



Supporting Information

for

Chemoselective *N*-acylation of indoles using thioesters as acyl source

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Experimental part and NMR spectra

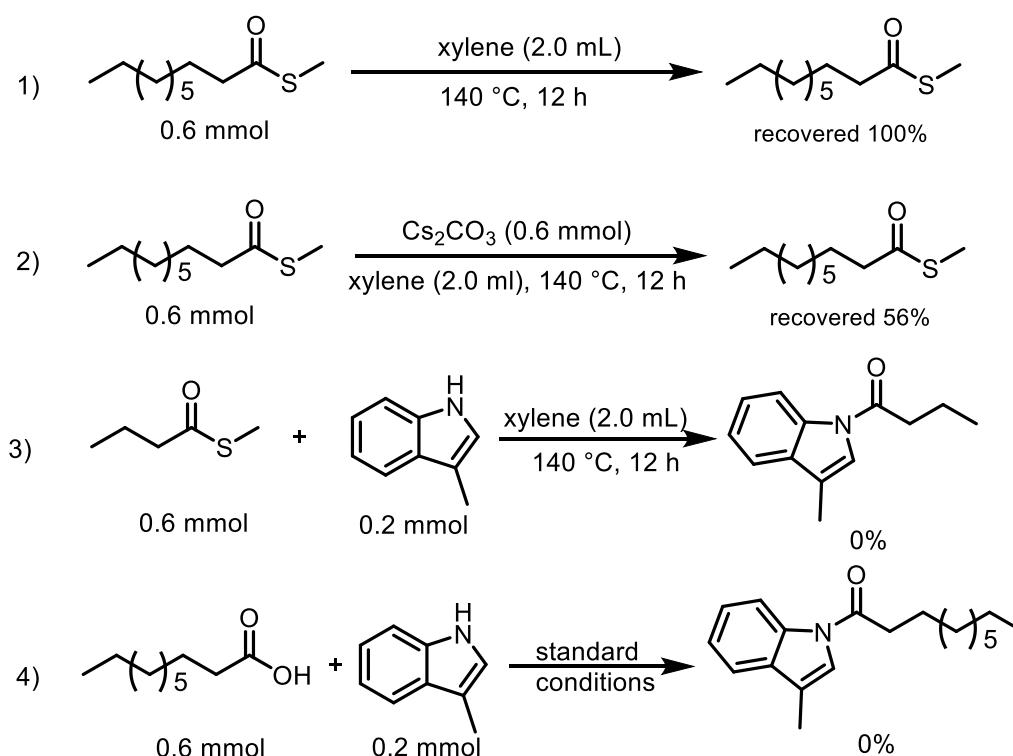
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General information

Most of the chemicals were purchased from Aladdin, Energy-Chemical, TCI or Alfa Aesar and used as such unless stated otherwise. NMR spectra were recorded on Bruker Avance 600 and Bruker ARX 400 spectrometers. Chemical shifts (ppm) are given relative to solvent: references for chloroform-*d* were 7.26 ppm (^1H NMR) and 77.00 ppm (^{13}C NMR). Multiplets were assigned as s (singlet), d (doublet), t (triplet), q (quartet), p (pentet), dd (doublet of doublet), m (multiplet), and br. s (broad singlet). ^{19}F NMR spectra were recorded on a Varian 400 instrument spectrometer. Chemical shifts (δ) were given in parts per million (ppm) and were measured downfield from internal tetramethylsilane. GC-yields were calculated using isooctane as internal standard. All measurements were carried out at room temperature unless otherwise stated. GC-MS analysis was performed on a Shimadzu 2010 instrument and Rtx-5 capillary column. High resolution mass spectra (HRMS) were recorded on Agilent 6210. The data are given as mass units per charge (m/z). Gas chromatography analysis was performed on a Shimadzu 2010 instrument with a FID detector and Rtx-5 capillary column. The starting materials, *S*-methyl thiolates (except **2a**) were prepared according the previous literature.¹ The products were isolated from the reaction mixture by column chromatography on silica gel 60, 0.063–0.2 mm, 70–230 mesh (Merck).

Control experiments.



(1) A 25 mL tube was charged with *S*-methyl decanethioate (121.2 mg, 0.6 mmol) and xylene (2.0 mL) and an oven-dried stirring bar. The reaction was heated under 140 °C for 12 hours. Afterwards, the reaction was cooled to room temperature, and 50 μL *n*-

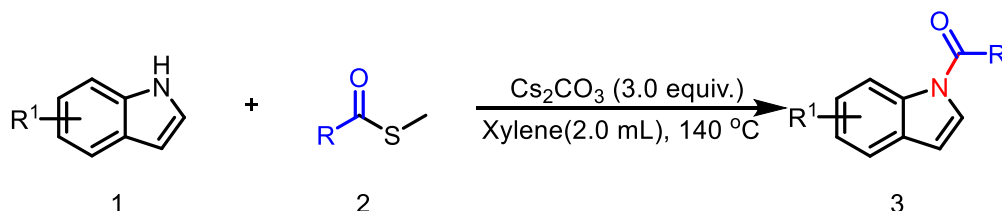
dodecane was added. Yield was determined by GC using *n*-dodecane as internal standard.

(2) A 25 mL tube was charged with *S*-methyl decanethioate (121.2 mg, 0.6 mmol, 1.0 equiv) and Cs₂CO₃ (195.6 mg, 0.6 mmol, 1.0 equiv) and xylene (2.0 mL) and an oven-dried stirring bar. The reaction was heated under 140 °C for 12 hours. Afterwards, the reaction is cooled to room temperature, and 50 µL *n*-dodecane was added. Yield was determined by GC using *n*-dodecane as internal standard.

(3) A 25 mL tube was charged with *S*-methyl butanethioate (70.8 mg, 0.6 mmol, 3.0 equiv), 3-methyl-1*H*-indole (26.2 mg, 0.2 mmol, 1.0 equiv), xylene (2.0 mL) and an oven-dried stirring bar. The reaction was heated under 140 °C for 12 hours. Afterwards, the reaction is cooled to room temperature, and 50 µL *n*-dodecane was added. Yield was determined by GC using *n*-dodecane as internal standard.

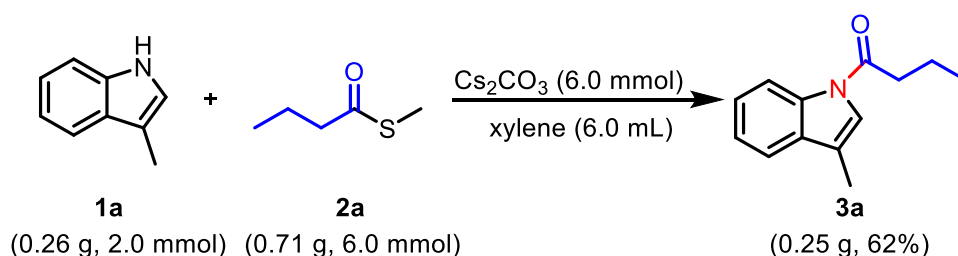
(4) A 25 mL tube was charged with decanoic acid (103.2 mg, 0.6 mmol, 3.0 equiv), 3-methyl-1*H*-indole (26.2 mg, 0.2 mmol, 1.0 equiv), xylene (2.0 mL) and an oven-dried stirring bar. The reaction was heated under 140 °C for 12 hours. Afterwards, the reaction is cooled to room temperature, and 50 µL *n*-dodecane was added. Yield was determined by GC using *n*-dodecane as internal standard.

General procedure for indoleamide



A 25 mL tube was charged with **1** (0.2 mmol, 1.0 equiv), **2** (0.6 mmol, 3.0 equiv), Cs₂CO₃ (0.6 mmol, 3.0 equiv) and xylene (2.0 mL) was added. The reaction was heated under 140 °C for 12 hours. Afterward, the reaction is cooled to room temperature. After removal of the solvent under reduced pressure, the pure product **3** was obtained by column chromatography on silica gel (eluent: pentane).

Gram scale

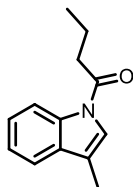


A 25 mL tube was charged with **1a** (0.26g, 2.0 mmol, 1.0 equiv), **2** (0.71g, 6.0

mmol, 1.0 equiv), Cs₂CO₃ (1.96 g, 6.0 mmol, 3.0 equiv) and xylene (6.0 mL) was added. The reaction was heated under 140 °C for 12 hours. Afterward, the reaction was cooled to room temperature. After removal of the solvent under reduced pressure, the pure product was obtained by column chromatography on silica gel (eluent: pentane).

Product Characterization

1-(3-Methyl-1*H*-indol-1-yl)butan-1-one (3a)²

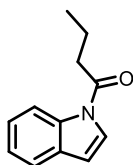


White solid, yield 97%

¹H NMR (600 MHz, Chloroform-*d*) δ = 8.48 – 8.40 (m, 1H), 7.50 (d, *J* = 7.6 Hz, 1H), 7.35 (t, *J* = 7.4 Hz, 1H), 7.29 (t, *J* = 7.2 Hz, 1H), 7.23 (s, 1H), 2.85 (t, *J* = 7.3 Hz, 2H), 2.29 (s, 3H), 1.87 (q, *J* = 7.4 Hz, 2H), 1.07 (t, *J* = 7.4 Hz, 3H).

¹³C NMR (151 MHz, Chloroform-*d*) δ = 171.04, 135.91, 131.30, 125.07, 123.23, 121.59, 118.71, 118.11, 116.62, 37.75, 18.17, 13.79, 9.67.

1-(1*H*-indol-1-yl)butan-1-one (3b)³

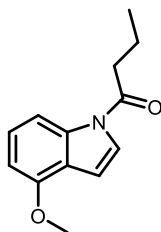


Colorless oil, yield 72%.

¹H NMR (600 MHz, Chloroform-*d*) δ = 8.48 (d, *J* = 8.1, 1H), 7.57 (d, *J* = 7.7, 1H), 7.47 (d, *J* = 3.3, 1H), 7.35 (t, *J* = 7.7, 1H), 7.30 – 7.24 (m, 1H), 6.64 (d, *J* = 3.6, 1H), 2.89 (t, *J* = 7.3, 2H), 1.88 (h, *J* = 7.3, 2H), 1.08 (t, *J* = 7.4, 3H).

¹³C NMR (151 MHz, Chloroform-*d*) δ = 171.41, 135.61, 130.31, 124.99, 124.56, 123.48, 120.78, 116.62, 108.89, 37.73, 18.12, 13.74.

1-(4-Methoxy-1*H*-indol-1-yl)butan-1-one (3c)

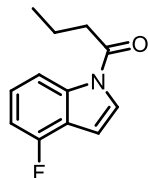


White solid, yield 94%

¹H NMR (600 MHz, Chloroform-*d*) δ = 8.07 (d, *J* = 8.3, 1H), 7.36 (d, *J* = 3.6, 1H), 7.29 – 7.26 (m, 1H), 6.76 (d, *J* = 3.7, 1H), 6.71 (d, *J* = 8.0, 1H), 3.94 (s, 3H), 2.87 (t, *J* = 7.3, 2H), 1.87 (h, *J* = 7.4, 2H), 1.07 (t, *J* = 7.4, 3H).

¹³C NMR (151 MHz, Chloroform-*d*) δ = 171.55, 152.75, 136.84, 125.95, 123.03, 120.53, 109.69, 105.89, 103.98, 55.34, 37.76, 18.08, 13.72.
HRMS (ESI) calcd for $[M + H]^+$ (C₁₃H₁₆O₂N), 218.1176; found, 218.1175.

1-(4-Fluoro-1*H*-indol-1-yl)butan-1-one (3d)



White solid, yield 85%

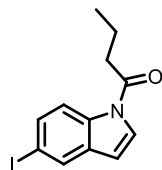
¹H NMR (600 MHz, Chloroform-*d*) δ = 8.24 (d, *J* = 8.3, 1H), 7.44 (d, *J* = 3.8, 1H), 7.31 – 7.26 (m, 1H), 6.98 – 6.92 (m, 1H), 6.74 (d, *J* = 3.8, 1H), 2.89 (t, *J* = 7.3, 2H), 1.91 – 1.84 (m, 2H), 1.07 (t, *J* = 7.4, 3H).

¹³C NMR (151 MHz, Chloroform-*d*) δ = 171.38, 155.60 (*J* = 124.58), 125.87, 125.82, 124.50, 112.66, 108.87, 108.75, 104.39, 37.74, 18.02, 13.67.

¹⁹F NMR (564 MHz, Chloroform-*d*) δ = -122.11.

HRMS (ESI) calcd for $[M + H]^+$ (C₁₂H₁₃ONF), 206.0976; found, 206.0975.

1-(5-Iodo-1*H*-indol-1-yl)butan-1-one (3e)



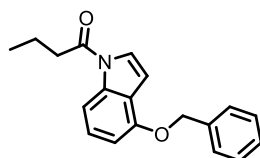
White solid, yield 67%

¹H NMR (600 MHz, Chloroform-*d*) δ = 8.23 (d, *J* = 8.7, 1H), 7.89 (d, *J* = 1.0, 1H), 7.61 – 7.60 (m, 1H), 7.41 (d, *J* = 3.5, 1H), 6.54 (d, *J* = 3.5, 1H), 2.86 (t, *J* = 7.3, 2H), 1.92 – 1.80 (m, 2H), 1.07 (t, *J* = 7.4, 3H).

¹³C NMR (151 MHz, Chloroform-*d*) δ = 171.30, 134.85, 133.48, 132.56, 129.60, 125.29, 118.41, 107.84, 87.63, 37.61, 18.01, 13.74.

HRMS (ESI) calcd for $[M + H]^+$ (C₁₂H₁₃ONI), 314.0036; found, 314.0033.

1-(4-(Benzyloxy)-1*H*-indol-1-yl)butan-1-one (3f)



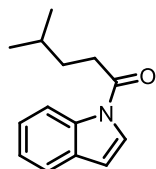
White solid, yield 97%

¹H NMR (600 MHz, Chloroform-*d*) δ 8.11 (d, *J* = 8.2 Hz, 1H), 7.50 (d, *J* = 7.5 Hz, 2H), 7.42 (t, *J* = 7.5 Hz, 2H), 7.39 – 7.33 (m, 2H), 7.27 (t, *J* = 8.2 Hz, 1H), 6.84 (d, *J* = 3.6 Hz, 1H), 6.79 (d, *J* = 8.0 Hz, 1H), 5.21 (s, 2H), 2.88 (t, *J* = 7.3 Hz, 2H), 1.88 (h, *J* = 7.4 Hz, 2H), 1.09 (t, *J* = 7.4 Hz, 3H).

¹³C NMR (151 MHz, Chloroform-*d*) δ = 171.57, 151.92, 137.16, 136.95, 128.54, 127.90, 127.36, 125.96, 123.14, 120.96, 109.99, 106.12, 105.53, 70.11, 37.77, 18.09, 13.77.

HRMS (ESI) calcd for $[M + H]^+$ (C₁₉H₂₀O₂N), 294.1489; found, 294.1487.

1-(1*H*-indol-1-yl)-4-methylpentan-1-one (3g)



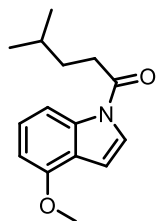
Yellow solid, yield 75%

¹H NMR (600 MHz, Chloroform-*d*) δ = 8.46 (d, *J* = 8.3, 1H), 7.56 (d, *J* = 7.7, 1H), 7.47 (d, *J* = 3.7, 1H), 7.37 – 7.32 (m, 1H), 7.28 – 7.26 (m, 1H), 6.63 (d, *J* = 3.7, 1H), 2.94 – 2.86 (m, 2H), 1.78 – 1.67 (m, 3H), 0.98 (d, *J* = 6.4, 6H).

¹³C NMR (151 MHz, Chloroform-*d*) δ = 171.73, 135.64, 130.31, 125.03, 124.59, 123.49, 120.72, 116.60, 108.91, 33.90, 33.51, 27.68, 22.30.

HRMS (ESI) calcd for $[M + Na]^+$ (C₁₄H₁₇ONNa), 238.1202; found, 238.1200.

1-(4-Methoxy-1*H*-indol-1-yl)-4-methylpentan-1-one (3h)



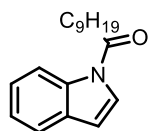
White solid, yield 89%

¹H NMR (600 MHz, Chloroform-*d*) δ = 8.05 (d, *J*=8.3, 1H), 7.37 (d, *J*=3.7, 1H), 7.26 (d, *J* = 10.1, 1H), 6.76 (d, *J* = 3.7, 1H), 6.71 (d, *J*=8.0, 1H), 3.93 (s, 3H), 2.93 – 2.85 (m, 2H), 1.77 – 1.66 (m, 3H), 0.97 (d, *J* = 6.3, 6H).

¹³C NMR (151 MHz, Chloroform-*d*) δ = 171.87, 152.75, 136.87, 125.98, 123.05, 120.55, 109.70, 105.92, 104.00, 55.39, 33.94, 33.47, 27.67, 22.28.

HRMS (ESI) calcd for $[M + Na]^+$ (C₁₅H₁₉O₂NNa), 268.1308; found, 268.1306.

1-(1*H*-Indol-1-yl)decan-1-one (3i)

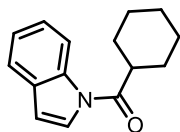


Colorless oil, yield 74%.

¹H NMR (600 MHz, Chloroform-*d*) δ = 8.47 (d, *J* = 8.2 Hz, 1H), 7.56 (d, *J* = 7.7 Hz, 1H), 7.45 (d, *J* = 3.6 Hz, 1H), 7.35 (t, *J* = 7.7 Hz, 1H), 7.32 – 7.22 (m, 1H), 6.62 (d, *J* = 3.7 Hz, 1H), 2.89 (t, *J* = 7.5 Hz, 2H), 1.86 – 1.81 (m, 2H), 1.46 – 1.41 (m, 2H), 1.39 – 1.34 (m, 2H), 1.37 – 1.23 (m, 8H), 0.89 (t, *J* = 6.9 Hz, 3H).

¹³C NMR (151 MHz, Chloroform-*d*) δ = 171.55, 135.64, 130.33, 125.00, 124.61, 123.48, 120.71, 116.60, 108.87, 35.88, 31.82, 29.39, 29.35, 29.21, 24.69, 22.61, 14.02.

Cyclohexyl(1*H*-indol-1-yl)methanone (3j)⁴

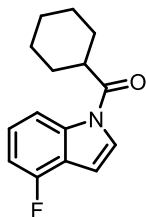


Pink solid, yield 63%

¹H NMR (600 MHz, Chloroform-*d*) δ 8.49 (d, *J* = 8.3 Hz, 1H), 7.55 (d, *J* = 7.7 Hz, 1H), 7.50 (d, *J* = 3.7 Hz, 1H), 7.34 (t, *J* = 7.8 Hz, 1H), 7.28 – 7.24 (m, 1H), 6.63 (d, *J* = 3.5 Hz, 1H), 3.00 (tt, *J* = 11.5, 3.3 Hz, 1H), 2.01 (d, *J* = 12.5 Hz, 2H), 1.93 – 1.85 (m, 2H), 1.80 – 1.64 (m, 3H), 1.48 – 1.29 (m, 3H).

¹³C NMR (151 MHz, Chloroform-*d*) δ = 174.82, 135.71, 130.38, 125.02, 124.52, 123.48, 120.62, 116.78, 108.81, 43.74, 29.56, 25.72, 25.62.

Cyclohexyl(4-fluoro-1*H*-indol-1-yl)methanone (3k)



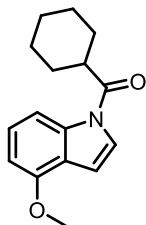
White solid, yield 70%

¹H NMR (600 MHz, Chloroform-*d*) δ 8.26 (d, *J* = 8.3 Hz, 1H), 7.47 (d, *J* = 3.7 Hz, 1H), 7.29 – 7.24 (m, 1H), 6.97 – 6.92 (m, 1H), 6.74 (d, *J* = 3.5 Hz, 1H), 2.99 (tt, *J* = 11.5, 3.2 Hz, 1H), 2.01 (d, *J* = 12.6 Hz, 2H), 1.89 (d, *J* = 13.3 Hz, 2H), 1.77 (d, *J* = 12.7 Hz, 1H), 1.69 (qd, *J* = 13.2, 2.9 Hz, 2H), 1.45 – 1.36 (m, 2H), 1.35 – 1.30 (m, 1H).

¹³C NMR (151 MHz, Chloroform-*d*) δ = 174.84, 155.55 (*J* = 124.58), 137.74, 125.84, 124.46, 119.20, 112.83, 108.84, 104.30, 43.81, 29.51, 25.66, 25.56.

HRMS (ESI) calcd for [M + H]⁺ (C₁₅H₁₇ONF), 246.1289; found, 246.1287.

Cyclohexyl(4-methoxy-1*H*-indol-1-yl)methanone (3l)



White solid, yield 75%

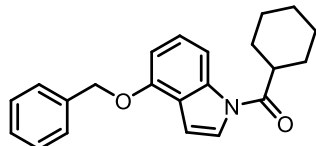
¹H NMR (600 MHz, Chloroform-*d*) δ 8.08 (d, *J* = 8.3 Hz, 1H), 7.41 (d, *J* = 3.7 Hz, 1H), 7.27 (t, *J* = 8.2 Hz, 1H), 6.77 (d, *J* = 3.7 Hz, 1H), 6.71 (d, *J* = 8.0 Hz, 1H), 3.94 (s, 3H), 3.00 (tt, *J* = 11.6, 3.2 Hz, 1H), 2.00 (d, *J* = 12.5 Hz, 2H), 1.88 (d, *J* = 13.3 Hz, 2H), 1.76

(d, $J = 12.6$ Hz, 1H), 1.68 (qd, $J = 13.1, 2.9$ Hz, 2H), 1.44 – 1.35 (m, 2H), 1.35 – 1.29 (m, 1H).

^{13}C NMR (151 MHz, Chloroform- d) $\delta = 174.96, 152.68, 136.93, 125.96, 122.99, 120.61, 109.88, 105.81, 103.98, 55.40, 43.80, 29.53, 25.72, 25.62$.

HRMS (ESI) calcd for $[\text{M} + \text{Na}^+]^+$ ($\text{C}_{16}\text{H}_{19}\text{O}_2\text{NNa}$), 280.1308; found, 280.1308.

(4-(Benzyloxy)-1*H*-indol-1-yl)(cyclohexyl)methanone (3m)



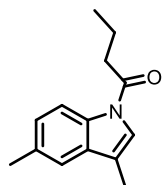
White solid, yield 72%

^1H NMR (600 MHz, Chloroform- d) $\delta = 8.10$ (d, $J = 8.3$ Hz, 1H), 7.48 (d, $J = 7.4$ Hz, 2H), 7.43 – 7.38 (m, 3H), 7.33 (t, $J = 7.3$ Hz, 1H), 7.28 – 7.22 (m, 1H), 6.83 (d, $J = 3.7$ Hz, 1H), 6.77 (d, $J = 8.0$ Hz, 1H), 5.21 (s, 2H), 3.02 – 2.99 (m, 1H), 2.01 (d, $J = 12.4$ Hz, 2H), 1.91 – 1.88 (m, 2H), 1.77 (d, $J = 12.5$ Hz, 1H), 1.73 – 1.66 (m, 2H), 1.47 – 1.26 (m, 3H).

^{13}C NMR (151 MHz, Chloroform- d) $\delta = 174.96, 151.85, 137.18, 137.05, 128.50, 127.85, 127.31, 125.93, 123.06, 121.04, 110.17, 106.03, 105.57, 70.16, 43.79, 29.55, 25.73, 25.62$.

HRMS (ESI) calcd for $[\text{M} + \text{H}]^+$ ($\text{C}_{22}\text{H}_{24}\text{O}_2\text{N}$), 334.1802; found, 334.1801.

1-(3,5-Dimethyl-1*H*-indol-1-yl)butan-1-one (3n)

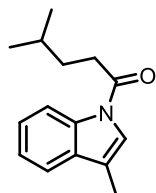


White solid, yield 65%

^1H NMR (600 MHz, Chloroform- d) $\delta = 8.31$ (d, $J = 5.8$, 1H), 7.27 (d, $J = 13.1$, 1H), 7.20 – 7.14 (m, 2H), 2.82 (t, $J = 7.4$, 2H), 2.46 (s, 3H), 2.26 (d, $J = 1.1$, 3H), 1.86 (h, $J = 7.4$ Hz, 2H), 1.06 (t, $J = 7.4$, 3H).

^{13}C NMR (151 MHz, Chloroform- d) $\delta = 170.80, 134.12, 132.75, 131.53, 126.27, 121.69, 118.68, 117.86, 116.25, 37.64, 21.34, 18.19, 13.76, 9.60$.

4-Methyl-1-(3-methyl-1*H*-indol-1-yl)pentan-1-one (3o)



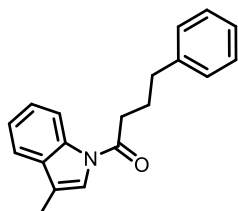
Colorless oil, yield 68%

¹H NMR (600 MHz, Chloroform-*d*) δ = 8.44 (d, *J* = 7.7, 1H), 7.49 (d, *J* = 7.6, 1H), 7.36 – 7.33 (m, 1H), 7.30 – 7.24 (m, 1H), 7.22 (s, 1H), 2.89 – 2.81 (m, 2H), 2.28 (d, *J* = 1.2, 3H), 1.77 – 1.66 (m, 3H), 0.97 (t, *J* = 6.6, 6H).

¹³C NMR (151 MHz, *cdcl*₃) δ = 171.36, 135.95, 131.29, 125.06, 123.20, 121.59, 118.68, 118.11, 116.63, 33.87, 33.54, 27.71, 22.31, 9.63.

HRMS (ESI) calcd for [M + H]⁺ (C₁₅H₂₀ON), 230.1539; found, 230.1538.

1-(3-Methyl-1*H*-indol-1-yl)-4-phenylbutan-1-one (3p)



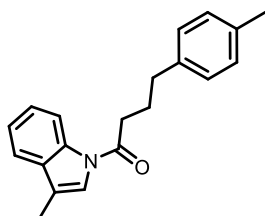
White solid, yield 93%.

¹H NMR (600 MHz, Chloroform-*d*) δ = 8.45 (s, 1H), 7.49 (d, *J* = 7.6, 1H), 7.38 – 7.27 (m, 4H), 7.26 – 7.21 (m, 3H), 7.11 (s, 1H), 2.86 (t, *J* = 7.4, 2H), 2.79 (t, *J* = 7.5, 2H), 2.26 (d, *J* = 1.1, 3H), 2.18 (p, *J* = 7.4 Hz, 2H).

¹³C NMR (151 MHz, Chloroform-*d*) δ = 170.80, 141.23, 135.90, 131.31, 128.51, 128.46, 126.08, 125.10, 123.27, 121.53, 118.72, 118.19, 116.61, 35.00, 34.84, 26.03, 9.64.

HRMS (ESI) calcd for [M + H]⁺ (C₁₉H₂₀ON), 278.1539; found, 278.1538.

1-(3-Methyl-1*H*-indol-1-yl)-4-(*p*-tolyl)butan-1-one (3q)



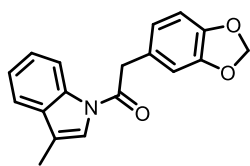
White solid, yield 76%

¹H NMR (600 MHz, Chloroform-*d*) δ = 8.46 (s, 1H), 7.51 – 7.47 (m, 1H), 7.38 – 7.23 (m, 3H), 7.17 – 7.07 (m, 4H), 2.91 – 2.80 (m, 2H), 2.77 – 2.72 (m, 2H), 2.39 – 2.30 (m, 3H), 2.30 – 2.23 (m, 3H), 2.19 – 2.13 (m, 2H).

¹³C NMR (151 MHz, Chloroform-*d*) δ = 170.88, 138.11, 135.90, 135.53, 131.30, 129.13, 128.39, 125.08, 123.25, 121.57, 118.70, 118.14, 116.61, 34.84, 34.55, 26.12, 20.97, 9.64.

HRMS (ESI) calcd for [M + H]⁺ (C₂₀H₂₂ON), 292.1696; found, 292.1694.

2-(Benzo[d][1,3]dioxol-5-yl)-1-(3-methyl-1*H*-indol-1-yl)ethan-1-one (3r)



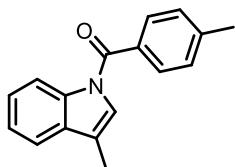
White solid, yield 85%

¹H NMR (600 MHz, dms-*d*6) δ = 8.29 (d, J = 8.0, 1H), 7.78 (s, 1H), 7.53 (d, J = 7.5, 1H), 7.31 – 7.24 (m, 2H), 6.92 (d, J = 0.8, 1H), 6.85 (d, J = 7.9, 1H), 6.80 (d, J = 7.9, 1H), 5.97 (s, 2H), 4.23 (s, 2H), 2.23 (s, 3H).

¹³C NMR (151 MHz, dms-*d*6) δ = 170.22, 147.65, 146.57, 135.79, 131.53, 128.38, 125.19, 123.79, 123.06, 119.37, 117.52, 116.37, 110.44, 108.58, 101.30, 41.64, 9.78.

HRMS (ESI) calcd for $[M + Na]^+$ (C₁₈H₁₅O₃NNa), 316.0944; found, 316.0942.

(3-Methyl-1*H*-indol-1-yl)(*p*-tolyl)methanone (3s)⁵

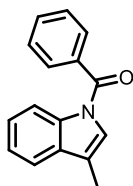


White solid, yield 93%

¹H NMR (600 MHz, Chloroform-*d*) δ = 8.36 (d, J = 8.2, 1H), 7.62 (d, J = 8.0, 2H), 7.53 (d, J = 7.8, 1H), 7.38 – 7.35 (m, 1H), 7.33 – 7.31 (m, 3H), 7.08 (d, J = 1.0, 1H), 2.45 (s, 3H), 2.25 (d, J = 1.2, 3H).

¹³C NMR (151 MHz, Chloroform-*d*) δ = 168.35, 142.15, 136.34, 132.12, 131.75, 129.15, 129.10, 124.80, 124.46, 123.47, 118.74, 117.48, 116.39, 21.51, 9.55.

(3-Methyl-1*H*-indol-1-yl)(phenyl)methanone (3t)⁶

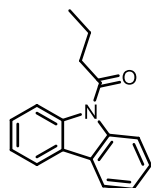


White solid, yield 96%

¹H NMR (600 MHz, Chloroform-*d*) δ = 8.41 (d, J = 8.1, 1H), 7.73 (d, J = 7.1, 2H), δ 7.60 (t, J = 7.4 Hz, 1H), 7.54 (q, J = 8.0, 7.4 Hz, 3H), 7.40 (t, J = 7.5 Hz, 1H), 7.35 (t, J = 7.3 Hz, 1H), 7.07 (s, 1H), 2.26 (s, 3H).

¹³C NMR (151 MHz, Chloroform-*d*) δ = 168.34, 136.31, 135.00, 131.82, 131.56, 128.99, 128.48, 125.01, 124.33, 123.65, 118.82, 117.84, 116.50, 9.61.

1-(9*H*-carbazol-9-yl)butan-1-one (3u)⁷



White solid, yield 84%

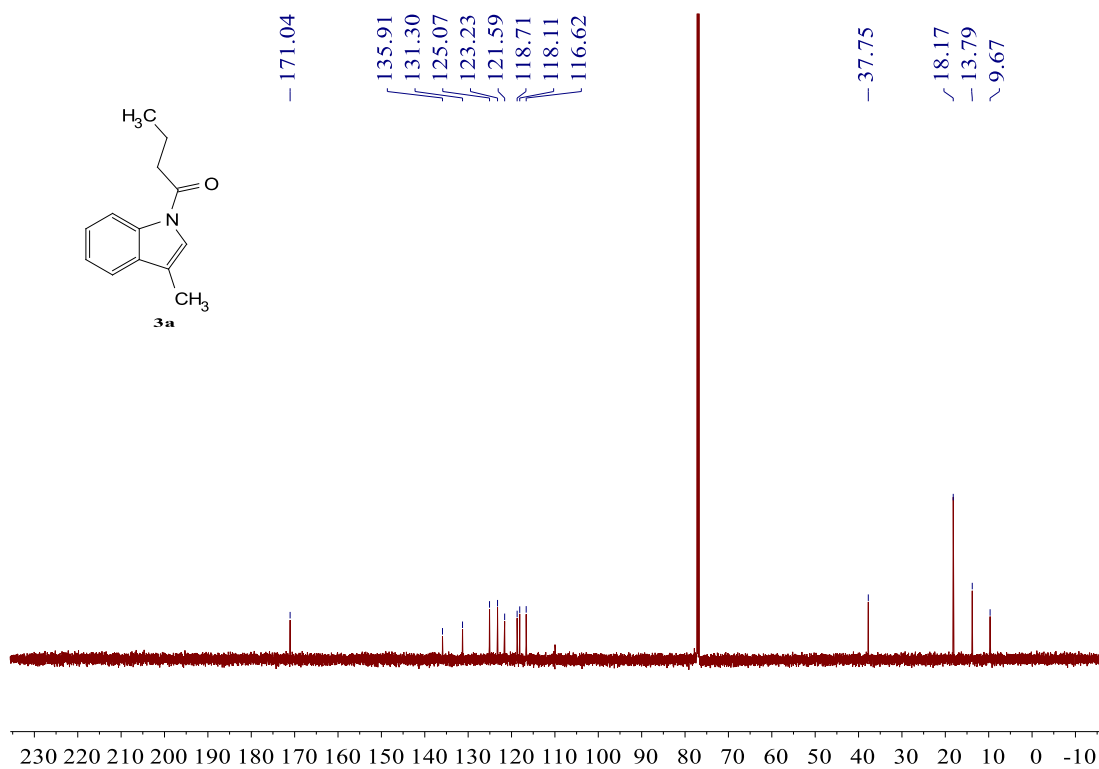
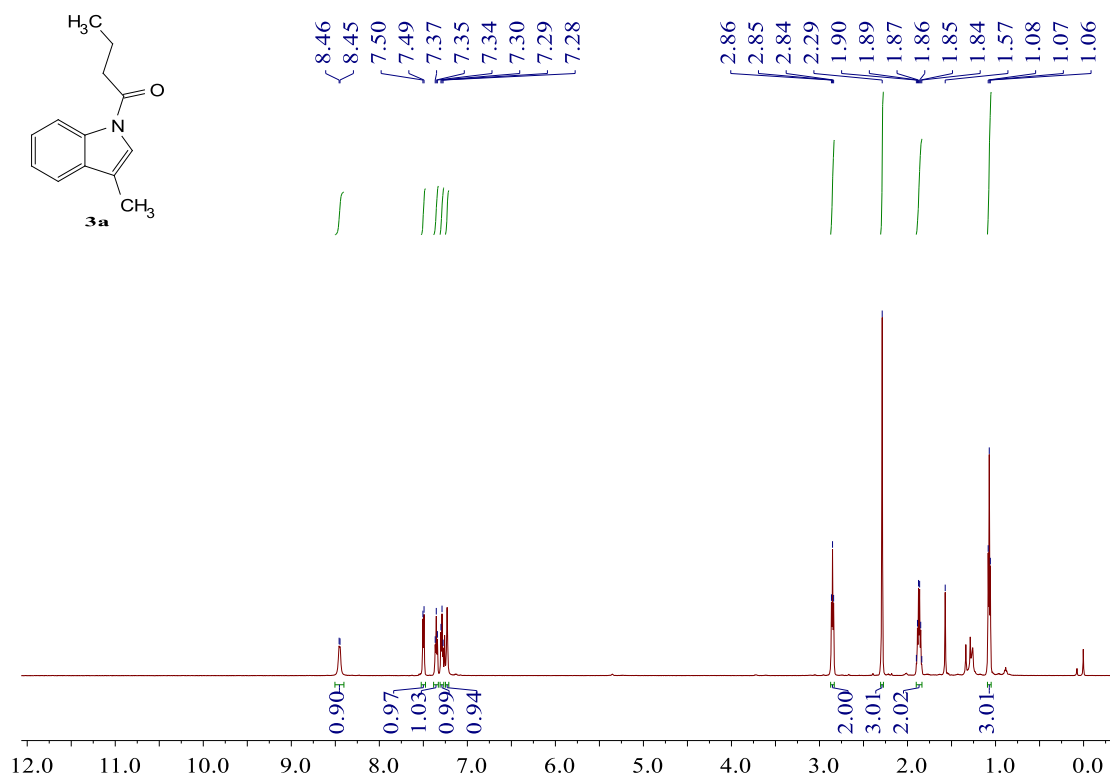
¹H NMR (600 MHz, Chloroform-*d*) δ 8.22 (d, *J* = 8.4 Hz, 2H), 7.98 (d, *J* = 7.6 Hz, 2H), 7.47 (t, *J* = 7.8 Hz, 2H), 7.37 (t, *J* = 7.4 Hz, 2H), 3.10 (t, *J* = 7.2 Hz, 1H), 1.97 (h, *J* = 7.3 Hz, 1H), 1.13 (t, *J* = 7.4 Hz, 1H).

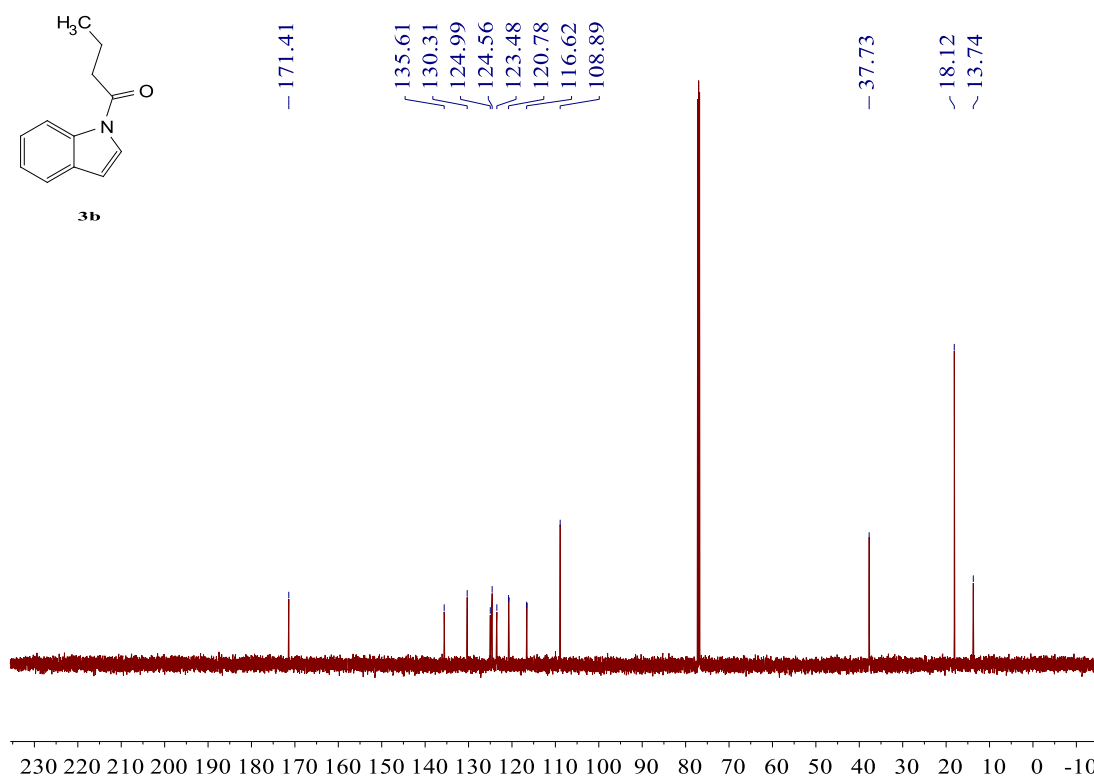
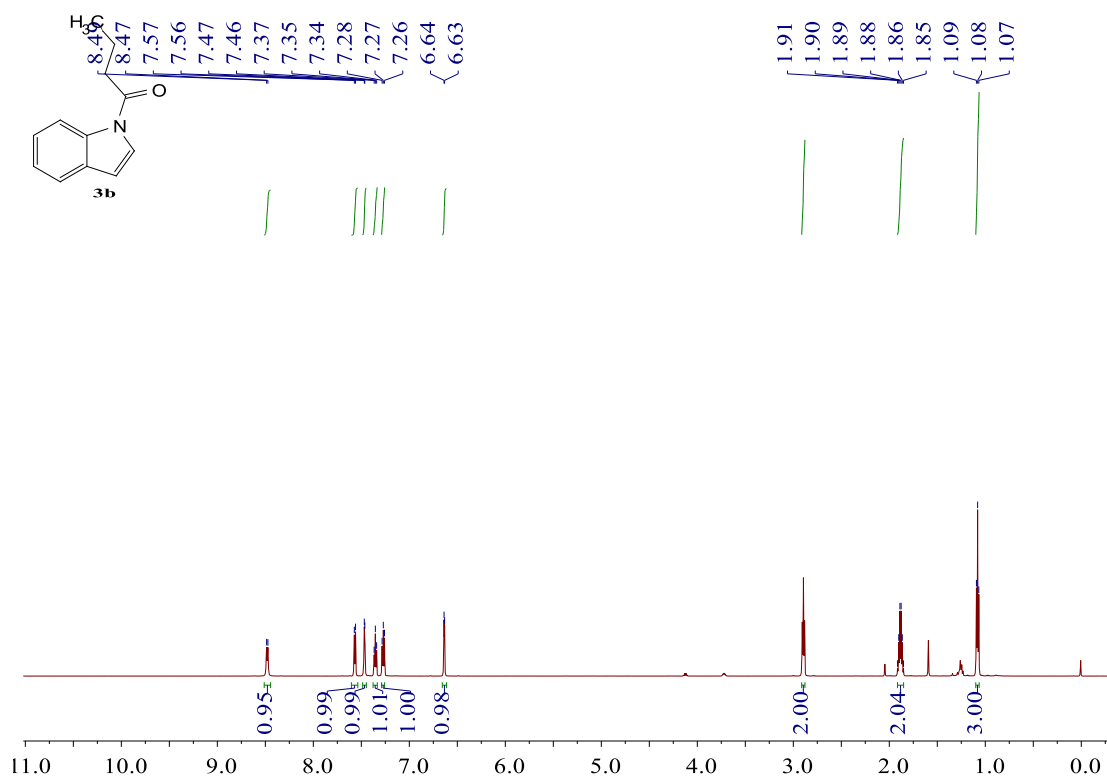
¹³C NMR (151 MHz, Chloroform-*d*) δ = 173.09, 138.58, 127.21, 126.37, 123.43, 119.72, 116.38, 41.00, 18.13, 13.77.

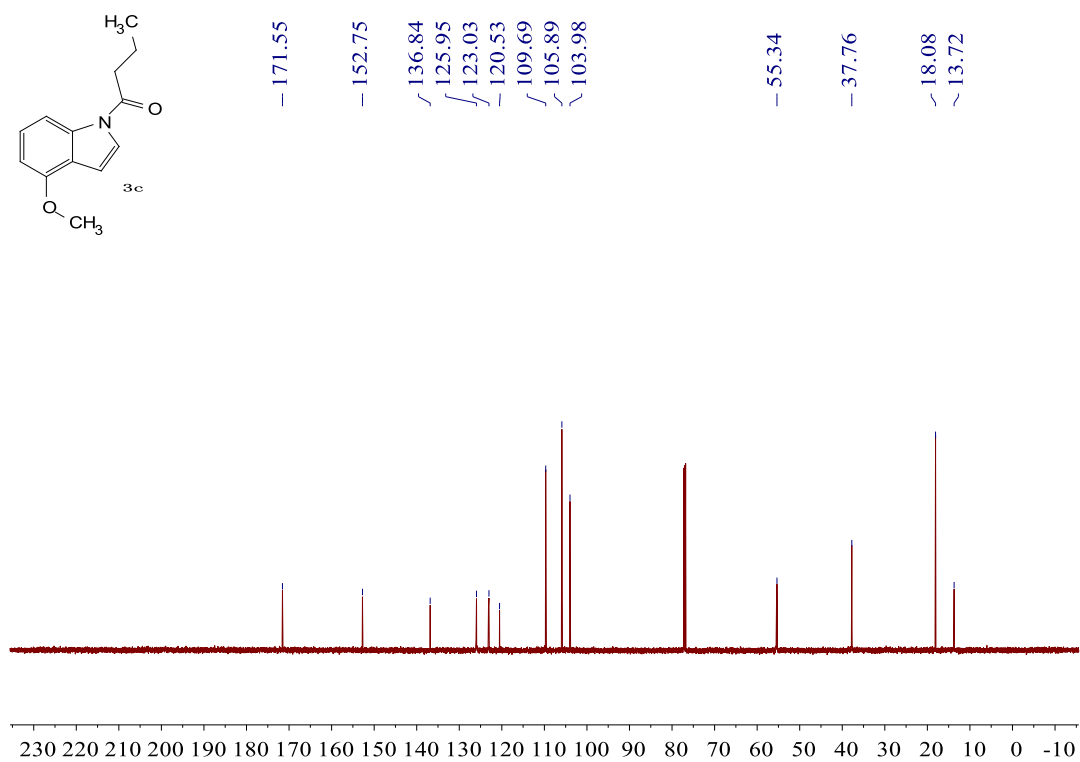
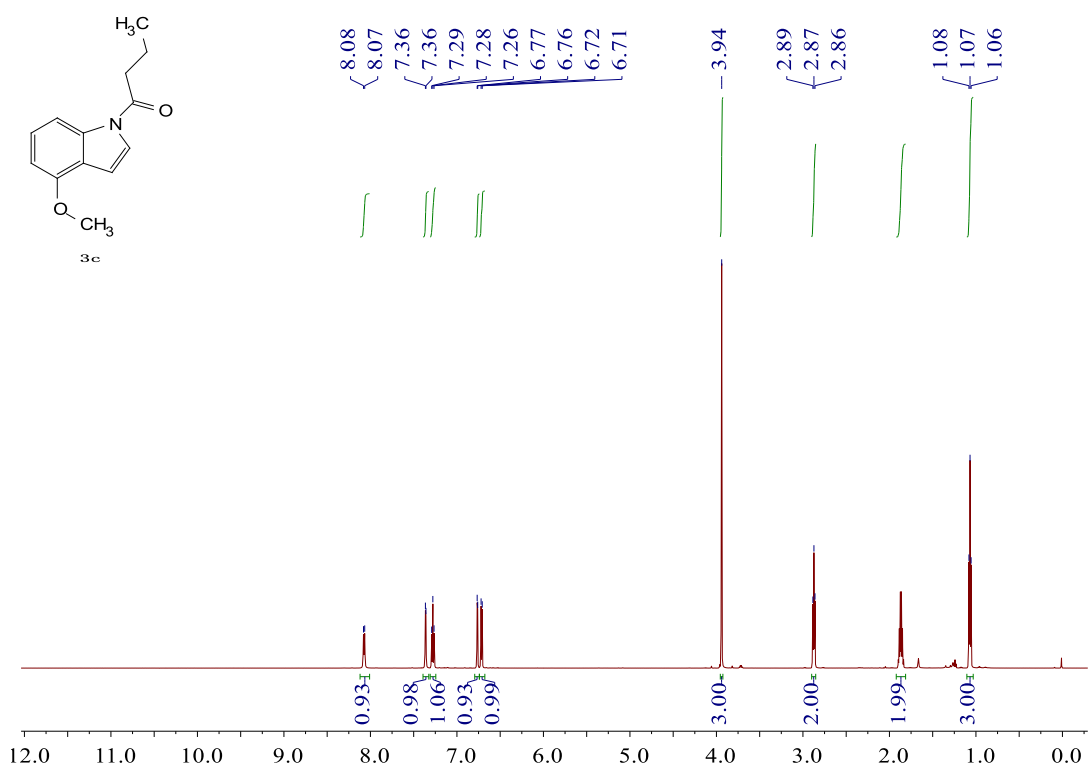
References

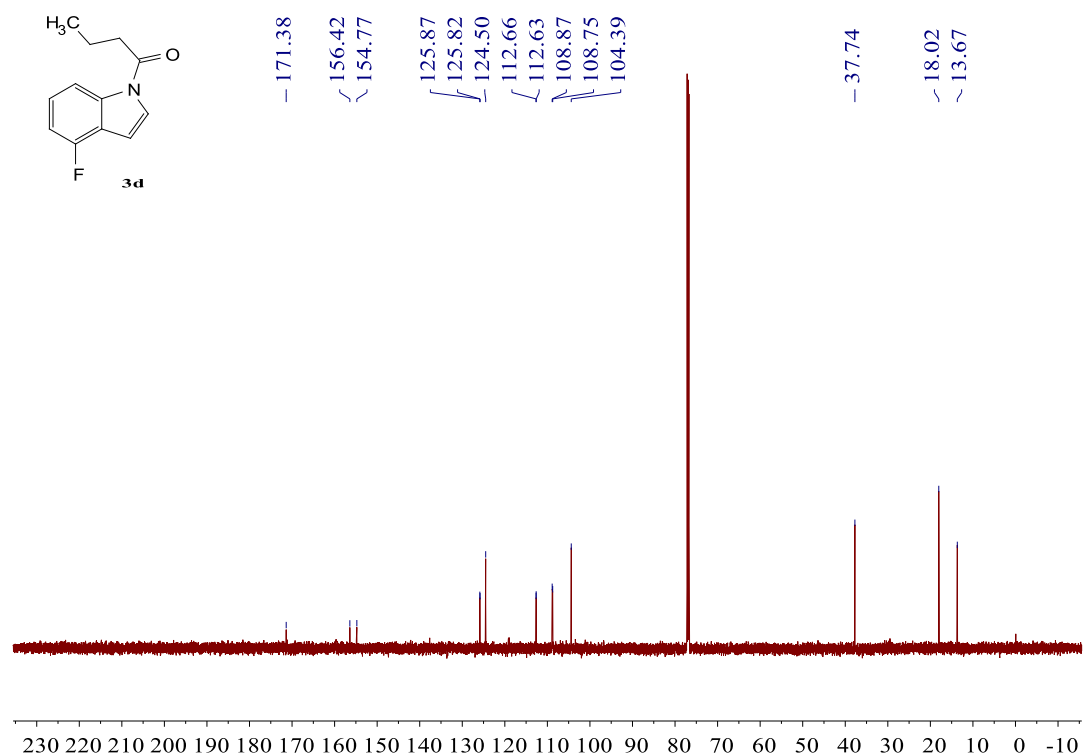
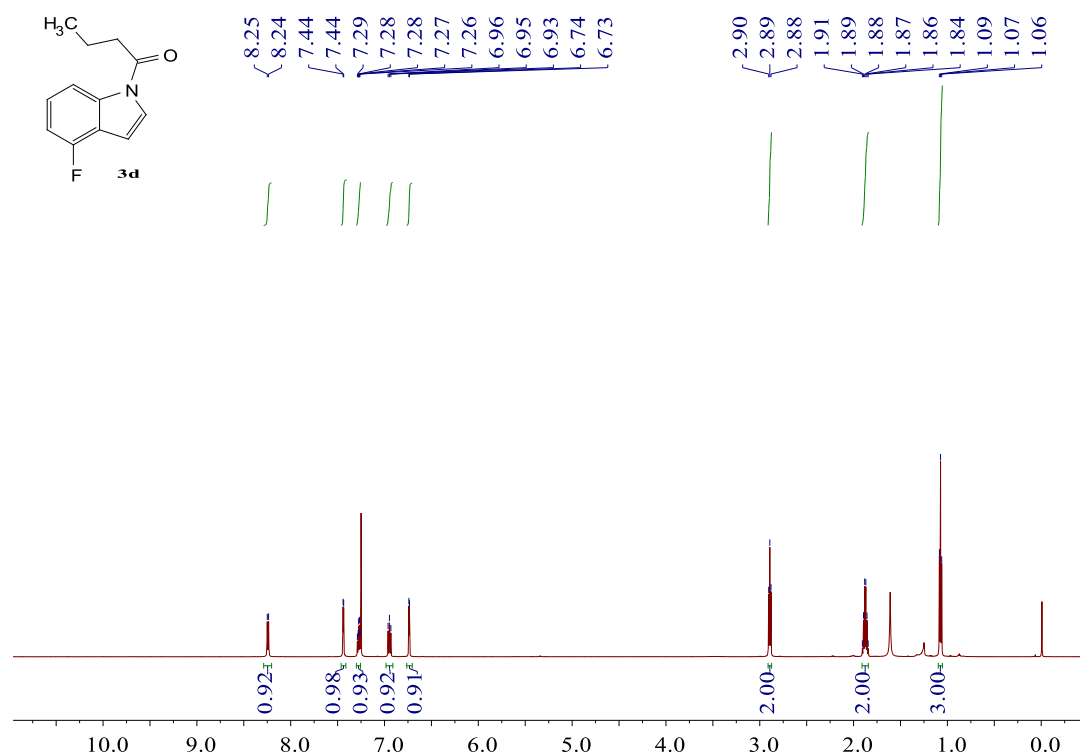
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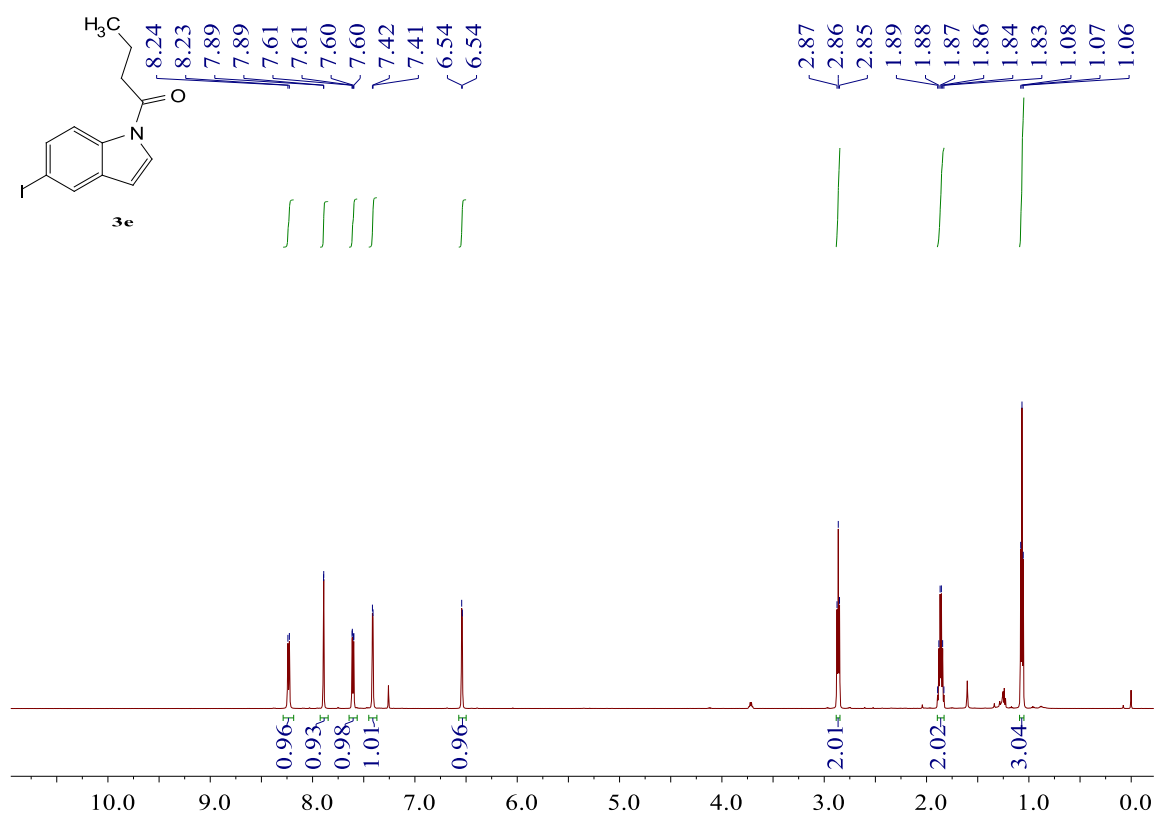
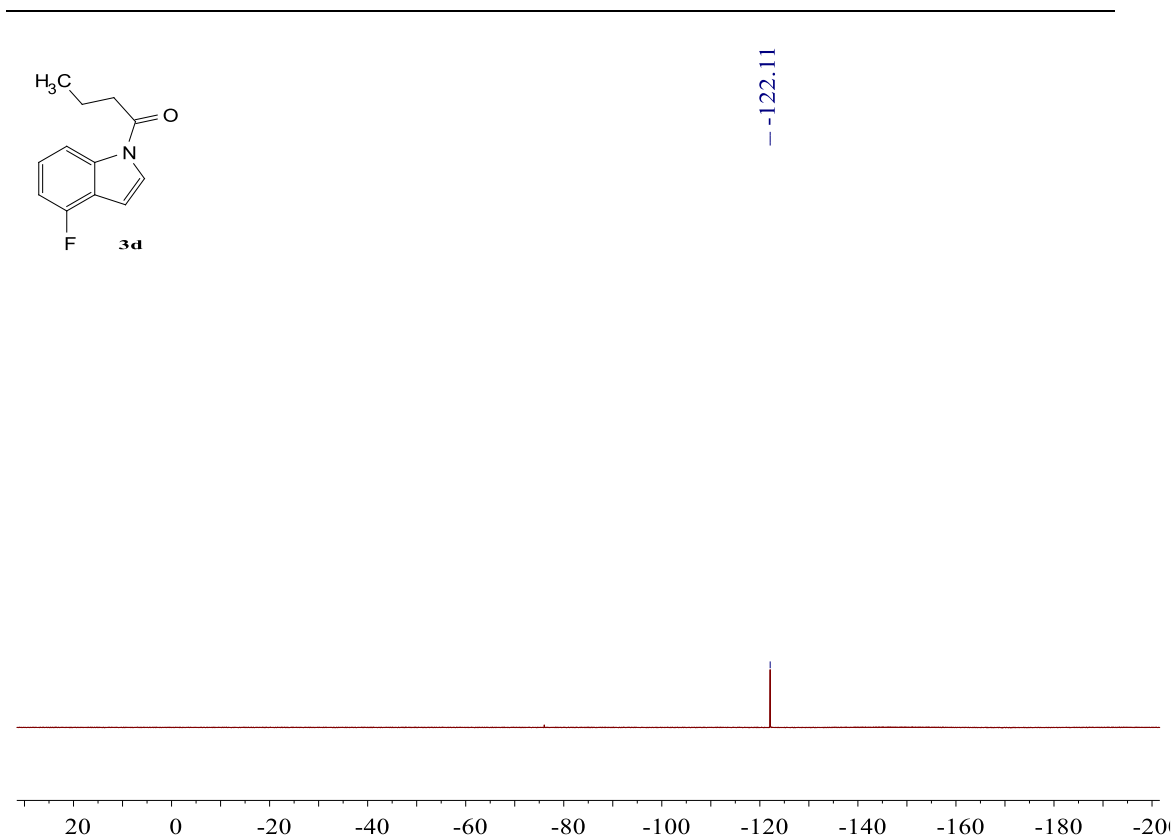
NMR spectra

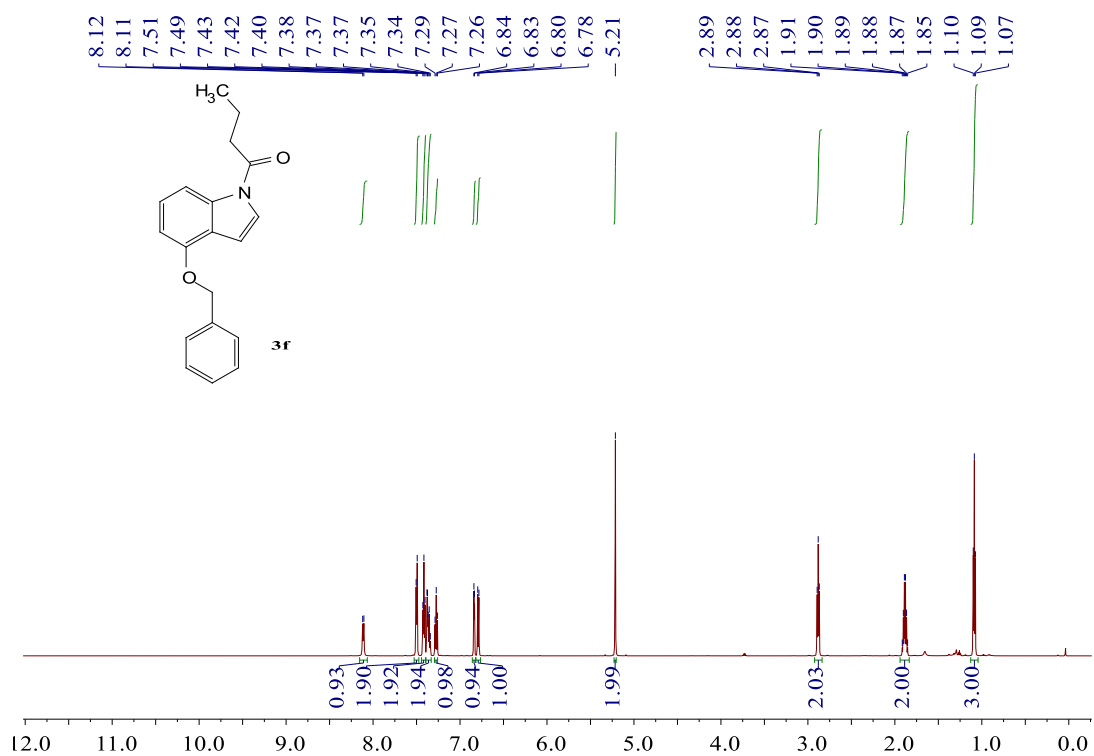
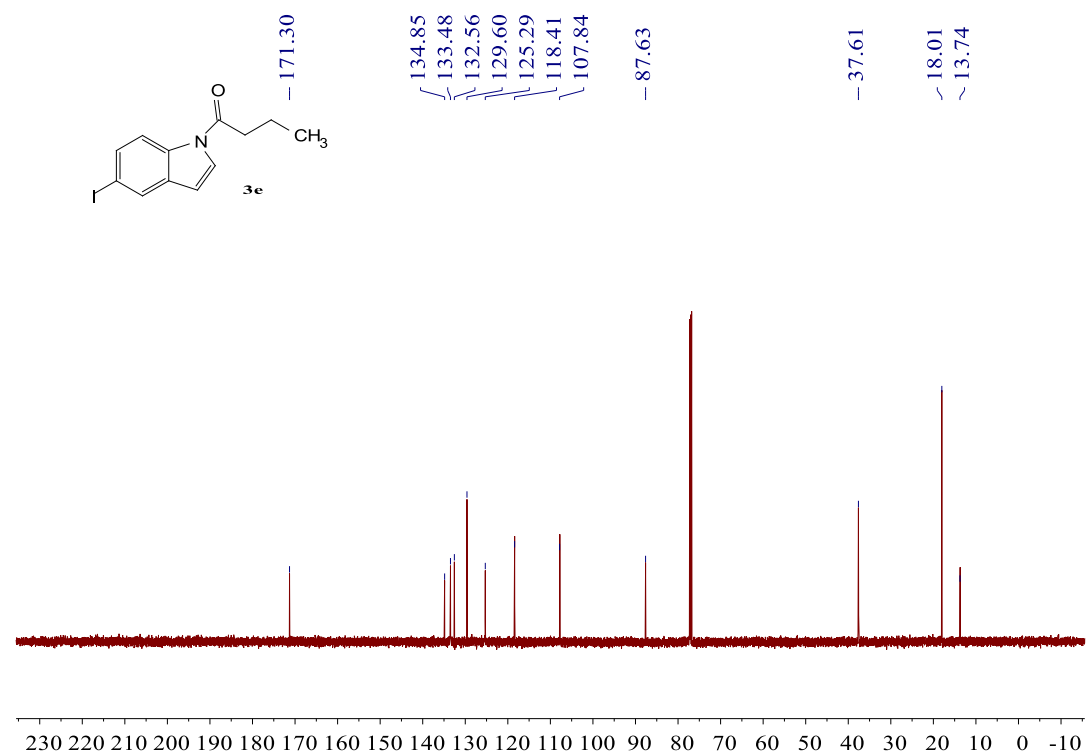


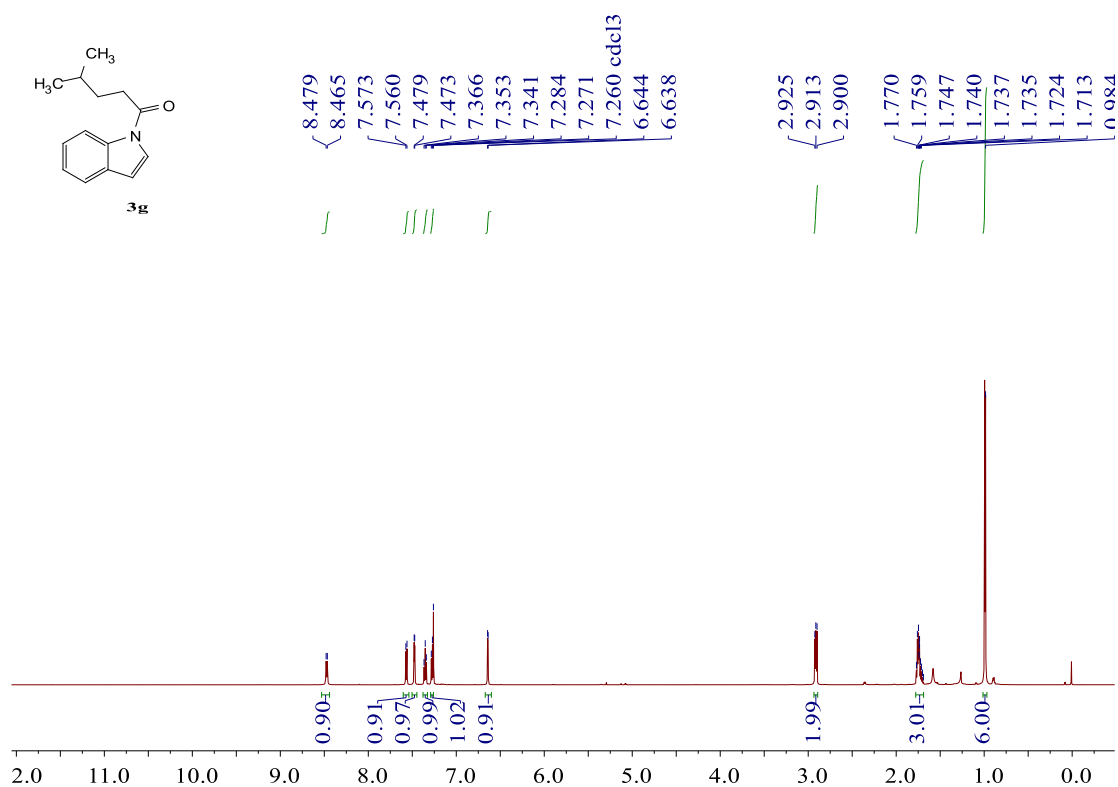
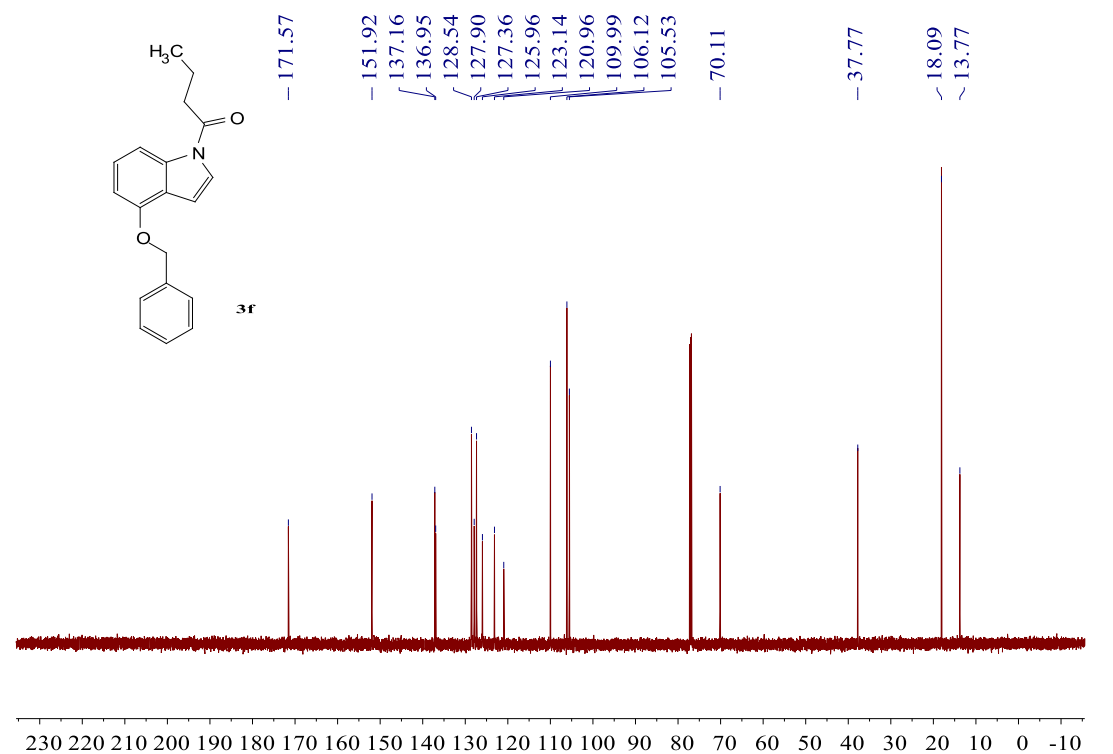


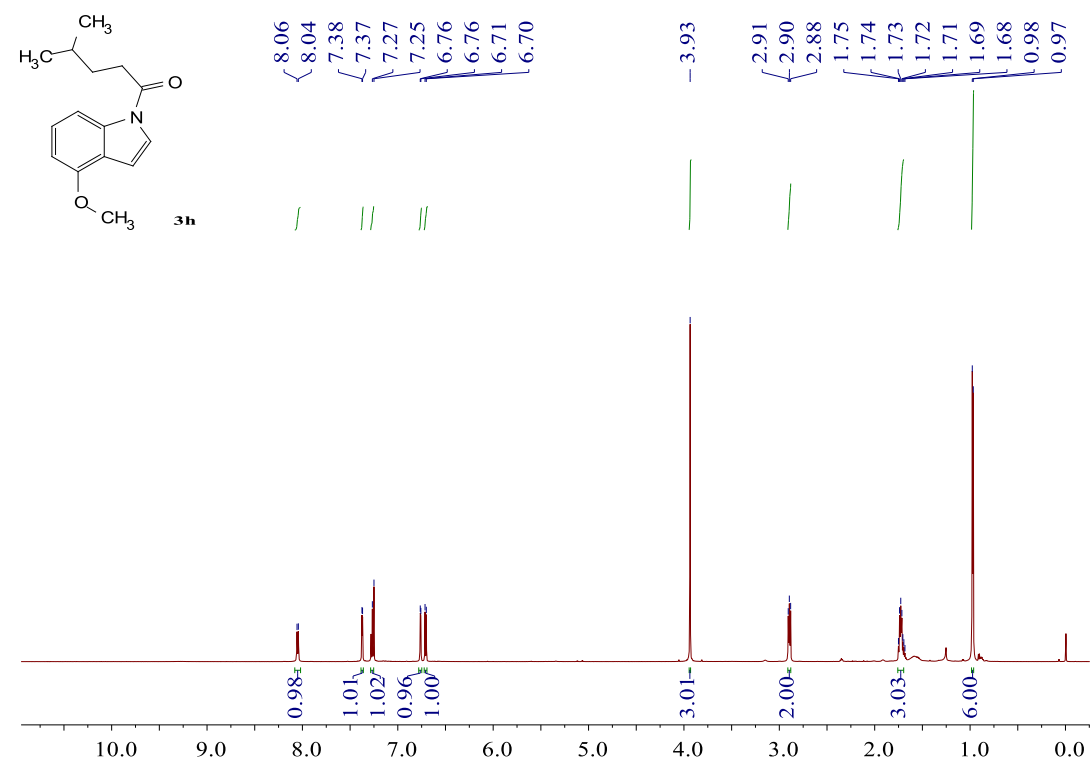
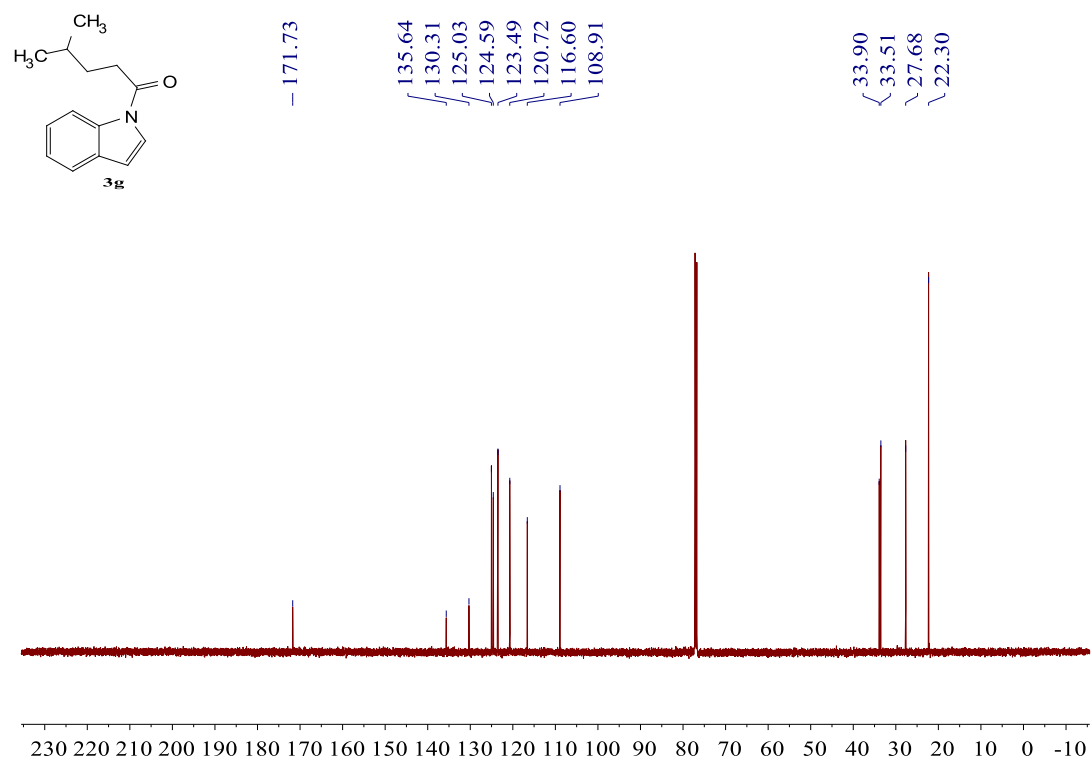


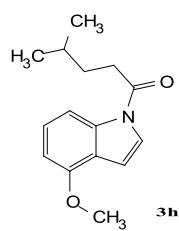












- 171.87

- 152.75

✓ 136.87

✓ 125.98

✓ 123.05

- 120.55

✓ 109.70

✓ 105.92

✓ 104.00

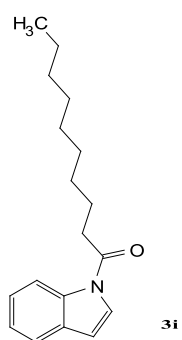
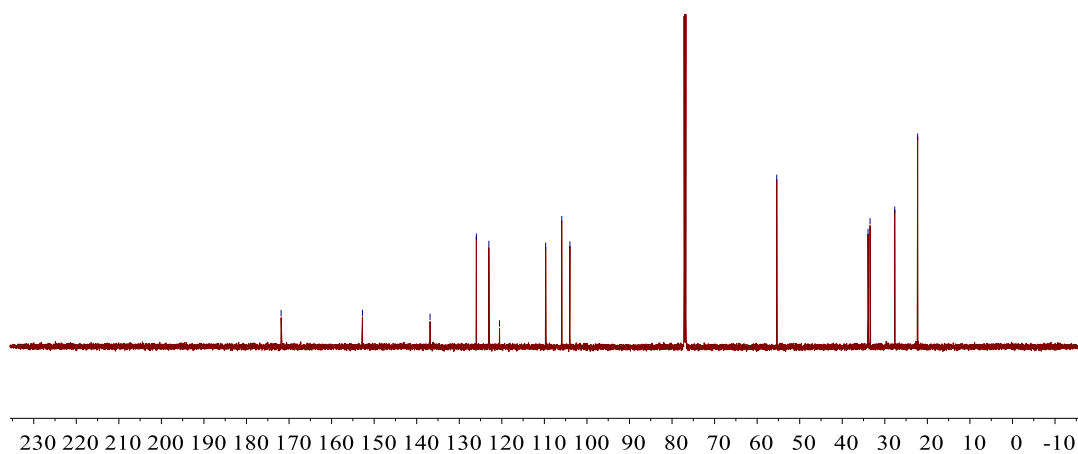
- 55.39

✓ 33.94

✓ 33.47

✓ 27.67

✓ 22.28



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