

Supporting Information of

**Carbon dioxide utilization in the efficient synthesis of
carbamates by deep eutectic solvents (DES) as green and
attractive solvent/catalyst systems**

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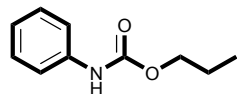
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A. Instruments and Materials

All chemicals were purchased from the Merck, Fluka and Aldrich Chemical companies in high purity. The products were characterized by their spectral and physical data such as NMR, FT-IR, MS, CHNS and melting point. ^1H and ^{13}C NMR spectra were recorded with Bruker Avance DPX 250 MHz instruments with Me_4Si or solvent resonance as the internal standard. Fourier transform infrared (FTIR) spectra were obtained using a Shimadzu FT-IR 8300 spectrophotometer. Elemental analysis was done on a 2400 series PerkinElmer analyzer. The mass spectra were recorded on a Shimadzu GC-MS QP 1000 EX instrument. Melting points were determined on a Mel-Temp apparatus and were uncorrected. Determination of the purity of the substrate and monitoring of the reaction were accomplished by thin-layer chromatography (TLC) on a silica-gel polygram SILG/UV 254 plates.

B. Analytical Data of Compounds Synthesized

1-Propyl phenylcarbamate (C1):



White crystal; mp 50-51°C.

IR (KBr); 3317 (s), 3138 (m), 3058 (m), 3019 (vw), 2974 (s), 2985 (s), 1704 (vs), 1597 (s), 1544 (s), 1447 (s), 1376 (m), 1317 (vs), 1304 (m), 1238 (vs), 1177 (m), 1159 (w), 1121 (s), 1080 (m), 1054 (s), 1027 (m), 995 (vw), 966 (w), 905 (s), 855 (vw), 845 (vw), 823 (w), 761 (s), 747 (s), 690 (s), 508 (m) cm^{-1} .

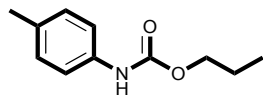
H-NMR (250 MHz, CDCl_3): δ = 7.26 (m, 4H), 6.97 (m, 1H), 6.64 (s, br, 1H, NH), 4.05 (t, J = 7.5 Hz, 2H), 1.62 (sex, J = 7.5 Hz, 2H), 0.90 (t, J = 7.5 Hz, 3H) ppm.

C-NMR (63 MHz, CDCl_3): δ = 153.74, 137.98, 129.01, 123.30, 118.63, 66.83, 22.26, 10.34 ppm.

MS Calcd m/z 179.22, Found 179.

Anal. Calcd for $\text{C}_{10}\text{H}_{13}\text{NO}_2$: C, 67.02; H, 7.31; N, 7.82%. Found: C, 66.97; H, 7.32; N, 7.86%.

1-Propyl (4-methylphenyl)carbamate (C2):



White crystal; mp 52-54 °C.

IR (KBr); 3316 (vs), 3134 (m), 3059 (m), 3020 (vw), 2974 (vs), 2983 (s), 2885 (m), 1703 (vs), 1598 (s), 1541 (s), 1445 (s), 1376 (m), 1318 (s), 1307 (w), 1237 (vs), 1175 (m), 1158 (w), 1120 (m), 1059 (m), 1057 (vs), 1027 (m), 997 (vw), 967 (vw), 904 (vs), 859 (vw), 846 (vw), 823 (w), 766 (m), 742 (s), 691 (s), 509 (m) cm^{-1} .

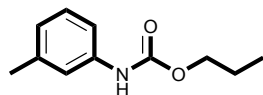
$^1\text{H-NMR}$ (250 MHz, CDCl_3): δ = 7.18 (d, J = 7.5 Hz, 2H), 7.02 (d, J = 7.5 Hz, 2H), 6.62 (s, br, 1H, NH), 4.03 (t, J = 7.5 Hz, 2H), 2.21 (s, 3H), 1.61 (sextuplet, J = 7.5 Hz, 2H), 0.88 (t, J = 7.5 Hz, 3H) ppm.

$^{13}\text{C-NMR}$ (63 MHz, CDCl_3): δ = 153.9, 135.4, 129.5, 126.7, 118.8, 66.7, 22.3, 20.7, 10.4 ppm.

MS Calcd m/z 193.25, Found 193.

Anal. Calcd for $\text{C}_{11}\text{H}_{15}\text{NO}_2$: C, 68.37; H, 7.82; N, 7.25%. Found: C, 68.31; H, 7.78; N, 7.32%.

1-Propyl (3-methylphenyl)carbamate (C3):



White crystal; mp 46-47 °C.

IR (KBr); 3294 (vs), 3192 (w), 3118 (w), 3063 (w), 2963 (m), 2903 (vw), 1706 (vs), 1671 (s), 1593 (s), 1560 (vw), 1539 (m), 1447 (w), 1414 (s), 1364 (m), 1319 (s), 1275 (s), 1254 (m), 1221 (vs), 1190 (w), 1087 (m), 1048 (vs), 1025 (vw), 986 (w), 959 (m), 912 (vw), 842 (m), 829 (vw), 757 (m), 716 (w), 698 (m), 630 (vw), 608 (m), 592 (vw), 583 (vw), 498 (vw), 480 (w) cm^{-1} .

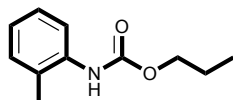
$^1\text{H-NMR}$ (250 MHz, CDCl_3): δ = 7.23-7.08 (m, 3H), 6.99 (d, J = 7.5 Hz, 1H), 6.85 (s, br, 1H, NH), 4.10 (t, J = 7.5 Hz, 2H), 2.30 (s, 3H), 1.68 (sextuplet, J = 7.5 Hz, 2H), 0.96 (t, J = 7.5 Hz, 3H) ppm.

$^{13}\text{C-NMR}$ (63 MHz, CDCl_3): δ = 154.1, 143.7, 139.6, 132.4, 132.4, 130.9, 128.8, 66.8, 22.3, 14.1, 10.3 ppm.

MS Calcd m/z 193.25, Found 193.

Anal. Calcd for $\text{C}_{11}\text{H}_{15}\text{NO}_2$: C, 68.37; H, 7.82; N, 7.25%. Found: C, 68.32; H, 7.77; N, 7.32%.

1-Propyl (2-methylphenyl)carbamate (C4):



White crystal; mp 42-43 °C.

IR (KBr); 3322 (vs), 3198 (m), 3132 (m), 3032 (m), 2944 (m), 2920 (m), 2861 (vw), 1709 (vs), 1602 (s), 1578 (vw), 1541 (vs), 1454 (vw), 1407 (m), 1376 (vw), 1319 (s), 1300 (m), 1275 (w),

1232 (vs), 1211 (w), 1157 (vw), 1115 (m), 1082 (m), 1067 (vs), 959 (vw), 902 (w), 858 (m), 820 (vs), 764 (m), 740 (s), 708 (w), 695 (s), 610 (vw), 554 (w), 528 (vw), 511 (m), 462 (m), 426 (w) cm^{-1} .

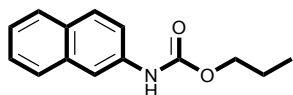
$^1\text{H-NMR}$ (250 MHz, CDCl_3): δ = 7.26-7.20 (m, 1H), 7.00-6.97 (m, 1H), 6.88-6.84 (m, 2H), 6.59 (s, br, 1H, NH), 4.12 (t, J = 7.5 Hz, 2H), 2.40 (s, 3H), 1.68 (sextuplet, J = 7.5 Hz, 2H), 0.96 (t, J = 7.5 Hz, 3H) ppm.

$^{13}\text{C-NMR}$ (63 MHz, CDCl_3): δ = 155.1, 141.0, 137.7, 131.1, 126.9, 126.0, 122.1, 66.3, 19.2, 16.0, 10.4 ppm.

MS Calcd m/z 193.25, Found 193.

Anal. Calcd for $\text{C}_{11}\text{H}_{15}\text{NO}_2$: C, 68.37; H, 7.82; N, 7.25%. Found: C, 68.33; H, 7.79; N, 7.29%.

1-Propyl (naphthalene-2-yl)carbamate (C5):



White crystal; mp 104-106°C.

IR (KBr): 316 (vs), 3053 (m), 2956 (vw), 2924 (vs), 2851 (s), 1709 (vs), 1598 (m), 1543 (m), 1466 (vw), 1444 (m), 1376 (w), 1318 (s), 1237 (vs), 1177 (m), 1120 (s), 1086 (m), 1054 (s), 967 (w), 904 (m), 859 (w), 823 (w), 746 (s), 696 (s), 509 (m), 419 (vw) cm^{-1} .

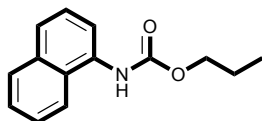
$^1\text{H-NMR}$ (250 MHz, CDCl_3): δ = 7.92-7.86 (m, 3H), 7.62 (m, 1H), 7.51-7.45 (m, 2H), 7.30-7.25 (m, 1H), 6.98 (s, br, 1H, NH), 4.10 (t, J = 7.5 Hz, 2H), 1.66 (sextuplet, J = 7.5 Hz, 2H), 0.96 (t, J = 7.5 Hz, 3H) ppm.

$^{13}\text{C-NMR}$ (63 MHz, CDCl_3): δ = 154.9, 148.7, 133.4, 130.5, 128.8, 127.5, 127.3, 126.4, 125.3, 122.1, 118.3, 66.8, 22.3, 10.3 ppm.

MS Calcd m/z 229.28, Found 229.

Anal. Calcd for $\text{C}_{14}\text{H}_{15}\text{NO}_2$: C, 73.34; H, 6.59; N, 6.11%. Found: C, 73.27; H, 6.51; N, 6.25%.

1-Propyl (naphthalene-1-yl)carbamate (C6):



White crystal; mp 73-75°C.

IR (KBr): 3286 (vs), 3056 (vw), 3033 (vw), 3014 (w), 2965 (vs), 2985 (s), 2875 (s), 1696 (vs), 1534 (s), 1478 (vw), 1363 (w), 1346 (s), 1256 (s), 1248 (vs), 1174 (w), 1128 (vw), 1110 (s), 1072 (s), 1033 (m), 1011 (s), 962 (vw), 949 (m), 909 (vw), 899 (vw), 862 (vw), 784 (vs), 768 (vs), 670 (m), 632 (w), 558 (m), 528 (w), 444 (vw), 418 (m) cm^{-1} .

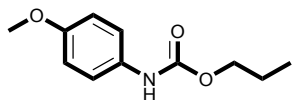
$^1\text{H-NMR}$ (250 MHz, CDCl_3): δ = 7.34-7.81 (m, 7H), 6.90 (s, br, 1H, NH), 4.09 (t, J = 7.5 Hz, 2H), 1.63 (sextuplet, J = 7.5 Hz, 2H), 0.90 (t, J = 7.5 Hz, 3H) ppm.

$^{13}\text{C-NMR}$ (63 MHz, CDCl_3): $\delta = 154.6, 134.1, 132.6, 130.9, 128.8, 128.7, 126.2, 126.0, 125.8, 124.9, 120.5, 67.1, 22.3, 10.4$ ppm.

MS Calcd m/z 229.28, Found 229.

Anal. Calcd for $\text{C}_{14}\text{H}_{15}\text{NO}_2$: C, 73.34; H, 6.59; N, 6.11%. Found: C, 73.31; H, 6.54; N, 6.19%.

1-Propyl (4-methoxyphenyl)carbamate (C7):



White crystal; mp 86-87 °C.

IR (KBr): 3340 (vs), 3216 (m), 3158 (vw), 3012 (m), 2969 (m), 2940 (m), 2858 (m), 2842 (m), 1704 (vs), 1553 (s), 1593 (s), 1517 (m), 1459 (m), 1380 (s), 1335 (m), 1292 (w), 1263 (vs), 1235 (vs), 1188 (w), 1158 (s), 1140 (s), 1024 (vs), 928 (m), 844 (m), 807 (s), 768 (s), 740 (vw), 691 (m), 624 (w), 574 (m), 559 (w), 532 (m), 478 (w) cm^{-1} .

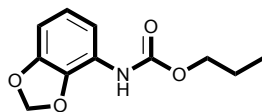
$^1\text{H-NMR}$ (250 MHz, CDCl_3): $\delta = 7.88$ (d, $J = 7.5$ Hz, 2H), 7.45 (d, $J = 7.5$ Hz, 2H), 7.08 (s, br, 1H, NH), 4.10 (t, $J = 7.5$ Hz, 2H), 2.52 (s, 3H), 1.65 (sextuplet, $J = 7.5$ Hz, 2H), 0.93 (t, $J = 7.5$ Hz, 3H) ppm.

$^{13}\text{C-NMR}$ (63 MHz, CDCl_3): $\delta = 155.7, 154.7, 144.0, 122.2, 113.6, 66.2, 54.8, 21.8, 10.9$ ppm.

MS Calcd m/z 209.25, Found 209.

Anal. Calcd for $\text{C}_{11}\text{H}_{15}\text{NO}_3$: C, 63.14; H, 7.23; N, 6.69%. Found: C, 63.13; H, 7.20; N, 6.74%.

1-Propyl (benzo[*d*][1,3]dioxol-5-yl)carbamate (C8):



White crystal; mp 78-80 °C.

IR (KBr): 3337 (vs), 3137 (m), 3059 (m), 3014 (vw), 2973 (s), 2964 (s), 2869 (vw), 1701 (vs), 1591 (s), 1578 (vw), 1542 (s), 1447 (m), 1376 (w), 1311 (s), 1301 (w), 1237 (vs), 1271 (m), 1258 (w), 1121 (m), 1082 (m), 1051 (s), 1017 (m), 995 (vw), 967 (w), 905 (m), 851 (vw), 846 (vw), 821 (w), 762 (m), 742 (m), 691 (s), 509 (m) cm^{-1} .

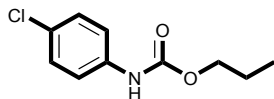
$^1\text{H-NMR}$ (250 MHz, CDCl_3): $\delta = 7.08$ (s, br, 1H, NH), 6.70 (m, 3H), 5.92 (s, 2H), 4.10 (t, $J = 7.5$ Hz, 2H), 1.67 (sextuplet, $J = 7.5$ Hz, 2H), 0.96 (t, $J = 7.5$ Hz, 3H) ppm.

$^{13}\text{C-NMR}$ (63 MHz, CDCl_3): $\delta = 154.1, 147.9, 143.7, 128.8, 114.9, 112.0, 108.1, 101.2, 66.8, 22.2, 10.3$ ppm.

MS Calcd m/z 223.23, Found 223.

Anal. Calcd for $\text{C}_{11}\text{H}_{13}\text{NO}_4$: C, 59.19; H, 5.87; N, 6.27%. Found: C, 59.15; H, 5.83; N, 6.33%.

1-Propyl (4-chlorophenyl)carbamate (C9)



White crystal; mp 82-84°C.

IR (KBr): 3323 (vs), 3102 (w), 3042 (m), 2977 (vs), 2988 (m), 2897 (m), 2879 (s), 2754 (m), 1699 (vs), 1604 (s), 1592 (s), 1541 (s), 1406 (s), 1386 (m), 1308 (s), 1285 (m), 1243 (vs), 1174 (m), 1138 (w), 1089 (s), 1067 (s), 1010 (s), 977 (m), 915 (m), 892 (vw), 857 (m), 820 (vs), 773 (m), 755 (s), 683 (m), 506 (s), 412 (m) cm^{-1} .

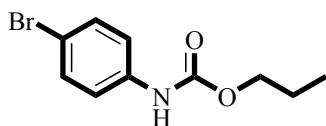
$^1\text{H-NMR}$ (250 MHz, CDCl_3): δ = 7.26 (d, J = 9 Hz, 2H), 7.18 (d, J = 9 Hz, 2H), 6.63 (s, br, 1H, NH), 4.05 (t, J = 7.5 Hz, 2H), 1.62 (sextuplet, J = 7.5 Hz, 2H), 0.90 (t, J = 7.5 Hz, 3H) ppm.

$^{13}\text{C-NMR}$ (63 MHz, CDCl_3): δ = 153.6, 136.6, 129.0, 128.3, 119.8, 67.0, 22.2, 10.3 ppm.

MS Calcd m/z 213.66, Found 213.

Anal. Calcd for $\text{C}_{10}\text{H}_{12}\text{ClNO}_2$: C, 56.22; H, 5.66; N, 6.56%. Found: C, 56.17; H, 5.61; N, 6.63%.

1-Propyl (4-bromophenyl)carbamate (C10)



White crystal; mp 76-78°C.

IR (KBr): 3308 (vs), 3108 (w), 3038 (m), 2971 (vs), 2938 (s), 2901 (w), 2880 (m), 1706 (vs), 1590 (s), 1560 (vw), 1518 (vs), 1492 (vs), 1403 (s), 1350 (m), 1310 (s), 1286 (m), 1242 (vs), 1180 (w), 1135 (w), 1116 (w), 1102 (m), 1076 (vs), 1013 (s), 974 (m), 968 (m), 913 (m), 893 (w), 856 (w), 842 (vw), 819 (vs), 790 (w), 772 (m), 758 (m), 749 (m), 724 (vw), 622 (s), 532 (m), 512 (w), 501 (m), 445 (w) cm^{-1} .

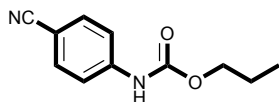
$^1\text{H-NMR}$ (250 MHz, CDCl_3): δ = 7.39 (d, J = 7.5 Hz, 2H), 7.28 (d, J = 7.5 Hz, 2H), 6.76 (s, br, 1H, NH), 4.12 (t, J = 7.5 Hz, 2H), 1.69 (sextuplet, J = 7.5 Hz, 2H), 0.96 (t, J = 7.5 Hz, 3H) ppm.

$^{13}\text{C-NMR}$ (63 MHz, CDCl_3): δ = 153.6, 132.1, 131.9, 128.4, 120.2, 67.0, 22.2, 10.3 ppm.

MS Calcd m/z 258.12, Found 257.

Anal. Calcd for $\text{C}_{10}\text{H}_{12}\text{BrNO}_2$: C, 46.53; H, 4.69; N, 5.43%. Found: C, 46.50; H, 4.65; N, 5.49%.

1-Propyl (4-cyanophenyl)carbamate (C11):



White crystal; mp 88-90°C.

IR (KBr): 3286 (vs), 3179 (m), 3108 (m), 2972 (vs), 2959 (s), 2880 (vw), 2224 (vs), 1736 (m), 1718 (vs), 1601 (vs), 1526 (vs), 1458 (vw), 1415 (s), 1352 (w), 1321 (vs), 1269 (m), 1205 (vs),

1178 (s), 1076 (s), 1055 (s), 951 (m), 894 (w), 851 (s), 838 (s), 768 (m), 722 (m), 556 (s), 546 (s), 514 (w) cm^{-1} .

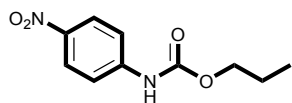
$^1\text{H-NMR}$ (250 MHz, CDCl_3): δ = 7.59 (d, J = 10 Hz, 2H), 7.50 (d, J = 10 Hz, 2H), 6.83 (s, br, 1H, NH), 4.15 (t, J = 7.5 Hz, 2H), 1.71 (sextuplet, J = 7.5 Hz, 2H), 0.98 (t, J = 7.5 Hz, 3H) ppm.

$^{13}\text{C-NMR}$ (63 MHz, CDCl_3): δ = 158.7, 146.3, 133.7, 118.2, 115.5, 106.2, 67.4, 22.1, 10.3 ppm.

MS Calcd m/z 204.23, Found 204.

Anal. Calcd for $\text{C}_{11}\text{H}_{12}\text{N}_2\text{O}_4$: C, 64.69; H, 5.92; N, 13.72%. Found: C, 64.62; H, 5.84; N, 13.84%.

1-Propyl (4-nitrophenyl)carbamate (C12):



Pale yellow crystal; mp 114-115°C.

IR (KBr); 3340 (vs), 3115 (m), 2942 (vs), 2880 (s), 1736 (vs), 1600 (s), 1550 (vw), 1490 (w), 1413 (m), 1388 (w), 1330 (s), 1304 (m), 1276 (vw), 1216 (s), 1180 (s), 1123 (w), 1112 (m), 1055 (s), 974 (w), 959 (vw), 919 (w), 867 (m), 857 (s), 829 (w), 752 (s), 727 (vw), 696 (m), 670 (vs), 530 (m), 501 (s), 412 (m) cm^{-1} .

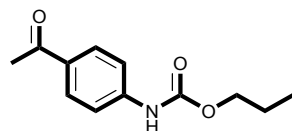
$^1\text{H-NMR}$ (250 MHz, CDCl_3): δ = 8.12 (d, J = 7.5 Hz, 2H), 7.50 (d, J = 7.5 Hz, 2H), 7.07 (s, br, 1H, NH), 4.09 (t, J = 7.5 Hz, 2H), 1.64 (sextuplet, J = 7.5 Hz, 2H), 0.90 (t, J = 7.5 Hz, 3H) ppm.

$^{13}\text{C-NMR}$ (63 MHz, CDCl_3): δ = 153.0, 144.1, 130.9, 125.2, 117.7, 67.6, 22.1, 10.3 ppm.

MS Calcd m/z 224.22, Found 224.

Anal. Calcd for $\text{C}_{10}\text{H}_{12}\text{N}_2\text{O}_4$: C, 53.57; H, 5.39; N, 12.49%. Found: C, 53.52; H, 5.34; N, 12.54%.

1-Propyl (4-acetylphenyl)carbamate (C13):



White crystal; mp 112-114 °C.

IR (KBr); 3304 (vs), 3076 (w), 2973 (s), 2952 (s), 2882 (w), 1736 (vs), 1702 (vw), 1664 (s), 1594 (vs), 1530 (s), 1478 (w), 1413 (s), 1376 (w), 1360 (s), 1319 (s), 1278 (s), 1217 (s), 1185 (m), 1138 (w), 1080 (w), 1052 (s), 958 (m), 916 (w), 895 (vw), 849 (s), 824 (s), 762 (m), 713 (s), 630 (vw), 589 (s), 508 (m), 500 (m), 468 (w) cm^{-1} .

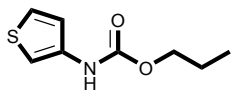
$^1\text{H-NMR}$ (250 MHz, CDCl_3): δ = 7.85 (d, J = 7.5 Hz, 2H), 7.43 (d, J = 7.5 Hz, 2H), 6.95 (s, br, 1H, NH), 4.08 (t, J = 7.5 Hz, 2H), 2.50 (s, 3H), 1.63 (sextuplet, J = 7.5 Hz, 2H), 0.91 (t, J = 7.5 Hz, 3H) ppm.

^{13}C -NMR (63 MHz, CDCl_3): $\delta = 200.5, 153.2, 142.5, 130.9, 129.9, 117.5, 67.2, 26.4, 22.2, 10.3$ ppm.

MS Calcd m/z 221.26, Found 221.

Anal. Calcd for $\text{C}_{12}\text{H}_{15}\text{NO}_3$: C, 65.14; H, 6.83; N, 6.33%. Found: C, 65.10; H, 6.80; N, 6.39%.

1-Propyl (thiophen-3-yl)carbamate (C14):



White crystal; mp 70-72 °C.

IR (KBr); 3315 (vs), 3143 (m), 3108 (m), 2966 (s), 2936 (s), 2864 (m), 1697 (vs), 1550 (s), 1466 (m), 1415 (vw), 1398 (vw), 1379 (m), 1366 (w), 1262 (s), 1245 (s), 1174 (s), 1108 (w), 1071 (s), 1040 (s), 971 (m), 956 (vw), 938 (vs), 909 (w), 876 (m), 842 (s), 778 (vs), 734 (m), 670 (s), 623 (w), 599 (w), 471 (w), 420 (w) cm^{-1} .

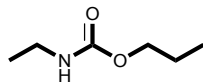
^1H -NMR (250 MHz, CDCl_3): $\delta = 7.14$ (d, $J = 5.5$ Hz, 1H), 6.87 (d, $J = 5.5$ Hz, 2H), 6.53 (s, br, 1H, NH), 4.06 (t, $J = 7.5$ Hz, 2H), 1.62 (sextuplet, $J = 7.5$ Hz, 2H), 0.89 (t, $J = 7.5$ Hz, 3H).

^{13}C -NMR (63 MHz, CDCl_3): $\delta = 153.3, 124.7, 120.7, 107.8, 67.0, 22.2, 10.3$.

MS Calcd m/z 185.24, Found 185.

Anal. Calcd for $\text{C}_8\text{H}_{11}\text{NO}_2\text{S}$: C, 51.87; H, 5.99; N, 7.56; S, 17.31%. Found: C, 51.84; H, 5.93; N, 7.61; S, 17.33%.

1-Propyl ethylcarbamate (C15):



White crystal; mp 63-65°C.

IR (KBr); 3304 (vs), 2975 (s), 2899 (w), 2863 (vw), 1702 (vs), 1488 (s), 1445 (m), 1398 (vs), 1346 (w), 1319 (m), 1297 (s), 1243 (vs), 1176 (m), 1153 (m), 1115 (m), 1079 (w), 1052 (vw), 918 (m), 865 (m), 803 (w), 764 (vs), 700 (vs), 650 (m), 620 (vw), 593 (m), 535 (m) cm^{-1} .

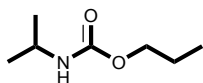
^1H -NMR (250 MHz, CDCl_3): $\delta = 5.52$ (s, br, 1H, NH), 4.04 (t, $J = 7.5$ Hz, 2H), 2.70 (q, $J = 7.5$ Hz, 2H), 1.60 (sex, $J = 7.5$ Hz, 2H), 1.14 (t, $J = 7.5$ Hz, 3H), 0.89 (t, $J = 7.5$ Hz, 3H) ppm.

^{13}C -NMR (63 MHz, CDCl_3): $\delta = 153.9, 66.7, 43.7, 22.3, 14.1, 10.4$ ppm.

MS Calcd m/z 131.18, Found 131

Anal. Calcd for $\text{C}_6\text{H}_{13}\text{NO}_2$: C, 54.94; H, 9.99; N, 10.68%. Found: C, 54.91; H, 9.95; N, 10.73%.

1-Propyl *iso*-propylcarbamate (C16):



White crystal; mp 53-54 °C.

IR (KBr); 3307 (vs), 2941 (s), 2864 (s), 1703 (vs), 1496 (m), 1369 (m), 1280 (m), 1206 (w), 1178 (s), 1104 (vw), 1073 (w), 1029 (vw), 972 (vw), 903 (vw), 870 (m), 755 (vs), 700 (s), 615 (m), 592 (w), 529 (m), 422 (m) cm^{-1} .

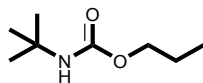
$^1\text{H-NMR}$ (250 MHz, CDCl_3): δ = 5.01 (s, br, 1H, NH), 4.08 (t, J = 7.5 Hz, 2H), 2.81 (sept, J = 7.5 Hz, 1H), 1.62 (sex, J = 7.5 Hz, 2H), 1.24 (t, J = 7.5 Hz, 6H), 0.91 (t, J = 7.5 Hz, 3H) ppm.

$^{13}\text{C-NMR}$ (63 MHz, CDCl_3): δ = 153.9, 67.9, 41.0, 22.9, 16.2, 11.0 ppm.

MS Calcd m/z 145.20, Found 145

Anal. Calcd for $\text{C}_7\text{H}_{15}\text{NO}_2$: C, 57.90; H, 10.41; N, 9.65%. Found: C, 57.87; H, 10.39; N, 9.69%.

1-Propyl *tert*-butylcarbamate (C17):



White crystal; mp 48-49 °C.

IR (KBr); 3324 (vs), 3067 (vw), 3032 (vw), 2962 (s), 2878 (m), 2813 (w), 1698 (vs), 1534 (s), 1364 (vw), 1345 (m), 1256 (s), 1239 (vs), 1174 (vw), 1105 (m), 1070 (m), 1029 (w), 1009 (m), 978 (w), 880 (vw), 846 (m), 78m (s), 776 (s), 767 (s), 746 (s), 696 (s), 578 (w), 530 (w), 492 (w), 419 (vw) cm^{-1} .

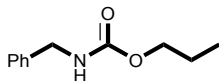
$^1\text{H-NMR}$ (250 MHz, CDCl_3): δ = 4.95 (s, br, 1H, NH), 4.08 (t, J = 7.5 Hz, 2H), 1.64 (sex, J = 7.5 Hz, 2H), 1.11 (s, 9H), 0.88 (t, J = 7.5 Hz, 3H) ppm.

$^{13}\text{C-NMR}$ (63 MHz, CDCl_3): δ = 155.1, 65.7, 44.2, 23.7, 21.0, 12.8 ppm.

MS Calcd m/z 159.23, Found 159

Anal. Calcd for $\text{C}_8\text{H}_{17}\text{NO}_2$: C, 60.35; H, 10.76; N, 8.80%. Found: C, 60.31; H, 10.72; N, 8.87%.

1-Propyl benzylcarbamate (C18):



White crystal; mp 123-125 °C.

IR (KBr); 3338 (s), 3053 (m), 3043 (m), 2978 (s), 2929 (m), 2874 (vw), 1702 (vs), 1598 (s), 1541 (vs), 1492 (m), 1459 (w), 1447 (s), 1409 (vw), 1371 (w), 1315 (s), 1299 (s), 1244 (vs), 1133 (vw), 1084 (s), 1068 (s), 1030 (w), 1016 (w), 899 (m), 845 (m), 809 (vs), 764 (s), 742 (s), 690 (vs), 670 (vw), 655 (vw), 526 (vw), 497 (s), 453 (s), 418 (vw) cm^{-1} .

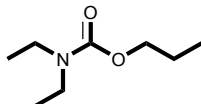
$^1\text{H-NMR}$ (250 MHz, CDCl_3): δ = 7.29-7.26 (m, 5H), 5.13 (s, br, 1H, NH), 3.39 (s, 2H), 4.06 (t, J = 7.5 Hz, 2H), 1.61 (sex, J = 7.5 Hz, 2H), 0.89 (t, J = 7.5 Hz, 3H) ppm.

$^{13}\text{C-NMR}$ (63 MHz, CDCl_3): δ = 156.8, 138.6, 128.5, 127.5, 127.2, 67.0, 45.5, 22.6, 10.3 ppm.

MS Calcd m/z 193.15, Found 193

Anal. Calcd for $C_{11}H_{15}NO_2$: C, 68.37; H, 7.82; N, 7.25%. Found: C, 68.34; H, 7.78; N, 7.29%.

1-Propyl diethylcarbamate (C19):



Colorless liquid.

IR (KBr); 2962 (s), 2935 (vw), 2898 (w), 2898 (s), 1696 (vs), 1435 (m), 1339 (m), 1254 (s), 1121 (s), 1080 (vs), 1018 (vw), 943 (s), 887 (w), 788 (s), 740 (m), 638 (vs), 556 (vs), 528 (vs), 457 (vw), 438 (m) cm^{-1} .

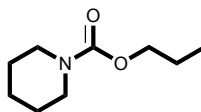
1H -NMR (250 MHz, $CDCl_3$): δ = 4.10 (t, J = 7.5 Hz, 2H), 2.30 (q, J = 7.5 Hz, 4H), 1.64 (sex, J = 7.5 Hz, 2H), 1.20 (t, J = 7.5 Hz, 6H), 0.90 (t, J = 7.5 Hz, 3H) ppm.

^{13}C -NMR (63 MHz, $CDCl_3$): δ = 154.1, 67.1, 44.4, 22.3, 14.1, 10.4 ppm.

MS Calcd m/z 159.23, Found 159

Anal. Calcd for $C_8H_{17}NO_2$: C, 60.35; H, 10.76; N, 8.80%. Found: C, 60.30; H, 10.74; N, 8.83%.

piperidine-1-carboxylic acid propyl ester (C20):



Colorless liquid.

IR (KBr); 2954 (vs), 2873 (s), 1698 (vs), 1612 (s), 1408 (vs), 1385 (m), 1341 (s), 1306 (w), 1219 (w), 1184 (m), 1143 (vw), 1048 (vs), 1003 (vw), 975 (vw), 916 (m), 842 (w), 787 (m), 706 (m), 570 (vs), 531 (w) cm^{-1} .

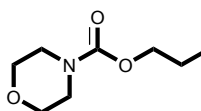
1H -NMR (250 MHz, $CDCl_3$): δ = 4.15 (t, J = 7.5 Hz, 2H), 3.75 (t, J = 7.5 Hz, 4H), 1.91-1.78 (m, 6H), 1.95 (q, J = 7.5 Hz, 2H), 0.95 (t, J = 7.5 Hz, 3H) ppm.

^{13}C -NMR (63 MHz, $CDCl_3$): δ = 150.8, 66.5, 32.0, 23.5, 19.4, 13.6, 10.5 ppm.

MS Calcd m/z 171.24, Found 171

Anal. Calcd for $C_9H_{17}NO_2$: C, 63.13; H, 10.01; N, 8.18%. Found: C, 63.04; H, 9.94; N, 8.23%.

morpholine-4-carboxylic acid propyl ester(C21):



Colorless liquid.

IR (KBr); 2956 (w), 2924 (vs), 2851 (s), 1702 (vs), 1602 (w), 1501 (w), 1420 (s), 1291 (s), 1220 (m), 1198 (vs), 1162 (m), 1104 (m), 1017 (vs), 864 (vs), 833 (m), 816 (s), 782 (w), 712 (m), 630 (w), 592 (w), 541 (m), 496 (m), 448 (w) cm^{-1} .

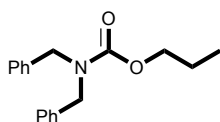
$^1\text{H-NMR}$ (250 MHz, CDCl_3): δ = 4.11 (d, J = 7.5 Hz, 2H), 3.58 (t, J = 8.0 Hz, 3H), 3.29 (t, J = 8.0 Hz, 3H), 1.64 (sex, J = 7.5 Hz, 2H), 0.90 (t, J = 7.5 Hz, 3H) ppm.

$^{13}\text{C-NMR}$ (63 MHz, CDCl_3): δ = 150.6, 64.9, 61.4, 46.2, 21.4, 15.6 ppm.

MS Calcd m/z 173.21, Found 173

Anal. Calcd for $\text{C}_8\text{H}_{15}\text{NO}_3$: C, 55.47; H, 8.73; N, 8.09%. Found: C, 55.41; H, 8.65; N, 8.21%.

1-Propyl dibenzylcarbamate (C22):



White crystal; mp 147-148 $^{\circ}\text{C}$.

IR (KBr); 3206 (vw), 3182 (s), 3052 (vw), 2965 (m), 2861 (s), 2771 (vw), 1700 (s), 1602 (s), 1588 (s), 1504 (vs), 1446 (m), 1376 (m), 1344 (m), 1294 (m), 1238 (s), 1211 (vs), 1094 (m), 1074 (m), 1010 (m), 978 (s), 875 (s), 850 (vs), 815 (vs), 752 (vs), 691 (s), 629 (m), 599 (vw), 561 (w), 501 (m) cm^{-1} .

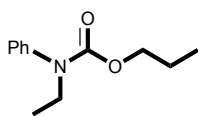
$^1\text{H-NMR}$ (250 MHz, CDCl_3): δ = 7.26-7.20 (m, 10H), 4.10 (t, J = 7.5 Hz, 2H), 3.41 (s, 4H), 1.66 (sex, J = 7.5 Hz, 2H), 0.96 (t, J = 7.5 Hz, 3H) ppm.

$^{13}\text{C-NMR}$ (63 MHz, CDCl_3): δ = 158.7, 140.8, 128.1, 126.9, 126.5, 66.4, 44.3, 21.5, 11.0 ppm.

MS Calcd m/z 283.37, Found 283.

Anal. Calcd for $\text{C}_{18}\text{H}_{21}\text{NO}_2$: C, 76.30; H, 7.47; N, 4.94%. Found: C, 76.28; H, 7.45; N, 4.98%.

1-Propyl ethyl(phenyl)carbamate (C23):



White crystal; mp 173-175 $^{\circ}\text{C}$.

IR (KBr); 3156 (s), 3022 (vw), 2985 (s), 2882 (vw), 1698 (vs), 1405 (s), 1313 (m), 1241 (vs), 1206 (m), 1106 (m), 1058 (vs), 1034 (vs), 928 (w), 851 (m), 784 (w), 764 (m), 698 (vs), 595 (s), 558 (m), 478 (vw) cm^{-1} .

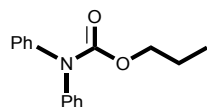
$^1\text{H-NMR}$ (250 MHz, CDCl_3): δ = 7.41-7.36 (m, 5H), 4.10 (t, J = 7.5 Hz, 2H), 2.70 (q, J = 7.5 Hz, 2H), 1.67 (sex, J = 7.5 Hz, 2H), 1.15 (t, J = 7.5 Hz, 3H), 0.96 (t, J = 7.5 Hz, 3H) ppm.

^{13}C -NMR (63 MHz, CDCl_3): $\delta = 155.2, 137.9, 131.9, 126.8, 126.6, 66.5, 43.4, 22.0, 16.3, 10.0$ ppm.

MS Calcd m/z 207.27, Found 207

Anal. Calcd for $\text{C}_{12}\text{H}_{17}\text{NO}_2$: C, 69.54; H, 8.27; N, 6.76%. Found: C, 69.51; H, 8.26; N, 6.79%.

1-Propyl diphenylcarbamate (C24):



White crystal; mp 210-212 °C.

IR (KBr): 3172 (s), 3044 (m), 2947 (m), 2919 (m), 2875 (w), 1709 (vs), 1614 (s), 1498 (vs), 1383 (vs), 1265 (m), 1187 (vs), 1118 (m), 1091 (s), 1028 (vw), 990 (vs), 921 (w), 893 (vw), 837 (m), 773 (vs), 724 (m), 709 (vw), 619 (vs), 551 (m), 472 (m) cm^{-1} .

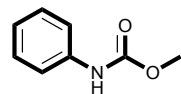
^1H -NMR (250 MHz, CDCl_3): $\delta = 7.38$ -7.34 (m, 4H), 7.22-7.15 (m, 4H), 6.89-6.83 (m, 2H), 4.05 (t, $J = 7.5$ Hz, 2H), 1.62 (sex, $J = 7.5$ Hz, 2H), 0.88 (t, $J = 7.5$ Hz, 3H) ppm.

^{13}C -NMR (63 MHz, CDCl_3): $\delta = 154.5, 139.0, 127.1, 119.6, 116.2, 66.8, 22.3, 10.3$ ppm.

MS Calcd m/z 255.32, Found 255.

Anal. Calcd for $\text{C}_{16}\text{H}_{17}\text{NO}_2$: C, 75.27; H, 6.71; N, 5.49%. Found: C, 75.25; H, 6.68; N, 5.53%.

Methyl phenylcarbamate (C25):



White crystal; mp 46-48°C.

IR (KBr): 3308 (s), 3059 (w), 2966 (m), 2934 (w), 2875 (m), 2772 (w), 1706 (vs), 1591 (s), 1560 (w), 1518 (vs), 1492 (s), 1350 (m), 1310 (s), 1286 (s), 1261 (s), 1242 (vs), 1180 (w), 11178 (vw), 1102 (w), 1076 (s), 1013 (m), 968 (m), 913 (w), 893 (vw), 856 (w), 842 (vw), 819 (s), 771 (m), 749 (m), 622 (m), 501 (w), 445 (vw) cm^{-1} .

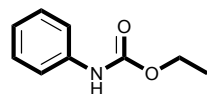
^1H -NMR (250 MHz, CDCl_3): $\delta = 7.15$ (m, 5H), 6.63 (s, br, 1H, NH), 4.13 (s, 3H) ppm.

^{13}C -NMR (63 MHz, CDCl_3): $\delta = 155.5, 132.5, 129.1, 126.5, 122.3, 68.1$ ppm.

MS Calcd m/z 151.17, Found 151.

Anal. Calcd for $\text{C}_8\text{H}_9\text{NO}_2$: C, 63.56; H, 6.00; N, 9.27%. Found: C, 63.52; H, 5.93; N, 9.34%.

Ethyl phenylcarbamate (C26):



White crystal; mp 49-50°C.

IR (KBr); 3320 (s), 3140 (m), 3059 (m), 3020 (vw), 2974 (s), 2984 (s), 1701 (vs), 1598 (s), 1543 (s), 1444 (s), 1376 (m), 1318 (vs), 1304 (m), 1237 (vs), 1177 (m), 1158 (w), 1120 (s), 1059 (m), 1054 (s), 1029 (m), 997 (vw), 967 (w), 904 (s), 859 (vw), 846 (vw), 823 (w), 762 (s), 746 (s), 696 (s), 509 (m) cm^{-1} .

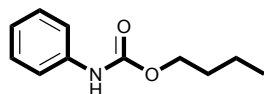
$^1\text{H-NMR}$ (250 MHz, CDCl_3): δ = 7.25 (m, 4H), 6.97 (m, 1H), 6.64 (s, br, 1H, NH), 4.15 (q, J = 7.0 Hz, 2H), 1.23 (t, J = 7.0 Hz, 3H) ppm.

$^{13}\text{C-NMR}$ (63 MHz, CDCl_3): δ = 158.4, 138.0, 129.0, 123.3, 118.7, 61.2, 14.6 ppm.

MS Calcd m/z 165.19, Found 165.

Anal. Calcd for $\text{C}_9\text{H}_{11}\text{NO}_2$: C, 65.44; H, 6.71; N, 8.48%. Found: C, 65.41; H, 6.72; N, 8.50%.

1-Butyl phenylcarbamate (C27):



White crystal; mp 60-62°C.

IR (KBr); 3318 (s), 3059 (w), 3019 (vw), 2966 (s), 2934 (m), 2897 (vw), 2875 (m), 1702 (vs), 1602 (s), 1534 (s), 1474 (vw), 1438 (m), 1357 (vw), 1318 (s), 1311 (s), 1272 (vw), 1228 (s), 1131 (w), 1085 (w), 1060 (s), 1030 (m), 996 (vw), 976 (vw), 908 (s), 842 (vs), 774 (vw), 747 (s), 694 (s), 621 (w), 509 (vs), 447 (m), 434 (m) cm^{-1} .

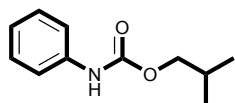
$^1\text{H-NMR}$ (250 MHz, CDCl_3): δ = 7.25 (m, 4H), 6.98 (m, 1H), 6.58 (s, br, 1H, NH), 4.01 (t, J = 7.5 Hz, 2H), 1.59 (m, 2H), 1.30 (m, 2H), 0.88 (t, J = 7.5 Hz, 3H) ppm.

$^{13}\text{C-NMR}$ (63 MHz, CDCl_3): δ = 153.8, 138.0, 129.0, 123.3, 118.7, 65.1, 31.0, 19.1, 13.7 ppm.

MS Calcd m/z 193.25, Found 193.

Anal. Calcd for $\text{C}_{11}\text{H}_{15}\text{NO}_2$: C, 68.37; H, 7.82; N, 7.25%. Found: C, 68.34; H, 7.83; N, 7.26%.

iso-Butyl phenylcarbamate (C28):



White crystal; mp 84-86 °C.

IR (KBr); 3311 (s), 3138 (m), 3057 (m), 2974 (s), 2960 (s), 2875 (m), 1705 (vs), 1601 (s), 1542 (s), 1444 (m), 1318 (s), 1304 (m), 1283 (w), 1233 (vs), 1132 (w), 1086 (m), 1063 (s), 1029 (m), 998 (vw), 965 (w), 925 (vw), 904 (s), 850 (vw), 841 (vw), 760 (s), 745 (s), 696 (s), 509 (m) cm^{-1} .

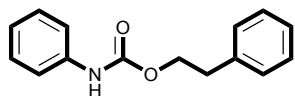
$^1\text{H-NMR}$ (250 MHz, CDCl_3): δ = 7.32-7.21 (m, 4H), 7.00-6.96 (m, 1H), 6.68 (s, br, 1H, NH), 3.87 (d, J = 7.5 Hz, 2H), 1.89 (hep, J = 7.5 Hz, 1H), 0.88 (d, J = 7.5 Hz, 6H) ppm.

$^{13}\text{C-NMR}$ (63 MHz, CDCl_3): δ = 153.8, 138.0, 129.0, 123.3, 118.7, 71.4, 28.0, 19.1 ppm.

MS Calcd m/z 193.25, Found 193.

Anal. Calcd for $C_{11}H_{15}NO_2$: C, 68.37; H, 7.82; N, 7.25%. Found: C, 68.33; H, 7.82; N, 7.28%.

2-phenylethyl phenylcarbamate (C29):



White crystal; mp 78-80 °C.

IR (KBr); 3339 (m), 3254 (w), 3116 (w), 3070 (vw), 1706 (vs), 1417 (m), 1321 (s), 1246 (s), 1182 (m), 1138 (vw), 1110 (vs), 1059 (vw), 1048 (vs), 995 (vw), 936 (w), 903 (m), 824 (m), 793 (s), 763 (vw), 710 (m), 604 (vs), 463 (m), 411 (m) cm^{-1} .

1H -NMR (250 MHz, $CDCl_3$): δ = 7.55-7.50 (m, 5H), 7.10-7.32 (m, 4H), 6.99-6.96 (m, 1H), 6.55 (s, br, 1H, NH), 4.01 (t, J = 7.5 Hz, 2H), 2.83 (t, J = 7.5 Hz, 3H) ppm.

^{13}C -NMR (63 MHz, $CDCl_3$): δ = 156.6, 140.3, 138.3, 130.6, 128.8, 126.2, 124.1, 121.5, 63.9, 34.9 ppm.

MS Calcd m/z 241.29, Found 241.

Anal. Calcd for $C_{15}H_{15}NO_2$: C, 64.67; H, 6.27; N, 5.81%. Found: C, 64.64; H, 6.25; N, 5.87%.

2-Propyl phenylcarbamate (C30):



White crystal; mp 83-85°C.

IR (KBr); 3323 (s), 3132 (m), 3062 (m), 3018 (vw), 2981 (s), 2988 (m), 1702 (vs), 1597 (s), 1534 (s), 1501 (m), 1490 (m), 1468 (w), 1443 (m), 1370 (s), 1340 (w), 1306 (s), 1240 (vs), 1180 (m), 1144 (m), 1108 (s), 1084 (m), 1048 (s), 1027 (m), 960 (w), 926 (w), 908 (w), 878 (vw), 829 (vw), 803 (s), 766 (s), 746 (vs), 701 (s), 692 (s), 670 (vw), 525 (m), 508 (s), 418 (m) cm^{-1} .

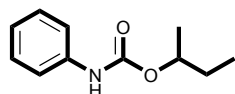
1H -NMR (250 MHz, $CDCl_3$): δ = 7.20 (m, 4H), 6.97 (m, 1H), 6.55 (s, br, 1H, NH), 4.96 (q, J = 7.5 Hz, 1H), 1.22 (d, J = 7.5 Hz, 6H) ppm.

^{13}C -NMR (63 MHz, $CDCl_3$): δ = 153.2, 138.1, 129.0, 123.2, 118.6, 68.7, 22.0 ppm.

MS Calcd m/z 179.22, Found 179.

Anal. Calcd for $C_{10}H_{13}NO_2$: C, 67.02; H, 7.31; N, 7.82%. Found: C, 66.98; H, 7.32; N, 7.85%.

2-Butyl phenylcarbamate (C31):



White crystal; mp 64-66°C.

IR (KBr); 3320 (s), 3139 (m), 3058 (m), 3019 (vw), 2974 (s), 2984 (s), 2882 (m), 1701 (vs), 1599 (s), 1543 (s), 1466 (vw), 1444 (s), 1376 (m), 1318 (vs), 1304 (m), 1237 (vs), 1177 (m), 1158 (w), 1120 (s), 1059 (m), 1054 (s), 1029 (m), 997 (vw), 967 (w), 904 (s), 859 (vw), 846 (vw), 823 (w), 761 (s), 745 (s), 696 (s), 509 (m), 419 (m) cm^{-1} .

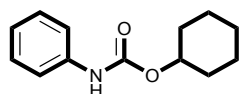
$^1\text{H-NMR}$ (250 MHz, CDCl_3): δ = 7.23 (m, 4H), 6.95 (m, 1H), 6.62 (s, br, 1H, NH), 4.66 (sex, J = 3.75 Hz, 1H), 1.84 (m, 2H), 1.67 (d, J = 7.5 Hz, 3H), 1.32 (t, J = 7.5 Hz, 3H) ppm.

$^{13}\text{C-NMR}$ (63 MHz, CDCl_3): δ = 153.2, 138.2, 129.0, 123.2, 118.6, 73.6, 31.9, 25.4, 23.8 ppm.

MS Calcd m/z 193.25, Found 193.

Anal. Calcd for $\text{C}_{11}\text{H}_{15}\text{NO}_2$: C, 68.37; H, 7.82; N, 7.25%. Found: C, 68.33; H, 7.83; N, 7.27%.

Cyclohexyl phenylcarbamate (C32):



White crystal; mp 79-80°C.

IR (KBr); 3358 (vs), 3124 (m), 3058 (m), 2928 (vs), 2860 (s), 1706 (vs), 1603 (s), 1578 (vw), 1528 (vs), 1466 (vw), 1444 (vs), 1353 (w), 1329 (m), 1320 (m), 1301 (m), 1233 (s), 1196 (vw), 1083 (m), 1057 (s), 1029 (m), 1017 (m), 951 (m), 900 (m), 892 (m), 854 (vw), 838 (m), 801 (vw), 758 (s), 769 (m), 737 (s), 691 (vs), 670 (vw), 602 (s), 504 (s), 442 (w) cm^{-1} .

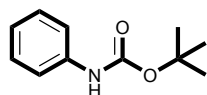
$^1\text{H-NMR}$ (250 MHz, CDCl_3): δ = 7.24 (m, 4H), 6.96 (m, 1H), 6.62 (s, br, 1H, NH), 4.77 (qunt, J = 5.5 Hz, 1H), 1.41-1.66 (m, 2H), 1.19 (m, 4H), 0.86 (m, 4H) ppm.

$^{13}\text{C-NMR}$ (63 MHz, CDCl_3): δ = 153.5, 138.2, 129.0, 123.2, 118.6, 73.2, 29.0, 19.7, 9.7 ppm.

MS Calcd m/z 199.29, Found 199.

Anal. Calcd for $\text{C}_{11}\text{H}_{21}\text{NO}_2$: C, 66.29; H, 10.62; N, 7.03%. Found: C, 66.25; H, 10.63; N, 7.07%.

tert-Butyl phenylcarbamate (C33):



White crystal; mp 134-135°C.

IR (KBr); 3312 (s), 3127 (m), 3042 (m), 3006 (m), 2985 (s), 2932 (s), 1698 (vs), 1598 (s), 1524 (s), 1502 (w), 1478 (w), 1444 (m), 1392 (s), 1368 (s), 1315 (m), 1248 (s), 1163 (vs), 1083 (m), 1054 (s), 1022 (m), 910 (s), 896 (m), 851 (vw), 822 (s), 775 (vs), 746 (vs), 692 (vs), 526 (vw), 511 (vs), 459 (m), 416 (w) cm^{-1} .

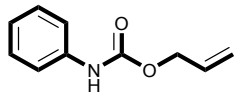
$^1\text{H-NMR}$ (250 MHz, CDCl_3): δ = 7.26 (m, 4H), 6.95 (m, 1H), 6.42 (s, br, 1H, NH), 1.45 (s, 9H) ppm.

$^{13}\text{C-NMR}$ (63 MHz, CDCl_3): δ = 156.0, 134.4, 129.0, 123.0, 118.5, 69.0, 28.3 ppm.

MS Calcd m/z 193.25, Found 193.

Anal. Calcd for C₁₁H₁₅NO₂: C, 68.37; H, 7.82; N, 7.25%. Found: C, 68.34; H, 7.83; N, 7.26%.

Allyl phenylcarbamate (C34):



White crystal; mp 67-68 °C.

IR (KBr); 3340 (vs), 3094 (s), 3046 (m), 2930 (w), 2882 (vw), 1706 (vs), 1598 (s), 1538 (vs), 1492 (w), 1459 (vw), 1447 (s), 1409 (w), 1371 (vw), 1315 (s), 1299 (m), 1242 (vs), 1084 (m), 1068 (s), 1030 (vw), 1016 (vw), 899 (w), 845 (m), 810 (vs), 764 (m), 742 (m), 690 (m), 656 (w), 608 (vw), 467 (s), 453 (w), 418 (vw) cm⁻¹.

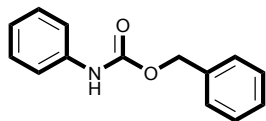
¹H-NMR (250 MHz, CDCl₃): δ = 7.31-7.21 (m, 4H), 6.95-6.91 (m, 1H), 6.45 (s, br, 1H, NH), 5.86-5.74 (m, 1H), 5.15 (d, J = 8 Hz, 1H), 5.01 (d, J = 8 Hz, 1H), 3.40 (d, J = 7.5 Hz, 2H) ppm.

¹³C-NMR (63 MHz, CDCl₃): δ = 154.7, 138.4, 134.9, 128.7, 128.0, 121.8, 116.7, 31.5 ppm.

MS Calcd *m/z* 177.20, Found 177.

Anal. Calcd for C₁₀H₁₁NO₂: C, 67.78; H, 6.26; N, 7.90%. Found: C, 67.75; H, 6.23; N, 7.94%.

Benzyl phenylcarbamate (C35):



White crystal; mp 70-72 °C.

IR (KBr); 3305 (vs), 3105 (w), 3036 (w), 2971 (vs), 2934 (s), 2901 (m), 2876 (s), 1706 (vs), 1592 (s), 1560 (vw), 1515 (s), 1496 (s), 1405 (m), 1350 (m), 1306 (vs), 1286 (s), 1262 (m), 1245 (vs), 1180 (vw), 1116 (w), 1102 (m), 1078 (s), 1013 (vs), 977 (s), 968 (s), 918 (w), 893 (w), 815 (s), 788 (m), 771 (m), 758 (m), 749 (m), 724 (vw), 628 (s), 532 (m), 518 (vw), 508 (m), 445 (vw) cm⁻¹.

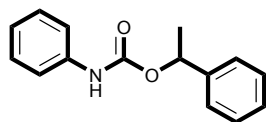
¹H-NMR (250 MHz, CDCl₃): δ = 7.09-7.38 (m, 9H), 7.02 (m, 1H), 6.84 (s, br, 1H, NH), 5.16 (s, 2H) ppm.

¹³C-NMR (63 MHz, CDCl₃): δ = 153.4, 137.8, 136.0, 129.0, 128.6, 128.2, 126.9, 123.4, 118.8, 66.9 ppm.

MS Calcd *m/z* 227.26, Found 227.

Anal. Calcd for C₁₄H₁₃NO₂: C, 73.99; H, 5.77; N, 6.16%. Found: C, 73.93; H, 5.74; N, 6.22%.

1-phenylethyl phenylcarbamate (C36):



White crystal; mp 90-92 °C.

IR (KBr); 3338 (s), 3220 (m), 3130 (w), 3042 (w), 2938 (w), 2881 (vw), 1702 (vs), 1598 (s), 1541 (vs), 1492 (w), 1459 (w), 1447 (m), 1409 (vw), 1371 (w), 1315 (s), 1299 (m), 1244 (vs), 1084 (m), 1068 (s), 1030 (w), 1016 (w), 899 (m), 845 (m), 809 (vs), 764 (vs), 742 (vs), 690 (vs), 670 (vw), 655 (w), 526 (vw), 497 (s), 453 (m), 418 (vw) cm^{-1} .

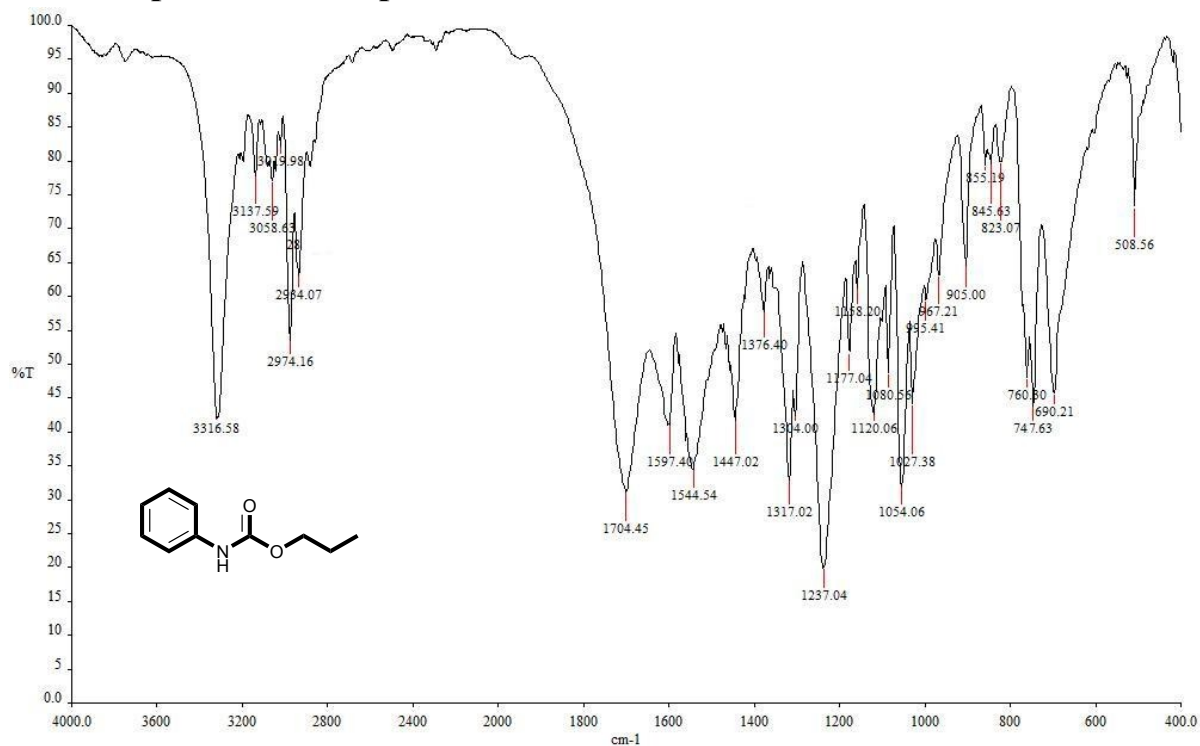
$^1\text{H-NMR}$ (250 MHz, CDCl_3): δ = 7.65-7.61 (m, 5H), 7.28-7.16 (m, 4H), 6.98-6.96 (m, 1H), 6.55 (s, br, 1H, NH), 4.62 (q, J = 7.5 Hz, 1H), 1.40 (d, J = 7.5 Hz, 3H) ppm.

$^{13}\text{C-NMR}$ (63 MHz, CDCl_3): δ = 156.1, 142.8, 133.2, 128.2, 127.9, 127.3, 125.9, 125.6, 125.2, 70.7, 22.5 ppm.

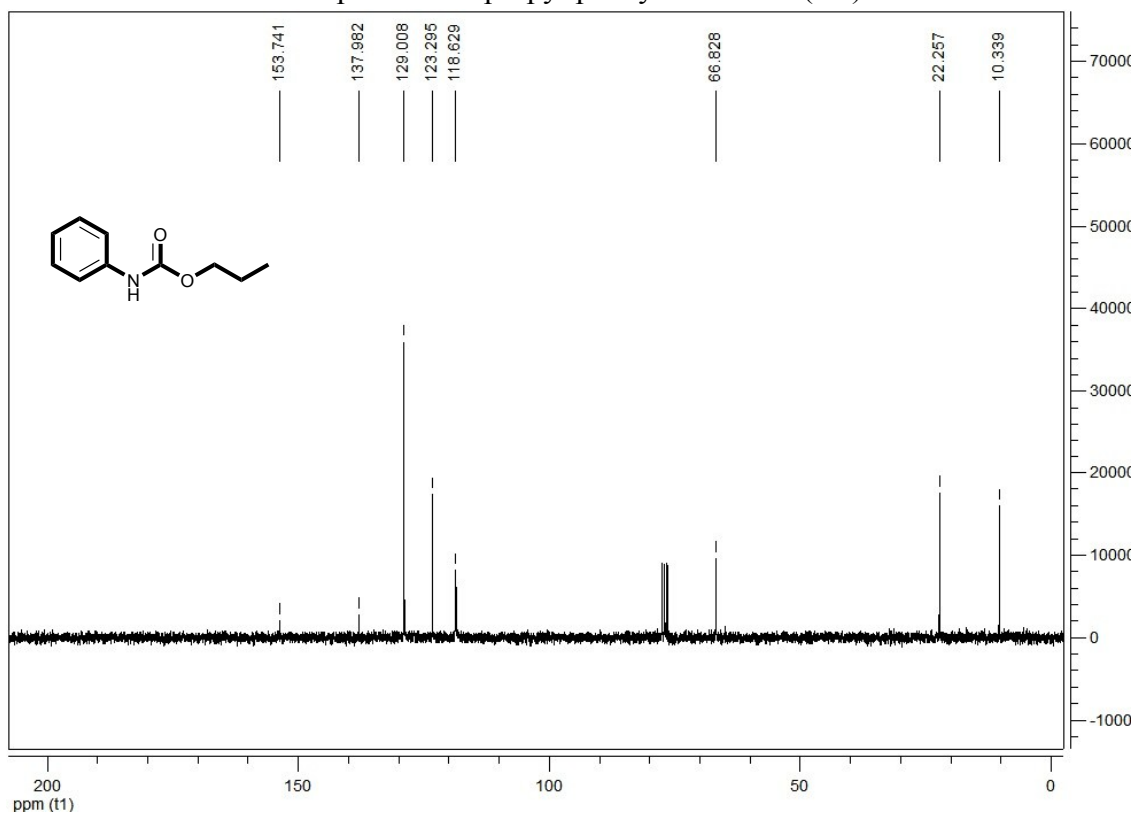
MS Calcd m/z 241.29, Found 241.

Anal. Calcd for $\text{C}_{15}\text{H}_{15}\text{NO}_2$: C, 64.67; H, 6.27; N, 5.81%. Found: C, 64.63; H, 6.24; N, 5.89%.

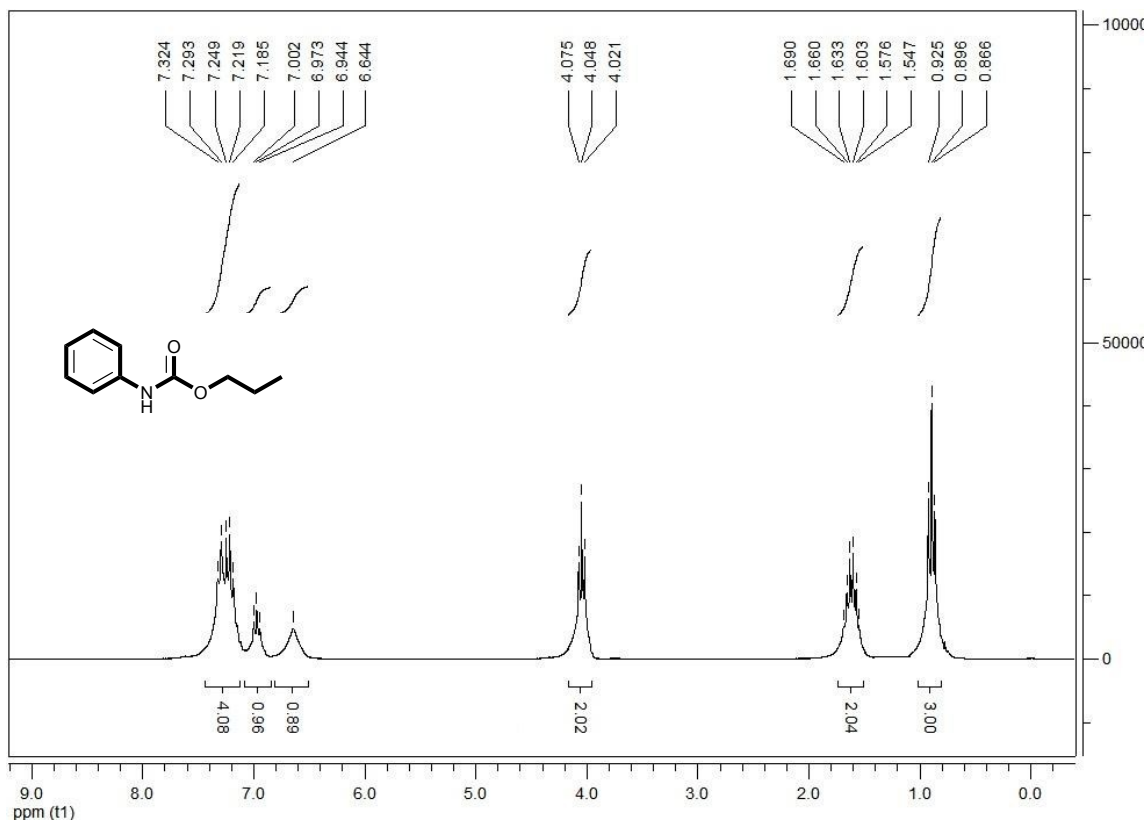
C. Scanned Spectra of Compounds:



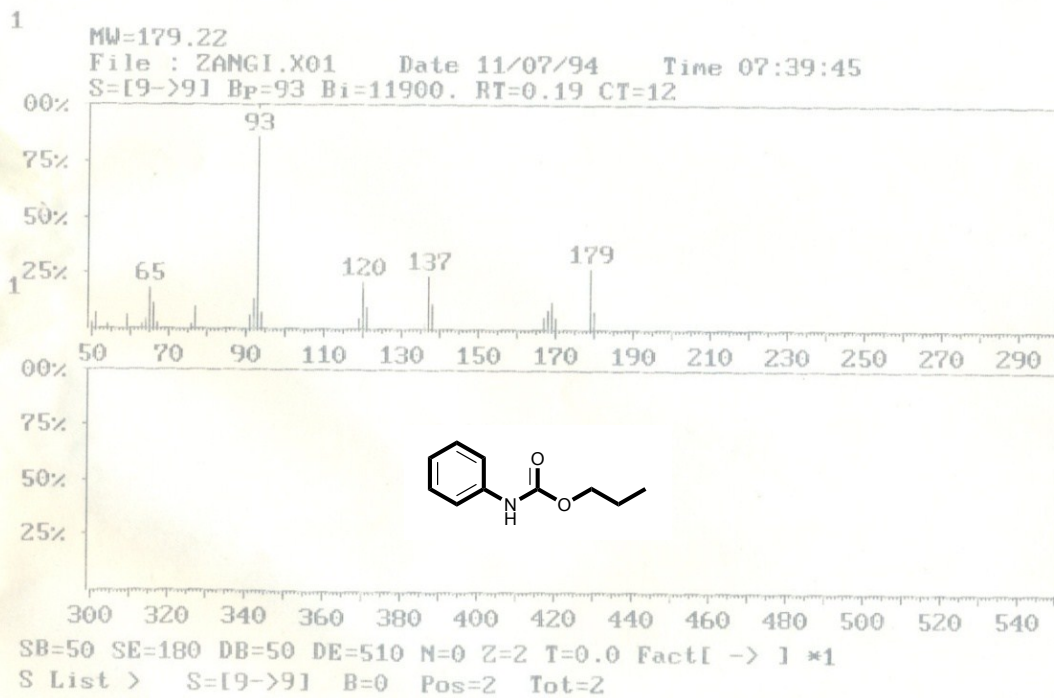
FT-IR spectra of 1-propyl phenylcarbamate (C1) in KBr.



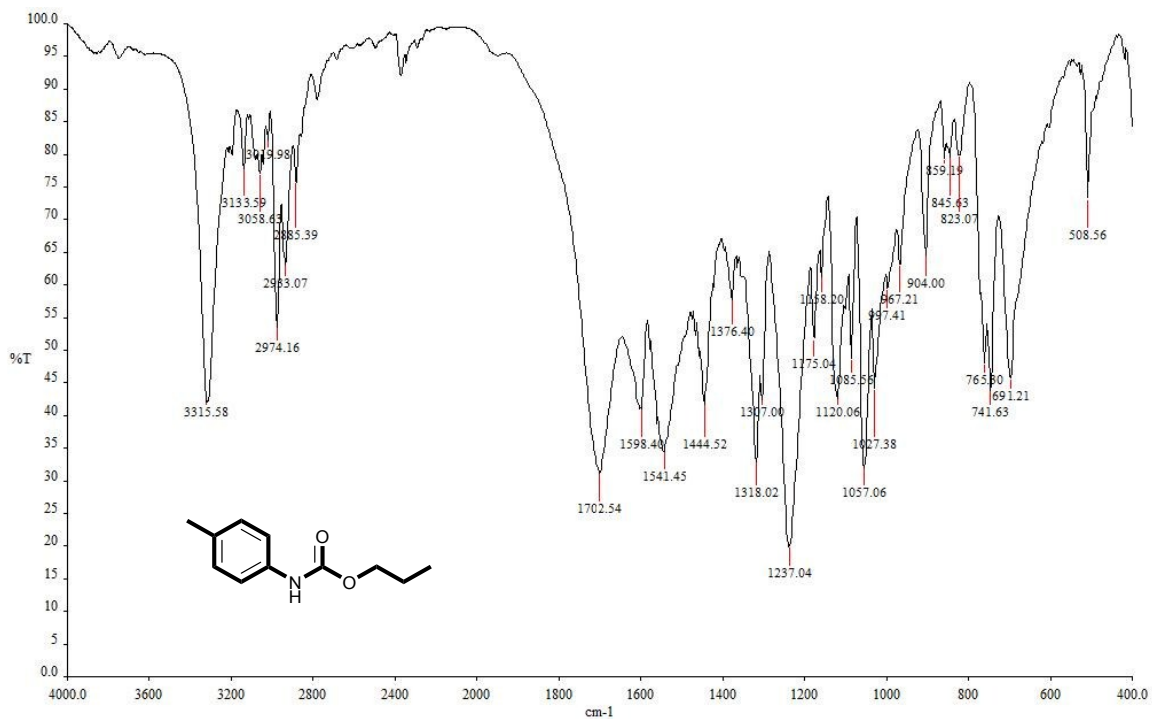
¹³C-NMR spectra (63 MHz) of 1-propyl phenylcarbamate (C1) in CDCl₃.



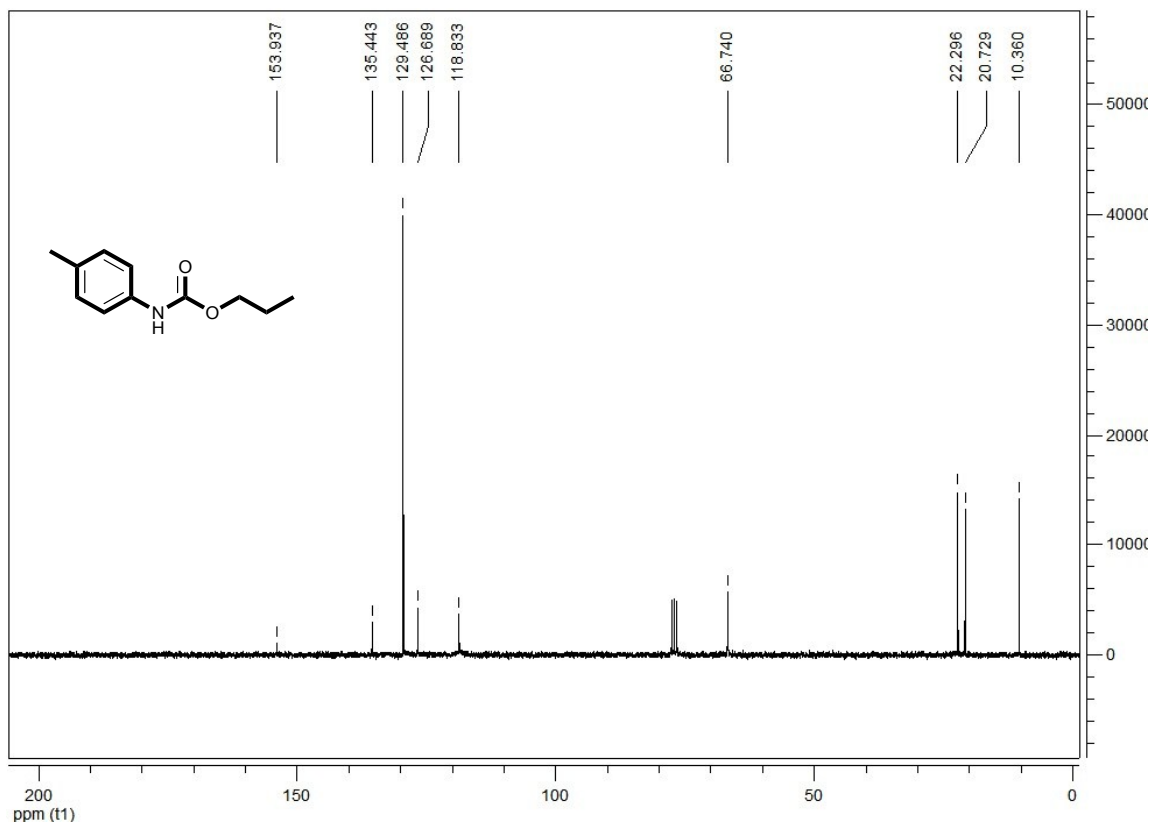
$^1\text{H-NMR}$ spectra (250 MHz) of 1-propyl phenylcarbamate (C1) in CDCl_3 .



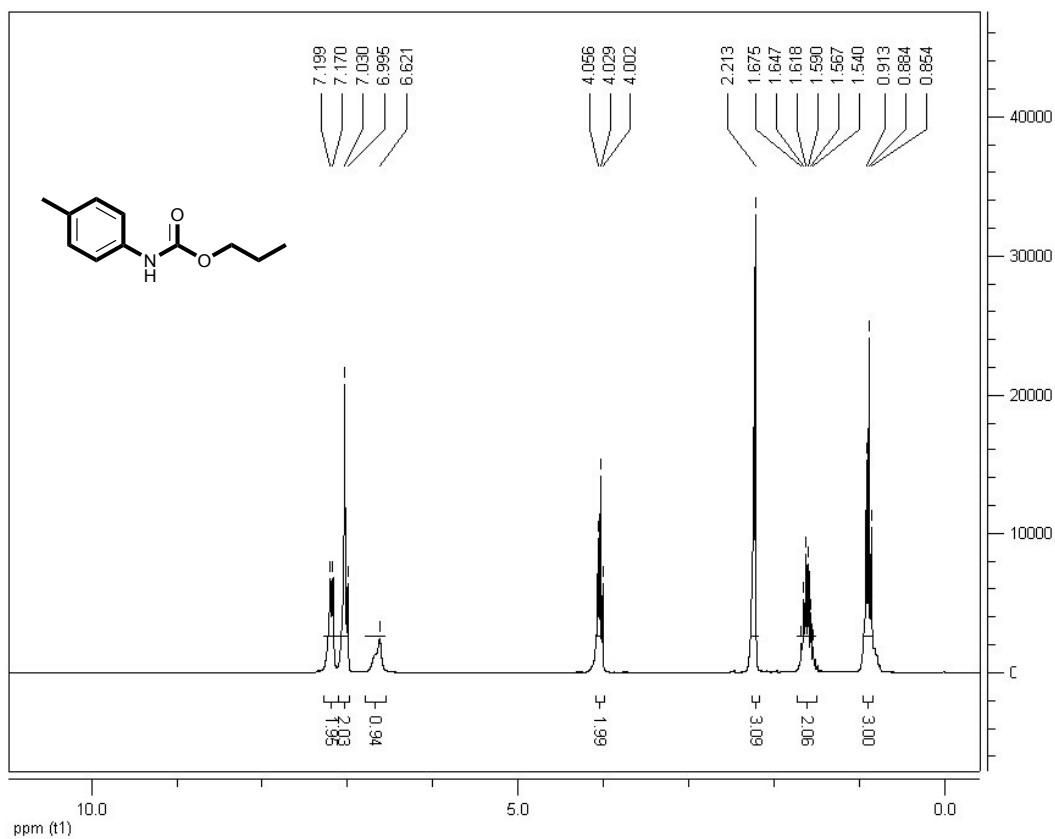
MS of 1-propyl phenylcarbamate (C1).



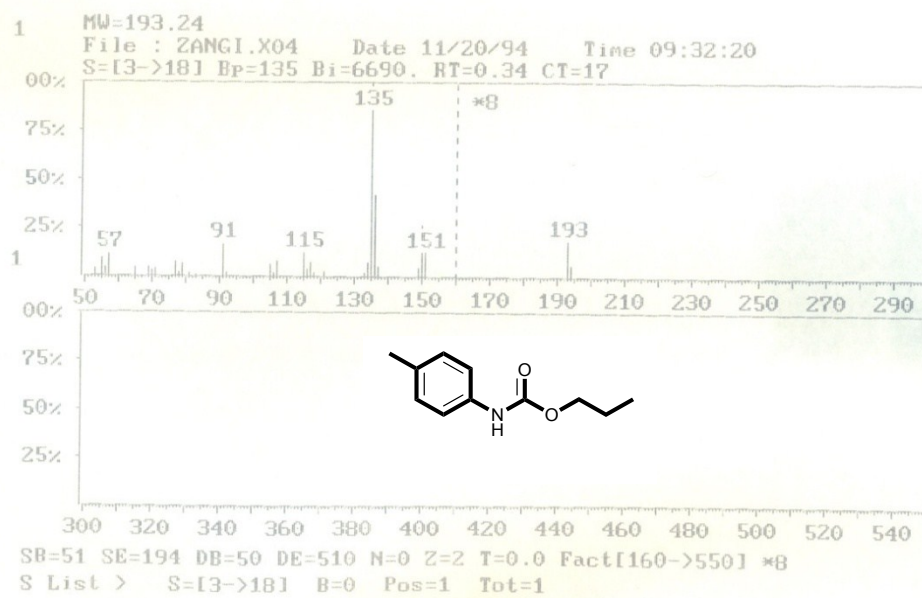
FT-IR spectra of 1-propyl (4-methylphenyl)carbamate (C2) in KBr.



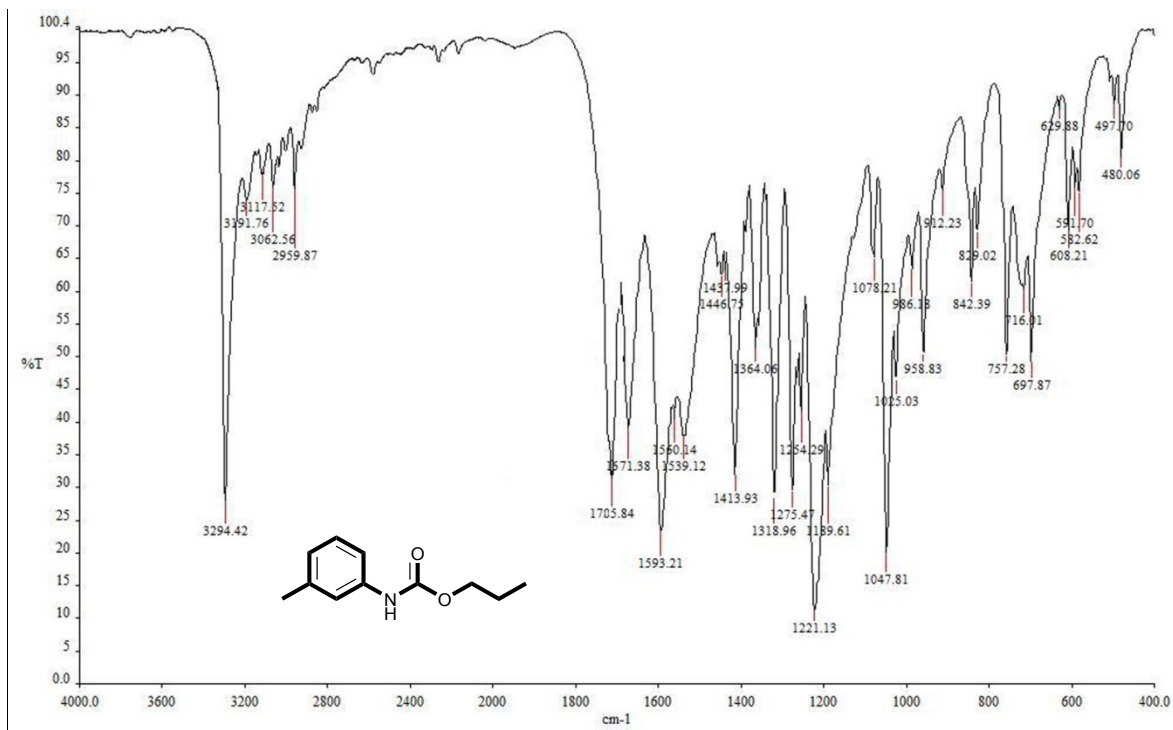
¹³C-NMR spectra (63 MHz) of 1-propyl (4-methylphenyl)carbamate (C2) in CDCl₃.



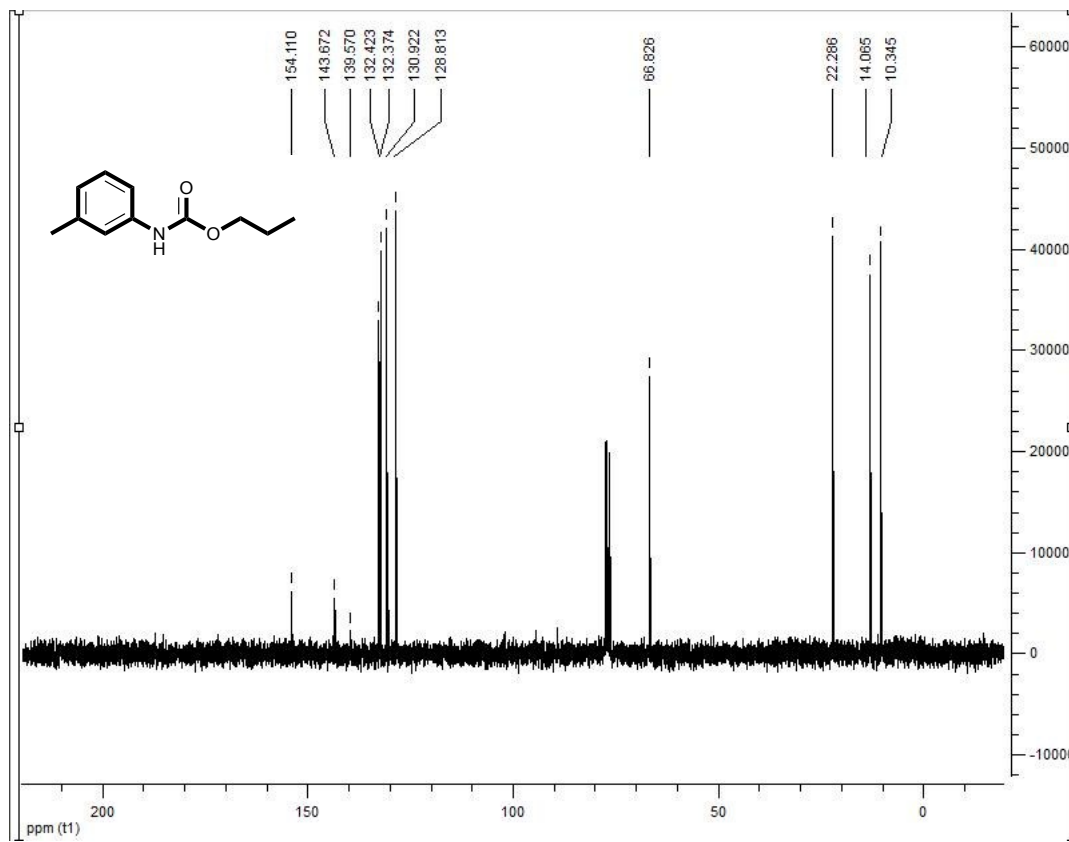
$^1\text{H-NMR}$ spectra (250 MHz) of 1-propyl (4-methylphenyl)carbamate (C2) in CDCl_3 .



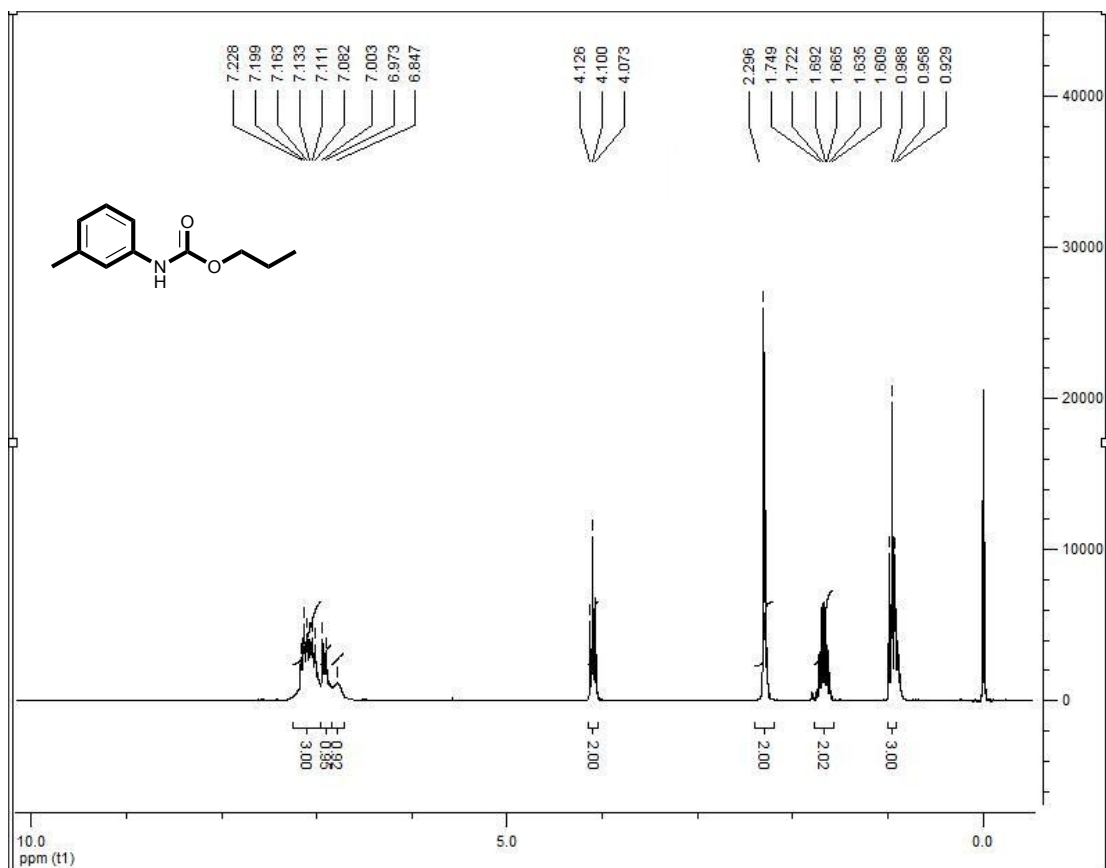
MS of 1-propyl (4-methylphenyl)carbamate (C2).



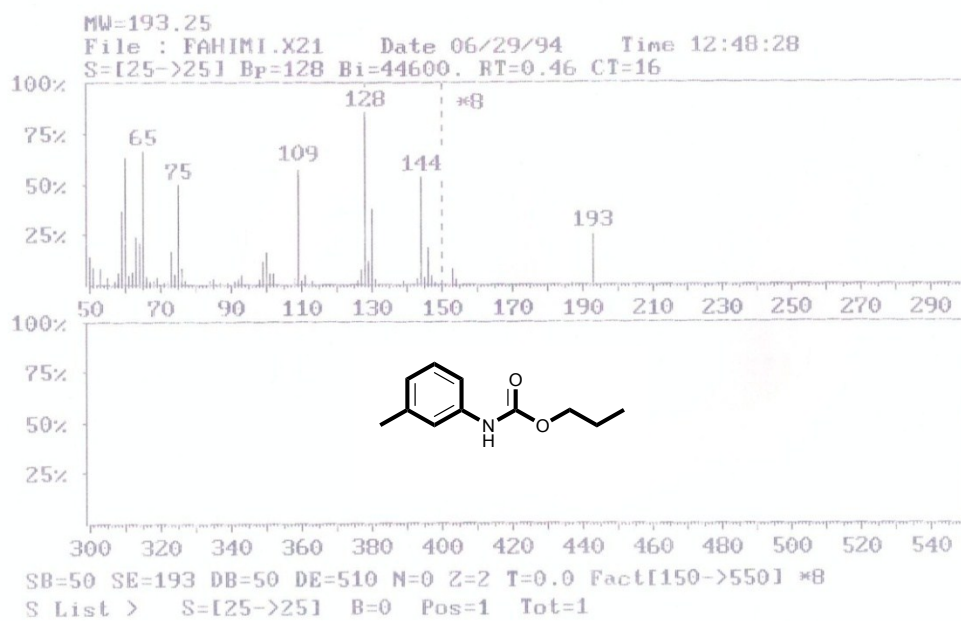
FT-IR spectra of 1-propyl (3-methylphenyl)carbamate (C3) in KBr.



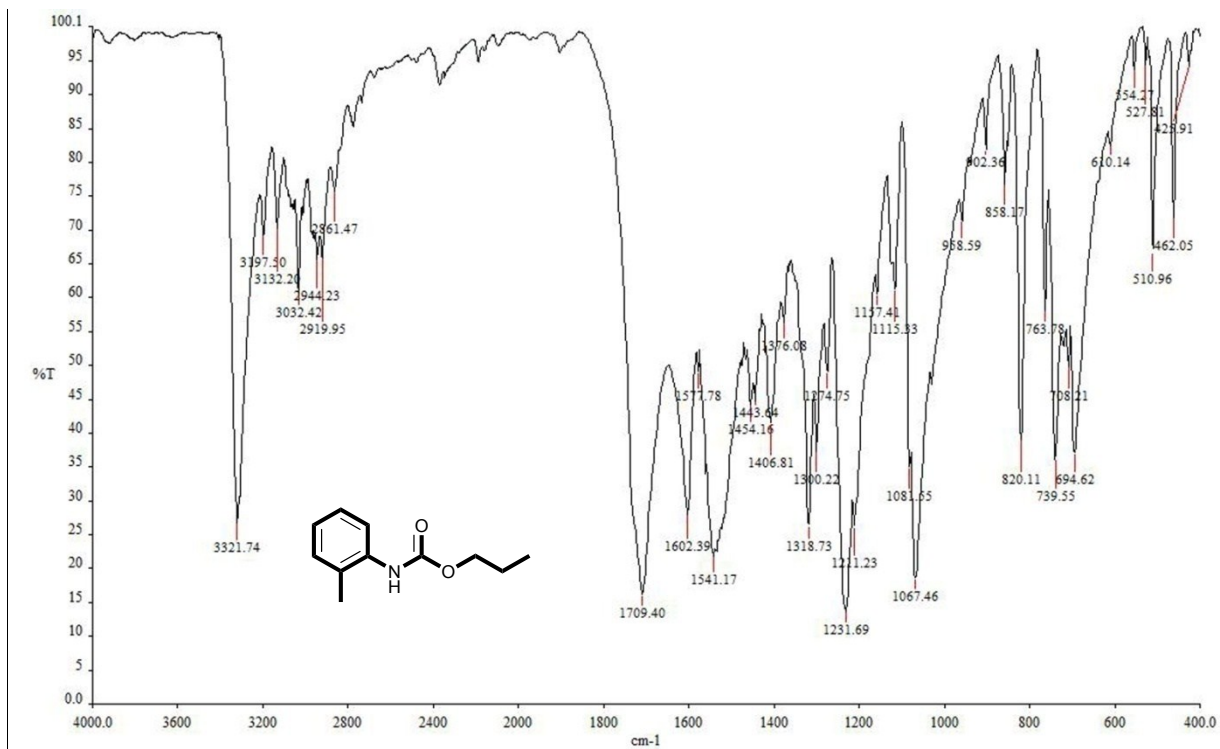
¹³C-NMR spectra (63 MHz) of 1-propyl (3-methylphenyl)carbamate (C3) in CDCl₃.



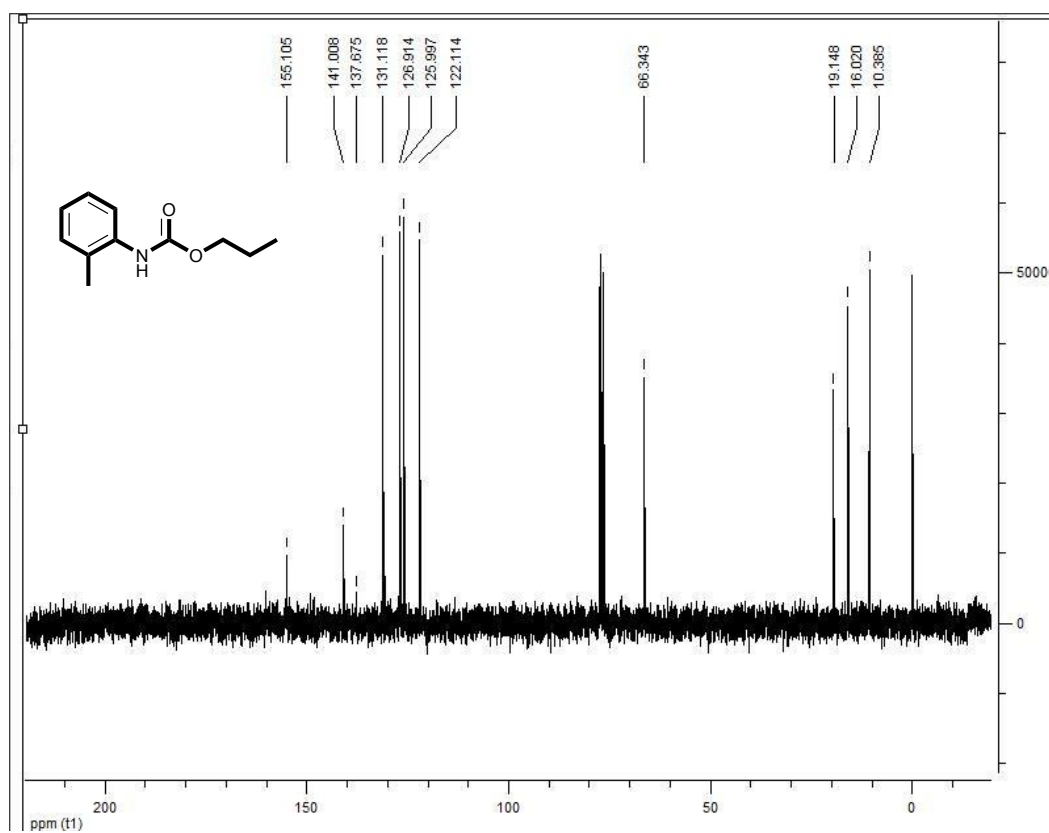
$^1\text{H-NMR}$ spectra (250 MHz) of 1-propyl (3-methylphenyl)carbamate (**C3**) in CDCl_3 .



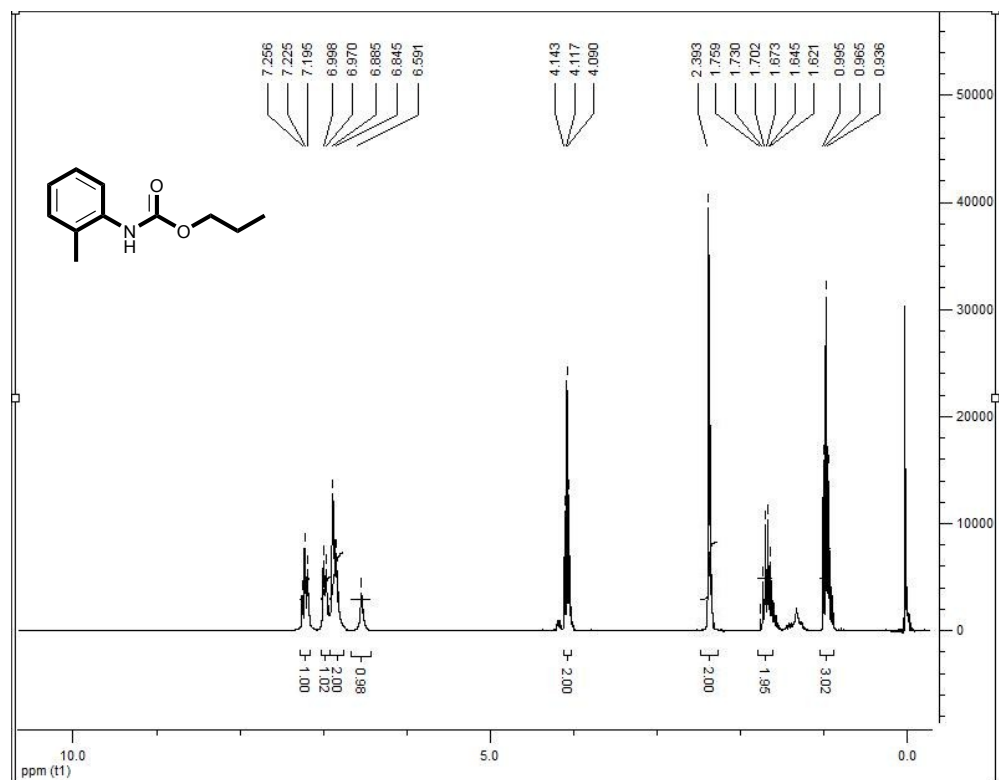
MS of 1-propyl (3-methylphenyl)carbamate (**C3**).



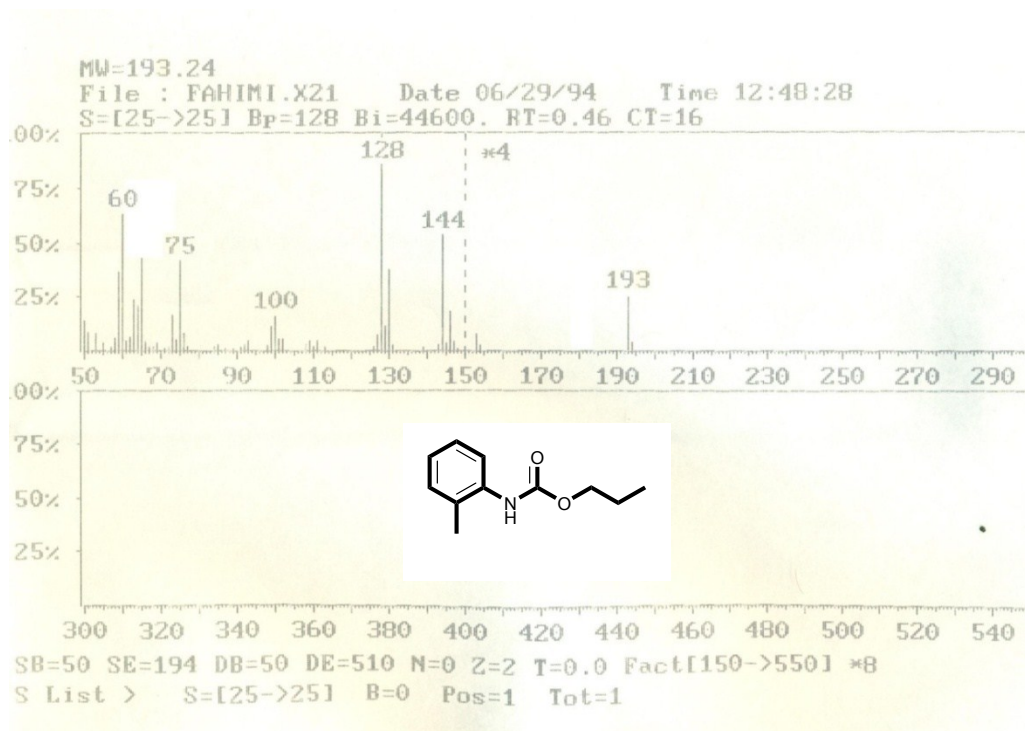
FT-IR spectra of 1-propyl (2-methylphenyl)carbamate (C4) in KBr.



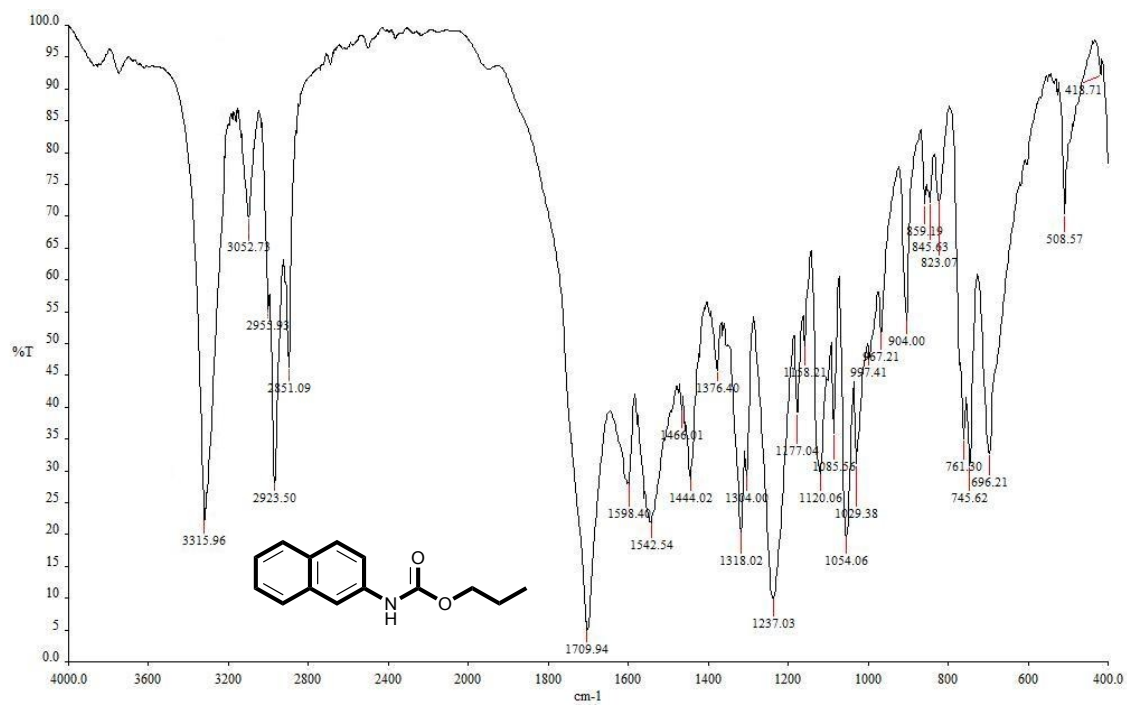
¹³C-NMR spectra (63 MHz) of 1-propyl (2-methylphenyl)carbamate (C4) in CDCl₃.



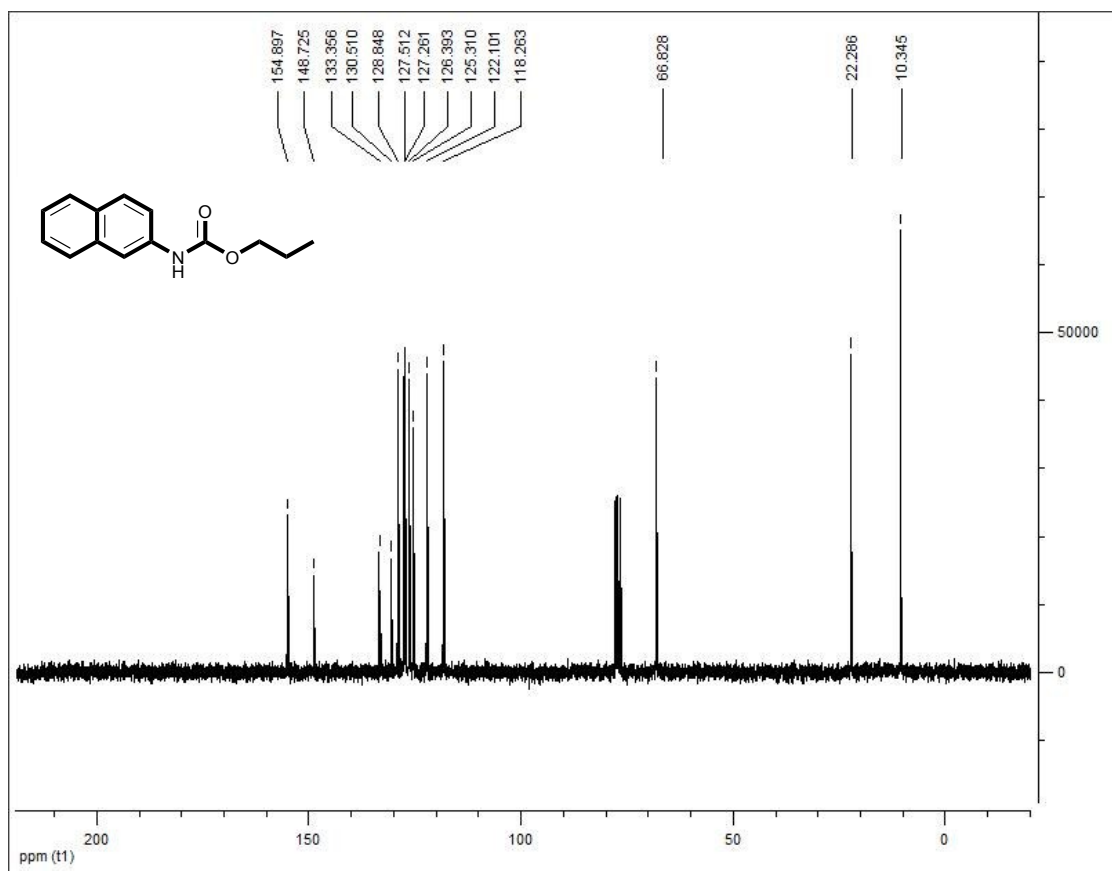
$^1\text{H-NMR}$ spectra (250 MHz) of 1-propyl (2-methylphenyl)carbamate (C4) in CDCl_3 .



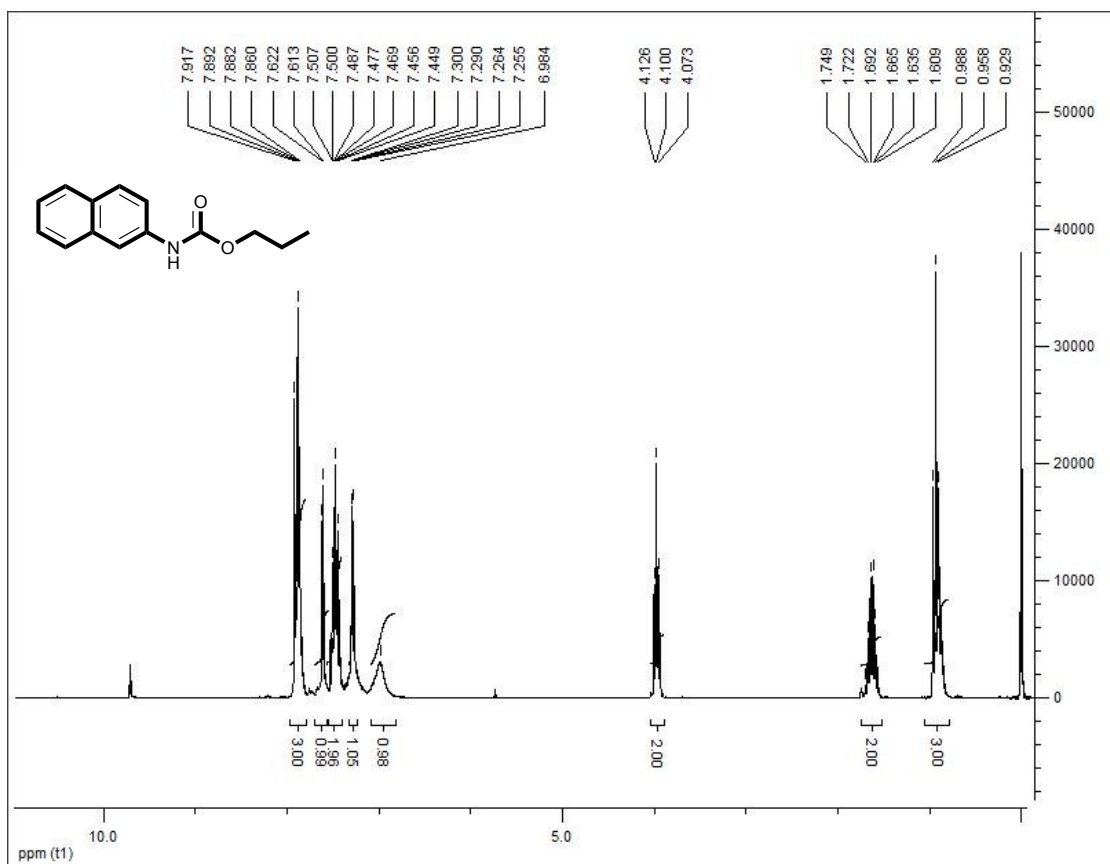
MS of 1-propyl (2-methylphenyl)carbamate (C4).



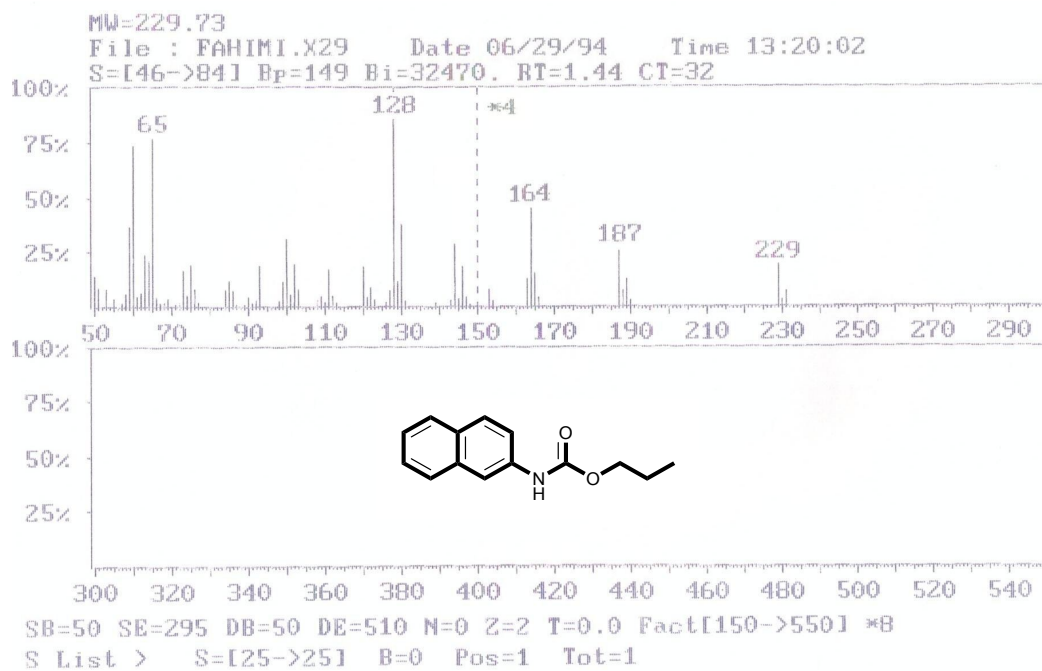
FT-IR spectra of 1-propyl (naphthalene-2-yl)carbamate (C5) in KBr.



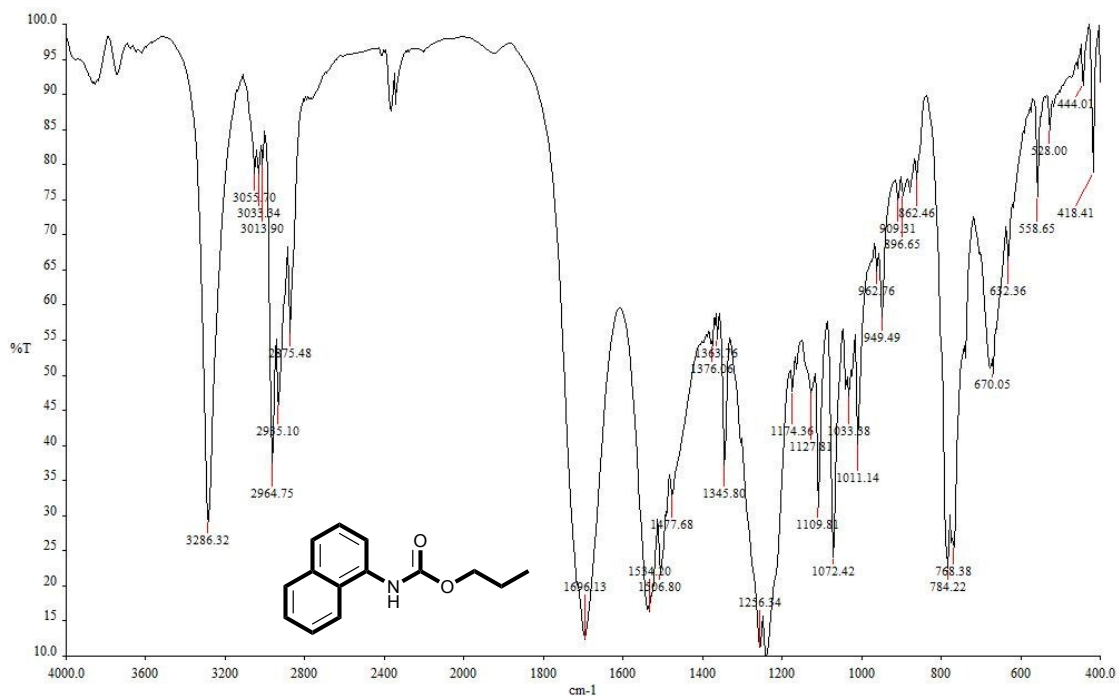
¹³C-NMR spectra (63 MHz) of 1-propyl (naphthalene-2-yl)carbamate (C5) in CDCl₃.



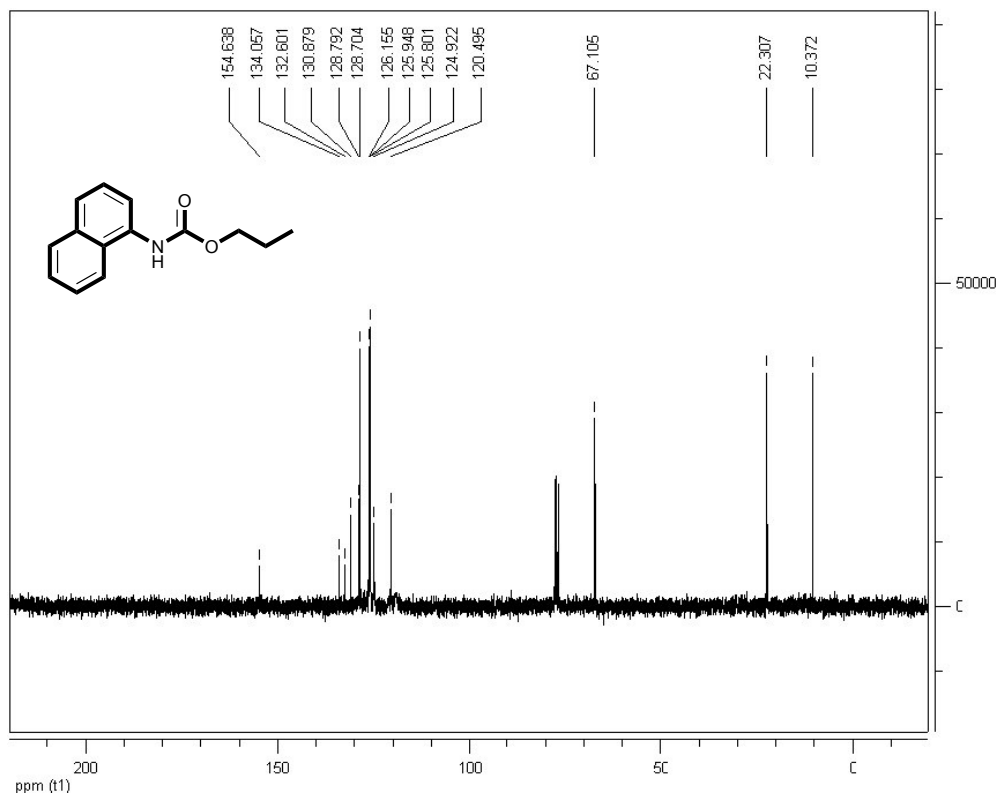
¹H-NMR spectra (250 MHz) of 1-propyl (naphthalene-2-yl)carbamate (C5) in CDCl₃.



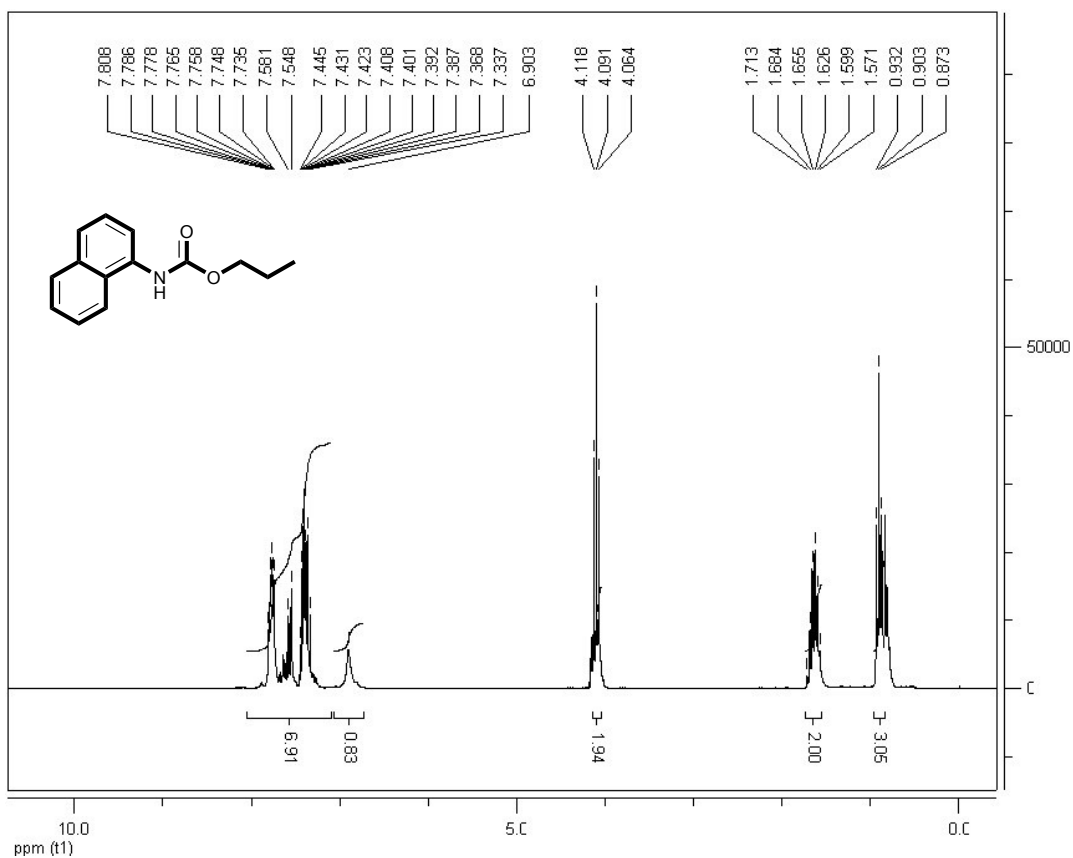
MS of 1-propyl (naphthalene-2-yl)carbamate (C5).



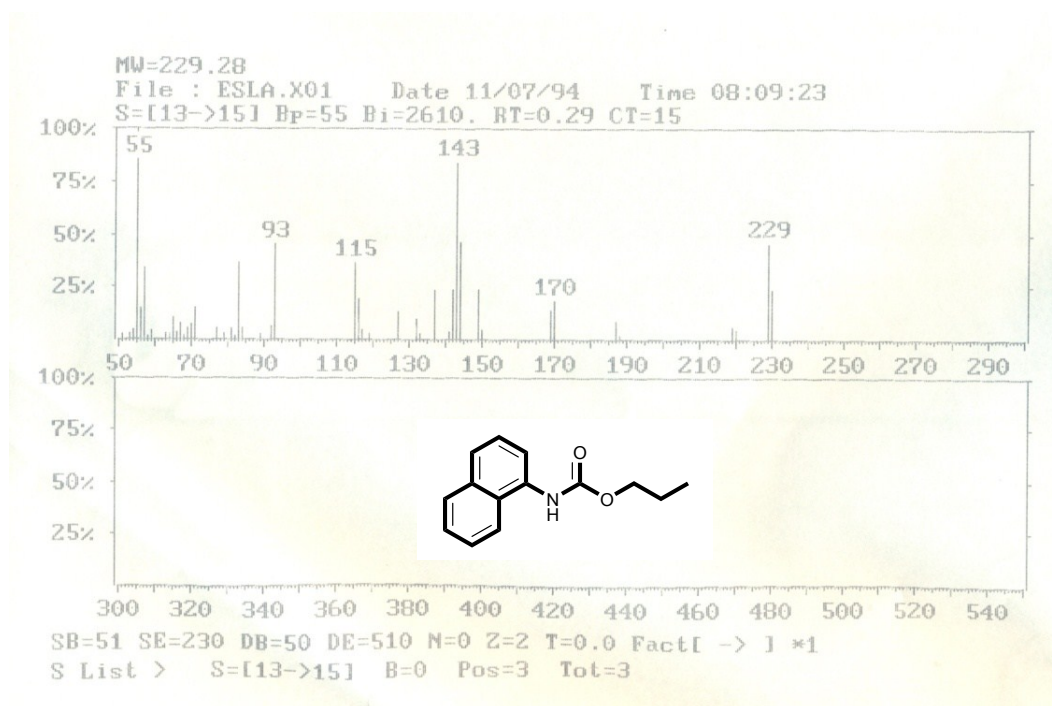
FT-IR spectra of 1-propyl (naphthalene-1-yl)carbamate (C6) in KBr.



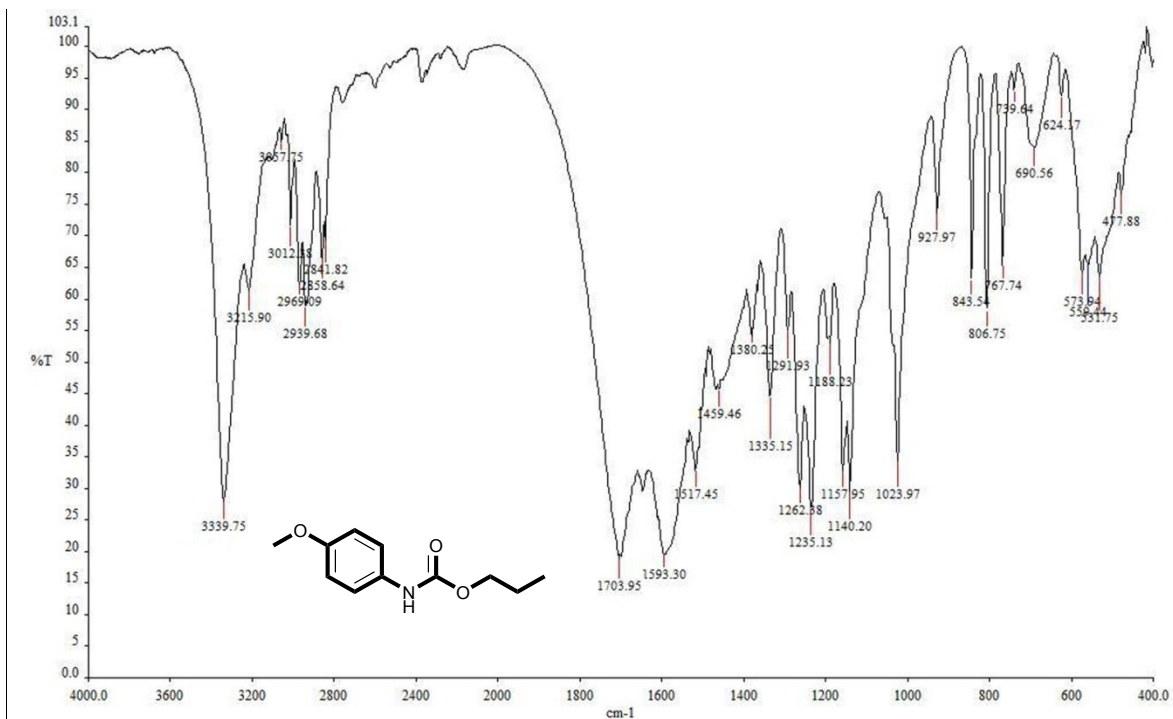
¹³C-NMR spectra (63 MHz) of 1-propyl (naphthalene-1-yl)carbamate (C6) in CDCl₃.



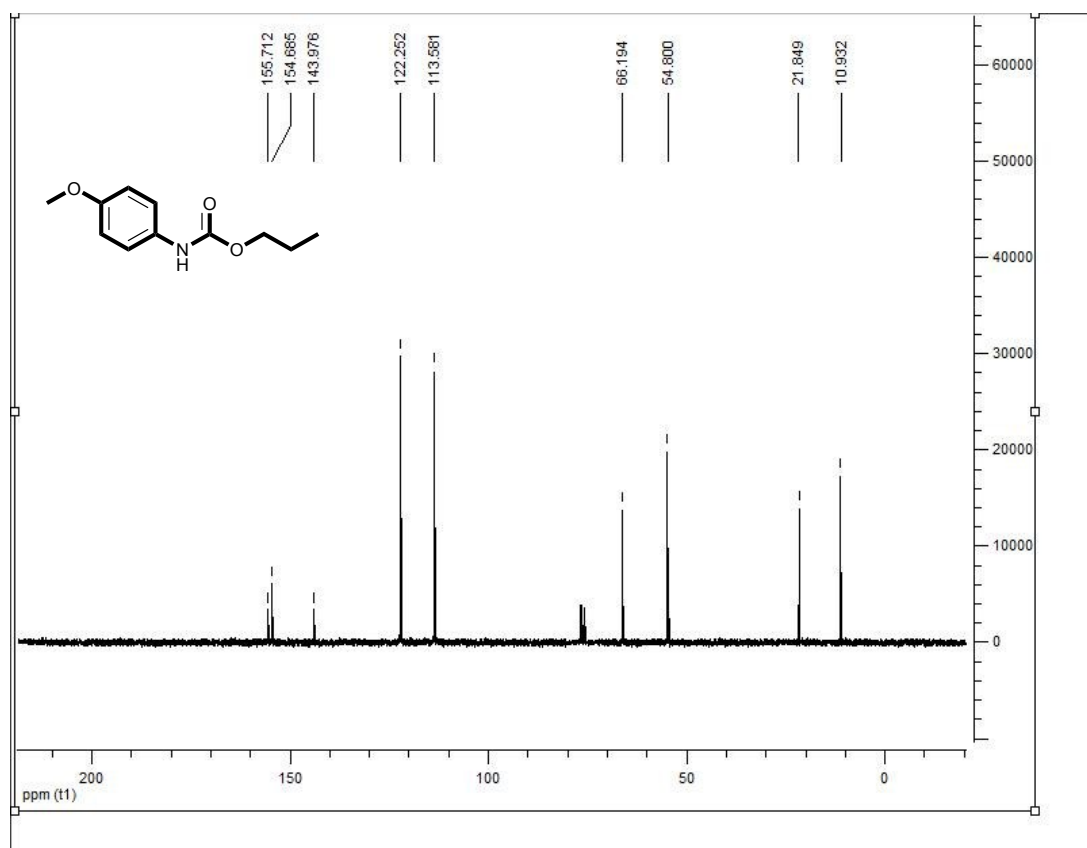
¹H-NMR spectra (250 MHz) of 1-propyl (naphthalene-1-yl)carbamate (C6) in CDCl₃.



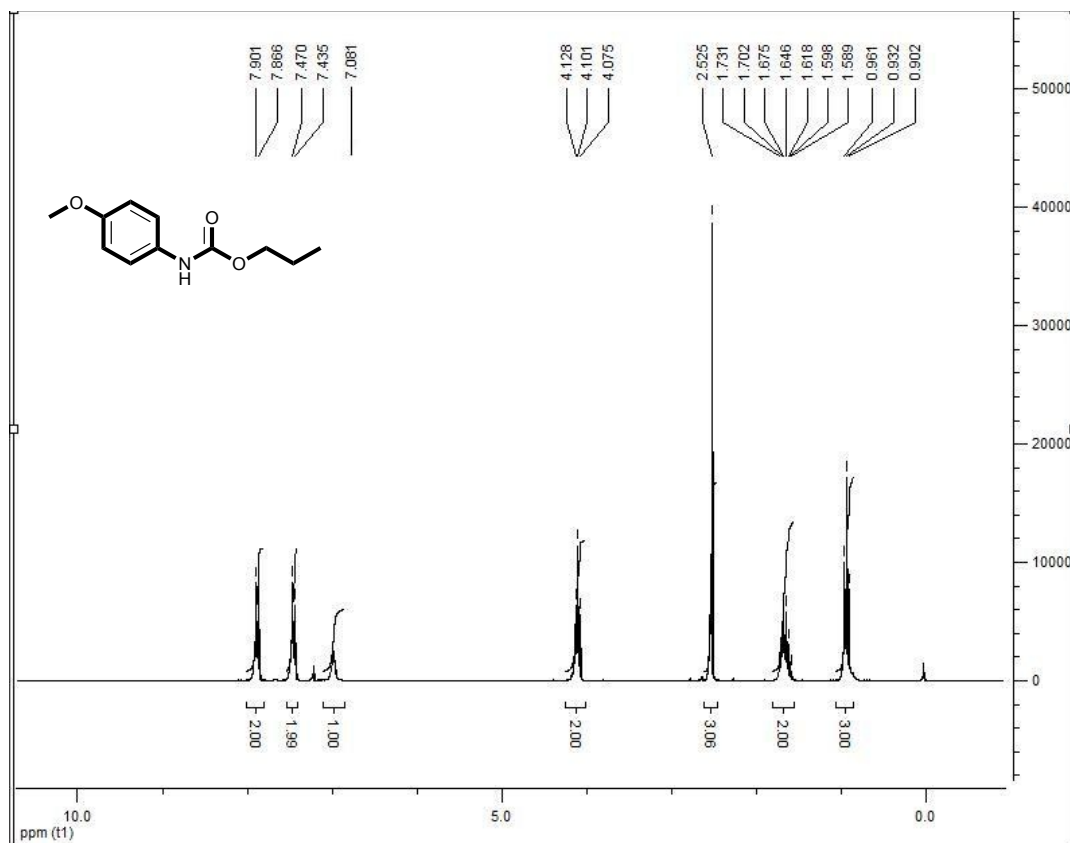
MS of 1-propyl (naphthalene-1-yl)carbamate (C6).



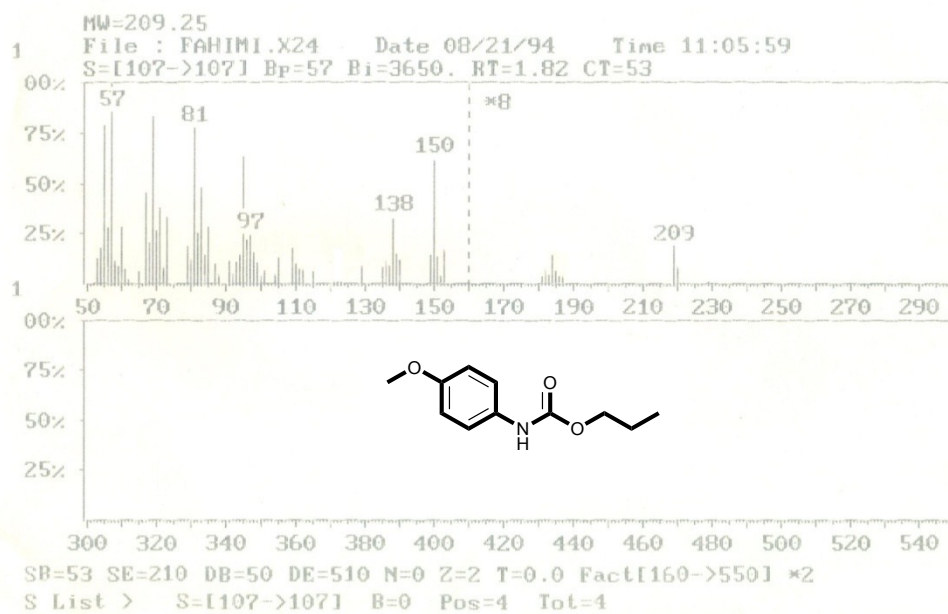
FT-IR spectra of 1-propyl (4-methoxyphenyl)carbamate (C7) in KBr.



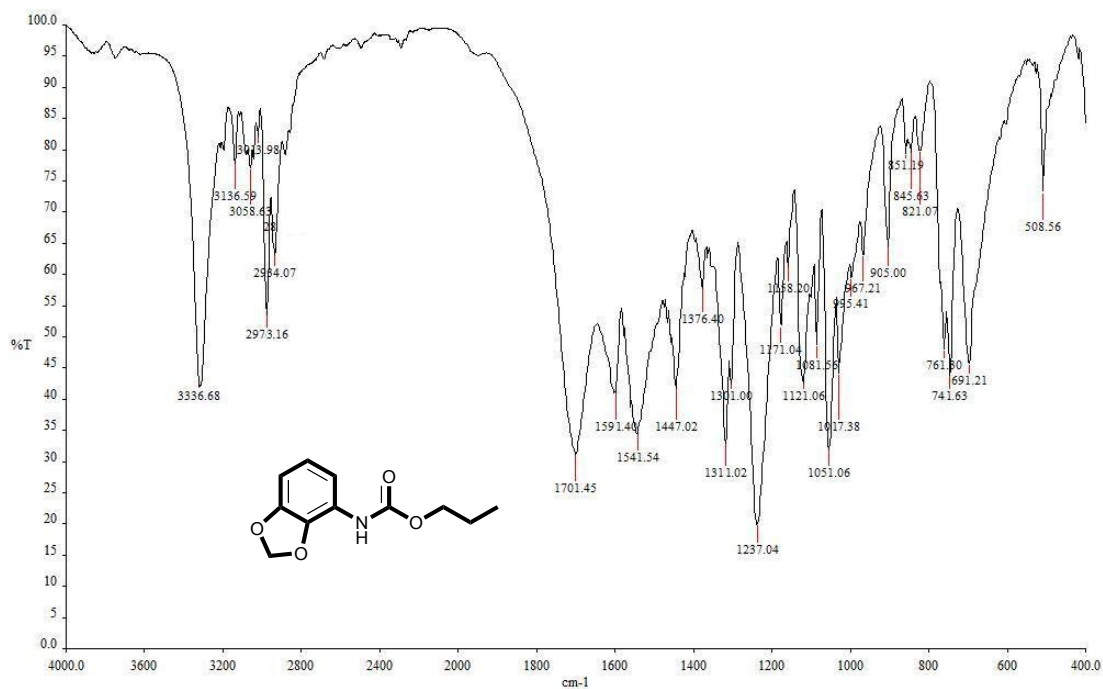
¹³C-NMR spectra (63 MHz) of 1-propyl (4-methoxyphenyl)carbamate (C7) in CDCl₃.



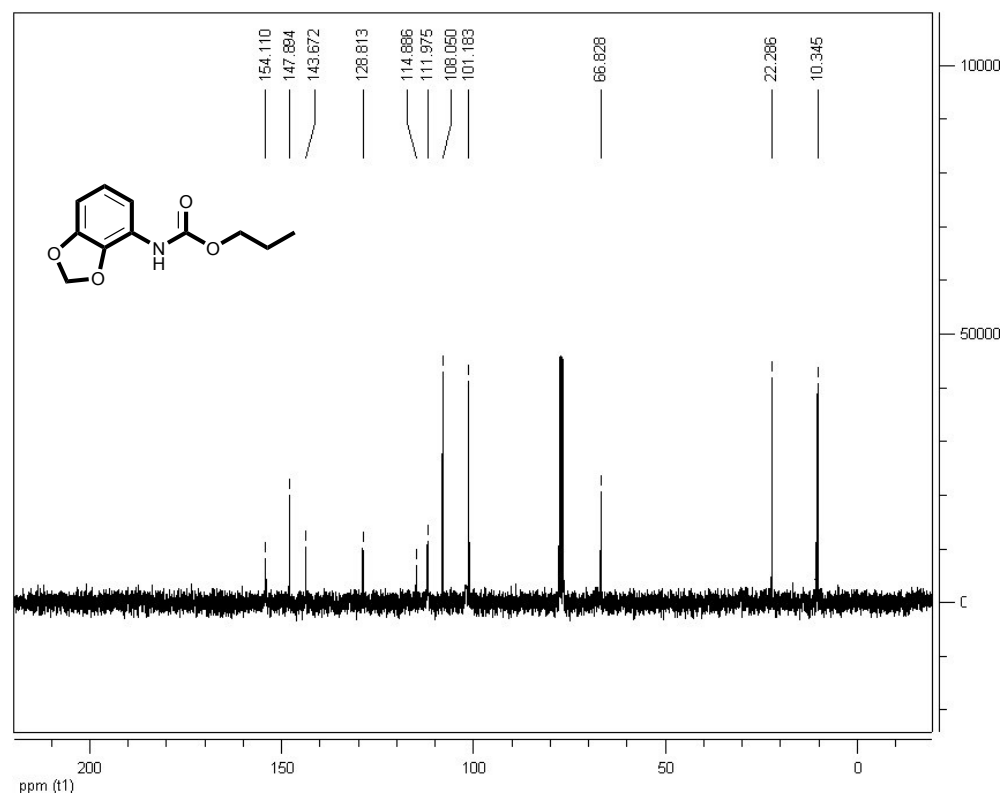
¹H-NMR spectra (250 MHz) of 1-propyl (4-methoxyphenyl)carbamate (C7) in CDCl₃.



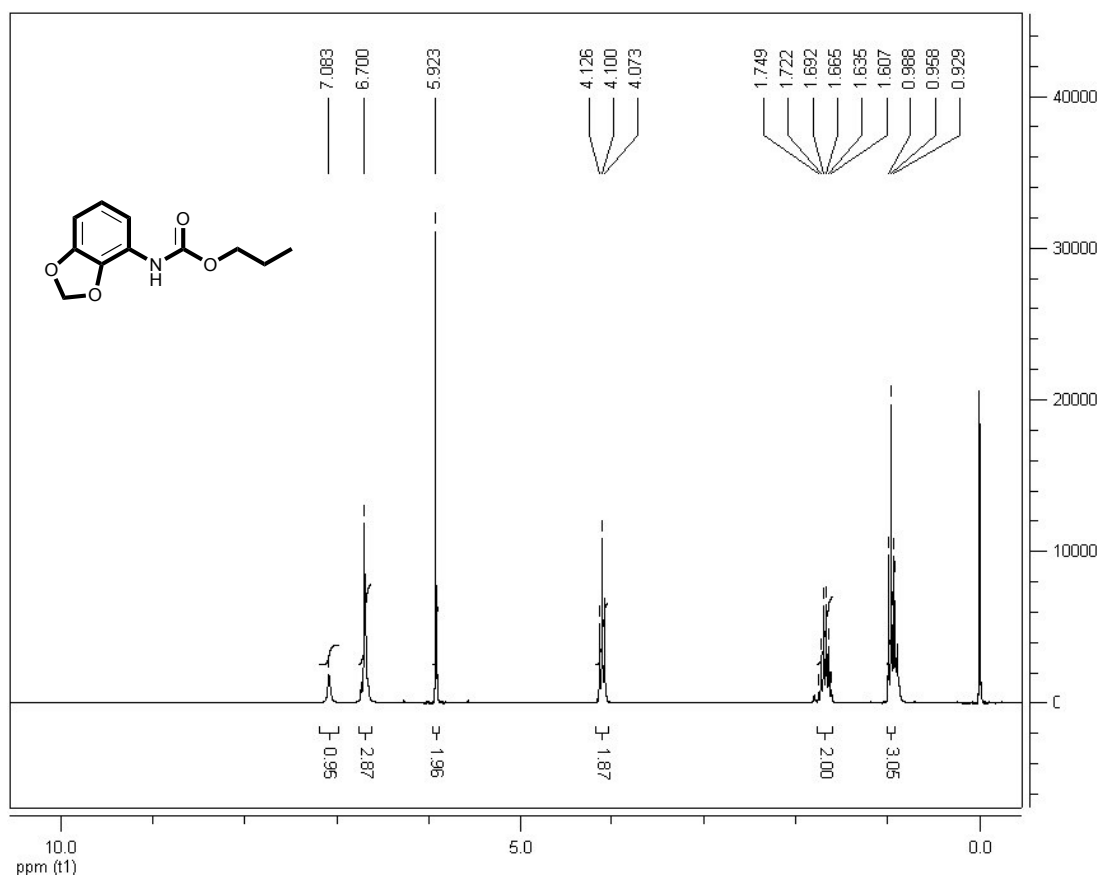
MS of 1-propyl (4-methoxyphenyl)carbamate (C7).



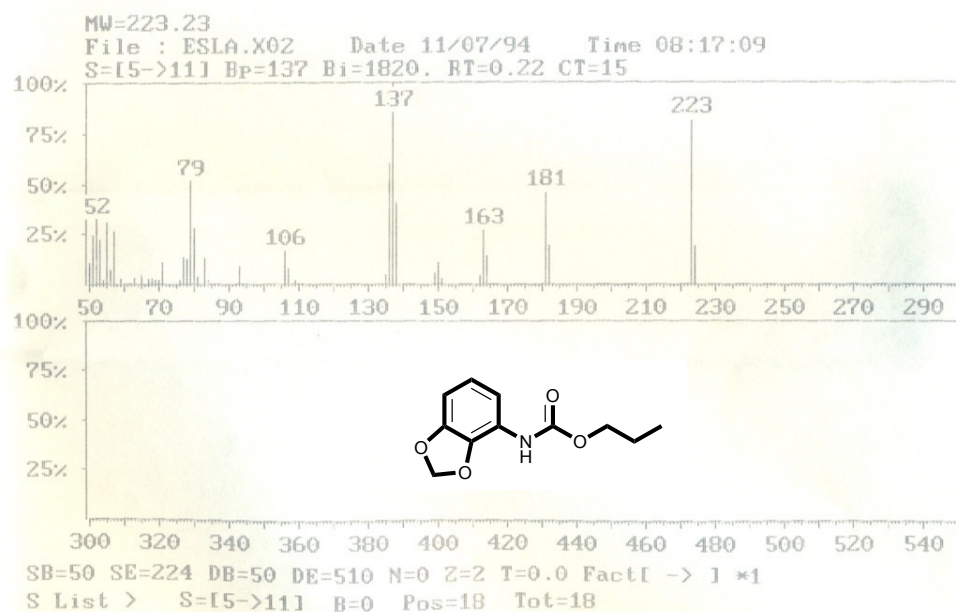
FT-IR spectra of 1-propyl (benzo[*d*][1,3]dioxol-5-yl)carbamate (C8) in KBr.



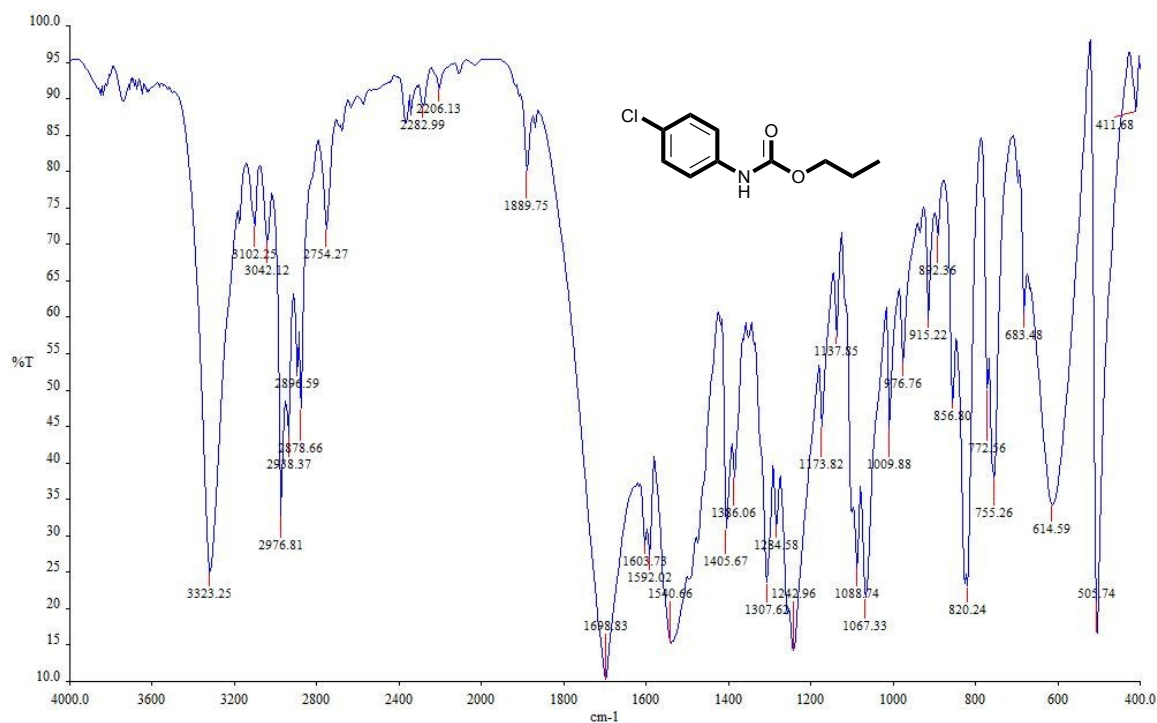
¹³C-NMR spectra (63 MHz) of 1-propyl (benzo[*d*][1,3]dioxol-5-yl)carbamate (C8) in CDCl₃.



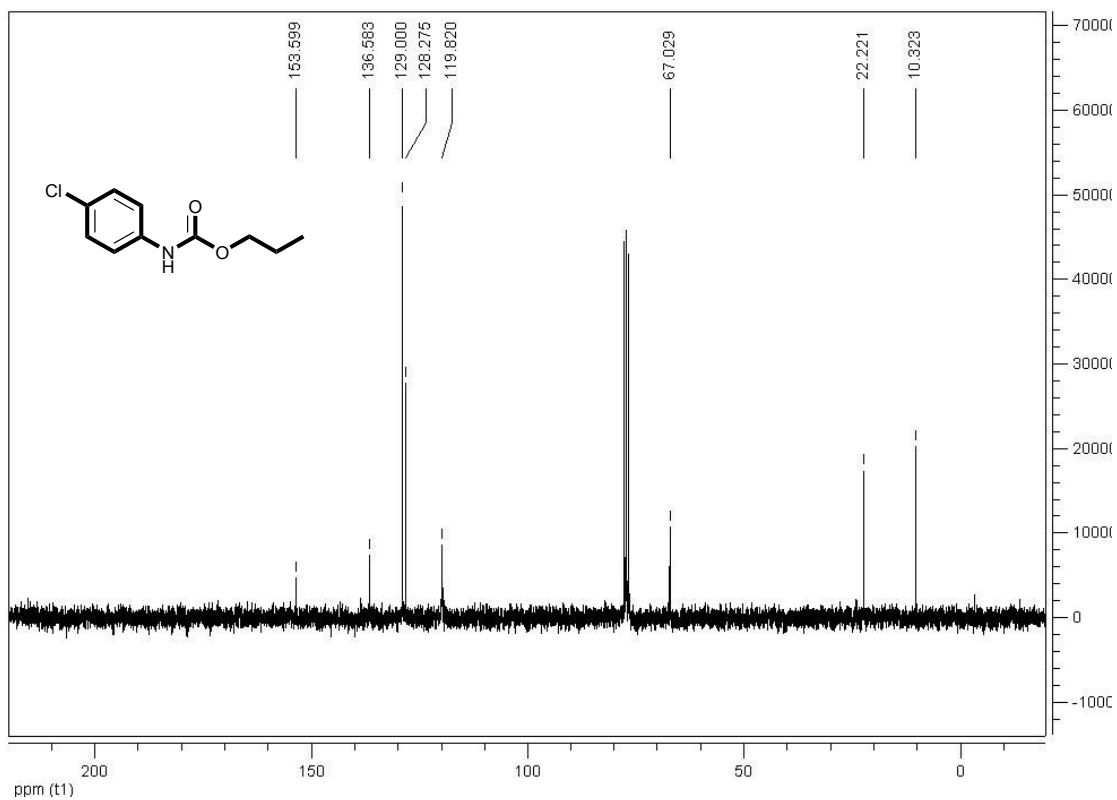
$^1\text{H-NMR}$ spectra (250 MHz) of 1-propyl (benzo[d][1,3]dioxol-5-yl)carbamate (**C8**) in CDCl_3 .



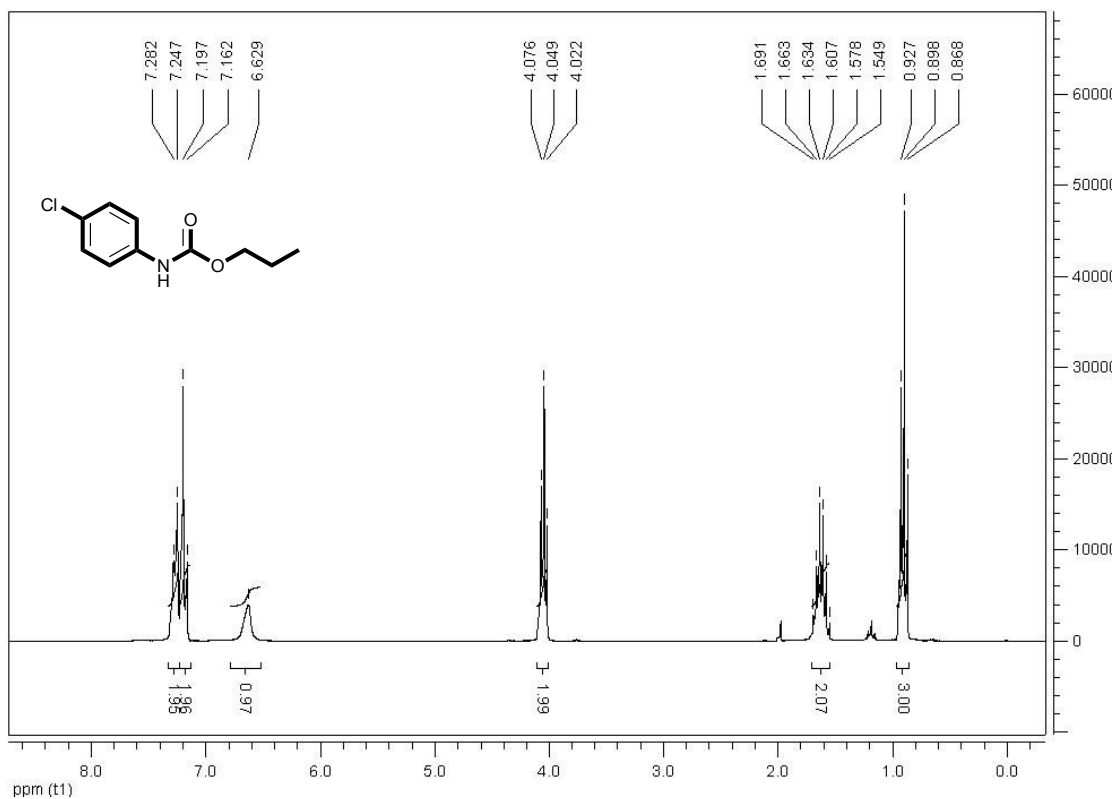
MS of 1-propyl (benzo[d][1,3]dioxol-5-yl)carbamate (**C8**).



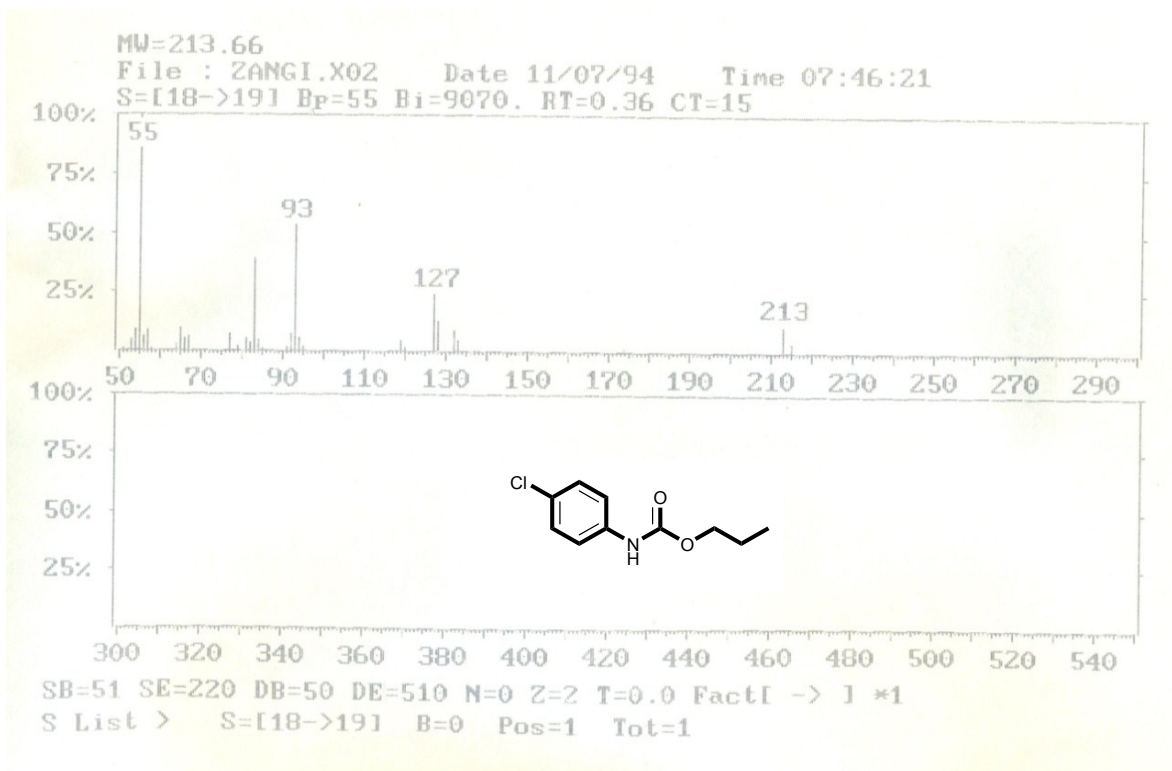
FT-IR spectra of 1-propyl (4-chlorophenyl)carbamate (C9) in KBr.



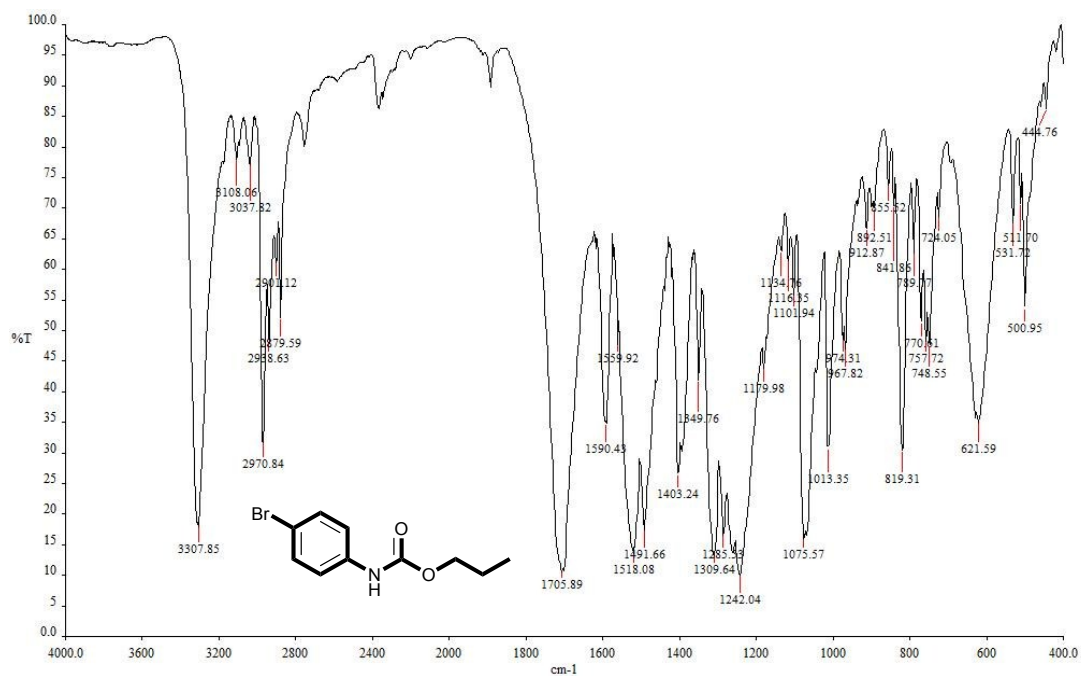
¹³C-NMR spectra (63 MHz) of 1-propyl (4-chlorophenyl)carbamate (C9) in CDCl₃



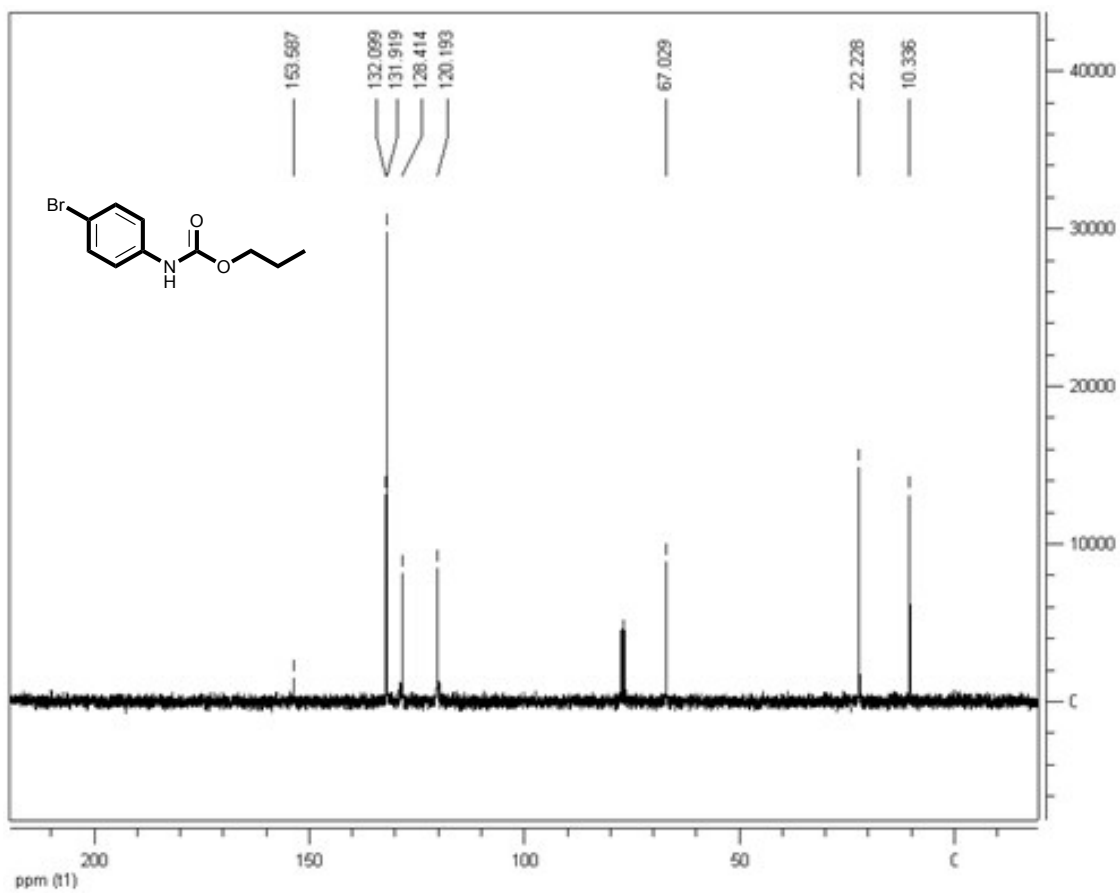
$^1\text{H-NMR}$ spectra (250 MHz) of 1-propyl (4-chlorophenyl)carbamate (**C9**) in CDCl_3 .



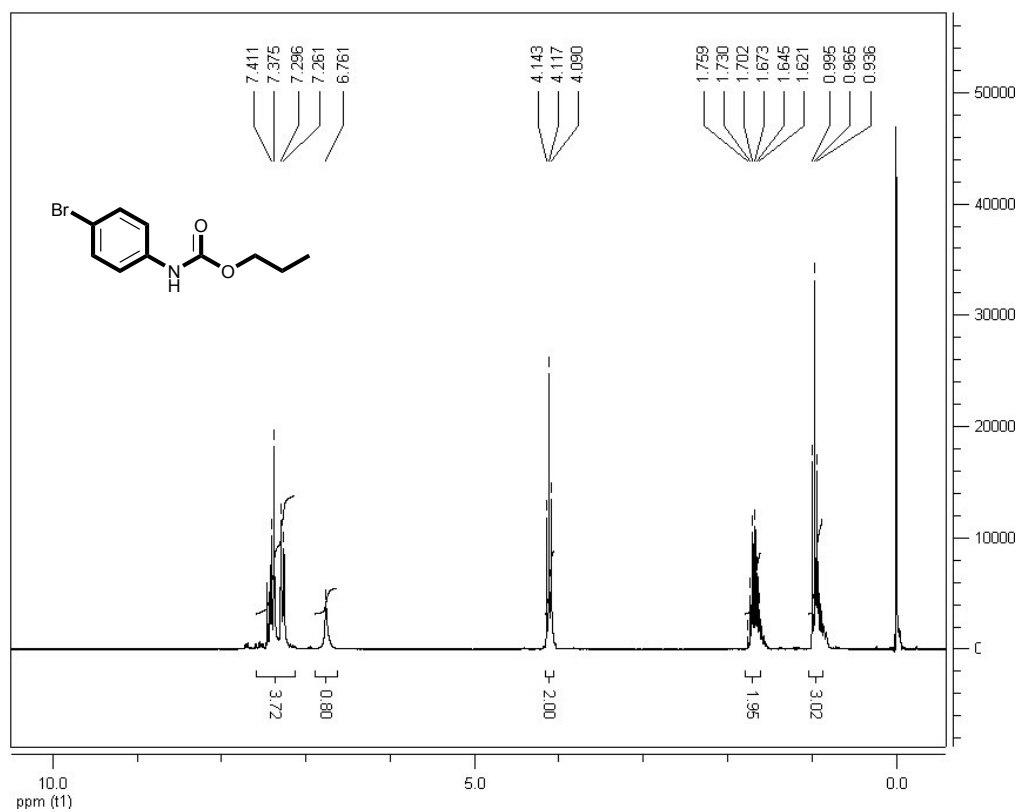
MS of 1-propyl (4-chlorophenyl)carbamate (**C9**).



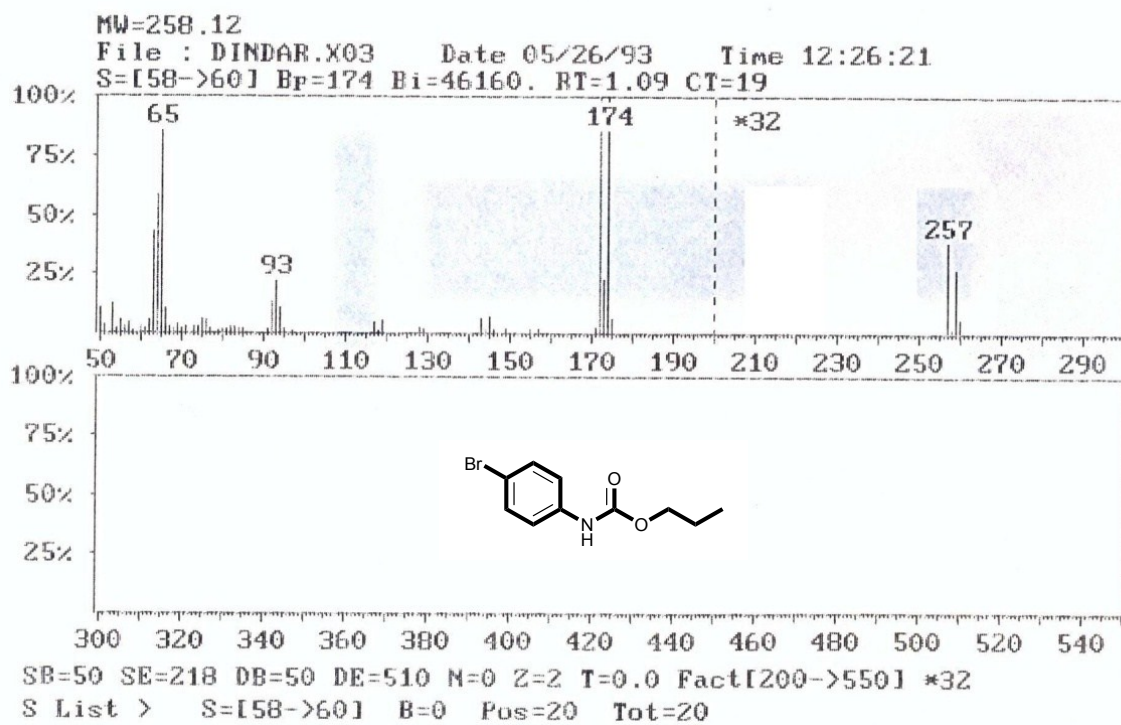
FT-IR spectra of 1-propyl (4-bromophenyl)carbamate (C10) in KBr .



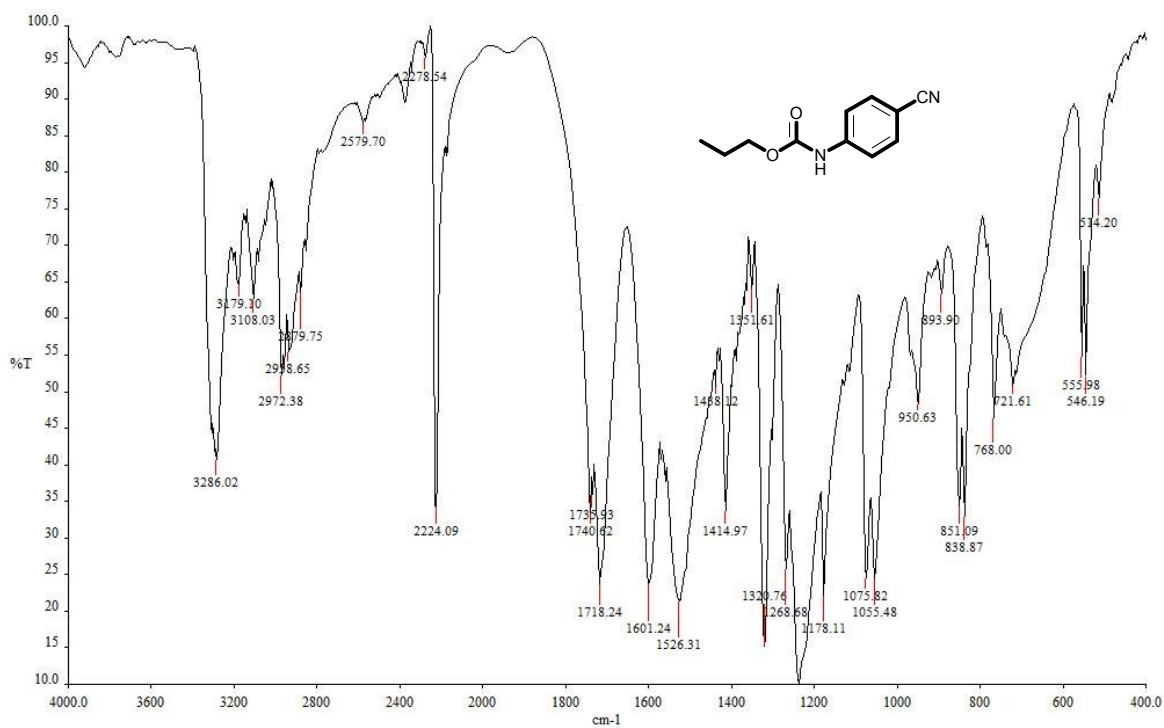
¹³C-NMR spectra (63 MHz) of 1-propyl (4-bromophenyl)carbamate (C10) in CDCl₃.



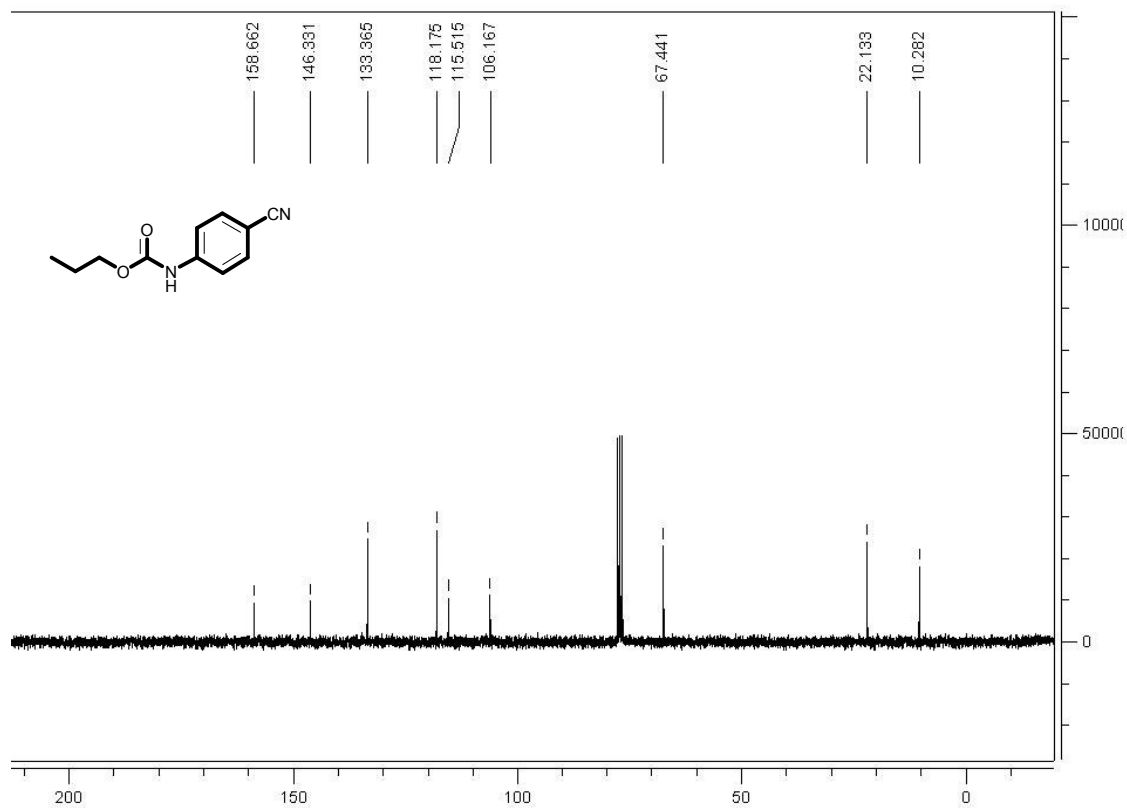
¹H-NMR spectra (250 MHz) of 1-propyl (4-bromophenyl)carbamate (C10) in CDCl₃.



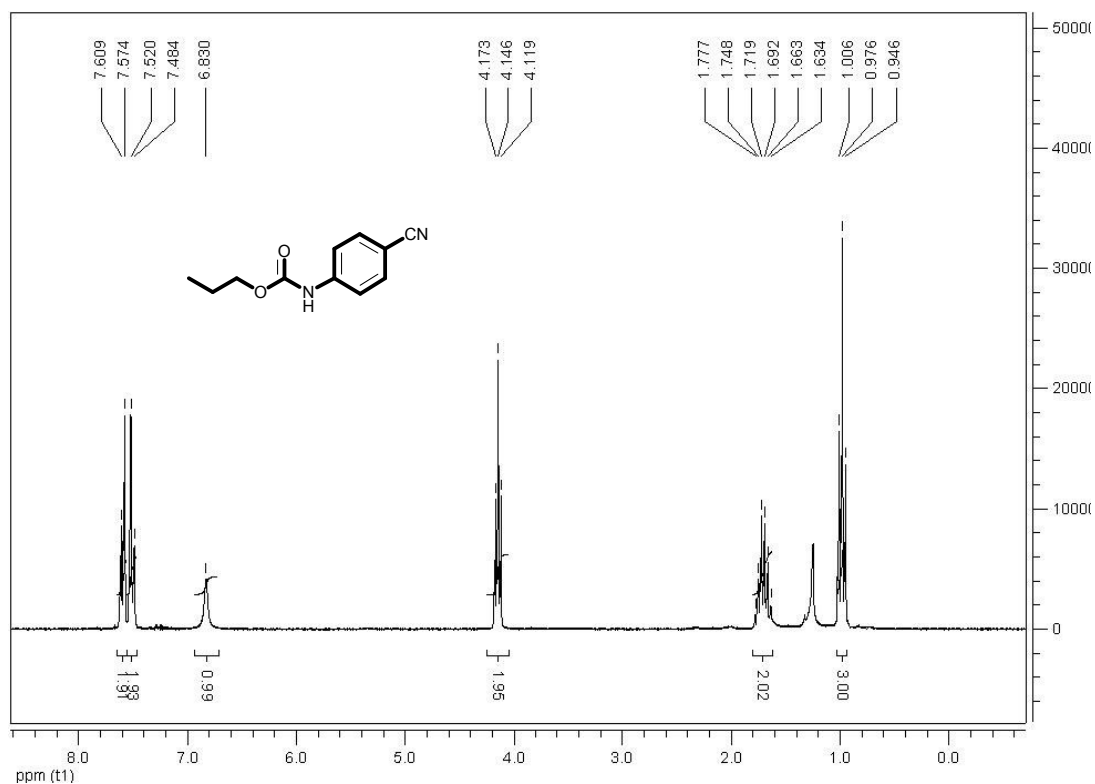
MS of 1-propyl (4-bromophenyl)carbamate (C10).



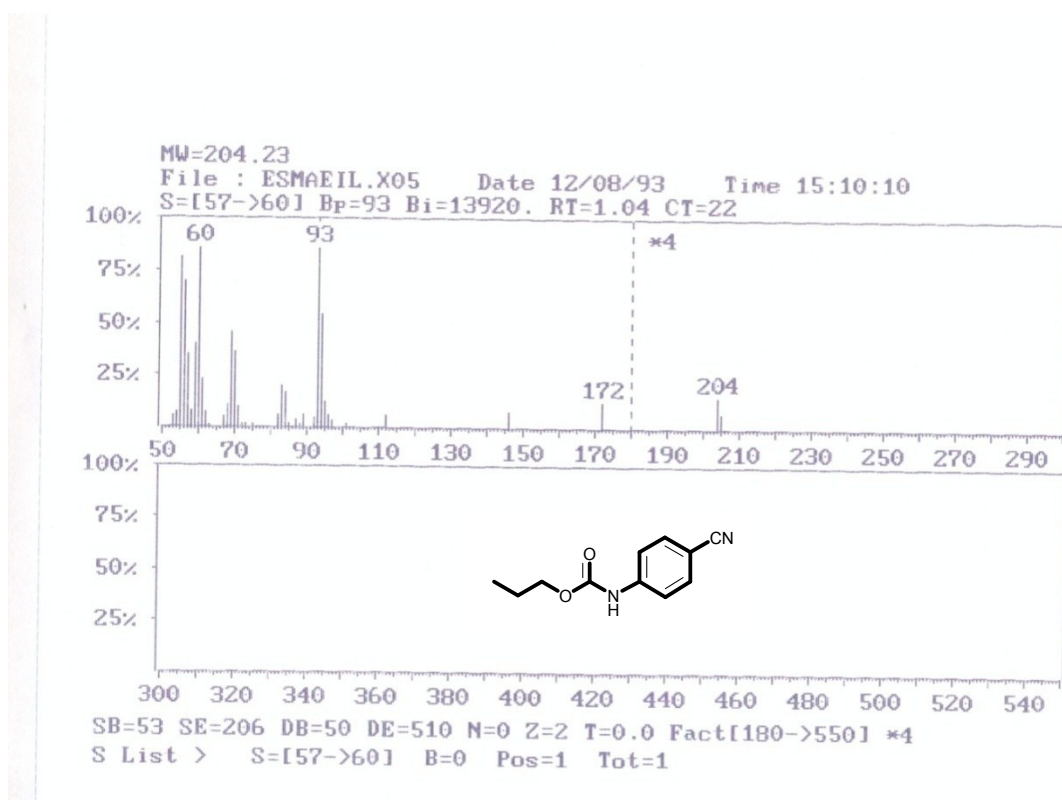
FT-IR spectra of 1-propyl (4-cyanophenyl)carbamate (C11) in KBr .



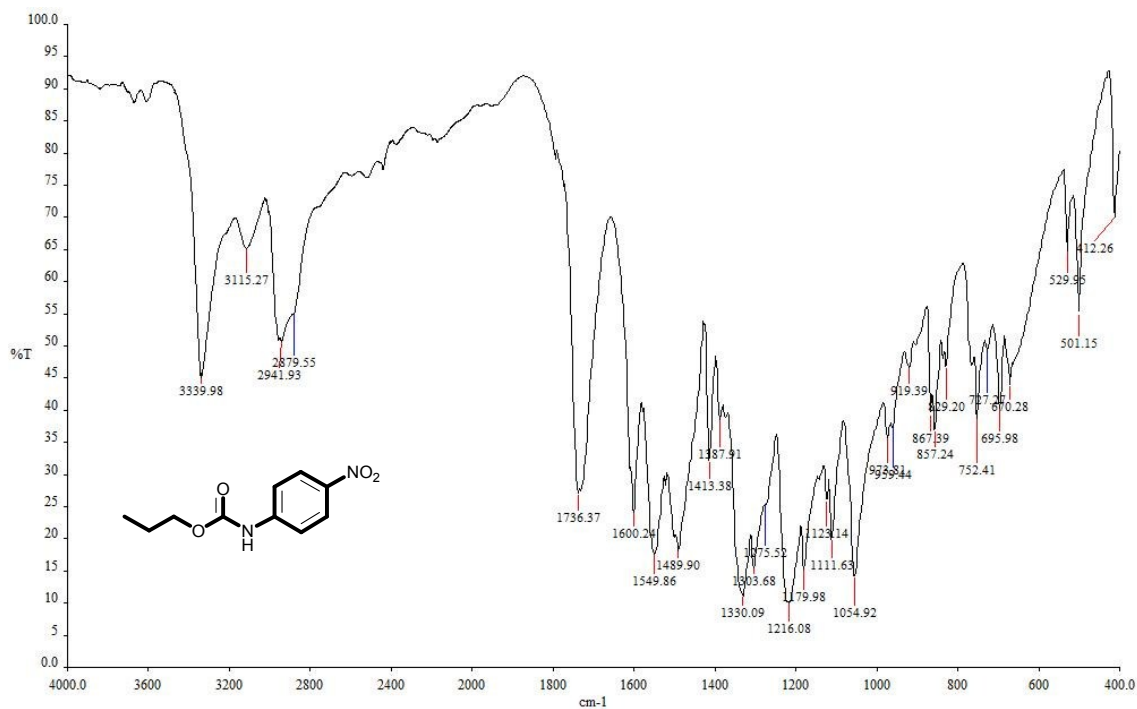
¹³C-NMR spectra (63 MHz) of 1-propyl (4-cyanophenyl)carbamate (C11) in CDCl₃.



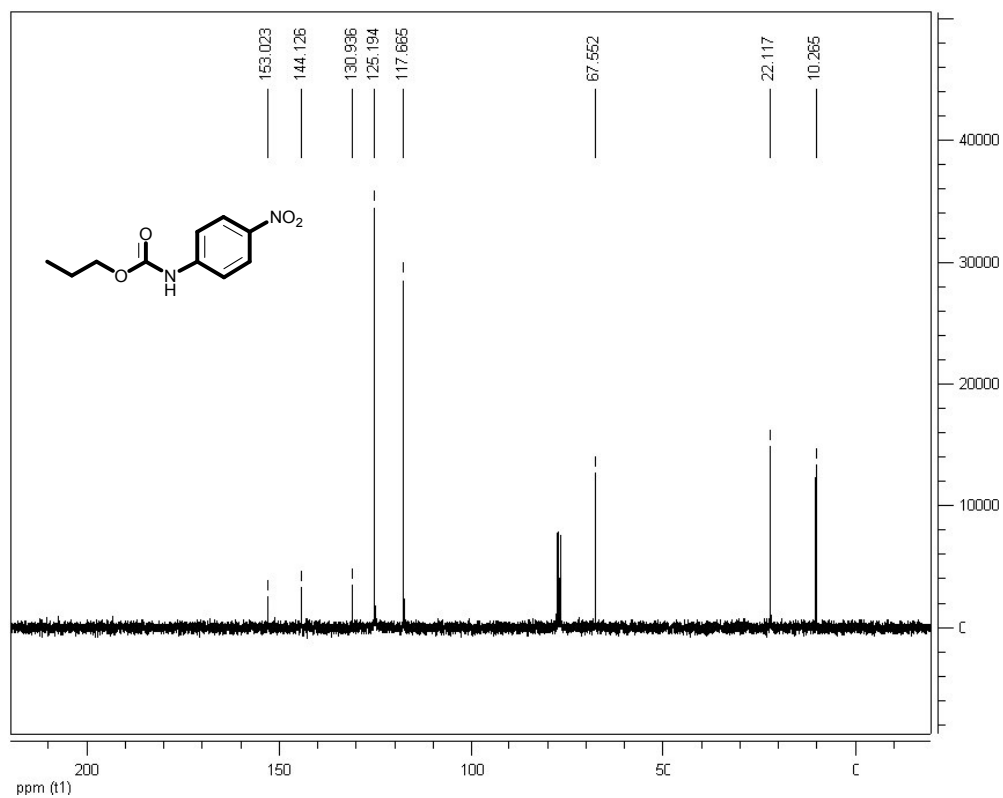
$^1\text{H-NMR}$ spectra (250 MHz) of 1-propyl (4-cyanophenyl)carbamate (C11) in CDCl_3 .



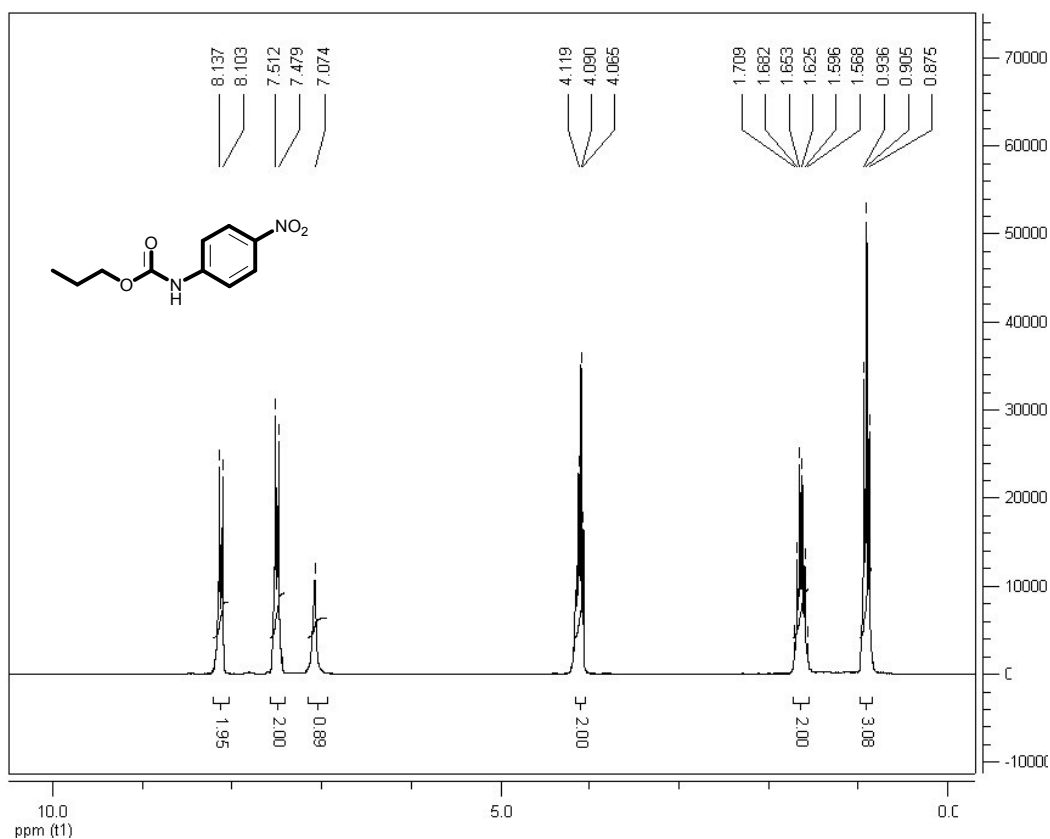
MS of 1-propyl (4-cyanophenyl)carbamate (C11).



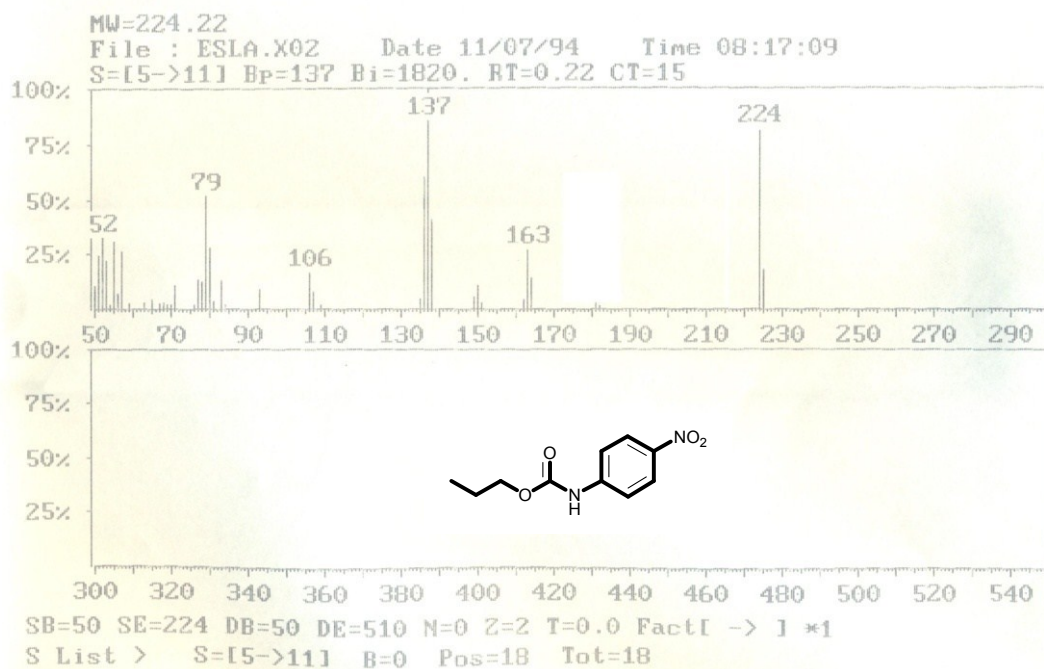
FT-IR spectra of 1-propyl (4-nitrophenyl)carbamate (C12) in KBr .



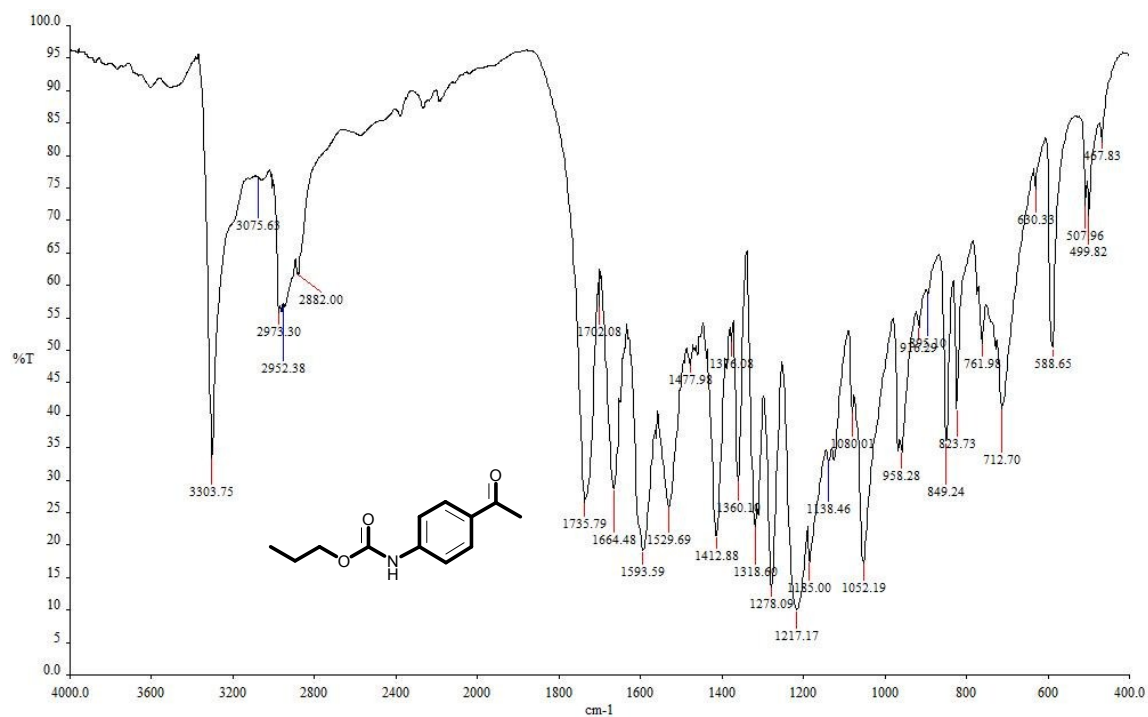
¹³C-NMR spectra (63 MHz) of 1-propyl (4-nitrophenyl)carbamate (C12) in CDCl₃.



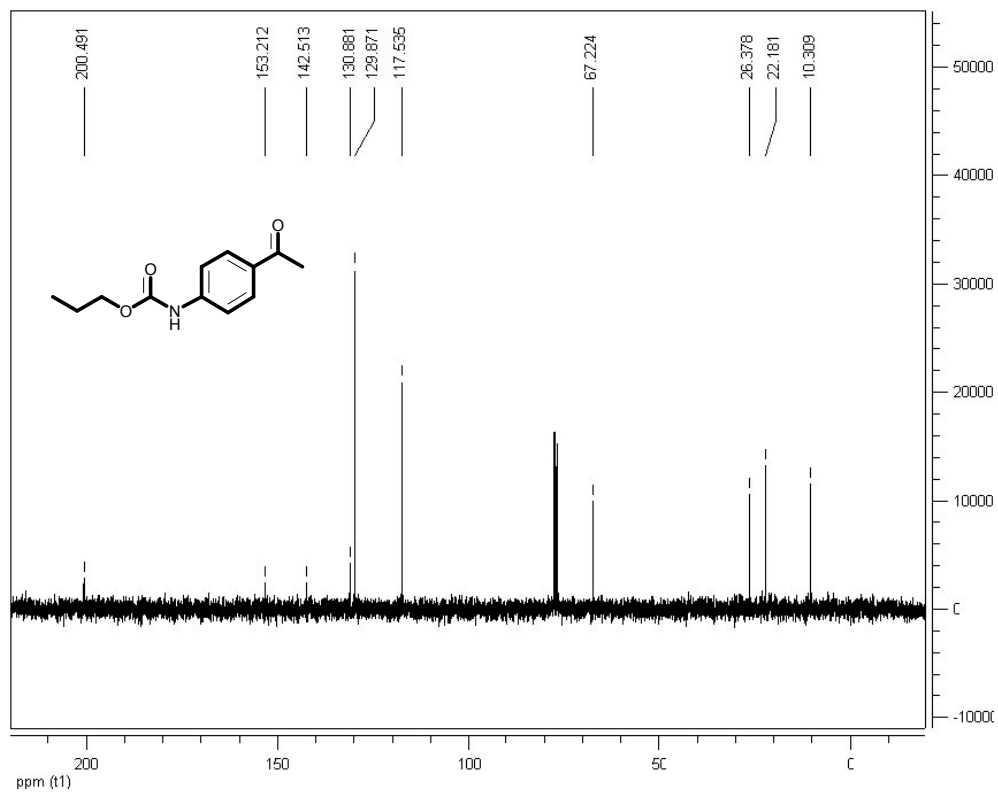
$^1\text{H-NMR}$ spectra (250 MHz) of 1-propyl (4-nitrophenyl)carbamate (**C12**) in CDCl_3 .



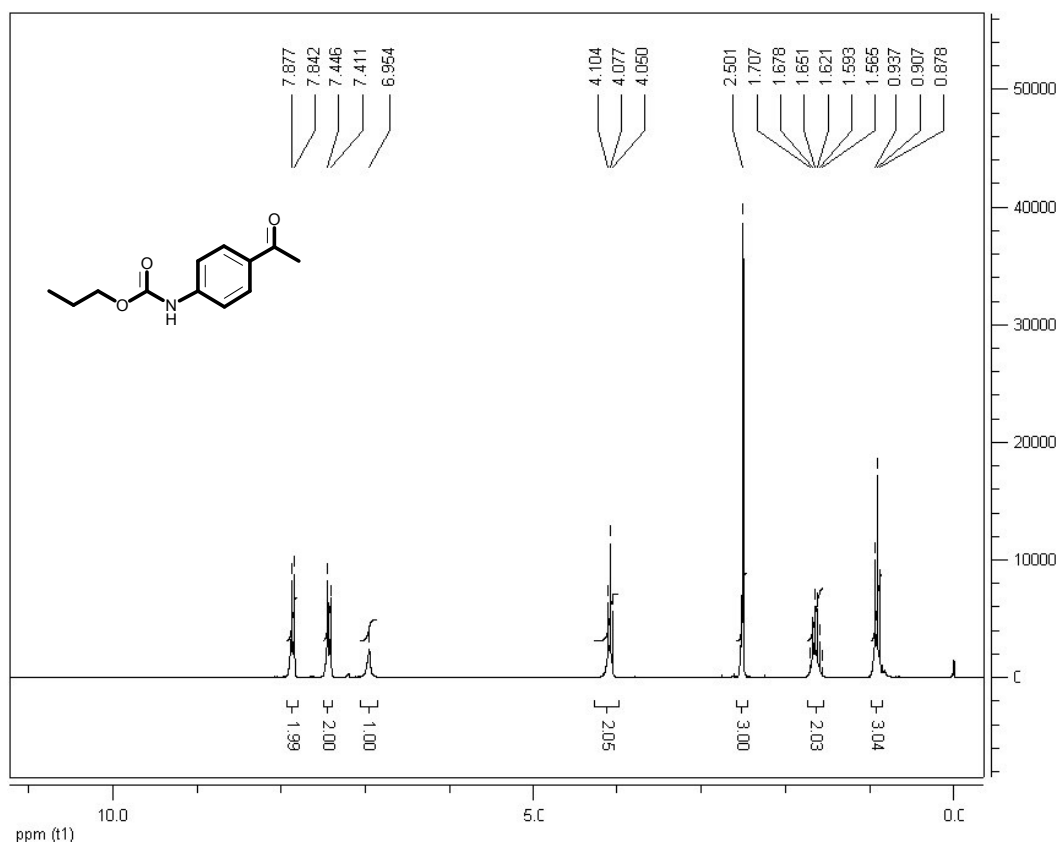
MS of 1-propyl (4-nitrophenyl)carbamate (**C12**).



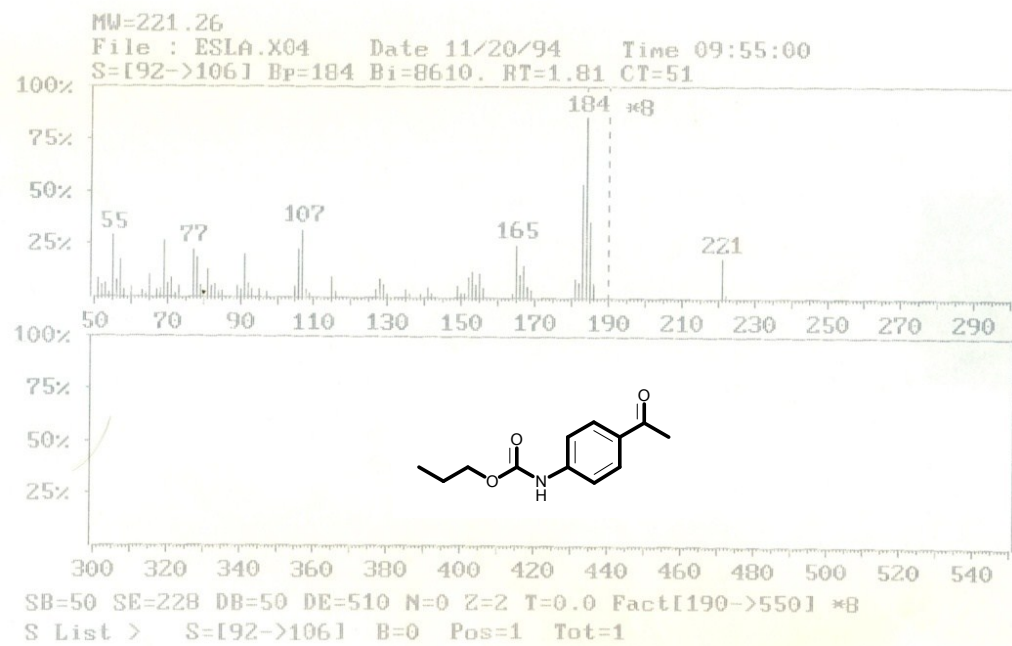
FT-IR spectra of 1-propyl (4-acetylphenyl)carbamate (C13) in KBr .



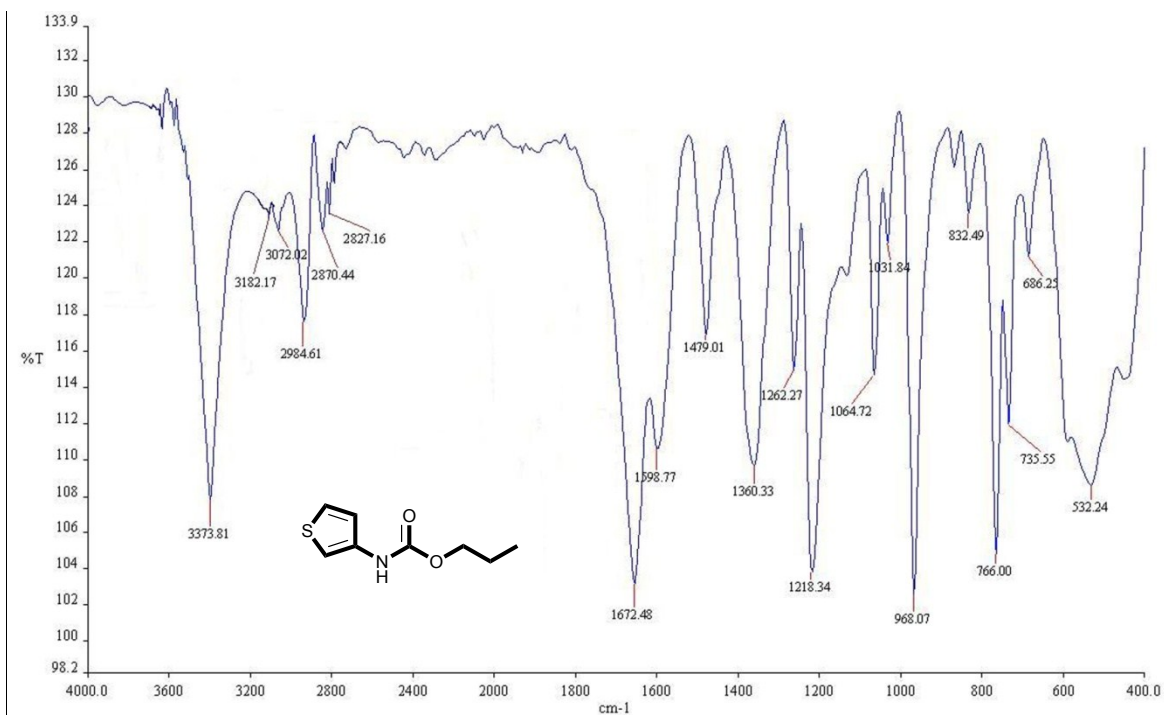
¹³C-NMR spectra (63 MHz) of 1-propyl (4-acetylphenyl)carbamate (C13) in CDCl₃.



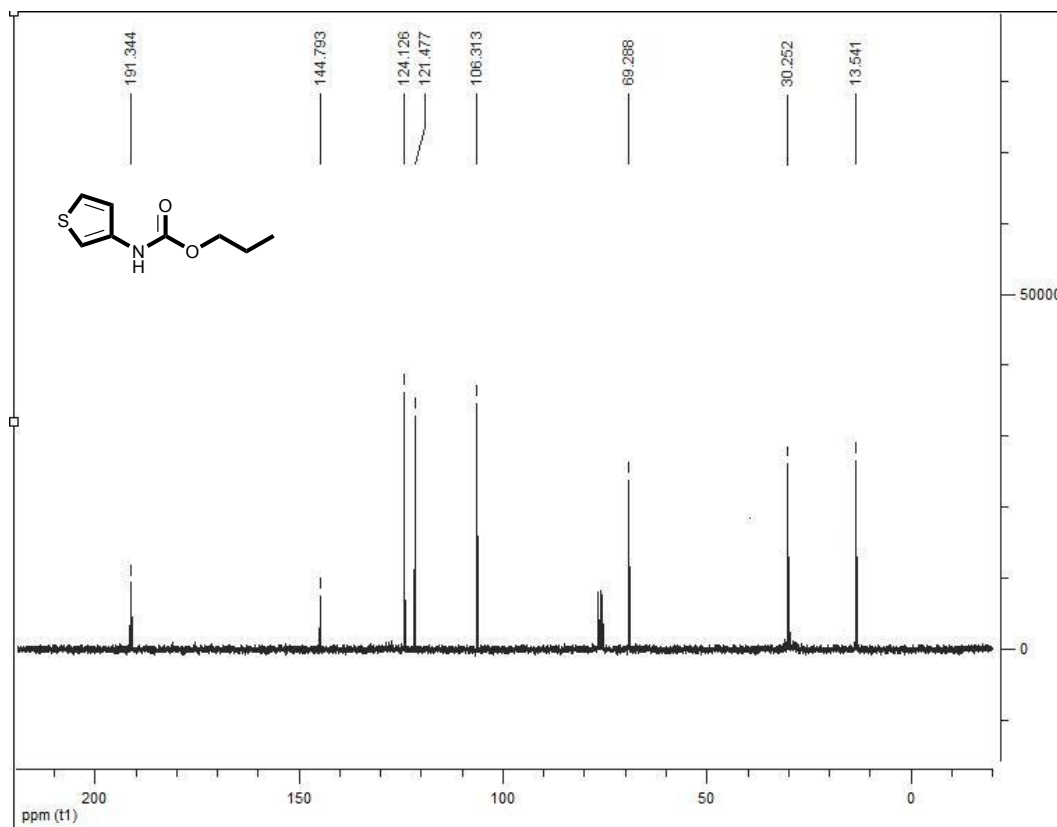
$^1\text{H-NMR}$ spectra (250 MHz) of 1-propyl (4-acetylphenyl)carbamate (C13) in CDCl_3 .



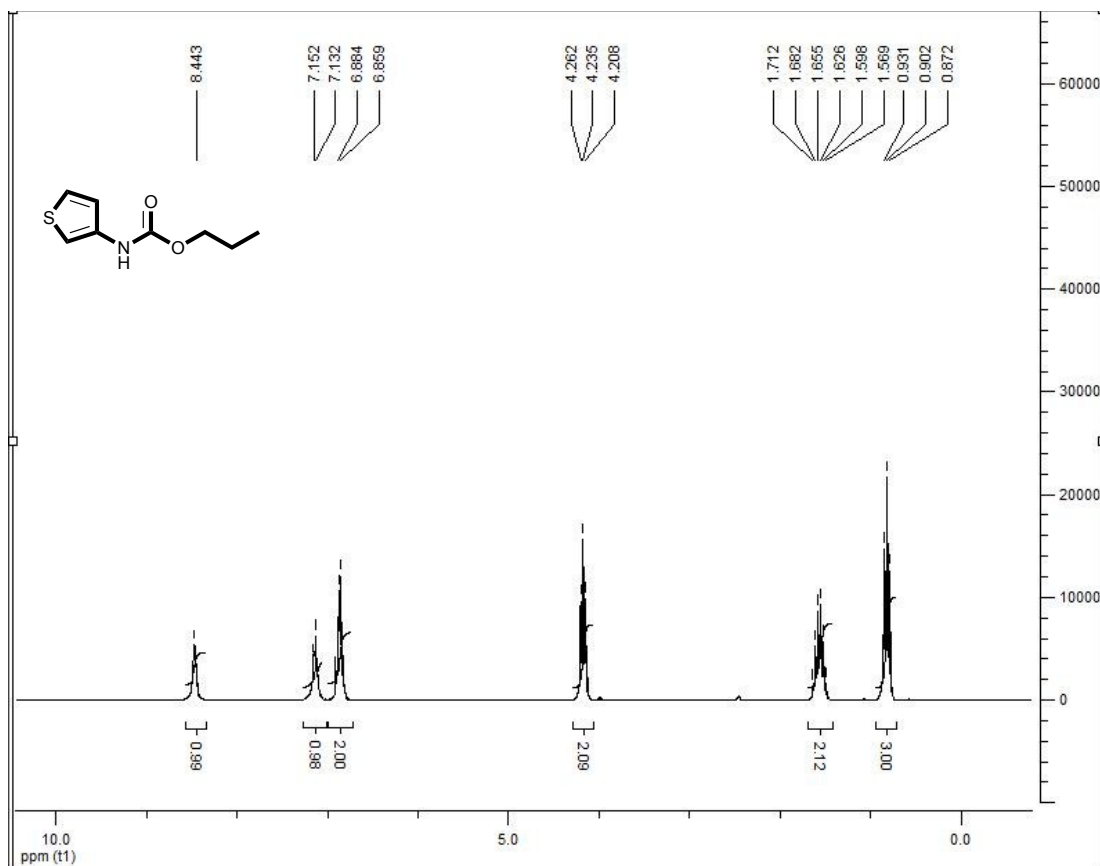
MS of 1-propyl (4-acetylphenyl)carbamate (C13).



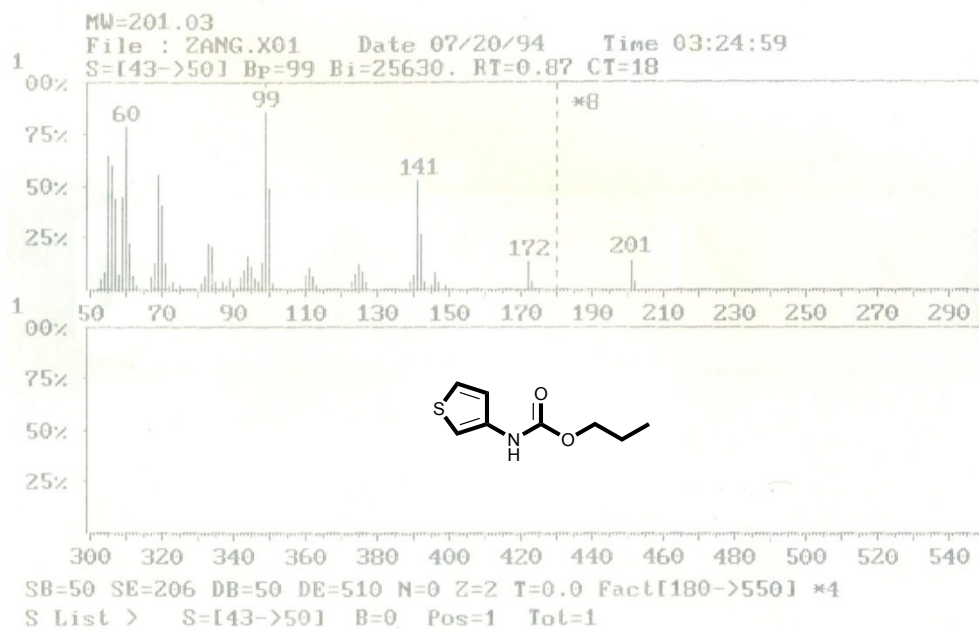
FT-IR spectra of 1-propyl (thiophen-3-yl)thiocarbamate (C14) in KBr.



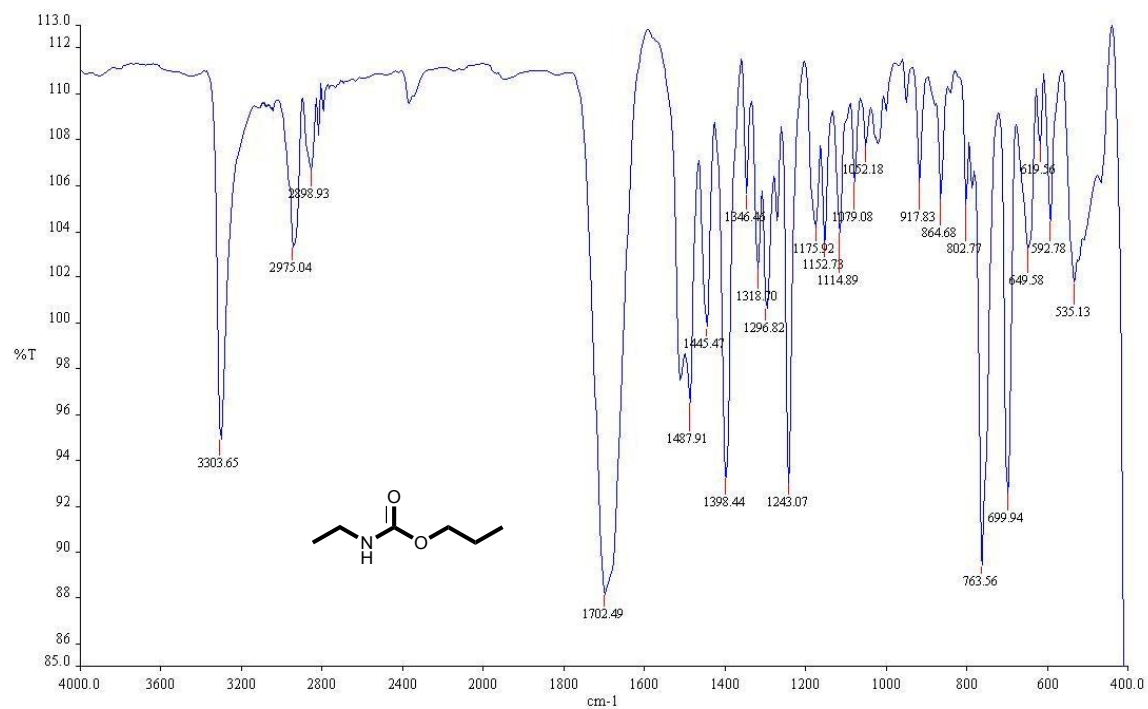
¹³C-NMR spectra (63 MHz) of 1-propyl (thiophen-3-yl)thiocarbamate (C14) in CDCl₃.



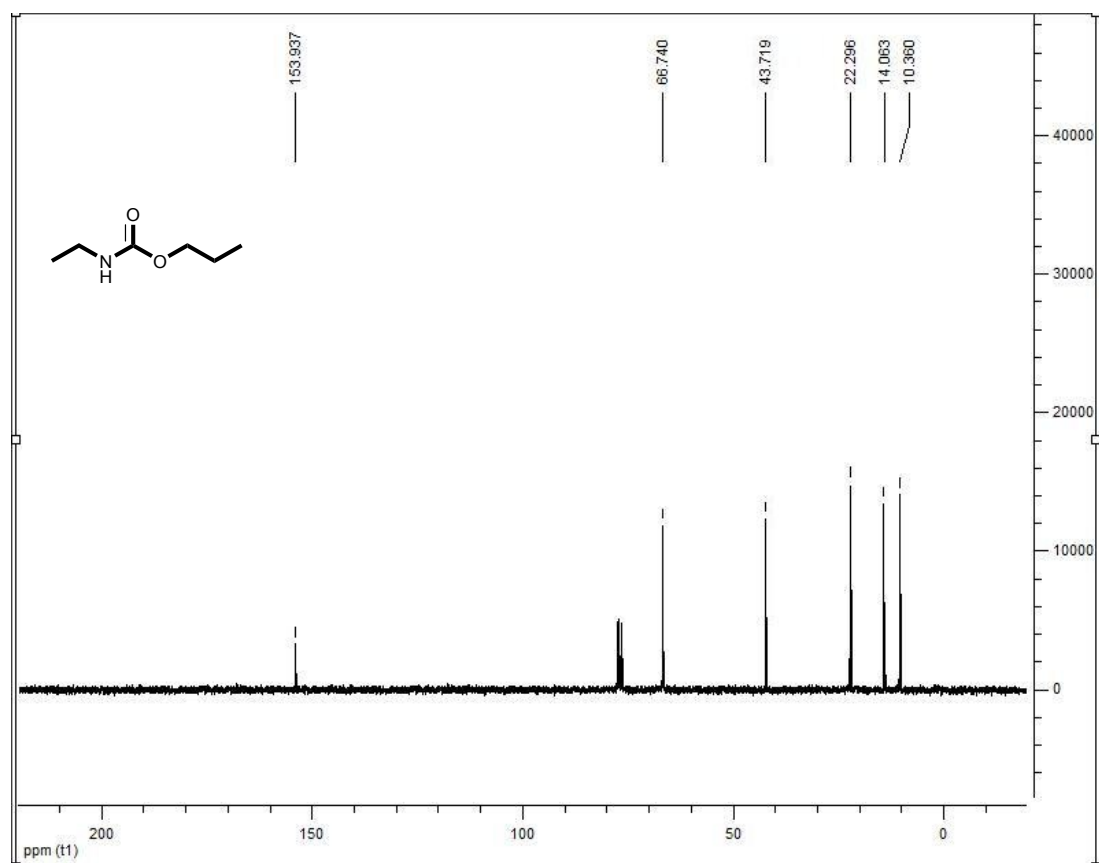
¹H-NMR spectra (250 MHz) of 1-propyl (thiophen-3-yl)thiocarbamate (C14) in CDCl₃.



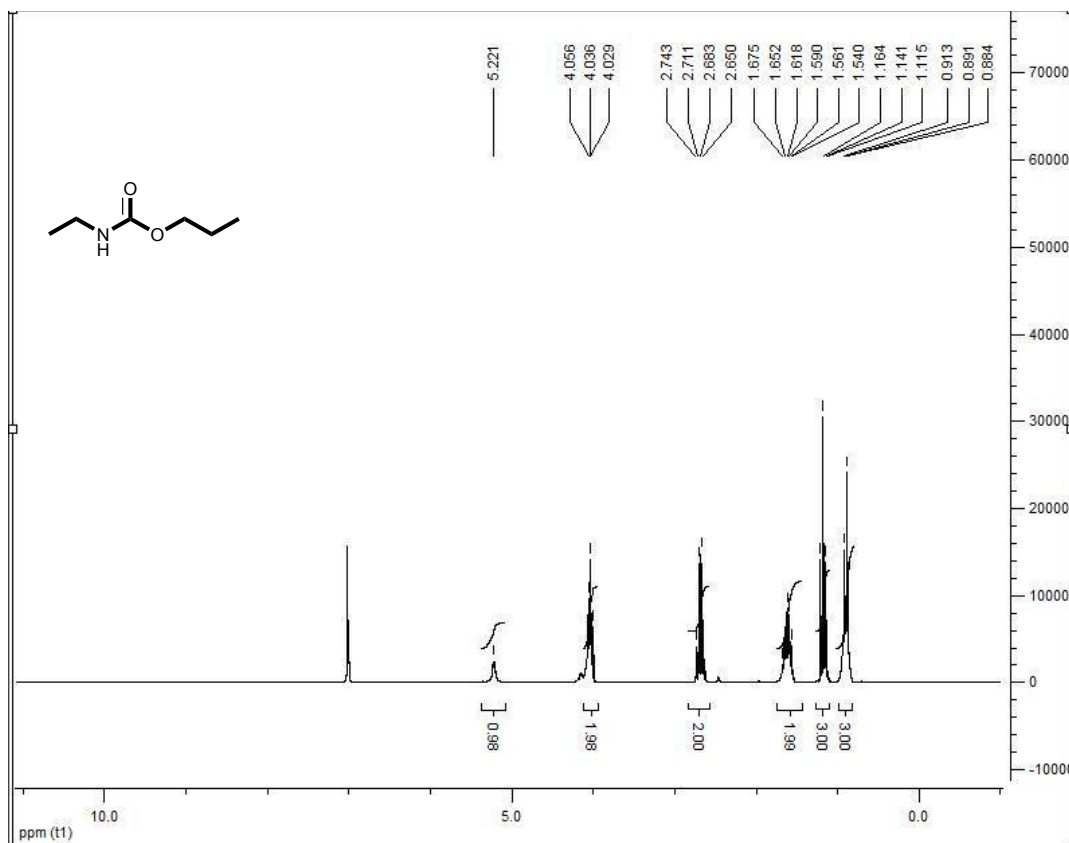
MS of 1-propyl (thiophen-3-yl)thiocarbamate (C14).



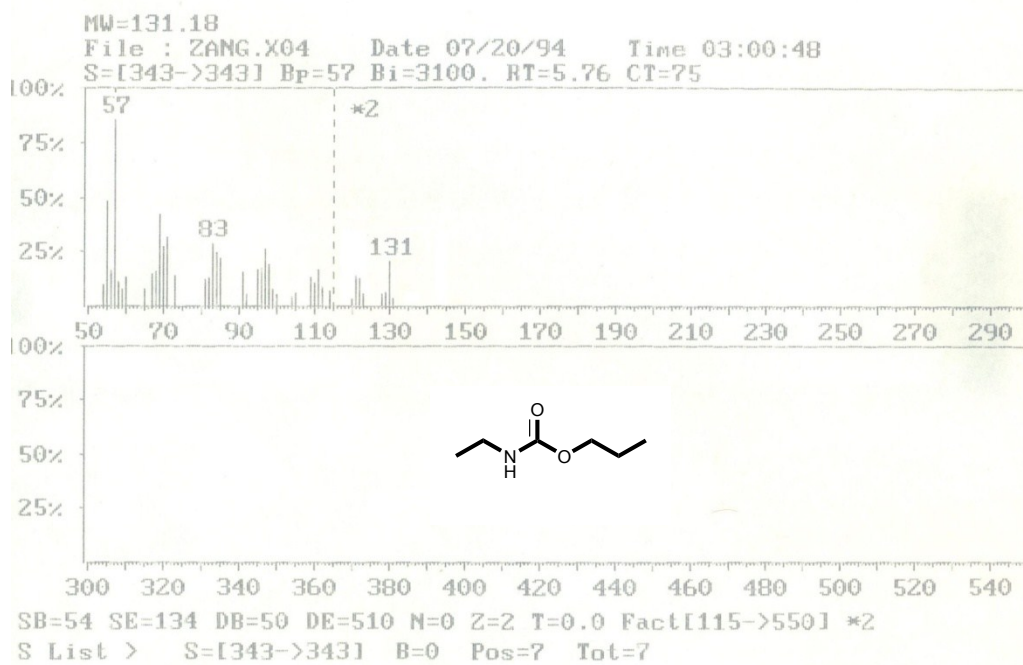
FT-IR spectra of 1-propyl ethylcarbamate (C15) in KBr .



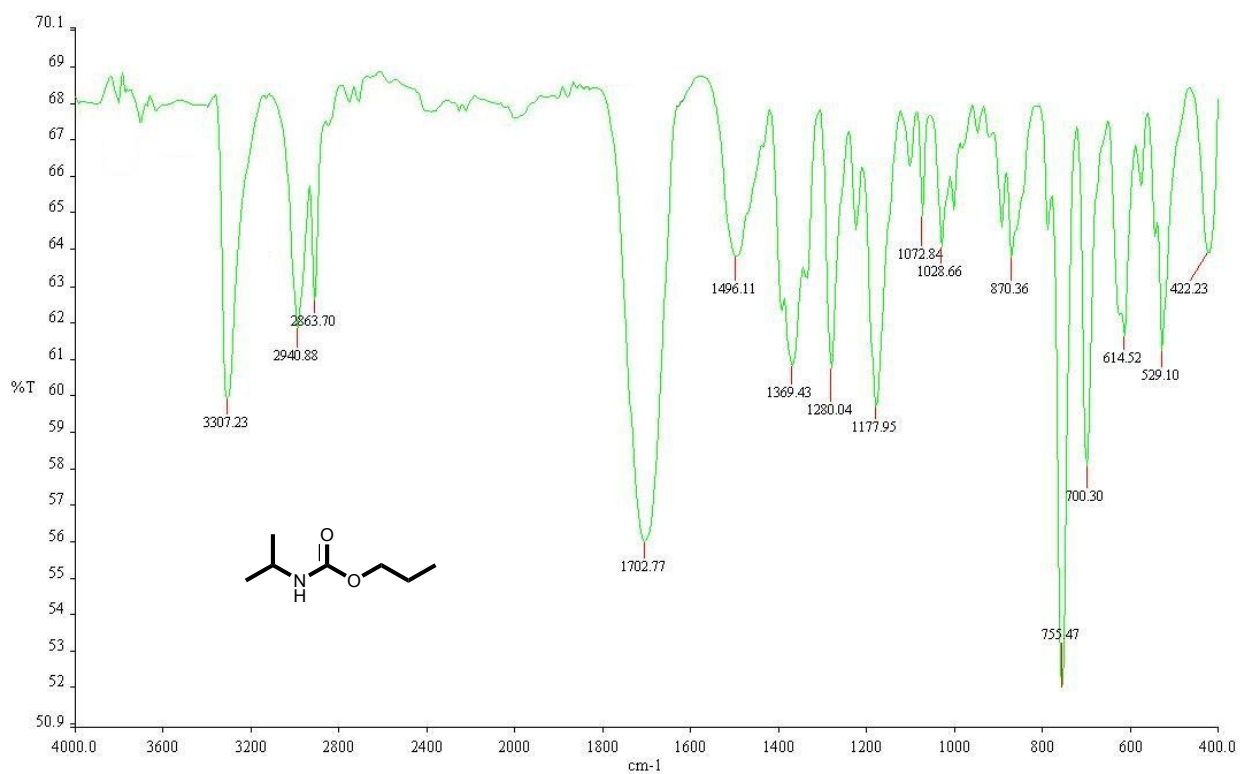
¹³C-NMR spectra (63 MHz) of 1-propyl ethylcarbamate (C15) in CDCl₃.



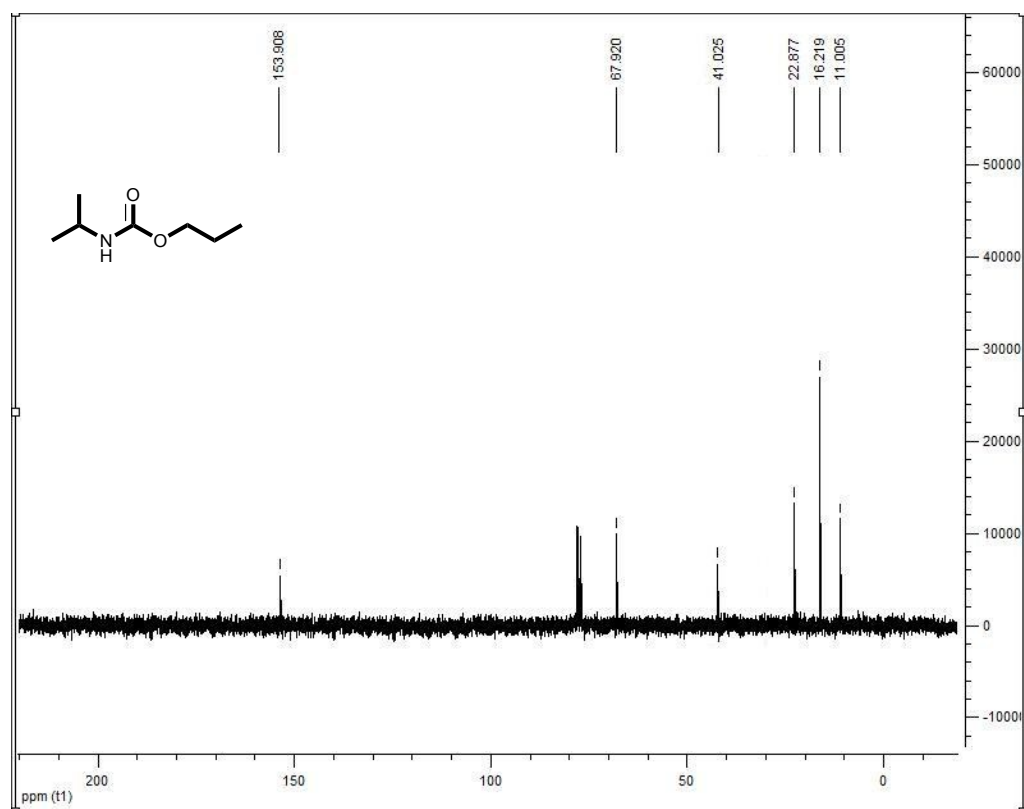
$^1\text{H-NMR}$ spectra (250 MHz) of 1-propyl ethylcarbamate (**C15**) in CDCl_3 .



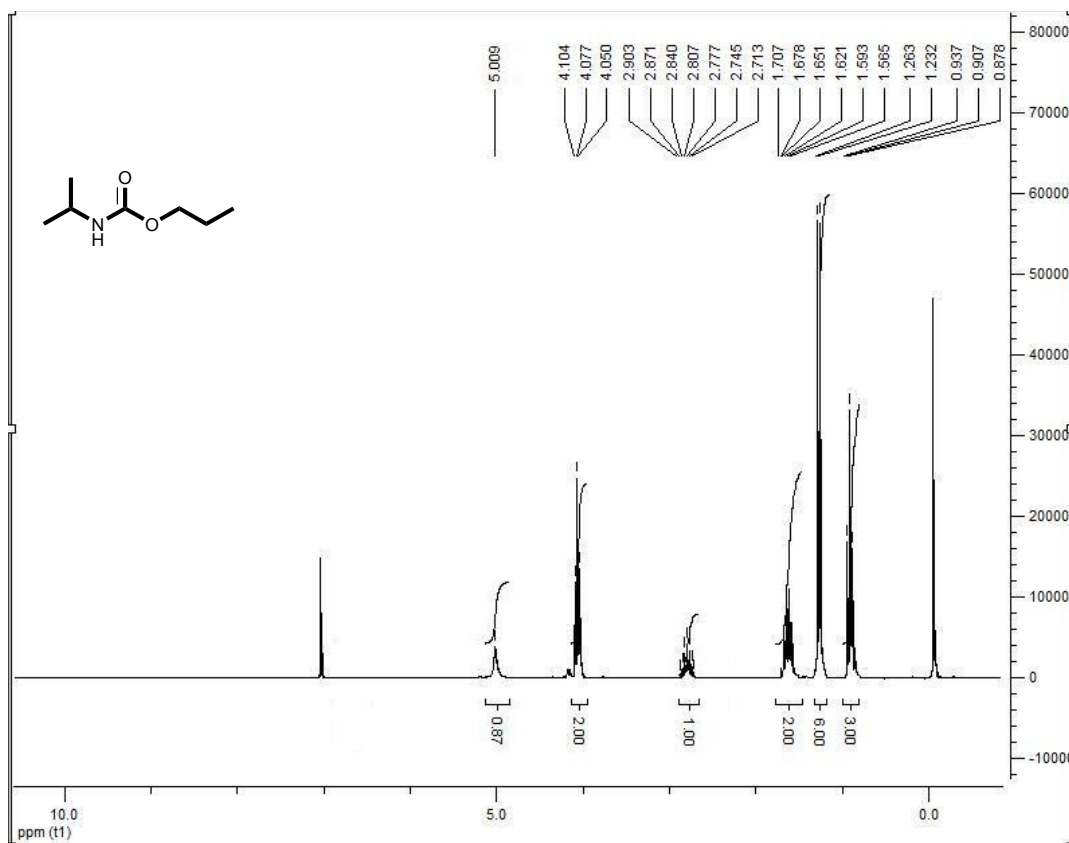
MS of 1-propyl ethylcarbamate (**C15**).



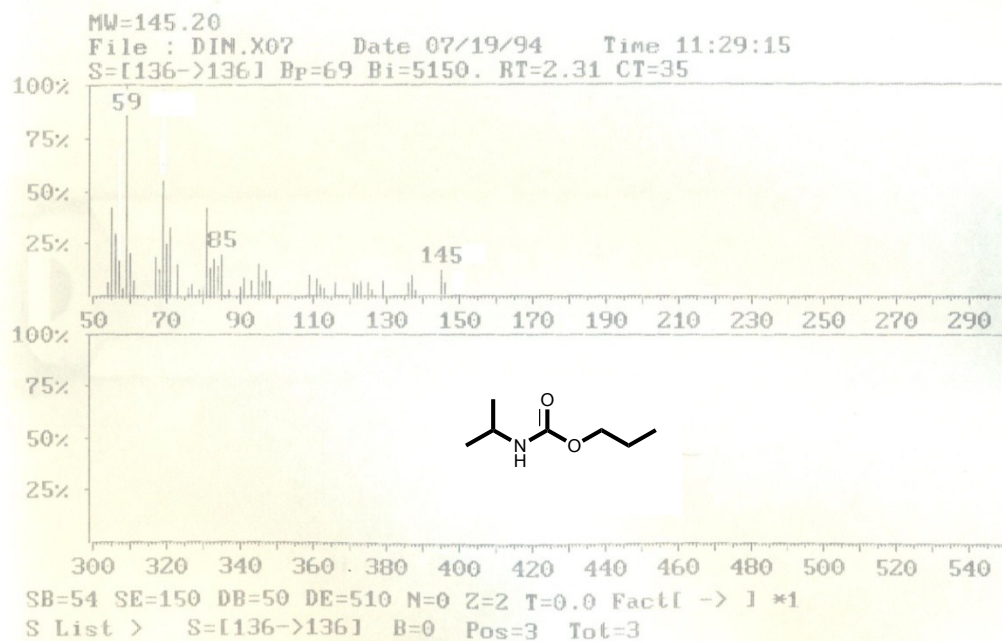
FT-IR spectra of 1-propyl *iso*-propylcarbamate (C16) in KBr .



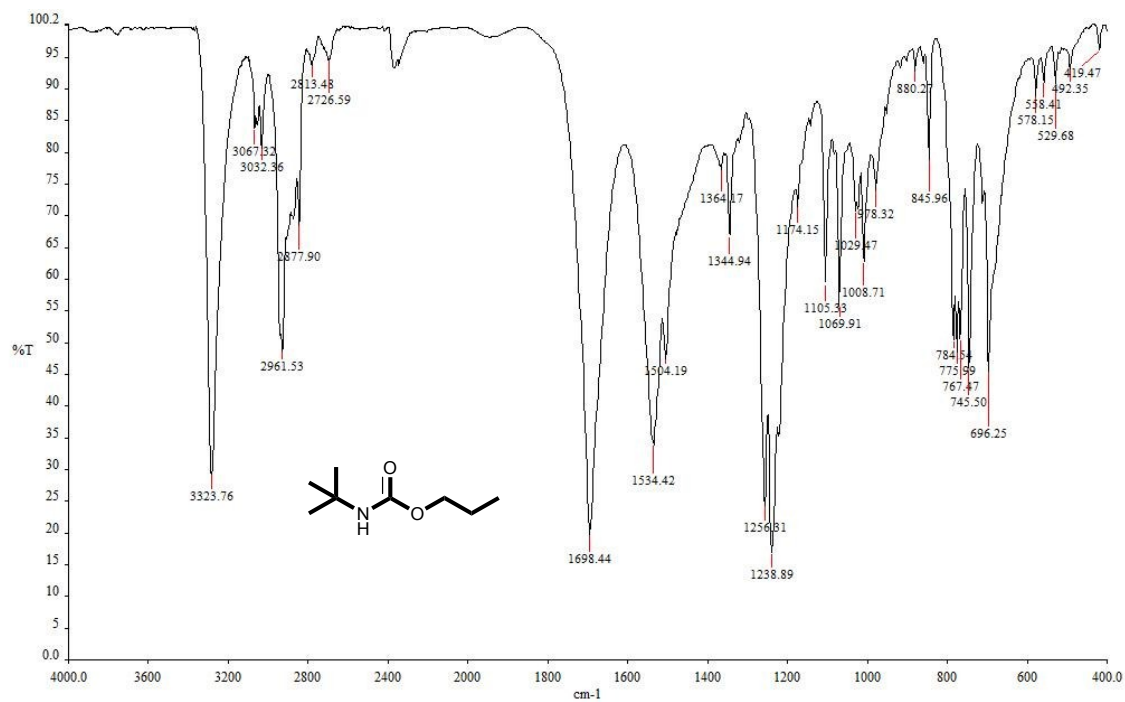
¹³C-NMR spectra (63 MHz) of 1-propyl *iso*-propylcarbamate (C16) in CDCl₃.



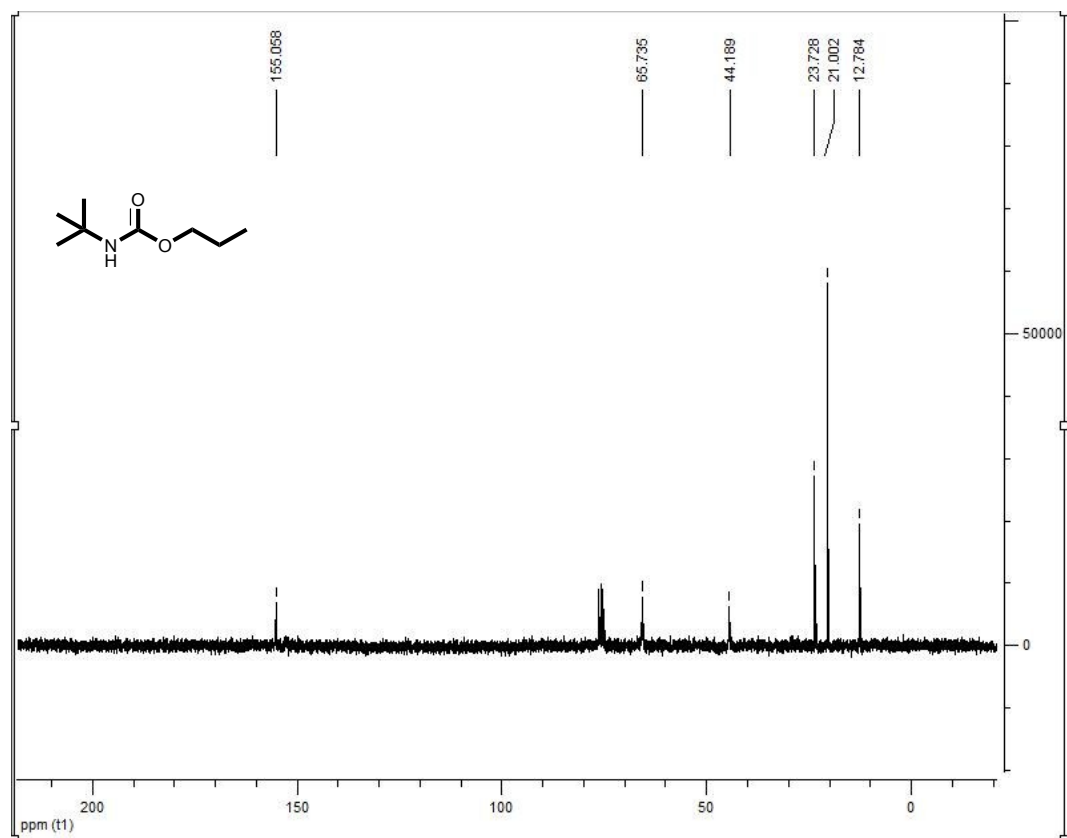
¹H-NMR spectra (250 MHz) of 1-propyl *iso*-propylcarbamate (**C16**) in CDCl₃.



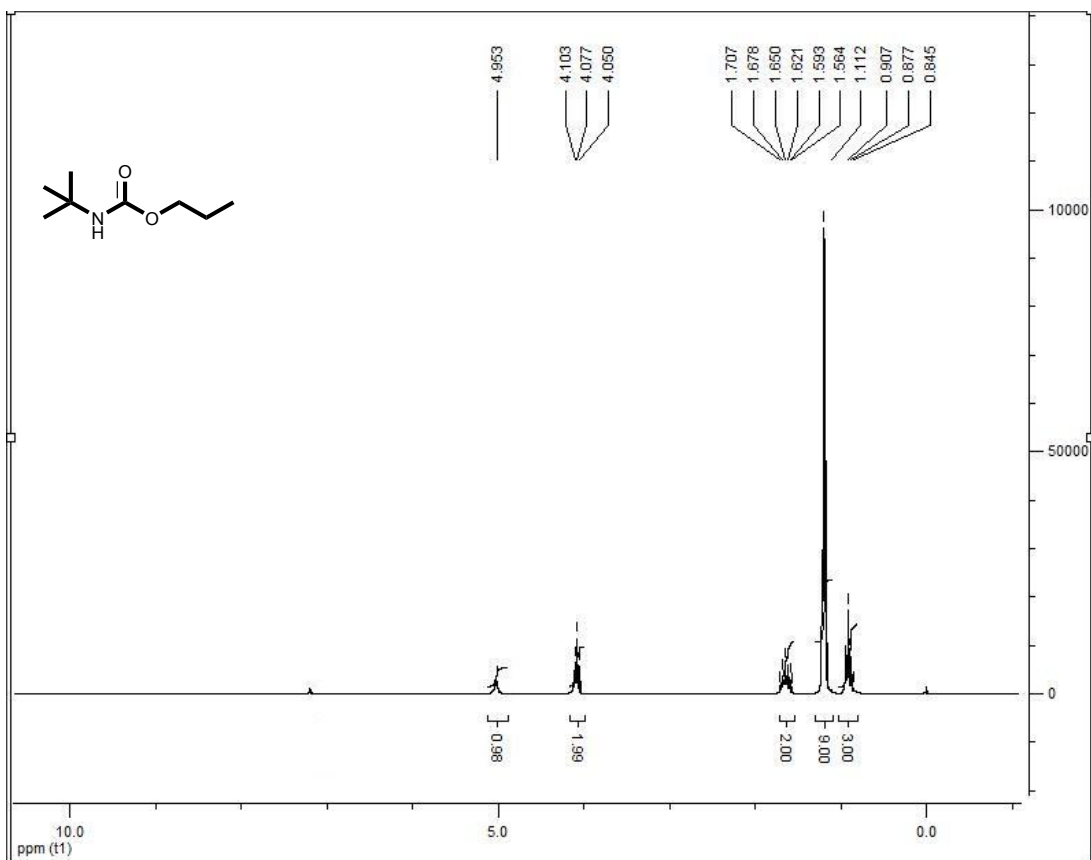
MS of 1-propyl *iso*-propylcarbamate (**C16**).



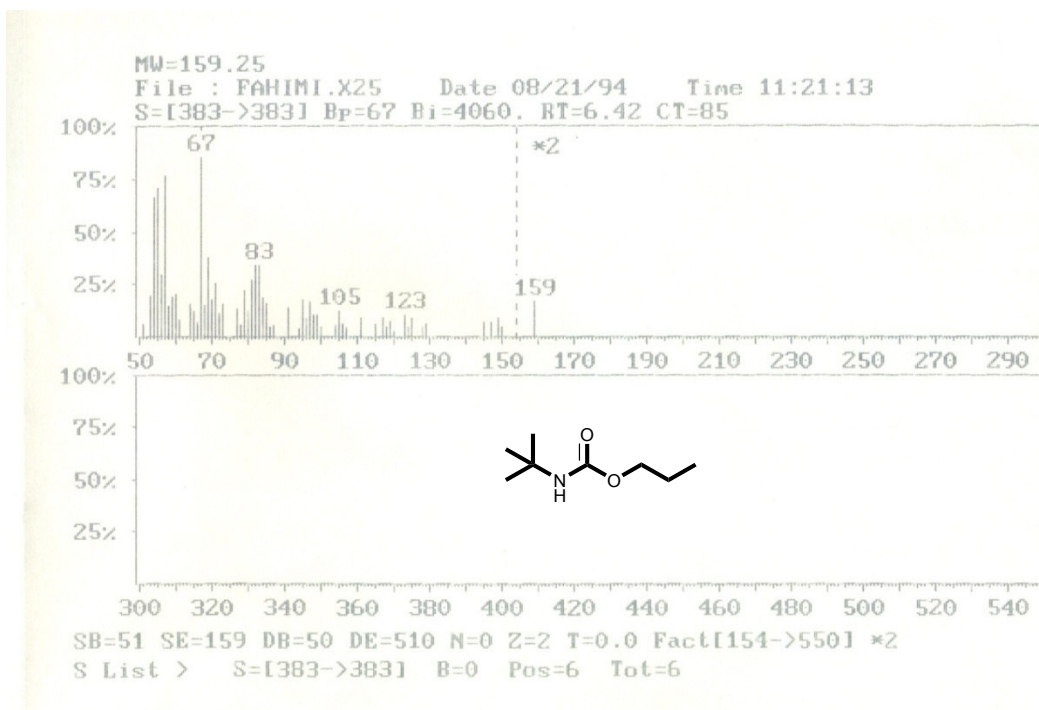
FT-IR spectra of 1-propyl *tert*-butylcarbamate (C17) in KBr .



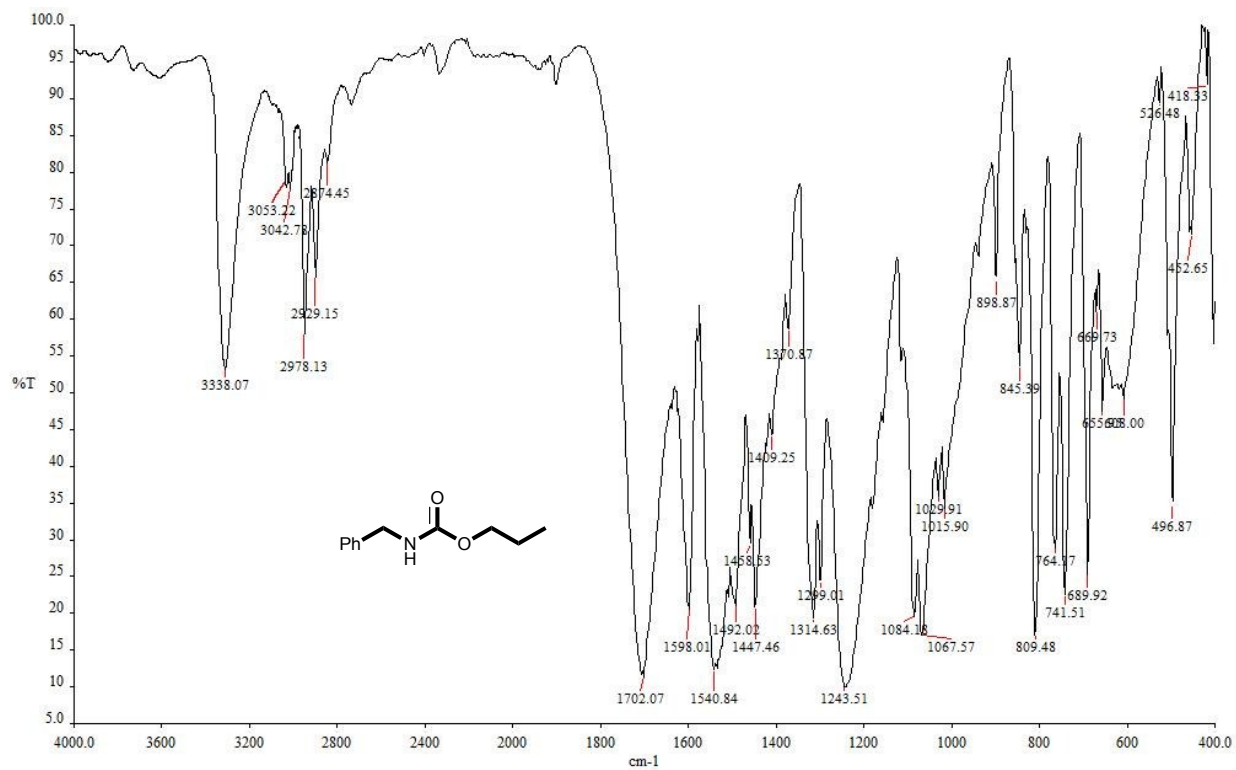
¹³C-NMR spectra (63 MHz) of 1-propyl *tert*-butylcarbamate (C17) in CDCl₃.



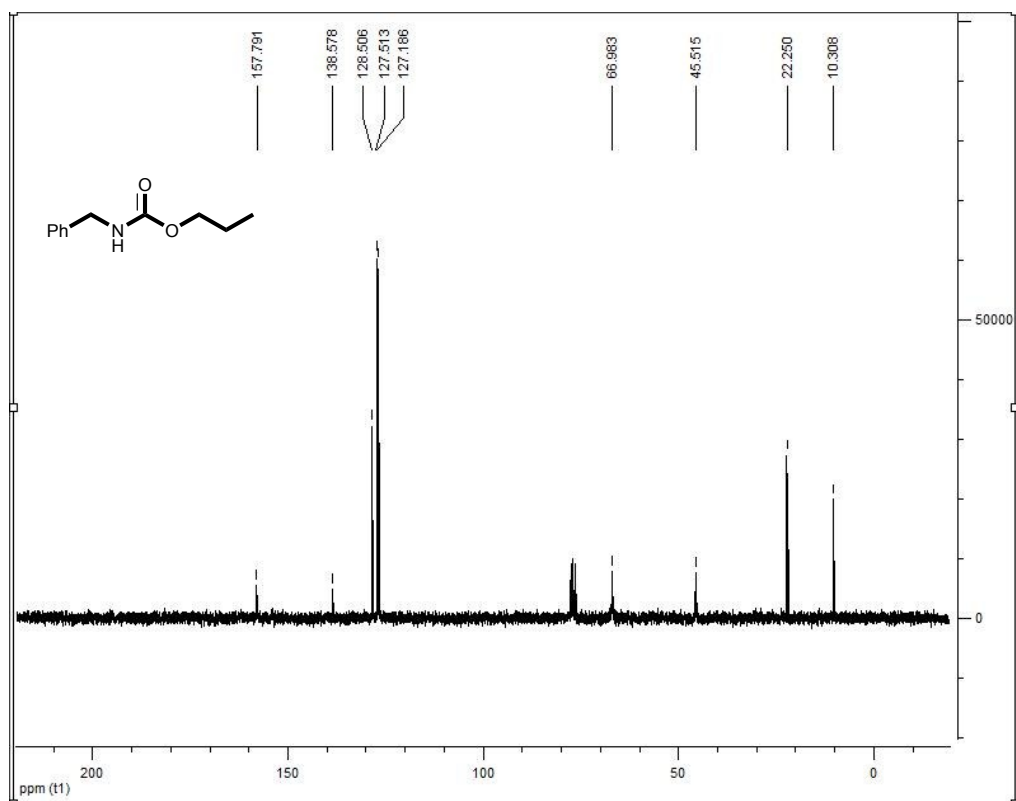
$^1\text{H-NMR}$ spectra (250 MHz) of 1-propyl *tert*-butylcarbamate (C17) in CDCl_3 .



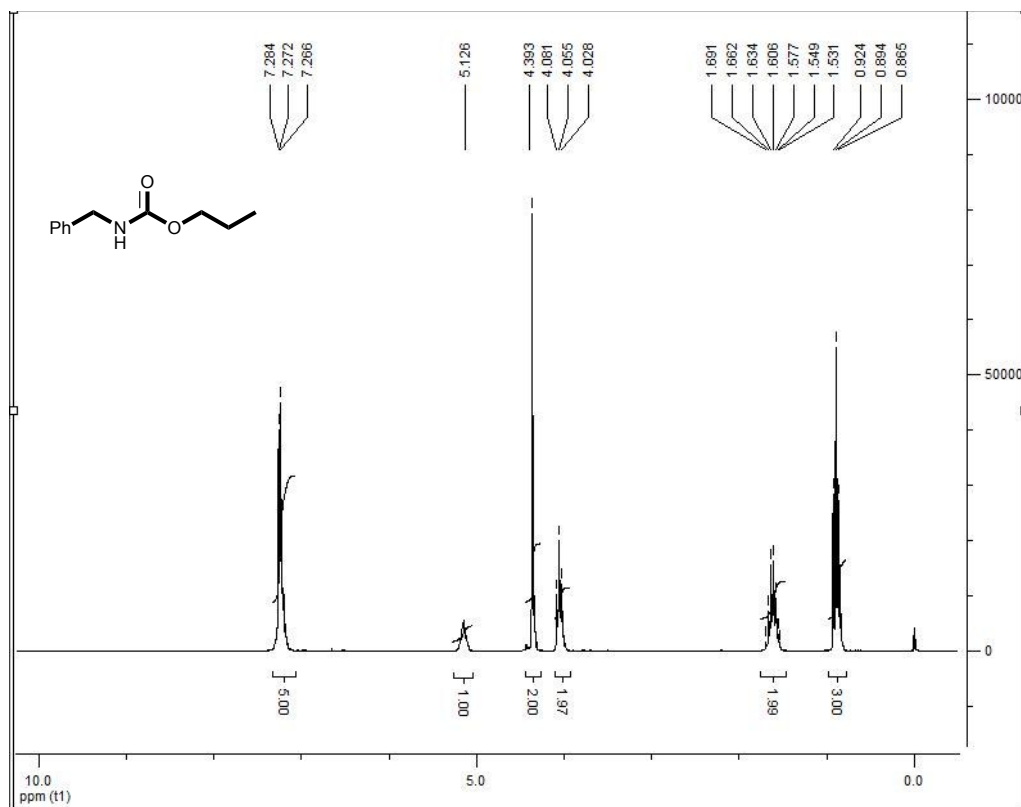
MS of 1-propyl *tert*-butylcarbamate (C17).



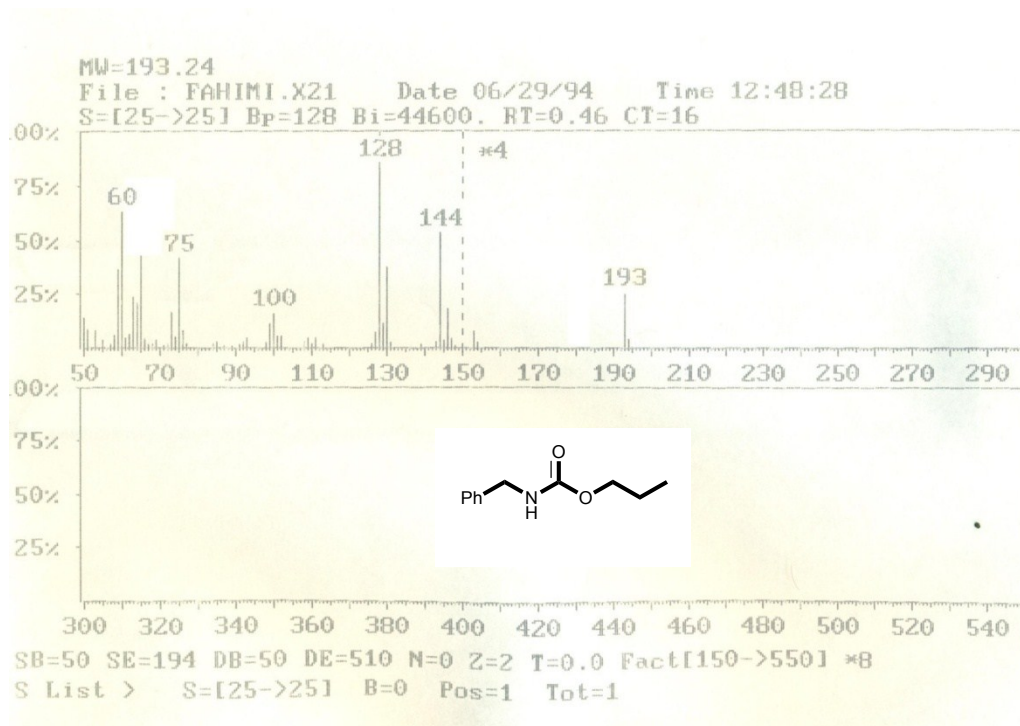
FT-IR spectra of 1-propyl benzylcarbamate (C18) in KBr .



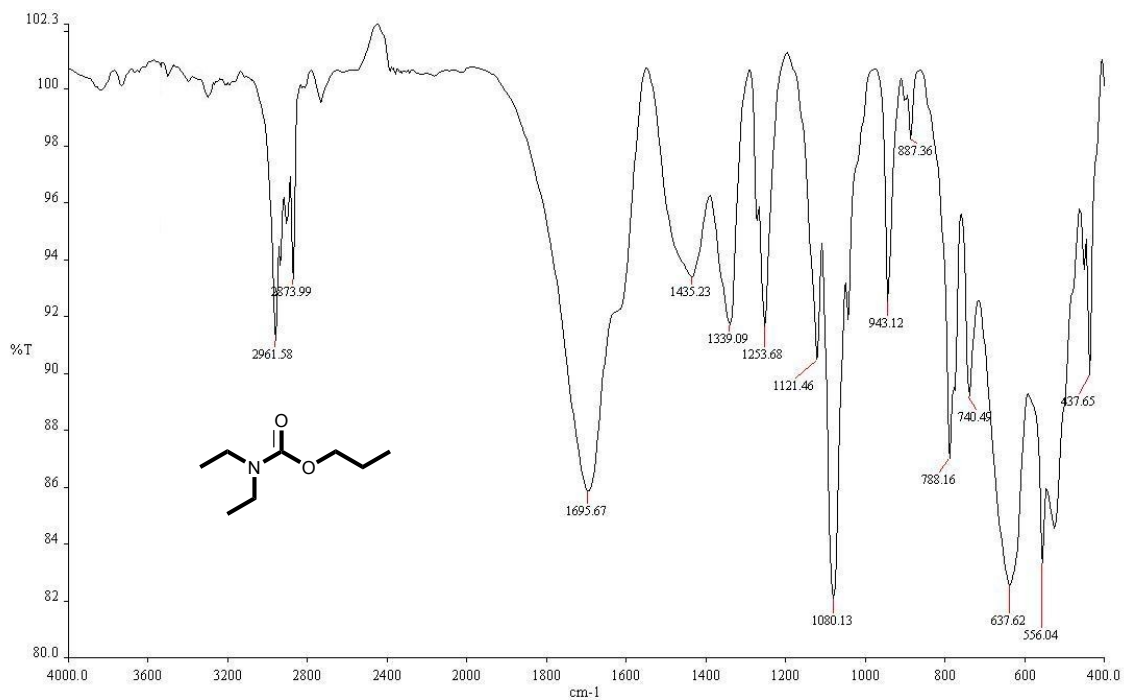
¹³C-NMR spectra (63 MHz) of 1-propyl benzylcarbamate (C18) in CDCl₃.



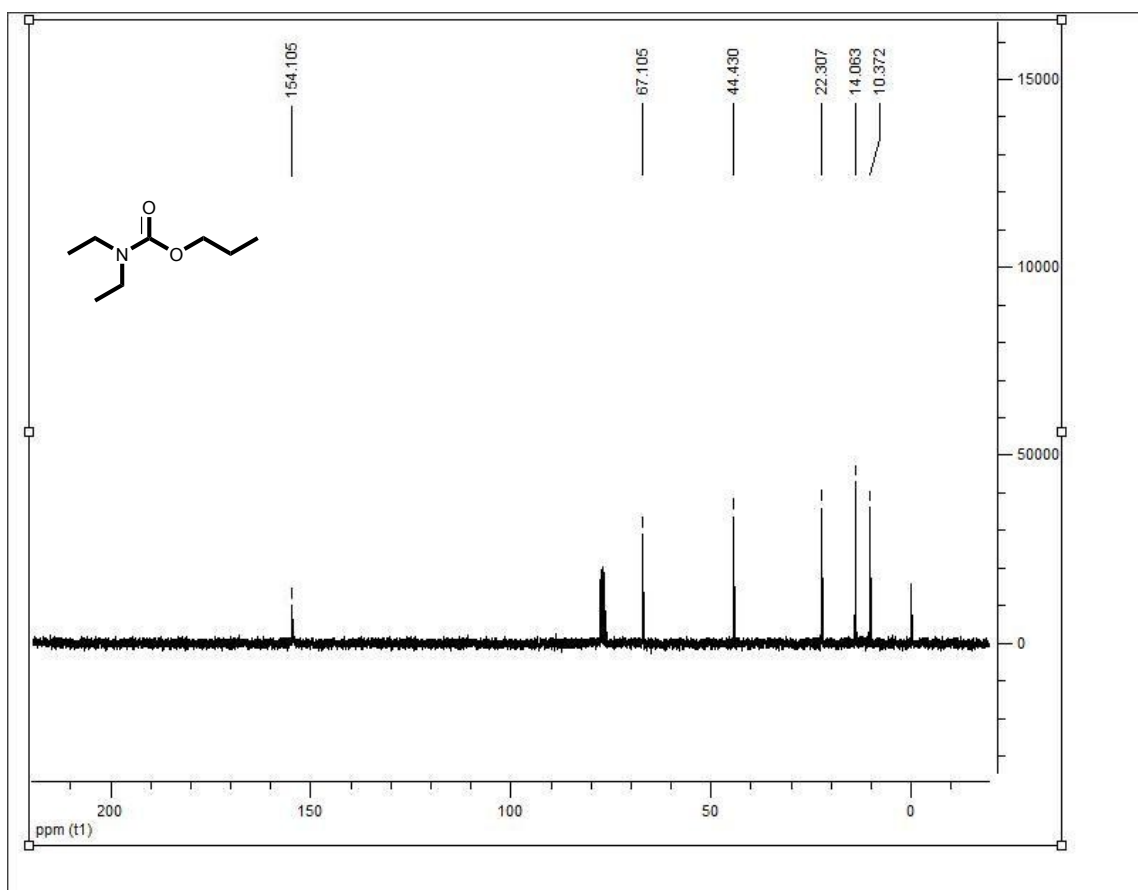
¹H-NMR spectra (250 MHz) of 1-propyl benzylcarbamate (C18) in CDCl₃.



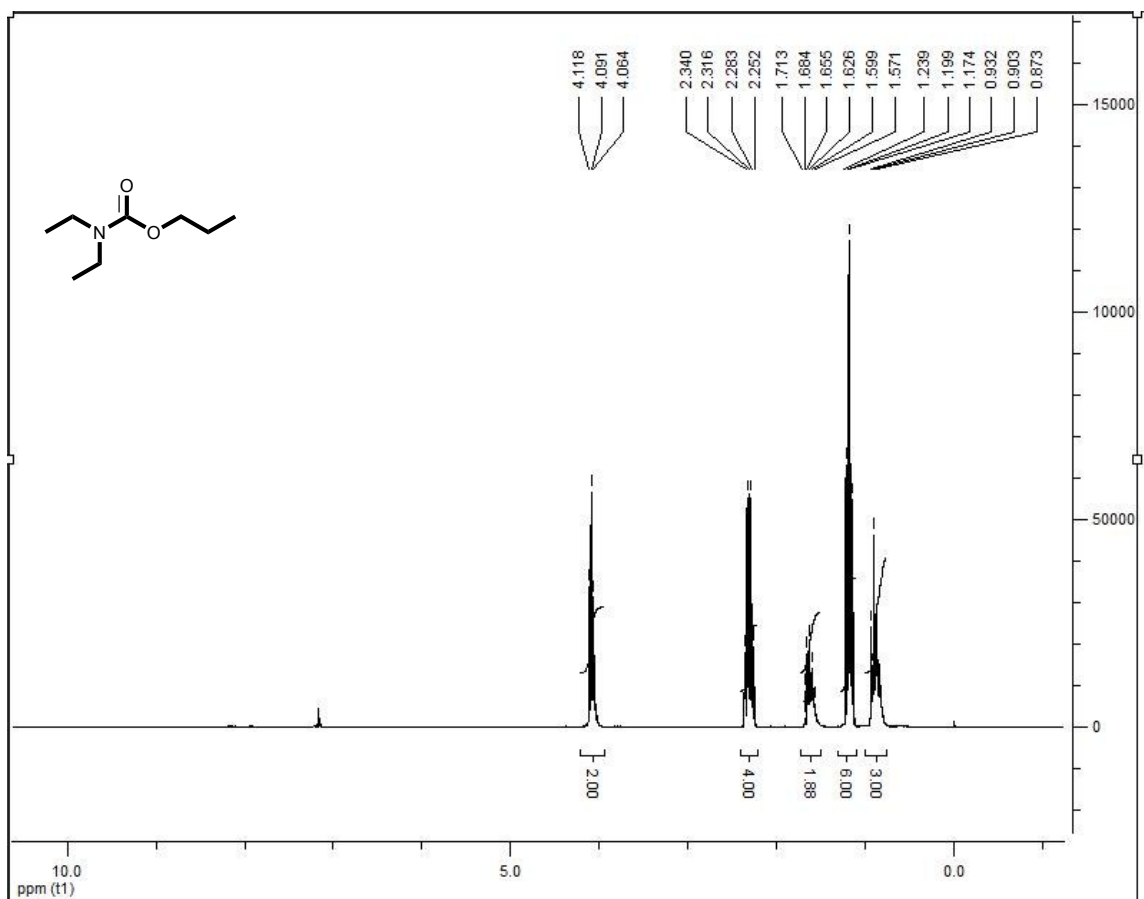
MS of 1-propyl benzylcarbamate (C18).



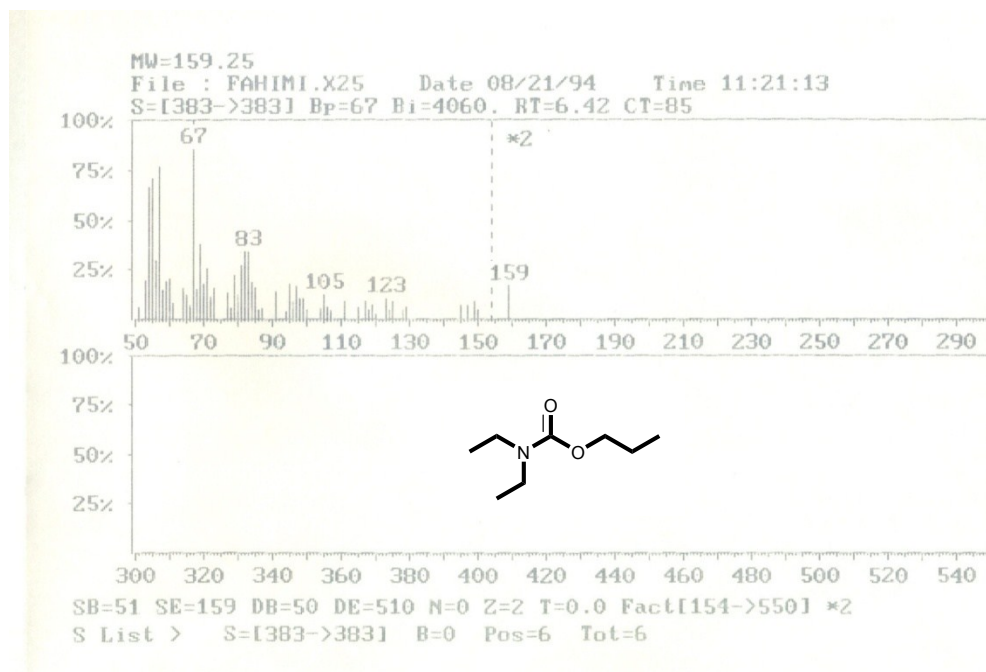
FT-IR spectra of 1-propyl diethylcarbamate (C19) in KBr .



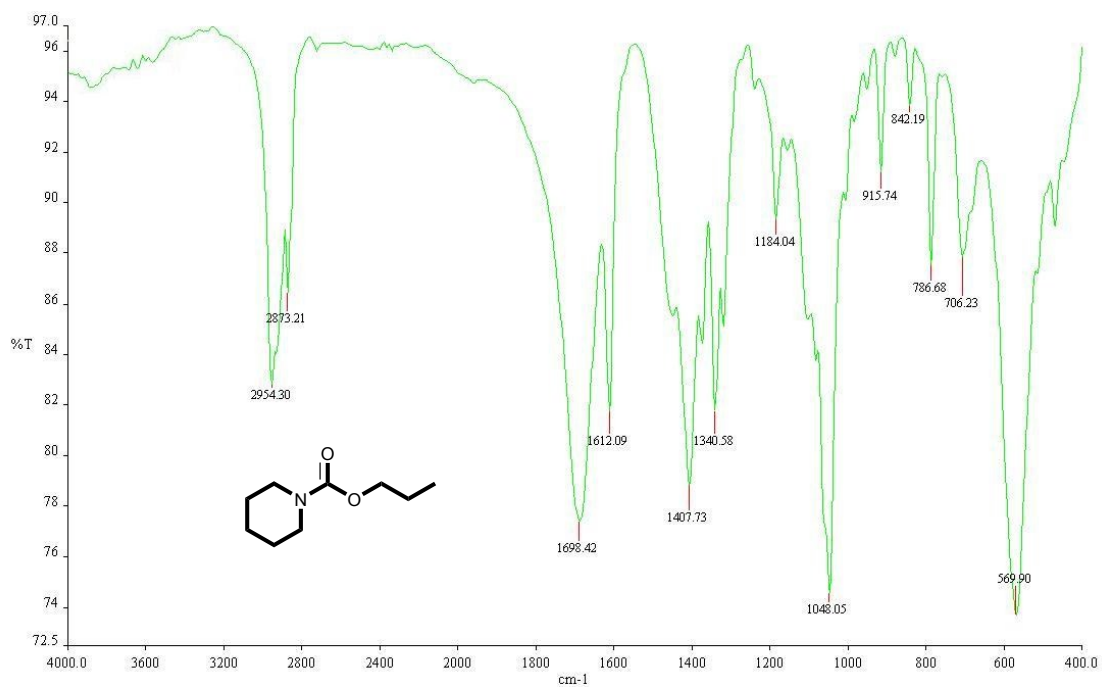
¹³C-NMR spectra (63 MHz) of 1-propyl diethylcarbamate (C19) in CDCl₃.



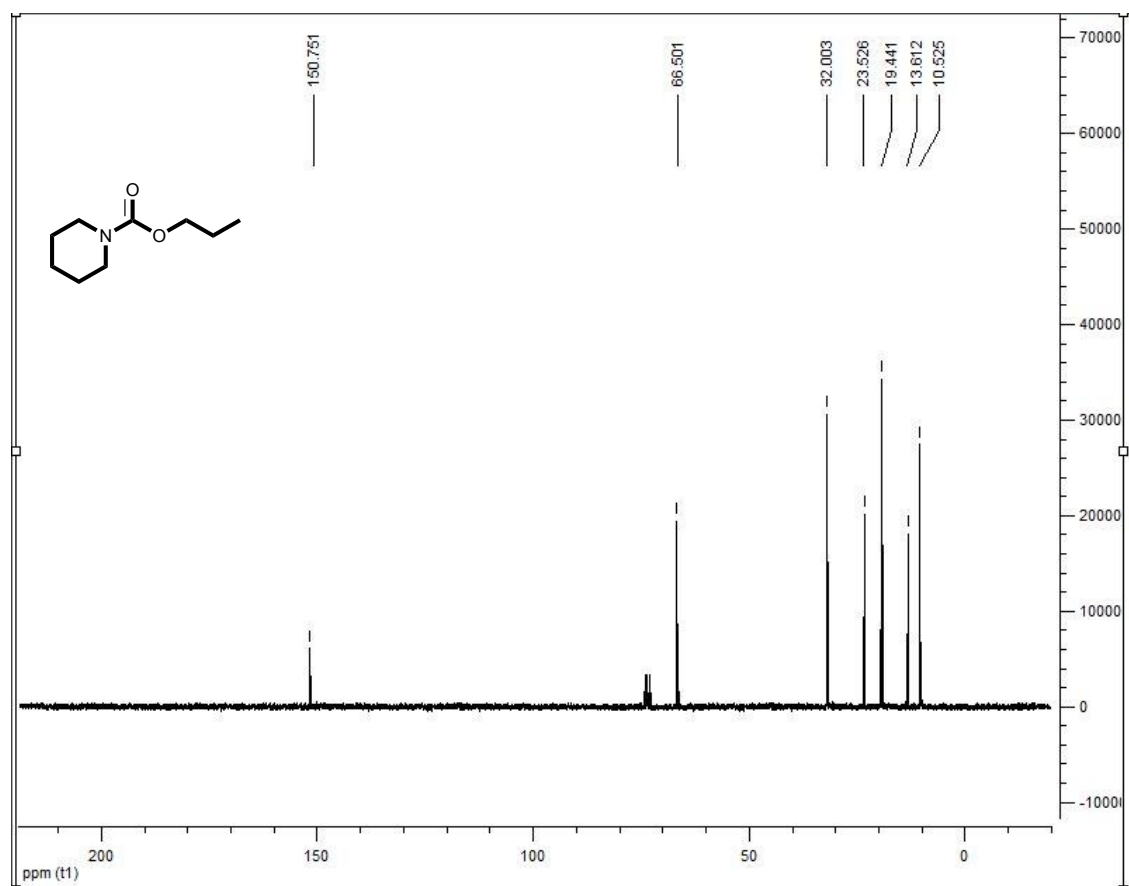
¹H-NMR spectra (250 MHz) of 1-propyl diethylcarbamate (C19) in CDCl₃.



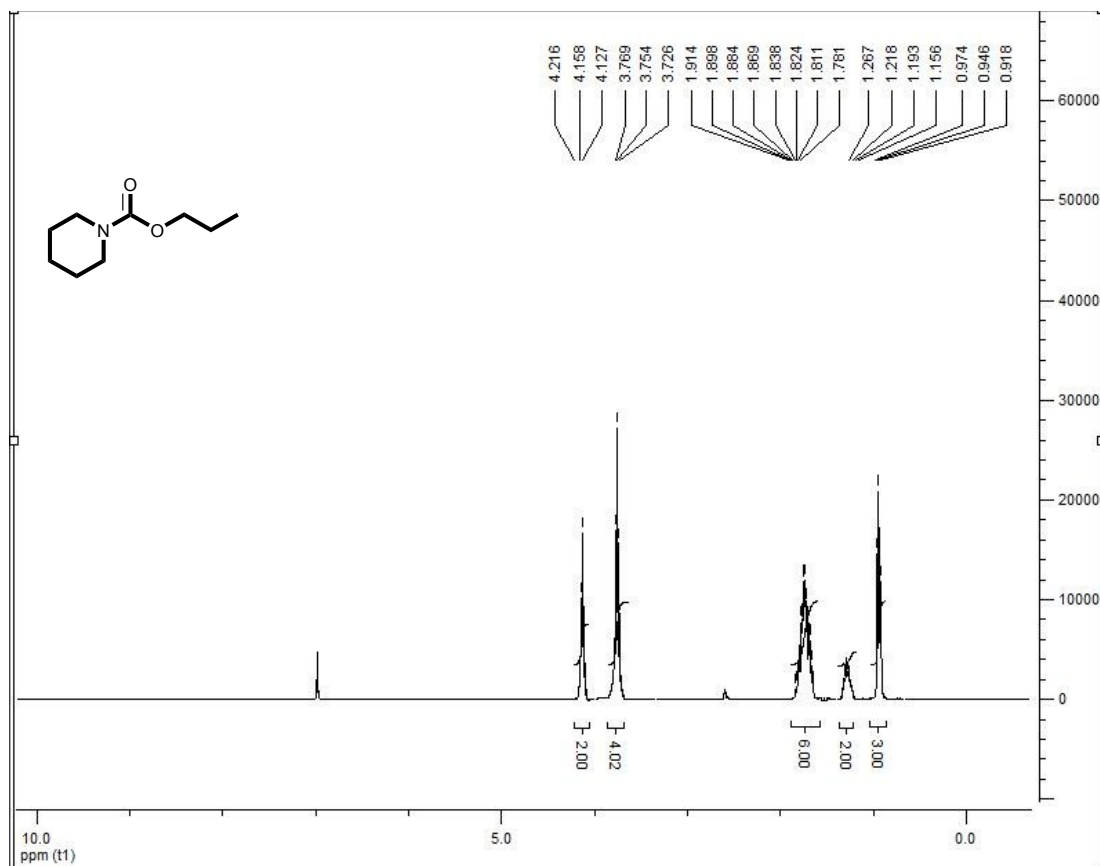
MS of 1-propyl diethylcarbamate (C19).



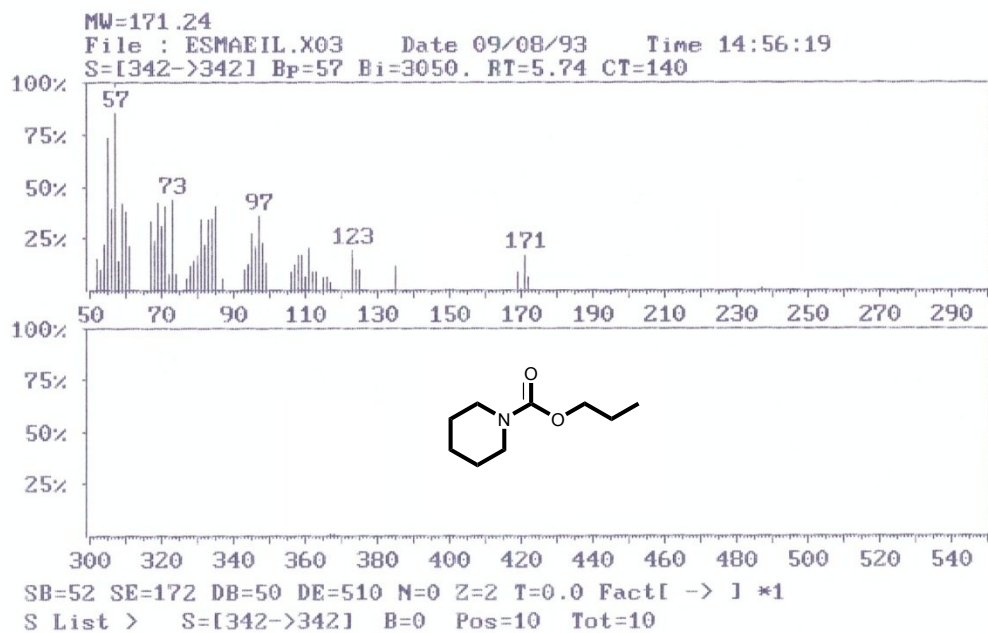
FT-IR spectra of piperidine-1-carboxylic acid propyl ester (C20) in KBr.



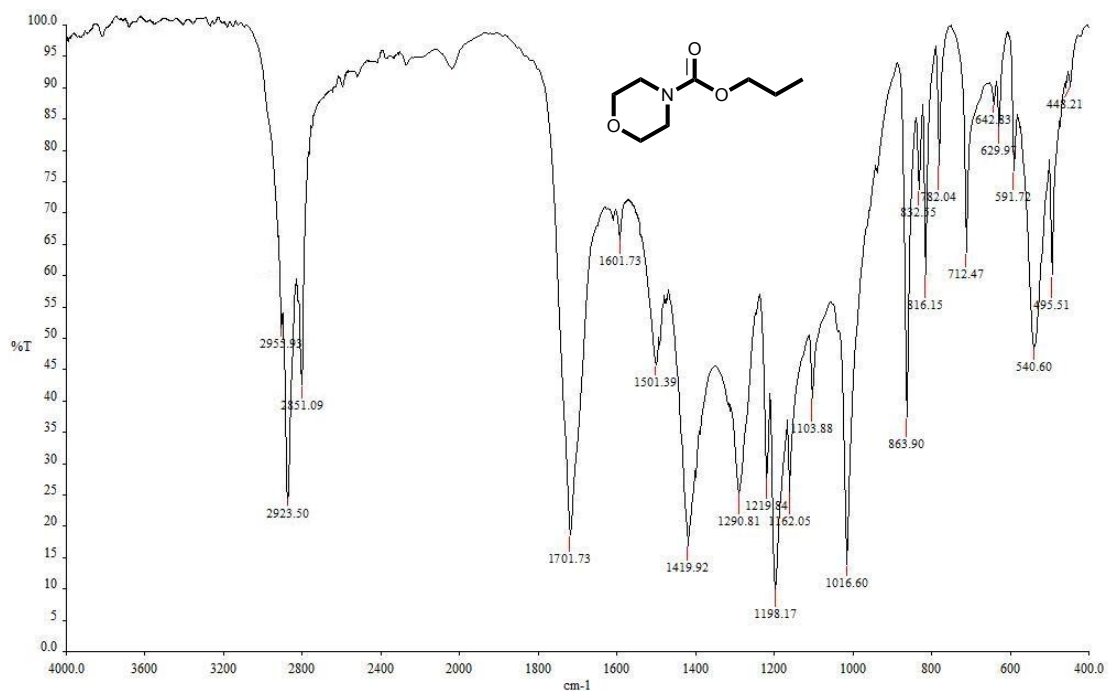
¹³C-NMR spectra (63 MHz) of piperidine-1-carboxylic acid propyl ester (C20) in CDCl₃.



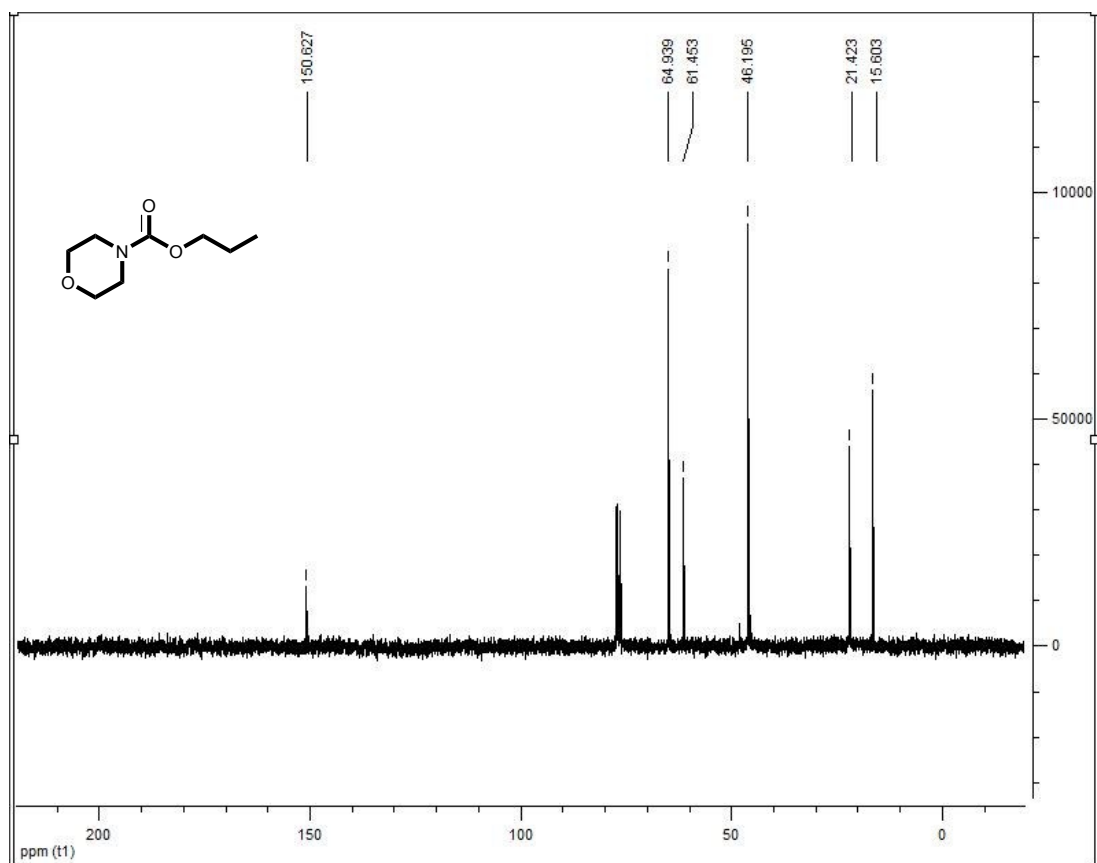
¹H-NMR spectra (250 MHz) of piperidine-1-carboxylic acid propyl ester (C20) in CDCl₃.



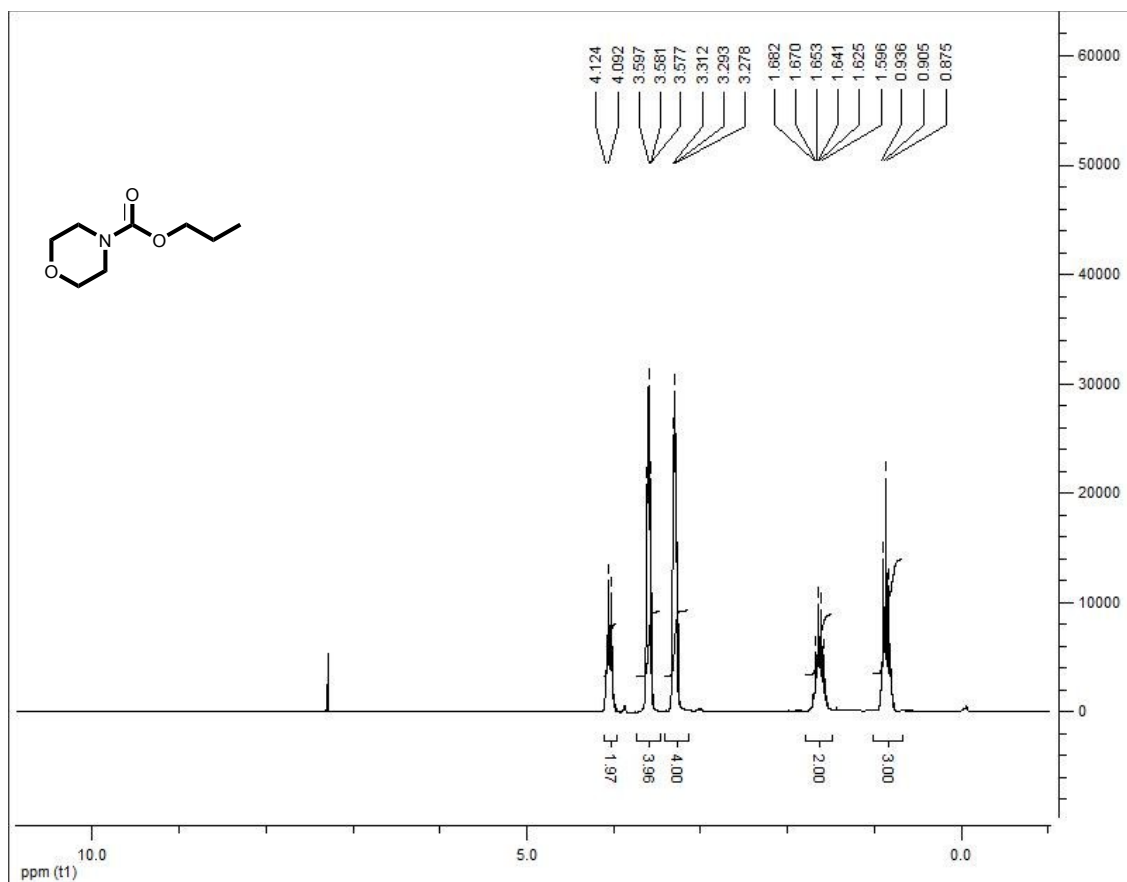
MS of piperidine-1-carboxylic acid propyl ester (C20).



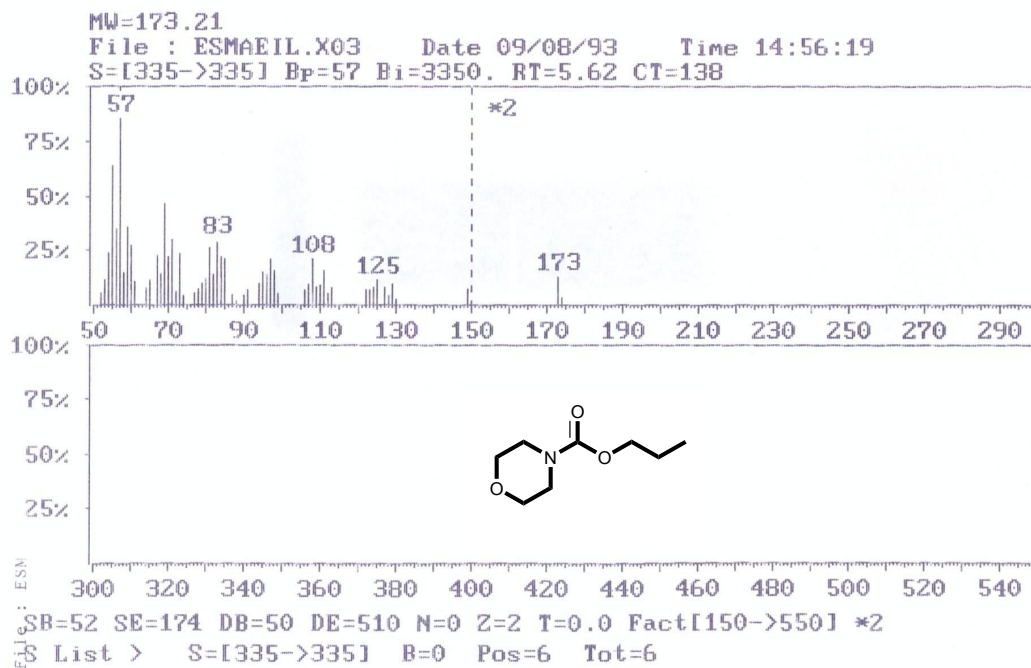
FT-IR spectra of morpholine-4-carboxylic acid propyl ester (C21) in KBr.



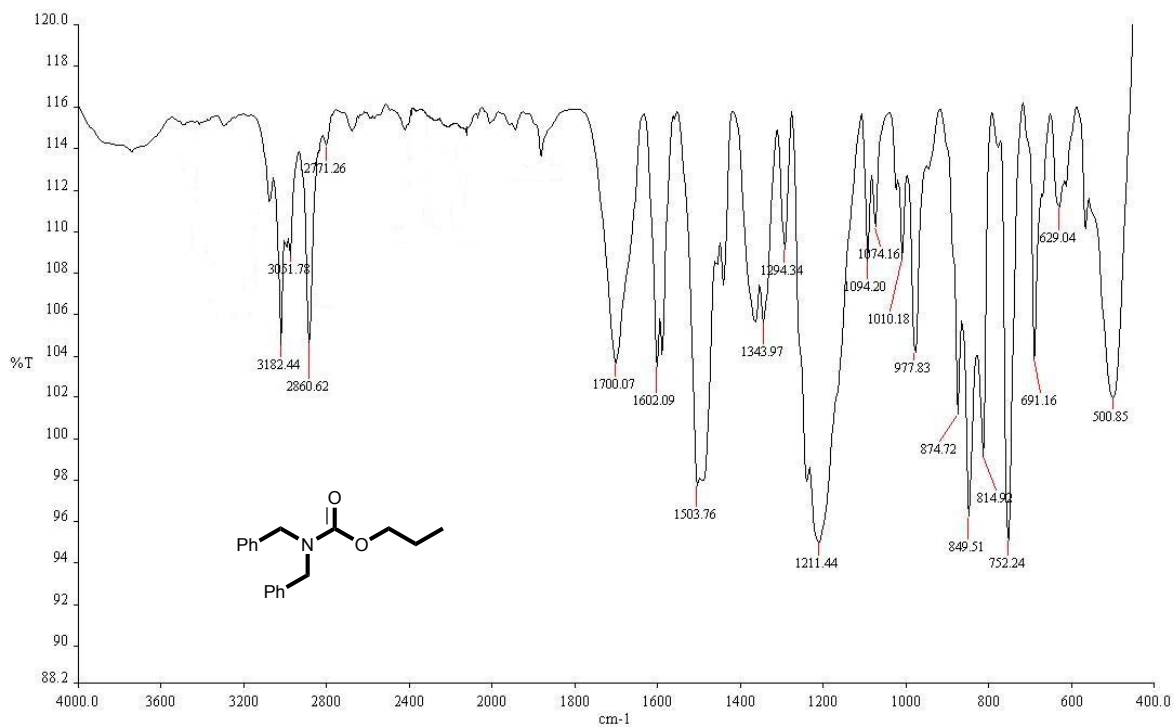
¹³C-NMR spectra (63 MHz) of morpholine-4-carboxylic acid propyl ester (C21) in CDCl₃.



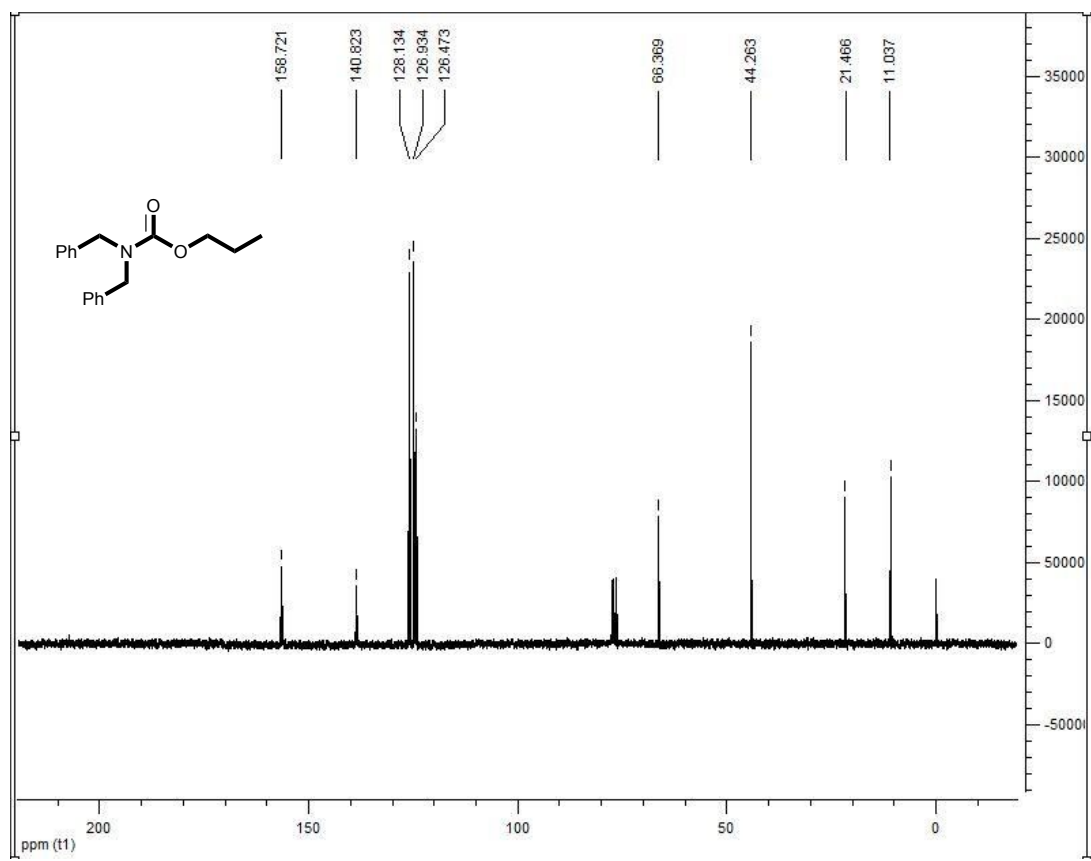
¹H-NMR spectra (250 MHz) of morpholine-4-carboxylic acid propyl ester (C21) in CDCl₃.



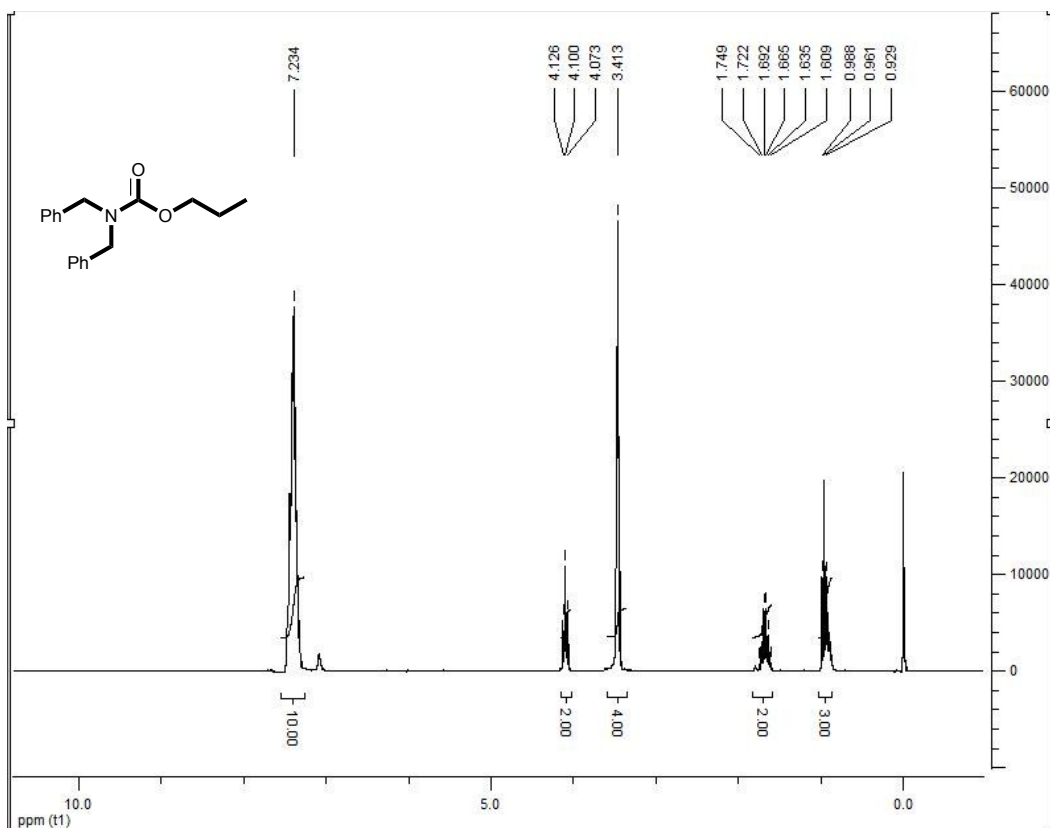
MS of morpholine-4-carboxylic acid propyl ester (C21).



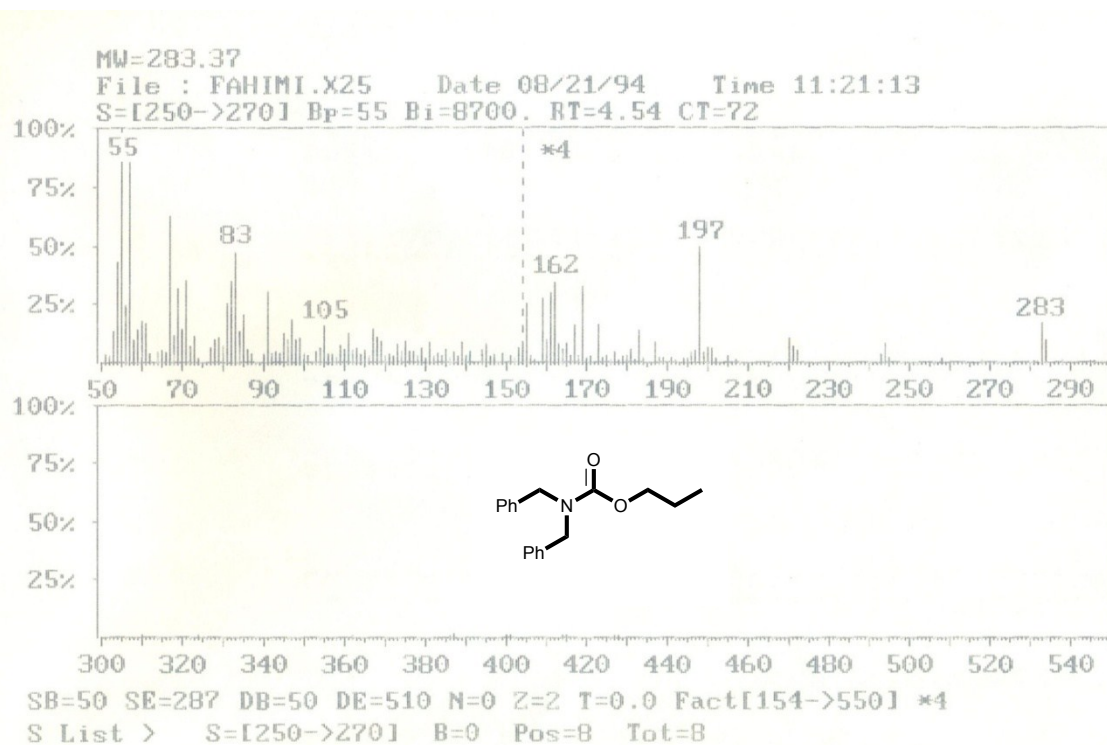
FT-IR spectra of 1-propyl dibenzylcarbamate (C22) in KBr .



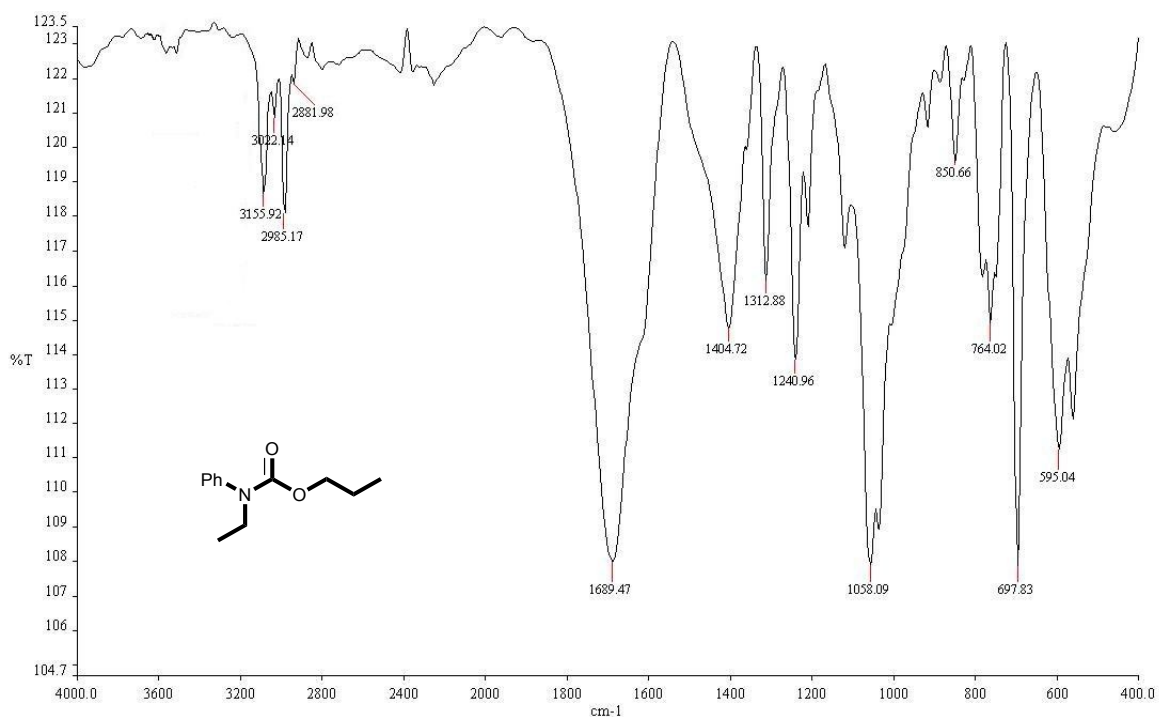
¹³C-NMR spectra (63 MHz) of 1-propyl dibenzylcarbamate (C22) in CDCl₃.



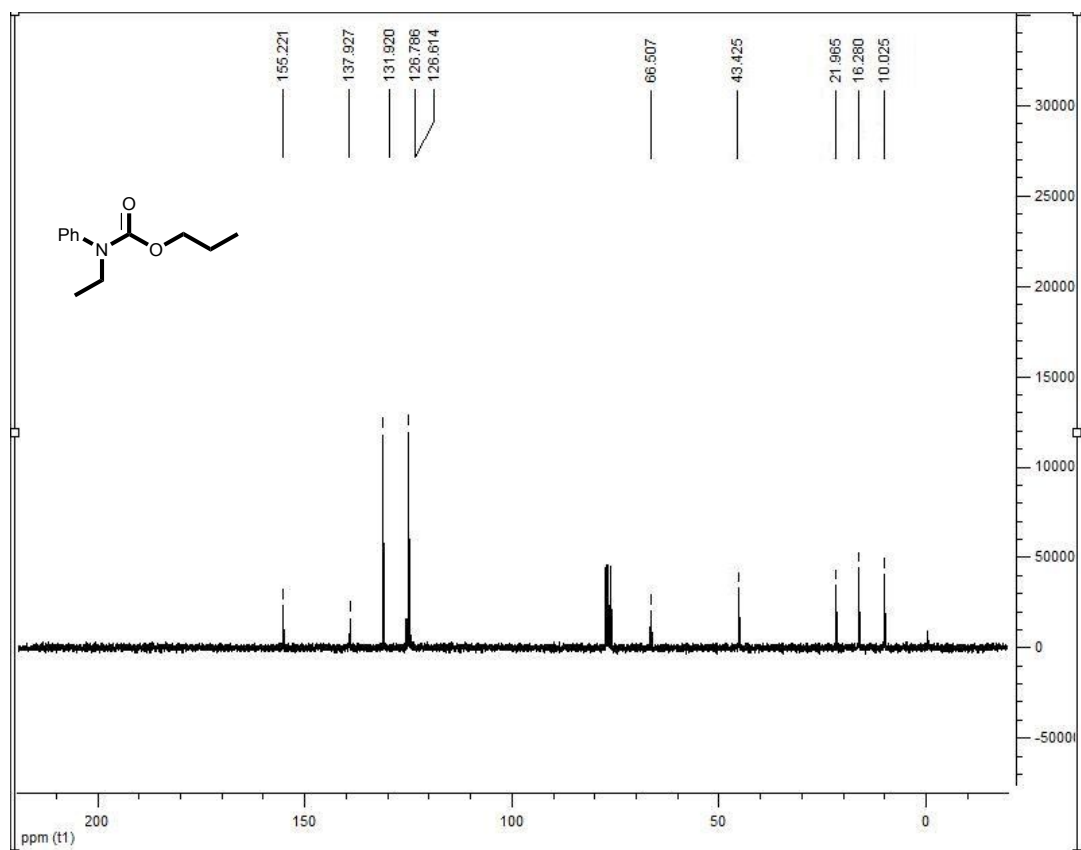
¹H-NMR spectra (250 MHz) of 1-propyl dibenzylcarbamate (C22) in CDCl₃.



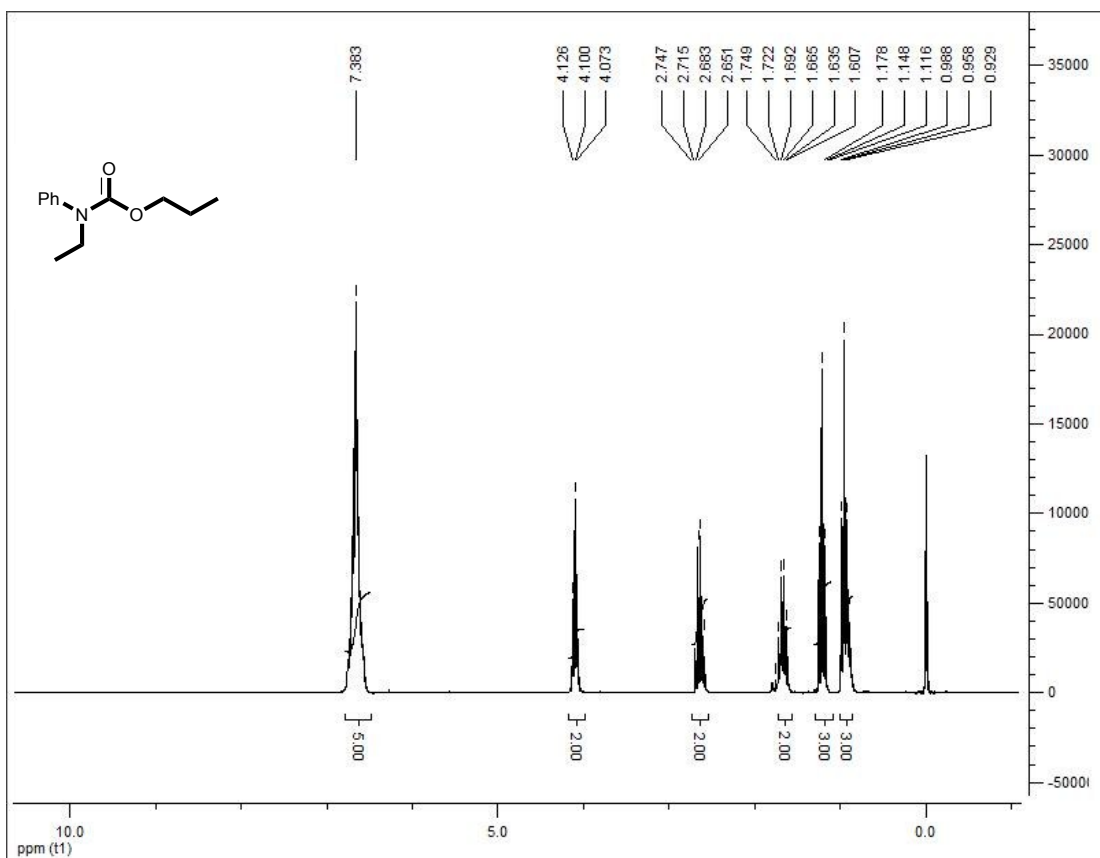
MS of 1-propyl dibenzylcarbamate (C22).



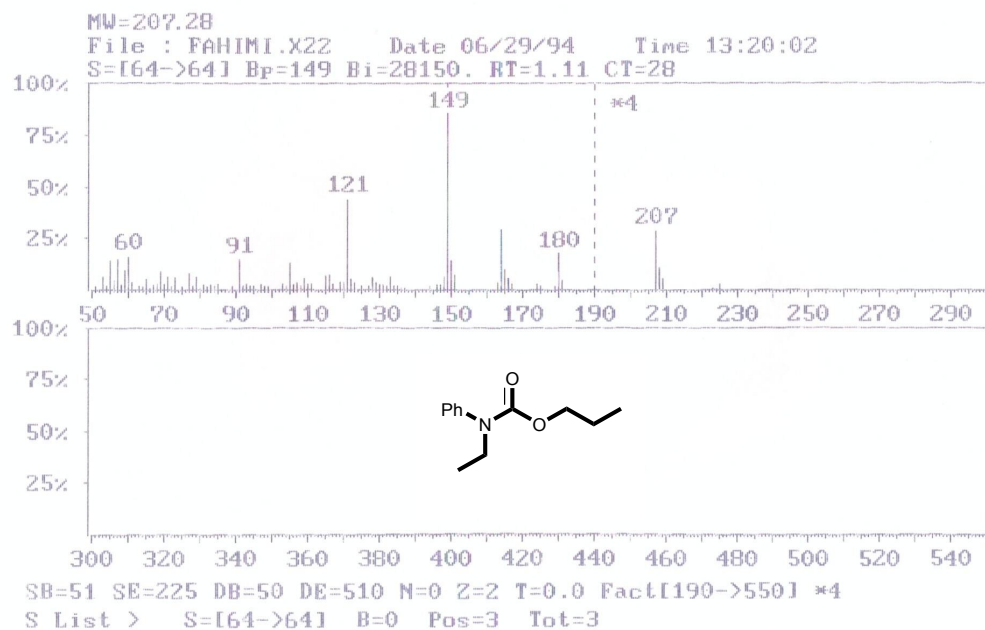
FT-IR spectra of 1-propyl ethyl(phenyl)carbamate (C23) in KBr .



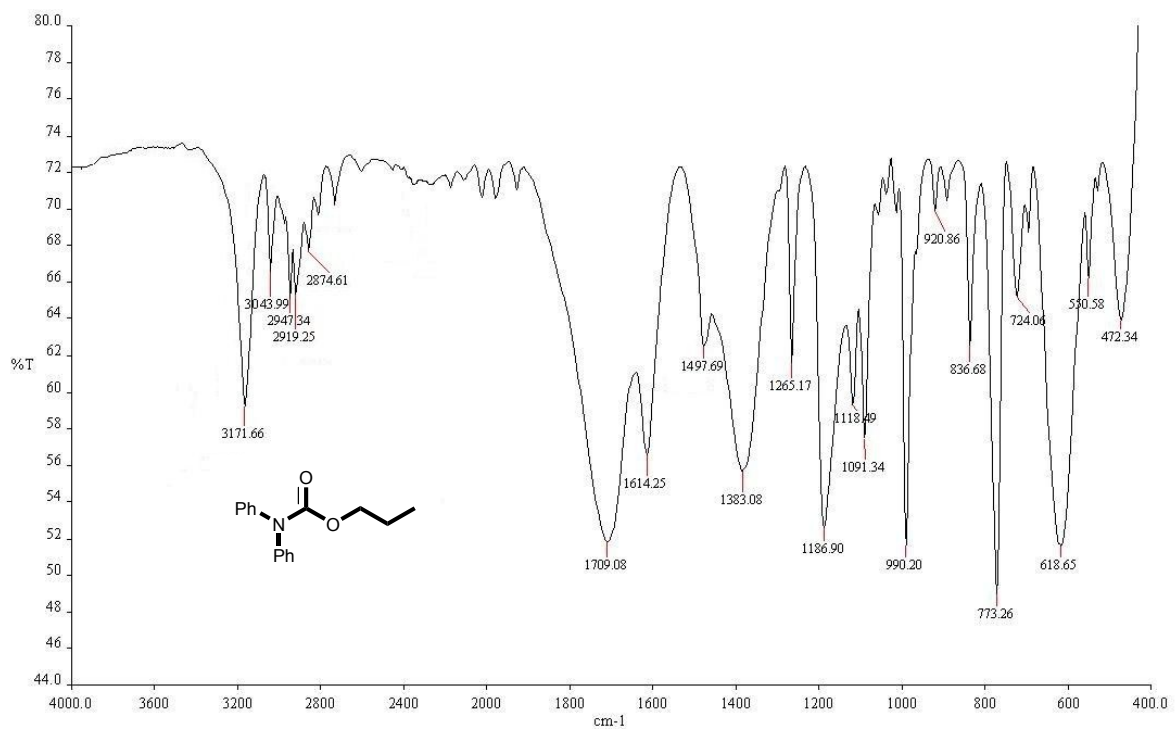
¹³C-NMR spectra (63 MHz) of 1-propyl ethyl(phenyl)carbamate (C23) in CDCl₃.



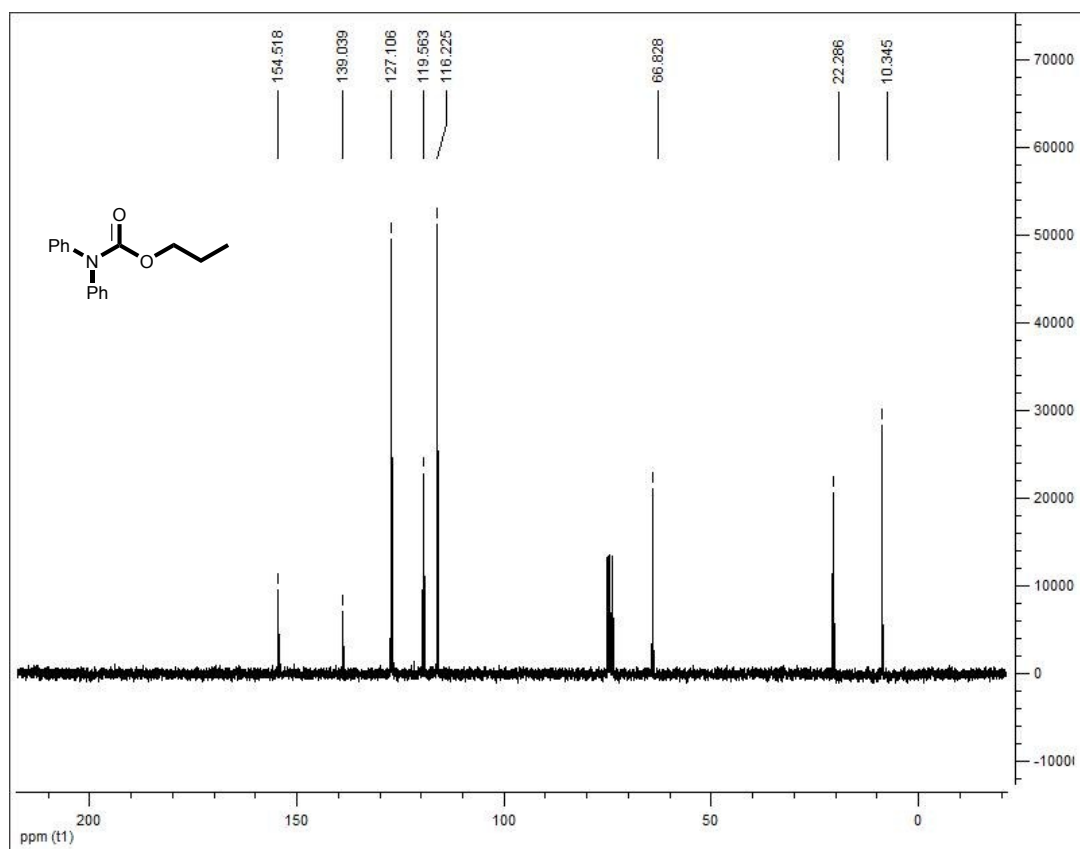
¹H-NMR spectra (250 MHz) of 1-propyl ethyl(phenyl)carbamate (C23) in CDCl₃.



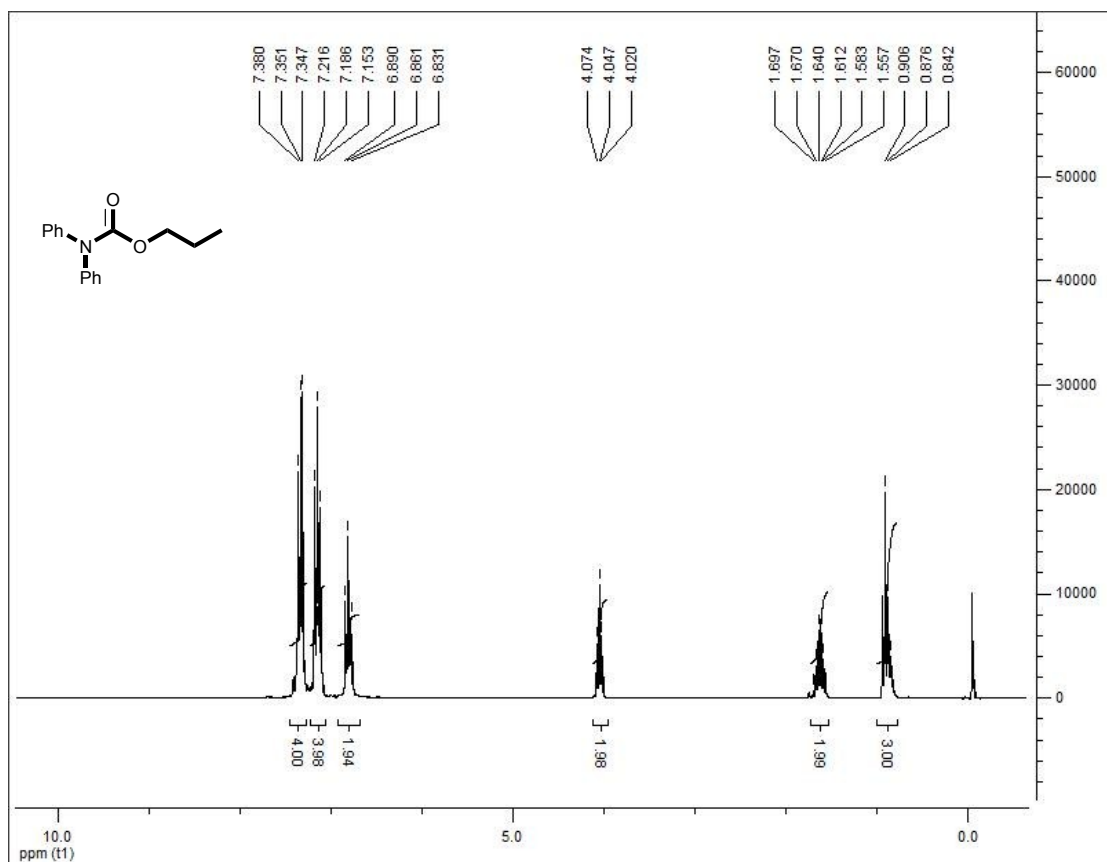
MS of 1-propyl ethyl(phenyl)carbamate (C23).



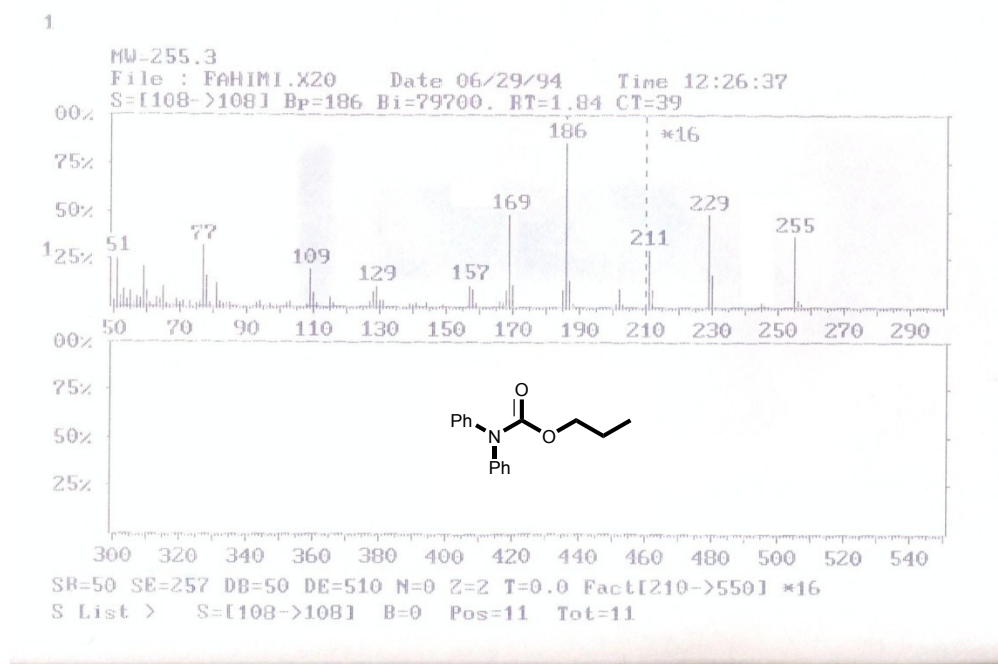
FT-IR spectra of 1-propyl diphenylcarbamate (C24) in KBr .



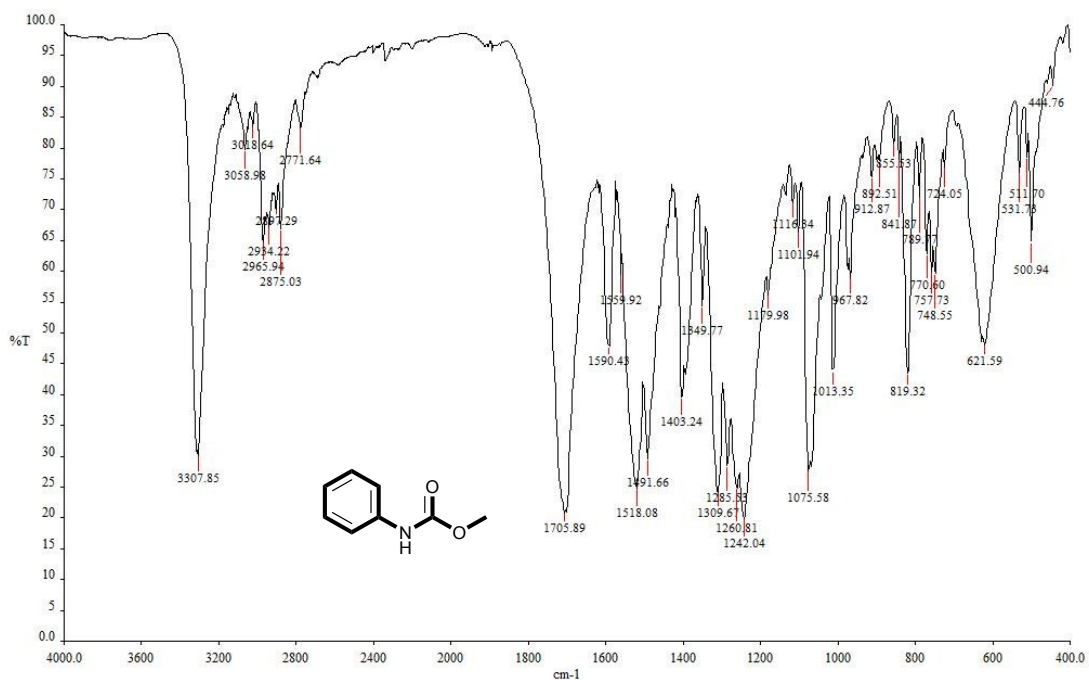
¹³C-NMR spectra (63 MHz) of 1-propyl diphenylcarbamate (C24) in CDCl₃.



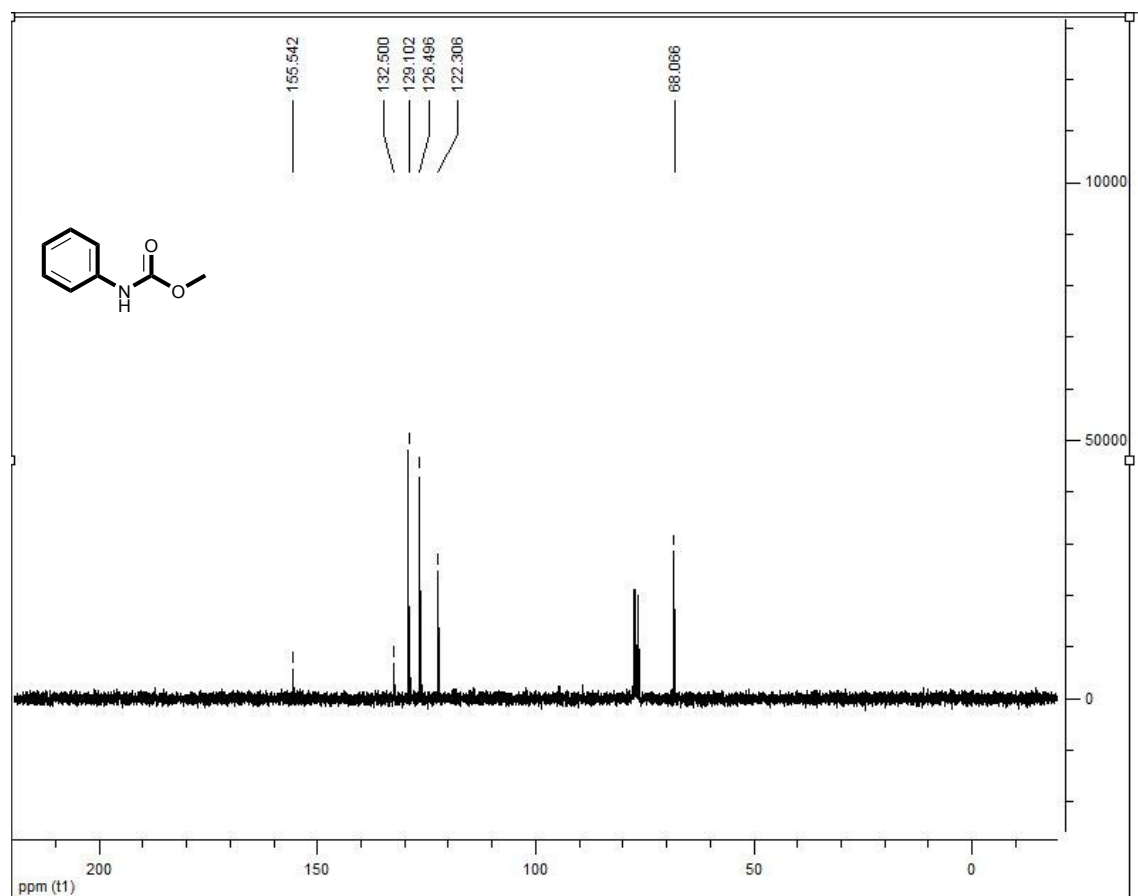
¹H-NMR spectra (250 MHz) of 1-propyl diphenylcarbamate (C24) in CDCl₃.



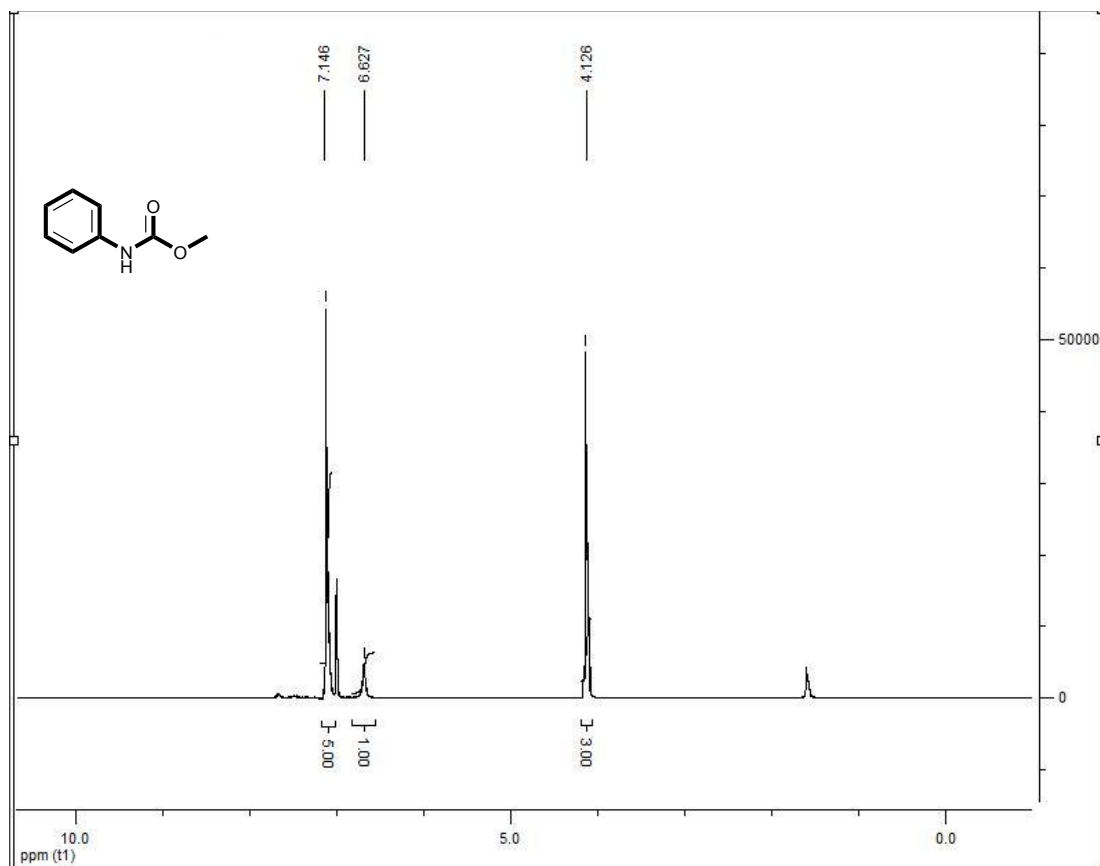
MS of 1-propyl diphenylcarbamate (C24).



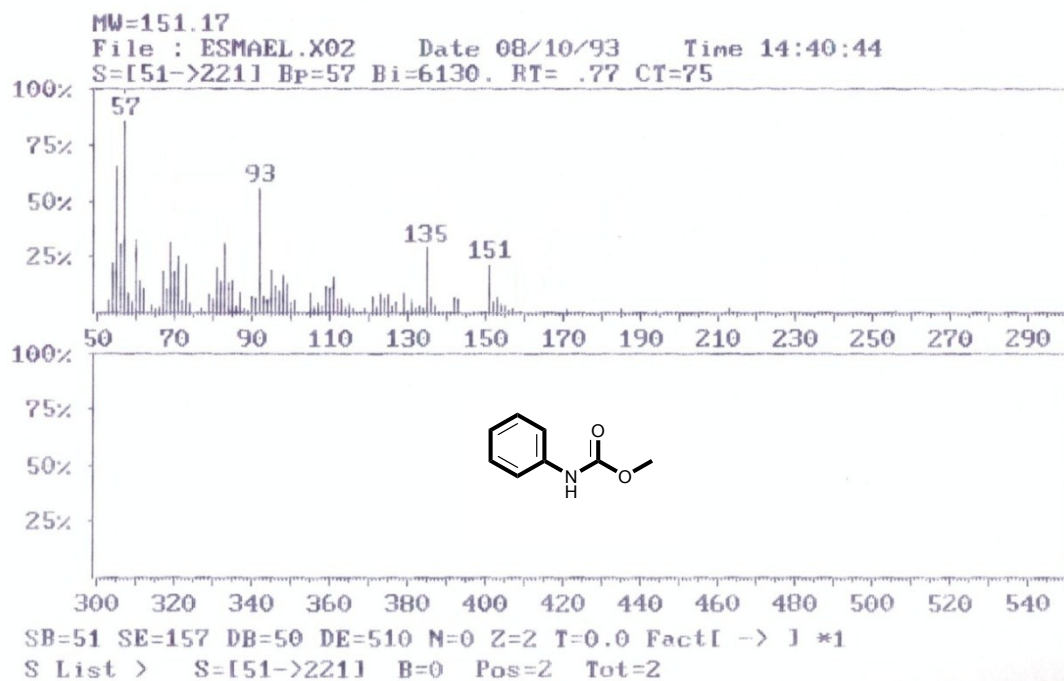
FT-IR spectra of methyl phenylcarbamate (C25) in KBr.



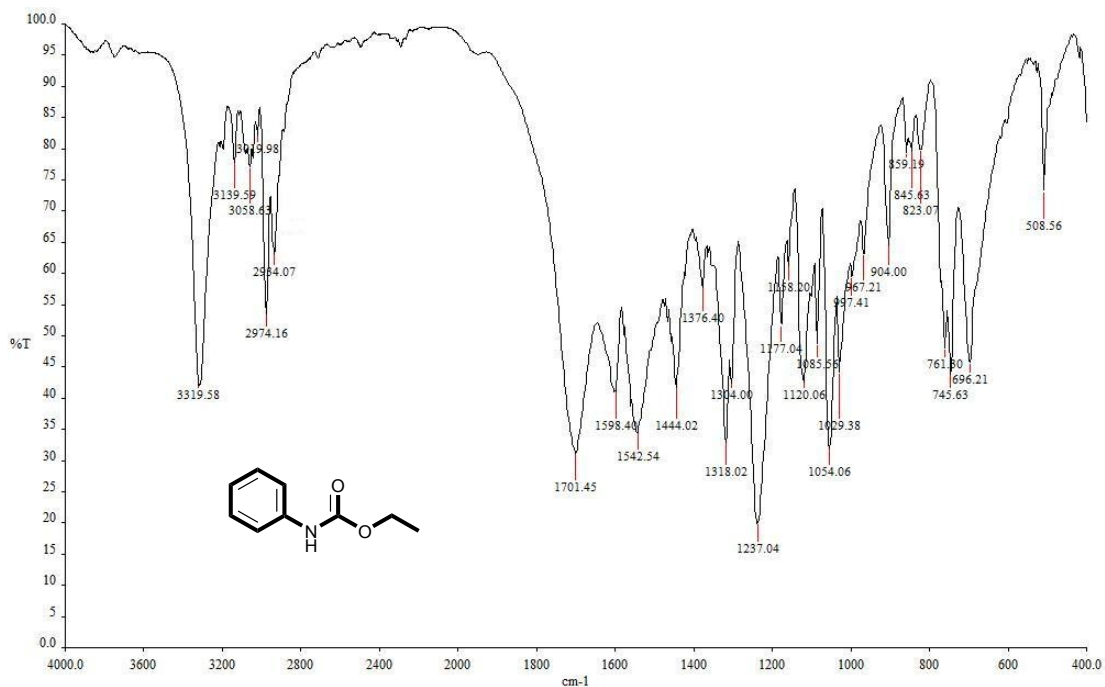
¹³C-NMR spectra (63 MHz) of methyl phenylcarbamate (C25) in CDCl₃.



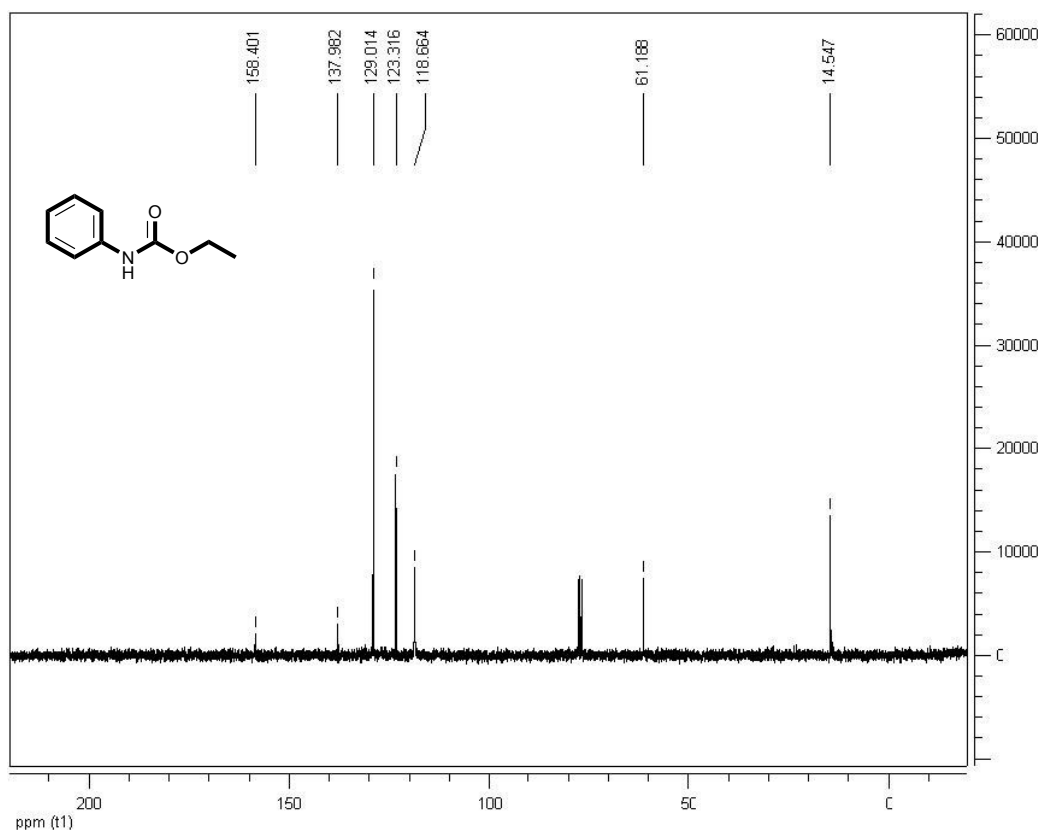
¹H-NMR spectra (250 MHz) of methyl phenylcarbamate (C25) in CDCl₃.



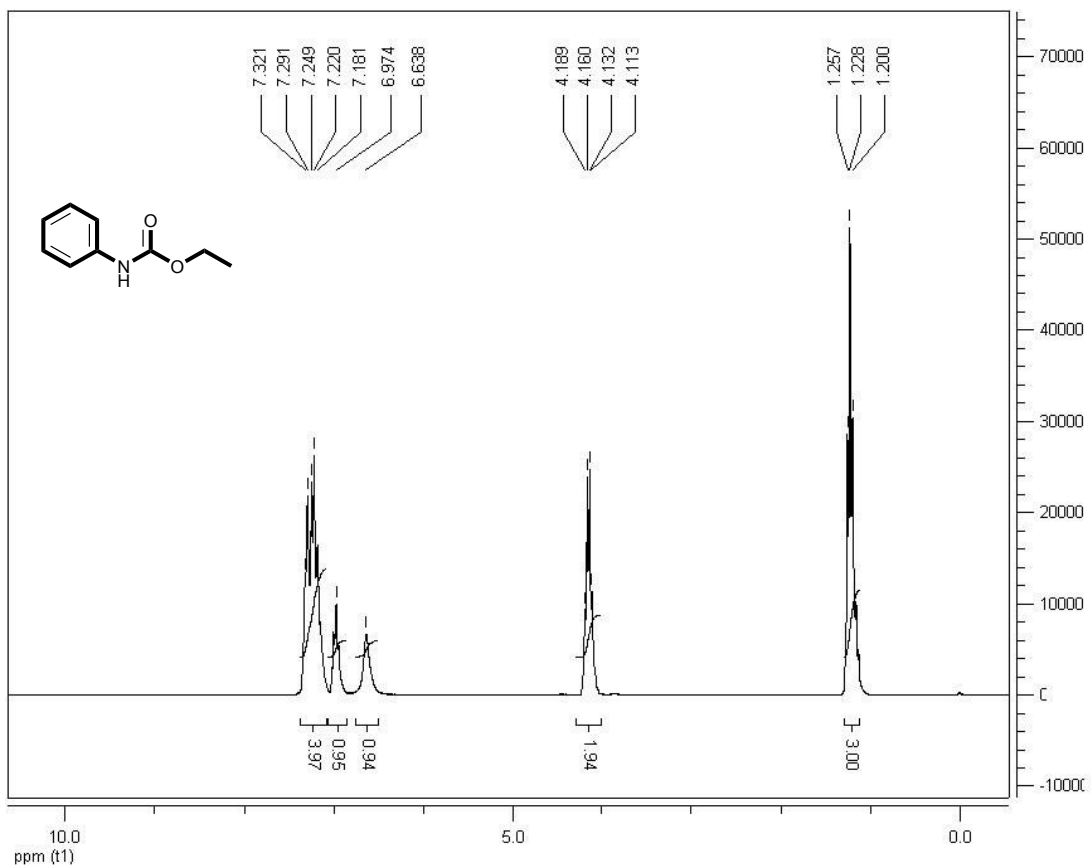
MS of methyl phenylcarbamate (C25).



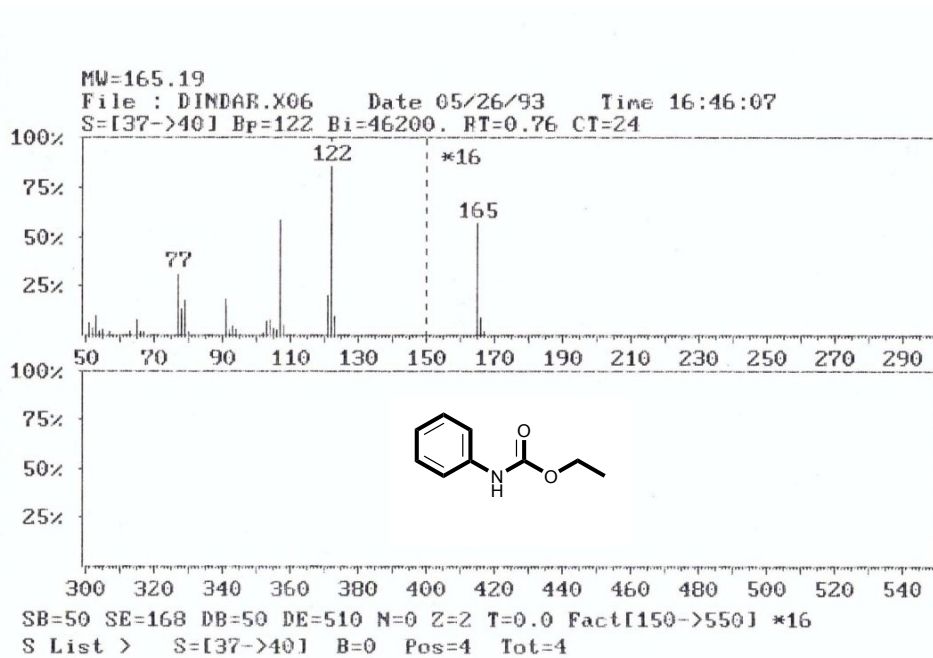
FT-IR spectra of ethyl phenylcarbamate (C26) in KBr.



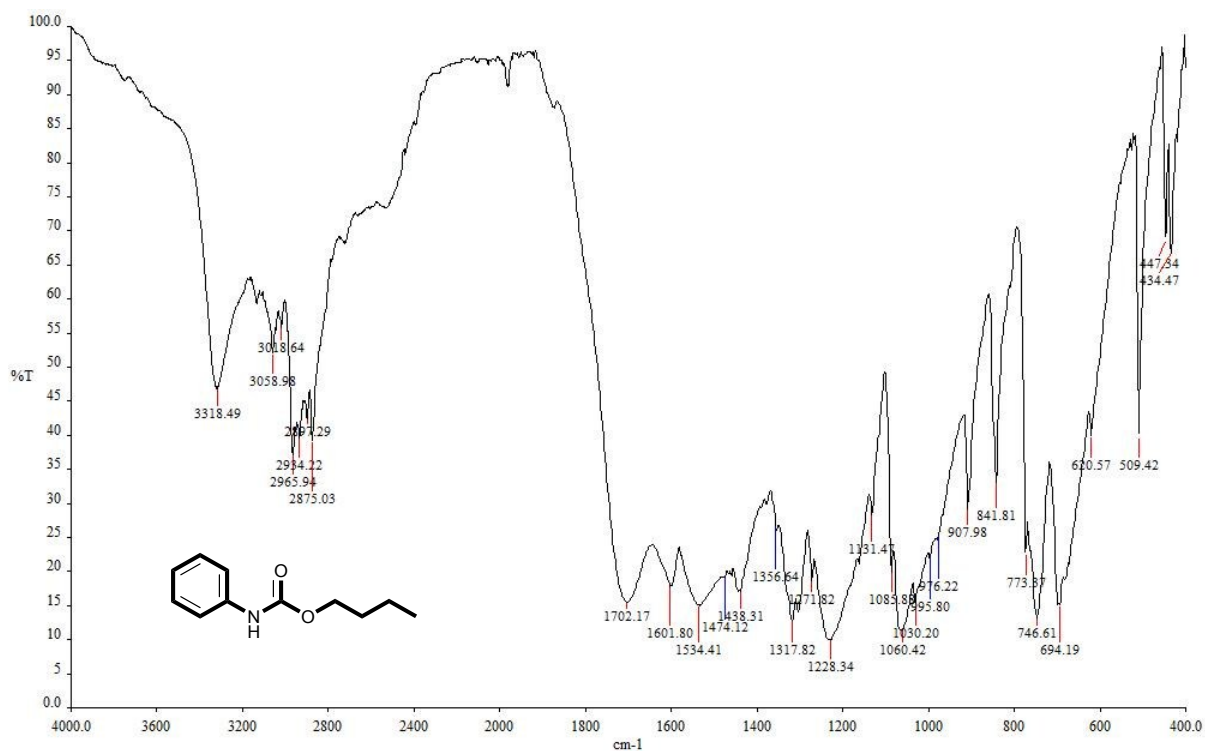
¹³C-NMR spectra (63 MHz) of ethyl phenylcarbamate (C26) in CDCl₃.



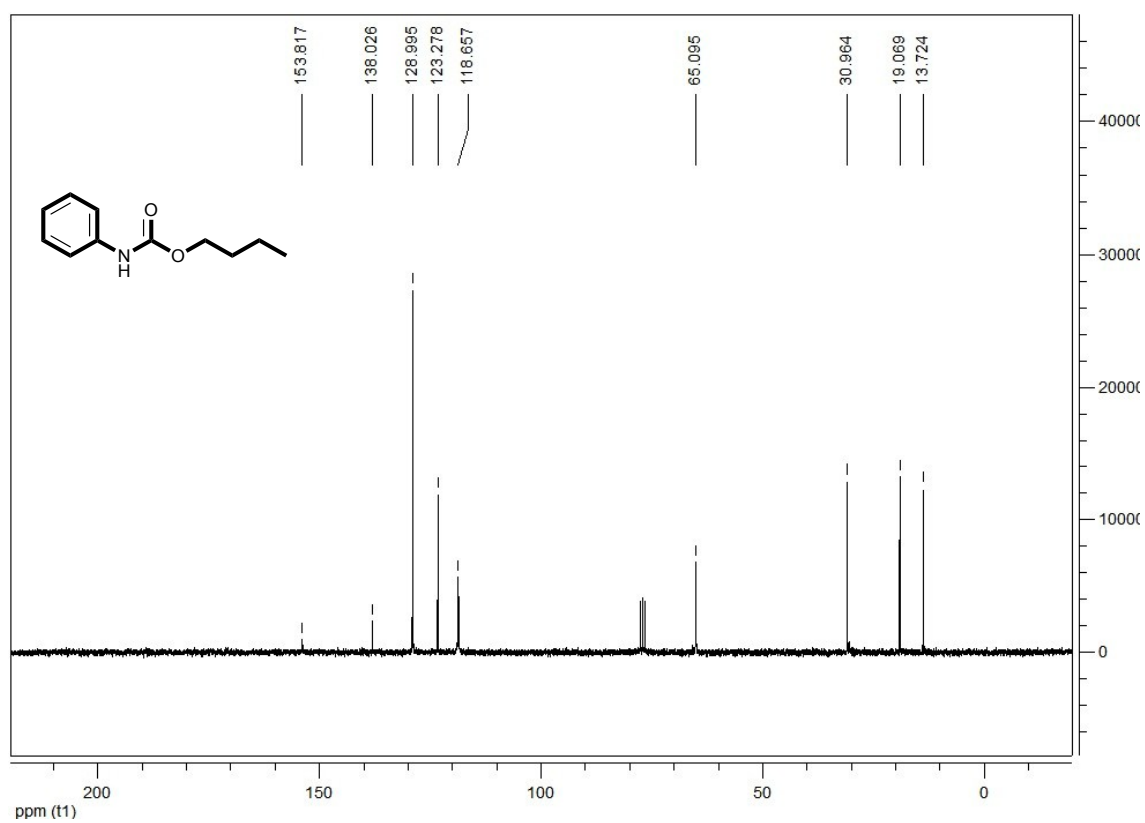
¹H-NMR spectra (250 MHz) of ethyl phenylcarbamate (C26) in CDCl₃.



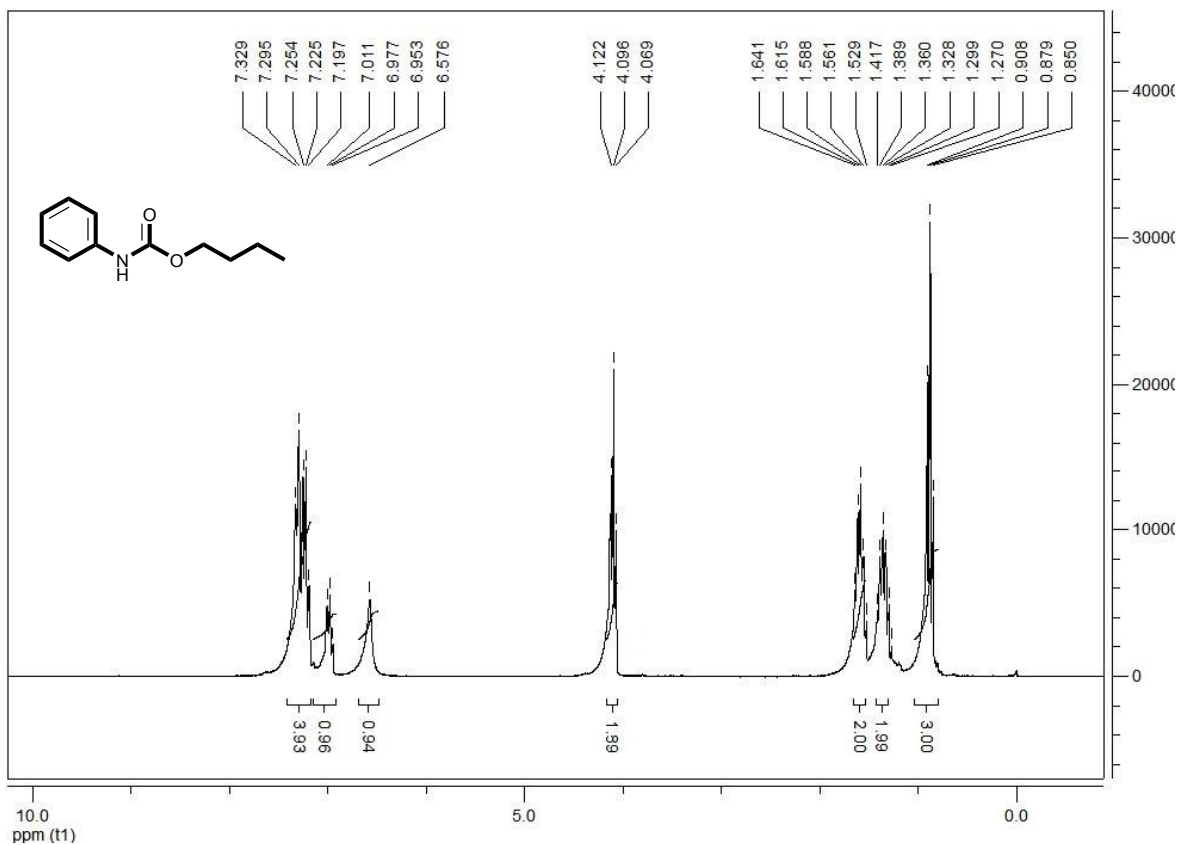
MS of ethyl phenylcarbamate (C26).



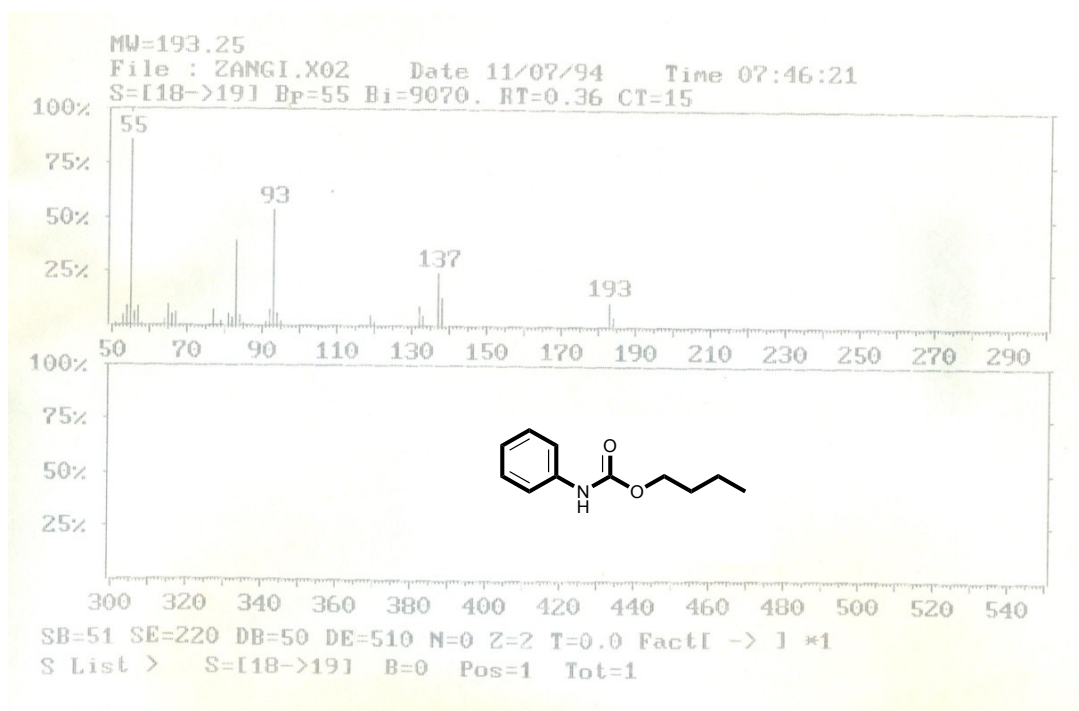
FT-IR spectra of 1-butyl phenylcarbamate (C27) in KBr.



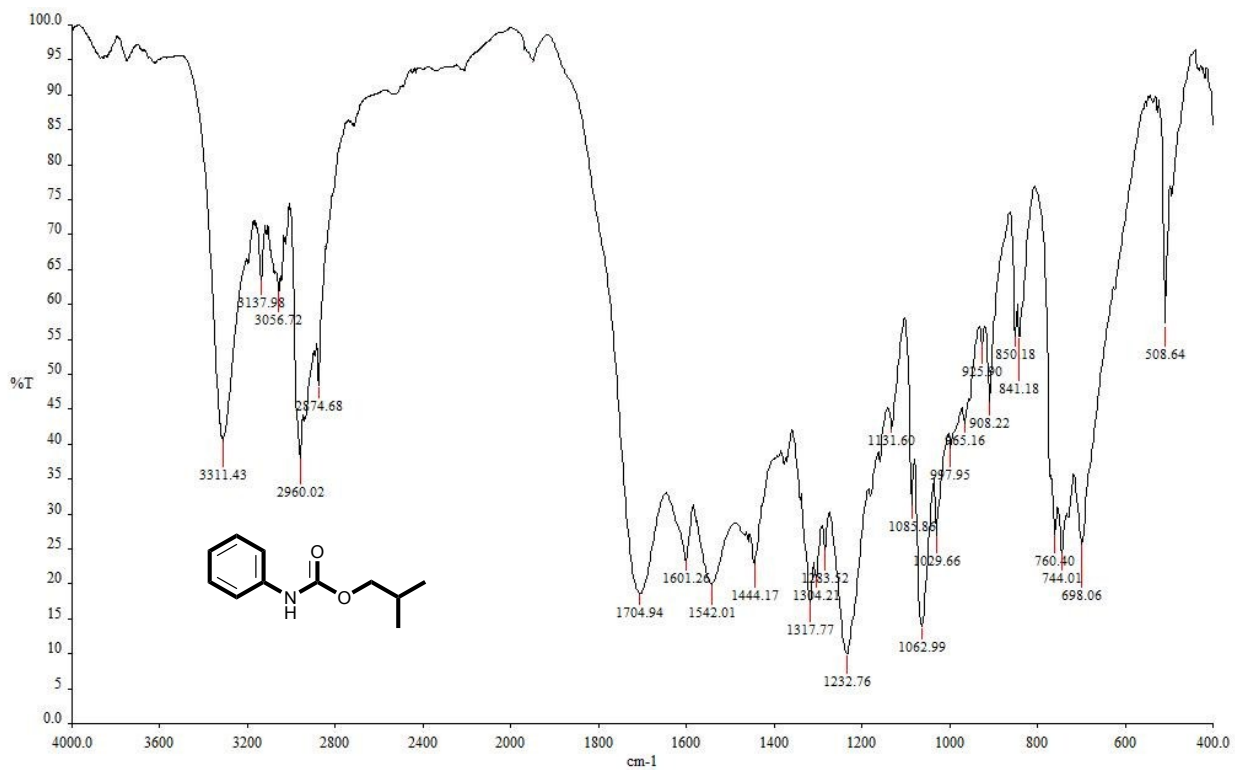
¹³C-NMR spectra (63 MHz) of 1-butyl phenylcarbamate (C27) in CDCl₃.



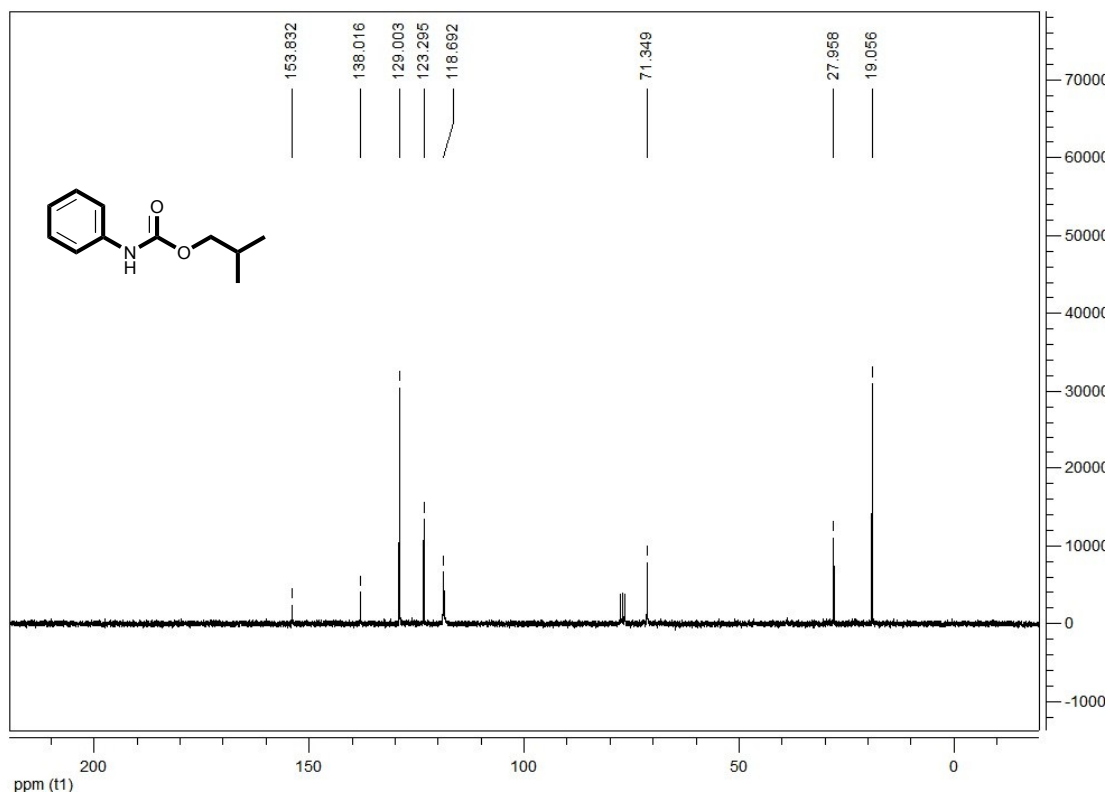
¹H-NMR spectra (250 MHz) of 1-butyl phenylcarbamate (C27) in CDCl₃.



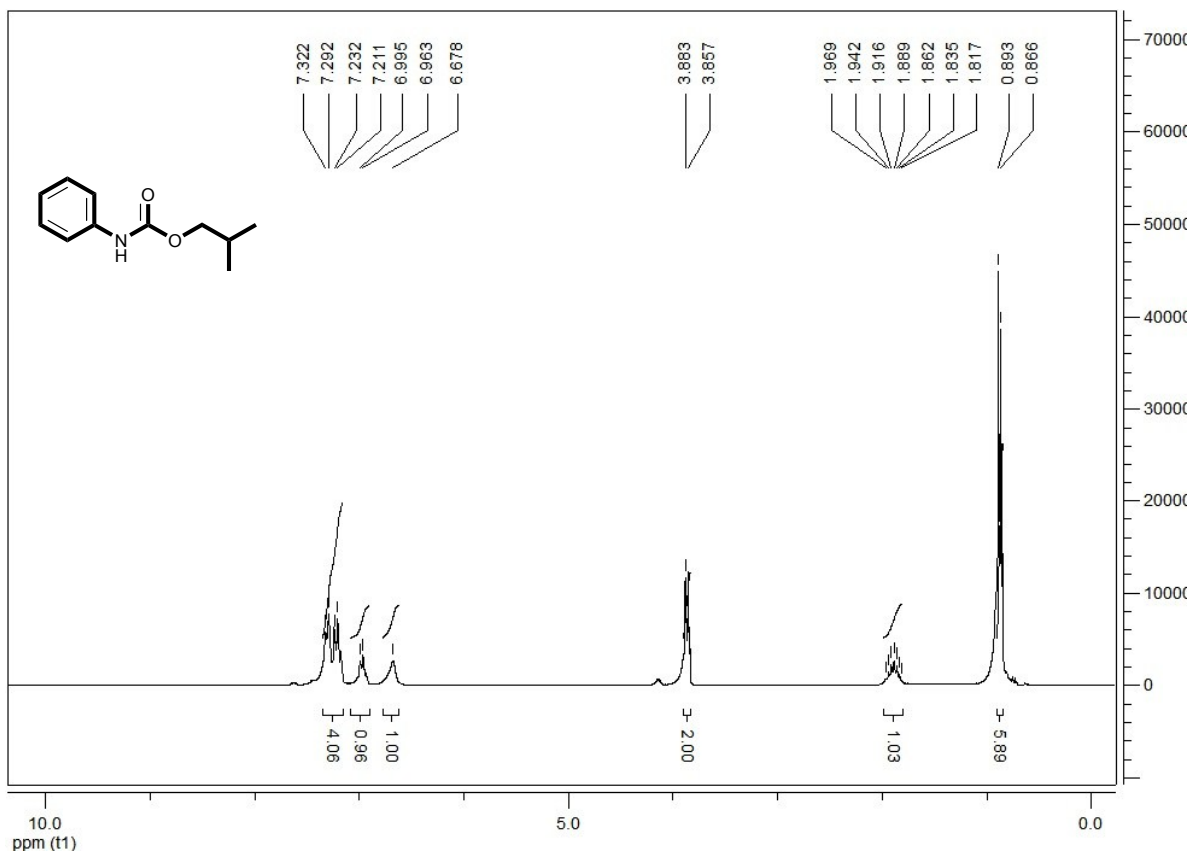
MS of 1-butyl phenylcarbamate (C27).



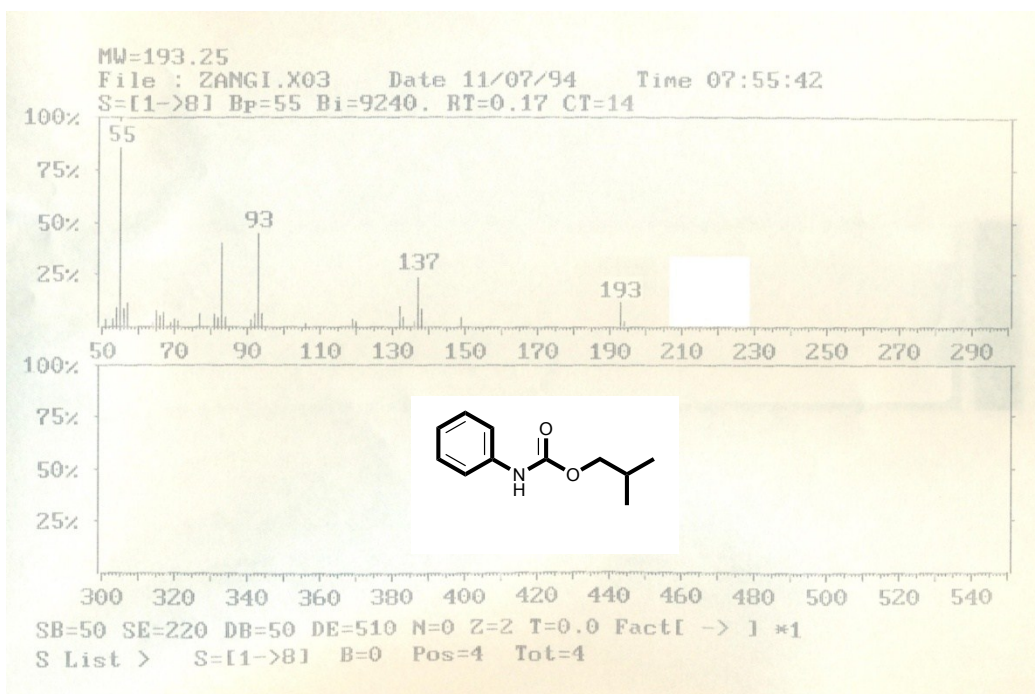
FT-IR spectra of *iso*-butyl phenylcarbamate (C28) in KBr .



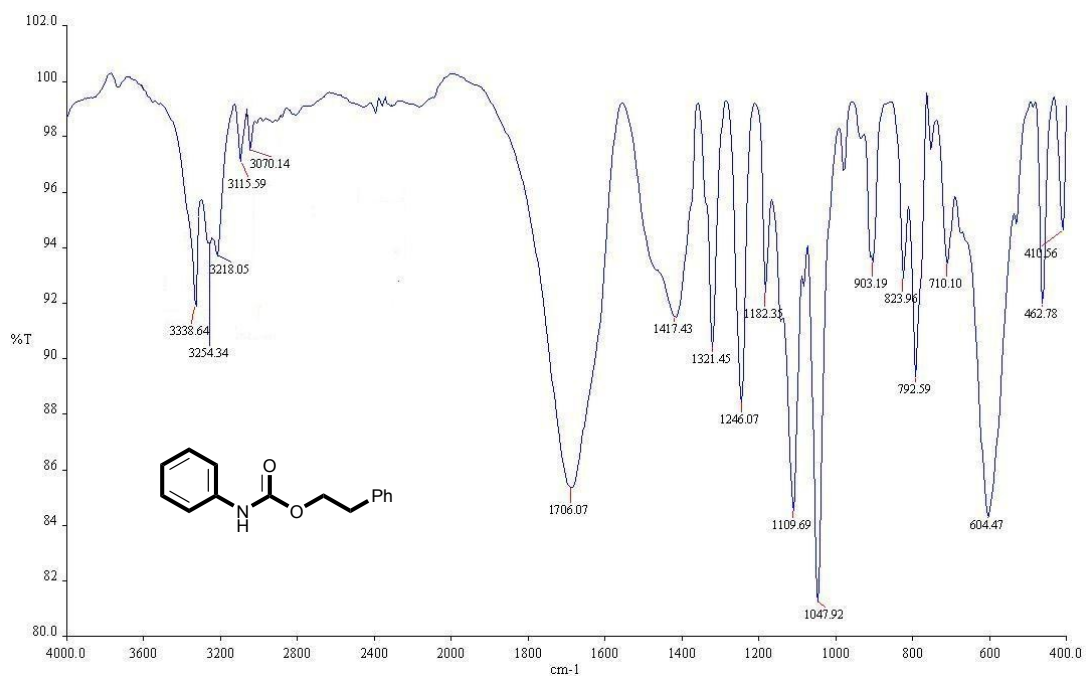
¹³C-NMR spectra (63 MHz) of *iso*-butyl phenylcarbamate (C28) in CDCl₃.



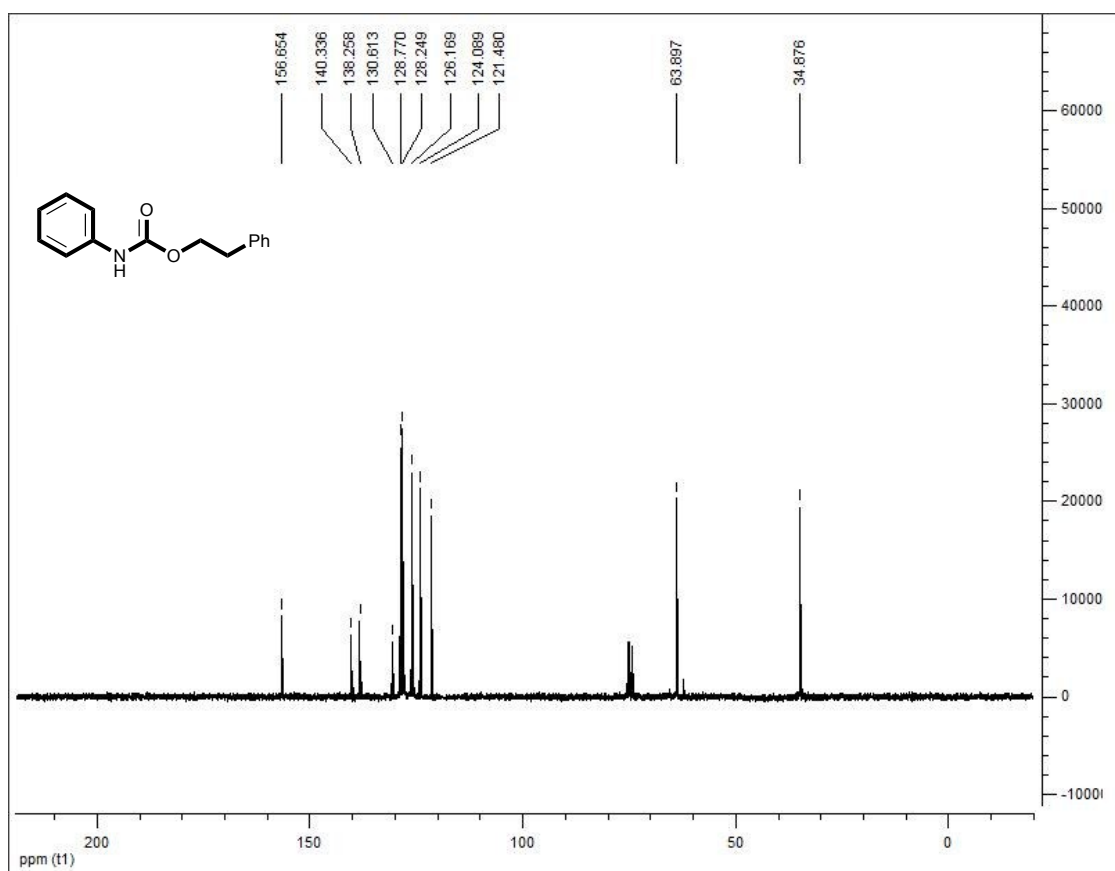
$^1\text{H-NMR}$ spectra (250 MHz) of *iso*-butyl phenylcarbamate (C28) in CDCl_3 .



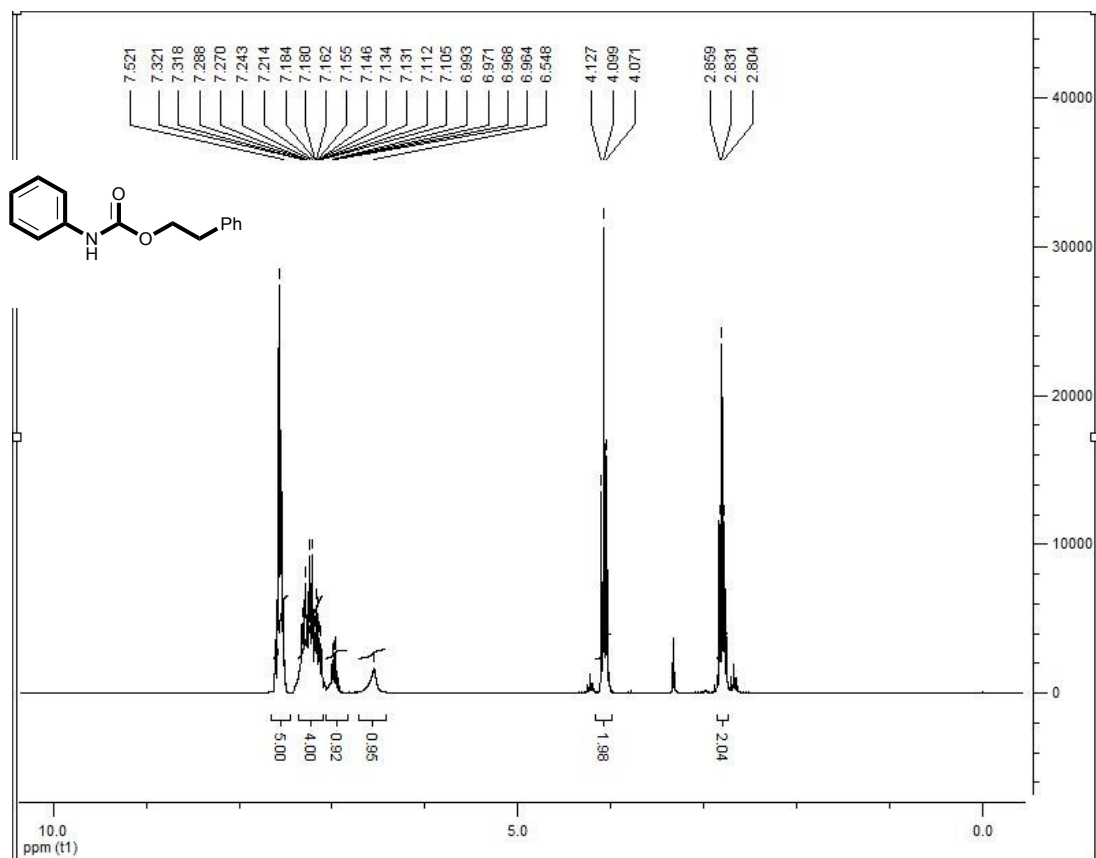
MS of *iso*-butyl phenylcarbamate (C28).



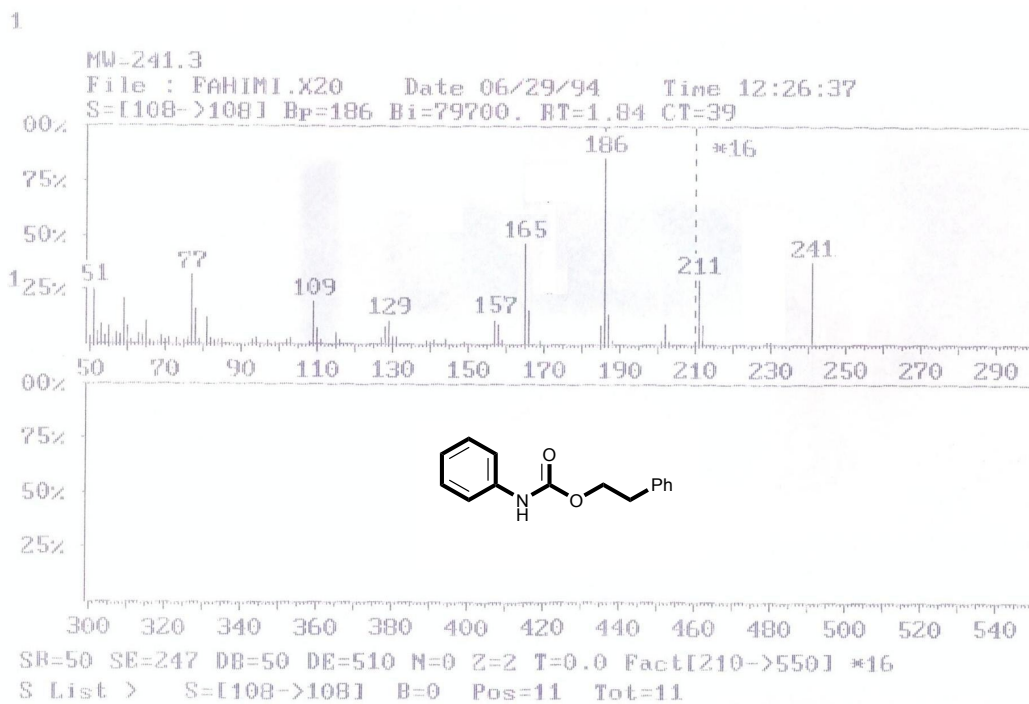
FT-IR spectra of phenethyl phenylcarbamate (C29) in KBr .



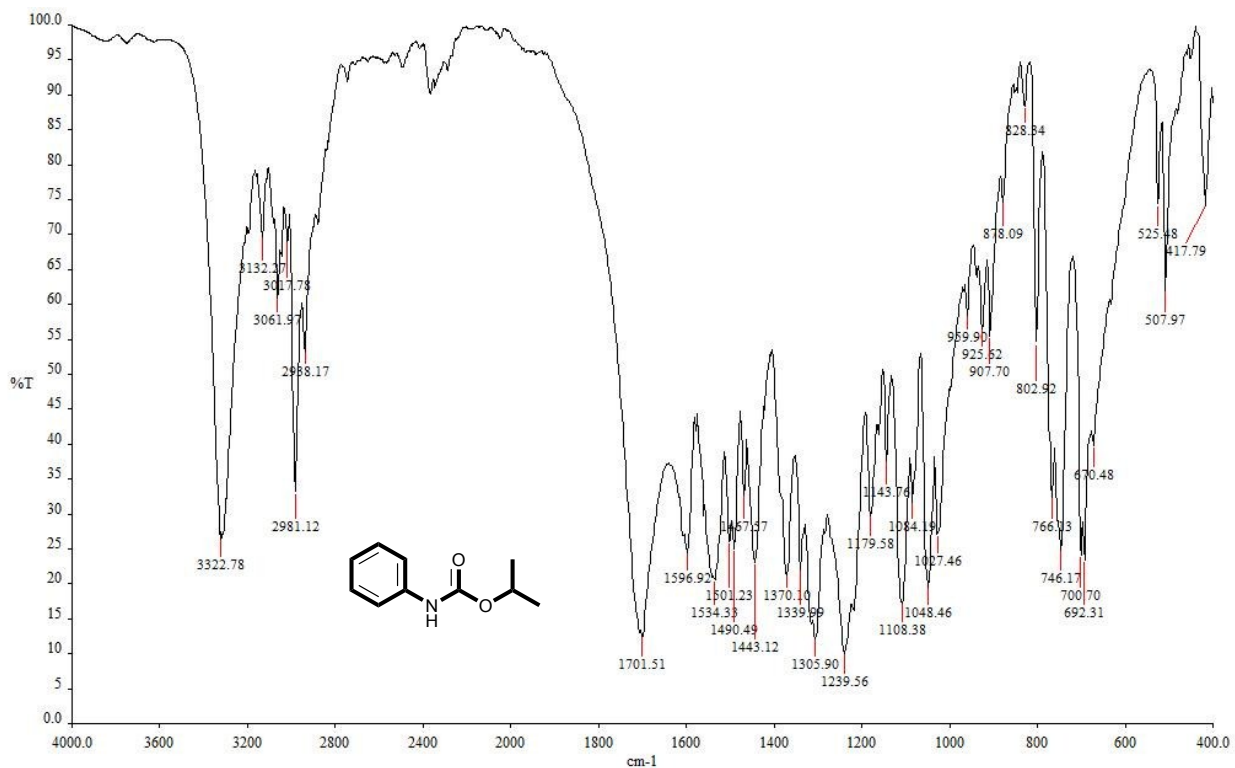
¹³C-NMR spectra (63 MHz) of phenethyl phenylcarbamate (C29) in CDCl₃.



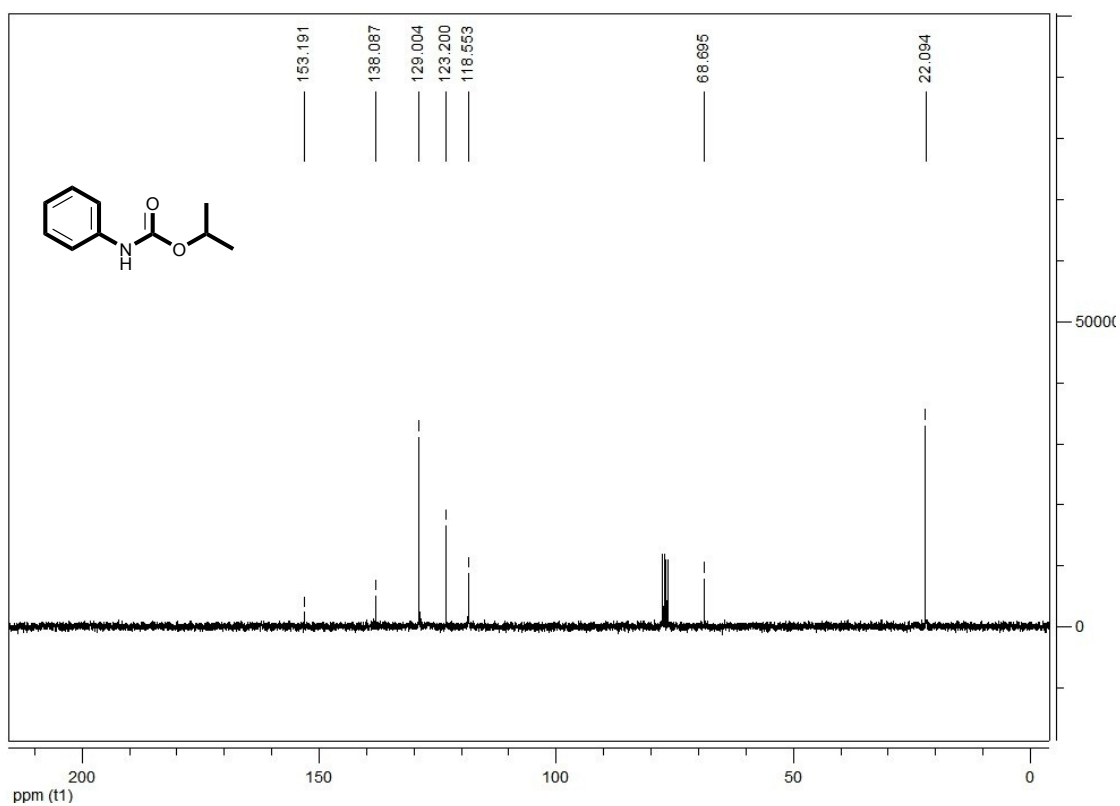
¹H-NMR spectra (250 MHz) of phenethyl phenylcarbamate (C29) in CDCl₃.



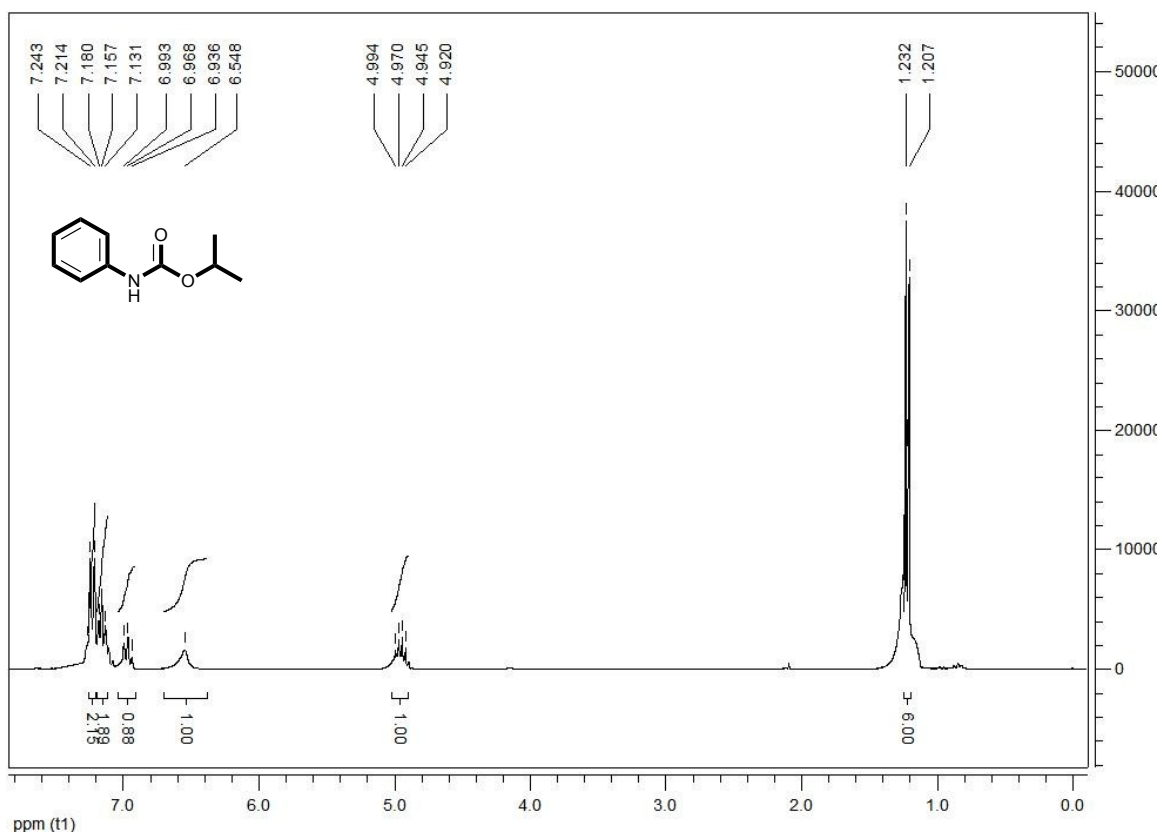
MS of phenethyl phenylcarbamate (C29).



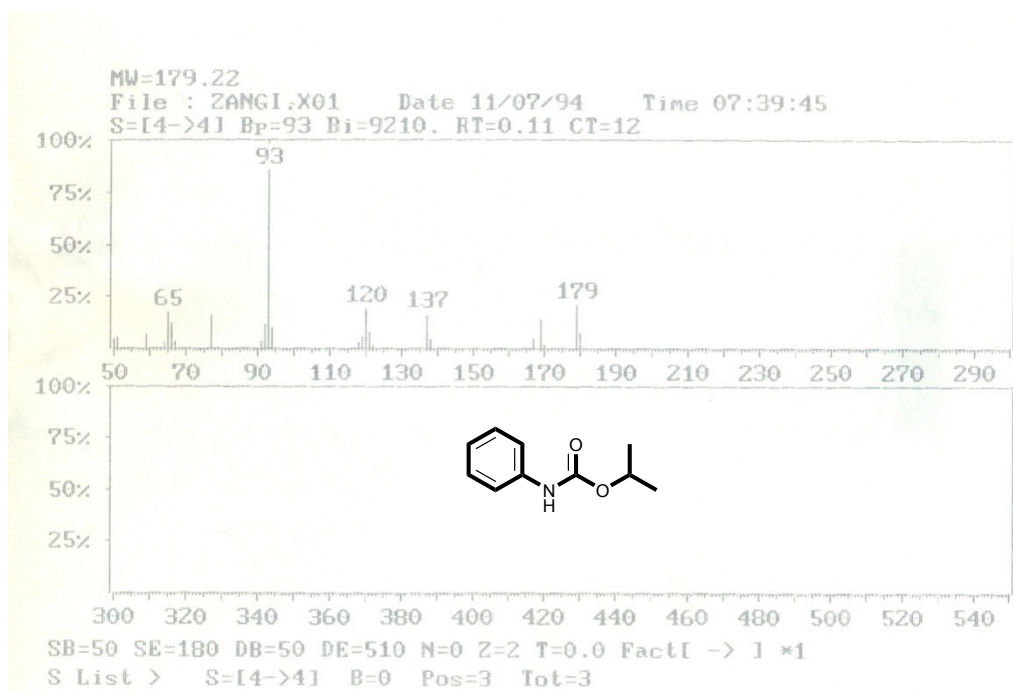
FT-IR spectra of 2-propyl phenylcarbamate (C30) in KBr .



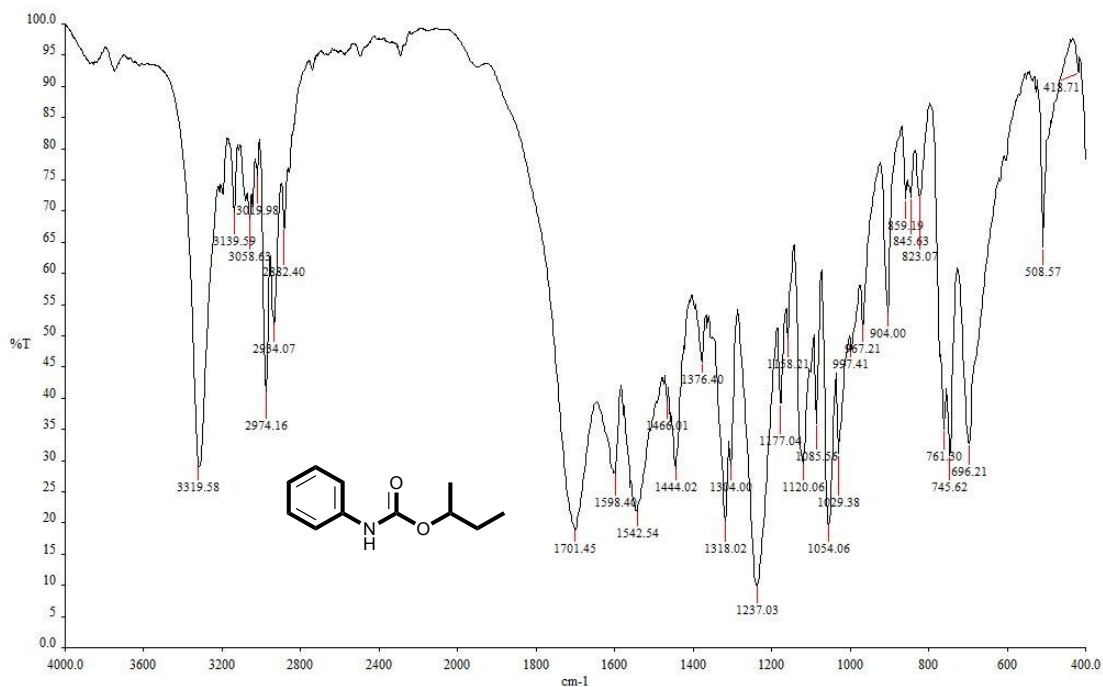
¹³C-NMR spectra (63 MHz) of 2-propyl phenylcarbamate (C30) in CDCl₃.



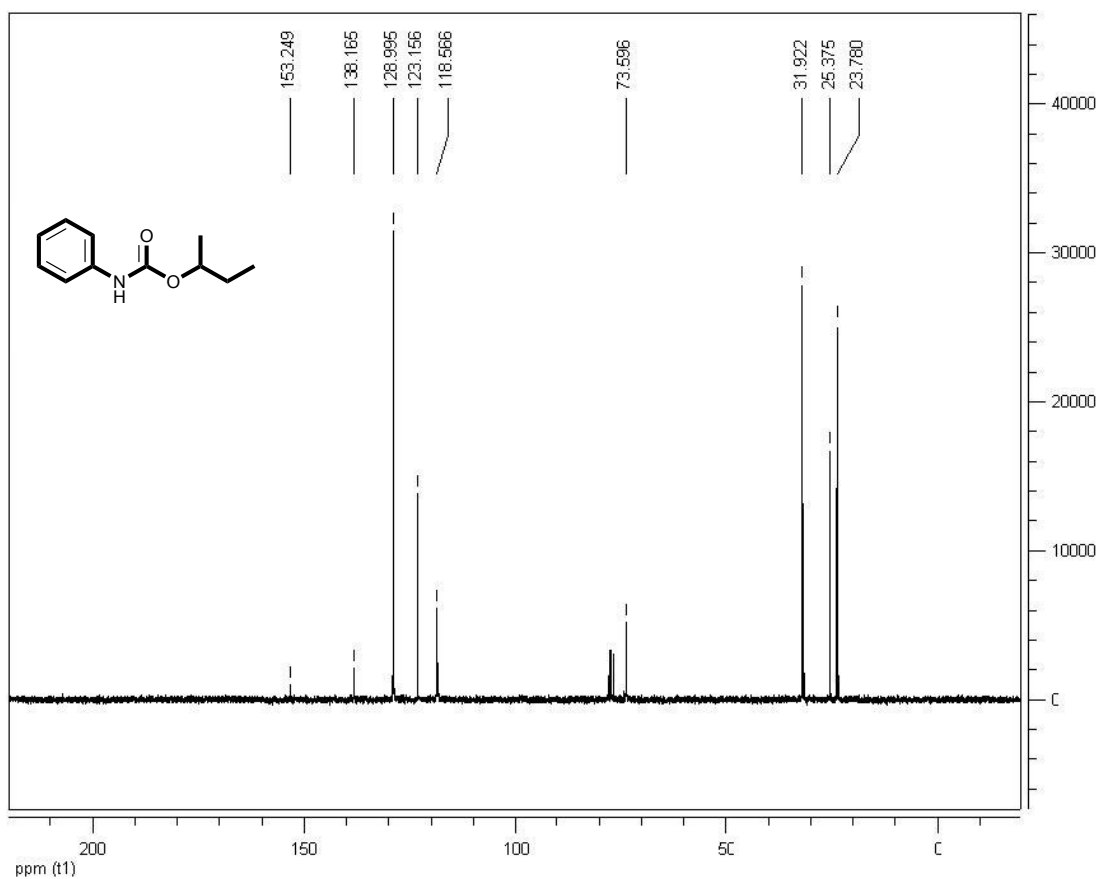
$^1\text{H-NMR}$ spectra (250 MHz) of 2-propyl phenylcarbamate (**C30**) in CDCl_3 .



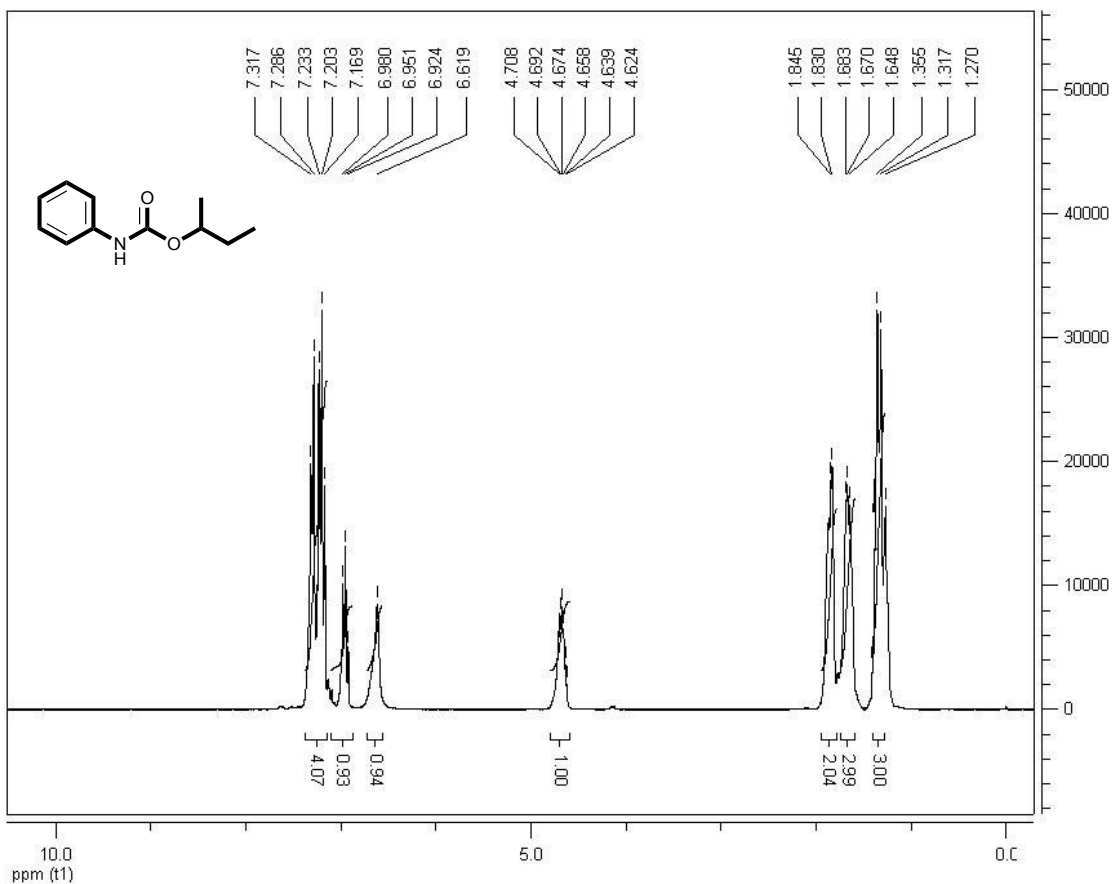
MS of 2-propyl phenylcarbamate (**C30**).



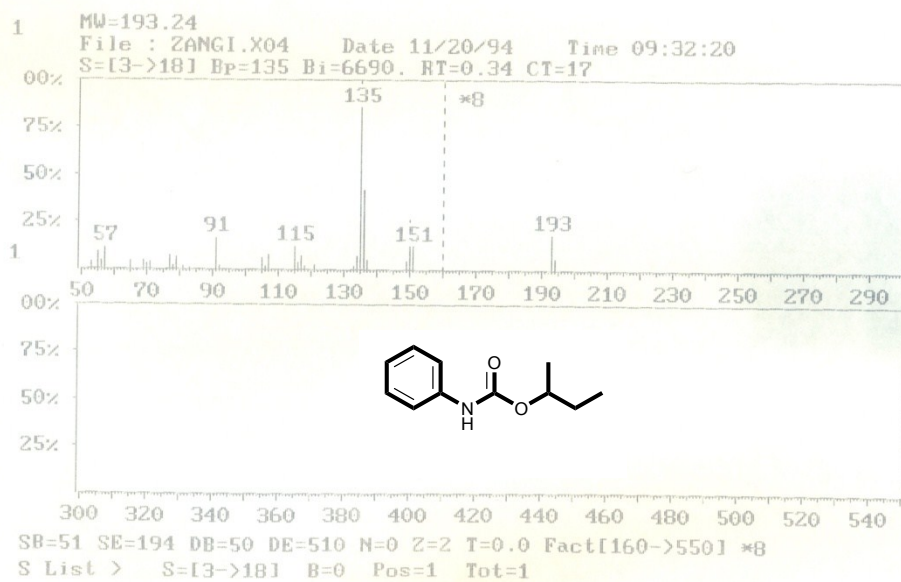
FT-IR spectra of 2-butyl phenylcarbamate (C31) in KBr .



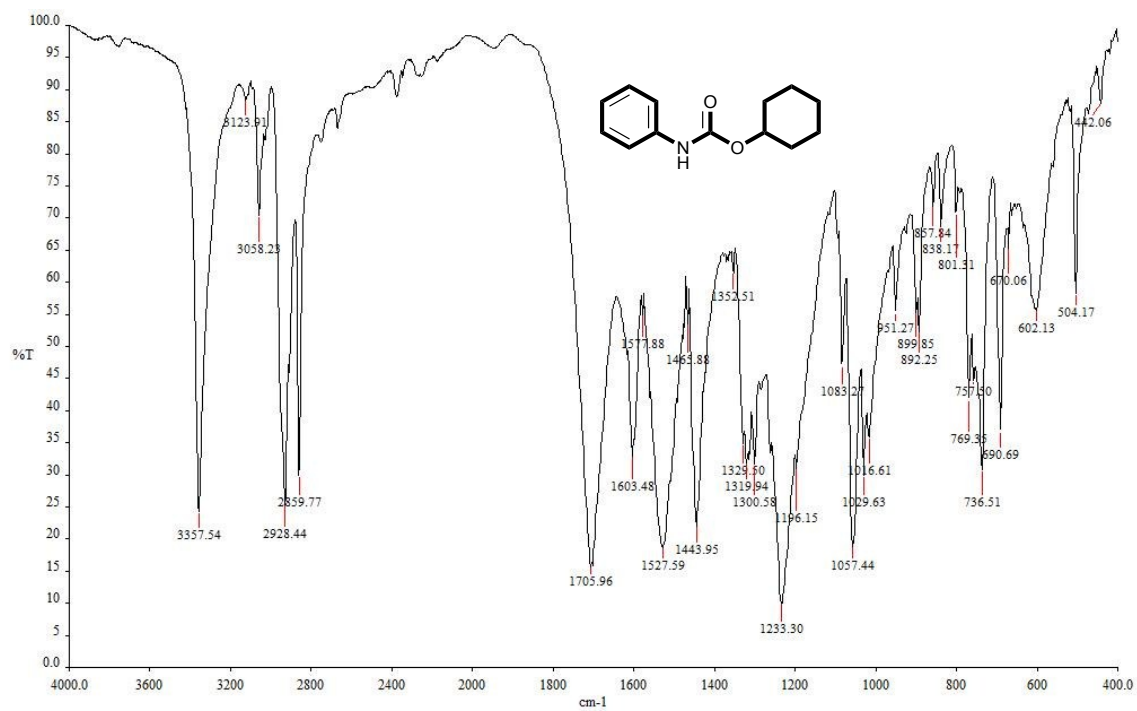
¹³C-NMR spectra (63 MHz) of 2-butyl phenylcarbamate (C31) in CDCl₃.



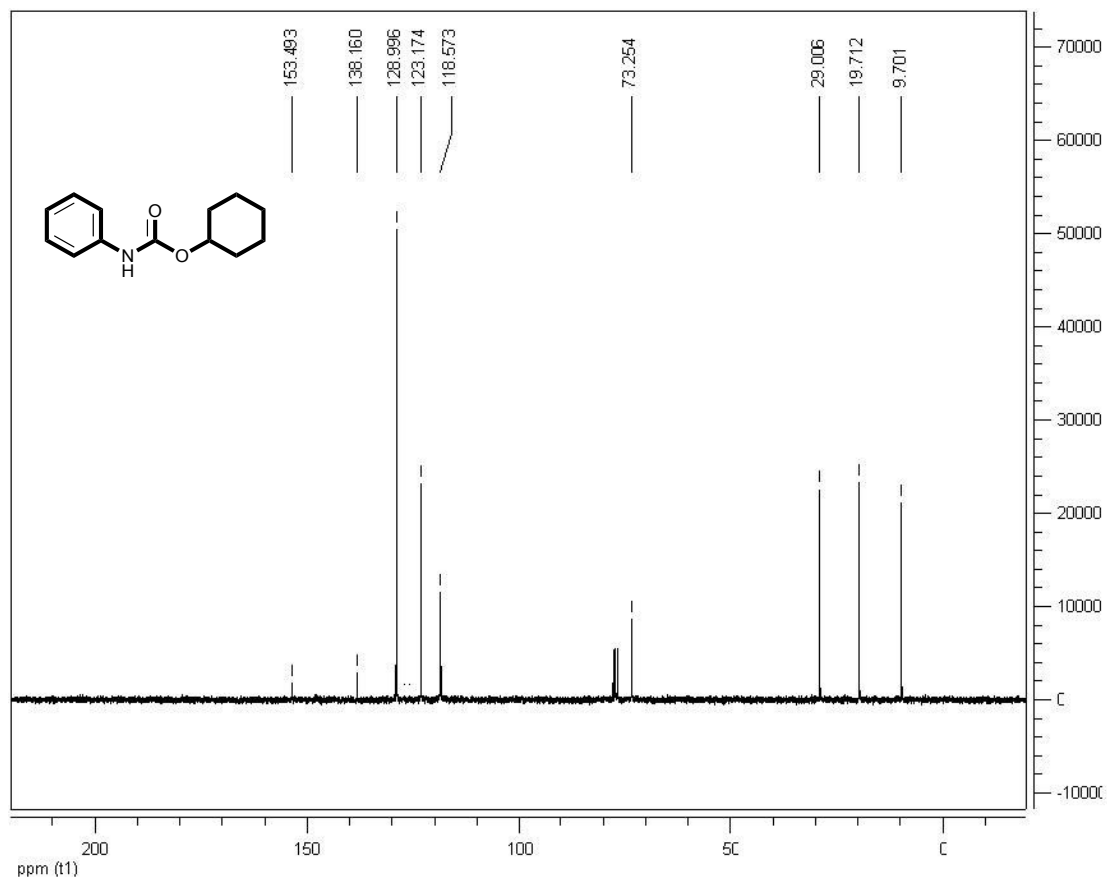
¹H-NMR spectra (250 MHz) of 2-butyl phenylcarbamate (C31) in CDCl₃.



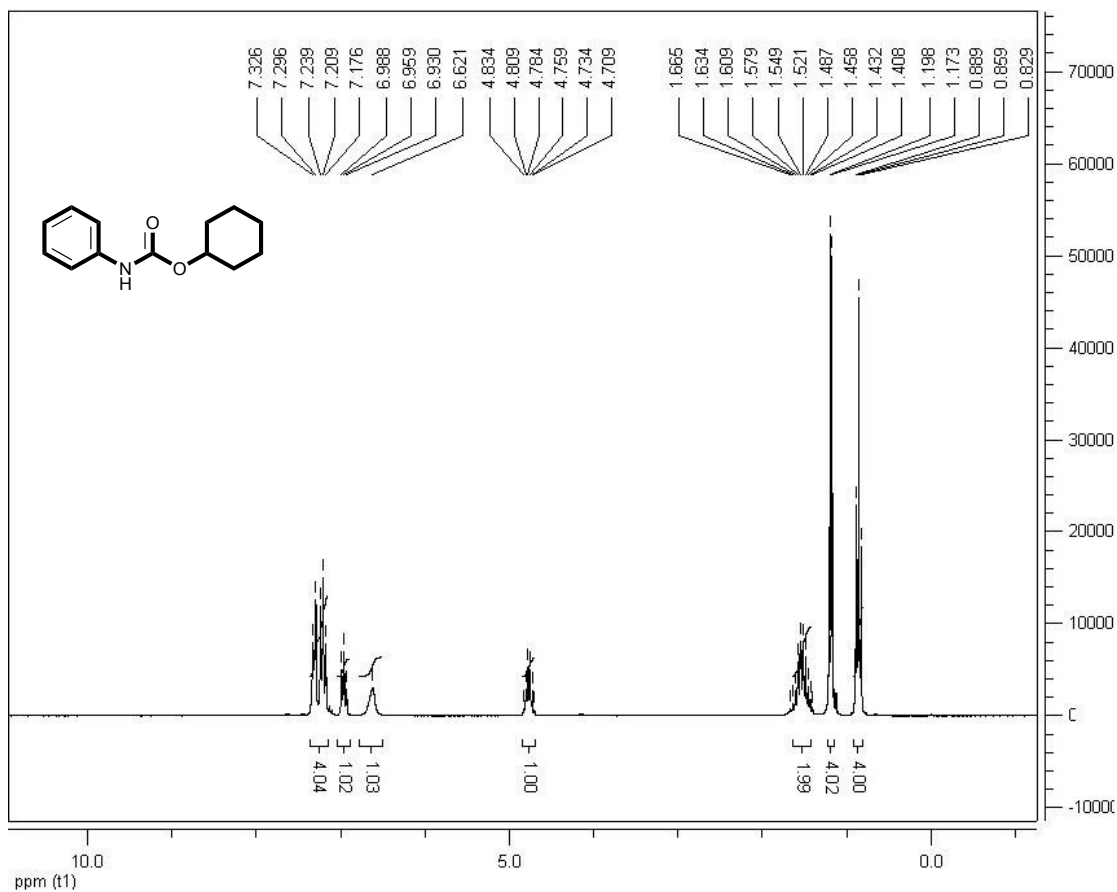
MS of 2-butyl phenylcarbamate (C31).



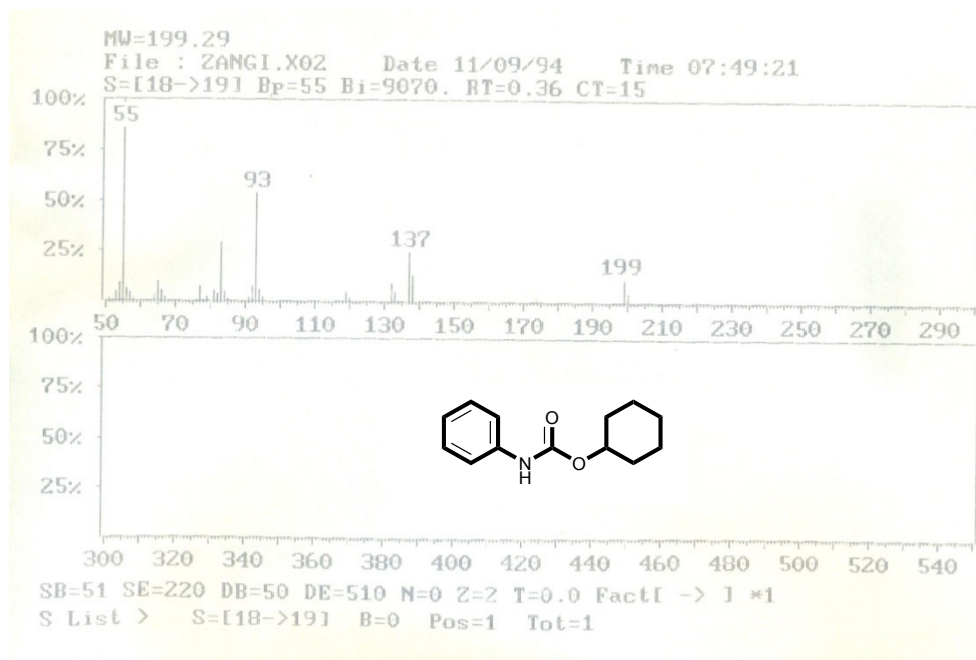
FT-IR spectra of cyclohexyl phenylcarbamate (C32) in KBr .



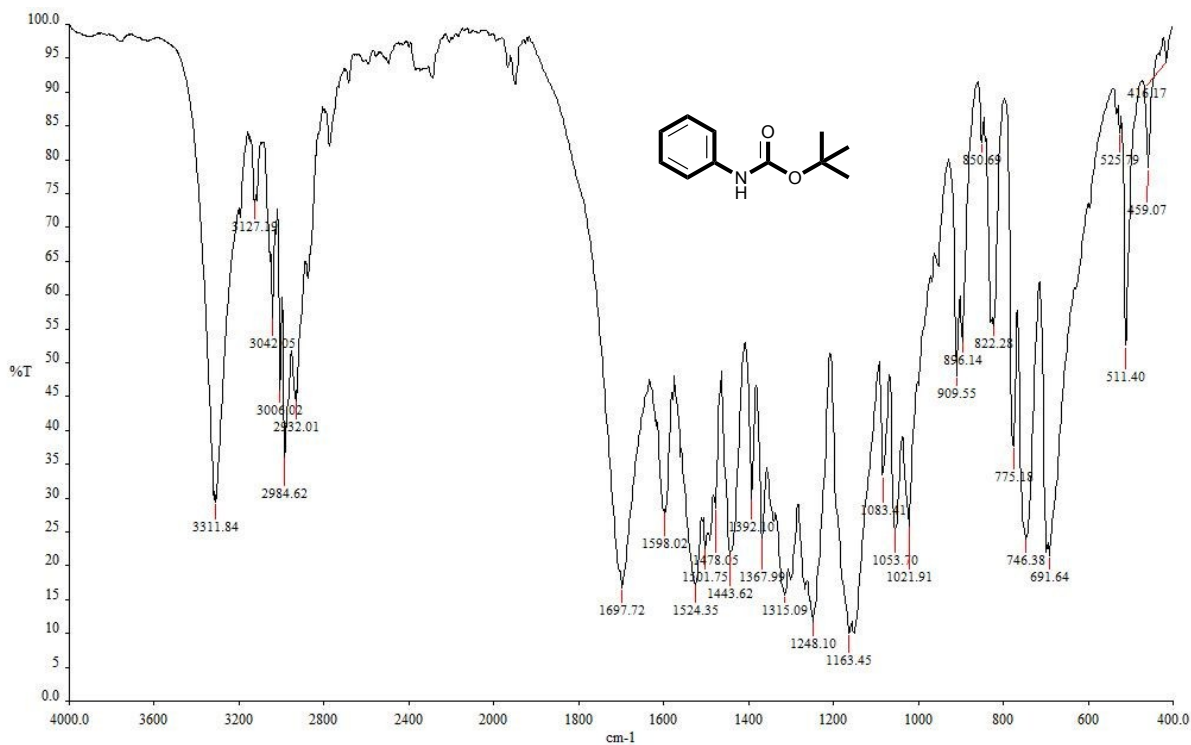
¹³C-NMR spectra (63 MHz) of cyclohexyl phenylcarbamate (C32) in CDCl₃.



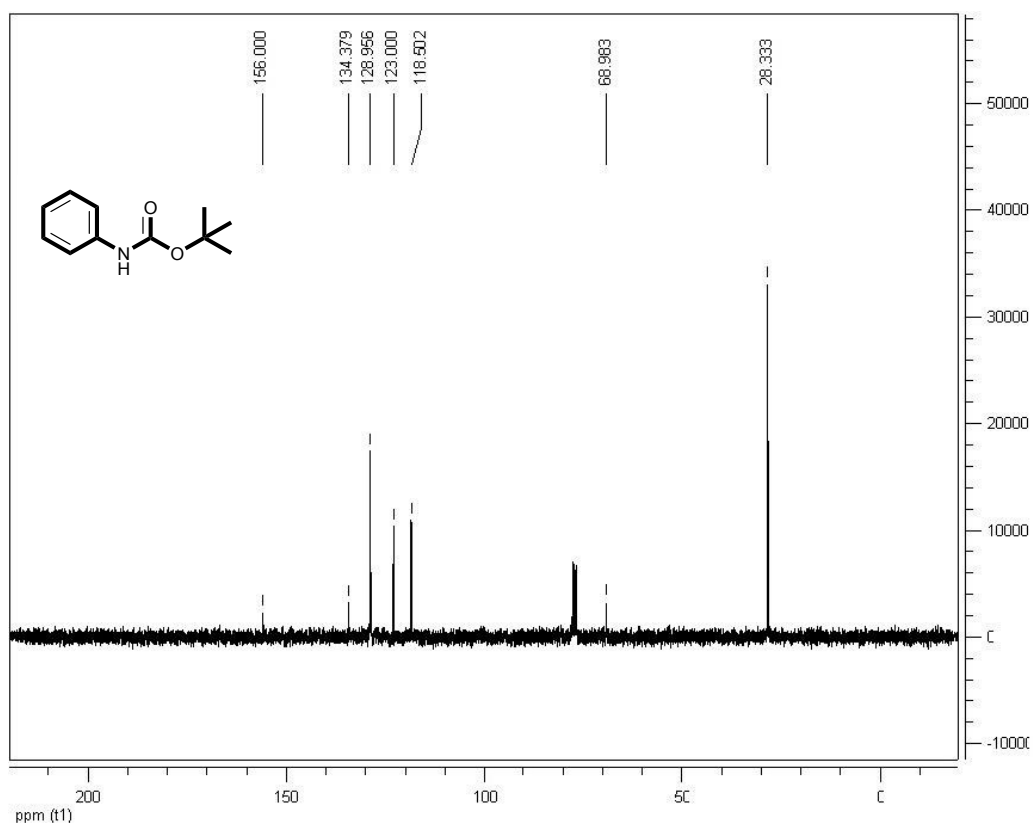
¹H-NMR spectra (250 MHz) of cyclohexyl phenylcarbamate (C32) in CDCl₃.



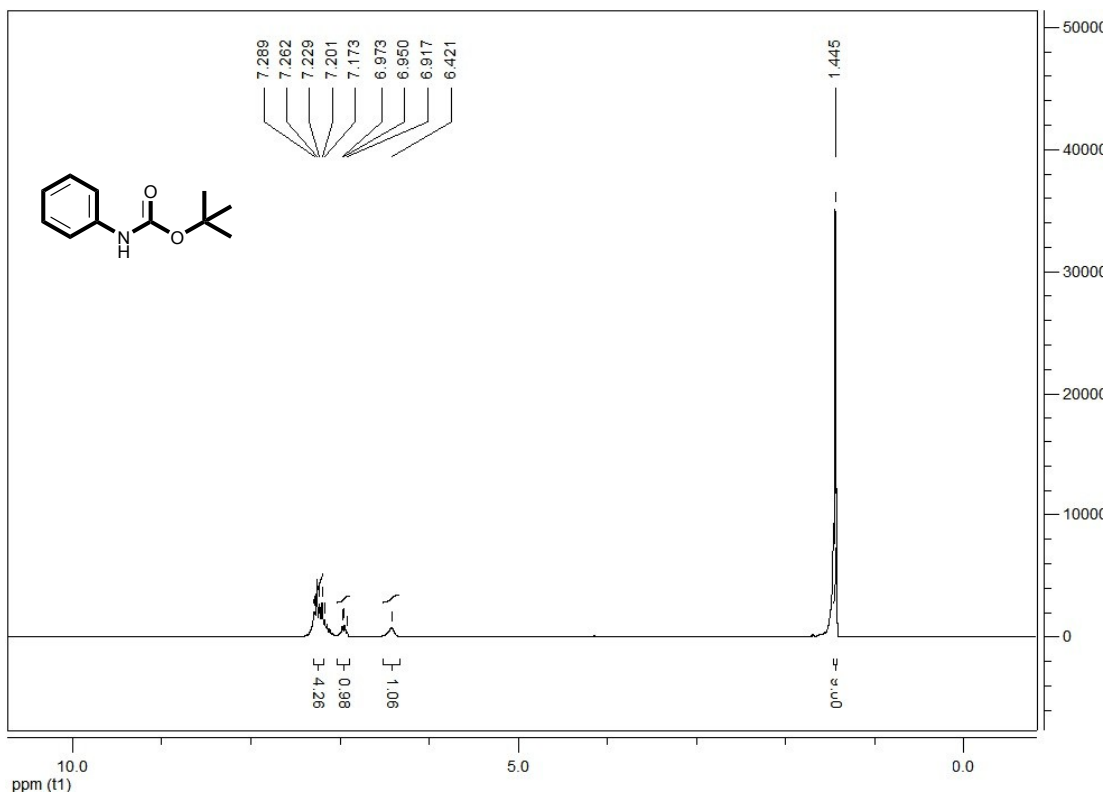
MS of cyclohexyl phenylcarbamate (C32).



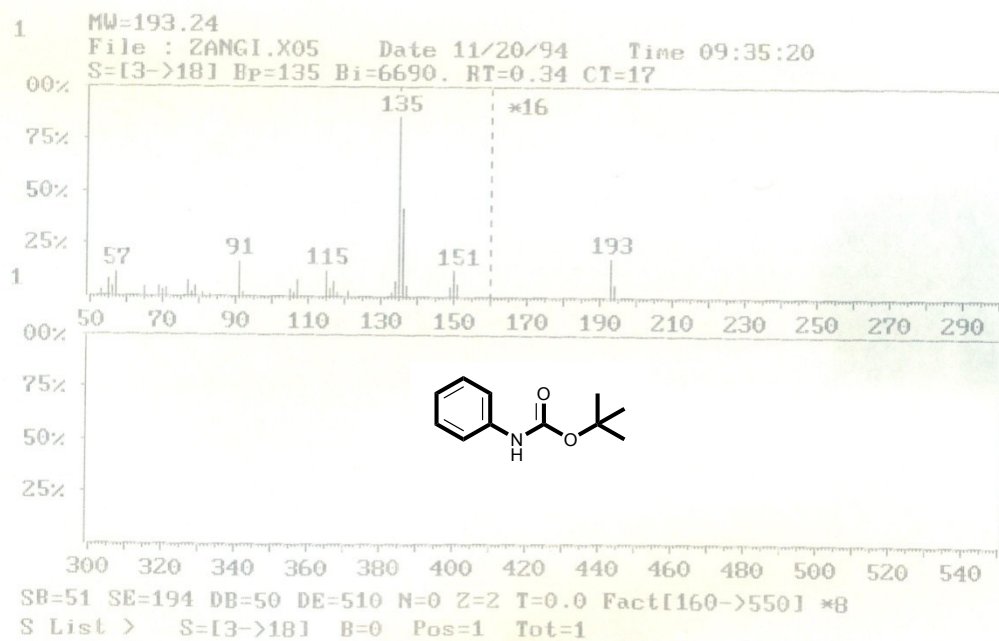
FT-IR spectra of *tert*-butyl phenylcarbamate (C33) in KBr .



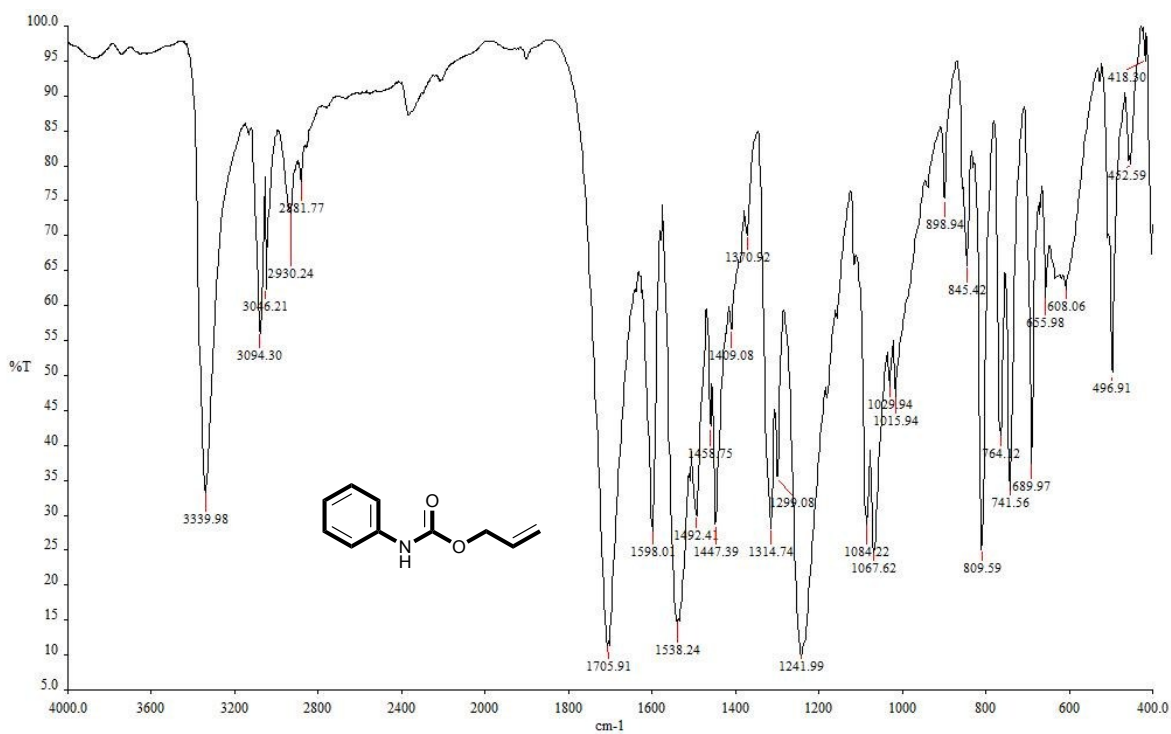
¹³C-NMR spectra (63 MHz) of *tert*-butyl phenylcarbamate (C33) in CDCl₃.



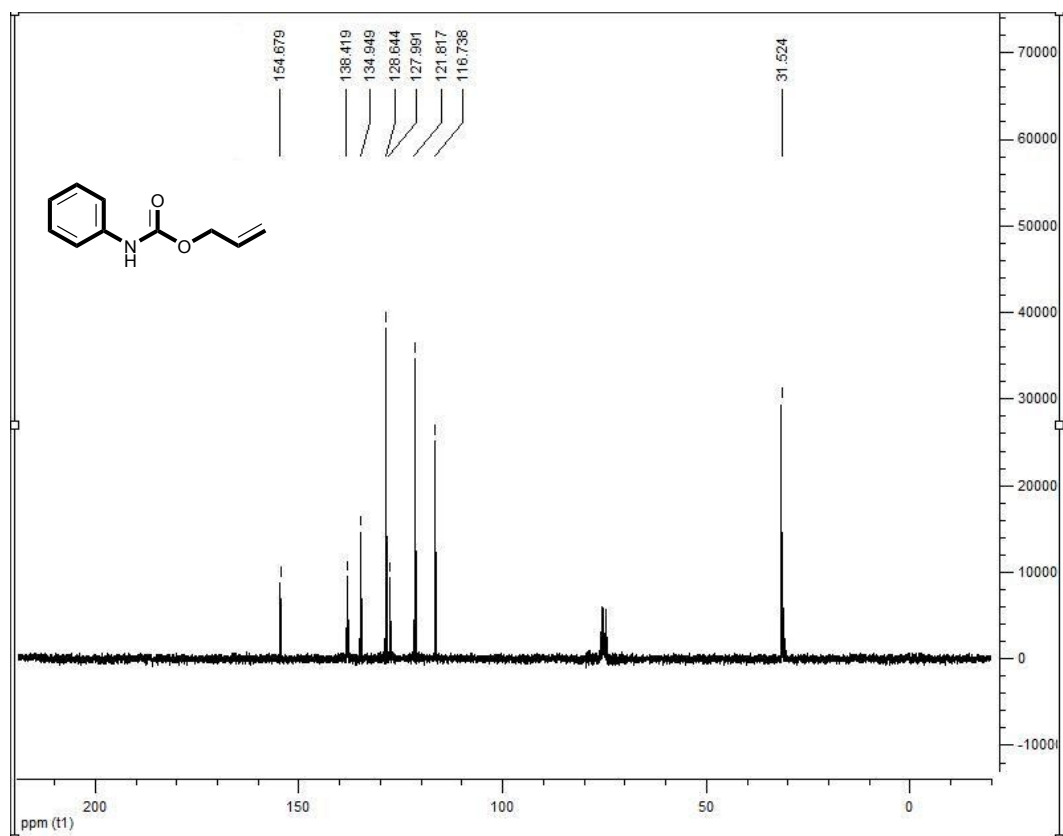
$^1\text{H-NMR}$ spectra (250 MHz) of *tert*-butyl phenylcarbamate (C33) in CDCl_3 .



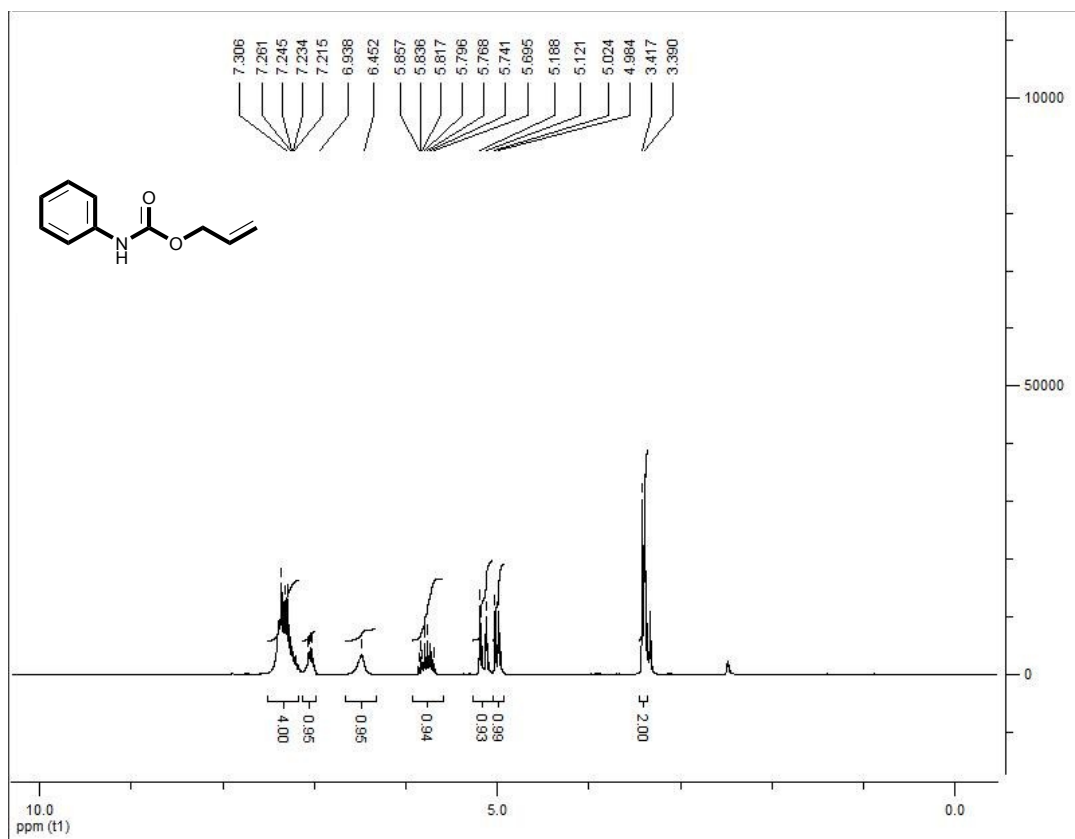
MS of *tert*-butyl phenylcarbamate (C33).



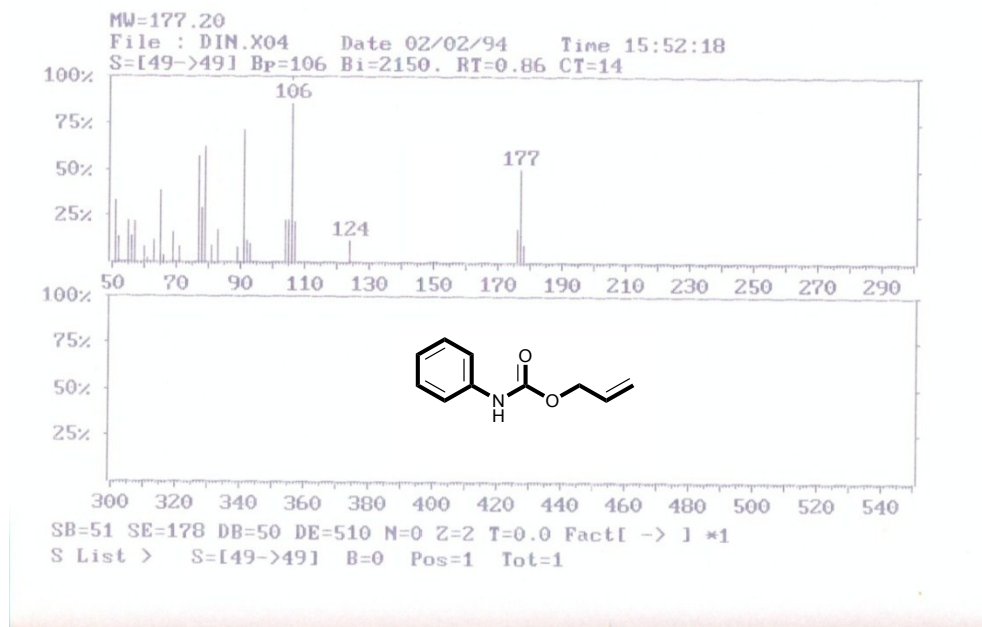
FT-IR spectra of allyl phenylcarbamate (C34) in KBr.



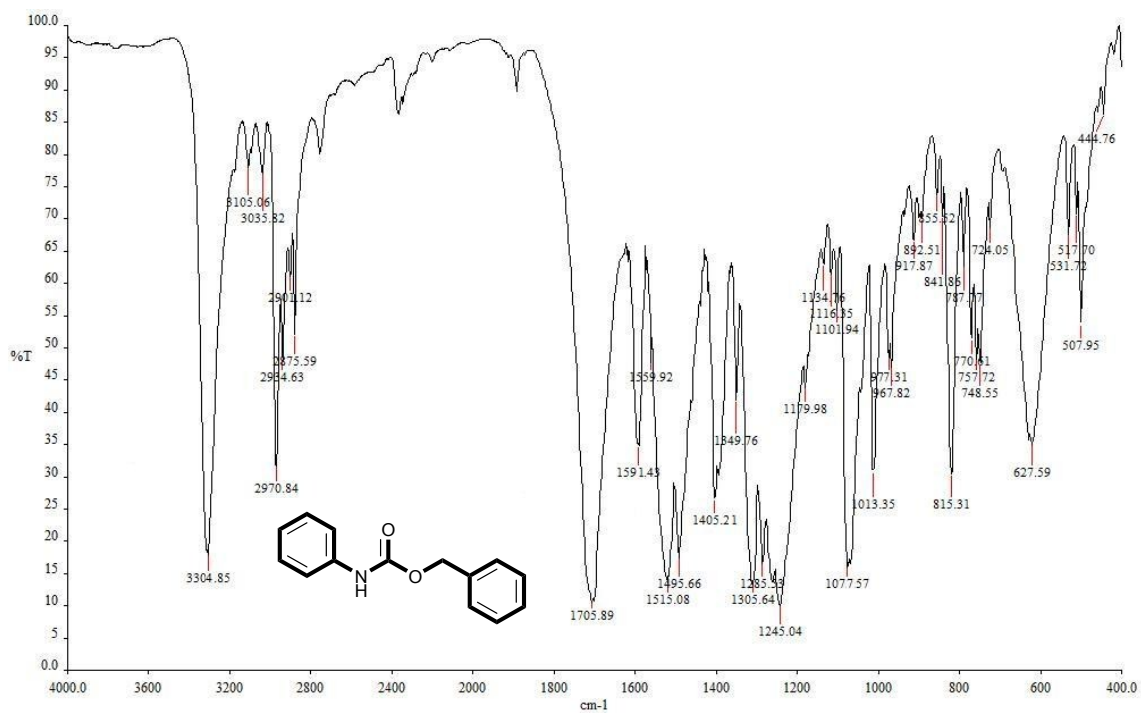
¹³C-NMR spectra (63 MHz) of allyl phenylcarbamate (C34) in CDCl₃.



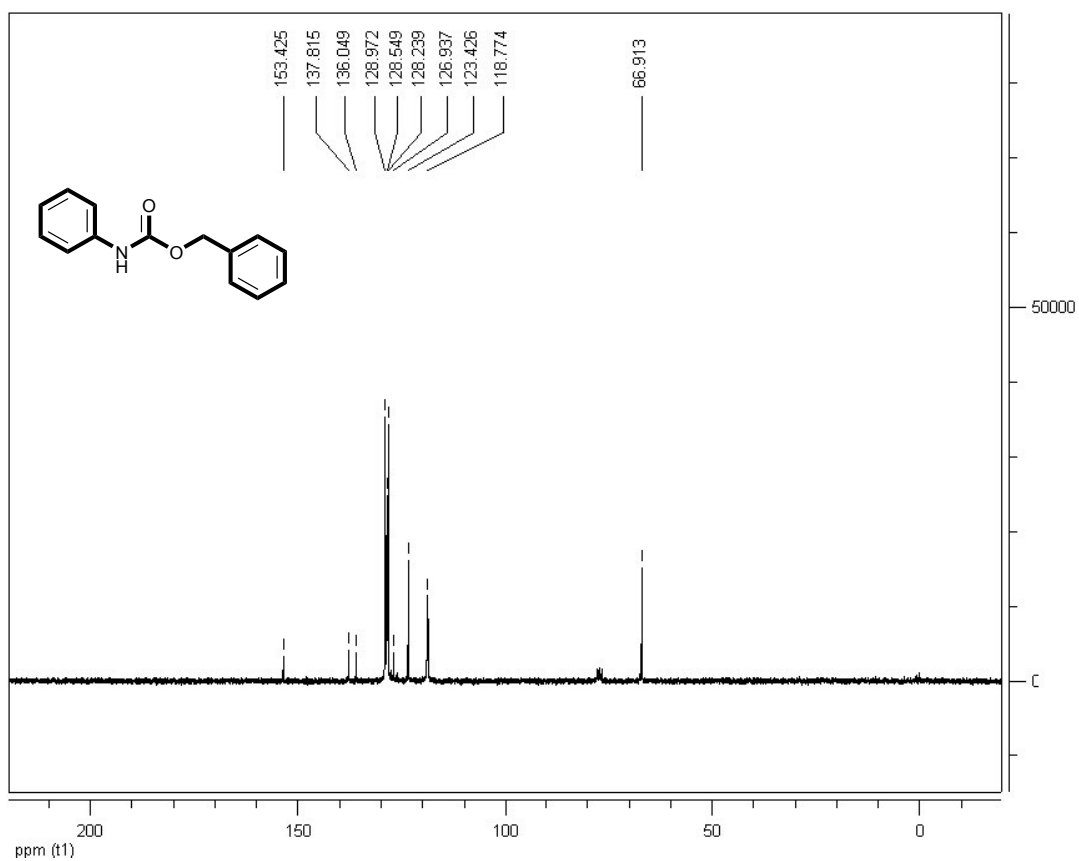
¹H-NMR spectra (250 MHz) of allyl phenylcarbamate (C34) in CDCl₃.



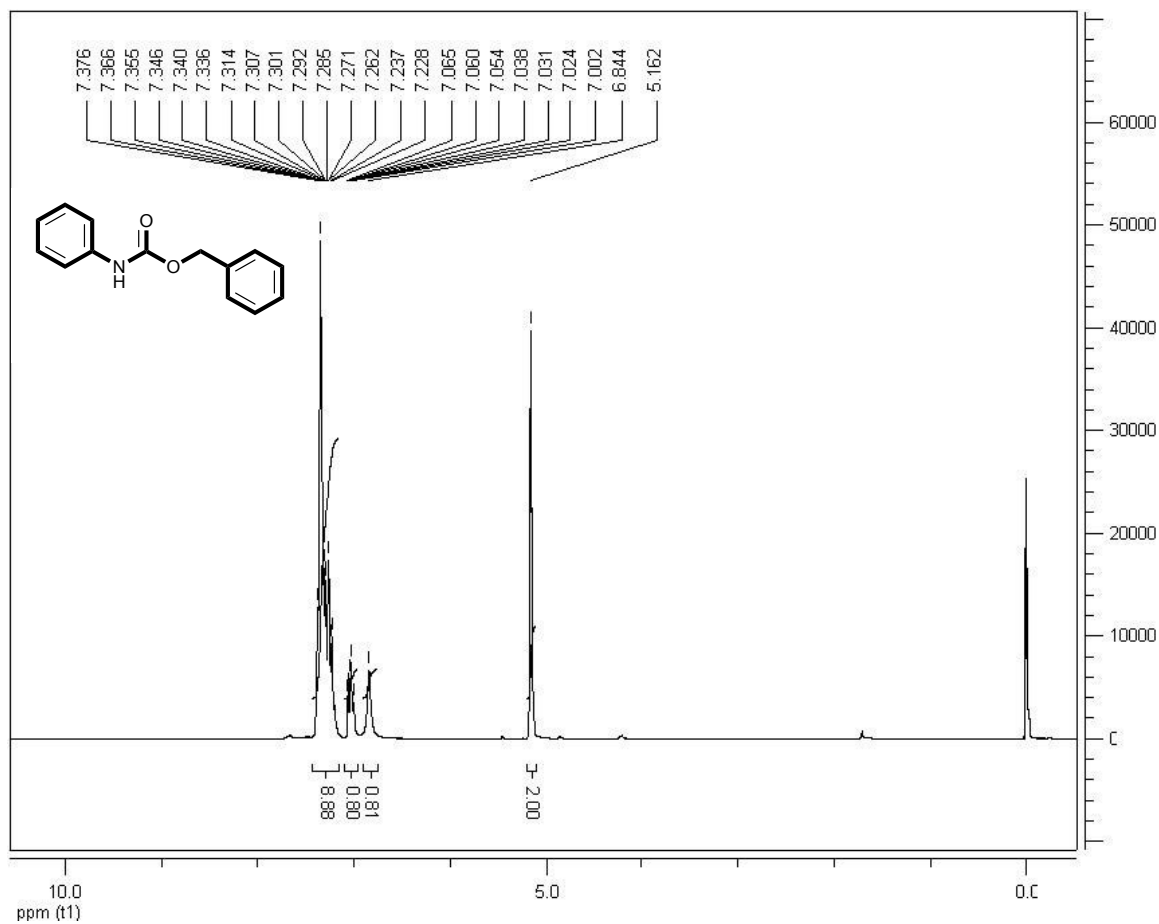
MS of allyl phenylcarbamate (C34).



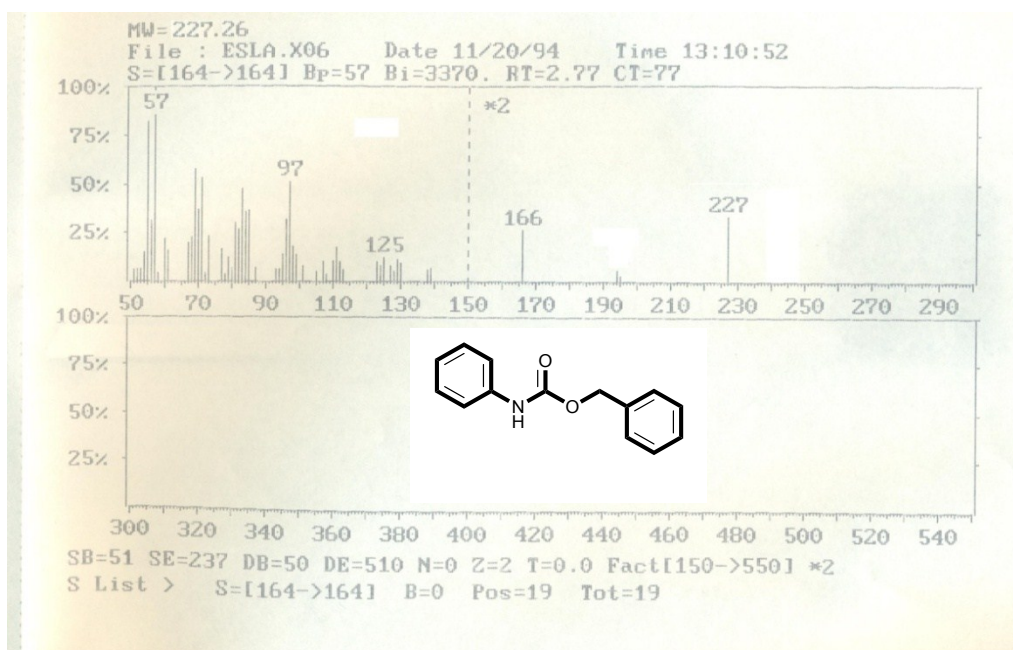
FT-IR spectra of benzyl phenylcarbamate (C35) in KBr.



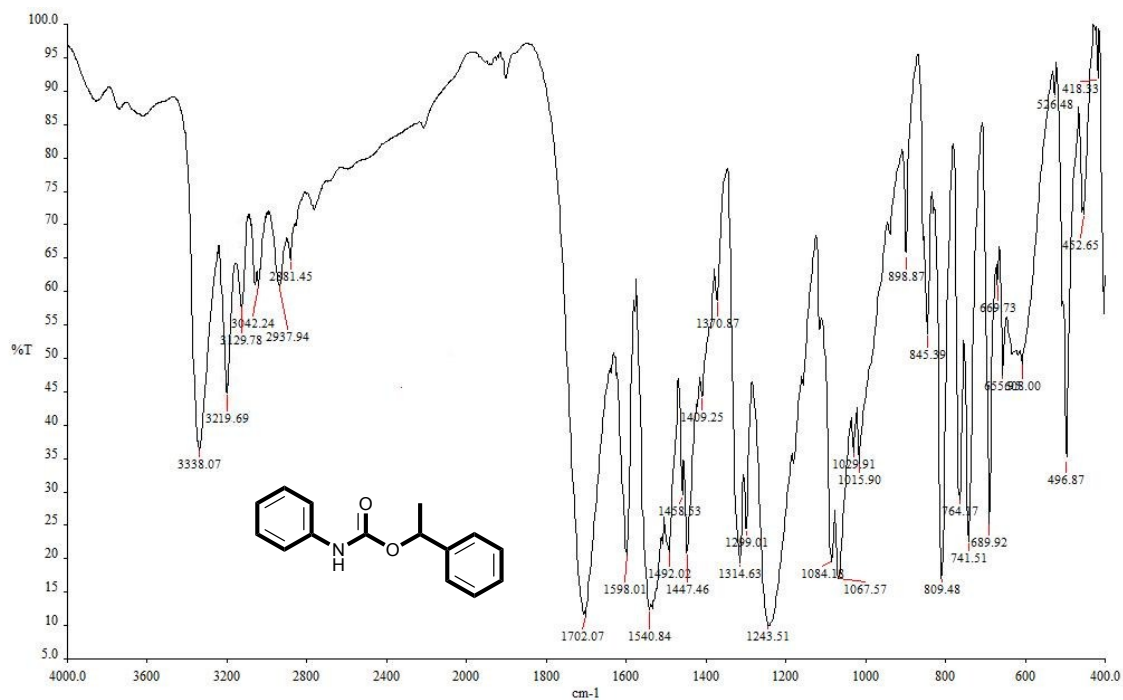
¹³C-NMR spectra (63 MHz) of benzyl phenylcarbamate (C35) in CDCl₃.



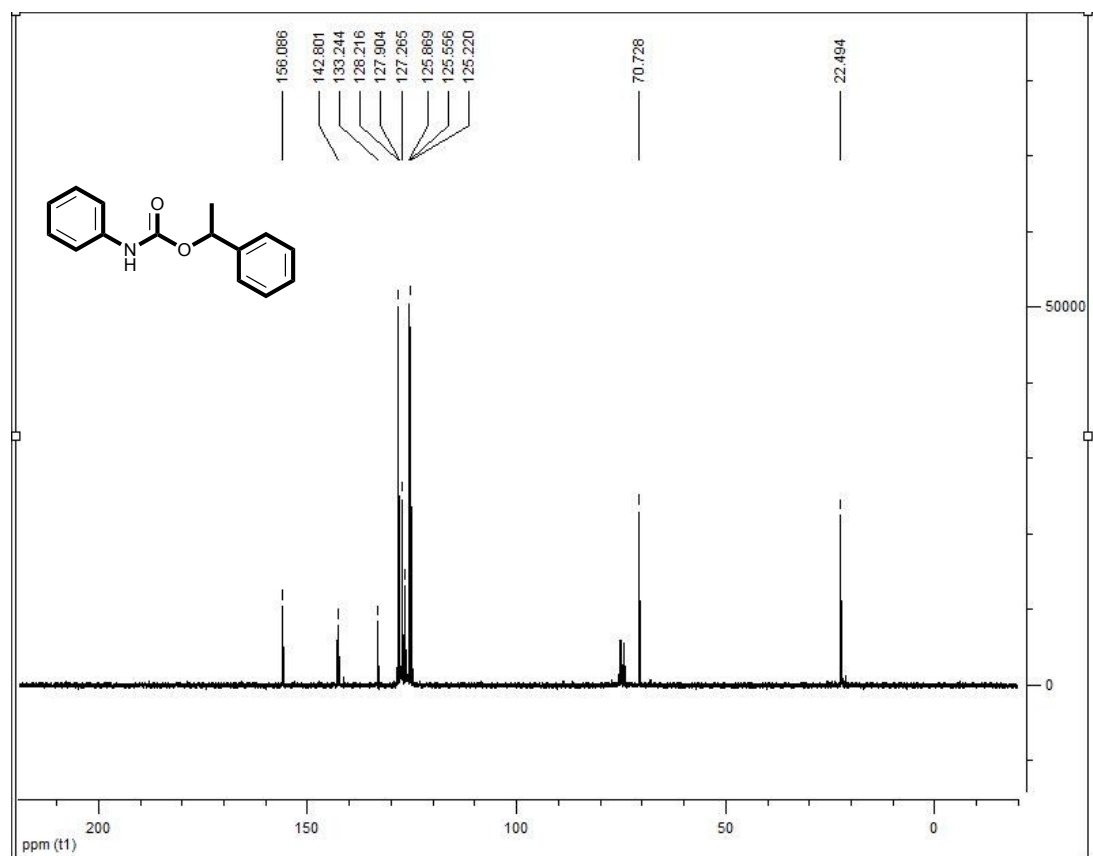
$^1\text{H-NMR}$ spectra (250 MHz) of benzyl phenylcarbamate (C35) in CDCl_3 .



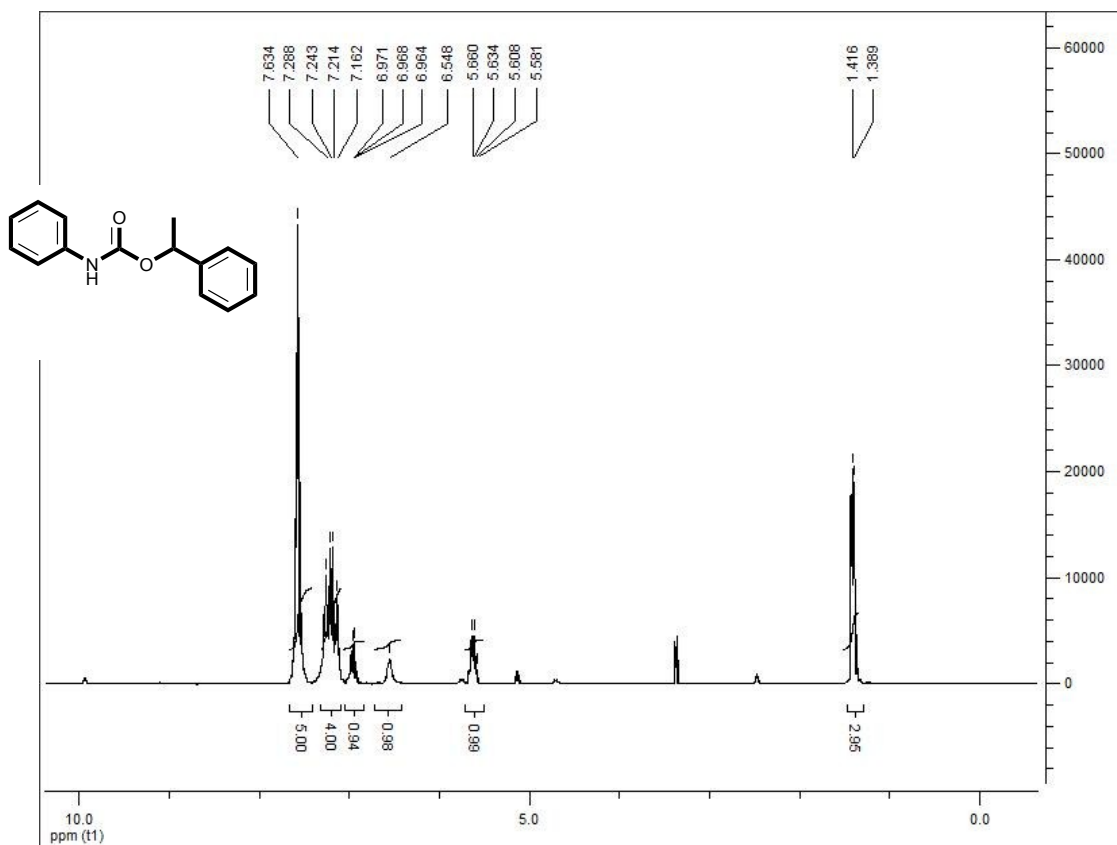
MS of benzyl phenylcarbamate (C35).



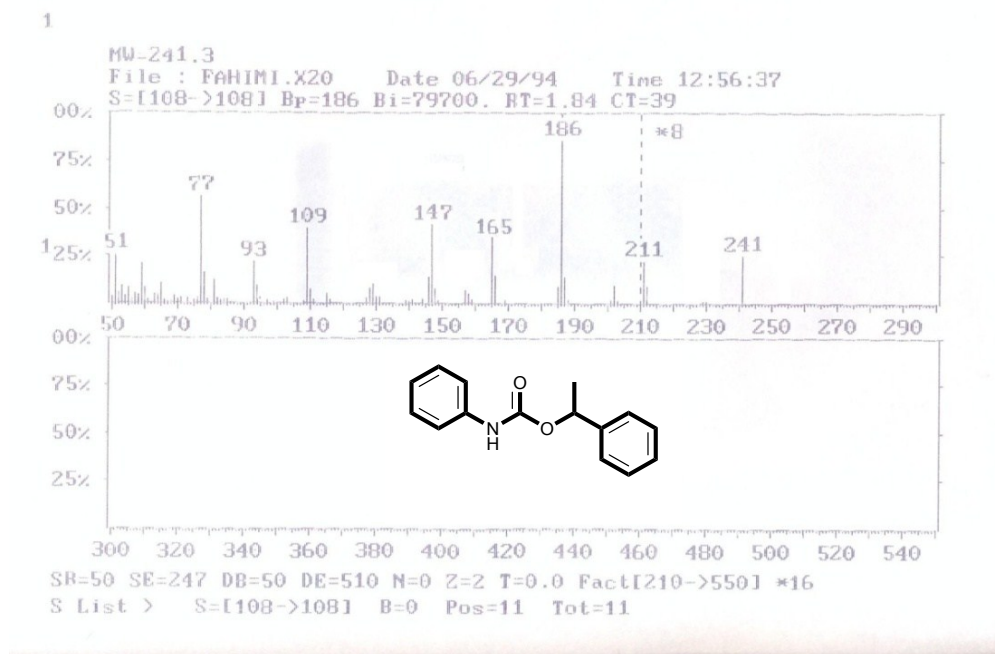
FT-IR spectra of 1-phenylethyl phenylcarbamate (C36) in KBr.



¹³C-NMR spectra (63 MHz) of 1-phenylethyl phenylcarbamate (C36) in CDCl₃.



¹H-NMR spectra (250 MHz) of 1-phenylethyl phenylcarbamate (C36) in CDCl₃.



MS of 1-phenylethyl phenylcarbamate (C36).