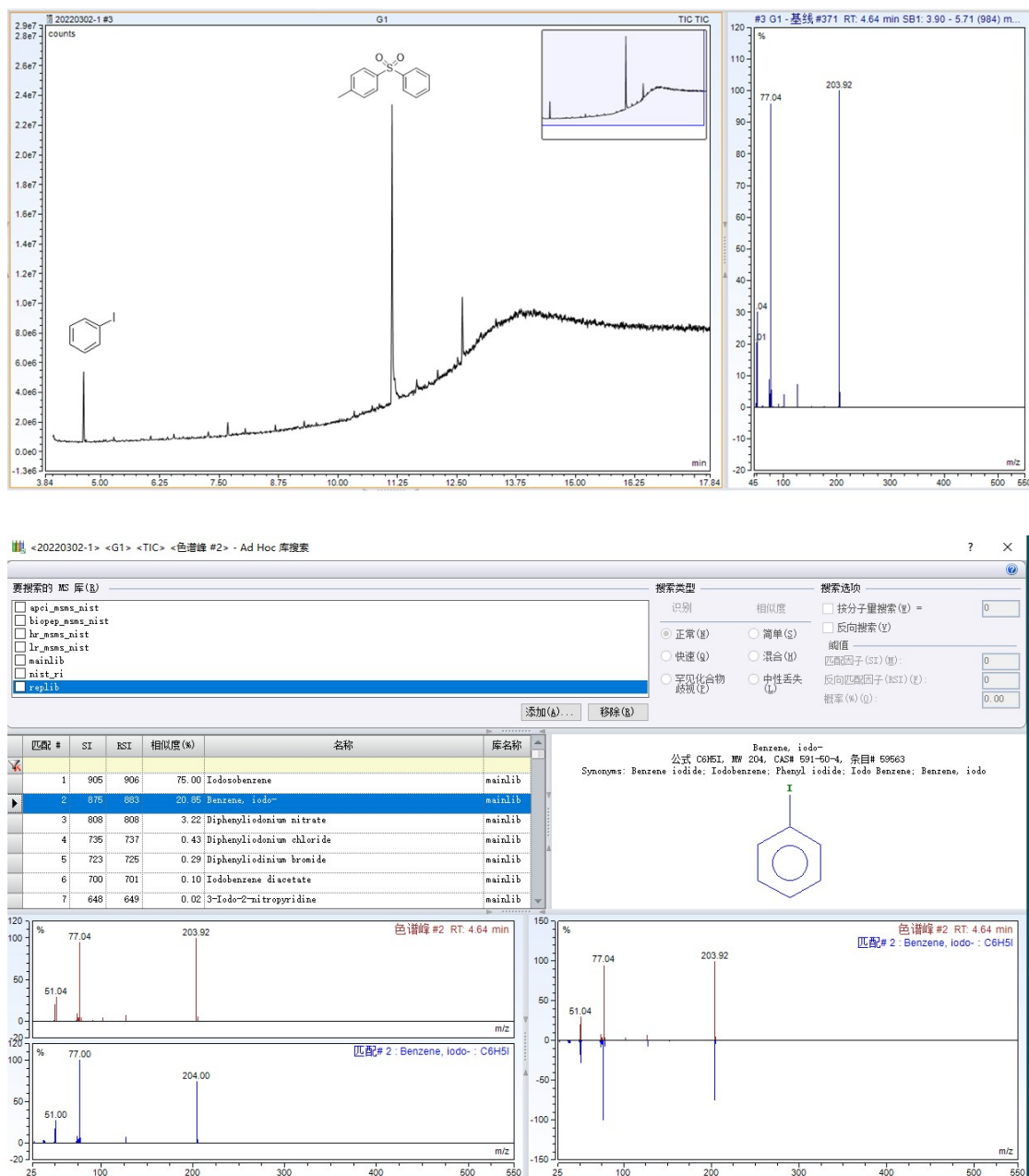
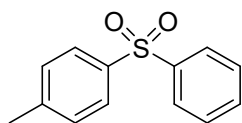


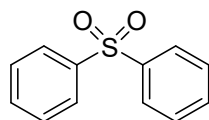
Figure S1

4. Data for the sulfone products



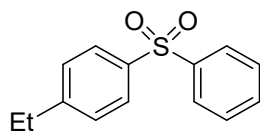
1-methyl-4-(phenylsulfonyl)benzene (3a)³

White solid; mp: 117.7-119.2 °C; ¹H NMR (500 MHz, CDCl₃) δ 7.93 (d, *J* = 7.7 Hz, 2H), 7.83 (d, *J* = 8.3 Hz, 2H), 7.55 (t, *J* = 7.4 Hz, 1H), 7.49 (t, *J* = 7.6 Hz, 2H), 7.30 (d, *J* = 8.3 Hz, 2H), 2.39 (s, 3H); ¹³C NMR (125 MHz, CDCl₃) δ 144.17, 141.92, 138.58, 133.00, 129.92, 129.22, 127.70, 127.48, 21.57.



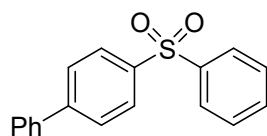
Sulfonyldibenzene (3b)⁴

White solid (41 mg, 94%); mp: 123.0-123.7 °C; ¹H NMR (500 MHz, CDCl₃) δ 7.98 – 7.92 (m, 4H), 7.57 (t, *J* = 7.4 Hz, 2H), 7.50 (t, *J* = 7.5 Hz, 4H). ¹³C NMR (125 MHz, CDCl₃) δ 141.54, 133.20, 129.28, 127.64.



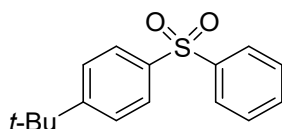
1-ethyl-4-(phenylsulfonyl)benzene (3c)⁵

White solid (41 mg, 83%); mp: 120.7-122.1 °C; ¹H NMR (500 MHz, CDCl₃) δ 7.94 (d, *J* = 7.5 Hz, 2H), 7.86 (d, *J* = 8.4 Hz, 2H), 7.54 (t, *J* = 7.3 Hz, 1H), 7.49 (t, *J* = 7.4 Hz, 2H), 7.32 (d, *J* = 8.4 Hz, 2H), 2.68 (q, *J* = 7.6 Hz, 2H), 1.22 (t, *J* = 7.6 Hz, 3H). ¹³C NMR (125 MHz, CDCl₃) δ 149.24, 140.88, 137.71, 131.98, 128.19, 127.75, 126.75, 126.47, 27.78, 14.05.



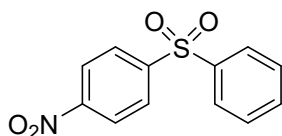
4-(phenylsulfonyl)-1,1'-biphenyl (3d)³

White solid (55.3 mg, 94%); mp: 144.7-145.6 °C; ¹H NMR (500 MHz, CDCl₃) δ 8.00 (t, *J* = 8.5 Hz, 4H), 7.70 (d, *J* = 8.5 Hz, 2H), 7.57 (dd, *J* = 6.5, 5.1 Hz, 3H), 7.52 (t, *J* = 7.4 Hz, 2H), 7.46 (t, *J* = 7.4 Hz, 2H), 7.40 (t, *J* = 7.3 Hz, 1H). ¹³C NMR (125 MHz, CDCl₃) δ 146.16, 141.69, 140.07, 139.13, 133.19, 129.32, 129.04, 128.58, 128.19, 127.93, 127.63, 127.33.



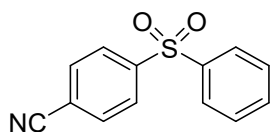
1-(tert-butyl)-4-(phenylsulfonyl)benzene (3e)⁶

White solid (47.8 mg, 87%); mp: 156.8-159.1 °C; ¹H NMR (500 MHz, CDCl₃) δ 7.95 (d, *J* = 7.4 Hz, 2H), 7.87 (d, *J* = 8.7 Hz, 2H), 7.59 – 7.47 (m, 5H), 1.30 (s, 9H). ¹³C NMR (125 MHz, CDCl₃) δ 157.06, 141.88, 138.48, 133.01, 129.21, 127.57, 127.50, 126.30, 35.16, 31.01.



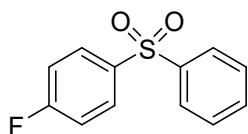
1-nitro-4-(phenylsulfonyl)benzene (3f)³

White solid (36.4 mg, 69%); mp: 143.6- 145.0°C; ¹H NMR (500 MHz, CDCl₃) δ 8.35 (d, *J* = 8.9 Hz, 2H), 8.14 (d, *J* = 8.9 Hz, 2H), 7.98 (d, *J* = 7.7 Hz, 2H), 7.65 (t, *J* = 7.4 Hz, 1H), 7.57 (t, *J* = 7.7 Hz, 2H). ¹³C NMR (125 MHz, CDCl₃) δ 150.35, 147.36, 140.00, 134.19, 129.75, 129.02, 128.06, 124.58.



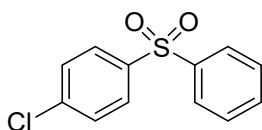
4-(phenylsulfonyl)benzotrile (3g)³

White solid (29.6 mg, 61%); mp: 124.9- 125.7 °C; ¹H NMR (500 MHz, CDCl₃) δ 8.06 (d, *J* = 8.4 Hz, 2H), 7.96 (d, *J* = 7.6 Hz, 2H), 7.81 (d, *J* = 8.4 Hz, 2H), 7.64 (t, *J* = 7.4 Hz, 1H), 7.56 (t, *J* = 7.7 Hz, 2H). ¹³C NMR (125 MHz, CDCl₃) δ 145.86, 140.11, 134.08, 133.13, 129.70, 128.31, 128.01, 117.19, 116.94.



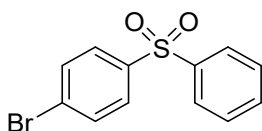
1-fluoro-4-(phenylsulfonyl)benzene (3h)⁴

White solid (43.5 mg, 92%); mp: 110.9- 113.1 °C; ¹H NMR (500 MHz, CDCl₃) δ 8.00 – 7.91 (m, 4H), 7.52 (s, 3H), 7.18 (t, *J* = 8.6 Hz, 2H). ¹³C NMR (125 MHz, CDCl₃) δ 165.42(d, *J* = 255.78 Hz), 141.42, 137.64(d, *J* = 3.78 Hz), 133.34, 130.48(d, *J* = 10.08 Hz), 129.39, 127.56, 116.61(d, *J* = 22.68 Hz).



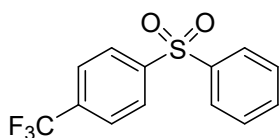
1-chloro-4-(phenylsulfonyl)benzene (3i)⁴

White solid (44.1 mg, 87%); mp: 90.3- 92.2 °C; ¹H NMR (500 MHz, CDCl₃) δ 7.96 – 7.91 (m, 2H), 7.91 – 7.86 (m, 2H), 7.59 (t, *J* = 7.4 Hz, 1H), 7.55 – 7.45 (m, 4H). ¹³C NMR (125 MHz, CDCl₃) δ 141.16, 140.09, 139.90, 133.45, 129.62, 129.42, 129.12, 127.63.



1-bromo-4-(phenylsulfonyl)benzene (3j)⁴

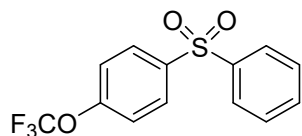
White solid (47 mg, 79%); mp: 105.9 – 106.6 °C; ¹H NMR (500 MHz, CDCl₃) δ 7.93 (dd, *J* = 8.3, 1.3 Hz, 2H), 7.81 (d, *J* = 8.6 Hz, 2H), 7.64 (d, *J* = 8.5 Hz, 2H), 7.59 (t, *J* = 7.4 Hz, 1H), 7.52 (t, *J* = 7.6 Hz, 2H). ¹³C NMR (125 MHz, CDCl₃) δ 141.10, 140.63, 133.47, 132.60, 129.43, 129.19, 128.46, 127.64.



1-(phenylsulfonyl)-4-(trifluoromethyl)benzene (3k)⁶

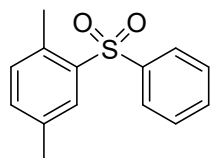
White solid (50.6 mg, 88%); mp: 89.7- 90.5 °C; ¹H NMR (500 MHz, CDCl₃) δ 8.08 (d, *J* = 8.2 Hz, 2H), 8.00 – 7.94 (m, 2H), 7.77 (d, *J* = 8.3 Hz, 2H), 7.58 (dt, *J* = 36.2, 7.3

Hz, 3H). ^{13}C NMR (125 MHz, CDCl_3) δ 145.18, 140.54, 134.84 (q, $J = 32.76$ Hz), 133.81, 129.56, 128.21, 127.90, 123.46 (q, $J = 3.78$ Hz), 123.09 (q, $J = 273.42$ Hz).



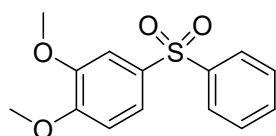
1-(phenylsulfonyl)-4-(trifluoromethoxy)benzene (3l)⁷

White solid (53.9 mg, 89%); mp: 59.3-60.7 °C; ^1H NMR (500 MHz, CDCl_3) δ 8.00 (d, $J = 8.9$ Hz, 2H), 7.98 – 7.93 (m, 2H), 7.60 (t, $J = 7.4$ Hz, 1H), 7.54 (t, $J = 7.6$ Hz, 2H), 7.33 (d, $J = 8.7$ Hz, 2H). ^{13}C NMR (125 MHz, CDCl_3) δ 152.55, 141.04, 139.92, 133.57, 129.90, 129.49, 127.74, 123.26, 121.10, 120.16 (q, $J = 260.82$ Hz).



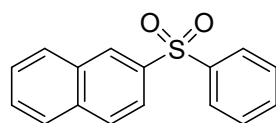
1,4-dimethyl-2-(phenylsulfonyl)benzene (3m)⁸

White solid (41.9 mg, 85%); mp: 117.1-119.3 °C; ^1H NMR (500 MHz, CDCl_3) δ 8.05 (s, 1H), 7.88 – 7.84 (m, 2H), 7.57 (t, $J = 7.4$ Hz, 1H), 7.49 (t, $J = 7.6$ Hz, 2H), 7.29 (d, $J = 7.7$ Hz, 1H), 7.11 (d, $J = 7.7$ Hz, 1H), 2.42 (s, 3H), 2.37 (s, 3H). ^{13}C NMR (125 MHz, CDCl_3) δ 141.41, 138.32, 136.49, 134.82, 134.40, 132.97, 132.64, 129.75, 129.02, 127.59, 20.94, 19.73.



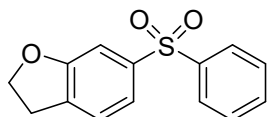
1,2-dimethoxy-4-(phenylsulfonyl)benzene (3n)⁸

White solid (49.9 mg, 89%); mp: 112.3-113.3 °C; ^1H NMR (500 MHz, CDCl_3) δ 7.91 (dd, $J = 7.1, 1.5$ Hz, 2H), 7.58 – 7.45 (m, 4H), 7.37 (d, $J = 2.1$ Hz, 1H), 6.92 (d, $J = 8.5$ Hz, 1H), 3.89 (d, $J = 3.0$ Hz, 6H). ^{13}C NMR (125 MHz, CDCl_3) δ 153.05, 149.26, 142.24, 133.05, 132.94, 129.25, 127.26, 121.94, 110.87, 109.86, 56.28, 56.23.



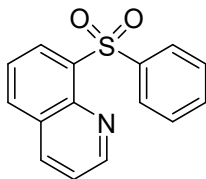
2-(phenylsulfonyl)naphthalene (3o)³

White solid (49.2 mg, 91%); mp: 113.5 – 115.0 °C; ¹H NMR (500 MHz, CDCl₃) δ 8.59 (s, 1H), 8.04 – 7.96 (m, 3H), 7.93 (d, *J* = 8.7 Hz, 1H), 7.90 – 7.83 (m, 2H), 7.66 – 7.58 (m, 2H), 7.56 (t, *J* = 7.3 Hz, 1H), 7.50 (t, *J* = 7.4 Hz, 2H). ¹³C NMR (125 MHz, CDCl₃) δ 141.59, 138.35, 134.99, 133.19, 132.19, 129.66, 129.40, 129.29, 129.16, 129.09, 127.92, 127.70, 127.64, 122.67.



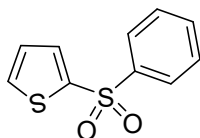
6-(phenylsulfonyl)-2,3-dihydrobenzofuran (3p)

White solid (41.7 mg, 80%), R_f: 0.51 (PE/EtOAc=6/1); mp: 121.1 – 122.0 °C; ¹H NMR (500 MHz, CDCl₃) δ 7.94 – 7.89 (m, 2H), 7.75 (d, *J* = 7.0 Hz, 2H), 7.54 (t, *J* = 7.3 Hz, 1H), 7.49 (t, *J* = 7.4 Hz, 2H), 6.83 (d, *J* = 9.1 Hz, 1H), 4.65 (t, *J* = 8.8 Hz, 2H), 3.24 (t, *J* = 8.8 Hz, 2H). ¹³C NMR (125 MHz, CDCl₃) δ 164.33, 142.51, 133.02, 132.76, 129.47, 129.19, 128.67, 127.24, 124.93, 109.78, 72.37, 28.97. HRMS (ESI) calcd for C₁₄H₁₂O₃S (M + H)⁺ 261.0507, found 261.0576.



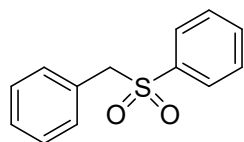
8-(phenylsulfonyl)quinoline (3q)⁴

White solid (34.3 mg, 64%); mp: 117.7 – 119.2 °C; ¹H NMR (500 MHz, CDCl₃) δ 8.96 (d, *J* = 2.6 Hz, 1H), 8.72 (d, *J* = 7.4 Hz, 1H), 8.24 (d, *J* = 7.4 Hz, 2H), 8.17 (d, *J* = 8.3 Hz, 1H), 8.07 (d, *J* = 8.2 Hz, 1H), 7.69 (t, *J* = 7.8 Hz, 1H), 7.52 (t, *J* = 7.3 Hz, 1H), 7.49 – 7.42 (m, 3H). ¹³C NMR (125 MHz, CDCl₃) δ 151.19, 143.71, 141.78, 137.80, 136.33, 134.66, 132.92, 131.82, 129.19, 128.93, 128.31, 125.51, 122.11.



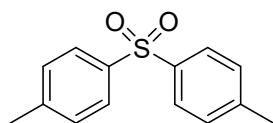
2-(phenylsulfonyl)thiophene (3r)³

White solid (12.5 mg, 28%); mp: 120.5– 122.1 °C; ¹H NMR (500 MHz, CDCl₃) δ 8.03 – 7.98 (m, 2H), 7.70 (dd, *J* = 3.8, 1.3 Hz, 1H), 7.65 (dd, *J* = 5.0, 1.3 Hz, 1H), 7.55 (dt, *J* = 31.8, 7.3 Hz, 3H), 7.09 (dd, *J* = 4.9, 3.8 Hz, 1H). ¹³C NMR (125 MHz, CDCl₃) δ 142.99, 142.02, 133.91, 133.39, 133.32, 129.32, 127.86, 127.31.



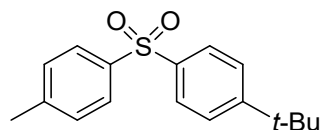
(benzylsulfonyl)benzene (3s)⁹

White solid (20.1 mg, 43%); mp: 142.7 – 143.9 °C; ¹H NMR (500 MHz, CDCl₃) δ 7.65 – 7.58 (m, 3H), 7.48 – 7.42 (m, 2H), 7.32 (t, *J* = 7.4 Hz, 1H), 7.28 – 7.23 (m, 2H), 7.08 (d, *J* = 7.2 Hz, 2H), 4.31 (s, 2H). ¹³C NMR (125 MHz, CDCl₃) δ 137.79, 133.76, 130.84, 128.92, 128.80, 128.65, 128.61, 128.10, 62.89.



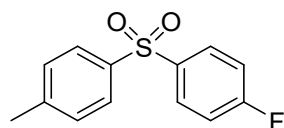
4,4'-sulfonylbis(methylbenzene) (4a)¹⁰

White solid (35.2 mg, 72%); mp: 145.5 - 145.8 °C; ¹H NMR (500 MHz, CDCl₃) δ 7.81 (d, *J* = 8.3 Hz, 4H), 7.28 (d, *J* = 8.1 Hz, 4H), 2.39 (s, 6H). ¹³C NMR (125 MHz, CDCl₃) δ 143.96, 139.02, 129.88, 127.57, 21.58.



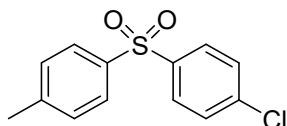
1-(tert-butyl)-4-tosylbenzene (4b)¹¹

White solid (55.3 mg, 96%); mp: 142.2-143.1 °C ¹H NMR (500 MHz, CDCl₃) δ 7.84 (dd, *J* = 8.4, 5.2 Hz, 4H), 7.49 (d, *J* = 8.6 Hz, 2H), 7.29 (d, *J* = 8.2 Hz, 2H), 2.39 (s, 3H), 1.30 (s, 9H). ¹³C NMR (125 MHz, CDCl₃) δ 156.86, 143.96, 138.98, 138.90, 129.88, 127.67, 127.37, 126.28, 35.17, 31.06, 21.59.



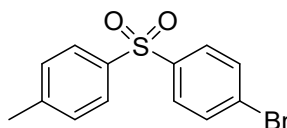
1-fluoro-4-tosylbenzene (4c)¹⁰

White solid (30.7 mg, 76%); mp: 106.1-107.2 °C; ¹H NMR (500 MHz, CDCl₃) δ 7.95 (dd, *J* = 8.9, 5.1 Hz, 2H), 7.81 (d, *J* = 8.3 Hz, 2H), 7.31 (d, *J* = 8.4 Hz, 2H), 7.16 (t, *J* = 8.6 Hz, 2H), 2.40 (s, 3H). ¹³C NMR (125 MHz, CDCl₃) δ 166.35, 164.31, 144.39, 138.49, 138.07(d, *J* = 2.52 Hz), 130.32(d, *J* = 10.08 Hz), 130.04, 127.64, 116.54(d, *J* = 22.68 Hz), 21.61.



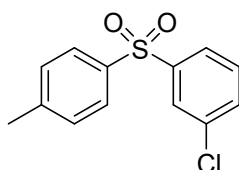
1-chloro-4-tosylbenzene (4d)¹⁰

White solid (39.3 mg, 67%); mp: 130.5-131.6 °C; ¹H NMR (500 MHz, CDCl₃) δ 7.86 (d, *J* = 8.7 Hz, 2H), 7.81 (d, *J* = 8.3 Hz, 2H), 7.46 (d, *J* = 8.7 Hz, 2H), 7.31 (d, *J* = 8.0 Hz, 2H), 2.40 (s, 3H). ¹³C NMR (125 MHz, CDCl₃) δ 144.55, 140.52, 139.68, 138.22, 130.08, 129.58, 128.99, 127.72, 21.63.



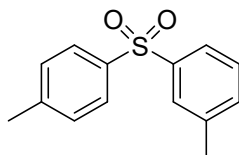
1-bromo-4-tosylbenzene (4e)¹⁰

White solid (47.5 mg, 76%); mp: 133.7-134.2 °C; ¹H NMR (500 MHz, CDCl₃) δ 7.80 (dd, *J* = 10.9, 8.5 Hz, 4H), 7.63 (d, *J* = 8.5 Hz, 2H), 7.31 (d, *J* = 8.2 Hz, 2H), 2.40 (s, 3H). ¹³C NMR (125 MHz, CDCl₃) δ 144.57, 141.06, 138.16, 132.56, 130.09, 129.07, 128.25, 127.73, 21.64.



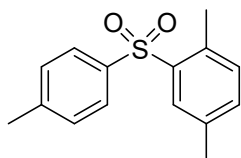
1-chloro-3-tosylbenzene (4f)¹⁰

White solid (41.6 mg, 79%); mp: 128.3-129.4 °C; ¹H NMR (500 MHz, CDCl₃) δ 7.91 (s, 1H), 7.82 (t, *J* = 8.0 Hz, 3H), 7.51 (d, *J* = 8.0 Hz, 1H), 7.43 (t, *J* = 7.9 Hz, 1H), 7.32 (d, *J* = 8.3 Hz, 2H), 2.41 (s, 3H). ¹³C NMR (125 MHz, CDCl₃) δ 144.75, 143.75, 137.89, 135.41, 133.19, 130.60, 130.14, 127.88, 127.56, 125.64, 21.65.



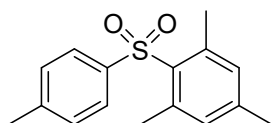
1-methyl-3-tosylbenzene (4g)¹⁰

White solid (42 mg, 85%); mp: 114.2-115.7 °C; ¹H NMR (500 MHz, CDCl₃) δ 7.83 (d, *J* = 8.3 Hz, 2H), 7.73 (d, *J* = 6.5 Hz, 2H), 7.40 – 7.32 (m, 2H), 7.29 (d, *J* = 8.1 Hz, 2H), 2.39 (s, 6H). ¹³C NMR (125 MHz, CDCl₃) δ 144.10, 141.76, 139.50, 138.76, 133.86, 129.91, 129.11, 127.80, 127.69, 124.68, 21.60, 21.37.



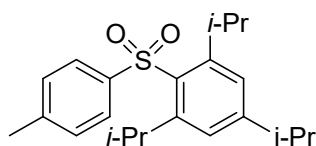
1,4-dimethyl-2-tosylbenzene (4h)⁵

White solid (51.6 mg, 97%); mp: 104.9-106.7 °C; ¹H NMR (500 MHz, CDCl₃) δ 8.03 (s, 1H), 7.74 (d, *J* = 8.3 Hz, 2H), 7.30 – 7.26 (m, 3H), 7.09 (d, *J* = 7.7 Hz, 1H), 2.41 (s, 3H), 2.40 (s, 3H), 2.37 (s, 3H). ¹³C NMR (125 MHz, CDCl₃) δ 143.87, 138.68, 138.45, 136.40, 134.69, 134.22, 132.58, 129.63, 129.60, 127.68, 21.60, 20.93, 19.73.



1,3,5-trimethyl-2-tosylbenzene (4i)¹⁰

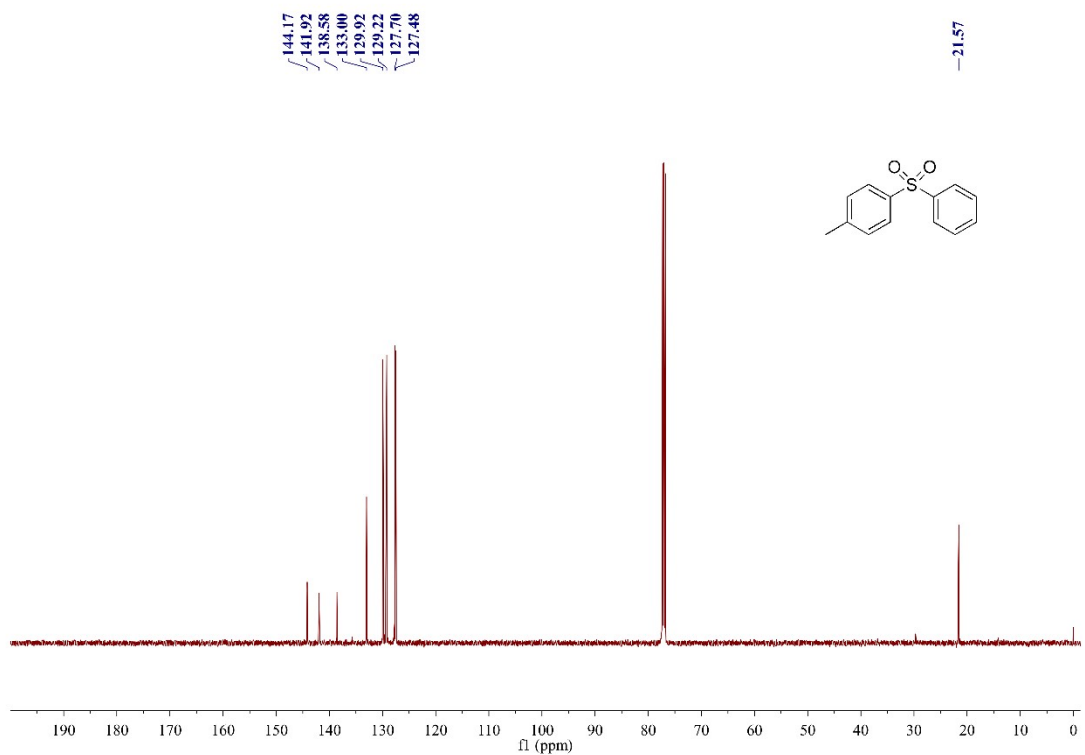
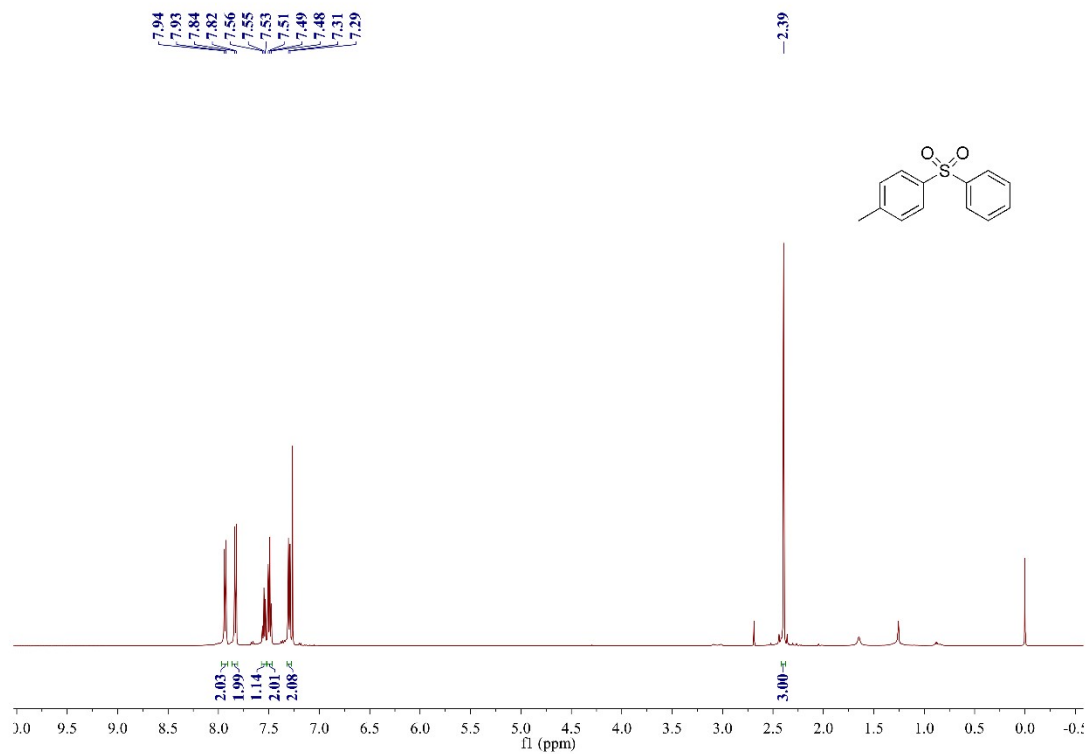
White solid (39.6 mg, 72%); mp: 118.3 - 118.8 °C; ¹H NMR (500 MHz, CDCl₃) δ 7.67 (d, *J* = 8.3 Hz, 2H), 7.25 (s, 1H), 6.93 (s, 2H), 2.59 (s, 6H), 2.39 (s, 3H), 2.29 (s, 3H). ¹³C NMR (125 MHz, CDCl₃) δ 143.40, 143.21, 140.61, 139.97, 134.13, 132.19, 129.49, 126.33, 22.87, 21.57, 21.04.

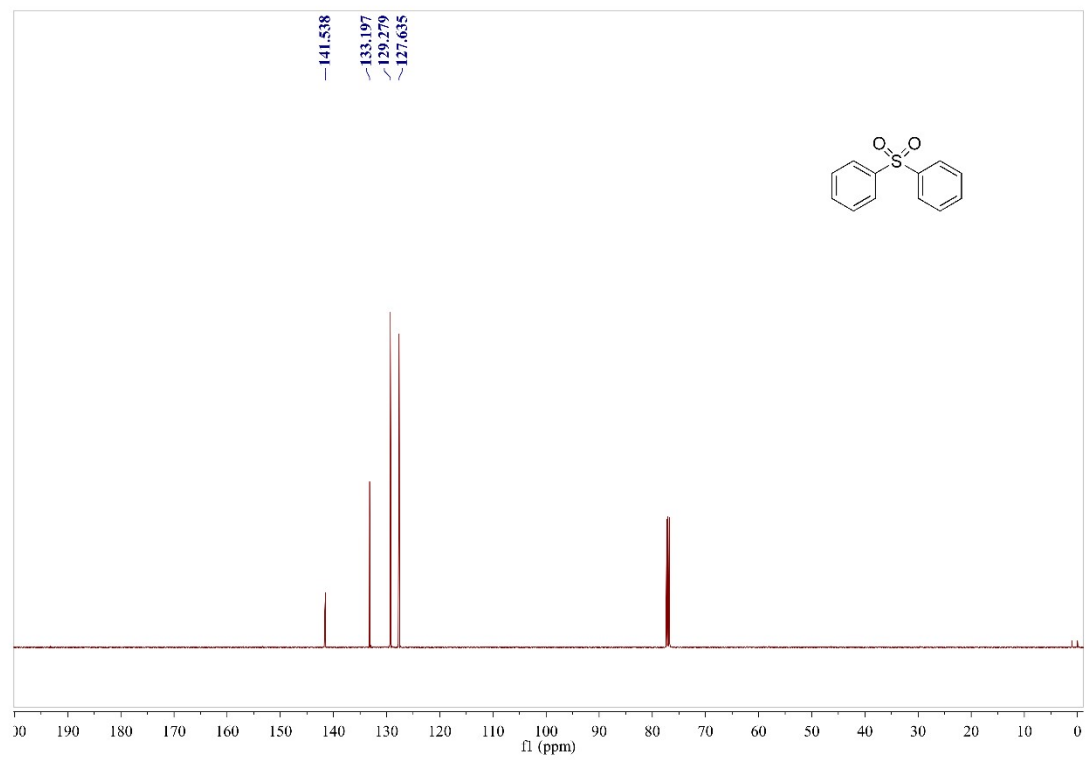
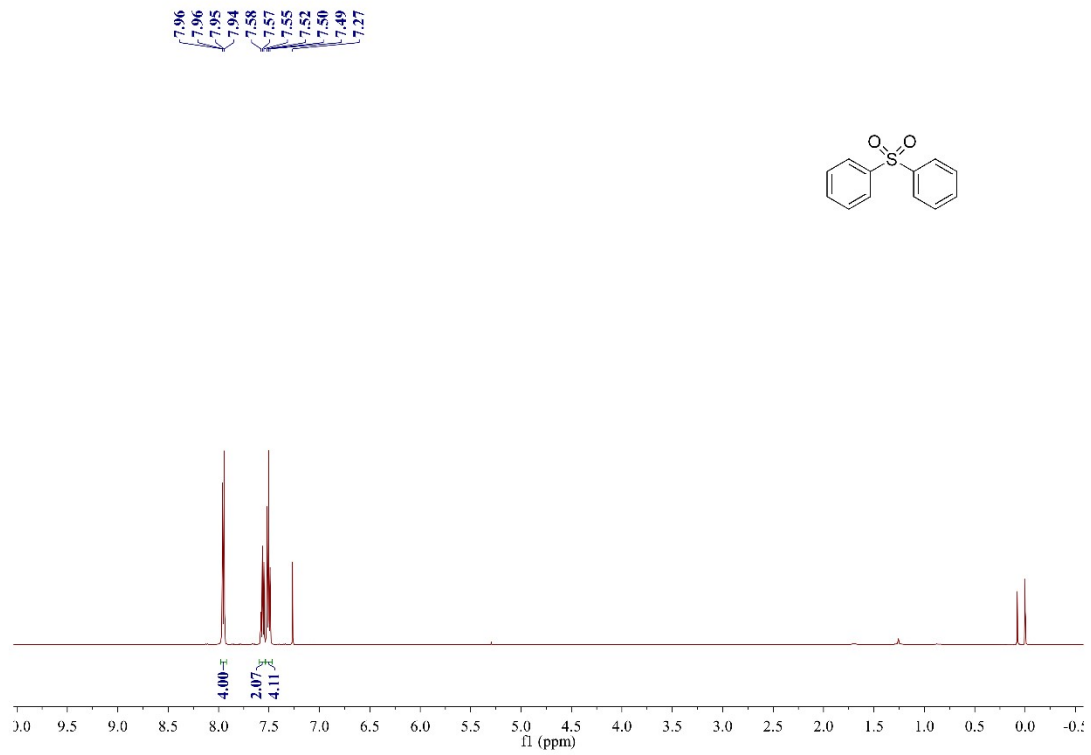


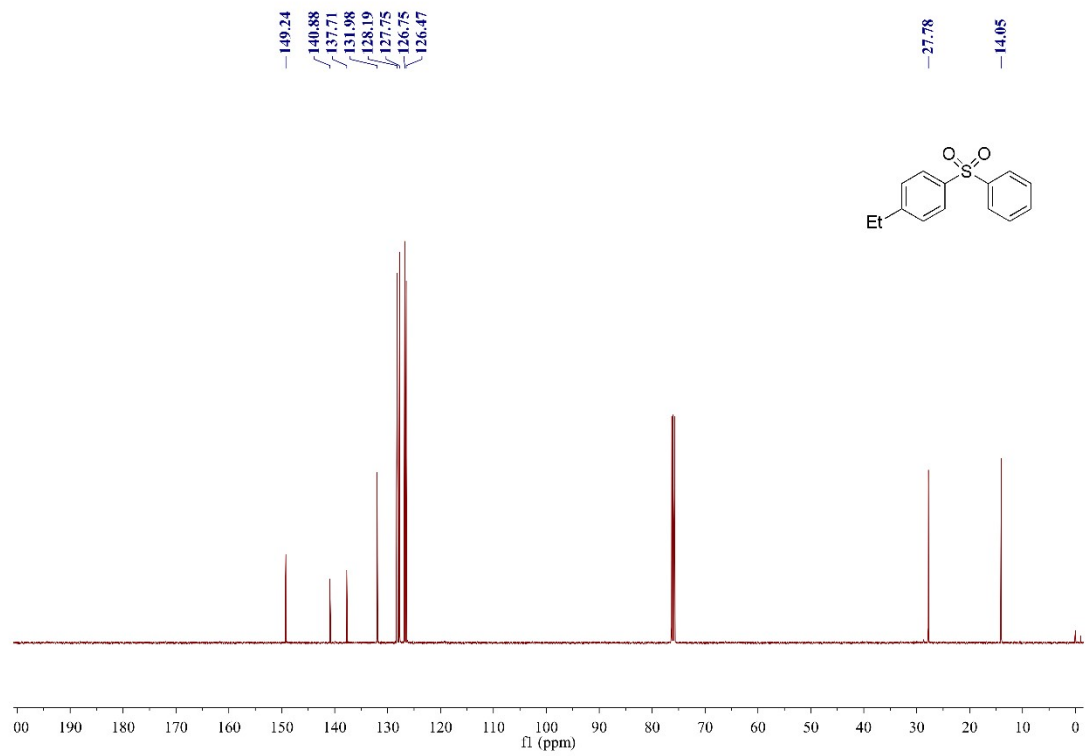
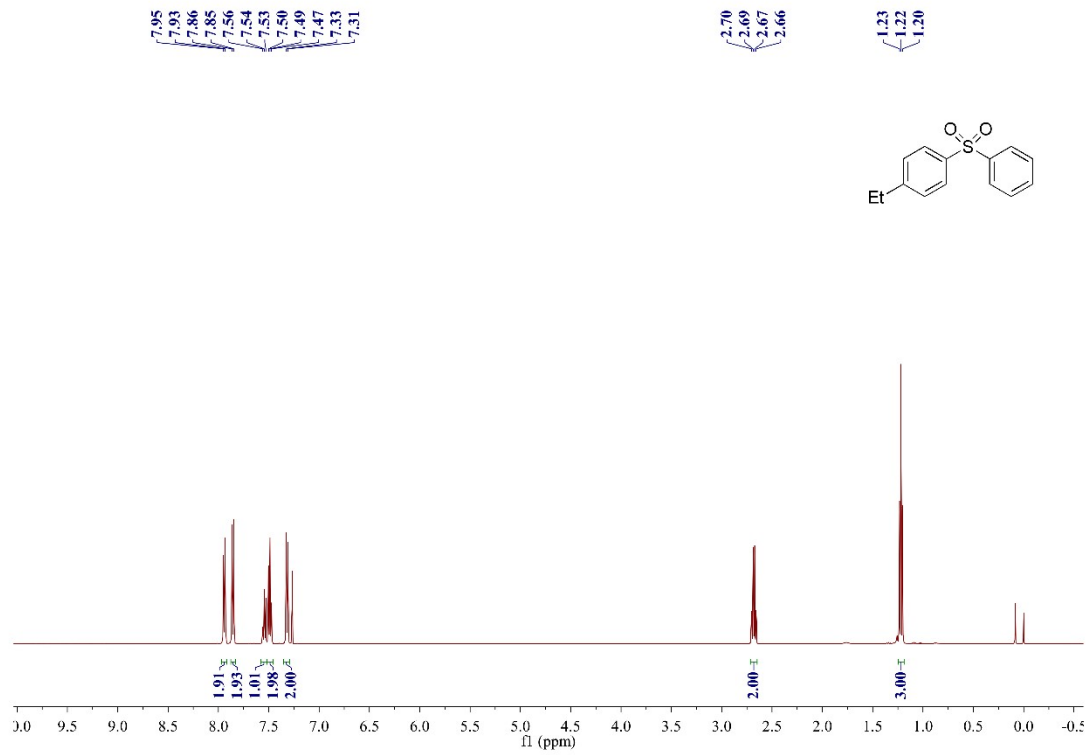
1,3,5-triisopropyl-2-tosylbenzene (4j)

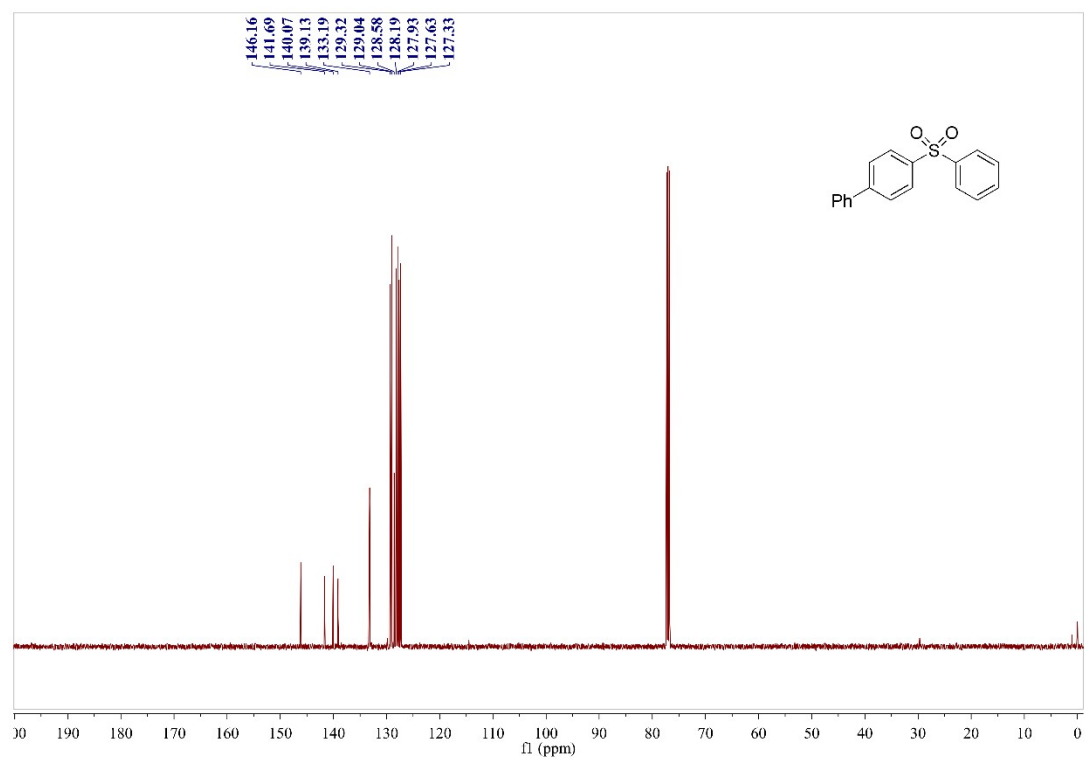
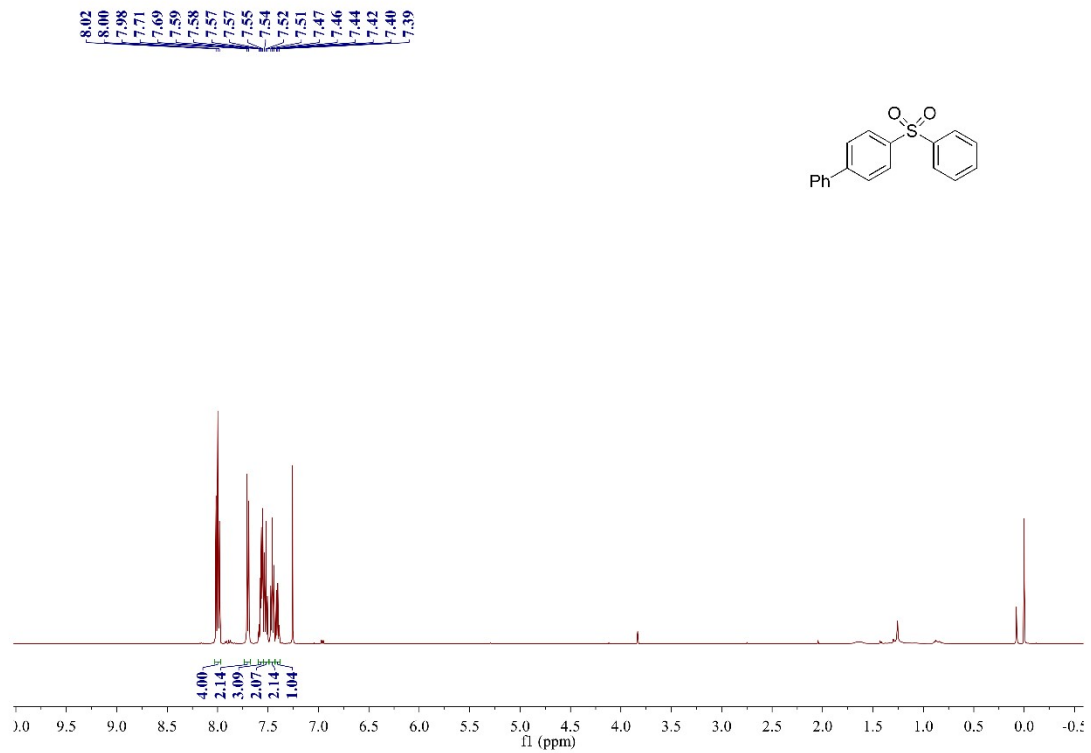
Colourless liquid (34.6 mg, 48%), *R*_f: 0.53(PE/EtOAc=9/1); ¹H NMR (500 MHz, CDCl₃) δ 7.64 (d, *J* = 8.3 Hz, 2H), 7.27 (d, *J* = 8.1 Hz, 2H), 7.16 (s, 2H), 4.19 (hept, *J* = 6.7 Hz, 2H), 2.90 (hept, *J* = 6.9 Hz, 1H), 2.39 (s, 3H), 1.25 (d, *J* = 6.9 Hz, 6H), 1.13 (d, *J* = 6.8 Hz, 12H). ¹³C NMR (125 MHz, CDCl₃) δ 153.68, 151.21, 142.95, 142.38, 132.58, 129.53, 125.69, 124.00, 34.22, 29.40, 24.66, 23.60, 21.55. HRMS (ESI) calcd for C₂₂H₃₀O₂S (M + H)⁺ 358.1967, found 359.2042.

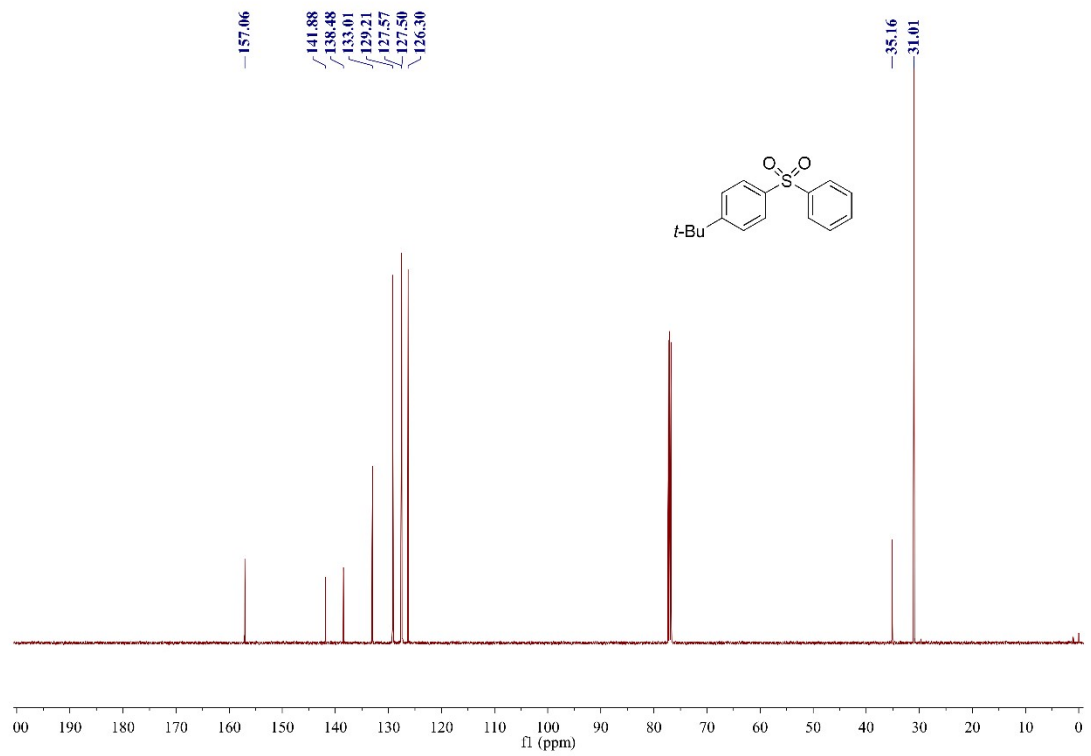
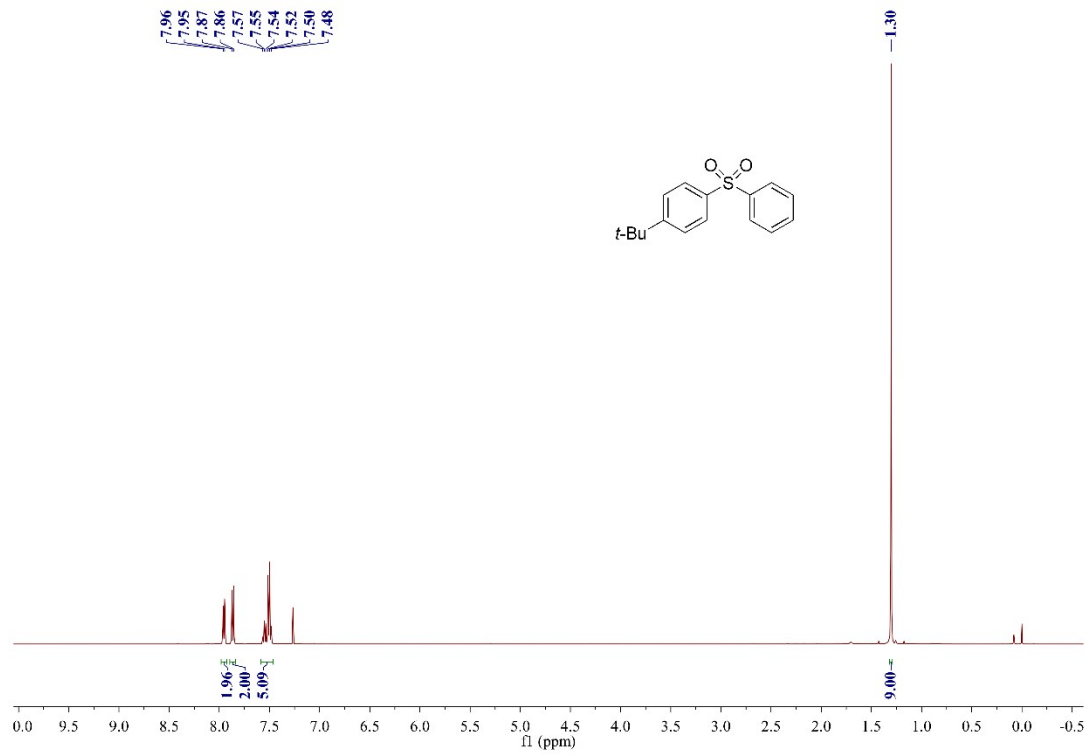
5. ^1H NMR and ^{13}C NMR spectra for compounds



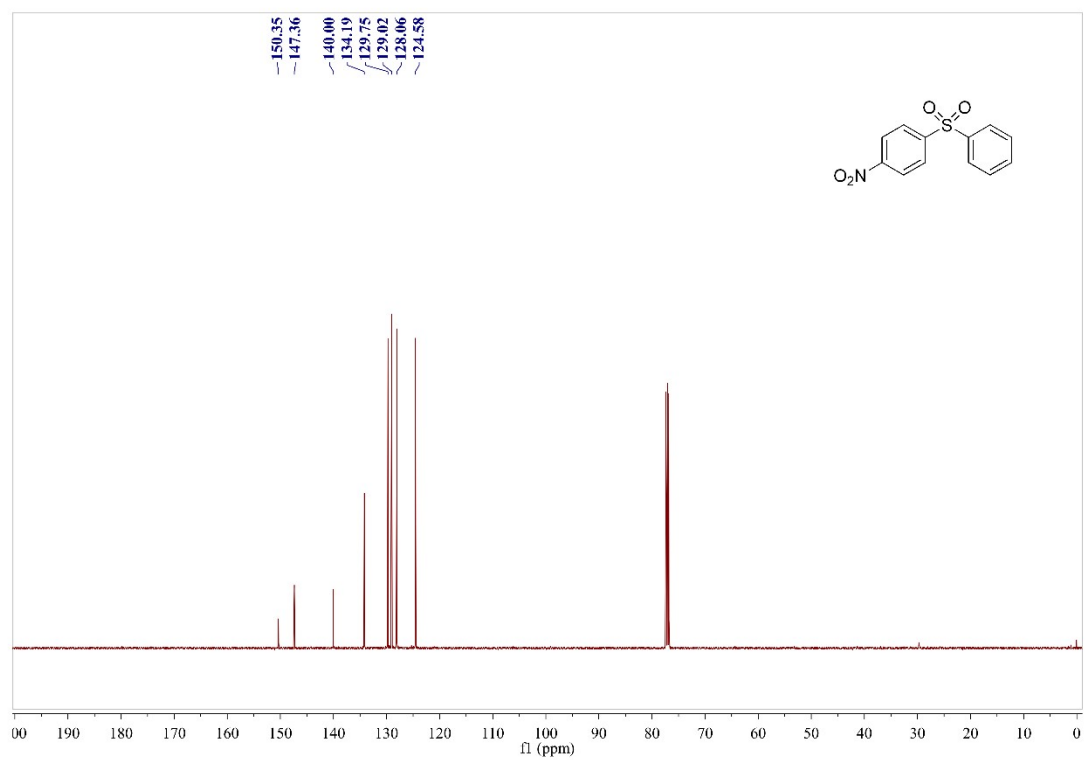
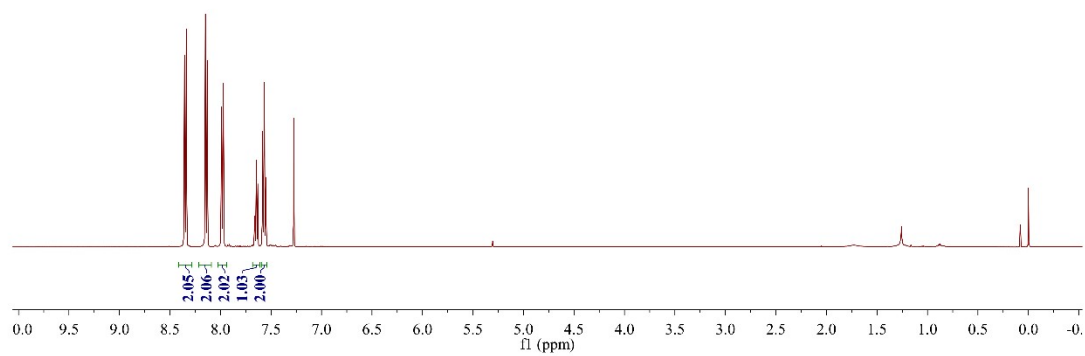
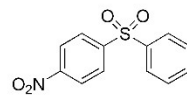


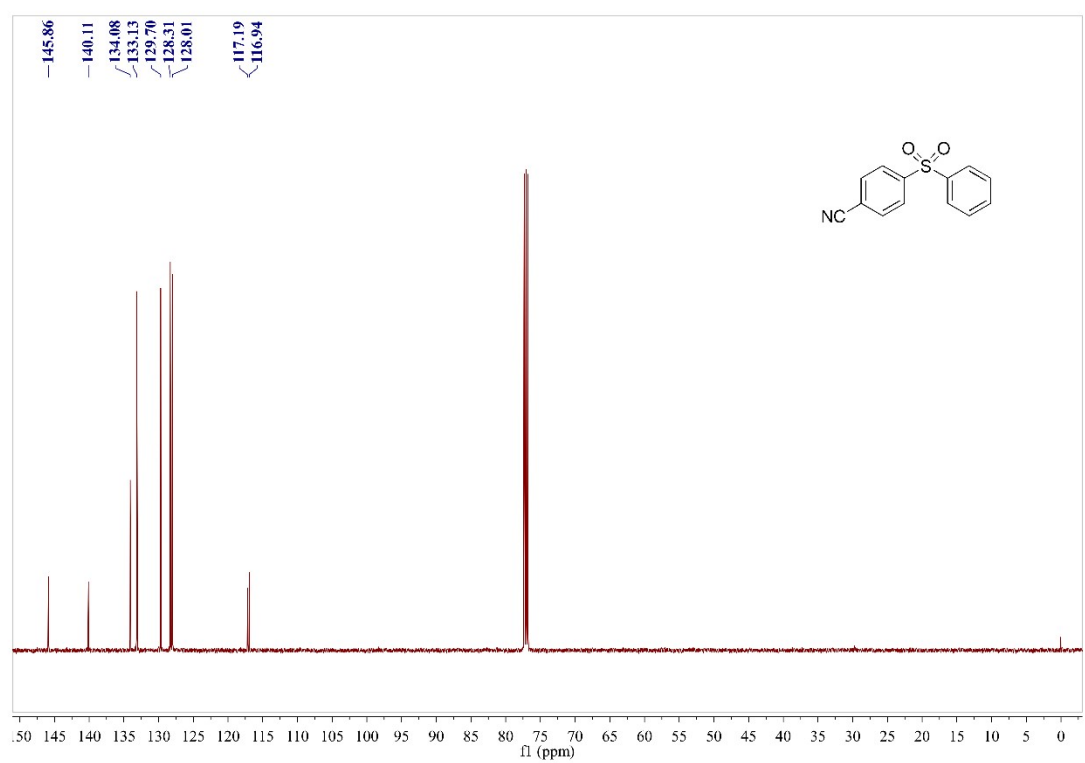
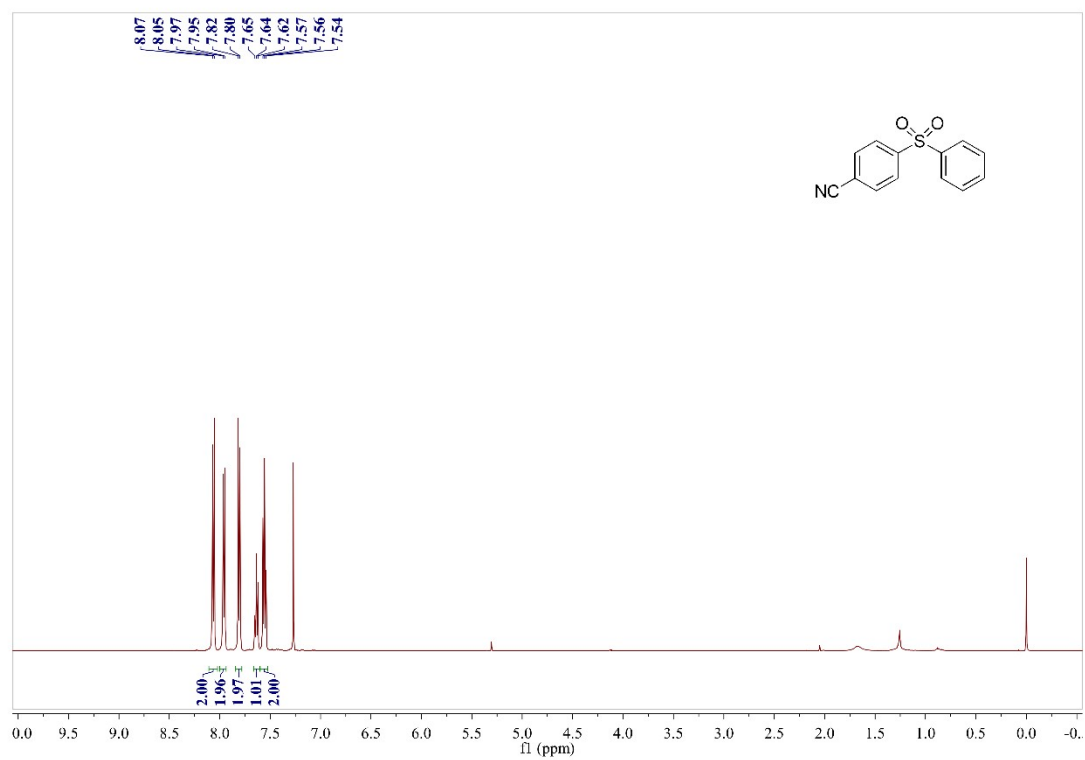


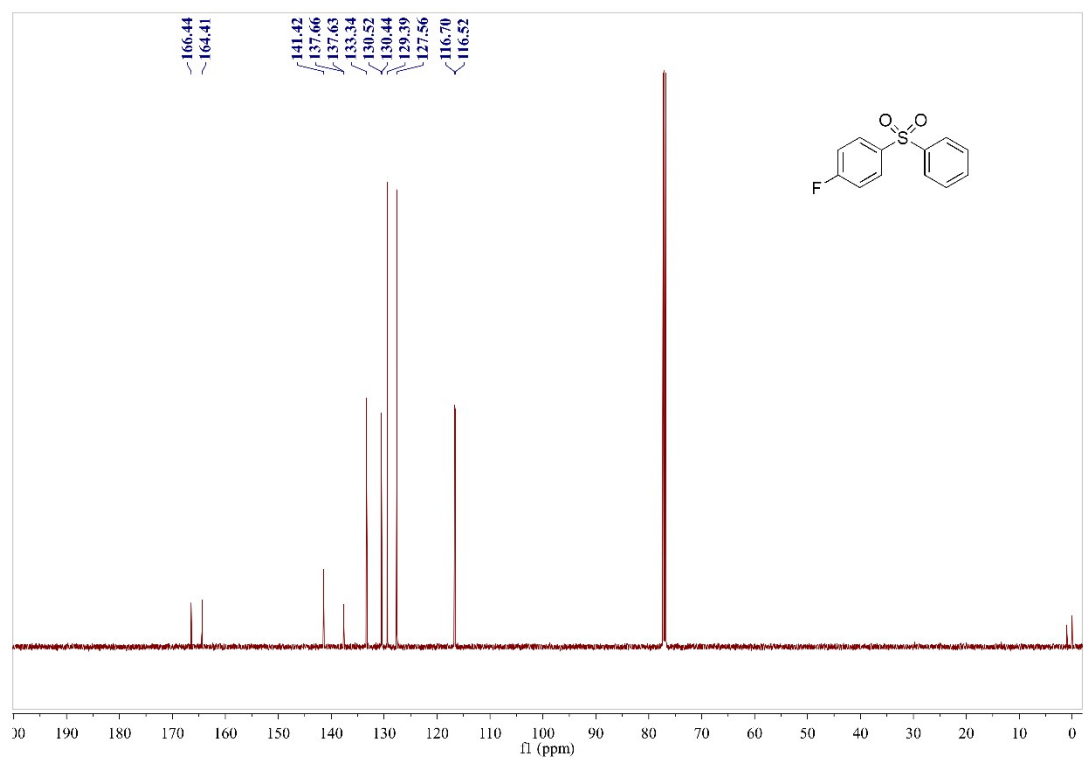
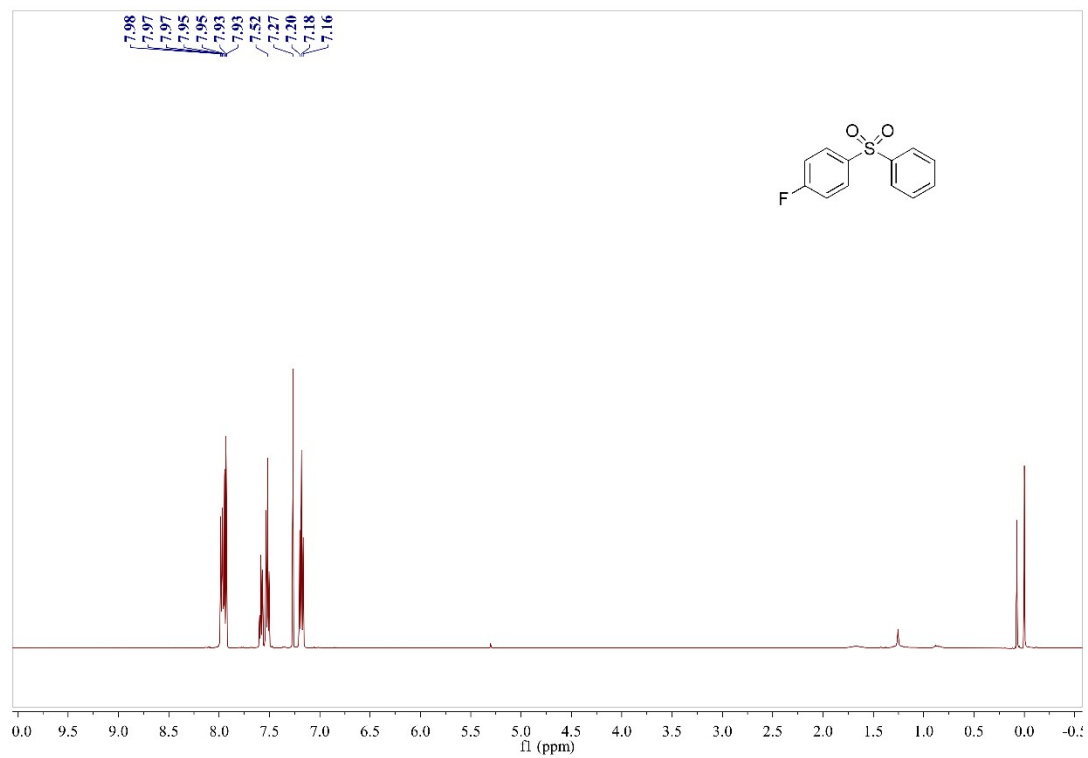


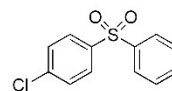
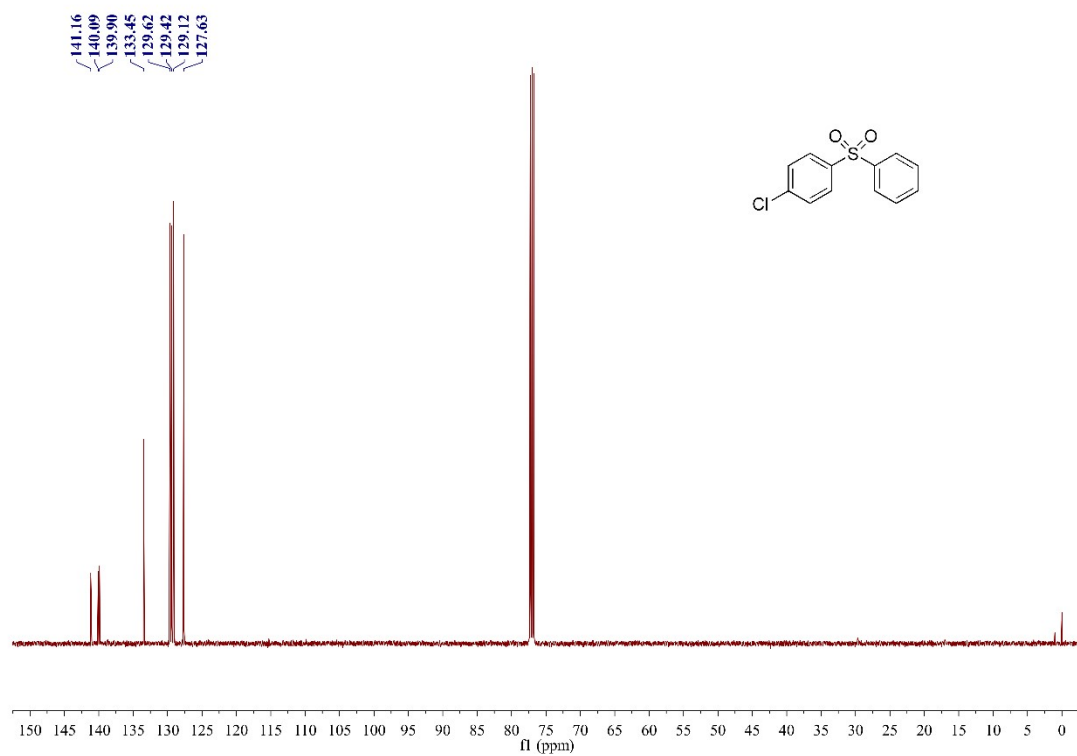
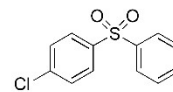
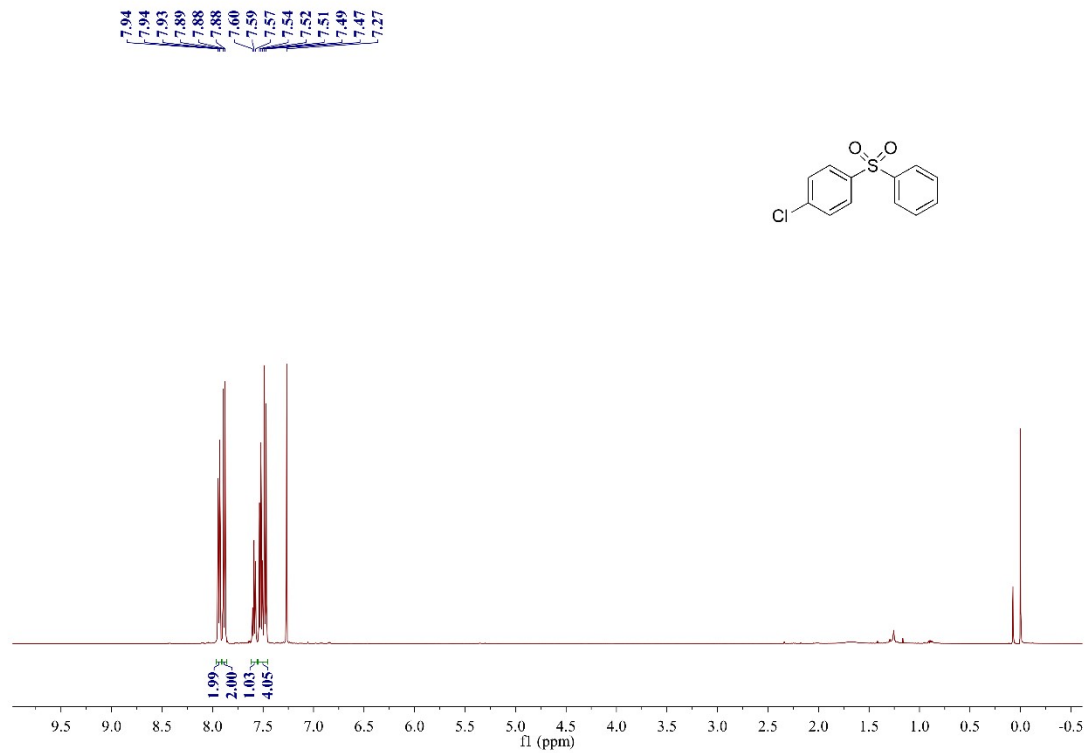


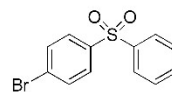
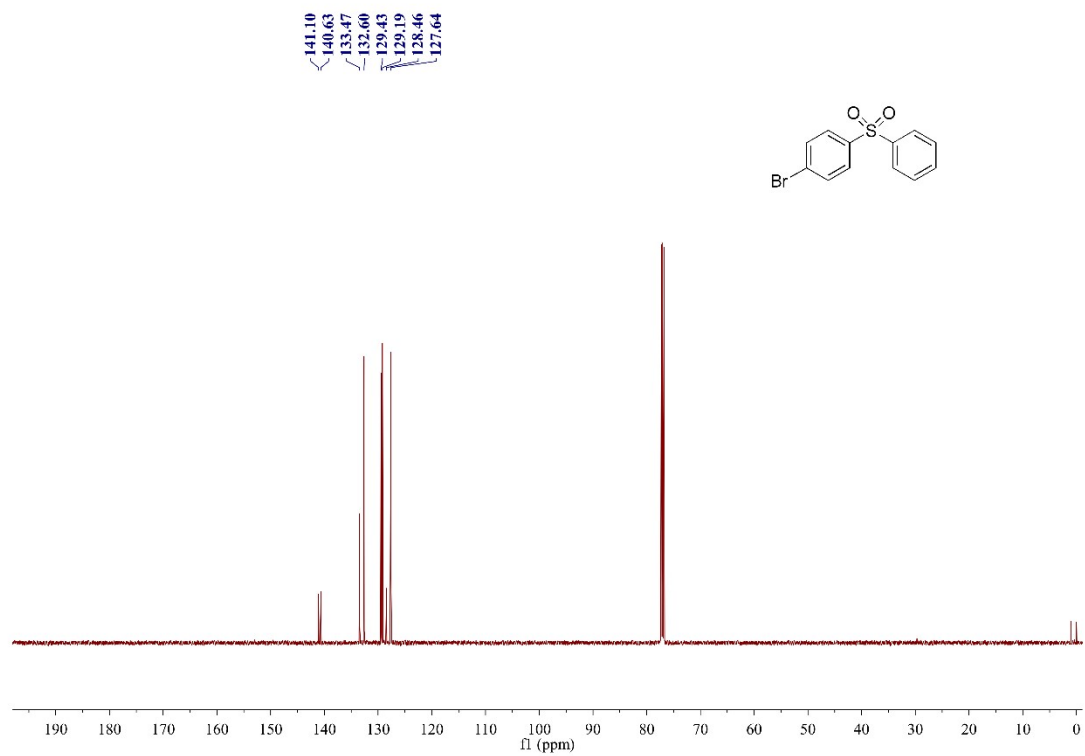
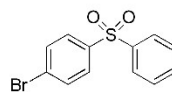
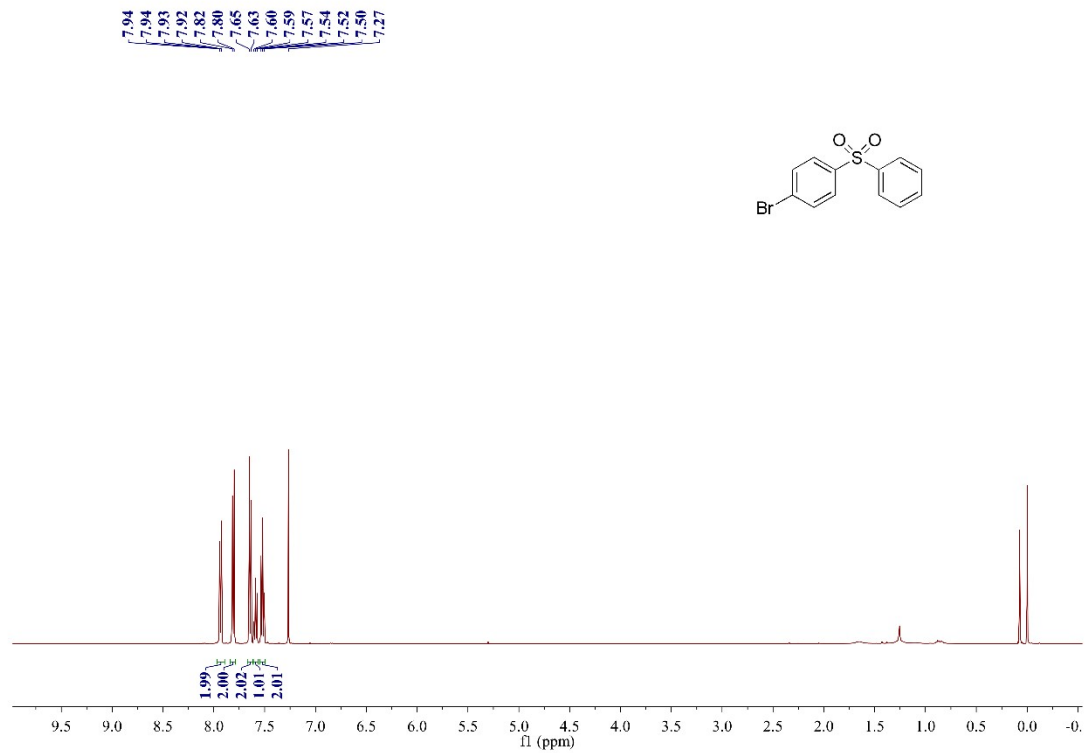
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8.13
7.99
7.97
7.66
7.63
7.58
7.57



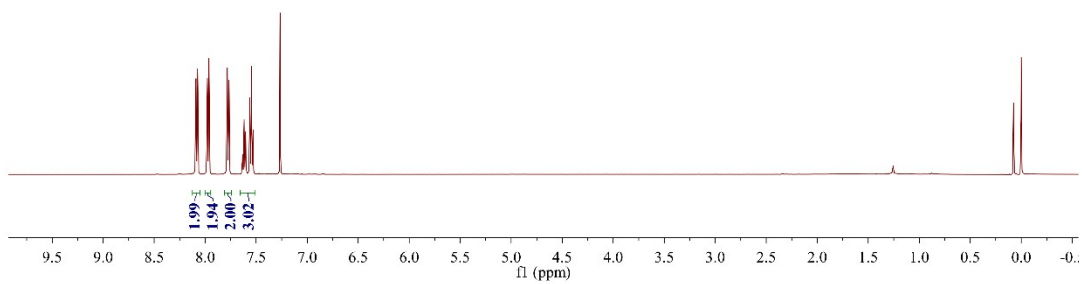
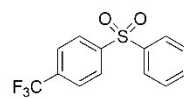




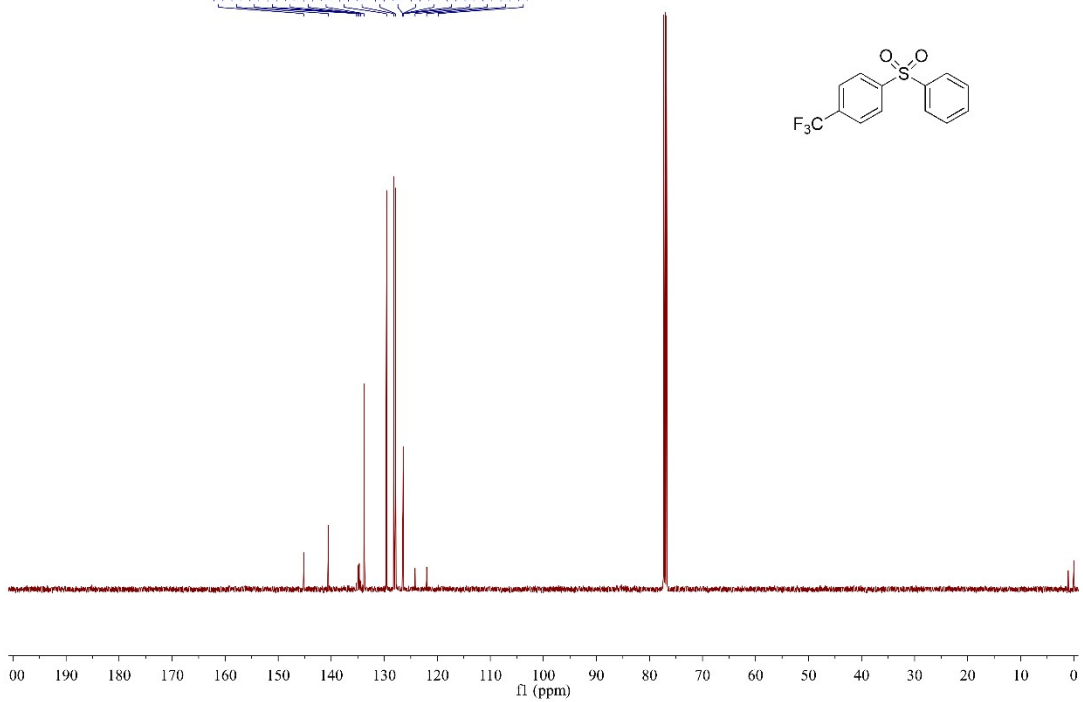
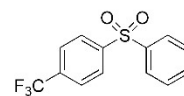


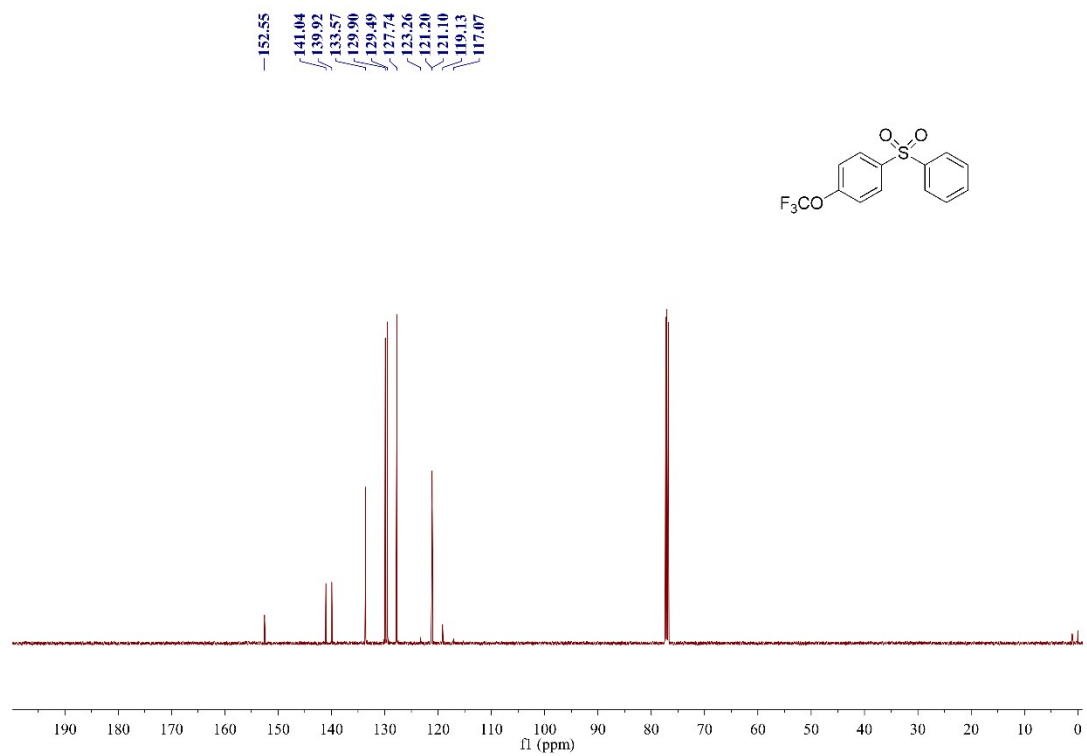
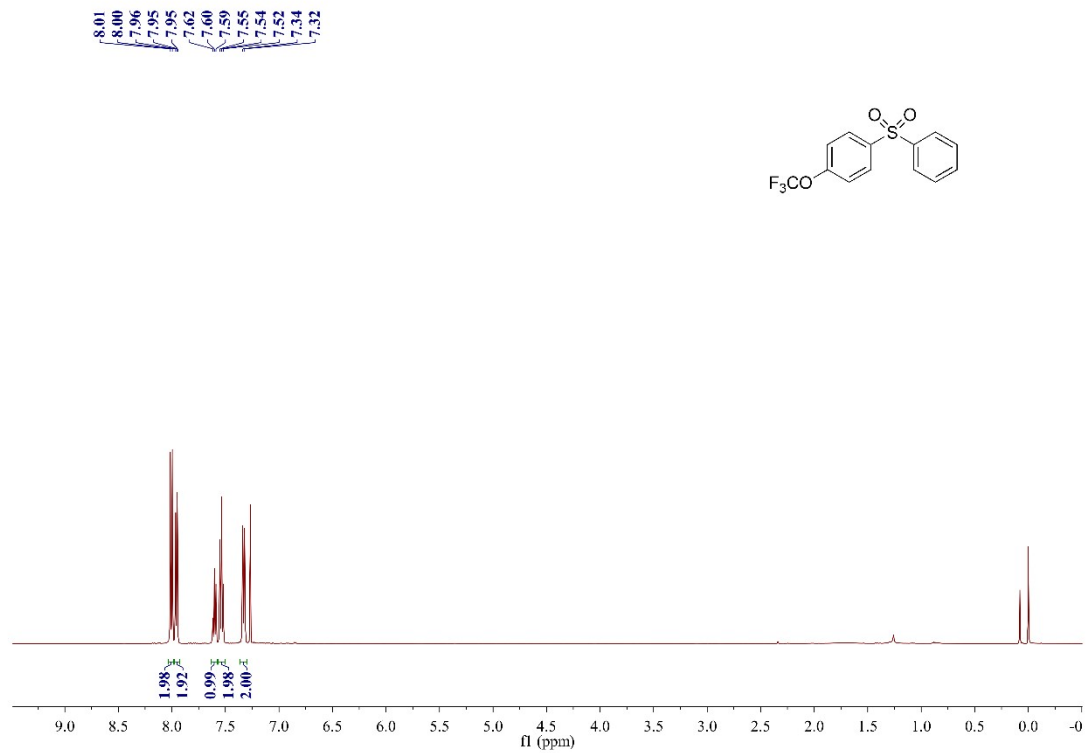


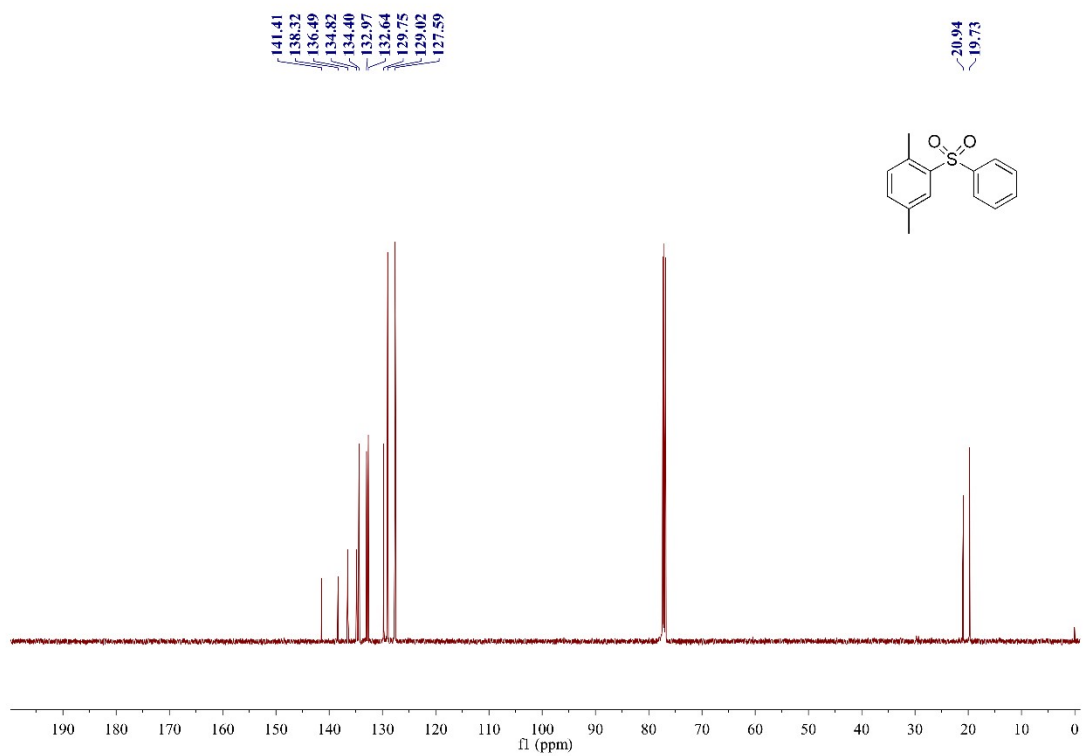
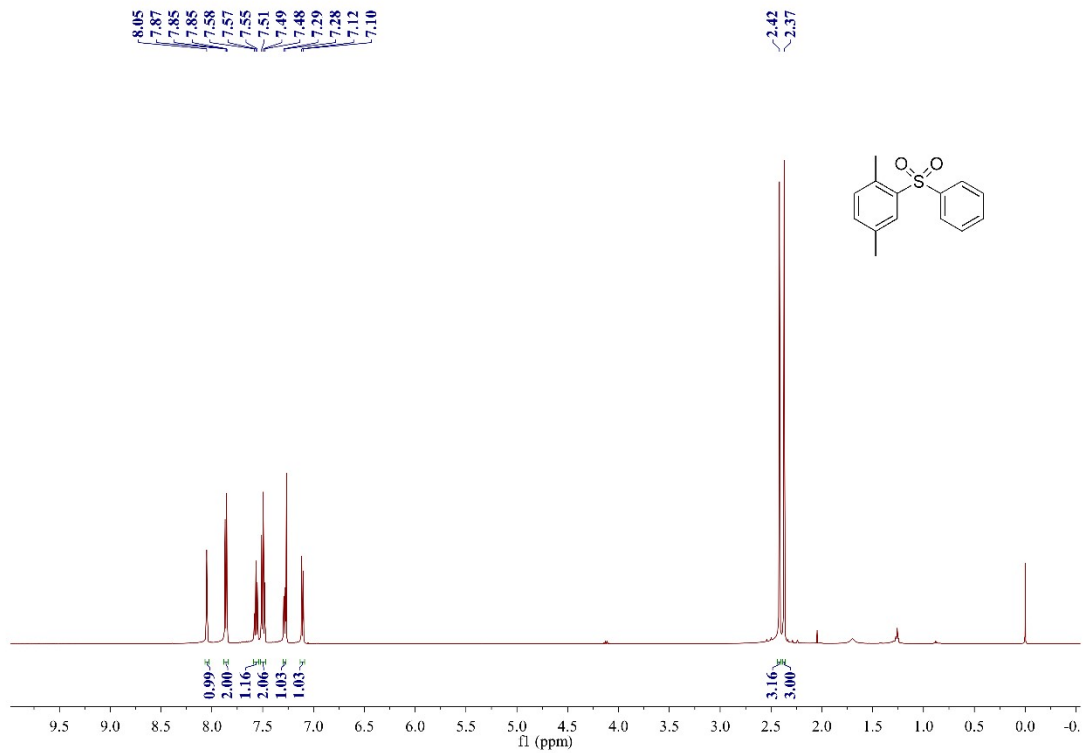
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7.63
7.62
7.60
7.56
7.55
7.53

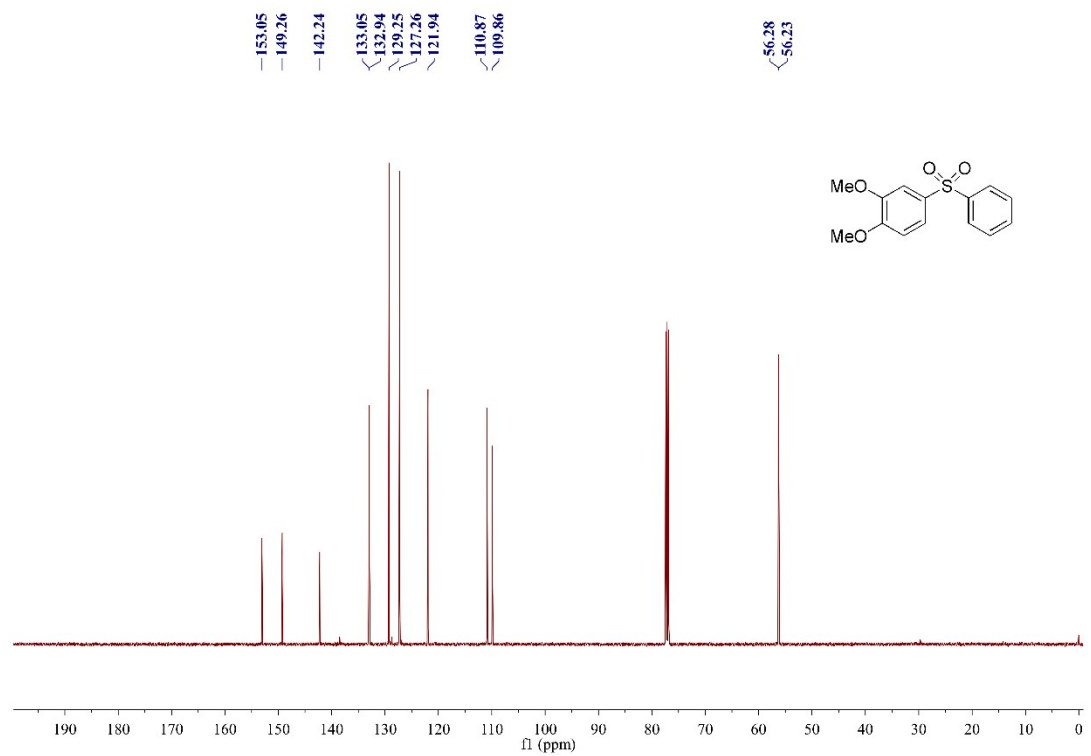
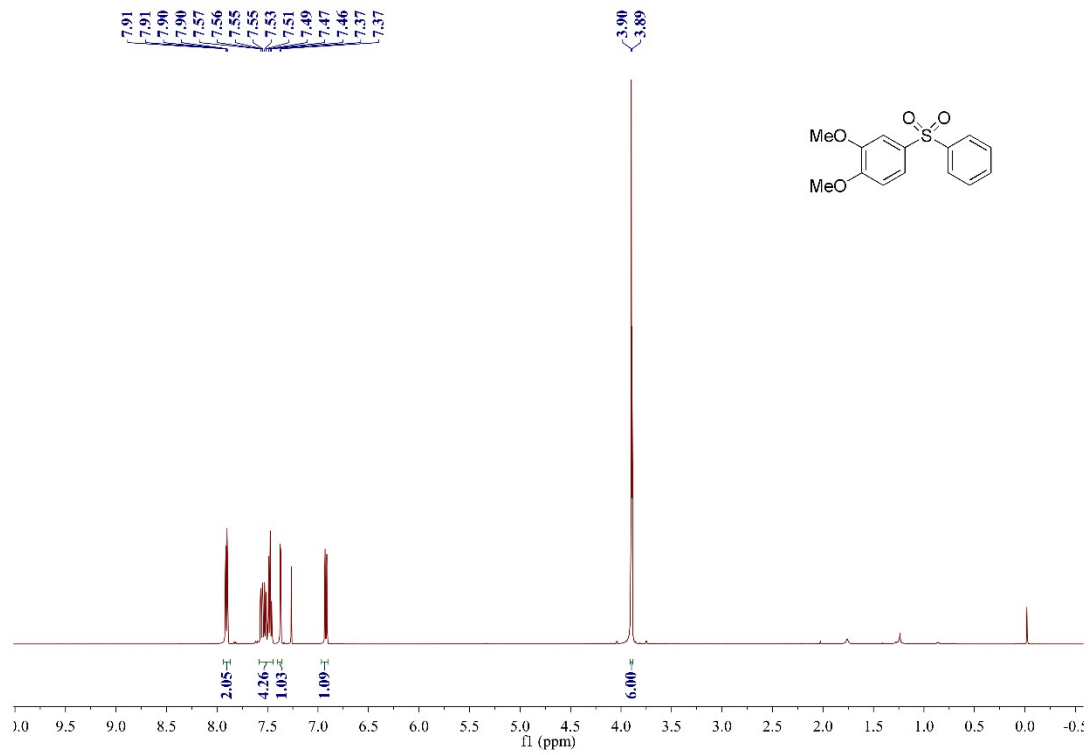


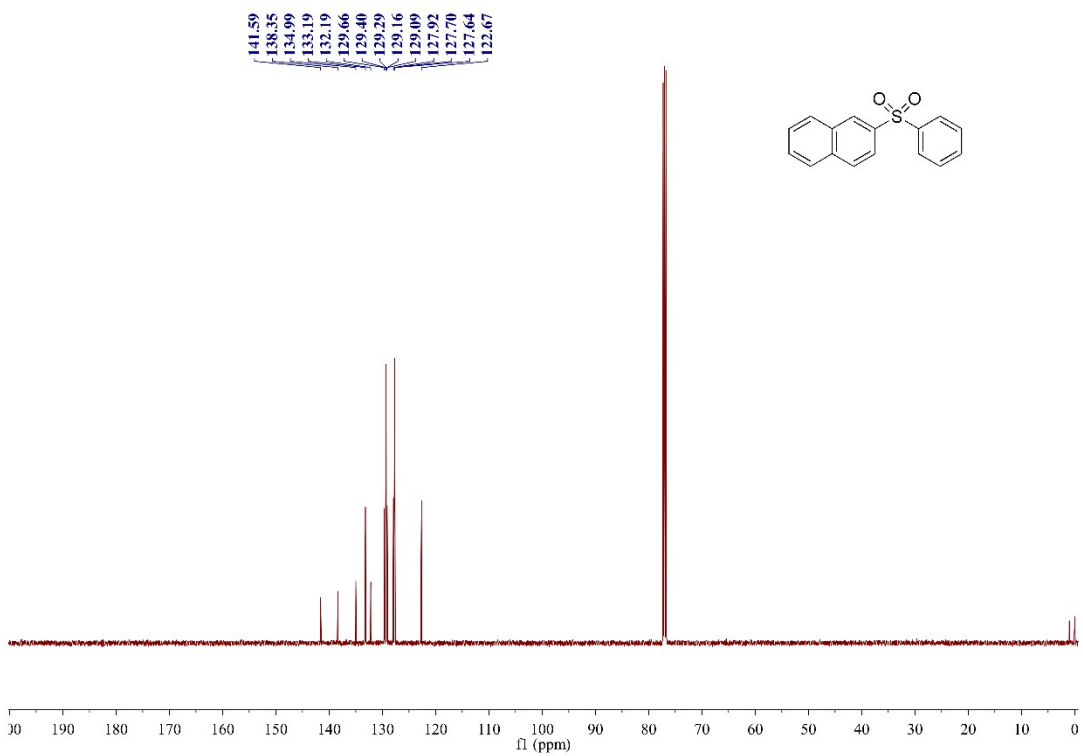
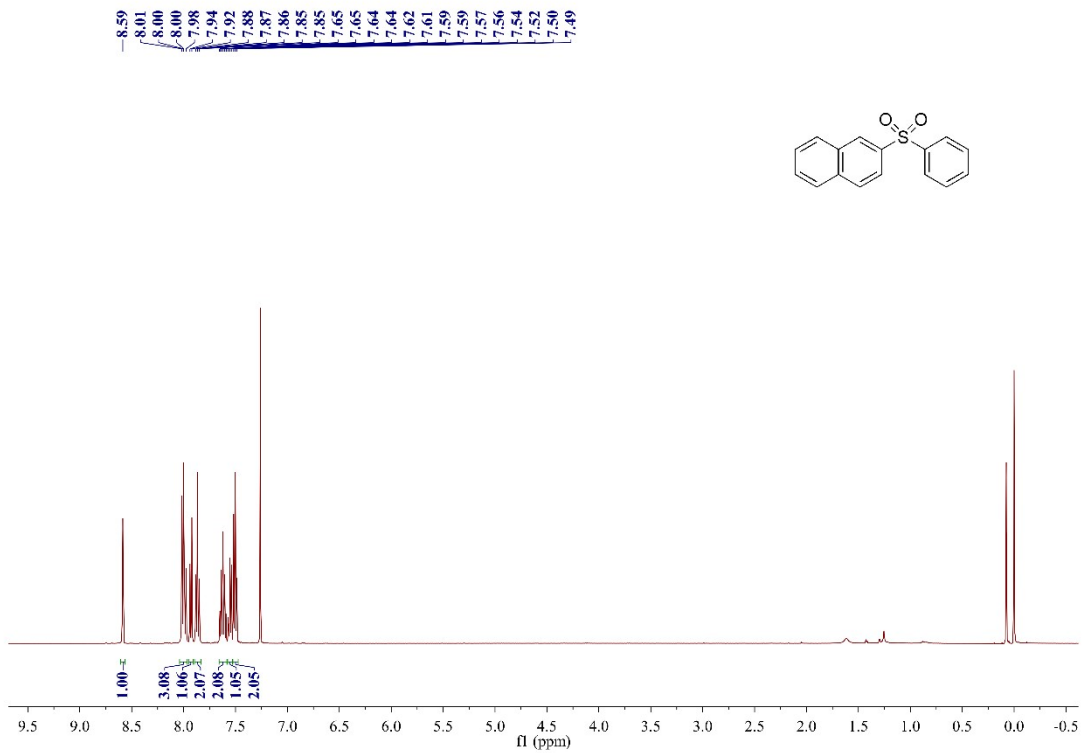
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140.54
135.23
134.97
134.71
134.44
133.81
129.56
128.21
127.90
126.51
126.48
126.45
126.42
126.35
124.18
122.01
119.84

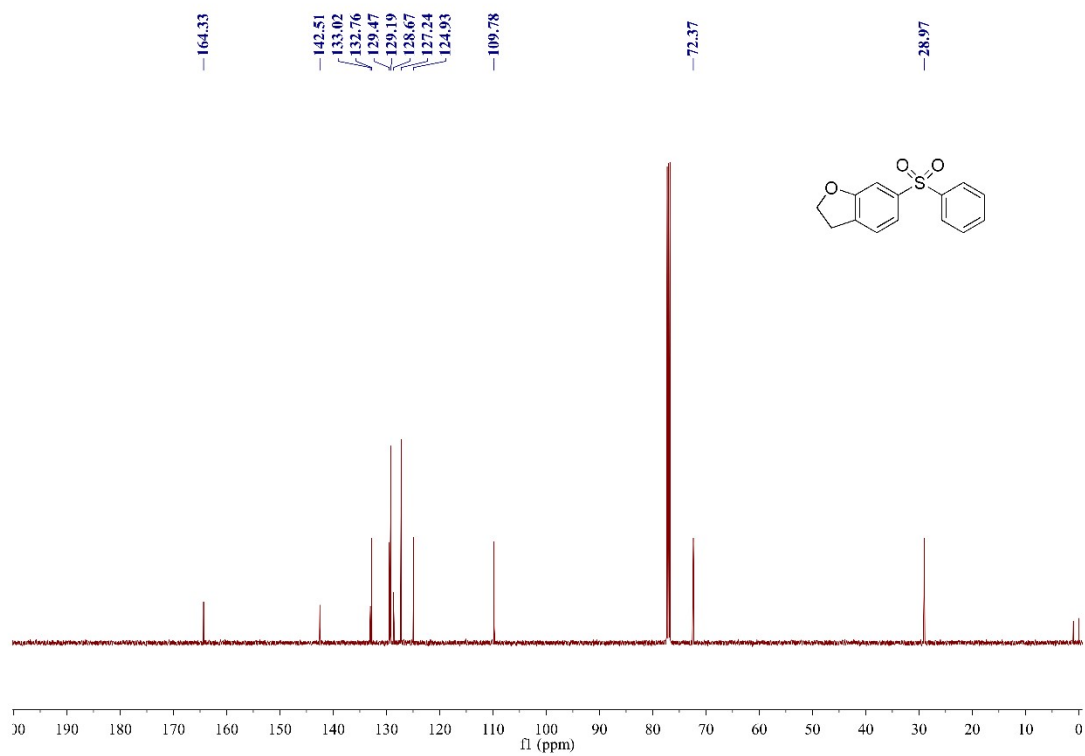
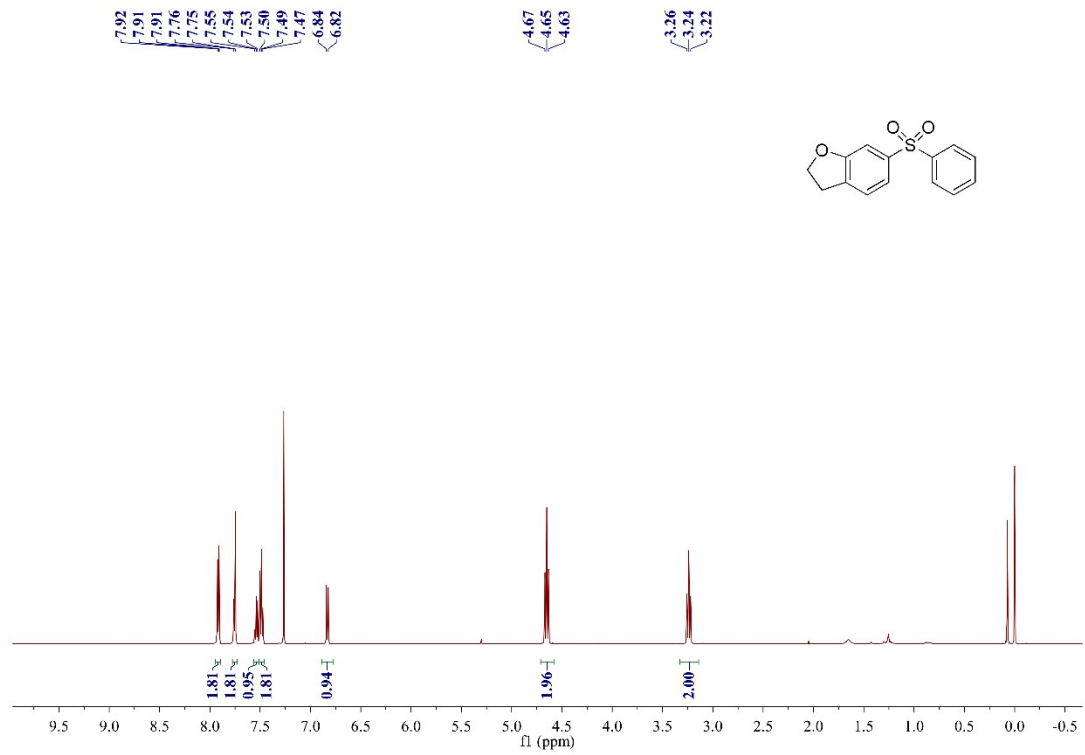


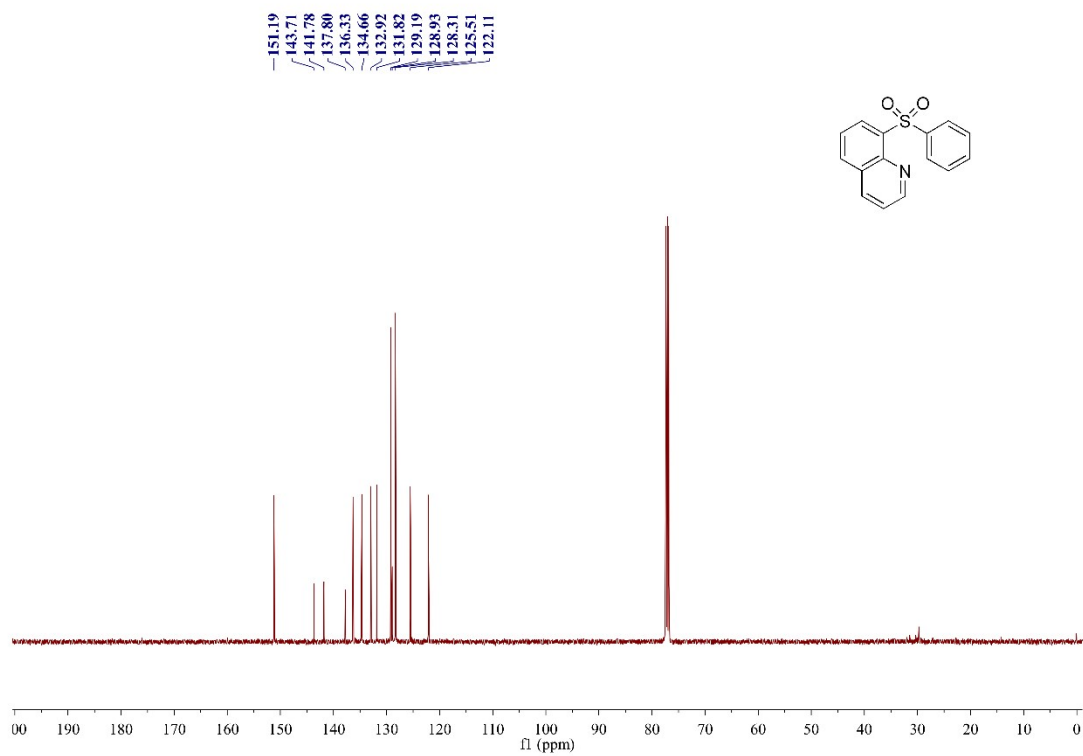
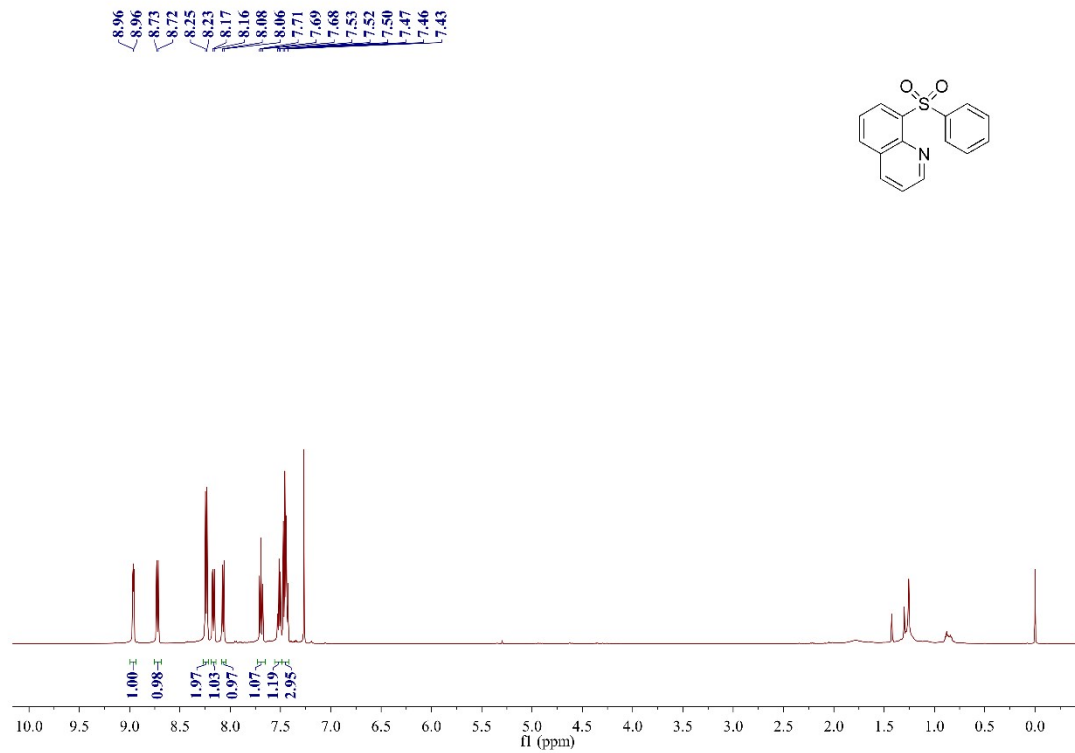


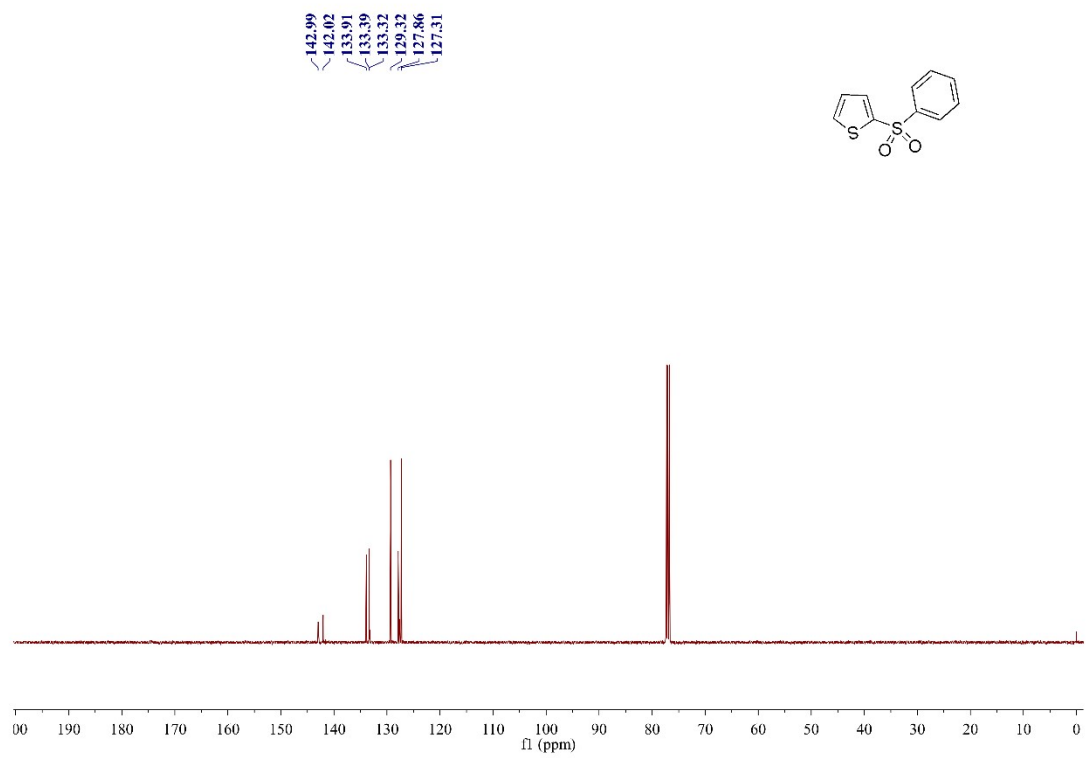
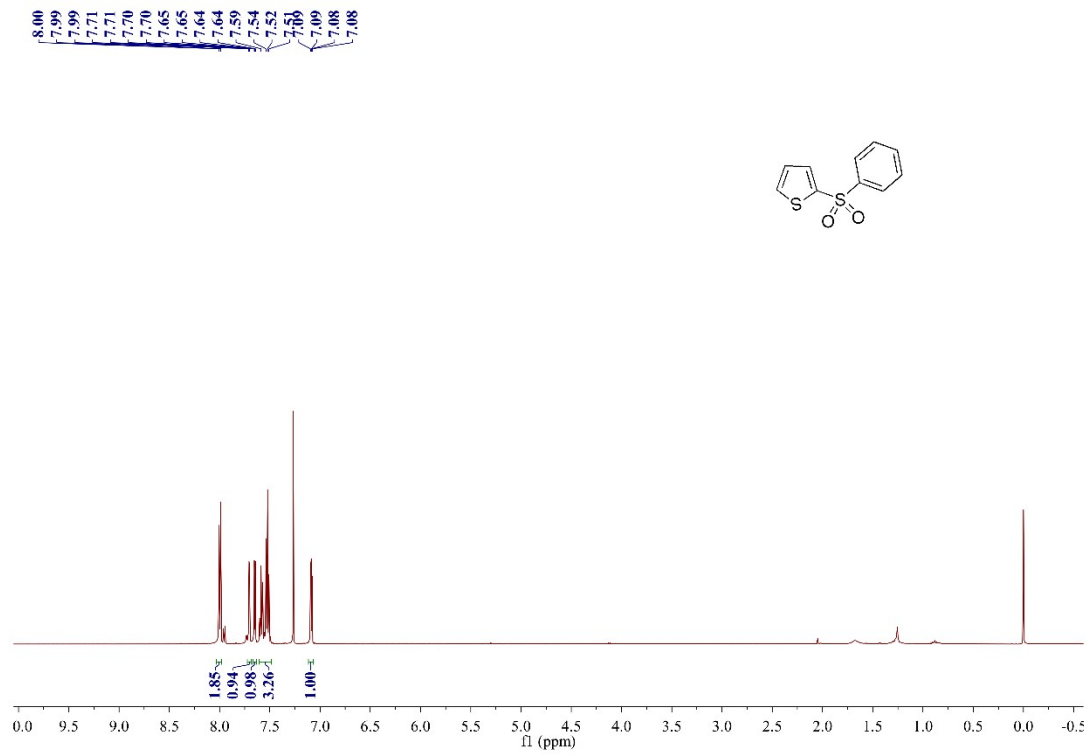


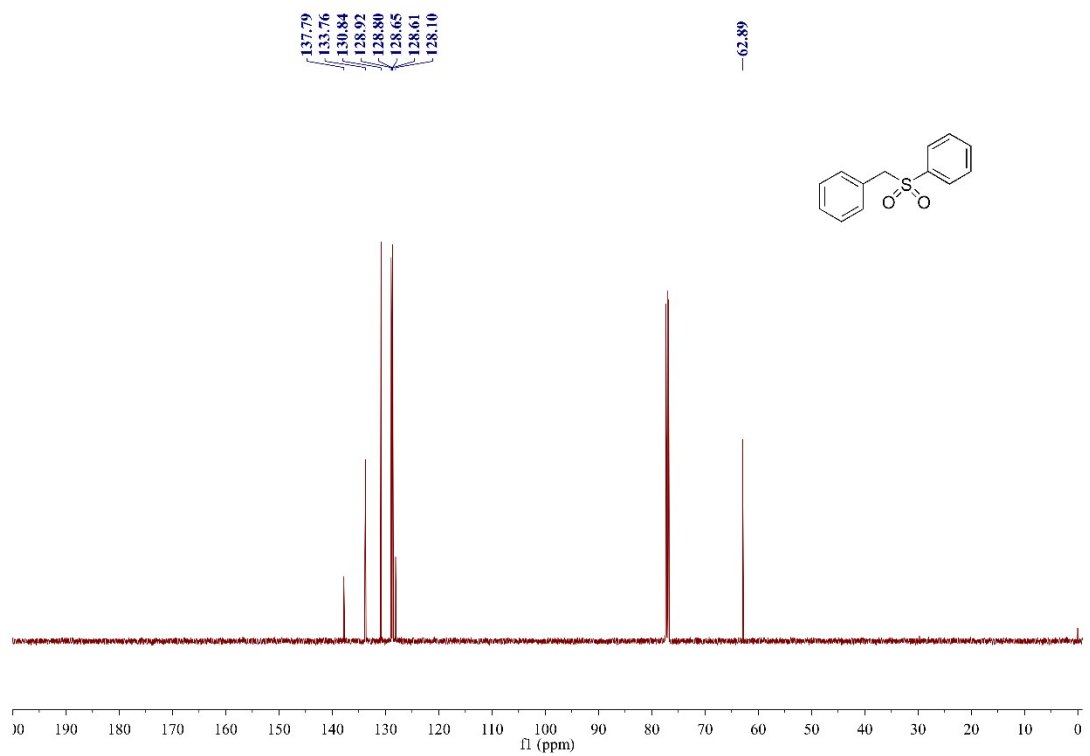
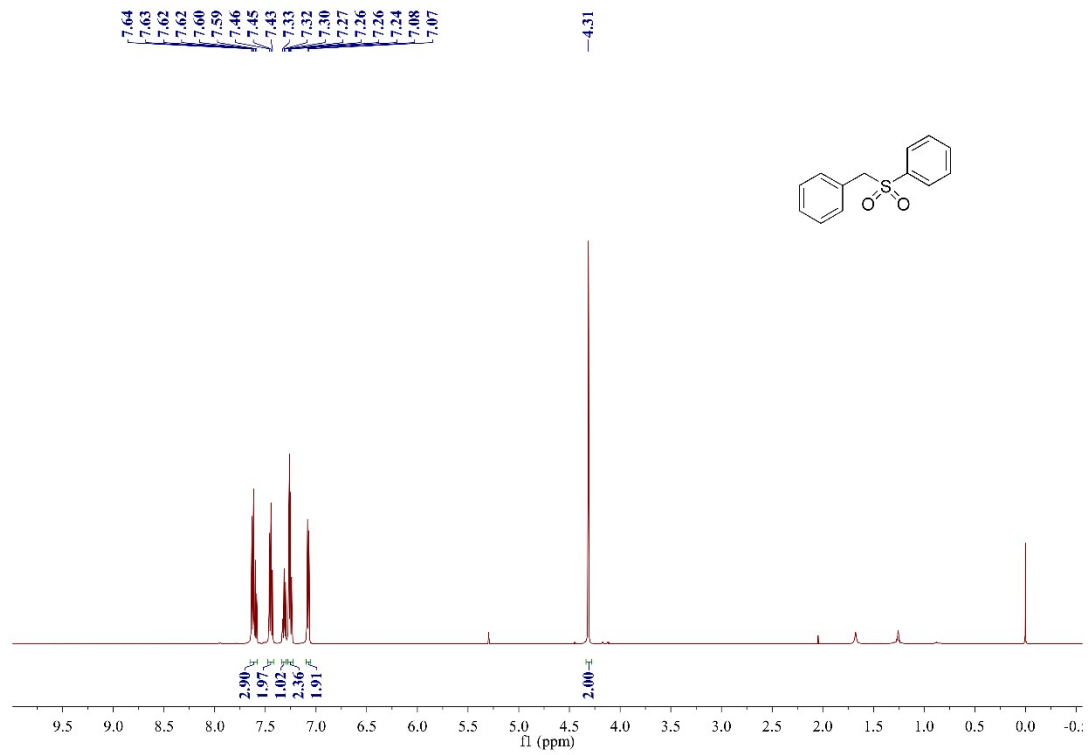


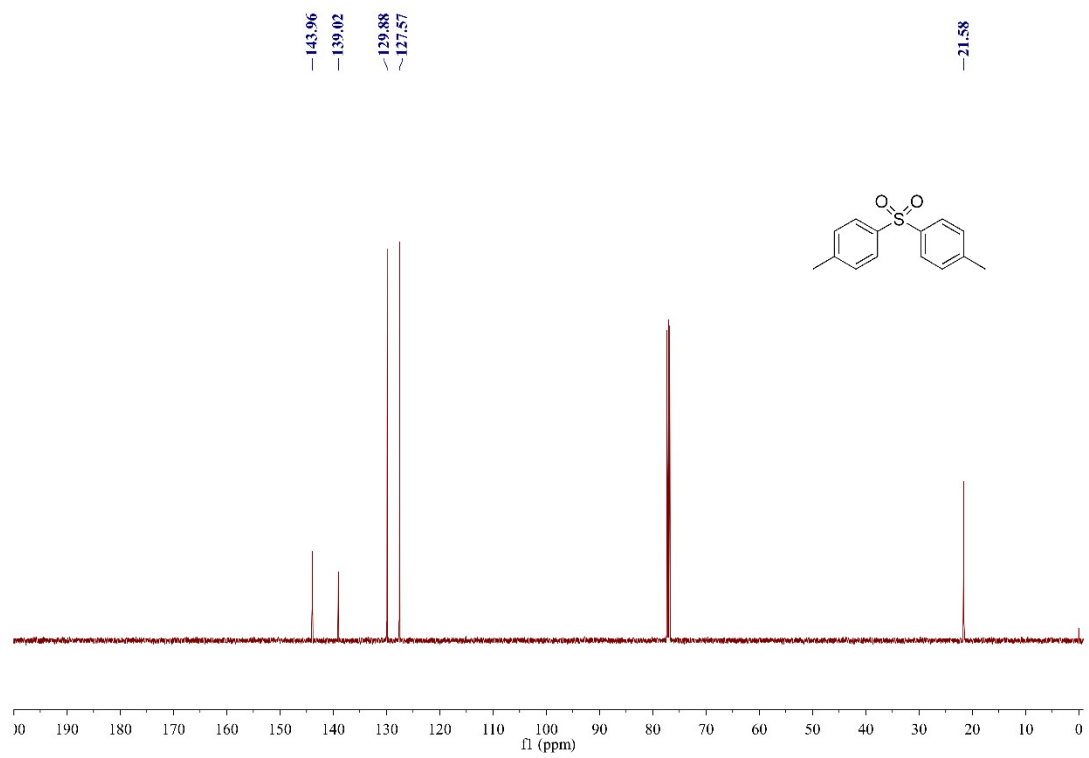
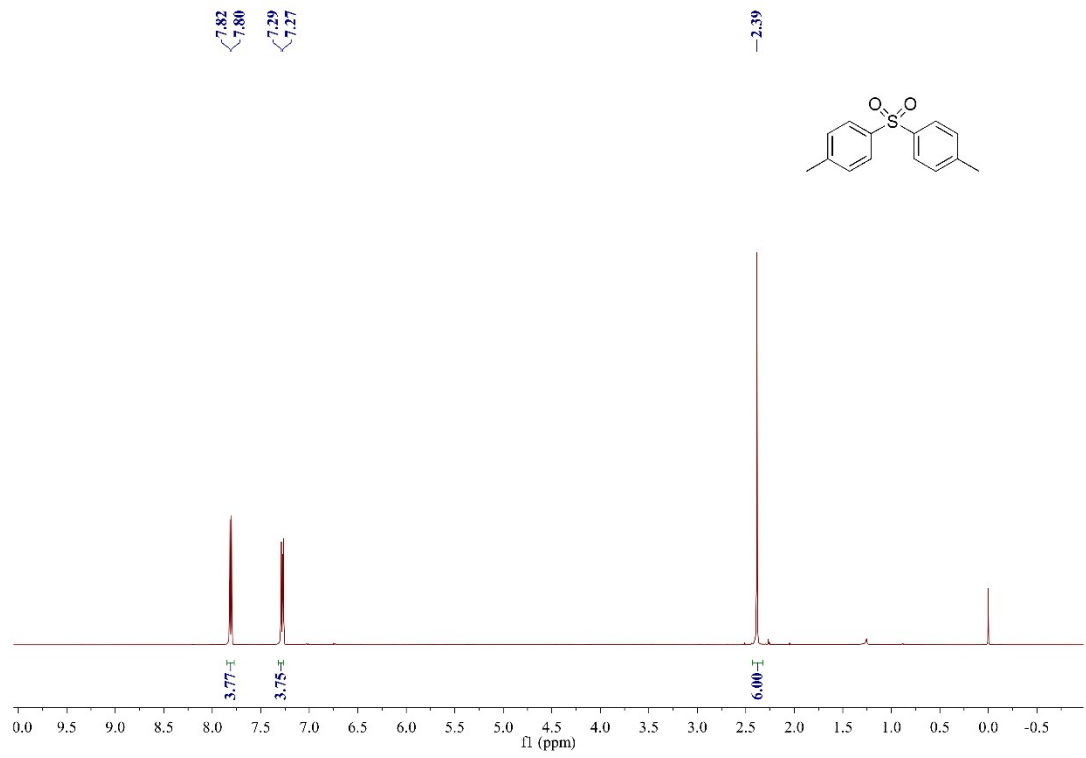


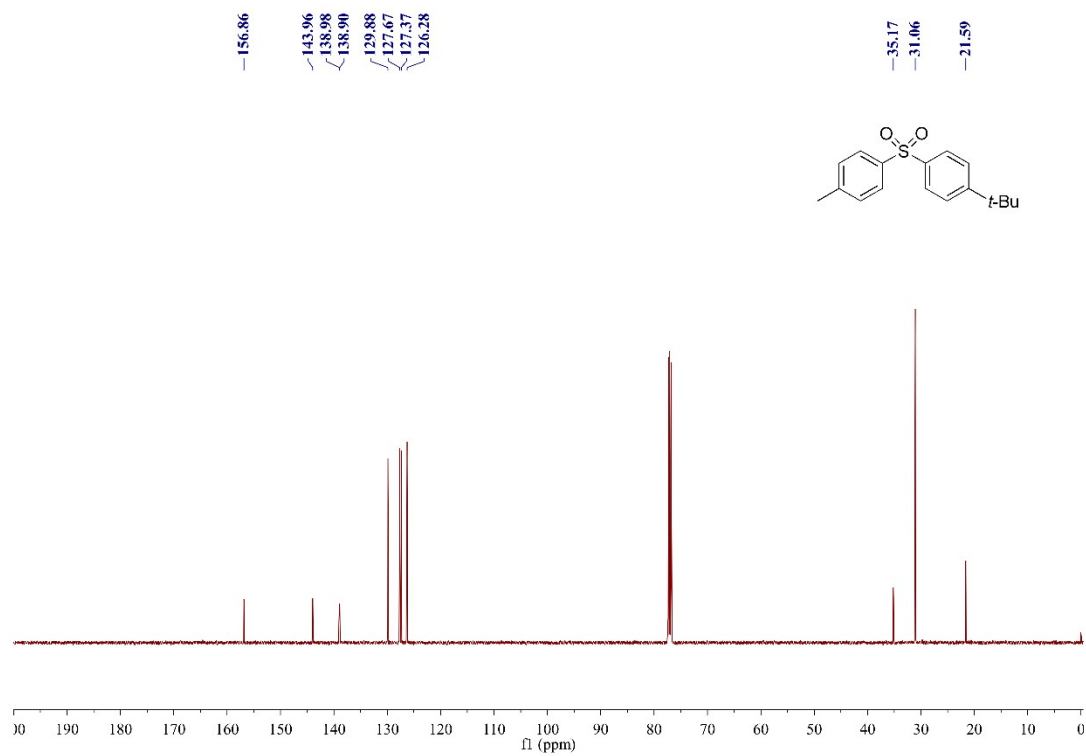
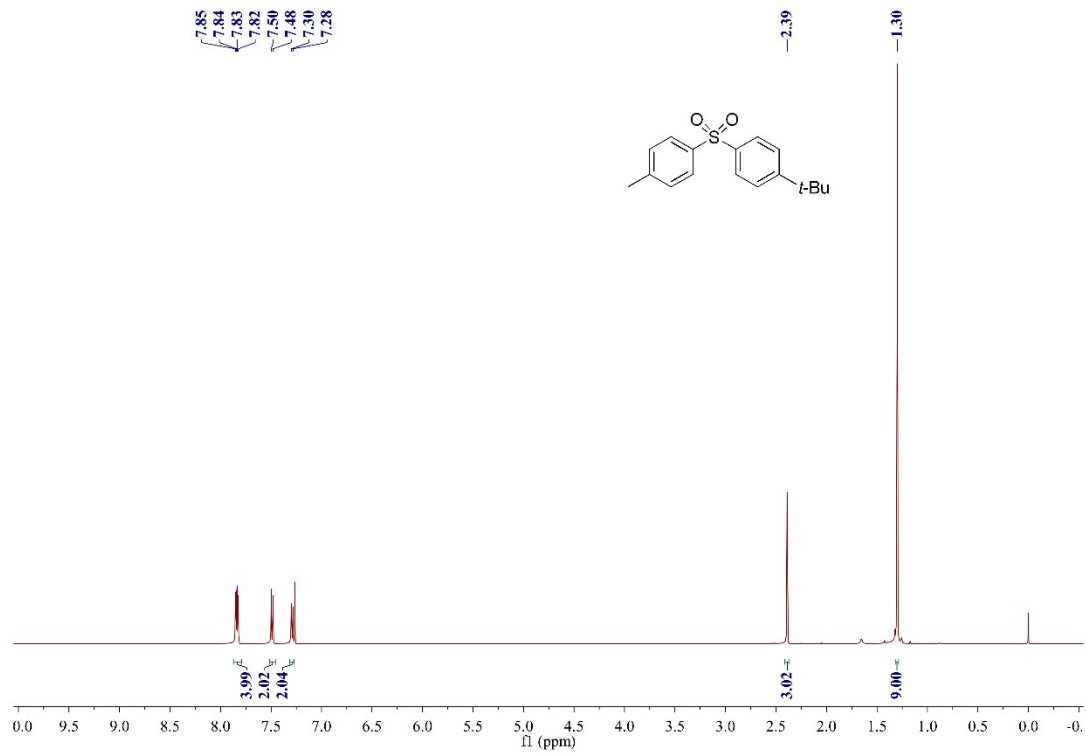


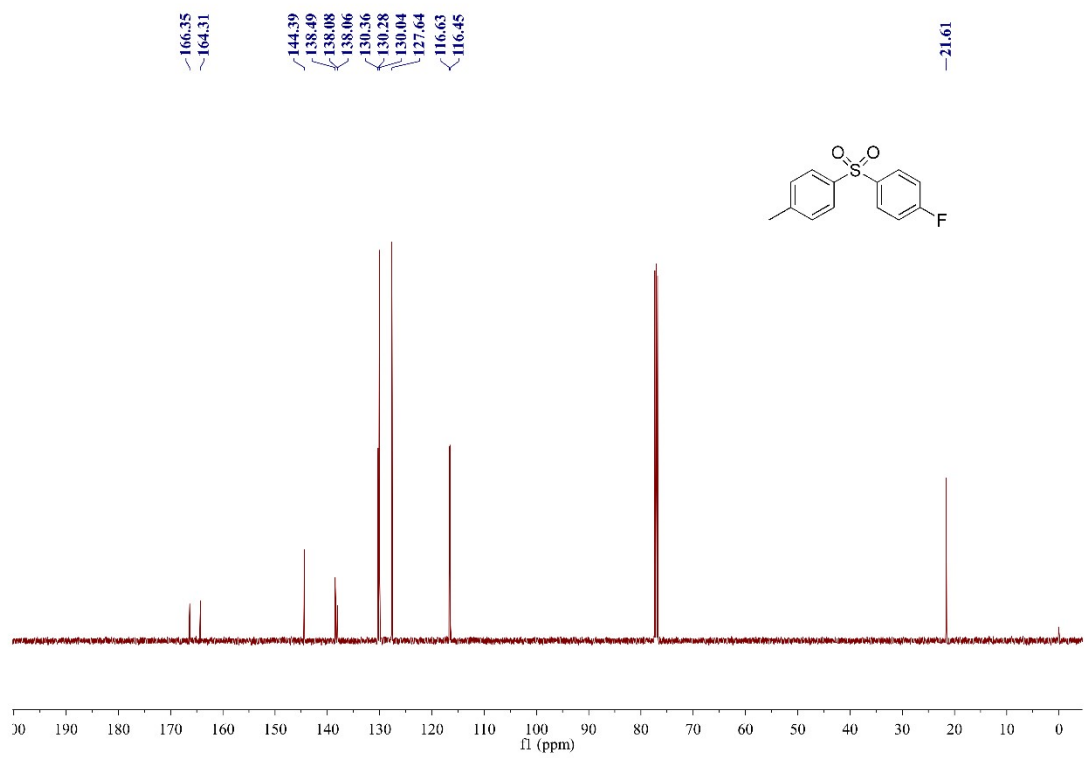
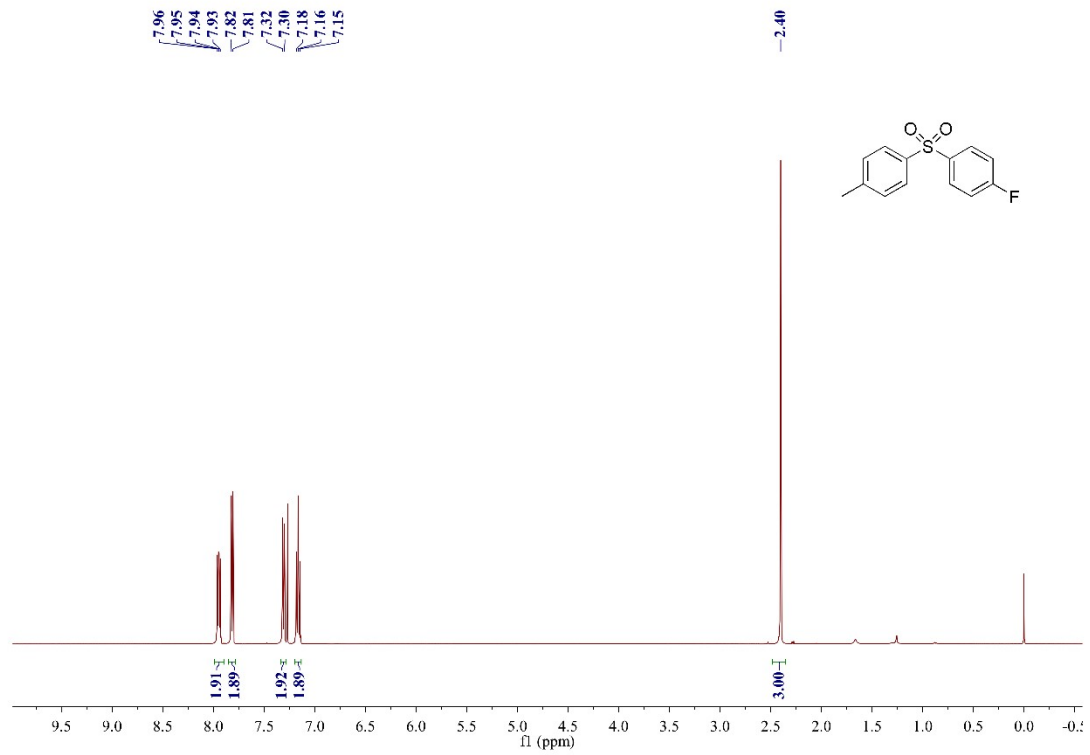


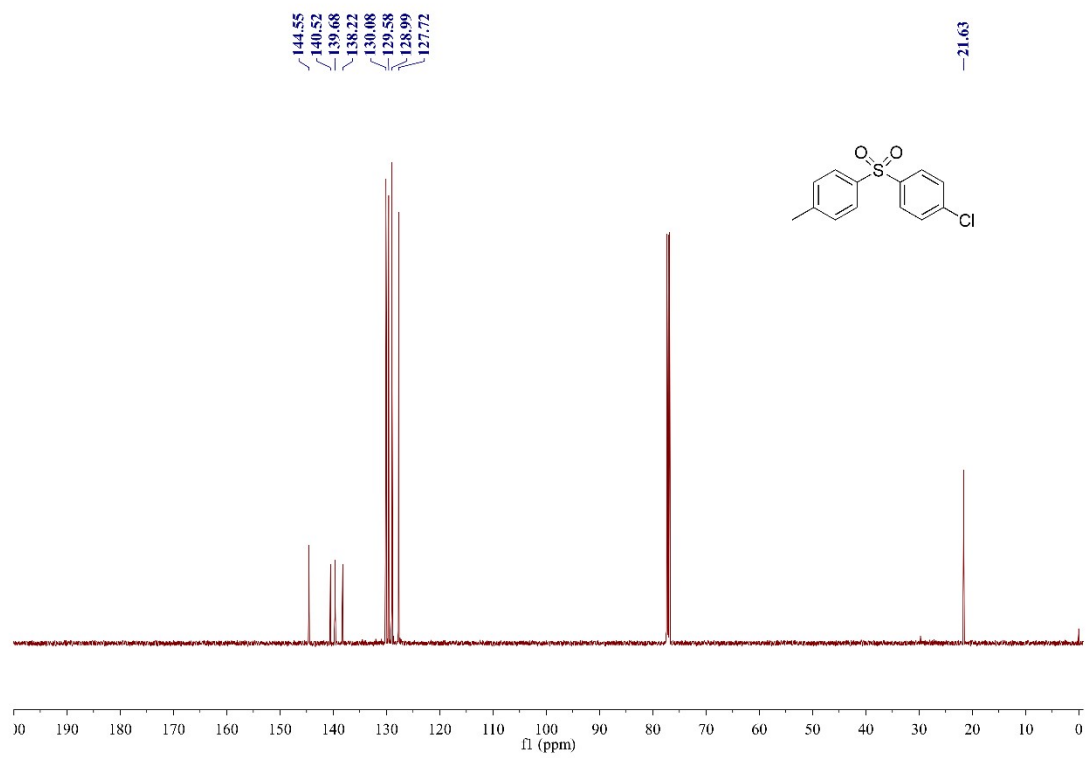
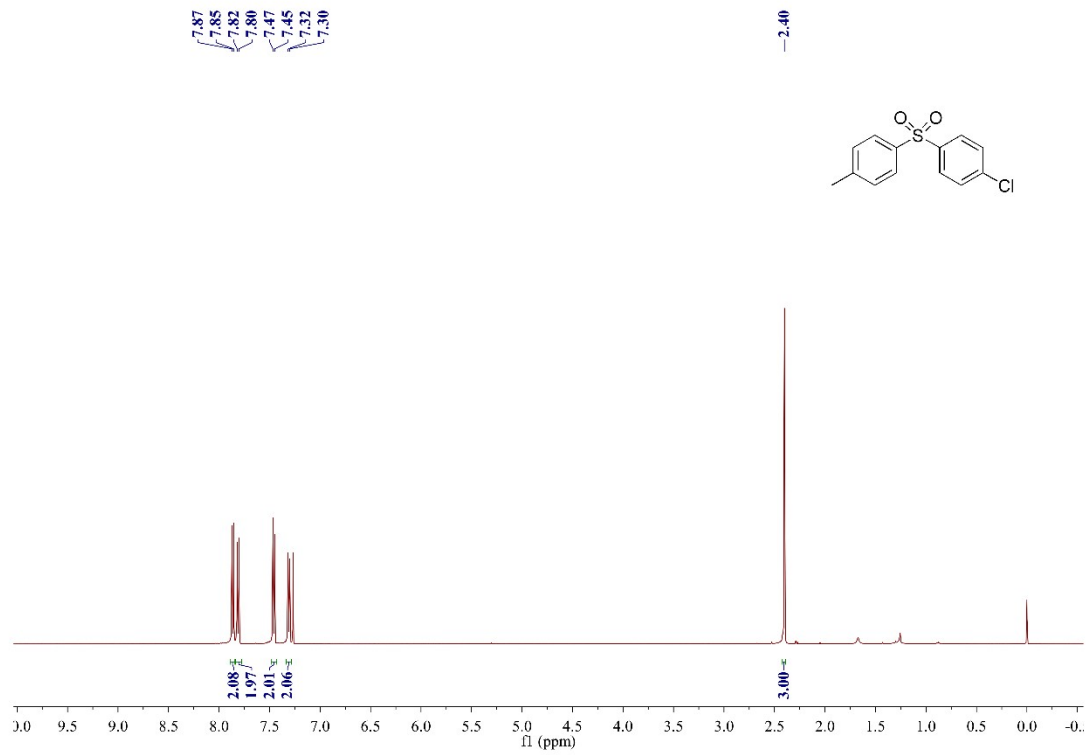


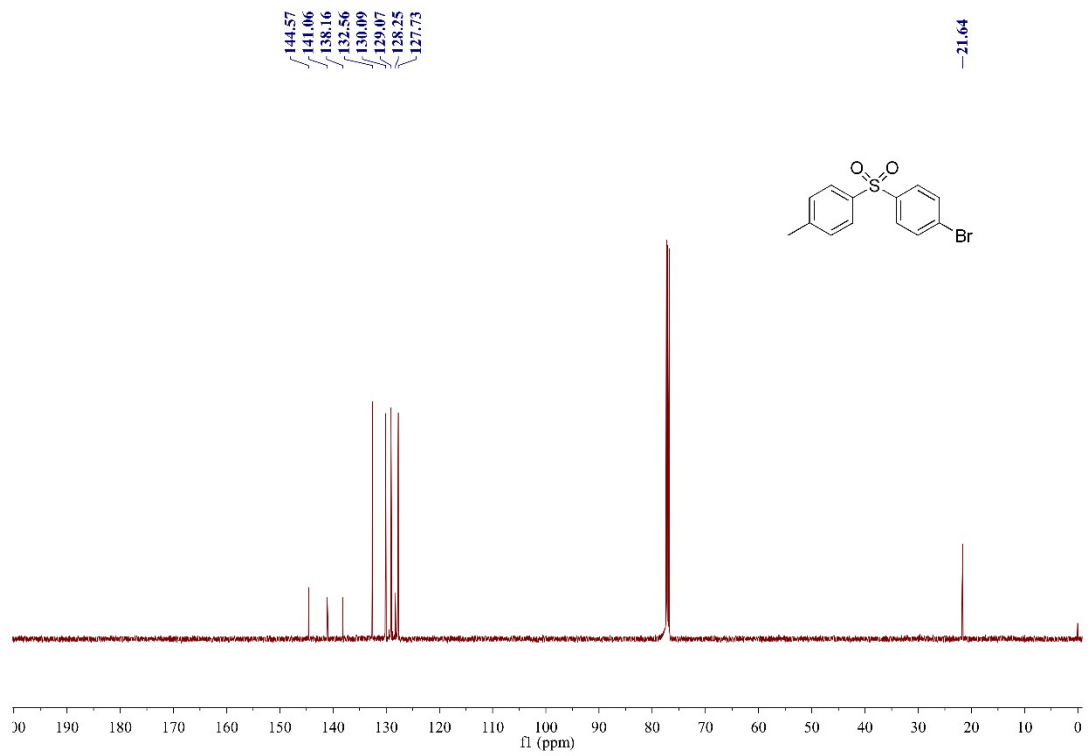
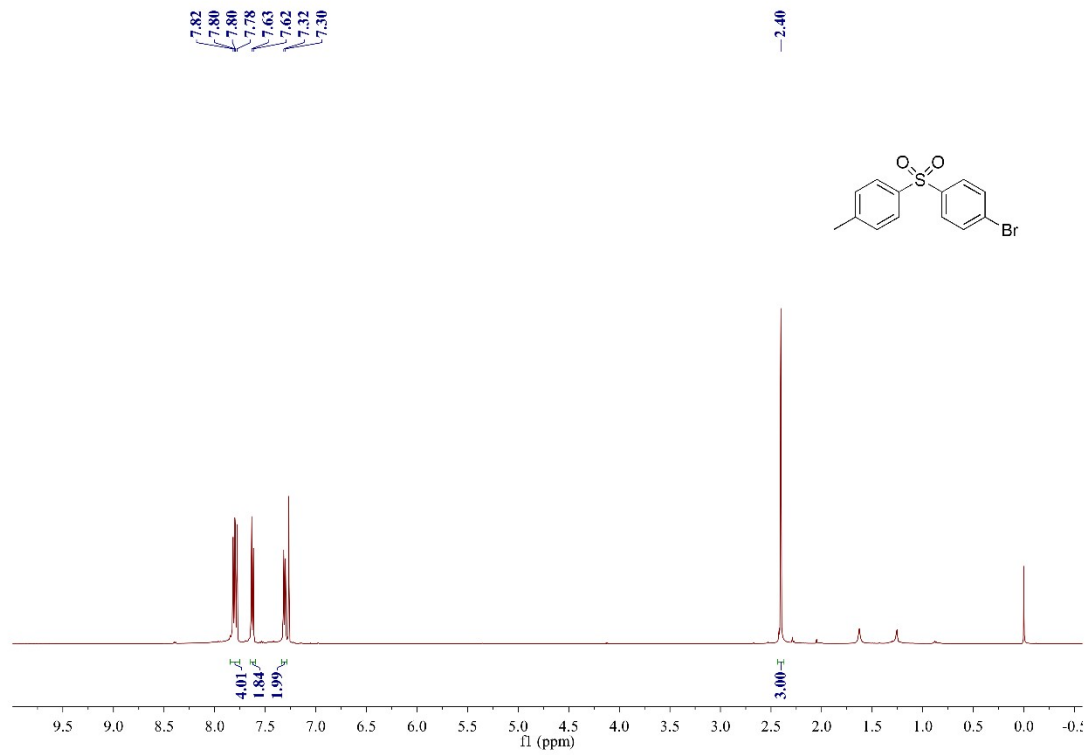


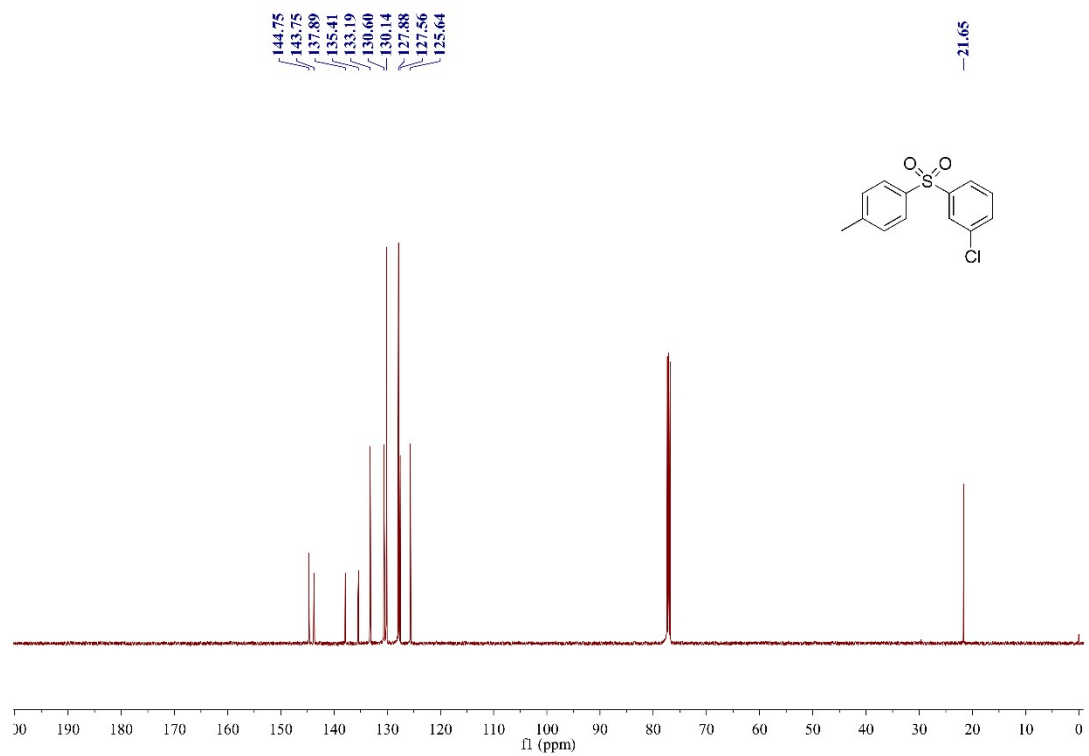
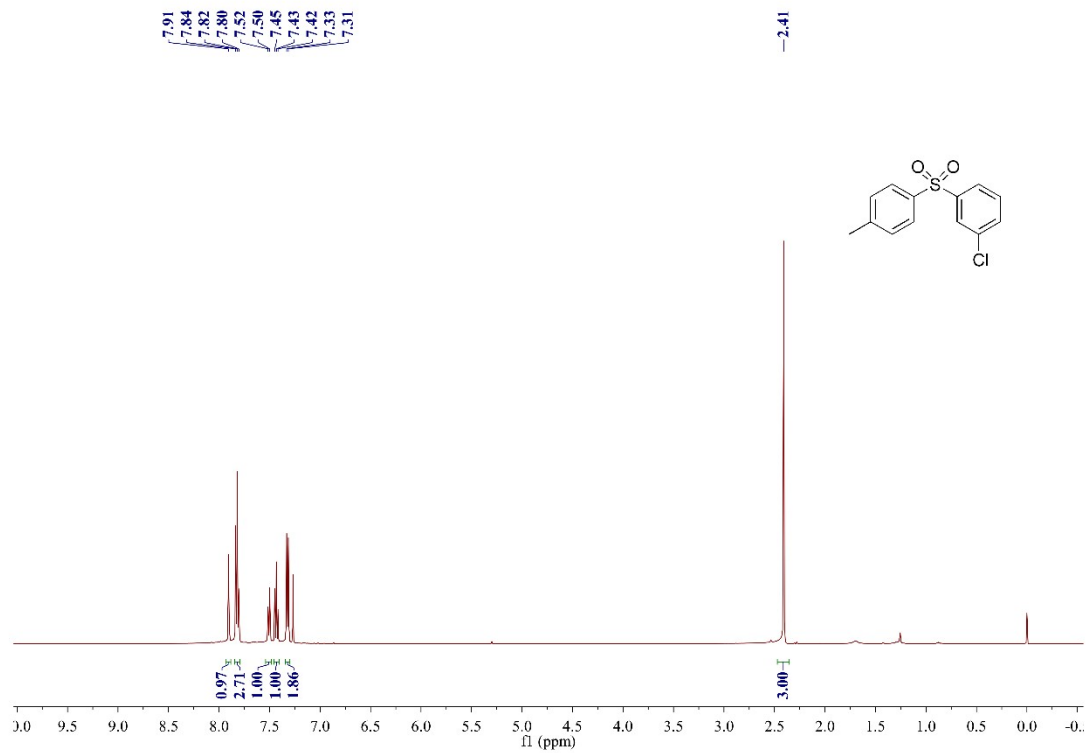


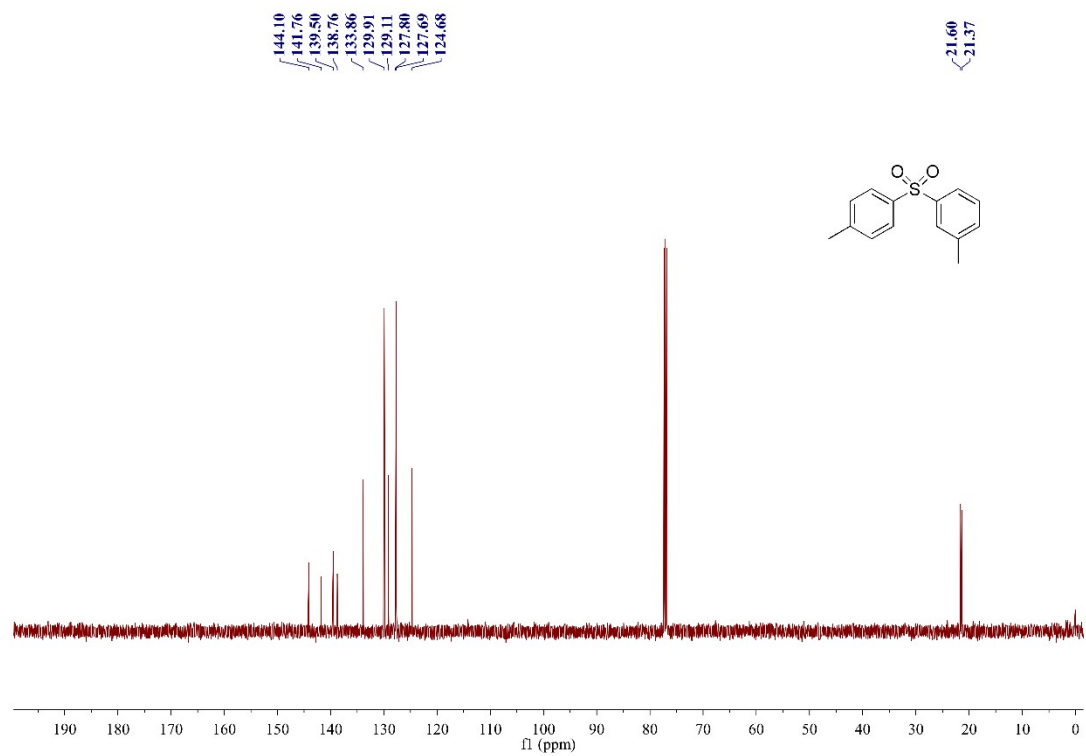
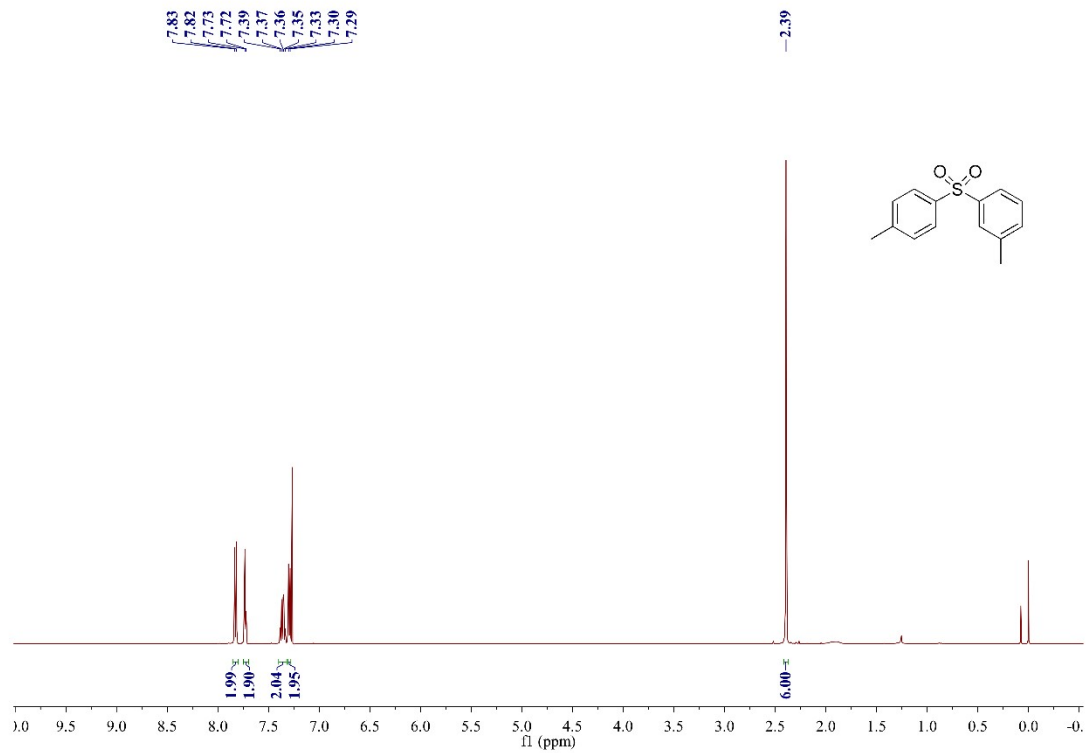


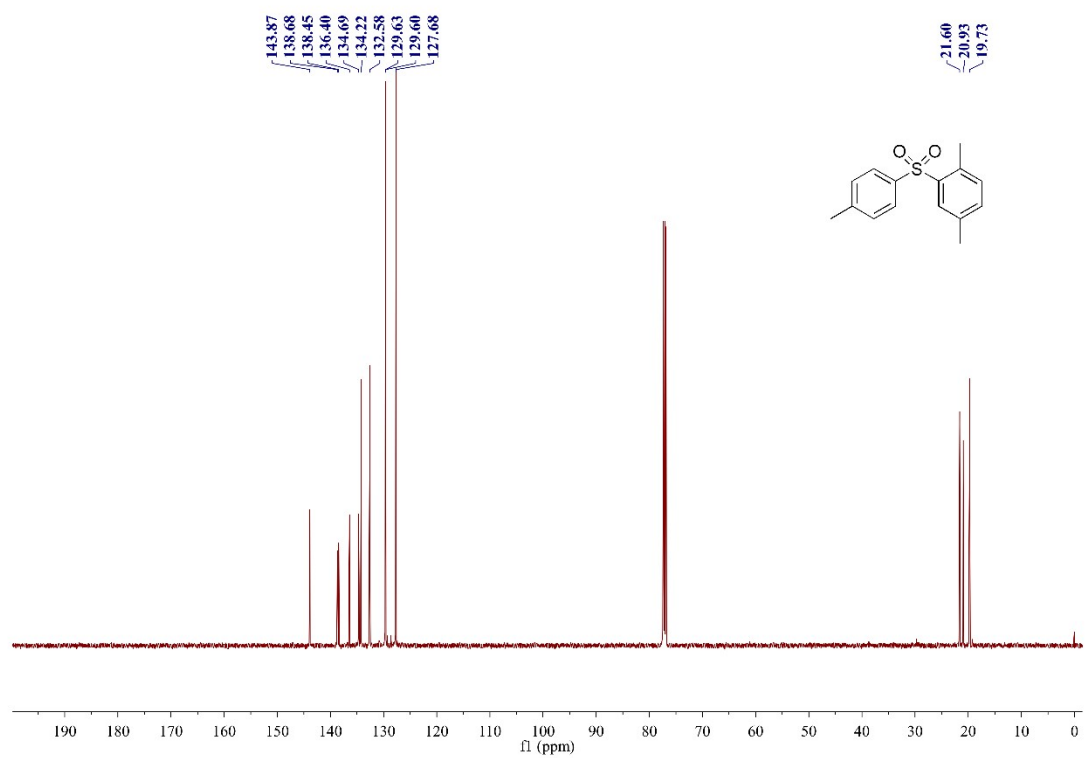
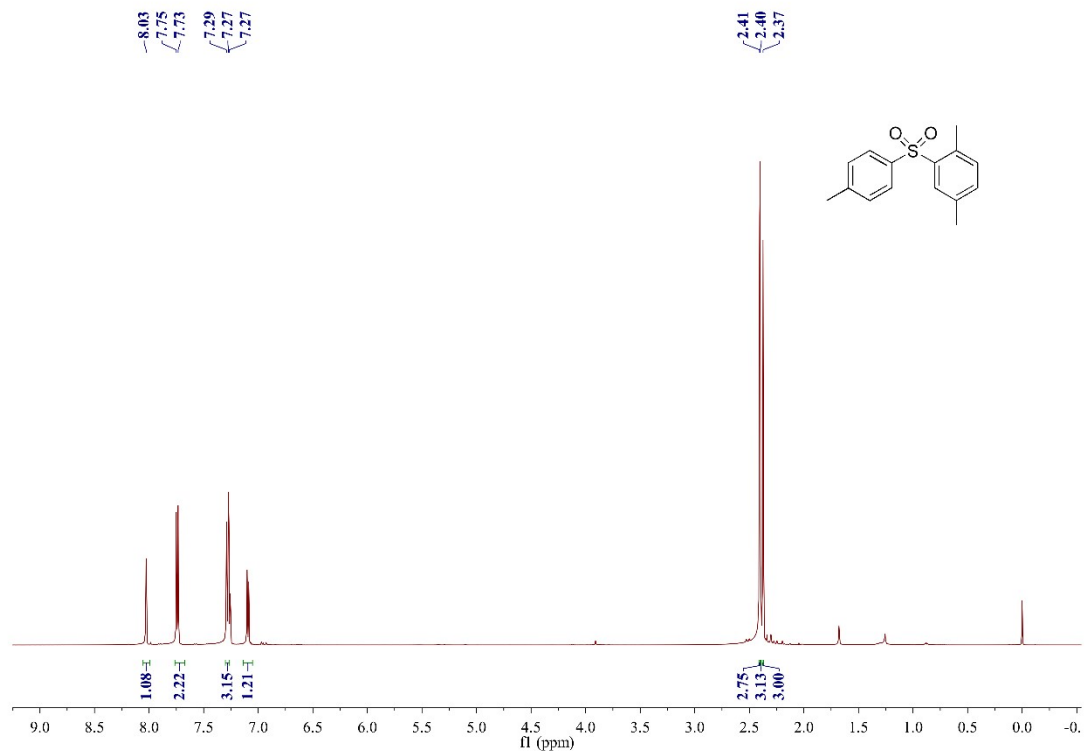


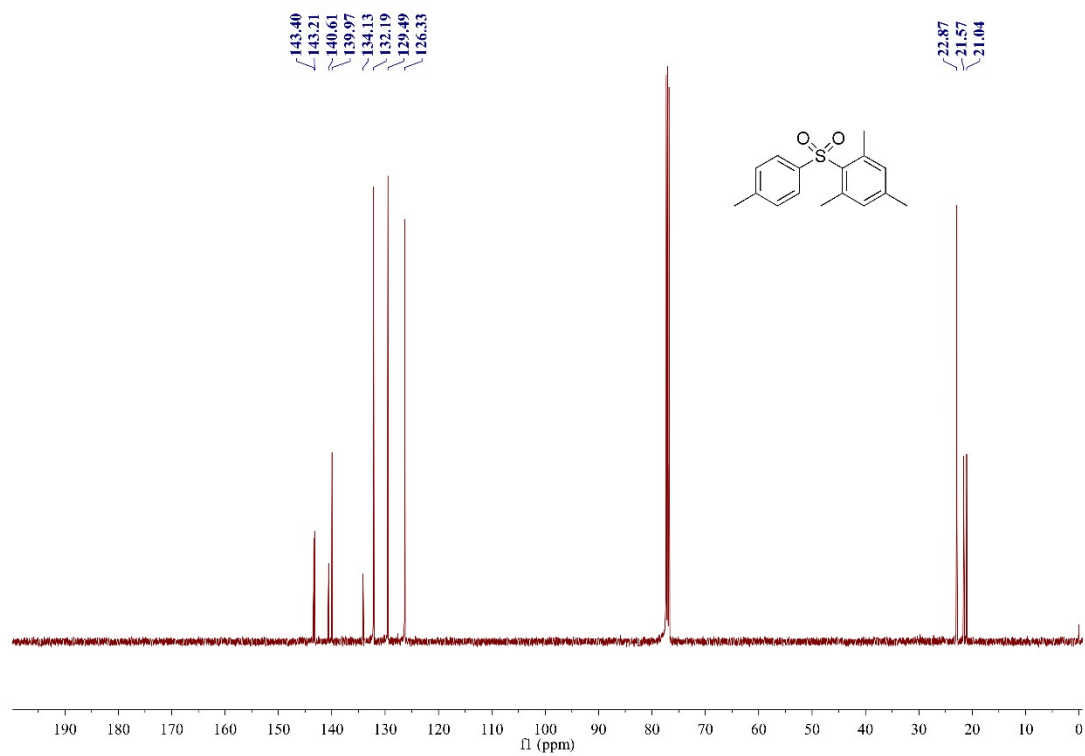
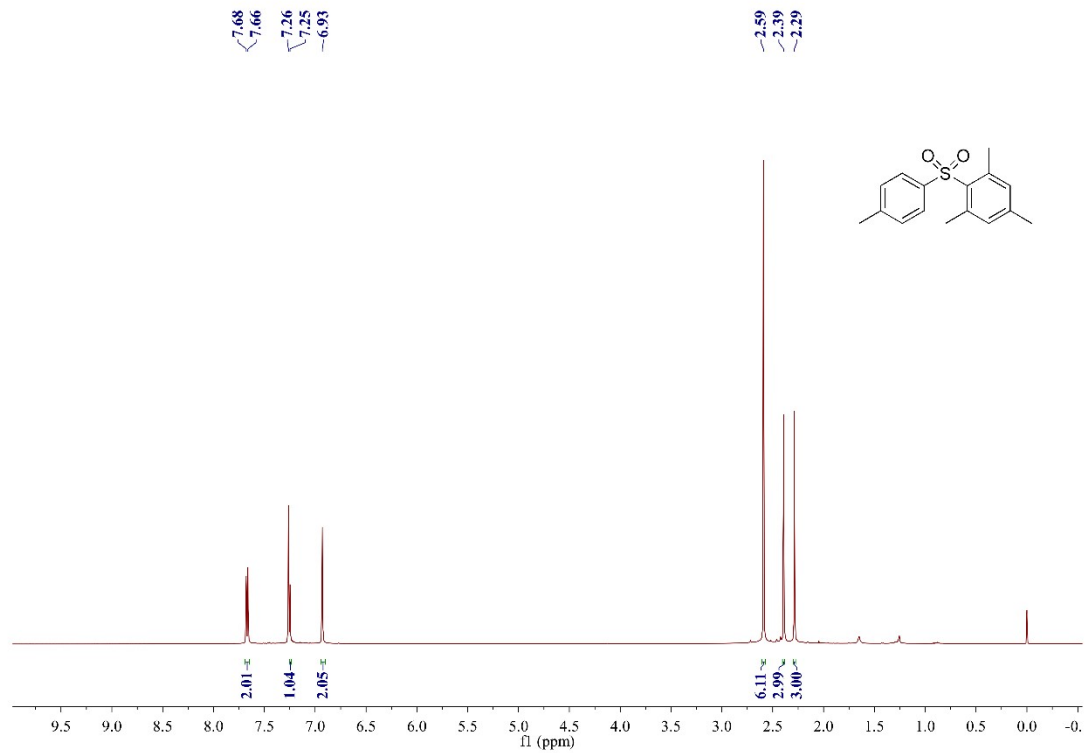


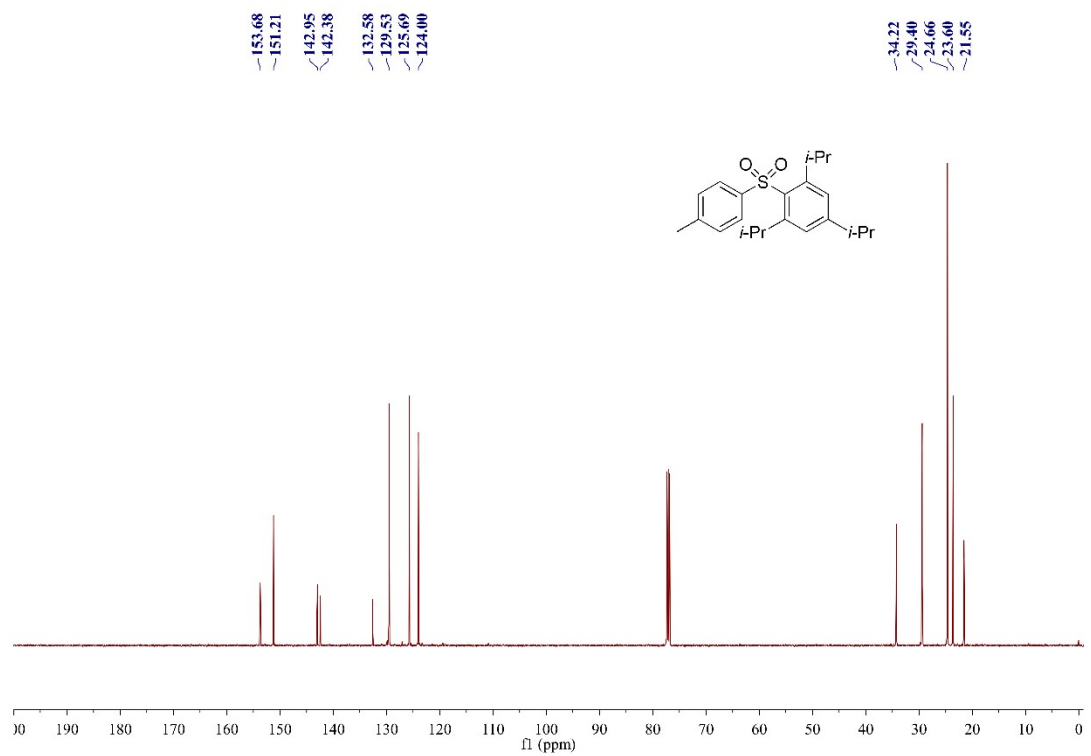
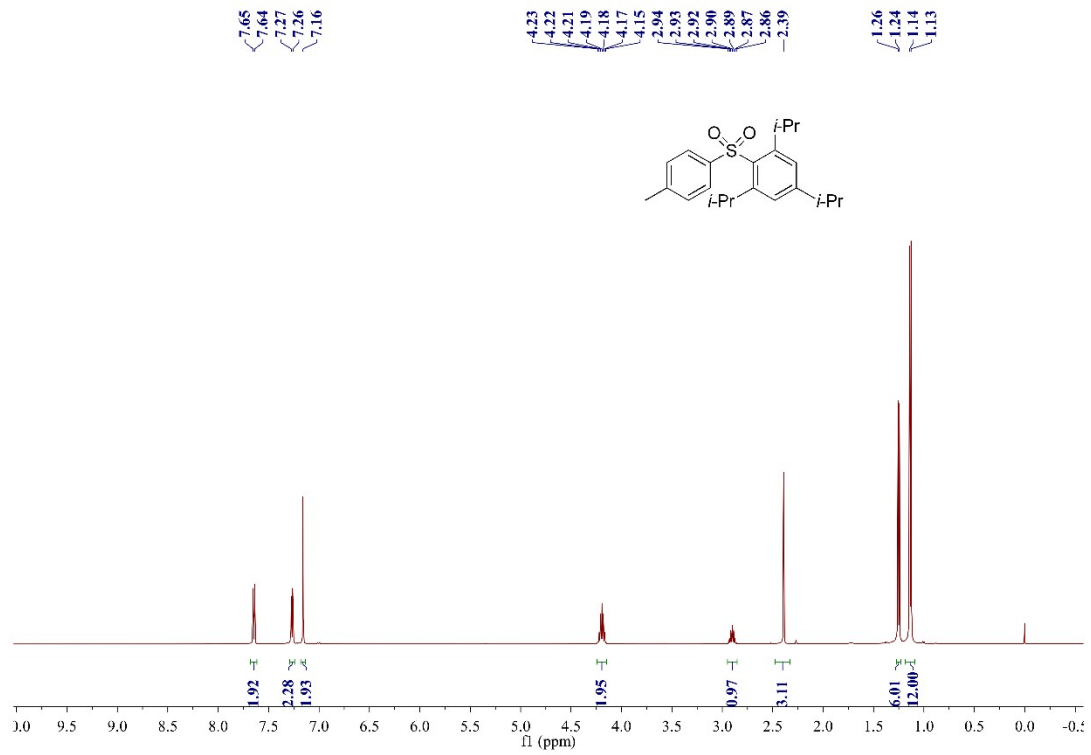












6. References

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