# Supplementary Information

## Synthesis of Alkyl Sulfones via a Photocatalytic Multicomponent Reaction of Aryldiazo Tetrafluoroborate Salts, Styrene Derivatives, and Sodium Metabisulfite

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## 1. General Information

Commercial chemicals and solvents were used without any purification. Reaction progress was analyzed by thin-layer chromatography (TLC) using silica gel 60 $F_{254}$ pre-coated aluminum plate from Merck and TLC spots were observed under UV light (254 nm) exposure. Flash chromatography was carried out using 230–400 mesh silica gel and analytical grade solvents. Stuart SMP10 Melting Point Apparatus was used to record melting points of products. Structure elucidation by NMR ($^{1}$H and $^{13}$C NMR) was performed on a Bruker AVANCE III HD-400 MHz Fourier transform NMR spectrometer at the Future Energy Convergence Core Center (FECC). The chemical shifts were reported in $\delta$ units (ppm) relative to the residual protonated solvent resonance, the coupling constants ($J$) quoted in Hz, and multiplicity of signals was abbreviated as follows: singlet (s); doublet (d); doublet of doublet (dd); triplet (t); multiplet (m).

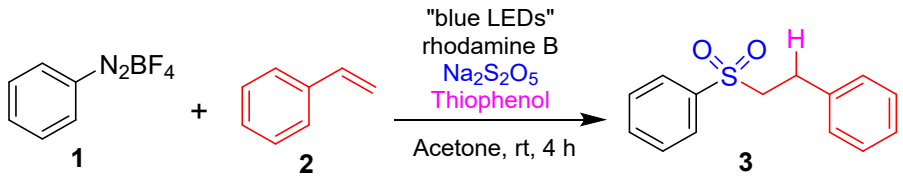
## 2. Screening of reaction conditions for the synthesis of alkyl sulfones

**Table S1.** Screening of reaction condition in the synthesis of alkyl sulfones[a]


| Entry | Solvent | Yield[b] (%) |
|---|---|---|
| 1 | DMF | Trace |
| 2 | THF | 8 |
| 3 | EtOH | 25 |
| 4 | $CH_2Cl_2$ | 43 |
| 5 | Toluene | 60 |
| 6 | 1,4-Dioxane | 64 |
| 7 | DCE | 83 |
| 8 | MeCN | 85 |
| 9 | EtOAc | 87 |
| 10 | Acetone | 91 |

[a] Reaction conditions: compound 1 (0.5 mmol), styrene 2 (1.0 mmol), $Na_2S_2O_5$ (0.75 mmol), Rhodamine B (0.025 mmol), acetone (2 mL), irradiation by blue LEDs (5W x 2 bulbs), 4 h, under $N_2$.
[b] Isolated yield after purification by flash column chromatography.

**Table S2.** Screening amount of photocatalyst in the preparation of alkyl sulfones[a]




| Entry | Rhodamine B | Yield[b] (%) |
|---|---|---|
| 1 | No photocatalyst | 7 |
| 2 | Rhodamine B (1 mol%) | 33 |
| 3 | Rhodamine B (2 mol%) | 62 |
| 4 | Rhodamine B (5 mol%) | 91 |
| 5 | Rhodamine B (10 mol%) | 91 |
| 6 | Rhodamine B (20 mol%) | 91 |
| 7 | Rhodamine B (30 mol%) | 91 |

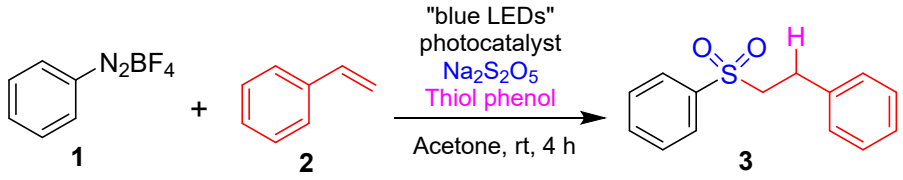
[a] Reaction conditions: compound 1 (0.5 mmol), $Na_2S_2O_5$ (0.75 mmol), styrene (1.0 mmol), thiophenol (0.75 mmol), rhodamine B, acetone (2 mL), irradiation by blue LEDs (5 W × 2 bulbs), 4 h, under $N_2$.
[b] Isolated yield after purification by flash column chromatography.

**Table S3.** Screening of $SO_2$ source in the preparation of alkyl sulfones[a]


| Entry | $SO_2$ source | Yield[b] (%) |
|---|---|---|
| 1 | $Na_2S_2O_5$ 0.5 equiv | 39 |
| 2 | $Na_2S_2O_5$ 1.0 equiv | 75 |
| 3 | $Na_2S_2O_5$ 1.2 equiv | 86 |
| 4 | $Na_2S_2O_5$ 1.5 equiv | 91 |
| 5 | $Na_2S_2O_5$ 2.0 equiv | 91 |
| 6 | $Na_2S_2O_5$ 3.0 equiv | 91 |
| 7 | $K_2S_2O_5$ 1.0 equiv | Trace |
| 8 | $K_2S_2O_5$ 2.0 equiv | Trace |
| 9 | DABSO 1.0 equiv | 49 |
| 10 | DABSO 1.5 equiv | 82 |
| 11 | DABSO 2.0 equiv | 84 |

[a] Reaction conditions: compound 1 (0.5 mmol), $SO_2$ source, styrene (1.0 mmol), thiophenol (0.75 mmol), rhodamine B (0.025 mmol), acetone (2 mL), irradiation by blue LEDs (5 W × 2 bulbs), 4 h, under $N_2$.
[b] Isolated yield after purification by flash column chromatography.

**Table S4.** Screening of amount of styrene in the preparation of alkyl sulfones[a]




| Entry | Styrene | Yield[b] (%) |
|---|---|---|
| 1 | Styrene (0.5 equiv) | 43 |
| 2 | Styrene (1.0 equiv) | 62 |
| 3 | Styrene (2.0 equiv) | 91 |
| 4 | Styrene (3.0 equiv.) | 91 |
| 5 | Styrene (4.0 equiv.) | 91 |

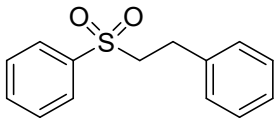
[a] Reaction conditions: compound 1 (0.5 mmol), $Na_2S_2O_5$ (0.75 mmol), styrene, thiophenol (0.75 mmol), rhodamine B (0.025 mmol), acetone (2 mL), irradiation by blue LEDs (5 W × 2 bulbs), 4 h, under $N_2$.
[b] Isolated yield after purification by flash column chromatography.

**3. General procedure of the synthesis of alkyl sulfones**

A typical synthetic method is as follows. Phenyl diazonium tetrafluoro borate 1 (96 mg, 0.5 mmol), $Na_2S_2O_5$ (142.5 mg, 0.75 mmol), rhodamine B (12 mg, 0.025 mol), styrene 2 (104 mg, 1 mmol), and thiophenol (82.5 mg, 0.75 mmol) were added to acetone (2.0 mL). The mixture was stirred at room temperature under $N_2$ pressure with irradiation from blue LEDs. After 4 h, the reaction mixture was extracted with $CH_2Cl_2$ (50 mL) and washed with water (50 mL). The organic layer was dried by anhydrous sodium sulfate and was concentrated under reduced pressure. The residue was purified by column chromatography on silica gel with hexane-EtOAc as the eluent to produce final product 3a (111.9 mg, 91%).

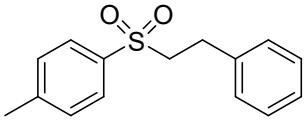
## 4. Chracterization of alkyl sulfone compounds

### (phenethylsulfonyl)benzene (3a)



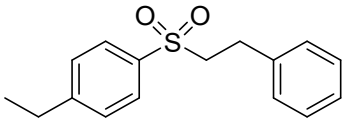
**3a** was obtained in 91% yield (111.9 mg) according to the general procedure (Hexan/EtOAc, 3:1): colorless oil; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.95 (dd, $J$ = 5.6 Hz, $J$ = 1.6 Hz, 2H), 7.67 (t, $J$ = 7.6 Hz, 1H), 7.58 (t, $J$ = 8.0 Hz, 2H), 7.28-7.20 (m, 3H), 7.12 (d, $J$ = 7.2 Hz, 2H), 3.39-3.34 (m, 2H), 3.07-3.03 (m, 2H); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$ 139.0, 137.5, 133.8, 129.4 (2C), 128.8 (2C), 128.3 (2C), 128.1 (2C), 126.9, 57.6, 28.7; HRMS (ESI) m/z $(M+H)^+$ calcd for $C_{14}H_{15}O_2S$ = 247.0793; found 247.0791.

### 1-methyl-4-(phenethylsulfonyl)benzene (3b)



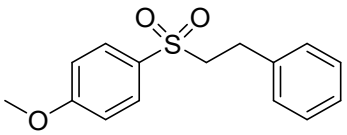
**3b** was obtained in 93% yield (120.9 mg) according to the general procedure (Hexan/EtOAc, 3:1): colorless oil; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.83 (d, $J$ = 8.0 Hz, 2H), 7.38 (d, $J$ = 8.0 Hz, 2H), 7.28-7.25 (m, 2H), 7.20 (t, $J$ = 7.2 Hz, 1H), 7.12 (d, $J$ = 6.8 Hz, 2H), 3.36-3.32 (m, 2H), 3.05-3.01 (m, 2H), 2.46 (s, 3H); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$ 144.8, 137.6, 136.1, 129.9 (2C), 128.8 (2C), 128.3 (2C), 128.1 (2C), 126.9, 57.7, 28.8, 21.7; HRMS (ESI) m/z $(M+H)^+$ calcd for $C_{15}H_{17}O_2S$ = 261.0949; found 261.0945.

### 1-ethyl-4-(phenethylsulfonyl)benzene (3c)



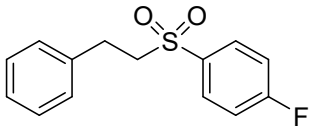
**3c** was obtained in 94% yield (128.8 mg) according to the general procedure (Hexan/EtOAc, 3:1): colorless oil; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.85 (d, $J$ = 8.4 Hz, 2H), 7.40 (d, $J$ = 8.8 Hz, 2H), 7.28-7.24 (m, 2H), 7.20 (t, $J$ = 7.2 Hz, 1H), 7.12 (d, $J$ = 6.8 Hz, 2H), 3.37-3.33 (m, 2H), 3.07-3.03 (m, 2H), 2.76 (q, $J$ = 7.6 Hz, 2H), 1.28 (t, $J$ = 8.0 Hz, 3H); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$ 150.9, 137.6, 136.3, 128.9 (2C), 128.8 (2C), 128.3 (2C), 128.2 (2C), 126.9, 57.6, 28.9, 28.8, 15.1; HRMS (ESI) m/z $(M+H)^+$ calcd for $C_{16}H_{19}O_2S$ = 275.1106; found 275.1103.

**1-methoxy-4-(phenethylsulfonyl)benzene (3d)**



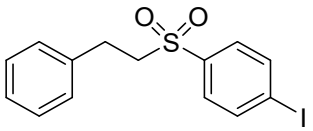
**3d** was obtained in 95% yield (131.1 mg) according to the general procedure (Hexan/EtOAc, 3:1): colorless oil; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.87 (d, $J$ = 8.8 Hz, 2H), 7.28-7.20 (m, 3H), 7.12 (m, 2H), 7.04 (d, $J$ = 8.8 Hz, 2H), 3.89 (s, 3H), 3.35-3.31 (m, 2H), 3.05-3.01 (m, 2H); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$ 163.8, 137.6, 130.5, 130.3 (2C), 128.8 (2C), 128.3 (2C), 114.5 (2C), 57.8, 55.7 28.9; HRMS (ESI) m/z $(M+H)^+$ calcd for $C_{15}H_{17}O_3S$ = 277.0898; found 277.0895.

**1-fluoro-4-(phenethylsulfonyl)benzene (3e)**



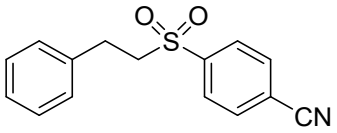
**3e** was obtained in 84% yield (110.9 mg) according to the general procedure (Hexan/EtOAc, 3:1): colorless oil; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.95 (dd, $J$ = 5.2 Hz, $J$ = 4.0 Hz, 2H), 7.26-7.21 (m, 5H), 7.12 (d, $J$ = 6.8 Hz, 2H), 3.38-3.34 (m, 2H), 3.07-3.03 (m, 2H); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$ 167.2, 164.6, 137.2, 135.1, 131.0, 130.9, 128.9 (2C), 128.3 (2C), 127.0, 116.8, 116.6, 57.7, 28.8; HRMS (ESI) m/z $(M+H)^+$ calcd for $C_{14}H_{14}FO_2S$ = 265.0699; found 265.0698.

**1-iodo-4-(phenethylsulfonyl)benzene (3f)**



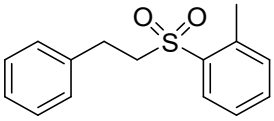
**3f** was obtained in 86% yield (159.5 mg) according to the general procedure (Hexan/EtOAc, 3:1): colorless oil; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.94 (d, $J$ = 8.8 Hz, 2H), 7.64 (d, $J$ = 8.8 Hz, 2H), 7.28-7.21 (m, 3H), 7.11 (d, $J$ = 6.8 Hz, 2H), 3.37-3.33 (m, 2H), 3.06-3.02 (m, 2H); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$ 138.7 (2C), 138.2, 137.2, 129.5 (2C), 128.9 (2C), 128.3 (2C), 127.0, 101.8, 57.5, 28.8; HRMS (ESI) m/z $(M+H)^+$ calcd for $C_{14}H_{14}IO_2S$ = 372.9759; found 372.9757.

**4-(phenethylsulfonyl)benzonitrile (3g)**



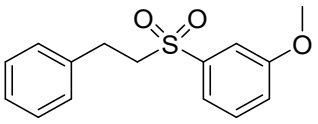
**3g** was obtained in 55% yield (74.5 mg) according to the general procedure (Hexan/EtOAc, 3:1): colorless oil; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.04 (d, $J$ = 8.8 Hz, 2H), 7.86 (d, $J$ = 8.8 Hz, 2H), 7.28-7.21 (m, 3H), 7.11 (d, $J$ = 6.8 Hz, 2H), 3.43-3.39 (m, 2H), 3.09-3.05 (m, 2H); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$ 143.3, 136.7, 133.1 (2C), 128.9 (2C), 128.8 (2C), 128.3 (2C), 127.2, 117.6, 117.1, 57.4, 28.6; HRMS (ESI) m/z $(M+H)^+$ calcd for $C_{15}H_{14}NO_2S$ = 272.0745; found 272.0747.

**1-methyl-2-(phenethylsulfonyl)benzene (3h)**



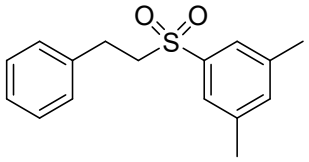
**3h** was obtained in 71% yield (92.2 mg) according to the general procedure (Hexan/EtOAc, 3:1): colorless oil; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.06 (d, $J$ = 7.6 Hz, 1H), 7.54 (t, $J$ = 7.2 Hz, 1H), 7.42-7.34 (m, 3H), 7.29-7.23 (m, 2H), 7.14 (d, $J$ = 7.6 Hz, 2H), 3.43-3.39 (m, 2H), 3.08-3.03 (m, 2H), 2.72 (s, 3H); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$ 137.9, 137.6, 137.1, 133.8, 132.8, 130.3, 128.8 (2C), 128.3 (2C), 126.9, 126.7, 56.7, 28.5, 20.4; HRMS (ESI) m/z $(M+H)^+$ calcd for $C_{15}H_{17}O_2S$ = 261.0949; found 261.0947.

**1-methoxy-4-(phenethylsulfonyl)benzene (3i)**



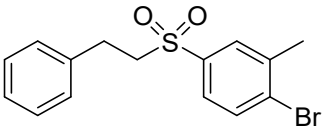
**3i** was obtained in 77% yield (106.3 mg) according to the general procedure (Hexan/EtOAc, 3:1): colorless oil; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.51-7.43 (m, 2H), 7.42 (d, $J$ = 2.0 Hz, 1H), 7.27-7.25 (m, 2H), 7.22-7.19 (m, 2H), 7.13 (d, $J$ = 6.8 Hz, 2H), 3.88 (s, 3H), 3.39-3.34 (m, 2H), 3.08-3.03 (m, 2H); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$ 160.1, 140.2, 137.5, 130.5, 128.8 (2C), 128.3 (2C), 126.9, 120.3, 120.2, 112.5, 57.5, 55.8, 28.8; HRMS (ESI) m/z $(M+H)^+$ calcd for $C_{15}H_{17}O_3S$ = 277.0898; found 277.0896.

**1,3-dimethyl-5-(phenethylsulfonyl)benzene (3j)**



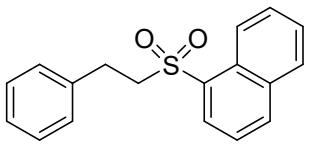
**3j** was obtained in 80% yield (109.6 mg) according to the general procedure (Hexan/EtOAc, 3:1): colorless oil; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.53 (s, 2H), 7.28-7.25 (m, 4H), 7.20 (t, $J$ = 7.2 Hz, 1H), 7.13 (d, $J$ =6.8 Hz, 2H), 3.37-3.32 (m, 2H), 3.07-3.03 (m, 2H), 2.40 (s, 6H); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$ 139.5, 138.8, 137.6, 135.5, 128.8 (2C), 128.3 (2C), 126.9, 125.5 (2C), 57.5, 28.8, 21.3 (2C); HRMS (ESI) m/z $(M+H)^+$ calcd for $C_{16}H_{19}O_2S$ = 275.1106; found 275.1107.

**1-bromo-2-methyl-4-(phenethylsulfonyl)benzene (3k)**



**3k** was obtained in 73% yield (123.0 mg) according to the general procedure (Hexan/EtOAc, 3:1): colorless oil; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.76-7.72 (m, 2H), 7.60-7.57 (m, 1H), 7.28-7.19 (m, 3H), 7.12 (d, $J$ = 6.4 Hz, 2H), 3.38-3.34 (m, 2H), 3.07-3.03 (m, 2H), 2.48 (s, 3H); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$ 138.9, 138.1, 137.2, 133.4, 129.9, 128.8 (2C), 128.4, 128.3 (2C), 127.0, 126.7, 57.6, 28.8, 23.1; HRMS (ESI) m/z $(M+H)^+$ calcd for $C_{15}H_{16}BrO_2S$ = 339.0054; found 339.0056.

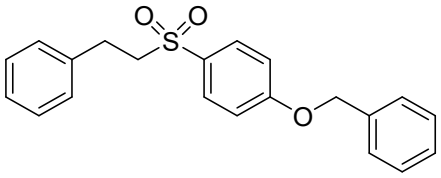
**1-(phenethylsulfonyl)naphthalene (3l)**



**3l** was obtained in 67% yield (99.1 mg) according to the general procedure (Hexan/EtOAc, 3:1): colorless oil; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 8.77 (d, $J$ = 8.4 Hz, 1H), 8.35 (d, $J$ = 8.2 Hz, 1H), 8.13 (d, $J$ = 8.8 Hz, 1H), 7.97 (d, $J$ = 8.8 Hz, 1H), 7.72 (t, $J$ = 8.4 Hz, 2H), 7.65-7.59 (m, 2H), 7.24-7.15 (m, 3H), 7.06 (d, $J$ = 6.8 Hz, 2H), 3.59-3.55 (m, 2H), 3.07-3.03 (m, 2H); $^{13}$C

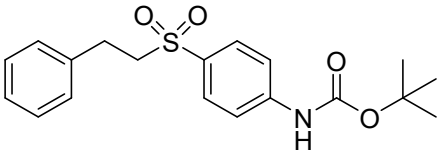
NMR (100 MHz, $CDCl_3$) $\delta$ 137.4, 135.3, 134.2, 134.0, 130.8, 129.3 (2C), 129.2, 128.7 (2C), 128.6, 128.2, 127.1, 126.8, 124.5, 123.9, 57.1, 28.7; HRMS (ESI) m/z $(M+H)^+$ calcd for $C_{18}H_{17}O_2S$ = 297.0949; found 297.0945.

**1-(benzyloxy)-4-(phenethylsulfonyl)benzene (3m)**



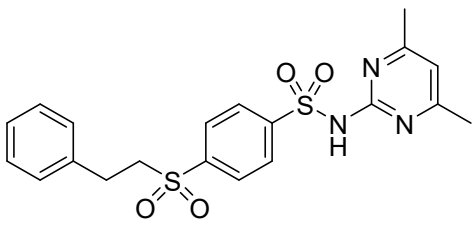
**3m** was obtained in 54% yield (95.4 mg) according to the general procedure (Hexan/EtOAc, 3:1): colorless oil; $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.87 (d, $J$ = 9.2 Hz, 2H), 7.43-7.41 (m, H), 7.27-7.24 (m, 3H), 7.11-7.09 (m, 4H), 5.15 (s, 2H), 3.36-3.31 (m, 2H), 3.06-3.01 (m, 3H); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$ 162.9, 137.6, 135.7, 133.1, 130.3 (2C), 128.8 (3C), 128.4, 128.3 (2C), 127.9 (2C), 127.5, 115.4 (2C), 70.4, 57.8, 28.9; HRMS (ESI) m/z $(M+H)^+$ calcd for $C_{21}H_{21}O_3S$ = 353.1211; found 353.1212.

**tert-butyl (4-(phenethylsulfonyl)phenyl)carbamate (3n)**



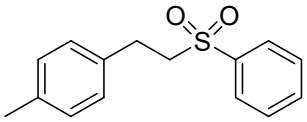
**3n** was obtained in 51% yield (92.1 mg) according to the general procedure (Hexan/EtOAc, 3:1): colorless oil; $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.85 (d, $J$ = 8.8 Hz, 2H), 7.53 (d, $J$ = 8.8 Hz, 2H), 7.28-7.25 (m, 3H), 7.22-7.18 (m, 1H), 7.11 (d, $J$ = 6.0 Hz, 2H), 6.87 (br. s, 1H), 3.35-3.31 (m, 2H), 3.04-2.99 (m, 2H), 1.53 (s, 3H); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$ 152.1, 143.7, 137.5, 132.2, 129.5 (2C), 128.8 (2C), 128.3 (2C), 126.9, 118.0 (2C), 81.7, 57.8, 28.9, 28.3 (3C); HRMS (ESI) m/z $(M+H)^+$ calcd for $C_{19}H_{24}O_4S$ = 362.1426; found 362.1425.

**N-(4,6-dimethylpyrimidin-2-yl)-4-(phenethylsulfonyl)benzenesulfonamide (3o)**



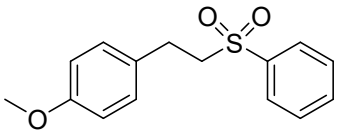
**3o** was obtained in 46% yield (99.1 mg) according to the general procedure (Hexan/EtOAc, 1:2): colorless oil; $^{1}$H NMR (400 MHz, CDCl3) δ 8.34 (d, J = 8.8 Hz, 2H), 8.04 (d, J = 8.8 Hz, 2H), 7.23-7.18 (m, 3H), 7.09 (d, J = 6.4 Hz, 2H), 6.66 (s, 1H), 3.41-3.38 (m, 2H), 3.07-3.03 (m, 2H), 2.38 (s, 6H); $^{13}$C NMR (100 MHz, $CDCl_3$) δ 168.4 (2C), 155.7, 145.3, 142.9, 136.9, 129.7 (2C), 128.9 (2C), 128.3 (2C), 128.2 (2C), 127.1, 114.9, 57.4, 28.6, 23.5 (2C); HRMS (ESI) m/z $(M+H)^+$ calcd for $C_{20}H_{22}N_3O_4S_2$ = 432.1052; found 432.1051.

**1-methyl-4-(2-(phenylsulfonyl)ethyl)benzene (4a)**



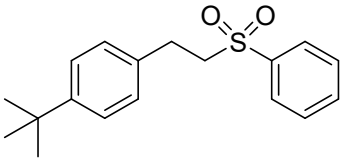
**4a** was obtained in 92% yield (119.6 mg) according to the general procedure (Hexan/EtOAc, 3:1): colorless oil; $^{1}$H NMR (400 MHz, $CDCl_3$) *δ* 7.96 (d, *J* = 7.2 Hz, 2H), 7.67 (t, *J* = 7.2 Hz, 1H), 7.58 (t, *J* = 7.6 Hz, 2H), 7.09 (d, *J* = 8.0 Hz, 2H), 7.01 (d, *J* = 8.0 Hz, 2H), 3.37-3.328 (m, 2H), 3.03-2.99 (m, 2H), 2.30 (s, 3H); $^{13}$C NMR (100 MHz, $CDCl_3$) *δ* 139.1, 136.6, 134.4, 133.8, 129.5 (2C), 129.3 (2C), 128.2 (2C), 128.1 (2C), 57.7, 28.3, 21.0; HRMS (ESI) m/z $(M+H)^+$ calcd for $C_{15}H_{17}O_2S$ = 261.0949; found 261.0947.

**1-methoxy-4-(2-(phenylsulfonyl)ethyl)benzene (4b)**



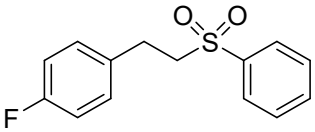
**4b** was obtained in 89% yield (122.8 mg) according to the general procedure (Hexan/EtOAc, 3:1): colorless oil; $^{1}$H NMR (400 MHz, $CDCl_3$) *δ* 7.94 (d, *J* = 7.6 Hz, 2H), 7.67 (t, *J* = 7.6 Hz, 1H), 7.58 (t, *J* = 7.6 Hz, 2H), 7.04 (d, *J* = 8.8 Hz, 2H), 6.80 (d, *J* = 8.8 Hz, 2H), 3.76 (s, 3H), 3.35-3.30 (m, 2H), 3.01-2.97 (m, 2H); $^{13}$C NMR (100 MHz, $CDCl_3$) *δ* 158.6, 139.2, 133.8, 129.3 (4C), 128.1 (2C), 114.2 (2C), 57.8, 55.3, 27.9; HRMS (ESI) m/z $(M+H)^+$ calcd for $C_{15}H_{17}O_3S$ = 277.0898; found 277.0895.

**1-(tert-butyl)-4-(2-(phenylsulfonyl)ethyl)benzene (4c)**



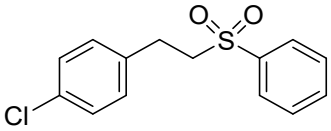
**4c** was obtained in 81% yield (122.3 mg) according to the general procedure (Hexan/EtOAc, 3:1): colorless oil; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.94 (d, $J$ = 7.2 Hz, 2H), 7.66 (t, $J$ = 7.6 Hz, 1H), 7.57 (t, $J$ = 8.0 Hz, 2H), 7.29 (d, $J$ = 8.4 Hz, 2H), 7.06 (d, $J$ = 8.4 Hz, 2H), 3.38-3.34 (m, 2H), 3.05-3.00 (m, 2H), 1.28 (s, 9H); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$ 149.9, 139.1, 134.4, 133.7, 129.3 (2C), 128.1 (2C), 127.9 (2C), 125.7 (2C), 57.7, 34.4, 31.1 (3C), 28.2; HRMS (ESI) m/z $(M+H)^+$ calcd for $C_{18}H_{23}O_2S$ = 303.1419; found 303.1416.

**1-fluoro-4-(2-(phenylsulfonyl)ethyl)benzene (4d)**



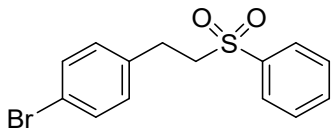
**4d** was obtained in 92% yield (121.4 mg) according to the general procedure (Hexan/EtOAc, 3:1): colorless oil; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.94 (d, $J$ = 7.2 Hz, 2H), 7.67 (t, $J$ = 7.6 Hz, 1H), 7.58 (t, $J$ = 8.4 Hz, 2H), 7.09-7.06 (m, 2H), 6.97-6.92 (m, 2H), 3.35-3.31 (m, 2H), 3.06-3.01 (m, 2H); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$ 163.0, 160.6, 139.0, 133.9, 133.2, 129.9, (2C), 129.4, 128.1 (2C), 115.8, 115.6, 57.6, 27.9; HRMS (ESI) m/z $(M+H)^+$ calcd for $C_{14}H_{14}FO_2S$ = 265.0699; found 265.0696.

**1-chloro-4-(2-(phenylsulfonyl)ethyl)benzene (4e)**



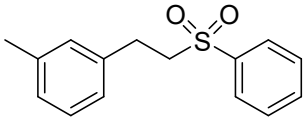
**4e** was obtained in 88% yield (123.2 mg) according to the general procedure (Hexan/EtOAc, 3:1): yellow oil; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.93 (d, $J$ = 7.2 Hz, 2H), 7.67 (t, $J$ = 7.6 Hz, 1H), 7.56 (t, $J$ = 8.0 Hz, 2H), 7.24 (d, $J$ = 8.4 Hz, 2H), 7.06 (d, $J$ = 8.4 Hz, 2H), 3.35-3.31 (m, 2H), 3.05-3.01 (m, 2H); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$ 138.9, 135.9, 133.9, 132.8, 129.7 (2C), 129.4 (2C), 128.9 (2C), 120.1 (2C), 57.3, 28.2; HRMS (ESI) m/z $(M+H)^+$ calcd for $C_{14}H_{14}ClO_2S$ = 281.0403; found 281.0401.

**1-bromo-4-(2-(phenylsulfonyl)ethyl)benzene (4f)**



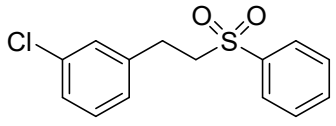
**4f** was obtained in 87% yield (144.5 mg) according to the general procedure (Hexan/EtOAc, 3:1): yellow oil; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.93 (d, $J$ = 7.2 Hz, 2H), 7.68 (t, $J$ = 7.6 Hz, 1H), 7.58 (t, $J$ = 8.0 Hz, 2H), 7.39 (d, $J$ = 8.4 Hz, 2H), 7.00 (d, $J$ = 8.4 Hz, 2H), 3.35-3.31 (m, 2H), 3.05-2.99 (m, 2H); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$ 138.9, 136.4, 133.9, 131.9 (2C), 130.1 (2C), 129.4 (2C), 128.1 (2C), 120.8, 57.2, 28.2; HRMS (ESI) m/z $(M+H)^+$ calcd for $C_{14}H_{14}BrO_2S$ = 324.9898; found 324.9895.

**1-methyl-3-(2-(phenylsulfonyl)ethyl)benzene (4g)**



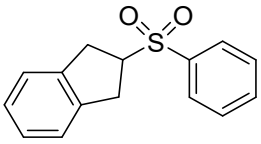
**4g** was obtained in 90% yield (117.0 mg) according to the general procedure (Hexan/EtOAc, 3:1): colorless oil; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.95 (d, $J$ = 6.8 Hz, 2H), 7.67 (t, $J$ = 7.2 Hz, 1H), 7.58 (t, $J$ = 7.6 Hz, 2H), 7.15 (t, $J$ = 7.6 Hz, 1H), 7.02 (d, $J$ = 7.6 Hz, 1H), 6.92 (d, $J$ = 7.6 Hz, 2H), 3.37-3.33 (m, 2H), 3.03-2.99 (m, 2H), 2.29 (s, 3H); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$ 139.1, 138.5, 137.4, 133.8, 129.3 (2C), 129.1, 128.7, 128.1 (2C), 127.7, 125.3, 57.6, 28.7, 21.3; HRMS (ESI) m/z $(M+H)^+$ calcd for $C_{15}H_{17}O_2S$ = 261.0949; found 261.0947.

**1-chloro-3-(2-(phenylsulfonyl)ethyl)benzene (4h)**



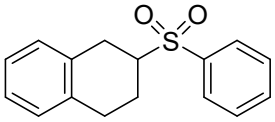
**4h** was obtained in 89% yield (124.6 mg) according to the general procedure (Hexan/EtOAc, 3:1): colorless oil; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.94 (d, $J$ = 6.8 Hz, 2H), 7.67 (t, $J$ = 7.6 Hz, 1H), 7.58 (t, $J$ = 8.0 Hz, 2H), 7.20-7.15 (m, 2H), 7.09 (s, 1H), 7.02-7.00 (m, 1H), 3.37-3.33 (m, 2H), 3.06-3.02 (m, 2H); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$ 139.4, 138.9, 134.6, 133.9, 130.1, 129.4 (2C), 128.5, 128.1 (2C), 127.2, 126.5, 57.2, 28.4; HRMS (ESI) m/z $(M+H)^+$ calcd for $C_{14}H_{14}ClO_2S$ = 281.0403; found 281.0405.

**2-(phenylsulfonyl)-2,3-dihydro-1H-indene (4i)**



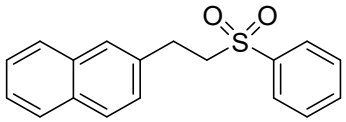
**4i** was obtained in 81% yield (104.5 mg) according to the general procedure (Hexan/EtOAc, 3:1): colorless oil; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.95 (d, $J$ = 7.2 Hz, 2H), 7.65 (t, $J$ = 7.6 Hz, 1H), 7.56 (t, $J$ = 7.6 Hz, 2H), 7.14 (s, 4H), 4.08-3.99 (s, 2H), 3.52-3.46 (m, 2H), 3.23-3.16 (m, 2H); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$ 139.5, 138.3, 133.8, 129.3 (2C), 128.6 (2C), 127.2 (2C), 124.4 (2C), 63.6, 33.8 (2C); HRMS (ESI) m/z $(M+H)^+$ calcd for $C_{15}H_{15}O_2S$ = 259.0793; found 259.0794.

**2-(phenylsulfonyl)-1,2,3,4-tetrahydronaphthalene (4j)**



**4j** was obtained in 85% yield (115.6 mg) according to the general procedure (Hexan/EtOAc, 3:1): colorless oil; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.96 (d, $J$ = 7.2 Hz, 2H), 7.69 (t, $J$ = 7.2 Hz, 1H), 7.60 (t, $J$ = 7.6 Hz, 2H), 7.13-7.05 (m, 4H), 3.39-3.31 (m, 1H), 3.05-3.03 (m, 2H), 2.99-2.93 (m, 1H), 2.87-2.78 (m, 1H), 2.42-2.37 (m, 1H), 1.89-1.78 (s, 1H); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$ 137.7, 134.8, 133.9, 132.9, 129.2 (2C), 129.1 (2C), 129.0, 128.8, 126.5, 126.3, 60.6, 31.6, 28.8, 28.4; HRMS (ESI) m/z $(M+H)^+$ calcd for $C_{16}H_{17}O_2S$ = 273.0949; found 273.0948.

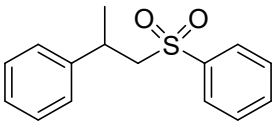
**2-(2-(phenylsulfonyl)ethyl)naphthalene (4k)**



**4k** was obtained in 88% yield (130.2 mg) according to the general procedure (Hexan/EtOAc, 3:1): colorless oil; $^{1}$H NMR (400 MHz, $CDCl_3$) $\delta$ 7.97 (d, $J$ = 7.2 Hz, 2H), 7.80-7.72 (m, 3H), 7.66-7.64 (m, 1H), 7.59-7.55 (m, 3H), 7.45-7.44 (m, 2H), 7.24-7.21 (m, 1H), 3.48-3.44 (m, 2H), 3.24-3.20 (m, 2H); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$ 139.1, 134.8, 133.8, 133.5, 132.3,

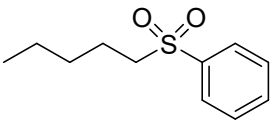
129.4 (2C), 128.6, 128.1 (2C), 127.7, 127.5, 126.8, 126.4, 126.3, 125.9, 57.5, 28.9; HRMS (ESI) m/z $(M+H)^+$ calcd for $C_{18}H_{17}O_2S$ = 297.0949; found 297.0946.

**((2-phenylpropyl)sulfonyl)benzene (4l)**



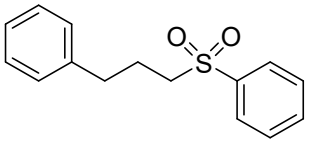
**4l** was obtained in 75% yield (130.2 mg) according to the general procedure (Hexan/EtOAc, 3:1): colorless oil; $^1$H NMR (400 MHz, $CDCl_3$) δ 7.82 (d, J = 8.4 Hz, 2H), 7.58 (t, J = 7.2 Hz, 1H), 7.47 (t, J = 7.2 Hz, 2H), 7.22 (t, J = 6.4 Hz, 2H), 7.16 (t, J = 7.2 Hz, 1H), 7.09 (d, J = 8.4 Hz, 2H), 3.45-3.33 (m, 3H), 1.45 (d, J = 6.4 Hz, 3H); $^{13}$C NMR (100 MHz, CDCl3) δ 146.2, 136.5, 130.0 (2C), 128.9 (2C), 128.3 (2C), 127.1, 126.4, 124.8 (2C), 73.9, 49.6, 29.4; HRMS (ESI) m/z $(M+H)^+$ calcd for $C_{15}H_{17}O_2S$ = 261.0949; found 261.0947.

**(pentylsulfonyl)benzene (4m)**



**4m** was obtained in 69% yield (73.1 mg) according to the general procedure (Hexan/EtOAc, 3:1): colorless oil; $^1$H NMR (400 MHz, $CDCl_3$) δ 7.91 (d, J = 8.8 Hz, 2H), 7.65 (t, J = 7.2 Hz, 1H), 7.56 (t, J = 7.6 Hz, 2H), 3.09-3.05 (m, 2H), 1.73-1.65 (m, 2H), 1.35-1.26 (m, 4H), 0.85 (t, J = 6.8 Hz, 3H); $^{13}$C NMR (100 MHz, $CDCl_3$) δ 139.2, 133.6, 129.3 (2C), 128.1 (2C), 56.3, 30.4, 22.3, 22.1, 13.7; HRMS (ESI) m/z $(M+H)^+$ calcd for $C_{11}H_{17}O_2S$ = 213.0949; found 213.0950.

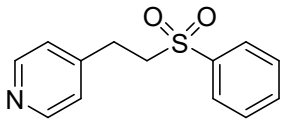
**((3-phenylpropyl)sulfonyl)benzene (4n)**



**4n** was obtained in 79% yield (102.7 mg) according to the general procedure (Hexan/EtOAc, 3:1): colorless oil; $^1$H NMR (400 MHz, $CDCl_3$) δ 7.89 (d, J = 7.2 Hz, 2H), 7.65 (t, J = 7.2 Hz,

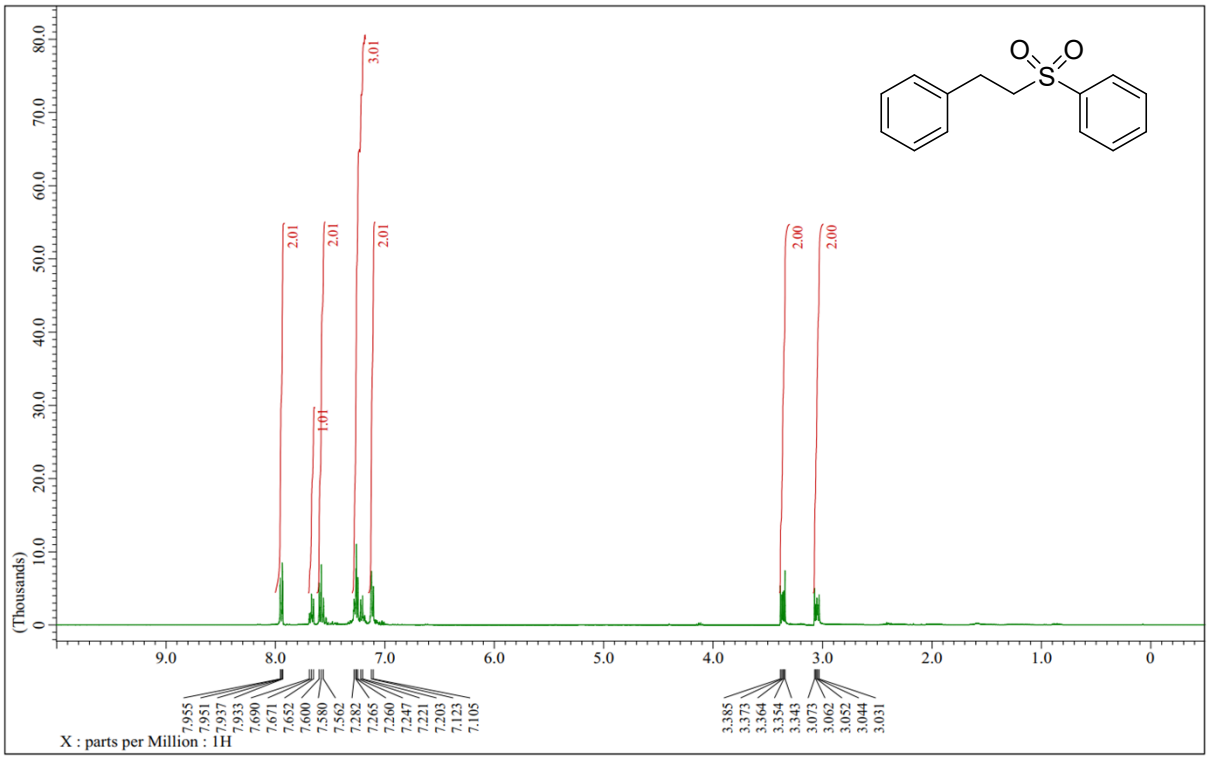
1H), 7.56 (t, J = 7.6 Hz, 2H), 7.27 (t, J = 6.8 Hz, 2H), 7.19 (t, J = 6.8 Hz, 2H), 7.56 (d, J = 7.6 Hz, 2H), 3.09-3.05 (m, 2H), 2.69 (t, J = 7.6 Hz, 2H), 2.09-2.01 (m, 2H); $^{13}C$ NMR (100 MHz, $CDCl_3$) δ 139.9, 139.1, 133.7, 129.3 (2C), 128.6 (2C), 128.4 (2C), 128.1 (2C), 126.4, 55.5, 34.1, 24.2; HRMS (ESI) m/z $(M+H)^+$ calcd for $C_{15}H_{17}O_2S$ = 261.0949; found 261.0948.

**4-(2-(phenylsulfonyl)ethyl)pyridine (4o)**

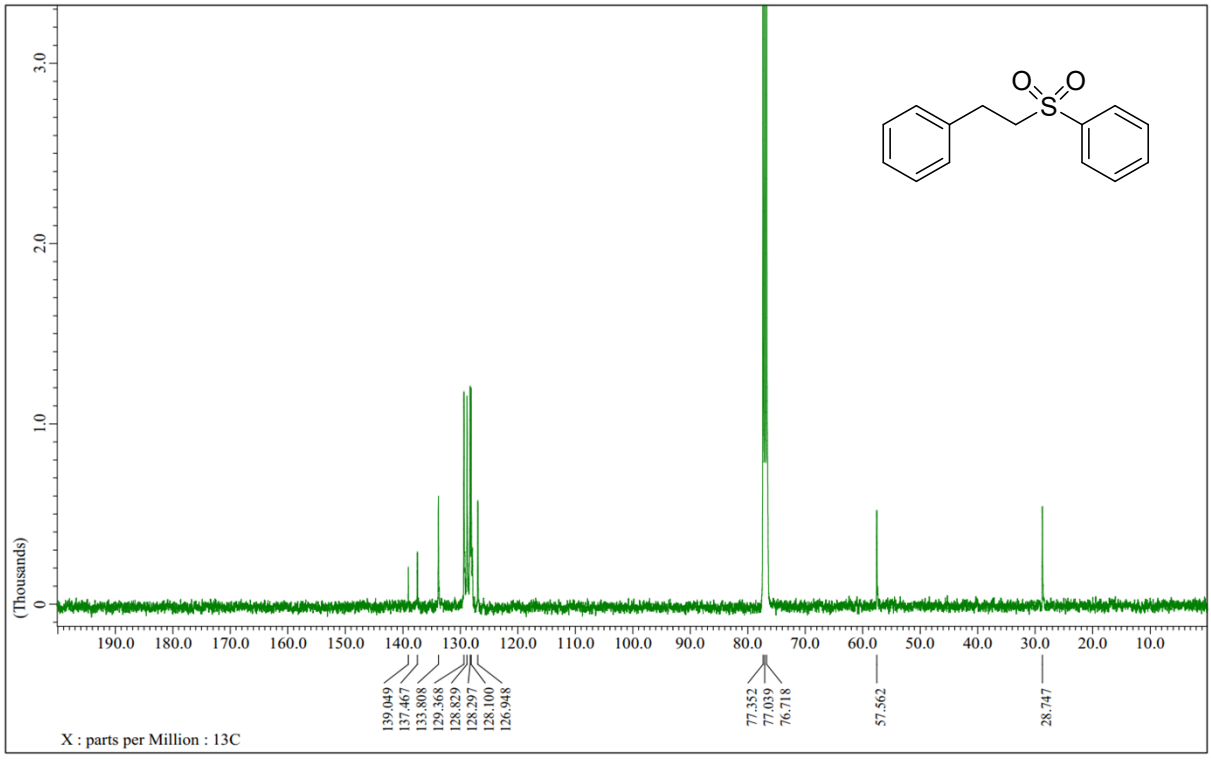



**4o** was obtained in 73% yield (90.2 mg) according to the general procedure (Hexan/EtOAc, 3:1): colorless oil; $^1H$ NMR (400 MHz, $CDCl_3$) δ 8.53 (s, 2H), 7.94 (d, J = 8.8 Hz, 2H), 7.68 (t, J = 7.6 Hz, 1H), 7.58 (t, J = 7.6 Hz, 2H), 7.12 (s, 2H), 3.39-3.35 (m, 2H), 3.11-3.06 (m, 2H); $^{13}C$ NMR (100 MHz, $CDCl_3$) δ 149.5, 147.2, 138.8, 134.1, 129.5 (2C), 128.1 (2C), 123.9 (2C), 56.1, 28.1; HRMS (ESI) m/z $(M+H)^+$ calcd for $C_{13}H_{14}NO_2S$ = 248.0745; found 248.0743.

**(phenethylsulfonyl)benzene (3a)**

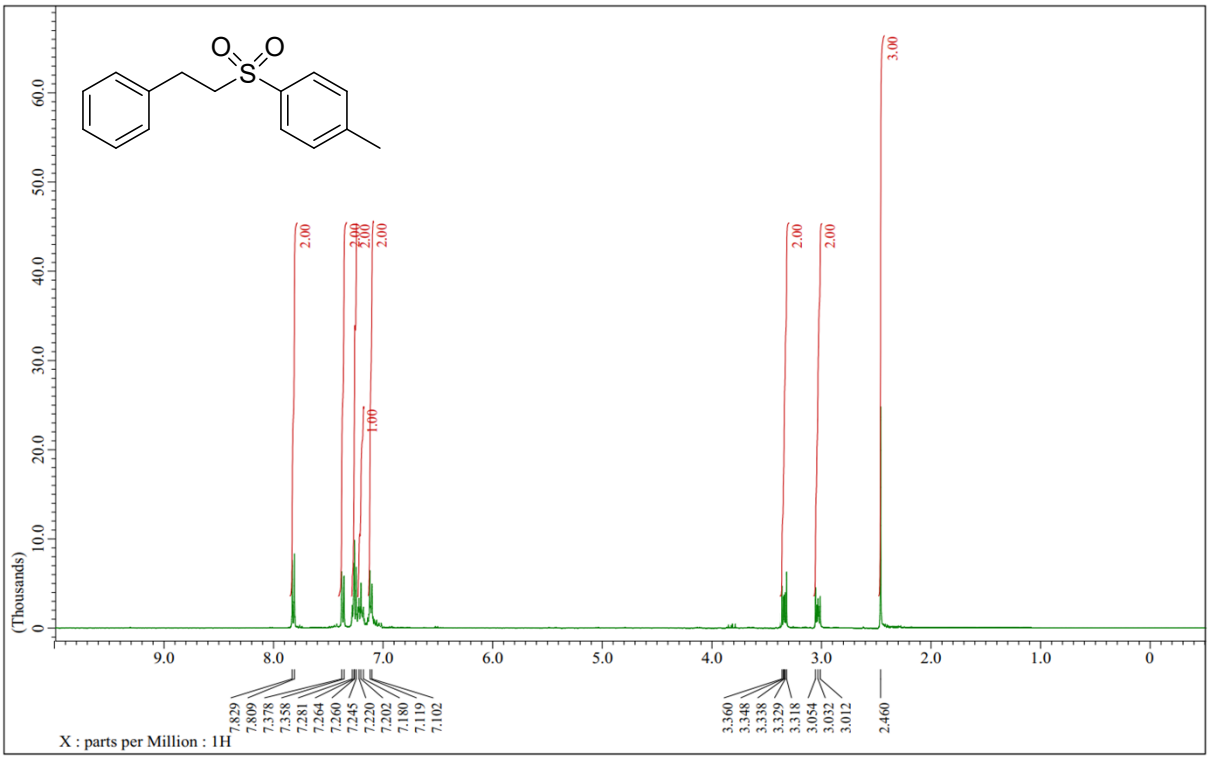



$^{1}$H NMR spectrum of (phenethylsulfonyl)benzene

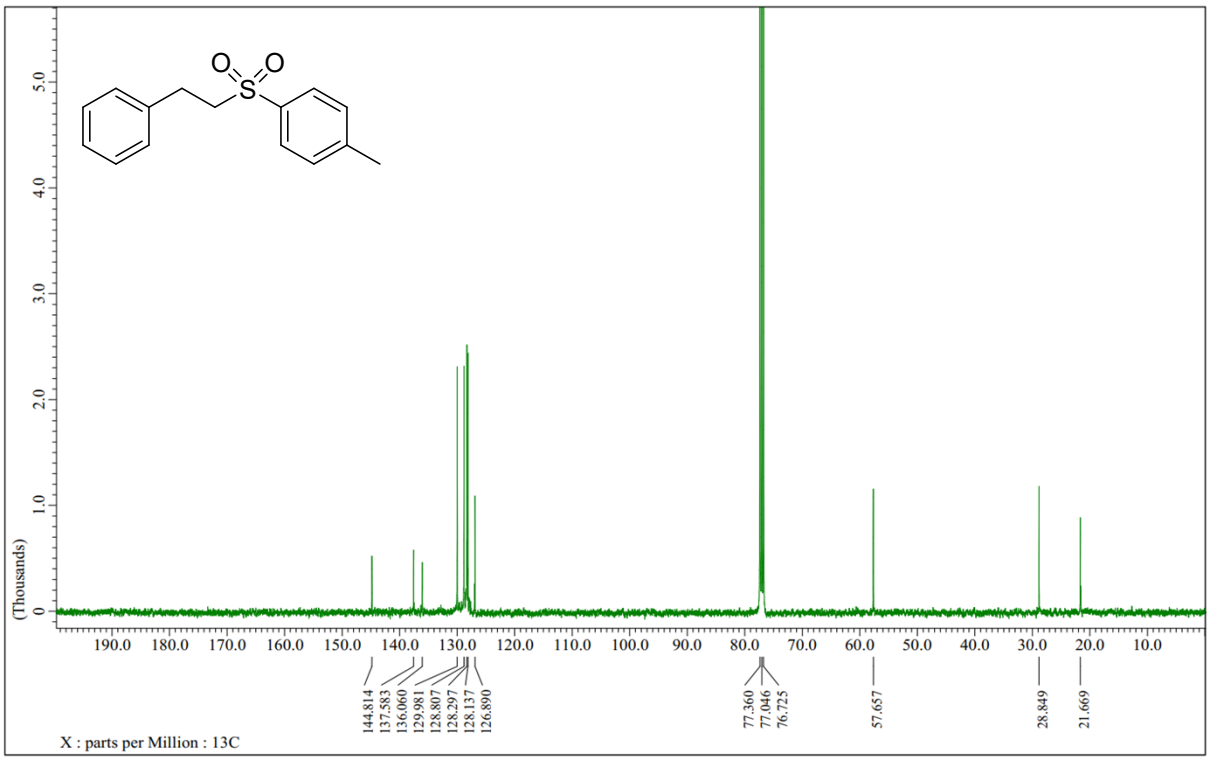



$^{13}$C NMR spectrum of (phenethylsulfonyl)benzene

**1-methyl-4-(phenethylsulfonyl)benzene (3b)**

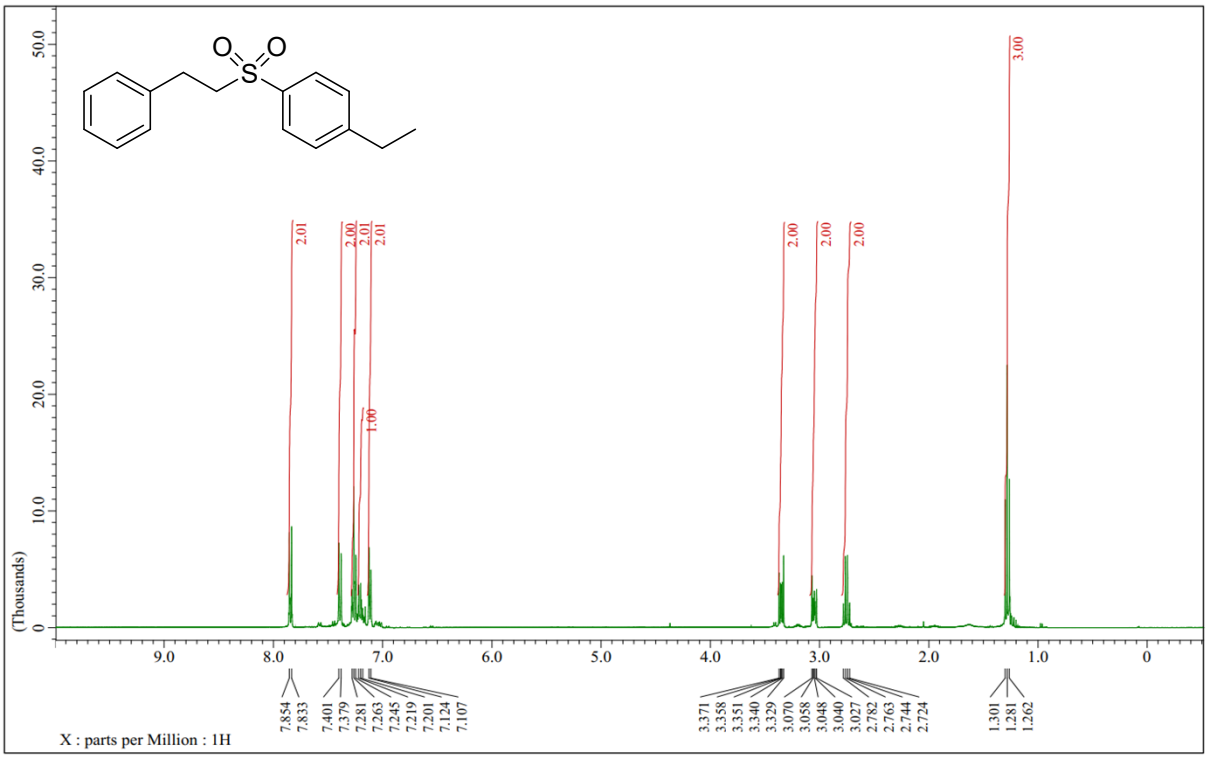



$^{1}$H NMR spectrum of 1-methyl-4-(phenethylsulfonyl)benzene

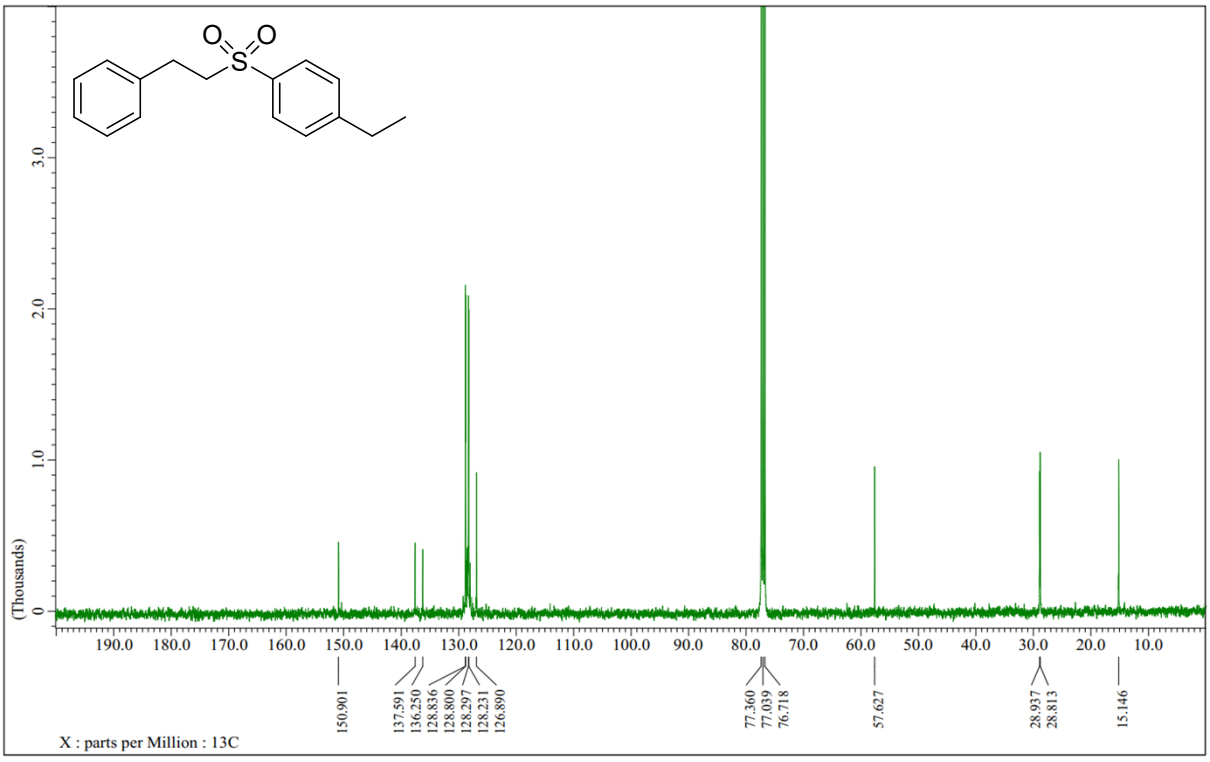



$^{13}$C NMR spectrum of 1-methyl-4-(phenethylsulfonyl)benzene

**1-ethyl-4-(phenethylsulfonyl)benzene (3c)**

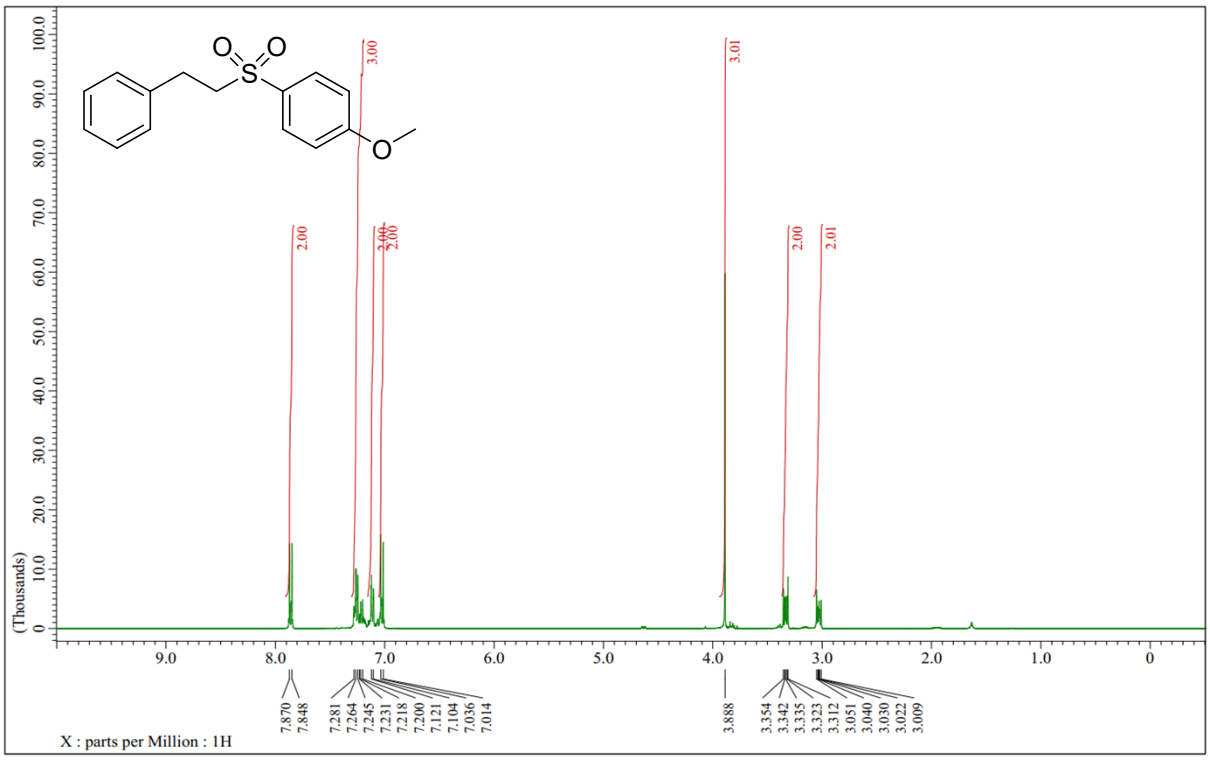



$^{1}$H NMR spectrum of 1-ethyl-4-(phenethylsulfonyl)benzene

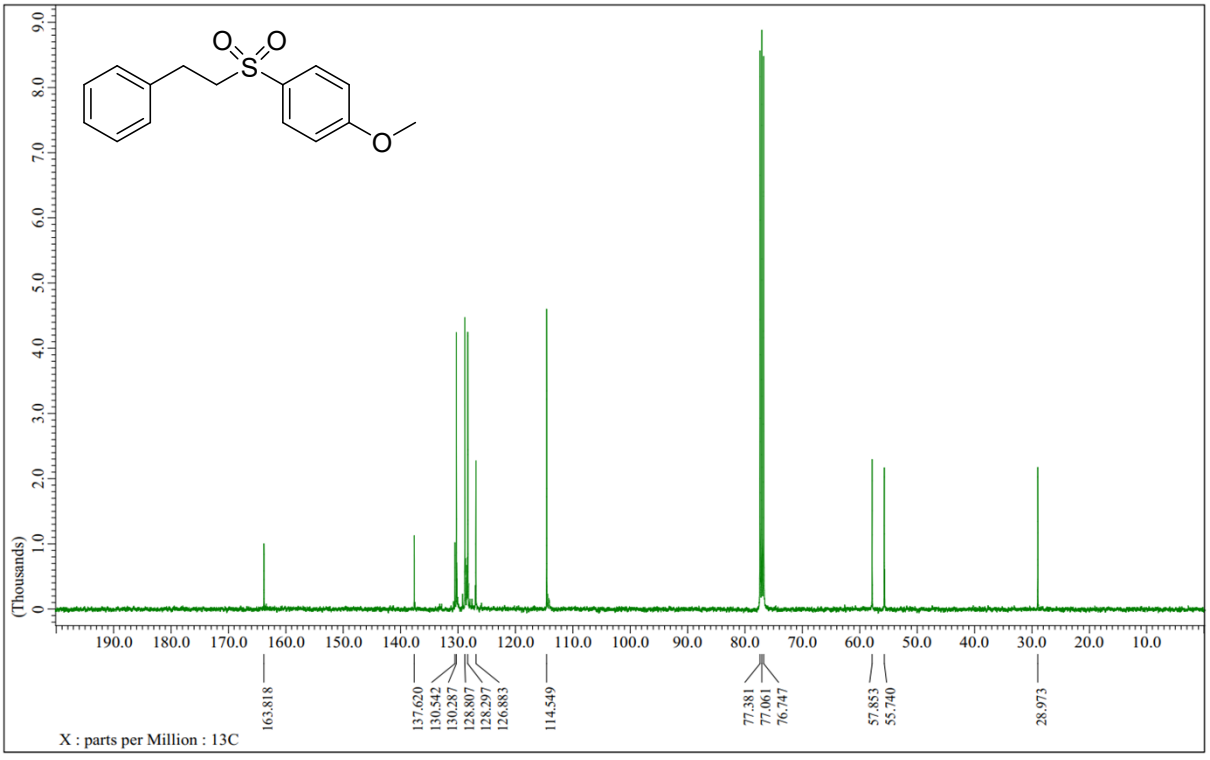



$^{13}$C NMR spectrum of 1-ethyl-4-(phenethylsulfonyl)benzene

**1-methoxy-4-(phenethylsulfonyl)benzene (3d)**

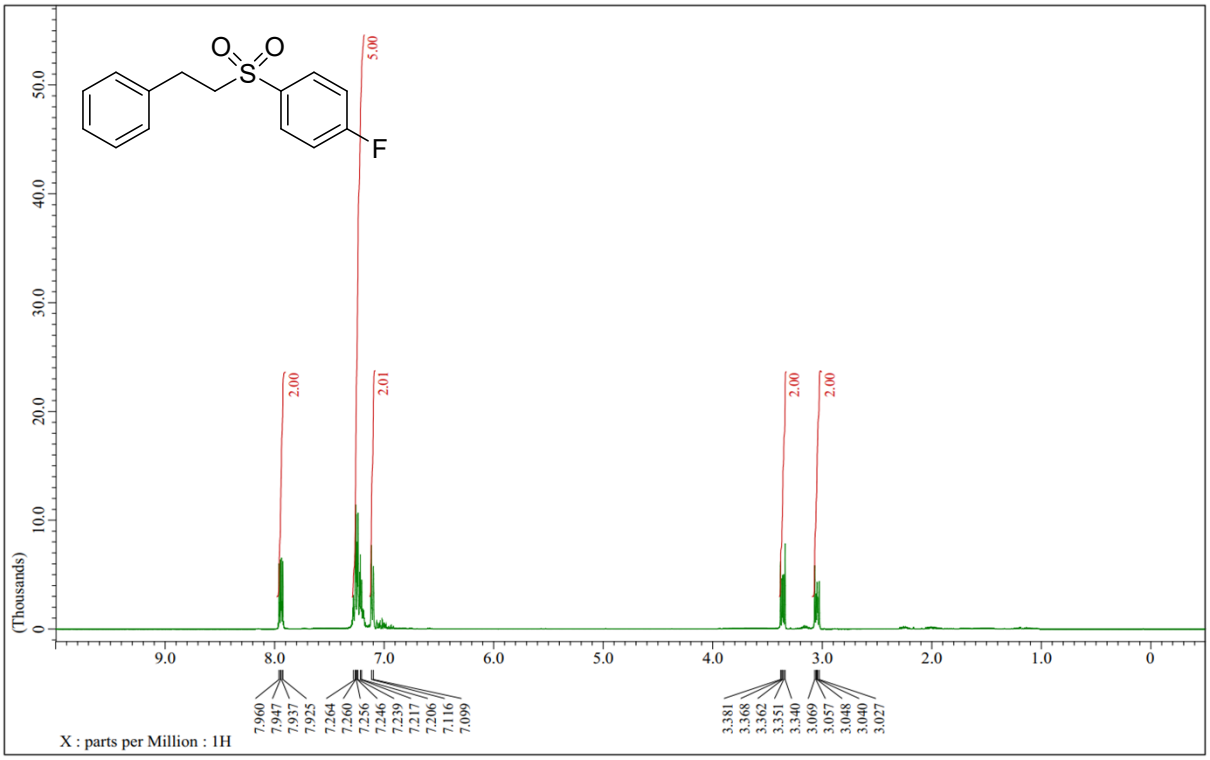



$^{1}$H NMR spectrum of 1- methoxy -4-(phenethylsulfonyl)benzene

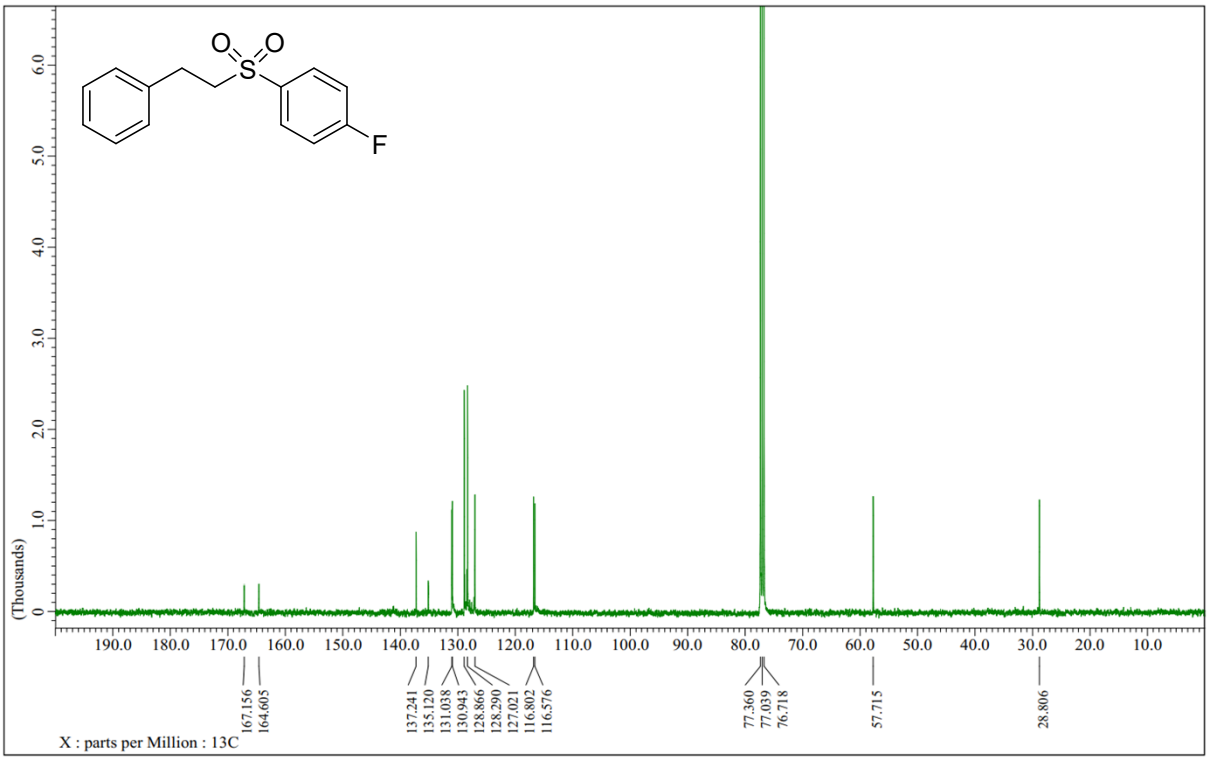



$^{13}$C NMR spectrum of 1- methoxy -4-(phenethylsulfonyl)benzene

**1-fluoro-4-(phenethylsulfonyl)benzene (3e)**

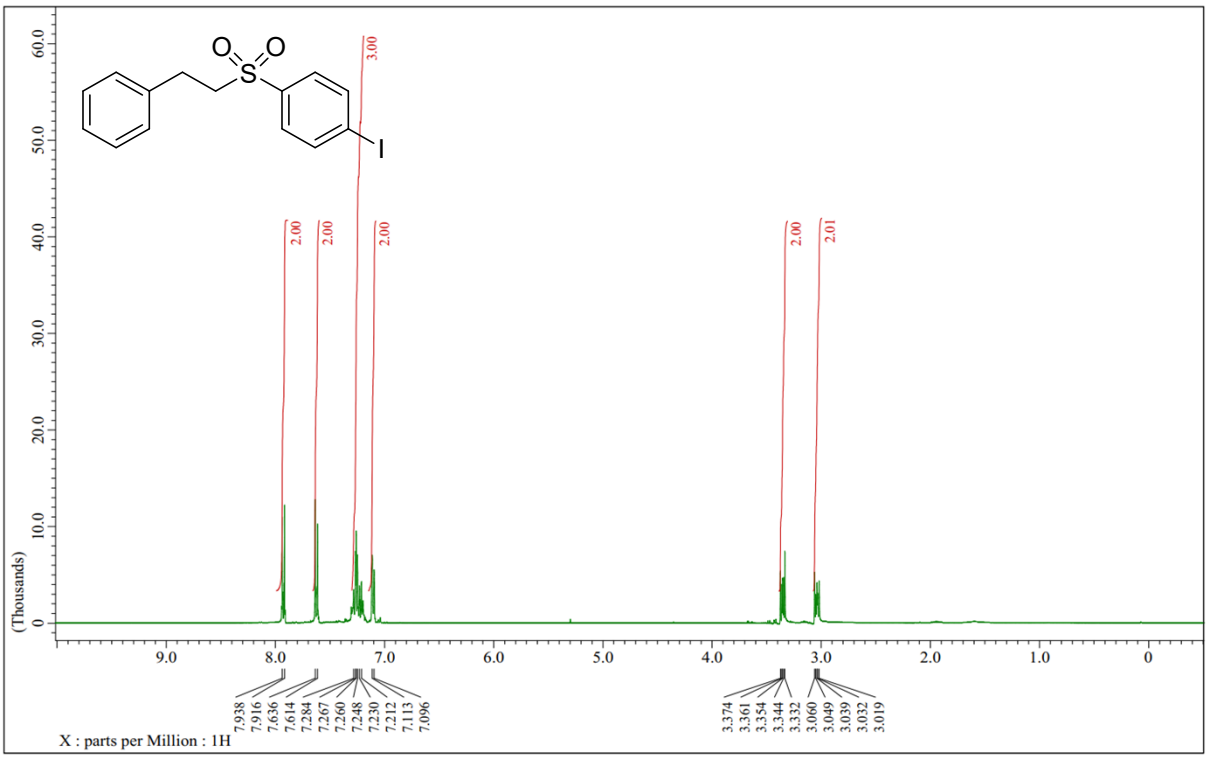



$^{1}$H NMR spectrum of 1-fluoro-4-(phenethylsulfonyl)benzene

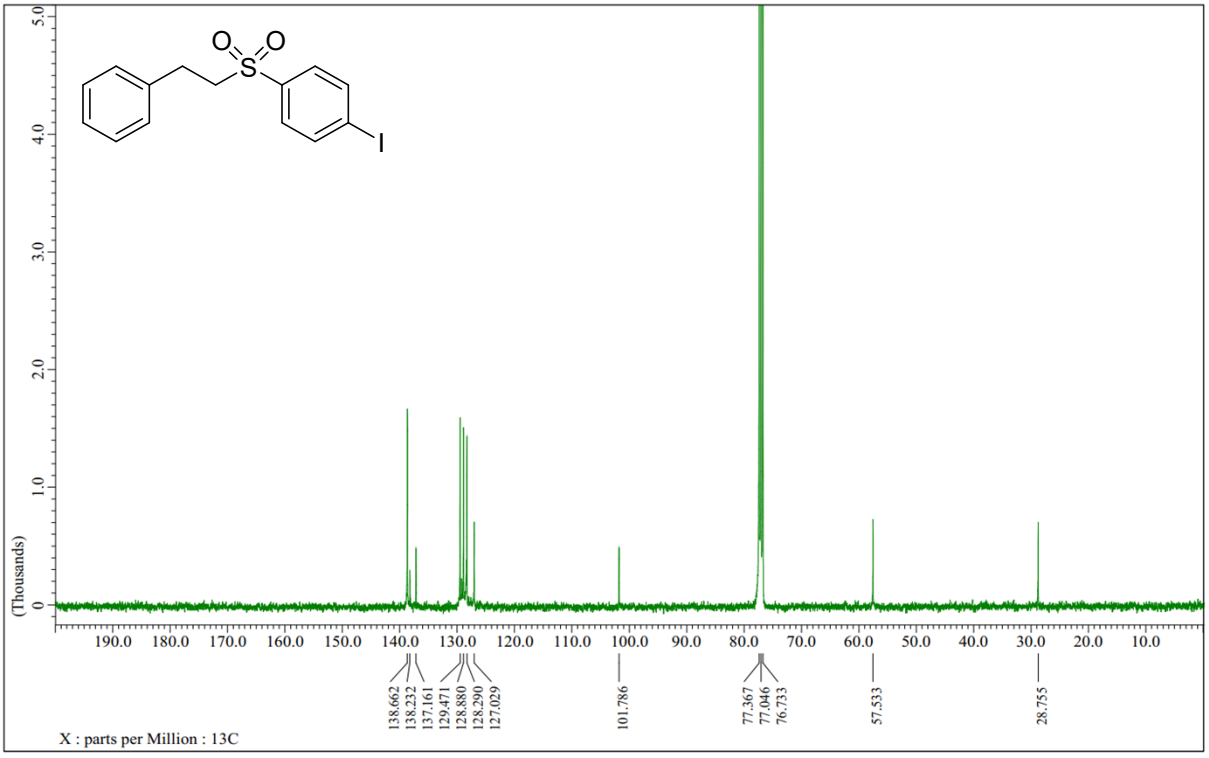



$^{13}$C NMR spectrum of 1-fluoro-4-(phenethylsulfonyl)benzene

**1-iodo-4-(phenethylsulfonyl)benzene (3f)**

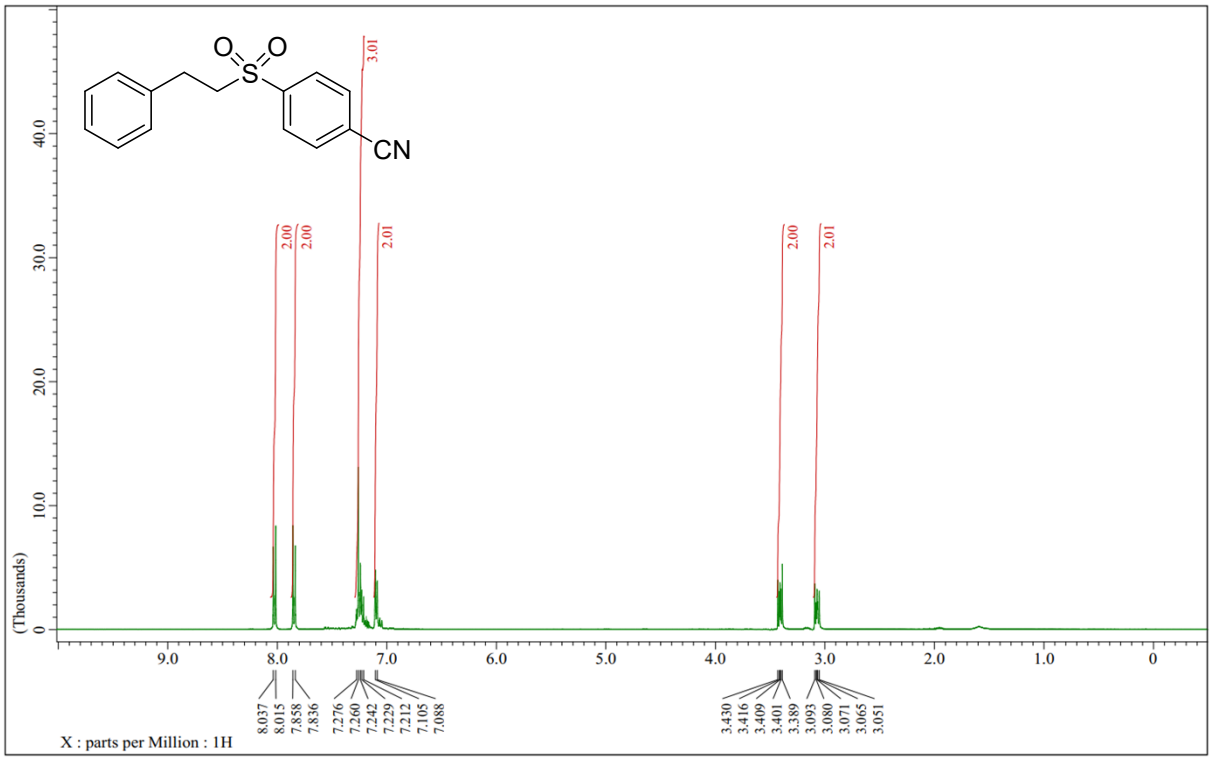



$^{1}$H NMR spectrum of 1-iodo-4-(phenethylsulfonyl)benzene

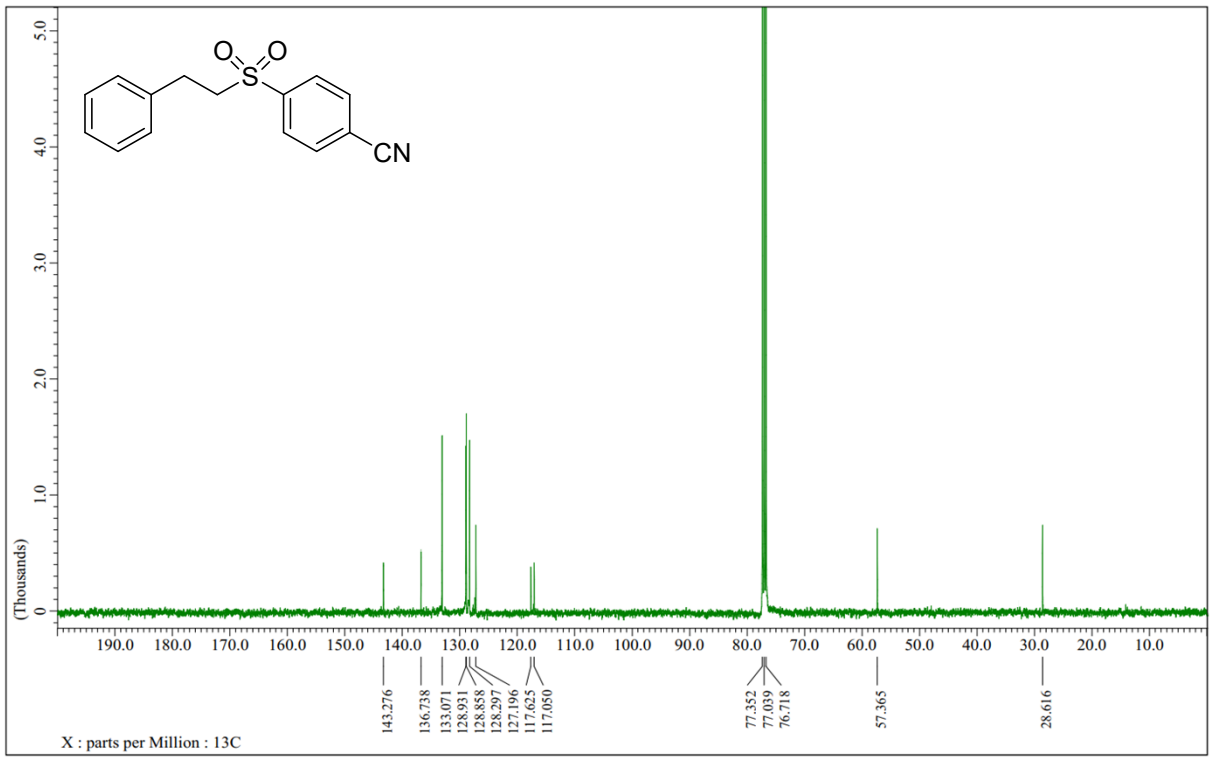



$^{13}$C NMR spectrum of 1-iodo-4-(phenethylsulfonyl)benzene

**4-(phenethylsulfonyl)benzonitrile (3g)**

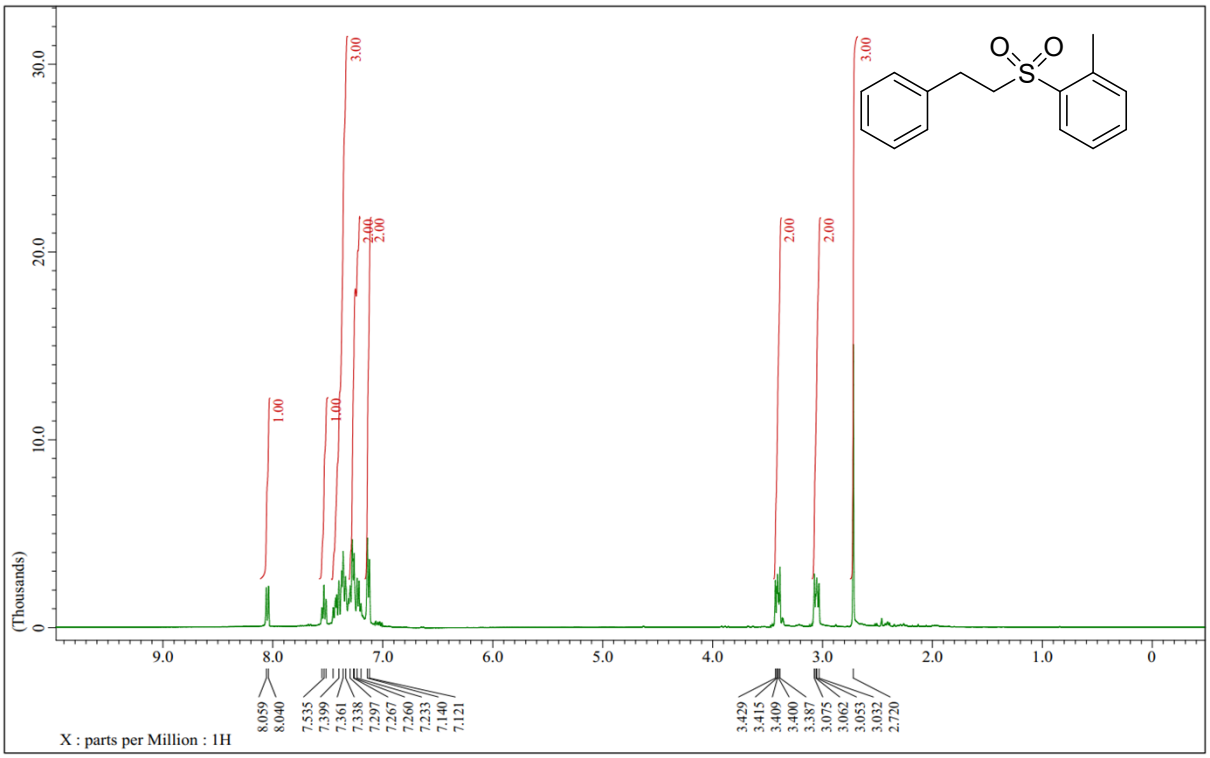



$^{1}$H NMR spectrum of 4-(phenethylsulfonyl)benzonitrile

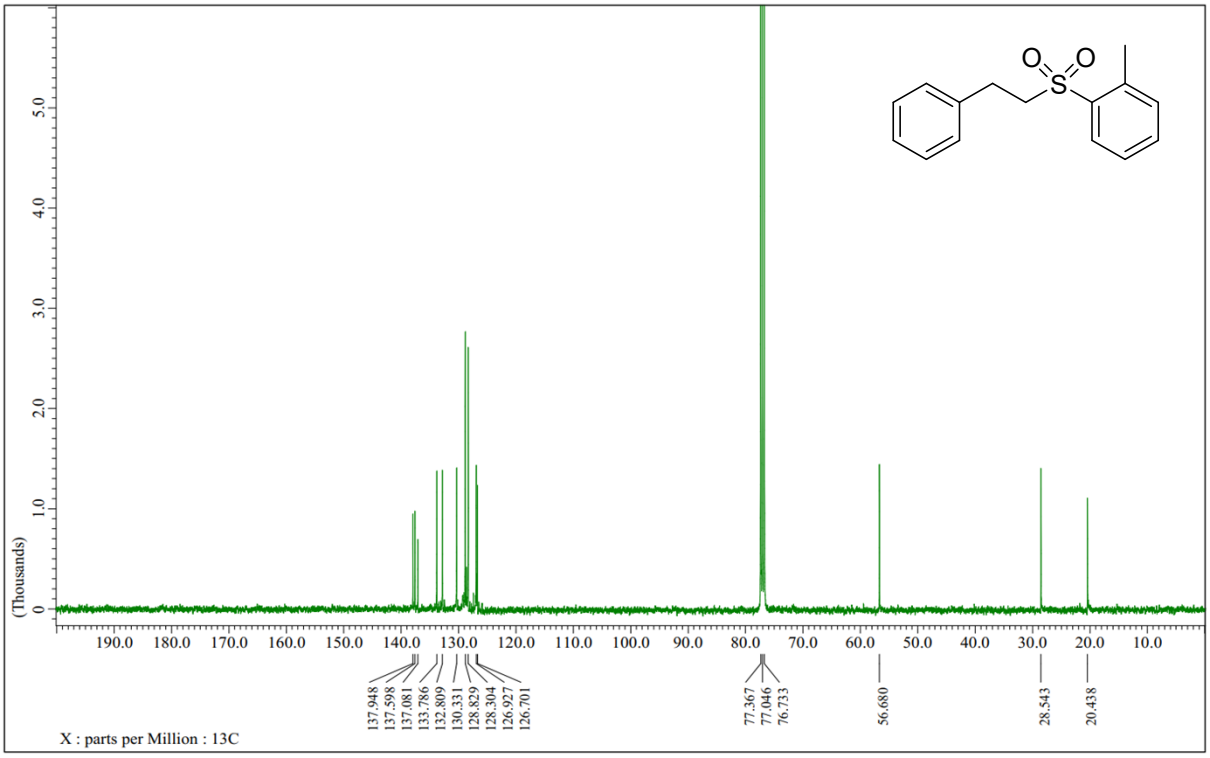



$^{13}$C NMR spectrum of 4-(phenethylsulfonyl)benzonitrile

**1-methyl-2-(phenethylsulfonyl)benzene (3h)**

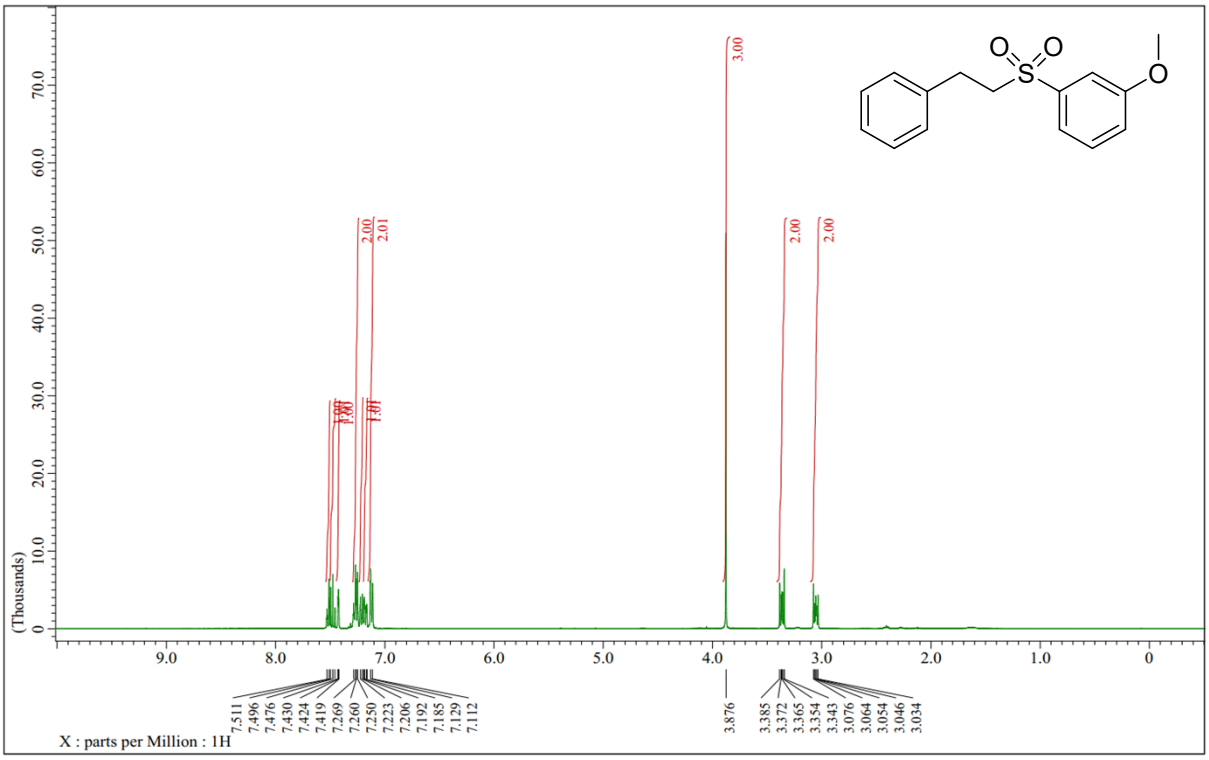



$^{1}$H NMR spectrum of 1-methyl-2-(phenethylsulfonyl)benzene

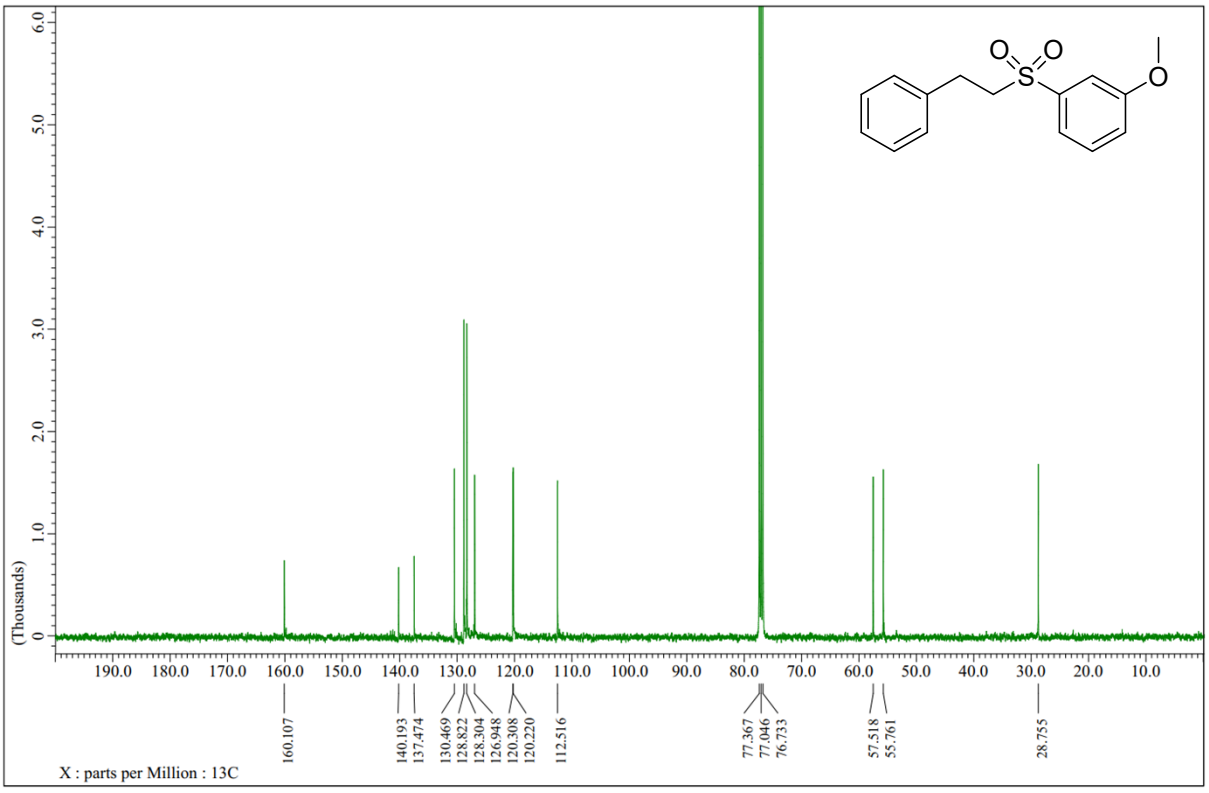



$^{13}$C NMR spectrum of 1-methyl-2-(phenethylsulfonyl)benzene

**1-methoxy-4-(phenethylsulfonyl)benzene (3i)**

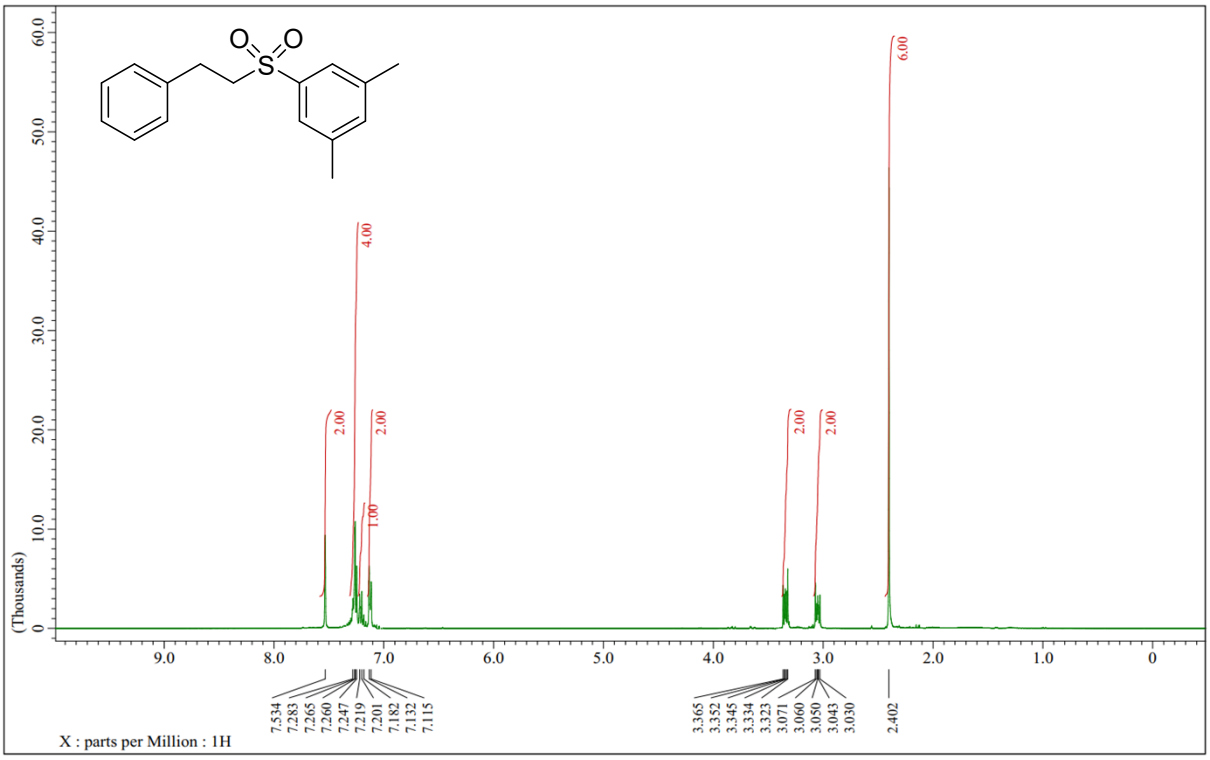



$^{1}$H NMR spectrum of 1-methoxy-4-(phenethylsulfonyl)benzene

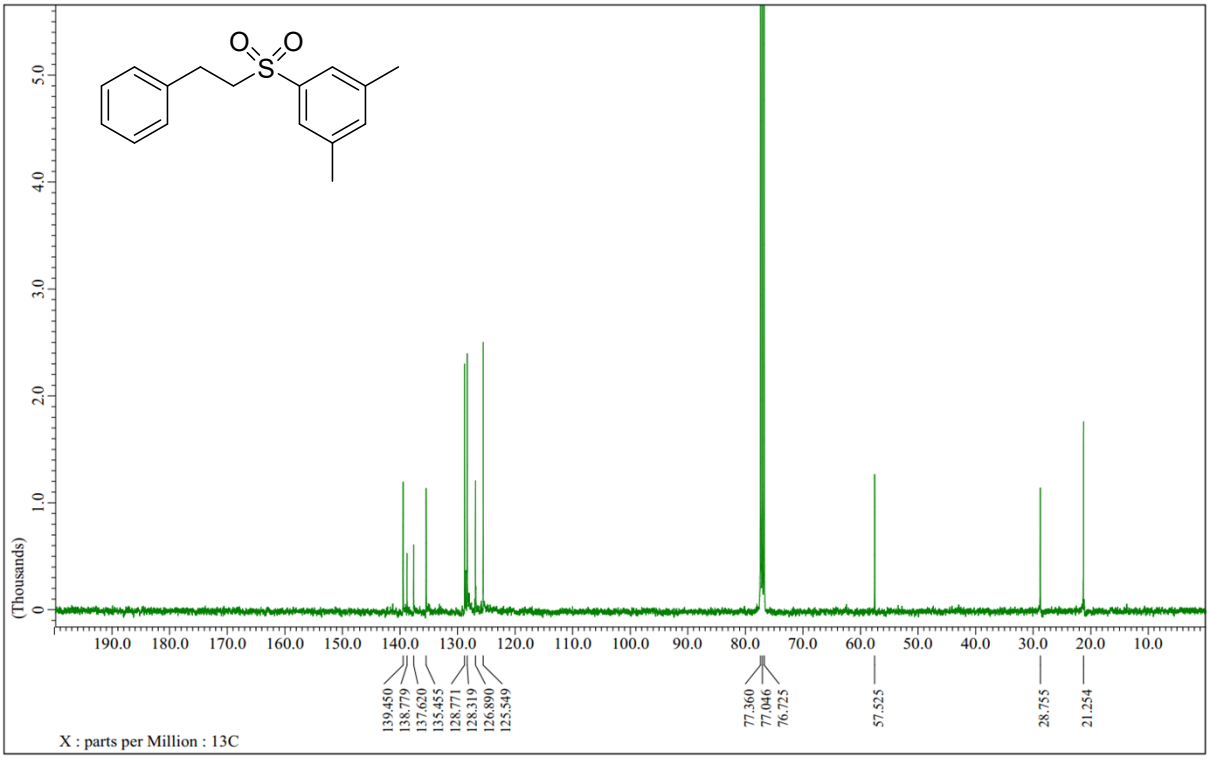



$^{13}$C NMR spectrum of 1-methoxy-4-(phenethylsulfonyl)benzene

**1,3-dimethyl-5-(phenethylsulfonyl)benzene (3j)**

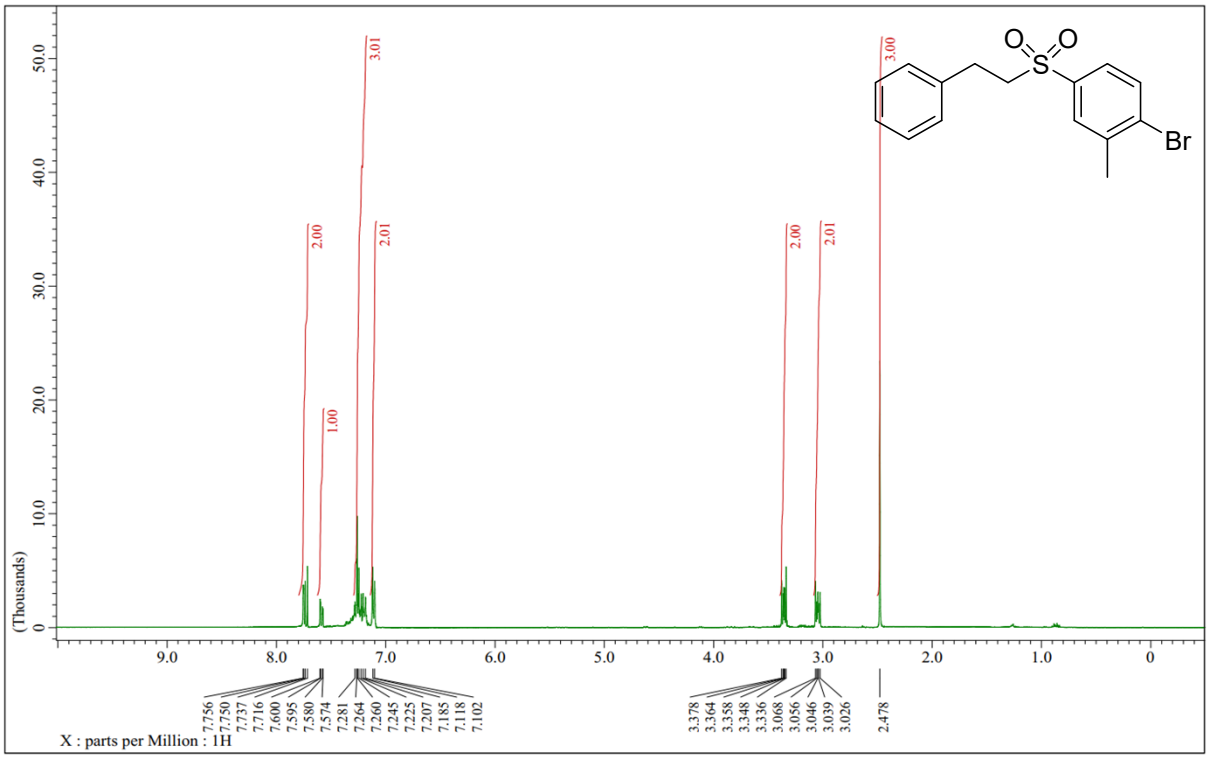



$^{1}$H NMR spectrum of 1,3-dimethyl-5-(phenethylsulfonyl)benzene

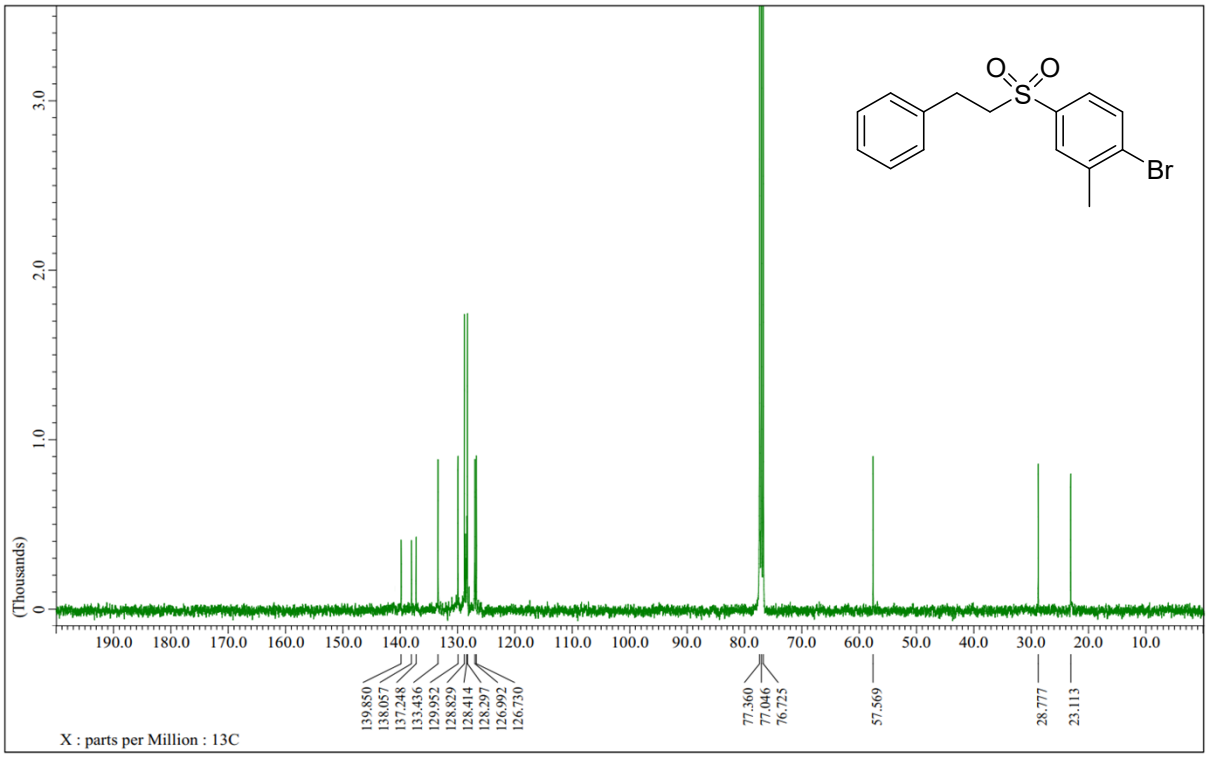



$^{13}$C NMR spectrum of 1,3-dimethyl-5-(phenethylsulfonyl)benzene

**1-bromo-2-methyl-4-(phenethylsulfonyl)benzene (3k)**

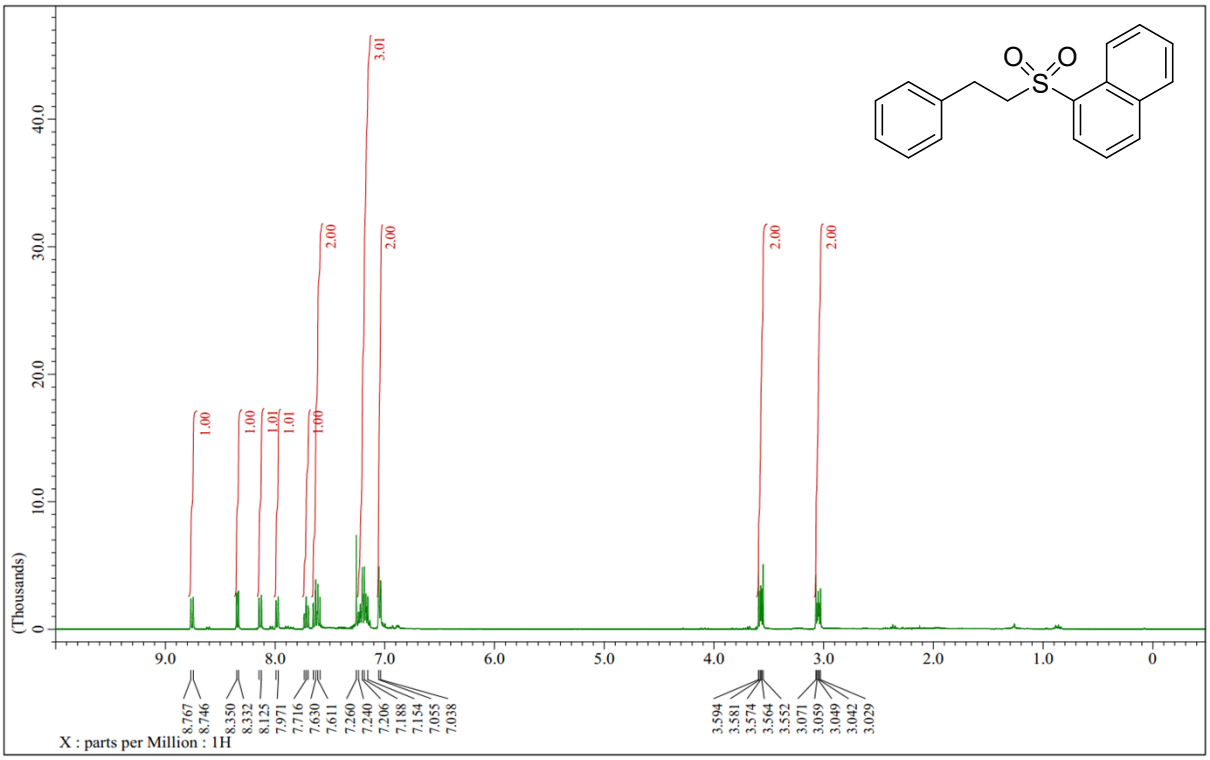



$^{1}$H NMR spectrum of 1-bromo-2-methyl-4-(phenethylsulfonyl)benzene

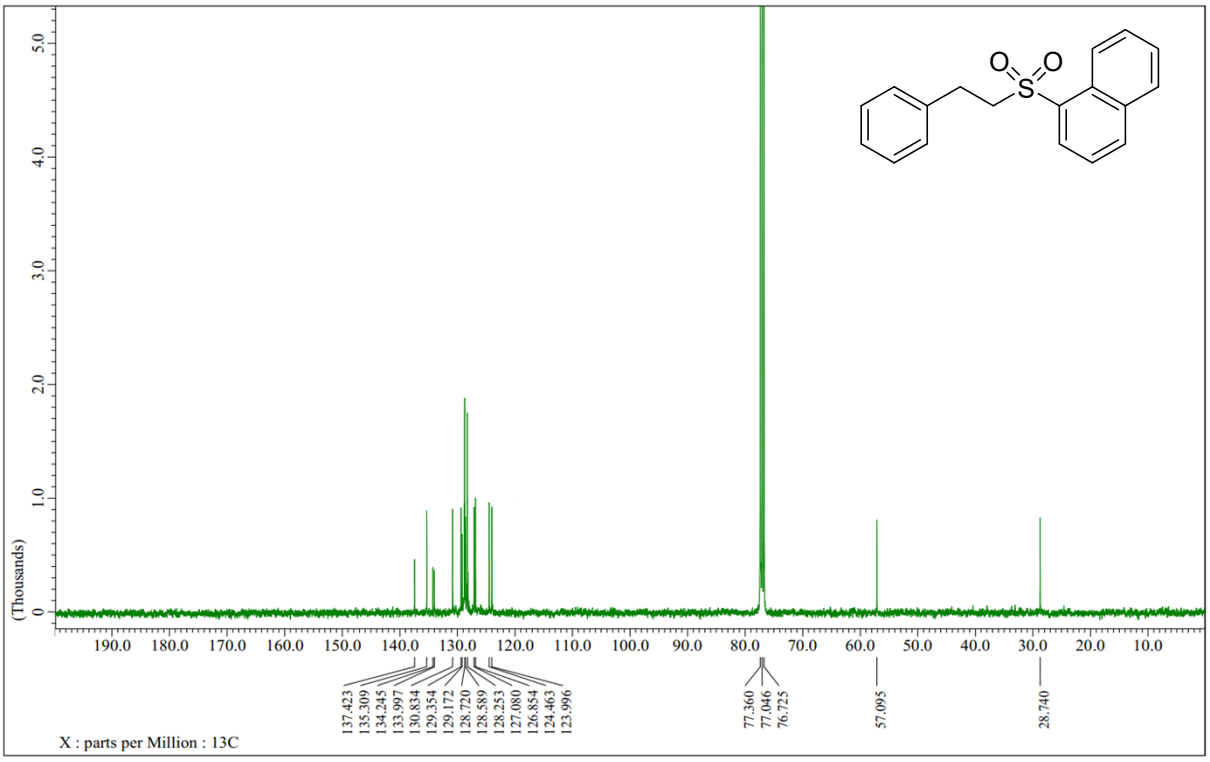



$^{13}$C NMR spectrum of 1-bromo-2-methyl-4-(phenethylsulfonyl)benzene

**1-(phenethylsulfonyl)naphthalene (3l)**

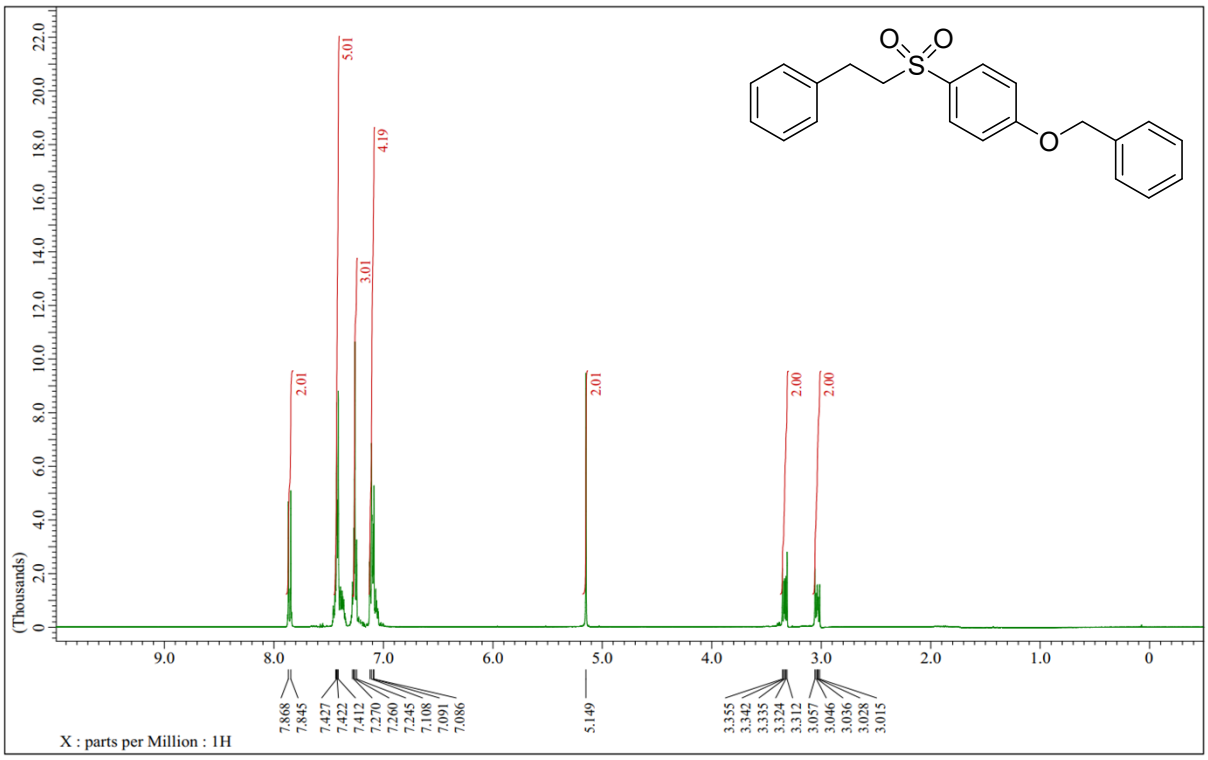



$^{1}$H NMR spectrum of 1-(phenethylsulfonyl)naphthalene

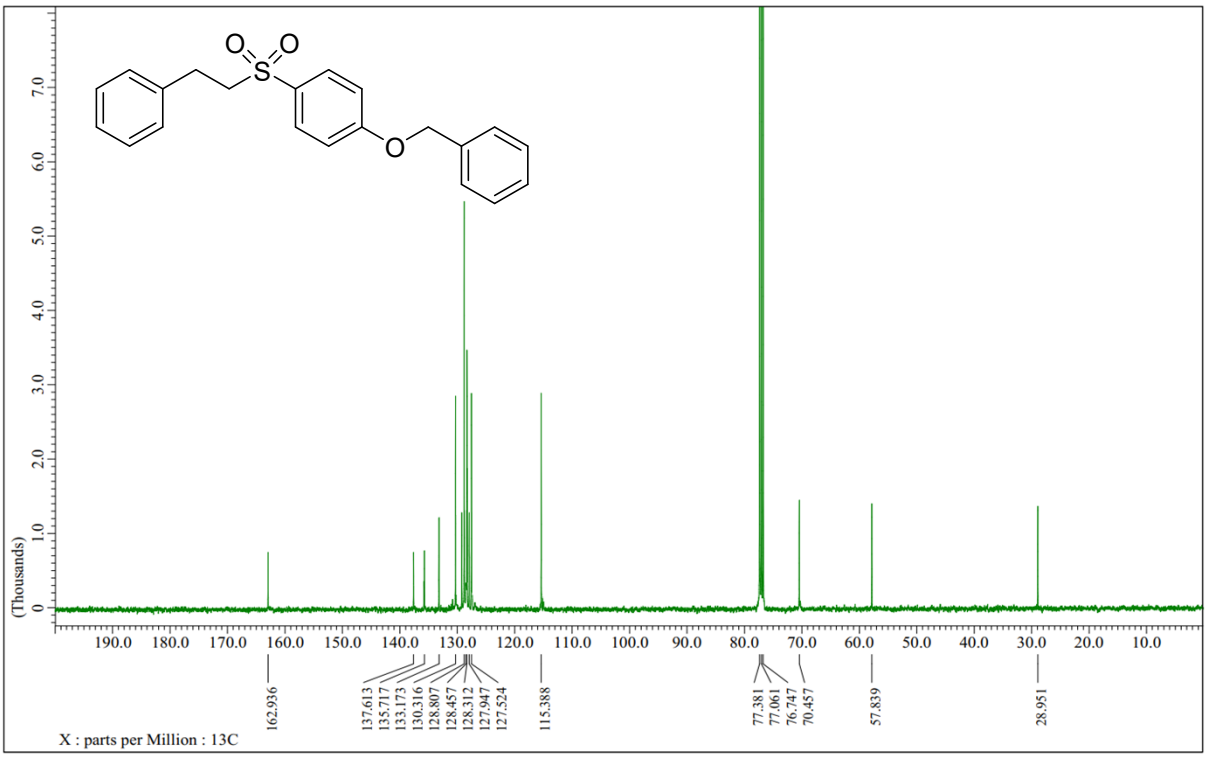



$^{13}$C NMR spectrum of 1-(phenethylsulfonyl)naphthalene

**1-(benzyloxy)-4-(phenethylsulfonyl)benzene (3m)**

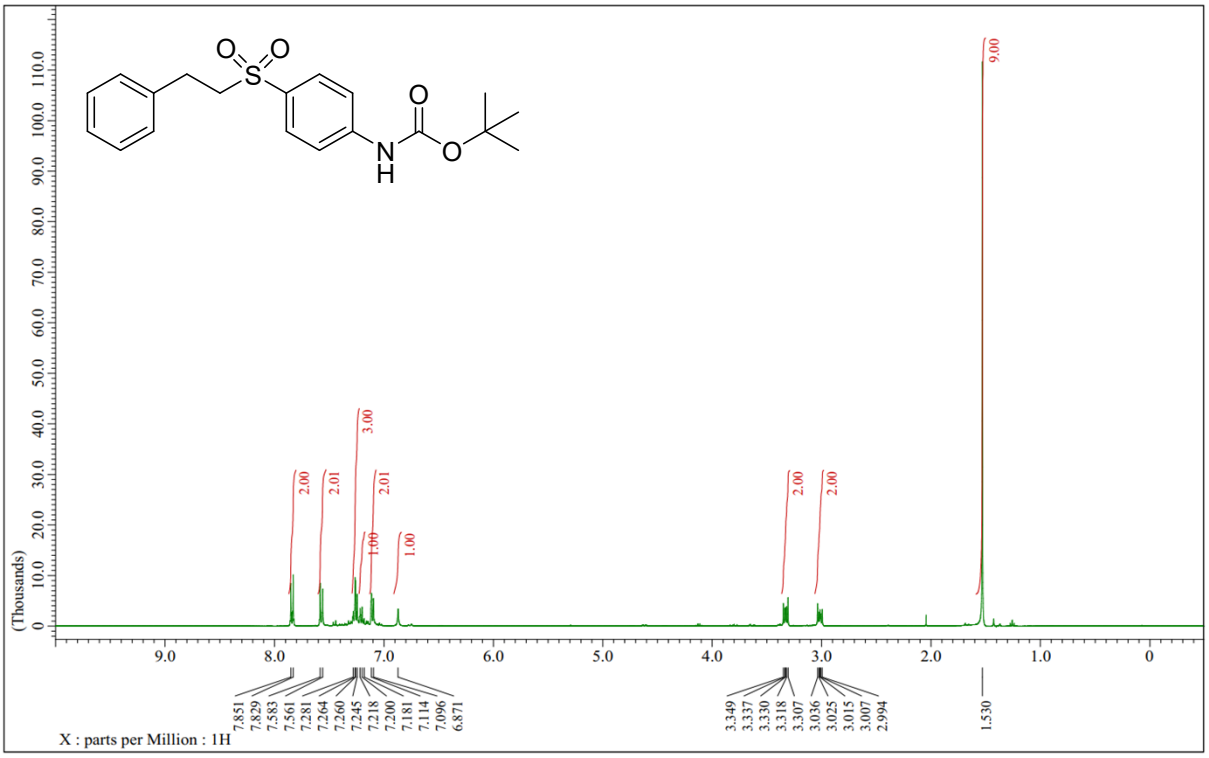



$^{1}$H NMR spectrum of 1-(benzyloxy)-4-(phenethylsulfonyl)benzene

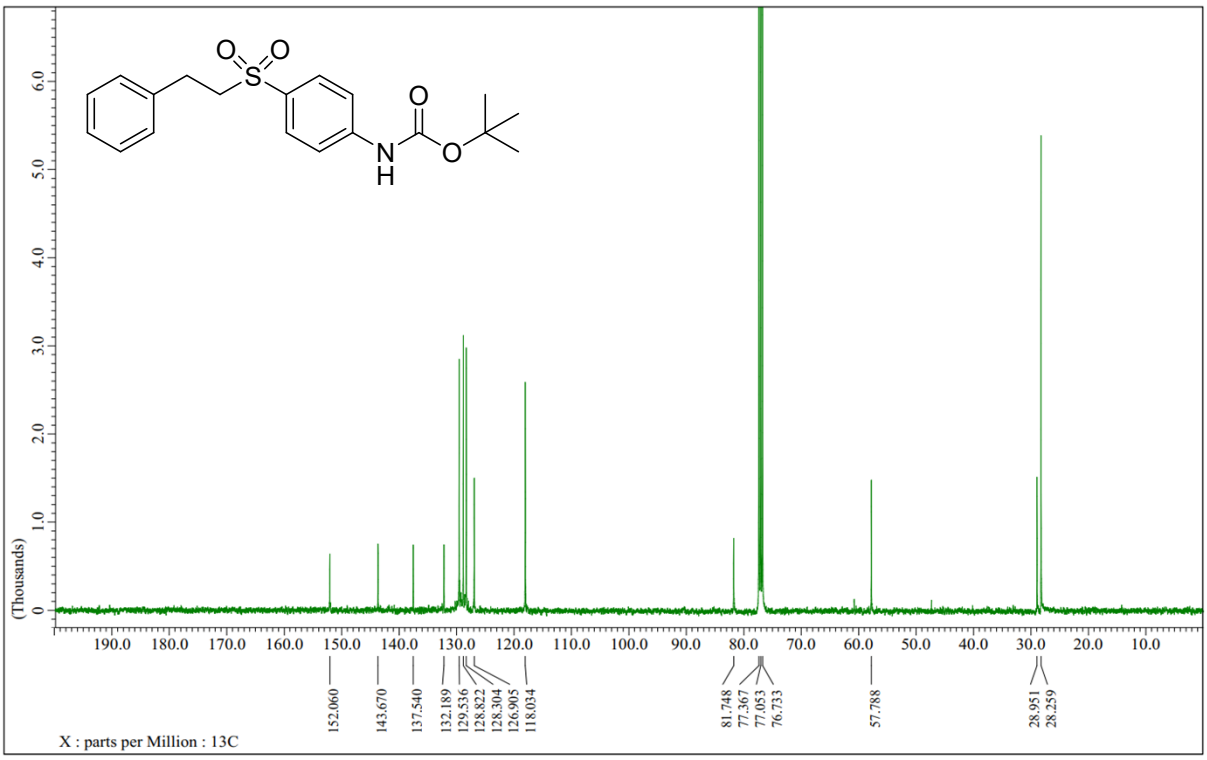



$^{13}$C NMR spectrum of 1-(phenethylsulfonyl)naphthalene

**tert-butyl (4-(phenethylsulfonyl)phenyl)carbamate (3n)**

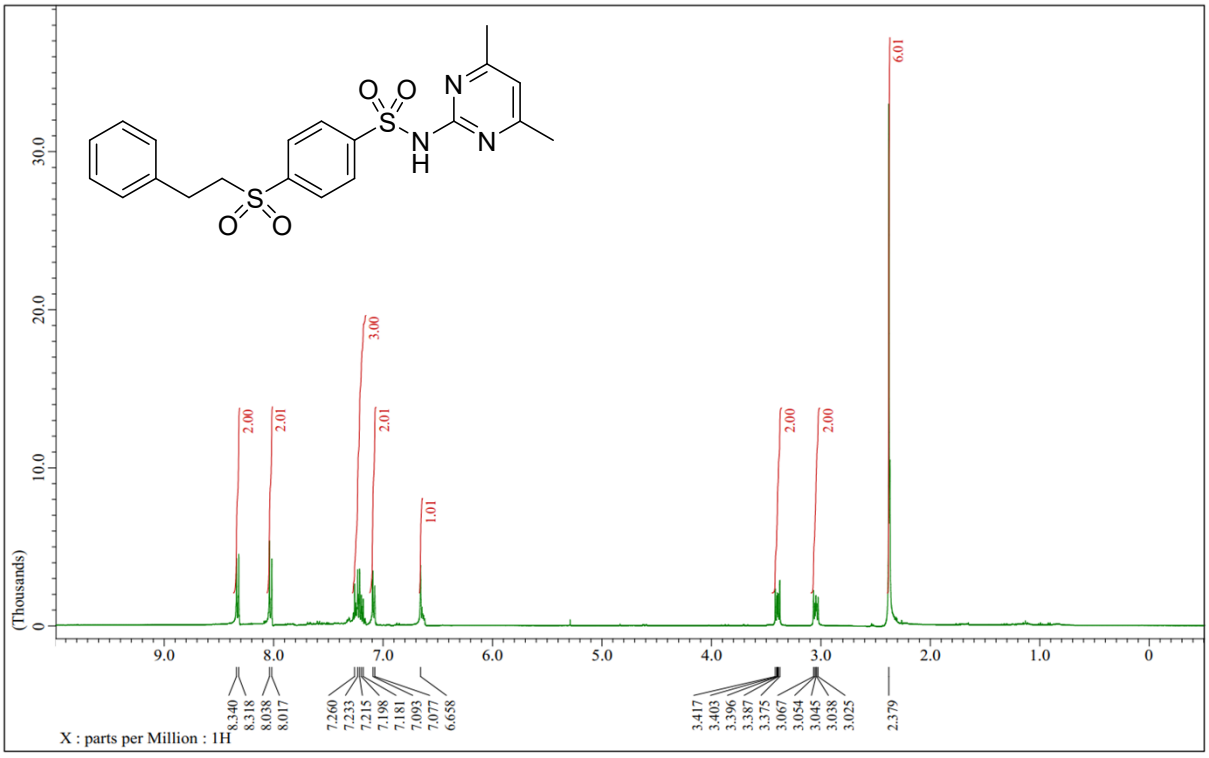



$^{1}$H NMR spectrum of tert-butyl (4-(phenethylsulfonyl)phenyl)carbamate

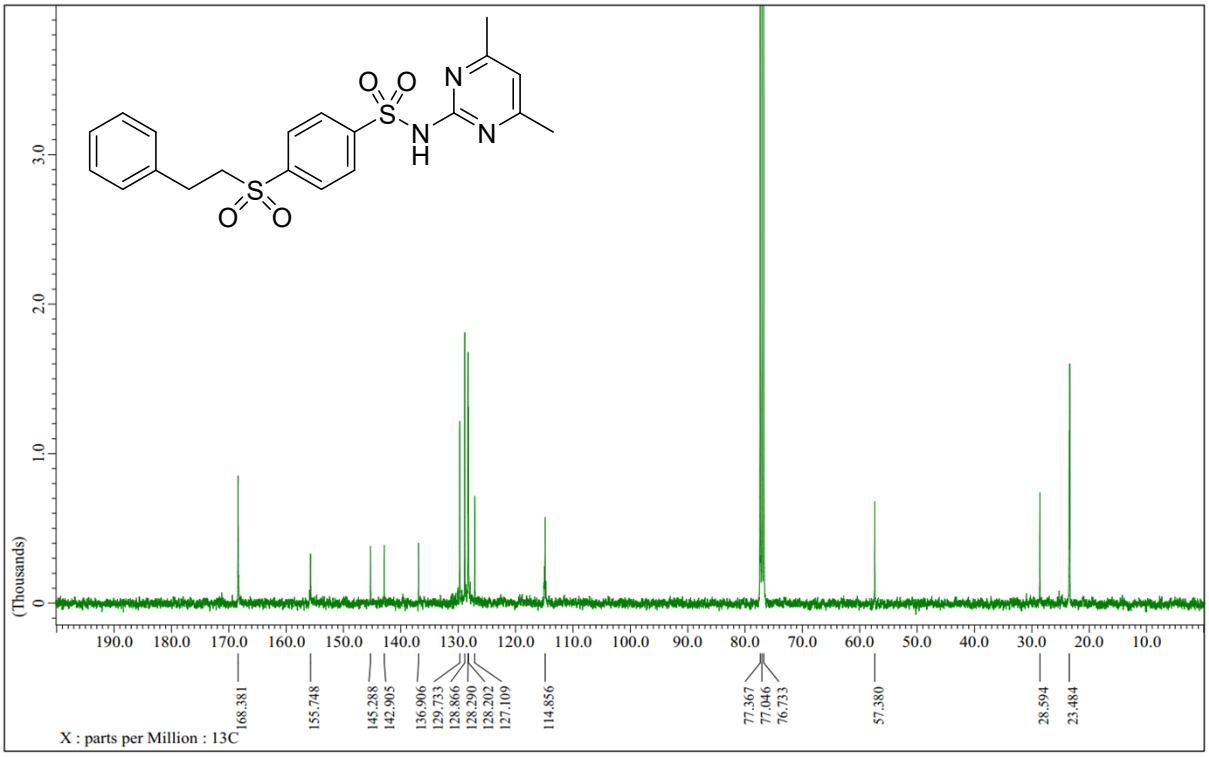



$^{13}$C NMR spectrum of tert-butyl (4-(phenethylsulfonyl)phenyl)carbamate

**N-(4,6-dimethylpyrimidin-2-yl)-4-(phenethylsulfonyl)benzenesulfonamide (3o)**

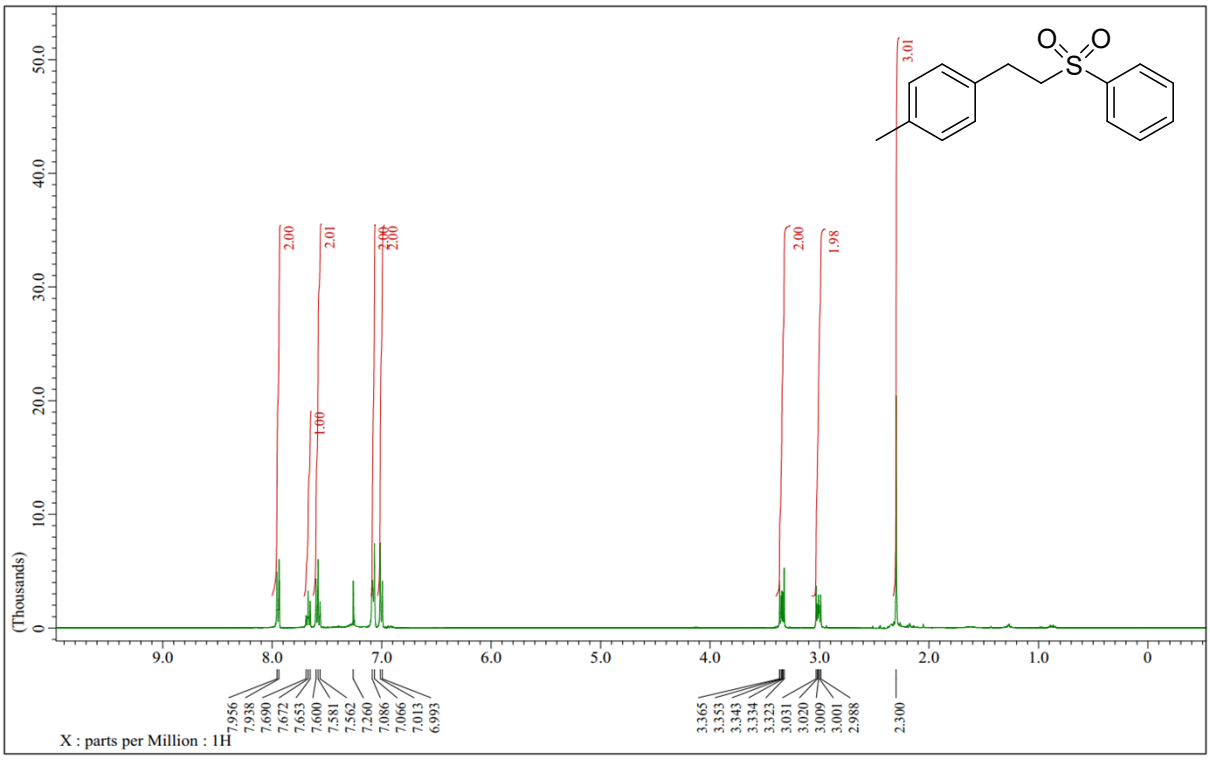



$^{1}$H NMR spectrum of N-(4,6-dimethylpyrimidin-2-yl)-4-(phenethylsulfonyl)benzenesulfonamide

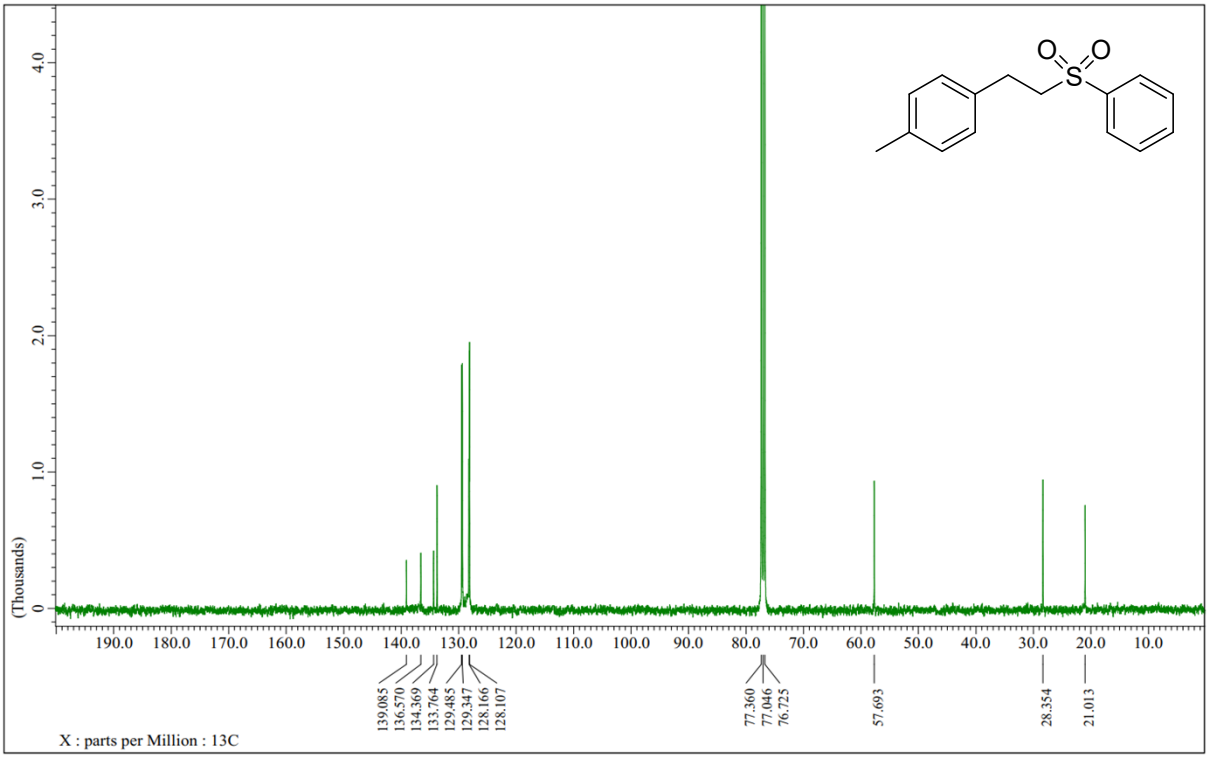



$^{13}$C NMR spectrum of N-(4,6-dimethylpyrimidin-2-yl)-4-(phenethylsulfonyl)benzenesulfonamide

**1-methyl-4-(2-(phenylsulfonyl)ethyl)benzene (4a)**

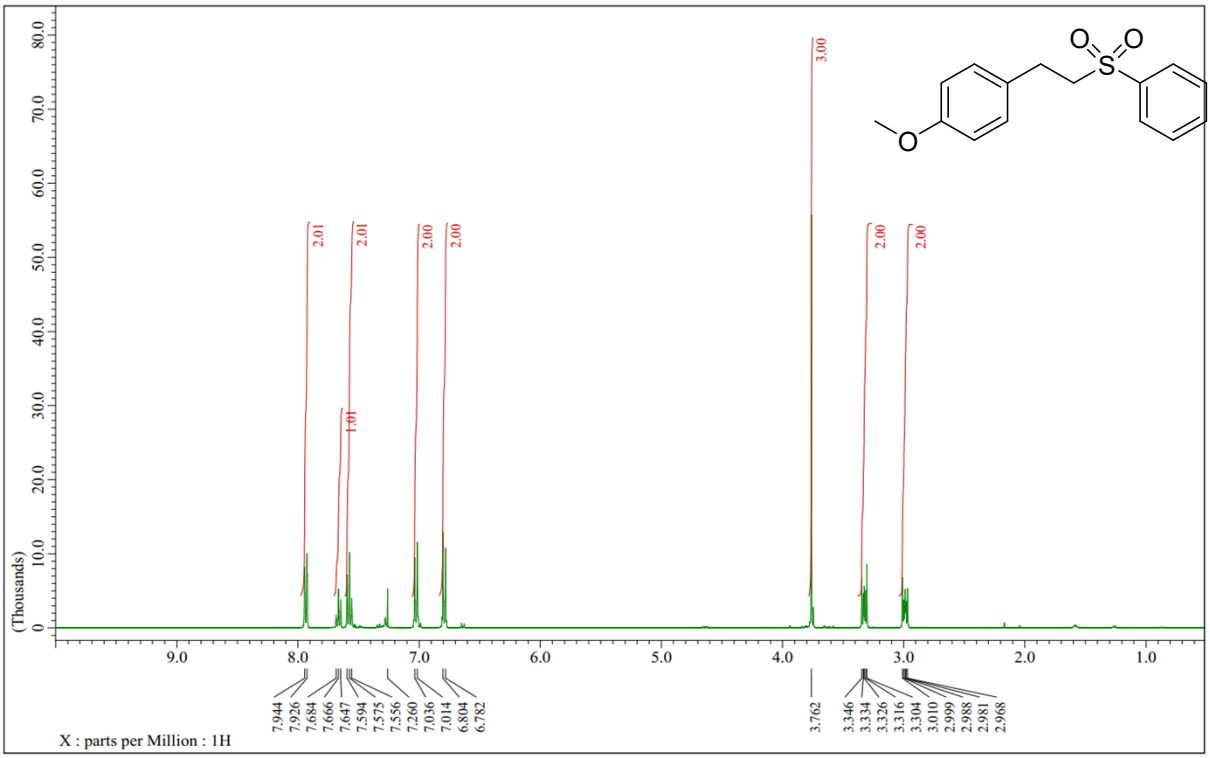



$^{1}$H NMR spectrum of 1-methyl-4-(2-(phenylsulfonyl)ethyl)benzene

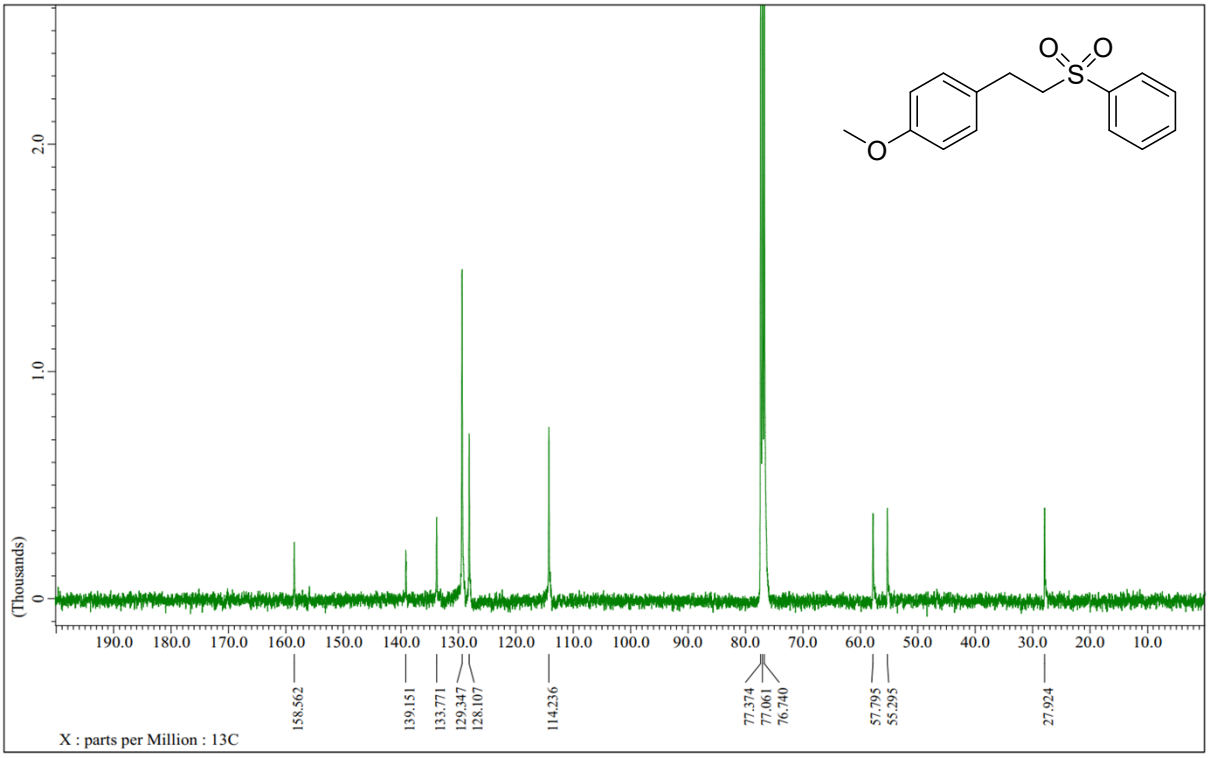



$^{13}$C NMR spectrum of 1-methyl-4-(2-(phenylsulfonyl)ethyl)benzene

**1-methoxy-4-(2-(phenylsulfonyl)ethyl)benzene (4b)**

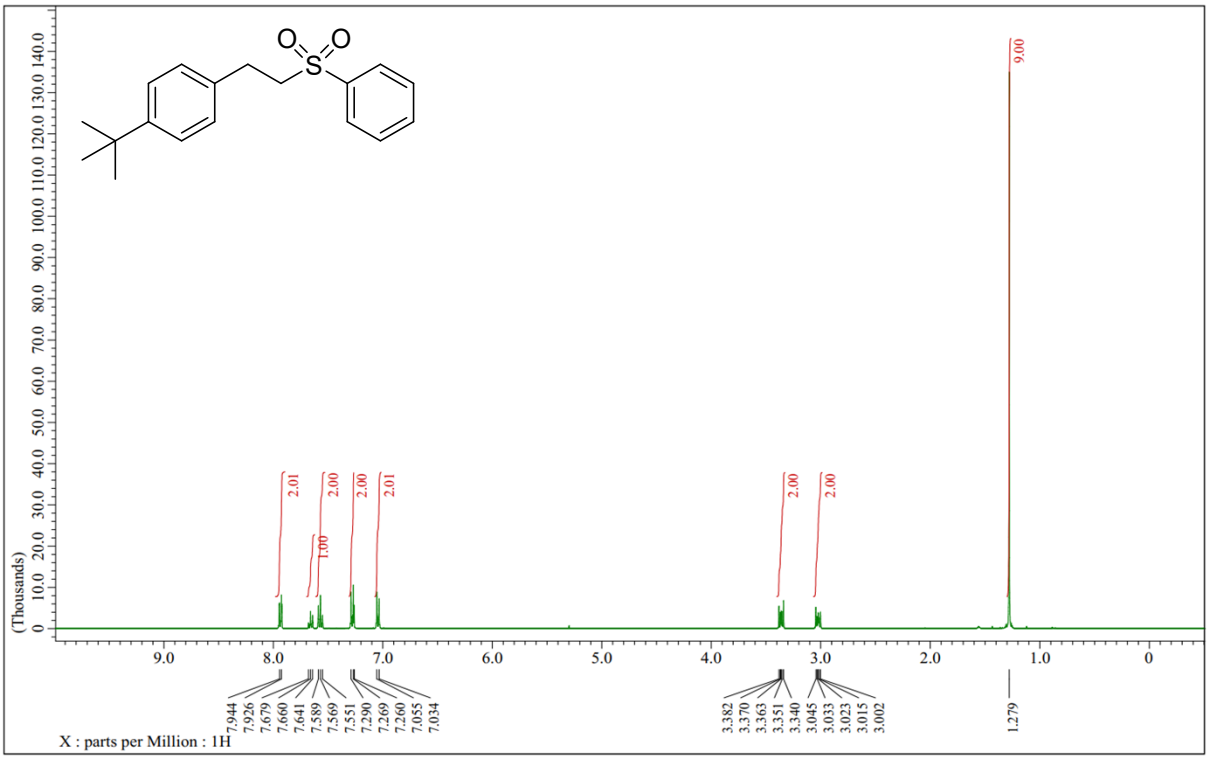



$^{1}$H NMR spectrum of 1-methoxy-4-(2-(phenylsulfonyl)ethyl)benzene

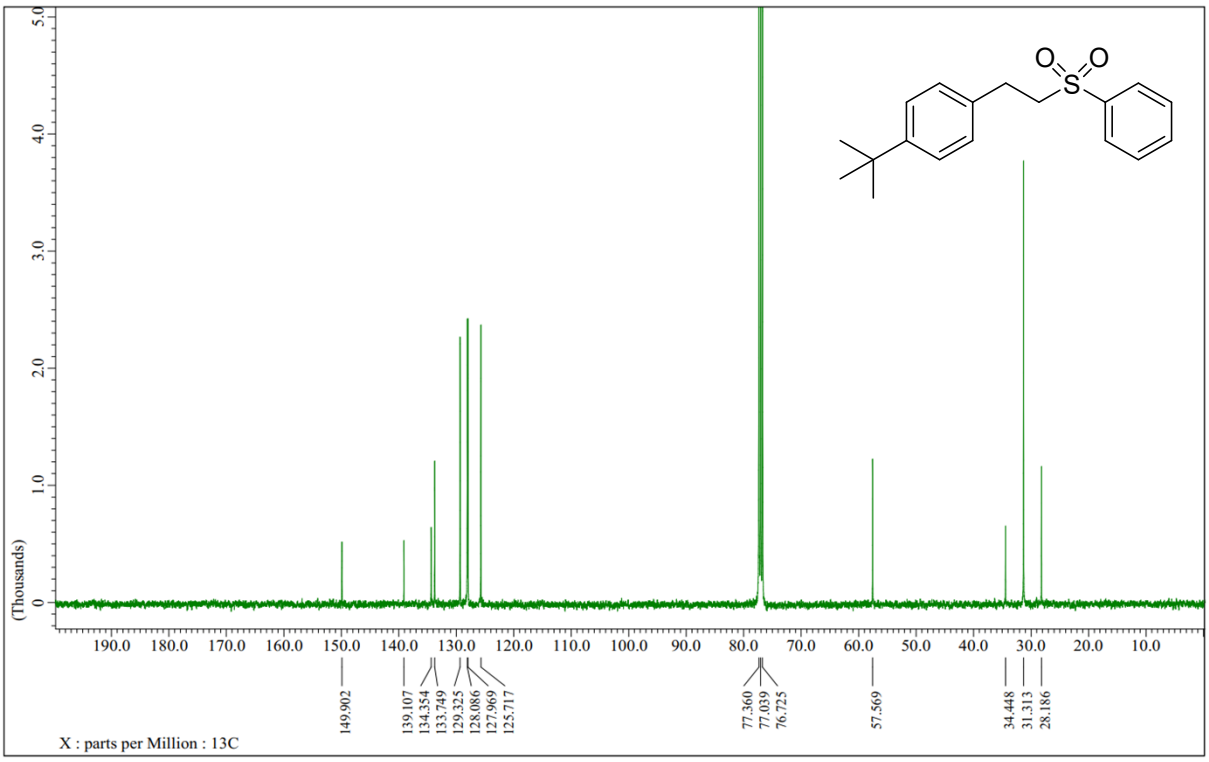



$^{13}$C NMR spectrum of 1-methoxy-4-(2-(phenylsulfonyl)ethyl)benzene

**1-(tert-butyl)-4-(2-(phenylsulfonyl)ethyl)benzene (4c)**

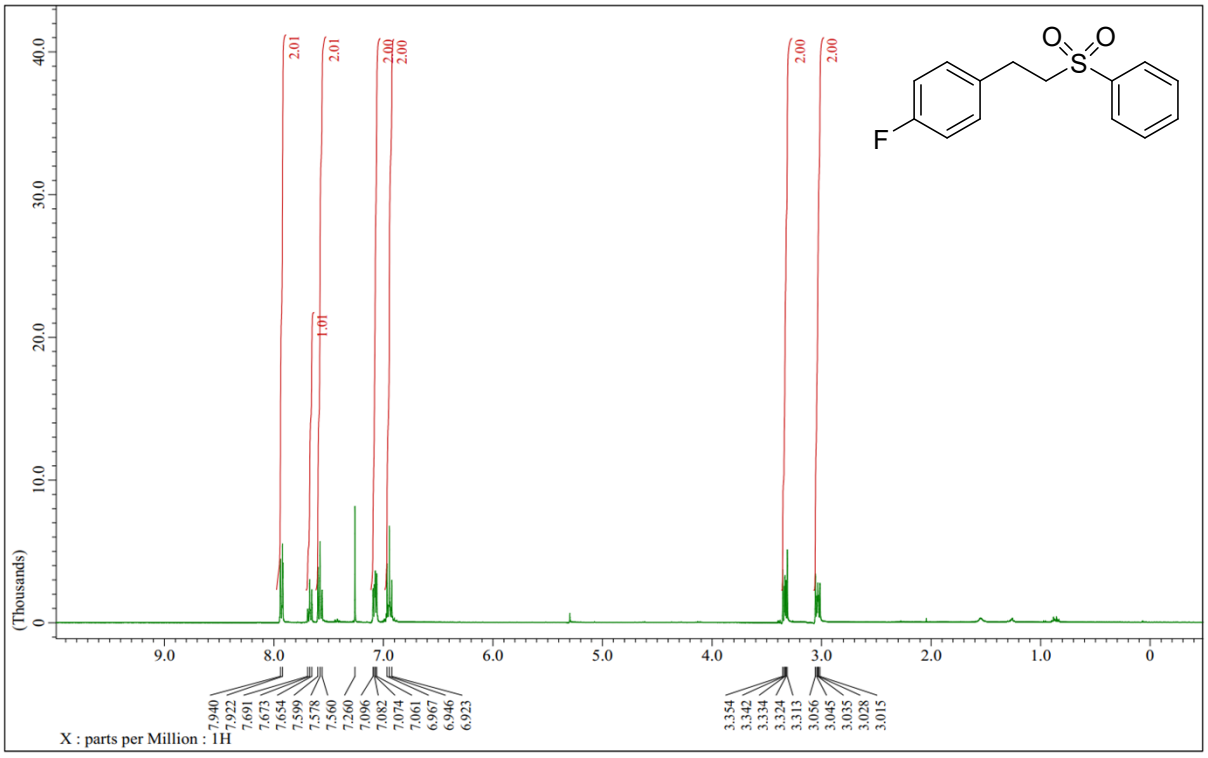



$^{1}$H NMR spectrum of 1-(tert-butyl)-4-(2-(phenylsulfonyl)ethyl)benzene

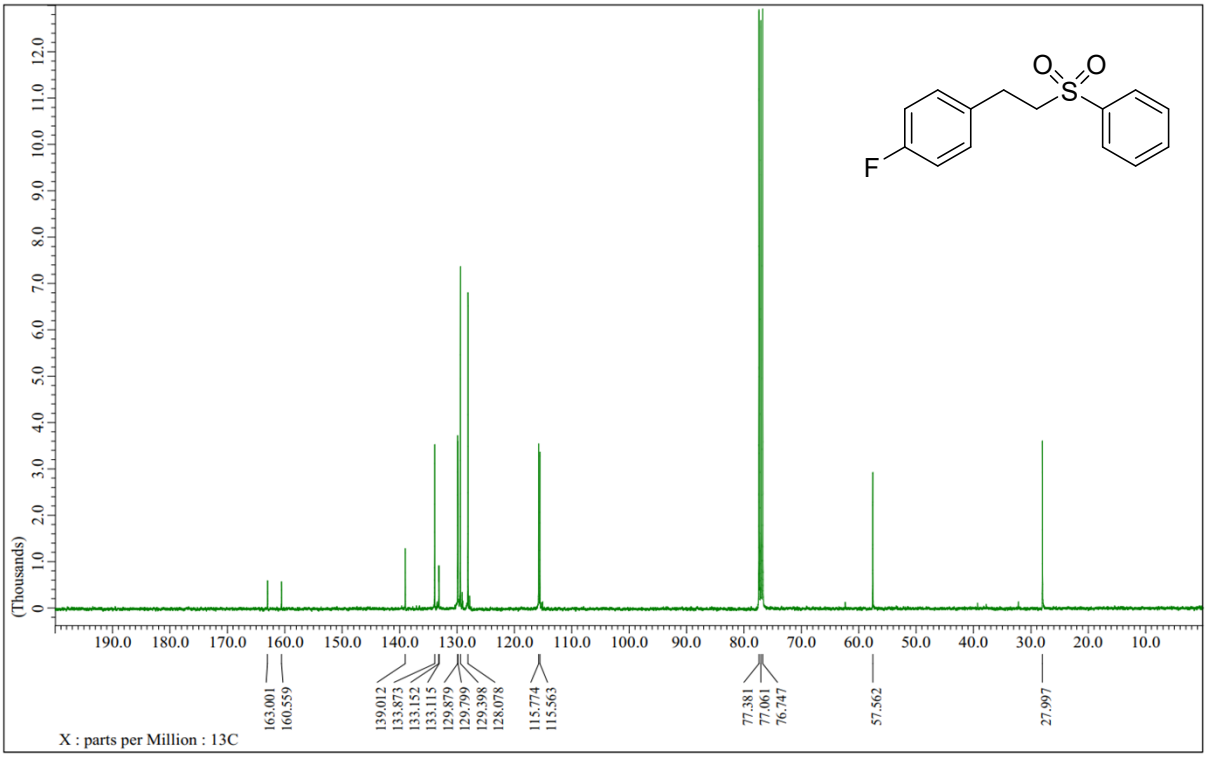



$^{13}$C NMR spectrum of 1-(tert-butyl)-4-(2-(phenylsulfonyl)ethyl)benzene

**1-fluoro-4-(2-(phenylsulfonyl)ethyl)benzene (4d)**

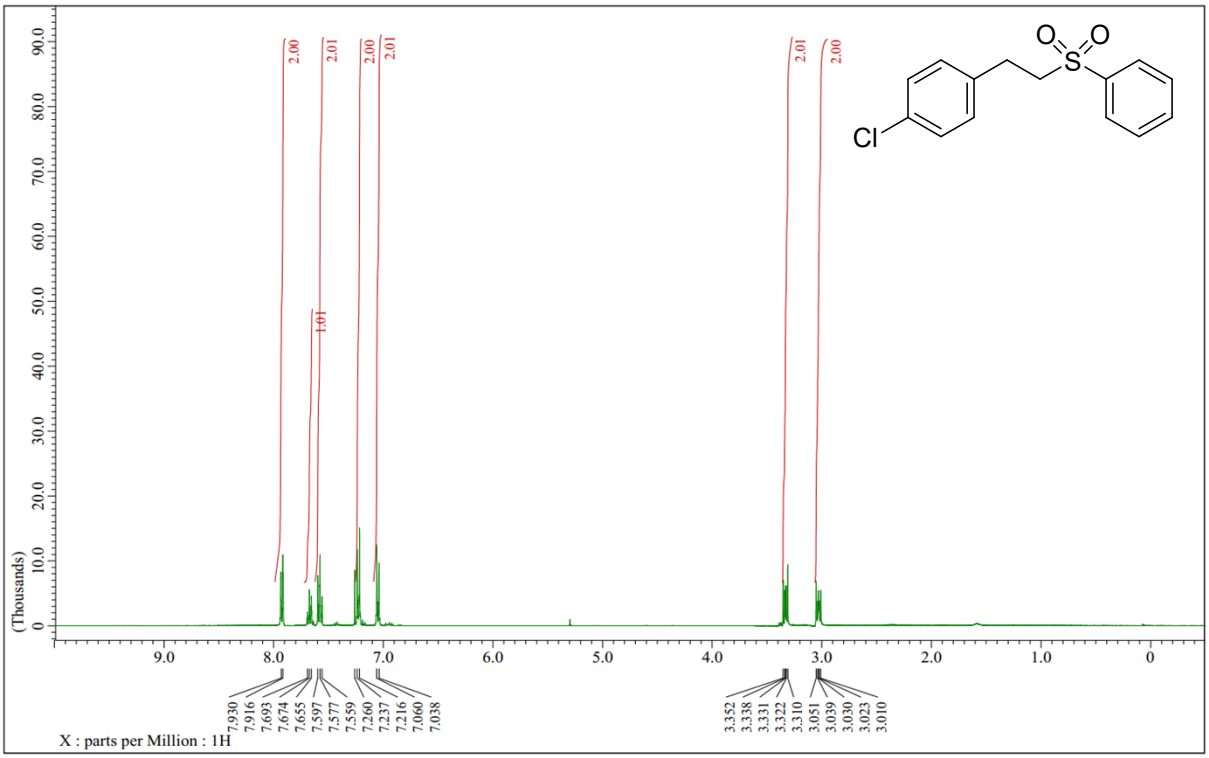



$^{1}$H NMR spectrum of 1-fluoro-4-(2-(phenylsulfonyl)ethyl)benzene

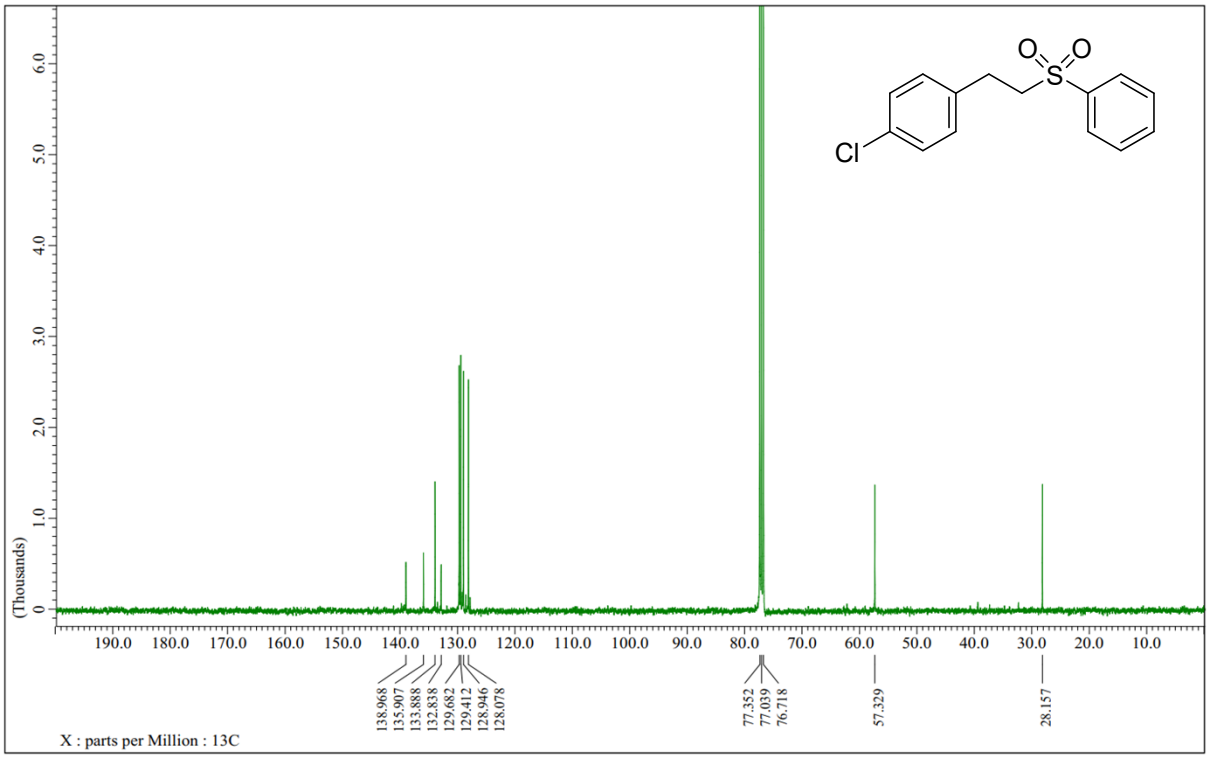



$^{13}$C NMR spectrum of 1-fluoro-4-(2-(phenylsulfonyl)ethyl)benzene

**1-chloro-4-(2-(phenylsulfonyl)ethyl)benzene (4e)**

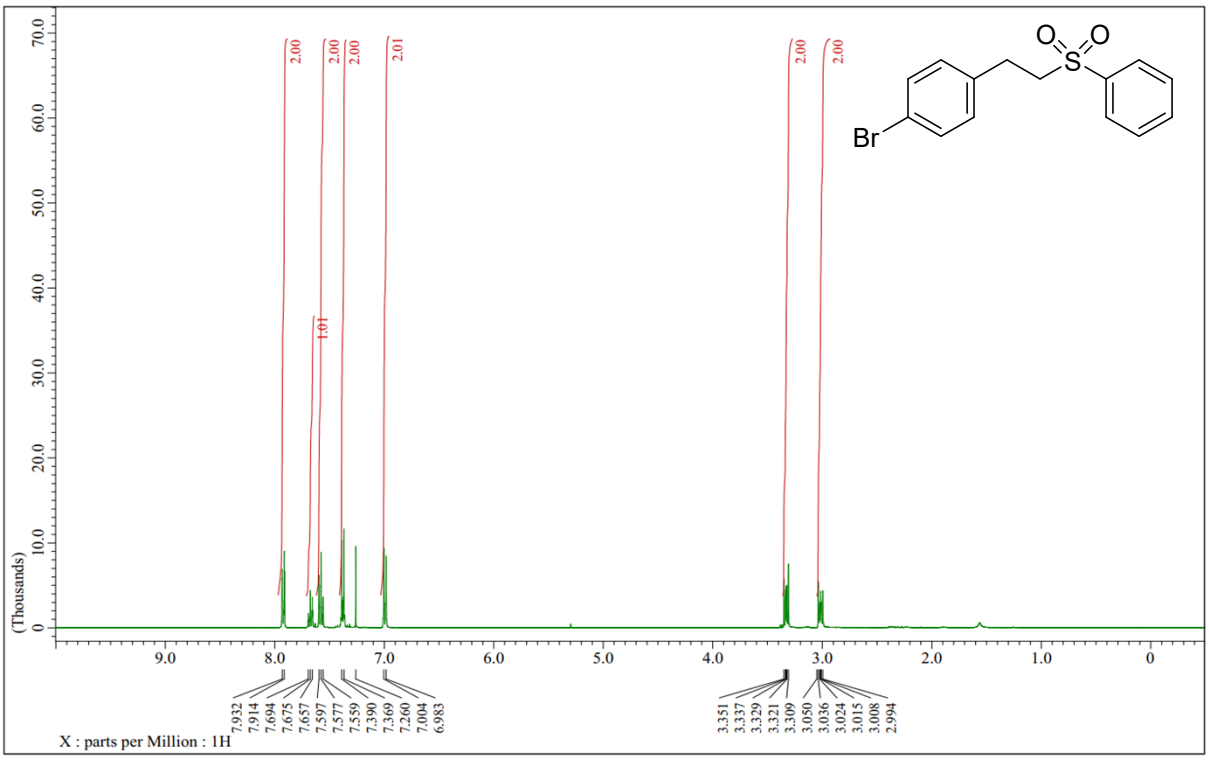



$^{1}$H NMR spectrum of 1-chloro-4-(2-(phenylsulfonyl)ethyl)benzene

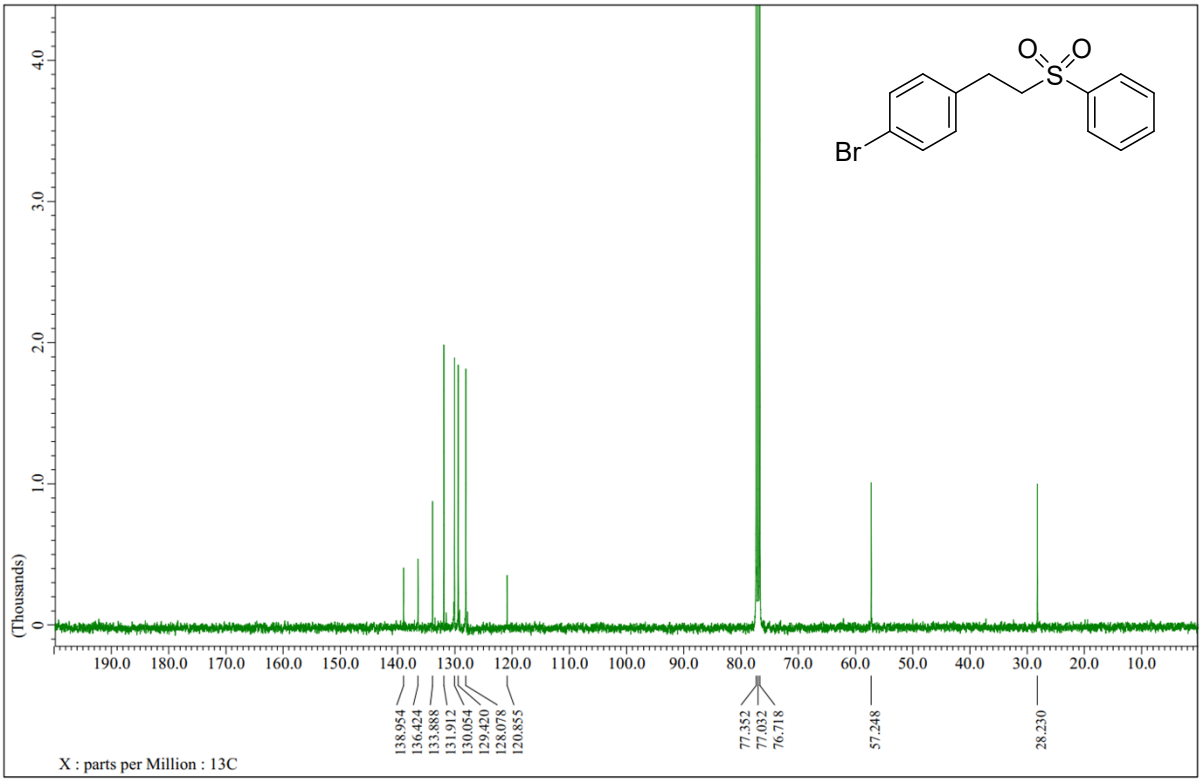



$^{13}$C NMR spectrum of 1-chloro-4-(2-(phenylsulfonyl)ethyl)benzene

**1-bromo-4-(2-(phenylsulfonyl)ethyl)benzene (4f)**

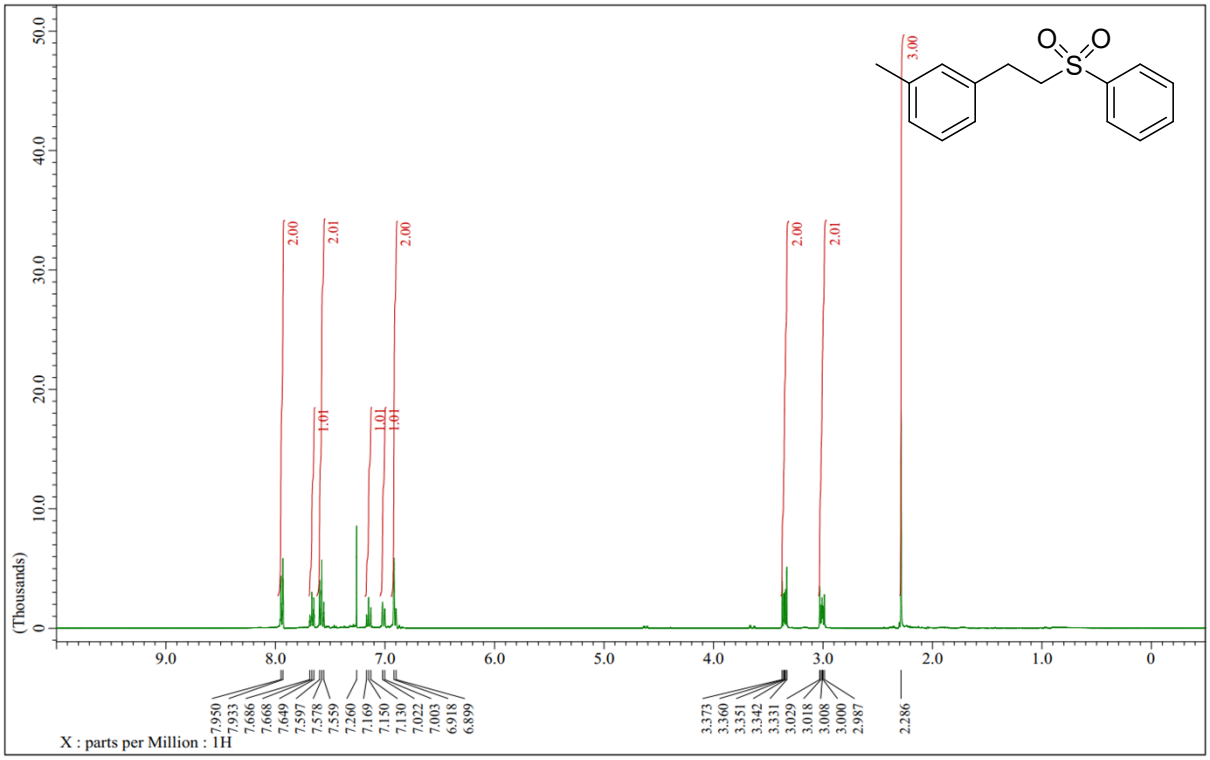



$^{1}$H NMR spectrum of 1-bromo-4-(2-(phenylsulfonyl)ethyl)benzene

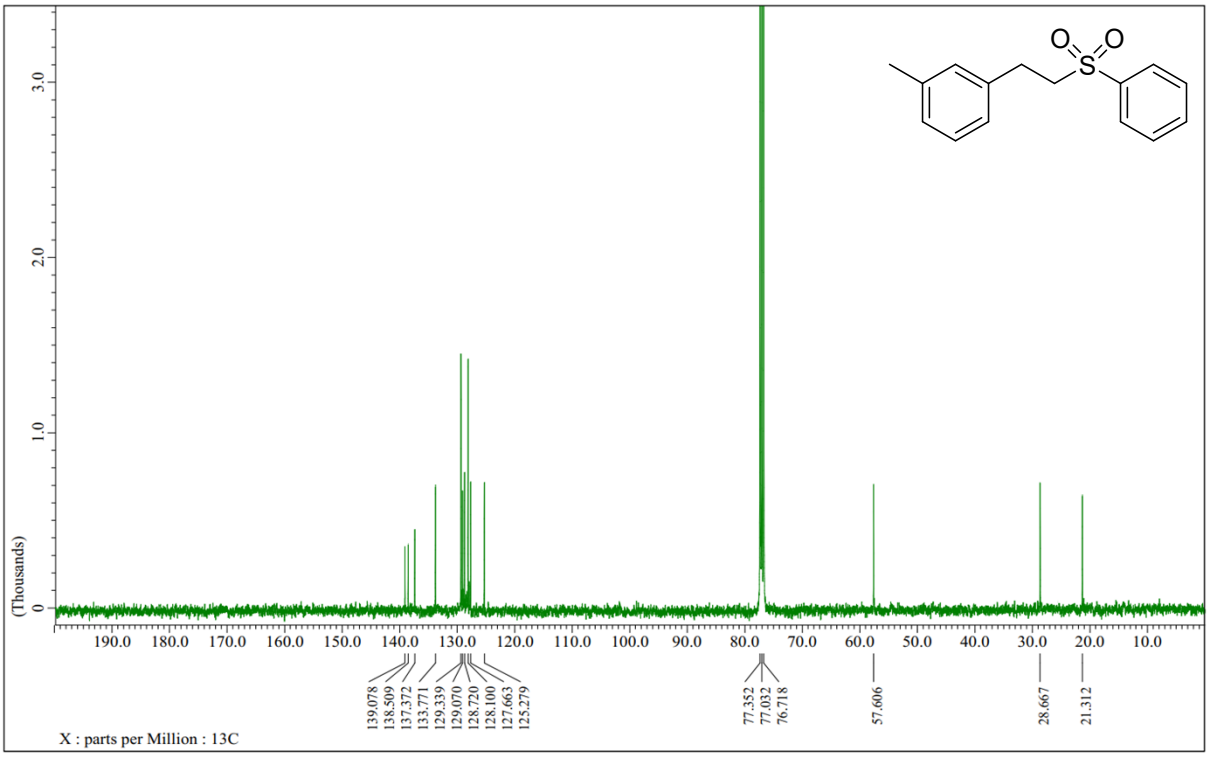



$^{13}$C NMR spectrum of 1-bromo-4-(2-(phenylsulfonyl)ethyl)benzene

**1-methyl-3-(2-(phenylsulfonyl)ethyl)benzene (4g)**

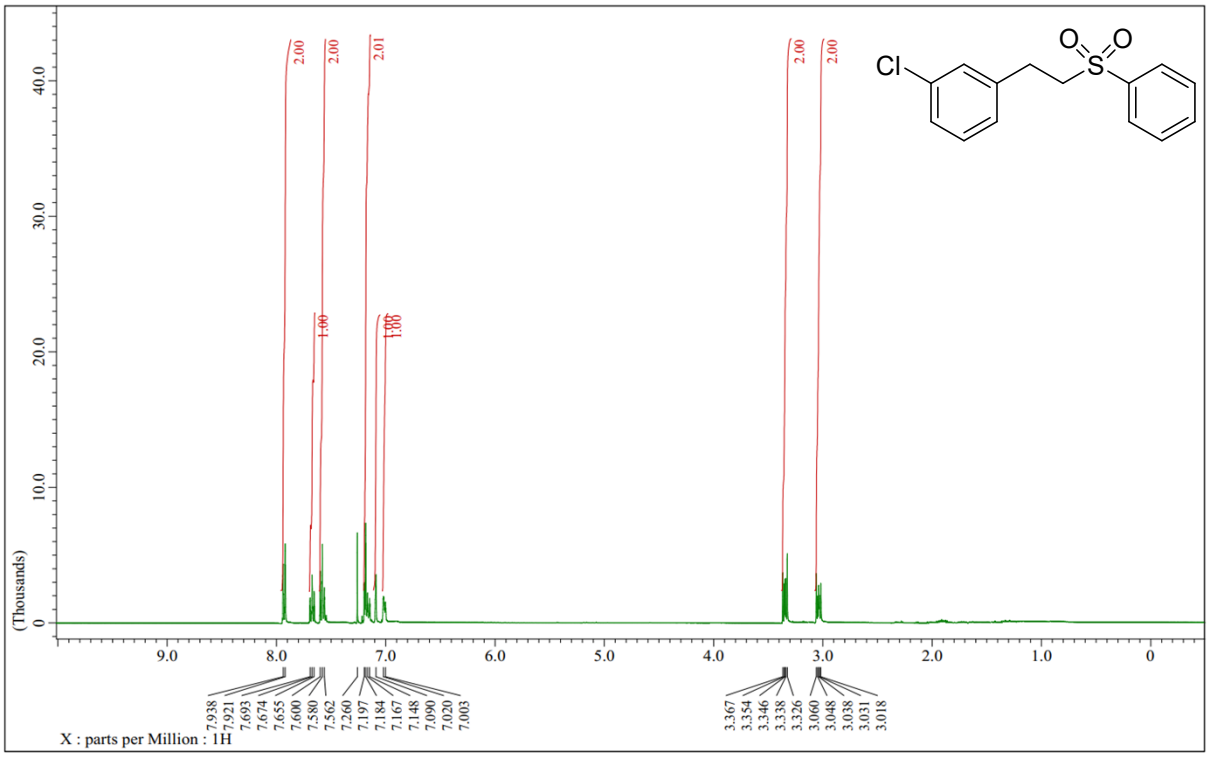



$^{1}$H NMR spectrum of 1-methyl-3-(2-(phenylsulfonyl)ethyl)benzene

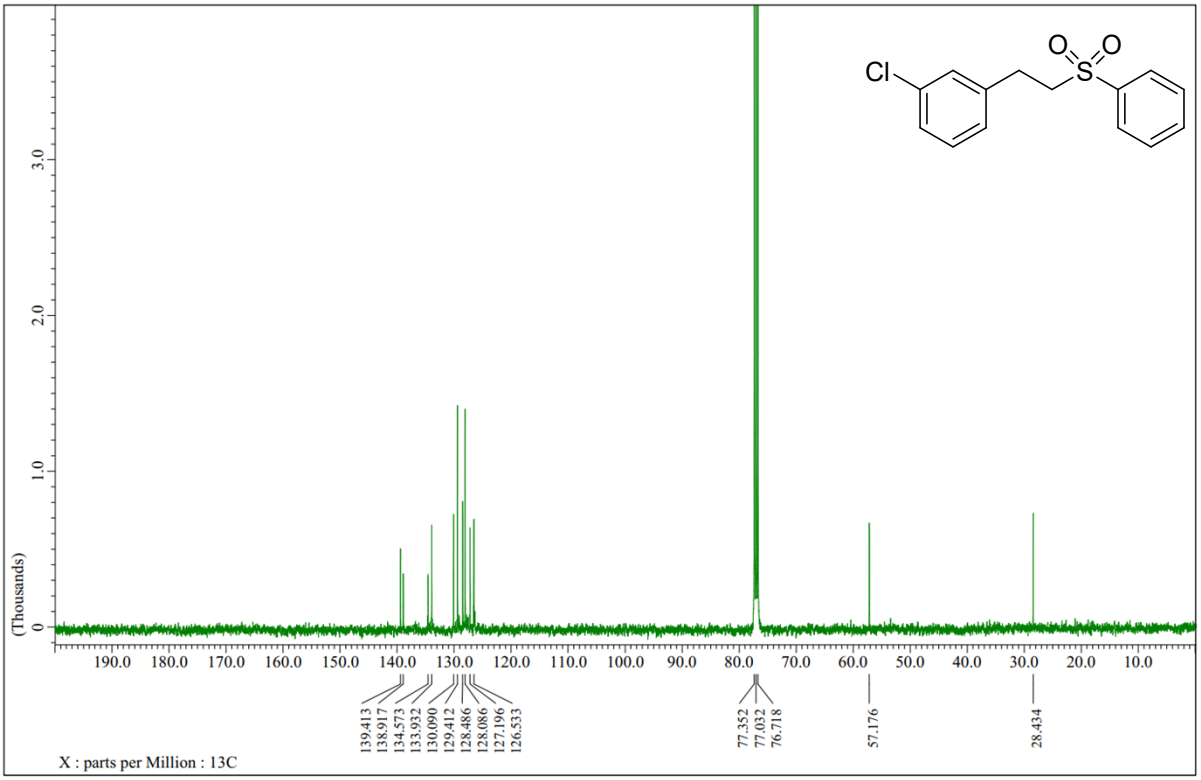



$^{13}$C NMR spectrum of 1-methyl-3-(2-(phenylsulfonyl)ethyl)benzene

**1-chloro-3-(2-(phenylsulfonyl)ethyl)benzene (4h)**

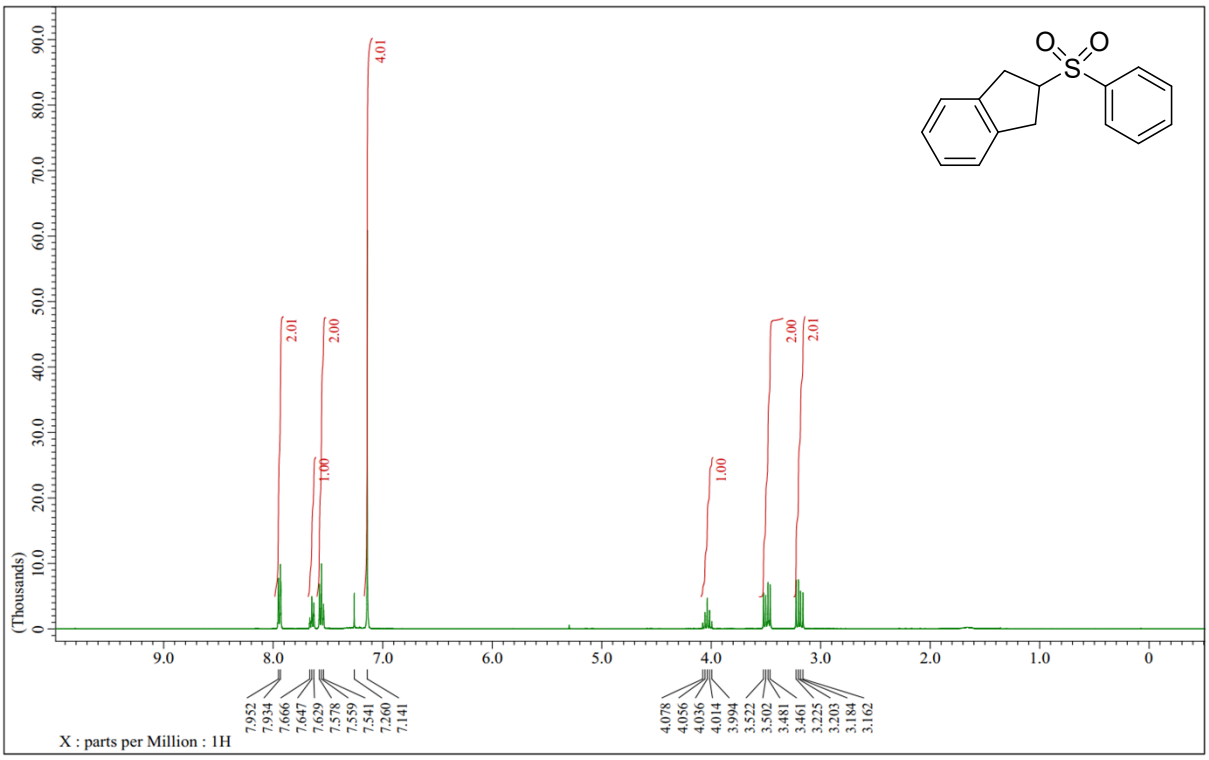



$^{1}$H NMR spectrum of 1-chloro-3-(2-(phenylsulfonyl)ethyl)benzene

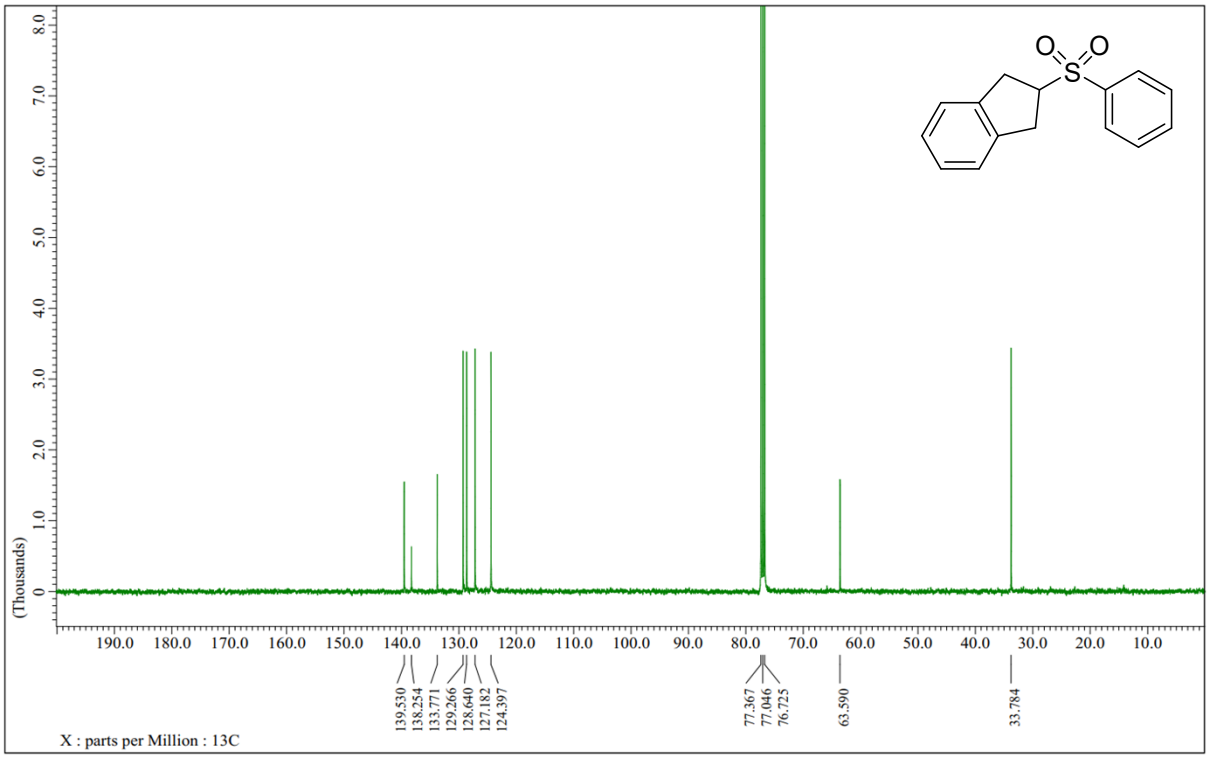



$^{13}$C NMR spectrum of 1-chloro-3-(2-(phenylsulfonyl)ethyl)benzene

**2-(phenylsulfonyl)-2,3-dihydro-1H-indene (4i)**

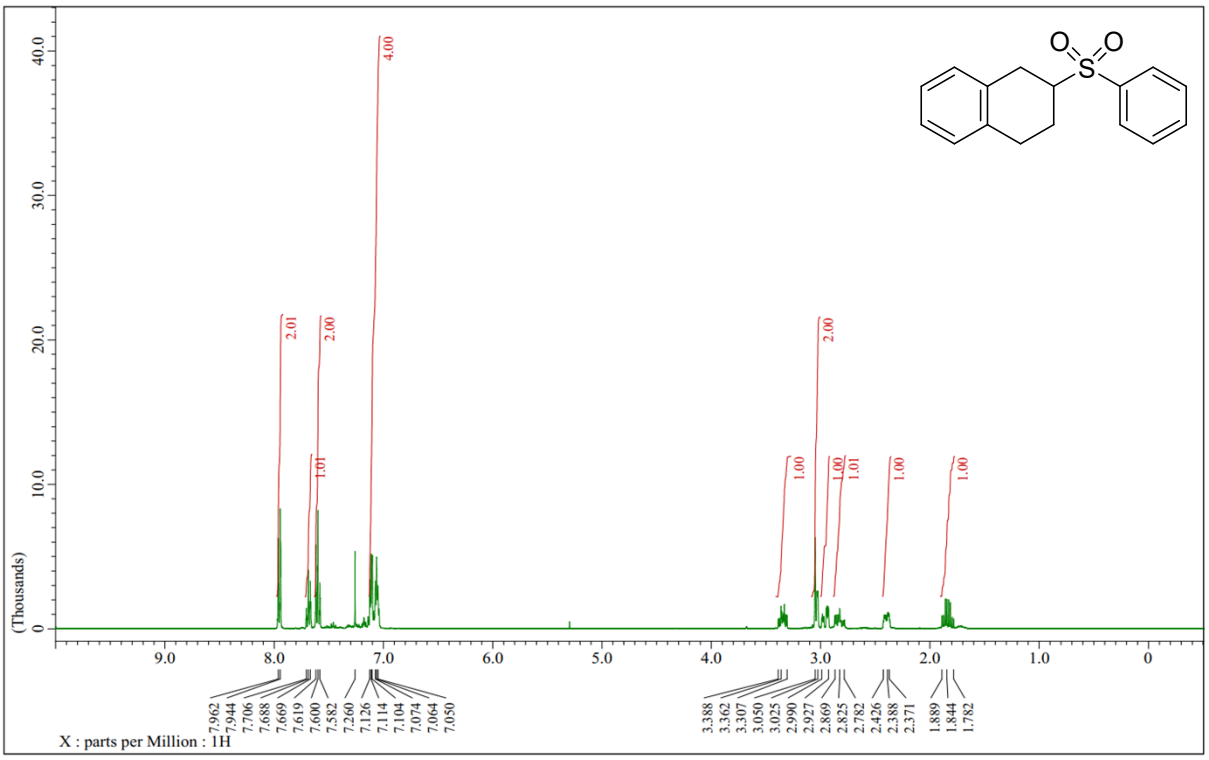



$^{1}$H NMR spectrum of 2-(phenylsulfonyl)-2,3-dihydro-1H-indene

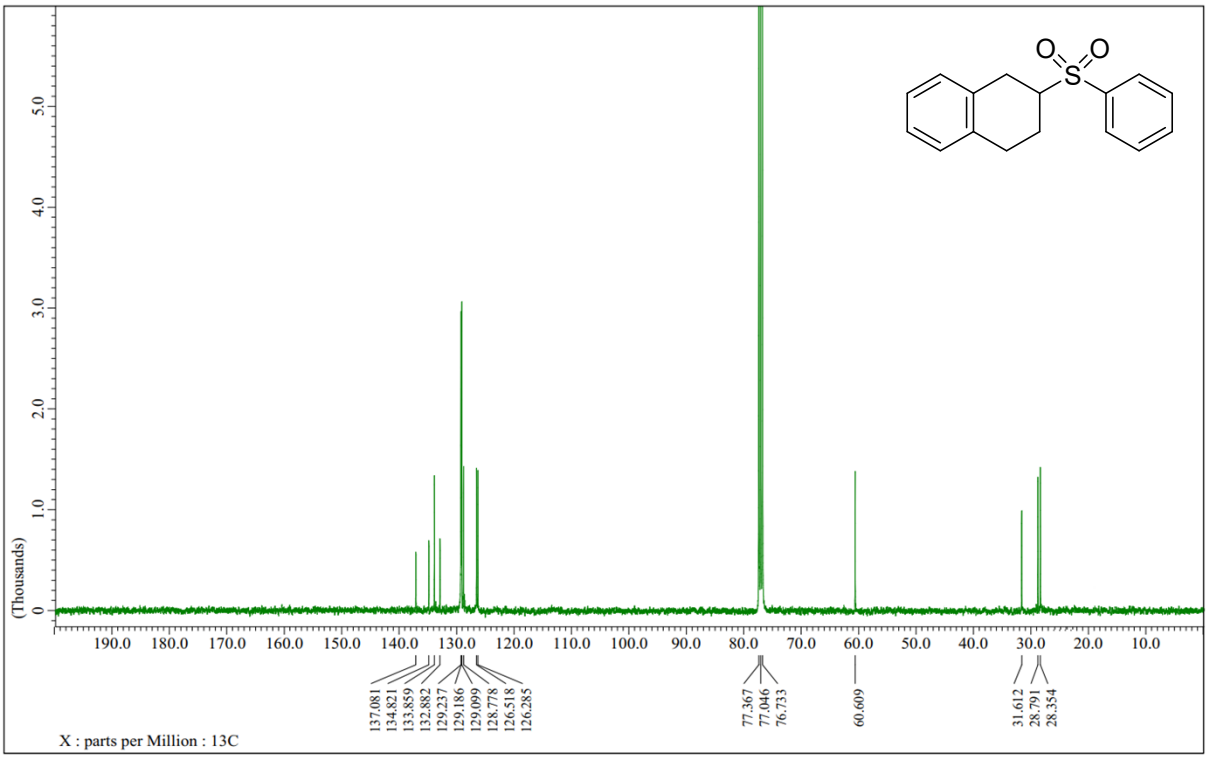



$^{13}$C NMR spectrum of 2-(phenylsulfonyl)-2,3-dihydro-1H-indene

**2-(phenylsulfonyl)-1,2,3,4-tetrahydronaphthalene (4j)**

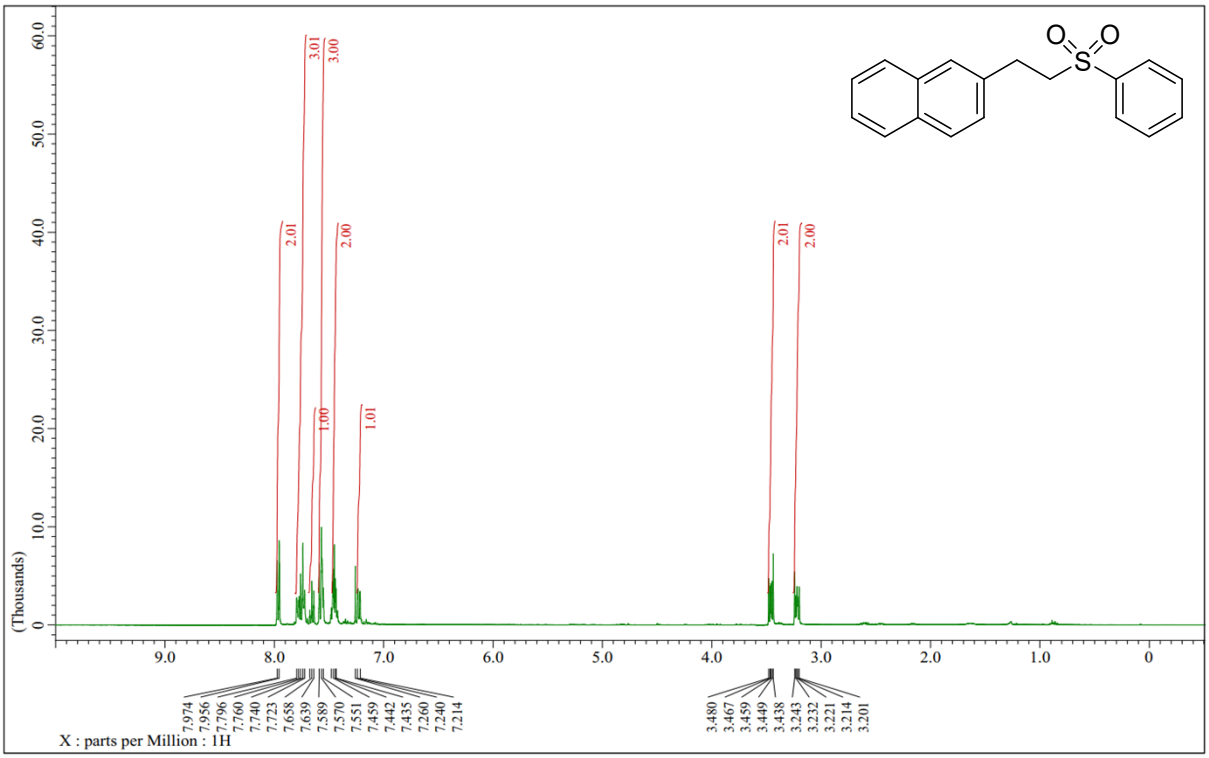



$^{1}$H NMR spectrum of 2-(phenylsulfonyl)-1,2,3,4-tetrahydronaphthalene

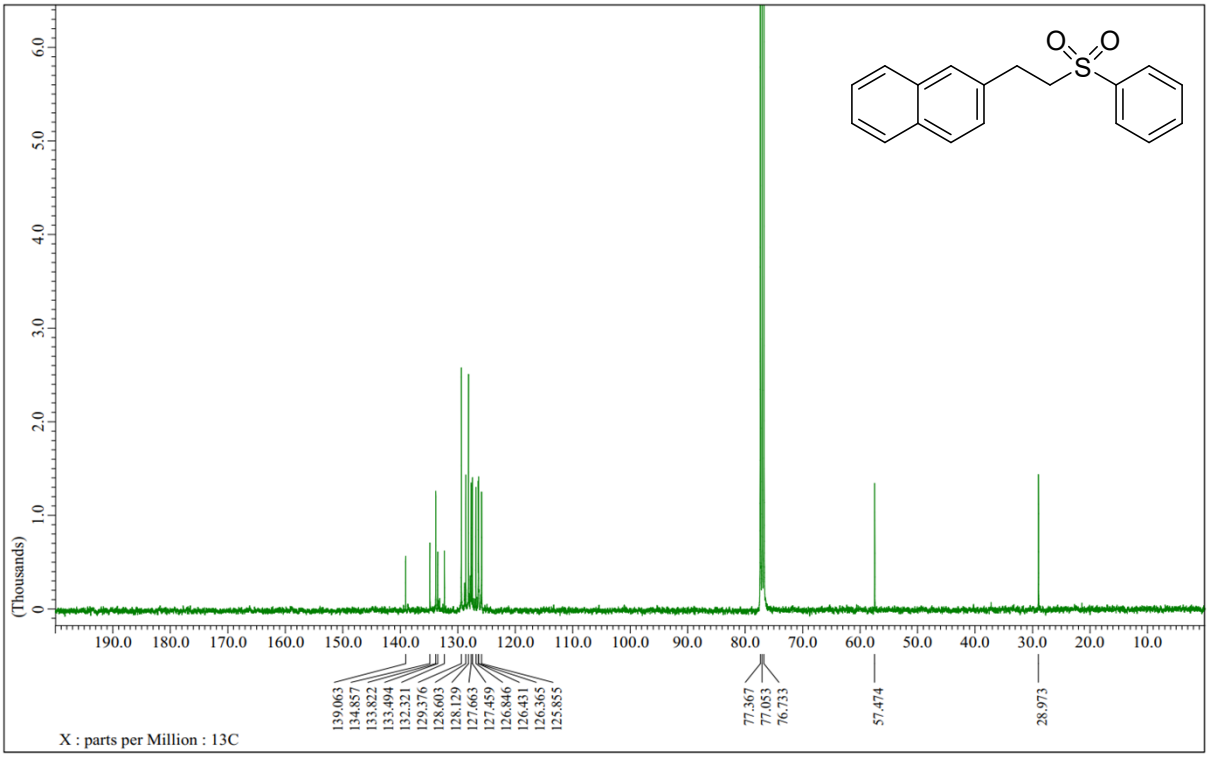



$^{13}$C NMR spectrum of 2-(phenylsulfonyl)-1,2,3,4-tetrahydronaphthalene

**2-(2-(phenylsulfonyl)ethyl)naphthalene (4k)**

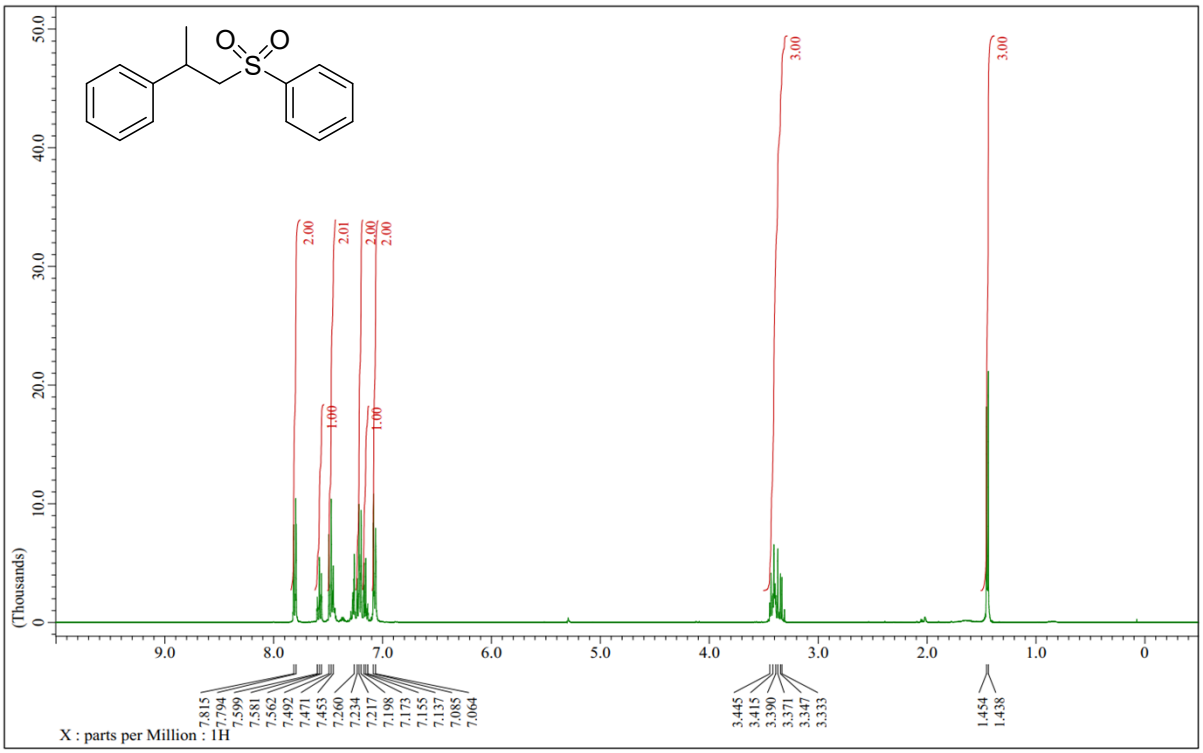



$^{1}$H NMR spectrum of 2-(2-(phenylsulfonyl)ethyl)naphthalene

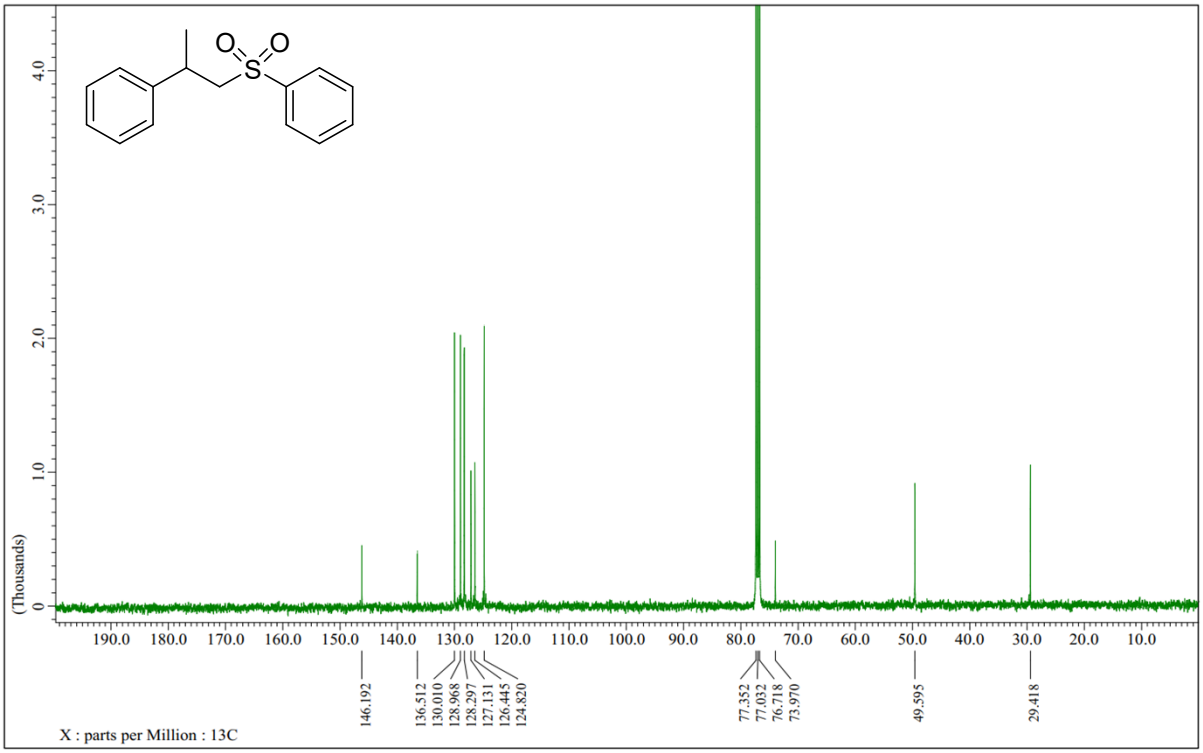



$^{13}$C NMR spectrum of 2-(2-(phenylsulfonyl)ethyl)naphthalene

**((2-phenylpropyl)sulfonyl)benzene (4l)**

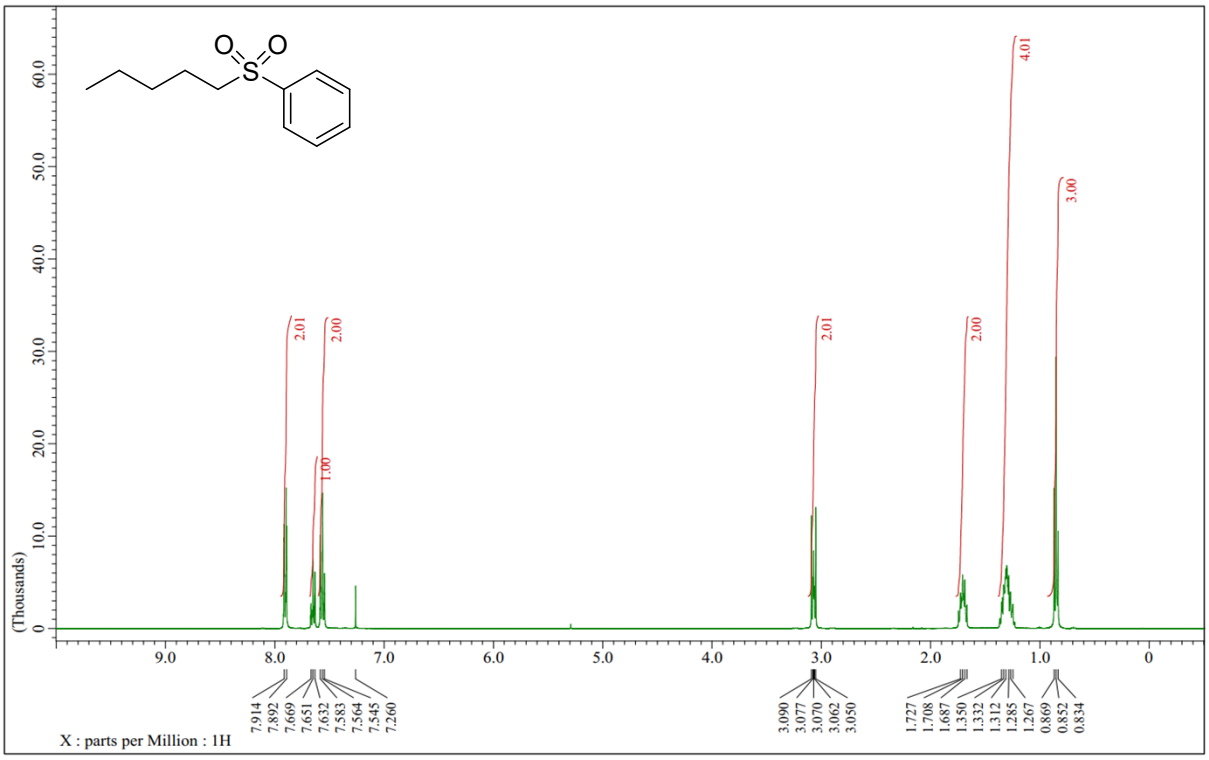



$^{1}$H NMR spectrum of ((2-phenylpropyl)sulfonyl)benzene

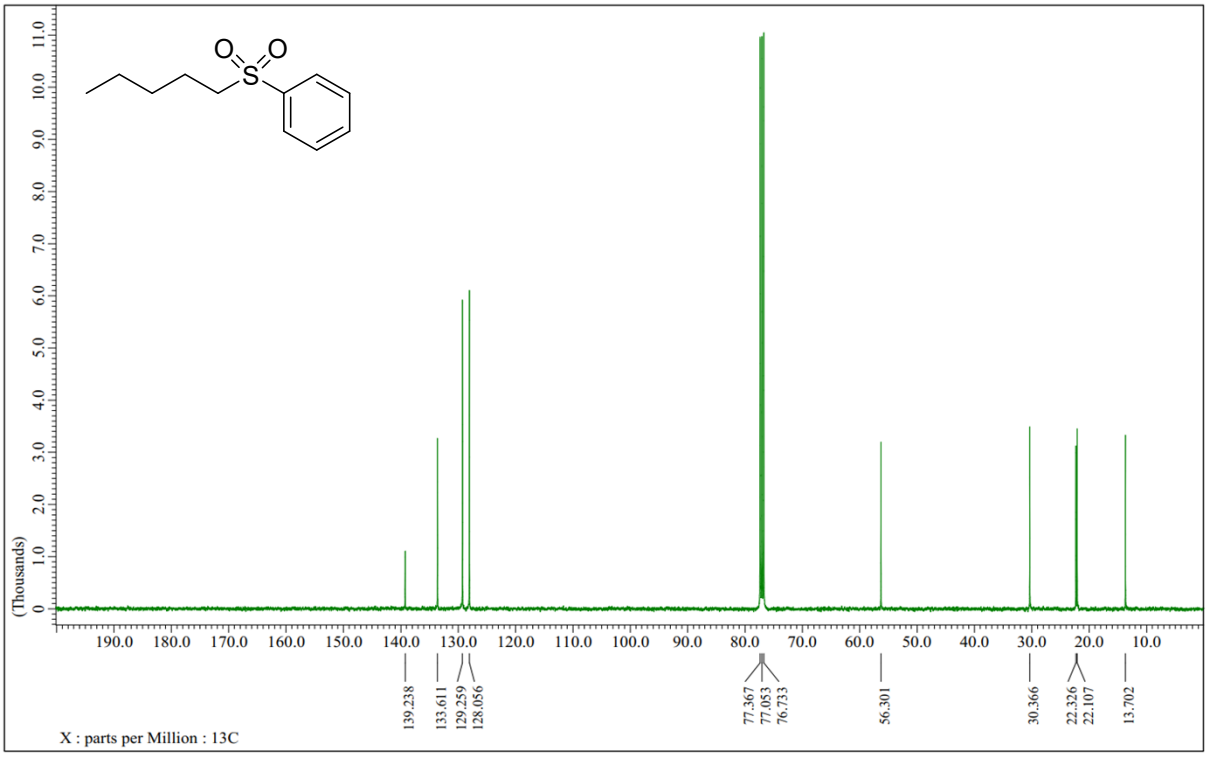



$^{13}$C NMR spectrum of ((2-phenylpropyl)sulfonyl)benzene

**(pentylsulfonyl)benzene (4m)**

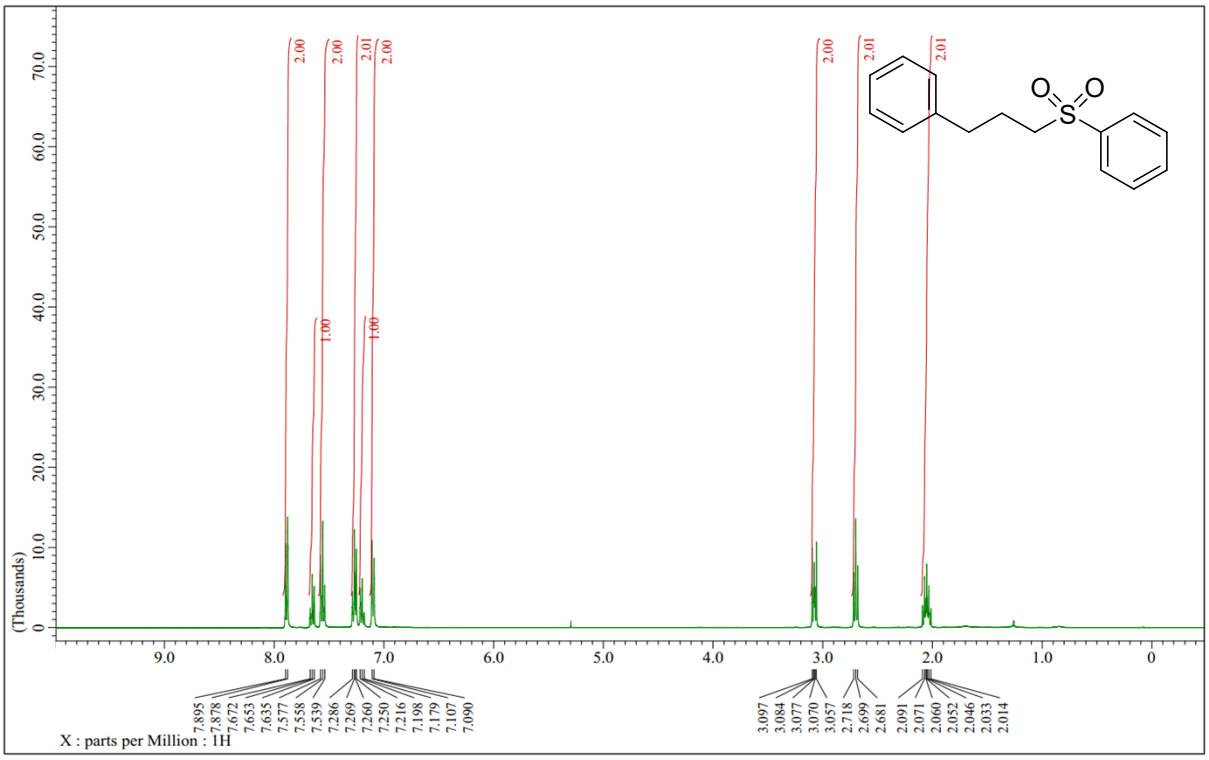



$^{1}$H NMR spectrum of (pentylsulfonyl)benzene

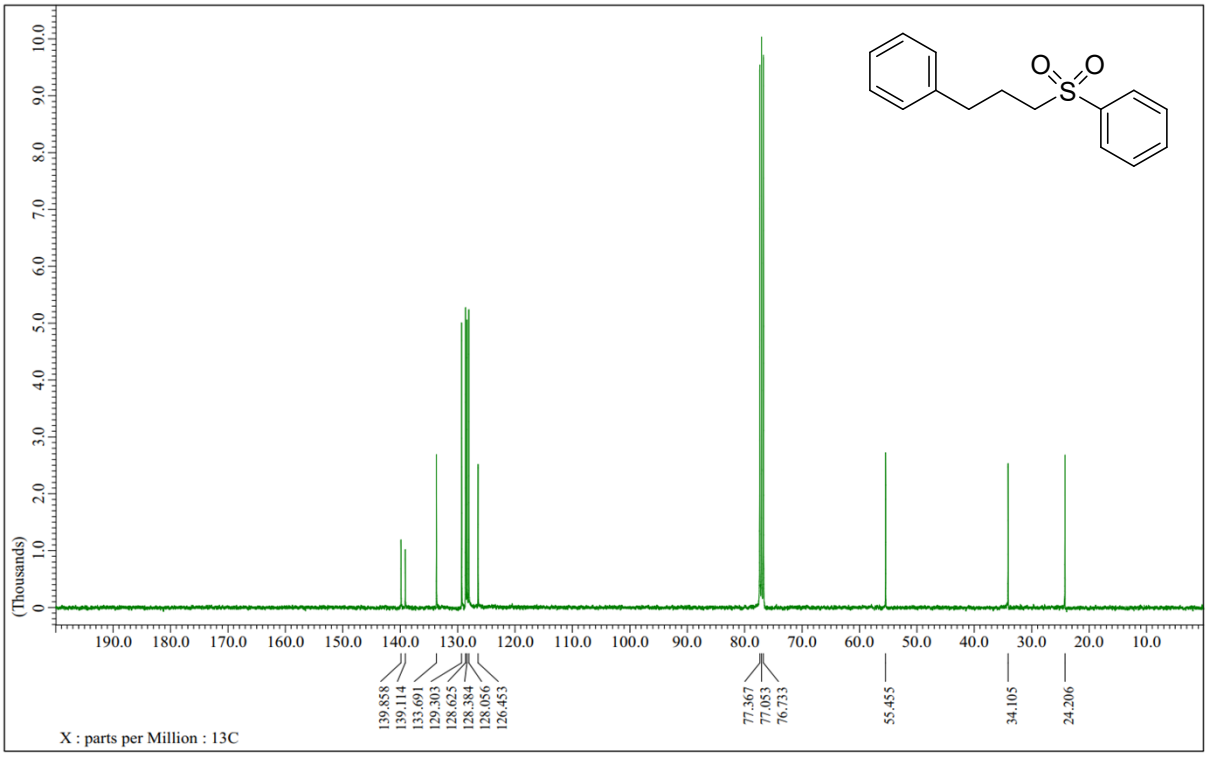



$^{13}$C NMR spectrum of (pentylsulfonyl)benzene

**((3-phenylpropyl)sulfonyl)benzene (4n)**

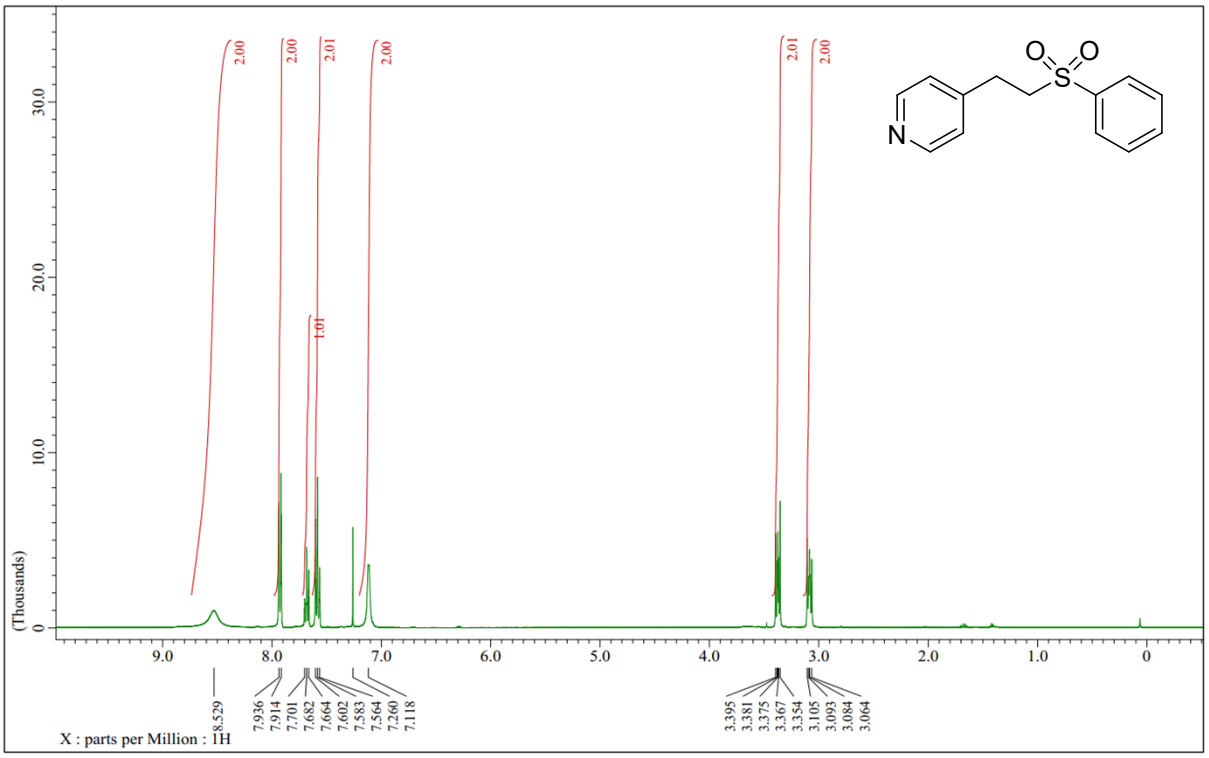



$^{1}$H NMR spectrum of ((3-phenylpropyl)sulfonyl)benzene

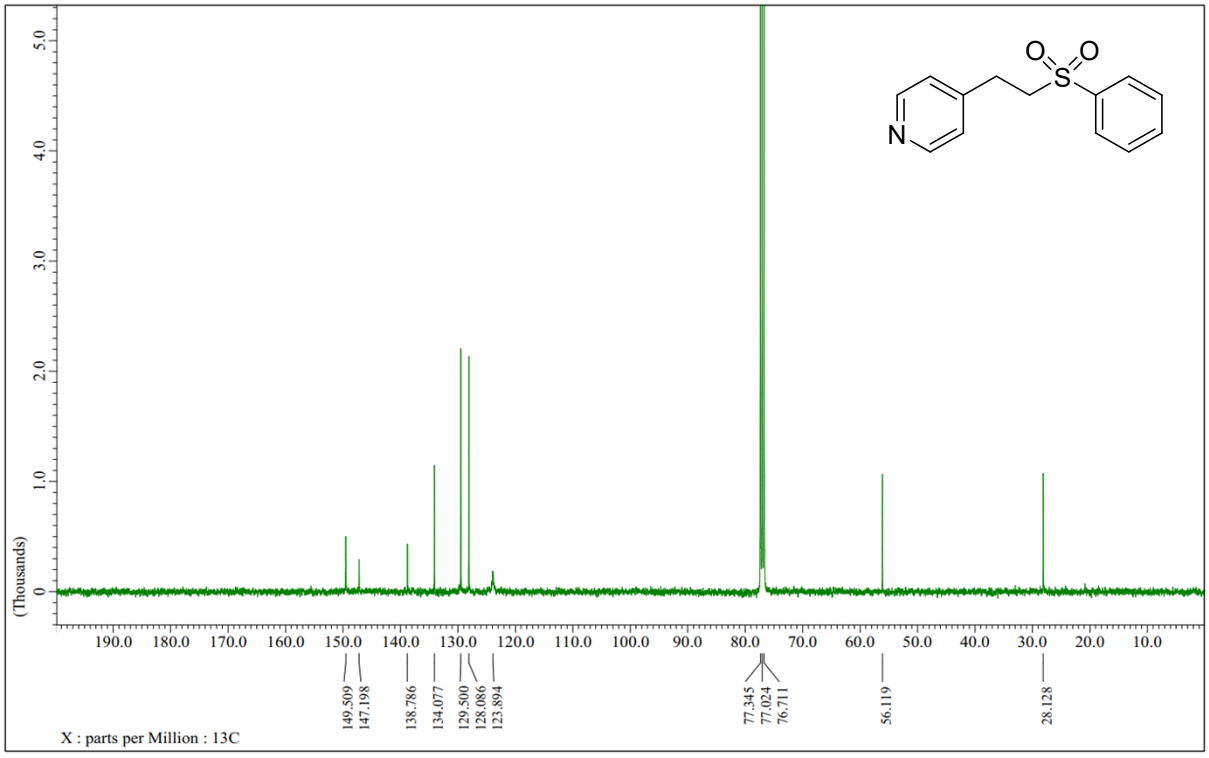



$^{13}$C NMR spectrum of ((3-phenylpropyl)sulfonyl)benzene

**4-(2-(phenylsulfonyl)ethyl)pyridine (4o)**




$^{1}$H NMR spectrum of 4-(2-(phenylsulfonyl)ethyl)pyridine




$^{13}$C NMR spectrum of 4-(2-(phenylsulfonyl)ethyl)pyridine