

## Supplementary Information

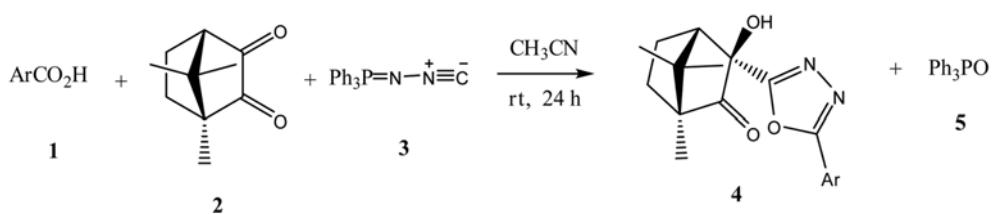
### One-pot, Three-component Synthesis of Fully Substituted 1,3,4-Oxadiazole Derivatives from (*N*-isocyanoimino)triphenylphosphorane, Aromatic Carboxylic acids and (1*R*)-(-)-Campherchinon

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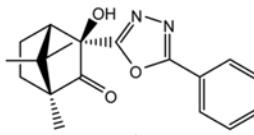
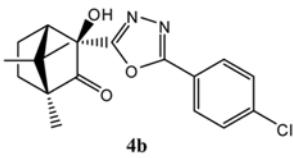
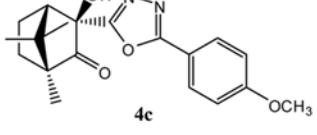
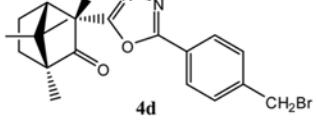
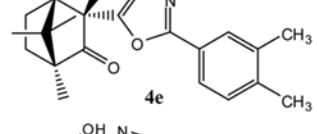
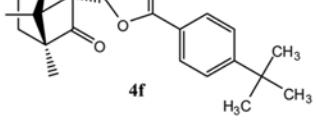
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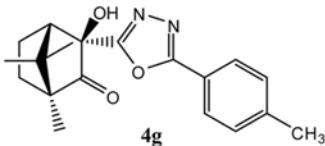
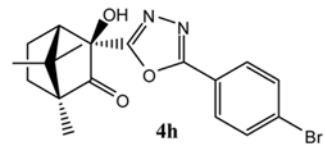
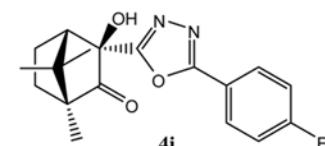
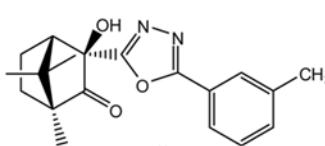
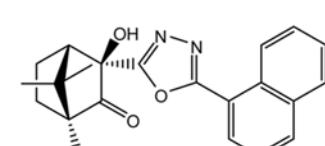
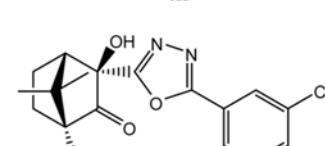
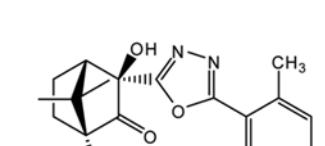
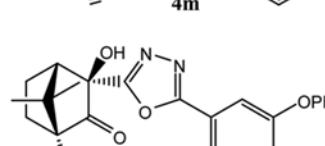
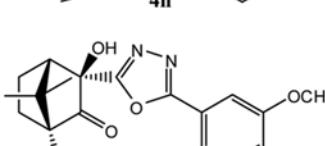


**Scheme 1.** Three-component synthesis of sterically congested 2,5-disubstituted 1,3,4-oxadiazoles **4** (see Table 1).

**Table 1.** Synthesis of sterically congested 1,3,4-oxadiazole derivatives **4a-o** from (1*R*)-(-)-campherchinon **2** and (*N*-isocyanoimino)triphenylphosphorane **3** in the presence of carboxylic acid **1** (See Scheme 1)

	ArCOOH	Product	Yield <sup>a</sup> (%)
1	C <sub>6</sub> H <sub>5</sub> COOH		90
2	4-ClC <sub>6</sub> H <sub>4</sub> COOH		88
3	4-MeOC <sub>6</sub> H <sub>4</sub> COOH		87
4	4-BrCH <sub>2</sub> C <sub>6</sub> H <sub>4</sub> COOH		88
5	3,4-diMeC <sub>6</sub> H <sub>4</sub> COOH		86
6	4-t-BuC <sub>6</sub> H <sub>4</sub> COOH		87

**Table 1.** Continued

	ArCOOH	Product	Yield <sup>a</sup> (%)
7	4-MeC <sub>6</sub> H <sub>4</sub> COOH		86
8	4-BrC <sub>6</sub> H <sub>4</sub> COOH		87
9	4-FC <sub>6</sub> H <sub>4</sub> COOH		85
10	3-MeC <sub>6</sub> H <sub>4</sub> COOH		89
11	C <sub>10</sub> H <sub>7</sub> COOH		86
12	3-ClC <sub>6</sub> H <sub>4</sub> COOH		88
13	2-MeC <sub>6</sub> H <sub>4</sub> COOH		87
14	3-PhOC <sub>6</sub> H <sub>4</sub> COOH		86
15	3,5-diMeOC <sub>6</sub> H <sub>3</sub> COOH		88

**3-Hydroxyl-1,7,7-trimethyl-3-(5-phenyl)-1,3,4-oxadiazol-2-yl]bicyclo[2.2.1]heptan-2-one (4a).** White powder, yield: 90%, mp 173–175°. IR (KBr): 3283 (OH), 2961, 2928, 1762, 1606, 1548, 1485, 1088, 785, 690 cm<sup>-1</sup>; <sup>1</sup>H NMR δ 7.50–8.03 (m, 5H, CH<sub>arom</sub>), 3.65 (s, 1H, OH), 2.52 (s, 1H, CH), 1.68–1.91 (m, 4H, 2CH<sub>2</sub>), 1.05 (s, 3H, CH<sub>3</sub>), 1.16 (s, 6H, 2CH<sub>3</sub>). <sup>13</sup>C NMR δ 213.00 (C=O), 166.76, 165.54 (2C=N), 131.95, 129.01, 127.10 (5CH), 123.21 (C), 77.65 (C-OH), 58.29 (C), 52.79 (CH), 46.22 (C), 27.96, 23.29 (2CH<sub>2</sub>), 21.92, 20.42, 9.45 (3CH<sub>3</sub>). MS m/z (%) 312 (M<sup>+</sup>, 48), 269 (12), 241 (20), 202 (92), 187 (100), 147 (28), 105 (40), 83 (44), 77 (48), 55 (56), 41 (32). Anal. Calcd for C<sub>18</sub>H<sub>20</sub>N<sub>2</sub>O<sub>3</sub> (312.15): C 69.21, H 6.45, N 8.97. Found: C 69.15, H 6.51, N 9.03.

**3-[5-(4-Chlorophenyl)-1,3,4-oxadiazol-2-yl]-3-hydroxy-1,7,7-trimethylbicyclo[2.2.1]heptan-2-one (4b).** White powder, yield: 88%, mp 127–129°. IR (KBr): 3354 (OH), 2960, 2928, 1762, 1606, 1547, 1458, 1100, 843 cm<sup>-1</sup>; <sup>1</sup>H NMR δ 7.95 (d, <sup>3</sup>J<sub>HH</sub> = 6.5 Hz, 2H, CH<sub>arom</sub>), 7.45 (d, <sup>3</sup>J<sub>HH</sub> = 6.5 Hz, 2H, CH<sub>arom</sub>), 3.75 (s, 1H, OH), 2.51 (m, 1H, CH), 1.73–1.91 (m, 4H, 2CH<sub>2</sub>), 1.04 (s, 3H, CH<sub>3</sub>), 1.16 (s, 6H, 2CH<sub>3</sub>). <sup>13</sup>C NMR δ 213.01 (C=O), 165.74, 164.24 (2C=N), 138.30 (C), 129.40, 128.37 (4CH), 121.88 (C), 77.60 (C-OH), 58.29 (C), 52.75 (CH), 46.23 (C), 27.93, 23.31 (2CH<sub>2</sub>), 9.43, 20.42, 21.93 (3CH<sub>3</sub>). MS m/z (%) 346 (M<sup>+</sup>, 32), 249 (20), 236 (48), 221 (64), 207 (32), 167 (28), 156 (36), 149 (96), 139 (100), 111 (56), 95 (48), 83 (68), 69 (56), 55 (72), 41 (64). Anal. Calcd for C<sub>18</sub>H<sub>19</sub>ClN<sub>2</sub>O<sub>3</sub> (346.11): C 62.34, H 5.52, N 8.08. Found: C 62.39, H 5.47, N 8.03.

**3-Hydroxyl-3-[5-(4-methoxyphenyl)-1,3,4-oxadiazol-2-yl]-1,7,7-trimethylbicyclo[2.2.1]heptan-2-one (4c).** White powder, yield 87%, mp 177–179°. IR (KBr): 3275 (OH), 2963, 2934, 1765, 1616, 1503, 1455, 1084, 837 cm<sup>-1</sup>; <sup>1</sup>H NMR δ 7.92 (d, <sup>3</sup>J<sub>HH</sub> = 8.75 Hz, 2H, CH<sub>arom</sub>), 6.94 (d, <sup>3</sup>J<sub>HH</sub> = 8.75 Hz, 2H, CH<sub>arom</sub>), 4.00 (s, 1H, OH), 3.85 (s, 3H, OCH<sub>3</sub>), 2.46 (m, 1H, CH), 1.60–1.94 (m, 4H, 2CH<sub>2</sub>), 1.03 (s, 3H, CH<sub>3</sub>), 1.04 (s, 3H, CH<sub>3</sub>), 1.16 (s, 3H, CH<sub>3</sub>). <sup>13</sup>C NMR δ 213.08 (C=O), 165.18, 165.07 (2C=N), 162.41 (C), 128.87, 114.40 (4CH), 115.93 (C), 76.63 (C-OH), 55.47 (OCH<sub>3</sub>), 58.52 (C), 52.83 (CH), 46.18 (C), 27.97, 23.29 (2CH<sub>2</sub>), 21.92, 20.44, 9.45 (3CH<sub>3</sub>). MS m/z (%) 342 (M<sup>+</sup>, 40), 293 (16), 271 (16), 245 (24), 232 (36), 217 (100), 203 (48), 176 (36), 149 (56), 133 (84), 83 (24), 69 (28), 55 (32), 41 (20). Anal. Calcd for C<sub>19</sub>H<sub>22</sub>N<sub>2</sub>O<sub>4</sub> (342.16): C 66.65, H 6.48, N 8.18. Found: C 66.60, H 6.43, N 8.123.

**3-[5-[4-(Bromomethyl)phenyl]-1,3,4-oxadiazol-2-yl]-3-hydroxy-1,7,7-trimethylbicyclo[2.2.1]heptan-2-one (4d).** White powder, yield 88%, mp 117–119°. IR (KBr): 3274 (OH), 2960, 2928, 1764, 1616, 1554, 1417, 1087, 858 cm<sup>-1</sup>; <sup>1</sup>H NMR δ 7.99 (d, <sup>3</sup>J<sub>HH</sub> = 7.2 Hz, 2H, CH<sub>arom</sub>), 7.50 (d, <sup>3</sup>J<sub>HH</sub> = 7.2 Hz, 2H, CH<sub>arom</sub>), 4.50 (s, 2H, CH<sub>2</sub>), 3.93 (s, 1H, OH), 2.51 (m, 1H, CH), 1.73–1.85 (m, 4H, 2CH<sub>2</sub>), 1.04 (s, 3H, CH<sub>3</sub>), 1.17 (s, 6H, 2CH<sub>3</sub>). <sup>13</sup>C NMR δ 213.21 (C=O), 165.83, 164.85 (2C=N), 141.72 (2C), 129.68, 127.52 (4CH), 123.32 (C), 76.65 (C-OH), 58.28 (C), 52.79 (CH), 46.22 (C), 32.15 (CH<sub>2</sub>Br), 27.95, 23.28 (2CH<sub>2</sub>), 21.93, 20.42, 9.44 (3CH<sub>3</sub>). MS m/z (%) 404 (M<sup>+</sup>, 20), 296 (24), 279 (56), 214 (24), 159

(60), 116 (100), 83 (48), 69 (36), 55 (80), 41 (56). Anal. Calcd for C<sub>19</sub>H<sub>21</sub>BrN<sub>2</sub>O<sub>3</sub> (404.07): C 56.31, H 5.22, N 6.91. Found: C 56.36, H 5.17, N 6.86.

**3-[5-(3,4-Dimethylphenyl)-1,3,4-oxadiazol-2-yl]-3-hydroxy-1,7,7-trimethylbicyclo[2.2.1]heptan-2-one (4e).** White powder, yield 86%, mp 152–154°. IR (KBr): 3285 (OH), 2943, 2928, 1764, 1615, 1551, 1489, 1088, 856, 726 cm<sup>-1</sup>; <sup>1</sup>H NMR δ 7.21–7.80 (m, 3H, CH<sub>arom</sub>), 3.57 (s, 1H, OH), 2.48 (m, 1H, CH), 2.31 (s, 6H, 2CH<sub>3</sub>), 1.62–1.96 (m, 4H, 2CH<sub>2</sub>), 1.05 (s, 3H, CH<sub>3</sub>), 1.16 (s, 6H, 2CH<sub>3</sub>). <sup>13</sup>C NMR δ 213.00 (C=O), 166.34, 165.20 (2C=N), 141.26, 137.51 (2C), 130.22, 128.05, 124.62 (3CH), 120.93 (C), 76.65 (C-OH), 58.26 (C), 52.80 (CH), 46.20 (C), 27.95, 23.30 (2CH<sub>2</sub>), 19.94, 19.62 (2CH<sub>3</sub>), 21.91, 20.44, 9.45 (3CH<sub>3</sub>). MS m/z (%) 340 (M<sup>+</sup>, 68), 269 (24), 243 (48), 230 (28), 215 (88), 201 (92), 175 (24), 149 (36), 133 (100), 116 (32), 105 (44), 69 (40), 55 (40), 41 (44). Anal. Calcd for C<sub>20</sub>H<sub>24</sub>N<sub>2</sub>O<sub>3</sub> (340.18): C 70.56, H 7.11, N 8.23. Found: C 70.50, H 7.17, N 8.17.

**3-[5-[4-(Tert-butyl)phenyl]-1,3,4-oxadiazol-2-yl]-3-hydroxy-1,7,7-trimethylbicyclo[2.2.1]heptan-2-one (4f).** Colorless Oil, yield 87%, IR (KBr): 3408 (OH), 2963, 2871, 1762, 1615, 1500, 1458, 1112, 843 cm<sup>-1</sup>; <sup>1</sup>H NMR δ 7.95 (d, <sup>3</sup>J<sub>HH</sub> = 8.0 Hz, 2H, CH<sub>arom</sub>), 7.49 (d, <sup>3</sup>J<sub>HH</sub> = 8.0 Hz, 2H, CH<sub>arom</sub>), 3.51 (s, 1H, OH), 2.47 (m, 1H, CH), 1.62–1.90 (m, 4H, 2CH<sub>2</sub>), 1.34 (s, 9H, 3CH<sub>3</sub>), 1.04 (s, 3H, CH<sub>3</sub>), 1.17 (s, 6H, 2CH<sub>3</sub>). <sup>13</sup>C NMR δ 213.11 (C=O), 165.37 (2C=N), 155.62 (C), 126.95, 125.97 (4CH), 120.61(C), 76.66 (C-OH), 58.27 (C), 52.86 (CH), 46.20 (C), 35.06 (C), 31.07 (3CH<sub>3</sub>), 27.98, 23.24 (2CH<sub>2</sub>), 21.92, 20.43, 9.45 (3CH<sub>3</sub>). Anal. Calcd for C<sub>22</sub>H<sub>28</sub>N<sub>2</sub>O<sub>3</sub> (368.21): C 71.71, H 7.66, N 7.60. Found: C 71.76, H 7.61, N 7.65.

**3-Hydroxyl-1,7,7-trimethyl-3-[5-(4-methylphenyl)-1,3,4-oxadiazol-2-yl]bicyclo[2.2.1]heptan-2-one (4g).** White powder, yield 86%, mp 136–138°. IR (KBr): 3281 (OH), 2955, 2929, 1766, 1615, 1548, 1499, 1088, 823 cm<sup>-1</sup>; <sup>1</sup>H NMR δ 7.89 (d, <sup>3</sup>J<sub>HH</sub> = 6.25 Hz, 2H, CH<sub>arom</sub>), 7.26 (d, <sup>3</sup>J<sub>HH</sub> = 6.25 Hz, 2H, CH<sub>arom</sub>), 3.73 (s, 1H, OH), 2.50 (s, 1H, CH), 2.40 (s, 3H, CH<sub>3</sub>), 1.67–1.95 (m, 4H, 2CH<sub>2</sub>), 1.04 (s, 3H, CH<sub>3</sub>), 1.16 (s, 6H, 2CH<sub>3</sub>). <sup>13</sup>C NMR δ 213.11 (C=O), 165.34 (2C=N), 142.50 (C), 129.67, 127.05 (4CH), 120.66 (C), 76.66 (C-OH), 58.27(C), 52.84 (CH), 46.20 (C), 27.97, 23.28 (2CH<sub>2</sub>), 21.92, 21.62, 20.43, 9.45 (4CH<sub>3</sub>). Anal. Calcd for C<sub>19</sub>H<sub>22</sub>N<sub>2</sub>O<sub>3</sub> (326.16): C 69.92, H 6.79, N 8.58. Found: C 69.86, H 6.73, N 8.52.

**3-[5-(4-Bromophenyl)-1,3,4-oxadiazol-2-yl]-3-hydroxy-1,7,7-trimethylbicyclo[2.2.1]heptan-2-one (4h).** White powder, yield 87%, mp 153–155°. IR (KBr): 3274 (OH), 2959, 2925, 1762, 1603, 1542, 1486, 1087, 838 cm<sup>-1</sup>; <sup>1</sup>H NMR δ 7.89 (d, <sup>3</sup>J<sub>HH</sub> = 8.5 Hz, 2H, CH<sub>arom</sub>), 7.62 (d, <sup>3</sup>J<sub>HH</sub> = 8.5 Hz, 2H, CH<sub>arom</sub>), 3.78 (s, 1H, OH), 2.47 (m, 1H, CH), 1.63–1.97 (m, 4H, 2CH<sub>2</sub>), 1.05 (s, 3H, CH<sub>3</sub>), 1.16 (s, 6H, 2CH<sub>3</sub>). <sup>13</sup>C NMR δ 210.00 (C=O), 165.73, 153.50 (2C=N), 132.38, 128.49 (4CH), 127.86, 122.21 (2C), 76.23 (C-OH), 58.28 (C), 52.73 (CH), 46.23 (C), 27.95, 23.32 (2CH<sub>2</sub>), 21.92, 20.43, 9.43 (3CH<sub>3</sub>). Anal. Calcd for C<sub>18</sub>H<sub>19</sub>BrN<sub>2</sub>O<sub>3</sub> (390.06): C 55.26, H 4.89, N 7.16. Found: C 55.31, H 4.94, N 7.11.

**3-[5-(4-Fluorophenyl)-1,3,4-oxadiazol-2-yl]-3-hydroxy-1,7,7-trimethylbicyclo[2.2.1]heptan-2-one (4i).** Colorless Oil, yield 85%, IR (KBr): 3416 (OH), 2964, 2928, 1760, 1611, 1500, 1417, 1237, 845 cm<sup>-1</sup>; <sup>1</sup>H NMR δ 7.15-8.07(m, 4H, CH<sub>arom</sub>), 3.55 (s, 1H, OH), 2.51 (m, 1H, CH), 1.74-1.87 (m, 4H, 2CH<sub>2</sub>), 1.05 (s, 3H, CH<sub>3</sub>), 1.16 (s, 6H, 2CH<sub>3</sub>). <sup>13</sup>C NMR δ 212.96 (C=O), 166.75, 165.26 (2C=N), 161.50 (C, d, <sup>3</sup>J<sub>CF</sub> = 503.3 Hz), 129.44 (2CH, d, <sup>3</sup>J<sub>CF</sub> = 8.8 Hz), 119.87 (C, d, <sup>4</sup>J<sub>CF</sub> = 4.4 Hz), 116.40 (2CH, d, <sup>2</sup>J<sub>CF</sub> = 22.6 Hz), 76.23 (C-OH), 58.28 (C), 52.72 (CH), 46.23 (2C), 27.92, 23.32 (2CH<sub>2</sub>), 21.91, 20.43, 9.43 (3CH<sub>3</sub>). Anal. Calcd for C<sub>18</sub>H<sub>19</sub>FN<sub>2</sub>O<sub>3</sub> (330.14): C 65.44, H 5.80, N 8.48. Found: C 65.39, H 5.74, N 8.53.

**3-Hydroxyl-1,7,7-trimethyl-3-[5-(3-methylphenyl)-1,3,4-oxadiazol-2-yl]bicyclo[2.2.1]heptan-2-one (4j).** White powder, yield 89%, mp 134-136°. IR (KBr): 3282 (OH), 2959, 2927, 1762, 1597, 1557, 1456, 1089, 819, 723, 688 cm<sup>-1</sup>; <sup>1</sup>H NMR δ 7.33-7.83 (m, 4H, CH<sub>arom</sub>), 3.95 (s, 1H, OH), 2.53 (m, 1H, CH), 2.39 (s, 3H, CH<sub>3</sub>), 1.77-1.85 (m, 4H, 2CH<sub>2</sub>), 1.04 (s, 3H, CH<sub>3</sub>), 1.05 (s, 3H, CH<sub>3</sub>), 1.16 (s, 3H, CH<sub>3</sub>). <sup>13</sup>C NMR δ 213.04 (C=O), 165.50 (2C=N), 138.89 (C), 132.72, 128.88, 127.59, 124.26 (4CH), 123.30 (C), 76.66 (C-OH), 58.28 (C), 52.84 (CH), 46.20 (C), 27.97, 23.28 (2CH<sub>2</sub>), 21.25 (CH<sub>3</sub>), 21.93, 20.43, 9.45 (3CH<sub>3</sub>). Anal. Calcd for C<sub>19</sub>H<sub>22</sub>N<sub>2</sub>O<sub>3</sub> (326.16): C 69.92, H 6.79, N 8.58. Found: C 69.87, H 6.85, N 8.64.

**3-Hydroxyl-1,7,7-trimethyl-3-[5-(1-naphthyl)-1,3,4-oxadiazol-2-yl]bicyclo[2.2.1]heptan-2-one (4k).** White powder, yield 86%, mp 135-137°. IR (KBr): 3426 (OH), 2925, 2872, 1760, 1579, 1536, 1456, 1108, 857, 774 cm<sup>-1</sup>; <sup>1</sup>H NMR δ 7.51-9.16 (m, 7H, CH<sub>arom</sub>), 3.62 (s, 1H, OH), 2.57 (m, 1H, CH), 1.66-1.96 (m, 4H, 2CH<sub>2</sub>), 1.08 (s, 3H, CH<sub>3</sub>), 1.20 (s, 6H, 2CH<sub>3</sub>). <sup>13</sup>C NMR δ 213.34 (C=O), 165.21 (2C=N), 133.86, 130.00, 128.30 (3C), 132.84, 128.74, 128.66, 128.22, 126.71, 126.04, 124.78 (7CH), 76.43 (C-OH), 58.33 (C), 52.87 (CH), 46.28 (C), 28.03, 23.36 (2CH<sub>2</sub>), 21.95, 20.45, 9.47 (3CH<sub>3</sub>). Anal. Calcd for C<sub>22</sub>H<sub>22</sub>N<sub>2</sub>O<sub>3</sub> (362.16): C 72.91, H 6.12, N 7.73. Found: C 72.85, H 6.17, N 7.78.

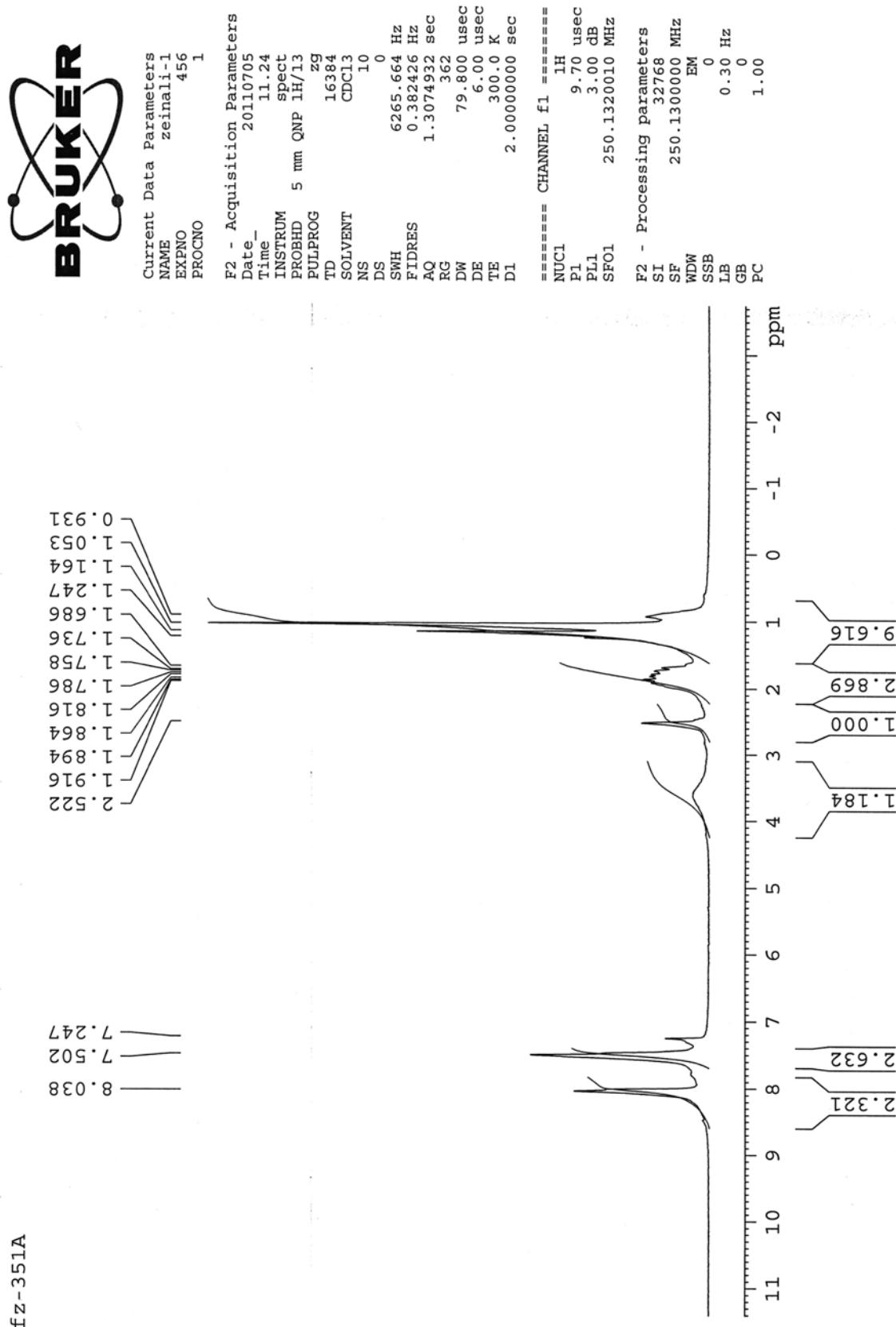
**3-[5-(3-Chlorophenyl)-1,3,4-oxadiazol-2-yl]-3-hydroxy-1,7,7-trimethylbicyclo[2.2.1]heptan-2-one (4l).** White powder, yield 88%, mp 146-148°. IR (KBr): 3272 (OH), 2962, 2928, 1764, 1581, 1547, 1444, 1092, 806, 779, 680 cm<sup>-1</sup>; <sup>1</sup>H NMR δ 7.43-8.01 (m, 4H, CH<sub>arom</sub>), 3.15 (s, 1H, OH), 2.52 (m, 1H, CH), 1.70-1.95 (m, 4H, 2CH<sub>2</sub>), 1.05 (s, 3H, CH<sub>3</sub>), 1.07 (s, 3H, CH<sub>3</sub>), 1.17 (s, 3H, CH<sub>3</sub>). <sup>13</sup>C NMR δ

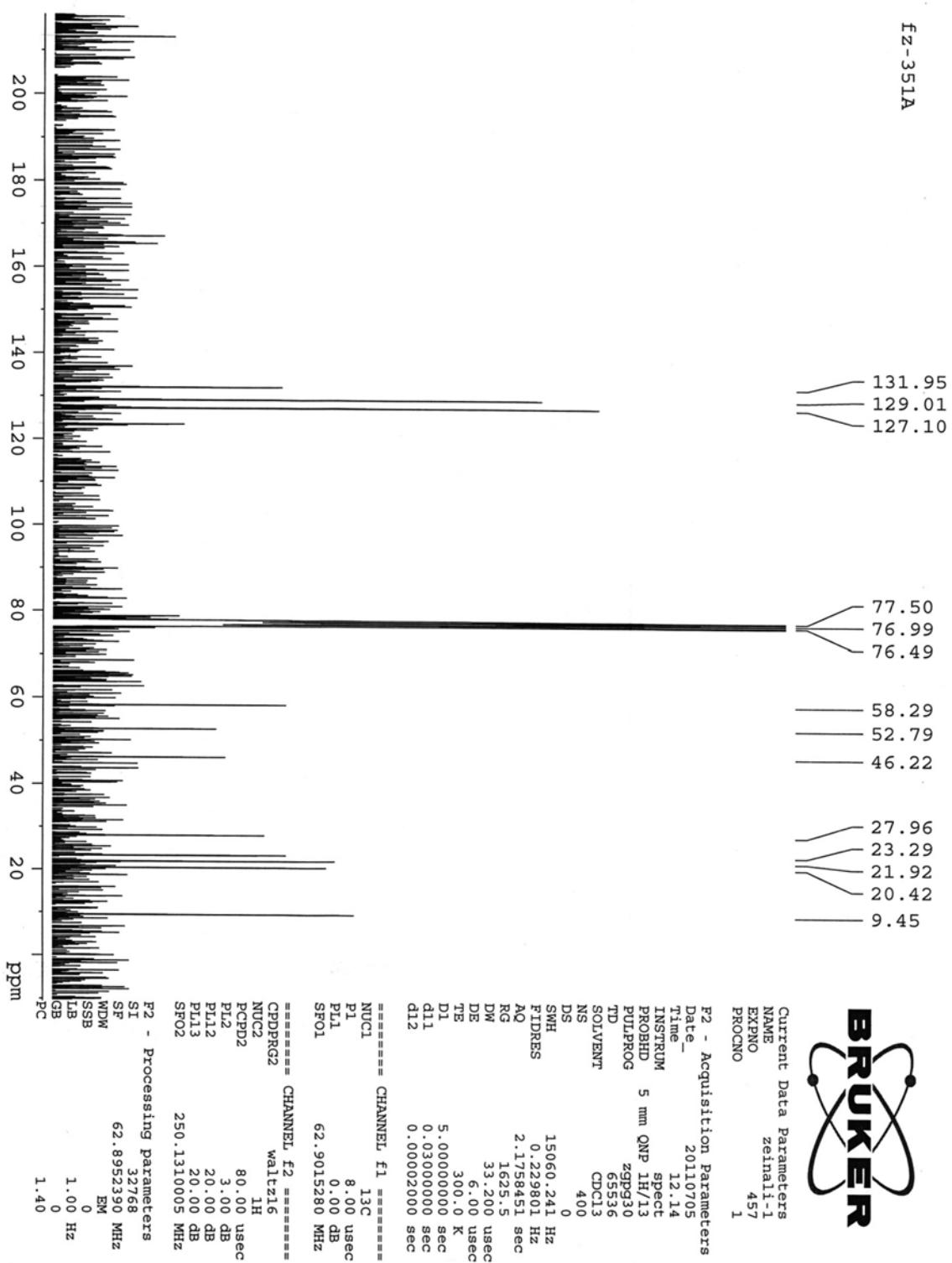
213.12 (C=O), 165.34, 161.20 (2C=N), 135.31 (C), 132.02, 130.22, 127.06, 125.19 (4CH), 124.13 (C), 73.65 (C-OH), 58.46 (C), 52.82 (CH), 46.24 (C), 27.94, 23.31 (2CH<sub>2</sub>), 21.92, 20.42, 9.43 (3CH<sub>3</sub>). Anal. Calcd for C<sub>18</sub>H<sub>18</sub>ClN<sub>3</sub>O (327.81): C 65.95, H 5.53, N 12.82. Found: C 65.83, H 5.49, N 12.77.

**3-Hydroxyl-1,7,7-trimethyl-3-[5-(2-methylphenyl)-1,3,4-oxadiazol-2-yl]bicyclo[2.2.1]heptan-2-one (4m).** White powder, yield 87%, mp 110-112°. IR (KBr): 3417 (OH), 2957, 2925, 1763, 1600, 1542, 1455, 1109, 772, 723 cm<sup>-1</sup>; <sup>1</sup>H NMR δ 7.05-7.91 (m, 4H, CH<sub>arom</sub>), 3.80 (s, 1H, OH), 2.64 (s, 3H, CH<sub>3</sub>), 2.48 (m, 1H, CH), 1.69-1.97 (m, 4H, 2CH<sub>2</sub>), 1.04 (s, 3H, CH<sub>3</sub>), 1.05 (s, 3H, CH<sub>3</sub>), 1.16 (s, 3H, CH<sub>3</sub>). <sup>13</sup>C NMR δ 213.95 (C=O), 168.45, 166.35 (2C=N), 138.51 (C), 131.72, 131.44, 129.17, 126.13 (4CH), 122.53 (C), 93.15 (C-OH), 58.31 (C), 52.87 (CH), 46.26 (C), 28.05, 23.25 (2CH<sub>2</sub>), 19.24 (CH<sub>3</sub>), 21.94, 20.41, 9.44 (3CH<sub>3</sub>). Anal. Calcd for C<sub>19</sub>H<sub>22</sub>N<sub>2</sub>O<sub>3</sub> (326.16): C 69.92, H 6.79, N 8.58. Found: C 69.86, H 6.73, N 8.64.

**3-Hydroxyl-1,7,7-trimethyl-3-[5-(3-phenoxyphenyl)-1,3,4-oxadiazol-2-yl]bicyclo[2.2.1]heptan-2-one (4n).** White powder, yield 86%, mp 105-107°. IR (KBr): 3159 (OH), 2950, 2927, 1762, 1596, 1551, 1448, 1098, 894, 759, 688 cm<sup>-1</sup>; <sup>1</sup>H NMR δ 7.01-7.77 (m, 9H, CH<sub>arom</sub>), 3.62 (s, 1H, OH), 2.49 (m, 1H, CH), 1.68-1.96 (m, 4H, 2CH<sub>2</sub>), 1.04 (s, 3H, CH<sub>3</sub>), 1.15 (s, 6H, 2CH<sub>3</sub>). <sup>13</sup>C NMR δ 205.96 (C=O), 165.97, 157.98 (2C=N), 156.45, 154.60 (2C), 130.53, 129.98, 124.98, 124.01, 121.75, 119.23, 117.07 (9CH), 122.11 (C), 76.45 (C-OH), 58.26 (C), 52.88 (CH), 46.21 (C), 27.90, 23.31 (2CH<sub>2</sub>), 21.92, 20.42, 9.44 (3CH<sub>3</sub>). Anal. Calcd for C<sub>24</sub>H<sub>24</sub>N<sub>2</sub>O<sub>4</sub> (404.17): C 71.27, H 5.98, N 6.93. Found: C 71.33, H 5.92, N 6.87.

**3-[5-(3,5-Dimethoxyphenyl)-1,3,4-oxadiazol-2-yl]-3-hydroxy-1,7,7-trimethylbicyclo[2.2.1]heptan-2-one (4o).** Yellow Oil, yield: 88%. IR (KBr): 3465 (OH), 2961, 2873, 1762, 1601, 1557, 1456, 1159, 884 cm<sup>-1</sup>; <sup>1</sup>H NMR δ 6.58-7.19 (m, 3H, CH<sub>arom</sub>), 3.82 (s, 6H, OCH<sub>3</sub>), 3.70 (s, 1H, OH), 2.51 (m, 1H, CH), 1.67-1.90 (m, 4H, 2CH<sub>2</sub>), 1.03 (s, 3H, CH<sub>3</sub>), 1.04 (s, 3H, CH<sub>3</sub>), 1.16 (s, 3H, CH<sub>3</sub>). <sup>13</sup>C NMR δ 213.87 (C=O), 166.67, 161.07 (2C=N), 161.07, 124.86 (3C), 104.18, 104.62 (3CH), 76.45 (C-OH), 58.28 (C), 55.64 (2OCH<sub>3</sub>), 52.78 (CH), 46.19 (C), 27.94, 23.29 (2CH<sub>2</sub>), 21.92, 20.43, 9.44 (3CH<sub>3</sub>). Anal. Calcd for C<sub>20</sub>H<sub>24</sub>N<sub>2</sub>O<sub>5</sub> (372.17): C 64.50, H 6.50, N 7.52. Found: C 64.45, H 6.55, N 7.57.

**Figure 1.** <sup>1</sup>H NMR spectrum of **4a**.

Figure 2. <sup>13</sup>C NMR spectrum of 4a.

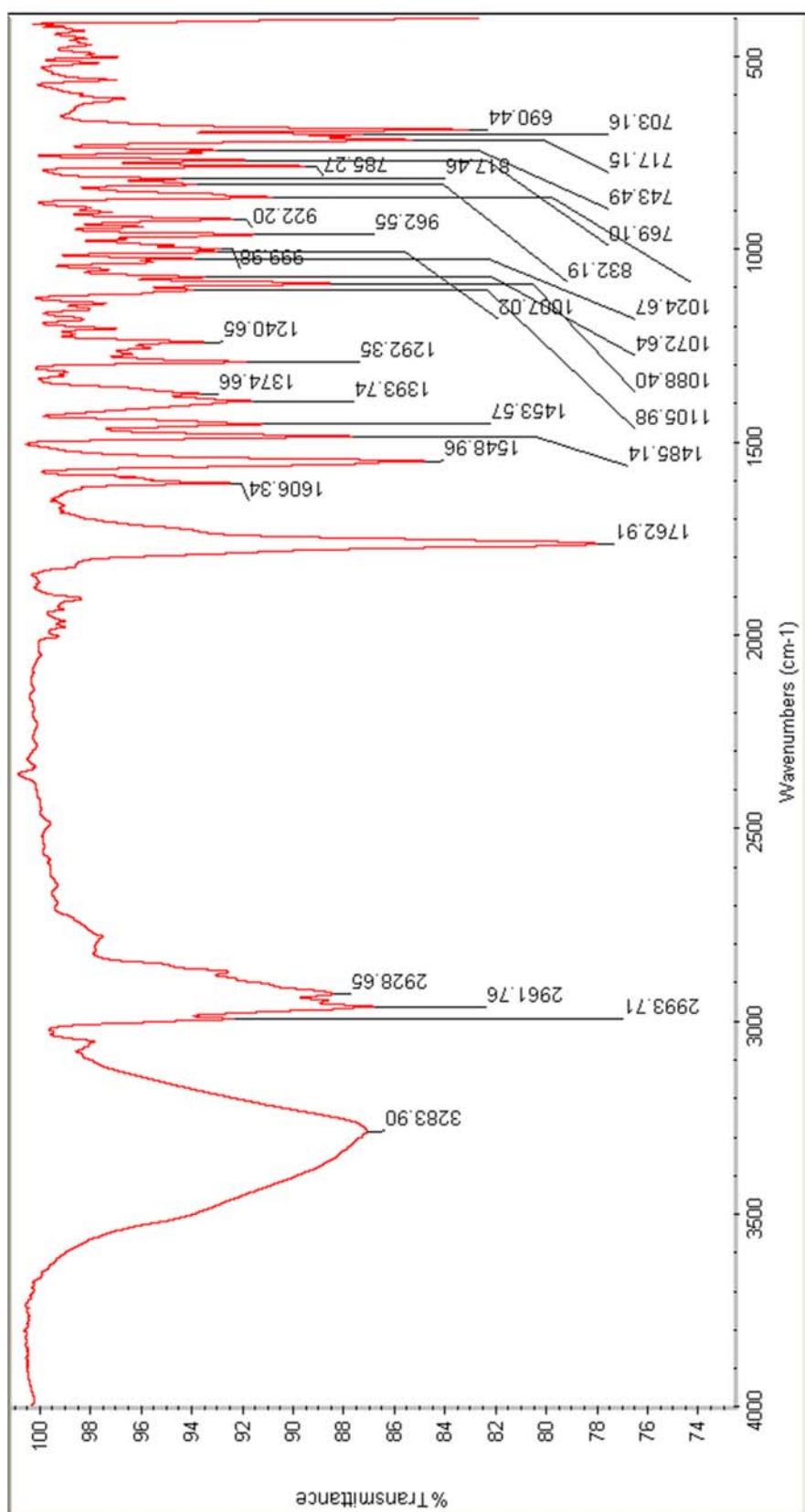
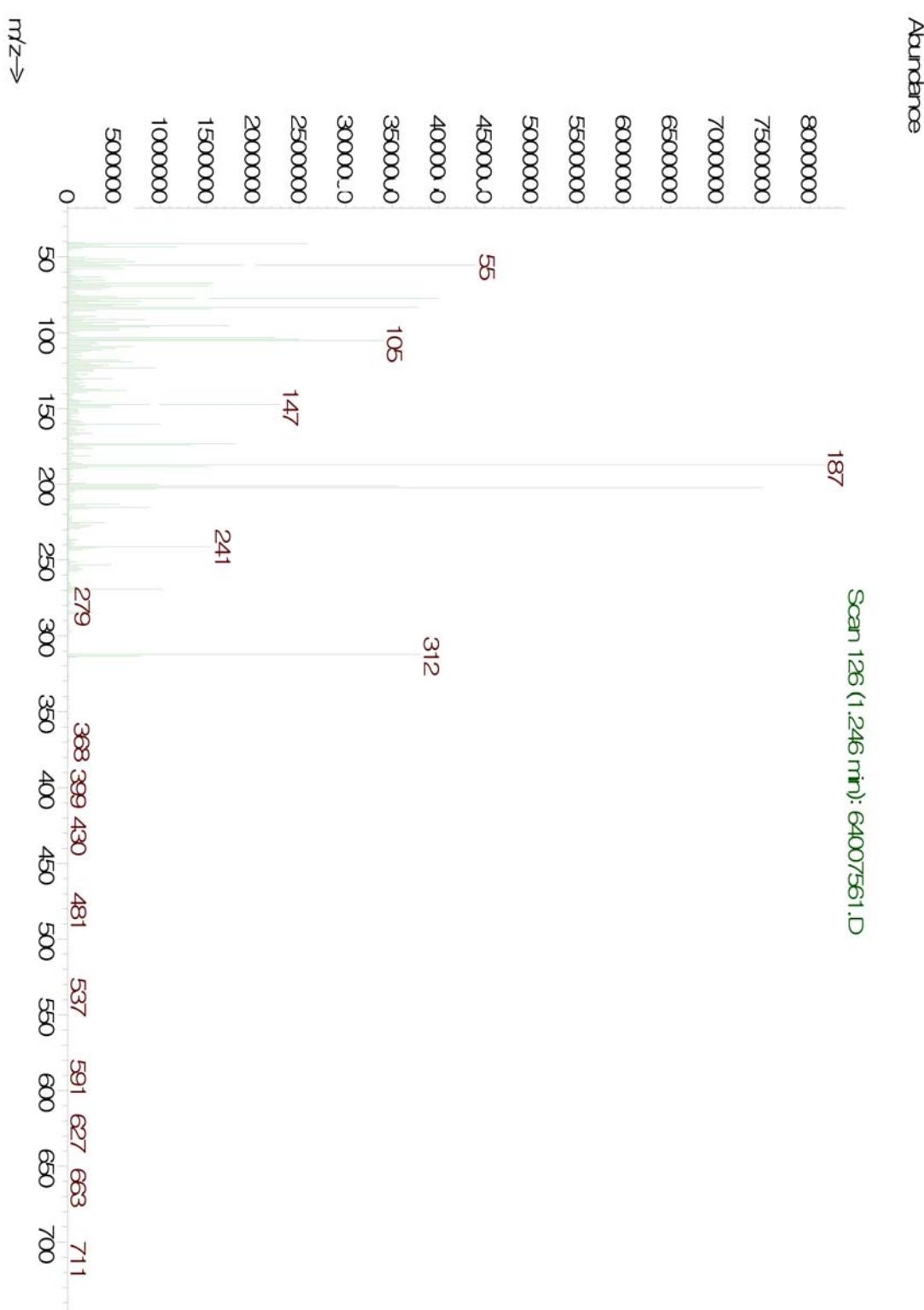
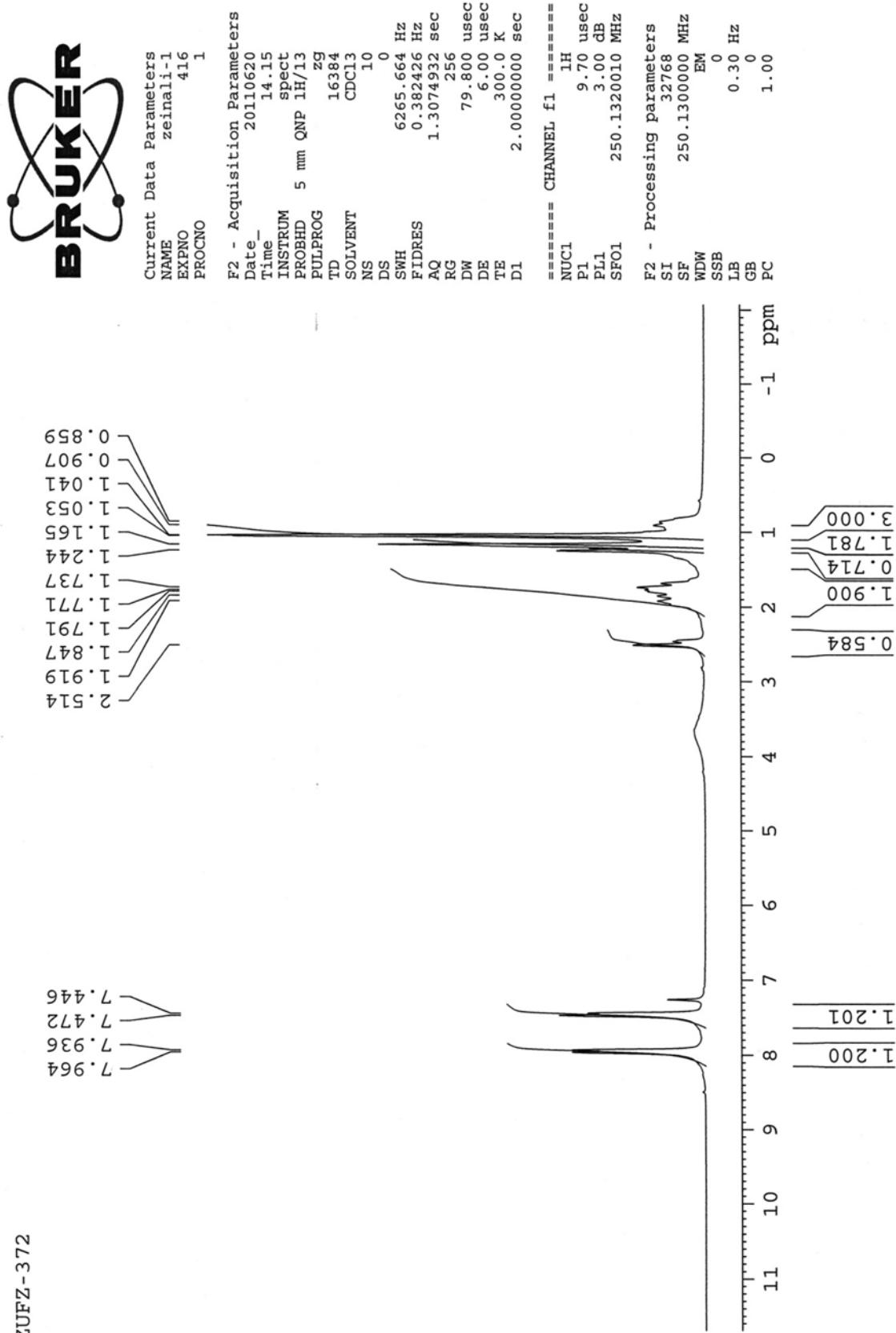


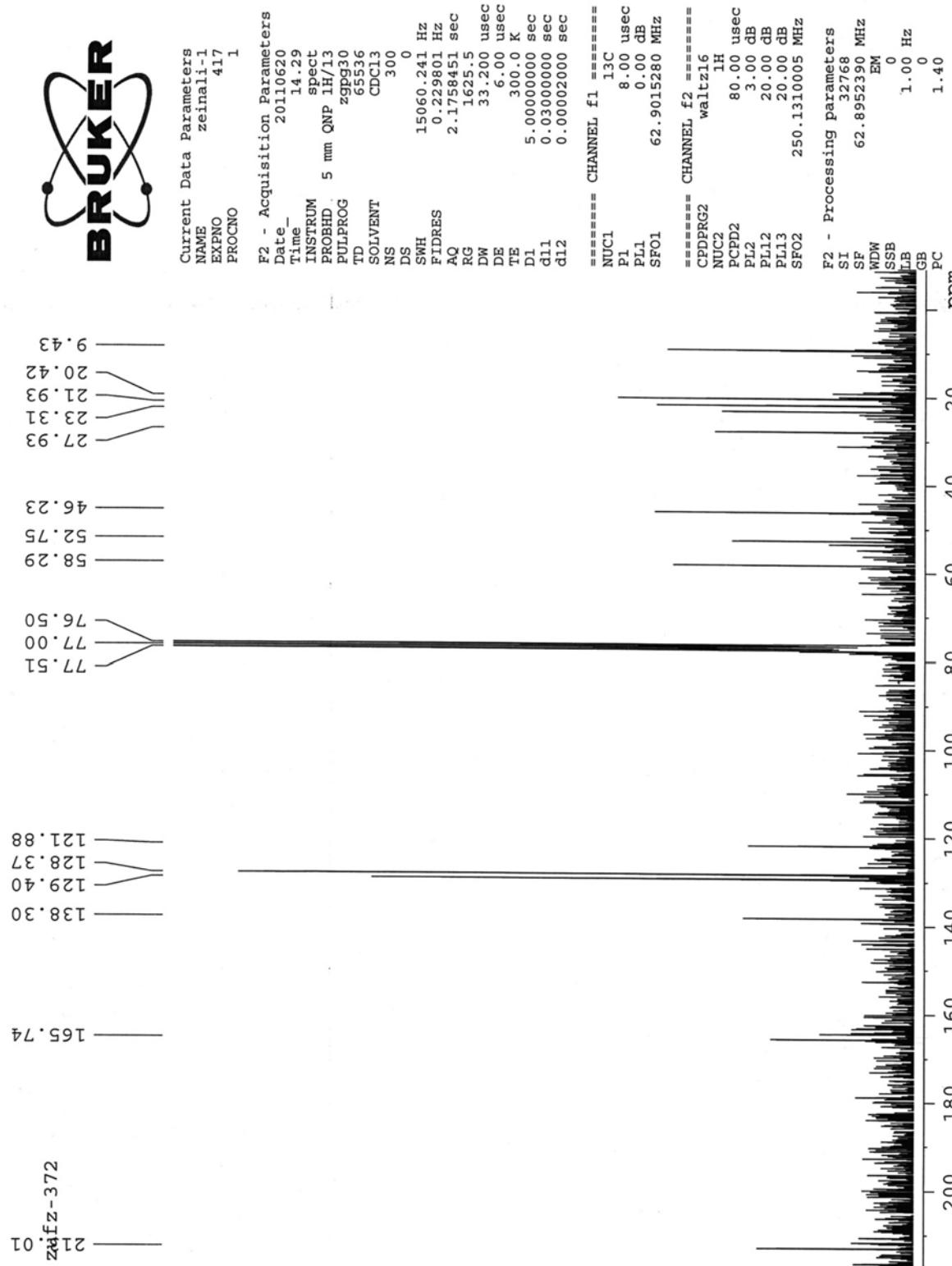
Figure 3. IR spectrum of 4a.



**Figure 4.** Mass spectrum of **4a**.



**Figure 5.**  $^1\text{H}$  NMR spectrum of **4b**.

**Figure 6.**  $^{13}\text{C}$  NMR spectrum of **4b**.

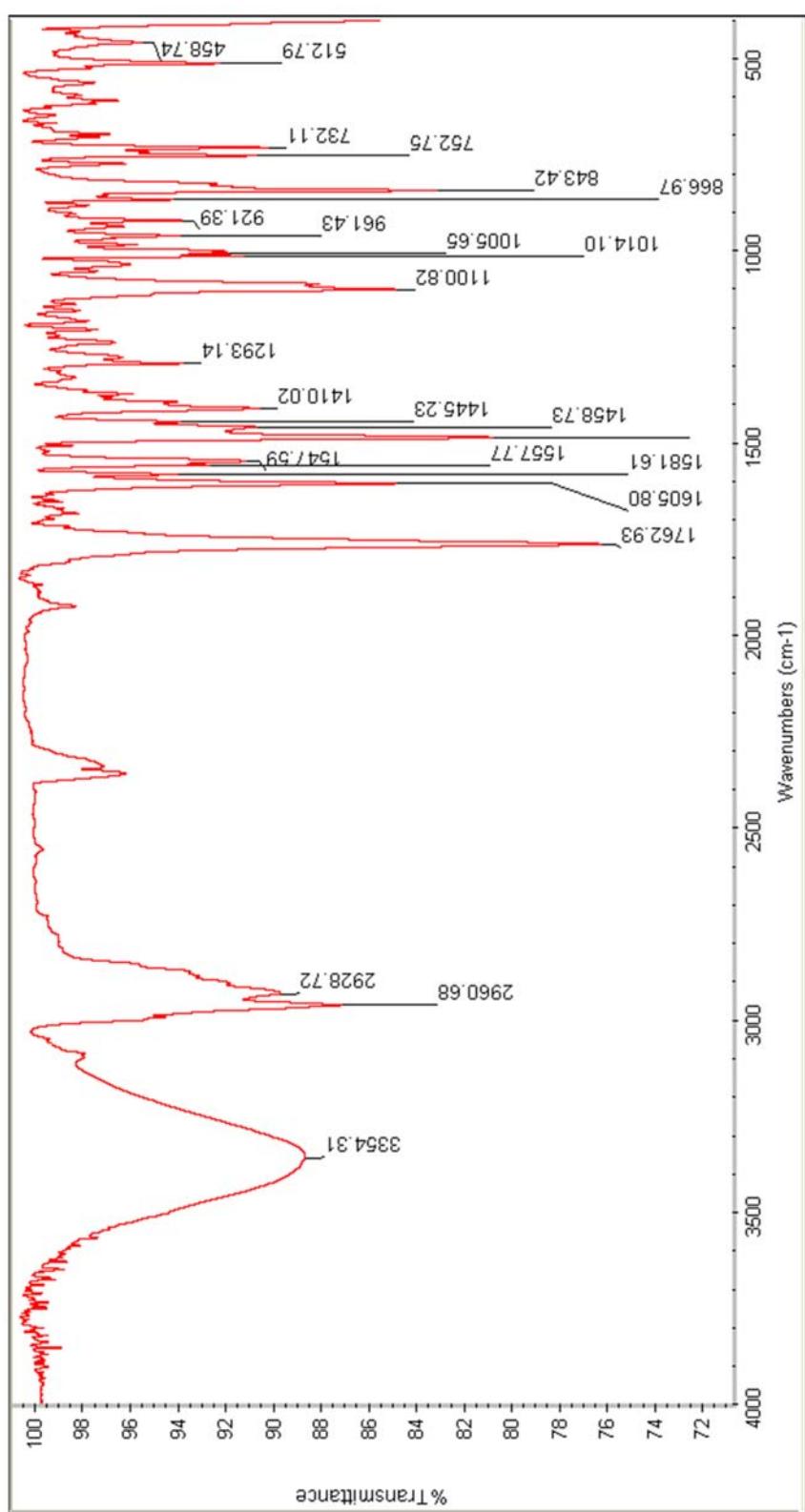
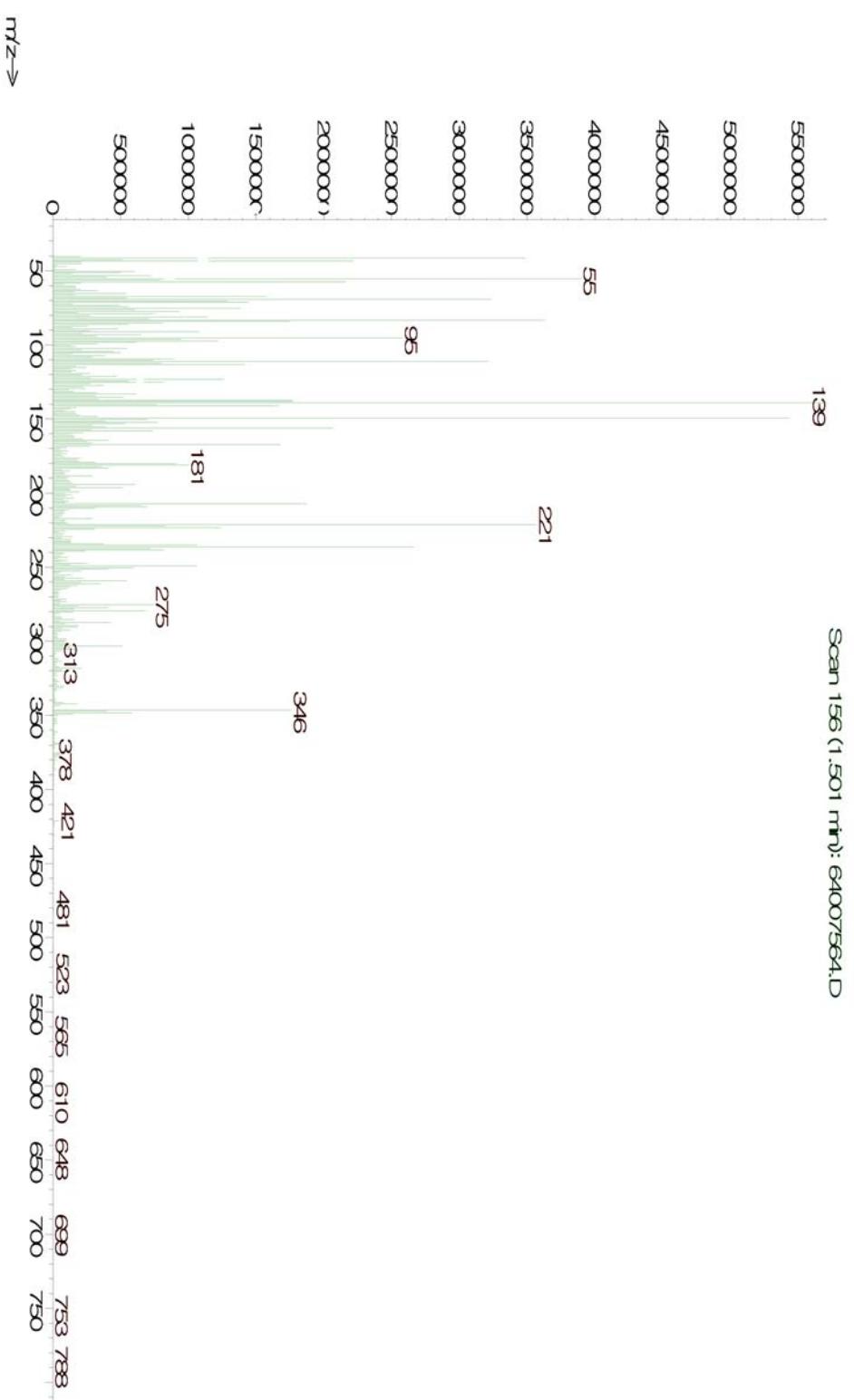
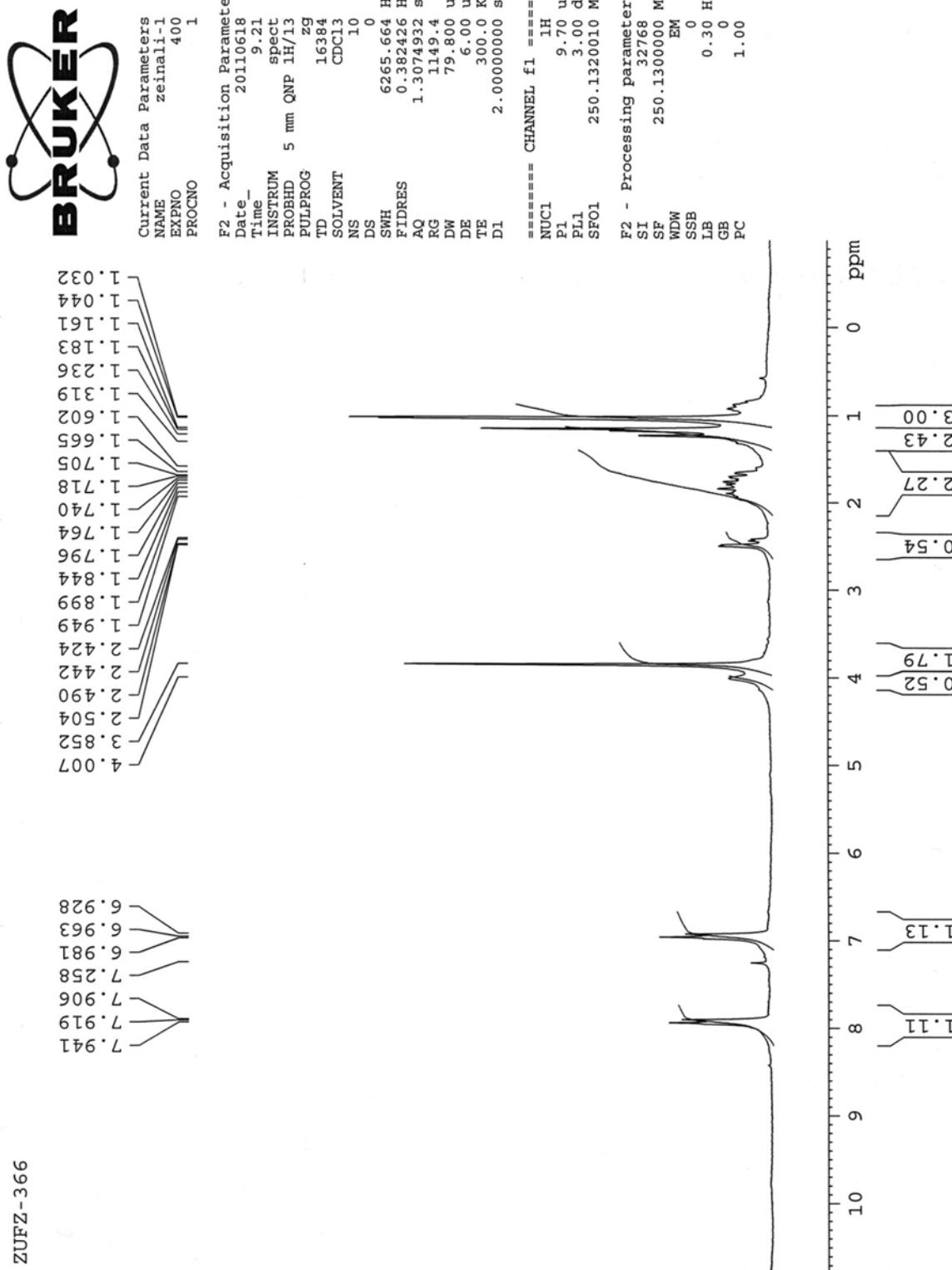
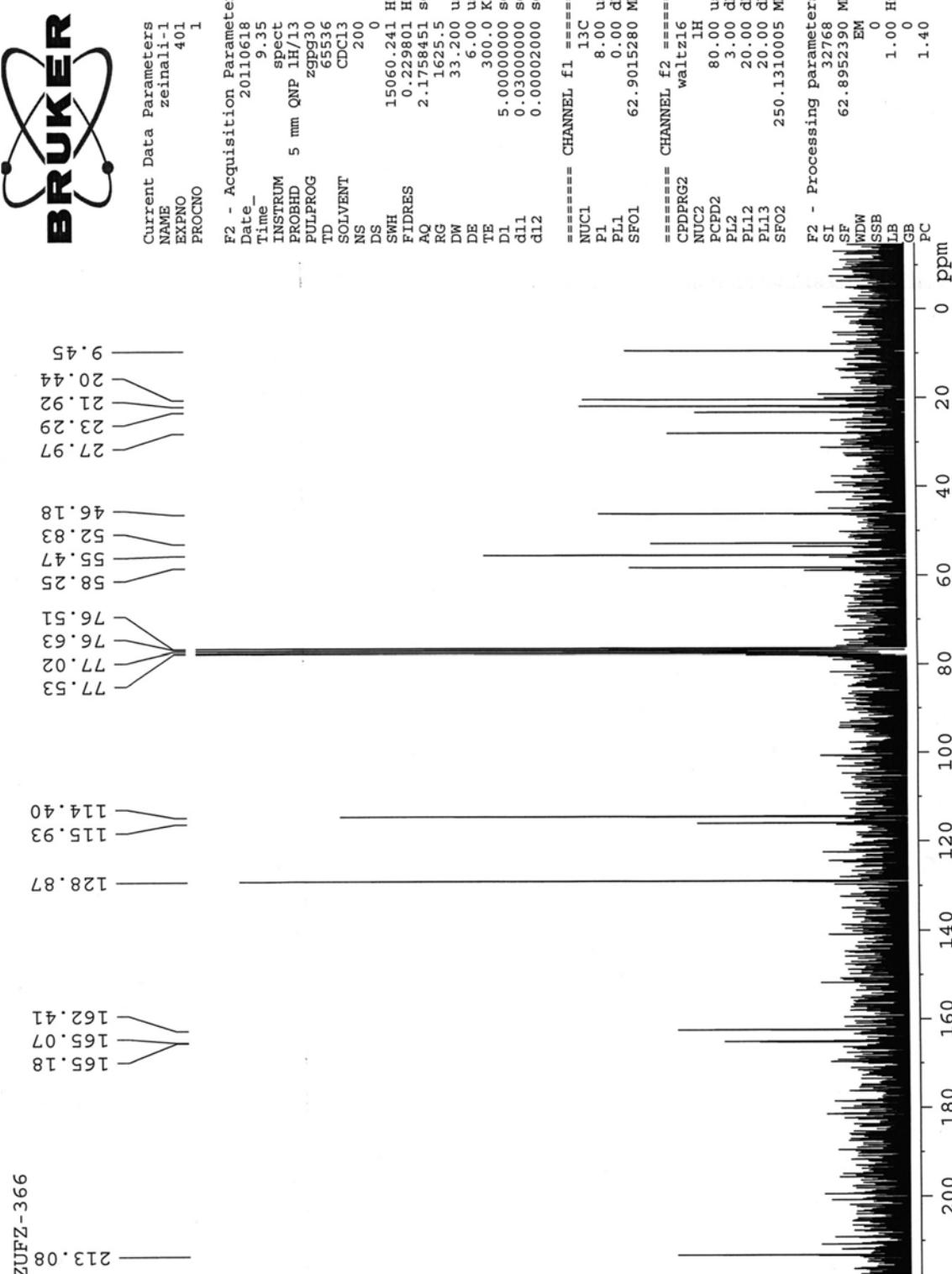


Figure 7. IR spectrum of **4a**.



**Figure 8.** Mass spectrum of 4a.

**Figure 9.** <sup>1</sup>H NMR spectrum of **4c**.

**Figure 10.**  $^{13}\text{C}$  NMR spectrum of **4c**.

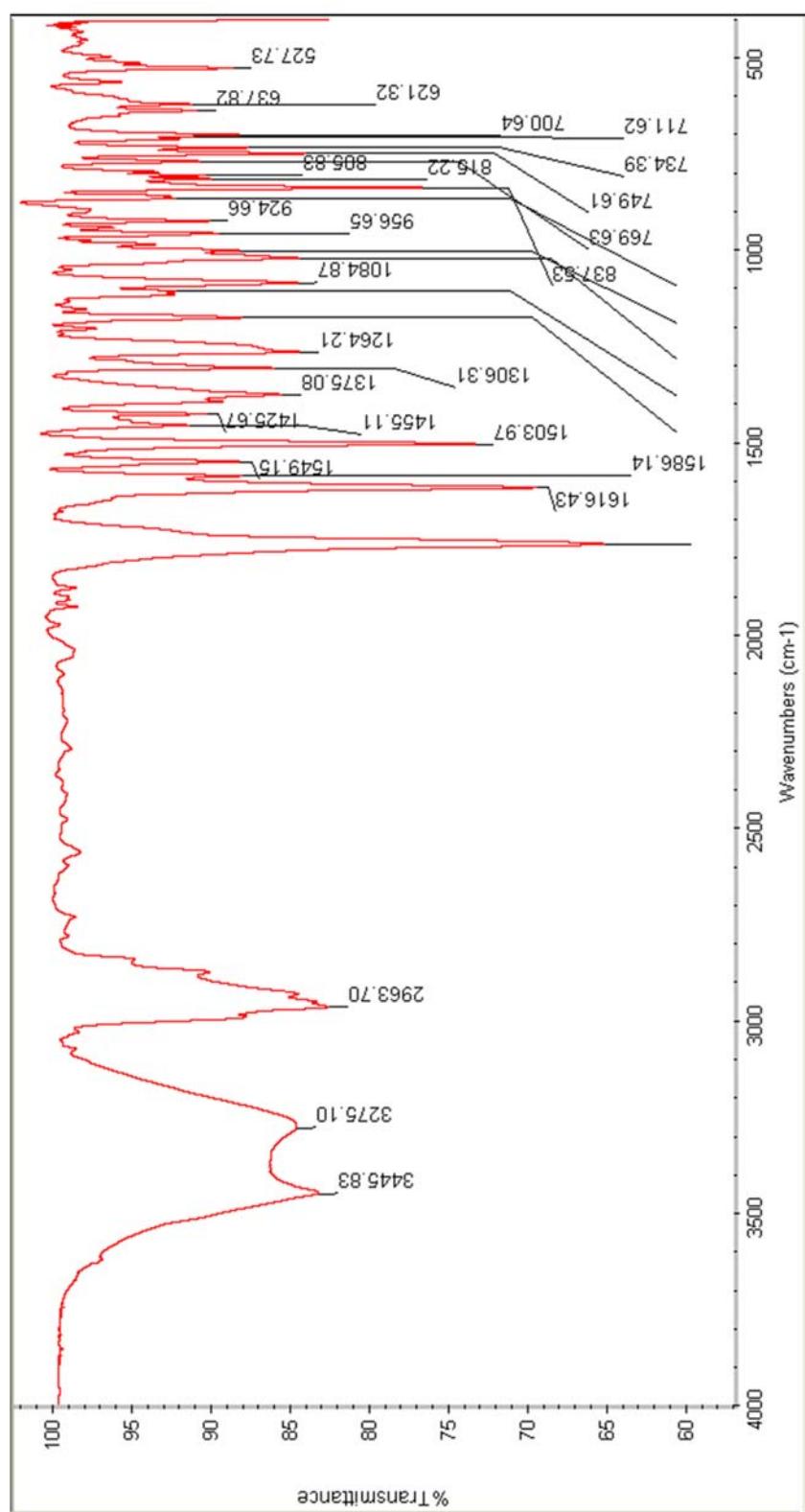
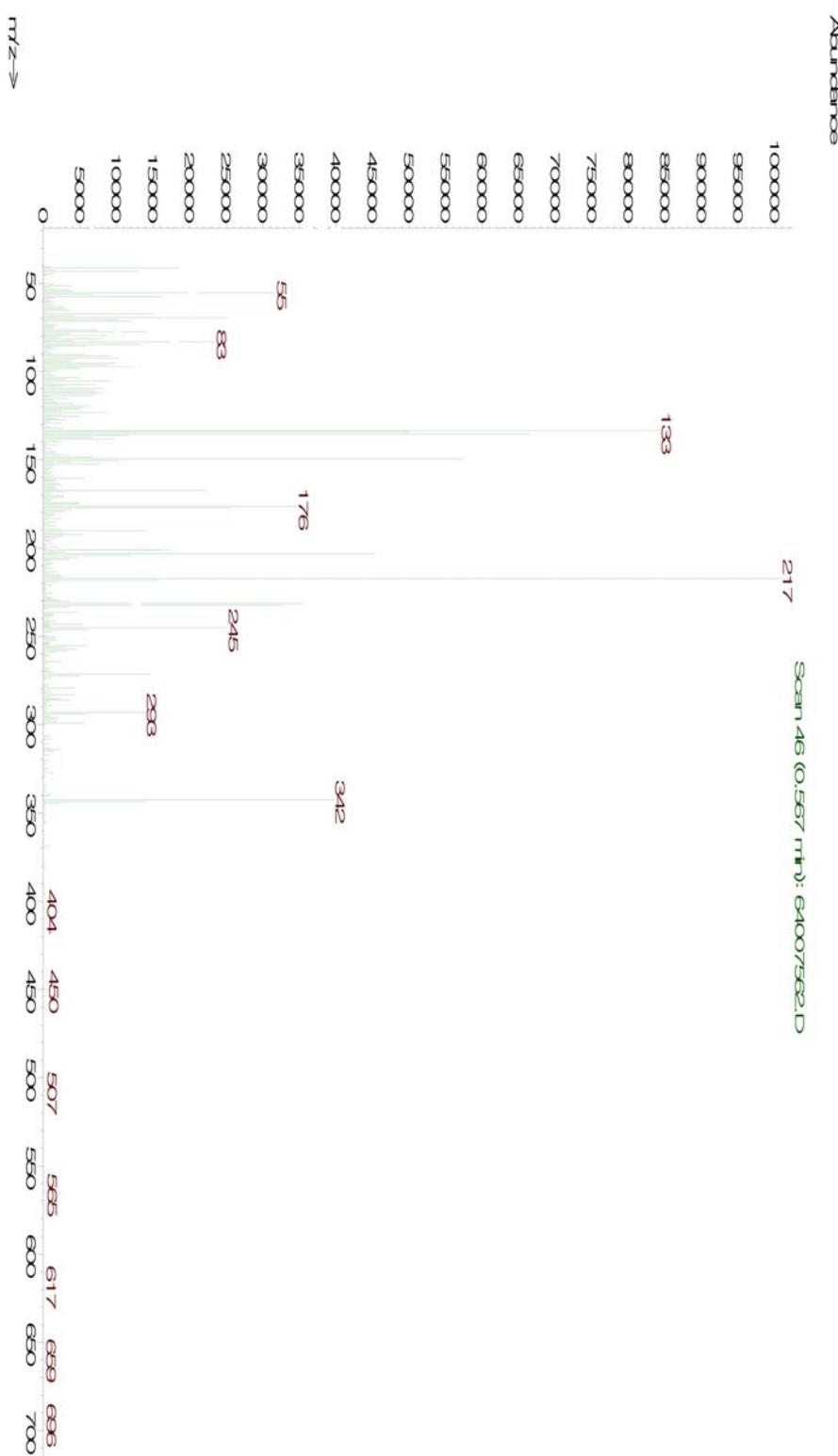
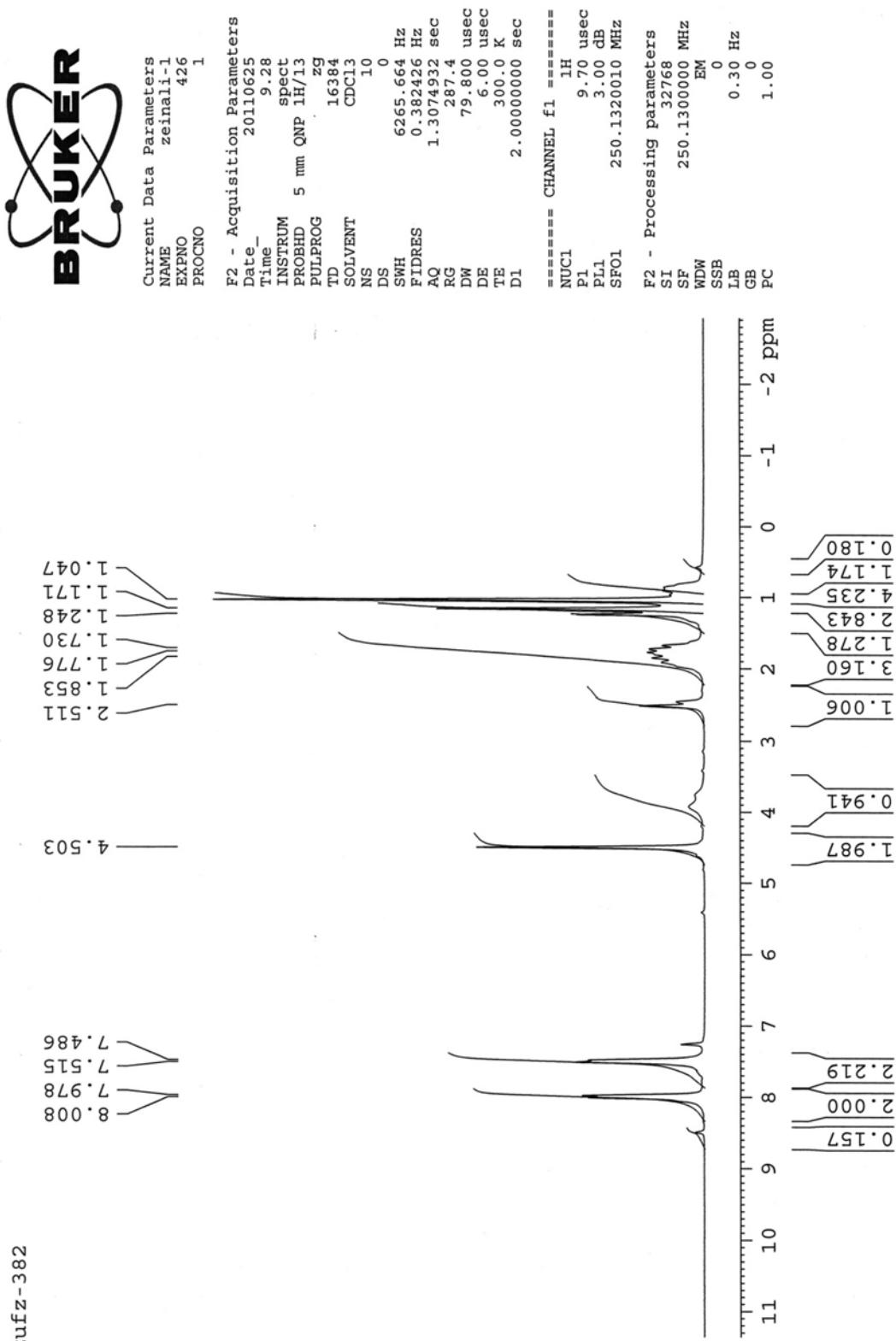


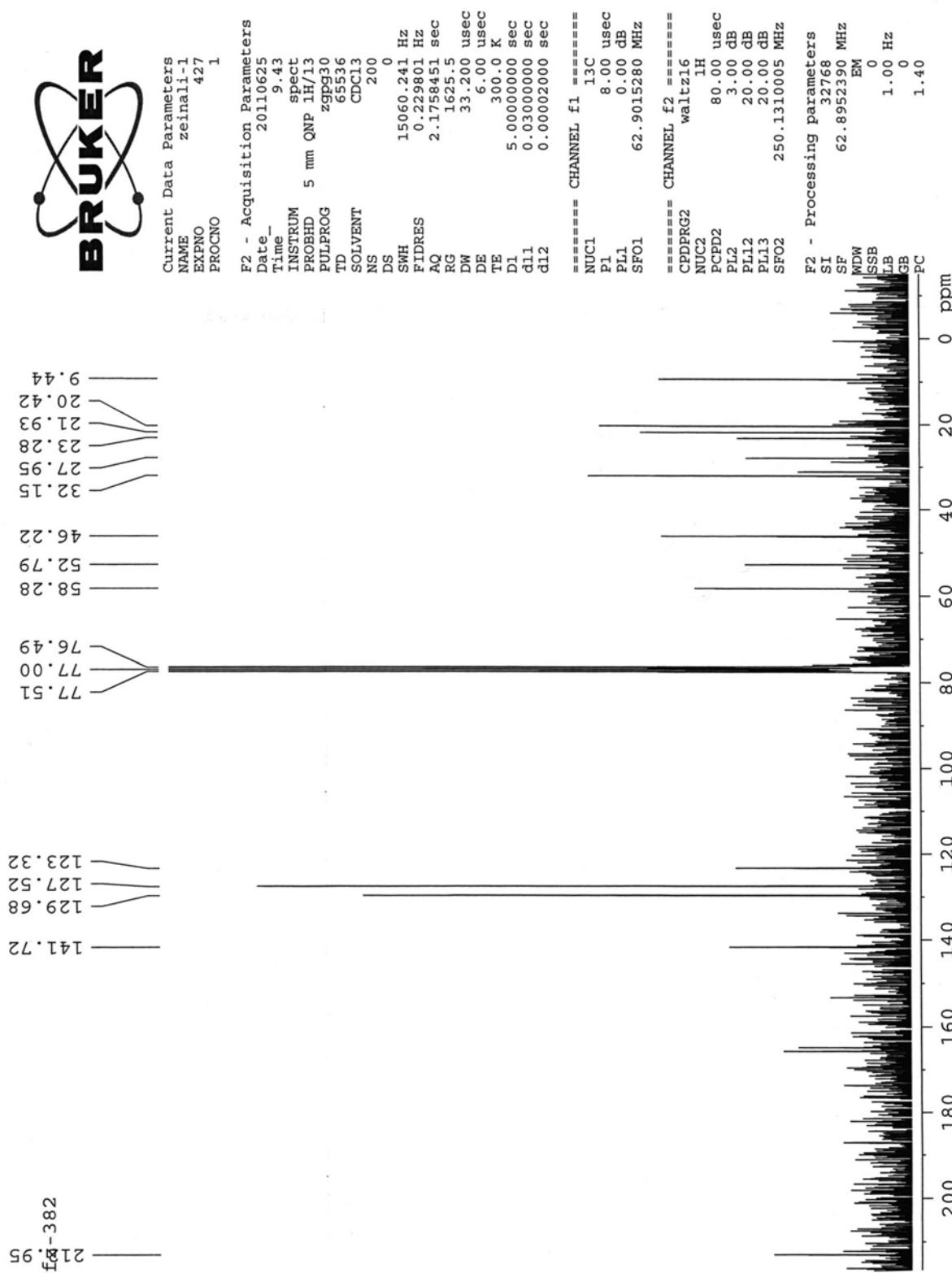
Figure 11. IR spectrum of **4c**.



**Figure 12.** Mass spectrum of **4c**.

Figure 13. <sup>1</sup>H NMR spectrum of 4d.

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**Figure 14.**  $^{13}\text{C}$  NMR spectrum of **4d**.

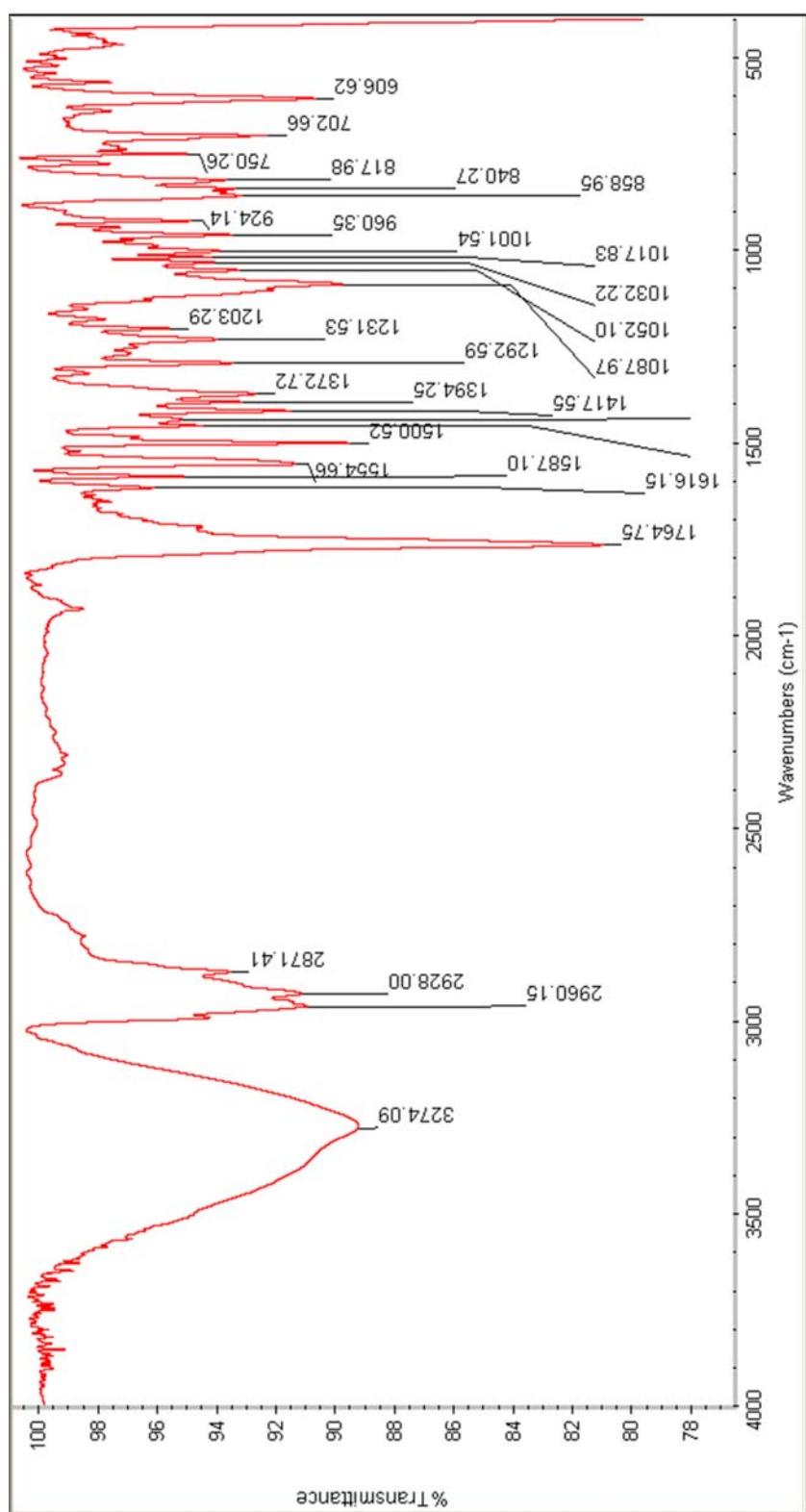
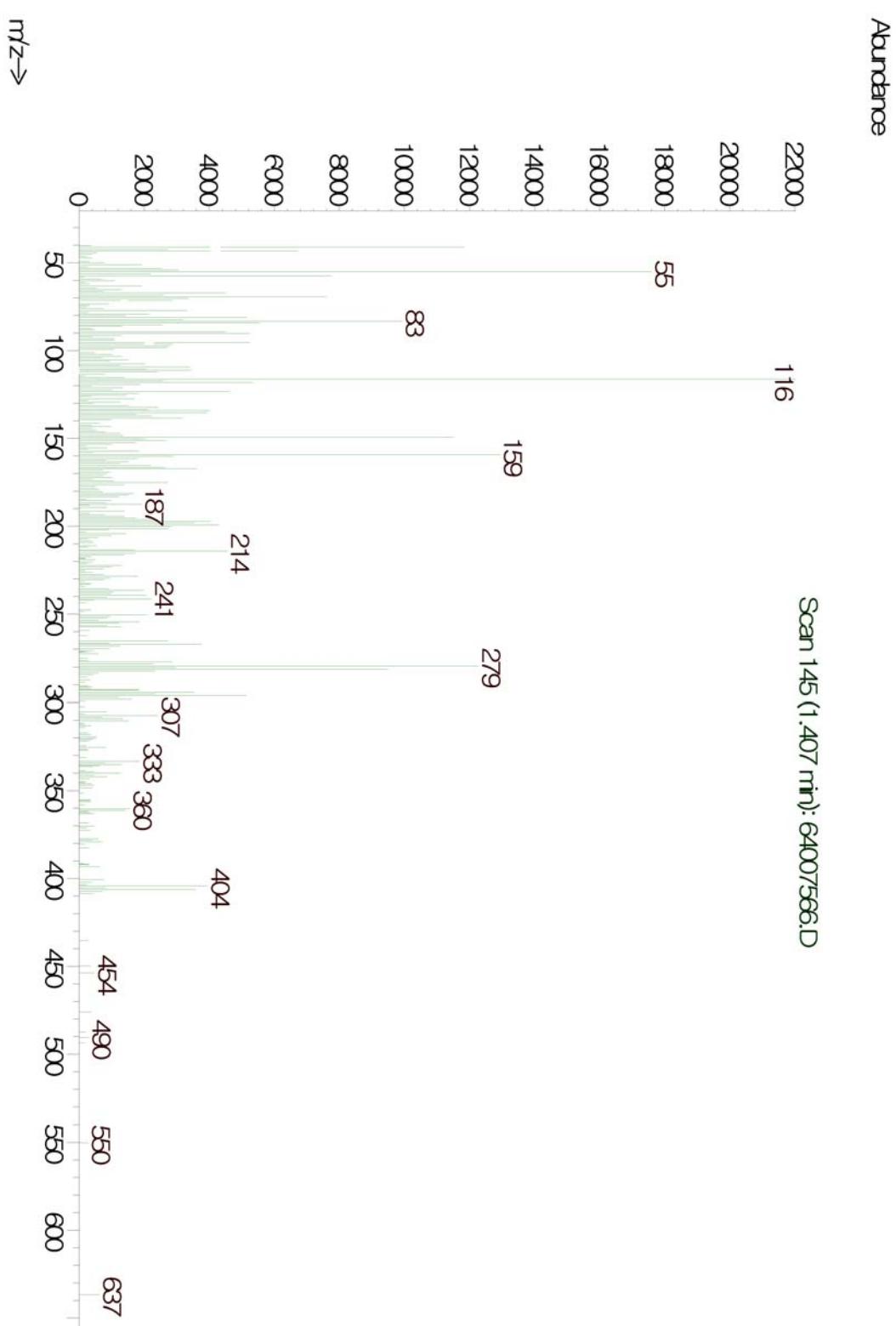
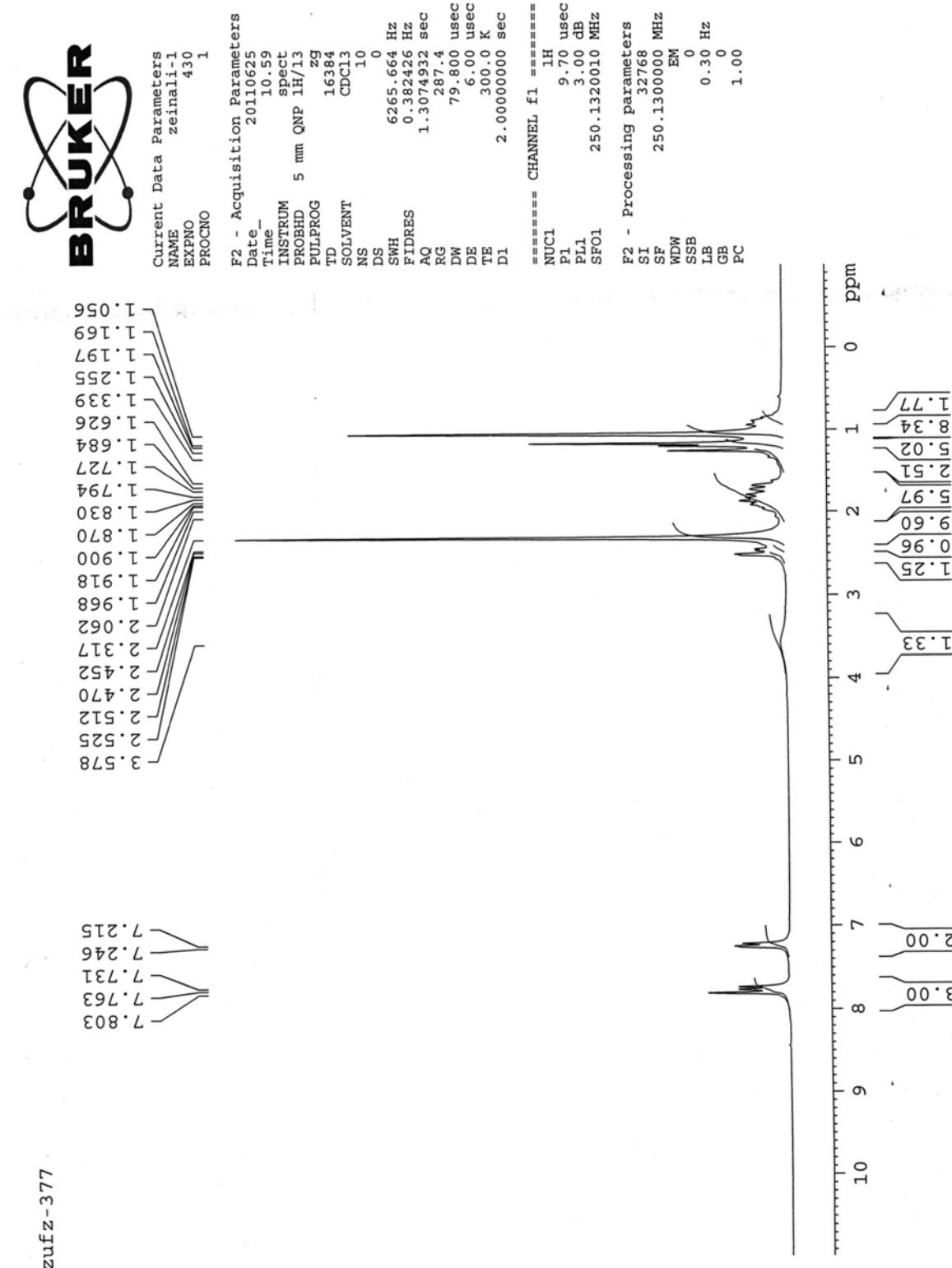


Figure 15. IR spectrum of 4d.



**Figure 16.** Mass spectrum of 4d.

**Figure 17.** <sup>1</sup>H NMR spectrum of **4e**.

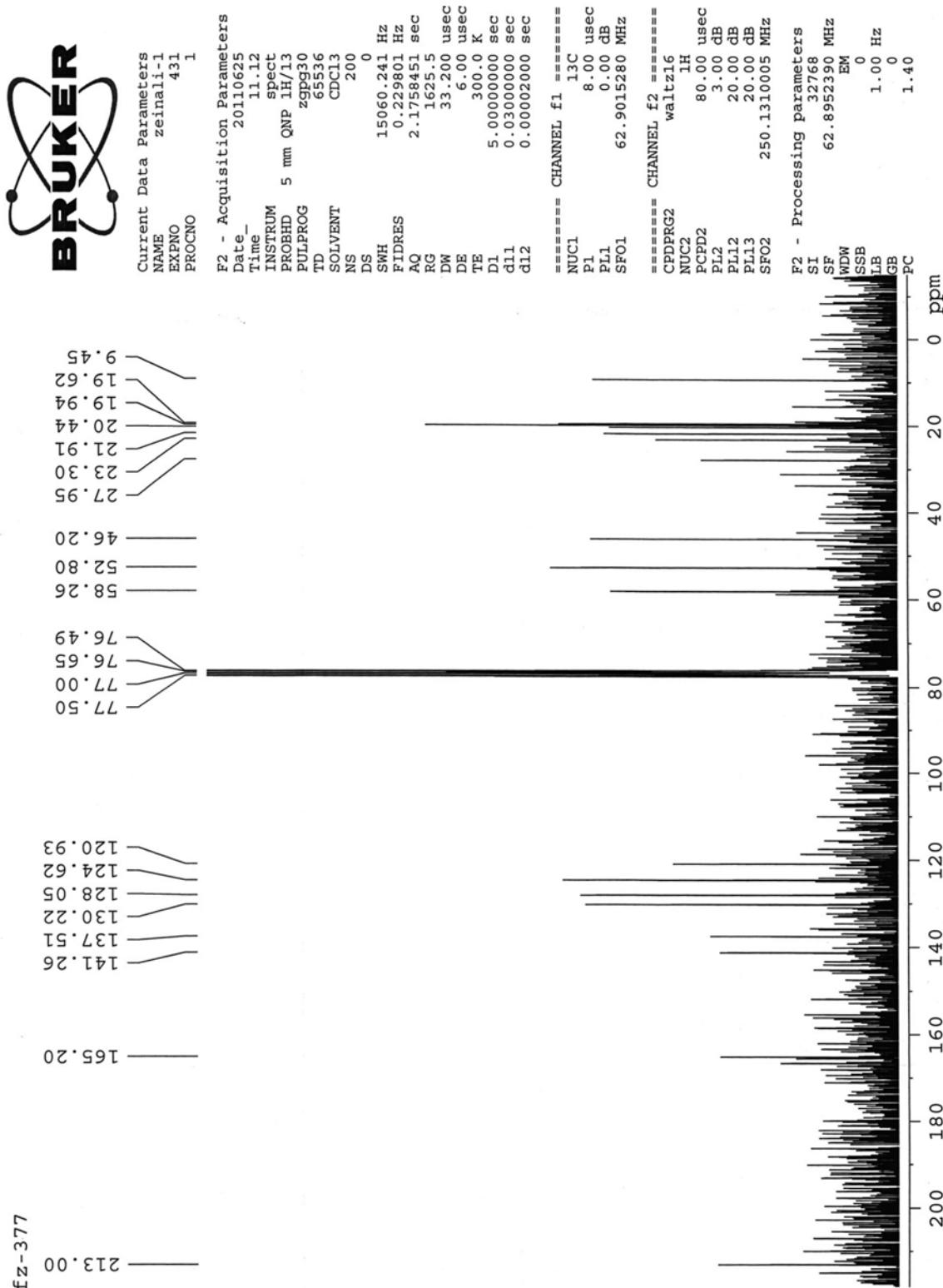
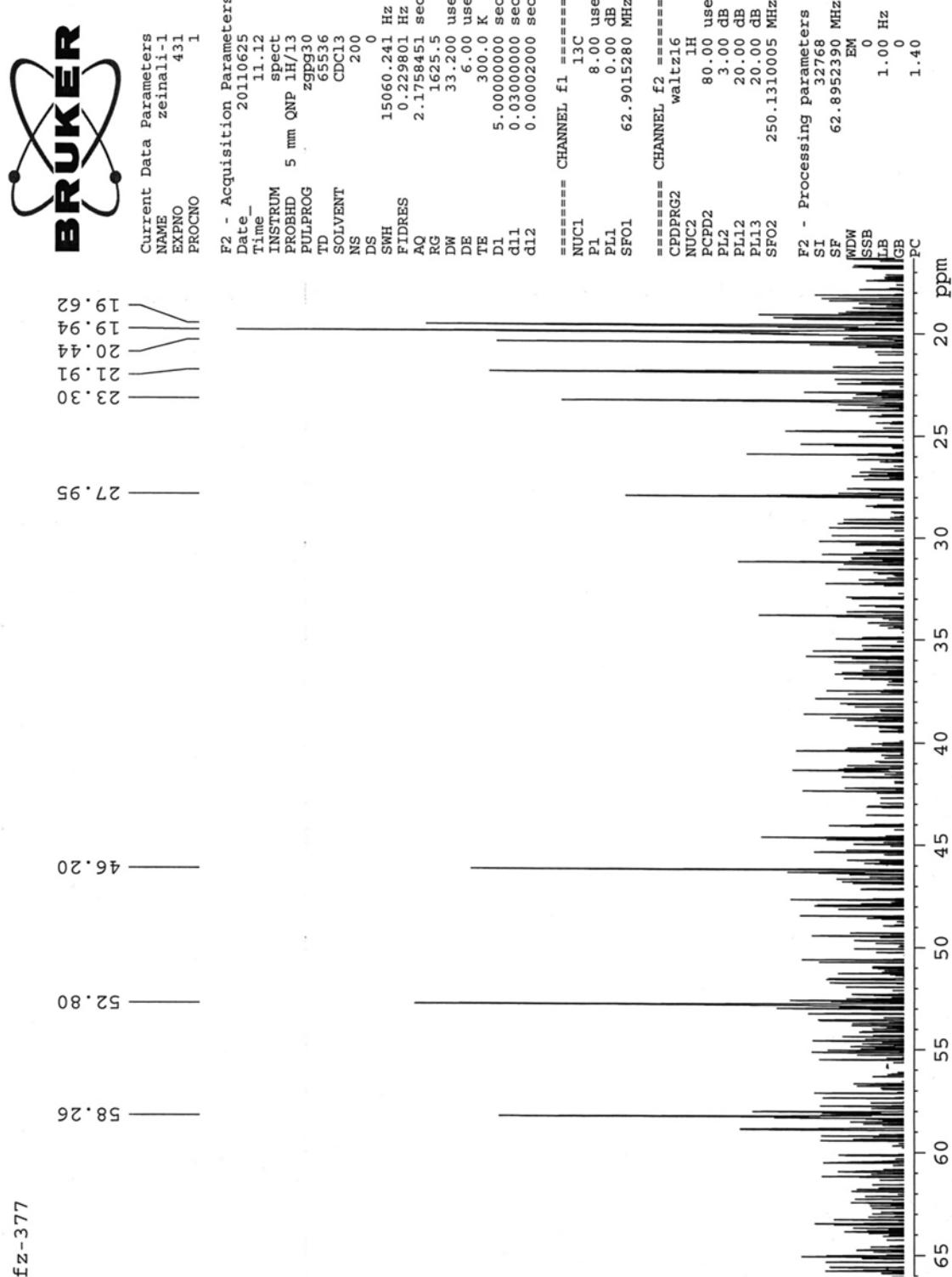


Figure 18. <sup>13</sup>C NMR spectrum of **4e**.

Figure 18.  $^{13}\text{C}$  NMR spectrum of **4e**.

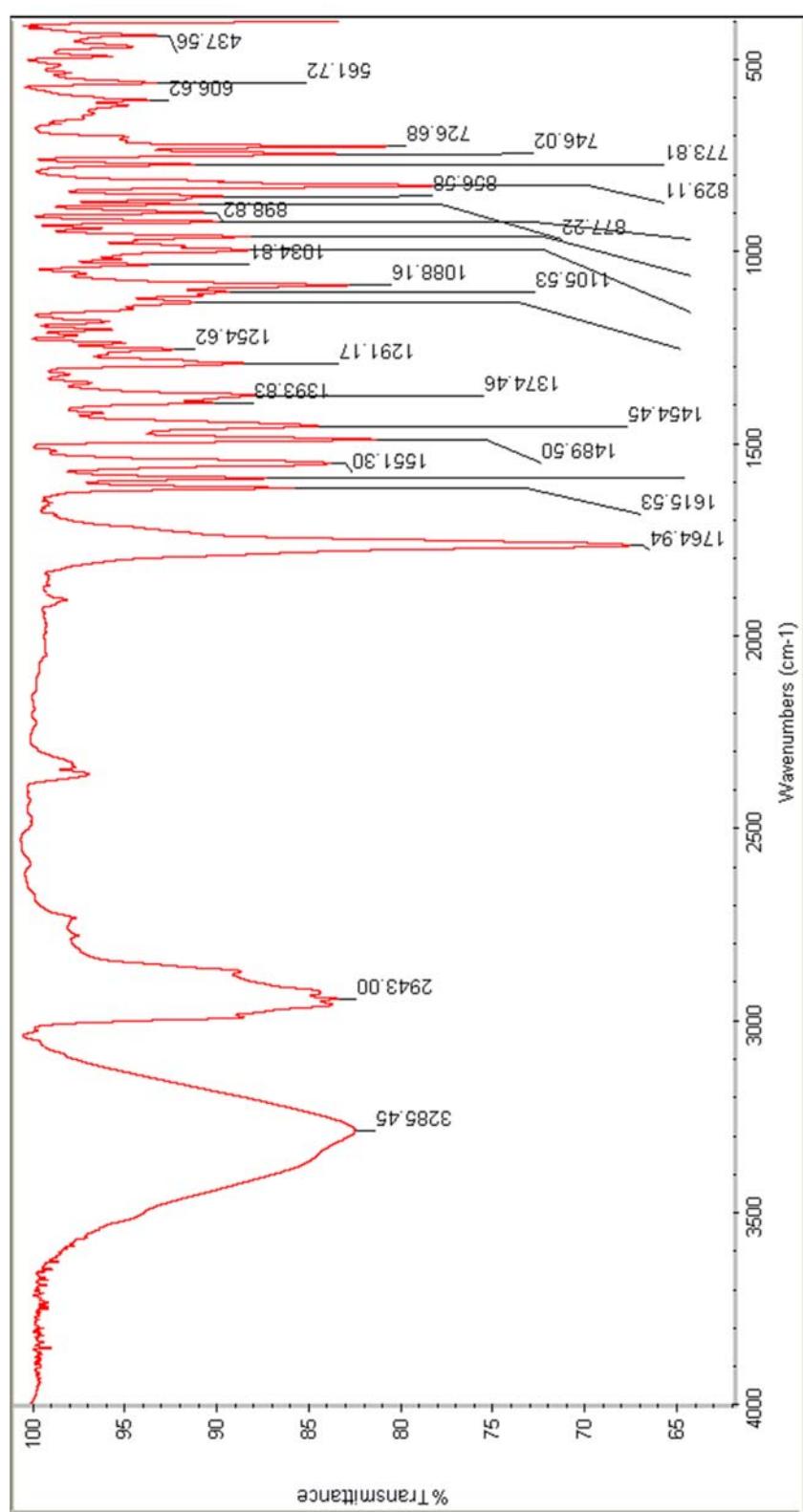


Figure 19. IR spectrum of 4e.

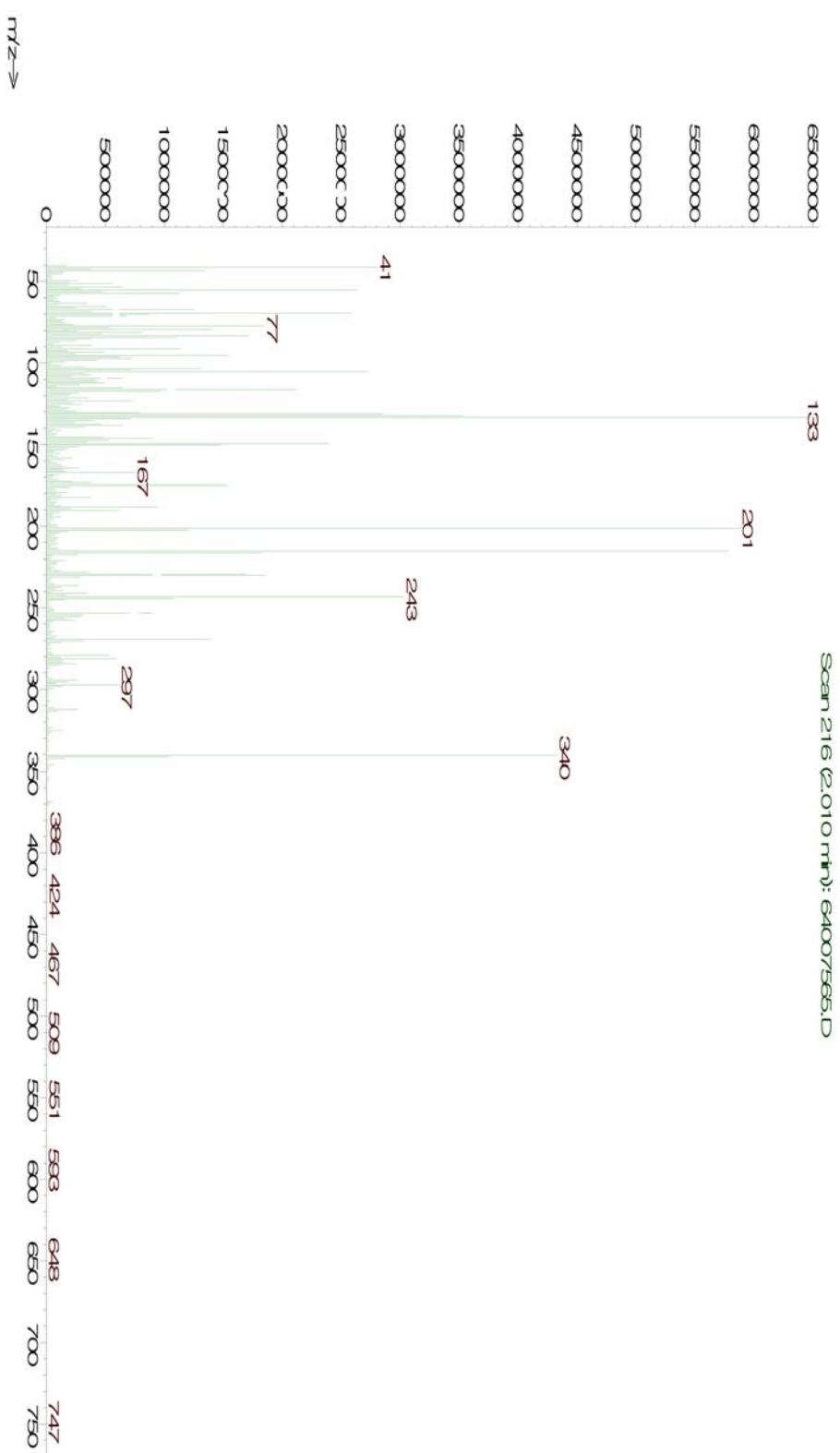


Figure 20. Mass spectrum of **4e**.

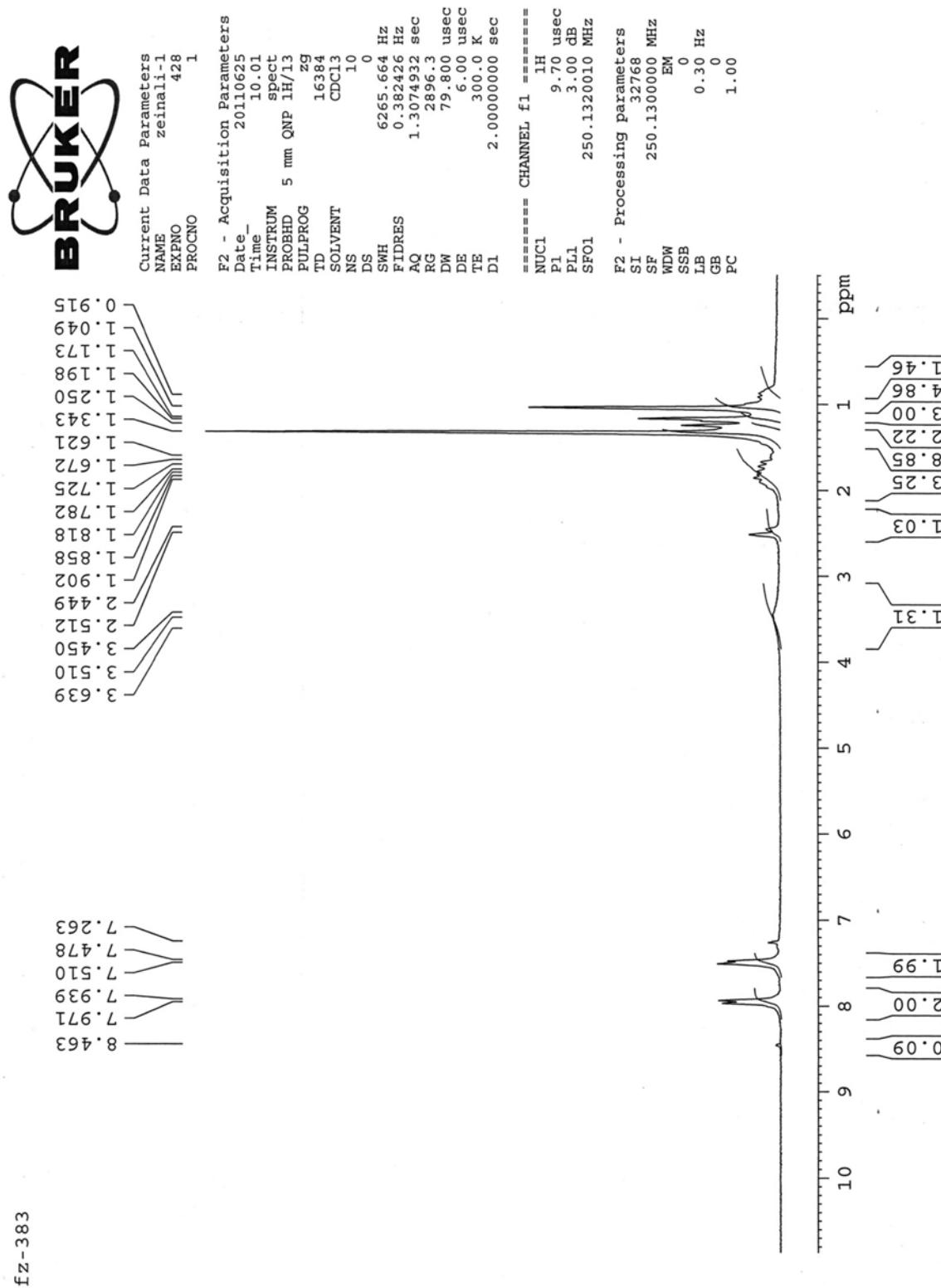
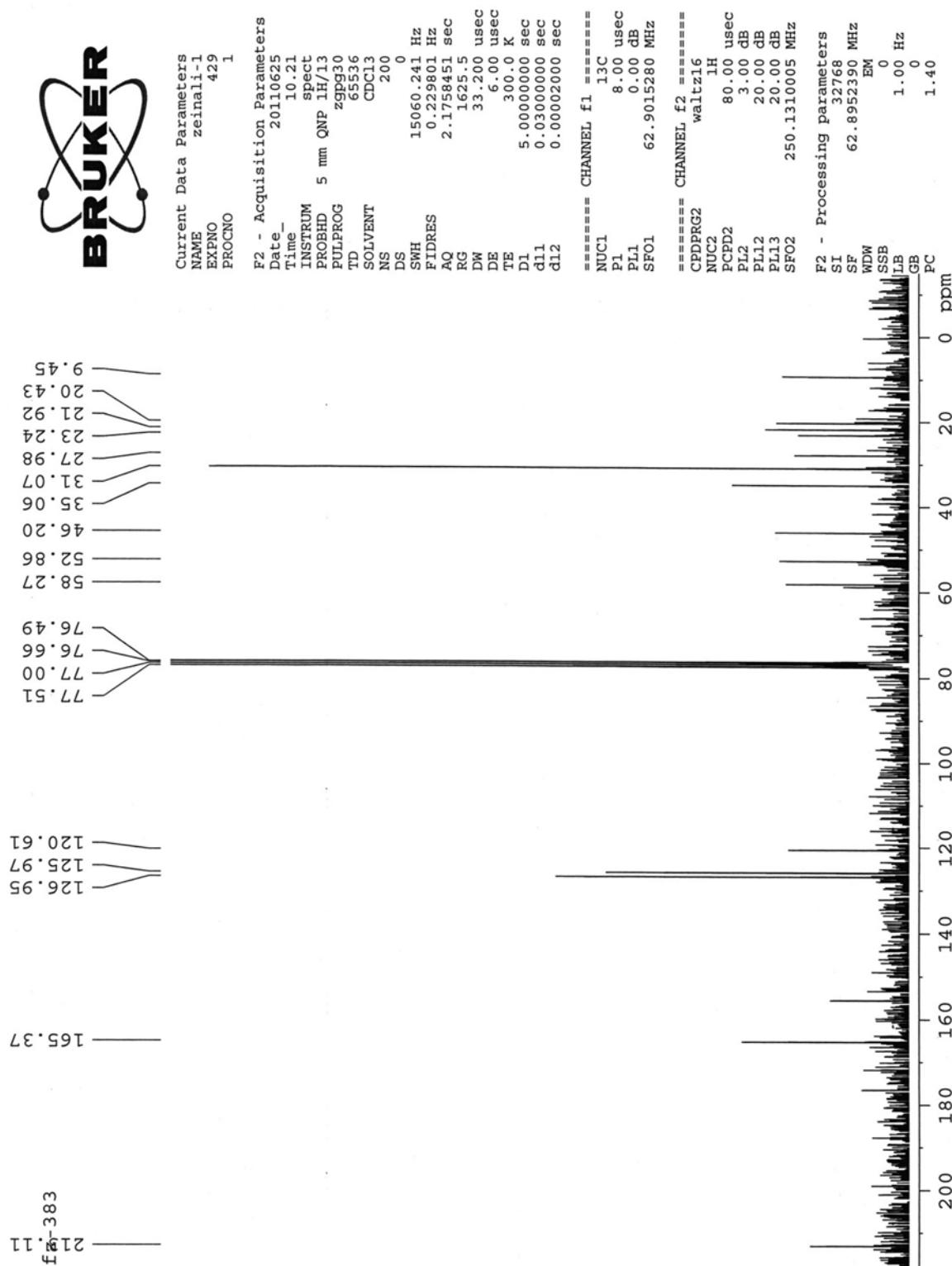


Figure 21. <sup>1</sup>H NMR spectrum of **4f**.

Figure 22. <sup>13</sup>C NMR spectrum of **4f**.

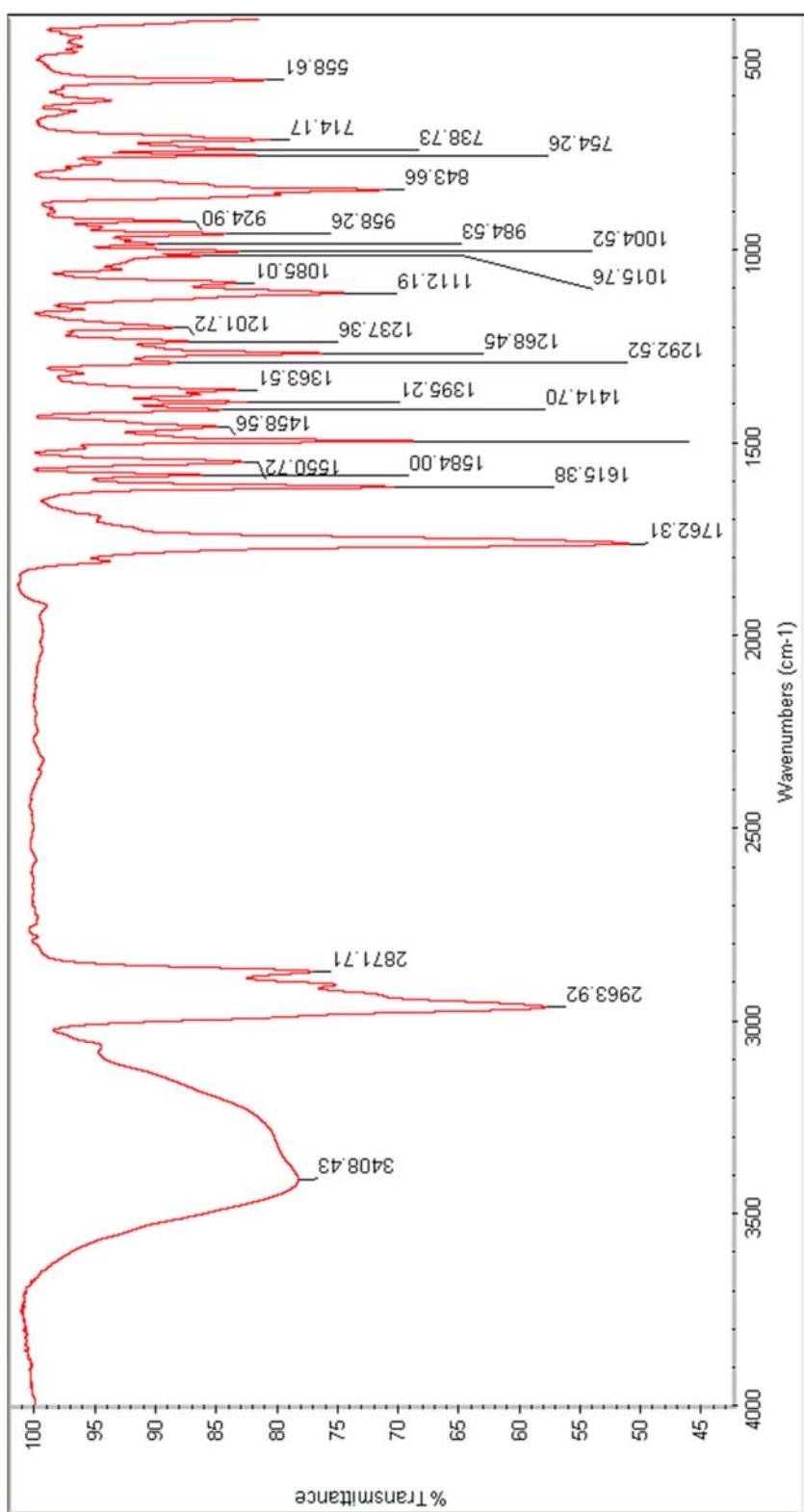
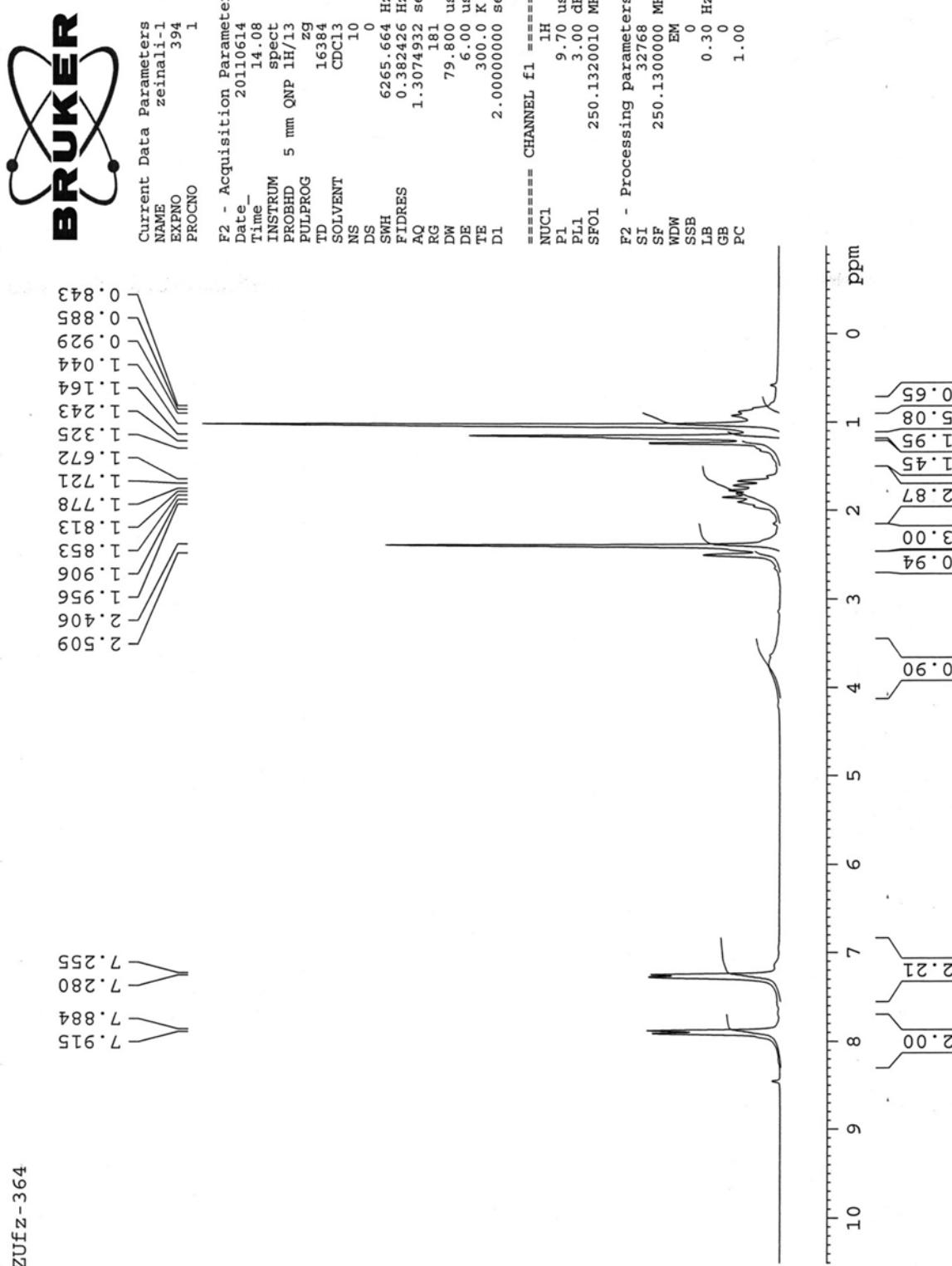


Figure 23. IR spectrum of **4f**.

**Figure 24.** <sup>1</sup>H NMR spectrum of **4g**.

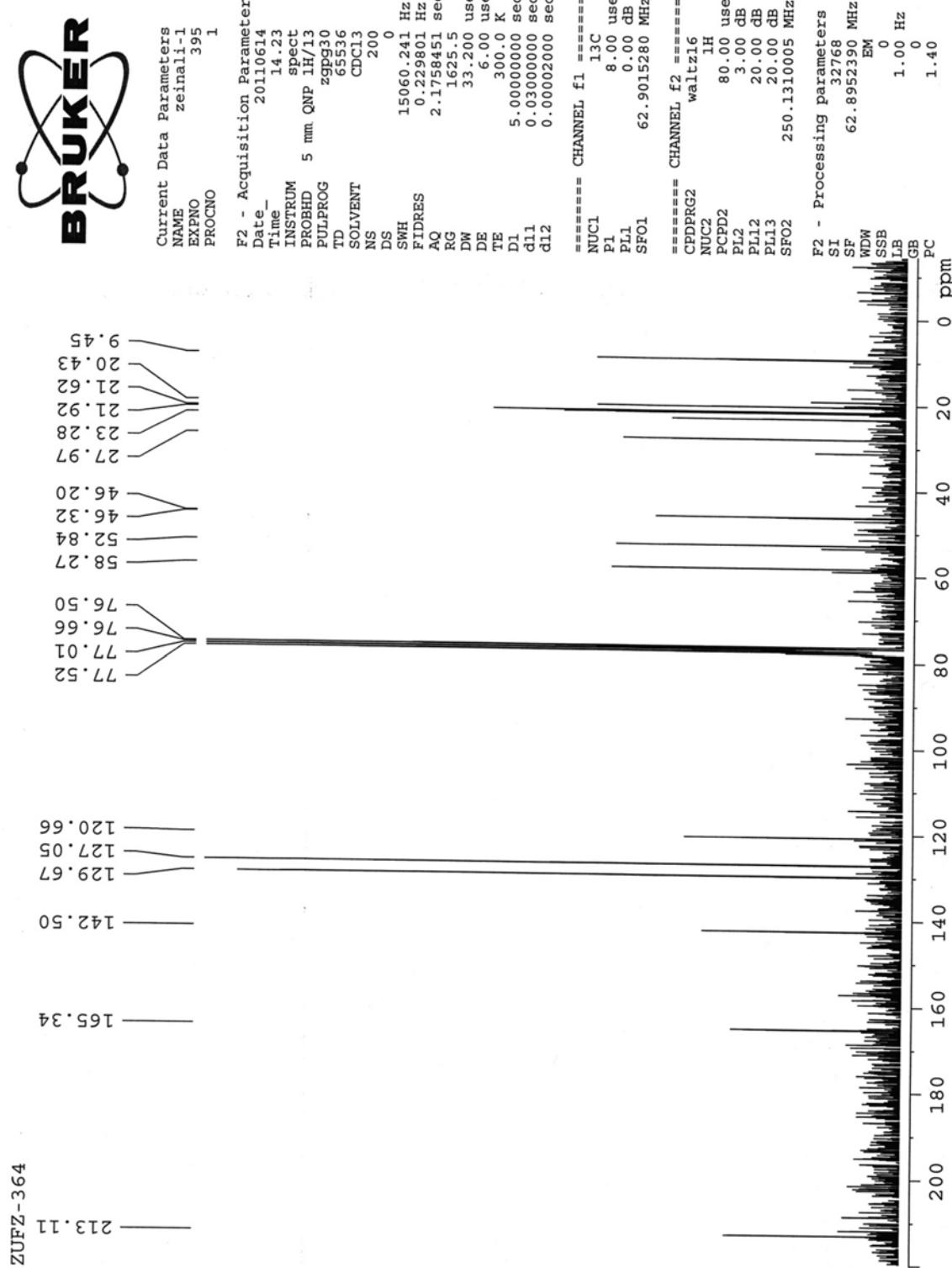
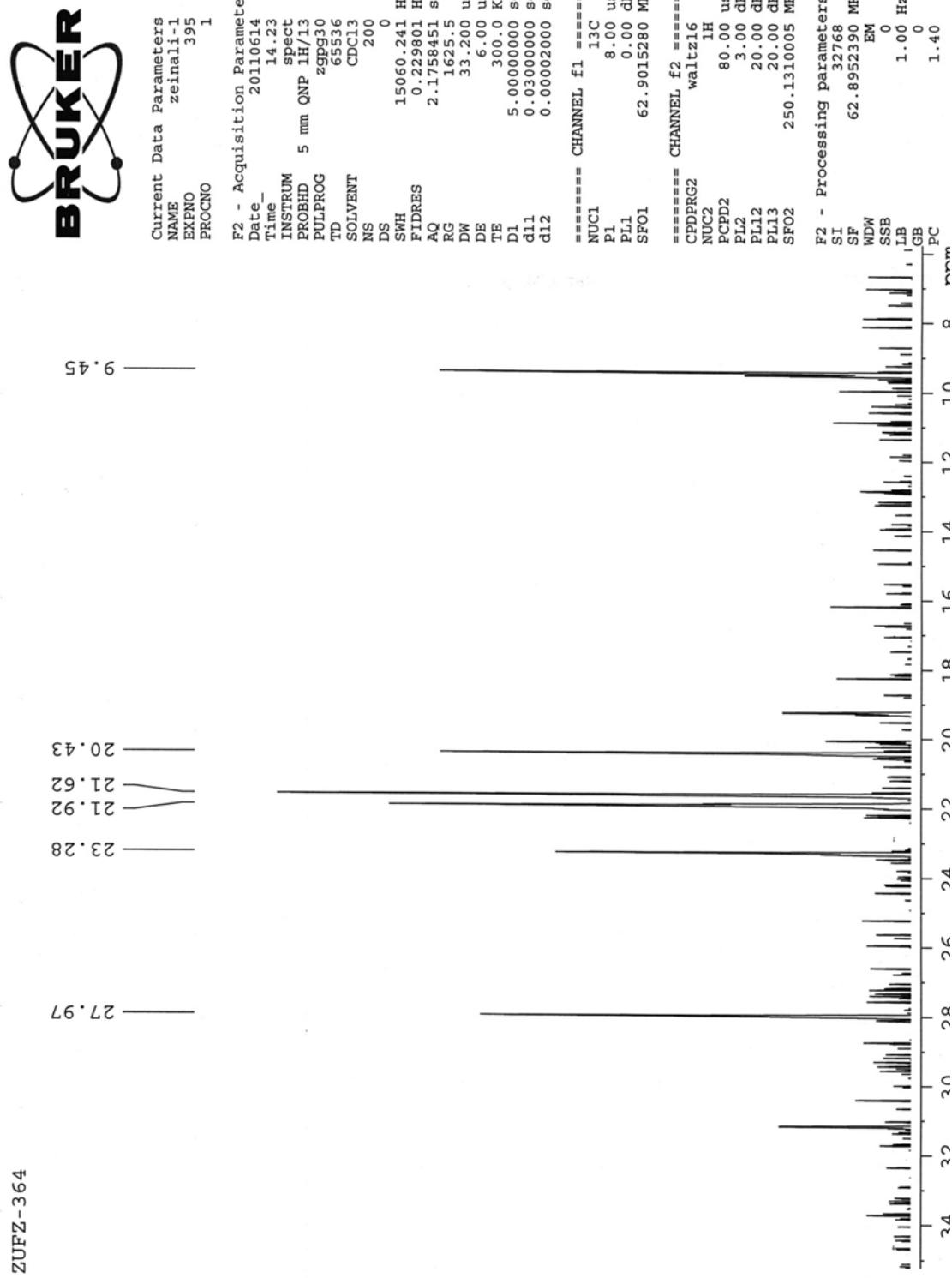
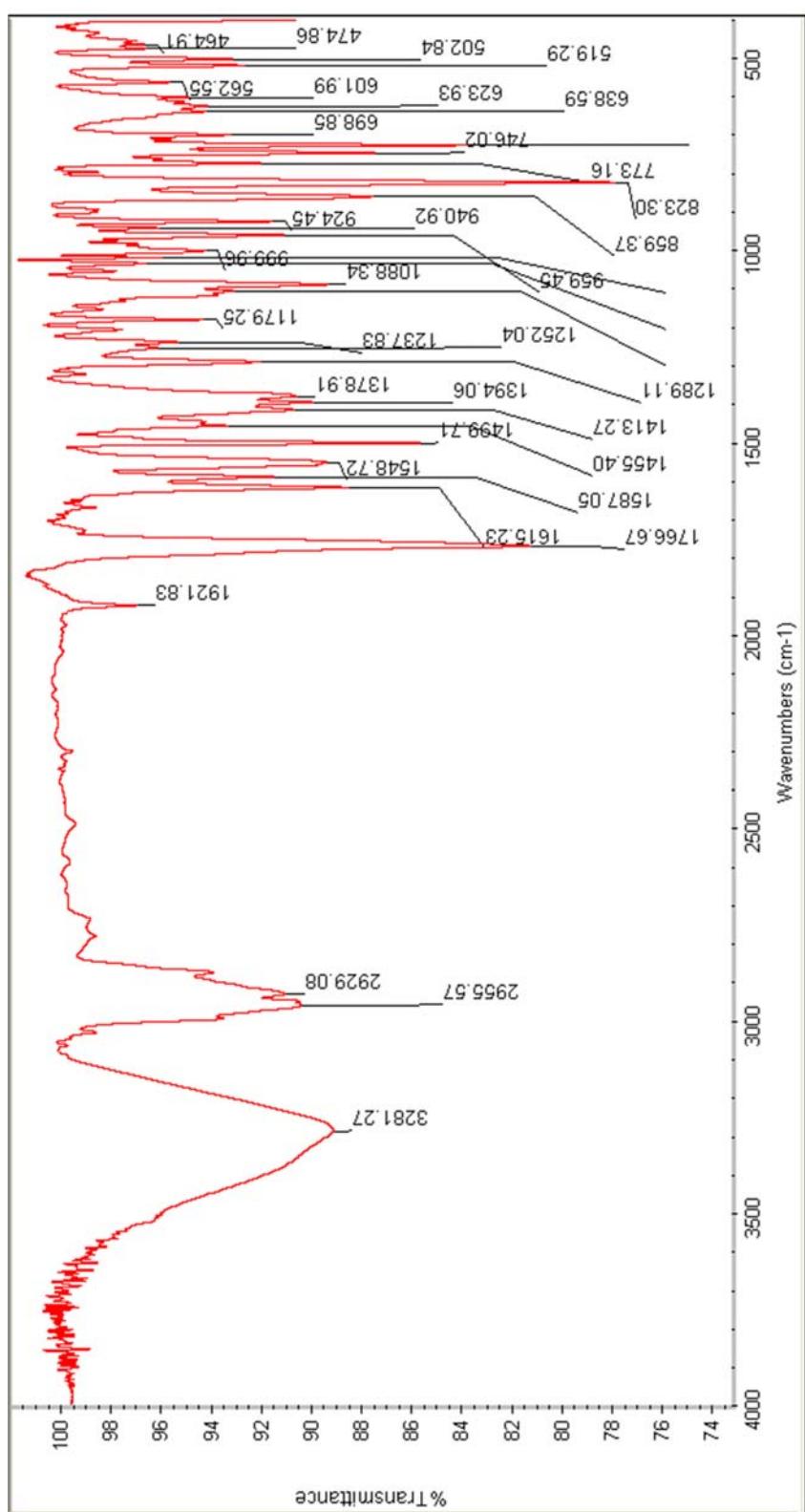
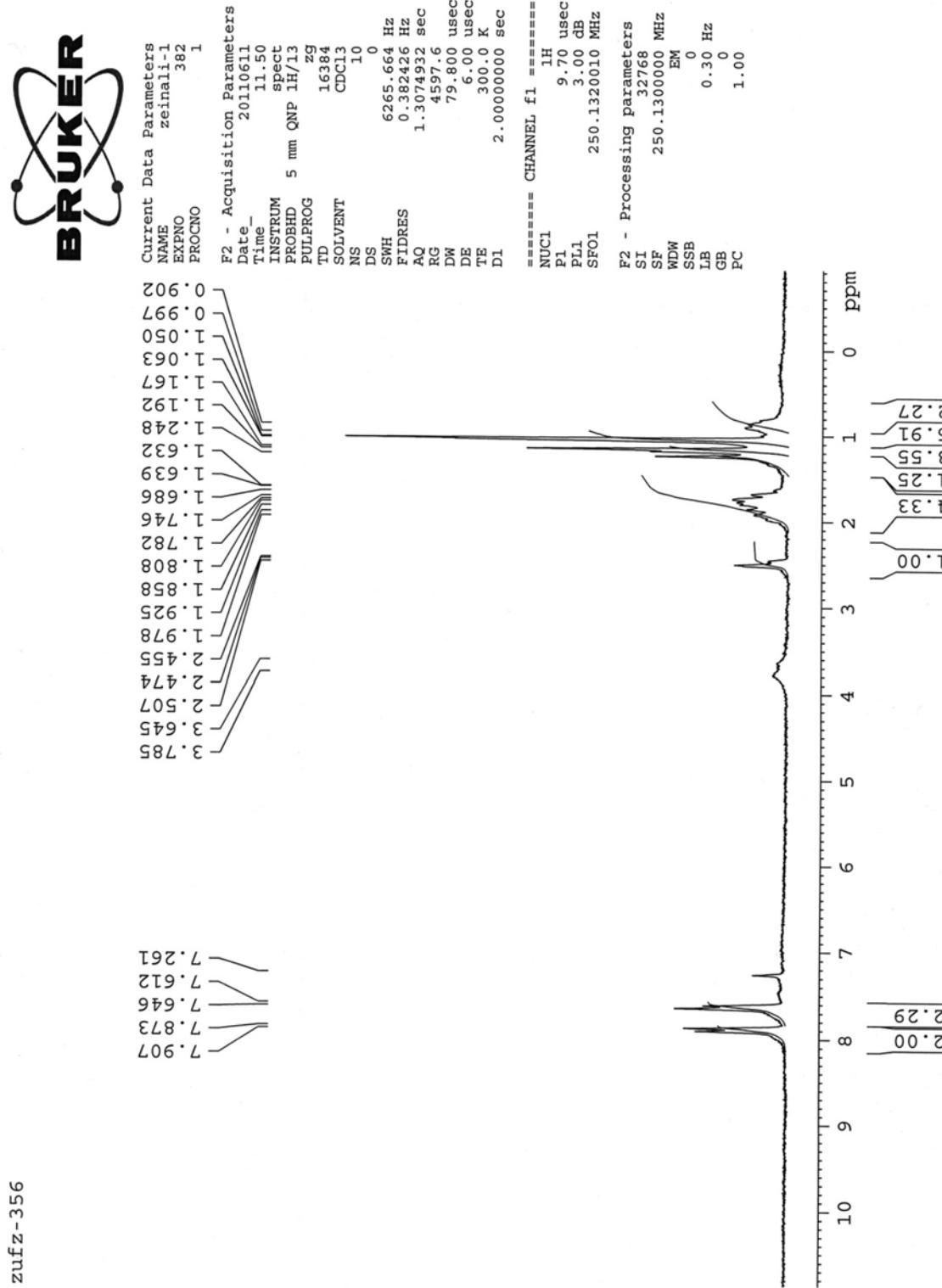


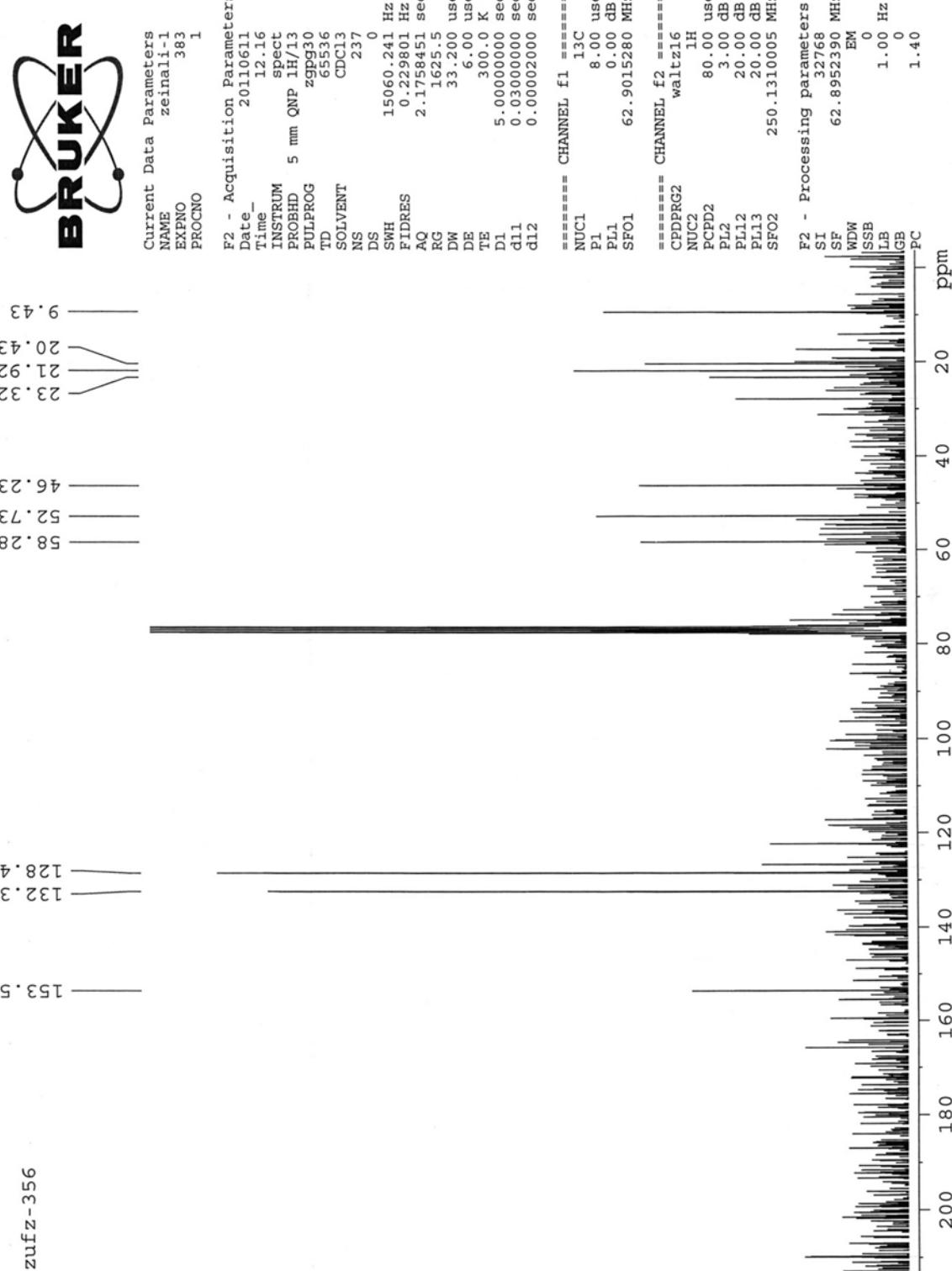
Figure 25.  $^{13}\text{C}$  NMR spectrum of **4g**.

**Figure 25.** <sup>13</sup>C NMR spectrum of **4g**.



**Figure 26.** IR spectrum of **4g**.

Figure 27.  $^1\text{H}$  NMR spectrum of **4h**.

**Figure 28.**  $^{13}\text{C}$  NMR spectrum of **4h**.

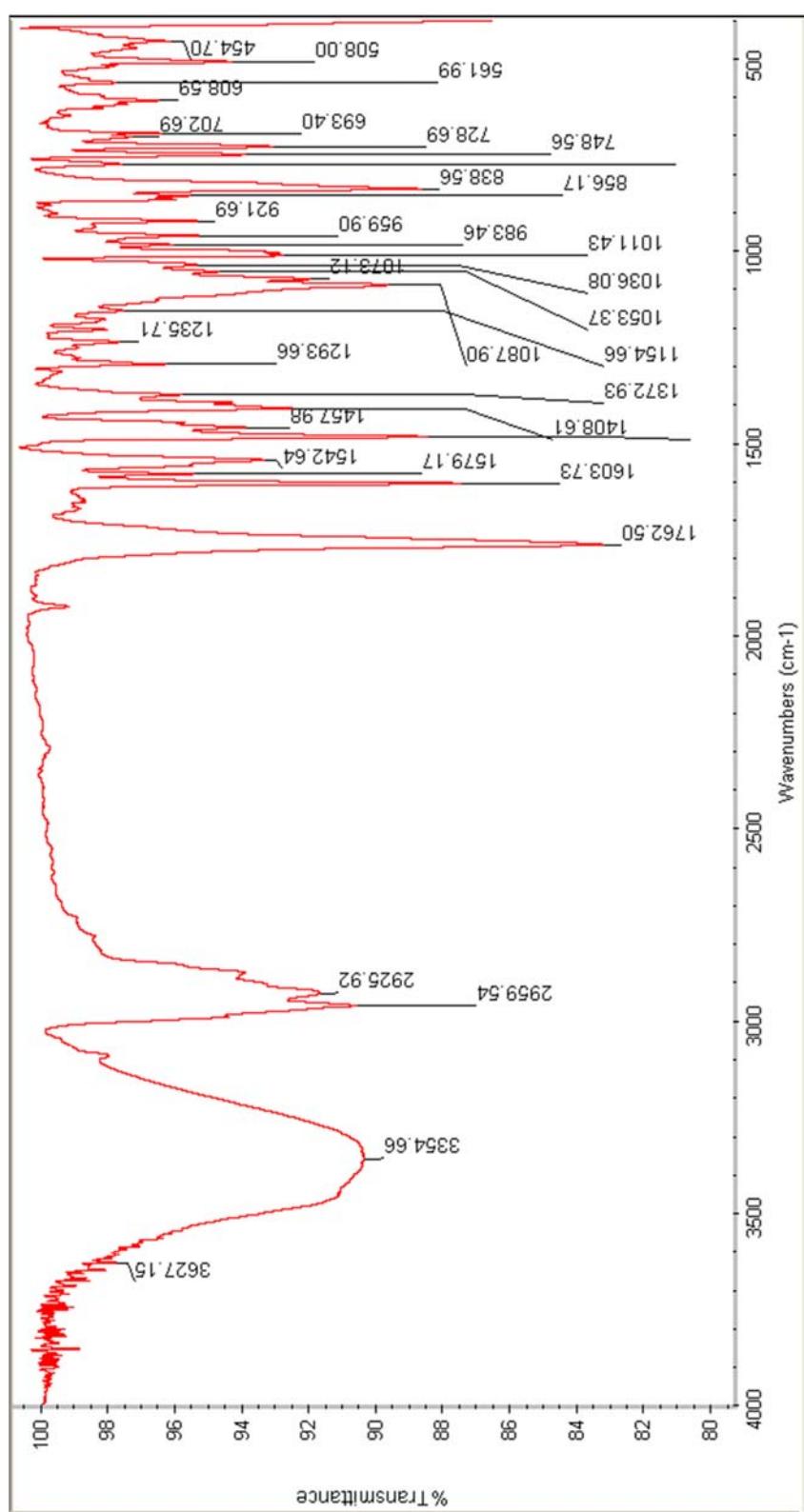
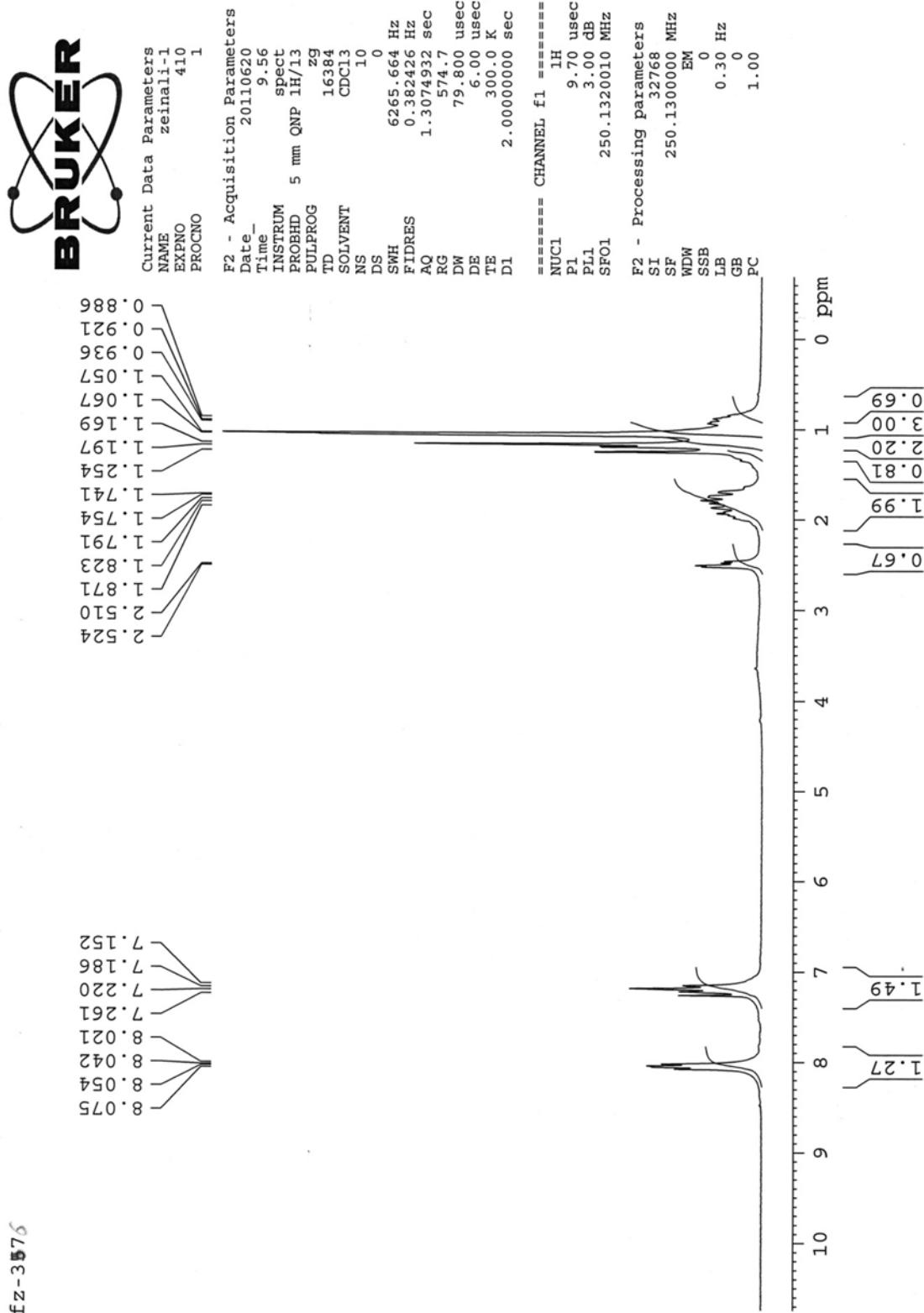
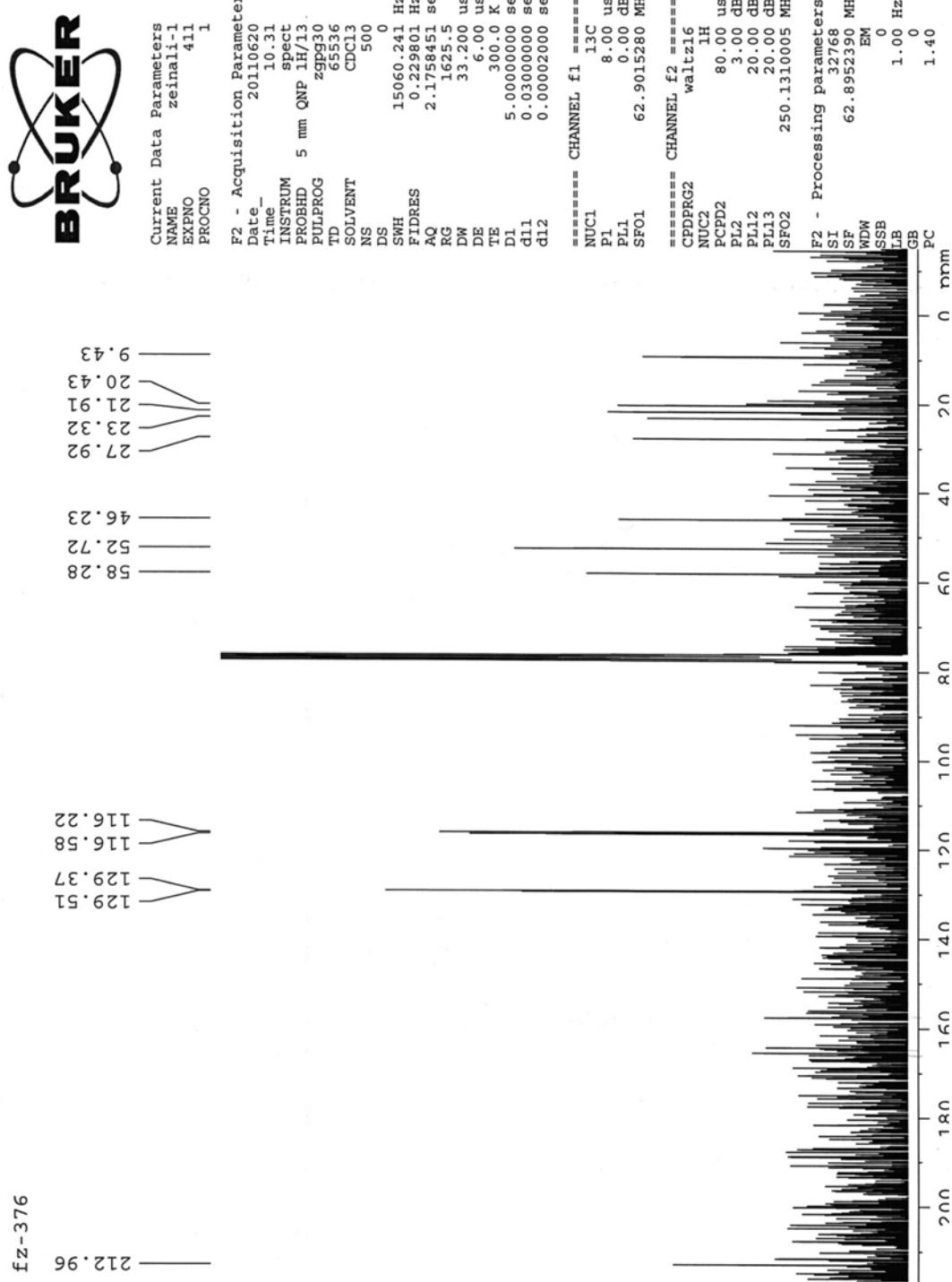
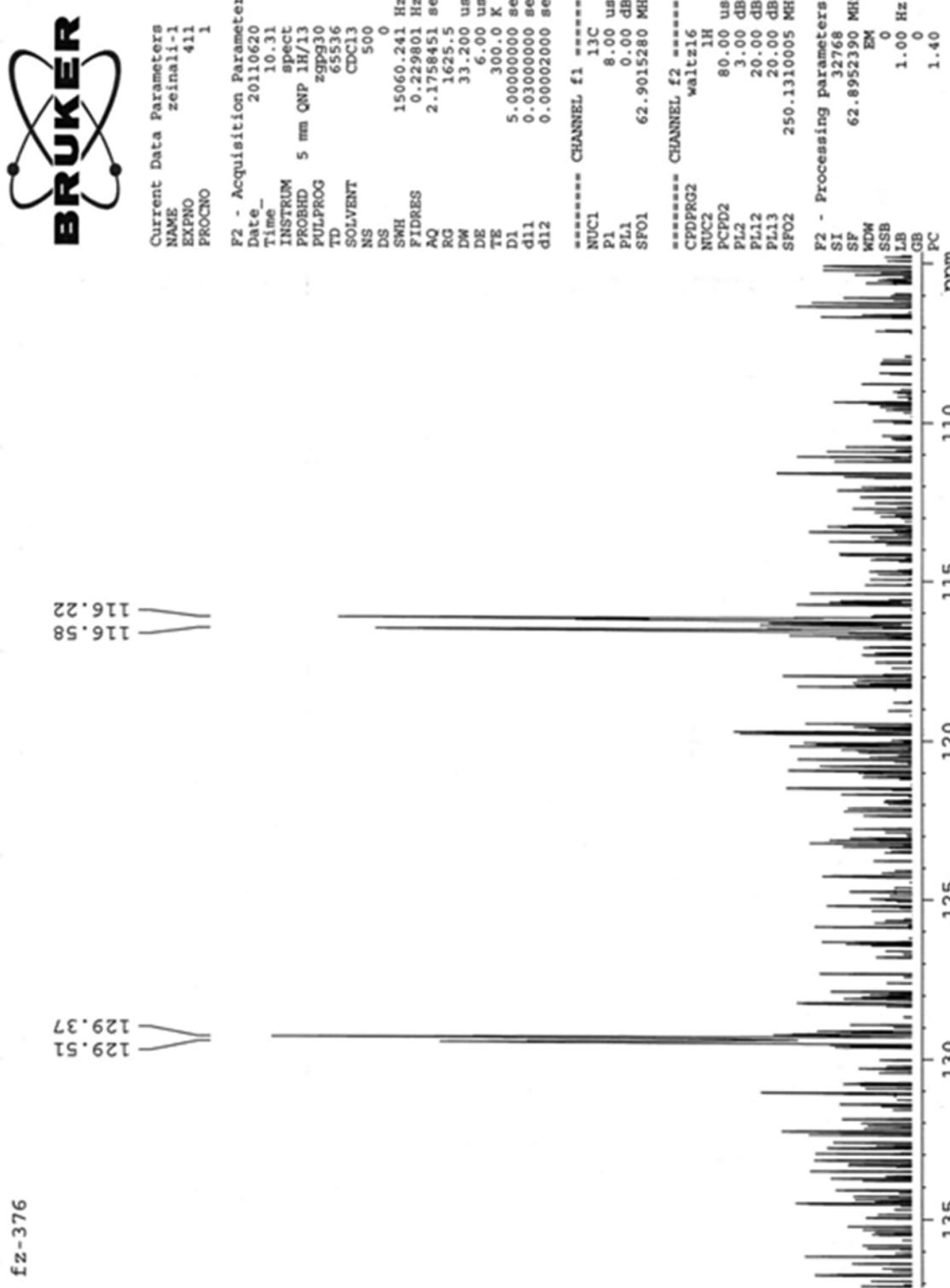


Figure 29. IR spectrum of **4h**.



**Figure 31.** <sup>13</sup>C NMR spectrum of **4i**.

Figure 31.  $^{13}\text{C}$  NMR spectrum of **4i**.

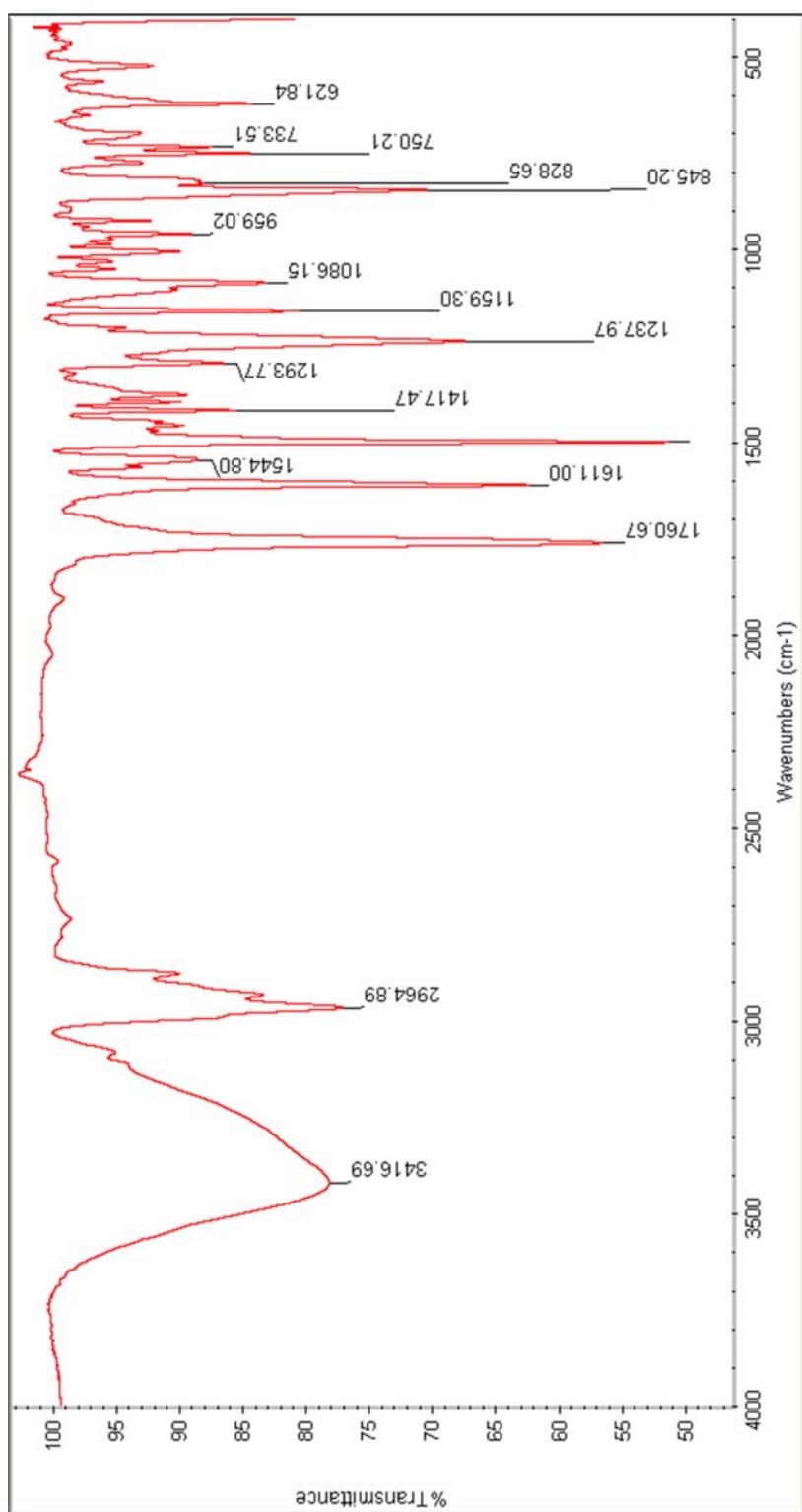
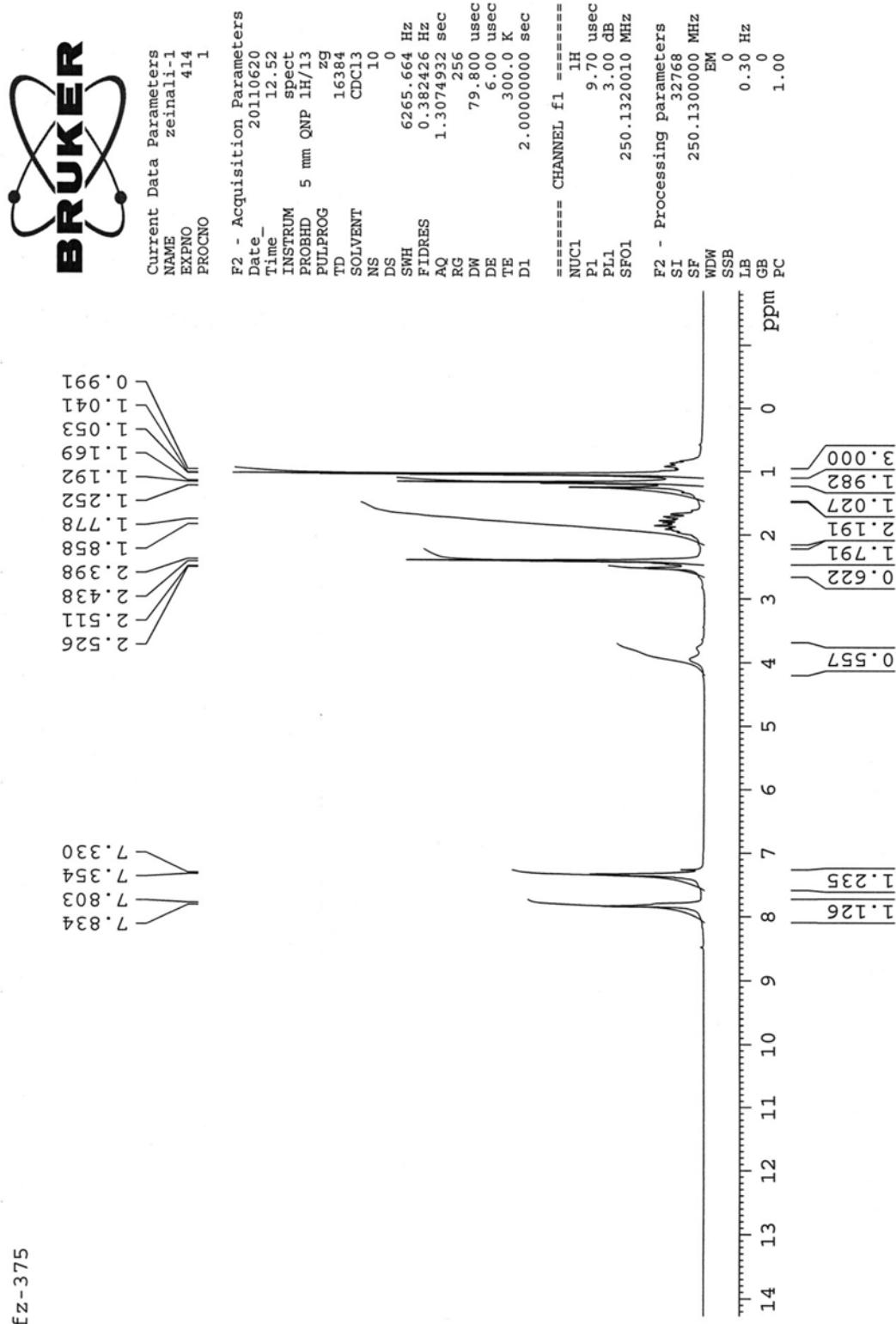
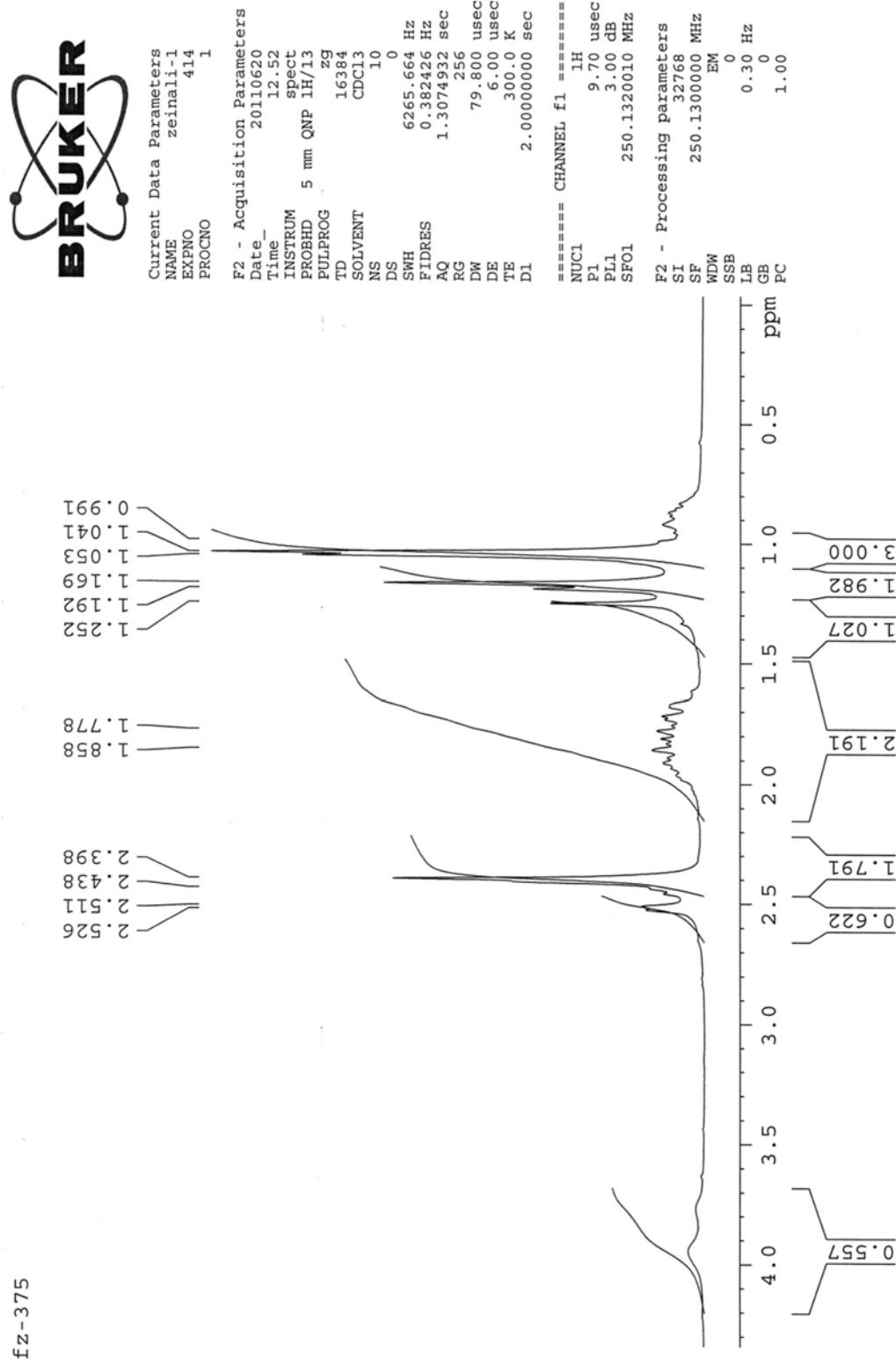
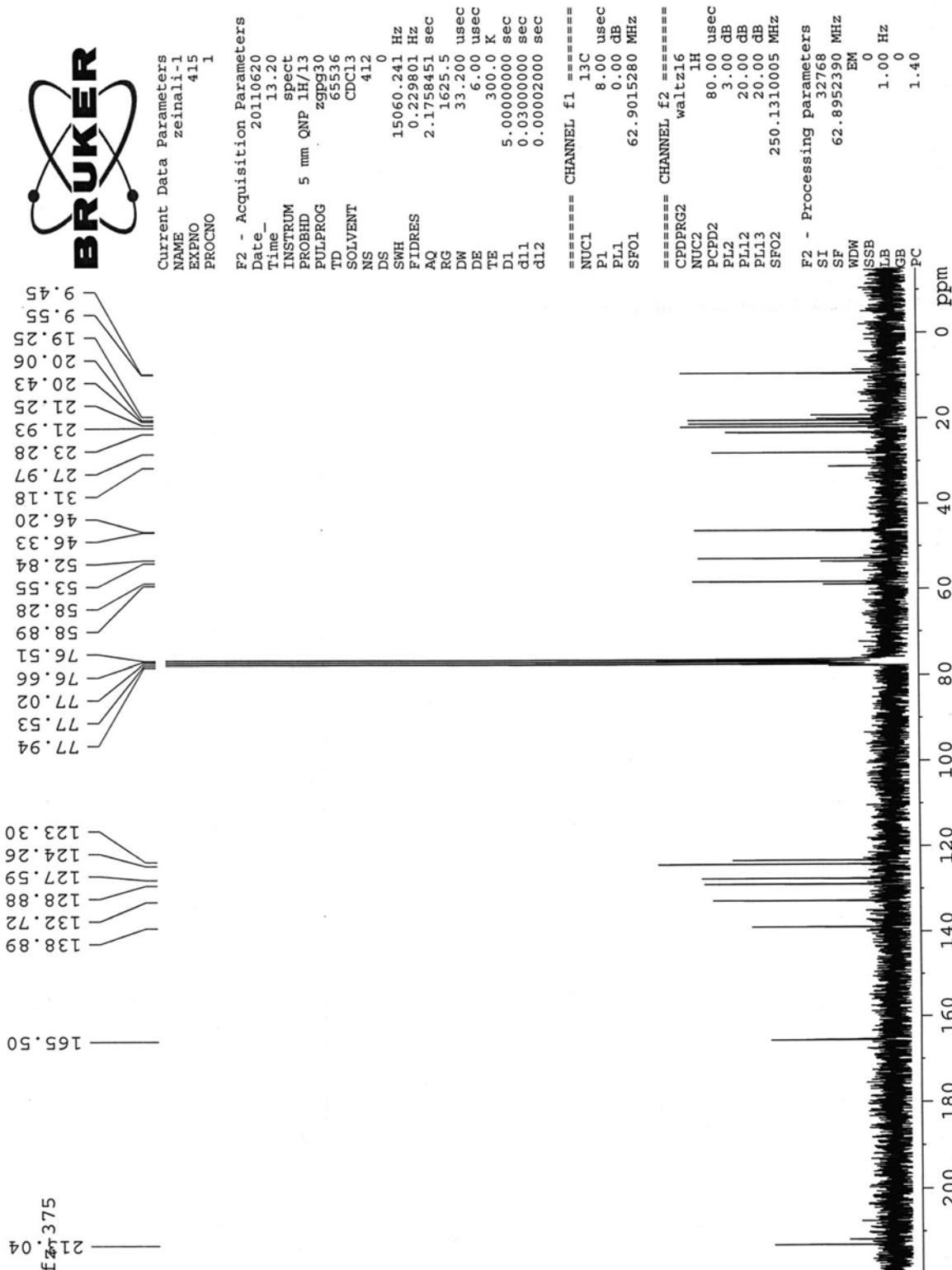


Figure 32. IR spectrum of **4i**.



**Figure 33.**  $^1\text{H}$  NMR spectrum of **4j**.

Figure 33. <sup>1</sup>H NMR spectrum of **4j**.

Figure 34.  $^{13}\text{C}$  NMR spectrum of **4j**.

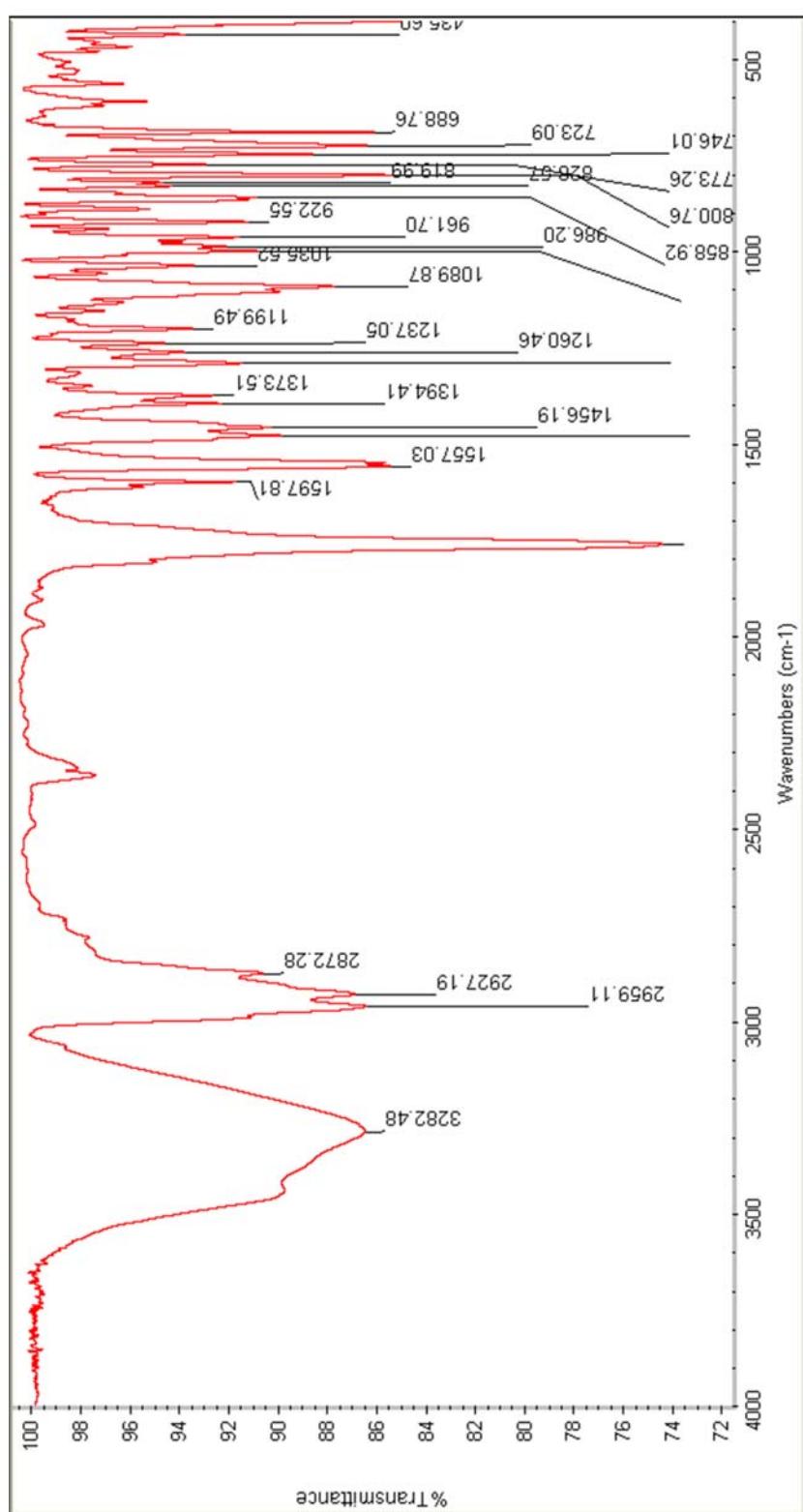
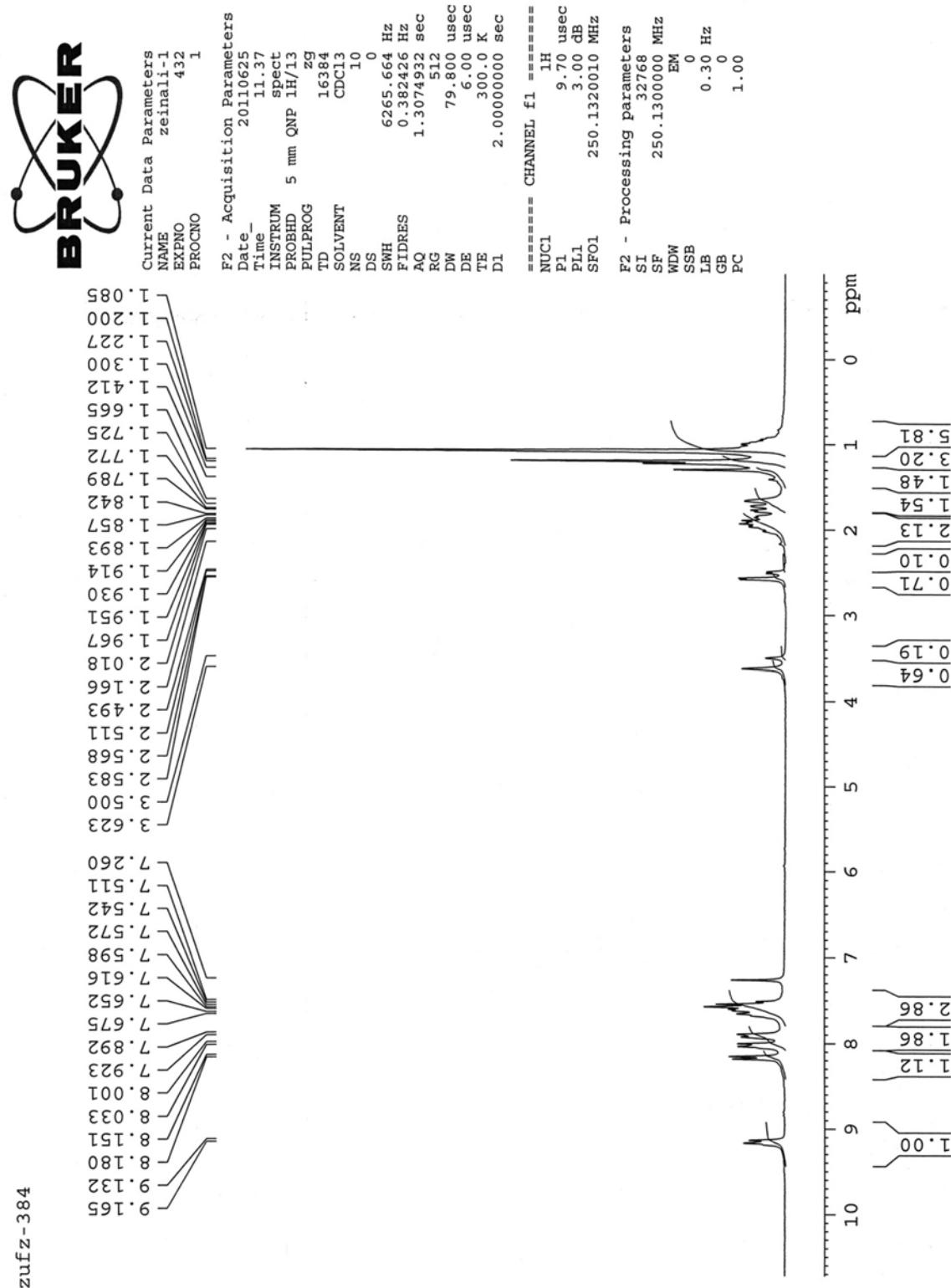
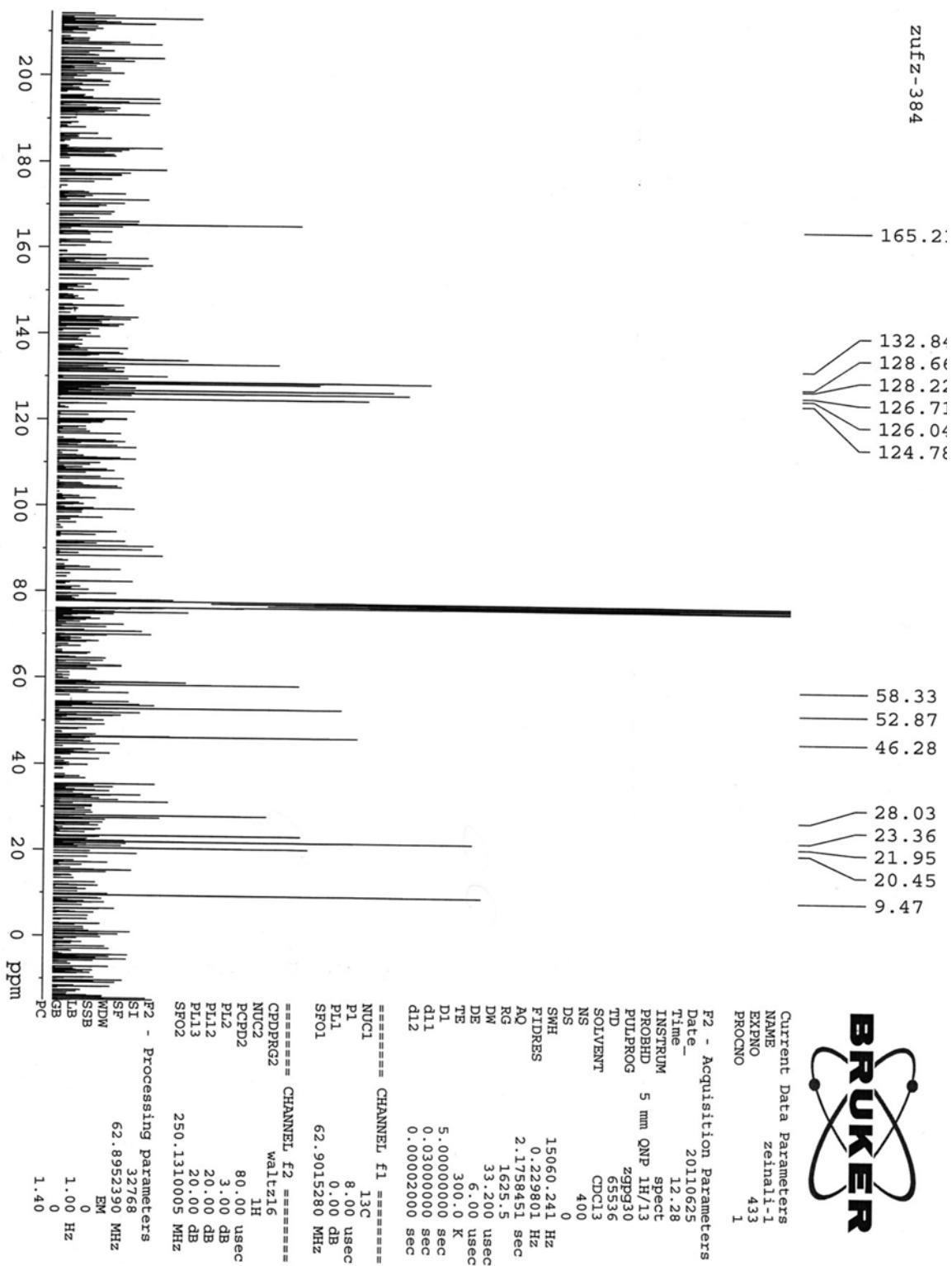


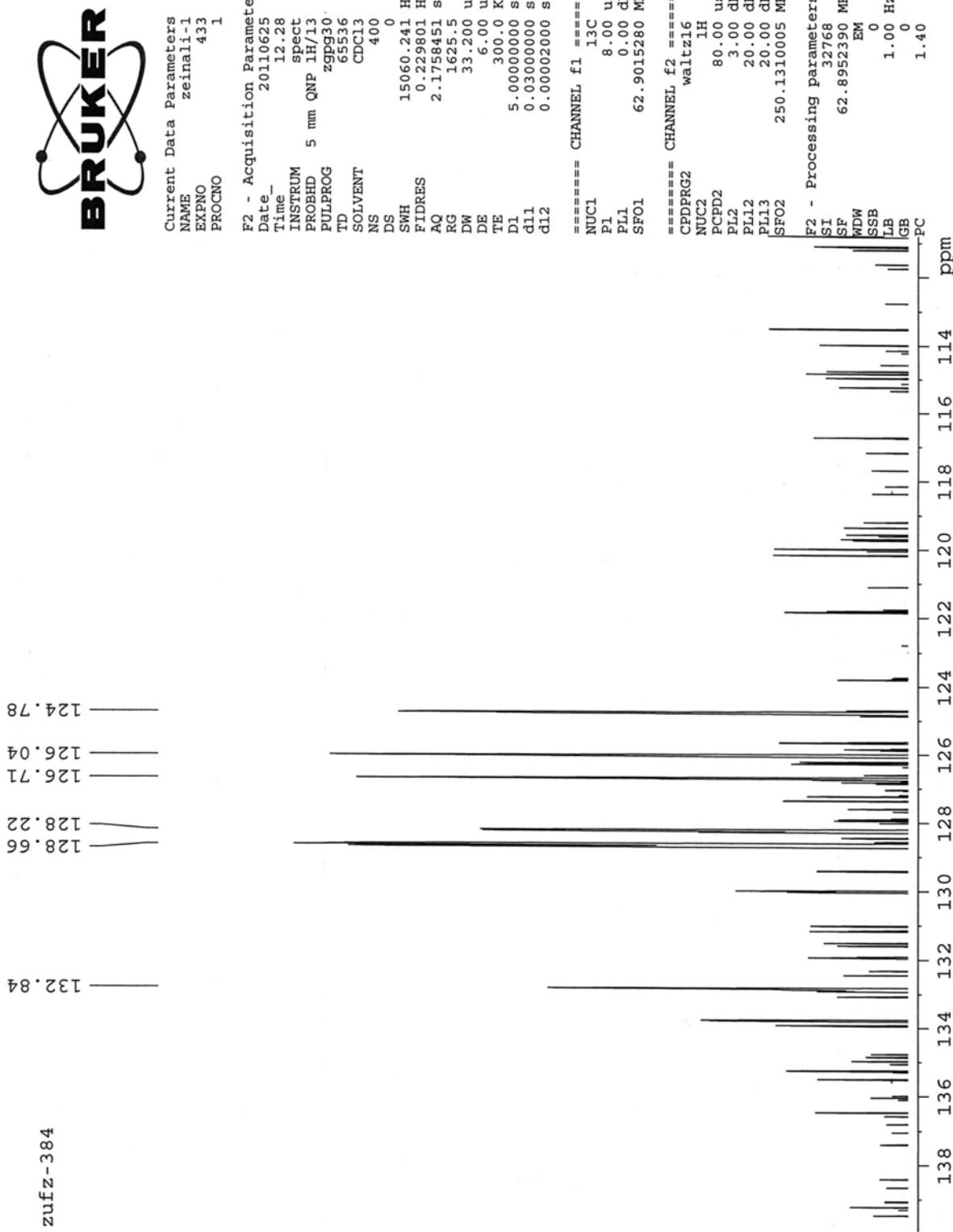
Figure 35. IR spectrum of 4j.



**Figure 36.**  $^1\text{H}$  NMR spectrum of **4k**.

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**Figure 37.** <sup>13</sup>C NMR spectrum of **4k**.

Figure 37.  $^{13}\text{C}$  NMR spectrum of **4k**.

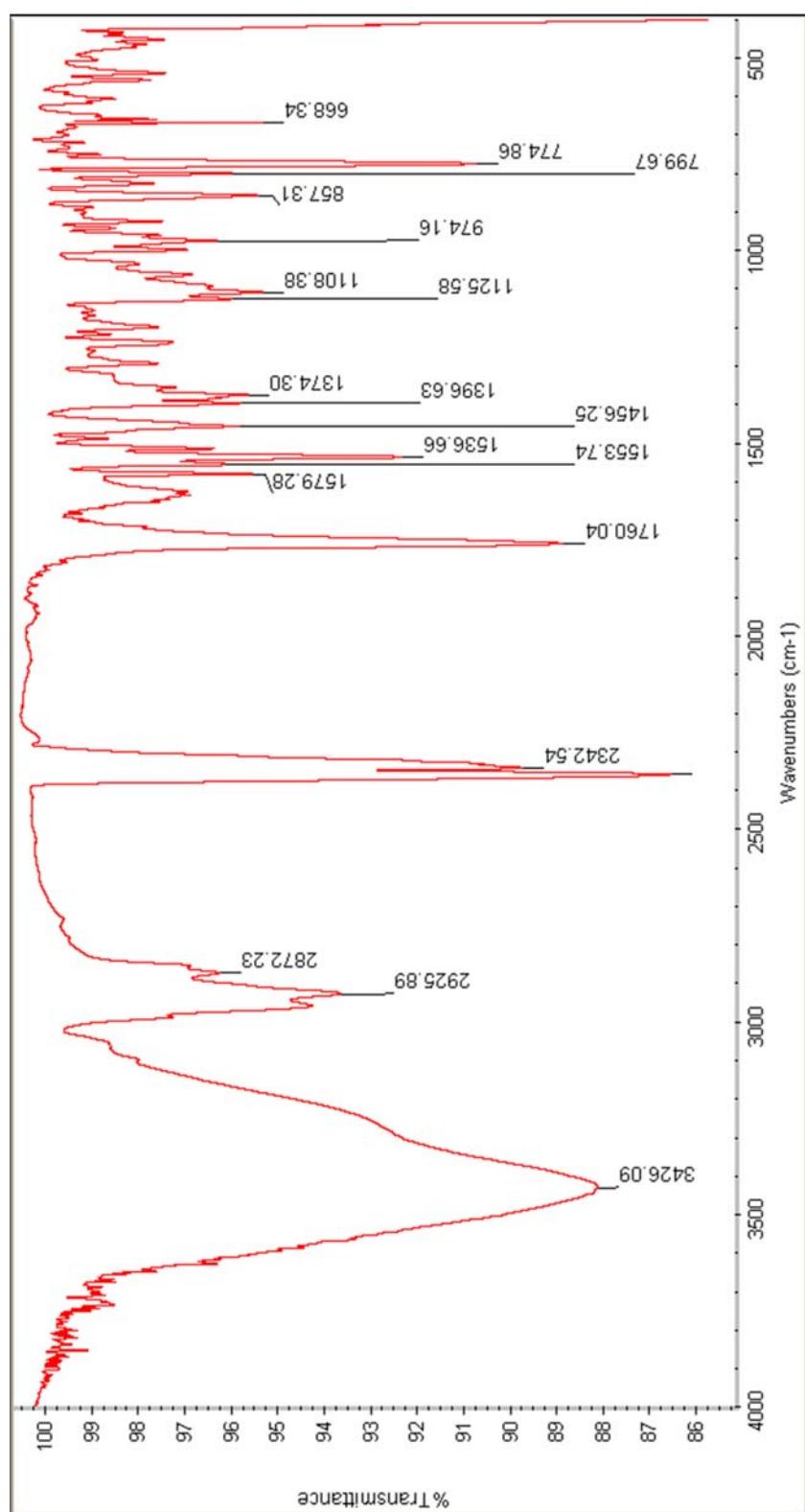
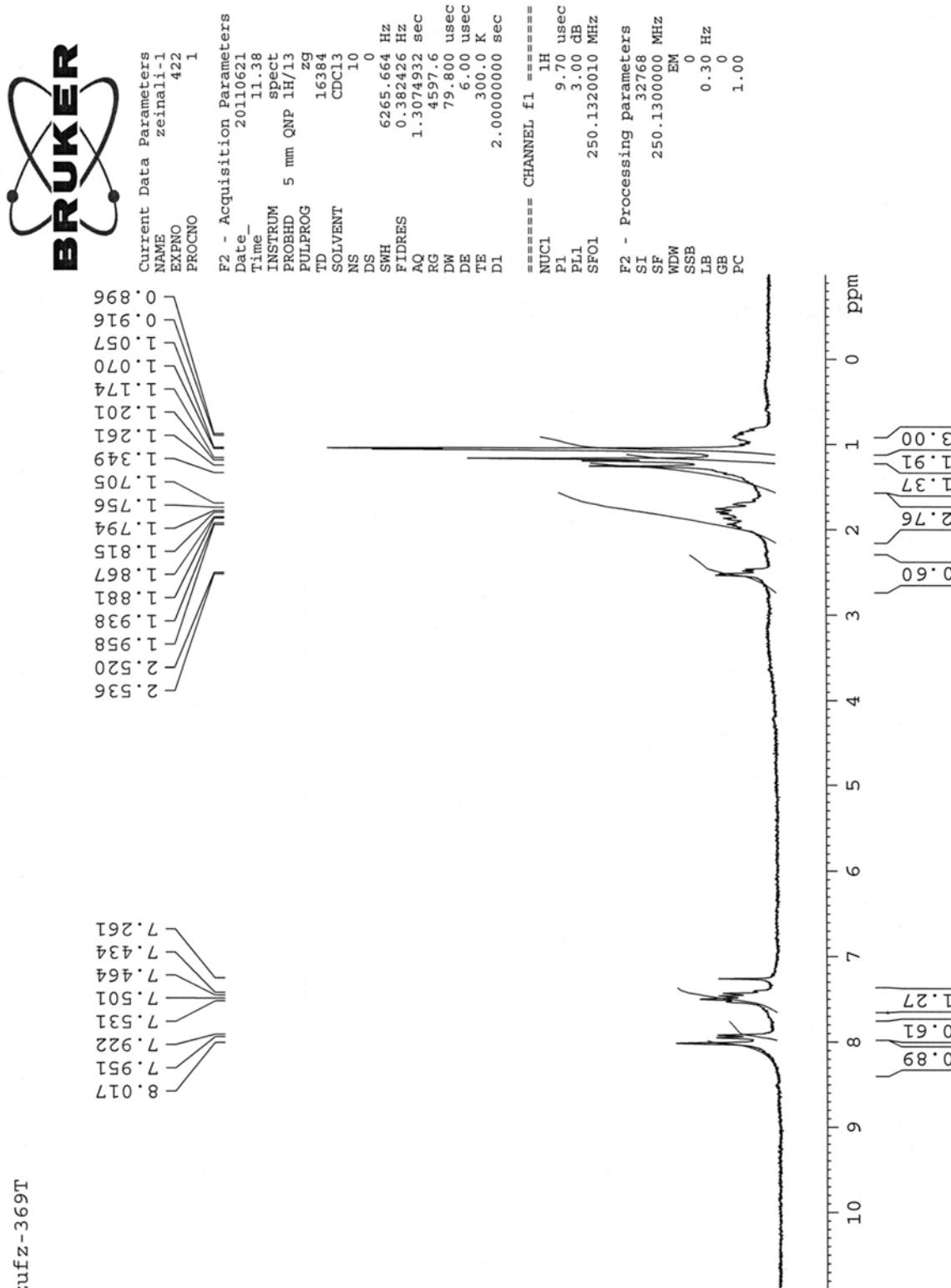
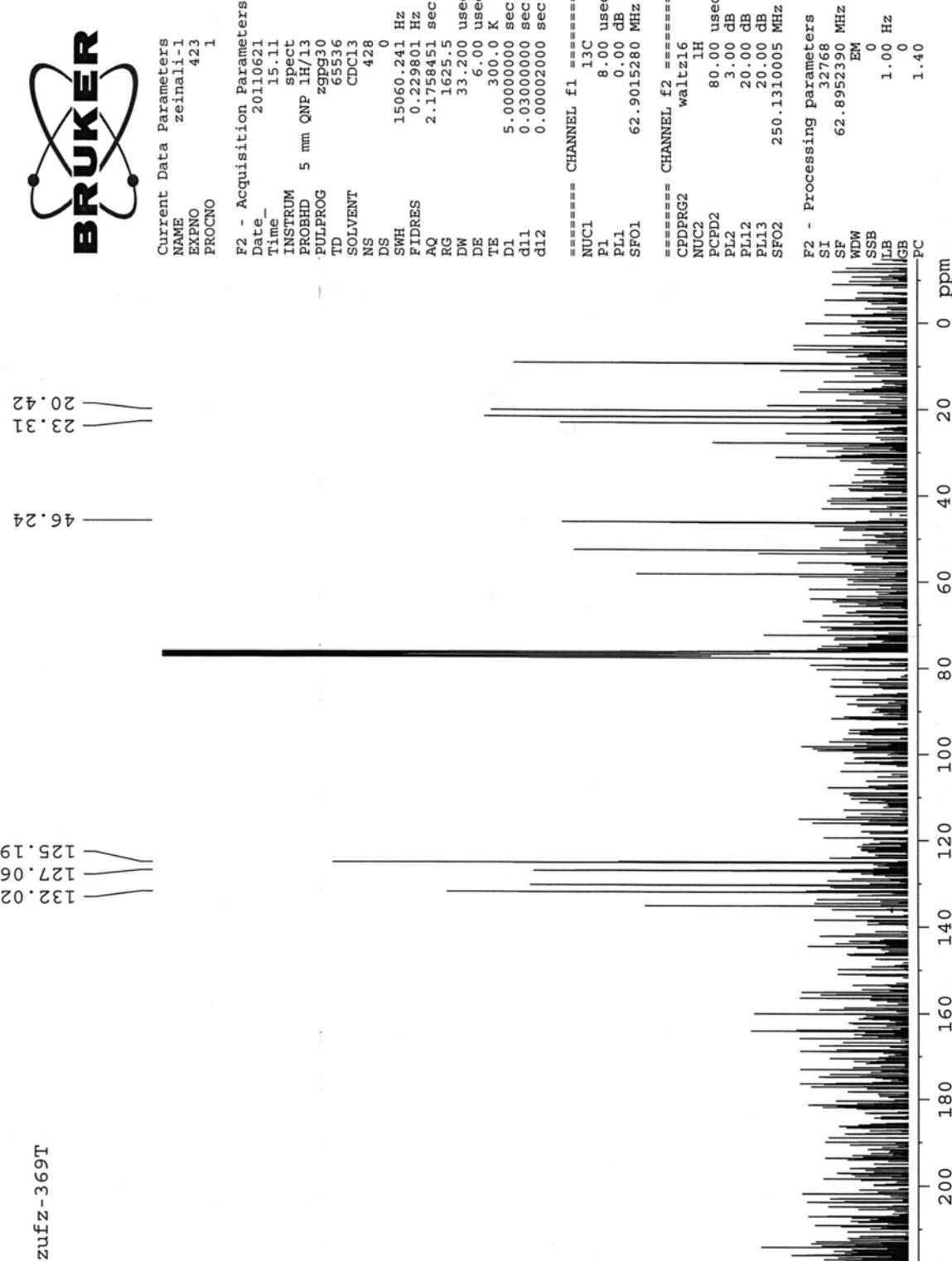
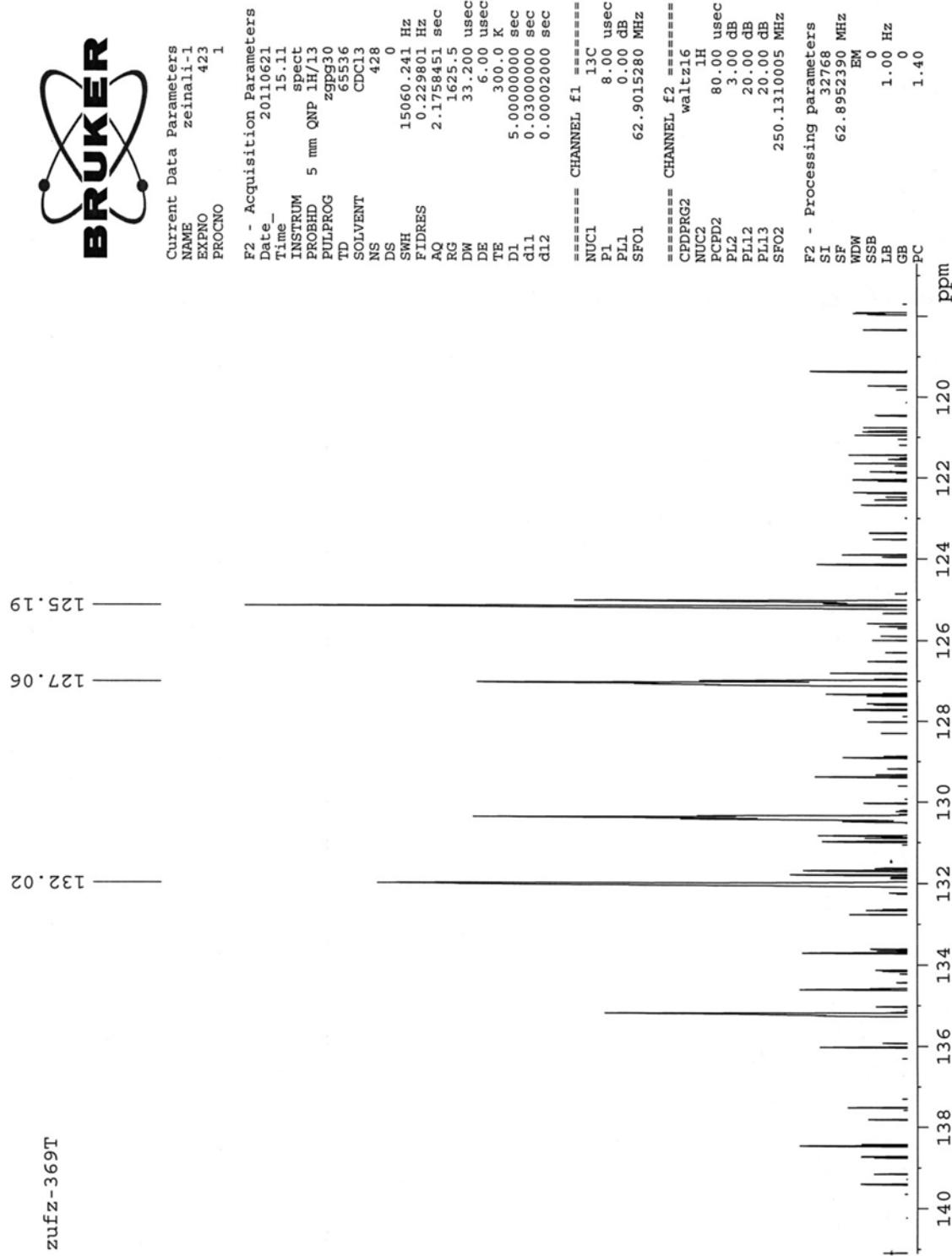


Figure 38. IR spectrum of **4k**.

**Figure 39.** <sup>1</sup>H NMR spectrum of **4l**.

**Figure 40.**  $^{13}\text{C}$  NMR spectrum of **4l**.

**Figure 40.**  $^{13}\text{C}$  NMR spectrum of **4l**.

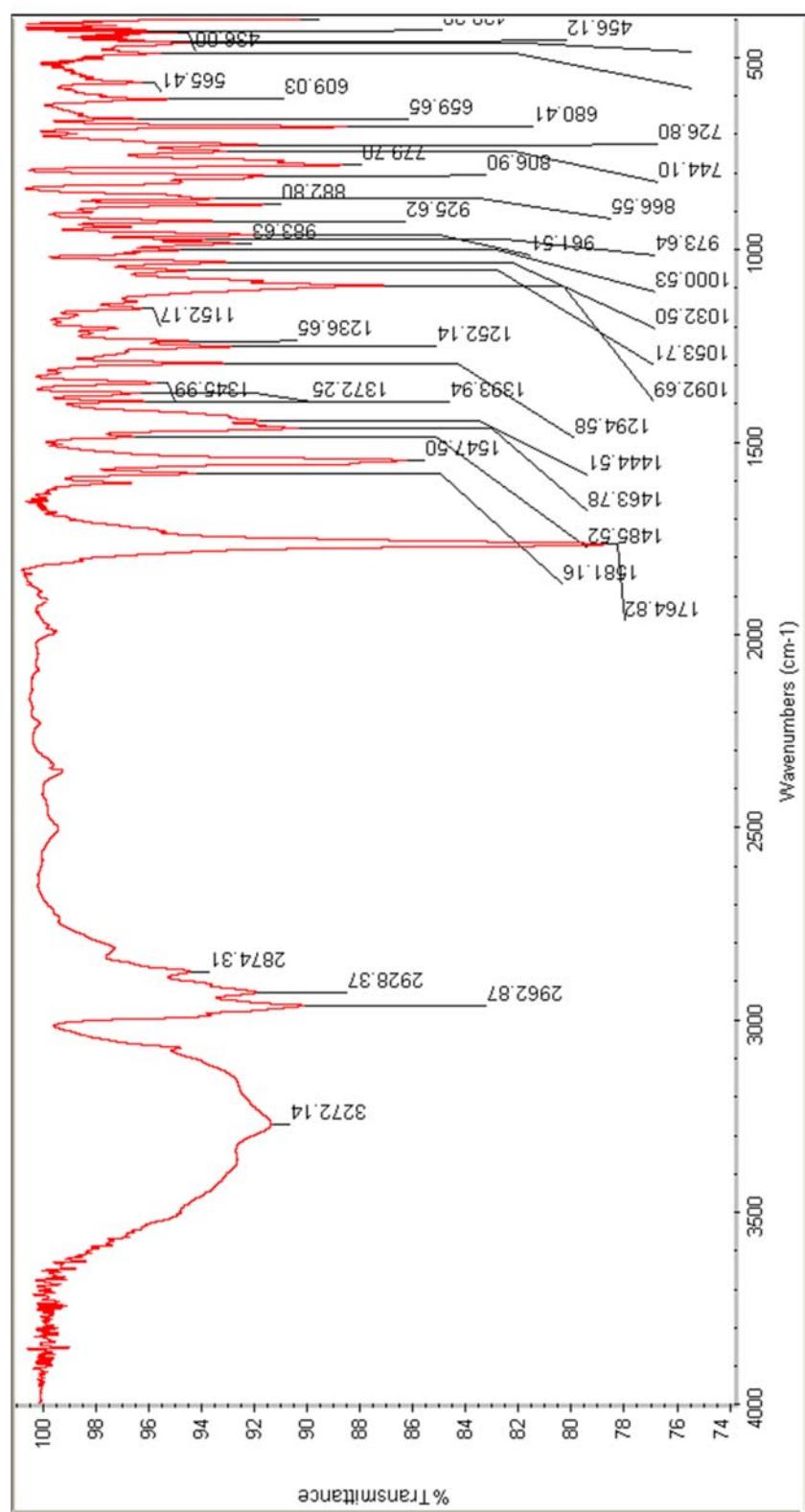
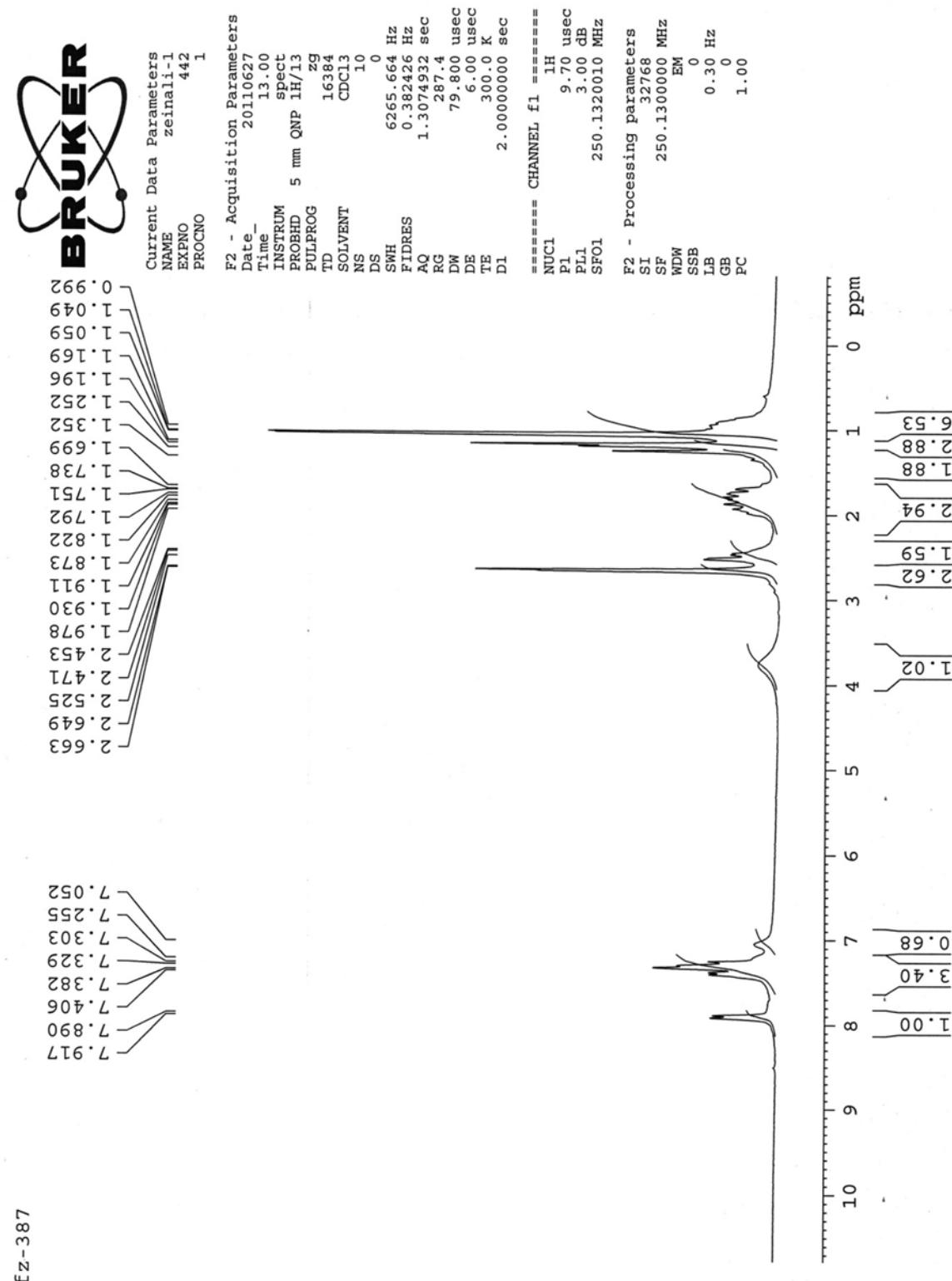
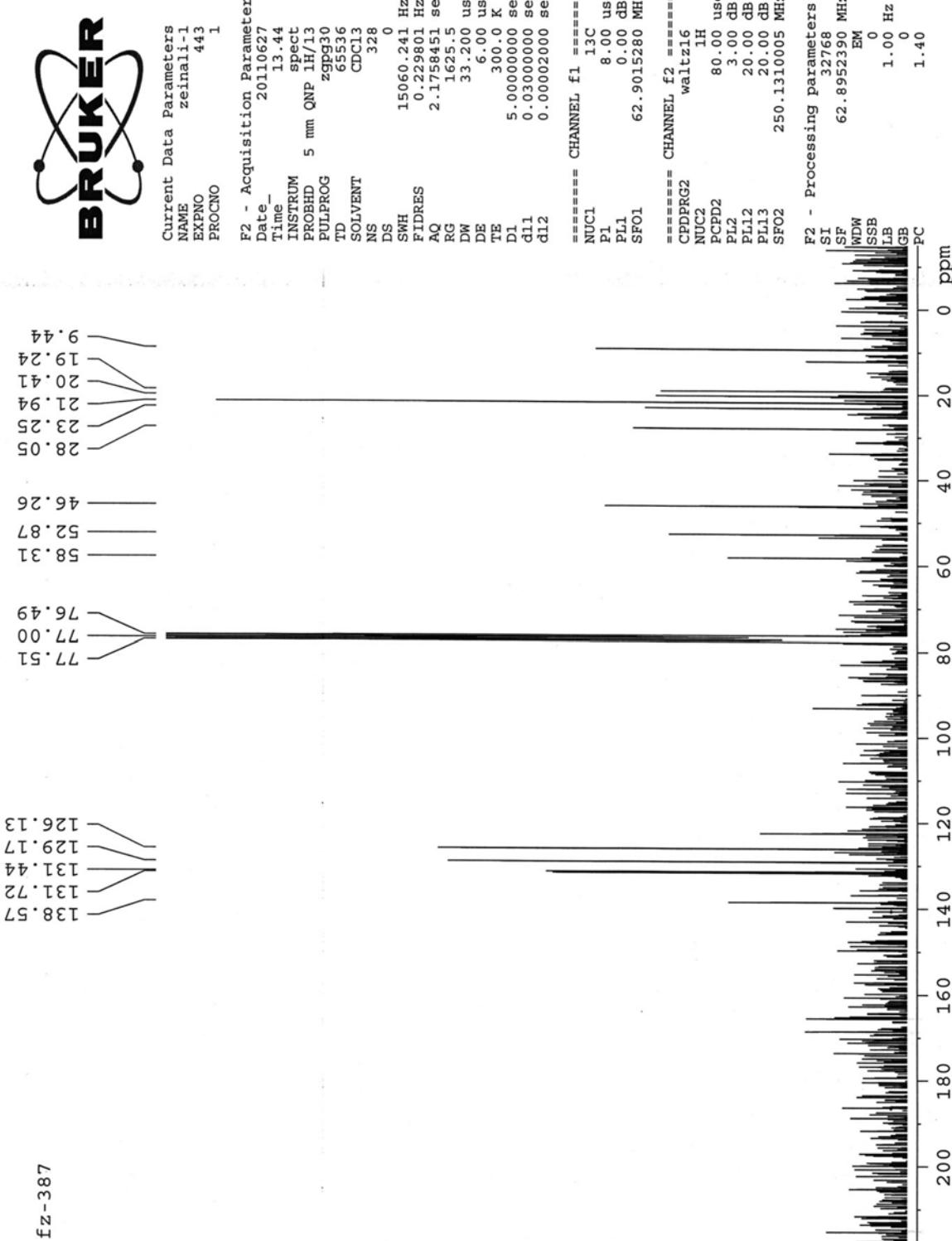


Figure 41. IR spectrum of 4l.



**Figure 42.**  $^1\text{H}$  NMR spectrum of **4m**.

**Figure 43.**  $^{13}\text{C}$  NMR spectrum of **4m**.

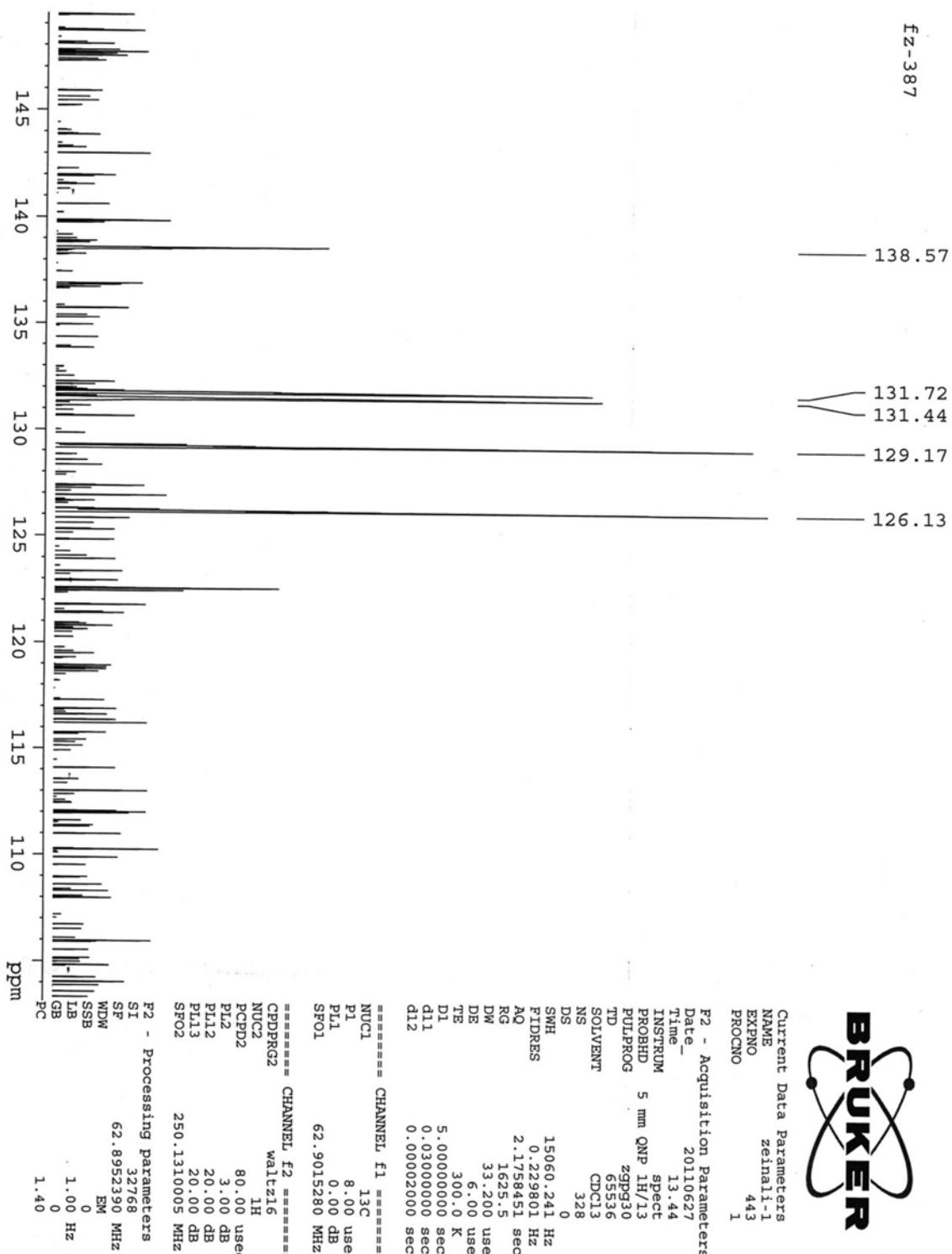


Figure 43. <sup>13</sup>C NMR spectrum of **4m**.

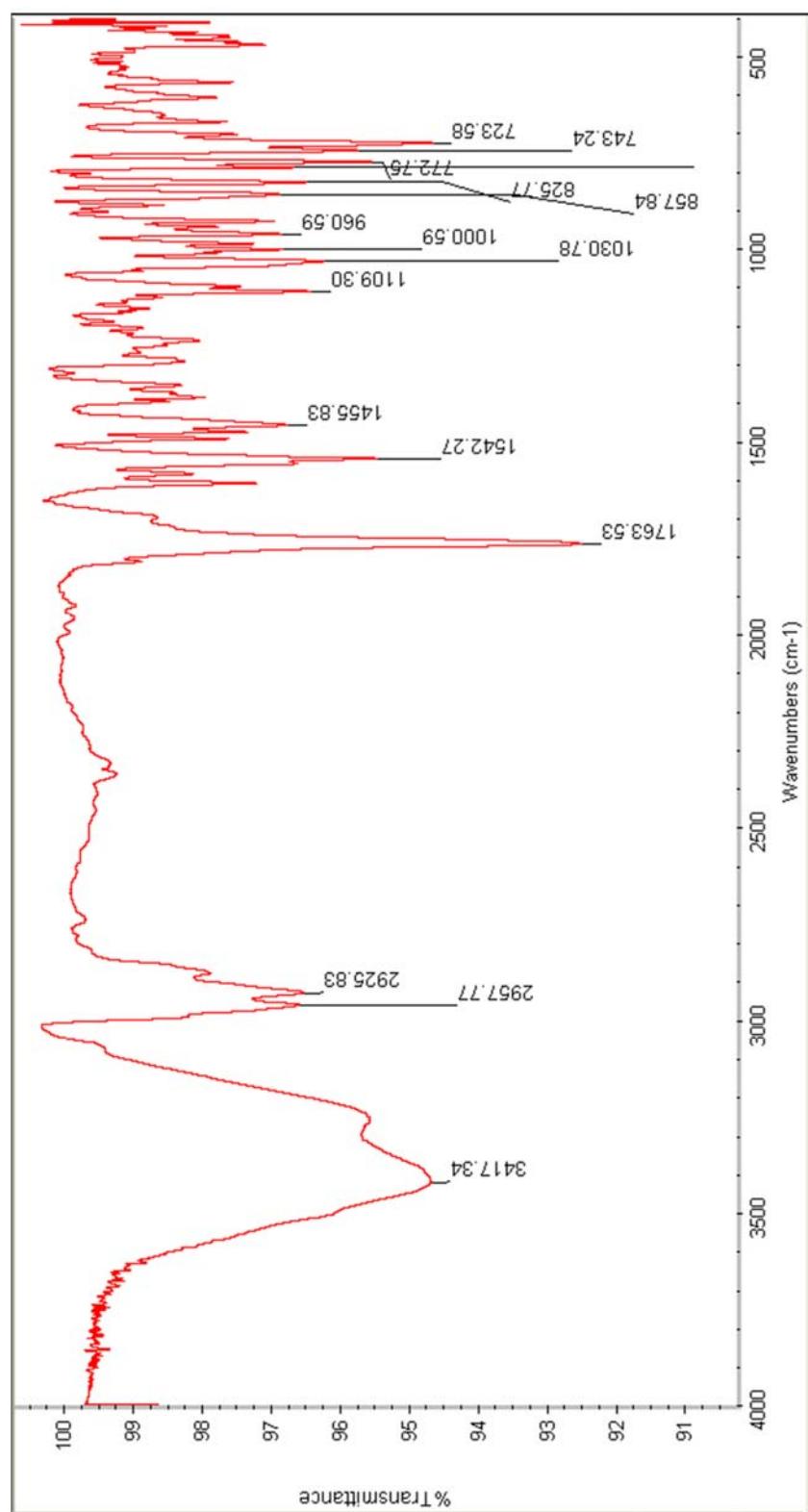
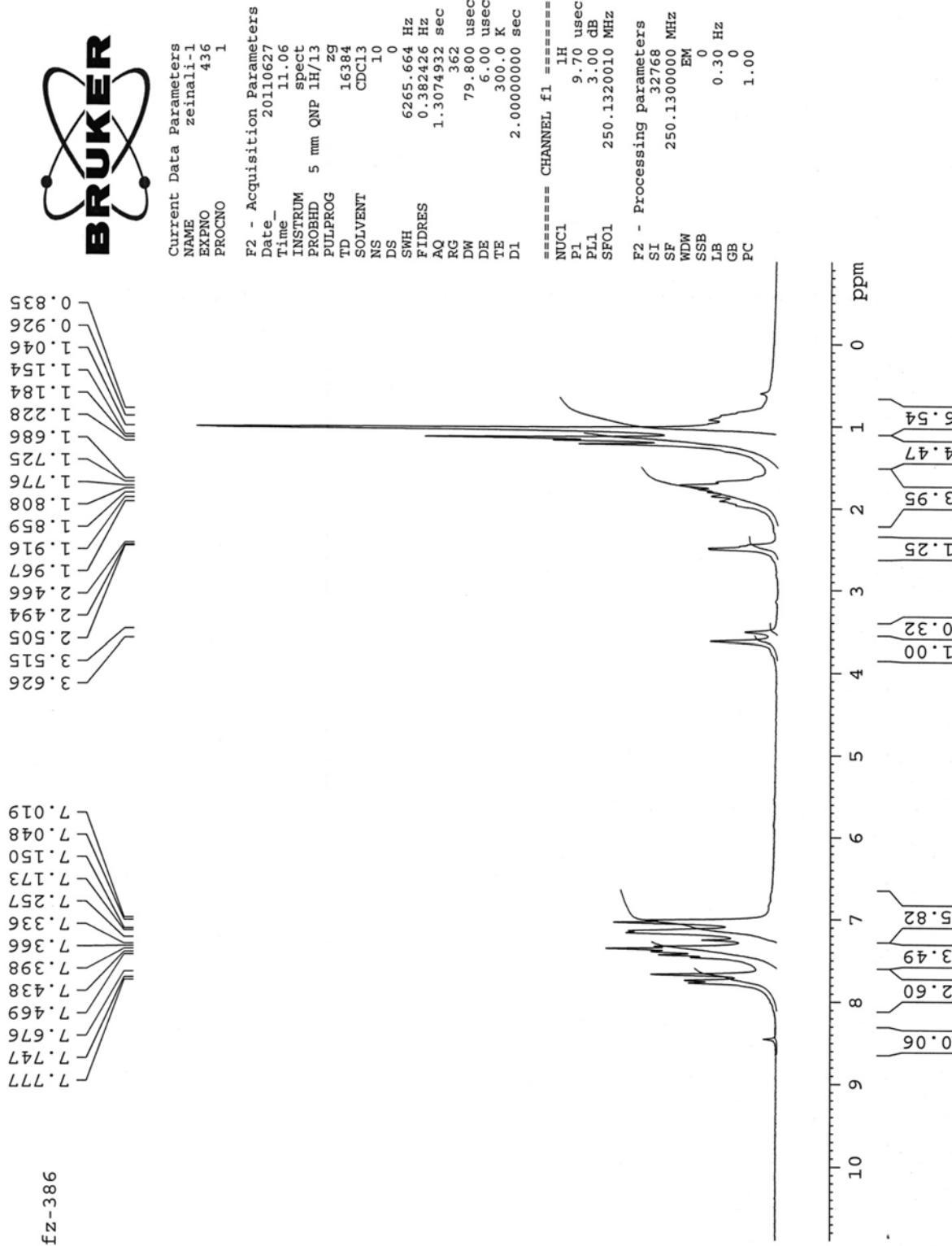
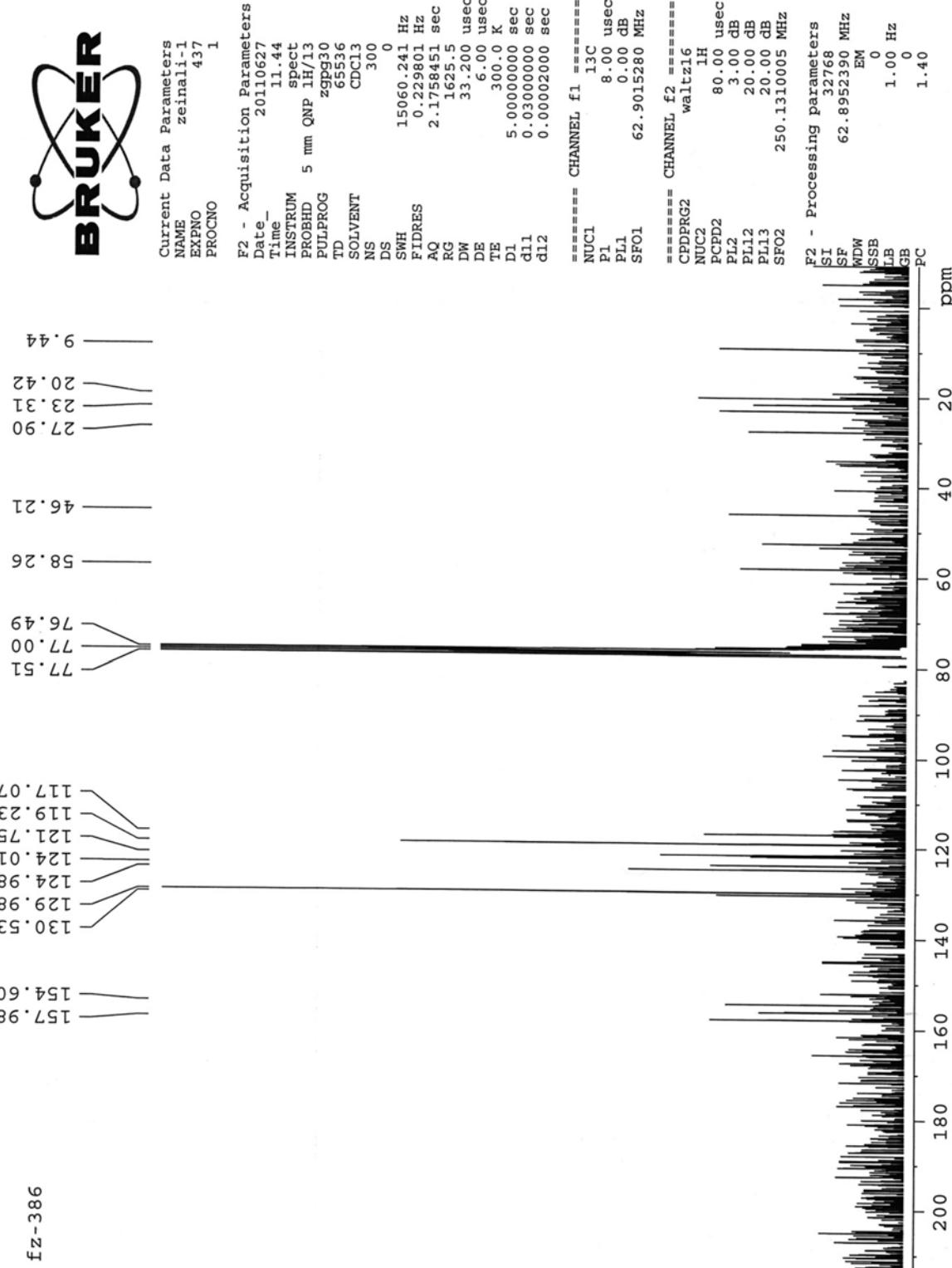
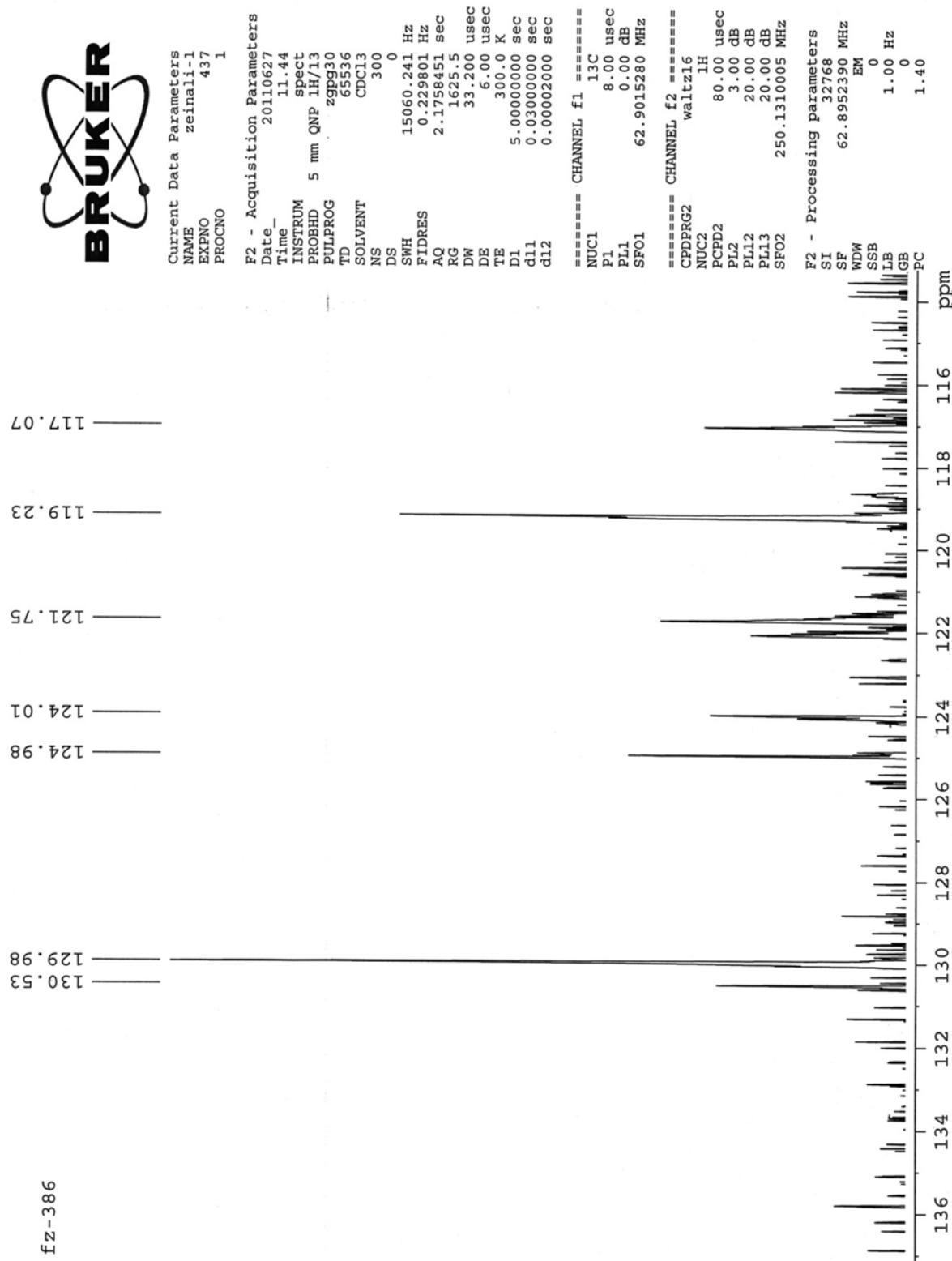


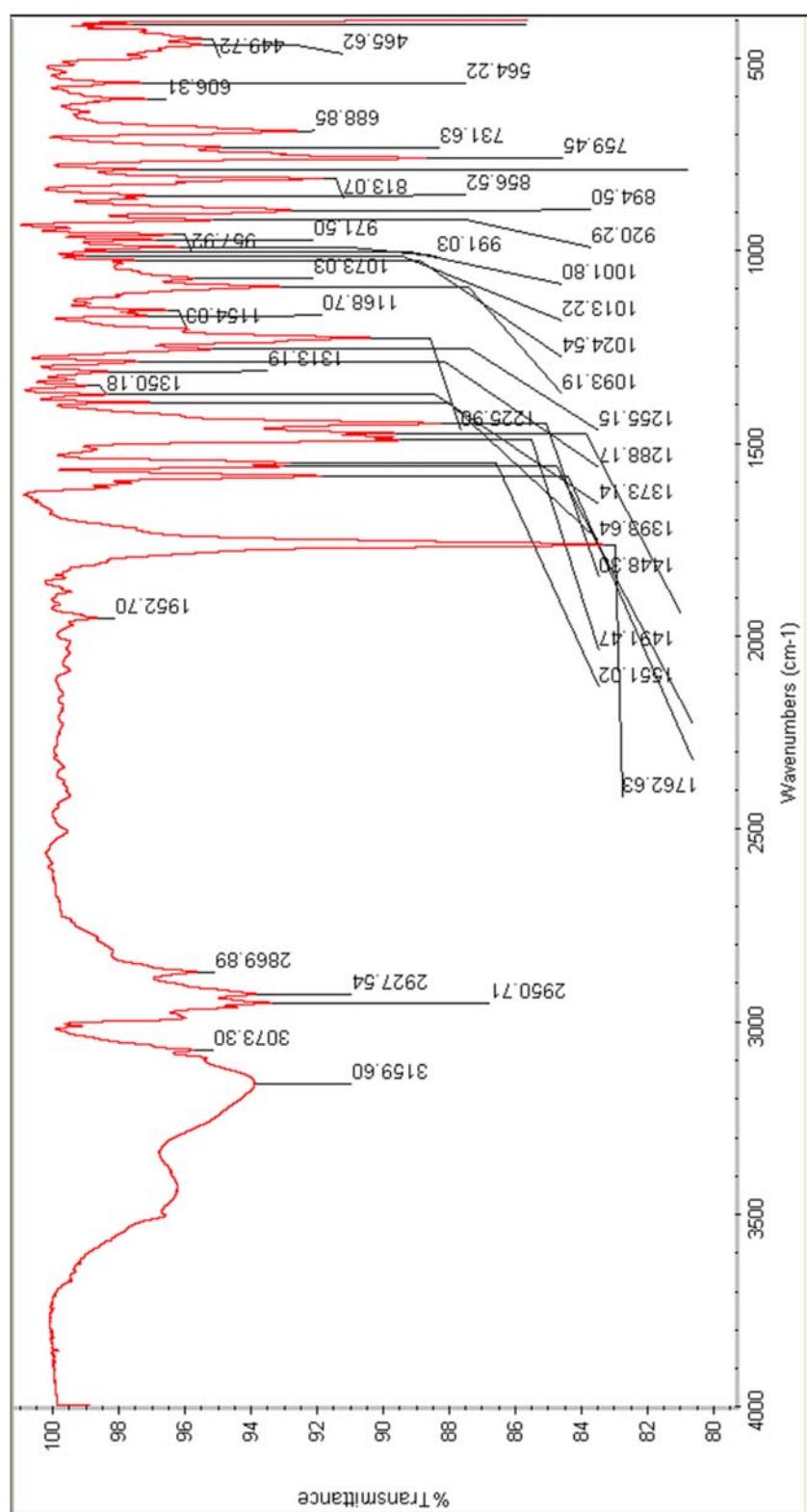
Figure 44. IR spectrum of **4m**.

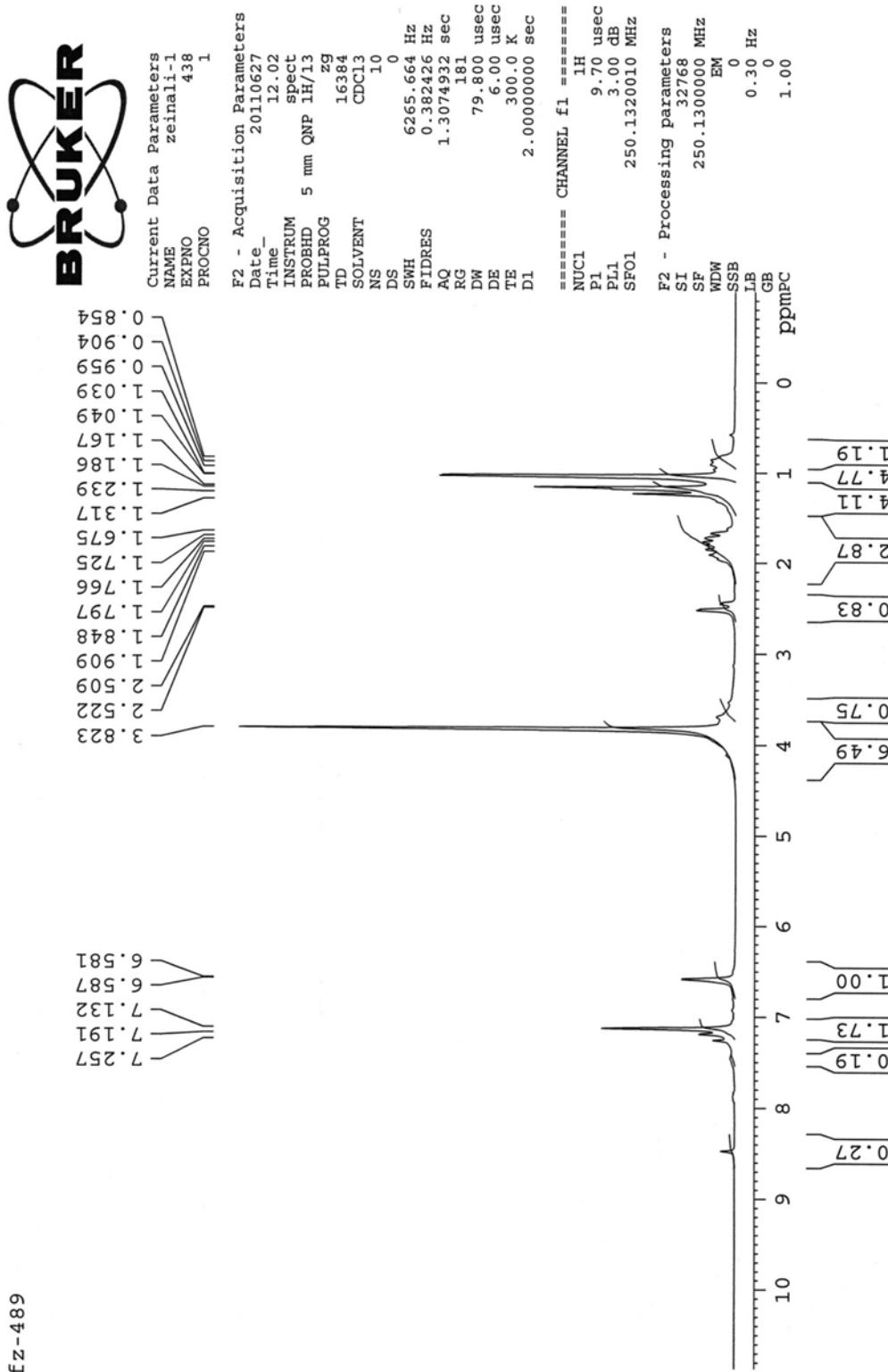


**Figure 45.**  $^1\text{H}$  NMR spectrum of **4n**.

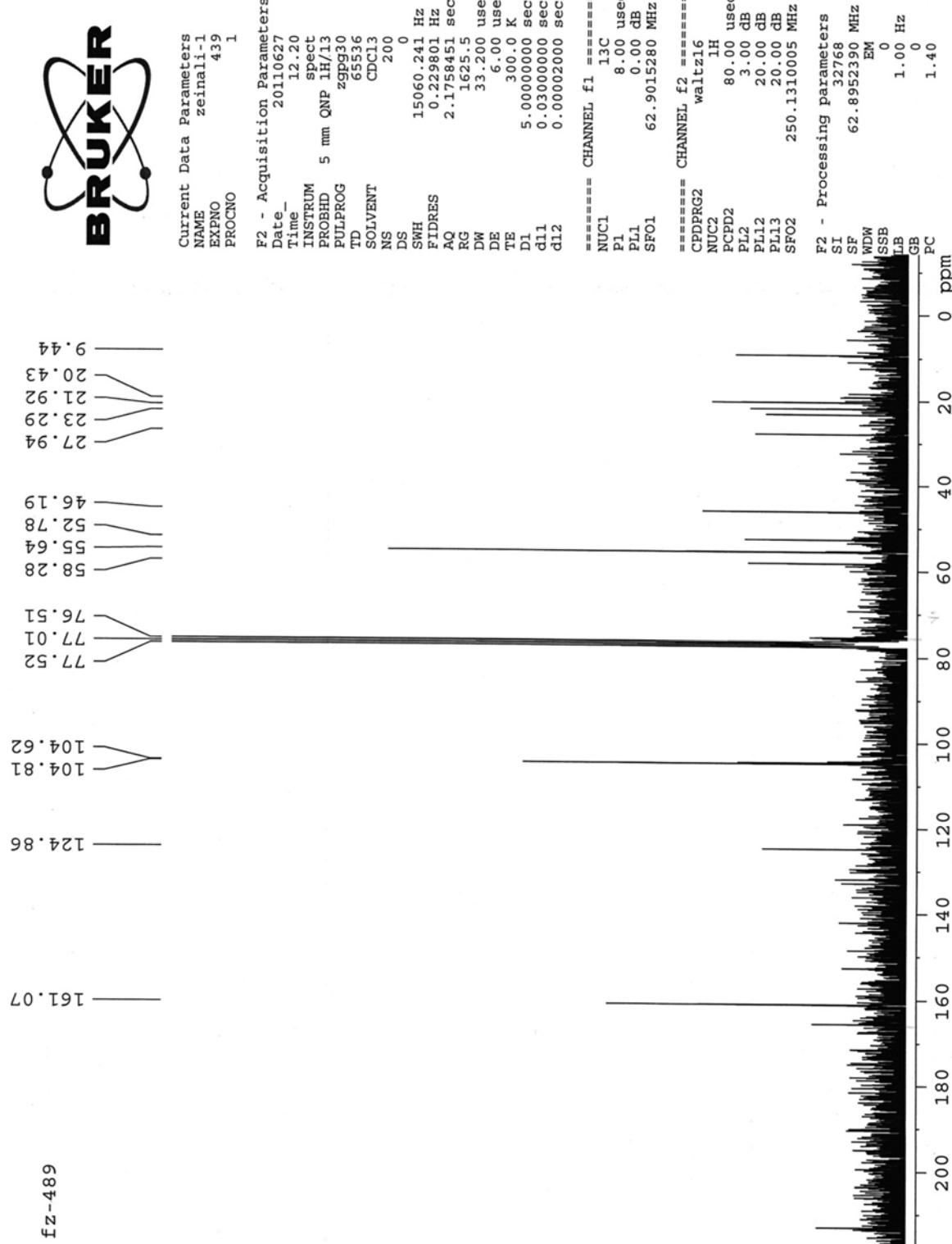
Figure 46.  $^{13}\text{C}$  NMR spectrum of **4n**.

**Figure 46.** <sup>13</sup>C NMR spectrum of **4n**.

Figure 47. IR spectrum of **4n**.



**Figure 48.**  $^1\text{H}$  NMR spectrum of **4o**.

**Figure 49.** <sup>13</sup>C NMR spectrum of **4o**.

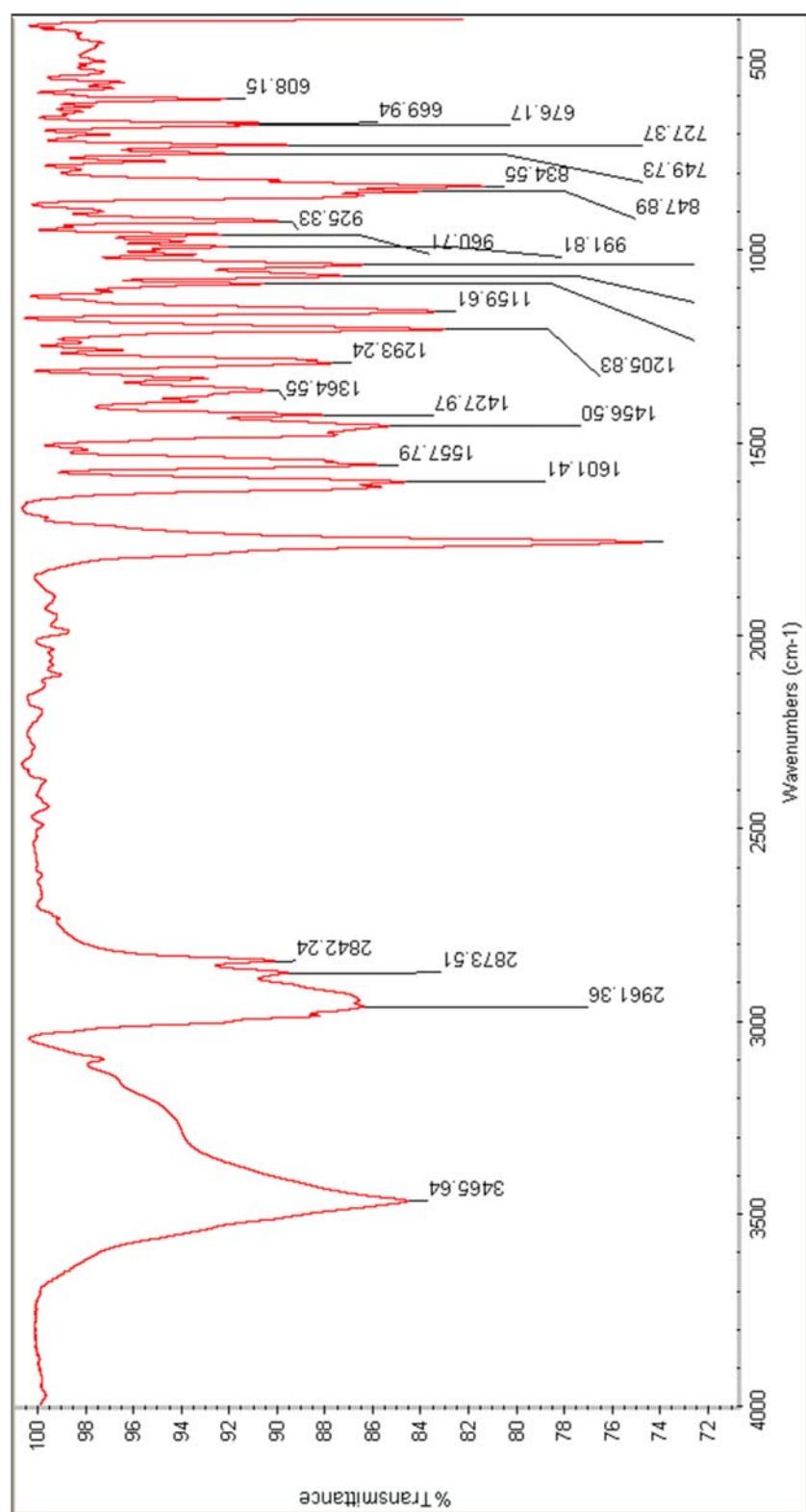


Figure 50. IR spectrum of **4o**.