Electronic Supplementary Material (ESI) for New Journal of Chemistry.

Supporting Information of

Fe_3O_4@SiO_2/Schiff base/Cu(II) Complex as an Efficient Recyclable Magnetic Nanocatalyst for Selective Mono *N*-Arylation of Primary *O*-Alkyl Thiocarbamates and Primary Alkyl Carbamates with Aryl Halides and Arylboronic Acids

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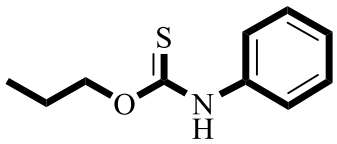
A. Instruments and Materials

All chemicals were purchased from the Merck, Flucka 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. ^{1}H and ^{13}C NMR spectra were recorded with Bruker Avance DPX 250MHz 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. Melting points were determined on a Mel-Temp apparatus and were uncorrected. The mass spectra were recorded on a Shimadzu GC-MS QP 1000 EX instrument. 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

***O*-Propyl phenylthiocarbamate (4a):**



White crystal; mp 43-44°C.

IR (KBr); 3304 (s), 3093 (w), 2923 (m), 1633 (vs), 1503 (s), 1488 (s), 1445 (s), 1398 (vs), 1346 (m), 1319 (m), 1297 (m), 1256 (w), 1243 (vs), 1176 (m), 1153 (m), 1115 (m), 1079 (w), 1052 (w), 1017 (vw), 987 (vw), 918 (m), 865 (m), 803 (w), 764 (vs), 700 (vs), 650 (m), 620 (w), 593 (m), 535 (m) cm^{-1} .

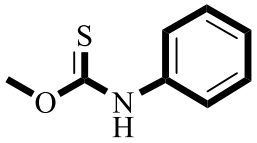
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 8.31 (s, br, 1H, NH), 7.24 (m, 5H), 4.26 (t, J = 7.5 Hz, 2H), 1.66 (sextuplet, J = 7.0 Hz, 2H), 0.92 (t, J = 7.0 Hz, 3H) ppm.

^{13}C-NMR (63 MHz, $CDCl_3$):δ =188.7, 137.6, 128.8, 125.6, 121.7, 72.2, 22.3, 10.3 ppm.

MS Calcd *m/z* 195.28, Found 195.

Anal. Calcd for $C_{10}H_{13}NOS$: C, 61.51; H, 6.71; N, 7.17; S, 16.42%. Found: C, 61.48; H, 6.65; N, 7.21; S, 16.52%.

***O*-Methyl phenylthiocarbamate (4b):**



White crystal; mp 93–94 °C.

IR (KBr); 3364 (s), 3067 (w), 3032 (w), 2952 (vw), 2923 (s), 1694 (vs), 1534 (s), 1504 (w), 1364 (vw), 1345 (m), 1256 (s), 1239 (vs), 1174 (vw), 1105 (m), 1070 (m), 1029 (w), 1009 (w), 978 (vw), 880 (vw), 846 (m), 784 (s), 776 (s), 767 (m), 696 (s), 578 (w), 530 (w), 492 (w), 419 (vw) cm^{-1} .

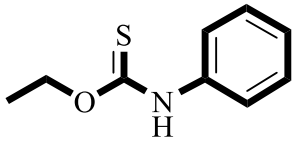
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 8.57 (s, br, 1H, NH), 7.19 (m, 5H), 4.44 (s, 3H) ppm.

^{13}C-NMR (63 MHz, $CDCl_3$):δ =188.1, 137.3, 129.4, 125.6, 121.0, 71.3 ppm.

MS Calcd *m/z* 167.23, Found 167.

Anal. Calcd for C_8H_9NOS: C, 57.46; H, 5.42; N, 8.38; S, 19.17%. Found: C, 57.41; H, 5.48; N, 8.31; S, 19.08%.

***O*-Ethyl phenylthiocarbamate (4c):**



White crystal; mp 69-71°C.

IR (KBr); 3307 (s), 3085 (vw), 2975 (s), 1623 (vs), 1496 (m), 1396 (m), 1280 (s), 1206 (vw), 1178 (m), 1073 (m), 1029 (m), 953 (vw), 870 (m), 755 (vs), 700 (s), 615 (m), 589 (vw), 529 (m), 422 (m) cm^{-1} .

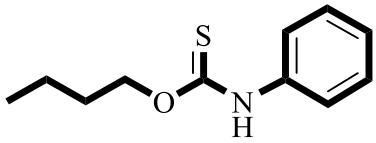
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 8.28 (s, br, 1H, NH), 7.18 (m, 5H), 4.45 (q, J = 7.5 Hz, 2H), 1.27 (t, J = 7.5 Hz, 3H) ppm.

^{13}C-NMR (63 MHz, $CDCl_3$):δ =188.1, 138.0, 129.0, 126.0, 121.2, 68.3 ppm.

MS Calcd *m/z* 181.25, Found 181.

Anal. Calcd for $C_9H_{11}NOS$: C, 69.64; H, 6.12; N, 7.73; S, 17.69%. Found: C, 69.61; H, 6.07; N, 7.79; S, 17.58%.

***O*-Butyl phenylthiocarbamate (4d):**



White crystal; mp 54-56 °C.

IR (KBr); 3408 (vs), 3053 (m), 2956 (vw), 2924 (s), 2851 (m), 1654 (s), 1593 (s), 1517 (m), 1459 (m), 1380 (w), 1335 (m), 1292 (w), 1262 (s), 1235 (s), 1188 (m), 1158 (s), 1140 (s), 1024 (s), 928 (m), 844 (m), 807 (s), 768 (m), 740 (vw), 691 (m), 624 (w), 573 (m), 532 (m), 478 (w) cm^{-1} .

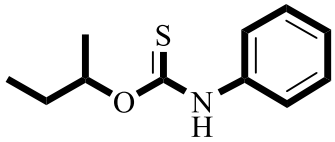
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 8.39 (s, br, 1H, NH), 7.20 (m, 5H), 4.41 (t, J = 7.0 Hz, 2H), 1.48 (m, 2H), 1.29 (m, 2H), 0.86 (t, J = 7.0 Hz, 3H) ppm.

^{13}C-NMR (63 MHz, $CDCl_3$):δ =190.4, 138.0, 129.1, 123.4, 118.8, 71.2, 15.5 ppm.

MS Calcd *m/z* 209.31, Found 209.

Anal. Calcd for $C_{11}H_{15}NOS$: C, 63.12; H, 7.22; N, 6.97; S, 15.32%. Found: C, 63.08; H, 7.18; N, 7.03; S, 15.25%.

***O*-2-Butyl phenylthiocarbamate (4e):**



White crystal; mp 45-46 °C.

IR (KBr); 3375 (s), 3104 (m), 2935 (s), 2885 (m), 1634 (vs), 1487 (s), 1328 (m), 1289 (m), 1245 (vs), 1190 (m), 1163 (m), 1110 (m), 1080 (w), 1047 (w), 1024 (s), 958 (w), 831 (m), 750 (vs), 596 (s), 634 (m), 583 (m), 525 (m), 504 (vw), 466 (s) cm^{-1} .

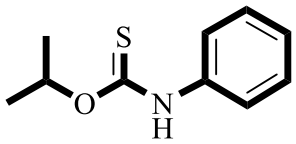
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 8.39 (s, br, 1H, NH), 7.32 (m, 5H), 4.25 (sextuplet, J = 7.0 Hz, 1H), 1.19 (m, 2H), 0.83 (d, J = 7.0 Hz, 3H), 0.56 (d, J = 7.0 Hz, 3H) ppm.

^{13}C-NMR (63 MHz, $CDCl_3$):δ =191.7, 138.0, 129.0, 123.3, 118.6, 76.8, 20.3, 22.3, 10.3 ppm.

MS Calcd *m/z* 209.31, Found 209.

Anal. Calcd for $C_{11}H_{15}NOS$: C, 63.12; H, 7.22; N, 6.97; S, 15.32%. Found: C, 63.14; H, 7.20; N, 6.92; S, 15.38%.

***O*-2-Propyl phenylthiocarbamate (4f):**



White crystal; mp 79-80°C.

IR (KBr); 3413 (s), 3157 (w), 2982 (m), 2918 (m), 2892 (w), 1641 (vs), 1503 (m), 1418 (s), 1291 (m), 1220 (w), 1198 (s), 1162 (w), 1103 (w), 1016 (vs), 977 (vw), 864 (s), 833 (m), 816 (m), 782 (w), 713 (m), 643 (vw), 607 (vw), 542 (s), 595 (m), 549 (vw) cm^{-1} .

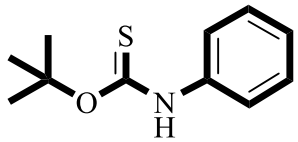
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 8.21 (s, br, 1H, NH), 7.44 (m, 1H), 4.97 (septuplet, J = 7.0 Hz, 2H), 1.23 (d, J = 7.0 Hz, 3H) ppm.

^{13}C-NMR (63 MHz, $CDCl_3$):δ =191.2, 138.2, 128.2, 123.2, 118.5, 72.7, 25.1 ppm.

MS Calcd *m/z* 195.28, Found 195.

Anal. Calcd for $C_{10}H_{13}NOS$: C, 61.51; H, 6.71; N, 7.17; S, 16.42%. Found: C, 61.48; H, 6.67; N, 7.26; S, 16.36%.

***O-tert*-Butyl phenylthiocarbamate (4g):**



White crystal; mp 86-88°C.

IR (KBr); 3304 (s), 3108 (w), 3038 (w), 2971 (s), 2939 (m), 2901 (m), 1624 (vs), 1572 (s), 1498 (w), 1470 (w), 1376 (w), 1345 (m), 1304 (vs), 1252 (s), 1234 (vs), 1166 (s), 1110 (m), 1036 (w), 1010 (vw), 958 (m), 881 (m), 863 (s), 818 (s), 733 (vw), 699 (vw), 657 (s), 566 (w), 511 (vw), 446 (vw) cm^{-1} .

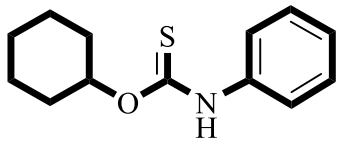
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 8.57 (s, br, 1H, NH), 7.33 (m, 1H), 1.44 (s, 3H) ppm.

^{13}C-NMR (63 MHz, $CDCl_3$):δ =189.4, 135.0, 129.6, 126.3, 121.7, 66.4, 29.0 ppm.

MS Calcd *m/z* 209.31, Found 209.

Anal. Calcd for $C_{11}H_{15}NOS$: C, 63.12; H, 7.22; N, 6.97; S, 15.32%. Found: C, 63.04; H, 7.16; N, 7.05; S, 15.42%.

***O*-Cyclohexyl phenylthiocarbamate (4h):**



White crystal; mp 77-79°C.

IR (KBr); 3322 (s), 3132 (m), 3032 (m), 2960 (m), 2928 (m), 2856 (w), 1659 (vs), 1602 (s), 1578 (vw), 1541 (s), 1454 (w), 1407 (m), 1376 (vw), 1319 (s), 1300 (w), 1275 (w), 1232 (vs), 1211 (vw), 1157 (vw), 1115 (m), 1067 (vs), 959 (vw), 902 (vw), 858 (m), 820 (s), 764 (m), 740 (s), 695 (s), 610 (vw), 554 (w), 511 (m), 462 (m), 429 (vw) cm^{-1} .

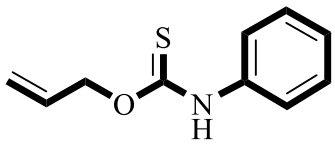
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 8.49 (s, br, 1H, NH), 7.34 (m, 5H), 4.38 (m, 1H), 1.76 (m, 2H), 1.61 (m, 2H), 1.32 (m, 2H), 1.16 (m, 4H) ppm.

^{13}C-NMR (63 MHz, $CDCl_3$):δ =188.8, 133.8, 129.6, 126.3, 121.7, 73.9, 27.7, 16.9, 11.1 ppm.

MS Calcd *m/z* 235.35, Found 235.

Anal. Calcd for $C_{13}H_{17}NOS$: C, 66.35; H, 7.28; N, 5.95; S, 13.62%. Found: C, 66.31; H, 7.22; N, 6.04; S, 13.57%.

***O*-Allyl phenylthiocarbamate (4i):**



White crystal; mp 66-67°C.

IR (KBr); 3338 (s), 3142 (vw), 3108 (m), 3031 (vw), 2950 (w), 1684 (vs), 1599 (m), 1546 (s), 1508 (s), 1416 (w), 1330 (s), 1304 (s), 1276 (w), 1222 (vs), 1184 (s), 1111 (m), 1063 (m), 1029 (vw), 986 (vw), 867 (vw), 853 (m), 763 (vw), 748 (w), 729 (vw), 691 (w), 670 (vw), 574 (s), 495 (vw), 458 (vw), 402 (vw) cm^{-1} .

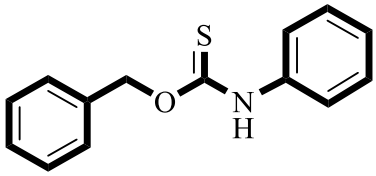
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 8.44 (s, br, 1H, NH), 7.37 (m, 5H), 5.93 (m, 1H), 5.31 (dd, J_1 = 17.5 Hz, J_2 = 1.0 Hz, 1H), 5.20 (dd, J_1 = 17.5 Hz, J_2 = 1.0 Hz, 1H), 4.47 (d, J = 6.0 Hz, 3H) ppm.

^{13}C-NMR (63 MHz, $CDCl_3$):δ =188.7, 134.4, 132.8, 129.4, 127.9, 123.0, 117.8, 69.6 ppm.

MS Calcd *m/z* 193.26, Found 193.

Anal. Calcd for $C_{10}H_{11}NOS$: C, 62.15; H, 5.74; N, 7.25; S, 16.59%. Found: C, 62.11; H, 5.67; N, 7.33; S, 16.48%.

***O*-Benzyl phenylthiocarbamate (4j):**



White crystal; mp 75-77°C.

IR (KBr); 3340 (s), 3178 (m), 3120 (m), 3100 (m), 2930 (w), 2881 (vw), 1672 (vs), 1598 (s), 1578 (vw), 1540 (s), 1492 (m), 1374 (vw), 1315 (s), 1299 (m), 1242 (vs), 1180 (w), 1084 (s), 1067 (s), 1030 (w), 1016 (w), 899 (w), 846 (w), 809 (vs), 764 (m), 742 (vs), 690 (s), 699 (vw), 608 (w), 526 (vw), 497 (m) cm^{-1} .

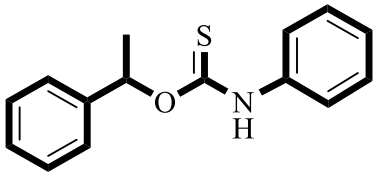
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 8.02 (s, br, 1H, NH), 7.37-7.23 (m, 9H), 7.06-6.99 (m, 1H), 5.16 (s, 3H) ppm.

^{13}C-NMR (63 MHz, $CDCl_3$):δ =191.4, 138.8, 137.0, 130.0, 129.6, 129.2, 127.0, 124.3, 119.8, 72.9 ppm.

MS Calcd *m/z* 243.32, Found 243.

Anal. Calcd for $C_{14}H_{13}NOS$: C, 69.11; H, 5.39; N, 5.76, S, 13.18%. Found: C, 69.04; H, 5.33; N, 5.84, S, 13.25%.

***O*-1-Phenylethyl phenylthiocarbamate (4k):**



White crystal; mp 69-70°C.

IR (KBr); 3409 (s), 3154 (m), 3053 (m), 2923 (m), 2851 (w), 1663 (vs), 1586 (vs), 1560 (s), 1498 (s), 1393 (s), 1342 (s), 1258 (m), 1209 (s), 1126 (m), 1054 (m), 1022 (w), 949 (vw), 910 (w), 863 (m), 830 (m), 802 (m), 766 (w), 723 (w), 697 (vw), 651 (m), 562 (s), 520 (w), 444 (vw), 426 (m) cm^{-1} .

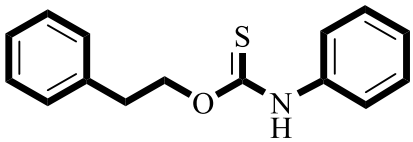
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 8.42 (s, br, 1H, NH), 7.35-7.25 (m, 10H), 5.62 (q, J = 7.0 Hz, 1H), 1.42 (d, J = 7.5 Hz, 3H) ppm.

^{13}C-NMR (63 MHz, $CDCl_3$):δ =189.6, 132.6, 128.4, 128.2, 127.9, 127.3, 125.6, 125.2, 121.2, 70.7, 22.5 ppm.

MS Calcd *m/z* 257.35, Found 257.

Anal. Calcd for $C_{15}H_{15}NOS$: C, 70.01; H, 5.88; N, 5.44; S, 12.46%. Found: C, 69.93; H, 5.82; N, 5.52; S, 12.51%.

***O*-2-Phenylethyl phenylthiocarbamate (4l):**



White crystal; mp 89-91°C.

IR (KBr); 3338 (s), 3089 (m), 3033 (m), 2937 (m), 2885 (w), 1676 (vs), 1591 (s), 1534 (s), 1478 (vw), 1388 (m), 1352 (m), 1294 (m), 1265 (w), 1239 (w), 1130 (vw), 1099 (m), 1062 (s), 871 (m), 824 (s), 785 (m), 759 (w), 648 (w), 517 (m), 477 (w), 441 (m) cm^{-1} .

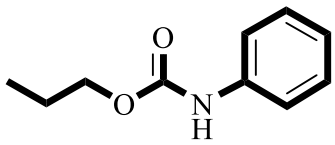
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 8.54 (s, br, 1H, NH), 7.28-7.19 (m, 10H), 4.01 (t, J = 7.0 Hz, 2H), 2.83 (t, J = 7.0 Hz, 2H) ppm.

^{13}C-NMR (63 MHz, $CDCl_3$):δ =188.2, 138.3, 131.9, 128.8, 128.2, 128.1, 126.2, 121.8, 115.6, 63.9, 34.9 ppm.

MS Calcd *m/z* 257.35, Found 257.

Anal. Calcd for $C_{15}H_{15}NOS$: C, 70.01; H, 5.88; N, 5.44; S, 12.46%. Found: C, 69.94; H, 5.82; N, 5.52; S, 12.58%.

Propyl phenylcarbamate (5a):



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} .

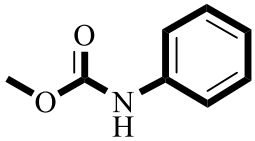
^{1}H-NMR (250 MHz, $CDCl_3$):δ= 7.26 (m, 4H), 6.97 (m, 1H), 6.64 (s, br, 1H, NH), 4.05 (t, J = 7.5 Hz, 2H), 1.62 (sex, J = 7.5 Hz, 2H), 0.90 (t, J = 7.5 Hz, 3H) ppm.

^{13}C-NMR (63 MHz, $CDCl_3$):δ =153.7, 138.0, 129.0, 123.3, 118.6, 66.8, 22.3, 10.3 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, 66.97; H, 7.32; N, 7.86%.

Methyl phenylcarbamate (5b):



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} .

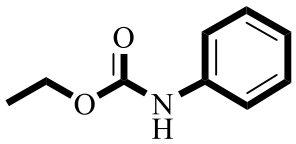
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 7.15 (m, 5H), 6.63 (s, br, 1H, NH), 4.13 (s, 3H) ppm.

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

MS Calcd *m/z* 151.17, Found 151.

Anal. Calcd for $C_8H_9NO_2$: C, 63.56; H, 6.00; N, 9.27%. Found: C, 63.52; H, 5.93; N, 9.34%.

Ethyl phenylcarbamate (5c):



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} .

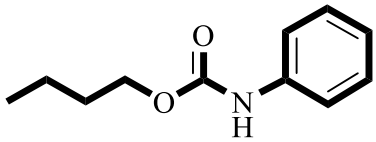
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 7.25 (m, 4H), 6.97 (m, 1H), 6.64 (s, br, 1H, NH), 4.15 (q, J = 7.0 Hz, 2H), 1.23 (t, J = 7.0 Hz, 3H) ppm.

^{13}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 $C_9H_{11}NO_2$: C, 65.44; H, 6.71; N, 8.48%. Found: C, 65.41; H, 6.72; N, 8.50%.

1-Butyl phenylcarbamate (5d):



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} .

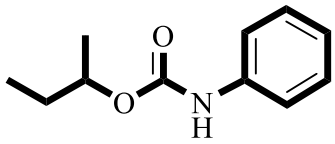
^{1}H-NMR (250 MHz, $CDCl_3$):δ = 7.25 (m, 4H), 6.98 (m, 1H), 6.58 (s, br, 1H, NH), 4.01 (t, J = 7.5 Hz, 2H), 1.59 (m, 2H), 1.30 (m, 2H), 0.88 (t, J = 7.5 Hz, 3H) ppm.

^{13}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 $C_{11}H_{15}NO_2$: C, 68.37; H, 7.82; N, 7.25%. Found: C, 68.34; H, 7.83; N, 7.26%.

2-Butyl phenylcarbamate (5e):



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} .

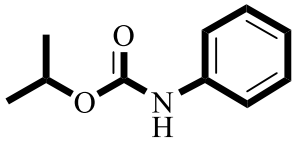
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 7.23 (m, 4H), 6.95 (m, 1H), 6.62 (s, br, 1H, NH), 4.66 (sex, J = 3.75 Hz, 1H), 1.84 (m, 2H), 1.67 (d, J = 7.5 Hz, 3H), 1.32 (t, J = 7.5 Hz, 3H) ppm.

^{13}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 $C_{11}H_{15}NO_2$: C, 68.37; H, 7.82; N, 7.25%. Found: C, 68.33; H, 7.83; N, 7.27%.

2-Propyl phenylcarbamate (5f):



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} .

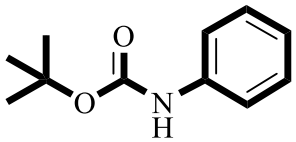
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 7.20 (m, 4H), 6.97 (m, 1H), 6.55 (s, br, 1H, NH), 4.96 (q, J = 7.5 Hz, 1H), 1.22 (d, J = 7.5 Hz, 6H) ppm.

^{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%.

***tert*-Butyl phenylcarbamate (5g):**



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}.

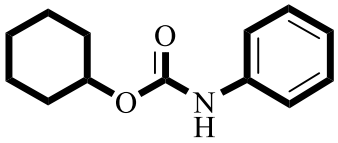
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 7.26 (m, 4H), 6.95 (m, 1H), 6.42 (s, br, 1H, NH), 1.45 (s, 9H) ppm.

^{13}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 $C_{11}H_{15}NO_2$: C, 68.37; H, 7.82; N, 7.25%. Found: C, 68.34; H, 7.83; N, 7.26%.

Cyclohexyl phenylcarbamate (5h):



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}.

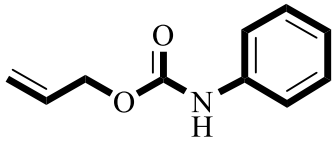
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 7.24 (m, 4H), 6.96 (m, 1H), 6.62 (s, br, 1H, NH), 4.77 (qunt, J = 5.5 Hz, 1H), 1.41-1.66 (m, 2H), 1.19 (m, 4H), 0.86 (m, 4H) ppm.

^{13}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 $C_{11}H_{21}NO_2$: C, 66.29; H, 10.62; N, 7.03%. Found: C, 66.25; H, 10.63; N, 7.07%.

Allyl phenylcarbamate (5i):



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} .

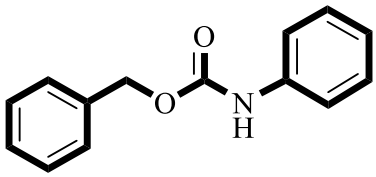
^{1}H-NMR (250 MHz, $CDCl_3$):δ= 7.31-7.21 (m, 4H), 6.95-6.91 (m, 1H), 6.45 (s, br, 1H, NH), 5.86-5.74 (m, 1H), 5.15 (d, J = 8 Hz, 1H), 5.01 (d, J = 8 Hz, 1H), 3.40 (d, J = 7.5 Hz, 2H) ppm.

^{13}C-NMR (63 MHz, $CDCl_3$):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 $C_{10}H_{11}NO_2$: C, 67.78; H, 6.26; N, 7.90%. Found: C, 67.75; H, 6.23; N, 7.94%.

Benzyl phenylcarbamate (5j):



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}.

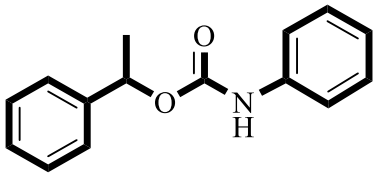
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 7.09-7.38 (m, 9H), 7.02 (m, 1H), 6.84 (s, br, 1H, NH), 5.16 (s, 2H) ppm.

^{13}C-NMR (63 MHz, $CDCl_3$): 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 $C_{14}H_{13}NO_2$: C, 73.99; H, 5.77; N, 6.16%. Found: C, 73.93; H, 5.74; N, 6.22%.

1-phenylethyl phenylcarbamate (5k):



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}.

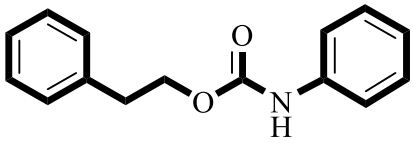
^{1}H-NMR (250 MHz, $CDCl_3$):δ= 7.65-7.61 (m, 5H), 7.28-7.16 (m, 4H), 6.98-6.96 (m, 1H), 6.55 (s, br, 1H, NH), 4.62 (q, J = 7.5 Hz, 1H), 1.40 (d, J = 7.5 Hz, 3H) ppm.

^{13}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 $C_{15}H_{15}NO_2$: C, 64.67; H, 6.27; N, 5.81%. Found: C, 64.63; H, 6.24; N, 5.89%.

2-phenylethyl phenylcarbamate (5l):



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} .

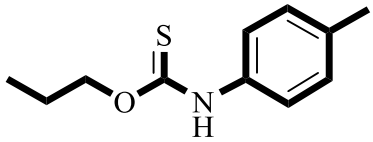
^{1}H-NMR (250 MHz, $CDCl_3$):δ= 7.55-7.50 (m, 5H), 7.10-7.32 (m, 4H), 6.99-6.96 (m, 1H), 6.55 (s, br, 1H, NH), 4.01 (t, J = 7.5 Hz, 2H), 2.83 (t, J = 7.5 Hz, 3H) ppm.

^{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%.

***O*-Propyl (4-methylphenyl)thiocarbamate (4m):**



White crystal; mp 47-49 °C.

IR (KBr); 3332 (vs), 3081 (w), 3040 (w), 2969 (s), 2937 (w), 2878 (w), 1648 (vs), 1611 (m), 1483 (w), 1459 (w), 1364 (s), 1282 (vw), 1220 (s), 1177 (s), 1112 (m), 1032 (m), 984 (m), 670 (s), 946 (w), 872 (vw), 836 (m), 790 (w), 774 (s), 746 (s), 710 (m), 680 (m), 600 (s), 527 (m) cm^{-1}.

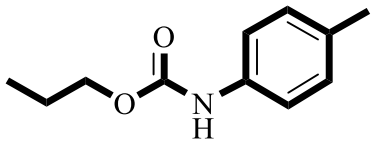
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 8.38 (s, br, 1H, NH), 7.16 (d, J = 7.5 Hz, 2H), 7.02 (d, J = 7.5 Hz, 2H), 1.73 (sextuplet, J = 7.5 Hz, 2H), 0.99 (t, J = 7.5 Hz, 3H) ppm.

^{13}C-NMR (63 MHz, $CDCl_3$): δ =191.1, 136.4, 129.8, 127.7, 119.8, 70.7, 28.7, 22.3, 10.4 ppm.

MS Calcd *m/z* 209.31, Found 209.

Anal. Calcd for $C_{11}H_{15}NOS$: C, 63.12; H, 7.22; N, 6.69; S, 15.32%. Found: C, 63.03; H, 7.16; N, 6.78; S, 15.24%.

Propyl (4-methylphenyl)carbamate (5m):



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}.

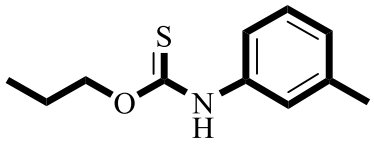
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 7.18 (d, J = 7.5 Hz, 2H), 7.02 (d, J = 7.5 Hz, 2H), 6.62 (s, br, 1H, NH), 4.03 (t, J = 7.5 Hz, 2H), 2.21 (s, 3H), 1.61 (sextuplet, J = 7.5 Hz, 2H), 0.88 (t, J = 7.5 Hz, 3H) ppm.

^{13}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 $C_{11}H_{15}NO_2$: C, 68.37; H, 7.82; N, 7.25%. Found: C, 68.31; H, 7.78; N, 7.32%.

***O*-Propyl (3-methylphenyl)thiocarbamate (4n):**



White crystal; mp 43-44 °C.

IR (KBr); 3389 (vs), 3168 (w), 3032 (w), 2966 (s), 2926 (m), 2872 (m), 1650 (vs), 1616 (m), 1376 (s), 1345 (m), 1280 (m), 1247 (vs), 1155 (s), 1096 (s), 1060 (m), 1016 (s), 987 (m), 948 (vw), 912 (m), 889 (vw), 868 (w), 816 (m), 775 (m), 690 (m), 602 (m), 574 (m), 548 (vw), 494 (vw), 420 (vw) cm^{-1}.

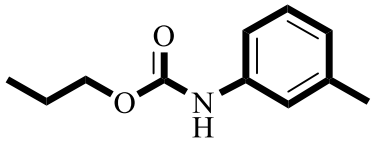
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 8.40 (s, br, 1H, NH), 7.34-7.27 (m, 1H), 7.09 (d, J = 7.5 Hz, 2H), 7.01-6.96 (m, 2H), 4.19 (t, J = 7.5 Hz, 2H), 2.18 (s, 3H), 1.59 (sextuplet, J = 7.5 Hz, 2H), 0.85 (t, J = 7.5 Hz, 3H) ppm.

^{13}C-NMR (63 MHz, $CDCl_3$): δ =188.4, 139.6, 131.8, 129.1, 126.5, 122.3, 118.6, 66.4, 21.3, 17.7, 11.7 ppm.

MS Calcd *m/z* 209.31, Found 209.

Anal. Calcd for $C_{11}H_{15}NOS$: C, 63.12; H, 7.22; N, 6.69; S, 15.32%. Found: C, 63.03; H, 7.18; N, 6.74; S, 15.19%.

Propyl (3-methylphenyl)carbamate (5n):



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}.

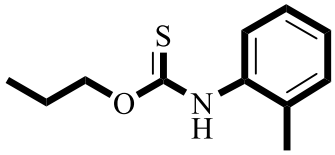
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 7.23-7.08 (m, 3H), 6.99 (d, J = 7.5 Hz, 1H), 6.85 (s, br, 1H, NH), 4.10 (t, J = 7.5 Hz, 2H), 2.30 (s, 3H), 1.68 (sextuplet, J = 7.5 Hz, 2H), 0.96 (t, J = 7.5 Hz, 3H) ppm.

^{13}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 $C_{11}H_{15}NO_2$: C, 68.37; H, 7.82; N, 7.25%. Found: C, 68.32; H, 7.77; N, 7.32%.

_O_-Propyl (2-methylphenyl)thiocarbamate (4o):



Pale yellow liquid.

IR (KBr); 3318 (s), 3140 (w), 3059 (w), 2981 (m), 2954 (m), 2882 (w), 1689 (vs), 1405 (m), 1313 (m), 1241 (s), 1205 (w), 1126 (w), 1058 (vs), 1047 (vs), 937 (w), 895 (vw), 851 (w), 783 (m), 764 (m), 698 (vs), 595 (s), 573 (s) cm^{-1}.

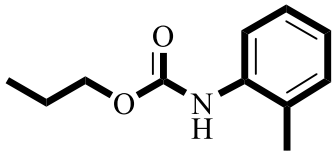
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 8.44 (s, br, 1H, NH), 7.25-7.05 (m, 4H), 4.31 (t, J = 7.5 Hz, 2H), 2.22 (s, 3H), 1.71 (sextuplet, J = 7.5 Hz, 2H), 0.98 (t, J = 7.5 Hz, 3H) ppm.

^{13}C-NMR (63 MHz, $CDCl_3$): δ =189.1, 134.8, 131.1, 128.9, 126.9, 126.0, 122.1, 64.5, 23.8, 16.0, 10.8 ppm.

MS Calcd *m/z* 209.31, Found 209.

Anal. Calcd for $C_{11}H_{15}NOS$: C, 63.12; H, 7.22; N, 6.69; S, 15.32%. Found: C, 63.03; H, 7.09; N, 6.81; S, 15.17%.

Propyl (2-methylphenyl)carbamate (5o):



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}.

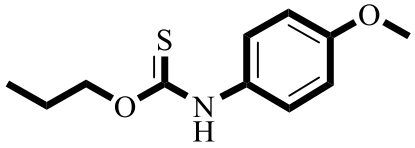
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 7.26-7.20 (m, 1H), 7.00-6.97 (m, 1H), 6.88-6.84 (m, 2H), 6.59 (s, br, 1H, NH), 4.12 (t, J = 7.5 Hz, 2H), 2.40 (s, 3H), 1.68 (sextuplet, J = 7.5 Hz, 2H), 0.96 (t, J = 7.5 Hz, 3H) ppm.

^{13}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 $C_{11}H_{15}NO_2$: C, 68.37; H, 7.82; N, 7.25%. Found: C, 68.33; H, 7.79; N, 7.29%.

***O*-Propyl (4-methoxyphenyl)thiocarbamate (4p):**



White crystal; mp 77-79 °C.

IR (KBr); 3329 (vs), 3024 (vw), 3002 (w), 2978 (m), 2920 (m), 2900 (m), 2856 (m), 1649 (vs), 1534 (s), 1504 (m), 1364 (vw), 1345 (m), 1256 (vs), 1239 (vs), 1174 (vw), 1105 (m), 1070 (m), 1029 (w), 1009 (m), 978 (w), 880 (vw), 846 (m), 785 (s), 767 (s), 746 (s), 696 (s), 578 (w), 558 (w), 530 (s), 492 (w), 419 (m) cm^{-1}.

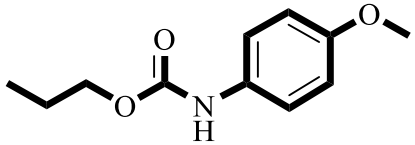
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 8.60 (s, br, 1H, NH), 7.63 (d, J = 7.5 Hz, 2H), 7.45 (d, J = 7.5 Hz, 2H), 4.19 (t, J = 7.5 Hz, 2H), 3.81 (s, 3H), 1.59 (sextuplet, J = 7.5 Hz, 2H), 0.85 (t, J = 7.5 Hz, 3H) ppm.

^{13}C-NMR (63 MHz, $CDCl_3$): δ =189.0, 133.7, 129.0, 126.9, 123.2, 73.6, 55.9, 31.9, 23.8 ppm.

MS Calcd *m/z* 225.31, Found 225.

Anal. Calcd for $C_{11}H_{15}NO_2S$: C, 58.64; H, 6.71; N, 6.22; S, 14.23%. Found: C, 58.57; H, 6.63; N, 6.29; S, 14.16%.

Propyl (4-methoxyphenyl)carbamate (5p):



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}.

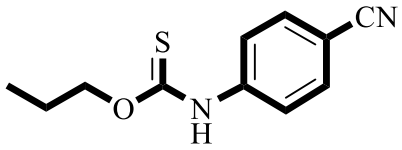
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 7.88 (d, J = 7.5 Hz, 2H), 7.45 (d, J = 7.5 Hz, 2H), 7.08 (s, br, 1H, NH), 4.10 (t, J = 7.5 Hz, 2H), 2.52 (s, 3H), 1.65 (sextuplet, J = 7.5 Hz, 2H), 0.93 (t, J = 7.5 Hz, 3H) ppm.

^{13}C-NMR (63 MHz, $CDCl_3$): δ =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 $C_{11}H_{15}NO_3$: C, 63.14; H, 7.23; N, 6.69%. Found: C, 63.13; H, 7.20; N, 6.74%.

***O*-Propyl (4-cyanophenyl)thiocarbamate (4q):**



White crystal; mp 101-103°C.

IR (KBr); 3394 (vs), 3168 (vw), 3059 (m), 3029 (m), 2930 (m), 2863 (m), 2226 (vs), 1656 (vs), 1599 (s), 1512 (m), 1497 (m), 1452 (vs), 1391 (vs), 1358 (m), 1313 (vw), 1272 (vw), 1258 (vs), 1179 (vs), 1142 (vw), 1120 (m), 1093 (m), 1018 (vs), 1005 (m), 960 (w), 948 (vw), 917 (w), 871 (w), 839 (vs), 819 (vs), 745 (vs), 696 (vs), 622 (w), 526 (vw), 479 (m), 459 (m) cm^{-1}.

^{1}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.

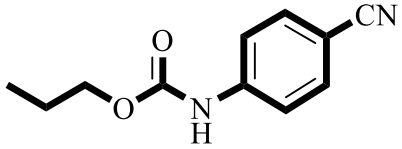
^{13}C-NMR (63 MHz, $CDCl_3$): δ = 188.1, 135.5, 129.5, 126.7, 118.8, 106.0, 68.5, 20.7, 11.0 ppm.

MS Calcd *m/z* 220.29, Found 220.

Anal. Calcd for $C_{11}H_{12}N_2OS$: C, 52.98; H, 5.49; N, 12.72; S, 14.55%. Found: C, 52.92; H, 5.43; N, 12.81; S, 14.41%.

M+-[CH2=CHCH3, SH], 55), 118 (M+-[C4H6OS], 100), 102 (C6H4CN, 46

Propyl (4-cyanophenyl)carbamate (5q):



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}.

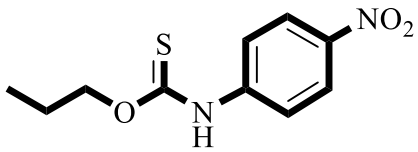
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 7.59 (d, J = 10 Hz, 2H), 7.50 (d, J = 10 Hz, 2H), 6.83 (s, br, 1H, NH), 4.15 (t, J = 7.5 Hz, 2H), 1.71 (sextuplet, J = 7.5 Hz, 2H), 0.98 (t, J = 7.5 Hz, 3H) ppm.

^{13}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 $C_{11}H_{12}N_2O_4$: C, 64.69; H, 5.92; N, 13.72%. Found: C, 64.62; H, 5.84; N, 13.84%.

***O*-Propyl (4-nitrophenyl)thiocarbamate (4r):**



Pale yellow crystal; mp 133-135°C.

IR (KBr); 3311 (vs), 3024 (w), 3002 (vw), 2978 (m), 2920 (m), 2900 (m), 2856 (m), 2764 (w), 1664 (vs), 1608 (s), 1471 (vs), 1430 (vs), 1376 (w), 1366 (w), 1296 (s), 1273 (s), 1209 (m), 1160 (m), 1108 (vs), 1068 (m), 1019 (m), 987 (s), 924 (w), 853 (m), 766 (s), 712 (m), 636 (w), 574 (m), 539 (m), 414 (w) cm^{-1}.

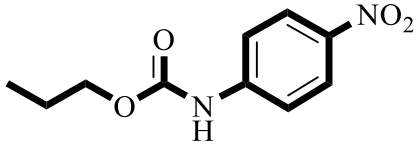
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 8.64 (s, br, 1H, NH), 8.19 (d, J = 7.5 Hz, 2H), 7.55 (d, J = 7.5 Hz, 2H), 4.25 (t, J = 7.5 Hz, 2H), 1.66 (sextuplet, J = 7.5 Hz, 2H), 0.92 (t, J = 7.5 Hz, 3H) ppm.

^{13}C-NMR (63 MHz, $CDCl_3$): δ = 190.0, 143.9, 131.0, 125.1, 117.7, 72.6, 30.5, 10.3 ppm.

MS Calcd *m/z* 240.28, Found 240.

Anal. Calcd for $C_{10}H_{12}N_2O_3S$: C, 49.99; H, 5.03; N, 11.66; S, 13.34%. Found: C, 49.93; H, 4.94; N, 11.75; S, 13.29%.

Propyl (4-nitrophenyl)carbamate (5r):



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}.

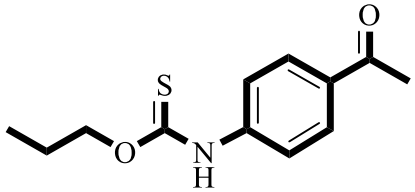
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 8.12 (d, J = 7.5 Hz, 2H), 7.50 (d, J = 7.5 Hz, 2H), 7.07 (s, br, 1H, NH), 4.09 (t, J = 7.5 Hz, 2H), 1.64 (sextuplet, J = 7.5 Hz, 2H), 0.90 (t, J = 7.5 Hz, 3H) ppm.

^{13}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 $C_{10}H_{12}N_2O_4$: C, 53.57; H, 5.39; N, 12.49%. Found: C, 53.52; H, 5.34; N, 12.54%.

***O*-Propyl (4-acetylphenyl)thiocarbamate (4s):**



White crystal; mp 128-130 °C.

IR (KBr); 3344 (s), 3263 (m), 3208 (m), 2954 (s), 2873 (m), 1733 (vs), 1688 (s), 1612 (m), 1444 (w), 1408 (s), 1378 (m), 1341 (s), 1316 (m), 1260 (w), 1184 (m), 1158 (w), 1048 (vs), 985 (vw), 916 (m), 980 (vw), 842 (w), 787 (m), 706 (m), 570 (vs), 488 (w) cm^{-1}.

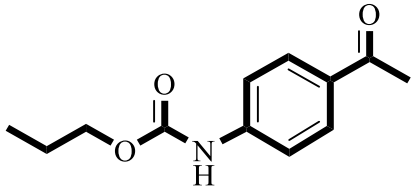
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 8.32 (s, br, 1H, NH), 7.92 (d, J = 7.5 Hz, 2H), 7.48 (d, J = 7.5 Hz, 2H), 4.27 (t, J = 7.5 Hz, 2H), 2.10 (s, 3H), 1.67 (sextuplet, J = 7.5 Hz, 2H), 0.93 (t, J = 7.5 Hz, 3H) ppm.

^{13}C-NMR (63 MHz, $CDCl_3$): δ = 200.5, 190.2, 142.5, 130.9, 129.9, 117.5, 70.2, 31.4, 27.2, 10.3 ppm.

MS Calcd *m/z* 237.32, Found 237.

Anal. Calcd for $C_{12}H_{15}NO_2S$: C, 60.73; H, 6.37; N, 5.90; S, 13.51%. Found: C, 60.62; H, 6.31; N, 5.98; S, 13.46%.

Propyl (4-acetylphenyl)carbamate (5s):



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}.

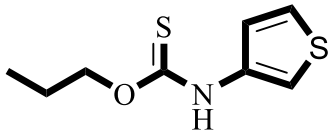
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 7.85 (d, J = 7.5 Hz, 2H), 7.43 (d, J = 7.5 Hz, 2H), 6.95 (s,br, 1H, NH), 4.08 (t, J = 7.5 Hz, 2H), 2.50 (s, 3H), 1.63 (sextuplet, J = 7.5 Hz, 2H), 0.91 (t, J = 7.5 Hz, 3H) ppm.

^{13}C-NMR (63 MHz, $CDCl_3$): δ = 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 $C_{12}H_{15}NO_3$: C, 65.14; H, 6.83; N, 6.33%. Found: C, 65.10; H, 6.80; N, 6.39%.

***O*-Propyl (thiophen-3-yl)thiocarbamate (4t):**



White crystal; mp 83-85 °C.

IR (KBr); 3374 (vs), 3182 (vw), 3072 (w), 2985 (m), 2870 (w), 2827 (w), 1672 (vs), 1599 (s), 1479 (m), 1360 (s), 1262 (m), 1218 (vs), 1156 (w), 1065 (m), 1032 (w), 968 (vs), 910 (vw), 832 (w), 766 (vs), 736 (s), 686 (m), 568 (m), 532 (m), 478 (m) cm^{-1}.

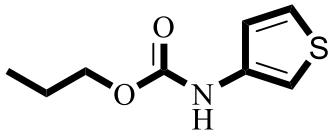
^{1}H-NMR (250 MHz, $CDCl_3$):δ = 8.44 (s, br, 1H, NH), 7.14 (d, J = 5.5 Hz, 1H), 6.86 (d, J = 5.5 Hz, 2H), 4.24 (t, J = 7.5 Hz, 2H), 1.63 (sextuplet, J = 7.5 Hz, 2H), 0.90 (t, J = 7.5 Hz, 3H).

^{13}C-NMR (63 MHz, $CDCl_3$): δ = 191.3, 144.8, 124.1, 121.5, 106.3, 69.3, 30.2, 13.5.

MS Calcd *m/z* 201.03, Found 201.

Anal. Calcd for $C_8H_{11}NOS_2$: C, 47.73; H, 5.51; N, 6.96; S, 31.85%. Found: C, 47.64; H, 5.46; N, 7.06; S, 32.03%.

Propyl (thiophen-3-yl)carbamate (5t):



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}.

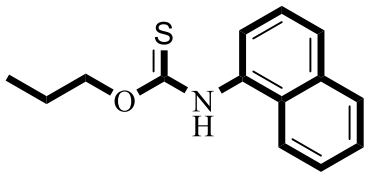
^{1}H-NMR (250 MHz, $CDCl_3$):δ = 7.14 (d, J = 5.5 Hz, 1H), 6.87 (d, J = 5.5 Hz, 2H), 6.53 (s, br, 1H, NH), 4.06 (t, J = 7.5 Hz, 2H), 1.62 (sextuplet, J = 7.5 Hz, 2H), 0.89 (t, J = 7.5 Hz, 3H).

^{13}C-NMR (63 MHz, $CDCl_3$): δ =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 $C_8H_{11}NO_2S$: 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%.

***O*-Propyl (naphthalene-1-yl)thiocarbamate (4u):**



White crystal; mp 89-90°C.

IR (KBr); 3369 (s), 3130 (w), 3042 (w), 2965 (m), 2915 (w), 2849 (w), 1644 (vs), 1578 (m), 1496 (w), 1485 (w), 1412 (vs), 1343 (vs), 1240 (s), 1102 (w), 1079 (vs), 1046 (s), 978 (w), 907 (w), 840 (w), 797 (vw), 752 (s), 702 (vs), 645 (m), 570 (m), 497 (m), 426 (w) cm^{-1}.

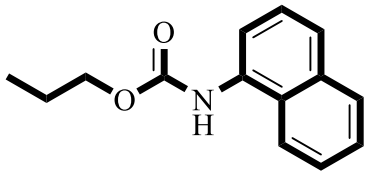
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 8.40 (s, br, 1H, NH), 7.53 (d, J = 7.5 Hz, 2H), 7.24 (t, J = 7.5 Hz, 2H), 7.02 (d, J = 7.5 Hz, 1H), 6.85-6.68 (m, 3H), 4.19 (t, J = 7.5 Hz, 2H), 1.58 (sextuplet, J = 7.5 Hz, 2H), 0.85 (t, J = 7.5 Hz, 3H) ppm.

^{13}C-NMR (63 MHz, $CDCl_3$): δ = 190.4, 143.2, 138.6, 134.3, 128.7, 126.2, 123.1, 119.8, 118.7, 117.0, 113.8, 66.8, 22.7, 10.3 ppm.

MS Calcd *m/z* 245.34, Found 245.

Anal. Calcd for $C_{14}H_{15}NOS$: C, 68.54; H, 6.16; N, 5.71; S, 13.07%. Found: C, 68.47; H, 6.11; N, 5.83; S, 12.96%.

Propyl (naphthalene-1-yl)carbamate (5u):



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}.

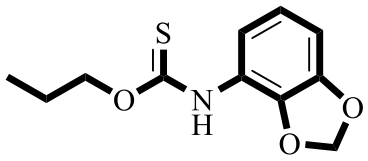
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 7.34-7.81 (m, 7H), 6.90 (s, br, 1H, NH), 4.09 (t, J = 7.5 Hz, 2H), 1.63 (sextuplet, J = 7.5 Hz, 2H), 0.90 (t, J = 7.5 Hz, 3H) ppm.

^{13}C-NMR (63 MHz, $CDCl_3$): δ = 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 $C_{14}H_{15}NO_2$: C, 73.34; H, 6.59; N, 6.11%. Found: C, 73.31; H, 6.54; N, 6.19%.

***O*-Propyl (benzo[*d*][1,3]dioxol-5-yl)thiocarbamate (4v)**



White crystal; mp 87-88 °C.

IR (KBr); 3340 (vs), 3058 (m), 3042 (m), 2930 (m), 2881 (w), 1672 (vs), 1598 (s), 1578 (vw), 1540 (vs), 1492 (w), 1458 (w), 1447 (s), 1500 (vw), 1374 (w), 1315 (s), 1299 (m), 1242 (vs),

1180 (w), 1121 (vw), 1081 (vw), 1084 (s), 1067 (s), 1030 (w), 1015 (w), 945 (vw), 899 (w), 846 (m), 809 (vs), 764 (s), 742 (s), 690 (s), 656 (m), 608 (m), 497 (s), 458 (w) cm^{-1}.

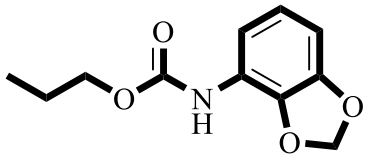
^{1}H-NMR (250 MHz, $CDCl_3$):δ = 8.57 (s, br, 1H, NH), 7.33 (m, 3H), 5.15 (s, 2H), 4.19 (t, J = 7.5 Hz, 2H), 1.59 (sextuplet, J = 7.5 Hz, 2H), 0.85 (t, J = 7.5 Hz, 3H) ppm.

^{13}C-NMR (63 MHz, $CDCl_3$): δ = 189.0, 133.0, 129.5, 128.5, 126.7, 118.9, 66.9, 20.7, 11.0 ppm.

MS Calcd *m/z* 239.23, Found 239.

Anal. Calcd for $C_{11}H_{13}NO_3S$: C, 55.21; H, 5.48; N, 5.85; S, 13.40%. Found: C, 55.14; H, 5.42; N, 5.96; S, 13.32%.

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



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}.

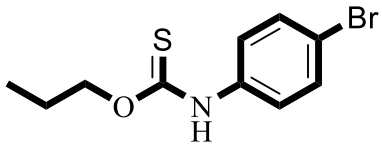
^{1}H-NMR (250 MHz, $CDCl_3$):δ = 7.08 (s, br, 1H, NH), 6.70 (m, 3H), 5.92 (s, 2H), 4.10 (t, J = 7.5 Hz, 2H), 1.67 (sextuplet, J = 7.5 Hz, 2H), 0.96 (t, J = 7.5 Hz, 3H) ppm.

^{13}C-NMR (63 MHz, $CDCl_3$): δ = 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 $C_{11}H_{13}NO_4$: C, 59.19; H, 5.87; N, 6.27%. Found: C, 59.15; H, 5.83; N, 6.33%.

***O*-Propyl (4-bromophenyl)thiocarbamate (4w)**



White crystal; mp 58-60°C.

IR (KBr); 3406 (s), 3174 (m), 3075 (w), 2970 (m), 2984 (w), 1644 (vs), 1611 (m), 1578 (w), 1470 (s), 1418 (vw), 1388 (w), 1365 (vw), 1320 (s), 1265 (w), 1172 (w), 1110 (w), 1090 (w), 1064 (m), 1010 (s), 968 (vw), 850 (vw), 833 (w), 819 (s), 730 (vw), 710 (w), 687 (s), 610 (m), 545 (s), 498 (w), 473 (w), 460 (m) cm^{-1}.

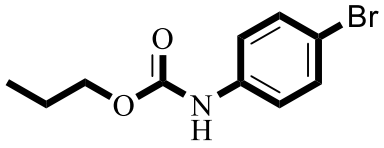
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 8.54 (s, br, 1H, NH), 7.33 (d, J = 7.5 Hz, 2H), 7.08 (d, J = 7.5 Hz, 2H), 4.19 (t, J = 7.5 Hz, 2H), 1.59 (sextuplet, J = 7.5 Hz, 2H), 0.86 (t, J = 7.5 Hz, 3H) ppm.

^{13}C-NMR (63 MHz, $CDCl_3$): δ = 190.8, 141.6, 132.4, 130.9, 128.8, 68.1, 30.3, 10.9 ppm.

MS Calcd *m/z* 274.18, Found 273.

Anal. Calcd for $C_{10}H_{12}BrNOS$: C, 43.81; H, 4.41; N, 5.11, S, 11.69%. Found: C, 43.72; H, 4.35; N, 5.19, S, 11.57%.

Propyl (4-bromophenyl)carbamate (5w)



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}.

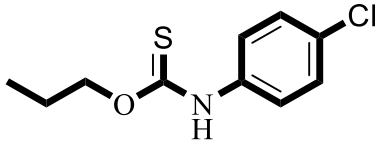
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 7.39 (d, J = 7.5 Hz, 2H), 7.28 (d, J = 7.5 Hz, 2H), 6.76 (s, br, 1H, NH), 4.12 (t, J = 7.5 Hz, 2H), 1.69 (sextuplet, J = 7.5 Hz, 2H), 0.96 (t, J = 7.5 Hz, 3H) ppm.

^{13}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 $C_{10}H_{12}BrNO_2$: C, 46.53; H, 4.69; N, 5.43%. Found: C, 46.50; H, 4.65; N, 5.49%.

***O*-Propyl (4-chlorophenyl)thiocarbamate (4x)**



White crystal; mp 51-53°C.

IR (KBr); 3376 (vs), 3078 (vw), 2948 (w), 2924 (m), 2860 (w), 1618 (vs), 1474 (s), 1458 (m), 1442 (vs), 1285 (m), 1260 (s), 1223 (vs), 1166 (vw), 1093 (vw), 1064 (vs), 1034 (w), 1017 (vs), 974 (w), 871 (m), 856 (m), 767 (s), 728 (s), 717 (m), 670 (w), 633 (vw), 617 (w), 560 (m), 494 (w), 426 (vw) cm^{-1}.

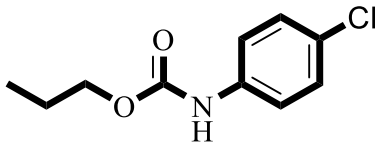
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 8.43 (s, br, 1H, NH), 7.54 (d, J = 8 Hz, 2H), 7.07 (d, J = 9 Hz, 2H), 4.25 (t, J = 7.5 Hz, 2H), 1.66 (sextuplet, J = 7.5 Hz, 2H), 0.92 (t, J = 7.5 Hz, 3H) ppm.

^{13}C-NMR (63 MHz, $CDCl_3$): δ = 189.1, 138.0, 129.0, 123.3, 118.7, 70.5, 31.0, 11.0 ppm.

MS Calcd *m/z* 229.73, Found 229.

Anal. Calcd for $C_{10}H_{12}ClNOS$: C, 52.28; H, 5.27; N, 6.10; S, 13.96%. Found: C, 52.22; H, 5.21; N, 6.19; S, 13.86%.

Propyl (4-chlorophenyl)carbamate (5x)



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}.

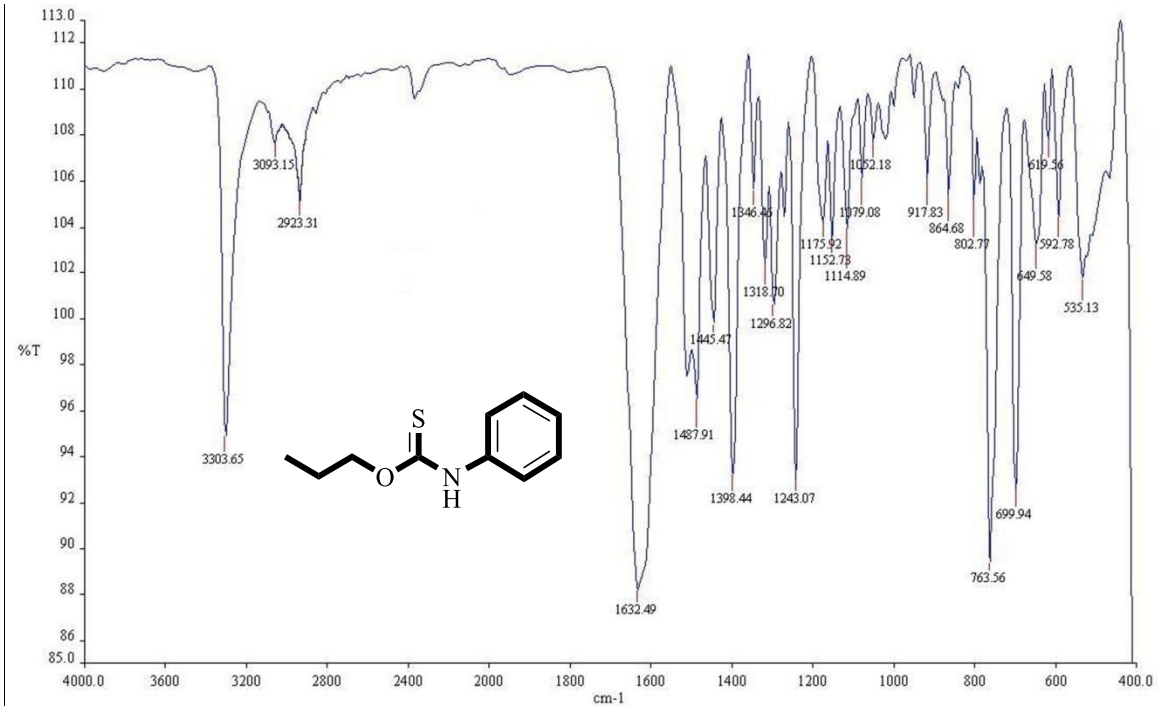
^{1}H-NMR (250 MHz, $CDCl_3$): δ = 7.26 (d, J = 9 Hz, 2H), 7.18 (d, J = 9 Hz, 2H), 6.63 (s, br, 1H, NH), 4.05 (t, J = 7.5 Hz, 2H), 1.62 (sextuplet, J = 7.5 Hz, 2H), 0.90 (t, J = 7.5 Hz, 3H) ppm.

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

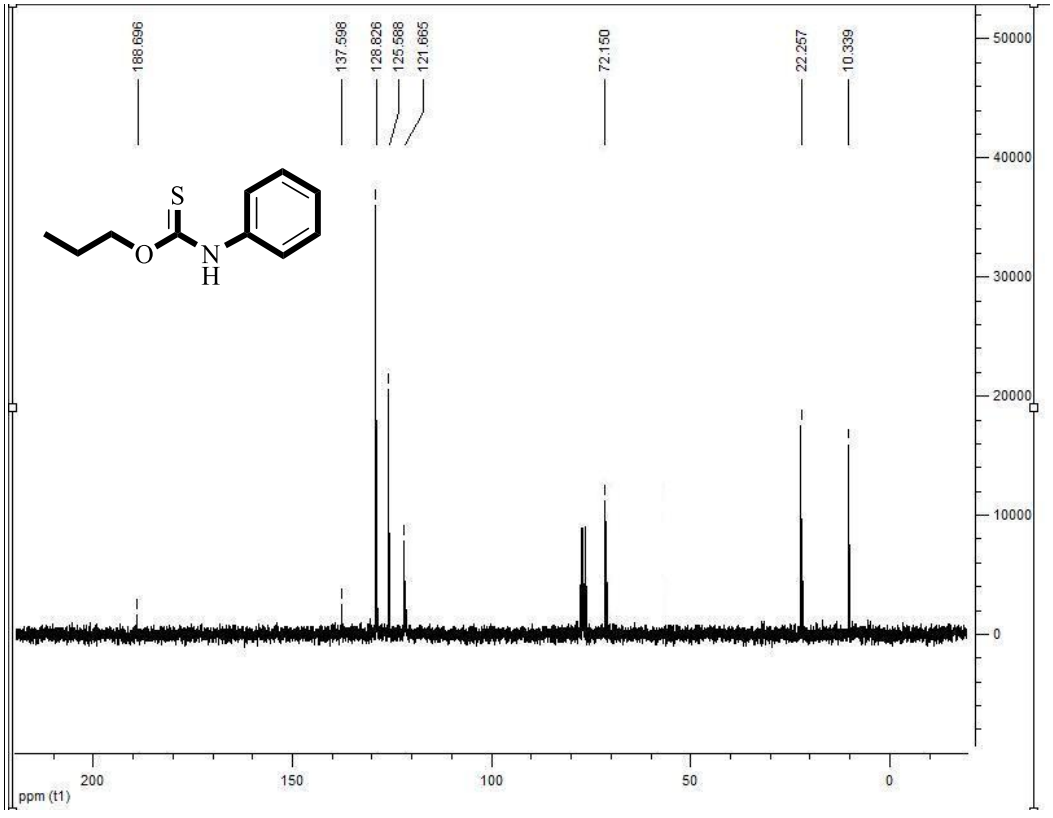
MS Calcd *m/z* 213.66, Found 213.

Anal. Calcd for $C_{10}H_{12}ClNO_2$: C, 56.22; H, 5.66; N, 6.56%. Found: C, 56.17; H, 5.61; N, 6.63%.

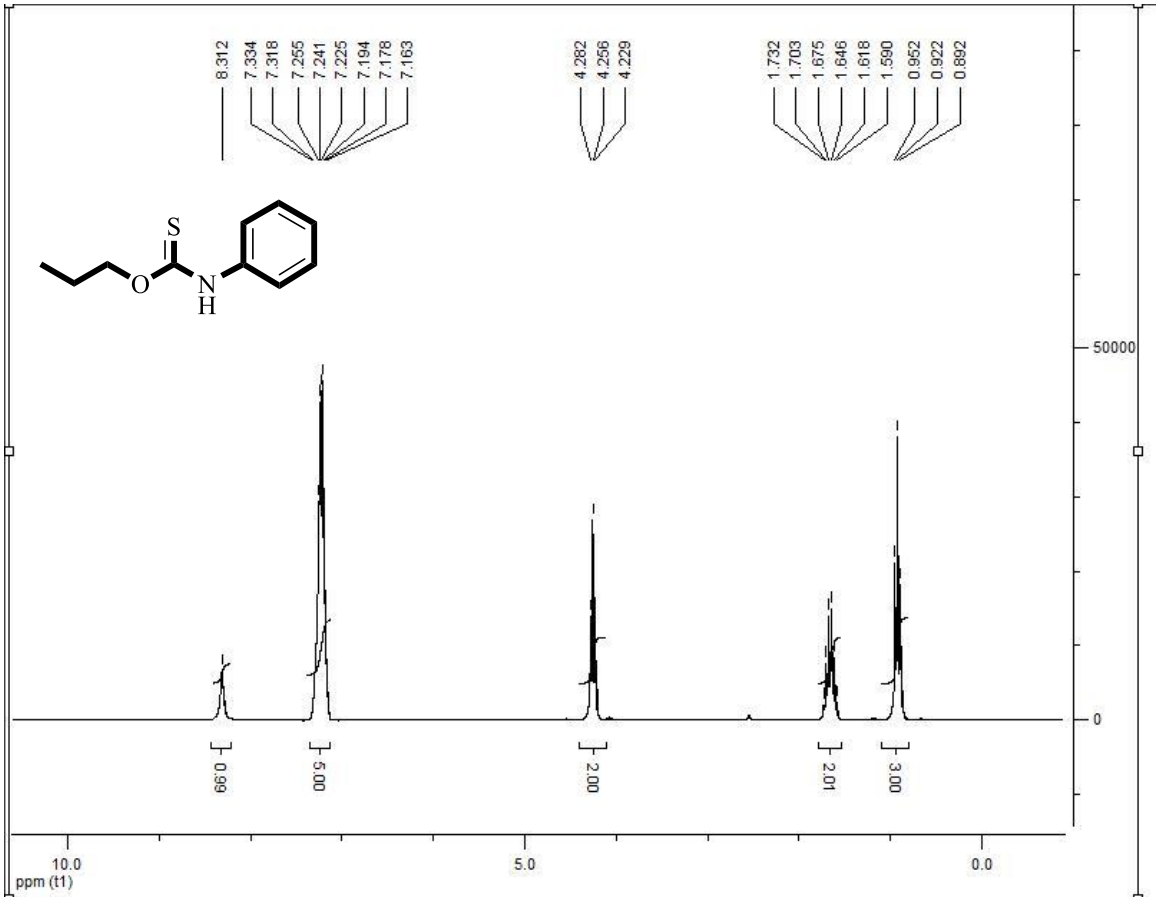
C. Scanned Spectra of Compounds



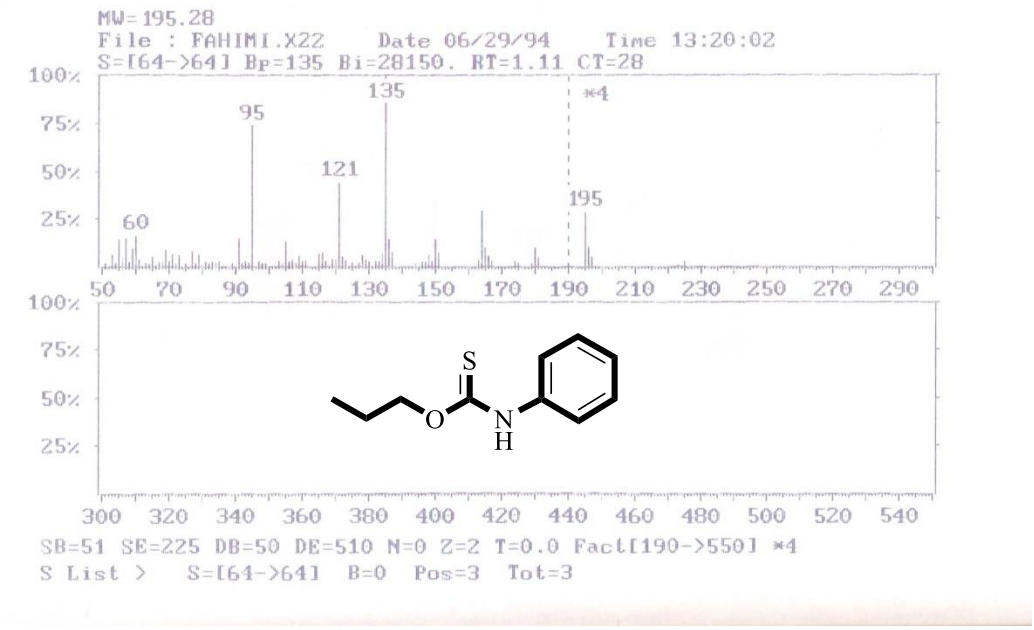
FT-IR spectra of o-propyl phenylthiocarbamate (**4a**) in KBr.



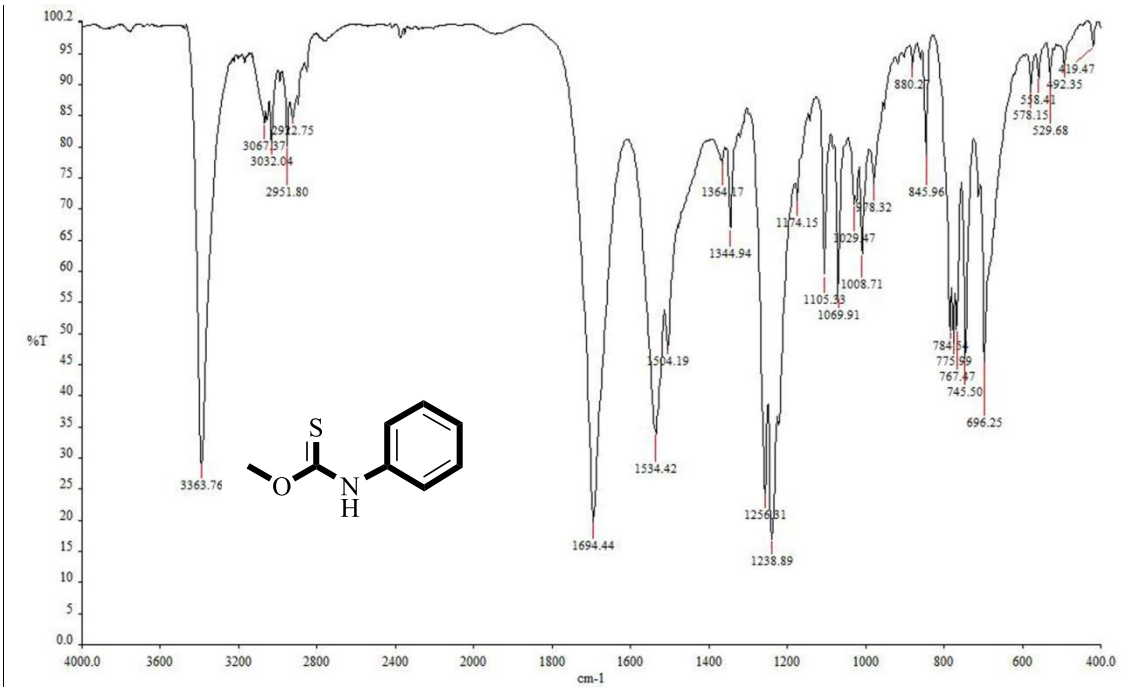
^{13}C-NMR spectra (63 MHz) of o-propyl phenylthiocarbamate (**4a**) in $CDCl_3$.



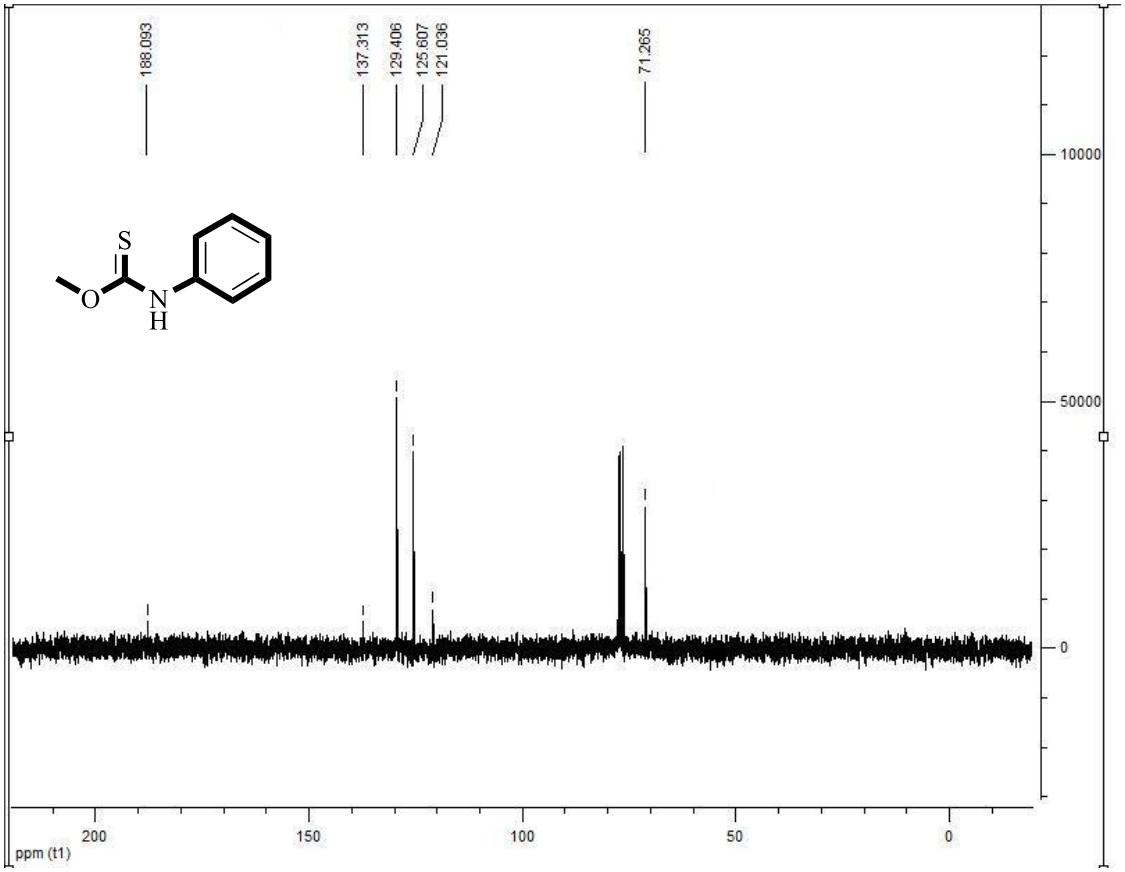
^{1}H-NMR spectra (250 MHz) of o-propyl phenylthiocarbamate (**4a**) in $CDCl_3$.



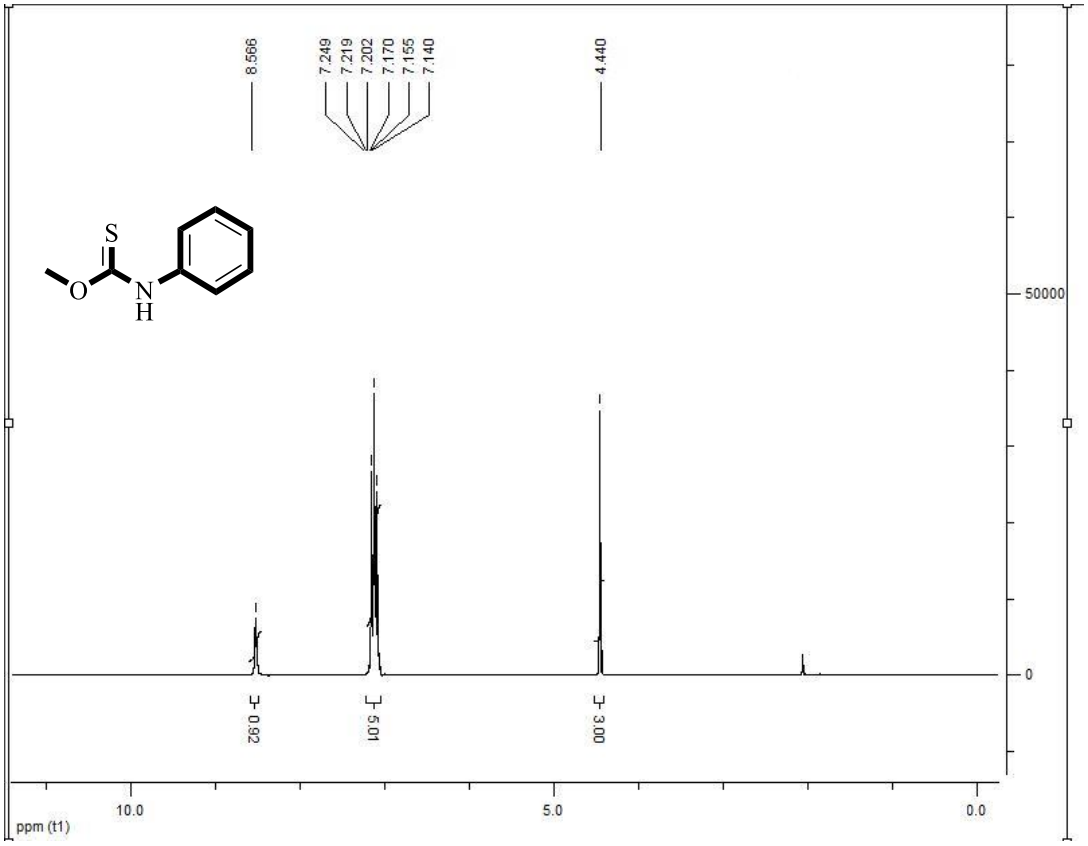
MS of o-propyl phenylthiocarbamate (**4a**).



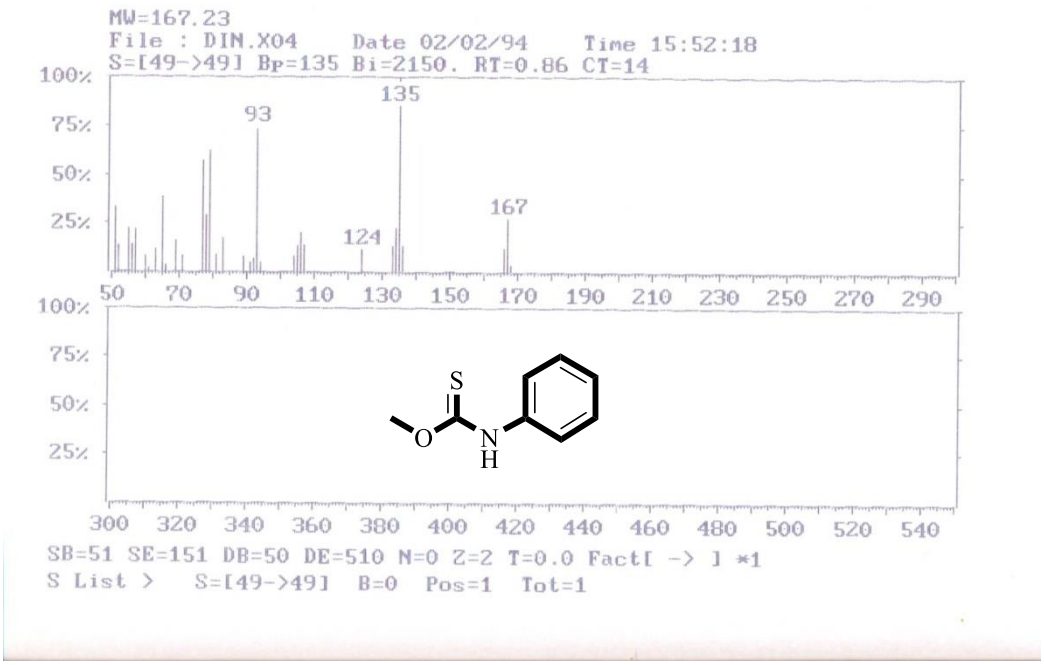
FT-IR spectra of o-methyl phenylthiocarbamate (**4b**) in KBr.



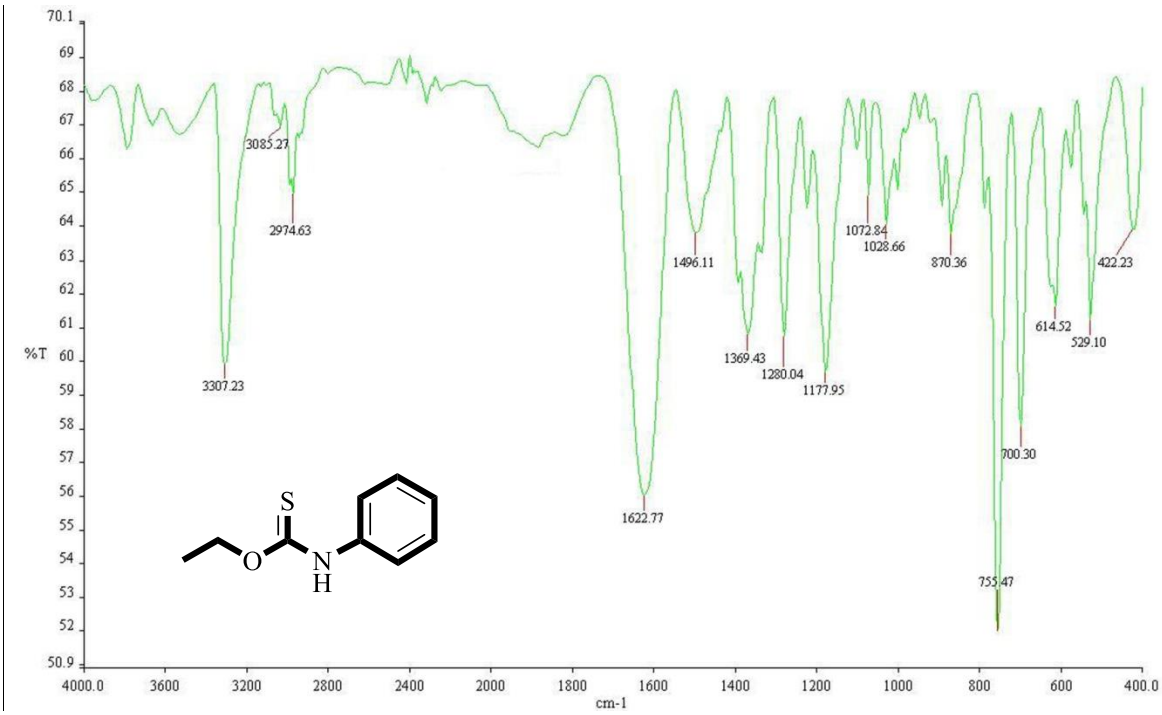
^{13}C-NMR spectra (63 MHz) of o-methyl phenylthiocarbamate (**4b**) in $CDCl_3$.



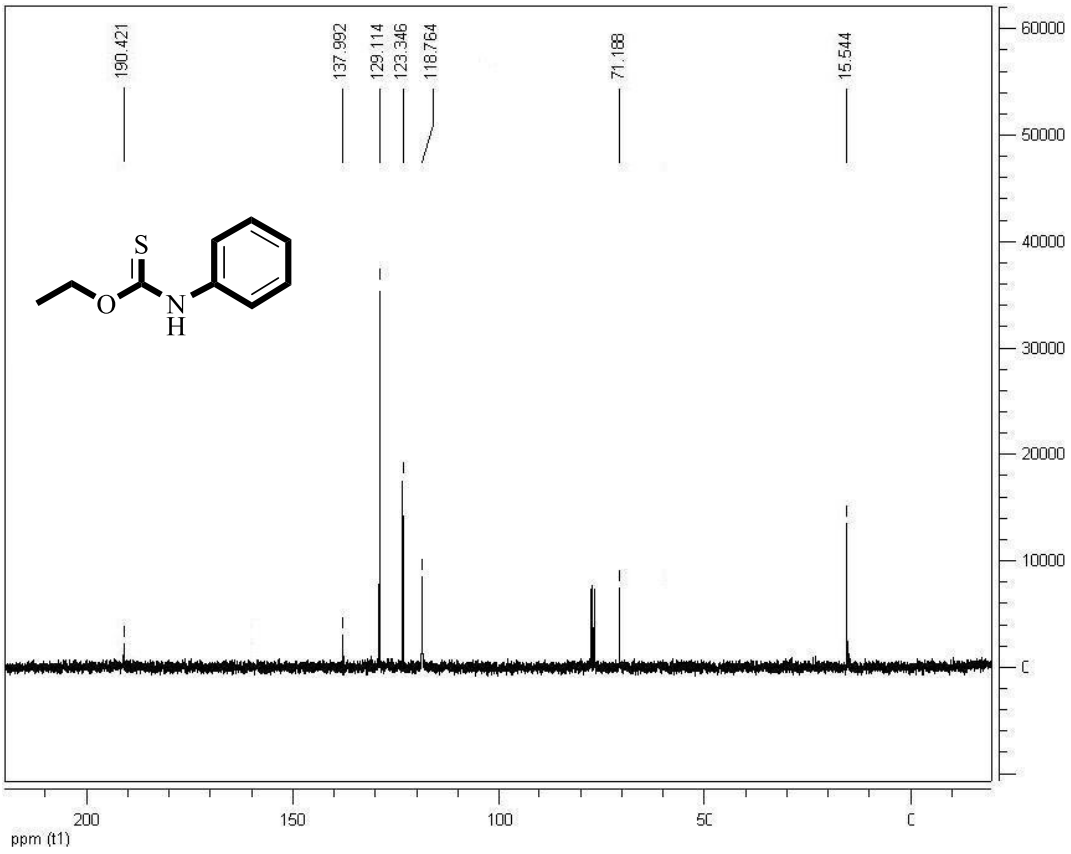
^{1}H-NMR spectra (250 MHz) of o-methyl phenylthiocarbamate (**4b**) in $CDCl_3$.



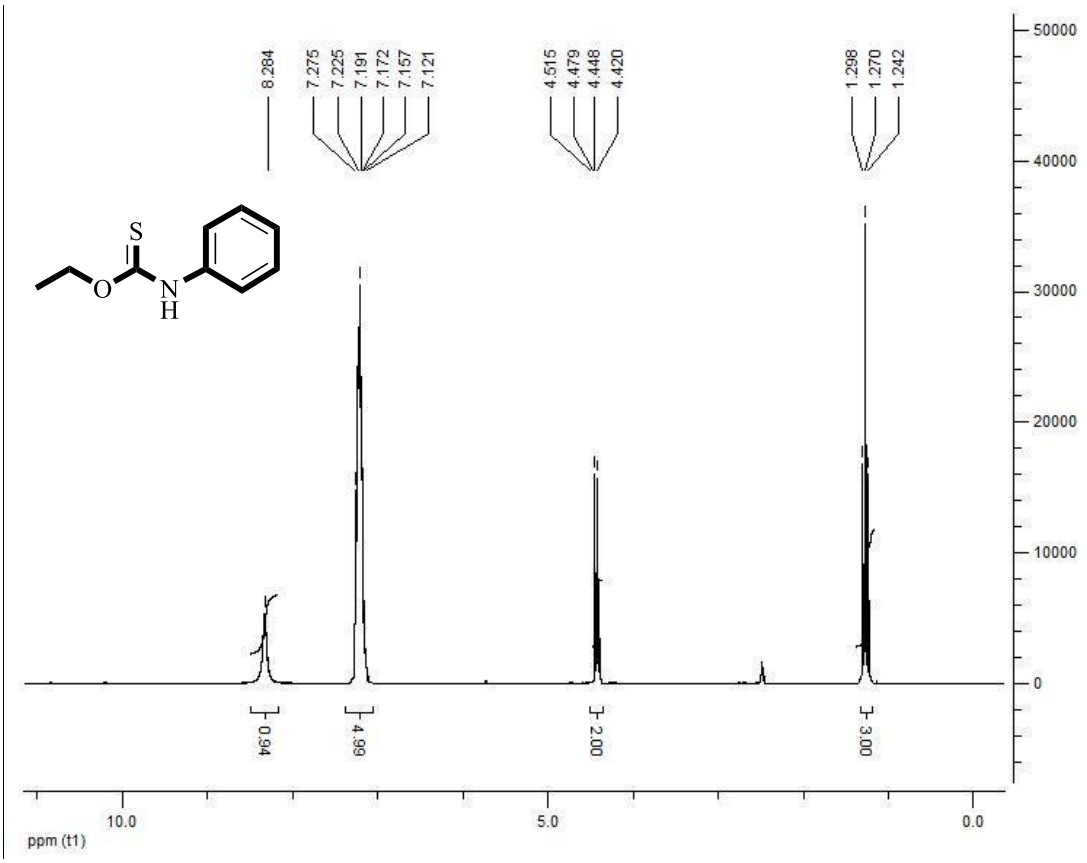
MS of o-methyl phenylthiocarbamate (**4b**).



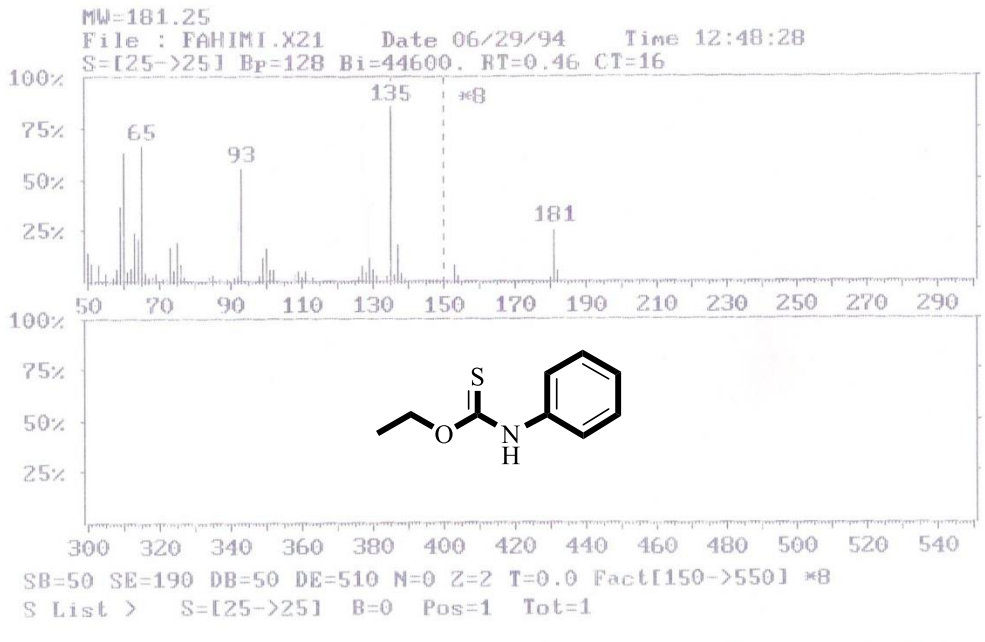
FT-IR spectra of o-ethyl phenylthiocarbamate (**4c**) in KBr.



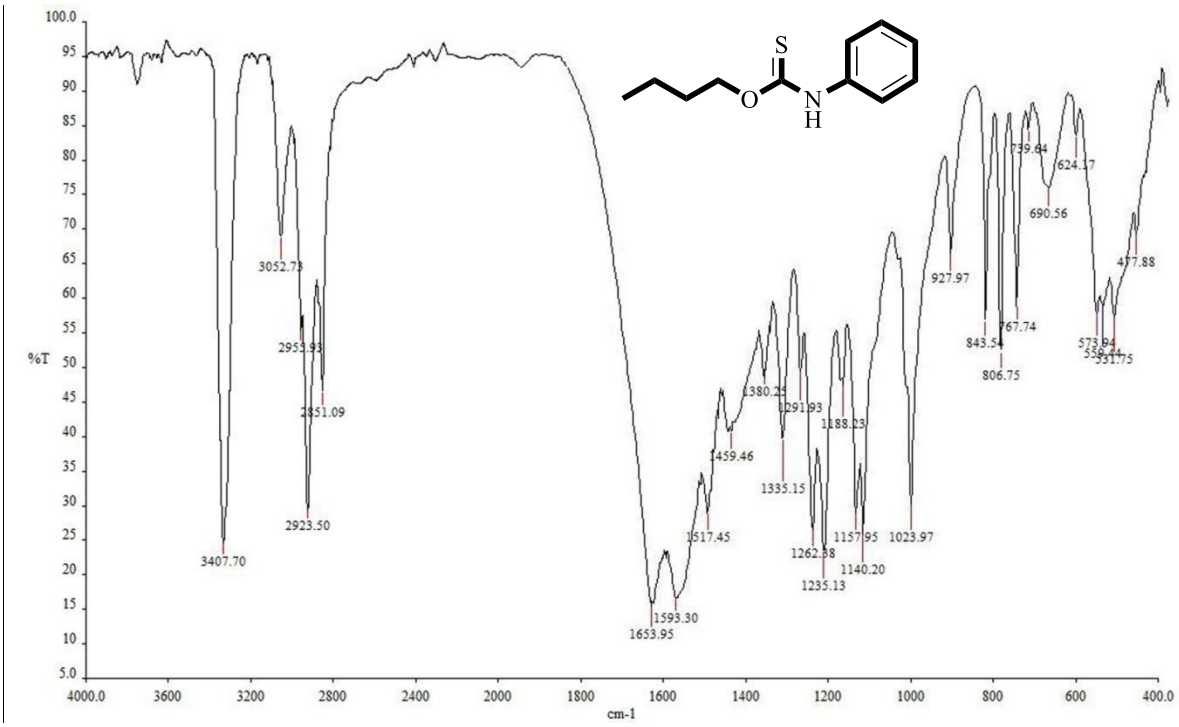
^{13}C-NMR spectra (63 MHz) of o-ethyl phenylthiocarbamate (**4c**) in $CDCl_3$.



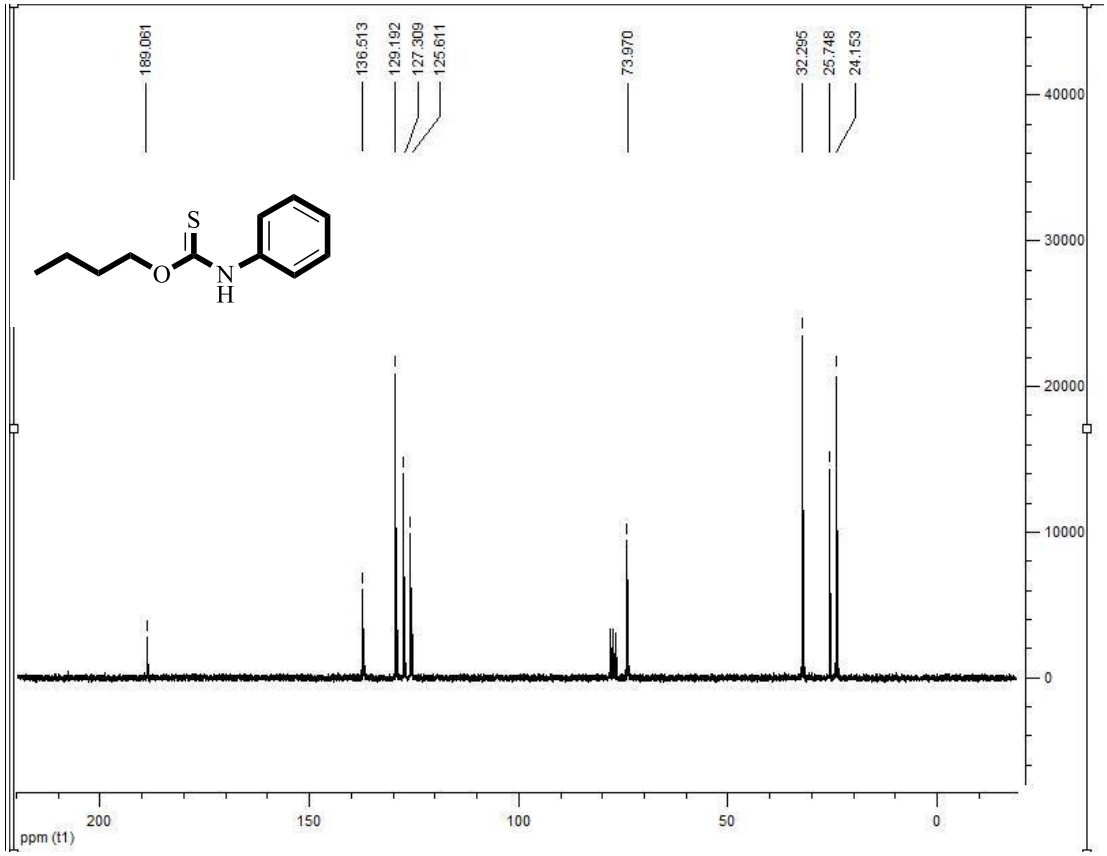
^{1}H-NMR spectra (250 MHz) of o-ethyl phenylthiocarbamate (**4c**) in $CDCl_3$.



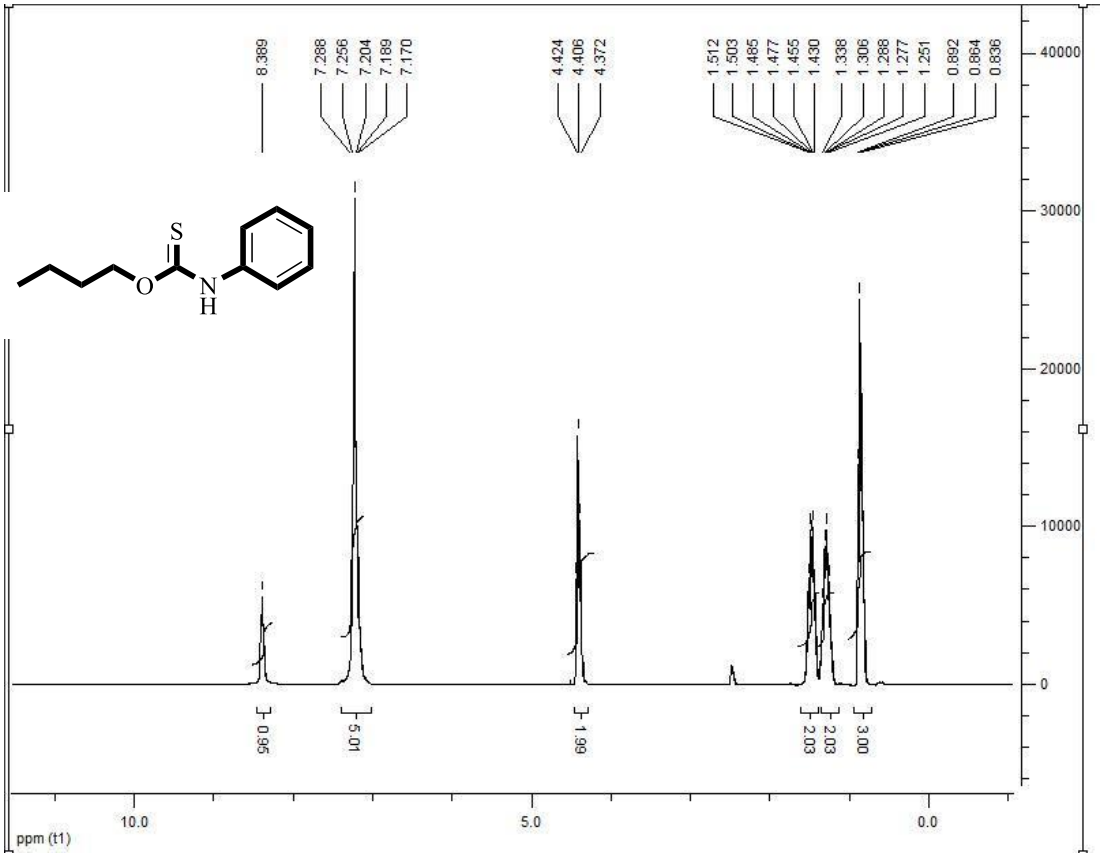
MS of o-ethyl phenylthiocarbamate (**4c**).



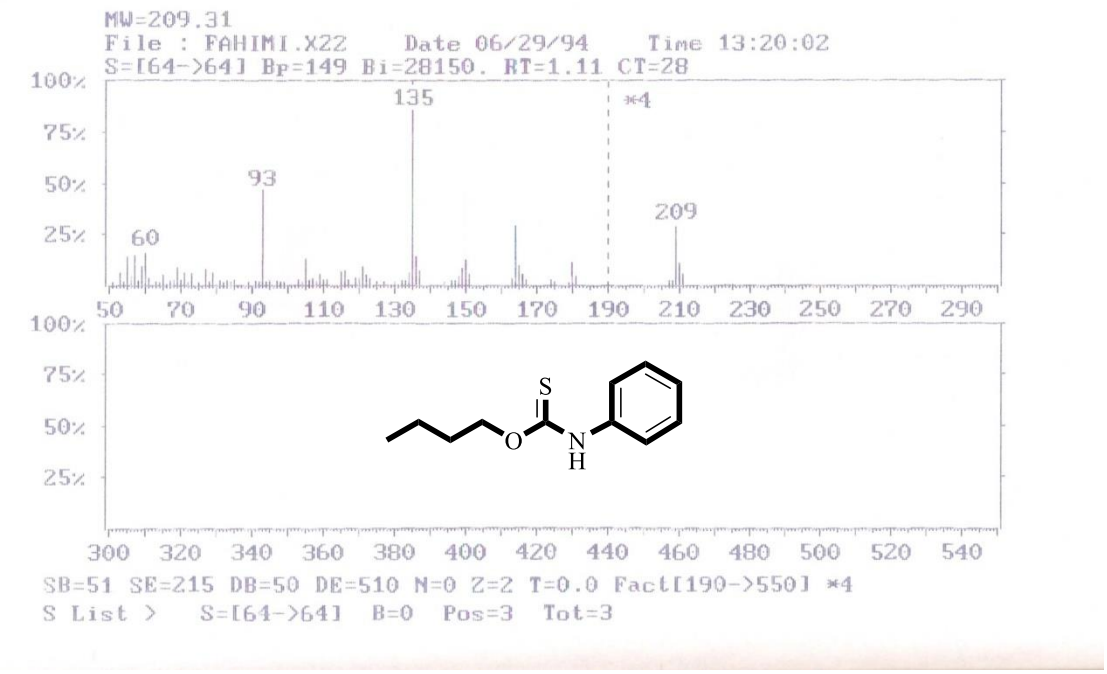
FT-IR spectra of o-butyl phenylthiocarbamate (**4d**) in KBr.



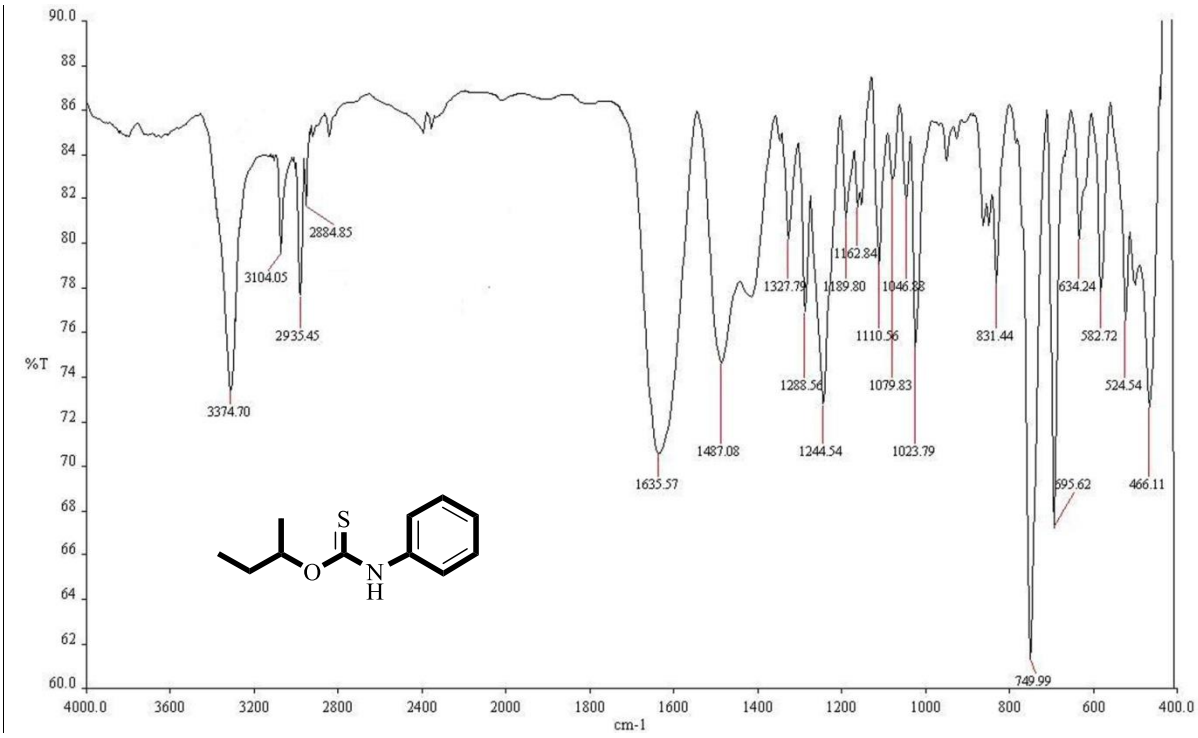
^{13}C-NMR spectra (63 MHz) of o-butyl phenylthiocarbamate (**4d**) in $CDCl_3$.



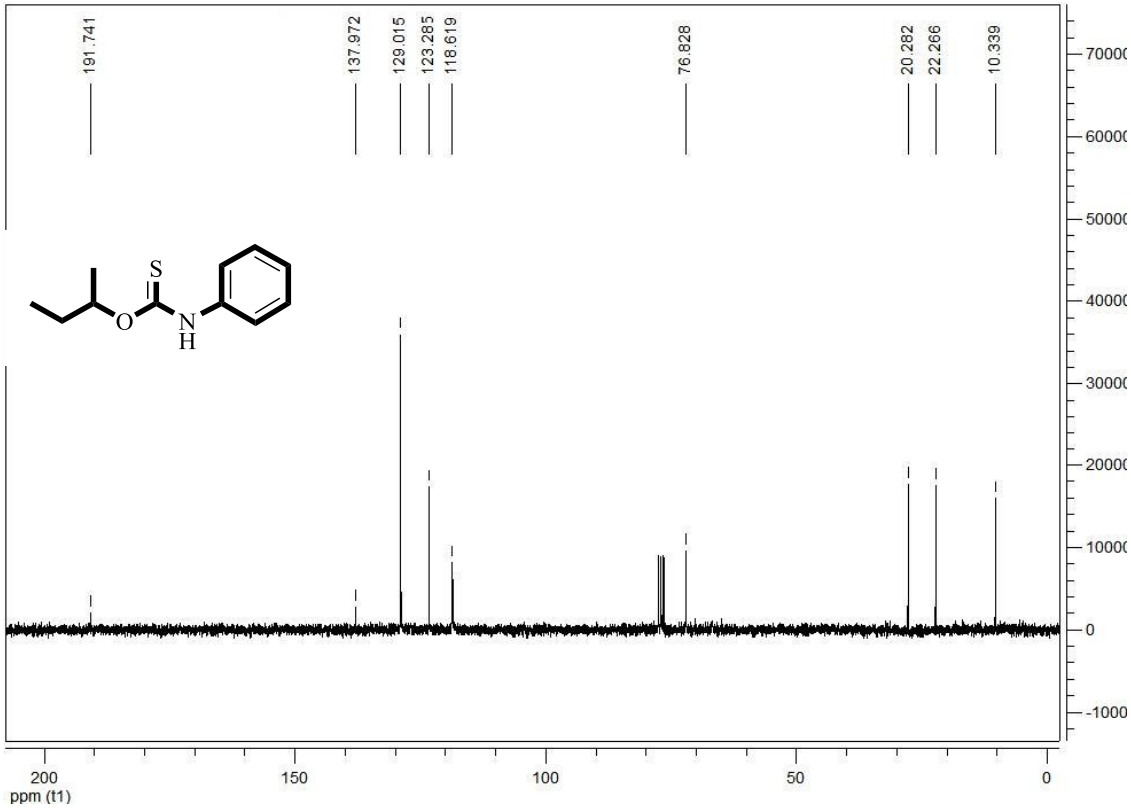
^{1}H-NMR spectra (250 MHz) of o-butyl phenylthiocarbamate (**4d**) in $CDCl_3$.



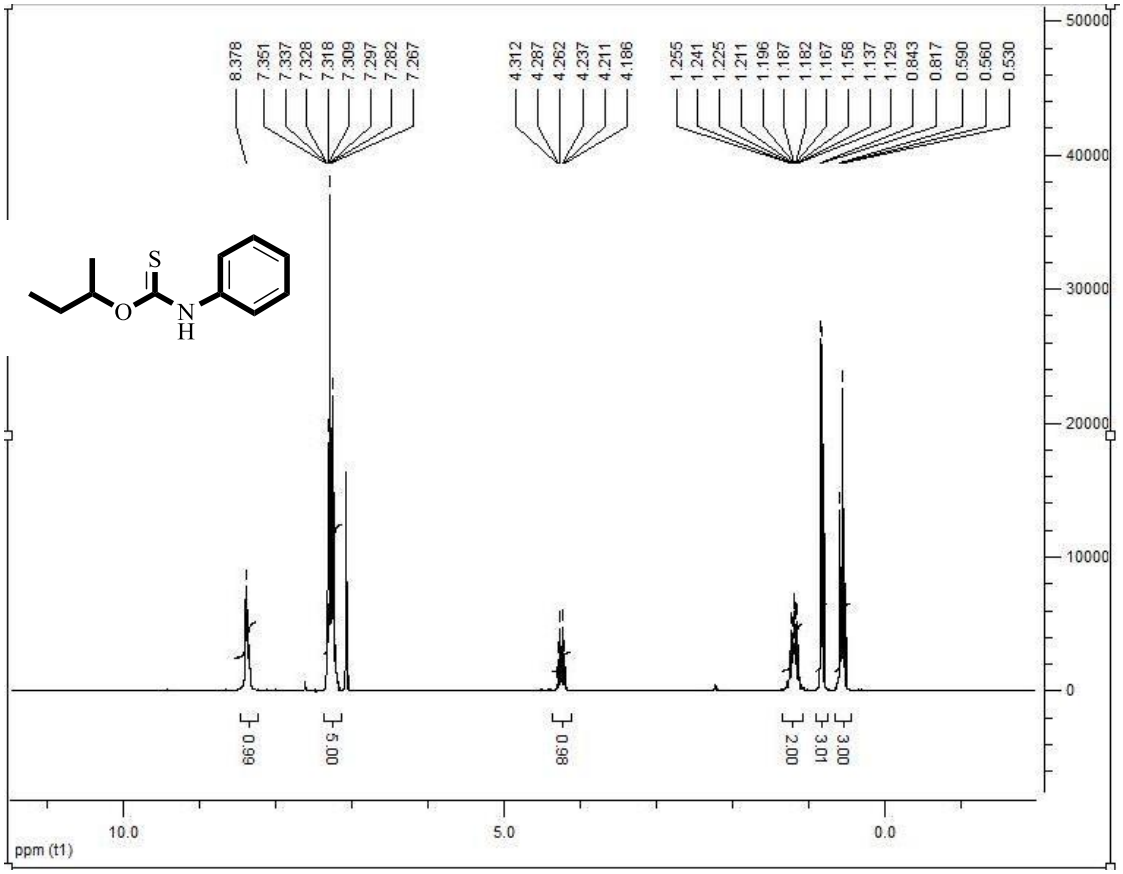
MS of o-butyl phenylthiocarbamate (**4d**).



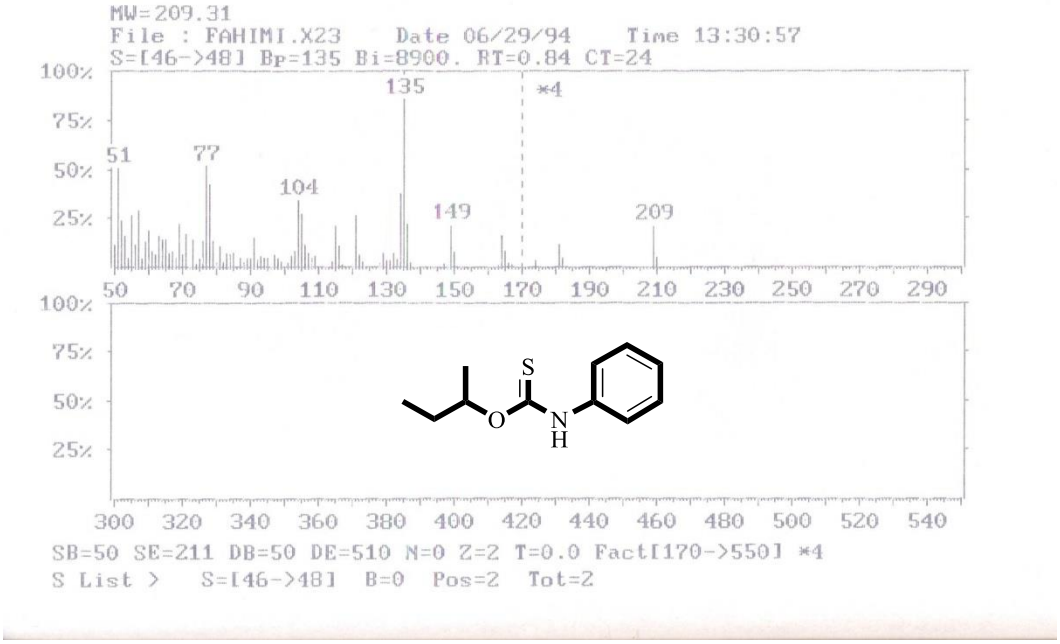
FT-IR spectra of o-2-butyl phenylthiocarbamate (**4e**) in KBr.



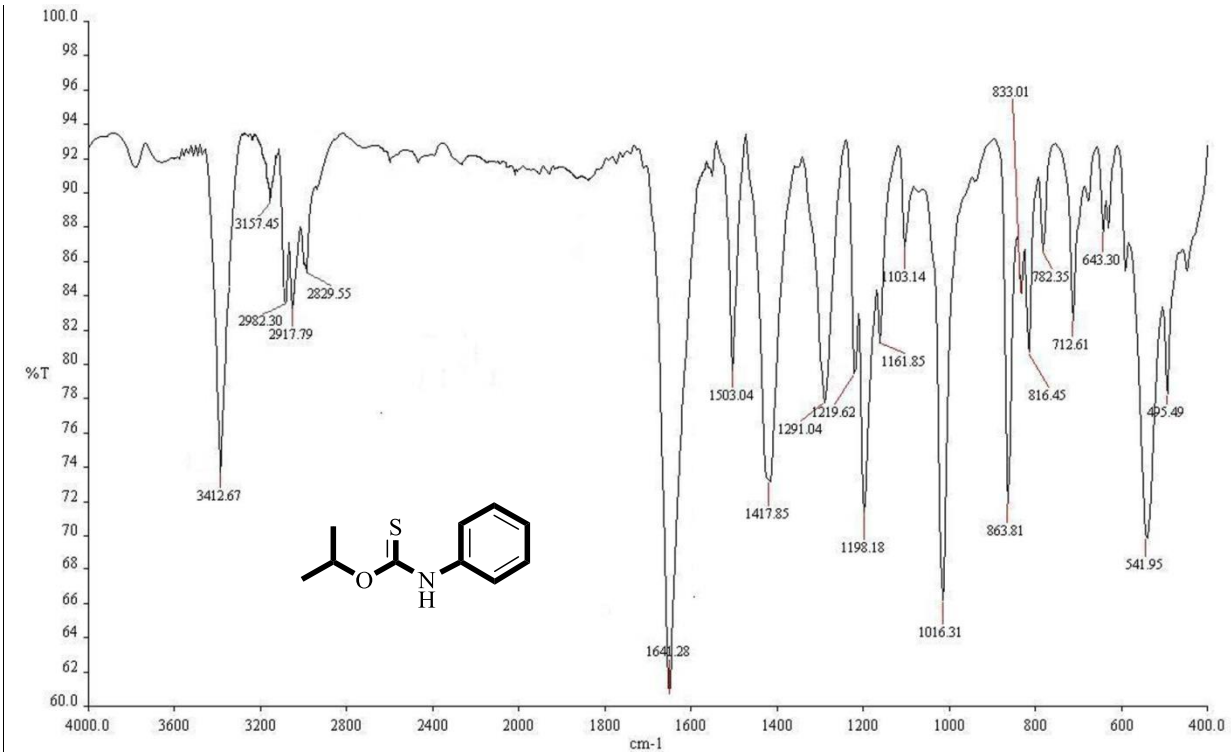
^{13}C-NMR spectra (63 MHz) of o-2-butyl phenylthiocarbamate (**4e**) in $CDCl_3$.



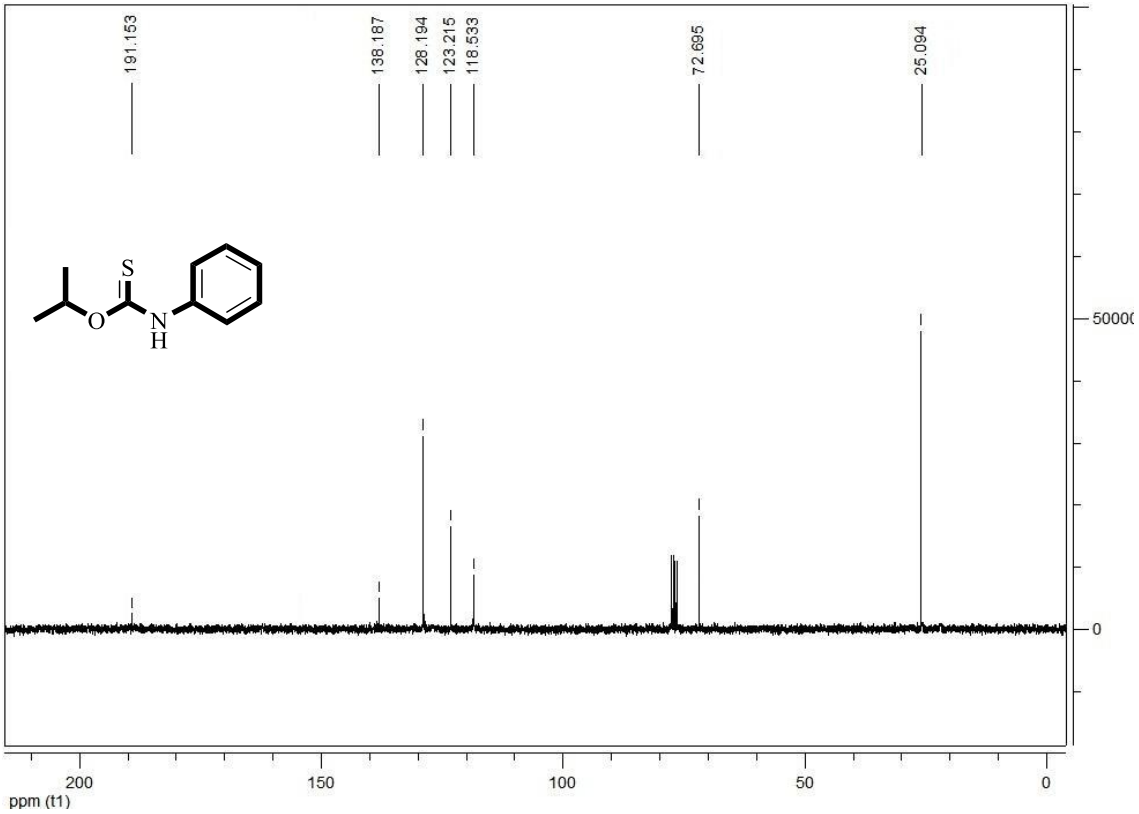
^{1}H-NMR spectra (250 MHz) of o-2-butyl phenylthiocarbamate (**4e**) in $CDCl_3$.



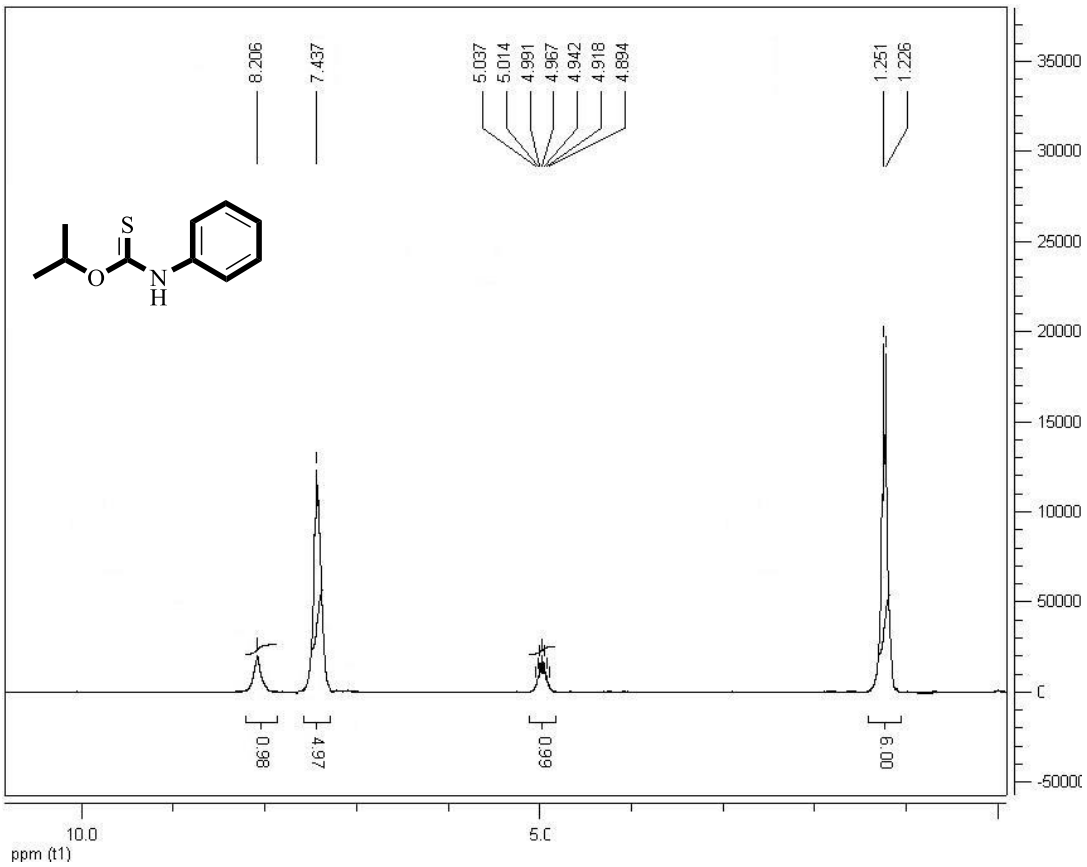
MS of o-2-butyl phenylthiocarbamate (**4e**).



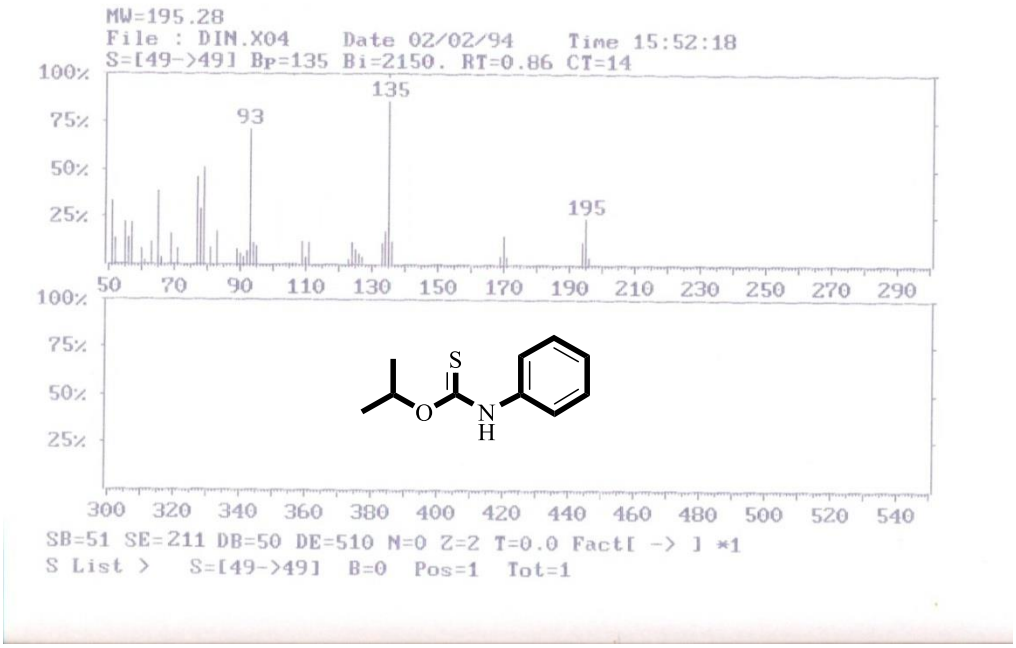
FT-IR spectra of o-2-propyl phenylthiocarbamate (**4f**) in KBr.



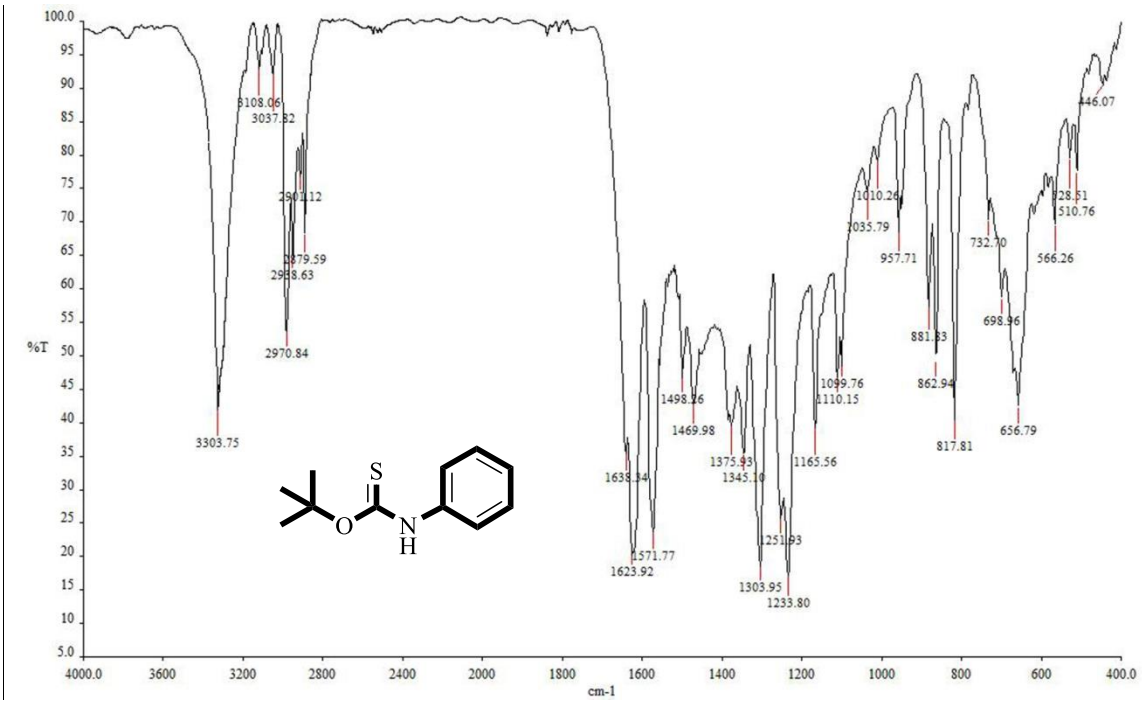
^{13}C-NMR spectra (63 MHz) of o-2-propyl phenylthiocarbamate (**4f**) in $CDCl_3$.



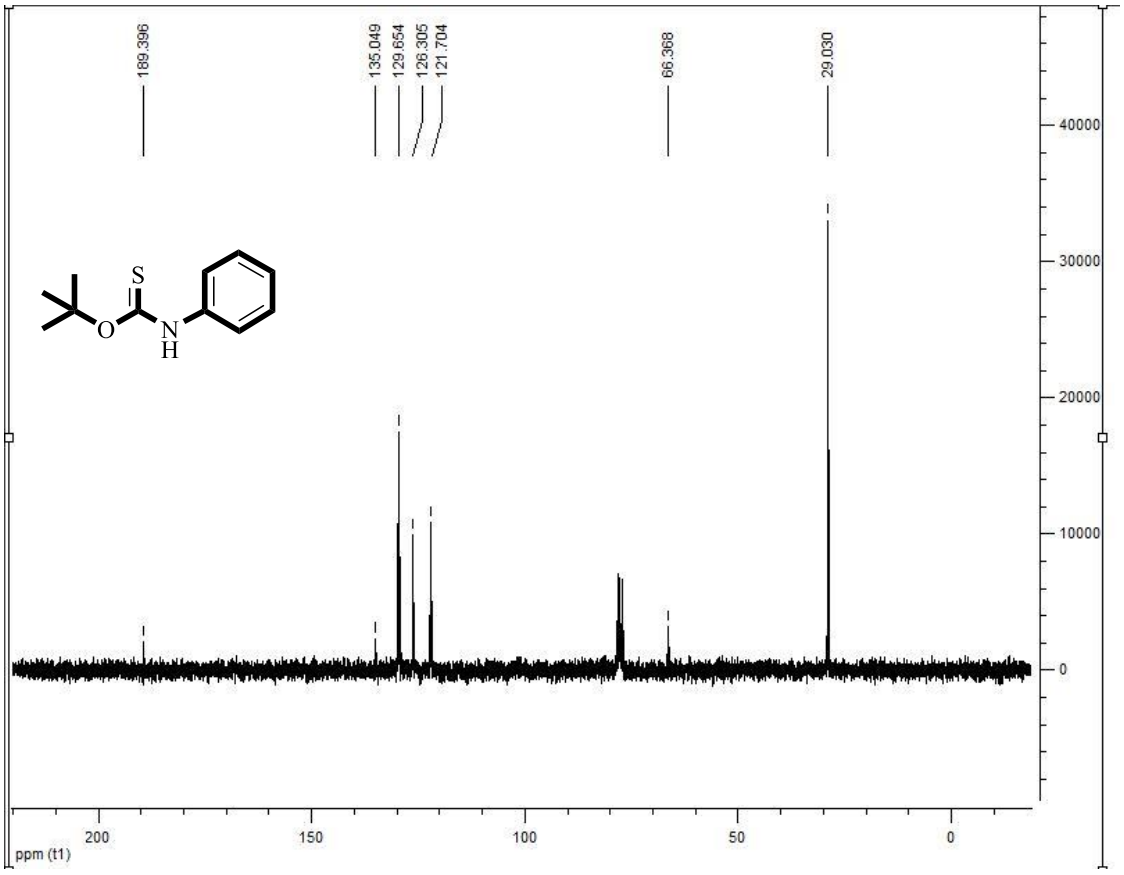
^{1}H-NMR spectra (250 MHz) of o-2-propyl phenylthiocarbamate (**4f**) in $CDCl_3$.



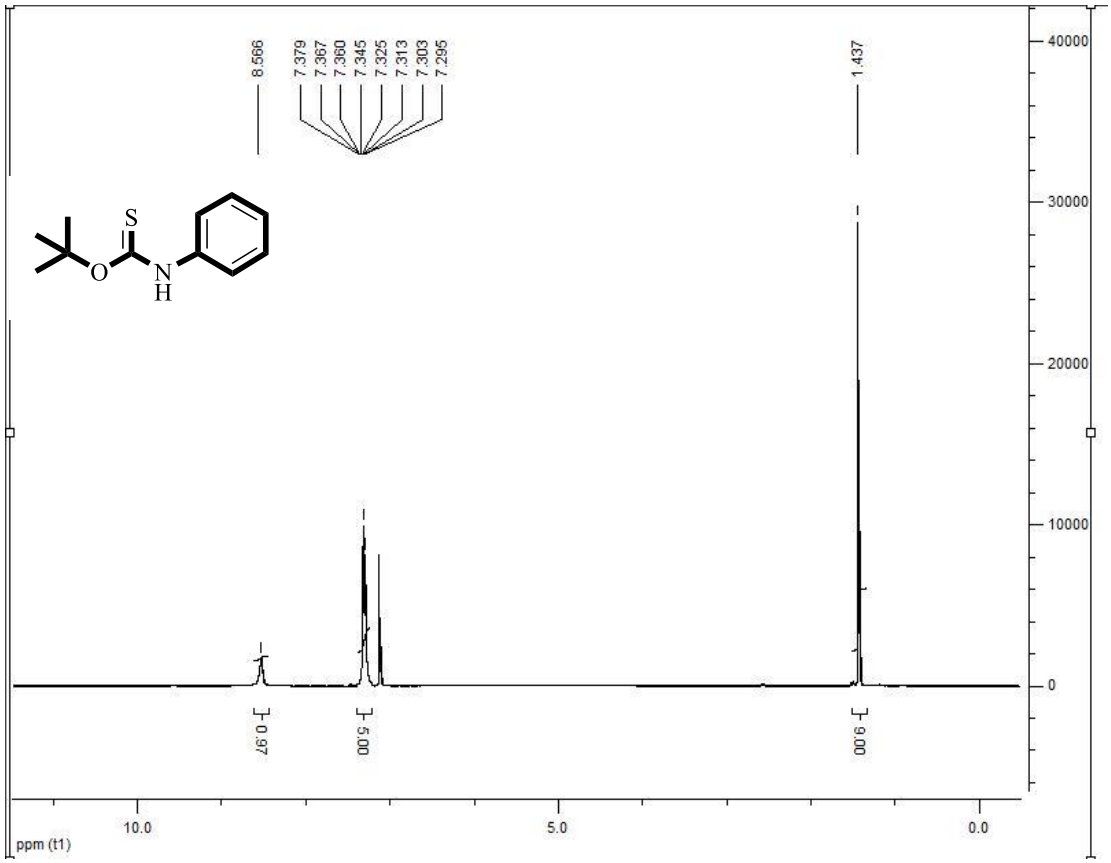
MS of o-2-propyl phenylthiocarbamate (**4f**).



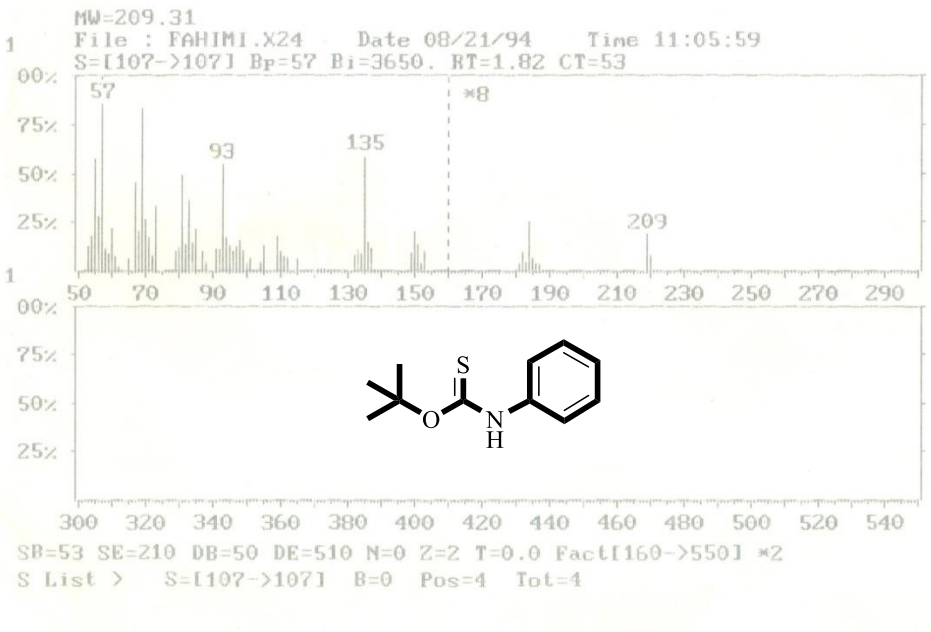
FT-IR spectra of o-*tert*-butyl phenylthiocarbamate (**4g**) in KBr.



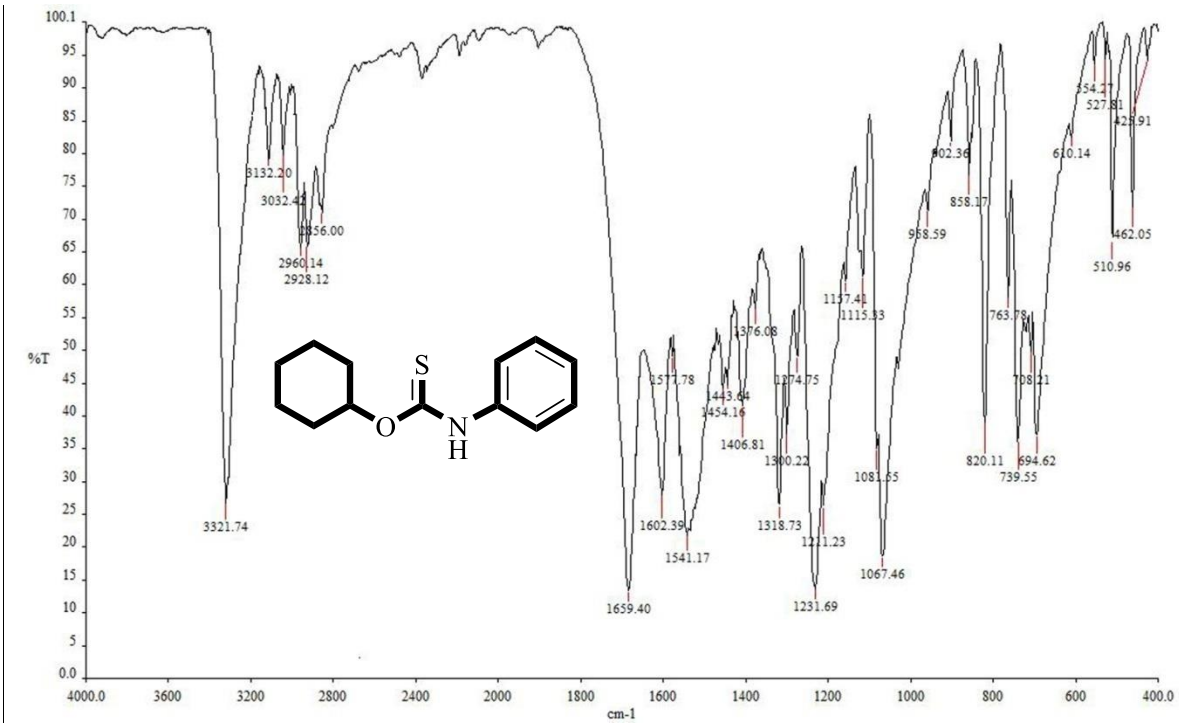
^{13}C-NMR spectra (63 MHz) of o-*tert*-butyl phenylthiocarbamate (**4g**) in $CDCl_3$.



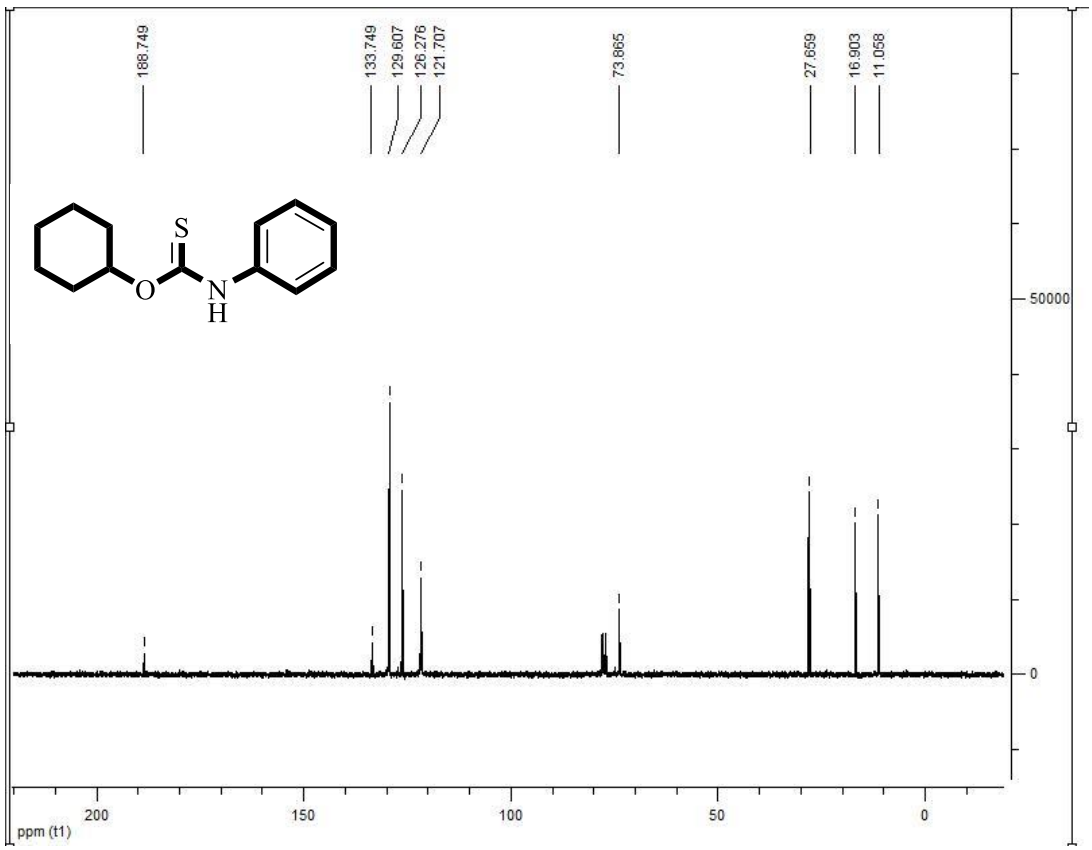
^{1}H-NMR spectra (250 MHz) of o-*tert*-butyl phenylthiocarbamate (**4g**) in $CDCl_3$.



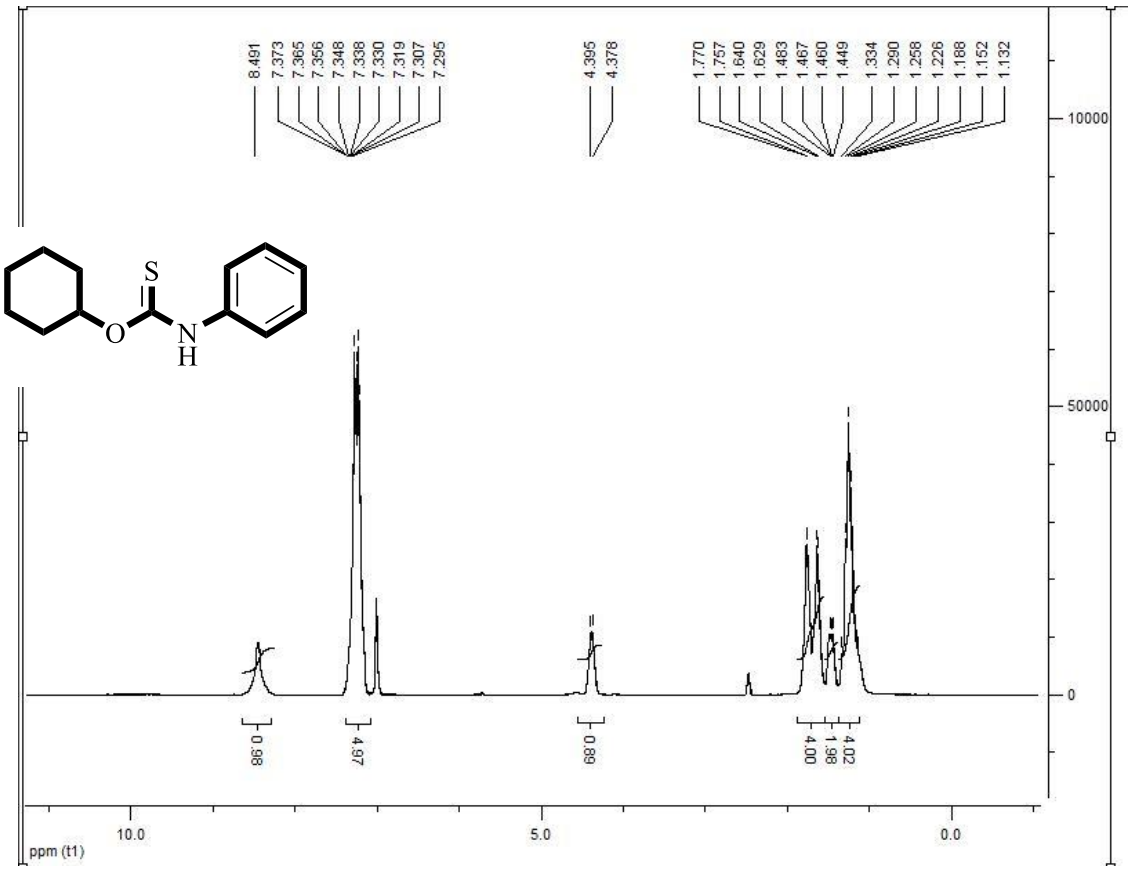
MS of o-*tert*-butyl phenylthiocarbamate (**4g**).



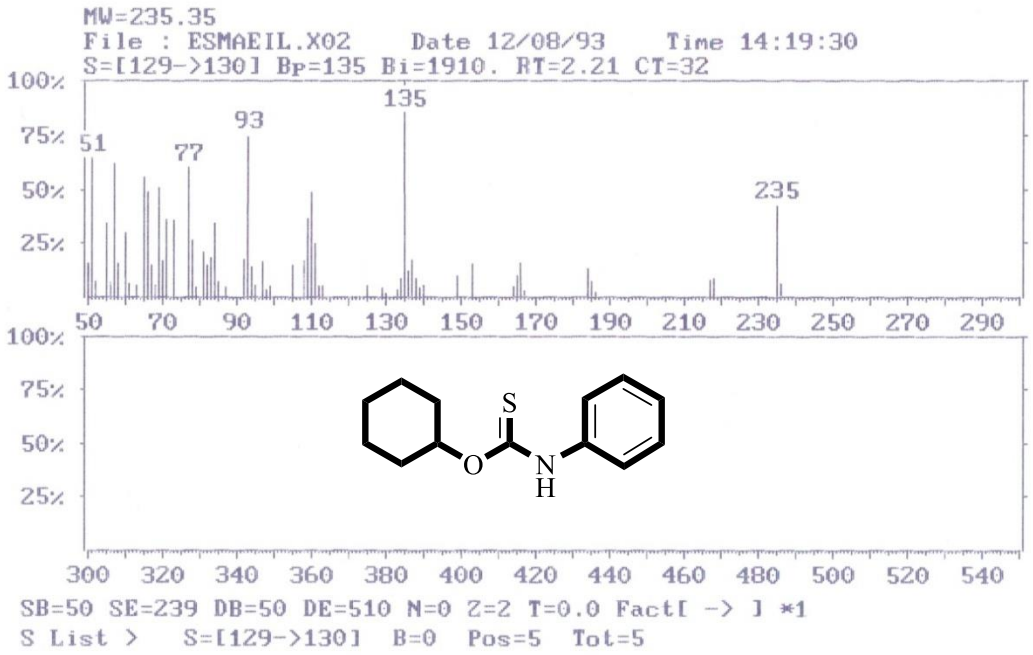
FT-IR spectra of o-cyclohexyl phenylthiocarbamate (**4h**) in KBr.



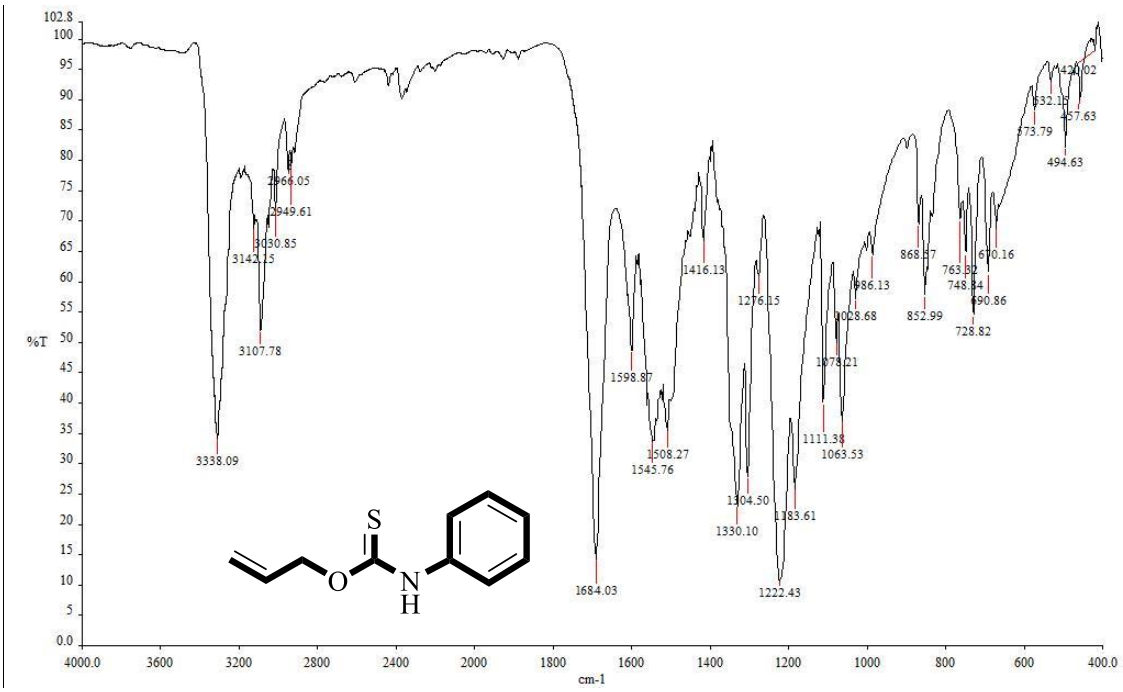
^{13}C-NMR spectra (63 MHz) of o-cyclohexyl phenylthiocarbamate (**4h**) in $CDCl_3$.



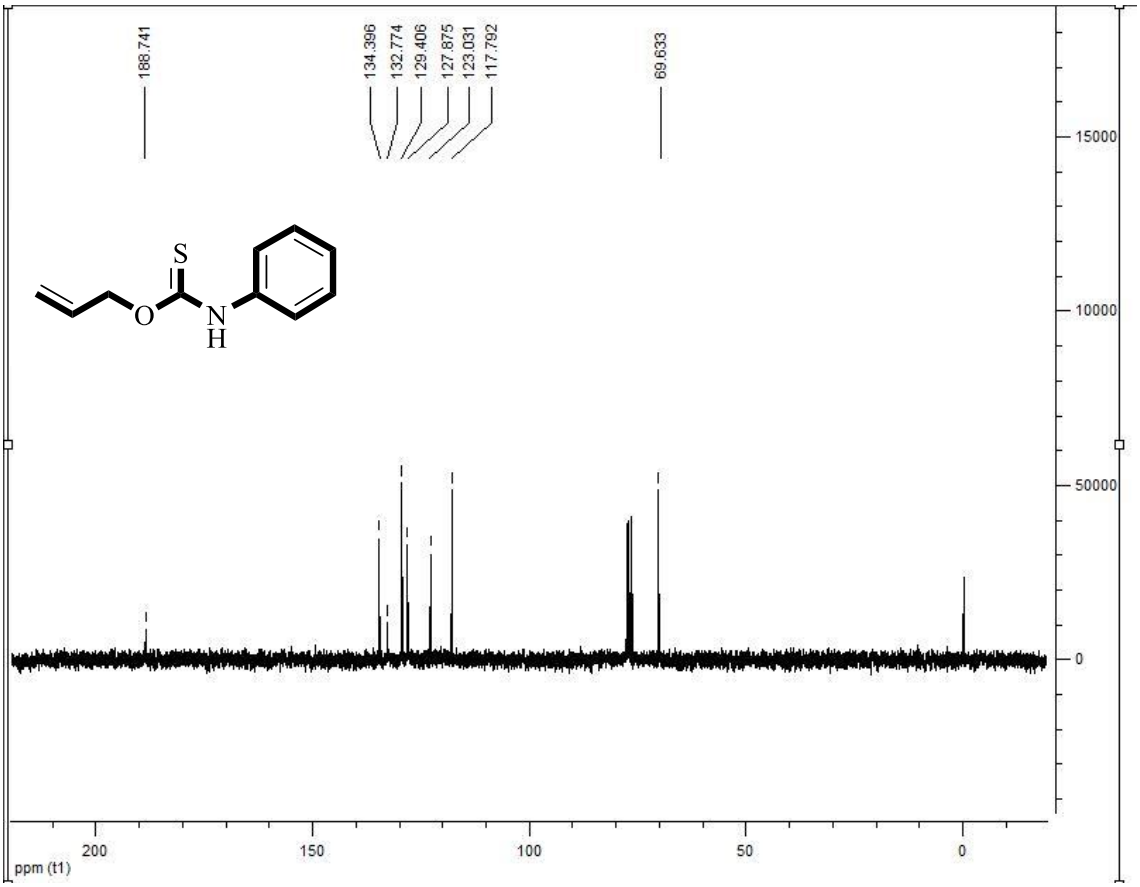
^{1}H-NMR spectra (250 MHz) of o-cyclohexyl phenylthiocarbamate (**4h**) in $CDCl_3$.



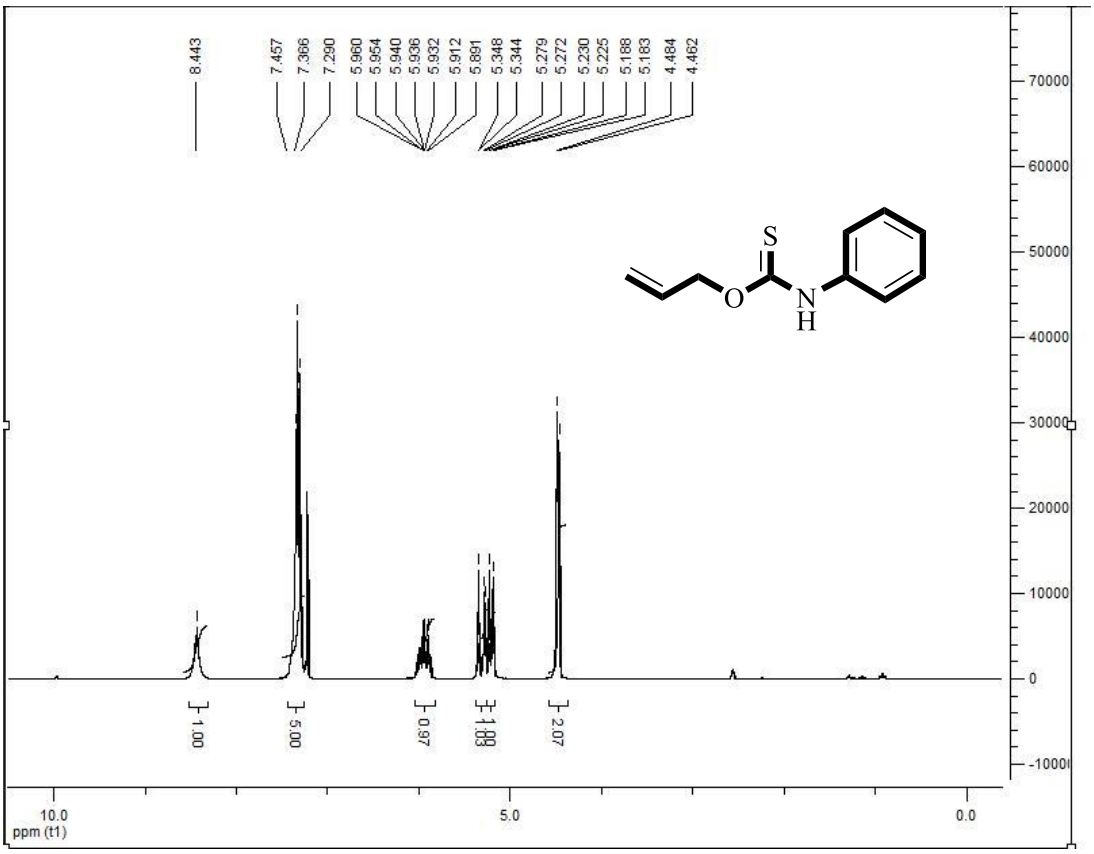
MS of o-cyclohexyl phenylthiocarbamate (**4h**).



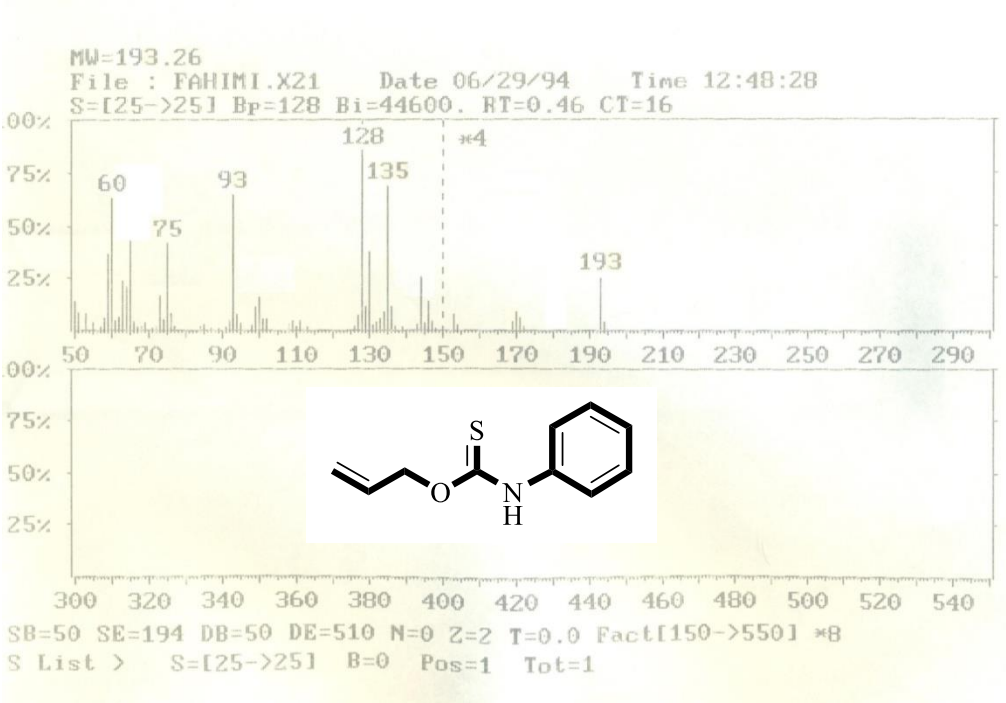
FT-IR spectra of o-allyl phenylthiocarbamate (**4i**) in KBr.



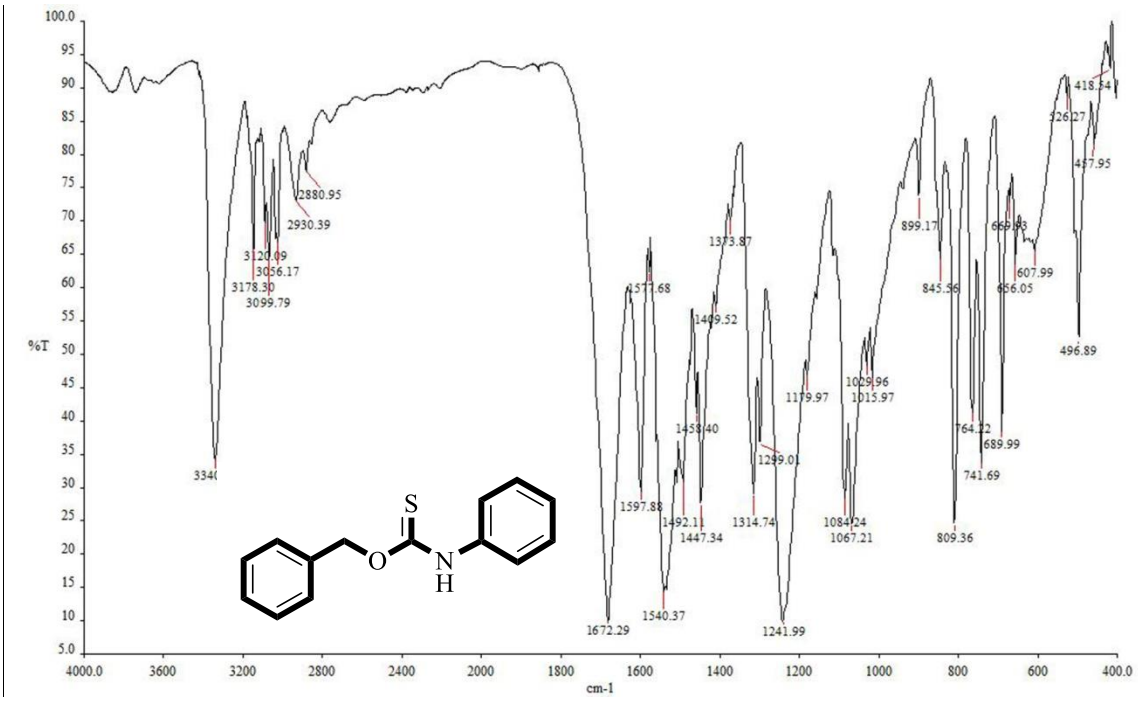
^{13}C-NMR spectra (63 MHz) of o-allyl phenylthiocarbamate (**4i**) in $CDCl_3$.



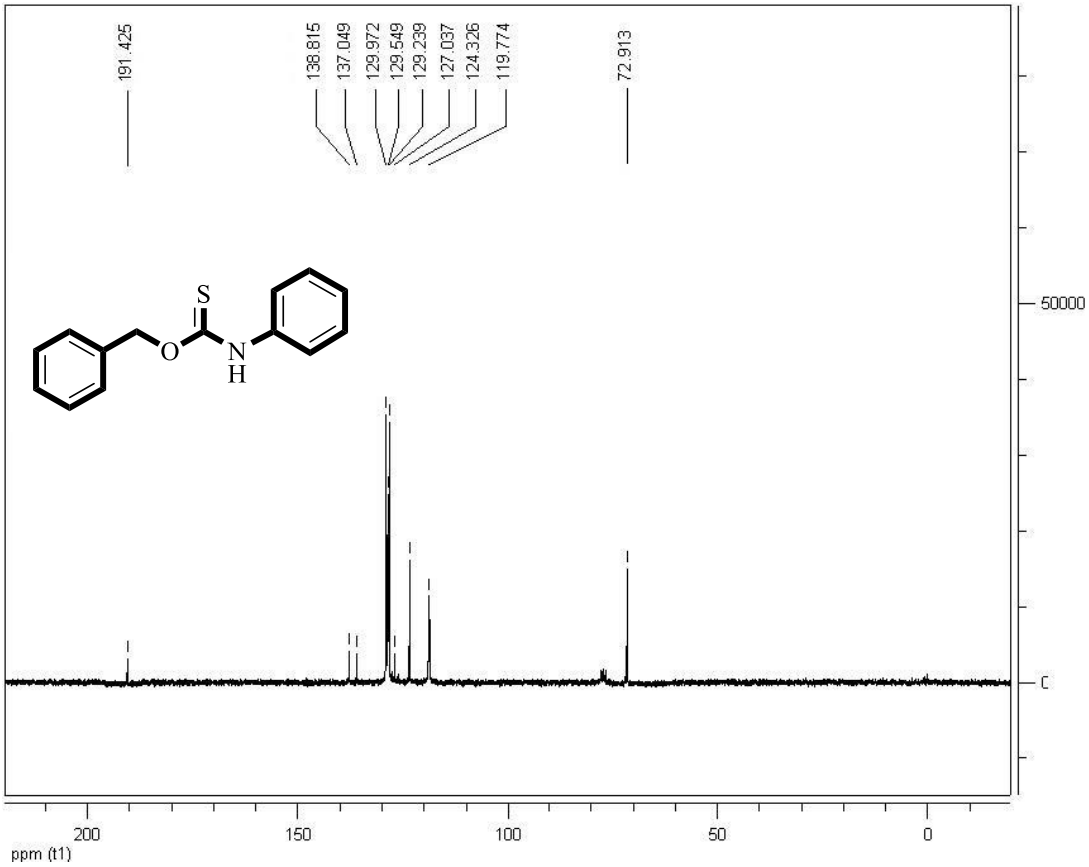
^{1}H-NMR spectra (250 MHz) of o-allyl phenylthiocarbamate (**4i**) in $CDCl_3$.



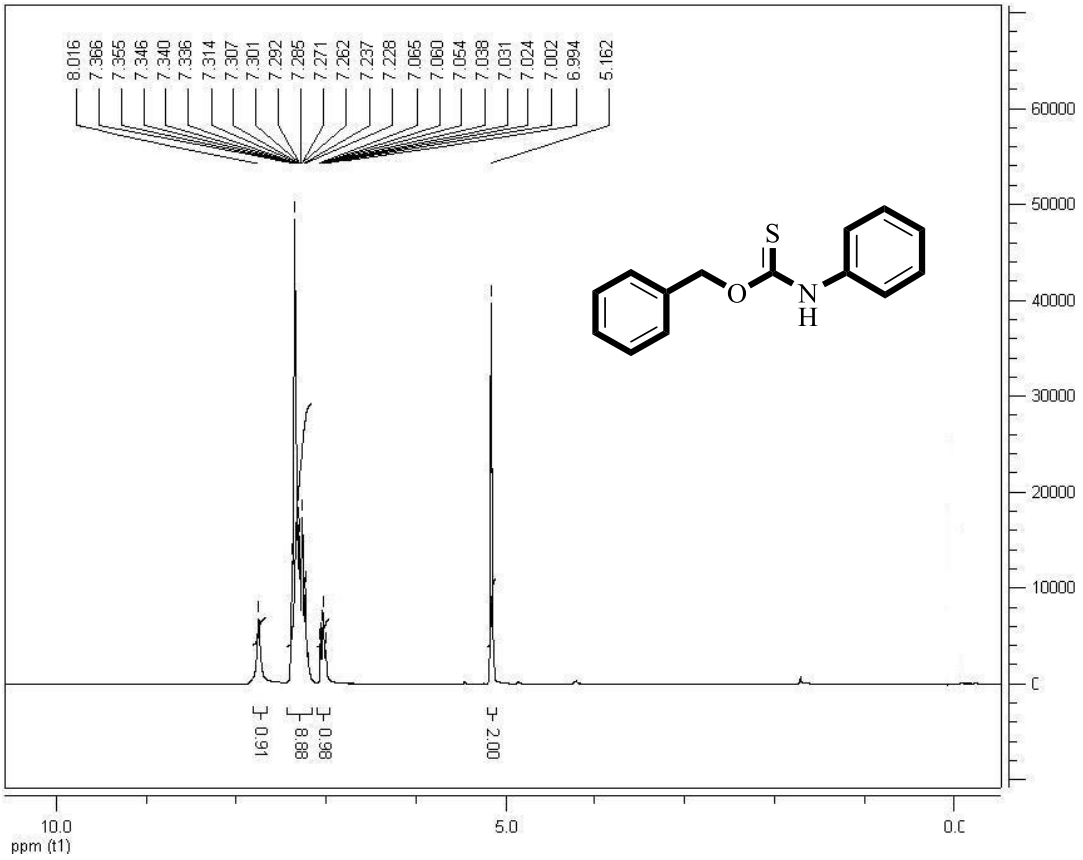
MS of o-allyl phenylthiocarbamate (**4i**).



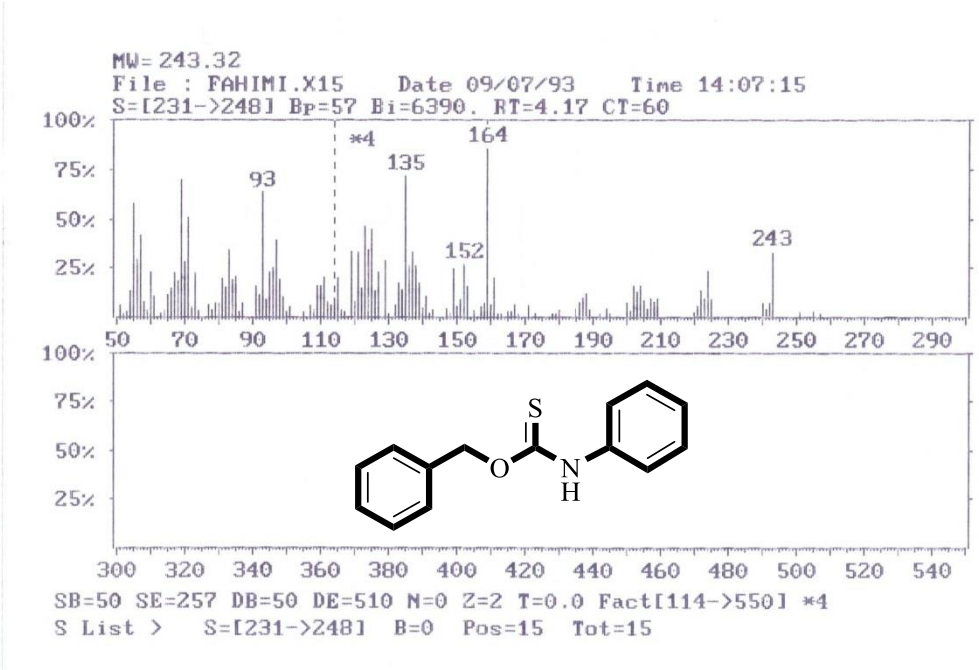
FT-IR spectra of o-benzyl phenylthiocarbamate (**4j**) in KBr.



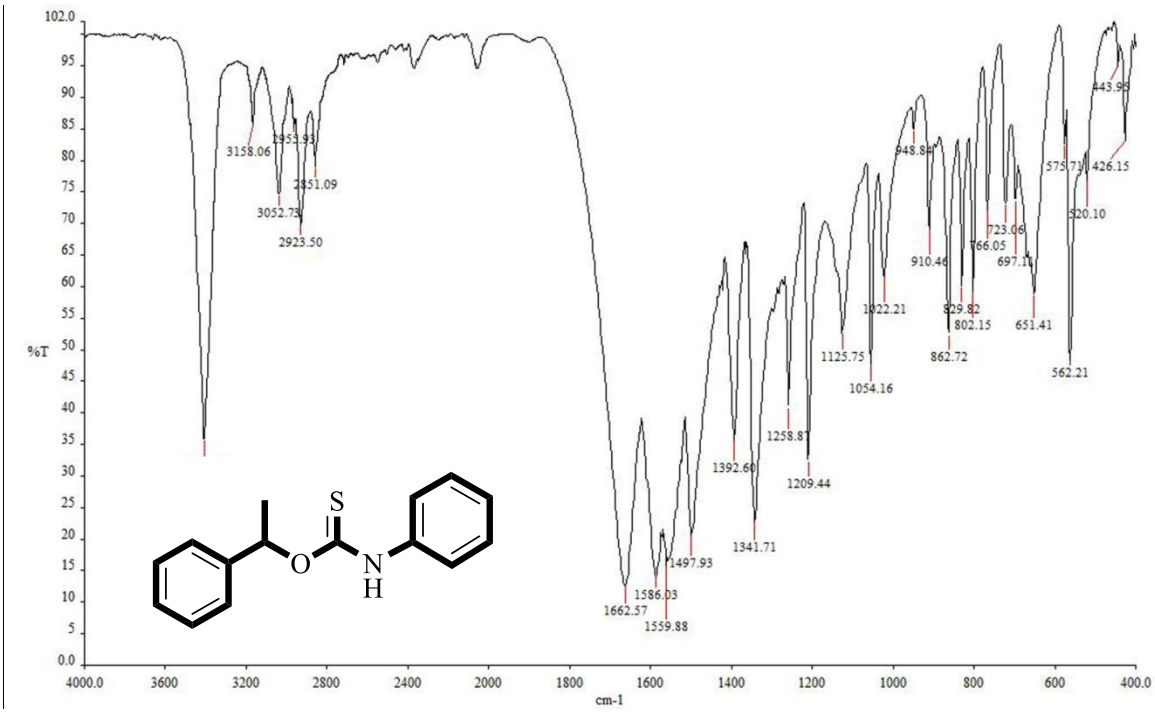
^{13}C-NMR spectra (63 MHz) of o-benzyl phenylthiocarbamate (**4j**) in $CDCl_3$.



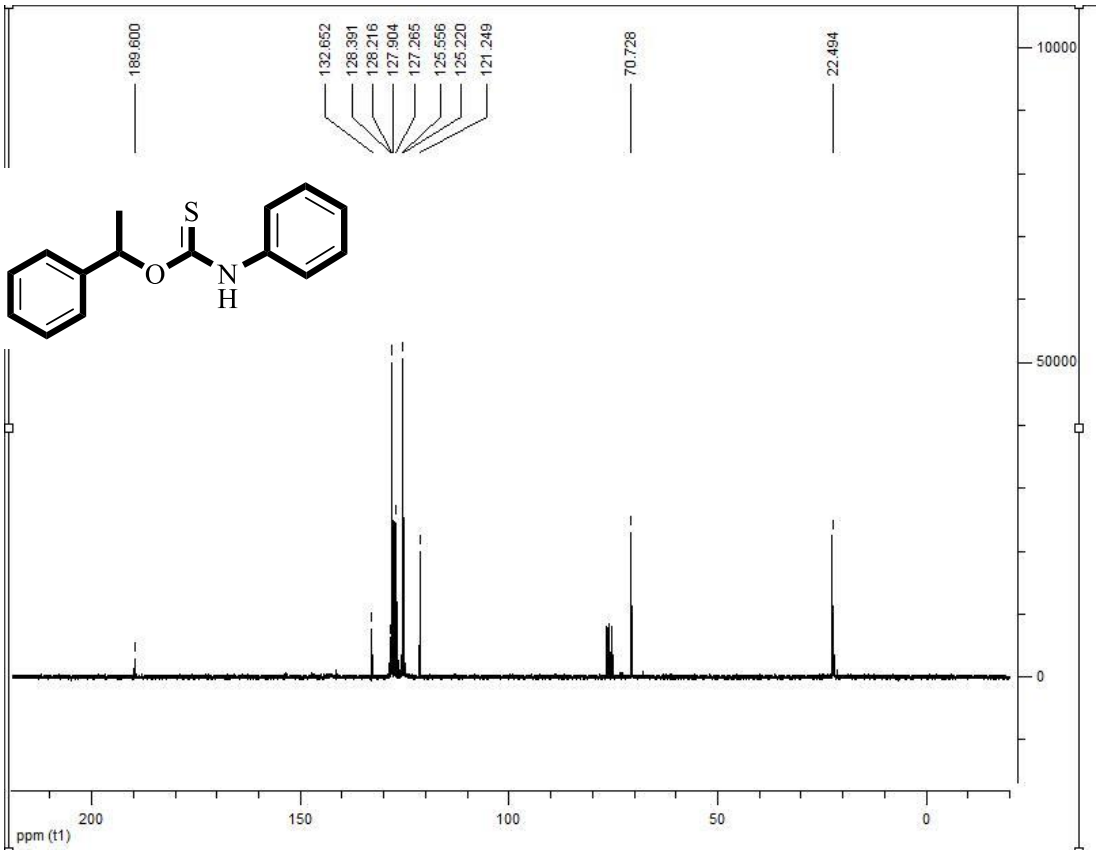
^{1}H-NMR spectra (250 MHz) of o-benzyl phenylthiocarbamate (**4j**) in $CDCl_3$.



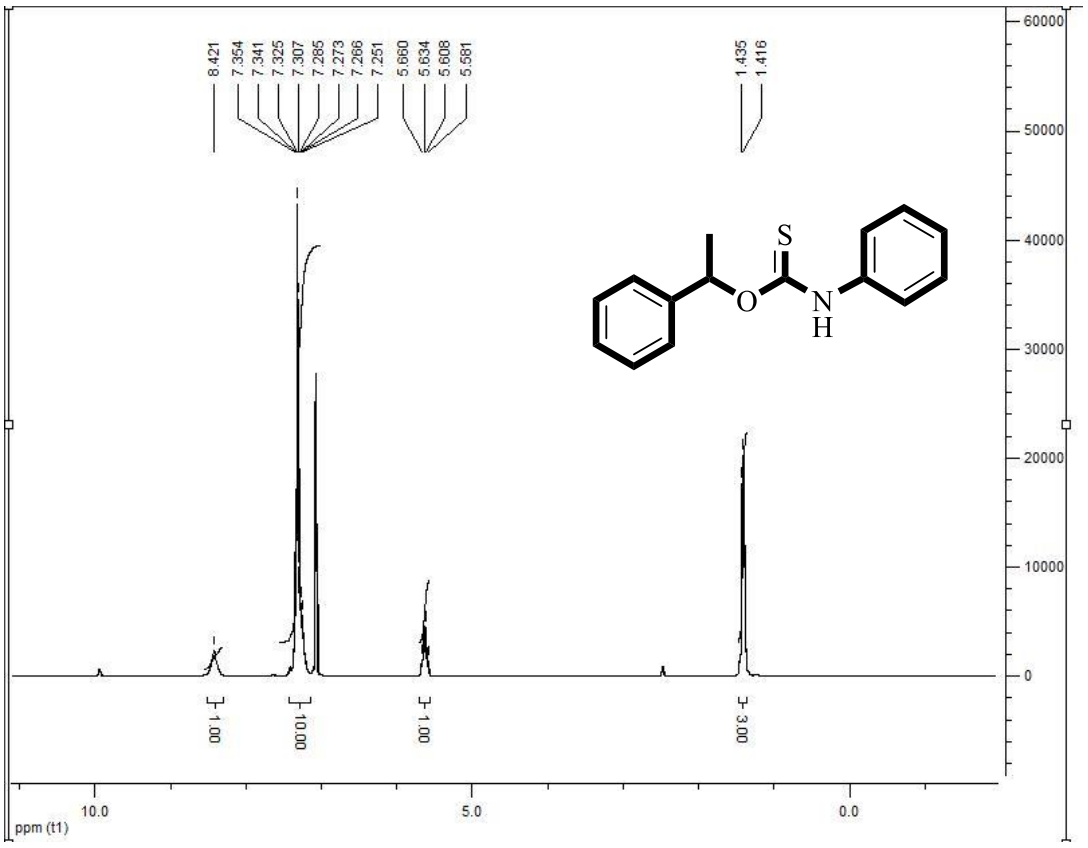
MS of o-benzyl phenylthiocarbamate (**4j**).



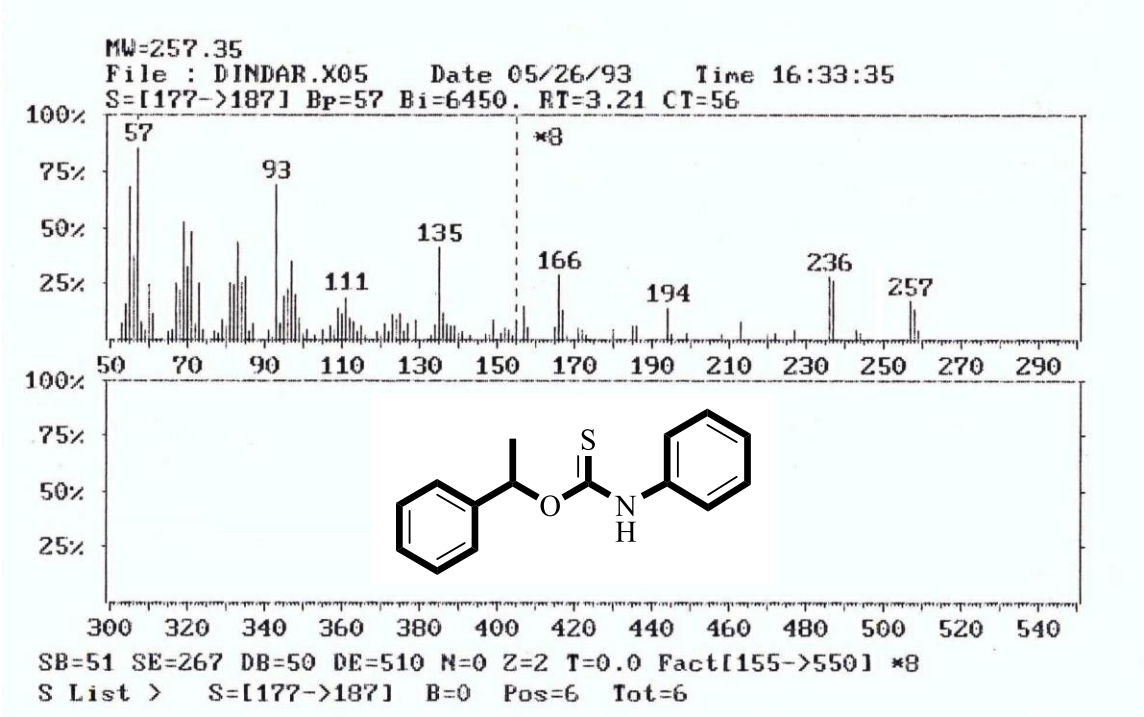
FT-IR spectra of o-1-phenylethyl phenylthiocarbamate (**4k**) in KBr.



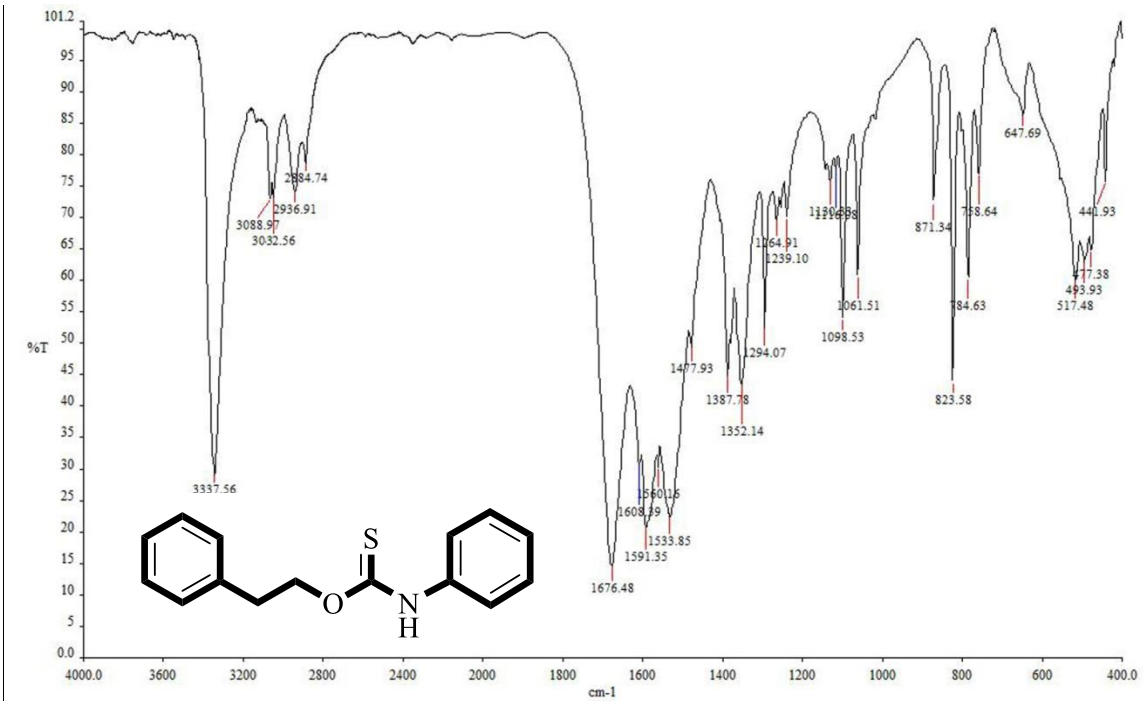
^{13}C-NMR spectra (63 MHz) of o-1-phenylethyl phenylthiocarbamate (**4k**) in $CDCl_3$.



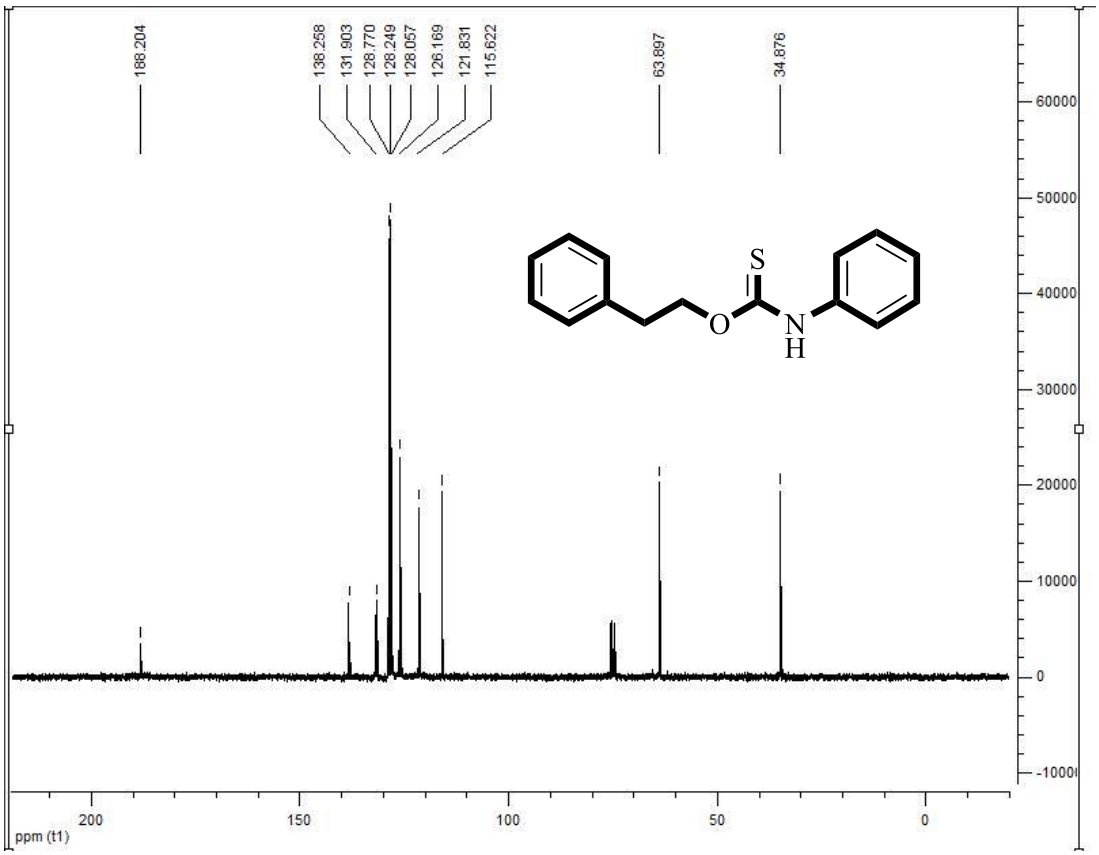
^{1}H-NMR spectra (250 MHz) of o-1-phenylethyl phenylthiocarbamate (**4k**) in $CDCl_3$.



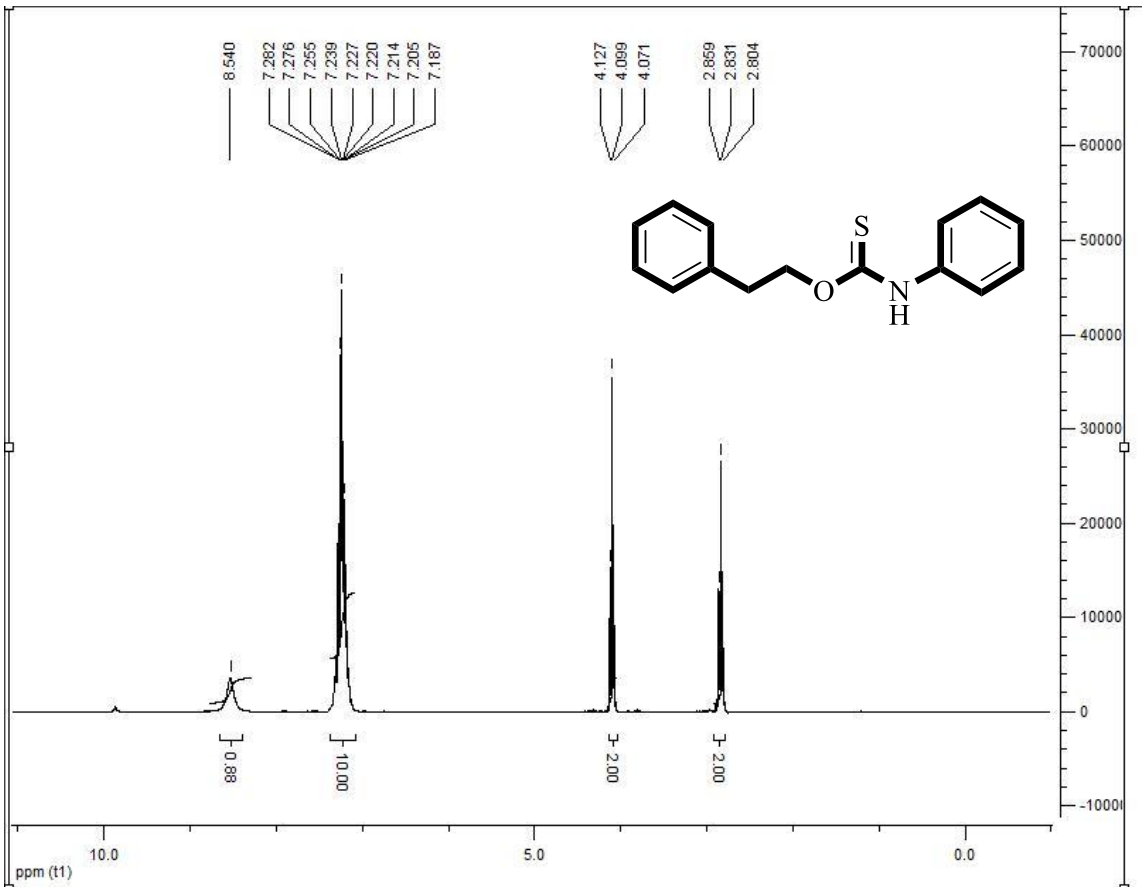
MS of o-1-phenylethyl phenylthiocarbamate (**4k**).



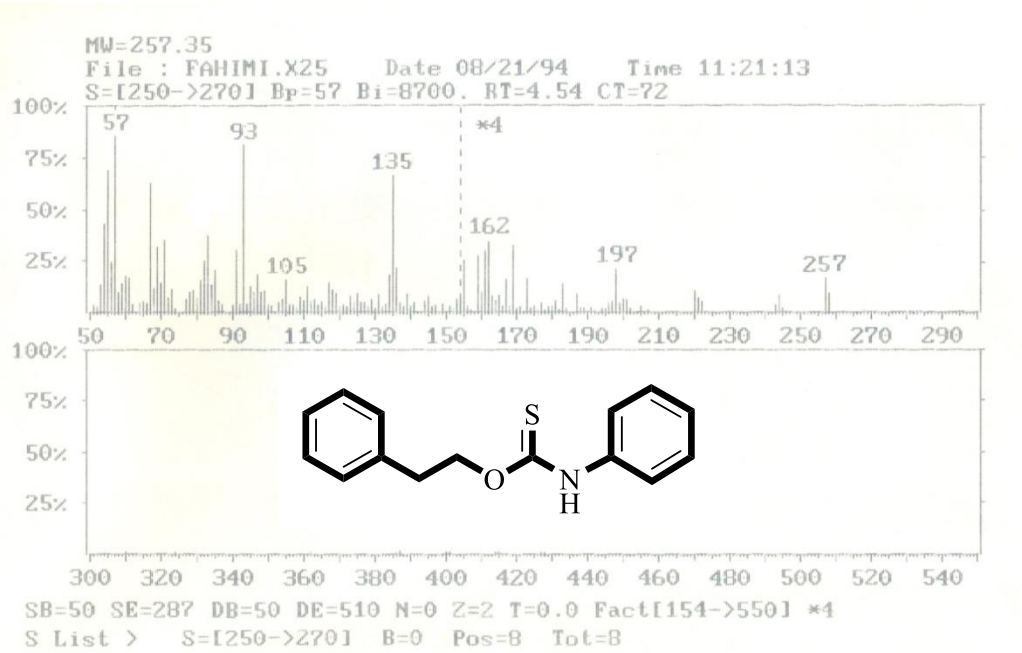
FT-IR spectra of o-2-phenylethyl phenylthiocarbamate (**4l**) in KBr.



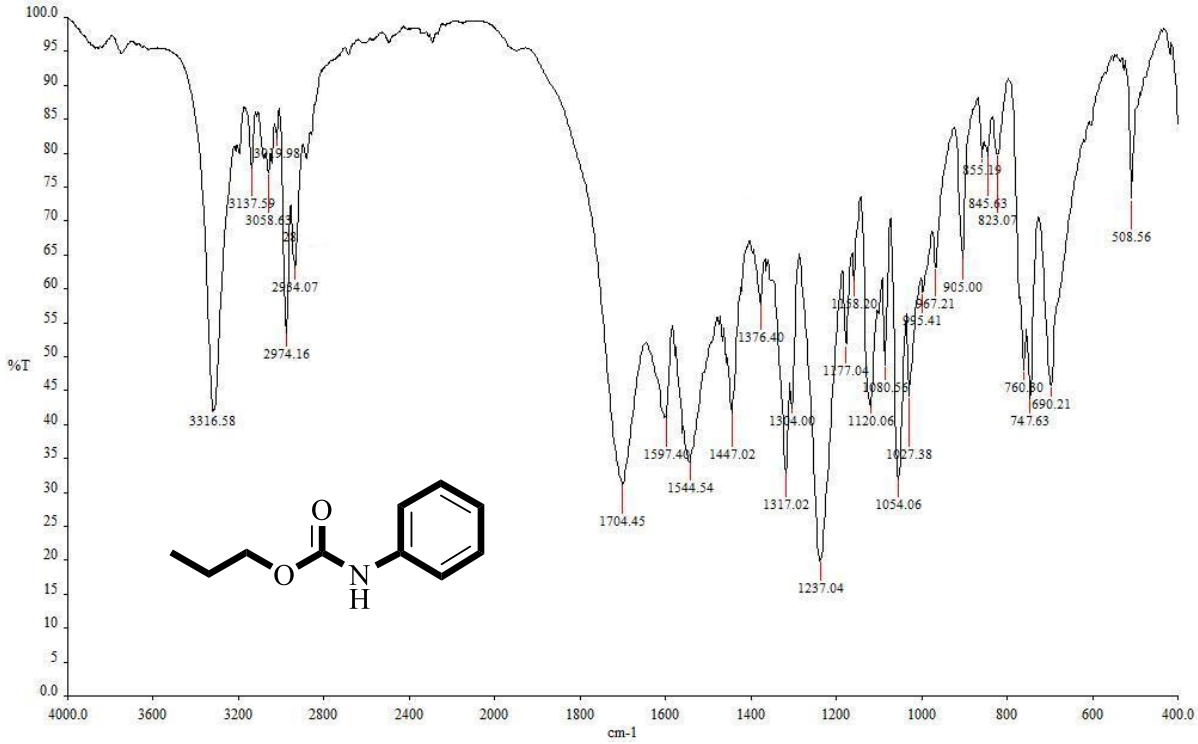
^{13}C-NMR spectra (63 MHz) of o-2-phenylethyl phenylthiocarbamate (**4l**) in $CDCl_3$.



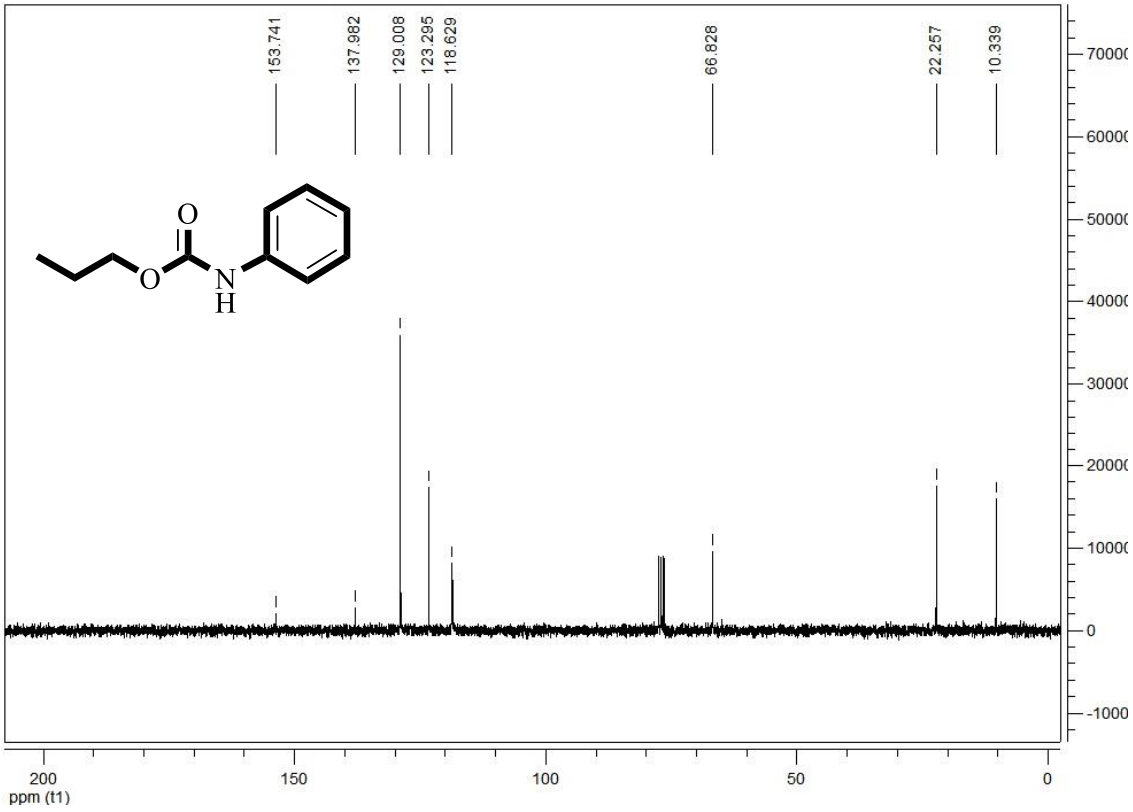
^{1}H-NMR spectra (250 MHz) of o-2-phenylethyl phenylthiocarbamate (**4l**) in $CDCl_3$.



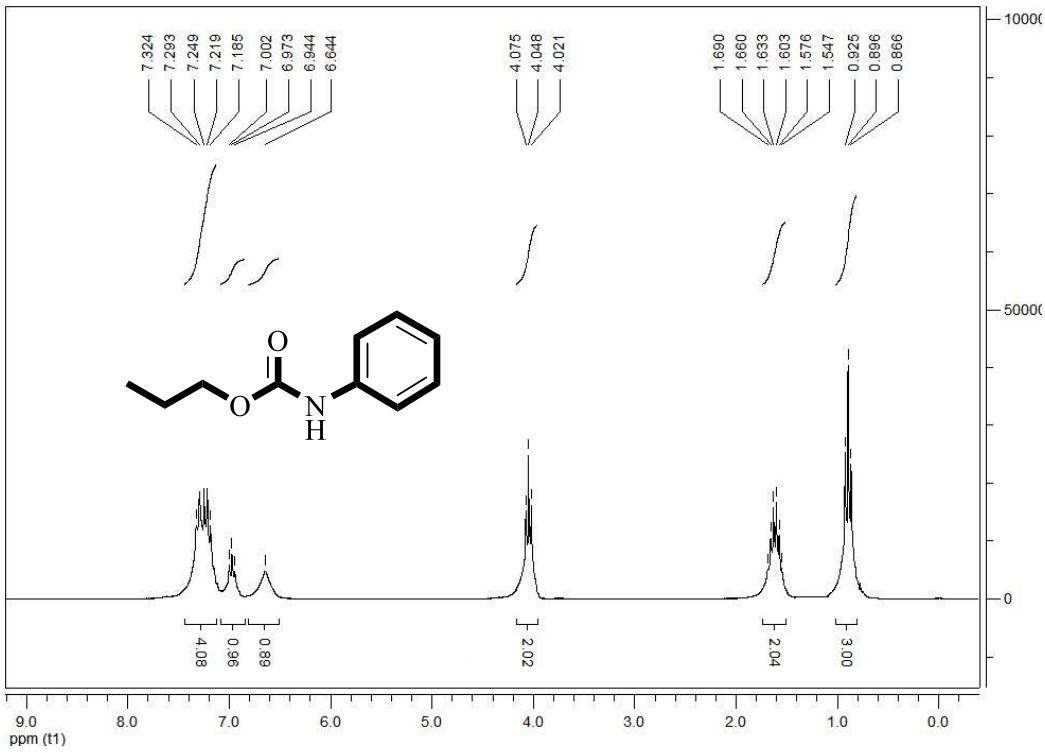
MS of o-2-phenylethyl phenylthiocarbamate (**4l**).



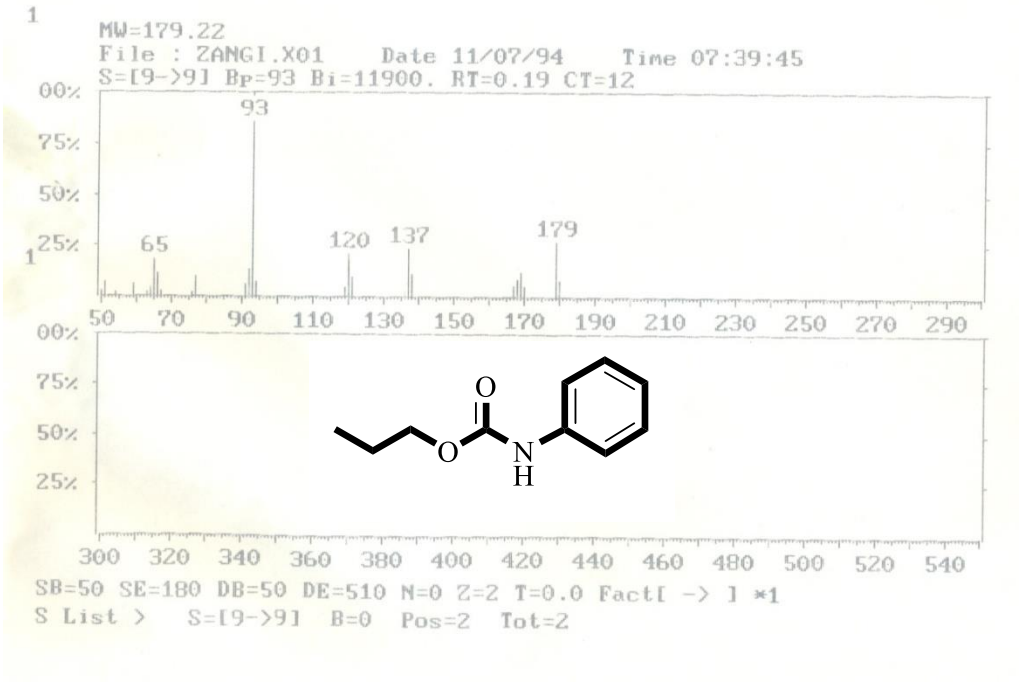
FT-IR spectra of propyl phenylcarbamate (**5a**) in KBr.



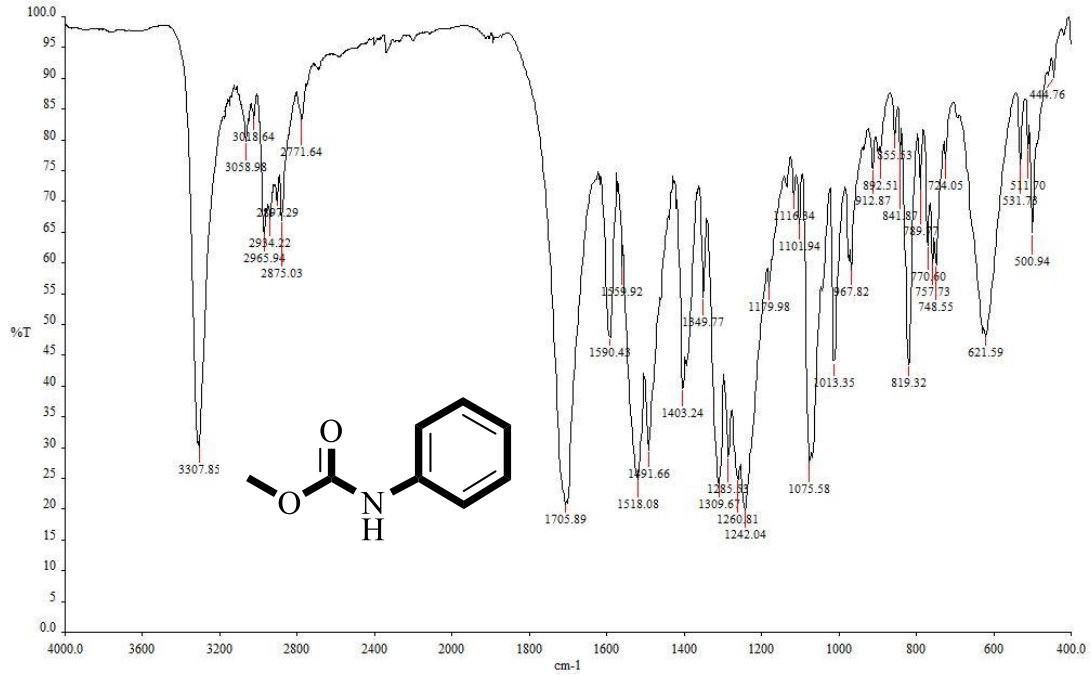
^{13}C-NMR spectra (63 MHz) of propyl phenylcarbamate (**5a**) in $CDCl_3$.



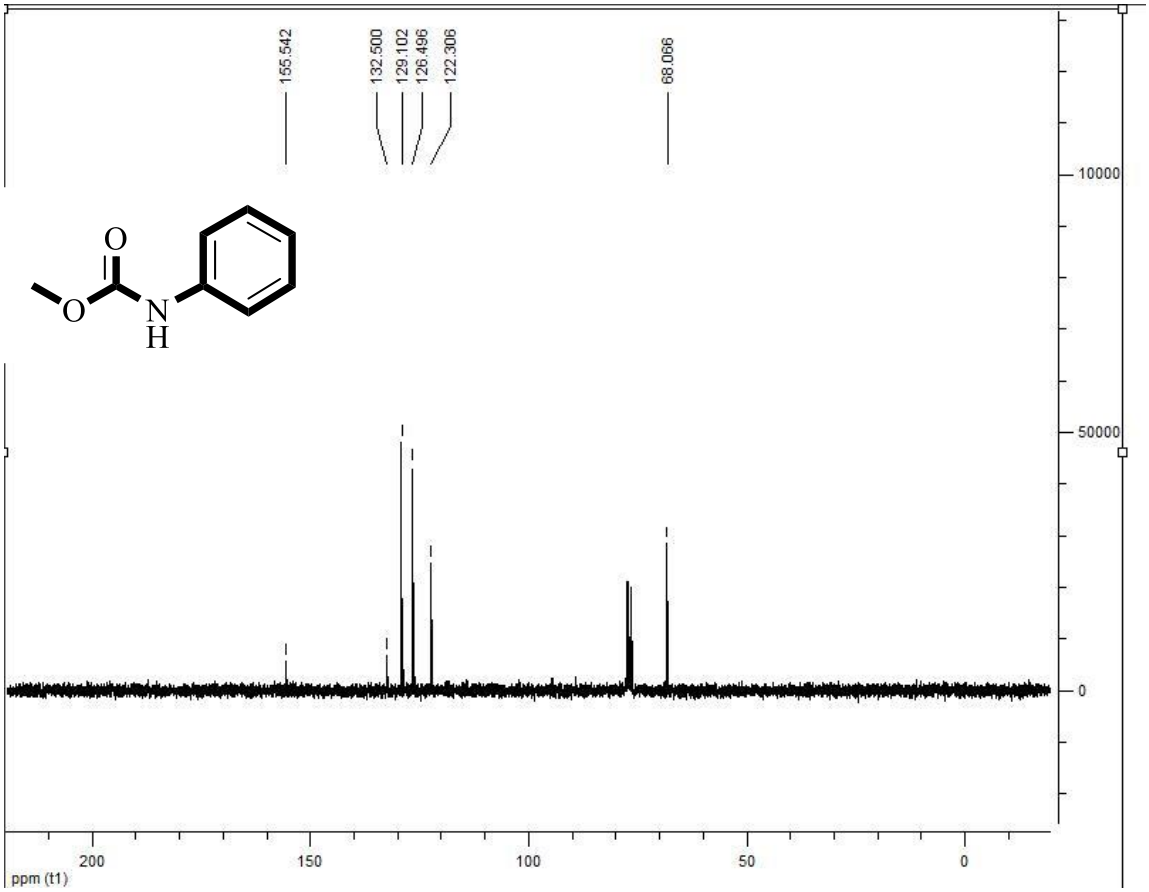
^{1}H-NMR spectra (250 MHz) of propyl phenylcarbamate (**5a**) in $CDCl_3$.



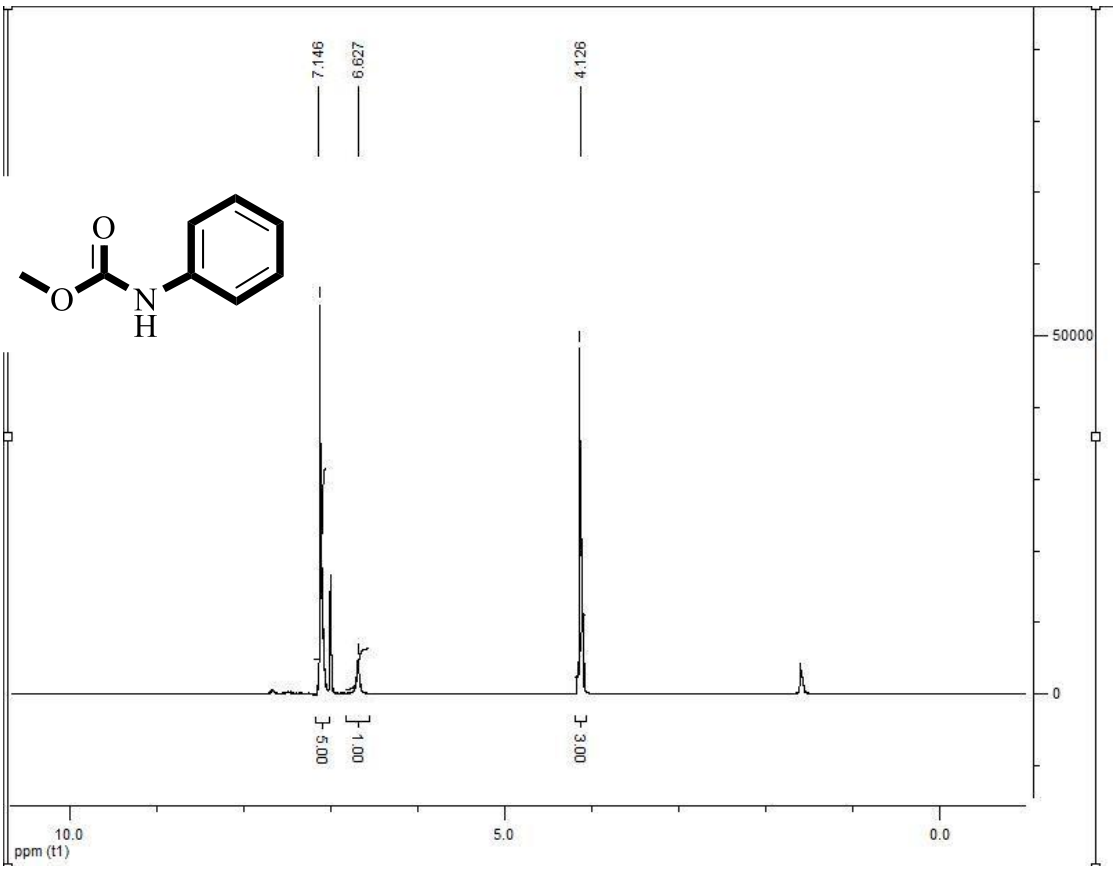
MS of propyl phenylcarbamate (**5a**).



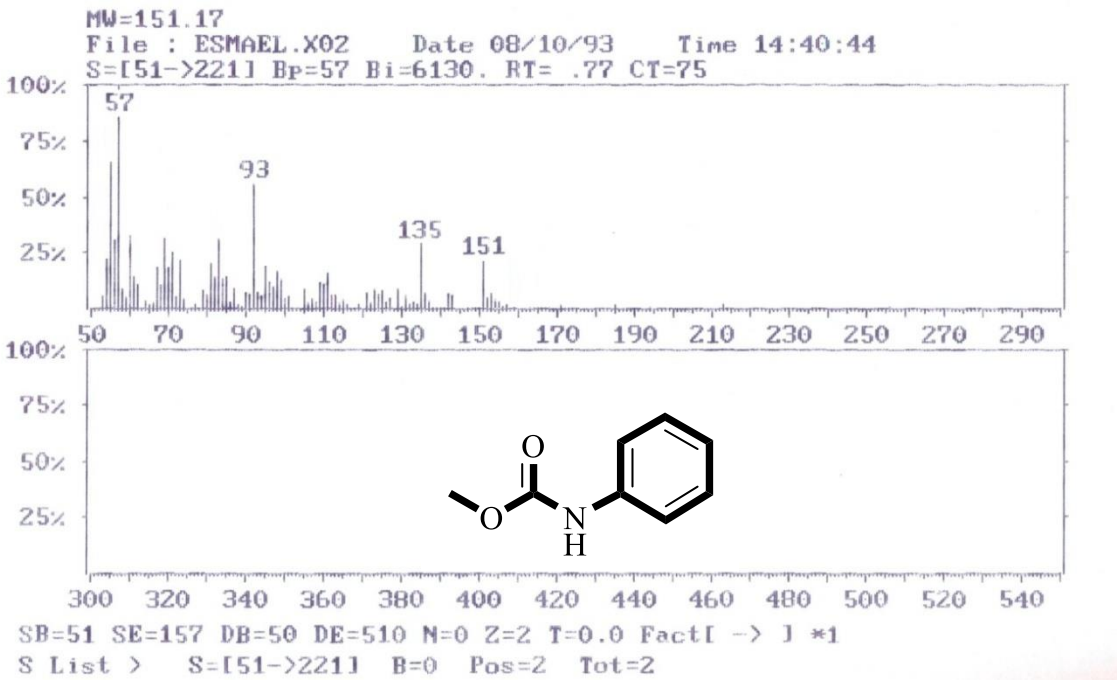
FT-IR spectra of methyl phenylcarbamate (**5b**) in KBr.



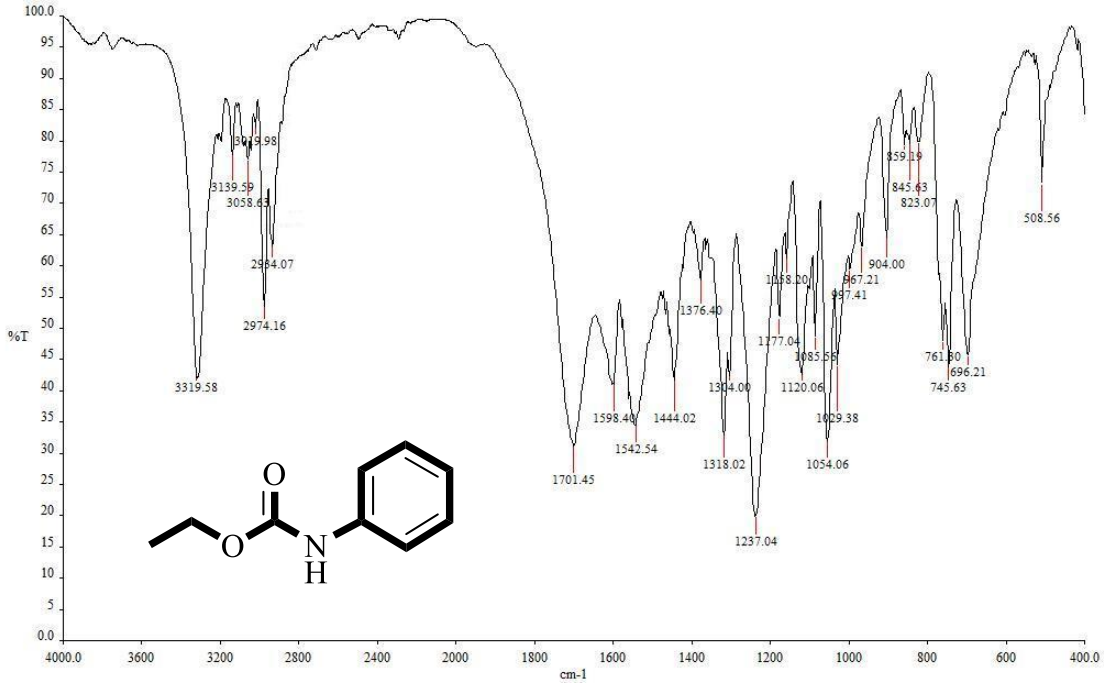
^{13}C-NMR spectra (63 MHz) of methyl phenylcarbamate (**5b**) in $CDCl_3$.



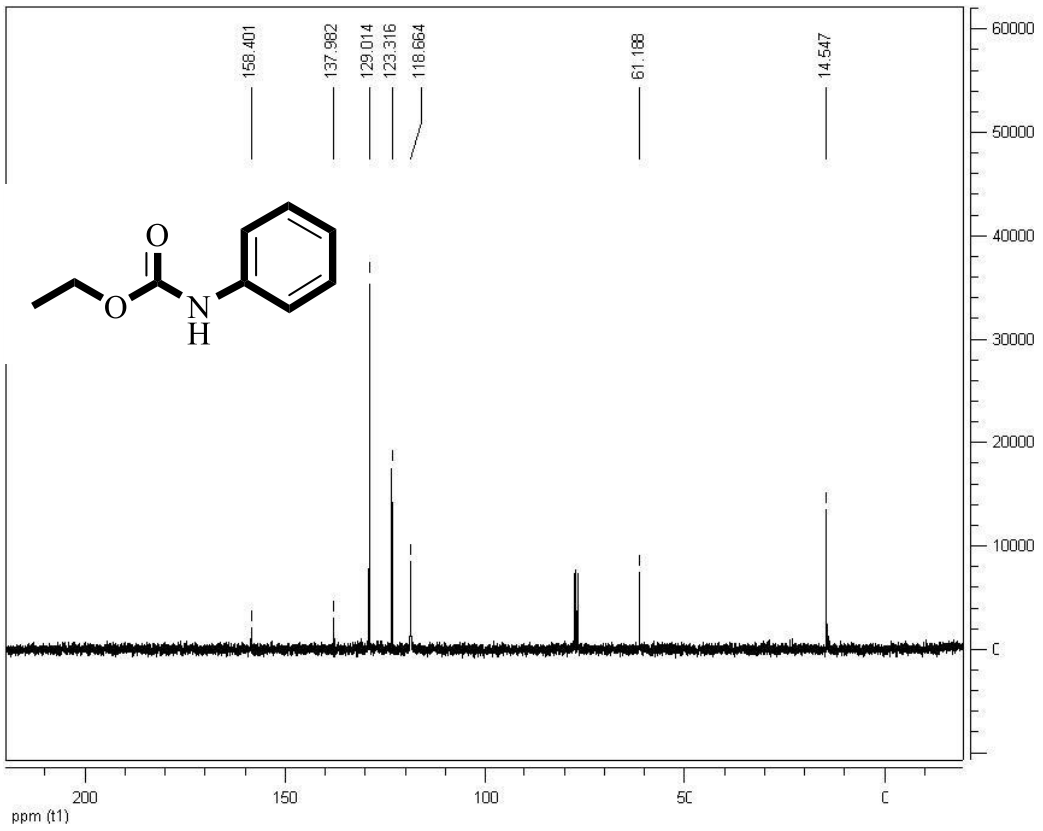
^{1}H-NMR spectra (250 MHz) of methyl phenylcarbamate (**5b**) in $CDCl_3$.



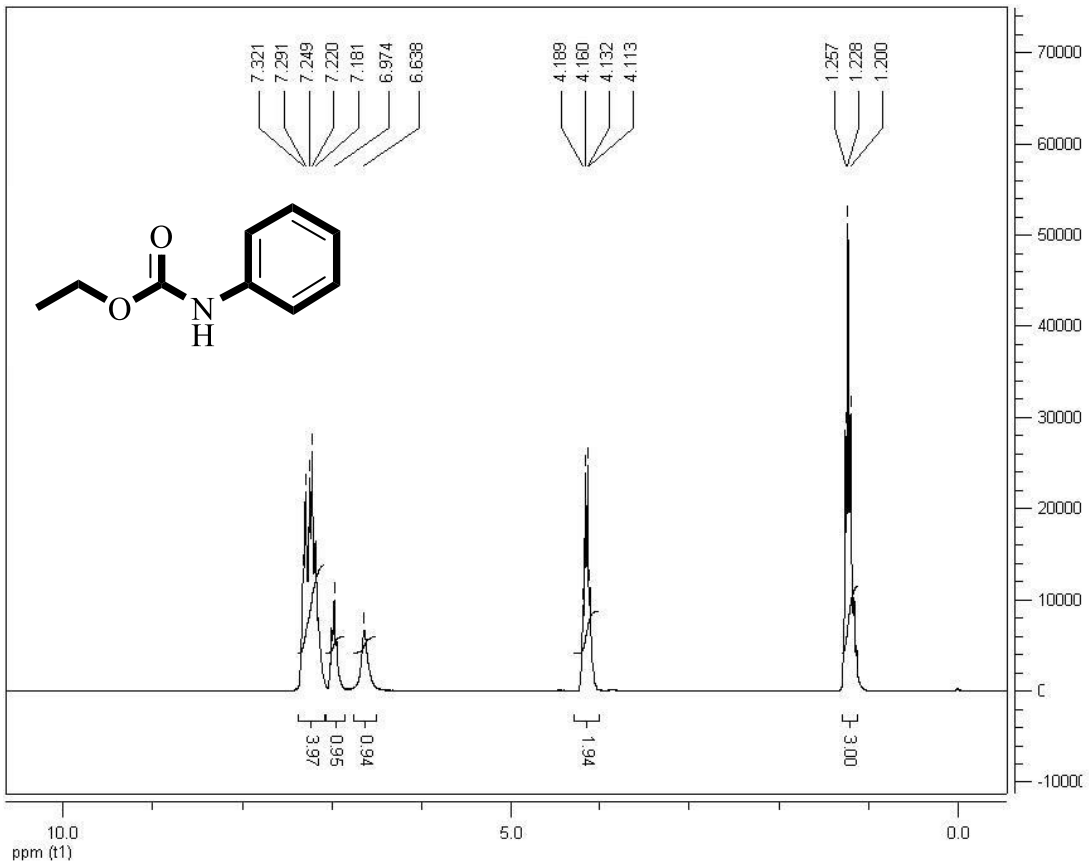
MS of methyl phenylcarbamate (**5b**).



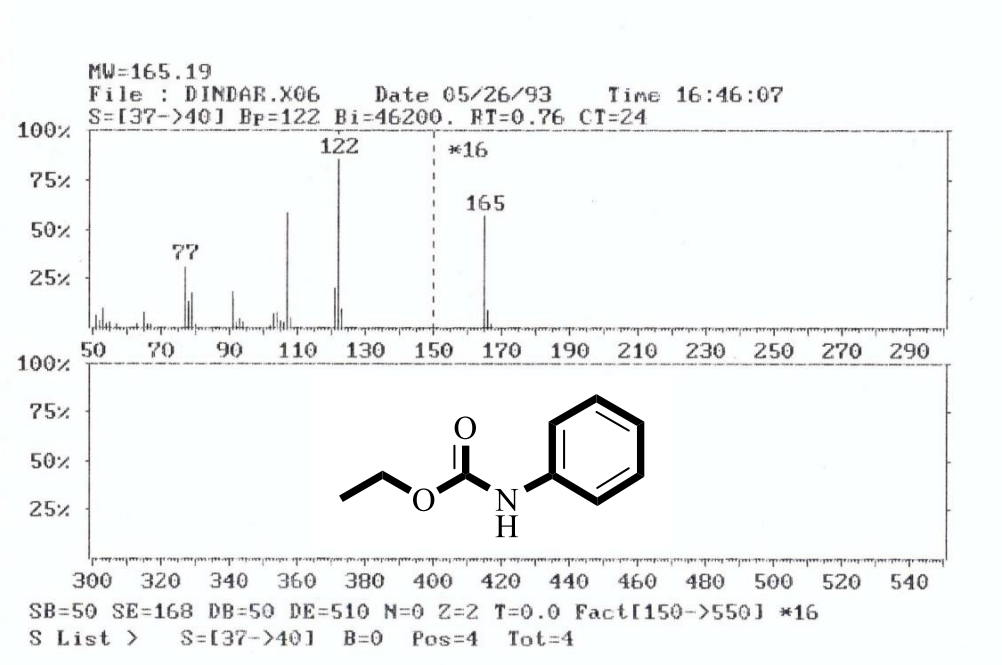
FT-IR spectra of ethyl phenylcarbamate (**5c**) in KBr.



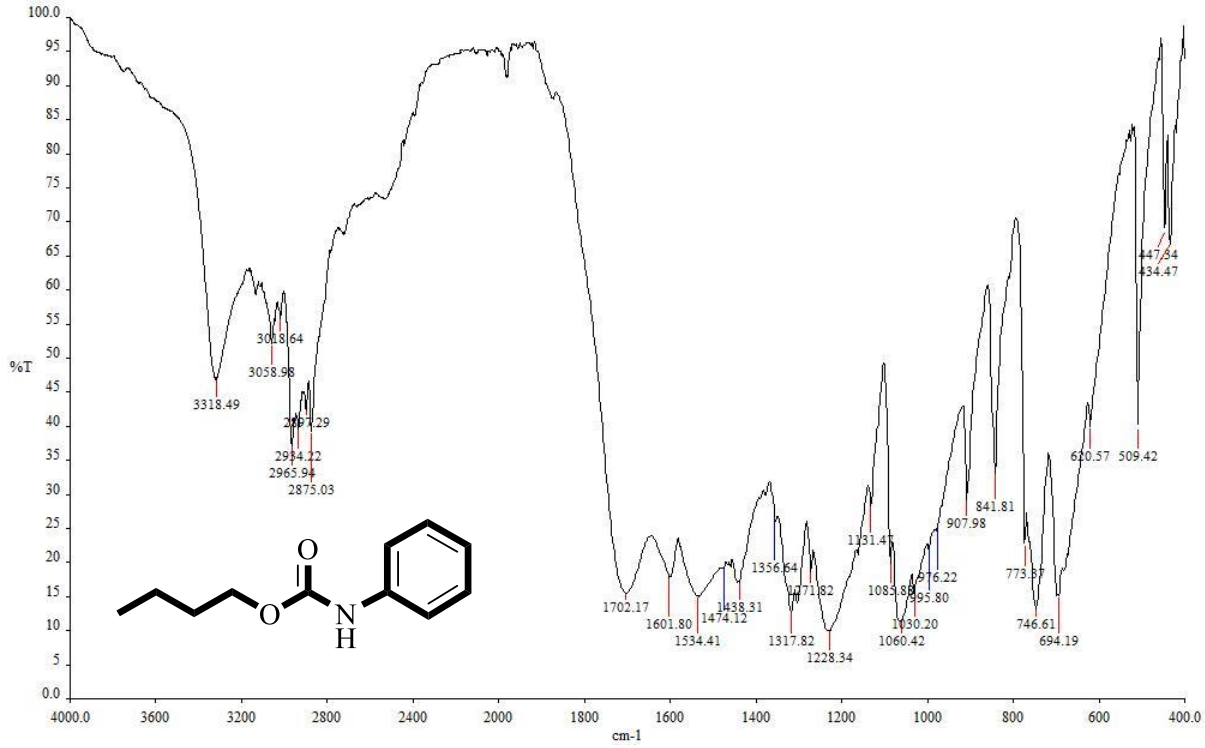
^{13}C-NMR spectra (63 MHz) of ethyl phenylcarbamate (**5c**) in $CDCl_3$.



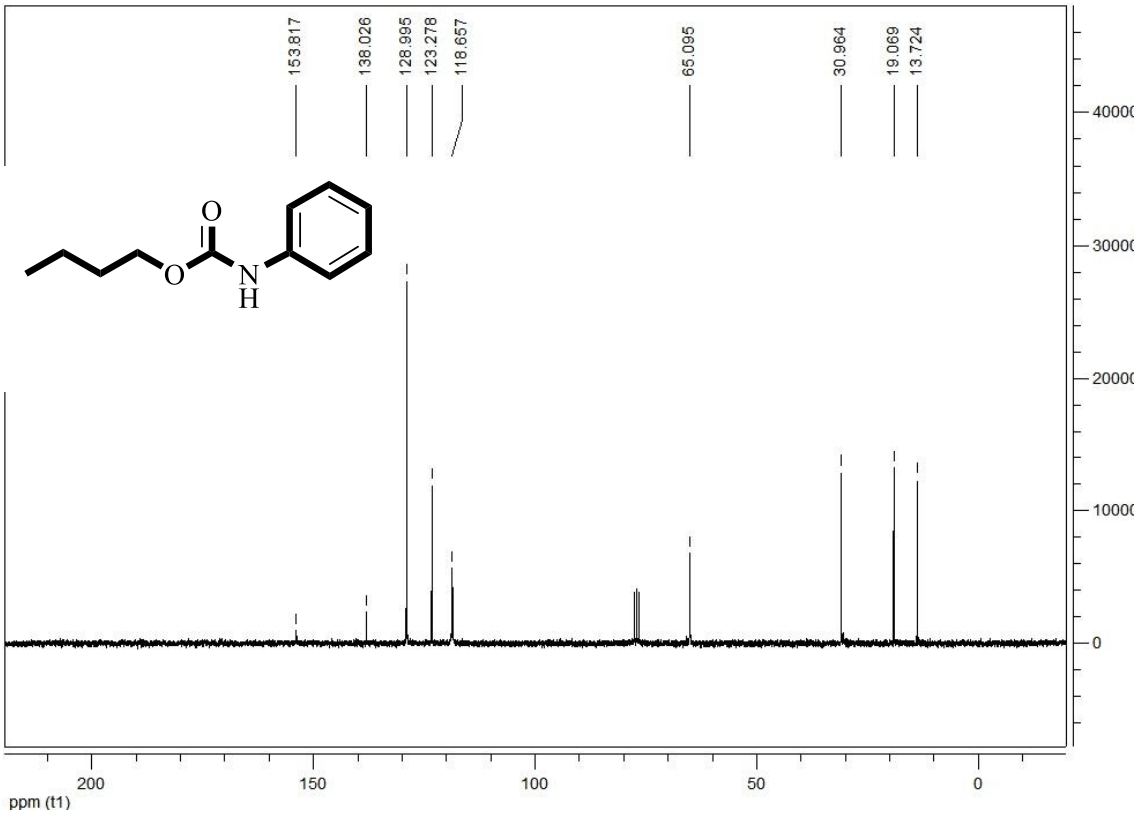
^{1}H-NMR spectra (250 MHz) of ethyl phenylcarbamate (**5c**) in $CDCl_3$.



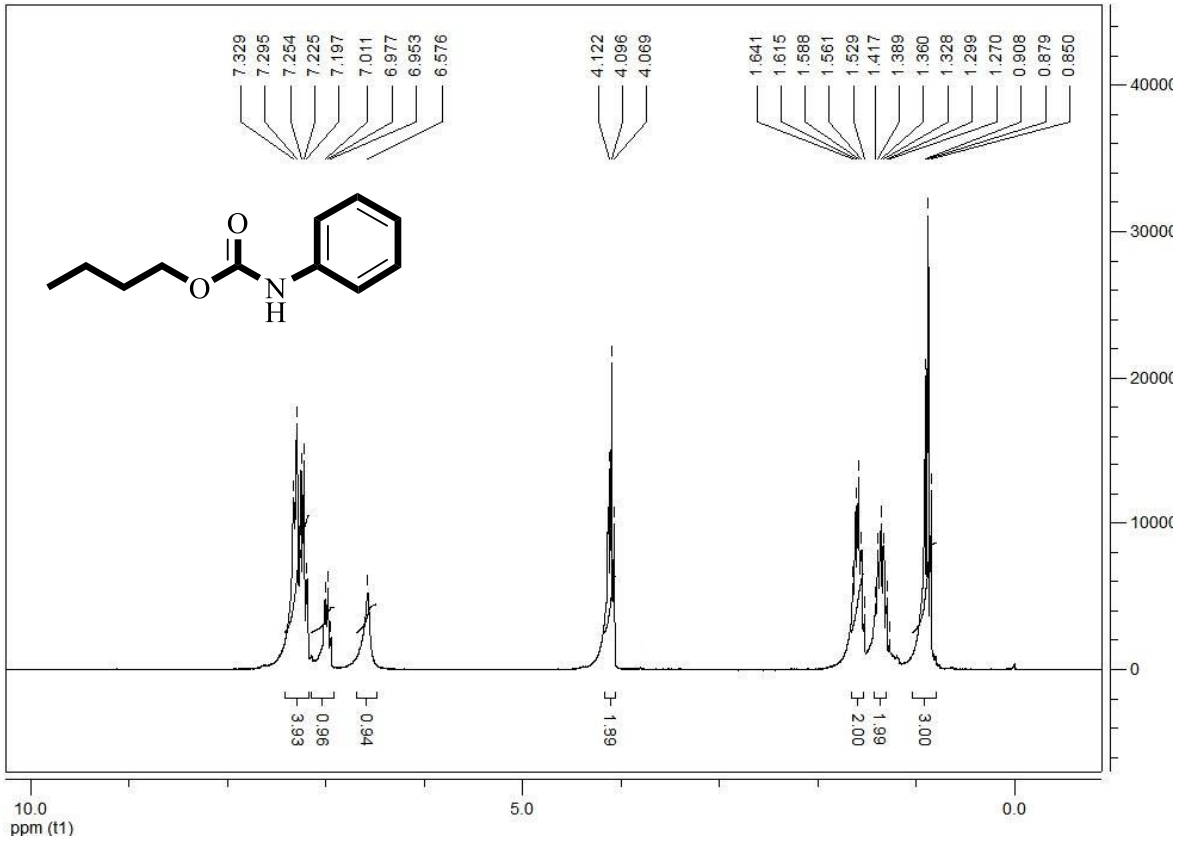
MS of ethyl phenylcarbamate (**5c**).



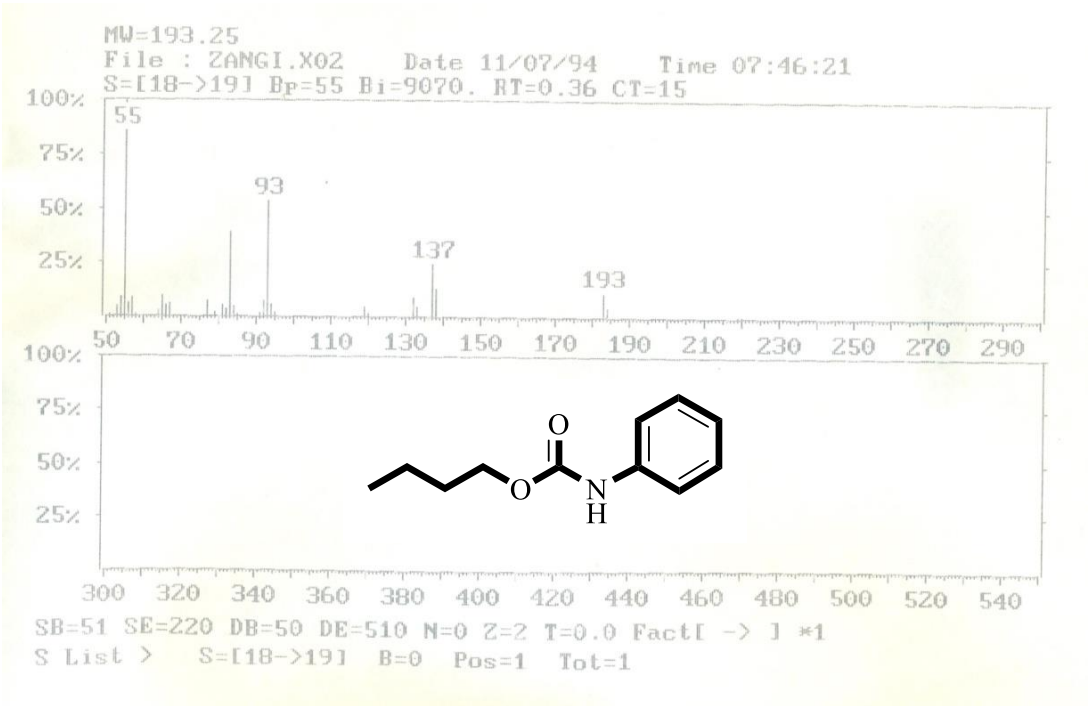
FT-IR spectra of 1-butyl phenylcarbamate (**5d**) in KBr.



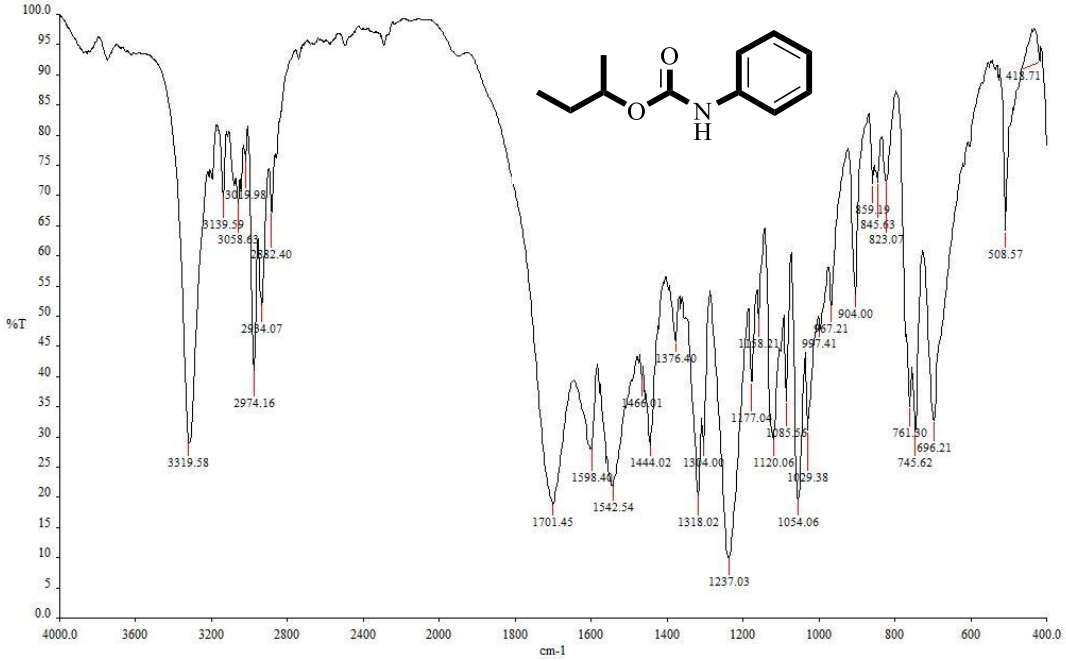
^{13}C-NMR spectra (63 MHz) of 1-butyl phenylcarbamate (**5d**) in $CDCl_3$.



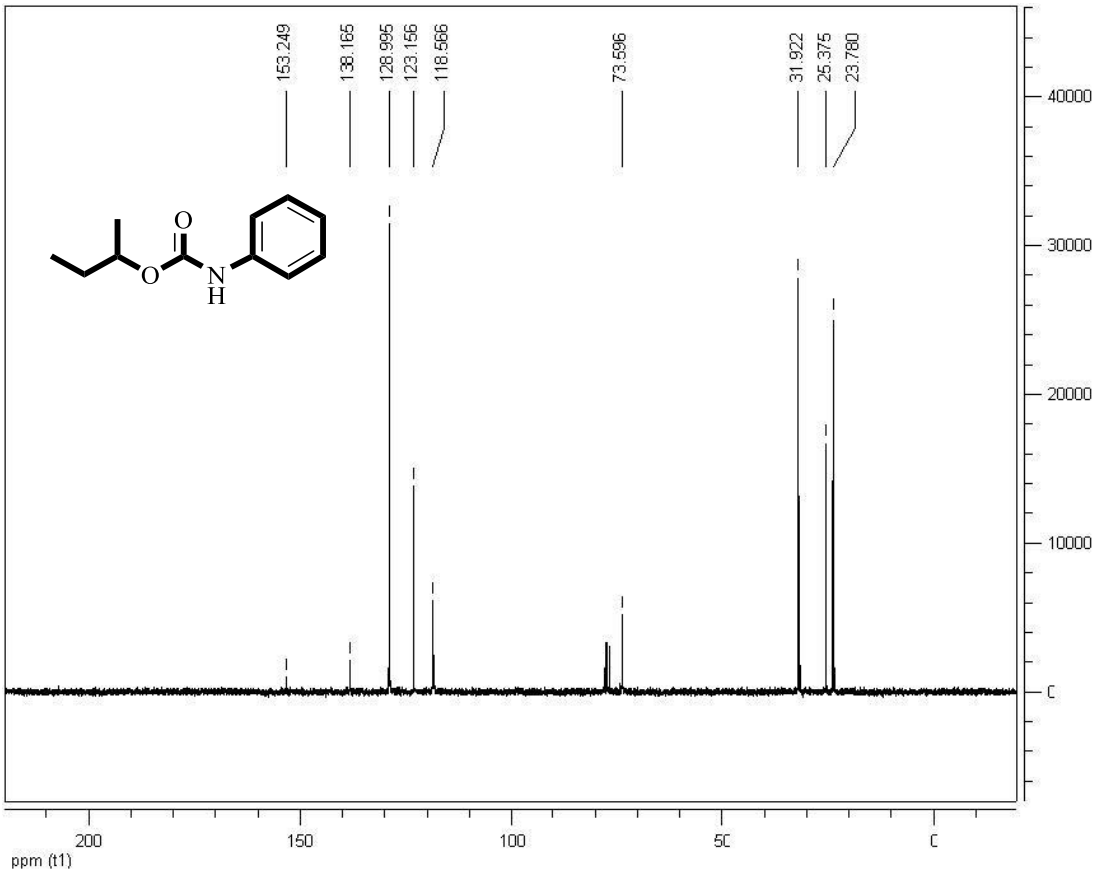
^{1}H-NMR spectra (250 MHz) of 1-butyl phenylcarbamate (**5d**) in $CDCl_3$.



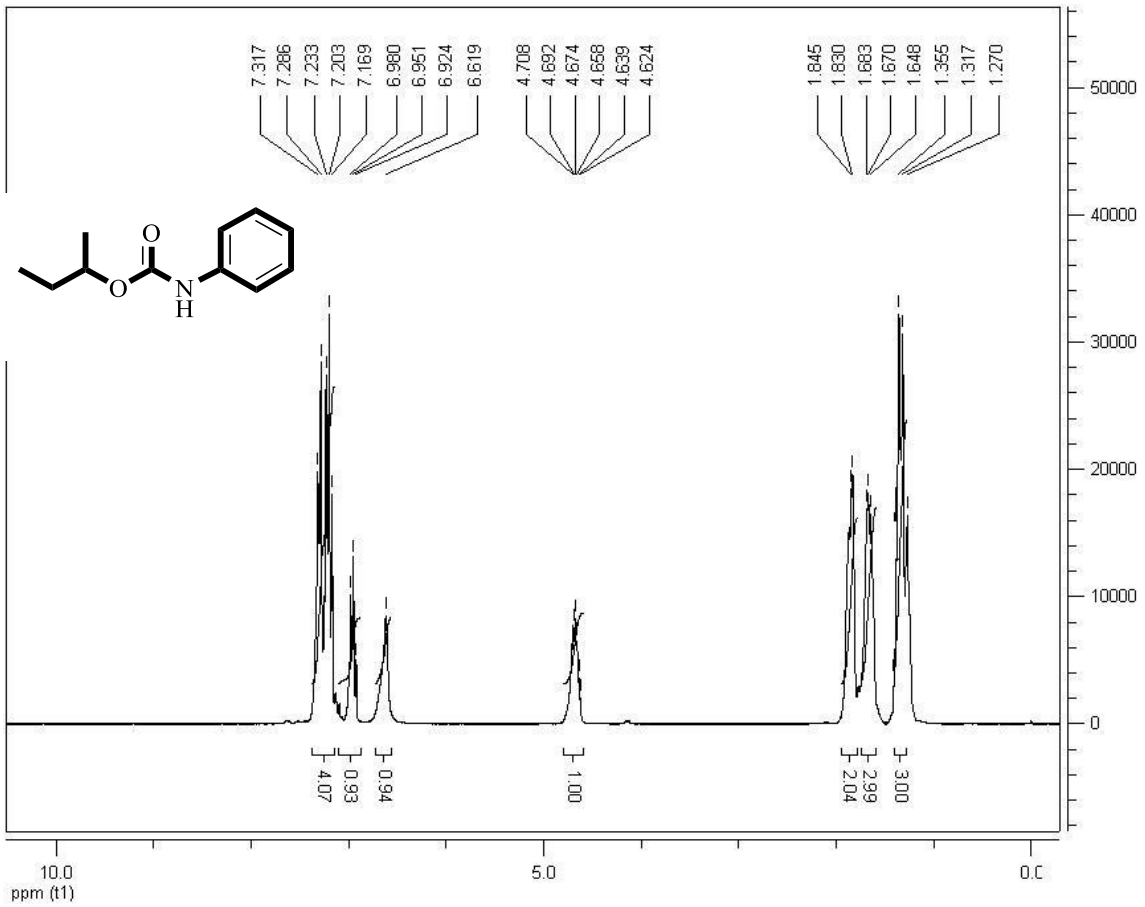
MS of 1-butyl phenylcarbamate (**5d**).



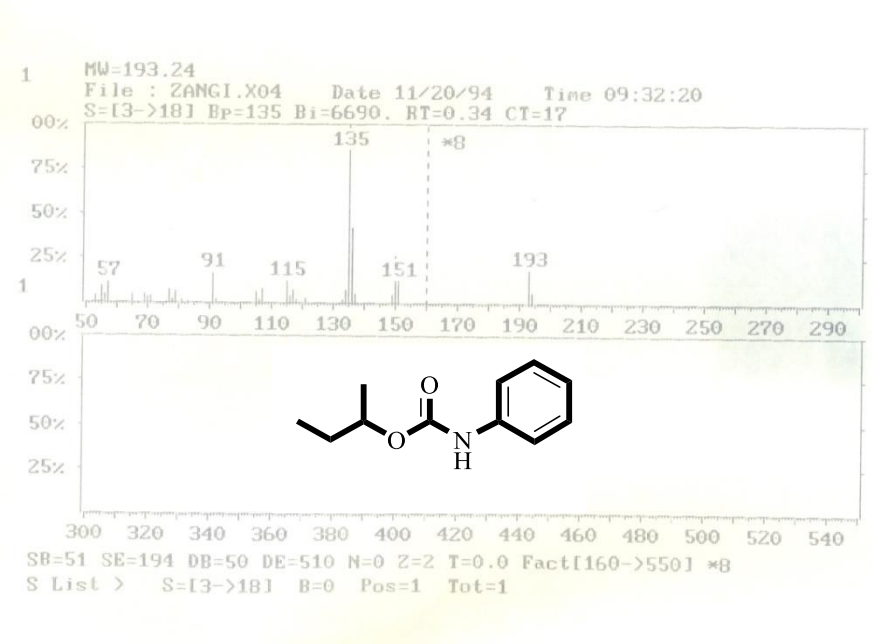
FT-IR spectra of 2-butyl phenylcarbamate (**5e**) in KBr.



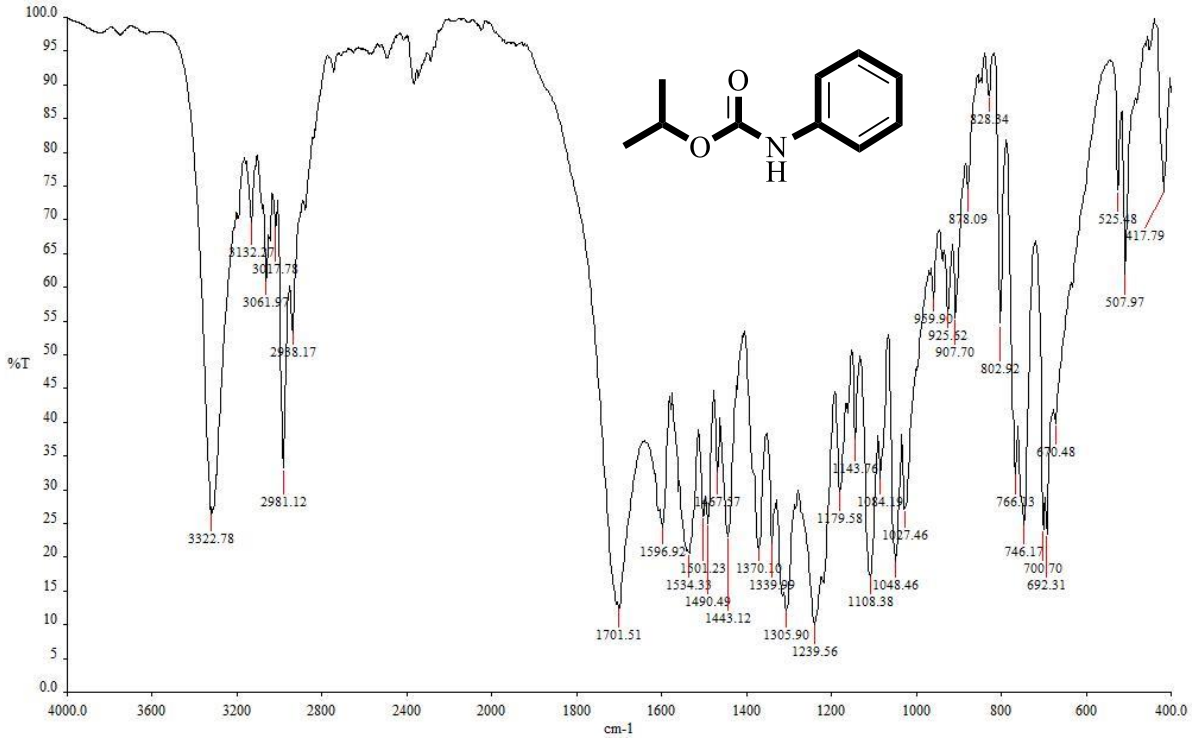
^{13}C-NMR spectra (63 MHz) of 2-butyl phenylcarbamate (**5e**) in $CDCl_3$.



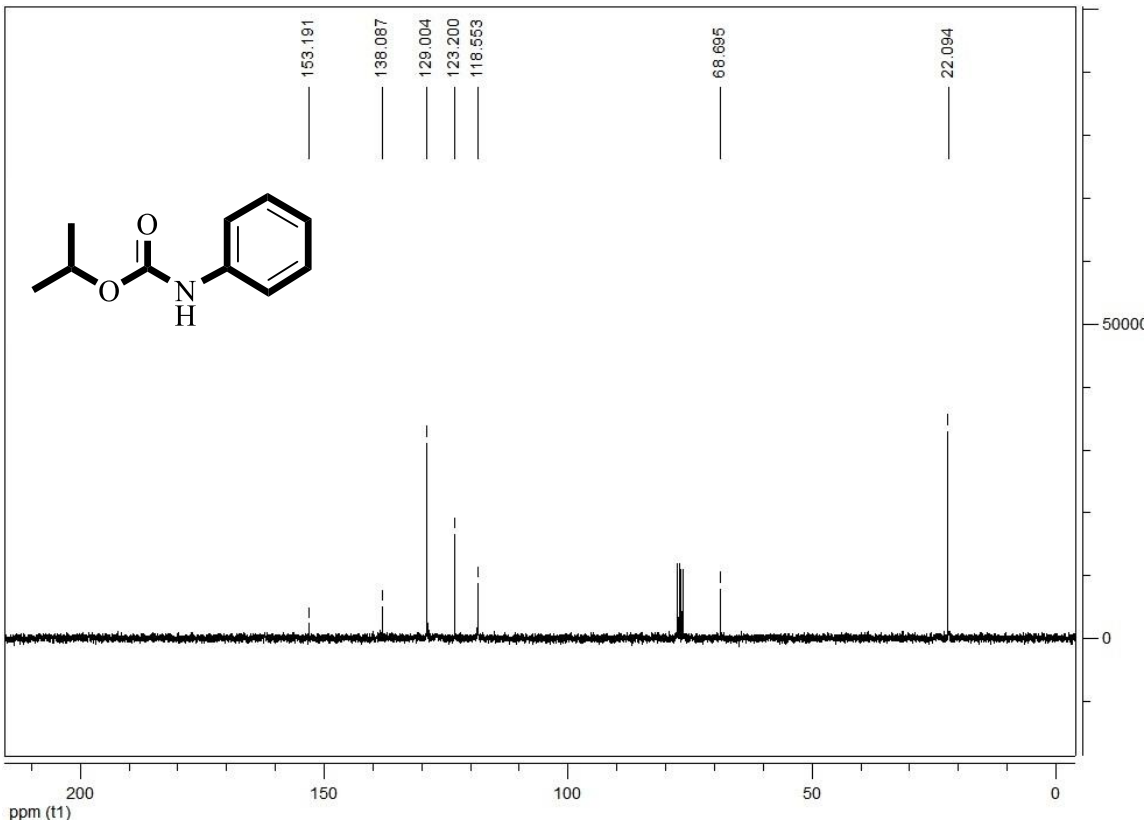
^{1}H-NMR spectra (250 MHz) of 2-butyl phenylcarbamate (**5e**) in $CDCl_3$.



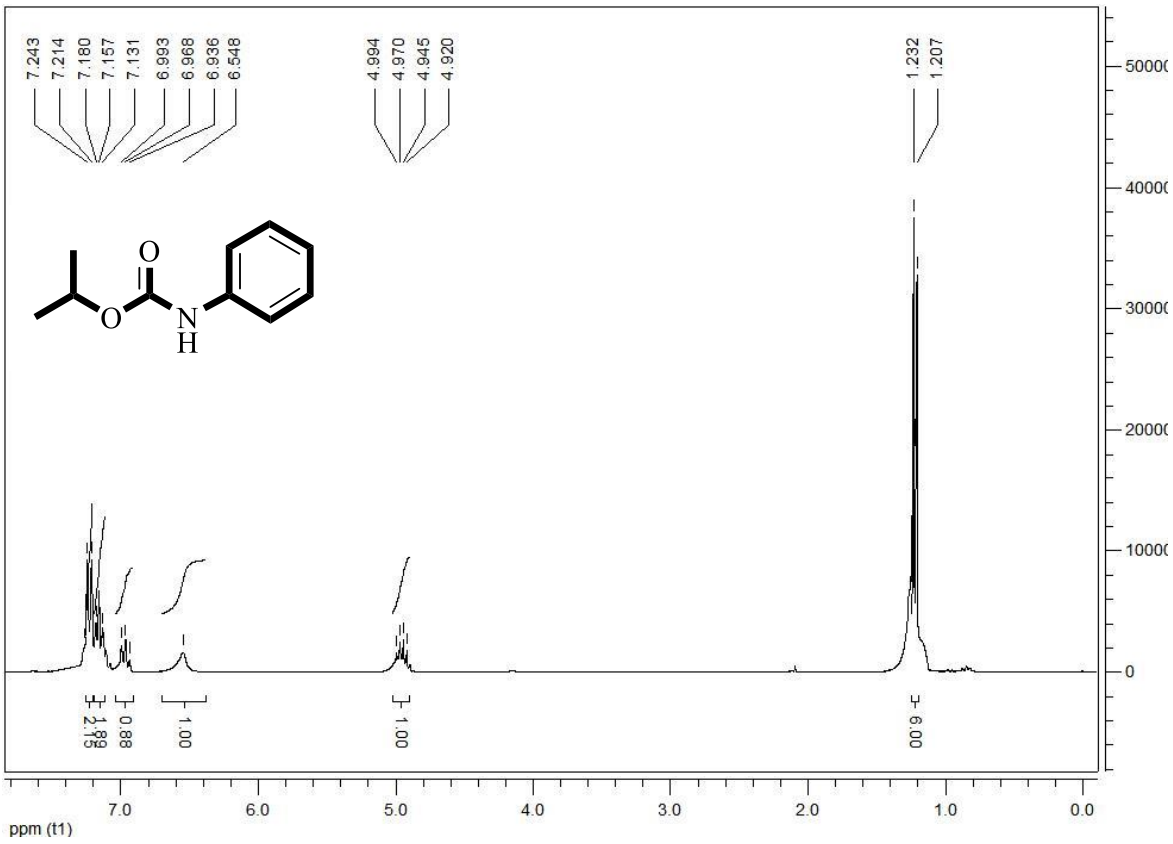
MS of 2-butyl phenylcarbamate (**5e**).



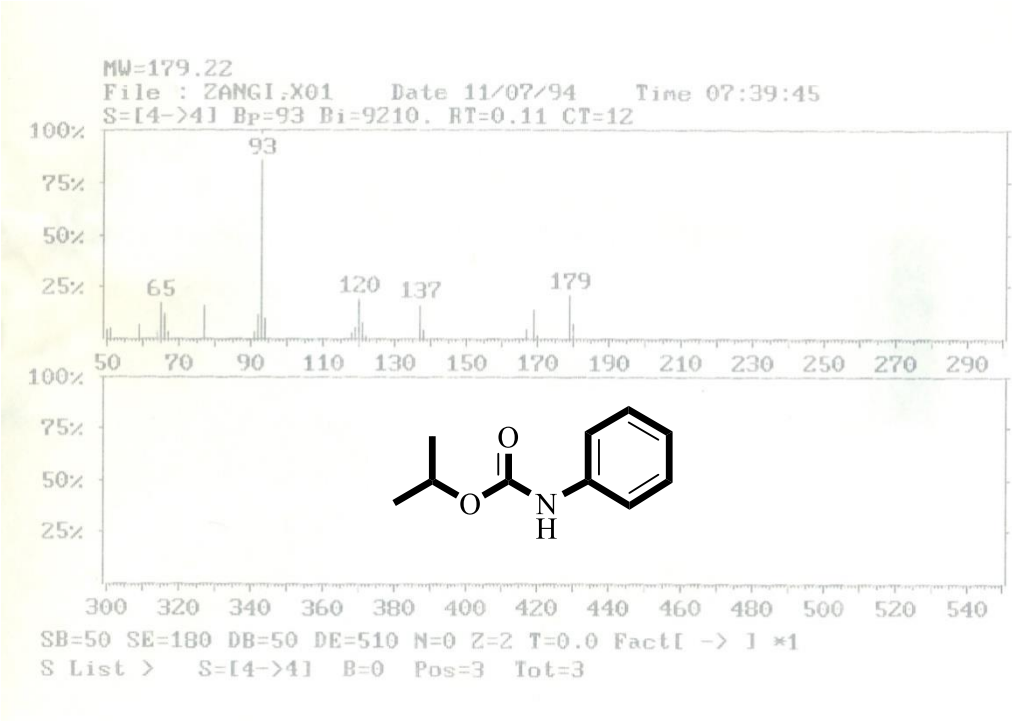
FT-IR spectra of 2-propyl phenylcarbamate (**5f**) in KBr.



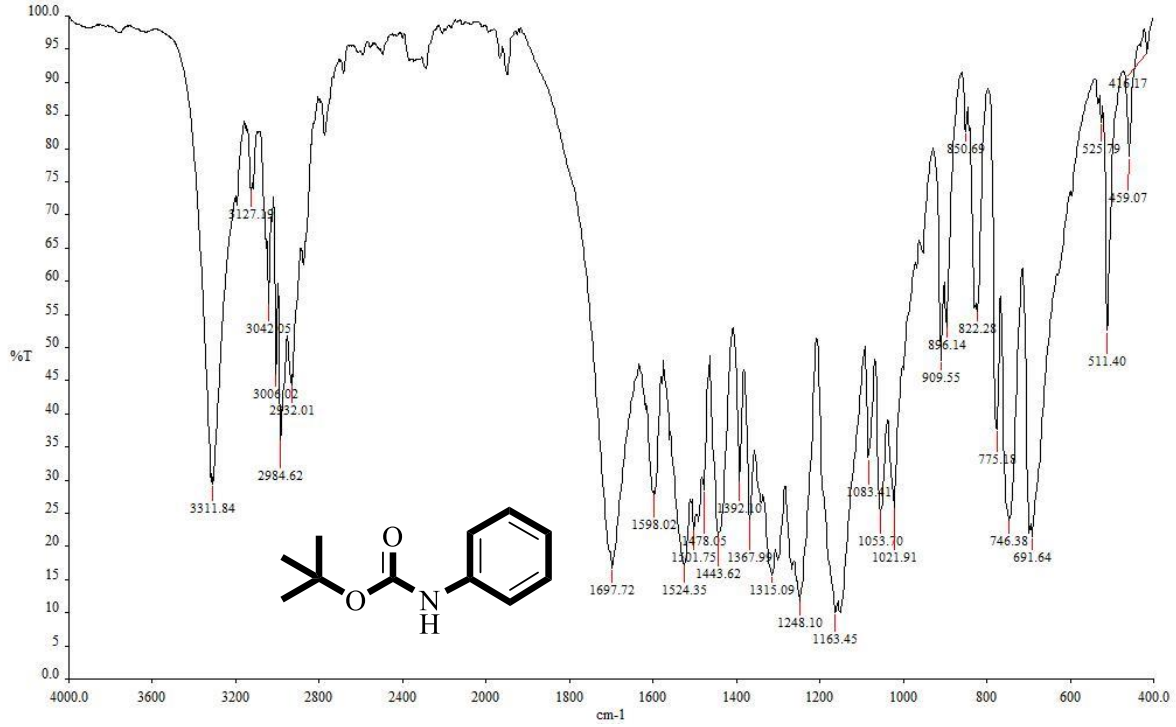
^{13}C-NMR spectra (63 MHz) of 2-propyl phenylcarbamate (**5f**) in $CDCl_3$.



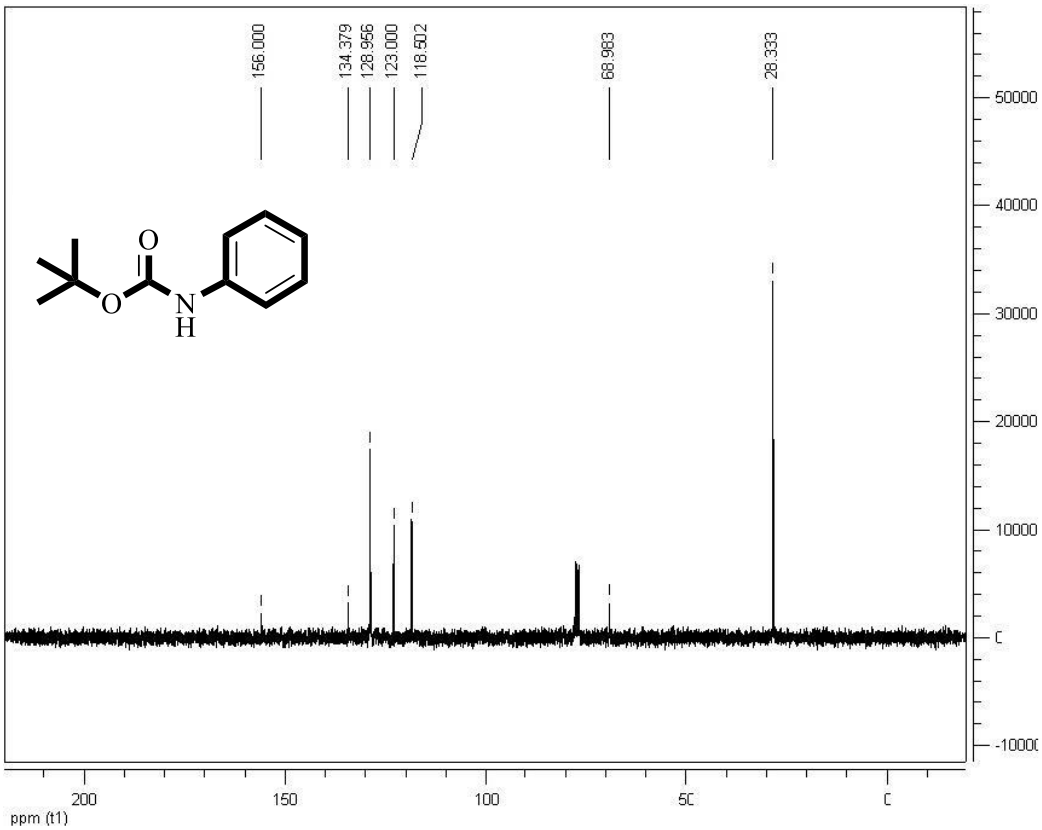
^{1}H-NMR spectra (250 MHz) of 2-propyl phenylcarbamate (**5f**) in $CDCl_3$.



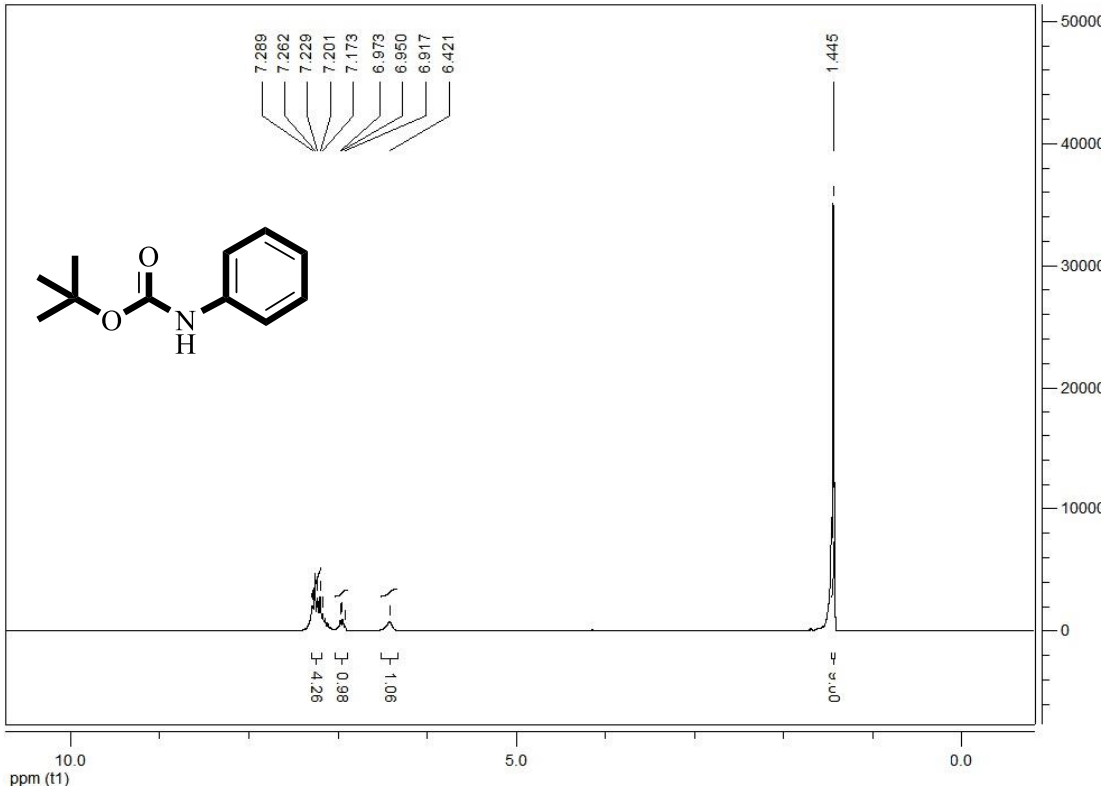
MS of 2-propyl phenylcarbamate (**5f**).



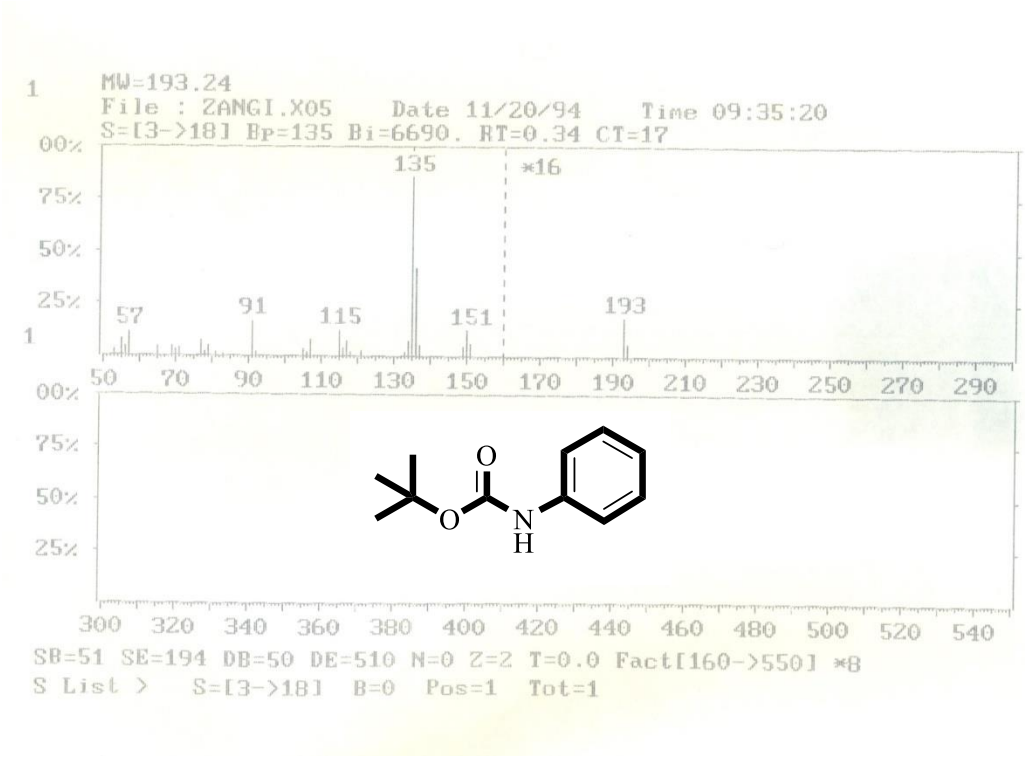
FT-IR spectra of *tert*-butyl phenylcarbamate (**5g**) in KBr.



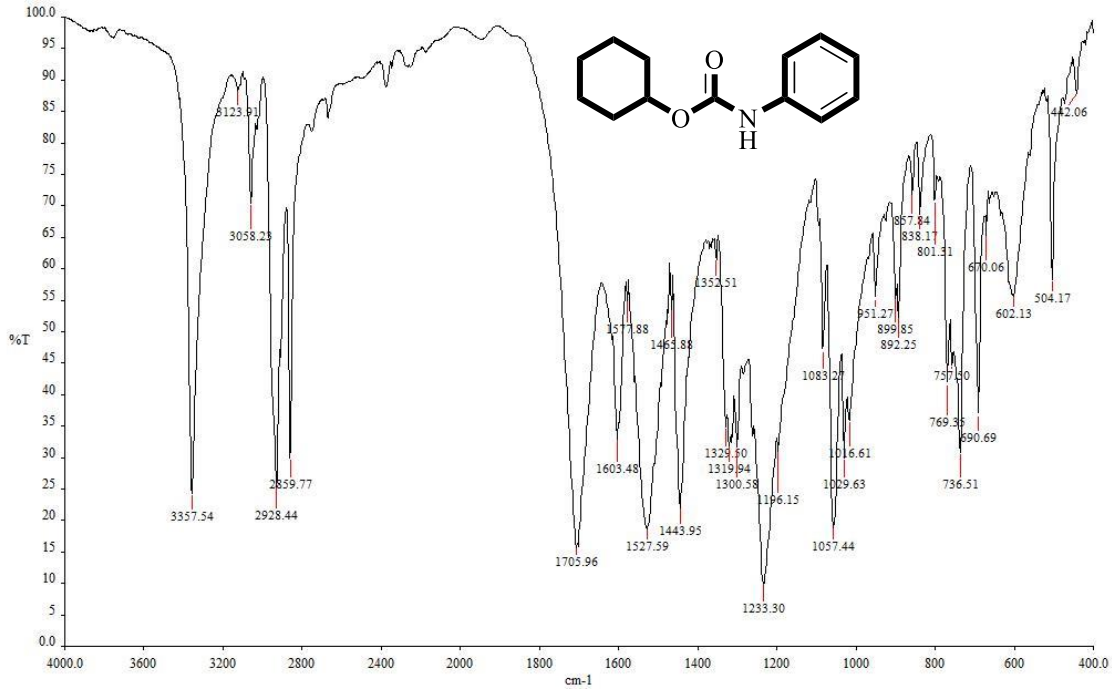
^{13}C-NMR spectra (63 MHz) of *tert*-butyl phenylcarbamate (**5g**) in $CDCl_3$.



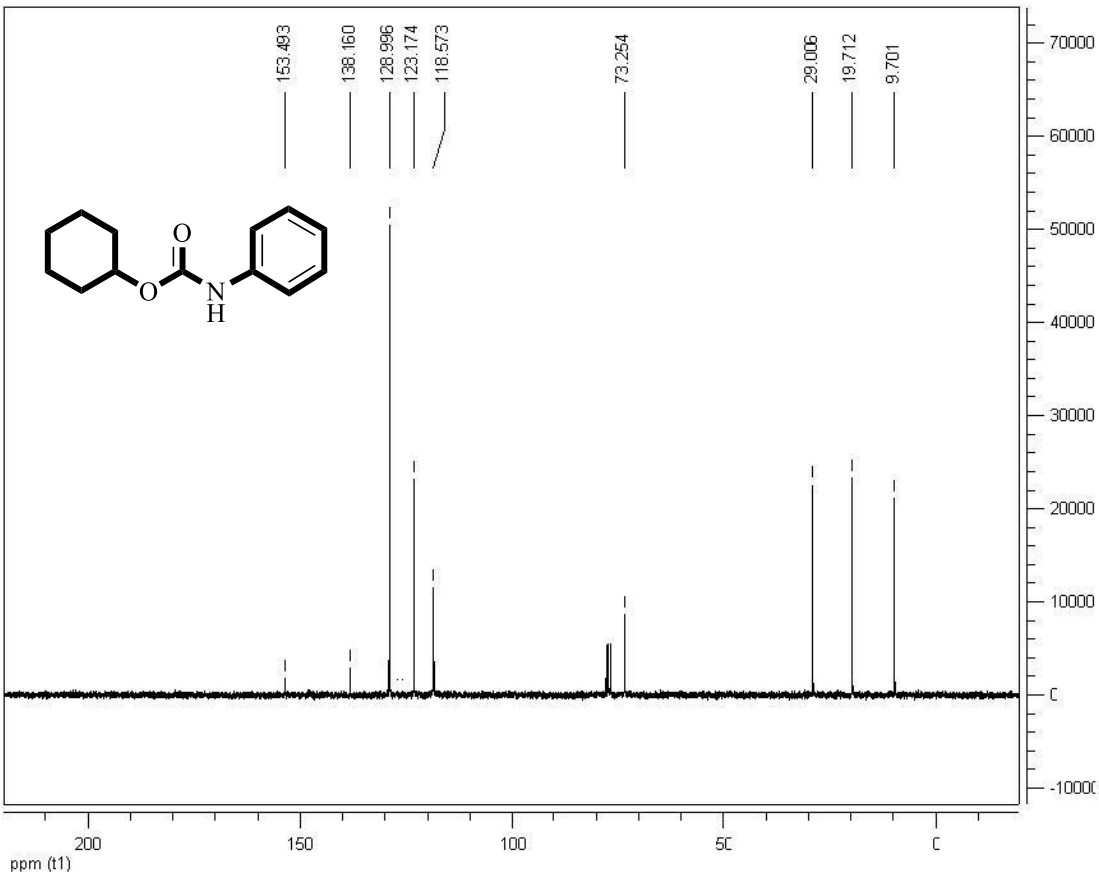
^{1}H-NMR spectra (250 MHz) of *tert*-butyl phenylcarbamate (**5g**) in $CDCl_3$.



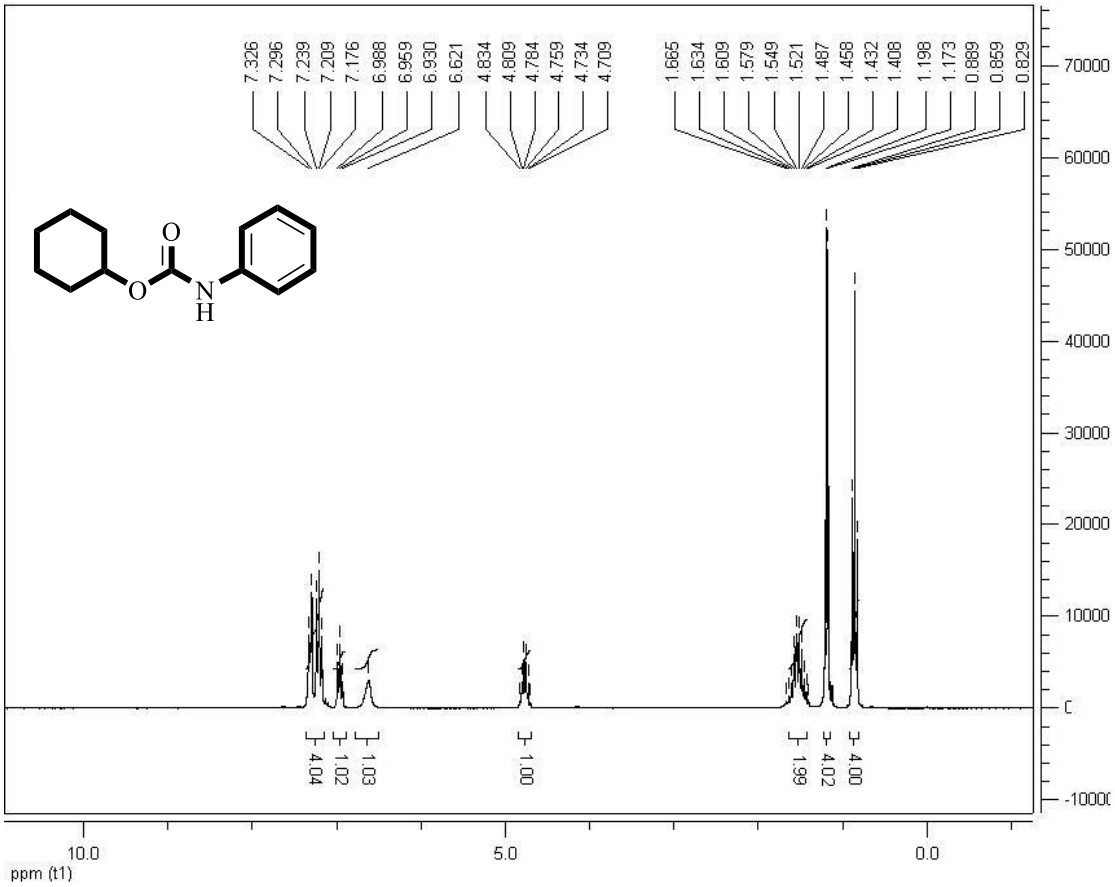
MS of *tert*-butyl phenylcarbamate (**5g**).



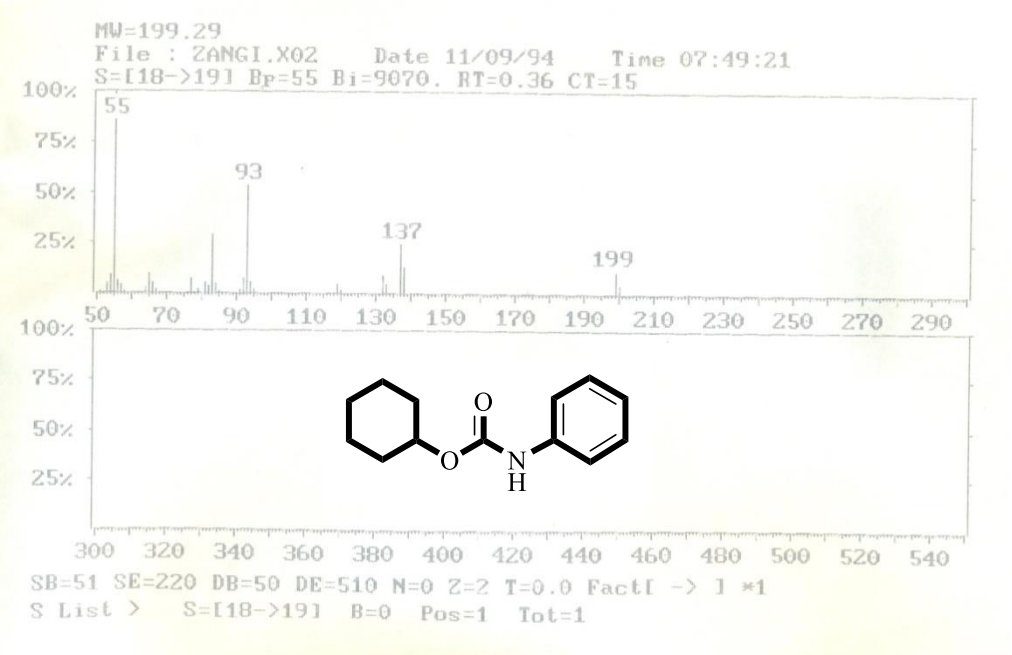
FT-IR spectra of cyclohexyl phenylcarbamate (**5h**) in KBr.



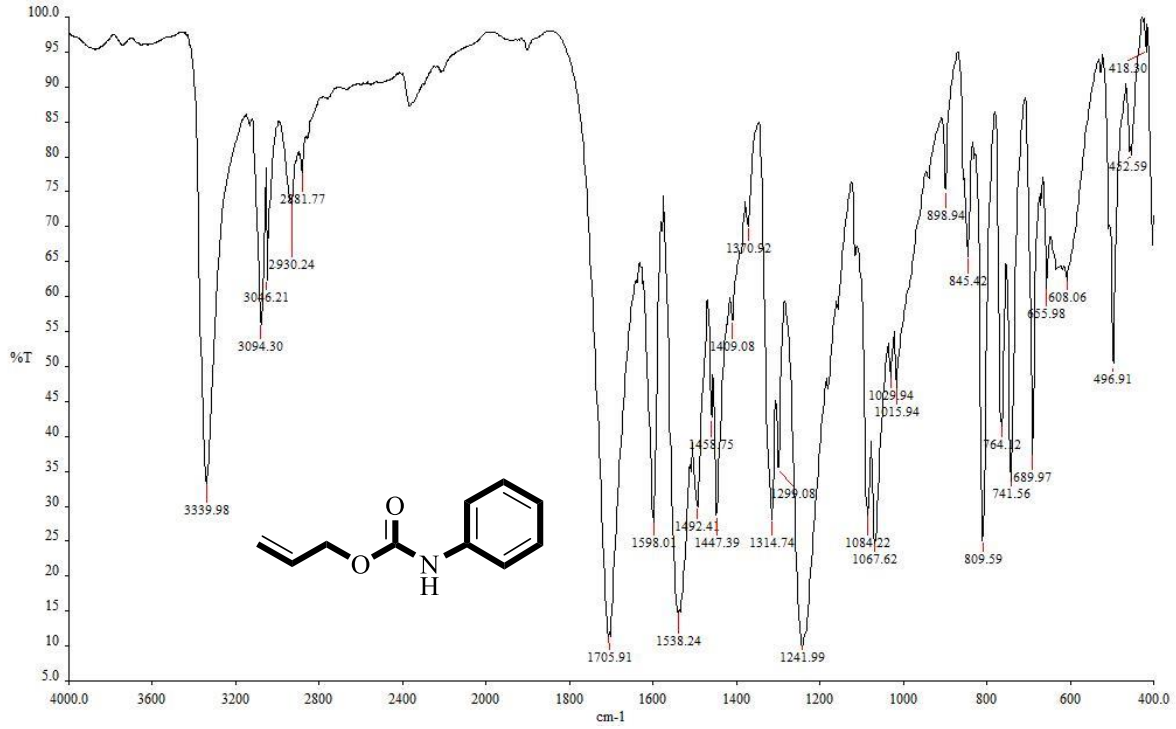
^{13}C-NMR spectra (63 MHz) of cyclohexyl phenylcarbamate (**5h**) in $CDCl_3$.



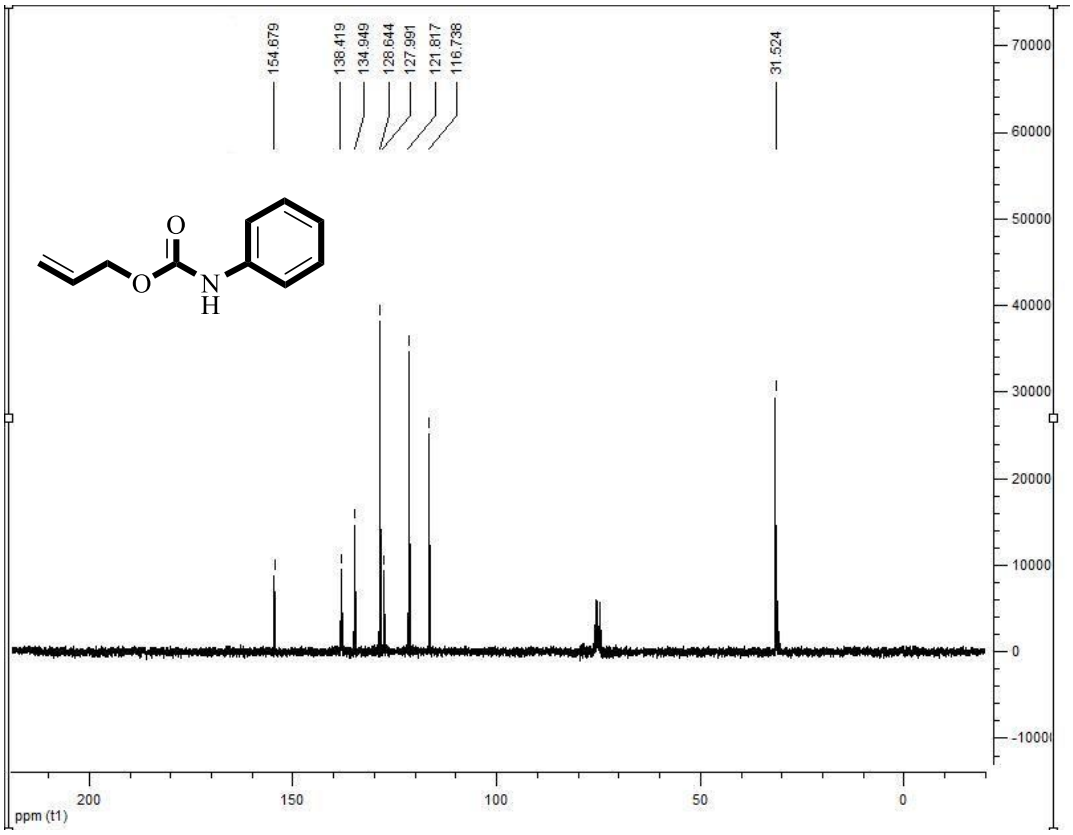
^{1}H-NMR spectra (250 MHz) of cyclohexyl phenylcarbamate (**5h**) in $CDCl_3$.



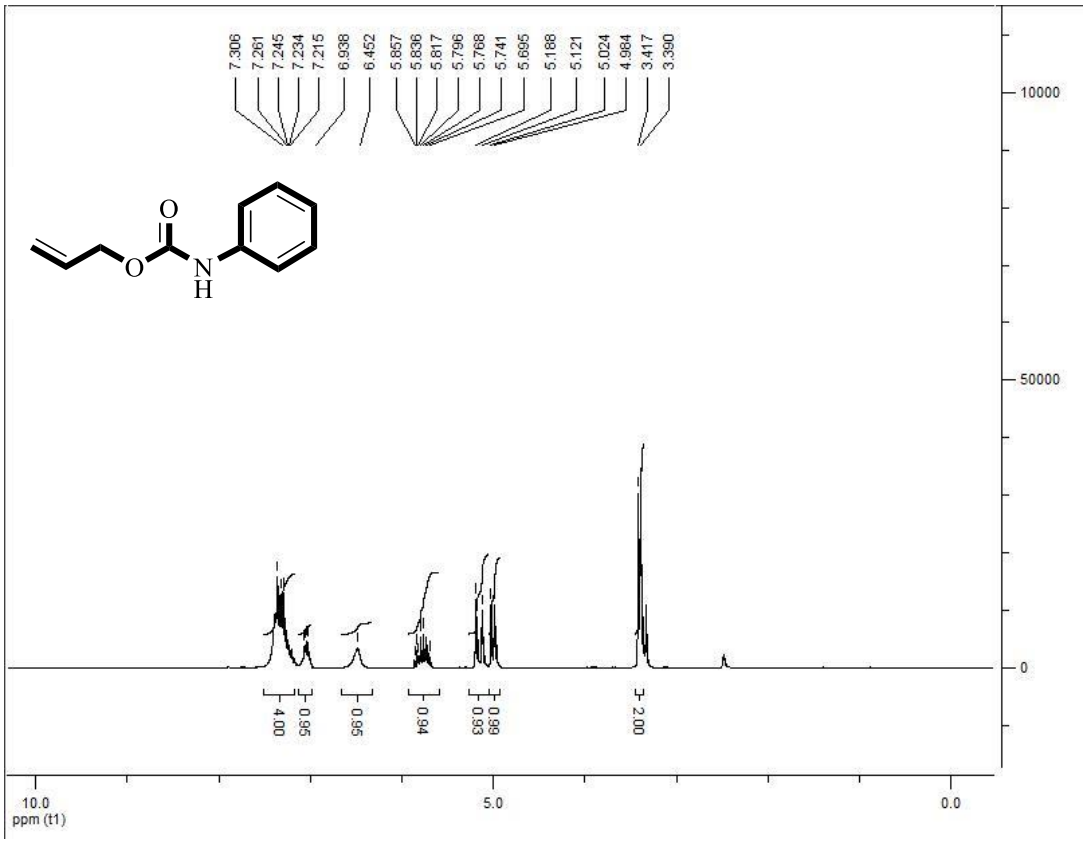
MS of cyclohexyl phenylcarbamate (**5h**).



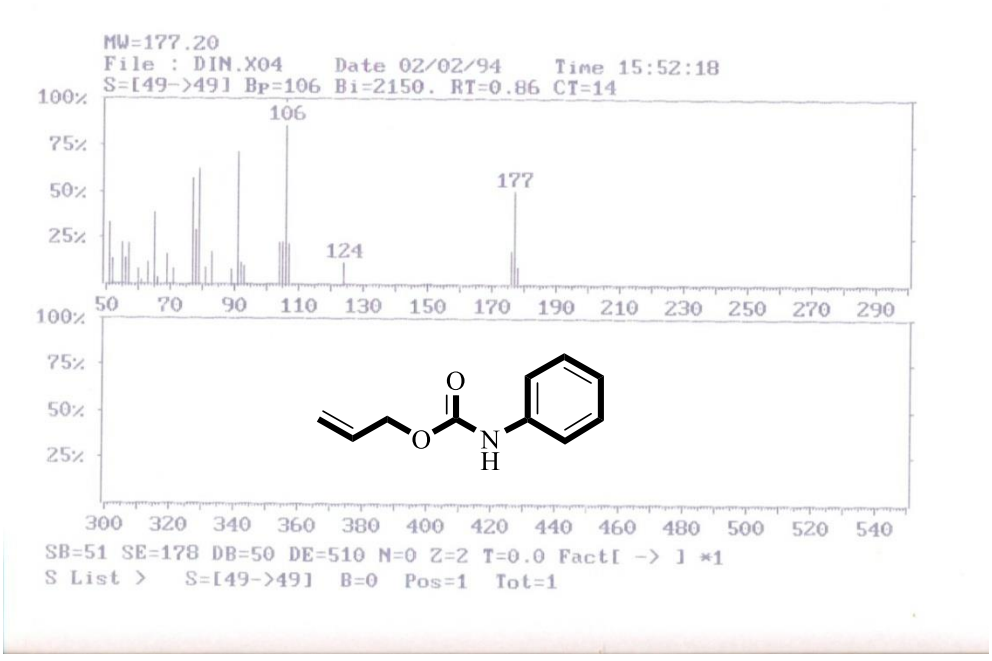
FT-IR spectra of allyl phenylcarbamate (**5i**) in KBr.



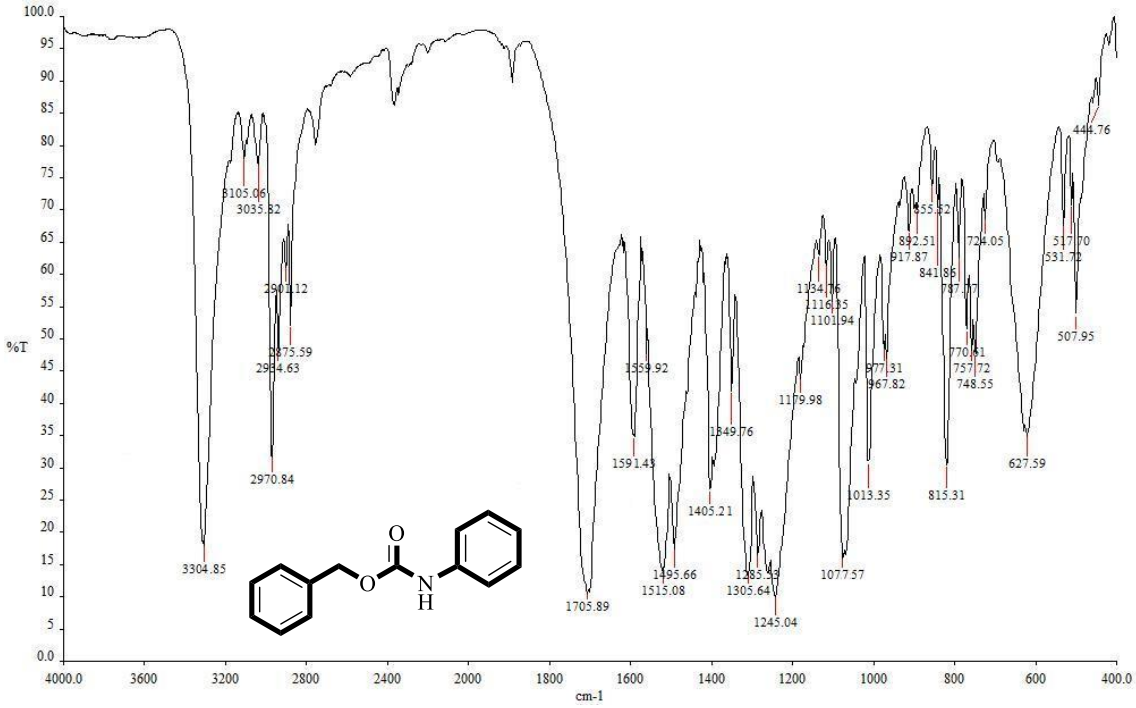
^{13}C-NMR spectra (63 MHz) of allyl phenylcarbamate (**5i**) in $CDCl_3$.



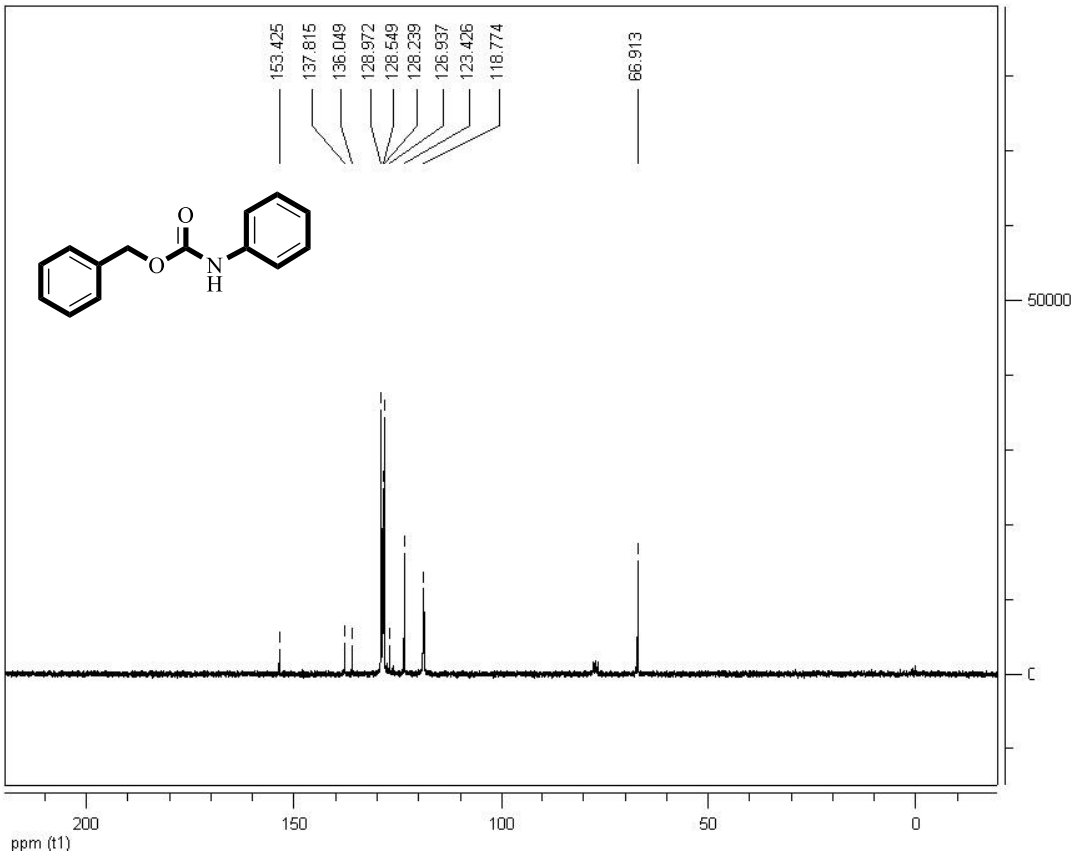
^{1}H-NMR spectra (250 MHz) of allyl phenylcarbamate (**5i**) in $CDCl_3$.



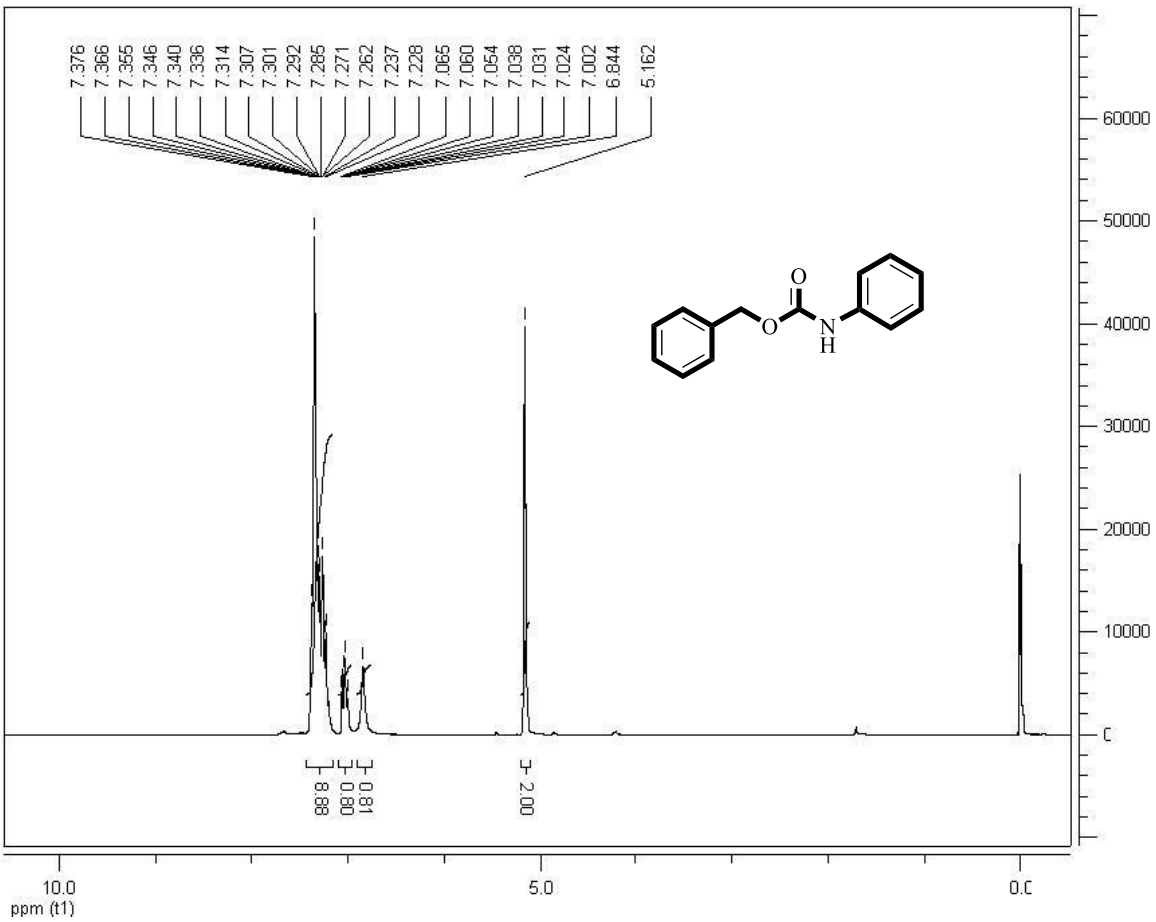
MS of allyl phenylcarbamate (**5i**).



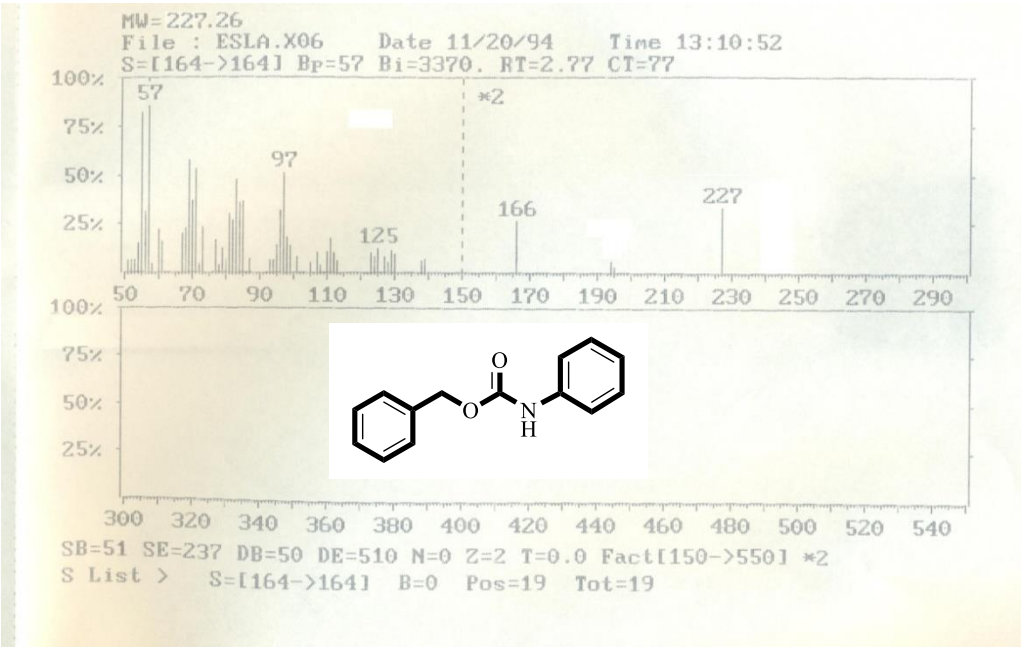
FT-IR spectra of benzyl phenylcarbamate (**5j**) in KBr.



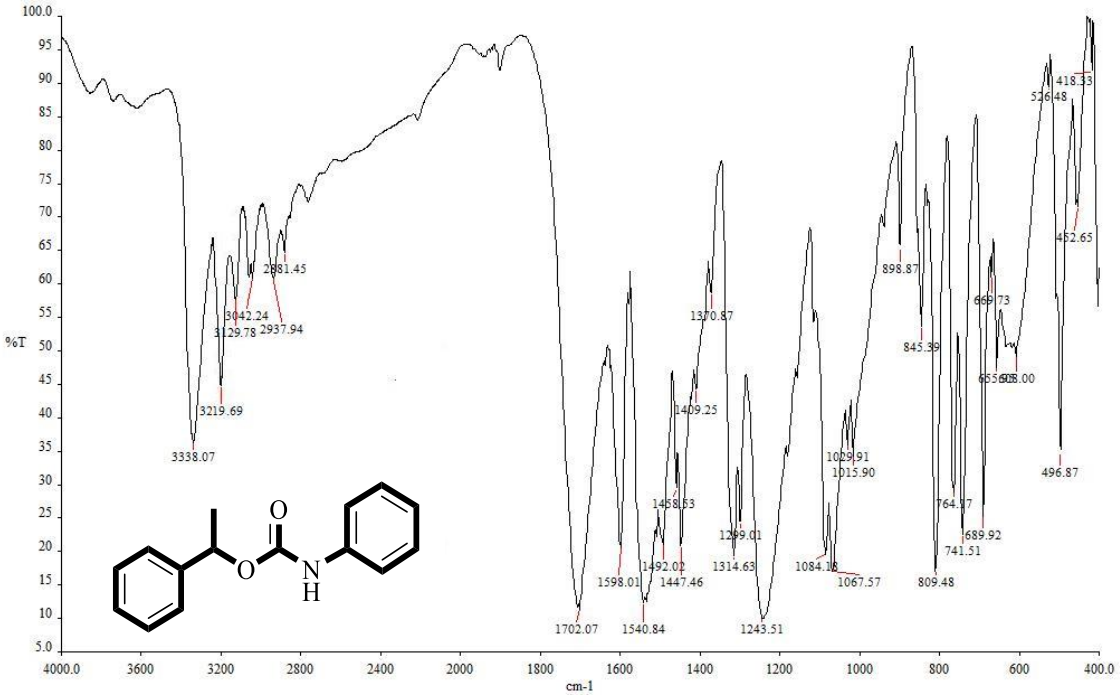
^{13}C-NMR spectra (63 MHz) of benzyl phenylcarbamate (**5j**) in $CDCl_3$.



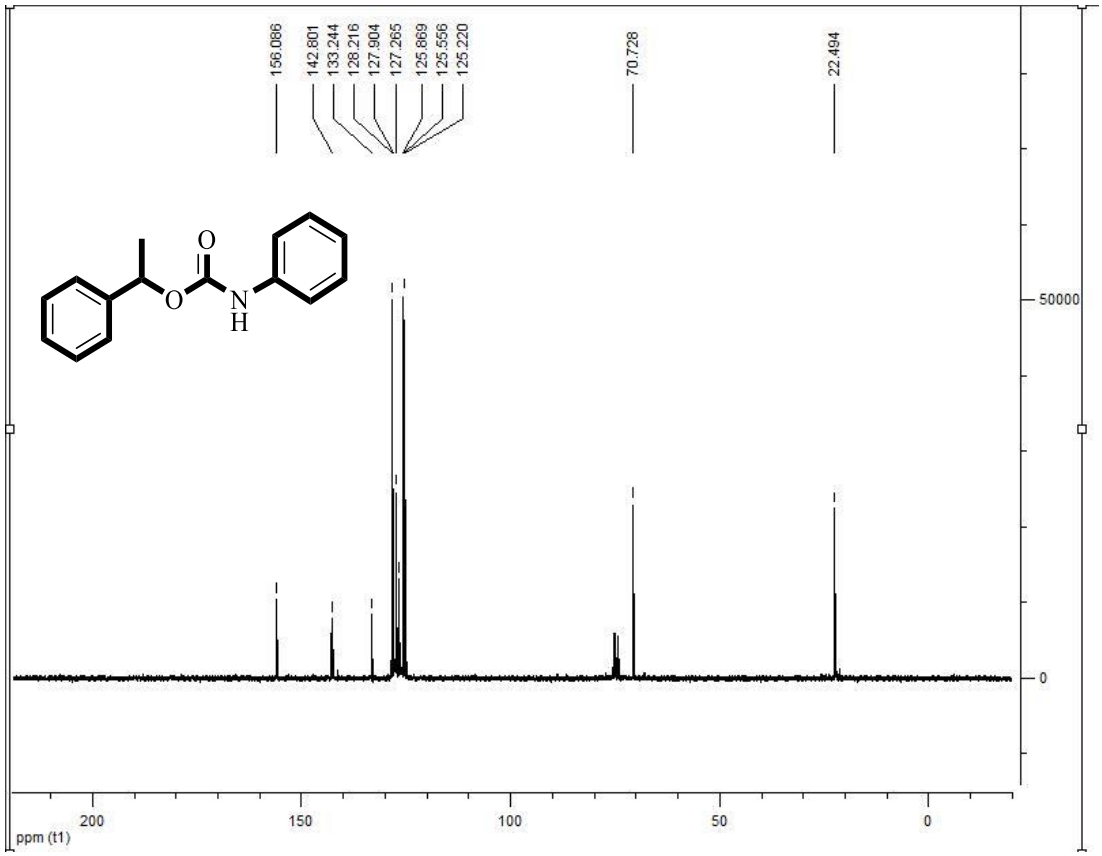
^{1}H-NMR spectra (250 MHz) of benzyl phenylcarbamate (**5j**) in $CDCl_3$.



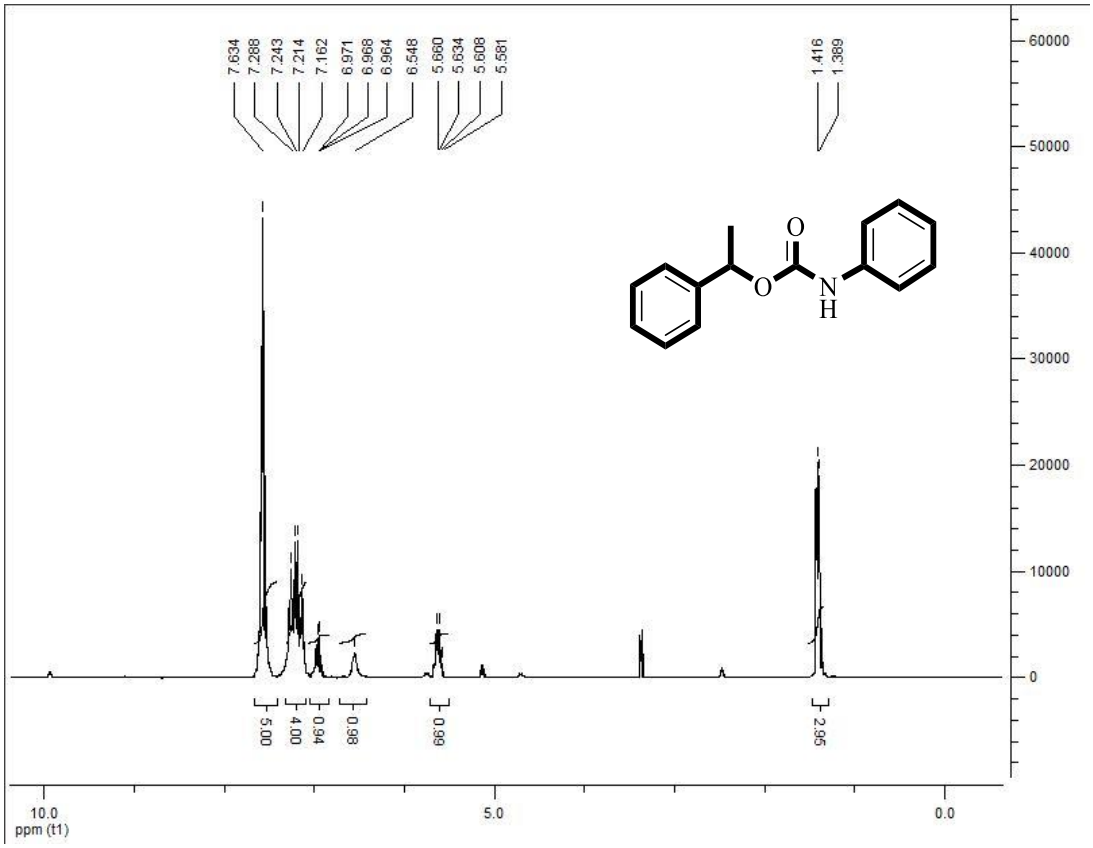
MS of benzyl phenylcarbamate (**5j**).



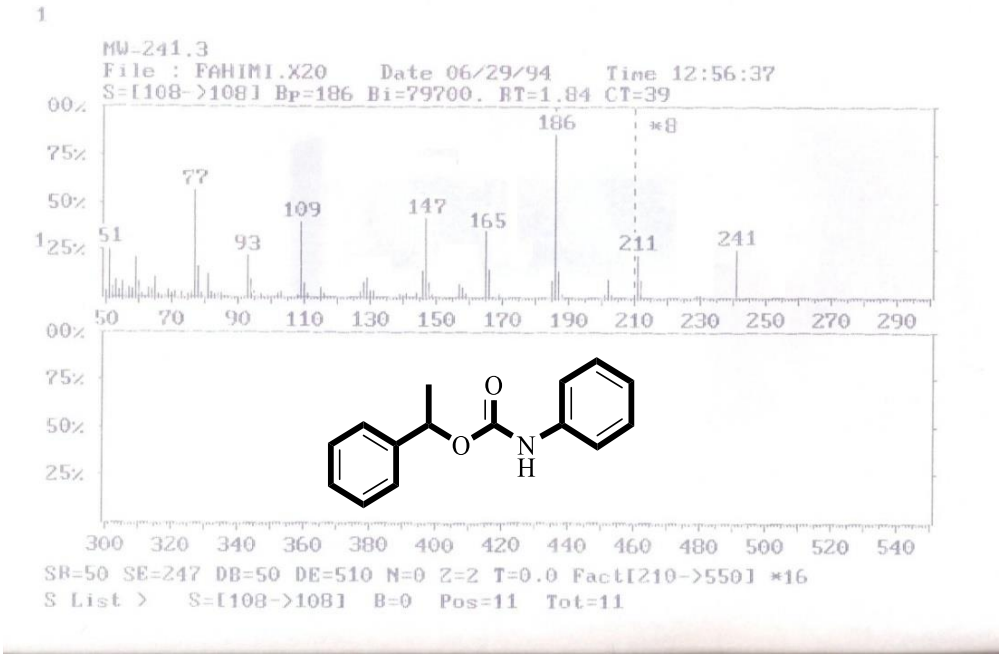
FT-IR spectra of 1-phenylethyl phenylcarbamate (**5k**) in KBr.



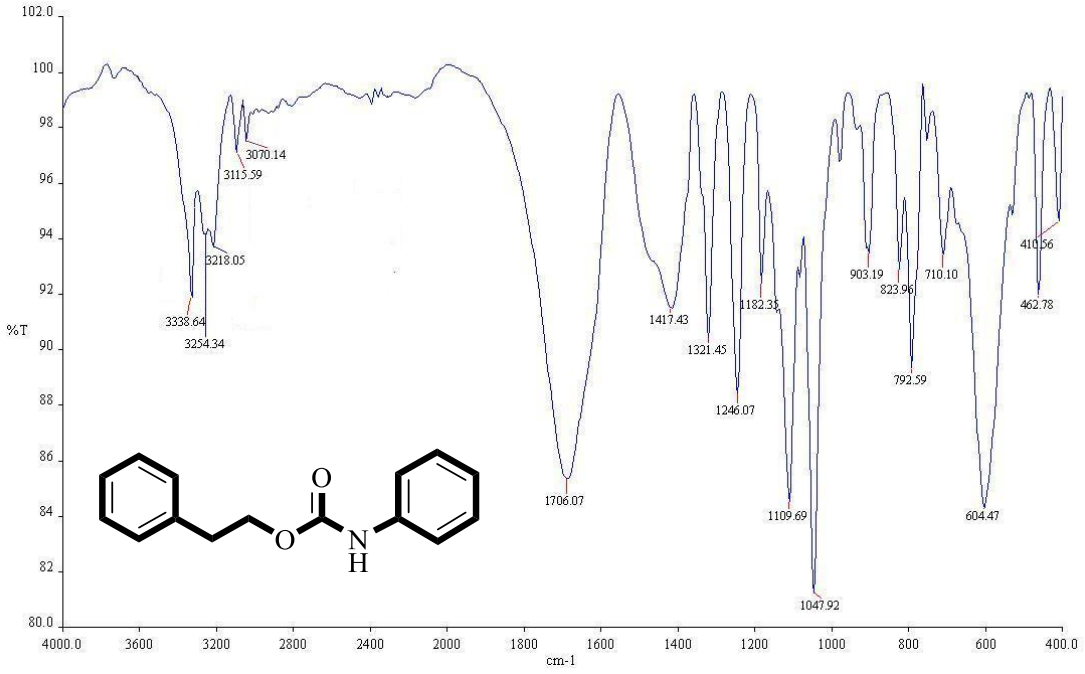
^{13}C-NMR spectra (63 MHz) of 1-phenylethyl phenylcarbamate (**5k**) in $CDCl_3$.



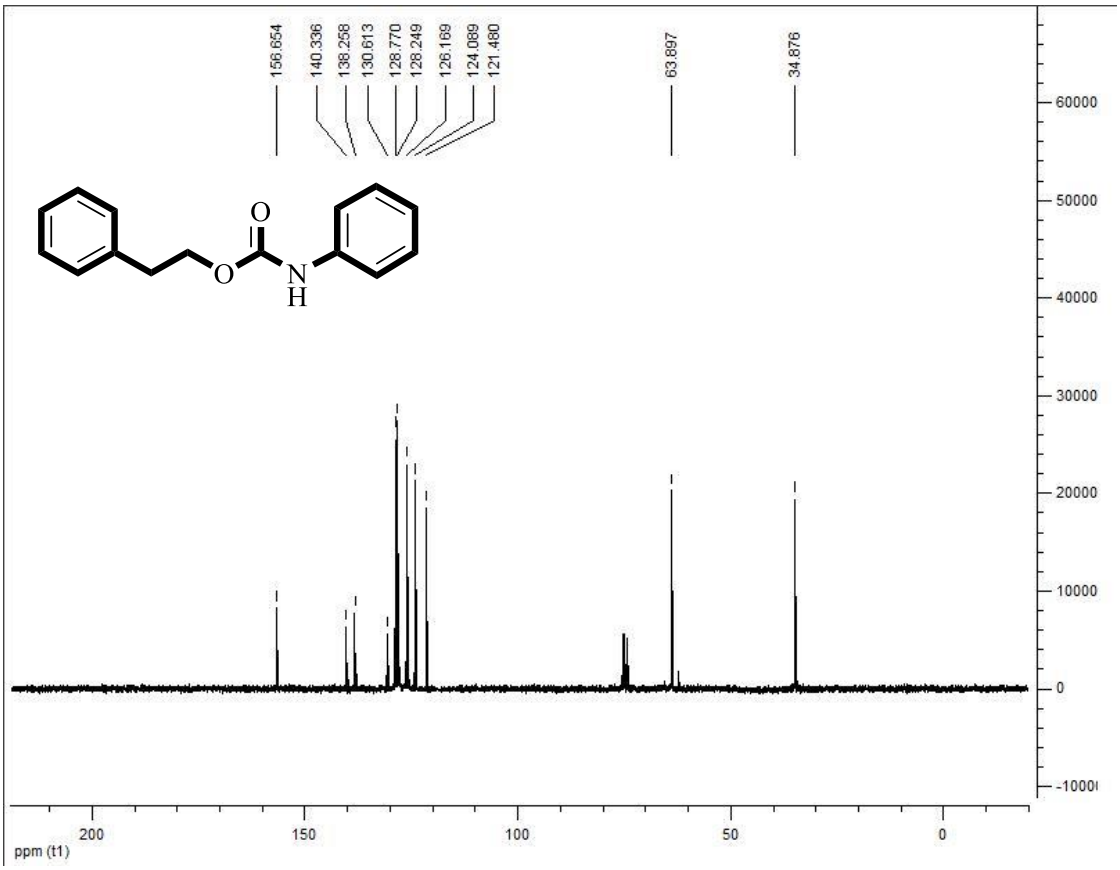
^{1}H-NMR spectra (250 MHz) of 1-phenylethyl phenylcarbamate (**5k**) in $CDCl_3$.



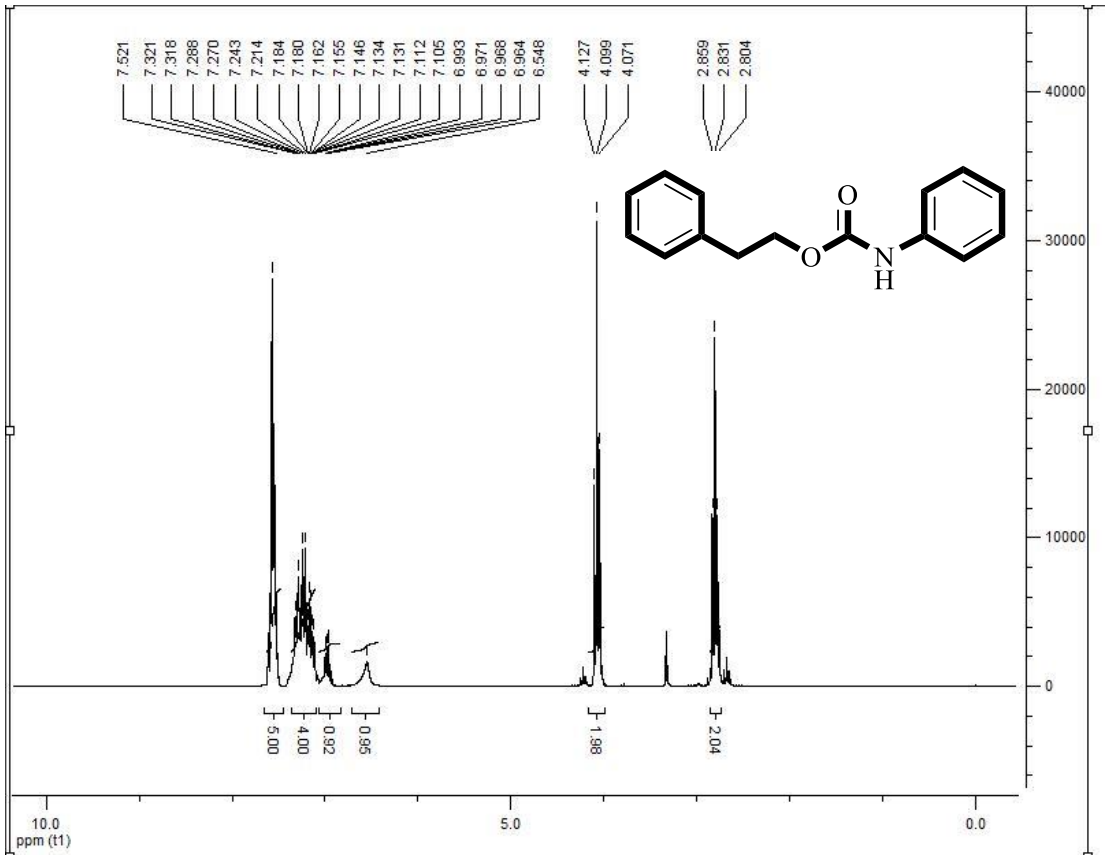
MS of 1-phenylethyl phenylcarbamate (**5k**).



FT-IR spectra of 2-phenylethyl phenylcarbamate (**5l**) in KBr.



^{13}C-NMR spectra (63 MHz) of 2-phenylethyl phenylcarbamate (**5l**) in $CDCl_3$.



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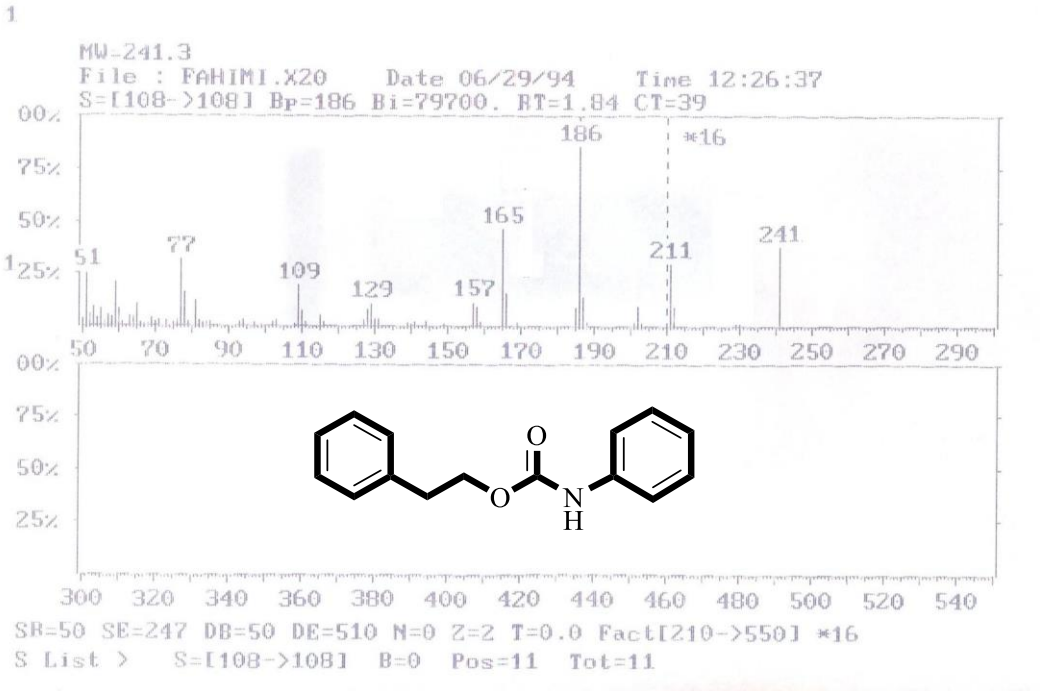
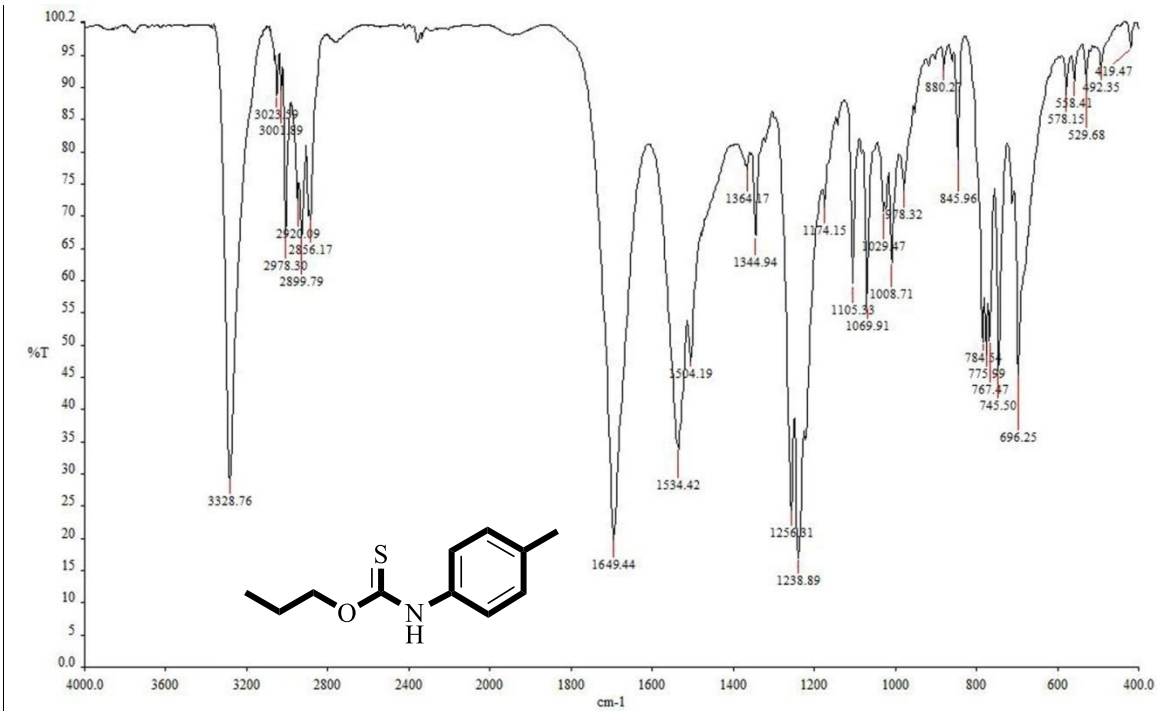
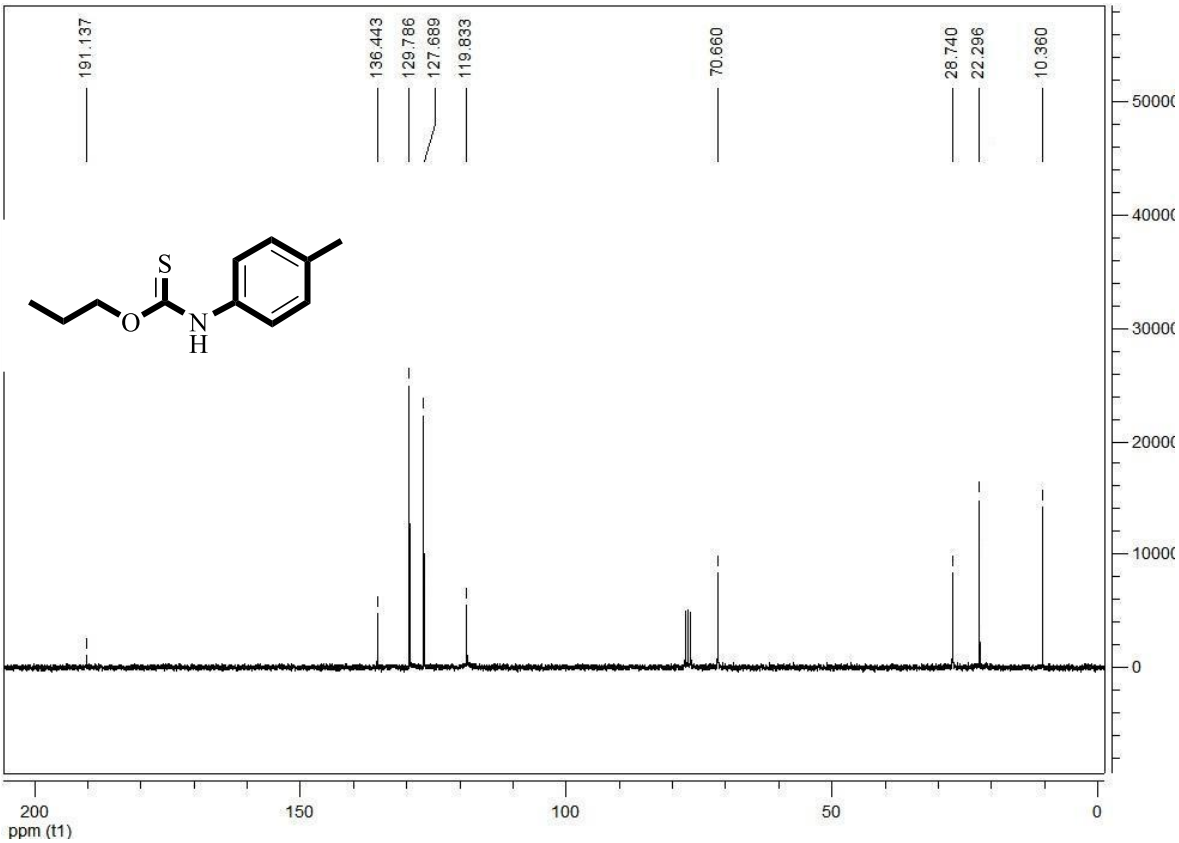


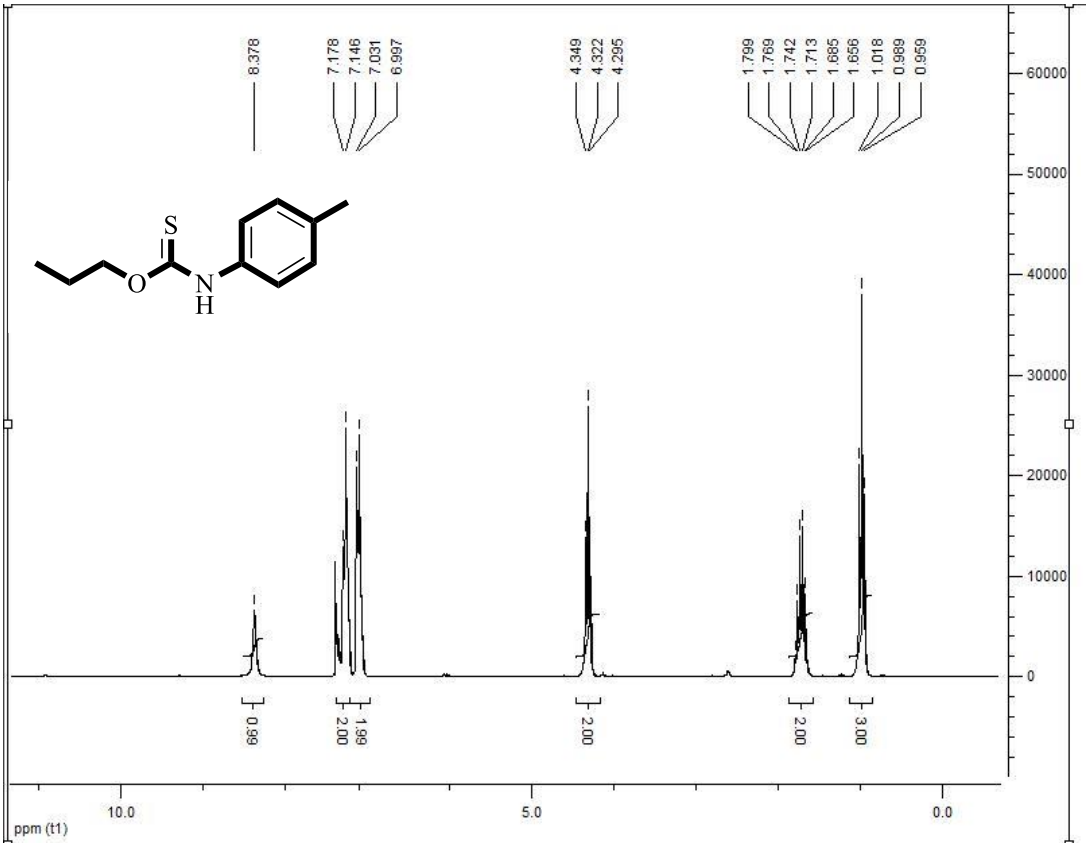
MS of 2-phenylethyl phenylcarbamate (**5l**).



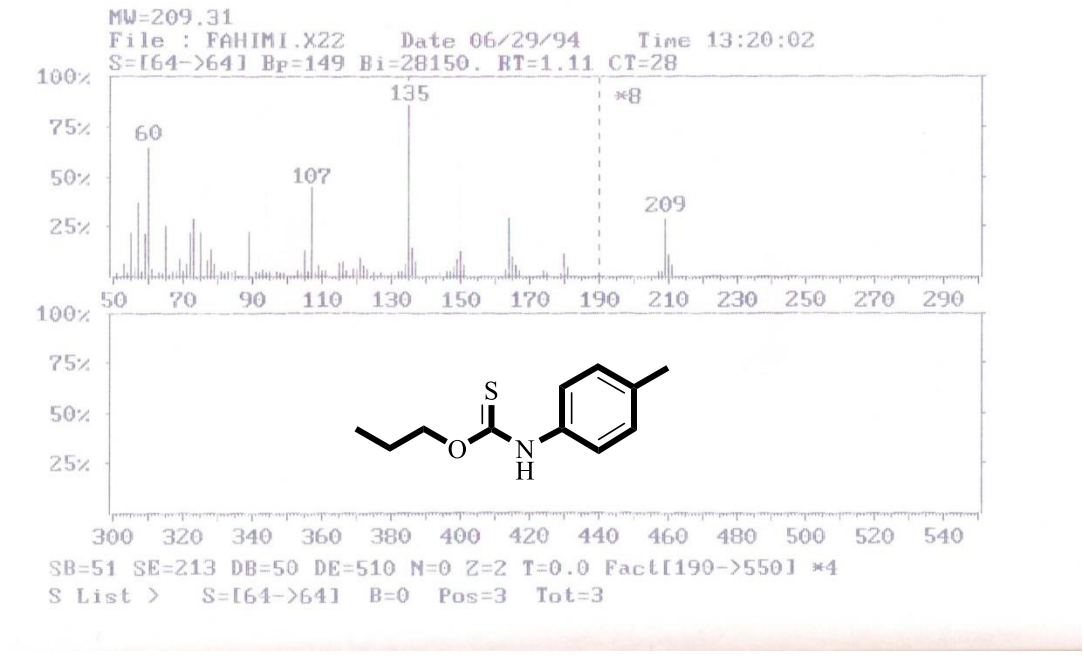
FT-IR spectra of o-propyl (4-methylphenyl)thiocarbamate (**4m**) in KBr.



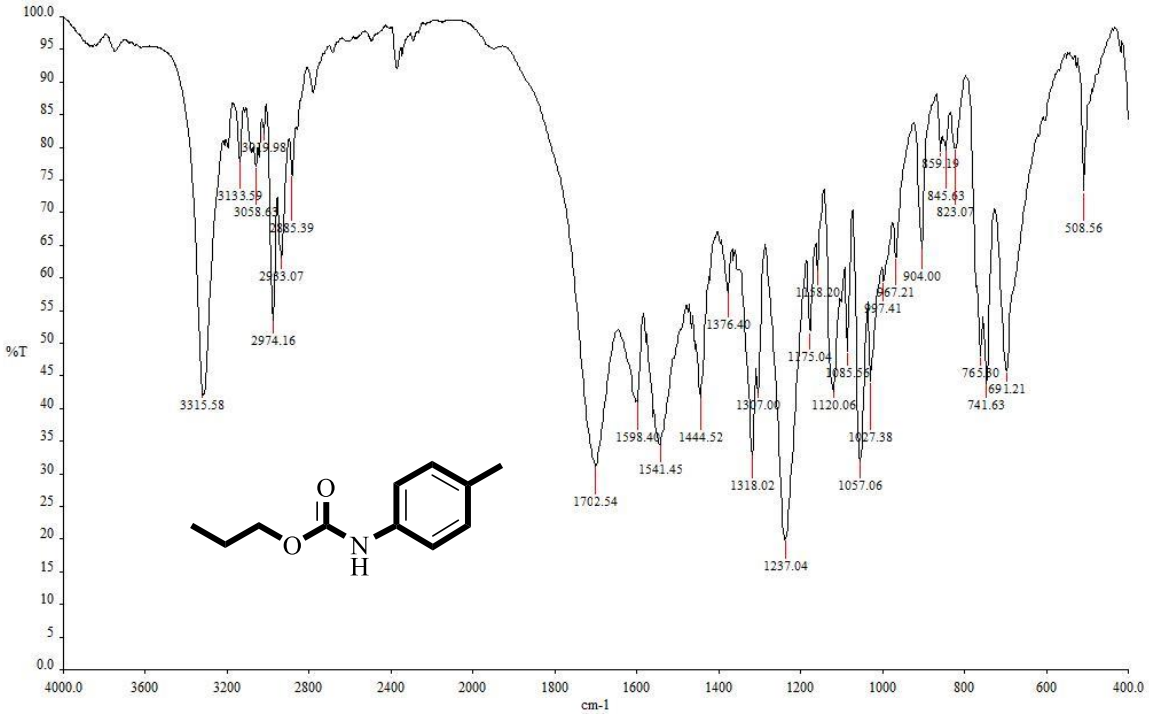
^{13}C-NMR spectra (63 MHz) of o-propyl (4-methylphenyl)thiocarbamate (**4m**) in $CDCl_3$.



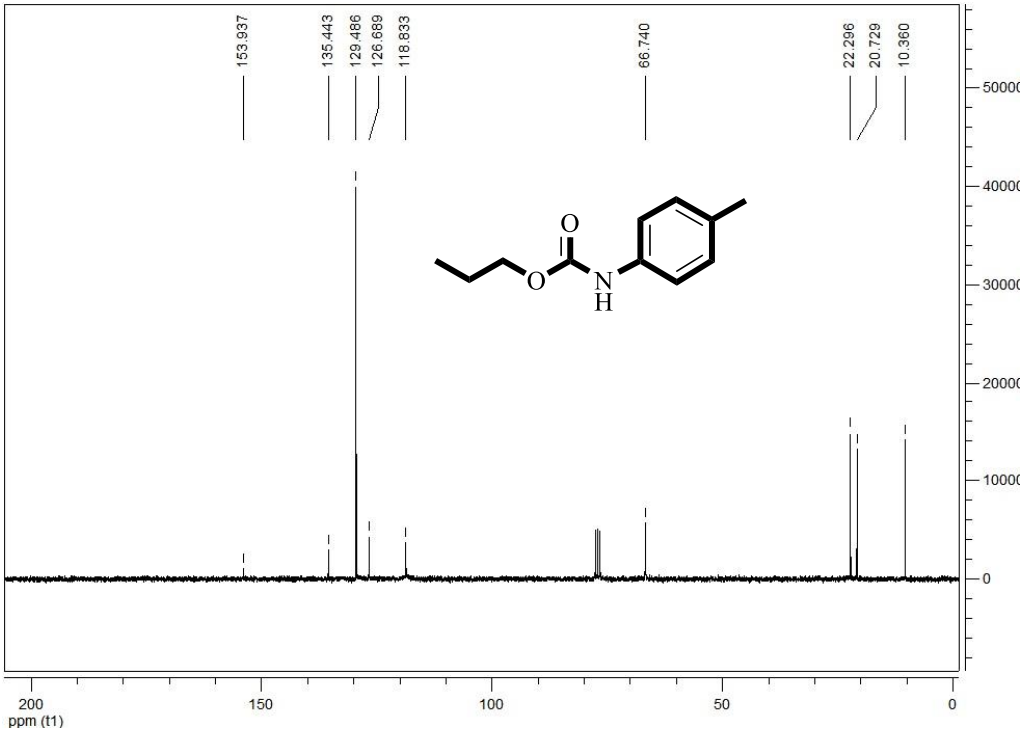
^{1}H-NMR spectra (250 MHz) of o-propyl (4-methylphenyl)thiocarbamate (**4m**) in $CDCl_3$.



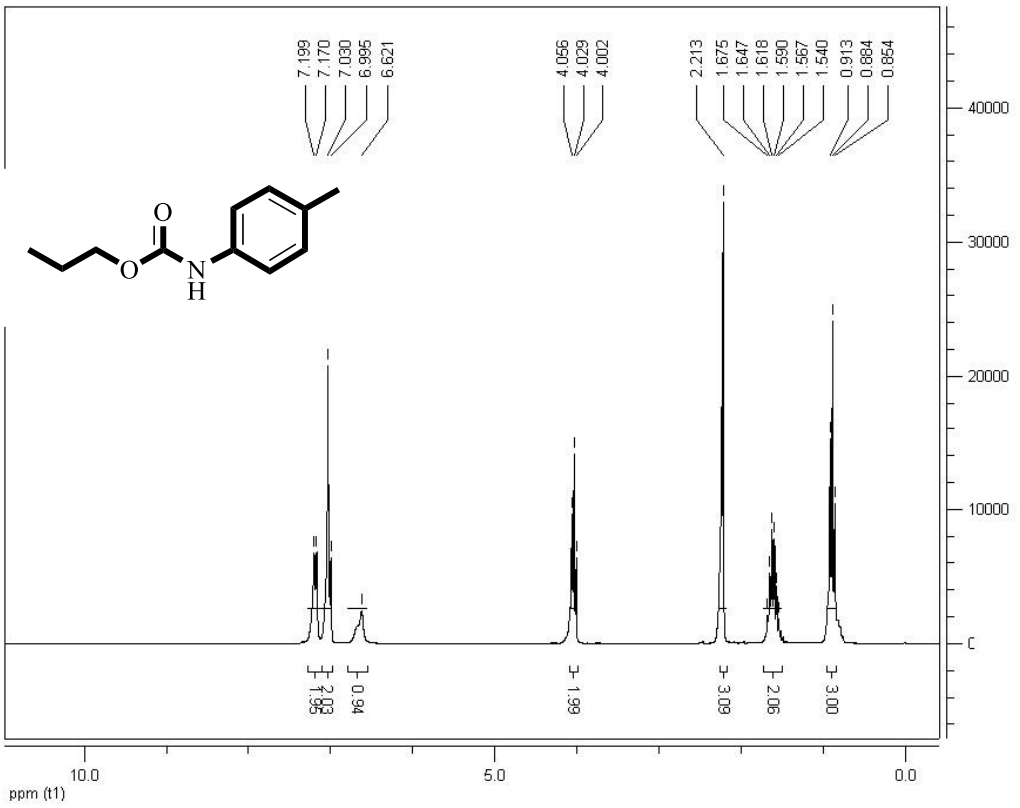
MS of propyl o-propyl (4-methylphenyl)thiocarbamate (**4m**).



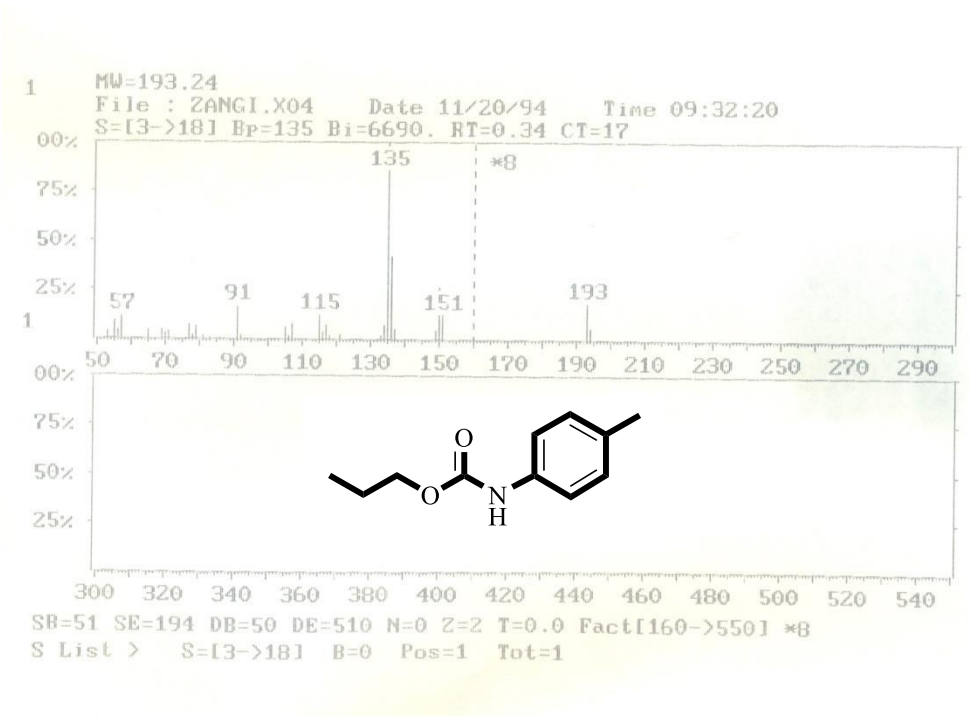
FT-IR spectra of propyl (4-methylphenyl)carbamate (**5m**) in KBr.



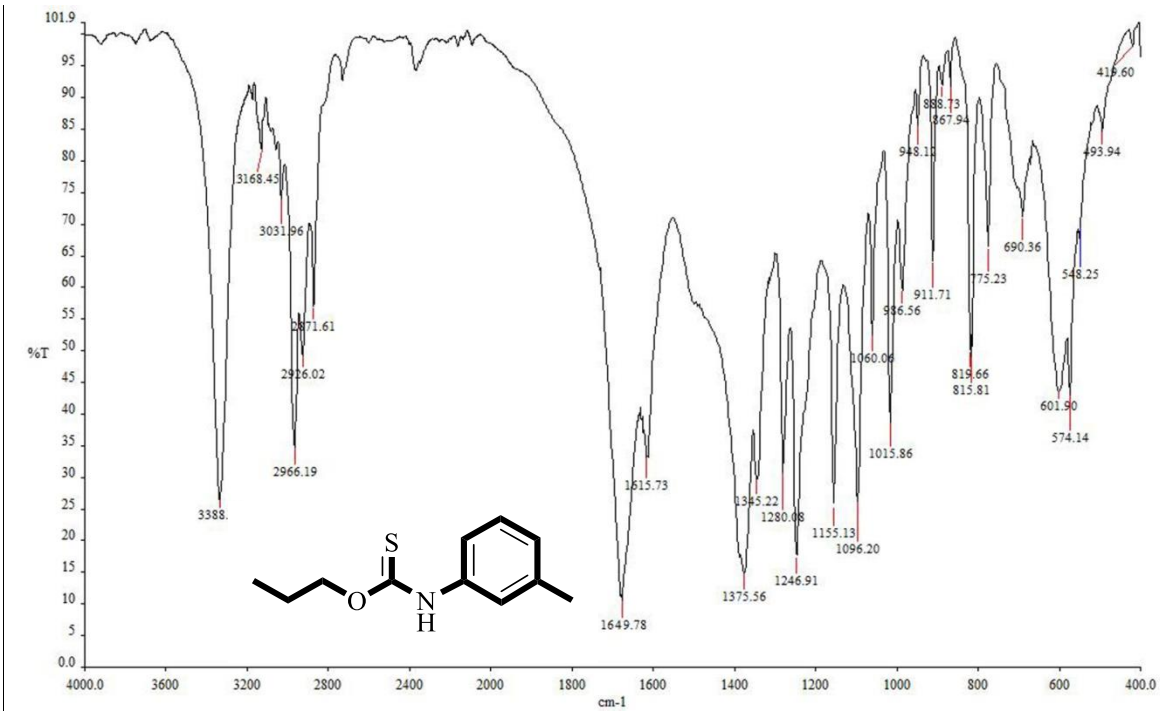
^{13}C-NMR spectra (63 MHz) of propyl (4-methylphenyl)carbamate (**5m**) in $CDCl_3$.



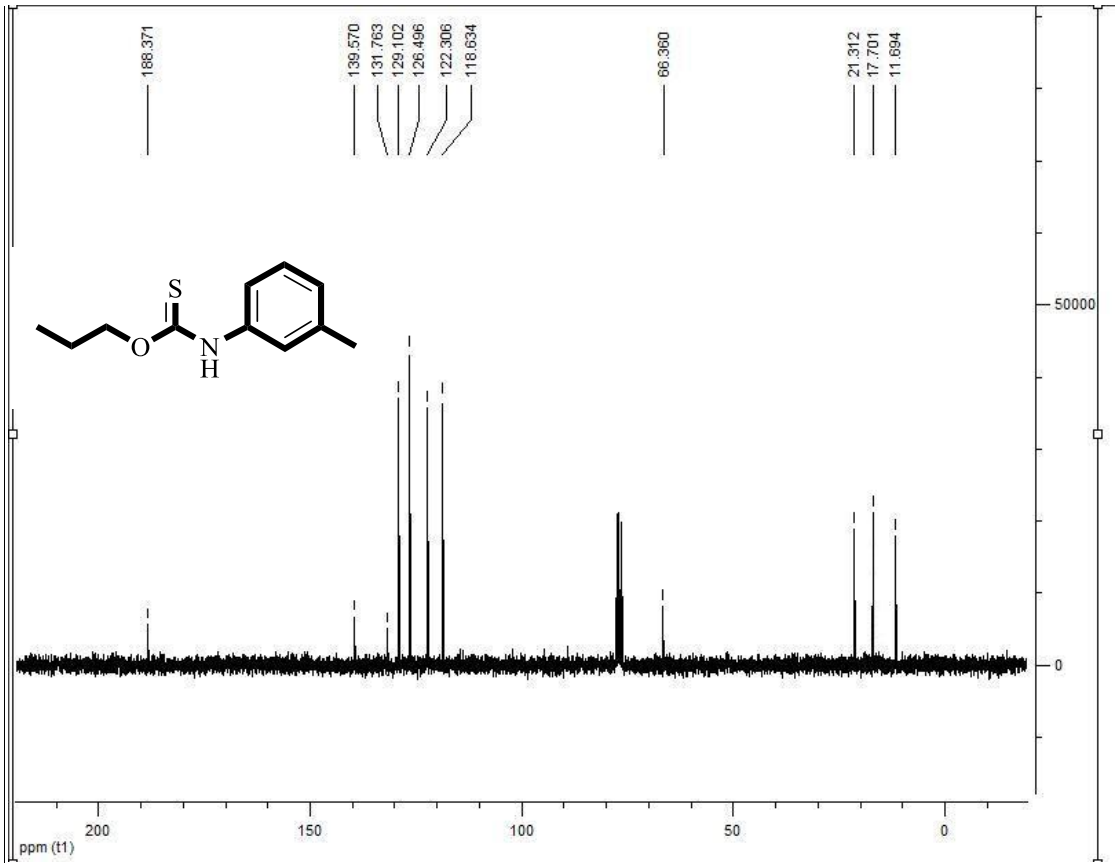
^{1}H-NMR spectra (250 MHz) of propyl (4-methylphenyl)carbamate (**5m**) in $CDCl_3$.



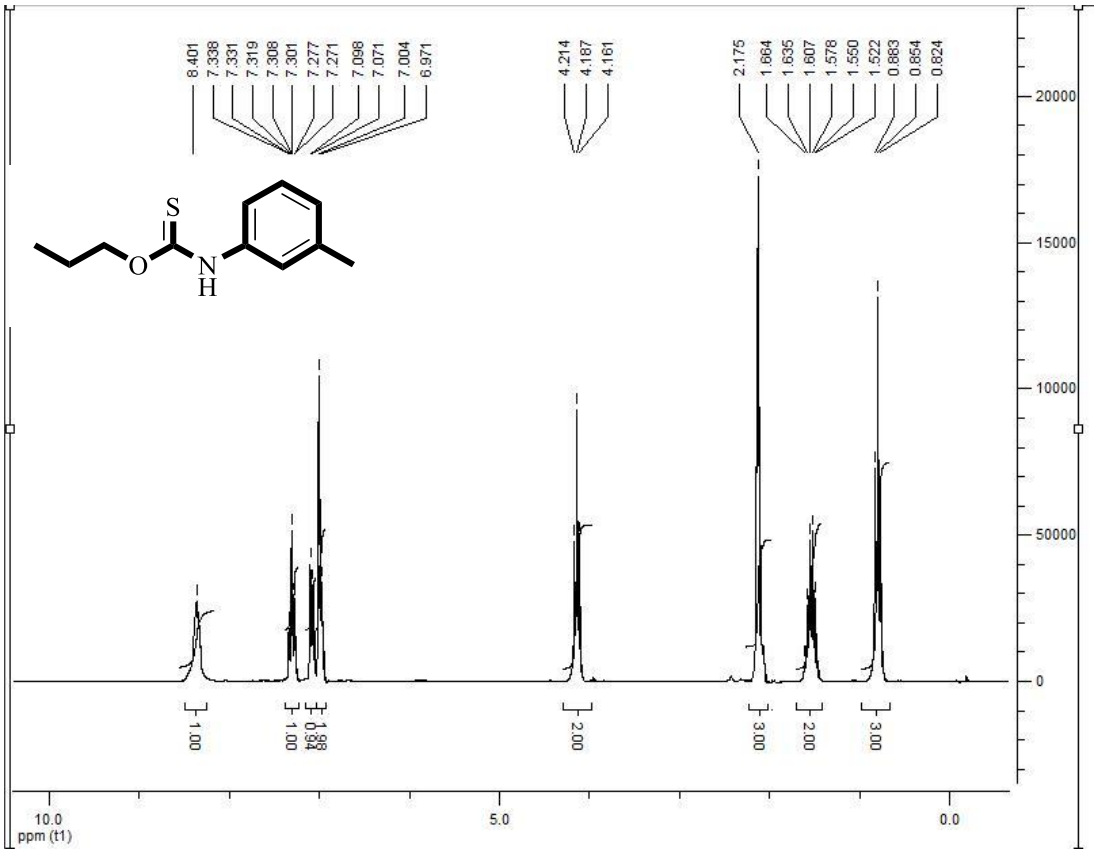
MS of propyl (4-methylphenyl)carbamate (**5m**).



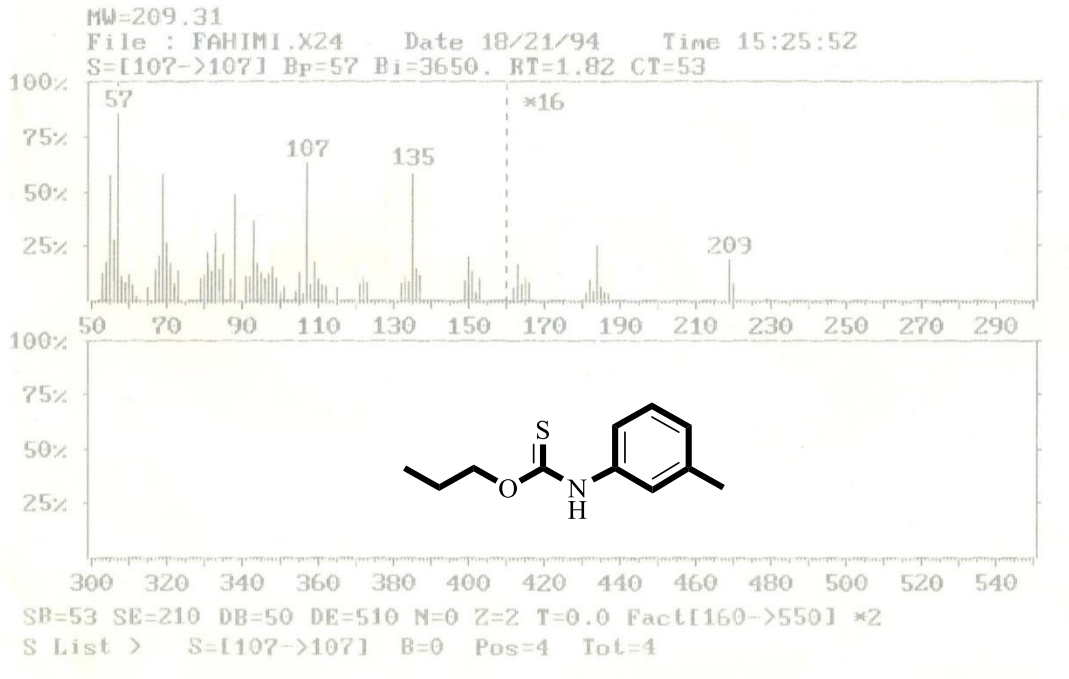
FT-IR spectra of o-propyl (3-methylphenyl)thiocarbamate (**4n**) in KBr.



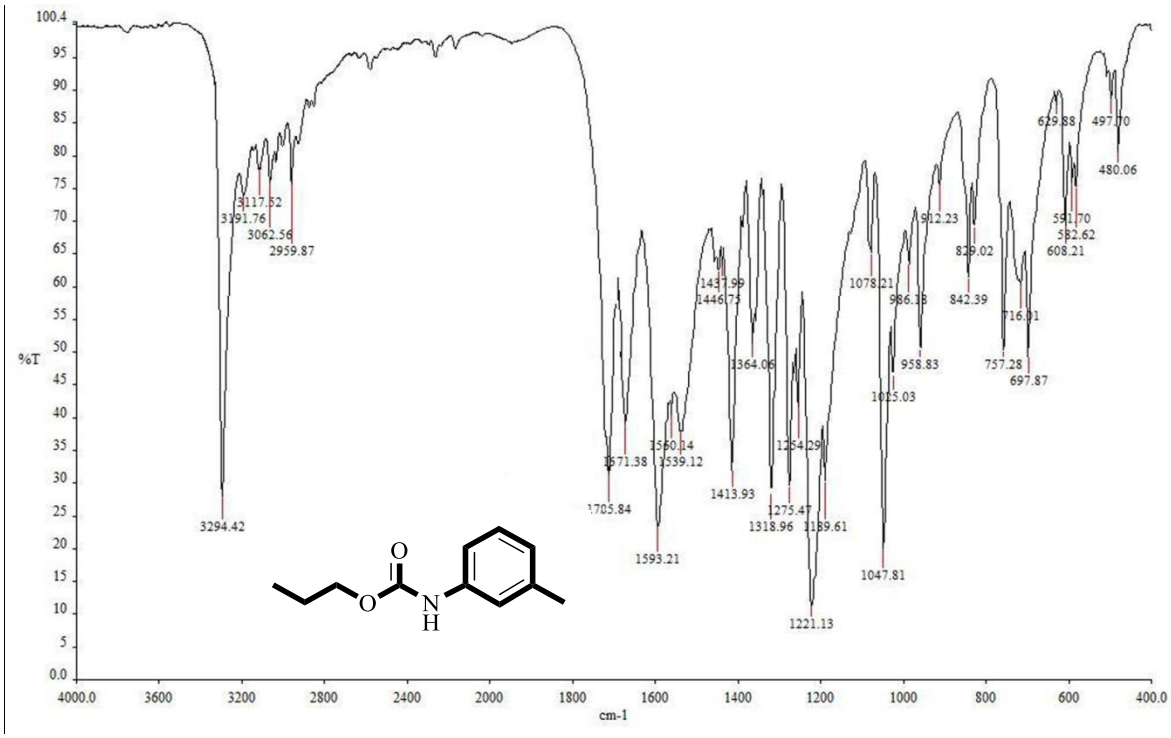
^{13}C-NMR spectra (63 MHz) of o-propyl (3-methylphenyl)thiocarbamate (**4n**) in $CDCl_3$.



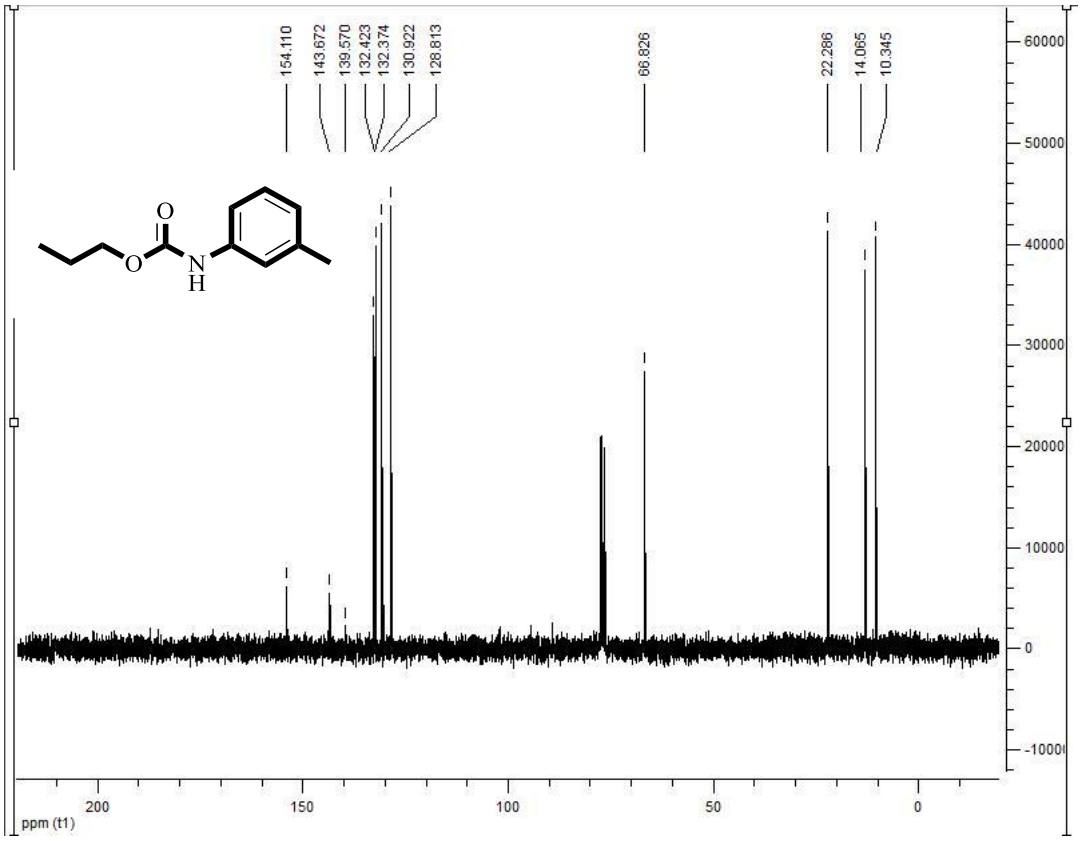
^{1}H-NMR spectra (250 MHz) of o-propyl (3-methylphenyl)thiocarbamate (**4n**) in $CDCl_3$.



MS of o-propyl (3-methylphenyl)thiocarbamate (**4n**).



FT-IR spectra of propyl (3-methylphenyl)carbamate (**5n**) in KBr.



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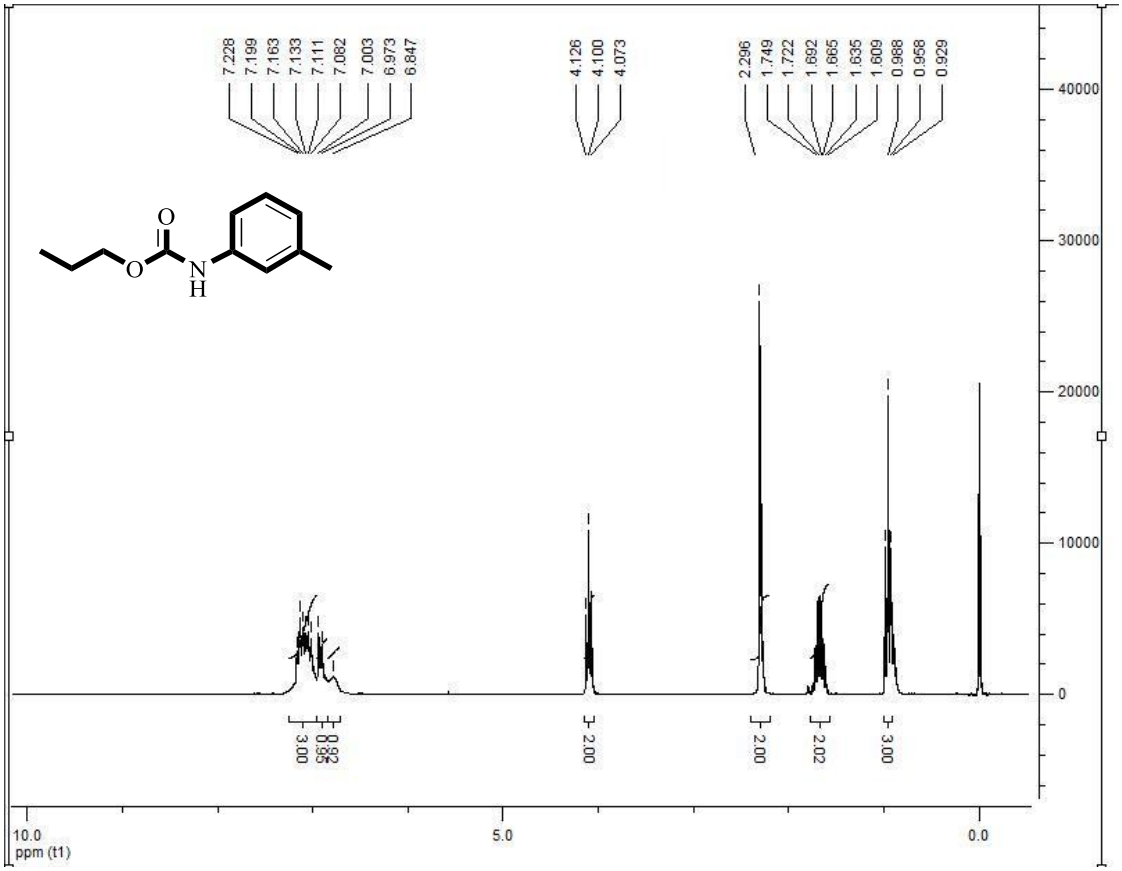

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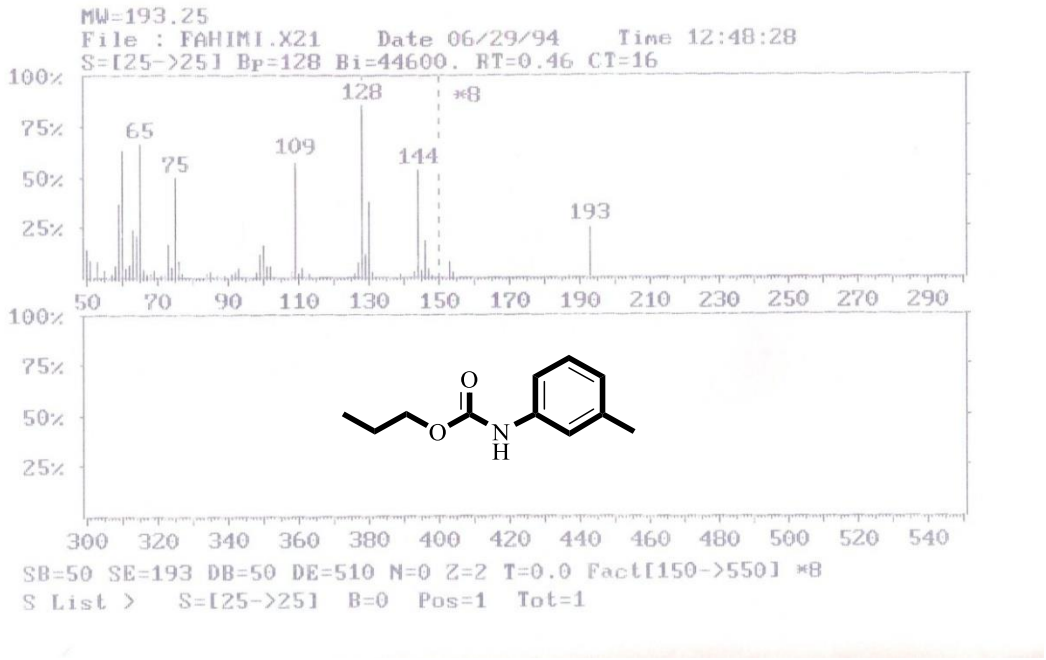
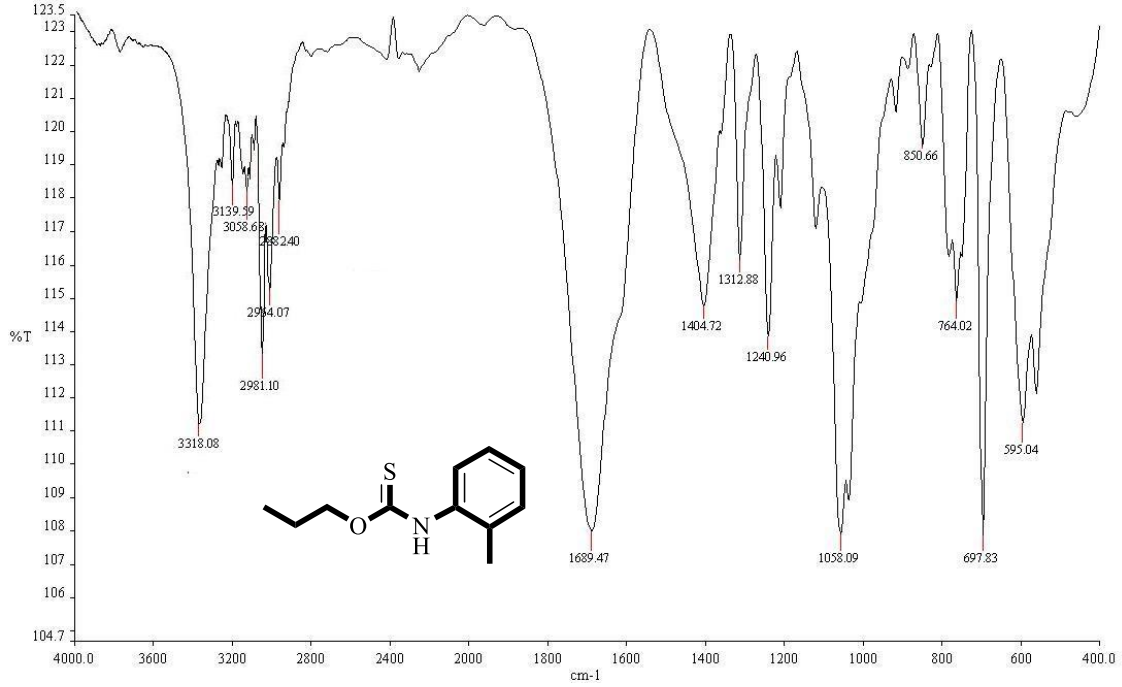
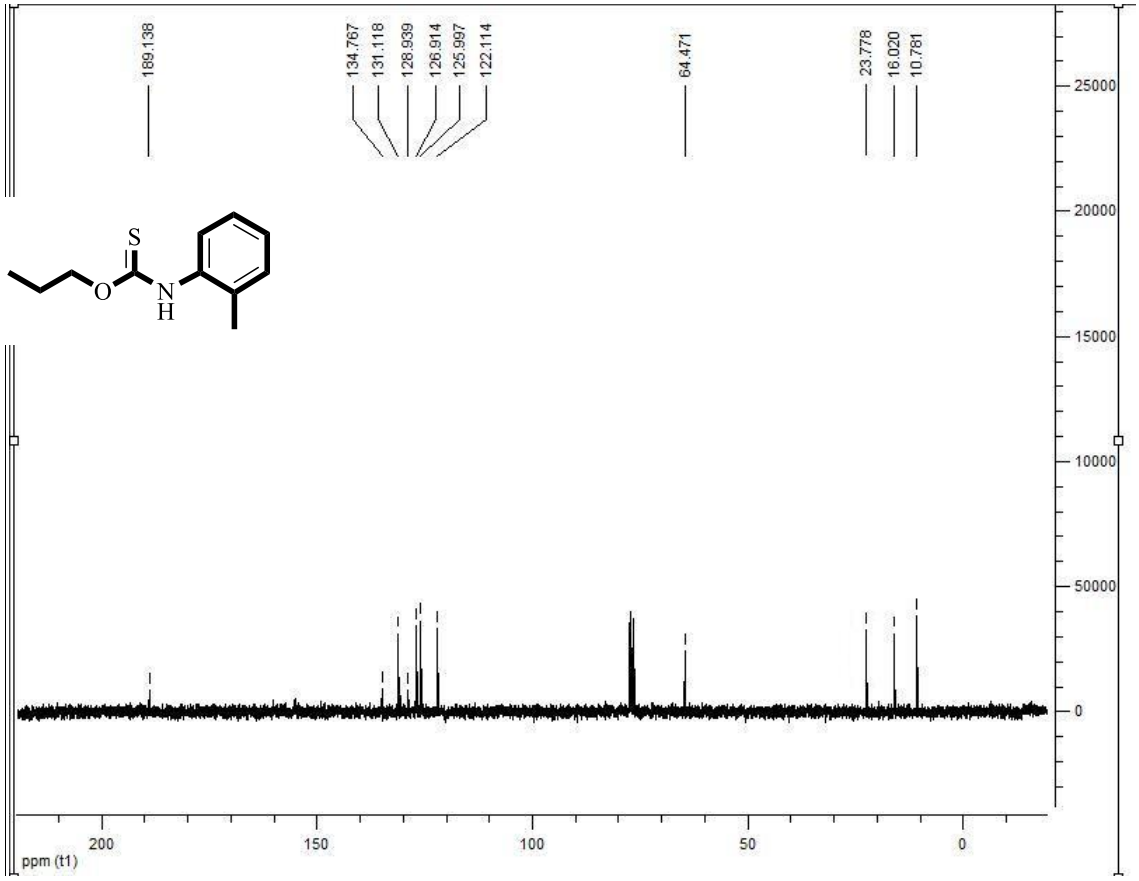


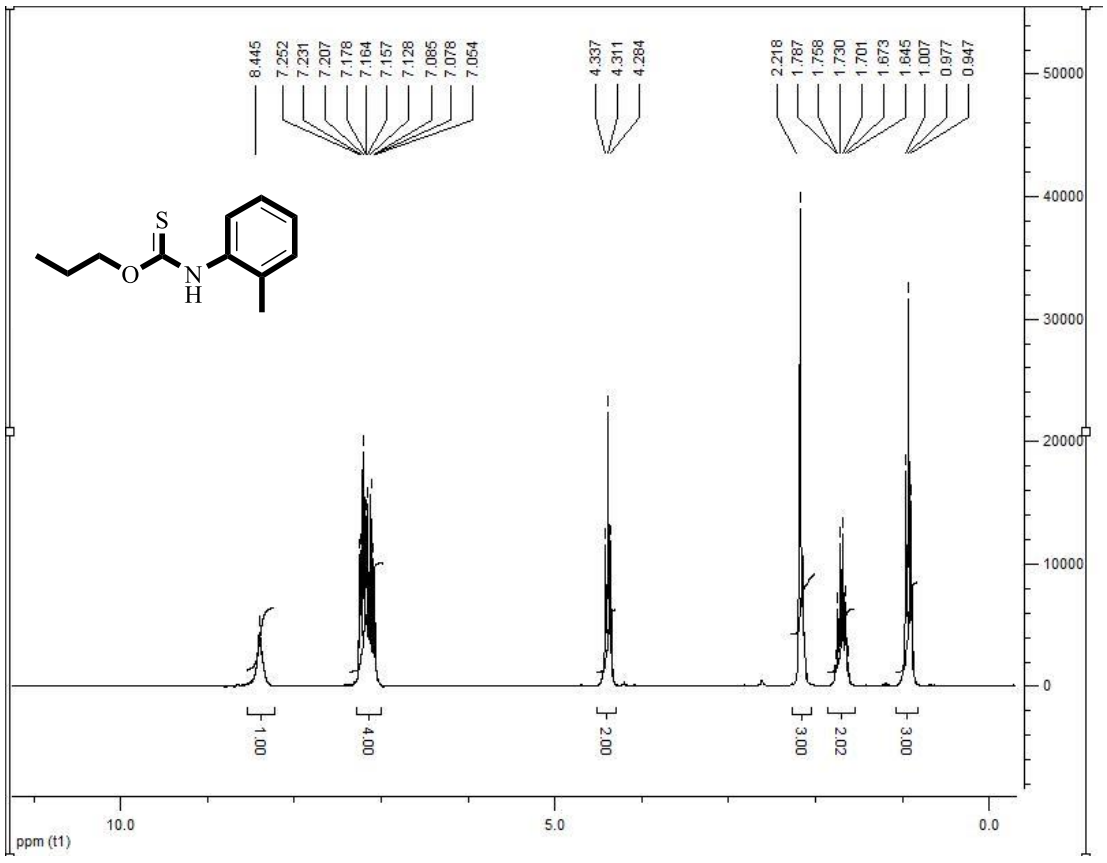
MS of propyl propyl (3-methylphenyl)carbamate (**5n**).



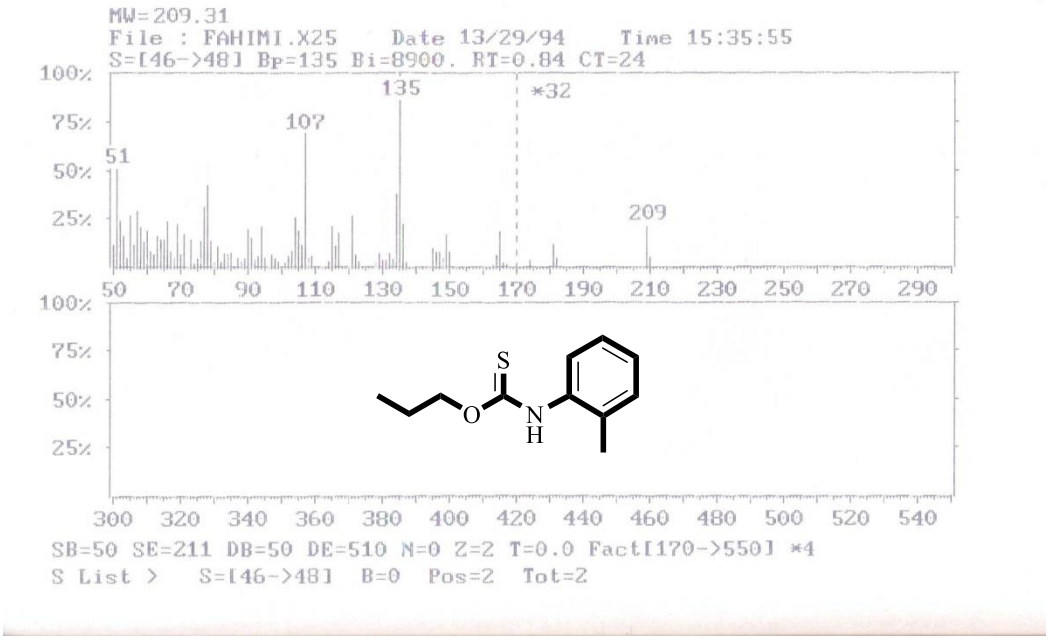
FT-IR spectra of o-propyl (2-methylphenyl)thiocarbamate (**4o**) in KBr.



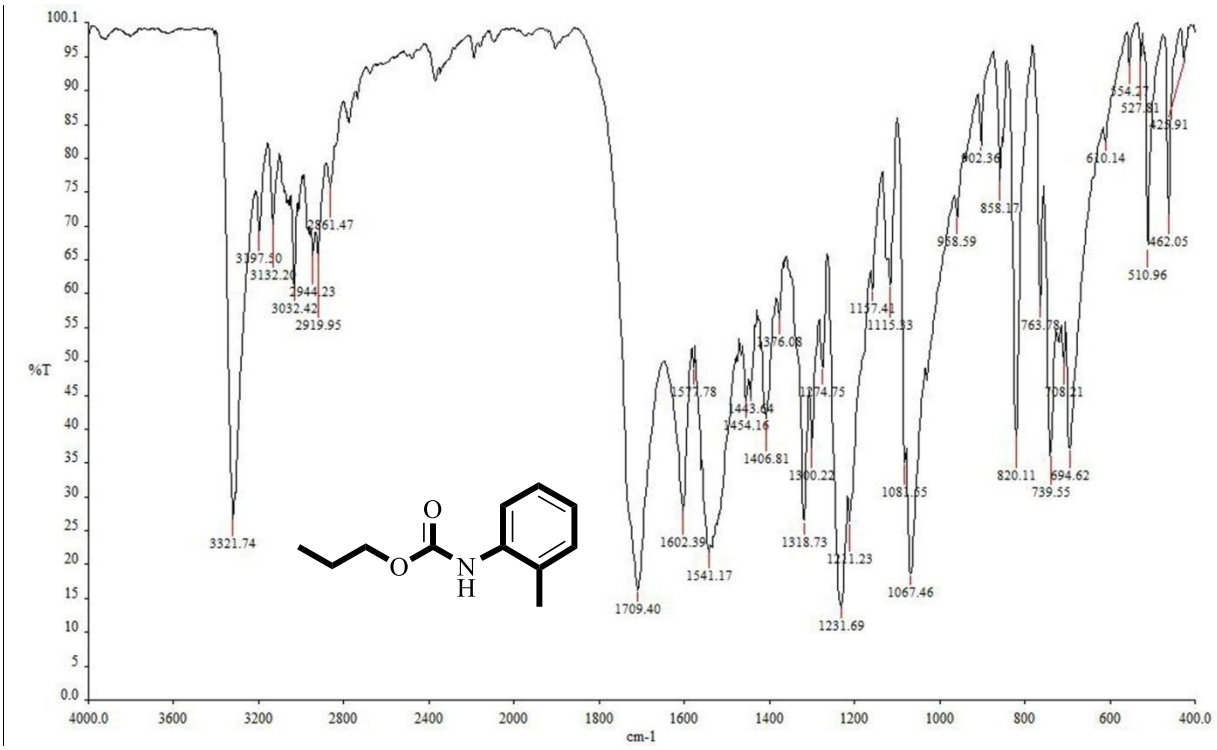
^{13}C-NMR spectra (63 MHz) of o-propyl (2-methylphenyl)thiocarbamate (**4o**) in $CDCl_3$.



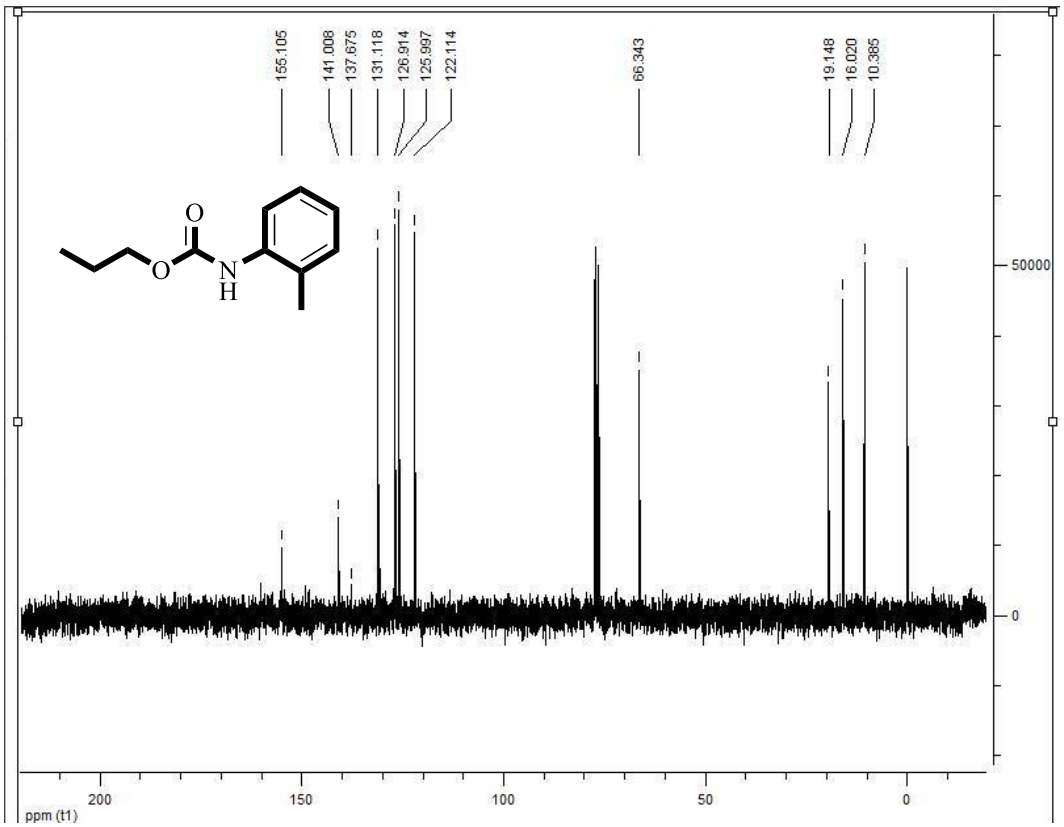
^{1}H-NMR spectra (250 MHz) of o-propyl (2-methylphenyl)thiocarbamate (**4o**) in $CDCl_3$.



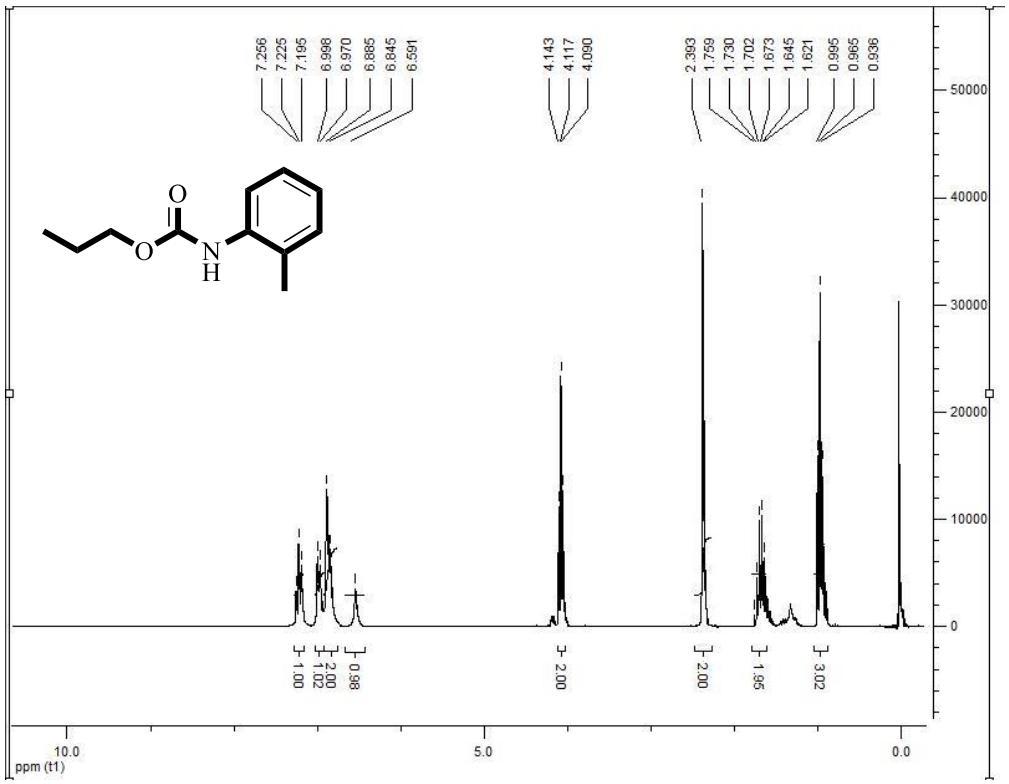
MS of o-propyl (2-methylphenyl)thiocarbamate (**4o**).



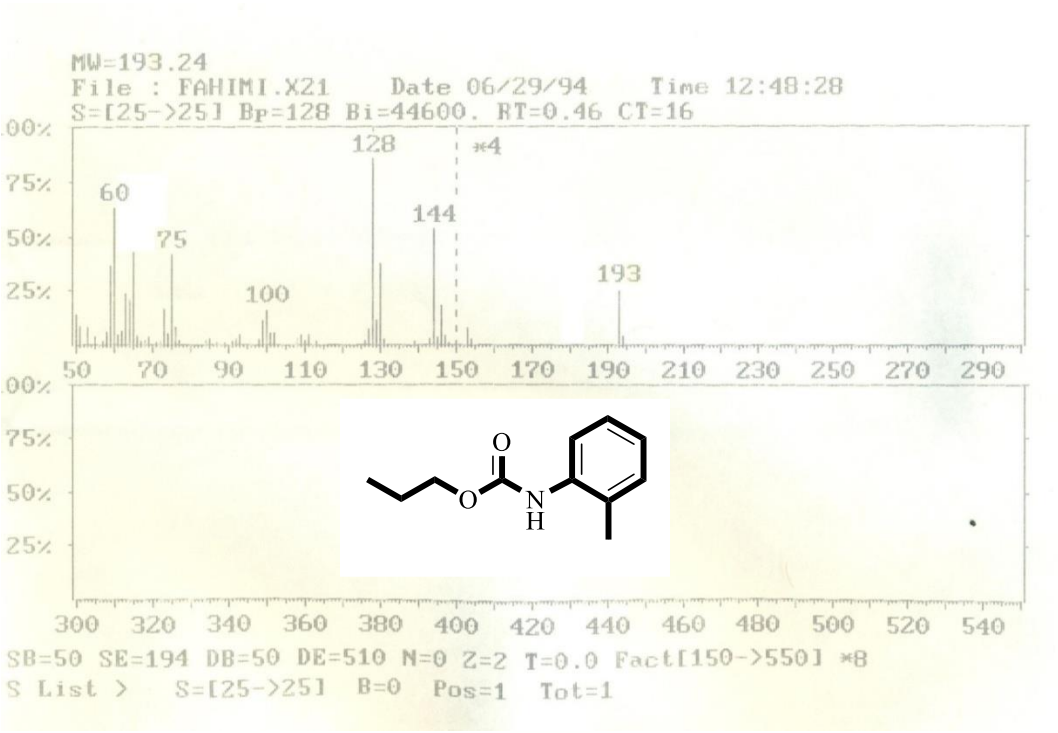
FT-IR spectra of propyl (2-methylphenyl)carbamate (**5o**) in KBr.



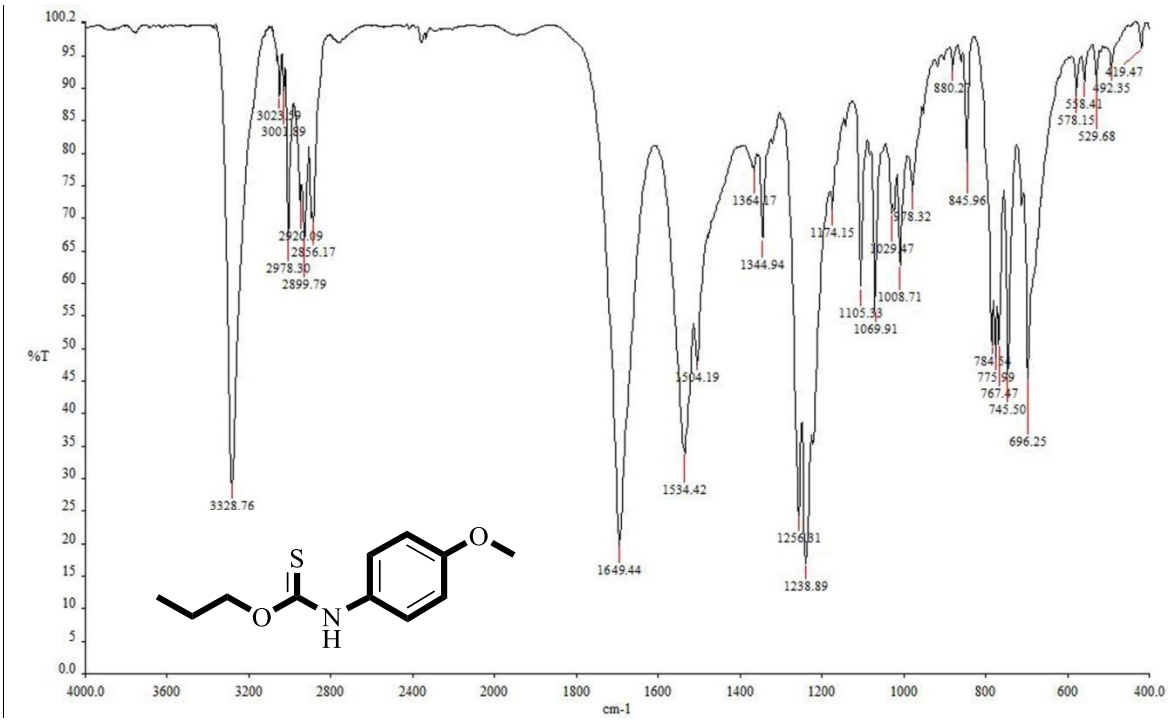
^{13}C-NMR spectra (63 MHz) of propyl (2-methylphenyl)carbamate (**5o**) in $CDCl_3$.



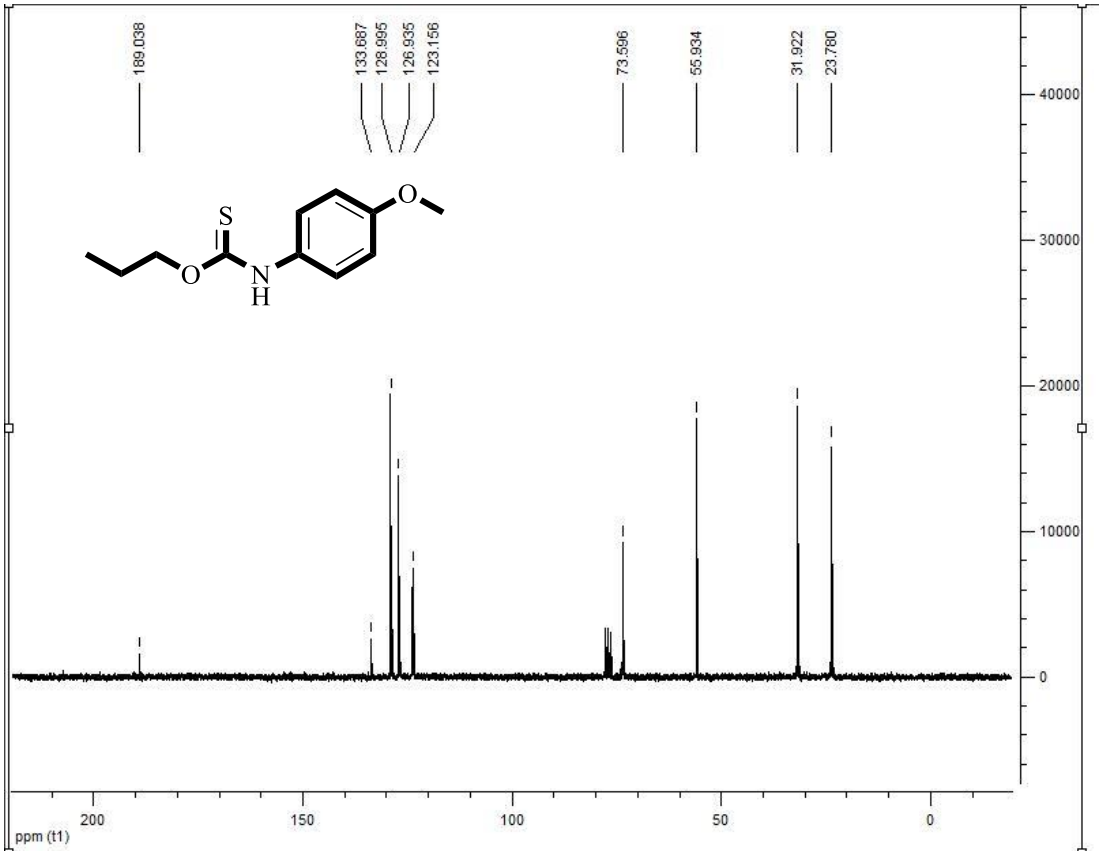
^{1}H-NMR spectra (250 MHz) of propyl (2-methylphenyl)carbamate (**5o**) in $CDCl_3$.



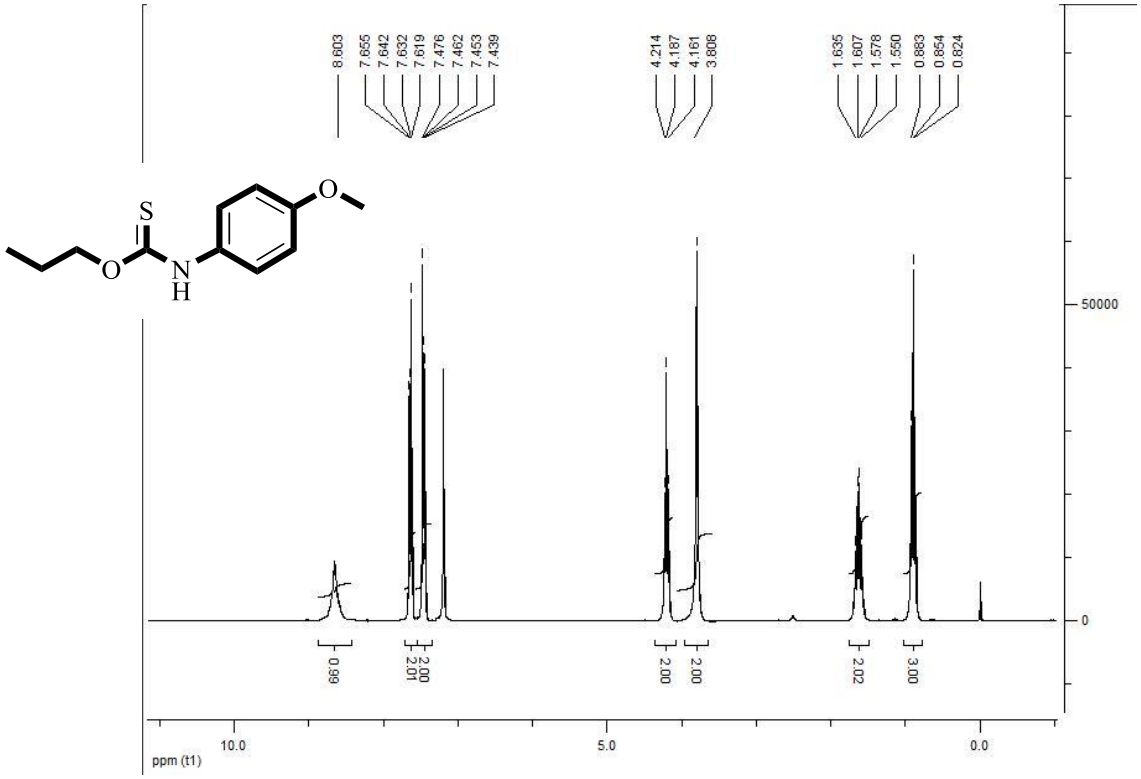
MS of propyl (2-methylphenyl)carbamate (**5o**).



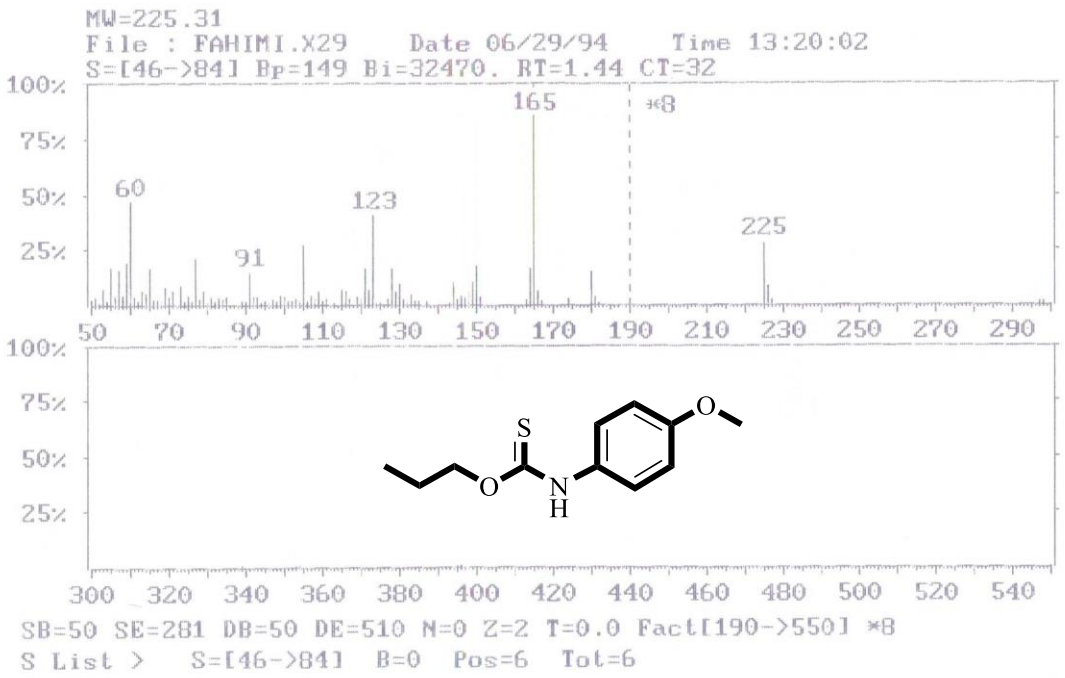
FT-IR spectra of o-propyl (4-methoxyphenyl)thiocarbamate (**4p**) in KBr.



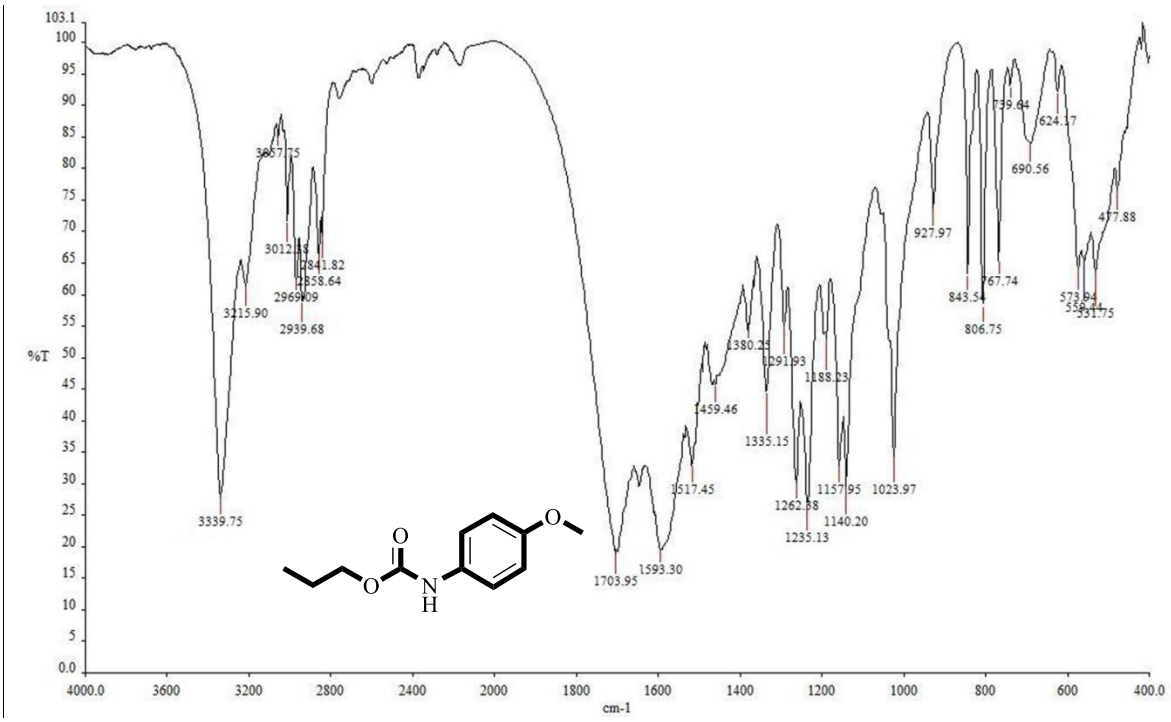
^{13}C-NMR spectra (63 MHz) of o-propyl (4-methoxyphenyl)thiocarbamate (**4p**) in $CDCl_3$.



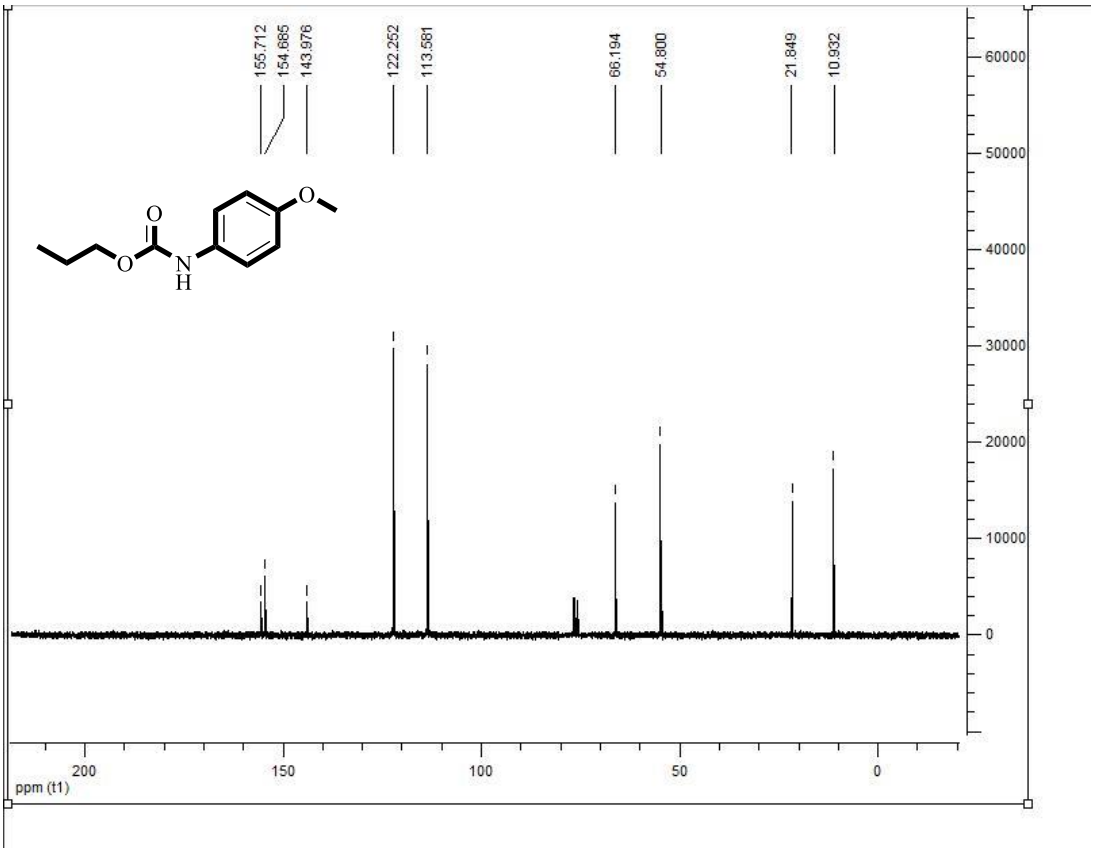
^{1}H-NMR spectra (250 MHz) of o-propyl (4-methoxyphenyl)thiocarbamate (**4p**) in $CDCl_3$.



MS of o-propyl (4-methoxyphenyl)thiocarbamate (**4p**).



FT-IR spectra of propyl (4-methoxyphenyl)carbamate (**5p**) in KBr.



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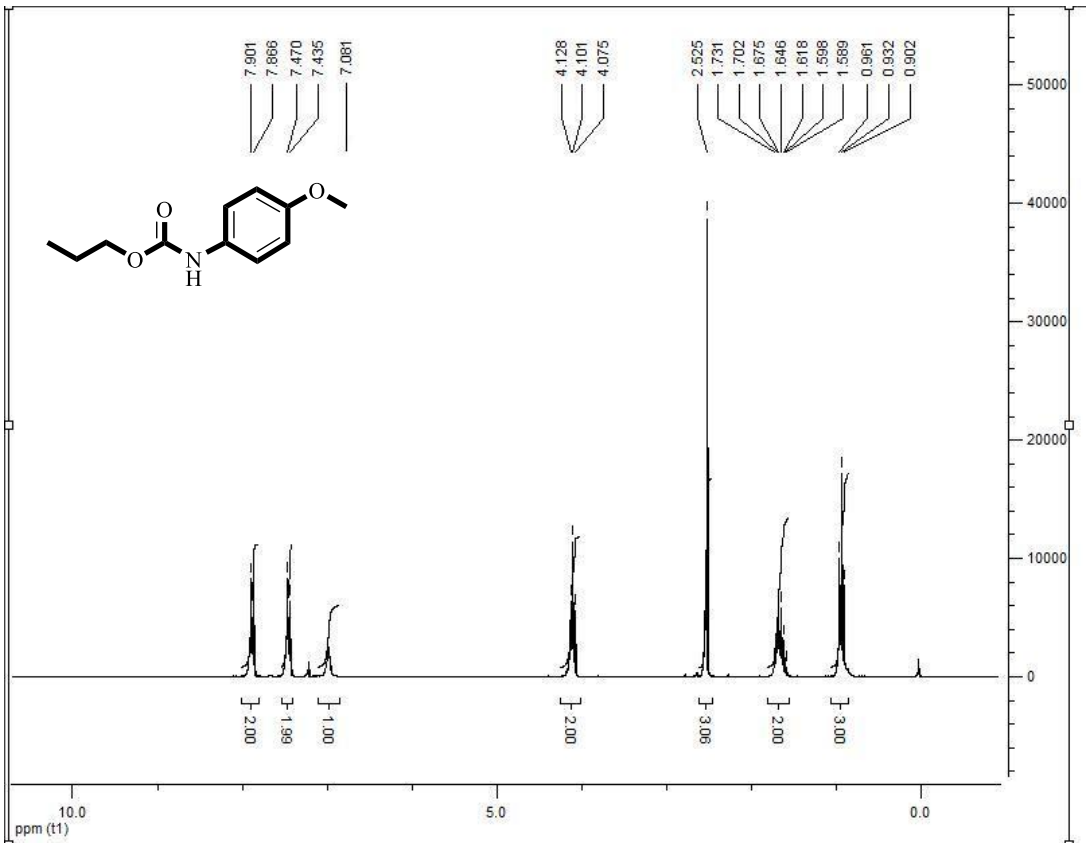

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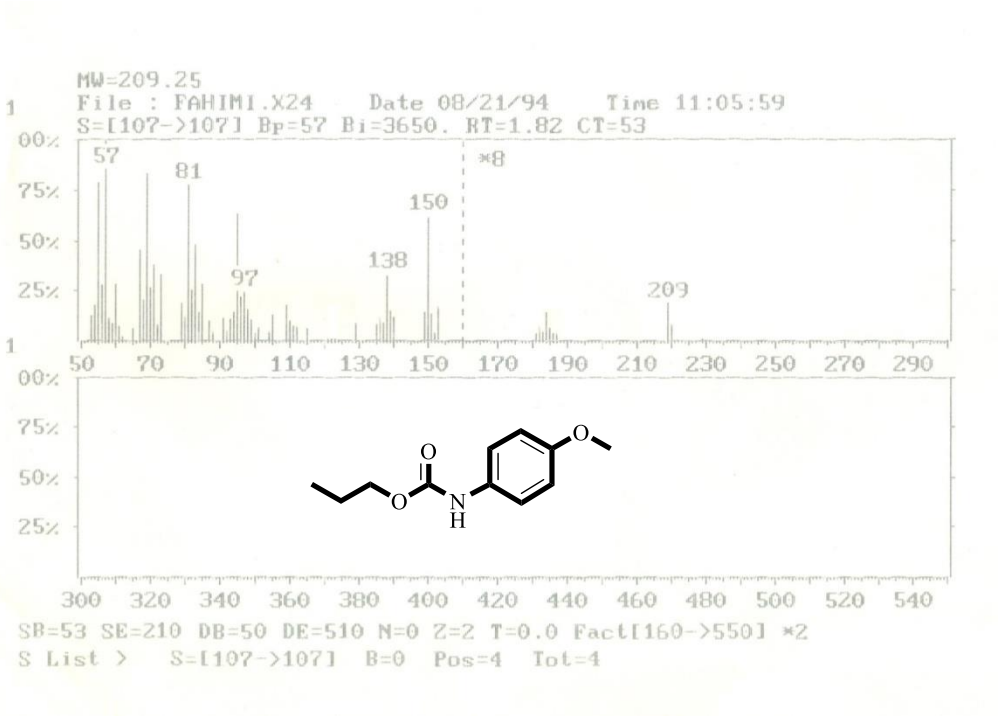
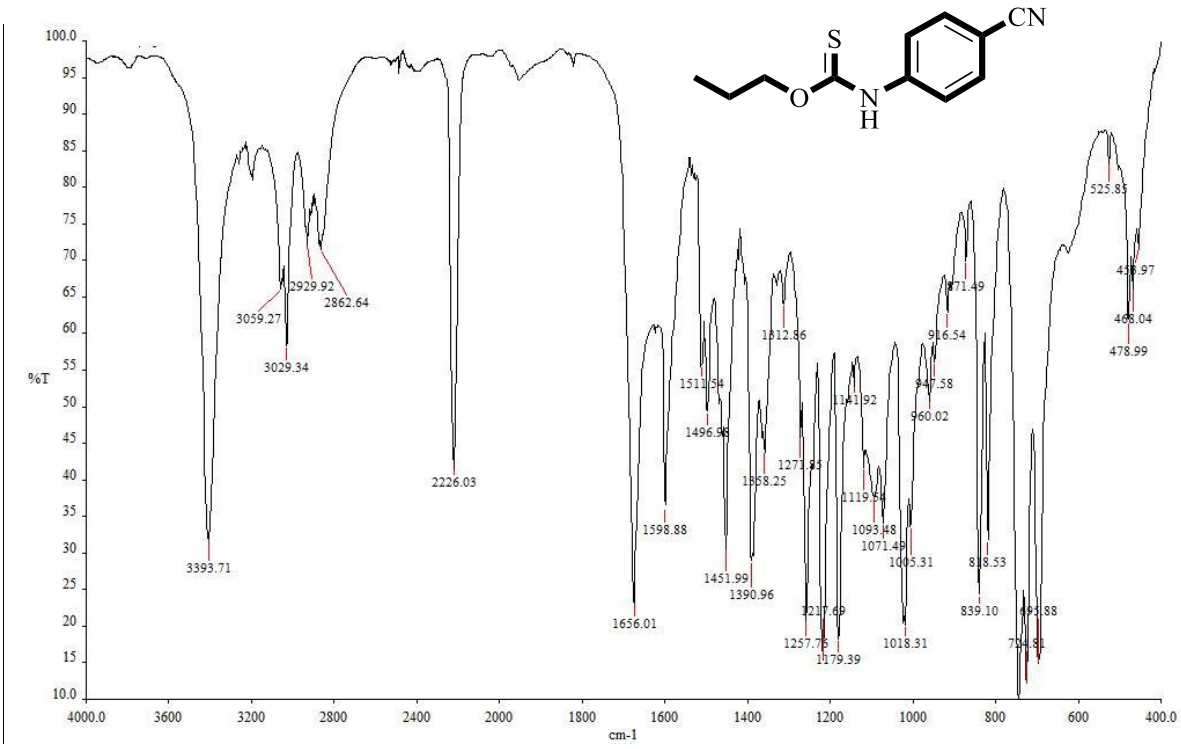
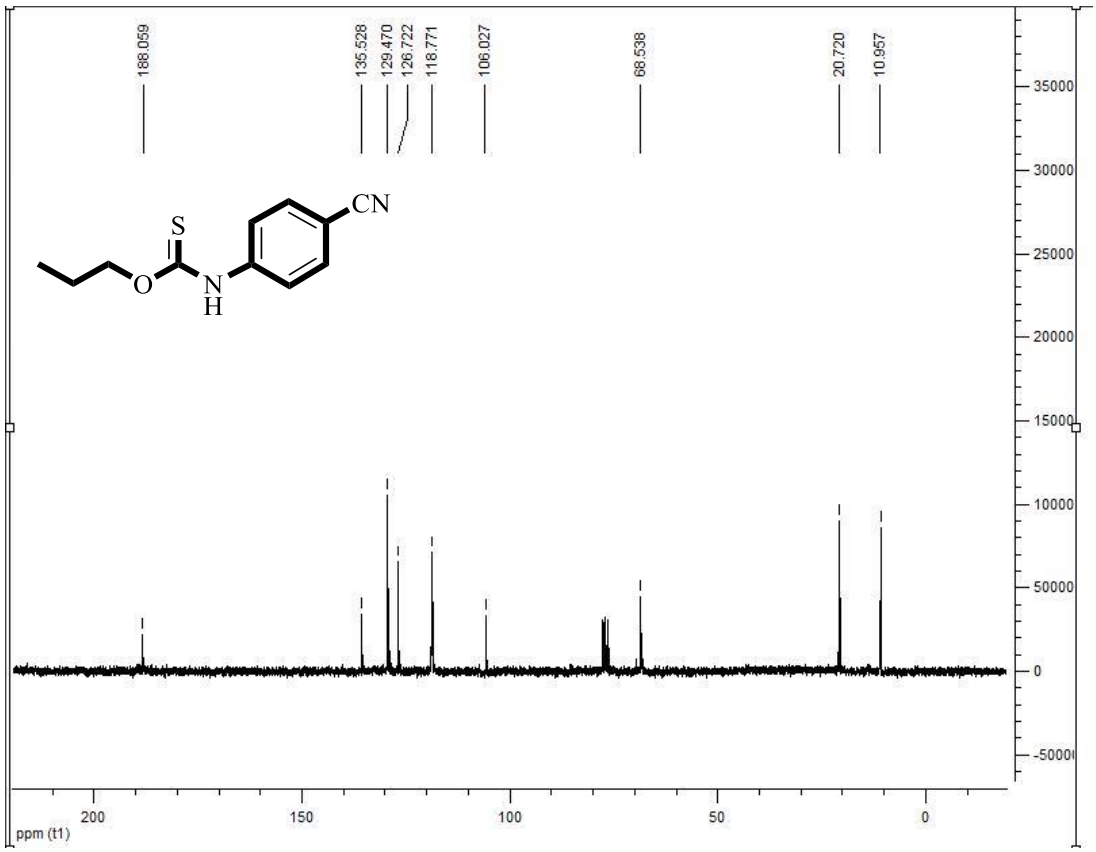


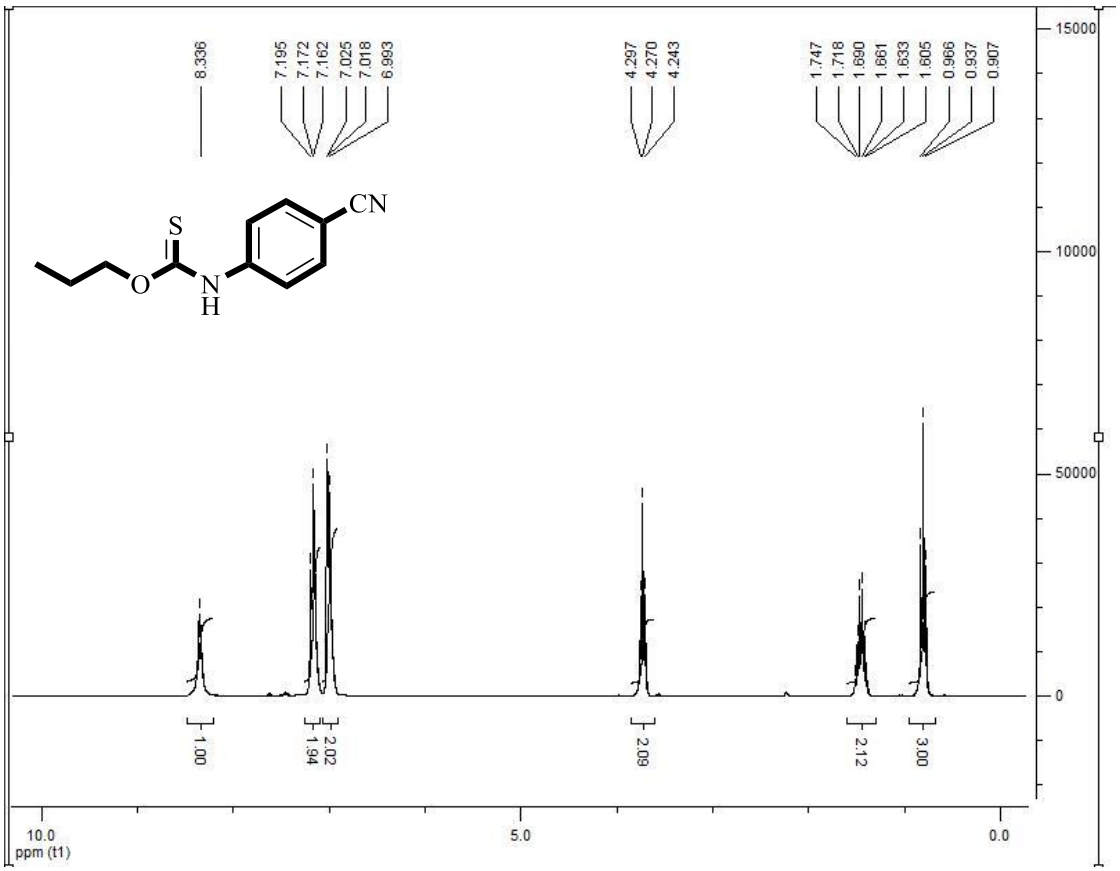
MS of propyl (4-methoxyphenyl)carbamate (**5p**).



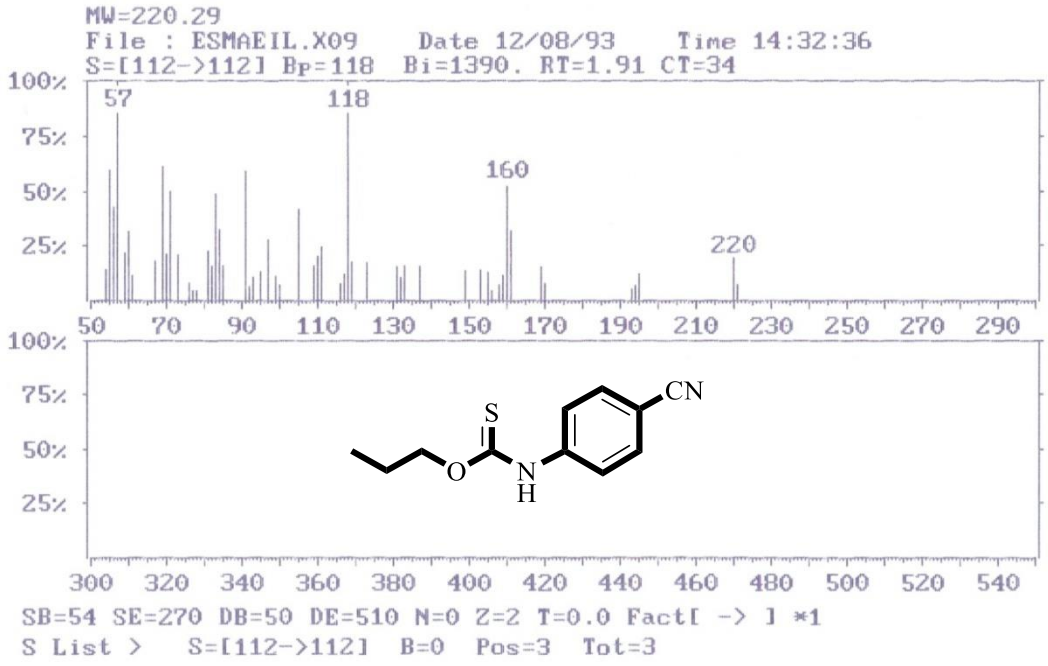
FT-IR spectra of o-propyl (4-cyanophenyl)thiocarbamate (**4q**) in KBr.



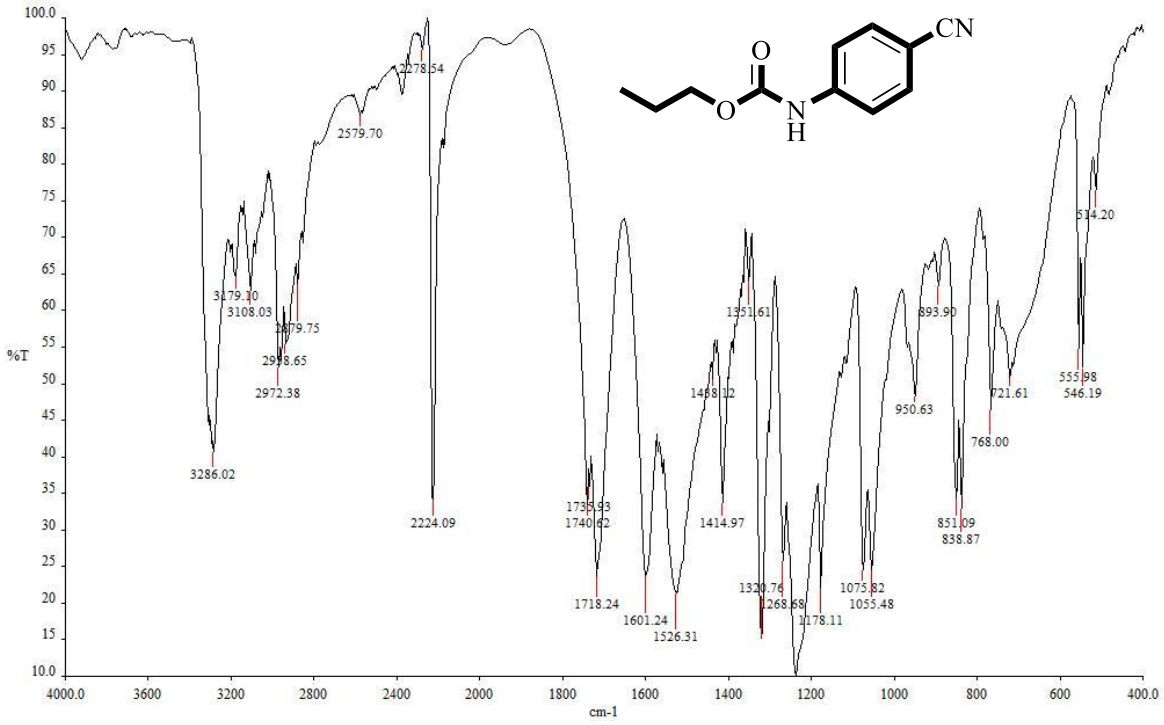
^{13}C-NMR spectra (63 MHz) of o-propyl (4-cyanophenyl)thiocarbamate (**4q**) in $CDCl_3$.



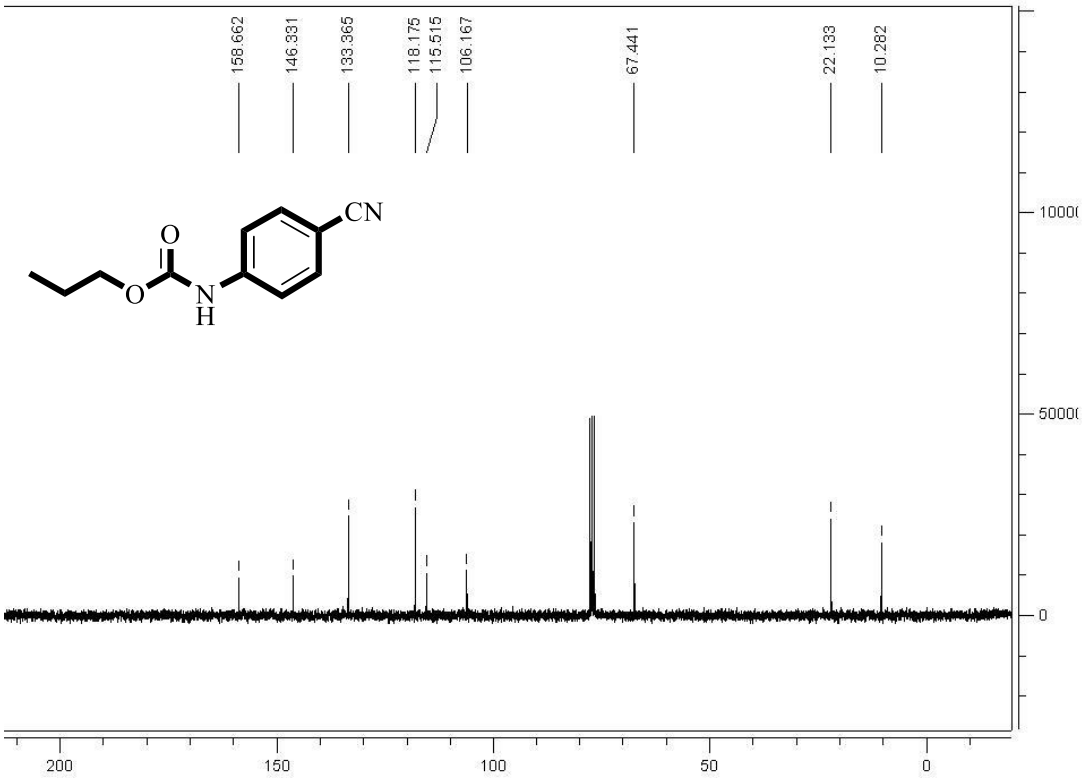
^{1}H-NMR spectra (250 MHz) of o-propyl (4-cyanophenyl)thiocarbamate (**4q**) in $CDCl_3$.



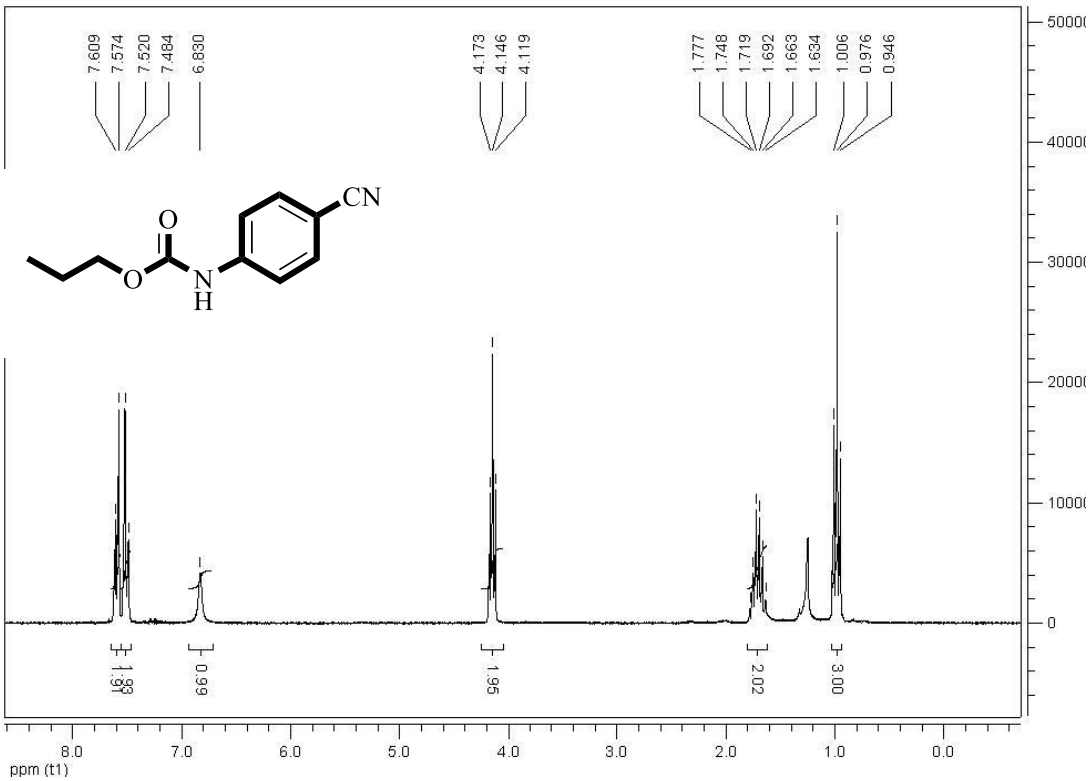
MS of o-propyl (4-cyanophenyl)thiocarbamate (**4q**).



FT-IR spectra of propyl (4-cyanophenyl)carbamate (**5q**) in KBr.



^{13}C-NMR spectra (63 MHz) of propyl (4-cyanophenyl)carbamate (**5q**) in $CDCl_3$.



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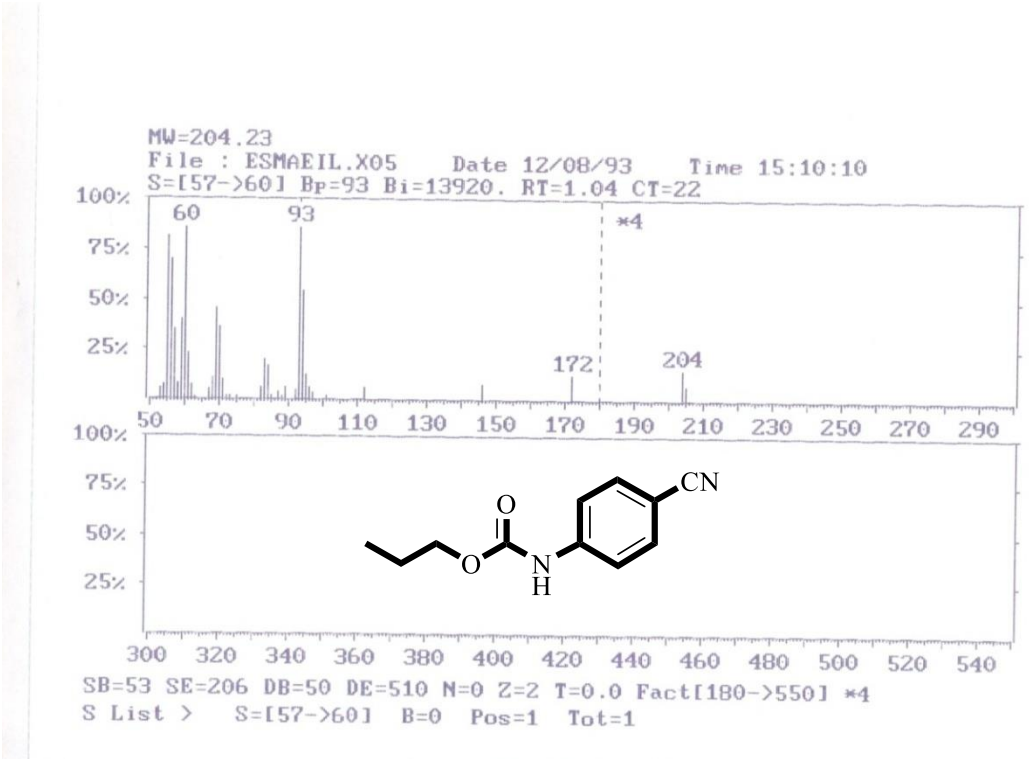
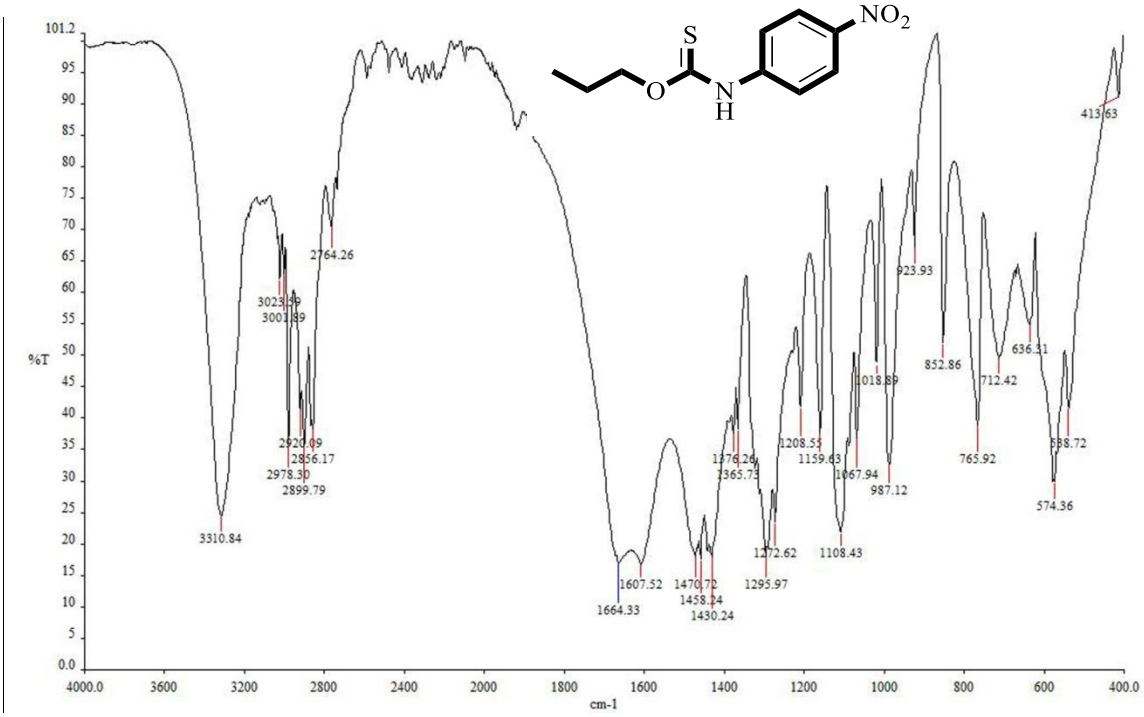
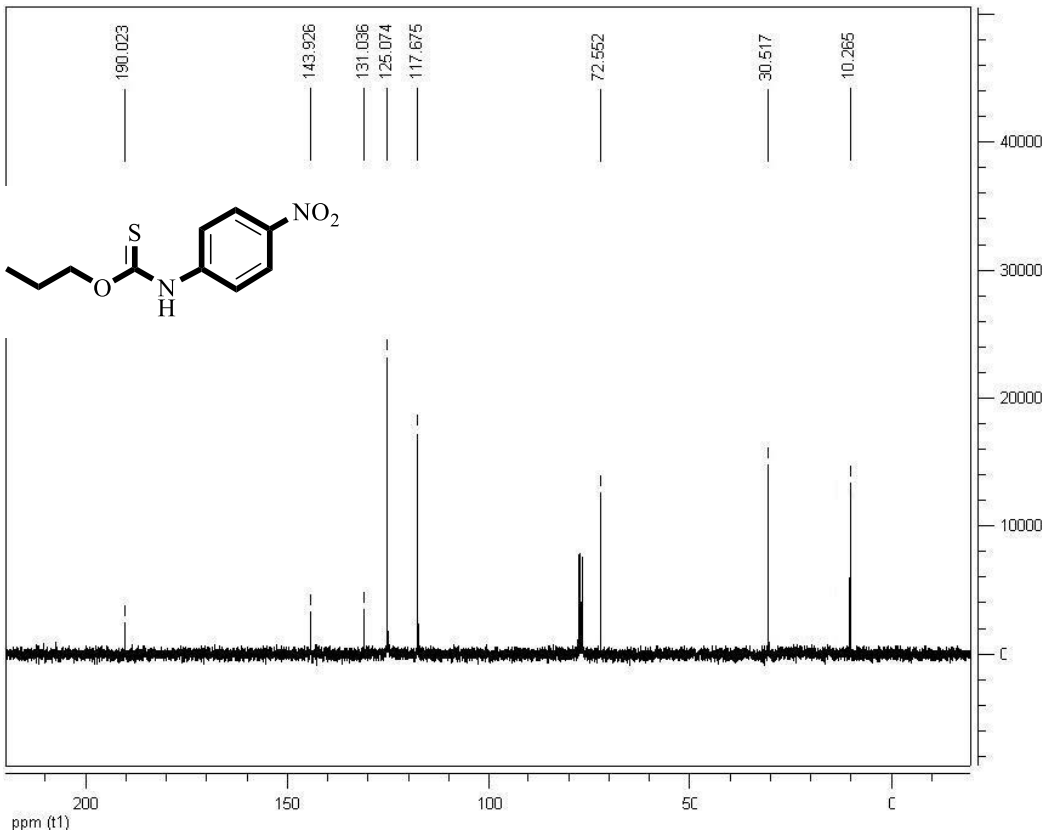


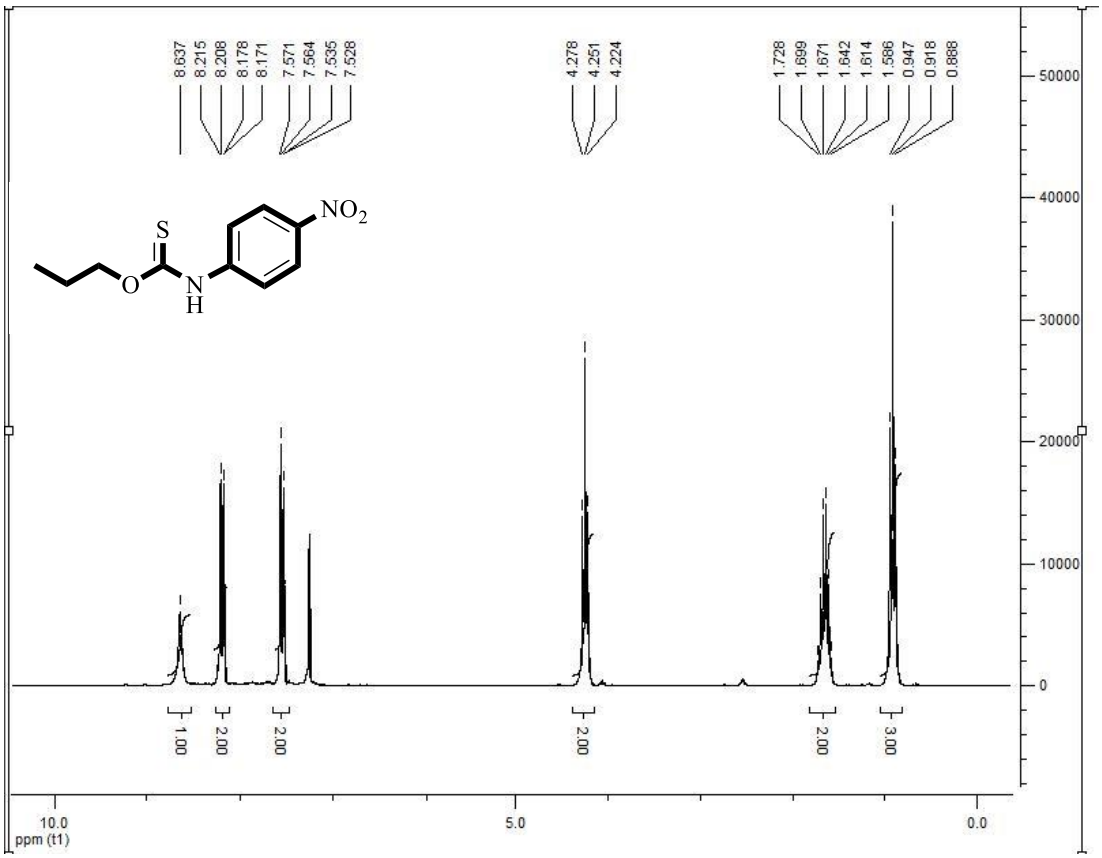
MS of propyl (4-cyanophenyl)carbamate (**5q**).



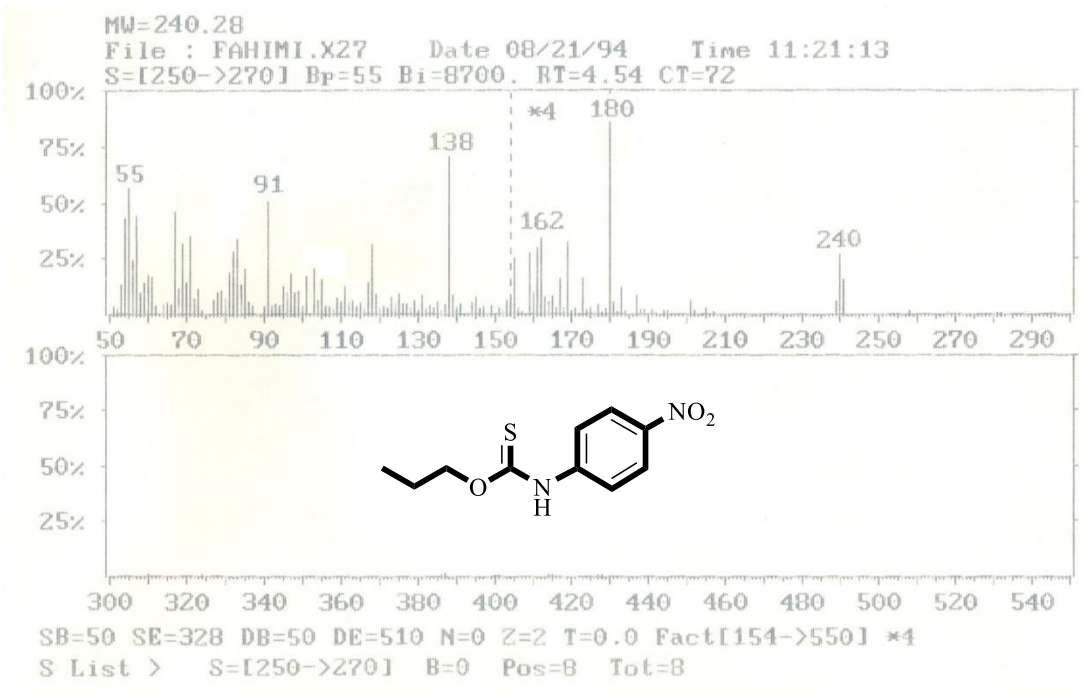
FT-IR spectra of o-propyl (4-nitrophenyl)thiocarbamate (**4r**) in KBr.



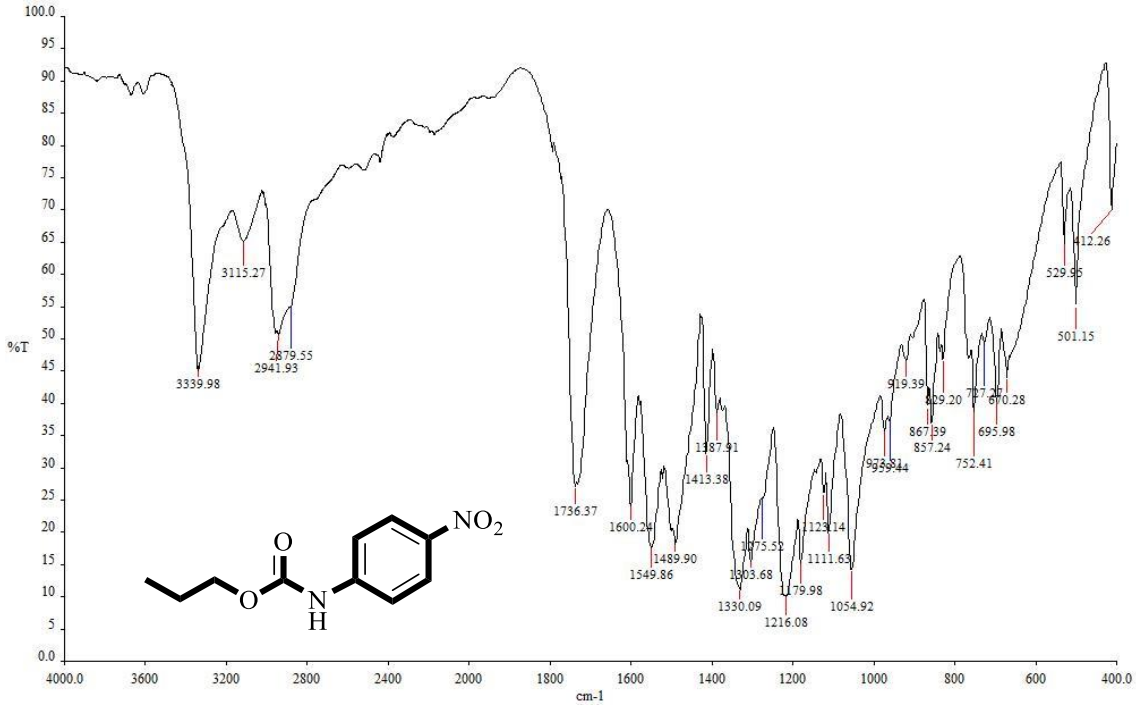
^{13}C-NMR spectra (63 MHz) of o-propyl (4-nitrophenyl)thiocarbamate (**4r**) in $CDCl_3$.



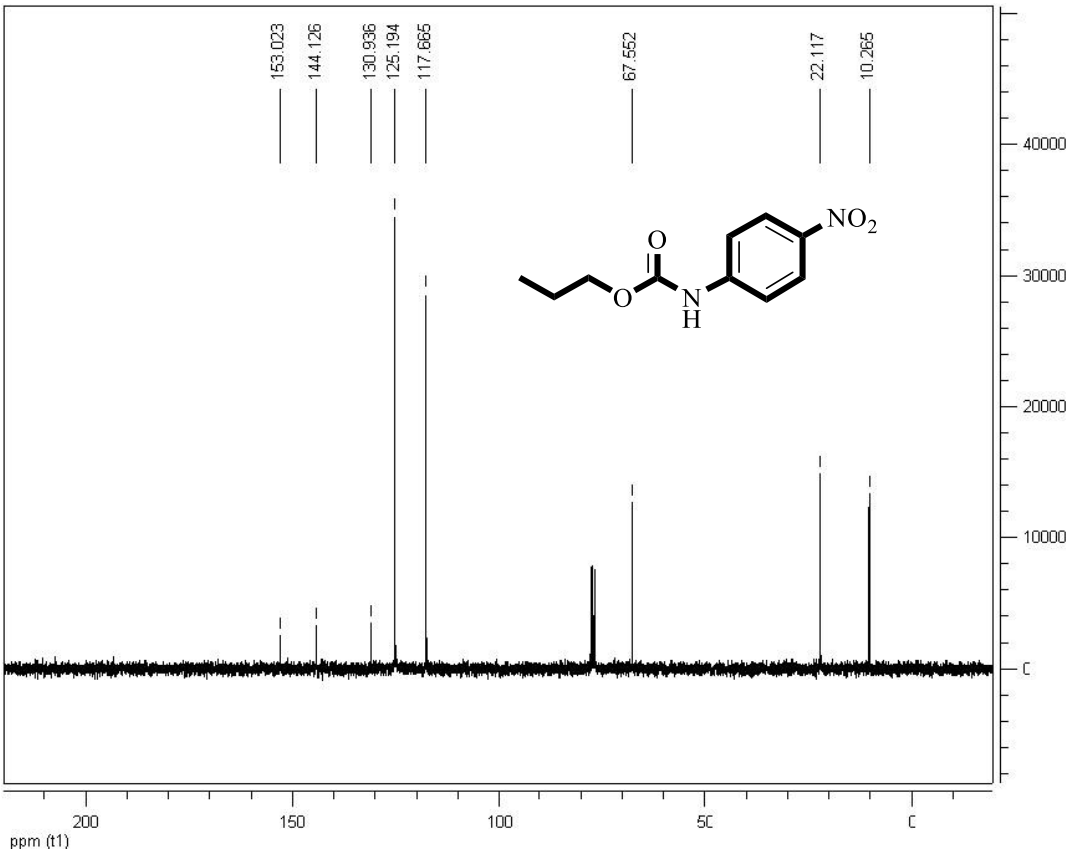
^{1}H-NMR spectra (250 MHz) of o-propyl (4-nitrophenyl)thiocarbamate (**4r**) in $CDCl_3$.



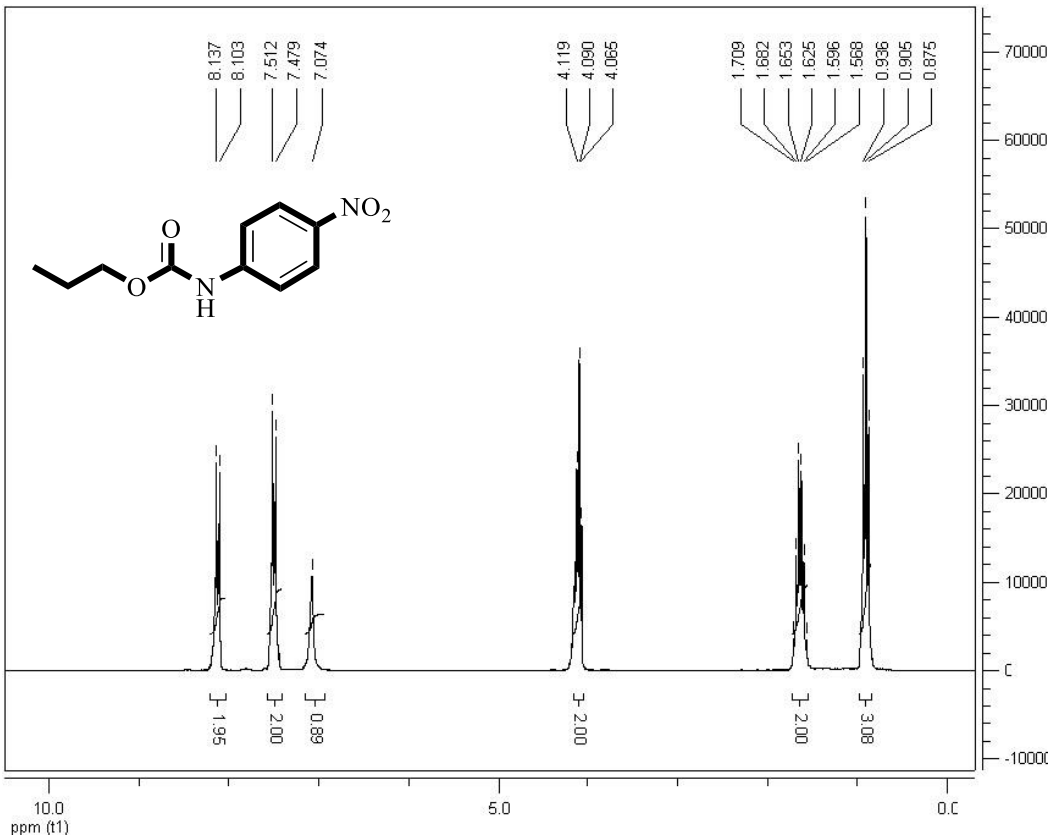
MS of o-propyl (4-nitrophenyl)thiocarbamate (**4r**).



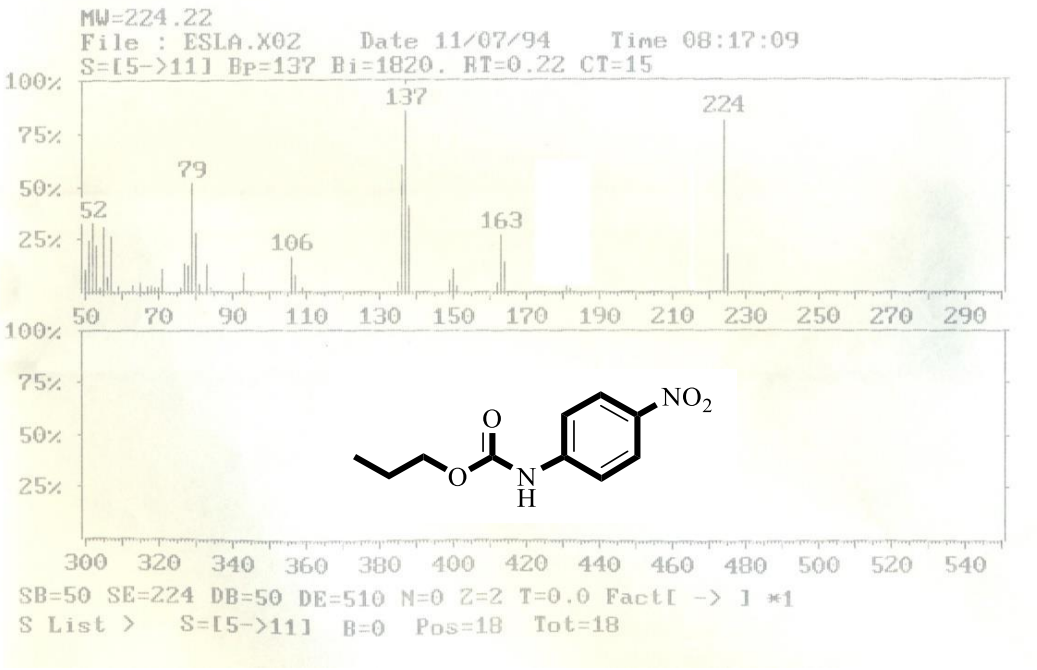
FT-IR spectra of propyl (4-nitrophenyl)carbamate (**5r**) in KBr.



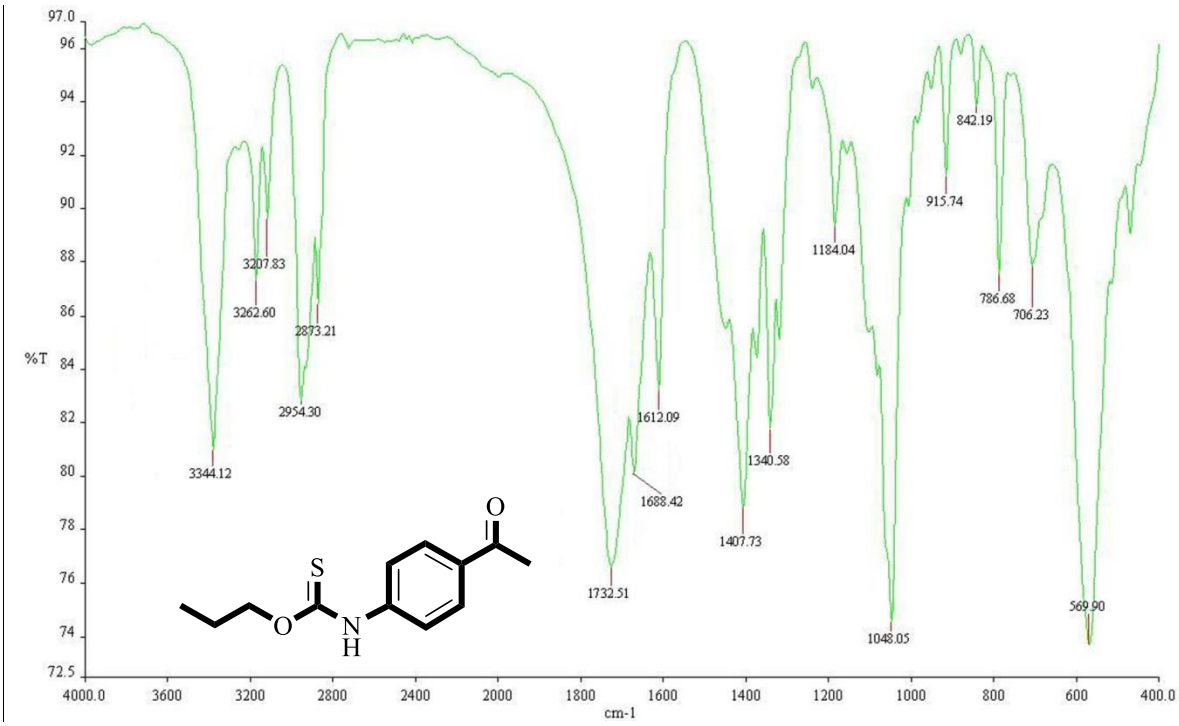
^{13}C-NMR spectra (63 MHz) of propyl (4-nitrophenyl)carbamate (**5r**) in $CDCl_3$.



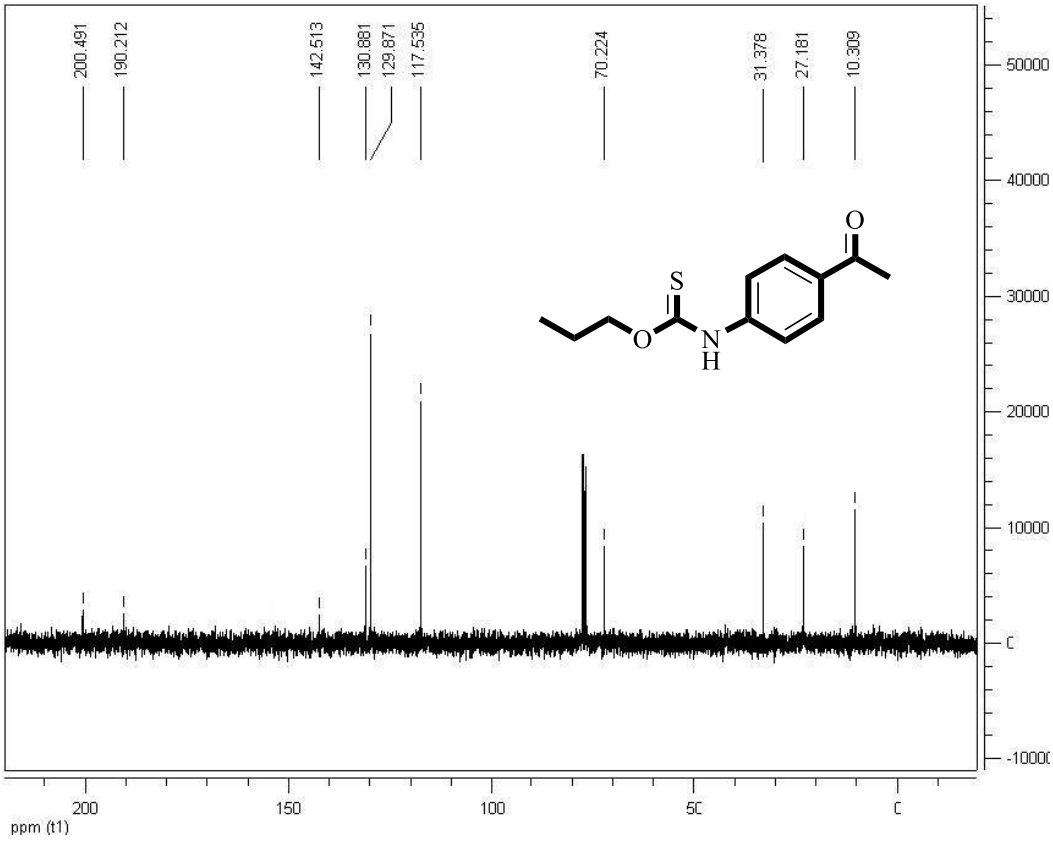
^{1}H-NMR spectra (250 MHz) of propyl (4-nitrophenyl)carbamate (**5r**) in $CDCl_3$.



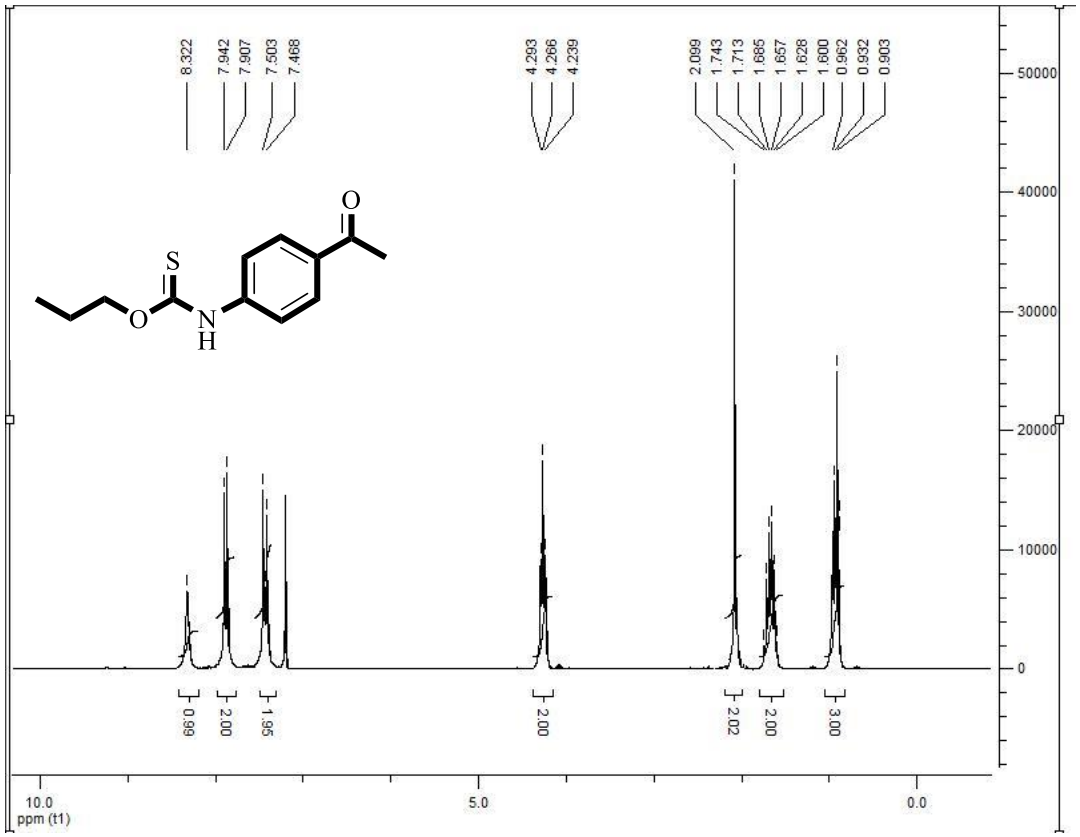
MS of propyl (4-nitrophenyl)carbamate (**5r**).



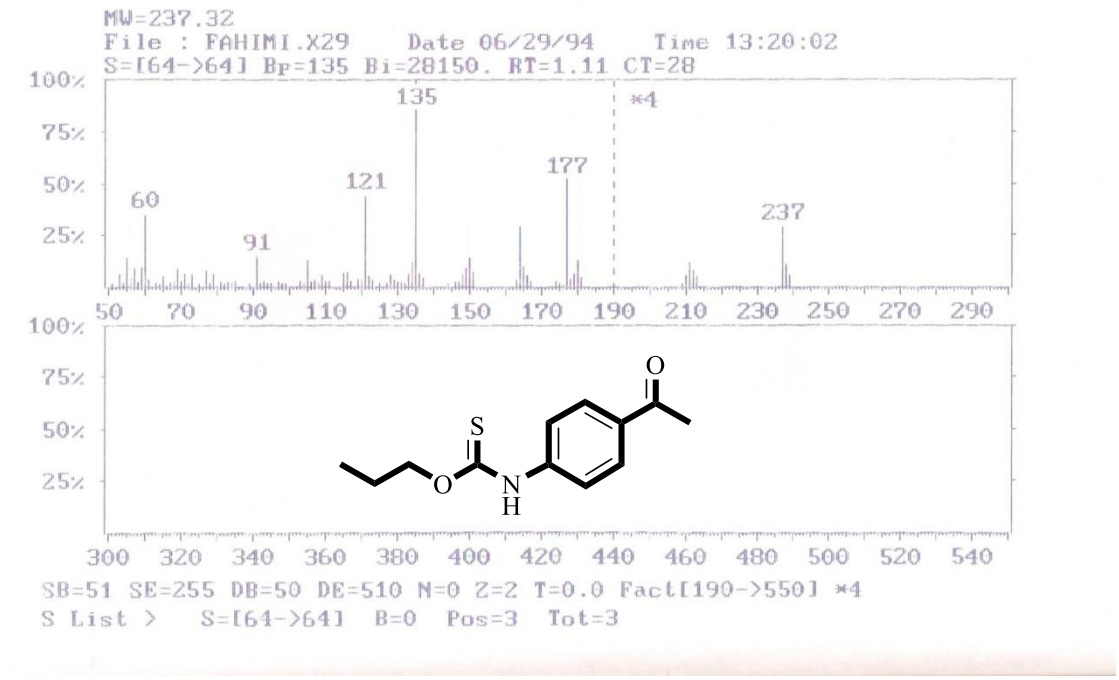
FT-IR spectra of o-propyl (4-acetylphenyl)thiocarbamate (**4s**) in KBr.



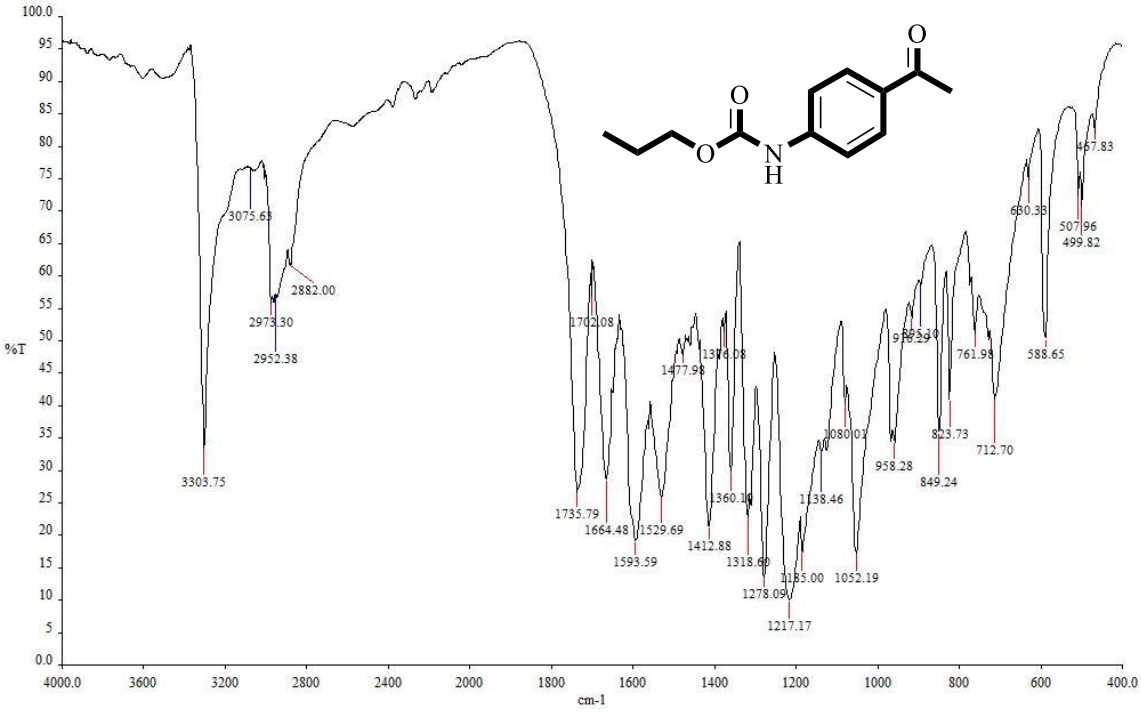
^{13}C-NMR spectra (63 MHz) of o-propyl (4-acetylphenyl)thiocarbamate (**4s**) in $CDCl_3$.



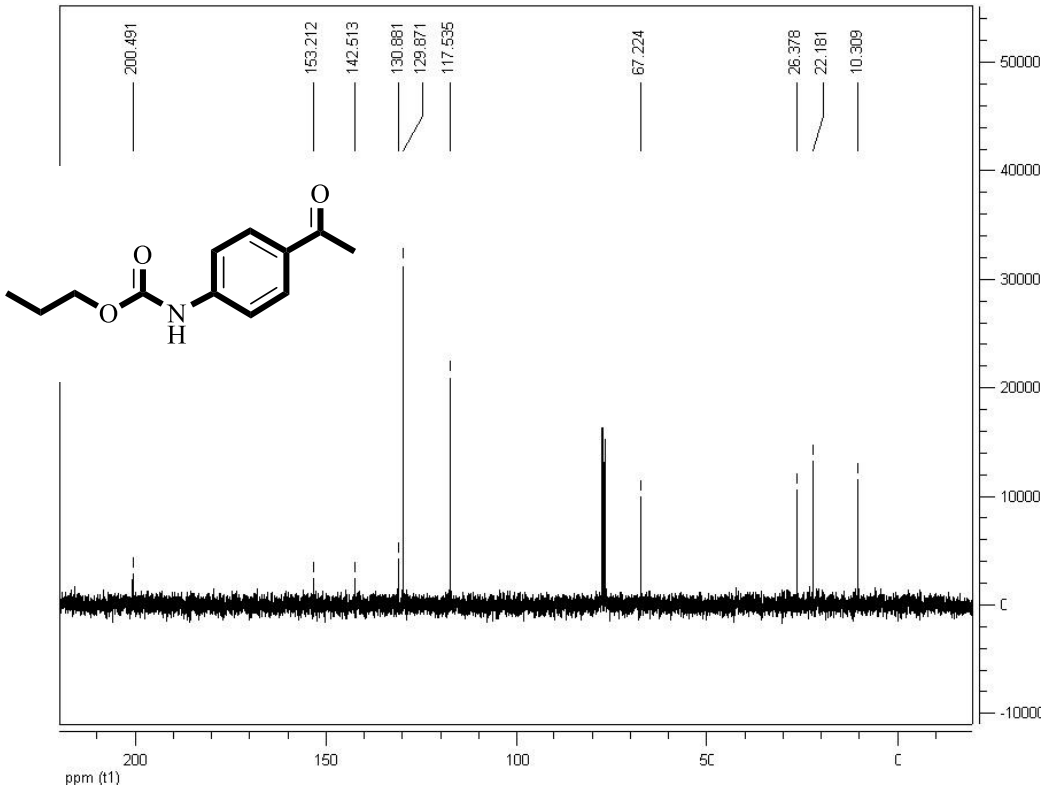
^{1}H-NMR spectra (250 MHz) of o-propyl (4-acetylphenyl)thiocarbamate (**4s**) in $CDCl_3$.



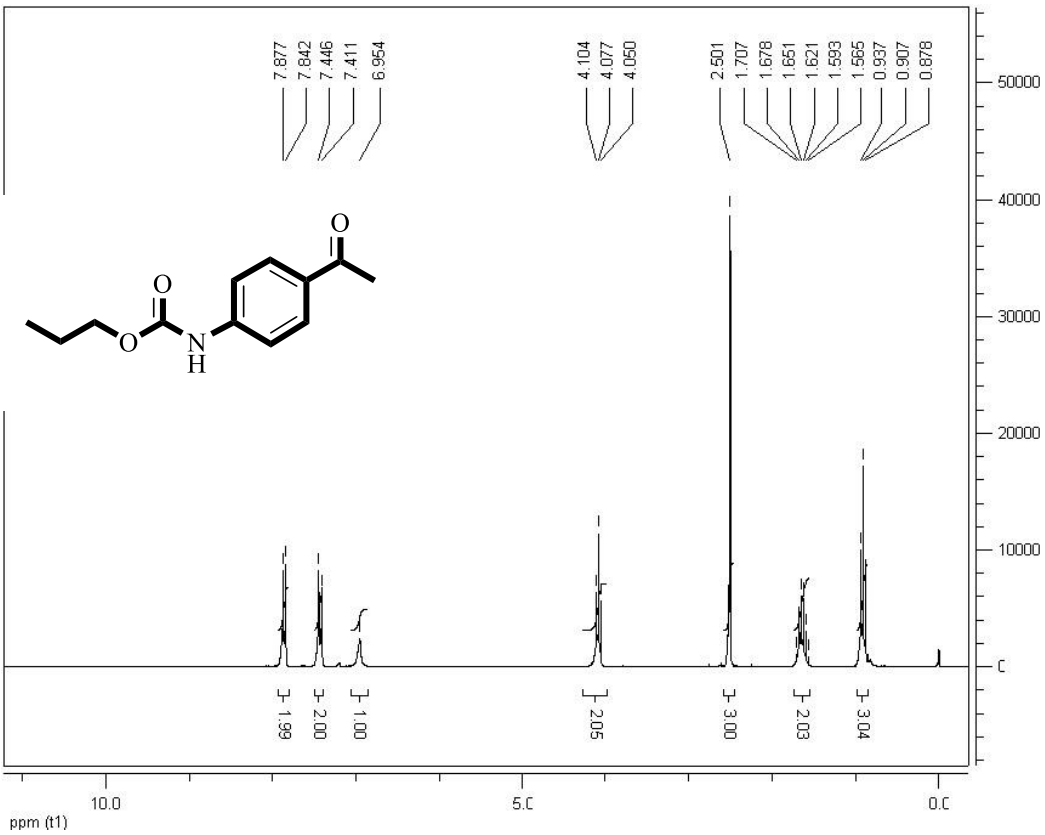
MS of o-propyl (4-acetylphenyl)thiocarbamate (**4s**).



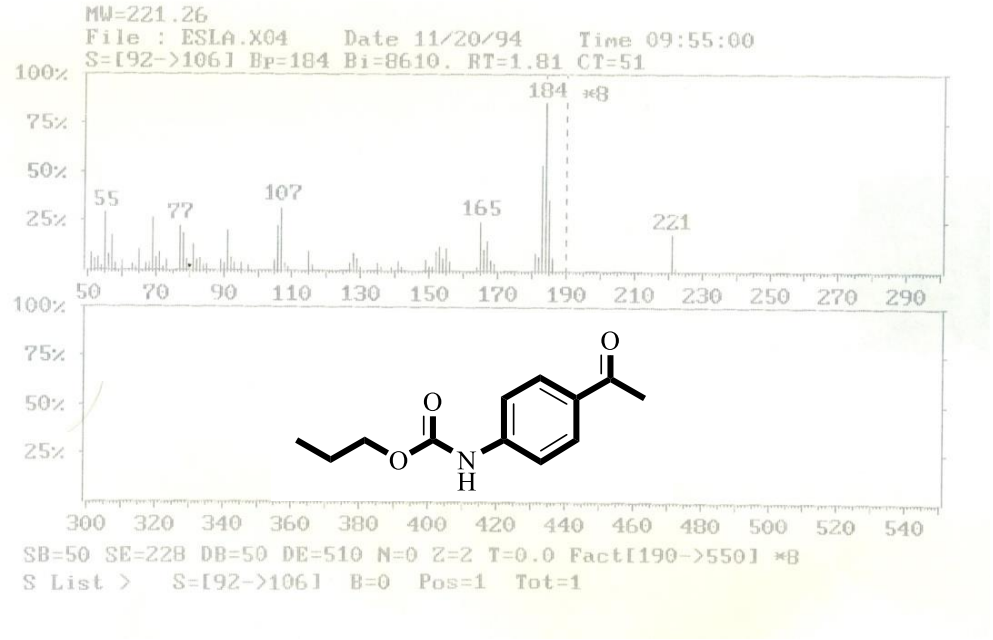
FT-IR spectra of propyl (4-acetylphenyl)carbamate (**5s**) in KBr.



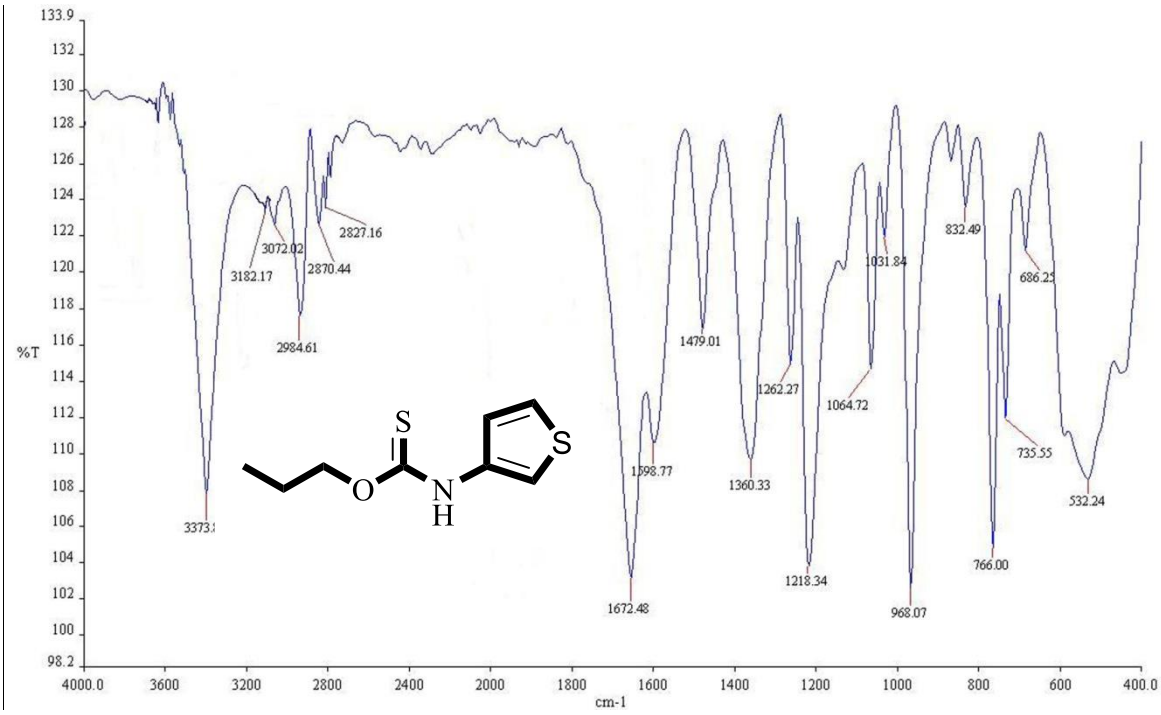
^{13}C-NMR spectra (63 MHz) of propyl (4-acetylphenyl)carbamate (**5s**) in $CDCl_3$.



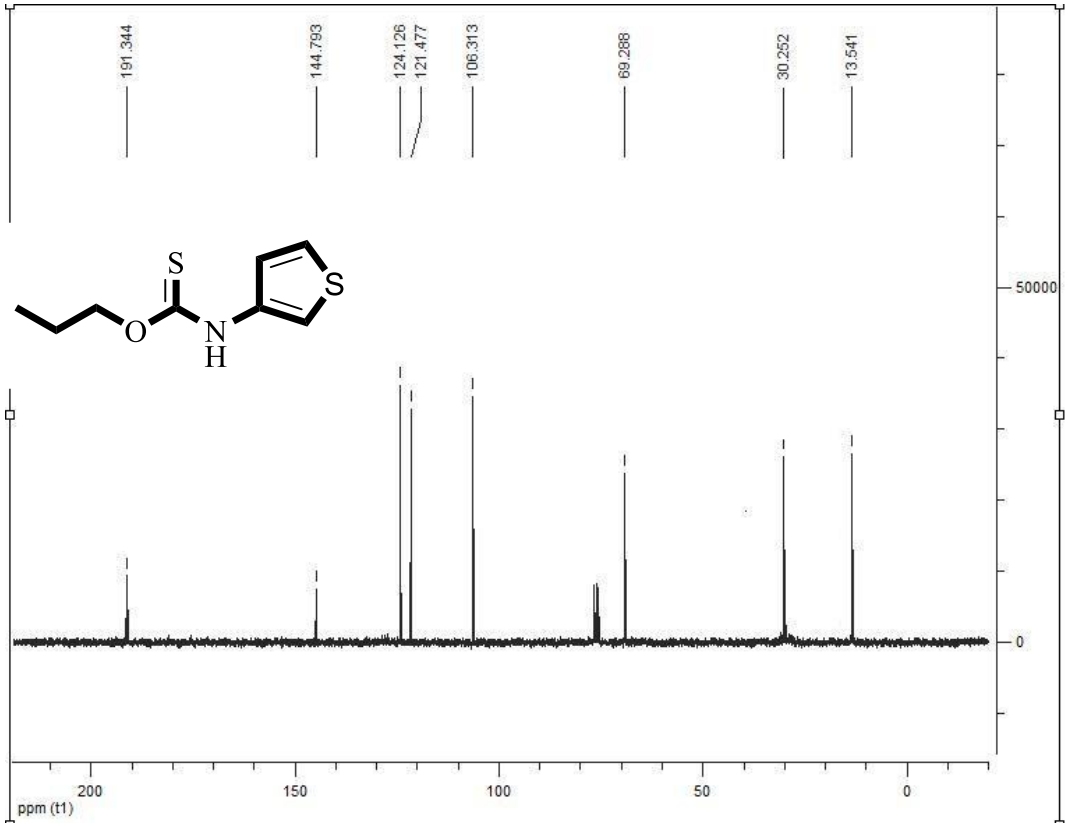
^{1}H-NMR spectra (250 MHz) of propyl (4-acetylphenyl)carbamate (**5s**) in $CDCl_3$.



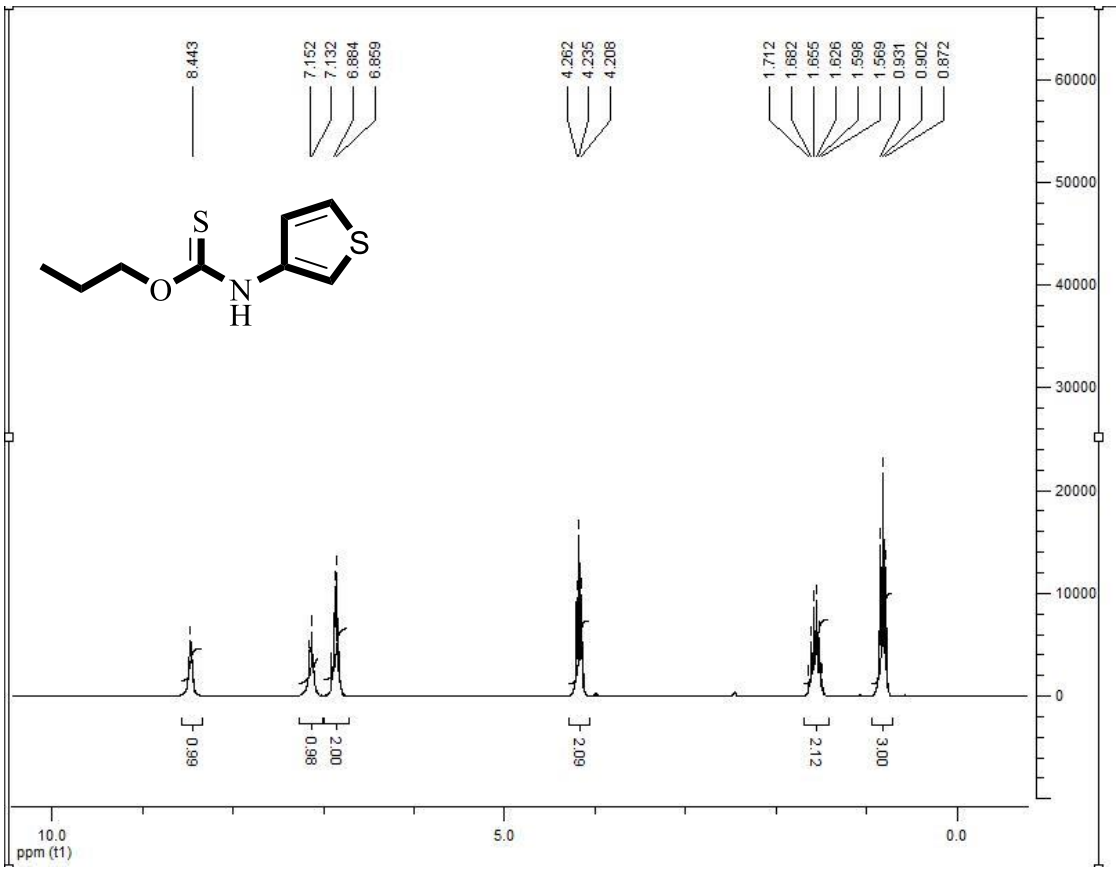
MS of propyl (4-acetylphenyl)carbamate (**5s**).



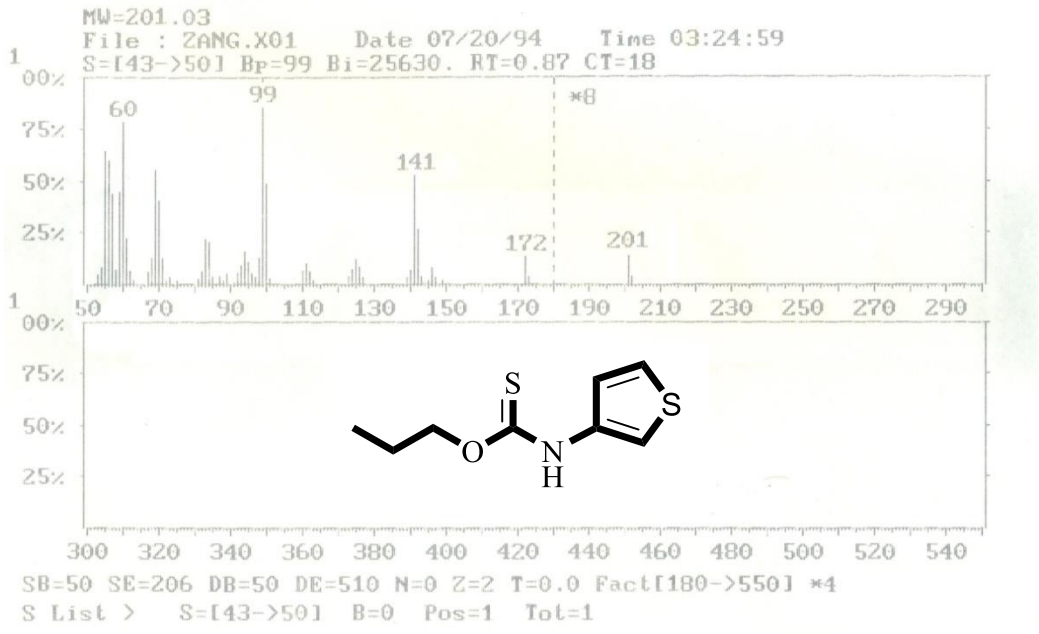
FT-IR spectra of o-propyl (thiophen-3-yl)thiocarbamate (**4t**) in KBr.



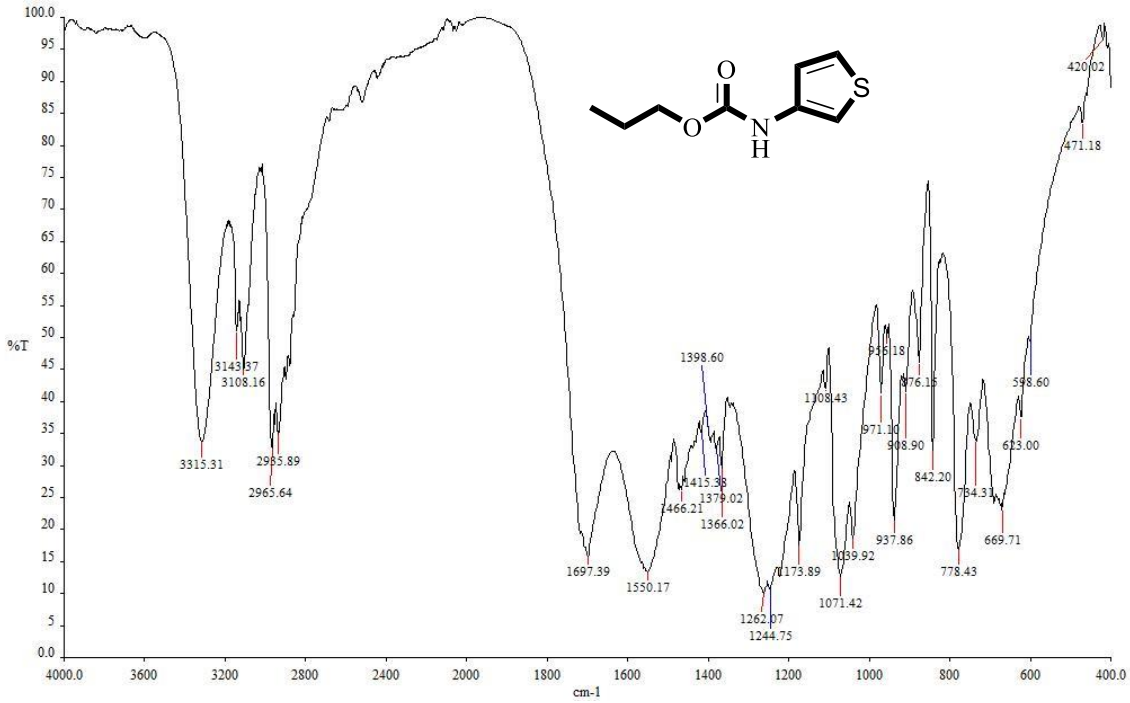
^{13}C-NMR spectra (63 MHz) of o-propyl (thiophen-3-yl)thiocarbamate (**4t**) in $CDCl_3$.



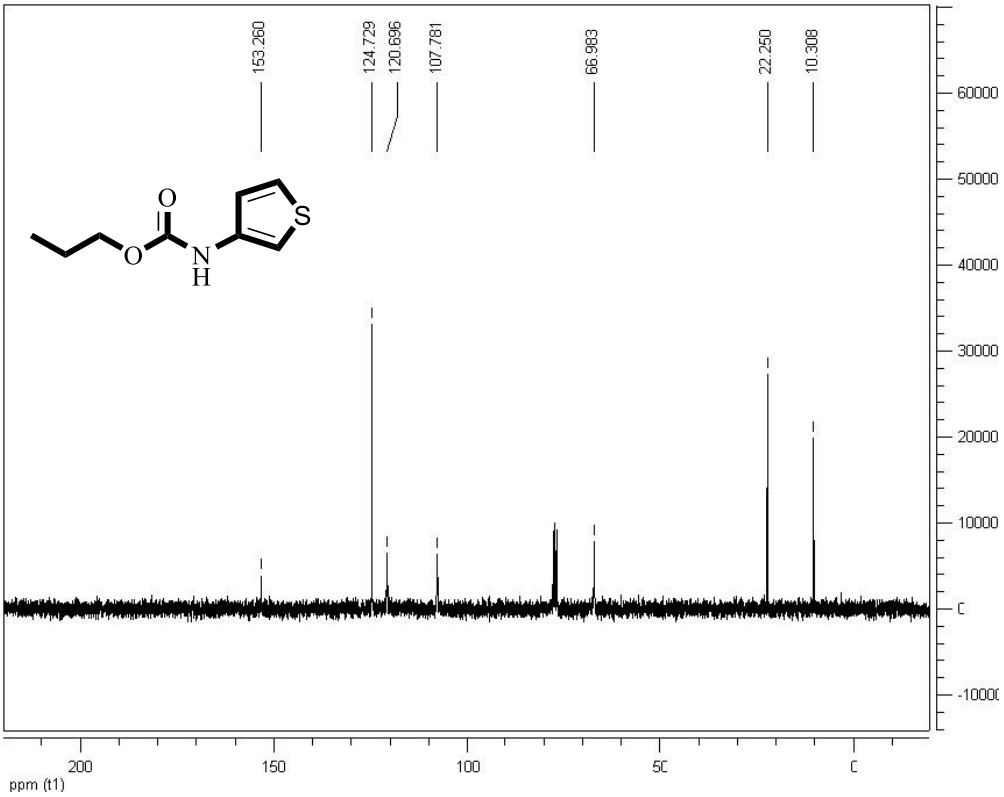
^{1}H-NMR spectra (250 MHz) of o-propyl (thiophen-3-yl)thiocarbamate (**4t**) in $CDCl_3$.



MS of o-propyl (thiophen-3-yl)thiocarbamate (**4t**).



FT-IR spectra of propyl (thiophen-3-yl)carbamate (**5t**) in KBr.



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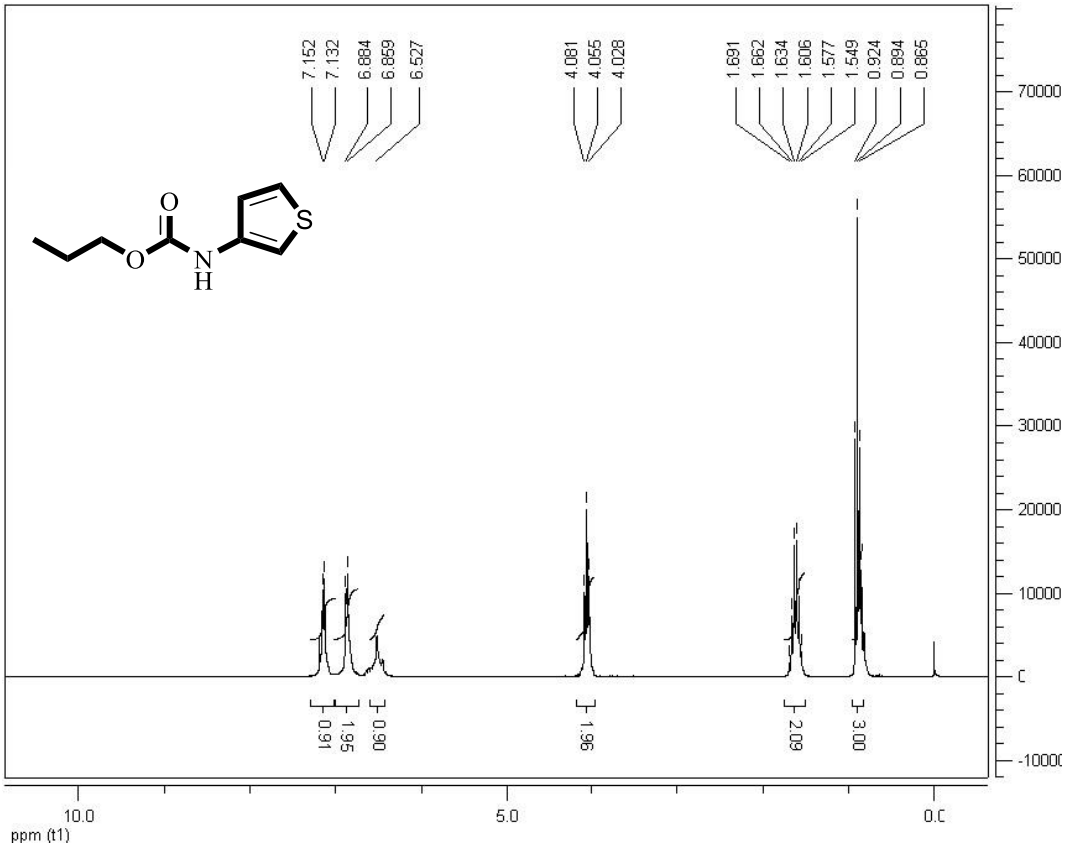

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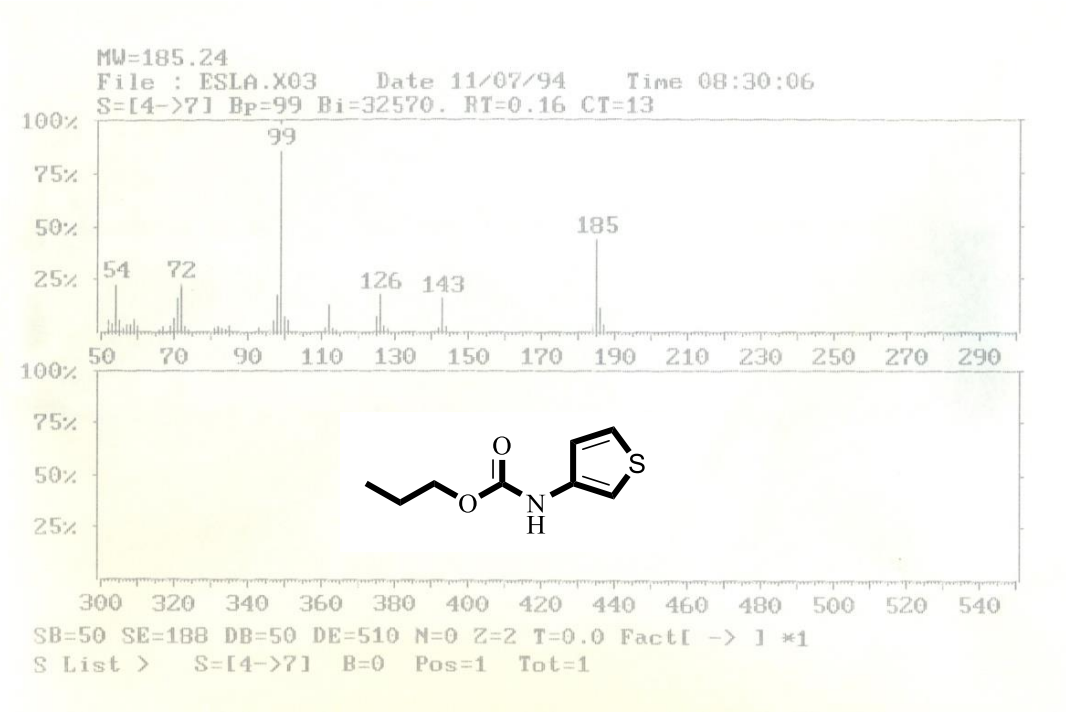
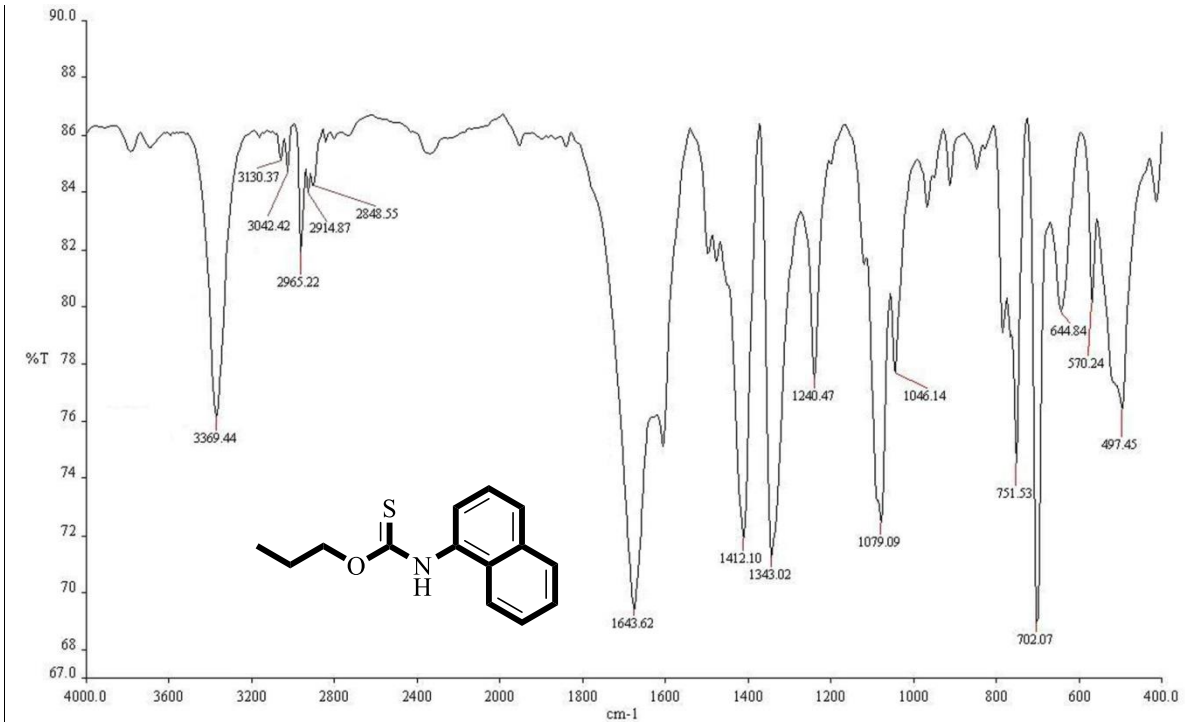
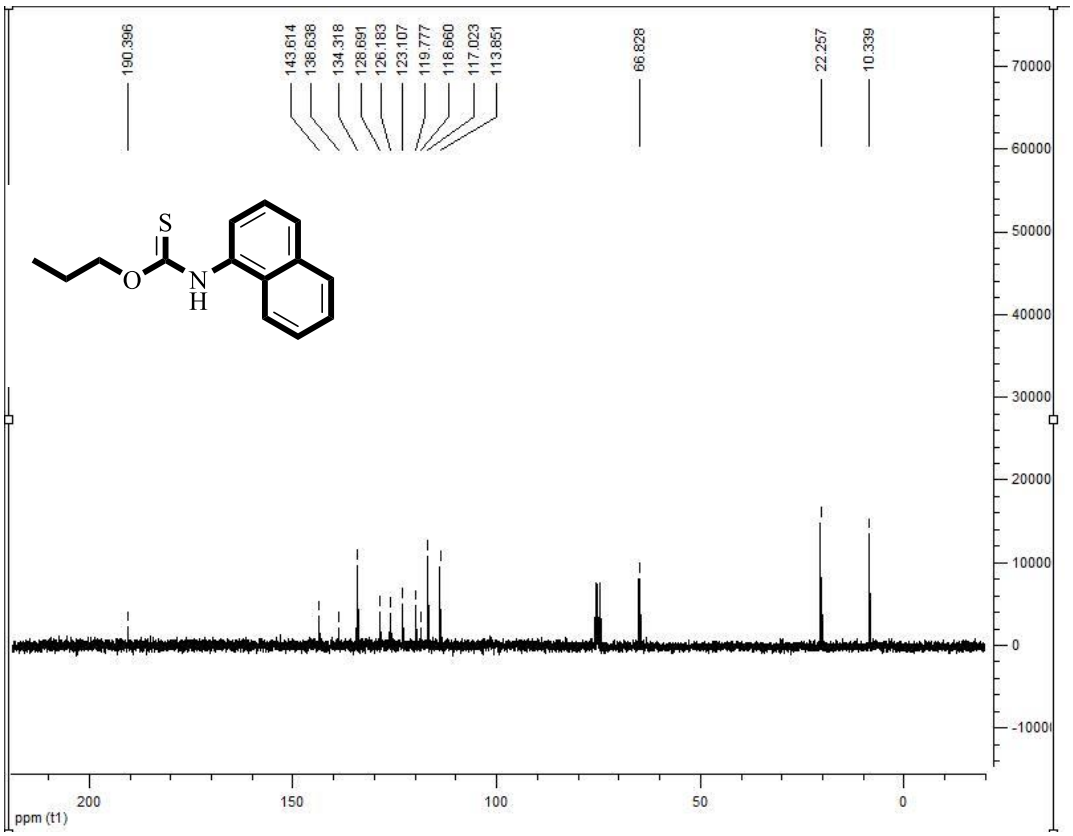


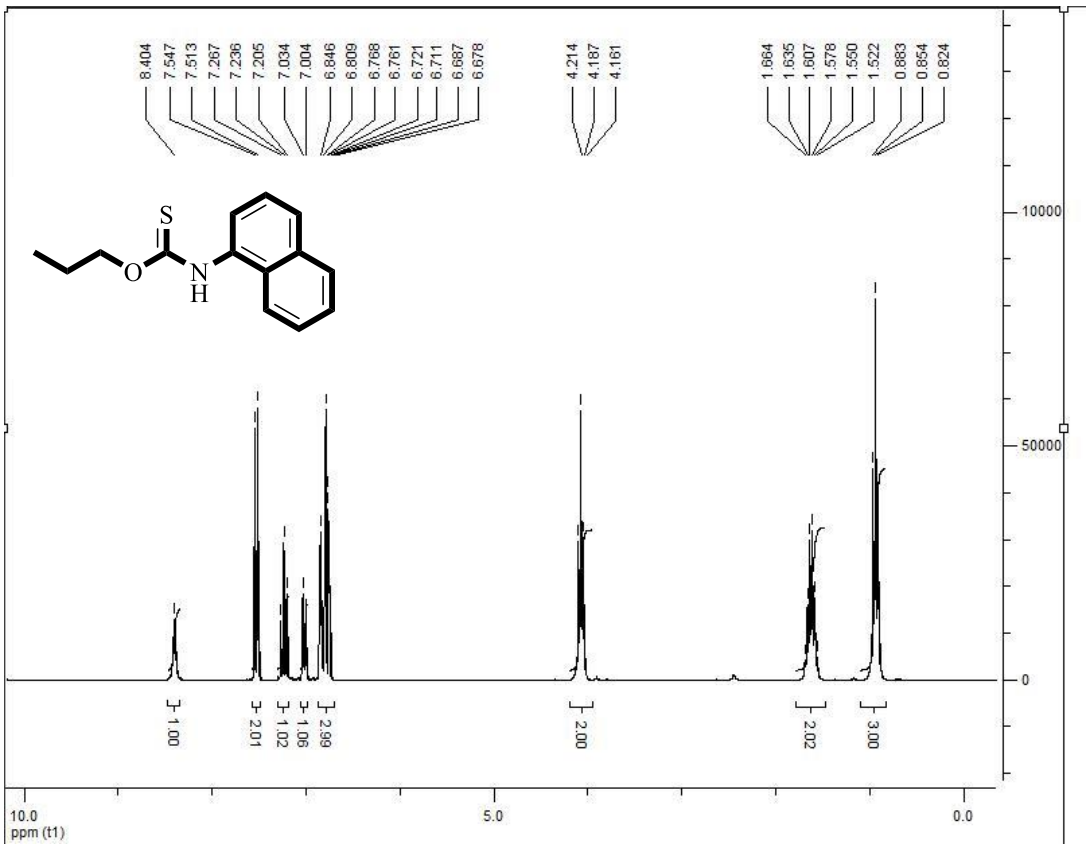
MS of propyl (thiophen-3-yl)carbamate (**5t**).



FT-IR spectra of o-propyl (naphthalene-1-yl)thiocarbamate (**4u**) in KBr.



^{13}C-NMR spectra (63 MHz) of o-propyl (naphthalene-1-yl)thiocarbamate (**4u**) in $CDCl_3$.



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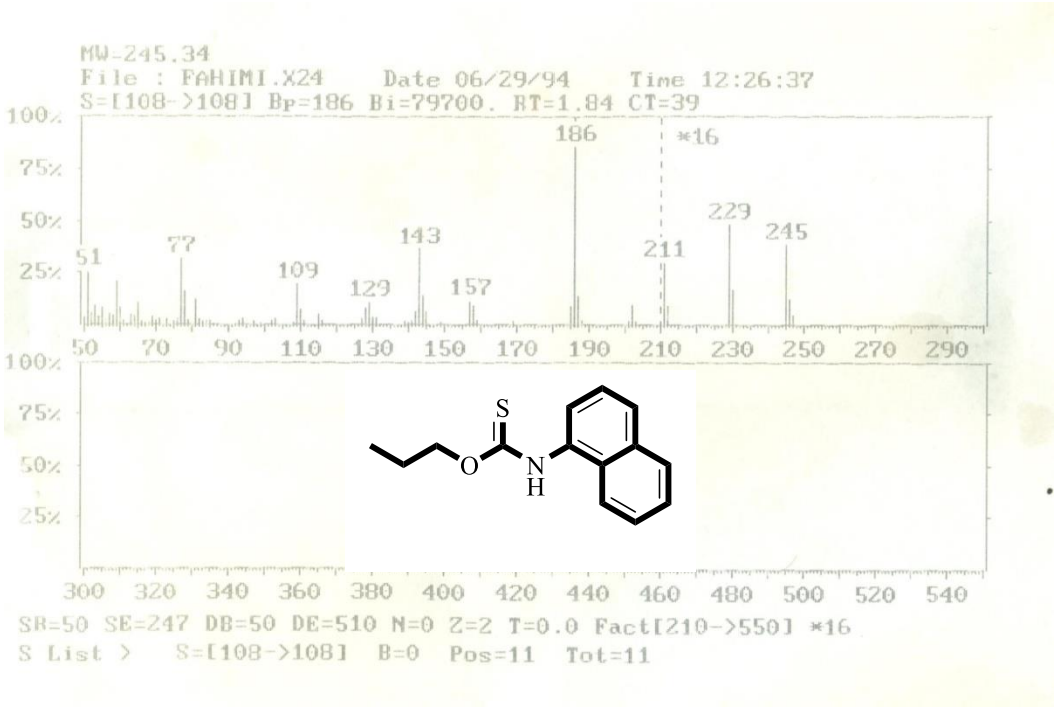
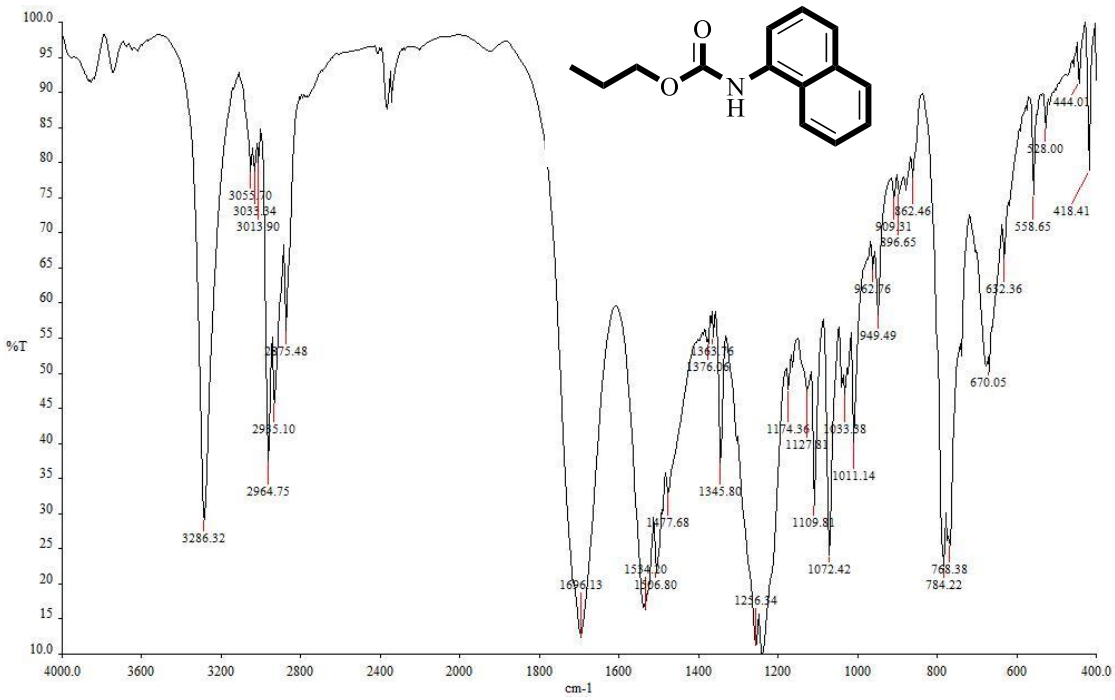
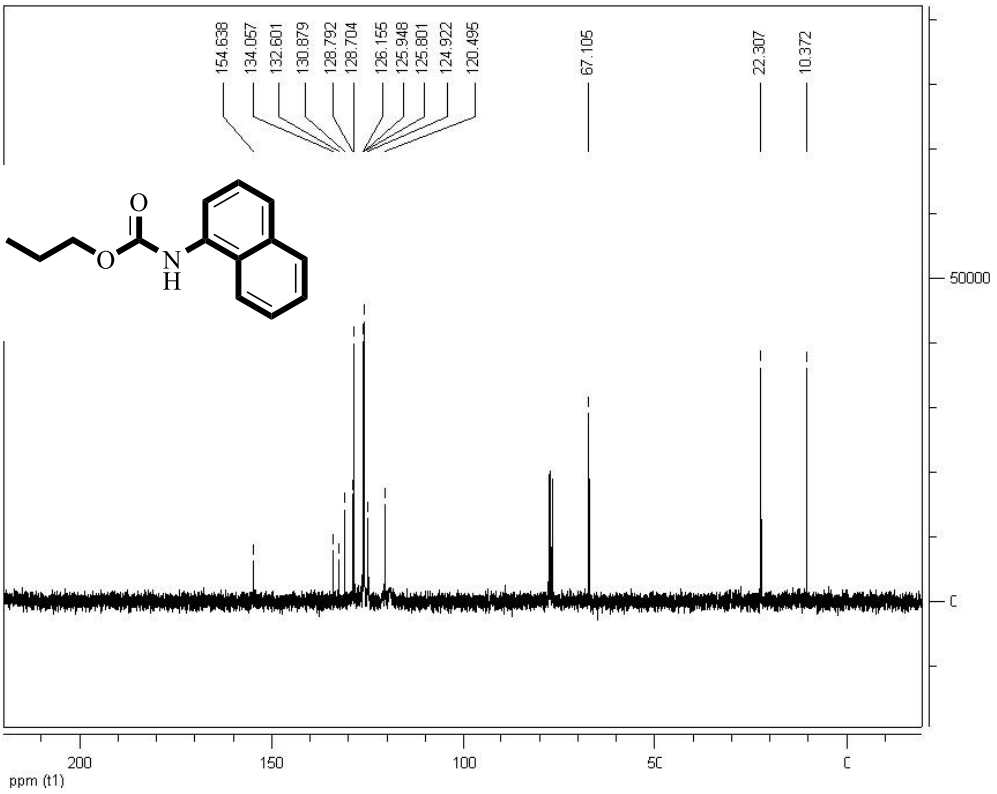


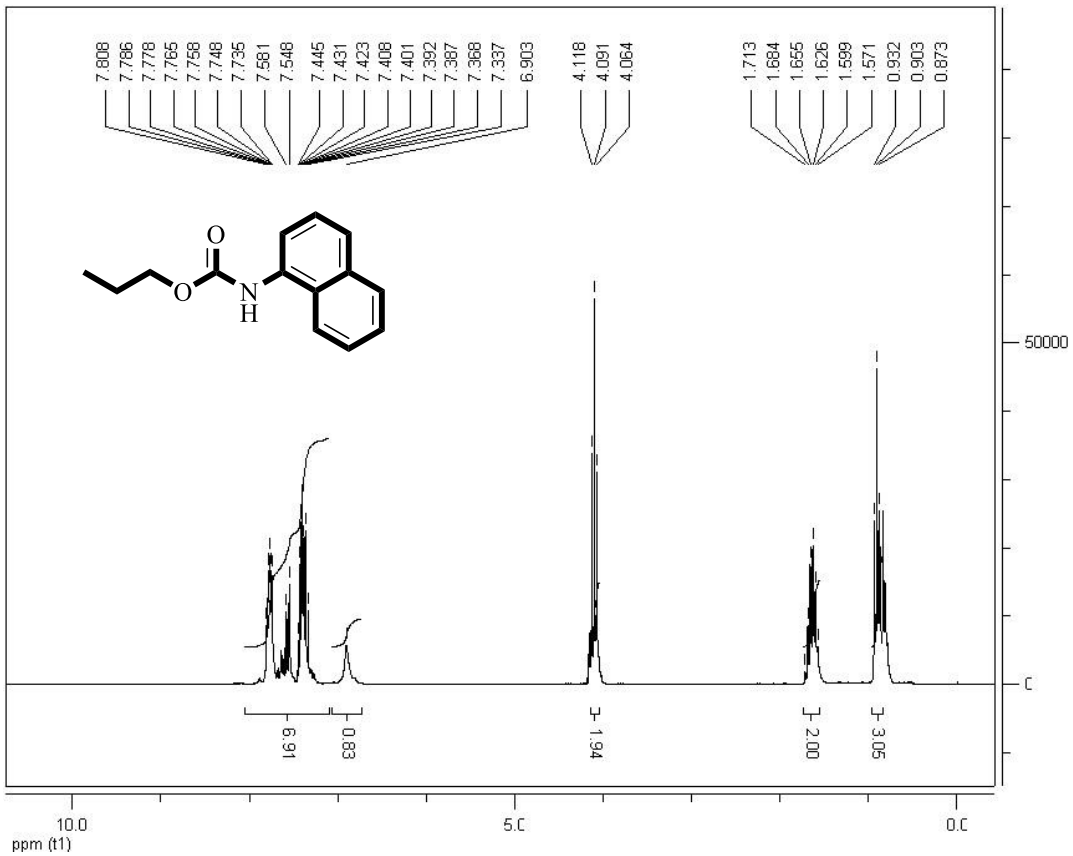
MS of o-propyl (naphthalene-1-yl)thiocarbamate (**4u**).



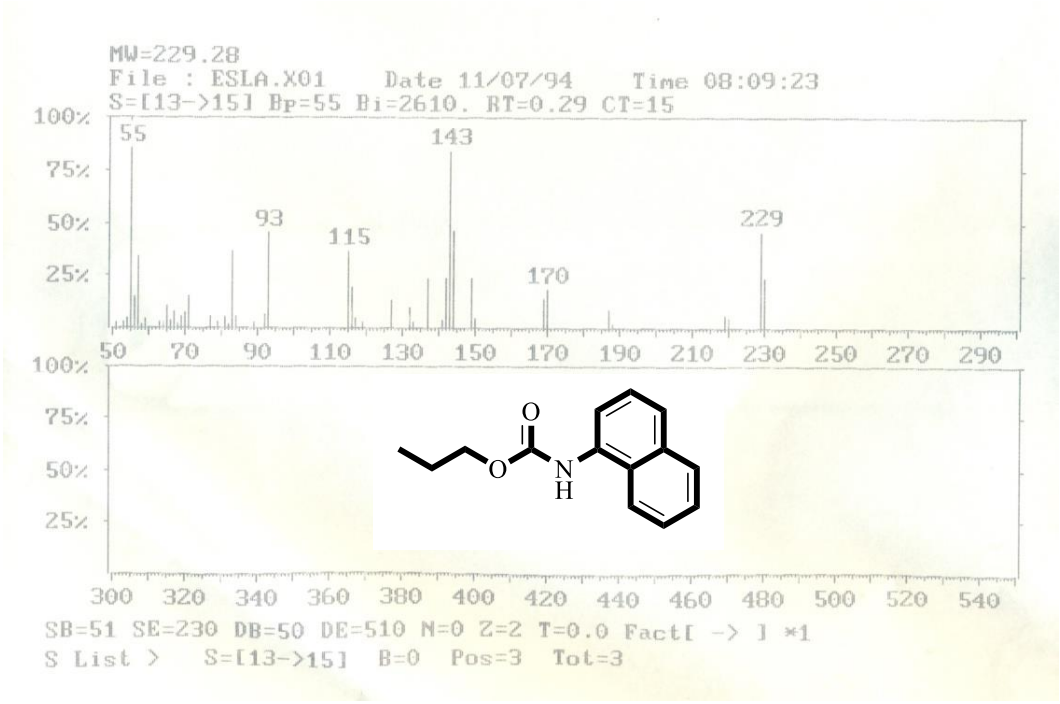
FT-IR spectra of propyl (naphthalene-1-yl)carbamate (**5u**) in KBr.



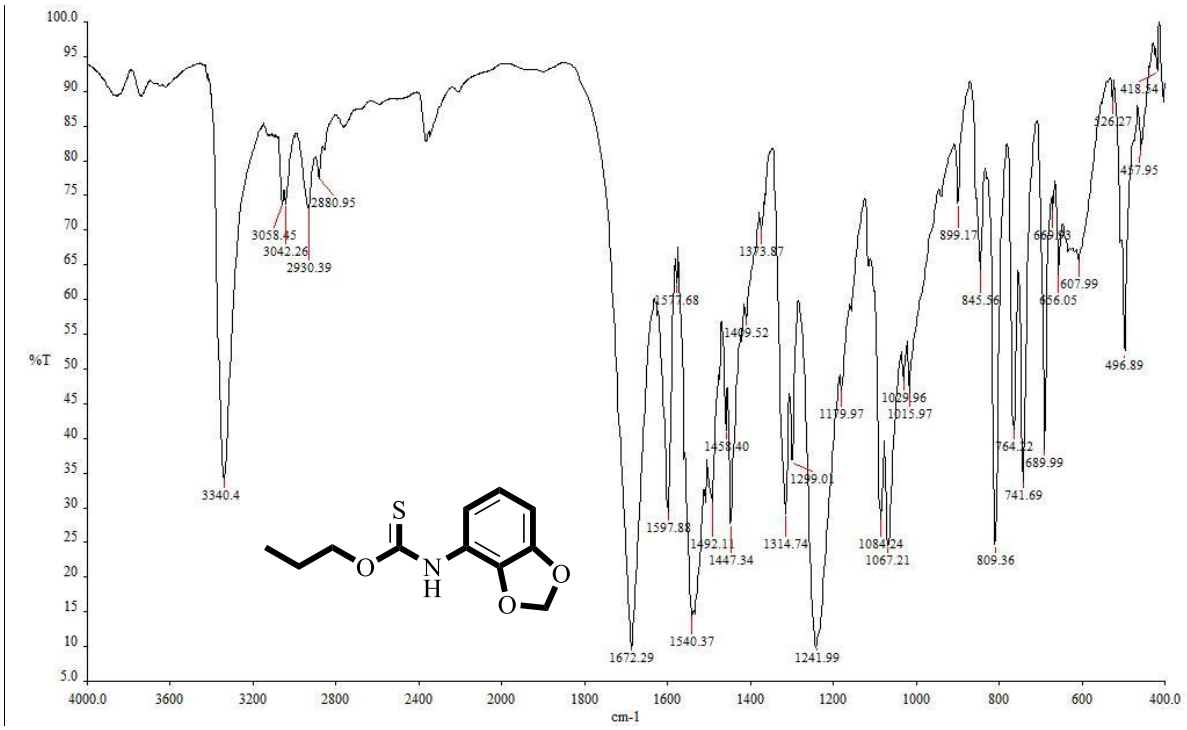
^{13}C-NMR spectra (63 MHz) of propyl (naphthalene-1-yl)carbamate (**5u**) in $CDCl_3$.



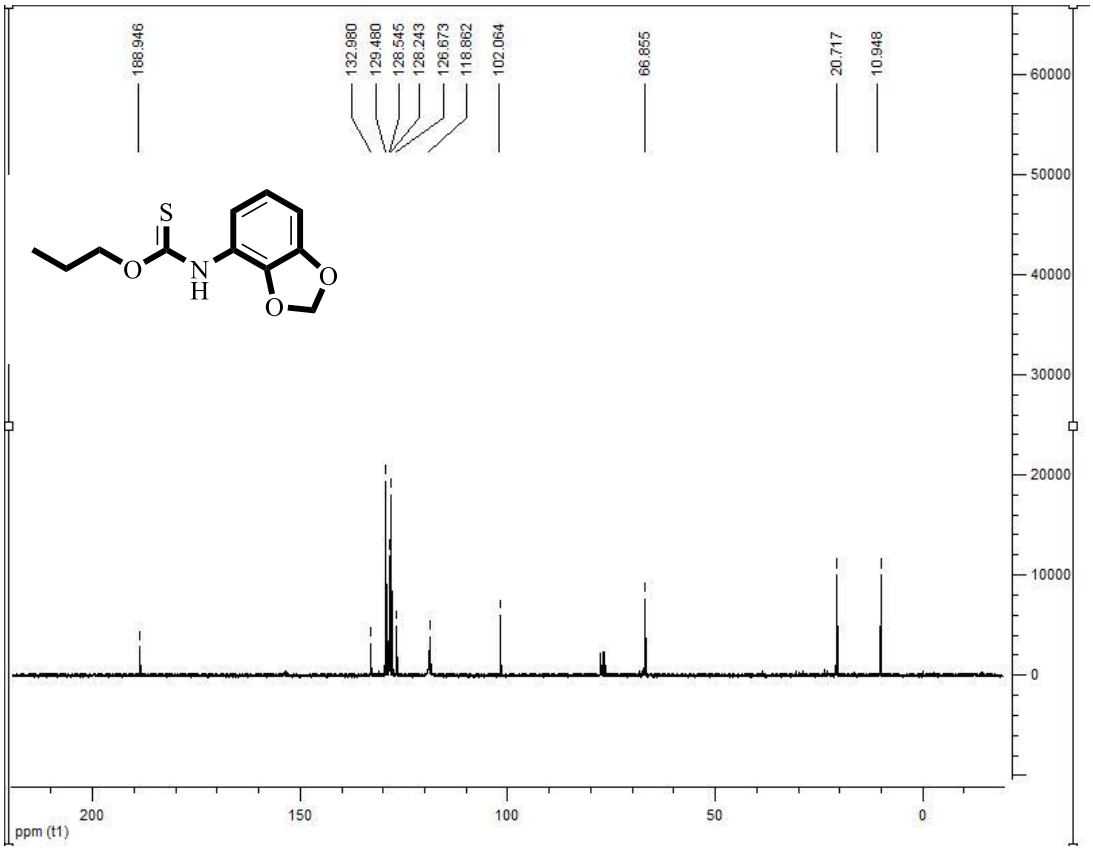
^{1}H-NMR spectra (250 MHz) of propyl (naphthalene-1-yl)carbamate (**5u**) in $CDCl_3$.



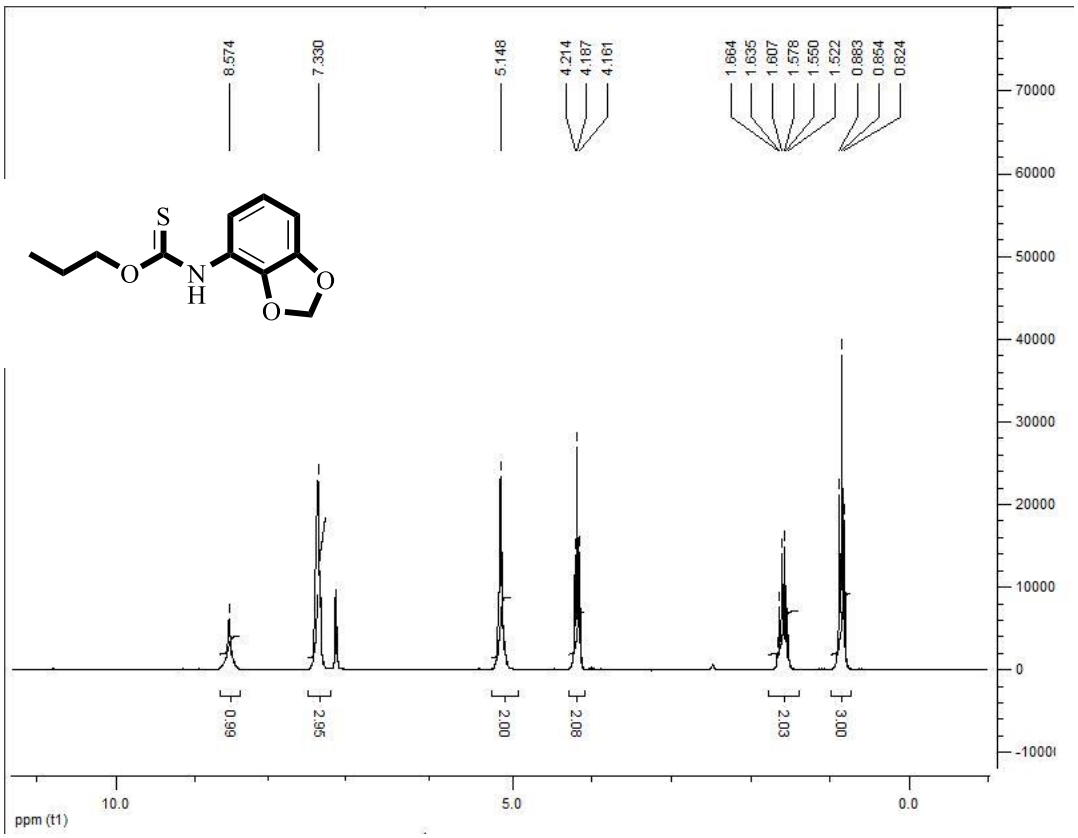
MS of propyl (naphthalene-1-yl)carbamate (**5u**).



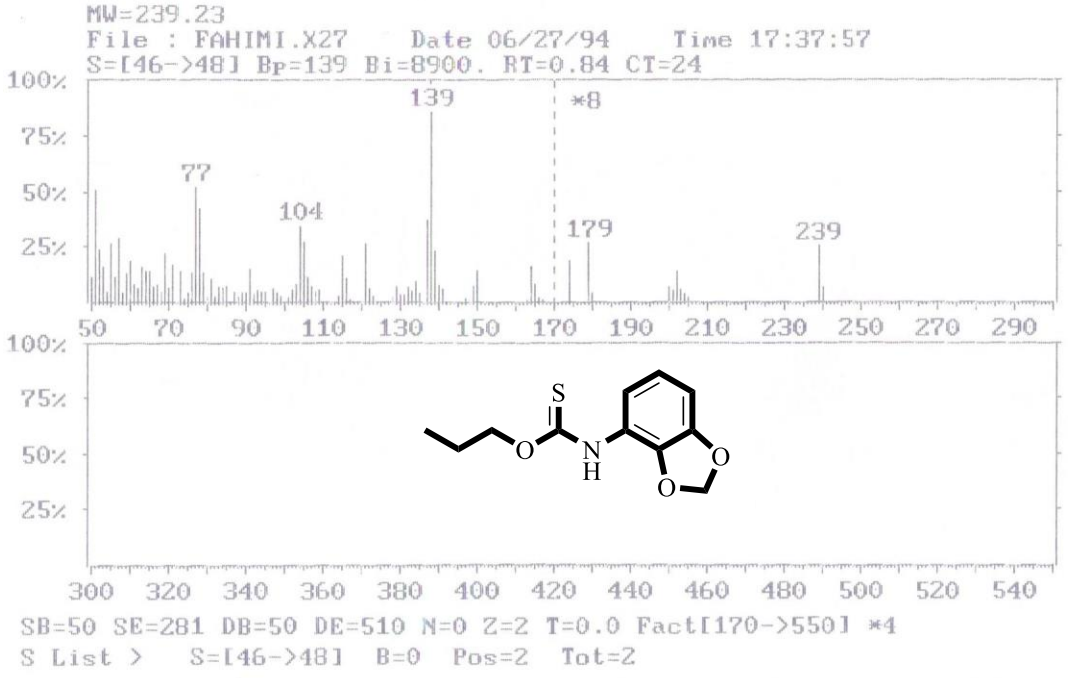
FT-IR spectra of o-propyl (benzo[*d*][1,3]dioxol-5-yl)thiocarbamate (**4v**) in KBr.



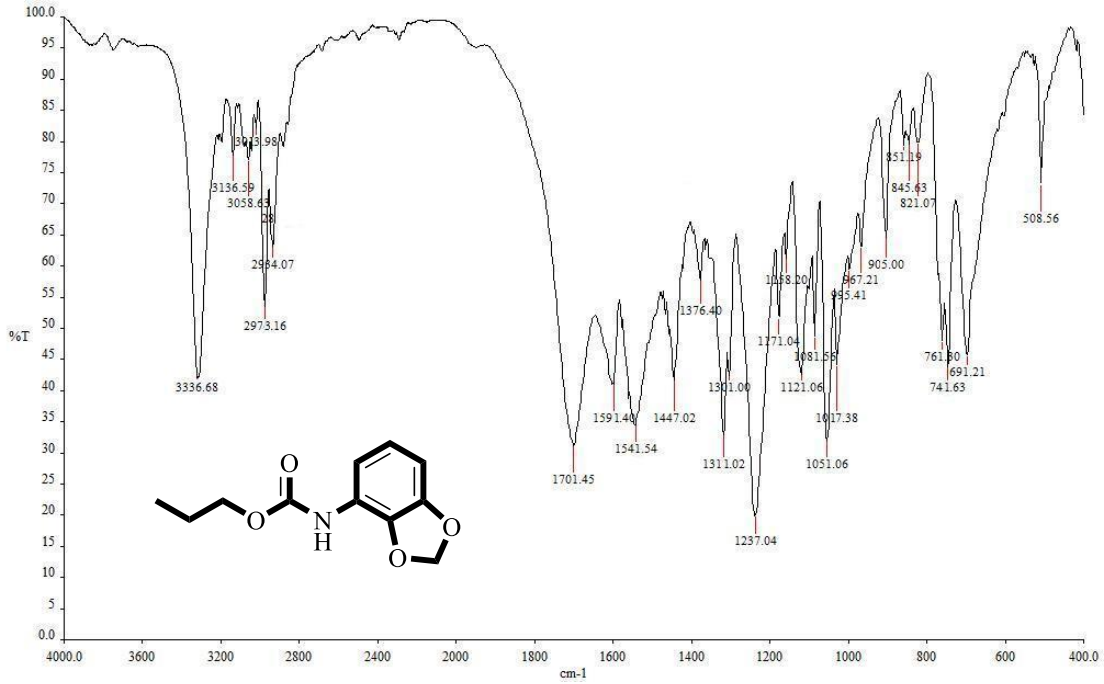
^{13}C-NMR spectra (63 MHz) of o-propyl (benzo[*d*][1,3]dioxol-5-yl)thiocarbamate (**4v**) in $CDCl_3$.



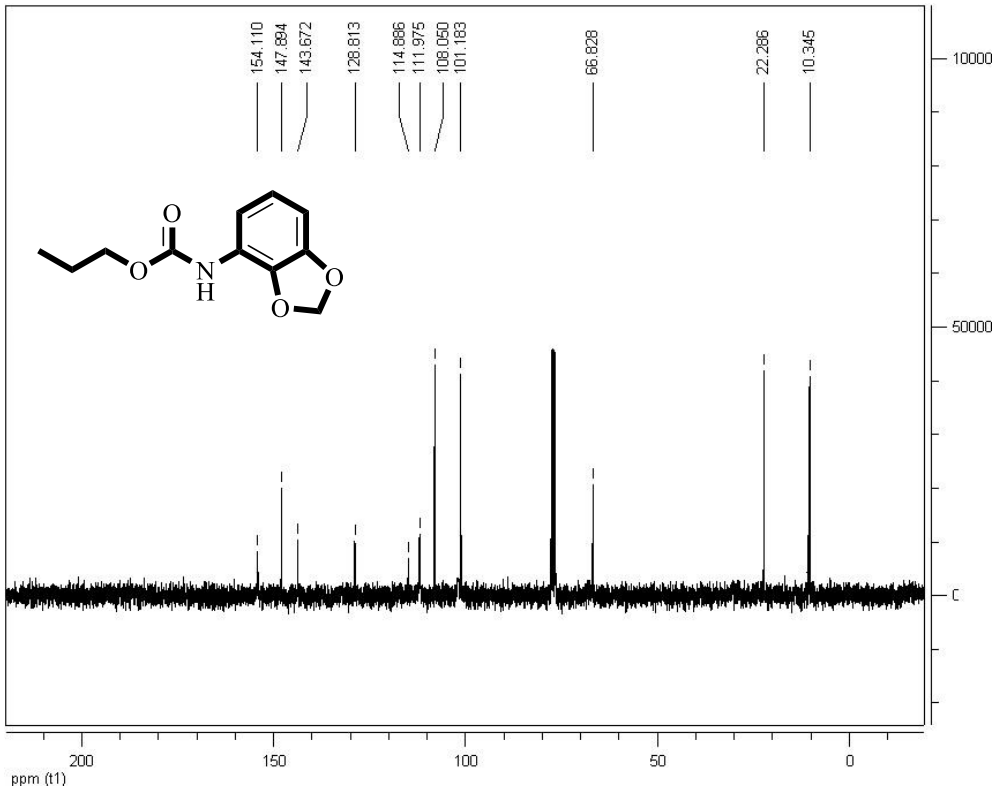
^{1}H-NMR spectra (250 MHz) of o-propyl (benzo[*d*][1,3]dioxol-5-yl)thiocarbamate (**4v**) in $CDCl_3$.



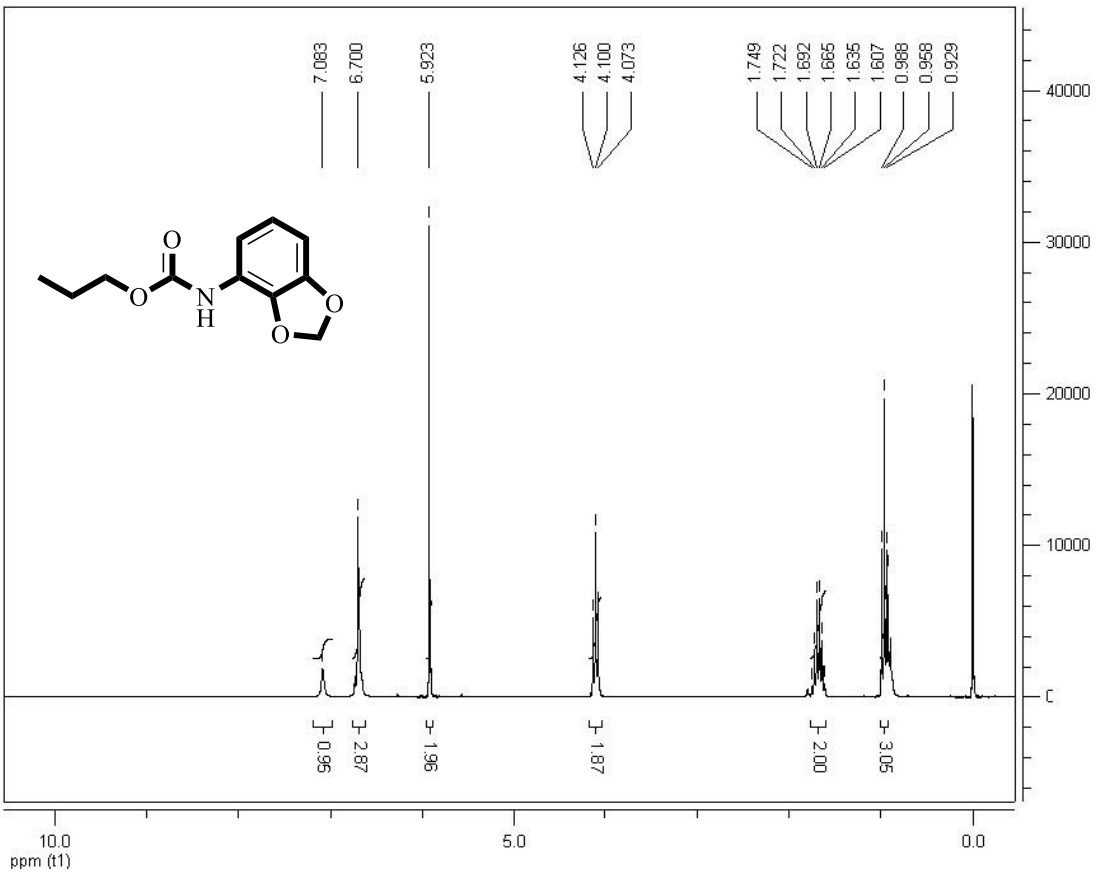
MS of o-propyl (benzo[*d*][1,3]dioxol-5-yl)thiocarbamate (**4v**).



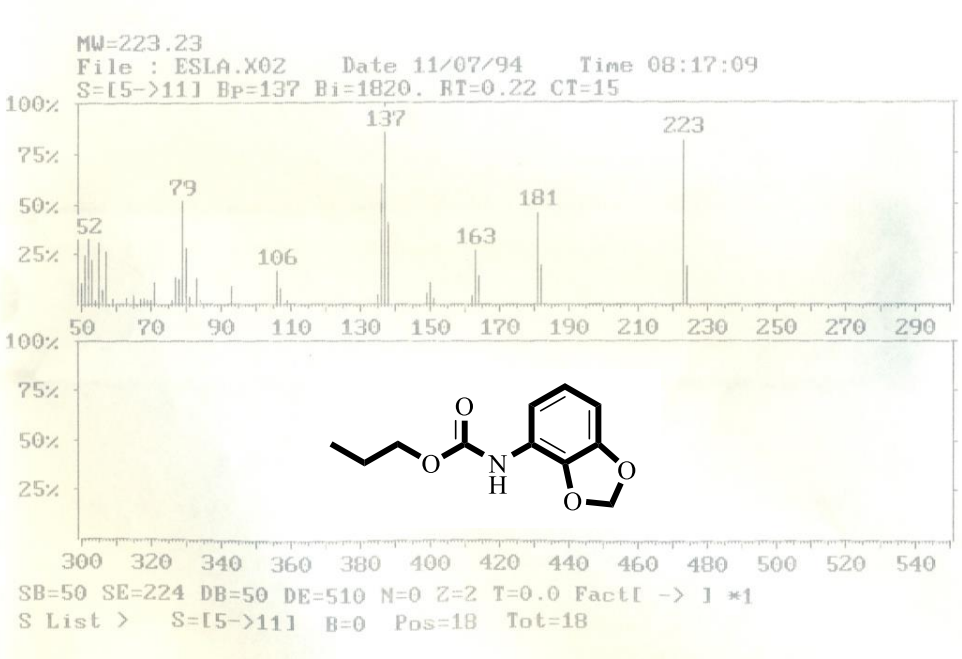
FT-IR spectra of propyl (benzo[*d*][1,3]dioxol-5-yl)carbamate (**5v**) in KBr.



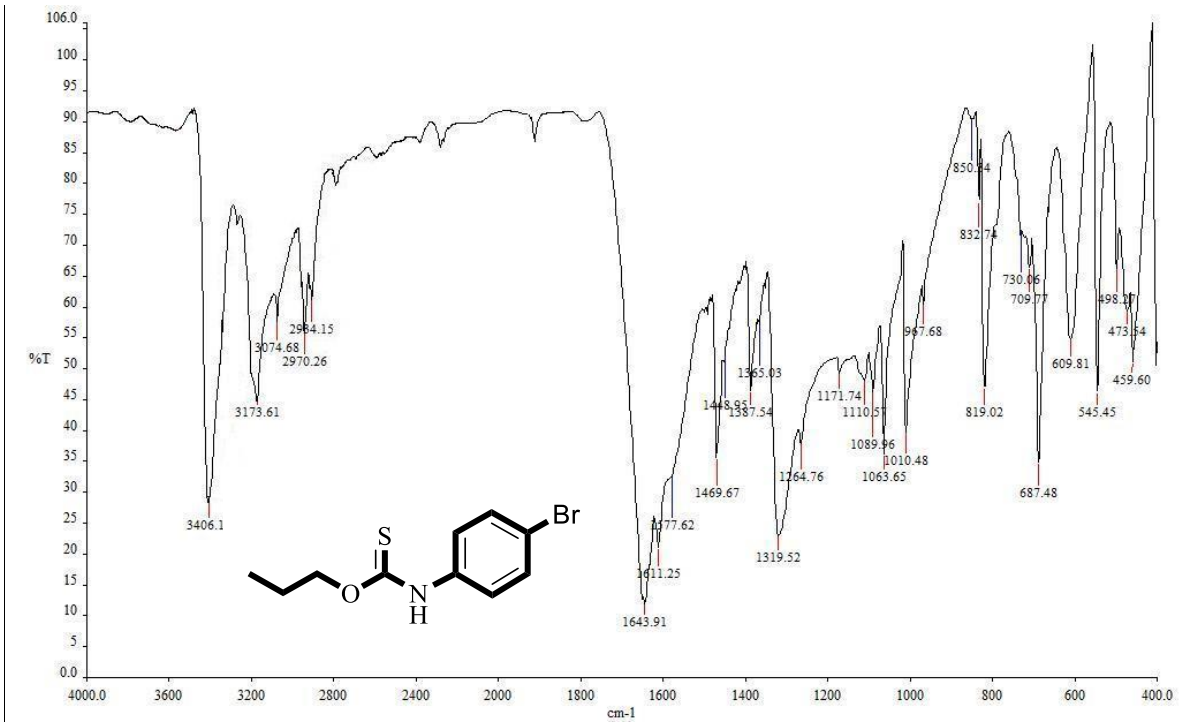
^{13}C-NMR spectra (63 MHz) of propyl (benzo[*d*][1,3]dioxol-5-yl)carbamate (**5v**) in $CDCl_3$.



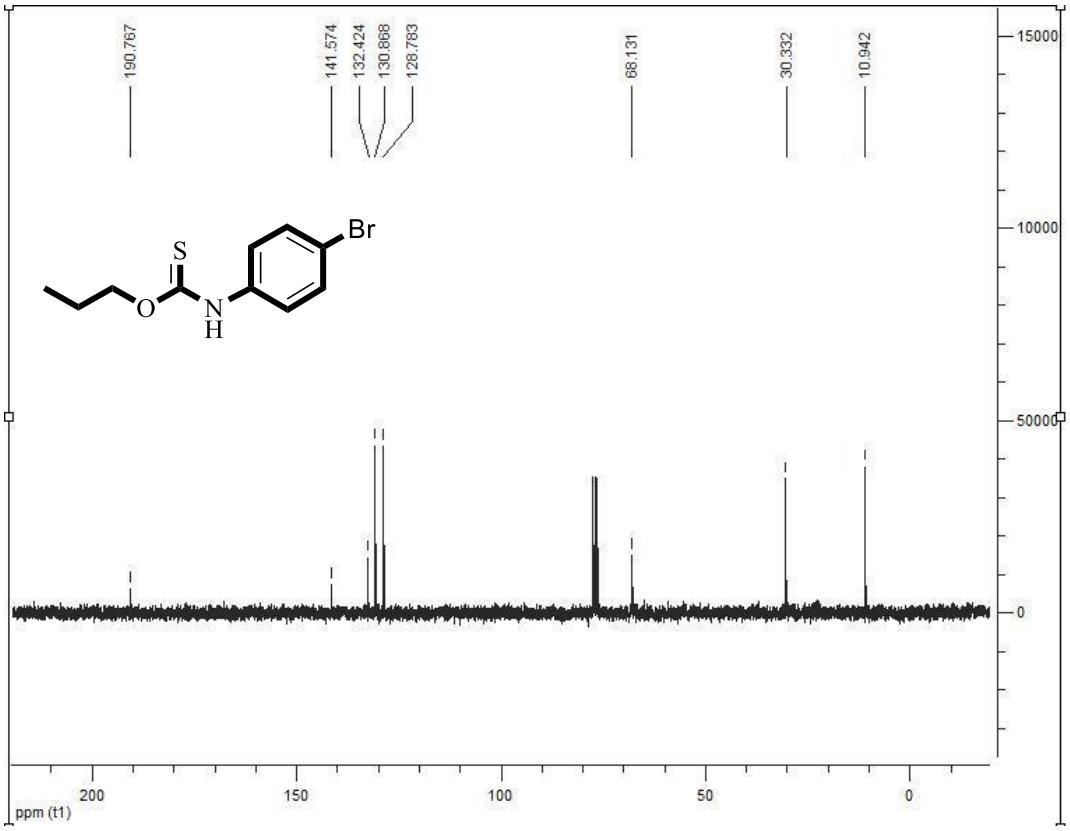
^{1}H-NMR spectra (250 MHz) of propyl (benzo[*d*][1,3]dioxol-5-yl)carbamate (**5v**) in $CDCl_3$.



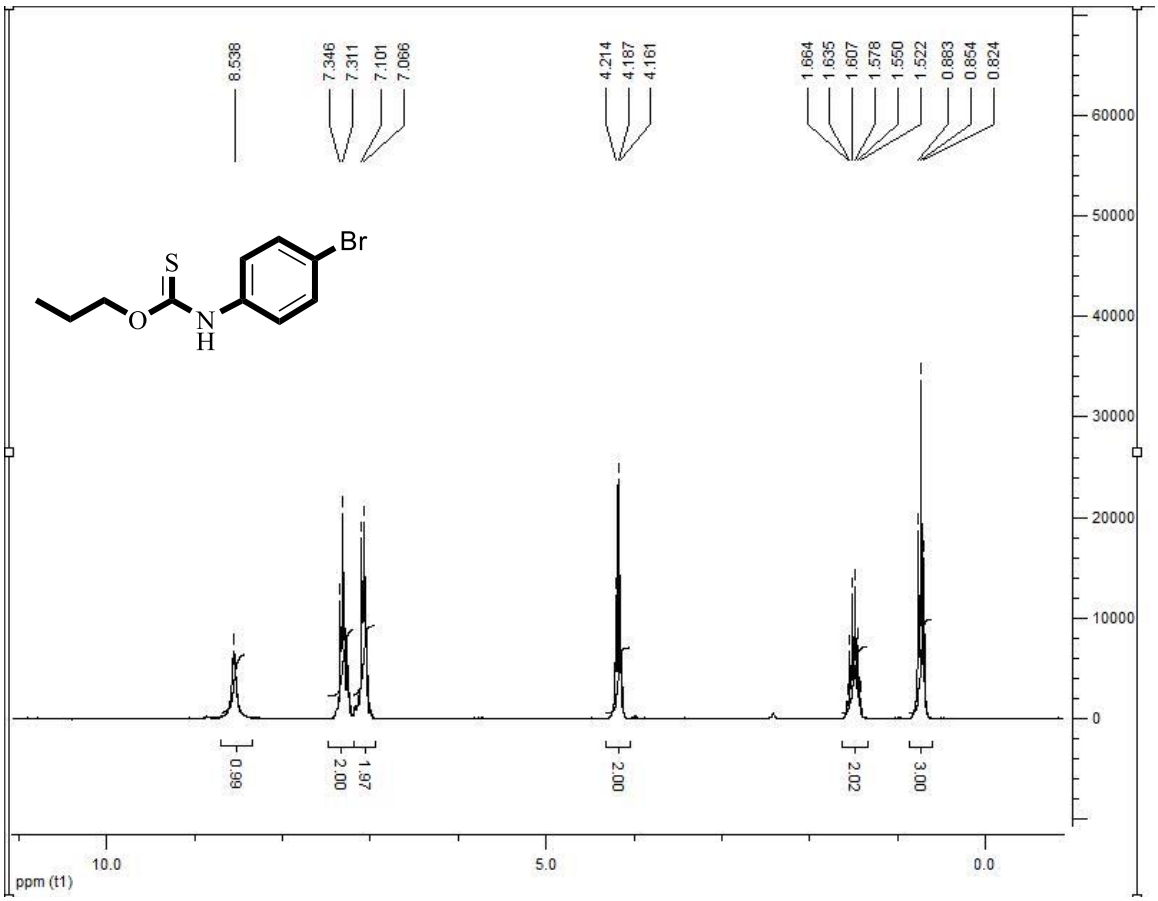
MS of propyl (benzo[*d*][1,3]dioxol-5-yl)carbamate (**5v**).



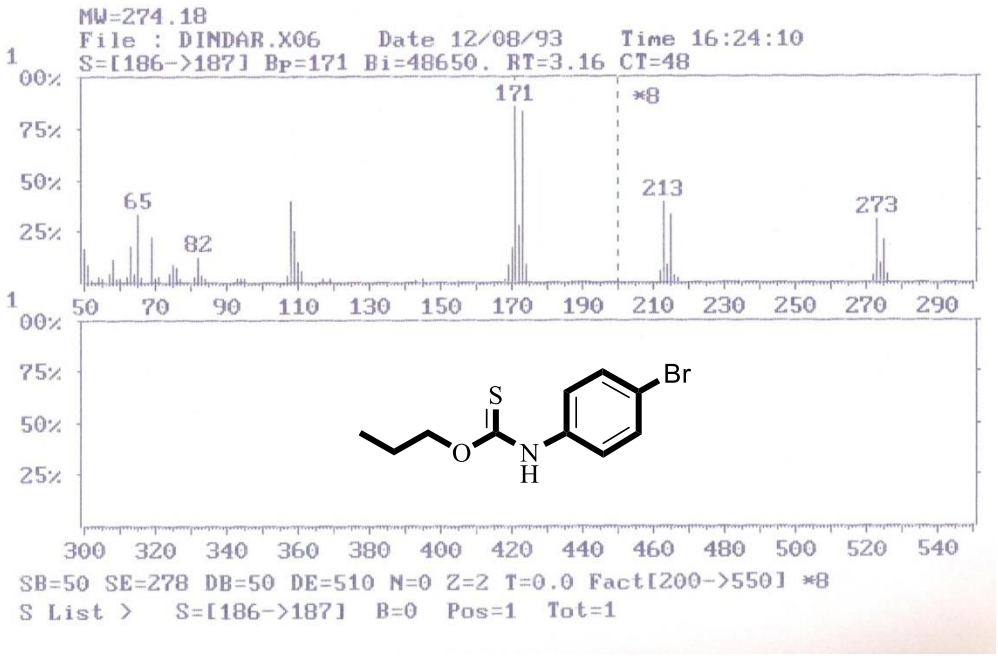
FT-IR spectra of o-propyl (4-bromophenyl)thiocarbamate (**4w**) in KBr.



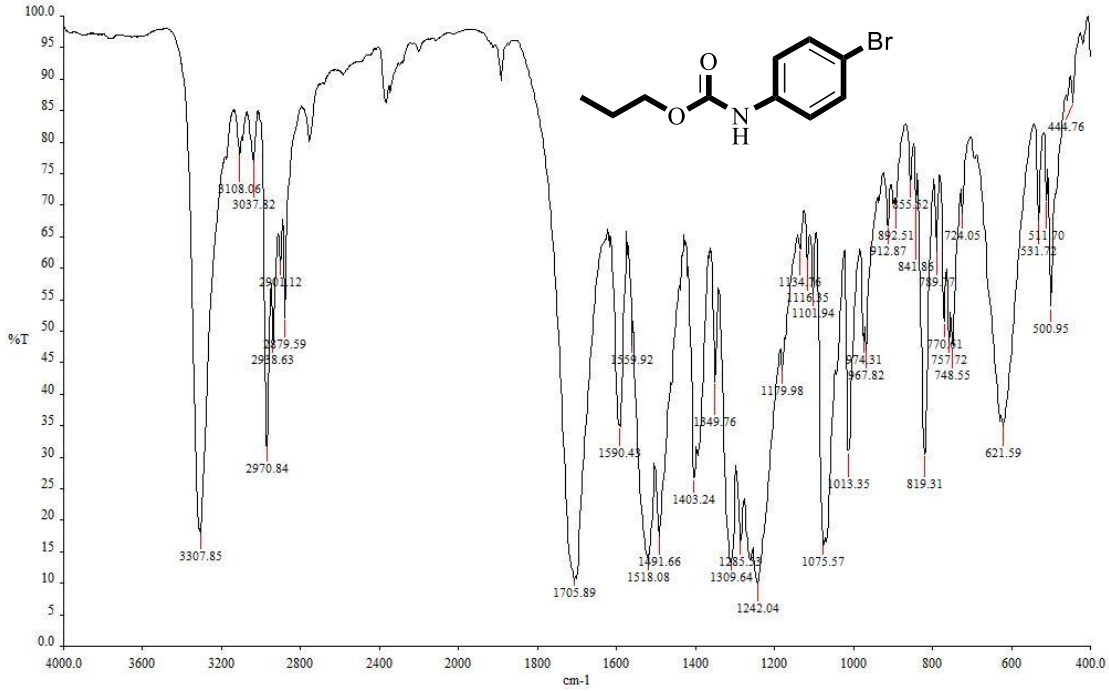
^{13}C-NMR spectra (63 MHz) of o-propyl (4-bromophenyl)thiocarbamate (**4w**) in $CDCl_3$.



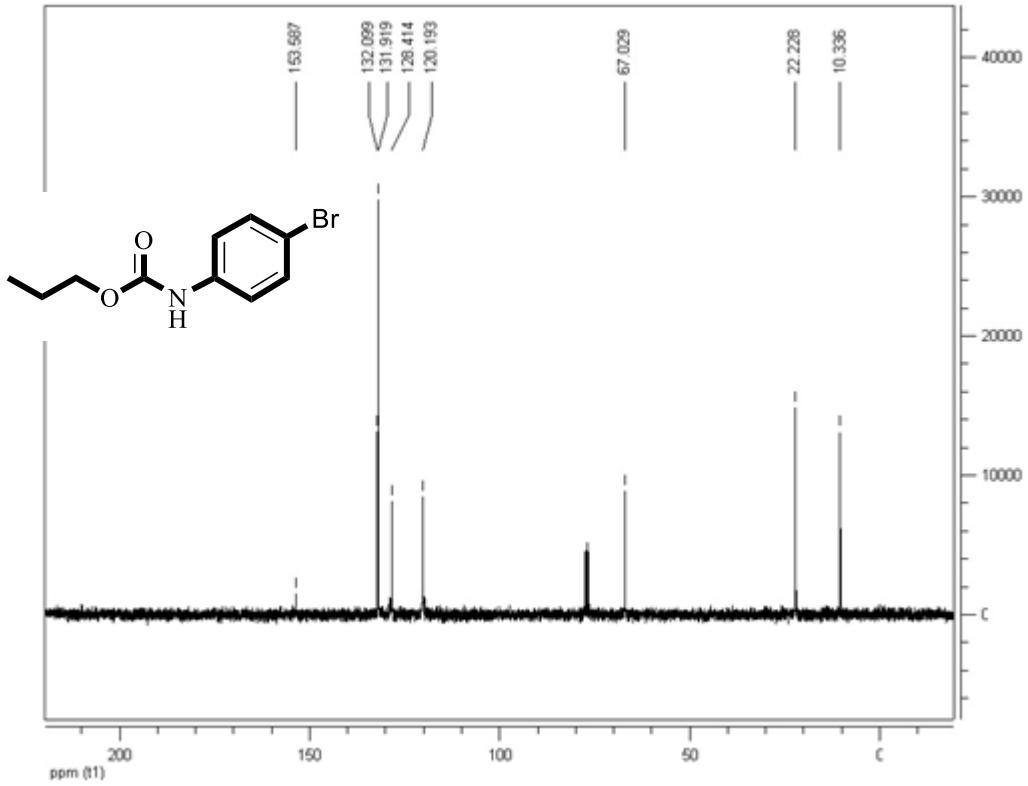
^{1}H-NMR spectra (250 MHz) of o-propyl (4-bromophenyl)thiocarbamate (**4w**) in $CDCl_3$.



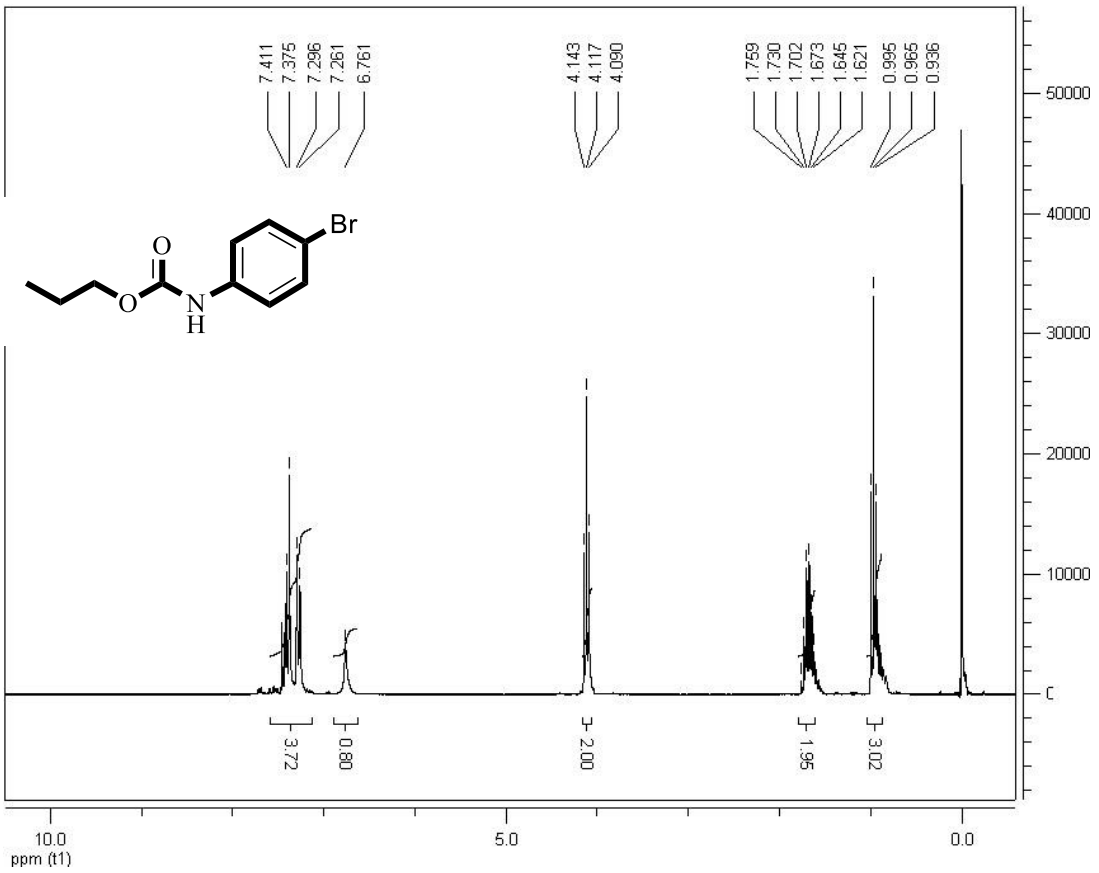
MS of o-propyl (4-bromophenyl)thiocarbamate (**4w**).



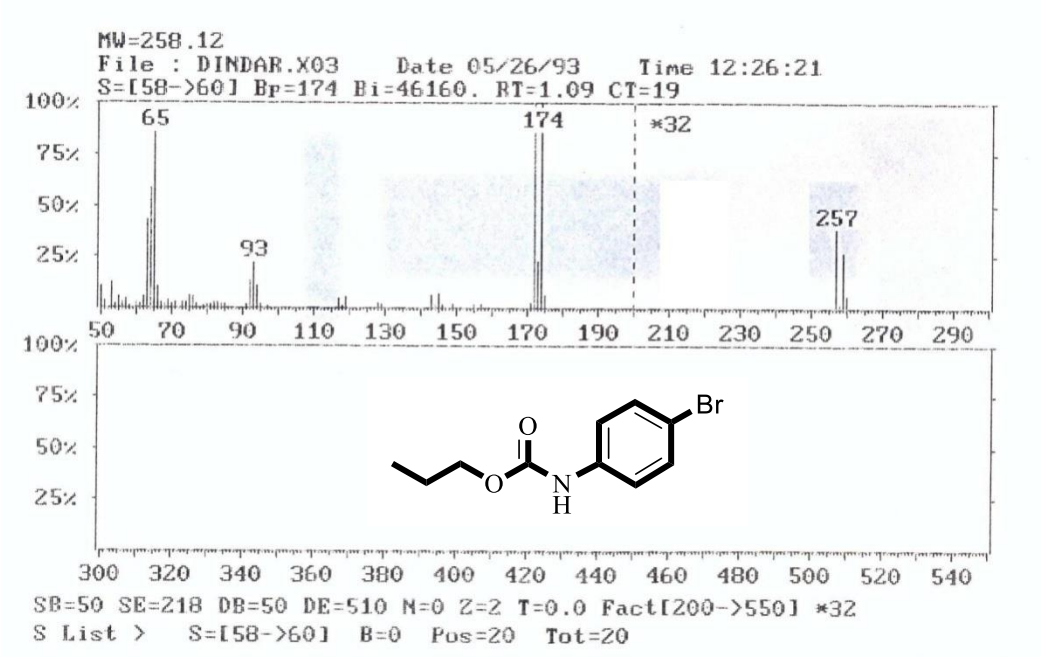
FT-IR spectra of propyl (4-bromophenyl)carbamate (**5w**) in KBr.



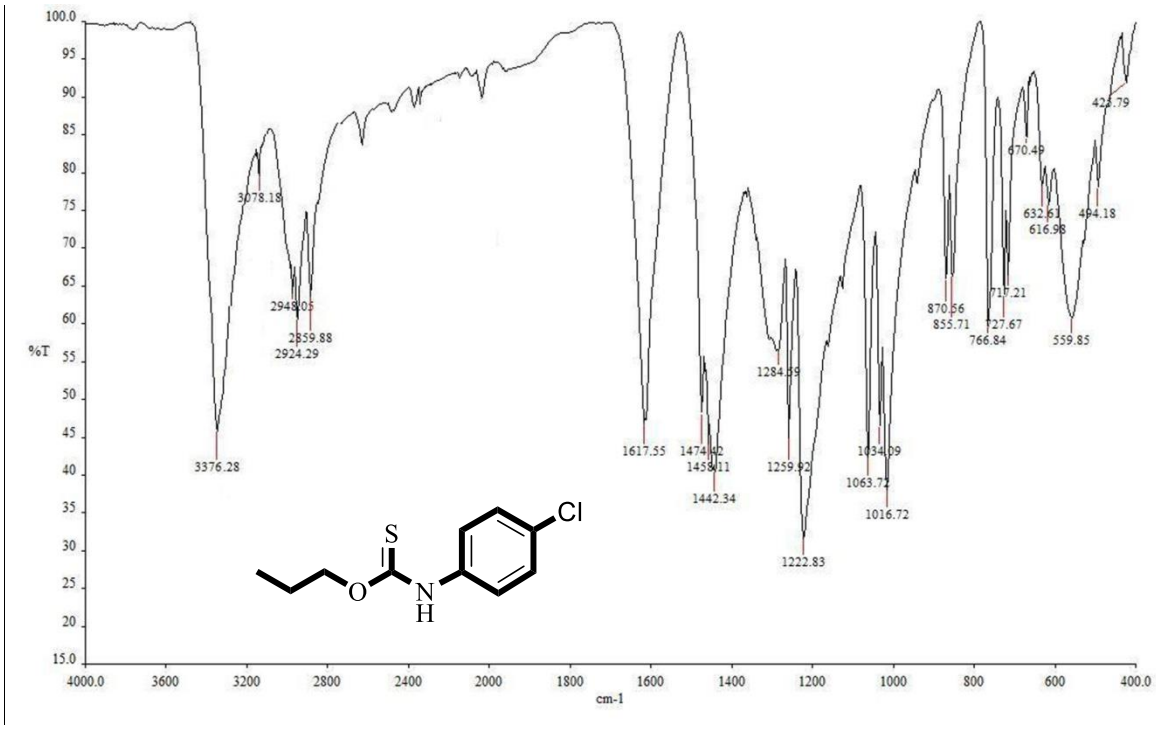
^{13}C-NMR spectra (63 MHz) of propyl (4-bromophenyl)carbamate (**5w**) in $CDCl_3$.



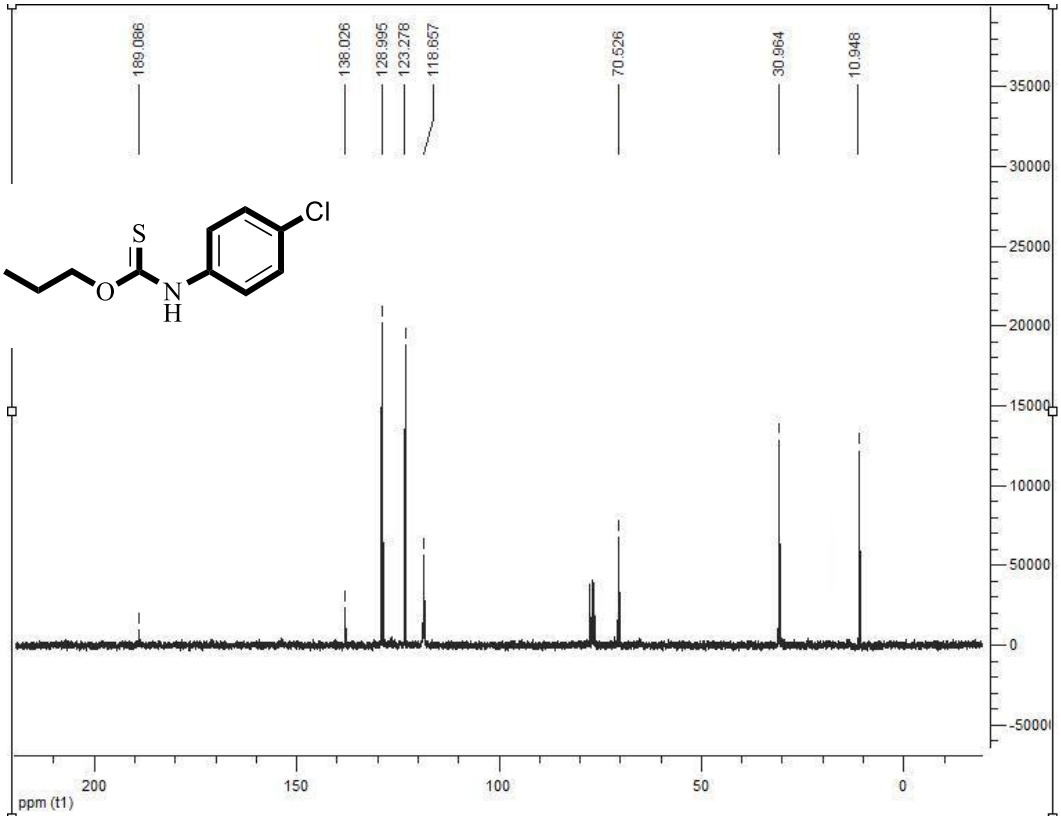
^{1}H-NMR spectra (250 MHz) of propyl (4-bromophenyl)carbamate (**5w**) in $CDCl_3$.



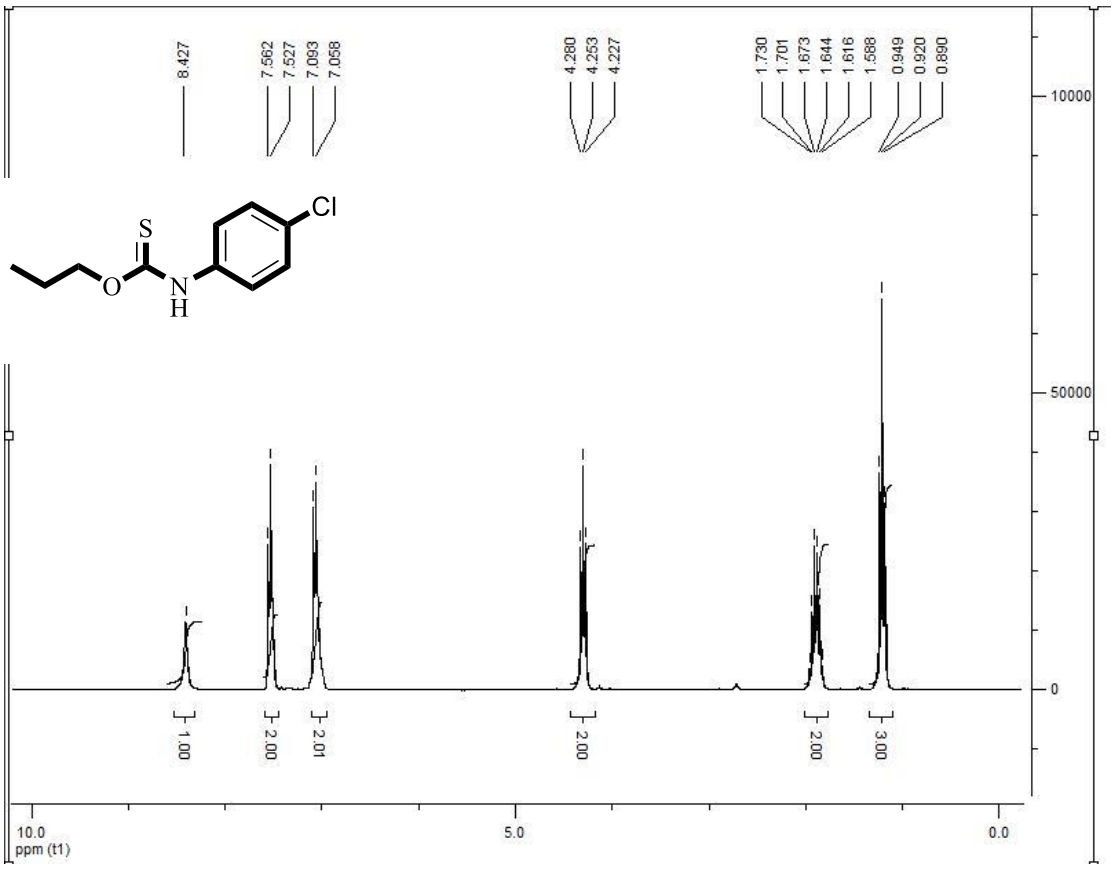
MS of propyl (4-bromophenyl)carbamate (**5w**).



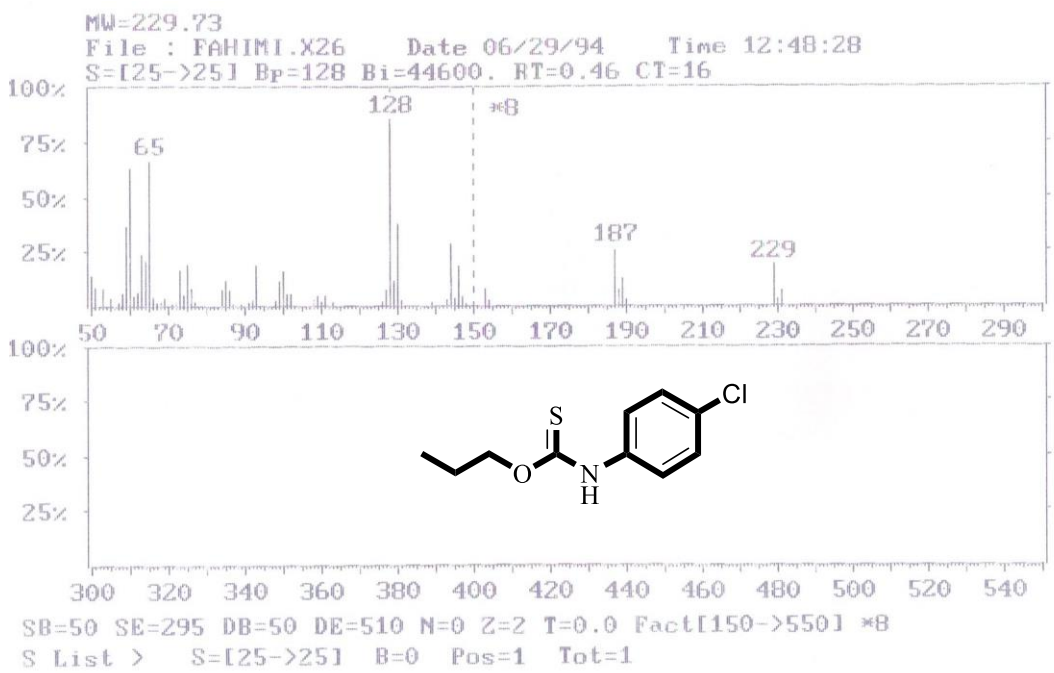
FT-IR spectra of o-propyl (4-chlorophenyl)thiocarbamate (**4x**) in KBr.



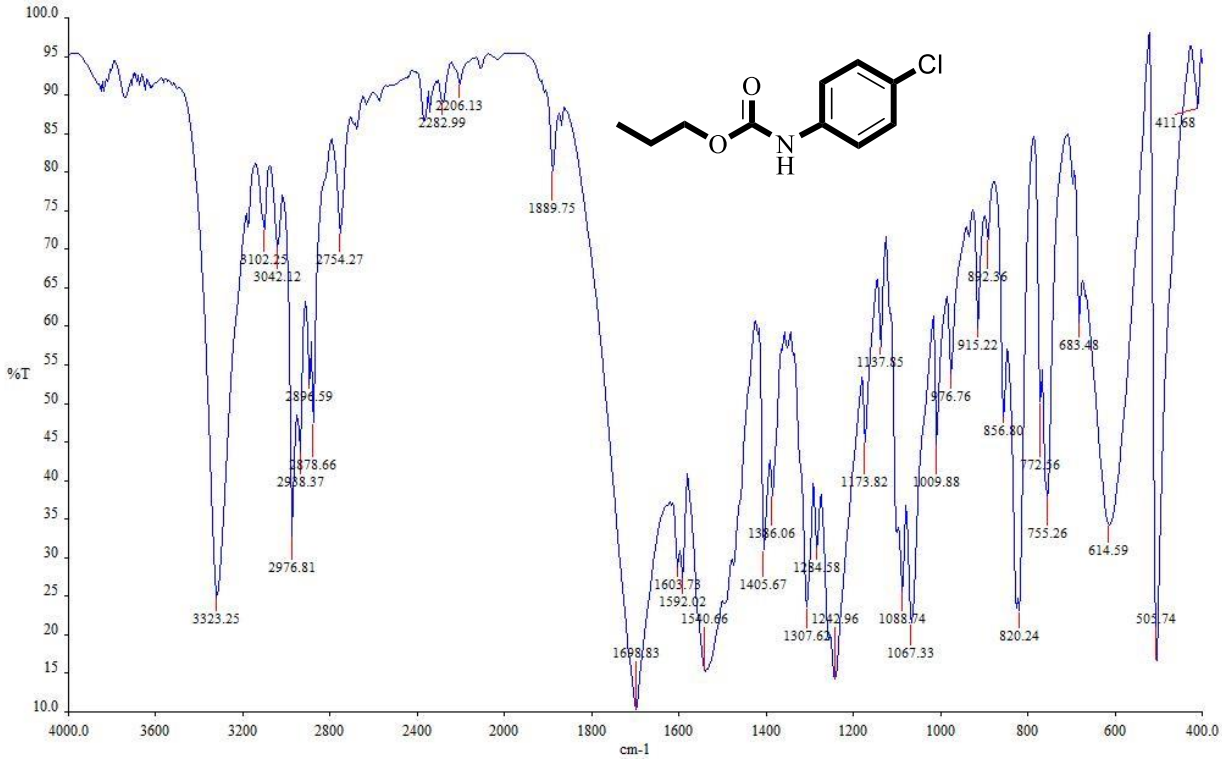
^{13}C-NMR spectra (63 MHz) of o-propyl (4-chlorophenyl)thiocarbamate (**4x**) in $CDCl_3$.



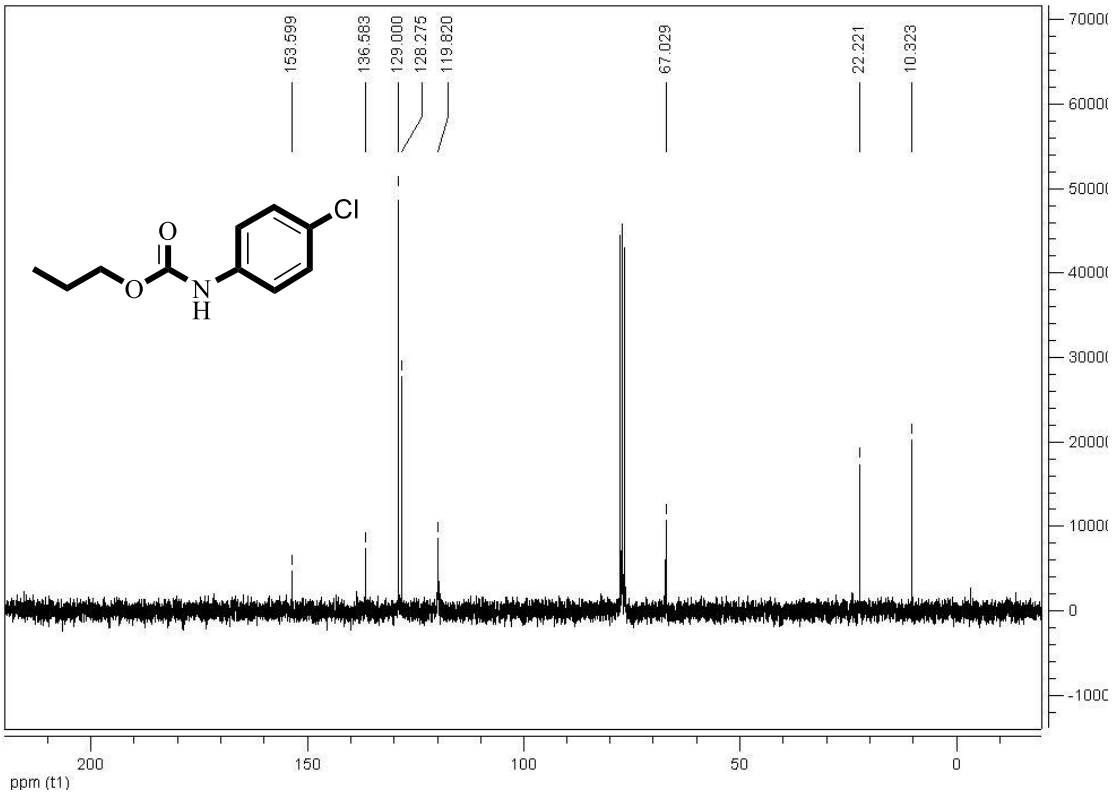
^{1}H-NMR spectra (250 MHz) of o-propyl (4-chlorophenyl)thiocarbamate (**4x**) in $CDCl_3$.



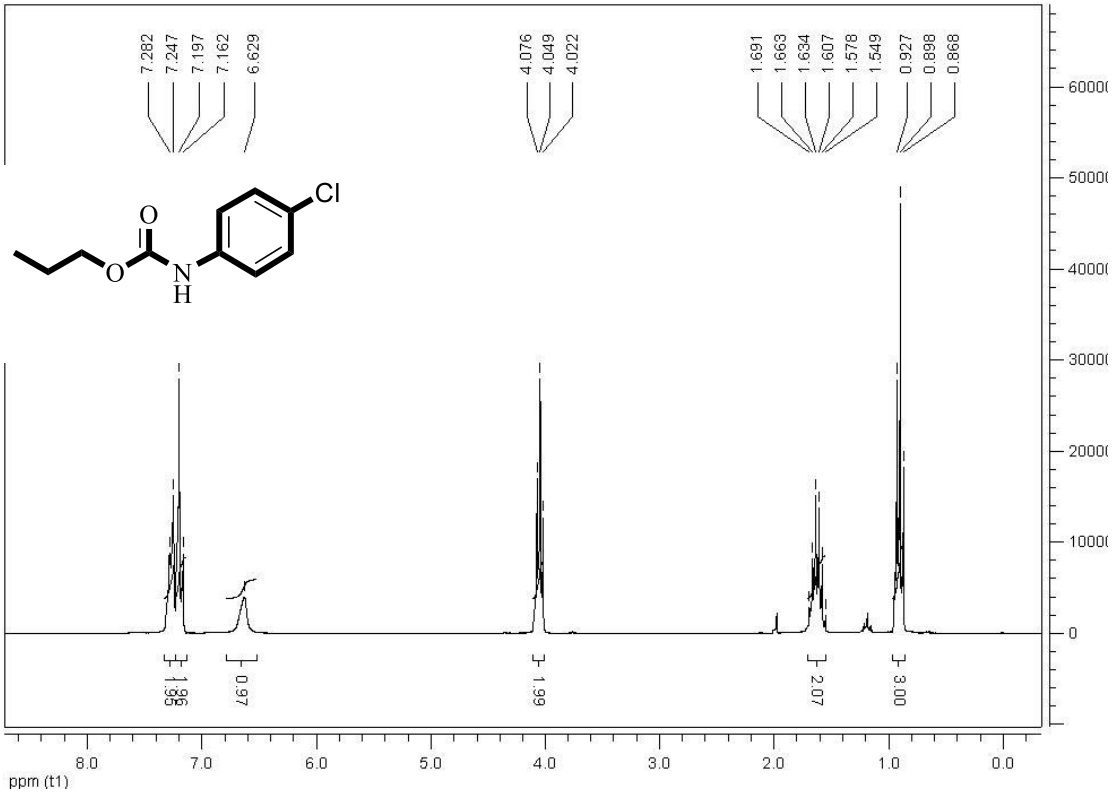
MS of o-propyl (4-chlorophenyl)thiocarbamate (**4x**).



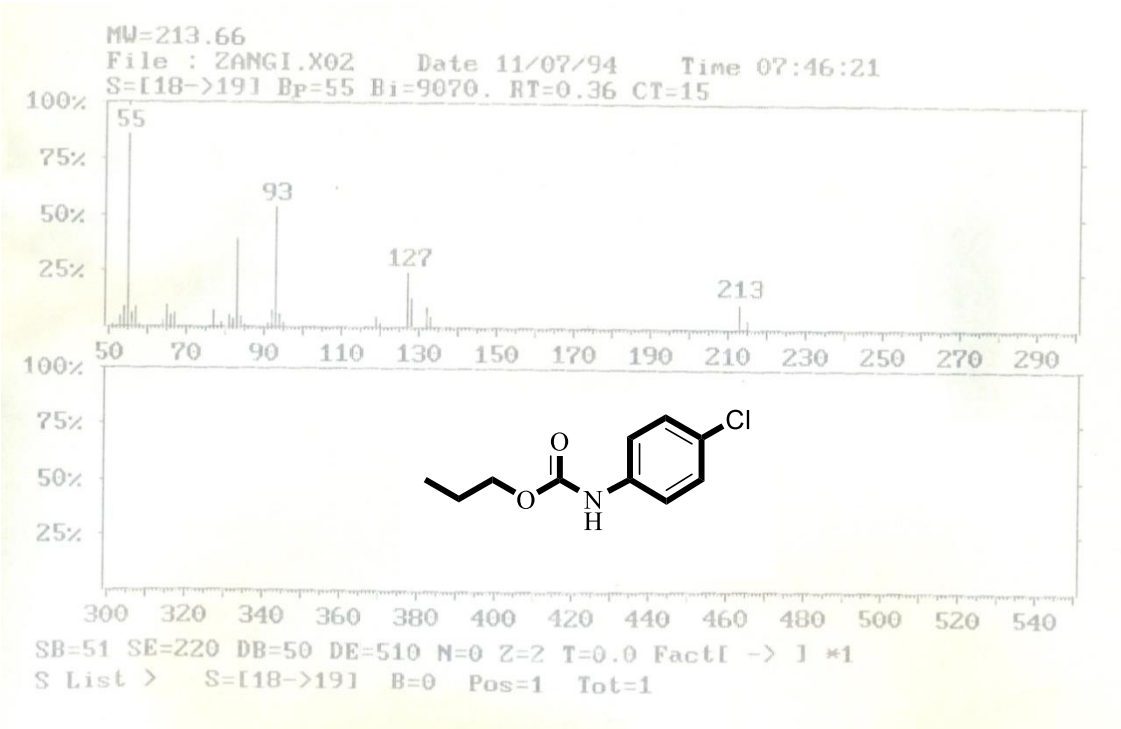
FT-IR spectra of propyl (4-chlorophenyl)carbamate (**5x**) in KBr.



^{13}C-NMR spectra (63 MHz) of propyl (4-chlorophenyl)carbamate (**5x**) in $CDCl_3$.



^{1}H-NMR spectra (250 MHz) of propyl (4-chlorophenyl)carbamate (**5x**) in $CDCl_3$.



MS of propyl (4-chlorophenyl)carbamate (**5x**).