

## Supplementary Information

### Decarboxylative acylation of indolines with $\alpha$ -keto acids under palladium catalysis: a facile strategy for the synthesis of 7-substituted indoles

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## General methods

Commercially available reagents were used without additional purification, unless otherwise stated. Sealed tubes ( $13 \times 100 \text{ mm}^2$ ) were purchased from Fischer Scientific and dried in oven for overnight and cooled at room temperature prior to use. Thin layer chromatography was carried out using plates coated with Kieselgel 60F<sub>254</sub> (Merck). For flash column chromatography, E. Merck Kieselgel 60 (230–400 mesh) was used. Nuclear magnetic resonance spectra (<sup>1</sup>H and <sup>13</sup>C NMR) were recorded on a Bruker Unity 300, 400, 500 and 700 MHz spectrometer for CDCl<sub>3</sub> and CD<sub>3</sub>OD solution and chemical shifts are reported as parts per million (ppm). Resonance patterns are reported with the notations s (singlet), d (doublet), t (triplet), q (quartet), and m (multiplet). In addition, the notation br is used to indicate a broad signal. Coupling constants (*J*) are reported in hertz (Hz). IR spectra were recorded on a Varian 2000 Infrared spectrophotometer and are reported as cm<sup>-1</sup>. High-resolution mass spectra (HRMS) were recorded on a JEOL JMS-600 spectrometer.

### General procedure for the synthesis of *N*-acylindolines (**1a–c**, **1e–p**, **1r** and **1s**)

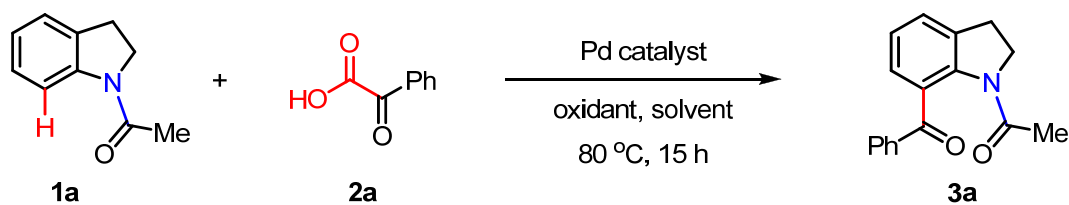
To a stirred solution of indoline (8.4 mmol) and triethyl amine (25.2 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (10 mL) was added a solution of acyl chloride (12.6 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (7 mL) at 0°C. The reaction mixture was stirred for 15 min at this temperature and further stirred for 2.5 hours at room temperature. The resulting mixture was partitioned between CH<sub>2</sub>Cl<sub>2</sub> and H<sub>2</sub>O. The organic layer was dried over Na<sub>2</sub>SO<sub>4</sub> and concentrated in vacuo. The residue was purified by flash column chromatography (silica gel, *n*-hexanes/EtOAc = 10:1) to afford the corresponding *N*-acyl compounds.<sup>1</sup>

### General procedure for the synthesis of *N*-benzoylcarbazole (**1q**)

To a stirred solution of 9*H*-carbazole (1.00 g, 5.99 mmol) in DMF (30 mL) was added NaH (0.48g, 11.98 mmol, 60% dispersion in mineral oil) at 0 °C. The solution was stirred for 30 min at 0°C. To a resulting mixture was added dropwise a solution of benzoyl chloride (1.04 mL, 8.99 mmol) at 0°C. The reaction mixture was stirred at this temperature for 10 min and further stirred for 2.5 hours at room temperature. The reaction mixture was quenched and partitioned between EtOAc and H<sub>2</sub>O. The organic layer was dried over Na<sub>2</sub>SO<sub>4</sub> and concentrated in vacuo. The residue was purified by flash column chromatography (silica gel, *n*-hexanes/EtOAc = 15:1) to afford **1q**.

(1) (a) G. Yang, P. Lindovska, D. Zhu, J. Kim, P. Wang, R.-Y. Tang, M. Movassaghi and J.-Q. Yu, *J. Am. Chem. Soc.*, 2014, **136**, 10807; (b) K. G. Liu, J. R. Lo and A. J. Robichaud, *Tetrahedron*, 2010, **66**, 573.

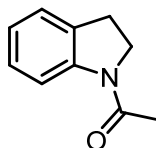
### Selected optimization of the reaction conditions



entry	catalyst (mol %)	oxidant (equiv.)	solvent	yield (%)
1	Pd(OAc) <sub>2</sub> (10)	(NH <sub>4</sub> ) <sub>2</sub> S <sub>2</sub> O <sub>8</sub> (2)	DCE	47
2	Pd(OAc) <sub>2</sub> (10)	K <sub>2</sub> S <sub>2</sub> O <sub>8</sub> (2)	DCE	32
3	Pd(OAc) <sub>2</sub> (10)	Na <sub>2</sub> S <sub>2</sub> O <sub>8</sub> (2)	DCE	35
4	Pd(OAc) <sub>2</sub> (10)	Ag <sub>2</sub> O (2)	DCE	trace
5	Pd(OAc) <sub>2</sub> (10)	oxone (2)	DCE	12
6	Pd(OAc) <sub>2</sub> (10)	(NH <sub>4</sub> ) <sub>2</sub> S <sub>2</sub> O <sub>8</sub> (2)	diglyme	34
7	Pd(OAc) <sub>2</sub> (10)	(NH <sub>4</sub> ) <sub>2</sub> S <sub>2</sub> O <sub>8</sub> (2)	1,4-dioxane	38
8	Pd(OAc) <sub>2</sub> (10)	(NH <sub>4</sub> ) <sub>2</sub> S <sub>2</sub> O <sub>8</sub> (2)	THF	30
9	Pd(OAc) <sub>2</sub> (10)	(NH <sub>4</sub> ) <sub>2</sub> S <sub>2</sub> O <sub>8</sub> (2)	toluene	10
10	Pd(OAc) <sub>2</sub> (10)	(NH <sub>4</sub> ) <sub>2</sub> S <sub>2</sub> O <sub>8</sub> (2)	DMF	trace
11	PdCl <sub>2</sub> (10)	(NH <sub>4</sub> ) <sub>2</sub> S <sub>2</sub> O <sub>8</sub> (2)	DCE	N.R.
12	Pd(OTf) <sub>2</sub> (10)	(NH <sub>4</sub> ) <sub>2</sub> S <sub>2</sub> O <sub>8</sub> (2)	DCE	45
13	Pd(TFA) <sub>2</sub> (10)	(NH <sub>4</sub> ) <sub>2</sub> S <sub>2</sub> O <sub>8</sub> (2)	DCE	68
<b>14</b>	<b>Pd(TFA)<sub>2</sub> (5)</b>	<b>(NH<sub>4</sub>)<sub>2</sub>S<sub>2</sub>O<sub>8</sub> (2)</b>	<b>DCE</b>	<b>65</b>
15	Pd(TFA) <sub>2</sub> (2.5)	(NH <sub>4</sub> ) <sub>2</sub> S <sub>2</sub> O <sub>8</sub> (2)	DCE	48
16	Pd(TFA) <sub>2</sub> (5)	(NH <sub>4</sub> ) <sub>2</sub> S <sub>2</sub> O <sub>8</sub> (3)	DCE	56
17	Pd(TFA) <sub>2</sub> (5)	(NH <sub>4</sub> ) <sub>2</sub> S <sub>2</sub> O <sub>8</sub> (1.5)	DCE	54

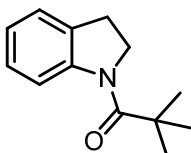
## Characterization data for *N*-acylindolines (1a–c and 1e–s)

### 1-(Indolin-1-yl)ethanone (1a)



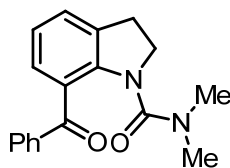
$^1\text{H}$  NMR (700 MHz,  $\text{CDCl}_3$ )  $\delta$  8.20 (d,  $J = 8.0$  Hz, 1H), 7.20–7.16 (m, 2H), 7.01–6.99 (m, 1H), 4.05 (t,  $J = 8.4$  Hz, 2H), 3.20 (t,  $J = 8.4$  Hz, 2H), 2.22 (s, 3H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CDCl}_3$ )  $\delta$  168.7, 142.9, 131.0, 127.5, 124.5, 123.5, 117.0, 48.7, 28.0, 24.2.

### 1-(Indolin-1-yl)-2,2-dimethylpropan-1-one (1b)



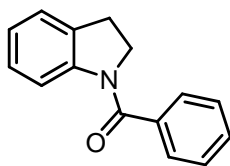
$^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  8.23 (d,  $J = 8.5$  Hz, 1H), 7.26–7.17 (m, 2H), 7.02 (t,  $J = 7.0$  Hz, 1H), 4.23 (t,  $J = 8.1$  Hz, 2H), 3.14 (t,  $J = 8.1$  Hz, 2H), 1.38 (s, 9H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  176.5, 144.7, 130.7, 127.3, 124.2, 123.6, 118.4, 49.4, 40.2, 29.3, 27.7.

### 7-Benzoyl-*N,N*-dimethylindoline-1-carboxamide (1c)



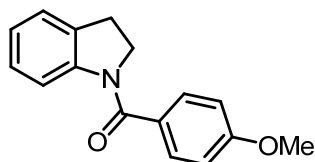
$^1\text{H}$  NMR (700 MHz,  $\text{CDCl}_3$ )  $\delta$  7.19 (d,  $J = 7.2$  Hz, 1H), 7.16–7.14 (m, 1H), 6.96 (d,  $J = 7.9$  Hz, 1H), 6.91–6.89 (m, 1H), 3.92 (t,  $J = 8.2$  Hz, 2H), 3.05 (t,  $J = 8.2$  Hz, 2H), 2.96 (s, 6H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CDCl}_3$ )  $\delta$  160.3, 144.3, 131.4, 127.0, 124.8, 121.3, 113.3, 50.3, 38.1, 28.1.

**Indolin-1-yl(phenyl)methanone (1e)**



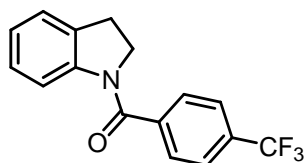
$^1\text{H}$  NMR (700 MHz,  $\text{CD}_3\text{OD}$ )  $\delta$  7.57–7.50 (m, 6H), 7.27 (d,  $J = 7.8$  Hz, 1H), 7.08 (br s, 2H), 4.06 (br s, 2H), 3.14 (t,  $J = 8.0$  Hz, 2H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CD}_3\text{OD}$ )  $\delta$  171.3, 143.8, 138.4, 134.4, 131.7, 129.9, 128.1, 126.2, 125.8, 118.8, 52.4, 29.2.

**Indolin-1-yl(4-methoxyphenyl)methanone (1f)**



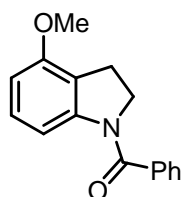
$^1\text{H}$  NMR (700 MHz,  $\text{CD}_3\text{OD}$ )  $\delta$  8.10 (d,  $J = 9.0$  Hz, 1H), 7.56 (d,  $J = 8.4$  Hz, 2H), 7.26 (d,  $J = 7.4$  Hz, 1H), 7.10 (d,  $J = 8.9$  Hz, 1H), 7.05–7.03 (m, 3H), 4.12 (t,  $J = 8.1$  Hz, 2H), 3.88 (s, 3H), 3.13 (t,  $J = 8.1$  Hz, 2H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CD}_3\text{OD}$ )  $\delta$  171.2, 166.6, 143.9, 133.9, 130.4, 128.1, 126.2, 125.5, 122.3, 115.6, 115.1, 56.1, 52.3, 29.1.

**Indolin-1-yl(4-(trifluoromethyl)phenyl)methanone (1g)**



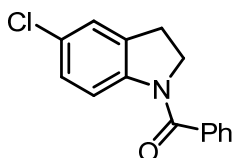
$^1\text{H}$  NMR (700 MHz,  $\text{CD}_3\text{OD}$ )  $\delta$  8.18 (br s, 1H), 7.85–7.79 (m, 4H), 7.29 (t,  $J = 7.9$  Hz, 2H), 7.12 (br s, 1H), 4.03 (br s, 2H), 3.17 (t,  $J = 7.9$  Hz, 2H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CD}_3\text{OD}$ )  $\delta$  169.6, 143.7, 142.2, 134.3, 133.3, 128.8, 128.3, 126.9, 126.5, 126.2, 118.8, 52.3, 29.4.

**(4-Methoxyindolin-1-yl)(phenyl)methanone (1h)**



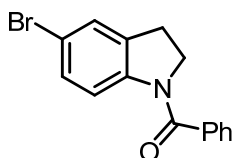
$^1\text{H}$  NMR (700 MHz,  $\text{CD}_3\text{OD}$ )  $\delta$  7.56–7.50 (m, 6H), 7.19 (br s, 1H), 6.72 (br s, 1H), 4.07 (br s, 2H), 3.85 (s, 3H), 3.04 (t,  $J = 8.1$  Hz, 2H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CD}_3\text{OD}$ )  $\delta$  171.3, 157.6, 144.9, 138.4, 131.7, 129.9, 129.7, 128.1, 121.4, 111.7, 108.1, 56.1, 52.8, 26.2.

**(5-Chloroindolin-1-yl)(phenyl)methanone (1i)**



$^1\text{H}$  NMR (700 MHz,  $\text{CD}_3\text{OD}$ )  $\delta$  7.59–7.51 (m, 6H), 7.29 (s, 1H), 7.21 (br s, 1H), 4.10 (br s, 2H), 3.15 (t,  $J = 8.2$  Hz, 2H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CD}_3\text{OD}$ )  $\delta$  171.3, 142.7, 138.1, 136.8, 131.8, 130.5, 129.9, 129.2, 128.1, 126.3, 119.6, 52.6, 29.1.

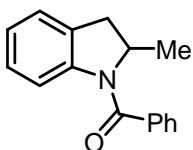
**(5-Bromoindolin-1-yl)(phenyl)methanone (1j)**



$^1\text{H}$  NMR (700 MHz,  $\text{CD}_3\text{OD}$ )  $\delta$  7.59–7.51 (m, 6H), 7.43 (s, 1H), 7.34 (br s, 1H), 4.09 (br s, 2H), 3.15 (t,  $J = 8.2$  Hz, 2H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CD}_3\text{OD}$ )  $\delta$  171.3, 138.1, 137.1, 134.0, 131.8, 131.1, 130.8, 129.9, 129.3, 128.1, 117.9, 52.5, 29.0.

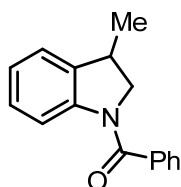
**(2-Methylindolin-1-yl)(phenyl)methanone (1k)**





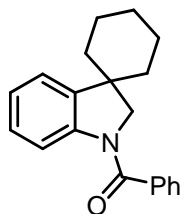
$^1\text{H}$  NMR (700 MHz,  $\text{CD}_3\text{OD}$ )  $\delta$  7.57–7.50 (m, 5H), 7.28 (d,  $J$  = 8.3 Hz, 1H), 7.05 (br s, 2H), 4.74 (br s, 1H), 3.49–3.46 (m, 1H), 2.69 (d,  $J$  = 15.6 Hz, 1H), 1.19 (s, 3H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CD}_3\text{OD}$ )  $\delta$  171.3, 142.4, 138.3, 133.9, 130.8, 129.5, 128.2, 128.1, 126.8, 125.6, 118.2, 58.7, 36.7, 21.1.

**(3-Methylindolin-1-yl)(phenyl)methanone (1l)**



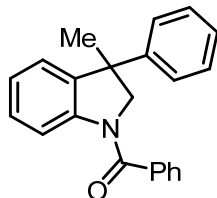
$^1\text{H}$  NMR (700 MHz,  $\text{CD}_3\text{OD}$ )  $\delta$  7.58–7.51 (m, 6H), 7.28 (d,  $J$  = 7.4 Hz, 2H), 7.12 (br s, 1H), 4.23 (br s, 1H), 3.63 (br s, 1H), 3.46 (t,  $J$  = 7.1 Hz, 1H), 1.32 (s, 3H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CD}_3\text{OD}$ )  $\delta$  171.2, 143.2, 139.5, 138.3, 131.7, 129.9, 128.3, 128.2, 126.0, 125.1, 118.7, 60.4, 36.4, 19.8.

**Phenyl(spiro[cyclohexane-1,3'-indoline]-1'-yl)methanone (1m)**



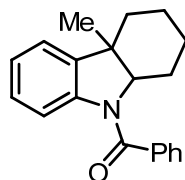
$^1\text{H}$  NMR (700 MHz,  $\text{CD}_3\text{OD}$ )  $\delta$  7.58–7.54 (m, 6H), 7.27 (d,  $J$  = 8.2 Hz, 2H), 7.11 (br s, 1H), 3.92 (br s, 2H), 1.69 (br s, 8H), 1.35 (s, 2H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CD}_3\text{OD}$ )  $\delta$  171.3, 143.4, 142.6, 138.3, 131.8, 130.1, 128.6, 128.2, 126.1, 123.9, 118.9, 62.5, 37.7, 26.5, 24.2.

**(3-Methyl-3-phenylindolin-1-yl)(phenyl)methanone (1n)**



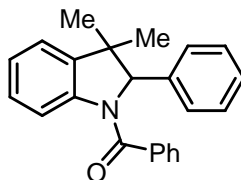
$^1\text{H}$  NMR (700 MHz,  $\text{CD}_3\text{OD}$ )  $\delta$  8.03 (s, 1H), 7.41–7.35 (m, 5H), 7.18–7.02 (m, 8H), 4.07–3.99 (m, 2H), 1.63 (s, 3H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CD}_3\text{OD}$ )  $\delta$  161.1, 137.6, 133.3, 132.4, 127.8, 121.9, 120.0, 119.7, 118.9, 118.2, 117.9, 117.5, 116.3, 115.5, 109.1, 23.2, 20.9, 16.5.

**(4a-Methyl-2,3,4,4a-tetrahydro-1H-carbazol-9(9aH)-yl)(phenyl)methanone (1o)**



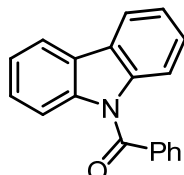
$^1\text{H}$  NMR (700 MHz,  $\text{CD}_3\text{OD}$ )  $\delta$  7.58–7.52 (m, 6H), 7.25 (d,  $J$  = 8.8 Hz, 1H), 7.13 (br s, 2H), 2.35 (d,  $J$  = 15.1 Hz, 1H), 1.61–1.54 (m, 4H), 1.27 (s, 3H), 1.15–1.12 (m, 3H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CD}_3\text{OD}$ )  $\delta$  171.6, 142.0, 141.5, 138.1, 131.7, 130.1, 128.3, 128.2, 126.1, 123.3, 119.4, 70.6, 33.4, 31.1, 30.1, 23.9, 23.3.

**(3,3-Dimethyl-2-phenylindolin-1-yl)(phenyl)methanone (1p)**



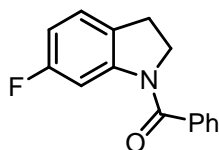
$^1\text{H}$  NMR (700 MHz,  $\text{CD}_3\text{OD}$ )  $\delta$  7.45–7.34 (m, 5H), 7.23–7.19 (m, 7H), 6.82 (br s, 2H), 5.01 (s, 1H), 1.48 (s, 3H), 0.92 (s, 3H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CD}_3\text{OD}$ )  $\delta$  170.9, 141.7, 140.9, 140.8, 139.6, 136.7, 129.8, 128.1, 127.9, 127.4, 127.3, 126.3, 124.9, 122.6, 116.5, 78.1, 31.1, 21.4.

**(9H-Carbazol-9-yl)(phenyl)methanone (1q)**



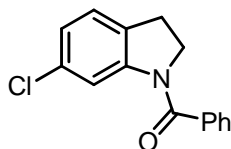
$^1\text{H}$  NMR (700 MHz,  $\text{CD}_3\text{OD}$ )  $\delta$  7.94 (d,  $J = 7.7$  Hz, 2H), 7.60–7.58 (m, 1H), 7.55 (dd,  $J = 7.0, 1.5$  Hz, 2H), 7.46 (t,  $J = 7.5$  Hz, 2H), 7.31 (d,  $J = 8.3$  Hz, 2H), 7.23 (td,  $J = 7.7, 0.9$  Hz, 2H), 7.18 (dt,  $J = 7.7, 1.3$  Hz, 2H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CD}_3\text{OD}$ )  $\delta$  171.3, 140.5, 137.3, 133.7, 130.3, 130.1, 127.9, 127.5, 124.8, 121.1, 116.8.

**(6-Fluoroindolin-1-yl)(phenyl)methanone (1r)**



$^1\text{H}$  NMR (700 MHz,  $\text{CD}_3\text{OD}$ )  $\delta$  7.59–7.51 (m, 6H), 7.23 (dt,  $J = 8.0, 1.3$  Hz, 1H), 6.80 (br s, 1H), 4.11 (br s, 2H), 3.11 (t,  $J = 8.2$  Hz, 2H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CD}_3\text{OD}$ )  $\delta$  171.4, 163.4 (d,  $J_{\text{C-F}} = 238.1$  Hz), 145.1, 138.0, 131.8, 129.9, 129.4, 128.1, 126.8 (d,  $J_{\text{C-F}} = 30.8$  Hz), 111.8 (d,  $J_{\text{C-F}} = 21.7$  Hz), 106.4, 53.2, 28.5.

**(6-Chloroindolin-1-yl)(phenyl)methanone (1s)**



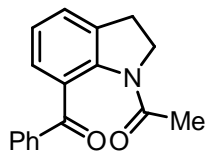
$^1\text{H}$  NMR (700 MHz,  $\text{CD}_3\text{OD}$ )  $\delta$  7.61–7.52 (m, 6H), 7.24 (d,  $J = 8.0$  Hz, 1H), 7.08 (br s, 1H), 4.11 (br s, 2H), 3.13 (t,  $J = 8.3$  Hz, 2H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CD}_3\text{OD}$ )  $\delta$  171.5, 145.1, 138.0, 133.6, 133.2, 131.9, 129.9, 128.1, 127.1, 125.4, 118.7, 52.5, 28.7.

### Typical procedure for C7-acylation of indolines (**3a–c**, **3e–s** and **4b–m**)

To an oven-dried sealed tube charged with *N*-acetylindoline (**1a**) (32.2 mg, 0.2 mmol, 100 mol %), Pd(TFA)<sub>2</sub> (3.3 mg, 0.01 mmol, 5 mol %) and (NH<sub>4</sub>)<sub>2</sub>S<sub>2</sub>O<sub>8</sub> (91.2 mg, 0.4 mmol, 200 mol %) in DCE (1 mL) was added phenylglyoxylic acid (**2a**) (45 mg, 0.3 mmol, 150 mol %). The reaction mixture was allowed to stir at 80 °C for 15 h, and cooled to room temperature. The reaction mixture was diluted with EtOAc (3 mL) and concentrated in vacuo. The residue was purified by flash column chromatography (*n*-hexanes/EtOAc = 3:1) to afford 34.5 mg of **3a** in 65% yield.

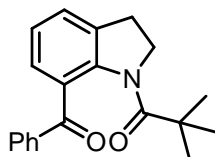
## Characterization data for products (3a–c, 3e–s and 4b–m)

### 1-(7-Benzoylindolin-1-yl)ethanone (3a)



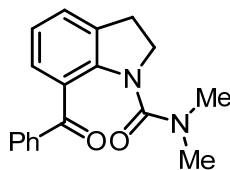
$^1\text{H}$  NMR (700 MHz,  $\text{CDCl}_3$ )  $\delta$  7.83 (d,  $J = 7.8$  Hz, 2H), 7.45–7.43 (m, 1H), 7.35 (t,  $J = 7.9$  Hz, 2H), 7.25 (d,  $J = 7.4$  Hz, 1H), 7.08 (d,  $J = 7.5$  Hz, 1H), 7.01 (t,  $J = 7.4$  Hz, 1H), 4.07 (t,  $J = 8.1$  Hz, 2H), 3.15 (t,  $J = 8.1$  Hz, 2H), 2.00 (s, 3H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CDCl}_3$ )  $\delta$  194.1, 167.7, 138.8, 137.4, 133.5, 132.2, 129.9, 128.8, 128.1, 127.1, 126.3, 123.8, 49.4, 28.9, 23.3; IR (KBr)  $\nu$  3054, 2928, 1660, 1597, 1446, 1433, 1394, 1324, 1273, 1169, 1006, 926, 735  $\text{cm}^{-1}$ ; HRMS (EI) calcd for  $\text{C}_{17}\text{H}_{15}\text{NO}_2$   $[\text{M}]^+$  265.1103, found 265.1103.

### 1-(7-Benzoylindolin-1-yl)-2,2-dimethylpropan-1-one (3b)



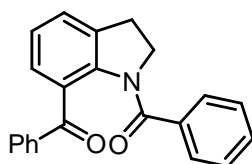
$^1\text{H}$  NMR (300 MHz,  $\text{CDCl}_3$ )  $\delta$  7.77–7.73 (m, 2H), 7.53–7.47 (m, 1H), 7.43–7.39 (m, 4H), 7.18 (t,  $J = 7.5$  Hz, 1H), 4.20 (t,  $J = 7.7$  Hz, 2H), 3.15 (t,  $J = 7.4$  Hz, 2H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CDCl}_3$ )  $\delta$  193.6, 176.7, 141.4, 137.9, 133.0, 131.9, 129.3, 128.7, 127.9, 126.7, 124.5, 50.2, 39.2, 30.2, 27.4; IR (KBr)  $\nu$  3055, 2967, 1664, 1634, 1587, 1476, 1447, 1432, 1399, 1358, 1322, 1278, 1205, 1097, 989, 739  $\text{cm}^{-1}$ ; HRMS (EI) calcd for  $\text{C}_{20}\text{H}_{21}\text{NO}_2$   $[\text{M}]^+$  307.1572, found 307.1581.

### 7-Benzoyl-*N,N*-dimethylindoline-1-carboxamide (3c)



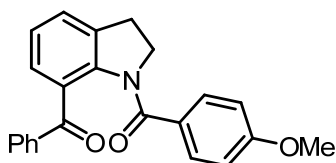
$^1\text{H}$  NMR (700 MHz,  $\text{CDCl}_3$ )  $\delta$  7.68 (d,  $J = 8.1$  Hz, 2H), 7.42–7.41 (m, 1H), 7.32 (t,  $J = 8.0$  Hz, 2H), 7.26–7.23 (m, 2H), 6.93 (t,  $J = 7.4$  Hz, 1H), 3.83 (t,  $J = 8.2$  Hz, 2H), 3.08 (t,  $J = 8.3$  Hz, 2H), 2.56 (s, 6H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CDCl}_3$ )  $\delta$  195.4, 161.2, 143.8, 137.8, 132.9, 132.0, 130.0, 129.6, 128.5, 128.3, 127.9, 127.3, 126.3, 122.1, 51.5, 37.2, 29.3; IR (KBr)  $\nu$  3049, 2926, 1658, 1598, 1447, 1381, 1268, 1225, 1166, 985, 733  $\text{cm}^{-1}$ ; HRMS (EI) calcd for  $\text{C}_{18}\text{H}_{18}\text{N}_2\text{O}_2$   $[\text{M}]^+$  294.1368, found 294.1367.

### Indoline-1,7-diylbis(phenylmethanone) (3e)



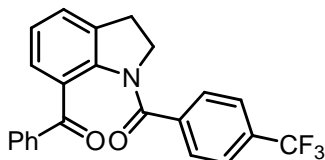
$^1\text{H}$  NMR (700 MHz,  $\text{CDCl}_3$ )  $\delta$  7.80 (d,  $J = 7.4$  Hz, 2H), 7.43 (tt,  $J = 7.3, 1.2$  Hz, 1H), 7.34–7.32 (m, 6H), 7.28–7.25 (m, 3H), 7.11 (t,  $J = 7.5$  Hz, 1H), 4.03 (t,  $J = 7.9$  Hz, 2H), 3.05 (t,  $J = 7.9$  Hz, 2H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CDCl}_3$ )  $\delta$  194.3, 169.5, 140.2, 137.2, 135.5, 134.3, 133.6, 132.3, 131.0, 129.9, 128.9, 128.2, 128.1, 127.8, 127.1, 124.5, 52.6, 29.5; IR (KBr)  $\nu$  3055, 1659, 1638, 1575, 1446, 1431, 1383, 1352, 1325, 1264, 1071, 983, 735, 694  $\text{cm}^{-1}$ ; HRMS (EI) calcd for  $\text{C}_{22}\text{H}_{17}\text{NO}_2$   $[\text{M}]^+$  327.1259, found 327.1254.

### (7-Benzoylindolin-1-yl)(4-methoxyphenyl)methanone (3f)



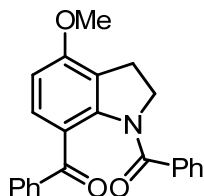
$^1\text{H}$  NMR (700 MHz,  $\text{CDCl}_3$ )  $\delta$  7.89 (d,  $J = 7.2$  Hz, 2H), 7.52–7.49 (m, 1H), 7.43–7.40 (m, 5H), 7.35 (d,  $J = 7.2$  Hz, 1H), 7.18 (t,  $J = 7.5$  Hz, 1H), 6.84 (d,  $J = 8.7$  Hz, 2H), 4.16 (t,  $J = 7.9$  Hz, 2H), 3.82 (s, 3H), 3.14 (t,  $J = 7.9$  Hz, 2H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CDCl}_3$ )  $\delta$  194.4, 169.4, 161.8, 140.6, 137.1, 134.2, 132.3, 130.0, 129.9, 128.7, 128.0, 127.8, 127.6, 127.1, 124.3, 113.5, 55.3, 52.9, 29.5; IR (KBr)  $\nu$  3055, 2934, 1664, 1643, 1604, 1511, 1446, 1375, 1327, 1251, 1171, 1027, 842, 733  $\text{cm}^{-1}$ ; HRMS (EI) calcd for  $\text{C}_{23}\text{H}_{19}\text{NO}_3$   $[\text{M}]^+$  357.1365, found 357.1359.

**(7-Benzoylindolin-1-yl)(4-trifluoromethylphenyl)methanone (3g)**



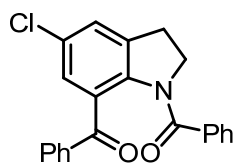
$^1\text{H}$  NMR (700 MHz,  $\text{CDCl}_3$ )  $\delta$  7.78 (d,  $J = 7.0$  Hz, 2H), 7.51 (d,  $J = 7.8$  Hz, 2H), 7.44–7.42 (m, 3H), 7.34–7.32 (m, 3H), 7.27 (d,  $J = 7.6$  Hz, 1H), 7.12 (t,  $J = 7.6$  Hz, 1H), 3.98 (t,  $J = 7.7$  Hz, 2H), 3.06 (t,  $J = 7.9$  Hz, 2H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CDCl}_3$ )  $\delta$  194.3, 168.0, 139.8, 139.0, 137.1, 134.3, 132.6 (q,  $J_{\text{C-F}} = 32.1$  Hz), 132.4, 129.9, 128.9, 128.2, 128.1, 127.9, 127.2, 125.4 (q,  $J_{\text{C-F}} = 3.8$  Hz), 124.9, 123.6 (q,  $J_{\text{C-F}} = 270.8$  Hz), 52.4, 29.5; IR (KBr)  $\nu$  3057, 2928, 1717, 1657, 1596, 1448, 1408, 1385, 1320, 1266, 1169, 1127, 1065, 1017, 736  $\text{cm}^{-1}$ ; HRMS (EI) calcd for  $\text{C}_{23}\text{H}_{16}\text{F}_3\text{NO}_2$   $[\text{M}]^+$  395.1133, found 395.1126.

**(4-Methoxyindoline-1,7-diyl)bis(phenylmethanone) (3h)**



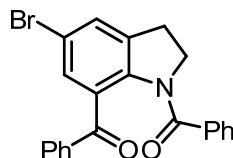
$^1\text{H}$  NMR (300 MHz,  $\text{CDCl}_3$ )  $\delta$  7.85 (d,  $J = 7.4$  Hz, 2H), 7.48–7.32 (m, 9H), 6.71 (d,  $J = 8.4$  Hz, 1H), 4.09 (t,  $J = 7.7$  Hz, 2H), 3.91 (s, 3H), 3.03 (t,  $J = 7.6$  Hz, 2H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CDCl}_3$ )  $\delta$  194.0, 169.7, 157.9, 142.2, 137.8, 135.6, 132.1, 130.9, 130.4, 129.8, 128.2, 127.9, 127.8, 122.4, 121.3, 106.4, 55.6, 53.0, 29.7; IR (KBr)  $\nu$  3067, 2923, 1660, 1642, 1600, 1443, 1418, 1377, 1334, 1270, 1098, 1052, 994, 833, 708, 693  $\text{cm}^{-1}$ ; HRMS (EI) calcd for  $\text{C}_{23}\text{H}_{19}\text{NO}_3$   $[\text{M}]^+$  357.1365, found 357.1367.

**(5-Chloroindoline-1,7-diyl)bis(phenylmethanone) (3i)**



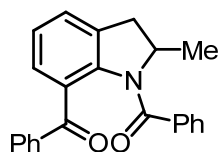
$^1\text{H}$  NMR (300 MHz,  $\text{CDCl}_3$ )  $\delta$  7.87 (d,  $J = 6.9$  Hz, 2H), 7.53–7.50 (m, 1H), 7.45–7.31 (m, 9H), 4.12 (t,  $J = 7.8$  Hz, 2H), 3.12 (t,  $J = 8.0$  Hz, 2H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CDCl}_3$ )  $\delta$  192.9, 169.4, 138.9, 136.6, 136.3, 135.1, 132.7, 131.2, 129.9, 129.7, 128.3, 128.2, 127.8, 127.5, 127.1, 52.7, 29.3; IR (KBr)  $\nu$  3054, 2921, 1717, 1662, 1596, 1579, 1448, 1419, 1365, 1322, 1266, 1209, 1172, 1013, 882, 736  $\text{cm}^{-1}$ ; HRMS (EI) calcd for  $\text{C}_{22}\text{H}_{16}\text{ClNO}_2$   $[\text{M}]^+$  361.0870, found 361.0862.

**(5-Bromoindoline-1,7-diyl)bis(phenylmethanone) (3j)**



$^1\text{H}$  NMR (300 MHz,  $\text{CDCl}_3$ )  $\delta$  7.87 (d,  $J = 7.4$  Hz, 2H), 7.52–7.34 (m, 10H), 4.11 (t,  $J = 7.6$  Hz, 2H), 3.13 (t,  $J = 7.6$  Hz, 2H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CDCl}_3$ )  $\delta$  192.8, 169.4, 139.4, 136.7, 136.6, 135.1, 132.7, 131.2, 130.3, 130.1, 129.9, 128.3, 128.2, 127.8, 117.1, 52.7, 29.3; IR (KBr)  $\nu$  3063, 2917, 2666, 1689, 1664, 1600, 1579, 1448, 1415, 1365, 1319, 1267, 1069, 875, 708  $\text{cm}^{-1}$ ; HRMS (EI) calcd for  $\text{C}_{22}\text{H}_{16}\text{BrNO}_2$   $[\text{M}]^+$  405.0364, found 405.0374.

**(2-Methylindoline-1,7-diyl)bis(phenylmethanone) (3k)**

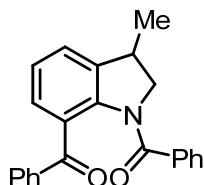


$^1\text{H}$  NMR (300 MHz,  $\text{CDCl}_3$ )  $\delta$  7.77 (d,  $J = 7.3$  Hz, 2H), 7.55–7.22 (m, 9H), 7.12–7.09 (m, 2H), 4.28 (t,  $J = 6.5$  Hz, 1H), 3.41–3.34 (m, 1H), 2.62 (d,  $J = 15.5$  Hz, 1H), 1.35 (d,  $J = 6.4$  Hz, 3H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CDCl}_3$ )  $\delta$  194.1, 169.8, 138.9, 135.9, 133.5, 132.2, 130.2, 129.8, 129.5, 128.3, 128.2, 128.1, 127.9, 126.7, 125.2, 58.9, 37.1, 21.1; IR (KBr)  $\nu$  3060, 2960, 2924, 1664, 1646, 1444, 1371, 1344, 1324, 1267, 1210, 1150, 1072, 994, 859, 734  $\text{cm}^{-1}$ ; HRMS (EI)



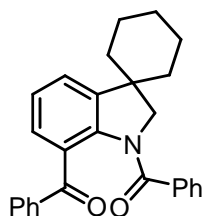
calcd for C<sub>23</sub>H<sub>19</sub>NO<sub>2</sub> [M]<sup>+</sup> 341.1416, found 341.1413.

**(3-Methylindoline-1,7-diyl)bis(phenylmethanone) (3l)**



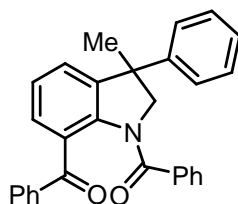
<sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>) δ 7.89 (d, *J* = 6.9 Hz, 2H), 7.49 (d, *J* = 6.4 Hz, 1H), 7.43–7.36 (m, 9H), 7.22 (t, *J* = 7.3 Hz, 1H), 4.20 (t, *J* = 8.9 Hz, 1H), 3.69 (t, *J* = 7.8 Hz, 1H), 3.48–3.41 (m, 1H), 1.33 (d, *J* = 6.5 Hz, 3H); <sup>13</sup>C NMR (175 MHz, CDCl<sub>3</sub>) δ 194.4, 169.3, 139.8, 139.3, 137.2, 135.5, 132.3, 130.9, 129.9, 128.8, 128.3, 128.1, 127.9, 127.8, 125.8, 124.7, 60.4, 36.2, 18.4; IR (KBr) ν 3055, 2963, 2927, 1717, 1664, 1598, 1439, 1379, 1328, 1271, 1172, 1024, 965, 706 cm<sup>-1</sup>; HRMS (EI) calcd for C<sub>23</sub>H<sub>19</sub>NO<sub>2</sub> [M]<sup>+</sup> 341.1416, found 341.1419.

**Spiro[cyclohexane-1,3'-indoline]-1',7'-diylbis(phenylmethanone) (3m)**



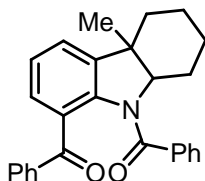
<sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>) δ 7.88 (d, *J* = 7.5 Hz, 2H), 7.52–7.47 (m, 1H), 7.43–7.31 (m, 9H), 7.21 (t, *J* = 7.5 Hz, 1H), 3.89 (s, 2H), 1.71–1.63 (m, 6H), 1.28–1.15 (m, 4H); <sup>13</sup>C NMR (175 MHz, CDCl<sub>3</sub>) δ 194.4, 169.6, 143.3, 139.3, 137.2, 135.6, 132.3, 130.8, 130.0, 128.8, 128.3, 128.2, 128.1, 127.6, 124.8, 124.7, 62.2, 45.7, 35.7, 25.3, 22.9; IR (KBr) ν 3054, 2923, 1649, 1598, 1434, 1378, 1342, 1322, 1265, 1248, 1210, 1024, 963, 735, 708, 689 cm<sup>-1</sup>; HRMS (EI) calcd for C<sub>27</sub>H<sub>25</sub>NO<sub>2</sub> [M]<sup>+</sup> 395.1885, found 395.1882.

**(3-Methyl-3-phenylindoline-1,7-diyl)bis(phenylmethanone) (3n)**



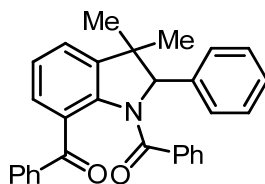
$^1\text{H}$  NMR (700 MHz,  $\text{CDCl}_3$ )  $\delta$  7.94 (d,  $J = 7.9$  Hz, 2H), 7.52–7.41 (m, 4H), 7.37–7.29 (m, 7H), 7.28–7.20 (m, 5H), 4.22 (d,  $J = 10.7$  Hz, 1H), 4.05 (d,  $J = 10.7$  Hz, 1H), 1.72 (s, 3H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CDCl}_3$ )  $\delta$  194.4, 169.4, 144.9, 142.7, 139.8, 137.2, 135.3, 132.4, 130.9, 130.1, 129.1, 128.6, 128.4, 128.3, 128.1, 127.6, 126.9, 126.5, 126.4, 125.1, 68.5, 49.2, 22.7; IR (KBr)  $\nu$  3053, 2968, 2873, 1718, 1659, 1598, 1436, 1370, 1322, 1264, 1154, 1067, 1027, 732  $\text{cm}^{-1}$ ; HRMS (EI) calcd for  $\text{C}_{29}\text{H}_{23}\text{NO}_2$   $[\text{M}]^+$  417.1729, found 417.1720.

**(4a-Methyl-2,3,4,4a-tetrahydro-1H-carbazole-8,9(9aH)-diyl)bis(phenylmethanone) (3o)**



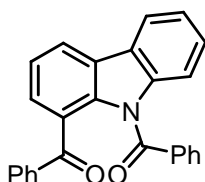
$^1\text{H}$  NMR (300 MHz,  $\text{CDCl}_3$ )  $\delta$  7.81 (d,  $J = 7.5$  Hz, 2H), 7.51–7.47 (m, 2H), 7.42–7.27 (m, 7H), 7.15 (d,  $J = 8.0$  Hz, 2H), 3.62 (s, 1H), 2.32 (d,  $J = 13.8$  Hz, 1H), 2.13–2.08 (m, 1H), 1.66–1.50 (m, 4H), 1.23–1.14 (m, 2H), 1.09 (s, 3H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CDCl}_3$ )  $\delta$  194.4, 170.1, 141.7, 138.8, 137.6, 136.4, 132.1, 130.5, 130.2, 129.8, 128.4, 128.1, 127.9, 126.4, 125.5, 124.4, 45.4, 32.6, 29.7, 29.6, 29.3, 23.2, 22.1; IR (KBr)  $\nu$  3060, 2928, 2857, 1739, 1666, 1598, 1445, 1432, 1370, 1330, 1304, 1274, 1149, 1072, 736, 700  $\text{cm}^{-1}$ ; HRMS (EI) calcd for  $\text{C}_{27}\text{H}_{25}\text{NO}_2$   $[\text{M}]^+$  395.1885, found 395.1882.

**(3,3-Dimethyl-2-phenylindoline-1,7-diyl)bis(phenylmethanone) (3p)**



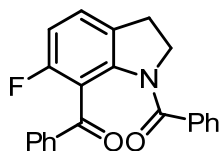
$^1\text{H}$  NMR (300 MHz,  $\text{CDCl}_3$ )  $\delta$  8.04 (d,  $J = 7.5$  Hz, 2H), 7.56–7.51 (m, 1H), 7.44 (t,  $J = 8.0$  Hz, 2H), 7.39–7.31 (m, 5H), 7.27–7.23 (m, 3H), 7.21–7.16 (m, 5H), 4.77 (s, 1H), 1.38 (s, 3H), 0.99 (s, 3H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CDCl}_3$ )  $\delta$  194.7, 170.2, 142.7, 139.8, 139.3, 136.8, 135.5, 132.5, 130.6, 130.4, 128.5, 128.2, 128.1, 127.9, 127.8, 127.7, 127.5, 127.1, 124.9, 124.8, 46.7, 31.3, 22.3; IR (KBr)  $\nu$  3057, 2961, 1651, 1599, 1437, 1372, 1327, 1266, 1154, 1073, 923, 735,  $700\text{ cm}^{-1}$ ; HRMS (EI) calcd for  $\text{C}_{30}\text{H}_{25}\text{NO}_2$   $[\text{M}]^+$  431.1885, found 431.1887.

**(9H-Carbazole-1,9-diyl)bis(phenylmethanone) (3q)**



$^1\text{H}$  NMR (300 MHz,  $\text{CDCl}_3$ )  $\delta$  8.24 (d,  $J = 7.6$  Hz, 1H), 8.09 (d,  $J = 7.5$  Hz, 1H), 7.81 (dd,  $J = 8.1, 1.2$  Hz, 2H), 7.70 (dd,  $J = 8.1, 1.2$  Hz, 2H), 7.54–7.47 (m, 4H), 7.45–7.35 (m, 6H), 6.99 (d,  $J = 8.1$  Hz, 1H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CDCl}_3$ )  $\delta$  195.3, 170.5, 139.8, 137.2, 136.9, 134.8, 133.2, 132.8, 130.6, 130.2, 130.1, 128.8, 128.4, 128.1, 127.3, 127.1, 126.7, 124.9, 122.8, 122.4, 120.1, 113.8; IR (KBr)  $\nu$  3058, 2930, 1786, 1675, 1598, 1477, 1443, 1325, 1299, 1211, 1175, 1154, 1070, 860, 786, 754,  $704\text{ cm}^{-1}$ ; HRMS (EI) calcd for  $\text{C}_{26}\text{H}_{17}\text{NO}_2$   $[\text{M}]^+$  375.1259, found 375.1254.

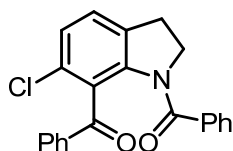
**(6-Fluoroindoline-1,7-diyl)bis(phenylmethanone) (3r)**



$^1\text{H}$  NMR (300 MHz,  $\text{CDCl}_3$ )  $\delta$  7.97 (d,  $J = 7.3$  Hz, 2H), 7.54–7.28 (m, 9H), 6.88 (t,  $J = 8.3$  Hz, 1H), 4.14 (t,  $J = 7.8$  Hz, 2H), 3.08 (t,  $J = 7.8$  Hz, 2H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CDCl}_3$ )  $\delta$  190.5, 169.2, 159.2 (d,  $J_{\text{C-F}} = 244.0$  Hz), 141.5 (d,  $J_{\text{C-F}} = 63.5$  Hz), 137.8, 135.3, 132.7, 131.1, 129.7 (d,  $J_{\text{C-F}} = 2.5$  Hz), 129.4, 128.3, 128.2, 127.9, 126.7 (d,  $J_{\text{C-F}} = 9.6$  Hz), 118.0 (d,  $J_{\text{C-F}} = 20.9$  Hz), 111.7 (d,  $J_{\text{C-F}} = 23.8$  Hz), 53.5, 29.0; IR (KBr)  $\nu$  2924, 2851, 1714, 1684, 1650, 1598, 1493,

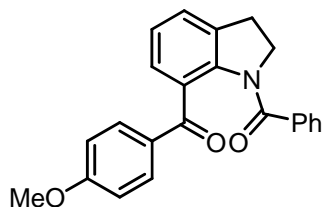
1463, 1448, 1384, 1318, 1264, 1170, 1099, 1005, 886, 732  $\text{cm}^{-1}$ ; HRMS (EI) calcd for  $\text{C}_{22}\text{H}_{16}\text{FNO}_2$   $[\text{M}]^+$  345.1165, found 345.1170.

**(6-Chloroindoline-1,7-diyl)bis(phenylmethanone) (3s)**



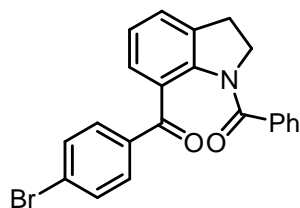
$^1\text{H}$  NMR (300 MHz,  $\text{CDCl}_3$ )  $\delta$  7.94 (d,  $J = 7.2$  Hz, 2H), 7.56–7.26 (m, 9H), 7.18 (d,  $J = 7.2$  Hz, 1H), 4.09 (t,  $J = 7.9$  Hz, 2H), 3.09 (t,  $J = 7.9$  Hz, 2H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CDCl}_3$ )  $\delta$  192.0, 169.1, 141.5, 137.7, 135.3, 133.1, 132.5, 131.1, 130.5, 129.5, 128.3, 128.2, 127.8, 127.6, 126.4, 126.2, 53.2, 29.3; IR (KBr)  $\nu$  2950, 2660, 2550, 1679, 1600, 1495, 1419, 1322, 1286, 1179, 1071, 930, 702  $\text{cm}^{-1}$ ; HRMS (EI) calcd for  $\text{C}_{22}\text{H}_{16}\text{ClNO}_2$   $[\text{M}]^+$  361.0870, found 361.0866.

**(1-Benzoylindolin-7-yl)(4-methoxyphenyl)methanone (4b)**



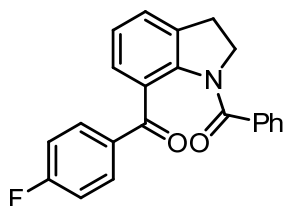
$^1\text{H}$  NMR (700 MHz,  $\text{CDCl}_3$ )  $\delta$  7.80 (d,  $J = 8.1$  Hz, 2H), 7.39 (d,  $J = 7.2$  Hz, 2H), 7.32–7.29 (m, 2H), 7.27–7.23 (m, 3H), 7.08 (t,  $J = 7.5$  Hz, 1H), 6.82 (d,  $J = 7.1$  Hz, 2H), 4.04 (t,  $J = 7.8$  Hz, 2H), 3.76 (s, 3H), 3.04 (t,  $J = 7.9$  Hz, 2H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CDCl}_3$ )  $\delta$  193.2, 169.4, 163.1, 140.1, 135.6, 134.4, 132.2, 130.9, 130.1, 129.2, 128.2, 128.1, 127.7, 126.7, 124.4, 113.4, 55.4, 52.7, 29.5; IR (KBr)  $\nu$  2924, 2840, 1658, 1636, 1598, 1573, 1508, 1432, 1379, 1330, 1253, 1143, 1081, 1026, 998, 884, 732  $\text{cm}^{-1}$ ; HRMS (EI) calcd for  $\text{C}_{23}\text{H}_{19}\text{NO}_3$   $[\text{M}]^+$  357.1365, found 357.1364.

**(1-Benzoylindolin-7-yl)(4-bromophenyl)methanone (4c)**



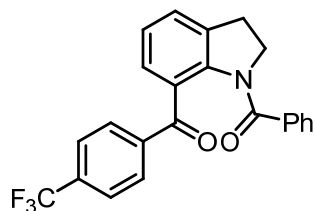
$^1\text{H}$  NMR (700 MHz,  $\text{CDCl}_3$ )  $\delta$  7.78 (d,  $J = 8.3$  Hz, 2H), 7.57 (d,  $J = 8.5$  Hz, 2H), 7.46–7.42 (m, 4H), 7.38 (t,  $J = 7.3$  Hz, 2H), 7.33 (d,  $J = 7.6$  Hz, 1H), 7.21 (t,  $J = 7.6$  Hz, 1H), 4.14 (t,  $J = 7.9$  Hz, 2H), 3.15 (t,  $J = 7.9$  Hz, 2H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CDCl}_3$ )  $\delta$  193.3, 169.5, 140.1, 136.1, 135.3, 134.4, 131.5, 131.3, 131.1, 128.5, 128.4, 127.8, 127.5, 127.4, 127.2, 124.6, 52.7, 29.5; IR (KBr)  $\nu$  3054, 2924, 1642, 1583, 1447, 1431, 1381, 1350, 1327, 1278, 1205, 1063, 989, 883, 788, 751  $\text{cm}^{-1}$ ; HRMS (EI) calcd for  $\text{C}_{22}\text{H}_{16}\text{BrNO}_2$   $[\text{M}]^+$  405.0364, found 405.0364.

**(1-Benzoylindolin-7-yl)(4-fluorophenyl)methanone (4d)**



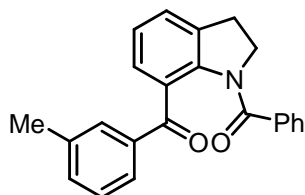
$^1\text{H}$  NMR (700 MHz,  $\text{CDCl}_3$ )  $\delta$  7.95–7.93 (m, 2H), 7.47–7.41 (m, 4H), 7.38–7.33 (m, 3H), 7.20 (t,  $J = 7.5$  Hz, 1H), 7.15–7.09 (m, 2H), 4.13 (t,  $J = 7.9$  Hz, 2H), 3.15 (t,  $J = 7.8$  Hz, 2H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CDCl}_3$ )  $\delta$  192.9, 169.5, 165.3 (d,  $J_{\text{C-F}} = 252.4$  Hz), 140.1, 135.4, 134.4, 133.6, 132.5 (d,  $J_{\text{C-F}} = 8.9$  Hz), 131.1, 128.6, 128.3, 127.8, 127.5, 127.1, 124.6, 115.1 (d,  $J_{\text{C-F}} = 22.1$  Hz), 52.7, 29.5; IR (KBr)  $\nu$  3060, 2923, 1665, 1596, 1504, 1447, 1430, 1379, 1327, 1287, 1224, 1151, 1093, 1006, 847, 757, 734  $\text{cm}^{-1}$ ; HRMS (EI) calcd for  $\text{C}_{22}\text{H}_{16}\text{FNO}_2$   $[\text{M}]^+$  345.1165, found 345.1165.

**(1-Benzoylindolin-7-yl)(4-trifluoromethylphenyl)methanone (4e)**



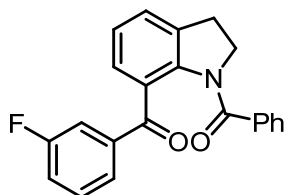
$^1\text{H}$  NMR (700 MHz,  $\text{CDCl}_3$ )  $\delta$  7.90 (d,  $J = 8.1$  Hz, 2H), 7.58 (d,  $J = 8.1$  Hz, 2H), 7.36–7.32 (m, 2H), 7.30–7.24 (m, 5H), 7.13 (t,  $J = 7.5$  Hz, 1H), 4.02 (t,  $J = 7.9$  Hz, 2H), 3.06 (t,  $J = 7.9$  Hz, 2H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CDCl}_3$ )  $\delta$  193.1, 169.7, 140.3, 140.1, 135.2, 134.4, 133.5 (q,  $J_{\text{C-F}} = 31.8$  Hz), 131.2, 130.2, 128.3, 128.1, 127.6, 127.5, 127.4, 125.1 (q,  $J_{\text{C-F}} = 2.3$  Hz), 124.8, 123.8 (q,  $J_{\text{C-F}} = 270.7$  Hz), 52.6, 29.5; IR (KBr)  $\nu$  3049, 2941, 1658, 1639, 1586, 1447, 1432, 1381, 1350, 1319, 1287, 1205, 1166, 1131, 1107, 1060, 990, 851, 761, 748, 693  $\text{cm}^{-1}$ ; HRMS (EI) calcd for  $\text{C}_{23}\text{H}_{16}\text{F}_3\text{NO}_2$   $[\text{M}]^+$  395.1133, found 395.1130.

**(1-Benzoylindolin-7-yl)(*m*-tolyl)methanone (4f)**



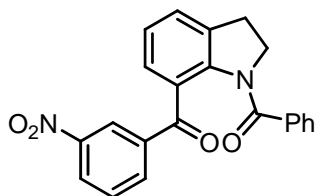
$^1\text{H}$  NMR (700 MHz,  $\text{CDCl}_3$ )  $\delta$  7.78 (s, 1H), 7.70 (d,  $J = 7.0$  Hz, 1H), 7.48 (d,  $J = 7.0$  Hz, 2H), 7.43–7.41 (m, 2H), 7.38–7.33 (m, 5H), 7.20 (t,  $J = 7.6$  Hz, 1H), 4.14 (t,  $J = 7.9$  Hz, 2H), 3.16 (t,  $J = 7.9$  Hz, 2H), 2.39 (s, 3H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CDCl}_3$ )  $\delta$  194.5, 169.5, 140.2, 137.8, 137.1, 135.6, 134.3, 133.2, 130.9, 130.4, 129.1, 128.2, 127.9, 127.8, 127.4, 126.9, 124.4, 52.7, 29.5, 21.3; IR (KBr)  $\nu$  3054, 2919, 2857, 1655, 1641, 1599, 1583, 1448, 1432, 1384, 1352, 1328, 1279, 1136, 1024, 875, 792, 749, 709  $\text{cm}^{-1}$ ; HRMS (EI) calcd for  $\text{C}_{23}\text{H}_{19}\text{NO}_2$   $[\text{M}]^+$  341.1416, found 341.1412.

**(1-Benzoylindolin-7-yl)(3-fluorophenyl)methanone (4g)**



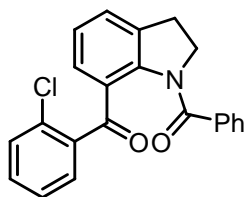
$^1\text{H}$  NMR (700 MHz,  $\text{CDCl}_3$ )  $\delta$  7.85 (d,  $J = 7.7$  Hz, 1H), 7.70 (d,  $J = 7.6$  Hz, 1H), 7.61 (d,  $J = 9.2$  Hz, 1H), 7.47–7.34 (m, 7H), 7.23–7.20 (m, 2H), 4.14 (t,  $J = 7.9$  Hz, 2H), 3.15 (t,  $J = 7.9$  Hz, 2H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CDCl}_3$ )  $\delta$  192.8, 169.5, 162.5 (d,  $J_{\text{C-F}} = 245.2$  Hz), 140.1, 139.3 (d,  $J_{\text{C-F}} = 6.0$  Hz), 135.4, 134.4, 131.1, 129.7 (d,  $J_{\text{C-F}} = 7.5$  Hz), 128.3, 128.2, 127.8, 127.6, 127.3, 125.7 (d,  $J_{\text{C-F}} = 2.6$  Hz), 124.7, 119.3 (d,  $J_{\text{C-F}} = 21.0$  Hz), 116.6 (d,  $J_{\text{C-F}} = 22.2$  Hz), 52.7, 29.5; IR (KBr)  $\nu$  3066, 2922, 1722, 1660, 1639, 1585, 1445, 1431, 1385, 1352, 1326, 1292, 1266, 1218, 1127, 1073, 998, 808, 784, 746, 710  $\text{cm}^{-1}$ ; HRMS (EI) calcd for  $\text{C}_{22}\text{H}_{16}\text{FNO}_2$   $[\text{M}]^+$  345.1165, found 345.1165.

**(1-Benzoylindolin-7-yl)(3-nitrophenyl)methanone (4h)**



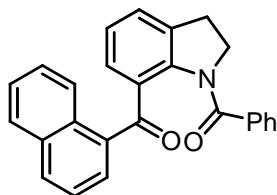
$^1\text{H}$  NMR (700 MHz,  $\text{CDCl}_3$ )  $\delta$  8.67 (s, 1H), 8.36–8.33 (m, 2H), 7.62 (t,  $J = 7.9$  Hz, 1H), 7.49 (dd,  $J = 7.4, 1.1$  Hz, 1H), 7.44–7.40 (m, 3H), 7.38–7.34 (m, 3H), 7.27 (q,  $J = 7.9$  Hz, 1H), 4.18 (t,  $J = 7.9$  Hz, 2H), 3.20 (t,  $J = 7.9$  Hz, 2H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CDCl}_3$ )  $\delta$  191.4, 169.5, 148.0, 139.9, 138.6, 135.5, 135.1, 134.5, 131.2, 129.4, 128.4, 127.8, 127.6, 127.5, 127.4, 126.6, 125.1, 124.6, 52.7, 29.5; IR (KBr)  $\nu$  3077, 2940, 1653, 1638, 1527, 1448, 1432, 1381, 1345, 1325, 1272, 1204, 1155, 1079, 1010, 907, 820, 739, 699  $\text{cm}^{-1}$ ; HRMS (EI) calcd for  $\text{C}_{22}\text{H}_{16}\text{N}_2\text{O}_4$   $[\text{M}]^+$  372.1110, found 372.1115.

**(1-Benzoylindolin-7-yl)(2-chlorophenyl)methanone (4i)**



$^1\text{H}$  NMR (700 MHz,  $\text{CDCl}_3$ )  $\delta$  7.75 (dd,  $J = 7.6, 1.5$  Hz, 1H), 7.47–7.34 (m, 9H), 7.25 (td,  $J = 8.1, 1.1$  Hz, 1H), 7.20 (t,  $J = 7.6$  Hz, 1H), 4.12 (t,  $J = 7.8$  Hz, 2H), 3.12 (t,  $J = 7.8$  Hz, 2H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CDCl}_3$ )  $\delta$  192.9, 170.2, 140.8, 137.0, 135.4, 134.7, 132.9, 132.4, 131.7, 131.2, 130.2, 129.5, 128.3, 128.2, 128.1, 128.0, 126.3, 124.8, 53.1, 29.5; IR (KBr)  $\nu$  3062, 2899, 1682, 1644, 1584, 1467, 1428, 1376, 1329, 1287, 1252, 1174, 1062, 998, 882, 788  $\text{cm}^{-1}$ ; HRMS (EI) calcd for  $\text{C}_{22}\text{H}_{16}\text{ClNO}_2$   $[\text{M}]^+$  361.0870, found 361.0865.

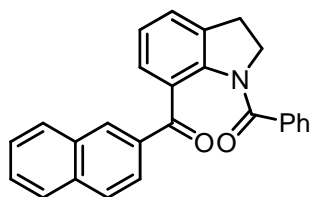
**(7-(1-Naphthoyl)indolin-1-yl)(phenyl)methanone (4j)**



$^1\text{H}$  NMR (700 MHz,  $\text{CDCl}_3$ )  $\delta$  8.69 (d,  $J = 8.5$  Hz, 1H), 7.98 (d,  $J = 8.2$  Hz, 1H), 7.90 (d,  $J = 7.0$  Hz, 1H), 7.86 (d,  $J = 7.5$  Hz, 1H), 7.54–7.40 (m, 3H), 7.34–7.32 (m, 3H), 7.15 (t,  $J = 7.6$  Hz, 1H), 4.14 (t,  $J = 7.9$  Hz, 2H), 3.15 (t,  $J = 7.9$  Hz, 2H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CDCl}_3$ )  $\delta$  196.1, 169.9, 140.9, 135.5, 134.7, 134.5, 133.8, 132.4, 131.5, 131.1, 130.2, 130.1, 128.7, 128.2, 128.1, 128.0, 127.5, 127.4, 126.3, 126.1, 124.4, 124.1, 52.8, 29.5; IR (KBr)  $\nu$  3060, 2940, 1720, 1640, 1594, 1575, 1509, 1443, 1429, 1377, 1345, 1324, 1277, 1245, 1198, 1080, 1051, 955, 889, 773, 751, 703  $\text{cm}^{-1}$ ; HRMS (EI) calcd for  $\text{C}_{26}\text{H}_{19}\text{NO}_2$   $[\text{M}]^+$  377.1416, found 377.1416.

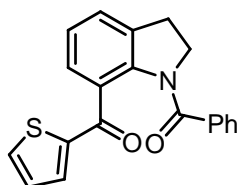
**(7-(2-Naphthoyl)indolin-1-yl)(phenyl)methanone (4k)**





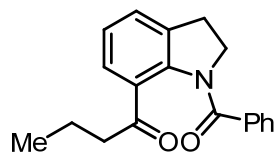
$^1\text{H}$  NMR (700 MHz,  $\text{CDCl}_3$ )  $\delta$  8.39 (s, 1H), 8.06 (d,  $J = 8.4$  Hz, 1H), 7.92 (d,  $J = 7.9$  Hz, 1H), 7.87 (m, 2H), 7.59 (dt,  $J = 7.4, 1.2$  Hz, 1H), 7.53 (dt,  $J = 7.4, 1.1$  Hz, 1H), 7.47–7.43 (m, 2H), 7.38–7.37 (m, 3H), 7.28–7.23 (m, 3H), 4.16 (t,  $J = 7.9$  Hz, 2H), 3.19 (t,  $J = 7.8$  Hz, 2H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CDCl}_3$ )  $\delta$  194.3, 169.5, 140.3, 135.4, 134.5, 134.4, 132.4, 131.6, 130.9, 129.4, 129.1, 128.2, 128.1, 127.9, 127.8, 127.7, 127.1, 126.3, 125.8, 124.5, 52.7, 29.6; IR (KBr)  $\nu$  3053, 2921, 1722, 1653, 1629, 1591, 1446, 1433, 1378, 1326, 1284, 1118, 1024, 898, 759, 730  $\text{cm}^{-1}$ ; HRMS (EI) calcd for  $\text{C}_{26}\text{H}_{19}\text{NO}_2$   $[\text{M}]^+$  377.1416, found 377.1414.

**(1-Benzoylindolin-7-yl)(thiophen-2-yl)methanone (4l)**



$^1\text{H}$  NMR (700 MHz,  $\text{CDCl}_3$ )  $\delta$  7.55 (dd,  $J = 5.2, 1.3$  Hz, 2H), 7.46 (d,  $J = 7.2$  Hz, 2H), 7.38 (d,  $J = 7.7$  Hz, 1H), 7.35–7.28 (m, 4H), 7.10 (t,  $J = 7.5$  Hz, 1H), 7.04 (t,  $J = 4.7$  Hz, 1H), 4.08 (t,  $J = 7.9$  Hz, 2H), 3.05 (t,  $J = 7.9$  Hz, 2H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CDCl}_3$ )  $\delta$  186.5, 169.3, 144.1, 139.8, 135.6, 134.6, 133.7, 133.6, 131.1, 128.9, 128.3, 128.1, 127.6, 127.5, 127.1, 124.4, 52.7, 29.5; IR (KBr)  $\nu$  3049, 2923, 2856, 1730, 1638, 1621, 1519, 1447, 1429, 1413, 1385, 1352, 1326, 1292, 1204, 1080, 1051, 965, 792, 723, 700  $\text{cm}^{-1}$ ; HRMS (EI) calcd for  $\text{C}_{20}\text{H}_{15}\text{NO}_2\text{S}$   $[\text{M}]^+$  333.0823, found 333.0826.

**1-(1-Benzoylindolin-7-yl)butan-1-one (4m)**



$^1\text{H}$  NMR (300 MHz,  $\text{CDCl}_3$ )  $\delta$  7.66 (d,  $J = 8.4$  Hz, 2H), 7.50–7.42 (m, 3H), 7.38 (d,  $J = 7.6$  Hz, 1H), 7.34 (dd,  $J = 7.4, 0.9$  Hz, 1H), 7.16 (t,  $J = 7.5$  Hz, 1H), 4.16 (t,  $J = 7.9$  Hz, 2H), 3.09 (t,  $J = 7.9$  Hz, 2H), 2.87 (t,  $J = 7.4$  Hz, 2H), 1.80–1.68 (m, 2H), 0.96 (t,  $J = 7.4$  Hz, 3H);  $^{13}\text{C}$  NMR (175 MHz,  $\text{CDCl}_3$ )  $\delta$  202.6, 169.8, 138.9, 135.8, 134.5, 131.5, 131.1, 128.5, 128.1, 126.8, 125.6, 124.8, 52.7, 42.6, 29.4, 17.5, 13.9; IR (KBr)  $\nu$  2927, 1692, 1647, 1574, 1491, 1445, 1373, 1322, 1250, 1114, 1073, 1026, 876, 790  $\text{cm}^{-1}$ ; HRMS (EI) calcd for  $\text{C}_{19}\text{H}_{19}\text{NO}_2$   $[\text{M}]^+$  293.1416, found 293.1412.

## One-pot scale-up experiment and characterization of **5a**

To an oven-dried sealed tube charged with *N*-benzoylindoline (**1e**) (0.5 g, 2.2 mmol, 100 mol %), Pd(TFA)<sub>2</sub> (36.5 mg, 0.11 mmol, 5 mol %), and (NH<sub>4</sub>)<sub>2</sub>S<sub>2</sub>O<sub>8</sub> (1.03 g, 4.4 mmol, 200 mol %) in DCE (10 mL) was added phenylglyoxylic acid (**2a**) (0.49 g, 3.3 mmol, 150 mol%). The reaction mixture was allowed to stir at 80 °C for 30 h, and cooled to room temperature. DDQ (2.49 g, 11.0 mmol, 500 mol %) was added to the reaction mixture and the reaction mixture was stirred at 120 °C for 18 h. The reaction mixture was diluted with EtOAc (30 mL) and washed with water. The aqueous layer was extracted with EtOAc (3 × 30 mL). The combined organic layer was dried over Mg<sub>2</sub>SO<sub>4</sub> and concentrated in vacuo. The residue was purified by flash column chromatography (*n*-hexanes/EtOAc = 5:1) to afford 0.44 g of **5a** in 62% yield.

### (*1H*-Indole-1,7-diyl)bis(phenylmethanone) (**5a**)

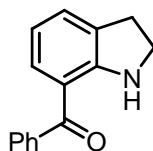


<sup>1</sup>H NMR (700 MHz, CDCl<sub>3</sub>) δ 7.84 (dd, *J* = 8.1, 1.1 Hz, 2H), 7.68 (dd, *J* = 7.7, 1.2 Hz, 1H), 7.63 (dd, *J* = 8.1, 1.1 Hz, 2H), 7.46–7.41 (m, 2H), 7.35–7.31 (m, 5H), 7.27 (t, *J* = 7.6 Hz, 1H), 7.17 (d, *J* = 3.7 Hz, 1H), 6.59 (d, *J* = 3.7 Hz, 1H); <sup>13</sup>C NMR (175 MHz, CDCl<sub>3</sub>) δ 194.9, 168.1, 137.5, 133.1, 132.8, 132.7, 132.4, 132.1, 130.1, 129.8, 129.2, 128.6, 128.2, 127.4, 125.5, 123.7, 123.1, 108.0; IR (KBr) ν 3057, 2923, 2851, 1692, 1664, 1597, 1542, 1448, 1413, 1321, 1270, 1198, 1178, 1067, 1021, 888, 872, 787 cm<sup>-1</sup>; HRMS (EI) calcd for C<sub>22</sub>H<sub>15</sub>NO<sub>2</sub> [M]<sup>+</sup> 325.1103, found 325.1102.

## General procedure and characterization for the deprotection of *N*-benzoylindoline **3e**

To a stirred solution of indoline-1,7-diylbis(phenylmethanone) (**3e**) (68.7 mg, 0.21 mmol) in EtOH (4 mL) was added saturated solution of KOH (3 mL) at room temperature. The reaction mixture was allowed to stir for 12 h at 100 °C. The reaction mixture was diluted with EtOAc (10 mL) and washed with water. The aqueous layer was extracted with EtOAc (3 × 10 mL). The combined organic layer was dried over Mg<sub>2</sub>SO<sub>4</sub> and concentrated in vacuo. The residue was purified by flash column chromatography (*n*-hexanes/EtOAc = 10:1) to afford 37.9 mg of free-(NH)-indoline **5b** in 81% yield.

### Indolin-7-yl(phenyl)methanone (**5b**)

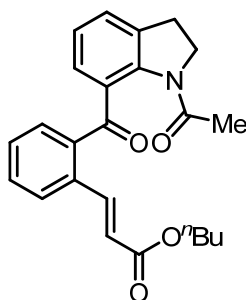


<sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>) δ 7.66 (dd, *J* = 7.8, 1.3 Hz, 2H), 7.52–7.46 (m, 3H), 7.29–7.26 (m, 1H), 7.20 (dd, *J* = 6.9, 1.2 Hz, 2H), 6.49 (t, *J* = 6.9 Hz, 1H), 3.82 (t, *J* = 8.4 Hz, 2H), 3.12 (t, *J* = 8.7 Hz, 2H); <sup>13</sup>C NMR (175 MHz, CDCl<sub>3</sub>) δ 197.4, 155.5, 139.7, 131.4, 130.8, 130.7, 128.8, 128.1, 115.1, 114.9, 46.7, 28.1; IR (KBr) ν 3392, 3060, 2928, 2890, 1620, 1569, 1507, 1470, 1390, 1306, 1226, 1198, 1008, 735, 702 cm<sup>-1</sup>; HRMS (EI) calcd for C<sub>15</sub>H<sub>13</sub>NO [M]<sup>+</sup> 223.0997, found 223.1003.

### General procedure for the olefination of C7-acylated indoline 3a

To an oven-dried sealed tube charged with 1-(7-benzoylindolin-1-yl)ethanone (**3a**) (52.9 mg, 0.2 mmol, 100 mol %), [Ru(*p*-cymene)<sub>2</sub>Cl<sub>2</sub>] (3.1 mg, 0.005 mmol, 2.5 mol %), AgSbF<sub>6</sub> (6.8 mg, 0.02 mmol, 10 mol%) and Cu(OAc)<sub>2</sub> (9.0 mg, 0.05 mmol, 25 mol %) in DCE (1 mL) was added *n*-butyl acrylate (51.2 mg, 0.4 mmol, 200 mol %). The reaction mixture was allowed to stir for 12 h at 110 °C. The reaction mixture was diluted with EtOAc (10 mL) and washed with water. The aqueous layer was extracted with EtOAc (3 × 10 mL). The combined organic layer was dried over Mg<sub>2</sub>SO<sub>4</sub> and concentrated in vacuo. The residue was purified by flash column chromatography (*n*-hexanes/EtOAc = 2:1) to afford desired product **5c** (35.2 mg, 45% yield) and starting material **3a** (20.1 mg, 38% recovered yield).

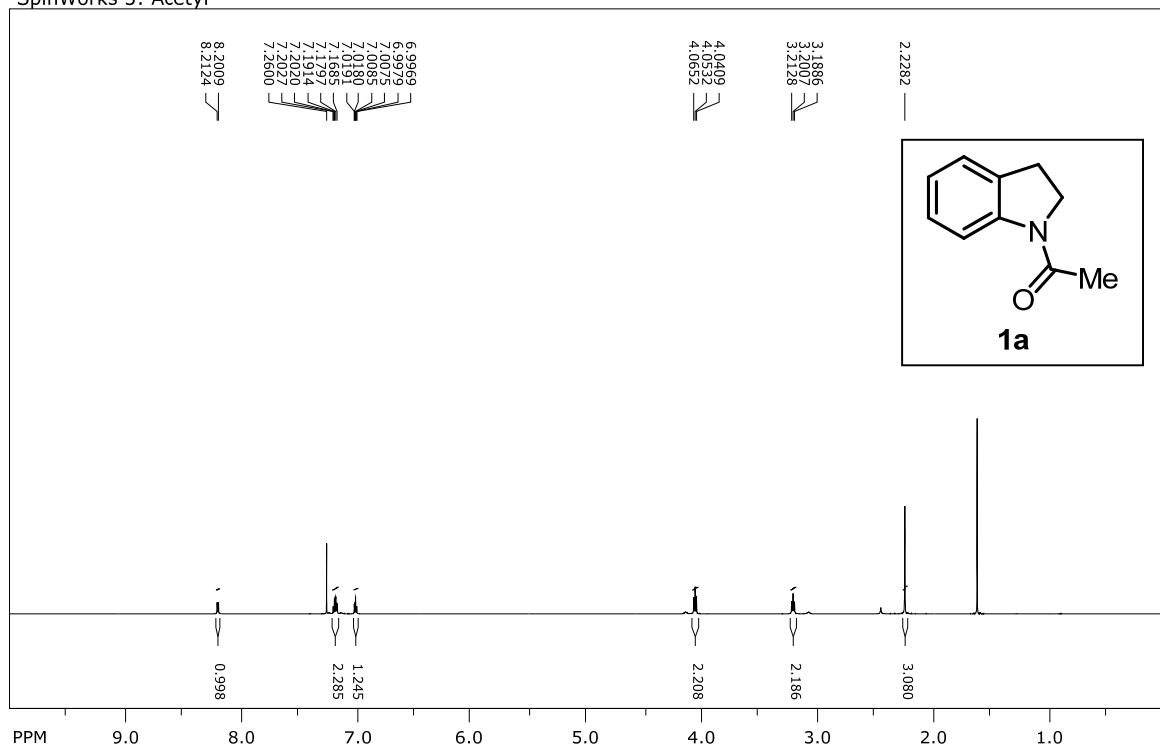
### (*E*)-Butyl 3-(2-(1-acetylidoline-7-carbonyl)phenyl)acrylate (**5c**)



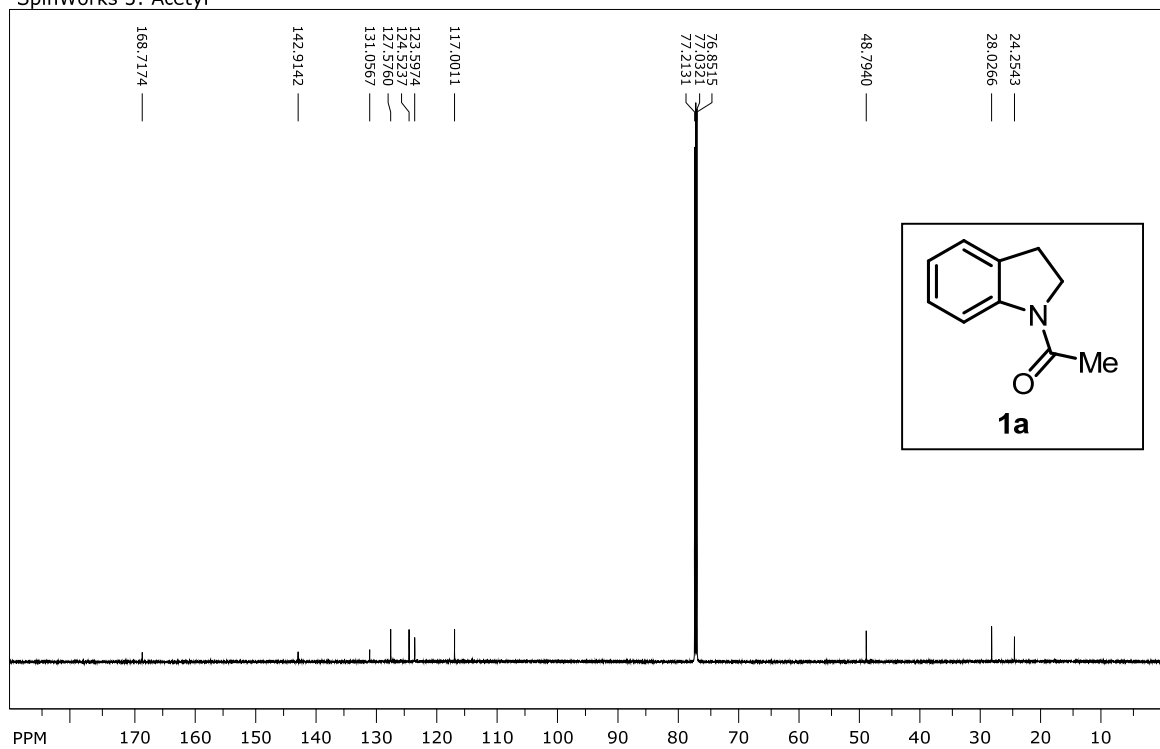
<sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ 8.28 (d, *J* = 15.9 Hz, 1H), 7.67–7.62 (m, 2H), 7.49 (t, *J* = 7.5 Hz, 1H), 7.38–7.34 (m, 2H), 7.13–7.06 (m, 2H), 6.30 (d, *J* = 15.9 Hz, 1H), 4.16–4.13 (m, 4H) 3.21 (t, *J* = 8.0 Hz, 2H), 2.08 (s, 3H), 1.66–1.58 (m, 2H), 1.42–1.39 (m, 2H), 0.94 (t, *J* = 7.4 Hz, 3H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 194.7, 167.9, 166.7, 144.2, 139.3, 137.4, 136.4, 133.8, 131.7, 131.5, 129.7, 128.7, 127.6, 127.1, 125.7, 124.1, 120.3, 64.2, 49.6, 30.7, 28.9, 23.2, 19.1, 13.7; IR (KBr) ν 3054, 2924, 1642, 1583, 1447, 1431, 1381, 1350, 1327, 1278, 1205, 1063, 989, 883, 788, 751 cm<sup>-1</sup>; HRMS (EI) calcd for C<sub>24</sub>H<sub>25</sub>NO<sub>4</sub> [M]<sup>+</sup> 391.1784, found 391.1781.

# <sup>1</sup>H and <sup>13</sup>C NMR spectra of all compounds

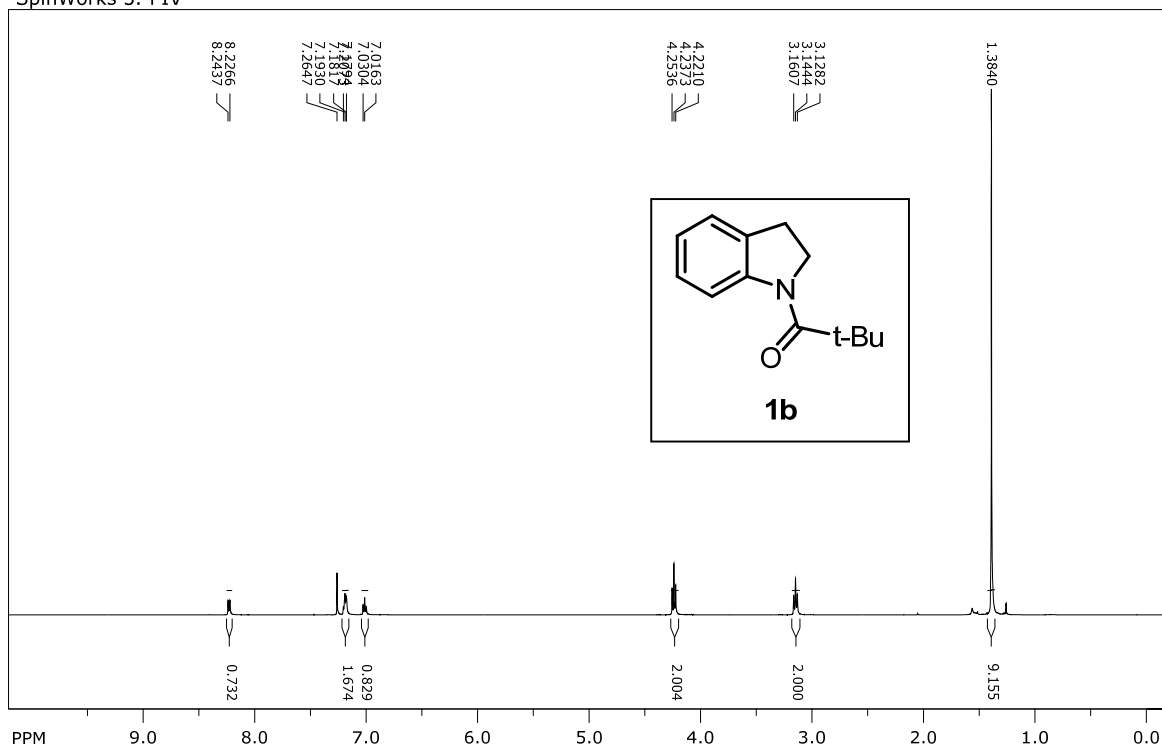
SpinWorks 3: Acetyl



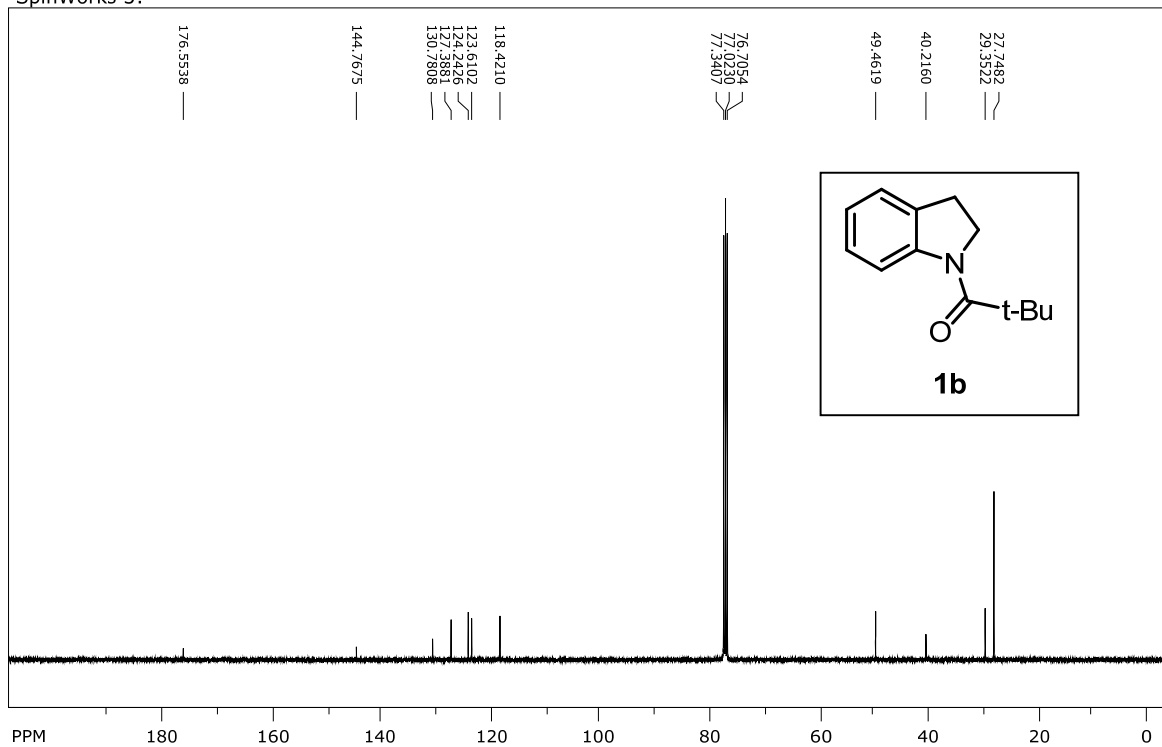
SpinWorks 3: Acetyl



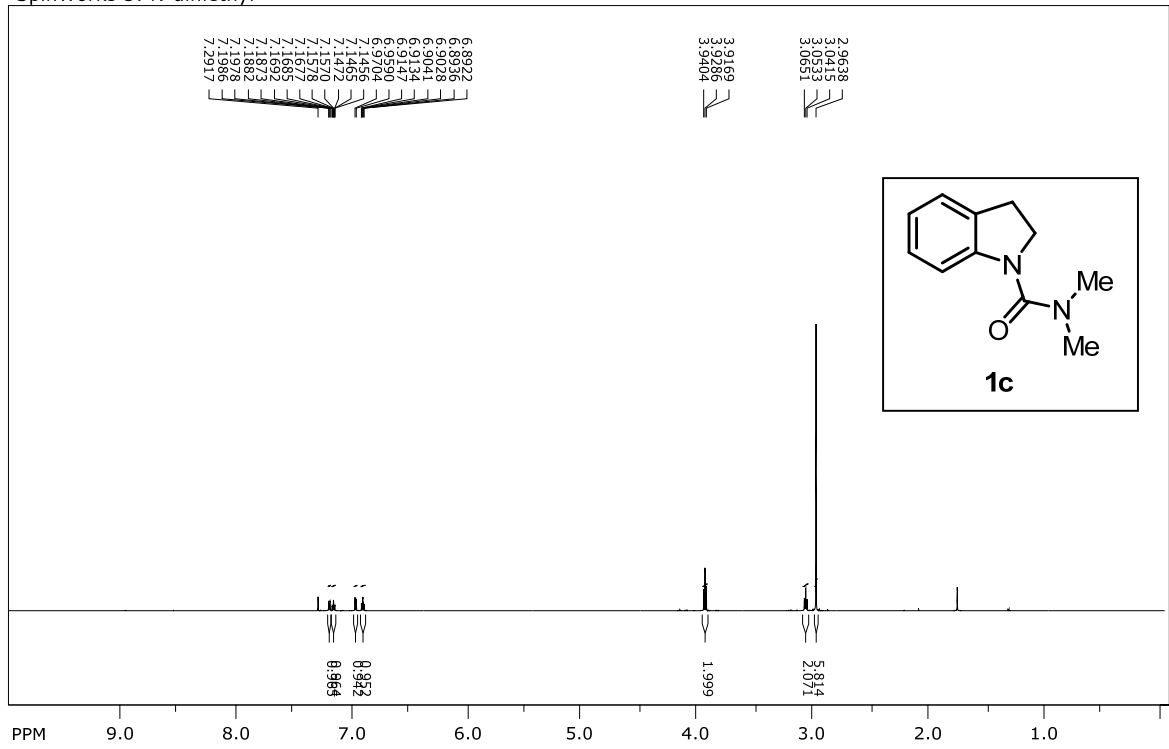
SpinWorks 3: PIV



SpinWorks 3:

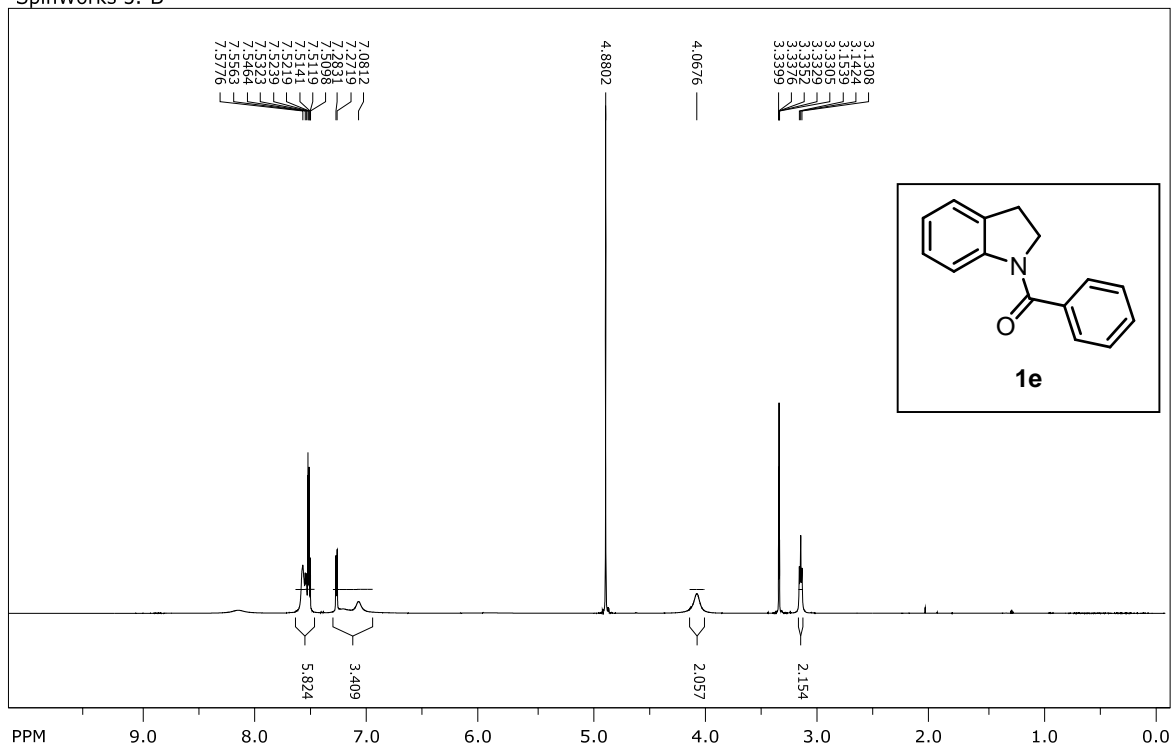


SpinWorks 3: N-dimethyl

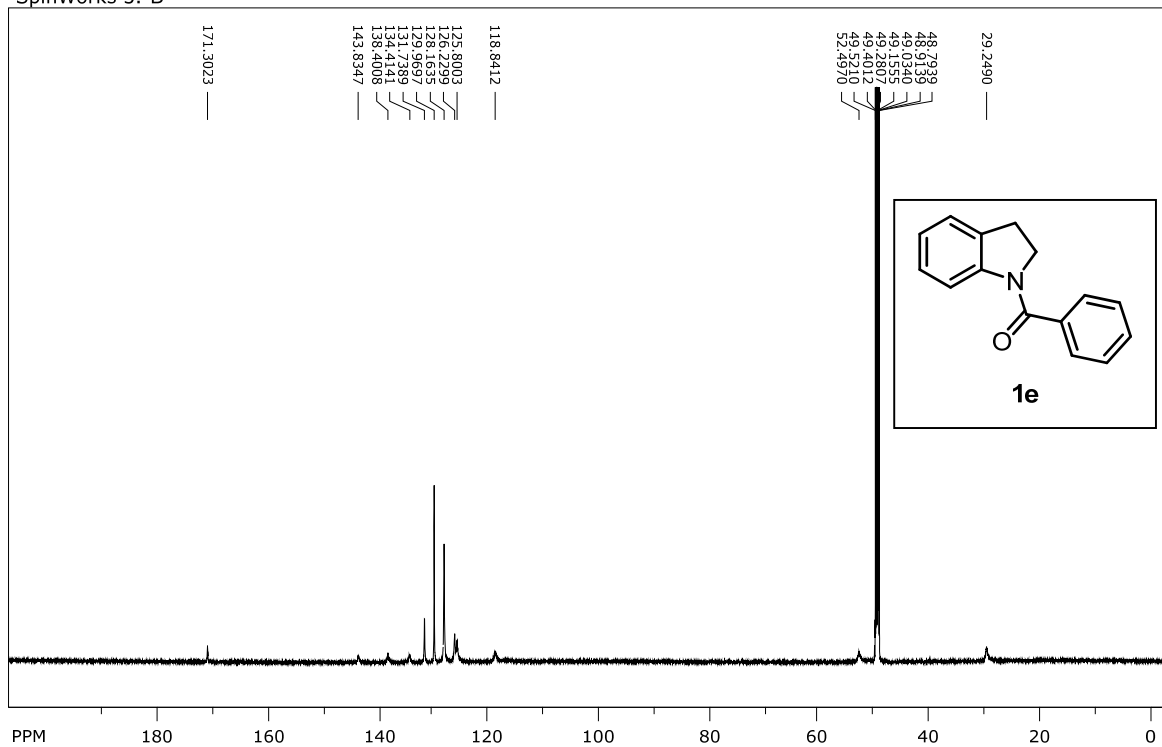




SpinWorks 3: B



SpinWorks 3: B



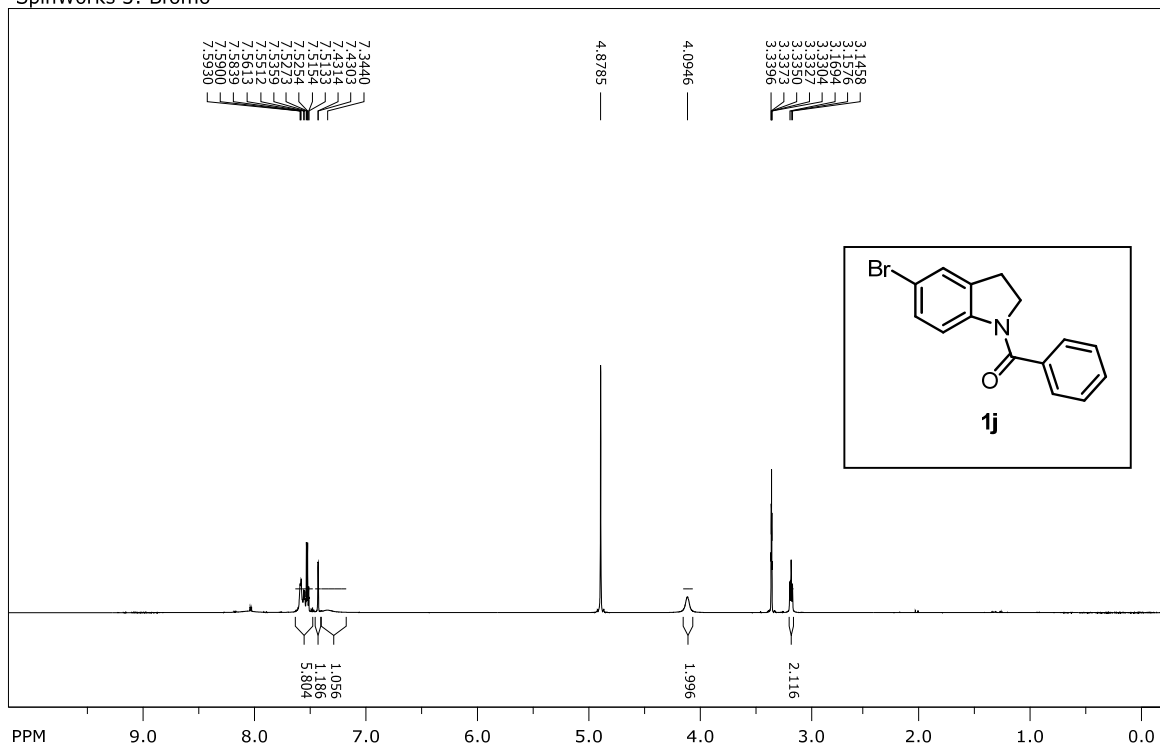




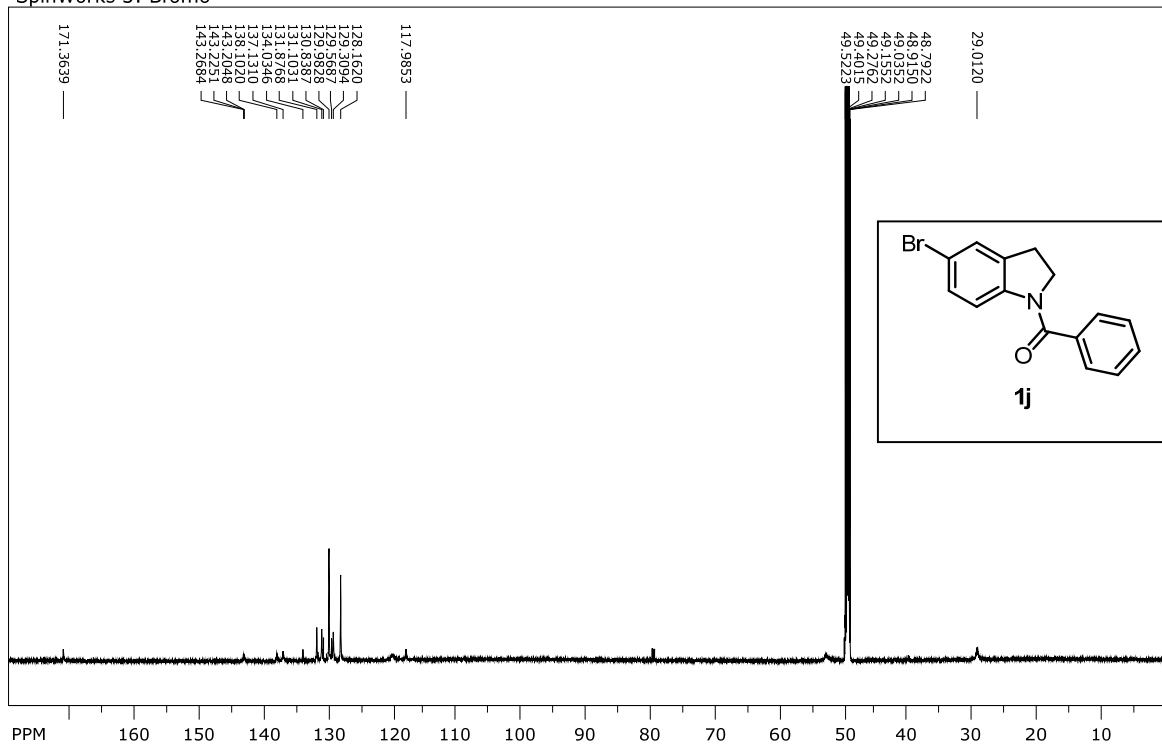




SpinWorks 3: Bromo

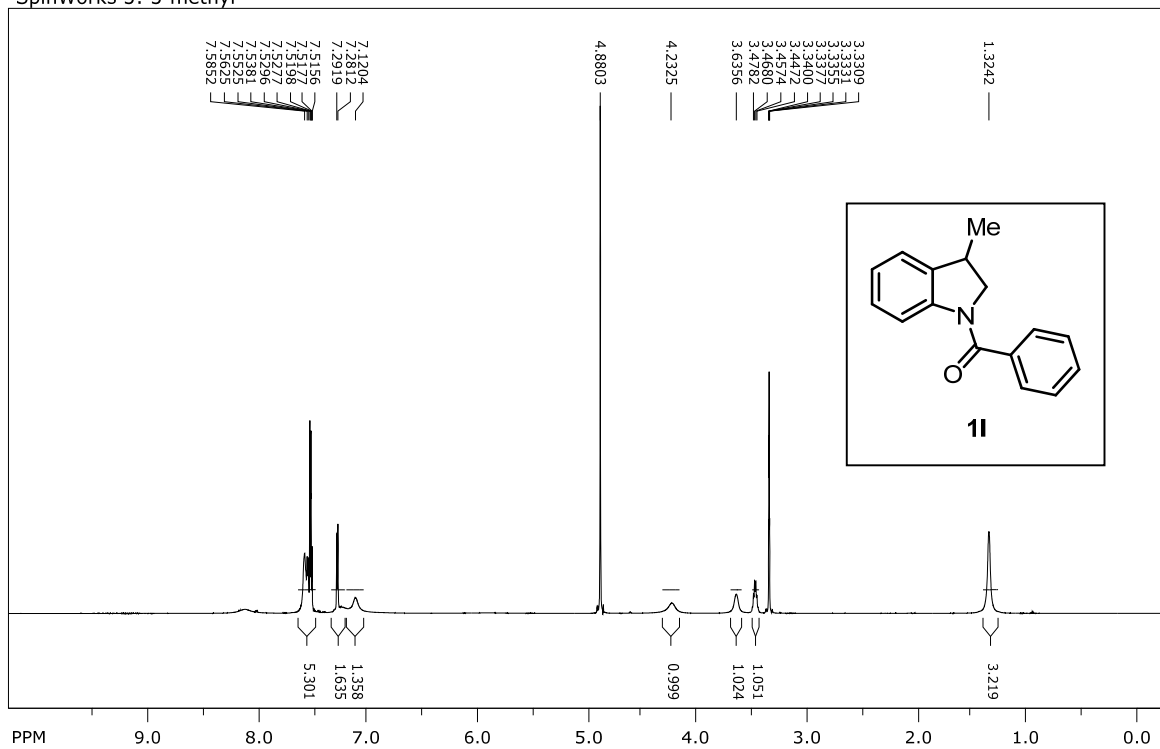


SpinWorks 3: Bromo

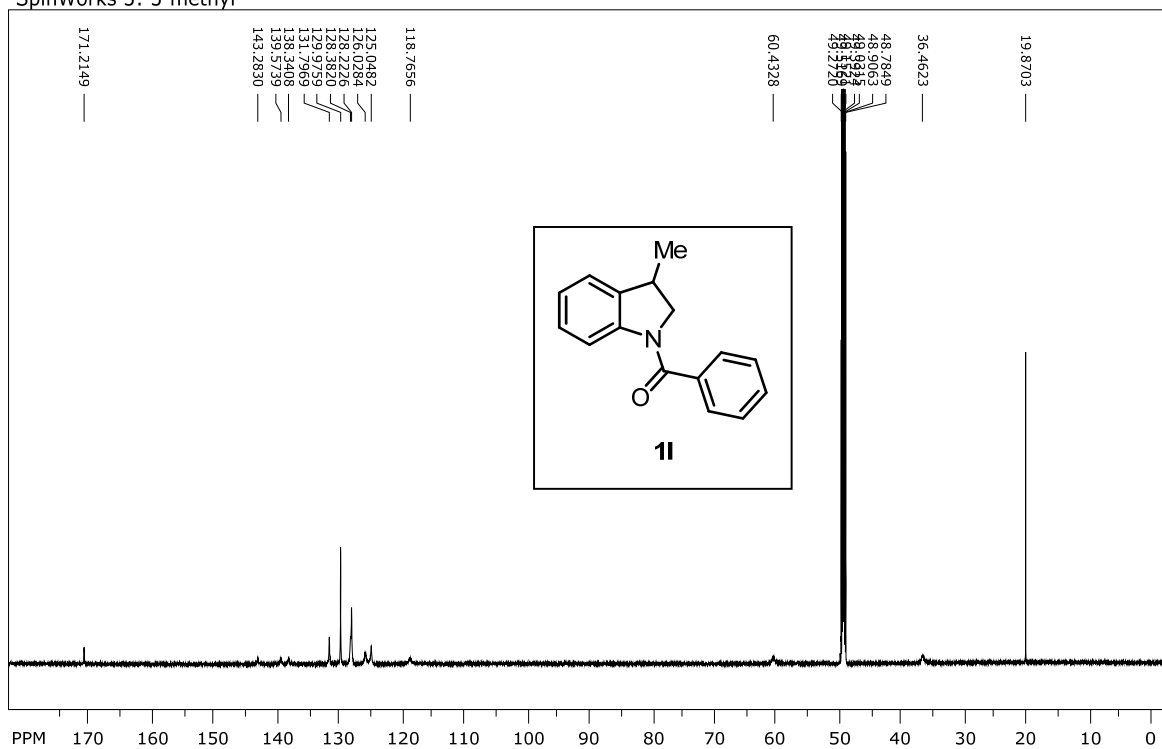




SpinWorks 3: 3-methyl

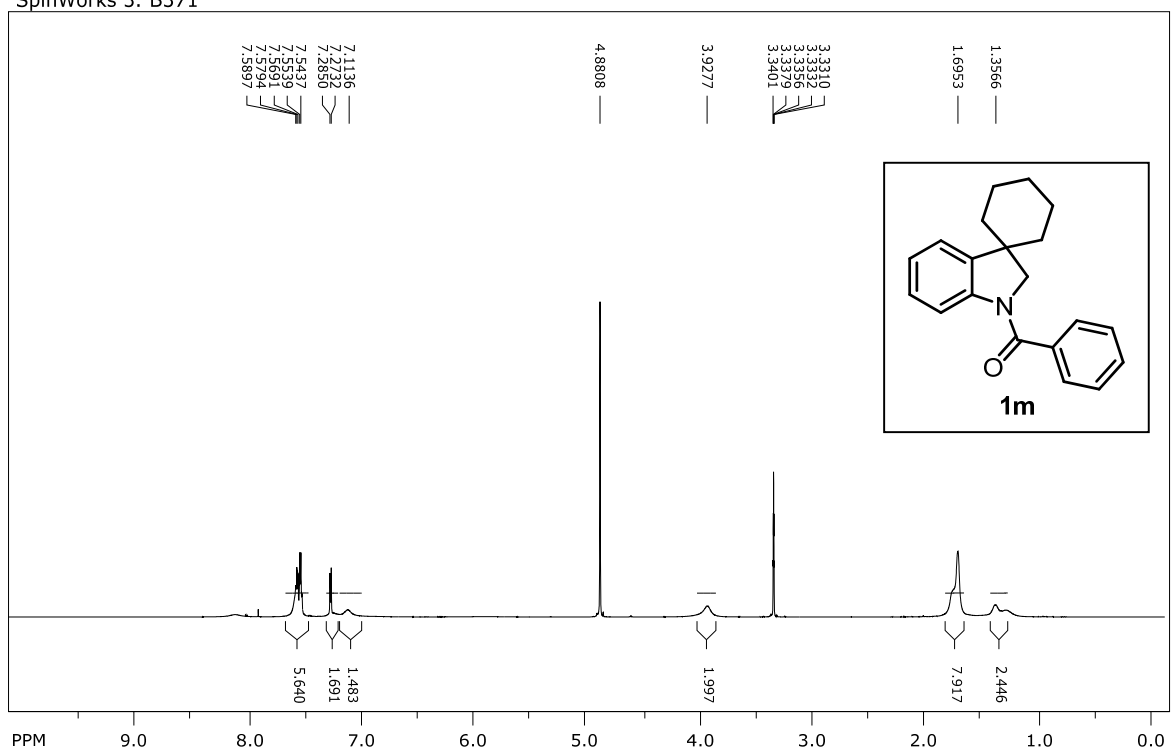


SpinWorks 3: 3-methyl

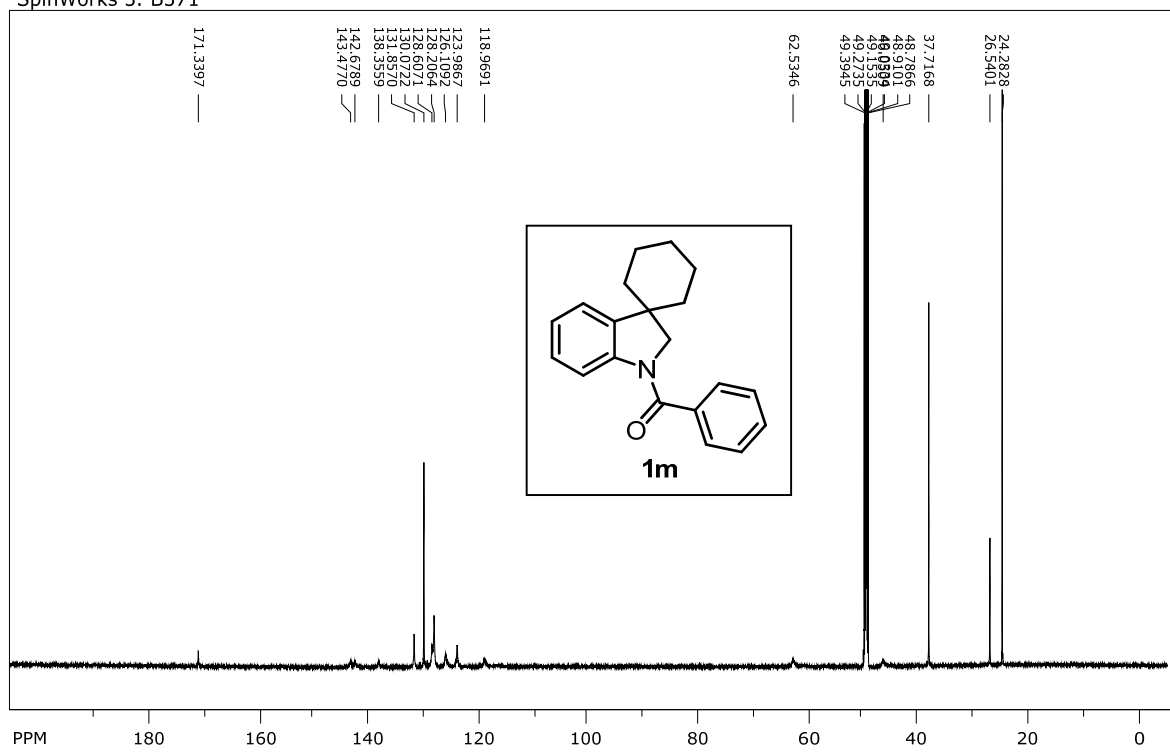




SpinWorks 3: B371

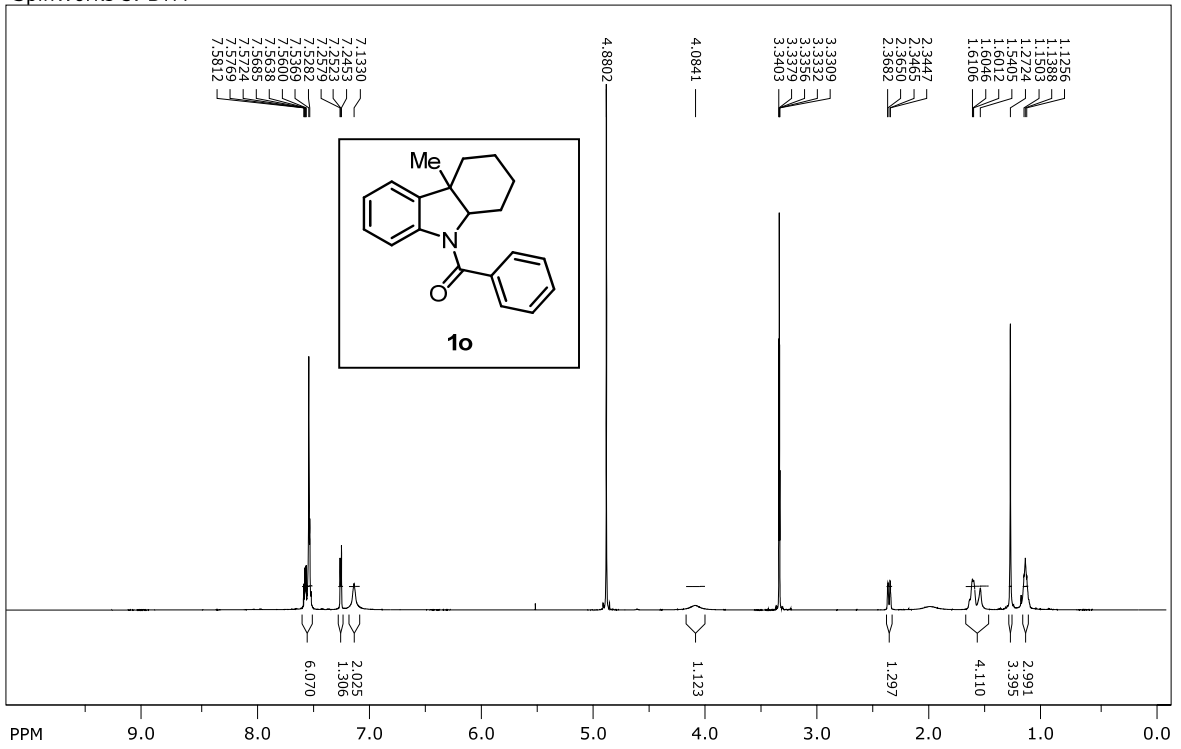


SpinWorks 3: B371

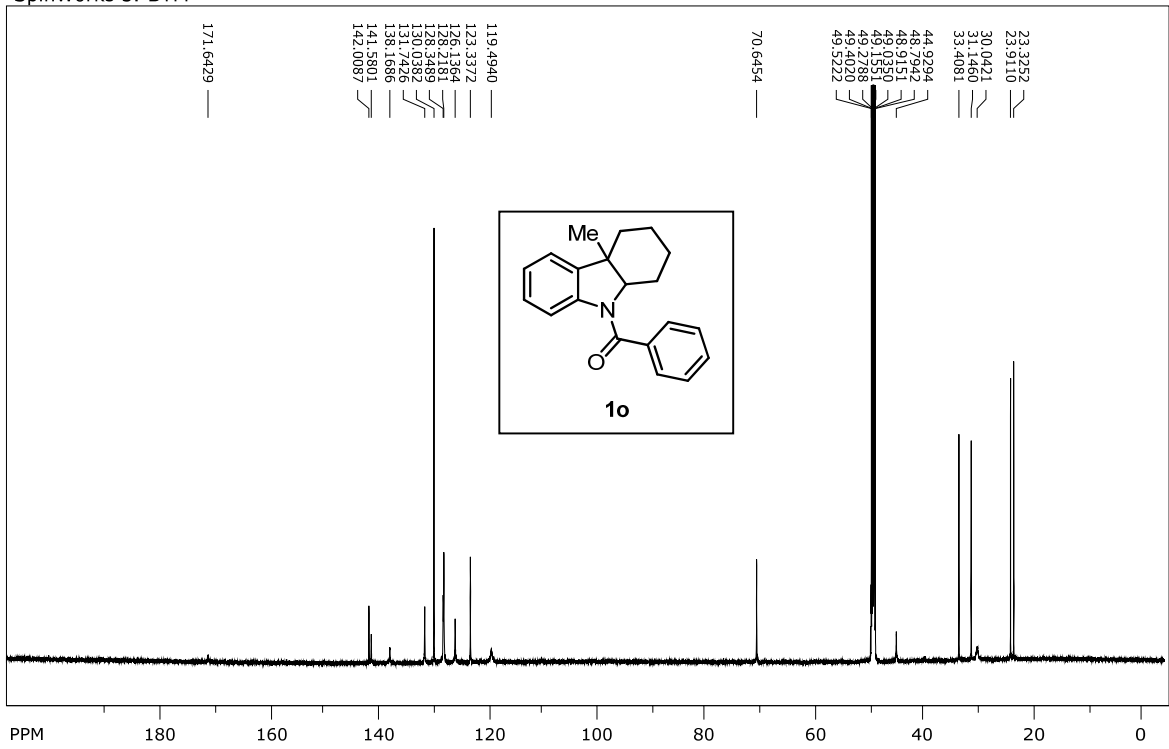




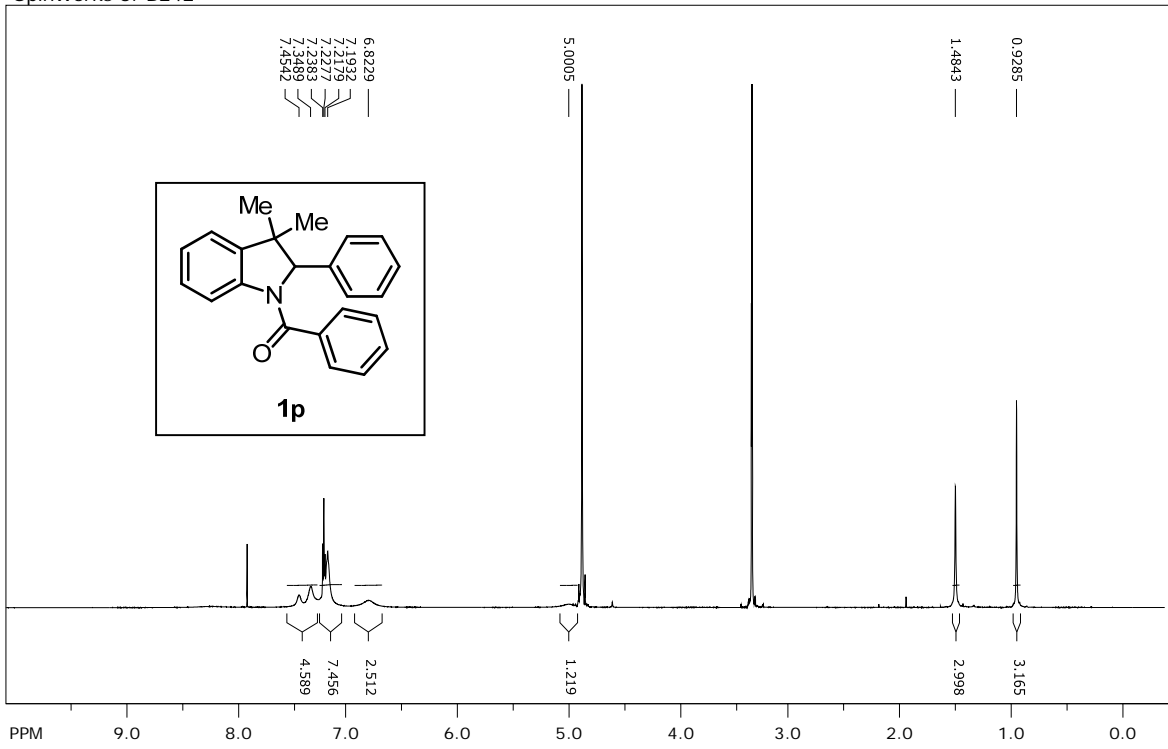
SpinWorks 3: BYM



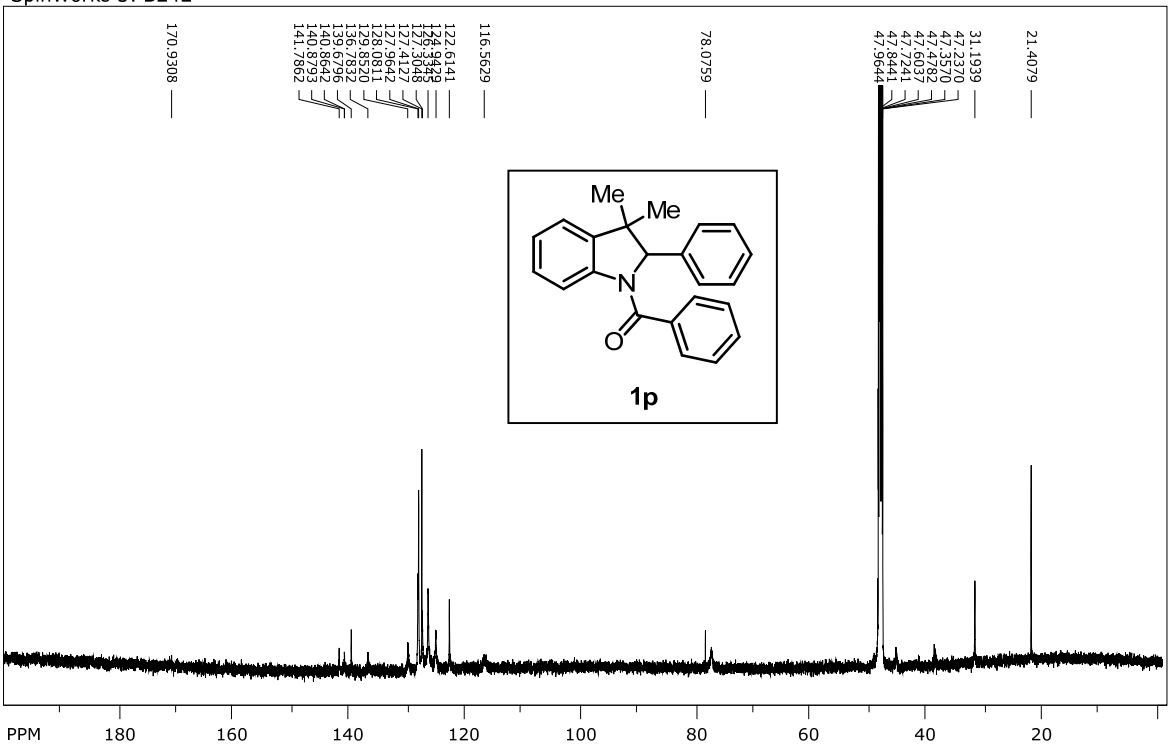
SpinWorks 3: BYM



SpinWorks 3: B242

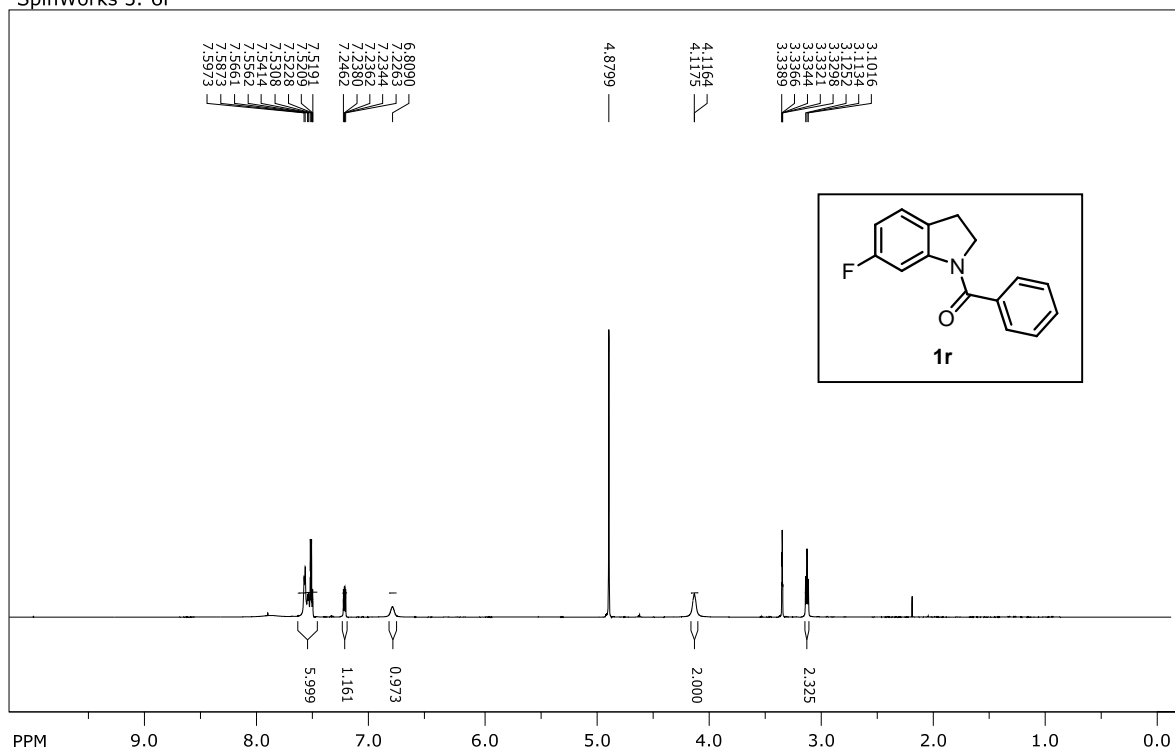


SpinWorks 3: B242

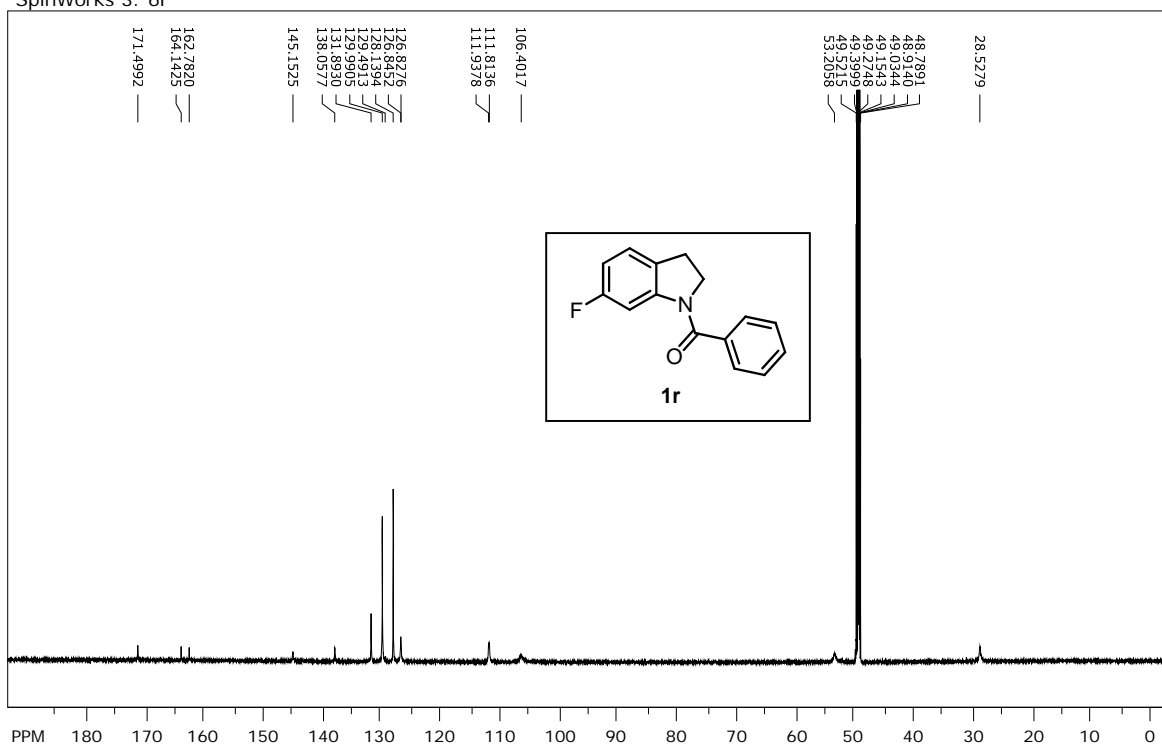




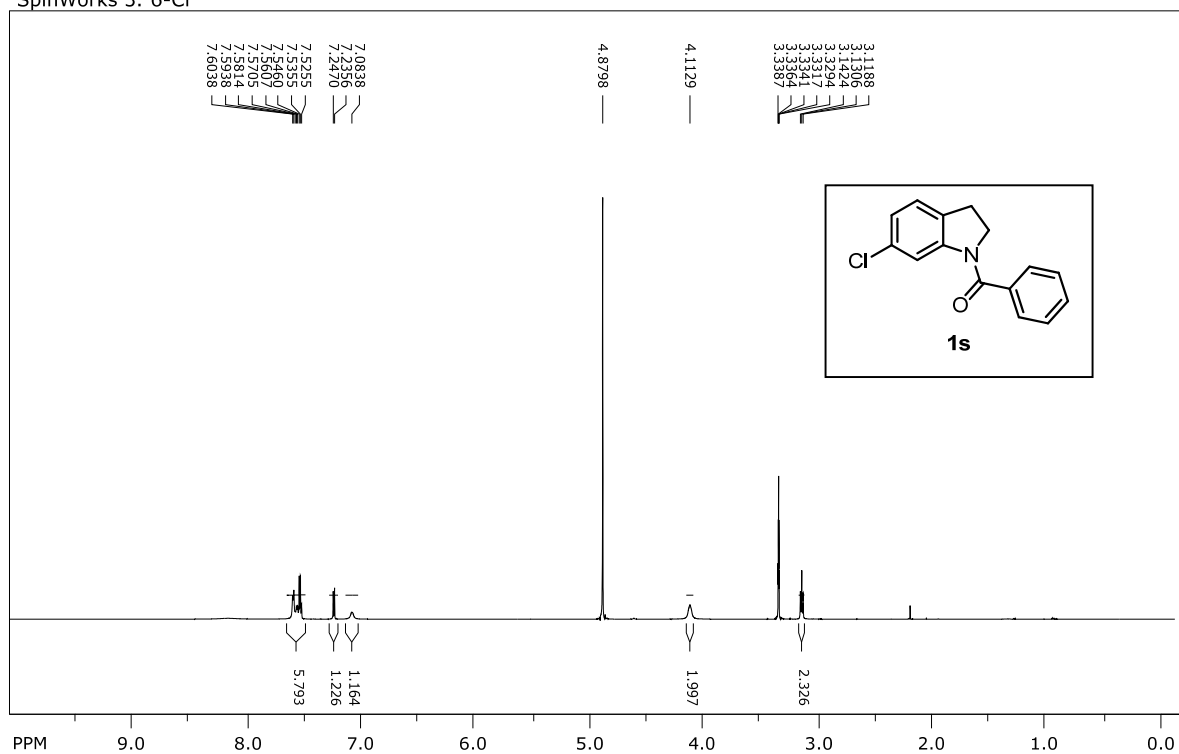
SpinWorks 3: 6F



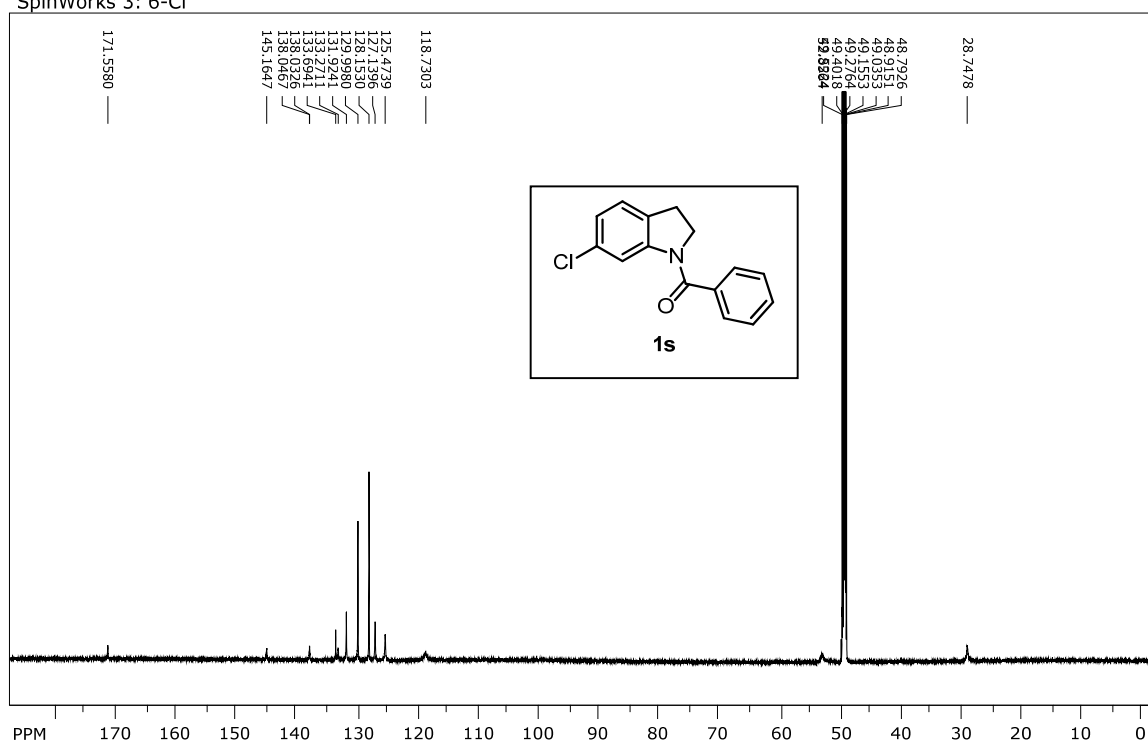
SpinWorks 3: 6F



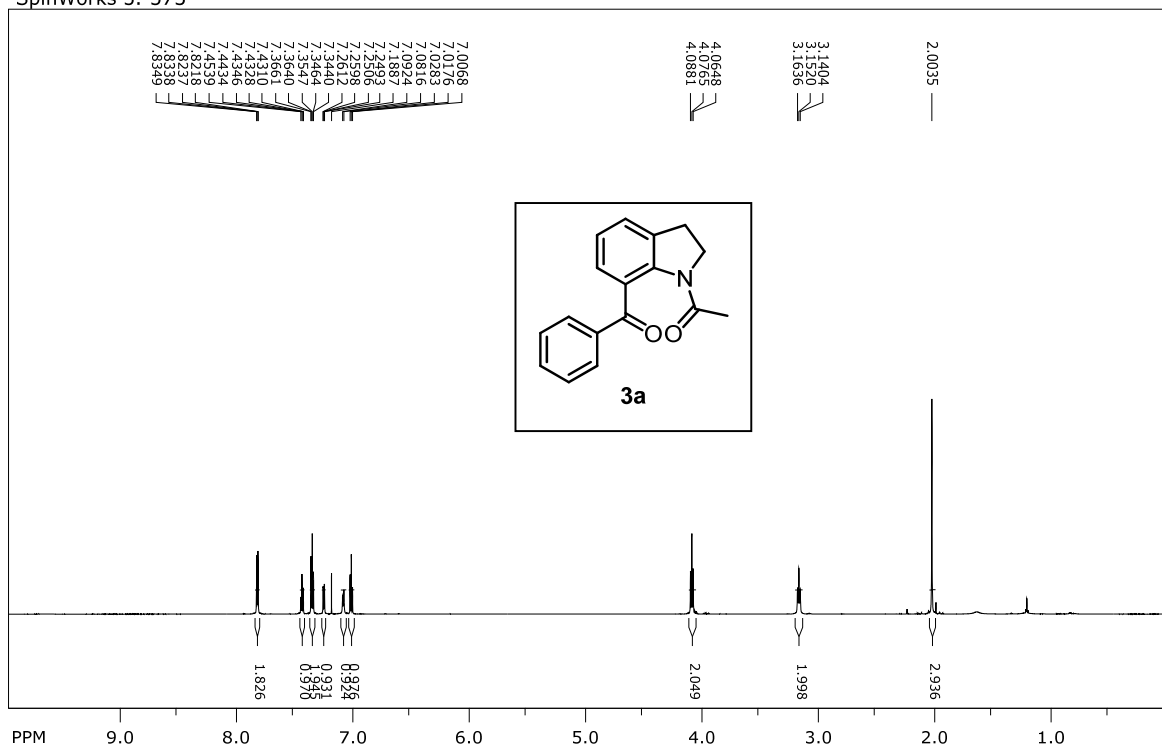
SpinWorks 3: 6-Cl



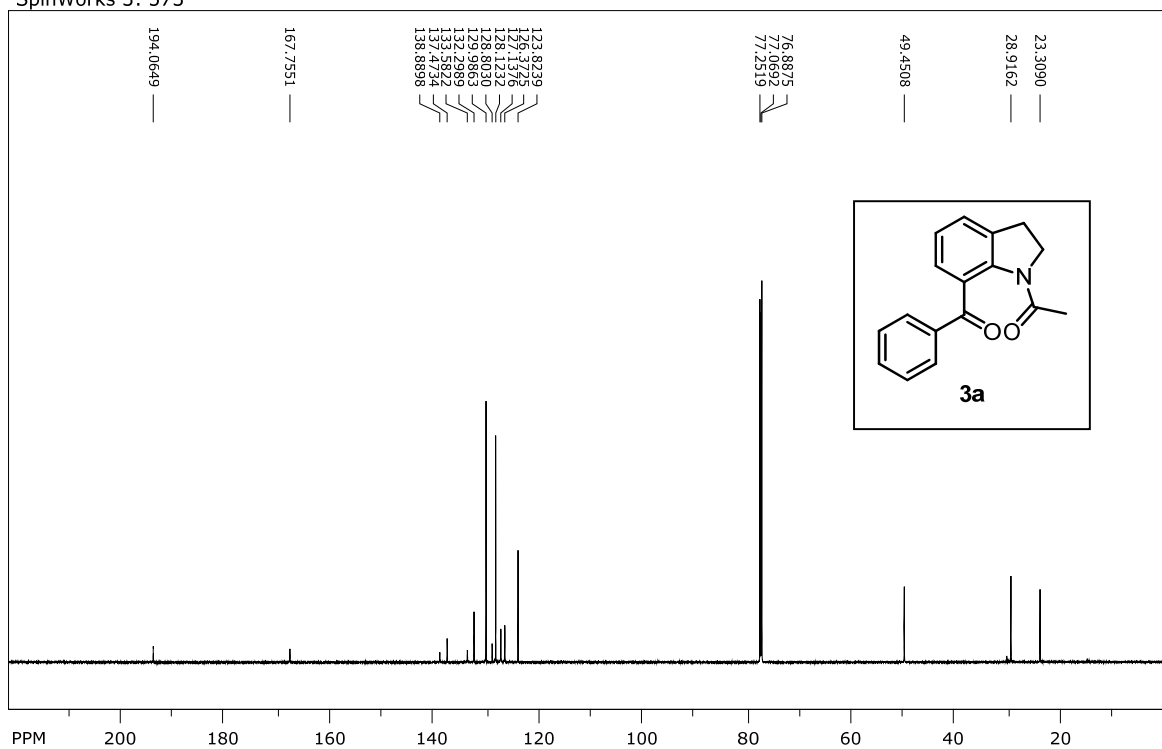
SpinWorks 3: 6-Cl



SpinWorks 3: 573

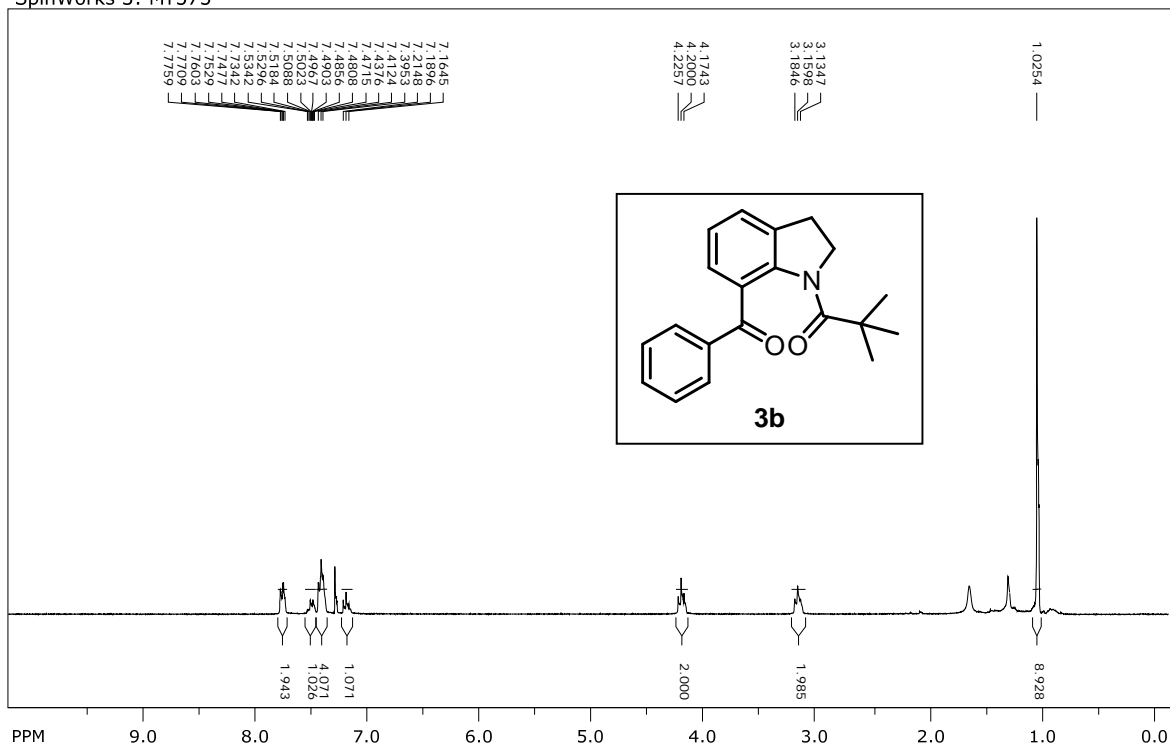


SpinWorks 3: 573

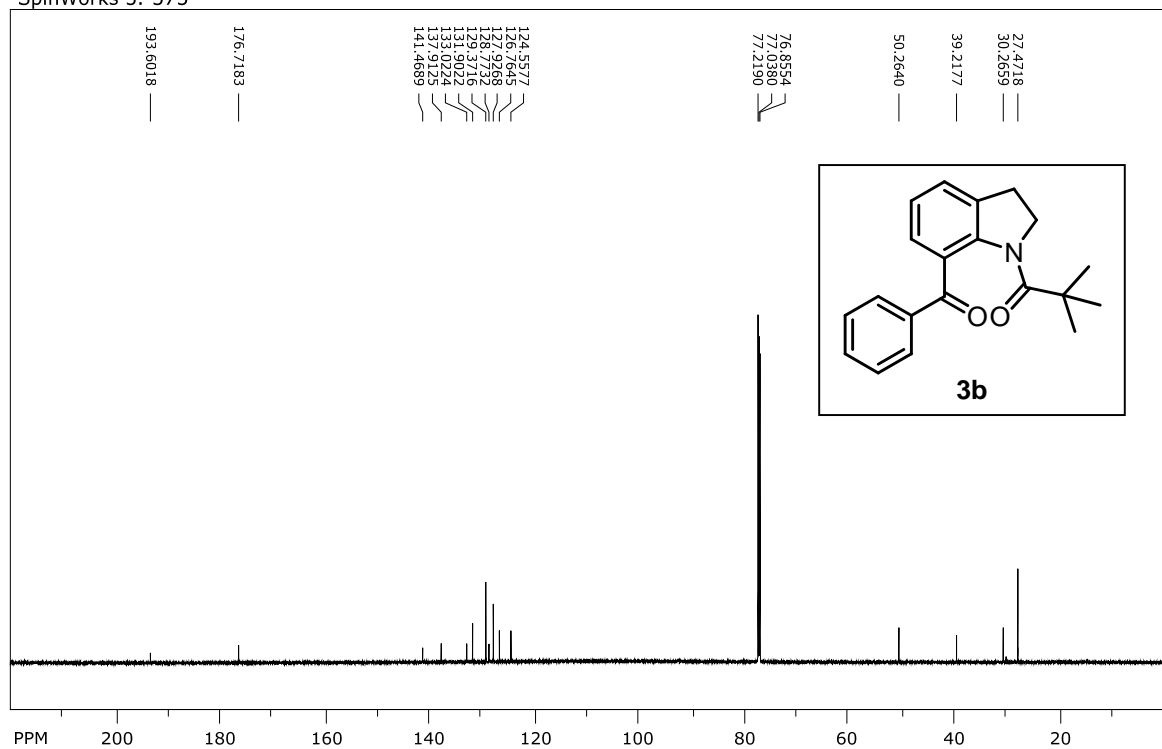




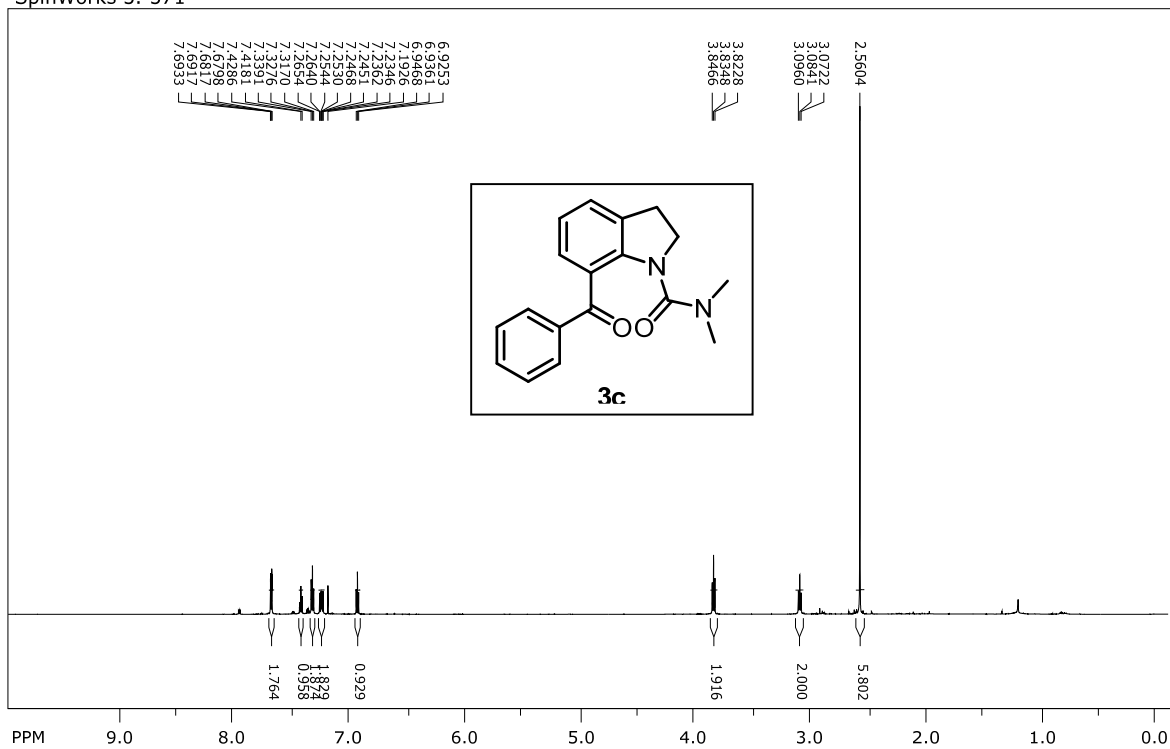
SpinWorks 3: MY575



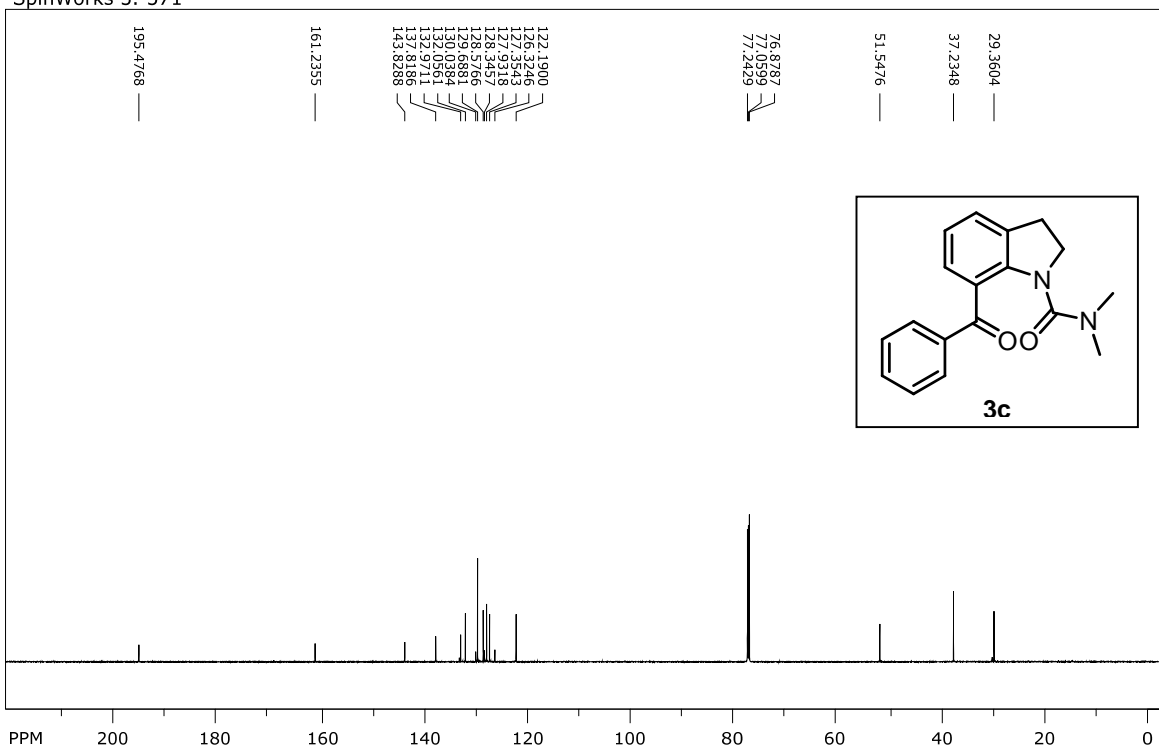
SpinWorks 3: 575



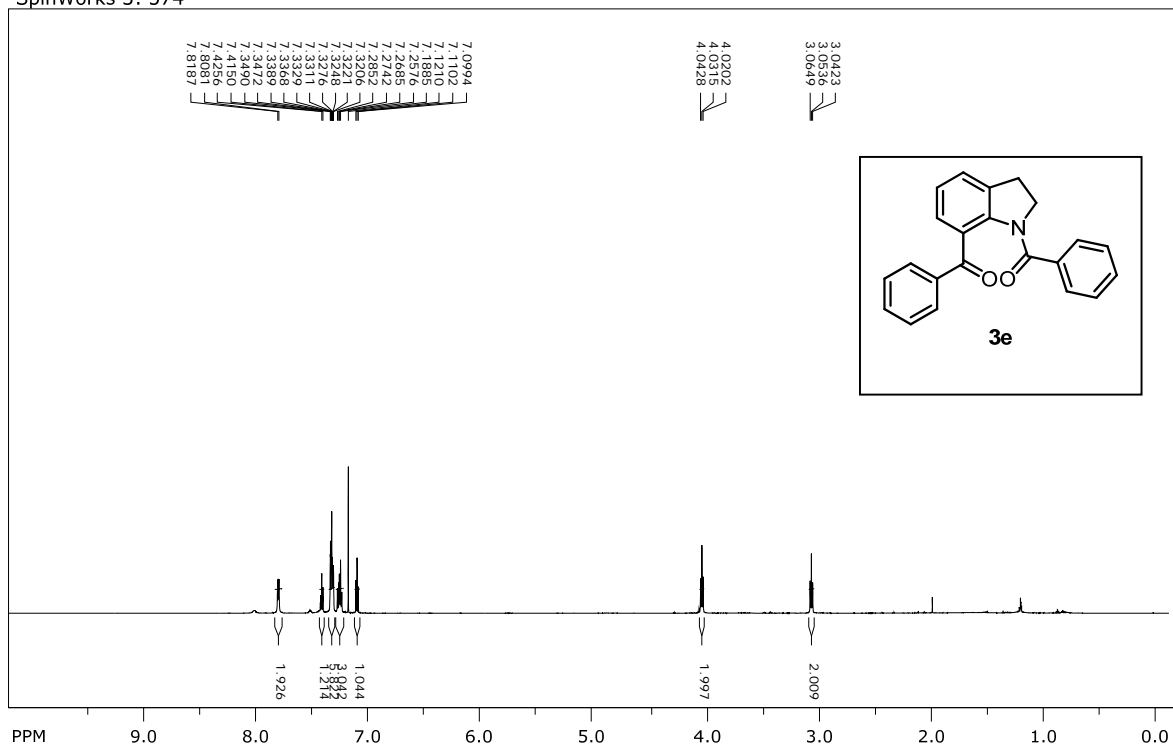
SpinWorks 3: 571



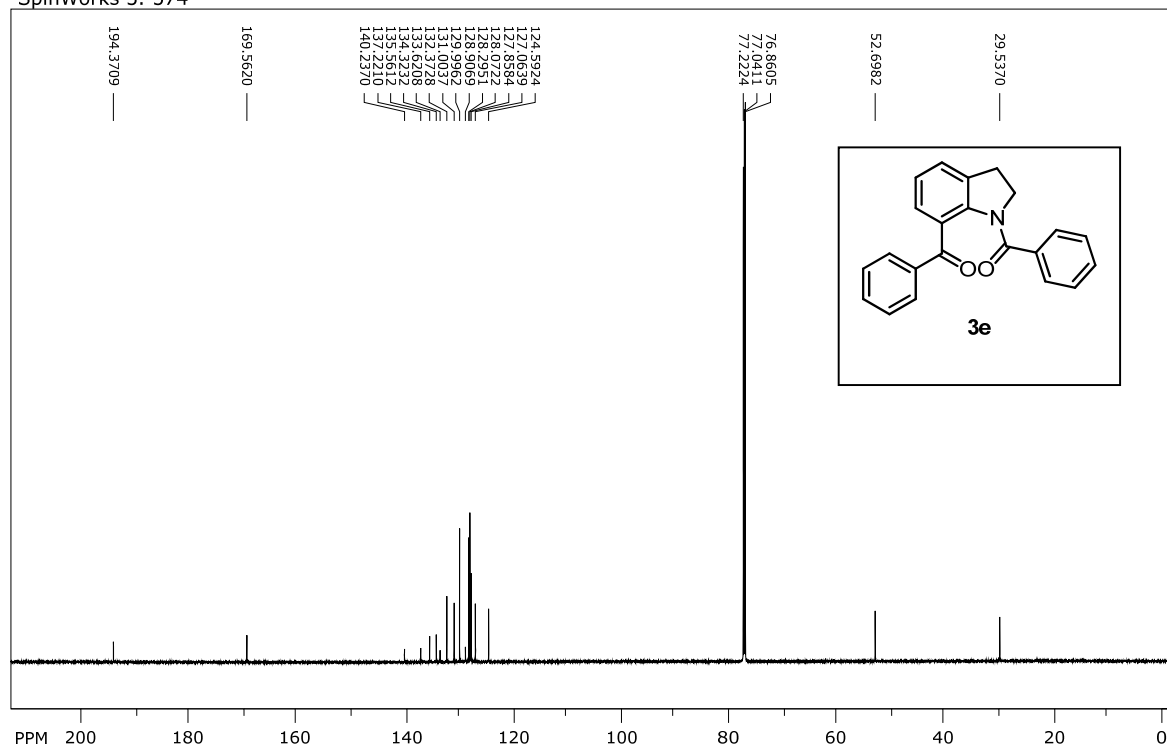
SpinWorks 3: 571



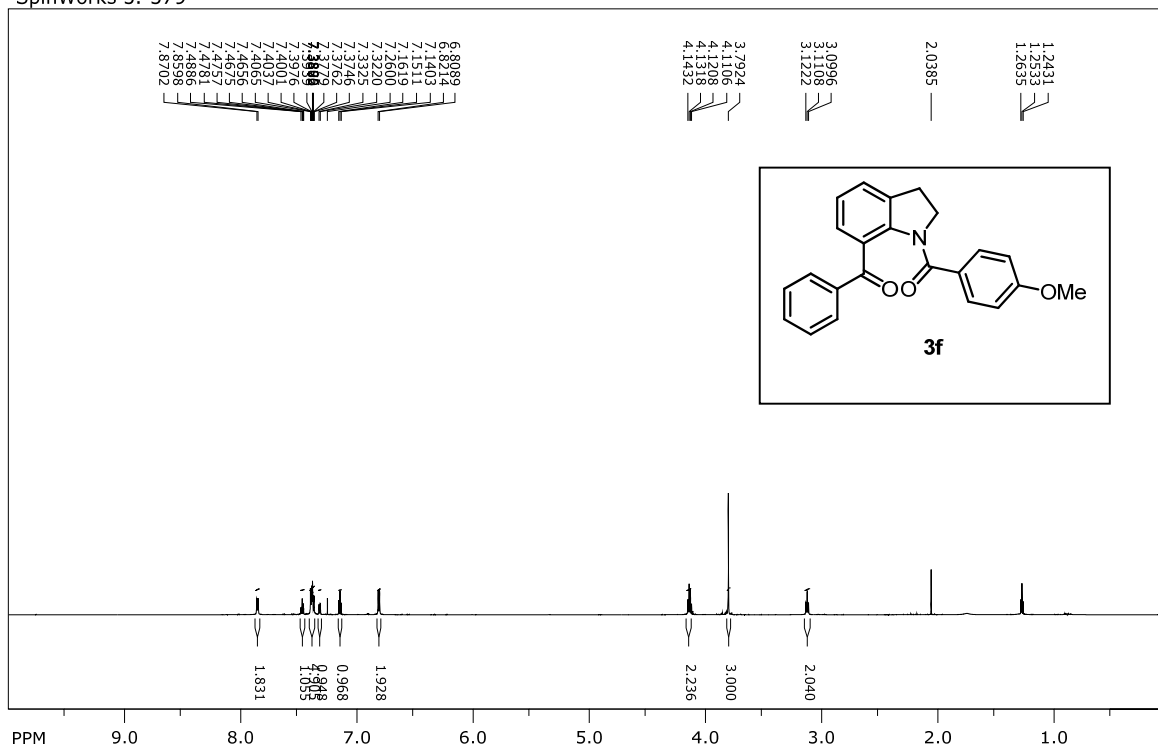
SpinWorks 3: 574



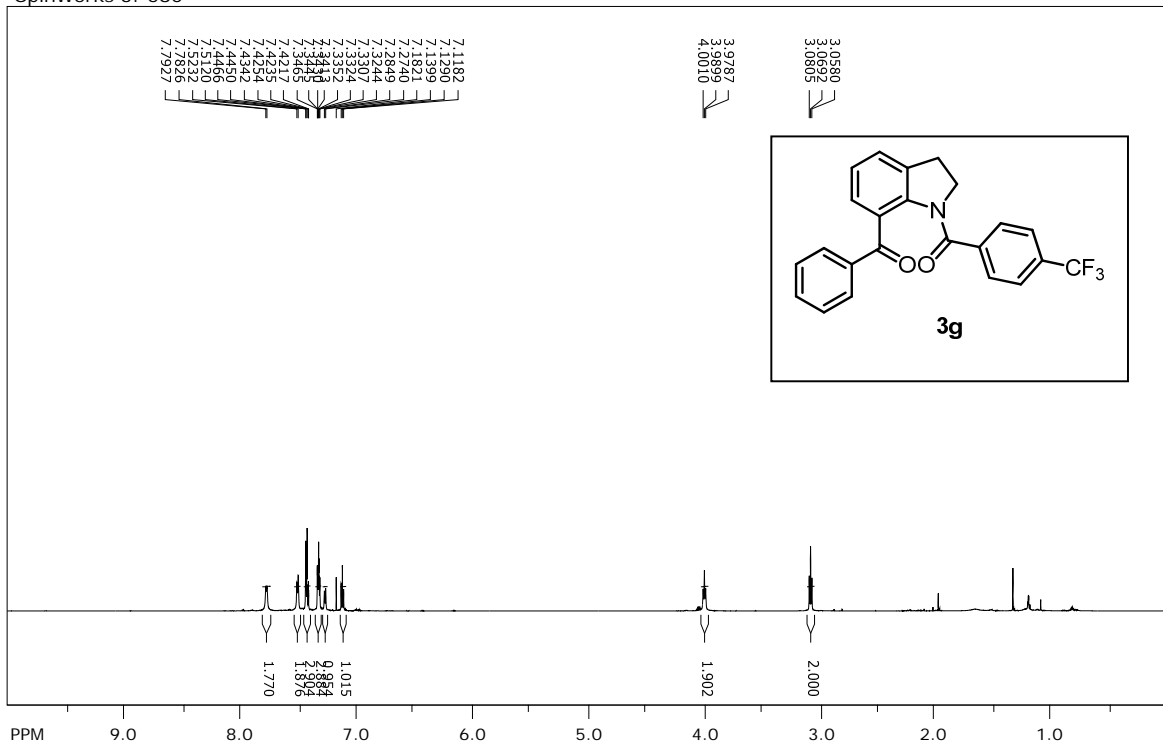
SpinWorks 3: 574



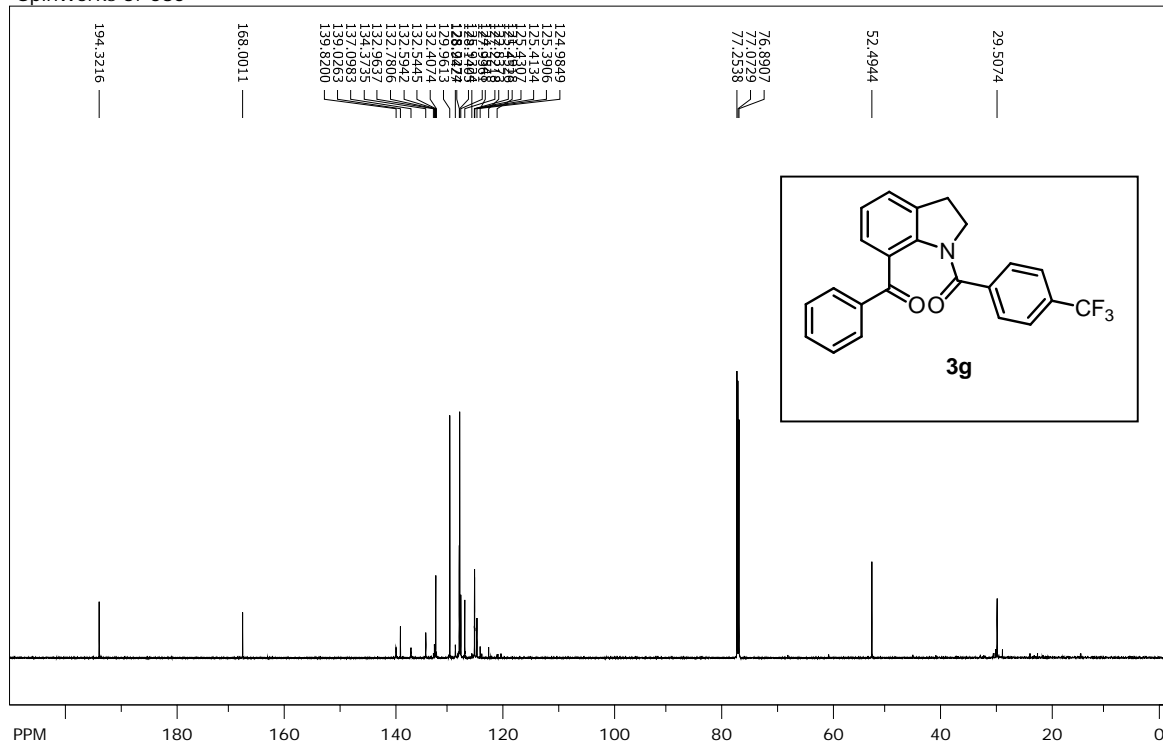
SpinWorks 3: 579



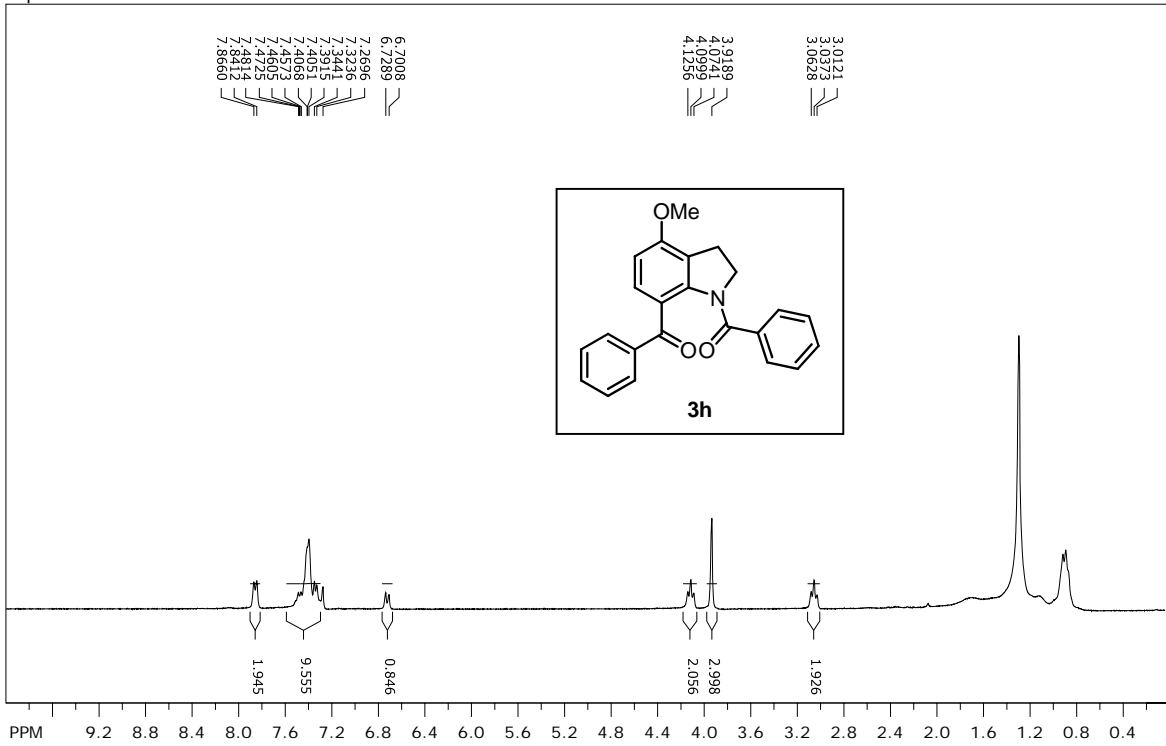
SpinWorks 3: 580



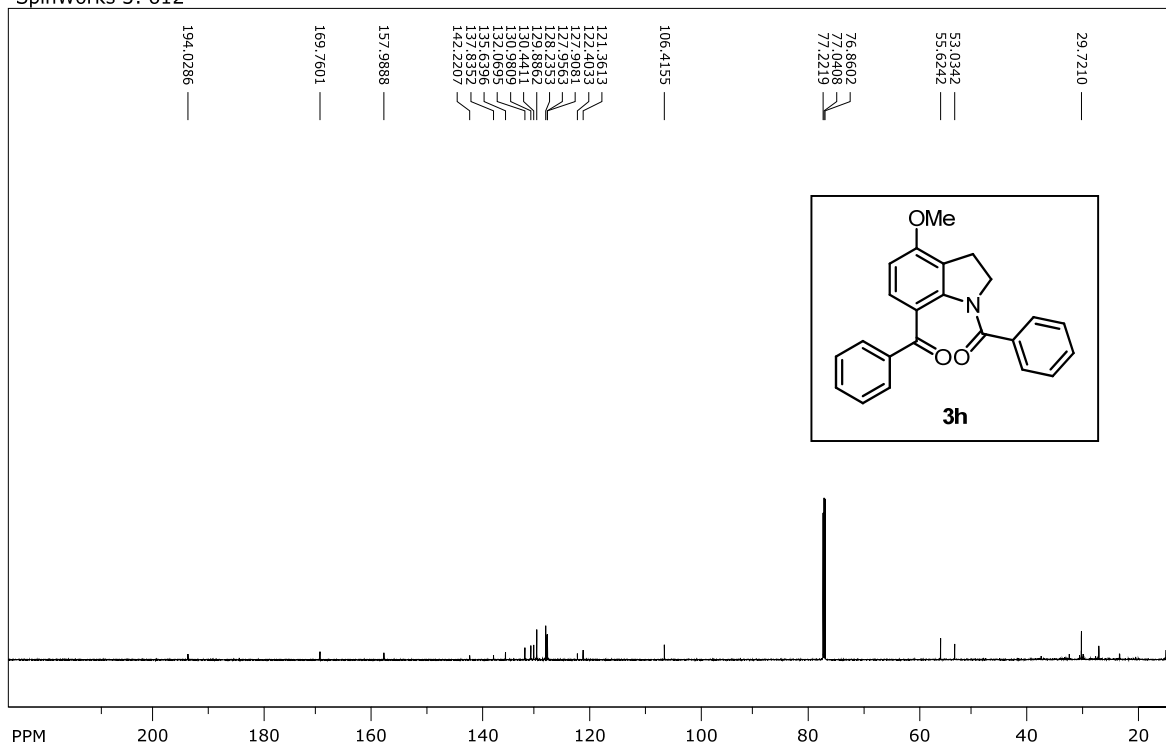
SpinWorks 3: 580



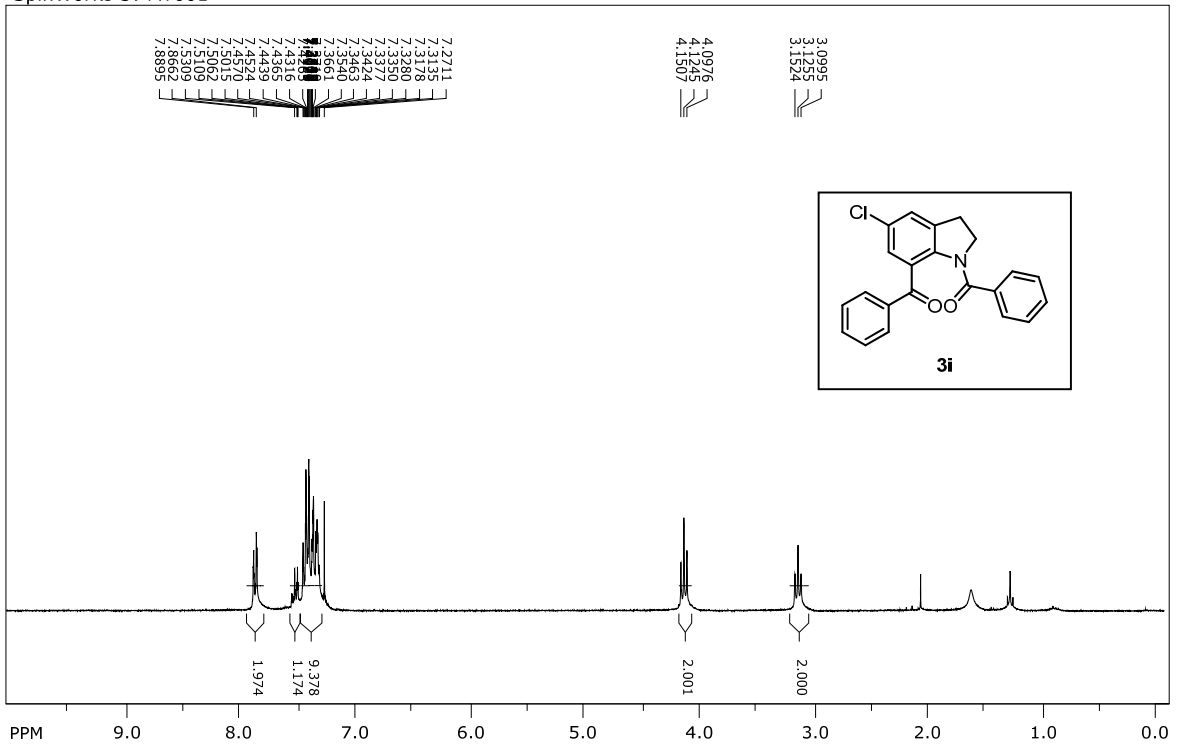
SpinWorks 3: MY612



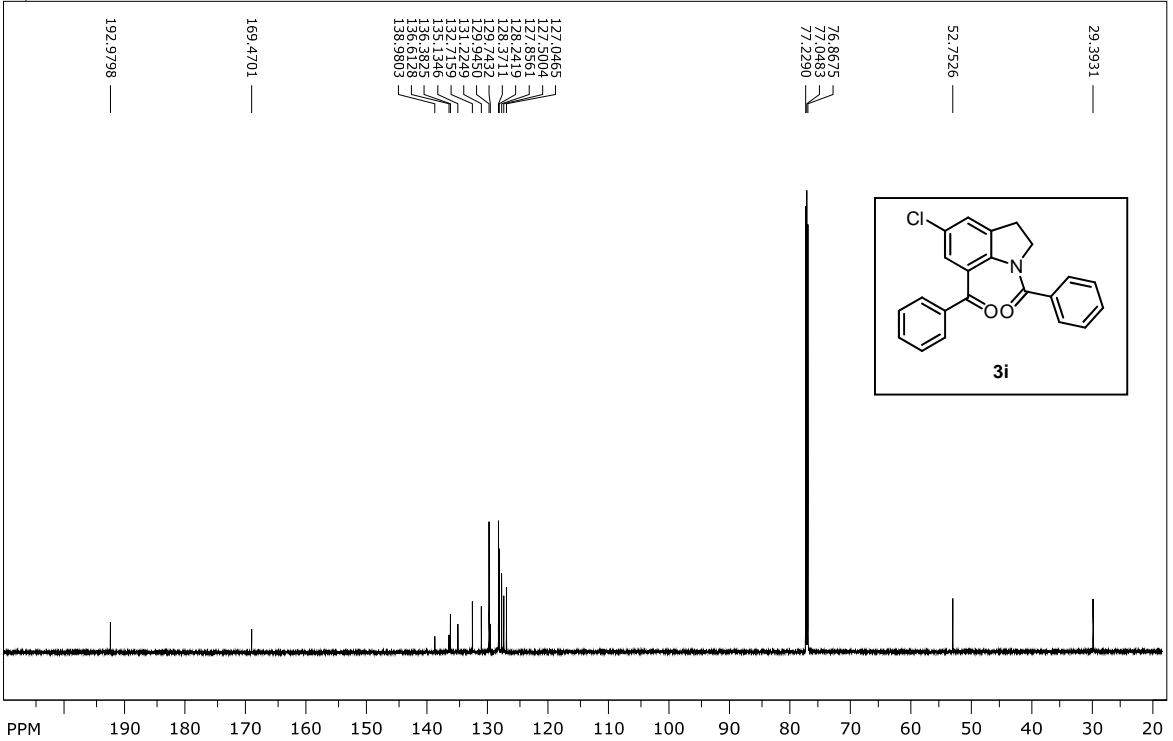
SpinWorks 3: 612



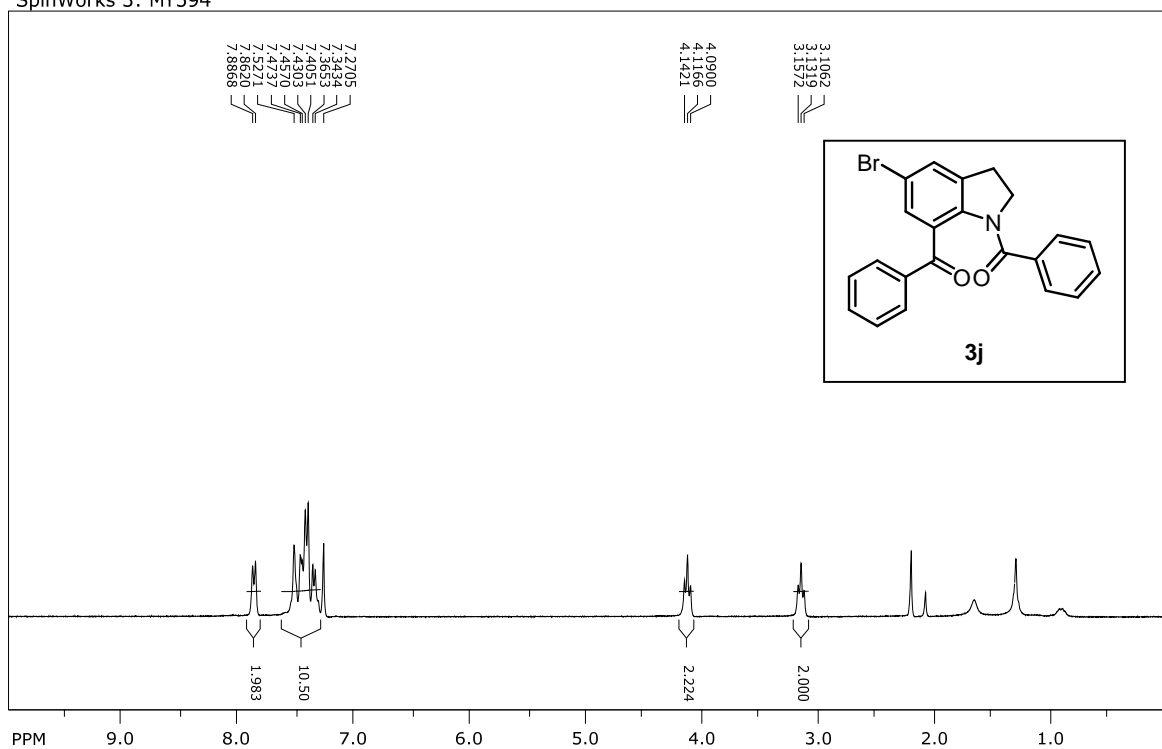
SpinWorks 3: MY601



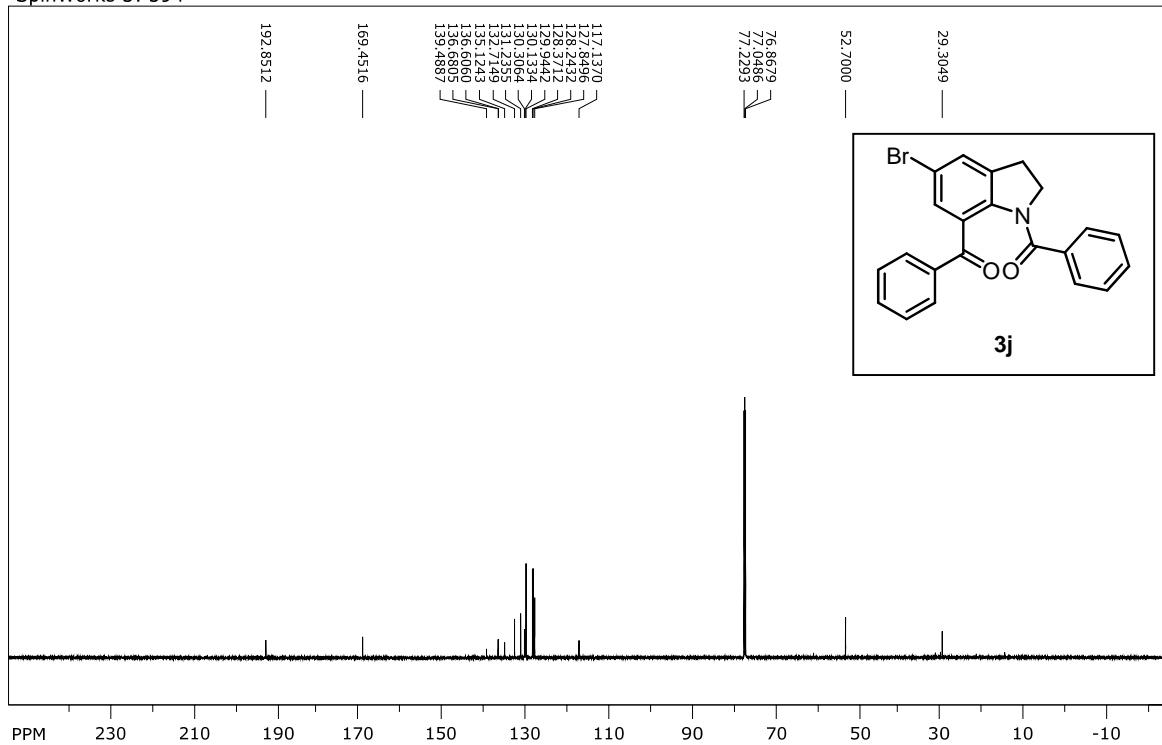
SpinWorks 3: 601



SpinWorks 3: MY594

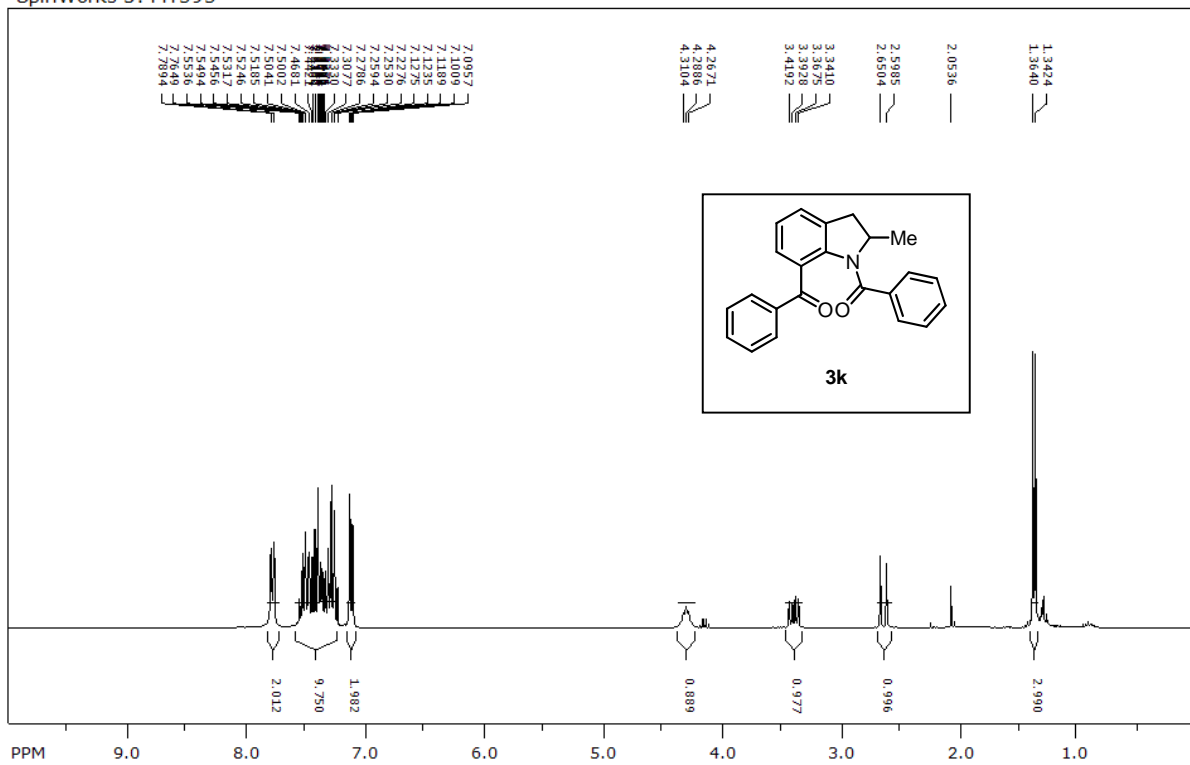


SpinWorks 3: 594

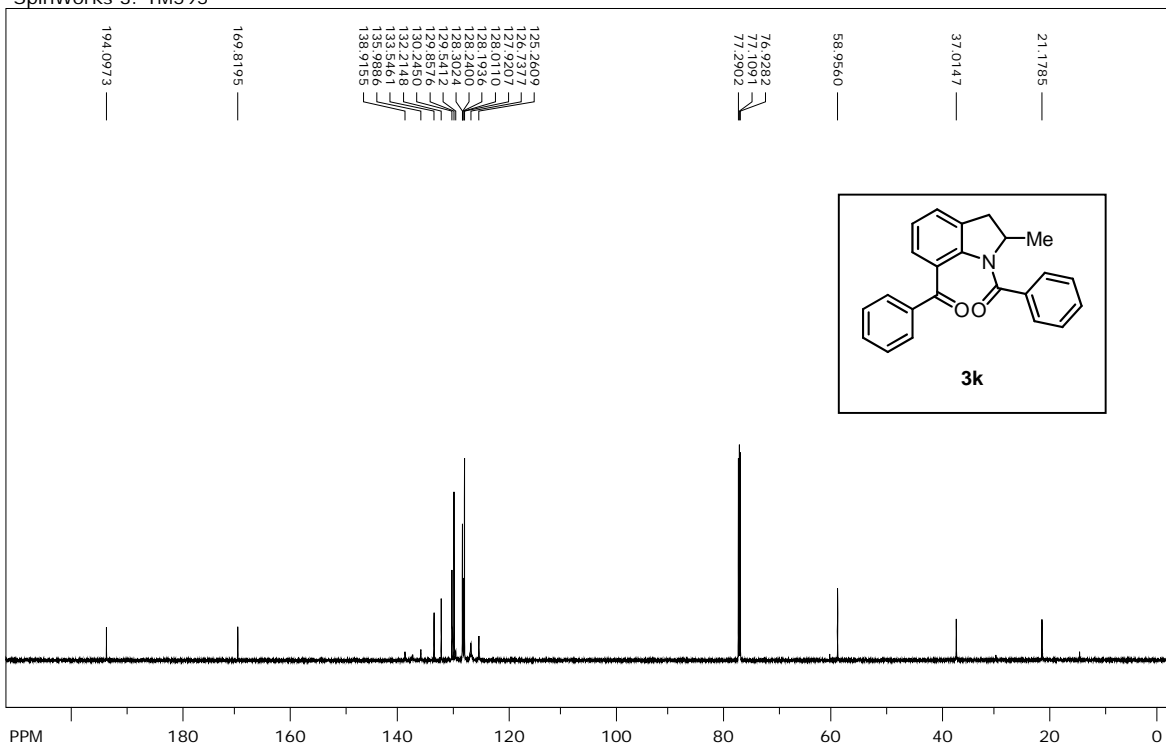




SpinWorks 3: MY595

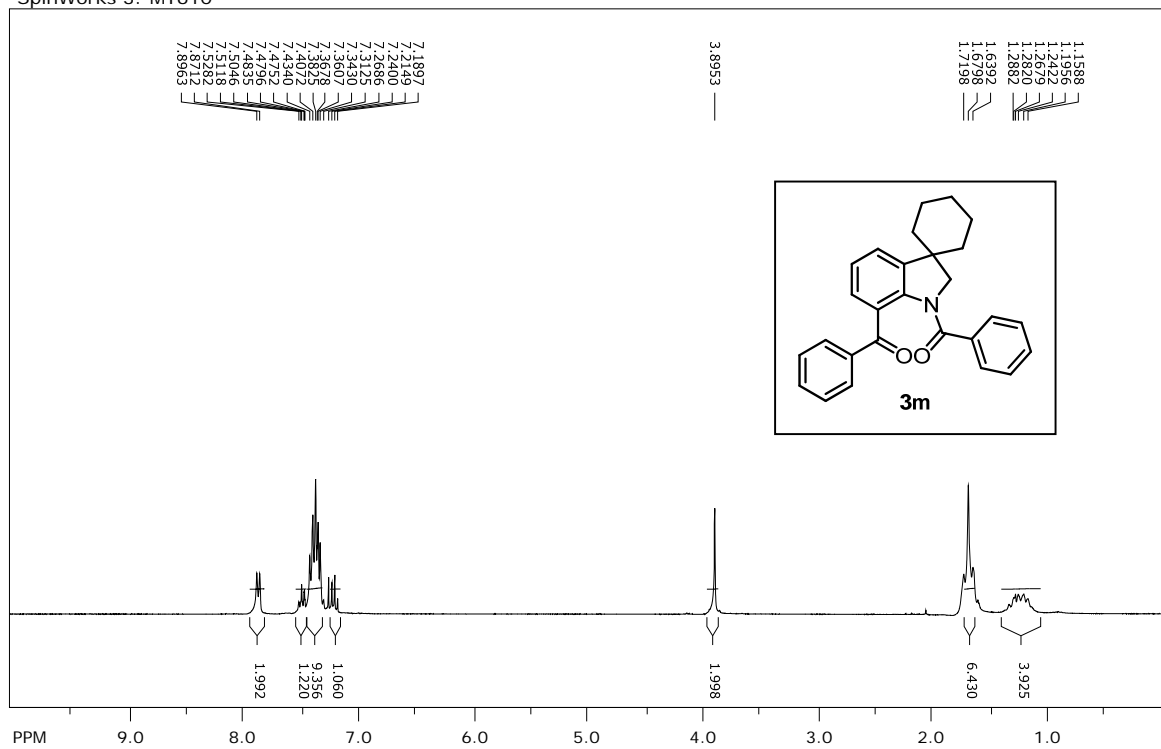


SpinWorks 3: YM595

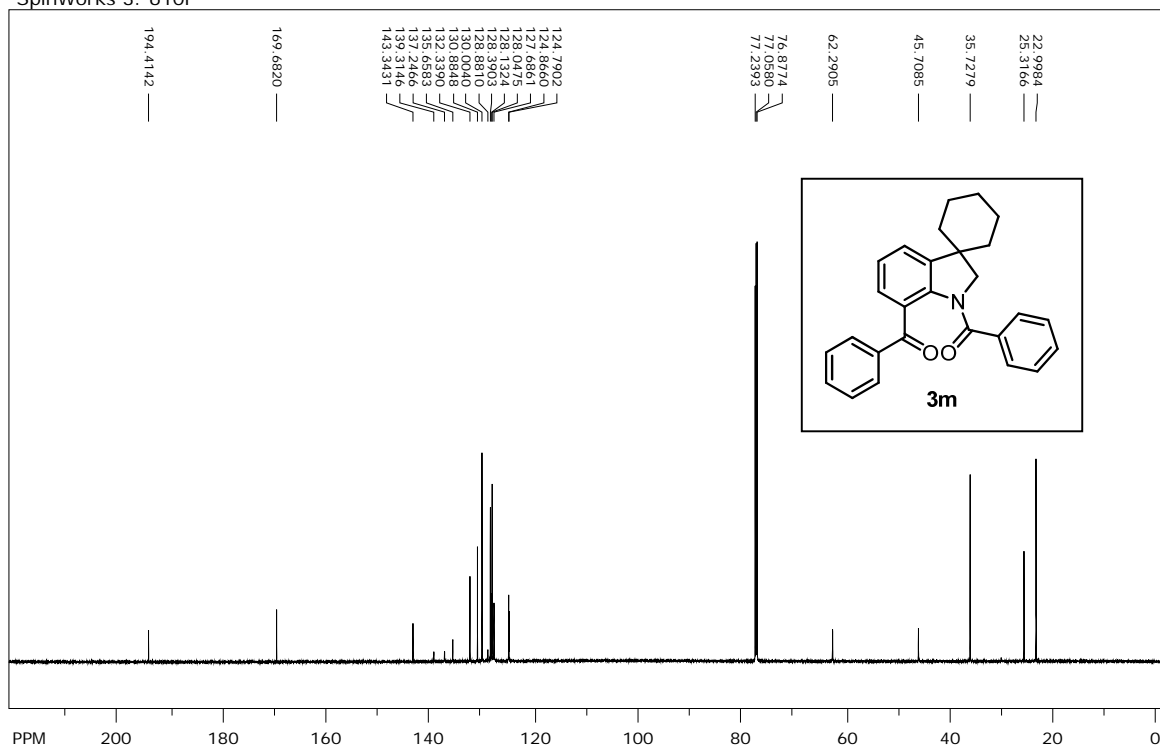




SpinWorks 3: MY610

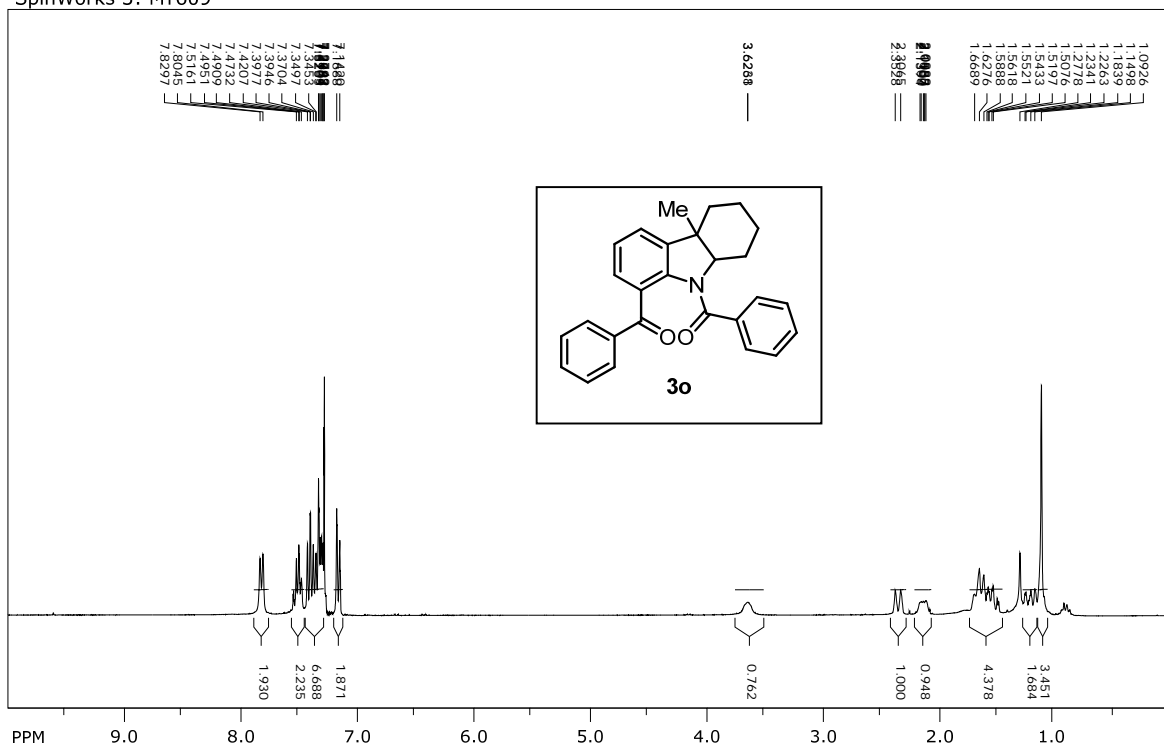


SpinWorks 3: 610P

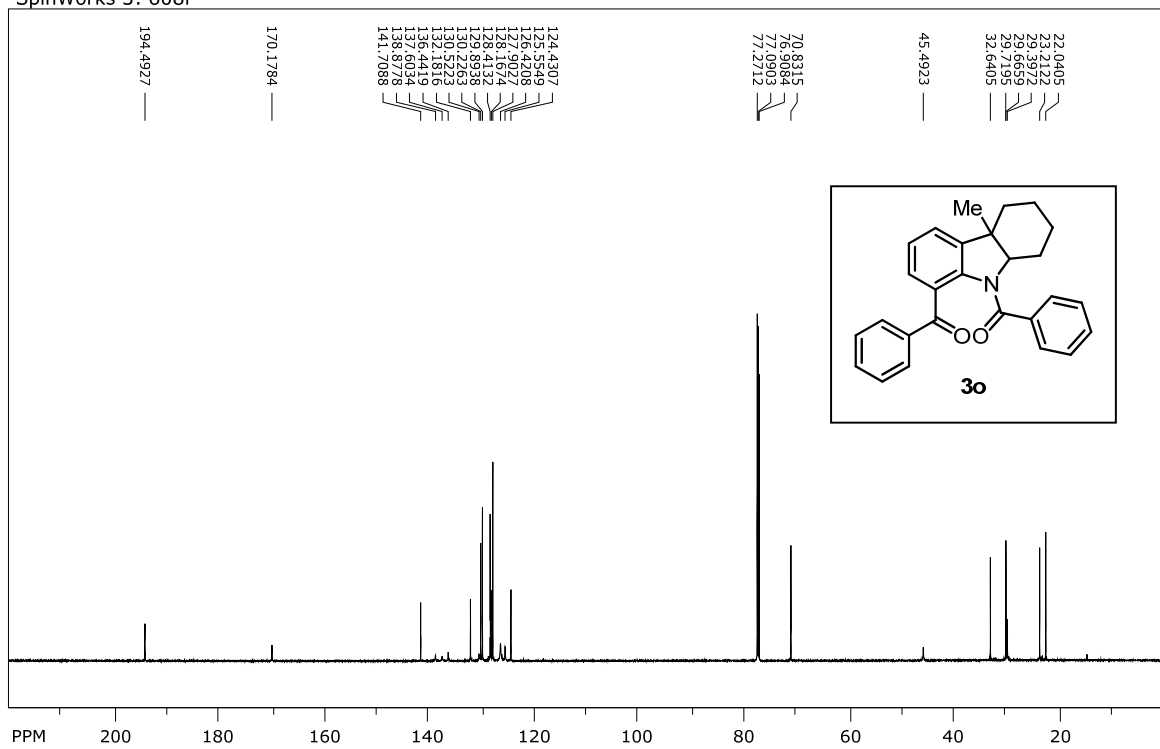




SpinWorks 3: MY609

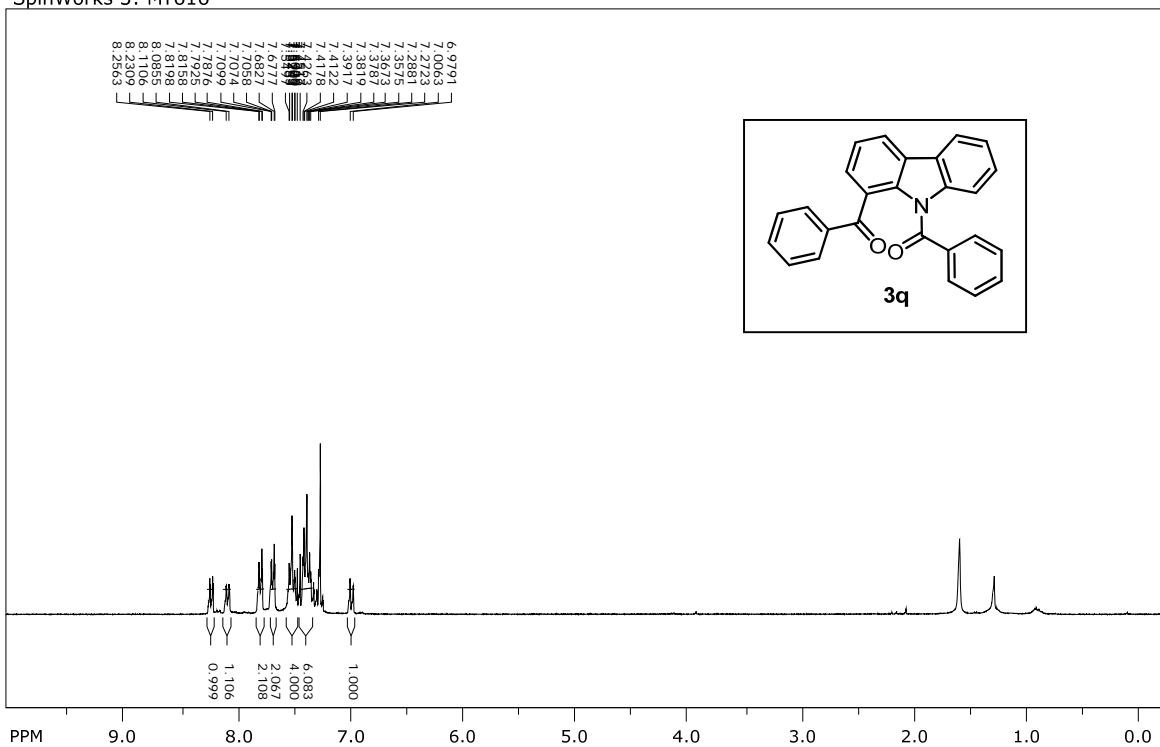


SpinWorks 3: 608P

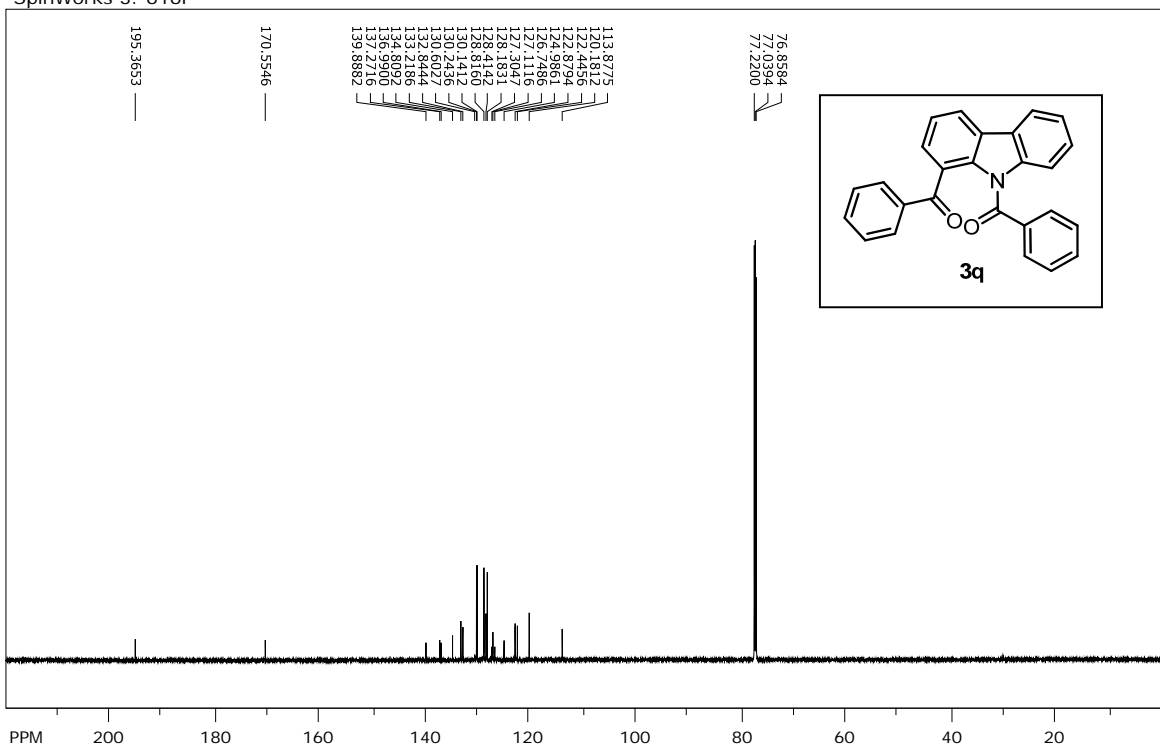




SpinWorks 3: MY616



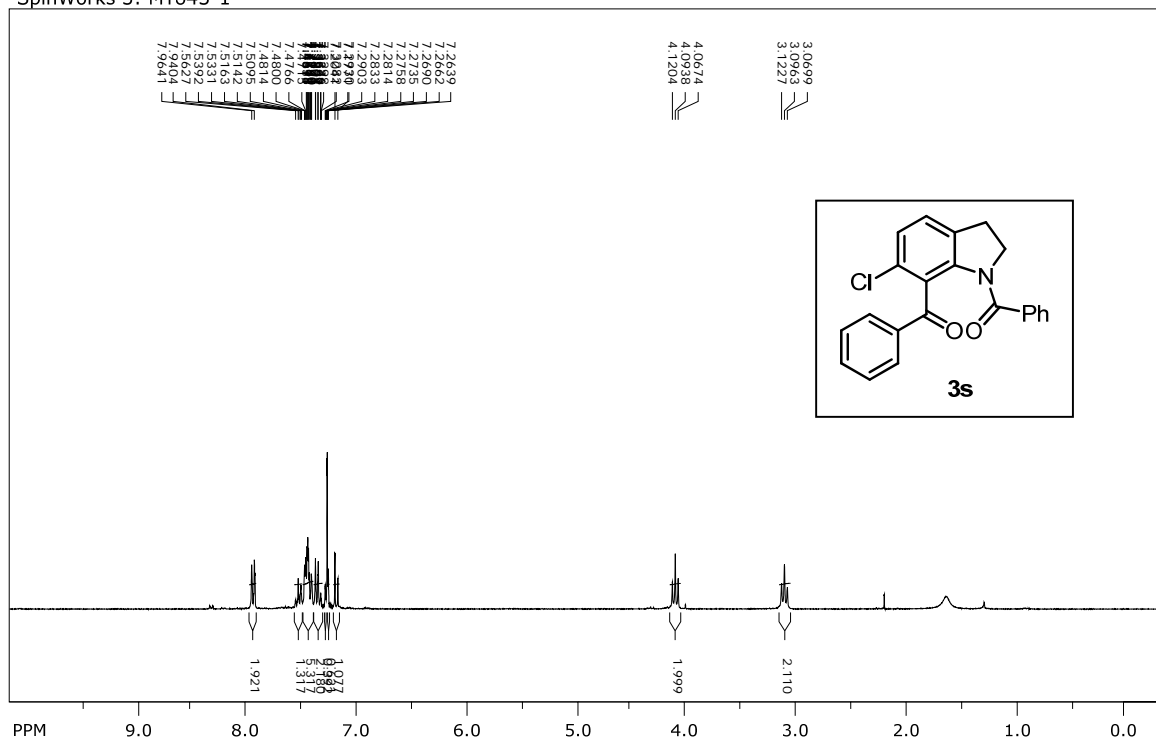
SpinWorks 3: 616P



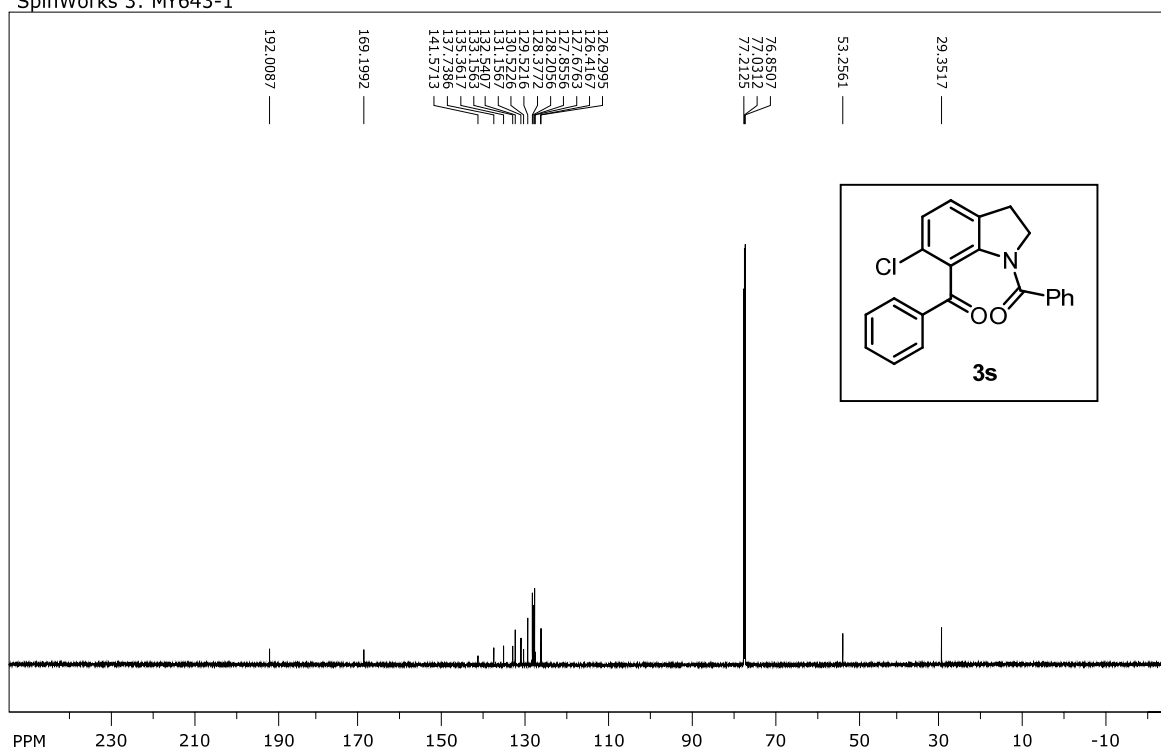




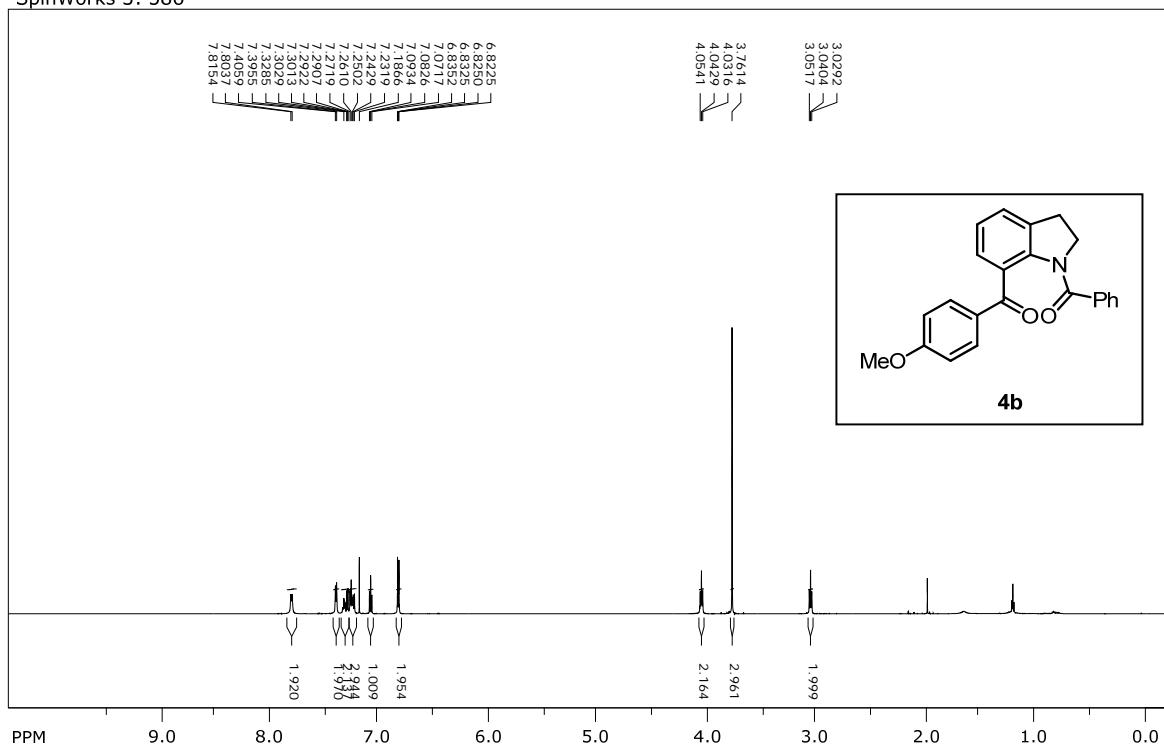
SpinWorks 3: MY643-1



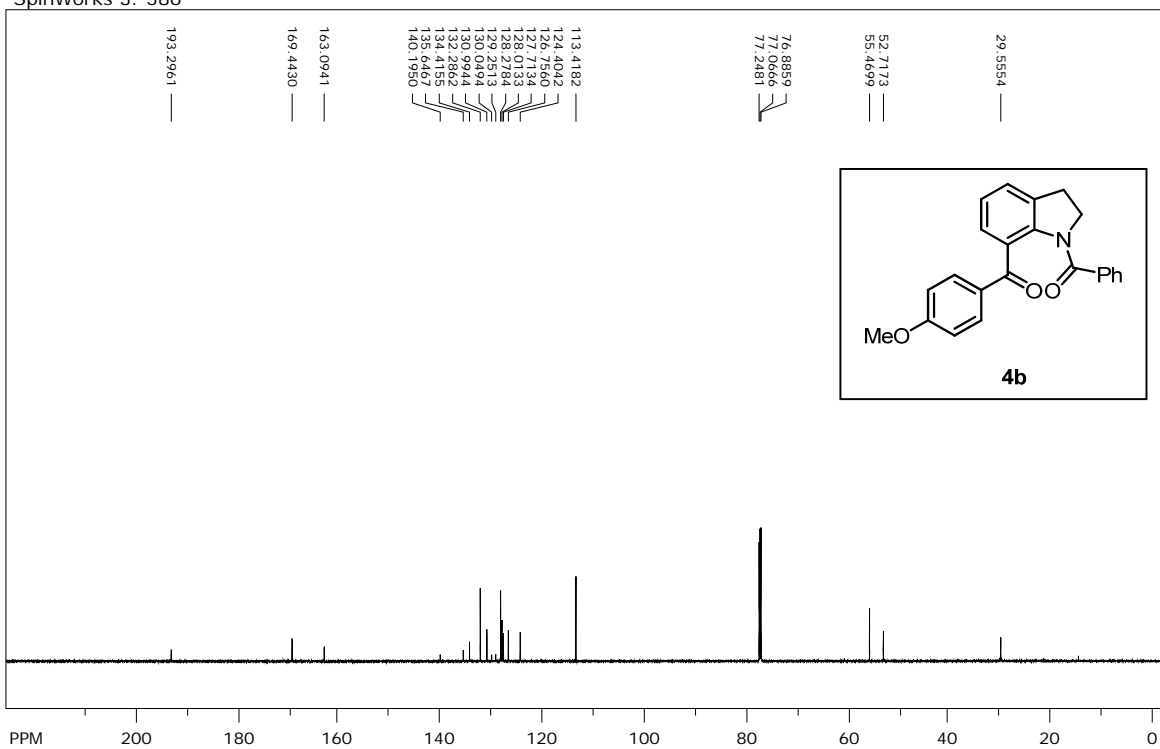
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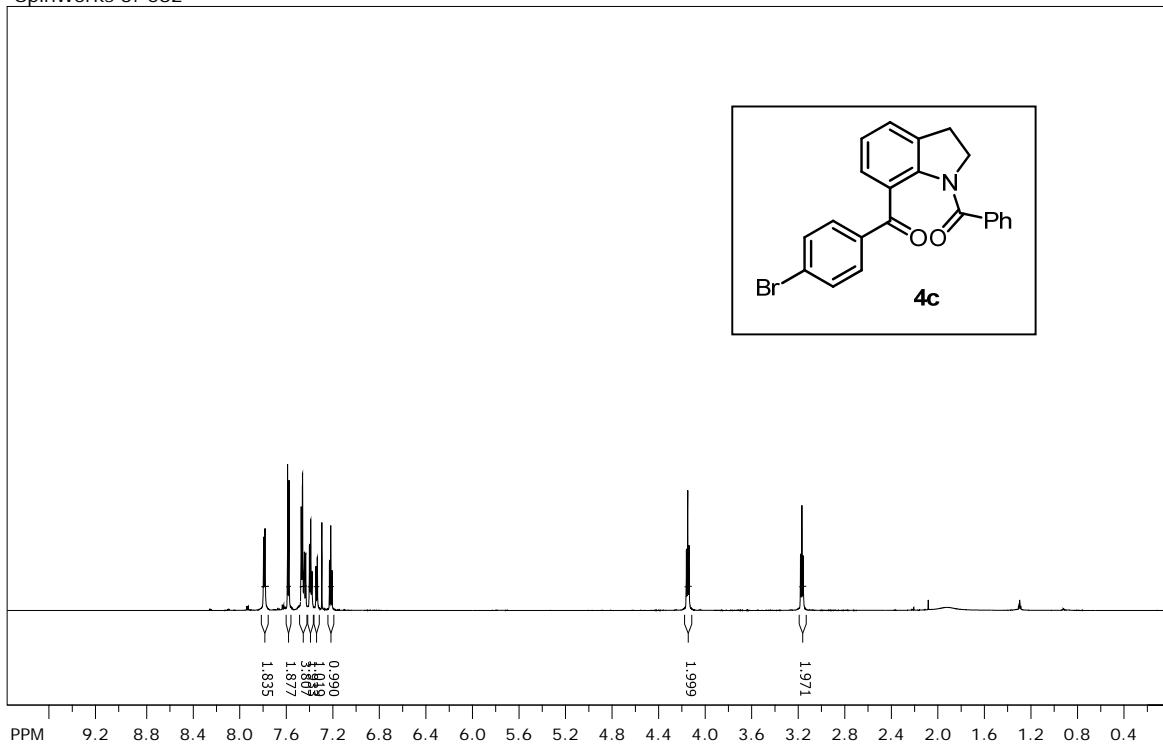
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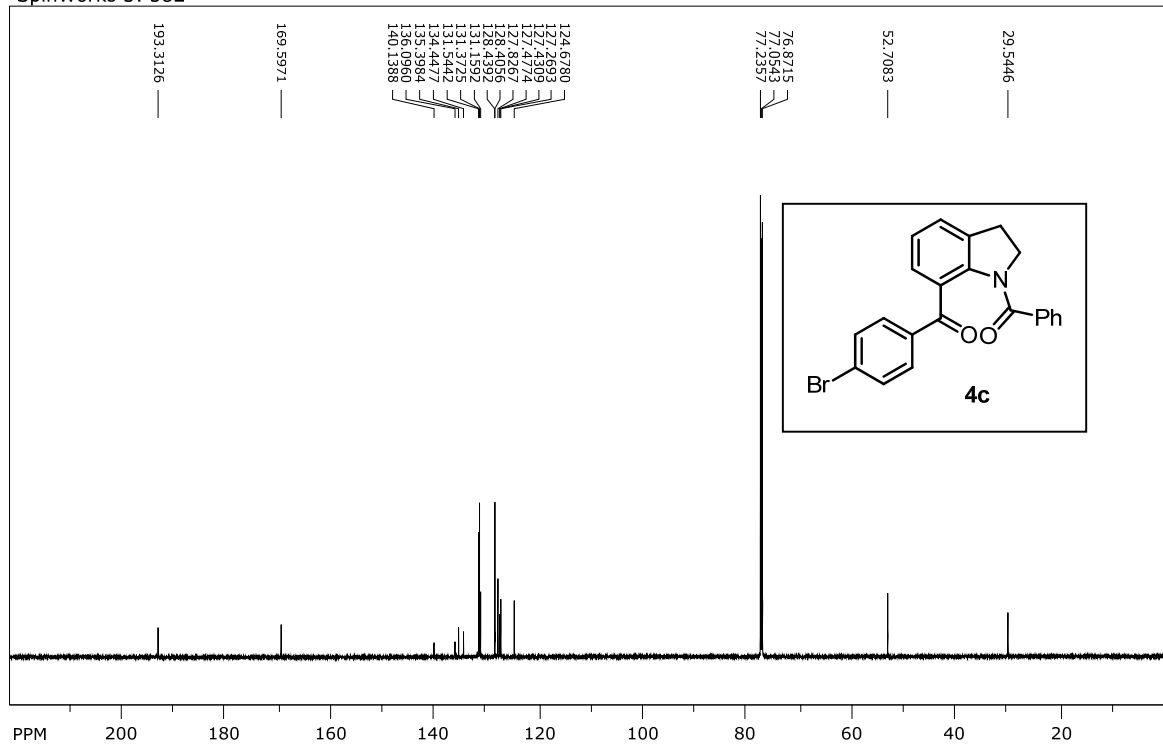
SpinWorks 3: 586



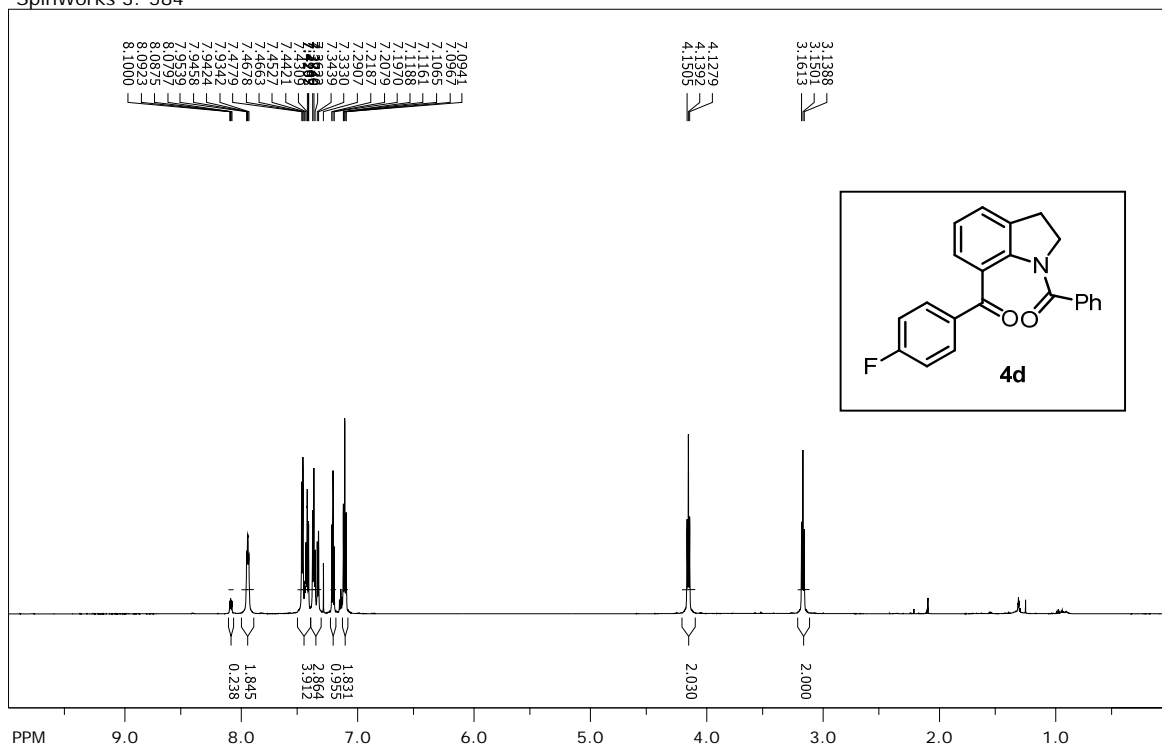
SpinWorks 3: 582



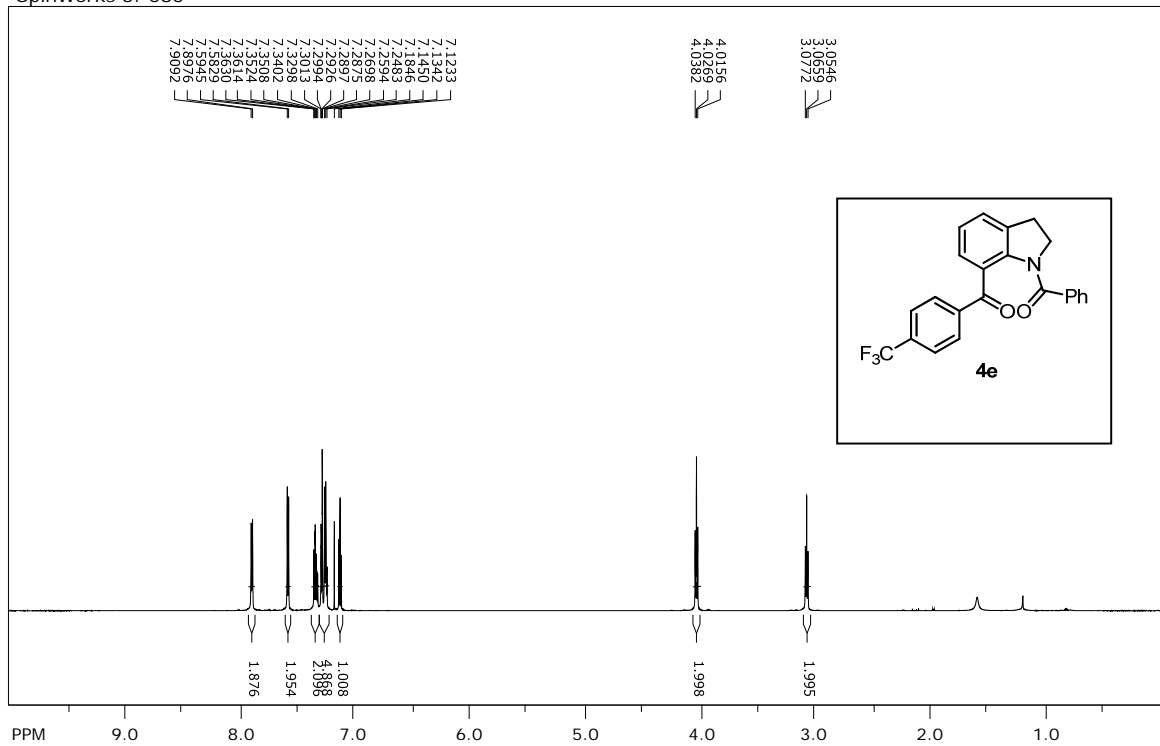
SpinWorks 3: 582



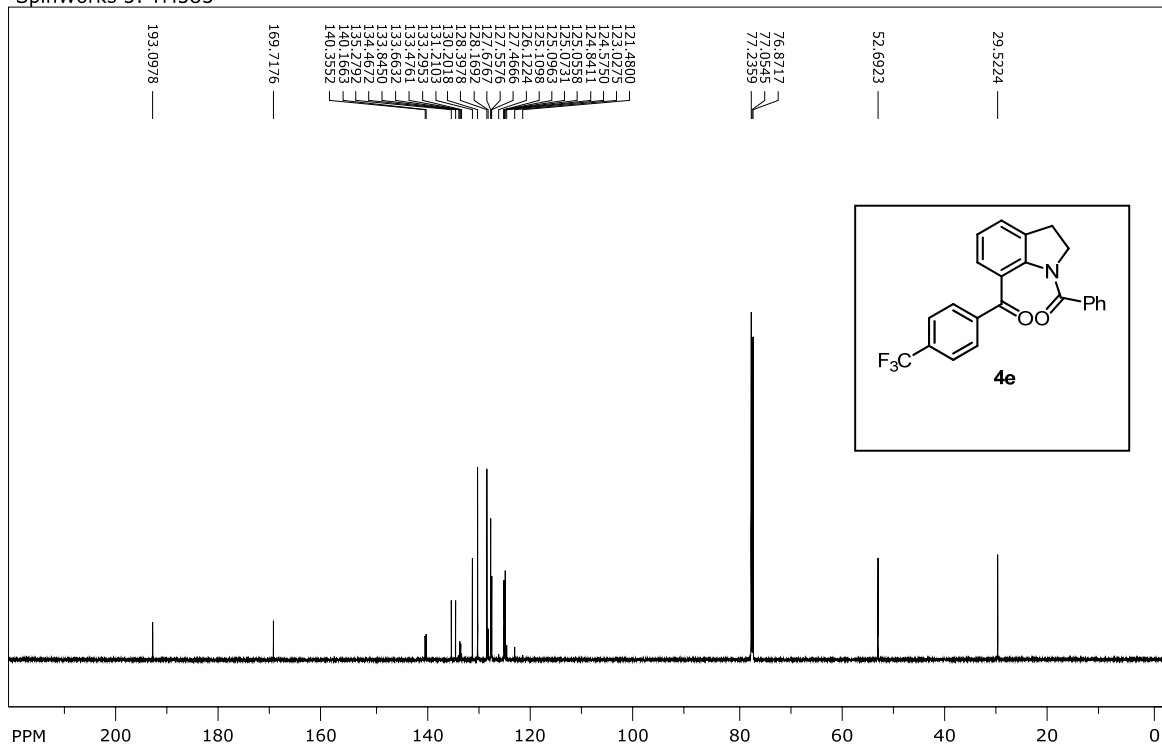
SpinWorks 3: 584



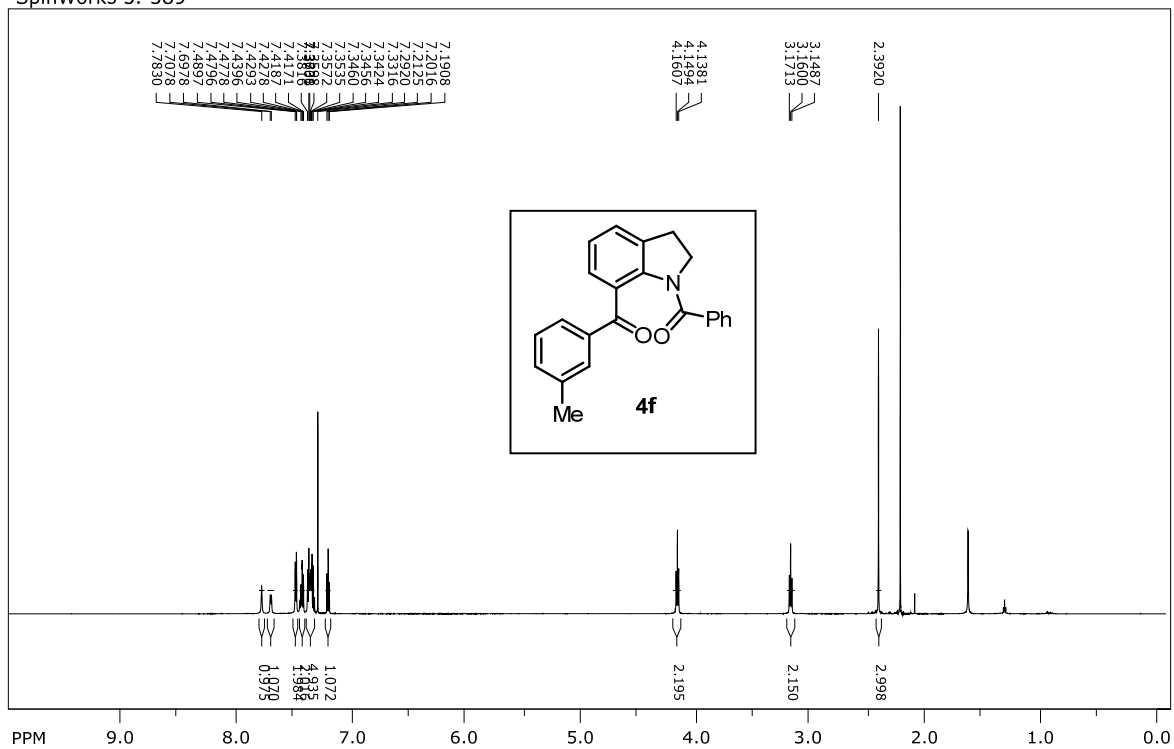
SpinWorks 3: 585



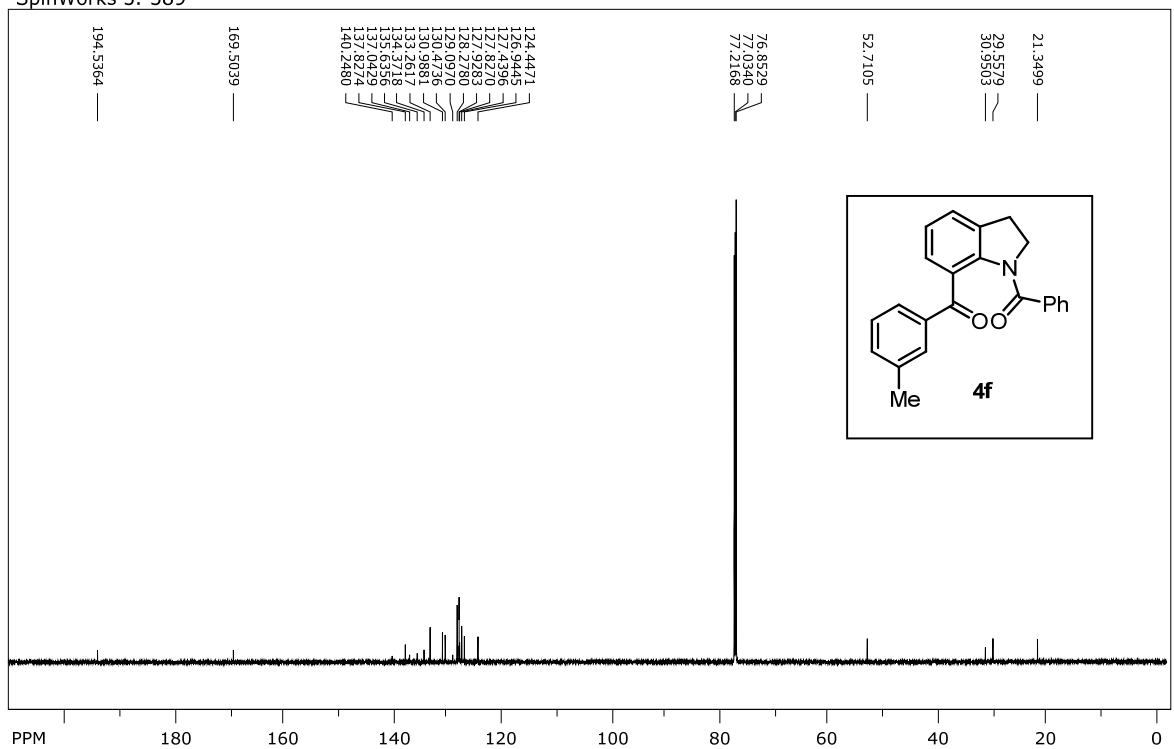
SpinWorks 3: YM585



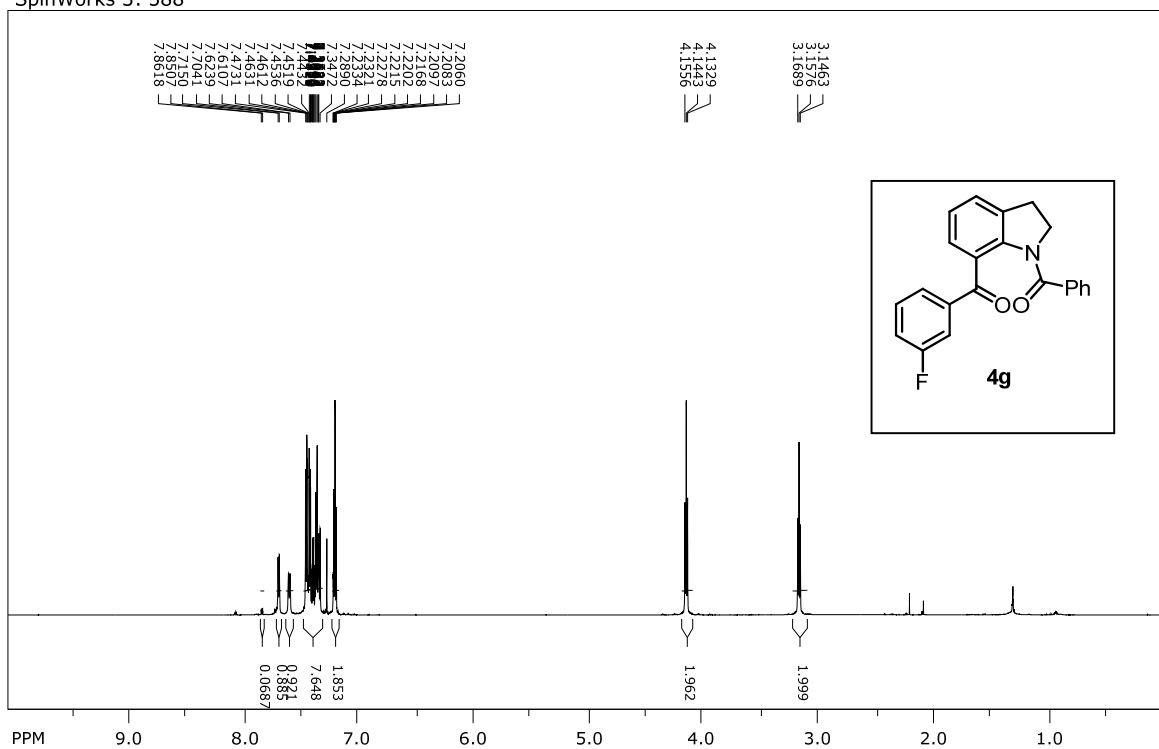
SpinWorks 3: 589



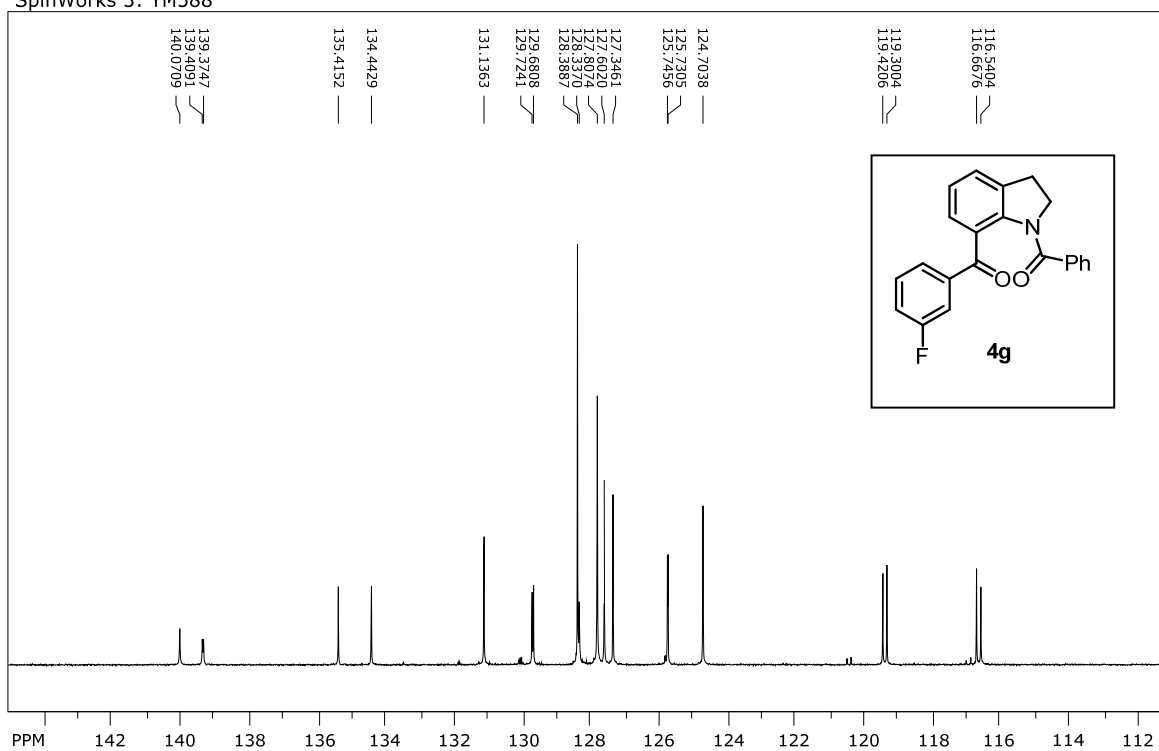
SpinWorks 3: 589



SpinWorks 3: 588



SpinWorks 3: YM588

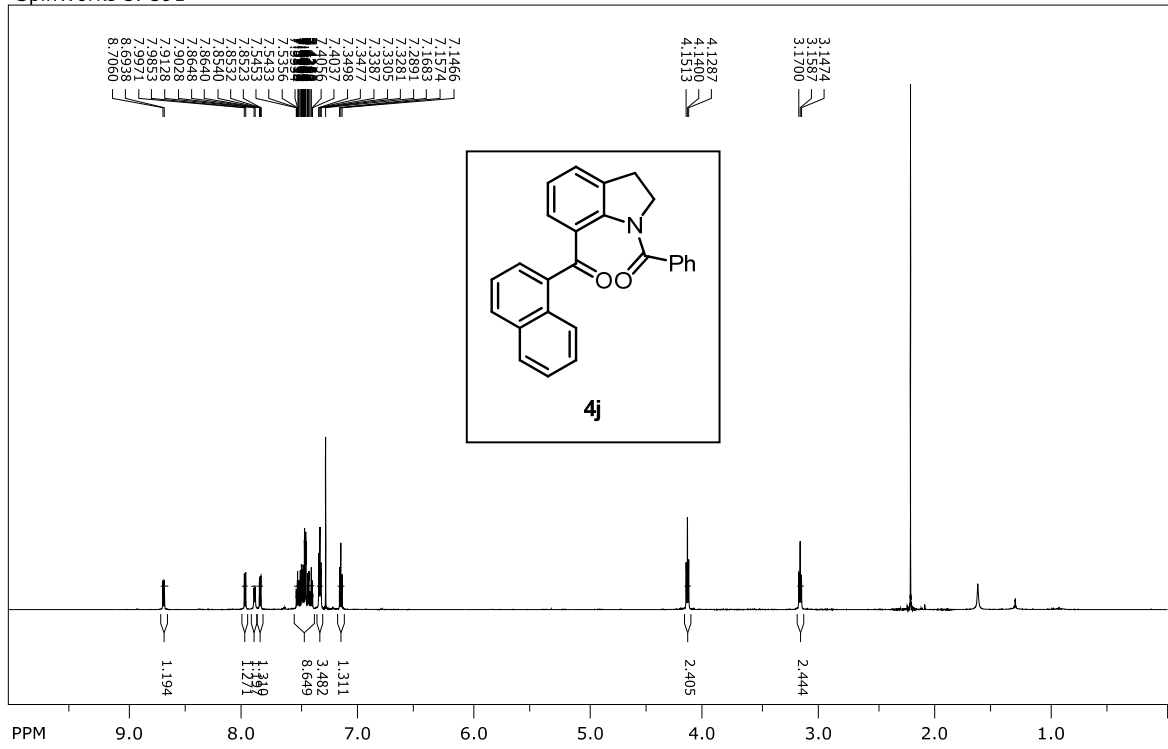




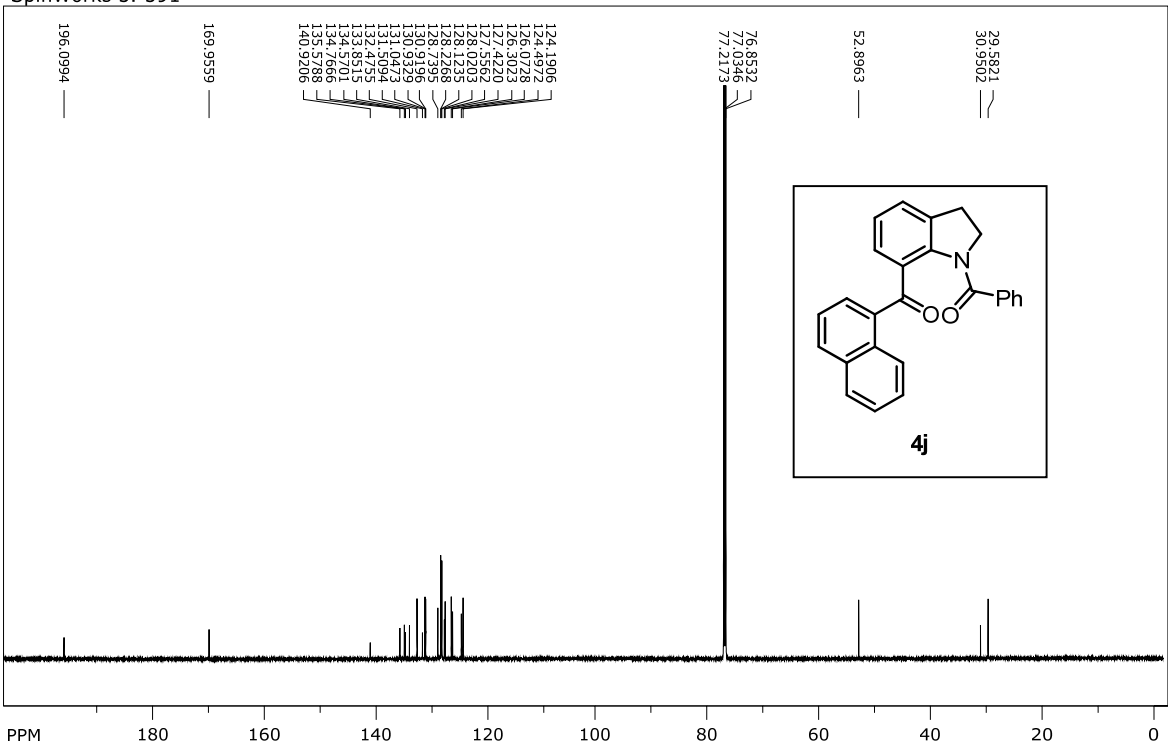




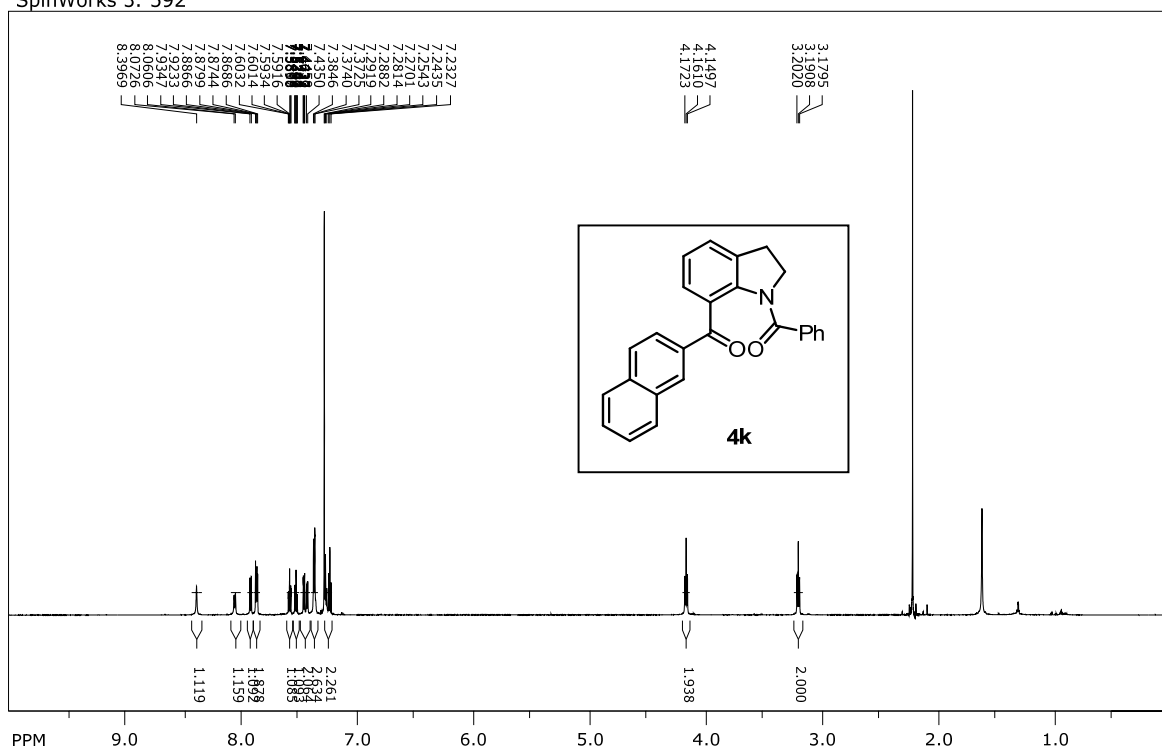
SpinWorks 3: 591



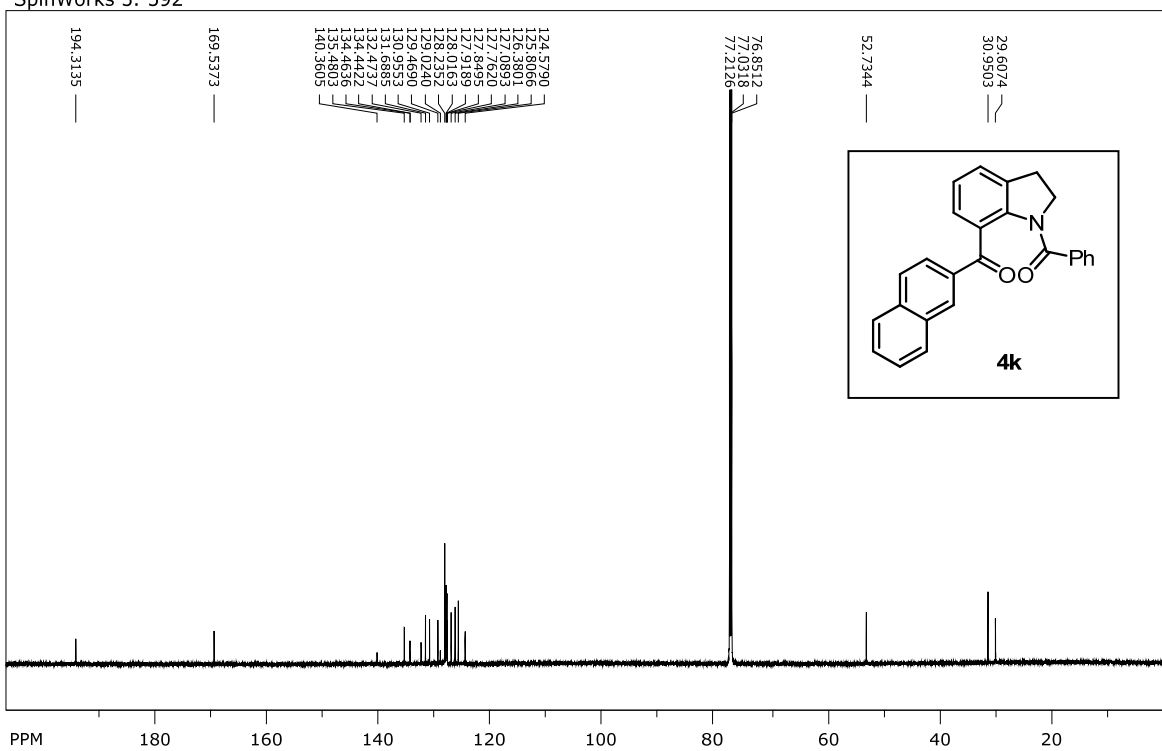
SpinWorks 3: 591



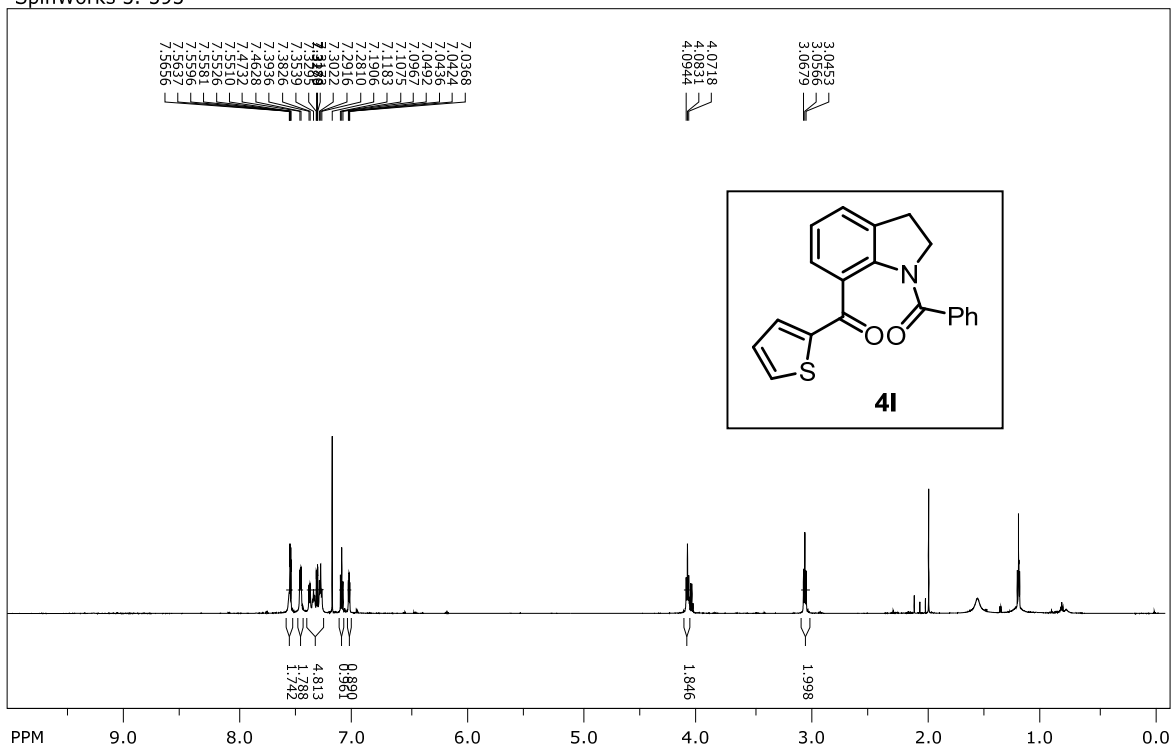
SpinWorks 3: 592



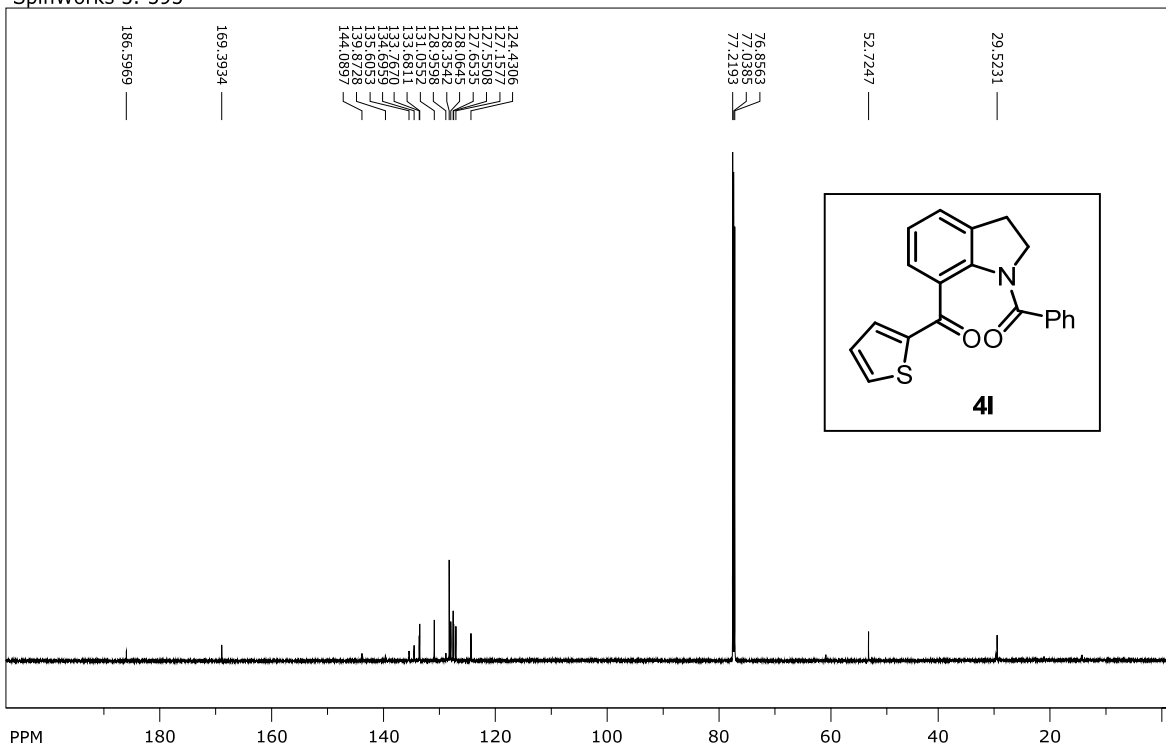
SpinWorks 3: 592



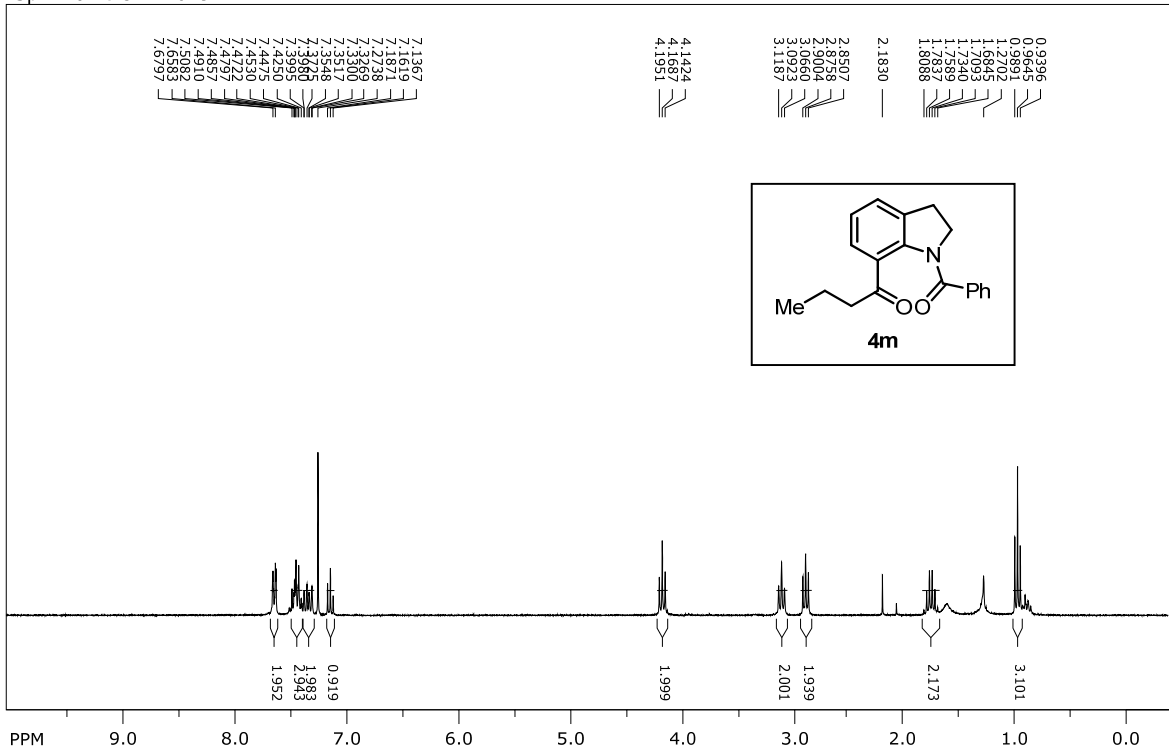
SpinWorks 3: 593



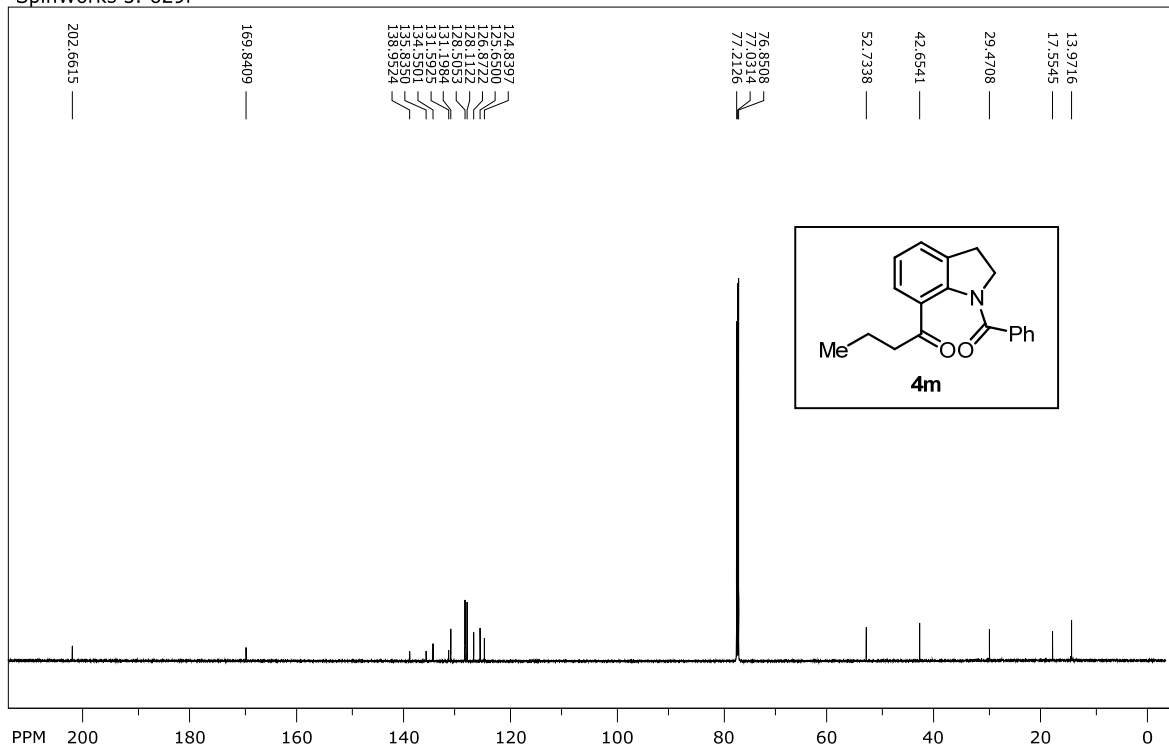
SpinWorks 3: 593



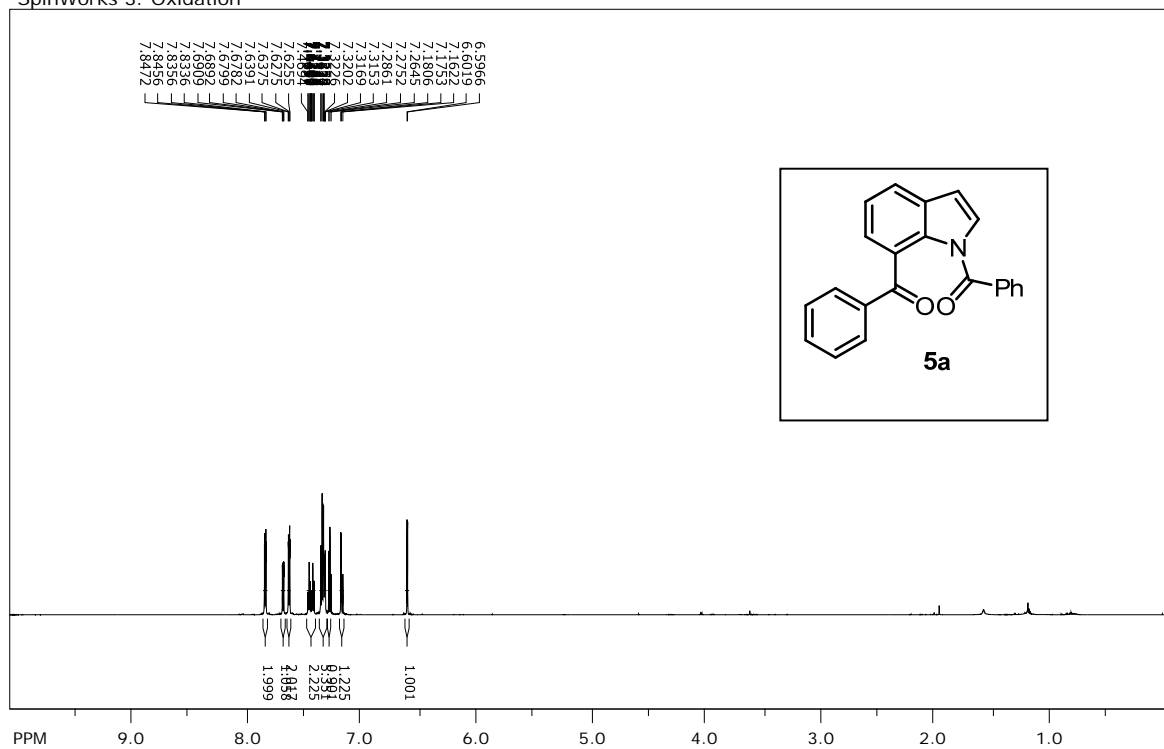
SpinWorks 3: MY629



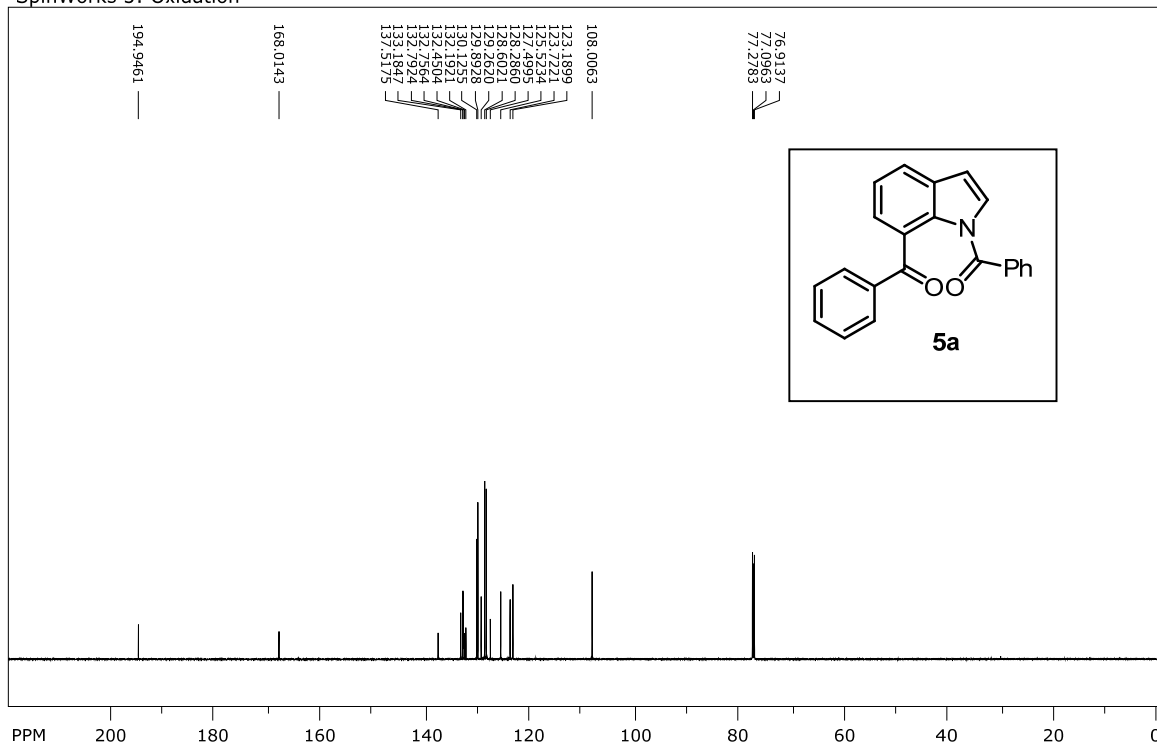
SpinWorks 3: 629P



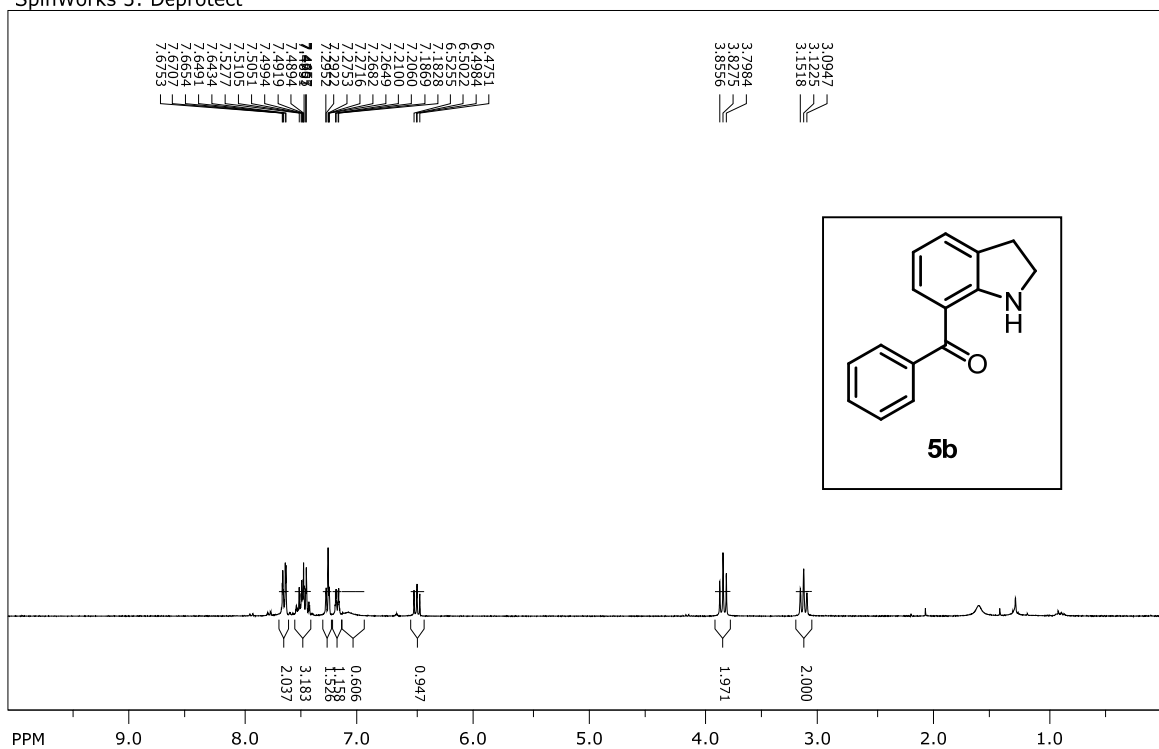
SpinWorks 3: Oxidation



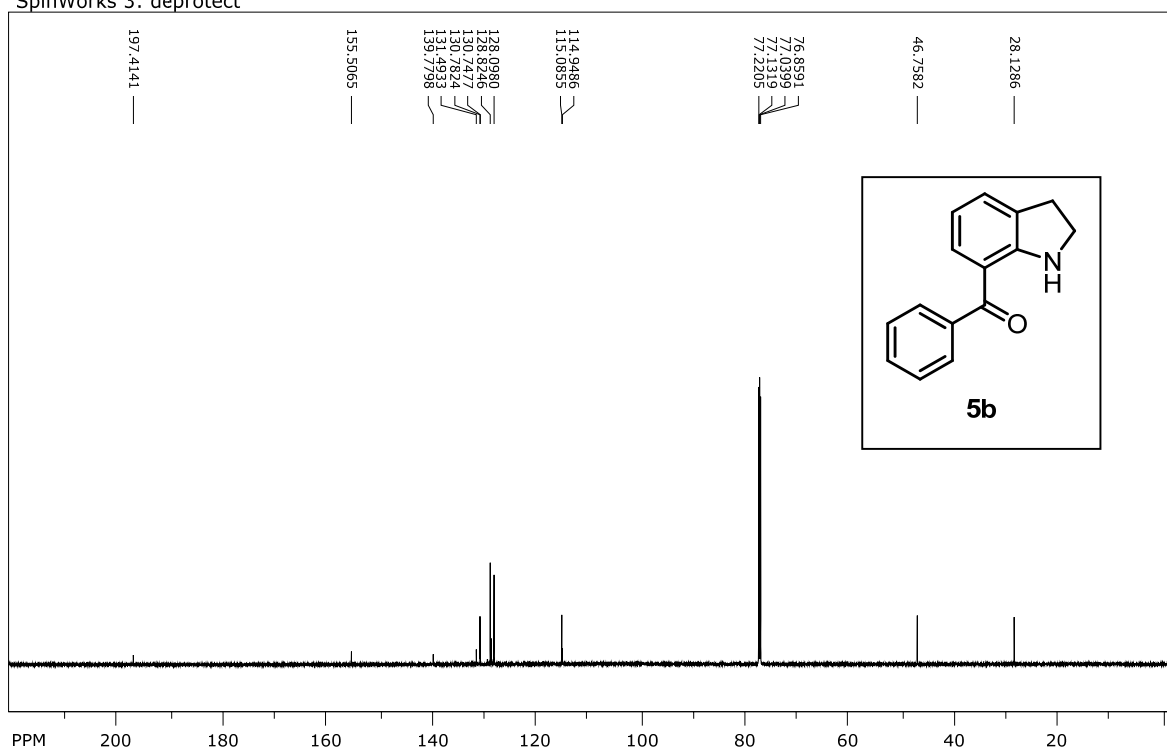
SpinWorks 3: Oxidation



SpinWorks 3: Deprotect



SpinWorks 3: deprotect



SpinWorks 3: 623-2

