

Supporting Information

Silver-Mediated Oxidative C–C Bond Sulfonylation/Arylation of Methylenecyclopropanes with Sodium Sulfinates: Facile Access to 3-Sulfonyl-1,2- Dihydronaphthalenes

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1. General Information

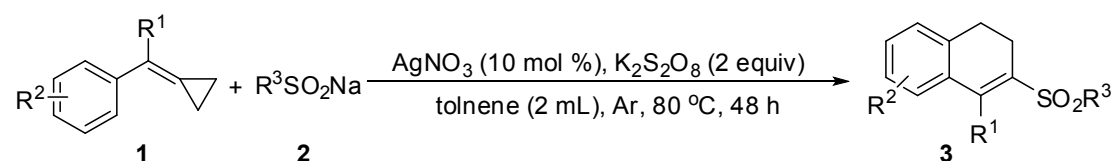
All reactions were carried out with magnetic stirring and in dried glassware. Standard syringe techniques were applied for transfer of dry solvents. All reagents and solvents were commercially available and used without any further purification unless specified. Proton (^1H NMR) and carbon (^{13}C NMR) nuclear magnetic resonance spectra were recorded at 400 MHz and 100MHz, respectively. The chemical shifts are given in parts per million (ppm) on the delta (δ) scale. The solvent peak was used as a reference value, for ^1H NMR: TMS = 0.00 ppm, for ^{13}C NMR: CDCl_3 = 77.00 ppm. The following abbreviations were used to explain multiplicities: s = singlet, d = doublet, dd = doublet of doublet, t = triplet, td = triplet of doublet, q = quartet, m = multiplet, and br = broad. Analytical TLC was performed on precoated silica gel plates. High-resolution mass spectra (HRMS) were obtained on an Agilent mass spectrometer using ESI-TOF (electrospray ionization-time of flight).

2. Experiment Section

2.1 General procedure for the synthesis of methylcyclopropanes (1):

All methylcyclopropanes (MCPs) (**1**) were synthesized according to the known methods^[1-3].

2.2 Typical Experimental Procedure for the Silver-Mediated synthesis of 3-Sulfonyl-1,2-Dihydronaphthalenes from MCPs and Sodium Sulfinates.



To a Schlenk tube were added **1** (0.2 mmol), **2** (1.5 equiv, 0.3 mmol), AgNO₃ (10 mol %), K₂S₂O₈ (2 equiv, 0.4 mmol), and toluene (2 mL). Then the mixture was stirred at 80 °C (oil bath temperature) in argon atmosphere (1 atm) for 36 h until complete consumption of starting material as monitored by TLC and GC-MS analysis. After the reaction was finished, the reaction mixture was washed with brine. The aqueous phase was re-extracted with EtOAc (3×10 mL). The combined organic extracts were dried over Na₂SO₄ and concentrated in vacuum. The residue was

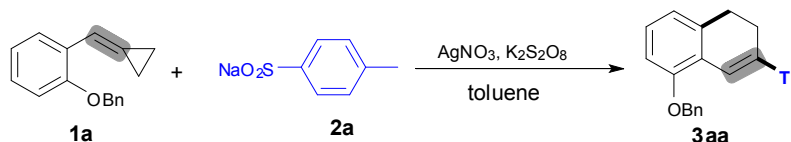
purified by silica gel flash column chromatography (hexane/ethyl acetate = 20 : 1 to 10 : 1) to afford the desired products **3**.

2.3 Table S1: Screening the optimal conditions

Initially, we set out to investigate the difunctionalization of 1-(benzyloxy)-2-(cyclopropylidene-methyl)-benzene (**1a**) with sodium *p*-tolylsulfinate (**2a**) to identify the optimal reaction conditions. As shown in Table 1, we found that treatment of substrate **1a** with sodium sulfinate **2a**, AgNO₃ (10 mol%) and K₂S₂O₈ (1.5 equiv) in toluene at 80 °C under argon atmosphere for 36 hour produced the target product, 5-(benzyloxy)-3-tosyl-1,2-dihydronaphthalene **3aa**, in 88% yield (entry 1). Next, a range of silver catalysts, such as Ag₂CO₃, Ag₂SO₄, AgF, AgSCN and AgIO₃, were tested (entries 2–6). Although the reactions in presence of these silver salts could take place smoothly, none of them was superior to AgNO₃. We noted that the desired product **3aa** could also be obtained in 35% yield absence of silver salt (entry 7). Reducing the amount of AgNO₃ to 5 mol % afforded the product **3aa** in 71% yield (entry 8). A series of oxidants, including DDQ (2,3-dicyano-5,6-dichlorobenzoquinone), (NH₄)₂S₂O₈, PhI(OAc)₂ ((diacetoxyiodo)benzene), BQ (benzoquinone), DTBP (di-*tert*-butyl peroxide), and TBHP (*tert*-butyl hydroperoxide), were examined, and no obvious improvement of the reaction yields was obtained (entries 9–14). The results showed that the K₂S₂O₈ was important for the ring-opening/cyclization, the absence of K₂S₂O₈ led to no detectable amounts of 2-sulfonylated 3,4-dihydronaphthalene **3aa** (entry 15). Several solvents were also surveyed, suggesting that toluene is the best suited solvent according to the reaction yields, as other solvents such as benzene, dioxane, ⁿBuOAc, DMF, and DMSO could not improve the reaction yield (entries 16–20). A moderate yield was afforded by using dioxane in the reaction system (entry 17). The variation of the reaction temperatures indicated that 80 °C was best suited temperatures (entries 21–22). A lower temperature led to the MCPs unactive and a higher temperature resulted in decomposing of the starting materials. We were delighted to find that conducting the reaction under air atmosphere gave the desired product **3aa** in 84% yield (entry 23). Additionally, no obvious improvement of the yield was afforded when the

difunctionalization reaction was carried out with a longer reaction time (entry 24). To our delighted, a 1 g (3.77 mmol) of substrate **1a** could generate the desired product **3aa** in good yield (entry 25).

Table S1. Screening of Optimal Reaction Conditions^a

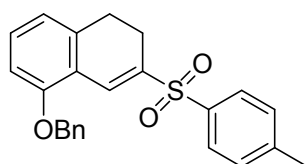


entry	catalyst (mol %)	oxidant	solvent	T (°C)	yield (%) ^b
1	AgNO ₃ (10)	K ₂ S ₂ O ₈	toluene	80	88
2	Ag ₂ CO ₃ (10)	K ₂ S ₂ O ₈	toluene	80	42
3	Ag ₂ SO ₄ (10)	K ₂ S ₂ O ₈	toluene	80	50
4 ^c	AgF (10)	K ₂ S ₂ O ₈	toluene	80	44
5 ^c	AgSCN (10)	K ₂ S ₂ O ₈	toluene	80	38
6	AgIO ₃ (10)	K ₂ S ₂ O ₈	toluene	80	56
7	—	K ₂ S ₂ O ₈	toluene	80	35
8	AgNO ₃ (5)	K ₂ S ₂ O ₈	toluene	80	71
9	AgNO ₃ (10)	DDQ	toluene	80	0
10 ^c	AgNO ₃ (10)	(NH ₄) ₂ S ₂ O ₈	toluene	80	70
11 ^c	AgNO ₃ (10)	PhI(OAc) ₂	toluene	80	0
12 ^c	AgNO ₃ (10)	BQ	toluene	80	0
13 ^c	AgNO ₃ (10)	DTBP	toluene	80	0
14	AgNO ₃ (10)	TBHP	toluene	80	13
15 ^c	AgNO ₃ (10)	—	toluene	80	0
16	AgNO ₃ (10)	K ₂ S ₂ O ₈	bezene	80	58
17	AgNO ₃ (10)	K ₂ S ₂ O ₈	dioxane	80	68
18	AgNO ₃ (10)	K ₂ S ₂ O ₈	ⁿ BuOAc	80	36
19	AgNO ₃ (10)	K ₂ S ₂ O ₈	DMF	80	40
20 ^c	AgNO ₃ (10)	K ₂ S ₂ O ₈	DMSO	80	trace
21	AgNO ₃ (10)	K ₂ S ₂ O ₈	toluene	100	75
22	AgNO ₃ (10)	K ₂ S ₂ O ₈	toluene	60	60
23 ^d	AgNO ₃ (10)	K ₂ S ₂ O ₈	toluene	80	84
24 ^e	AgNO ₃ (10)	K ₂ S ₂ O ₈	toluene	80	89
25 ^f	AgNO ₃ (10)	K ₂ S ₂ O ₈	toluene	80	73

^a Reaction conditions: **1a** (0.2 mmol), **2a** (0.3 mmol, 1.5 equiv), catalyst (10 mol %), oxidant (0.4 mmol, 2 equiv) and solvent (2 mL) at 80 °C under an argon atmosphere for 36 h. ^b Isolated yield. ^c Over 85% of raw material **1a** was recovered, and the rest was decomposed. ^d under air atmosphere. ^e For 48 h. ^f **1a** (1 g, 4.24 mmol) and solvent (10 mL) for 72 h.

3. Analytical data

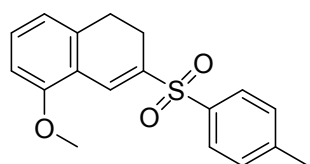
5-(Benzyloxy)-3-tosyl-1,2-dihydronaphthalene (3aa): Yield: 68.7 mg, 88%; yellow solid, mp



82.5-84.3 °C (uncorrected); ¹H NMR (400 MHz, CDCl₃) δ: 8.04 (s, 1H), 7.81 (d, *J* = 8.0 Hz, 2H), 7.42-7.40 (m, 4H), 7.36-7.30 (m, 3H), 7.18 (t, *J* = 8.0 Hz, 1H), 6.78 (d, *J* = 8.4 Hz, 1H), 6.72 (d, *J* = 7.6 Hz,

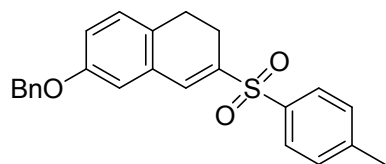
1H), 5.14 (s, 2H), 2.82 (t, $J = 8.0$ Hz, 2H), 2.47 (t, $J = 8.0$ Hz, 2H), 2.42 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ : 155.9, 140.0, 137.2, 137.0, 136.8, 136.6, 131.1, 129.7, 129.4, 128.7, 128.0, 127.9, 127.1, 120.4, 120.2, 110.7, 70.3, 27.9, 21.6, 21.3; HRMS (ESI-TOF) m/z : $\text{C}_{24}\text{H}_{23}\text{O}_3\text{S}$ ($\text{M} + \text{H}$) $^+$ calcd for 391.1362, found 391.1368.

5-Methoxy-3-tosyl-1,2-dihydronaphthalene (3ba): Yield: 50.3 mg, 80%; yellow oil; ^1H NMR



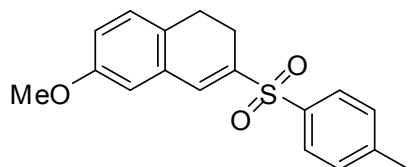
(400 MHz, CDCl_3) δ : 8.02 (s, 1H), 7.81 (d, $J = 8.4$ Hz, 2H), 7.31 (d, $J = 8.0$ Hz, 2H), 7.21 (d, $J = 8.0$ Hz, 1H), 6.76-6.70 (m, 2H), 3.86 (s, 3H), 2.81 (t, $J = 8.4$ Hz, 2H), 2.47-2.42 (m, 5H); ^{13}C NMR (100 MHz, CDCl_3) δ : 156.8, 144.0, 137.1, 137.0, 136.6, 131.2, 129.7, 129.6, 127.9, 120.0, 119.9, 109.1, 55.5, 27.9, 21.6, 21.4; HRMS (ESI-TOF) m/z : $\text{C}_{18}\text{H}_{19}\text{O}_3\text{S}$ ($\text{M} + \text{H}$) $^+$ calcd for 315.1049, found 315.1056.

6-(Benzyloxy)-3-tosyl-1,2-dihydronaphthalene (3ca) and 8-(benzyloxy)-3-tosyl-1,2-

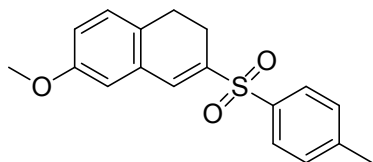


dihydronaphthalene (3ca'): Yield: 69.4 mg, 89%; yellow oil; ^1H NMR (400 MHz, CDCl_3) δ : 7.80 (d, $J = 8.0$ Hz, 2H), 7.52 (d, $J = 12.8$ Hz, 1H), 7.43-7.31 (m, 7H), 7.18 (t, $J = 8.0$ Hz, 0.6H), 7.03 (d, $J = 8.8$ Hz, 0.4H), 6.95-6.88 (m, 2H), 5.06 (s, 2H), 2.92 (t, $J = 8.4$ Hz, 1.2H), 2.78 (t, $J = 8.0$ Hz, 0.8H), 2.48-2.43 (m, 5H); ^{13}C NMR (100 MHz, CDCl_3) δ : 157.7, 155.3, 144.3, 138.6, 136.8, 136.7, 136.5, 134.7, 134.6, 132.1, 131.9, 129.8, 129.8, 128.6, 128.6, 128.0, 128.0, 128.0, 127.8, 127.4, 127.4, 127.1, 123.9, 121.9, 116.6, 115.2, 114.2, 70.2, 29.7, 26.7, 22.1, 21.6, 21.1, 20.3; HRMS (ESI-TOF) m/z : $\text{C}_{24}\text{H}_{23}\text{O}_3\text{S}$ ($\text{M} + \text{H}$) $^+$ calcd for 391.1362, found 391.1368.

6-Methoxy-3-tosyl-1,2-dihydronaphthalene (3da) and 8-methoxy-3-tosyl-1,2-



dihydronaphthalene (3da'): Yield: 51.5 mg, 82%; white solid, mp 83.1-84.3 $^\circ\text{C}$ (uncorrected); ^1H NMR (400 MHz, CDCl_3) δ : 7.80 (d, $J = 8.4$ Hz, 2H), 7.52 (s, 1H), 7.32 (d, $J = 8.0$ Hz, 2H), 7.20 (t, $J = 8.0$ Hz, 0.7H), 7.04 (d, $J = 9.2$ Hz, 0.3H), 6.89 (t, $J = 7.2$ Hz, 1.4H), 6.82 (s, 0.6H), 3.81 (s, 2.1H), 3.80 (s, 0.9H), 2.85 (t, $J = 7.6$ Hz, 1.4H), 2.79 (t, $J = 8.0$ Hz, 0.6H), 2.49-2.43 (m, 5H); ^{13}C NMR (100 MHz, CDCl_3) δ : 157.5, 155.2, 143.3, 138.0, 137.5, 135.5, 133.7, 133.7, 130.9, 128.8, 128.8, 127.6, 127.0, 126.5, 126.4, 122.4, 120.5, 114.7, 113.2, 111.7, 51.5, 54.4, 28.7, 28.3, 26.1, 25.7, 21.1, 20.6; HRMS (ESI-TOF) m/z : $\text{C}_{18}\text{H}_{19}\text{O}_3\text{S}$ ($\text{M} + \text{H}$) $^+$ calcd for 315.1049, found 315.1056.



6-Methoxy-3-tosyl-1,2-dihydronaphthalene (3da): Yield:

51.5 mg, 82%; white solid, mp 82.0-84.9 °C (uncorrected); ¹H

NMR (400 MHz, CDCl₃) δ: 7.80 (d, *J* = 8.4 Hz, 2H), 7.53 (s,

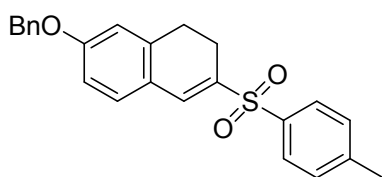
1H), 7.32 (d, *J* = 8.0 Hz, 2H), 7.20 (t, *J* = 8.0 Hz, 1H), 6.89 (t, *J* = 7.2 Hz, 2H), 3.81 (s, 3H), 2.85

(t, *J* = 8.4 Hz, 2H), 2.47-2.43 (m, 5H); ¹³C NMR (100 MHz, CDCl₃) δ: 156.2, 144.2, 138.5, 136.5,

134.7, 131.9, 129.8, 128.0, 127.4, 123.4, 121.5, 112.7, 55.5, 21.6, 21.1, 20.0; HRMS (ESI-TOF)

m/z: C₁₈H₁₉O₃S (M + H)⁺ calcd for 315.1049, found 315.1056.

7-(Benzyloxy)-3-tosyl-1,2-dihydronaphthalene yellow solid (3ea): Yield: 71.8 mg, 92%; yellow



solid, mp 95.7-97.0 °C (uncorrected); ¹H NMR (400 MHz,

CDCl₃) δ: 7.79 (d, *J* = 8.4 Hz, 2H), 7.54-7.52 (m, 1H), 7.42-

7.36 (m, 4H), 7.35-7.32 (m, 3H), 7.19 (d, *J* = 8.0 Hz, 1H),

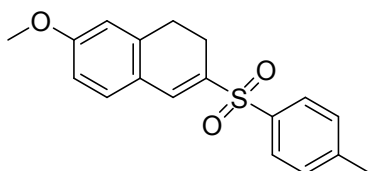
5.07 (s, 2H), 2.82 (t, *J* = 8.0 Hz, 2H), 2.45 (t, *J* = 8.0 Hz, 2H),

2.42 (s, 3H); ¹³C NMR (100 MHz, CDCl₃) δ: 160.5, 144.1, 137.6, 136.9, 136.4, 135.4, 134.6,

130.5, 129.8, 128.6, 128.1, 127.9, 127.4, 124.3, 114.8, 112.7, 70.0, 28.0, 21.6, 21.5; HRMS (ESI-

TOF) *m/z*: C₂₄H₂₃O₃S (M + H)⁺ calcd for 391.1362, found 391.1368.

7-Methoxy-3-tosyl-1,2-dihydronaphthalene (3fa): Yield: 54.0 mg, 86%; yellow solid, mp



102.1-103.5 °C (uncorrected); ¹H NMR (400 MHz, CDCl₃) δ:

7.79 (d, *J* = 6.4 Hz, 2H), 7.53 (s, 1H), 7.32 (d, *J* = 8.0 Hz, 2H),

7.20 (d, *J* = 8.4 Hz, 1H), 6.76-6.73 (m, 1H), 6.70 (s, 1H), 3.81

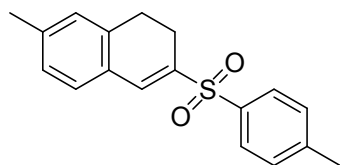
(s, 3H), 2.83 (t, *J* = 8.4 Hz, 2H), 2.48-2.44 (m, 2H), 2.43 (s,

3H); ¹³C NMR (100 MHz, CDCl₃) δ: 161.3, 144.0, 137.6, 136.9, 135.2, 134.7, 130.5, 129.8, 127.8,

124.1, 114.0, 111.8, 55.3, 21.1, 21.6, 21.5; HRMS (ESI-TOF) *m/z*: C₁₈H₁₉O₃S (M + H)⁺ calcd for

315.1049, found 315.1056.

7-Methyl-3-tosyl-1,2-dihydronaphthalene (3ga): Yield: 48.3 mg, 81%; white solid, mp 108.7-



109.9 °C (uncorrected); ¹H NMR (400 MHz, CDCl₃) δ: 7.83-

7.78 (m, 3H), 7.37-7.32 (m, 2H), 7.16 (t, *J* = 7.6 Hz, 1H), 7.06 (d,

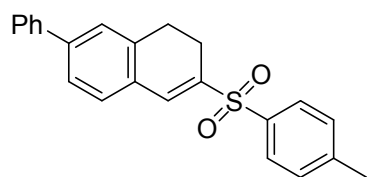
J = 7.2 Hz, 1H), 6.96 (d, *J* = 7.2 Hz, 1H), 2.81 (t, *J* = 8.0 Hz, 2H),

2.46-2.44 (m, 8H); ¹³C NMR (100 MHz, CDCl₃) δ: 144.2, 138.3, 136.7, 136.5, 135.9, 131.6, 130.0,

129.8, 129.4, 128.9, 127.9, 125.5, 28.3, 21.6, 21.4, 19.0; HRMS (ESI-TOF) *m/z*: C₁₈H₁₉O₂S (M +

H)⁺ calcd for 299.1100, found 299.1107.

7-Phenyl-3-tosyl-1,2-dihydronaphthalene (3ha): Yield: 62.7 mg, 87%; yellow oil; ¹H NMR

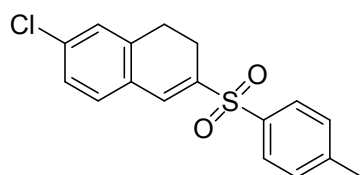


(400 MHz, CDCl₃) δ: 7.83 (s, 2H), 7.61 (s, 1H), 7.57 (s, 2H), 7.46-7.42 (m, 3H), 7.37-7.26 (m, 5H), 2.93 (t, *J* = 8.4 Hz, 2H), 2.53 (t, *J* = 8.4 Hz, 2H), 2.43 (s, 3H); ¹³C NMR (100 MHz,

CDCl₃) δ: 144.3, 143.2, 140.2, 138.2, 136.6, 136.0, 134.4, 130.1, 129.8, 129.4, 128.8, 128.0, 127.8, 127.0, 126.5, 125.8, 27.8, 21.8, 21.6; HRMS (ESI-TOF) *m/z*: C₂₃H₂₁O₂S (M + H)⁺ calcd for 361.1257, found 361.1266

7-Chloro-3-tosyl-1,2-dihydronaphthalene (3ia): Yield: 49.0 mg, 77%; white solid, mp 64.6-66.1

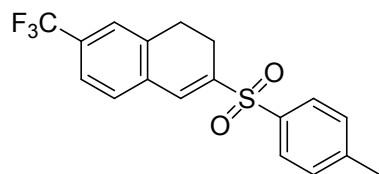
°C (uncorrected); ¹H NMR (400 MHz, CDCl₃) δ: 7.80 (d, *J* = 8.0 Hz, 2H), 7.52 (s, 1H), 7.34 (d, *J*



= 8.0 Hz, 2H), 7.22-7.17 (m, 2H), 7.12 (s, 1H), 2.84 (t, *J* = 8.0 Hz, 2H), 2.48 (t, *J* = 8.4 Hz, 2H), 2.43 (s, 3H); ¹³C NMR (100 MHz, CDCl₃) δ: 144.4, 138.8, 137.2, 136.3, 135.9, 133.5, 129.9, 129.9, 129.5, 128.0, 127.9, 127.2, 27.4, 21.6, 21.4;

HRMS (ESI-TOF) *m/z*: C₁₇H₁₆³⁵ClO₂S (M + H)⁺ calcd for 319.0554, found 319.0562.

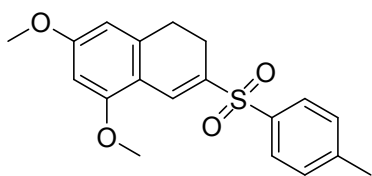
3-Tosyl-7-(trifluoromethyl)-1,2-dihydronaphthalene (3ja): Yield: 51.4 mg, 73%; white solid,



mp 74.1-76.0 °C (uncorrected); ¹H NMR (400 MHz, CDCl₃) δ: 7.81 (d, *J* = 8.4 Hz, 2H), 7.57 (s, 1H), 7.49 (d, *J* = 8.0 Hz, 1H), 7.37-7.32 (m, 4H), 2.92 (t, *J* = 8.0 Hz, 2H), 2.53 (t, *J* = 8.0 Hz, 2H), 2.44 (s, 3H); ¹³C NMR (100 MHz, CDCl₃) δ: 144.7,

141.3, 136.1, 136.0, 134.2, 133.0, 130.0, 129.9, 129.0, 128.1, 128.0, 124.5, 124.5, 124.1, 124.1, 122.4, 27.4, 21.6, 21.5; ¹⁹F NMR (282 MHz, CDCl₃) δ: -62.9 (s, 3F); HRMS (ESI-TOF) *m/z*: C₁₈H₁₆¹⁹F₃O₂S (M + H)⁺ calcd for 353.0818, found 353.0824.

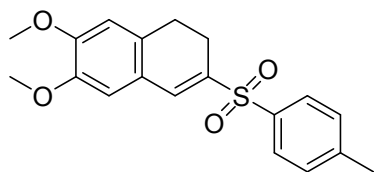
5,7-Dimethoxy-3-tosyl-1,2-dihydronaphthalene (3ka): Yield: 46.8 mg, 68%; yellow oil; ¹H



NMR (400 MHz, CDCl₃) δ: 7.93 (s, 1H), 7.79 (d, *J* = 8.4 Hz, 2H), 7.29 (t, *J* = 8.8 Hz, 2H), 6.28 (t, *J* = 8.4 Hz, 2H), 3.83 (s, 3H), 3.80 (s, 3H), 2.78 (t, *J* = 8.0 Hz, 2H), 2.44-2.40 (m, 5H); ¹³C NMR (100 MHz, CDCl₃) δ: 162.5, 158.3, 143.7, 138.7,

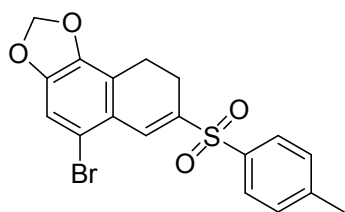
137.3, 133.2, 129.9, 129.7, 127.8, 113.5, 104.9, 96.3, 55.5, 55.4, 28.6, 21.6, 21.4; HRMS (ESI-TOF) *m/z*: C₁₉H₂₁O₄S (M + H)⁺ calcd for 345.1155, found 345.1160.

6,7-Dimethoxy-3-tosyl-1,2-dihydronaphthalene (3la): Yield: 48.9 mg, 71%; yellow oil; ¹H



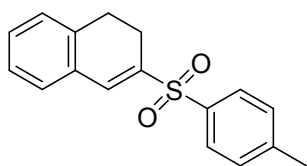
NMR (400 MHz, CDCl₃) δ: 7.80 (d, *J* = 8.4 Hz, 2H), 7.50 (s, 1H), 7.32 (d, *J* = 8.0 Hz, 2H), 6.79 (s, 1H), 6.66 (s, 1H), 3.88 (s, 6H), 2.80 (t, *J* = 8.0 Hz, 2H), 2.46 (t, *J* = 8.4 Hz, 2H), 2.43 (s, 3H); ¹³C NMR (100 MHz, CDCl₃) δ: 150.5, 147.7, 144.1, 136.9, 135.7, 134.8, 129.8, 128.9, 127.9, 123.5, 112.0, 111.0, 56.1, 56.0, 27.4, 21.7, 21.6; HRMS (ESI-TOF) *m/z*: C₁₉H₂₁O₄S (M + H)⁺ calcd for 345.1155, found 345.1160.

5-Bromo-7-tosyl-8,9-dihydronaphtho[1,2-d][1,3]dioxole (3ma): Yield: 37.4 mg, 46%; yellow



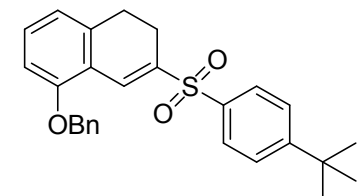
oil; ¹H NMR (400 MHz, CDCl₃) δ: 7.85 (t, *J* = 7.2 Hz, 2H), 7.37 (d, *J* = 8.0 Hz, 2H), 7.08 (s, 1H), 6.79 (s, 1H), 6.04 (s, 2H), 3.57 (t, *J* = 8.0 Hz, 2H), 2.77 (t, *J* = 8.0 Hz, 2H), 2.46 (s, 3H); ¹³C NMR (100 MHz, CDCl₃) δ: 149.3, 147.6, 144.8, 140.8, 139.7, 135.8, 130.0, 128.3, 126.3, 115.6, 113.2, 108.5, 102.3, 41.3, 30.2, 21.7; HRMS (ESI-TOF) *m/z*: C₁₈H₁₆⁸⁰BrO₄S (M + H)⁺ calcd for 406.9947, found 406.9956.

3-Tosyl-1,2-dihydronaphthalene (3na): Yield: 42.0 mg, 74%; white solid, mp 80.4-81.7 °C



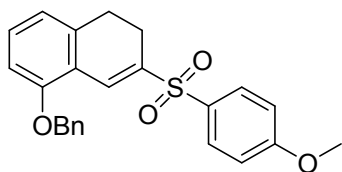
(uncorrected); ¹H NMR (400 MHz, CDCl₃) δ: 7.80 (d, *J* = 8.4 Hz, 2H), 7.57 (s, 1H), 7.33 (d, *J* = 8.4 Hz, 2H), 7.30-7.23 (m, 3H), 7.13 (d, *J* = 6.8 Hz, 1H), 2.86 (t, *J* = 8.0 Hz, 2H), 2.49 (t, *J* = 8.0 Hz, 2H), 2.43 (s, 3H); ¹³C NMR (100 MHz, CDCl₃) δ: 144.3, 138.4, 136.5, 135.5, 134.7, 131.0, 130.4, 129.8, 129.0, 128.0, 127.7, 127.1, 27.5, 21.7, 21.6; HRMS (ESI-TOF) *m/z*: C₁₇H₁₇O₂S (M + H)⁺ calcd for 285.0944, found 285.0952.

5-(Benzyloxy)-3-((4-(tert-butyl)phenyl)sulfonyl)-1,2-dihydronaphthalene (3ab): Yield: 76.9

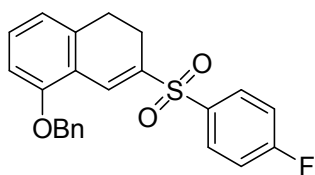


mg, 89%; yellow soli, mp 113.8-115.1 °C (uncorrected); ¹H NMR (400 MHz, CDCl₃) δ: 8.08 (s, 1H), 7.84 (d, *J* = 8.8 Hz, 2H), 7.51 (d, *J* = 8.8 Hz, 2H), 7.44-7.38 (m, 4H), 7.35-7.33 (m, 1H), 7.17 (t, *J* = 8.0 Hz, 1H), 6.78 (d, *J* = 8.4 Hz, 1H), 6.71 (d, *J* = 7.6 Hz, 1H), 5.14 (s, 2H), 2.83 (t, *J* = 8.0 Hz, 2H), 2.48 (t, *J* = 8.0 Hz, 2H), 1.32 (s, 9H); ¹³C NMR (100 MHz, CDCl₃) δ: 156.9, 155.8, 137.2, 136.9, 136.8, 136.6, 131.1, 129.5, 128.6, 127.9, 127.7, 127.1, 126.1, 120.4, 120.2, 110.7, 70.2, 35.1, 31.0, 27.9, 21.4; HRMS (ESI-TOF) *m/z*: C₂₇H₂₉O₃S (M + H)⁺ calcd for 433.1832, found 433.1837.

5-(Benzyloxy)-3-((4-methoxyphenyl)sulfonyl)-1,2-dihydronaphthalene (3ac): Yield: 69.0 mg,

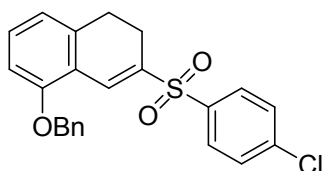


85%; yellow solid, mp 52.1-53.5 °C (uncorrected); ¹H NMR (400 MHz, CDCl₃) δ: 8.00 (s, 1H), 7.85 (d, *J* = 9.2 Hz, 2H), 7.42-7.38 (m, 4H), 7.36-7.33 (m, 1H), 7.18 (t, *J* = 8.0 Hz, 1H), 6.98 (d, *J* = 8.8 Hz, 2H), 6.78 (d, *J* = 8.4 Hz, 1H), 6.72 (d, *J* = 7.6 Hz, 1H), 5.13 (s, 2H), 3.86 (s, 3H), 2.83 (t, *J* = 8.0 Hz, 2H), 2.47 (t, *J* = 8.4 Hz, 2H); ¹³C NMR (100 MHz, CDCl₃) δ: 163.4, 155.8, 137.4, 137.2, 136.6, 131.2, 131.1, 130.2, 128.9, 128.7, 128.0, 127.1, 120.5, 120.3, 114.3, 110.7, 70.3, 55.6, 28.0, 21.3; HRMS (ESI-TOF) *m/z*: C₂₄H₂₃O₄S (M + H)⁺ calcd for 407.1312, found 407.1316.



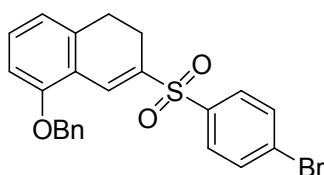
5-(Benzyloxy)-3-((4-fluorophenyl)sulfonyl)-1,2-dihydronaphthalene (3ad): Yield: 64.6 mg, 82%; colorless oil; ¹H NMR (400 MHz, CDCl₃) δ: 8.04 (s, 1H), 7.96-7.92 (m, 2H), 7.42-7.38 (m, 4H), 7.37-7.34 (m, 1H), 7.20 (t, *J* = 7.6 Hz, 3H), 6.79 (d, *J* = 8.4 Hz, 1H), 6.73 (d, *J* = 7.6 Hz, 1H), 5.14 (s, 2H), 2.84 (t, *J* = 8.4 Hz, 2H), 2.47 (t, *J* = 8.0 Hz, 2H); ¹³C NMR (100 MHz, CDCl₃) δ: 166.7, 164.2, 155.9, 137.2, 136.5, 136.5, 131.4, 130.8, 130.7, 130.0, 128.7, 128.0, 127.1, 120.3, 120.2, 116.5, 116.3, 110.7, 70.3, 27.9, 21.3; ¹⁹F NMR (282 MHz, CDCl₃): δ: -104.3 (s, 1F); HRMS (ESI-TOF) *m/z*: C₂₃H₂₀¹⁹FO₃S (M + H)⁺ calcd for 395.1112, found 395.1118.

5-(Benzyloxy)-3-((4-chlorophenyl)sulfonyl)-1,2-dihydronaphthalene (3ae): Yield: 65.6 mg,



80%; yellow oil; ¹H NMR (400 MHz, CDCl₃) δ: 8.06 (s, 1H), 7.86 (d, *J* = 8.4 Hz, 2H), 7.49 (d, *J* = 8.4 Hz, 2H), 7.42-7.37 (m, 4H), 7.36-7.34 (m, 1H), 7.20 (t, *J* = 8.0 Hz, 1H), 6.79 (d, *J* = 8.4 Hz, 1H), 6.73 (d, *J* = 7.2 Hz, 1H), 5.14 (s, 2H), 2.84 (t, *J* = 8.4 Hz, 2H), 2.47 (t, *J* = 8.0 Hz, 2H); ¹³C NMR (100 MHz, CDCl₃) δ: 156.0, 139.8, 138.4, 137.2, 136.5, 136.2, 131.5, 130.4, 129.5, 129.4, 128.7, 128.1, 127.1, 120.3, 120.2, 110.8, 70.3, 27.9, 21.3; HRMS (ESI-TOF) *m/z*: C₂₃H₂₀³⁵ClO₃S (M + H)⁺ calcd for 411.0816, found 411.0824.

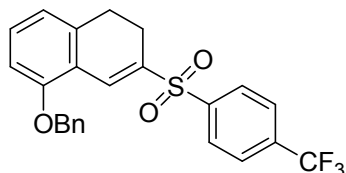
5-(Benzyloxy)-3-((4-bromophenyl)sulfonyl)-1,2-dihydronaphthalene (3af): Yield: 69.9 mg,



77%; yellow oil; ¹H NMR (400 MHz, CDCl₃) δ: 8.07 (s, 1H), 7.79 (d, *J* = 7.6 Hz, 2H), 7.66 (d, *J* = 8.8 Hz, 2H), 7.42-7.41 (m, 4H), 7.40-7.35 (m, 1H), 7.20 (t, *J* = 8.0 Hz, 1H), 6.79 (d, *J* = 8.4 Hz, 1H), 6.73 (t, *J* = 7.6 Hz, 1H), 5.14 (s, 2H), 2.83 (t, *J* = 8.0 Hz, 2H),

2.46 (t, $J = 8.0$ Hz, 2H); ^{13}C NMR (100 MHz, CDCl_3) δ : 156.0, 139.0, 137.2, 136.5, 136.1, 132.4, 131.5, 130.5, 129.5, 128.7, 128.4, 128.1, 127.1, 120.3, 120.2, 110.8, 70.3, 27.9, 21.3; HRMS (ESI-TOF) m/z : $\text{C}_{23}\text{H}_{20}^{80}\text{BrO}_3\text{S}$ ($\text{M} + \text{H}$) $^+$ calcd for 455.0311, found 455.0318.

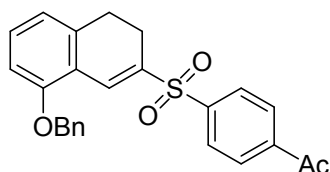
5-(Benzyloxy)-3-((4-(trifluoromethyl)phenyl)sulfonyl)-1,2-dihydronaphthalene (3ag): Yield:



63.9 mg, 72%; white solid, mp 74.7-76.3 °C (uncorrected); ^1H NMR (400 MHz, CDCl_3) δ : 8.13 (s, 1H), 8.06 (d, $J = 8.0$ Hz, 2H), 7.79 (d, $J = 8.4$ Hz, 2H), 7.43-7.36 (m, 5H), 7.21 (t, $J = 8.0$ Hz, 1H), 6.80 (d, $J = 8.4$ Hz, 1H), 6.73 (d, $J = 7.2$ Hz, 1H), 5.15 (s,

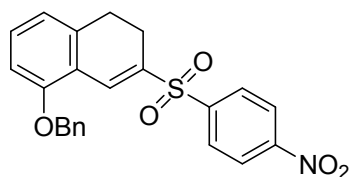
2H), 2.84 (t, $J = 8.0$ Hz, 2H), 2.47 (t, $J = 8.0$ Hz, 2H); ^{13}C NMR (100 MHz, CDCl_3) δ : 156.1, 137.3, 136.4, 135.5, 131.8, 131.5, 128.7, 128.5, 128.1, 127.2, 126.3, 126.3, 120.3, 120.1, 110.8, 70.4, 27.9, 21.4; HRMS (ESI-TOF) m/z : $\text{C}_{24}\text{H}_{20}^{19}\text{F}_3\text{O}_3\text{S}$ ($\text{M} + \text{H}$) $^+$ calcd for 445.1080, found 445.1086.

1-(4-((8-(Benzyloxy)-3,4-dihydronaphthalen-2-yl)sulfonyl)phenyl)ethanone (3ah): Yield: 58.5



mg, 70%; yellow oil; ^1H NMR (400 MHz, CDCl_3) δ : 8.21 (s, 1H), 7.91 (s, 4H), 7.43-7.39 (m, 5H), 7.31-7.26 (m, 1H), 7.03 (t, $J = 7.2$ Hz, 2H), 5.10 (s, 2H), 3.64 (t, $J = 8.0$ Hz, 2H), 2.82 (t, $J = 8.0$ Hz, 2H), 2.62 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ : 196.6, 143.2,

140.3, 139.8, 137.5, 136.2, 131.5, 128.9, 128.7, 128.6, 128.5, 128.3, 127.5, 122.1, 121.0, 112.3, 70.4, 41.5, 30.7, 26.9; HRMS (ESI-TOF) m/z : $\text{C}_{25}\text{H}_{23}\text{O}_4\text{S}$ ($\text{M} + \text{H}$) $^+$ calcd for 419.1312, found 419.1317.



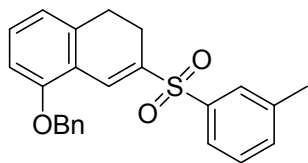
5-(Benzyloxy)-3-((4-nitrophenyl)sulfonyl)-1,2-

dihydronaphthalene (3ai): Yield: 53.1 mg, 63%; yellow oil;

^1H NMR (400 MHz, CDCl_3) δ : 8.36 (d, $J = 9.2$ Hz, 2H), 8.14-8.11 (m, 3H), 7.43-7.38 (m, 4H), 7.37-7.35 (m, 1H), 7.22 (t, $J = 8.0$ Hz, 1H), 6.81 (d, $J = 8.4$ Hz, 1H), 6.74 (d, $J = 7.6$ Hz, 1H), 5.15 (s, 2H), 2.85 (t, $J = 8.0$ Hz, 2H), 2.48 (t, $J = 7.6$ Hz, 2H); ^{13}C NMR (100 MHz, CDCl_3) δ : 156.2, 150.4, 145.9, 137.3, 136.3, 135.0, 132.2, 132.1, 129.2, 128.7, 128.2, 127.2, 124.4, 120.3, 119.9, 110.9, 70.4, 27.8, 21.3; HRMS (ESI-TOF) m/z : $\text{C}_{23}\text{H}_{20}\text{NO}_5\text{S}$ ($\text{M} + \text{H}$) $^+$ calcd for 422.1057, found 422.1064.

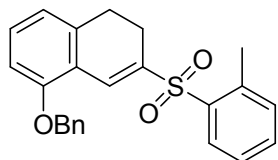
5-(Benzyloxy)-3-(*m*-tolylsulfonyl)-1,2-dihydronaphthalene (3aj): Yield: 60.9 mg, 78%; yellow oil; ^1H NMR (400 MHz, CDCl_3) δ : 8.05 (s, 1H), 7.73-7.71 (m, 2H), 7.43-7.37 (m, 6H), 7.35-7.32

(m, 1H), 7.18 (t, $J = 8.0$ Hz, 1H), 6.79 (d, $J = 8.4$ Hz, 1H), 6.72 (d, $J = 7.6$ Hz, 1H), 5.13 (s, 2H), 2.82 (t, $J = 8.4$ Hz, 2H), 2.50-2.46 (m, 2H), 2.41 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ : 155.9, 139.7, 139.3, 137.3, 136.9, 136.6, 133.9, 131.2, 129.7, 128.9, 128.6, 128.2, 128.0, 127.1, 125.1, 120.4, 120.3, 110.8, 70.3, 27.9, 21.4, 21.3; HRMS (ESI-TOF) m/z : $\text{C}_{24}\text{H}_{23}\text{O}_3\text{S}$ ($\text{M} + \text{H}$) $^+$ calcd for 391.1362, found 391.1368.

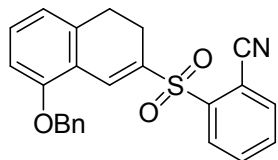


5-(Benzyloxy)-3-(*o*-tolylsulfonyl)-1,2-dihydronaphthalene (3ak):

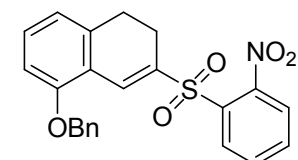
Yield: 56.2 mg, 72%; white oil; ^1H NMR (400 MHz, CDCl_3) δ : 8.10 (d, $J = 7.2$ Hz, 1H), 8.06 (s, 1H), 7.48 (t, $J = 7.2$ Hz, 1H), 7.42-7.35 (m, 6H), 7.31 (d, $J = 7.6$ Hz, 1H), 7.17 (d, $J = 7.6$ Hz, 1H), 7.03 (t, $J = 8.0$ Hz, 2H), 5.08 (s, 2H), 3.55 (t, $J = 8.0$ Hz, 2H), 2.78 (t, $J = 8.0$ Hz, 2H), 2.36 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ : 156.7, 138.7, 137.9, 137.3, 136.1, 135.8, 133.7, 132.8, 131.2, 130.4, 128.8, 128.6, 128.2, 127.7, 126.5, 122.4, 121.0, 112.2, 70.4, 41.7, 30.4, 19.9; HRMS (ESI-TOF) m/z : $\text{C}_{24}\text{H}_{23}\text{O}_3\text{S}$ ($\text{M} + \text{H}$) $^+$ calcd for 391.1362, found 391.1368.



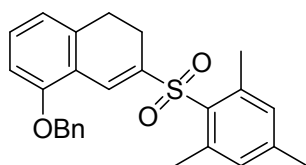
2-((8-(Benzyloxy)-3,4-dihydronaphthalen-2-yl)sulfonyl)benzonitrile (3al): Yield: 57.0 mg, 71%; yellow oil; ^1H NMR (400 MHz, CDCl_3) δ : 8.30 (s, 1H), 8.20 (d, $J = 7.6$ Hz, 1H), 7.76-7.68 (m, 3H), 7.38-7.32 (m, 6H), 7.00-6.97 (m, 2H), 5.11 (s, 2H), 3.61 (t, $J = 8.0$ Hz, 2H), 2.90 (t, $J = 8.0$ Hz, 2H); ^{13}C NMR (100 MHz, CDCl_3) δ : 156.5, 141.3, 141.1, 136.3, 135.9, 135.6, 133.4, 132.9, 131.5, 130.5, 129.2, 128.6, 128.0, 127.3, 122.0, 121.0, 115.3, 112.8, 111.6, 70.4, 41.2, 30.7; HRMS (ESI-TOF) m/z : $\text{C}_{24}\text{H}_{20}\text{NO}_3\text{S}$ ($\text{M} + \text{H}$) $^+$ calcd for 402.1158, found 402.1166.



5-(Benzyloxy)-3-((2-nitrophenyl)sulfonyl)-1,2-dihydronaphthalene (3am): Yield: 37.9 mg, 45%; yellow oil; ^1H NMR (400 MHz, CDCl_3) δ : 8.18 (d, $J = 8.0$ Hz, 1H), 7.99 (s, 1H), 7.72-7.71 (m, 2H), 7.66-7.63 (m, 1H), 7.40-7.33 (m, 6H), 7.06-6.98 (m, 2H), 5.10 (s, 2H), 3.68 (t, $J = 8.0$ Hz, 2H), 3.05 (t, $J = 7.2$ Hz, 2H); ^{13}C NMR (100 MHz, CDCl_3) δ : 156.8, 148.7, 138.7, 137.5, 136.3, 134.6, 132.4, 132.2, 132.1, 131.6, 128.9, 128.6, 128.0, 127.3, 124.9, 122.0, 121.0, 112.6, 70.4, 41.4, 30.5; HRMS (ESI-TOF) m/z : $\text{C}_{23}\text{H}_{20}\text{NO}_5\text{S}$ ($\text{M} + \text{H}$) $^+$ calcd for 422.1057, found 422.1064.

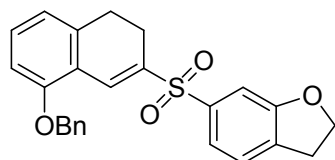


5-(Benzyloxy)-3-(mesitylsulfonyl)-1,2-dihydronaphthalene (3an): Yield: 53.5 mg, 64%; yellow oil; ^1H NMR (400 MHz, CDCl_3) δ : 7.80 (s, 1H), 7.40-7.36 (m, 5H), 7.28 (t, $J = 7.6$ Hz, 1H), 7.03-



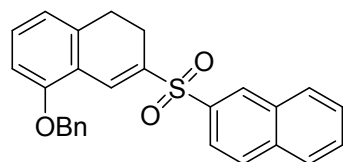
6.98 (m, 2H), 6.87 (s, 2H), 5.04 (s, 2H), 3.61 (t, $J = 8.0$ Hz, 2H), 2.86 (t, $J = 8.4$ Hz, 2H), 2.52 (s, 6H), 2.28 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ : 156.6, 143.3, 140.8, 139.0, 136.1, 134.9, 132.3, 131.1, 130.9, 128.7, 128.6, 121.1, 127.7, 122.4, 120.9, 112.1, 70.4, 41.9, 30.1, 22.6, 21.0; HRMS (ESI-TOF) m/z : $\text{C}_{26}\text{H}_{27}\text{O}_3\text{S}$ ($\text{M} + \text{H}$) $^+$ calcd for 419.1675, found 419.1675.

6-((8-(Benzyloxy)-3,4-dihydronaphthalen-2-yl)sulfonyl)-2,3-dihydrobenzofuran (3ao): Yield:



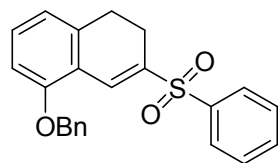
53.4 mg, 65%; yellow oil; ^1H NMR (400 MHz, CDCl_3) δ : 7.99 (s, 1H), 7.72-7.71 (m, 2H), 7.41-7.38 (m, 4H), 7.36-7.34 (m, 1H), 7.18 (t, $J = 8.0$ Hz, 1H), 6.85 (d, $J = 8.8$ Hz, 1H), 6.78 (d, $J = 8.4$ Hz, 1H), 6.73 (d, $J = 7.2$ Hz, 1H), 5.13 (s, 2H), 4.66 (t, $J = 8.8$ Hz, 2H), 3.24 (t, $J = 7.2$ Hz, 2H), 2.82 (d, $J = 8.8$ Hz, 2H), 2.48 (t, $J = 8.0$ Hz, 2H); ^{13}C NMR (100 MHz, CDCl_3) δ : 164.3, 155.8, 137.5, 137.2, 136.6, 131.1, 131.0, 129.8, 128.7, 128.6, 128.5, 128.0, 127.1 (2C), 125.2, 120.3, 110.7, 109.6, 72.3, 70.2, 29.0, 28.0, 21.3; (HRMS (ESI-TOF) m/z : $\text{C}_{25}\text{H}_{23}\text{O}_4\text{S}$ ($\text{M} + \text{H}$) $^+$ calcd for 419.1312, found 419.1317.

2-((8-(Benzyloxy)-3,4-dihydronaphthalen-2-yl)sulfonyl)naphthalene (3ap): Yield: 67.3 mg,



79%; green solid, mp 155.4-156.7 $^{\circ}\text{C}$ (uncorrected); ^1H NMR (400 MHz, CDCl_3) δ : 8.03 (d, $J = 8.8$ Hz, 1H), 7.99-7.96 (m, 2H), 7.92-7.87 (m, 2H), 7.62-7.59 (m, 2H), 7.37-7.32 (m, 4H), 7.28 (t, $J = 7.6$ Hz, 2H), 7.22 (d, $J = 7.2$ Hz, 1H), 7.04-6.98 (m, 2H), 5.13 (s, 2H), 3.51 (t, $J = 6.8$ Hz, 2H), 3.42 (t, $J = 6.4$ Hz, 2H); ^{13}C NMR (100 MHz, CDCl_3) δ : 155.9, 137.3, 136.6, 136.6, 136.5, 135.1, 132.2, 131.3, 130.1, 129.5, 129.5, 129.3, 129.0, 128.7, 128.0, 127.9, 127.5, 127.1, 122.9, 120.4, 120.3, 110.7, 70.3, 27.9, 21.4; HRMS (ESI-TOF) m/z : $\text{C}_{27}\text{H}_{23}\text{O}_3\text{S}$ ($\text{M} + \text{H}$) $^+$ calcd for 427.1362, found 427.1369.

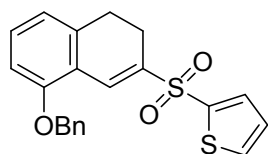
5-(Benzyloxy)-3-(phenylsulfonyl)-1,2-dihydronaphthalene (3aq): Yield: 64.7 mg, 86%; yellow



solid, mp 105.0-156.6 $^{\circ}\text{C}$ (uncorrected); ^1H NMR (400 MHz, CDCl_3) δ : 8.07 (s, 1H), 7.93 (d, $J = 8.0$ Hz, 2H), 7.59 (d, $J = 7.2$ Hz, 1H), 7.52 (t, $J = 7.2$ Hz, 2H), 7.43-7.36 (m, 4H), 7.35-7.32 (m, 1H), 7.18 (t, $J = 8.0$ Hz, 2H), 6.79 (d, $J = 8.4$ Hz, 1H), 6.72 (d, $J = 7.6$ Hz, 1H), 5.14 (s, 2H), 2.82 (t, $J = 8.0$ Hz, 2H), 2.50-2.45 (m, 2H); ^{13}C NMR (100 MHz, CDCl_3) δ : 155.9, 139.8, 137.2, 136.6, 136.5, 133.1, 131.3, 129.9, 129.1, 128.7, 128.0, 127.9, 127.1, 120.3, 120.3, 110.7, 70.3,

27.9, 21.3; HRMS (ESI-TOF) m/z : $C_{23}H_{21}O_3S$ ($M + H$)⁺ calcd for 377.1206, found 377.1211.

2-((8-(Benzyloxy)-3,4-dihydronaphthalen-2-yl)sulfonyl)thiophene (3ar): Yield: 50.4 mg, 66%;



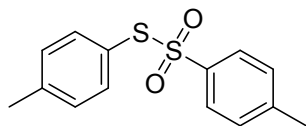
yellow solid, mp 83.4-85.1 °C (uncorrected); ¹H NMR (400 MHz, CDCl₃) δ: 8.16 (s, 1H), 7.63-7.62 (m, 2H), 7.40-7.35 (m, 5H), 7.31 (d, $J = 7.2$ Hz, 2H), 7.05-7.01 (m, 3H), 5.10 (s, 2H), 3.66 (t, $J = 8.0$ Hz,

2H), 2.97 (t, $J = 8.0$ Hz, 2H); ¹³C NMR (100 MHz, CDCl₃) δ: 156.7, 140.7, 138.9, 137.9, 136.3,

134.1, 131.3, 128.7, 128.6, 128.4, 128.1, 127.8, 127.3, 122.3, 121.0, 112.4, 70.3, 41.7, 30.7;

HRMS (ESI-TOF) m/z : $C_{21}H_{19}O_3S_2$ ($M + H$)⁺ calcd for 383.0770, found 383.0775.

S-*p*-tolyl 4-methylbenzenesulfonothioate (4): yield: 11.7 mg, 21%; ¹H NMR (400 MHz, CDCl₃)



δ: 7.46 (d, $J = 8.4$ Hz, 2H), 7.25-7.21 (m, 4H), 7.14 (d, $J = 8.0$ Hz, 2H), 2.43 (s, 3H), 2.38 (s, 3H); ¹³C NMR (100 MHz, CDCl₃) δ:

144.6, 142.0, 140.4, 136.5, 130.2, 129.3, 127.6, 124.5, 21.7, 21.5;

HRMS (ESI-TOF) m/z : $C_{14}H_{15}O_2S_2$ ($M + H$)⁺ calcd for 279.0508, found 279.0516.

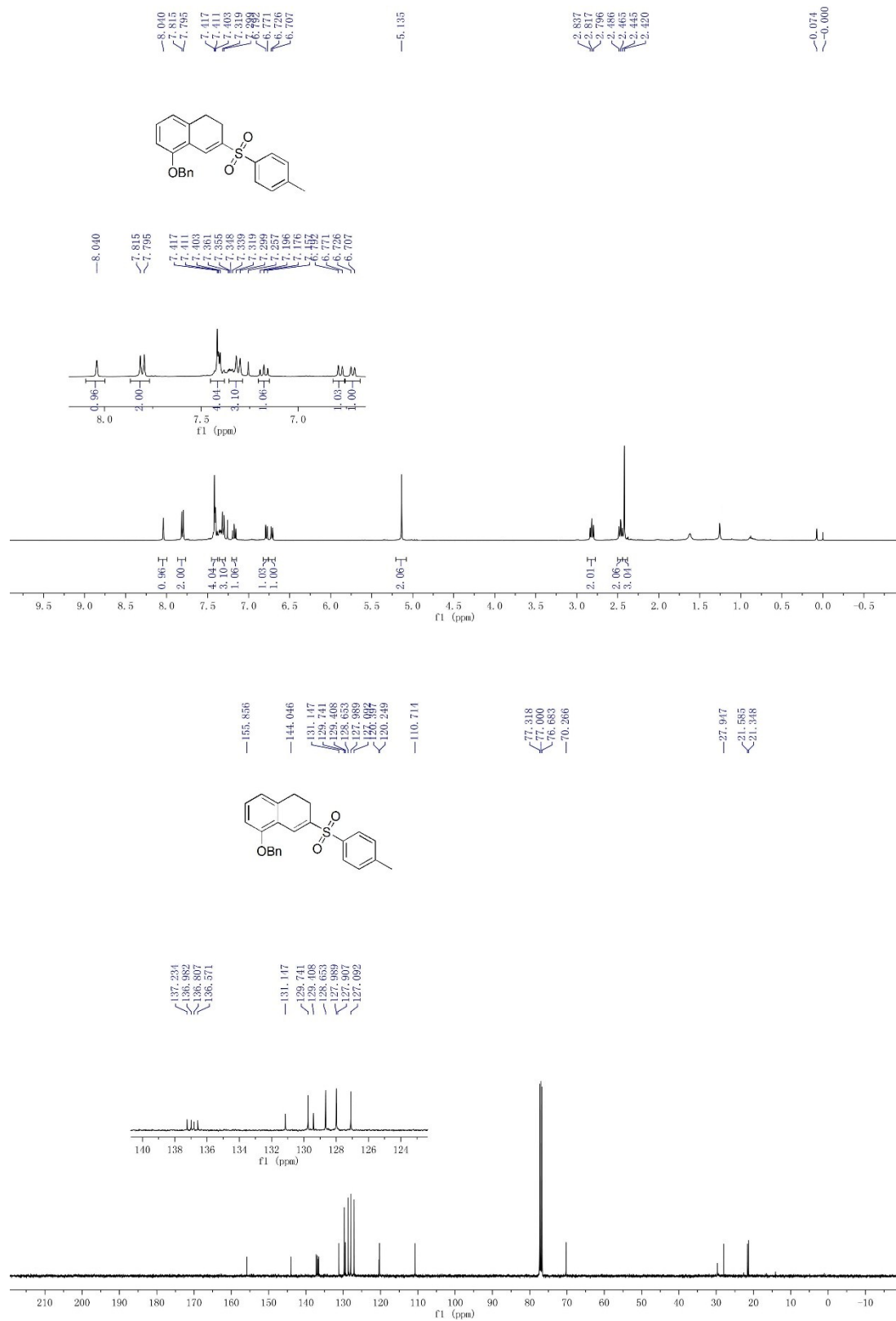
4. References

[1] Zhu, Z.-Z.; Chen, K.; Yu, L.-Z.; Tang, X.-Y.; Shi, M. *Org. Lett.* **2015**, *17*, 5994–5997.

[2] Liu, Y.; Wang, Q. L.; Zhou, C. S.; Xiong, B. Q.; Zhang, P. L.; Yang, C. A.; Tang, K. W. *J. Org. Chem.* **2017**, *82*, 7394–7401.

[3] Liu, Y.; Wang, Q. L.; Zhou, C. S.; Xiong, B. Q.; Zhang, P. L.; Yang, C. A.; Tang, K. W. *J. Org. Chem.* **2018**, *83*, 4657–4664.

5-(Benzyloxy)-3-tosyl-1,2-dihydronaphthalene (3aa)



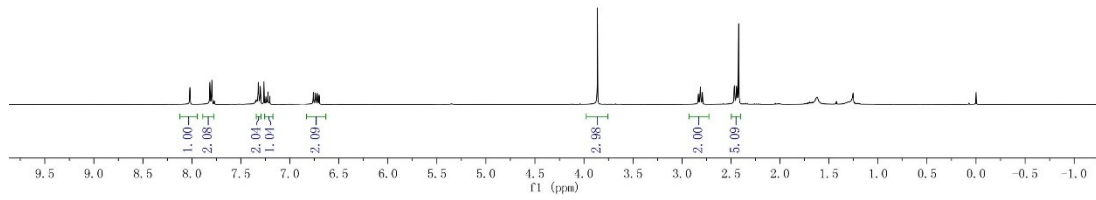
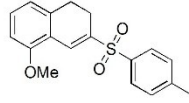
5-Methoxy-3-tosyl-1,2-dihydronaphthalene (3ba)

8.019
7.816
7.795
7.321
7.301
7.284
7.224
6.760
6.739
6.720
6.702

3.862

2.833
2.813
2.791
2.466
2.443
2.422

0.072
0.000

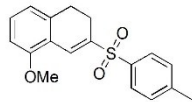


156.787
143.999
137.079
136.853
136.609
131.255
129.746
129.627
128.627
126.664
119.925
108.110

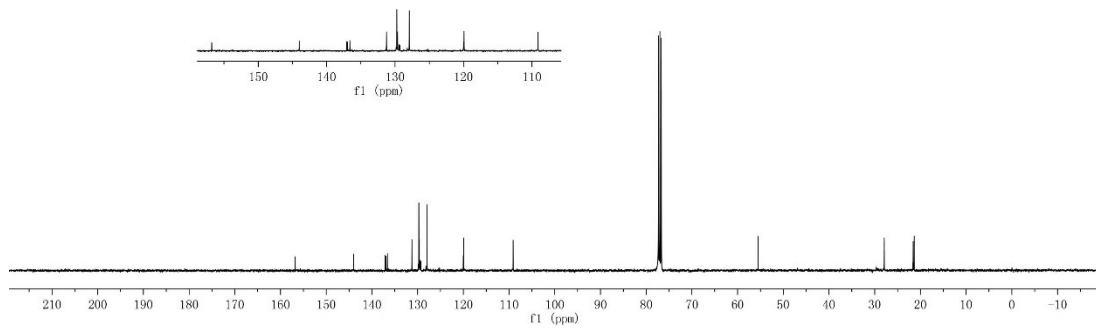
77.318
77.000
76.683

55.510

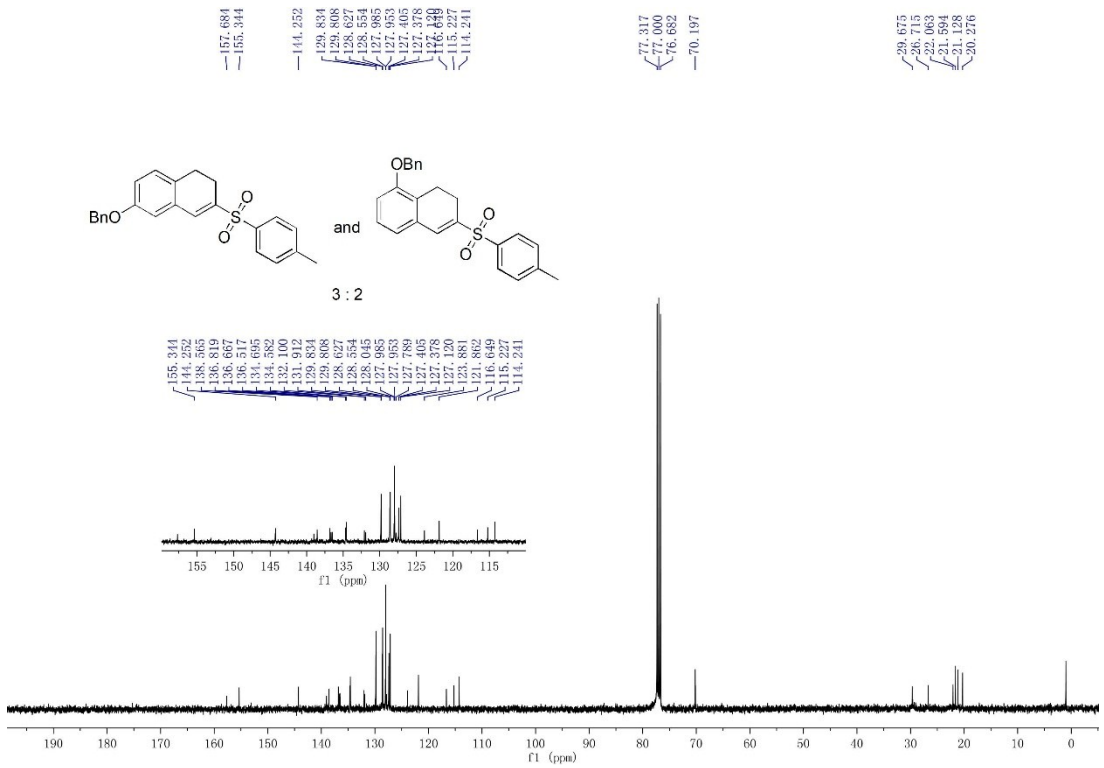
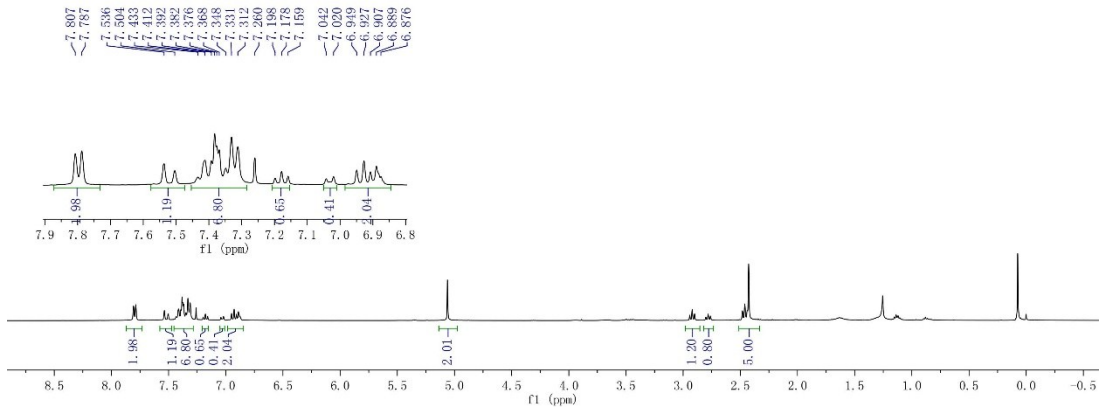
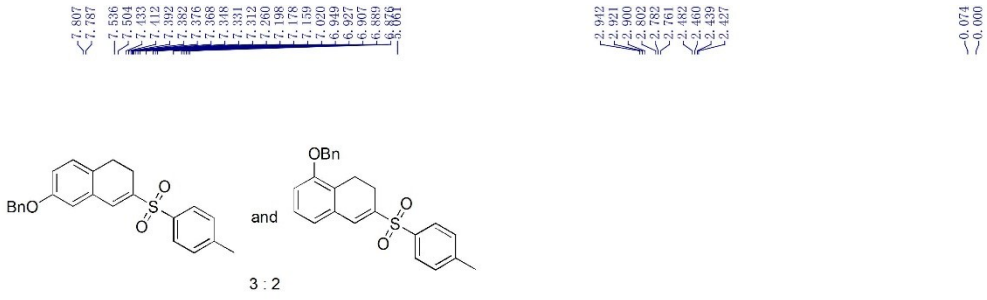
27.906
21.579
21.361



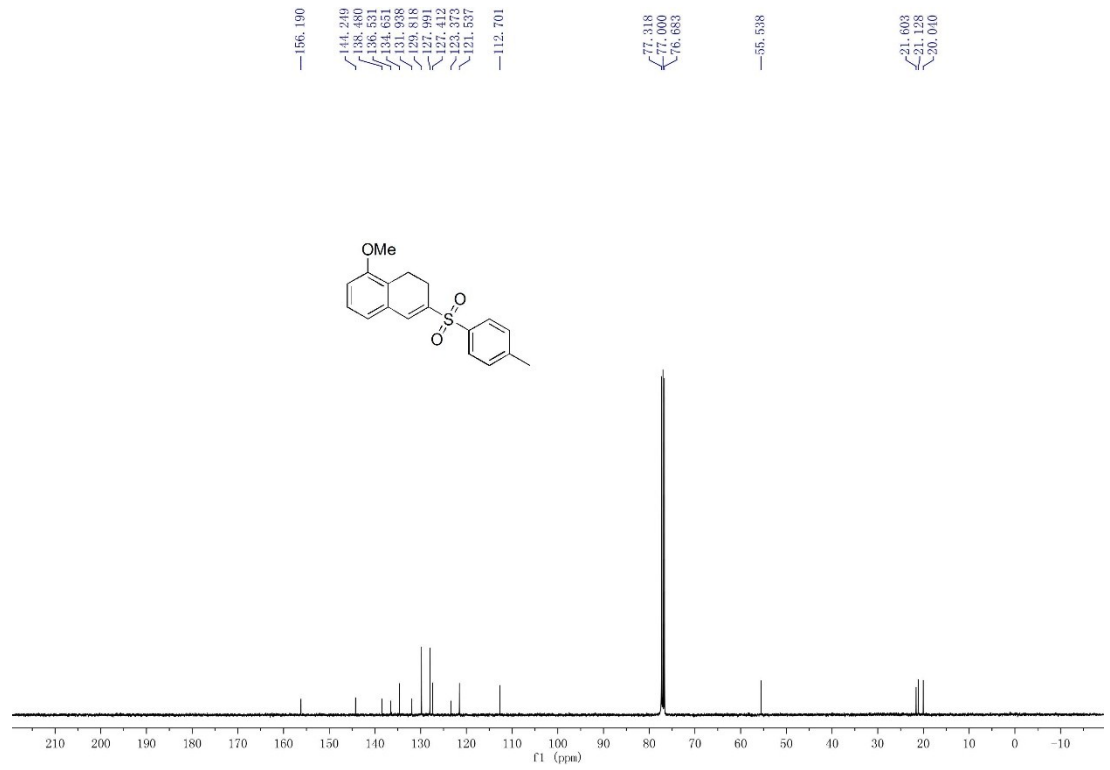
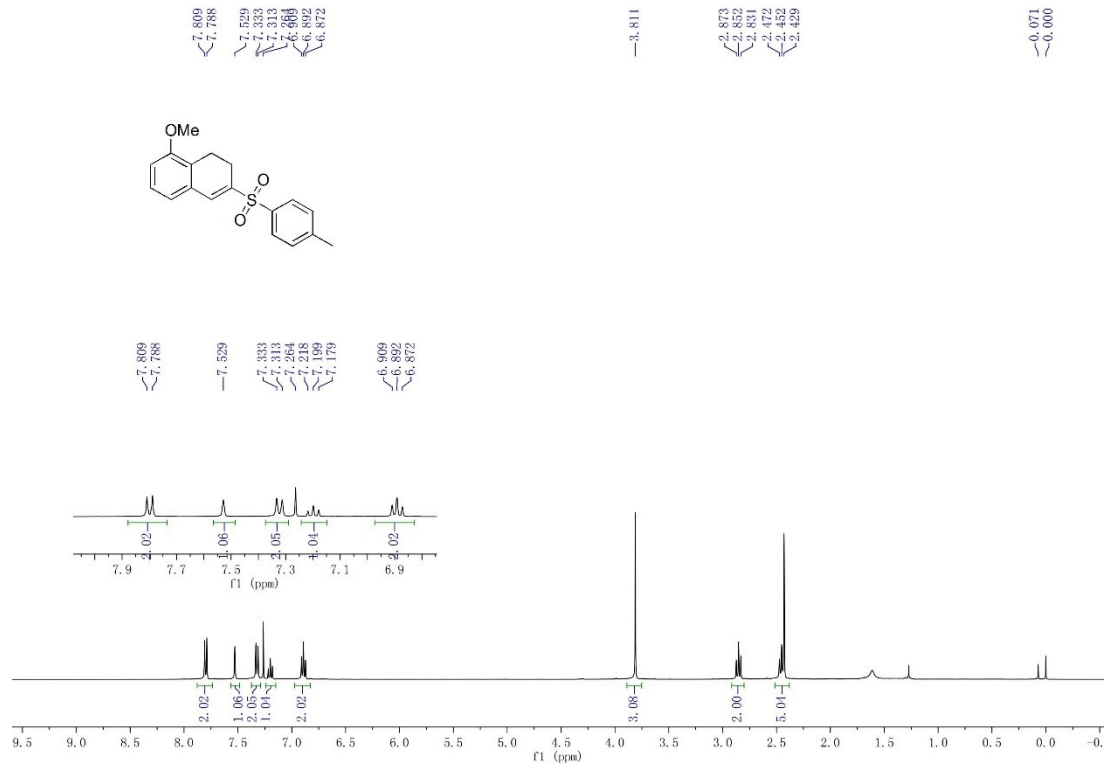
156.787
143.999
137.079
136.853
136.609
131.255
129.746
129.627
128.627
126.664
119.925
108.110



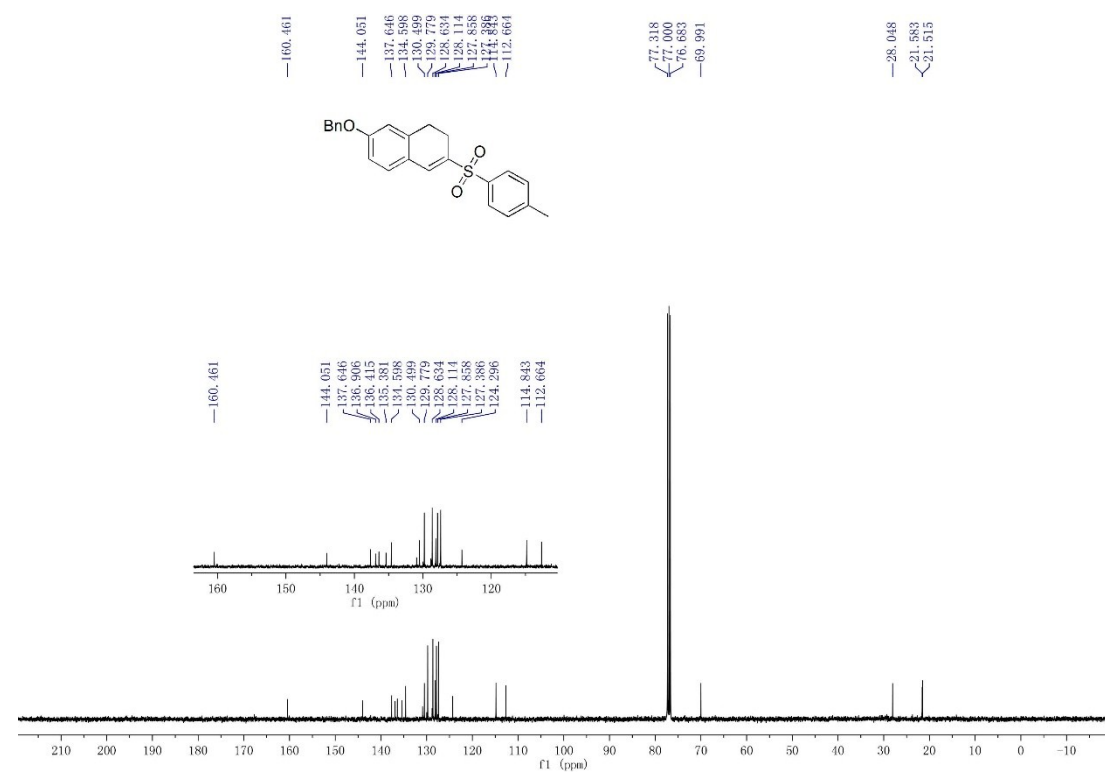
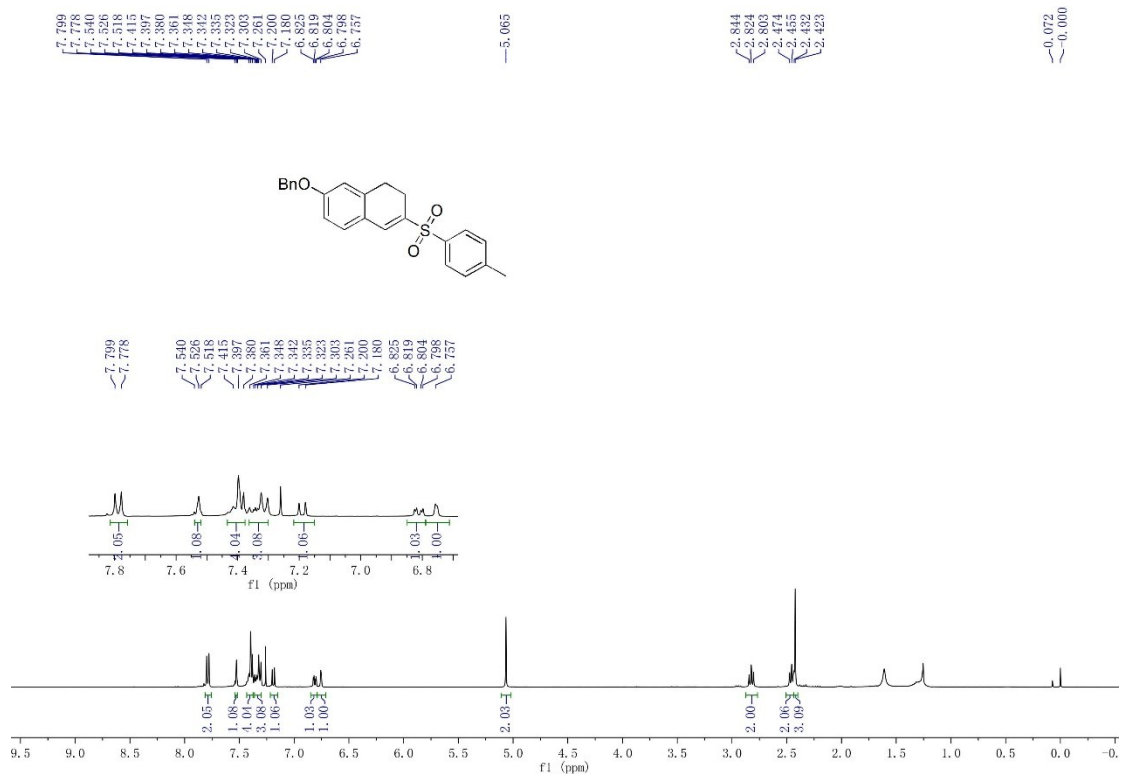
6-(Benzyloxy)-3-tosyl-1,2-dihydronaphthalene (3ca)



6-Methoxy-3-tosyl-1,2-dihydronaphthalene (3da)



7-(Benzyloxy)-3-tosyl-1,2-dihydronaphthalene yellow solid (3ea)



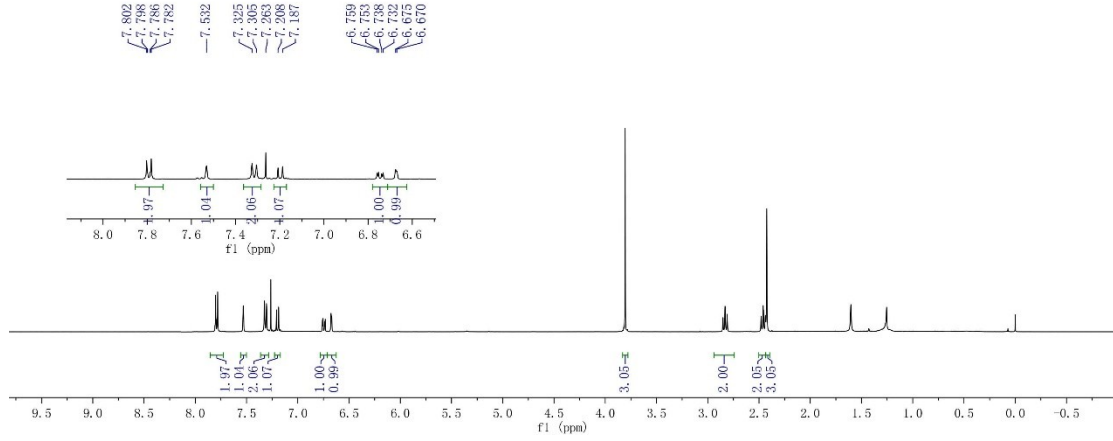
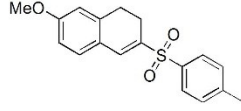
7-Methoxy-3-tosyl-1,2-dihydronaphthalene (3fa)

7.802
7.798
7.786
7.782
7.532
7.325
7.305
7.263
7.187
6.759
6.753
6.738
6.732
6.675
6.670

— 3.806

2.852
2.832
2.810
2.481
2.477
2.459
2.456
2.439
2.436
2.425

< 0.072
< 0.000

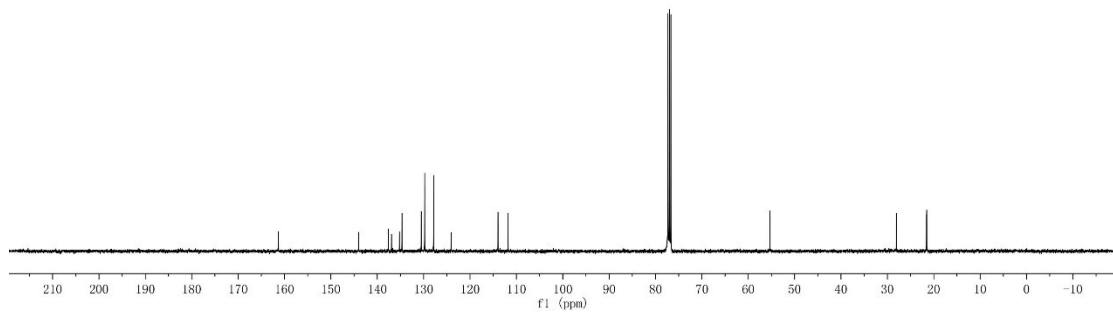
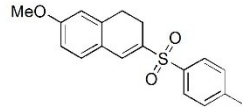


161.309
144.039
137.636
136.915
135.202
134.656
130.504
129.772
127.814
124.056
113.961
111.785

77.318
77.000
76.683

55.335

28.058
21.573
21.523

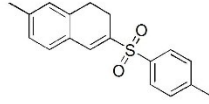


7-Methyl-3-tosyl-1,2-dihydronaphthalene (3ga)

7.895
7.817
7.797
7.782
7.566
7.517
7.317
7.262
7.175
7.156
7.137
7.089
7.050
6.907
6.949

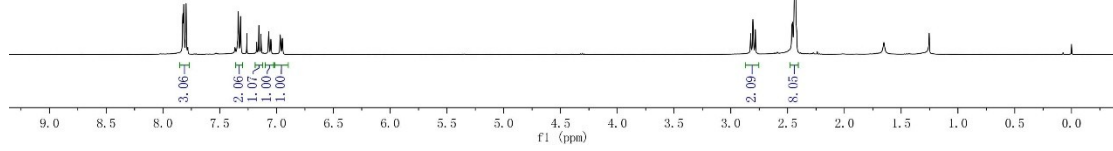
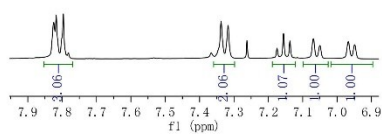
2.895
2.885
2.784
2.460
2.456
2.455

0.075
-0.000



7.825
7.797
7.782

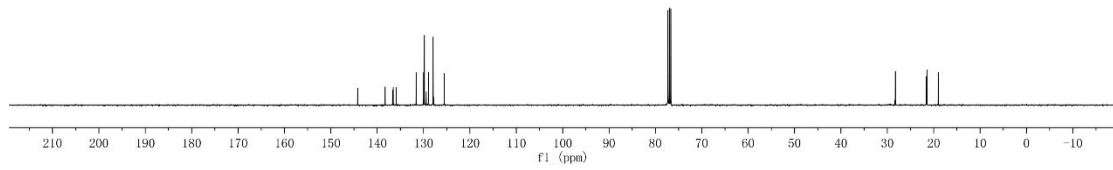
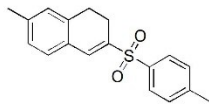
7.366
7.337
7.317
7.262
7.175
7.156
7.137
7.089
7.050
6.949



144.208
138.281
136.660
136.535
135.883
131.386
129.896
129.813
129.813
128.844
127.837
125.521

77.318
77.000
76.682

28.260
21.584
21.438
19.000

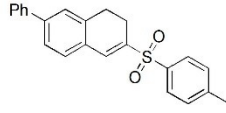


7-Phenyl-3-tosyl-1,2-dihydronaphthalene (3ha)

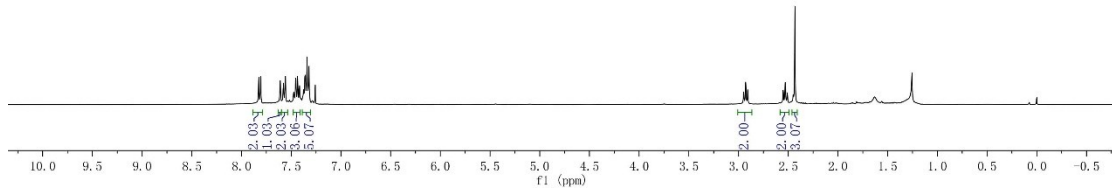
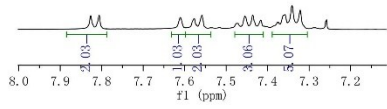
7.826
7.810
7.578
7.576
7.478
7.453
7.453
7.438
7.416
7.374
7.371
7.361
7.341
7.321
7.260
7.258

2.949
2.928
2.907
2.531
2.510
2.533

0.076
0.000



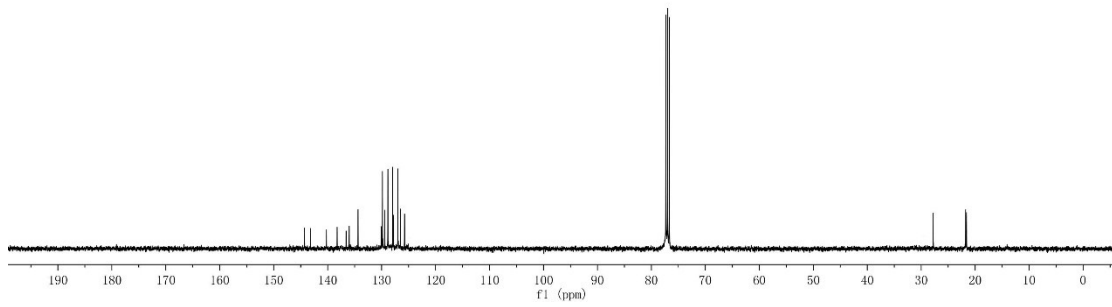
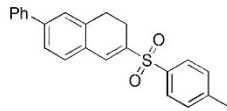
7.826
7.610
7.578
7.576
7.455
7.453
7.416
7.376
7.374
7.361
7.341
7.321
7.260
7.258



144.284
143.198
138.244
138.244
136.586
135.994
134.367
130.066
129.848
129.392
127.626
127.792
126.881
126.526
125.755

77.318
77.000
76.683

27.782
21.767
21.583



7-Chloro-3-tosyl-1,2-dihydronaphthalene (3ia)

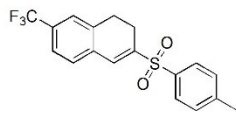


3-Tosyl-7-(trifluoromethyl)-1,2-dihydronaphthalene (3ja)

7.820
7.799
7.730
7.480
7.373
7.359
7.320
7.264

2.939
2.898
2.554
2.535
2.513
2.443

0.073
0.000



7.820
7.799

7.571

7.500
7.480

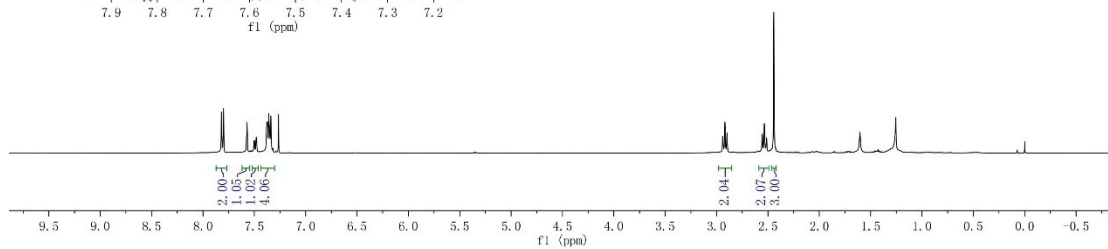
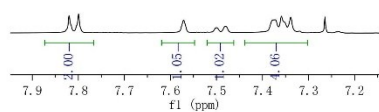
7.373

7.359

7.339

7.320

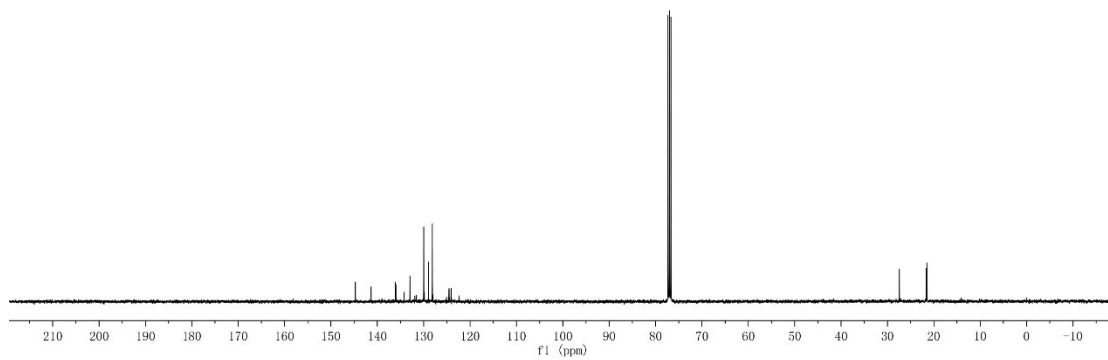
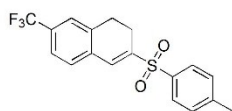
7.264

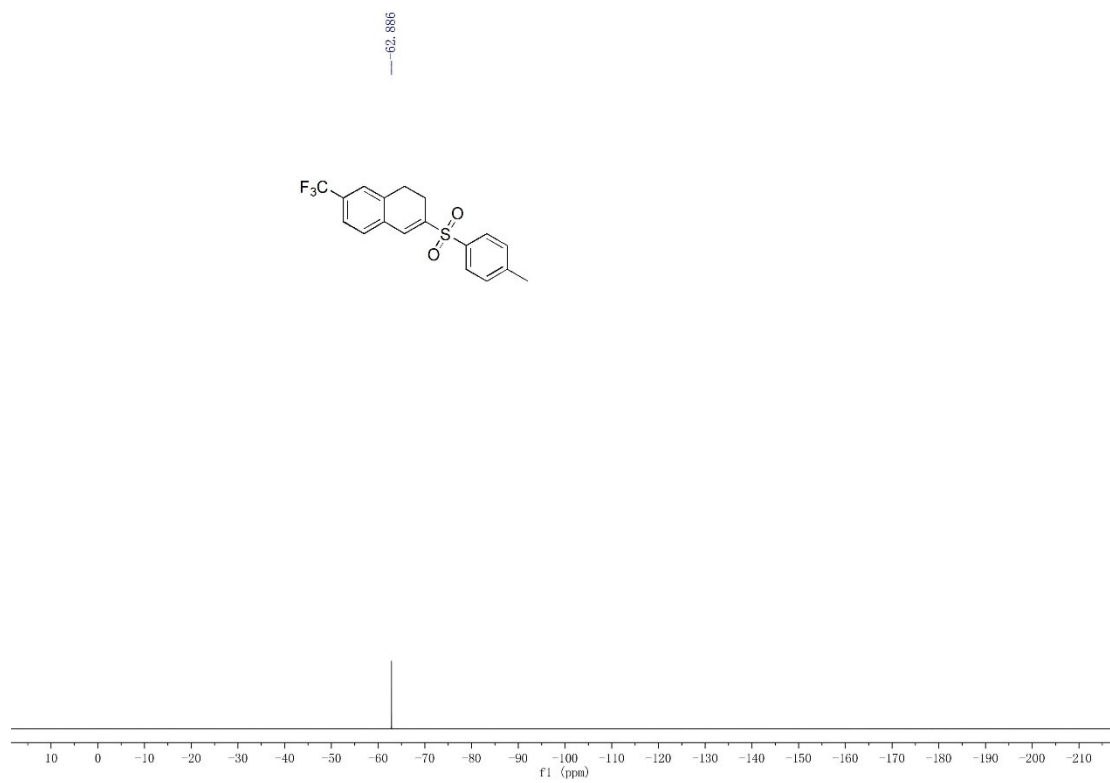


144.719
141.330
136.112
135.981
135.860
132.866
129.989
129.850
128.963
128.124
128.021
124.948
124.702
124.054
122.364

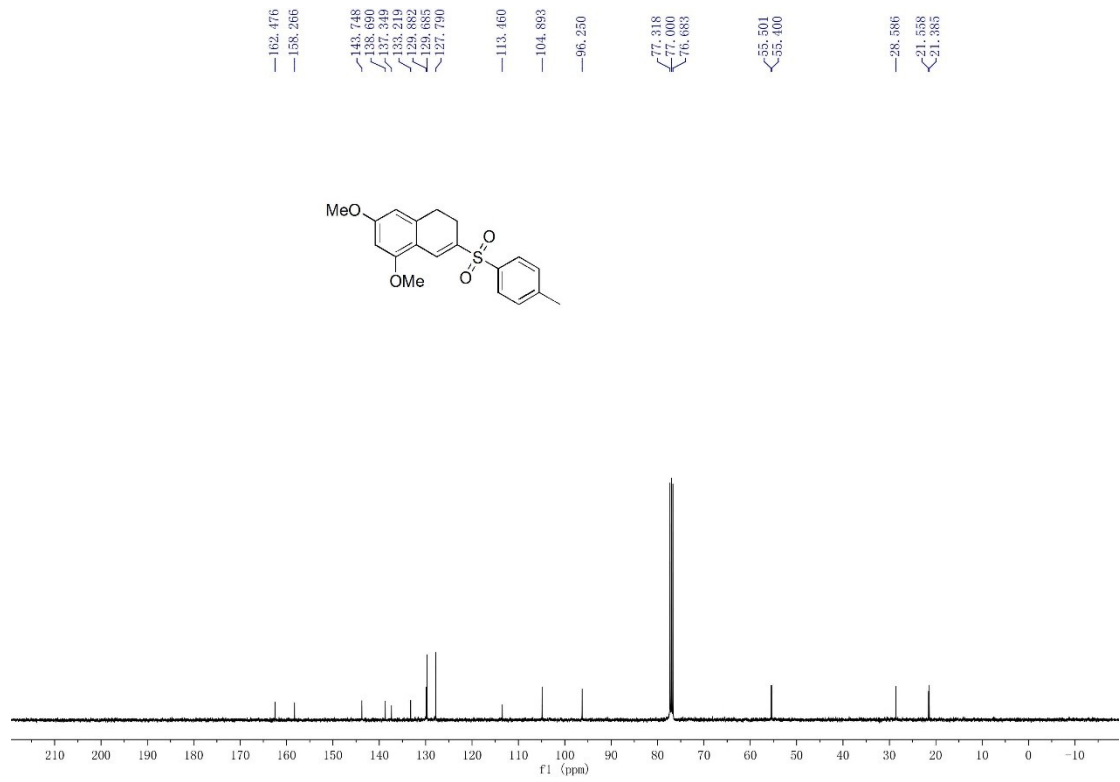
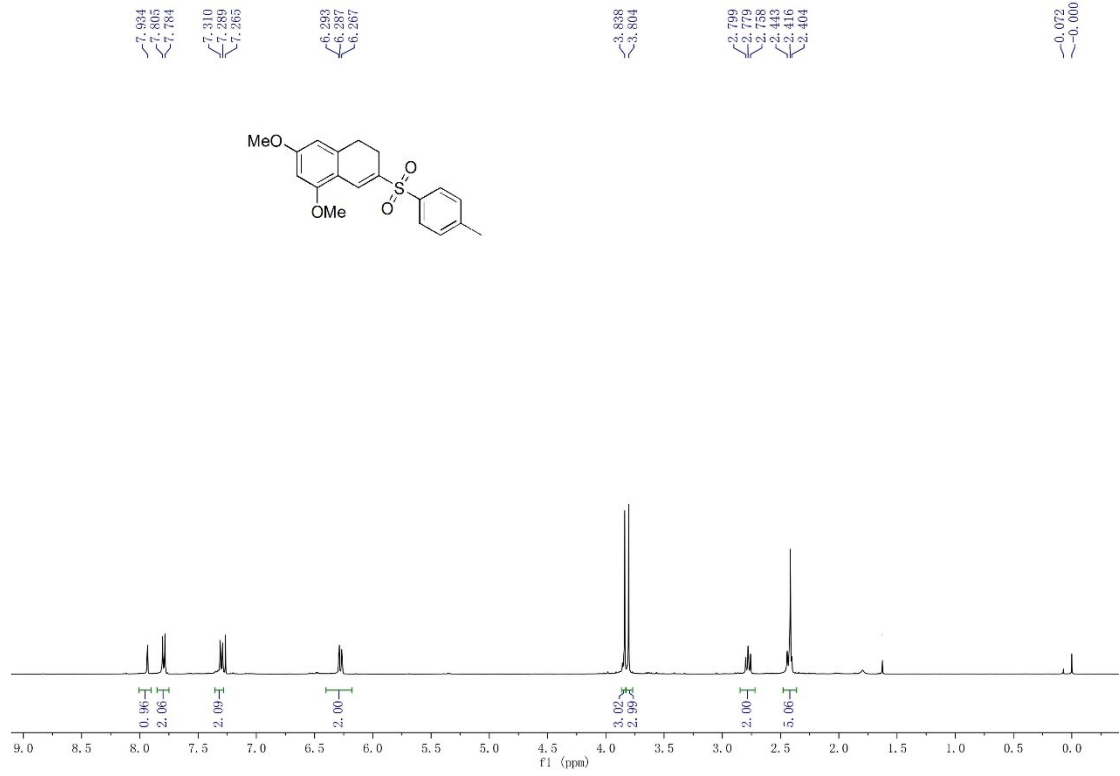
77.318
77.000
76.683

27.431
21.632
21.501





5,7-Dimethoxy-3-tosyl-1,2-dihydronaphthalene (3ka)



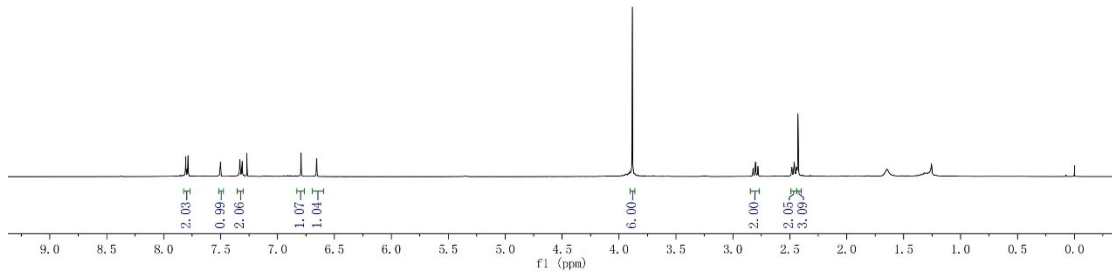
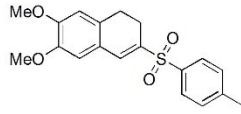
6,7-Dimethoxy-3-tosyl-1,2-dihydronaphthalene (3la)

7.807
7.786
7.501
7.331
7.311
7.288
6.793
6.656

3.883

2.822
2.780
2.481
2.460
2.439
2.428

0.073
0.000

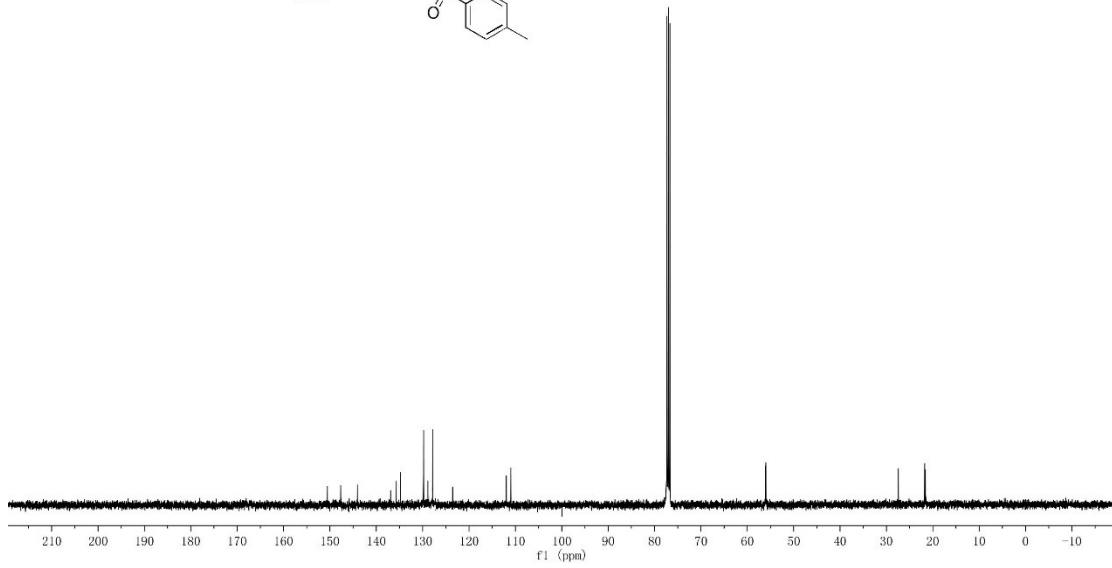
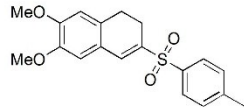


150.530
147.677
144.075
136.904
135.671
134.766
129.870
127.875
127.865
123.548
111.853
110.364

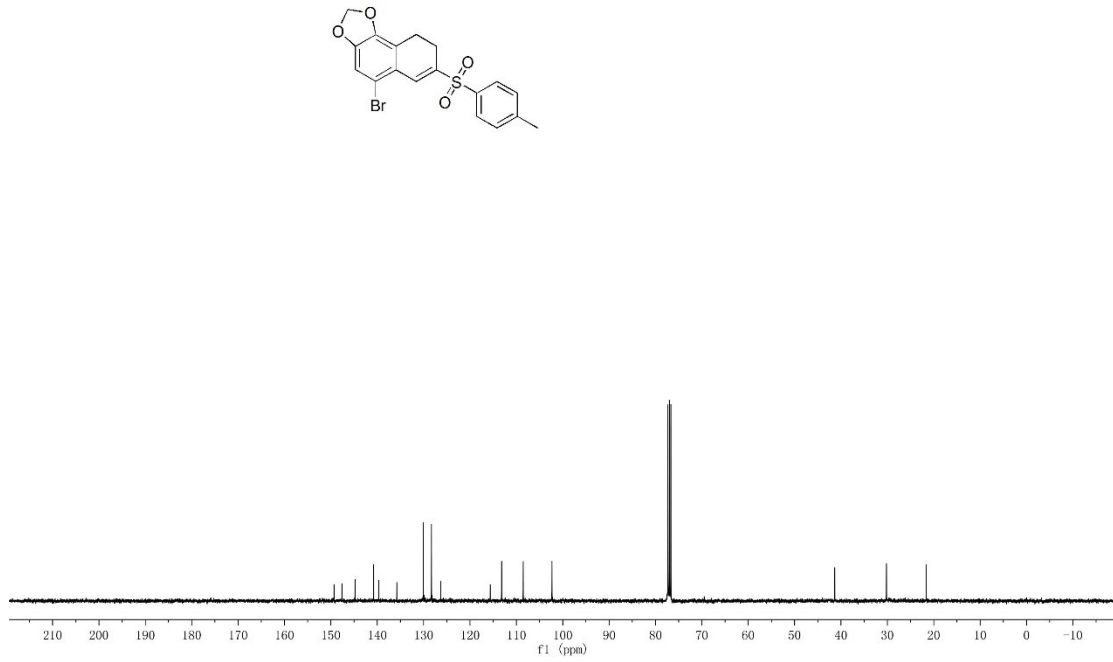
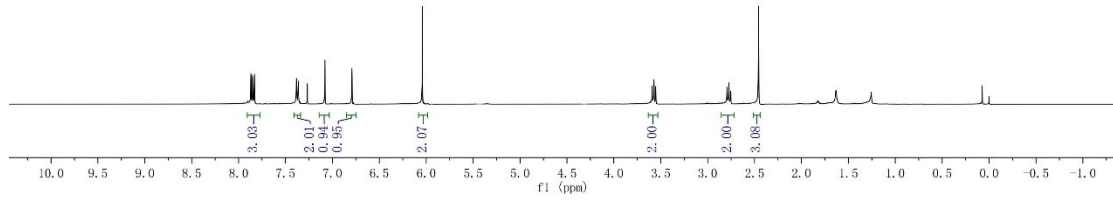
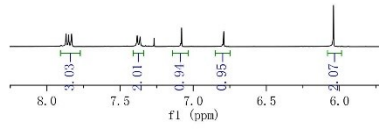
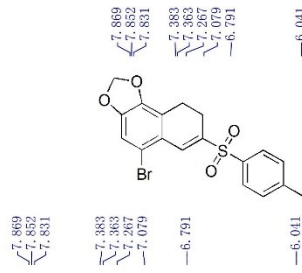
77.318
77.000
76.683

56.078
55.997

27.498
21.740
21.587



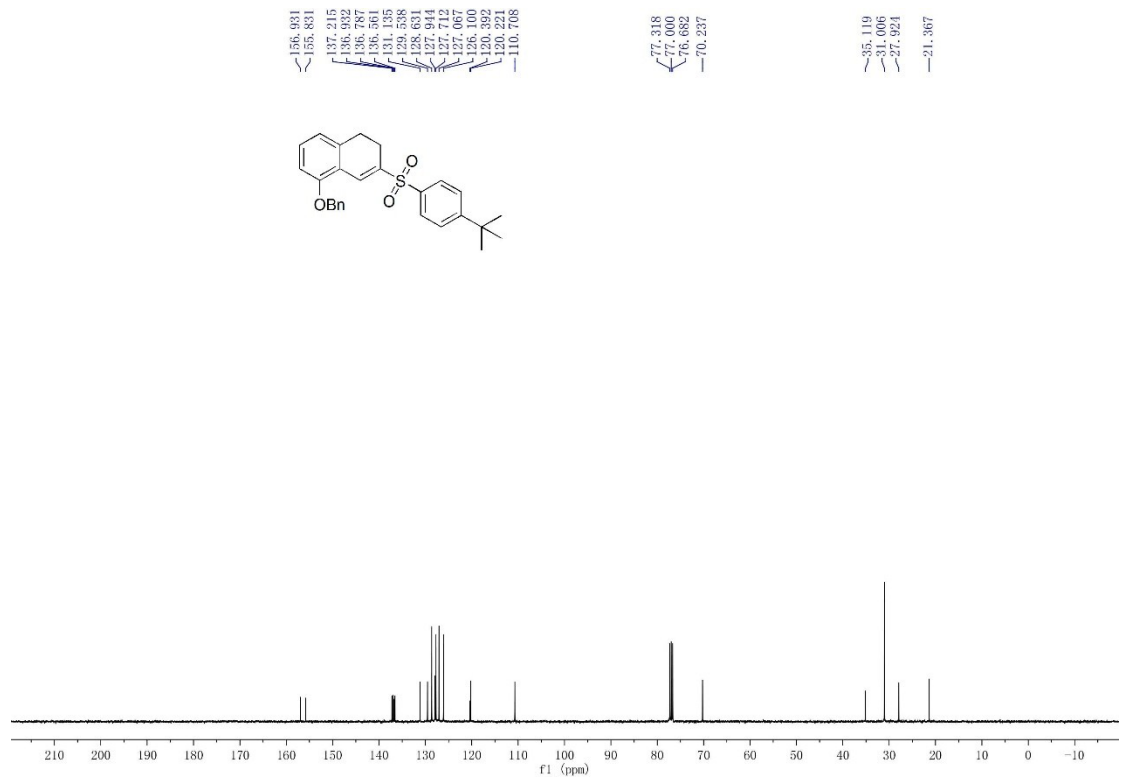
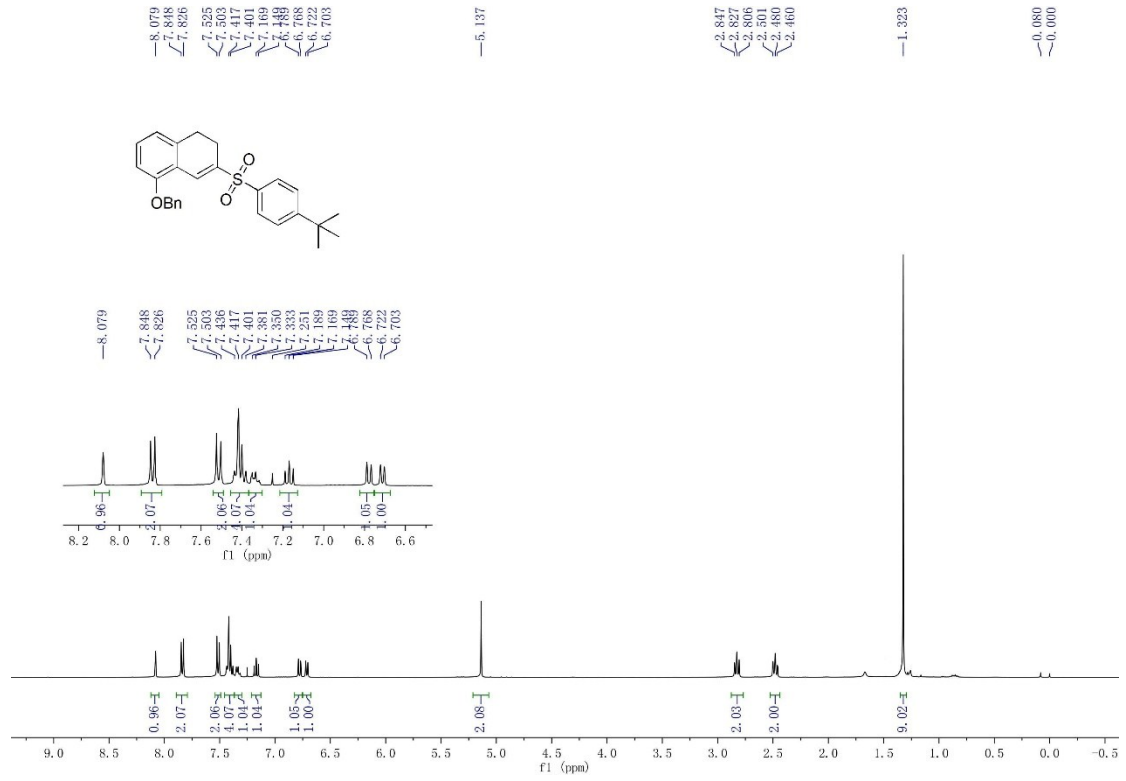
5-Bromo-7-tosyl-8,9-dihydro[1,2-d][1,3]dioxole (3ma)



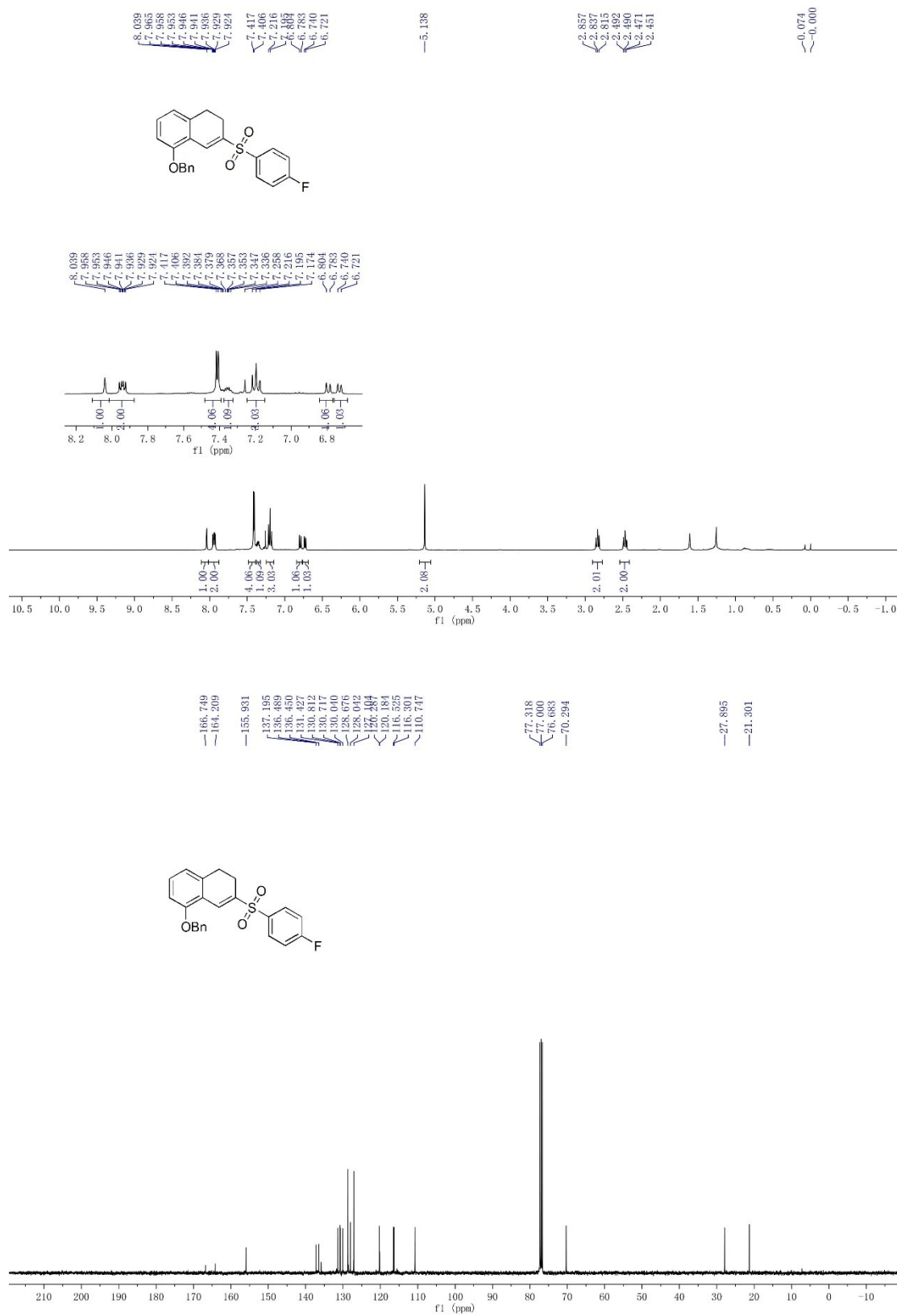
3-Tosyl-1,2-dihydronaphthalene (3na)



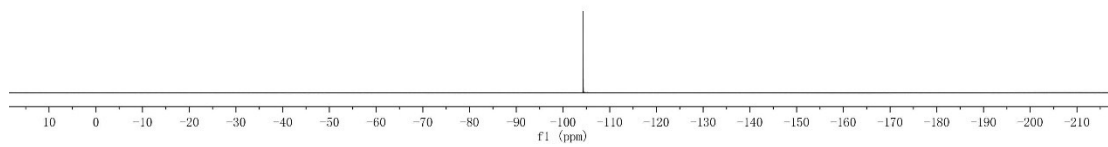
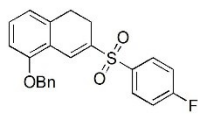
5-(Benzyloxy)-3-((4-*tert*-butyl)phenyl)sulfonyl)-1,2-dihydronaphthalene (3ab)



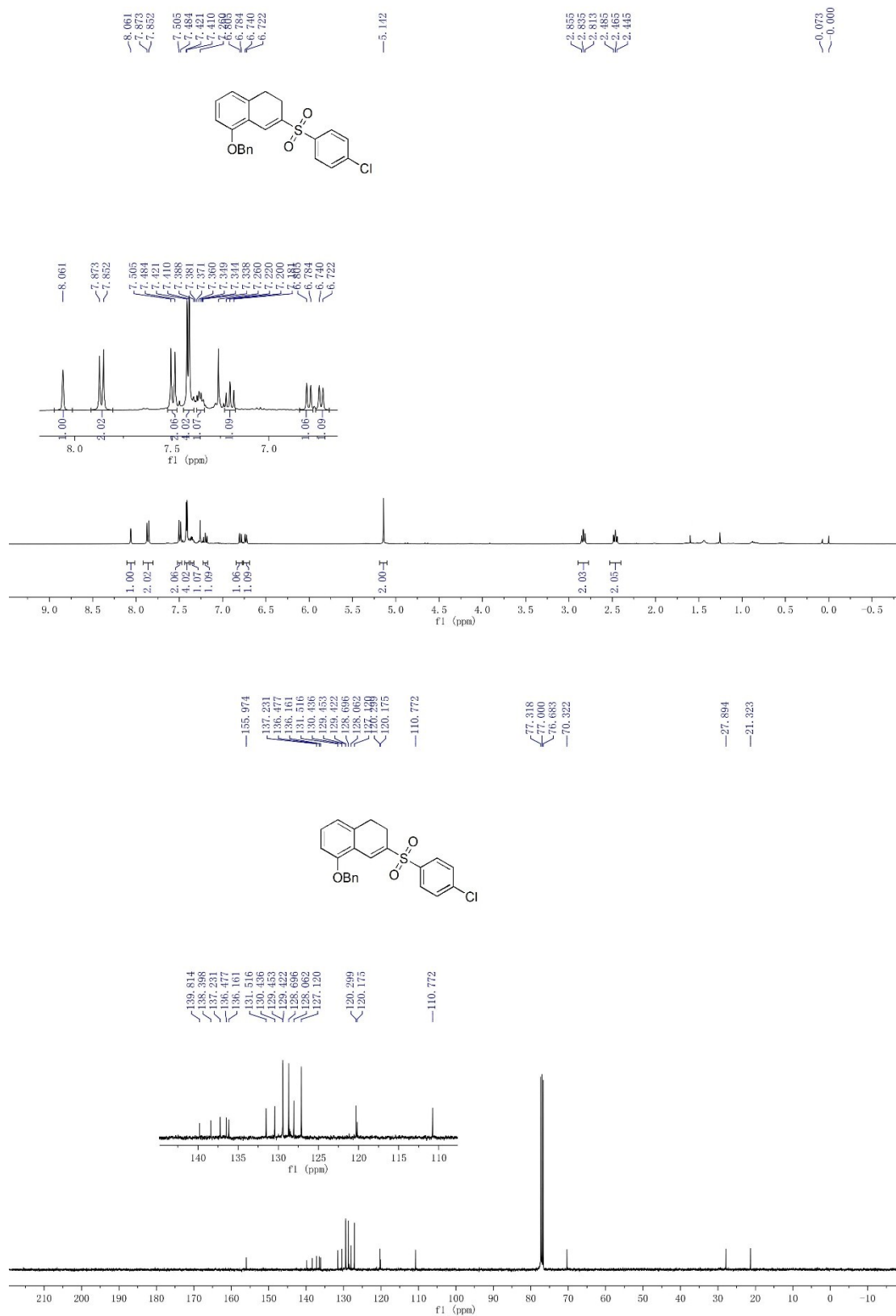
5-(Benzyloxy)-3-((4-fluorophenyl)sulfonyl)-1,2-dihydronaphthalene (3ad)



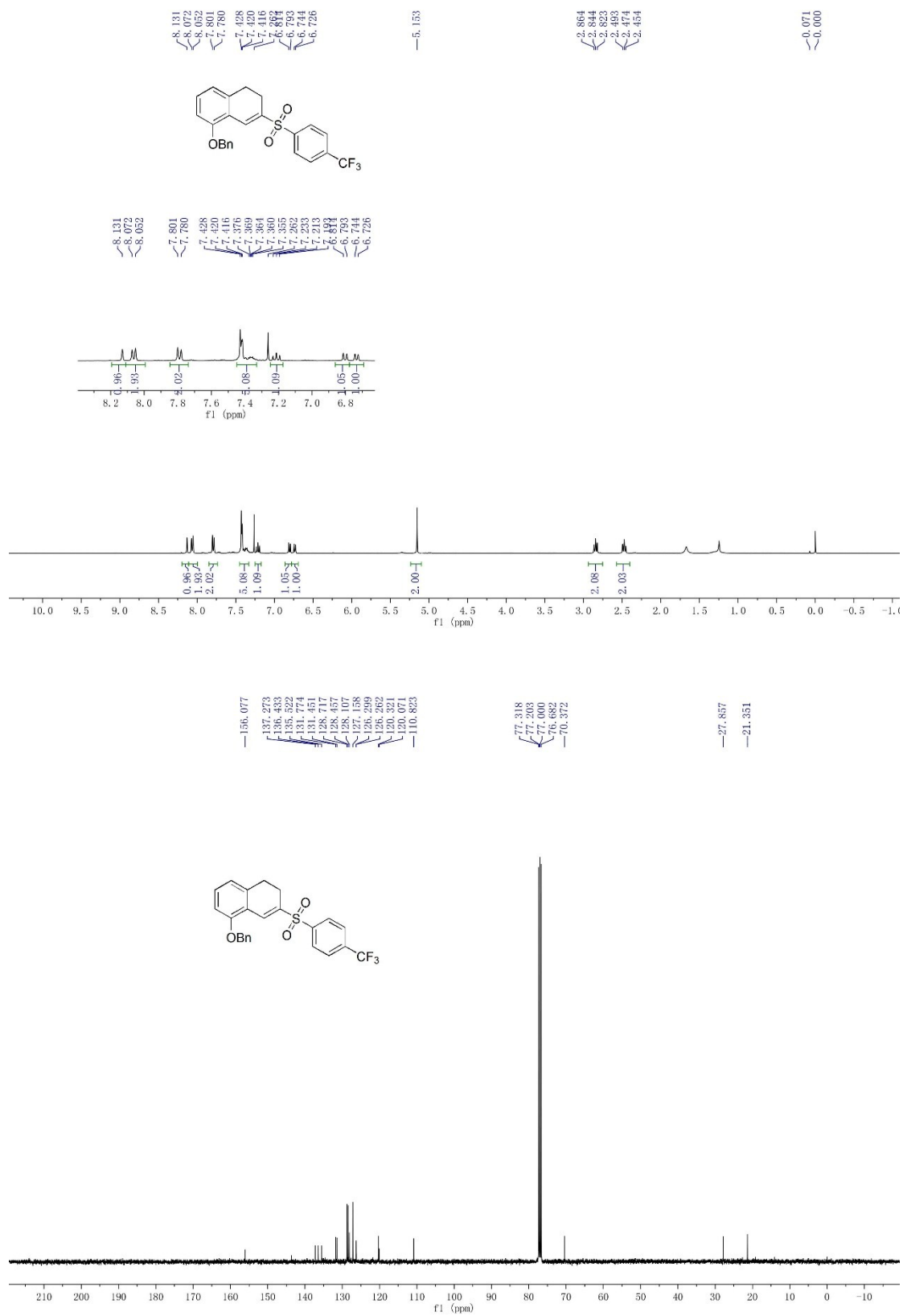
— 101.311



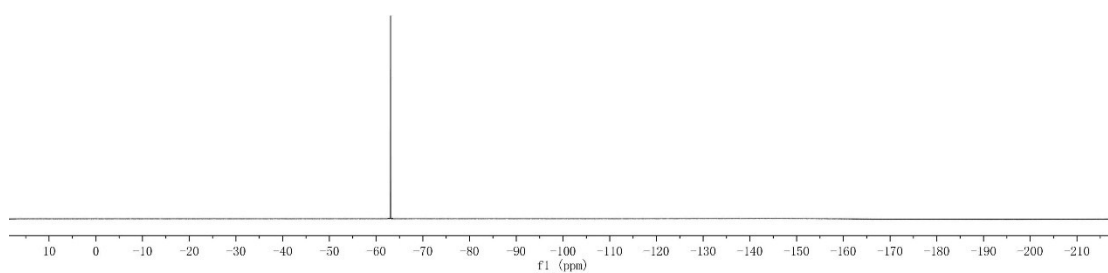
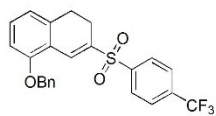
5-(Benzyloxy)-3-((4-chlorophenyl)sulfonyl)-1,2-dihydronaphthalene (3ae)



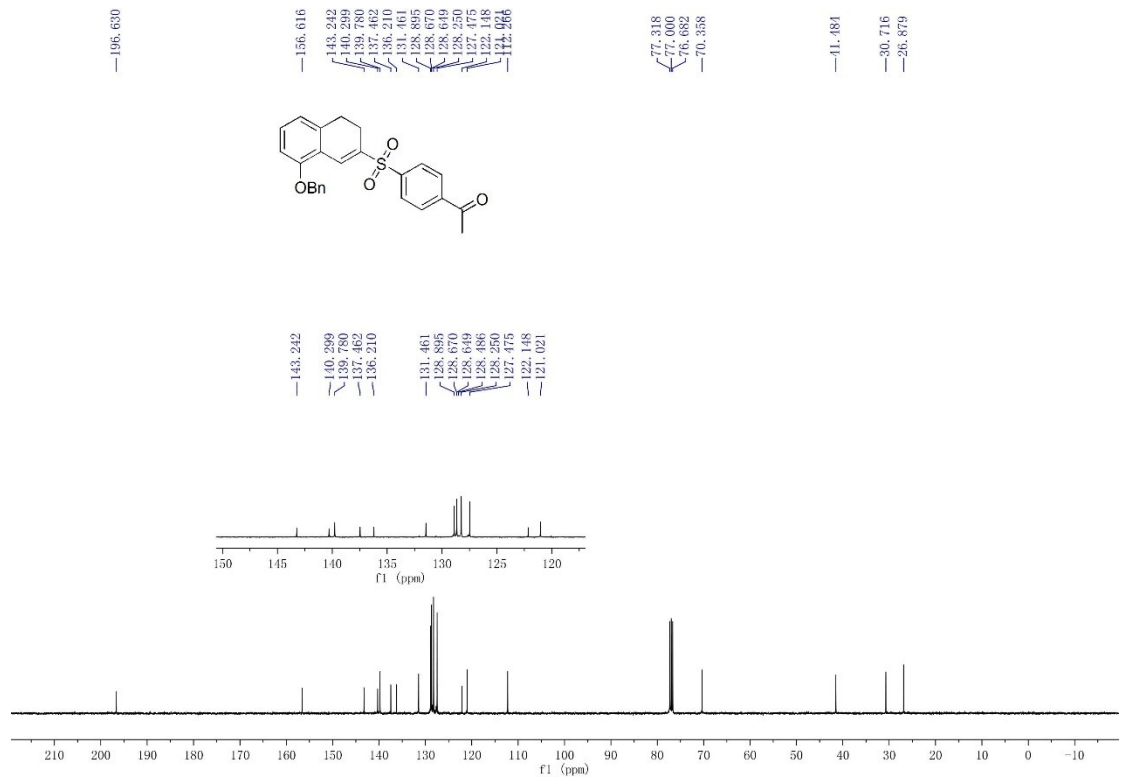
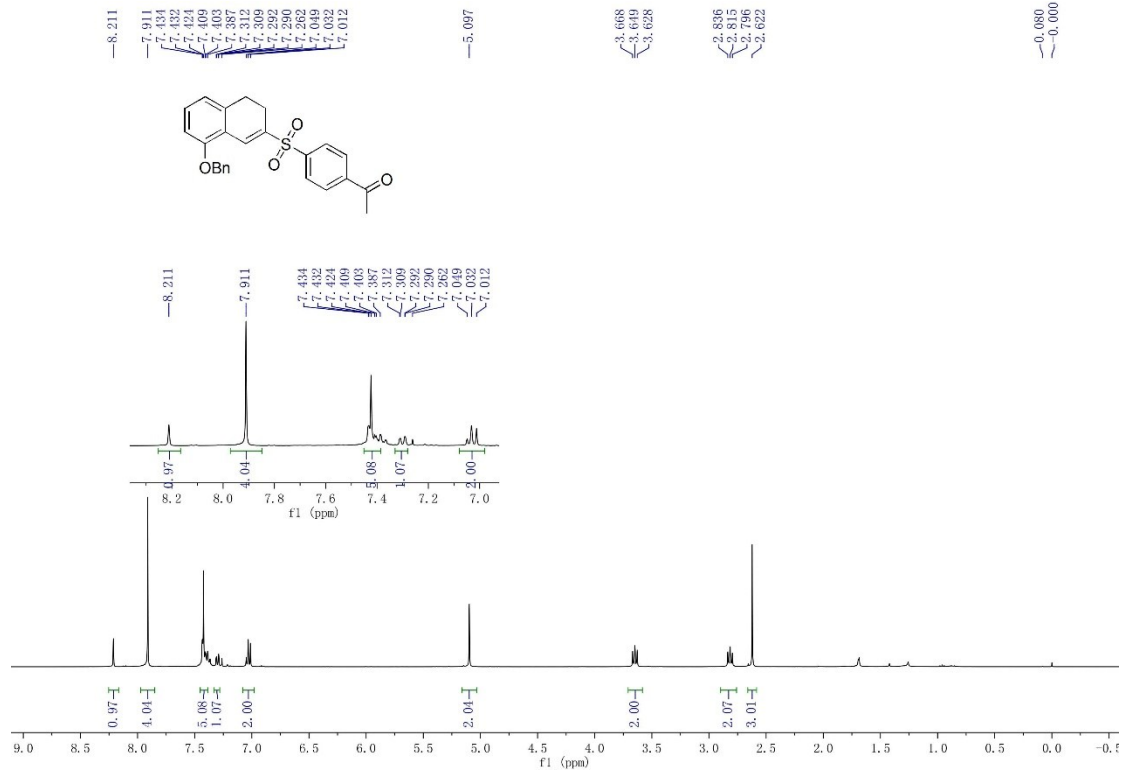
5-(Benzyloxy)-3-((4-(trifluoromethyl)phenyl)sulfonyl)-1,2-dihydronaphthalene (3ag)



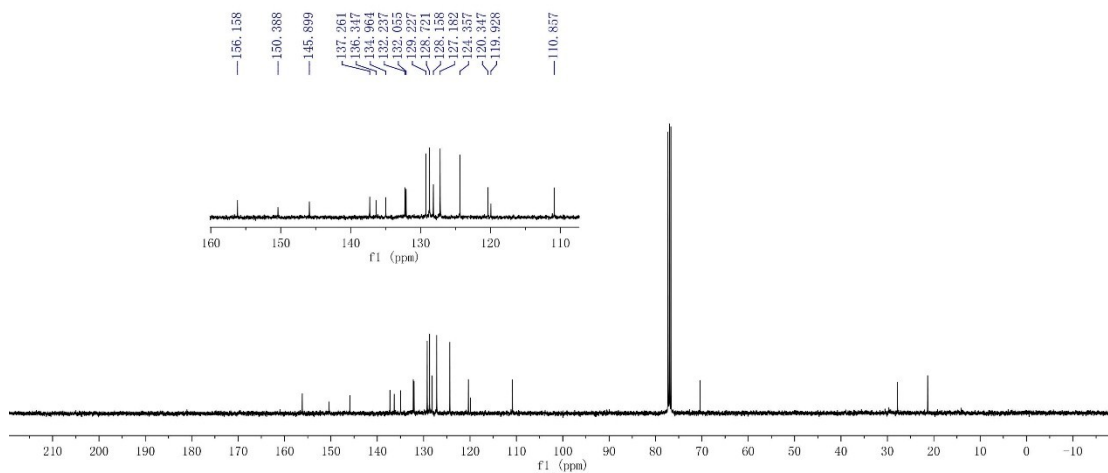
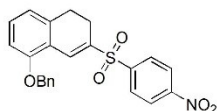
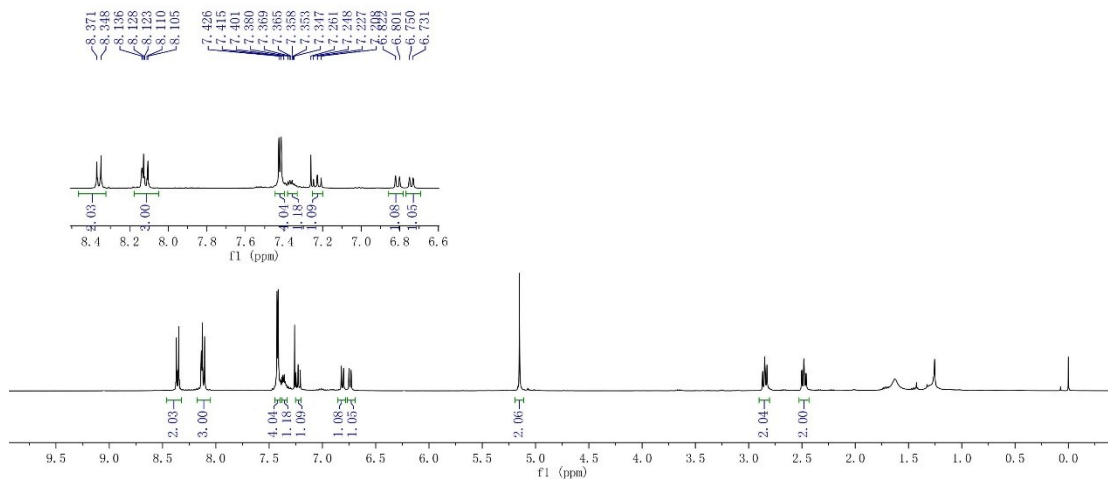
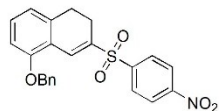
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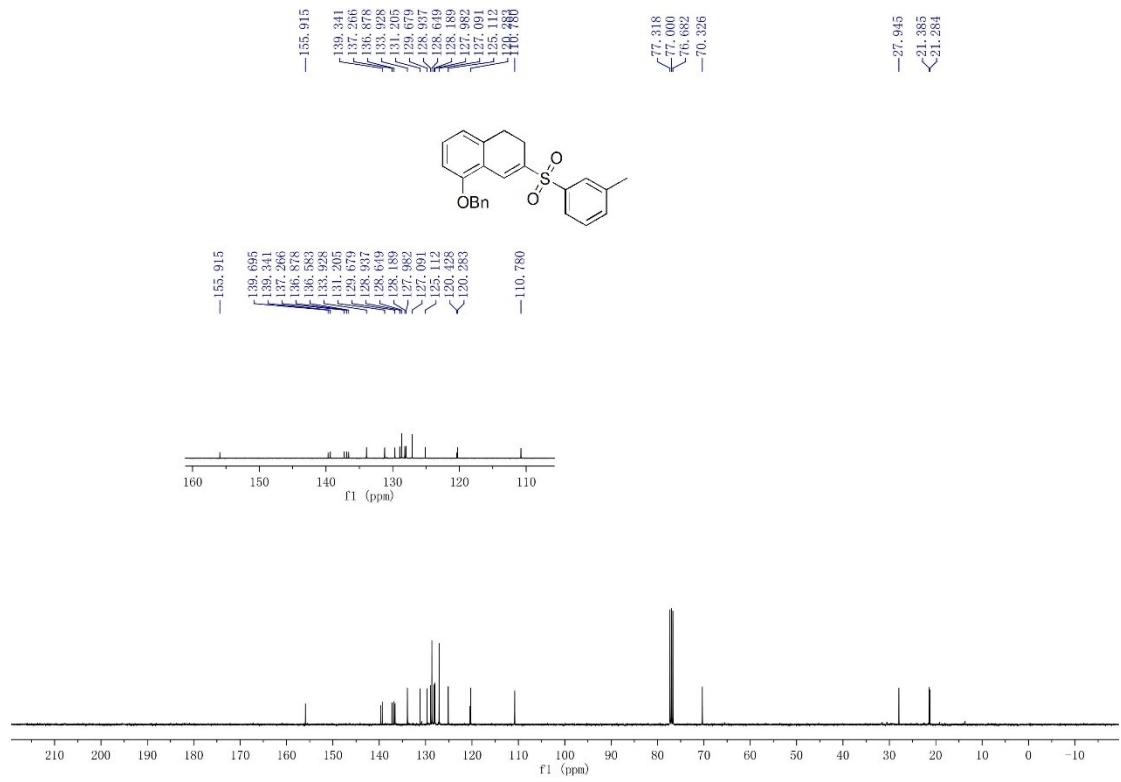
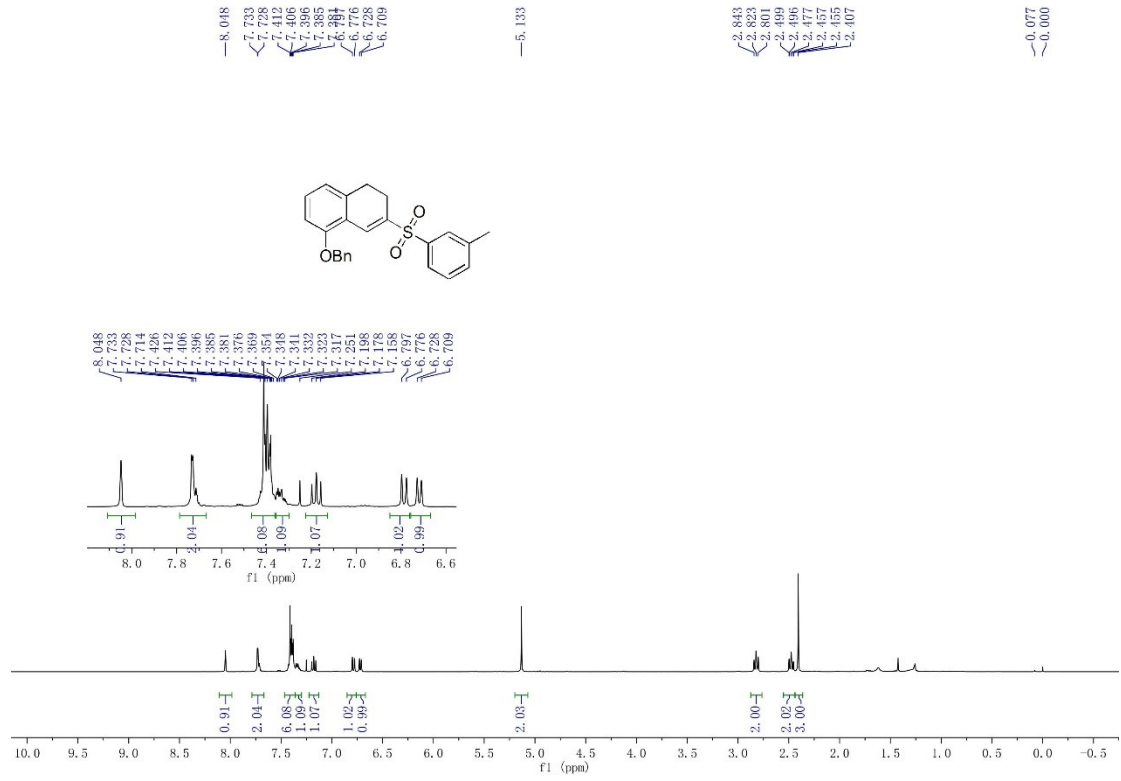
1-(4-((8-(Benzyloxy)-3,4-dihydronaphthalen-2-yl)sulfonyl)phenyl)ethanone (3ah)



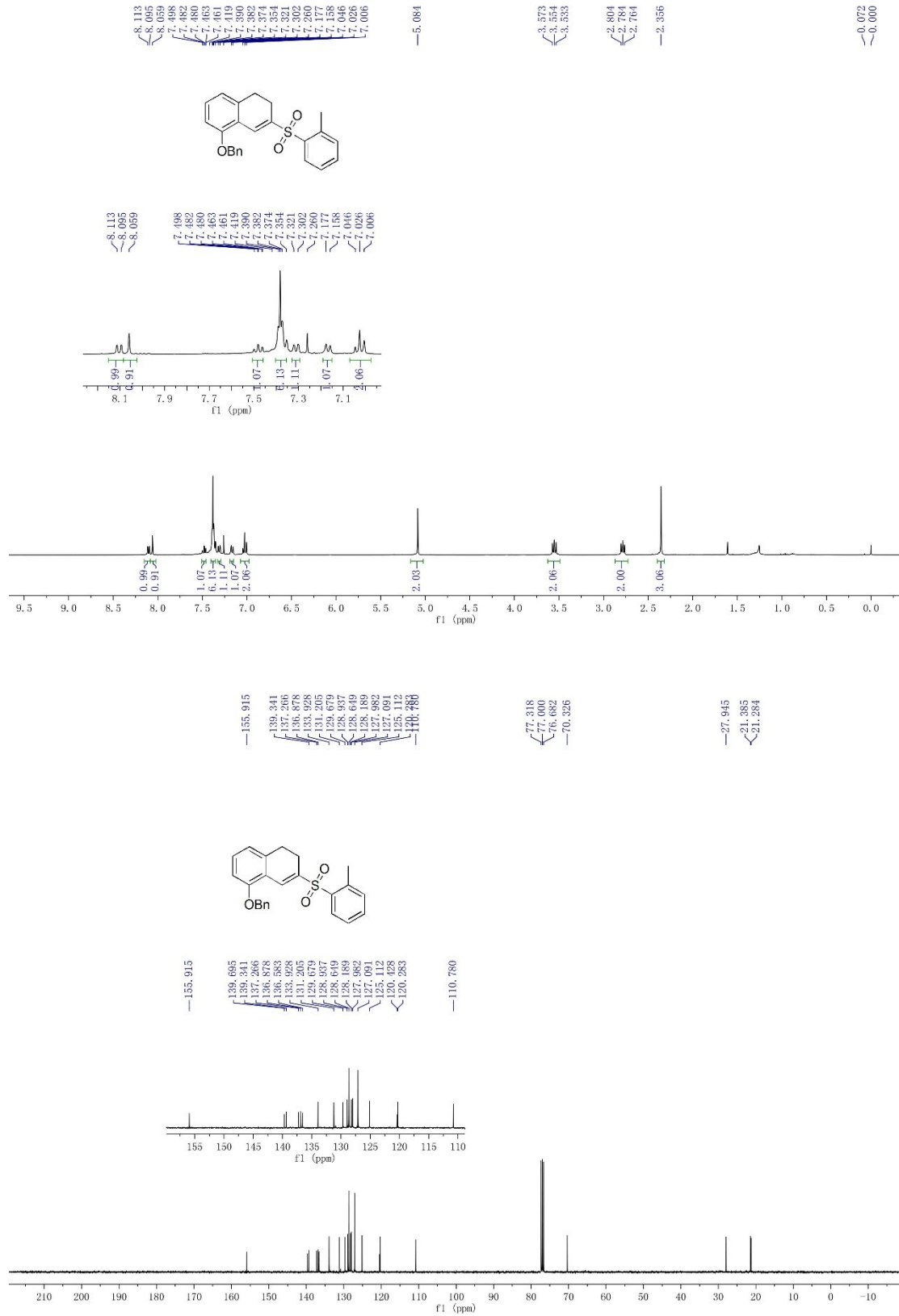
5-(Benzyloxy)-3-((4-nitrophenyl)sulfonyl)-1,2-dihydronaphthalene (3ai)



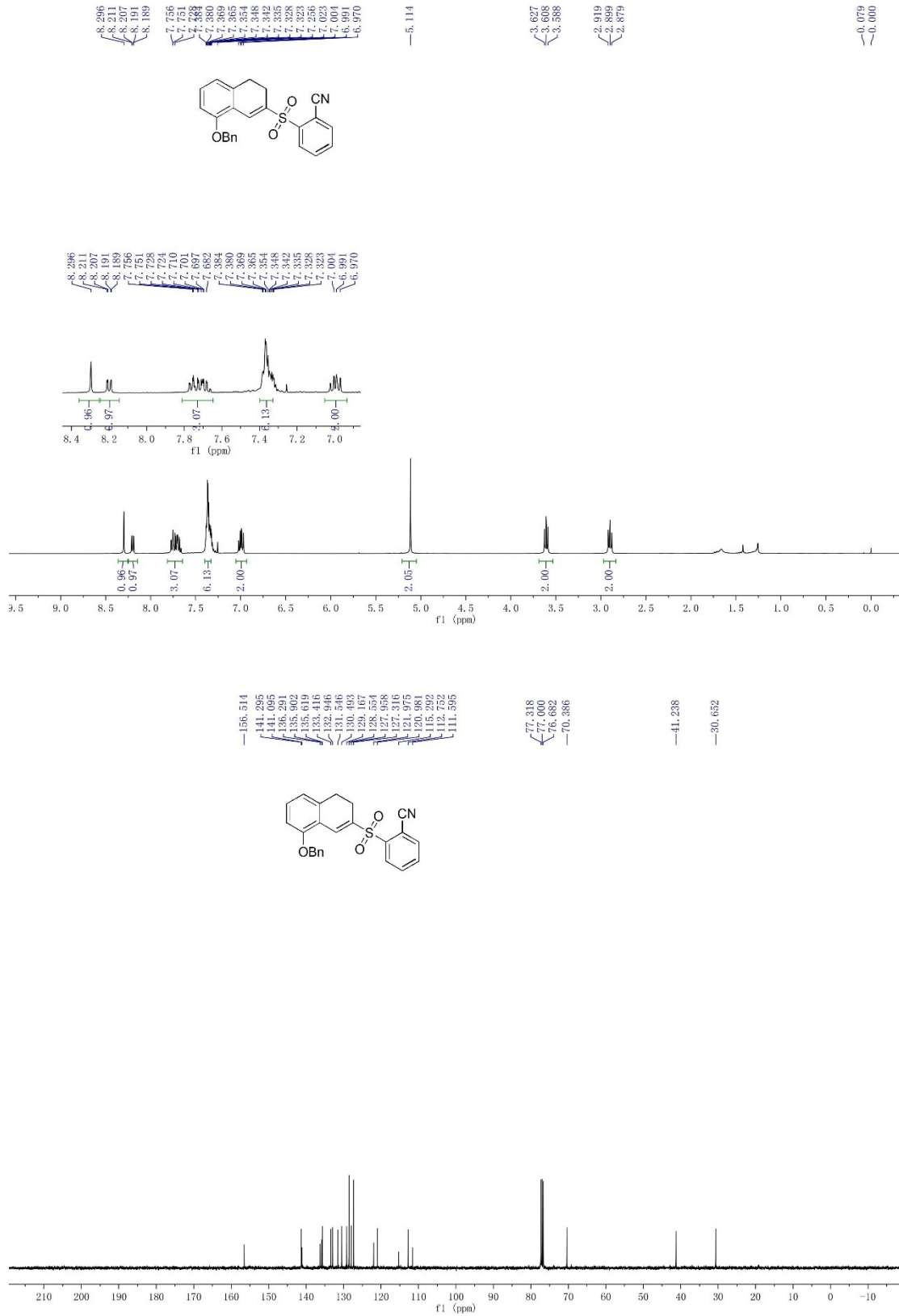
5-(Benzyloxy)-3-(m-tolylsulfonyl)-1,2-dihydronaphthalene (3aj)



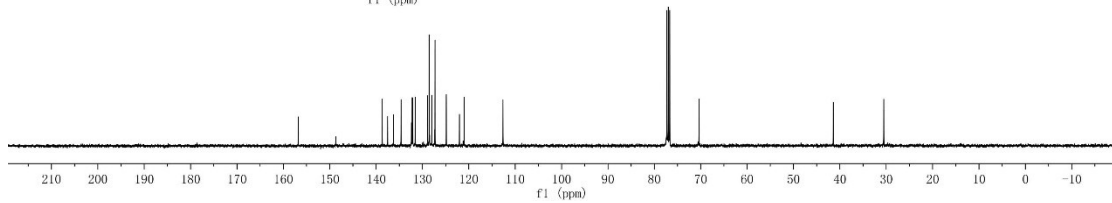
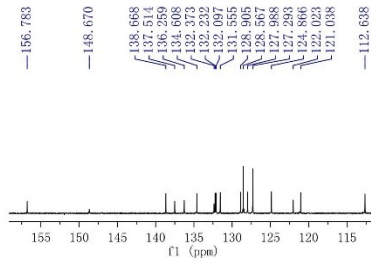
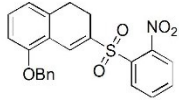
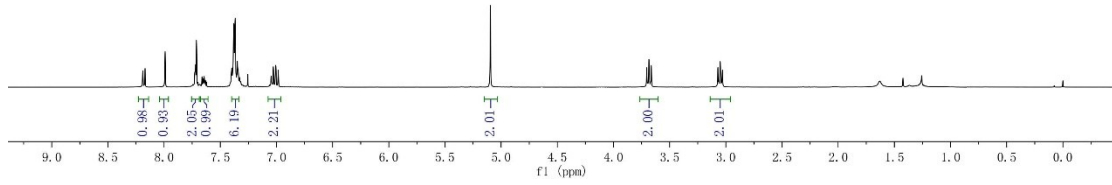
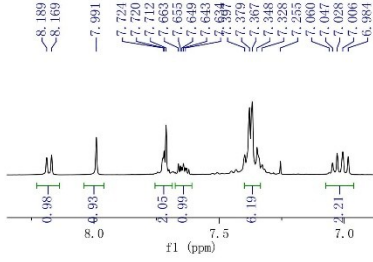
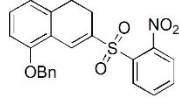
5-(Benzyloxy)-3-(o-tolylsulfonyl)-1,2-dihydronaphthalene (3ak)



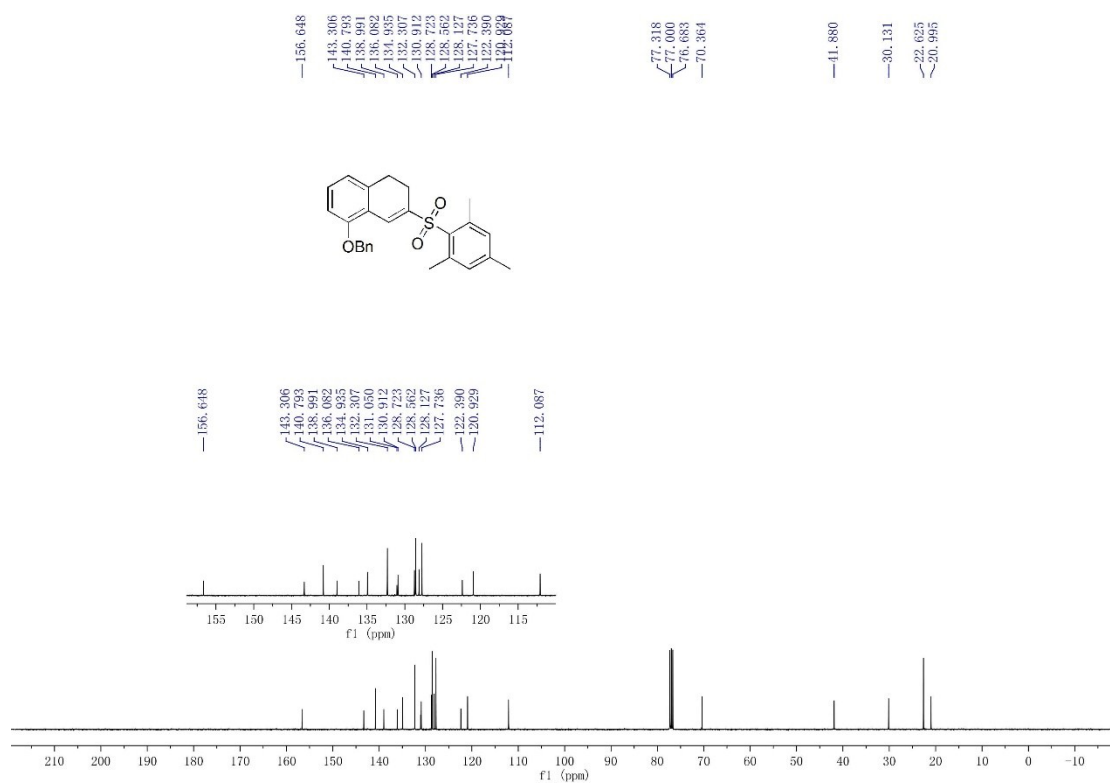
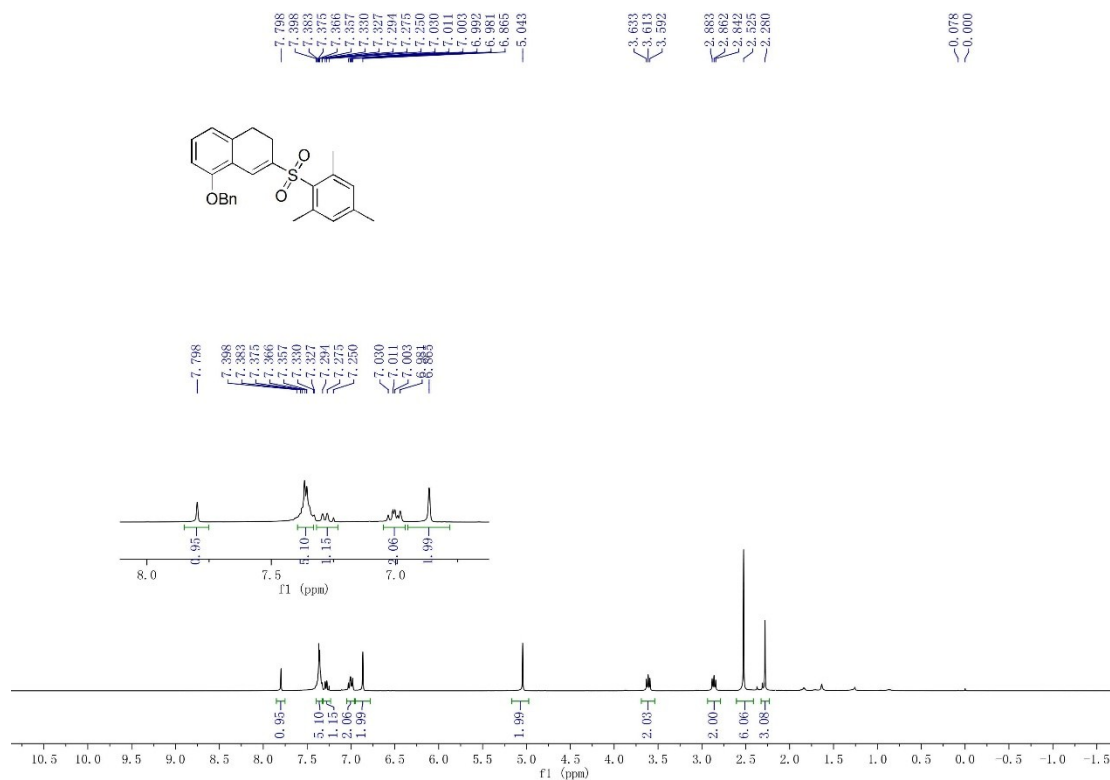
2-((8-(Benzyloxy)-3,4-dihydronaphthalen-2-yl)sulfonyl)benzonitrile (3a)



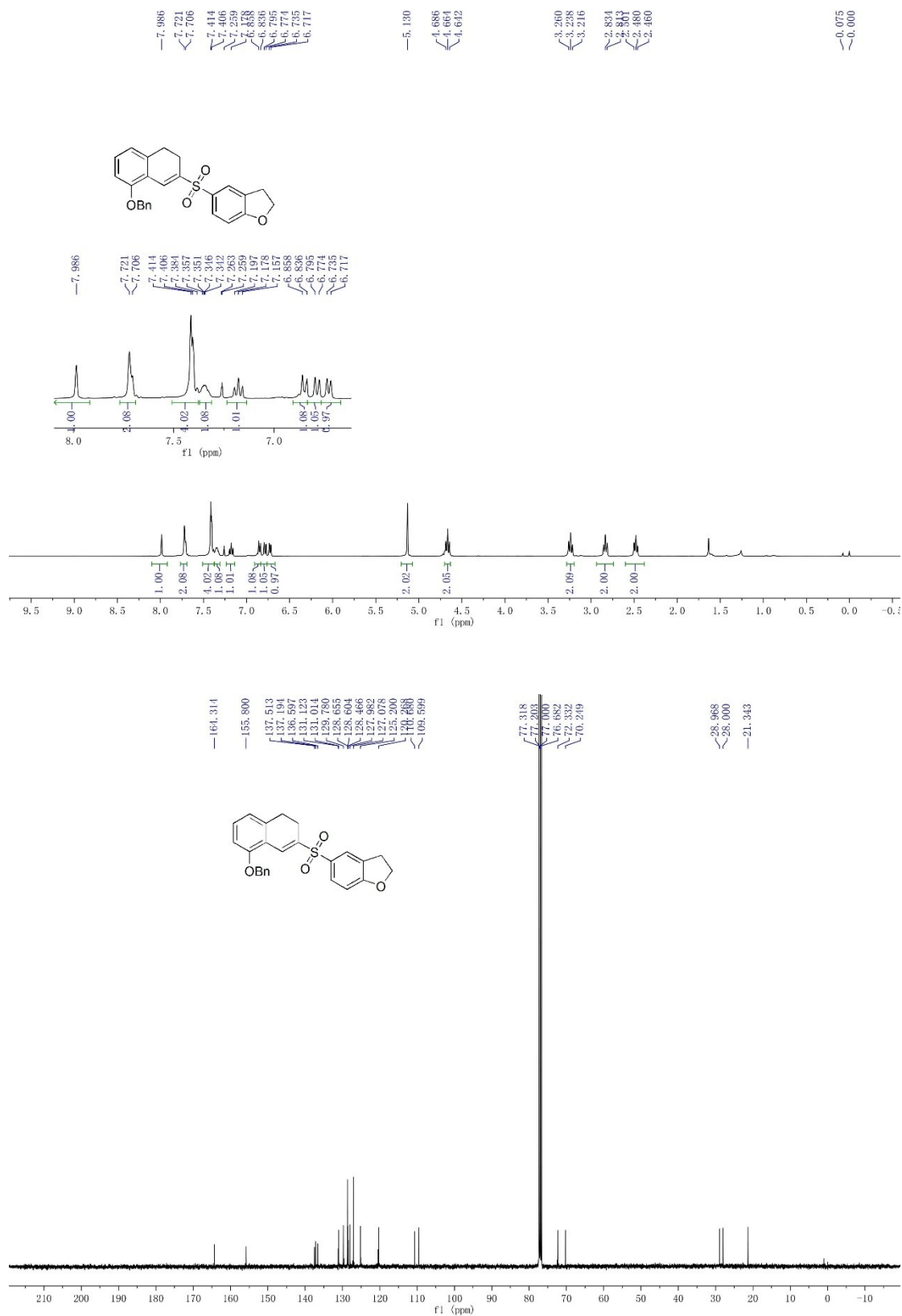
5-(Benzyloxy)-3-((2-nitrophenyl)sulfonyl)-1,2-dihydronaphthalene (3am)



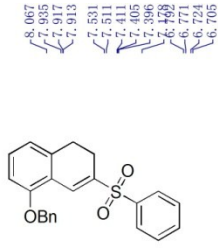
5-(Benzyloxy)-3-(mesitylsulfonyl)-1,2-dihydronaphthalene (3an)



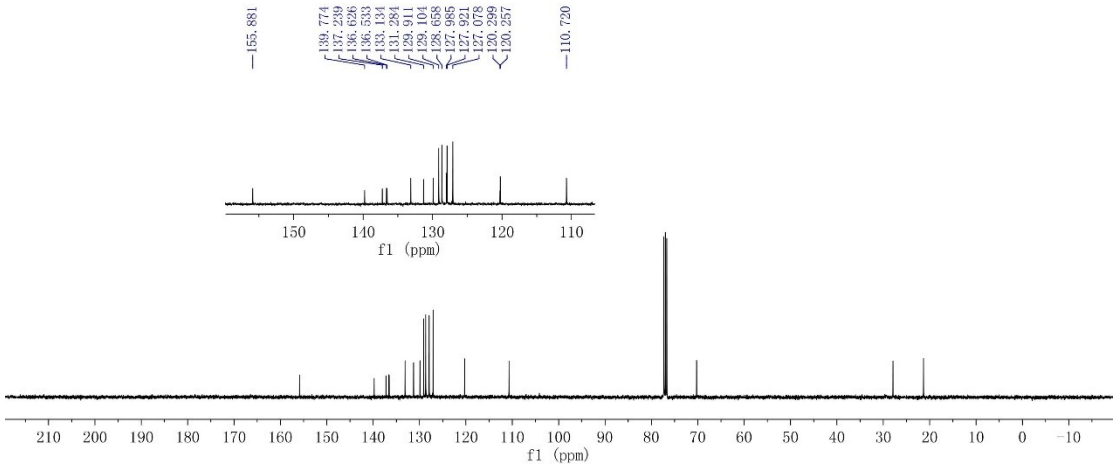
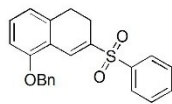
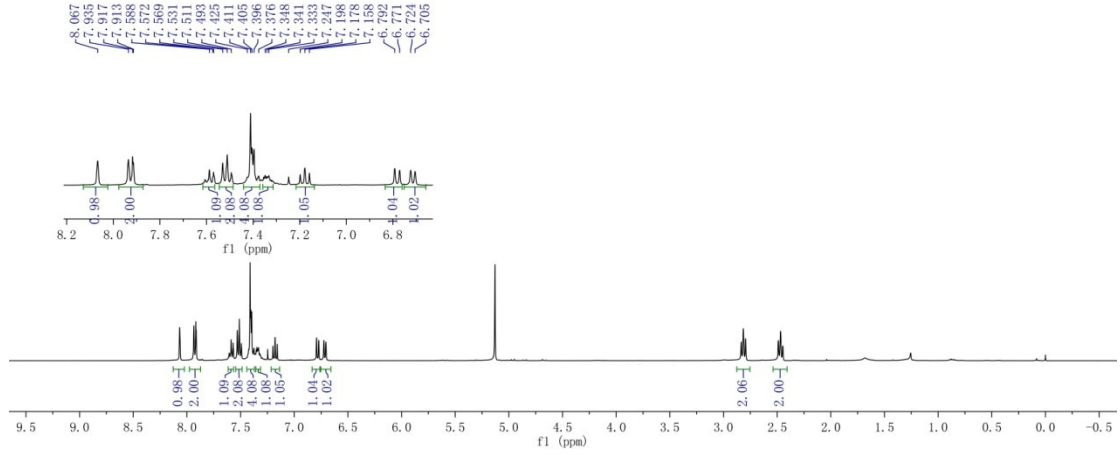
6-((8-(Benzyloxy)-3,4-dihydronaphthalen-2-yl)sulfonyl)-2,3-dihydrobenzofuran (3ao)



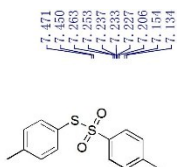
5-(Benzyloxy)-3-(phenylsulfonyl)-1,2-dihydronaphthalene (3aq)



8.067, 7.935, 7.917, 7.913, 7.872, 7.569, 7.531, 7.511, 7.493, 7.411, 7.396, 7.405, 7.396, 7.348, 7.341, 6.771, 6.724, 6.705, -5.130, -2.835, -2.815, -2.794, -2.490, -2.469, -2.449, -2.447, -0.082, -0.000



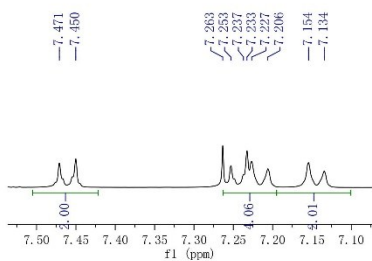
S-p-tolyl 4-methylbenzenesulfonothioate (4)



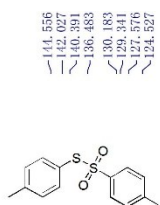
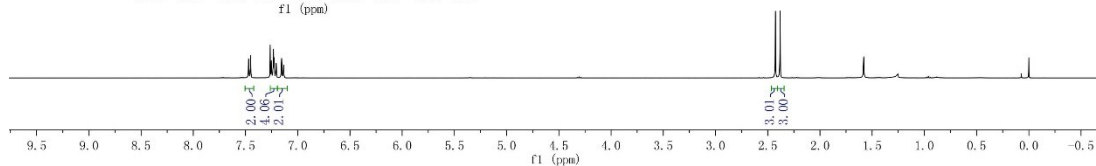
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7.450
7.263
7.253
7.237
7.227
7.206
7.154
7.134

2.426
2.381

0.070
0.000



7.471
7.450
7.263
7.253
7.237
7.227
7.206
7.154
7.134



144.556
142.027
140.391
136.483
130.183
128.341
127.576
124.527

77.317
77.000
76.682

21.057
21.177

