

Supporting Information

for

Gold-catalyzed intermolecular hydroamination of allenes with sulfonamides

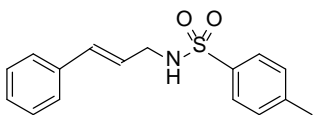
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Email: Dong-Mei Cui - cuidongmei@zjut.edu.cn

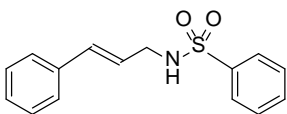
* Corresponding author

Analytical and spectroscopic data for compounds 3a–3j, 3ka, 3kb and 3l–3n.



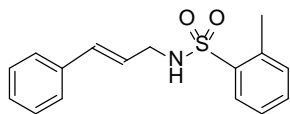
***N*-cinnamyl-4-methylbenzenesulfonamide (3a)** [1]: White solid; mp 103–105 °C;

^1H NMR (500 MHz, CDCl_3) δ 7.78 (d, $J = 8.0$ Hz, 2H), 7.32-7.22 (m, 7H), 6.44 (d, $J = 16.0$ Hz, 1H), 6.02 (dt, $J = 16.0, 6.5$ Hz, 1H), 4.52 (t, $J = 5.7$ Hz, 1H), 3.77-3.75 (m, 2H), 2.42 (s, 3H).



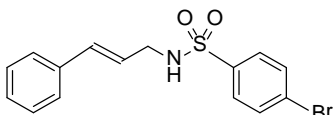
***N*-cinnamylbenzenesulfonamide (3b)** [2]: White solid; mp 69–70 °C; ^1H NMR

(500 MHz, CDCl_3) δ 7.91-7.90 (m, 2H), 7.89-7.50 (m, 3H), 7.30-7.22 (m, 5H), 6.45 (d, $J = 16.0$ Hz, 1H), 6.01 (dt, $J = 16.0, 6.0$ Hz, 1H), 4.75 (t, $J = 6.5$ Hz, 1H), 3.79-3.77 (m, 2 H).



***N*-cinnamyl-2-methylbenzenesulfonamide (3c)**: Pale yellow oil; ^1H NMR (500 MHz,

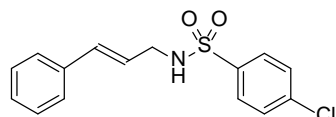
CDCl_3) δ 8.00 (d, $J = 8.0$ Hz, 1H), 7.48-7.44 (m, 1H), 7.33-7.23 (m, 7H), 6.44 (d, $J = 16.0$ Hz, 1H), 6.01 (dt, $J = 16.0, 6.5$ Hz, 1H), 4.68 (t, $J = 6.0$ Hz, 1H), 3.75 (dd, $J = 6.5, 6.0$ Hz, 2H), 2.67 (s, 3H); ^{13}C NMR (125 MHz, CDCl_3) δ 138.0, 137.0, 136.0, 133.3, 132.9, 132.6, 129.6, 128.6, 128.0, 126.4, 126.3, 124.0, 45.4, 20.4; IR (KBr, cm^{-1}) 3452, 2994, 1769, 1758, 1637, 1384, 1318, 1245, 1158, 1131, 967, 758, 691, 594, 542; HRMS (ESI) calcd for $\text{C}_{16}\text{H}_{17}\text{NO}_2\text{S}+\text{Na}$ 310.0878, found 310.0888.



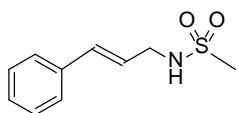
4-bromo-*N*-cinnamylbenzenesulfonamide (3d): Yellow solid; mp 53–55 °C; ^1H NMR

(500 MHz, CDCl_3) δ 7.76-7.74 (m, 2H), 7.66-7.64 (m, 2H), 7.31-7.23 (m, 5H), 6.45 (d, $J =$

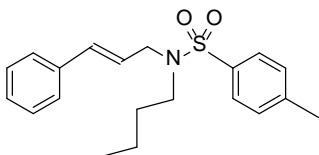
16.0 Hz, 1H), 6.01 (dt, $J = 16.0, J = 6.5$ Hz, 1H); 4.70 (t, $J = 6.3$ Hz, 1H), 3.79-3.77 (m, 2H); ^{13}C NMR (125 MHz, CDCl_3) δ 139.2, 135.8, 133.5, 132.4, 128.7, 128.6, 128.1, 127.8, 126.4, 123.6, 45.5; IR (KBr, cm^{-1}) 3421, 2984, 1654, 1637, 1560, 1508, 1383, 1241, 1162, 1096, 938, 848, 814, 668, 634, 608, 551; HRMS (ESI) calcd for $\text{C}_{15}\text{H}_{14}\text{NO}_2\text{S}+\text{Na}$ 373.9826, found 373.9842.



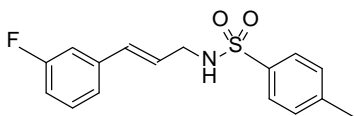
4-chloro-N-cinnamylbenzenesulfonamide (3e): White solid; mp 107–108 °C; ^1H NMR (500 MHz, CDCl_3) δ 7.82 (d, $J = 8.5$ Hz, 2H), 7.45 (d, $J = 8.5$ Hz, 2H), 7.30-7.22 (m, 5H), 6.44 (d, $J = 16.0$ Hz, 1H), 5.99 (dt, $J = 16.0, 6.5$ Hz, 1H), 4.90 (t, $J = 6.0$ Hz, 1H), 3.78-3.75(m, 2H); ^{13}C NMR (125 MHz, CDCl_3) δ 139.2, 138.7, 135.9, 133.4, 129.4, 128.6, 128.1, 126.4, 123.7, 45.5; IR (KBr, cm^{-1}) 3444, 2993, 1633, 1477, 1383, 1245, 1162, 1094, 1050, 751, 693, 622; HRMS (ESI) calcd for $\text{C}_{15}\text{H}_{14}\text{BrNO}_2\text{S}$ 307.0428, found 307.0425.



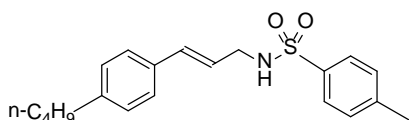
N-cinnamylmethanesulfonamide (3f): White solid; mp 67–69 °C; ^1H NMR (500 MHz, CDCl_3) δ 7.38-7.35 (m, 2H), 7.34-7.30 (m, 2H), 7.28-7.25 (m, 1H), 6.61 (d, $J = 16.0$ Hz, 1H), 6.20 (dt, $J = 16.0, 6.5$ Hz, 1H), 4.82 (t, $J = 5.5$ Hz, 1 H), 3.93-3.90 (m, 2H), 2.98 (s, 3H); ^{13}C NMR (125 MHz, CDCl_3) δ 136.0, 133.3, 128.7, 128.1, 126.5, 124.5, 45.4, 41.1; IR (KBr, cm^{-1}) 3459, 2994, 1769, 1758, 1636, 1383, 1245, 1056, 913, 743, 626; HRMS (EI) calcd for $\text{C}_{10}\text{H}_{13}\text{NO}_2\text{S}$ 211.0667, found 211.0668.



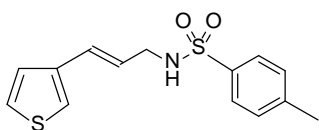
***N*-butyl-*N*-cinnamyl-4-methylbenzenesulfonamide (3g):** Yellow solid; mp 103–105 °C; ^1H NMR (500 MHz, CDCl_3) δ 7.72 (d, $J = 8.5$ Hz, 2H), 7.31-7.28 (m, 5H), 7.27-7.23 (q, $J = 3.7$ Hz, 2H), 6.44 (d, $J = 15.5$ Hz, 1H), 5.95 (dt, $J = 15.5, 5.3$ Hz, 1H), 3.96-3.94 (m, 2H), 3.16 (t, $J = 7.5$ Hz, 2H), 2.42 (s, 3H), 1.55-1.49(m, 2H), 1.31-1.23(m, 2H), 0.87 (t, $J = 7.5$ Hz, 3H); ^{13}C NMR (125 MHz, CDCl_3) δ 143.1, 137.3, 136.3, 133.5, 129.6, 128.7, 127.9, 127.2, 126.4, 124.4, 49.9, 47.1, 30.3, 21.5, 19.8, 13.7; IR (KBr, cm^{-1}) 3460, 3059, 2983, 2934, 1599, 1494, 1374, 1339, 1246, 1159, 1091, 912, 815, 738, 703, 653, 634, 608, 550; HRMS (EI) calcd for $\text{C}_{20}\text{H}_{25}\text{NO}_2\text{S}$ 343.1608, found 343.1612.



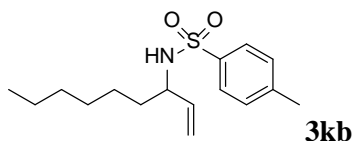
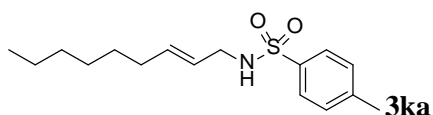
***N*-(3-fluorocinnamyl)-4-methylbenzenesulfonamide (3h):** Pale yellow solid; mp 81–82 °C; ^1H NMR (500 MHz, CDCl_3) δ 7.79-7.77 (m, 2H), 7.29-7.19 (m, 3H), 6.99-6.85 (m, 3H), 6.40 (d, $J = 15.5$ Hz, 1H), 6.00 (dt, $J = 15.5, 6.5$ Hz, 1H), 4.87 (t, $J = 6.3$ Hz, 1H), 3.77-3.74(m, 2H), 2.41 (s, 3H); ^{13}C NMR (125 MHz, CDCl_3) δ 163.1 (d, $J = 243.8$ Hz), 143.8, 138.6 (d, $J = 7.5$ Hz), 137.1, 131.9, 130.2 (d, $J = 8.8$ Hz), 129.9, 127.3, 125.7, 122.5 (d, $J = 2.5$ Hz), 114.8 (d, $J = 21.3$ Hz), 112.9 (d, $J = 22.5$ Hz), 45.4, 21.6; IR (KBr, cm^{-1}) 3417, 1636, 1384, 1246, 1158, 1092, 550; HRMS(ESI) calcd for $\text{C}_{16}\text{H}_{16}\text{FNO}_2\text{S}+\text{Na}$ 328.0783, found 328.0779.



***N*-(4-butylcinnamyl)-4-methylbenzenesulfonamide (3i)**: Pale yellow solid; mp 63–65 °C; ^1H NMR (500 MHz, CDCl_3) δ 7.77 (d, $J = 8.0$ Hz, 2H), 7.29 (d, $J = 8.0$ Hz, 2H), 7.34 (d, $J = 8.0$ Hz, 2H), 7.09 (d, $J = 8.0$, 2H), 6.40 (d, $J = 15.5$ Hz, 1H), 5.95 (dt, $J = 15.5$, 6.5 Hz, 1H), 4.66 (t, $J = 6.0$ Hz, 1H), 3.74-3.71 (m, 2H), 2.57 (t, $J = 7.5$ Hz, 2H), 2.41 (s, 3H), 1.60-1.54 (m, 2H), 1.37-1.30 (m, 2H), 0.91 (t, $J = 7.5$ Hz, 3H); ^{13}C NMR (125 MHz, CDCl_3) δ 143.5, 142.9, 137.1, 133.5, 133.1, 129.7, 128.6, 127.2, 126.3, 123.0, 45.6, 35.3, 33.5, 22.3, 21.5, 13.9; IR (KBr, cm^{-1}) 3412, 2930, 2858, 1638, 1618, 1512, 1384, 1331, 1245, 1161, 1094, 969, 913, 814, 734, 663, 607, 560, 551; HRMS (EI) calcd for $\text{C}_{20}\text{H}_{25}\text{NO}_2\text{S}$ 343.1606, found: 343.1618.

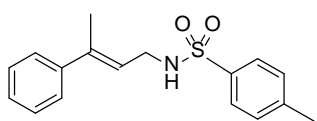


4-methyl-*N*-(3-(thiophen-3-yl)allyl)benzenesulfonamide (3j): Yellow solid; mp 97–100 °C; ^1H NMR (500 MHz, CDCl_3) δ 7.77 (d, $J = 8.5$, 2H), 7.31 (d, $J = 8.0$, 2H), 7.26-7.23 (m, 1H), 7.08-7.06 (m, 2H), 6.46 (d, $J = 16.0$ Hz, 1H), 5.87 (dt, $J = 16.0$, 6.5 Hz, 1H), 4.53 (t, $J = 6.3$ Hz, 1H), 3.73-3.70 (m, 2H), 2.42 (s, 3H); ^{13}C NMR (125 MHz, CDCl_3) δ 143.6, 138.7, 137.1, 129.7, 127.2, 126.2, 124.8, 123.8, 122.7, 45.5, 29.7, 21.5; IR (KBr, cm^{-1}) 3414, 2923, 1617, 1493, 1447, 1384, 1331, 1265, 1164, 1091, 1071, 909, 813, 767, 739, 699, 674, 574, 548; HRMS (EI) calcd for $\text{C}_{14}\text{H}_{15}\text{NO}_2\text{S}_2$ 293.0544, found 293.0547.



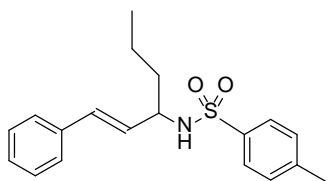
(E)-4-methyl-N-(non-2-enyl)benzenesulfonamide (3ka) and

4-methyl-N-(non-1-en-3-yl)benzenesulfonamide (3kb): Pale yellow oil; ^1H NMR (500 MHz, CDCl_3) (**3ka**) δ 7.75 (d, $J = 8.0$ Hz, 2H), 7.30 (d, $J = 8.0$ Hz, 2H), 5.58-5.51(m, 1H), 5.32-5.27 (m, 1H), 4.66 (t, $J = 6.0$ Hz, 1H), 3.53-3.50 (m, 2H), 2.42 (s, 3H), 1.94-1.89 (m, 2H), 1.29-1.22 (m, 8H), 0.88-0.83(m, 3H); ^1H NMR (500 MHz, CDCl_3) (**3kb**) δ 7.76-7.73 (m, 2H), 7.28-7.26 (m, 2H), 5.58-5.51 (m, 1H), 5.01-4.93 (m, 2H), 4.82 (d, $J = 7.5$ Hz, 1H), 3.75-3.71 (m, 1H), 2.41 (s, 3H), 1.46-1.42 (m, 2H), 1.29-1.22 (m, 8H), 0.88-0.83(m, 3H); ^{13}C NMR (125 MHz, CDCl_3) (**3ka** and **3kb**) δ 143.3, 143.1, 138.2, 137.9, 137.2, 135.0, 129.6, 129.4, 127.2, 124.3, 115.7, 56.3, 45.3, 35.5, 32.0, 31.6, 31.6, 29.7, 28.8, 28.79, 28.7, 25.1, 22.5, 22.4, 21.4, 14.0, 13.9; IR (KBr, cm^{-1}) 3415, 2961, 2927, 2872, 1636, 1465, 1384, 1330, 1161, 1095, 1048, 970, 922, 814, 707, 666, 552; HRMS (EI) calcd for $\text{C}_{16}\text{H}_{25}\text{NO}_2\text{S}$ 295.1606, found 295.1607.

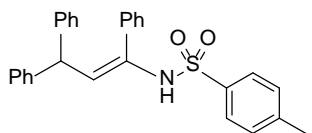


4-methyl-N-(3-phenylbut-2-enyl)benzenesulfonamide (3l): Yellow solid; mp 96–98 °C; ^1H NMR (500 MHz, CDCl_3) δ 7.78 (d, $J = 8.5$ Hz, 2H), 7.31-7.20 (m, 7H), 5.58-5.55 (m, 1H), 4.65 (t, $J = 5.8$ Hz, 1H), 3.78 (t, $J = 6.5$ Hz, 2H), 2.41 (s, 3H), 1.95 (s, 3H); ^{13}C NMR (125 MHz, CDCl_3) δ 143.5, 142.4, 139.3, 137.1, 129.7, 128.2, 127.4, 127.2, 125.7, 121.9, 41.5, 21.5, 16.0; IR (KBr, cm^{-1}) 3414, 2959, 2926, 1715, 1617, 1465, 1384, 1328,

1160, 1093, 813, 761, 700, 662, 550; HRMS (EI) calcd for C₁₇H₁₉NO₂S 301.1126, found 301.1122.



(E)-4-methyl-N-(1-phenylhex-1-en-3-yl)benzenesulfonamide (3m): White solid; mp 75–77 °C; ¹H NMR (500 MHz, CDCl₃) δ 7.74-7.72 (m, 2H), 7.25-7.14 (m, 5H), 7.09-7.07 (m, 2H), 6.17 (d, *J* = 15.5 Hz, 1H), 5.69 (dd, *J* = 15.5 Hz, *J* = 7.5 Hz, 1H), 5.12 (d, *J* = 8.0 Hz, 1H), 3.94-3.88 (m, 1H) , 2.27 (s, 3H), 1.57-1.47 (m, 2H), 1.35-1.24 (m, 2H), 0.85 (t, *J* = 7.5 Hz, 3H); ¹³C NMR (125 MHz, CDCl₃) δ 143.1, 138.2, 136.3, 131.3, 129.4, 129.0, 128.3, 127.5, 127.3, 126.3, 56.2, 38.0, 21.3, 18.6, 13.6; IR (KBr, cm⁻¹) 3275, 3058, 2958, 2931, 2871, 1598, 1448, 1384, 1324, 1159, 1093, 1028, 966, 813, 746, 667, 573; HRMS (EI) calcd for C₁₉H₂₃NO₂S 329.1446, found 329.1451.

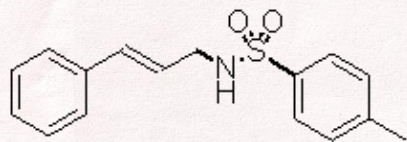


4-methyl-N-(1,3,3-triphenylprop-1-enyl)benzenesulfonamide (3n): Yellow solid; mp 113–114 °C; ¹H NMR (500 MHz, CDCl₃) δ 7.60 (d, *J* = 7.5 Hz, 2H), 7.46-7.45 (m, 2H), 7.45-7.20 (m, 11H), 6.94-6.92 (m, 4H), 6.06 (s, 1H), 5.93 (d, *J* = 9.0 Hz, 1H), 4.38 (d, *J* = 9.0 Hz, 1H) , 2.42 (s, 3H); ¹³C NMR (125 MHz, CDCl₃) δ 143.8, 142.8, 137.2, 136.8, 135.4, 129.6, 128.8, 128.6, 128.0, 127.9, 127.5, 127.3, 126.8, 48.7, 21.5; IR (KBr, cm⁻¹) 3418, 2924, 2853, 1617, 1456, 1384, 1326, 1265, 1160, 1093, 965, 814, 742, 705, 664, 551; HRMS (EI) calcd for C₂₈H₂₅NO₂S 439.1606, found 439.1610.

References

[1] Carta, F.; Pothen, B.; Maresca, A. *Chem. Biol. Drug Des.* **2009**, *74*, 196.
doi:10.1111/j.1747-0285.2009.00842.x

[2] Gensler, W. J.; Dheer, S. K. *J. Org. Chem.* **1981**, *46*, 4051. doi:10.1021/jo00333a023



3a

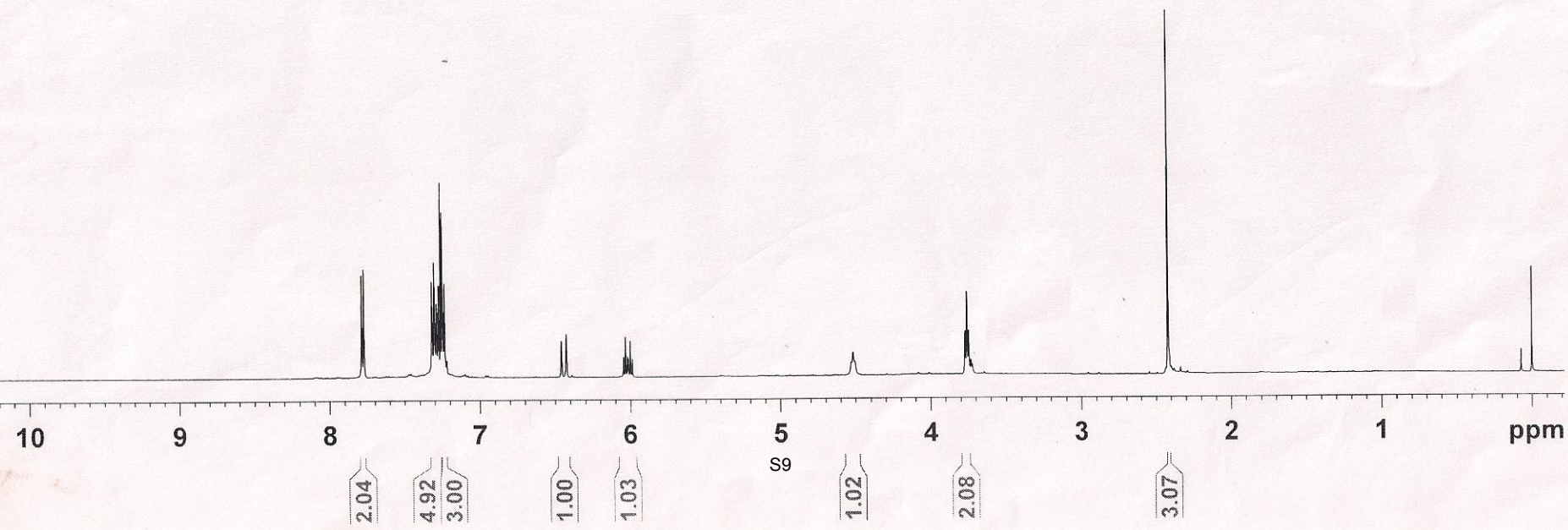
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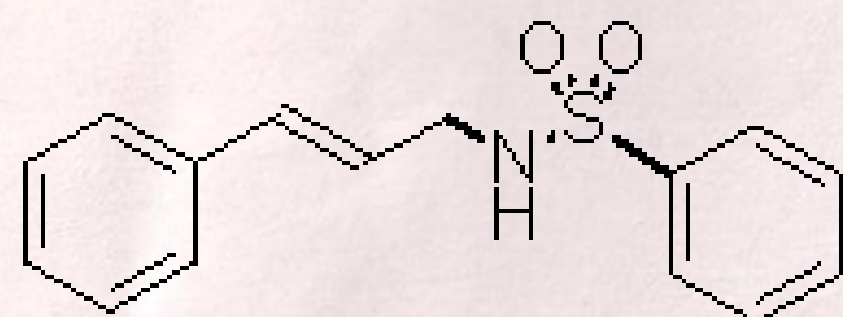
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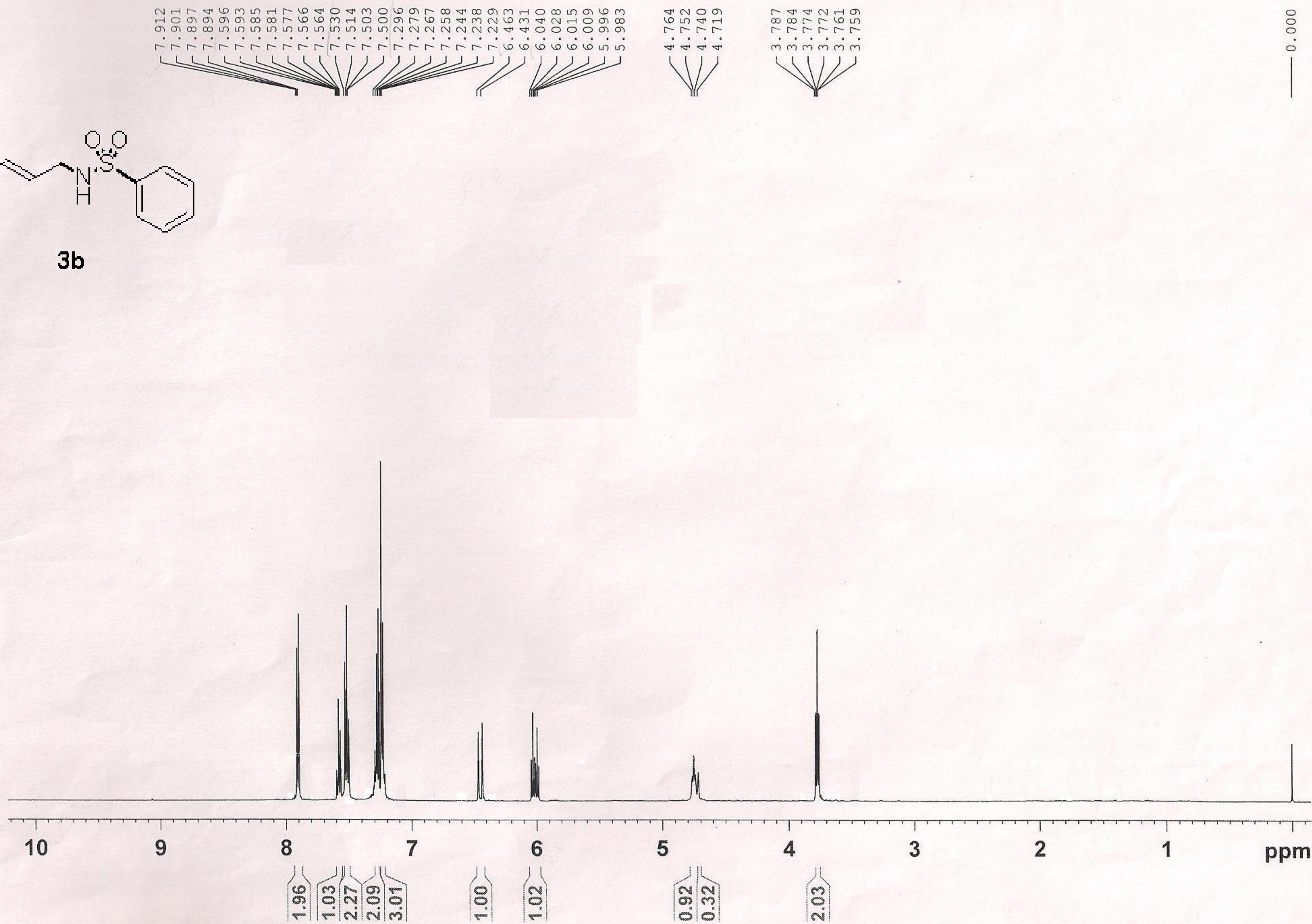


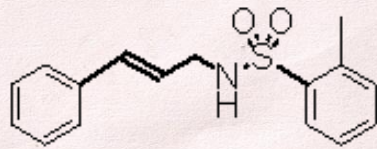
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CDC13



3b





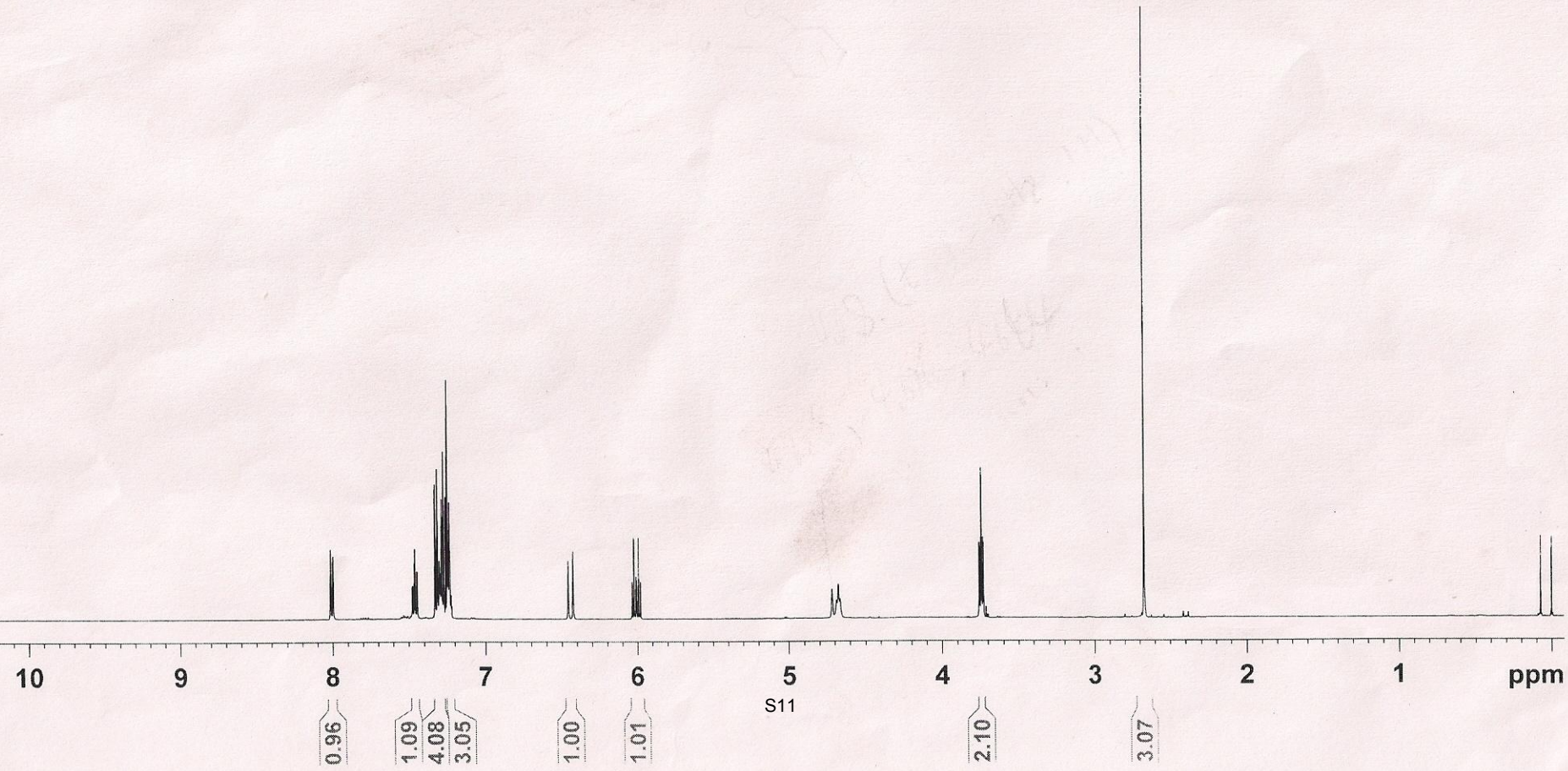
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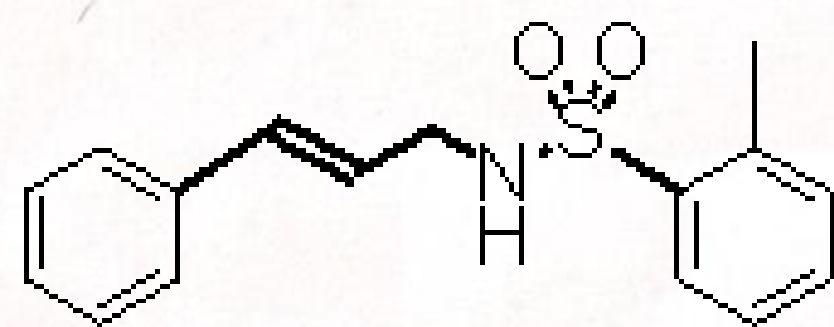
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S11



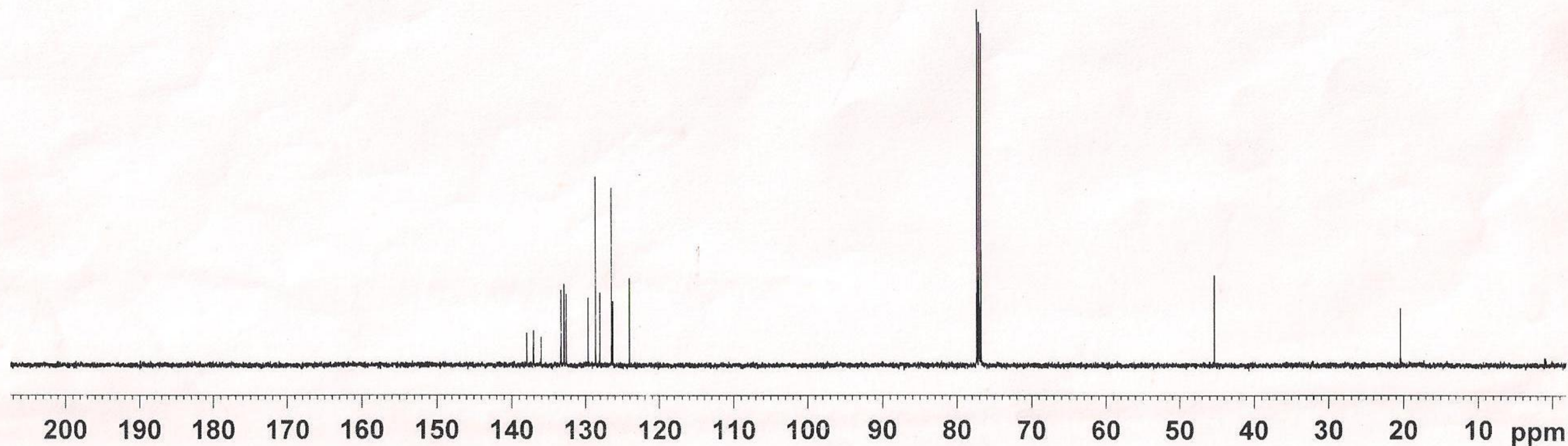
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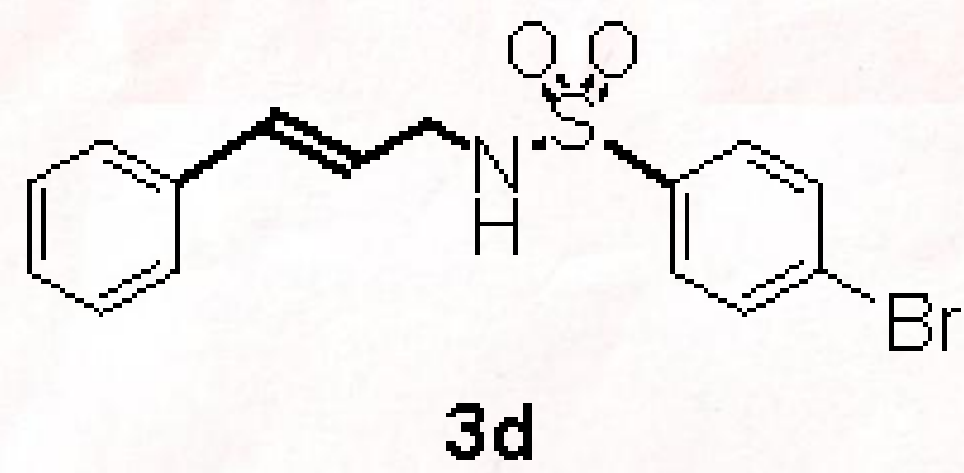
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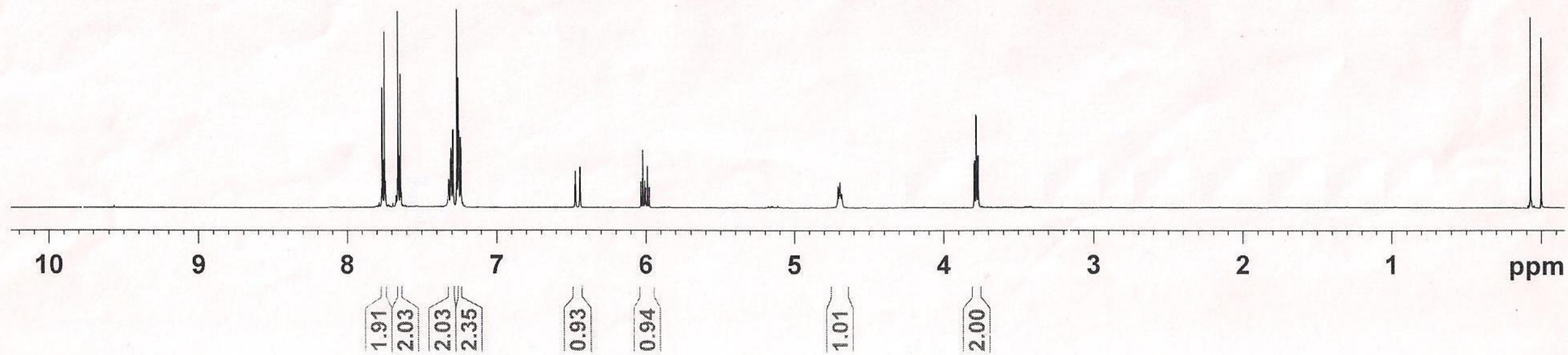


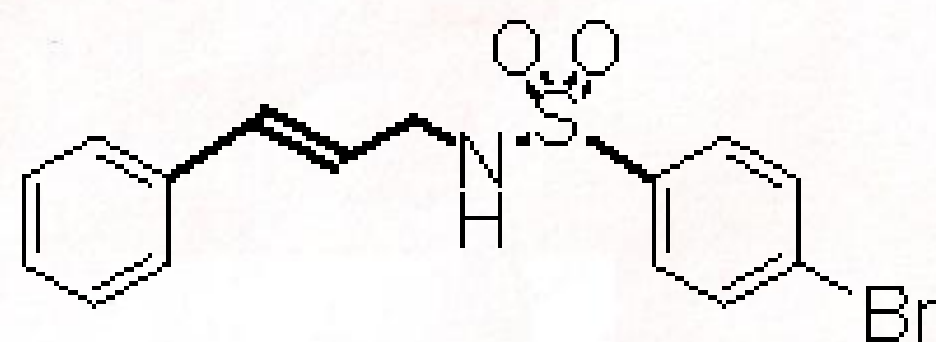
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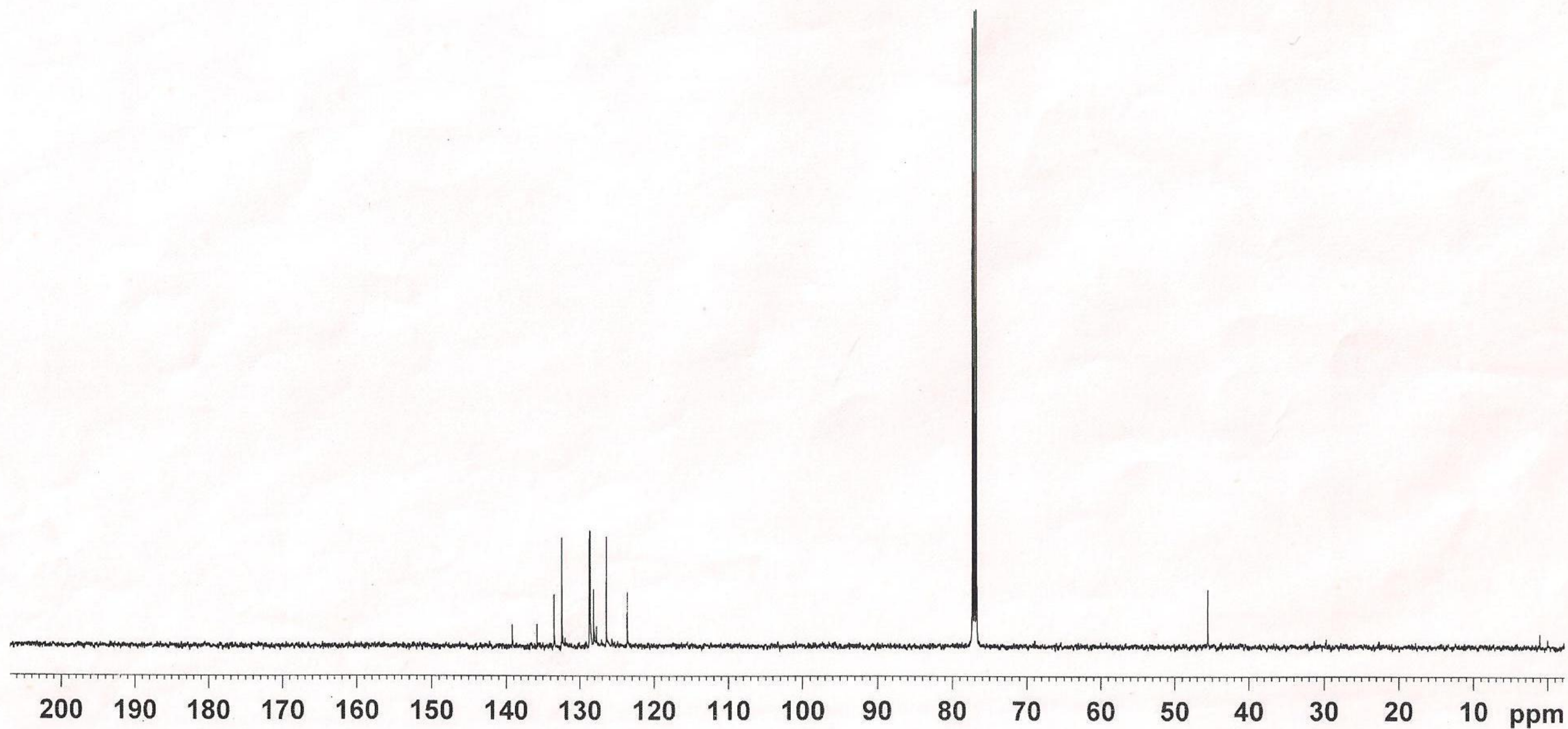


3d

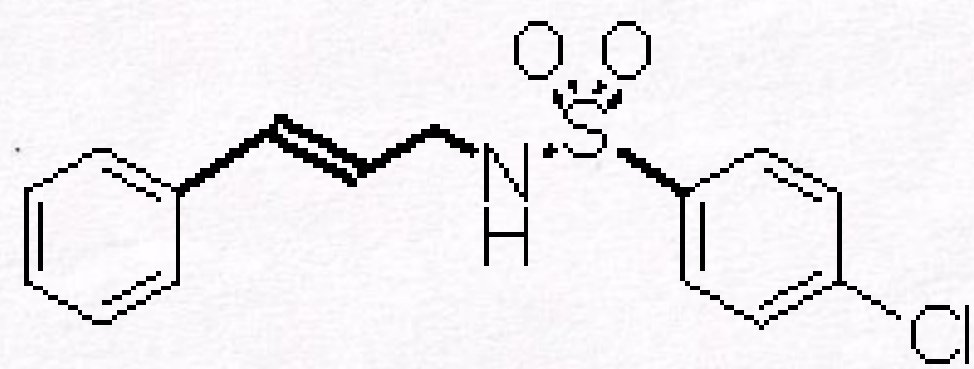
139.18
135.83
133.51
132.44
128.72
128.65
128.13
127.75
126.42
123.59

77.27
77.02
76.76

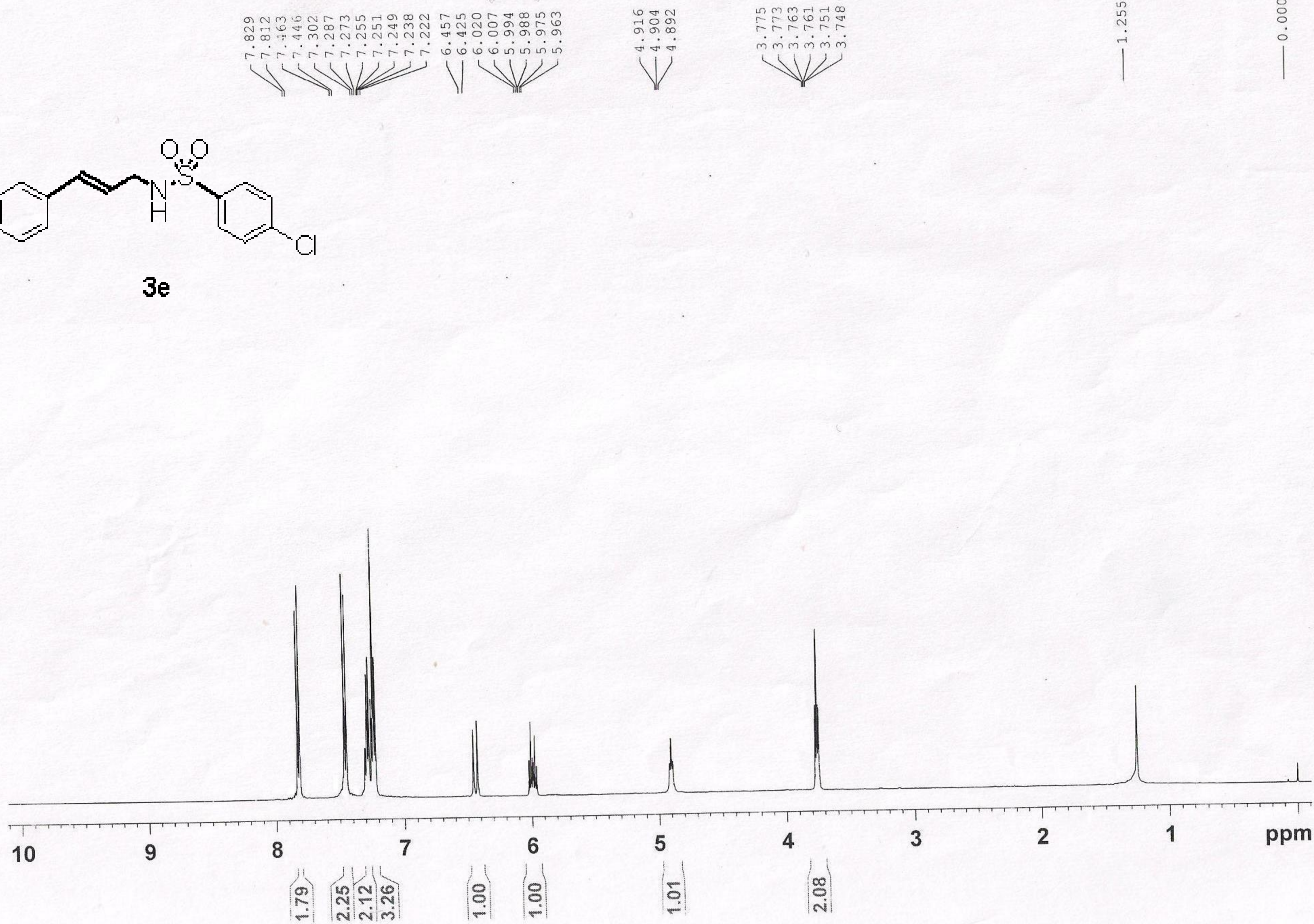
45.54

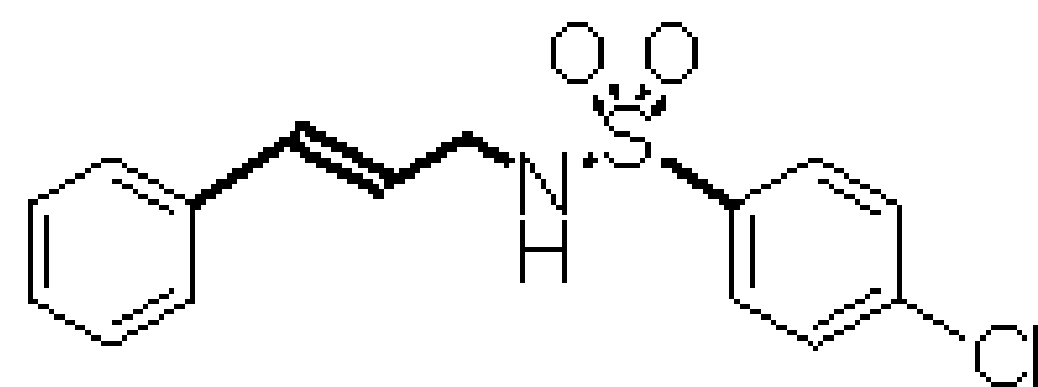


CHJ091127 CDC13



3e

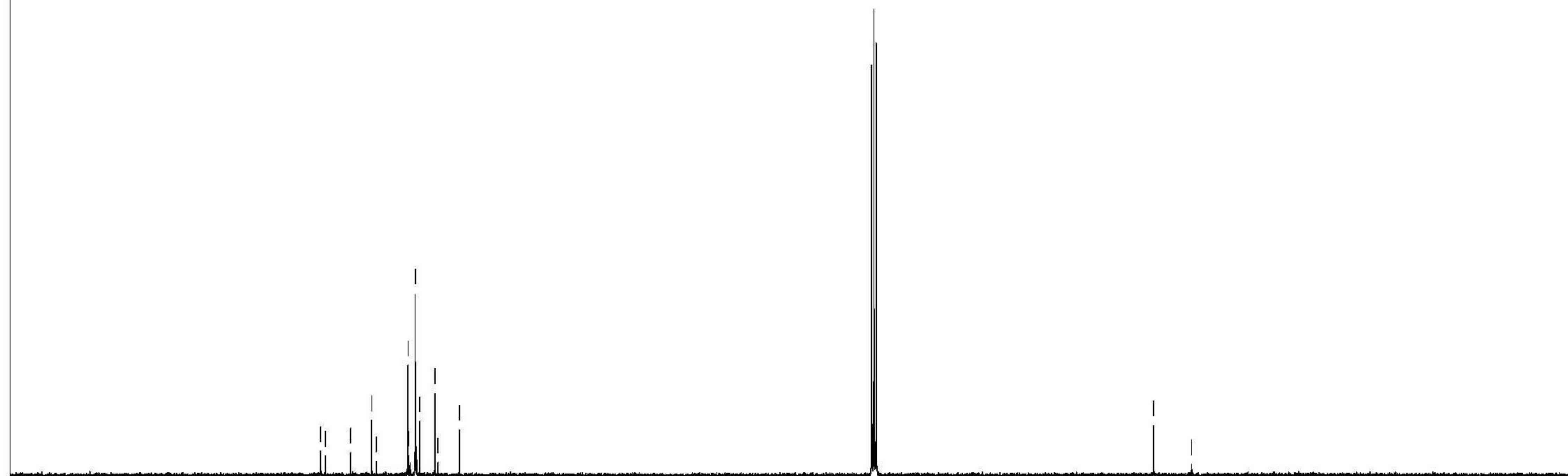




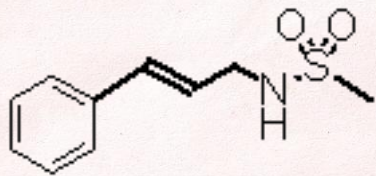
3e

139.263
138.756
135.880
133.518
133.031
129.436
129.396
128.635
128.590
128.113
126.419
126.063
123.664

45.529
41.240



170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
ppm (t1)



3f

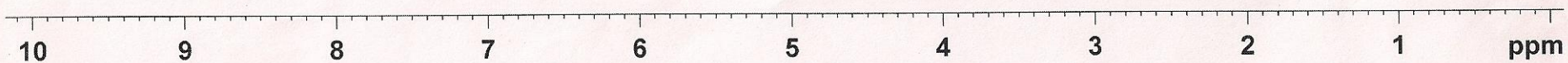
7.377
7.374
7.359
7.336
7.332
7.321
7.306
7.278
7.275
7.265
7.261
7.258
7.248
7.246
6.621
6.589
6.222
6.209
6.196
6.190
6.177
6.165

4.832
4.821
4.810

3.930
3.928
3.918
3.915
3.905
3.903

2.982

0.000



2.01
2.06
1.09

1.01

0.99

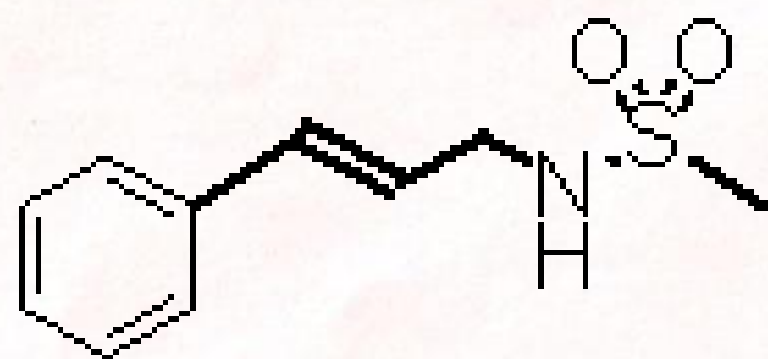
S17

0.95

2.02

3.00

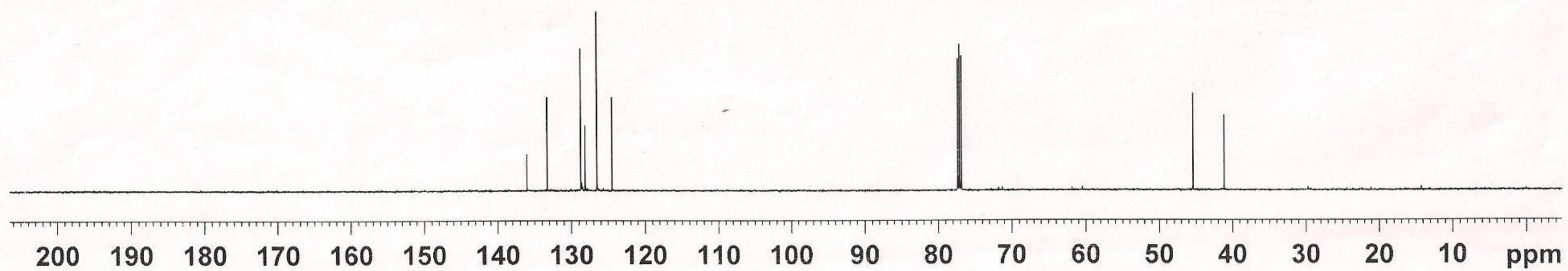
10 9 8 7 6 5 4 3 2 1 ppm

**3f**

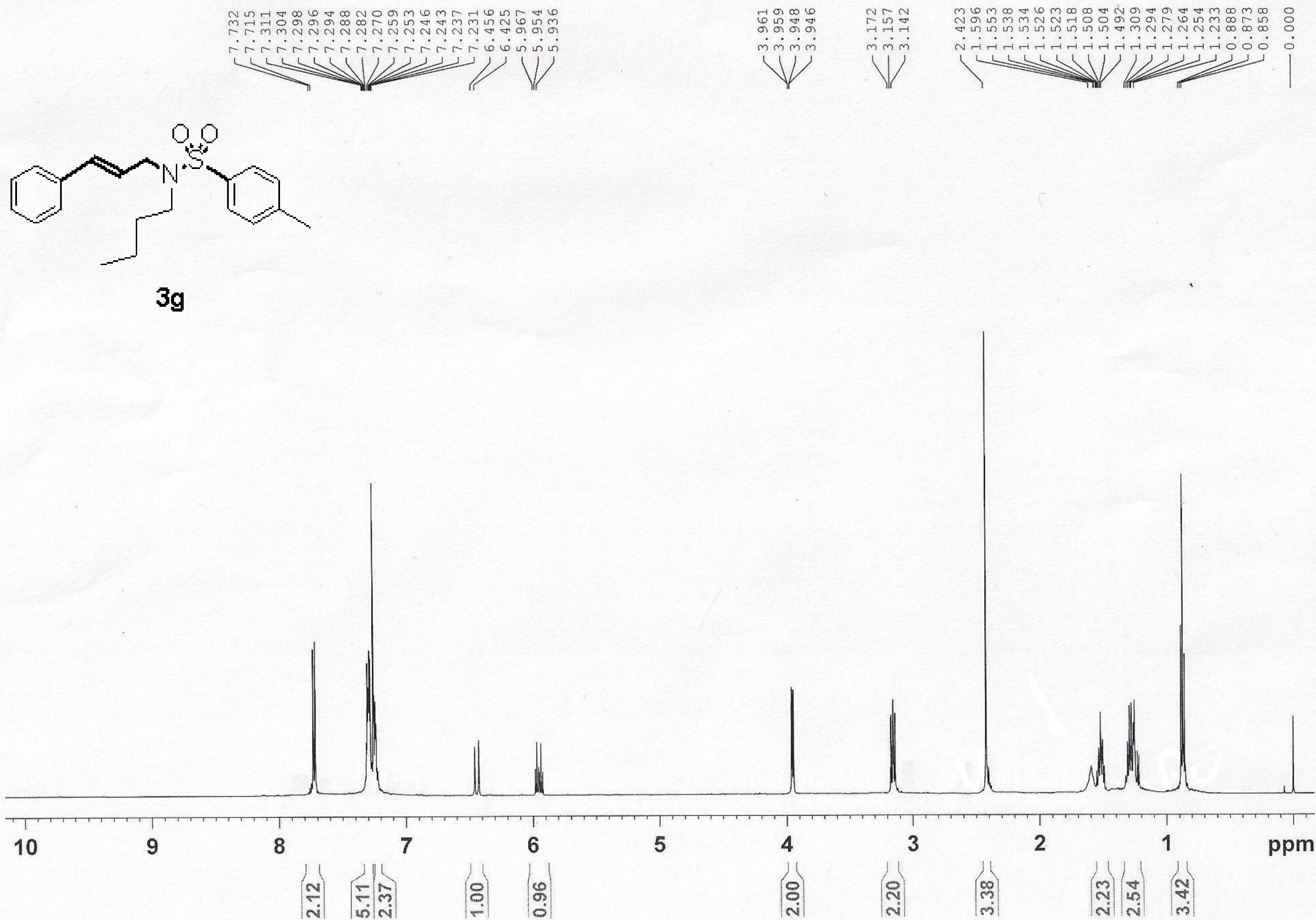
136.03
133.29
128.71
128.13
126.52
124.49

77.33
77.08
76.82

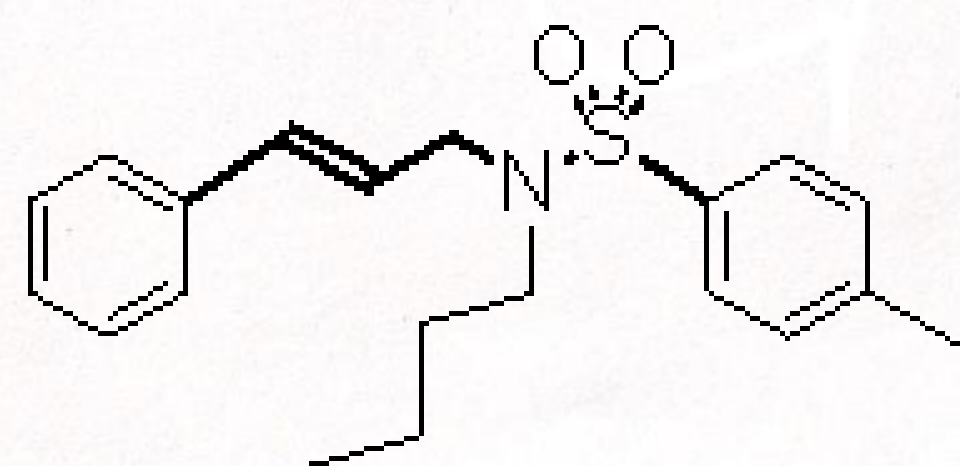
45.39
41.14



CHJ100408 CDC13



chj100129c CDCl3



3g

143.08
137.34
136.27
133.46
129.62
128.56
127.85
127.21
126.39
124.43

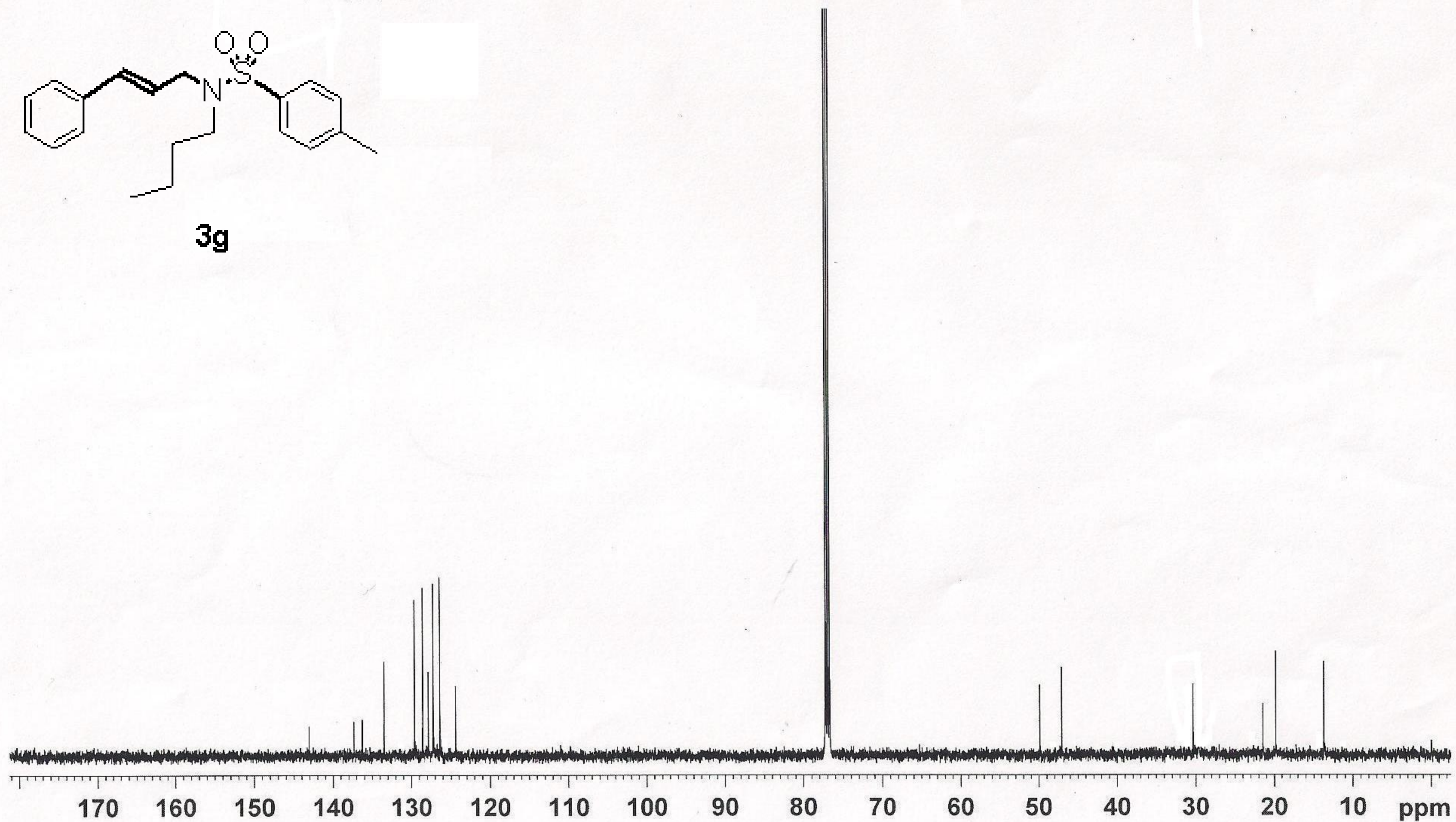
77.25
77.00
76.75

49.89
47.10

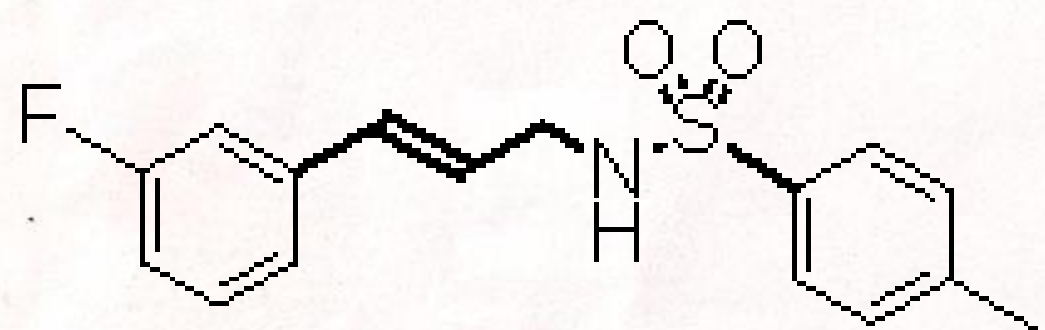
30.33

21.46
19.81

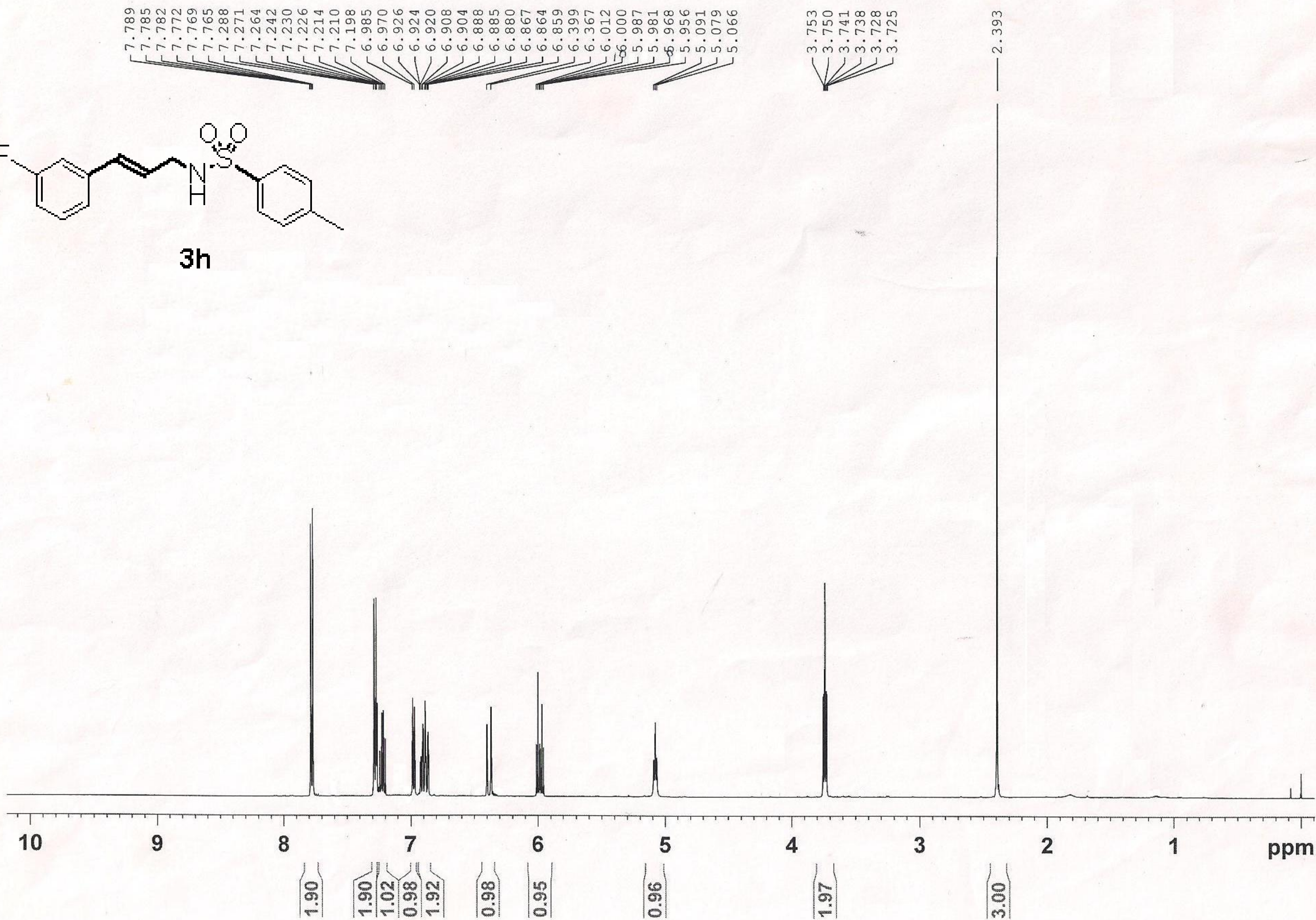
13.67



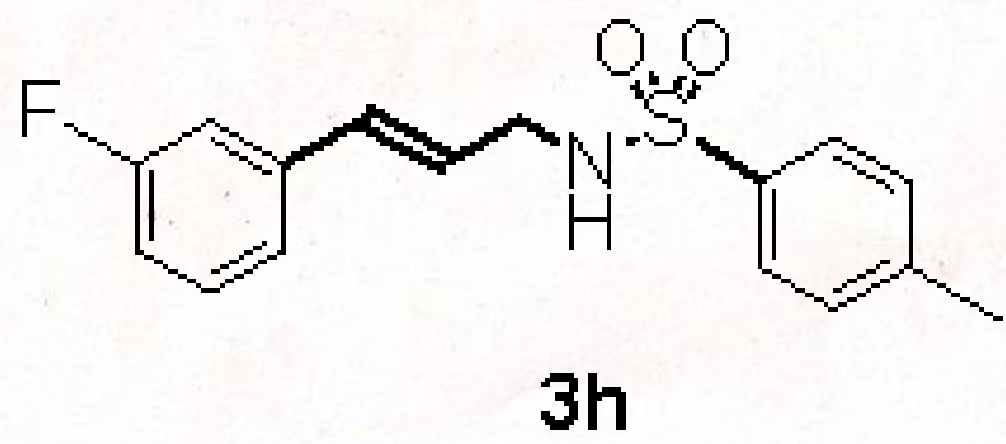
CHJ090310 CDC13



3h



chj081222 CDC13

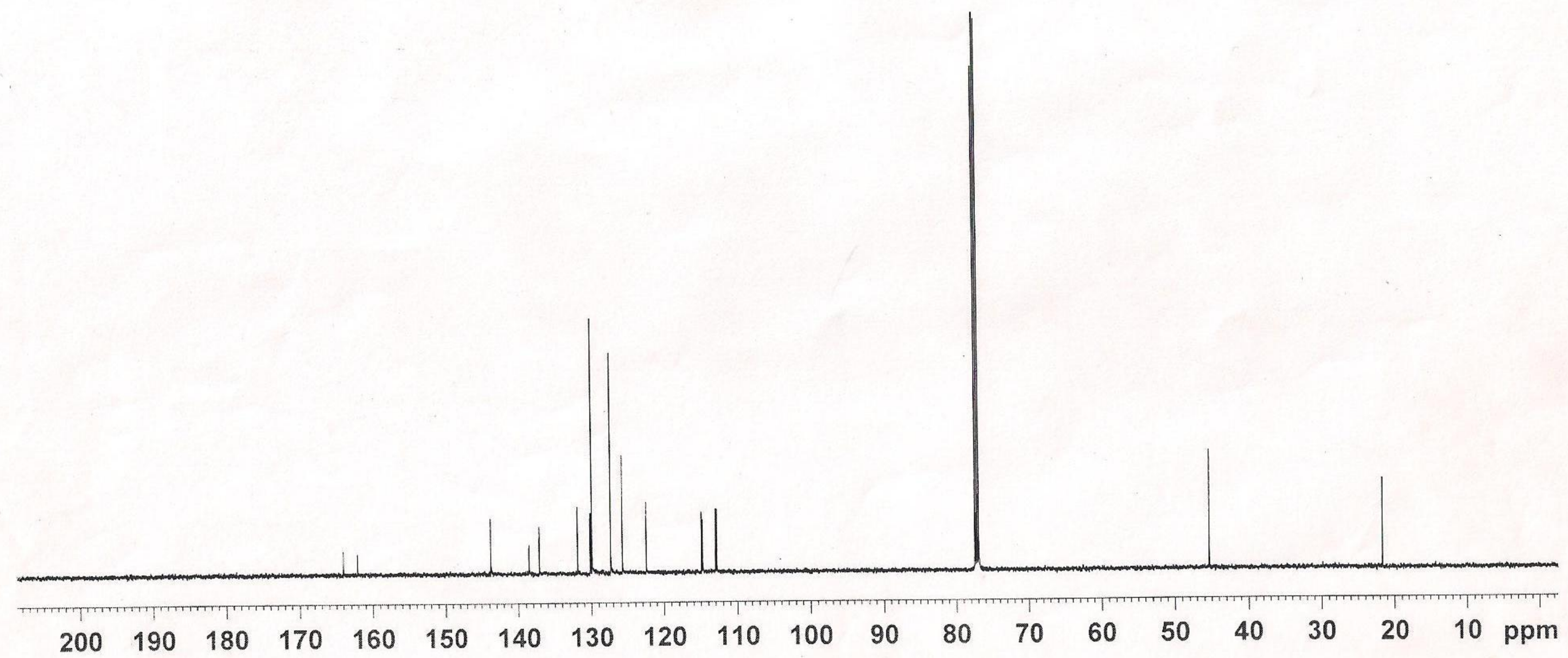


164.05
162.10
143.79
138.58
138.52
137.13
131.89
131.87
130.18
130.11
129.91
127.32
125.74
122.47
122.45
114.92
114.75
113.01
112.83

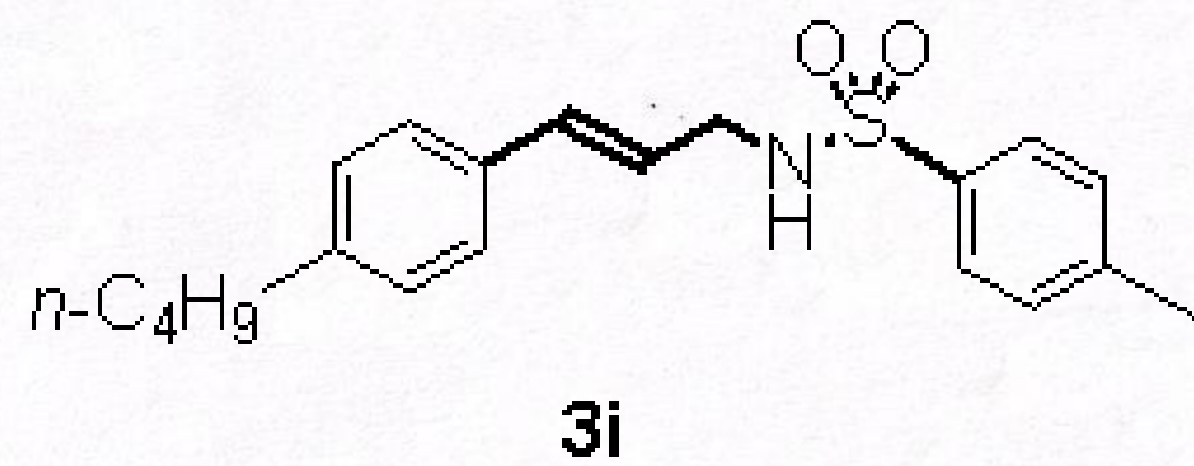
77.41
77.16
76.90

45.35

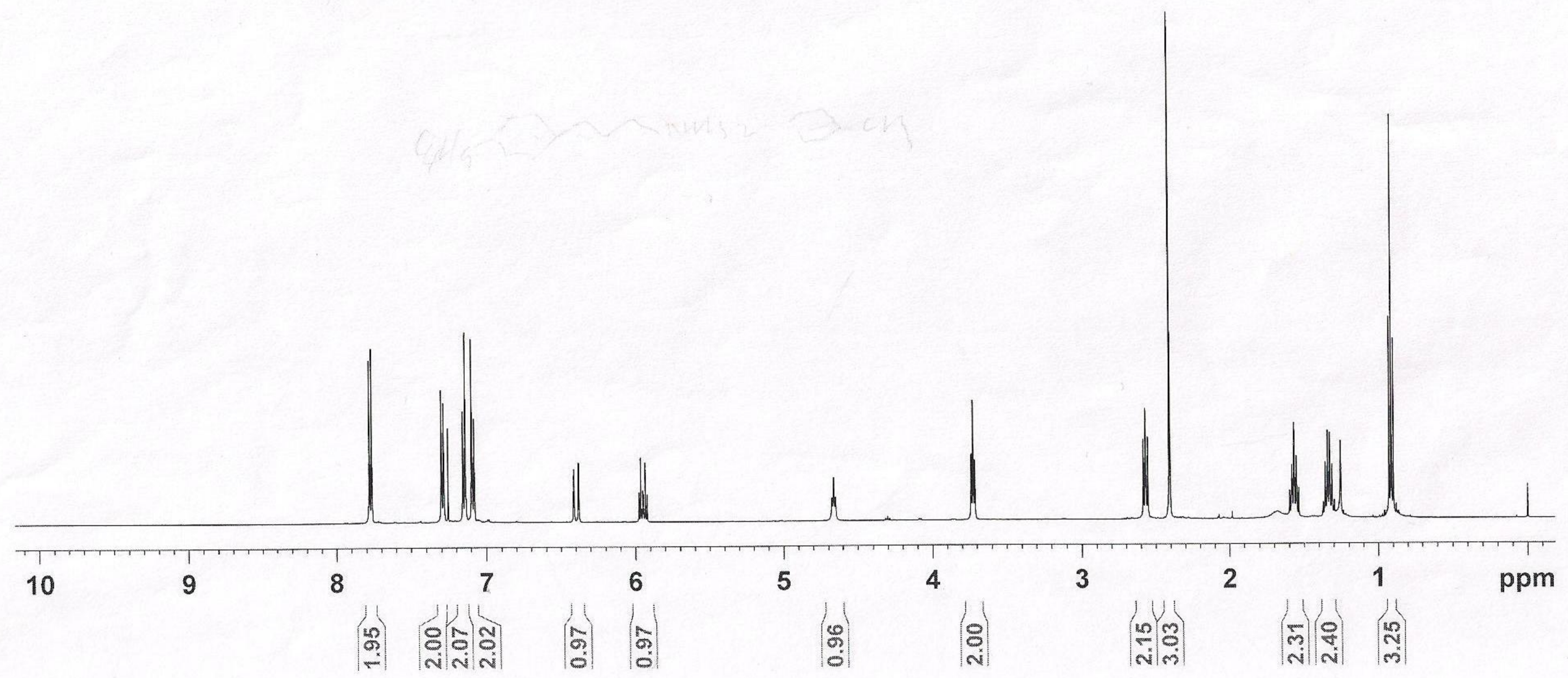
21.62



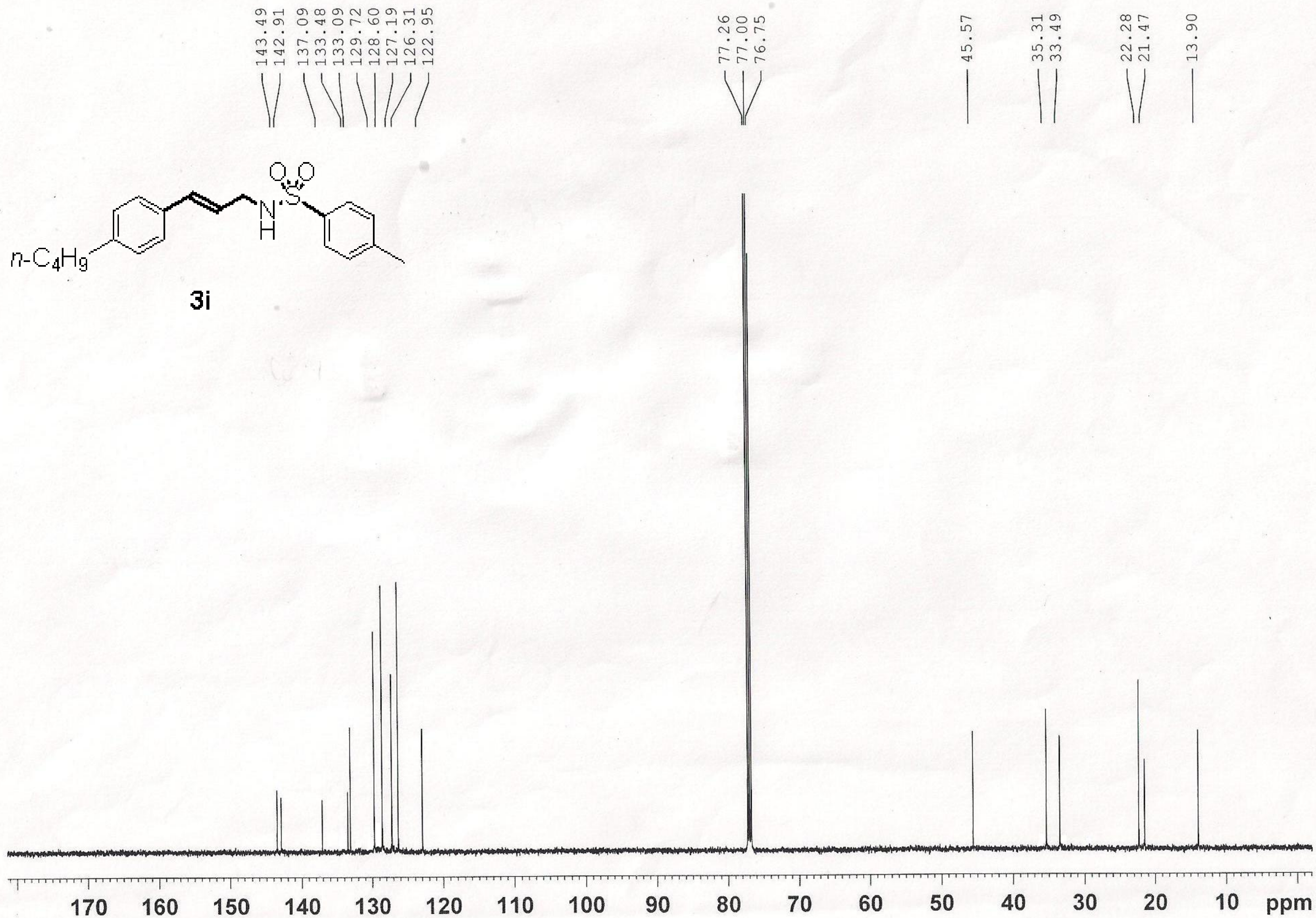
chjdingji CDC13



7.781
7.768
7.764
7.300
7.284
7.255
7.154
7.138
7.095
7.079
6.413
6.382
5.978
5.965
5.952
5.947
5.934
5.921
4.676
4.664
4.652
3.741
3.738
3.728
3.726
3.716
3.713
2.586
2.571
2.555
2.407
1.597
1.582
1.579
1.570
1.567
1.562
1.554
1.552
1.536
1.371
1.357
1.342
1.327
1.312
1.297
1.255
0.927
0.913
0.898

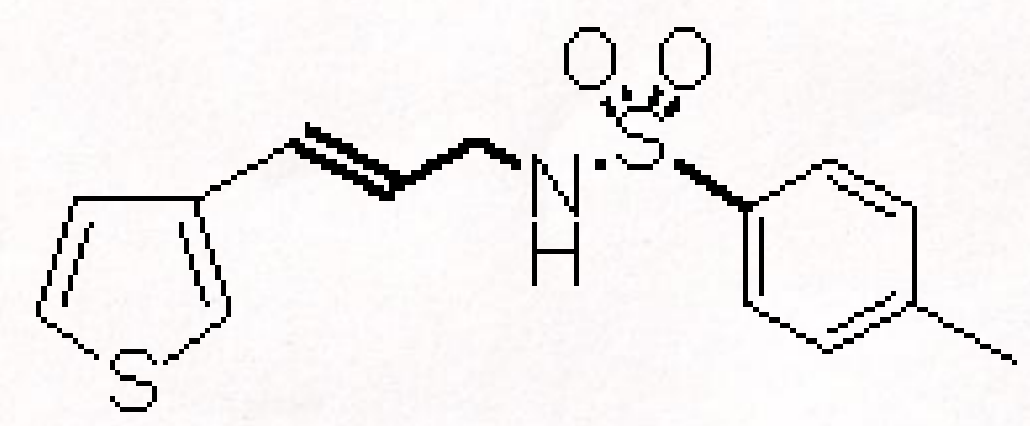


chj090210 CDC13



chj100201 CDC13

3j



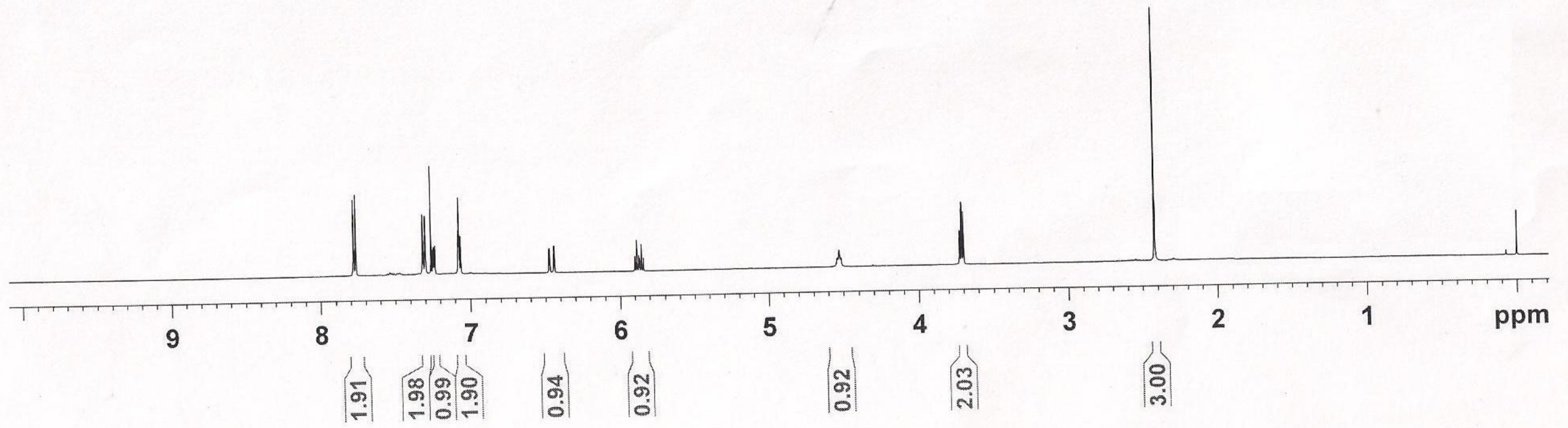
7.778
7.761
7.314
7.298
7.259
7.248
7.242
7.239
7.232
7.077
7.071
7.061
6.471
6.439
5.896
5.883
5.871
5.865
5.852
5.839

4.541
4.528
4.516

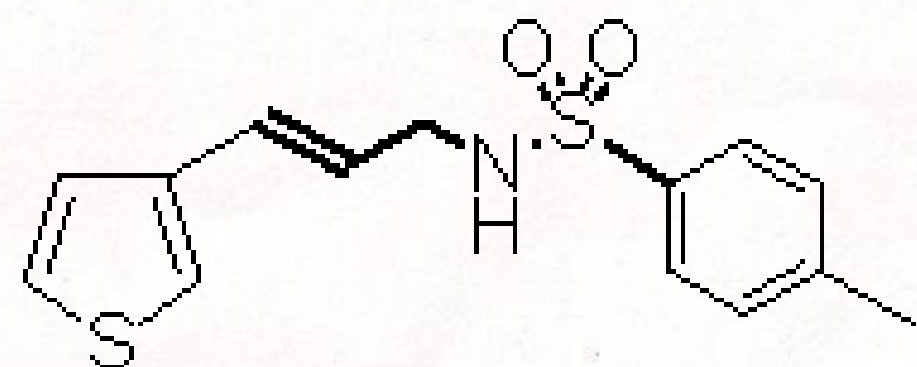
3.727
3.724
3.714
3.712
3.702
3.699

2.422

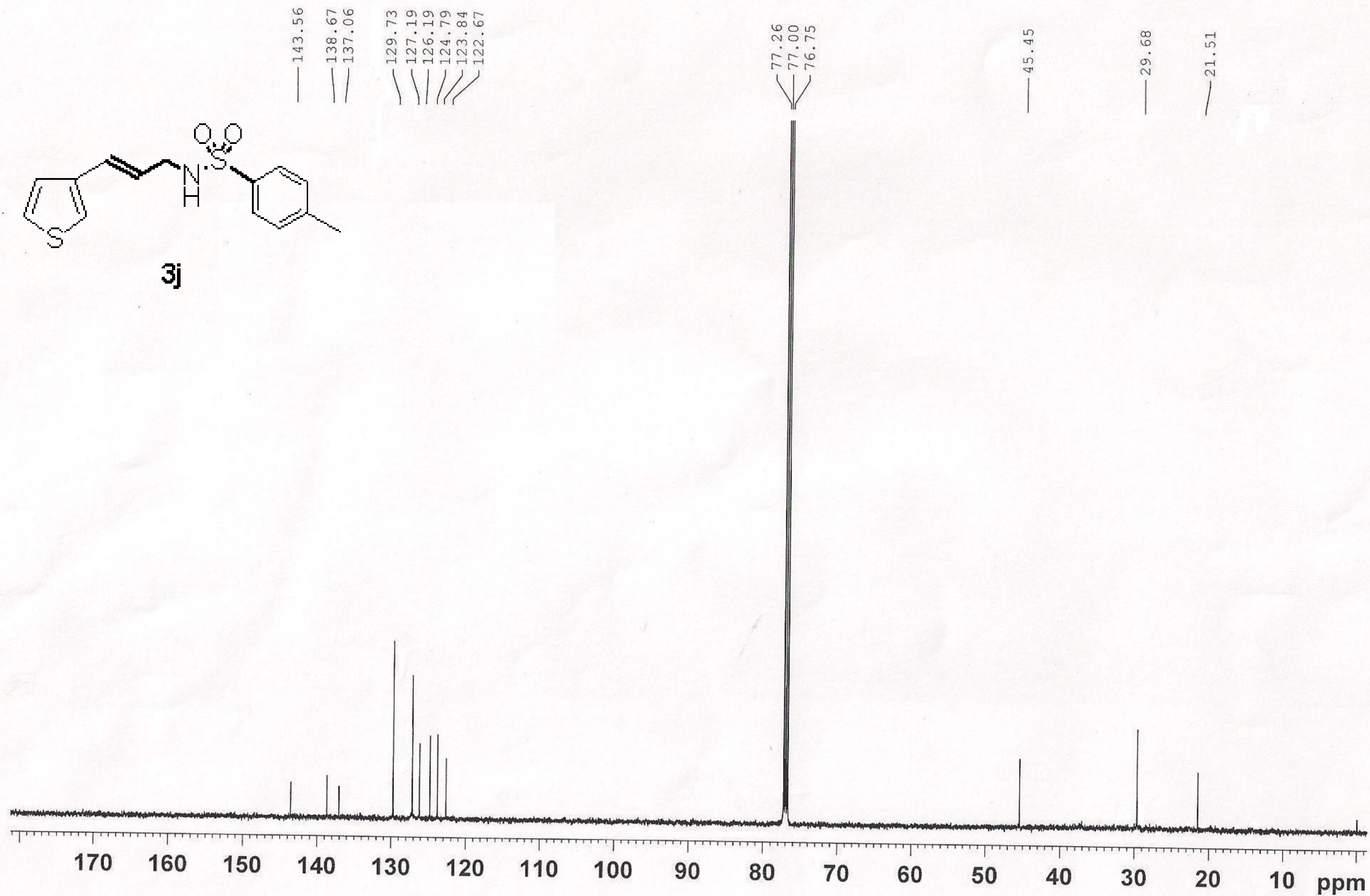
0.000

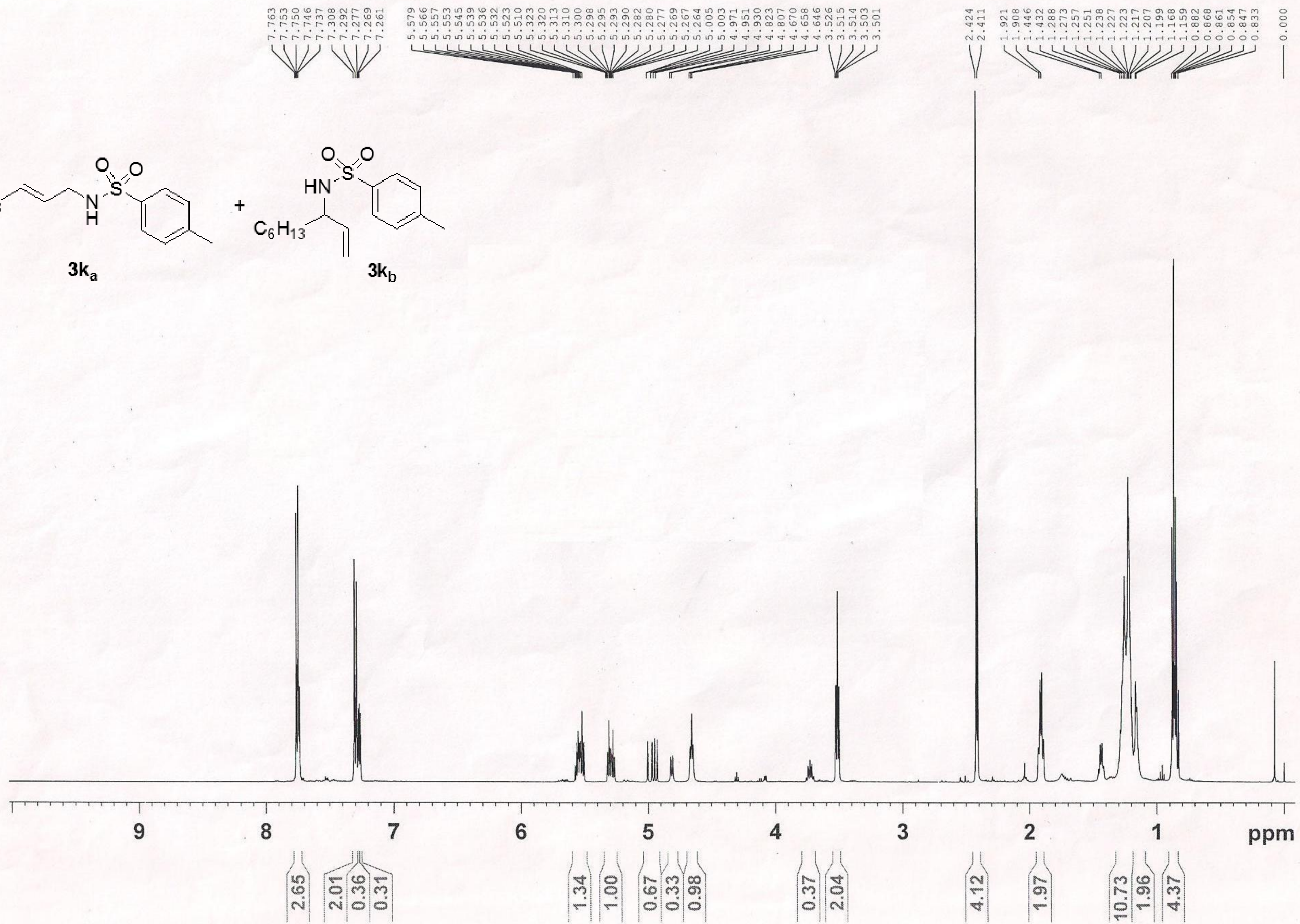
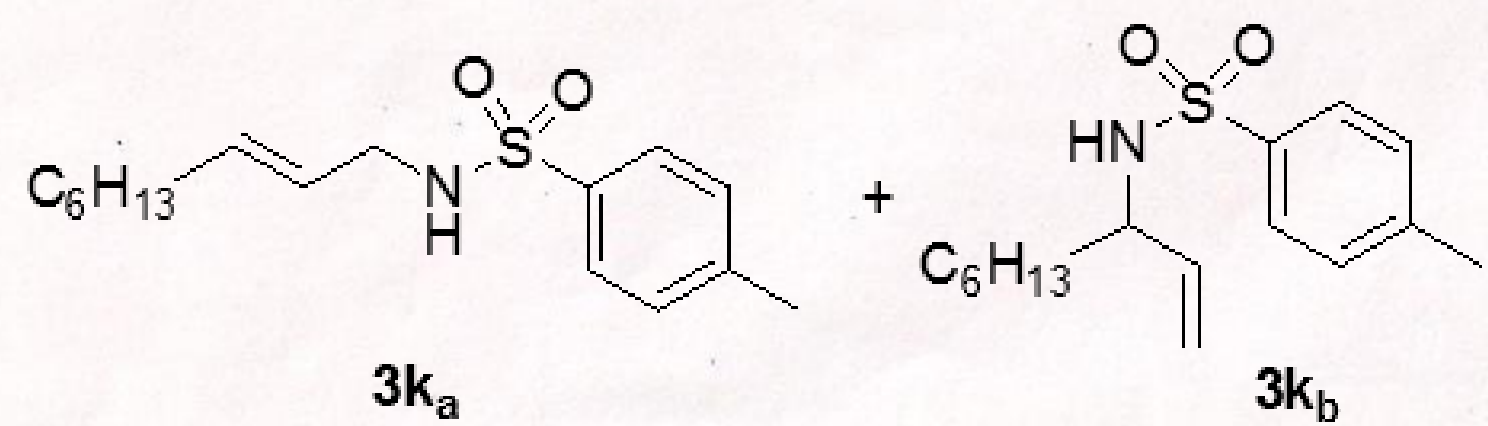


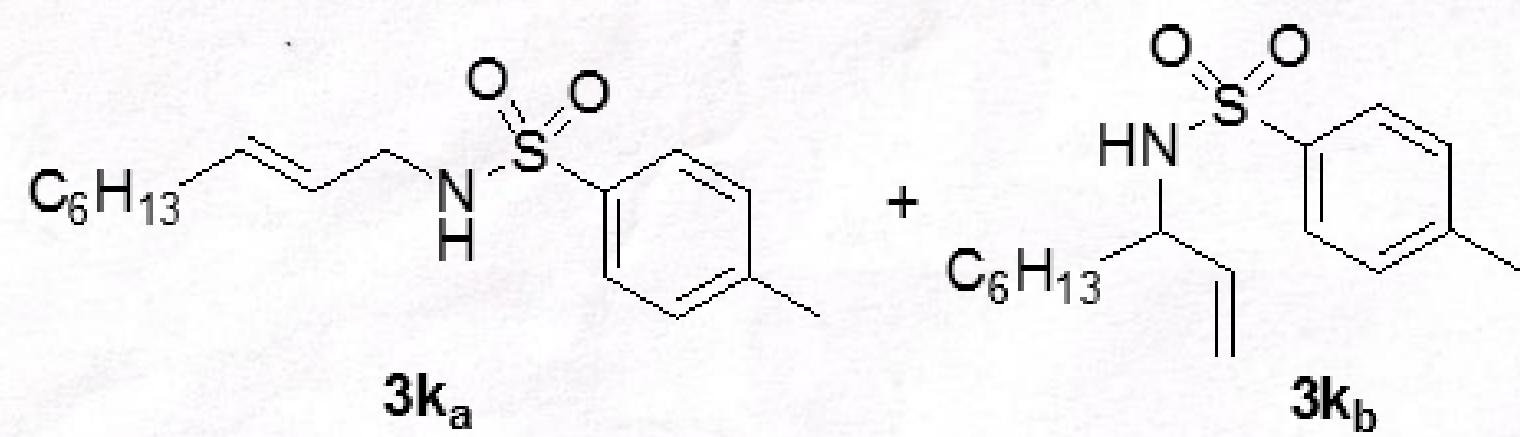
CHJ100308 CDC13



3j







143.27
143.06
138.23
137.94
137.22
135.04
129.61
129.42
127.16
124.31

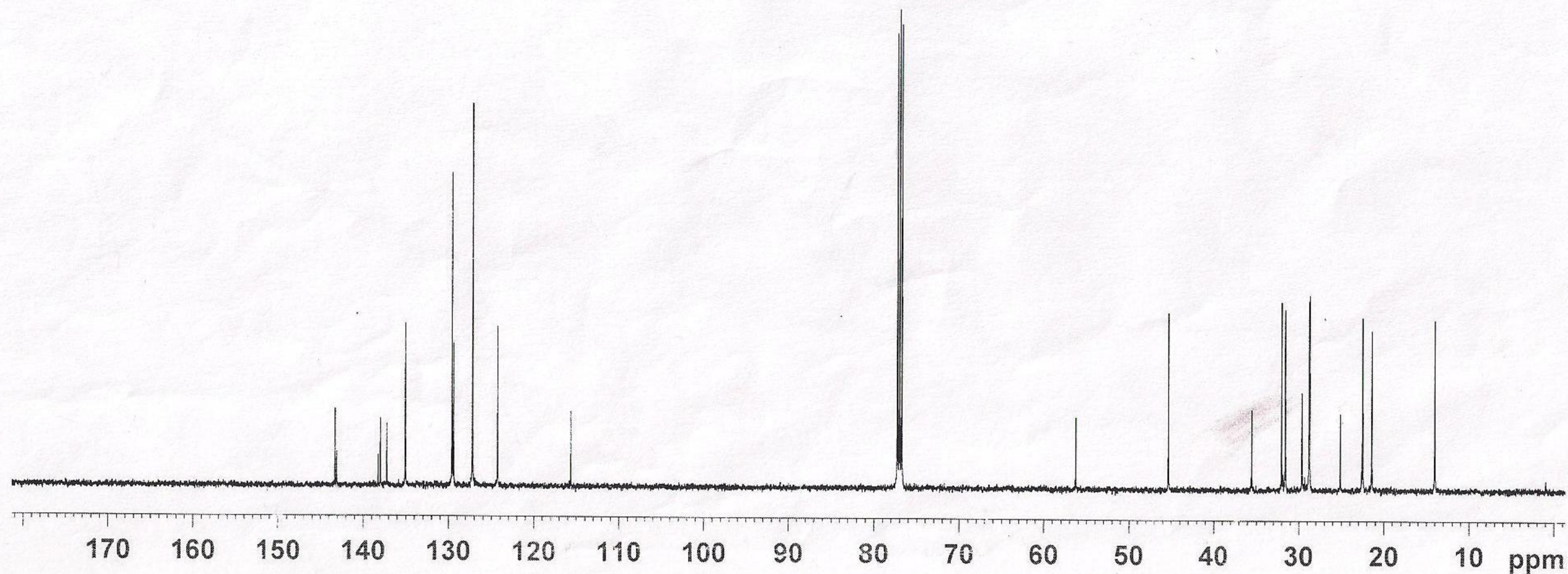
115.65

77.28
77.03
76.78

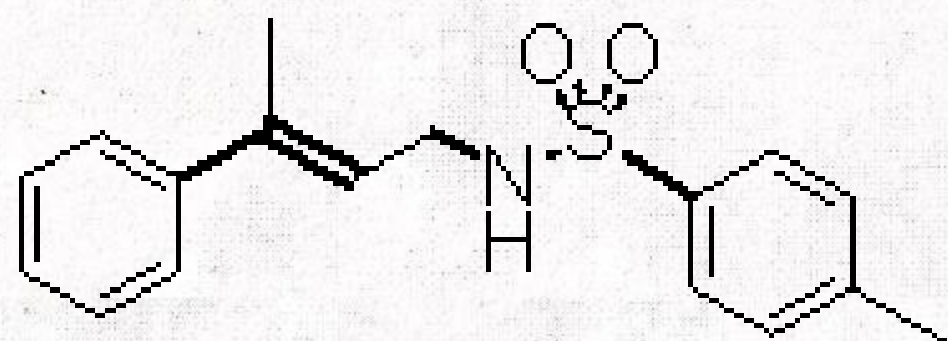
56.28

45.33

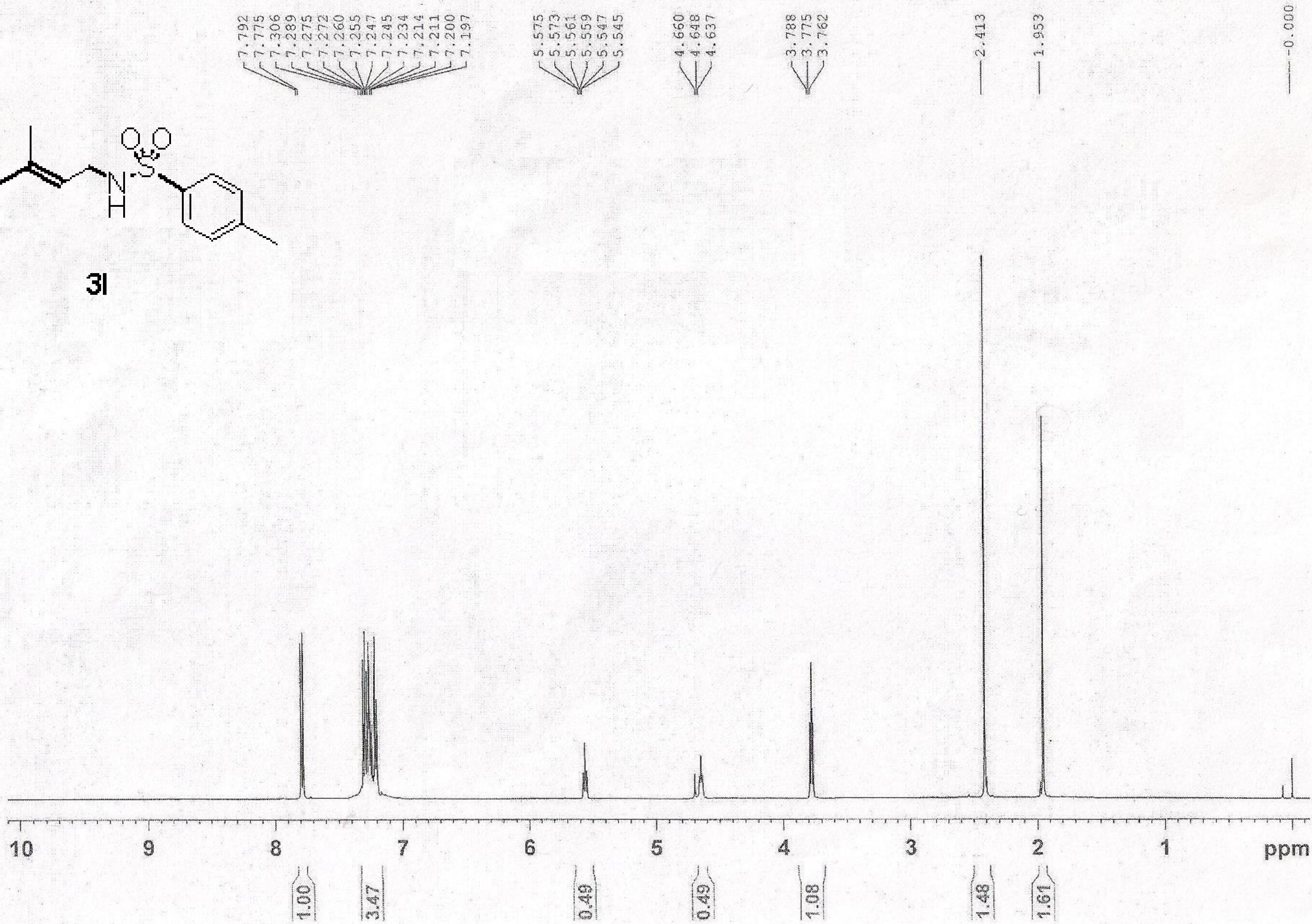
35.53
32.04
31.62
31.58
29.65
28.82
28.79
28.73
25.14
22.53
22.46
21.44
14.02
13.98



CHJ100321 CDC13



3l



chj100321C CDC13

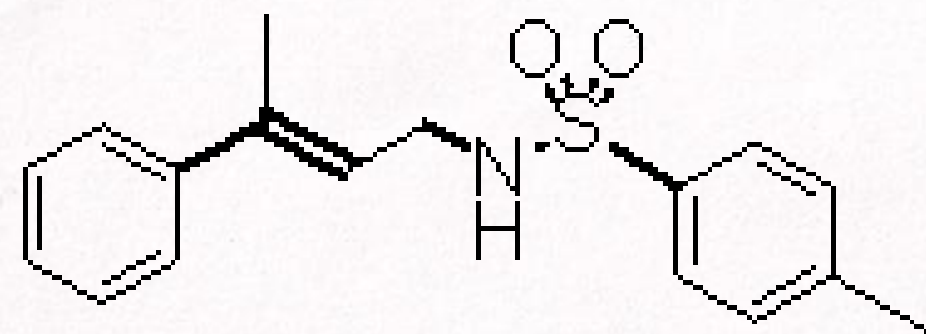
143.45
142.36
139.32
137.13
129.69
128.19
127.39
127.19
125.66
121.92

77.25
77.00
76.74

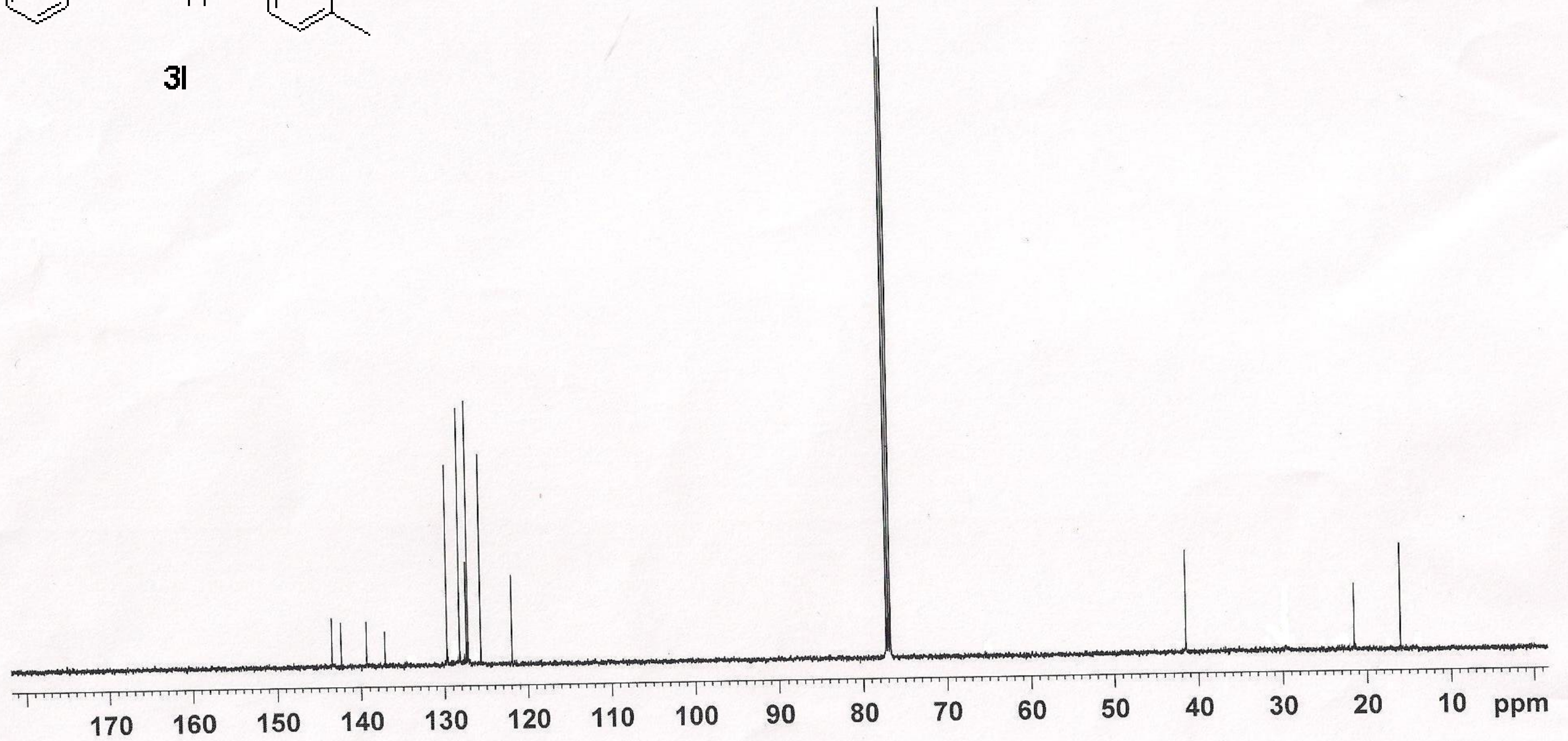
41.52

21.47

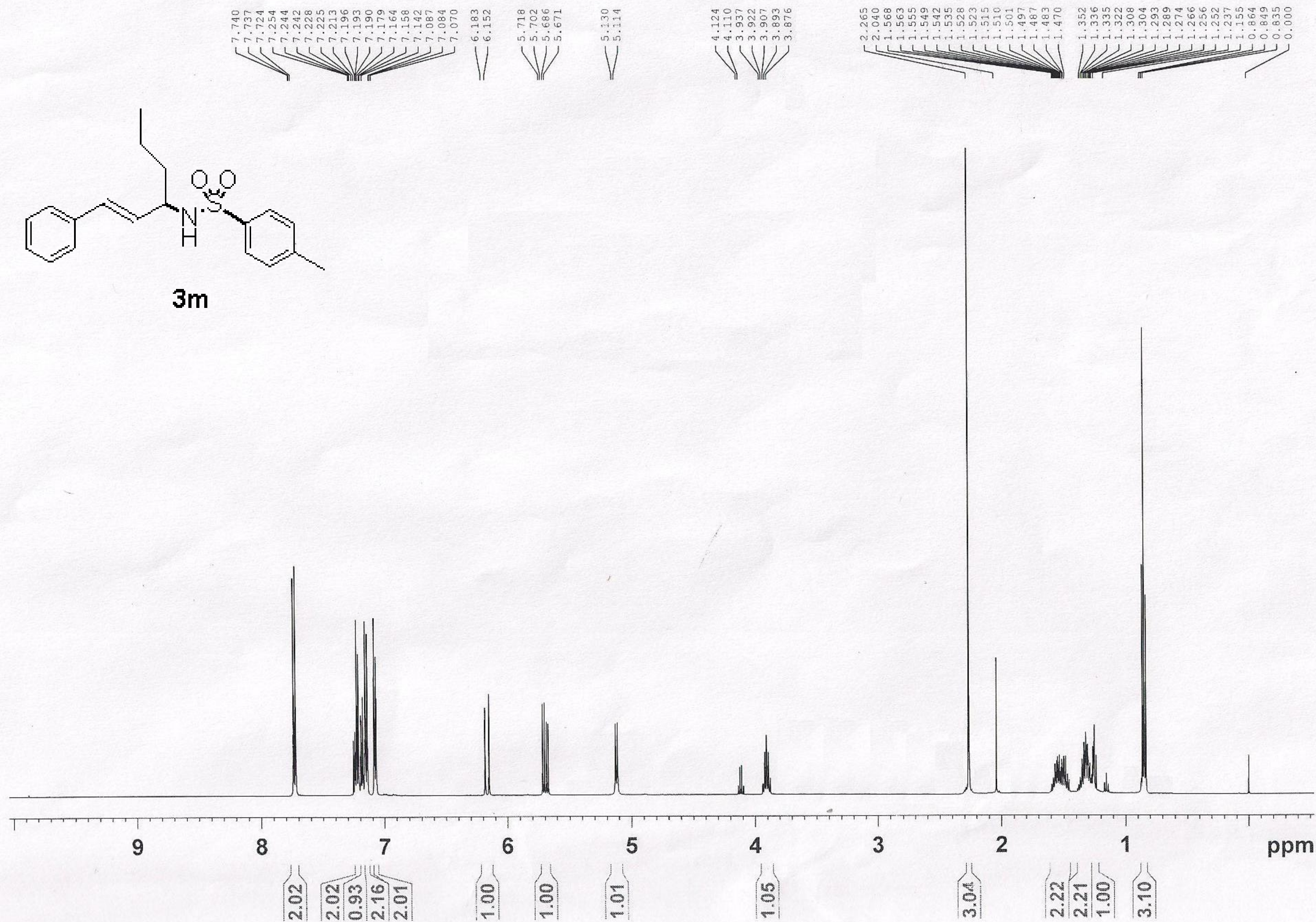
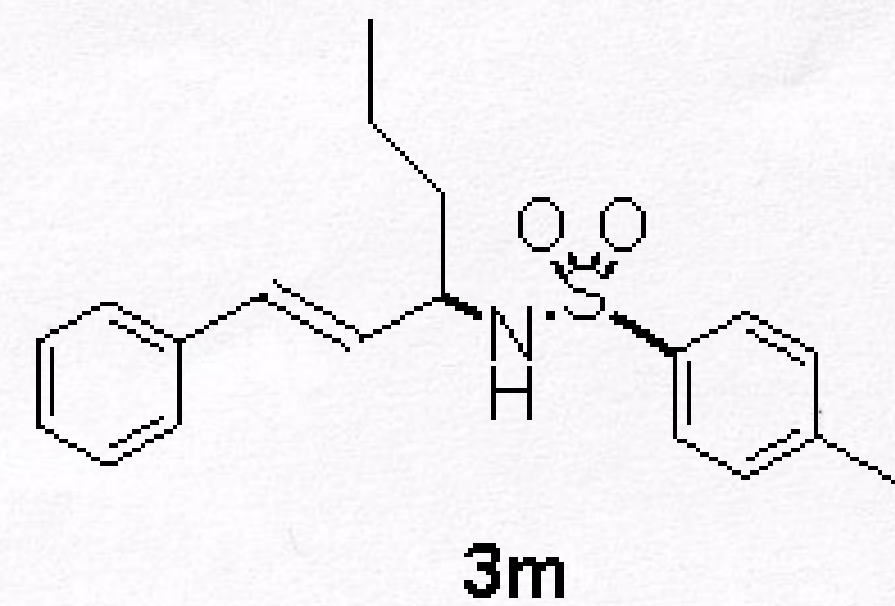
15.96

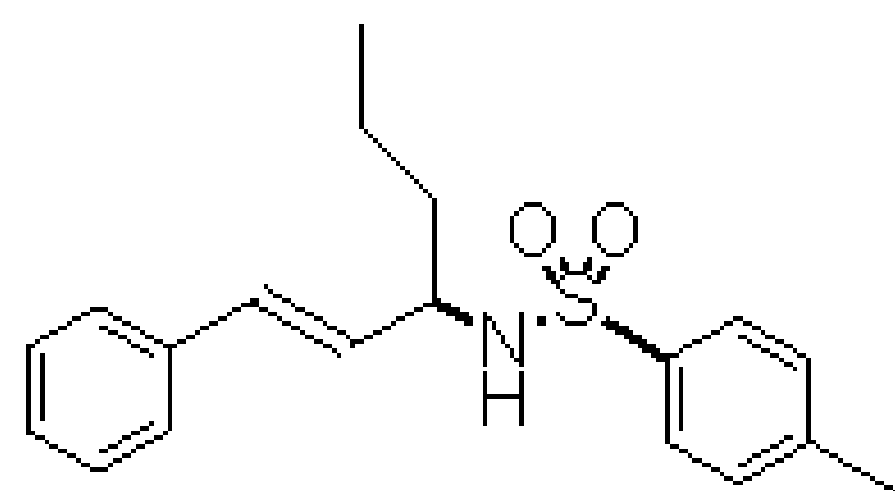


31



chjneibu CDC13





3m

143.108
138.217
136.323
131.274
129.428
128.966
128.309
127.543
127.268
126.286

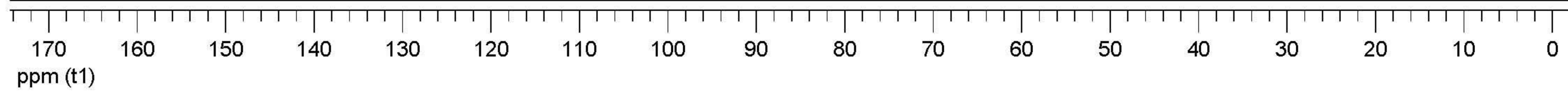
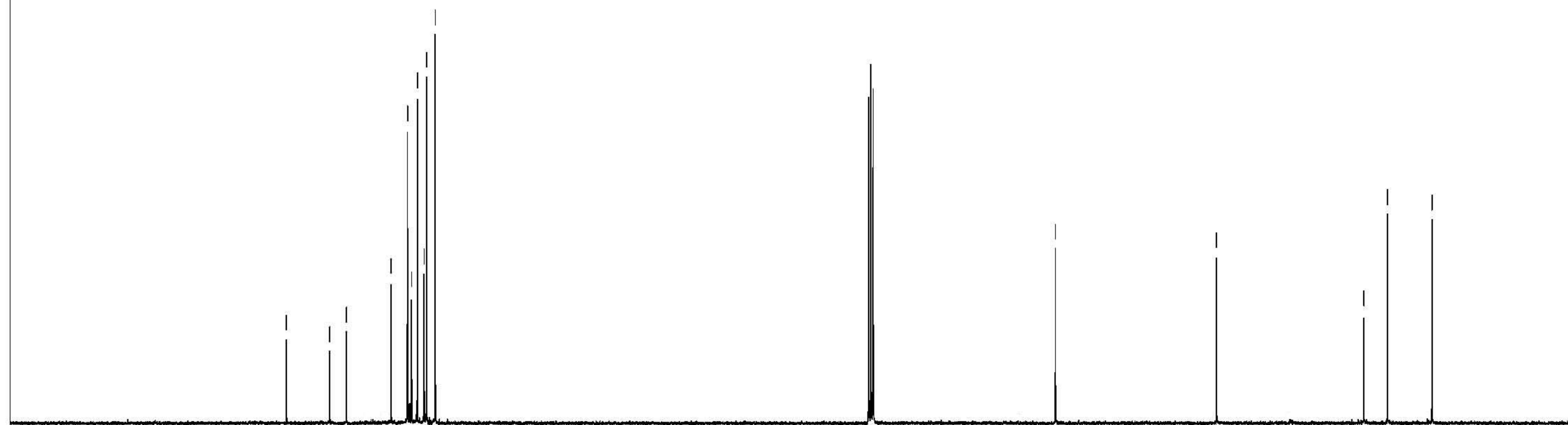
56.168

37.967

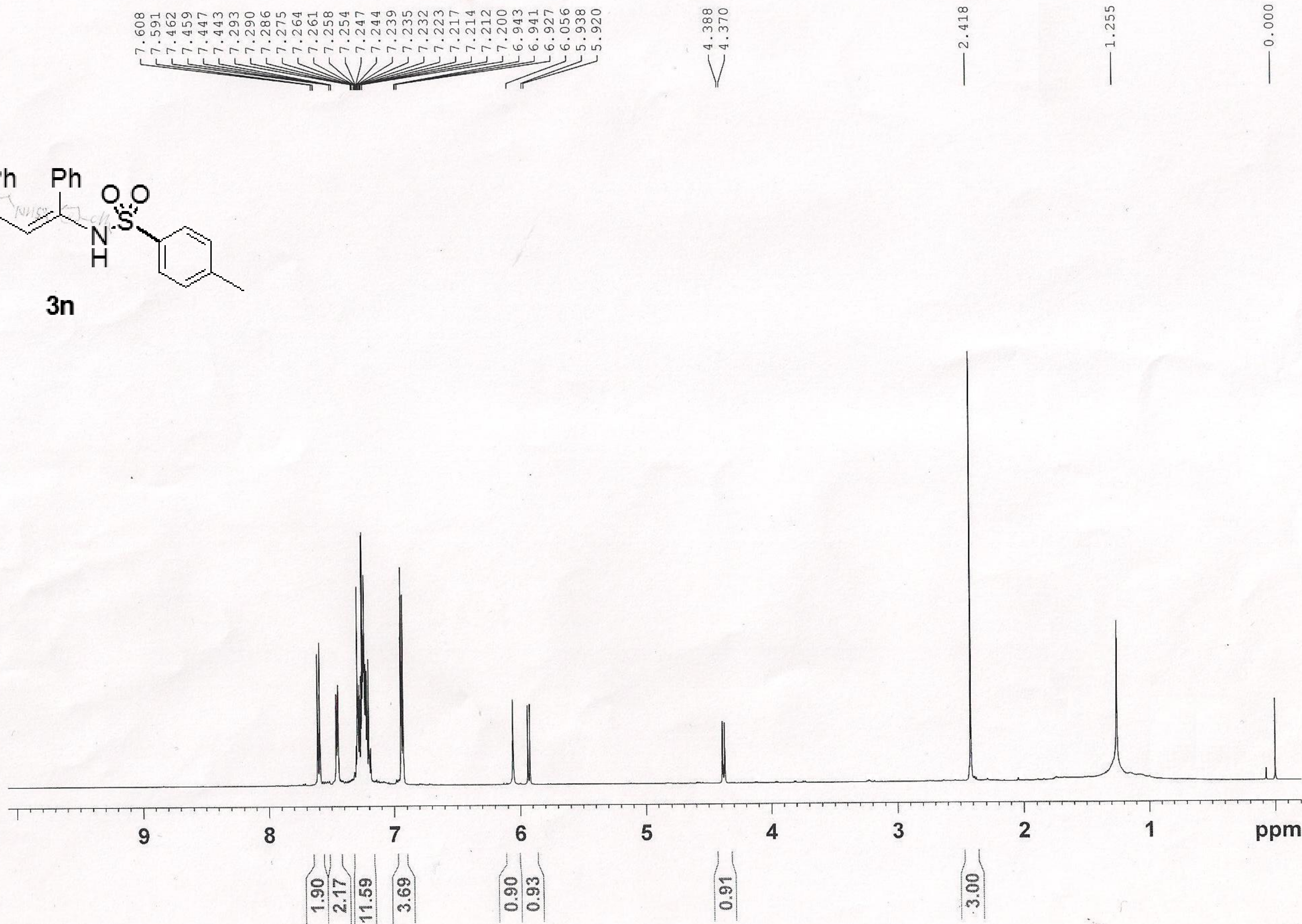
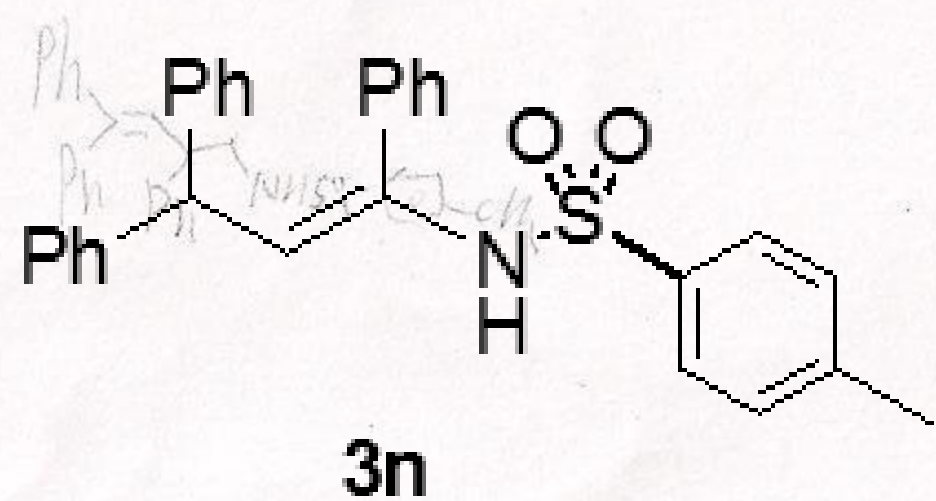
21.307

18.647

13.600



CHJ100323 CDC13



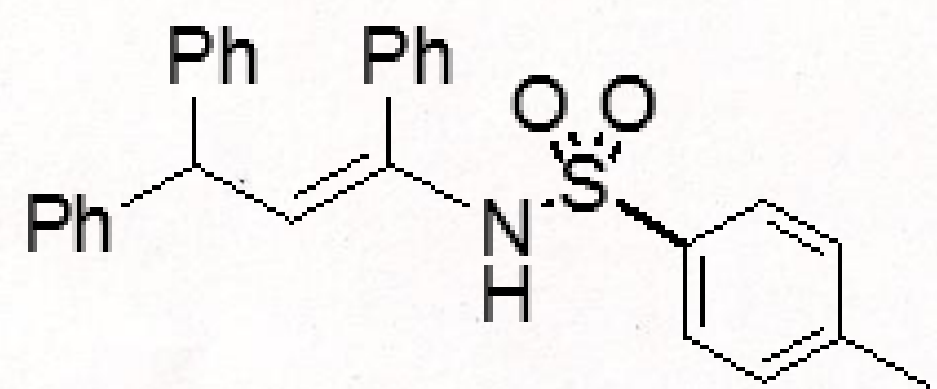
chj100324 CDC13

143.84
142.81
137.15
136.83
135.41
129.62
128.76
128.59
128.04
127.99
127.46
127.30
126.79

77.26
77.00
76.75

48.74

21.53



3n

