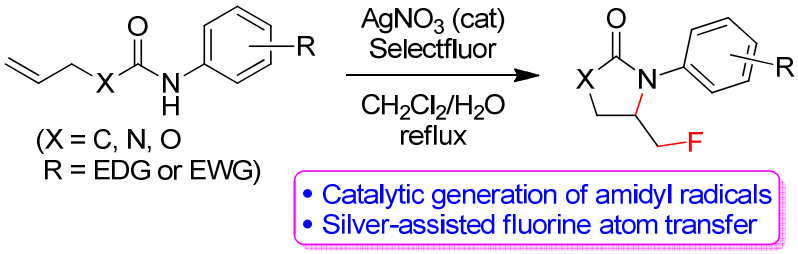
Supporting Information for

# Silver-Catalyzed Radical Aminofluorination of Unactivated Alkenes in Aqueous Media

Zhaodong Li, Liyan Song and Chaozhong Li *

Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences, 345 Lingling Road, Shanghai 200032, P. R. China. E-mail: clig@mail.sioc.ac.cn

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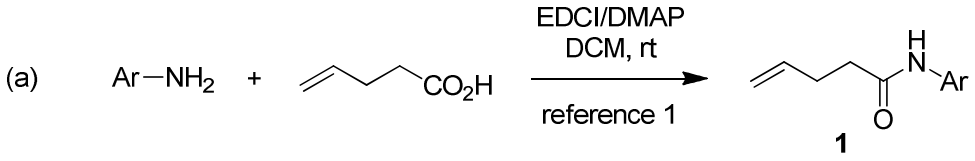
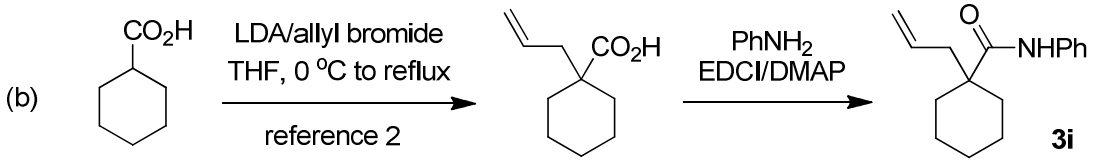
## 1. Characterizations of New Substrates.

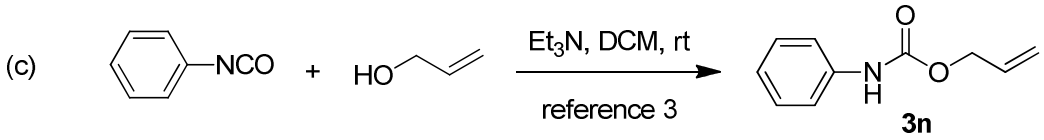
The amide substrates were prepared by conventional methods. Three representative examples are shown as follows.




Reference 1: Manzoni, M. R.; Zabawa, T. P.; Kasi, D.; Chemler, S. R. *Organometallics* **2004**, *23*, 5618.

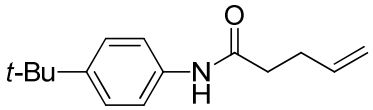



Reference 2: Miller, R. D.; Goelitz, P. *J. Org. Chem*. **1981**, *46*, 1616.



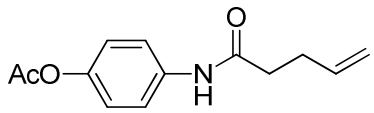

Reference 3: Nicolaou, K. C.; Baran, P. S.; Zhong, Y. L.; Sugita, K. *J. Am. Chem. Soc.* **2002**, *124*, 2212.

Characterizations of new substrates:

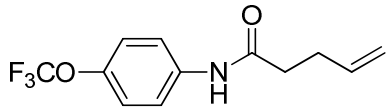



***N*-(4-(*tert*-Butyl)phenyl)-4-pentenamide (1b).** Colorless solid, mp: 104-106 °C; $^1$H

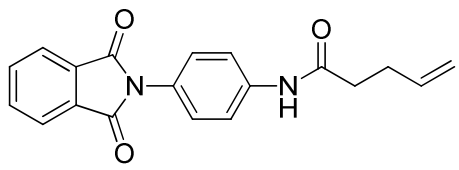
NMR (400 MHz, $CDCl_3$): δ 7.42 (d, *J* = 8.4 Hz, 2H), 7.33 (d, *J* = 8.4 Hz, 2H), 7.12 (br, 1H), 5.83-5.94 (m, 1H), 5.12 (d, *J* = 17.2 Hz, 1H), 5.05 (d, *J* = 10.4 Hz, 1H), 2.42-2.49 (m, 4H), 1.29 (s, 9H); $^{13}C$ NMR (100 MHz, $CDCl_3$): δ 170.9, 147.2, 137.0, 135.4, 125.8, 119.9, 115.8, 36.7, 34.4, 31.3, 29.6; IR (KBr): ν ($cm^{-1}$) 3327, 2962, 1665, 1601, 1536, 1405, 1319, 916, 829; Anal. calcd for $C_{15}H_{21}NO$: C, 77.88; H, 9.15; N, 6.05; Found: C, 78.19; H, 9.18; N, 6.13.



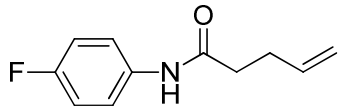

***N*-(4-Acetoxyphenyl)-4-pentenamide (1c).** White solid, mp: 106-108 °C; $^1H$ NMR (400 MHz, $CDCl_3$): δ 7.51 (d, *J* = 8.4 Hz, 2H), 7.19 (br, 1H), 7.04 (d, *J* = 8.8 Hz, 2H), 5.83-5.93 (m, 1H), 5.13 (d, *J* = 17.2 Hz, 1H), 5.06 (d, *J* = 10.0 Hz, 1H), 2.43-2.51 (m, 4H) , 2.28 (s, 3H); $^{13}C$ NMR (100 MHz, $CDCl_3$): δ 170.8, 169.8, 146.8, 136.9, 135.7, 121.9, 121.0, 115.9, 36.6, 29.4, 21.1.; IR (KBr): ν ($cm^{-1}$) 3291, 1766, 1660, 1538, 1507, 1409, 1373, 1218, 1194, 910; Anal. calcd for $C_{13}H_{15}NO_3$: C, 66.94; H, 6.48; N, 6.00; Found: C, 67.11; H, 6.74; N, 5.90.



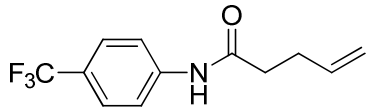

***N*-(4-(Trifluoromethoxy)phenyl)-4-pentenamide (1d).** White solid, mp: 56-58 °C; $^1H$ NMR (400 MHz, $CDCl_3$): δ 7.53 (d, *J* = 8.8 Hz, 2H), 7.31 (br, 1H), 7.16 (d, *J* = 8.8 Hz, 2H), 5.83-5.91 (m, 1H), 5.13 (d, *J* = 17.2 Hz, 1H), 5.07 (d, *J* = 10.0 Hz, 1H), 2.45-2.51 (m, 4H); $^{13}C$ NMR (100 MHz, $CDCl_3$): δ 171.2, 145.4, 136.6, 121.6, 120.5 (q, *J* = 255.2 Hz), 121.4, 115.9, 36.6, 29.4; $^{19}F$ NMR (282 MHz, $CDCl_3$) δ -59.0 (m, 3F); IR (KBr): ν ($cm^{-1}$) 1662, 1607, 1535, 1277, 1212, 1159, 921, 764, 750; Anal. calcd for $C_{12}H_{12}F_3NO_2$: C, 55.60; H, 4.67; N, 5.40; Found: C, 55.44; H, 4.77; N, 5.39.



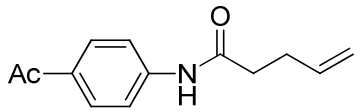
***N*-(4-(1,3-Dioxoisoindolin-2-yl)phenyl)-4-pentenamide (1e).** Yellow solid, mp: 246-248 °C; $^{1}$H NMR (400 MHz, $CDCl_3$): δ 7.93-7.99 (m, 2H), 7.77-7.83 (m, 2H), 7.66 (d, *J* = 8.4 Hz, 2H), 7.40 (d, *J* = 8.8 Hz, 2H), 7.33 (br, 1H), 5.86-5.93 (m, 1H), 5.14 (d, *J* = 17.2 Hz, 1H), 5.08 (d, *J* = 10.0 Hz, 1H), 2.48 (br, 4H); $^{13}$C NMR (100 MHz, DMSO-$d_6$): δ 171.2, 167.6, 139.5, 138.0, 135.2, 132.1, 128.3, 127.0, 123.9, 119.7, 115.7, 36.0, 29.5; IR (KBr): 3337, 2921, 2851, 1707, 1664, 1601, 1524, 1393, 1121, 1085, 717 $cm^{-1}$; ESI-MS: (*m/z*) 343 ($M^+$+Na); HRMS calcd for $C_{19}H_{16}N_2NaO_3$: 343.1053, found 393.1049.



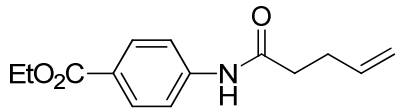

***N*-(4-Fluorophenyl)-4-pentenamide (1g).** White solid, mp: 66-68 °C; $^{1}$H NMR (400 MHz, $CDCl_3$): δ 7.45 (dd, *J* = 8.8, 4.8 Hz, 2H), 7.26 (br, 1H), 7.00 (t, *J* = 8.4 Hz, 2H), 5.83-5.91 (m, 1H), 5.12 (d, *J* = 17.6 Hz, 1H), 5.06 (d, *J* = 10.4 Hz, 1H), 2.48-2.50 (m, 4H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 171.1, 159.4 (d, *J* = 242.0 Hz), 136.8, 133.9, 122.1 (d, *J* = 8.0 Hz ), 115.9, 115.5 (d, *J* = 21.9 Hz), 36.5, 29.5; $^{19}$F NMR (282 MHz, $CDCl_3$) δ -119.6 (m ,1F); IR (KBr): ν ($cm^{-1}$) 3313, 3079, 2917, 1663, 1615, 1550, 1406, 1214, 920, 837; Anal. calcd for $C_{11}H_{12}FNO$: C, 68.38; H, 6.26; N, 7.25; Found: C, 68.13; H, 6.21; N, 7.28.



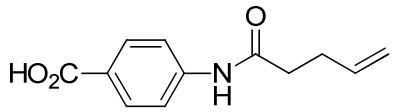

***N*-(4-(Trifluoromethyl)phenyl)-4-pentenamide (1h).** White solid, mp: 116-118 °C; $^{1}$H NMR (400 MHz, $CDCl_3$): δ 7.64 (d, *J* = 8.4 Hz, 2H), 7.57 (d, *J* = 8.8 Hz, 2H), 7.31 (br, 1H), 5.84-5.94 (m, 1H), 5.14 (d, *J* = 17.2 Hz, 1H), 5.08 (d, *J* = 10.0 Hz, 1H), 2.50 (br, 4H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 171.2, 141.0, 136.5, 126.3, 126.2, 124.0 (q, *J* = 269.7 Hz), 119.6, 116.2, 36.8, 29.3; $^{19}$F NMR (282 MHz, $CDCl_3$) δ -62.8 (m, 3F); IR (KBr): ν ($cm^{-1}$) 3310, 1678, 1600, 1527, 1408, 1334, 1160, 1118, 1069, 836; Anal. calcd for $C_{12}H_{12}F_3NO$: C, 59.26; H, 4.97; N, 5.76; Found: C, 59.19; H, 4.95; N, 5.68.



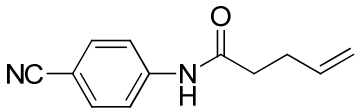
***N*-(4-Acetylphenyl)-4-pentenamide (1i).** White solid, mp: 116-118 °C; $^1$H NMR (400 MHz, $CDCl_3$): δ 7.93 (d, *J* = 8.8 Hz, 2H), 7.62 (d, *J* = 8.8 Hz, 2H), 7.47 (br, 1H), 5.85-5.92 (m, 1H), 5.14 (d, *J* = 17.2 Hz, 1H), 5.07 (d, *J* = 10.4 Hz, 1H), 2.58 (s, 3H), 2.50 (br, 4H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 197.1, 171.0, 142.4, 136.7, 132.9, 129.8, 119.0, 116.1, 36.9, 29.2, 26.4; IR (KBr): ν ($cm^{-1}$) 3334, 3106, 1702, 1664, 1600, 1534, 1408, 1364, 1282, 1175, 970, 842; Anal. calcd for $C_{13}H_{15}NO_2$: C, 71.87; H, 6.96; N, 6.45; Found: C, 71.68; H, 7.21; N, 6.20.



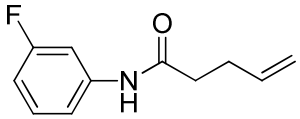
**Ethyl 4-(pent-4-enamido)benzoate (1j).** White solid, mp: 74-76 °C; $^1$H NMR (400 MHz, $CDCl_3$): δ 8.00 (d, *J* = 8.4 Hz, 2H), 7.60 (d, *J* = 8.8 Hz, 2H), 7.50 (br, 1H), 5.85-5.91 (m, 1H), 5.13 (d, *J* = 17.2 Hz, 1H), 5.07 (d, *J* = 10.4 Hz, 1H), 4.36 (q, *J* = 7.2 Hz, 2H), 2.49 (br, 4H), 1.39 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 170.9, 166.3, 142.1, 136.7, 130.8, 125.9, 118.9, 116.1, 60.9, 36.9, 29.3, 14.3; IR (KBr): ν ($cm^{-1}$) 3343, 2983, 1690, 1597, 1538, 1411, 1322, 1288, 1164, 916, 773; Anal. Calcd for $C_{14}H_{17}NO_3$: C, 68.00; H, 6.93; N, 5.66; Found: C, 67.89; H, 7.00; N, 5.63.



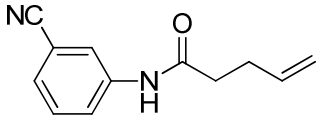
**4-(Pent-4-enamido)benzoic acid (1k).** White solid, mp: 242-244 °C; $^1$H NMR (400 MHz, DMSO-$d_6$): δ 10.22 (s, 1H), 7.88 (d, *J* = 8.8 Hz, 2H), 7.70 (d, *J* = 8.8 Hz, 2H), 5.80-5.91 (m, 1H), 5.07 (dd, *J* =17.6, 2.0 Hz, 1H), 4.99 (dd, *J* =10.0, 1.2 Hz, 1H), 2.32-2.51 (m, 5H); $^{13}$C NMR (100 MHz, DMSO-$d_6$): δ 176.3, 172.7, 148.2, 142.7, 135.5, 131.0, 123.5, 120.5, 40.8, 34.1; IR (KBr): ν ($cm^{-1}$) 3323, 2986, 1683, 1667, 1595, 1527, 1317, 1294, 1171, 856, 789; ESI-MS: (*m/z*) 242 ($M^+$+Na); HRMS calcd for $C_{12}H_{13}NNaO_3$ (M+Na): 242.0788, found 242.0790.



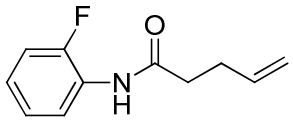
***N*-(4-Cyanophenyl)-4-pentenamide (1l).** White solid, mp: 96-98 °C; $^{1}$H NMR (400 MHz, $CDCl_3$): δ 7.65 (d, *J* = 8.8 Hz, 2H), 7.60 (d, *J* = 8.4 Hz, 2H), 7.43 (br, 1H), 5.83-5.93 (m, 1H), 5.14 (d, *J* = 17.2 Hz, 1H), 5.08 (d, *J* = 10.4 Hz, 1H), 2.50 (br, 4H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 170.9, 142.0, 136.5, 133.3, 119.5, 118.9, 116.3, 107.1, 36.8, 29.1; IR (KBr): ν ($cm^{-1}$) 3310, 2230, 1673, 1598, 1520, 1408, 1313, 1251, 1178, 929, 841; ESI-MS: (*m/z*) 223 ($M^+$+Na); HRMS calcd for $C_{12}H_{12}N_2NaO$ (M+Na): 223.0847, found 223.0833.



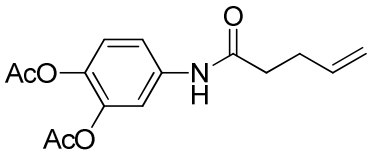
***N*-(3-Fluorophenyl)-4-pentenamide (3a).** Yellow oil; $^{1}$H NMR (400 MHz, $CDCl_3$): δ 7.48 (d, *J* = 6.8 Hz, 1H), 7.22–7.28 (m, 2H), 7.12 (d, *J* = 8.0 Hz, 1H), 6.80 (td, *J* = 8.4, 2.0 Hz, 1H), 5.83-5.93 (m, 1H), 5.13 (d, *J* = 17.6 Hz, 1H), 5.07 (d, *J* = 10.4 Hz, 1H), 2.43-2.51 (m, 4H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 171.8, 162.9 (d, *J* = 242.8 Hz), 139.6 (d, *J* = 11.7 Hz), 136.6, 130.0 (d, *J* = 9.5 Hz), 115.9, 115.6, 111.0 (d, *J* = 21.2 Hz), 107.7 (d, *J* = 25.6 Hz), 36.6, 29.4; $^{19}$F NMR (282 MHz, $CDCl_3$) δ -112.7 (s, 1F); IR (neat): ν ($cm^{-1}$) 3301, 3081, 1667, 1611, 1548, 1491, 1444, 1276, 917; ESI-MS: (*m/z*) 216 ($M^+$+Na); HRMS calcd for $C_{11}H_{12}FNNaO$ (M+Na): 216.0795, found 216.0791.



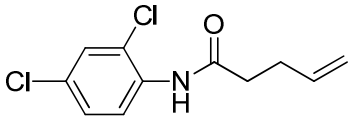
***N*-(3-Cyanophenyl)-4-pentenamide (3b).** Yellow solid, mp: 56-58 °C; $^{1}$H NMR (400 MHz, $CDCl_3$): δ 7.92 (s, 1H), 7.71 (d, *J* = 8.0 Hz, 1H), 7.37-7.44 (m, 3H), 5.84-5.92(m, 1H), 5.14 (d, *J* = 17.2 Hz, 1H), 5.08 (d, *J* = 10.8 Hz, 1H), 2.49 (br, 4H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 172.1, 139.2, 136.5, 129.9, 127.6, 124.4, 123.2, 118.8, 116.0, 112.4, 36.5, 29.3; IR (KBr): ν ($cm^{-1}$) 3333, 3081, 2235, 1697, 1589, 1553, 1429, 1286, 912, 794; Anal. calcd for $C_{12}H_{12}N_2O$: C, 71.98; H, 6.04; N, 13.99; Found: C, 71.66; H, 5.99; N, 13.75;



***N*-(2-Fluorophenyl)-4-pentenamide (3c).** Yellow oil; $^{1}$H NMR (400 MHz, $CDCl_3$): δ 8.32 (t, *J* = 8.0 Hz, 1H), 7.38 (br, 1H), 7.01-7.14 (m, 3H), 5.84-5.94 (m, 1H), 5.14 (d, *J* = 17.2 Hz, 1H), 5.07 (d, *J* = 10.4 Hz, 1H), 2.50 (br, 4H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 170.9, 152.6 (d, *J* = 239.9 Hz), 136.7, 126.3 (d, *J* = 10.3 Hz), 124.5 (d, *J* = 2.9 Hz), 124.4 (d, *J* = 7.3 Hz), 122.1 (d, *J* = 10 Hz), 116.0, 114.8 (d, *J* = 19.0 Hz), 36.7, 29.3; $^{19}$F NMR (282 MHz, $CDCl_3$) δ -132.1 (s ,1F); IR (neat): ν ($cm^{-1}$) 3373, 3078, 1672, 1617, 1533, 1455, 1260, 1194, 751; ESI-MS: (*m/z*) 216 ($M^+$+Na); HRMS calcd for $C_{11}H_{12}FNNaO$ (M+Na): 216.0795, found 216.0791.

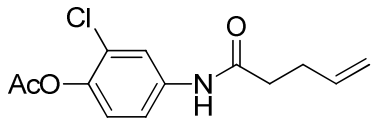


***N*-(3,4-Diacetoxyphenyl)-4-pentenamide (3e).** White solid, mp: 58-60 °C; $^{1}$H NMR (400 MHz, $CDCl_3$): δ 8.08 (br, 1H), 7.58 (d, *J* = 2.0 Hz,1H), 7.06 (dd, *J* = 8.8, 2.4 Hz, 2H), 6.99 (d, *J* = 8.8 Hz, 2H), 5.77-5.85 (m, 1H), 5.06 (dd, *J* = 17.2, 1.2 Hz, 1H), 5.00 (d, *J* = 10.4 Hz, 1H), 2.32-2.42 (m, 4H), 2.26 (s, 6H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 171.1, 168.8, 168.6, 141.9, 137.8, 136.9, 136.7, 123.2, 117.7, 115.6, 115.0, 36.3, 29.3, 20.6; IR (KBr): ν ($cm^{-1}$) 3367, 3055, 1771, 1693, 1611, 1505, 1265, 1187, 748, 731; ESI-MS: (*m/z*) 314 ($M^+$+Na); HRMS calcd for $C_{15}H_{17}NNaO_5$ (M+Na): 314.0999, found 314.0998.

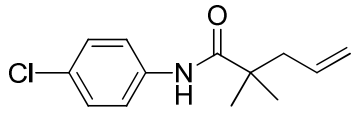


***N*-(2,4-Dichlorophenyl)-4-pentenamide (3f).** White solid, mp: 82-84 °C; $^{1}$H NMR (400 MHz, $CDCl_3$): δ 8.36 (d, *J* = 8.8 Hz, 1H), 7.57 (br, 1H), 7.37 (d, *J* = 2.4 Hz, 1H), 7.24 (dd, *J* = 9.2, 2.4 Hz, 1H), 5.83-5.95 (m, 1H), 5.14 (dd, *J* = 17.2, 1.5 Hz, 1H ), 5.08 (d, *J* = 10.0 Hz, 1H ), 2.47-2.56 (m, 4H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 170.5, 136.4, 133.4, 129.1, 128.7, 127.9, 123.2, 122.5, 116.3, 37.0, 29.2; IR (KBr): ν ($cm^{-1}$) 3283, 1658, 1520, 1381, 917, 862, 824; ESI-MS: (*m/z*) 266 ($M^+$+Na); HRMS calcd for $C_{11}H_{11}Cl_2NNaO$ (M+Na):

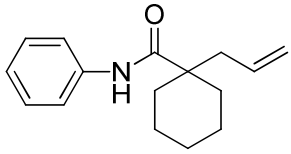
266.0110, found 266.0123.




**2-Chloro-4-(pent-4-enamido)phenyl acetate (3g).** White solid, mp: 100-102 °C; $^{1}$H NMR (400 MHz, $CDCl_3$): δ 7.69 (d, *J* = 2.0 Hz, 1H), 7.41 (br, 1H), 7.32 (dd, *J* = 8.8, 2.4 Hz, 1H), 7.03 (d, *J* = 8.8 Hz, 1H), 5.81-5.90 (m, 1H), 5.11 (dd, *J* = 17.2, 1.6 Hz, 1H ), 5.06 (d, *J* = 10.4 Hz, 1H ), 2.41-2.48 (m, 4H), 2.34 (s, 3H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 171.1, 169.4, 142.8, 136.9, 136.7, 126.8, 123.4, 121.6, 119.2, 115.8, 36.4, 29.3, 20.6; IR (KBr): ν ($cm^{-1}$) 1766, 1666, 1524, 1398, 1218, 905; Anal. calcd for $C_{13}H_{14}ClNO_3$: C, 58.32; H, 5.27; N, 5.23; Found: C, 58.04; H, 5.33; N, 5.21.

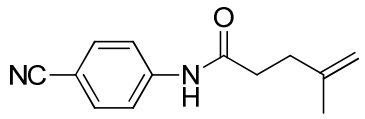



***N*-(4-Chlorophenyl)-2,2-dimethyl-4-pentenamide (3h).** White solid; $^{1}$H NMR (400 MHz, $CDCl_3$): δ 7.46 (d, *J* = 8.4 Hz, 1H), 7.32 (br, 1H), 7.28 (d, *J* = 8.8 Hz, 1H), 5.76-5.88 (m, 1H), 5.11-5.15 (m, 2H), 2.37 (d, *J* = 7.6 Hz, 2H), 1.29 (s, 6H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 175.6, 136.5, 134.1, 129.3, 129.0, 121.4, 118.7, 45.2, 42.9, 25.2; IR (KBr): ν ($cm^{-1}$) 3286, 2977, 1655, 1593, 1526, 1492, 1399, 1244, 1086, 917, 828; Anal. calcd for $C_{13}H_{16}ClNO$: C, 65.68; H, 6.78; N, 5.89; Found: C, 65.77; H, 6.83; N, 5.81.

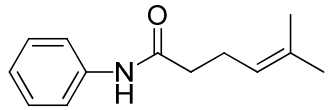



**1-Allyl-*N*-phenylcyclohexanecarboxamide (3i)**. White solid, mp: 86-88 $^{o}$C; $^{1}$H NMR (400 MHz, $CDCl_3$): δ 7.51 (d, *J* = 7.6 Hz, 2H), 7.32 (t, *J* = 8.4 Hz, 3H), 7.10 (t, *J* = 7.2 Hz, 1H), 5.74-5.84 (m, 1H), 5.06-5.10 (m, 2H), 2.33 (d, *J* = 7.6 Hz, 2H), 2.02-2.06 (m, 2H), 1.34-1.67 (m, 8H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 174.2, 137.9, 133.5, 129.0, 124.3, 120.2, 118.4, 47.3, 44.5, 34.1, 25.9, 22.9; IR (KBr): ν ($cm^{-1}$) 3319, 2939, 1652, 1597, 1534, 1439, 1298, 919, 749; ESI-MS: (*m/z*) 266 ($M^{+}$+Na); HRMS calcd for

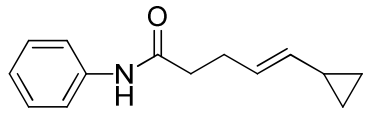
$C_{16}H_{21}NNaO$ (M+Na): 266.1515, found 216.1519.



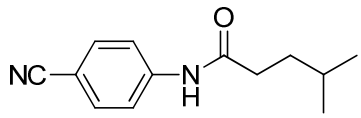
***N*-(4-Cyanophenyl)-4-methyl-4-pentenamide (3j).** White solid, mp: 96-98 °C; $^1$H NMR (400 MHz, $CDCl_3$): δ 7.65 (d, *J* = 8.8 Hz, 2H), 7.60 (d, *J* = 8.8 Hz, 2H), 7.51 (br, 1), 4.83 (s, 1H), 4.77 (s, 1H), 2.56 (t, *J* = 7.6 Hz, 2H), 2.45 (t, *J* = 7.2 Hz, 2H), 1.79 (s, 3H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 171.4, 144.1, 142.2, 133.3, 119.6, 118.9, 111.0, 106.9, 35.8, 32.9, 22.5; IR (KBr): ν ($cm^{-1}$) 3294, 3250, 2220, 1667, 1596, 1507, 1309, 1257, 1150, 837; Anal. calcd for $C_{13}H_{14}N_2O$: C, 72.87; H, 6.59; N, 13.07; Found: C, 72.67; H, 6.63; N, 13.11.



***N*-Phenyl-5-methyl-4-hexenamide (3m).** White solid, mp: 86-88 °C; $^1$H NMR (400 MHz, $CDCl_3$): δ 7.49 (d, *J* = 8.0 Hz, 2H), 7.31 (t, *J* = 7.6 Hz, 2H), 7.26 (br, 1H), 7.09 (t, *J* = 7.2 Hz, 1H), 5.16-5.17 (m, 1H), 2.36-2.43 (m, 4H), 1.72 (s, 3H), 1.65 (s, 3H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 171.5, 138.2, 133.5, 128.9, 124.2, 122.7, 120.0, 37.6, 25.7, 24.3, 17.8; IR (KBr): ν ($cm^{-1}$) 3297, 2914, 1661, 1600, 1545, 1443, 1310, 753; ESI-MS: (*m/z*) 226 ($M^+$+Na); HRMS calcd for $C_{13}H_{17}NNaO$ (M+Na): 226.1202, found 226.1205.



**(*E*)-5-Cyclopropyl-*N*-phenyl-4-pentenamide (5).** Yellow oil; $^1$H NMR (400 MHz, $CDCl_3$): δ 7.51 (d, *J* = 8.0 Hz, 2H), 7.32 (t, *J* = 8.0 Hz, 2H), 7.26 (br, 1H), 7.10 (t, *J* = 7.6 Hz, 1H), 5.33-5.39 (m, 1H), 4.86 (t, *J* = 10.4 Hz, 1H), 2.58-2.64 (m, 2H), 2.47 (t, *J* = 7.2 Hz, 2H), 1.58 (s, 1H), 0.72-0.77 (m, 2H), 0.32-0.36 (m, 2H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 171.3, 138.1, 135.9, 128.9, 125.7, 124.2, 120.1, 37.6, 23.8, 9.7, 7.0; IR (neat): ν ($cm^{-1}$) 3299, 3006, 1667, 1600, 1538, 1444, 1309, 1257, 755; ESI-MS: (*m/z*) 238 ($M^+$+Na); HRMS calcd for $C_{14}H_{17}NNaO$ (M+Na): 238.1202, found 238.1206.

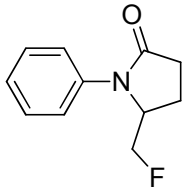


***N*-(4-Cyanophenyl)-4-methylpentanamide (8b)**. White solid, 72-74 °C; $^{1}$H NMR (400 MHz, $CDCl_3$): δ 7.66 (d, *J* = 8.8 Hz, 2H), 7.60 (d, *J* = 8.8 Hz, 2H), 7.33 (br, 1H), 2.40 (t, *J* = 7.6 Hz, 2H), 1.62-1.65 (m, 3H), 0.94 (d, *J* = 6.4 Hz, 6H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 172.7, 142.6, 133.2, 119.6, 119.1, 106.5, 35.7, 34.3, 27.8, 22.3; IR (KBr): ν ($cm^{-1}$) 3242, 2953, 2222, 1668, 1594, 1531, 1406, 1312, 842; ESI-MS: (*m/z*) 239 ($M^+$+Na); HRMS calcd for $C_{13}H_{16}N_2NaO$ (M+Na): 239.1155, found 239.1155.

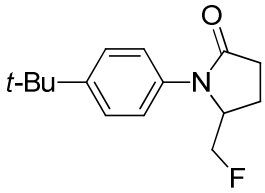
## 2. Typical Procedure for Radical Aminofluorination

**Typical Procedure for Silver-Catalyzed Radical Aminofluorination of Alkenes.** *N*-phenyl-4-pentenamide (**1a**, 52.5 mg, 0.3 mmol), $AgNO_3$ (5.1 mg, 0.03 mmol) and Selectfluor (212 mg, 0.6 mmol) were placed in a Schlenk-tube under nitrogen atmosphere. Dichloromethane (3 mL) and water (3 mL) was then added successively at room temperature. The reaction mixture was then refluxed with stirring for 12 h. The resulting mixture was cooled down to room temperature and extracted with dichloromethane (15 mL × 3). The combined organic phase was dried over anhydrous $Na_2SO_4$. After the removal of solvent under reduced pressure, the crude product was purified by column chromatography on silica gel with hexane/ethyl acetate/$CH_2Cl_2$ (2:1:1, v:v:v) as the eluent to give the pure product 5-(fluoromethyl)-1-phenylpyrrolidin-2-one (**2a**) as a yellow oil. Yield: 52.6 mg (91%).

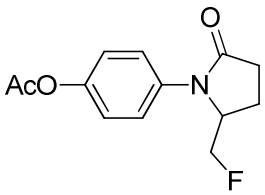
## 3. Characterizations of Products.



**5-(Fluoromethyl)-1-phenylpyrrolidin-2-one (2a).** Yellow oil; $^{1}$H NMR (400 MHz, $CDCl_3$): δ 7.36-7.43 (m, 4H), 7.23-7.26 (m, 1H), 4.30-4.52 (m, 3H), 2.67-2.76 (m, 1H), 2.52-2.60 (m, 1H), 2.34-2.41 (m, 1H), 2.14-2.22 (m, 1H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 174.6, 137.1, 129.3, 126.6, 124.7, 82.3 (d, *J* = 173.5 Hz), 59.7 (d, *J* = 20.4 Hz), 31.1, 20.7 (d, *J* = 4.4 Hz); $^{19}$F NMR (282 MHz, $CDCl_3$): δ -231.0 (m, 1F); IR (neat): ν ($cm^{-1}$) 2960, 1697, 1597, 1499, 1391, 1292, 1222, 1056, 761, 695; EIMS: *m/z* (rel intensity) 193 ($M^+$, 40), 160 (100), 132 (12), 117 (8), 104 (14), 91 (7), 77 (24), 51 (7); HRMS calcd for $C_{11}H_{12}FNO$: 193.0903, found 193.0905.

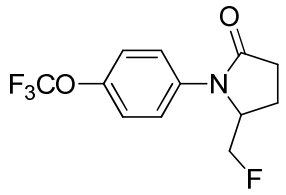


**1-(4-(*tert*-Butyl)phenyl)-5-(fluoromethyl)pyrrolidin-2-one (2b).** White solid, mp: 100-102 $^{o}$C; $^{1}$H NMR (400 MHz, $CDCl_3$): δ 7.41 (d, *J* = 8.4 Hz, 2H), 7.27 (d, *J* = 8.4 Hz, 2H), 4.24-4.52 (m, 3H), 2.65-2.72 (m, 1H), 2.50-2.58 (m, 1H), 2.33-2.39 (m, 1H), 2.15-2.20 (m, 1H), 1.31 (s, 9H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 174.7, 149.6, 134.3, 126.3, 124.4, 82.3 (d, *J* = 173.5 Hz), 59.9 (d, *J* = 20.4 Hz), 34.6, 31.3, 31.1, 20.8 (d, *J* = 4.4 Hz) ; $^{19}$F NMR (282 MHz, $CDCl_3$): δ -229.5 (m, 1F); IR (KBr): ν ($cm^{-1}$) 2962, 1698, 1516, 1394, 127, 1057, 1013, 956, 835; ESI-MS: (*m/z*) 272 ($M^+$+Na); HRMS calcd for $C_{15}H_{21}FNO$ (M): 250.1602, found 250.1601.

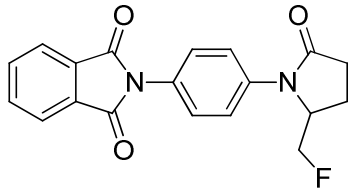


**1-(4-Acetoxylphenyl)-5-(fluoromethyl)pyrrolidin-2-one (2c).** Yellow solid, mp: 86-88 $^{o}$C; $^{1}$H NMR (400 MHz, $CDCl_3$): δ 7.39 (d, *J* = 8.8 Hz, 2H), 7.13 (d, *J* = 8.8 Hz, 2H),

4.25-4.53 (m, 3H), 2.65-2.74 (m, 1H), 2.49-2.57 (m, 1H), 2.28-2.41 (m, 4H), 2.12-2.20 (m, 1H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 174.7, 169.3, 148.7, 134.6, 125.6, 122.4, 82.2 (d, *J* = 174.1 Hz), 59.8 (d, *J* = 19.9 Hz), 31.0, 21.1, 20.7 (d, *J* = 4.3 Hz); $^{19}$F NMR (282 MHz, $CDCl_3$): δ -233.7 (m, 1F); IR (KBr): ν ($cm^{-1}$) 1755, 1698, 1508, 1387, 1372, 1197, 1014, 910; ESI-MS: (*m/z*) 274 ($M^+$+Na); HRMS calcd for $C_{13}H_{14}FNNaO_3$ (M+Na): 274.0855, found 274.0850.

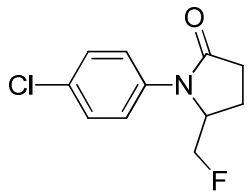



**5-(Fluoromethyl)-1-(4-(trifluoromethoxy)phenyl)pyrrolidin-2-one (2d).** Yellow oil; $^1$H NMR (400 MHz, $CDCl_3$): δ 7.43 (d, *J* = 8.8 Hz, 2H), 7.26 (d, *J* = 8.8 Hz, 2H), 4.31-4.52 (m, 3H), 2.67-2.74 (m, 1H), 2.52-2.59 (m, 1H), 2.35-2.42 (m, 1H), 2.14-2.20 (m, 1H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 174.6, 147.0, 135.7, 125.8, 121.8, 120.4 (q, *J* = 255.9 Hz), 82.2 (d, *J* = 173.5 Hz), 59.6 (d, *J* = 20.4 Hz), 30.9, 20.7 (d, *J* = 4.4 Hz); $^{19}$F NMR (282 MHz, $CDCl_3$): δ -58.8 (s, 3F), -233.5 (m, 1F); IR (neat): ν ($cm^{-1}$) 2962, 1704, 1510, 1390, 1260, 1222, 1164; ESI-MS: (*m/z*) 300 ($M^+$+Na); HRMS calcd for $C_{12}H_{11}F_4NNaO_2$ (M+Na): 300.0624, found 300.0632.

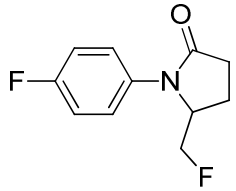



**2-(4-(2-(Fluoromethyl)-5-oxopyrrolidin-1-yl)phenyl)isoindoline-1,3-dione (2e).** White solid, mp: 186-188 $^o$C; $^1$H NMR (400 MHz, $CDCl_3$): δ 7.94-7.97 (m, 2H), 7.79-7.82 (m, 2H), 7.58 (d, *J* = 8.8 Hz, 2H), 7.52 (d, *J* = 8.8 Hz, 2H), 4.36-4.60 (m, 3H), 2.71-2.80 (m, 1H), 2.54-2.62 (m, 1H), 2.37-2.45 (m, 1H), 2.16-2.25 (m, 1H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 174.6, 167.1, 136.7, 134.5, 131.7, 129.5, 127.2, 124.5, 123.8, 82.3 (d, *J* = 173.5 Hz), 59.5 (d, *J* = 20.4 Hz), 31.1, 20.8 (d, *J* = 4.4 Hz); $^{19}$F NMR (282 MHz, $CDCl_3$): δ -233.9 (m, 1F); IR (KBr): ν ($cm^{-1}$) 3311, 1661, 1607, 1537, 1512, 1252, 1212, 1159; ESI-MS: (*m/z*) 361 ($M^+$+Na); HRMS calcd for $C_{19}H_{15}FN_2NaO_3$ (M+Na): 361.0964,

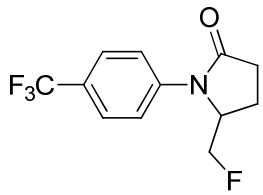
found 274.0974.



**1-(4-Chlorophenyl)-5-(fluoromethyl)pyrrolidin-2-one (2f).** Yellow oil; $^{1}$H NMR (400 MHz, $CDCl_3$): δ 7.32-7.38 (m, 4H), 4.28-4.52 (m, 3H), 2.65-2.74 (m, 1H), 2.50-2.58 (m, 1H), 2.32-2.42 (m, 1H), 2.12-2.19 (m, 1H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 174.6, 135.7, 131.8, 129.4, 125.7, 82.3 (d, *J* = 174.2 Hz), 59.5 (d, *J* = 20.4), 31.0, 20.6 (d, *J* = 4.4 Hz); $^{19}$F NMR (282 MHz, $CDCl_3$): δ -233.8 (m, 1F); IR (neat): ν ($cm^{-1}$) 2960, 1698, 1594, 1494, 1385, 1292, 1221, 1091, 1012, 830; ESI-MS: (*m/z*) 250/252 ($M^+$+Na); HRMS calcd for $C_{11}H_{11}ClFNNaO$ (M+Na): 250.0411; found, 250.0411.

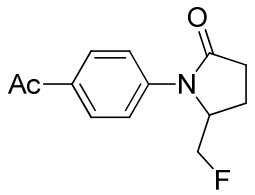


**5-Fluoromethyl-1-(4-fluorophenyl)pyrrolidin-2-one (2g).** Yellow oil; $^{1}$H NMR (400 MHz, $CDCl_3$): δ 7.32 (dd, *J* = 8.8, 4.8 Hz, 2H), 7.10 (t, *J* = 8.8 Hz, 2H), 4.22-4.50 (m, 3H), 2.64-2.73 (m, 1H), 2.50-2.59 (m, 1H), 2.32-2.42 (m, 1H), 2.12-2.20 (m, 1H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 174.8, 161.0 (d, *J* = 245 Hz), 133.0 (d, *J* = 2.2), 126.9 (d, *J* = 8.8 Hz), 116.2 (d, *J* = 21.6 Hz), 82.2 (d, *J* = 173.5 Hz), 60.0 (d, *J* = 19.7 Hz), 30.9, 20.6 (d, *J* = 4.4 Hz); $^{19}$F NMR (282 MHz, $CDCl_3$) δ -116.5 (s, 1F), -233.8 (m, 1F); IR (neat): ν ($cm^{-1}$) 2961, 1698, 1510, 1393, 1228, 836; ESI-MS: (*m/z*) 234 ($M^+$+Na); HRMS calcd for $C_{11}H_{11}F_2NNaO$ (M+Na): 234.0706, found 234.0705.

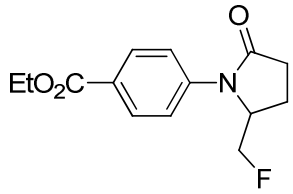


**5-(Fluoromethyl)-1-(4-(trifluoromethyl)phenyl)pyrrolidin-2-one (2h)**. White solid,

mp: 58-60 $^{o}$C; $^{1}$H NMR δ 7.66 (d, *J* = 8.4 Hz, 2H), 7.59 (d, *J* = 8.4 Hz, 2H), 4.35-4.55 (m, 3H), 2.70-2.77 (m, 1H), 2.53-2.61 (m, 1H), 2.37-2.42 (m, 1H), 2.16-2.22 (m, 1H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 174.7, 140.5, 127.8 (q, *J* = 32.0 Hz), 126.4 (q, *J* = 3.7 Hz), 123.9 (q, *J* = 268.7 Hz), 123.5, 82.3 (d, *J* = 175.0 Hz), 59.1 (d, *J* = 20.4 Hz), 31.2, 20.6 (d, *J* = 4.4 Hz); $^{19}$F NMR (282 MHz, $CDCl_3$): δ -62.8 (s, 3F), -233.3 (m, 1F); IR (KBr): ν ($cm^{-1}$) 2963, 1705, 1614, 1520, 1383, 1292, 1166, 1068, 1014, 843; ESI-MS: (*m/z*) 284 ($M^+$+Na); HRMS calcd for $C_{12}H_{11}F_4NNaO$ (M+Na): 284.0674, found 284.0669.

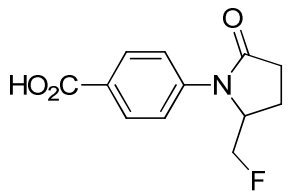



**1-(4-Acetylphenyl)-5-(fluoromethyl)pyrrolidin-2-one (2i)**. Yellow solid, mp: 58-60 $^{o}$C; $^{1}$H NMR (400 MHz, $CDCl_3$): δ 8.00 (d, *J* = 8.4 Hz, 2H), 7.59 (d, *J* = 8.4 Hz, 2H), 4.36-4.57 (m, 3H), 2.71-2.81 (m, 1H), 2.54-2.62 (m, 4H), 2.35-2.45 (m, 1H), 2.15-2.22 (m, 1H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 197.0, 174.6, 141.6, 134.2, 129.5, 122.7, 82.4 (d, *J* = 175.0 Hz), 58.9 (d, *J* = 20.5 Hz), 31.3, 26.5, 20.7 (d, *J* = 4.4 Hz); $^{19}$F NMR (282 MHz, $CDCl_3$): δ -233.1 (m, 1F); IR (KBr): ν ($cm^{-1}$) 2925, 1702, 1600, 1509, 1459, 1377, 1264, 1015, 838; ESI-MS: (*m/z*) 258 ($M^+$+Na); HRMS calcd for $C_{13}H_{14}FNNaO_2$ (M+Na): 258.0906, found 258.0909.

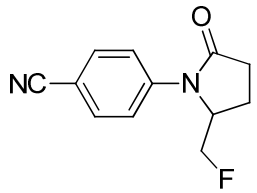



**5-(Fluoromethyl)-1-(4-(ethoxycarbonyl)phenyl)pyrrolidin-2-one (2j).** Yellow oil; $^{1}$H NMR (400 MHz, $CDCl_3$): δ 8.05 (d, *J* = 8.4 Hz, 2H), 7.53 (d, *J* = 8.4 Hz, 2H), 4.32-4.53 (m, 5H), 2.67-2.77 (m, 1H), 2.50-2.58 (m, 4H), 2.31-2.41 (m, 1H), 2.12-2.18 (m, 1H), 1.36 (t, *J* = 7.2 Hz, 3H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 174.6, 165.9, 141.4, 130.7, 127.6, 122.6, 82.3 (d, *J* = 174.2 Hz), 61.0, 58.9 (d, *J* = 20.4 Hz), 31.3, 20.6 (d, *J* = 4.3 Hz), 14.3; $^{19}$F NMR (282 MHz, $CDCl_3$): δ -233.4 (m, 1F); IR (neat): ν ($cm^{-1}$) 2981, 1720, 1704, 1605, 1512, 1379, 1184, 1018, 772; ESI-MS: (*m/z*) 288 ($M^+$+Na); HRMS calcd for

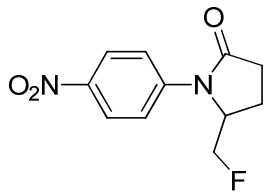
$C_{14}H_{16}FNNaO_3$ (M+Na): 288.1012, found 288.0999.



**4-(2-(Fluoromethyl)-5-oxopyrrolidin-1-yl)benzoic acid (2k)**. Gray solid; mp: 179-181 $^oC$; $^1H$ NMR (400 MHz, DMSO-$d_6$): δ 12.74 (br, 1H), 7.95 (d, *J* = 8.4 Hz, 2H), 7.70 (d, *J* = 8.4 Hz, 2H), 4.69-4.79 (m, 1H), 4.41-4.59 (m, 2H), 2.56-2.66 (m, 1H), 2.26-2.48 (m, 2H), 1.96-2.04 (m, 1H); $^{13}C$ NMR (100 MHz, $CDCl_3$): δ 174.8, 167.3, 142.2, 130.6, 127.3, 122.3, 83.4 (d, *J* = 169.1 Hz), 58.3 (d, *J* = 19.0 Hz), 31.5, 20.4 (d, *J* = 4.4 Hz); $^{19}F$ NMR (282 MHz, DMSO-$d_6$): δ -232.3 (m, 1F); IR (KBr): ν ($cm^{-1}$) 2966, 1699, 1673, 1606, 1514, 1376, 1289, 1267, 1210, 1015, 860, 776; ESI-MS: (*m/z*) 236 ($M^+$); HRMS calcd for $C_{12}H_{11}FNO_3$ (M-H): 236.0723, found 236.0727.

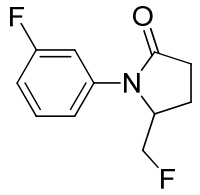


**1-(4-Cyanophenyl)-5-(fluoromethyl)pyrrolidin-2-one (2l).** White solid, mp: 84-86 $^oC$; $^1H$ NMR (400 MHz, $CDCl_3$): δ 7.63-7.69 (m, 4H), 4.37-4.58 (m, 3H), 2.72-2.81 (m, 1H), 2.54-2.62 (m, 1H), 2.35-2.45 (m, 1H), 2.15-2.21 (m, 1H); $^{13}C$ NMR (100 MHz, $CDCl_3$): δ 174.7, 141.5, 133.2, 122.9, 118.5, 108.8, 82.4 (d, *J* = 174.3 Hz), 58.6 (d, *J* = 20.4 Hz), 31.3, 20.6 (d, *J* = 4.4 Hz); $^{19}F$ NMR (282 MHz, $CDCl_3$): δ -232.3 (m, 1F); IR (KBr): ν ($cm^{-1}$) 2962, 2226, 1716, 1603, 1507, 1375, 1298, 1217, 1014, 840; ESI-MS: (*m/z*) 241 ($M^+$+Na); HRMS calcd for $C_{12}H_{11}FN_2NaO$ (M+Na): 241.0753, found 241.0747.

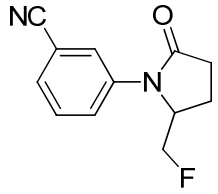


**5-(Fluoromethyl)-1-(4-nitrophenyl)pyrrolidin-2-one (2m).** Yellow solid, mp: 110-112

$^{o}$C; $^{1}$H NMR (400 MHz, $CDCl_3$): δ 8.27 (d, *J* = 9.2 Hz, 2H), 7.73 (d, *J* = 9.6 Hz, 2H), 4.40-4.63 (m, 3H), 2.75-2.84 (m, 1H), 2.56-2.65 (m, 1H), 2.40-2.46 (m, 1H), 2.17-2.24 (m, 1H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 174.7, 144.4, 143.3, 124.8, 122.3, 82.4 (d, *J* = 175.7 Hz), 58.7 (d, *J* = 20.4 Hz), 31.3, 20.6 (d, *J* = 4.3 Hz); $^{19}$F NMR (282 MHz, $CDCl_3$): δ -232.0 (m, 1F); IR (KBr): ν ($cm^{-1}$) 2992, 1703, 1598, 1498, 1379, 1291, 1206, 851, 751; ESI-MS: (*m/z*) 261 ($M^+$+Na); HRMS calcd for $C_{11}H_{11}FN_2NaO_3$ (M+Na): 261.0651, found 241.0640.

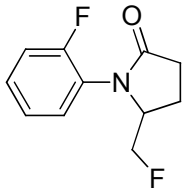



**5-(Fluoromethyl)-1-(3-fluorophenyl)pyrrolidin-2-one (4a).** Yellow oil; $^{1}$H NMR (400 MHz, $CDCl_3$): δ 7.34 (dd, *J* = 8.0, 14.8 Hz, 1H), 7.26 (dt, *J* = 10.8, 2.0 Hz, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 6.90-6.95 (m, 1H), 4.31-4.54 (m, 3H), 2.66-2.75 (m, 1H), 2.49-2.57 (m, 1H), 2.31-2.41 (m, 1H), 2.11-2.19 (m, 1H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 174.6, 162.9 (d, *J* = 244.3 Hz), 138.8 (d, *J* = 9.5 Hz), 130.3 (d, *J* = 9.5 Hz), 119.1 (d, *J* = 2.9 Hz), 113.0 (d, *J* = 21.1 Hz), 111.4 (d, *J* = 24.7 Hz), 82.2 (d, *J* = 173.6 Hz), 59.3 (d, *J* = 20.4 Hz), 31.2, 20.6 (d, *J* = 4.4 Hz); $^{19}$F NMR (282 MHz, $CDCl_3$): δ -112.5 (s, 1F), -233.4 (m, 1F); IR (neat): ν ($cm^{-1}$) 2962, 1713, 1614, 1590, 1494, 1454, 1319, 1231, 1058, 1014, 834, 779; ESI-MS: (*m/z*) 234 ($M^+$+Na); HRMS calcd. for $C_{11}H_{11}F_2NNaO$ (M+Na): 234.0706, found, 234.0702.

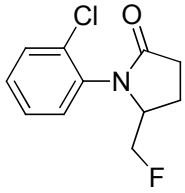



**1-(3-Cyanophenyl)-5-(fluoromethyl)pyrrolidin-2-one (4b).** White solid, mp: 80-82 $^{o}$C; $^{1}$H NMR (400 MHz, $CDCl_3$): δ 7.77 (s, 1H), 7.70-7.73 (m, 1H), 7.50-7.52 (m, 2H), 4.35-4.54 (m, 3H), 2.70-2.79 (m, 1H), 2.54-2.62 (m, 1H), 2.36-2.46 (m, 1H), 2.14-2.22 (m, 1H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 174.6, 138.3, 130.2, 129.4, 128.1, 127.0, 118.2,

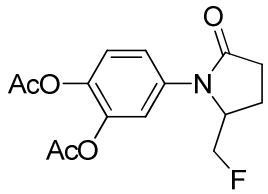
113.5, 82.3 (d, $J$ = 175.0 Hz), 59.0 (d, $J$ = 20.4 Hz), 31.0, 20.6 (d, $J$ = 4.4 Hz); $^{19}$F NMR (282 MHz, $CDCl_3$): δ -232.5 (m, 1F); IR (KBr): ν ($cm^{-1}$) 2960, 2230, 1704, 1600, 1582, 1487, 1461, 1383, 1255, 1119, 797; ESI-MS: (*m/z*) 241 ($M^+$+Na); HRMS calcd for $C_{12}H_{11}FN_2NaO$ (M+Na): 241.0753, found 241.0755.



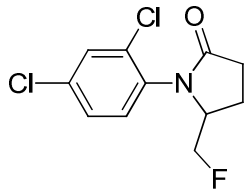

**5-(Fluoromethyl)-1-(2-fluorophenyl)pyrrolidin-2-one (4c).** Yellow oil; $^1$H NMR (400 MHz, $CDCl_3$): δ 7.27-7.38 (m, 2H), 7.13-7.21 (m, 2H), 4.22-4.42 (m, 3H), 2.51-2.71 (m, 2H), 2.37-2.44 (m, 1H), 2.13-2.20 (m, 1H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 175.0, 157.9 (d, $J$ = 248.6 Hz), 130.0, 129.4 (d, $J$ = 8.0 Hz), 124.8 (d, $J$ = 3.7 Hz), 124.4 (d, $J$ = 12.4 Hz), 116.6 (d, $J$ = 19.7 Hz), 82.5 (d, $J$ = 174.3 Hz), 59.7 (dd, $J$ = 19.7, 3.0 Hz), 30.2, 21.0 (d, $J$ = 4.3 Hz); $^{19}$F NMR (282 MHz, $CDCl_3$): δ -120.8 (s 1F,), -233.4 (m 1F,); IR (neat): ν ($cm^{-1}$) 2959, 1704, 1610, 1589, 1503, 1459, 1397, 1262, 1224, 1057, 811, 759; ESI-MS: (*m/z*) 234 ($M^+$+Na); HRMS calcd for $C_{11}H_{11}F_2NNaO$ (M+Na): 234.0706, found 234.0708.



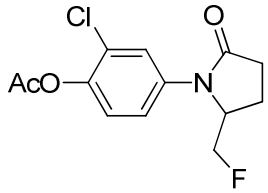

**1-(2-Chlorophenyl)-5-(fluoromethyl)pyrrolidin-2-one (4d).** Yellow oil; $^1$H NMR (400 MHz, $CDCl_3$): δ 7.48 (d, $J$ = 6.4 Hz, 1H), 7.25-7.32 (m, 3H), 4.22-4.41 (m, 3H), 2.52-2.69 (m, 2H), 2.39-2.47 (m, 1H), 2.19-2.22 (m, 1H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 175.2, 134.4, 132.6, 131.1, 130.5, 129.6, 127.9, 82.5 (d, $J$ = 174.3 Hz), 59.5 (d, $J$ = 19.7 Hz), 30.2, 21.2 (d, $J$ = 5.1 Hz); $^{19}$F NMR (282 MHz, $CDCl_3$): δ -233.0 (m, 1F); IR (neat): ν ($cm^{-1}$) 2958, 1705, 1588, 1481, 1395, 1226, 759; ESI-MS: (*m/z*) 250 ($M^+$+Na); HRMS calcd for $C_{11}H_{11}ClFNNaO$ (M+Na): 250.0411; found 250.0405.




**1-(3,4-Diacetoxylphenyl)-5-(fluoromethyl)pyrrolidin-2-one (4e).** Yellow solid, mp: 112-114 $^{o}$C; $^{1}$H NMR (400 MHz, $CDCl_3$): δ 7.38 (d, *J* = 2.0 Hz, 1H), 7.32 (dd, *J* = 8.8, 2.0 Hz, 1H), 7.22 (d, *J* = 8.8 Hz, 1H), 4.29-4.59 (m, 3H), 2.67-2.76 (m, 1H), 2.50–2.58 (m, 1H), 2.28–2.41 (m, 7H), 2.12–2.21 (m, 1H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 174.6, 168.1, 168.0, 142.4, 139.9, 135.4, 123.8, 121.6, 119.0, 82.2 (d, *J* = 174.2 Hz), 59.4 (d, *J* = 20.4 Hz), 31.1, 20.6 (d, *J* = 7.3 Hz); $^{19}$F NMR (282 MHz, $CDCl_3$): δ -233.5 (m, 1F); IR (KBr): ν ($cm^{-1}$) 3061, 2961, 1770, 1694, 1682, 1614, 1514, 1372, 1104, 1058, 903, 735; ESI-MS: (*m/z*) 332 ($M^{+}$+Na); HRMS calcd. for $C_{15}H_{16}FNNaO_5$ (M+Na): 332.0910, found 332.0902.

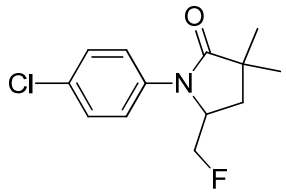



**1-(2,4-Dichlorophenyl)-5-(fluoromethyl)pyrrolidin-2-one (4f).** Yellow solid, mp: 88-90 $^{o}$C; $^{1}$H NMR (400 MHz, $CDCl_3$): δ 7.50 (d, *J* = 2.0 Hz, 1H), 7.32 (dd, *J* = 2.0, 8.4 Hz, 1H), 7.24 (d, *J* = 8.4 Hz, 1H), 4.20-4.43 (m, 3H), 2.52-2.69 (m, 2H), 2.39-2.47 (m, 1H), 2.15-2.22 (m, 1H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 175.2, 134.9, 135.5, 133.1, 131.9, 130.4, 128.3, 82.5 (d, *J* = 174.2 Hz), 59.4 (d, *J* = 19.7 Hz), 30.1, 21.2 (d, *J* = 5.1 Hz); $^{19}$F NMR (282 MHz, $CDCl_3$): δ -231.6 (m, 1F); IR (KBr): ν ($cm^{-1}$) 1705, 1481, 1397; ESI-MS: (*m/z*) 284 (M+Na); HRMS calcd for $C_{11}H_{10}Cl_2FNNaO$ (M+Na): 284.0021, found 284.0025.

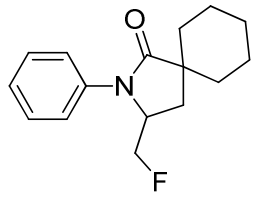



**1-(3-Chloro-4-(acetoxy)phenyl)-5-(fluoromethyl)pyrrolidin-2-one (4g).** Yellow oil; $^{1}$H

NMR (400 MHz, $CDCl_3$): δ 7.57 (d, *J* = 2.4 Hz, 1H), 7.33 (dd, *J* = 8.8, 2.0 Hz, 1H), 7.16 (d, *J* = 8.8 Hz, 1H), 4.28-4.55 (m, 3H), 2.66-2.74 (m, 1H), 2.49-2.58 (m, 1H), 2.31-2.39 (m, 4H), 2.13–2.22 (m, 1H); $^{13}C$ NMR (100 MHz, $CDCl_3$): δ 174.6, 168.4, 144.9, 135.7, 127.5, 125.9, 124.1, 123.4, 82.2 (d, *J* = 174.3 Hz), 59.5 (d, *J* = 20.4 Hz), 31.0, 20.6 (d, *J* = 4.3 Hz), 20.5; $^{19}F$ NMR (282 MHz, $CDCl_3$): δ -233.3 (m, 1F); IR (neat): ν ($cm^{-1}$) 2961, 1770, 1694, 1604, 1495, 1372, 1196, 1056, 1011, 907, 740; ESI-MS: (*m/z*): 308 ($M^+$+Na); HRMS calcd for $C_{13}H_{13}ClFNNaO_3$ (M+Na): 308.0466; found, 308.0455.

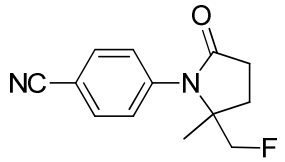



**1-(4-Chlorophenyl)-5-fluoromethyl-3,3-dimethylpyrrolidin-2-one (4h)**. White solid, mp: 62-64 $^oC$; $^1H$ NMR (400 MHz, $CDCl_3$): δ 7.36–7.38 (m, 2H), 7.28 (d, *J* = 8.8 Hz, 2H), 4.22–4.52 (m, 3H), 2.17 (dd, *J* = 13.2, 8.0 Hz, 1H), 1.99 (dd, *J* = 13.2, 7.2 Hz, 1H), 1.32 (s, 3H), 1.25 (s, 3H); $^{13}C$ NMR (100 MHz, $CDCl_3$): δ 179.4, 135.8, 132.0, 129.3, 126.2, 81.6 (d, *J* = 175.0 Hz), 56.0 (d, *J* = 20.4 Hz), 40.6, 35.7 (d, *J* = 4.4 Hz), 25.6 (d, *J* = 5.1 Hz); $^{19}F$ NMR (282 MHz, $CDCl_3$) δ -231.7 (m, 1F); IR (KBr): ν ($cm^{-1}$) 2965, 1697, 1594, 1494, 1459, 1374, 1321, 1233, 1033, 1014, 838; ESI-MS: (*m/z*) 278 ($M^+$+Na); HRMS calcd for $C_{13}H_{15}ClFNNaO$: 278.0724, found 278.0724.

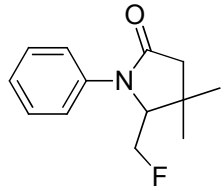



**3-(Fluoromethyl)-2-phenyl-2-azaspiro[4.5]decan-1-one (4i)**. Yellow oil; $^1H$ NMR (400 MHz, $CDCl_3$): δ 7.32 (t, *J* = 8.0 Hz, 2H), 7.25 (d, *J* = 7.2 Hz, 2H), 7.16 (t, *J* = 7.2 Hz, 1H), 4.17-4.33 (m, 3H), 2.24 (dd, *J* = 13.2, 8.8 Hz, 1H), 1.89 (dd, *J* = 13.2, 6.8 Hz, 1H), 1.45-1.82 (m, 8H), 1.24-1.35 (m, 2H); $^{13}C$ NMR (100 MHz, $CDCl_3$): δ 179.0, 137.2, 129.1, 126.4, 125.0, 82.0 (d, *J* = 174.2 Hz), 56.4 (d, *J* = 20.4 Hz), 45.2, 34.0, 33.1, 31.7, 29.7, 25.4, 22.2 (d, *J* = 3.6 Hz); $^{19}F$ NMR (282 MHz, $CDCl_3$) δ -227.7 (m, 1F); IR (neat):

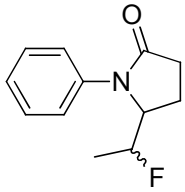
ν ($cm^{-1}$) 3054, 2932, 2856, 1694, 1597, 1496, 1386, 1266, 750, 727, 706; ESI-MS: (*m/z*) 284 ($M^+$+Na); HRMS calcd for $C_{16}H_{20}FNNaO$ (M+Na): 284.1427, found 284.1429.



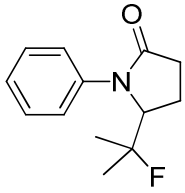

**1-(4-Cyanophenyl)-5-(fluoromethyl)-5-methylpyrrolidin-2-one (4j).** White solid, mp: 156-158 $^oC$; $^1H$ NMR (400 MHz, $CDCl_3$): δ 7.75 (d, *J* = 8.0 Hz, 2H), 7.32 (d, *J* = 8.0 Hz, 2H), 4.10-4.31 (m, 2H), 2.55-2.73 (m, 2H), 2.39-2.46 (m, 1H), 2.01-2.09 (m, 1H), 1.22 (d, *J* = 2.4 Hz, 3H); $^{13}C$ NMR (100 MHz, $CDCl_3$): δ 175.6, 140.3, 133.3, 130.5, 118.1, 112.2, 85.6 (d, *J* = 177.9 Hz), 64.7 (d, *J* = 17.5 Hz), 30.0, 29.9 (d, *J* = 2.9 Hz), 22.0 (d, *J* = 5.9 Hz); $^{19}F$ NMR (282 MHz, $CDCl_3$): δ -233.0 (t, *J* = 47.4 Hz, 1F); IR (KBr): ν ($cm^{-1}$) 2966, 2229, 1684, 1601, 1507, 1241, 983; ESI-MS: (*m/z*) 255 ($M^+$+Na); HRMS calcd for $C_{13}H_{13}FN_2NaO$ (M+Na): 255.0910, found 255.0901.



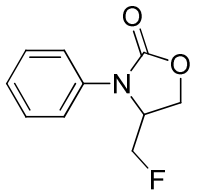

**5-(Fluoromethyl)-4,4-dimethyl-1-phenylpyrrolidin-2-one (4k).** Yellow oil; $^1H$ NMR (400 MHz, $CDCl_3$): δ 7.39-7.41 (m, 4H), 7.22-7.26 (m, 1H), 4.39-4.59 (m, 2H), 3.72 (dt, *J* = 30.8, 2.4 Hz, 1H), 2.63 (dd, *J* = 16.8, 2.0 Hz, 1H), 2.25 (d, *J* = 16.8 Hz, 1H), 1.34 (s, 3H), 1.30 (s, 3H); $^{13}C$ NMR (100 MHz, $CDCl_3$): δ 173.7, 137.5, 129.3, 126.5, 124.6, 80.3 (d, *J* = 173.6 Hz), 69.7 (d, *J* = 18.9 Hz), 46.5, 35.3, 29.9, 23.0 (d, *J* = 1.5 Hz); $^{19}F$ NMR (282 MHz, $CDCl_3$): δ -232.1 (m, 1F); IR (neat): ν ($cm^{-1}$) 2962, 1712, 1597, 1499, 1398, 1379, 1307, 1258, 1139, 1070, 762, 694; ESI-MS: (*m/z*) 244 ($M^+$+Na); HRMS calcd for $C_{13}H_{16}FNNaO$ (M+Na): 244.1114, found 244.1108.



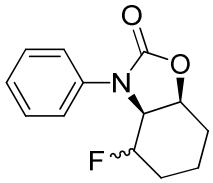
**5-(1-Fluoroethyl)-1-phenylpyrrolidin-2-one (4l).** This compound was isolated as a 1:1 mixture of two stereoisomers. Yellow oil; $^{1}$H NMR (400 MHz, $CDCl_3$): δ 7.25-7.34 (m, 4H), 7.13-7.21 (m, 1H), 4.69-4.73 (m, 0.5H), 4.56-4.61 (m, 0.5H), 4.38-4.45 (m, 0.5H), 4.00-4.10 (m, 0.5H), 2.54-2.63 (m, 1H), 2.39-2.49 (m, 1H), 1.94-2.27 (m, 2H), 1.08-1.23 (m, 3H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 174.7/174.5, 138.1/137.2, 129.3/129.1, 126.6/126.5, 125.2/124.2, 90.4 (d, *J* = 170.6 Hz)/87.7 (d, *J* = 173.5 Hz), 63.9 (d, *J* = 19.6 Hz)/62.0 (d, *J* = 25.5 Hz), 31.1, 19.6 (d, *J* = 2.9 Hz)/17.7 (d, *J* = 5.1 Hz), 16.8 (d, *J* = 21.9 Hz)/15.7 (d, *J* = 22.6 Hz); $^{19}$F NMR (282 MHz, $CDCl_3$): δ -183.0/-193.0 (2m, 1F,); IR (neat): ν ($cm^{-1}$) 3064, 2984, 2935, 1713, 1693, 1682, 1597, 1393, 1384, 1290, 1162, 1072, 758, 696; ESI-MS: (*m/z*) 230 ($M^+$+Na); HRMS calcd for $C_{12}H_{14}FNNaO$ (M+Na): 230.0957, found 230.0950.



**5-(2-Fluoropropan-2-yl)-1-phenylpyrrolidin-2-one (4m).** Yellow solid, mp: 88-90 $^{o}$C; $^{1}$H NMR (400 MHz, $CDCl_3$): δ 7.33-7.40 (m, 4H), 7.21 (t, *J* = 7.2 Hz, 1H), 4.37-4.43 (m, 1H), 2.63-2.72 (m, 1H), 2.47-2.55 (m, 1H), 2.28-2.39 (m, 1H), 1.98-2.06 (m, 1H), 1.28 (d, *J* = 10.0 Hz, 3H), 1.23 (d, *J* = 10.4 Hz, 3H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 175.0, 139.1, 128.9, 126.3, 125.1, 97.7 (d, *J* = 171.3 Hz), 66.6 (d, *J* = 24.0 Hz), 30.9, 24.0 (d, *J* = 24.1 Hz), 23.5 (d, *J* = 24.8 Hz), 20.7 (d, *J* = 6.6 Hz); $^{19}$F NMR (282 MHz, $CDCl_3$): δ -139.3 (m, 1F,); IR (KBr): ν ($cm^{-1}$) 2985, 2962, 1693, 1597, 1498, 1396, 1292, 1226, 882, 762, 696; ESI-MS: (*m/z*) 244 ($M^+$+Na); HRMS calcd for $C_{13}H_{17}FNO$ (M): 222.1294, found 222.1290.

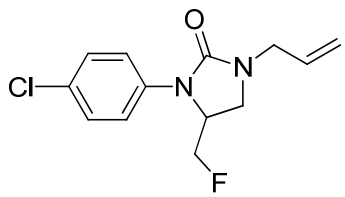


**4-(Fluoromethyl)-3-phenyloxazolidin-2-one (4n).** White solid, mp: 72-74 $^{o}$C; $^{1}$H NMR (400 MHz, $CDCl_3$): δ 7.38-7.44 (m, 4H), 7.21-7.26 (m, 1H), 4.36-4.61 (m, 5H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 155.7, 136.0, 129.5, 126.1, 122.7, 80.1 (d, *J* = 175.0 Hz), 63.6 (d, *J* = 5.1 Hz), 56.2 (d, *J* = 21.1 Hz); $^{19}$F NMR (282 MHz, $CDCl_3$): δ -236.0 (m, 1F); IR (KBr): ν ($cm^{-1}$) 2970, 1749, 1598, 1505, 1409, 1220, 1046, 962, 690; ESI-MS: (*m/z*) 218 ($M^+$+Na), 196 ($M^+$+H); HRMS calcd for $C_{10}H_{10}FNNaO_2$ (M+Na): 218.0593, found 218.0582.

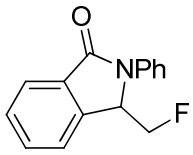


**4-Fluoro-3-phenylhexahydrobenzo[*d*]oxazol-2(3*H*)-one (4o).** This compound was isolated as a separable mixture of two stereoisomers in 1:1 ratio. One isomer: White solid, mp: 122-124 $^{o}$C; $^{1}$H NMR (400 MHz, $CDCl_3$): δ 7.56 (d, *J* = 7.6 Hz, 2H), 7.37 (t, *J* = 7.2 Hz, 2H), 7.17 (t, *J* = 7.2 Hz, 1H), 4.70-4.93 (m, 2H), 4.17 (ddd, *J* = 3.6, 6.8, 23.6 Hz, 1H), 2.14-2.30 (m, 2H), 1.74-1.91 (m, 2H), 1.35-1.51 (m, 2H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 156.3, 137.1, 129.3, 125.3, 121.7, 84.9 (d, *J* = 177.9 Hz), 72.4, 58.2 (d, *J* = 17.5 Hz), 26.9 (d, *J* = 21.2 Hz), 25.7, 12.7 (d, *J* = 5.1 Hz); $^{19}$F NMR (282 MHz, $CDCl_3$): δ -194.7 (m, 1F); IR (KBr): ν ($cm^{-1}$) 2954, 1748, 1601, 1499, 1398, 1198, 1104, 989, 753; ESI-MS: (*m/z*) 258 ($M^+$+Na); HRMS calcd for $C_{13}H_{14}FNNaO_2$ (M+Na): 258.0906, found 258.0902. The other isomer: White solid, mp: 106-108 $^{o}$C; $^{1}$H NMR (400 MHz, $CDCl_3$): δ 7.53 (d, *J* = 7.6 Hz, 2H), 7.38 (t, *J* = 7.6 Hz, 2H), 7.19 (t, *J* = 7.6 Hz, 1H), 4.67-4.87 (m, 2H), 4.35-4.42 (m, 1H), 1.64-2.14 (m, 6H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 155.5, 137.1 129.2, 125.5, 121.7, 91.3 (d, *J* = 176.4 Hz), 73.8 (d, *J* = 4.3 Hz), 59.7 (d, *J* = 27.0 Hz), 26.3 (d, *J* = 19.7 Hz), 25.4, 15.2 (d, *J* = 6.6 Hz); $^{19}$F NMR (282 MHz, $CDCl_3$): δ -178.2 (m, 1F); IR (KBr): ν ($cm^{-1}$) 2951, 1759, 1599, 1503, 1396, 1379, 1289, 1216, 1037, 742; ESI-MS: (*m/z*) 258 ($M^+$+Na); HRMS calcd for $C_{13}H_{14}FNNaO_2$ (M+Na): 258.0906, found

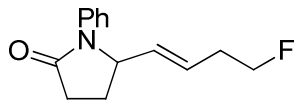
258.0902.



**1-Allyl-3-(4-chlorophenyl)-4-(fluoromethyl)imidazolidin-2-one (4p).** Yellow oil; $^{1}$H NMR (400 MHz, $CDCl_3$): δ 7.41 (d, *J* = 8.8 Hz, 2H), 7.31 (d, *J* = 8.8 Hz, 2H), 5.74-5.84 (m, 1H), 5.22-5.28 (m, 2H), 4.37-4.50 (m, 3H), 3.81-3.98 (m, 2H), 3.60 (t, *J* = 9.2 Hz, 1H), 3.41 (dd, *J* = 9.2, 4.4 Hz, 1H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 157.2, 137.0, 132.6, 129.3, 129.1, 122.2, 118.3, 81.0 (d, *J* = 175.0 Hz), 52.8 (d, *J* = 22.6 Hz), 46.6, 44.1 (d, *J* = 4.4 Hz); $^{19}$F NMR (282 MHz, $CDCl_3$): δ -218.6 (m, 1F); IR (neat): ν ($cm^{-1}$) 2923, 1713, 1695, 1495, 1444, 1268, 1091, 828, 753; ESI-MS: (*m/z*) 291 ($M^+$+Na); HRMS calcd for $C_{13}H_{14}CFN_2NaO$ (M+Na): 291.0676, found 291.0670.

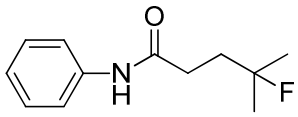


**3-(Fluoromethyl)-2-phenylisoindolin-1-one (4q).** White solid, mp: 94-96 $^{o}$C; $^{1}$H NMR (400 MHz, $CDCl_3$): δ 7.95 (d, *J* = 7.6 Hz, 1H), 7.55-7.66 (m, 5H), 7.46 (t, *J* = 8.0 Hz, 2H), 7.27 (t, *J* = 7.6 Hz, 1H), 5.35 (dt, *J* = 18.8, 4.4 Hz, 1H), 4.40-4.82 (m, 2H); $^{13}$C NMR (100 MHz, $CDCl_3$): δ 167.4, 141.4, 141.3, 136.7, 132.4, 132.3, 129.4, 129.3, 126.2, 124.4, 124.0, 122.8, 81.6 (d, *J* = 176.4 Hz), 60.6 (d, *J* = 22.6 Hz); $^{19}$F NMR (282 MHz, $CDCl_3$): δ -230.8 (m, 1F); IR (KBr): ν ($cm^{-1}$) 3061, 1694, 1597, 1499, 1379, 1214, 757; ESI-MS: (*m/z*) 264 ($M^+$+Na); HRMS calcd for $C_{15}H_{12}FNNaO$ (M+Na): 264.0801, found 264.0801.

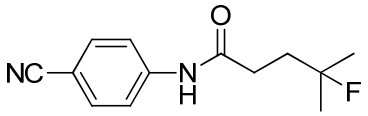


**(*E*)-5-(4-Fluorobut-1-en-1-yl)-1-phenylpyrrolidin-2-one (6).** Yellow oil; $^{1}$H NMR (400

MHz, $CDCl_3$): δ 7.41 (d, *J* = 7.6 Hz, 2H), 7.34 (t, *J* = 8.0 Hz, 2H), 7.15 (t, *J* = 7.2 Hz, 1H), 5.58-5.66 (m, 1H), 5.49 (dd, *J* = 7.6, 14.2 Hz, 1H), 4.60-4.65 (m, 1H), 4.27-4.42 (m, 2H), 2.48-2.68 (m, 2H), 2.31-2.43 (m, 3H), 1.86-1.94 (m, 1H); $^{13}C$ NMR (100 MHz, $CDCl_3$): δ 174.3, 138.0, 132.6, 128.7, 128.3 (d, *J* = 5.8 Hz), 125.3, 123.2, 82.6 (d, *J* = 166.9 Hz), 62.1, 33.1 (d, *J* = 20.4 Hz), 31.1, 26.3; $^{19}F$ NMR (282 MHz, $CDCl_3$): δ -218.7 (m, 1F); IR (neat): ν ($cm^{-1}$) 1694, 1597, 1499, 1384, 1219, 909; ESI-MS: (*m/z*) 256 ($M^+$+Na); HRMS calcd for $C_{14}H_{16}FNNaO$ (M+Na): 256.1114, found 256.1113.




**4-Fluoro-4-methyl-*N*-phenylpentanamide (9a).** White solid, mp: 106-108 °C; $^1$HNMR (400 MHz, $CDCl_3$): δ 7.50 (d, *J* = 7.6 Hz, 2H), 7.42 (br, 1H), 7.31 (t, *J* = 8.0 Hz, 2H), 7. 10 (t, *J* = 7.2 Hz, 1H), 2.47-2.51 (m, 2H), 2.01-2.10 (m, 2H), 1.38 (d, *J* = 21.6 Hz, 6H); $^{13}C$ NMR (100 MHz, $CDCl_3$): δ 170.9, 137.9, 129.0, 124.3, 119.9, 95.0 (d, *J* = 165.2 Hz), 36.4 (d, *J* = 22.6 Hz), 32.1 (d, *J* = 3.6 Hz), 26.7 (d, *J* = 24.4 Hz); $^{19}F$ NMR (282 MHz, $CDCl_3$): δ -114.2 (m, 1F); IR (KBr): ν ($cm^{-1}$) 3253, 2981, 1659, 1598, 1545, 1443, 1331, 965; ESI-MS: (*m/z*) 232 ($M^+$+Na); HRMS calcd for $C_{12}H_{16}FNNaO$ (M+Na): 232.1114, found 232.1114.



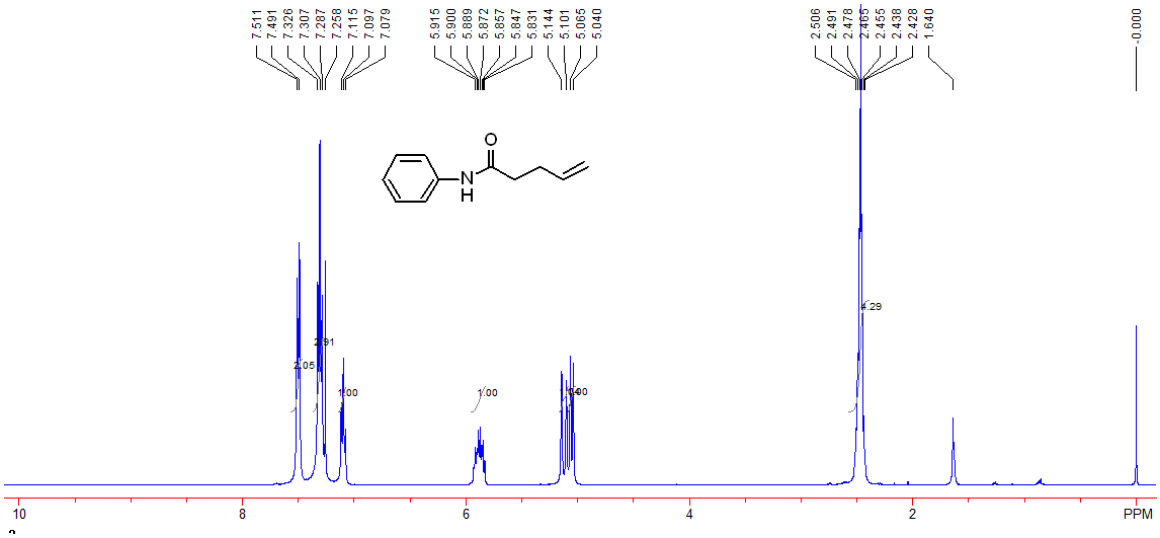

***N*-(4-Cyanophenyl)-4-fluoro-4-methylpentanamide (9b).** White solid, mp: 84-86 °C; $^1$H NMR (400 MHz, $CDCl_3$): δ 7.87 (br, 1), 7.68 (d, *J* = 8.8 Hz, 2H), 7.60 (d, *J* = 8.8 Hz, 2H), 2.53-2.57 (m, 2H), 2.02-2.11 (m, 2H), 1.39 (d, *J* = 21.6 Hz, 6H); $^{13}C$ NMR (100 MHz, $CDCl_3$): δ 171.5, 142.2, 133.3, 119.5, 118.9, 106.8, 95.0 (d, *J* = 164.7 Hz), 36.2 (d, *J* = 22.6 Hz), 32.1 (d, *J* = 3.6 Hz), 26.7 (d, *J* = 24.8 Hz); $^{19}F$ NMR (282 MHz, $CDCl_3$); δ -114.3 (m, 1F); IR (KBr): ν ($cm^{-1}$) 3328, 2982, 2226, 1681, 1594, 1525, 1265, 739; ESI-MS: *(m/z)* 257 ($M^+$+Na); HRMS calcd for $C_{13}H_{15}FN_2NaO$ (M+Na): 257.1066, found 257.1069.

## 4. References for Known Compounds.

| entry | reference | compd |
|---|---|---|
| 1 | Ney, J. E.; Wolfe, J. P. *Angew. Chem., Int. Ed.* **2004**, *43*, 3605. | **1a** |
| 2 | Lee, S. Y; Lee, C. W.; Oh, D. Y. *J. Org. Chem*. **1999**, *64*, 7017. | **1f** |
| 3 | Nicolaou, K. C.; Baran, P. S.; Zhong, Y.-L.; Sugita, K. *J. Am. Chem. Soc*. **2002**, *124*, 2212. | **1m, 3o, 7** |
| 4 | Tellitu, I.; Urrejola, A.; Serna, S.; Moreno, I.; Herrero, M. T.; Domínguez, E.; SanMartin, R.; Correa, A. *Eur. J. Org. Chem*. **2007**, 437. | **1n** |
| 5 | Mori, M.; Kudo, S.; Ban, Y. *J. Chem. Soc., Perkin Trans. 1* **1979**, 771. | **3d** |
| 6 | Yang, X.; Yuan, W.; Gu, S.; Yang, X.; Xiao, F.; Shen, Q.; Wu, F. *J. Fluorine Chem.* **2007**, *128*, 540. | **3k** |
| 7 | Eccott, E. N.; Linstead, R. P. *J. Chem. Soc.* **1929**, 2153. | **3l** |
| 8 | Kianmehr, E.; Baghersad, M. H. *Adv. Synth. Catal.* **2011**, *353*, 2599. | **3n** |
| 9 | Franz, R. A.; Applegath, F.; Morriss, F. V.; Baiocchi, F.; Breed, L. W. *J. Org. Chem.* **1962**, *27*, 4341. | **3p** |
| 10 | Pogosyan. *J. Org. Chem. USSR* (English Translation) **1970**, *6*, 138. | **3q** |
| 11 | Ito, K.; Iida, T.; Fujita, T.; Tsuji, S. *Synthesis* **1981**, 287. | **8a** |

## 5. $^{1}$H and $^{13}$C NMR Spectra of Substrates.

Compound **1a**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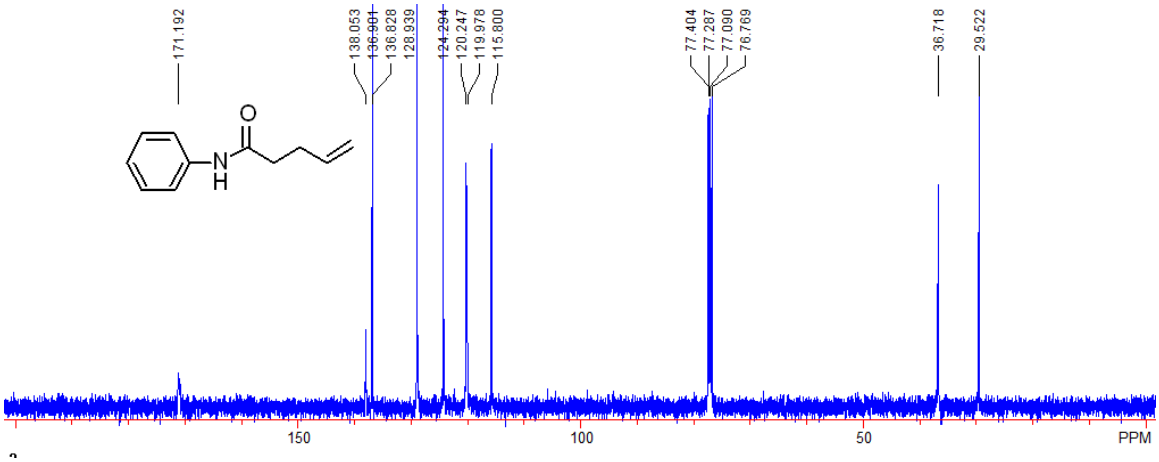
PPM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H
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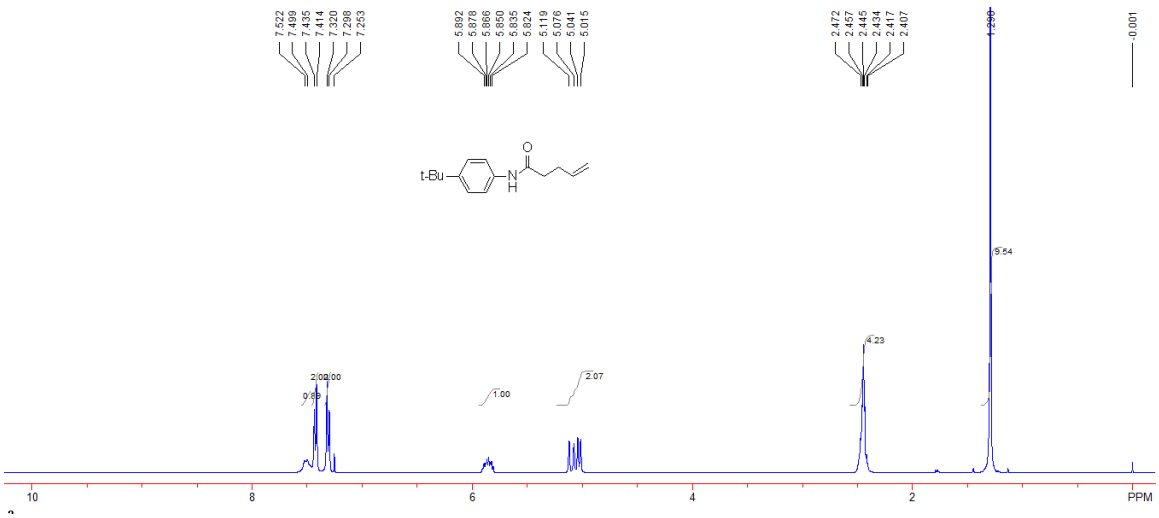
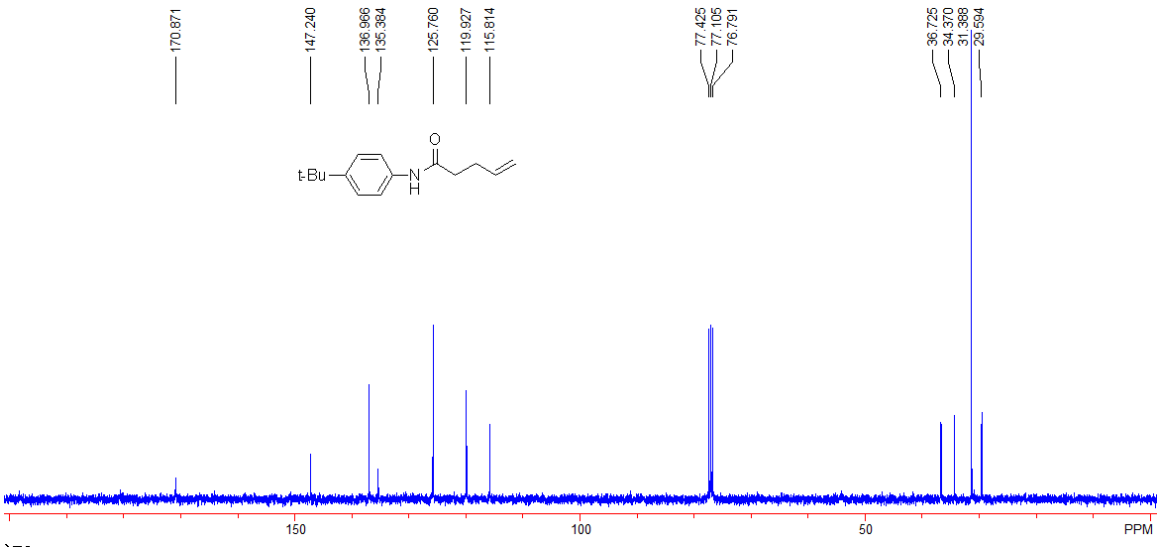
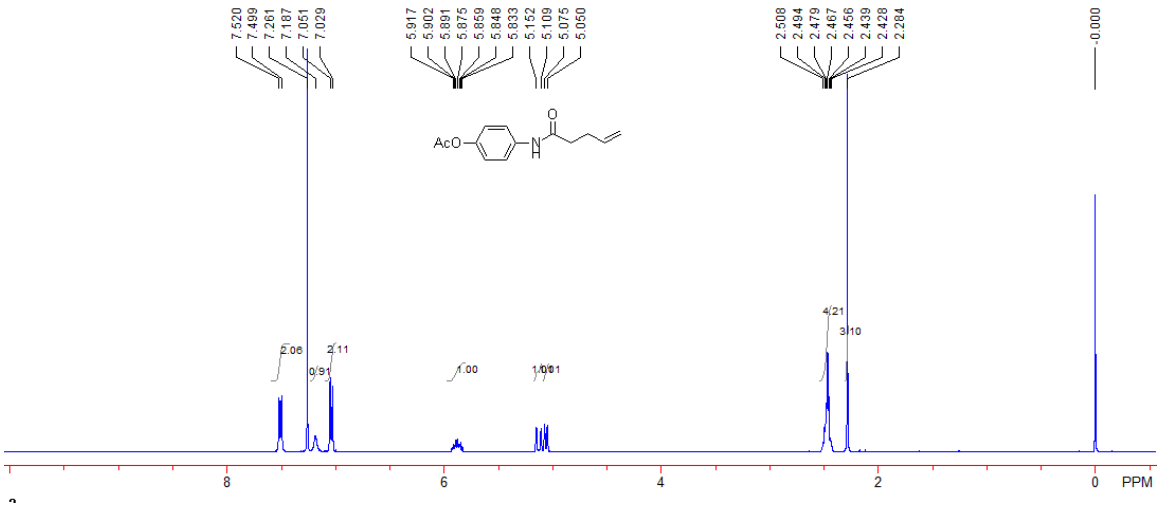
Compoound **1b**



Compound **1c**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AcO
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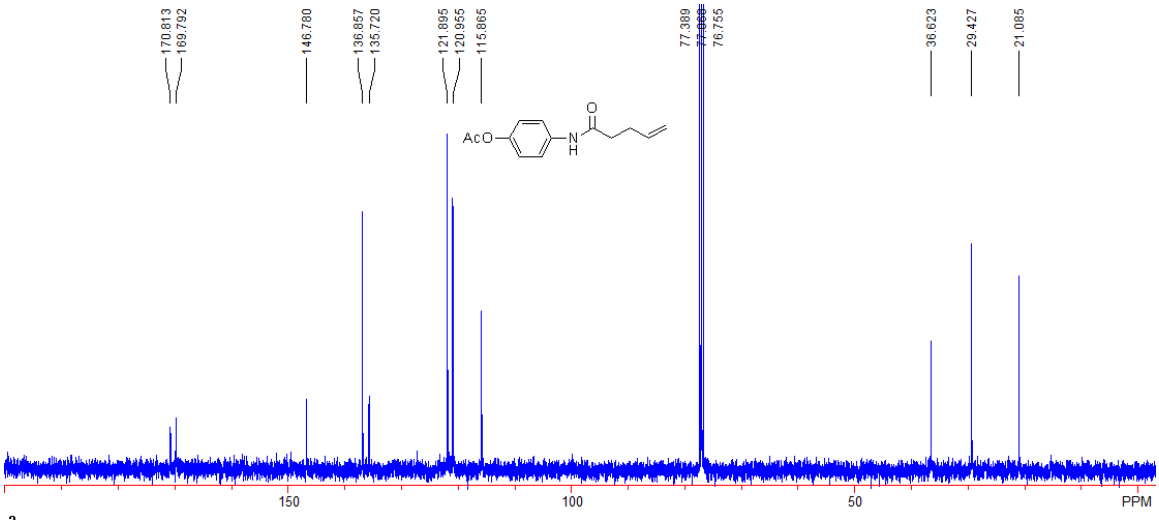
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21.085
AcO
N
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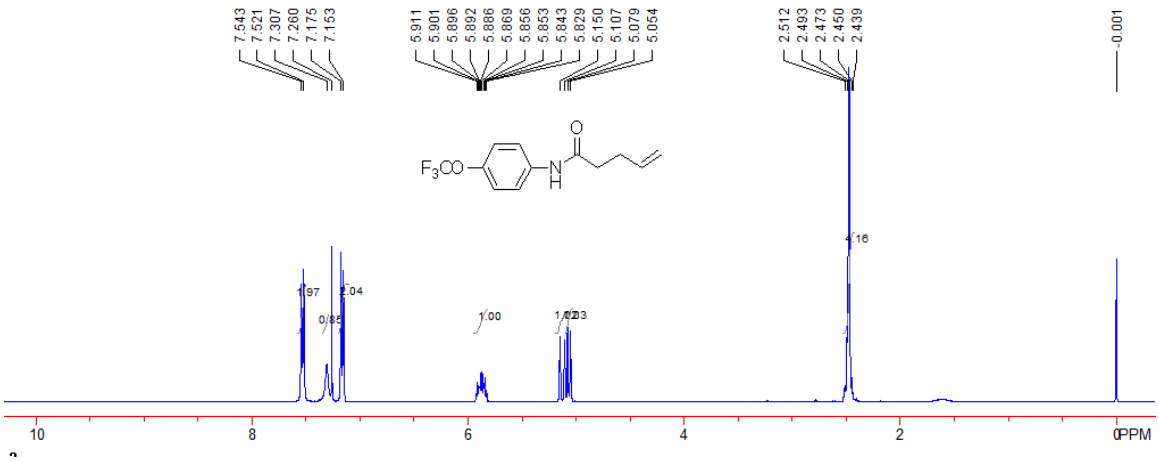
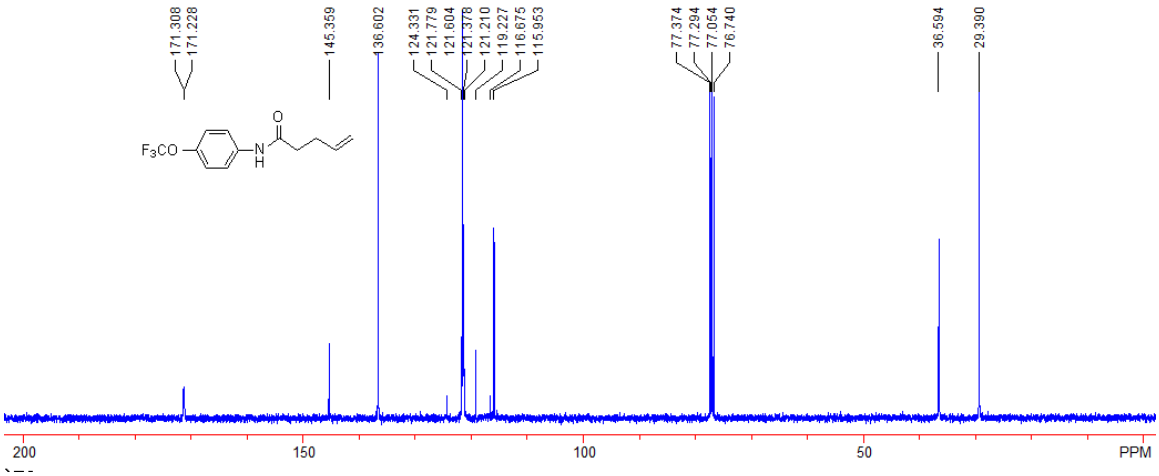
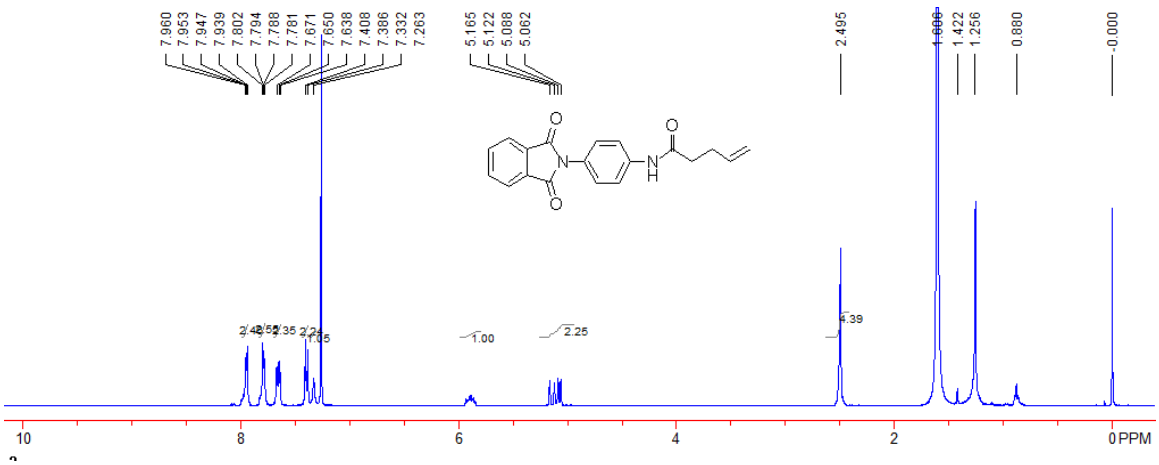
O
150
100
50
PPM

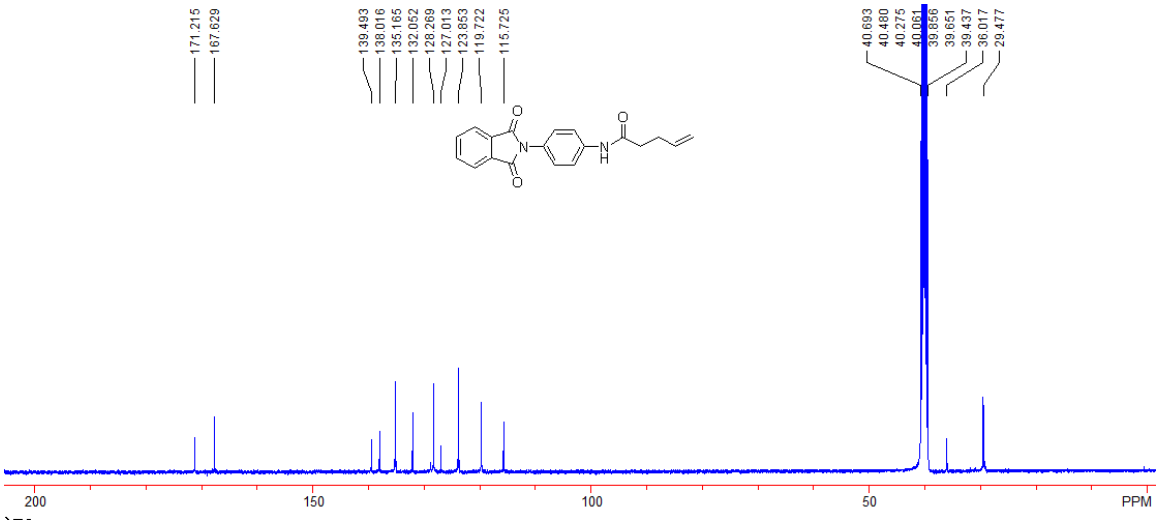
Compound **1d**


7.543
7.521
7.307
7.260
7.175
7.153
5.911
5.901
5.896
5.892
5.886
5.869
5.856
5.853
5.843
5.829
5.150
5.107
5.079
5.054
2.512
2.493
2.473
2.450
2.439
-0.001
F3CO
N
H
O
4.16
1.97
2.04
0.85
1.00
1.03
10
8
6
4
2
0
PPM

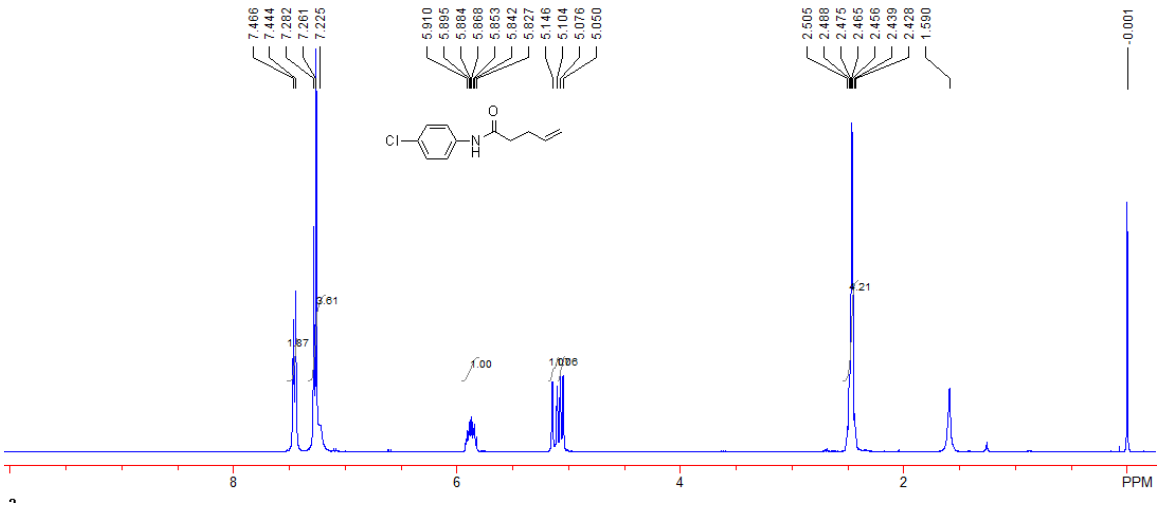

171.308
171.228
145.359
136.602
124.331
121.779
121.604
121.378
121.210
119.227
116.675
115.953
77.374
77.294
77.054
76.740
36.594
29.390
F3CO
N
H
O
200
150
100
50
PPM

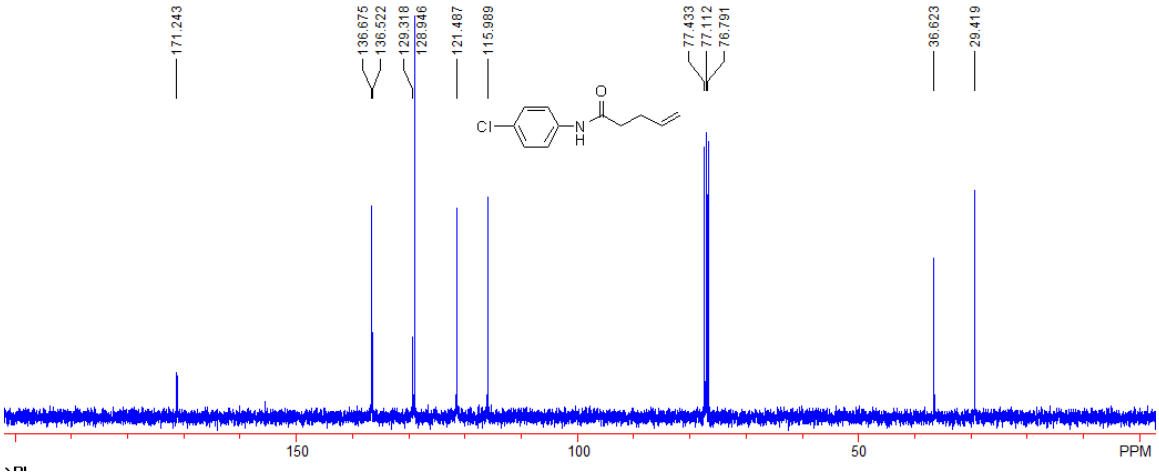
Compound **1e**


7.960
7.953
7.947
7.939
7.802
7.794
7.788
7.781
7.671
7.650
7.638
7.408
7.386
7.332
7.263
5.165
5.122
5.088
5.062
2.495
1.606
1.422
1.256
0.880
-0.000
1.00
2.25
4.39
10
8
6
4
2
0 PPM

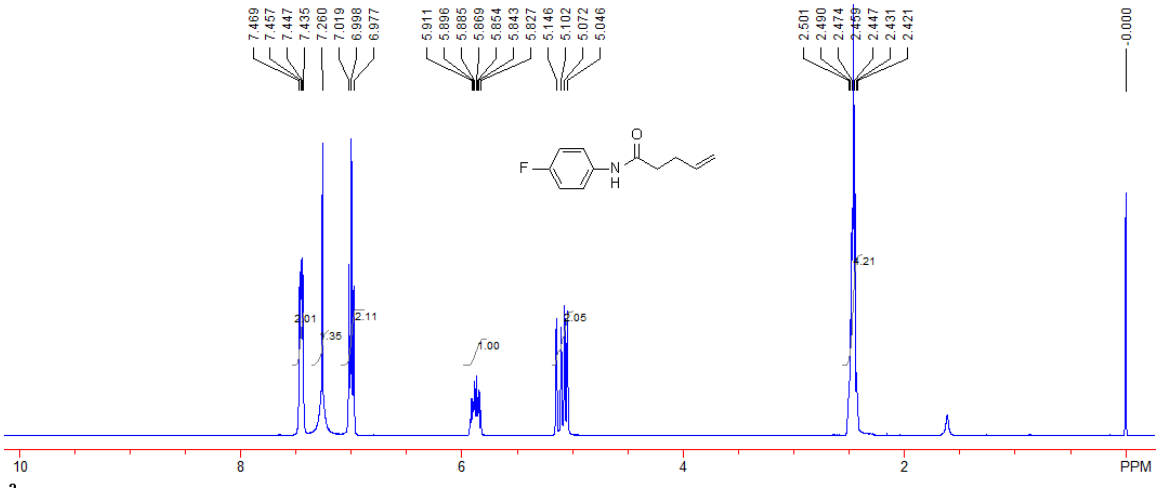

171.215
167.629
139.493
138.016
135.165
132.052
128.269
127.013
123.853
119.722
115.725
40.693
40.480
40.275
40.061
39.856
39.651
39.437
36.017
29.477
200
150
100
50
PPM

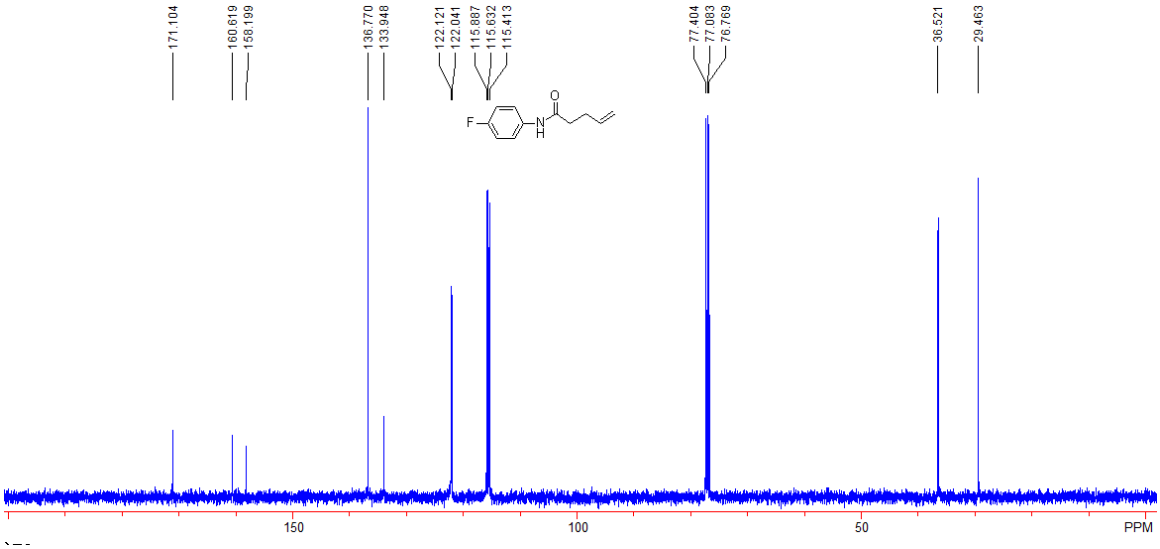
Compound **1f**


7.466
7.444
7.282
7.261
7.225
5.910
5.895
5.884
5.868
5.853
5.842
5.827
5.146
5.104
5.076
5.050
2.505
2.488
2.475
2.465
2.456
2.439
2.428
1.590
0.001
3.61
1.87
1.00
4.21
8
6
4
2
PPM

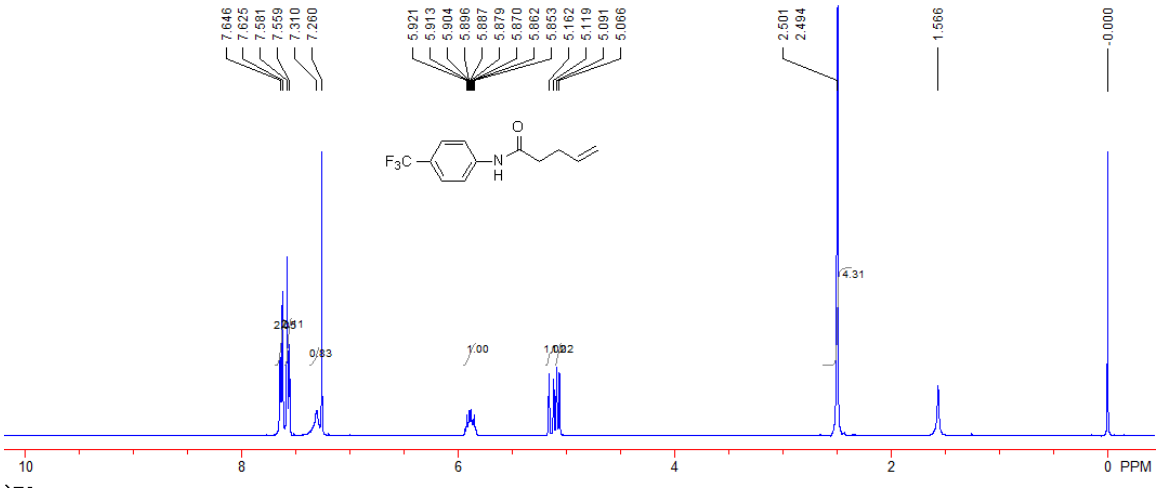

171.243
136.675
136.522
129.318
128.946
121.467
115.989
77.433
77.112
76.791
36.623
29.419
150
100
50
PPM

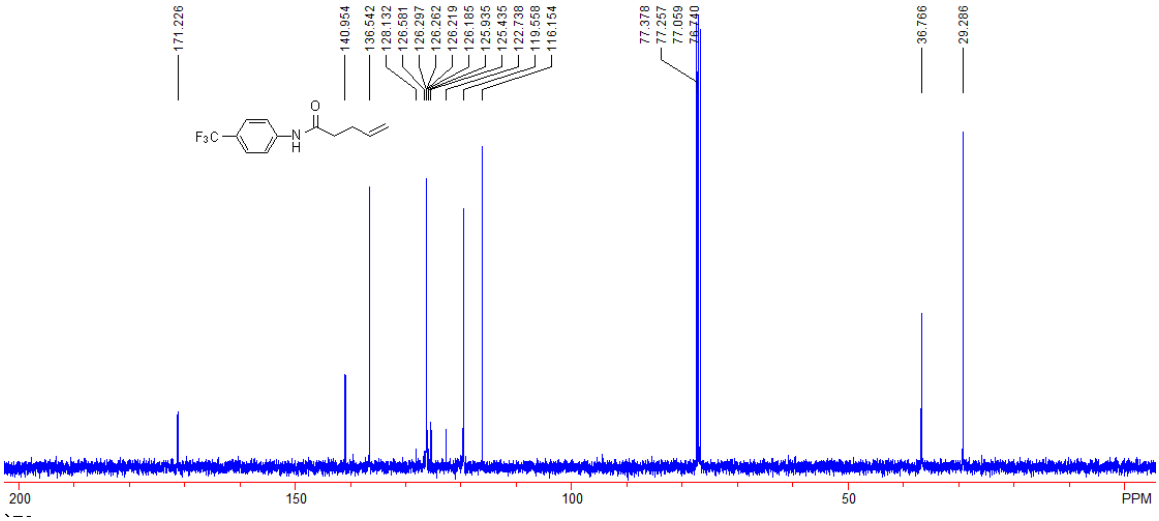
Compound **1g**


7.469
7.457
7.447
7.435
7.260
7.019
6.998
6.977
5.911
5.896
5.885
5.869
5.854
5.843
5.827
5.146
5.102
5.072
5.046
2.501
2.490
2.474
2.459
2.447
2.431
2.421
-0.000
F
N
H
O
2.01
1.35
2.11
1.00
2.05
4.21
10
8
6
4
2
PPM

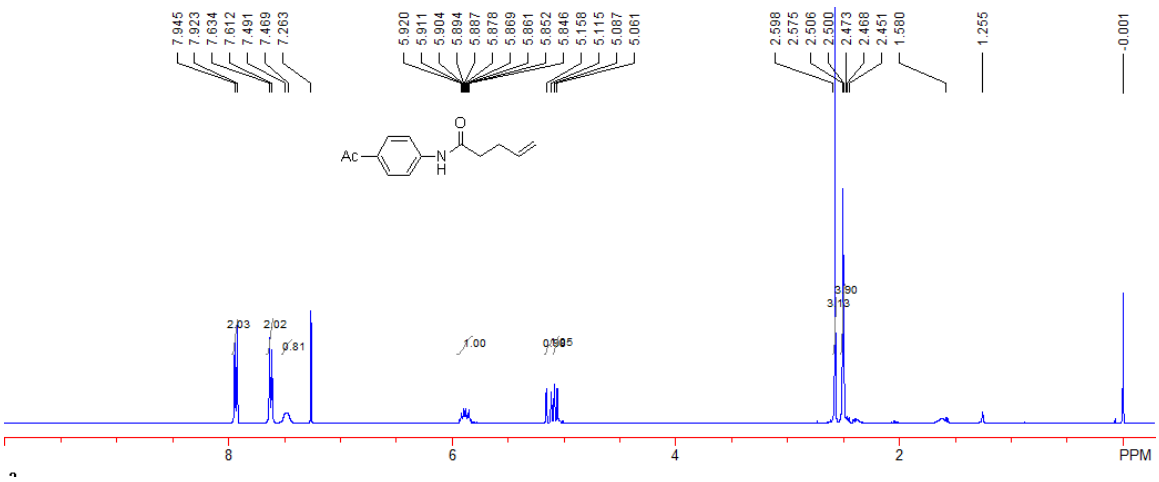

171.104
160.619
158.199
136.770
133.948
122.121
122.041
115.887
115.632
115.413
77.404
77.083
76.769
36.521
29.463
F
N
H
O
150
100
50
PPM

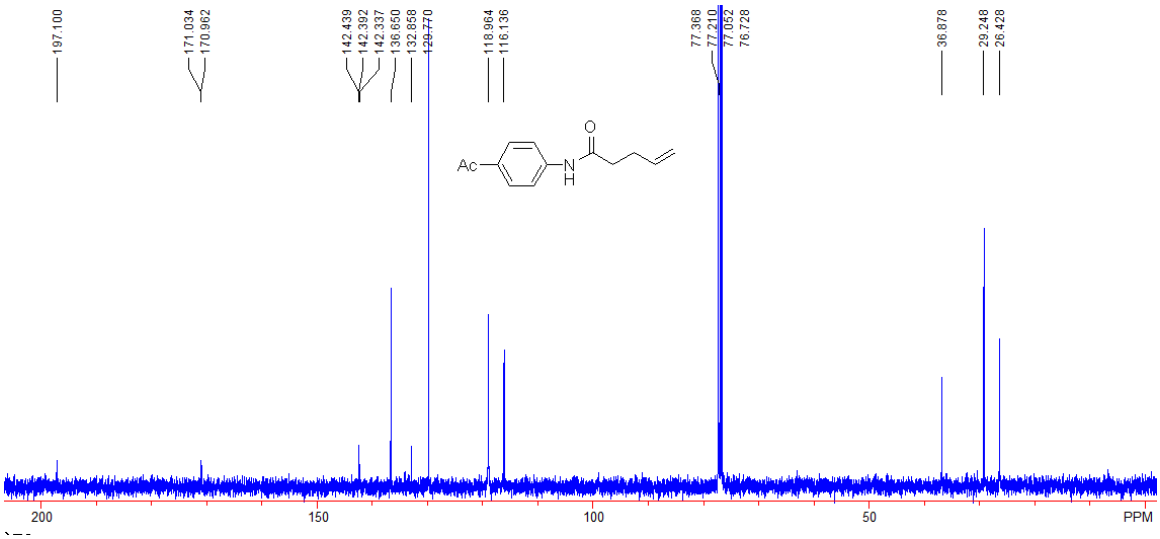
Compound **1h**


7.646
7.625
7.581
7.559
7.310
7.260
5.921
5.913
5.904
5.896
5.887
5.879
5.870
5.862
5.853
5.162
5.119
5.091
5.066
2.501
2.494
1.566
0.000
4.31
1.00
0.83
10
8
6
4
2
0
PPM

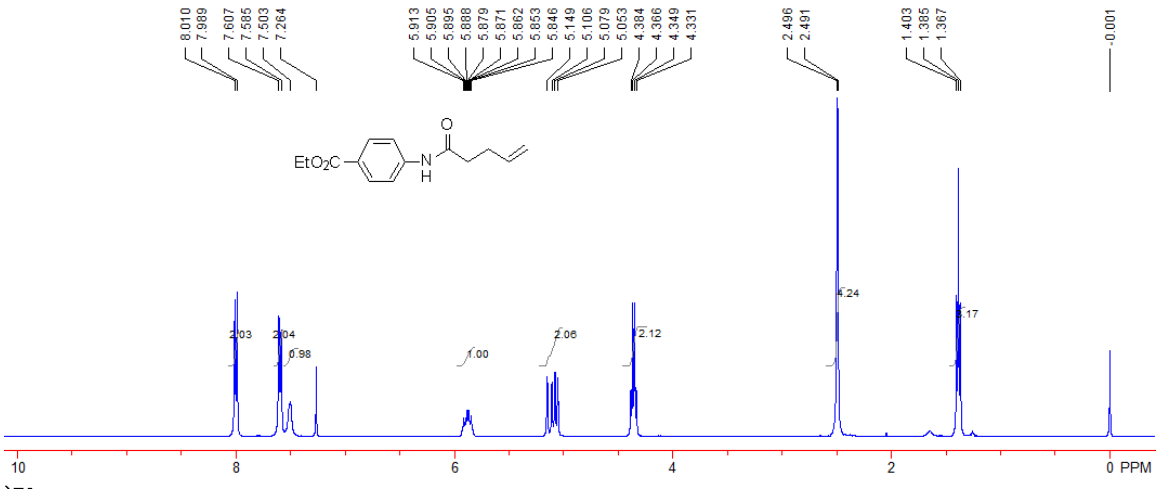

171.226
140.954
136.542
128.132
126.581
126.297
126.262
126.219
126.185
125.935
125.435
122.738
119.558
116.154
77.378
77.257
77.059
36.766
29.286
200
150
100
50
PPM

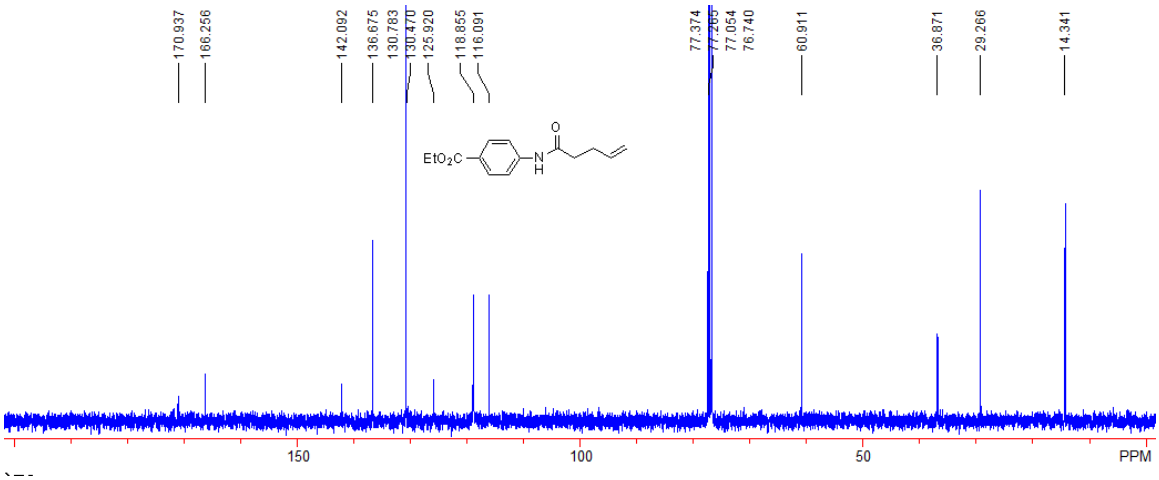
Compound **1i**


7.945
7.923
7.634
7.612
7.491
7.469
7.263
5.920
5.911
5.904
5.894
5.887
5.878
5.869
5.861
5.852
5.846
5.158
5.115
5.087
5.061
2.598
2.575
2.506
2.500
2.473
2.468
2.451
1.580
1.255
-0.001
Ac
N
H
O
2.03
2.02
0.81
1.00
3.90
3.13
8
6
4
2
PPM

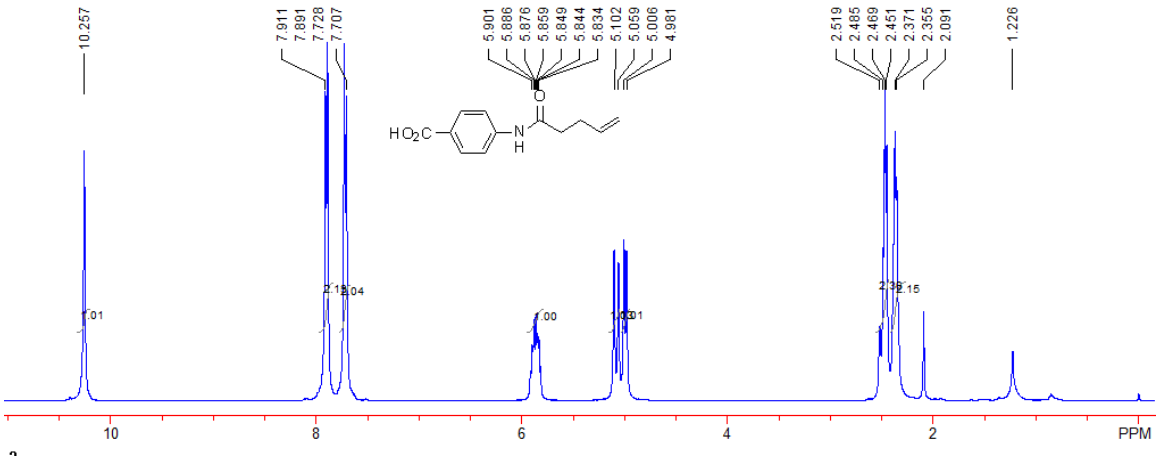

197.100
171.034
170.962
142.439
142.392
142.337
136.650
132.858
129.770
118.964
116.136
77.368
77.210
77.052
76.728
36.878
29.248
26.428
Ac
N
H
O
200
150
100
50
PPM

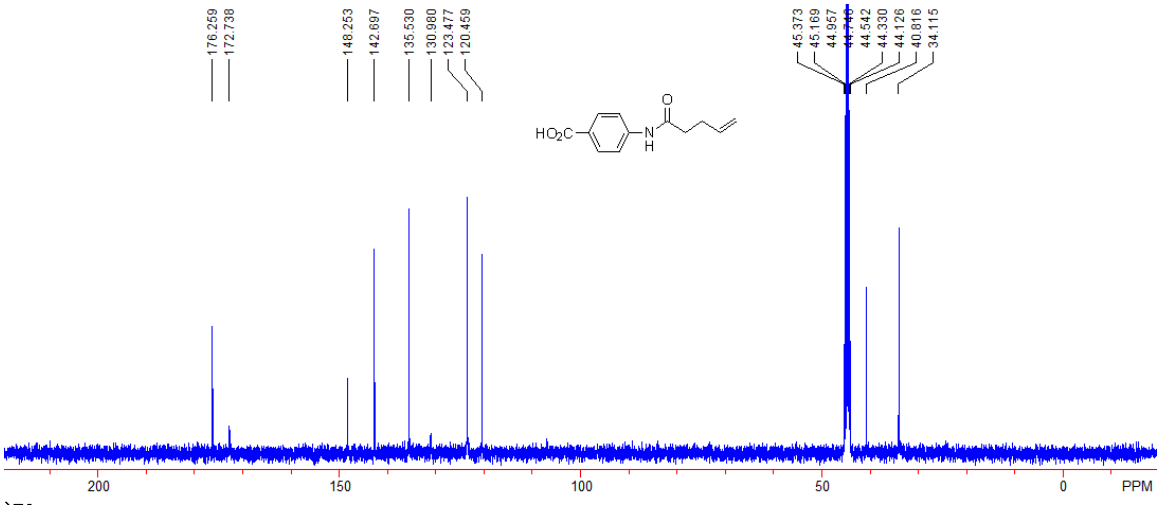
Compound **1j**


8.010
7.989
7.607
7.585
7.503
7.264
5.913
5.905
5.895
5.888
5.879
5.871
5.862
5.853
5.846
5.149
5.106
5.079
5.053
4.384
4.366
4.349
4.331
2.496
2.491
1.403
1.385
1.367
0.001
EtO2C
N
H
O
2.03
2.04
0.98
1.00
2.06
2.12
4.24
3.17
10
8
6
4
2
0 PPM

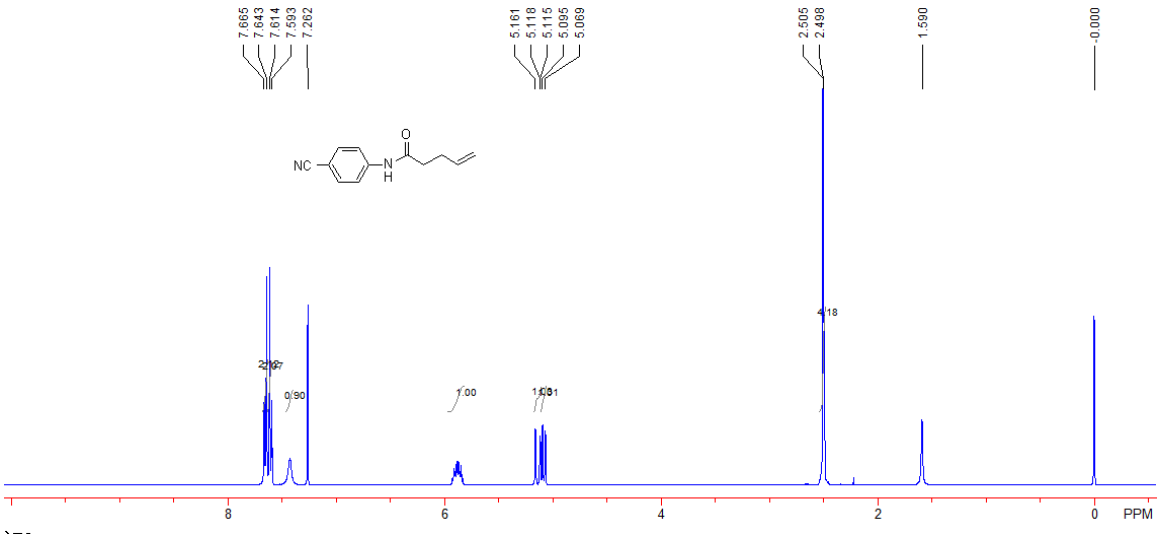

170.937
166.256
142.092
136.675
130.783
130.470
125.920
118.855
116.091
77.374
77.265
77.054
76.740
60.911
36.871
29.266
14.341
EtO2C
N
H
O
150
100
50
PPM

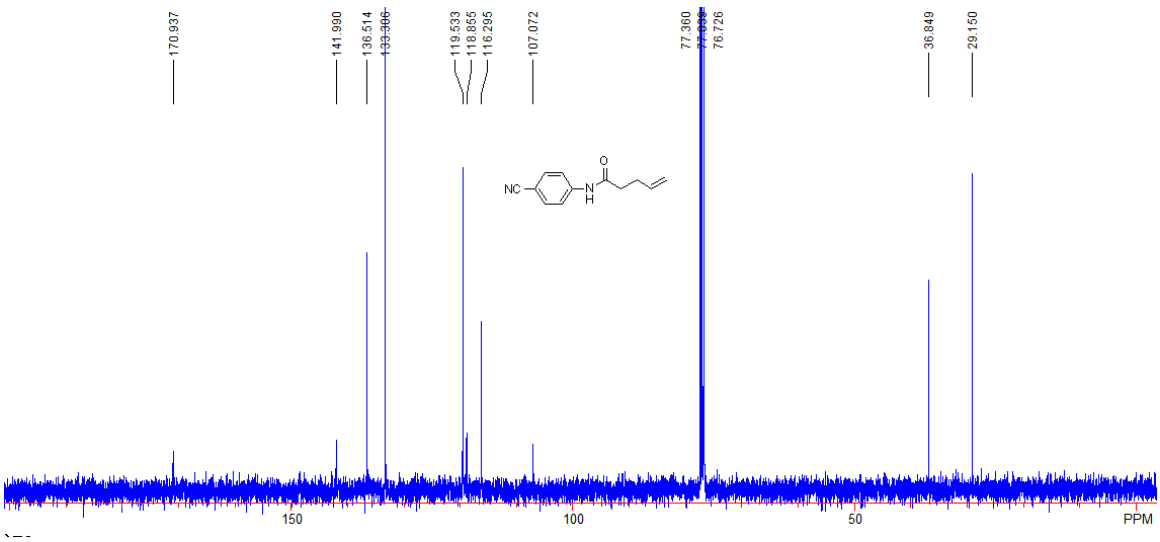
Compound **1k**


10.257
7.911
7.891
7.728
7.707
5.901
5.886
5.876
5.859
5.849
5.844
5.834
5.102
5.059
5.006
4.981
2.519
2.485
2.469
2.451
2.371
2.355
2.091
1.226
HO2C
N
H
O
1.01
2.13
2.04
1.00
1.01
2.38
2.15
10
8
6
4
2
PPM

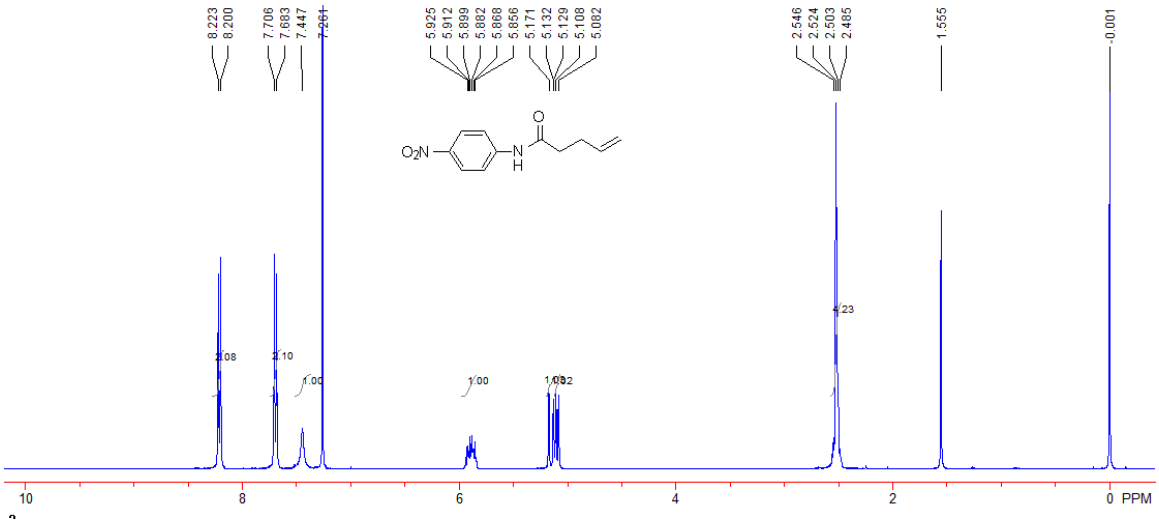

176.259
172.738
148.253
142.697
135.530
130.980
123.477
120.459
45.373
45.169
44.957
44.542
44.330
44.126
40.816
34.115
HO2C
N
H
O
200
150
100
50
0
PPM

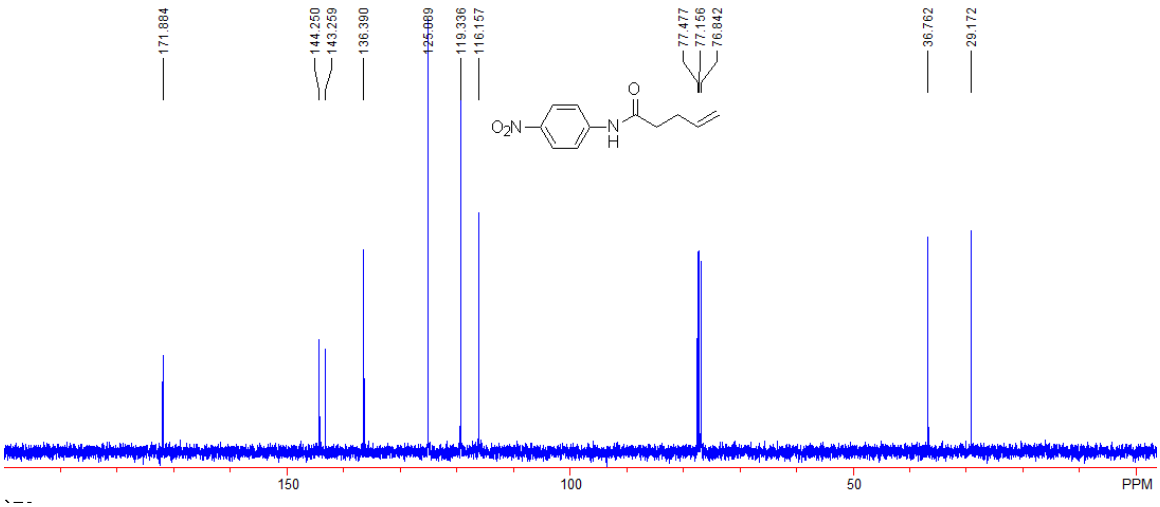
Compound **1l**


7.665
7.643
7.614
7.593
7.262
5.161
5.118
5.115
5.095
5.069
2.505
2.498
1.590
0.000
NC
O
N
H
4.18
2.07
0.90
1.00
1.01
8
6
4
2
0
PPM

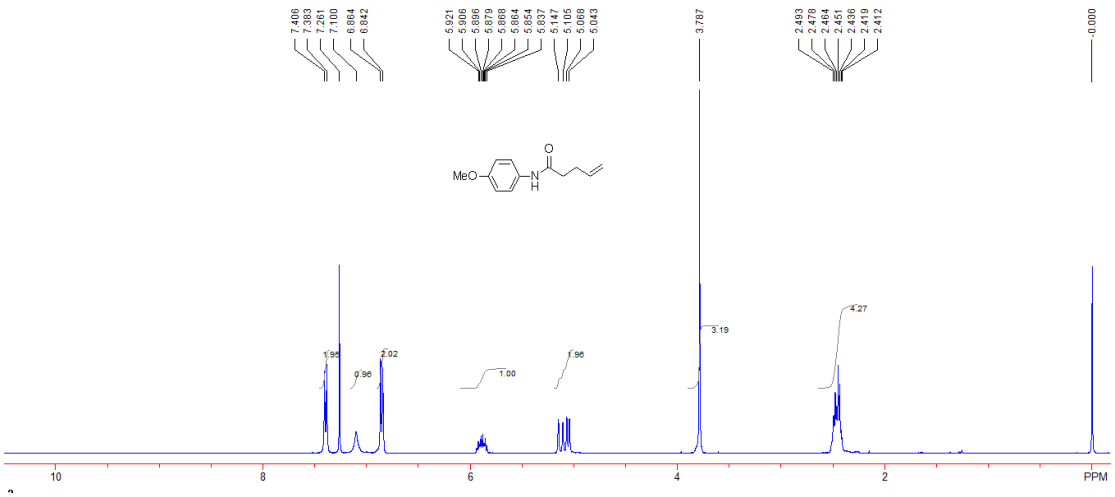

170.937
141.990
136.514
133.306
119.533
118.855
116.295
107.072
77.360
77.000
76.726
36.849
29.150
NC
O
N
H
150
100
50
PPM

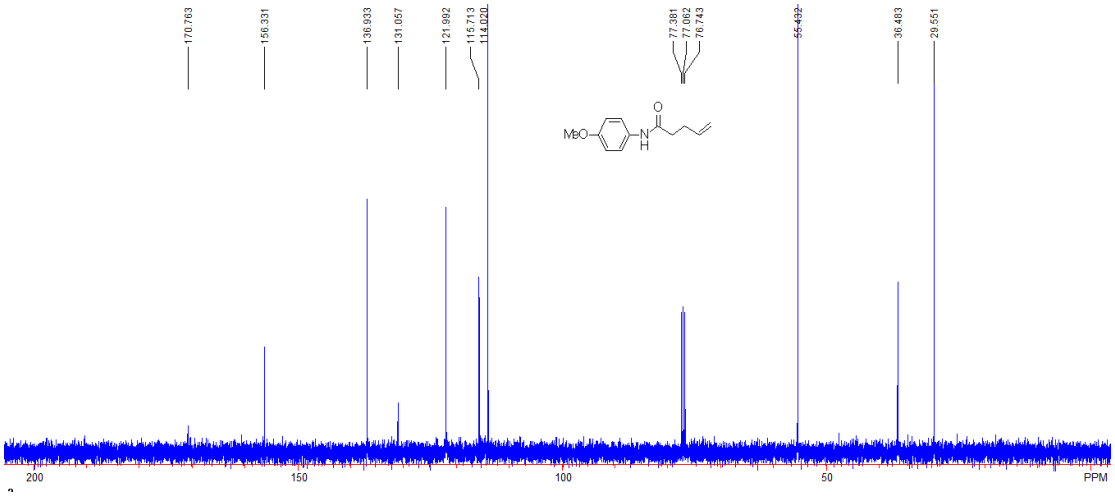
Compound **1m**


8.223
8.200
7.706
7.683
7.447
7.261
5.925
5.912
5.899
5.882
5.868
5.856
5.171
5.132
5.129
5.108
5.082
2.546
2.524
2.503
2.485
1.555
0.001
2.08
2.10
1.00
1.00
1.03
4.23
O2N
N
H
O
10
8
6
4
2
0 PPM

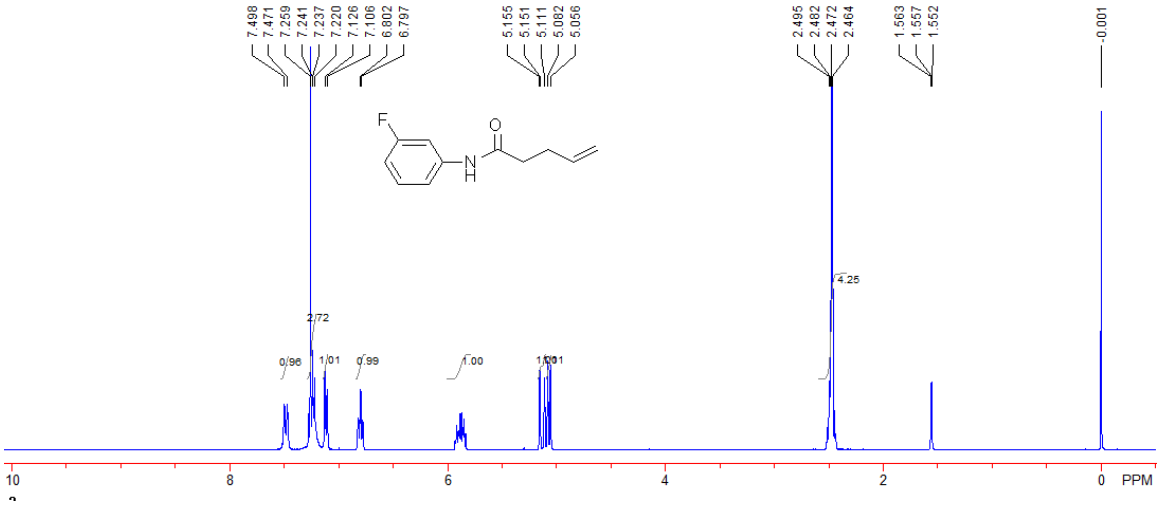

171.884
144.250
143.259
136.390
125.089
119.336
116.157
77.477
77.156
76.842
36.762
29.172
O2N
N
H
O
150
100
50
PPM

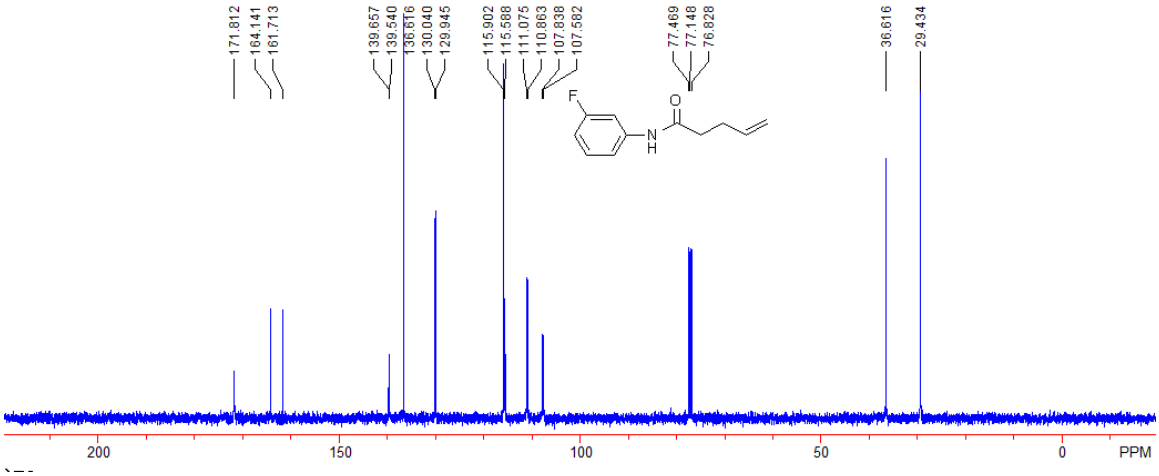
Compound **1n**


7.406
7.383
7.261
7.100
6.864
6.842
5.921
5.906
5.896
5.879
5.868
5.864
5.854
5.837
5.147
5.105
5.068
5.043
3.787
2.493
2.478
2.464
2.451
2.436
2.419
2.412
0.000
MeO
1.95
0.96
2.02
1.00
1.96
3.19
4.27
10
8
6
4
2
PPM

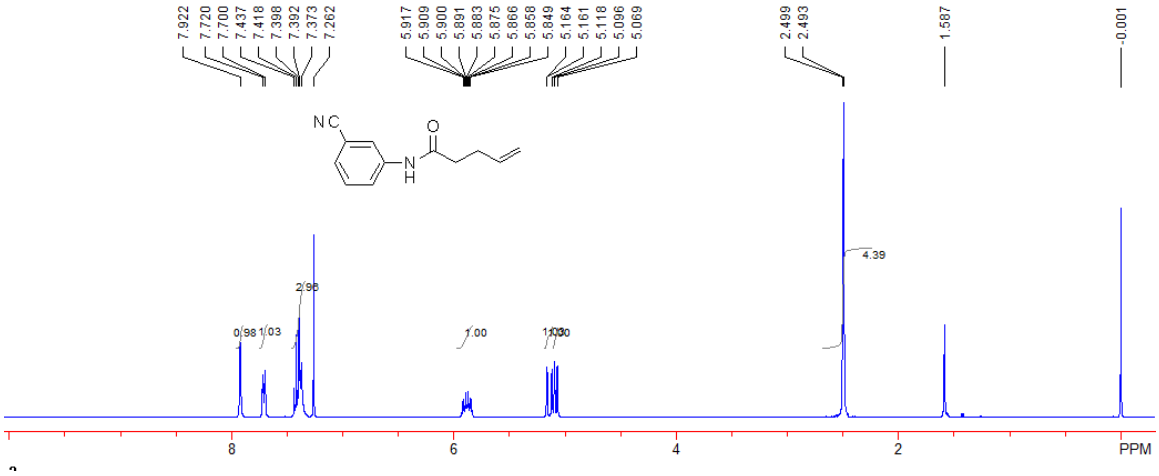

170.763
156.331
136.933
131.057
121.992
115.713
114.020
77.381
77.062
76.743
55.432
36.483
29.551
MeO
200
150
100
50
PPM

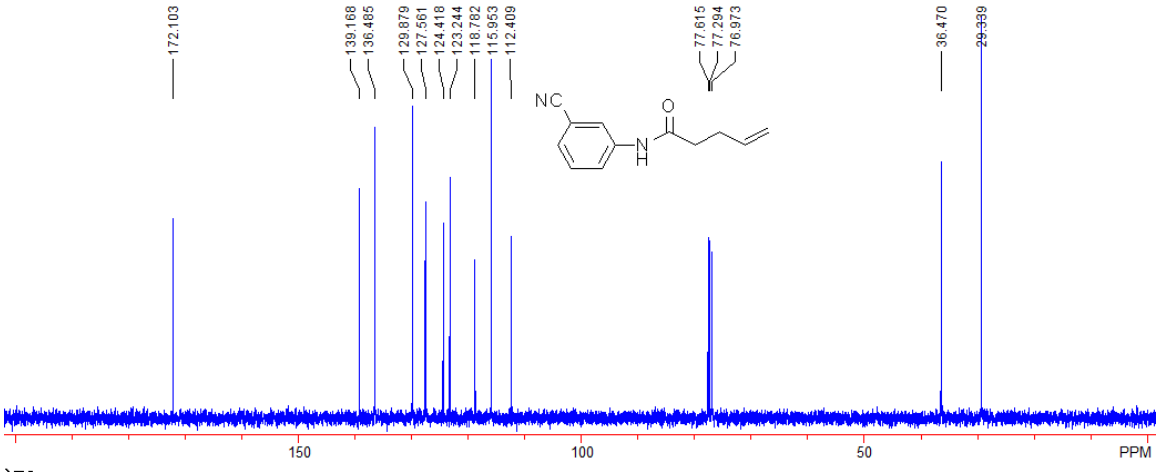
Compound **3a**


7.498
7.471
7.259
7.241
7.237
7.220
7.126
7.106
6.802
6.797
5.155
5.151
5.111
5.082
5.056
2.495
2.482
2.472
2.464
1.563
1.557
1.552
-0.001
F
O
N
H
4.25
2.72
0.96
1.01
0.99
1.00
1.01
10
8
6
4
2
0
PPM

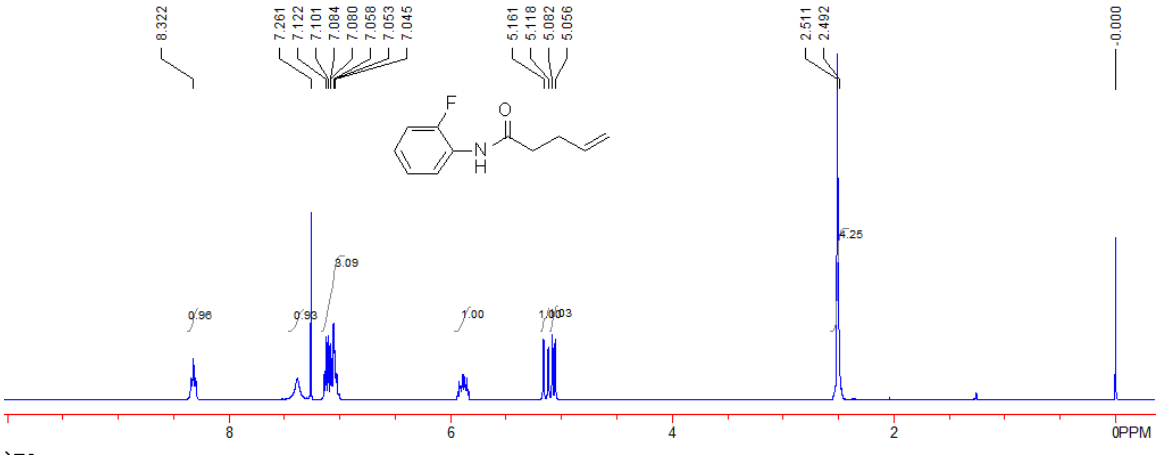

171.812
164.141
161.713
139.657
139.540
136.616
130.040
129.945
115.902
115.588
111.075
110.863
107.838
107.582
77.469
77.148
76.828
36.616
29.434
F
O
N
H
200
150
100
50
0
PPM

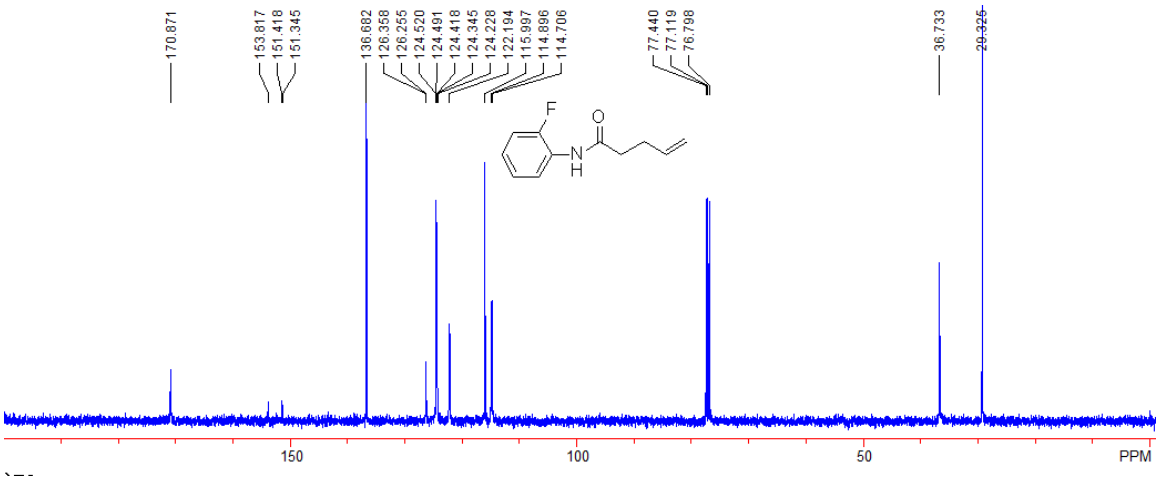
Compound **3b**


7.922
7.720
7.700
7.437
7.418
7.398
7.392
7.373
7.262
5.917
5.909
5.900
5.891
5.883
5.875
5.866
5.858
5.849
5.164
5.161
5.118
5.096
5.069
2.499
2.493
1.587
0.001
NC
O
N
H
4.39
2.96
0.98
1.03
1.00
8
6
4
2
PPM

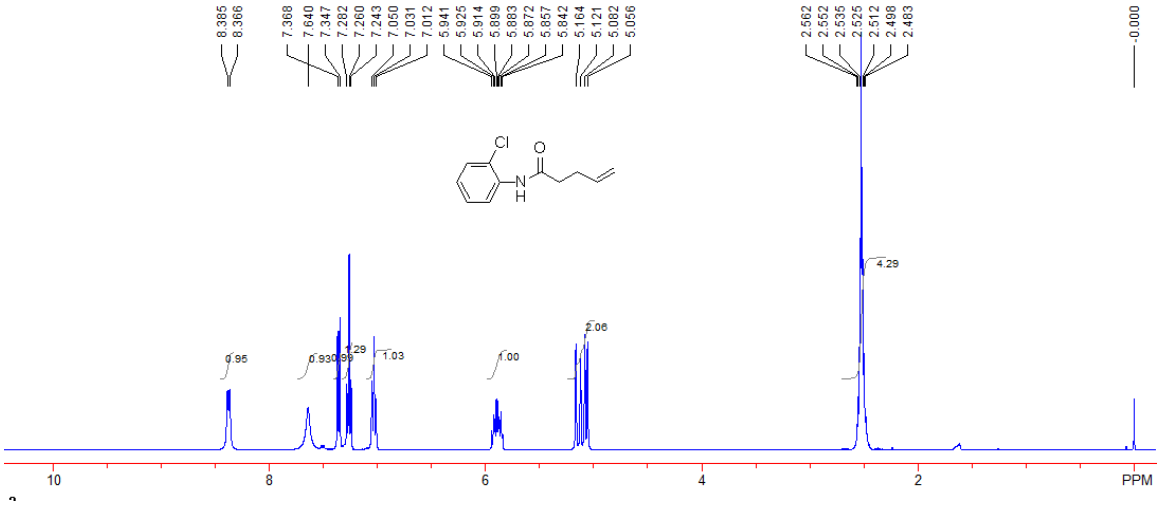

172.103
139.168
136.485
129.879
127.561
124.418
123.244
118.782
115.953
112.409
77.615
77.294
76.973
36.470
29.939
NC
O
N
H
150
100
50
PPM

Compound **3c**


8.322
7.261
7.122
7.101
7.084
7.080
7.058
7.053
7.045
5.161
5.118
5.082
5.056
2.511
2.492
0.000
F
O
N
H
4.25
3.09
0.96
0.93
1.00
1.03
8
6
4
2
0PPM


170.871
153.817
151.418
151.345
136.682
126.358
126.255
124.520
124.491
124.418
124.345
124.228
122.194
115.997
114.896
114.706
77.440
77.119
76.798
36.733
29.325
F
O
N
H
150
100
50
PPM

Compound **3d**


8.385
8.366
7.368
7.640
7.347
7.282
7.260
7.243
7.050
7.031
7.012
5.941
5.925
5.914
5.899
5.883
5.872
5.857
5.842
5.164
5.121
5.082
5.056
2.562
2.552
2.535
2.525
2.512
2.498
2.483
0.000
Cl
O
N
H
4.29
2.06
1.03
1.00
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0.93
0.99
0.29
10
8
6
4
2
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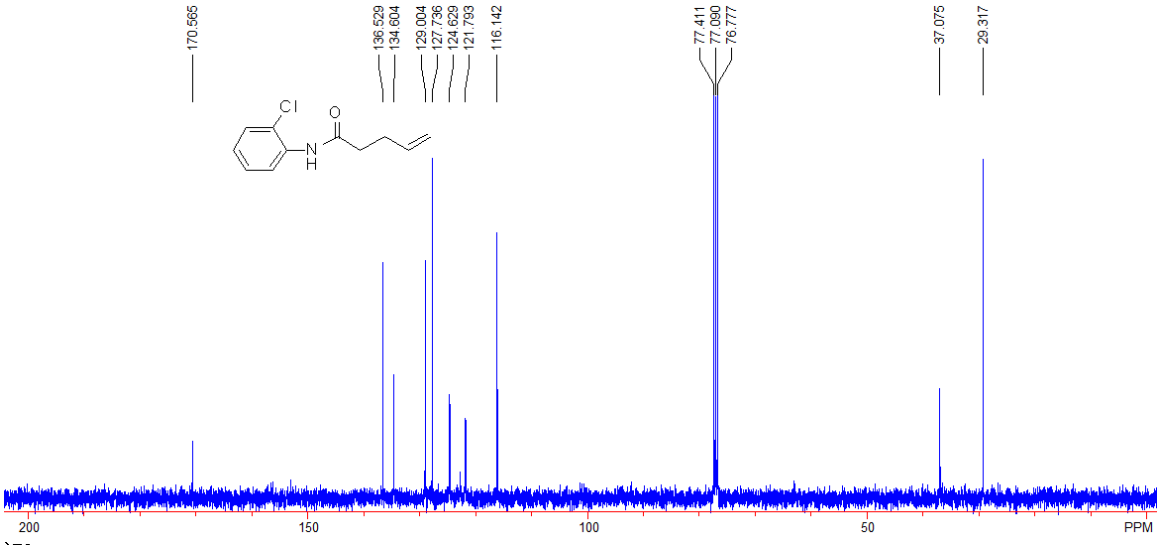
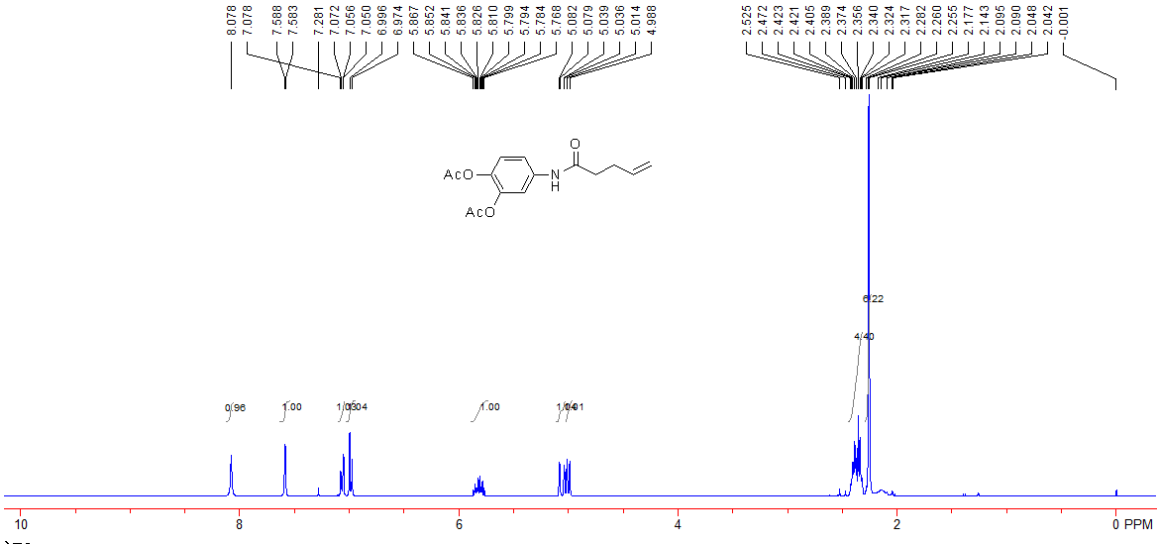
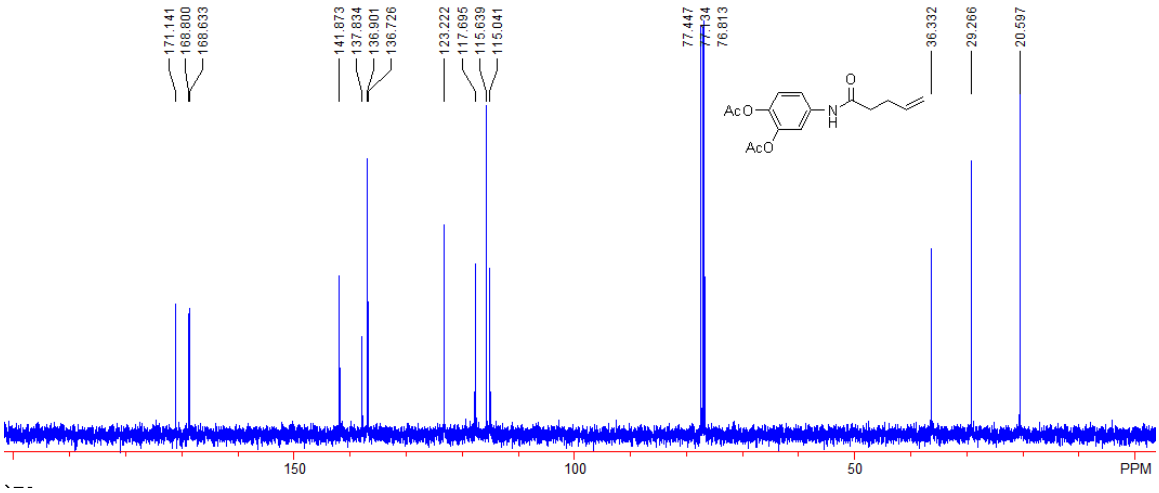
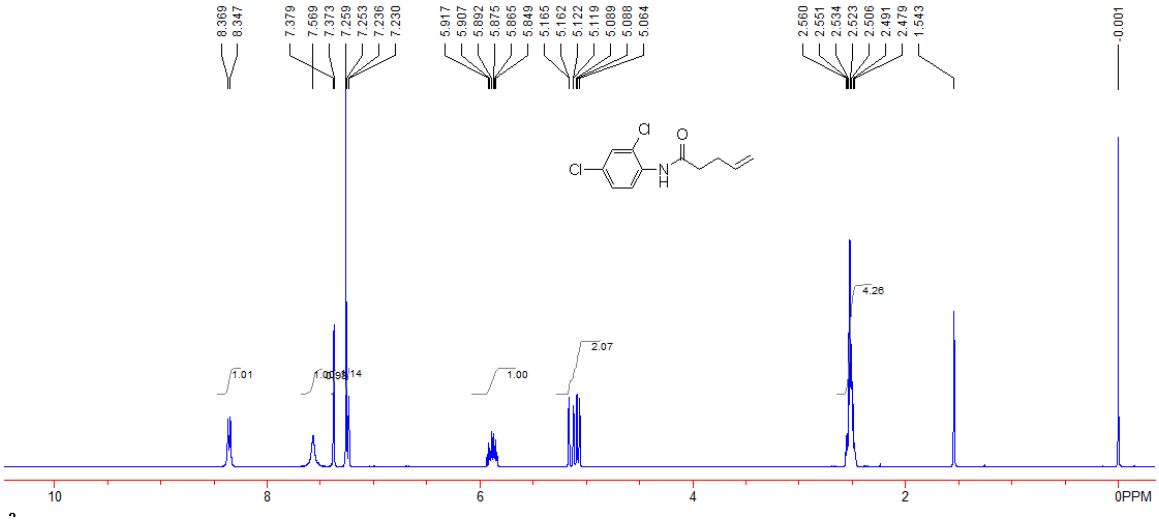

170.565
136.529
134.604
129.004
127.736
124.629
121.793
116.142
77.411
77.090
76.777
37.075
29.317
Cl
O
N
H
200
150
100
50
PPM

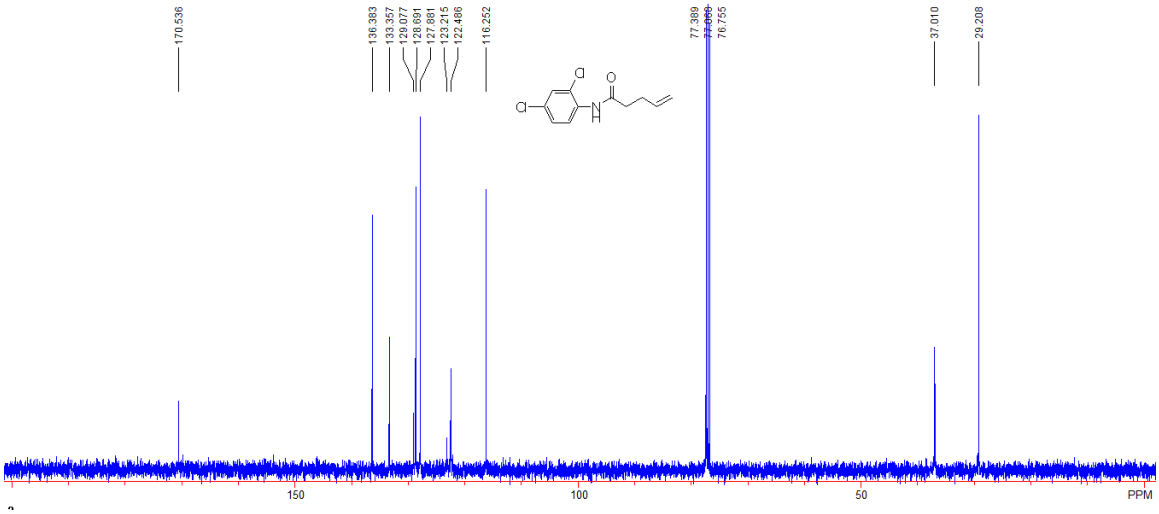
Compound **3e**


8.078
7.078
7.588
7.583
7.281
7.072
7.056
7.050
6.996
6.974
5.867
5.852
5.841
5.836
5.826
5.810
5.799
5.794
5.784
5.768
5.082
5.079
5.039
5.036
5.014
4.988
2.525
2.472
2.423
2.421
2.405
2.389
2.374
2.356
2.340
2.324
2.317
2.282
2.260
2.255
2.177
2.143
2.095
2.090
2.048
2.042
0.001
AcO
AcO
O
N
H
6.22
4.40
0.96
1.00
1.00
1.00
10
8
6
4
2
0 PPM

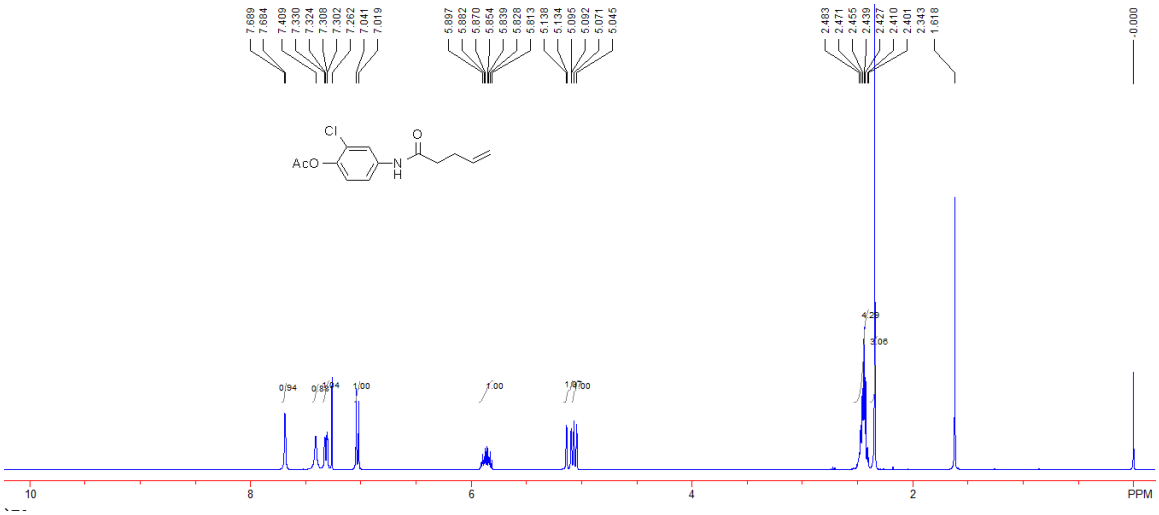

171.141
168.800
168.633
141.873
137.834
136.901
136.726
123.222
117.695
115.639
115.041
77.447
77.134
76.813
36.332
29.266
20.597
AcO
AcO
O
N
H
150
100
50
PPM

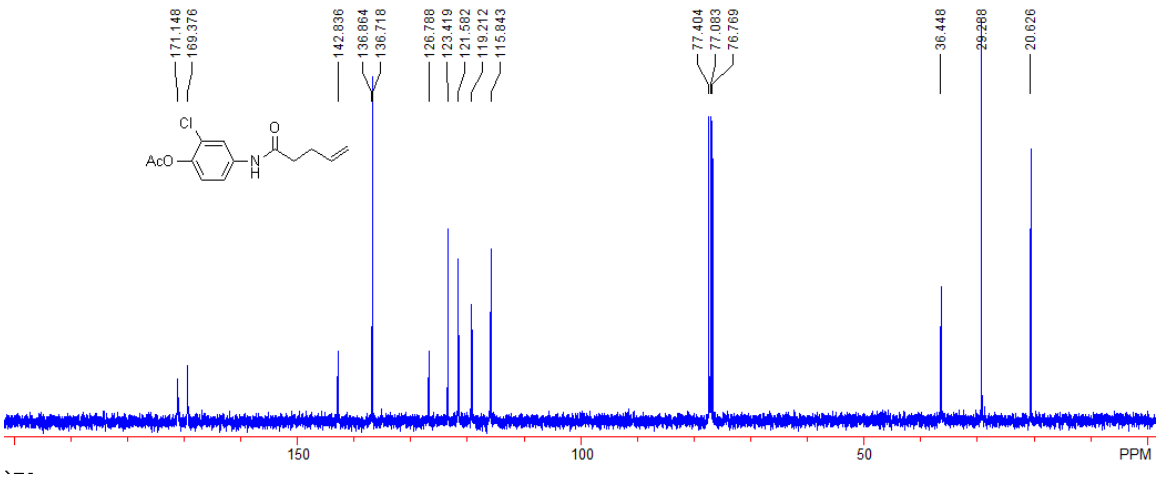
Compound **3f**


8.369
8.347
7.379
7.569
7.373
7.259
7.253
7.236
7.230
5.917
5.907
5.892
5.875
5.865
5.849
5.165
5.162
5.122
5.119
5.089
5.088
5.064
2.560
2.551
2.534
2.523
2.506
2.491
2.479
1.543
-0.001
Cl
Cl
O
N
H
1.01
1.00
2.07
4.26
10
8
6
4
2
0PPM

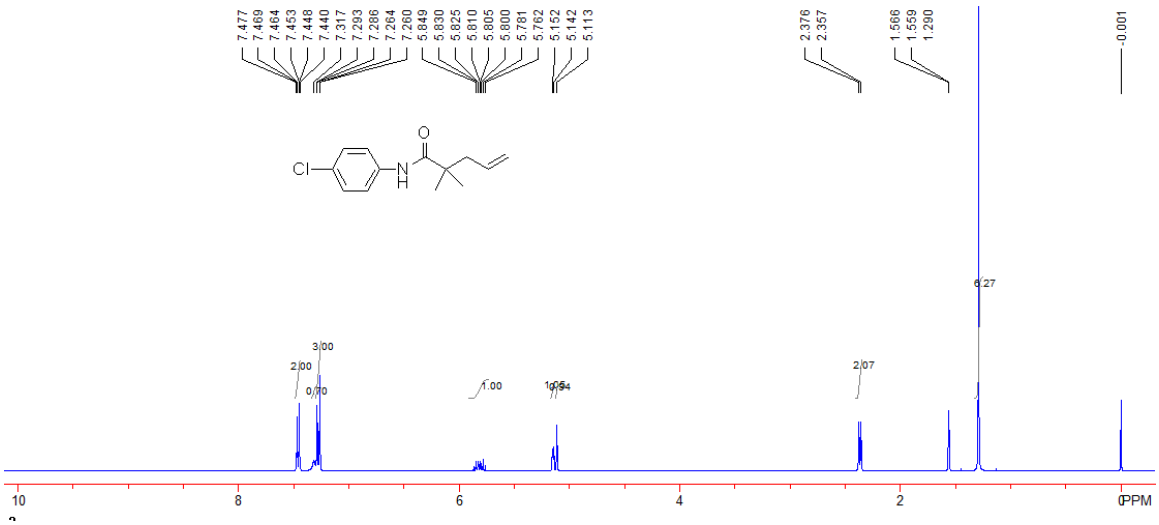

170.536
136.383
133.357
129.077
128.691
127.881
123.215
122.486
116.252
77.389
76.755
37.010
29.208
Cl
Cl
O
N
H
150
100
50
PPM

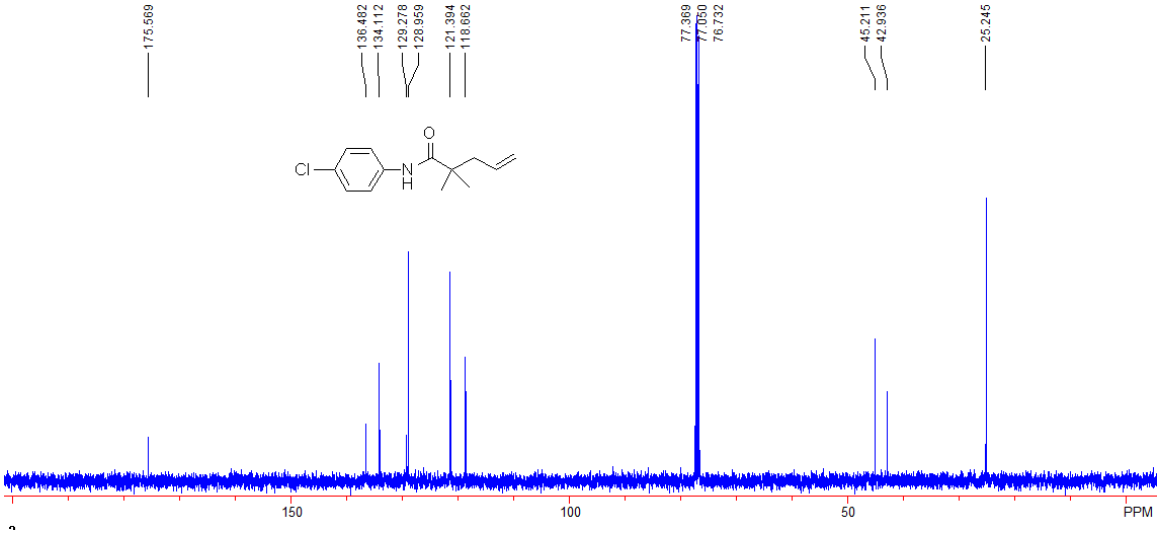
Compound **3g**


7.689
7.684
7.409
7.330
7.324
7.308
7.302
7.262
7.041
7.019
5.897
5.882
5.870
5.854
5.839
5.828
5.813
5.138
5.134
5.095
5.092
5.071
5.045
2.483
2.471
2.455
2.439
2.427
2.410
2.401
2.343
1.618
0.000
Cl
AcO
O
N
H
0.94
1.00
1.00
1.00
4.29
3.06
10
8
6
4
2
PPM

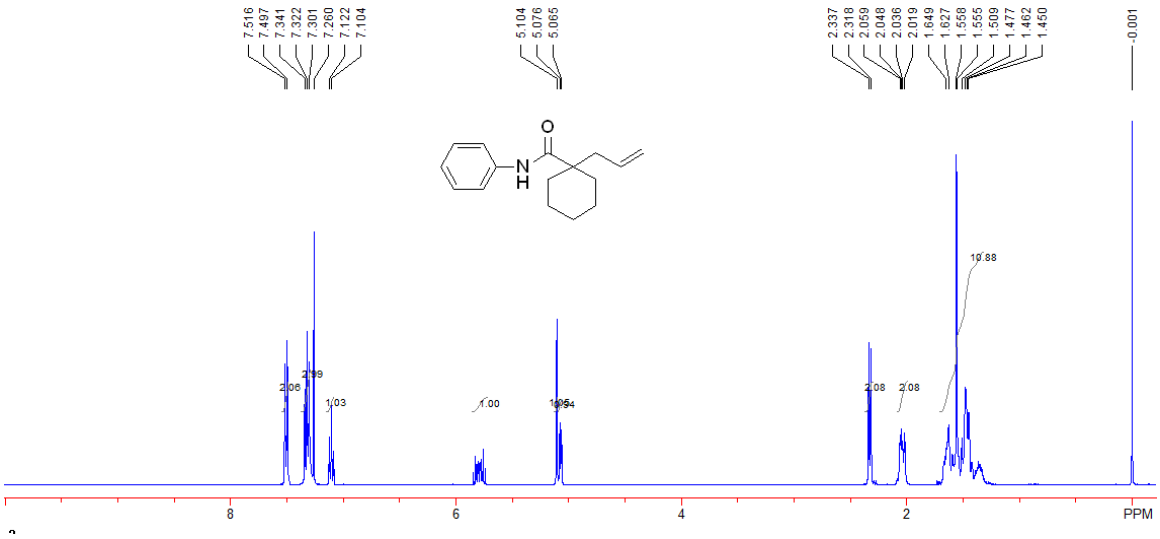

171.148
169.376
142.836
136.864
136.718
126.788
123.419
121.582
119.212
115.843
77.404
77.083
76.769
36.448
29.288
20.626
Cl
AcO
O
N
H
150
100
50
PPM

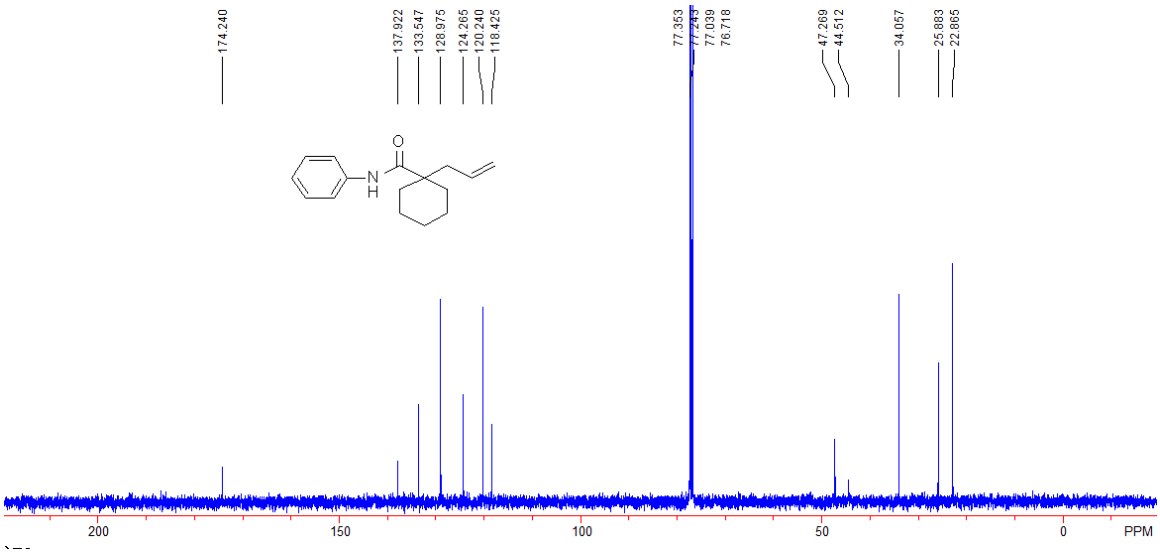
Compound **3h**


7.477
7.469
7.464
7.453
7.448
7.440
7.317
7.293
7.286
7.264
7.260
5.849
5.830
5.825
5.810
5.805
5.800
5.781
5.762
5.152
5.142
5.113
2.376
2.357
1.566
1.559
1.290
0.001
Cl
N
H
O
6.27
3.00
2.00
0.70
1.00
2.07
10
8
6
4
2
0
PPM

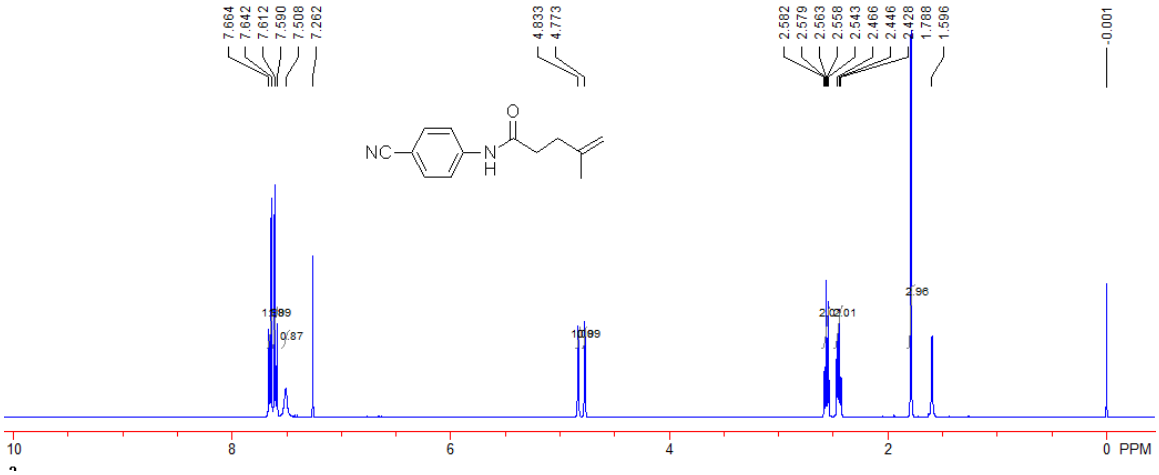

175.569
136.482
134.112
129.278
128.959
121.394
118.662
77.369
77.050
76.732
45.211
42.936
25.245
Cl
N
H
O
150
100
50
PPM

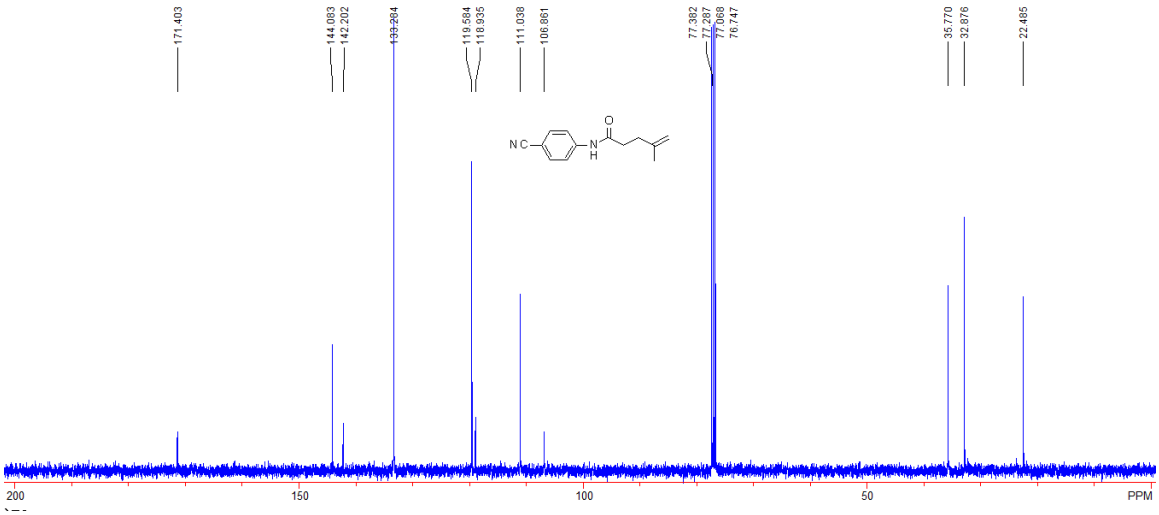
Compound **3i**


7.516
7.497
7.341
7.322
7.301
7.260
7.122
7.104
5.104
5.076
5.065
2.337
2.318
2.059
2.048
2.036
2.019
1.649
1.627
1.558
1.555
1.509
1.477
1.462
1.450
0.001
O
N
H
10.88
2.06
2.99
1.03
1.00
2.08
2.08
8
6
4
2
PPM

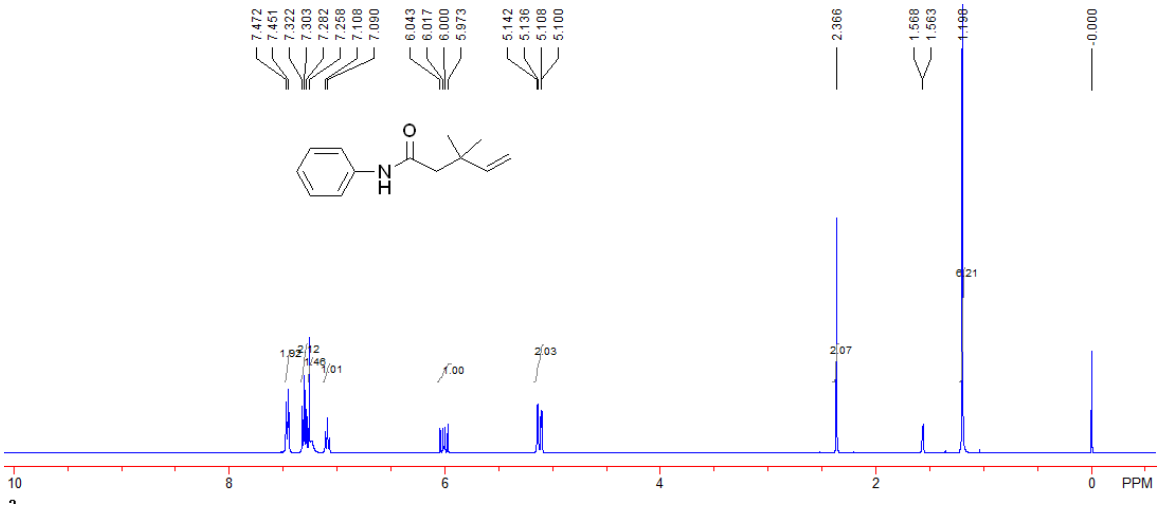

174.240
137.922
133.547
128.975
124.265
120.240
118.425
77.353
77.243
77.039
76.718
47.269
44.512
34.057
25.883
22.865
O
N
H
200
150
100
50
0
PPM

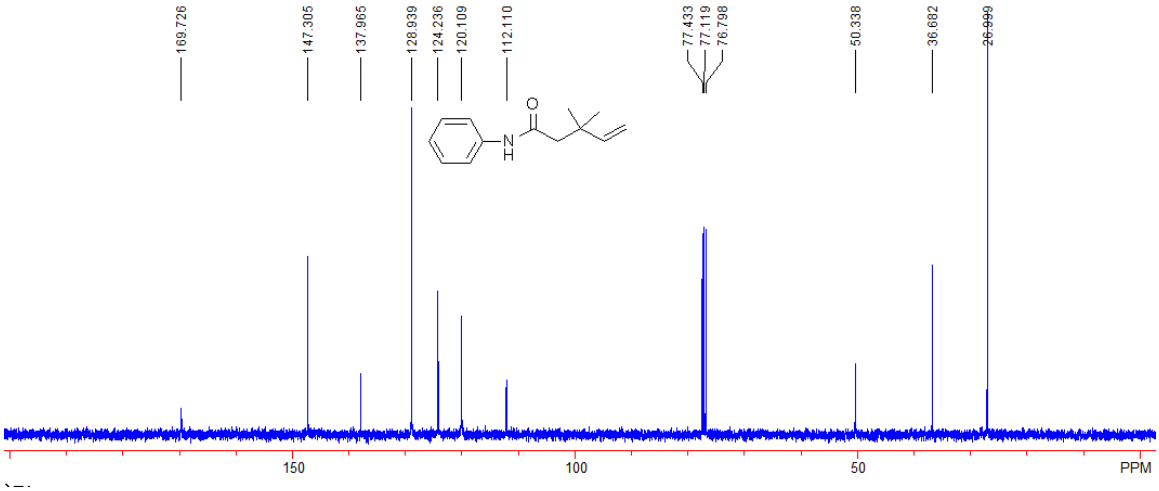
Compound **3j**


7.664
7.642
7.612
7.590
7.508
7.262
4.833
4.773
2.582
2.579
2.563
2.558
2.543
2.466
2.446
2.428
1.788
1.596
0.001
NC
N
H
O
0.87
2.96
10
8
6
4
2
0 PPM

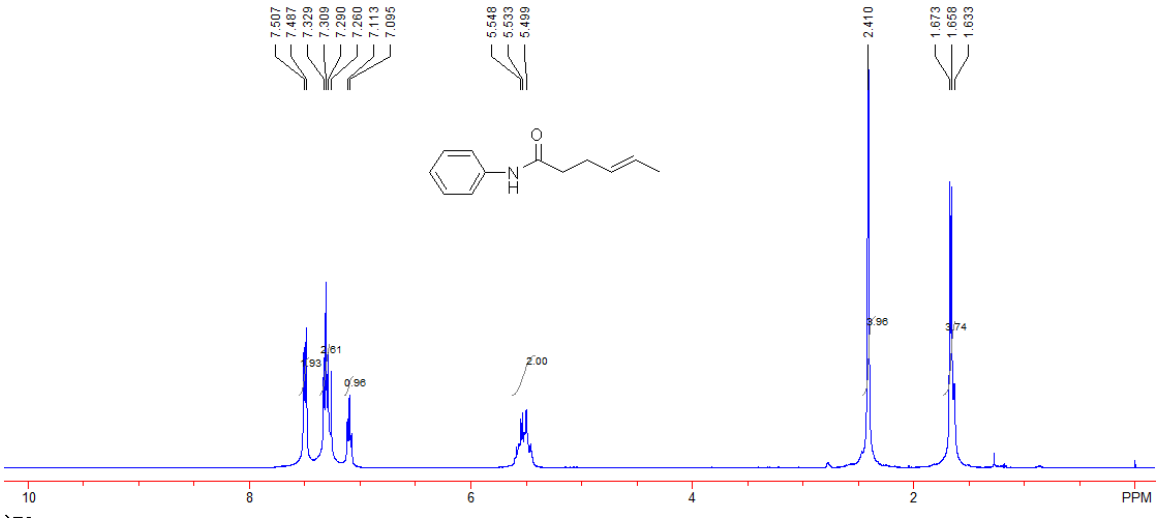

171.403
144.083
142.202
133.264
119.584
118.935
111.038
106.861
77.382
77.287
77.068
76.747
35.770
32.876
22.485
NC
N
H
O
200
150
100
50
PPM

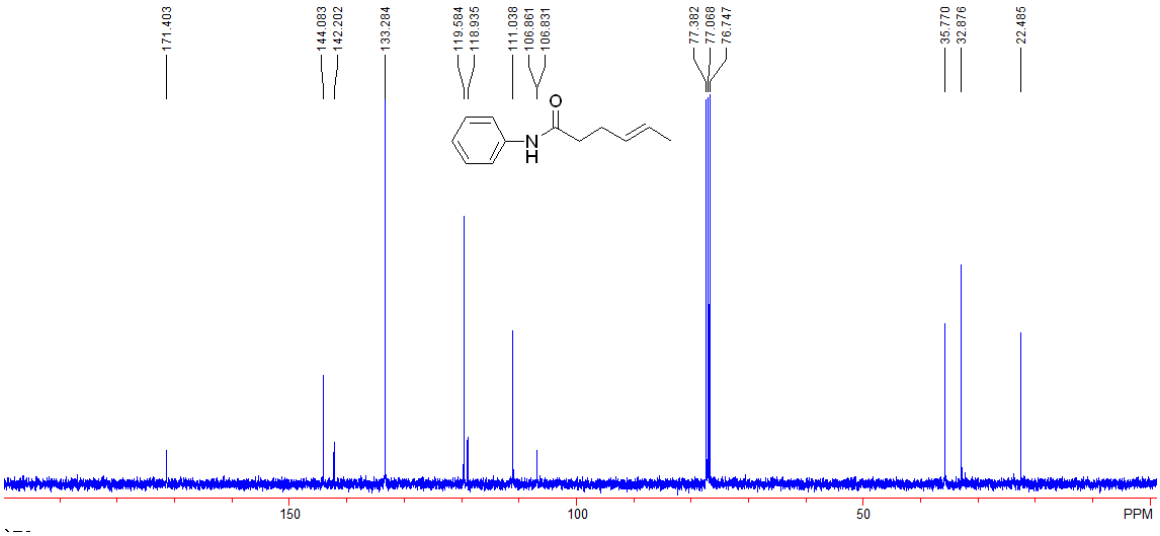
Compound **3k**


7.472
7.451
7.322
7.303
7.282
7.258
7.108
7.090
6.043
6.017
6.000
5.973
5.142
5.136
5.108
5.100
2.366
1.568
1.563
1.198
0.000
6.21
1.92
3.12
1.48
1.01
1.00
2.03
2.07
10
8
6
4
2
0
PPM


169.726
147.305
137.965
128.939
124.236
120.109
112.110
77.433
77.119
76.798
50.338
36.682
26.999
150
100
50
PPM

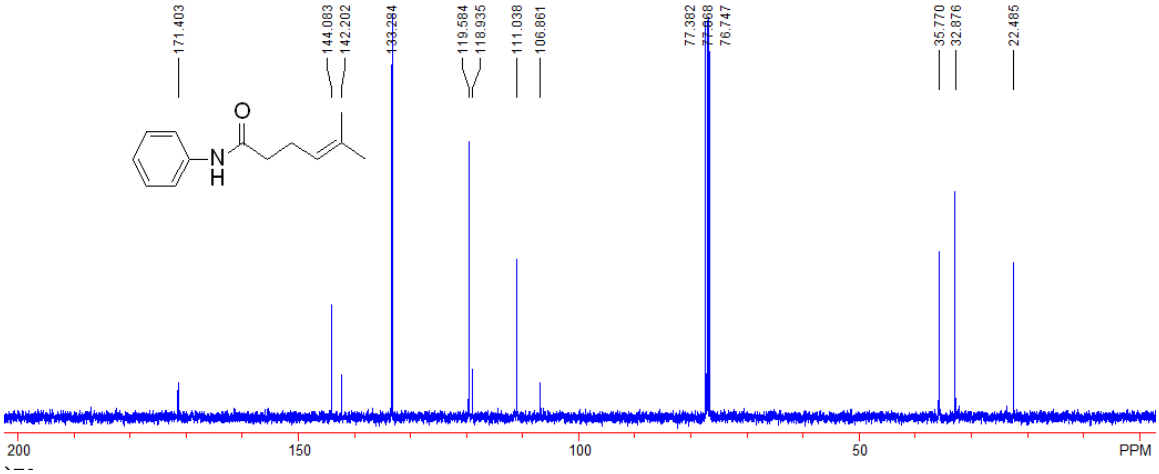
Compound **3l**


7.507
7.487
7.329
7.309
7.290
7.260
7.113
7.095
5.548
5.533
5.499
2.410
1.673
1.658
1.633
1.93
2.61
0.96
2.00
3.96
3.74
10
8
6
4
2
PPM

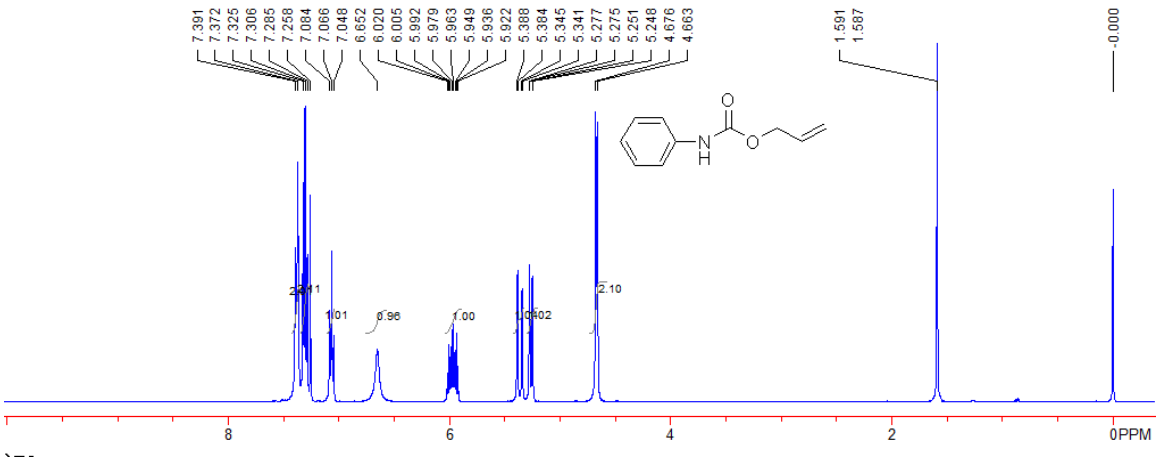

171.403
144.083
142.202
133.284
119.584
118.935
111.038
106.861
106.831
77.382
77.068
76.747
35.770
32.876
22.485
150
100
50
PPM

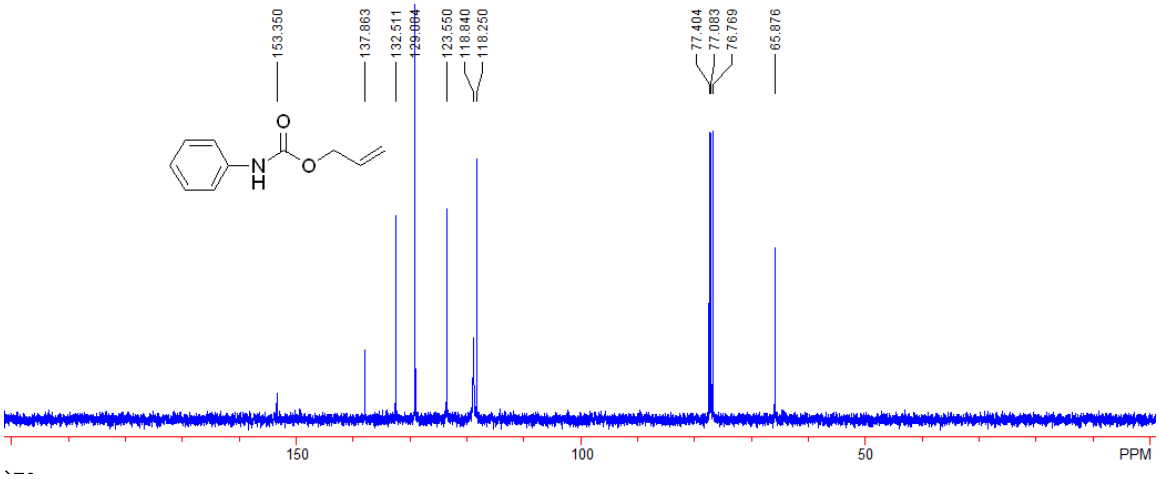
Compound **3m**


7.499
7.479
7.329
7.310
7.290
7.260
7.093
5.174
2.425
2.410
2.396
2.385
1.717
1.653
1.621
1.613
0.000
1.93
2.19
1.00
1.00
4.11
10
8
6
4
2
PPM

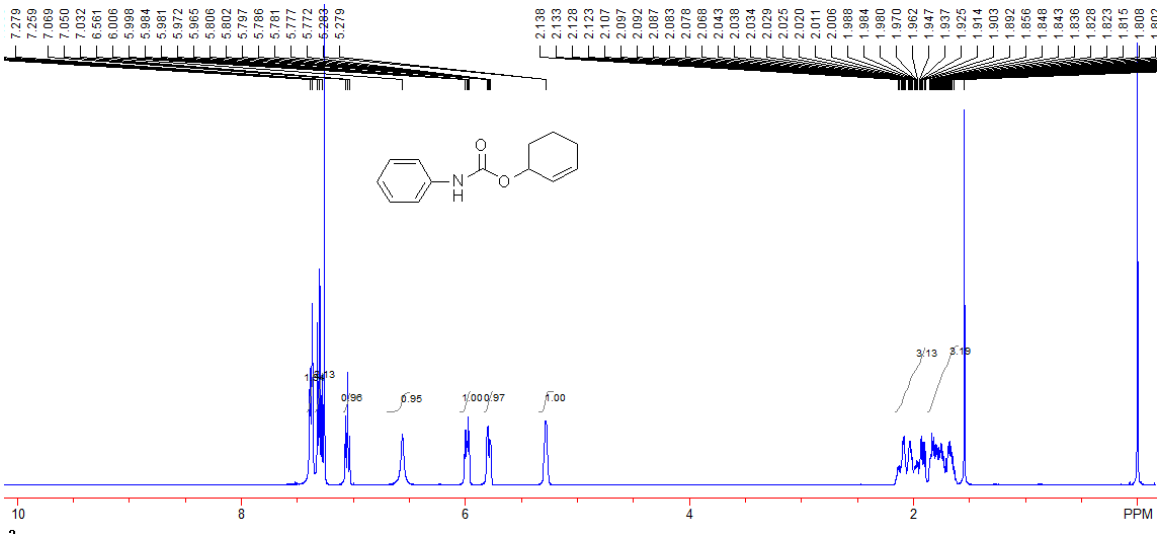

171.403
144.083
142.202
133.294
119.584
118.935
111.038
106.861
77.382
77.068
76.747
35.770
32.876
22.485
200
150
100
50
PPM

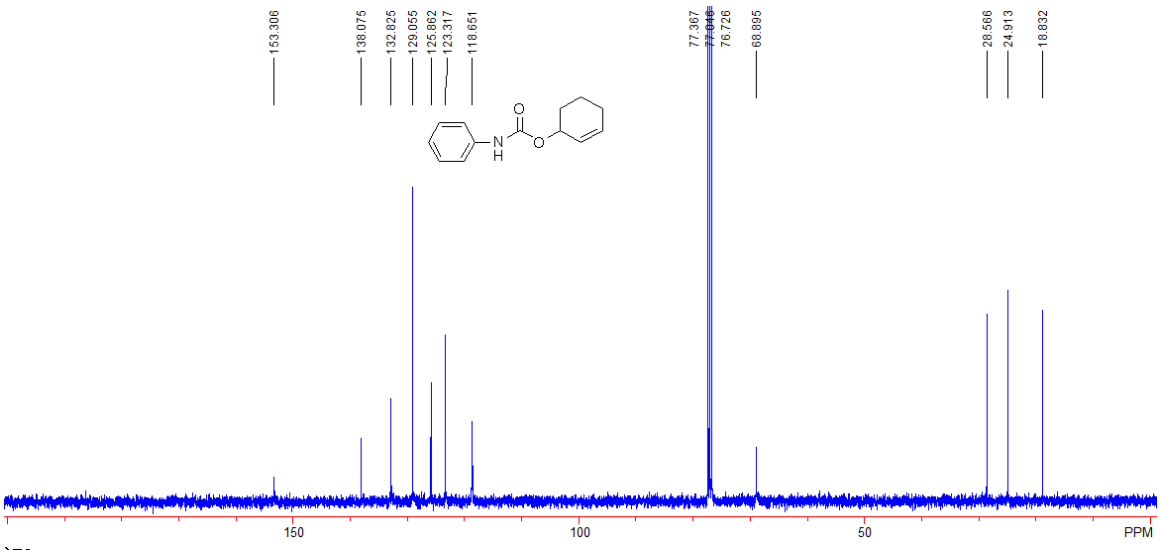
Compound **3n**


7.391
7.372
7.325
7.306
7.285
7.258
7.084
7.066
7.048
6.652
6.020
6.005
5.992
5.979
5.963
5.949
5.936
5.922
5.388
5.384
5.345
5.341
5.277
5.275
5.251
5.248
4.676
4.663
1.591
1.587
-0.000
2.10
1.01
0.96
1.00
1.0402
8
6
4
2
0PPM

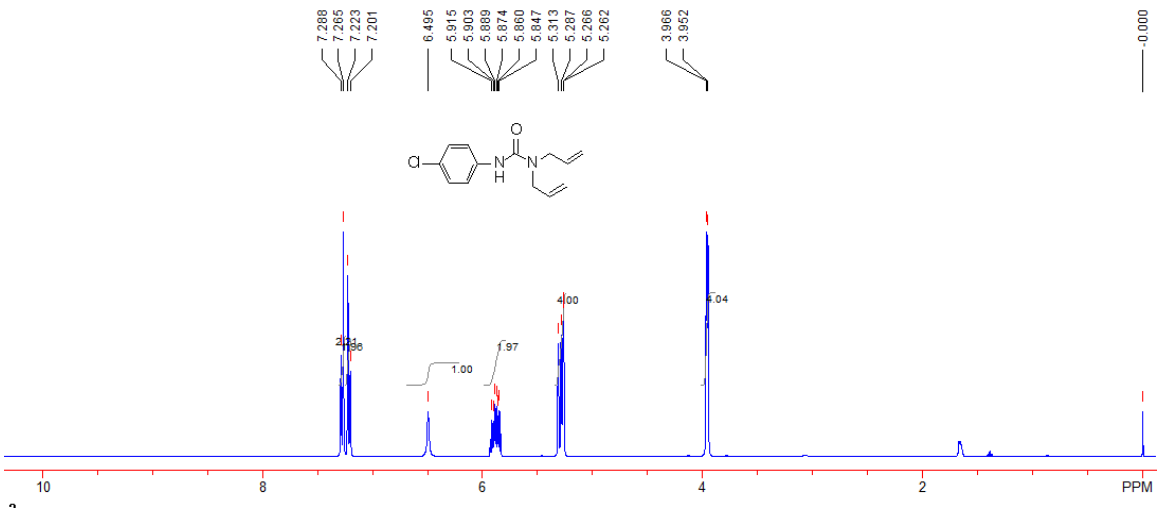

153.350
137.863
132.511
129.084
123.550
118.840
118.250
77.404
77.083
76.769
65.876
150
100
50
PPM

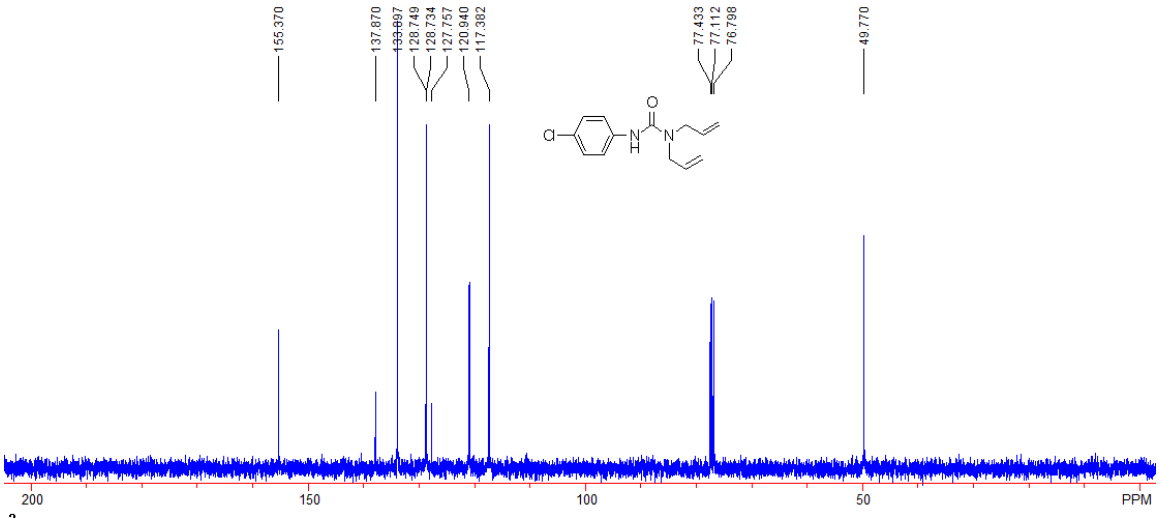
Compound **3o**


7.279
7.259
7.069
7.050
7.032
6.561
6.006
5.998
5.984
5.981
5.972
5.965
5.806
5.802
5.797
5.786
5.781
5.777
5.772
5.283
5.279
2.138
2.133
2.128
2.123
2.107
2.097
2.092
2.087
2.083
2.078
2.068
2.043
2.038
2.034
2.029
2.025
2.020
2.011
2.006
1.988
1.984
1.980
1.970
1.962
1.947
1.937
1.925
1.914
1.903
1.892
1.856
1.848
1.843
1.836
1.828
1.823
1.815
1.808
0.96
0.95
1.00
3.13
3.19
10
8
6
4
2
PPM

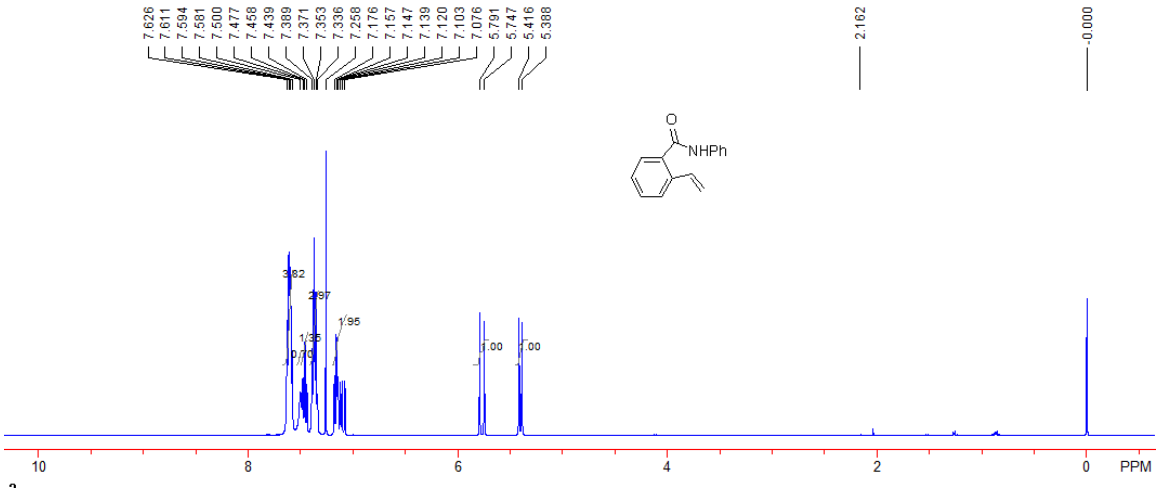

153.306
138.075
132.825
129.055
125.862
123.317
118.651
77.367
77.046
76.726
68.895
28.566
24.913
18.832
150
100
50
PPM

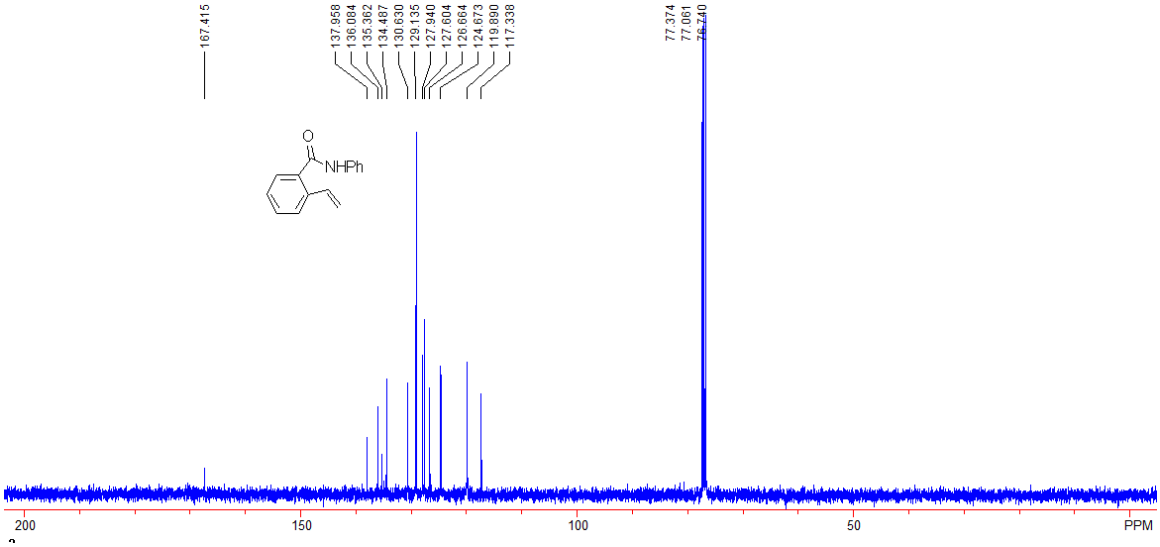
Compound **3p**


7.288
7.265
7.223
7.201
6.495
5.915
5.903
5.889
5.874
5.860
5.847
5.313
5.287
5.266
5.262
3.966
3.952
0.000
Cl
N
H
O
N
4.00
4.04
1.97
1.00
10
8
6
4
2
PPM

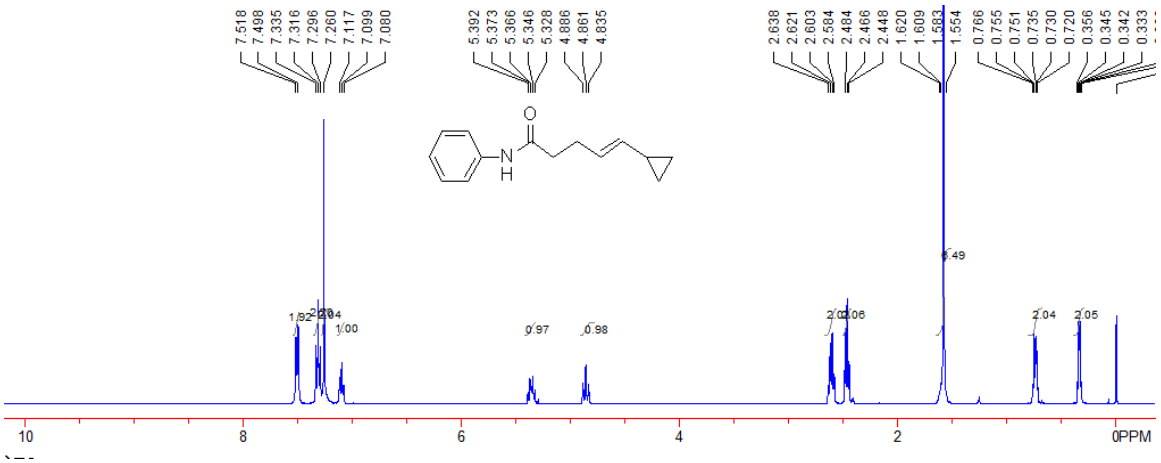

155.370
137.870
133.997
128.749
128.734
127.757
120.940
117.382
77.433
77.112
76.798
49.770
Cl
N
H
O
N
200
150
100
50
PPM

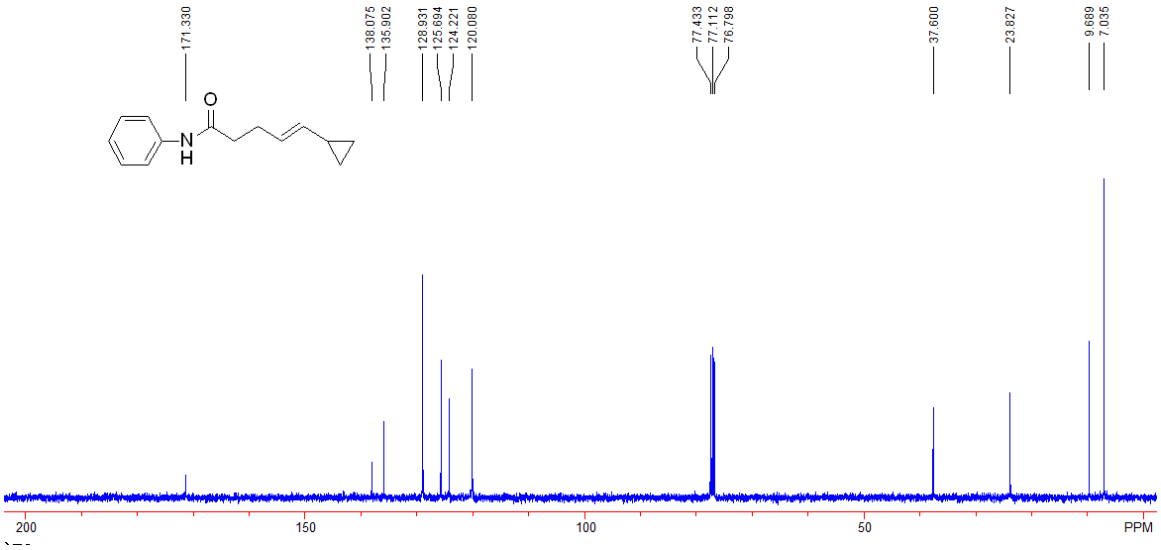
Compound **3q**


7.626
7.611
7.594
7.581
7.500
7.477
7.458
7.439
7.389
7.371
7.353
7.336
7.258
7.176
7.157
7.147
7.139
7.120
7.103
7.076
5.791
5.747
5.416
5.388
2.162
0.000
O
NHPh
3.82
2.97
1.95
1.35
0.70
1.00
1.00
10
8
6
4
2
0
PPM

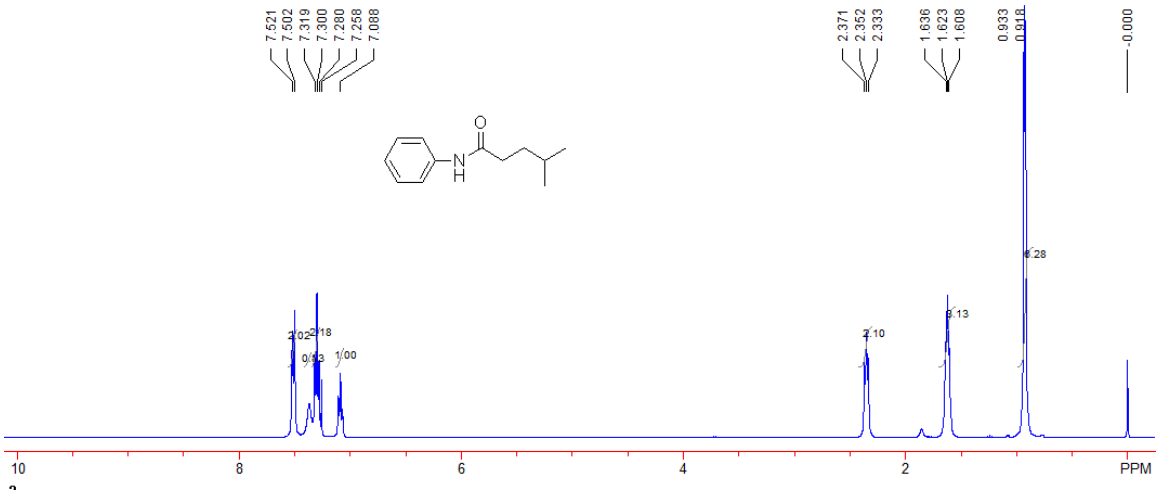

167.415
137.958
136.084
135.362
134.487
130.630
129.135
127.940
127.604
126.664
124.673
119.890
117.338
77.374
77.061
76.740
O
NHPh
200
150
100
50
PPM

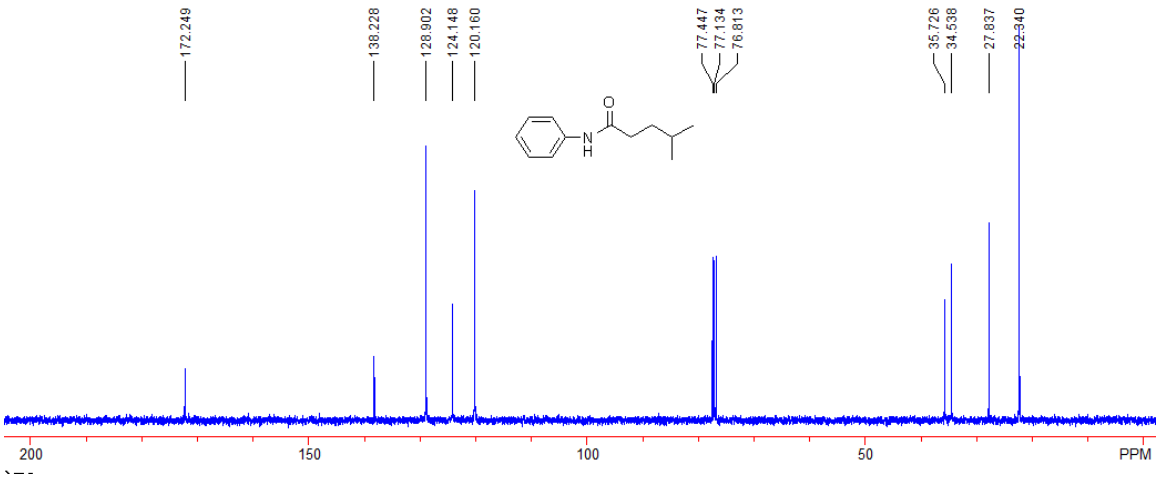
Compound **5**


7.518
7.498
7.335
7.316
7.296
7.260
7.117
7.099
7.080
5.392
5.373
5.366
5.346
5.328
4.886
4.861
4.835
2.638
2.621
2.603
2.584
2.484
2.466
2.448
1.620
1.609
1.583
1.554
0.766
0.755
0.751
0.735
0.730
0.720
0.356
0.345
0.342
0.333
6.49
1.00
0.97
0.98
2.04
2.05
10
8
6
4
2
0PPM

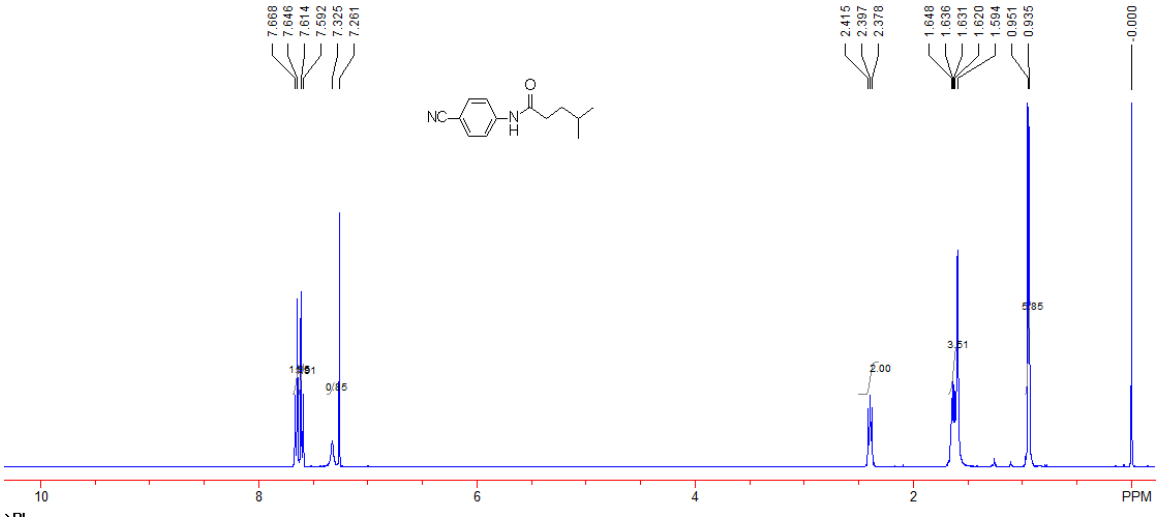

171.330
138.075
135.902
128.931
125.694
124.221
120.080
77.433
77.112
76.798
37.600
23.827
9.689
7.035
200
150
100
50
PPM

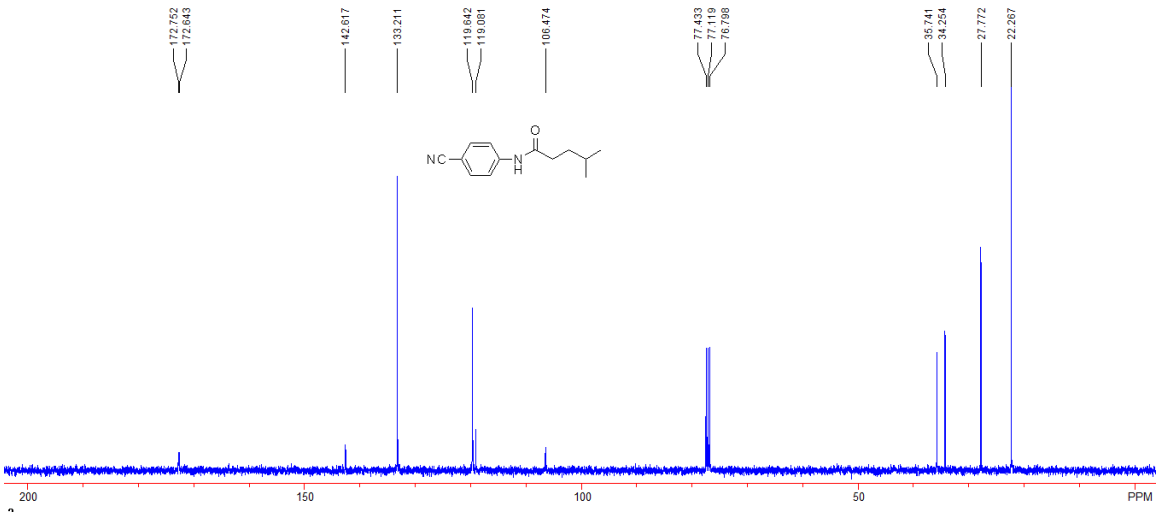
Compound **8a**


7.521
7.502
7.319
7.300
7.280
7.258
7.088
2.371
2.352
2.333
1.636
1.623
1.608
0.933
0.918
-0.000
2.02
2.18
0.63
1.00
2.10
3.13
6.28
10
8
6
4
2
PPM


172.249
138.228
128.902
124.148
120.160
77.447
77.134
76.813
35.726
34.538
27.837
22.340
200
150
100
50
PPM

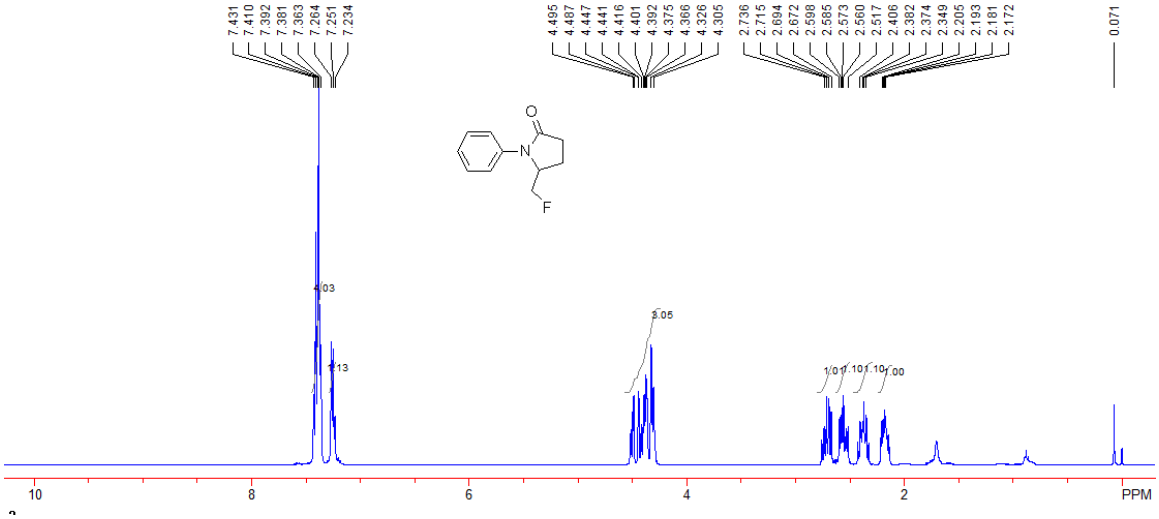
Compound **8b**

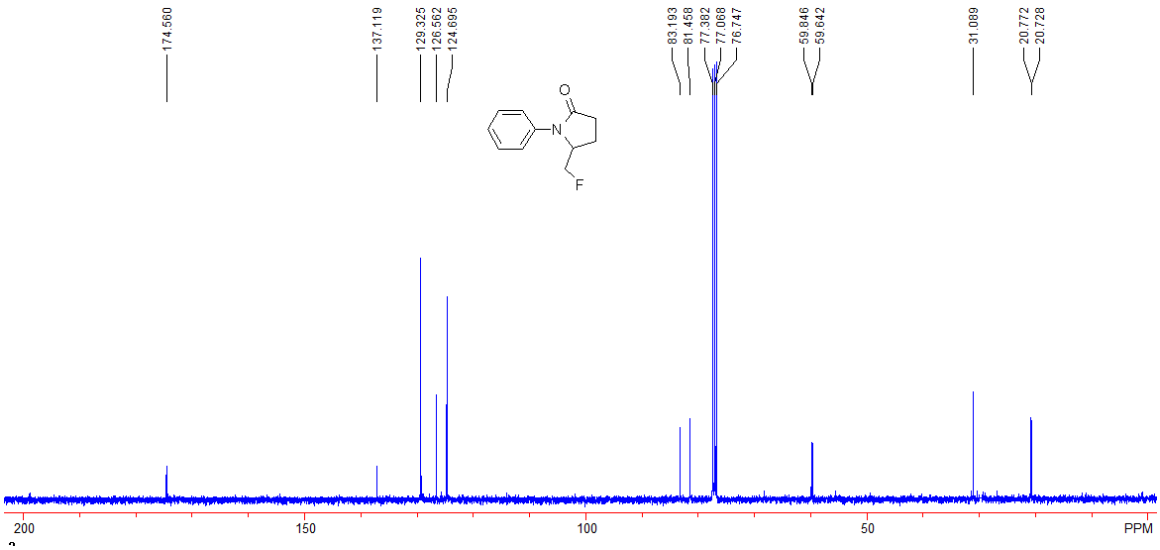


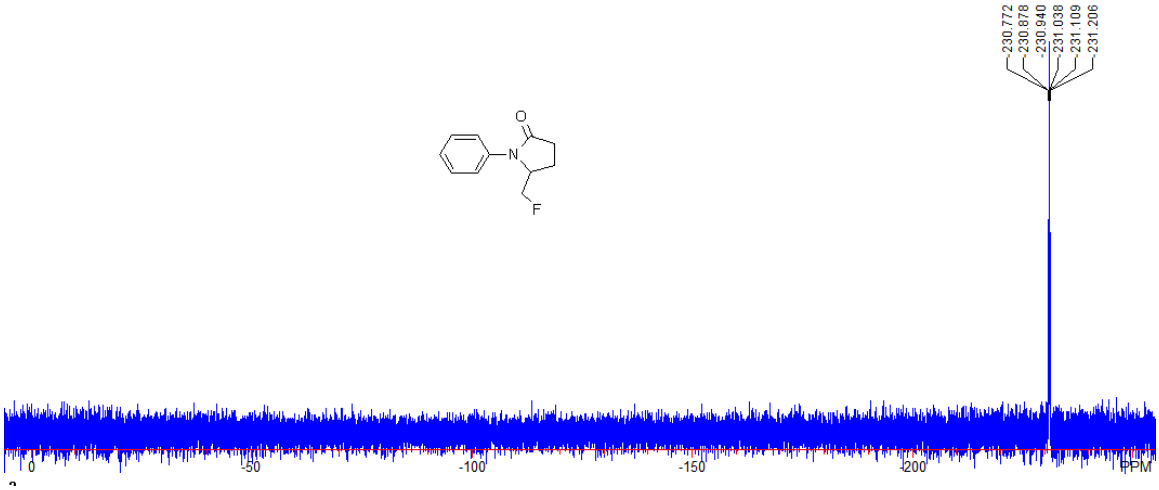




## 6. $^{1}H$, $^{13}C$ and $^{19}F$ NMR Spectra of Products.

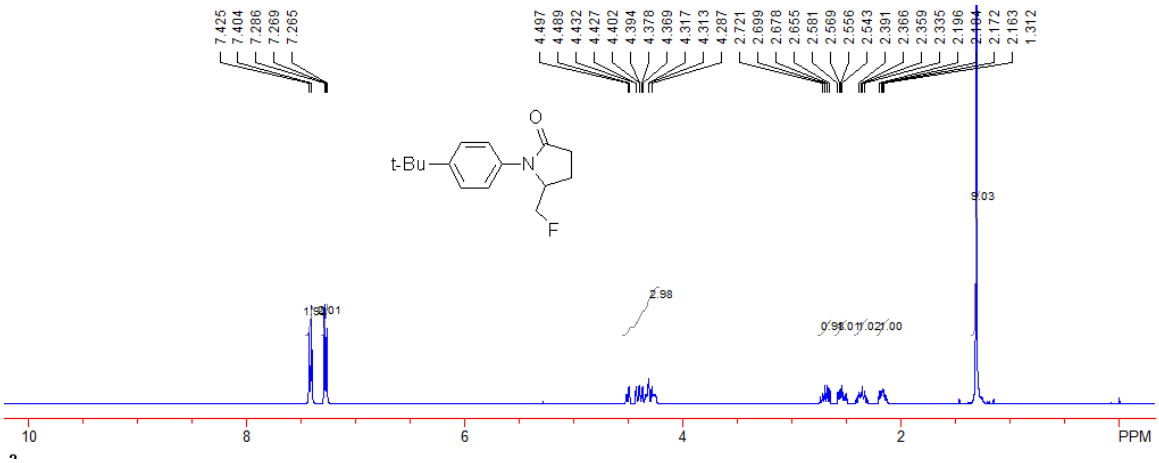
Compound **2a**

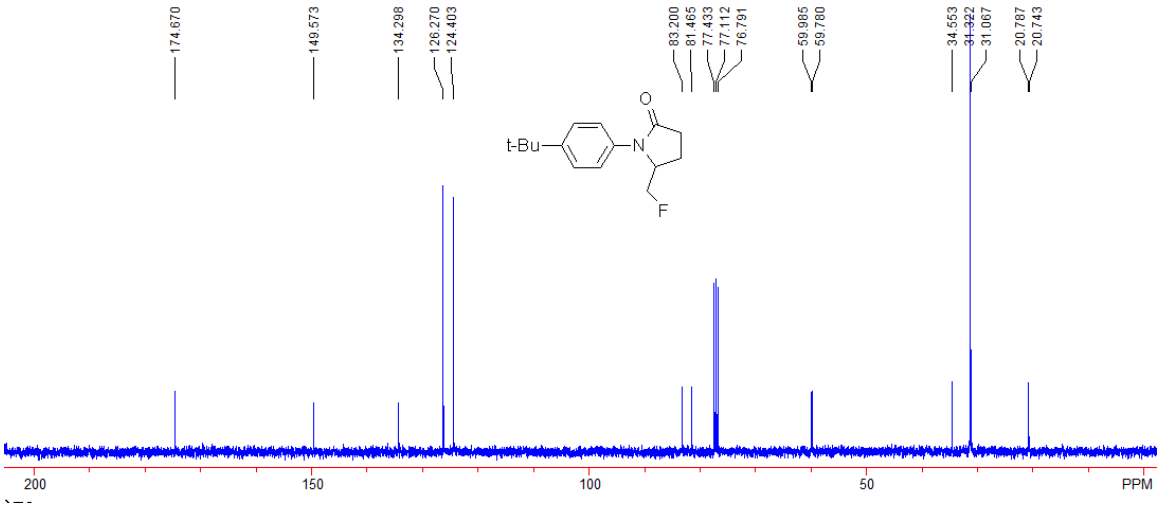

7.431
7.410
7.392
7.381
7.363
7.264
7.251
7.234
4.495
4.487
4.447
4.441
4.416
4.401
4.392
4.375
4.366
4.326
4.305
2.736
2.715
2.694
2.672
2.598
2.585
2.573
2.560
2.517
2.406
2.382
2.374
2.349
2.205
2.193
2.181
2.172
0.071
4.03
3.13
3.05
1.01
1.01
1.10
1.00
10
8
6
4
2
PPM

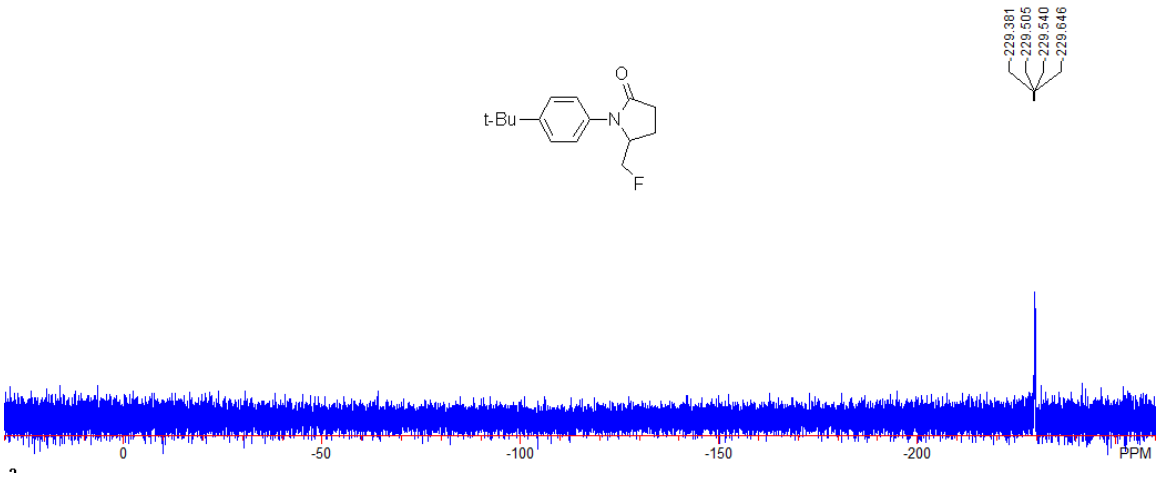

174.560
137.119
129.325
126.562
124.695
83.193
81.458
77.382
77.068
76.747
59.846
59.642
31.089
20.772
20.728
200
150
100
50
PPM


230.772
230.878
230.940
231.038
231.109
231.206
0
-50
-100
-150
-200
PPM

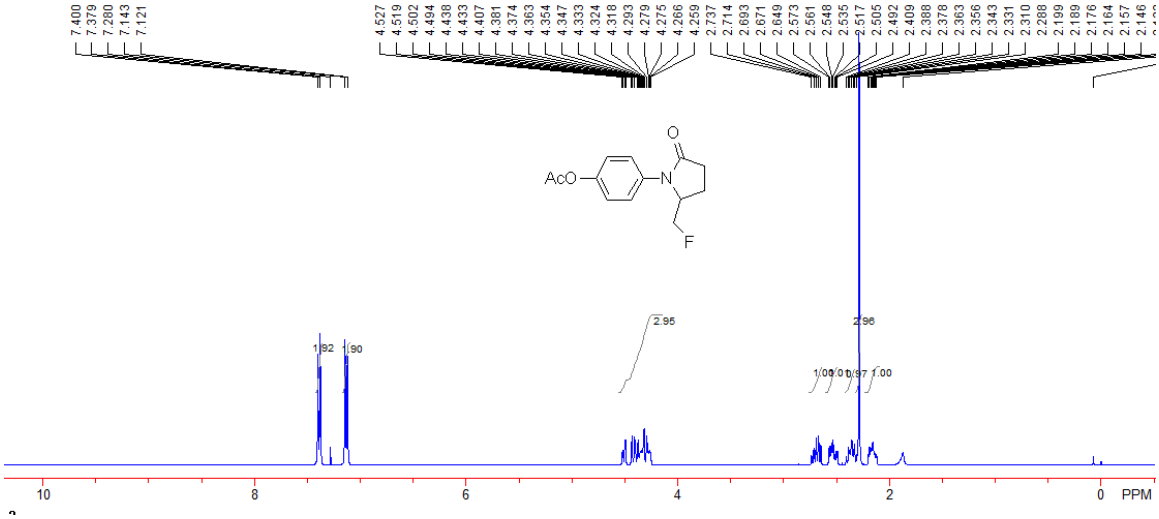
Compound **2b**

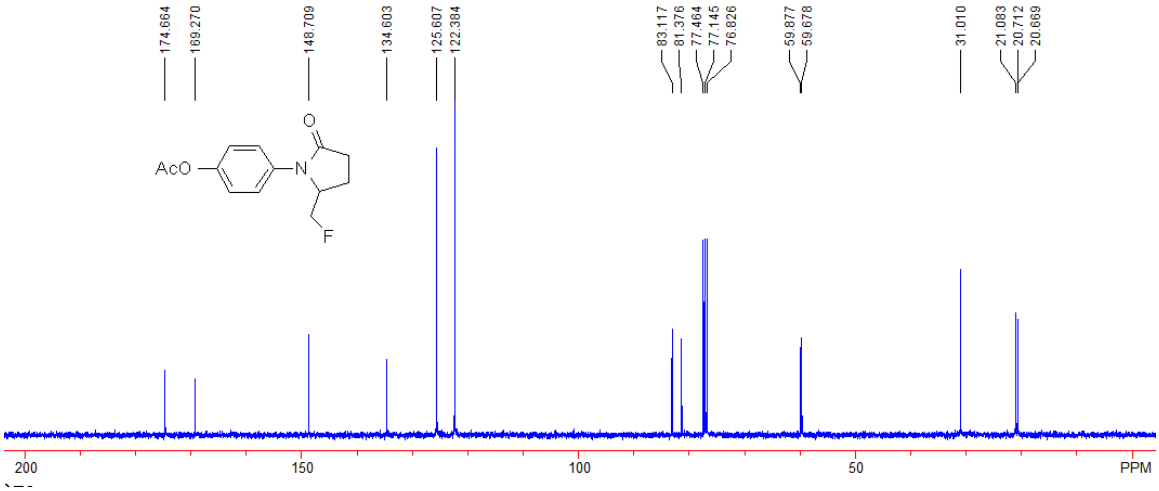

7.425
7.404
7.286
7.269
7.265
4.497
4.489
4.432
4.427
4.402
4.394
4.378
4.369
4.317
4.313
4.287
2.721
2.699
2.678
2.655
2.581
2.569
2.556
2.543
2.391
2.366
2.359
2.335
2.196
2.184
2.172
2.163
1.312
t-Bu
O
N
F
9.03
2.98
1.92
1.01
0.98
1.01
1.02
2.00
10
8
6
4
2
PPM

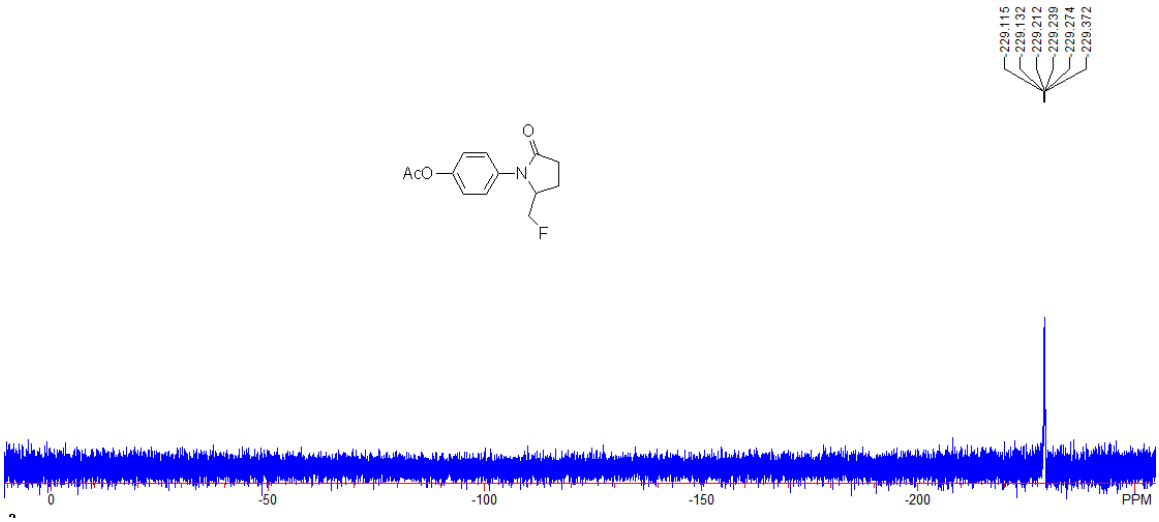

174.670
149.573
134.298
126.270
124.403
83.200
81.465
77.433
77.112
76.791
59.985
59.780
34.553
31.322
31.067
20.787
20.743
t-Bu
O
N
F
200
150
100
50
PPM


229.381
229.505
229.540
229.646
t-Bu
O
N
F
0
-50
-100
-150
-200
PPM

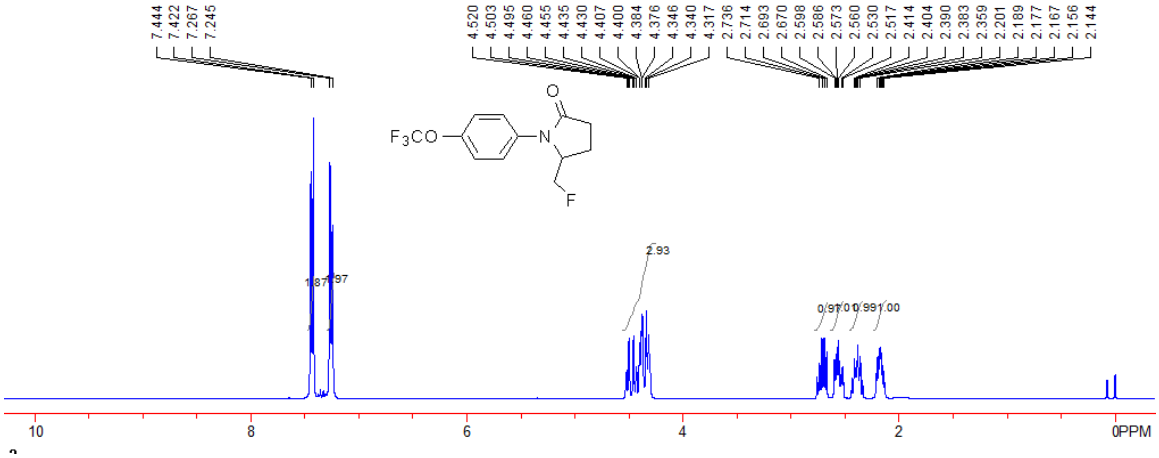
Compound **2c**

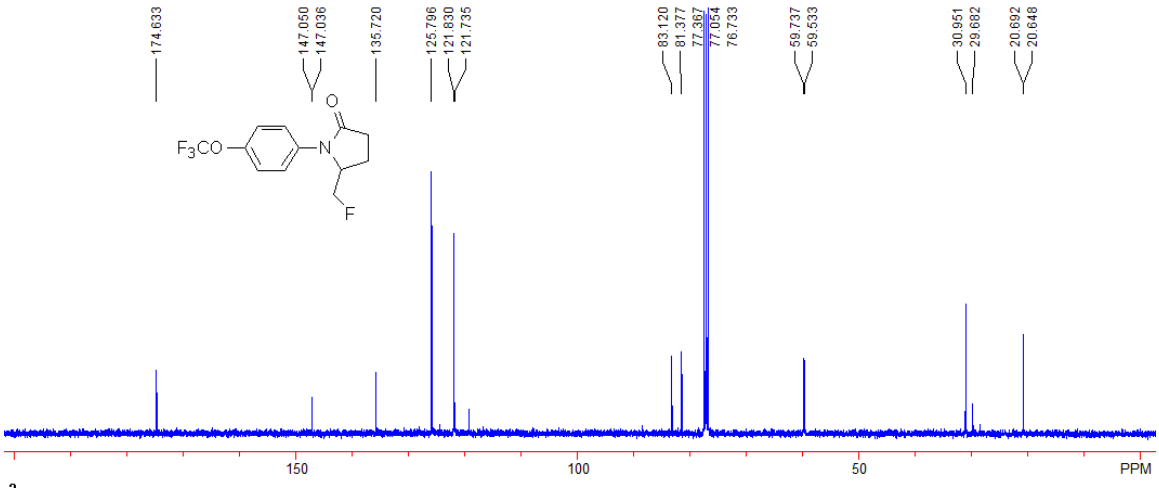

7.400
7.379
7.280
7.143
7.121
4.527
4.519
4.502
4.494
4.438
4.433
4.407
4.381
4.374
4.363
4.354
4.347
4.333
4.324
4.318
4.293
4.279
4.275
4.266
4.259
2.737
2.714
2.693
2.671
2.649
2.573
2.561
2.548
2.535
2.517
2.505
2.492
2.409
2.388
2.378
2.363
2.356
2.343
2.331
2.310
2.288
2.199
2.189
2.176
2.164
2.157
2.146
AcO
N
O
F
1.92
1.90
2.95
2.96
1.00
0.97
1.00
10
8
6
4
2
0
PPM

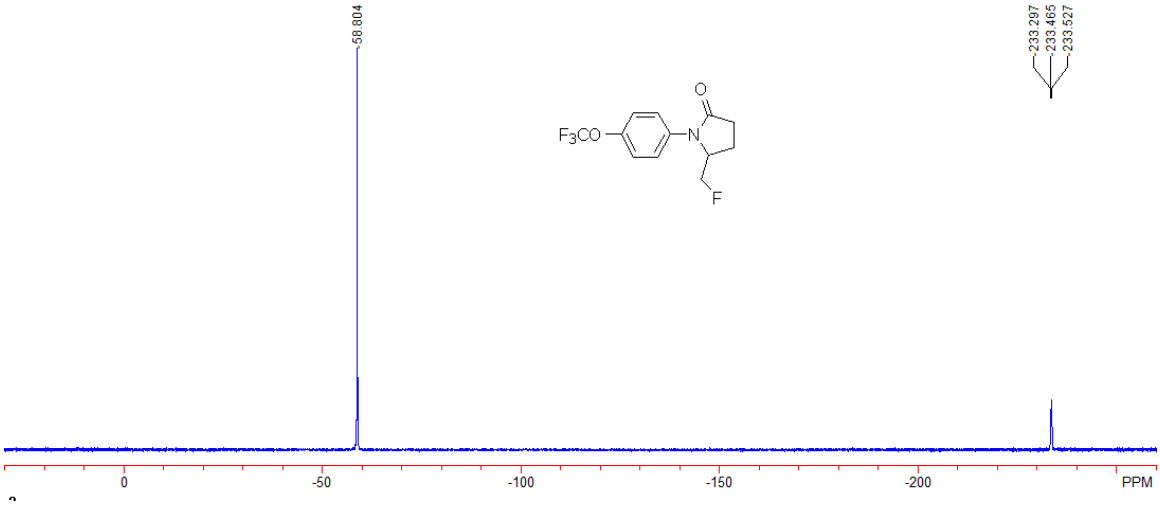

174.664
169.270
148.709
134.603
125.607
122.384
83.117
81.376
77.464
77.145
76.826
59.877
59.678
31.010
21.083
20.712
20.669
AcO
N
O
F
200
150
100
50
PPM


229.115
229.132
229.212
229.239
229.274
229.372
AcO
N
O
F
0
-50
-100
-150
-200
PPM

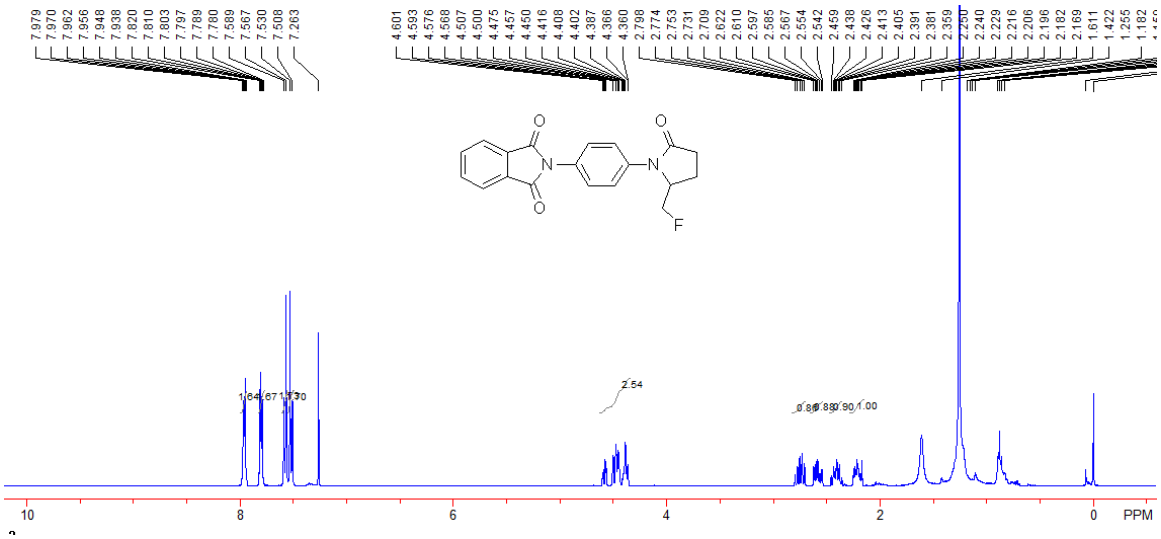
Compound **2d**

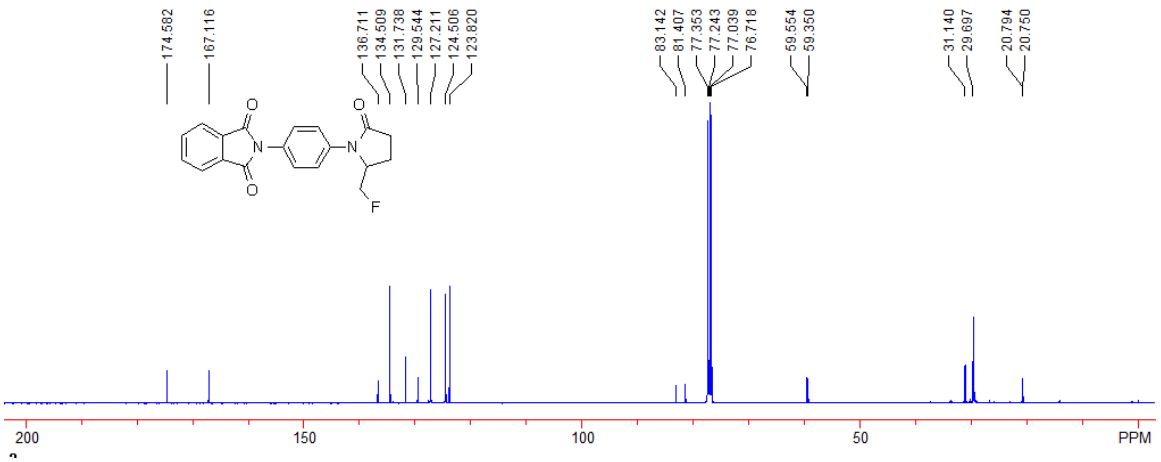

7.444
7.422
7.267
7.245
4.520
4.503
4.495
4.460
4.455
4.435
4.430
4.407
4.400
4.384
4.376
4.346
4.340
4.317
2.736
2.714
2.693
2.670
2.598
2.586
2.573
2.560
2.530
2.517
2.414
2.404
2.390
2.383
2.359
2.201
2.189
2.177
2.167
2.156
2.144
F3CO
N
O
F
2.93
1.87
1.97
0.97
1.00
0.99
1.00
10
8
6
4
2
0PPM

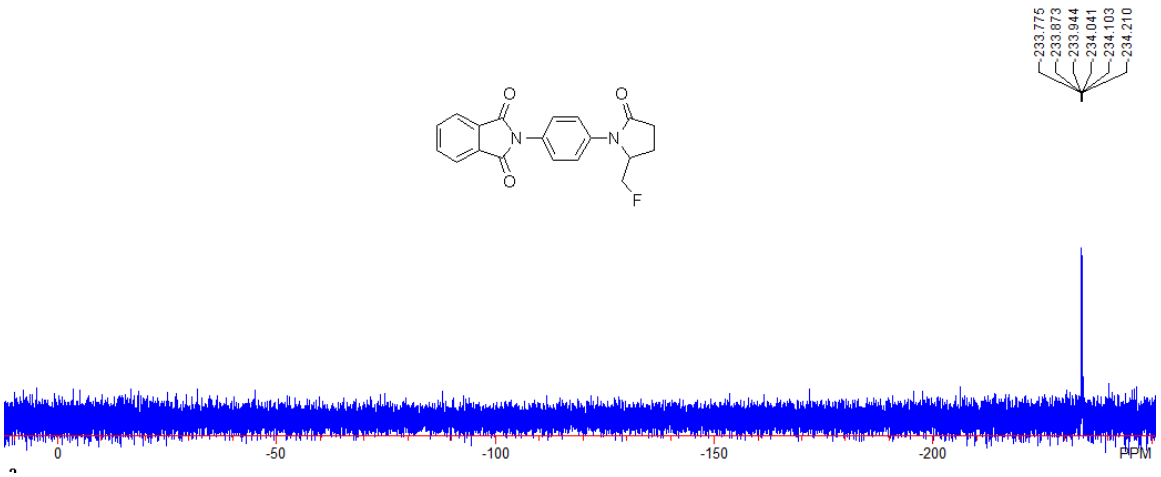

174.633
147.050
147.036
135.720
125.796
121.830
121.735
83.120
81.377
77.367
77.054
76.733
59.737
59.533
30.951
29.682
20.692
20.648
F3CO
N
O
F
150
100
50
PPM


58.804
233.297
233.465
233.527
F3CO
N
O
F
0
-50
-100
-150
-200
PPM

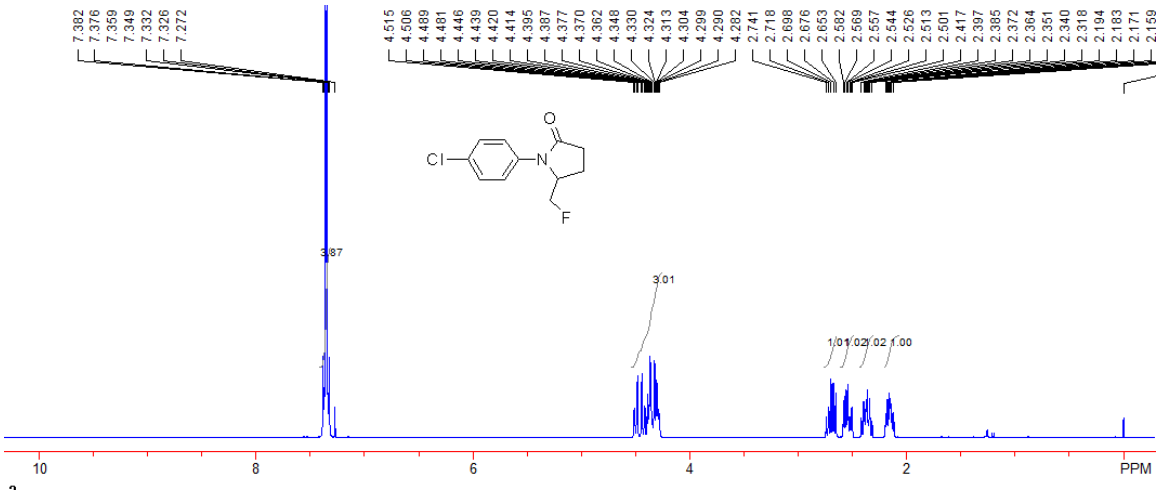
Compound **2e**

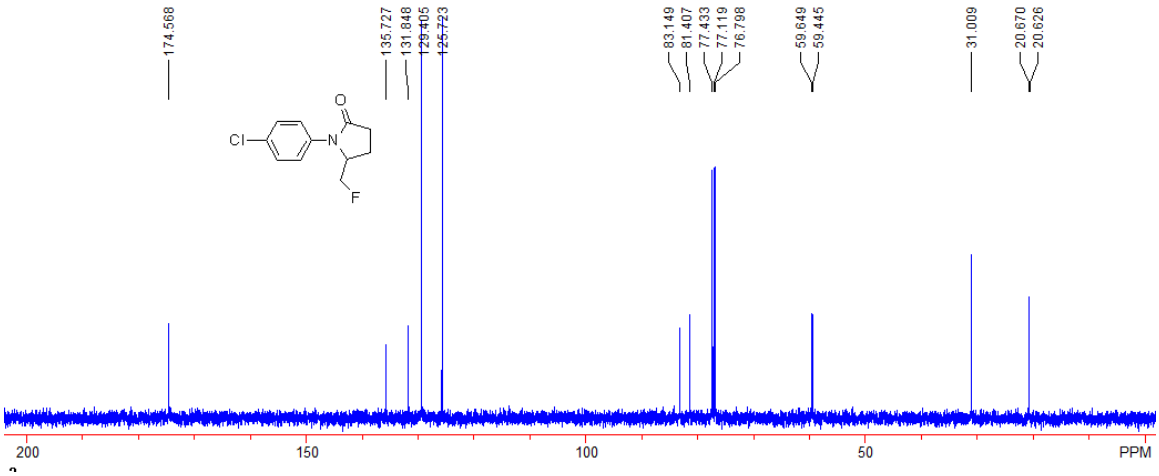

7.979
7.970
7.962
7.956
7.948
7.938
7.820
7.810
7.803
7.797
7.789
7.780
7.589
7.567
7.530
7.508
7.263
4.601
4.593
4.576
4.568
4.507
4.500
4.475
4.457
4.450
4.416
4.408
4.402
4.387
4.366
4.360
2.798
2.774
2.753
2.731
2.709
2.622
2.610
2.597
2.585
2.567
2.554
2.542
2.459
2.438
2.426
2.413
2.405
2.391
2.381
2.359
2.250
2.240
2.229
2.216
2.206
2.196
2.182
2.169
1.611
1.422
1.255
1.182
1.64
1.67
1.730
2.54
0.88
0.90
1.00
10
8
6
4
2
0
PPM

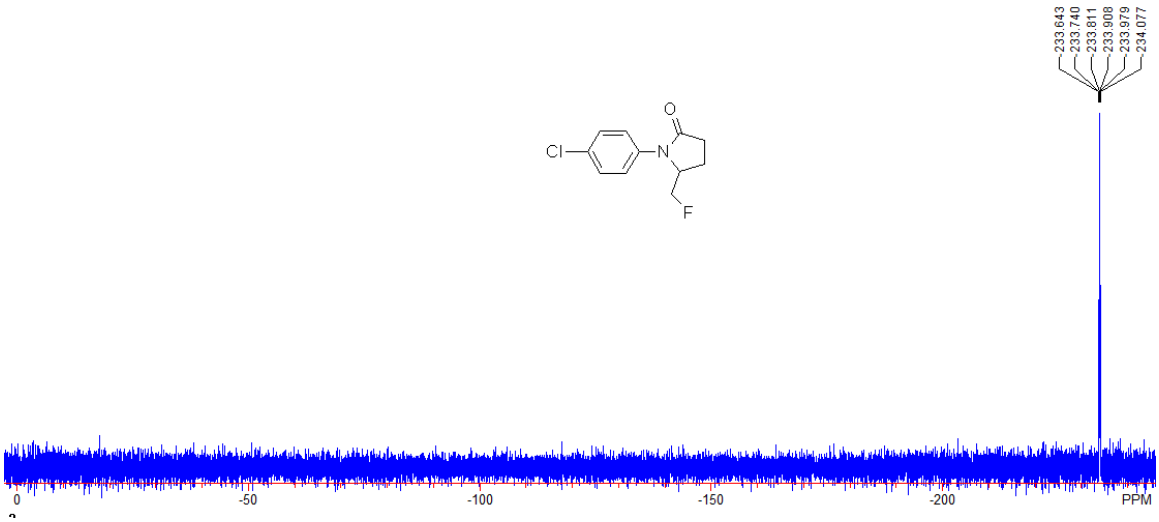

174.582
167.116
136.711
134.509
131.738
129.544
127.211
124.506
123.820
83.142
81.407
77.353
77.243
77.039
76.718
59.554
59.350
31.140
29.697
20.794
20.750
200
150
100
50
PPM


233.775
233.873
233.944
234.041
234.103
234.210
0
-50
-100
-150
-200
PPM

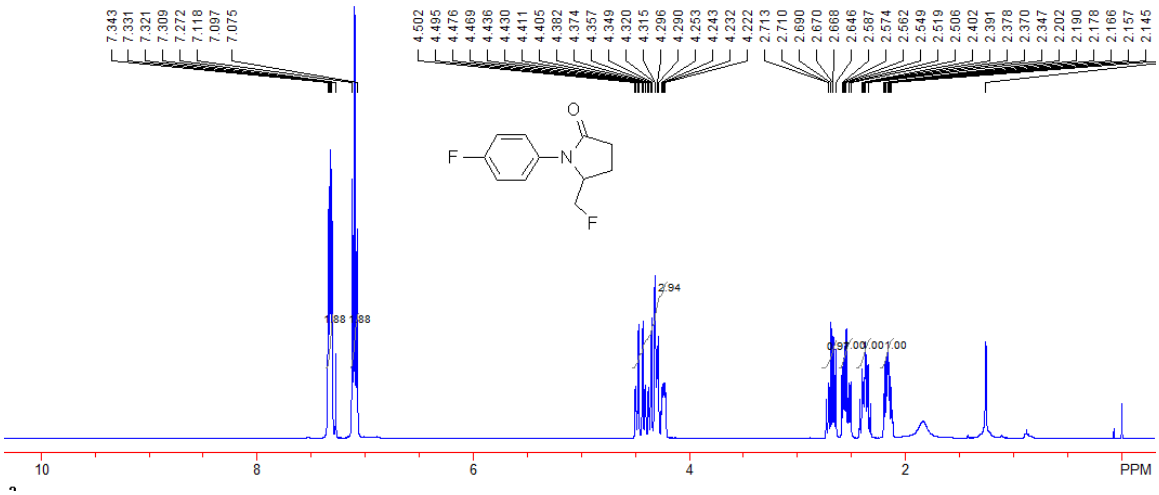
Compound **2f**

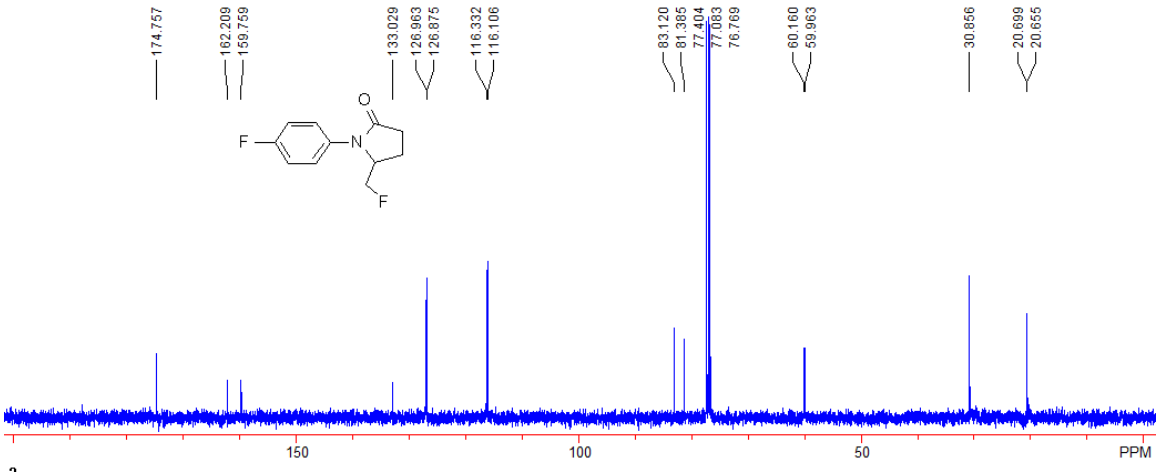

7.382
7.376
7.359
7.349
7.332
7.326
7.272
4.515
4.506
4.489
4.481
4.446
4.439
4.420
4.414
4.395
4.387
4.377
4.370
4.362
4.348
4.330
4.324
4.313
4.304
4.299
4.290
4.282
2.741
2.718
2.698
2.676
2.653
2.582
2.569
2.557
2.544
2.526
2.513
2.501
2.417
2.397
2.385
2.372
2.364
2.351
2.340
2.318
2.194
2.183
2.171
2.159
Cl
N
O
F
3.87
3.01
1.01
2.02
2.02
1.00
10
8
6
4
2
PPM

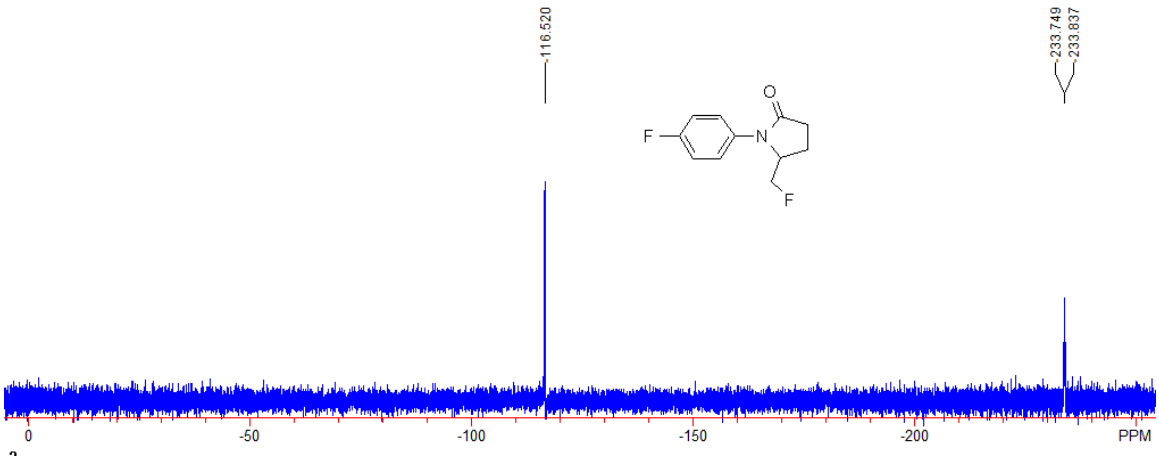

174.568
135.727
131.848
129.405
125.723
83.149
81.407
77.433
77.119
76.798
59.649
59.445
31.009
20.670
20.626
Cl
N
O
F
200
150
100
50
PPM


233.643
233.740
233.811
233.908
233.979
234.077
Cl
N
O
F
0
-50
-100
-150
-200
PPM

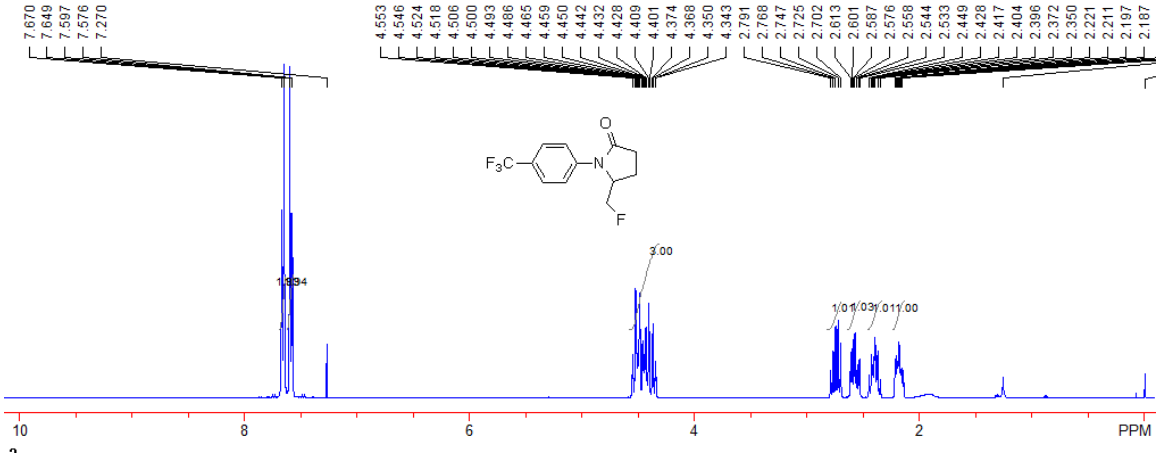
Compound **2g**

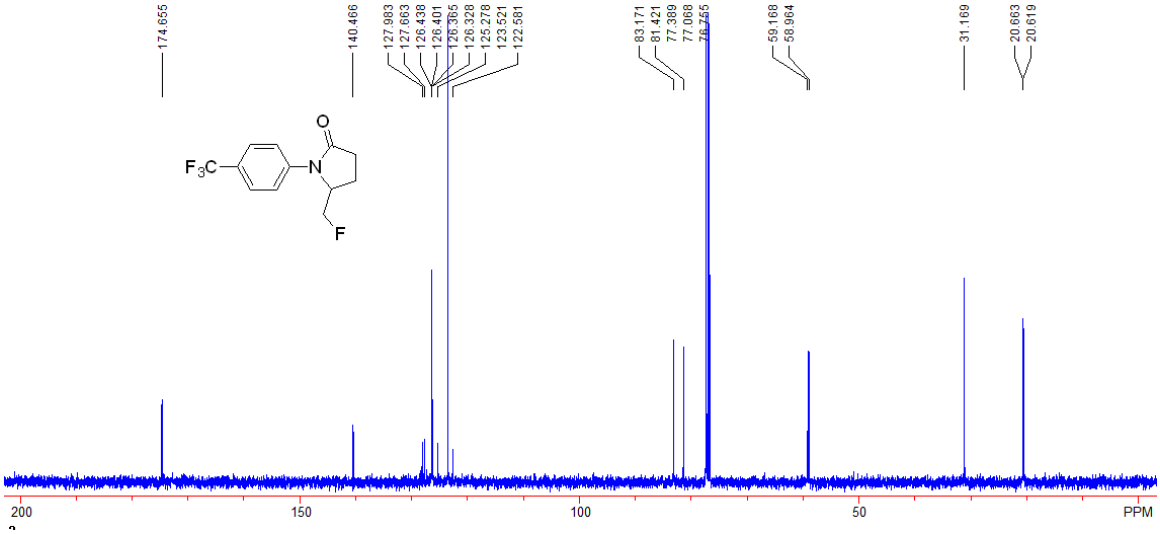

7.343
7.331
7.321
7.309
7.272
7.118
7.097
7.075
4.502
4.495
4.476
4.469
4.436
4.430
4.411
4.405
4.382
4.374
4.357
4.349
4.320
4.315
4.296
4.290
4.253
4.243
4.232
4.222
2.713
2.710
2.690
2.670
2.668
2.646
2.587
2.574
2.562
2.549
2.519
2.506
2.402
2.391
2.378
2.370
2.347
2.202
2.190
2.178
2.166
2.157
2.145
F
O
N
F
1.88
1.88
2.94
0.97
0.97
1.00
1.00
10
8
6
4
2
PPM

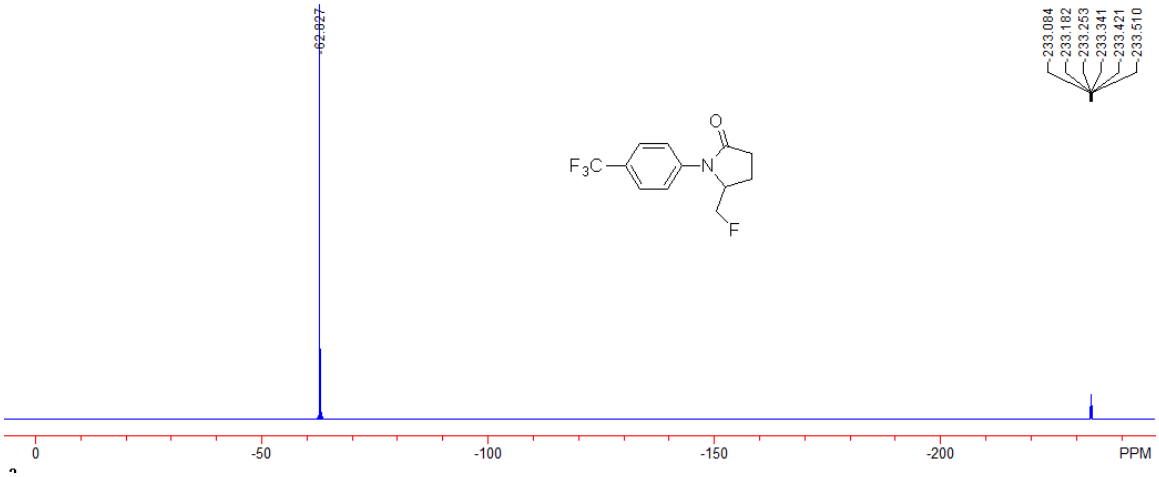

174.757
162.209
159.759
133.029
126.963
126.875
116.332
116.106
83.120
81.385
77.404
77.083
76.769
60.160
59.963
30.856
20.699
20.655
F
O
N
F
150
100
50
PPM


116.520
233.749
233.837
F
O
N
F
0
-50
-100
-150
-200
PPM

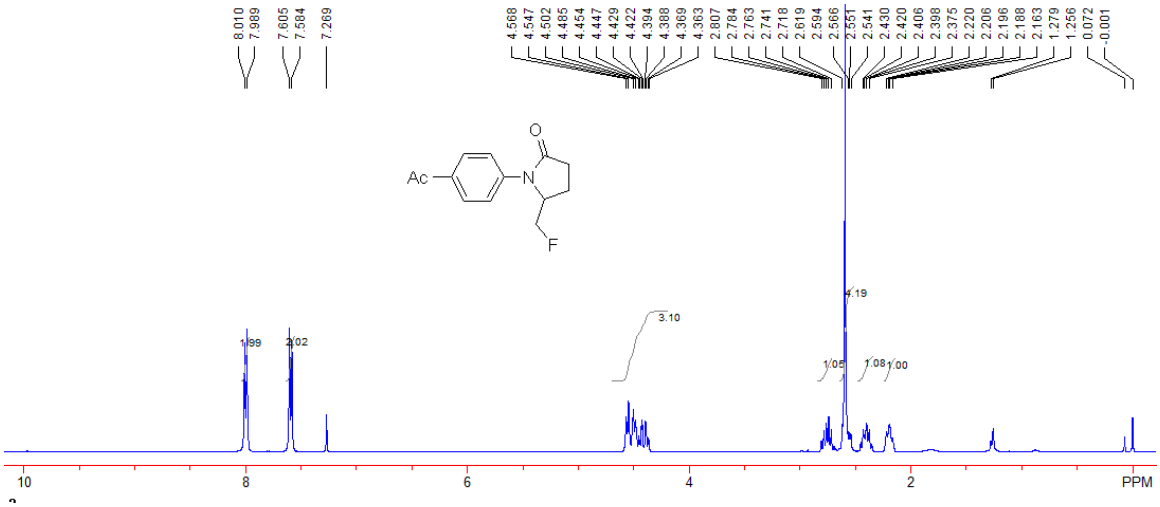
Compound **2h**


7.670
7.649
7.597
7.576
7.270
4.553
4.546
4.524
4.518
4.506
4.500
4.493
4.486
4.465
4.459
4.450
4.442
4.432
4.428
4.409
4.401
4.374
4.368
4.350
4.343
2.791
2.768
2.747
2.725
2.702
2.613
2.601
2.587
2.576
2.558
2.544
2.533
2.449
2.428
2.417
2.404
2.396
2.372
2.350
2.221
2.211
2.197
2.187
3.00
1.01
1.03
1.01
1.00
10
8
6
4
2
PPM


174.655
140.466
127.983
127.663
126.438
126.401
126.385
126.328
125.278
123.521
122.581
83.171
81.421
77.389
77.068
76.755
59.168
58.964
31.169
20.663
20.619
200
150
100
50
PPM


62.827
233.084
233.182
233.253
233.341
233.421
233.510
0
-50
-100
-150
-200
PPM

Compound **2i**


8.010
7.989
7.605
7.584
7.269
4.568
4.547
4.502
4.485
4.454
4.447
4.429
4.422
4.394
4.388
4.369
4.363
2.807
2.784
2.763
2.741
2.718
2.619
2.594
2.566
2.551
2.541
2.430
2.420
2.406
2.398
2.375
2.220
2.206
2.196
2.188
2.163
1.279
1.256
0.072
-0.001
Ac
N
O
F
1.99
2.02
3.10
4.19
1.05
1.08
1.00
10
8
6
4
2
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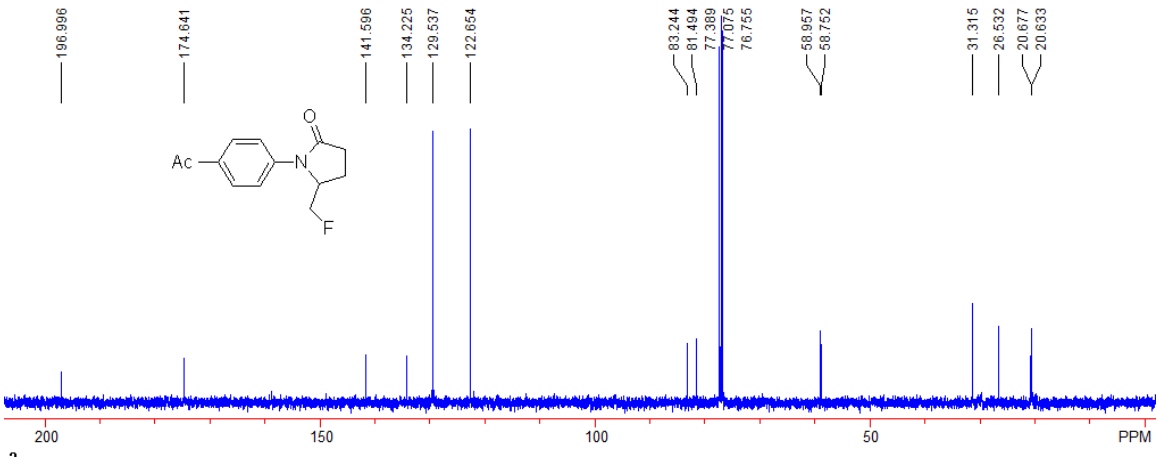
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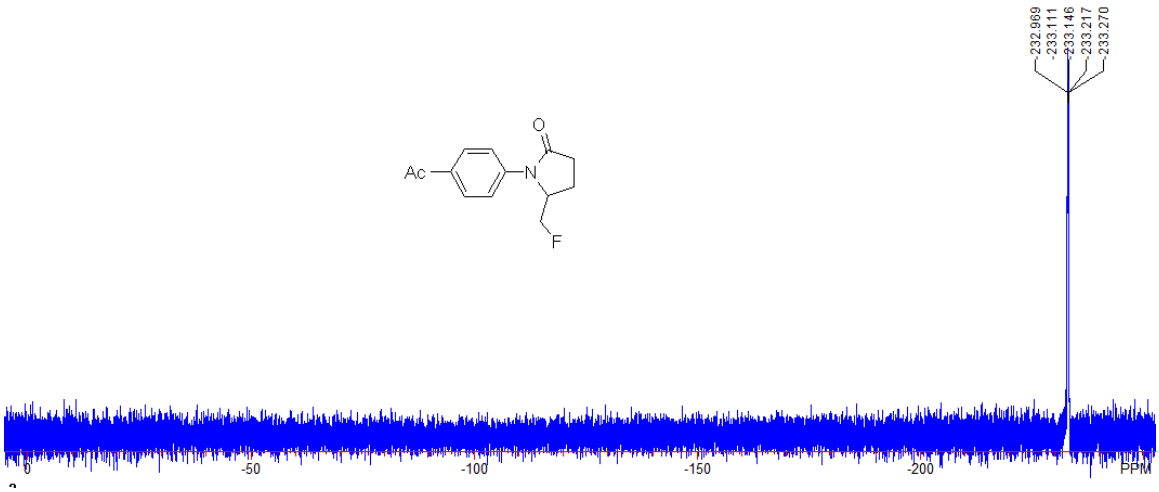
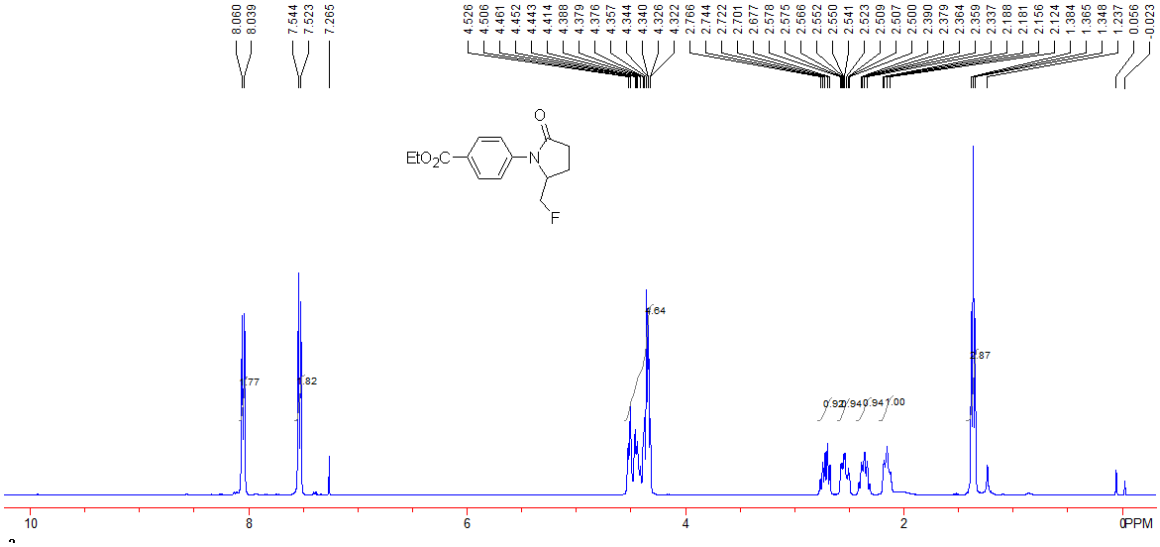
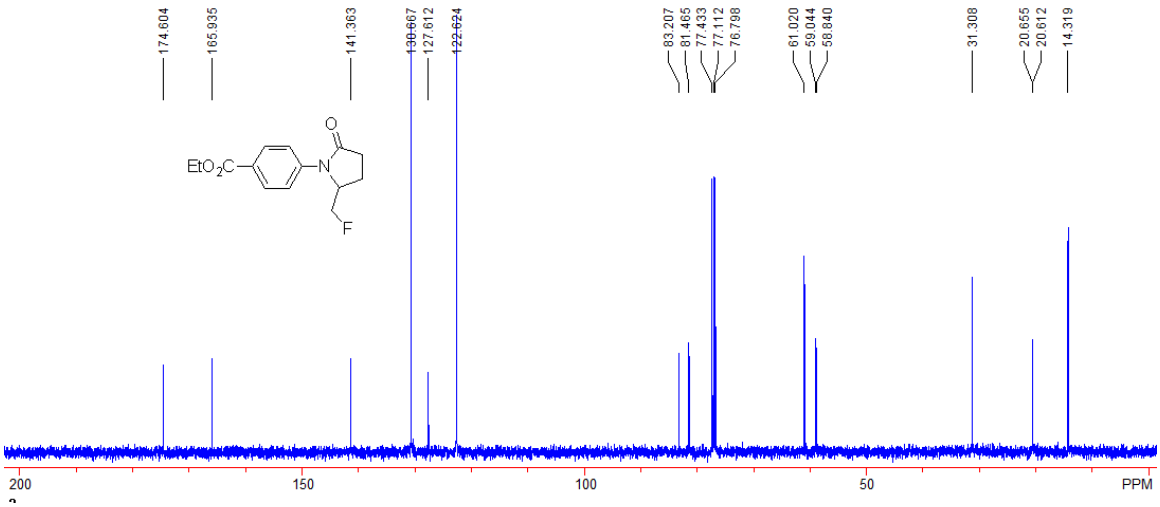
174.641
141.596
134.225
129.537
122.654
83.244
81.494
77.389
77.075
76.755
58.957
58.752
31.315
26.532
20.677
20.633
Ac
N
O
F
200
150
100
50
PPM


232.969
233.111
233.146
233.217
233.270
Ac
N
O
F
0
-50
-100
-150
-200
PPM

Compound **2j**


8.060
8.039
7.544
7.523
7.265
4.526
4.506
4.461
4.452
4.443
4.414
4.388
4.379
4.376
4.357
4.344
4.340
4.326
4.322
2.766
2.744
2.722
2.701
2.677
2.578
2.575
2.566
2.552
2.550
2.541
2.523
2.509
2.507
2.500
2.390
2.379
2.364
2.359
2.337
2.188
2.181
2.156
2.124
1.384
1.365
1.348
1.237
0.056
-0.023
EtO2C
N
O
F
1.77
1.82
3.64
0.92
0.94
0.94
1.00
2.87
10
8
6
4
2
0
PPM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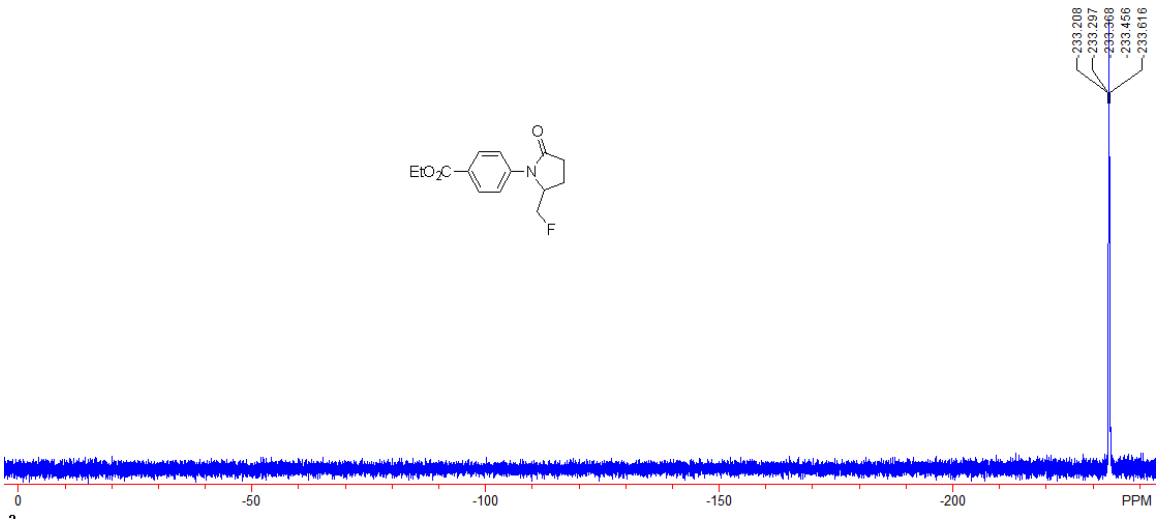
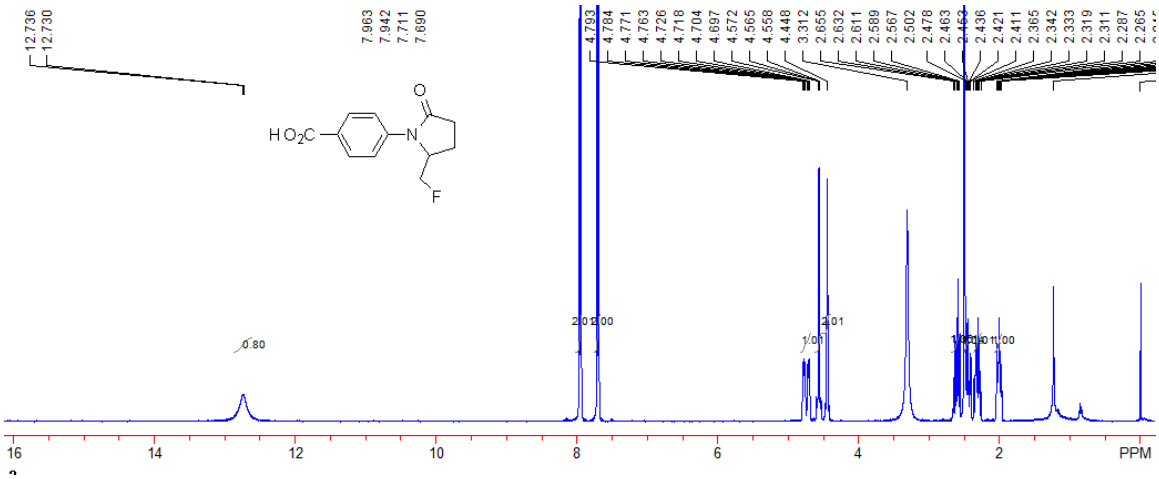
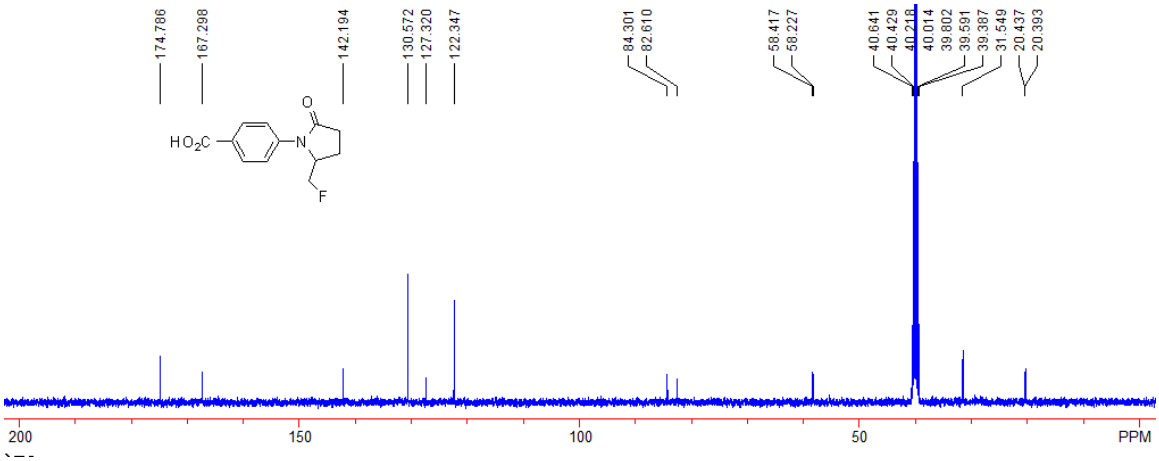
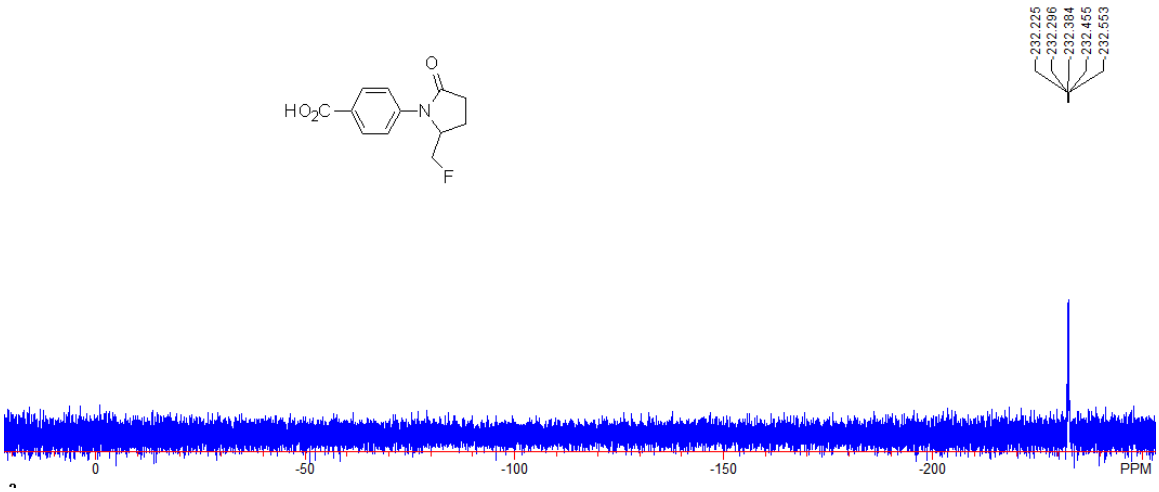
165.935
141.363
130.667
127.612
122.624
83.207
81.465
77.433
77.112
76.798
61.020
59.044
58.840
31.308
20.655
20.612
14.319
EtO2C
N
O
F
200
150
100
50
PPM


-233.208
-233.297
-233.368
-233.456
-233.616
EtO2C
N
O
F
0
-50
-100
-150
-200
PPM

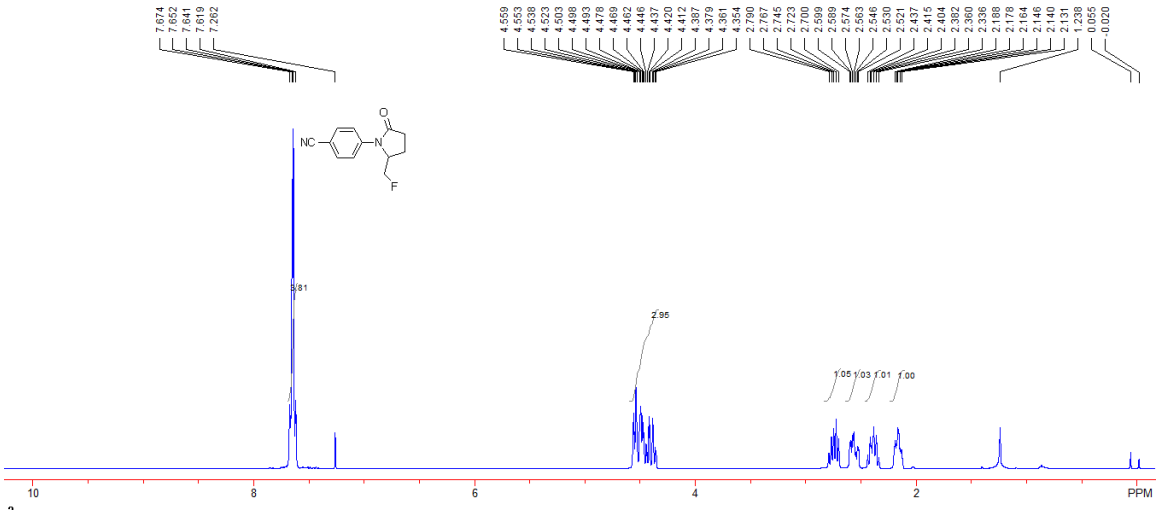
Compound **2k**

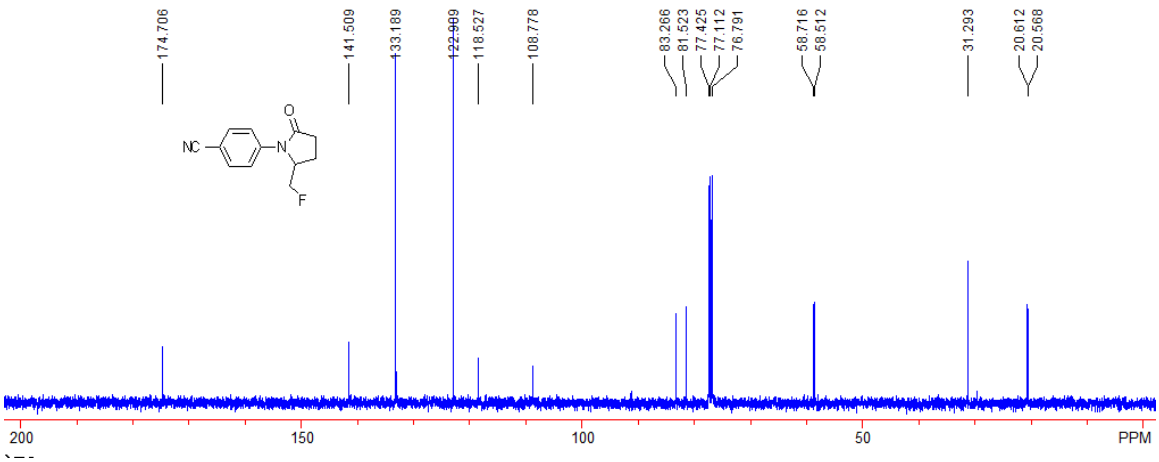

12.736
12.730
7.963
7.942
7.711
7.690
4.793
4.784
4.771
4.763
4.726
4.718
4.704
4.697
4.572
4.565
4.558
4.448
3.312
2.655
2.632
2.611
2.589
2.567
2.502
2.478
2.463
2.436
2.421
2.411
2.365
2.342
2.333
2.319
2.311
2.287
HO2C
O
N
F
0.80
2.00
2.01
1.00
16
14
12
10
8
6
4
2
PPM

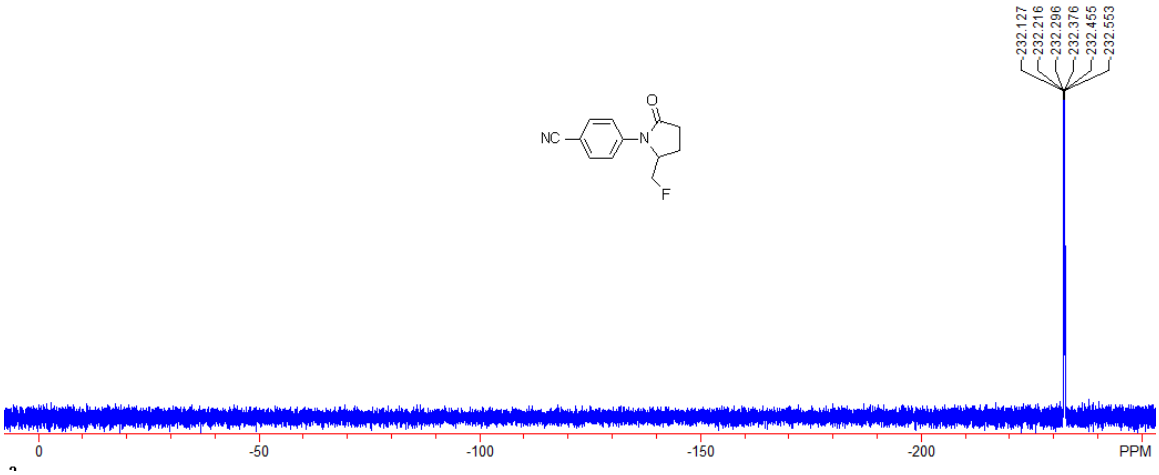

174.786
167.298
142.194
130.572
127.320
122.347
84.301
82.610
58.417
58.227
40.641
40.429
40.218
40.014
39.802
39.591
39.387
31.549
20.437
20.393
HO2C
O
N
F
200
150
100
50
PPM


232.225
232.296
232.384
232.455
232.553
HO2C
O
N
F
0
-50
-100
-150
-200
PPM

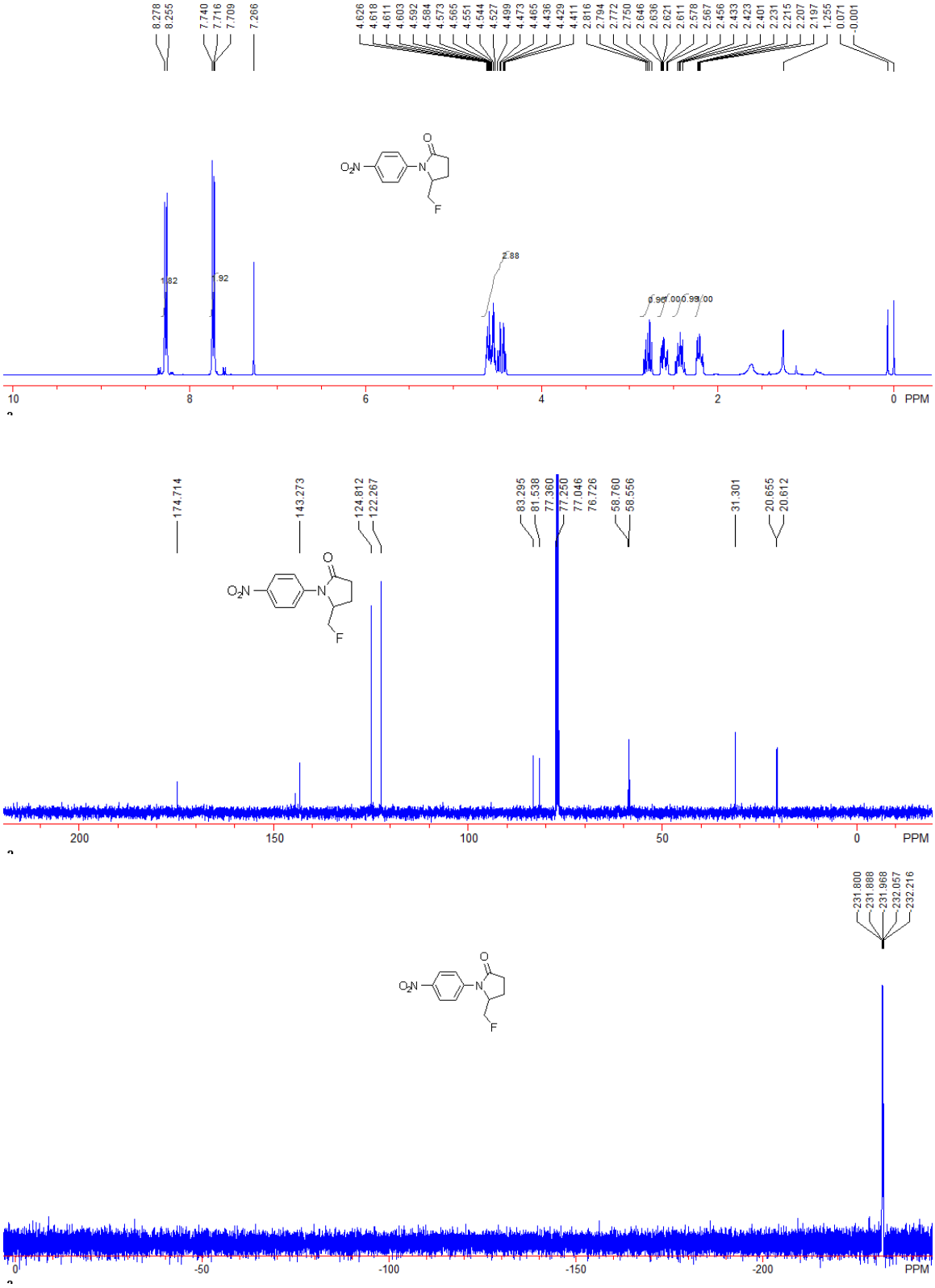
Compound **2l**


7.674
7.652
7.641
7.619
7.262
4.559
4.553
4.538
4.523
4.503
4.498
4.493
4.478
4.469
4.462
4.446
4.437
4.420
4.412
4.387
4.379
4.361
4.354
2.790
2.767
2.745
2.723
2.700
2.599
2.589
2.574
2.563
2.546
2.530
2.521
2.437
2.415
2.404
2.382
2.360
2.338
2.168
2.164
2.146
2.140
2.131
1.238
0.055
0.020
NC
O
N
F
5.81
2.95
1.05
1.03
1.01
1.00
10
8
6
4
2
PPM

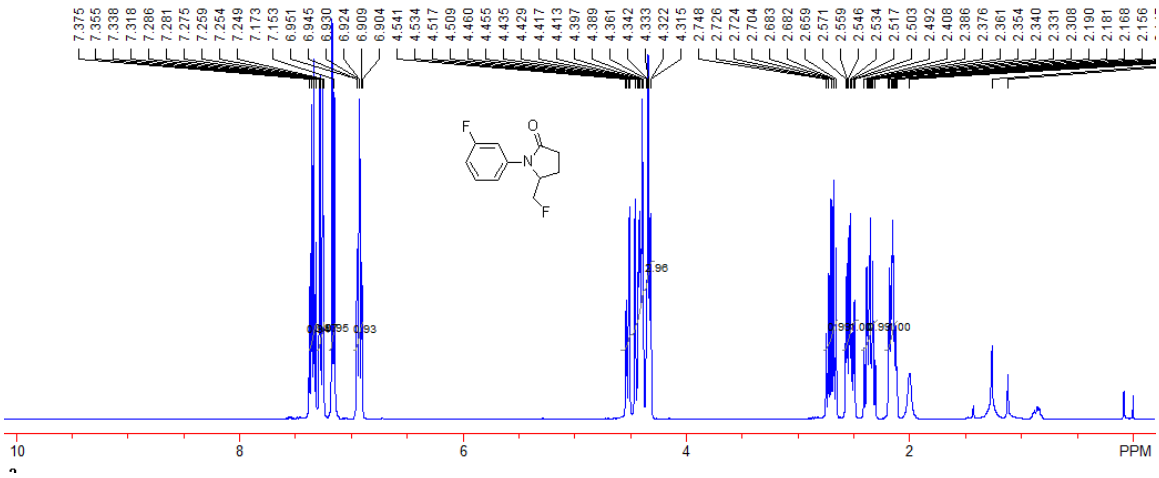

174.706
141.509
133.189
122.989
118.527
108.778
83.266
81.523
77.425
77.112
76.791
58.716
58.512
31.293
20.612
20.568
NC
O
N
F
200
150
100
50
PPM

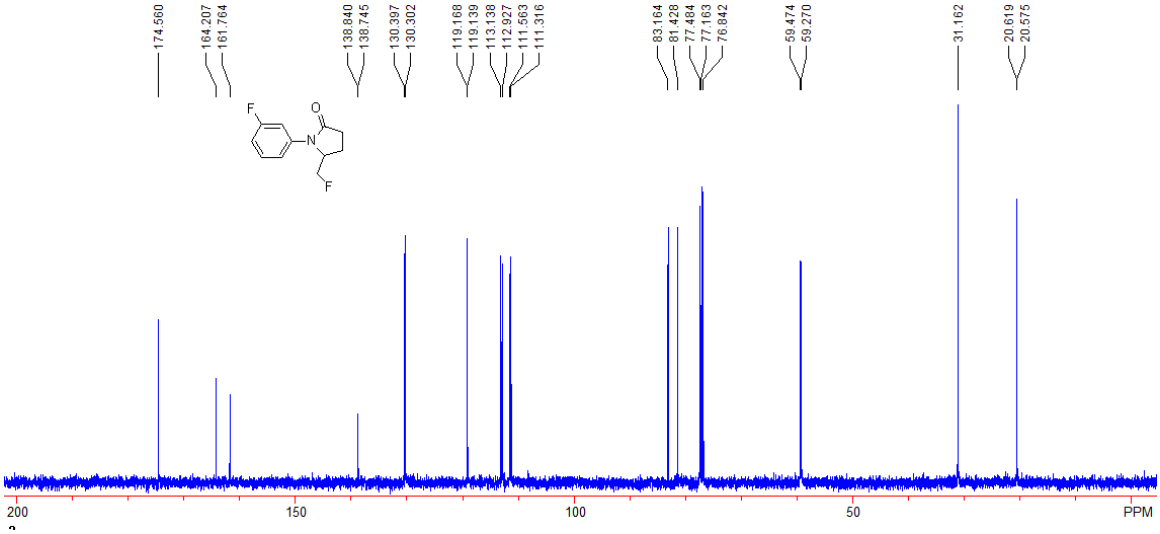

232.127
232.216
232.296
232.376
232.455
232.553
NC
O
N
F
0
-50
-100
-150
-200
PPM

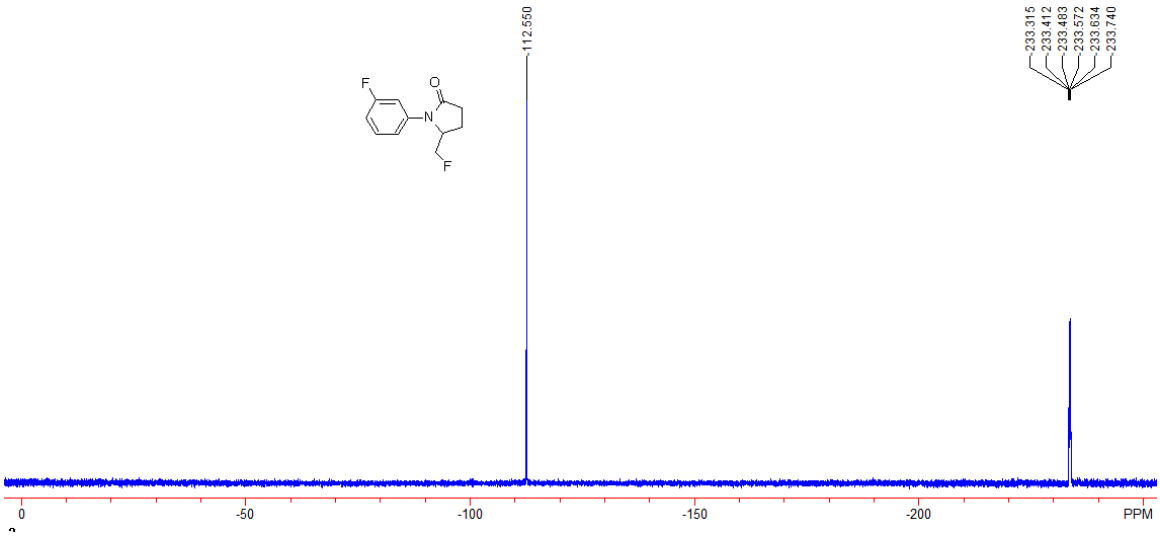
Compound **2m**


8.278
8.255
7.740
7.716
7.709
7.266
4.626
4.618
4.611
4.603
4.592
4.584
4.573
4.565
4.551
4.544
4.527
4.499
4.473
4.465
4.436
4.429
4.411
2.816
2.794
2.772
2.750
2.646
2.636
2.621
2.611
2.578
2.567
2.456
2.433
2.423
2.401
2.231
2.215
2.207
2.197
1.255
0.071
-0.001
O2N
O
N
F
1.82
1.92
2.88
0.98
1.00
0.99
1.00
10
8
6
4
2
0
PPM
174.714
143.273
124.812
122.267
83.295
81.538
77.360
77.250
77.046
76.726
58.760
58.556
31.301
20.655
20.612
200
150
100
50
0
PPM
231.800
231.888
231.968
232.057
232.216
0
-50
-100
-150
-200
PPM

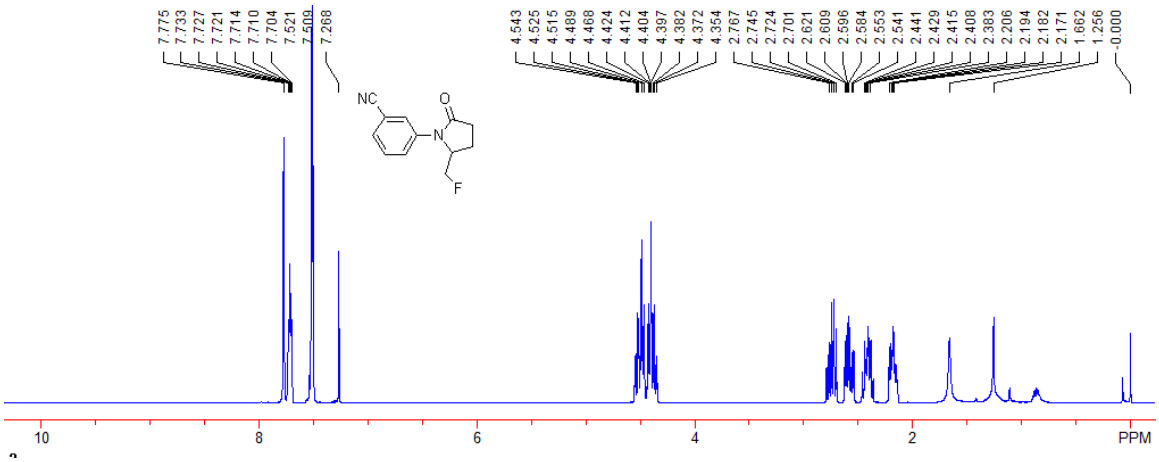
Compound **4a**

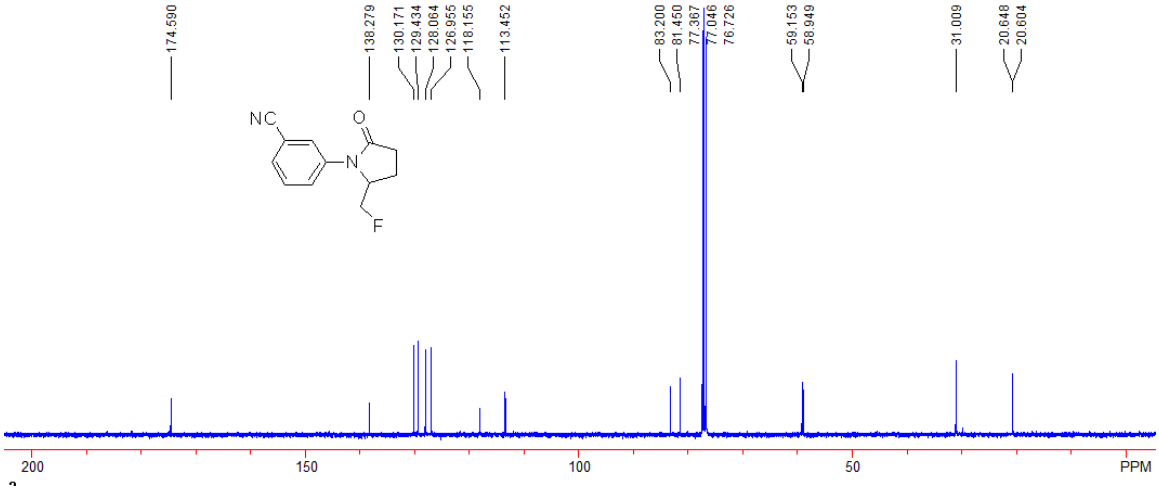

7.375
7.355
7.338
7.318
7.286
7.281
7.275
7.259
7.254
7.249
7.173
7.153
6.951
6.945
6.930
6.924
6.909
6.904
4.541
4.534
4.517
4.509
4.460
4.455
4.435
4.429
4.417
4.413
4.397
4.389
4.361
4.342
4.333
4.322
4.315
2.748
2.726
2.724
2.704
2.683
2.682
2.659
2.571
2.559
2.546
2.534
2.517
2.503
2.492
2.408
2.386
2.376
2.361
2.354
2.340
2.331
2.308
2.190
2.181
2.168
2.156
F
O
N
F
3.96
6.95
6.93
3.99
3.00
10
8
6
4
2
PPM

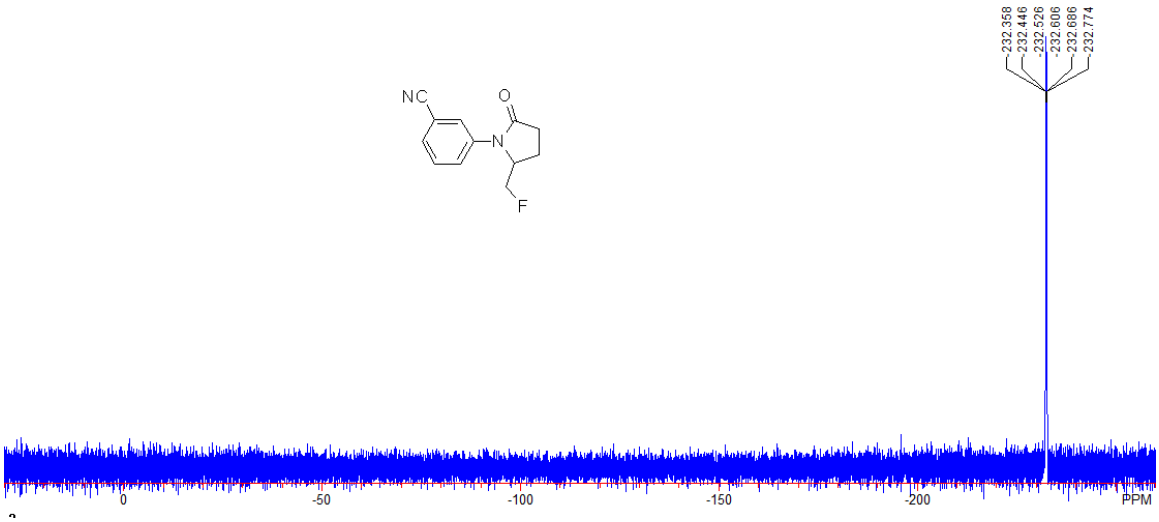

174.560
164.207
161.764
138.840
138.745
130.397
130.302
119.168
119.139
113.138
112.927
111.563
111.316
83.164
81.428
77.484
77.163
76.842
59.474
59.270
31.162
20.619
20.575
F
O
N
F
200
150
100
50
PPM


112.550
233.315
233.412
233.483
233.572
233.634
233.740
F
O
N
F
0
-50
-100
-150
-200
PPM

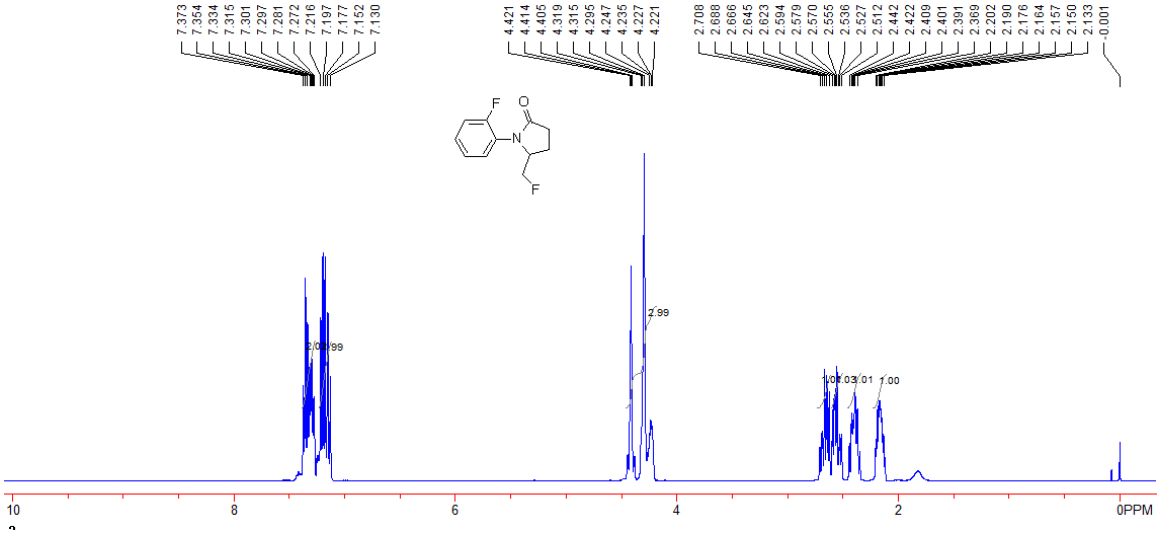
Compound **4b**


7.775
7.733
7.727
7.721
7.714
7.710
7.704
7.521
7.509
7.268
4.543
4.525
4.515
4.489
4.468
4.424
4.412
4.404
4.397
4.382
4.372
4.354
2.767
2.745
2.724
2.701
2.621
2.609
2.596
2.584
2.553
2.541
2.441
2.429
2.415
2.408
2.383
2.206
2.194
2.182
2.171
1.662
1.256
-0.000
NC
O
N
F
10
8
6
4
2
PPM


174.590
138.279
130.171
129.434
128.064
126.955
118.155
113.452
83.200
81.450
77.367
77.046
76.726
59.153
58.949
31.009
20.648
20.604
NC
O
N
F
200
150
100
50
PPM


-232.358
-232.446
-232.526
-232.606
-232.686
-232.774
NC
O
N
F
0
-50
-100
-150
-200
PPM

Compound **4c**


7.373
7.354
7.334
7.315
7.301
7.297
7.281
7.272
7.216
7.197
7.177
7.152
7.130
4.421
4.414
4.405
4.319
4.315
4.295
4.247
4.235
4.227
4.221
2.708
2.688
2.666
2.645
2.623
2.594
2.579
2.570
2.555
2.536
2.527
2.512
2.442
2.422
2.409
2.401
2.391
2.369
2.202
2.190
2.176
2.164
2.157
2.150
2.133
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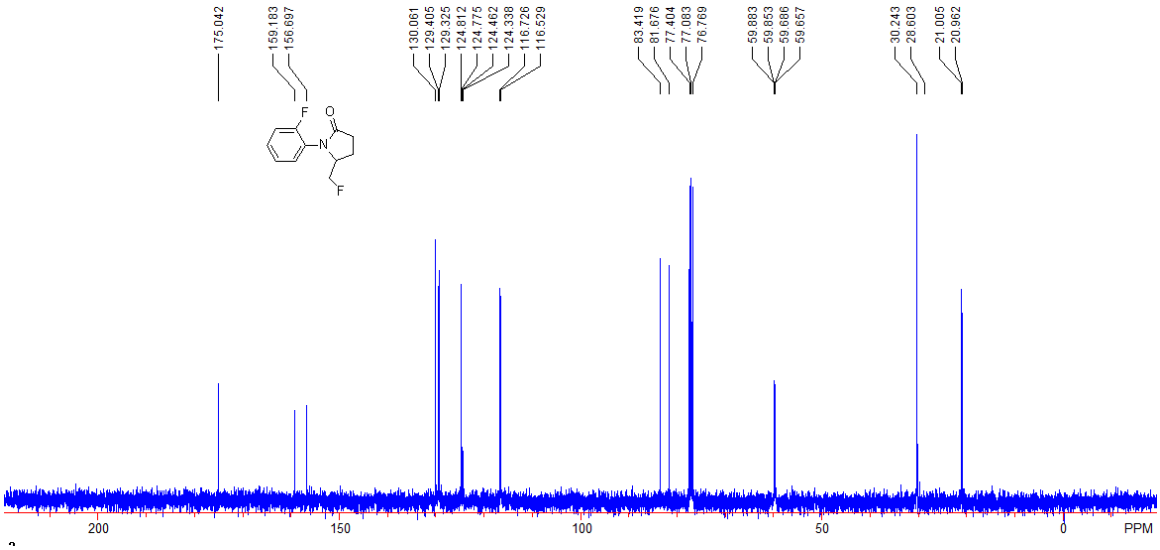
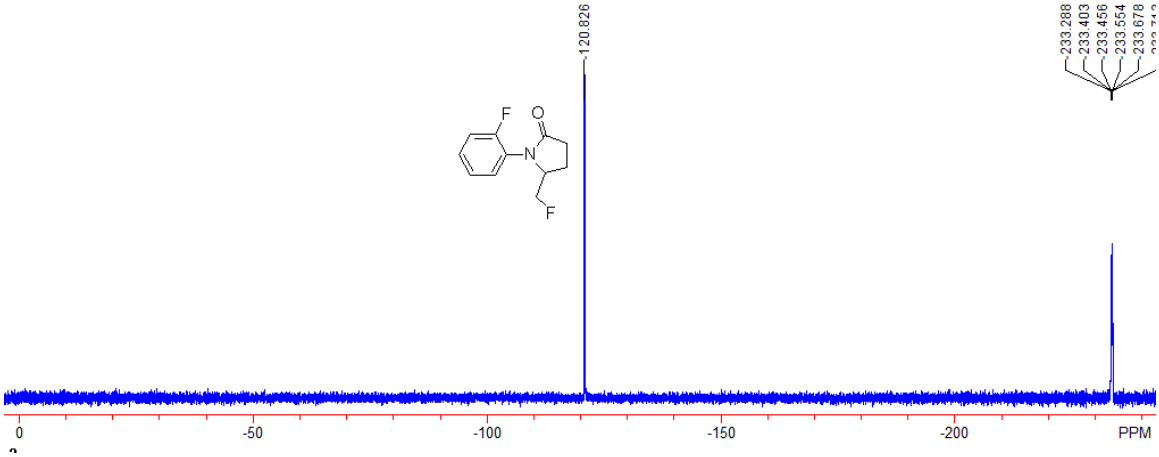
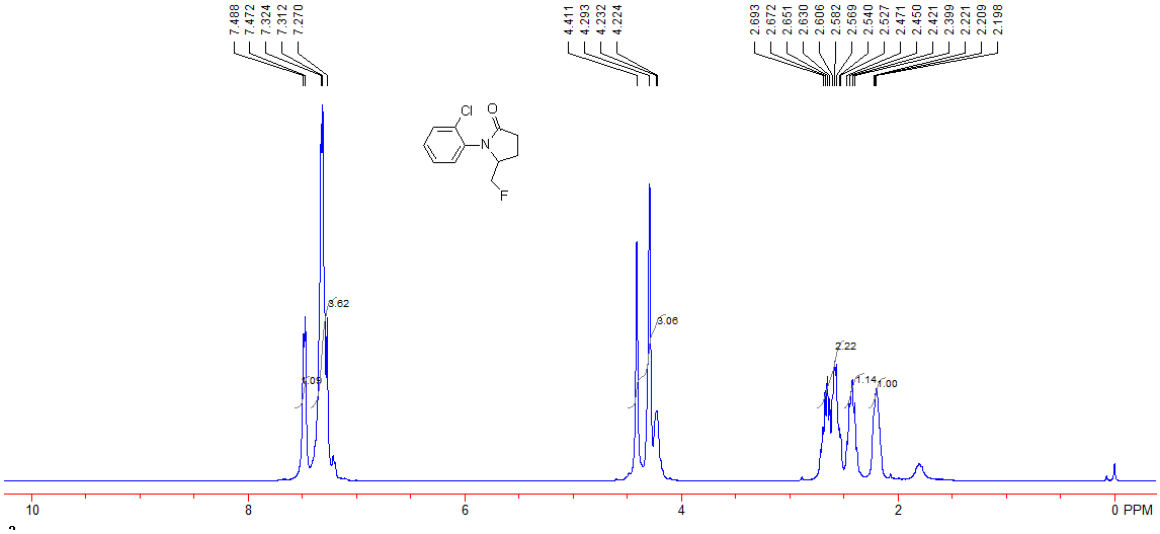
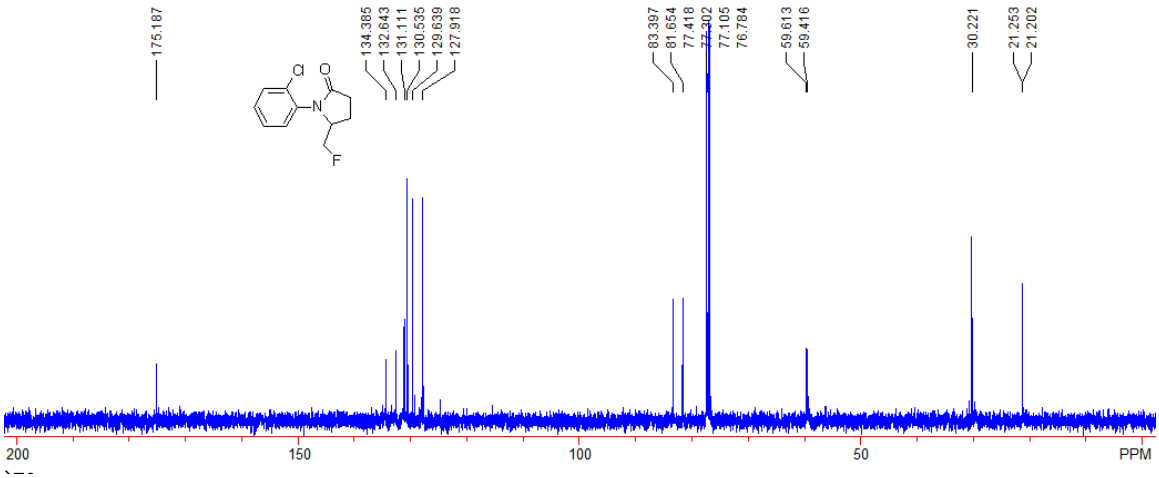
F
O
N
F
2.99
1.03
1.01
1.00
10
8
6
4
2
0PPM

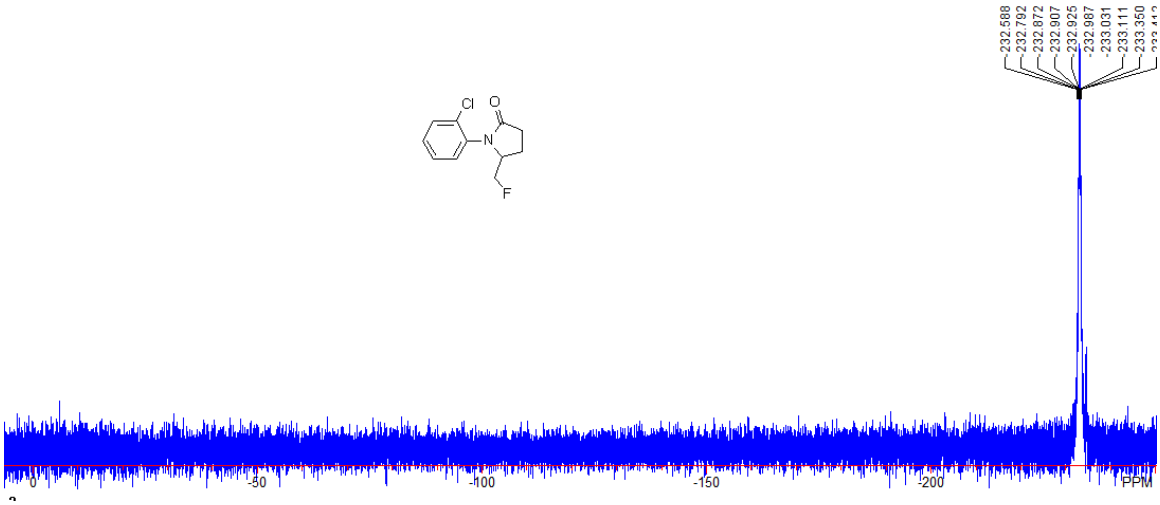

175.042
159.183
156.697
130.061
129.405
129.325
124.812
124.775
124.462
124.338
116.726
116.529
83.419
81.676
77.404
77.083
76.769
59.883
59.853
59.686
59.657
30.243
28.603
21.005
20.962
F
O
N
F
200
150
100
50
0
PPM


120.826
233.288
233.403
233.456
233.554
233.678
F
O
N
F
0
-50
-100
-150
-200
PPM

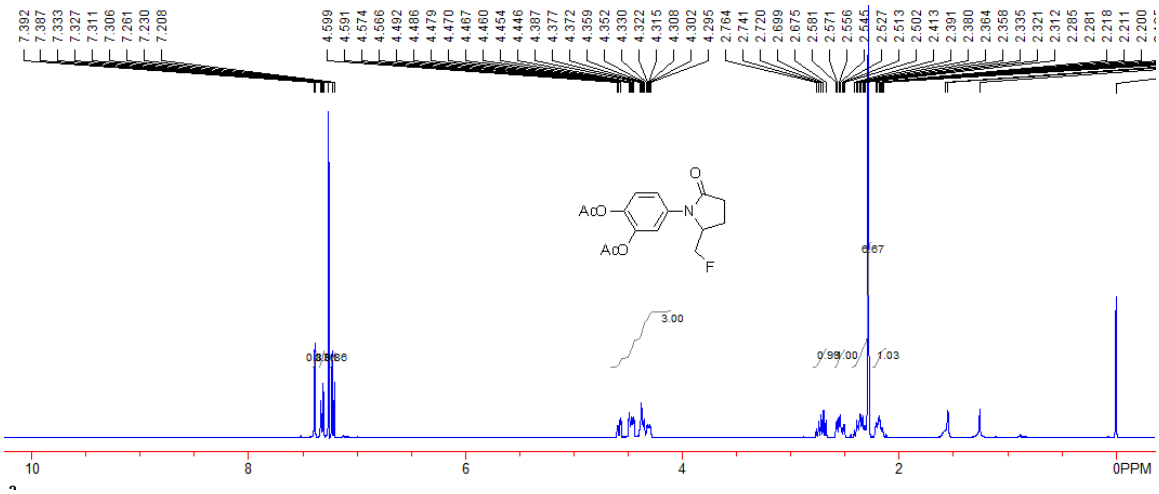
Compound **4d**

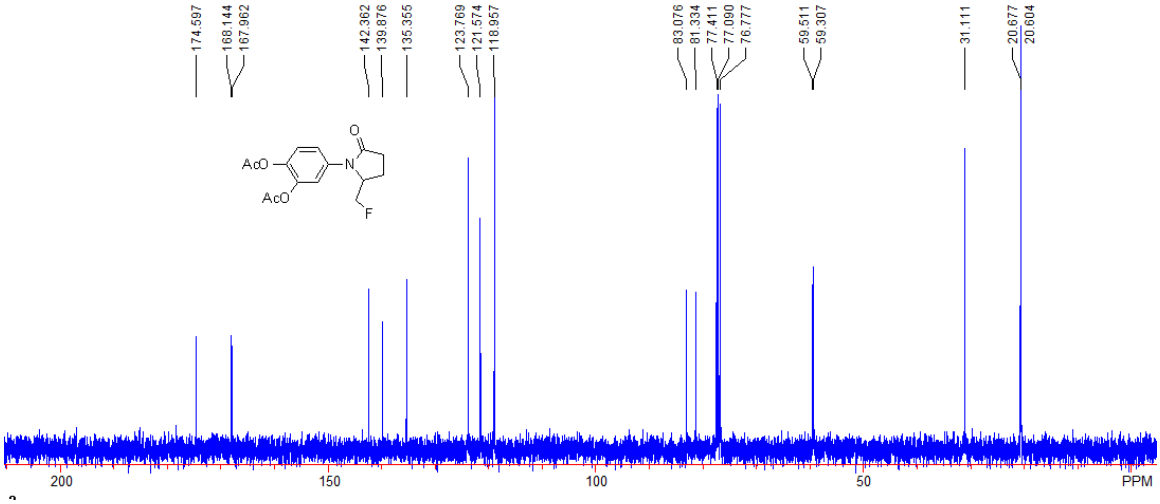

7.488
7.472
7.324
7.312
7.270
4.411
4.293
4.232
4.224
2.693
2.672
2.651
2.630
2.606
2.582
2.569
2.540
2.527
2.471
2.450
2.421
2.399
2.221
2.209
2.198
Cl
O
N
F
3.62
3.06
2.22
1.14
1.00
1.09
10
8
6
4
2
0 PPM

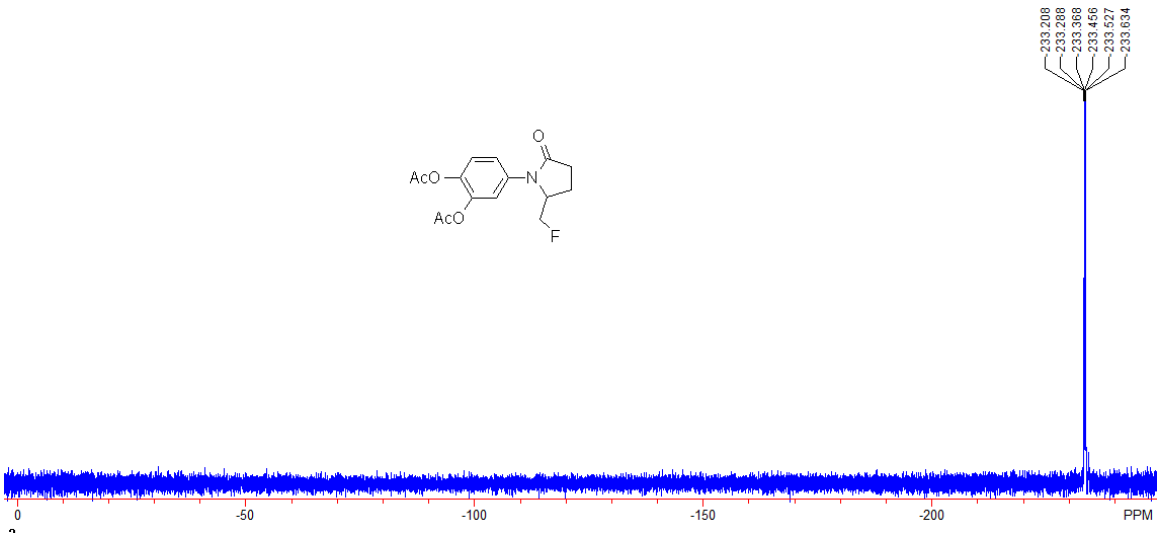

175.187
134.385
132.643
131.111
130.535
129.639
127.918
83.397
81.654
77.418
77.202
77.105
76.784
59.613
59.416
30.221
21.253
21.202
Cl
O
N
F
200
150
100
50
PPM


232.588
232.792
232.872
232.907
232.925
232.987
233.031
233.111
233.350
Cl
O
N
F
0
-50
-100
-150
-200
PPM

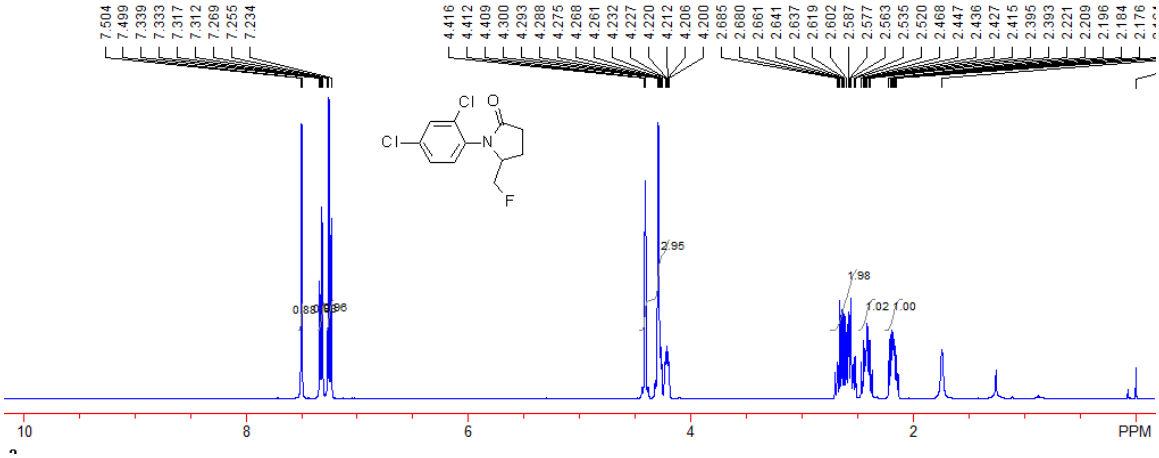
Compound **4e**

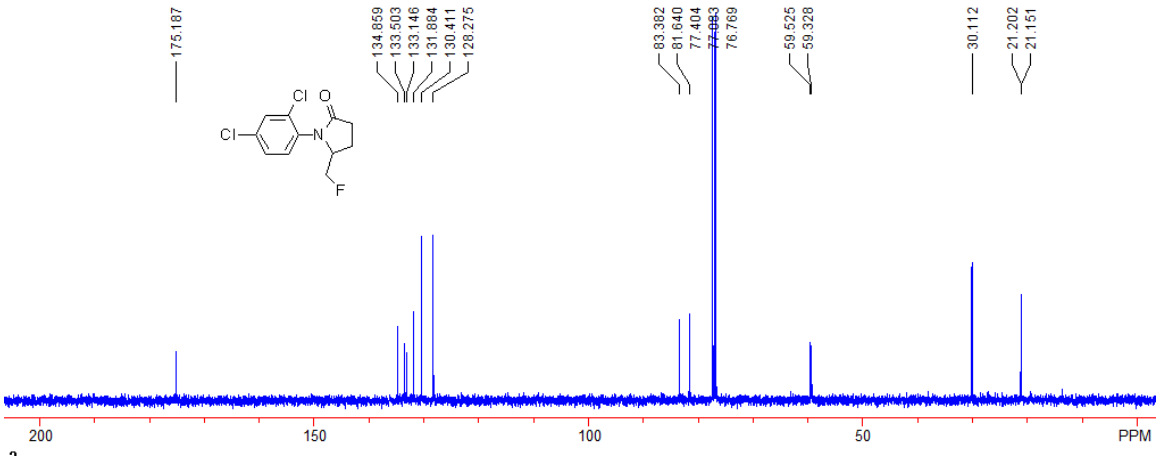

7.392
7.387
7.333
7.327
7.311
7.306
7.261
7.230
7.208
4.599
4.591
4.574
4.566
4.492
4.486
4.479
4.470
4.467
4.460
4.454
4.446
4.387
4.377
4.372
4.359
4.352
4.330
4.322
4.315
4.308
4.302
4.295
2.764
2.741
2.720
2.699
2.675
2.581
2.571
2.556
2.545
2.527
2.513
2.502
2.413
2.391
2.380
2.364
2.358
2.335
2.321
2.312
2.285
2.281
2.218
2.211
2.200
AcO
AcO
O
N
F
3.00
0.93
1.03
10
8
6
4
2
0PPM

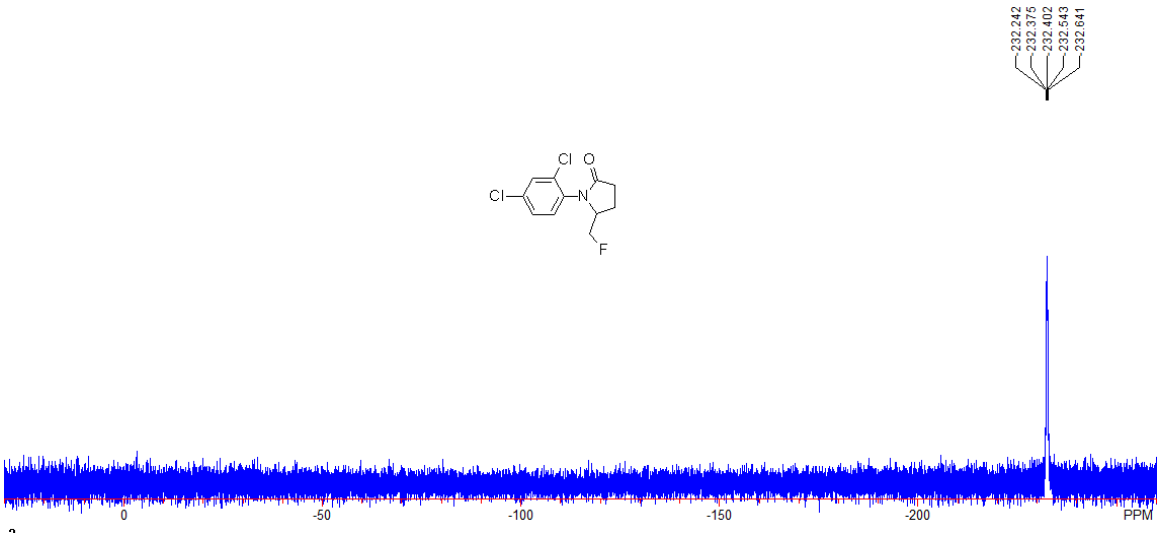

174.597
168.144
167.962
142.362
139.876
135.355
123.769
121.574
118.957
83.076
81.334
77.411
77.090
76.777
59.511
59.307
31.111
20.677
20.604
AcO
AcO
O
N
F
200
150
100
50
PPM


233.208
233.288
233.368
233.456
233.527
233.634
AcO
AcO
O
N
F
0
-50
-100
-150
-200
PPM

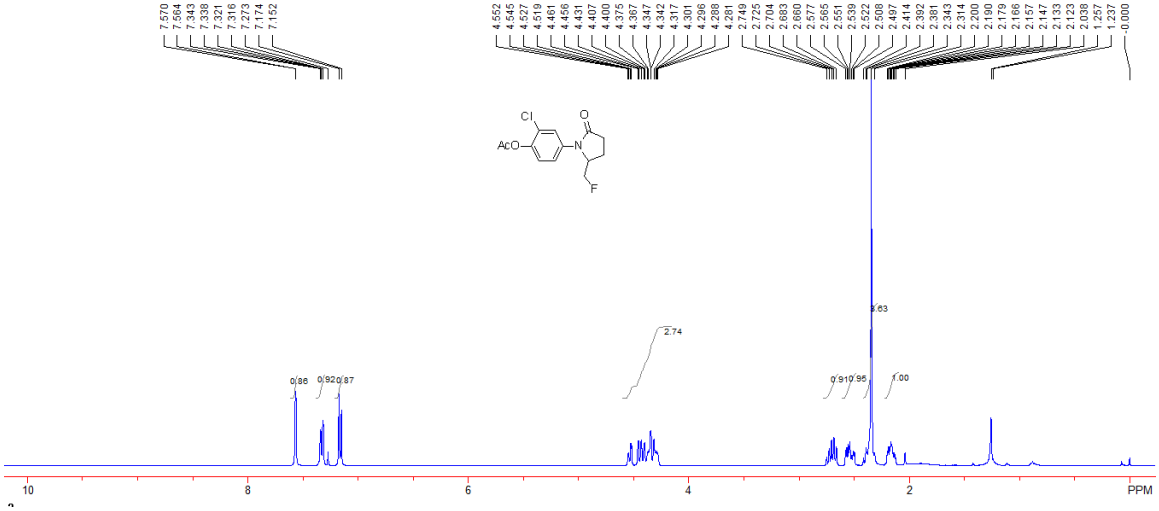
Compound **4f**

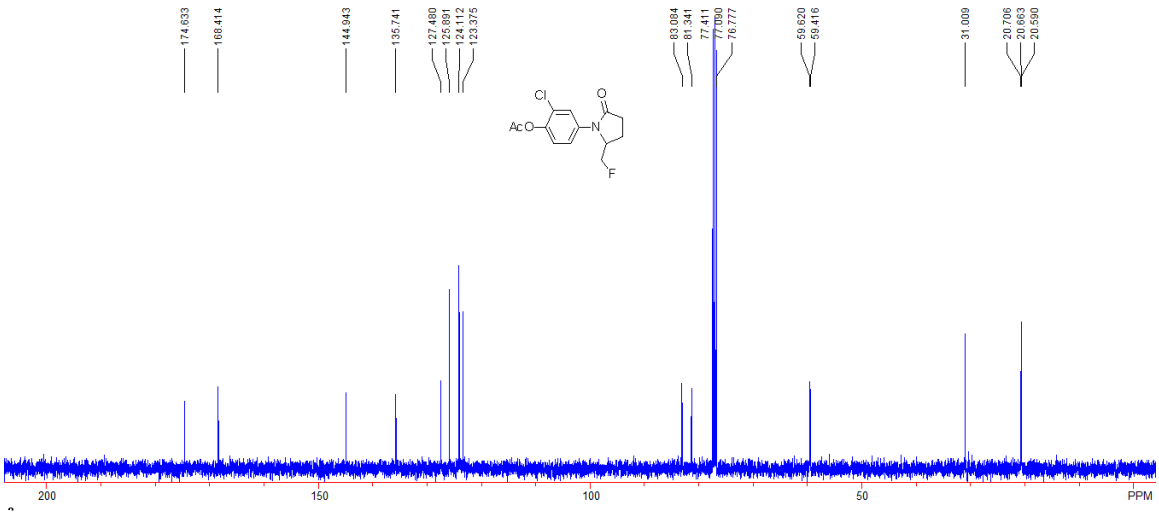

7.504
7.499
7.339
7.333
7.317
7.312
7.269
7.255
7.234
4.416
4.412
4.409
4.300
4.293
4.288
4.275
4.268
4.261
4.232
4.227
4.220
4.212
4.206
4.200
2.685
2.680
2.661
2.641
2.637
2.619
2.602
2.587
2.577
2.563
2.535
2.520
2.468
2.447
2.436
2.427
2.415
2.395
2.393
2.221
2.209
2.196
2.184
2.176
Cl
O
Cl
N
F
2.95
1.98
1.02
1.00
0.88
0.96
10
8
6
4
2
PPM

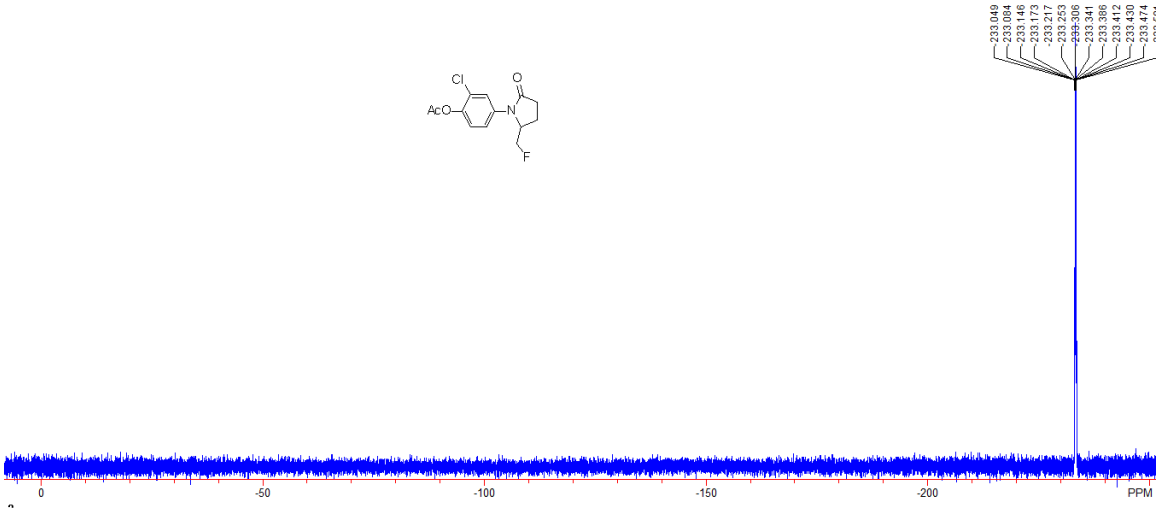

175.187
134.859
133.503
133.146
131.884
130.411
128.275
83.382
81.640
77.404
77.083
76.769
59.525
59.328
30.112
21.202
21.151
Cl
O
Cl
N
F
200
150
100
50
PPM


232.242
232.375
232.402
232.543
232.641
Cl
O
Cl
N
F
0
-50
-100
-150
-200
PPM

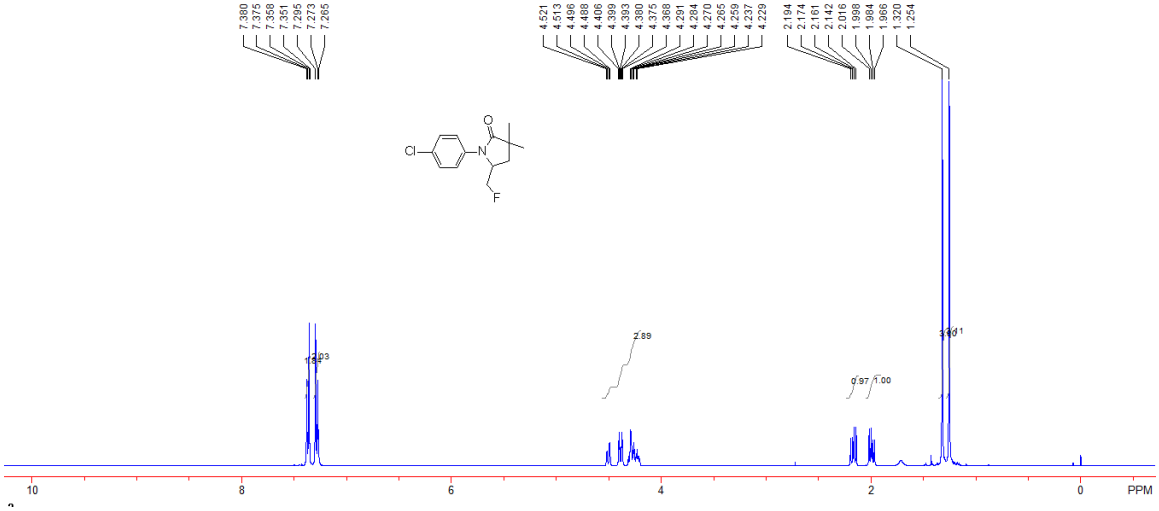
Compound **4g**

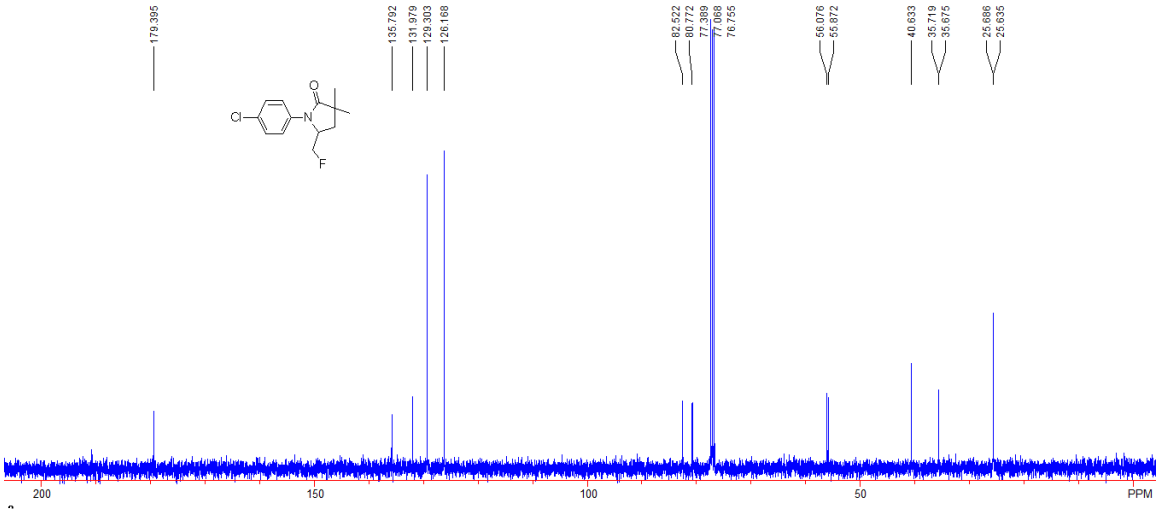

7.570
7.564
7.343
7.338
7.321
7.316
7.273
7.174
7.152
4.552
4.545
4.527
4.519
4.461
4.456
4.431
4.407
4.400
4.375
4.367
4.347
4.342
4.317
4.301
4.296
4.288
4.281
2.749
2.725
2.704
2.683
2.660
2.577
2.565
2.551
2.539
2.522
2.508
2.497
2.414
2.392
2.381
2.343
2.314
2.200
2.190
2.179
2.166
2.157
2.147
2.133
2.123
2.038
1.257
1.237
0.000
Cl
AcO
O
N
F
0.86
0.92
0.87
2.74
3.63
0.91
0.95
1.00
10
8
6
4
2
PPM

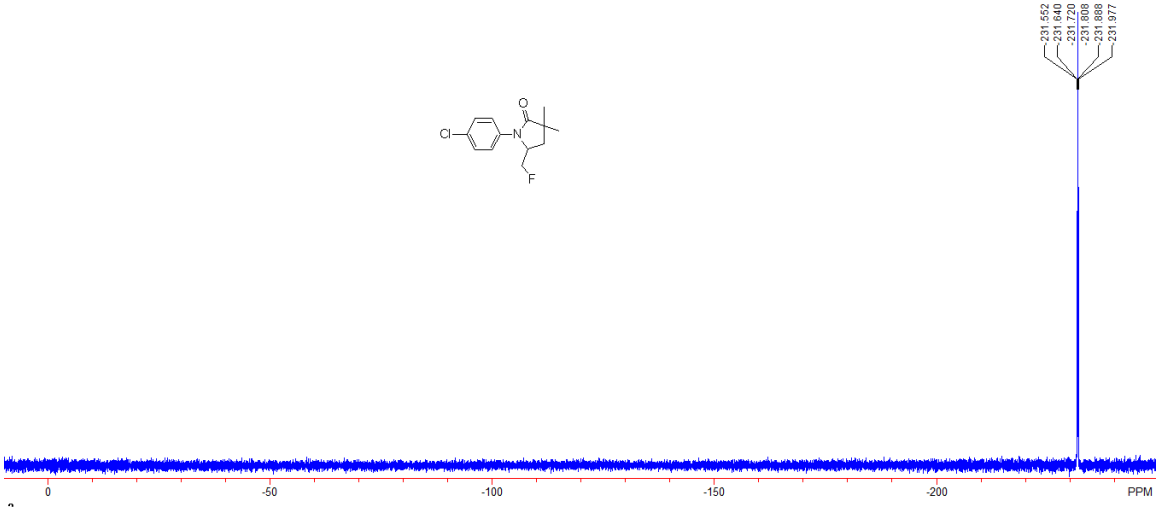

174.633
168.414
144.943
135.741
127.480
125.891
124.112
123.375
83.084
81.341
77.411
77.090
76.777
59.620
59.416
31.009
20.706
20.663
20.590
Cl
AcO
O
N
F
200
150
100
50
PPM


233.049
233.084
233.146
233.173
233.217
233.253
233.306
233.341
233.386
233.412
233.430
233.474
Cl
AcO
O
N
F
0
-50
-100
-150
-200
PPM

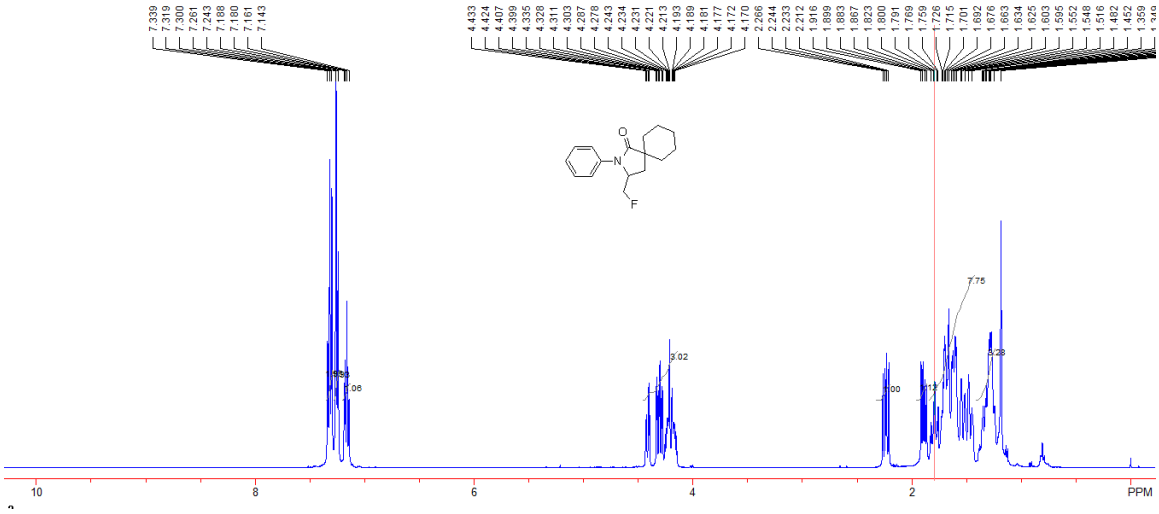
Compound **4h**

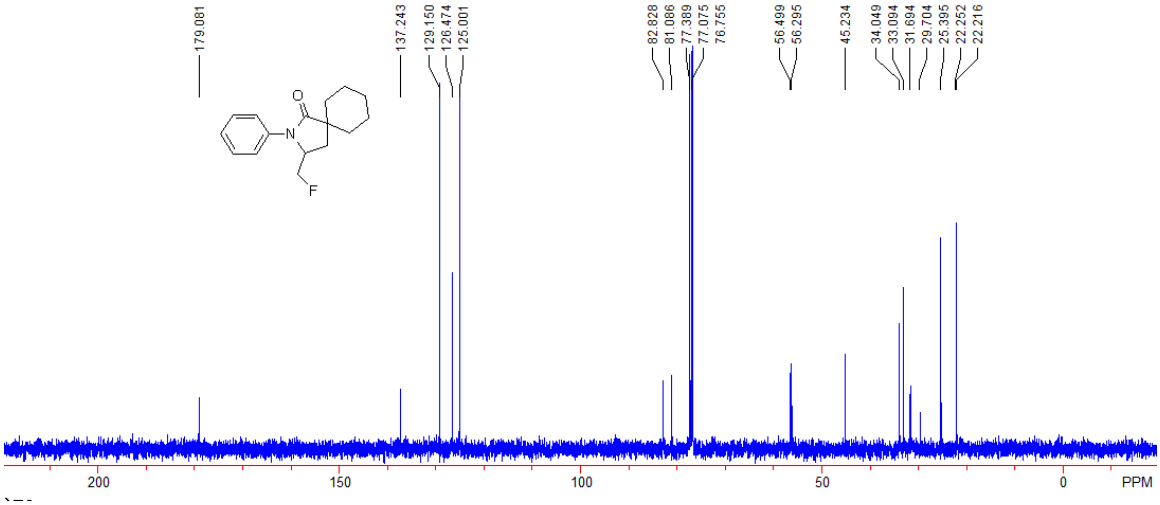

7.380
7.375
7.368
7.351
7.295
7.273
7.265
4.521
4.513
4.496
4.488
4.406
4.399
4.393
4.380
4.375
4.368
4.291
4.284
4.270
4.265
4.259
4.237
4.229
2.194
2.174
2.161
2.142
2.016
1.998
1.984
1.965
1.320
1.254
2.89
0.97
1.00
10
8
6
4
2
0
PPM

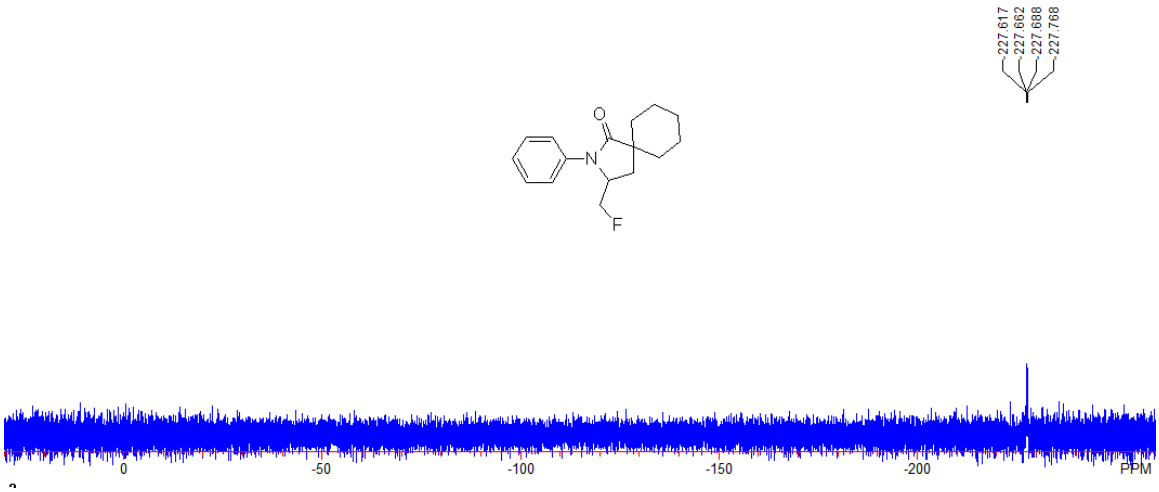

179.395
135.792
131.979
129.303
126.168
82.522
80.772
77.389
77.068
76.755
56.076
55.872
40.633
35.719
35.675
25.686
25.635
200
150
100
50
PPM


231.552
231.640
231.720
231.808
231.888
231.977
0
-50
-100
-150
-200
PPM

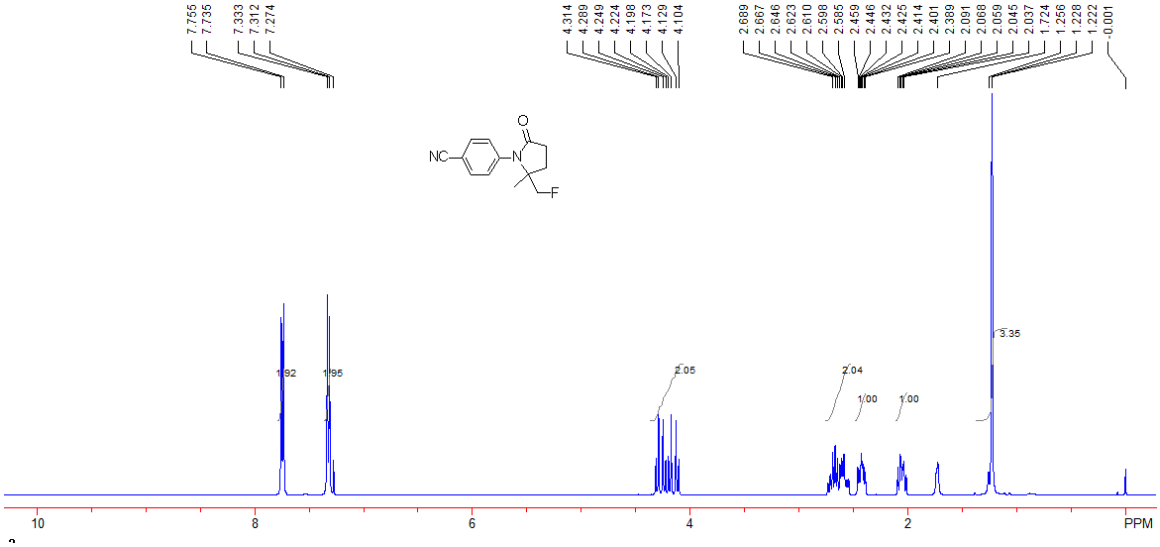
Compound **4i**

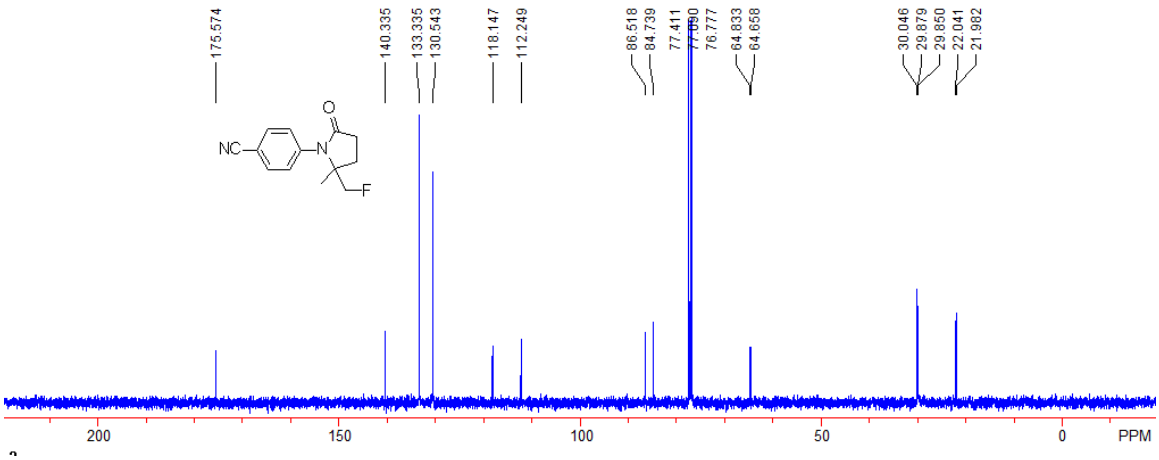

7.339
7.319
7.300
7.261
7.243
7.188
7.180
7.161
7.143
4.433
4.424
4.407
4.399
4.335
4.328
4.311
4.303
4.287
4.278
4.243
4.234
4.231
4.221
4.213
4.193
4.189
4.181
4.177
4.172
4.170
2.266
2.244
2.233
2.212
1.916
1.899
1.883
1.867
1.823
1.800
1.791
1.769
1.759
1.726
1.715
1.701
1.692
1.676
1.663
1.634
1.625
1.603
1.595
1.552
1.548
1.516
1.482
1.452
1.359
7.75
3.02
5.28
3.08
2.00
10
8
6
4
2
PPM

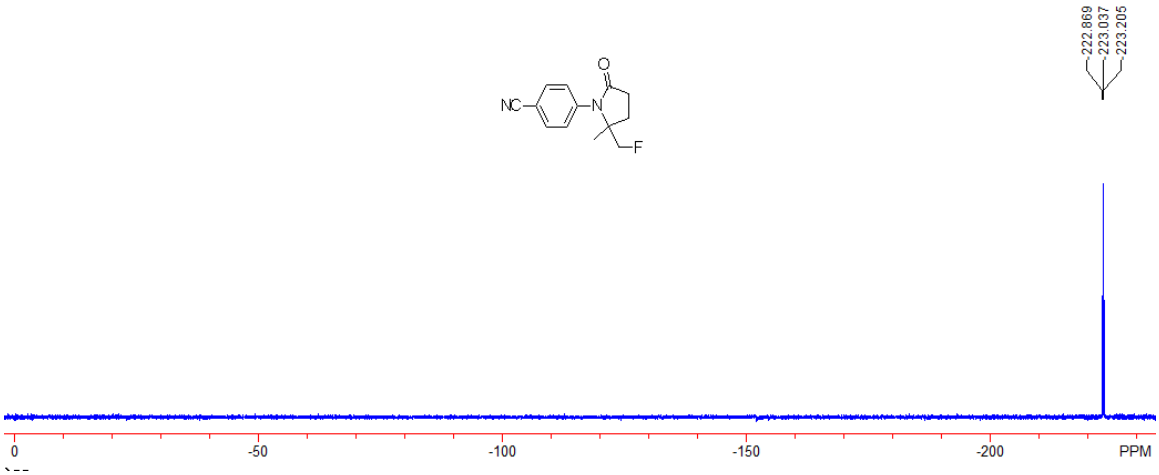

179.081
137.243
129.150
126.474
125.001
82.828
81.086
77.389
77.075
76.755
56.499
56.295
45.234
34.049
33.094
31.694
29.704
25.395
22.252
22.216
200
150
100
50
0
PPM


227.617
227.662
227.688
227.768
0
-50
-100
-150
-200
PPM

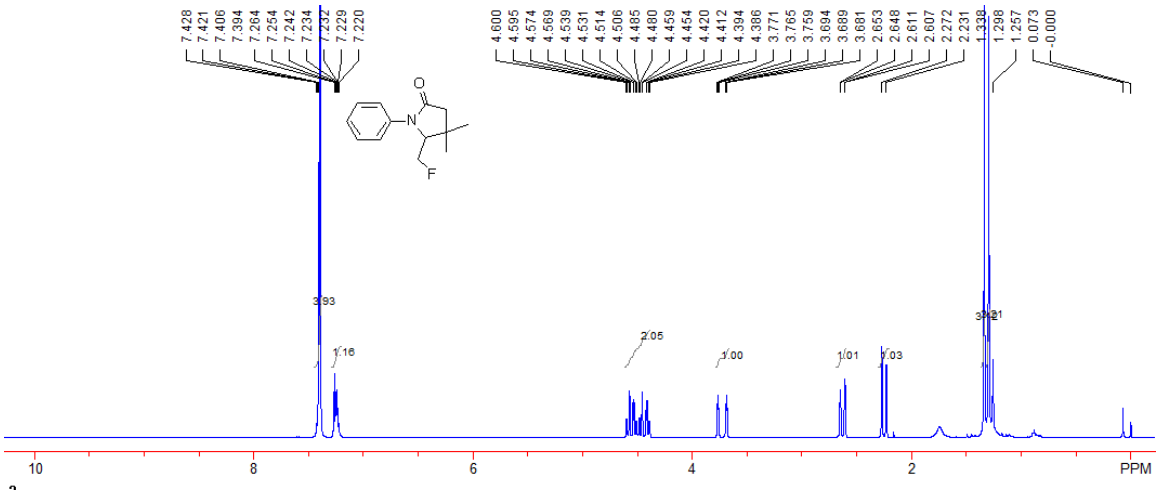
Compound **4j**

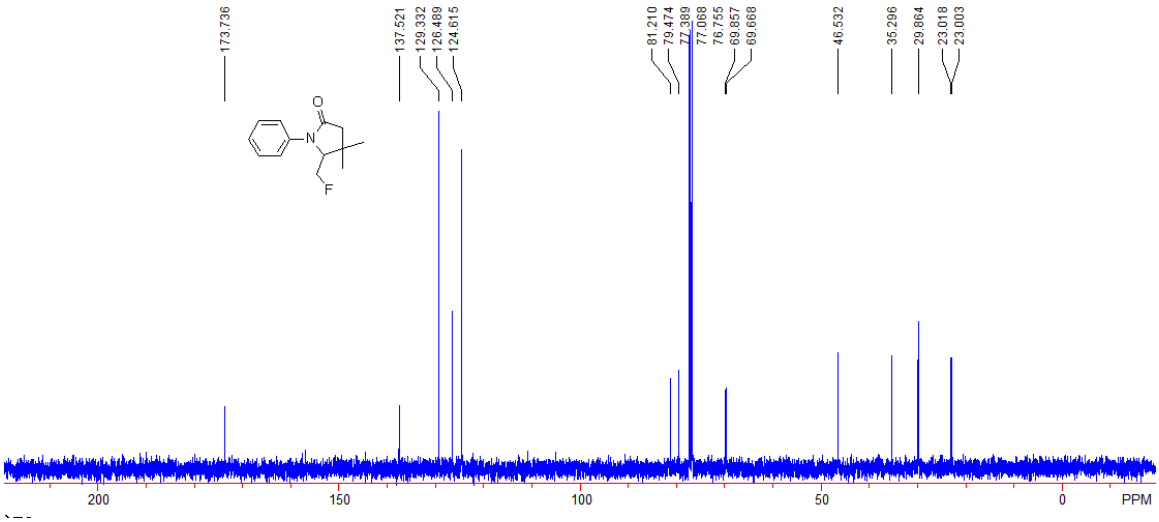

7.755
7.735
7.333
7.312
7.274
4.314
4.289
4.249
4.224
4.198
4.173
4.129
4.104
2.689
2.667
2.646
2.623
2.610
2.598
2.585
2.459
2.446
2.432
2.425
2.414
2.401
2.389
2.091
2.068
2.059
2.045
2.037
1.724
1.256
1.228
1.222
0.001
NC
O
N
F
1.92
1.95
2.05
2.04
1.00
1.00
3.35
10
8
6
4
2
PPM

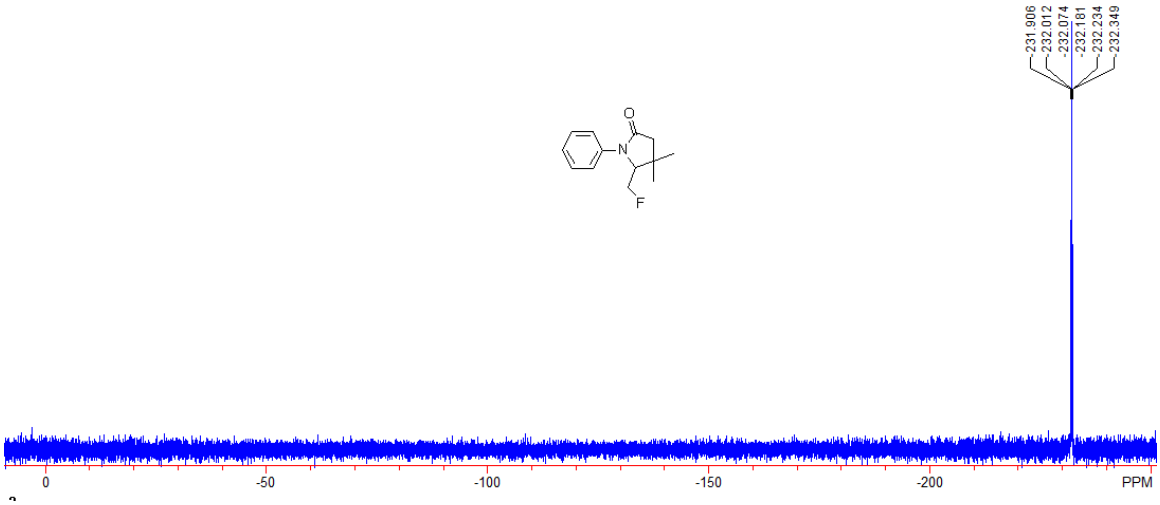

175.574
140.335
133.335
130.543
118.147
112.249
86.518
84.739
77.411
77.090
76.777
64.833
64.658
30.046
29.879
29.850
22.041
21.982
NC
O
N
F
200
150
100
50
0
PPM


222.869
223.037
223.205
NC
O
N
F
0
-50
-100
-150
-200
PPM

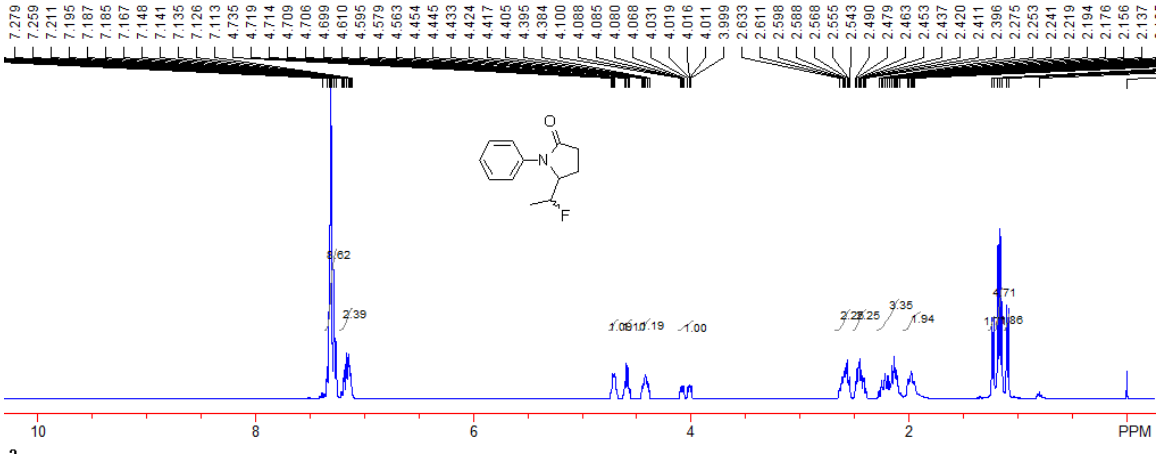
Compound **4k**

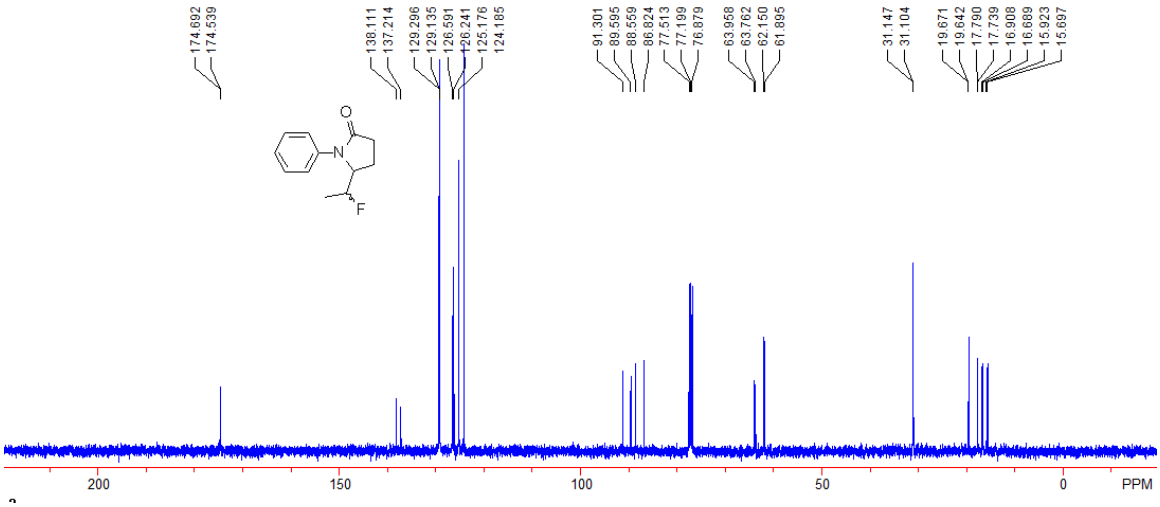

7.428
7.421
7.406
7.394
7.264
7.254
7.242
7.234
7.232
7.229
7.220
4.600
4.595
4.574
4.569
4.539
4.531
4.514
4.506
4.485
4.480
4.459
4.454
4.420
4.412
4.394
4.386
3.771
3.765
3.759
3.694
3.689
3.681
2.653
2.648
2.611
2.607
2.272
2.231
1.338
1.298
1.257
0.073
-0.000
3.93
1.16
2.05
1.00
1.01
1.03
3.21
10
8
6
4
2
PPM

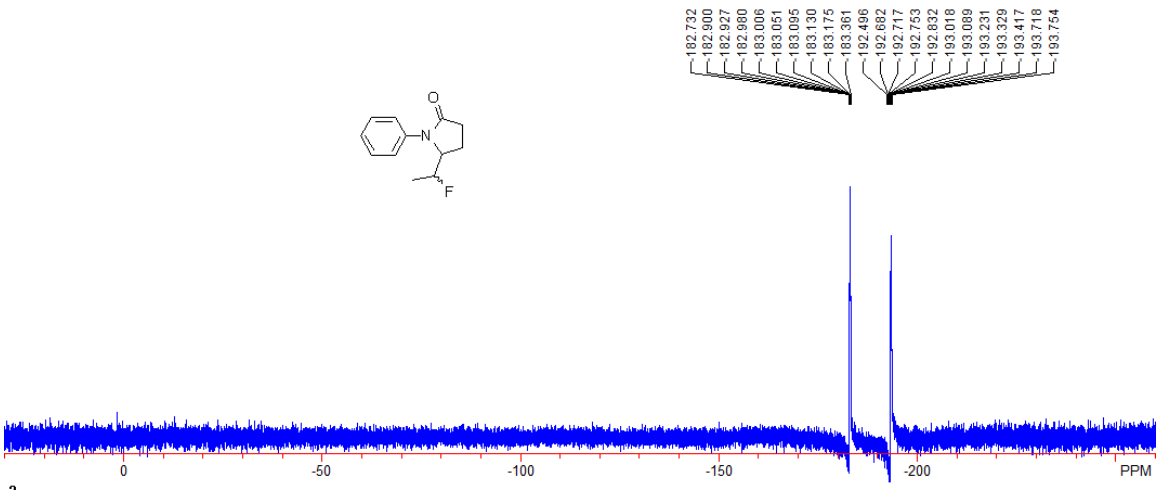

173.736
137.521
129.332
126.489
124.615
81.210
79.474
77.389
77.068
76.755
69.857
69.668
46.532
35.296
29.864
23.018
23.003
200
150
100
50
0
PPM


-231.906
-232.012
-232.074
-232.181
-232.234
-232.349
0
-50
-100
-150
-200
PPM

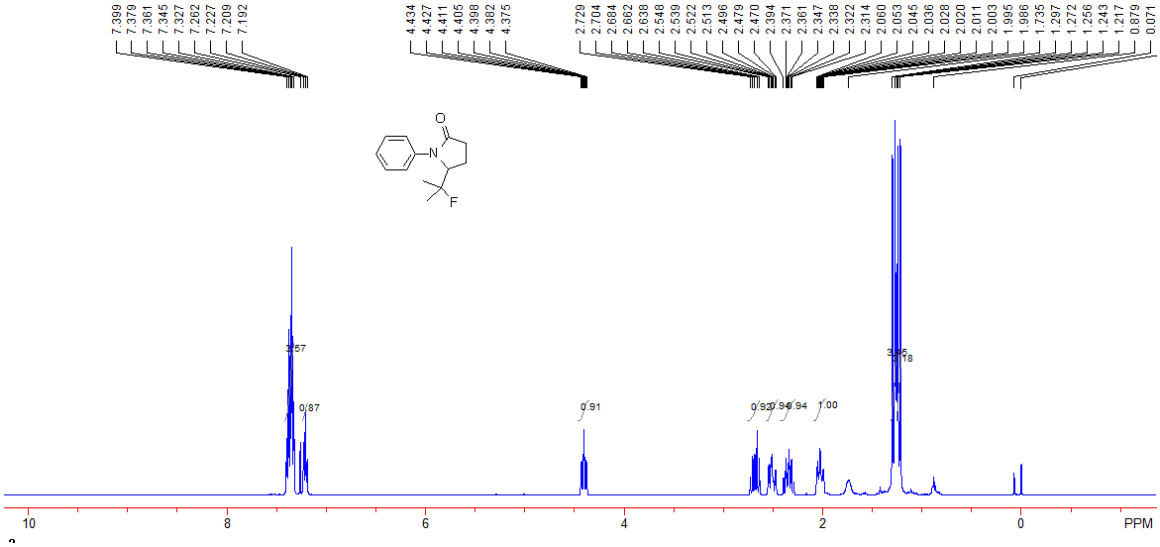
Compound **4l**

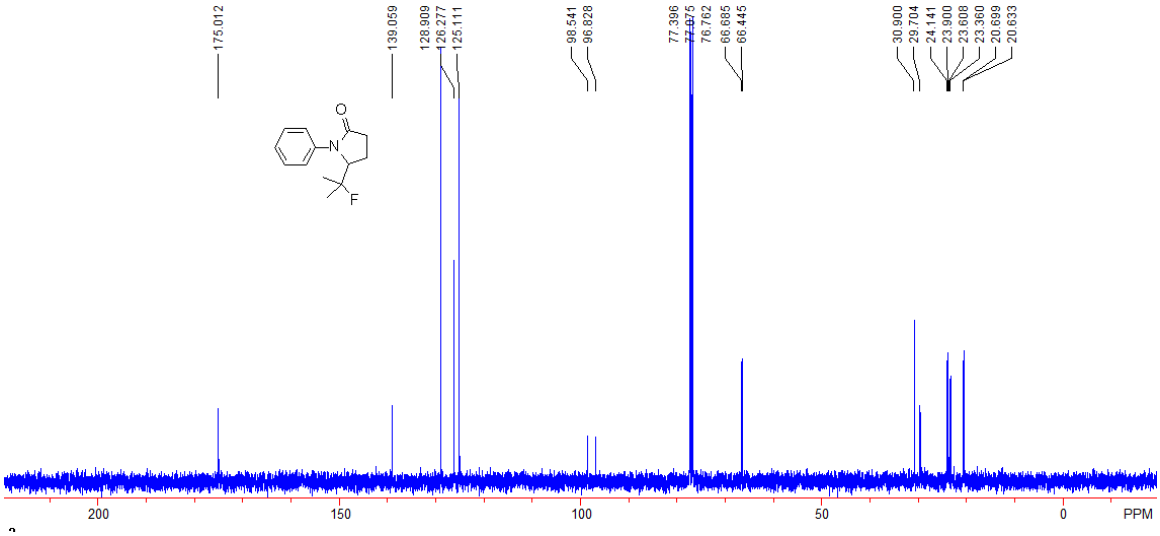


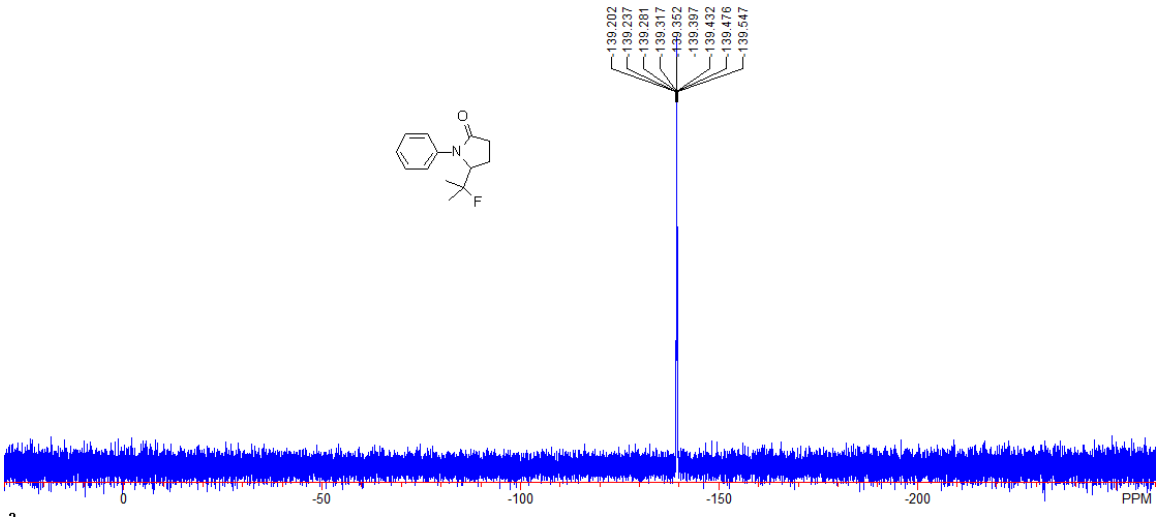



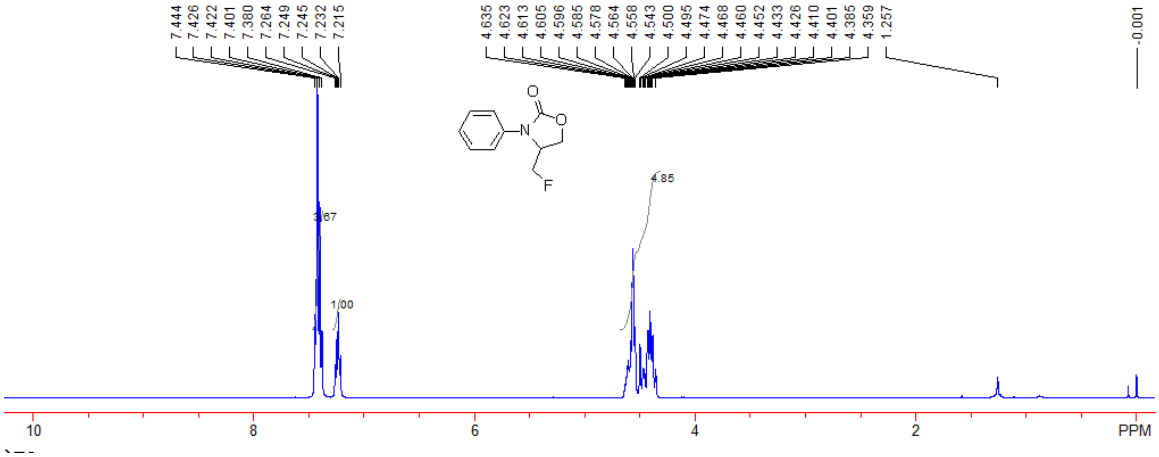
Compound **4m**

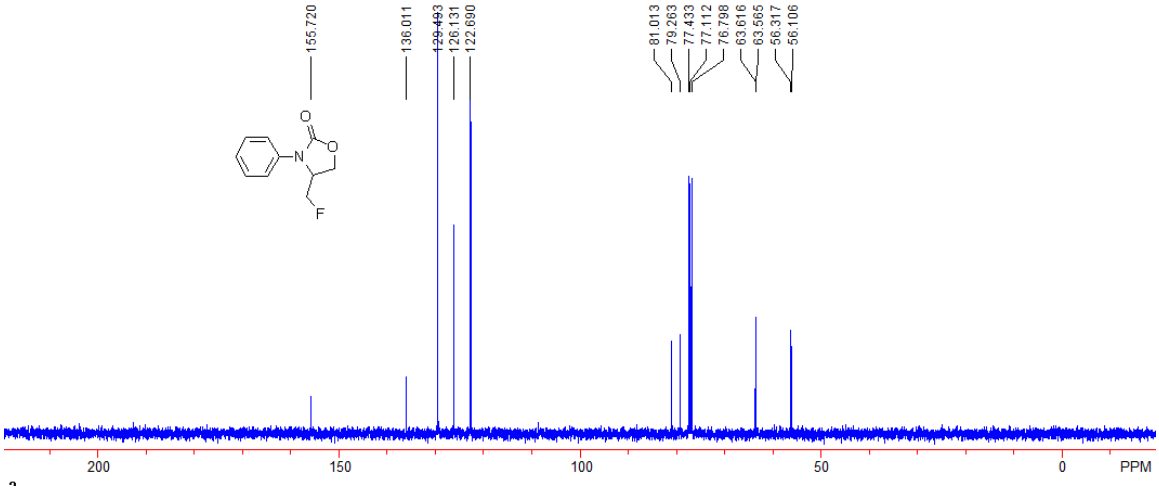

7.399
7.379
7.361
7.345
7.327
7.262
7.227
7.209
7.192
4.434
4.427
4.411
4.405
4.398
4.382
4.375
2.729
2.704
2.684
2.662
2.638
2.548
2.539
2.522
2.513
2.496
2.479
2.470
2.394
2.371
2.361
2.347
2.338
2.322
2.314
2.060
2.053
2.045
2.036
2.028
2.020
2.011
2.003
1.995
1.986
1.735
1.297
1.272
1.256
1.243
1.217
0.879
0.071
O
N
F
3.57
0.87
0.91
0.92
0.94
0.94
1.00
3.45
3.18
10
8
6
4
2
0
PPM

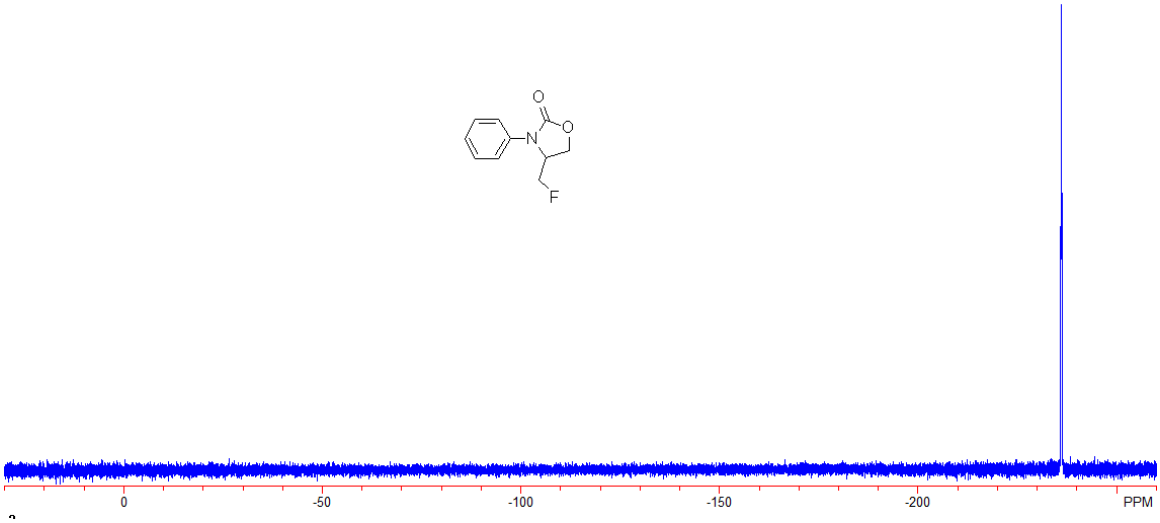

175.012
139.059
128.909
126.277
125.111
98.541
96.828
77.396
77.075
76.762
66.685
66.445
30.900
29.704
24.141
23.900
23.608
23.360
20.699
20.633
O
N
F
200
150
100
50
0
PPM


139.202
139.237
139.281
139.317
139.352
139.397
139.432
139.476
139.547
O
N
F
0
-50
-100
-150
-200
PPM

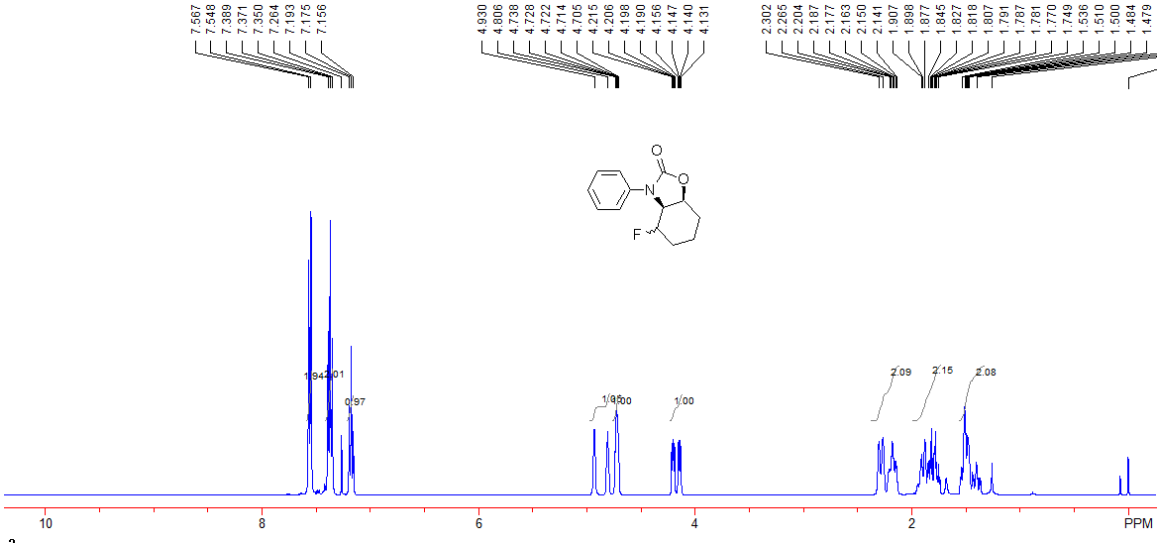
Compound **4n**

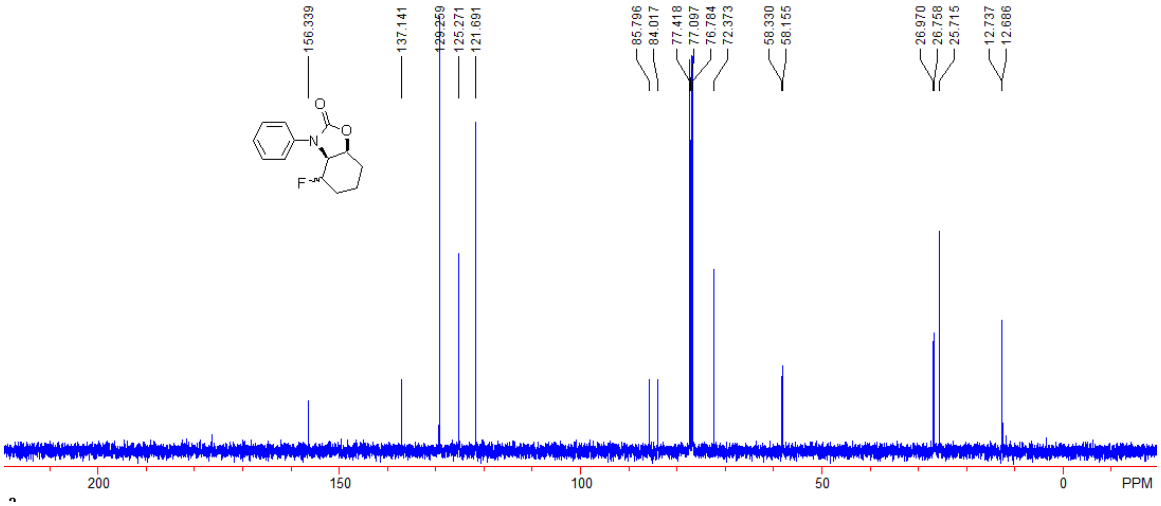

7.444
7.426
7.422
7.401
7.380
7.264
7.249
7.245
7.232
7.215
4.635
4.623
4.613
4.605
4.596
4.585
4.578
4.564
4.558
4.543
4.500
4.495
4.474
4.468
4.460
4.452
4.433
4.426
4.410
4.401
4.385
4.359
1.257
-0.001
O
N
O
F
4.85
3.67
1.00
10
8
6
4
2
PPM

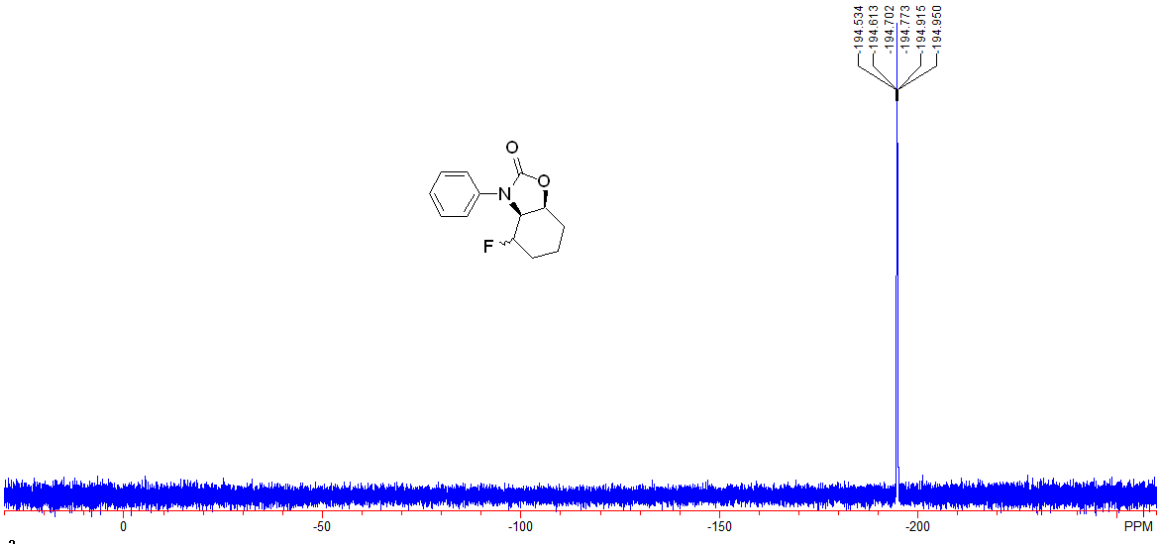

155.720
136.011
129.493
126.131
122.690
81.013
79.263
77.433
77.112
76.798
63.616
63.565
56.317
56.106
O
N
O
F
200
150
100
50
0
PPM


O
N
O
F
0
-50
-100
-150
-200
PPM

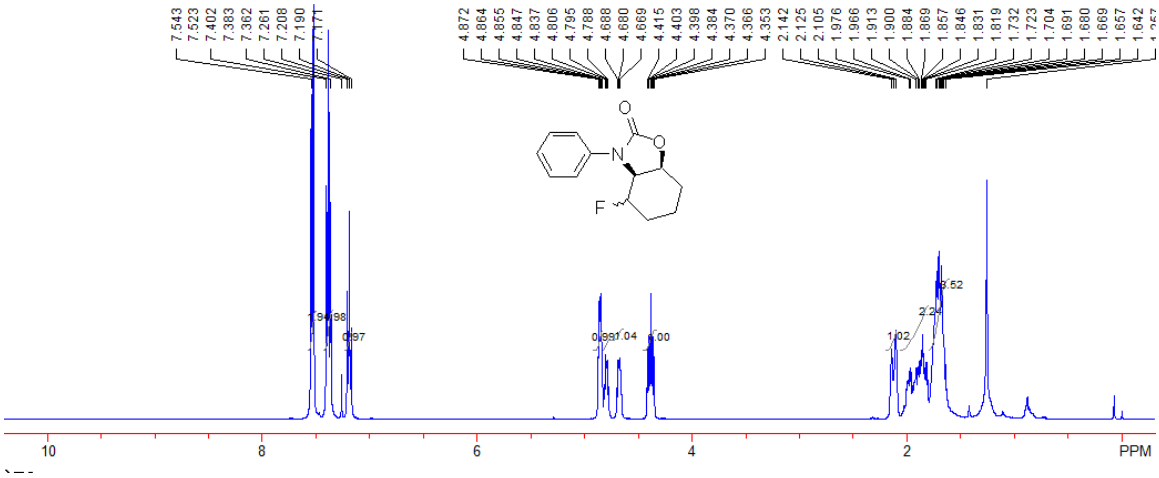
Compound **4o** (one isomer)

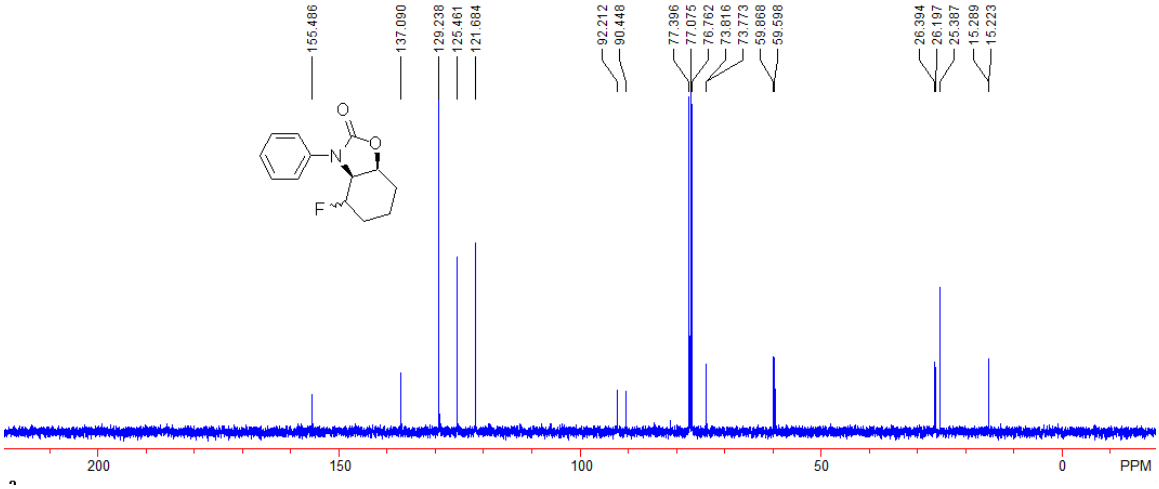


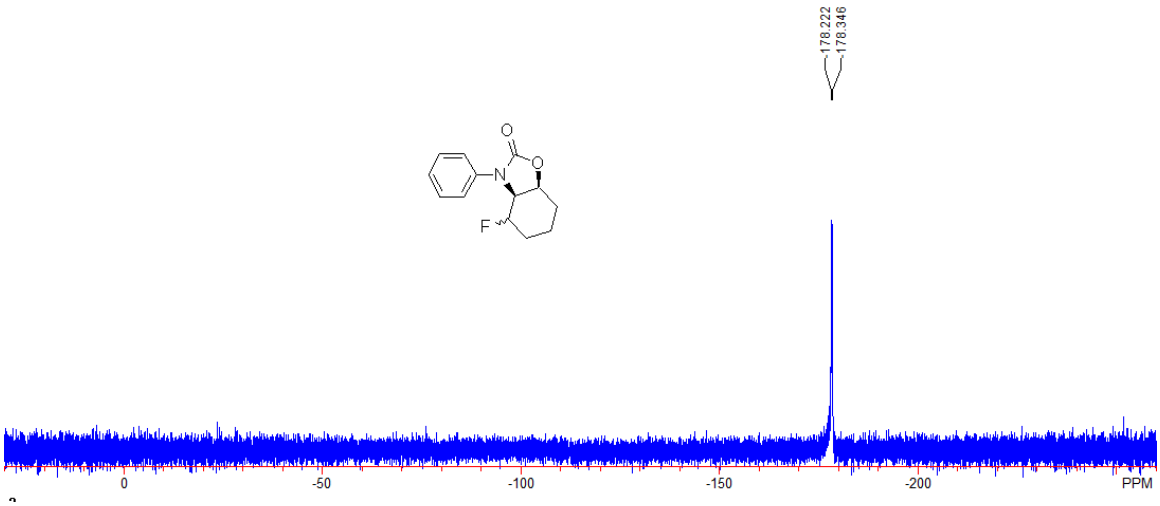



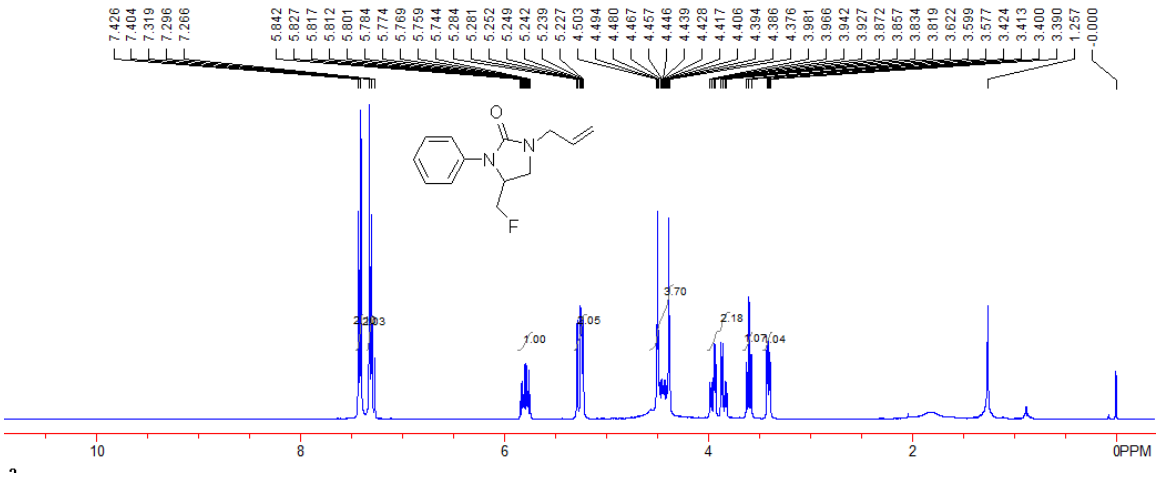
Compound **4o** (the other isomer)



Compound **4p**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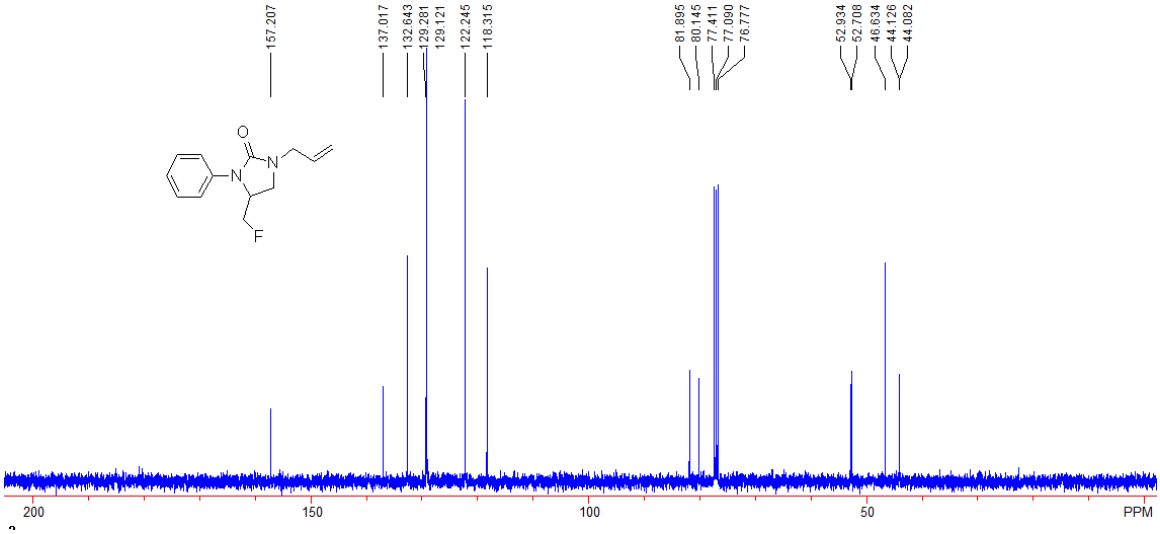
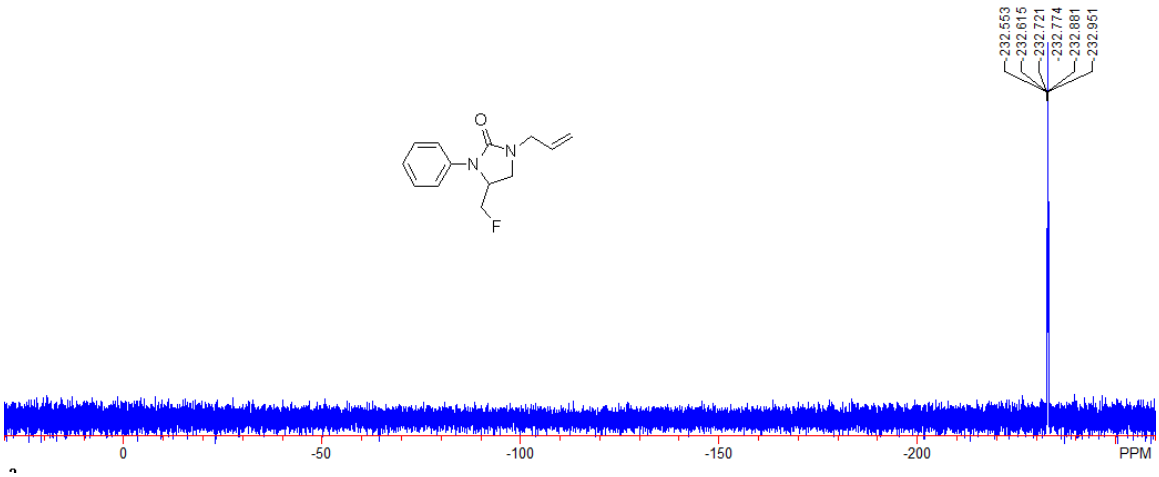
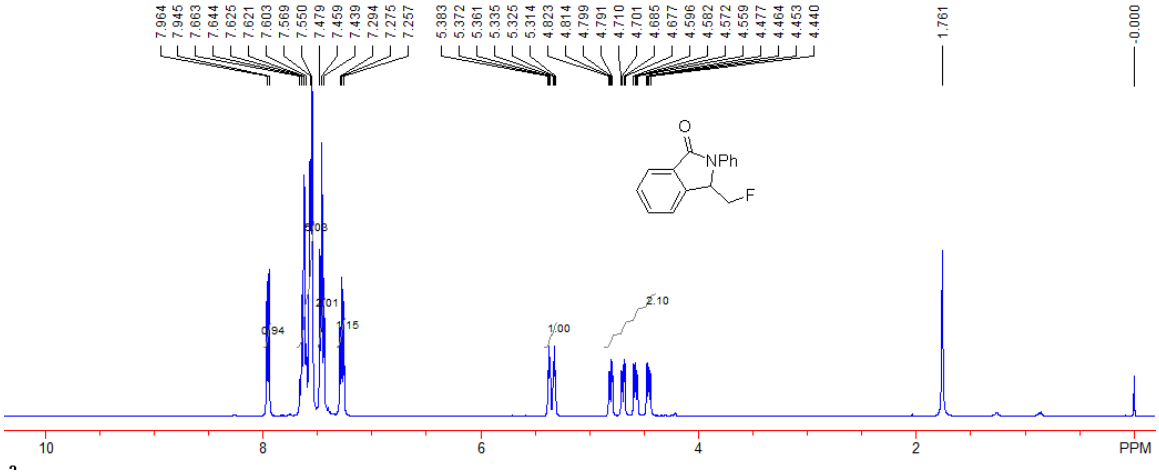
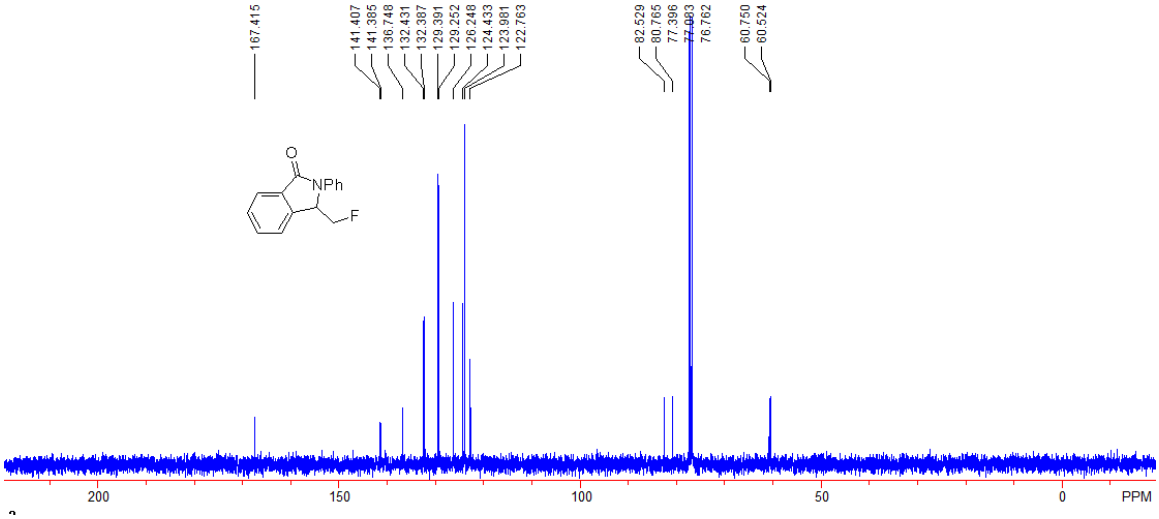
7.404
7.319
7.296
7.266
5.842
5.827
5.817
5.812
5.801
5.784
5.774
5.769
5.759
5.744
5.284
5.281
5.252
5.249
5.242
5.239
5.227
4.503
4.494
4.480
4.467
4.457
4.446
4.439
4.428
4.417
4.406
4.394
4.386
4.376
3.981
3.966
3.942
3.927
3.872
3.857
3.834
3.819
3.622
3.599
3.577
3.424
3.413
3.400
3.390
1.257
-0.000
O
N
N
F
2.00
1.00
2.05
3.70
2.18
1.07
1.04
10
8
6
4
2
0PPM

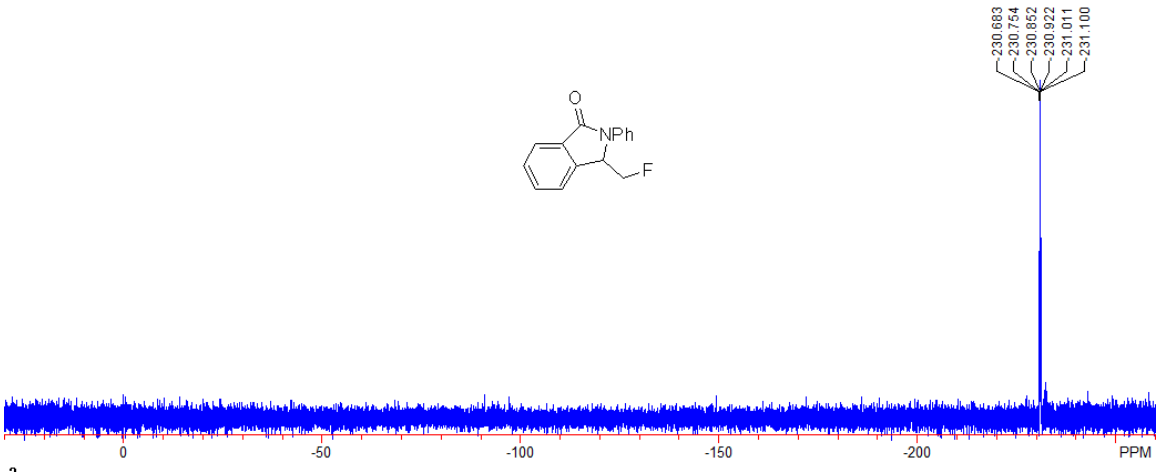

157.207
137.017
132.643
129.281
129.121
122.245
118.315
81.895
80.145
77.411
77.090
76.777
52.934
52.708
46.634
44.126
44.082
O
N
N
F
200
150
100
50
PPM


232.553
232.615
232.721
232.774
232.881
232.951
O
N
N
F
0
-50
-100
-150
-200
PPM

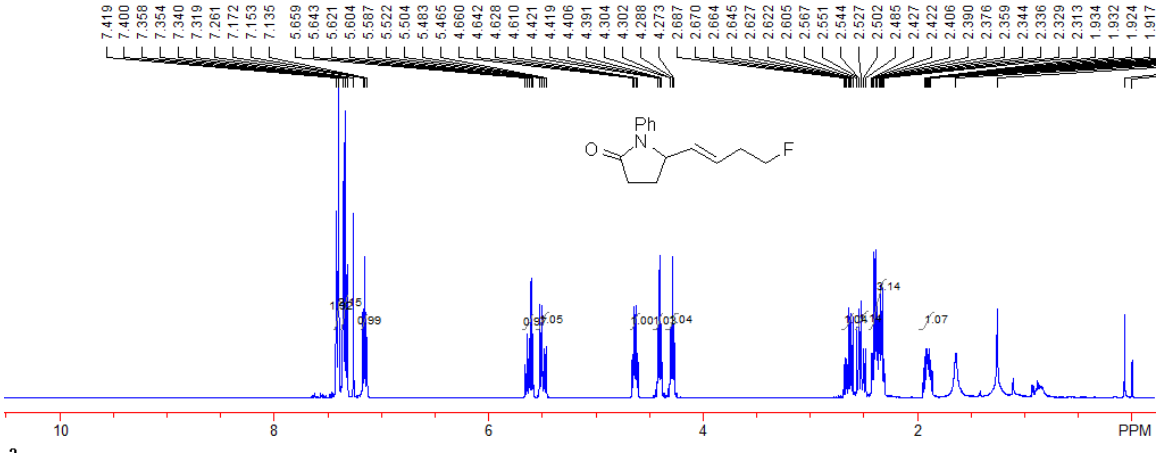
Compound **4q**

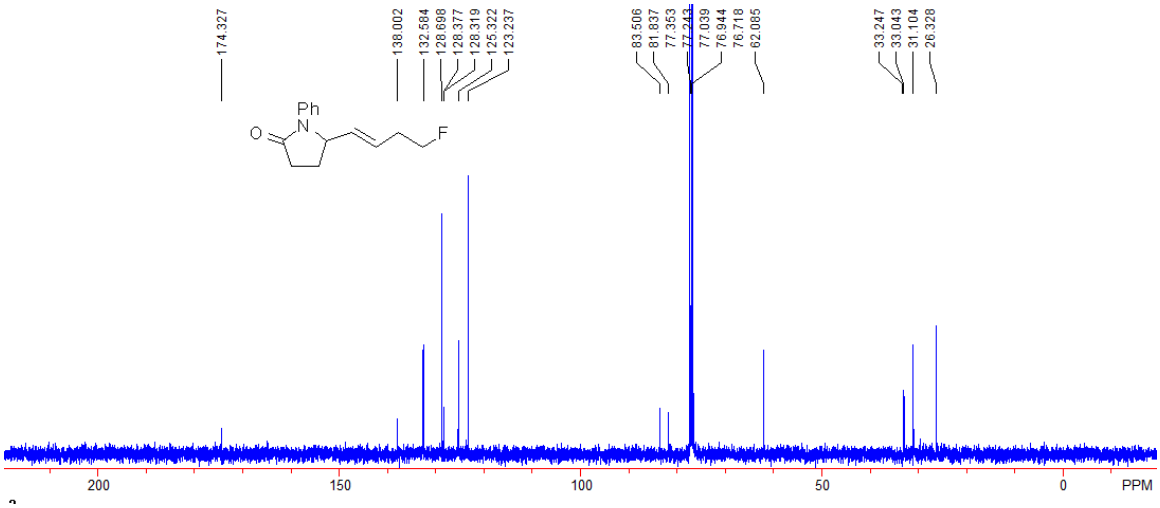

7.964
7.945
7.663
7.644
7.625
7.621
7.603
7.569
7.550
7.479
7.459
7.439
7.294
7.275
7.257
5.383
5.372
5.361
5.335
5.325
5.314
4.823
4.814
4.799
4.791
4.710
4.701
4.685
4.677
4.596
4.582
4.572
4.559
4.477
4.464
4.453
4.440
1.761
-0.000
NPh
F
5.08
2.01
1.15
0.94
1.00
2.10
10
8
6
4
2
PPM

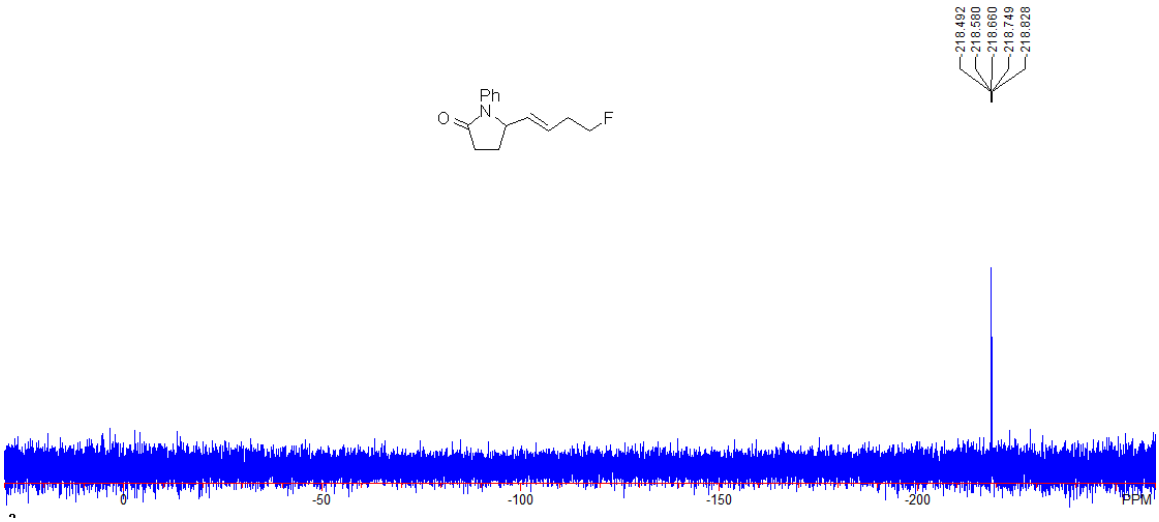

167.415
141.407
141.385
136.748
132.431
132.387
129.391
129.252
126.248
124.433
123.981
122.763
82.529
80.765
77.396
77.083
76.762
60.750
60.524
NPh
F
200
150
100
50
0
PPM


230.683
230.754
230.852
230.922
231.011
231.100
NPh
F
0
-50
-100
-150
-200
PPM

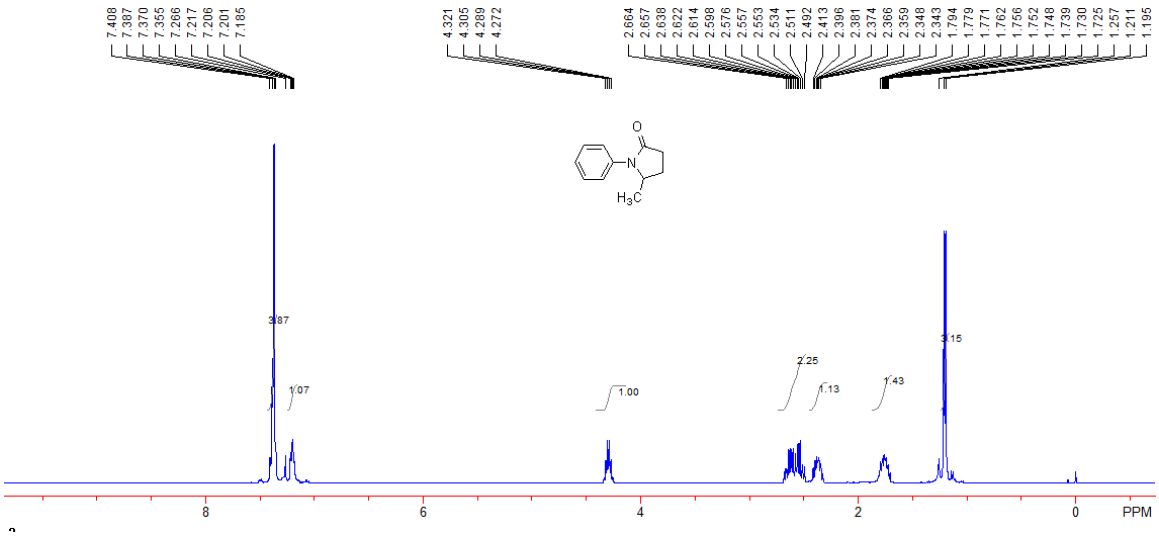
Compound **6**

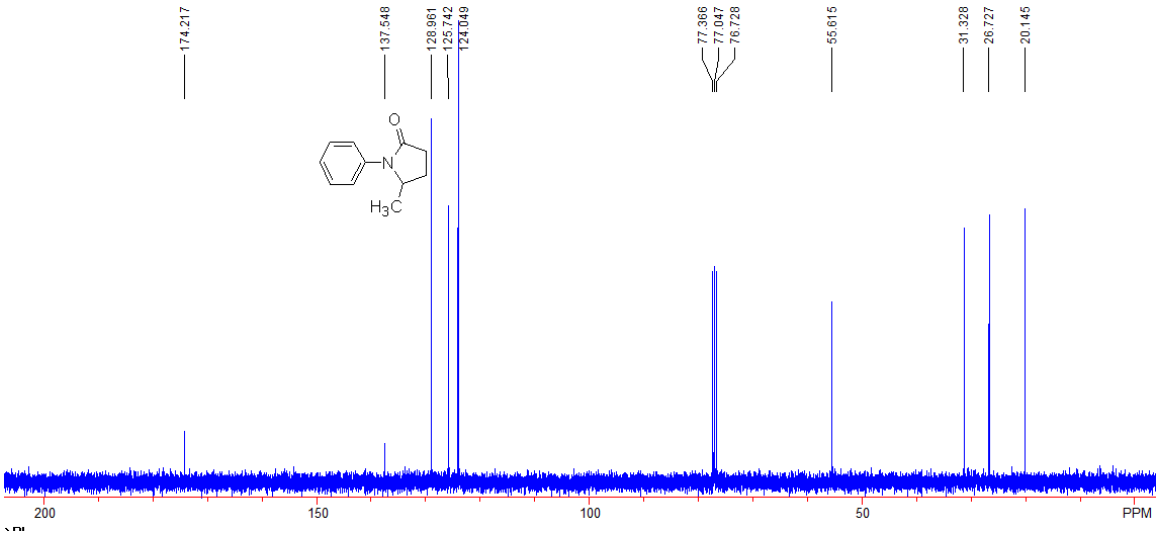

7.419
7.400
7.358
7.354
7.340
7.319
7.261
7.172
7.153
7.135
5.659
5.643
5.621
5.604
5.587
5.522
5.504
5.483
5.465
4.660
4.642
4.628
4.610
4.421
4.419
4.406
4.391
4.304
4.302
4.288
4.273
2.687
2.670
2.664
2.645
2.627
2.622
2.605
2.567
2.551
2.544
2.527
2.502
2.485
2.427
2.422
2.406
2.390
2.376
2.359
2.344
2.336
2.329
2.313
1.934
1.932
1.924
1.917
Ph
N
O
F
1.99
1.05
1.04
3.14
1.07
10
8
6
4
2
PPM


174.327
138.002
132.584
128.698
128.377
128.319
125.322
123.237
83.506
81.837
77.353
77.243
77.039
76.944
76.718
62.085
33.247
33.043
31.104
26.328
Ph
N
O
F
200
150
100
50
0
PPM

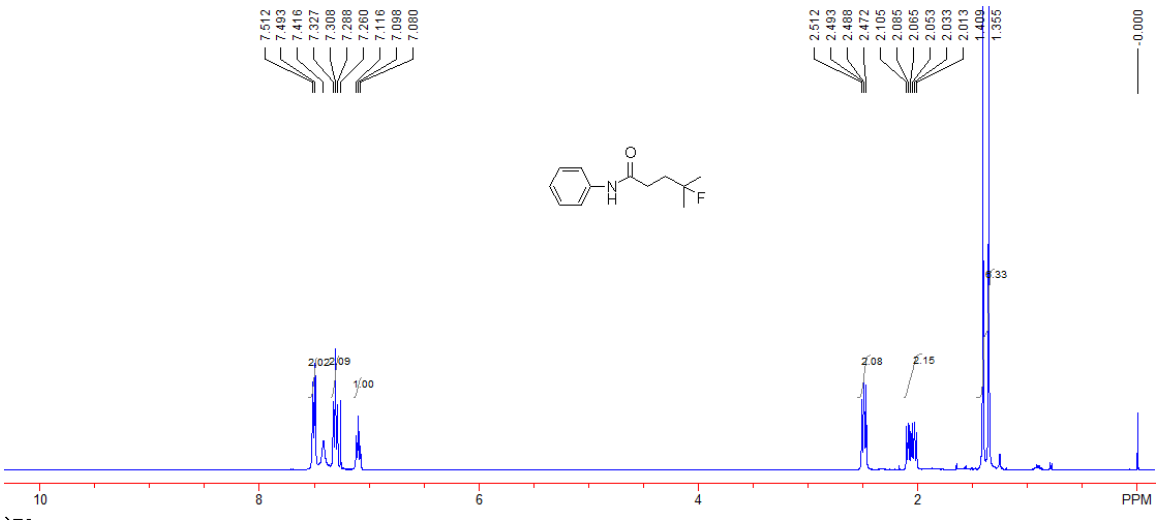

218.492
218.580
218.660
218.749
218.828
Ph
N
O
F
0
-50
-100
-150
-200
PPM

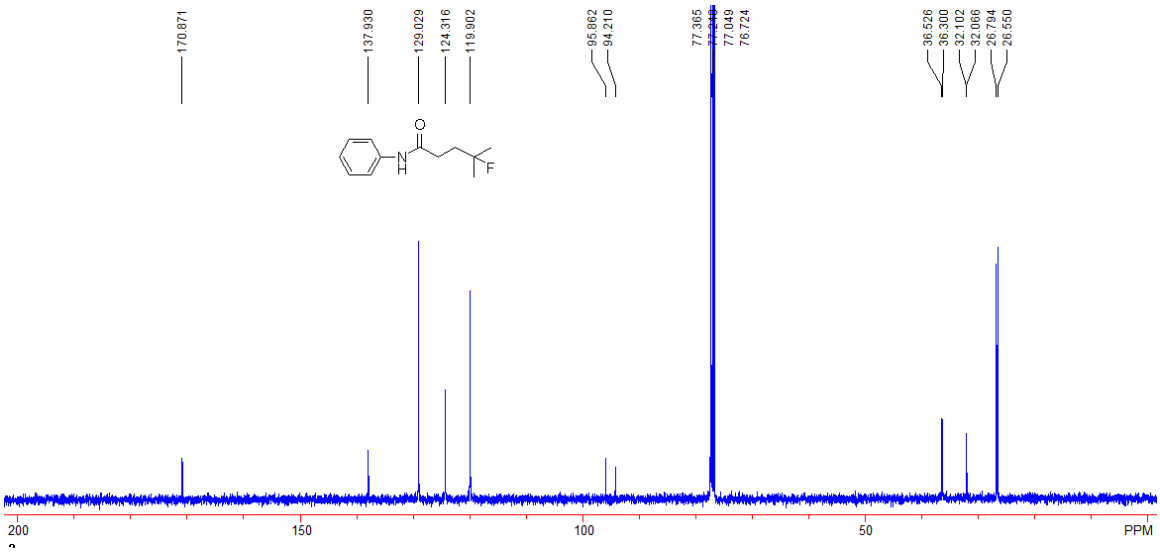
Compound **7**

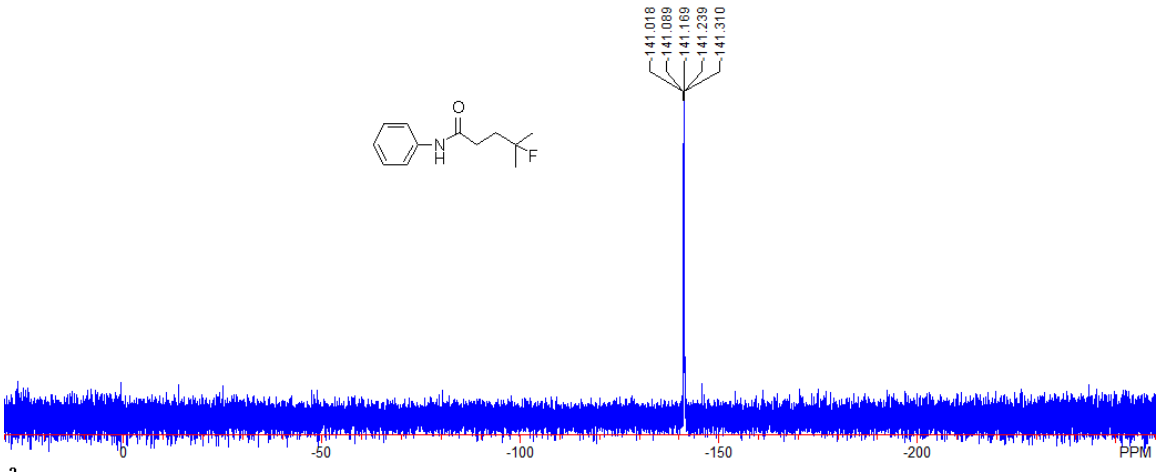

7.408
7.387
7.370
7.355
7.266
7.217
7.206
7.201
7.185
4.321
4.305
4.289
4.272
2.664
2.657
2.638
2.622
2.614
2.598
2.576
2.557
2.553
2.534
2.511
2.492
2.413
2.396
2.381
2.374
2.366
2.359
2.348
2.343
1.794
1.779
1.771
1.762
1.756
1.752
1.748
1.739
1.730
1.725
1.257
1.211
1.195
O
N
H3C
3.87
1.07
1.00
2.25
1.13
1.43
3.15
8
6
4
2
0
PPM


174.217
137.548
128.961
125.742
124.049
77.366
77.047
76.728
55.615
31.328
26.727
20.145
O
N
H3C
200
150
100
50
PPM

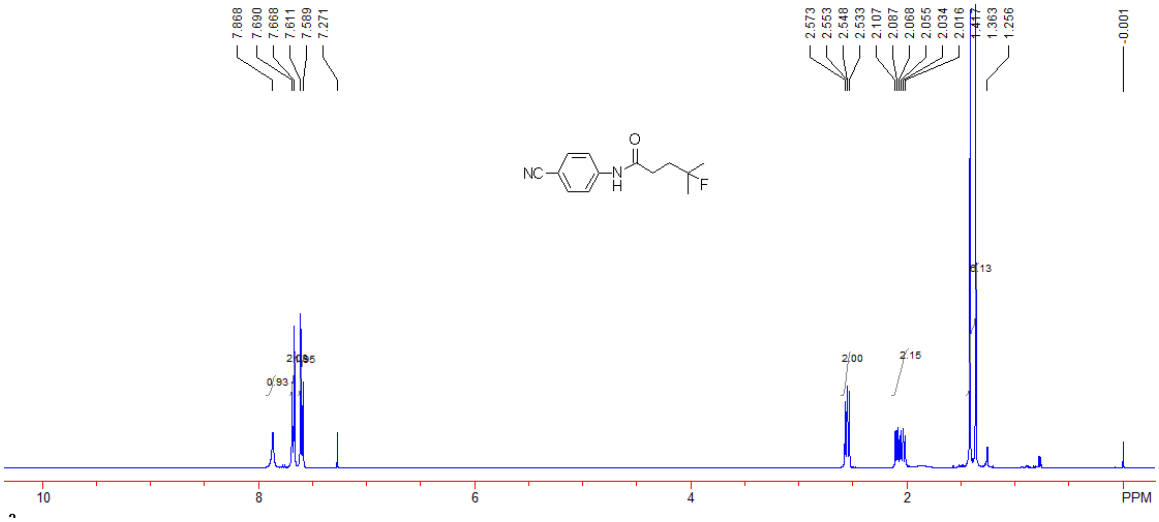
Compound **9a**

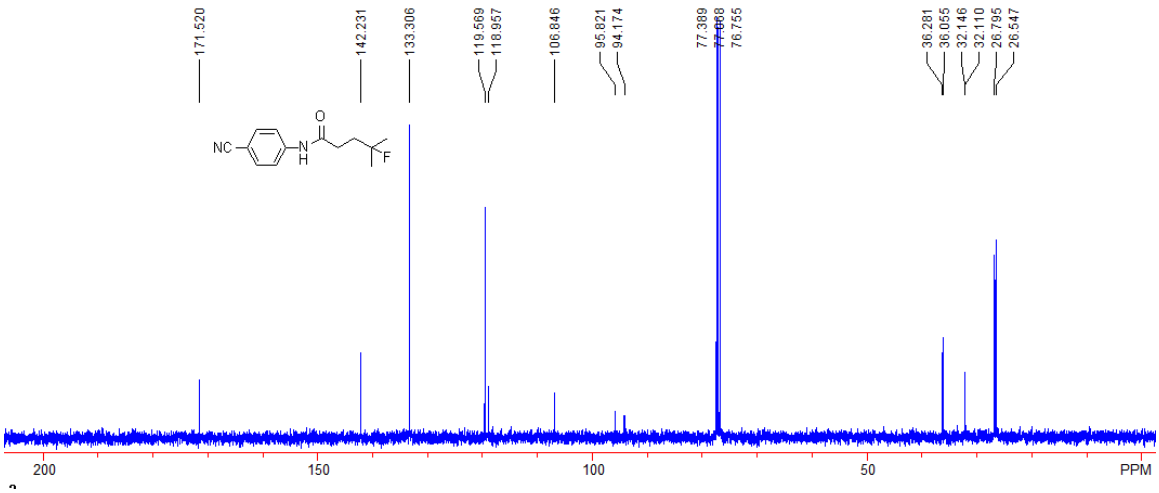

7.512
7.493
7.416
7.327
7.308
7.288
7.260
7.116
7.098
7.080
2.512
2.493
2.488
2.472
2.105
2.085
2.065
2.053
2.033
2.013
1.409
1.355
-0.000
2.02
2.09
1.00
2.08
2.15
6.33
10
8
6
4
2
PPM

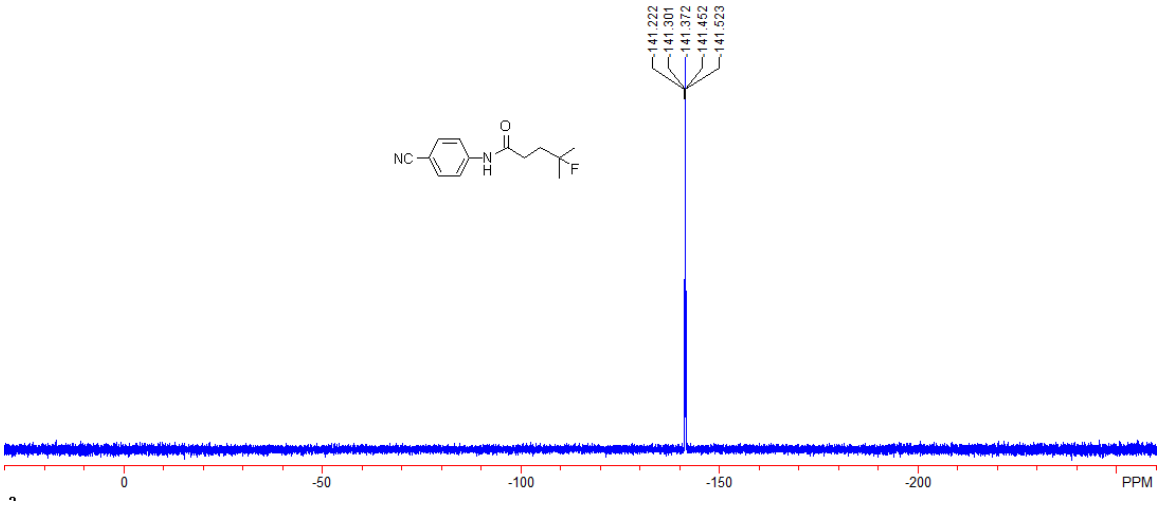

170.871
137.930
129.029
124.316
119.902
95.862
94.210
77.365
77.049
76.724
36.526
36.300
32.102
32.066
26.794
26.550
200
150
100
50
PPM


141.018
141.089
141.169
141.239
141.310
0
-50
-100
-150
-200
PPM

Compound **9b**


7.868
7.690
7.668
7.611
7.589
7.271
2.573
2.553
2.548
2.533
2.107
2.087
2.068
2.055
2.034
2.016
1.417
1.363
1.256
-0.001
NC
N
H
O
F
0.93
2.00
2.15
10
8
6
4
2
PPM


171.520
142.231
133.306
119.569
118.957
106.846
95.821
94.174
77.389
77.068
76.755
36.281
36.055
32.146
32.110
26.795
26.547
NC
N
H
O
F
200
150
100
50
PPM


141.222
141.301
141.372
141.452
141.523
NC
N
H
O
F
0
-50
-100
-150
-200
PPM