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Supporting Information

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Supporting Information

Iron-Catalyzed *S*-Arylation of Thiols with Aryl Iodides

*Arkaitz Correa, Mónica Carril, and Carsten Bolm**

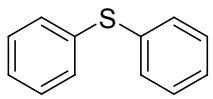
[*] Dr. A. Correa, Dr. M. Carril, Prof. Dr. C. Bolm, Institut für Organische Chemie der RWTH Aachen, Landoltweg 1, D-52056 Aachen, Germany, carsten.bolm@oc.rwth-aachen.de, Fax: +49 (241) 8092391

Supporting Information Available. Experimental details for compounds **3a-r** and ^{1}H-NMR and ^{13}C-NMR spectra of all compounds are included.

General information: All reagents were purchased from commercial suppliers and used without further purification. All experiments were carried out under argon. Flash chromatography was carried out with Merck silica gel 60 (63-200 mesh). Analytical TLC was performed with Merck silica gel 60 F_{254} plates, and the products were visualized by UV detection. ^{1}H-NMR and ^{13}C-NMR (300 or 400 MHz and 75 or 100 MHz, respectively) spectra were recorded in $CDCl_3$. Chemical shifts (δ) are reported in ppm using TMS as internal standard, and spin-spin coupling constants (J) are given in Hz. IR spectra were recorded on a Perkin-Elmer FT/IR 1760 as KBr pellets. Melting points were determined in open-end capillary tubes on a Büchi B-540 melting point apparatus and are uncorrected. Mass spectra were acquired on a Varian MAT 212 spectrometer (CI, 100 eV and EI, 70 eV). Microanalyses were obtained with a Vario EL element analyzer.

General procedure for *S*-arylation of thiols: A sealable tube equipped with a magnetic stir bar was charged with thiophenol (**1**, 1.0 equiv), NaO*t*Bu (2.0 equiv) and $FeCl_3$ (0.10 equiv). The aperture of the tube was then covered with a rubber septum, and an argon atmosphere was established. Phenyliodide (**2**, 1.5 equiv), *N,N'*-dimethylethylendiamine (0.20 equiv) and toluene (1 mL/mmol of **1**) were added via syringe. The septum was then replaced by a teflon-coated screw cap, and the reaction vessel was placed in a 135 °C oil bath. After stirring at this temperature for 24 h, the heterogeneous mixture was cooled to room temperature and diluted with dichloromethane. The resulting solution was directly filtered through a pad of silica and concentrated to afford the product, which was purified by silica gel chromatography to yield thioether **3**. The identity and purity of the known products was confirmed by ^{1}H- and ^{13}C-NMR spectroscopic analysis, and the new products were fully characterized.

Diphenyl sulfide[1] (3a). Following the general procedure using thiophenol (0.05 mL, 0.48 mmol) and iodobenzene (80 mL, 0.72 mmol) provided 82.4 mg (91% yield) of the coupling product as a colorless liquid after purification by flash chromatography (pentane) of the crude oil.

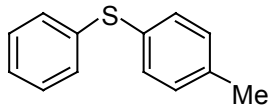


^{1}H-NMR (400 MHz, $CDCl_3$) δ 7.36-7.22 (m, 10H)

^{13}C-NMR (100 MHz, $CDCl_3$) δ 135.7 (C), 131.0 (CH), 129.1 (CH), 127.0 (CH).

All spectral data correspond to those given in the literature.

Phenyl tolyl sulfide[1] (3b). Following the general procedure using thiophenol (0.05 mL, 0.48 mmol) and 4-iodotoluene (162.2 mg, 0.72 mmol) provided 95.5 mg (98% yield) of the coupling product as a pale yellow liquid after purification by flash chromatography (pentane) of the crude oil.



^{1}H-NMR (400 MHz, $CDCl_3$) δ 7.41-7.16 (m, 9H), 2.42 (s, 3H).

^{13}C-NMR (100 MHz, $CDCl_3$) δ 137.5 (C), 132.2 (C), 131.2 (CH), 129.9 (CH), 129.7 (CH), 128.9 (CH), 128.5 (C), 126.3 (CH), 20.9 (CH_3).

All spectral data correspond to those given in the literature.

4-Nitrophenyl phenyl sulfide[1] (3c). Following the general procedure using thiophenol (0.08 mL, 0.77 mmol) and 4-iodonitrobenzene (119.6 mg, 0.47 mmol) provided 95.6 mg (88% yield) of the coupling product as a yellow solid after purification by flash chromatography (dichloromethane/pentane 3/7) of the crude oil.

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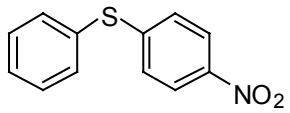
[1] T. Itoh, T. Mase, *Org. Lett*. **2004**, *6*, 4587.



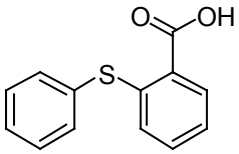
M.p. : 55-56 °C (lit.[1] 54-55 °C).

^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.05 (d, J = 8.8 Hz, 2H), 7.55-7.52 (m, 2H), 7.46-7.44 (m, 3H), 7.17 (d, J = 8.8 Hz, 2H).

^{13}C-NMR (100 MHz, $CDCl_3$) δ 148.3 (C), 145.1 (C), 134.5 (CH), 130.2 (C), 129.9 (CH), 129.5 (CH), 126.5 (CH), 123.8 (CH).

All spectral data correspond to those given in the literature.

2-Phenylthiobenzoic acid[2] (3d). Following the general procedure using thiophenol (0.08 mL, 0.77 mmol) and 2-iodobenzoic acid (123 mg, 0.48 mmol) provided 101.1 mg (90% yield) of the coupling product as a white solid after washing the crude mixture with water and dichloromethane, further acidification with 1M HCl and extraction of the aqueous layer with dichloromethane.



M.p. : 166-168 °C (lit.[2] 166.5-167 °C).

^{1}H-NMR (400 MHz, $CDCl_3$) δ 11.5 (bs, 1H) 8.14 (dd, J = 7.8, 1.6 Hz, 1H), 7.63-7.55 (m, 2H), 7.49-7.41 (m, 3H), 7.32-7.23 (m, 1H), 7.15 (dt, J = 7.6, 1.2 Hz, 1H), 6.82 (dd, J = 8.2, 0.9 Hz, 1H)

^{13}C-NMR (100 MHz, $CDCl_3$) δ 171.9 (C), 144.7 (C), 135.9 (CH), 133.2 (CH), 132.2 (CH), 132.1 (CH), 129.9 (CH), 129.3 (CH), 127.2 (CH), 125.3 (C), 124.3 (CH).

MS (EI) *m/z* (%) 230 (M^+, 100), 184 (36), 137 (66).

Calcd. for $C_{13}H_{10}O_2S$: C, 67.80; H, 4.38; found C, 67.83; H, 4.20.

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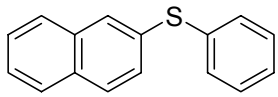
[2] J. Nakayama, T. Fujita, M. Hoshino, *Chem. Lett*. **1982**, 1777.

2-Naphthyl phenyl sulfide[3] (3e). Following the general procedure using 2-naphthalenthiol (100 mg, 0.61 mmol) and iodobenzene (0.093 mL, 0.92 mmol) provided 122 mg (85% yield) of the coupling product as a white solid after purification by flash chromatography (pentane) of the crude oil.



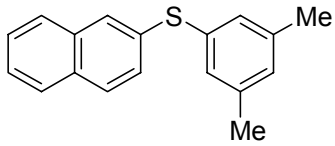
M.p. : 51-52 °C (lit.[3] 50 °C).

^{1}H-NMR (400 MHz, $CDCl_3$) δ 7.73-7.58 (m, 4H), 7.36-7.13 (m, 8H).

^{13}C-NMR (100 MHz, $CDCl_3$) δ 135.9 (C), 133.8 (C), 133.0 (C), 132.3 (C), 130.9 (CH), 129.9 (CH), 129.3 (CH), 128.9 (CH), 128.8 (CH), 127.8 (CH), 127.4 (CH), 127.1 (CH), 126.6 (CH), 126.2 (CH).

All spectral data correspond to those given in the literature.

3,5-Dimethylphenyl 2-naphthyl sulfide (3f). Following the general procedure using 2-naphthalenthiol (100 mg, 0.61 mmol) and 5-iodo-*m*-xylene (0.13 mL, 0.92 mmol) provided 135 mg (84% yield) of the coupling product as a white solid after purification by flash chromatography (pentane) of the crude oil.



M.p. : 99-100 ºC.

^{1}H-NMR (400 MHz, $CDCl_3$) δ 7.70-7.58 (m, 4H), 7.35-7.27 (m, 3H), 6.92 (s, 2H), 6.77 (s, 1H), 2.14 (s, 6H).

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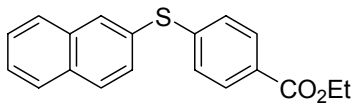
[3] C. Mispelaere-Canivet, J.-F. Spindler, S. Perrio, P. Beslin, *Tetrahedron* **2005**, *61*, 5253.

^{13}C-NMR (100 MHz, $CDCl_3$) δ 138.9 (C), 134.9 (C), 133.8 (C), 133.6 (C), 132.2 (C), 129.3 (CH), 129.2 (CH), 129.0 (CH), 128.8 (CH), 128.6 (CH), 127.8 (CH), 127.4 (CH), 126.6 (CH), 126.1 (CH), 21.4 (CH_3).

MS (EI) *m/z* (%) 264 (M^+, 100), 249 (18), 234 (19).

Calcd. for $C_{18}H_{16}S$: C, 81.77; H, 6.10; found C, 81.49; H, 5.98.

4-(**Thio-2-naphthyl)benzoic acid ethylester (3g).** Following the general procedure using 2-naphthalenthiol (100 mg, 0.61 mmol) and 4-iodobenzoic acid ethylester (0.16 mL, 0.92 mmol) provided 152 mg (81% yield) of the coupling product as a white solid after purification by flash chromatography (dichloromethane/pentane 2/8) of the crude oil.



M.p. : 55-56 ºC.

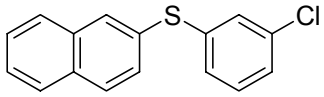
^{1}H-NMR (400 MHz, $CDCl_3$) δ 7.91-7.90 (m, 1H), 7.83-7.79 (m, 2H), 7.75-7.65 (m, 3H), 7.44-7.39 (m, 2H), 7.37 (dd, J = 8.5, 1.9 Hz, 1H), 7.17-7.13 (m, 2H), 4.25 (q, J = 7.1 Hz, 2H), 1.27 (t, J = 7.1 Hz, 3H).

^{13}C-NMR (100 MHz, $CDCl_3$) δ 166.1 (C), 143.9 (C), 133.8 (C), 132.9 (C), 132.8 (CH), 130.9 (CH), 130.2 (CH), 130.1 (CH), 129.8 (C), 129.3 (CH), 127.9 (C), 128.8 (CH), 127.7 (CH), 126.9 (CH), 126.8 (CH), 61.0 (CH_2), 14.5 (CH_3).

MS (EI) *m/z* (%) 308 (M^+, 100), 280 (15), 263 (22), 234 (36), 115 (20).

Calcd. for $C_{19}H_{16}O_2S$: C, 74.00; H, 5.23; found C, 73.66; H, 5.23.

3-Chlorophenyl 2-naphthyl sulfide (3h). Following the general procedure using 2-naphthalenthiol (100 mg, 0.61 mmol) and 1-iodo-3-chlorobenzene (0.14 mL, 0.92 mmol) provided 140 mg (85% yield) of the coupling product as a white solid after purification by flash chromatography (pentane) of the crude oil.



M.p. : 64-65 ºC.

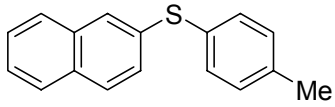
^{1}H-NMR (400 MHz, $CDCl_3$) δ 7.81 (d, J = 1.6 Hz, 1H), 7.72-7.62 (m, 3H), 7.39-7.35 (m, 2H), 7.31 (dd, J = 8.5, 1.9 Hz, 1H), 7.18-7.17 (m, 1H), 7.05 (s, 3H).

^{13}C-NMR (100 MHz, $CDCl_3$) δ 138.9 (C), 134.9 (C), 133.8 (C), 132.7 (C), 131.6 (CH), 131.1 (C), 130.1 (CH), 129.4 (CH), 129.3 (CH), 129.2 (CH), 127.9 (CH), 127.8 (CH), 127.6 (CH), 126.8 (CH), 126.7 (CH).

MS (EI) *m/z* (%) 272 (M^+ +2, 33), 270 (M^+, 100), 234 (50), 115 (19).

Calcd. for $C_{16}H_{11}ClS$: C, 70.97; H, 4.09; found C, 70.68; H, 4.23.

4-Methylphenyl 2-naphthyl sulfide[4] (3i). Following the general procedure using 2-naphthalenthiol (100 mg, 0.61 mmol) and 4-iodotoluene (205 mg, 0.92 mmol) provided 145 mg (96% yield) of the coupling product as a white solid after purification by flash chromatography (pentane) of the crude oil.



M.p. : 67-68 ºC (lit.[4] 66-67 ºC)

^{1}H-NMR (400 MHz, $CDCl_3$) δ 7.67-7.57 (m, 4H), 7.36-7.29 (m, 2H), 7.26-7.22 (m, 3H), 7.03 (d, J = 7.7 Hz, 2H), 2.24 (s, 3H).

^{13}C-NMR (100 MHz, $CDCl_3$) δ 137.6 (C), 134.4 (C), 133.8 (C), 132.1 (CH), 132.0 (C), 131.4 (C), 130.1 (CH), 128.7 (CH), 128.4 (CH), 127.9 (CH), 127.7 (CH), 127.3 (CH), 126.5 (CH), 125.9 (CH), 21.3 (CH_3).

All spectral data correspond to those given in the literature.

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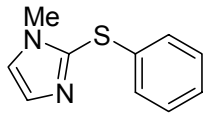
[4] T. Nakazawa, N. Hirose, K. Itabashi, *Synthesis* **1989**, 955.

2-(Phenylsulfanyl)-*N*-methylimidazole (3j). Following the general procedure using 2-mercapto-*N*-methylimidazole (100 mg, 0.86 mmol) and iodobenzene (0.14 mL, 1.29 mmol) and Cs_2CO_3 (560.4 mg, 1.72 mmol) as base provided 86 mg (52% yield) of the coupling product as a yellow oil after purification by flash chromatography (ethyl acetate) of the crude oil.



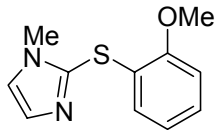
^{1}H-NMR (400 MHz, $CDCl_3$) δ 7.20-7.14 (m, 2H), 7.10-7.04 (m, 4H), 6.98 (d, J = 1.4 Hz, 1H), 3.54 (s, 3H).

^{13}C-NMR (100 MHz, $CDCl_3$) δ 137.9 (C), 134.9 (C), 130.1 (CH), 129.2 (CH), 127.9 (CH), 126.5 (CH), 123.8 (CH), 33.9 (CH_3).

MS (EI) *m/z* (%) 190 (M^+, 75), 189 (100), 91 (16), 51 (18).

Calcd. for $C_{10}H_{10}NS$: C, 63.13; H, 5.30; N, 14.72; found C, 62.83; H, 5.28; N, 14.81.

2-(2-Methoxyphenylsulfanyl)-*N*-methylimidazole (3k). Following the general procedure using 2-mercapto-*N*-methylimidazole (100 mg, 0.86 mmol) and 2-iodoanisole (0.18 mL, 1.29 mmol) and Cs_2CO_3 (560.4 mg, 1.72 mmol) as base provided 134 mg (71% yield) of the coupling product as a yellow oil after purification by flash chromatography (ethyl acetate) of the crude oil.



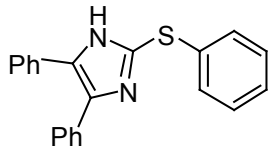
^{1}H-NMR (300 MHz, $CDCl_3$) δ 7.10-7.03 (m, 2H), 7.02-7.00 (m, 1H), 6.77-6.68 (m, 2H), 6.52-6.49 (m, 1H), 3.78 (s, 3H), 3.54 (s, 3H).

^{13}C-NMR (75 MHz, $CDCl_3$) δ 155.6 (C), 137.2 (C), 130.3 (CH), 127.6 (CH), 127.3 (CH), 124.0 (CH), 123.9 (CH), 121.5 (CH), 110.8 (CH), 55.9 (CH_3), 33.8 (CH_3).

MS (EI) *m/z* (%) 220 (M^+, 9), 189 (100).

Calcd. for $C_{11}H_{12}N_2OS$: C, 59.97; H, 5.49; N, 12.72; found C, 60.01; H, 5.43; N, 12.84.

4,5-Diphenyl-2-(phenylsulfanyl)imidazole (3l). Following the general procedure using 4,5-diphenyl-2-imidazolethiol (126.4 mg, 0.48 mmol) and iodobenzene (0.08 mL, 0.72 mmol) provided 96.8 mg (61% yield) of the coupling product as a white solid after purification by flash chromatography (ethyl acetate) of the crude oil.



M.p. : 207-209 ºC

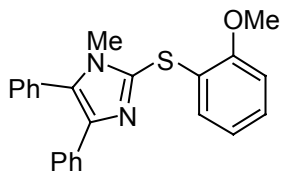
^{1}H-NMR (400 MHz, $CDCl_3$) δ 7.62 (dd, J = 8.3, 1.1 Hz, 4H), 7.39 (d, J = 6.0 Hz, 1H), 7.21 (m, 6H), 7.02 (t, J = 7.8 Hz, 4H).

^{13}C-NMR (100 MHz, $CDCl_3$) δ 137.4 (CH), 134.0 (C), 130.2 (CH), 129.5 (CH), 129.4 (CH), 128.6 (CH), 127.7 (CH), 127.7 (CH), 127.4 (CH), 127.3 (CH), 94.4 (C).

MS (EI) *m/z* (%) 328 (M^+, 100), 165 (12).

Calcd. for $C_{21}H_{16}N_2S$: C, 76.80; H, 4.91; N, 8.53; found C, 76.65; H, 5.22; N, 8.45.

4,5-Diphenyl-2-(2-methoxyphenylsulfanyl)imidazole (3m). Following the general procedure using 4,5-diphenyl-2-imidazolethiol (126.4 mg, 0.48 mmol) and 2-iodoanisole (0.10 mL, 0.72 mmol) and K_3PO_4 (204.4 mg, 0.96 mmol) as base provided 56.4 mg (33% yield) of the coupling product as a white solid after purification by flash chromatography (ethyl acetate) of the crude oil.



M.p. : 170-172 ºC

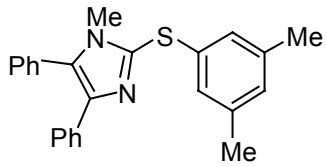
^{1}H-NMR (400 MHz, $CDCl_3$) δ 7.40 (dd, J = 7.7, 1.7 Hz, 4H), 7.27-7.12 (m, 8H), 6.88-6.75 (m, 2H), 3.83 (s, 3H).

^{13}C-NMR (100 MHz, $CDCl_3$) δ 157.0 (C), 137.4 (C), 131.6 (CH), 129.1 (CH), 128.6 (CH), 127.7 (CH), 127.6 (CH), 127.3 (C), 122.3 (C), 121.8 (CH), 111.4 (CH), 56.2 (CH_3).

MS (EI) *m/z* (%) 358 (M^+, 65), 327 (100).

Calcd. for $C_{23}H_{20}N_2OS$: C, 73.71; H, 5.06; N, 7.82; found C, 73.69; H, 5.34; N, 7.65.

2-(3,5-Dimethylphenylsulfanyl)-4,5-diphenylimidazole (3n). Following the general procedure using 4,5-diphenyl-2-imidazolethiol (126.4 mg, 0.48 mmol) and 5-iodo-*m*-xylene (0.11 mL, 0.72 mmol) provided 54.7 mg (32% yield) of the coupling product as a pale yellow solid after purification by flash chromatography (ethyl acetate) of the crude oil.



M.p. : 143-145 ºC

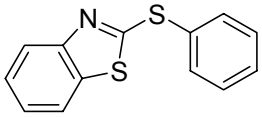
^{1}H-NMR (400 MHz, $CDCl_3$) δ 7.44-7.40 (m, 4H), 7.26-7.21 (m, 6H), 6.99 (s, 2H), 6.83 (s, 1H), 2.22 (s, 6H).

^{13}C-NMR (100 MHz, $CDCl_3$) δ. 139.1 (C), 138.3 (C), 133.0 (C), 132.3 (C), 129.4 (CH), 128.5 (CH), 127.9 (CH), 127.8 (CH), 127.5 (CH), 104.7 (C), 21.2 (CH_3).

MS (EI) *m/z* (%) 356 (M^+, 100).

Calcd. for $C_{24}H_{22}N_2S$: C, 77.49; H, 5.65; N, 7.86; found C, 77.10; H, 5.91; N, 7.66.

2-Phenylsulfanyl-benzothiazole[5] (3o). Following the general procedure using 2-mercaptobenzothiazole (100 mg, 0.58 mmol) and iodobenzene (0.09 mL, 0.87 mmol) provided 128 mg (91% yield) of the coupling product as a yellow oil after purification by flash chromatography (pentane/dichloromethane 9/1) of the crude oil.

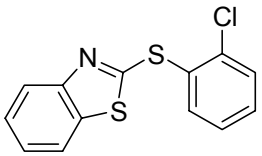


^{1}H-NMR (400 MHz, $CDCl_3$) δ 7.78-7.76 (m, 1H), 7.63-7.61 (m, 2H), 7.54-7.51 (m, 1H), 7.42-7.33 (m, 3H), 7.28 (dt, J = 7.8, 1.4 Hz, 1H), 7.14 (dt, J = 7.4, 1.1 Hz, 1H).

^{13}C-NMR (100 MHz, $CDCl_3$) δ 169.6 (C), 153.9 (C), 135.2 (C), 135.3 (CH), 130.5 (CH), 129.9 (CH), 126.2 (CH), 124.3 (CH), 121.9 (CH), 120.8 (CH).

All spectral data correspond to those given in the literature.

2-(2-Chlorophenylsulfanyl)benzothiazole (3p). Following the general procedure using 2-mercaptobenzothiazole (100 mg, 0.58 mmol) and 1-iodo-2-chlorobenzene (0.10 mL, 0.87 mmol) provided 128 mg (80% yield) of the coupling product as a white solid after purification by flash chromatography (dichloromethane/pentane 1/1) of the crude oil.



M.p. : 55-56 ºC.

^{1}H-NMR (300 MHz, $CDCl_3$) δ 7.79-7.83 (m, 1H), 7.68 (dd, J = 7.7, 1.7 Hz, 1H), 7.59-7.56 (m, 1H), 7.47 (dd, J = 7.9, 1.5 Hz, 1H), 7.36-7.16 (m, 4Hz).

^{13}C-NMR (75 MHz, $CDCl_3$) δ 166.9 (C), 153.8 (C), 138.9 (C), 137.0 (CH), 135.8 (C), 131.8 (CH), 130.8 (CH), 129.5 (C), 127.9 (CH), 126.3 (CH), 124.6 (CH), 122.2 (CH), 120.9 (CH).

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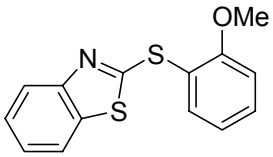
[5] C. Savarin, J. Srogl, L. S. Liebeskind, *Org. Lett.* **2002**, *4*, 4309.

MS (EI) *m/z* (%) 277 (M^+, 13), 242 (100), 108 (21).

Calcd. for $C_{13}H_8ClNS_2$: C, 56.21; H, 2.90; N, 5.04; found C, 56.45; H, 3.15; N, 5.05.

2-(2-Methoxyphenylsulfanyl)benzothiazole (3q). Following the general procedure using 2-mercaptobenzothiazole (100 mg, 0.58 mmol) and 2-iodoanisole (0.12 mL, 0.87 mmol) provided 145 mg (91% yield) of the coupling product as a white solid after purification by flash chromatography (dichloromethane) of the crude oil.



M.p. : 71-72 ºC.

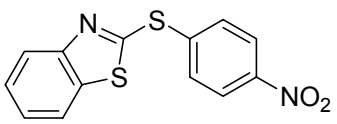
^{1}H-NMR (400 MHz, $CDCl_3$) δ 7.79-7.77 (m, 1H), 7.60 (dd, J = 7.7, 1.6 Hz, 1H), 7.55-7.52 (m, 1H), 6.97-6.92 (m, 1H); 6.74-6.66 (m, 1H), 6.61 (dt, J = 7.5, 1.4 Hz, 1H), 7.44-7.39 (m, 1H), 7.31-7.27 (m, 1H), 7.17-7.13 (m, 1H), 3.75 (s, 3H).

^{13}C-NMR (100 MHz, $CDCl_3$) δ 169.8 (C), 159.9 (C), 154.0 (C), 137.4 (CH), 135.6 (C), 132.8 (CH), 125.9 (CH), 124.0 (CH), 121.8 (CH), 121.5 (CH), 120.7 (CH), 117.7 (C), 111.9 (CH), 56.1 (CH_3).

MS (EI) *m/z* (%) 273 (M^+, 15), 242 (100).

Calcd. for $C_{14}H_{11}NOS_2$: C, 61.51; H, 4.06; N, 5.12; found C, 61.64; H, 4.29; N, 5.03.

2-(4-Nitrophenylsulfanyl)benzothiazole (3r). Following the general procedure using 2-mercaptobenzothiazole (100 mg, 0.58 mmol) and 4-iodonitrobenzene (220 mg, 0.87 mmol) provided 134 mg (80% yield) of the coupling product as an orange solid after purification by flash chromatography (dichloromethane) of the crude oil.



M.p. : 95-96 ºC.

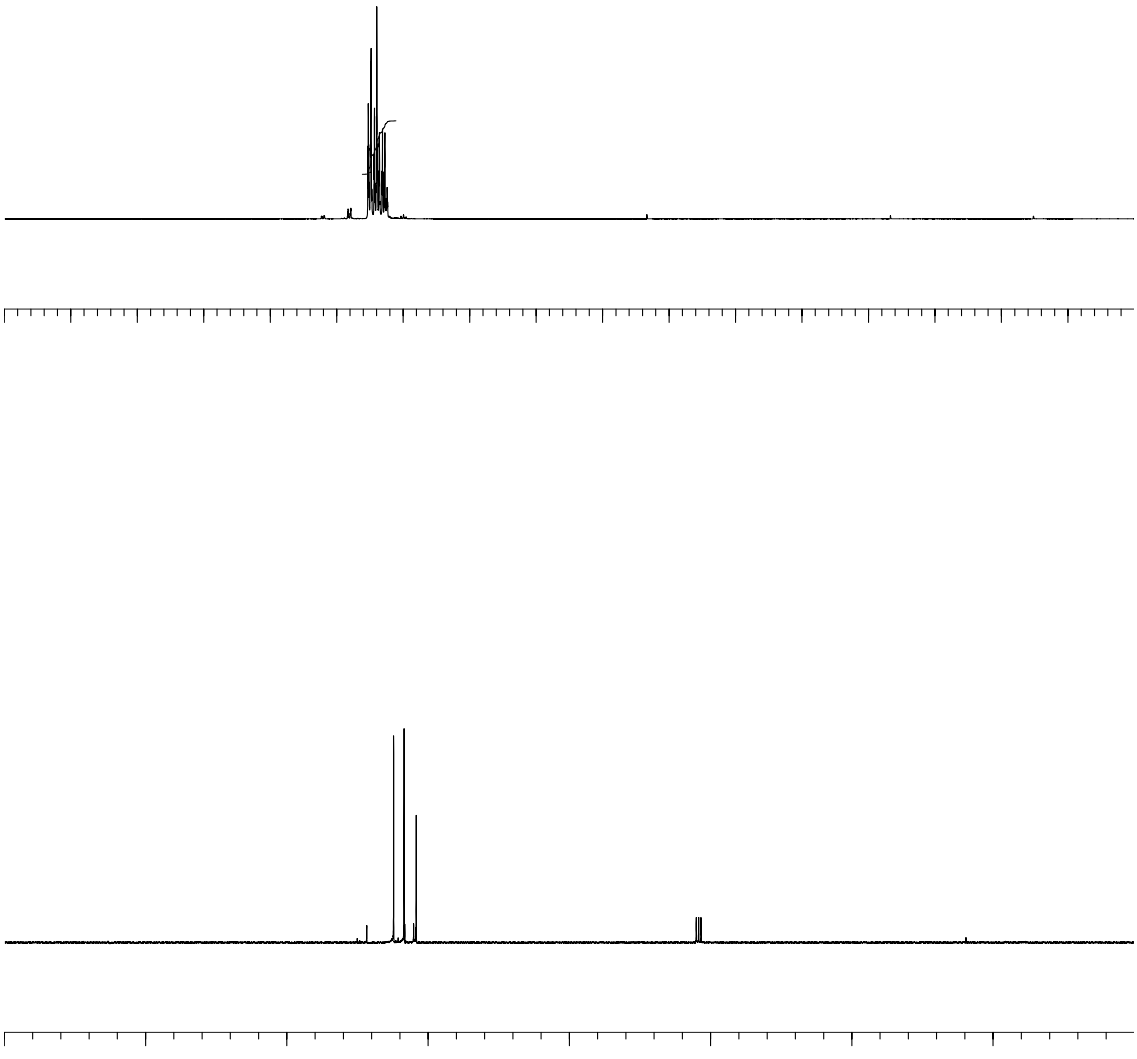
^{1}H-NMR (300 MHz, $CDCl_3$) δ 8.15-8.11 (m, 2H), 7.88-7.85 (m, 1H), 7.69-7.65 (m, 3H), 7.41-7.25 (m, 2H).

^{13}C-NMR (75 MHz, $CDCl_3$) δ 162.8 (C), 153.4 (C), 147.9 (C), 140.0 (C), 136.2 (C), 132.7 (CH), 126.7 (CH), 125.5 (CH), 124.5 (CH), 122.8 (CH), 121.2 (CH).

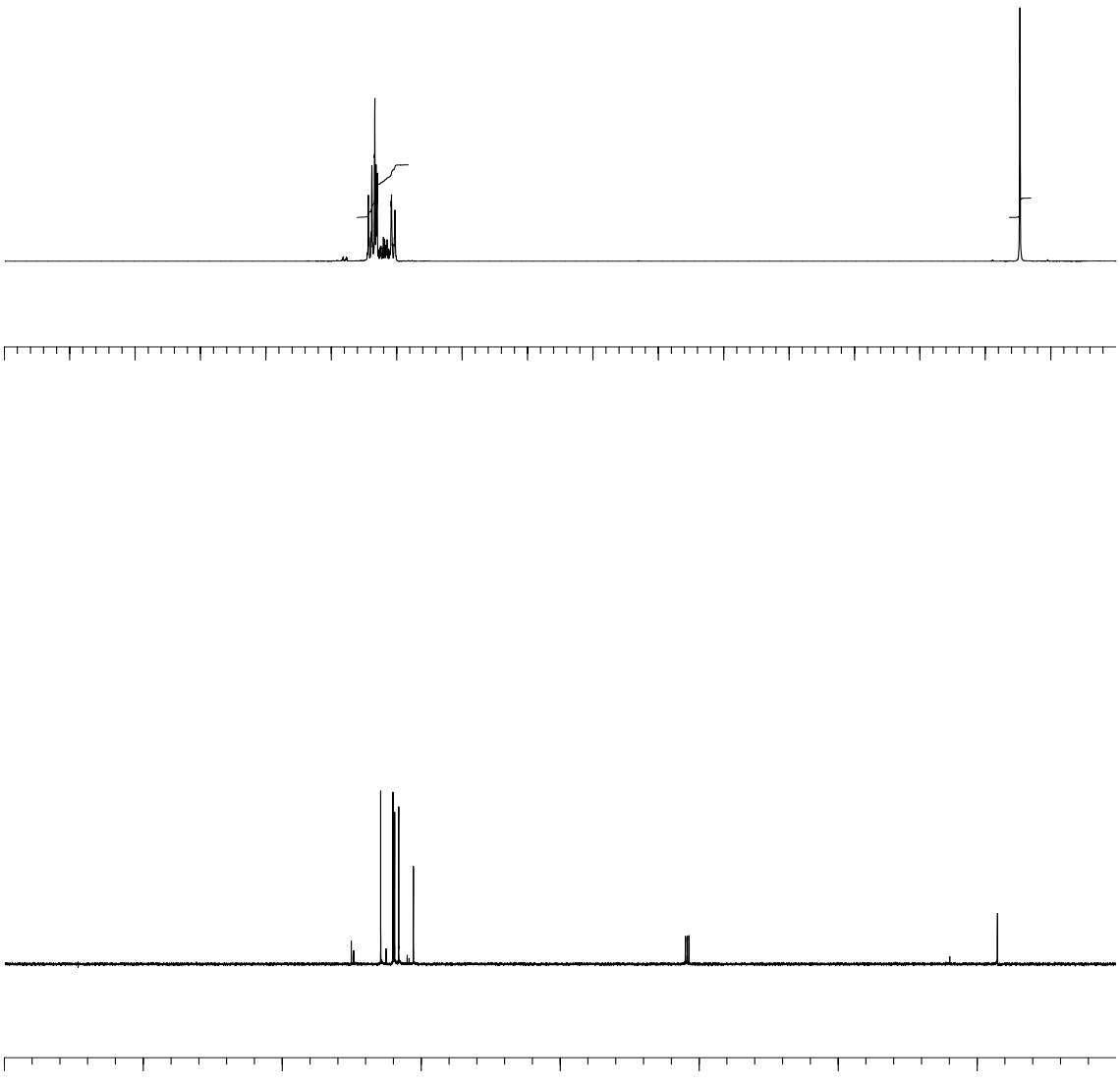
MS (EI) *m/z* (%) 290 (M^+, 10), 288 (100), 241 (39).

All spectral data correspond to those given in the literature.

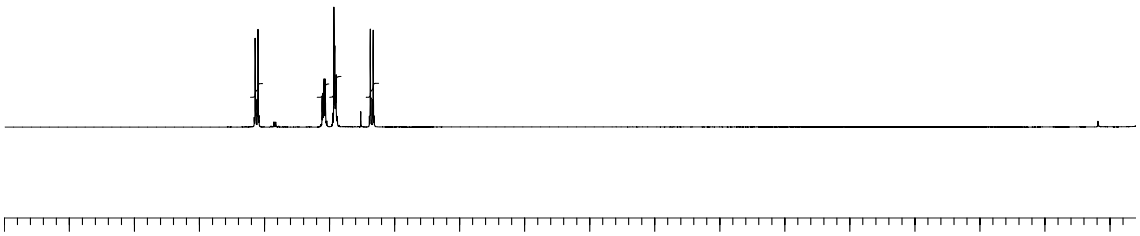
Diphenyl sulfide (3a)

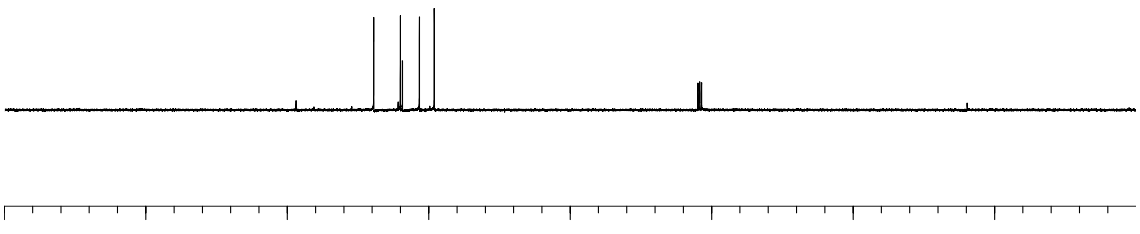


Phenyl tolyl sulfide (3b)

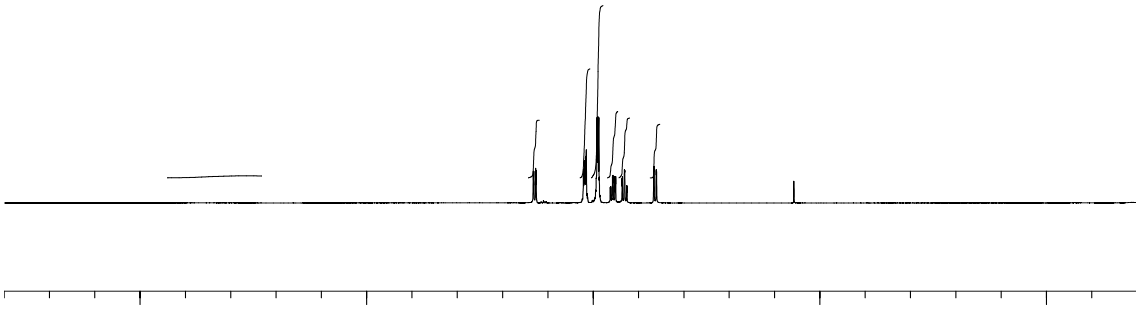


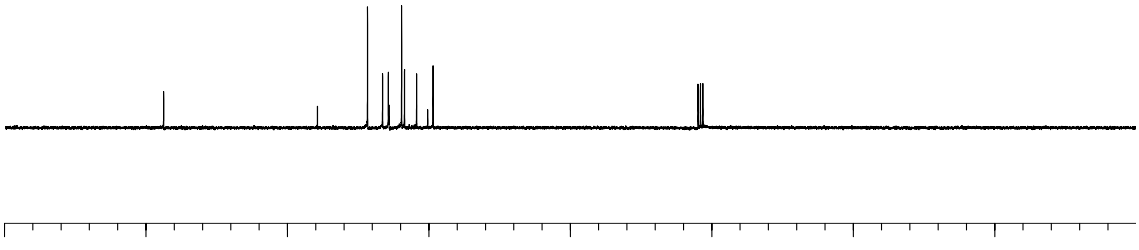
4-Nitrophenyl phenyl sulfide (3c)



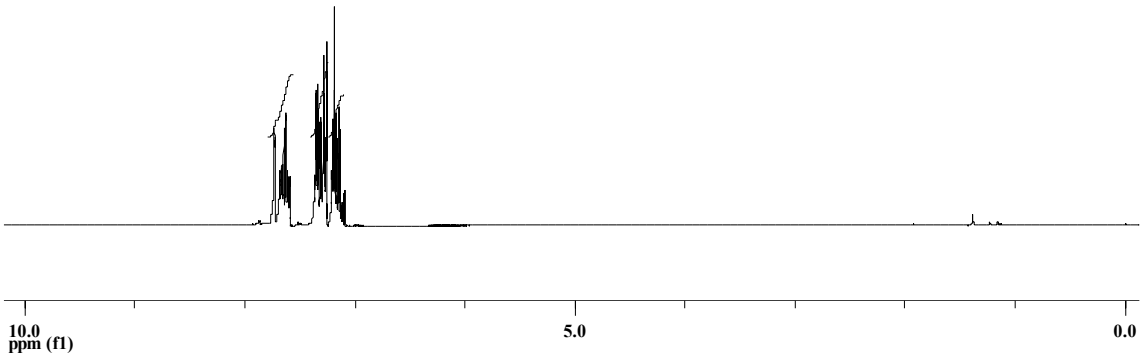


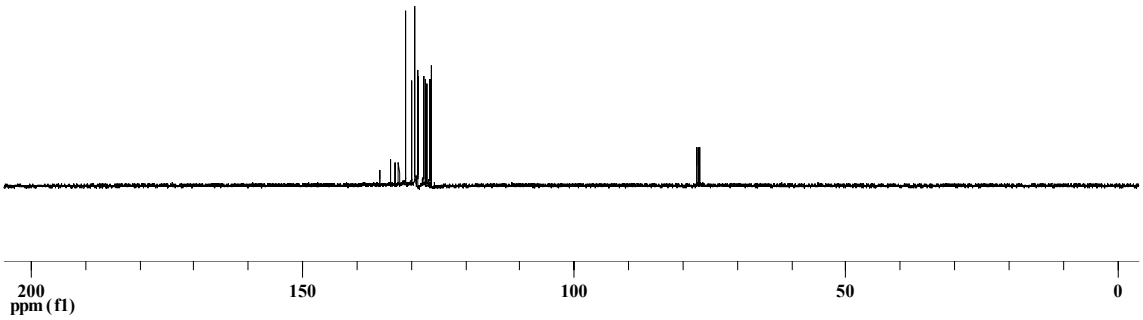
2-Phenylthiobenzoic acid (3d)



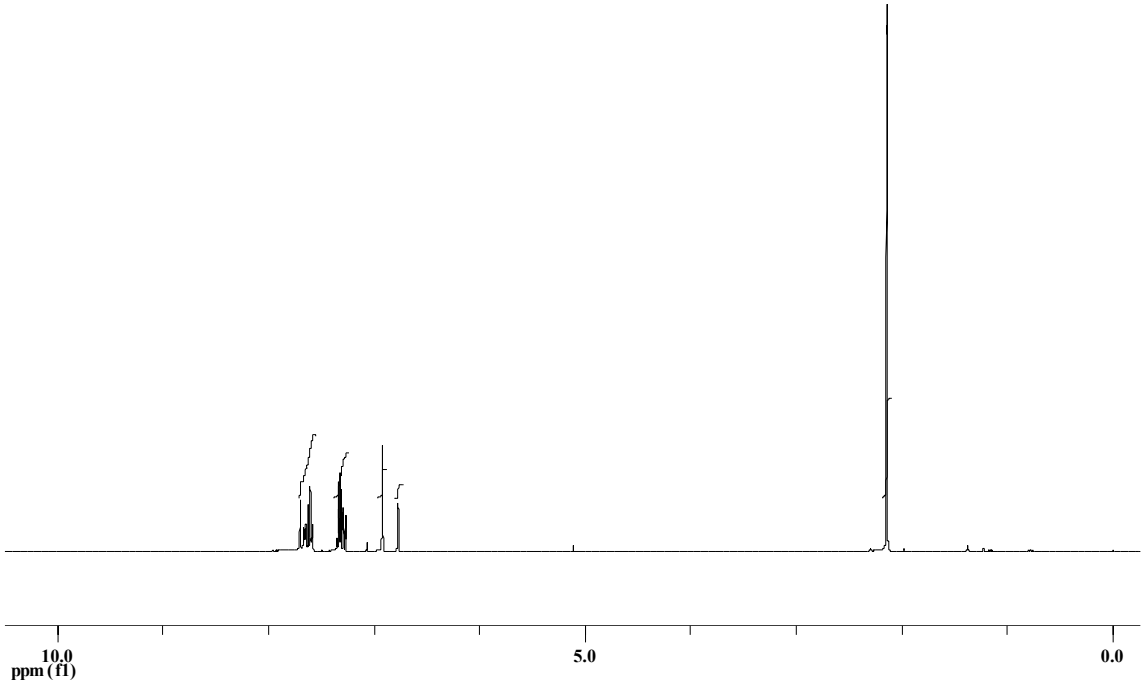


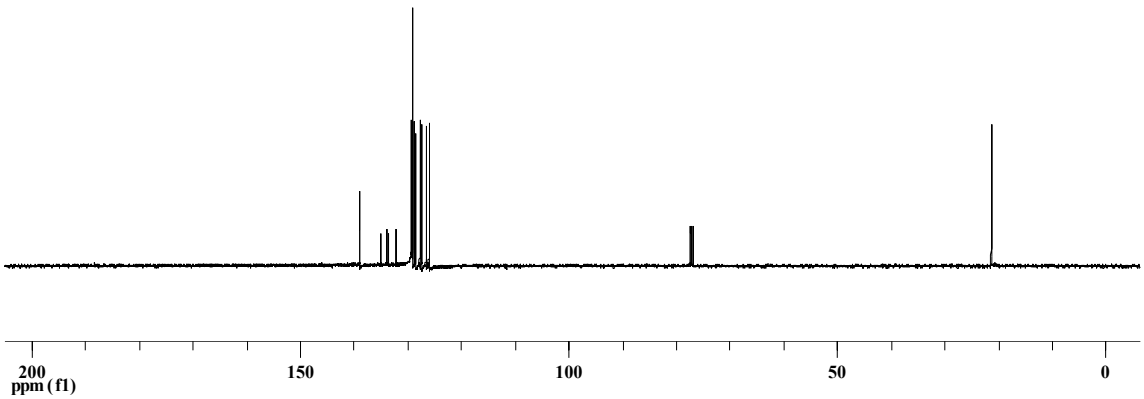
2-Naphthyl phenyl sulfide (3e)



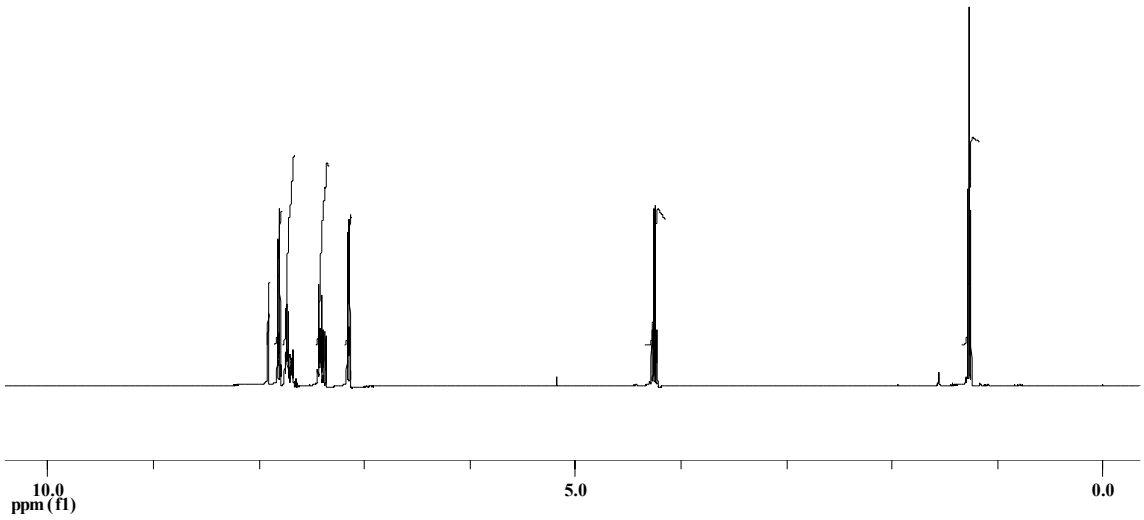


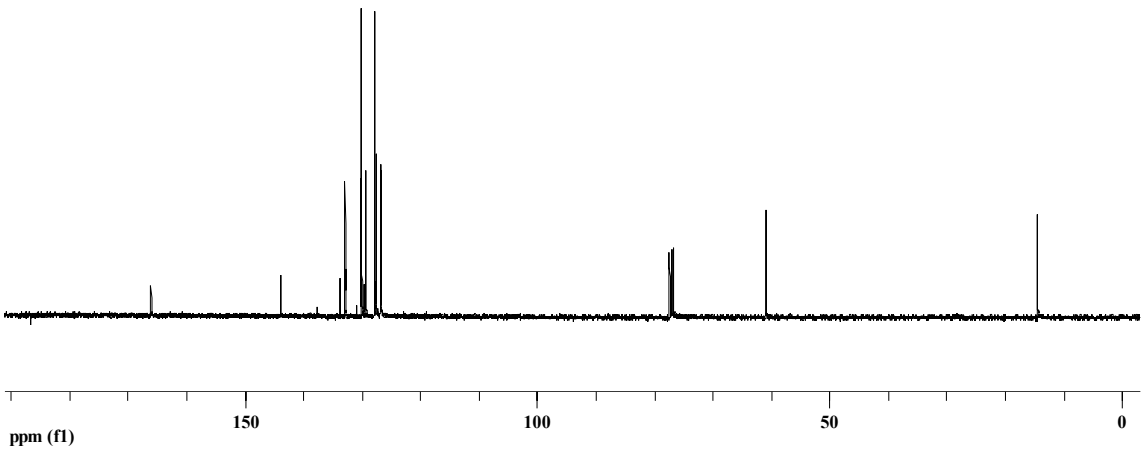
3,5-Dimethylphenyl 2-naphthyl sulfide (3f)



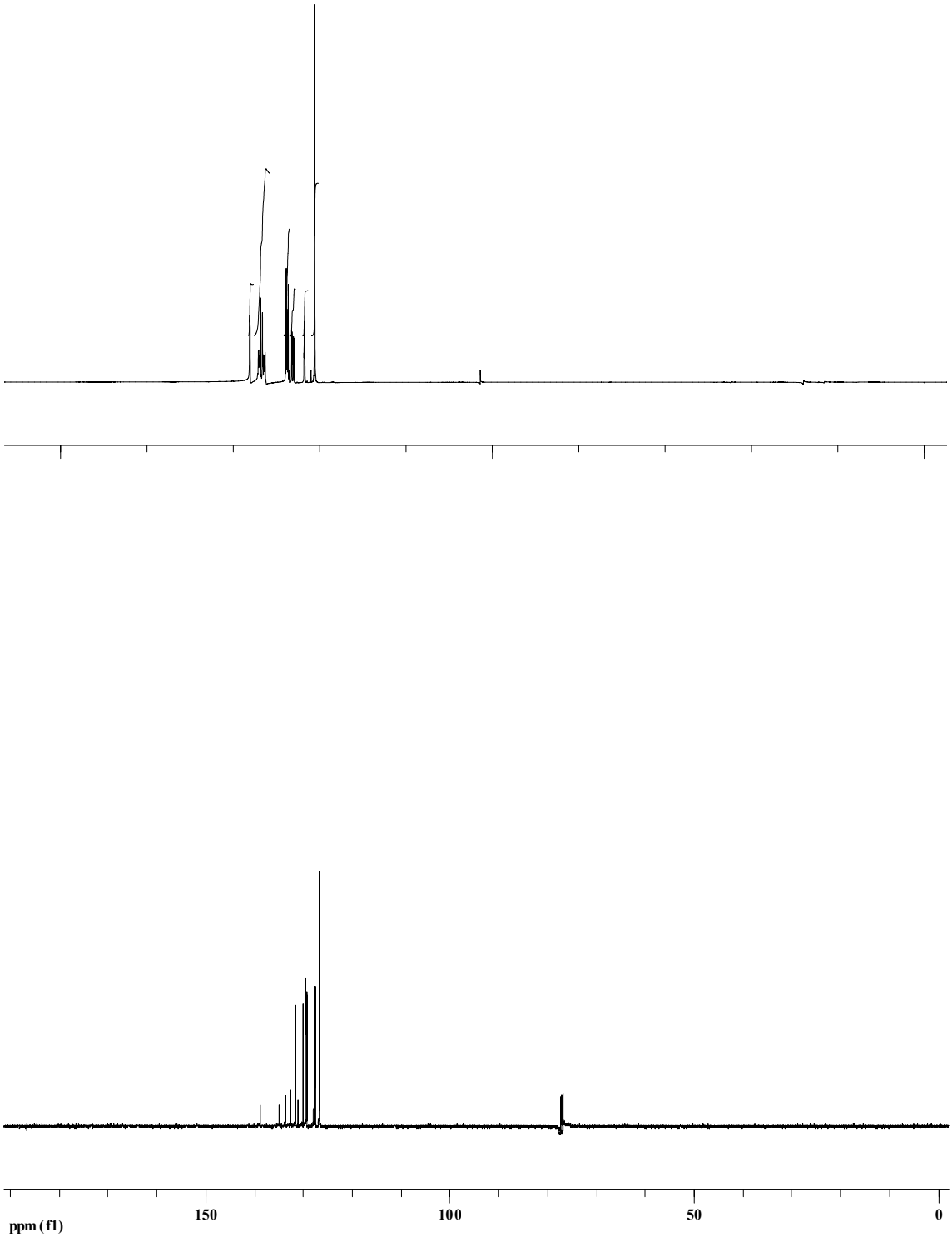


4-(**Thio-2-naphthyl)benzoic acid ethylester (3g)**

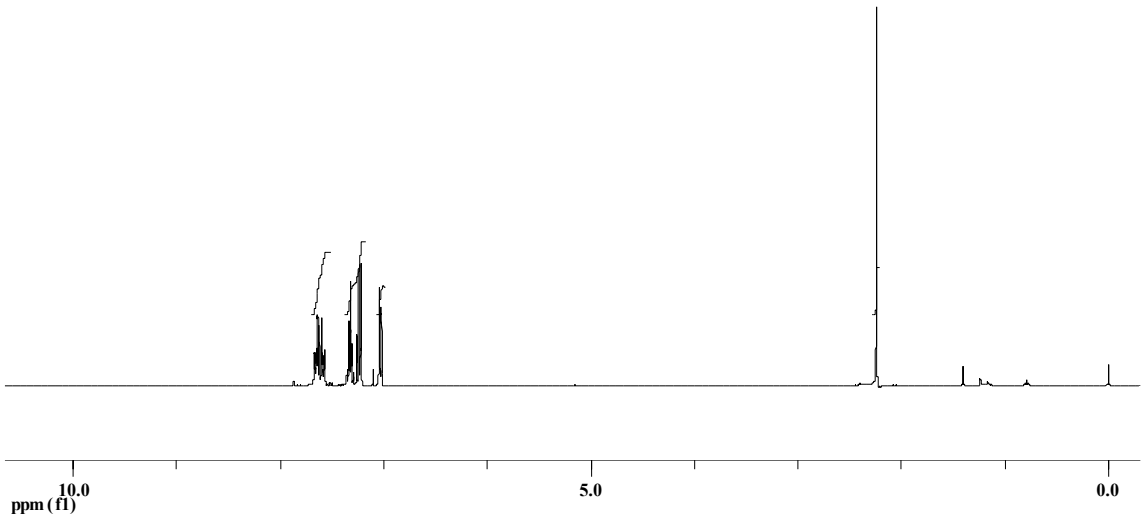


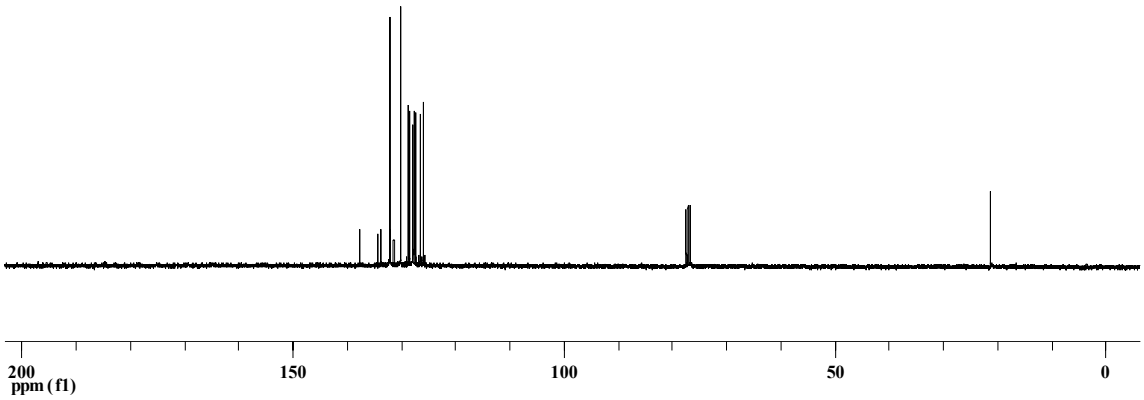


3-Chlorophenyl 2-naphthyl sulfide (3h)

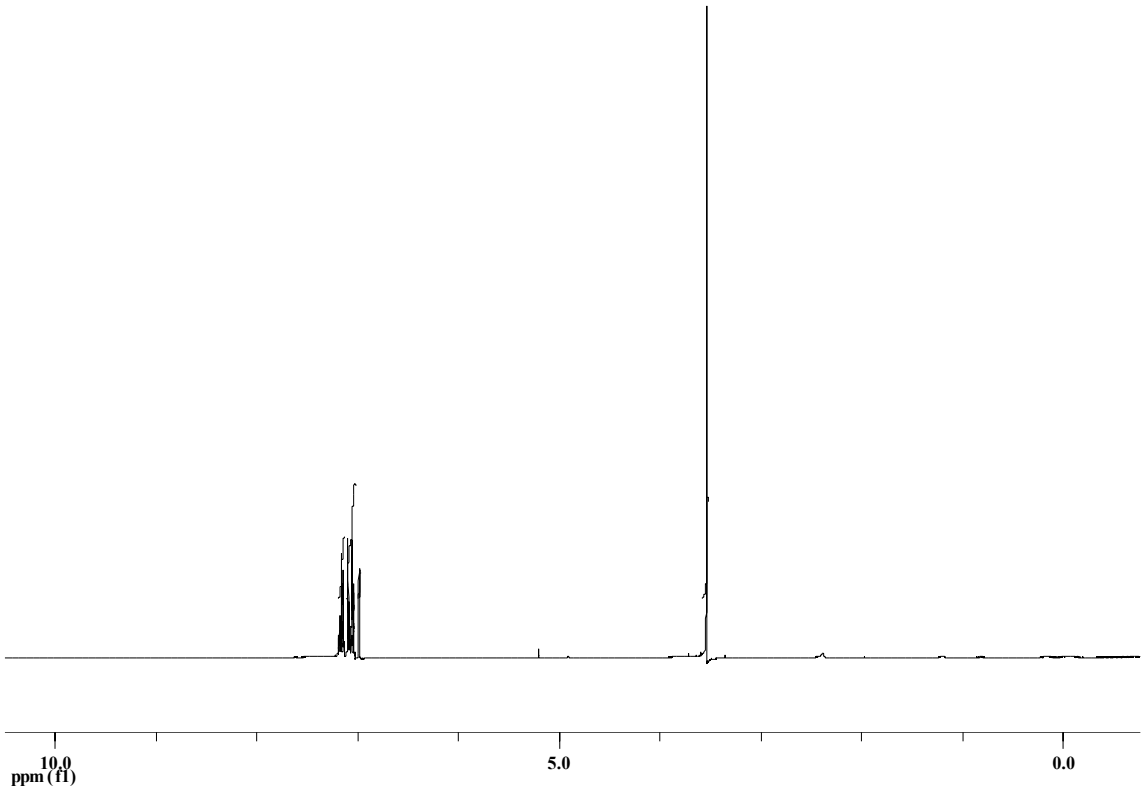


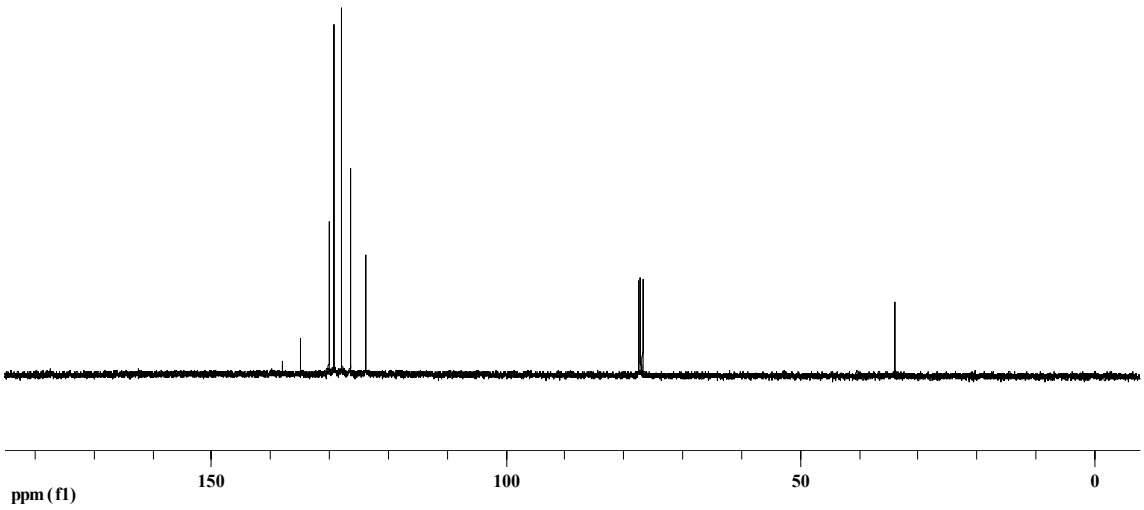
4-Methylphenyl 2-naphthyl sulfide (3i)



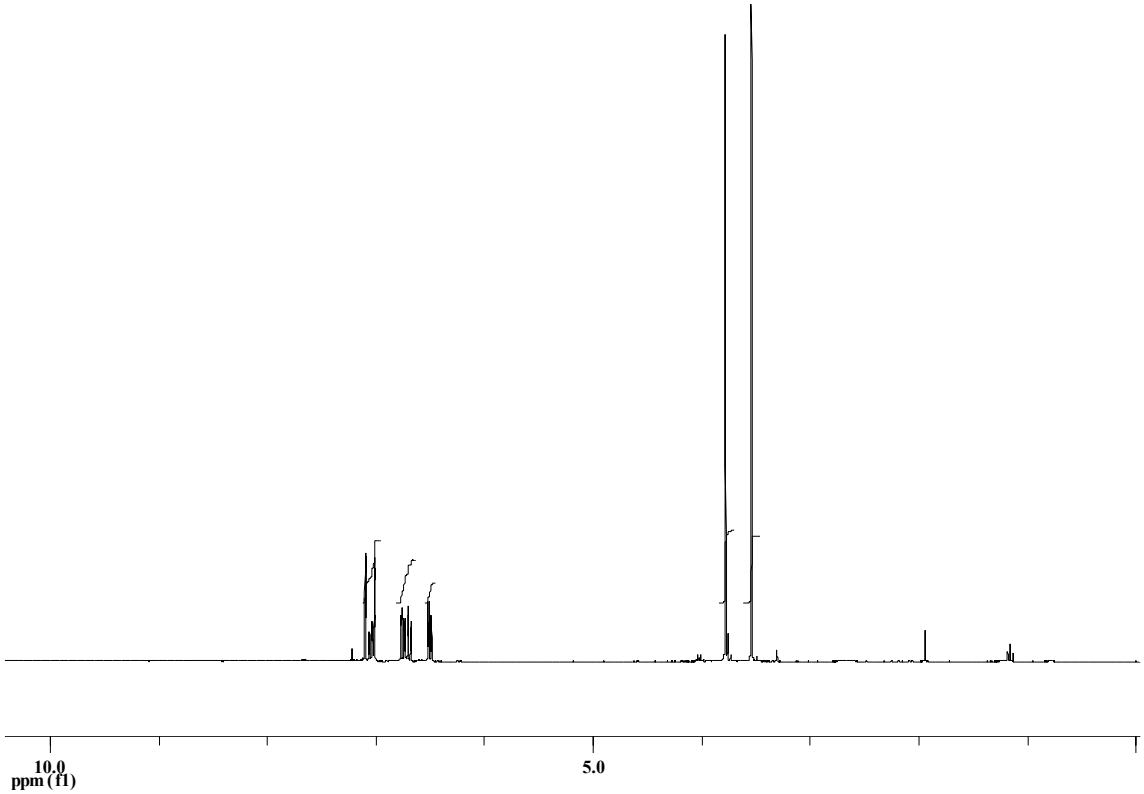


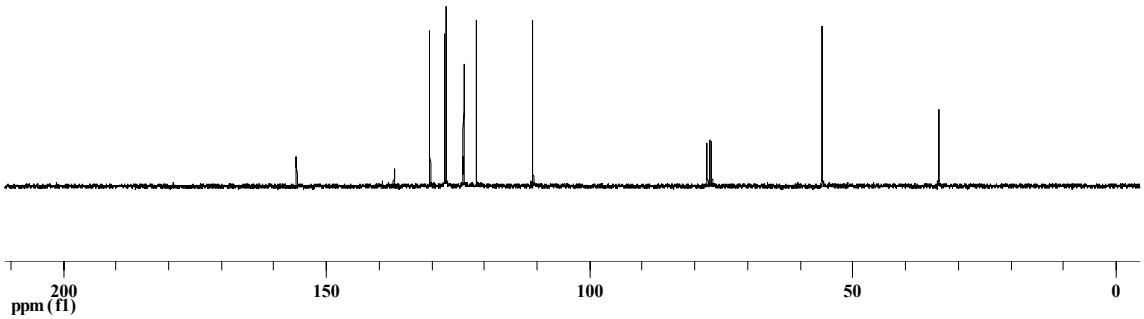
2-(Phenylsulfanyl)-*N*-methylimidazole (3j)



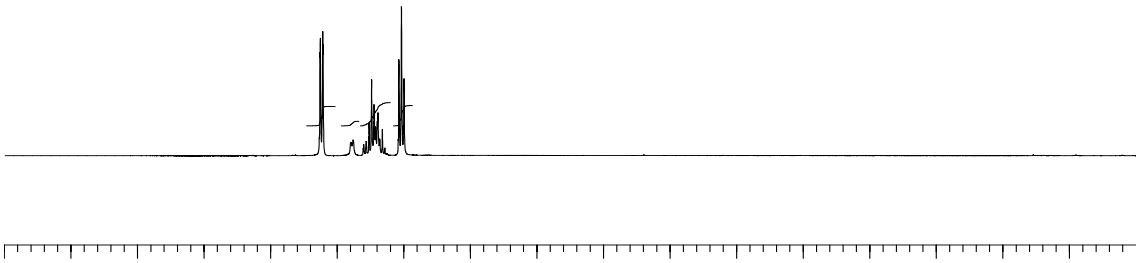


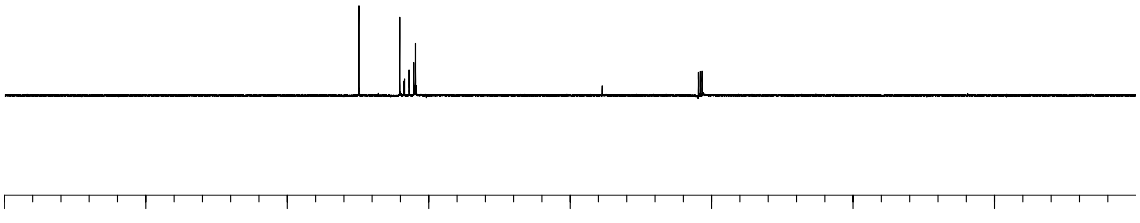
2-(2-Methoxyphenylsulfanyl)-*N*-methylimidazole (3k)



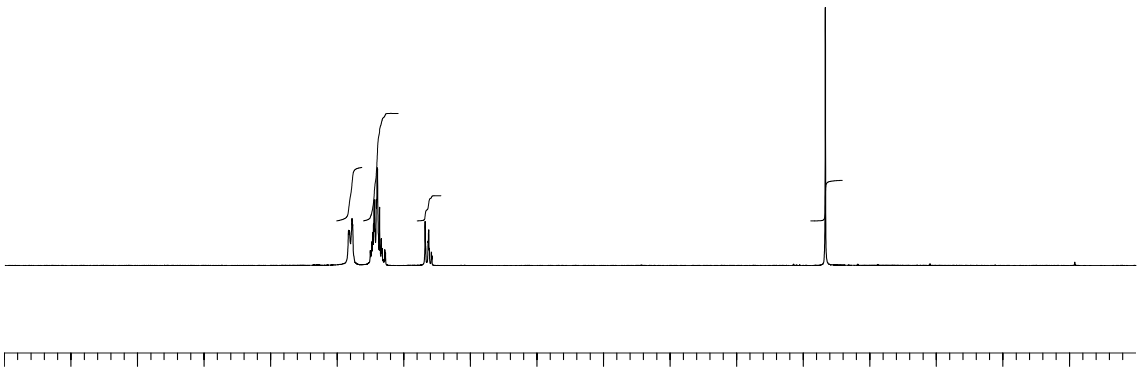


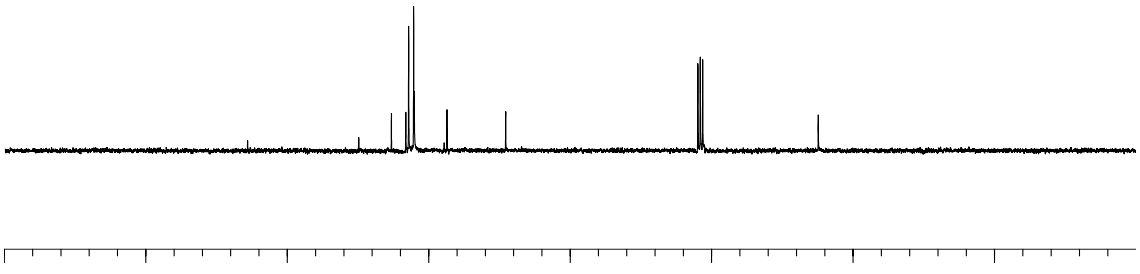
4,5-Diphenyl-2-(phenylsulfanyl)imidazole (3l)



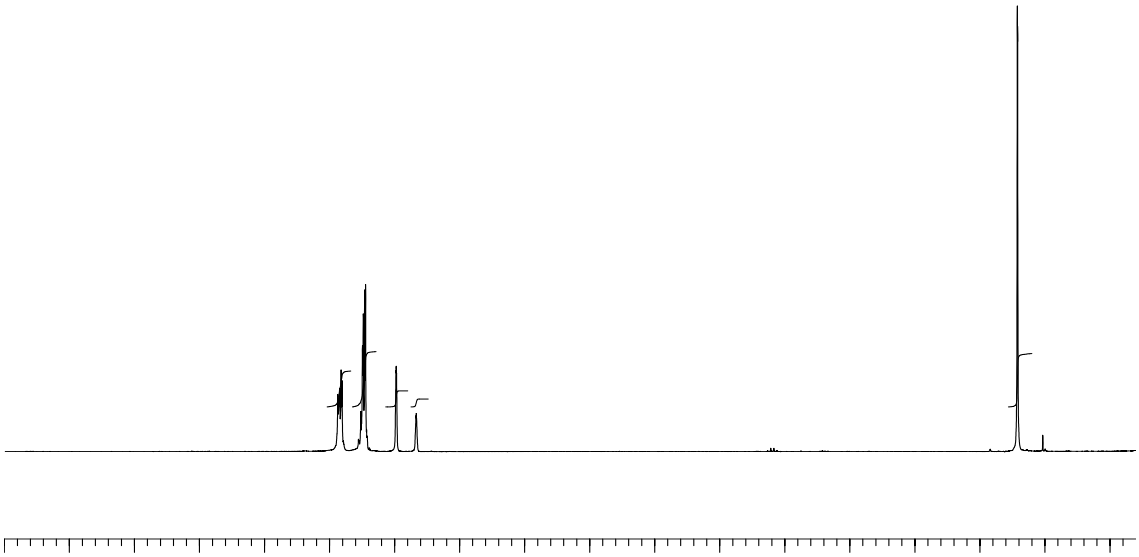


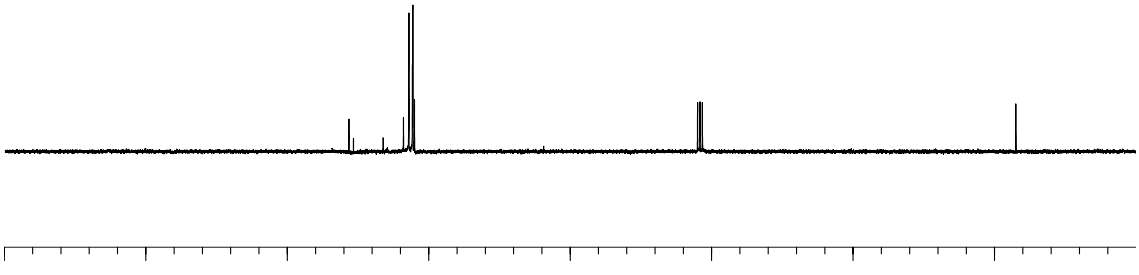
4,5-Diphenyl-2-(2-methoxyphenylsulfanyl)imidazole (3m)



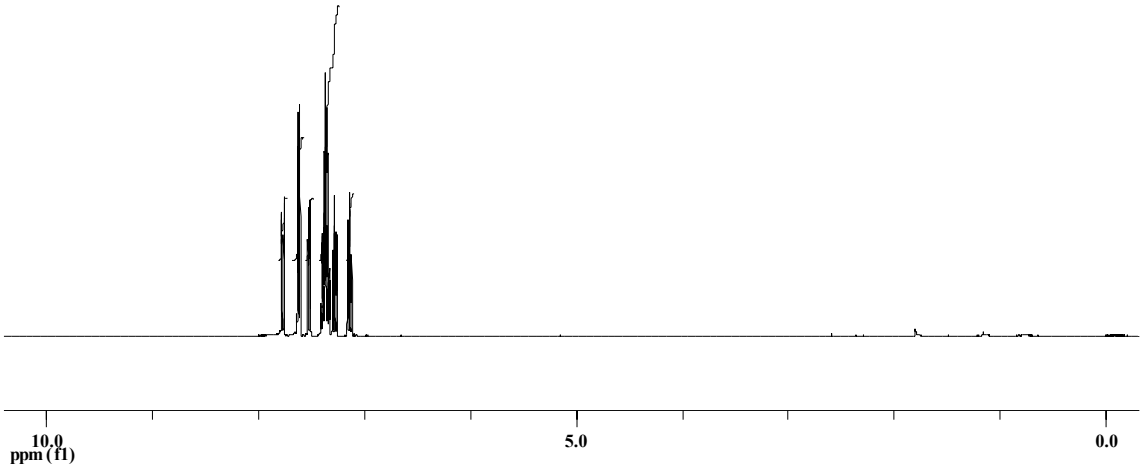


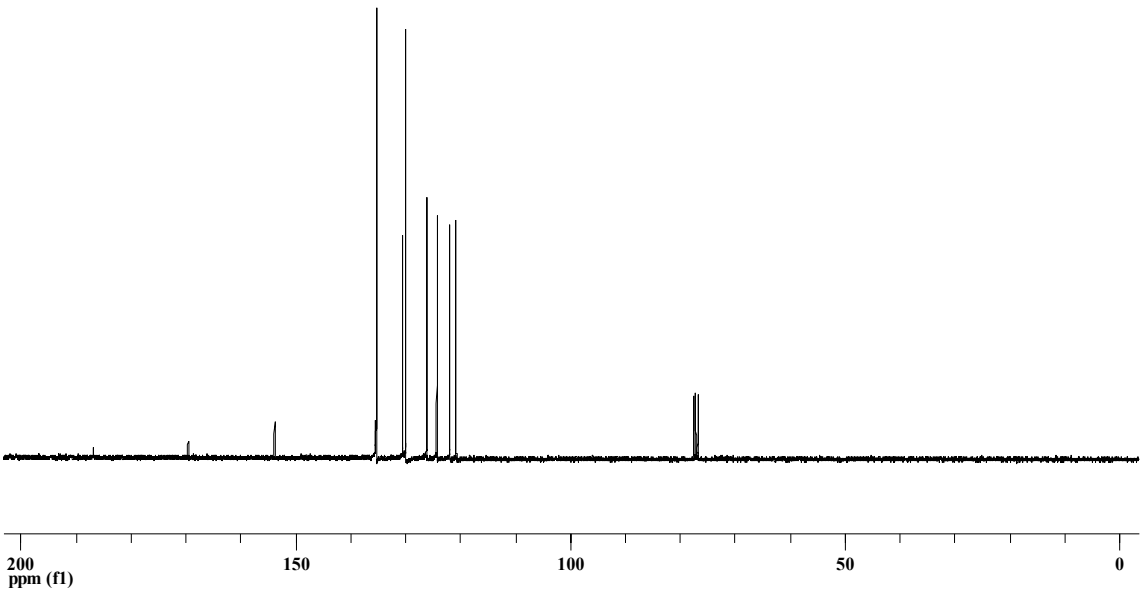
2-(3,5-Dimethylphenylsulfanyl)-4,5-diphenylimidazole (3n)



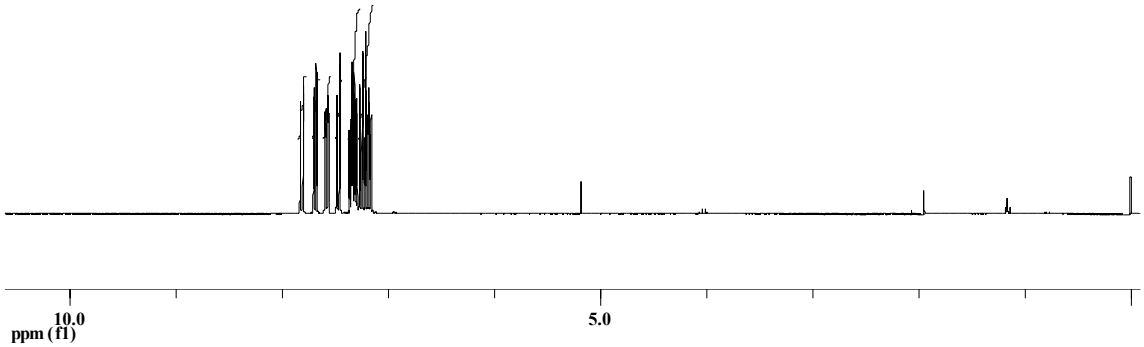


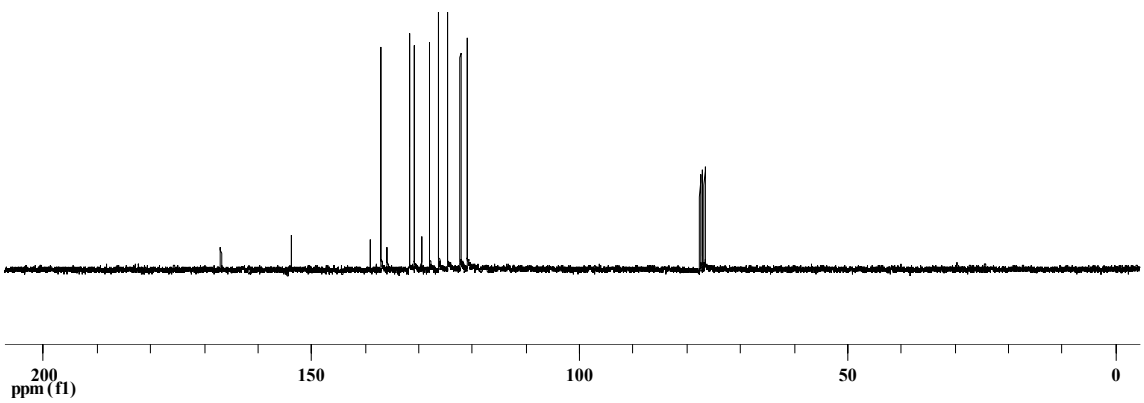
2-Phenylsulfanyl-benzothiazole (3o)



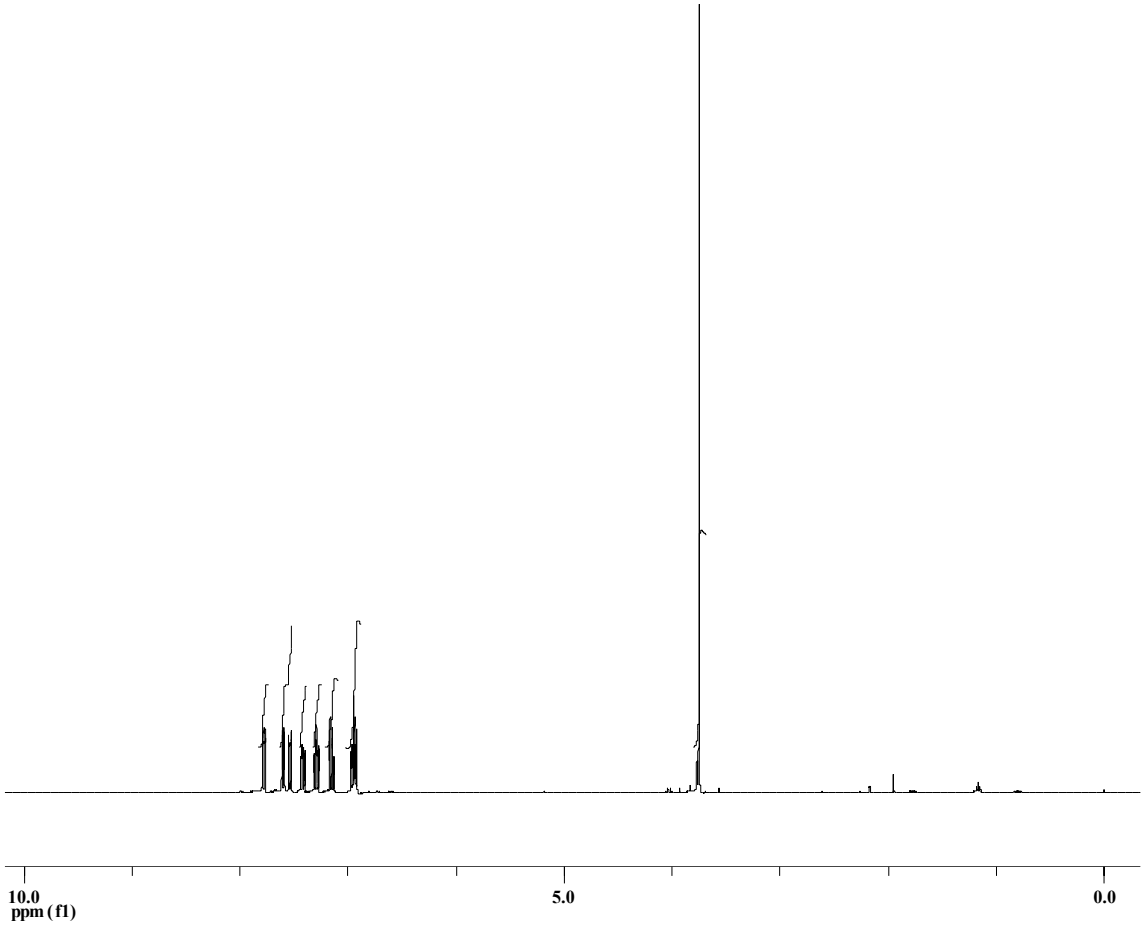


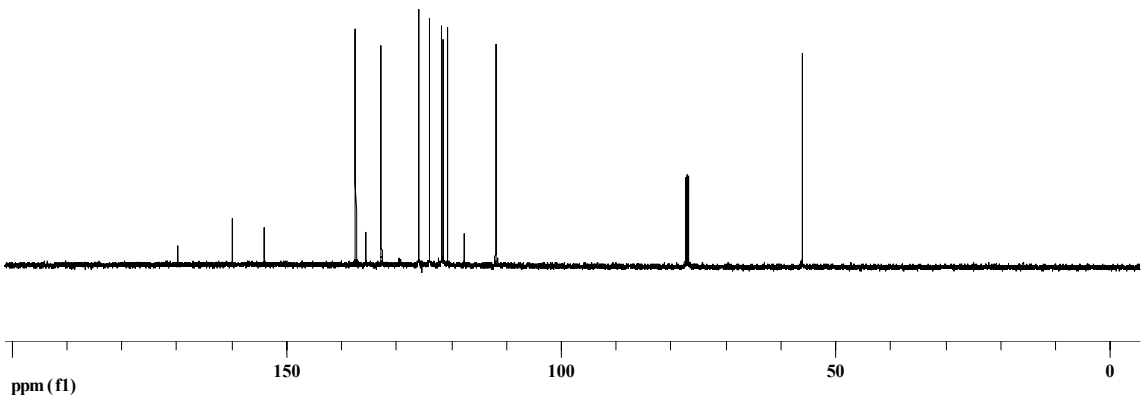
2-(2-Chlorophenylsulfanyl)benzothiazole (3p)





2-(2-Methoxyphenylsulfanyl)benzothiazole (3q)





2-(4-Nitrophenylsulfanyl)benzothiazole (3r)