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Supporting Information

Iron-Catalyzed *N*-Arylations of Amides

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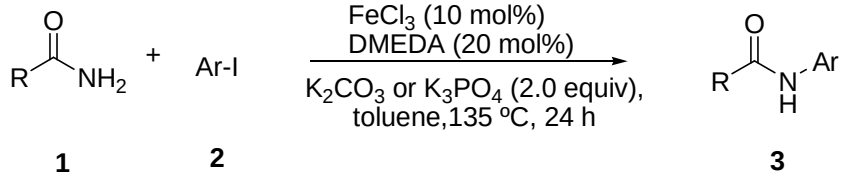
Supporting Information Available. Experimental details for *N*-aryl amides **3** and *N*-heterocycles **4a-b** and ^{1}H-NMR and ^{13}C-NMR spectra of all compounds are included.

General information: All reagents were purchased from commercial suppliers and used without further purification. All experiments were performed with anhydrous $FeCl_3$ (purity >98%) provided by Merck and 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 $CDCl_3$ unless other solvent is indicated. Chemical shifts (δ) are reported in ppm using TMS as internal standard, and spin-spin coupling constants (J) are given in Hz. 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 *N*-arylation of amides



1 **2** **3**

A sealable tube equipped with a magnetic stir bar was charged with amide (1.0 equiv), K_3PO_4 or K_2CO_3 (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. Aryl halide (1.5 equiv), *N,N'*-dimethylethylendiamine (0.20 equiv) and toluene (1 mL/mmol of amide) 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 yield the product, which was purified by silica gel chromatography to yield *N*-aryl amide **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.

***N*-Phenylbenzamide[1] (3aa).** Following the general procedure using benzamide (100 mg, 0.83 mmol) and iodobenzene (0.14 mL, 1.24 mmol) provided 128 mg (78% yield) of the coupling product as a white solid after purification by flash chromatography (dichloromethane) of the crude. ^{1}H-NMR (400 MHz, CD_3OD) δ 7.87-7.93 (m, 2H), 7.67-7.70 (m, 2H), 7.45-7.57 (m, 3H), 7.33-7.36 (m, 2H), 7.12-7.16 (m, 1H); ^{13}C-NMR (100 MHz, CD_3OD) δ 167.5 (C), 138.2 (C), 134.8 (C), 131.5 (CH), 128.5 (CH), 128.2 (CH), 127.3 (CH), 124.3 (CH), 121.0 (CH).

***N*-(2-Methoxyphenyl)benzamide[2] (3ab).** Following the general procedure using benzamide (100 mg, 0.83 mmol) and 2-iodoanisole (0.17 mL, 1.24 mmol) provided 150 mg (79% yield) of the coupling product as a white solid after purification by flash chromatography (dichloromethane) of the crude. ^{1}H-NMR (400 MHz) δ 8.54-8.56 (m, 2H), 7.89-7.92 (m, 2H), 7.47-7.56 (m, 3H), 7.08 (dt, J = 7.7, 1.6 Hz, 1H), 7.02 (dt, J = 7.7, 1.4 Hz, 1H), 6.92 (dt, J = 7.9, 1.4 Hz, 1H), 3.92 (s, 3H); ^{13}C-NMR (100 MHz) δ 165.1 (C), 128.1 (C), 135.3 (C), 131.7 (CH), 128.7 (CH), 127.8 (C), 127.0 (CH), 123.9 (CH), 121.2 (CH), 119.8 (CH), 109.9 (CH), 55.9 (CH_3).

***N*-(4-Ethoxycarbonylphenyl)benzamide[3] (3ac).** Following the general procedure using benzamide (100 mg, 0.83 mmol) and ethyl 4-iodobenzoate (0.22 mL, 1.24 mmol) provided 160 mg (72% yield) of the coupling product as a white solid after purification by flash chromatography (ethyl acetate/pentane 2/8) of the crude. ^{1}H-NMR (400 MHz) δ 8.24 (br s, 1H), 7.94 (d, J = 8.8 Hz, 2H), 7.77-7.80 (m, 2H), 7.67 (d, J = 8.8 Hz, 2H), 7.44-7.48 (m, 1H), 7.34-7.38 (m, 2H), 4.27 (q, J = 7.1 Hz, 2H), 1.31 (t, J = 7.1 Hz, 3H); ^{13}C-NMR (100 MHz) δ 166.1 (C), 165.9 (C), 142.1 (C), 134.5 (C), 132.1 (CH), 130.7 (CH), 128.8 (CH), 127.1 (CH), 126.1 (C), 119.3 (CH), 60.9 (CH_2), 14.5 (CH_3).

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***N*-(2-Chlorophenyl)benzamide[4] (3ad).** Following the general procedure using benzamide (100 mg, 0.83 mmol) and 1-chloro-2-iodobenzene (0.15 mL, 1.24 mmol) provided 126 mg (66% yield) of the coupling product as a white solid after purification by flash chromatography (dichloromethane) of the crude. ^{1}H-NMR (400 MHz) δ 8.52 (dd, J = 8.4, 1.4 Hz, 1H), 8.42 (br s, 1H), 7.87-7.90 (m, 2H), 7.45-7.55 (m, 3H), 7.36 (dd, J = 7.9, 1.4 Hz, 1H), 7.26-7.30 (m, 1H), 7.01-7.06 (m, 1H); ^{13}C-NMR (100 MHz) δ 165.2 (C), 134.7 (C), 134.5 (C), 132.1 (CH), 129.0 (CH), 128.9 (CH), 127.8 (CH), 127.1 (CH), 124.7 (CH), 123.1 (C), 121.6 (CH).

4-Chloro-*N*-phenylbenzamide[5] (3ba). Following the general procedure using 4-chlorobenzamide (100 mg, 0.63 mmol) and iodobenzene (0.097 mL, 0.94 mmol) provided 95 mg (65% yield) of the coupling product as a white solid after purification by flash chromatography (dichloromethane) of the crude. ^{1}H-NMR (300 MHz, CD_3OD) δ 7.89 (d, J = 8.8 Hz, 1H), 7.64 (d, J = 8.5 Hz, 1H), 7.49 (d, J = 8.8 Hz, 1H), 7.29-7.41 (m, 3H), 7.11-7.24 (m, 3H); ^{13}C-NMR (75 MHz, CD_3OD) δ 143.4 (C), 130.2 (C), 128.9 (CH), 128.4 (CH), 127.8 (C), 127.4 (C), 126.7 (CH), 124.3 (CH), 120.9 (CH).

4-Chloro-*N*-(2-methoxyphenyl)benzamide (3bb). Following the general procedure using 4-chlorobenzamide (100 mg, 0.63 mmol) and 2-iodoanisole (0.13 mL, 0.94 mmol) provided 132 mg (80% yield) of the coupling product as a white solid after purification by flash chromatography (ethyl acetate/pentane 2/8) of the crude. ^{1}H-NMR (400 MHz) δ 8.48-8.50 (m, 2H), 7.80-7.83 (m, 2H), 7.42-7.46 (m, 2H), 7.06-7.10 (m, 1H), 7.00 (dt, J = 7.8, 1.3 Hz, 1H), 6.90 (dd, J = 7.9, 1.4 Hz, 1H), 3.91 (s, 3H); ^{13}C-NMR (100 MHz) δ 164.0 (C), 148.1 (C), 137.9 (C), 133.6 (C), 128.9 (CH), 128.5 (CH), 127.5 (C), 124.1 (CH), 121.1 (CH), 119.8 (CH), 109.9 (CH), 55.9 (CH_3); MS (EI) *m/z* (%) 263 (M^+ +2, 59), 261 (M^+, 93), 139 (100), 111 (72), 75 (21); Calcd. for $C_{14}H_{12}ClNO_2$: C, 64.25; H, 4.62; N, 5.35; found C, 64.24; H, 4.54; N, 5.27.

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3-Methyl-*N*-phenylbenzamide[6] (3ca). Following the general procedure using 3-methylbenzamide (100 mg, 0.74 mmol) and iodobenzene (0.11 mL, 1.1 mmol) provided 149 mg (96% yield) of the coupling product as a white solid after purification by flash chromatography (ethyl acetate/pentane 3/7) of the crude. ^{1}H-NMR (400 MHz) δ 8.04 (br s, 1H), 7.51-7.56 (m, 4H), 7.19-7.25 (m, 4H), 7.01-7.05 (m, 1H), 2.27 (s, 3H); ^{13}C-NMR (100 MHz) δ 166.1 (C), 138.5 (C), 138.0 (C), 134.9 (C), 132.5 (CH), 128.9 (CH), 128.5 (CH), 127.8 (CH), 124.4 (CH), 124.0 (CH), 120.3 (CH), 21.5 (CH_3).

***N*-(2-Acetylphenyl)-3-methylbenzamide (3cb).** Following the general procedure using 3-methylbenzamide (100 mg, 0.74 mmol) and 2-iodoacetophenone (0.16 mL, 1.1 mmol) provided 160 mg (86% yield) of the coupling product as a white solid after purification by flash chromatography (dichloromethane) of the crude. ^{1}H-NMR (300 MHz) δ 12.6 (br s, 1H), 8.97 (dd, J = 8.7, 1.0 Hz, 1H), 7.85-7.93 (m, 3H), 7.55-7.61 (m, 1H), 7.34-7.43 (m, 2H), 7.09-7.14 (m, 1H), 2.68 (s, 3H), 2.45 (s, 3H); ^{13}C-NMR (75 MHz) δ 203.1 (C), 166.2 (C), 141.4 (C), 138.6 (C), 135.3 (CH), 134.8 (C), 132.7 (CH), 131.8 (CH), 128.7 (CH), 128.3 (CH), 124.4 (CH), 122.4 (CH), 121.9 (C), 120.7 (CH), 28.5 (CH_3), 21.5 (CH_3), MS (EI) *m/z* (%) 253 (M^+, 81), 210 (76), 119 (100), 91 (75), 65 (27); Calcd. for $C_{16}H_{15}NO_2$: C, 75.87; H, 5.97; N, 5.53; found C, 75.91; H, 6.07; N, 5.51.

3-Methyl-*N*-(4-tolyl)benzamide[7] (3cc). Following the general procedure using 3-methylbenzamide (100 mg, 0.74 mmol) and 4-iodotoluene (245 mg, 1.1 mmol) provided 148 mg (89% yield) of the coupling product as a white solid after purification by flash chromatography (ethyl acetate/pentane 2/8) of the crude. ^{1}H-NMR (300 MHz) δ 8.20 (br s, 1H), 7.46-7.51 (m, 2H), 7.39-7.42 (m, 2H), 7.09-7.16 (m, 2H), 6.96-6.99 (m, 2H), 2.20 (s, 3H), 2.19 (s, 3H); ^{13}C-NMR (75 MHz) δ 166.3 (C), 138.4 (C), 135.6 (C), 135.0 (C), 134.0 (C), 132.3 (CH), 129.4 (CH), 128.4 (CH), 127.9 (CH), 124.2 (CH), 120.7 (CH), 21.3 (CH_3), 20.9 (CH_3).

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4-Methoxy-*N*-phenylbenzamide[5] (3da). Following the general procedure using 4-methoxybenzamide (100 mg, 0.65 mmol) and iodobenzene (0.10 mL, 0.97 mmol) provided 108 mg (73% yield) of the coupling product as a white solid after purification by flash chromatography (ethyl acetate/pentane 3/7) of the crude. ^{1}H-NMR (400 MHz) δ 7.77 (d, J = 8.8 Hz, 2H), 7.71 (br s, 1H), 7.54-7.57 (m, 2H), 7.26-7.31 (m, 2H), 7.04-7.08 (m, 1H), 6.89 (d, J = 8.9 Hz, 2H), 3.79 (s, 3H); ^{13}C-NMR (100 MHz) δ 165.1 (C), 162.4 (C), 138.0 (C), 129.0 (CH), 128.9 (CH), 127.1 (C), 124.3 (CH), 120.1 (CH), 113.9 (CH), 55.5 (CH_3).

4-Methoxy-*N*-(2-tolyl)benzamide[2] (3db). Following the general procedure using 4-methoxybenzamide (100 mg, 0.65 mmol) and 2-iodotoluene (0.12 mL, 0.97 mmol) provided 154 mg (67% yield) of the coupling product as a white solid after purification by flash chromatography (ethyl acetate/pentane 2/8) of the crude. ^{1}H-NMR (400 MHz) δ 7.82 (d, J = 7.9 Hz, 1H), 7.75-7.78 (m, 2H), 7.59 (br s, 1H), 7.13-7.18 (m, 2H), 7.02 (dt, J = 8.3, 1.1 Hz, 1H), 6.87-6.90 (m, 2H), 3.79 (s, 3H), 2.24 (s, 3H); ^{13}C-NMR (100 MHz) δ 165.1 (C), 162.4 (C), 135.9 (C), 130.5 (CH), 129.2 (C), 128.9 (CH); 127.1 (C), 126.8 (CH), 125.1 (CH), 123.1 (CH), 113.9 (CH), 55.5 (CH_3), 18.0 (CH_3).

***N*-(2-Chlorophenyl)-4-methoxybenzamide[8] (3dc).** Following the general procedure using 4-methoxybenzamide (100 mg, 0.65 mmol) and 1-chloro-2-iodobenzene (0.11 mL, 0.97 mmol) provided 154 mg (91% yield) of the coupling product as a white solid after purification by flash chromatography (ethyl acetate/pentane 2/8) of the crude. ^{1}H-NMR (400 MHz) δ 8.43 (dd, J = 8.4, 1.6 Hz, 1H), 8.28 (br s, 1H), 7.78 (d, J = 9.1 Hz, 2H), 7.28 (dd, J = 7.9, 1.4 Hz, 1H), 7.16-7.27 (m, 1H), 6.95 (dt, J = 7.7, 1.6 Hz, 1H), 6.88 (d, J = 9.1 Hz, 2H), 3.76 (s, 3H); ^{13}C-NMR (100 MHz) δ 164.7 (C), 162.7 (C), 134.9 (C), 128.9 (CH), 128.8 (CH), 127.8 (CH), 126.7 (C), 124.5 (CH), 122.9 (C), 121.4 (CH), 114.1 (CH), 55.5 (CH_3).

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4-Methoxy-*N*-(3-tolyl)benzamide[9] (3dd). Following the general procedure using 4-methoxybenzamide (100 mg, 0.65 mmol) and 3-iodotoluene (0.13 mL, 0.97 mmol) provided 138 mg (88% yield) of the coupling product as a white solid after purification by flash chromatography (ethyl acetate/pentane 2/8) of the crude. ^{1}H-NMR (400 MHz) δ 8.11 (br s, 1H), 7.70 (d, J = 8.8 Hz, 2H), 7.31-7.38 (m, 2H), 7.08 (t, J = 7.8 Hz, 1H), 6.75 (d, J = 8.8 Hz, 1H), 6.59 (d, J = 8.8 Hz, 2H), 3.70 (s, 3H), 2.19 (s, 3H); ^{13}C-NMR (100 MHz) δ 165.5 (C), 162.2 (C), 138.8 (C), 138.1 (C), 129.0 (CH), 128.8 (CH), 127.2 (C), 125.1 (CH), 121.1 (CH), 117.5 (CH), 113.8 (CH), 55.5 (CH_3), 21.6 (CH_3).

***N*-Phenylacetamide[1] (3fa).** Following the general procedure using acetamide (100 mg, 1.69 mmol) and iodobenzene (0.27 mL, 2.53 mmol) provided 99 mg (43% yield) of the coupling product as a white solid after purification by flash chromatography (ethyl acetate) of the crude. ^{1}H-NMR (400 MHz) δ 8.80 (br s, 1H), 7.42 (d, J = 7.7 Hz, 2H), 7.17-7.21 (m, 2H), 7.19 (t, J = 7.4 Hz, 1H), 2.04 (s, 3H); ^{13}C-NMR (100 MHz) δ 168.9 (C), 138.0 (C), 128.9 (CH), 124.2 (CH), 120.2 (CH), 24.5 (CH_3).

***N*-(2-Methoxyphenyl)acetamide[1] (3fb).** Following the general procedure using acetamide (100 mg, 1.69 mmol) and 2-iodoanisole (0.35 mL, 2.53 mmol) provided 128 mg (46% yield) of the coupling product as a white solid after purification by flash chromatography (ethyl acetate/pentane 1/1) of the crude. ^{1}H-NMR (400 MHz) δ 8.25 (dd, J = 7.9, 1.4 Hz, 1H), 7.72 (br s, 1H), 6.93 (dt, J = 7.8, 1.4 Hz, 1H), 7.83-6.87 (m, 1H), 6.77 (dd, J = 8.1, 1.1 Hz, 1H), 3.76 (s, 3H), 2.03 (s, 3H); ^{13}C-NMR (100 MHz) δ 168.1 (C), 147.6 (C), 127.7 (C), 123.6 (CH), 120.9 (CH), 119.8 (CH), 109.9 (CH), 55.7 (CH_3), 25.0 (CH_3).

***N*-Phenylpropionamide[1] (3ga).** Following the general procedure using propionamide (100 mg, 1.33 mmol) and iodobenzene (0.21 mL, 1.98 mmol) provided 124 mg (63% yield) of the coupling product as a white solid after purification by flash

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chromatography (ethyl acetate/pentane 1/1) of the crude. ^{1}H-NMR (300 MHz) δ 7.94 (br s, 1H), 7.50 (d, J = 7.9 Hz, 2H), 7.25 (t, J = 7.7 Hz, 2H), 7.05 (t, J = 7.4 Hz, 1H), 2.33 (q, J = 7.4 Hz, 2H), 1.18 (t, J = 7.4 Hz, 3H); ^{13}C-NMR (75 MHz) δ 171.8 (C), 138.4 (C), 137.9 (C), 125.8 (CH), 117.8 (CH), 39.6 (CH_2), 21.4 (CH_3), 19.3 (CH_2), 13.9 (CH_3).

***N*-(3-Tolyl)propionamide[10] (3gb).** Following the general procedure using propionamide (100 mg, 1.33 mmol) and 3-iodotoluene (0.26 mL, 1.98 mmol) provided 152 mg (70% yield) of the coupling product as a white solid after purification by flash chromatography (ethyl acetate/pentane 3/7) of the crude. ^{1}H-NMR (400 MHz) δ 8.04 (br s, 1H), 7.29 (s, 1H), 7.22 (d, J = 7.9 Hz, 1H), 7.05 (t, J = 7.9 Hz, 1H), 6.79 (d, J = 7.4 Hz, 1H), 2.26 (q, J = 7.7 Hz, 2H), 2.12 (s, 3H), 1.03 (t, J = 7.7 Hz, 3H); ^{13}C-NMR (100 MHz) δ 171.5 (C), 137.4 (C), 136.9 (C), 127.4 (CH), 123.6 (CH), 119.6 (CH), 116.0 (CH), 29.5 (CH_2), 20.3 (CH_3), 8.8 (CH_3).

***N*-(2-Methoxyphenyl)propionamide[11] (3gc).** Following the general procedure using propionamide (100 mg, 1.33 mmol) and 2-iodoanisole (0.27 mL, 1.98 mmol) provided 136 mg (57% yield) of the coupling product as a white solid after purification by flash chromatography (ethyl acetate/pentane 3/7) of the crude. ^{1}H-NMR (400 MHz) δ 8.29 (d, J = 6.9 Hz, 1H), 7.71 (br s, 1H), 6.92 (dt, J = 7.7, 1.6 Hz, 1H), 6.85 (dt, J = 7.7, 1.4 Hz, 1H), 6.76 (dd, J = 8.2, 1.4 Hz, 1H), 3.76 (s, 3H), 2.32 (q, J = 7.4 Hz, 2H), 1.15 (t, J = 7.4 Hz, 3H); ^{13}C-NMR (100 MHz) δ 171.8 (C), 147.6 (C), 127.7 (C), 123.4 (CH), 120.9 (CH), 119.6 (CH), 109.8 (CH), 55.7 (CH_3), 31.1 (CH_2), 9.9 (CH_3).

***N*-Phenylbutyramide[12] (3ha).** Following the general procedure using butyramide (100 mg, 1.15 mmol) and iodobenzene (0.17 mL, 1.72 mmol) provided 146 mg (78% yield)

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of the coupling product as a white solid after purification by flash chromatography (ethyl acetate/pentane 3/7) of the crude. ^{1}H-NMR (400 MHz) δ 8.19 (br s, 1H), 7.45 (d, J = 7.7 Hz, 2H), 7.14-7.18 (m, 2H), 6.95-6.99 (m, 1H), 2.21 (t, J = 7.4 Hz, 2H), 1.58-1.67 (m, 2H), 0.86 (t, J = 7.4 Hz, 3H); ^{13}C-NMR (100 MHz) δ 172.1 (C), 138.2 (C), 128.8 (CH), 124.1 (CH), 120.2 (CH), 39.5 (CH_2), 19.3 (CH_2), 13.9 (CH_3).

***N*-(4-Ethoxycarbonylphenyl)butyramide[13] (3hb).** Following the general procedure using butyramide (100 mg, 1.15 mmol) and ethyl 4-iodobenzoate (0.29 mL, 1.72 mmol) provided 210 mg (78% yield) of the coupling product as a white solid after purification by flash chromatography (ethyl acetate/pentane 2/8) of the crude. ^{1}H-NMR (400 MHz) δ 8.33 (br s, 1H), 7.58 (s, 1H), 7.89 (d, J = 8.8 Hz, 2H), 7.57 (d, J = 8.8 Hz, 2H), 4.27 (q, J = 7.1 Hz, 2H), 2.29 (t, J = 7.4 Hz, 2H), 1.61-1.70 (m, 2H), 1.29 (t, J = 7.1 Hz, 2H), 0.88 (t, J = 7.4 Hz, 3H); ^{13}C-NMR (100 MHz) δ 172.1 (C), 166.3 (C), 142.4 (C), 130.6 (CH), 125.5 (C), 118.9 (CH), 60.9 (CH_2), 39.7 (CH_2), 19.1 (CH_2), 14.4 (CH_3), 13.8 (CH_3).

***N*-(4-Methoxyphenyl)butyramide[14] (3hc).** Following the general procedure using butyramide (100 mg, 1.15 mmol) and 4-iodoanisole (411 mg, 1.72 mmol) provided 159 mg (71% yield) of the coupling product as a white solid after purification by flash chromatography (ethyl acetate/pentane 2/8) of the crude. ^{1}H-NMR (400 MHz) δ 8.18 (br s, 1H), 7.37-7.41 (m, 2H), 6.75-6.79 (m, 2H), 3.73 (s, 3H), 2.26 (t, J = 7.4 Hz, 2H), 1.63-1.73 (m, 2H), 0.93 (t, J = 7.4 Hz, 3H); ^{13}C-NMR (100 MHz) δ 171.8 (C), 156.1 (C), 131.3 (C), 122.1 (CH), 113.9 (CH), 55.5 (CH_3), 39.3 (CH_2), 19.3 (CH_2), 13.9 (CH_3).

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***N*-(3-Chlorophenyl)butyramide[15] (3hd).** Following the general procedure using butyramide (100 mg, 1.15 mmol) and 1-chloro-3-iodobenzene (0.26 mL, 1.72 mmol) provided 164 mg (72% yield) of the coupling product as a white solid after purification by flash chromatography (ethyl acetate/pentane 2/8) of the crude. ^{1}H-NMR (400 MHz) δ 8.28 (br s, 1H), 7.58 (s, 1H), 7.27 (dd, J = 7.9, 0.8 Hz, 1H), 7.09 (t, J = 7.9 Hz, 1H), 6.95 (dd, J = 7.9, 0.8 Hz, 1H), 2.25 (t, J = 7.4 Hz, 2H), 1.59-1.68 (m, 2H), 0.87 (t, J = 7.4 Hz, 3H); ^{13}C-NMR (100 MHz) δ 172.3 (C), 139.2 (C), 134.4 (C), 124.1 (CH), 120.3 (CH), 118.2 (CH), 39.5 (CH_2), 19.2 (CH_2), 13.8 (CH_3).

***N*-(4-Nitrophenyl)butyramide[16] (3he).** Following the general procedure using butyramide (100 mg, 1.15 mmol) and 4-nitrobenzene (435 mg, 1.72 mmol) provided 159 mg (66% yield) of the coupling product as a yellow solid after purification by flash chromatography (ethyl acetate/pentane 2/8) of the crude. ^{1}H-NMR (400 MHz) δ 8.12 (d, J = 9.1 Hz, 2H), 7.69 (br s, 1H), 7.66 (d, J = 9.1 Hz, 2H), 2.34 (t, J = 7.1 Hz, 2H), 1.64-1.75 (m, 2H), 0.94 (t, J = 7.1 Hz, 3H); ^{13}C-NMR (100 MHz) δ 171.7 (C), 143.9 (C), 126.0 (CH); 118.9 (CH), 113.4 (C), 39.8 (CH_2), 18.9 (CH_2), 13.8 (CH_3).

***N*-(3,5-Dimethylphenyl)butyramide (3hf).** Following the general procedure using butyramide (100 mg, 1.15 mmol) and 5-iodo-*m*-xylene (0.24 mL, 1.72 mmol) provided 148 mg (67% yield) of the coupling product as a white solid after purification by flash chromatography (ethyl acetate/pentane 2/8) of the crude. ^{1}H-NMR (400 MHz) δ 8.00 (br s, 1H), 7.18 (s, 2H), 6.72 (s, 1H), 2.31 (t, J = 7.4 Hz, 2H), 2.24 (s, 6H), 1.68-1.78 (m, 2H), 0.97 (t, J = 7.4 Hz, 3H); ^{13}C-NMR (100 MHz) δ 171.8 (C), 138.4 (C), 137.9 (C), 125.8 (CH), 117.8 (CH), 39.6 (CH_2), 21.4 (CH_3), 19.3 (CH_2), 13.9 (CH_3); MS (EI) *m/z* (%) 191 (M^+, 33), 121 (100); Calcd. for $C_{12}H_{17}NO$: C, 75.35; H, 8.96; N, 7.32; found C, 75.62; H, 8.61; N, 7.26.

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[15] Korodi, F.; Cziaky, Z. *Org. Prep. Proc. Int.* **1990**, *22*, 579.

[16] Um, S.-J.; Sin, H.-S.; Rho, Y.-S.; Park, S.-H.; Kwon, Y.-J.; Park, M.-S.; Han, H.-S.; Kim, S.-M.; Kim, D.-M.; Oh, D.-K.; Park, J.-S.; Bae, T.-S. International patent 2002096857, **2002**.

***N*-Phenylnicotinamide[17] (3ia).** Following the general procedure using nicotinamide (100 mg, 0.82 mmol) and iodobenzene (0.12 mL, 1.23 mmol) provided 74 mg (45% yield) of the coupling product as a white solid after purification by flash chromatography (ethyl acetate) of the crude. ^{1}H-NMR (400 MHz) δ 8.95 (s, 1H), 8.83 (br s, 1H), 8.55-8.57 (d, J = 7.9 Hz, 1H), 7.53 (d, J = 7.7 Hz, 2H), 7.19-7.25 (m, 3H), 7.03-7.08 (m, 1H); ^{13}C-NMR (100 MHz) δ 164.2 (C), 152.1 (CH), 148.0 (CH), 137.6 (C), 135.5 (CH), 130.9 (C), 129.0 (CH), 124.9 (CH), 123.6 (CH), 120.7 (CH).

***N*-(2-Methoxyphenyl)nicotinamide[18] (3ib).** Following the general procedure using nicotinamide (100 mg, 0.82 mmol) and 2-iodoanisole (0.17 mL, 1.23 mmol) provided 75 mg (40% yield) of the coupling product as a white solid after purification by flash chromatography (ethyl acetate) of the crude. ^{1}H-NMR (400 MHz) δ 9.09 (d, J = 1.1 Hz, 1H), 8.73 (d, J = 3.8 Hz, 1H), 8.54 (br s, 1H), 8.45 (dd, J = 7.9, 1.1 Hz, 1H), 8.18 (dt, J = 7.9, 1.6 Hz, 1H), 7.39-7.42 (m, 1H), 7.06-7.09 (m, 1H), 6.96-7.00 (m, 1H), 6.89 (dd, J = 7.9, 1.1 Hz, 1H), 3.89 (s, 3H); ^{13}C-NMR (100 MHz) δ 163.2 (C), 152.3 (CH), 148.1 (C), 147.9 (CH), 135.1 (CH), 130.9 (C), 127.2 (C), 124.4 (CH), 123.6 (CH), 121.1 (CH), 119.9 (CH), 110.0 (CH), 55.9 (CH_3).

***N*-Phenyl-2-thiophenecarboxamide[19] (3ja).** Following the general procedure using 2-thiophenecarboxamide (100 mg, 0.65 mmol) and iodobenzene (0.10 mL, 0.97 mmol) provided 108 mg (85% yield) of the coupling product as a white solid after purification by flash chromatography (ethyl acetate/pentane 3/7) of the crude. ^{1}H-NMR (400 MHz) δ 7.78 (br s, 1H), 7.52-7.57 (m, 3H), 7.45 (dd, J = 4.9, 1.1 Hz, 1H), 7.23-7.29 (m, 2H), 7.02-7.08 (m, 2H); ^{13}C-NMR (100 MHz) δ 159.9 (C), 139.2 (C), 137.5 (C), 130.7 (CH), 129.0 (CH), 128.5 (CH), 127.8 (CH), 124.6 (CH), 120.3 (CH).

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[17] Lv, X.; Bao, W. *J. Org. Chem.* **2007**, *72*, 3863.

[18] Harrington, P. M. *Heterocycles* **1993**, *35*, 683.

[19] Roychowdhury, A.; Kumar, V.; Bhaduri, A. *Synth. Commun.* **2006**, *36*, 715.

***N*-(2-Methoxyphenyl)-2-thiophenecarboxamide[20] (3jb).** Following the general procedure using 2-thiophenecarboxamide (100 mg, 0.79 mmol) and 2-iodoanisole (0.16 mL, 1.18 mmol) provided 155 mg (85% yield) of the coupling product as a white solid after purification by flash chromatography (ethyl acetate/pentane 2/8) of the crude. ^{1}H-NMR (300 MHz) δ 8.34 (dd, J = 7.8, 1.8 Hz, 1H), 8.31 (br s, 1H), 7.48 (dd, J = 3.8, 1.2 Hz, 1H), 7.39 (dd, J = 4.9, 1.2 Hz, 1H), 6.84-7.00 (m, 3H), 6.78 (dd, J = 7.9, 1.5 Hz, 1H), 3.78 (s, 3H); ^{13}C-NMR (75 MHz) δ 159.6 (C), 148.0 (C), 139.9 (C), 130.7 (CH), 128.2 (CH), 127.8 (CH), 127.5 (C), 123.9 (CH), 121.2 (CH), 119.8 (CH), 110.0 (CH), 55.9 (CH_3).

***N*-(4-Fluorophenyl)-2-thiophenecarboxamide[20] (3jc).** Following the general procedure using 2-thiophenecarboxamide (100 mg, 0.79 mmol) and 1-fluoro-4-iodobenzene (0.13 mL, 1.18 mmol) provided 137 mg (80% yield) of the coupling product as a white solid after purification by flash chromatography (dichloromethane) of the crude. ^{1}H-NMR (400 MHz) δ 8.17 (br s, 1H), 7.58 (dd, J = 3.6, 1.1 Hz, 1H), 7.41-7.48 (m, 3H), 6.95-6.98 (m, 1H), 6.86-6.91 (m, 2H); ^{13}C-NMR (100 MHz) δ 160.3 (C), 159 (d, J = 243.0 Hz, C), 138.9 (C), 133.5 (d, J = 2.3 Hz, C), 130.9 (CH), 128.7 (CH), 127.8 (CH), 122.5 (d, J = 7.6 Hz, CH), 115.6 (d, J = 22.9 Hz, CH).

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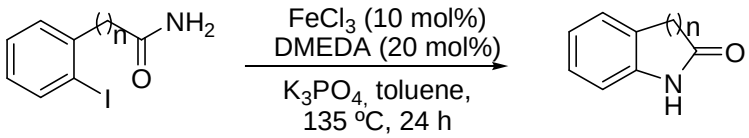
[20] Barbieri, C. L.; Ceraulo, L.; De Maria, P.; Fontana, A.; Spinelli, D.; Zuppiroli, L. *Heterocycles* **1991**, *32*, 975.

Intramolecular *N*-arylations of amides



2-Oxindole[21] (4a). Following the general procedure using (2-iodophenyl)acetamide (100 mg, 0.38 mmol) provided 36 mg (72% yield) of the coupling product as a white solid after purification by flash chromatography (ethyl acetate/pentane 1/1) of the crude. ^{1}H-NMR (300 MHz) δ 8.72 (br s, 1H), 7.12-7.19 (m, 2H), 6.94 (t, J = 7.3 Hz, 1H), 6.82 (d, J = 7.7 Hz, 1H), 3.48 (s, 2H); ^{13}C-NMR (75 MHz) δ 177.8 (C), 142.5 (C), 127.9 (CH), 125.3 (C), 124.6 (CH), 122.3 (CH), 109.7 (CH), 36.2 (CH_2).

3,4-Dihydro-2(1*H*)-quinolinone[22] (4b). Following the general procedure using (2-iodophenyl)propionamide (100 mg, 0.36 mmol) provided 39 mg (73% yield) of the coupling product as a white solid after purification by flash chromatography (ethyl acetate/pentane 1/1) of the crude. ^{1}H-NMR (300 MHz) δ 9.45 (br s, 1H), 7.06-7.11 (m, 2H), 6.89 (dt, J = 7.3, 1.2 Hz, 1H), 6.79 (d, J = 7.9 Hz, 1H), 2.86-2.91 (m, 2H), 2.54-2.59 (m, 2H); ^{13}C-NMR (75 MHz) δ 172.5 (C), 137.4 (C), 127.9 (CH), 127.5 (CH), 123.6 (C), 123.0 (CH), 115.7 (CH), 30.7 (CH_2), 25.3 (CH_2).

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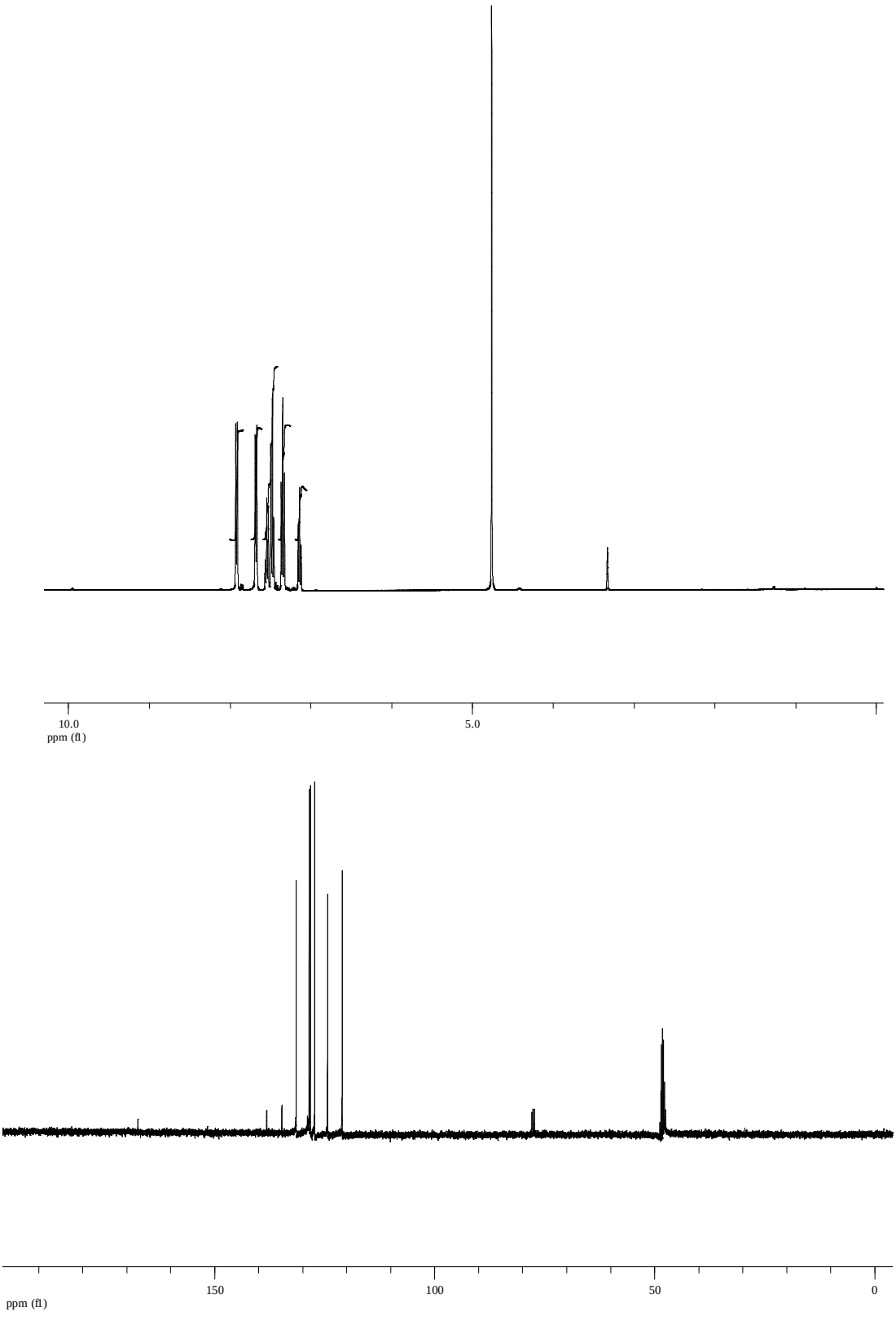
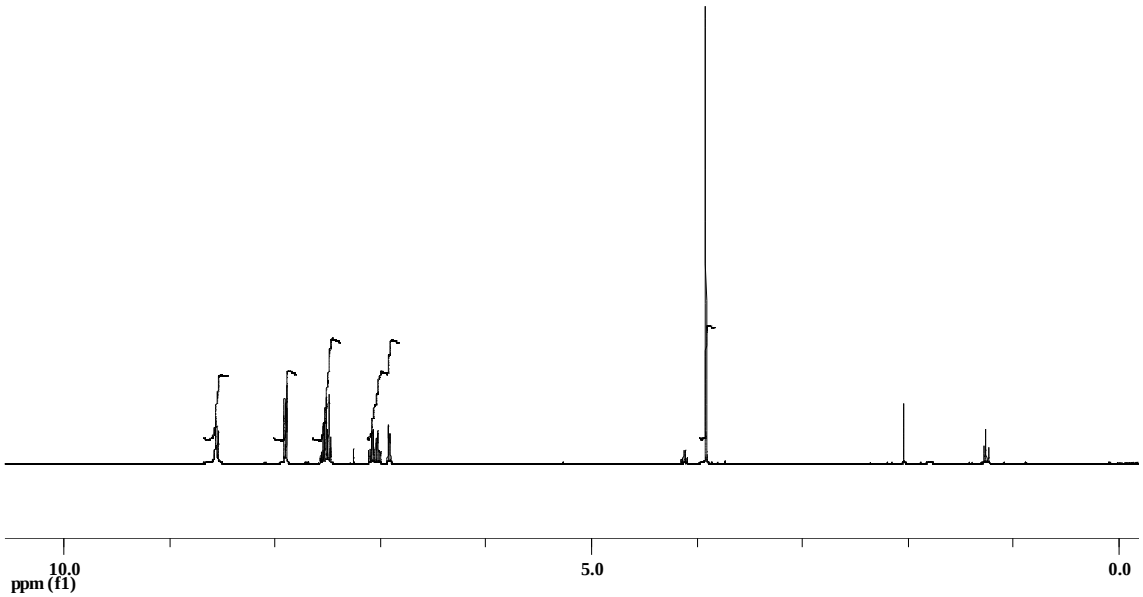
[21] Gassman, P. G.; Gilbert, D. P.; Luh, T.-Y. *J. Org. Chem.* **1977**, *42*, 1340.

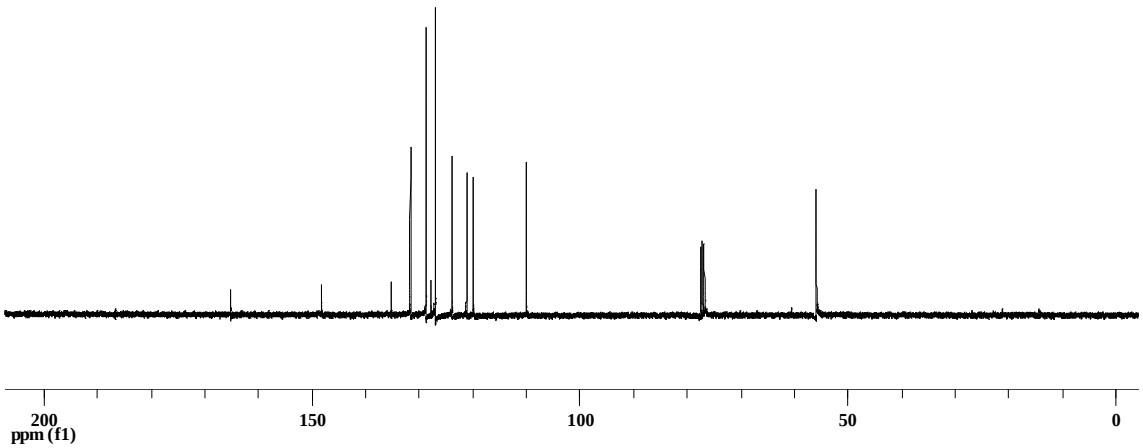
[22] Kikugawa, Y.; Nagashima, A.; Sakamoto, T.; Miyazama, E.; Shiiya, M. *J. Org. Chem.* **2003**, *68*, 6739.

_N_-Phenylbenzamide (3aa)

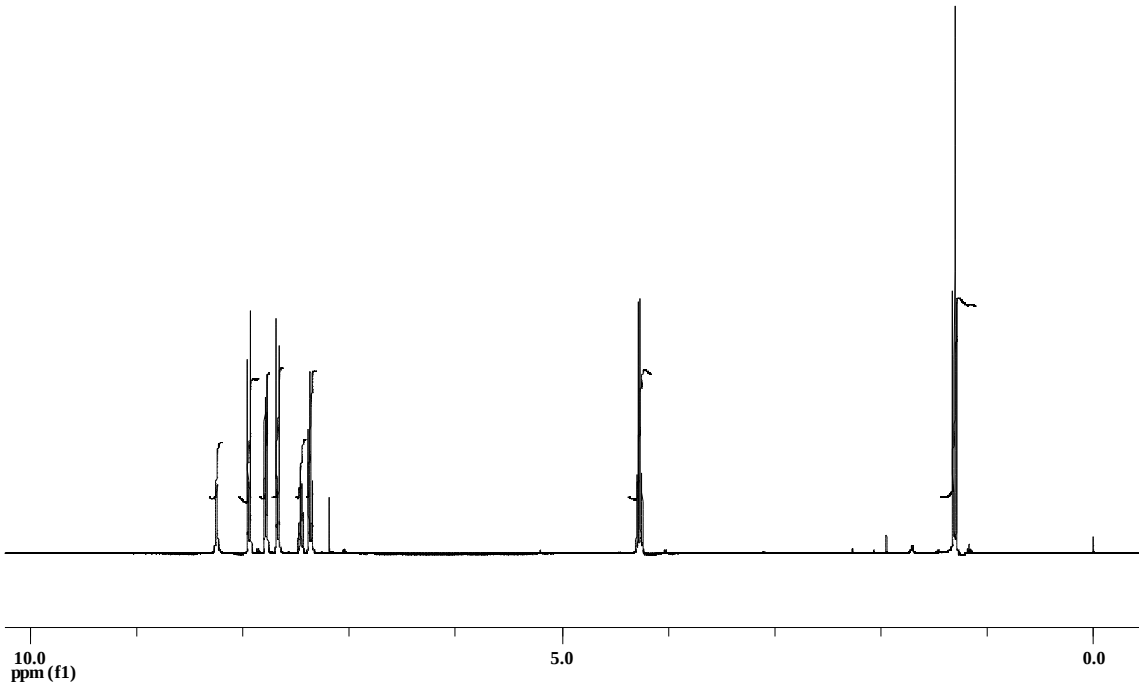


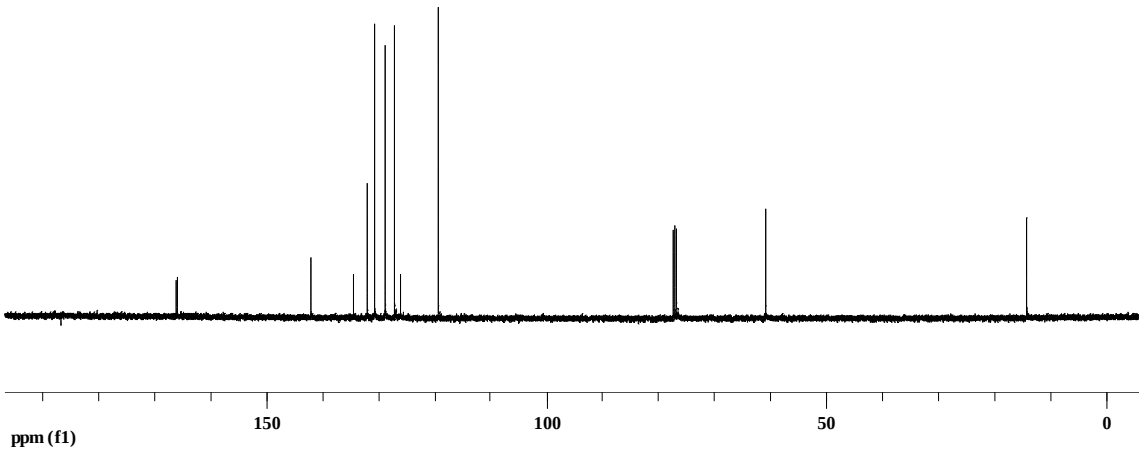
***N*-(2-Methoxyphenyl)benzamide (3ab)**



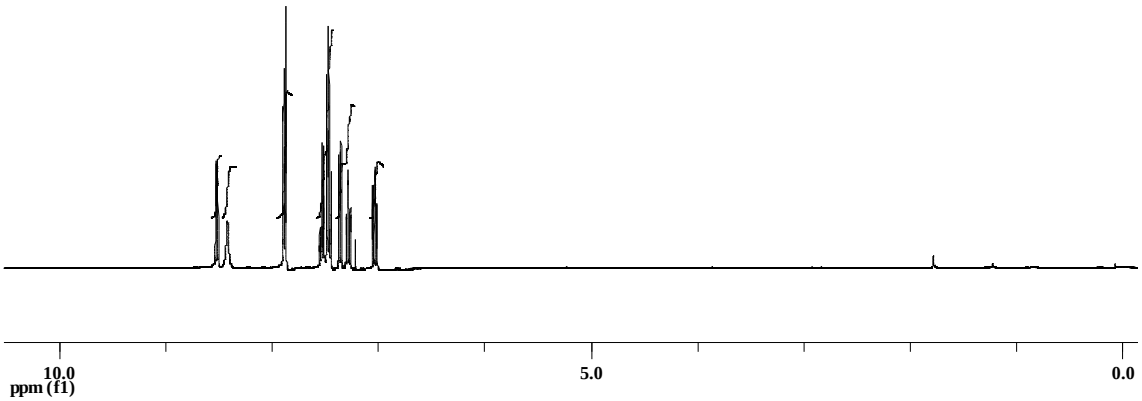


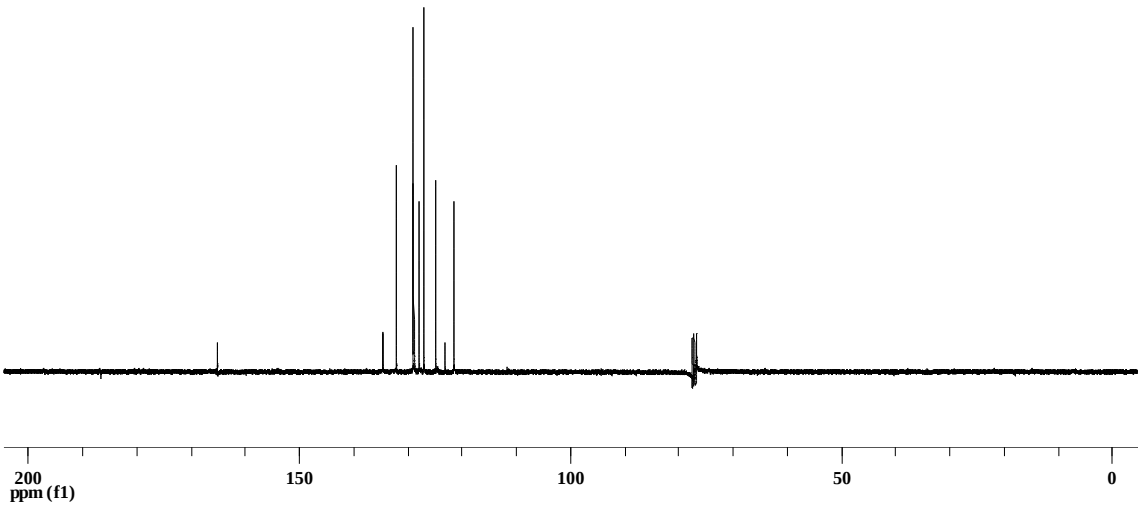
_N_-(4-Ethoxycarbonylphenyl)benzamide (3ac)



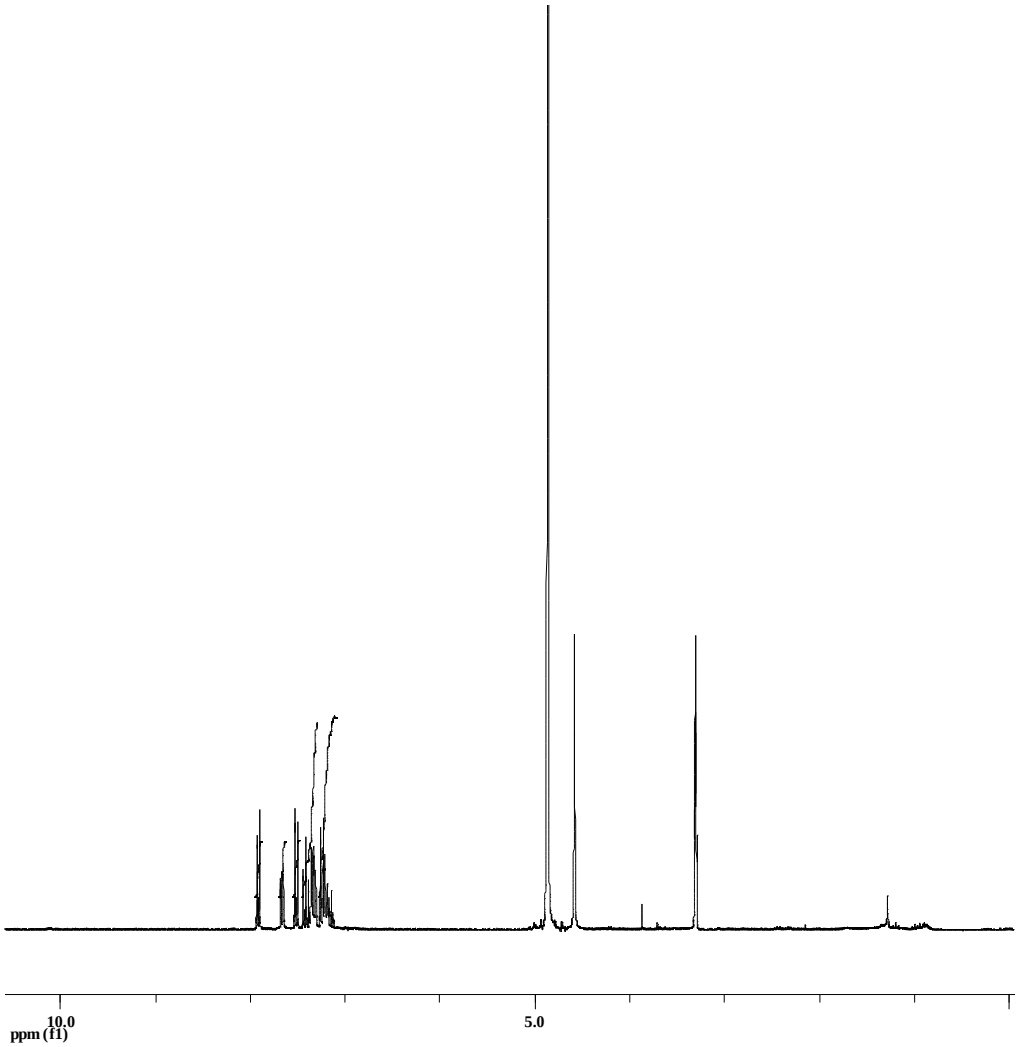


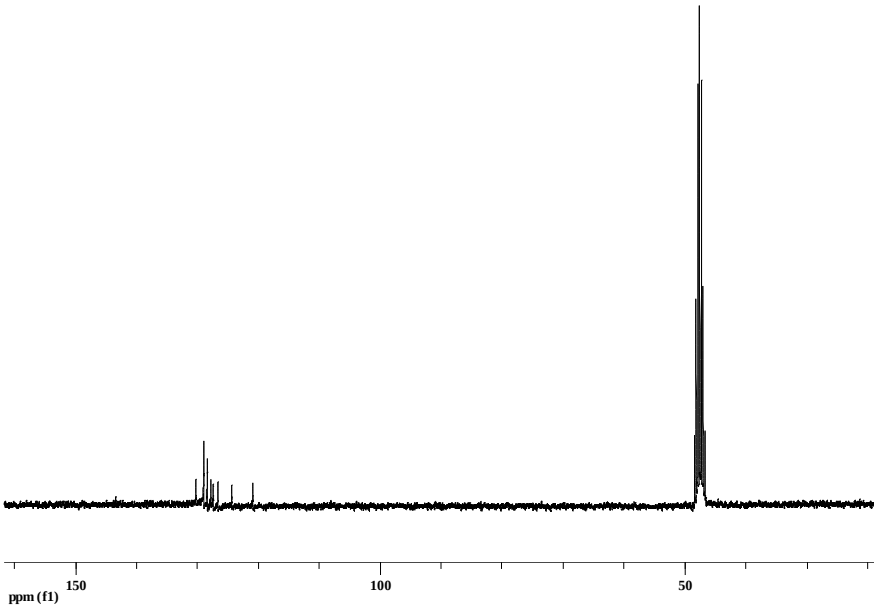
_N_-(2-Chlorophenyl)benzamide (3ad)



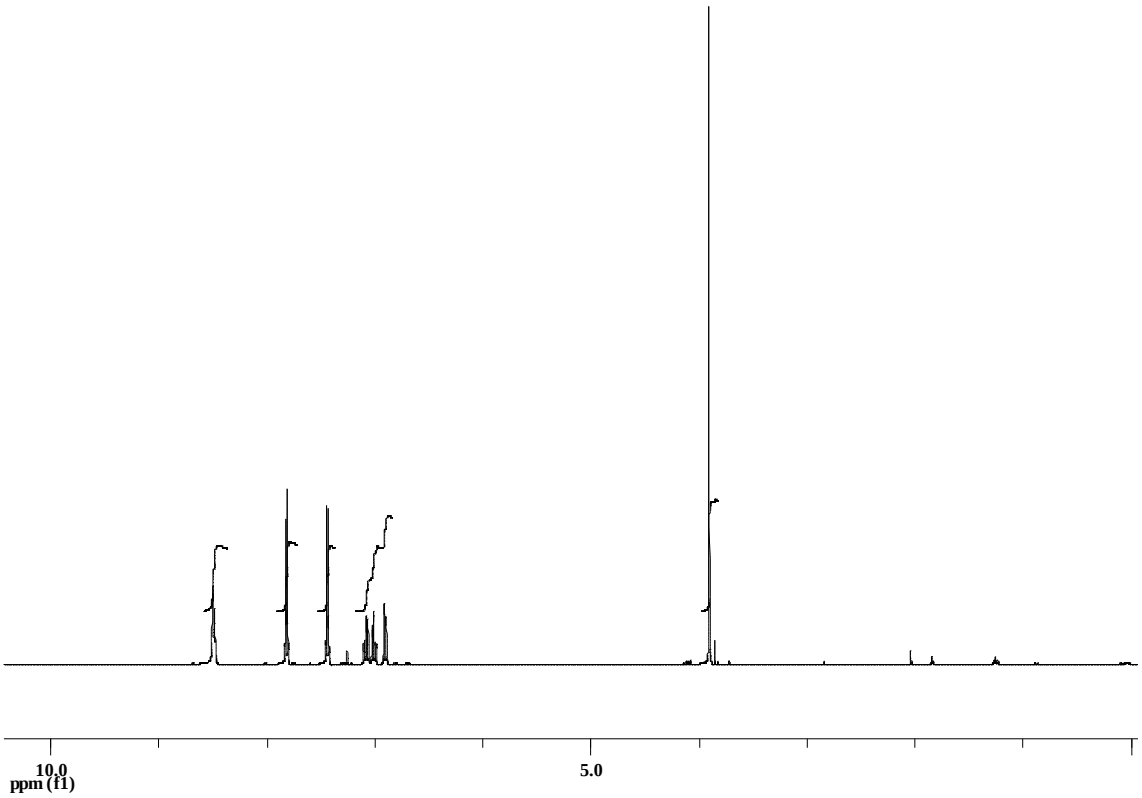


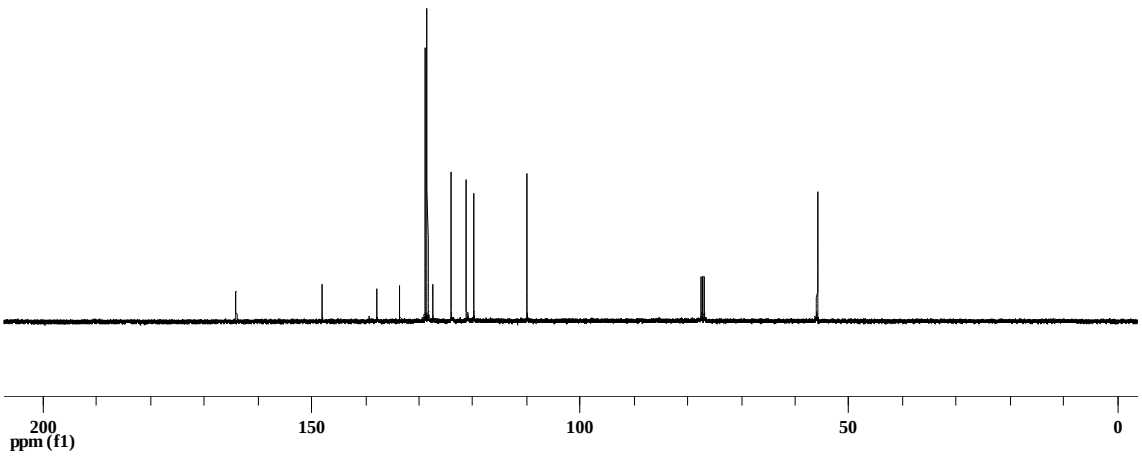
4-Chloro-*N*-phenylbenzamide (3ba)



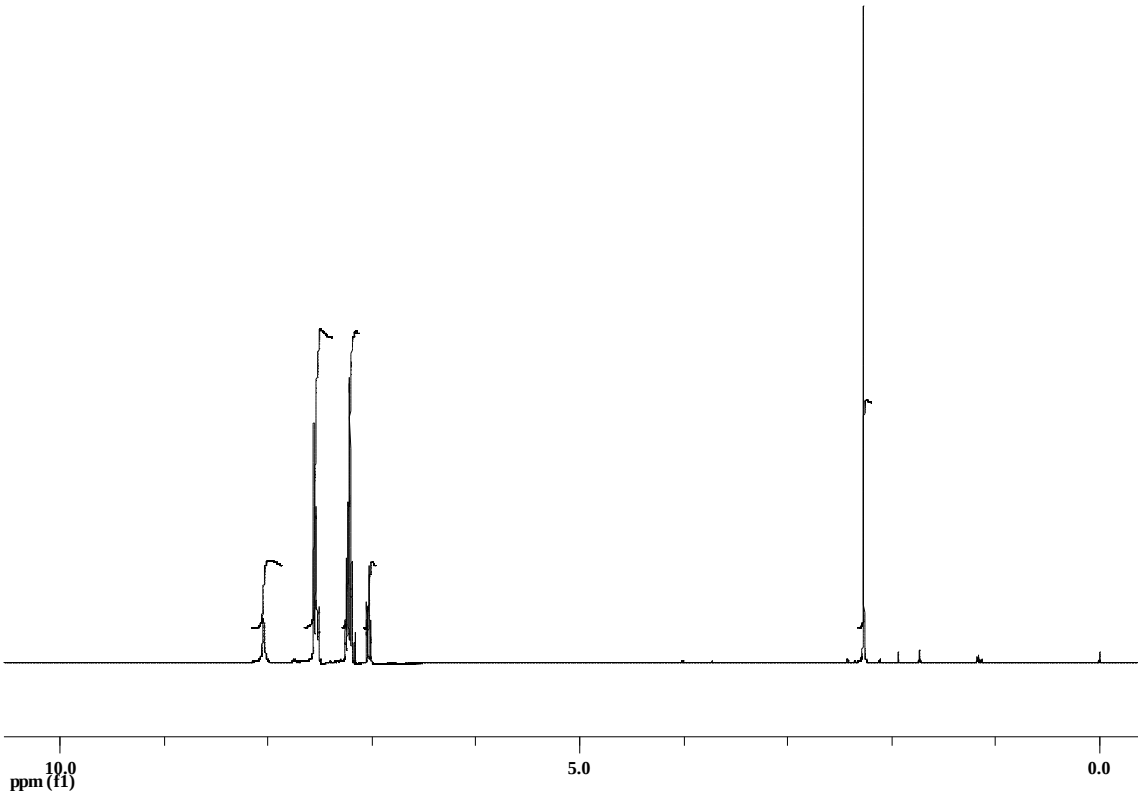


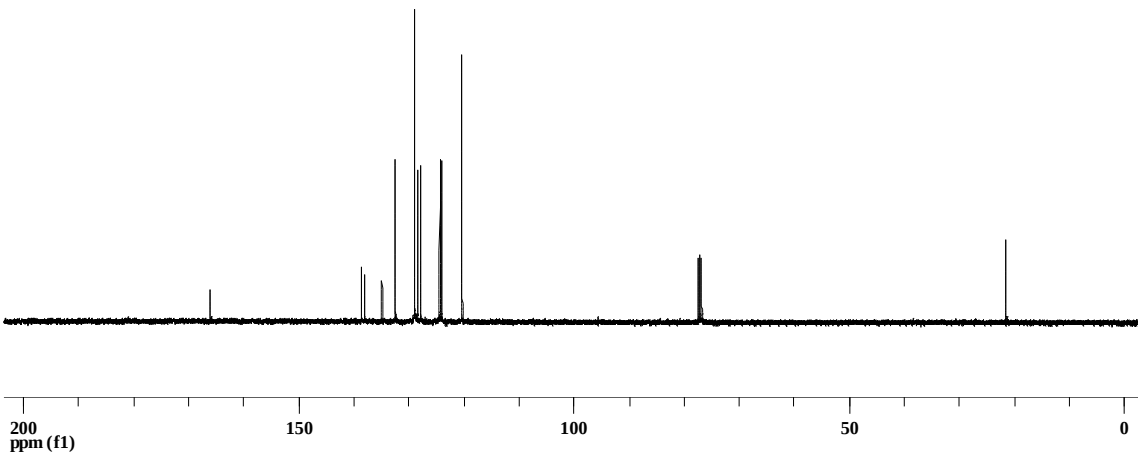
4-Chloro-*N*-(2-methoxyphenyl)benzamide (3bb)





3-Methyl-*N*-phenylbenzamide (3ca)





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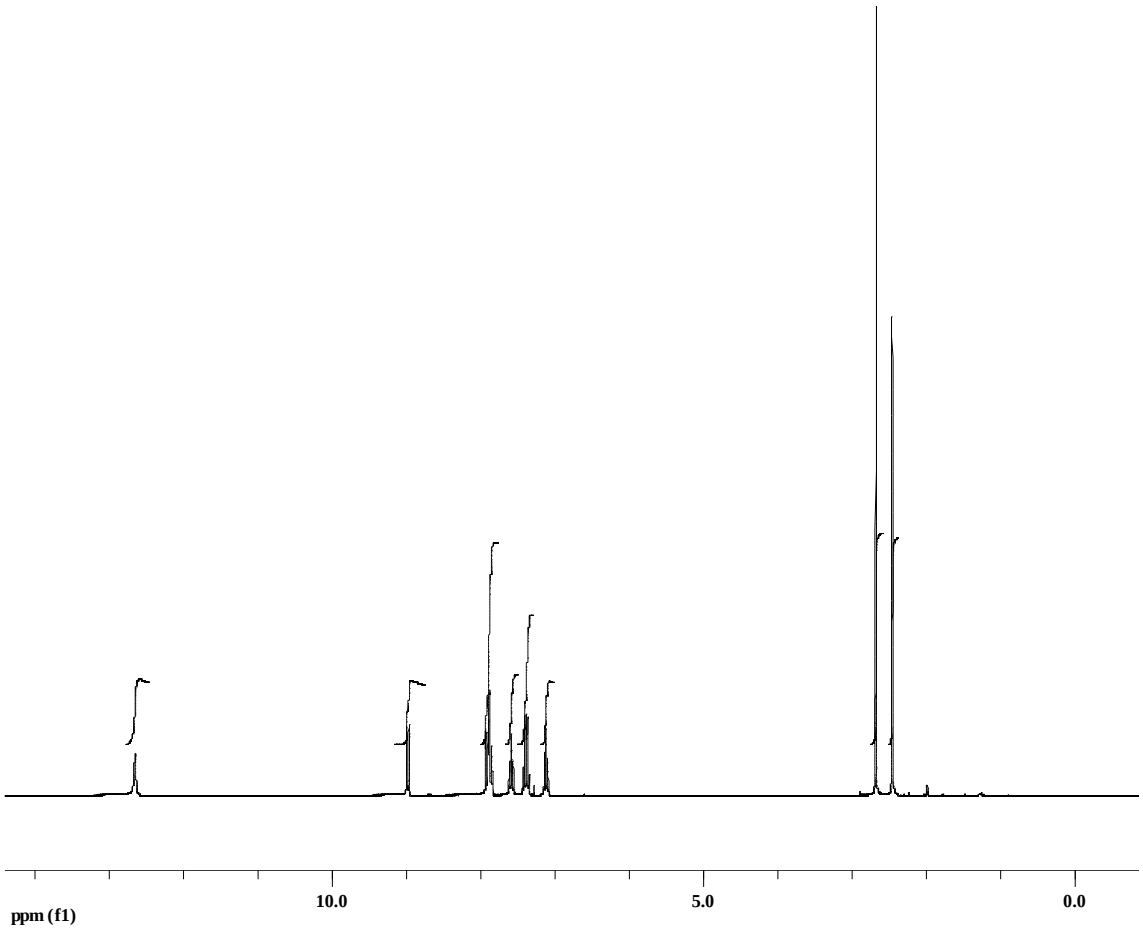
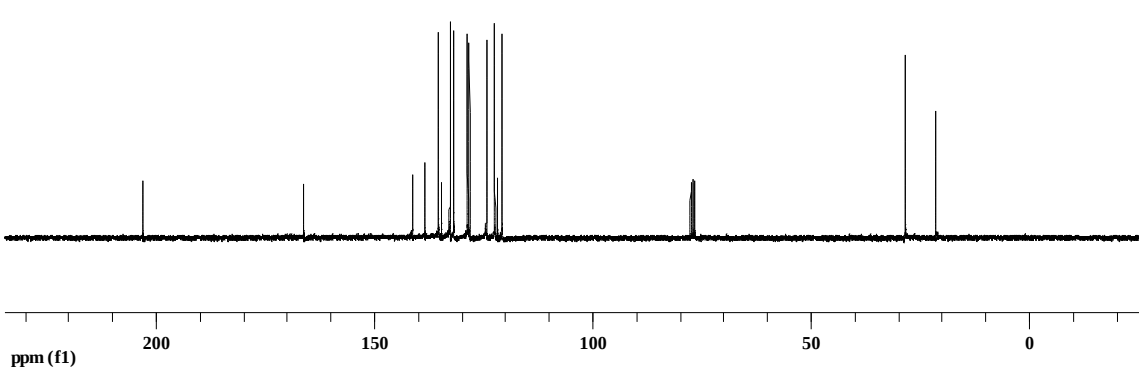
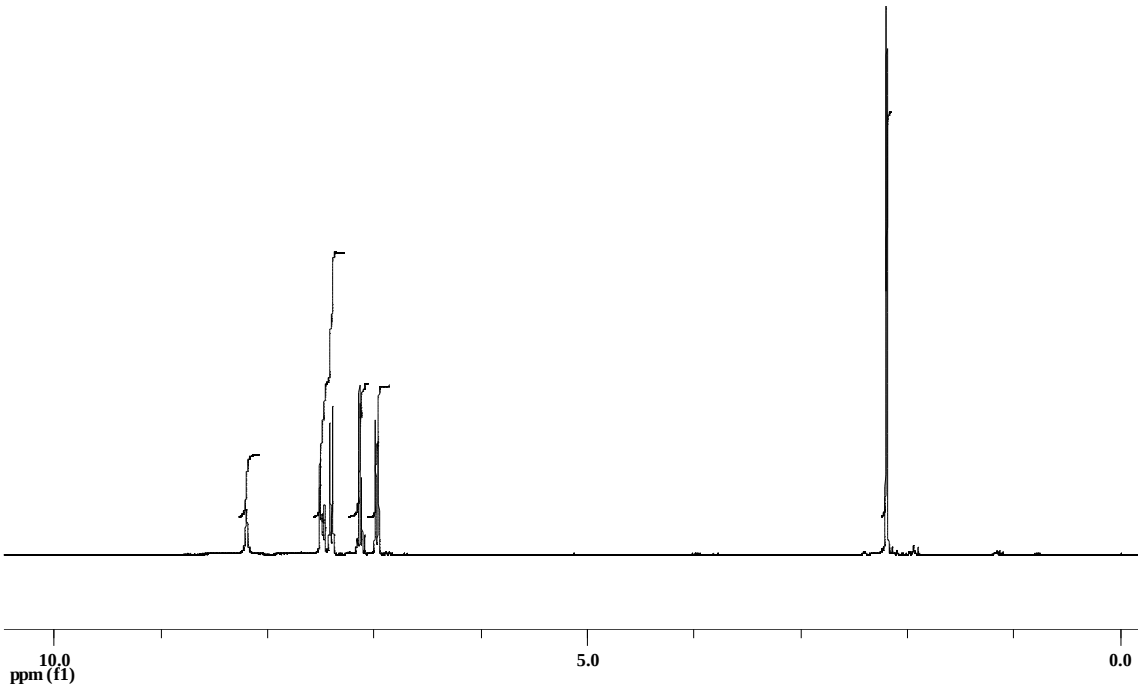
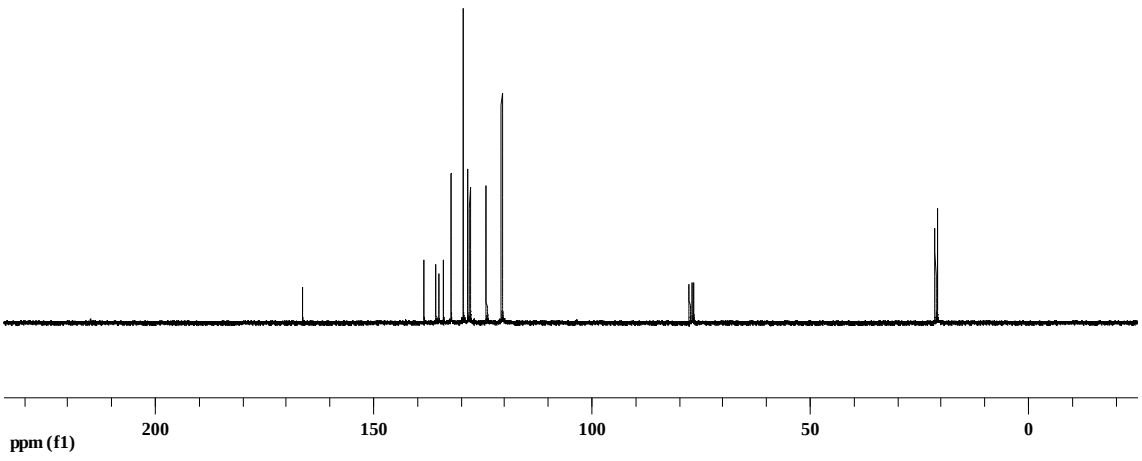


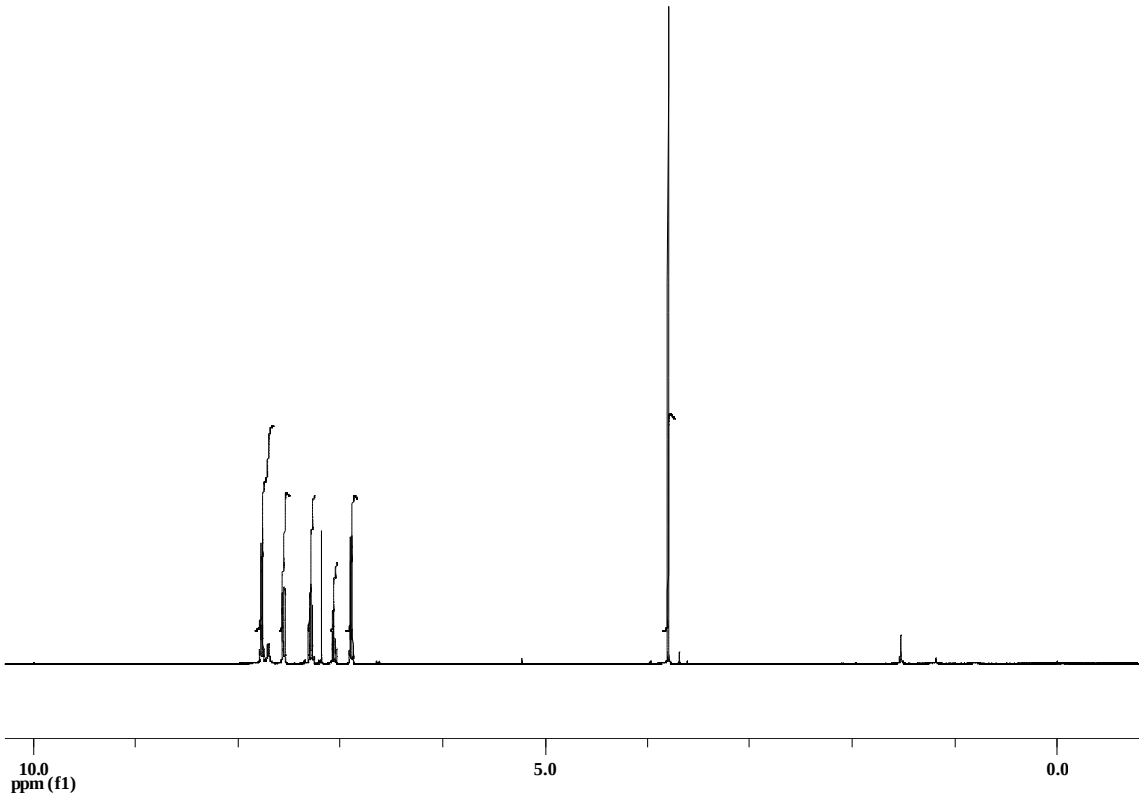


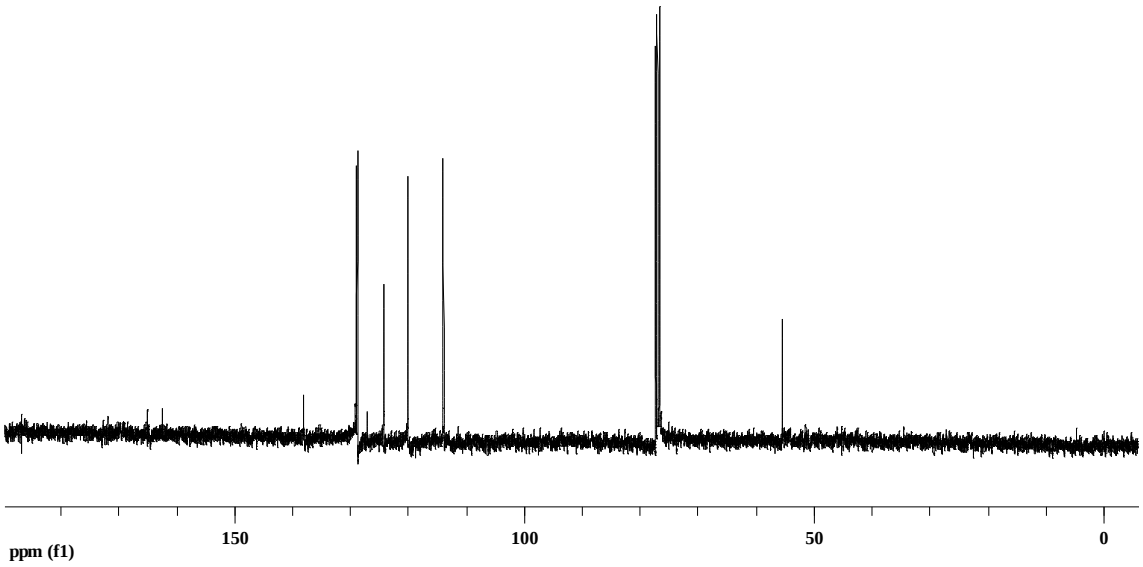
3-Methyl-*N*-(4-tolyl)benzamide (3cc)



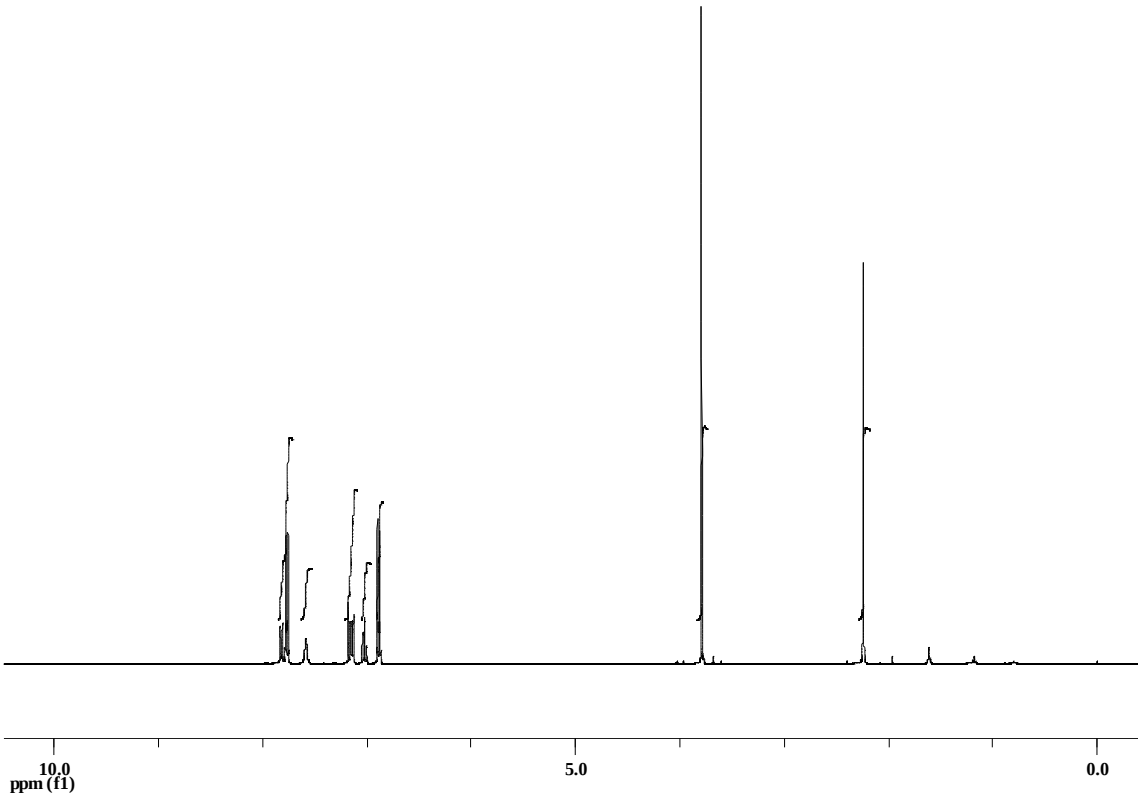


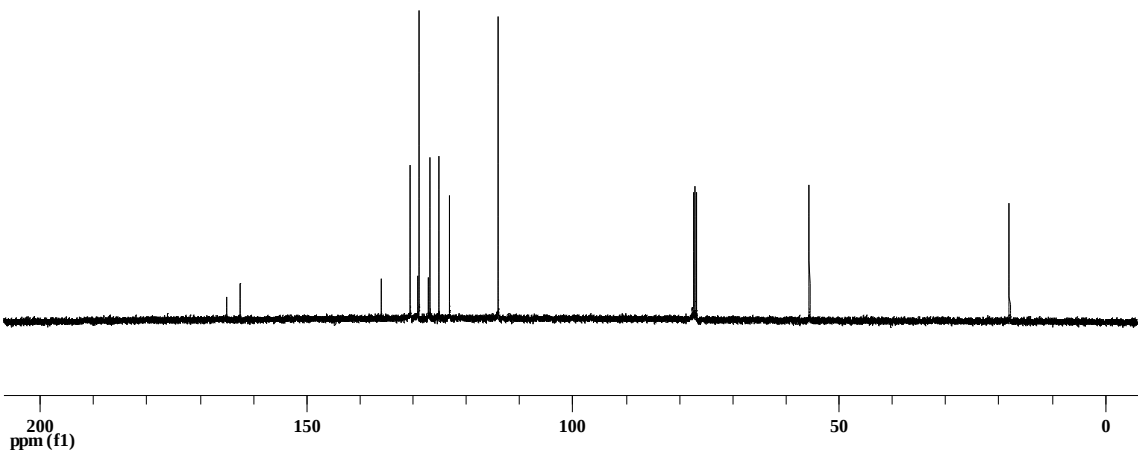
4-Methoxy-*N*-phenylbenzamide (3da)



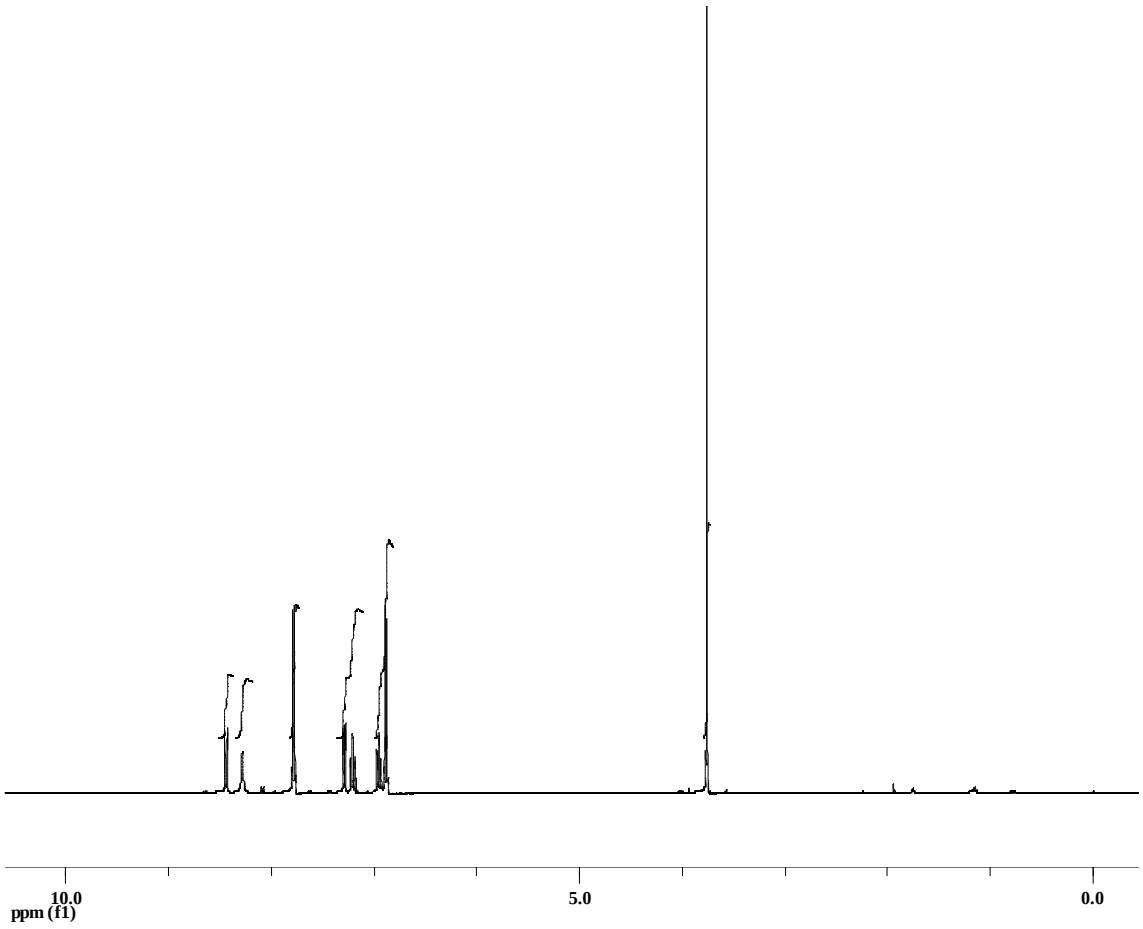


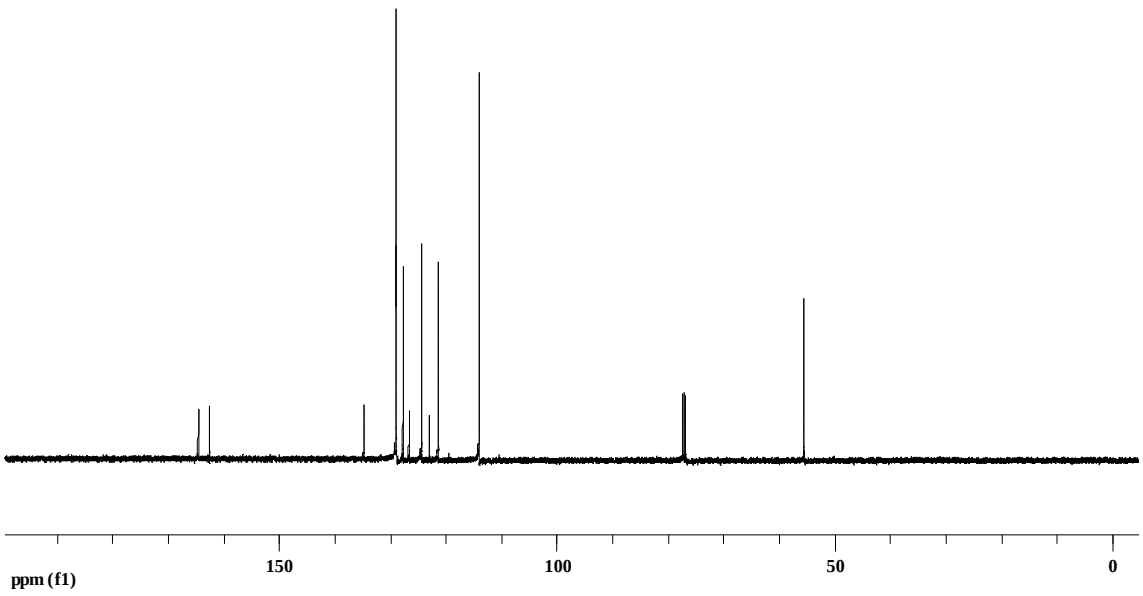
4-Methoxy-*N*-(2-tolyl)benzamide (3db)



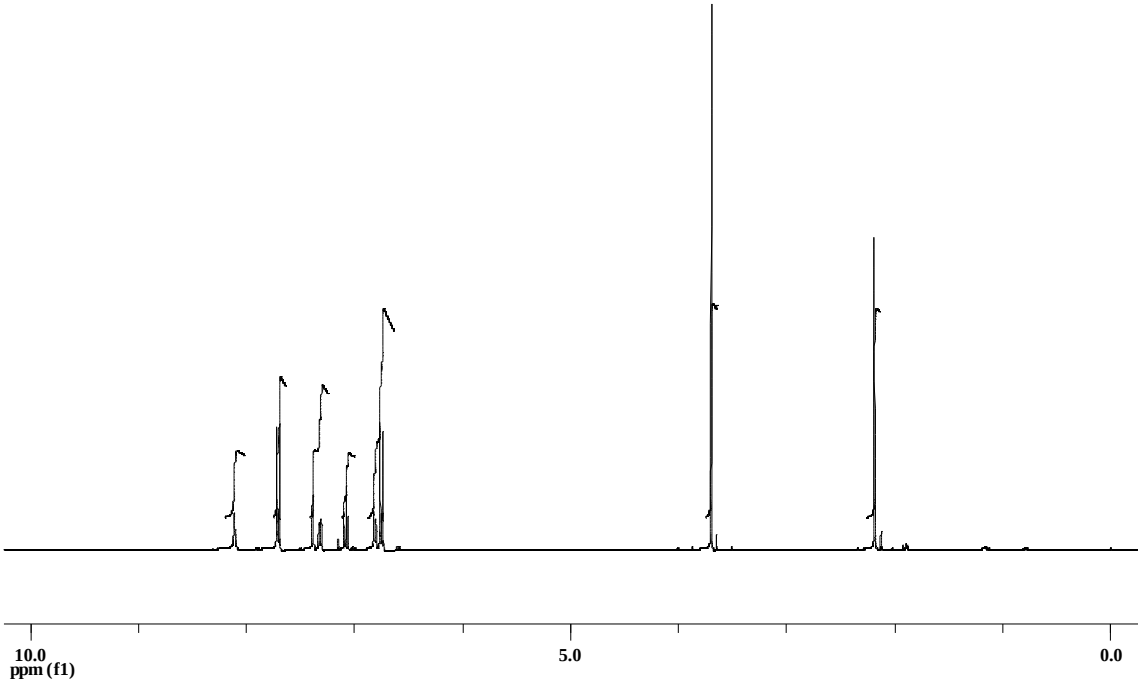


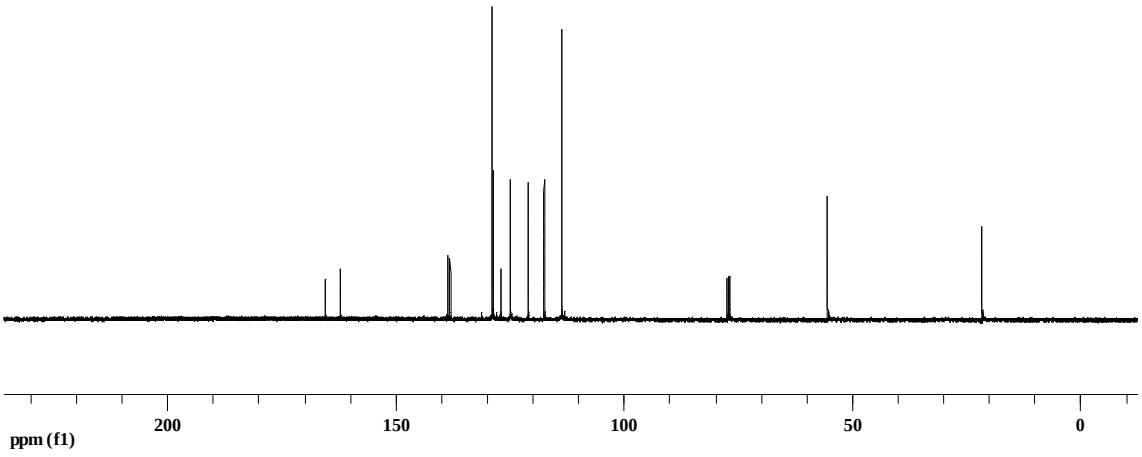
_N_-(2-Chlorophenyl)-4-methoxybenzamide (3dc)



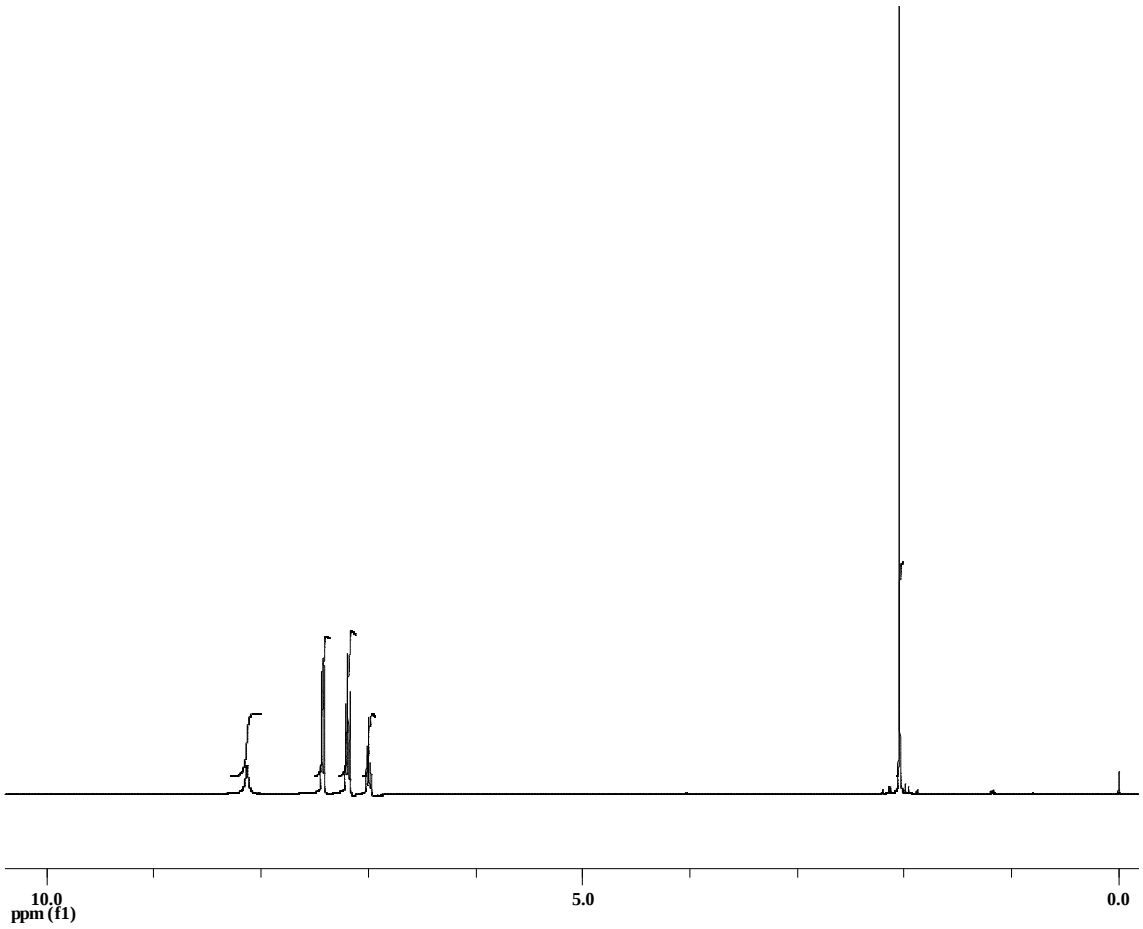


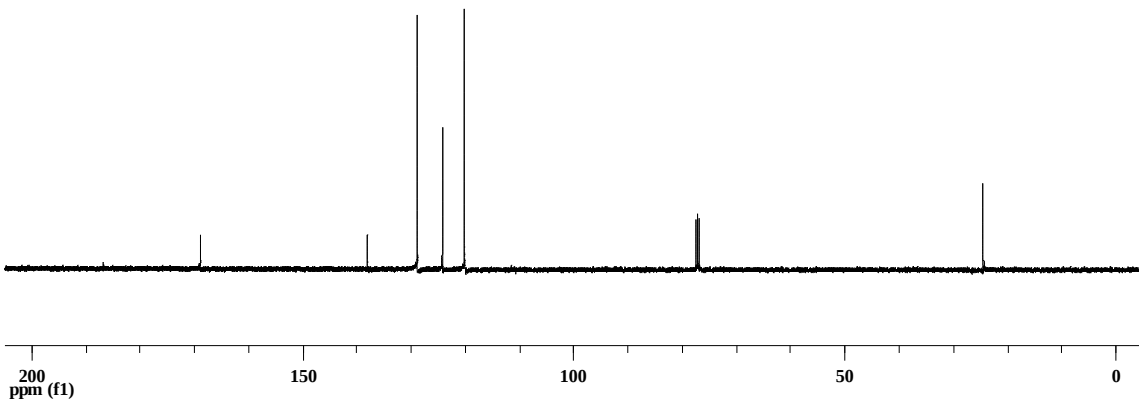
4-Methoxy-*N*-(3-tolyl)benzamide (3dd)



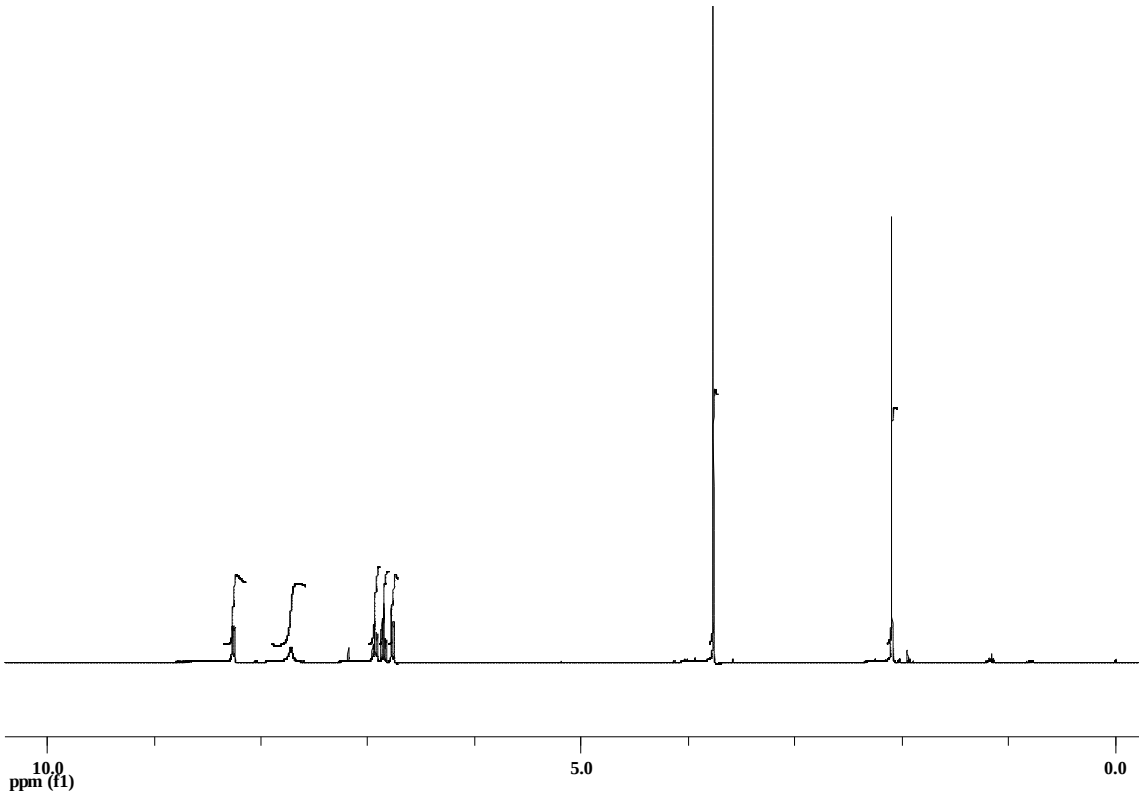


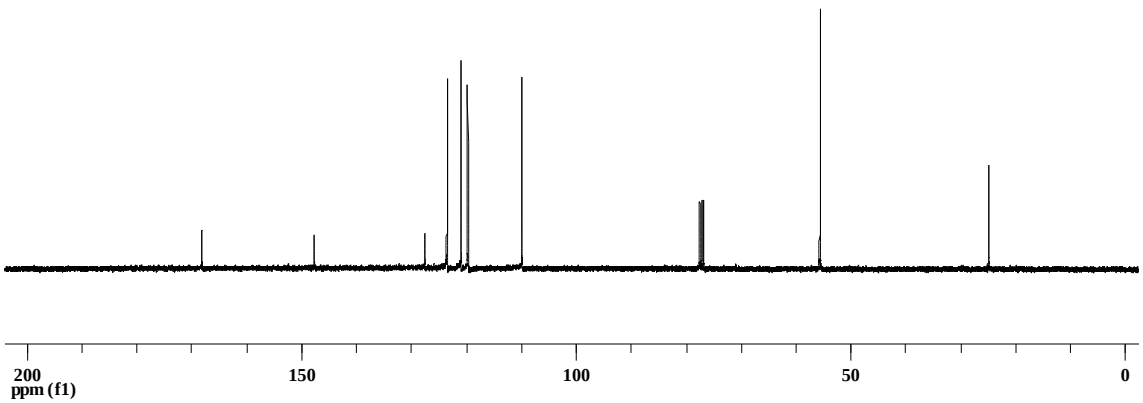
_N_-Phenylacetamide (3fa)





_N_-(2-Methoxyphenyl)acetamide (3fb)





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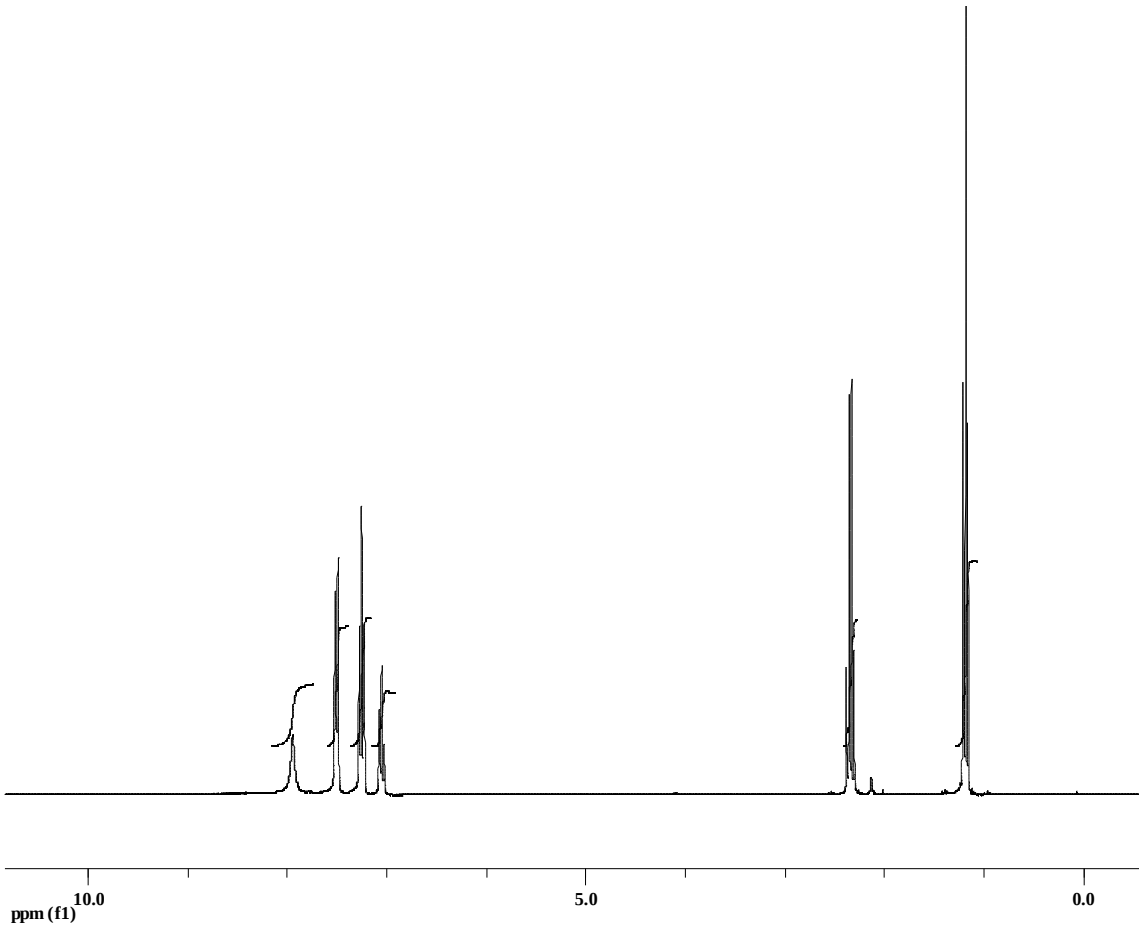
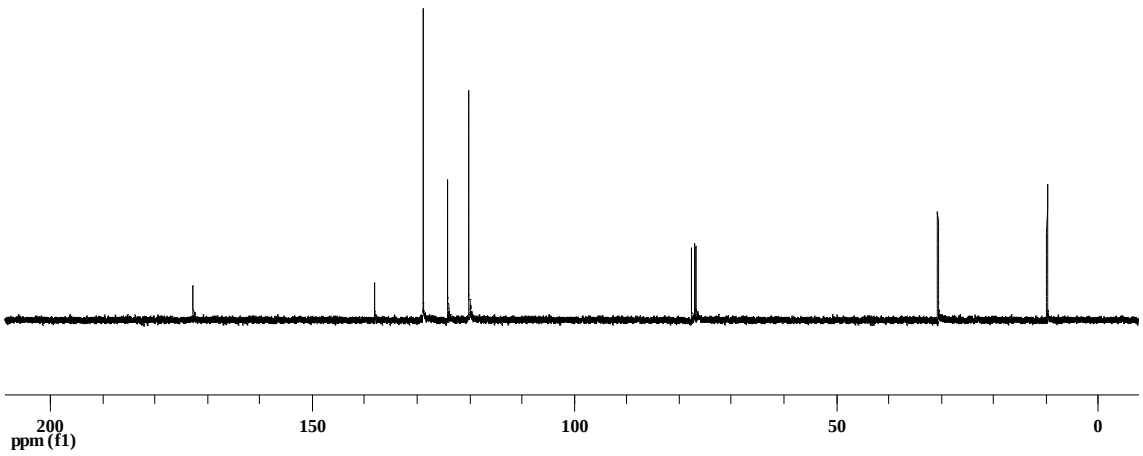
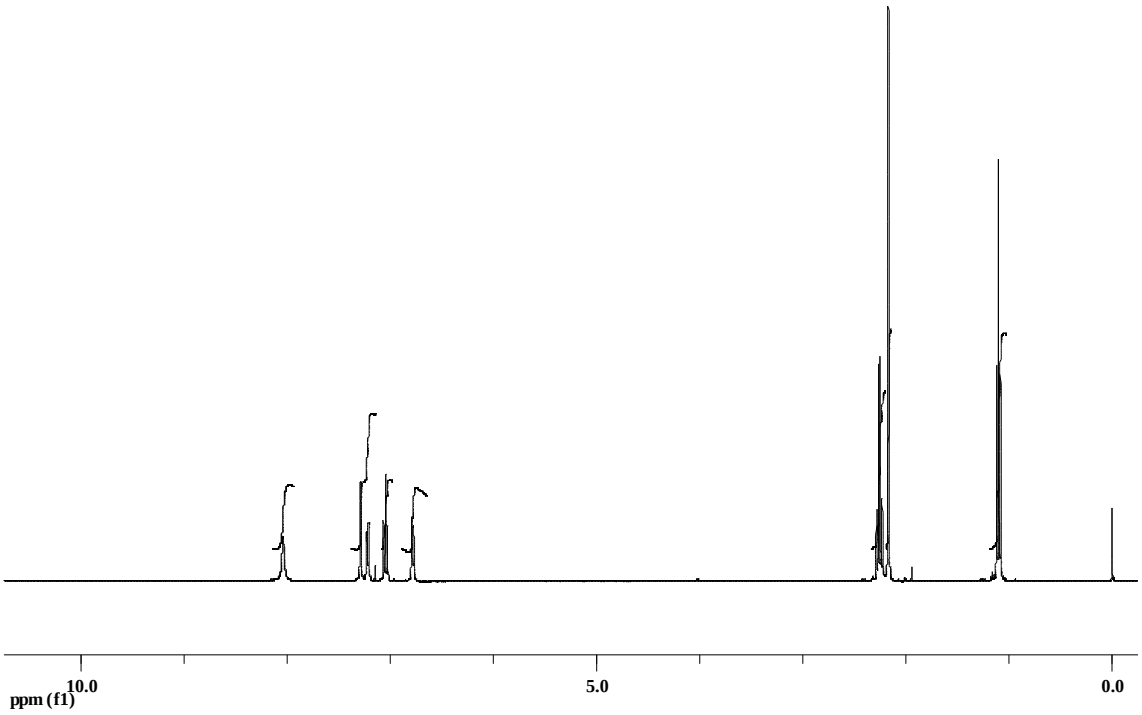
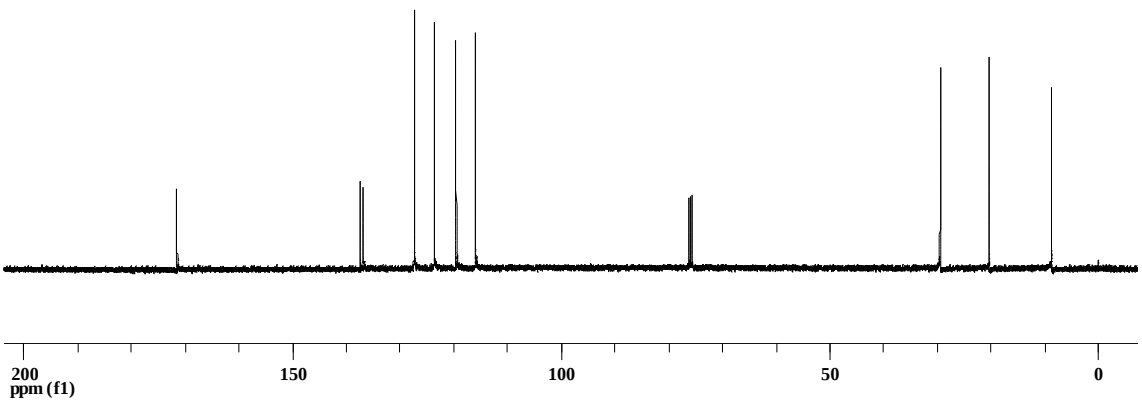


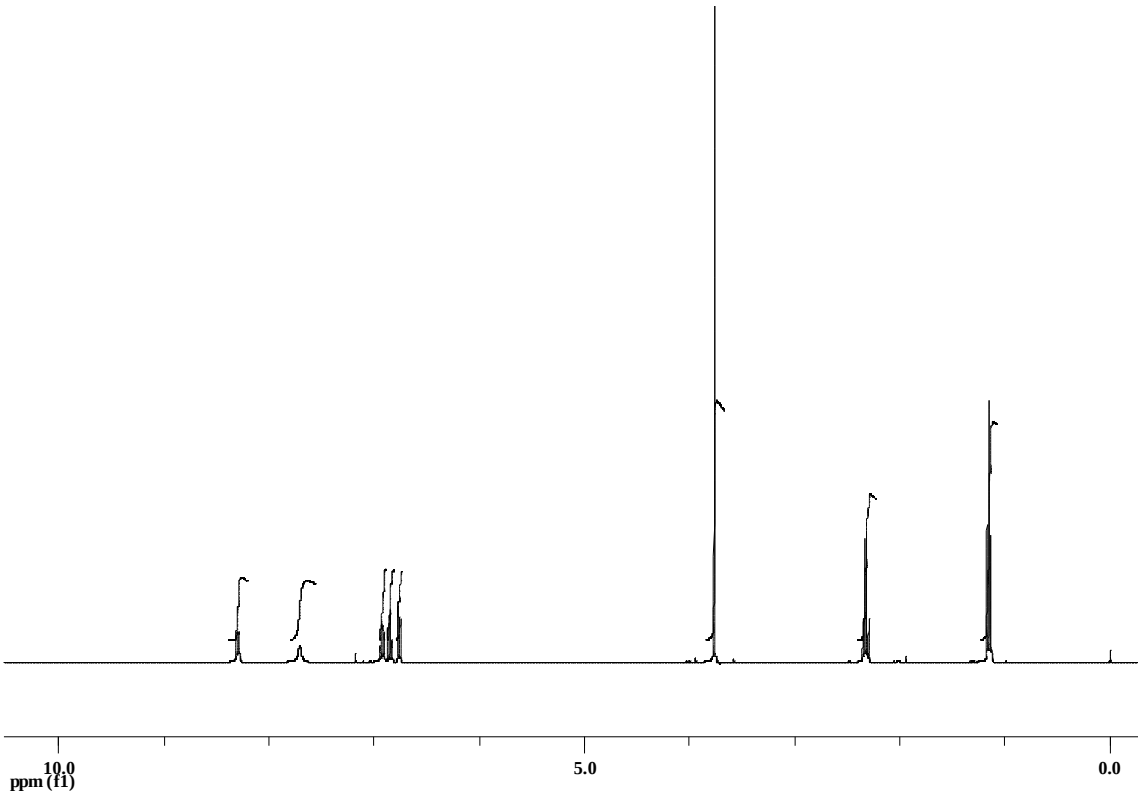


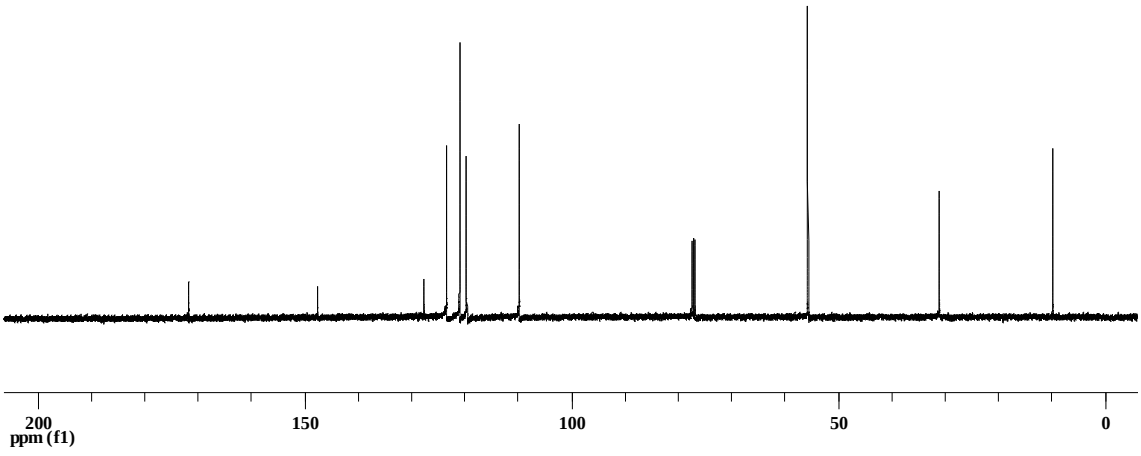
_N_-(3-Tolyl)propionamide (3gb)



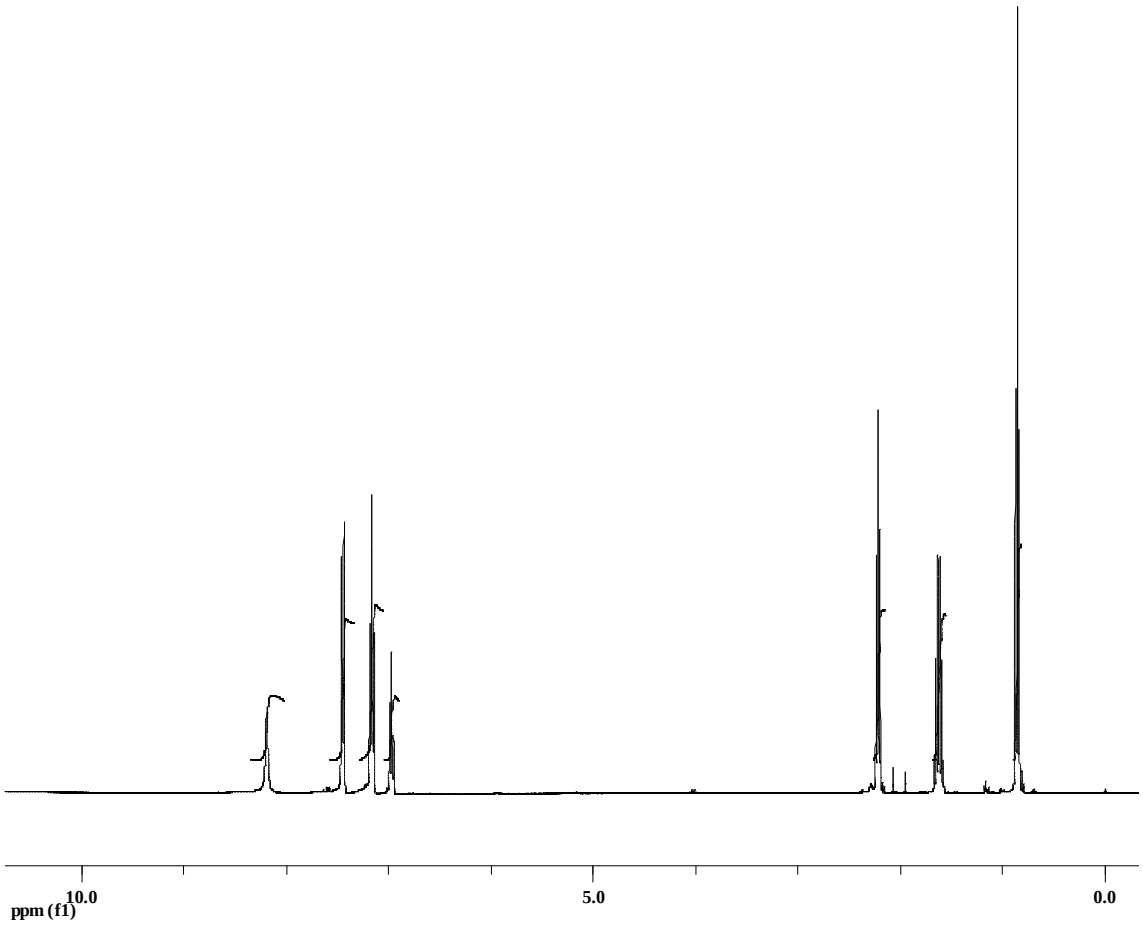


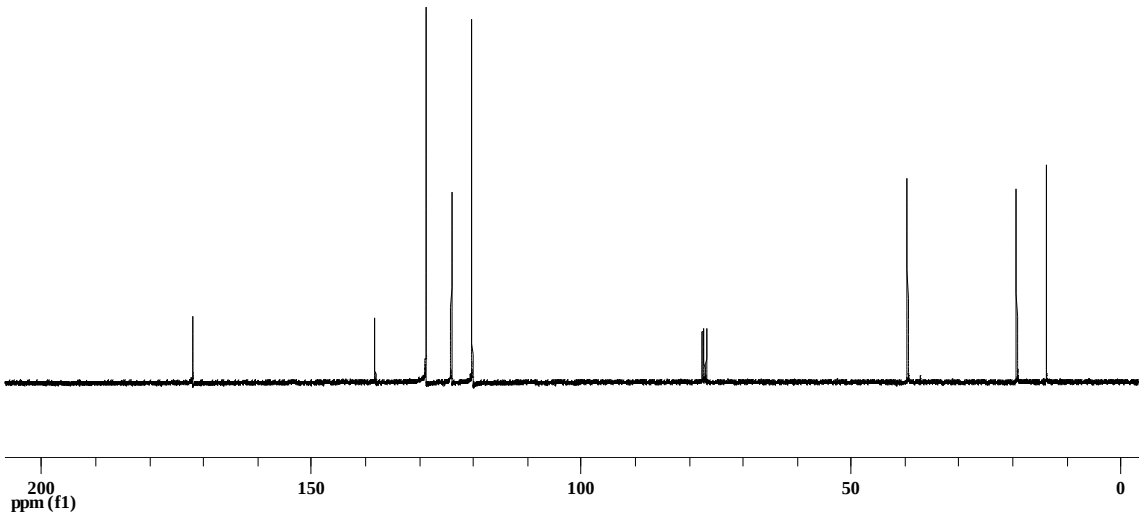
_N_-(2-Methoxyphenyl)propionamide (3gc)



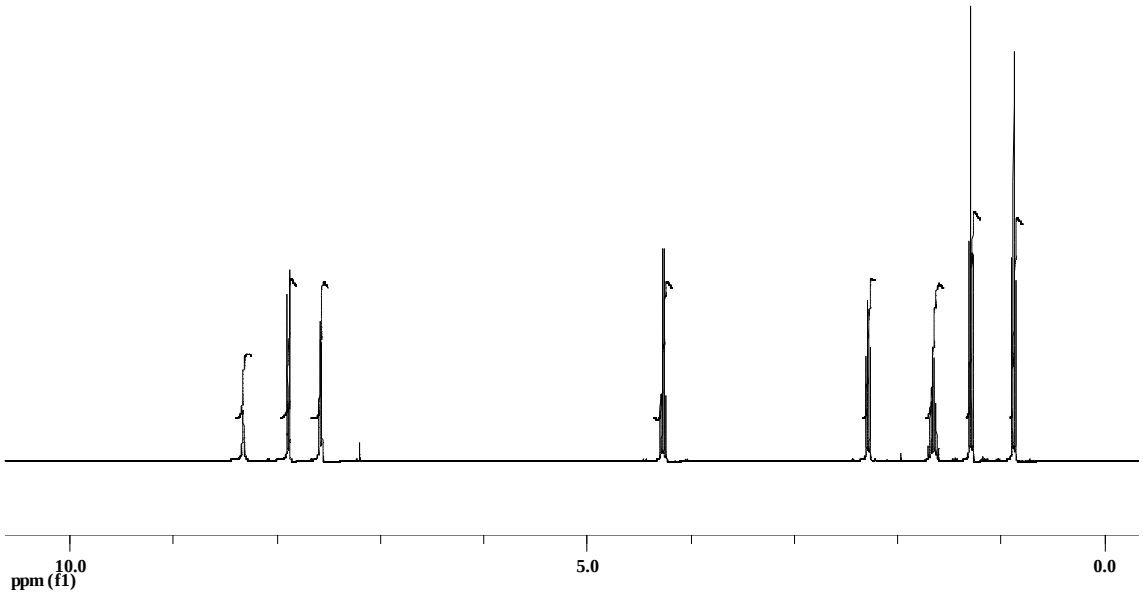


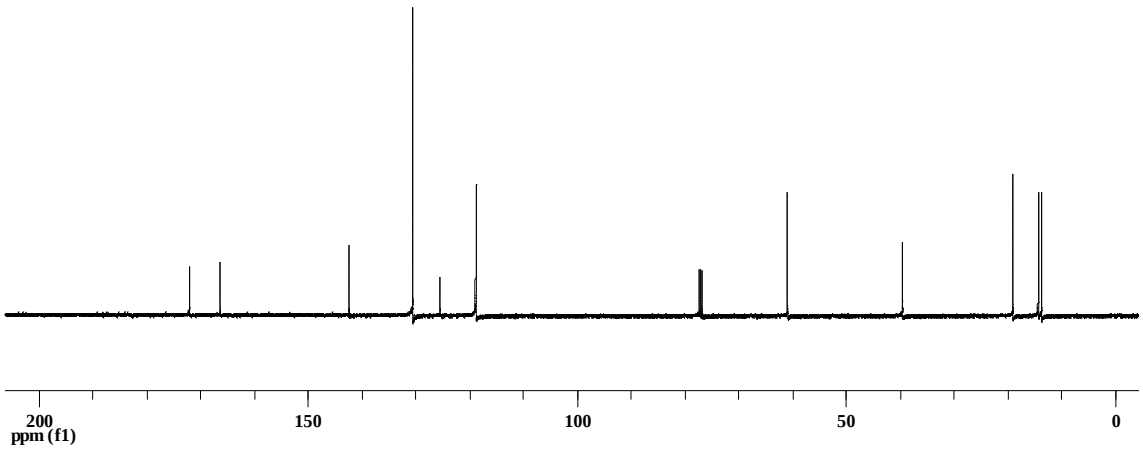
_N_-Phenylbutyramide (3ha)



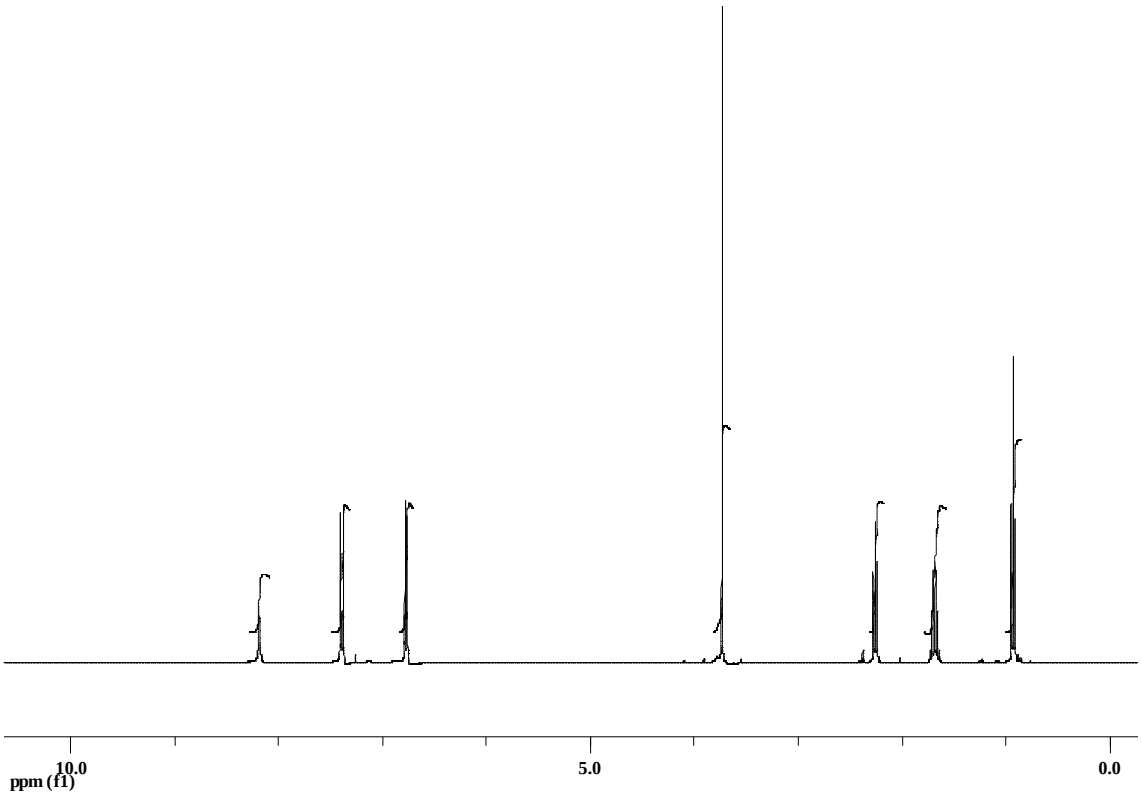


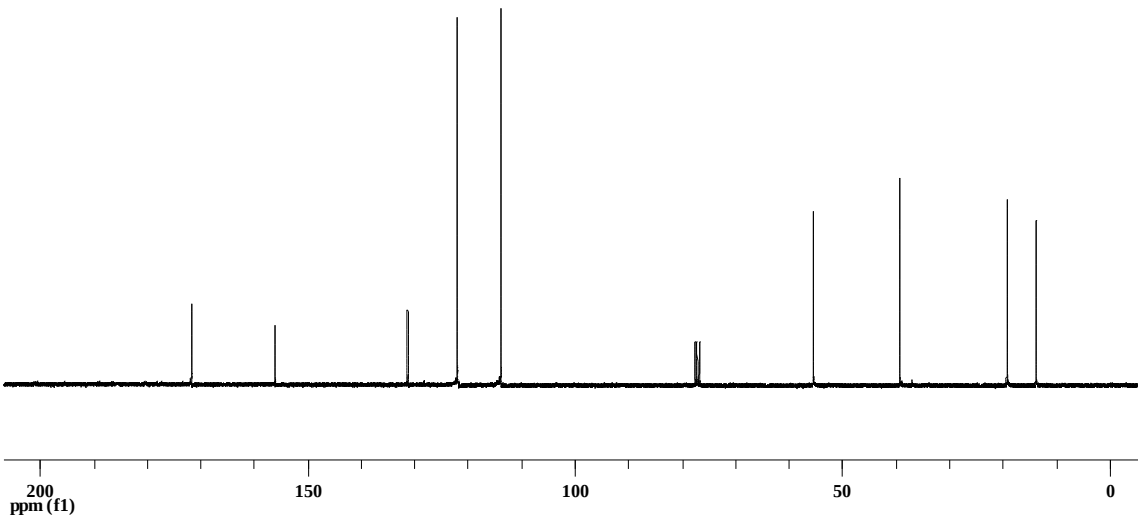
_N_-(4-Ethoxycarbonylphenyl)butyramide (3hb)



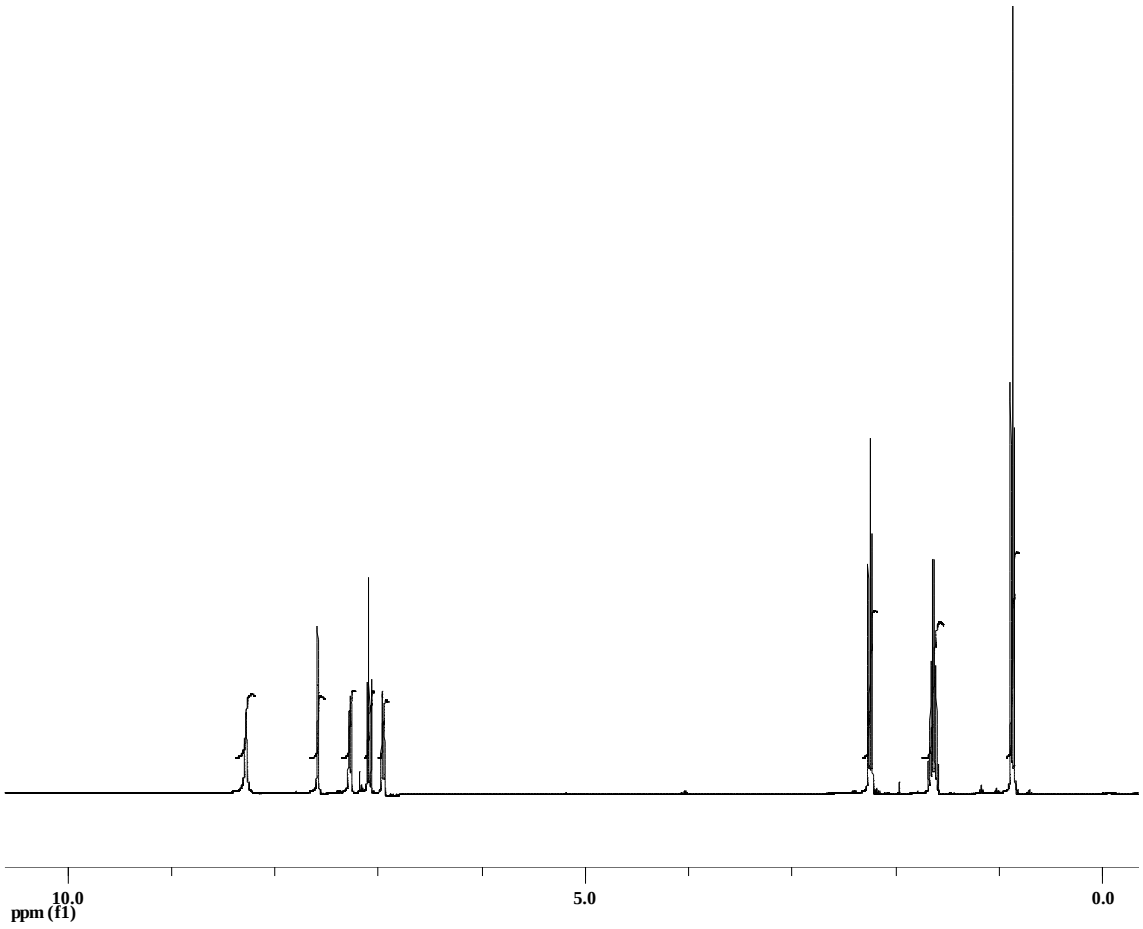


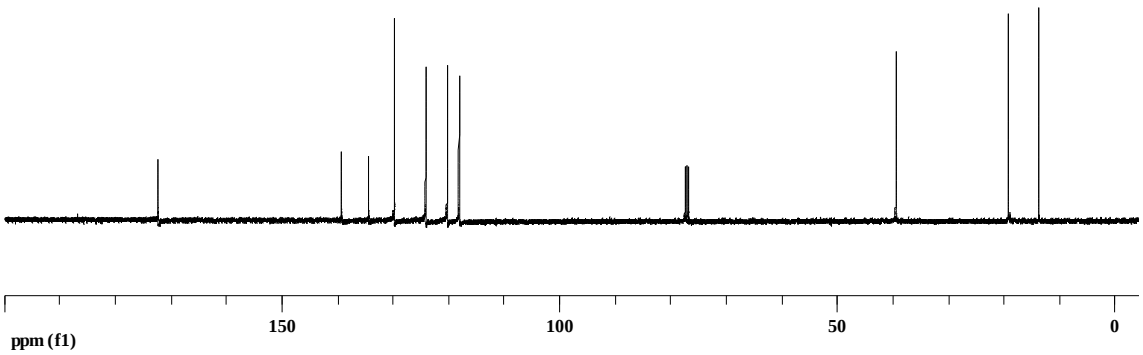
_N_-(4-Methoxyphenyl)butyramide (3hc)



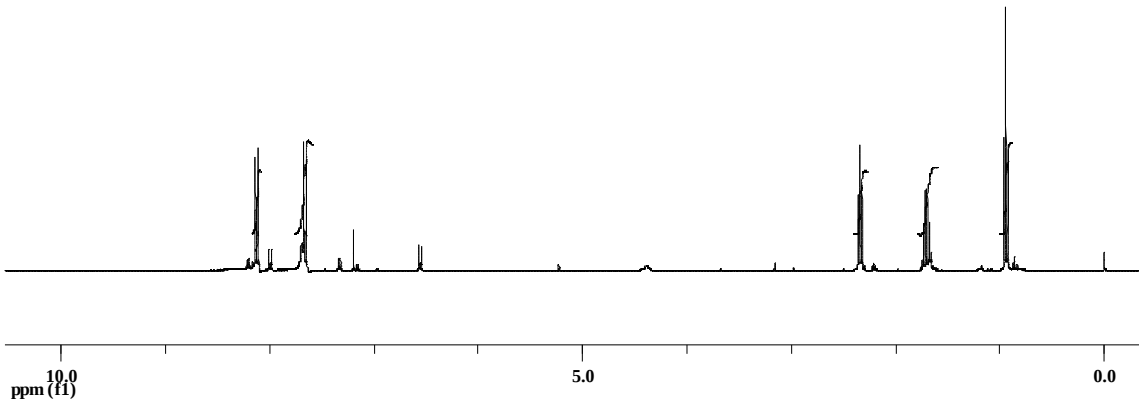


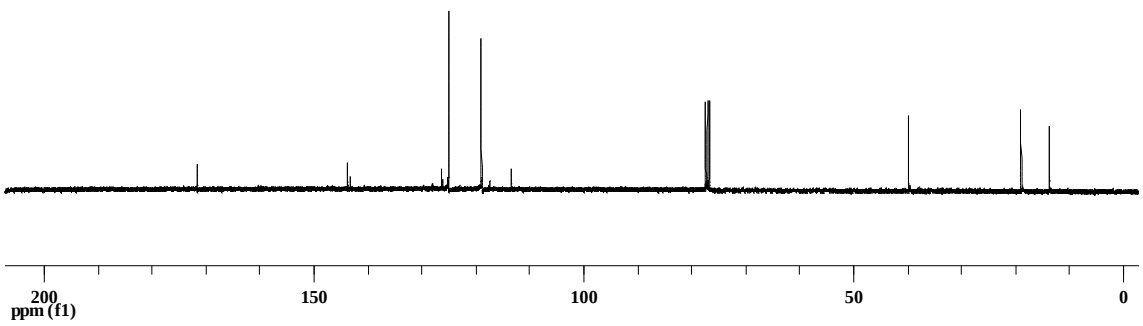
_N_-(3-Chlorophenyl)butyramide (3hd)



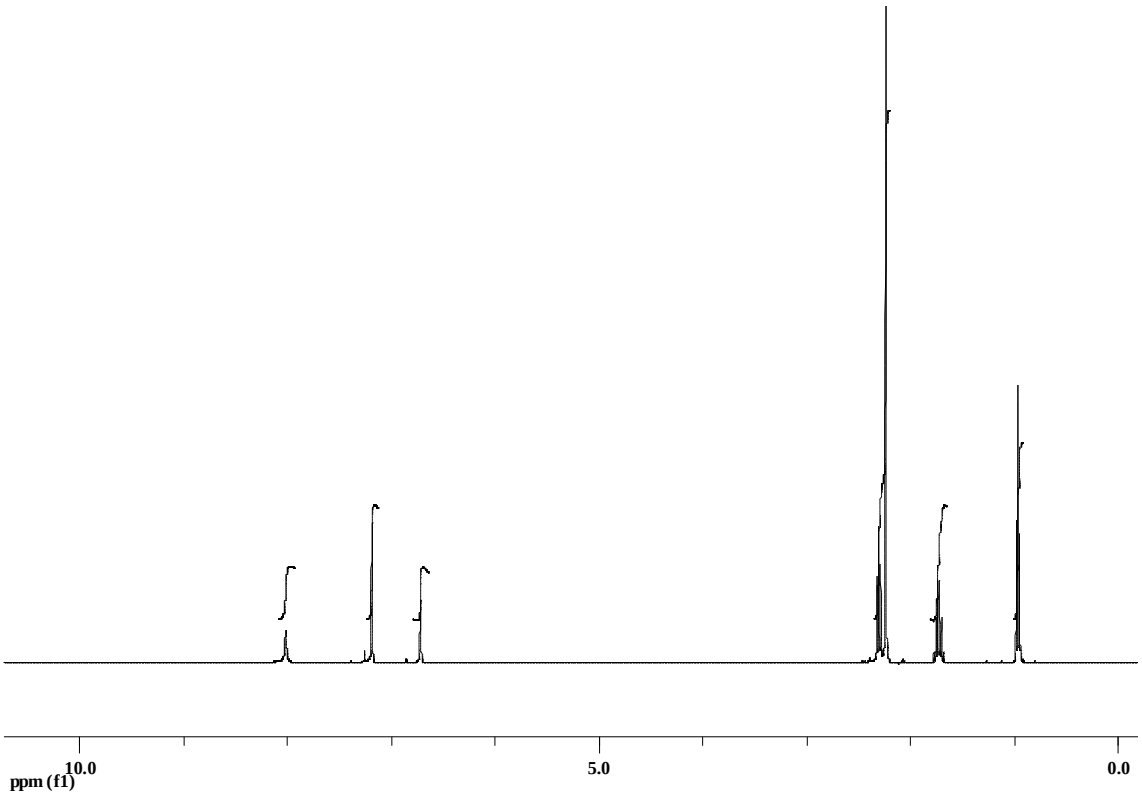


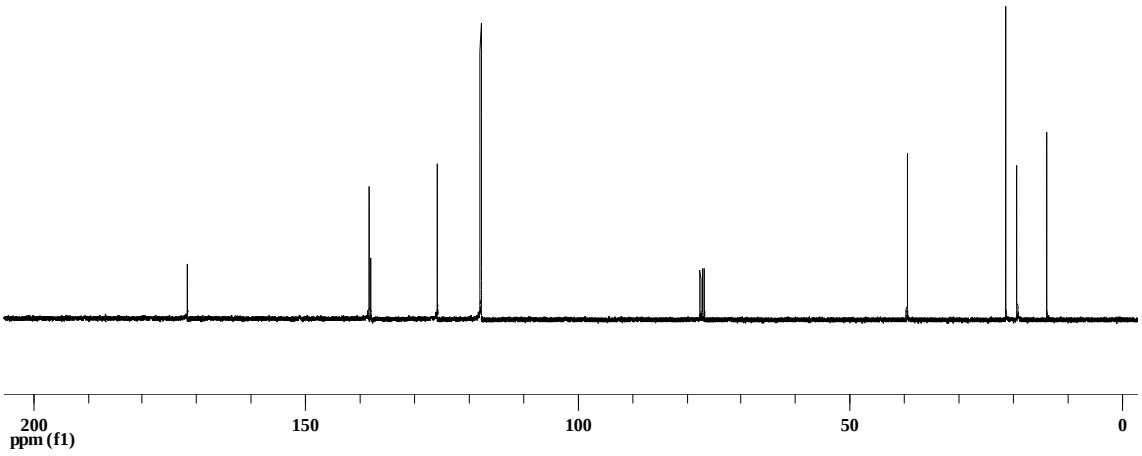
***N*-(4-Nitrophenyl)butyramide (3hd)**



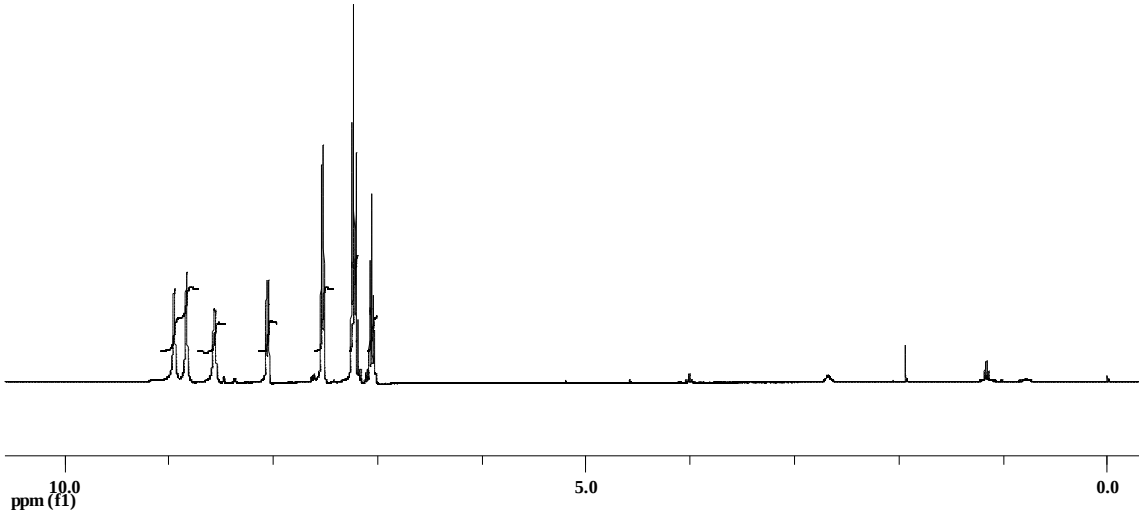


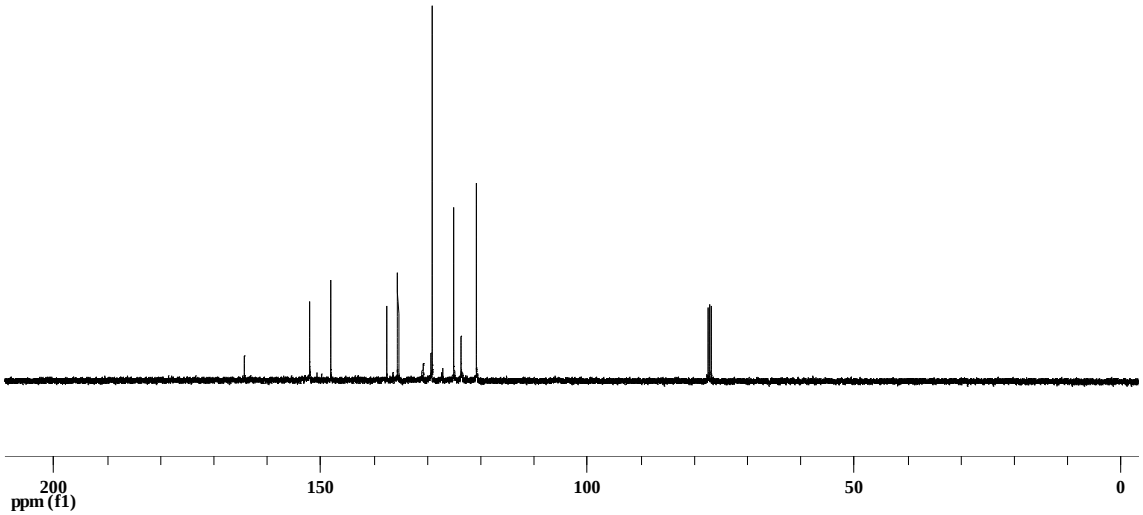
_N_-(3,5-Dimethylphenyl)butyramide (3hf)



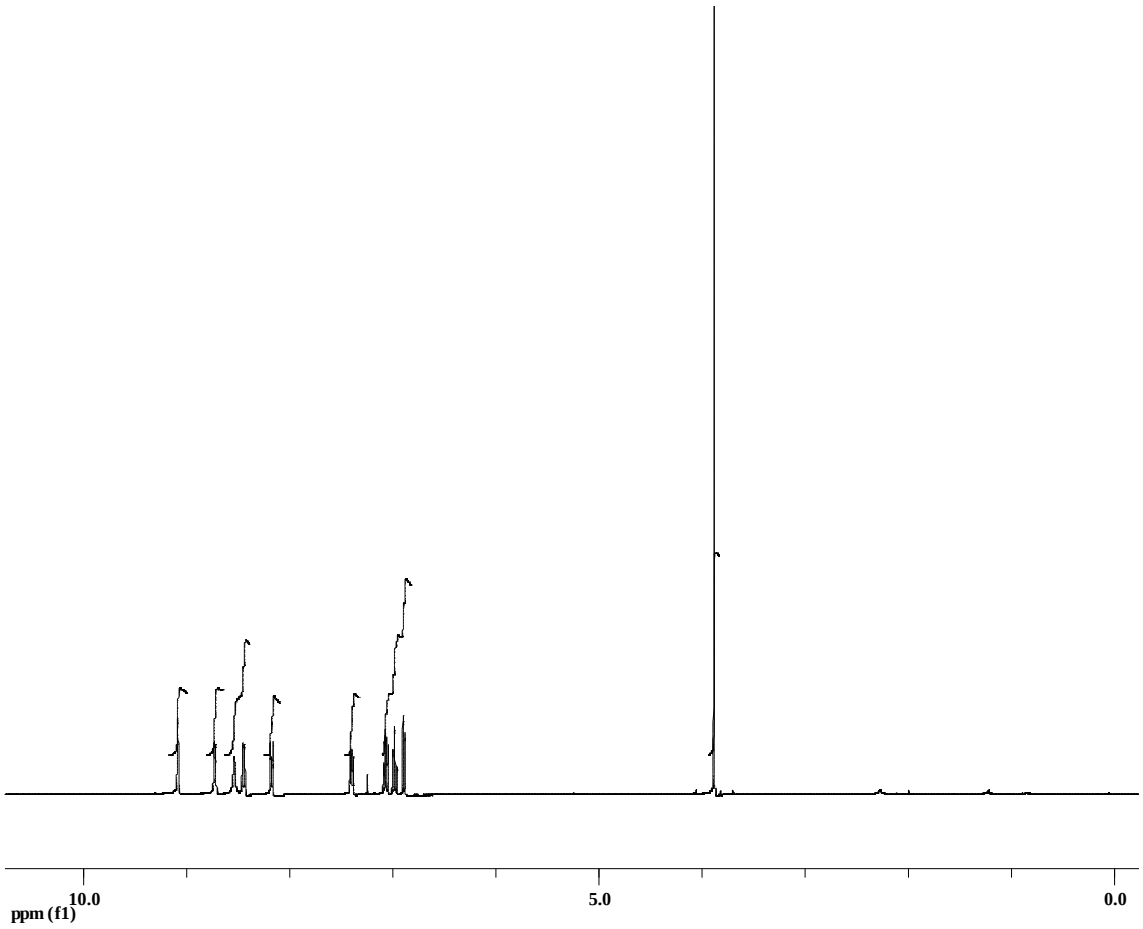


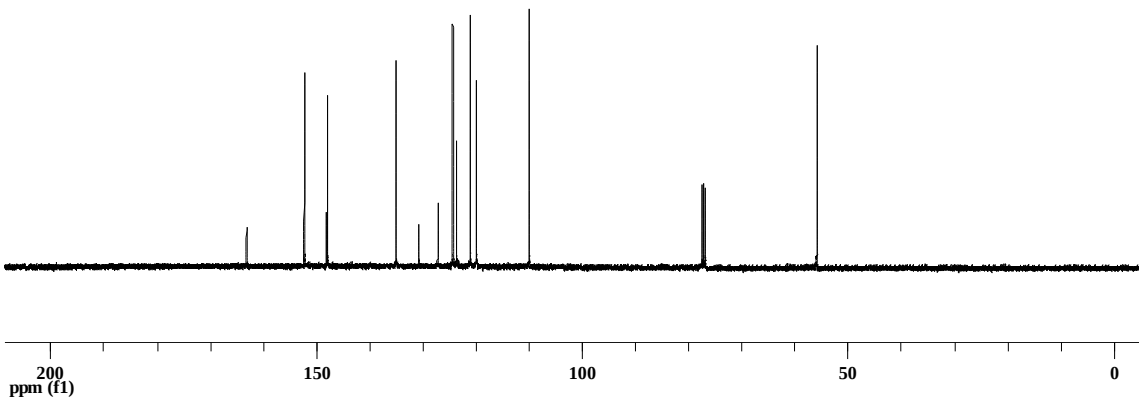
_N_-Phenylnicotinamide (3ha)



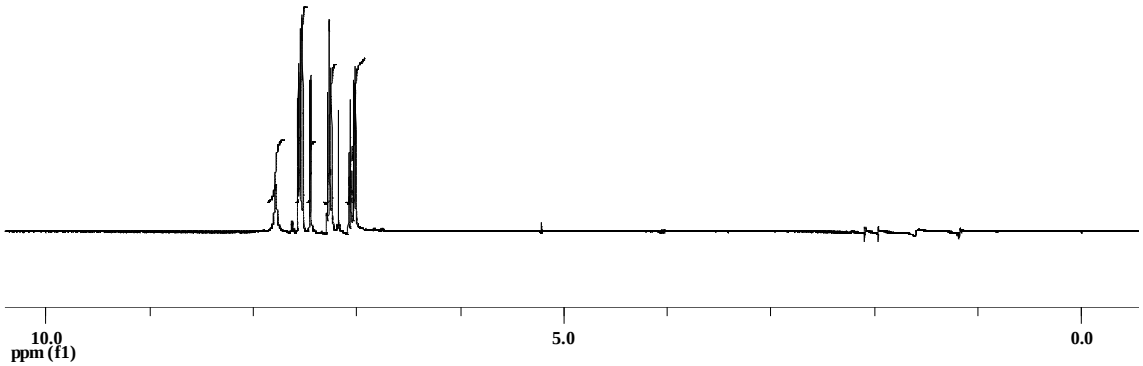


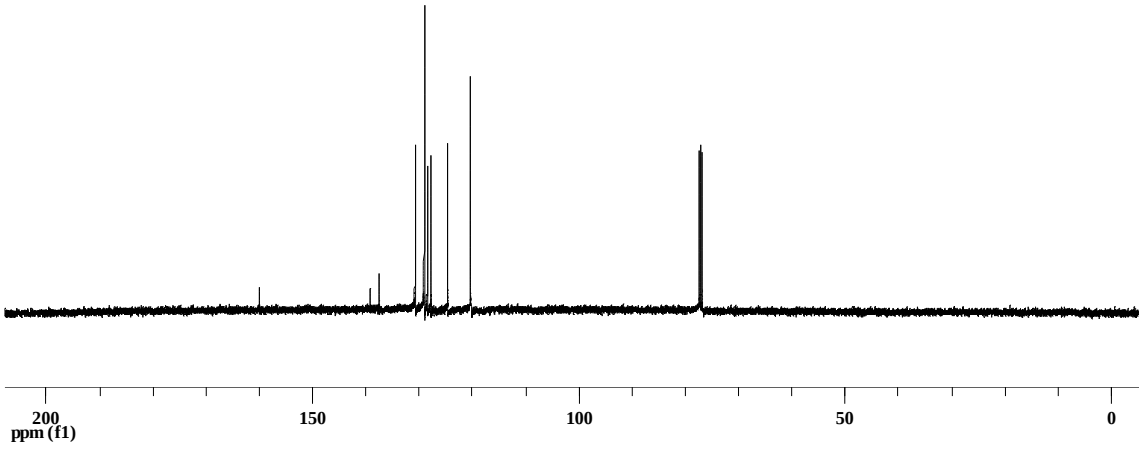
_N_-(2-Methoxyphenyl)nicotinamide (3ib)



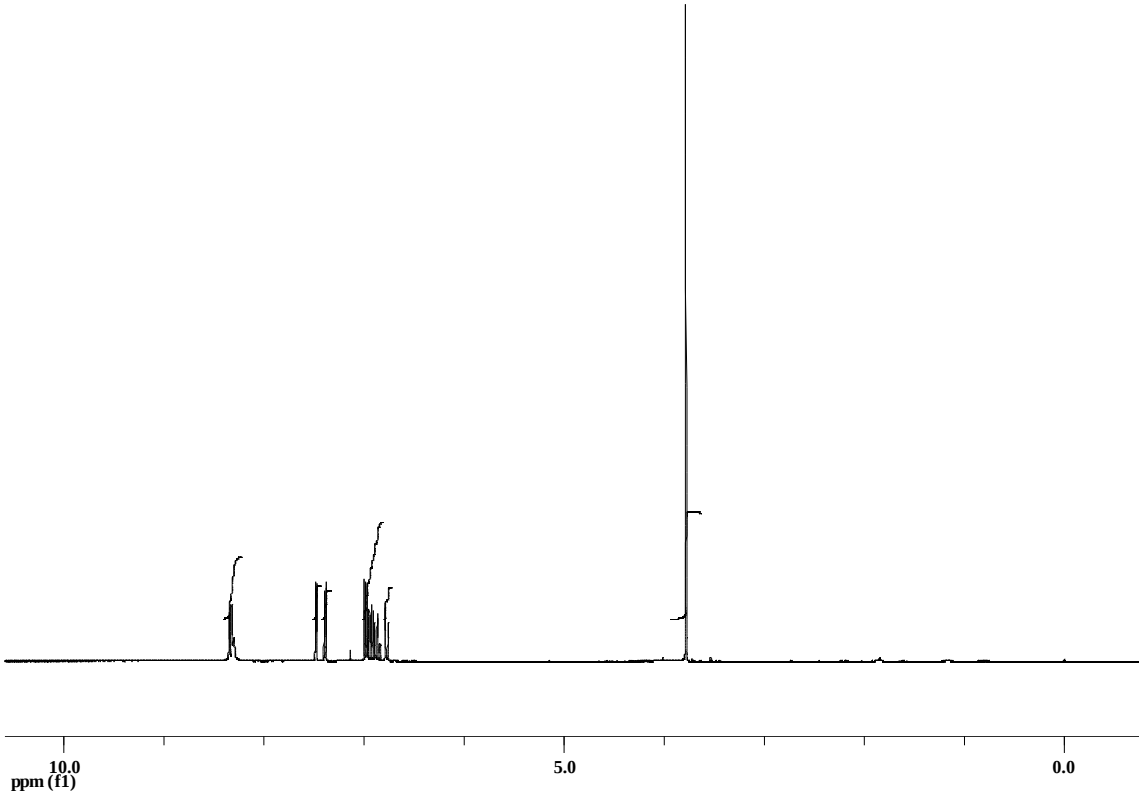


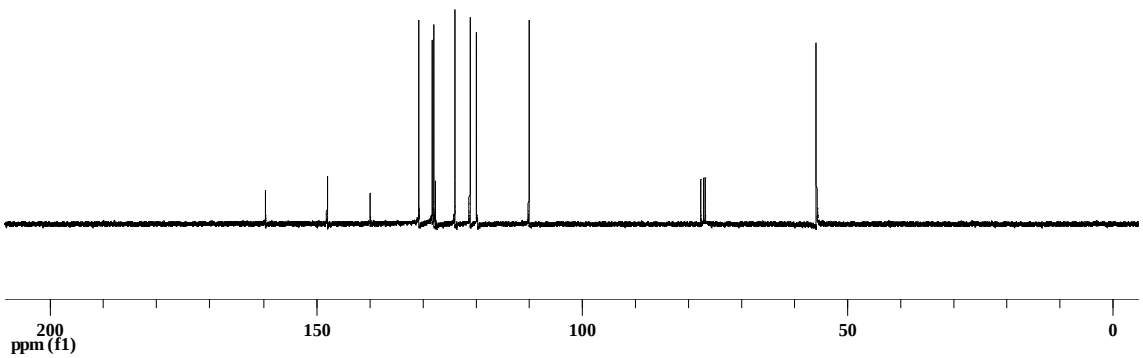
_N_-Phenyl-2-thiophenecarboxamide (3ia)



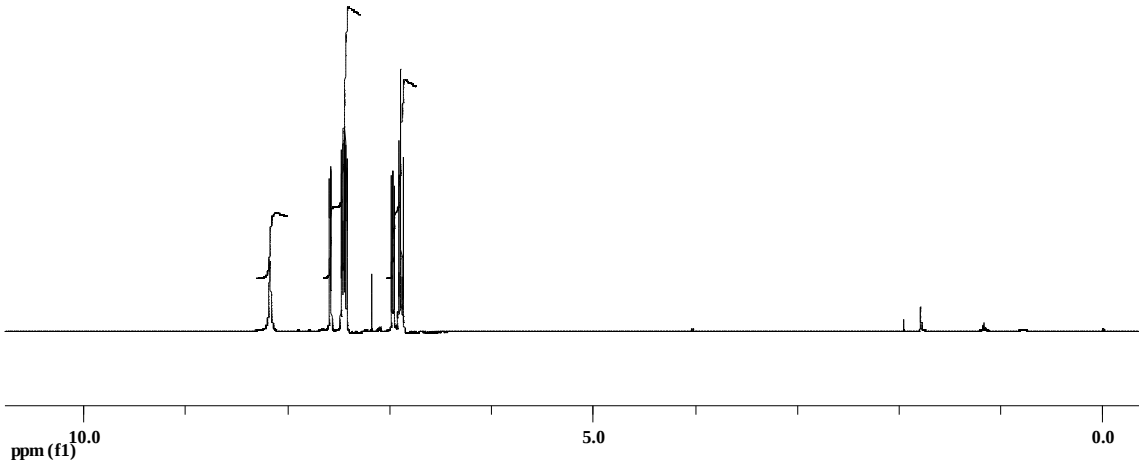


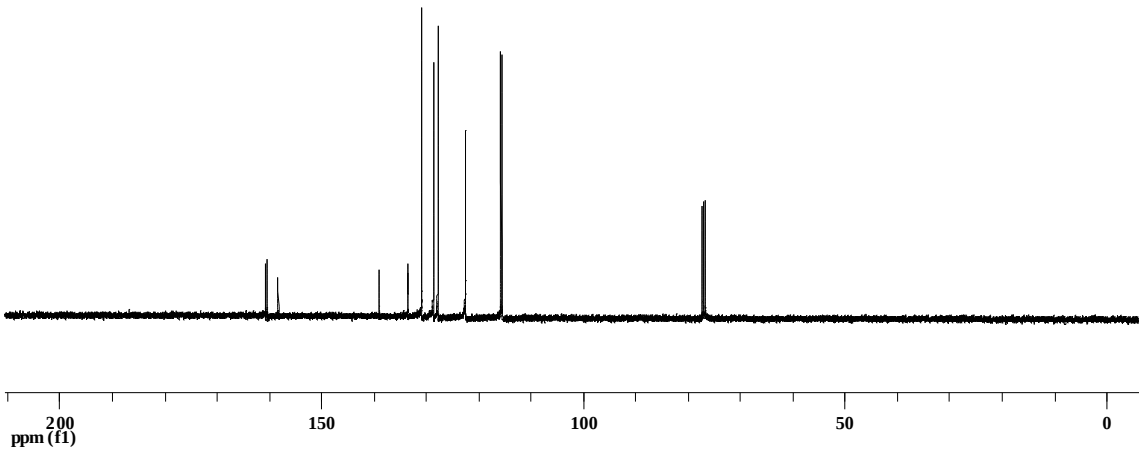
_N_-(2-Methoxyphenyl)-2-thiophenecarboxamide (3jb)



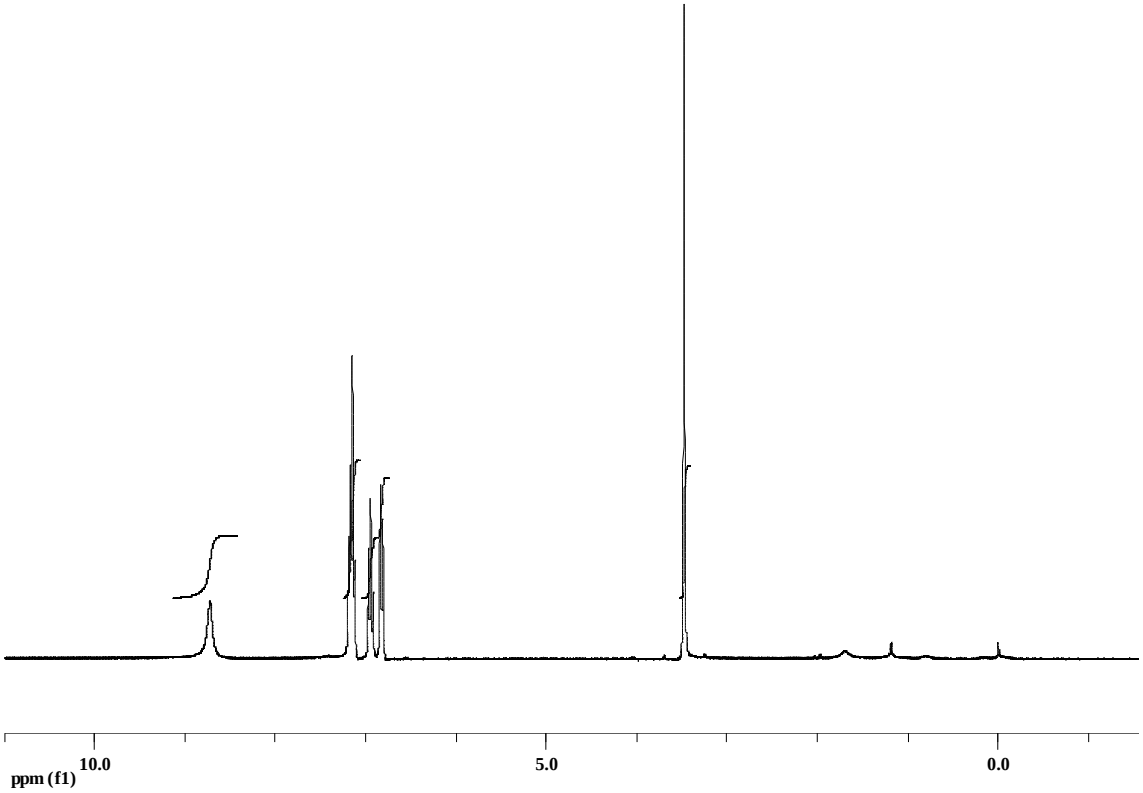


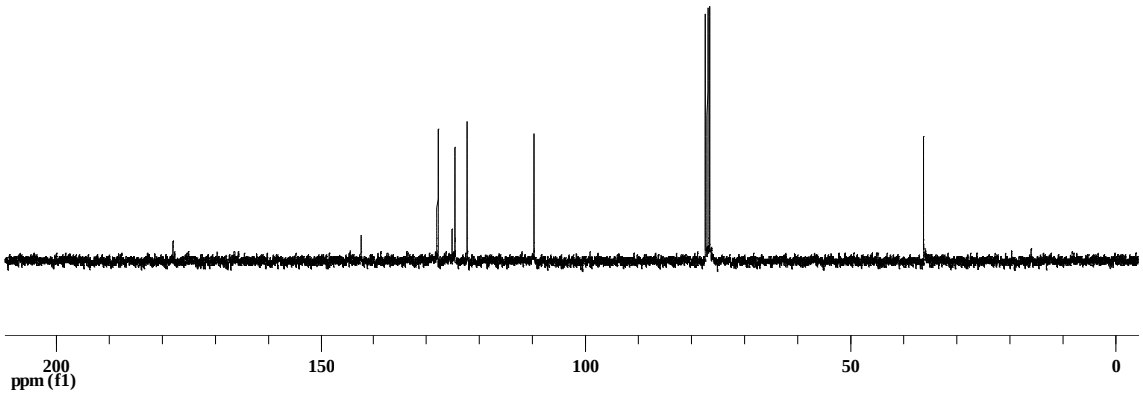
_N_-(4-Fluorophenyl)-2-thiophenecarboxamide (3jc)





2-**Oxindole (4a)**





3,4-Dihydro-2(1*H*)-quinolinone (4b)