

## Supplementary Material

# Palladium-catalyzed dehydrogenative coupling: an efficient synthetic strategy for the construction of the quinoline core

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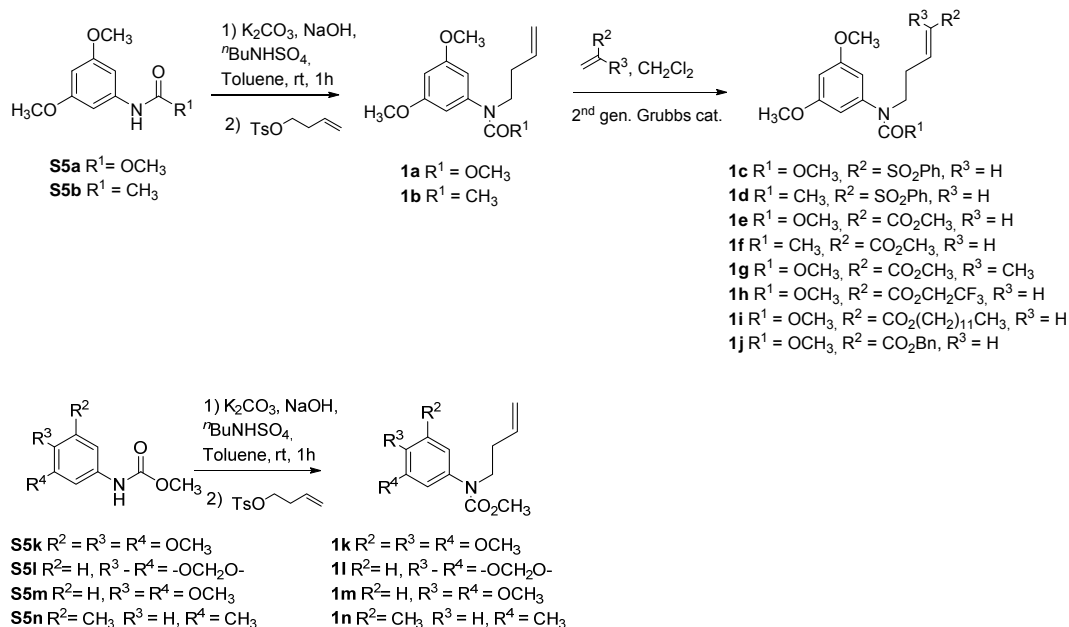
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### Table of contents

|  |    |
|--|----|
| 1. Synthesis of substituted anilines <b>1a-n</b> .   | S2 |
| 1.1. General procedure for the alkylation of protected anilines <b>S5</b> . Synthesis of <b>1a,b</b> and <b>1k-n</b> | S2 |
| 1.2. General procedure for the cross metathesis reaction. Synthesis of <b>1c-j</b> .                                 | S4 |
| 2. Copies of <sup>1</sup> H and <sup>13</sup> C NMR spectra of compounds described                                   | S8 |

## 1. Synthesis of substituted anilines 1a-n

Substrates **1a-b**, and **1k-n** were prepared by alkylation of the corresponding protected aniline with buten-3-yl tosylate. Subsequent cross metathesis catalyzed by Grubbs second generation catalyst provided the substituted alkenes **1c-j**.



**Scheme S1.** Preparation of substrates **1a-n**

### 1.1. General procedure for the alkylation of protected anilines **S5**. Synthesis of **1a,b** and **1k-n**.

Over a solution of the corresponding protected aniline **S5** (1 mmol) in toluene (3 mL), anhydrous K<sub>2</sub>CO<sub>3</sub> (1 mmol), powdered NaOH (4 mmol) and <sup>t</sup>Bu<sub>4</sub>NHSO<sub>4</sub> (0.05 mmol) were added. The mixture was stirred for 1 h at room temperature and then, it was heated at 80 °C for 15 min. Afterwards, a solution of but-3-enyl-4-methylbenzenesulfonate (1.6 mmol) in toluene (0.7 mL) was added, and the reaction was heated at 80 °C for the indicated time. The mixture was allowed to cool down to room temperature, and a 1 M aqueous solution of HCl (25 mL) was added. The organic layer was separated and the aqueous layer was extracted with Et<sub>2</sub>O (3 × 20 mL). The combined organic extracts were dried (Na<sub>2</sub>SO<sub>4</sub>) and concentrated *in vacuo*. Flash column chromatography (silica gel, hexane/AcOEt) afforded the corresponding *N*-substituted but-3-en-1-ylanilines **1a,b** and **1k-n**.

**Methyl but-3-en-1-yl(3,5-dimethoxyphenyl)carbamate (1a).** Prepared from methyl (3,5-dimethoxyphenyl)carbamate **S5a** (2.05 g, 9.72 mmol), anhydrous K<sub>2</sub>CO<sub>3</sub> (1.34 g, 9.72 mmol), powdered NaOH (1.55 g, 38.9 mmol) and <sup>t</sup>Bu<sub>4</sub>NHSO<sub>4</sub> (0.16 g, 0.49 mmol) in toluene (29.2 mL). The mixture was stirred for 1 h at room temperature and then, it was heated at 80 °C for 15 min. Afterwards, a solution of but-3-enyl-4-methylbenzenesulfonate **1c** (3.51 g, 15.6 mmol) in toluene (11 mL) was added, and the reaction was heated at 80 °C for 28 h. After work-up, the crude reaction product was purified by flash column chromatography (silica gel, hexane/AcOEt 8/2), affording **1a** (2.40 g, 93%) as an oil: IR (ATR) 1706 cm<sup>-1</sup> (C=O); <sup>1</sup>H NMR (CDCl<sub>3</sub>): δ 2.17-2.31 (m, 2H, NCH<sub>2</sub>CH<sub>2</sub>), 3.51-3.78 (m, 11H, COOCH<sub>3</sub>, NCH<sub>2</sub>CH<sub>2</sub>, 2 × OCH<sub>3</sub>), 4.82-5.11 (m, 2H, CH=CH<sub>2</sub>), 5.69 (ddt, *J* = 17.0, 10.2, 6.8 Hz, 1H, CH=CH<sub>2</sub>), 6.30 (s, 3H, H<sub>2</sub>, H<sub>4</sub>, H<sub>6</sub>); <sup>13</sup>C NMR (CDCl<sub>3</sub>): δ 32.7 (NCH<sub>2</sub>CH<sub>2</sub>), 49.6 (NCH<sub>2</sub>CH<sub>2</sub>), 52.6 (COOCH<sub>3</sub>), 55.2 (2 ×

OCH<sub>3</sub>), 98.7 (C<sub>4</sub>), 105.9 (C<sub>2</sub>, C<sub>6</sub>), 116.6 (CH=CH<sub>2</sub>), 135.2 (CH=CH<sub>2</sub>), 143.3 (C<sub>1</sub>), 155.8 (CO), 160.8 (C<sub>3</sub>, C<sub>5</sub>); MS (EI) *m/z* (rel intensity) 265.1 (M<sup>+</sup>, 25), 225.1 (13), 224.1 (100), 211.1 (12), 180.1 (23), 165.1 (22), 152.1 (39), 137.1 (10); HRMS (CI) calcd. for C<sub>14</sub>H<sub>20</sub>NO<sub>4</sub> [MH<sup>+</sup>], 266.1396; found: 266.1392.

***N*-(But-3-en-1-yl)-*N*-(3,5-dimethoxyphenyl)acetamide (1b).** Prepared from *N*-(3,5-dimethoxyphenyl)acetamide **S5b** (2.05 g, 10.5 mmol), anhydrous K<sub>2</sub>CO<sub>3</sub> (1.45 g, 10.5 mmol), powdered NaOH (1.68 g, 42.0 mmol) and *n*-Bu<sub>4</sub>NHSO<sub>4</sub> (0.18 g, 0.53 mmol) in toluene (31.5 mL). The mixture was stirred for 1 h at room temperature and then, it was heated at 80 °C for 15 min. Afterwards, a solution of but-3-enyl-4-methylbenzenesulfonate (3.80 g, 16.8 mmol) in toluene (9.5 mL) was added, and the reaction was heated at 80 °C for 4 h. After work-up, the crude reaction product was purified by flash column chromatography (silica gel, hexane/AcOEt 6/4), affording **1b** (1.73 g, 66%) as an oil: IR (ATR) 1656 cm<sup>-1</sup> (C=O); <sup>1</sup>H NMR (CDCl<sub>3</sub>): δ 1.80 (s, 3H, COCH<sub>3</sub>), 2.18-2.32 (m, 2H, NCH<sub>2</sub>CH<sub>2</sub>), 3.65-3.72 (m, 2H, NCH<sub>2</sub>CH<sub>2</sub>), 3.74 (s, 6H, 2 × OCH<sub>3</sub>), 4.95-5.08 (m, 2H, CH=CH<sub>2</sub>), 5.69 (ddt, *J* = 17.0, 10.2, 6.7 Hz, 1H, CH=CH<sub>2</sub>), 6.25 (d, *J* = 2.2 Hz, 2H, H<sub>2</sub>, H<sub>6</sub>), 6.37 (t, *J* = 2.2 Hz, 1H, H<sub>4</sub>); <sup>13</sup>C NMR (CDCl<sub>3</sub>): δ 22.4 (COCH<sub>3</sub>), 32.2 (NCH<sub>2</sub>CH<sub>2</sub>), 47.8 (NCH<sub>2</sub>CH<sub>2</sub>), 55.3 (2 × OCH<sub>3</sub>), 99.4 (C<sub>4</sub>), 106.4 (C<sub>2</sub>, C<sub>6</sub>), 116.4 (CH=CH<sub>2</sub>), 135.3 (CH=CH<sub>2</sub>), 144.5 (C<sub>1</sub>), 161.3 (C<sub>3</sub>, C<sub>5</sub>), 169.8 (CO); MS (EI) *m/z* (rel intensity) 249.1 (M<sup>+</sup>, 6), 195.1 (12), 167.1 (10), 166.1 (100); HRMS (CI) calcd. for C<sub>14</sub>H<sub>20</sub>NO<sub>3</sub> [MH<sup>+</sup>], 250.1443; found: 250.1455.

**Methyl but-3-en-1-yl(3,4,5-trimethoxyphenyl)carbamate (1k).** Prepared from carbamate **S5k** (0.40 g, 1.66 mmol), anhydrous K<sub>2</sub>CO<sub>3</sub> (0.24 g, 1.66 mmol), powder NaOH (0.27 g, 6.66 mmol) and *n*-Bu<sub>4</sub>NHSO<sub>4</sub> (0.029 g, 0.083 mmol) in toluene (20 mL). The mixture was stirred for 1 h at room temperature and then heated at 80 °C for 15 min. Afterwards but-3-enyl 4-methylbenzenesulfonate (0.60 g, 2.65 mmol) in toluene (3 mL) was added and the reaction mixture was heated at 80 °C for 28 h. After work-up, the crude reaction product was purified by flash column chromatography (silica gel, hexane/AcOEt 60:40) affording **1k** as an oil (0.29 g, 59 %): IR (ATR) 1700 cm<sup>-1</sup> (C=O); <sup>1</sup>H NMR (CDCl<sub>3</sub>): δ 2.26-2.37 (m, 2H, NCH<sub>2</sub>CH<sub>2</sub>), 3.64-3.76 (m, 5H, COOCH<sub>3</sub>, NCH<sub>2</sub>), 3.83 (s, 3H, OCH<sub>3</sub>), 3.85 (s, 3H, OCH<sub>3</sub>), 3.87 (s, 3H, OCH<sub>3</sub>), 5.04-5.11 (m, 2H, NCH<sub>2</sub>CH<sub>2</sub>CH=CH<sub>2</sub>), 5.78 (ddt, *J* = 17.1 Hz, 10.3 Hz, 6.8 Hz, 1 H, NCH<sub>2</sub>CH<sub>2</sub>CH=CH<sub>2</sub>), 6.41 (s, 2H, H<sub>2</sub>, H<sub>6</sub>); <sup>13</sup>C NMR (CDCl<sub>3</sub>): δ (ppm) = 32.7 (NCH<sub>2</sub>CH<sub>2</sub>), 49.9 (CO<sub>2</sub>CH<sub>3</sub>), 52.8 (NCH<sub>2</sub>), 56.1 (C<sub>3</sub>OCH<sub>3</sub>, C<sub>5</sub>OCH<sub>3</sub>), 60.7 (C<sub>4</sub>OCH<sub>3</sub>), 105.1 (C<sub>2</sub>, C<sub>6</sub>), 116.7 (CH=CH<sub>2</sub>), 135.2 (C<sub>1</sub>), 136.8 (C<sub>4</sub>), 137.3 (CH=CH<sub>2</sub>), 153.2 (C<sub>3</sub>, C<sub>5</sub>), 156.0 (NCO); MS (EI) *m/z* (rel intensity): 295 (M<sup>+</sup>, 71), 280 (19), 254 (100), 226 (23), 195 (46), 182 (24), 180 (51), 167 (13); HRMS (ESI<sup>+</sup>) calcd. for C<sub>15</sub>H<sub>22</sub>NO<sub>5</sub> [M+H]<sup>+</sup>, 296.1498; found: 296.1509.

**Methyl benzo[d][1,3]dioxol-5-yl(but-3-en-1-yl)carbamate (1l).** Prepared from carbamate **S5l** (0.72 g, 3.72 mmol), anhydrous K<sub>2</sub>CO<sub>3</sub> (0.49 g, 3.72 mmol), powder NaOH (0.57 g, 14.88 mmol) and *n*-Bu<sub>4</sub>NHSO<sub>4</sub> (0.060 g, 0.19 mmol) in toluene (45 mL). ). The mixture was stirred for 1 h at room temperature and then heated at 80 °C for 15 min. Afterwards but-3-enyl 4-methylbenzenesulfonate (1.26 g, 5.55 mmol) in toluene (5 mL) was added, and the reaction mixture was heated at 80 °C for 28 h. After work-up, the crude reaction product was purified by flash column chromatography (silica gel, hexane/AcOEt 70:30) affording **1l** as an oil (0.79 g, 85 %): IR (ATR) 1700 cm<sup>-1</sup> (C=O); <sup>1</sup>H NMR (CDCl<sub>3</sub>): δ 2.20-2.34 (m, 2H, NCH<sub>2</sub>CH<sub>2</sub>), 3.60-3.70 (m, 5H, COOCH<sub>3</sub>, NCH<sub>2</sub>), 4.98-5.09 (m, 2H, NCH<sub>2</sub>CH<sub>2</sub>CH=CH<sub>2</sub>), 5.73 (ddt, *J* = 17.0 Hz, 10.2 Hz, 6.8 Hz, 1 H, NCH<sub>2</sub>CH<sub>2</sub>CH=CH<sub>2</sub>), 5.95 (s, 2H, OCH<sub>2</sub>O), 6.59-6.66 (m, 2H, H<sub>2</sub>, H<sub>5</sub>), 6.75 (d, *J* = 8.1 Hz, 1H, H<sub>6</sub>); <sup>13</sup>C NMR (CDCl<sub>3</sub>): δ 32.6 (NCH<sub>2</sub>CH<sub>2</sub>), 50.0 (CO<sub>2</sub>CH<sub>3</sub>), 52.8 (NCH<sub>2</sub>), 101.5 (OCH<sub>2</sub>O), 108.1 (C<sub>2</sub>), 109.0 (C<sub>5</sub>), 116.8 (C<sub>6</sub>), 120.8 (CH=CH<sub>2</sub>), 135.1 (C<sub>1</sub>), 135.5 (CH=CH<sub>2</sub>), 146.3 (C<sub>4</sub>), 147.8 (C<sub>3</sub>), 156.2 (NCO); MS (EI) *m/z* (rel intensity): 249 (M<sup>+</sup>, 40), 209 (11), 208 (100), 176 (9), 164 (21), 149 (65), 136 (27), 106 (13); HRMS (ESI<sup>+</sup>) calcd. for C<sub>13</sub>H<sub>16</sub>NO<sub>4</sub> [M+H]<sup>+</sup>, 250.1079; found: 250.1092.

**Methyl but-3-en-1-yl(3,4-dimethoxyphenyl)carbamate (1m).** Prepared from carbamate **S5m** (0.63 g, 2.96 mmol), anhydrous K<sub>2</sub>CO<sub>3</sub> (0.42 g, 2.96 mmol), powder NaOH (0.48 g, 11.85 mmol) and *n*-Bu<sub>4</sub>NHSO<sub>4</sub> (0.051 g, 0.15 mmol) in toluene (35 mL). The mixture was stirred for 1 h at room temperature and then, it was heated at 80 °C for 15 min. Afterwards, a solution of but-3-enyl-4-methylbenzenesulfonate (1.072 g, 4.74 mmol) in toluene (4.5 mL) was added, and the reaction mixture was heated at 80 °C for 28 h. After work-up, the crude reaction product was purified by flash column chromatography (silica gel, hexane/AcOEt 70:30) affording **1m** as an oil (0.71 g, 91 %): IR (ATR) 1700 cm<sup>-1</sup> (C=O); <sup>1</sup>H NMR (CDCl<sub>3</sub>): δ 2.23-2.30 (m, 2H, NCH<sub>2</sub>CH<sub>2</sub>), 3.62-3.71 (m, 5H, COOCH<sub>3</sub>, NCH<sub>2</sub>), 3.82 (s, 3H, OCH<sub>3</sub>), 3.84 (s, 3H, OCH<sub>3</sub>), 4.97-5.07 (m, 2H, NCH<sub>2</sub>CH<sub>2</sub>CH=CH<sub>2</sub>), 5.73 (ddt, *J* = 17.0 Hz, 10.2 Hz, 6.8 Hz, 1H, NCH<sub>2</sub>CH<sub>2</sub>CH=CH<sub>2</sub>), 6.62-6.75 (m, 2H, H<sub>2</sub>, H<sub>5</sub>), 6.80 (d, *J* = 8.4 Hz, 1H, H<sub>6</sub>); <sup>13</sup>C NMR (CDCl<sub>3</sub>): δ 32.6 (NCH<sub>2</sub>CH<sub>2</sub>), 49.9 (CO<sub>2</sub>CH<sub>3</sub>), 52.7 (NCH<sub>2</sub>), 55.8 (OCH<sub>3</sub>), 111.0 (C<sub>2</sub>), 111.4 (C<sub>5</sub>), 116.6 (C<sub>6</sub>), 119.6 (CH=CH<sub>2</sub>), 134.5 (C<sub>1</sub>), 135.2 (CH=CH<sub>2</sub>), 147.8 (C<sub>4</sub>), 149.0 (C<sub>3</sub>), 156.1 (NCO); MS (EI) *m/z* (rel intensity): 265 (M<sup>+</sup>, 47), 225 (13), 224 (100), 192 (15), 180 (11), 165 (50), 152 (39), 150 (31); HRMS (ESI<sup>+</sup>) calcd. for C<sub>14</sub>H<sub>20</sub>NO<sub>4</sub> [M+H]<sup>+</sup>; 266.1396; found: 266.1393.

**Methyl but-3-en-1-yl(3,5-dimethylphenyl)carbamate (1n).** Prepared from carbamate **S5n** (0.87 g, 4.88 mmol), anhydrous K<sub>2</sub>CO<sub>3</sub> (0.70 g, 4.88 mmol), powder NaOH (0.80 g, 19.54 mmol) and *n*-Bu<sub>4</sub>NHSO<sub>4</sub> (0.085 g, 0.25 mmol) in toluene (58.5 mL). The mixture was stirred for 1 h at room temperature and then, it was heated at 80 °C for 15 min. Afterwards, a solution of but-3-enyl-4-methylbenzenesulfonate (1.77 g, 7.82 mmol) in toluene (7 mL) was added, and the reaction mixture was heated at 80 °C for 28 h. After work-up, the crude reaction product was purified by flash column chromatography (silica gel, hexane/AcOEt 70:30) affording **1n** as an oil (0.87 g, 76 %): IR (ATR) 1700 cm<sup>-1</sup> (C=O); <sup>1</sup>H NMR (CDCl<sub>3</sub>): δ 2.19-2.39 (m, 8H, NCH<sub>2</sub>CH<sub>2</sub>, 2 x CH<sub>3</sub>), 3.62-3.76 (m, 5H, COOCH<sub>3</sub>, NCH<sub>2</sub>), 4.99-5.10 (m, 2H, NCH<sub>2</sub>CH<sub>2</sub>CH=CH<sub>2</sub>), 5.76 (ddt, *J* = 17.1 Hz, 10.4 Hz, 6.8 Hz, 1H, NCH<sub>2</sub>CH<sub>2</sub>CH=CH<sub>2</sub>), 6.80 (s, 2H, H<sub>2</sub>, H<sub>6</sub>), 6.90 (s, 1H, H<sub>4</sub>); <sup>13</sup>C NMR (CDCl<sub>3</sub>): δ 21.2 (CH<sub>3</sub>), 32.7 (NCH<sub>2</sub>CH<sub>2</sub>), 49.9 (CO<sub>2</sub>CH<sub>3</sub>), 52.8 (NCH<sub>2</sub>), 116.6 (CH=CH<sub>2</sub>), 125.2 (C<sub>2</sub>, C<sub>6</sub>), 128.6 (C<sub>4</sub>), 135.2 (CH=CH<sub>2</sub>), 138.6 (C<sub>3</sub>, C<sub>5</sub>), 141.5 (C<sub>1</sub>), 156.2 (NCO); MS (EI) *m/z* (rel intensity): 233 (M<sup>+</sup>, 12), 192 (100), 148 (28), 133 (26), 121 (18), 105 (25); HRMS (ESI<sup>+</sup>) calcd. for C<sub>14</sub>H<sub>20</sub>NO<sub>2</sub> [M+H]<sup>+</sup>; 234.1494; found: 234.1503.

**1.2. General procedure for the cross metathesis reaction. Synthesis of 1c-j.** Over a solution of the corresponding *N*-but-3-en-1-ylaniline **1a-b** (1 mmol) in dry CH<sub>2</sub>Cl<sub>2</sub> (29 mL) under argon atmosphere, the corresponding acrylate (10 or 20 mmol) or phenyl vinyl sulfone (2.5 mmol) was added. The mixture was stirred, and then, a solution of 2<sup>nd</sup> generation Grubbs catalyst (0.05 mmol) in dry CH<sub>2</sub>Cl<sub>2</sub> (8 mL) was added *via canula*. The mixture was heated under reflux for 72 or 24 h, and every 24 h additional amounts of the catalyst (5 mol%) were added. Afterwards, the mixture was allowed to cool down to room temperature and the solvent was removed under reduced pressure. Flash column chromatography (silica gel, hexane/AcOEt 6/4) afforded the corresponding products **1c-j**.

**(E)-Methyl (3,5-dimethoxyphenyl)[4-(phenylsulfonyl)but-3-en-1-yl]carbamate (1c).** Prepared from carbamate **1a** (0.12 g, 0.45 mmol) and phenyl vinyl sulfone (0.18 g, 1.09 mmol) in dry CH<sub>2</sub>Cl<sub>2</sub> (13 mL), as well as a solution of 2<sup>nd</sup> generation Grubbs catalyst (19.1 mg, 0.023 mmol) in dry CH<sub>2</sub>Cl<sub>2</sub> (3.7 mL). The reaction mixture was heated under reflux for 72 h and additional amounts of the catalyst (19.1 mg, 0.023 mmol) were added every 24 h. After purification by flash column chromatography, **1c** was obtained (0.13 g, 71%) as an oil: IR (ATR) 1702 cm<sup>-1</sup> (C=O), 1229 cm<sup>-1</sup>, 1157 cm<sup>-1</sup> (R-SO<sub>2</sub>-R); <sup>1</sup>H NMR (CDCl<sub>3</sub>): δ 2.43 – 2.54 (m, 2H, NCH<sub>2</sub>CH<sub>2</sub>), 3.65 (s, 3H, COOCH<sub>3</sub>), 3.70 – 3.86 (m, 8H, NCH<sub>2</sub>CH<sub>2</sub>, 2 x OCH<sub>3</sub>), 6.25 (d, *J* = 2.2 Hz, 2H, H<sub>2</sub>, H<sub>6</sub>), 6.30 – 6.42 (m, 2H, H<sub>4</sub>, CH=CH-SO<sub>2</sub>Ph), 6.91 (dt, *J* = 15.2, 6.9 Hz, 1H, CH=CH-SO<sub>2</sub>Ph),

7.46 – 7.66 (m, 3H, H<sub>2'</sub>, H<sub>4'</sub>, H<sub>6'</sub>), 7.76 – 7.91 (m, 2H, H<sub>3'</sub>, H<sub>5'</sub>); <sup>13</sup>C NMR (CDCl<sub>3</sub>): δ 30.4 (NCH<sub>2</sub>CH<sub>2</sub>), 48.4 (NCH<sub>2</sub>CH<sub>2</sub>), 53.1 (COOCH<sub>3</sub>), 55.4 (2 × OCH<sub>3</sub>), 99.1 (C<sub>4</sub>), 105.7 (C<sub>2</sub>, C<sub>6</sub>), 127.6 (C<sub>2'</sub>, C<sub>6'</sub>), 129.3 (C<sub>3'</sub>, C<sub>5'</sub>), 132.2 (C<sub>4'</sub>), 133.4 (CH=CH-SO<sub>2</sub>Ph), 140.4 (C<sub>1'</sub>), 142.7 (C<sub>1</sub>), 143.1 (CH=CH-SO<sub>2</sub>Ph), 155.8 (CO), 161.0 (C<sub>3</sub>, C<sub>5</sub>); MS (ESI<sup>+</sup>) *m/z* (rel intensity) 407.1 (MH<sup>+</sup> + 1, 20), 406.1 (MH<sup>+</sup>, 100), 374.1 (1); HRMS (ESI<sup>+</sup>) calcd. for C<sub>20</sub>H<sub>24</sub>NO<sub>6</sub>S [MH<sup>+</sup>], 406.1324; found: 406.1326.

**(E)-N-(3,5-dimethoxyphenyl)-N-[4-(phenylsulphonyl)but-3-en-1-yl]acetamide (1d).** Prepared from acetamide **1b** (0.15 g, 0.59 mmol) and phenyl vinyl sulfone (0.25 g, 1.47 mmol) in dry CH<sub>2</sub>Cl<sub>2</sub> (17 mL), as well as a solution of 2<sup>nd</sup> generation Grubbs catalyst (25.0 mg, 0.029 mmol) in dry CH<sub>2</sub>Cl<sub>2</sub> (4.7 mL). The reaction mixture was heated under reflux for 72 h and additional amounts of the catalyst (25.0 mg, 0.029 mmol) were added every 24 h. After purification by flash column chromatography, **1d** was obtained (0.18 g, 77%) as an oil: IR (ATR) 1652 cm<sup>-1</sup> (C=O), 1311, 1143 cm<sup>-1</sup> (R-SO<sub>2</sub>-R); <sup>1</sup>H NMR (CDCl<sub>3</sub>): δ (1.84 (s, 3H, COCH<sub>3</sub>), 2.43-2.57 (m, 2H, NCH<sub>2</sub>CH<sub>2</sub>), 3.71 – 3.89 (m, 8H, NCH<sub>2</sub>CH<sub>2</sub>, 2 × OCH<sub>3</sub>), 6.23 (d, *J* = 2.2 Hz, 2H, H<sub>2</sub>, H<sub>6</sub>), 6.31 – 6.49 (m, 2H, H<sub>4</sub>, CH=CH-SO<sub>2</sub>Ph), 6.92 (dt, *J* = 14.8, 6.8 Hz, 1H, CH=CH-SO<sub>2</sub>Ph), 7.43 – 7.67 (m, 3H, H<sub>2'</sub>, H<sub>4'</sub>, H<sub>6'</sub>), 7.76 – 7.95 (m, 2H, H<sub>3'</sub>, H<sub>5'</sub>); <sup>13</sup>C NMR (CDCl<sub>3</sub>): δ 22.5 (COCH<sub>3</sub>), 29.9 (NCH<sub>2</sub>CH<sub>2</sub>), 46.7 (NCH<sub>2</sub>CH<sub>2</sub>), 55.5 (2 × OCH<sub>3</sub>), 99.8 (C<sub>4</sub>), 106.2 (C<sub>2</sub>, C<sub>6</sub>), 127.6 (C<sub>2'</sub>, C<sub>6'</sub>), 129.3 (C<sub>3'</sub>, C<sub>5'</sub>), 132.2 (C<sub>4'</sub>), 133.4 (CH=CH-SO<sub>2</sub>Ph), 140.5 (C<sub>1'</sub>), 143.4 (CH=CH-SO<sub>2</sub>Ph), 144.2 (C<sub>1</sub>), 161.6 (C<sub>3</sub>, C<sub>5</sub>), 170.5 (CO); MS (CI) *m/z* (rel intensity) 391.1 (MH<sup>+</sup> + 1, 20), 390.1 (MH<sup>+</sup>, 79), 348.1 (22), 250.1 (26), 249.1 (16), 248.1 (67), 247.1 (14), 232.1 (16), 231.1 (13), 208.1 (12), 206.1 (21), 197.1 (17), 196.1 (99), 195.1 (100), 180.1 (11), 166.1 (29), 153.1 (15), 125 (17), 111 (42), 110 (19); HRMS (CI) calcd. for C<sub>20</sub>H<sub>24</sub>NO<sub>5</sub>S [MH<sup>+</sup>], 390.1375; found: 390.1378.

**(E)-Methyl 5-[(3,5-dimethoxyphenyl)(methoxycarbonyl)amino]pent-2-enoate (1e).** Prepared from methyl carbamate **1a** (1.08 g, 4.09 mmol) and methyl acrylate (7.37 mL, 81.8 mmol) in dry CH<sub>2</sub>Cl<sub>2</sub> (118 mL), as well as a solution of 2<sup>nd</sup> generation Grubbs catalyst (0.17 g, 0.20 mmol) in dry CH<sub>2</sub>Cl<sub>2</sub> (33 mL). The reaction mixture was heated under reflux for 72 h and additional amounts of the catalyst (0.17 g, 0.20 mmol) were added every 24 h. After purification by flash column chromatography, **1e** was obtained (1.22 g, 88%) as a solid: mp (CH<sub>2</sub>Cl<sub>2</sub>) 68-70 °C; IR (ATR) 1727 cm<sup>-1</sup> (CO<sub>2</sub>CH<sub>3</sub>), 1691 cm<sup>-1</sup> (NCO<sub>2</sub>CH<sub>3</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>): δ 2.40-2.52 (m, 2H, NCH<sub>2</sub>CH<sub>2</sub>), 3.62-3.91 (m, 14H, 2 × OCH<sub>3</sub>, COOCH<sub>3</sub>, NCOOCH<sub>3</sub>, NCH<sub>2</sub>CH<sub>2</sub>), 5.82-5.91 (m, 1H, CO-CH=CH), 6.32 (d, *J* = 2.1 Hz, 2H, H<sub>2</sub>, H<sub>6</sub>), 6.37 (t, *J* = 2.1 Hz, 1H, H<sub>4</sub>), 6.88 (dt, *J* = 15.7, 7.3 Hz, 1H, CO-CH=CH); <sup>13</sup>C NMR (CDCl<sub>3</sub>): δ 31.2 (NCH<sub>2</sub>CH<sub>2</sub>), 48.9 (NCH<sub>2</sub>CH<sub>2</sub>), 51.5 (COOCH<sub>3</sub>), 53.0 (COOCH<sub>3</sub>), 55.4 (2 × OCH<sub>3</sub>), 99.1 (C<sub>4</sub>), 106.8 (C<sub>2</sub>, C<sub>6</sub>), 122.8 (CO-CH=CH), 143.1 (C<sub>1</sub>), 145.4 (CO-CH=CH), 155.8 (NCOOCH<sub>3</sub>), 161.0 (C<sub>3</sub>, C<sub>5</sub>), 166.6 (COOCH<sub>3</sub>); MS (EI) *m/z* (rel intensity) 323.1 (M<sup>+</sup>, 11), 250.1 (18), 225.1 (13), 224.1 (100), 211.1 (18), 180.1 (21), 165.1 (19), 152.1 (36); HRMS (ESI) calcd. for C<sub>16</sub>H<sub>22</sub>NO<sub>6</sub> [MH<sup>+</sup>], 324.1447; found: 324.1458.

**(E)-Methyl 5-[N-(3,5-dimethoxyphenyl)acetamido]pent-2-enoate (1f).** Prepared from acetamide **1b** (0.15 g, 0.59 mmol) and methyl acrylate (1.05 mL, 11.7 mmol) in dry CH<sub>2</sub>Cl<sub>2</sub> (17 mL), as well as a solution of 2<sup>nd</sup> generation Grubbs catalyst (24.8 mg, 0.029 mmol) in dry CH<sub>2</sub>Cl<sub>2</sub> (4.7 mL). The reaction mixture was heated under reflux for 72 h and additional amounts of the catalyst (24.8 mg, 0.029 mmol) were added every 24 h. After purification by flash column chromatography, **1f** was obtained (0.17 g, 91%) as a solid: mp (CH<sub>2</sub>Cl<sub>2</sub>) 63-65 °C; IR (ATR) 1724 cm<sup>-1</sup> (CO<sub>2</sub>CH<sub>3</sub>), 1656 cm<sup>-1</sup> (COCH<sub>3</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>): δ 1.87 (s, 3H, CH<sub>3</sub>), 2.40-2.53 (m, 2H, NCH<sub>2</sub>CH<sub>2</sub>), 3.60-3.86 (m, 11H, 2 × OCH<sub>3</sub>, COOCH<sub>3</sub>, NCH<sub>2</sub>CH<sub>2</sub>), 5.84 (d, *J* = 15.7 Hz, 1H, CO-CH=CH), 6.27 (d, *J* = 2.1 Hz, 2H, H<sub>2</sub>, H<sub>6</sub>), 6.43 (t, *J* = 2.1 Hz, 1H, H<sub>4</sub>), 6.87 (dt, *J* = 15.7, 7.7 Hz, 1H, CO-CH=CH); <sup>13</sup>C NMR (CDCl<sub>3</sub>): δ 22.4 (COCH<sub>3</sub>), 31.7 (NCH<sub>2</sub>CH<sub>2</sub>), 47.2 (NCH<sub>2</sub>CH<sub>2</sub>), 51.3 (COOCH<sub>3</sub>), 55.4 (2 × OCH<sub>3</sub>), 99.6 (C<sub>4</sub>), 106.3 (C<sub>2</sub>, C<sub>6</sub>), 122.6 (CO-CH=CH), 144.3 (C<sub>1</sub>), 145.6 (CO-

CH=CH), 161.4 (C<sub>3</sub>, C<sub>5</sub>), 166.5 (COOCH<sub>3</sub>), 170.1 (NCOCH<sub>3</sub>); MS (EI) *m/z* (rel intensity) 307.2 (M<sup>+</sup>, 12), 234.1 (34), 208.1 (10), 195.1 (15), 167.2 (24), 166.2 (100), 153.1 (12); HRMS (ESI) calcd. for C<sub>16</sub>H<sub>22</sub>NO<sub>5</sub> [MH<sup>+</sup>], 308.1498; found: 308.1507.

**(E)-Methyl 5-[(3,5-dimethoxyphenyl)(methoxycarbonyl)amino]-2-methylpent-2-enoate (1g).** Prepared from carbamate **1a** (0.36 g, 1.36 mmol) and methyl methacrylate (2.91 mL, 27.3 mmol) in dry CH<sub>2</sub>Cl<sub>2</sub> (39.4 mL), as well as a solution of 2<sup>nd</sup> generation Grubbs catalyst (57.9 mg, 0.068 mmol) in dry CH<sub>2</sub>Cl<sub>2</sub> (11 mL). The reaction mixture was heated under reflux for 72 h and additional amounts of the catalyst (57.9 mg, 0.068 mmol) were added every 24 h. After purification by flash column chromatography, **1g** was obtained (0.42 g, 92%) as an oil: IR (ATR) 1706 cm<sup>-1</sup> (C=O); <sup>1</sup>H NMR (CDCl<sub>3</sub>): δ 1.76 (s, 3H, CH<sub>3</sub>C=CH), 2.36-2.46 (m, 2H, NCH<sub>2</sub>CH<sub>2</sub>), 3.56-3.80 (m, 14H, 2 × OCH<sub>3</sub>, NCOOCH<sub>3</sub>, COOCH<sub>3</sub>, NCH<sub>2</sub>CH<sub>2</sub>), 6.29 (d, *J* = 1.5 Hz, 2H, H<sub>2</sub>, H<sub>6</sub>), 6.31-6.35 (m, 1H, H<sub>4</sub>), 6.61-6.69 (m, 1H, CO-C(CH<sub>3</sub>)=CH); <sup>13</sup>C NMR (CDCl<sub>3</sub>): δ 12.5 (CH<sub>3</sub>), 27.8 (NCH<sub>2</sub>CH<sub>2</sub>), 49.2 (NCH<sub>2</sub>CH<sub>2</sub>), 51.7 (COOCH<sub>3</sub>), 52.9 (COOCH<sub>3</sub>), 55.3 (2 × OCH<sub>3</sub>), 98.9 (C<sub>4</sub>), 106.7 (C<sub>2</sub>, C<sub>6</sub>), 129.5 (CO-C(CH<sub>3</sub>)=CH), 138.2 (CO-C(CH<sub>3</sub>)=CH), 143.2 (C<sub>1</sub>), 155.8 (NCOOCH<sub>3</sub>), 160.9 (C<sub>3</sub>, C<sub>5</sub>), 168.2 (COOCH<sub>3</sub>); MS (EI) *m/z* (rel intensity) 338.2 (M<sup>+</sup> + 1, 2), 337.2 (M<sup>+</sup>, 10), 305.1 (13), 225.1 (16), 224.2 (100), 211.1 (16), 180.1 (24), 165.1 (18), 152.1 (37); HRMS (ESI) calcd. for C<sub>17</sub>H<sub>24</sub>NO<sub>6</sub> [MH<sup>+</sup>], 338.1604; found: 338.1604.

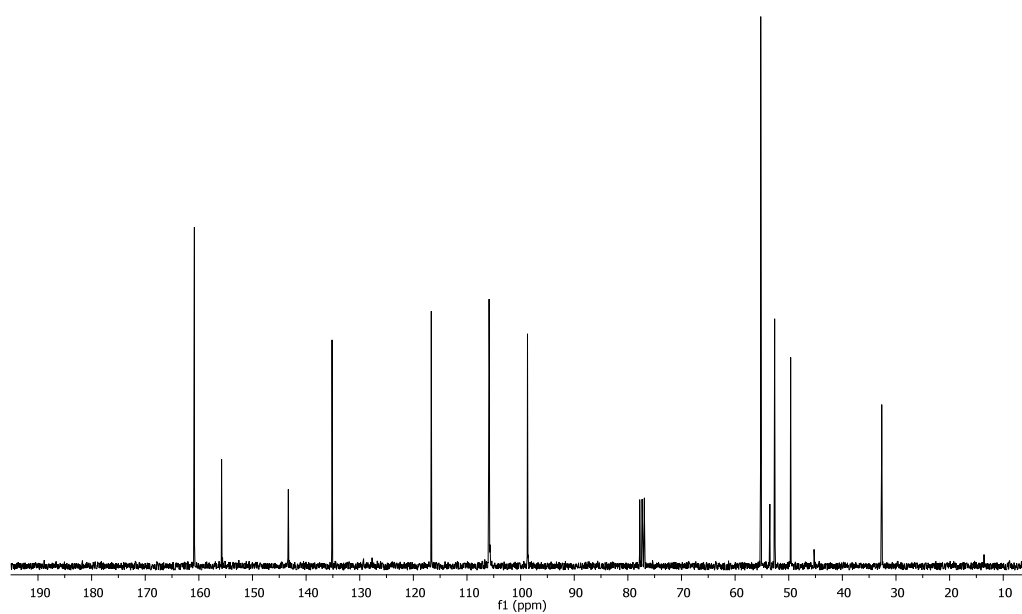
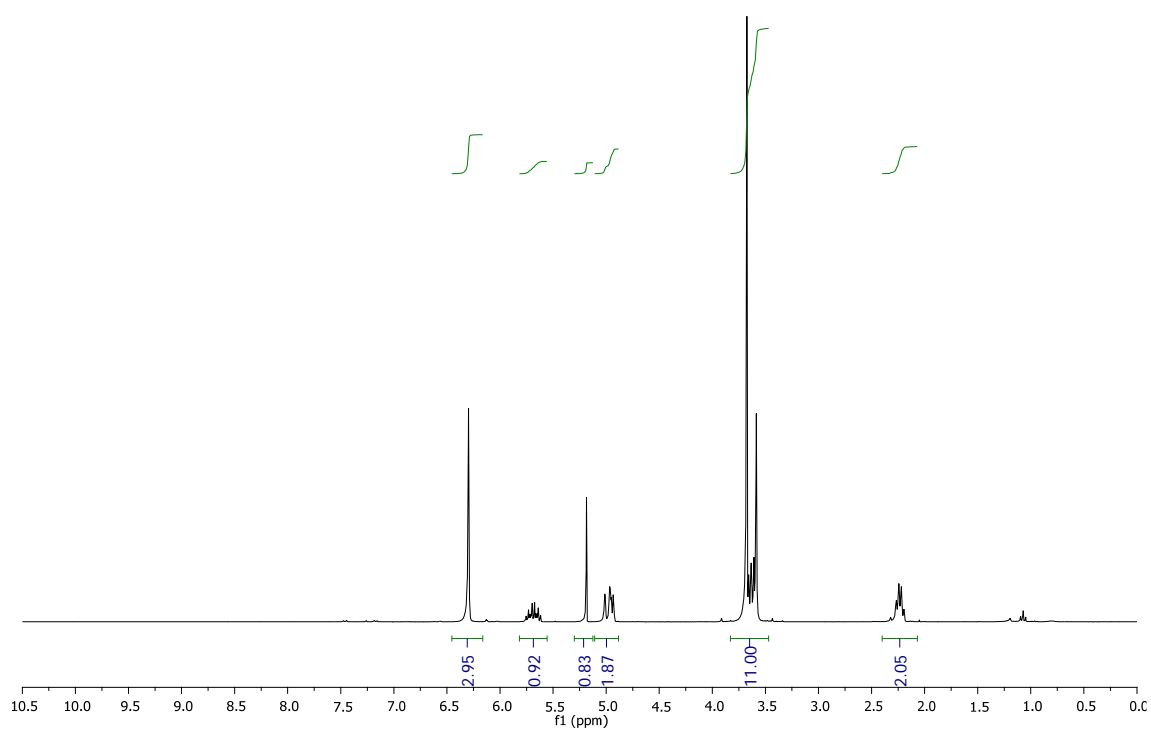
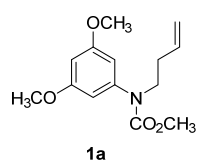
**(E)-2,2,2-Trifluoroethyl 5-[(3,5-dimethoxyphenyl)(methoxycarbonyl)amino]pent-2-enoate (1h).** Prepared from carbamate **1a** (0.30 g, 1.12 mmol) and 2,2,2-trifluoroethyl acrylate (1.42 mL, 11.2 mmol) in dry CH<sub>2</sub>Cl<sub>2</sub> (32.4 mL), as well as a solution of 2<sup>nd</sup> generation Grubbs catalyst (47.6 mg, 0.056 mmol) in dry CH<sub>2</sub>Cl<sub>2</sub> (9 mL). The reaction mixture was heated under reflux for 72 h and additional amounts of the catalyst (47.6 mg, 0.056 mmol) were added every 24 h. After purification by flash column chromatography, **1h** was obtained (0.41 g, 94%) as an oil: IR (ATR) 1739 cm<sup>-1</sup> (CO<sub>2</sub>CH<sub>2</sub>), 1701 cm<sup>-1</sup> (NCO<sub>2</sub>CH<sub>3</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>): δ 2.45-2.57 (m, 2H, NCH<sub>2</sub>CH<sub>2</sub>), 3.56-3.91 (m, 11H, 2 × OCH<sub>3</sub>, NCOOCH<sub>3</sub>, NCH<sub>2</sub>CH<sub>2</sub>), 4.49 (q, *J* = 8.5 Hz, 2H, CO<sub>2</sub>CH<sub>2</sub>CF<sub>3</sub>), 5.90 (d, *J* = 15.7 Hz, 1H, CO-CH=CH), 6.31 (d, *J* = 1.9 Hz, 2H, H<sub>2</sub>, H<sub>6</sub>), 6.36-6.39 (m, 1H, H<sub>4</sub>), 7.01 (dt, *J* = 15.7, 7.1 Hz, 1H, CO-CH=CH); <sup>13</sup>C NMR (CDCl<sub>3</sub>): δ 31.4 (NCH<sub>2</sub>CH<sub>2</sub>), 48.7 (NCH<sub>2</sub>CH<sub>2</sub>), 52.9 (COOCH<sub>3</sub>), 55.3 (2 × OCH<sub>3</sub>), 60.0 (q, *J* = 36.6 Hz, COOCH<sub>2</sub>CF<sub>3</sub>), 99.0 (C<sub>4</sub>), 106.8 (C<sub>2</sub>, C<sub>6</sub>), 121.2 (CO-CH=CH), 123.0 (q, *J* = 275.8 Hz, CF<sub>3</sub>), 143.0 (C<sub>1</sub>), 148.3 (CO-CH=CH), 155.8 (NCOOCH<sub>3</sub>), 160.9 (C<sub>3</sub>, C<sub>5</sub>), 164.2 (COOCH<sub>2</sub>); MS (EI) *m/z* (rel intensity) 392.2 (M<sup>+</sup> + 1, 4), 391.2 (M<sup>+</sup>, 20), 250.1 (19), 225.1 (14), 224.2 (100), 211.1 (15), 180.1 (23), 165.1 (19), 152.1 (35); HRMS (ESI) Calcd. for C<sub>17</sub>H<sub>21</sub>NO<sub>6</sub>F<sub>3</sub> [MH<sup>+</sup>], 392.1321; found: 392.1329.

**(E)-Dodecyl 5-[(3,5-dimethoxyphenyl)(methoxycarbonyl)amino]pent-2-enoate (1i).** Prepared from carbamate **1a** (0.29 g, 1.10 mmol) and lauryl acrylate (3.0 mL, 11.0 mmol) in dry CH<sub>2</sub>Cl<sub>2</sub> (31.9 mL), as well as a solution of 2<sup>nd</sup> generation Grubbs catalyst (46.8 mg, 0.055 mmol) in dry CH<sub>2</sub>Cl<sub>2</sub> (8.9 mL). The reaction mixture was heated under reflux for 72 h and additional amounts of the catalyst (46.8 mg, 0.055 mmol) were added every 24 h. After purification by flash column chromatography, **1i** was obtained (0.53 g, quant.) as an oil: IR (ATR) 1713 cm<sup>-1</sup> (C=O); <sup>1</sup>H NMR (CDCl<sub>3</sub>): δ 0.82 (t, *J* = 6.6 Hz, 3H, CH<sub>3</sub>), 1.15-1.33 (m, 18H, OCH<sub>2</sub>CH<sub>2</sub>(CH<sub>2</sub>)<sub>9</sub>CH<sub>3</sub>), 1.52-1.64 (m, 2H, CO<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>), 2.36-2.46 (m, 2H, NCH<sub>2</sub>CH<sub>2</sub>), 3.53-3.80 (m, 11H, 2 × OCH<sub>3</sub>, NCOOCH<sub>3</sub>, NCH<sub>2</sub>CH<sub>2</sub>), 4.04 (t, *J* = 6.7 Hz, 2H, CO<sub>2</sub>CH<sub>2</sub>), 5.79 (d, *J* = 15.7 Hz, 1H, CO-CH=CH), 6.28 (d, *J* = 1.8 Hz, 2H, H<sub>2</sub>, H<sub>6</sub>), 6.29-6.33 (m, 1H, H<sub>4</sub>), 6.67-6.96 (m, 1H, CO-CH=CH); <sup>13</sup>C NMR (CDCl<sub>3</sub>): δ 14.7 (CH<sub>3</sub>), 22.7 (CH<sub>3</sub>CH<sub>2</sub>), 25.9 (COOCH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>), 28.6, 29.2, 29.3, 29.5, 29.6, 29.7, (7 × CH<sub>2</sub>), 31.2 (NCH<sub>2</sub>CH<sub>2</sub>), 31.9 (CH<sub>3</sub>CH<sub>2</sub>CH<sub>2</sub>), 48.9 (NCH<sub>2</sub>CH<sub>2</sub>), 52.9 (COOCH<sub>3</sub>), 55.3 (2 × OCH<sub>3</sub>), 64.4 (COOCH<sub>2</sub>), 99.0 (C<sub>4</sub>), 106.8 (C<sub>2</sub>, C<sub>6</sub>), 123.3 (CO-CH=CH), 143.1 (C<sub>1</sub>), 145.0 (CO-CH=CH), 155.8

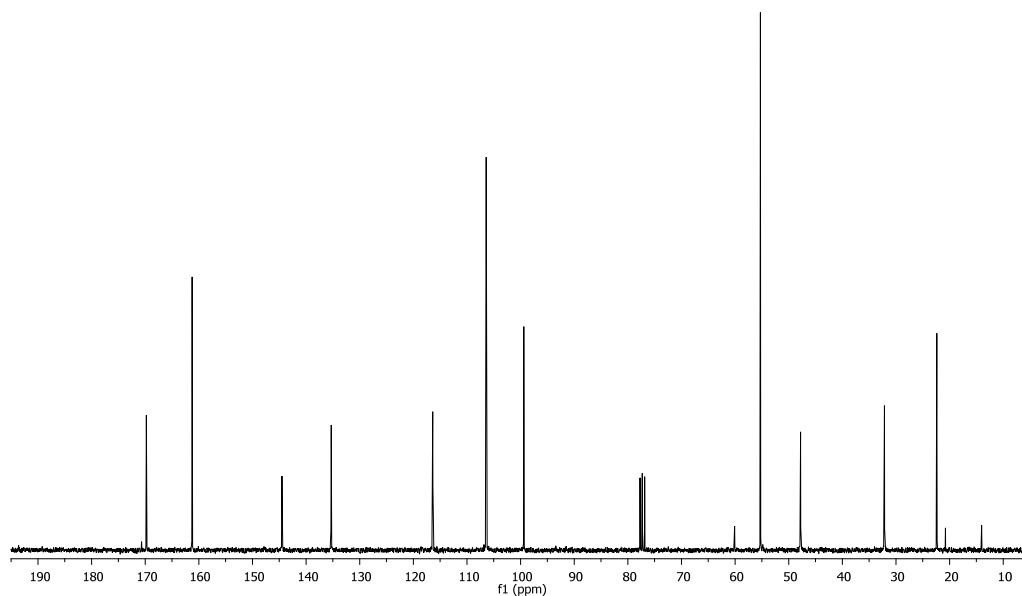
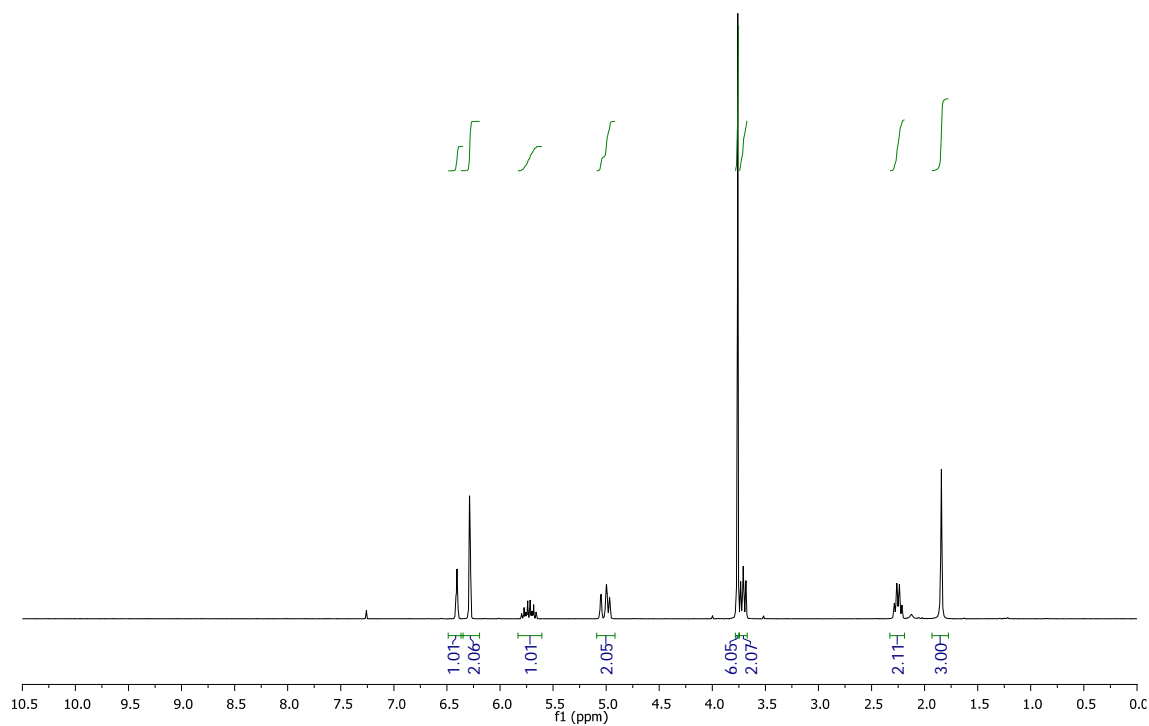
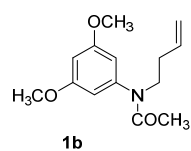
(NCOOCH<sub>3</sub>), 161.0 (C<sub>3</sub>, C<sub>5</sub>), 166.2 (COOCH<sub>2</sub>); MS (ESI) *m/z* (rel intensity) 479.3 (MH<sup>+</sup> + 1, 25), 478.3 (MH<sup>+</sup>, 100); HRMS (ESI<sup>+</sup>) calcd. for C<sub>27</sub>H<sub>44</sub>NO<sub>6</sub> [MH<sup>+</sup>], 478.3169; found: 478.3171.

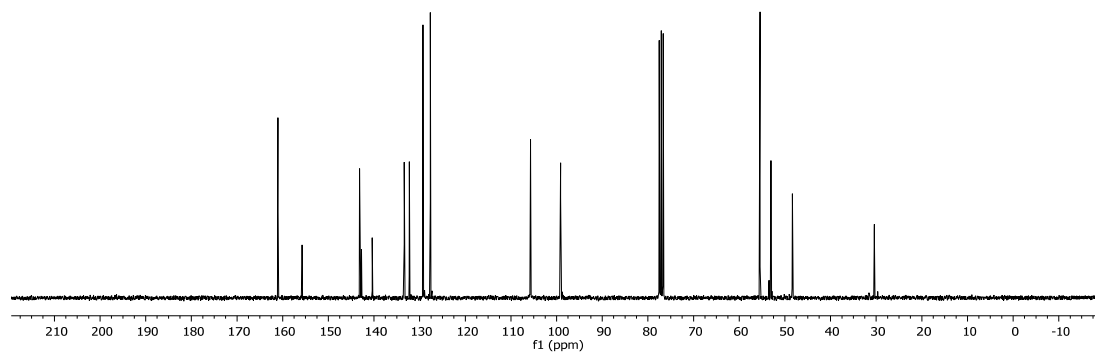
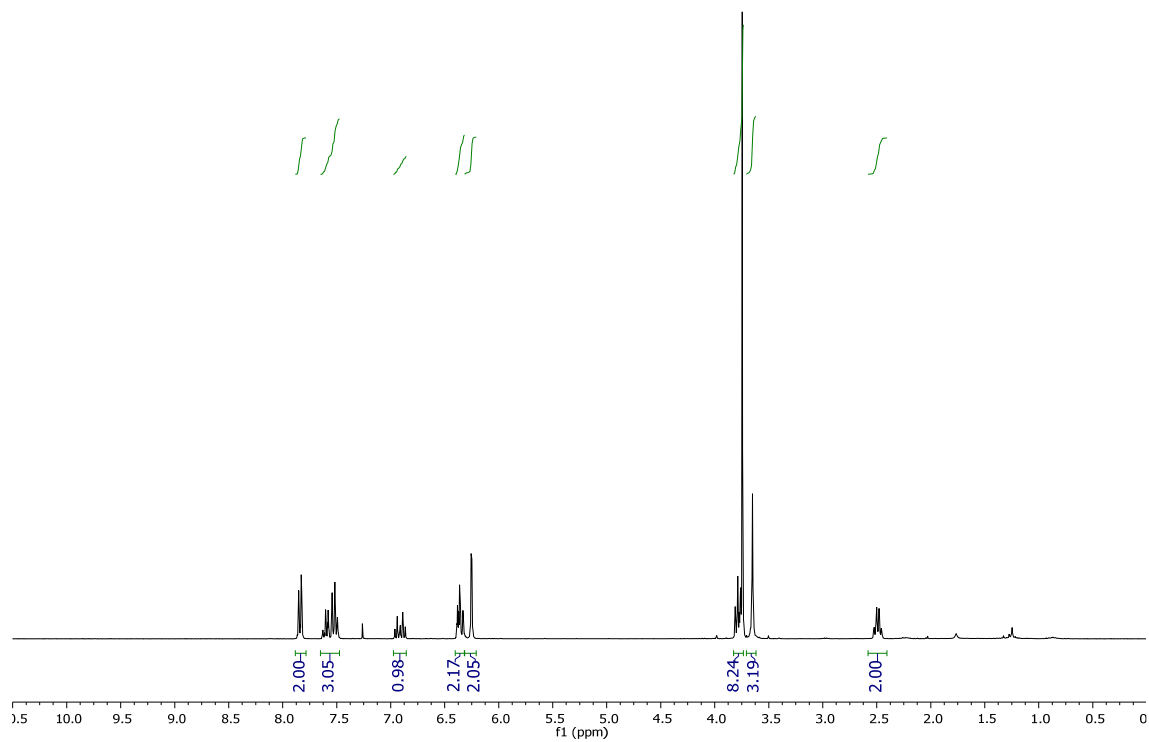
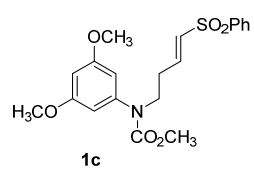
**(E)-Benzyl 5-[(3,5-dimethoxyphenyl)(methoxycarbonyl)amino]pent-2-enoate (1j).** Prepared from carbamate **1a** (0.24 g, 0.92 mmol) and benzyl acrylate (1.40 mL, 9.2 mmol) in dry CH<sub>2</sub>Cl<sub>2</sub> (26.5 mL), as well as a solution of 2<sup>nd</sup> generation Grubbs catalyst (38.9 mg, 0.046 mmol) in dry CH<sub>2</sub>Cl<sub>2</sub> (7.4 mL). The reaction mixture was heated under reflux for 24 h and after purification by flash column chromatography, **1j** was obtained (0.32 g, 86%) as an oil: IR (ATR) 1706 cm<sup>-1</sup> (C=O); <sup>1</sup>H NMR (CDCl<sub>3</sub>): δ 2.43-2.53 (m, 2H, NCH<sub>2</sub>CH<sub>2</sub>), 3.64-3.81 (m, 11H, NCH<sub>2</sub>CH<sub>2</sub>, NCOOCH<sub>3</sub>, 2 × OCH<sub>3</sub>), 5.16 (s, 2H, CH<sub>2</sub>Ph), 5.86-5.94 (m, 1H, CO-CH=CH), 6.33 (d, *J* = 2.2 Hz, 2H, H<sub>2</sub>, H<sub>6</sub>), 6.39 (t, *J* = 2.2 Hz, 1H, H<sub>4</sub>), 6.94 (dt, *J* = 15.7, 7.1 Hz, 1H, CO-CH=CH), 7.22 – 7.40 (m, 5H, Ph); <sup>13</sup>C NMR (CDCl<sub>3</sub>): δ 31.3 (NCH<sub>2</sub>CH<sub>2</sub>), 48.9 (NCH<sub>2</sub>CH<sub>2</sub>), 53.0 (COOCH<sub>3</sub>), 55.6 (2 × OCH<sub>3</sub>), 66.1 (CH<sub>2</sub>Ph), 99.1 (C<sub>4</sub>), 106.8 (C<sub>2</sub>, C<sub>6</sub>), 122.9 (CO-CH=CH), 128.1 (C<sub>2</sub>, C<sub>6</sub>), 128.2 (C<sub>4</sub>), 128.6 (C<sub>3</sub>, C<sub>5</sub>), 136.1 (C<sub>1</sub>), 143.1 (C<sub>1</sub>), 145.9 (CO-CH=CH), 155.8 (NCOOCH<sub>3</sub>), 161.0 (C<sub>3</sub>, C<sub>5</sub>), 165.9 (COOCH<sub>2</sub>); MS (EI) *m/z* (rel intensity) 400.2 (M<sup>+</sup> + 1, 2), 399.2 (M<sup>+</sup>, 7), 308.1 (24), 250.1 (16), 248.1 (19), 225.1 (13), 224.1 (100), 211.1 (13), 180.1 (25), 165.1 (19), 152.1 (37), 91.1 (49); HRMS (ESI<sup>+</sup>) calcd. for C<sub>22</sub>H<sub>26</sub>NO<sub>6</sub> [MH<sup>+</sup>], 400.1760; found: 400.1760.

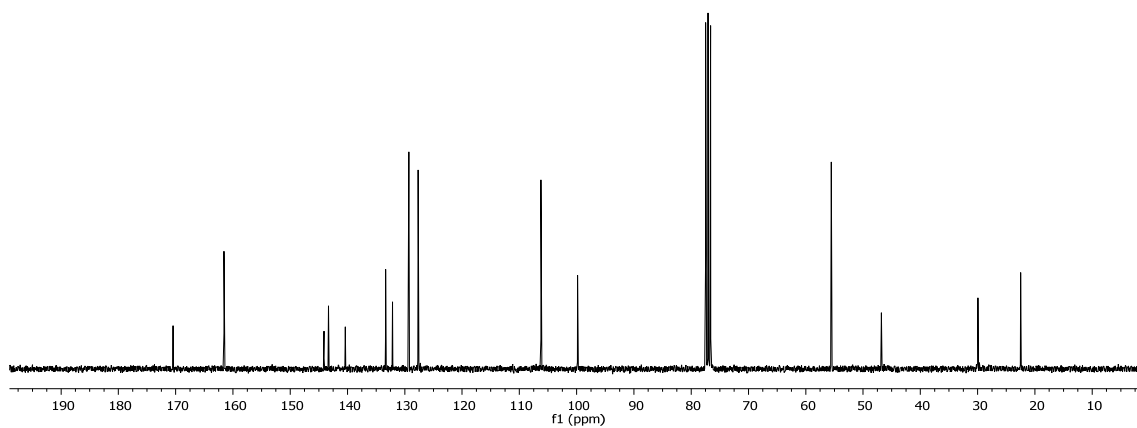
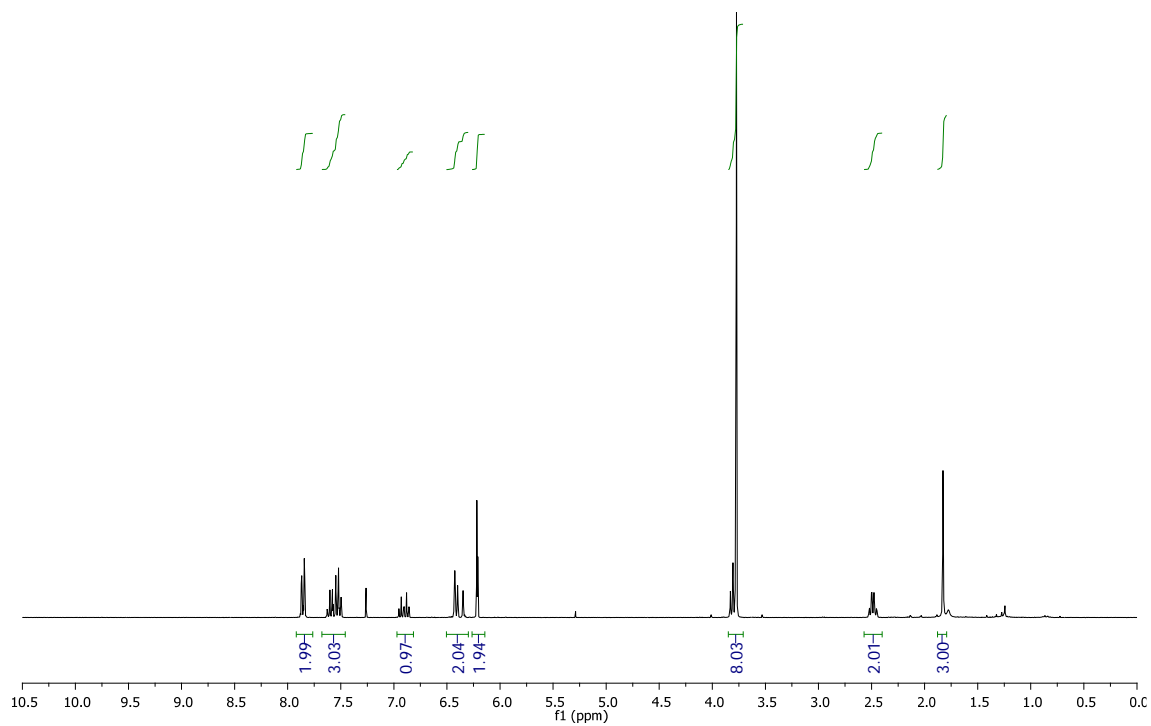
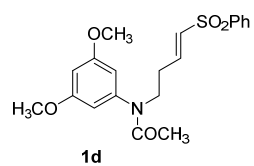
5. Copies of  $^1\text{H}$  and  $^{13}\text{C}$  NMR spectra of compounds described.

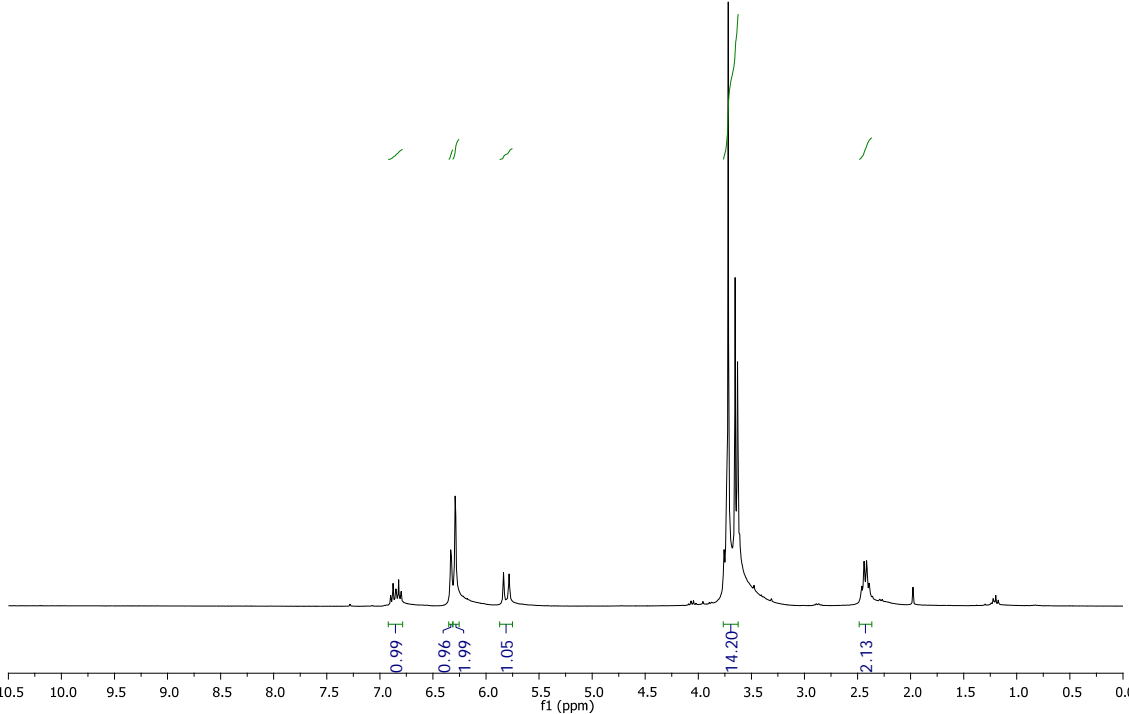


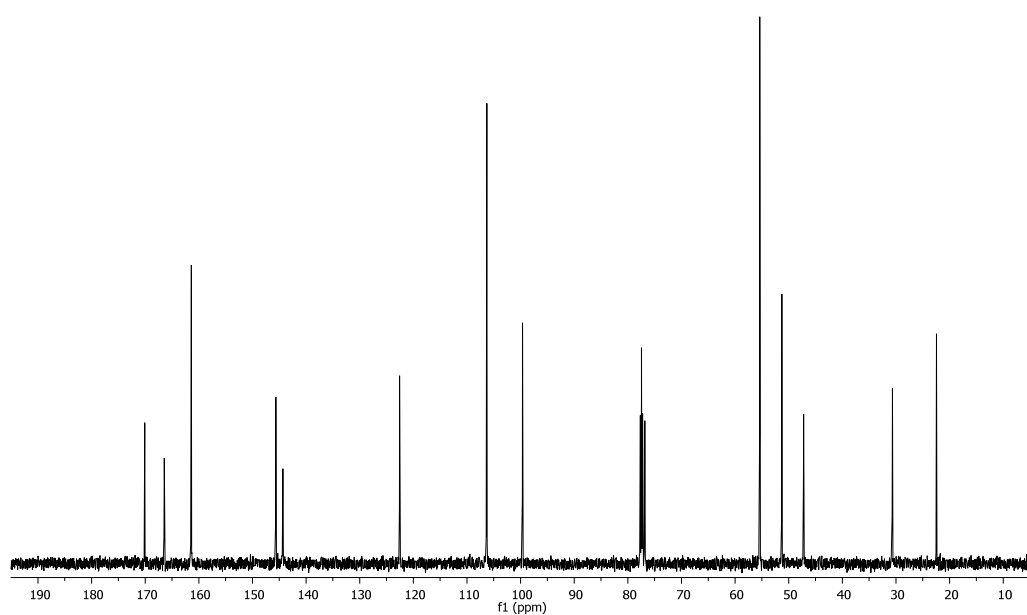
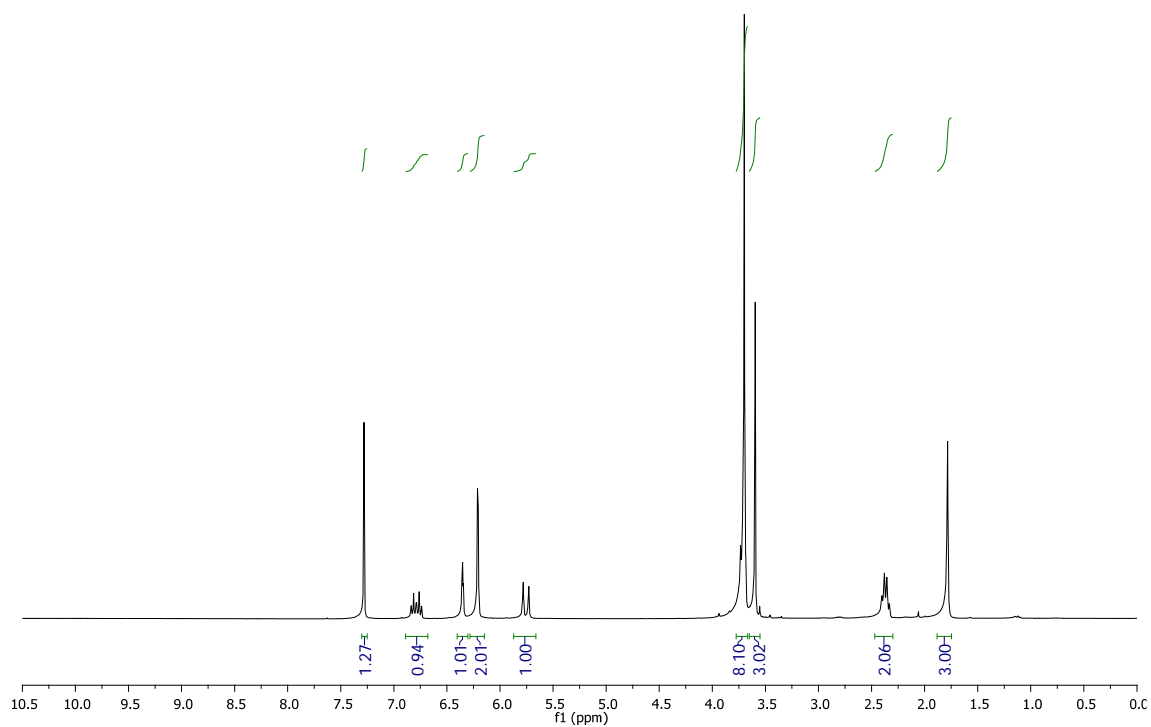
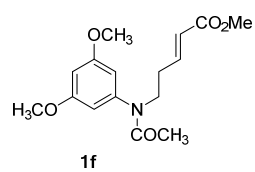


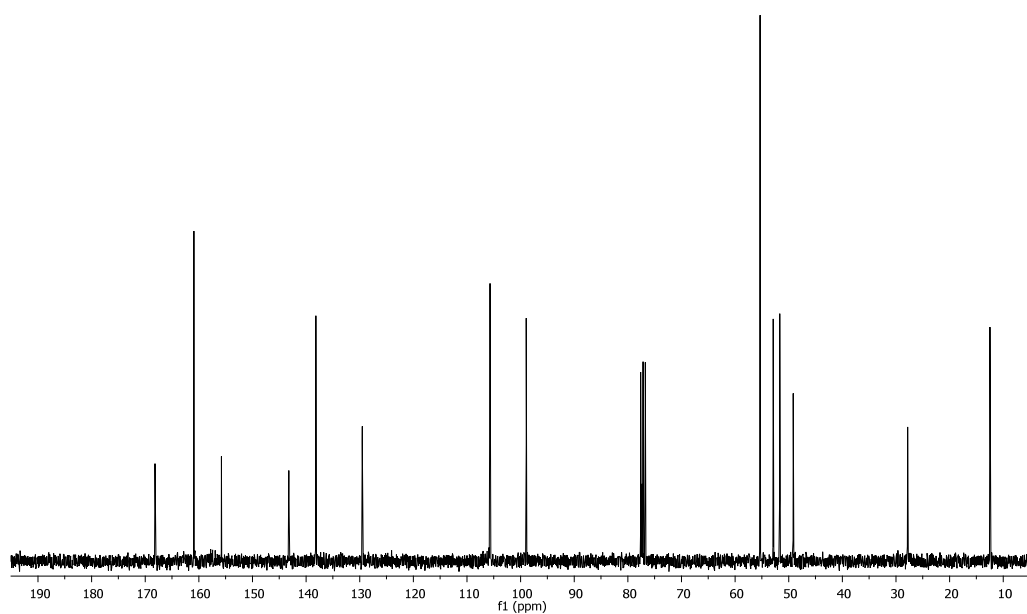
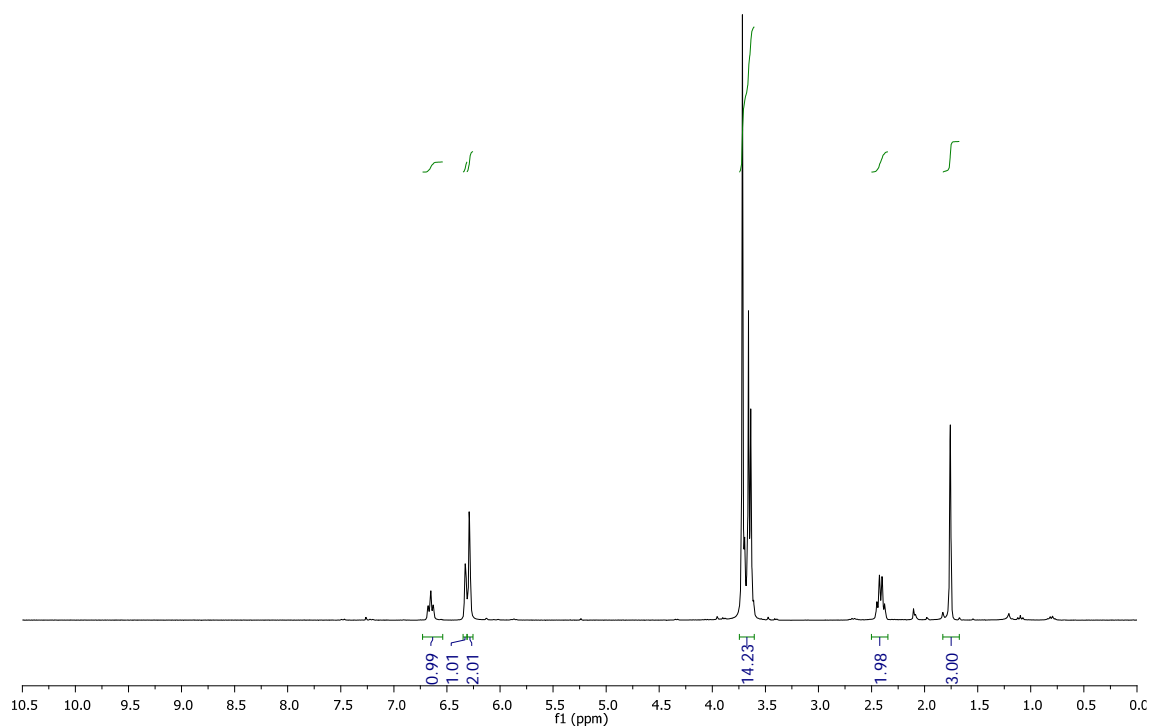
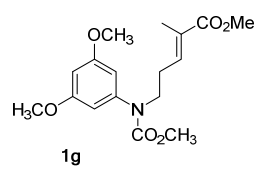


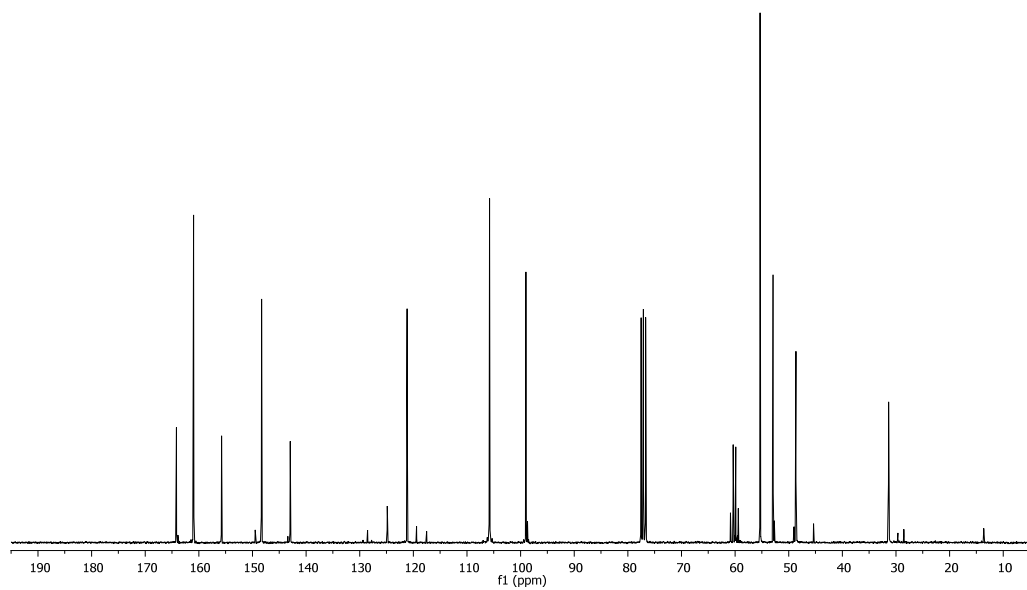
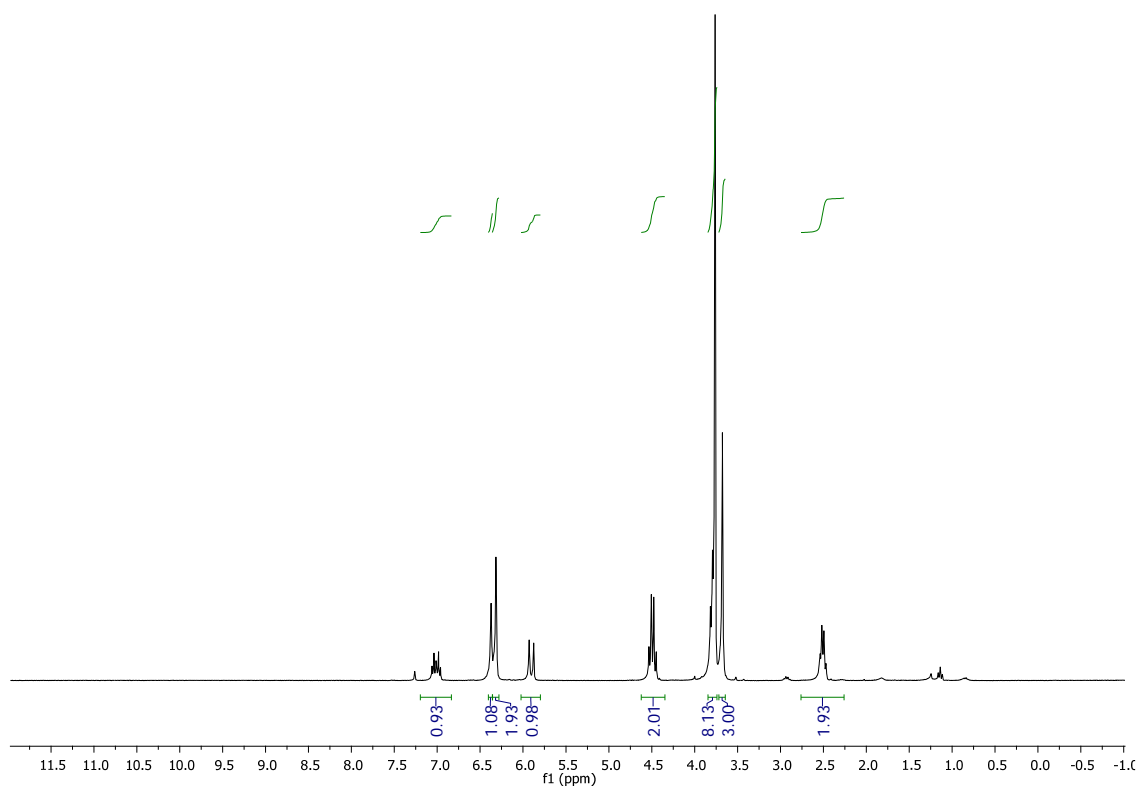
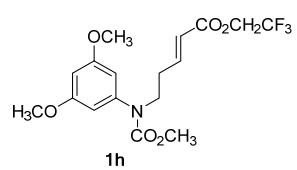


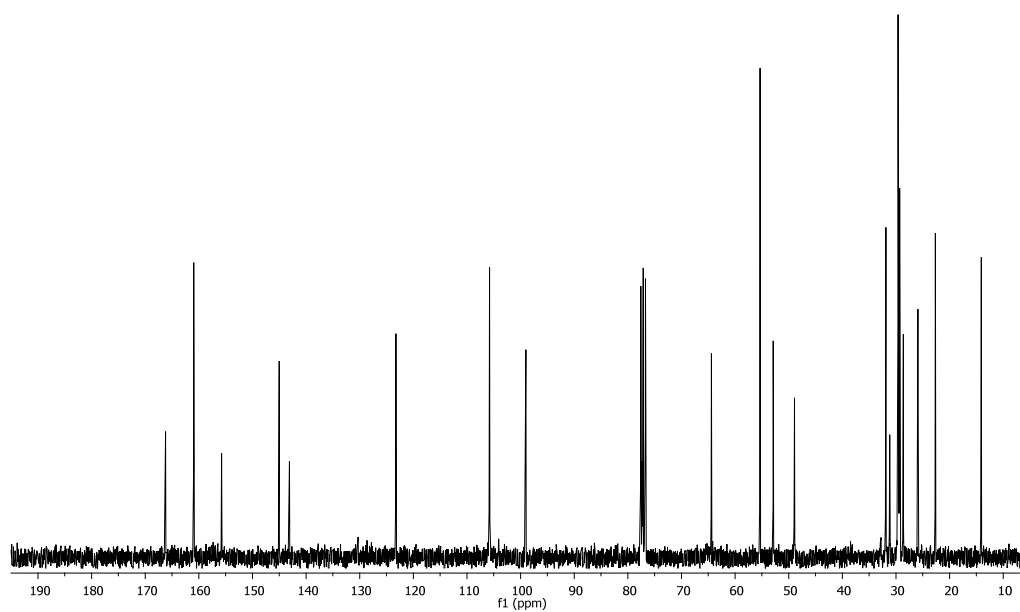
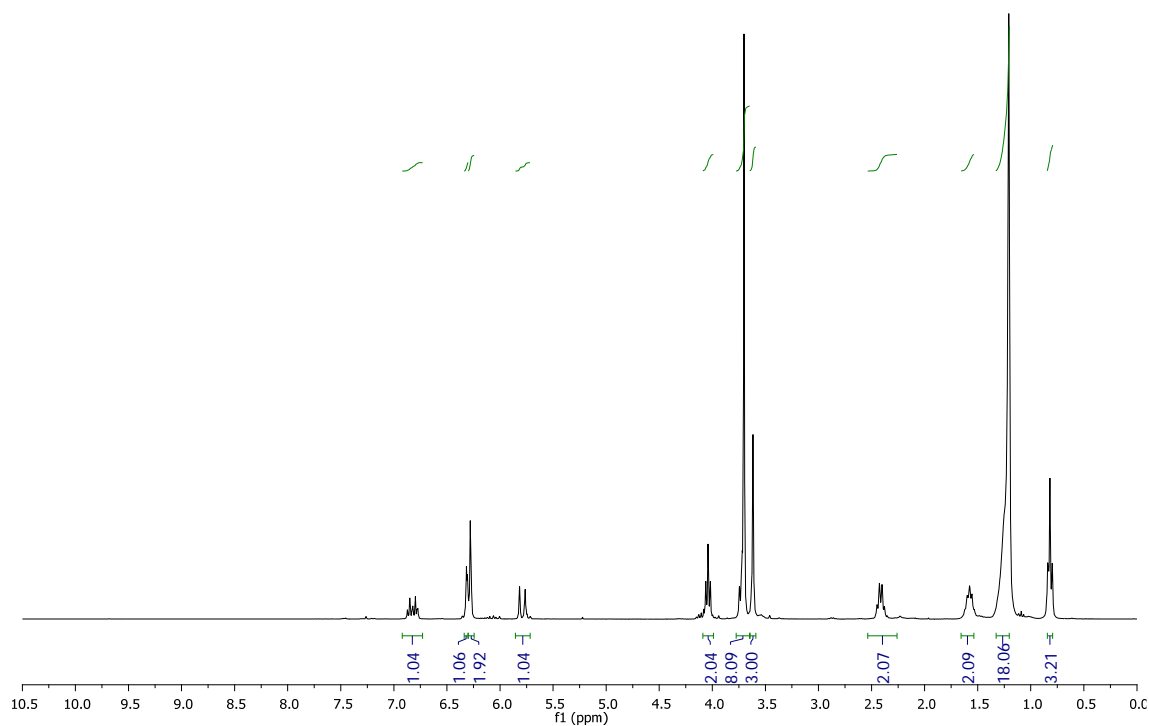
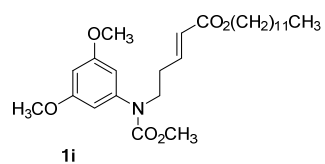




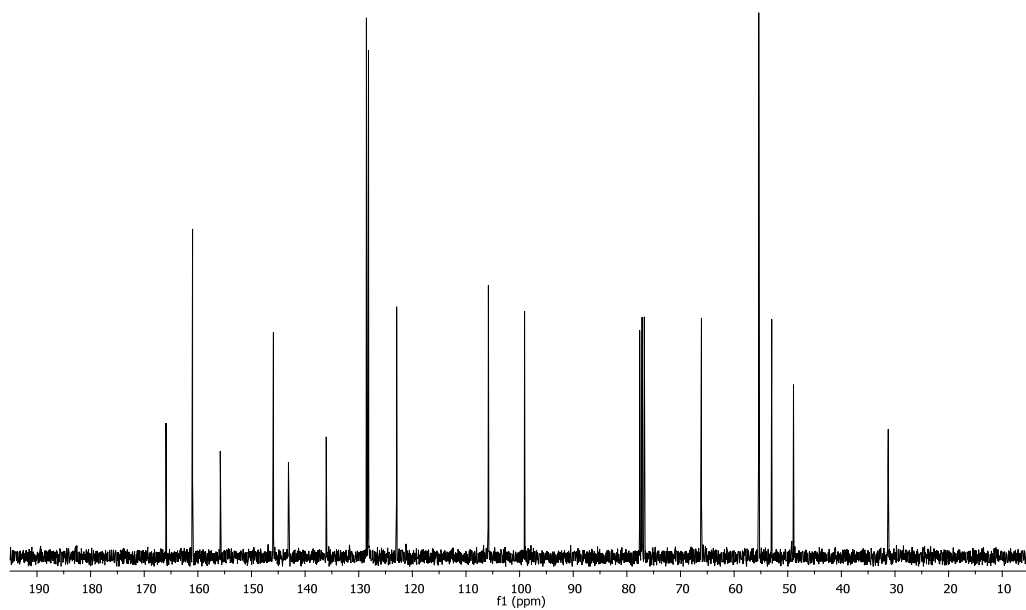
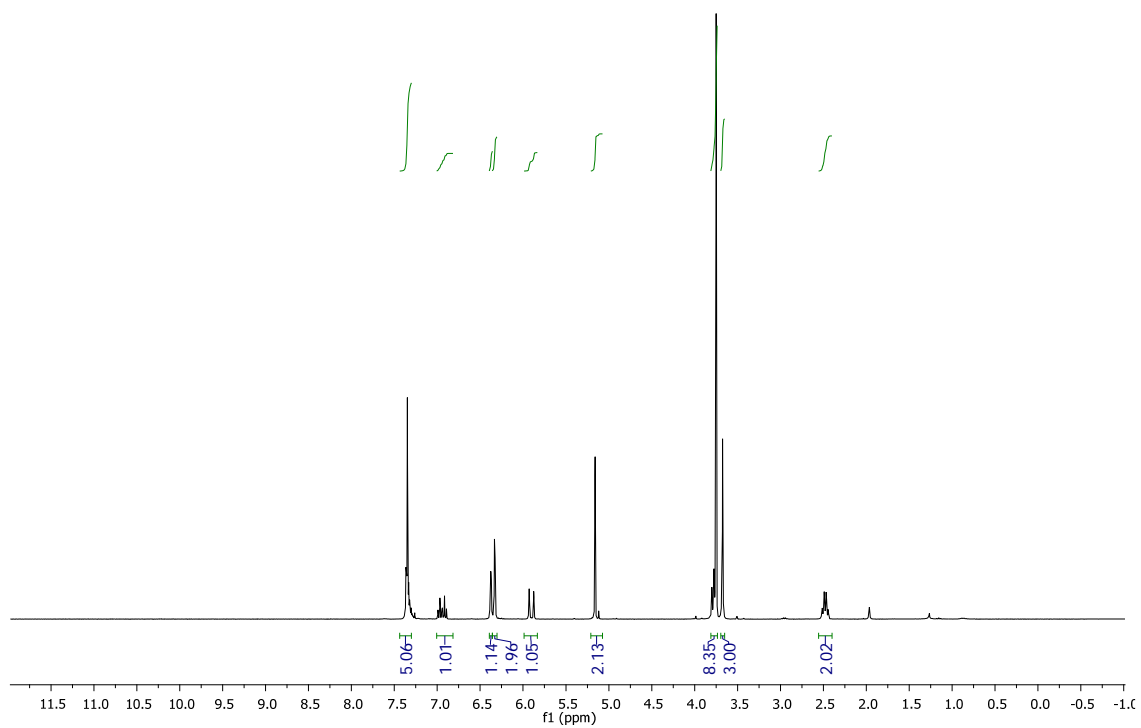
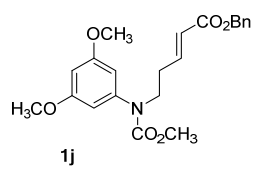


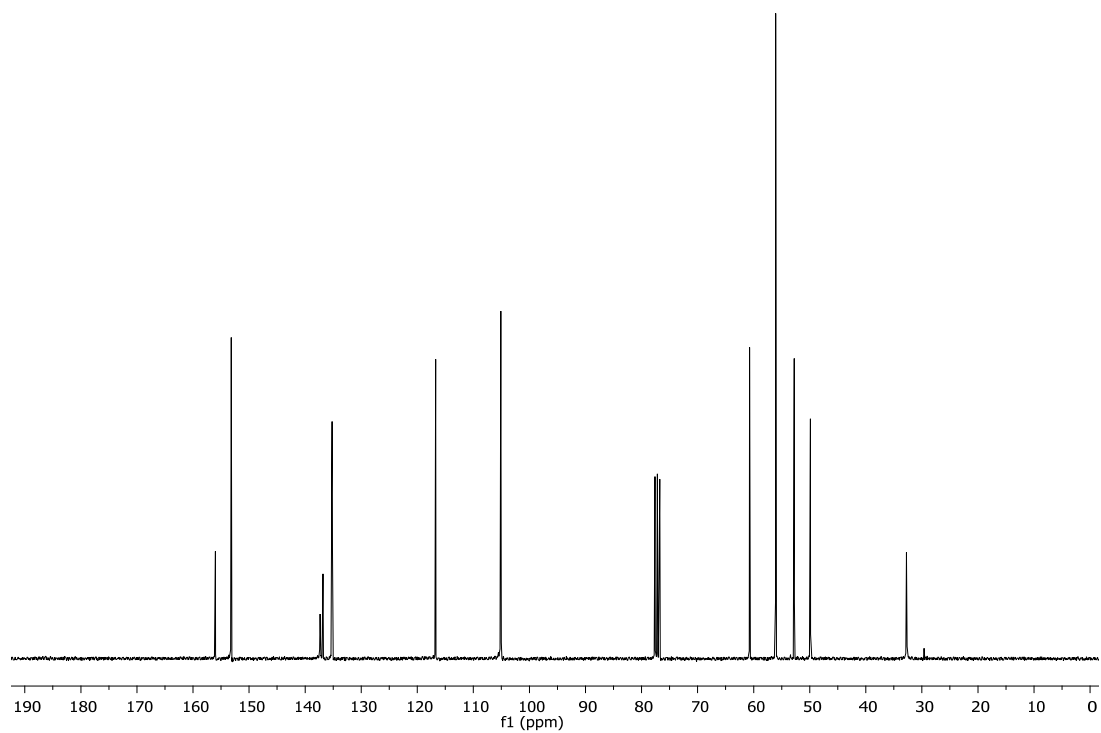
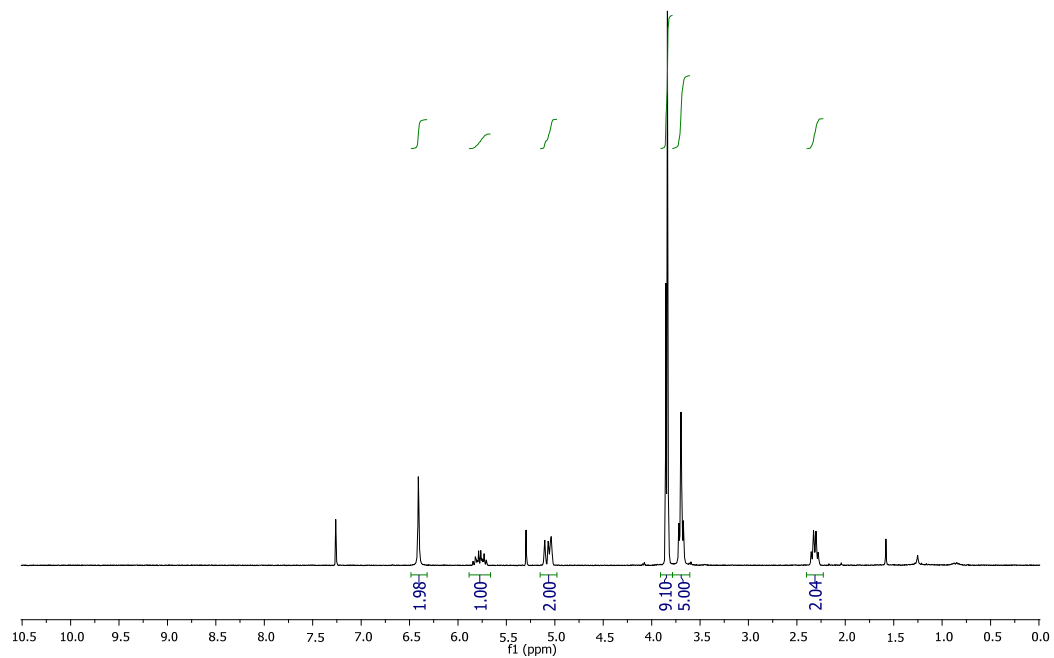
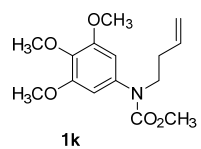


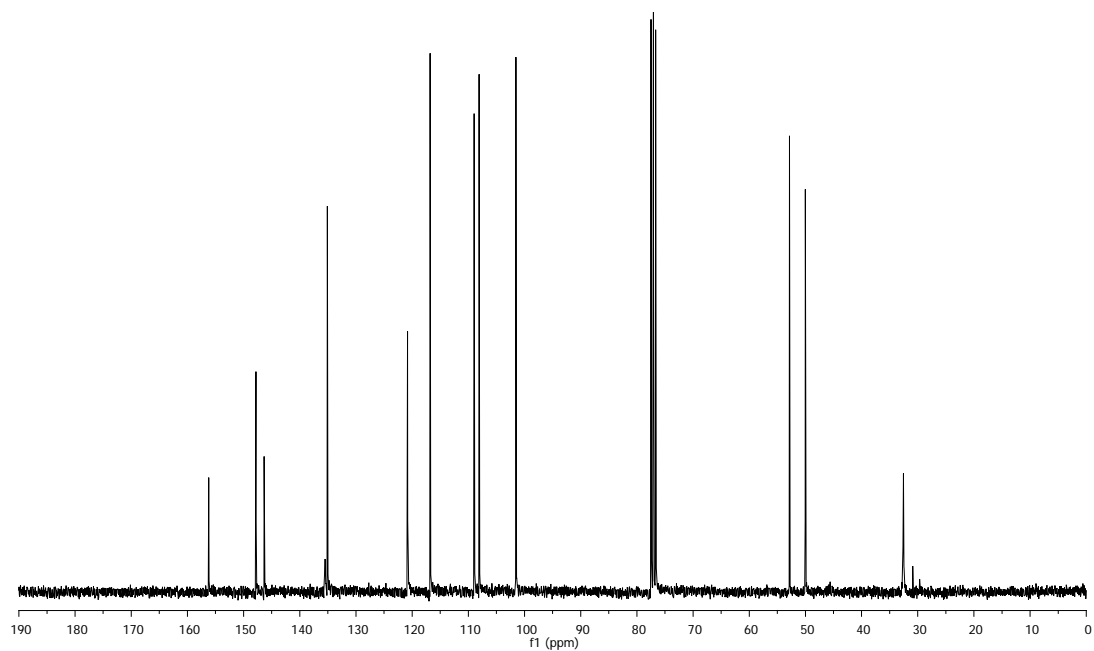
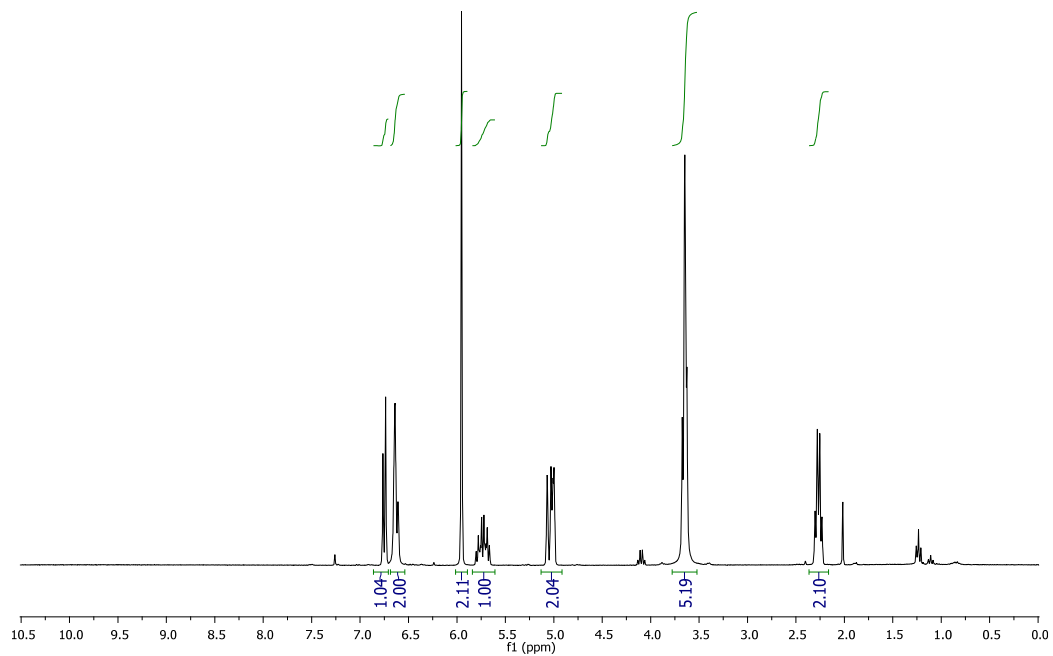
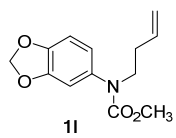


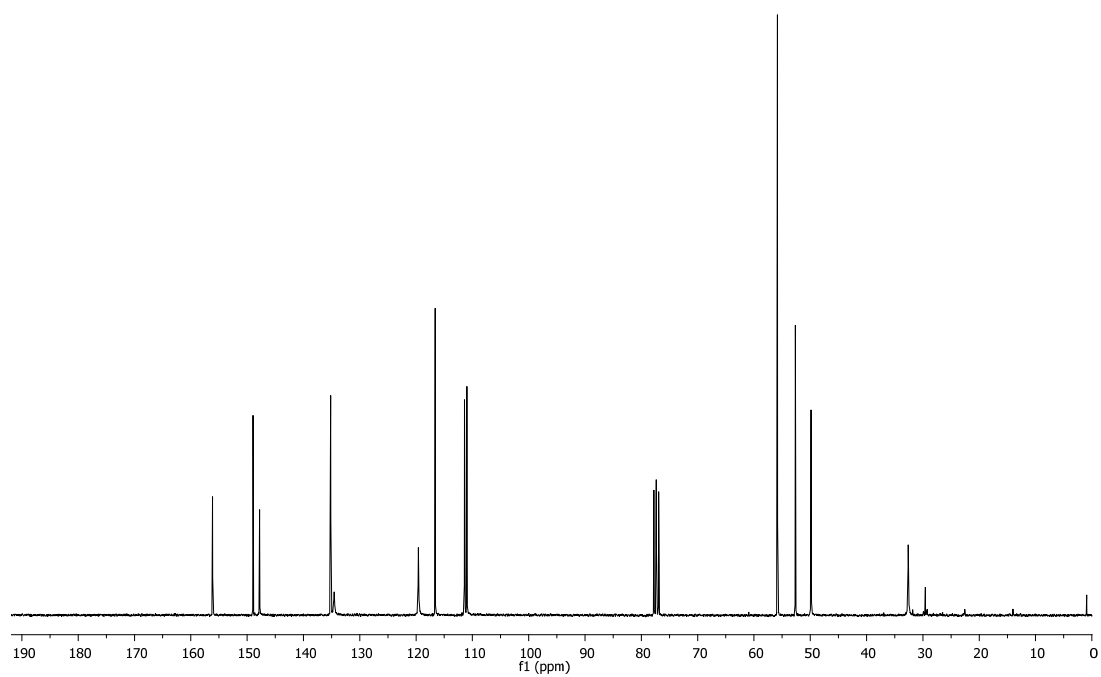
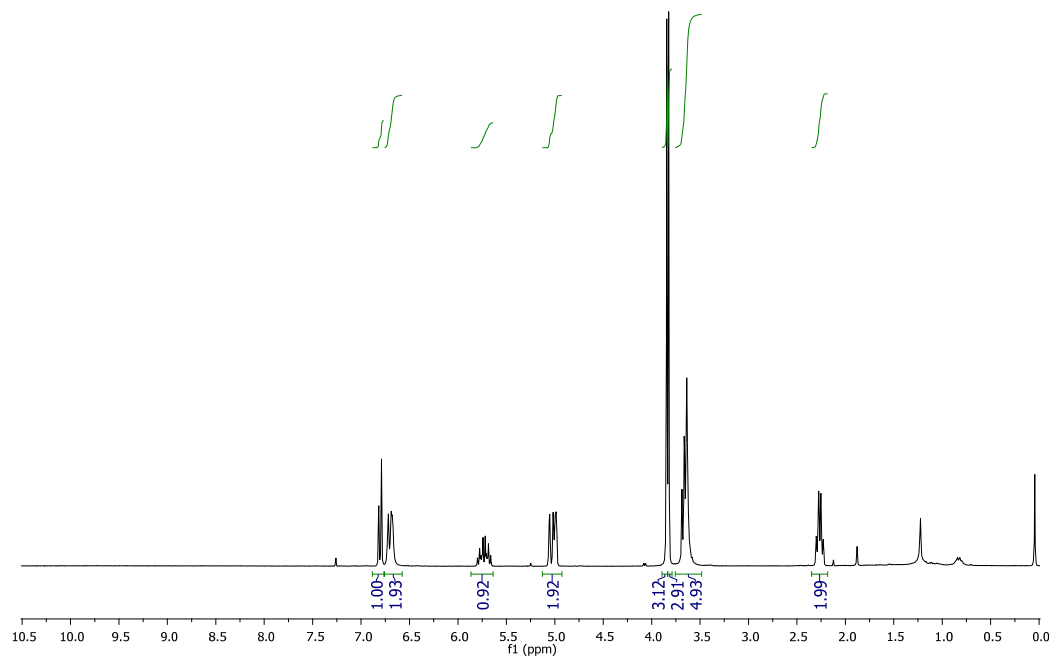
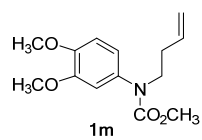


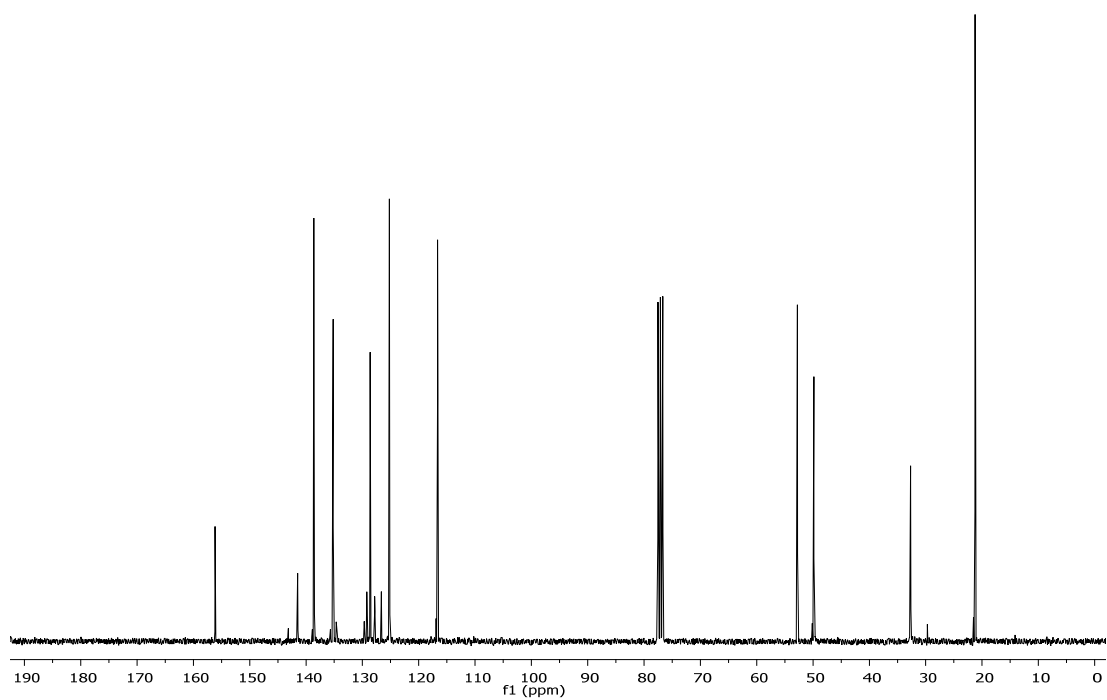
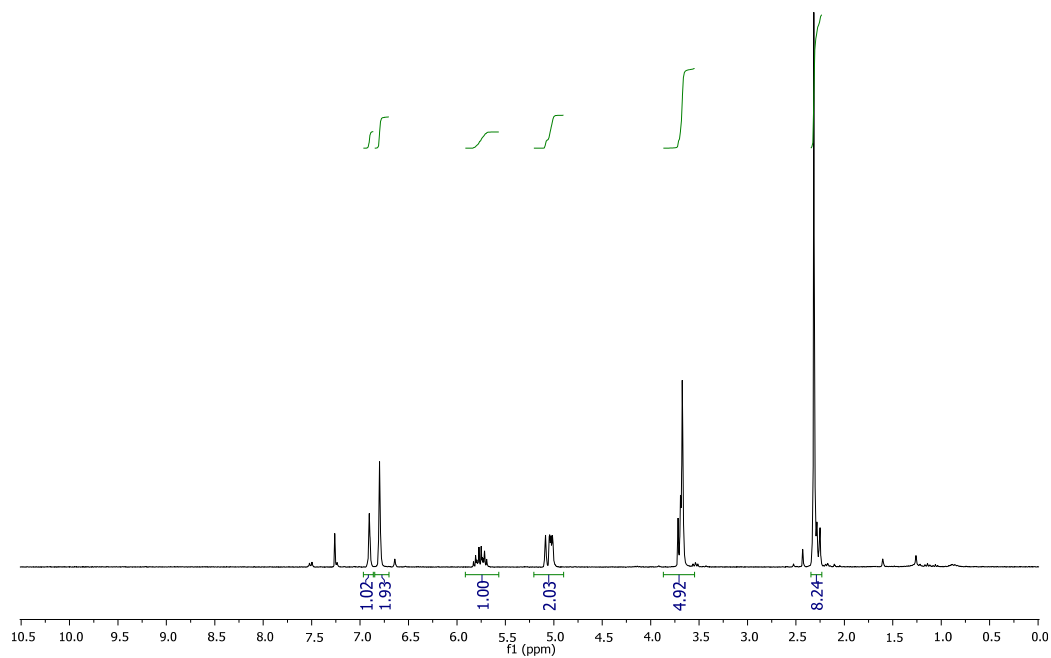
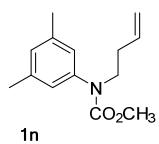


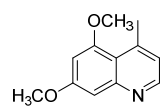




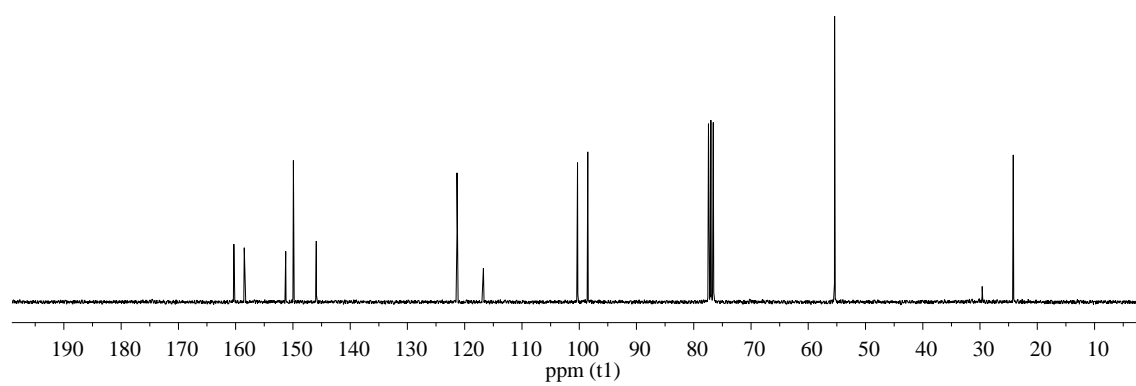
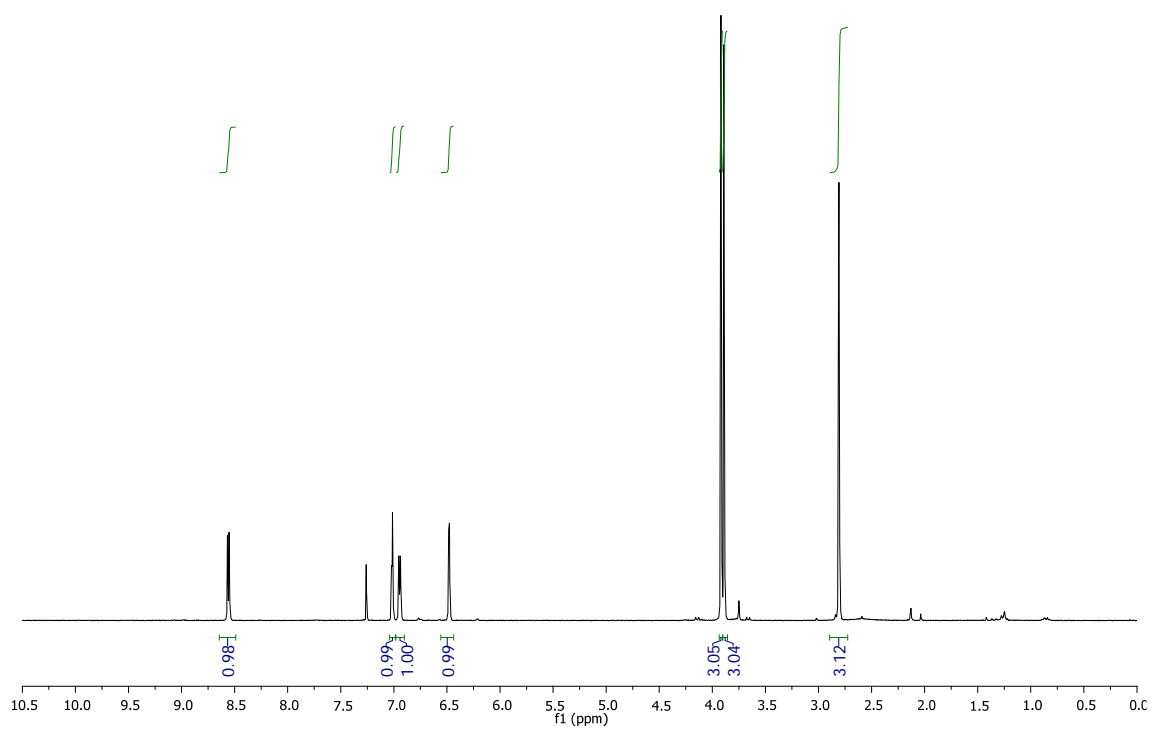


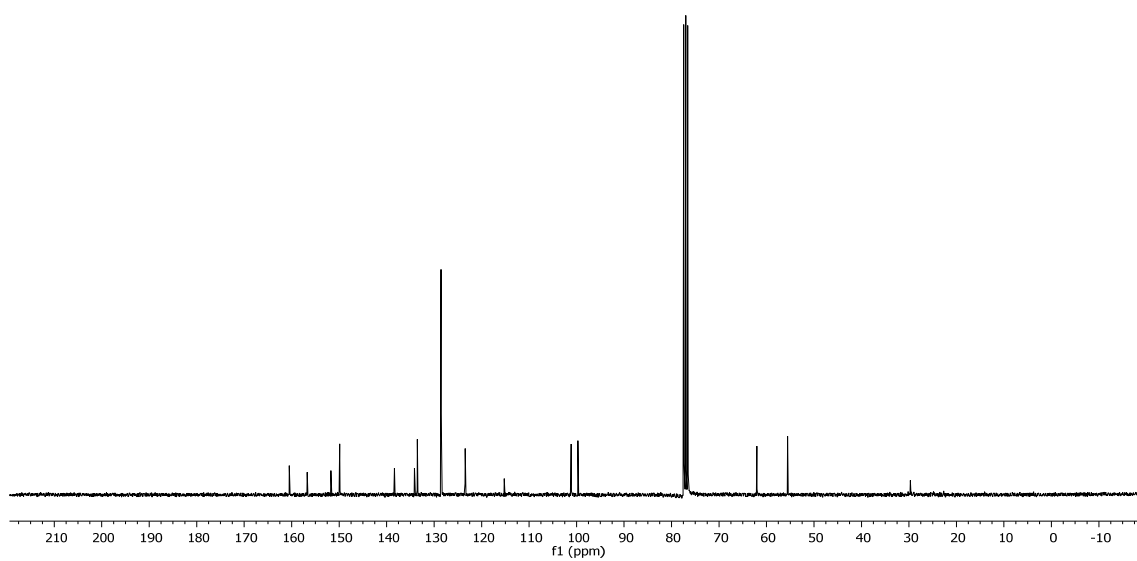
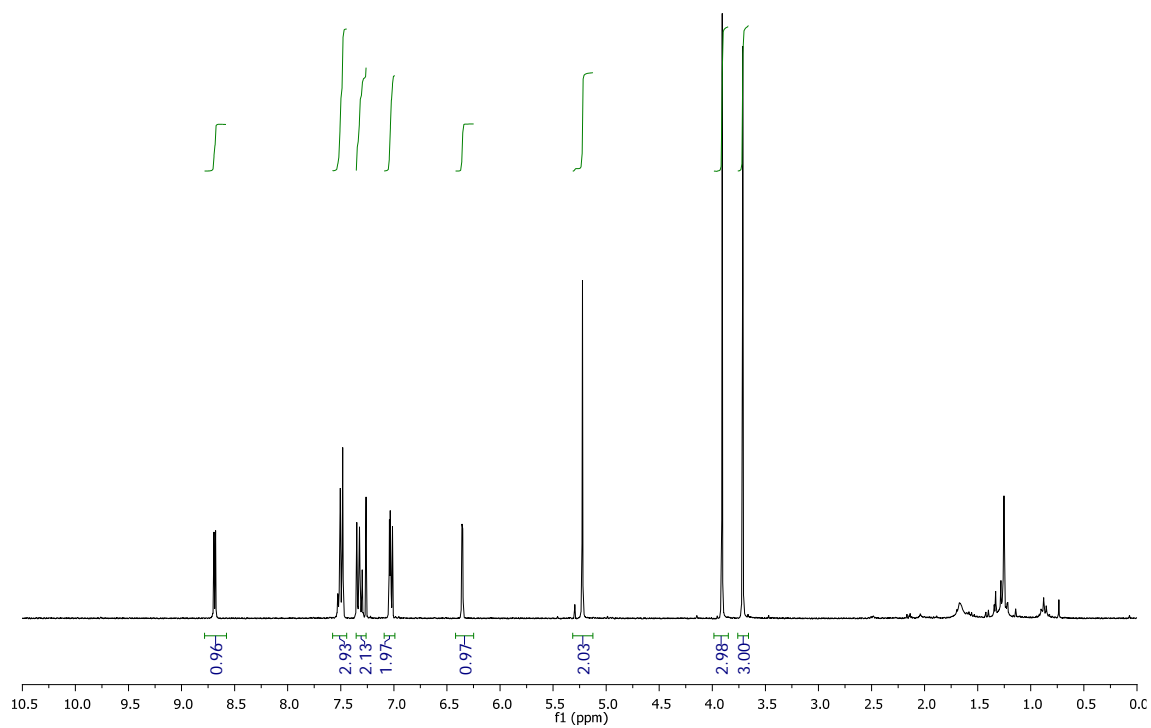
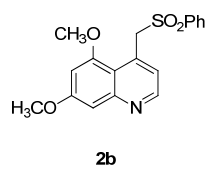


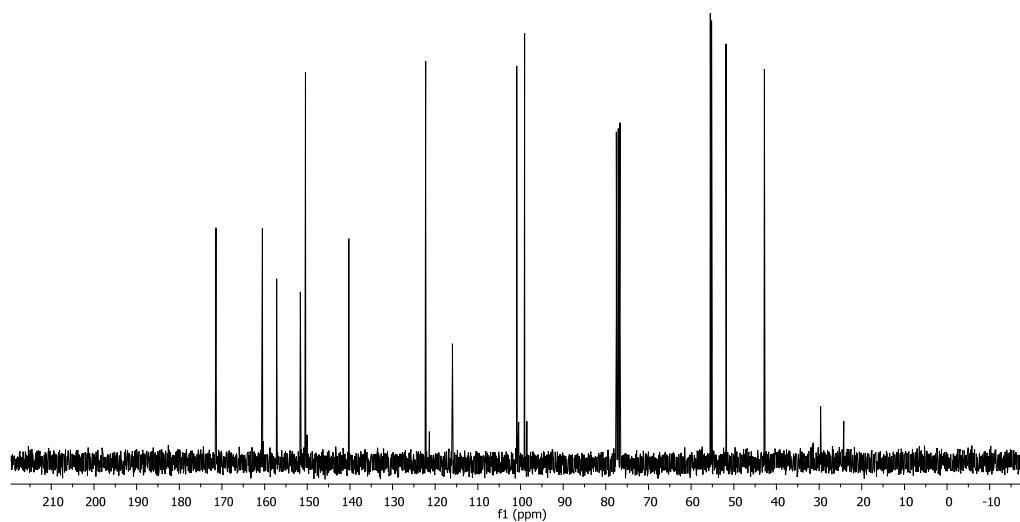
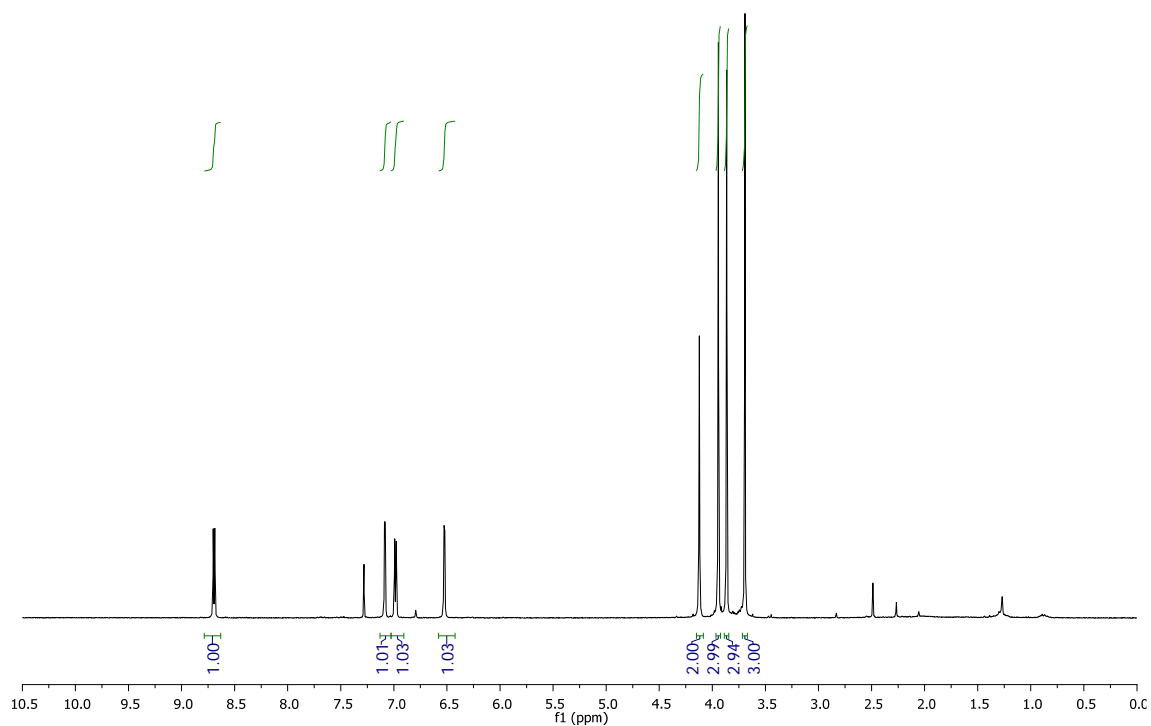
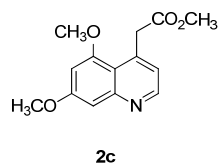




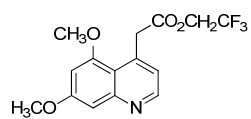
**2a**











2d

