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$H_3PW_{12}O_{40}$ Anchored on the Three-Dimensional and Networked SBA-15 as an Efficient and Recyclable Catalyst for Mannich Reaction

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Supplementary Information

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(Compound 1) [1]

3-(4-acetylphenyl)-1-phenyl-3-(phenylamino)propan-1-one

Mp 142-143 ^{O}C ^{1}H NMR (60 MHz,) δ 7.96 (s, 2H, AR-H), 7.83 (s, 2H, AR-H), 7.43 (s, 3H, AR-H), 7.29 (s, 2H, AR-H), 6.98 (s, 2H,AR-H), 6.79 (s, 1H, AR-H), 6.65 (s, 2H, AR-H, C-H), 5.07 (s, 1H), 3.41 (s, 3H, CH_3) ; IR (KBr) *v* (cm^{-1}): 694, 757, 1028, 1181, 1288, 1513, 1595, 1667, 3369.

(Compound 2) [2]

1,3-diphenyl-3-(phenylamino)propan-1-one

Mp 169-170 ^{O}C ^{1}H NMR (60 MHz,) δ 8.11 (s, 2H, AR-H), 7.66 (s, 3H, AR-H), 7.51 (d, *J* = 3.1 Hz, 4H, AR-H), 7.41 (s, 2H, AR-H), 7.14 (s, 2H, AR-H), 6.92 (s, 1H, AR-H), 6.80 (s, 2H, AR-H), 6.67 (s, 1H, AR-H), 5.16 (s, 1H, C-H), 3.69 (s, 2H, CH_2); IR (KBr) *v* (cm^{-1}): 622, 1397, 1622, 3233, 3423.

(Compound 3) [3]

2-(phenyl(phenylamino)methyl)cyclohexanone

Mp 114-115 ^{O}C ^{1}H NMR (60 MHz,) δ 7.49 (s, 5H, AR-H), 7.29 (s, 2H, AR-H), 6.83 (s, 3H, AR-H), 4.74 (s, 1H, C-H), 3.08 (s, 1H, C-H), 2.59 (s, 2H, CH_2), 2.15 (s, 1H, CH_2), 2.01 (s, 3H, CH_2), 1.73 (s, 2H, CH_2); IR (KBr) *v* (cm^{-1}): 613, 1397, 1622, 3233, 3423.

(Compound 4) [4]

2-((*p*-toluidino)(phenyl)methyl)cyclohexanone

Mp 118-119 ^{O}C ^{1}H NMR (60 MHz,) δ 7.61 (s, 4H, AR-H), 7.14 (s, 1H, AR-H), 6.86 (s, 4H, AR-H), 4.85 (s, 1H, C-H), 3.12 (s, 1H, C-H), 2.68 (s, 3H, CH_3), 2.45 (s, 3H, CH_2), 2.11 (s, 5H, CH_2); IR (KBr) *v* (cm^{-1}): 694, 793, 1118, 1316, 1450, 1523, 1622, 1702, 2855, 2927, 3405.

(Compound 5)

3-(*p*-toluidino)-1-phenyl-3-*p*-tolylpropan-1-one

Mp 135-136 ^{O}C ^{1}H NMR (60 MHz,) δ 8.62 (s, 2H, AR-H), 8.06 (s, 3H, AR-H), 7.68 (s, 2H, AR-H), 7.45 (s, 2H, AR-H), 7.36 (s, 4H, AR-H), 5.12 (s, 1H, C-H), 3.74 (s, 1H, C-H), 2.56 (s, 6H, CH_3); IR (KBr) *v* (cm^{-1}): 532, 820, 1108, 1397, 1622, 3450.

(Compound 6) [2]

1-phenyl-3-(phenylamino)-3-*p*-tolylpropan-1-one

Mp 134-135 ^{O}C ^{1}H NMR (60 MHz,) δ 8.35 (s, 2H, AR-H), 7.92 (s, 2H, AR-H), 7.77 (s, 2H, AR-H), 7.68 (s, 2H, AR-H), 7.49 (s, 2H, AR-H), 7.15 (s, 2H, AR-H), 7.01 (s, 1H, AR-H), 5.38 (s, 1H, C-H), 4.02 (s, 1H, CH_2), 3.91 (s, 1H, CH_2), 2.81 (s, 3H, CH_3); IR (KBr) *v* (cm^{-1}): 694, 748, 820, 992, 1288, 1513, 1604, 1667, 3387.

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(Compound 7) [2]

3-(*p*-toluidino)-1,3-diphenylpropan-1-one

Mp 167-168 ^{O}C ^{1}H NMR (60 MHz,) δ 8.12 (s, 2H, AR-H), 7.62 (s, 2H, AR-H), 7.55 (s, 2H, AR-H), 6.84 (s, 2H, AR-H), 6.71 (s, 2H, AR-H), 5.26 (s, 1H, C-H), 3.81 (s, 1H, CH_2), 3.63 (s, 1H, CH_2), 2.46 (s, 3H, CH_3); IR (KBr) *v* (cm^{-1}): 694, 793, 1280, 1523, 1612, 1675, 3395.

(Compound 8) [3]

3-(4-chlorophenyl)-1-phenyl-3-(phenylamino)propan-1-one

Mp 114-115 ^{O}C ^{1}H NMR (60 MHz,) δ 8.22 (s, 2H, AR-H), 8.12 (s, 1H, AR-H), 7.78 (s, 2H, AR-H), 7.59 (s, 2H, AR-H), 7.07 (s, 2H, AR-H), 6.89 (s, 2H, AR-H), 6.77 (s, 1H, AR-H), 5.24 (s, 1H, C-H), 3.79 (s, 1H, CH_2), 3.69 (s, 1H, CH_2); IR (KBr) *v* (cm^{-1}): 616, 690, 745, 824, 1219, 1288, 1395, 1488, 1507, 3387.

(Compound 9)

3-(*p*-toluidino)-3-(4-chlorophenyl)-1-phenylpropan-1-one

Mp 128-129 ^{O}C ^{1}H NMR (60 MHz,) δ 8.22 (s, 2H, AR-H), 7.95 (s, 1H, AR-H), 7.86 (s, 2H, AR-H), 7.44 (s, 2H, AR-H), 7.12 (s, 2H, AR-H), 6.67 (s, 2H, AR-H), 5.22 (s, 1H, C-H), 3.77 (s, 1H, CH_2), 3.67 (s, 1H, CH_2), 2.46(s, 3H, CH_3); IR (KBr) *v* (cm^{-1}): 685, 803, 1091, 1217, 1288, 1513, 3450.

(Compound 10)

3-(*p*-toluidino)-3-(4-acetylphenyl)-1-phenylpropan-1-one

Mp 152-154 ^{O}C ^{1}H NMR (60 MHz,) δ 8.50 (s, 4H, AR-H), 7.90 (s, 3H, AR-H), 7.52 (s, 2H, AR-H), 6.91 (d, *J* = 5.4 Hz, 2H, AR-H), 6.52 (s, 2H, AR-H), 5.13 (s, 1H, C-H), 3.97 (s, 2H, CH_2), 3.48 (s, 3H, CH_3), 2.28 (s, 3H, CH_3); IR (KBr) *v* (cm^{-1}): 804, 1245, 1288, 1400, 1513, 1622, 1667, 3450.

(Compound 11) [4]

2-((*p*-toluidino)(4-chlorophenyl)methyl)cyclohexanone

Mp 120-121 ^{O}C ^{1}H NMR (60 MHz,) δ 7.82 (s, 2H, AR-H), 7.39 (s, 2H, AR-H), 6.87 (s, 2H, AR-H), 6.54 (s, 2H, AR-H), 4.68 (s, 1H, C-H), 2.83 (s, 1H, C-H), 2.42 (s, 2H, CH_2), 2.02 (s, 3H, CH_3), 1.84 (s, 5H, CH_2); IR (KBr) *v* (cm^{-1}): 1091, 1502, 1525, 1635, 3457.

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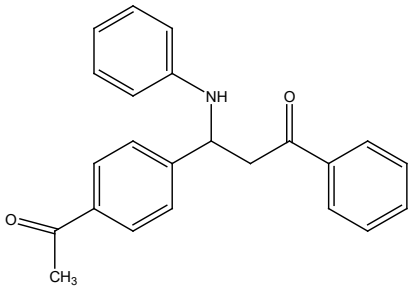

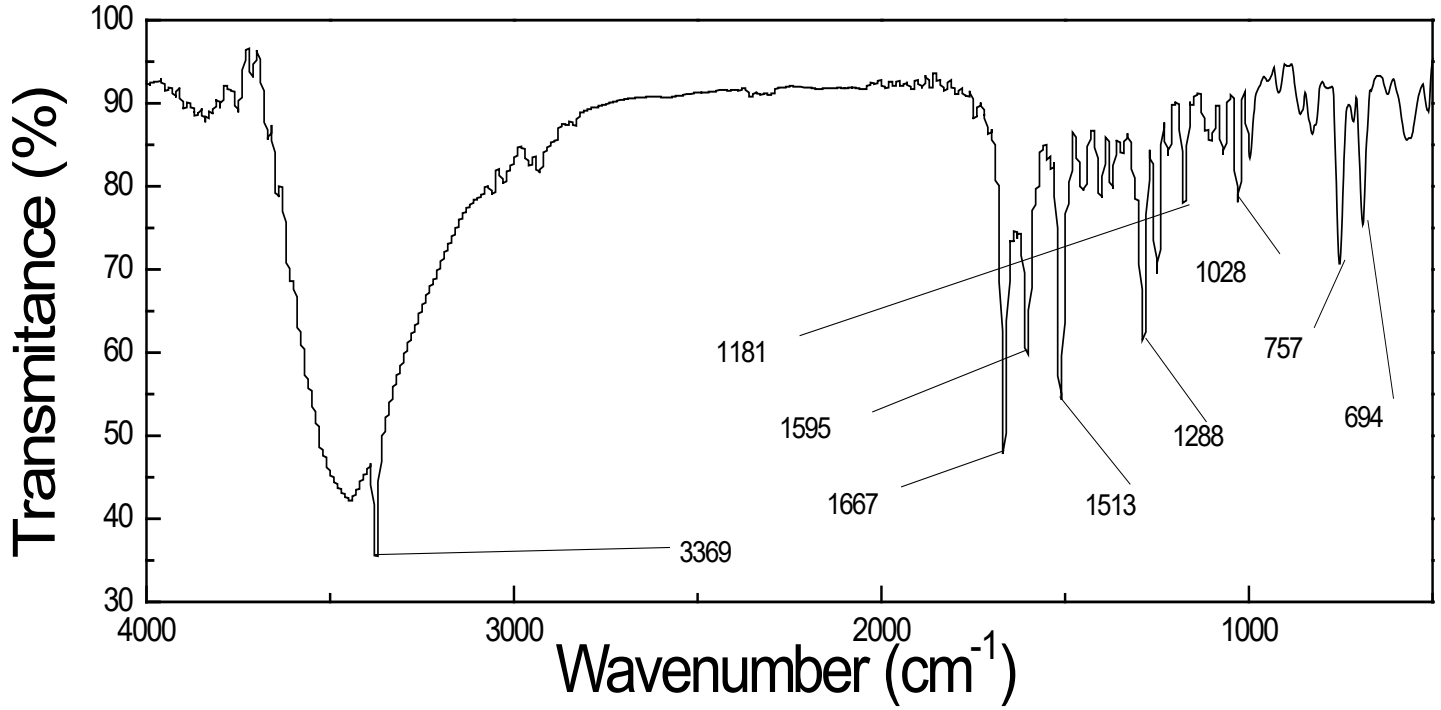

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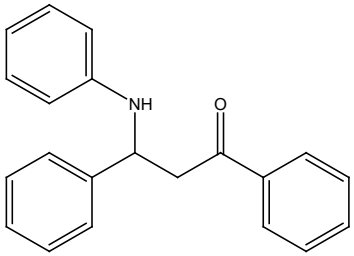

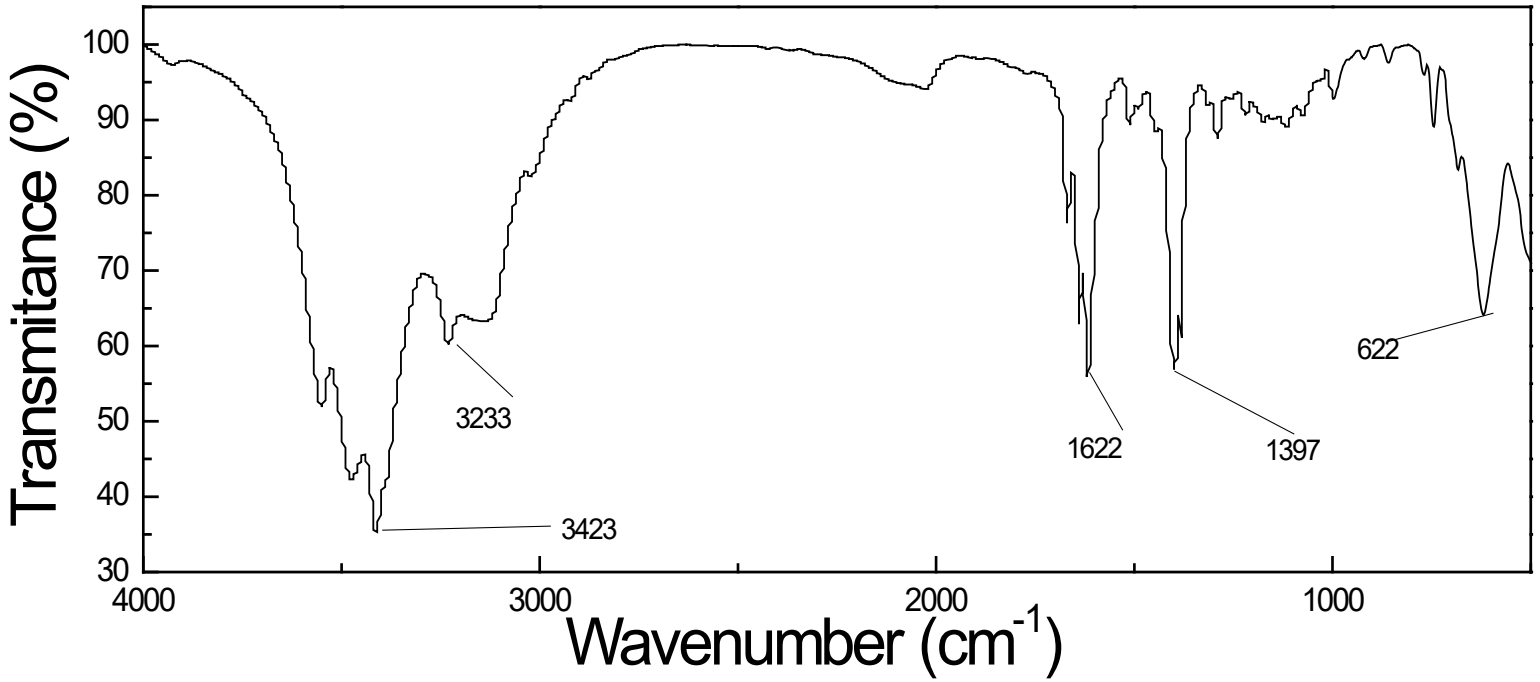

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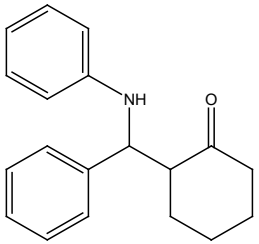

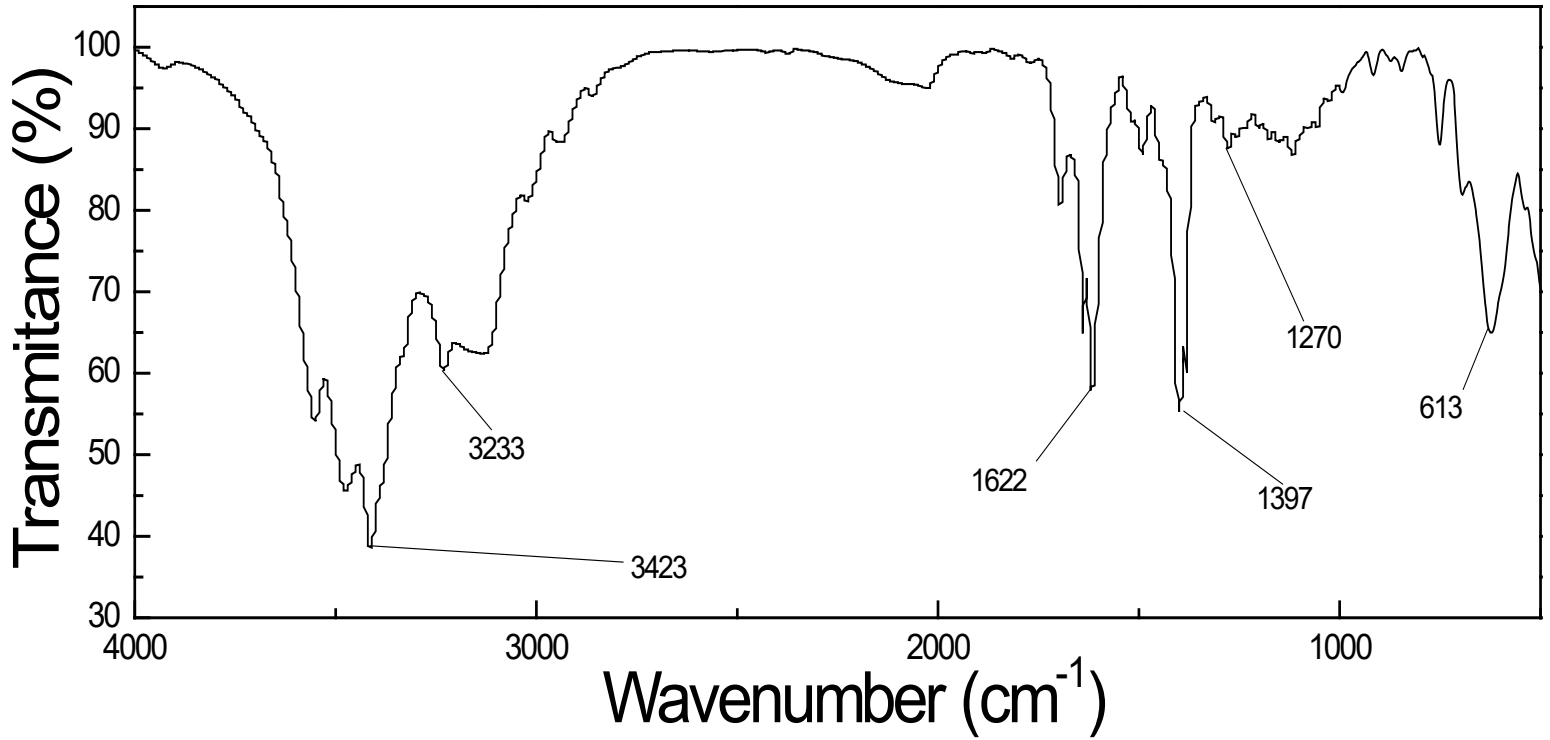

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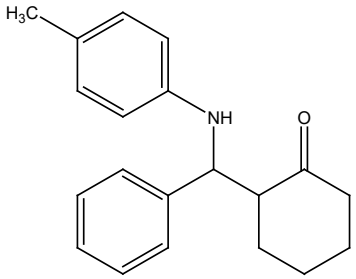

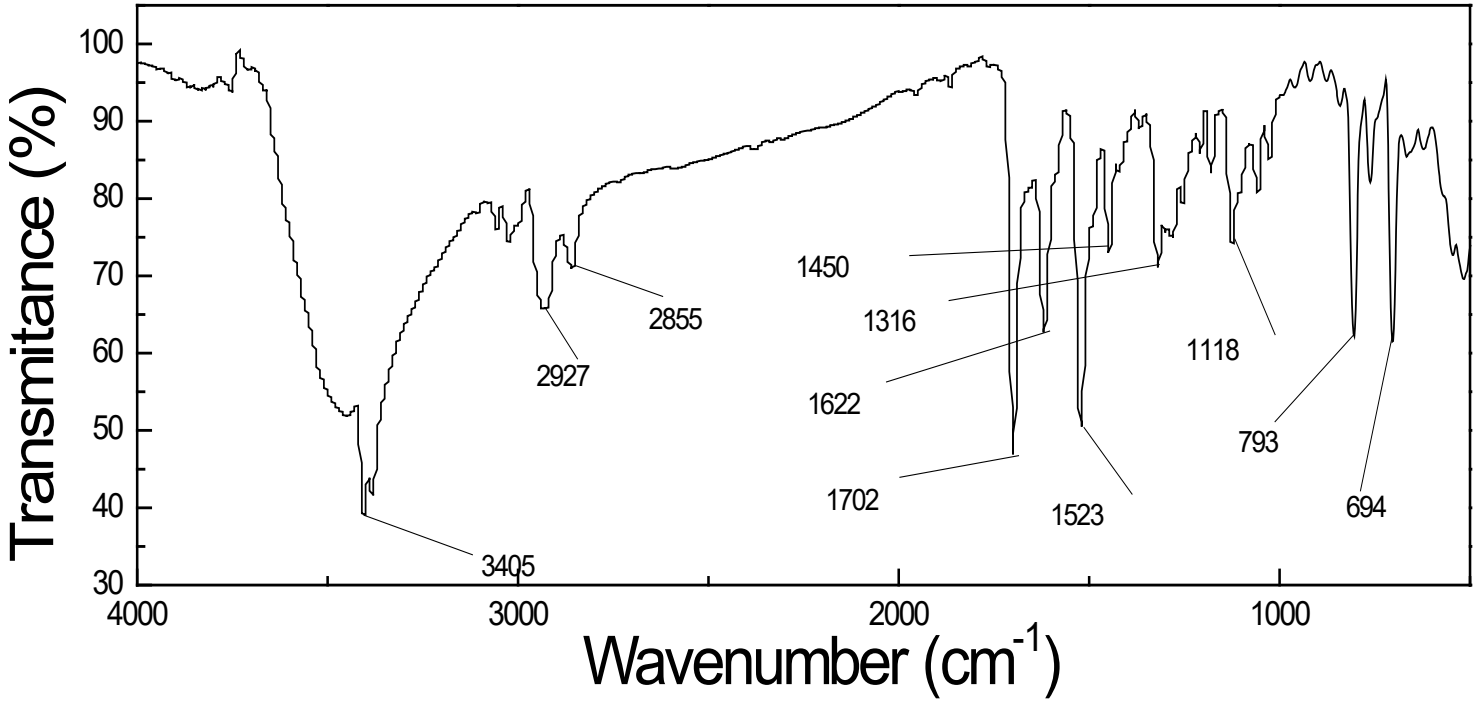

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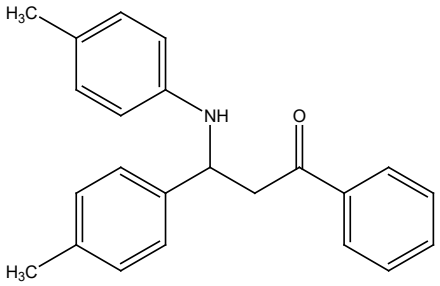

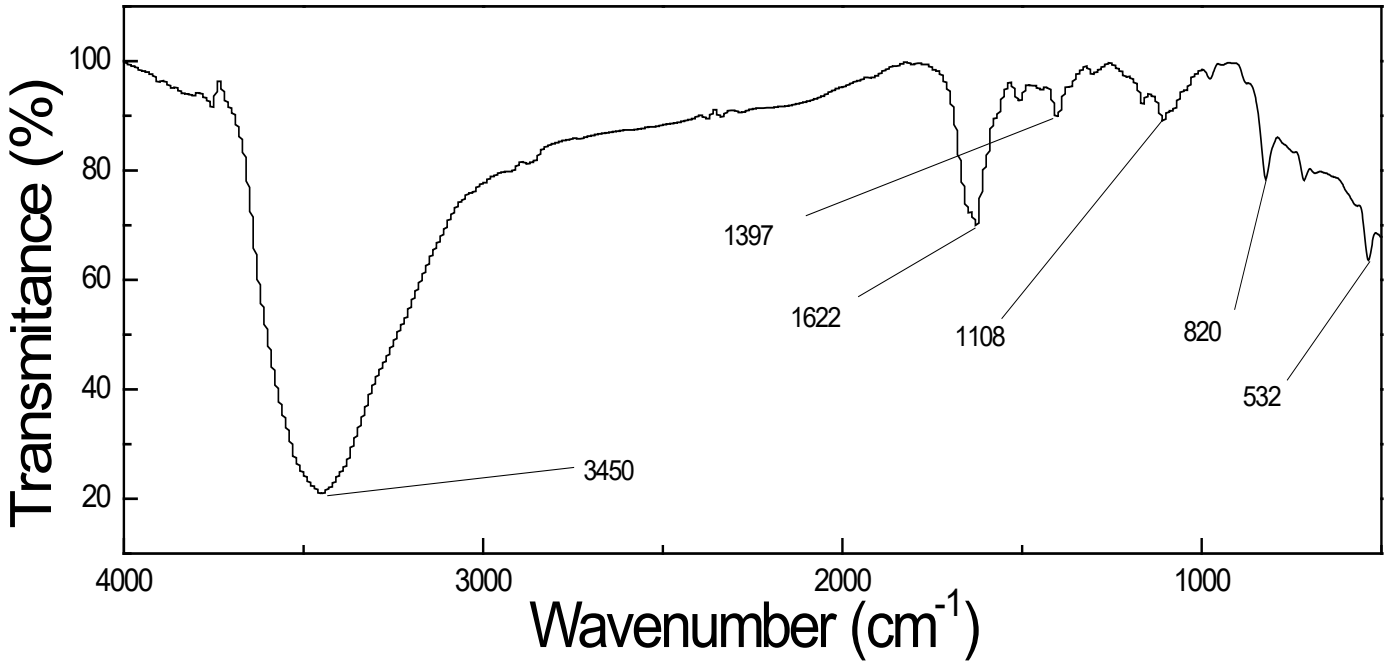

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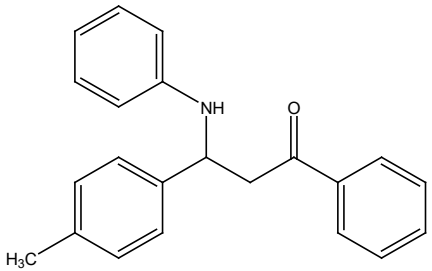

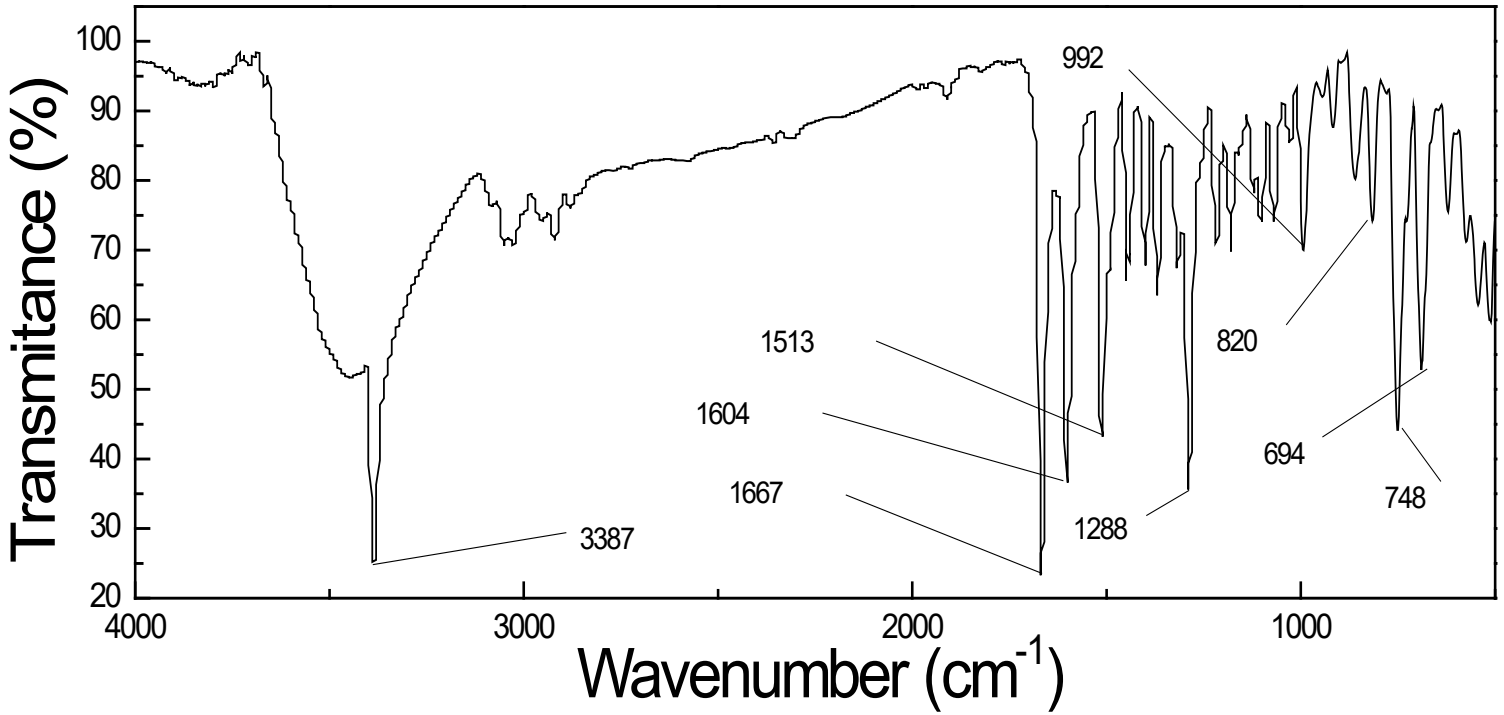

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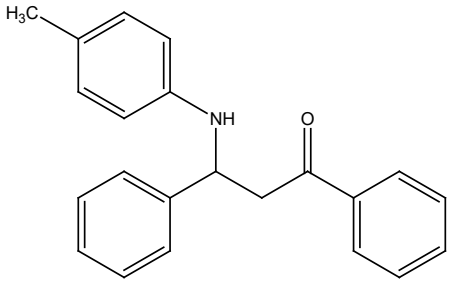

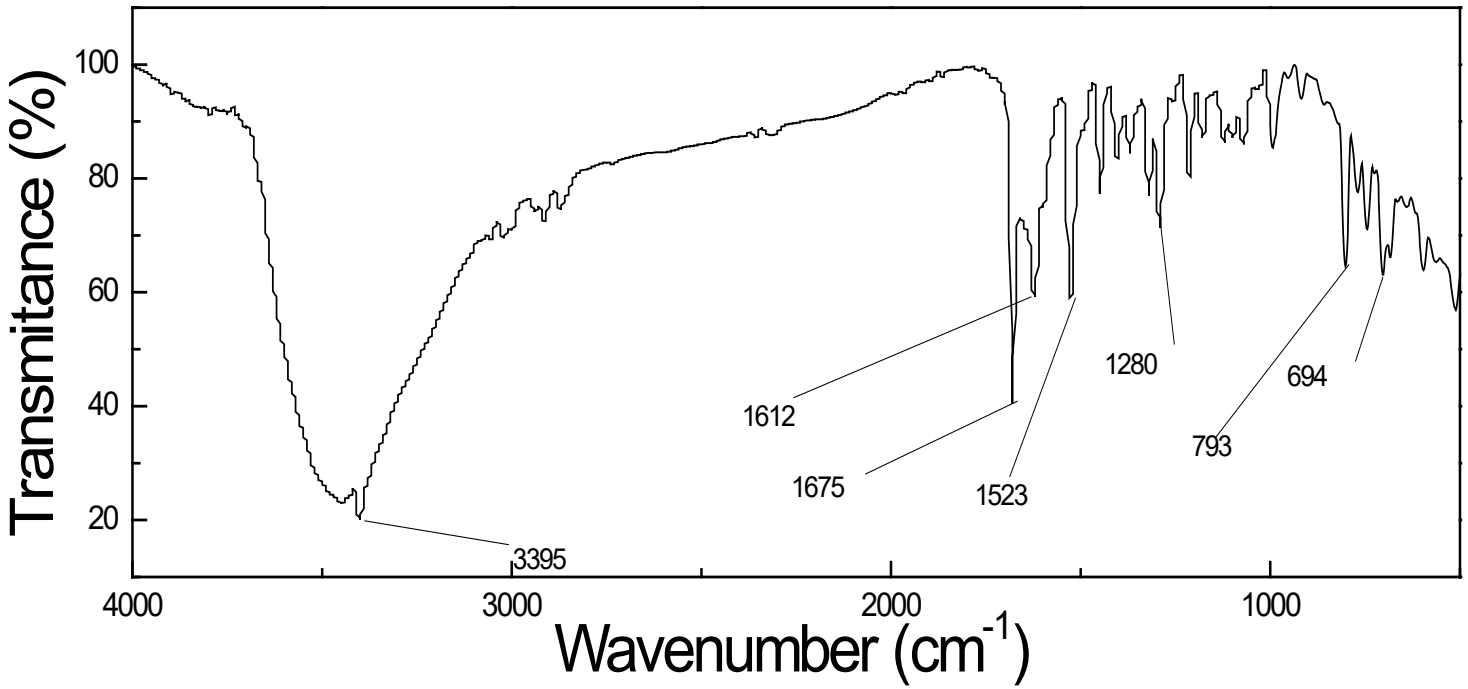

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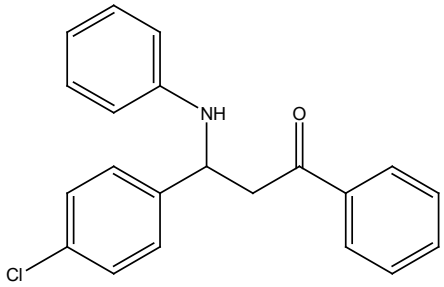

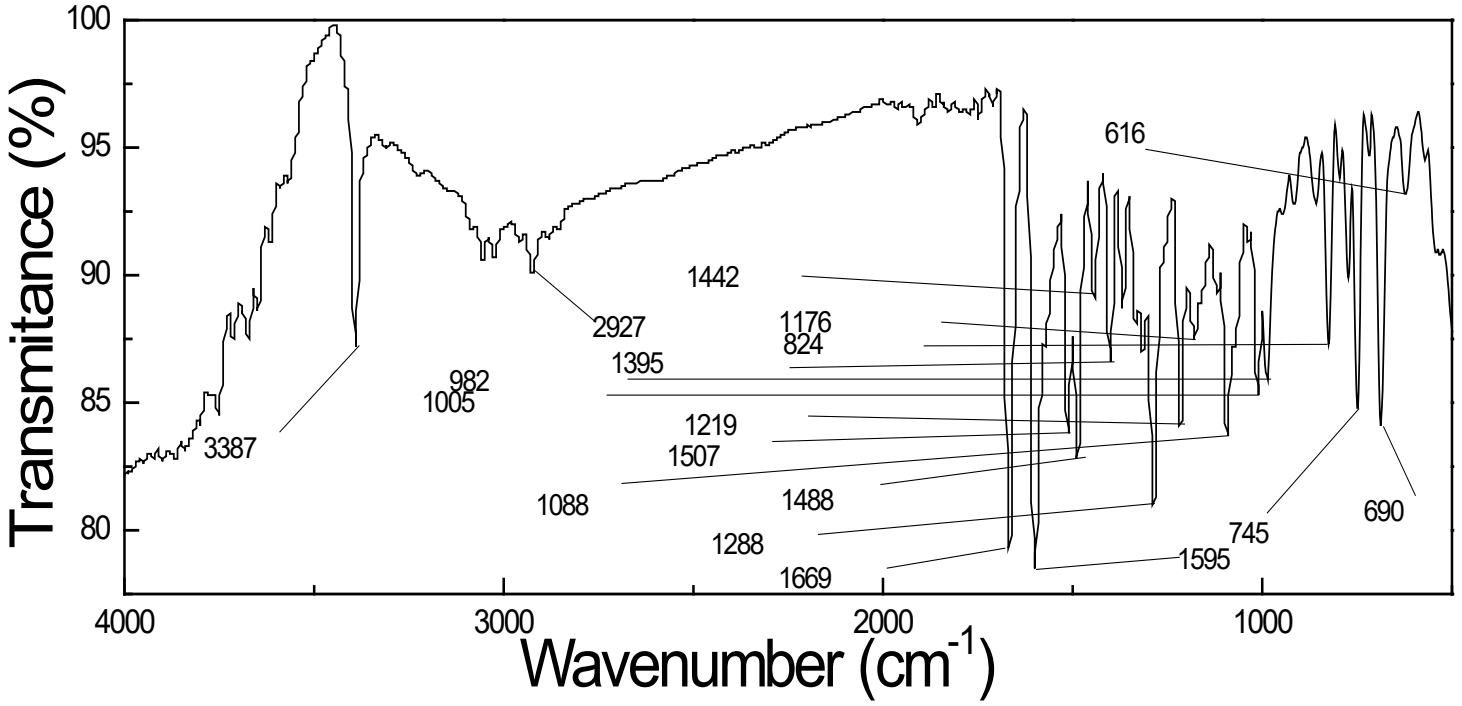

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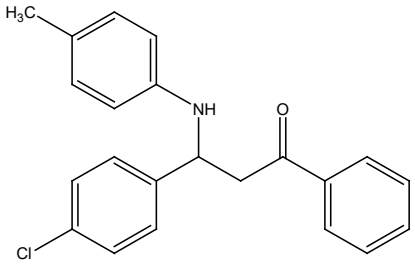

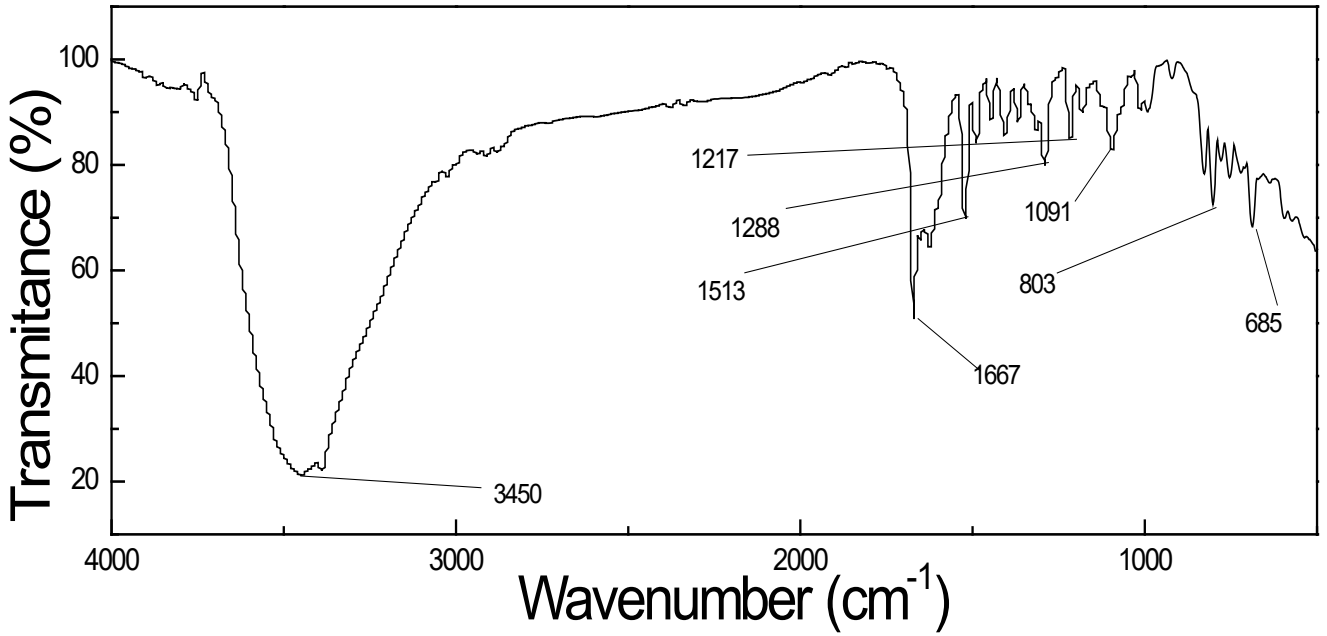

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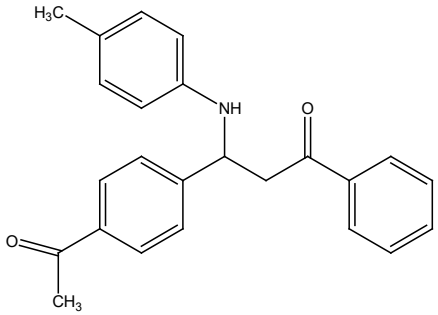
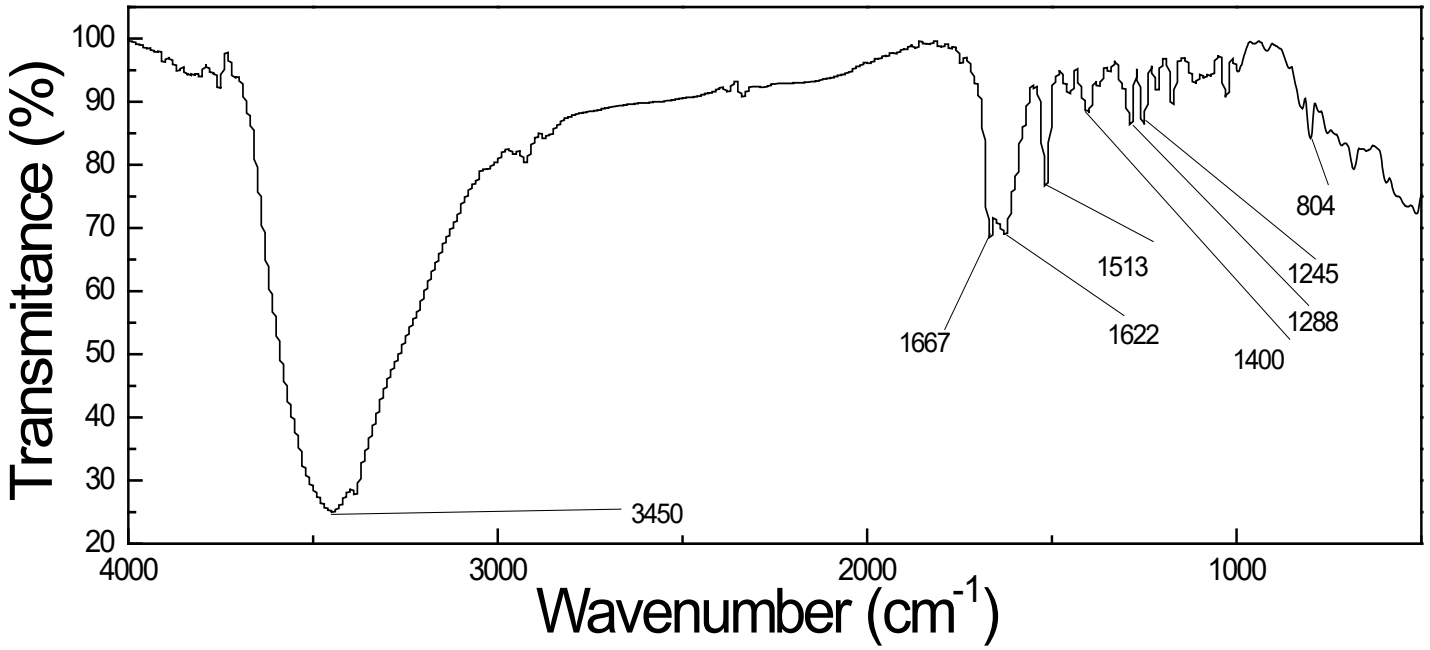
Compound 10





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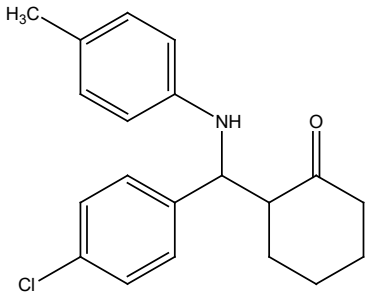
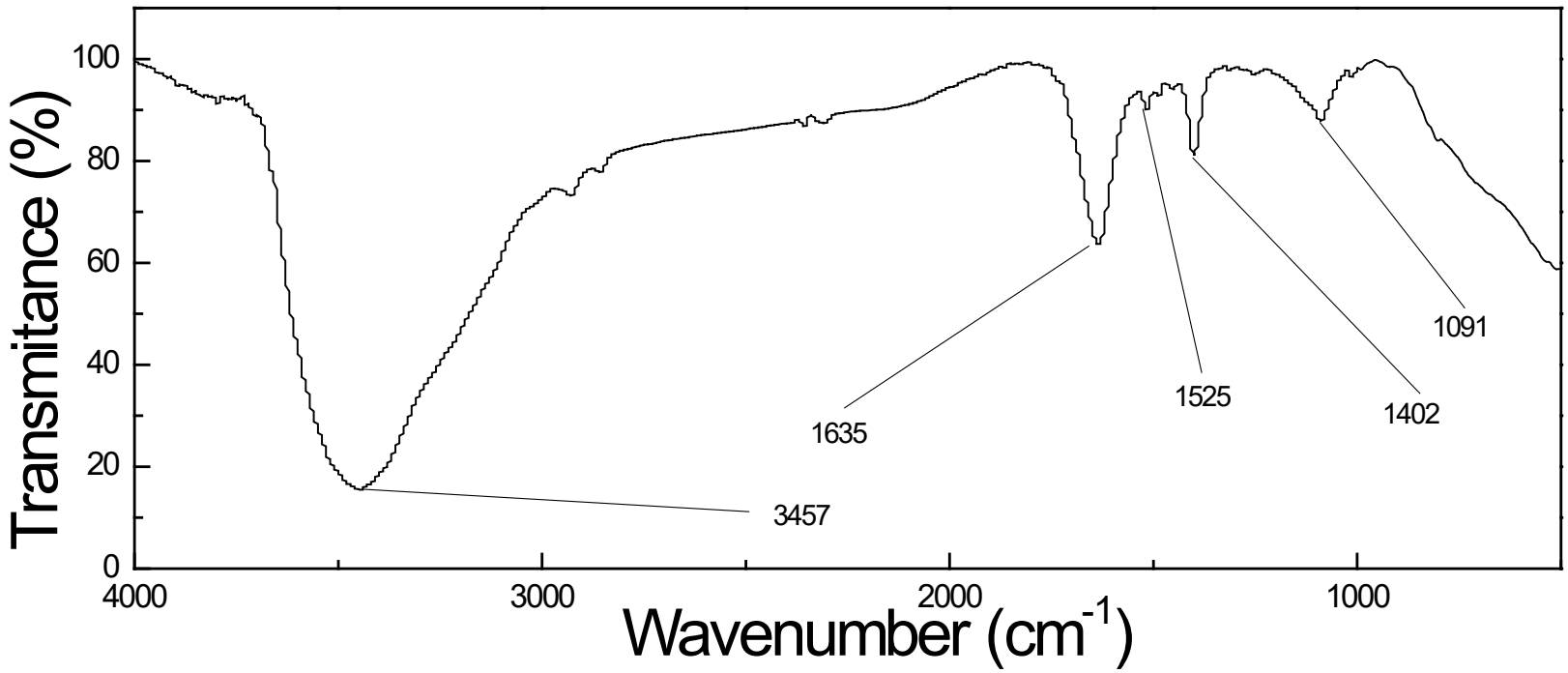
Compound 11





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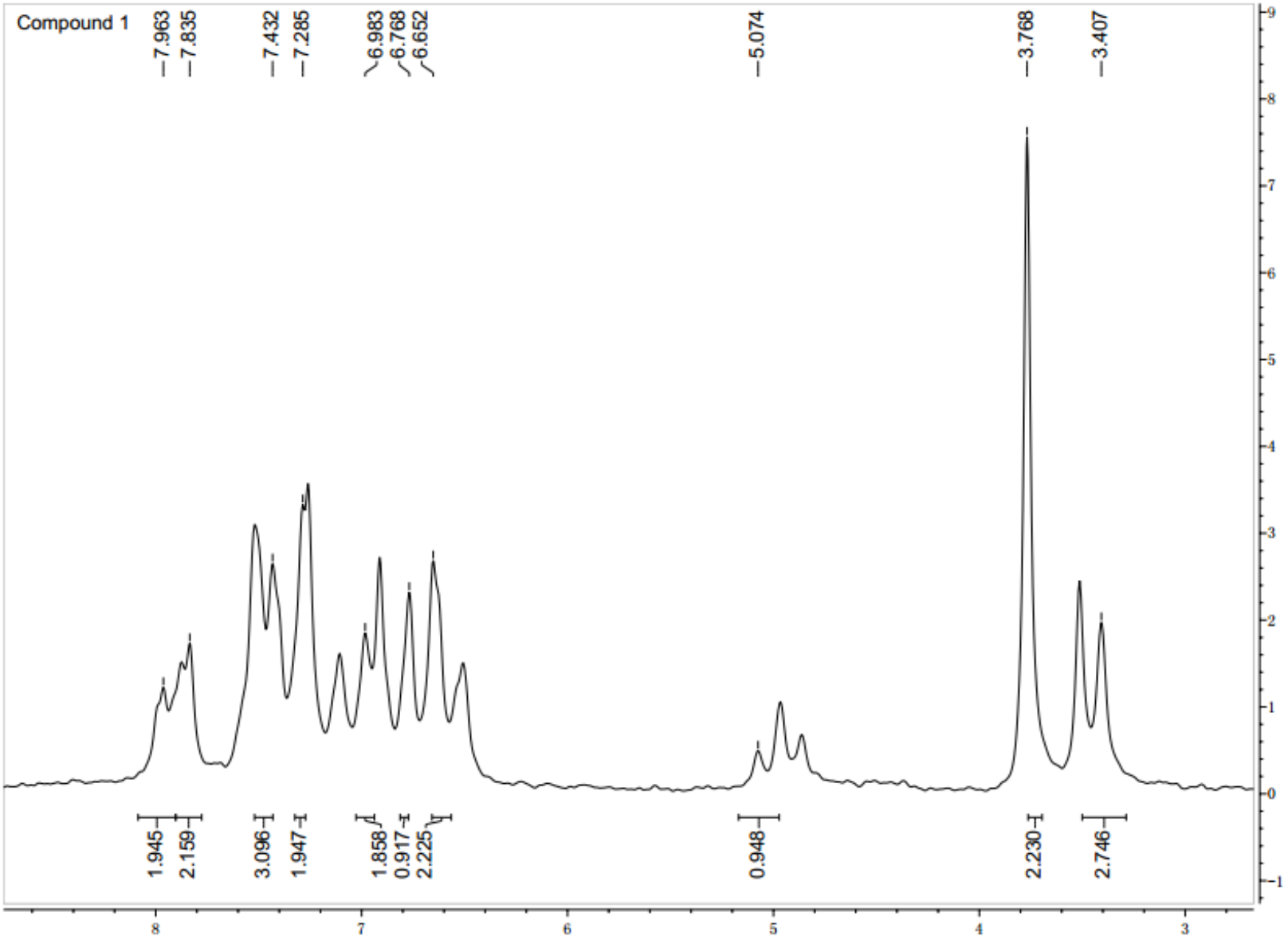

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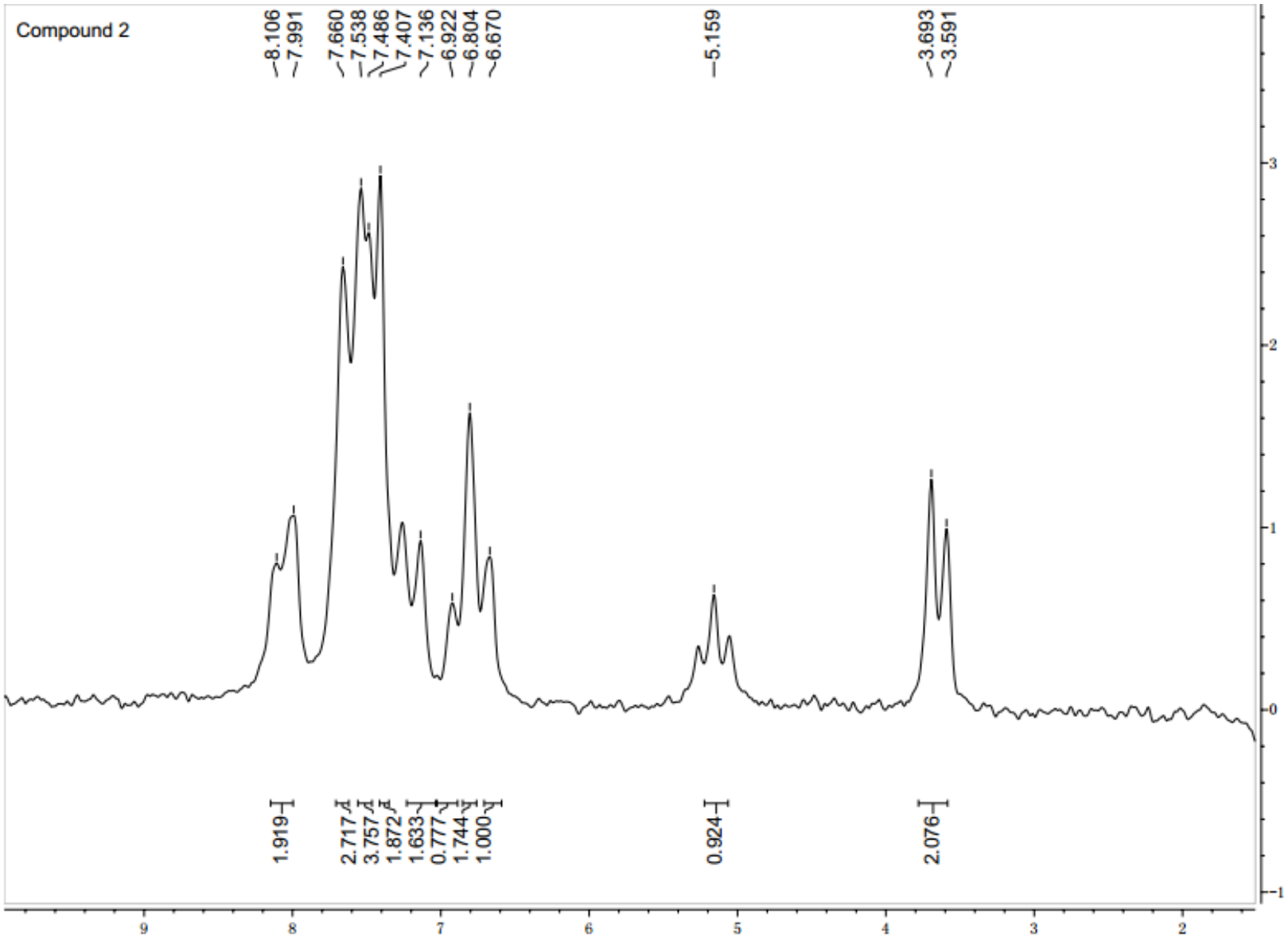

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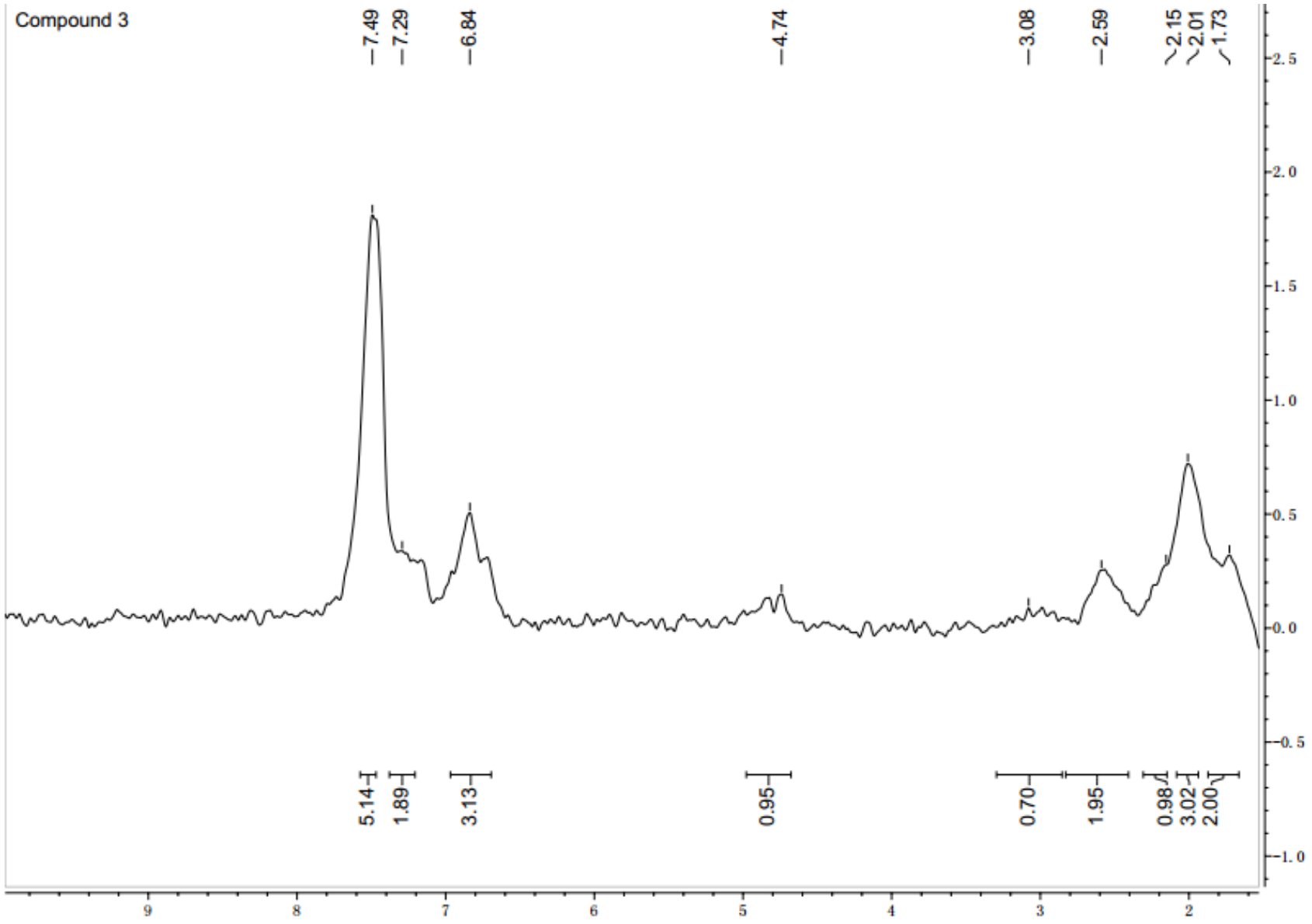

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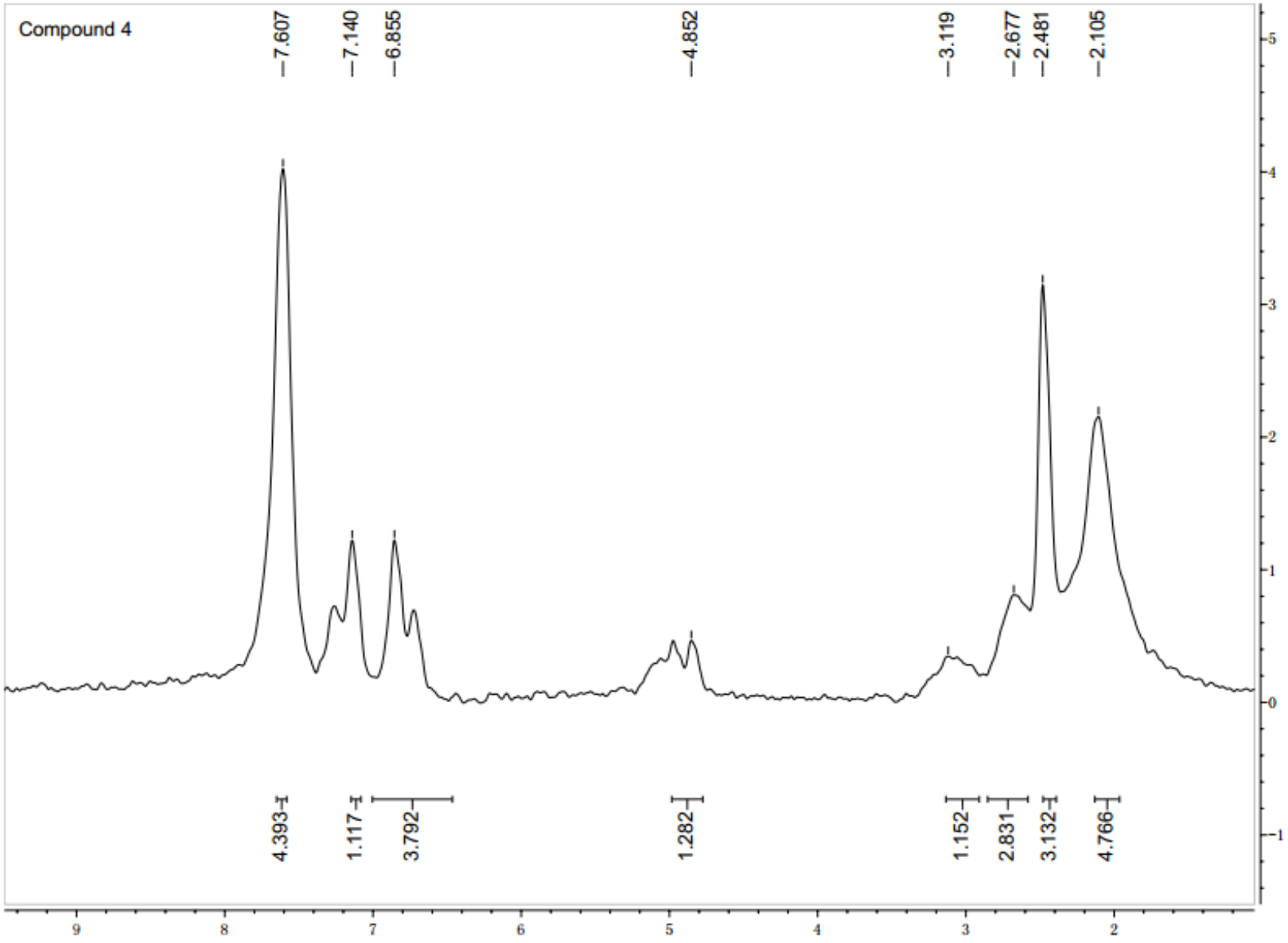

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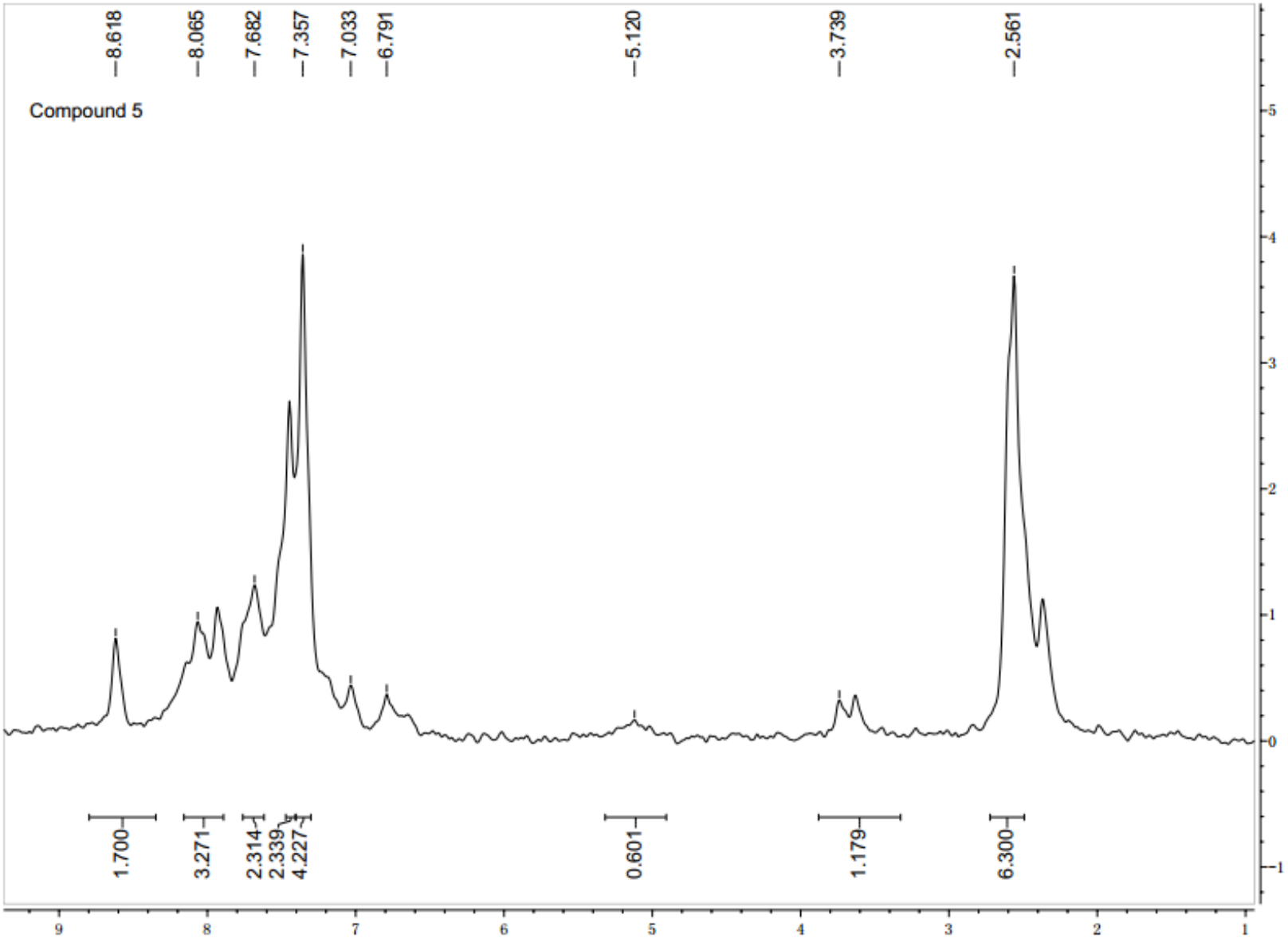

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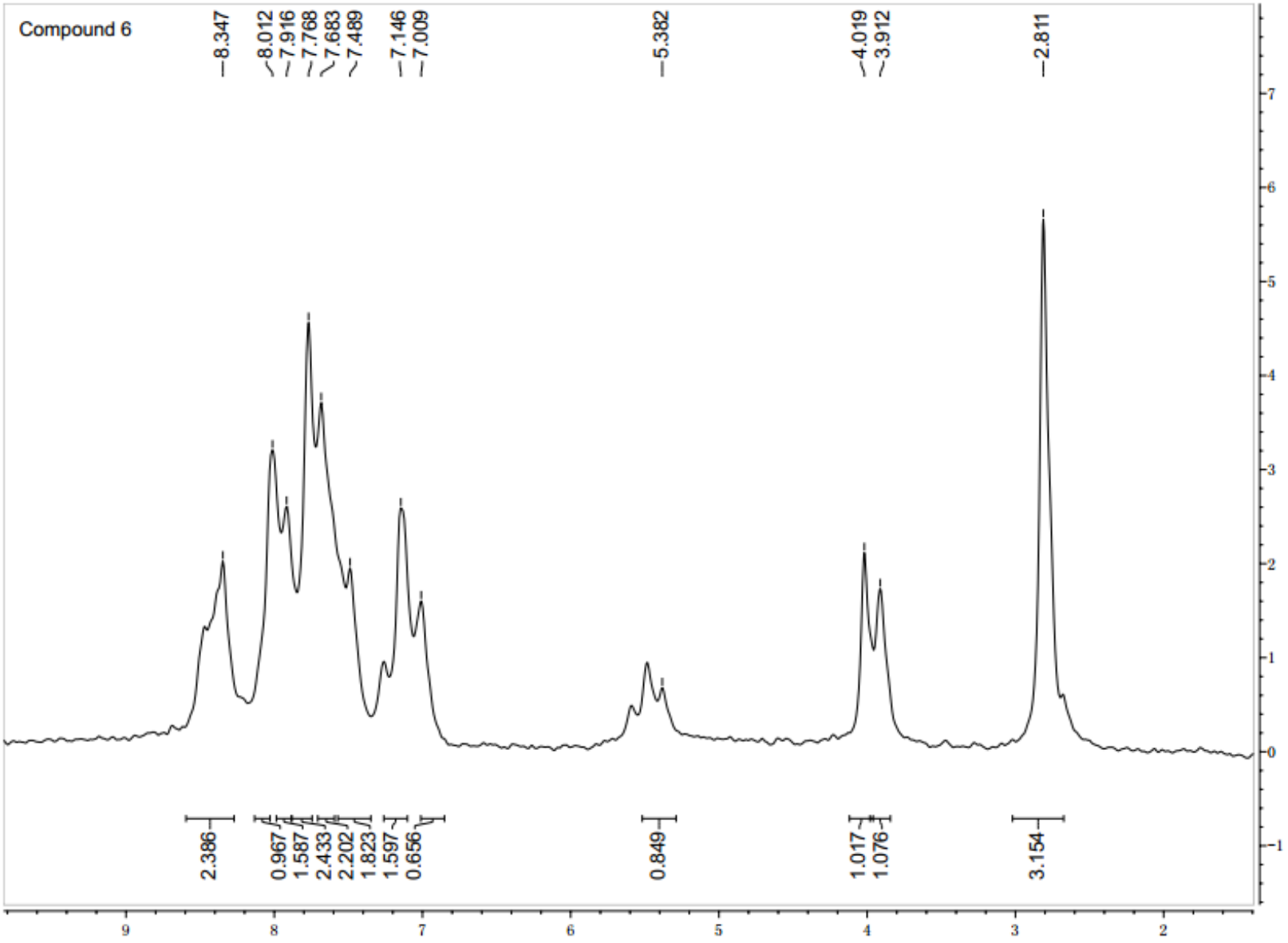

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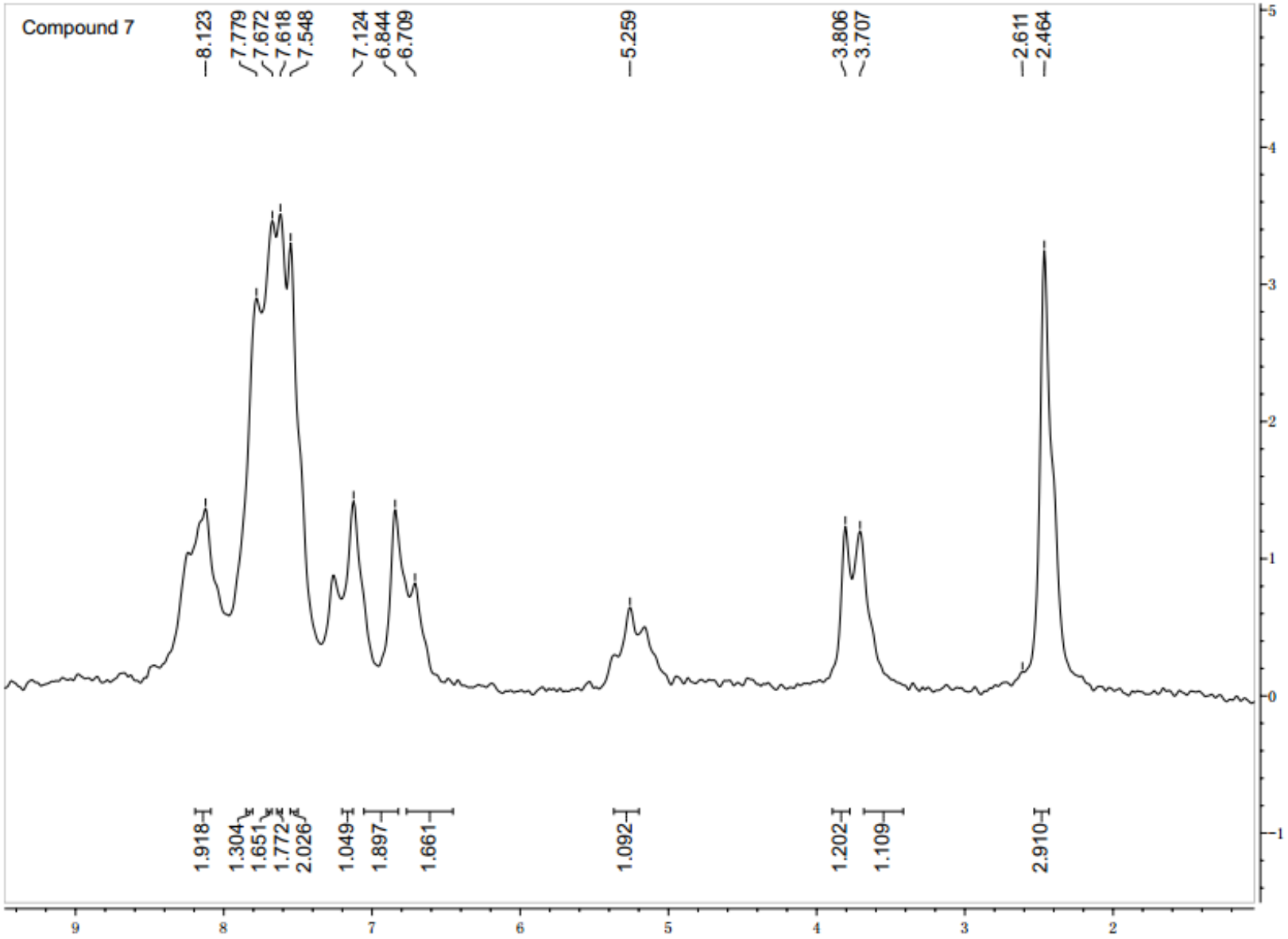

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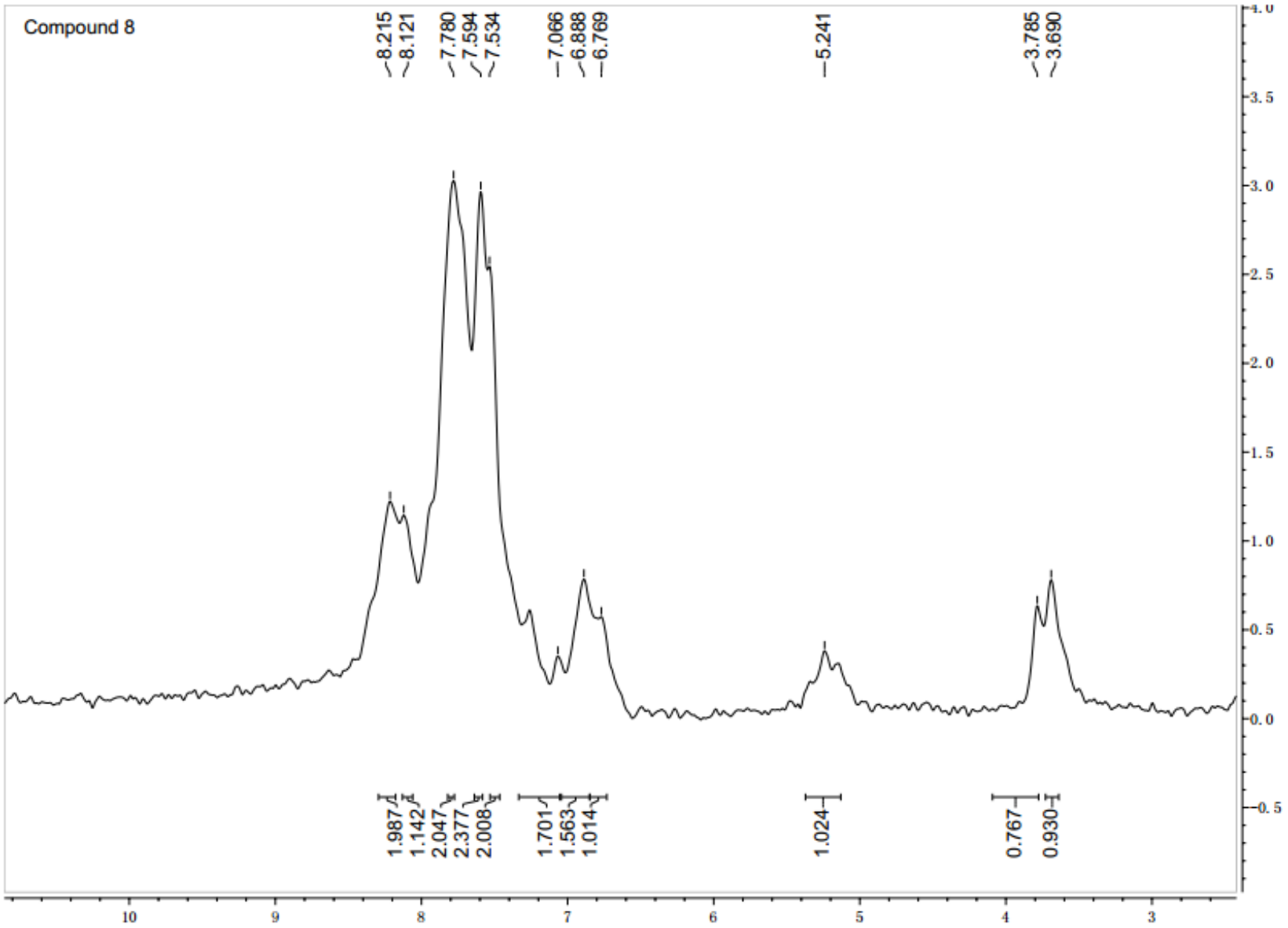

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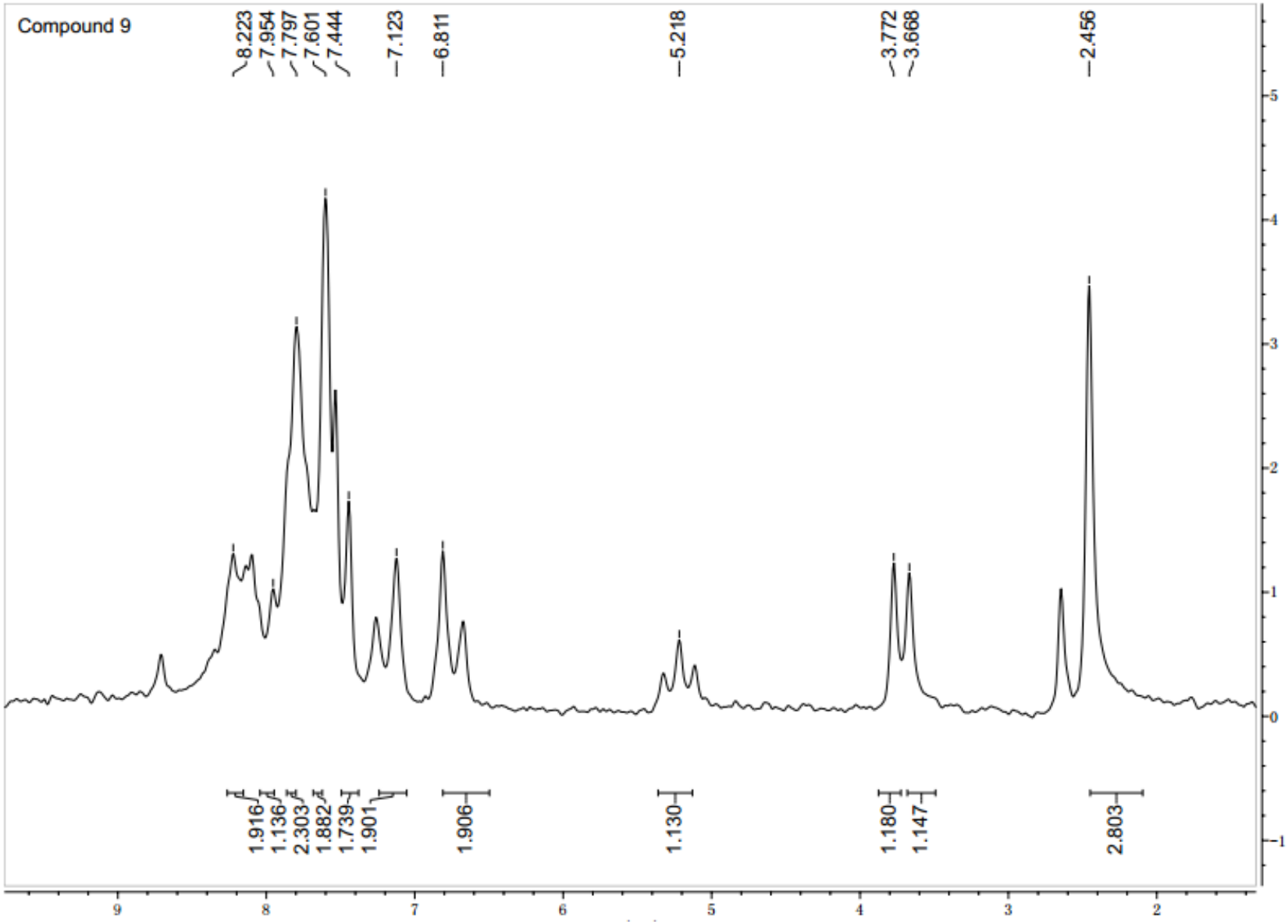

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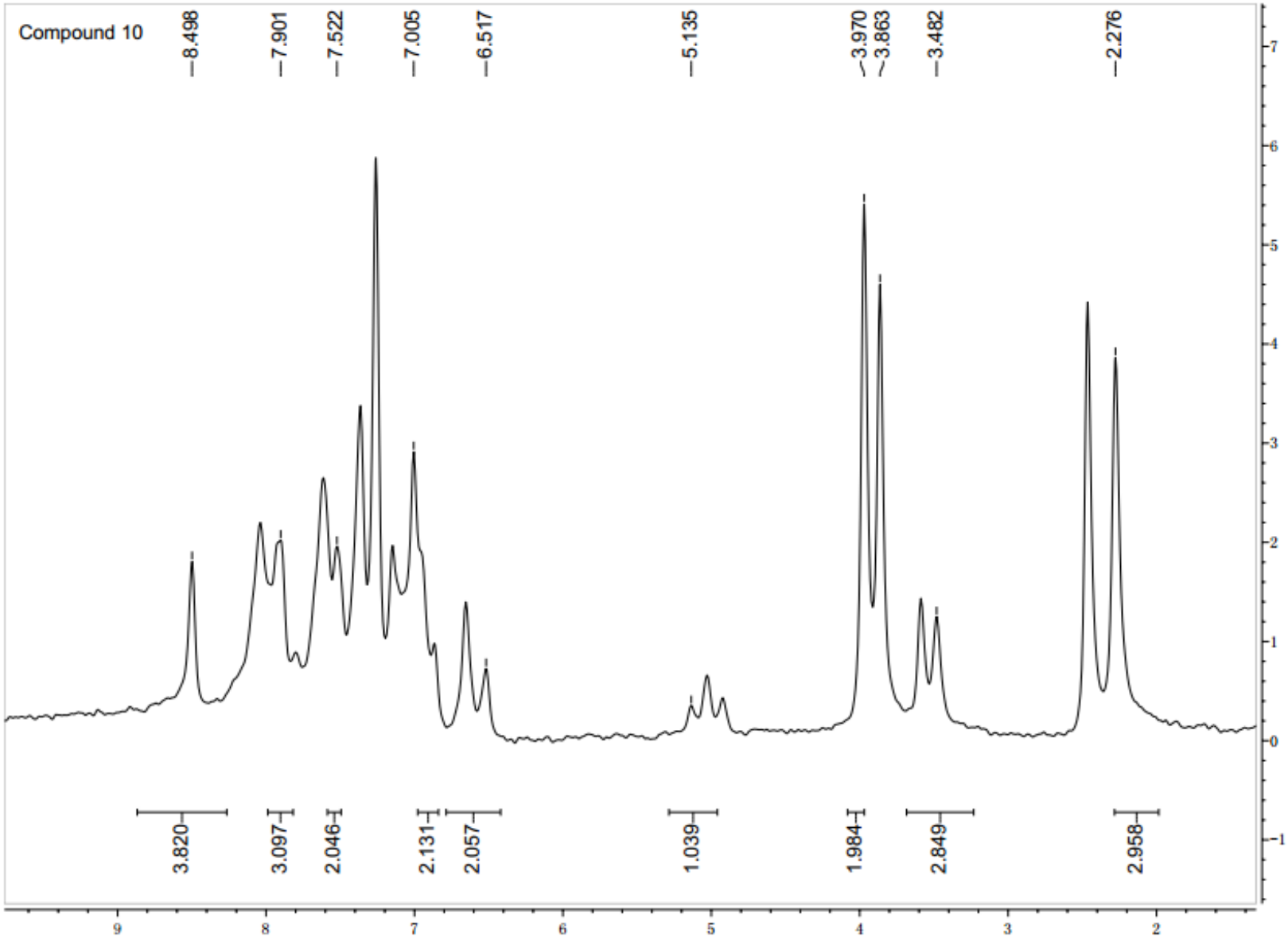

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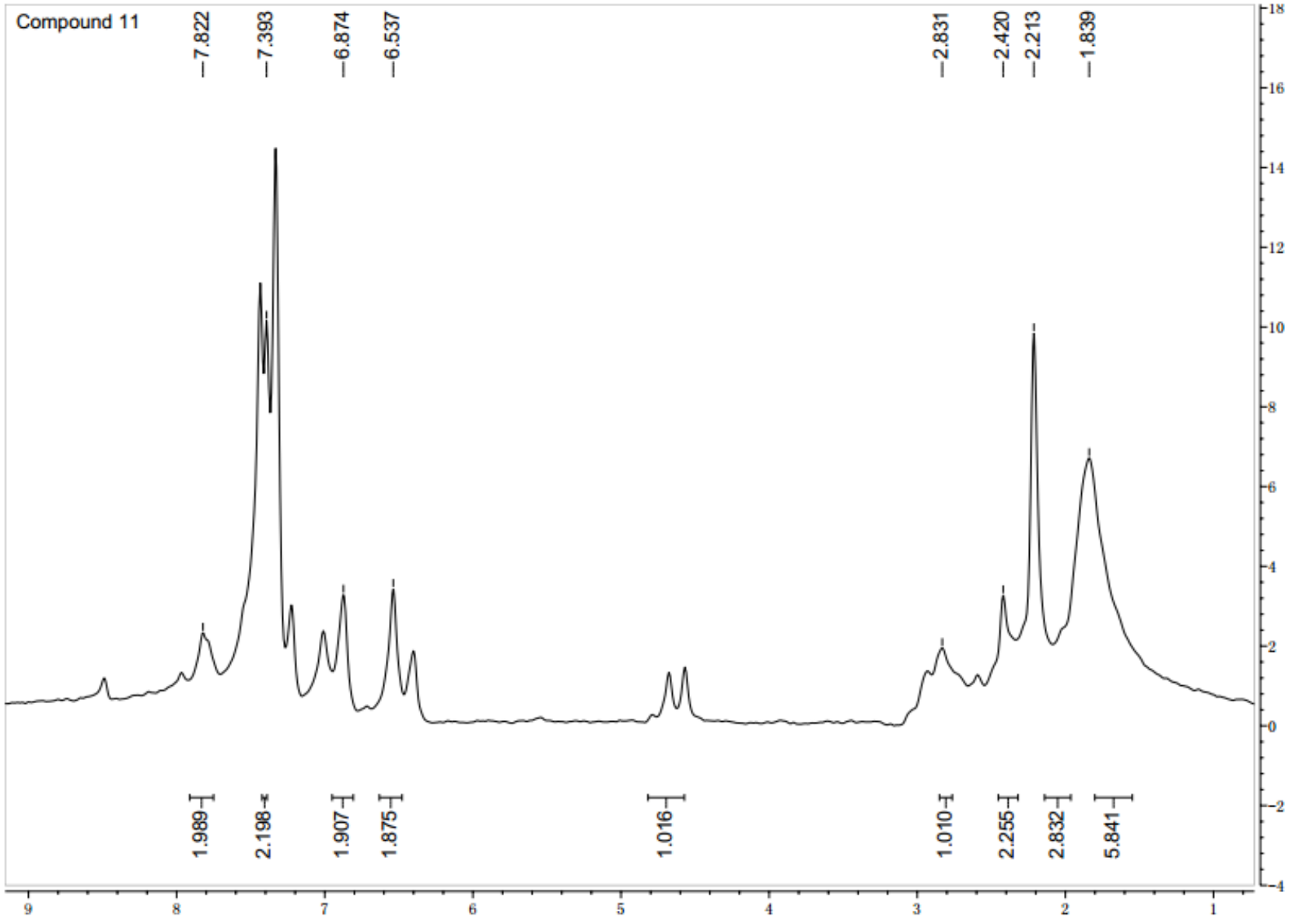

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