Supporting Information for

A systematic study on the *Z*-enoate assisted Meyer-Schuster rearrangement

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General procedure:

To a solution of the *z*-enoate-propargylic alcohol[1] (1equi.) and the arene (5 equiv.) in dichloromethane (5 mL / 0.2 mmol, 0.04 *M*) under nitrogen atmosphere was added an acid (1.3 equi.). The reaction tube was stirred either at prescribed temperature (0 °C or 55 °C or higher temperature) for 1-8 h. After completion of the reaction (by TLC analysis), saturated $NaHCO_3$, and DCM were added to reaction mixture and extracted with DCM. The combined organic layer was washed with the brine, dried ($MgSO_4$) and solvent was evaporated under reduced pressure. The crude material was purified by flash column chromatography using hexane-ethyl acetate mixture as eluent to yield the corresponding α-OMs or α-OTs or α-Cl-enone derivatives and arene trapped products.

Ethyl 6-methyl-5-(methylsulfonyloxy)-4-oxohept-5-enoate (12)

^{1}H NMR (400 MHz, $CDCl_3$): δ = 4.12 (q, *J* = 7.2 Hz, 2 H), 3.19 (s, 3 H), 2.99 (t, *J* = 6.7 Hz, 2 H), 2.64 (t, *J* = 6.5 Hz, 2 H), 2.15 (s, 3 H), 2.01 (s, 3 H) and 1.25 (t, *J* = 7.2 Hz, 3 H) ppm.

^{13}C NMR (100 MHz, $CDCl_3$): δ = 194.9,172.9, 142.4, 139.8, 60.8, 38.6, 35.4, 28.3, 21.8, 20.6 and 14.3 ppm.

IR (neat): 2980, 2936, 1735 (C=O), 1699 (C=O), 1625, 1408, 1358, 1348, 1200, 1107, 968 and 821 cm^{-1}.

HR ESI-MS: $[C_{11}H_{19}O_6S]^+ = [M+H]^+$ requires 279.0897; found 297.0894.

TLC: R_f = 0.4 (3:1, Hex/EtOAc)

Ethyl 6-methyl-4-oxo-5-(tosyloxy)hept-5-enoate (21)

^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.80 (d, *J* = 8.4 Hz, 2 H), 7.25 (d, *J* = 8.2 Hz, 2 H), 4.12 (q, *J* = 7.2 Hz, 2 H), 2.93 (t, *J* = 6.8 Hz, 2 H), 2.58 (t, *J* = 6.6 Hz, 2 H), 3.07 (s, 3 H), 2.47 (s, 3 H), 1.99 (s, 3 H) and 1.25 (t, *J* = 7.2 Hz, 3 H) ppm.

^{13}C NMR (100 MHz, $CDCl_3$): δ = 195.8, 172.8, 145.9, 141.3, 140.2, 132.7, 130.1, 128.7, 60.7, 35.2, 28.4, 21.9, 20.7, 20.2 and 14.3 ppm.

IR (neat): 2980, 2936, 2927, 2858, 1731 (C=O), 1698 (C=O), 1626, 1607, 1598, 1444, 1395, 1377, 1373, 1191, 1178, 1089, 997 and 812 cm^{-1}.

HR ESI-MS: $[C_{17}H_{23}O_6S]^+ = [M+H]^+$ requires 355.1210; found 355.1206.

TLC: R_f = 0.4 (4:1, Hex/EtOAc).

M. P.; 93-97 °C.

Ethyl 5-chloro-6-methyl-4-oxohept-5-enoate (22)

^{1}H NMR (400 MHz, $CDCl_3$): δ = 4.14 (q, *J* = 7.1 Hz, 2 H), 3.08 (t, *J* = 6.6 Hz, 2 H), 2.60 (t, *J* = 6.6 Hz, 2 H), 2.13 (s, 3 H), 2.02 (s, 3 H) and 1.26 (t, *J* = 7.2 Hz, 3 H) ppm

^{13}C NMR (100 MHz, $CDCl_3$): δ = 196.4,172.9, 145.8, 125.6, 60.7, 36.3, 28.6, 24.7, 22.8 and 14.3 ppm.

IR (neat): 2965, 2926, 2875, 2854, 1736 (C=O), 1691 (C=O), 1596, 1493, 1461, 1375, 1340, 1268, 1188, 1061, 965 and 819 cm^{-1}.

HR ESI-MS: $[C_{10}H_{16}ClO_3]^+ = [M+H]^+$ requires 219.0782; found 219.0779

TLC: R_f = 0.4 (18:1, Hex/EtOAc).

Ethyl 5-(4-hydroxyphenyl)-6-methyl-4-oxohept-5-enoate (13)

The hydroxyester[1] (40 mg, 0.22 mmol), phenol (77 mg, 0.82 mmol), in DCM (4 mL), and MsOH (27.4 mg, 0.02 mmol, 0.29 ml of 1.4 *M* in DCM) were stirred for 24 h at 0 °C to RT. Purification by flash column chromatography (8:1 hexanes:EtOAc) gave the1,4-keto-ester **13** (18 mg, 0.065 mmol, 30%) as a pale yellow oil and α-OMs-enone **12** (22 mg, 0.08 mmol, 36%) as a pale yellow oil.

^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.30-7.37 (m, 2 H), 7.00 (t, *J* = 7.3 Hz, 1 H), 6.89 (d, *J* = 7.8 Hz, 1 H), 4.09 (q, *J* = 7.1 Hz, 2 H), 2.75 (t, *J* = 6.6 Hz, 2 H), 2.49 (t, *J* = 6.6 Hz, 2 H), 2.22 (s, 3 H), 1.781 (s, 3 H) and 1.22 (t, *J* = 7.1 Hz, 3 H) ppm.

^{13}C NMR (100 MHz, $CDCl_3$): δ = 197.7, 173.0, 157.5, 143.0, 139.6, 130.1, 122.1, 114.7, 60.6, 35.1, 28.0, 20.7, 20.1 and 14.3 ppm.

IR (neat): 2952, 2854, 1734 (OC=O), 1699 (C=O), 1611, 1548, 1514, 1442, 1364, 1312, 1281, 1155, 1105, 1054, 954 and 817 cm^{-1}.

HR ESI-MS: $[C_{16}H_{20}O_4Na]^+ = [M+Na]^+$ requires 299.1254; found 299.1258

TLC: R_f = 0.4 (8:1, Hex/EtOAc).

Ethyl 5-(2,3-dimethoxyphenyl)-6-methyl-4-oxohept-5-enoate (15)

The hydroxyester (40 mg, 0.22 mmol), 1,2-dimethoxybenzene (113 mg, 0.82 mmol), in DCM (4 mL), and MsOH (27.4 mg, 0.02 mmol, 0.29 ml of 1.4 *M* in DCM) were stirred for 5 h at 0 °C to RT. Purification by flash column chromatography (6:1 hexanes:EtOAc) gave the1,4-keto-ester **15** (24 mg, 0.075 mmol, 34%) as a pale yellow oil and α-OMs-enone **12** (33 mg, 0.12 mmol, 54%) as a pale yellow oil.

^{1}H NMR (500 MHz, $CDCl_3$): δ = 6.87 (d, *J* = 8.2 Hz, 1 H), 6. 71 (dd, *J* = 8.2 & 1.8 Hz, 1 H), 6.67 (m, 1 H), 4.09 (q, *J* = 7.1 Hz, 2 H), 3.89 (s, 3 H), 3.86 (s, 3 H), 2.57 (t, *J* = 6.6 Hz, 2 H), 2.49 (t, *J* = 6.3 Hz, 2 H), 2.02 (s, 3 H), 1.68 (s, 3 H) and 1.23 (t, *J* = 7.1 Hz, 3 H) ppm.

^{13}C NMR (125 MHz, $CDCl_3$): δ = 203.1, 173.1, 149.0, 148.3, 143.3, 137.9, 131.1, 122.3, 112.8, 111.3, 60.6, 56.0, 55.9, 37.4, 28.4, 23.6, 22.4 and 14.3 ppm.

IR (neat): 2923, 2853, 1734 (OC=O), 1687 (C=O), 1618, 1568, 1514, 1445, 1374, 1312, 1282, 1153, 1112, 1034, 957 and 813 cm^{-1}.

HR ESI-MS: $[C_{18}H_{24}O_5Na]^+ = [M+Na]^+$ requires 343.1516; found 343.1516

TLC: R_f = 0.4 (6:1, Hex/EtOAc).

Ethyl 5-(2,4-dimethoxyphenyl)-6-methyl-4-oxohept-5-enoate (16)

The hydroxyester (30 mg, 0.16 mmol), 1,3-dimethoxybenzene (113 mg, 0.82 mmol), in DCM (3 mL), and MsOH (19.2 mg, 0.02 mmol, 0.14 ml of 1.4 *M* in DCM) were stirred for 4 h at 0 °C to RT. Purification by

flash column chromatography (6:1 hexanes:EtOAc) gave the1,4-keto-ester **16** (35 mg, 0.11 mmol, 68%) as a pale yellow oil and α-OMs-enone **12** (6 mg, 0.02 mmol, 10%) as a pale yellow oil.

^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.01 (d, *J* = 8.0 Hz, 1 H), 6.51-6.47 (m, 2 H), 4.11 (q, *J* = 7.1 Hz, 2 H), 3.83 (s, 3 H), 3.75 (s, 3 H), 2.51-2.45 (m, 4 H), 2.90 (s, 3 H), 1.64 (s, 3 H) and 1.23 (t, *J* = 7.1 Hz, 3 H) ppm.

^{13}C NMR (100 MHz, $CDCl_3$): δ = 202.3, 173.3, 160.8, 158.3, 145.9, 133.7, 132.4, 120.4, 104.6, 98.8, 60.5, 55.6, 55.5, 36.7, 28.6, 24.2, 22.6 and 14.3 ppm.

IR (neat): 2923, 2851, 1735 (OC=O), 1684 (C=O), 1608, 1578, 1504, 1443, 1372, 1302, 1272, 1155, 1114, 1033 and 800 cm^{-1}.

HR ESI-MS: $[C_{18}NaH_{24}O_5]^+ = [M+Na]^+$ requires 343.1516; found 343.1509

TLC: R_f = 0.4 (6:1, Hex/EtOAc).

Ethyl 6-methyl-4-oxo-5-(2,4,6-trimethoxyphenyl)hept-5-enoate (18)

The hydroxyester (30 mg, 0.16 mmol), 1,3,5-trimethoxybenzene (138 mg, 0.82 mmol), in DCM (3 mL), and MsOH (19.2 mg, 0.02 mmol, 0.14 ml of 1.4 *M* in DCM) were stirred for 6 h at 0 °C to RT. Purification by flash column chromatography (4:1 hexanes:EtOAc) gave the1,4-keto-ester **18** (42 mg, 0.12 mmol, 75%) as a pale yellow oil.

^{1}H NMR (500 MHz, $CDCl_3$): δ = 6.15 (s, 2 H), 4.08 (q, *J* = 7.0 Hz, 2 H), 3.84 (s, 3 H), 3.75 (s, 6 H), 2.45 (s, 4 H), 2.14 (s, 3 H), 1.56 (s, 3 H) and 1.22 (t, *J* = 7.0 Hz, 3 H) ppm.

^{13}C NMR (125 MHz, $CDCl_3$): δ = 201.8,173.5, 161.3, 158.8, 148.2, 128.4, 109.0, 90.6, 60.4, 55.8, 55.4, 36.2, 28.7, 24.3, 22.5 and 14.3 ppm.

IR (neat): 2932, 2844, 1734 (OC=O), 1689 (C=O), 1605, 1585, 1495, 1462, 1414, 1371, 1336, 1205, 1153, 1061, 952 and 813 cm^{-1}.

HR ESI-MS: $[C_{19}H_{26}O_6Na]^+ = [M+Na]^+$ requires 373.1622; found373.1618

TLC: R_f = 0.4 (4:1, Hex/EtOAc).

Ethyl 6-methyl-4-oxo-5-(thiophen-2-yl)hept-5-enoate (20)

The hydroxyester (40 mg, 0.22 mmol), thiophene (69 mg, 0.82 mmol), in DCM (4 mL), and MsOH (27.4 mg, 0.02 mmol, 0.29 ml of 1.4 *M* in DCM) were stirred for 2 h at 0 °C to RT. Purification by flash column chromatography (9:1 hexanes:EtOAc) gave the1,4-keto-ester **20** (23 mg, 0.086 mmol, 39%) as a pale yellow oil and α-OMs-enone **12** (24 mg, 0.086 mmol, 40%) as a pale yellow oil.

^{1}H NMR (500 MHz, $CDCl_3$): δ = 7.32 (dd, *J* = 5.2 & 1.2 Hz, 1 H), 7.03 (dd, *J* = 5.2 & 3.4 Hz, 1 H), 6.84 (dd, *J* = 3.4 & 1.2 Hz, 1 H), 4.11 (q, *J* = 7.1 Hz, 2 H), 2.69 (t, *J* = 6.6 Hz, 2 H), 2.52 (t, *J* = 6.6 Hz, 2 H), 2.05 (s, 3 H), 1.81 (s, 3 H) and 1.23 (t, *J* = 7.1 Hz, 3 H) ppm.

^{13}C NMR (125 MHz, $CDCl_3$): δ = 202.1, 173.0, 147.4, 139.1, 130.7, 127.9, 127.3, 126.4, 60.6, 37.1, 28.4, 24.0, 22.8 and 14.3 ppm.

IR (neat): 2932, 2853, 1735 (OC=O), 1697 (C=O), 1614, 1568, 1514, 1443, 1374, 1312, 1283, 1153, 1115, 1044, 954 and 819 cm^{-1}.

HR ESI-MS: $[C_{14}H_{19}O_3S]^+ = [M+Na]^+$ requires 267.1049; found 267.1042.

TLC: R_f = 0.4 (9:1, Hex/EtOAc).

5-(4-Chlorophenyl)-3-methylpent-1-yn-3-ol (S_1)

The ketone[2] (150 mg, 0.82 mmol), anhydrous THF (5 mL), ethynyl magnesium bromide (3.3 ml, 1.6 mmol, 0.5 M in THF) were stirred for 2 h at 0 °C. Purification by flash column chromatography (9:1 hexane:EtOAc) gave alcohol **S_1** (160 mg, 0.78 mmol, 95%) as a color less oil.

^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.24 (d, *J* = 8.4 Hz, 2 H), 7.15 (d, *J* = 8.4 Hz, 2 H), 2.85-2.80 (m, 2 H), 2.51 (s, 1 H), 2.04 (br s, 1H), 2.01-1.90 (m, 2 H) and 1.55 (s, 3 H) ppm.

^{13}C NMR (100 MHz, $CDCl_3$): δ = 140.4, 131.8, 129.9, 128.7, 87.3, 72.1, 68.0, 45.1, 30.6 and 30.2 ppm.

IR (neat): 3387, 3298, 2980, 2932, 2865, 1491, 1454, 1371, 1158, 1093, 1016, 907 and 661 cm^{-1}.

HR ESI-MS: $[C_{12}H_{13}ClNaO_3]^+ = [M+Na]^+$ requires 231.0547; found 231.0540

TLC: R_f = 0.4 (5:1, Hex/EtOAc)

(*Z*)-Ethyl 8-(4-chlorophenyl)-6-hydroxy-6-methyloct-2-en-4-ynoate (23)

Iodo-ester[3] (223 mg, 0.99 mmol), alcohol **S_1** (170 mg, 0.83 mmol), dry THF (8 mL), dry DIPA (2 ml), CuI (23.5 mg, 0.12 mmol) and $PdCl_2(PPh_3)_2$ (5.8 mg, 0.008 mmol) were stirred for 12 h at 0 °C to RT. Purification by flash column chromatography (4:1 hexane:EtOAc) gave the hydroxyester **23** (225 mg, 0.74 mmol, 89%) as a pale yellow oil.

^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.25-7.22 (m, 2 H), 7.18-7.16 (m, 2 H), 6.16 (d, *J* = 11.5 Hz, 1 H), 6.12 (d, *J* = 11.5 Hz, 1 H), 4.22 (q, *J* = 7.1 Hz, 2 H), 2.94-2.83 (m, 2 H), 2.07-1.95 (m, 2 H), 1.71 (br s, 1H), 1.60 (s, 3 H) and 1.30 (t, *J* = 7.1 Hz, 3 H) ppm.

^{13}C NMR (100 MHz, $CDCl_3$): δ = 164.7, 140.6, 131.7, 130.0, 129.2, 128.6, 122.6, 104.8, 80.9, 68.6, 60.6 (C-OH), 45.2, 30.6, 30.0 and 14.4 ppm.

IR (neat): 3439 (OH), 2981, 2935, 2864, 1712 (C=O), 1610, 1491, 1410, 1386, 1188, 1091, 1020, 816 and 665 cm^{-1}.

HR ESI-MS: $[C_{17}H_{19}ClNaO_3]^+ = [M+Na]^+$ requires 329.0915; found 329.0902

TLC: R_f = 0.4 (4:1, Hex/EtOAc)

Ethyl 8-(4-chlorophenyl)-6-methyl-5-(methylsulfonyloxy)-4-oxooct-5-enoate (25)

^{1}H NMR (400 MHz, $CDCl_3$): **Major isomer**: δ = 7.27-7.23 (m, 2 H), 7.17-7.14 (m, 2 H), 4.17-4.11 (m, 2 H), 3.15 (s, 3 H), 2.96-2.91 (m, 2 H), 2.82-2.71 (m, 4 H), 2.66-2.58 (m, 2 H), 1.93 (s, 3 H) and 1.27-1.23 (m, 3 H) ppm.

^{1}H NMR (400 MHz, $CDCl_3$): Minor: δ = 7.27-7.23 (m, 2 H), 7.17-7.14 (m, 2 H), 4.17-4.11 (m, 2 H), 3.19 (s, 3 H), 2.96-2.91 (m, 2 H), 2.82-2.71 (m, 4 H), 2.66-2.58 (m, 2 H), 2.15 (s, 3 H) and 1.27-1.23 (m, 3 H) ppm.

^{13}C NMR (100 MHz, $CDCl_3$): δ = 195.0, 194.8, 172.9, 172.8, 144.9, 140.2, 139.4, 132.1, 130.1, 129.9, 128.8, 128.7, 60.9, 60.8, 38.8, 38.5, 36.8, 35.6, 35.5, 35.2, 34.2, 32.8, 28.3, 28.2, 19.9, 18.7 and 14.3 ppm.

IR (neat): 2935, 2858, 1734 (OC=O), 1698 (C=O), 1611, 1563, 1524, 1442, 1384, 1322, 1293, 1152, 1115, 1054, 957 and 819 cm^{-1}.

HR ESI-MS: $[C_{18}NaClH_{23}O_6S]^+ = [M+Na]^+$ requires 425.0796; found 425.0791.

TLC: R_f = 0.4 (4:1, Hex/EtOAc).

Ethyl 4-(7-chloro-2-methyl-3,4-dihydronaphthalen-1-yl)-4-oxobutanoate (24)

^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.11-7.05 (m, 2 H), 6.89 (d, *J* = 1.8 Hz, 1 H), 4.18 (q, *J* = 7.1 Hz, 2 H), 2.97 (t, *J* = 6.5 Hz, 2 H), 2.76 (t, *J* = 8.1 Hz, 2 H), 2.68 (t, *J* = 6.5 Hz, 2 H), 2.28 (t, *J* = 7.8 Hz, 2 H,), 1.92 (s, 3 H) and 1.29 (t, *J* = 7.1 Hz, 3 H) ppm.

^{13}C NMR (100 MHz, $CDCl_3$): δ = 206.6, 172.7, 137.8, 134.9, 133.6, 133.0, 132.4, 128.9, 126.9, 123.6, 60.9, 40.0, 29.9, 28.1, 27.4, 20.8 and 14.4 ppm.

IR (neat): 2976, 2928, 2855, 1733 (OC=O), 1699 (C=O), 1595, 1483, 1433, 1399, 1372, 1262, 1206, 1158, 1098, 937 and 736 cm^{-1}.

HR ESI-MS: $[C_{17}H_{20}ClO_3]^+ = [M+H]^+$ requires 307.1095; found 307.1112

TLC: R_f = 0.4 (9:1, Hex/EtOAc)

References:

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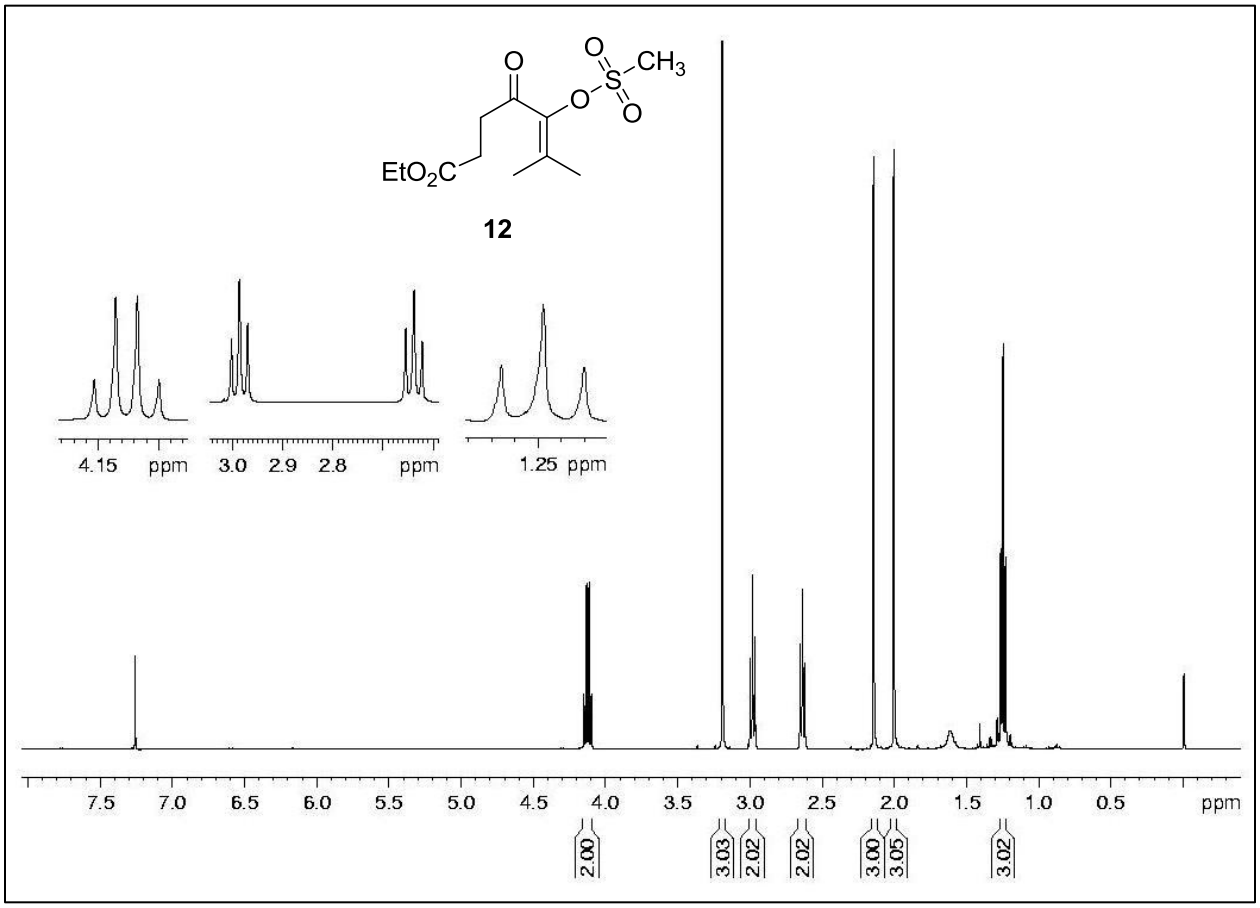
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3.03
2.02
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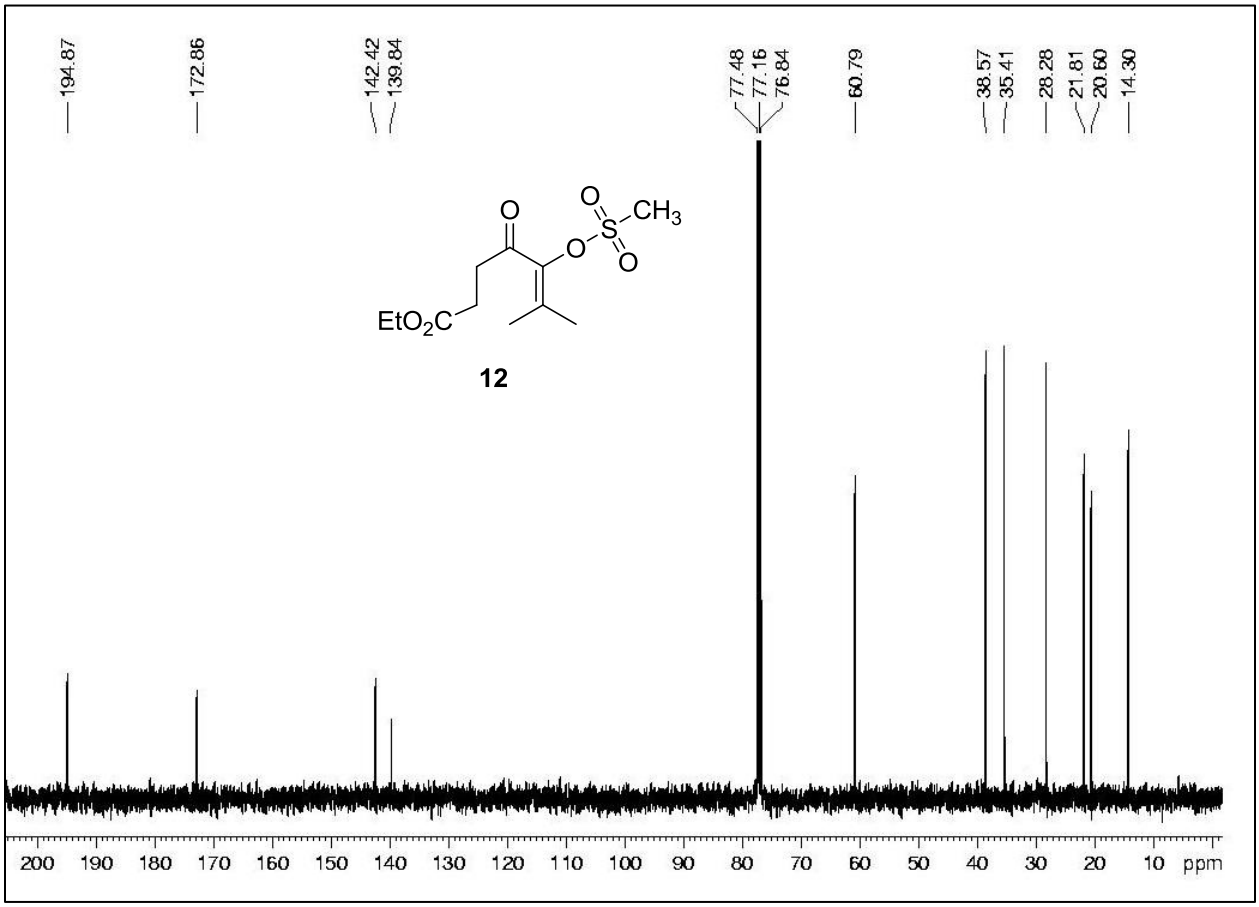
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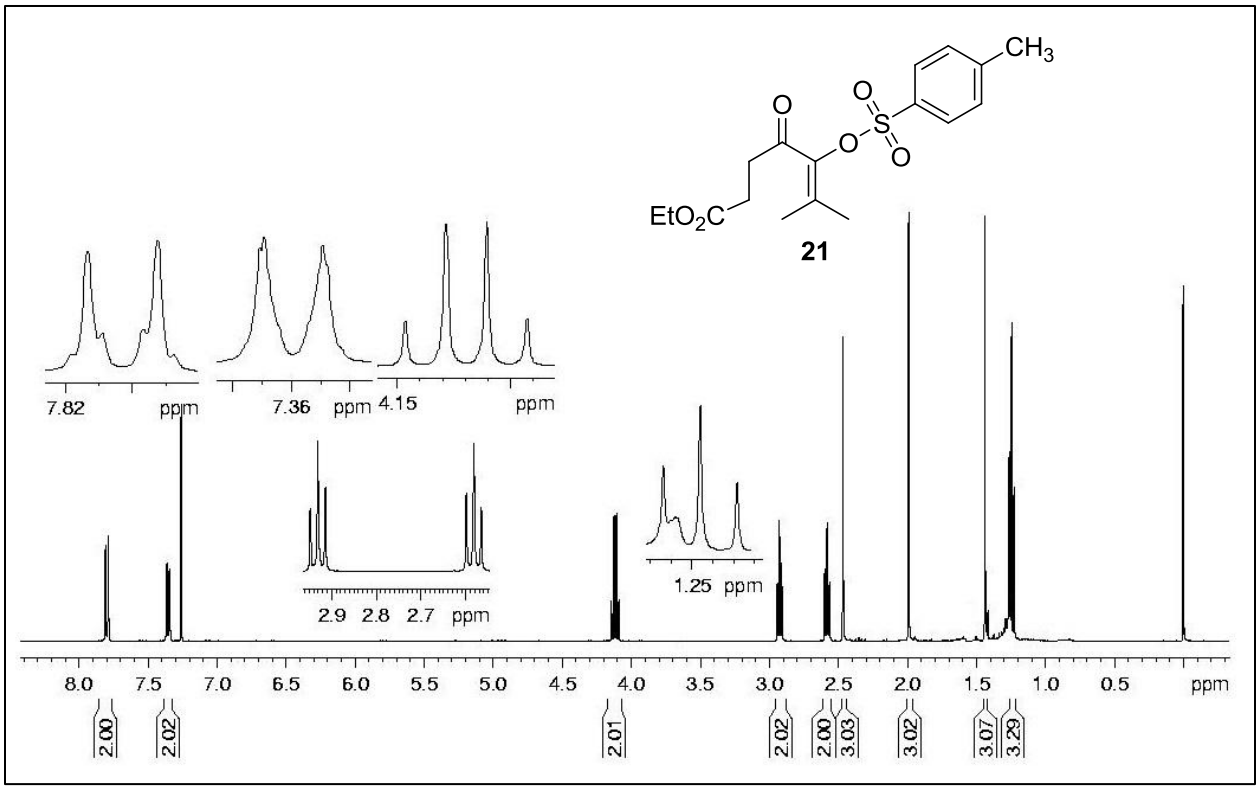
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8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm
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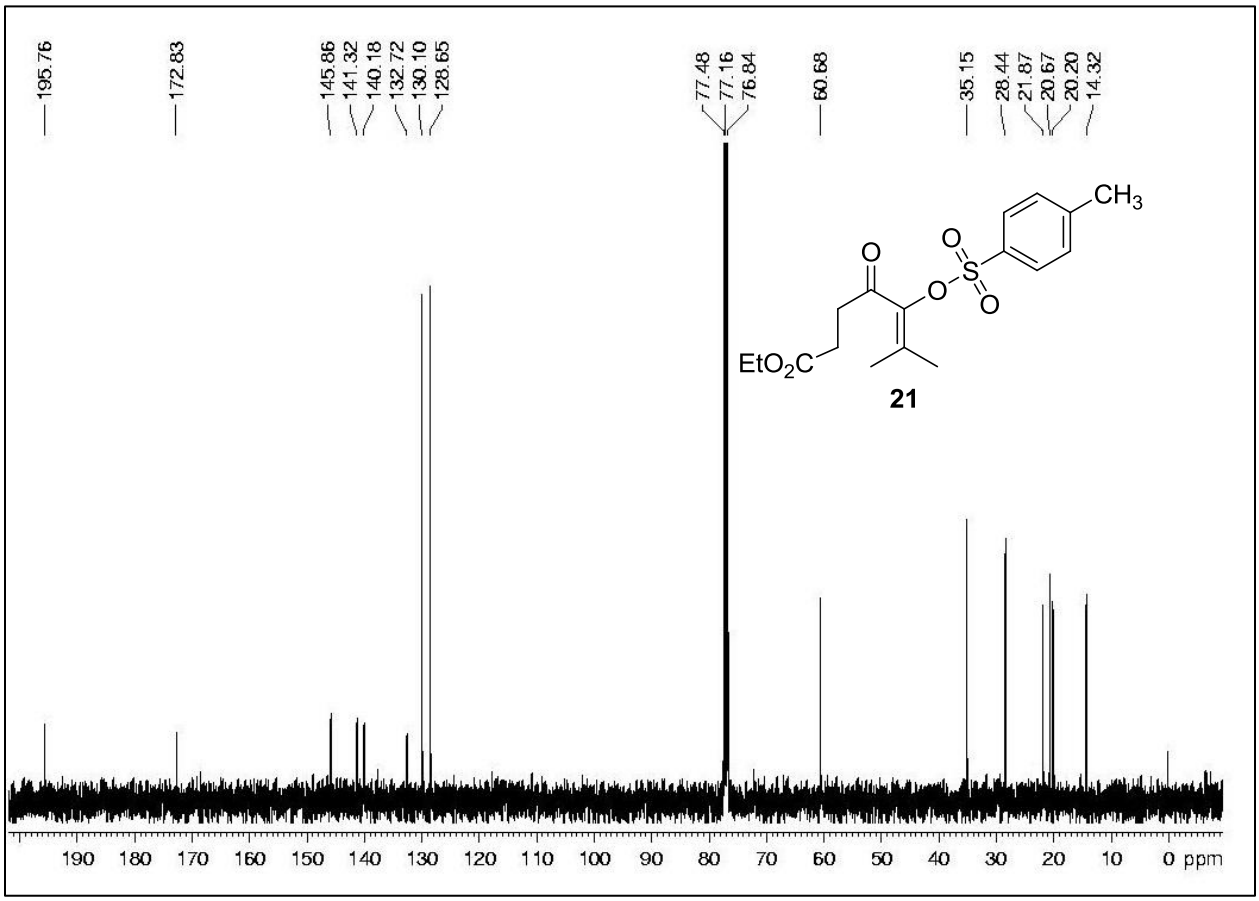
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28.44
21.87
20.67
20.20
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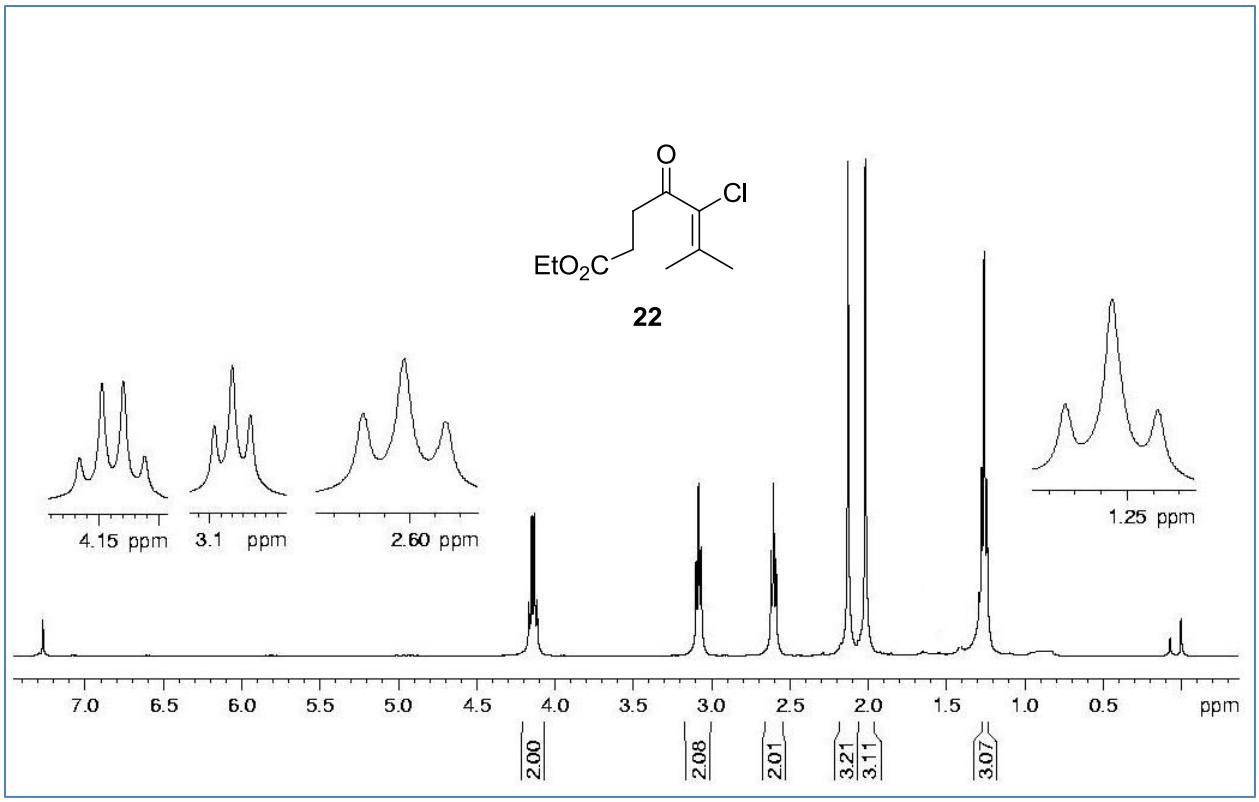
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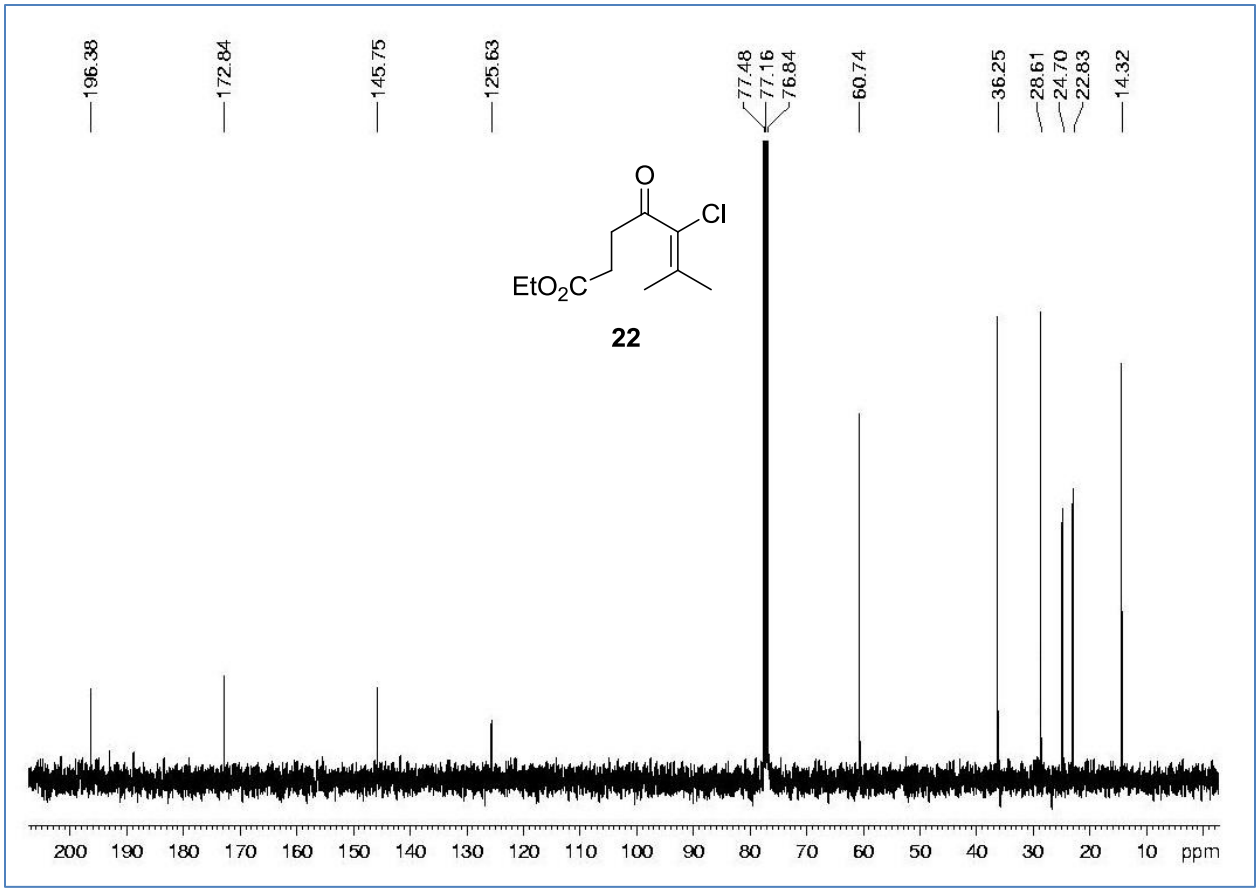
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Cl
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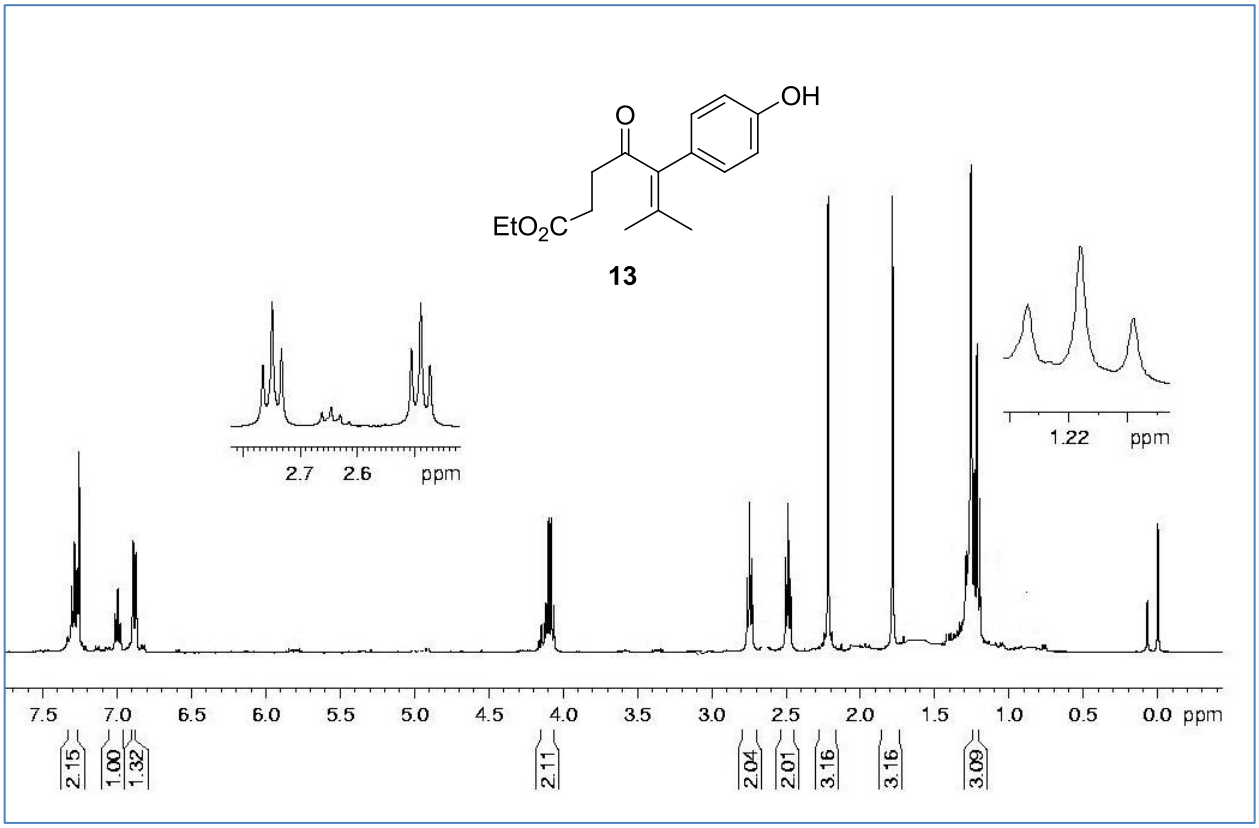
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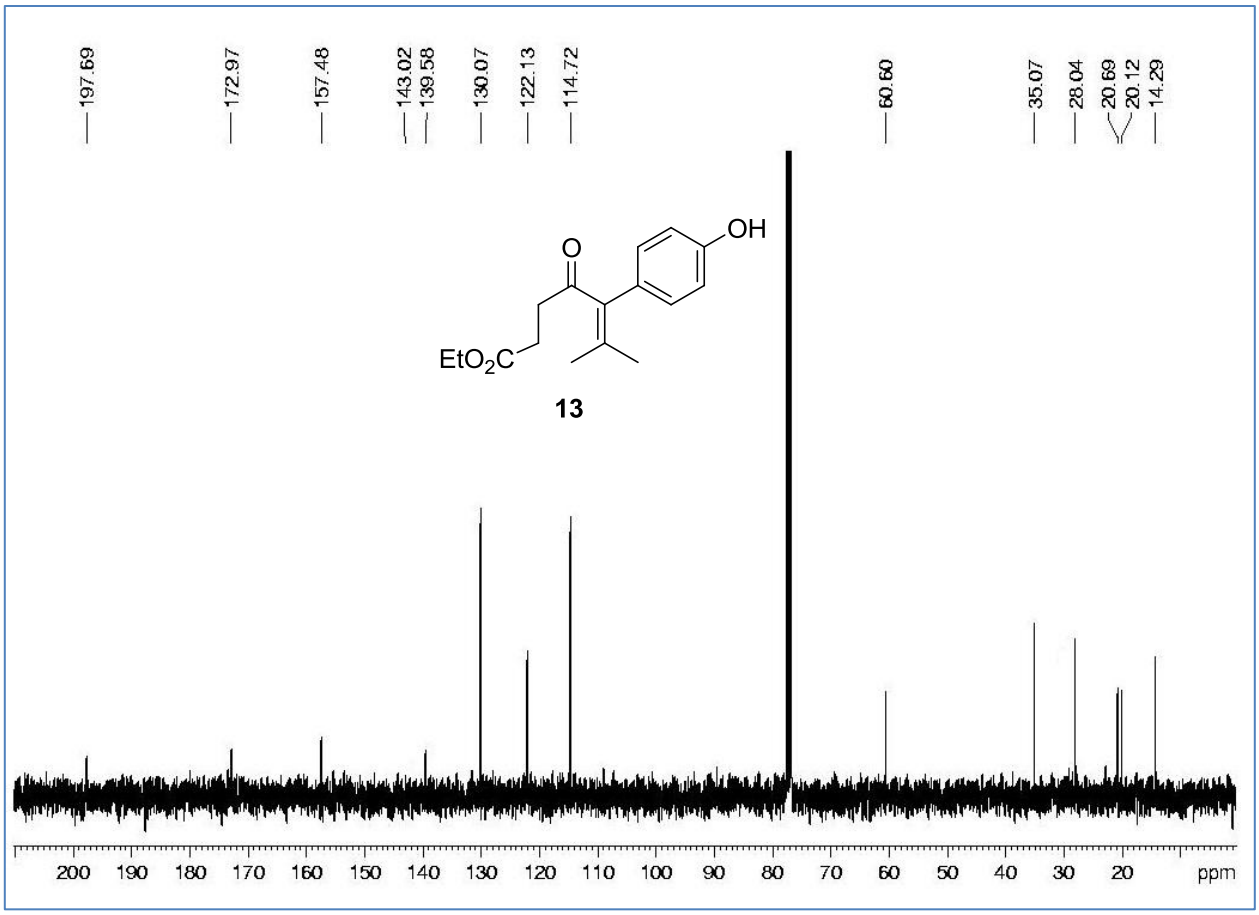
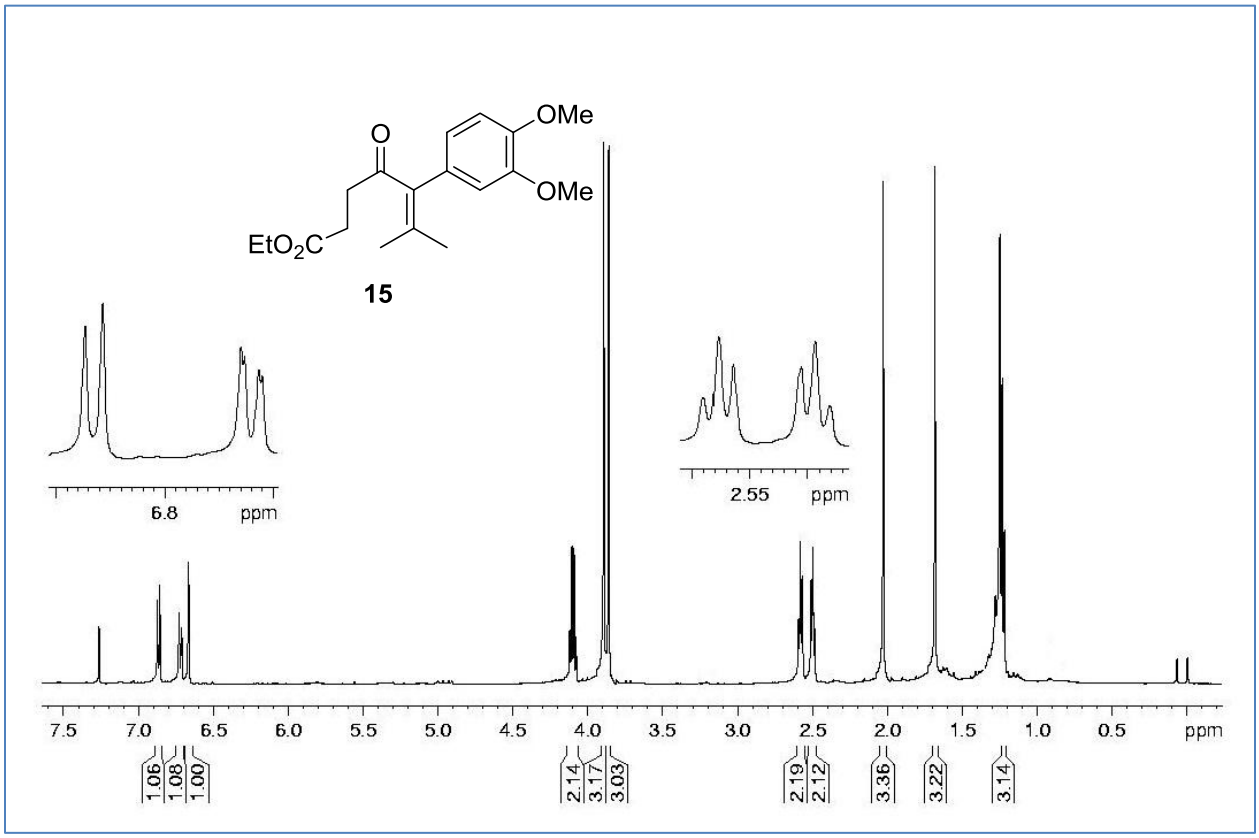
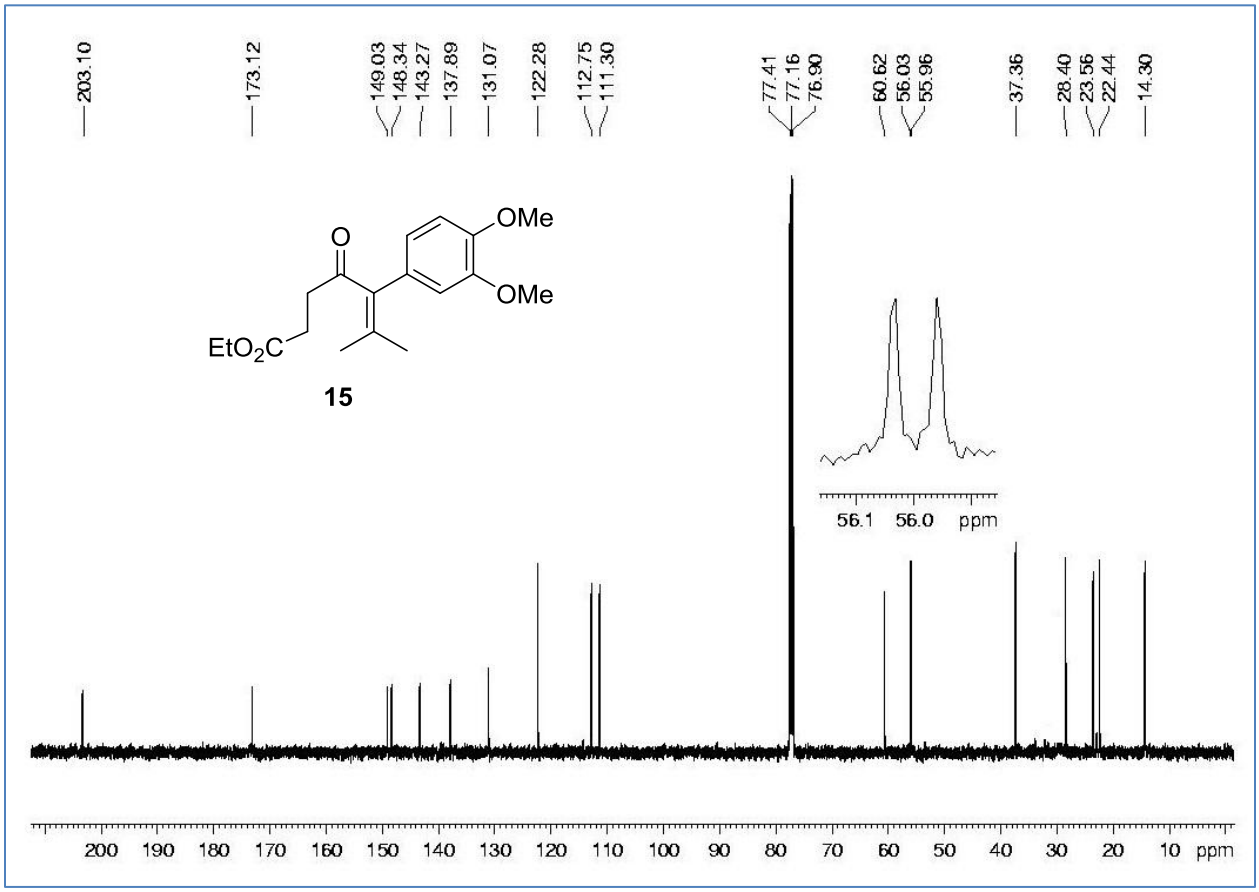
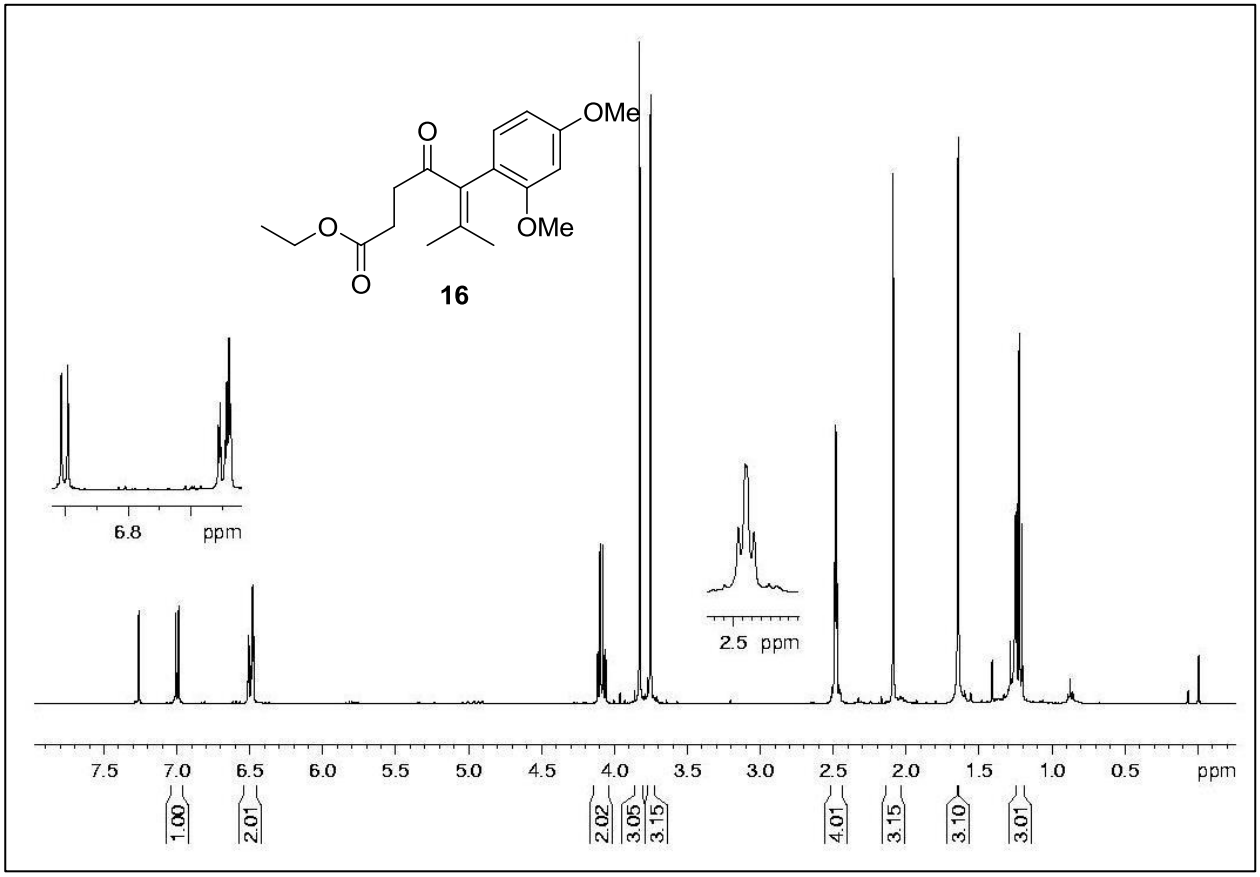
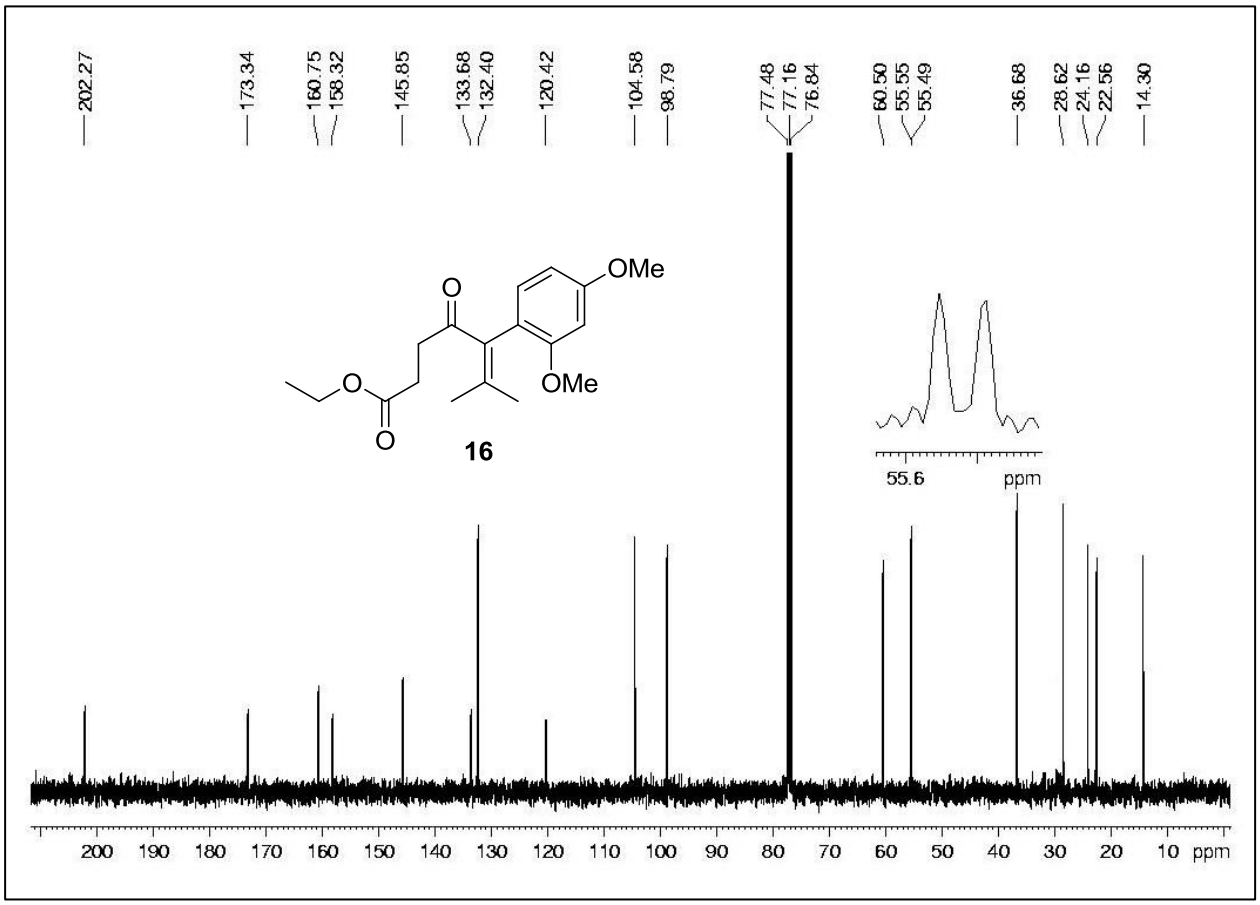
2.15
1.00
1.32
2.11
2.04
2.01
3.16
3.16
3.09

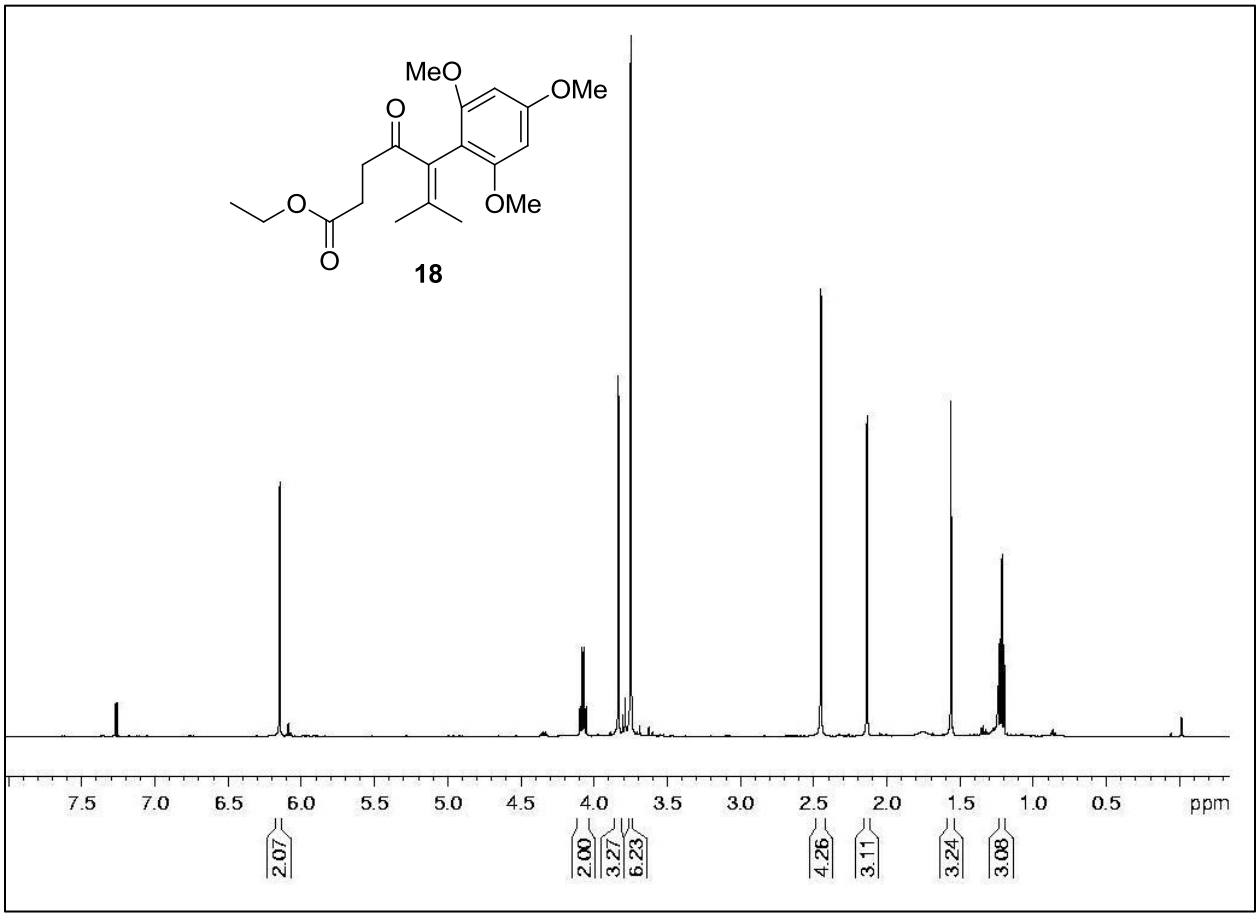

197.69
172.97
157.48
143.02
139.58
130.07
122.13
114.72
60.60
35.07
28.04
20.69
20.12
14.29
OH
O
EtO2C
13
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 ppm

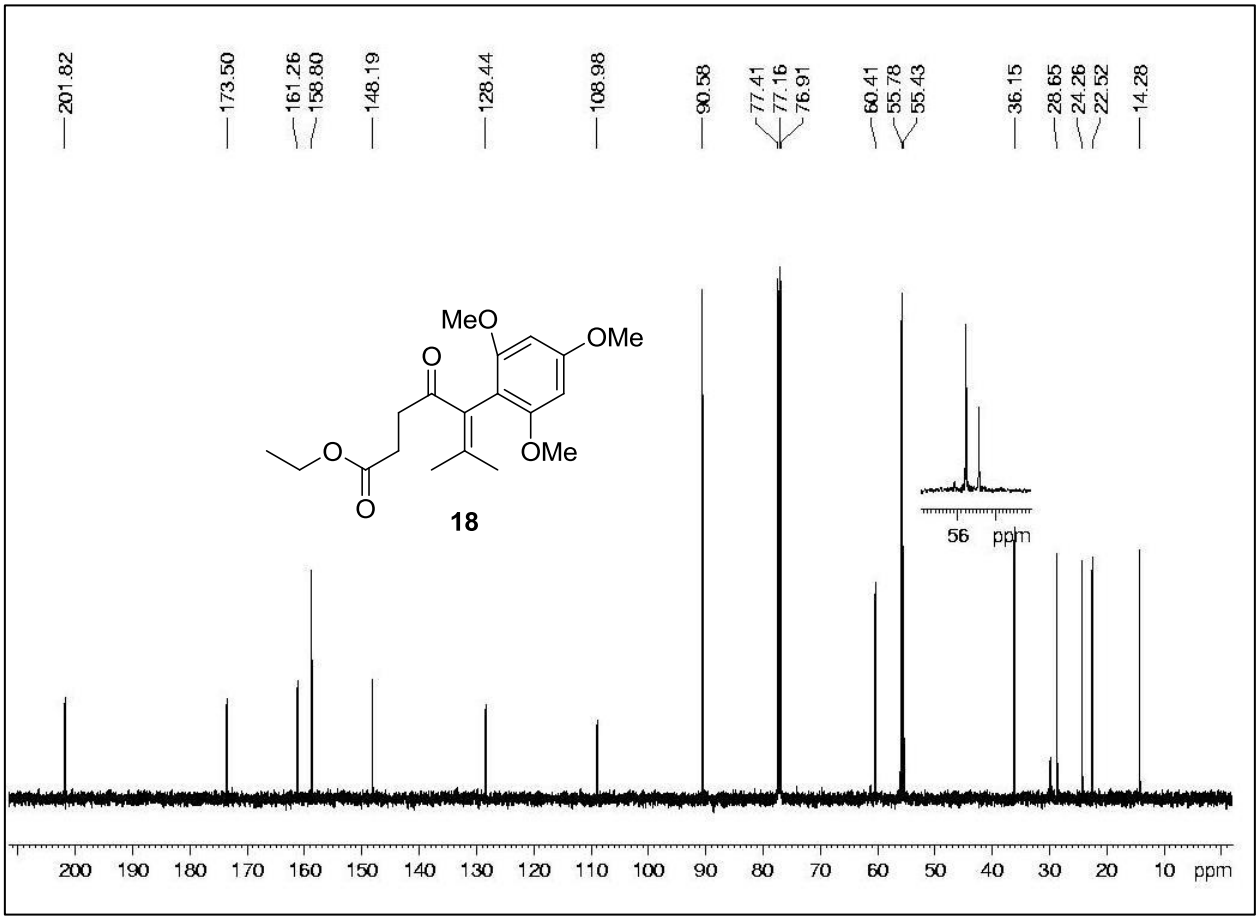

OMe
OMe
O
EtO2C
15
6.8 ppm
2.55 ppm
7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm
1.06 1.08 1.00 2.14 3.17 3.03 2.19 2.12 3.36 3.22 3.14

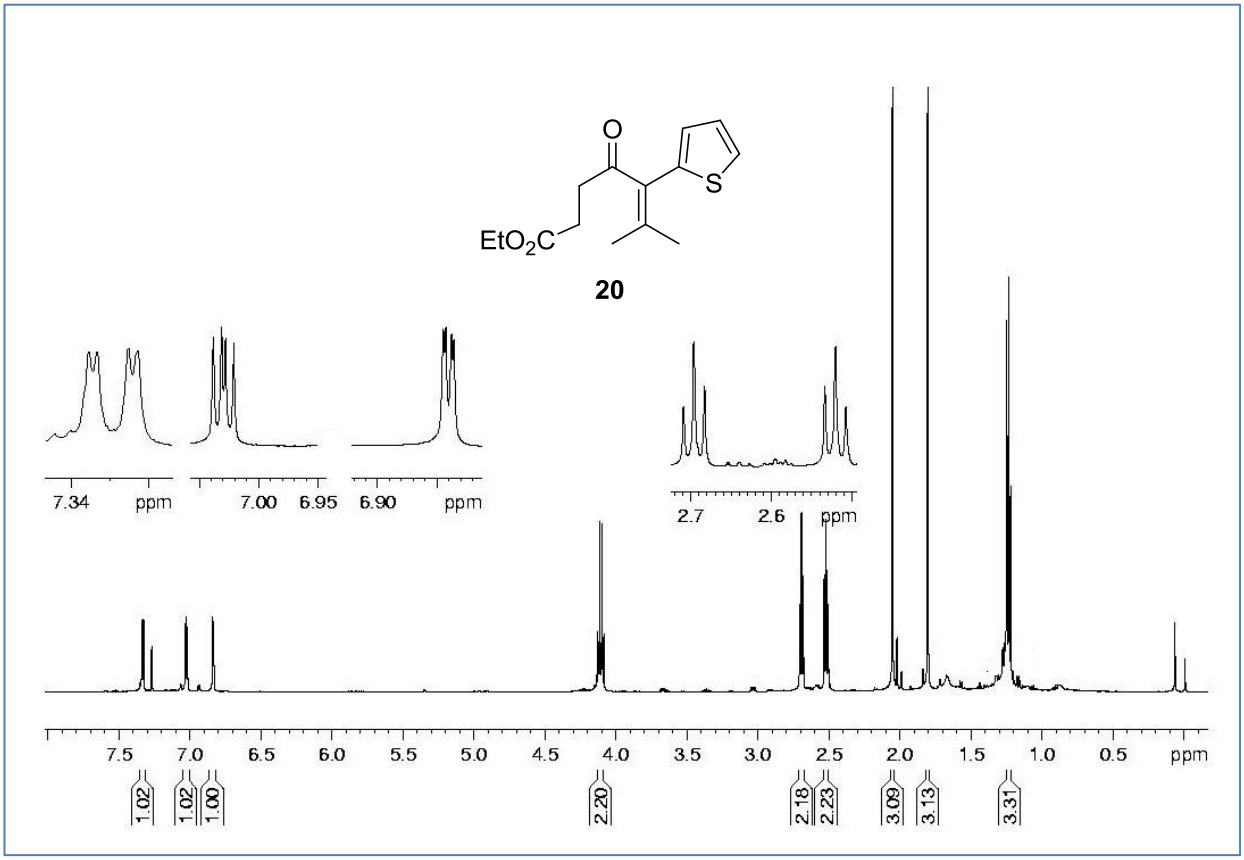

203.10 173.12 149.03 148.34 143.27 137.89 131.07 122.28 112.75 111.30 77.41 77.16 76.90 60.62 56.03 55.96 37.36 28.40 23.56 22.44 14.30
OMe
OMe
O
EtO2C
15
56.1 56.0 ppm
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm

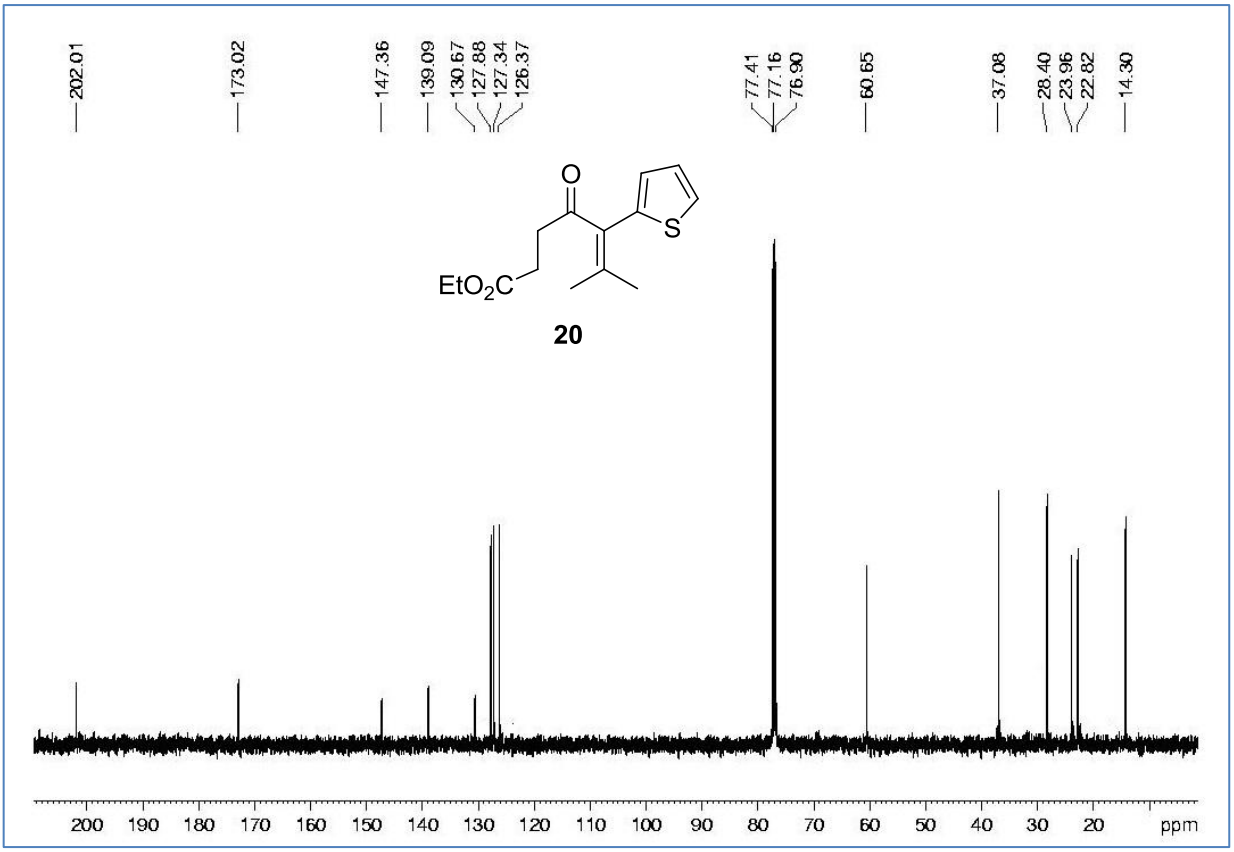

OMe
O
OMe
O
O
16
6.8 ppm
2.5 ppm
7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm
1.00 2.01 2.02 3.05 3.15 4.01 3.15 3.10 3.01

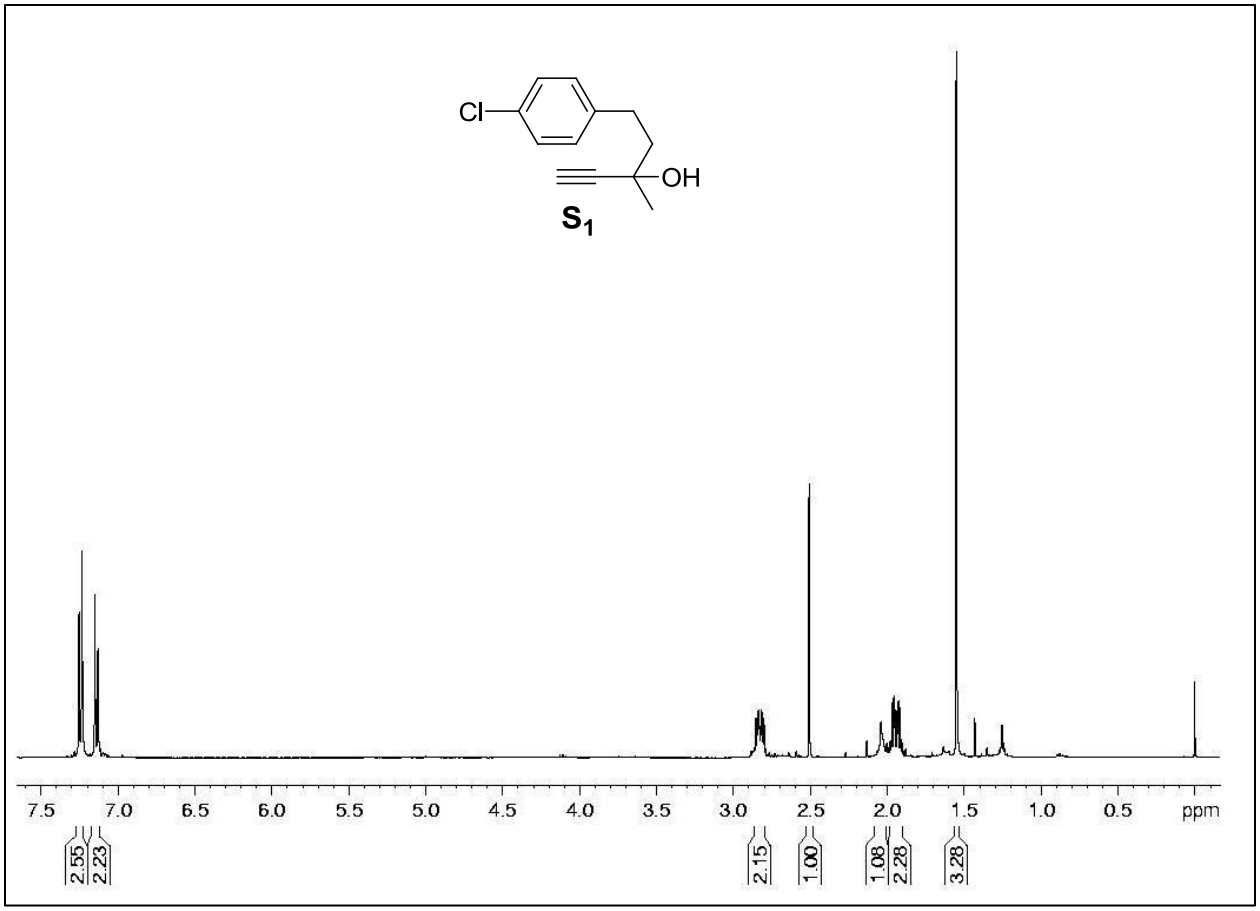

202.27 173.34 160.75 158.32 145.85 133.68 132.40 120.42 104.58 98.79 77.48 77.16 76.84 60.50 55.55 55.49 36.68 28.62 24.16 22.56 14.30
OMe
O
OMe
O
O
16
55.6 ppm
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm

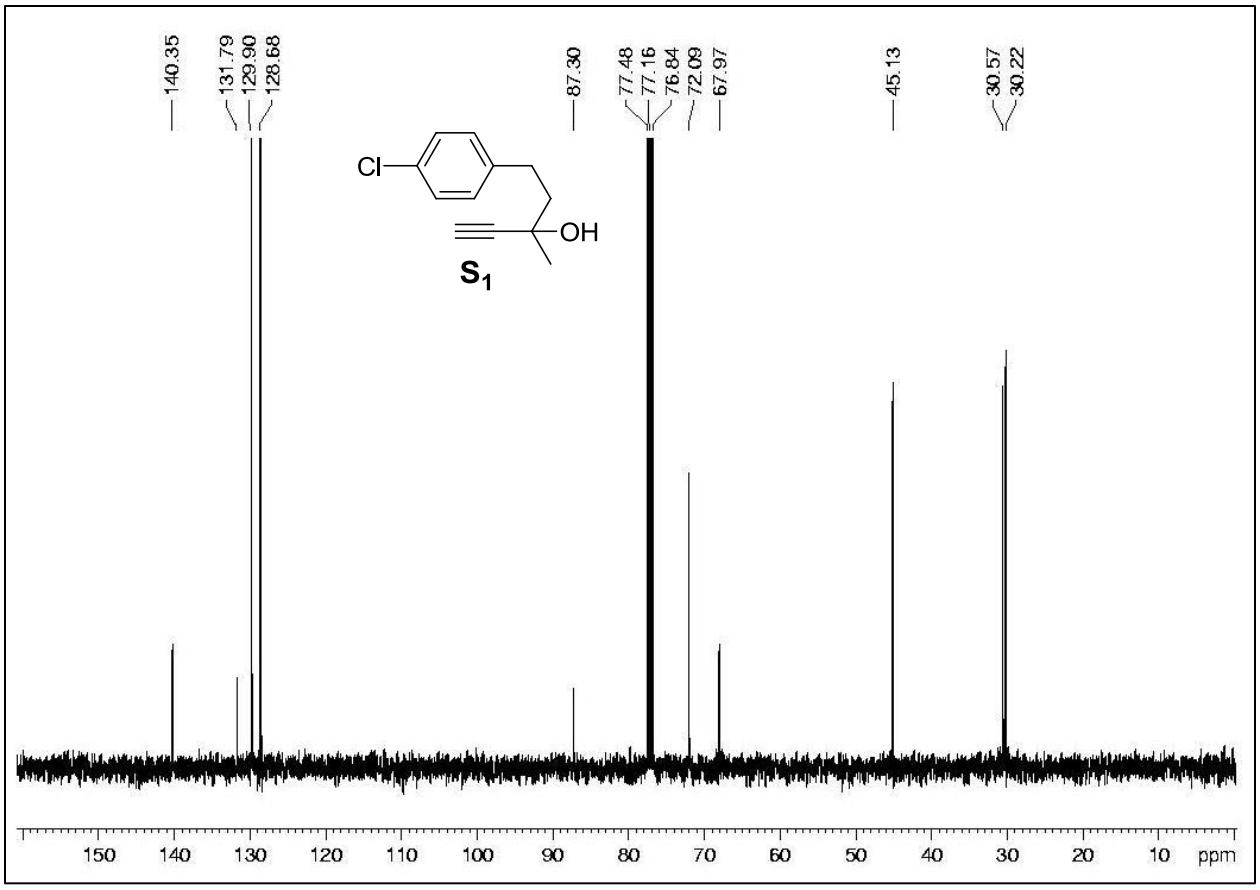

MeO
OMe
O
O
OMe
O
O
18
7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm
2.07
2.00
3.27
6.23
4.26
3.11
3.24
3.08

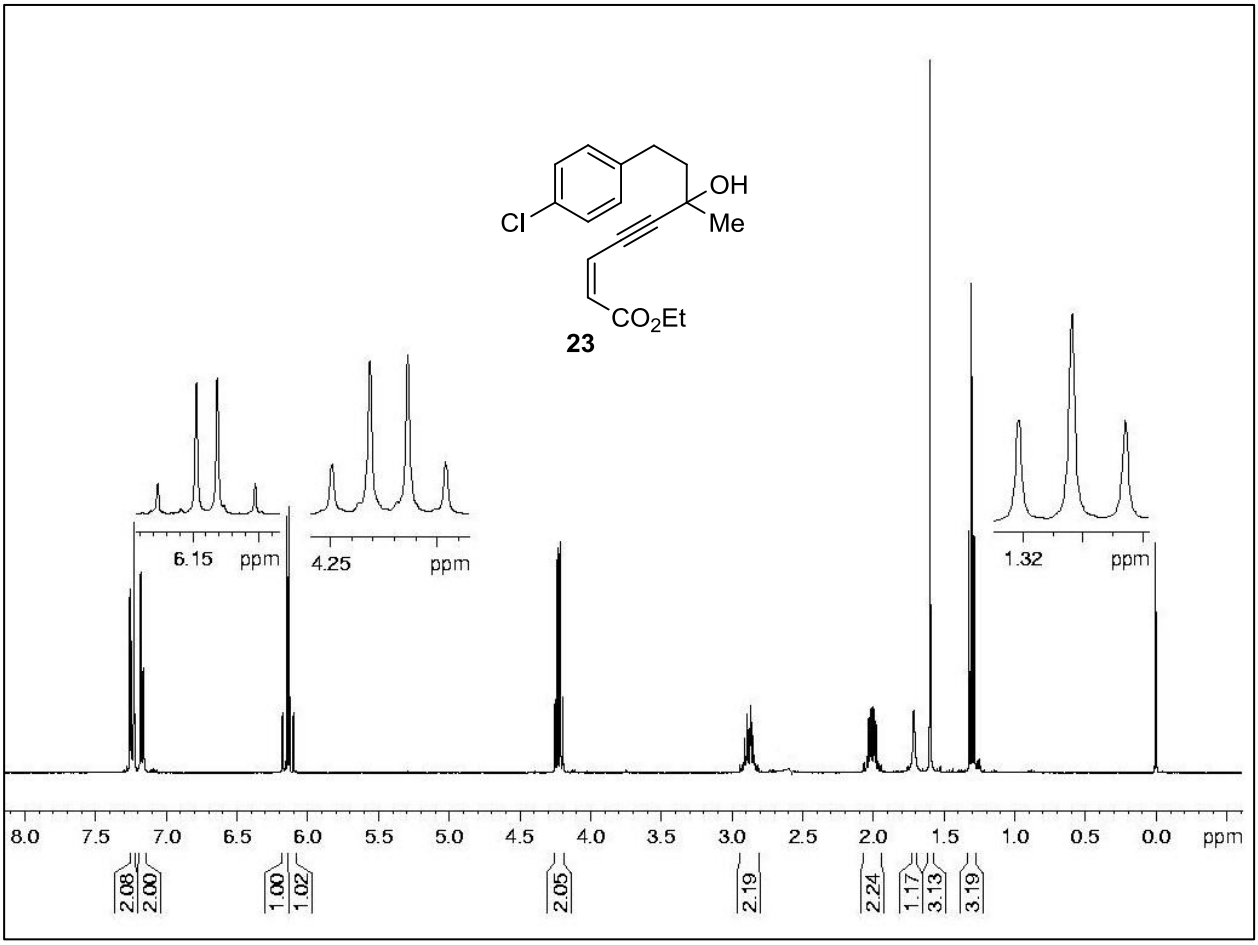

201.82
173.50
161.26
158.80
148.19
128.44
108.98
90.58
77.41
77.16
76.91
60.41
55.78
55.43
36.15
28.65
24.26
22.52
14.28
MeO
OMe
O
O
OMe
O
O
18
56 ppm
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm

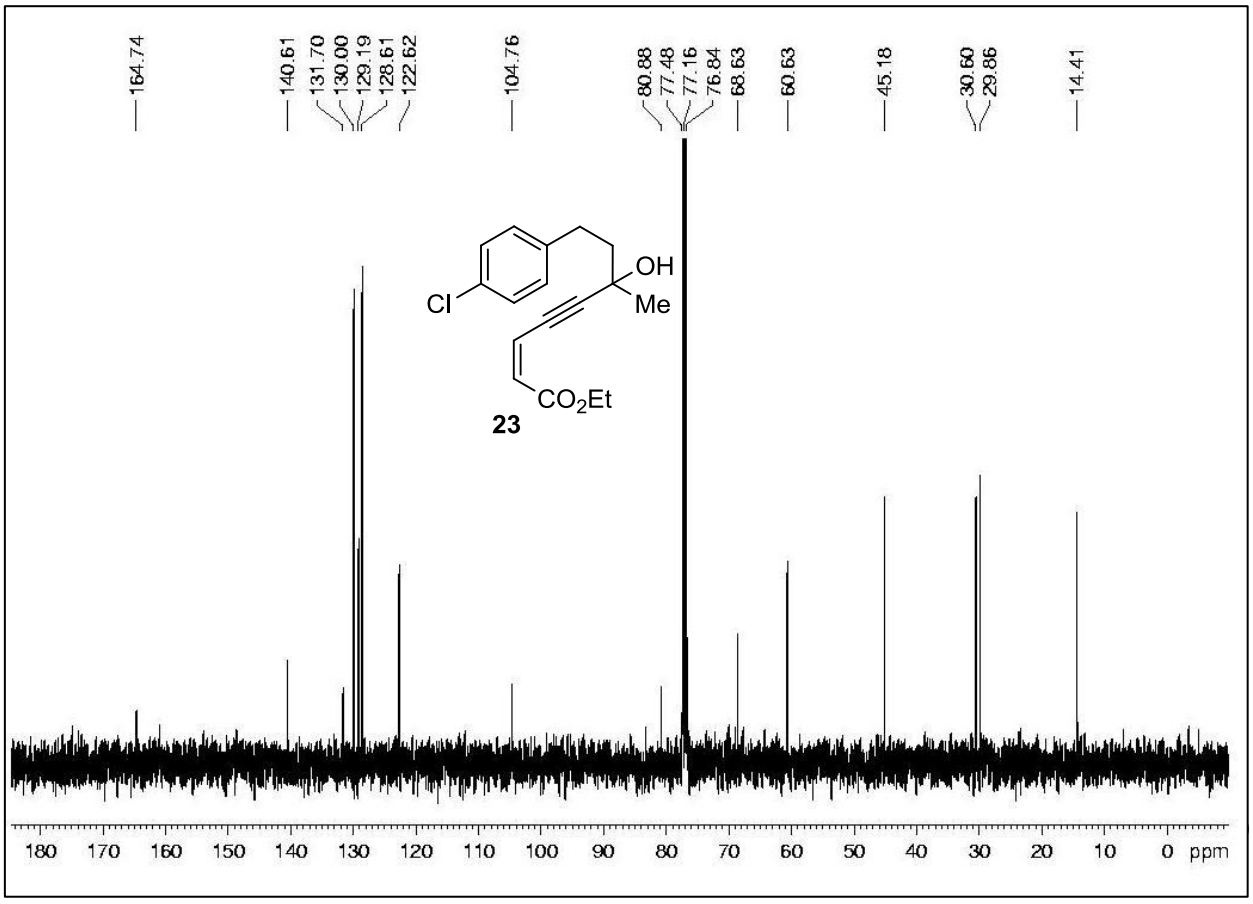

O
S
EtO2C
20
7.34 ppm
7.00 6.95
6.90 ppm
2.7 2.6 ppm
7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm
1.02
1.02
1.00
2.20
2.18
2.23
3.09
3.13
3.31

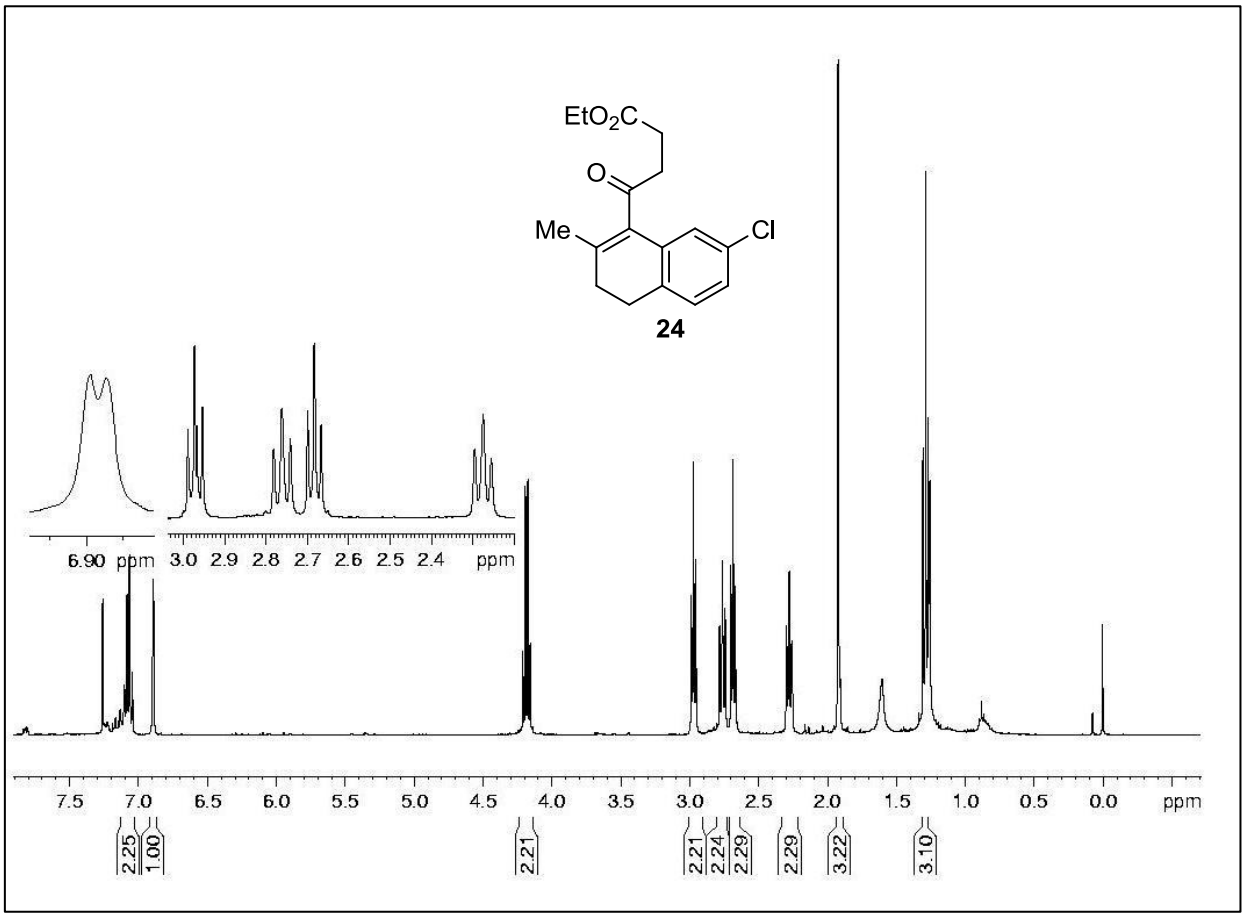

202.01
173.02
147.36
139.09
130.67
127.88
127.34
126.37
77.41
77.16
76.90
60.65
37.08
28.40
23.96
22.82
14.30
O
S
EtO2C
20
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 ppm

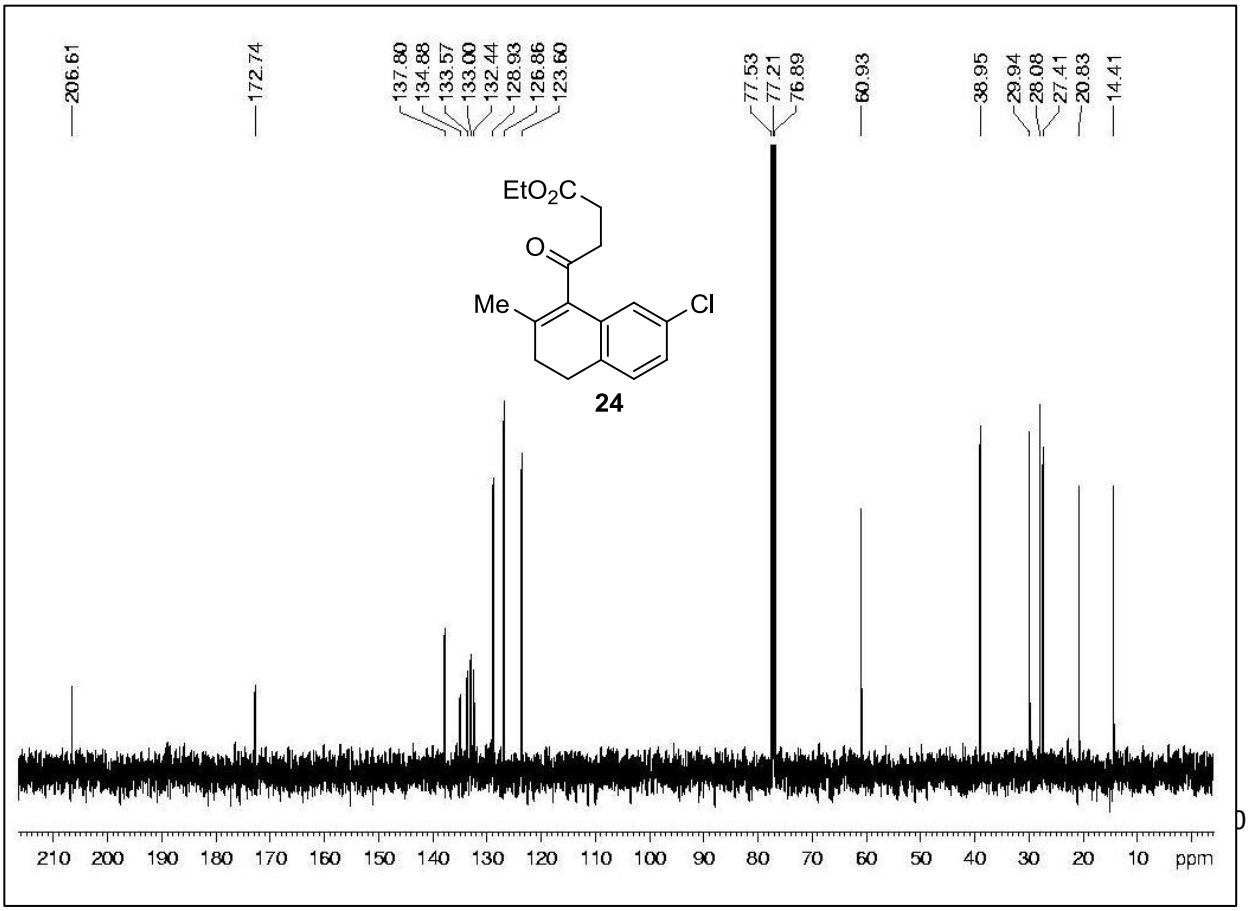

Cl
OH
S1
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
2.55
2.23
2.15
1.00
1.08
2.28
3.28

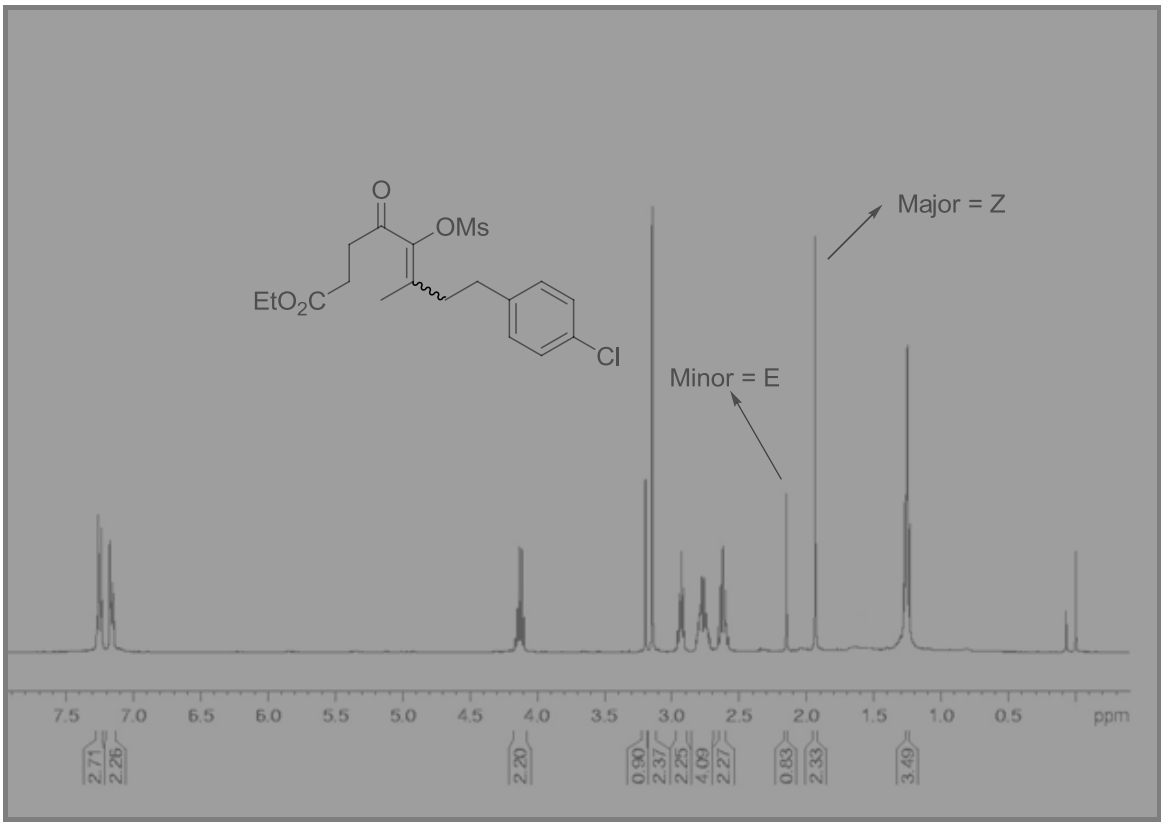

140.35
131.79
129.90
128.68
87.30
77.48
77.16
76.84
72.09
67.97
45.13
30.57
30.22
Cl
OH
S1
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
ppm

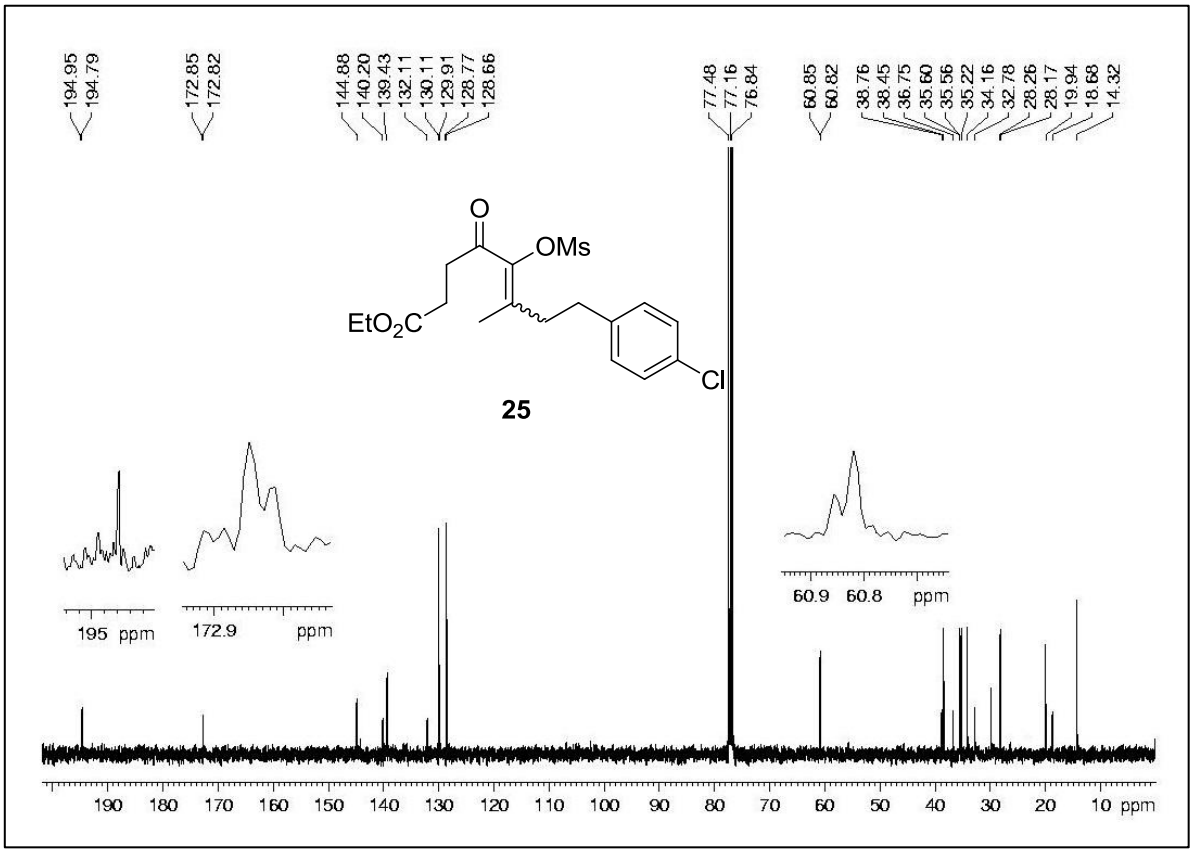

Cl
OH
Me
CO2Et
23
6.15 ppm
4.25 ppm
1.32 ppm
8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 ppm
2.08
2.00
1.00
1.02
2.05
2.19
2.24
1.17
3.13
3.19


164.74
140.61
131.70
130.00
129.19
128.61
122.62
104.76
80.88
77.48
77.16
76.84
68.63
60.63
45.18
30.60
29.86
14.41
Cl
OH
Me
CO2Et
23
180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm


EtO2C
O
Me
Cl
24
6.90 ppm
3.0 2.9 2.8 2.7 2.6 2.5 2.4 ppm
7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 ppm
2.25
1.00
2.21
2.21
2.24
2.29
2.29
3.22
3.10


206.61
172.74
137.80
134.88
133.57
133.00
132.44
128.93
126.86
123.60
77.53
77.21
76.89
60.93
38.95
29.94
28.08
27.41
20.83
14.41
EtO2C
O
Me
Cl
24
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm


O
OMs
EtO2C
Cl
Major = Z
Minor = E
7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm
2.71
2.26
2.20
0.90
2.37
2.25
4.09
2.27
0.83
2.33
3.49


194.95
194.79
172.85
172.82
144.88
140.20
139.43
132.11
130.11
129.91
128.77
128.66
77.48
77.16
76.84
60.85
60.82
38.76
38.45
36.75
35.60
35.56
35.22
34.16
32.78
28.26
28.17
19.94
18.68
14.32
O
OMs
EtO2C
Cl
25
195 ppm
172.9 ppm
60.9 60.8 ppm
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm