Ring-selective functionalisation of *N,N'*-diarylureas by regioselective *N*-alkylation and directed *ortho*-metallation

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SUPPLEMENTARY INFORMATION

General Procedure A - *Preparation of Ureas **7***

The aniline **6** (1 equiv.) was added to a solution of isocyanate (1 equiv.) in anhydrous CH_2Cl_2 in one portion. The solution was stirred for 18 hours at room temperature under a nitrogen atmosphere. The precipitate was filtered, washed with cold CH_2Cl_2 and dried under reduced pressure. Further purification was unnecessary.
(a modification of the method of Beaver, D. J.; Roman, D. P.; Stoffel, P. J. *J. Org. Chem.* 1959, 24, 1676)

General Procedure B – *Methylation of Ureas **7***

A solution of the urea (1 equiv.) in THF was slowly added to a suspension of NaH (60% in mineral oil, 1.2 equiv.) in anhydrous THF under an atmosphere of nitrogen. The reaction mixture was stirred for 15 minutes. Methyl iodide (1.5 equiv.) was added and the solution was stirred for a further 18 hours. Water was added and the mixture was extracted with diethyl ether. The combined ethereal layers were dried over $MgSO_4$, filtered and concentrated under reduced pressure to give a residue further purified by flash chromatography on silica.

General Procedure C – *Lithiation of Ureas **11***

sec-Butyllithium (2.5 equiv of 1.3 M solution in cyclohexane) was added to a stirred solution of the urea **11** in dry THF under nitrogen at –78 ℃. After 30 minutes the electrophile was added to the yellow solution. The reaction was stirred for a further 2

hours and then allowed to warm slowly to room temperature. Saturated ammonium chloride solution was added and the organic phase separated. The aqueous layer was extracted with diethyl ether and the combined organic layers were dried over $MgSO_4$, filtered and evaporated under reduced pressure to give a residue which was purified by flash chromatography on silica.

1-(2-Fluorophenyl)-3-phenylurea **7a**.[1] —Phenyl isocyanate (5.36 g, 4.92 ml, 45.0 mmol) was dissolved in DCM (100 ml) at room temperature and 2-fluoroaniline **6a** (5.00 g, 4.34 ml, 1 eq) was added. After 1 h a white solid began to settle out. After stirring for 1 d, the white precipitate was filtered and washed with cold CH_2Cl_2 (250 ml). Drying under high vacuum gave 8.59 g (37.3 mmol, 82.9 %) of the desired product. ^{1}H NMR (300 MHz, DMSO): δ = 9.09 (s, 1 H, N-H_F), 8.57 (s, 1 H, N-H), 8.19 (dt, ^{3}J=8.3 Hz, ^{4}J= 1.6 Hz, 1 H, H_5), 7.48 (d, ^{3}J=7.5 Hz, 2 H, $H_{11,}$ H_{15}), 7.32 (t, ^{3}J= 7.6 Hz, 2 H, H_{12}, H_{14}), 7.24 (m_c, 1 H, H_4?), 7.16 (t, ^{3}J= 7.7 Hz, 1 H, H_{13}), 7.02 (m_c, 2 H, H_3, H_5). ^{13}C NMR (75 MHz, DMSO): δ = 115.7 (d, 19.0 Hz), 118.81 (C_{11}, C_{15}), 121.20, 122.78, 123.1 (d, 7.5 Hz), 125.21, 125.26, 128.3 (d, 10.3 Hz), 129.6 (C_{12}, C_{14}), (N-Ar), (N-ArF), (C-F), (C=O): 140.16, 152.90, 154.28, 151.09.

1-(2-Chlorophenyl)-3-phenylurea **7b**.[1] —Phenyl isocyanate (3.20 g, 2.94 ml, 26.9 mmol) was dissolved in DCM (100 ml) at room temperature and 2-chloroaniline **6b** (3.43 g, 2.83 ml, 1 eq) was added in one portion. After 3 h a white solid settled out. The precipitate was filtered and washed with cold CH_2Cl_2 (200 ml). Drying under high vacuum afforded 4.70 g (19.0 mmol, 70.9 %). ^{1}H NMR (300 MHz, DMSO): δ = 7.03 (m_c, 2 H, Ar-H), 7.32 (m_c, 3 H, Ar-H), 7.49 (m_c, 3 H, Ar-H), 8.20 (dd, ^{3}J=8.3 Hz, ^{4}J=1.6 Hz, 1 H, H_6), 8.34 (s, 1 H, N-H), 9.44 (s, 1 H, N-H_{Cl}) . ^{13}C NMR (75 MHz, DMSO): δ = 118.91 (C_{11}, C_{15}), 121.99 (C_6), 122.60 (Cl-Ar), 122.84 (C_{13}), 123.96 (C_4), 128.29 (C_5), 129.62 (C_{12}, C_{14}), 129.92 (C_3), 136.72 (N-ArCl), 140.18 (N-Ar), 152.85 (C=O).

1-(2-Bromophenyl)-3-phenylurea **7c**.[1] —Phenyl isocyanate (2.08 g, 1.91 ml, 17.4 mmol) was dissolved in DCM (100 ml) at room temperature and 2-bromoaniline **6c** (3.00 g, 1 eq) was added in one portion. After stirring for 4 days the reaction mixture was filtered and a white solid isolated. Washing with cold CH_2Cl_2 (200 ml) and

drying under high vacuum afforded 3.56 g (12.2 mmol, 70.3 %). ^{1}H NMR (300 MHz, DMSO): δ = 7.00 (m_c, 2 H, H_3, H_{13}), 7.34 (m_c, 3 H, H_5, H_{12}, H_{14}), 7.50 (m_c, 2 H, H_{11}, H_{15}), 7.63 (dd, ^{3}J=8.0 Hz, ^{4}J=1.5 Hz , 1 H, H_3), 8.10 (dd, ^{3}J=8.3 Hz, ^{4}J=1.6 Hz , 1 H, H_6), 8.16 (s, 1 H, N-H), 9.48 (s, 1 H, N-H_{Br}). ^{13}C NMR (75 MHz, DMSO): δ = 113.72 (C-Br), 118.92 (C_{11}, C_{15}), 122.83 (C_6), 122.92 (C_{13}), 124, 75 (C_4), 128.79 (C_5), 129.61 (C_{12}, C_{14}), 133.20 (C_3), 137.81 (N-Ar), 140.21 (N-Ar_{Br}), 152.89 (C=O).

1-(2-Iodophenyl)-3-phenylurea **7d**.[1] —2-Iodoaniline **6d** (1.63 g, 1.50 ml, 13.7 mmol) was added in one portion to a solution of phenyl isocyanate in CH_2Cl_2 (100 ml). After 72 h a brownish precipitate had been formed. The settlings were filtered and washed with cold CH_2Cl_2 (200 ml). Drying under high vacuum afforded 3.76g (11.1 mmol, 81.2 %) of the wished product as a white brownish solid. ^{1}H NMR (300 MHz, DMSO): δ = 6.86 (t, ^{3}J=7.4 Hz ,1 H, H_4), 7.00 (t, ^{3}J=7.3 Hz ,1 H, H_{13}), 7.34 (m_c, 3 H, H_5, H_{12}, H_{14}); H_3, H_6, (H_{11}, H_{15}): 7.50 (d, ^{3}J= 7.9 Hz, 2 H), 7.86 (d, ^{3}J= 8.0 Hz, 2 H); 7.91 (s, 1 H, N-H), 9.45 (s, 1 H, N-H_I). ^{13}C NMR (75 MHz, DMSO): δ = 92.08 (C-I), 118.90 (C_{11}, C_{15}), (C_6), (C_{13}): 122.73, 123.80, 125.77 (C_4), 129.30 (C_5), 129.59 (C_{12}, C_{14}), 139.66 (C_3), (Ar-N), (Ar-N_I): 140.34, 140.57; 153.10 (C=O).

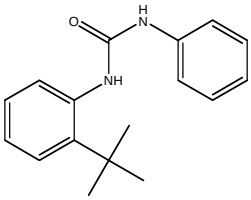
1-(2-Methylphenyl)-3-phenylurea **7e**.[2] —Phenyl isocyanate (3.20 g, 2.94 ml, 26.9 mmol) was dissolved in DCM (100 ml) at room temperature and *o*-toluidine **6e** (2.88 g, 2.91 ml, 1 eq) was added in one portion. After 5 min. a white solid began to settle out. After stirring for 12 h, the white precipitate was filtered and washed with cold CH_2Cl_2 (250 ml). Drying under high vacuum afforded 5.81 g (25.7 mmol, 95.5 %) of the desired product as a white solid. ^{1}H NMR (300 MHz, DMSO): δ = 2.27 (s, 3 H, CH_3); (H_4), (H_{13}), (H_3, H_5): 6.97 (m_c, 2 H), 7.17 (m_c, 2 H); 7.31 (m_c, 2 H, H_{12}, H_{14}), 7.50 (d, ^{3}J= 7.5 Hz ,2 H, H_{11}, H_{15}), 7.88 (d, ^{3}J= 8.1 Hz, 1 H, H_6); (N-H_{Me}), (N-H): 7.94 (s, 1 H), 9.04 (s, 1 H). ^{13}C NMR (75 MHz, DMSO): δ = 18.63 (CH_3), 118.71 (C_{11}, C_{15}), 121.72 (C_6), (C_{13}) (C_4): 122.41, 123.36; 126.88 (C_5), 128.17 (C-Me), 129.55 (C_{12}, C_{14}), 130.90 (C_3); (C-N), (C-N_{Me}): 138.14, 140.62; 153.38 (C=O).

1-(2-Ethylphenyl)-3-phenylurea **7f**.[2] —Phenyl isocyanate (3.20 g, 2.94 ml, 26.9 mmol) was dissolved in DCM (100 ml) at room temperature and 2-ethylaniline **6f** (3.26 g, 3.33 ml, 1 eq) was added in one portion. After stirring for 18 h, the white

precipitate was filtered and washed with cold CH_2Cl_2 (250 ml). Drying under high vacuum afforded 6.09 g (25.5 mmol, 94.3 %) of the desired product as a white solid. ^{1}H NMR (300 MHz, DMSO): δ = 1.20 (t, ^{3}J=7.5 Hz , 3 H, CH_3), 2.63 (q, ^{3}J=7.5 Hz, 2 H, CH_2); (H_{13}), (H_4),(H_3, H_5): 7.0 (m_c, 2 H), 7.18 (m_c, 2 H); 7.30 (m_c, 2 H, H_{12}, H_{14}), 7.49 (m_c, 2 H, H_{11}, H_{15}), 7.82 (dd, ^{3}J= 7.9 Hz, ^{4}J=1.2 Hz, 1 H, H_6), (N-H),(N-H_{Et}): 7.92 (s, 1 H), 9.03 (s, 1 H). ^{13}C NMR (75 MHz, DMSO): δ = 15.02 (-CH_3), 24.52 (CH_2), 118.68 (C_{11}, C_{15}), 122.39 (C_6), 122.77 (C_4 or C_{13}), 123.88 (C_{13} or C_4), 126.77 (C_5), 129.13 (C_3), 129.55 (C_{12}, C_{14}), 134.45 (C-Et); (C-N), (C-N_{Et}): 137.25, 140.65; 153.58 (C=O).

1-(2-Isopropylphenyl)-3-phenylurea **7g**. —Phenyl isocyanate (2.50 g, 2.29 ml, 21.0 mmol) was dissolved in DCM (100 ml) at room temperature and 2-isopropyl aniline **6g** (2.84 g, 2.97 ml, 1 eq) was added in one portion. After stirring for 18 h, the white precipitate was filtered and washed with cold CH_2Cl_2 (200 ml). Drying under high vacuum afforded 3.48 g (13.7 mmol, 65.2 %) of the desired product as a white solid. ^{1}H NMR (300 MHz, DMSO): δ = 1.22 (d, ^{3}J=6.8 Hz, 6 H, 2×CH_3), 3.18 (sept, ^{3}J=6.8 Hz, 1 H, H_{iso}), 6.98 (m_c, 1 H, H_4), 7.13 (m_c, 2 H, H_{13}, H_5), 7.30 (m_c, 3 H, H_{12}, H_{14}, H_3), 7.49 (m_c, 2 H, H_{11}, H_{15}), 7.70 (dd, ^{3}J=7.9 Hz, ^{4}J=1.4 Hz, 1 H, H_6). ^{13}C NMR (75 MHz, DMSO): δ = 23.86 (2×isoCH_3), 27.53 (CH_{iso}), 118.66 (C_{11}, C_{15}), 122.33 (C_6), (C_4) (C_{13}): 124.27, 125.96; 126.45 (C_5), 129.53 (C_{12}, C_{14}), 136.23 (C_3); (Ar-N), (Ar-$N_{isoProp}$): 140.11, 140.73; 153.86 (C=O).

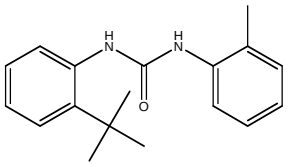
1-(2-tert-Butylphenyl)-3-phenylurea **7h**



By general procedure A, phenyl isocyanate (4.35 ml, 40 mmol, 1 equiv.) and 2-tert-butyl aniline **6h** (6.24 ml, 40 mmol, 1 equiv.) gave the product **7h** in 87% yield (9.329 g, 34.8 mmol) as a white powder; m.p. 208 ℃; R_f (1:3 EtOAc:Petrol) 0.33; ν_{max}(Nujol)/cm^{-1} 1637 (C=O); δ_H (300 MHz; DMSO) 1.40 (s, 9H, C(C*H*$_3$)), 3.40 (s, 3H, NC*H*$_3$), 6.96 (t, ^{3}*J*=7.3Hz, 1H, Ar-*H*), 7.14-7.33 (m, 5H, Ar-*H*), 7.40 (d,

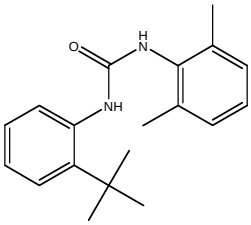
^3J=7.6Hz, 1H, Ar-*H*), 7.47 (d, ^3J=7.6Hz, 2H, Ar-*H*), 7.55 (s, 1H, N*H*), 9.04 (s, 1H, N*H*); δ_C (75MHz; DSMO) 31.2 (C(*C*H_3)$_3$), 35.3 (*C*(CH$_3$)$_3$), 118. 6, 122.2, 126.2, 126.8,126.9, 129.5, 130.9 (Ar*C*-H), 136.7, 141.0, 145.0, 154.2 (*C*=O); m/z (C.I.) 269 (100%, M + H$^+$); HRMS found: M$^+$, 269.1648. $C_{17}H_{20}N_2O$ requires 269.1643.

1-(2-tert-Butylphenyl)-3-o-tolylurea **7j**



General Procedure A was employed using *t*-butylphenyl isocyanate (0.30 ml, 1.7 mmol, 1 equiv) and *o*-toluidine (0.18 ml, 1.7mmol, 1 equiv) in 20 ml DCM to afford the desired product in 54% Yield (0.257g, 0.91 mmol) as a white powder; m.p. 206 ℃; R_f (1:3 EtOAc:Petrol) 0.19; ν_{max}($CHCl_3$)/cm^{-1} 1682 (C=O); δ_H (300 MHz; $CDCl_3$) 1.40 (s, 9H, C(C*H*$_3$)$_3$), 2.16 (s, 3H, C*H*$_3$), 6.22 (bs, 1H, N*H*), 6.31 (bs, 1H, N*H*), 7.14 (td, *J*= 7.3, 1.3 Hz, 1H, Ar-*H*), 7.20-7.36 (m, 5H, Ar-*H*), 7.50 (dd, *J*= 7.5, 2.0 Hz, 1H, Ar-*H*), 7.55 (dd, *J*= 7.5, 1.8 Hz, 1H, Ar-*H*), 7.73 (d, *J*= 8 Hz, 1H, Ar-*H*); δ_C (75MHz; DMSO) 18.8 (ArC-*C*H$_3$), 31.3 (C(*C*H$_3$)$_3$), 35.3 (*C*(CH$_3$)$_3$), 122.2, 123.3, 126.4, 126.8, 126.8, 126.9, 128.3, 130.9, 131.5, 136.8, 138.6, 145.7, 154.7 (*C*=O); m/z (C.I.) 283 (100%, M + H$^+$) ; HRMS found: M$^+$ 283.1804. $C_{18}H_{22}N_2O$ requires 283.1805.

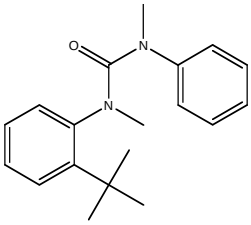
1-(2-tert-Butylphenyl)-3-(2,6-dimethylphenylurea) **7k**



General procedure A was employed using 2,3 dimethylphenyl isocyanate (2.78 ml, 20 mmol, 1 equiv) and 2-tert-butyl aniline (3.19 ml, 20 mmol, 1 equiv) To afford the product in 55% yield (3.26 g, 11.0 mmol) as a white powder; m.p. 260℃; R_f (1:3 EtOAc:Petrol) 0.33; ν_{max}(Nujol)/cm^{-1} 1630 (C=O); δ_H (300 MHz; DMSO) 1.41 (s, 9H, C(C*H*$_3$)), 2.25 (s, 6H, ArC-C*H*$_3$), 3.37 (s, 3H, NC*H*$_3$), 7.08-7.12 (m, 3H, Ar-*H*), 7.13 (d, *J*=7.6 Hz, 1H, Ar-*H*), 7.20 (td, *J*=7.6, 1.6 Hz, 1H, Ar-*H*), 7.28-7.34 (m, 1H, Ar-*H*) 7.36 (d, *J*=6.8 Hz, 1H, Ar-*H*), 7.60 (bs, 1H, N*H*), 8.05 (s, 1H, N*H*); δ_C (75MHz; DSMO) 19.1 (ArC-*C*H$_3$), 31.2 (C(*C*H$_3$)$_3$), 35.3 (*C*(CH$_3$)$_3$), 118.6, 122.2, 126.2, 126.8,

126.9, 129.5, 130.9 (Ar*C*-H), 136.7, 141.0, 145.0, 154.2 (*C*=O); m/z (C.I.) 297 (100%, M + H^+) ; HRMS found: M^+ 297.1957. $C_{19}H_{25}N_2O$ requires 297.1961.

1-(2-tert-Butylphenyl)-1,3-dimethyl-3-phenylurea **9**



General Procedure B was employed using 1-(2-*tert*-butylphenyl)-3-phenylurea (3g, 11.2 mmol), NaH (1.12g, 28.0 mmol, 2.5 equiv.) and MeI (2.09 ml, 4.77g, 33.6 mmol, 3 equiv.) To give the desired product as colourless cubic crystals in 70% yield (2.33g, 7.86 mmol), m.p. 52-53℃; R_f (8:1, Petrol:EtOAc) 0.11; $\nu_{max}(CHCl_3)/cm^{-1}$ 1638 (C=O); δ_H (300 MHz; $CDCl_3$) 1.42 (s, 9H, tBu), 3.12 (s, 6H, NMe), 6.50 (bs, 1H), 6.80 (bd, J= 3H), 7.00-7.22 (m, 4H) 7.39 (d, *J*=8.13Hz, 1H); δ_C ($CDCl_3$) 32.1 (C(*C*H_3)$_3$, 36.1 *C*(CH_3)$_3$, 41.3 (N*C*H_3), 41.6 (N*C*H_3), 125.9, 126.5, 126.7, 126.8, 128.8, 129.4, 131.8, 146.6, 146.9, 161.874 (*C*=O); m/z ; HRMS found: M^+ 297.1962, $C_{19}H_{25}N_2O$ requires 297.1961. (Found C, 77.1; H, 8.4; N, 9.5. $C_{19}H_{24}N_2O$ requires C, 77.0; H, 8.2; N, 9.5%).

1-Benzyl-1-(2-fluorophenyl)-3-phenylurea **11a**. —A mixture of the urea **7a** (266 mg, 1.16 mmol) and sodium hydroxide (55.6 mg, 1.39 mmol, 1.2 eq) was dissolved in THF (5 ml, dry) and was stirring for 0.5 h before addition of benzyl bromide (198 mg, 0.14 ml, 1.16 mmol, 1.0 eq). After stirring for 42 h, first Et_2O (5 ml) and then distilled H_2O (1 ml) was added. The aqueous phase was washed with Et_2O (3 × 10 ml) and the combined organic phases were dried over Na_2SO_4. Evaporation and drying under high vacuum gave 320 mg (crude yield) of a highly viscous oil. The crude product was purified by column chromatography using a mixture of petrol:ethyl acetate (10:1). The desired product was obtained as a white solid (209 mg, mol, 56.3 %, R_f (4:1 petrol (40/60) – EtOAc) = 0.30). ^{1}H NMR (300 MHz, $CDCl_3$): δ = 4.97 (s, 2 H, Ph-CH_AH, Ph-CHH_B), 6.19 (s, 1 H, N-H), 7.06 (m_c, 1 H, Ar-H), 7.16 (m_c, 2 H, Ar-H), 7.32 (m_c, 11 H, Ar-H). ^{13}C NMR (75 MHz, $CDCl_3$): δ = 52.65 (Ph-CH_2), 117.77 (d, J=19.8), 117.77 (C_3), 120.04 (C_{11}, C_{15}), 123.58 (C_6), 125.56 (d, J=4.0 Hz), 125.57 (C_5), 127.73 (C_{13}), 128.66 (C_{18}, C_{22}), 128.93 (C_{19}, C_{21}), 129.12 (C_{12}, C_{14}), 130.57 (d,

J=7.8 Hz), 130.58 (C_4), 131.50 (C_{20}); (C_{17}), (Ar-N_F), (C=O), (N-Ar), (C-F): 137.87, 138.80, 154.47, 157.26, 160.61. *m/z* (CI) 321 (100%, $M+H^+$), 202 (40%, $(C_6H_5F)NH_2^+(C_7H_7)$), 91 (57%, $C_7H_7^+$); *m/z* (EI) 201 (10%, $(C_6H_5F)NH_2^+(C_7H_7)$), 91 (100%, $C_7H_7^+$). (Found: MH^+, 321.1395.$C_{20}H_{18}O_1N_2F_1$ requires *MH*, 321.1398). IR (film): ν/ cm^{-1} = 3300 (m) (N-H), 3058 (w) (Ar-H), 1659 (s) (C=O), 1597 (m), 1531 (s), 1500 (s), 1455 (w), 1442 (s).

1-Benzyl-1-(2-chlorophenyl)-3-phenylurea **11b**. —A mixture of the urea **7b** (250 mg, 1.01 mmol) and sodium hydroxide (48.7 mg, 1.22 mmol, 1.2 eq) was dissolved in THF (7 ml, dry) and was stirring for 0.5 h before addition of benzyl bromide (174 mg, 0.12 ml, 1.01 mmol, 1.0 eq). After stirring for 21 h, first Et_2O (5 ml) and then distilled H_2O (1 ml) was added. The aqueous phase was washed with Et_2O (3 × 10 ml) and the combined organic phases were dried over Na_2SO_4. After evaporation of Et_2O and drying under high vacuum the crude product was purified by column chromatography using a mixture of Petrolether : Ethylacetate (10:1). The desired product was obtained as white crystals (143 mg, 0.43 mmol, 42 %, R_f (4:1 petrol (40/60) – EtOAc) = 0.38). ^{1}H NMR (300 MHz, $CDCl_3$): δ = 4.34 (s, 1 H, $PhCH_AH$), 5.56 (s, 1 H, $PhCHH_B$), 6.03 (s, 1 H, N-H), 7.07 (dd, ^{3}J=7.7 Hz, ^{4}J=0.9 Hz, 2 H, H_{18}, H_{22}), 7.25 – 7.45 (m, 12 H, Ar-H), 7.61 (m_c, 1 H, H_6).
^{13}C NMR (75 MHz, $CDCl_3$): δ = 52.18 (CH_2-Ph), 120.34 (C_{11}, C_{15}), 123.71 (C_6), 127.80 (C_{13}), 128.56 (C_4) , 128.68 (C_{18}, C_{22}), 129.12 (C_{19}, C_{21}), 129.31 (C_{12}, C_{14}), 130.37 (C_{20}), 131.57 (C_5), 132.14 (C_3), 134.47 (Ar-Cl), 137.83 (N-Ar), 138.03 (C-CH_2), 138.78 (N-ArCl), 154.48 (C=O). *m/z* (CI) 337 (100%, $M+H^+$), 247 (25%, $M+H^+$–benzyl), 182 (21%, $(C_6H_5)CH_2$-NH^+-(C_6H_4)), 91 (18%,$C_7H_7^+$); *m/z* (EI) 336 (9%, M^+), 301 (19%, M^+–Cl), 91 (100%, $C_7H_7^+$). (Found: MH^+, 337.1103.$C_{20}H_{18}O_1N_2Cl_1$ requires *MH*, 337.1102). IR (film): ν/ cm^{-1} = (N-H): 3425 (w), 3335 (w); (Ar-H): 3062 (w), 3031 (w); (Alkyl C-H): 2925 (w), 2854 (w); (C=O) 1679 (s); 1523 , 1441, 1313 (m), 1240 (m), 752 (m), 731 (m), 699 (m).

1-Benzyl-1-(2-bromophenyl)-3-phenylurea **11c**. —A mixture of the urea **7c** (350 mg, 1.21 mmol) and sodium hydroxide (57.9 mg, 1.45 mmol, 1.2 eq) was dissolved in THF (7 ml, dry) and was stirring for 0.5 h before addition of benzyl bromide (207 mg, 0.14 ml, 1.21 mmol, 1.0 eq). After stirring for 15 h, first Et_2O (5 ml) and then distilled

H_2O (1 ml) was added. The aqueous phase was washed with Et_2O (3 × 10 ml) and the combined organic phases were dried over Na_2SO_4. After evaporation of Et_2O and drying under high vacuum the crude product was purified by column chromatography using a mixture of Petrolether : Ethylacetate (10:1). The desired product was obtained as white crystals (179 mg, 0.47 mmol, 39 %, R_f (4:1 petrol (40/60) – EtOAc) = 0.30). ^{1}H NMR (300 MHz, $CDCl_3$): δ = 4.26 (d, 15.0 Hz, 1 H, Ph-CH_AH), 5.60 (d, 15.0 Hz, 1 H, Ph-CHH_B), 5.95 (s, 1 H, NH), 7.0 – 7.1 (m, 3H, Ar-H), 7.2 – 7.4 (m, 10 H, Ar-H), 7.78-7.81 (m, 1 H, H_6). ^{13}C NMR (75 MHz, $CDCl_3$): δ = 52.13 (Ph-CH_2), 120.24 (C_{11}, C_{15}), 123.61 (C-Br), 128.67 (C_{18}, C_{22}), 129.09 (C_{19}, C_{21}), 129.19 (C_{20}), 129.42 (C_{12}, C_{14}); (C_{13}), (C_6), (C_4), (C_5), (C_3): 127.78, 129.49, 130.55, 132.35, 134.79; (C_{17}), (N-Ar), (N-ArBr): 137.86, 138.84, 139.53; 154.21 (C=O). *m/z* (CI) 383 (63%, ^{81}Br, $M+H^+$), 381 (54%, ^{79}Br, $M+H^+$), 301 (45%,M^+–Br), 91 (100%, $C_7H_7^+$); m/z (EI) 301 (17%, M^+–Br), 91 (100%, $C_7H_7^+$). (Found: MH^+, 381.0597.$C_{20}H_{18}O_1N_2Br_1$ requires *MH*, 381.0597). IR (film): ν/ cm^{-1} = (N-H): 3424 (w), 3332 (w); (Ar-H): 3061 (w), 3029 (w); (C-H Alkyl): 2959 (w), 2928 (w); 1678 (s) (C=O), 1595 (m), 1523 (s), 1499 (m), 1473 (m), 1441 (s).

1-Benzyl-1-(2-iodophenyl)-3-phenylurea **11d**. —A mixture of the urea **7d** (300 mg, 0.89 mmol) and sodium hydroxide (43.4 mg, 1.07 mmol, 1.2 eq) was dissolved in THF (7 ml, dry) and was stirring for 0.5 h before addition of benzyl bromide (152 mg, 0.11 ml, 0.89 mmol, 1.0 eq). After stirring for 18 h, first Et_2O (5 ml) and then distilled H_2O (1 ml) was added. The aqueous phase was washed with Et_2O (3 × 10 ml) and the combined organic phases were dried over Na_2SO_4. Evaporation and drying under high vacuum gave a highly viscous yellowish oil. The crude product was purified by column chromatography using a mixture of Toluene : Ethylacetate (20:1). The desired product was obtained as a white solid (158 mg, 0.37 mmol, 41.5 %, R_f (10:1 petrol (40/60) – EtOAc) = 0.66). ^{1}H NMR (300 MHz, $CDCl_3$): δ = 4.18 (d, ^{2}J=14.7 Hz, 1 H, PhCH_AH), 5.63 (d, ^{2}J=14.7 Hz, 1 H, PhCHH_B), 5.90 (s, 1 H, N-H), 6.96 (dd, ^{3}J=7.8 Hz, ^{4}J=1.7 Hz, 1 H, H_6), 7.15 (m_c, 2 H, Ar-H, 7.25 (m_c, 9 H, Ar-H), 8.05 (dd, ^{3}J=7.9 Hz, ^{4}J=1.5 Hz, 1 H, H_3). ^{13}C NMR (75 MHz, $CDCl_3$): δ = 52.25 (Ph-CH_2), 101.46 (I-Ar); (C_6), (C_{13}), (C_4), (C_{20}), (C_5): 123.61, 127.8, 130.10, 130.65, 131.79; 120.30 (C_{11}, C_{15}); (C_{18}, C_{22}), (C_{19}, C_{21}), (C_{12}, C_{14}): 128.69, 129.09, 129.58; (C_{17}), (N-

Ar), (C_3), (N-ArI): 137.88, 138.89, 141.15, 142.83; 153.95 (C=O). *m/z* (CI) 429 (10%, $M+H^+$), 303 (100%, $M+H^+$-I).
m/z (EI) 91 (100%, $C_7H_7^+$). (Found: MH^+, 429.0456.$C_{20}H_{18}O_1N_2I_1$ requires *MH*, 429.0458). IR (film): ν/ cm^{-1} = (N-H): 3422 (m), 3321 (m); (Ar-H): 3059 (m), 3029 (m); 2927 (w) (C-H Alkyl), 1676 (C=O), 1595 (s), 1523 (s), 1494 (s), 1441 (s).

1-Benzyl-1-(2-methylphenyl)-3-phenylurea **11e**.[3] —A mixture of the urea **7e** (500 mg, 2.21 mmol) and sodium hydroxide (106 mg, 2.65 mmol, 1.2 eq) was dissolved in THF (8 ml, dry) and was stirring for 0.5 h before addition of benzyl bromide (378 mg, 0.26 ml, 2.21 mmol, 1.0 eq). After stirring for 60 h, first Et_2O (5 ml) and then distilled H_2O (1 ml) was added. The aqueous phase was washed with Et_2O (3 × 10 ml) and the combined organic phases were dried over Na_2SO_4. Evaporation and drying under high vacuum gave 698 mg (crude yield) of a highly viscous oil. The crude product was purified by column chromatography using a mixture of Petrolether: Ethylacetate (10:1). The desired product was obtained as a white solid (307 mg, mol, 44.0 %, R_f (4:1 petrol (40/60) – EtOAc) = 0.37). ^{1}H NMR (300 MHz, $CDCl_3$): δ = 2.18 (s, 3 H, Ar-CH_3), 4.53 (d, ^{2}J=14.5 Hz, 1H, Ph-CH_AH), 5.27 (d, ^{2}J=14.3 Hz, 1H, Ph-CHH_B), 6.07 (s, 1 H, N-H), 7.03 (d, ^{3}J=7.4 Hz, 1 H, H_3), 7.3 (m_c, 13 H, Ar-H). ^{13}C NMR (75 MHz, $CDCl_3$): δ = 17.76 (Ar-CH_3), 52.58 (Ph-CH_2), 119.75 (C_{11}, C_{15}); (C_6), (C_4), (C_{13}), (C_5), (C_{20}), (C_3) : 123.27, 127.72, 127.97, 129.19, 130.13, 132.23; (C_{18}, C_{22}), (C_{19}, C_{21}), (C_{12}, C_{14}): 128.63, ,129.10, 129.49, (C-Me), (N-ArMe), (N-Ar), (C-CH_2): 137.66, 138.22, 139.15, 139.39; 154.60 (C=O). *m/z* (CI) 317 (100%, $M+H^+$), 91 (18%, ($C_7H_7^+$)); *m/z* (EI) 316 (5%, M^+), 91 (100%, ($C_7H_7^+$)). (Found: MH^+, 317.1651.$C_{21}H_{21}O_1N_2$ requires *MH*, 317.1648). IR (film): ν/ cm^{-1} = (N-H): 3419 (m), 3328 (m); (Ar-H): 3061 (m), 3029 (m); (Alkyl-H): 2924 (m); (C=O) 1677 (s); 1594 (s), 1522 (s), 1441 (s), 1357 (s), 1311 (s), 1243 (s), 1212 (s), 753 (s), 728 (s), 700 (s).

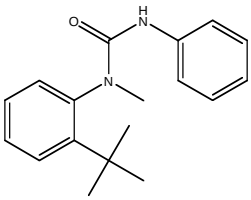
1-Benzyl-1-(2-ethylphenyl)-3-phenylurea **11f**. —A mixture of the urea **7f** (500 mg, 2.08 mmol) and sodium hydroxide (100 mg, 2.50 mmol, 1.2 eq) was dissolved in THF (8 ml, dry) and was stirring for 0.5 h before addition of Benzyl bromide (356 mg, 0.25 ml, 2.08 mmol, 1.0 eq). After stirring for 7 h, first Et_2O (5 ml) and then distilled H_2O (1 ml) was added. The aqueous phase was washed with Et_2O (3 × 10 ml) and the combined organic phases were dried over Na_2SO_4. Evaporation and drying under high

vacuum gave 0.64 g (crude yield) of a highly viscous oil. The crude product was purified by column chromatography using a mixture of Petrolether: Ethylacetate (10:1). The desired product was obtained as a white solid (224 mg, 0.68 mmol, 32.6 %, R_f (4:1 petrol (40/60) – EtOAc) = 0.27) . ^{1}H NMR (300 MHz, $CDCl_3$): δ = 1.15 (t, ^{3}J=7.6 Hz, 3 H, CH_{3Et}), 2.56 (m_c, 2 H, CH_{2Et}), 4.44 (d, ^{2}J= 14.4 Hz, Ph-CH_AH), 5.33 (d, ^{2}J= 14.4 Hz, Ph-CHH_B), 6.04 (s, 1 H, N-H), 7.01 (m_c, 2 H, H_4?, H_{13}?), 7.26 (m_c, 10 H, Ar-H), 7.35 (m_c, 2 H, Ar-H). ^{13}C NMR (75 MHz, $CDCl_3$): δ = 14.64 (CH_{3Et}), 23.56 (CH_{2Et}), 53.00 (Ph-CH_2), 119.70 (C_{11}, C_{15}); (C_4), (C_6), (C_{13}), (C_5), (C_{20}), (C_3): 123.24, 127.69, 127.73, 129.42, 130.22, 130.34; (C_{18}, C_{22}), (C_{19}, C_{21}), (C_{12}, C_{14}): 128.62, 129.09, 129.49; (C_2), (N-ArEt), (N-Ar), (C_{17}): 138.21, 138.71, 139.06, 143.32; 154.83 (C=O). *m/z* (CI) 331 (100%, $M+H^+$), 241 (23%, $M+H^+$–($C_7H_7^+$)+H^+), 91 (60%, ($C_7H_7^+$)); *m/z* (EI) 91 (100%, ($C_7H_7^+$)). (Found: MH^+, 331.1807.$C_{22}H_{23}O_1N_2$ requires *MH*, 331.1805). IR (film): ν/ cm^{-1} = 3419 (w) (N-H); (Ar-H): 3061 (w), 3030 (w); (Alkyl C-H); 2970 (w), 2932 (w), 2875 (w); 1677 (s) (C=O), 1594 (m), 1521 (s), 1501 (m), 1440(s).

1-Benzyl-1-(2-isopropylphenyl)-3-phenylurea **11g**. —A mixture of the urea **7g** (500 mg, 1.97 mmol) and sodium hydroxide (94.5 mg, 2.36 mmol, 1.2 eq) was dissolved in THF (8 ml, dry) and was stirring for 0.5 h before addition of Benzyl bromide (404 mg, 0.28 ml, 1.16 mmol, 1.0 eq). After stirring for 18.5 h, first Et_2O (5 ml) and then distilled H_2O (1 ml) was added. The aqueous phase was washed with Et_2O (3 × 10 ml) and the combined organic phases were dried over Na_2SO_4. Evaporation and drying under high vacuum gave 669 mg (crude yield) of a highly viscous oil. The crude product was purified by column chromatography using a mixture of Petrolether: Diethylether (10:1). The desired product was obtained as a white solid (407 mg, 1.18 mmol, 60.0 %, R_f (4:1 petrol (40/60) – Et_2O) = 0.30) . ^{1}H NMR (300 MHz, $CDCl_3$): δ = 1.02 (d, ^{3}J= 6.9 Hz, CH_{3isoA}) 1.20 (d, ^{3}J= Hz, CH_{3isoB}), 3.13 (sept, ^{3}J=6.8 Hz, 1 H, CH_{iso}), 4.54 (d, ^{2}J=14.3 Hz, Ph-CH_AH), 5.28 (d, ^{2}J=14.3 Hz, Ph-CHH_B), 6.04 (s, 1 H, N-H), 7.02 (m_c, 2 H, H_4, H_{13}), 7.27 (m_c,10 H, Ar-H), 7.43 (m_c, 2 H, Ar-H). ^{13}C NMR (75 MHz, $CDCl_3$): δ = 24.04 (CH_{3isoA}), 24.51 (CH_{3isoB}), 53.41 (Ph-CH_2), 119.62 (C_{11}, C_{15}); (C_6), (C_4), (C_{13}), (C_5), (C_3), (C_{20}): 123.24, 127.60, 127.74, 128.15,129.72, 130.06; (C_{18}, C_{22}), (C_{19}, C_{21}), (C_{12}, C_{14}): 128.66, 129.12, 129.58; (C-$N_{isoProp}$), (C-N), (C_2), (C_{17}): 137.71, 138.18, 139.04, 148.33; 155.01 (C=O). *m/z* (CI) 345 (100%,

M+H$^+$), 91 (8%, ($C_7H_7^+$)). *m/z* (EI) 91 (100%, ($C_7H_7^+$)). (Found: MH^+, 345.1967.$C_{23}H_{25}O_1N_2$ requires *MH*, 345.1961). IR (film): ν/ cm^{-1} = 3420 (w) (N-H), (Ar-H): 3061 (w), 3029 (w); (C-H Alkyl): 2963 (w), 2926 (w), 2867 (w); 1677 (s) (C=O); 1594 (m), 1522 (s), 1500 (m), 1488 (m), 1440 (s).

1-(2-tert-Butylphenyl)-1-methyl-3-phenylurea **11h**

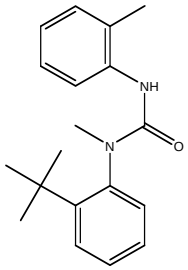


By General Procedure B was followed, 1-(2-*tert*-butylphenyl)-3-phenylurea **7h** (2.0 g, 7.4 mmol), NaH (0.36 g, 8.9 mmol, 1.2 equiv.) and MeI (0.7 ml, 1.59 g, 11.2 mmol, 1.5 equiv.) gave a crude product which was purified by flash chromatography to give the urea **11h** as a white solid in 86% yield (1.80 g, 6.4 mmol); m.p. 84-85 ℃; R_f (8:1, Petrol:EtOAc) 0.21; $\nu_{max}(CHCl_3)/cm^{-1}$ 1631 (C=O); δ_H (300 MHz; $CDCl_3$) 1.48 (s, 9H, C(C*H*$_3$)), 3.30 (s, 3H, NC*H*$_3$), 5.98 (bs, 1H, N*H*), 6.98-7.04 (m, 1H, Ar-*H*), 7.20-7.30 (m, 5H, Ar-*H*), 7.37 (td, *J*=7.3, 1.7 Hz, 1H, Ar-*H*), 7.43 (td, *J*=7.3, 1.7 Hz, 1H, Ar-*H*) 7.39 (dd, *J*=7.9, 1.7 Hz, 1H, Ar-*H*); δ_C (75MHz; $CDCl_3$) 31.9 (C(*C*H_3)$_3$), 36.2 (*C*(CH_3)$_3$), 39.1 (N*C*H_3), 119.5, 123.2, 128.7, 129.0, 129.4, 129.7, 131.1, 141.0, 148.8, 155.8 (*C*=O); m/z (C.I.) 283 (100%, M + H^+); HRMS found: M^+ 283.1803. $C_{18}H_{23}N_2O$ requires 283.1805.

1-Benzyl-1-(2-tert-butylphenyl)-3-phenylurea **11i**. —A mixture of the urea **7h** (500 mg, 1.87 mmol) and sodium hydroxide (89.5 mg, 2.24 mmol, 1.2 eq) was dissolved in THF (8 ml, dry) and the solution was stirring for 0.5 h before addition of benzyl bromide (319 mg, 0.22 ml, 1.87 mmol, 1.0 eq). After stirring for 18 h, first Et_2O (5 ml) and then distilled H_2O (1 ml) was added. The aqueous phase was washed with Et_2O (5 × 10 ml) and the combined organic phases were dried over Na_2SO_4. Evaporation and drying under high vacuum gave 584 mg (crude yield) of a highly viscous oil and a waxy solid. The crude product was purified by column chromatography using a mixture of Petrolether: Ethylacetate (10:1). The desired product was obtained as a white solid (388 mg, mol, 58.0 %, R_f (4:1 petrol (40/60) – EtOAc) = 0.45). ^{1}H NMR (300 MHz, $CDCl_3$): δ = 1.51 (s, 9 H, 3×CH_3), 3.89 (d,

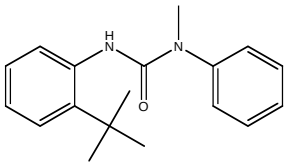
^{2}J=14.4 Hz, 1 H, Ph-CH_AH), (d, ^{2}J= 14.4 Hz, 1 H, Ph-CHH_B), 6.01 (s, 1 H, N-H), 6.65 (dd, ^{3}J= 7.9 Hz, ^{4}J=1.5 Hz,1 H, H_3), 7.04 (m_c, 1 H), 7.13 (dt, ^{3}J=7.5 Hz, ^{4}J=1.6 Hz, 1 H, H_4 or H_5 or H_{13} or H_{20}), 7.34 (m_c, 9 H, Ar-H), 7.68 (dd, ^{3}J=8.2 Hz, ^{4}J=1.5 Hz, 1 H, H_6?). ^{13}C NMR (75 MHz, $CDCl_3$): δ = 32.36 (3 × CH_3), 36.59 (C_{tert}), 54.32 (Ph-CH_2), 119.70 (C_{11}, C_{15}); (C_6), (C_4), (C_{13}), (C_3), (C_5), (C_{20}): 123.26, 127.60, 127.78, 129.54, 130.58, 133.00; (C_{18}, C_{22}), (C_{19}, C_{21}), (C_{12}, C_{14}): 128.63, 129.10, 130.02; (N-Ar^{t}Bu), (C_2), (N-Ar), (C_{17}): 138.16, 138.34, 138.98, 148.65; 155.16 (C=O). *m/z* (CI) 360 (100%, M+H^{+}), 301 (57%, (M–^{t}Bu)$^{+}$); *m/z* (EI) 301 (21%, (M–^{t}Bu)$^{+}$), 182 (47%, (C_7H_7)-NH^{+}-(C_6H_5)), 91 (100%, (C_7H_7)$^{+}$). (Found: MH^{+}, 359.2118.$C_{24}H_{27}O_1N_2$ requires *MH*, 359.2118). IR (film): ν/ cm^{-1} = 3421 (w) (N-H), (Ar-H): 3061 (w), 3030 (w); 2962 (w) (C-H Alkyl), 1678 (C=O), (C=C): 1594 (m), 1521 (s), 1500 (m), 1486 (m), 1440 (s).

1-(2-tert-Butylphenyl)-1-methyl-3-o-tolylurea **11j**



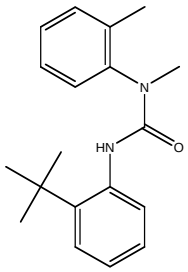
General procedure B was followed, employing 1-(2-*tert*-butylphenyl)-3-*o*-tolylurea (0.200 g, 0.75 mmol), NaH (0.036 g, 0.89 mmol) and MeI (0.07 ml, 0.159 g, 1.12 mmol) in 20 ml of anhydrous THF to give a colourless oil purified by column chromatography to afford the above product in 65% yield (0.138 g, 0.49 mmol) as a white solid; m.p 121 ℃; R_f (1:3 EtOAc:Petrol) 0.32; ν_{max}($CHCl_3$)/cm^{-1} 1684 (C=O) ; δ_H (300 MHz; $CDCl_3$) 1.48 (s, 9H, $C(CH_3)_3$), 1.80 (s, 3H, CH_3), 3.32 (s, 3H, NCH_3), 5.90 (bs, 1H, NH), 6.96 (td, J= 7.5, 1.2 Hz, 1H, Ar-H), 7.07 (d, J= 7.0 Hz, 1H, Ar-H), 7.20 (d, J= 7.0 Hz, 1H, Ar-H), 7.27 (dd, J= 7.0, 2.0 Hz, 1H, Ar-H), 7.42 (tdd, J= 7.5, 7.3, 2.0 Hz, 2H, Ar-H), 7.65 (dd, J= 7.6, 2.0 Hz, 1H, Ar-H), 8.03 (d, J= 8.0 Hz, 1H, Ar-H); δ_C (75MHz, $CDCl_3$) 17.3 (CH_3), 32.0 ($C(CH_3)_3$, 36.2 $C(CH_3)_3$, 39.0 (NCH_3), 120.4, 123.3, 126.6, 127.2, 128.6, 129.4, 129.7, 130.3, 131.0, 137.8, 141.0, 148.9 (C=O); m/z (C.I.) 397 (100%, M^{+}); HRMS found: M^{+} 297.1962. $C_{19}H_{25}N_2O$ requires 297.1961. Found: C, 76.8; H, 8.3; N 9.4%. $C_{19}H_{25}N_2O$ requires C, 77.0; H, 8.2; N, 9.5%.

3-(2-tert-Butylphenyl)-1-methyl-1-phenylurea **12h**



By general procedure A, *t*-butylphenyl isocyanate **14** (1.73 ml, 10 mmol, 1 equiv.) and *N*-methylaniline (1.08 ml, 10 mmol, 1 equiv.) in 50ml of DCM gave an oil which was purified by column chromatography to give the urea **12h** in 83% yield (2.34 g, 8.3 mmol); m.p. 78 ° C; R_f (1:4, EtOAc:petrol) 0.34 ; $\nu_{max}(CHCl_3)/cm^{-1}$ 1631 (C=O) ; δ_H (500 MHz; $CDCl_3$) 1.20 (s, 9H, C(C*H*$_3$)), 3.40 (s, 3H, NC*H*$_3$), 6.26 (bs, 1H, N*H*), 7.04 (td, *J*=7.9, 1.4 Hz, 1H, Ar-*H*), 7.24 (td, *J*=7.0, 1.4 Hz, 1H, Ar-*H*), 7.28 (dd, *J*= 8.0, 1.4Hz, 1H, Ar-*H*), 7.39-7.44 (m, 3H, Ar-*H*), 7.52 (t, *J*=7.4 Hz, 2H, Ar-H), 7.84 (d, J=8.1 Hz, 1H, Ar-*H*); δ_C (75MHz; $CDCl_3$) 30.5 (C(*C*H_3)$_3$), 34.3 (*C*(CH$_3$)$_3$), 37.7 (N*C*H_3), 124.5, 125.9, 126.5, 127.1, 128.7, 130.7, 130.8, (Ar*C*-H) 1371.1, 140.6, 143.1, 155.2 (*C*=O); m/z (C.I.) 283 (100%, M + H^+); HRMS found: M^+ 283.1802. $C_{18}H_{23}N_2O$ requires 283.1805. Found: C, 76.4; H, 7.8; N 9.8%. $C_{19}H_{25}N_2O$ requires C, 76.6; H, 7.9; N, 9.9%.

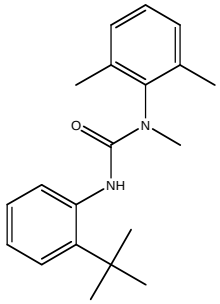
3-(2-tert-Butylphenyl)-1-methyl-1-o-tolylurea **12j**



General procedure B was followed, employing 1-(2-*tert*-butylphenyl)-3-*o*-tolylurea (0.200 g, 0.75 mmol), NaH (0.036 g, 0.89 mmol) and MeI (0.07 ml, 0.159 g, 1.12 mmol) in 20 ml of anhydrous THF to give a colourless oil purified by column chromatography to afford the above minor product in 12% yield (0.026 g, 0.09 mmol) as a white solid; m.p 120℃; R_f (1:3 EtOAc:Petrol) 0.21; $\nu_{max}(CHCl_3)/cm^{-1}$ 1684 (C=O) ; δ_H (300 MHz; $CDCl_3$) 1.09 (s, 9H, C(CH$_3$)$_3$), 2.40 (s, 3H, CH$_3$), 3.38 (s, 3H, NCH$_3$), 6.20 (bs, 1H, NH), 7.04 (td, J= 7.4, 1.5 Hz, 1H, Ar-H), 7.23 (dd, J= 7.7, 1.5

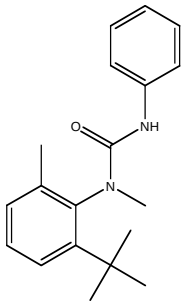
Hz, 1H, Ar-H), 7.28 (dd, J= 8.0, 1.5 Hz, 1H, Ar-H), 7.35-7.40 (m, 4H, Ar-H), 7.93 (dd, J= 8.0, 1.5 Hz, 1H, Ar-H); δ_C (75MHz, $CDCl_3$) 17.7 (CH_3), 30.3 (C(CH_3)$_3$, 34.1 $C(CH_3)_3$, 36.2 (NCH_3), 124.1, 125.0, 126.4, 127.0, 128.3, 129.2, 129.5, 132.3, 137.2, 137.6, 140.0, 141.1, 155.0 (C=O); m/z (C.I.) 397 (100%, M^+); HRMS found: M^+ 297.1965. $C_{19}H_{25}N_2O$ requires 297.1961.

3-(2-tert-Butylphenyl)-1-methyl-1-(2,6-dimethylphenylurea) **12k**



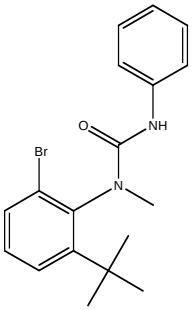
General Procedure B was employed using 1-(2-*tert*-butylphenyl)-3-(2,6-dimethylphenylurea) (0.600g, 2.02 mmol), NaH (60% in mineral oil, 0.096g, 2.4 mmol, 1.2 equiv.) and MeI (0.19 ml, 0.431 g, 3.04 mmol, 1.5 equiv.) The crude product was further purified by column chromatography to give the desired product as a white solid in 75% yield (0.440 g, 1.52 mmol), m.p. 71℃; R_f (4:1, Petrol:EtOAc) 0.26 ; $\nu_{max}(CHCl_3)/cm^{-1}$ 1661 (C=O) ; δ_H (300 MHz; $CDCl_3$) 1.08 (s, 9H, CCH_3), 2.38 (s, 6H, ArC-CH_3), 3.30 (s, 3H, NCH_3), 6.20 (bs, 1H, N*H*), 7.03 (td, *J*= 7.4, 1.5 Hz, 1H, Ar-*H*), 7.20-7.30 (m, 5H, Ar-*H*), 8.00 (dd, *J*= 8.1, 1.4 Hz, 1H, Ar-*H*); δ_C (75MHz; $CDCl_3$) 18.1 (ArC-CH_3), 30.3 (C(CH_3)$_3$), 34.1 ($C(CH_3)_3$), 34.5 (NCH_3), 123.9, 124.4, 127.1, 129.1, 129.7 (Ar*C*-H), 137.4, 139.5, 139.7, 154.9 (C=O); m/z (C.I.) 311 (100%, M + H^+) ; HRMS found: M^+ 311.2115. $C_{20}H_{26}N_2O$ requires 311.2118.

1-(2-tert-Butyl-methylphenyl)-1-methyl-3-phenylurea **16a**



General procedure C was followed employing 1-(2-*tert*-butylphenyl)-1-methyl-3-phenylurea (0.230g, 0.82 mmol), sBuLi (2.6 ml, 2.85 mmol, 3.5 equiv.) and methyliodide (0.08ml, 1.22 mmol, 1.5 equiv.) To afford the product in 54% yield (0.131g, 0.44 mmol) as a white solid, m.p. 121 ℃; R_f (1:4 EtOAc:Petrol) 0.29 ; $\nu_{max}(CHCl_3)/cm^{-1}$ 1682 (C=O); δ_H (300 MHz; $CDCl_3$) 1.46 (s, 9H, tBu), 2.30 (s, 3H, ArCC*H*$_3$), 3.25 (s, 3H, NMe), 6.04 (s, 1H, N*H*), 7.00-7.06 (m, 1H, Ar-*H*), 7.23-7.35 (m, 7H, Ar-*H*), 7.50 (d, *J*=7.8Hz, 1H); δ_C ($CDCl_3$) 18.4 (CH_3), 32.3 (C(*C*H$_3$)), 36.5 (*C*(CH_3), 37.5 (N*C*H$_3$), 119.7, 123.2, 127.7, 129.1, 129.2, 130.4, 139.0, 139.1, 149.1, 155.3 (*C*=O); m/z (C.I.) 297 (100%, M^+); HRMS found: M^+ 297.1966. $C_{19}H_{25}N_2O$ requires 297.1961. Found: C, 77.0; H, 8.2; N 9.4%. $C_{19}H_{25}N_2O$ requires C, 77.0; H, 8.2; N, 9.5%.

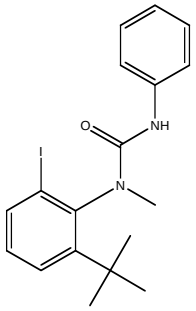
1-(2-tert-Butyl-6-bromophenyl)-1-methyl-3-phenylurea **16b**



By General Procedure C, 1-(2-*tert*-butylphenyl)-1-methyl-3-phenylurea **11h** (0.100 g, 0.35 mmol), *sec*-BuLi (0.68 ml, 0.88 mmol) and dibromoethane (0.1ml) gave a crude product which was further purified by flash chromatography to yield the bromo compound **16b** as a white solid in 80% yield (0.101 g, 0.28 mmol), m.p. 86 ℃; $\nu_{max}(CHCl_3)/cm^{-1}$ 1681 (C=O); δ_H (300 MHz; $CDCl_3$) 1.44 (s, 9H, C(C*H*$_3$)$_3$), 3.23 (s, 3H, NC*H*$_3$), 5.98 (bs, 1H, N*H*), 7.01-7.08 (tt, *J*=6.7, 2.0 Hz, 1H, Ar-*H*), 7.23-7.37 (m, 5H, Ar-*H*), 7.62 (dd, *J*=8.2, 1.5 Hz, 1H, Ar-*H*), 7.72 (dd, *J*=7.9, 1.5Hz, 1H, Ar-*H*); δ_C

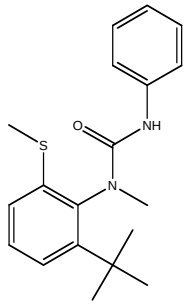
(75MHz; $CDCl_3$) 32.1 (C(*C*H_3)$_3$), 37.1 (*C*(CH$_3$)$_3$), 37.8 (N*C*H$_3$), 119.5, 120.2, 123.5, 127.9, 129.1, 129.5, 130.4 (Ar*C*-H), 138.9, 139.0, 152.0, 155.0 (*C*=O); m/z (E.S.) 361 (100%, M + H^+) ; HRMS found: M^+ 361.0905. $C_{18}H_{22}N_2OBr$ requires 361.0910.

1-(2-tert-Butyl-6-iodophenyl)-1-methyl-3-phenylurea **16c**



By General Procedure C, 1-(2-*tert*-Butylphenyl)-1-methyl-3-phenylurea **11h** (0.100 g, 0.35 mmol), *sec*-BuLi (0.68 ml, 0.88 mmol) and iodine in THF (0.223 g, 0.88 mmol) gave a crude product which was purified by flash chromatography to yield the iodo-compound **16c** as a white solid in 93% yield (0.133 g, 0.29 mmol); m.p. 96 ℃; $\nu_{max}(CHCl_3)/cm^{-1}$ 1677 (C=O); δ_H (300 MHz; $CDCl_3$) 1.40 (s, 9H, C(C*H*$_3$)$_3$), 3.15 (s, 3H, NC*H*$_3$), 5.76 (bs, 1H, N*H*), 6.93 (tt, *J*= 6.9, 1.7 Hz, 1H, Ar-*H*), 7.00 (t, *J*=7.9 Hz, 1H, Ar-*H*), 7.16-7.21 (m, 4H, Ar-*H*), 7.54 (d, *J*=8.2, 1.4 Hz 2H, Ar-*H*); δ_C (75MHz; $CDCl_3$) 32.2 (C(*C*H$_3$)$_3$), 37.2 (*C*(CH$_3$)$_3$), 38.0 (N*C*H$_3$), 104.8 (Ar*C*-I), 120.3, 123.6, 129.1, 130.3, 130.8, 139.9 (Ar*C*-H), 139.0, 141.8, 151.9, 154.7 (*C*=O); m/z (C.I.) 409 (100%, M + H^+); HRMS found: M^+ 409.0772. $C_{18}H_{22}N_2OI$ requires 409.0771.

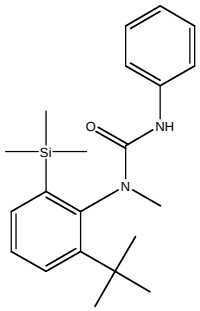
1-(2-tert-Butyl-6-(methylthio)phenyl)-1-methyl-3-phenylurea **16d**



By General Procedure C, 1-(2-*tert*-butylphenyl)-1-methyl-3-phenylurea **11h** (0.100 g, 0.35 mmol), *sec*-BuLi (0.68 ml, 0.88 mmol) and dimethyldisulfide (0.1 ml) gave a

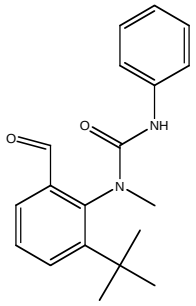
crude product which was purified by flash chromatography to yield the sulfide **16d** as a white solid in 95% yield (0.109g, 0.33 mmol), m.p. 122 ℃; $\nu_{max}(CHCl_3)/cm^{-1}$ 1681 (C=O); δ_H (300 MHz; $CDCl_3$) 1.34 (s, 9H, C(C*H*$_3$)$_3$), 2.34 (s, 3H, SC*H*$_3$), 3.16 (s, 3H, NC*H*$_3$), 5.94 (bs, 1H, N*H*), 6.92 (tt, *J*= 7.3, 1.4 Hz, 1H, Ar-*H*), 7.05 (d, *J*=7.0, 2.2 Hz, 1H, Ar-*H*), 7.13-7.18 (m, 4H, Ar-*H*), 7.28-7.30 (m, 2H, Ar-*H*); δ_C (75MHz; $CDCl_3$) 15.2 (S*C*H$_3$) 32.4 (C(*C*H$_3$)$_3$), 36.9 (*C*(CH$_3$)$_3$), 37.0 (N*C*H$_3$), 120.2, 123.3, 123.7, 125.9, 129.2, 129.7 (Ar*C*-H), 137.3, 139.3, 142.5, 150.0 (*C*=O); m/z (C.I.) 329 (100%, M + H^+) ; HRMS found: M^+ 329.1680. $C_{19}H_{25}N_2OS$ requires 329.1682.

1-(2-tert-Butyl-6-(trimethylsilyl)phenyl)-1-methyl-3-phenylurea **16e**



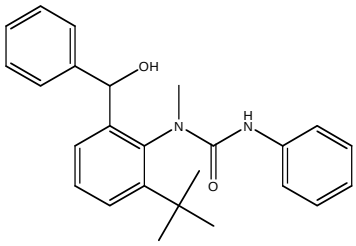
By General Procedure C, 1-(2-*tert*-butylphenyl)-1-methyl-3-phenylurea **11h** (0.100 g, 0.35 mmol), *sec*-BuLi (0.68 ml, 0.88 mmol) and chlorotrimethylsilane (0.1 ml) gave a crude product which was purified by flash chromatography to yield the silane **16e** as a white solid in 81% yield (0.100 g, 0.28 mmol), 70-71 ℃; $\nu_{max}(CHCl_3)/cm^{-1}$ 1682 (C=O); δ_H (300 MHz; $CDCl_3$) 0.40 (s, 9H, Si(C*H*$_3$)), 1.45 (s, 9H, C(C*H*$_3$)$_3$), 3.29 (s, 3H, NC*H*$_3$), 6.01 (bs, 1H, N*H*), 7.00-7.08 (m, 1H, Ar-*H*), 7.25-7.30 (m, 4H, Ar-*H*), 7.43 (t, *J*=7.4 Hz, 1H, Ar-*H*), 7.62 (dd, *J*=7.3, 1.6 Hz, 1H, Ar-*H*), 7.75 (dd, *J*=8.0, 1.6 Hz, 1H, Ar-*H*); δ_C (75MHz; $CDCl_3$) 1.0 (Si(*C*H$_3$)$_3$) 32.7 (C(*C*H$_3$)$_3$), 37.1 (*C*(CH$_3$)$_3$), 39.4 (N*C*H$_3$), 119.6, 123.1, 128.9, 129.1, 132.2, 135.7 (Ar*C*-H), 138.9, 142.9, 143.7, 148.7, 155.1 (*C*=O); m/z (C.I.) 355 (100%, M + H^+) ; HRMS found: M^+ 355.2200. $C_{21}H_{31}N_2OSi$ requires 355.2200.

1-(2-tert-Butyl-6-formylphenyl)-1-methyl-3-phenylurea **16f**



By General Procedure C, 1-(2-*tert*-butylphenyl)-1-methyl-3-phenylurea **11h** (0.100 g, 0.35 mmol), *sec*-BuLi (0.68 ml, 0.88mmol) and DMF (0.1ml) gave a crude product which was purified by flash chromatography to yield the aldehyde **16f** as a white solid in 66% yield (0.071g, 0.23 mmol); m.p. 128 ℃; $\nu_{max}(CHCl_3)/cm^{-1}$ 1685 (C=O); δ_H (300 MHz; $CDCl_3$) 1.52 (s, 9H, C(C*H*$_3$)$_3$), 3.37 (s, 3H, NC*H*$_3$), 5.88 (bs, 1H, N*H*), 7.03-7.10 (m, 1H, Ar-*H*), 7.23-7.26 (m, 4H, Ar-*H*), 7.61 (t, *J*= 7.6 Hz, 1H, Ar-*H*), 7.98 (dd, *J*=7.6, 1.8 Hz, 2H, Ar-*H*), 10.18 (s, 1H, C*H*O); δ_C (75MHz; $CDCl_3$) 32.2 (C(*C*H$_3$)$_3$), 36.9 (*C*(CH$_3$)$_3$), 40.4 (NCH$_3$), 120.2, 123.9, 129.1, 129.5, 130.0, 136.3 (Ar*C*-H), 135.5, 135.3, 138.4, 150.1, 155.2 (N*C*=O), 190.2 (*C*=O); m/z (C.I.) 311 (100%, M + H^+).

1-(2-tert-Butyl-6-(hydroxy(phenyl)methyl)phenyl)-1-methyl-3-phenylurea **16g**



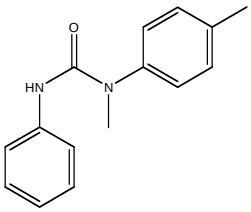
By General procedure C, 1-(2-*tert*-butylphenyl)-1-methyl-3-phenylurea **11h** (0.100 g, 0.35 mmol), *sec*-BuLi (1.3M solution in cyclohexane, 0.68 ml, 0.89 mmol, 2.5 equiv.) and benzaldehyde (0.09ml, 0.89 mmol, 2.5 equiv.) gave the alcohol **16g** in 83% yield (0.113g, 0.29 mmol) as a separable mixture of diastereoisomers.

Major diastereoisomer: m.p. 190-191 ℃; R_f (1:4 EtOAc:Petrol) 0.21 ; $\nu_{max}(CHCl_3)/cm^{-1}$ 3447 (OH), 1732.49 (C=O); δ_H (300 MHz; $CDCl_3$) 1.44 (s, 9H, C(C*H*$_3$)), 2.97(s, 3H, NC*H*$_3$), 3.54 (d, *J*=4.4Hz, 1H, O*H*), 5.88 (d, *J*=4.4Hz, 1H C*H*COH), 6.46 (s, 1H, N*H*), 6.96 (t, *J*=7.3Hz, 1H, Ar-*H*), 7.14 (t, *J*=7.3Hz, 2H, Ar-*H*), 7.22 (d, *J*=7.4Hz, 1H, Ar-*H*), 7.30-7.40 (m, 8H, Ar-*H*) 7.60 (dd, *J*=7.6, 2.2Hz, 1H,

Ar-*H*); δ_C (75MHz; $CDCl_3$) 32.4 (C(*C*H_3)), 36.77 (*C*(CH_3), 39.2 (N*C*H) 39.3 (N*C*H_3), 70.8 (*C*HOH), 138.2, 139.0, 143.7, 144.1, 148.7, 155.8 (*C*=O); m/z (C.I.) 389 ; HRMS found: M^+ 389.2227. $C_{25}H_{28}N_2O_2$ requires 389.2224.

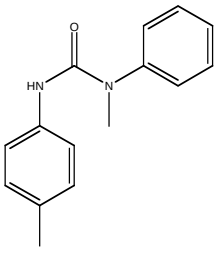
Minor diastereoisomer: m.p. 191-192 ℃; R_f (1:4 EtOAc:Petrol) 0.07; δ_H (300 MHz; $CDCl_3$) 1.45 (s, 9H, C(C*H*$_3$)$_3$), 2.21 (s, 1H, O*H*), 3.42 (s, 3H, NC*H*$_3$), 5.88 (bs, 1H, N*H*), 6.00 (s, 1H, C*H*OH), 6.94-6.99 (m, Ar-*H*), 7.12 (t, *J*=7.3Hz, 1H, Ar-*H*), 7.16 (d, *J*=7.3Hz, 2H, Ar-*H*), 7.22 (t, *J*=7.6Hz, 2H, Ar-*H*), 7.39 (d, *J*=7.2Hz, 2H, Ar-*H*), 7.47 (t, *J*=7.9Hz, 1H, Ar-*H*), 7.62 (dd, *J*=8.2, 1.5Hz, 1H, Ar-*H*), 7.66 (dd, *J*=7.7, 1.5 Hz, 1H, Ar-*H*); δ_C (75MHz; $CDCl_3$) 32.6 (C(*C*H_3)), 37.1 (*C*(CH_3), 39.0 (N*C*H) 39.0 (N*C*H_3), 72.0 (*C*HOH), 137.4, 138.6, 143.2, 144.3, 149.2, 155.2 (*C*=O); m/z (C.I.) 389 (100%, M^+); HRMS found: M^+ 389.2226 requires $C_{25}H_{28}N_2O_2$ 389.2224.

1-Methyl-3-phenyl-1-p-tolylurea **17a**



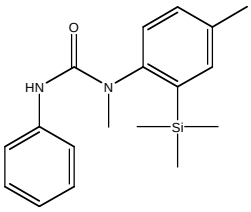
General procedure A was followed employing phenyl isocyanate (4.17 g, 35.0 mmol) and *p*-toluidine (4.20 g, 35.0 mmol) to obtain the product in 81 % yield (6.48 g, 27.0 mmol) as a pale yellow solid, m.p. 131 ℃; R_f (1:3 EtOAc:Petroleum ether) 0.25; $\nu_{max}(CHCl_3)/cm^{-1}$ 1648.5 (C=O); δ_H (300 MHz; $CDCl_3$) 2.46 (s, 3H, CH_3), 3.38 (s, 3H, NC*H*$_3$), 6.32 (bs, 1H, N*H*), 7.03 (tt, *J*=7.1, 1.4 Hz, 2H, ArC-*H*), 7.24-7.36 (m, 8H, Ar-*H*); δ_C ($CDCl_3$) 21.6 (ArC-*C*H_3), 37.7 (N-*C*H_3), 119.6, 123.2, 127.7, 129.2, 131.4, 138.4, 139.4, 140.6, 155.2 (*C*=O); m/z (C.I.) 241 (100%, M + H^+) ; HRMS found: M^+ 241.1334. $C_{15}H_{17}N_2O$ requires 241.1332.

1-Methyl-1-phenyl-3-p-tolylurea **17b**



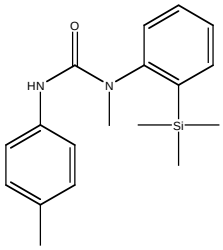
General procedure A was followed employing *p*-tolyl isocyanate (4.66 g, 35.0 mmol) and *N*-methylaniline (3.75 g, 35.0 mmol) to obtain the product in 77 % yield (6.48 g, 27.0 mmol) as a pale yellow solid, m.p. 109 ℃; R_f (1:3 EtOAc:Petroleum ether) 0.21; $\nu_{max}(CHCl_3)/cm^{-1}$ 1653.8 (C=O); δ_H (300 MHz; $CDCl_3$) δ_H (300 MHz; $CDCl_3$) 2.31 (s, 3H, CH_3), 3.39 (s, 3H, NC*H*$_3$), 6.23 (bs, 1H, N*H*), 7.10 (d, *J*=8.5 Hz, 2H, ArC-*H*), 7.22 (d, *J*=8.5 Hz, 1H, Ar-*H*), 7.38-7.44 (m, 4H, Ar-*H*), 7.53 (t, *J*=7.6 Hz, 1H, Ar-*H*); δ_C ($CDCl_3$) 21.1 (ArC-*C*H_3), 37.7 (N-*C*H_3), 119.8, 127.9, 128.2, 129.7, 130.7, 132.8, 136.7, 143.4, 155.0 (*C*=O); m/z (C.I.) 241 (100%, M + H^+) ; HRMS found: M^+ 241.1335. $C_{15}H_{17}N_2O$ requires 241.1332.

1-Methyl-1-(4-methyl-2-(trimethylsilyl)phenyl)-3-phenylurea **18a**



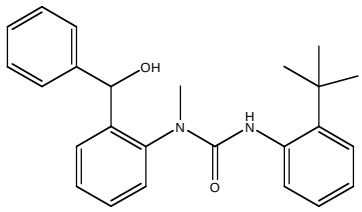
General procedure C was followed employing urea (0.100g, 0.416mmol), sBuLi (0.95 ml, 1.1M solution in cyclohexane, 1.040 mmol), and chlorotrimethylsalene (0.13 ml, 1.04 mmol) to obtain the product in 54% yield (0.085g, 0.272 mmol) as a white solid, m.p. ℃; R_f (1:3 EtOAc:Petroleum ether) 0.26; $\nu_{max}(CHCl_3)/cm^{-1}$ 3422 (NH), 1684 (C=O); δ_H (300 MHz; $CDCl_3$) 0.35 (s, 9H, $SiCH_3$), 2.43 (s, 3H, ArC-C*H*$_3$), 3.29 (s, 3H, NC*H*$_3$), 6.02 (bs, 1H, N*H*), 7.02 (tt, *J*=6.5, 1.8 Hz, 1H, ArC-*H*), 7.20 (d, *J*=7.9 Hz, 1H, Ar-*H*), 7.25-7.32 (m, 4H, Ar-*H*), 7.35 (dd, *J*=7.9, 2.2 Hz, 1H, Ar-*H*), 7.47 (dd, *J*=2.2 Hz, 1H, Ar-*H*); δ_C ($CDCl_3$) –0.04 ($Si(CH_3)_3$), 21.0 (ArC-*C*H_3), 38.3 (N-*C*H_3), 119.6, 128.5, 128.8, 129.5, 131.8, 132.6 (ArC-*H*), 136.4 (Ar*C*-CH_3), 137.0 (Ar*C*-Si), 140.7 (Ar*C*-NH), 147.9 (Ar*C*-NCH_3), 155.5 (*C*=O); m/z (C.I.) 313 (100%, M + H^+) ; HRMS found: M^+ 313.1732. $C_{18}H_{24}N_2OSi$ requires 313.1731.

1-Methyl-1-(2-(trimethylsilyl)phenyl)-3-p-tolylurea **18b**



General procedure C was followed employing urea (0.100g, 0.416mmol), sBuLi (0.95 ml, 1.1M solution in cyclohexane, 1.040 mmol), and chlorotrimethylsalene (0.13 ml, 1.04 mmol) to obtain the product in 46% yield (0.060g, 0.19 mmol) as a white solid, m.p. ℃; R_f (1:3 EtOAc:Petroleum ether) 0.25; $\nu_{max}(CHCl_3)/cm^{-1}$ 3425 (NH), 1684 (C=O); δ_H (300 MHz; $CDCl_3$) 0.33 (s, 9H, $SiCH_3$), 2.29 (s, 3H, ArC-C*H*$_3$), 3.28 (s, 3H, NC*H*$_3$), 5.87 (bs, 1H, N*H*), 7.04 (d, *J*=8.6 Hz, 2H, Ar-*H*), 7.18 (d, *J*=8.6 Hz, 2H, Ar-*H*), 7.30 (dd, *J*=7.6, 1.4 Hz, 1H, Ar-*H*), 7.45 (td, *J*=7.4, 1.4 Hz, 1H, Ar-*H*), 7.55 (td, *J*=7.4, 1.8 Hz, 1H, Ar-*H*), 7.70 (dd, *J*=7.4, 1.8 Hz, 1H, Ar-*H*); δ_C ($CDCl_3$) –0.04 ($Si(CH_3)_3$), 21.0 (ArC-*C*H_3), 38.3 (N-*C*H_3), 119.6, 128.5, 128.8, 129.5, 131.8, 132.6 (ArC-*H*), 136.4 (Ar*C*-CH_3), 137.0 (Ar*C*-Si), 140.7 (Ar*C*-NH), 147.9 (Ar*C*-NCH_3), 155.5 (*C*=O); m/z (C.I.) 313 (100%, M + H^+) ; HRMS found: M^+ 313.1726. $C_{18}H_{24}N_2OSi$ requires 313.1731.

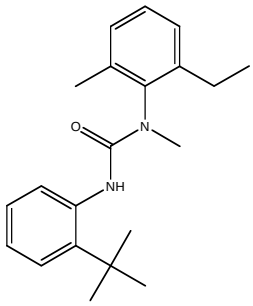
3-(2-*tert*-Butylphenyl)-1-(2-(hydroxy(phenyl)methyl)phenyl)-1-methylurea **19**



By general procedure C, 3-(2-*tert*-butylphenyl)-1-methyl-1-phenylurea **12h** (0.100 g, 0.35 mmol), sBuLi (1.3M solution in cyclohexane, 0.68 ml, 0.89 mmol, 2.5 equiv.) and benzaldehyde (0.09ml, 0.89 mmol, 2.5 equiv.) gave a compound tentatively identified as **20** in 14% yield (0.016g, 0.04 mmol) as a 1:2 mixture of conformers. R_f (1:3 EtOAc:Petrol) 0.09; Major conformer δ_H (300 MHz; $CDCl_3$) 1.11 (s, 9H, C(C*H*$_3$)$_3$), 1.24 (s, 1H, O*H*), 2.84 (s, 3H, NC*H*$_3$), 6.13 (s, 1H C*H*COH), 6.36 (bs, 1H, N*H*), 7.06 (t, *J*=7.2 Hz, 1 H, Ar-*H*), 7.08-7.14 (m, 1H, Ar-*H*), 7.18 (t, *J*=7.4 Hz, 1H, Ar-*H*), 7.24 (t, *J*=7.0 Hz, 1H, Ar-*H*), 7.30-7.38 (m, 5H, Ar-*H*), 7.45 (m, 2H, Ar-*H*), 7.75-7.78 (m, 1H, Ar-*H*), 7.86-7.91 (m, 1H, Ar-*H*); minor conformer 0.95 (s, 9H, C(C*H*$_3$)$_3$), 1.18 (s, 1H, O*H*), 3.33 (s, 3H, NC*H*$_3$), 6.08 (s, 1H C*H*COH), 5.80 (bs, 1H, N*H*), 6.97 (t, *J*=7.0Hz, 1H, Ar-*H*), 7.08-7.14 (m, 1H, Ar-*H*), 7.18 (t, *J*=7.4 Hz, 1H,

Ar-*H*), 7.24 (t, *J*=7.0 Hz, 1H, Ar-*H*), 7.30-7.38 (m, 5H, Ar-*H*), 7.45 (m, 2H, Ar-*H*), 7.56 (d, *J*=6.9 Hz, 1H, Ar-*H*), 7.86-7.91 (m, 1H, Ar-*H*); m/z (C.I.) 389 ; HRMS found: M^+ 389.2222. $C_{25}H_{28}N_2O_2$ requires 389.2224.

3-(2-tert-Butyl-6-methylphenyl)-1-(2-ethyl-6-methylphenyl)-1-methylurea **20**



General Procedure C was employed using 3-(2-*tert*-butylphenyl)-1-methyl-1-(2,6-dimethylphenylurea) (0.100g, 0.344 mmol), sBuLi (0.66ml, 0.86mmol) and MeI (0.03 ml, 0.073 g, 0.86 mmol, 1.5 equiv.) To give a crude purified by column chromatography to afford the desired product as a white solid in 64% yield (0.071 g, 0.22 mmol), m.p. 123 ℃; R_f (1:3; EtOAc:Petroleum ether) 0.26 ; $\nu_{max}(CHCl_3)/cm^{-1}$ 1648 (C=O) ; δ_H (300 MHz; $CDCl_3$) 1.03 (s, 9H, CC*H*$_3$), 1.27 (t, *J*= 7.6 Hz, 3H, CH_2CH_3), 2.39 (s, 3H, ArC-C*H*$_3$), 2.74 (dq, *J*= 9.5, 7.6 Hz, 2H, CH_2CH_3), 3.30 (s, 3H, NC*H*$_3$), 6.18 (bs, 1H, N*H*), 7.02 (td, *J*= 7.6, 1.5 Hz, 1H, Ar-*H*), 7.20-7.30 (m, 5H, Ar-*H*), 8.00 (dd, *J*= 8.1, 1.5 Hz, 1H, Ar-*H*); δ_C (75MHz; $CDCl_3$) 14.8 (CH_2CH_3), 18.2 (ArC-CH_3) 24.2 (ArC-CH_2CH_3), 30.2 ($C(CH_3)_3$), 34.1 ($C(CH_3)_3$), 35.3 (NCH_3), 123.9, 124.3, 126.4, 127.1, 127.7, 129.2, 129.6 (Ar*C*-H), 137.4, 139.6, 139.0, 139.7, 143.5, 155.0 (*C*=O); m/z (C.I.) 326 (100%, M + H^+) ; HRMS found: M^+ 325.2270. $C_{21}H_{28}N_2O$ requires 325.2274.

References:

1. Mido, Y.; Okuno, T. *J. Mol. Struc.* **1982**, 29

2. Miyahara, M. *Chem. Pharm. Bull.* **1986**, 1950

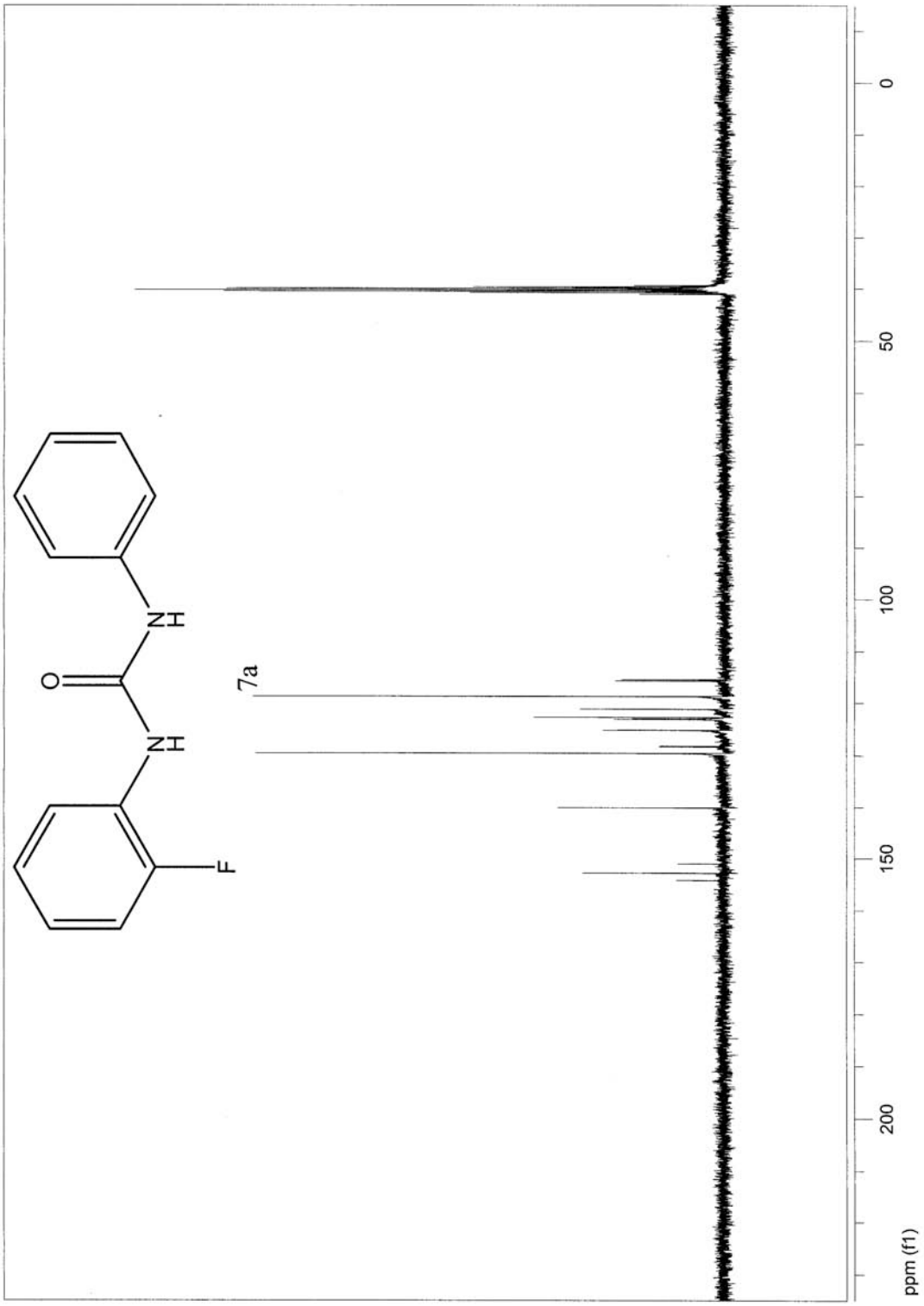
3. *Bull. Soc. Chim. Fr.* **1919**, 321

Spectra

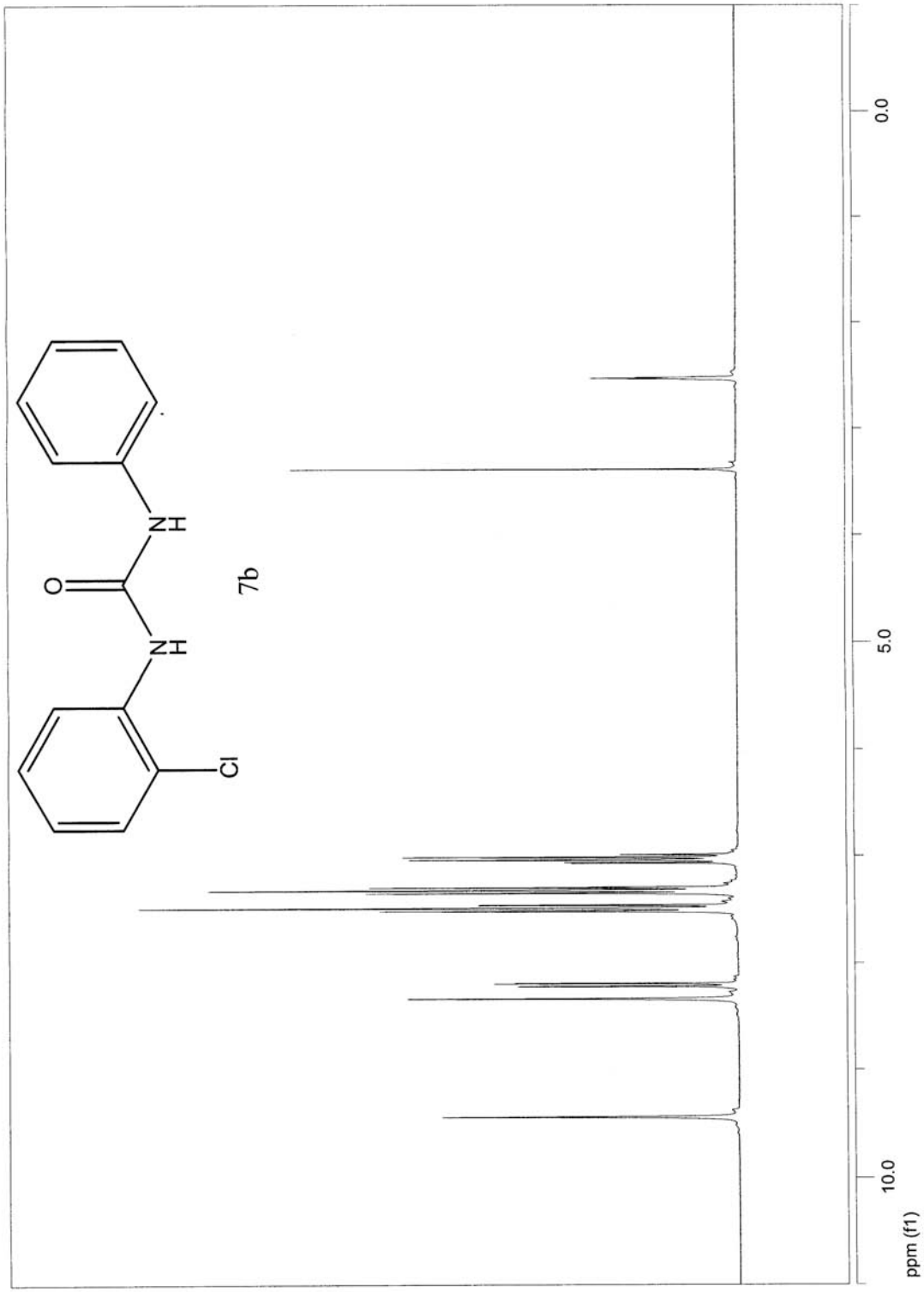
NMR spectra of **7** were determined out in DMSO at room temperature; the ^{1}H NMR spectrum of **11e** was determined in d_6-toluene at –80 °C. All other NMR spectra were determined in $CDCl_3$ at room temperature. ^{1}H NMR was carried out at 300 MHz; ^{13}C NMR was carried out at 75 MHz.

7a - H

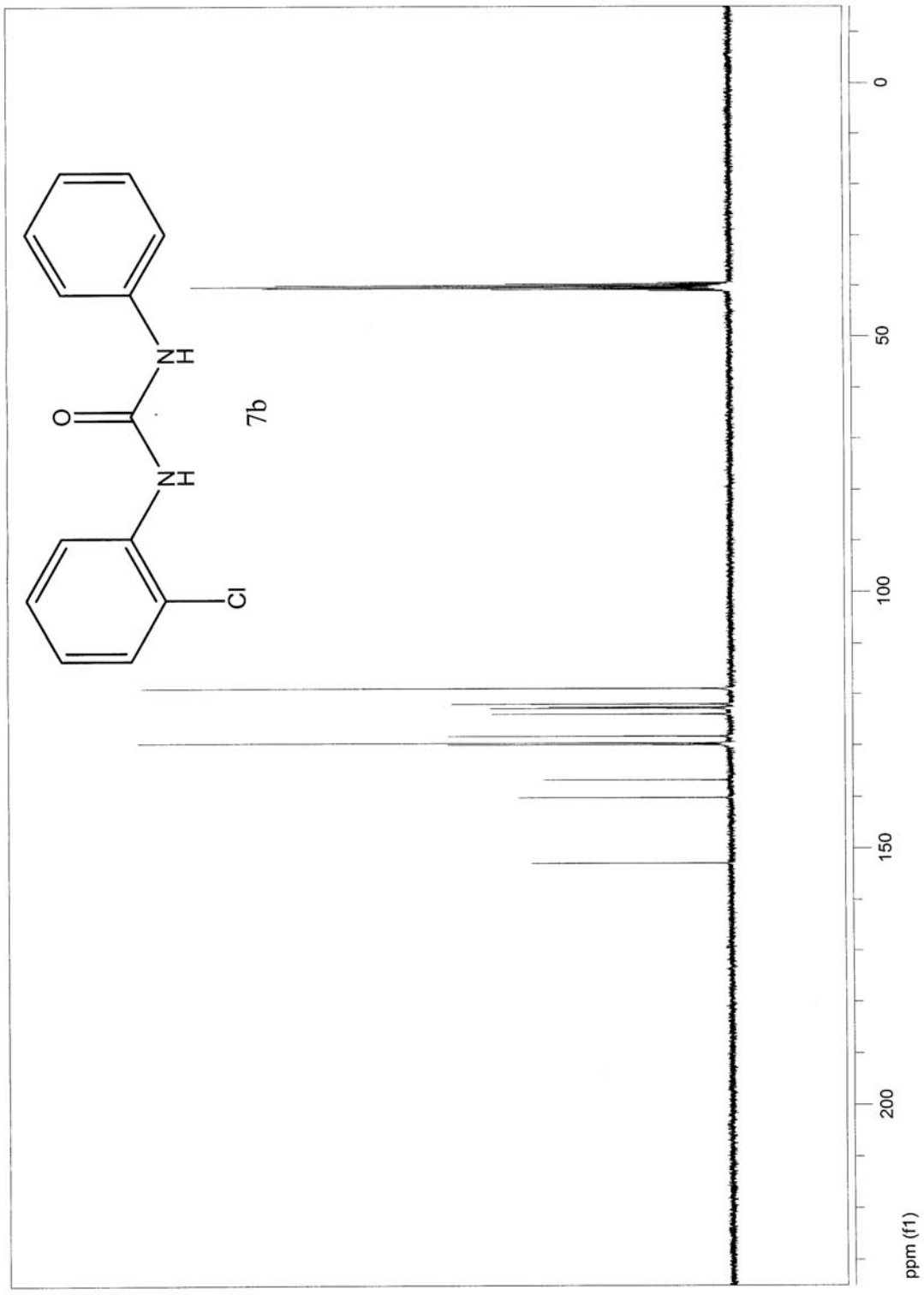
7a - C



7b – H



7b - C



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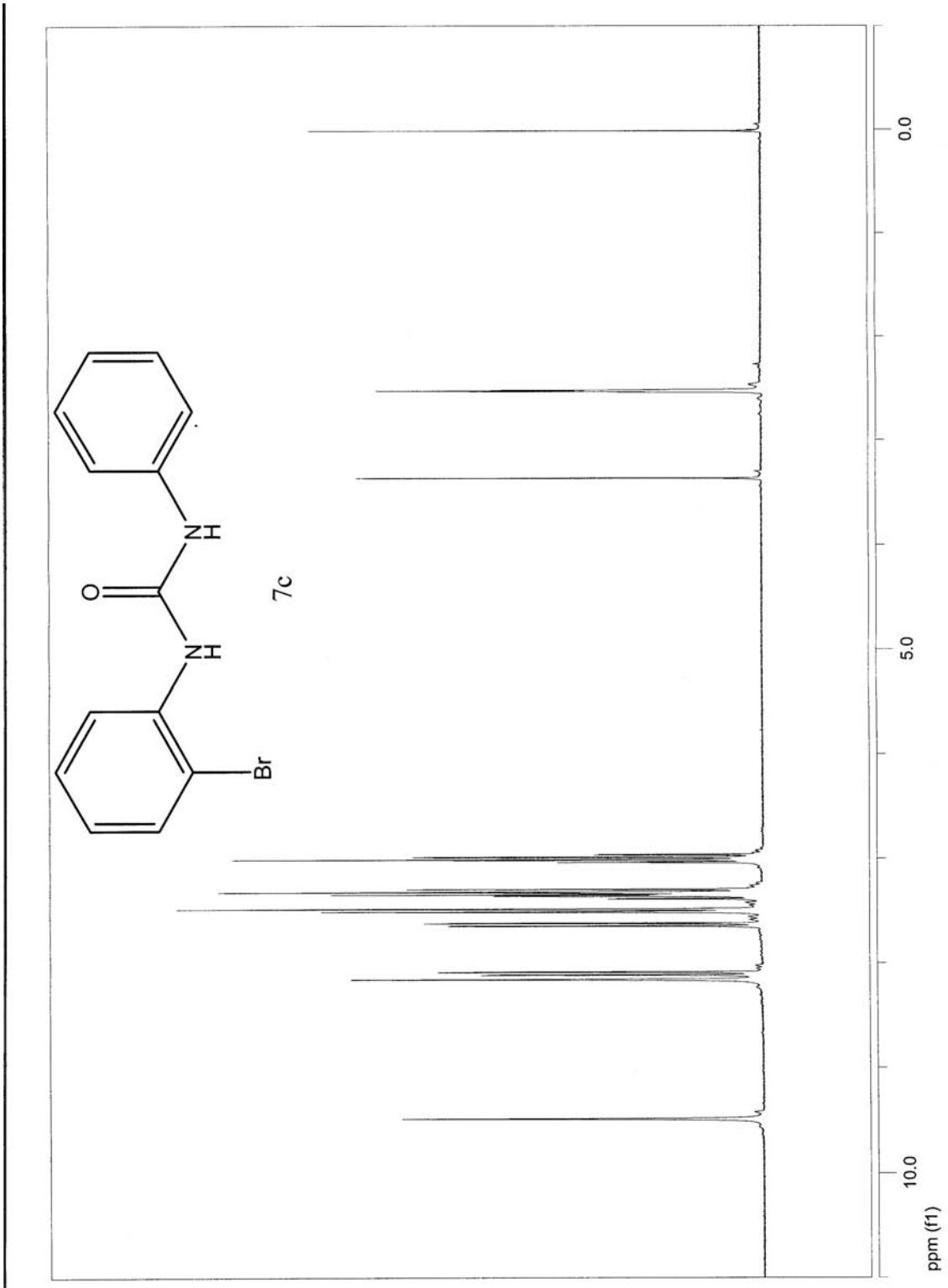
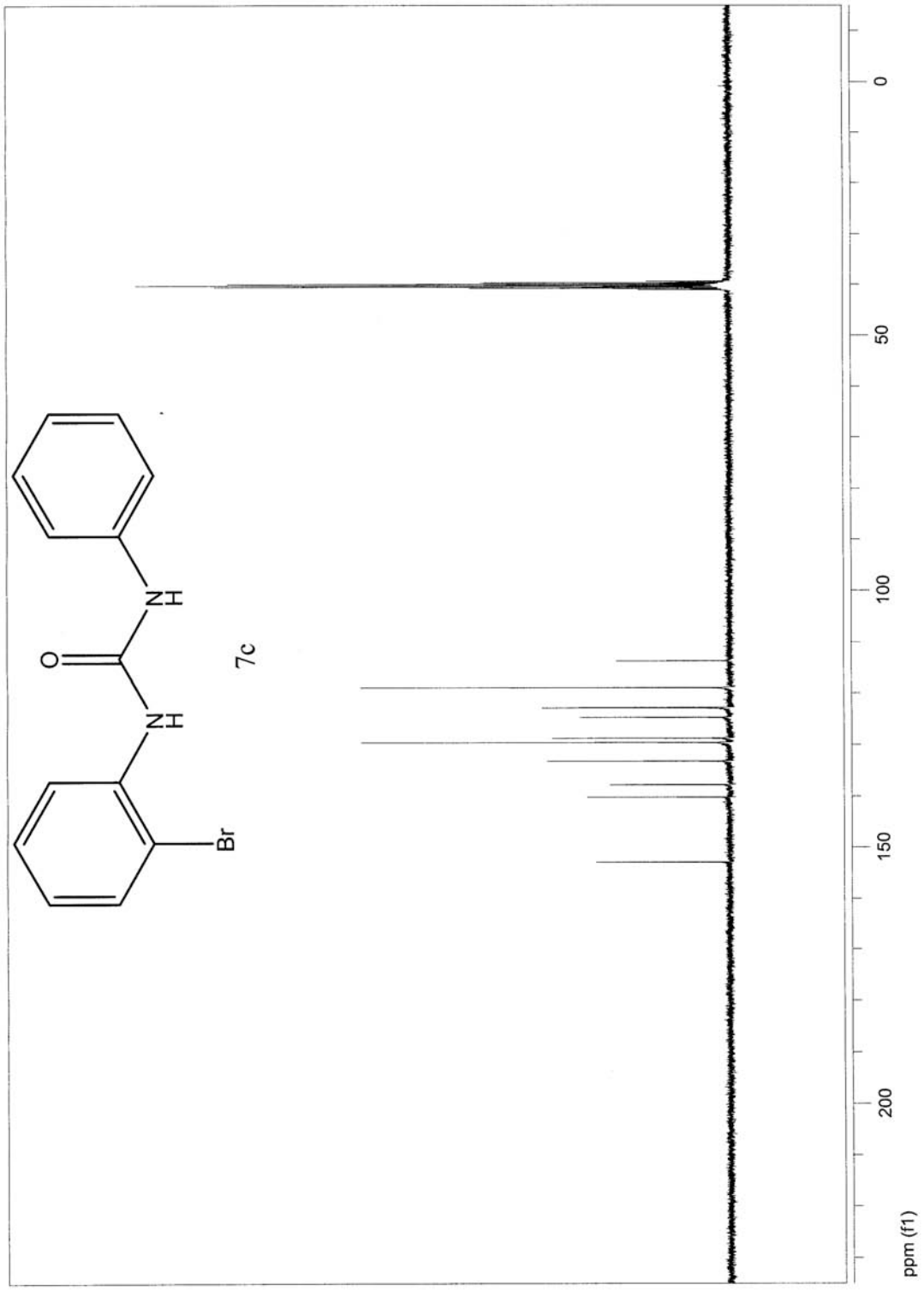
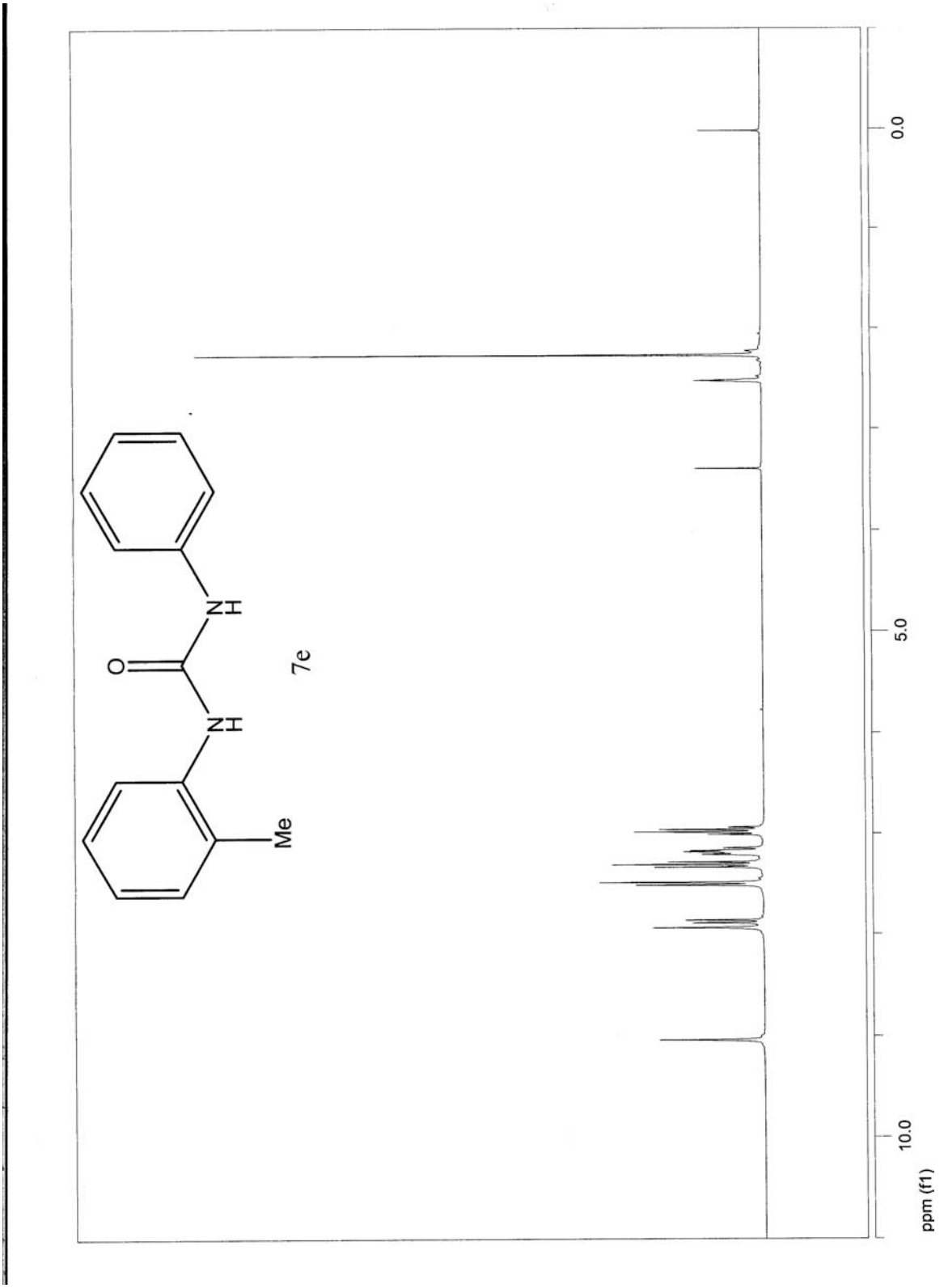


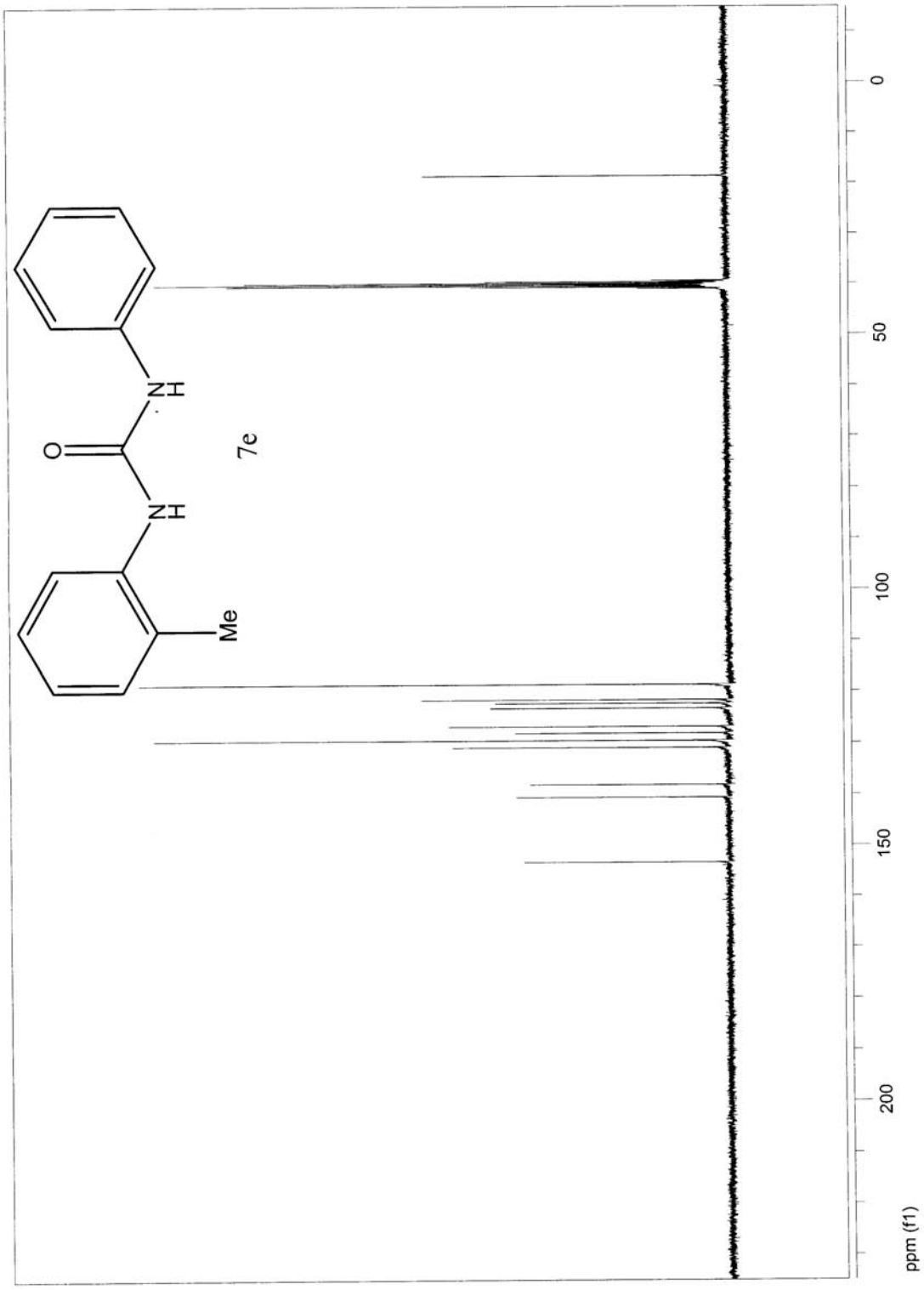
7c - C



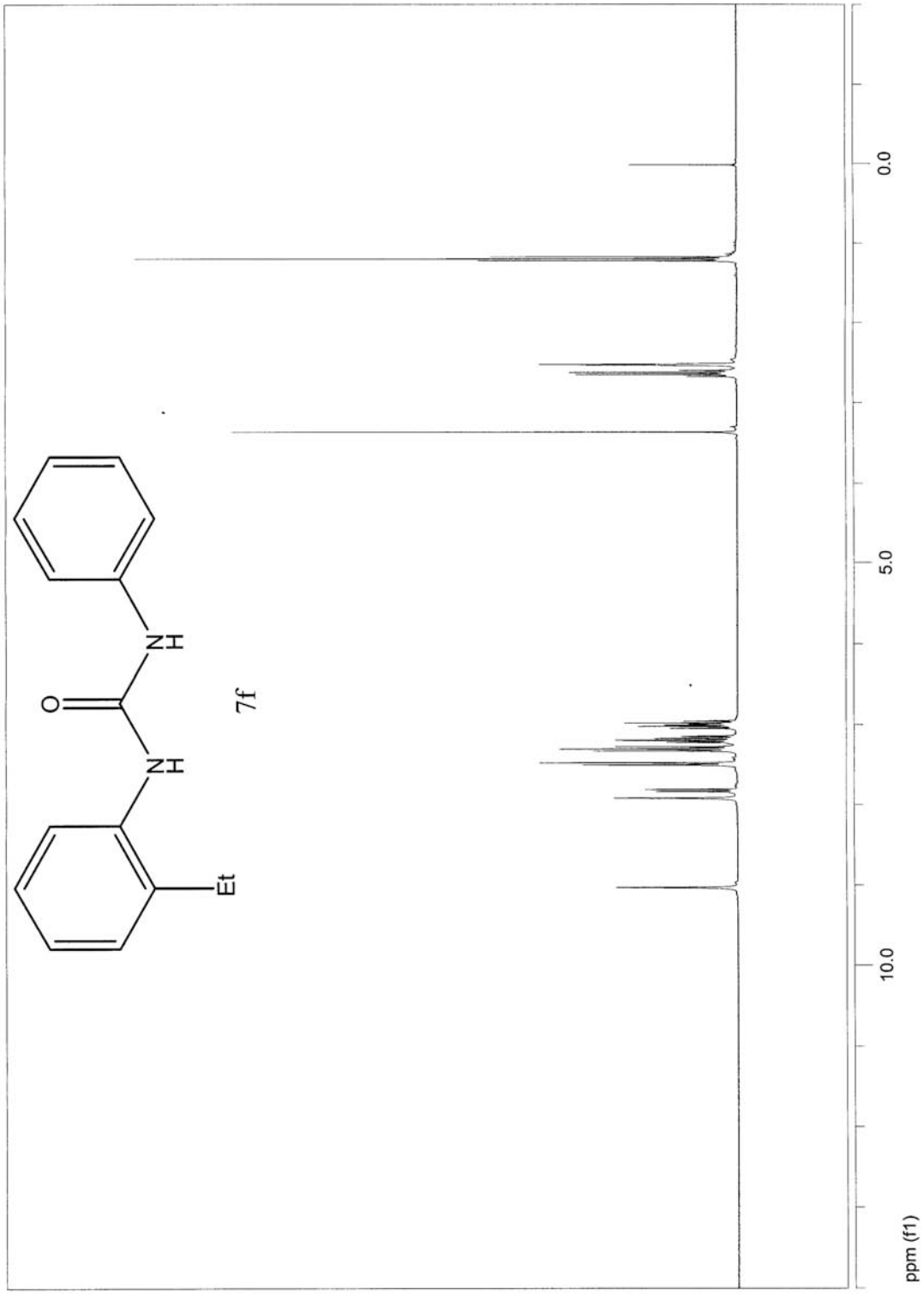
7e - H



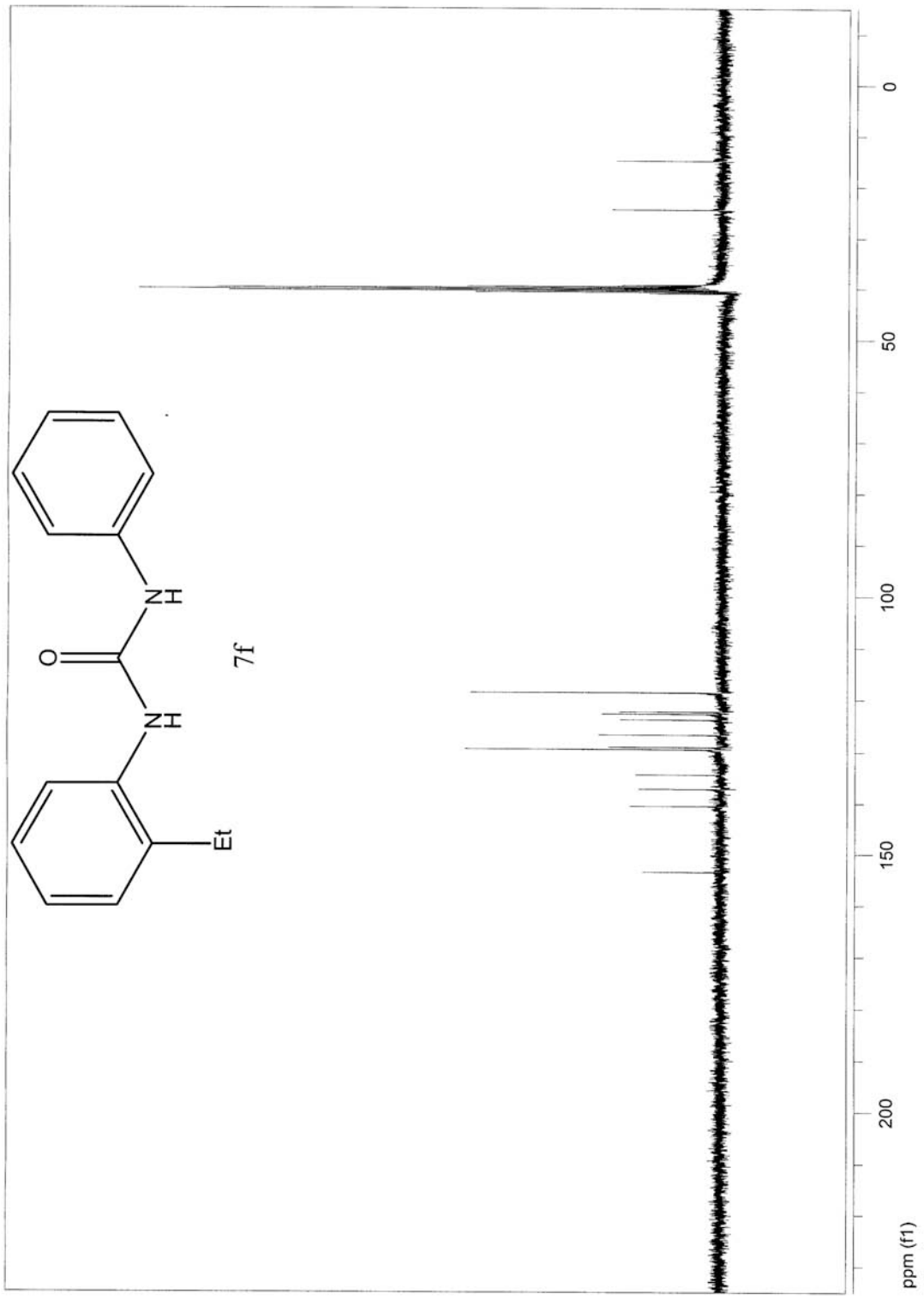
7e - C



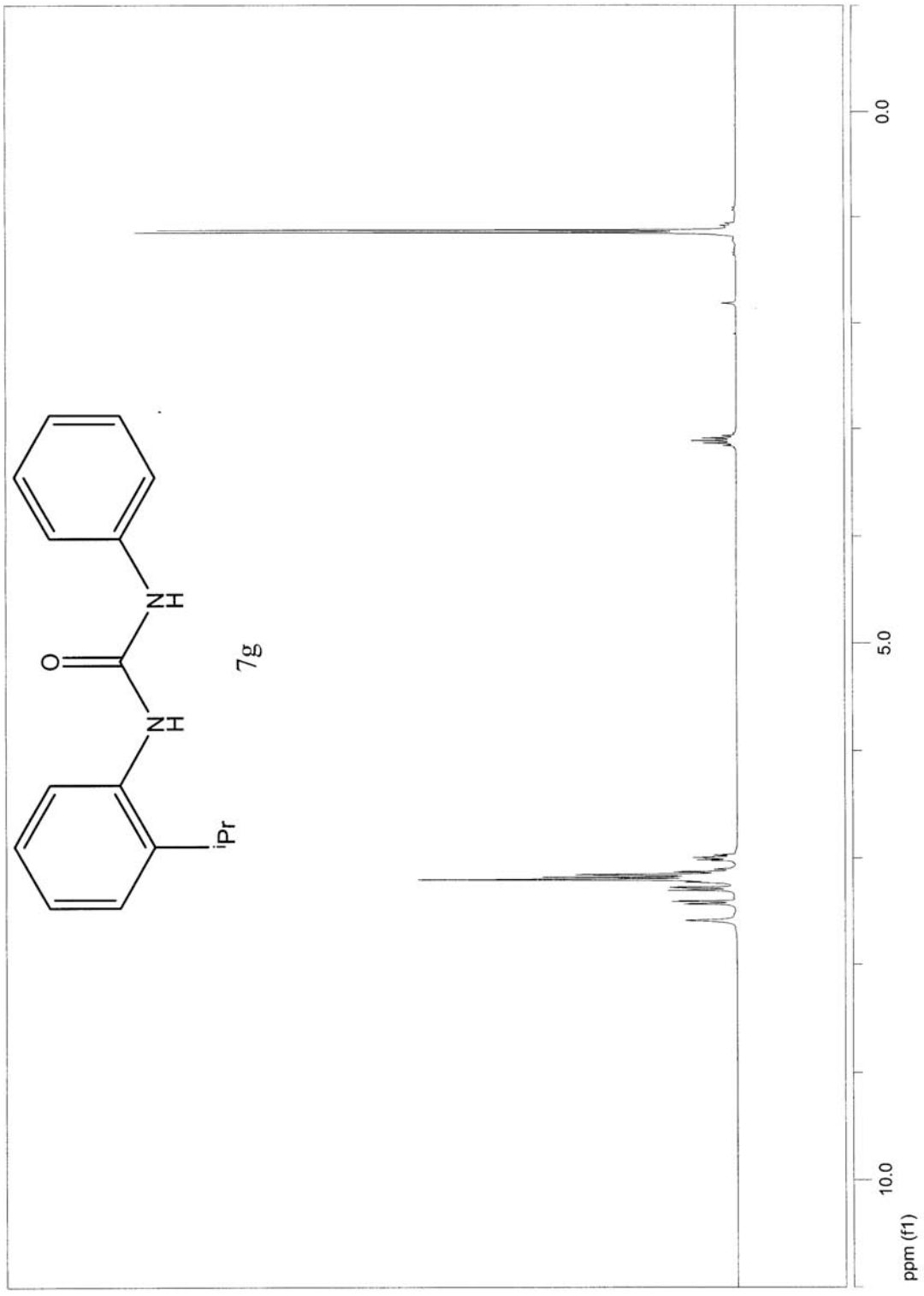
7f - H



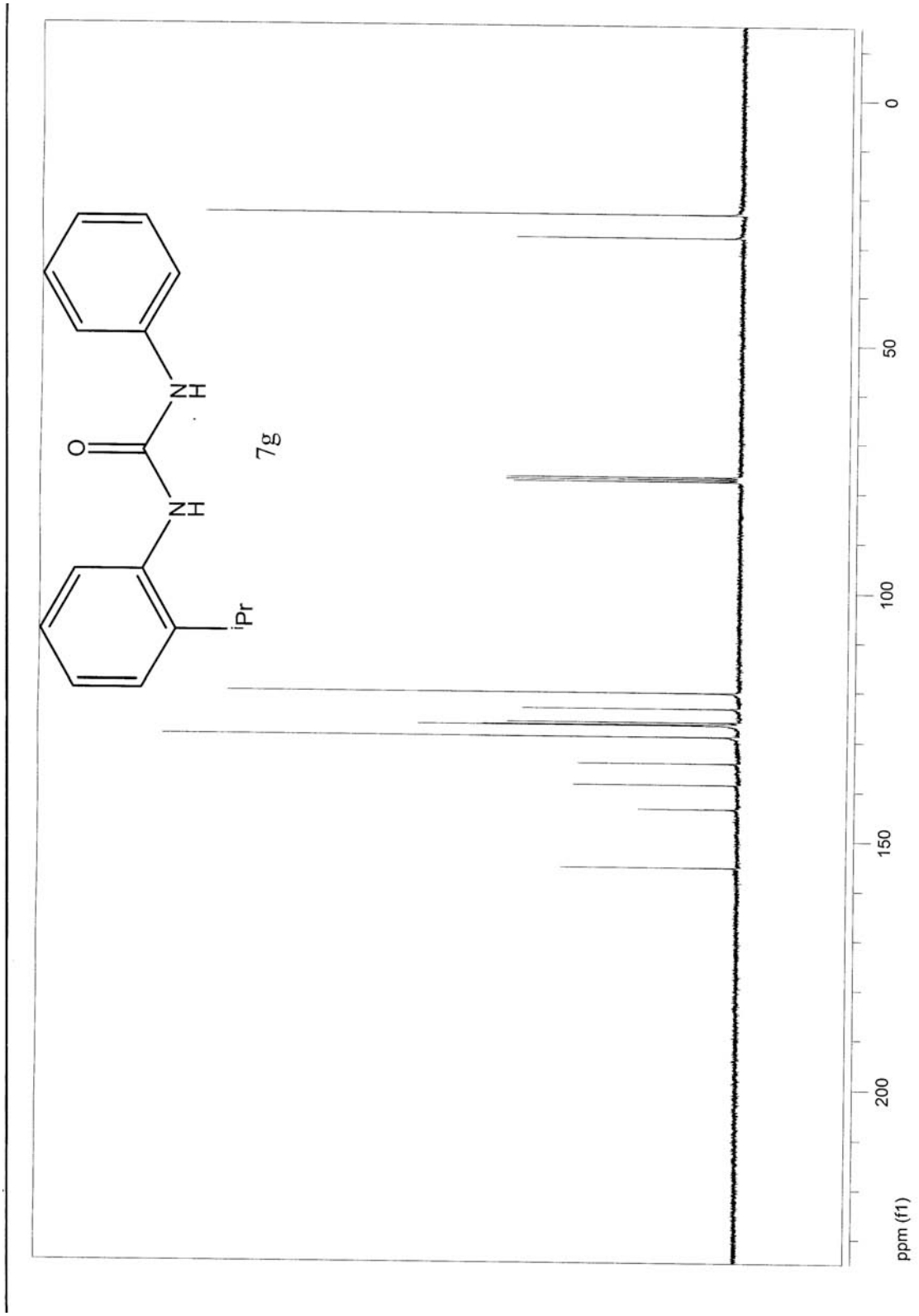
7f - C



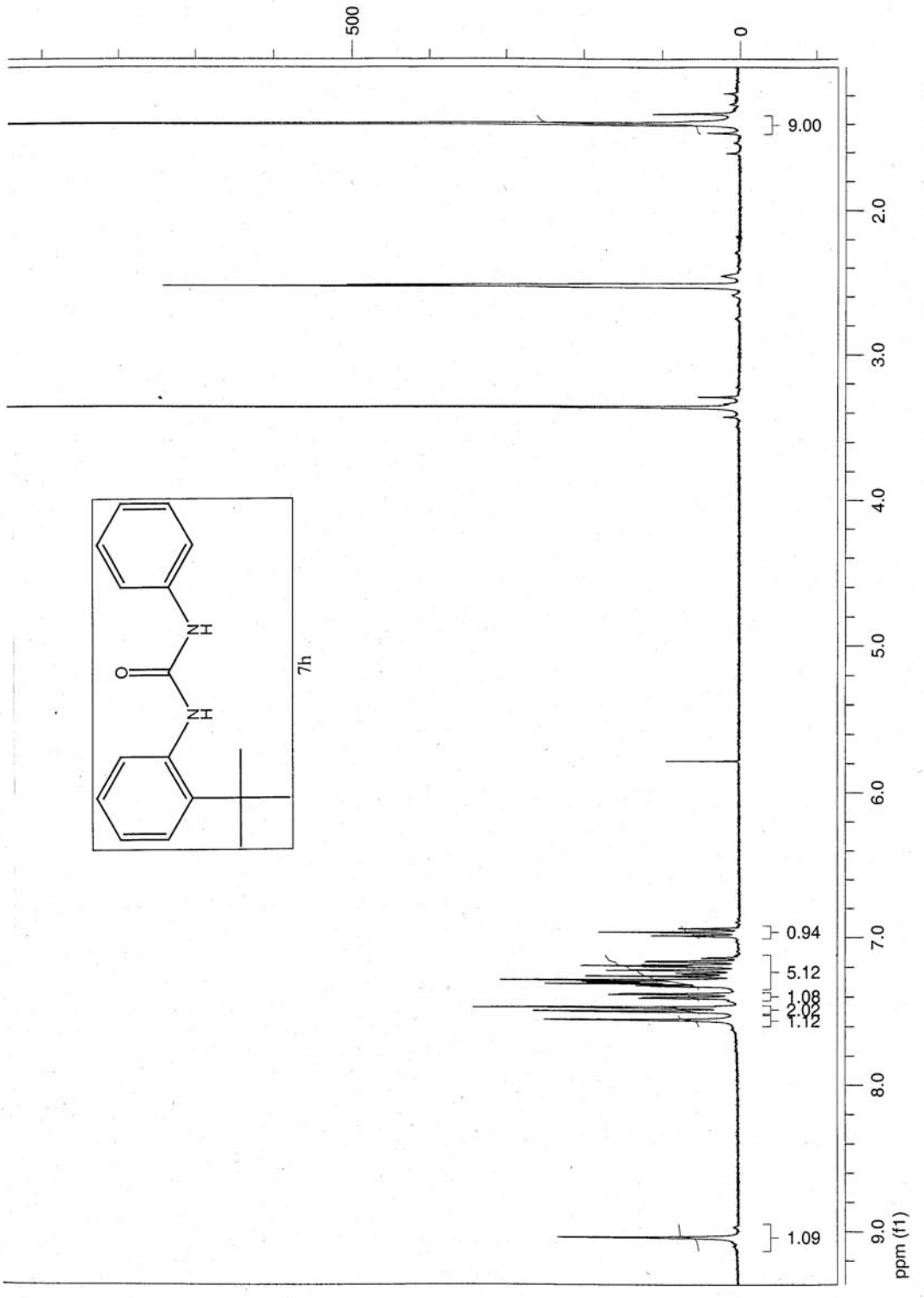
7g - H



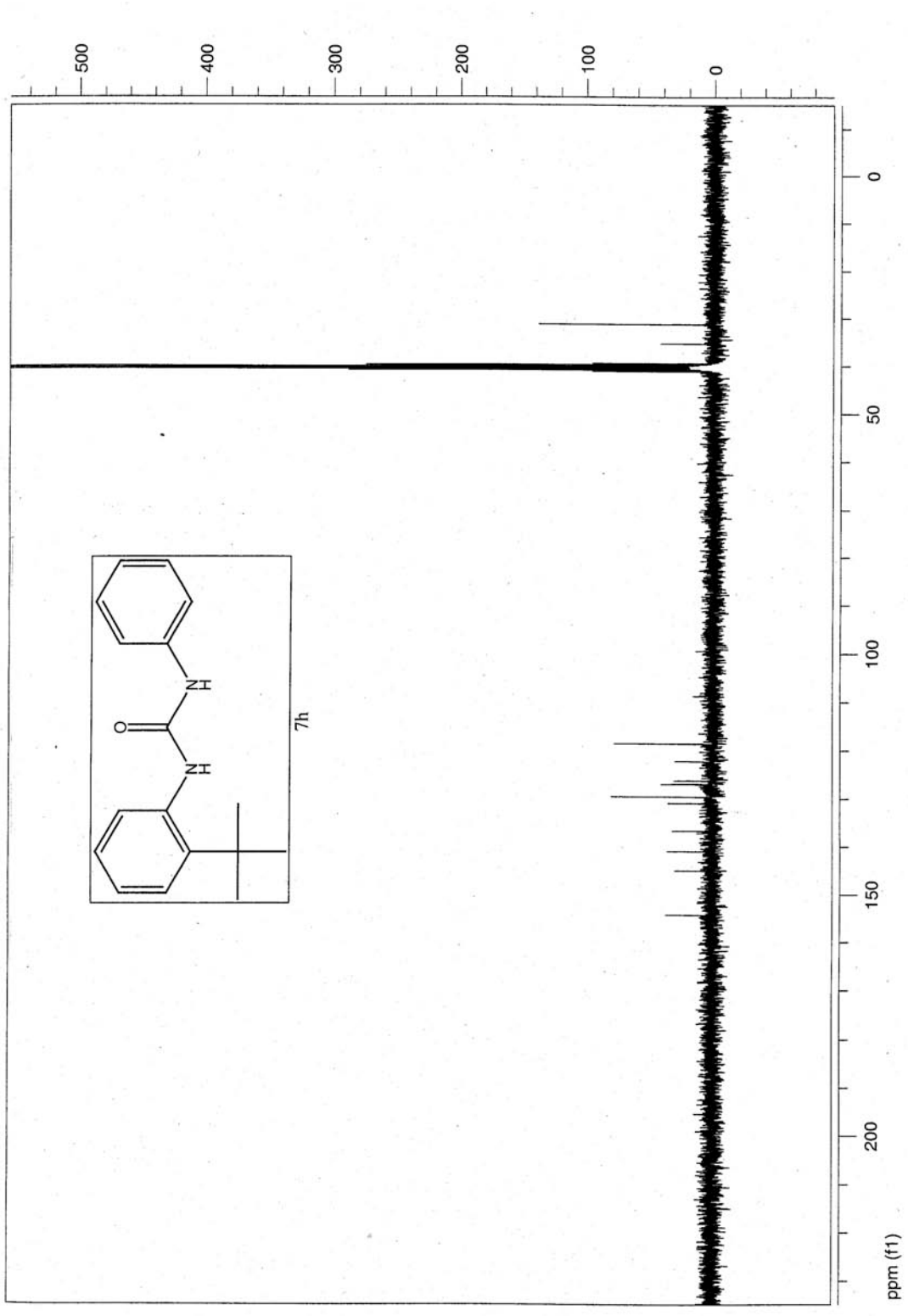
7g - C



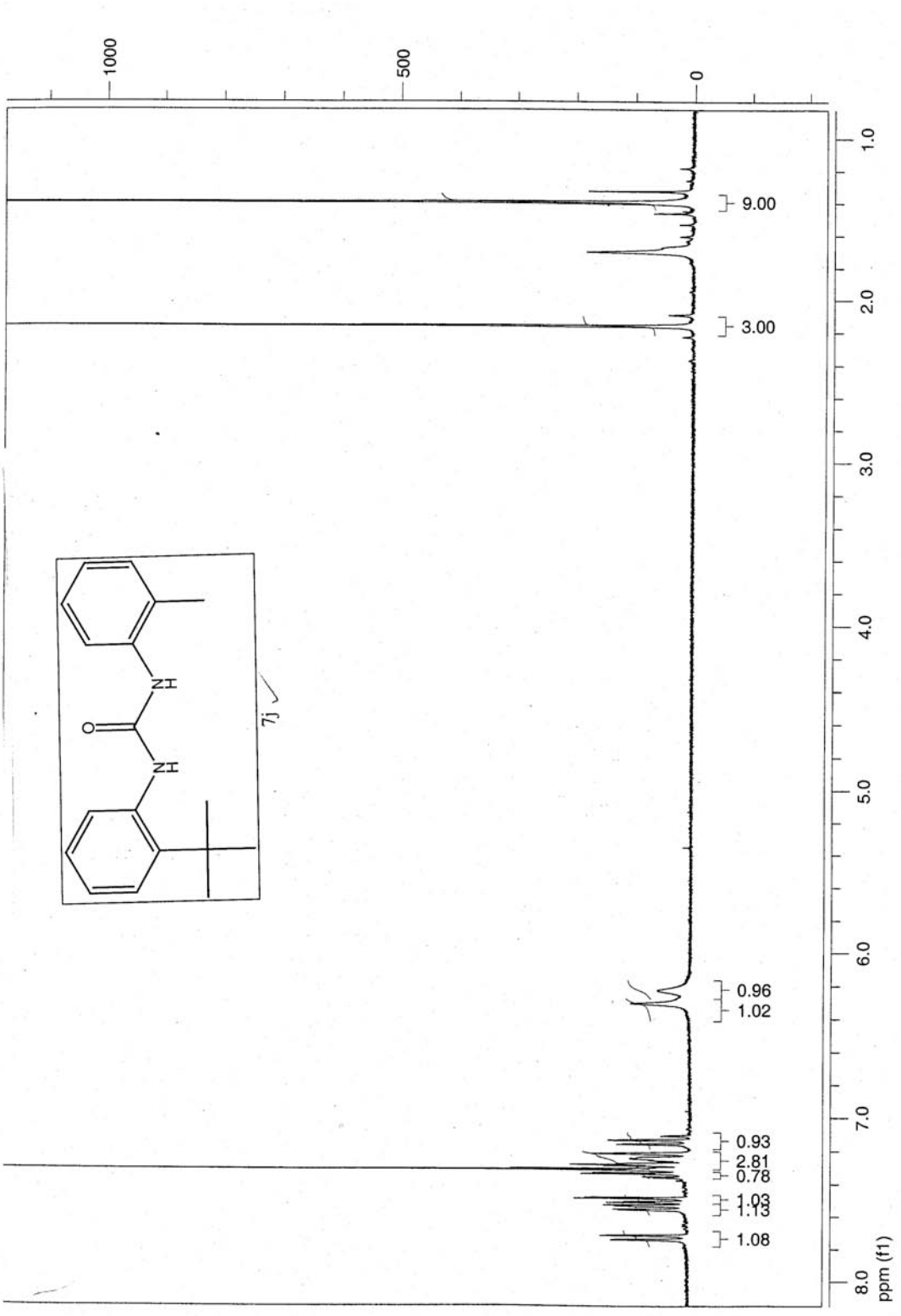
7h – H



7h - C



7j - H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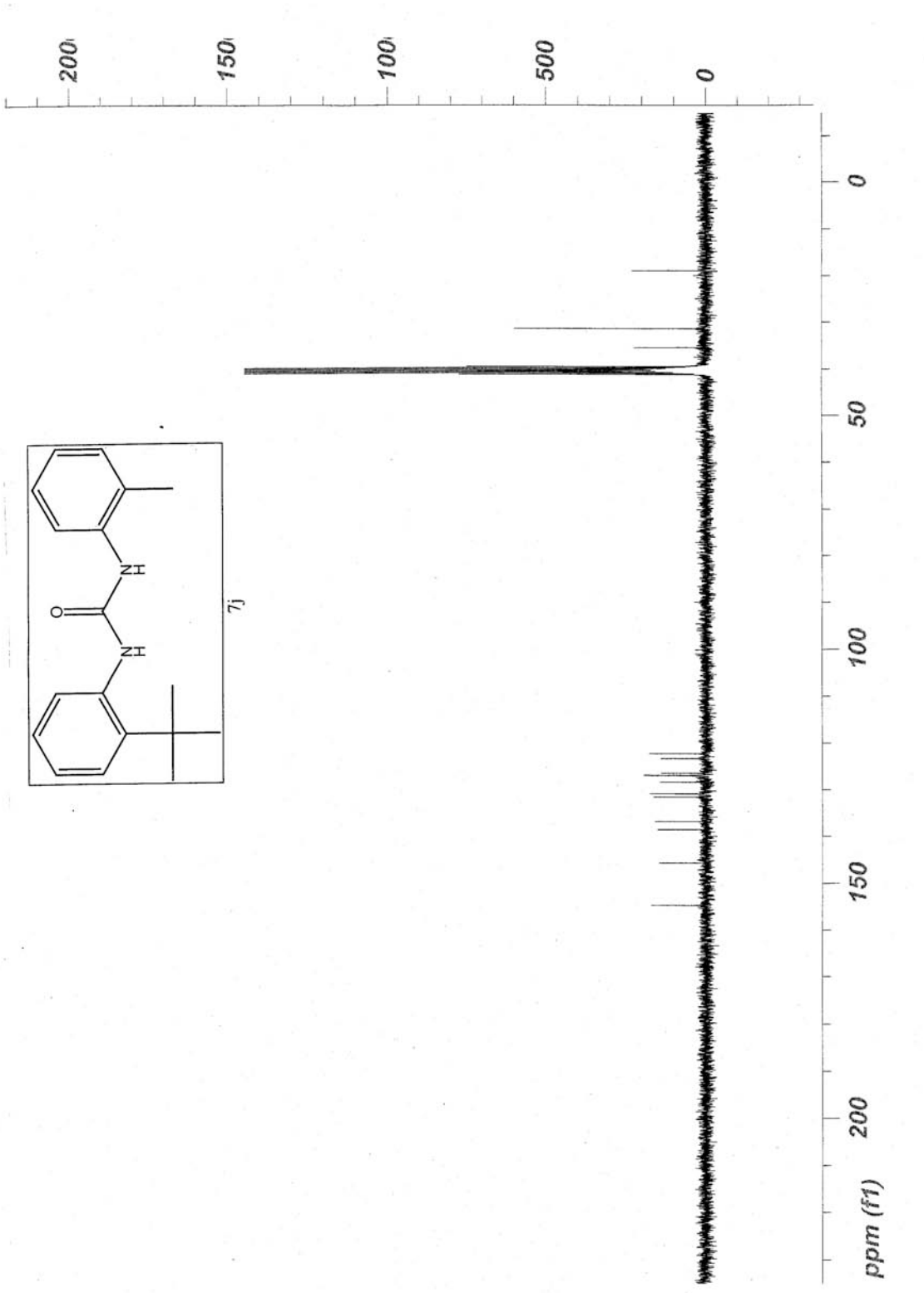
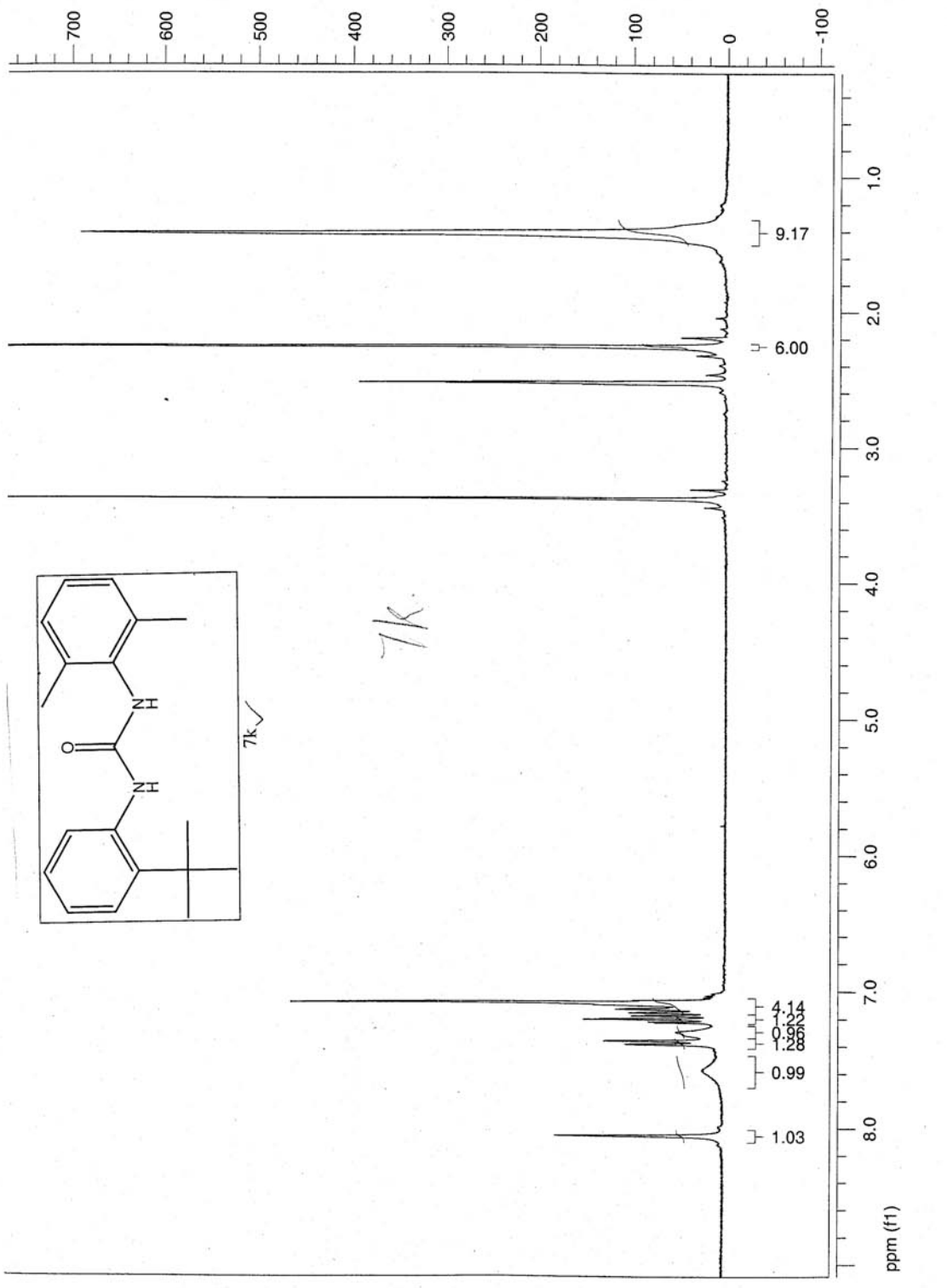
3.0
4.0
5.0
6.0
7.0
8.0
ppm (f1)
NH
O
NH
7j

7j - C



7k - H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4.14
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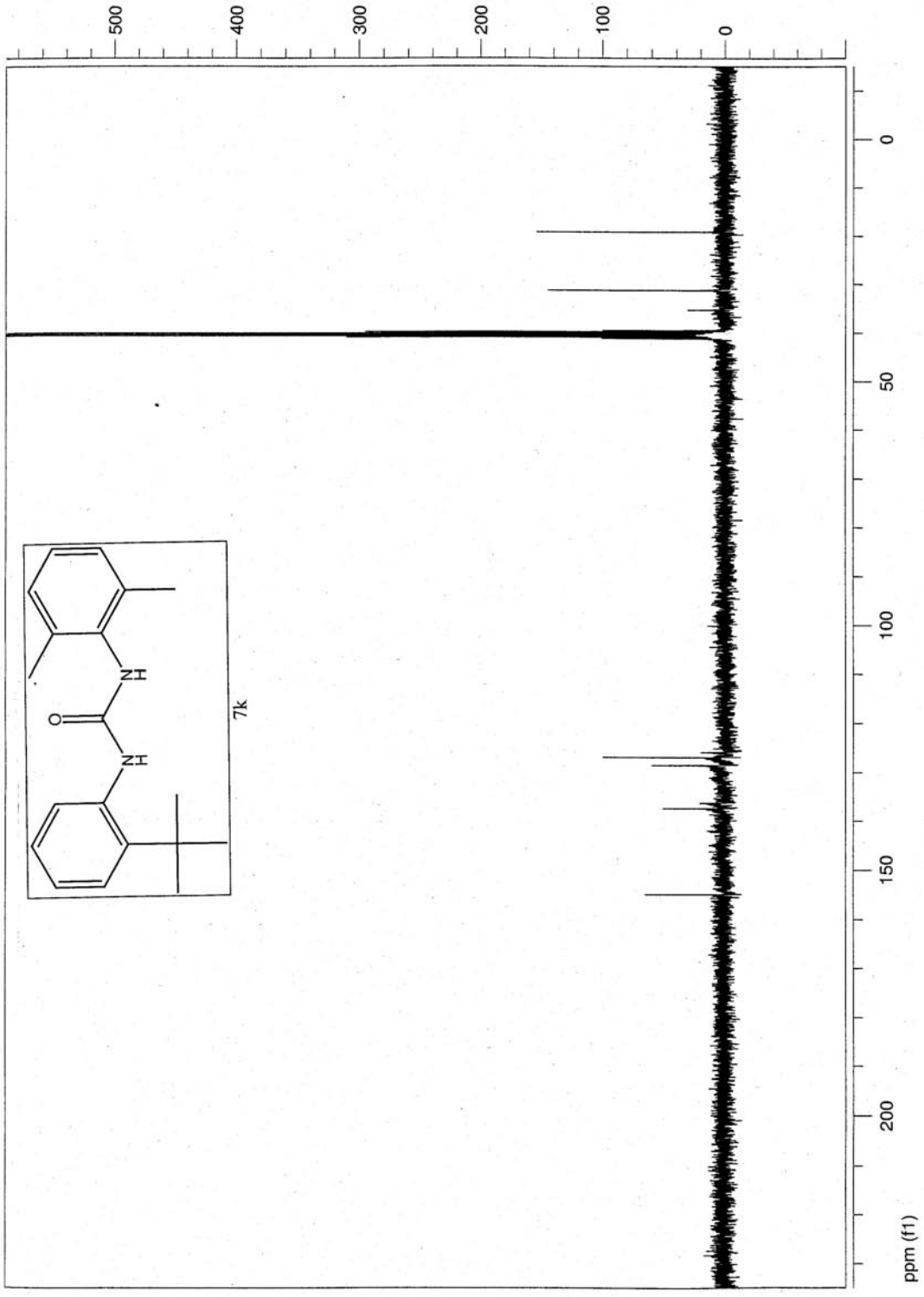
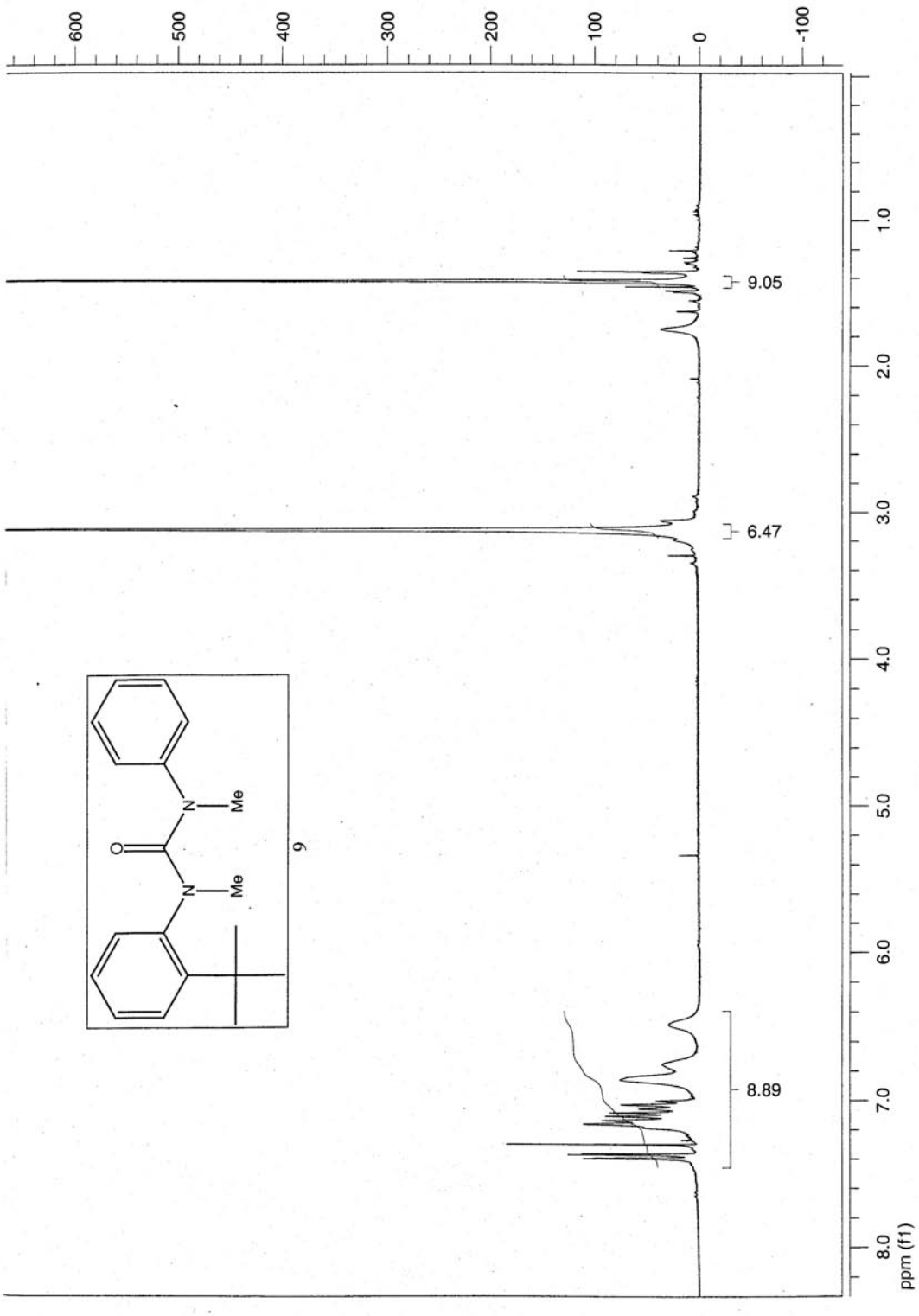
1.28
0.99
1.03
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
ppm (f1)
7k
11k

7k - C



9 - H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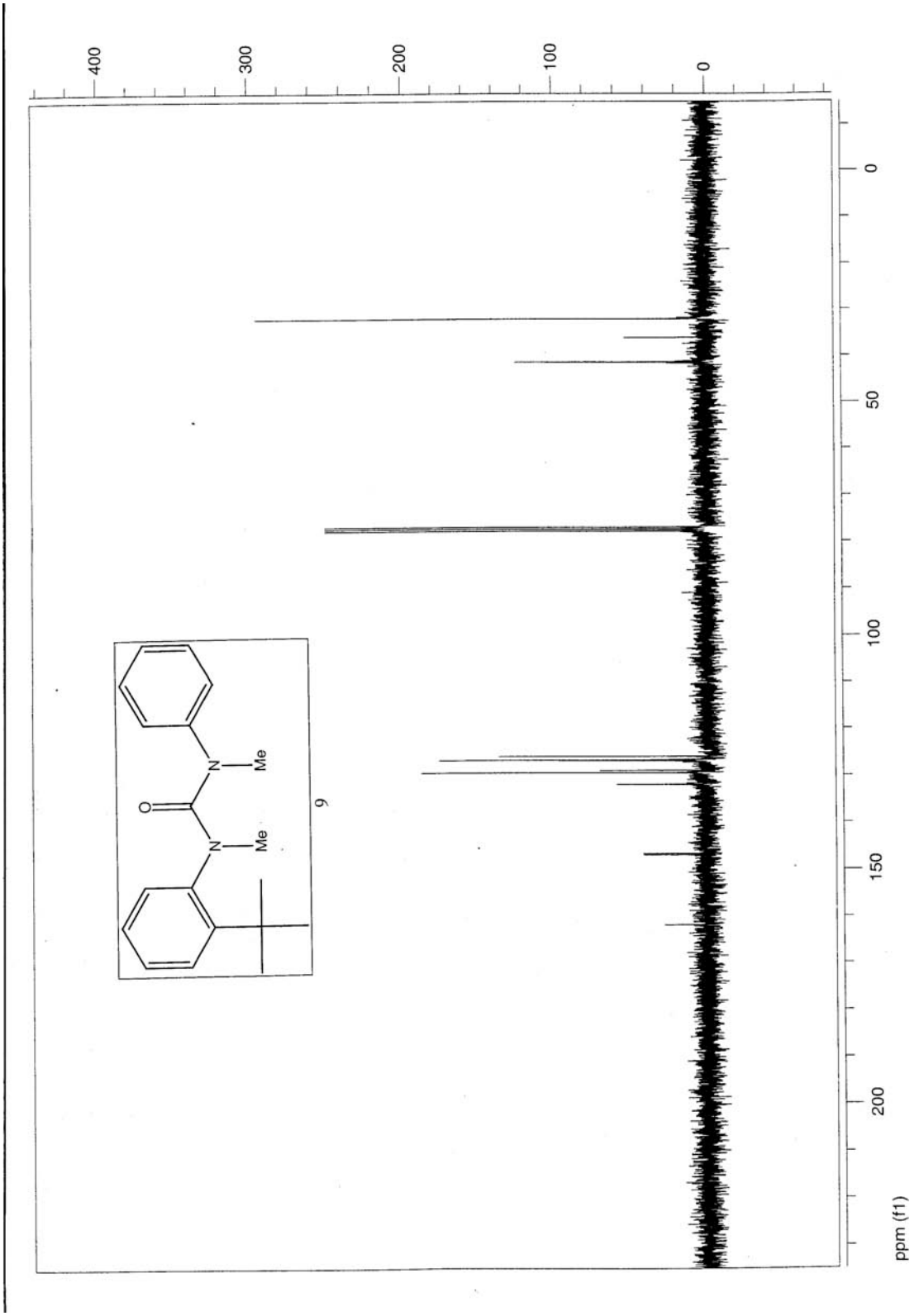
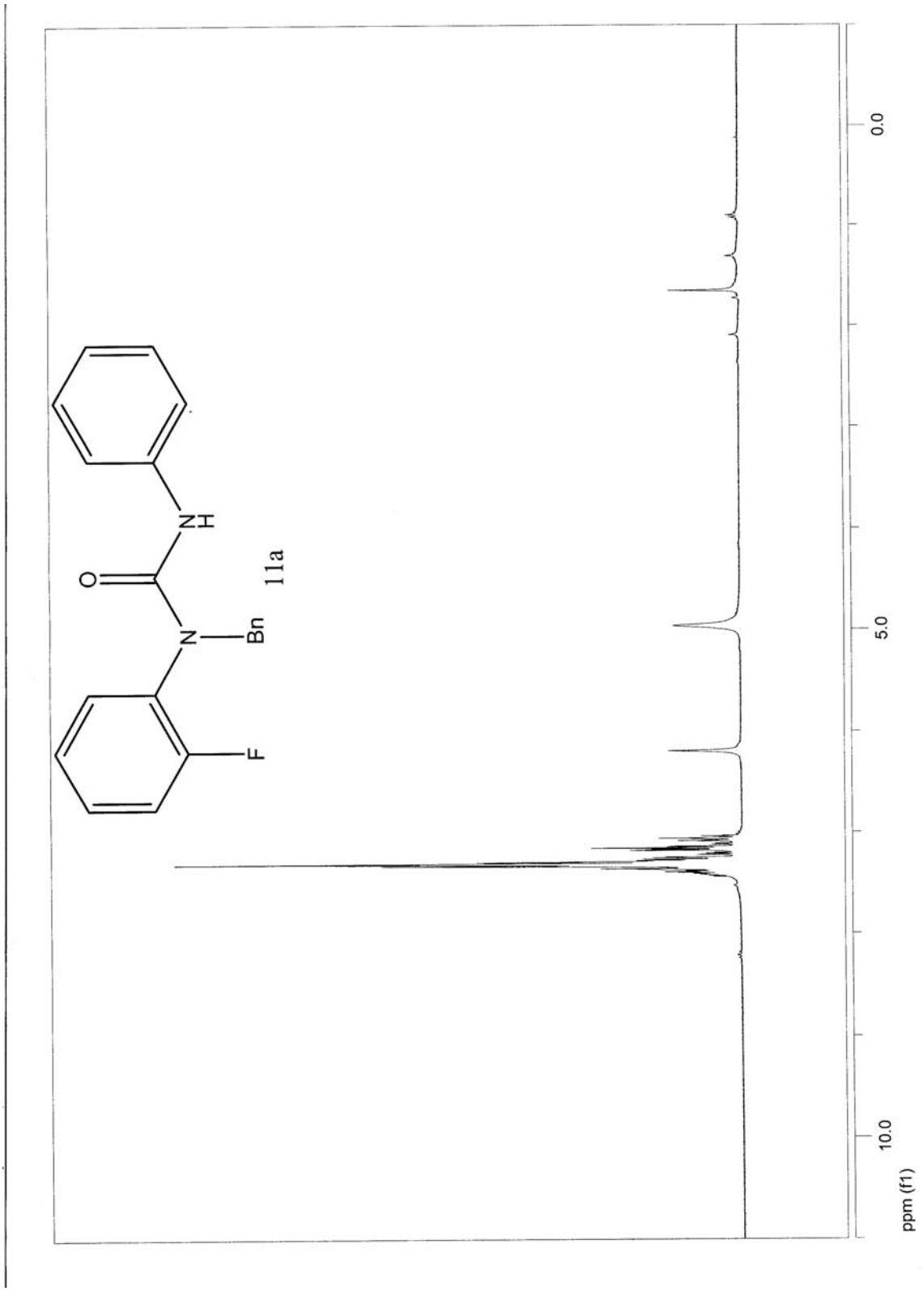
6.0
7.0
8.0
ppm (f1)
N
Me
O
N
Me
9

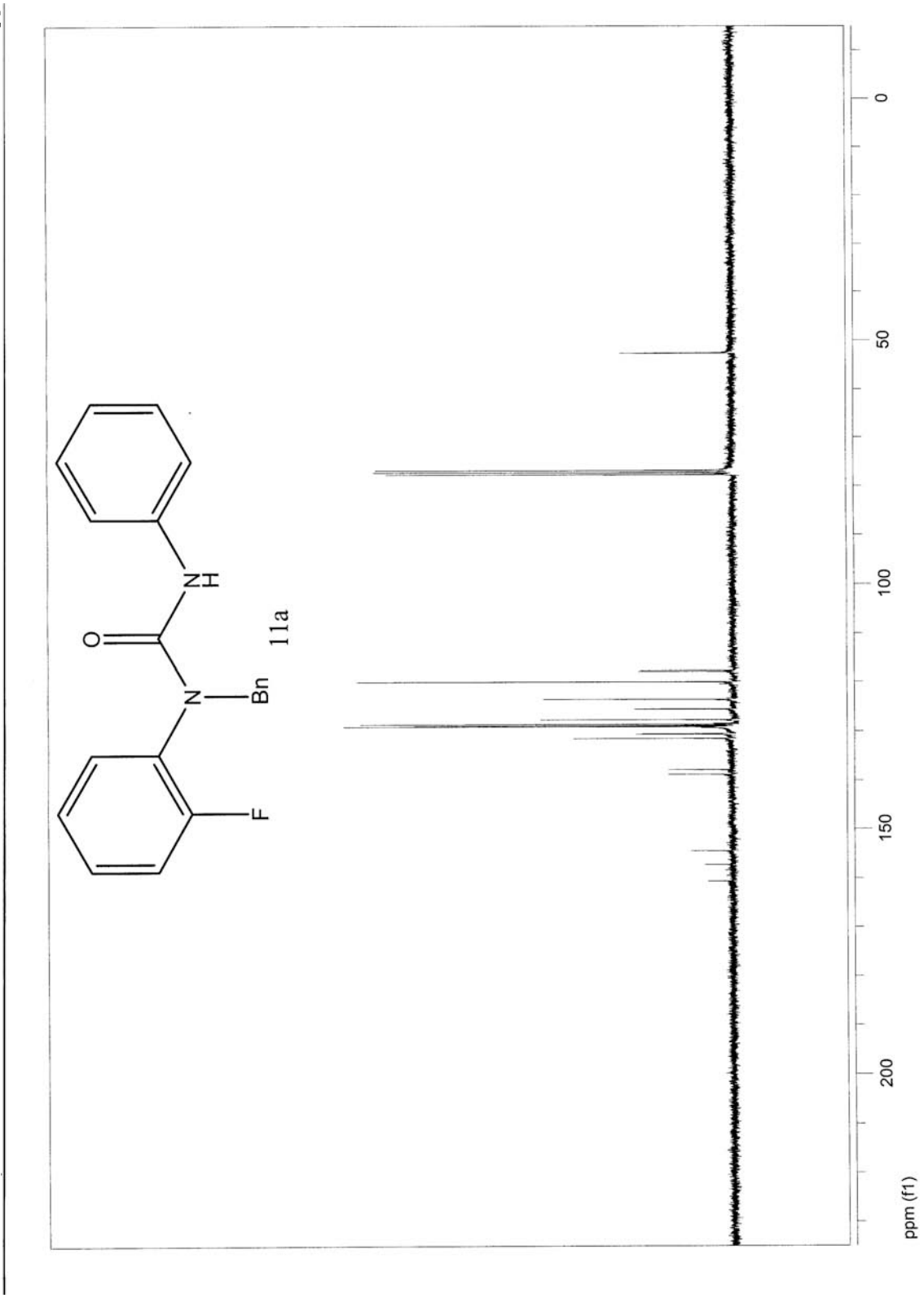
9 - C



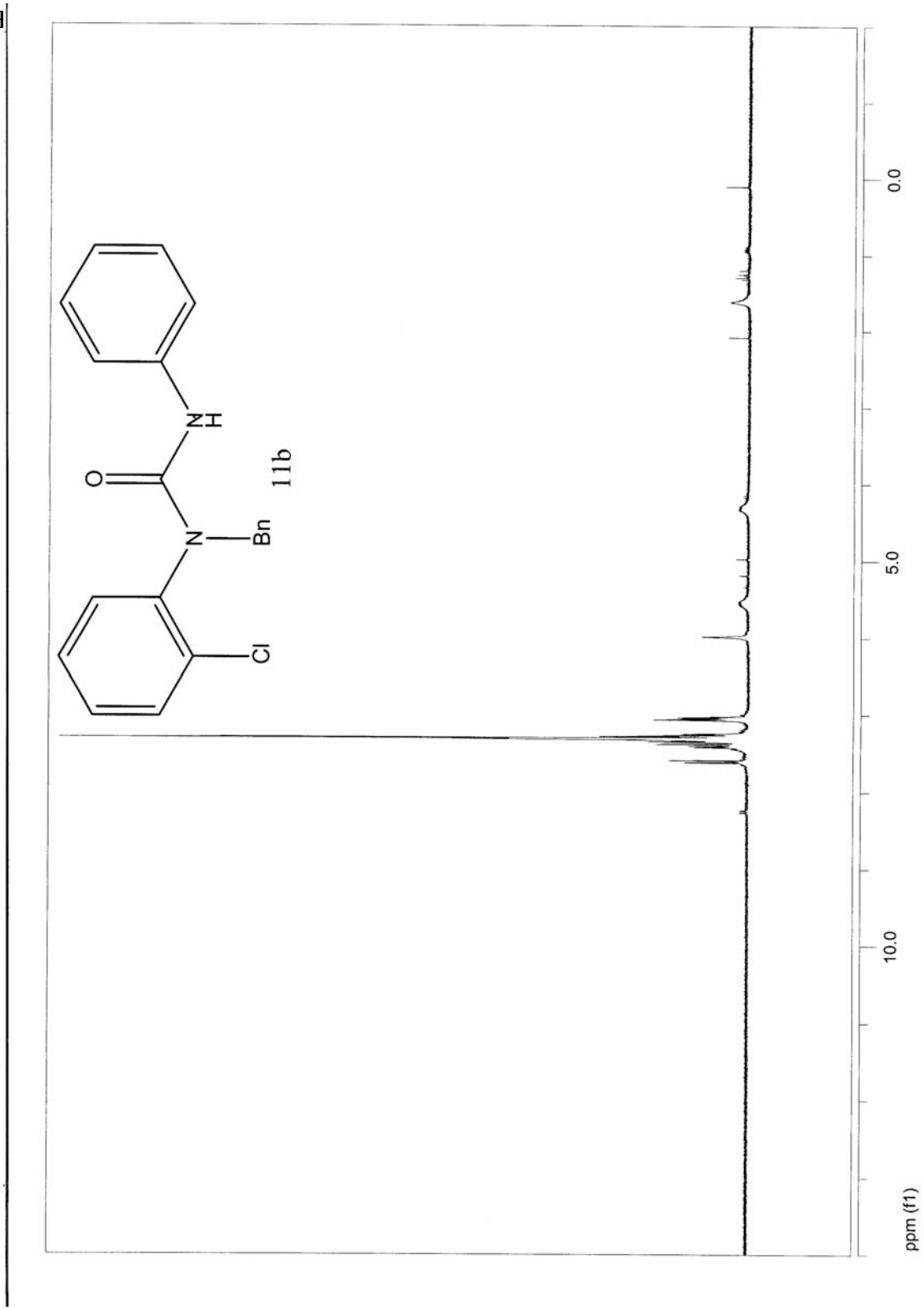
11a - H



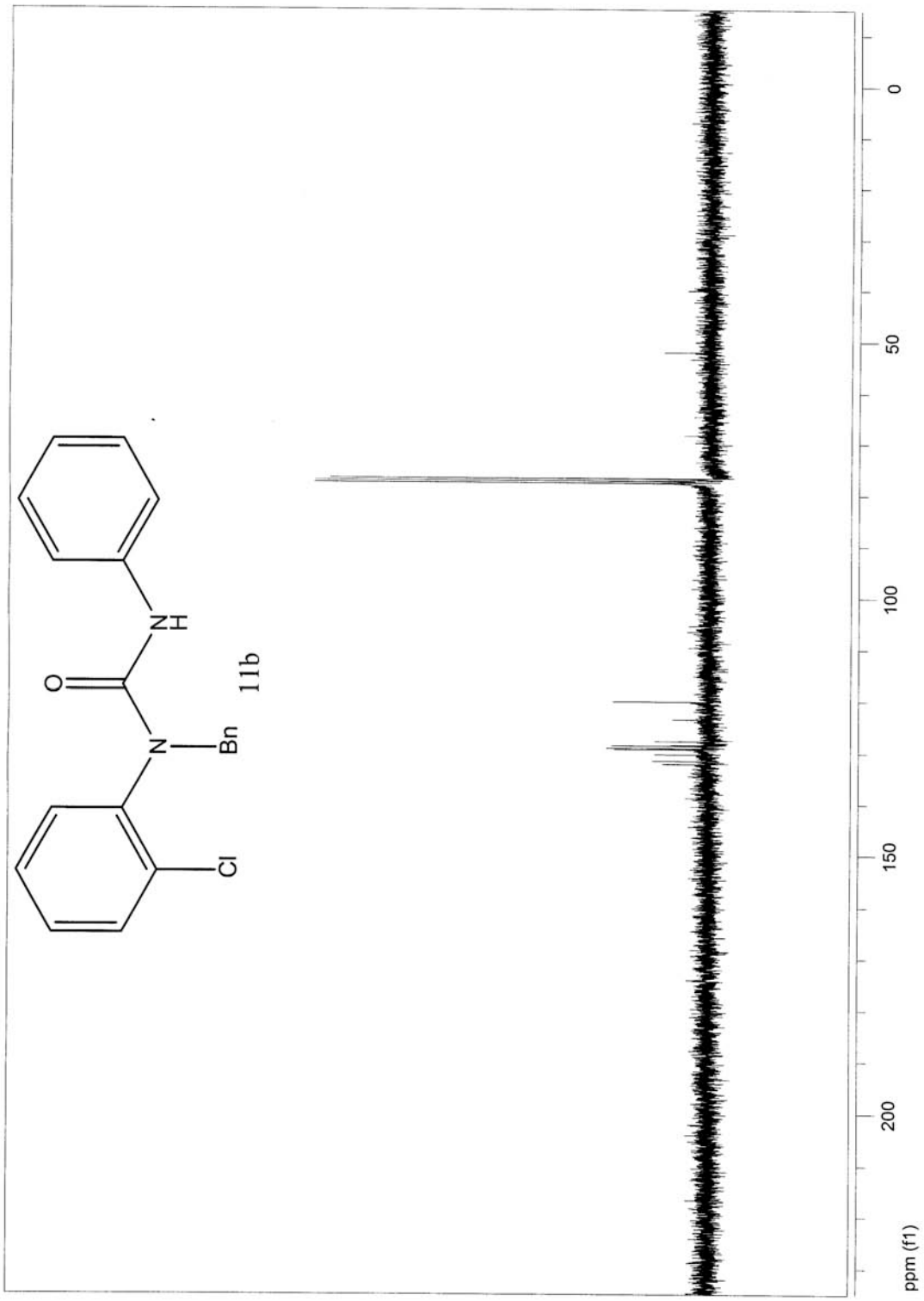
11a - C



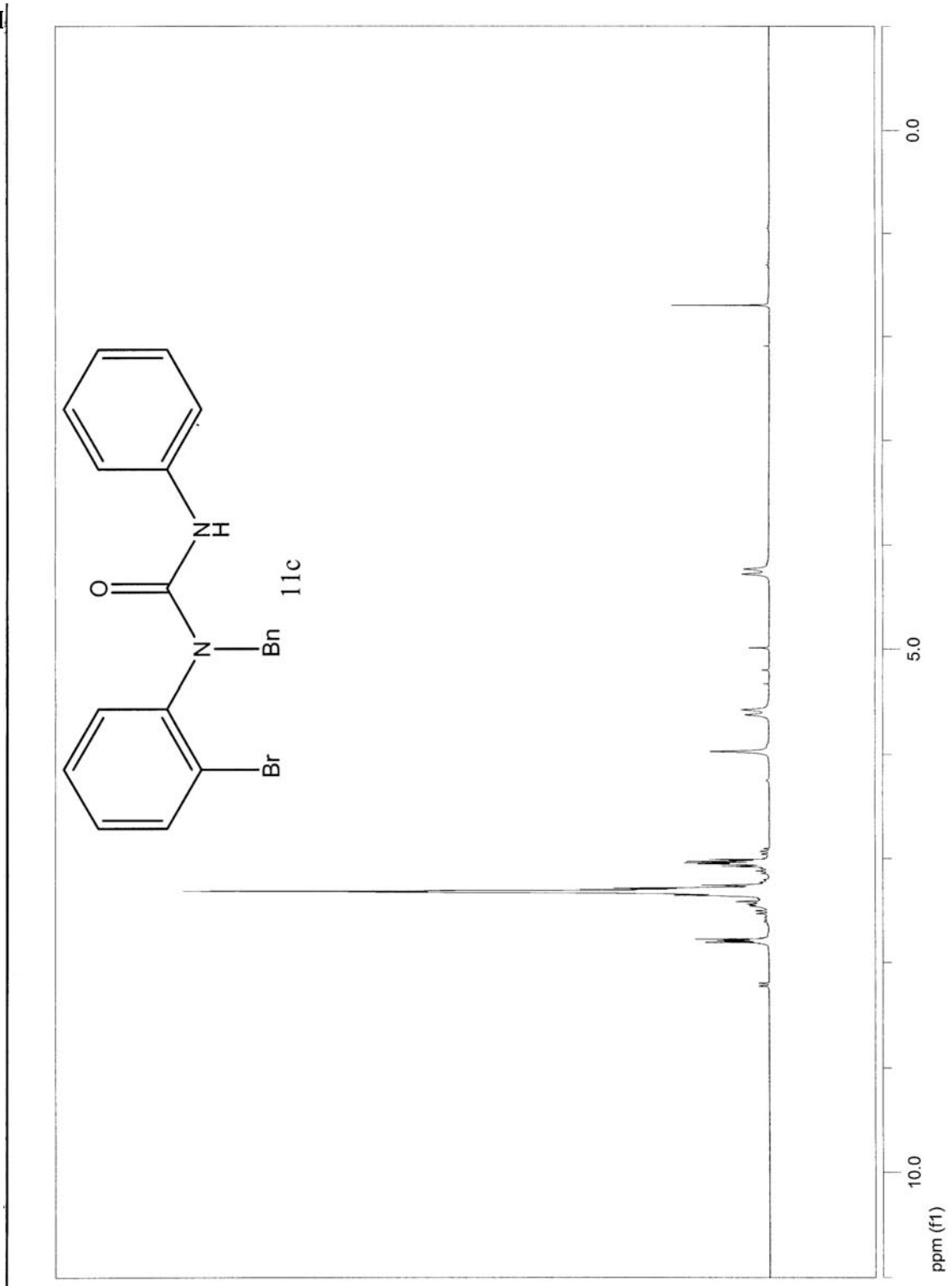
11b - H



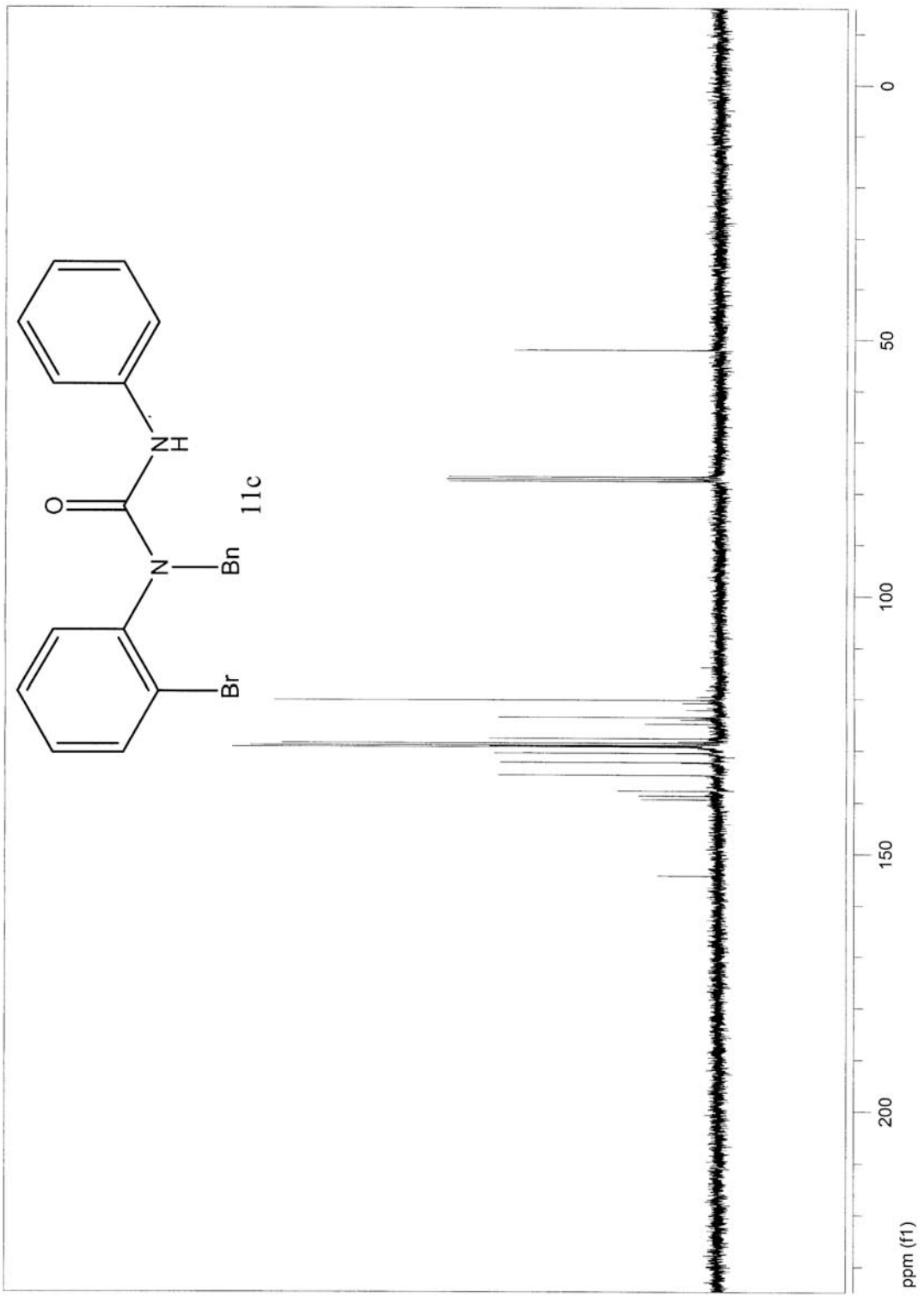
11b - C



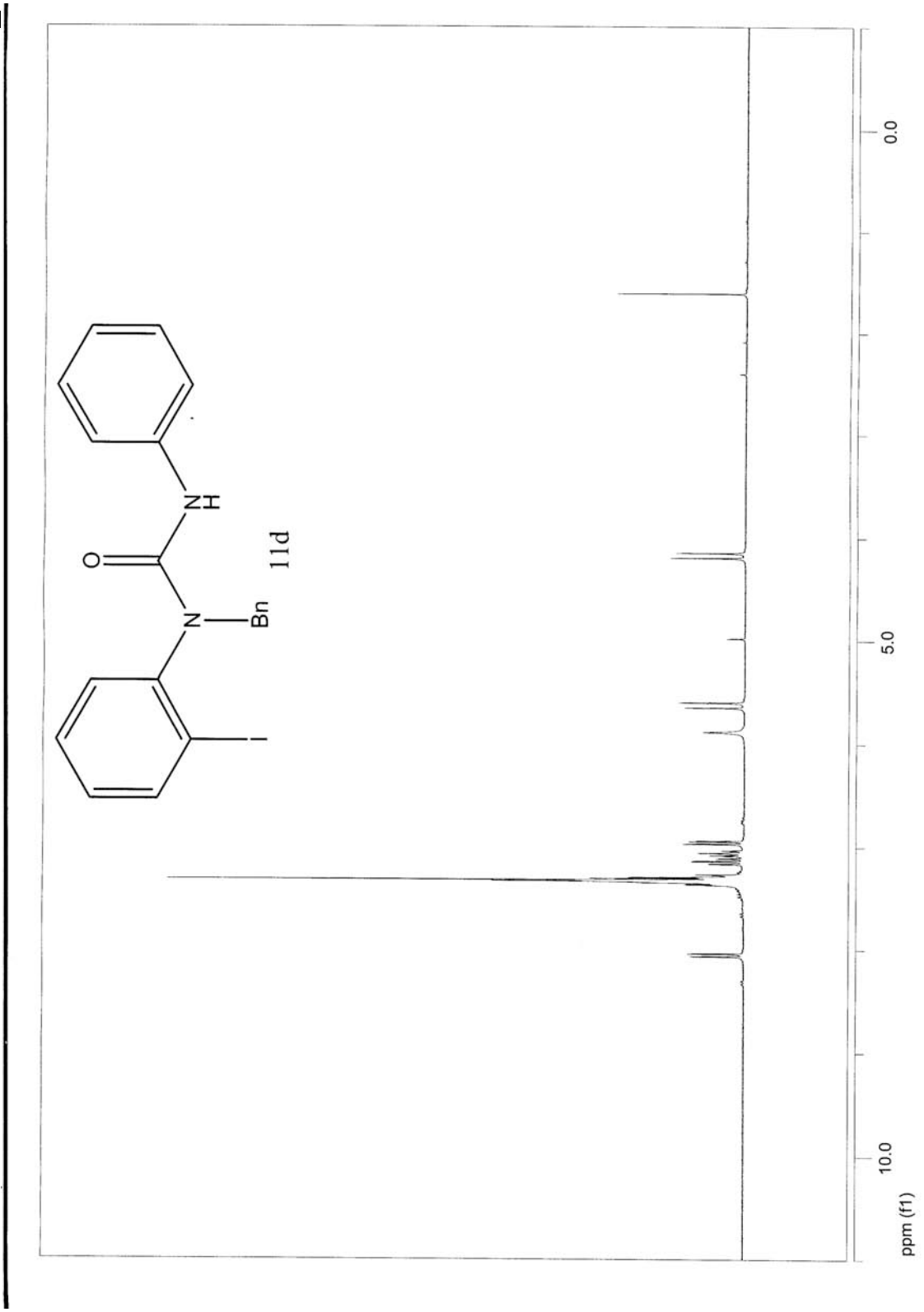
11c - H



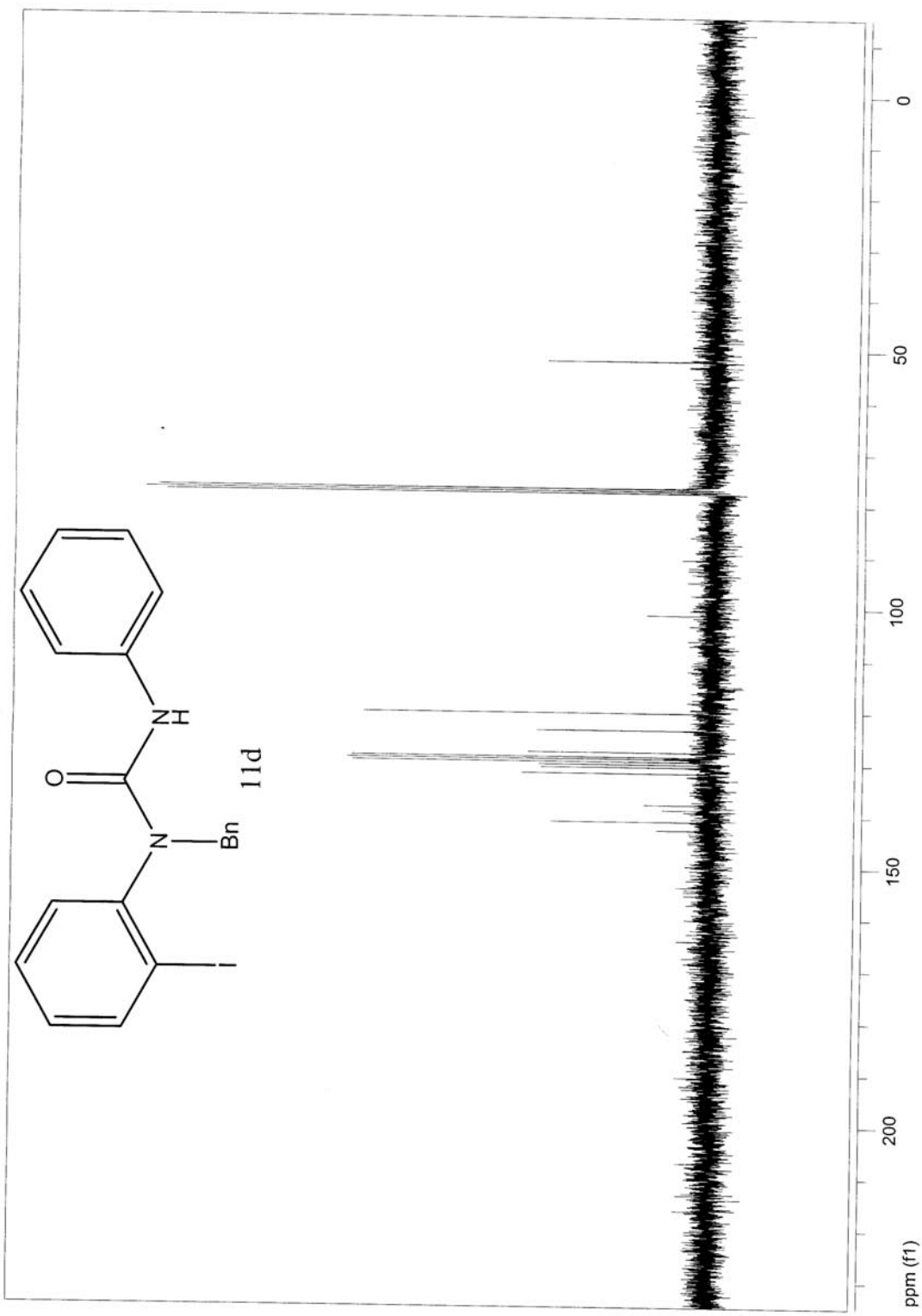
11c - C



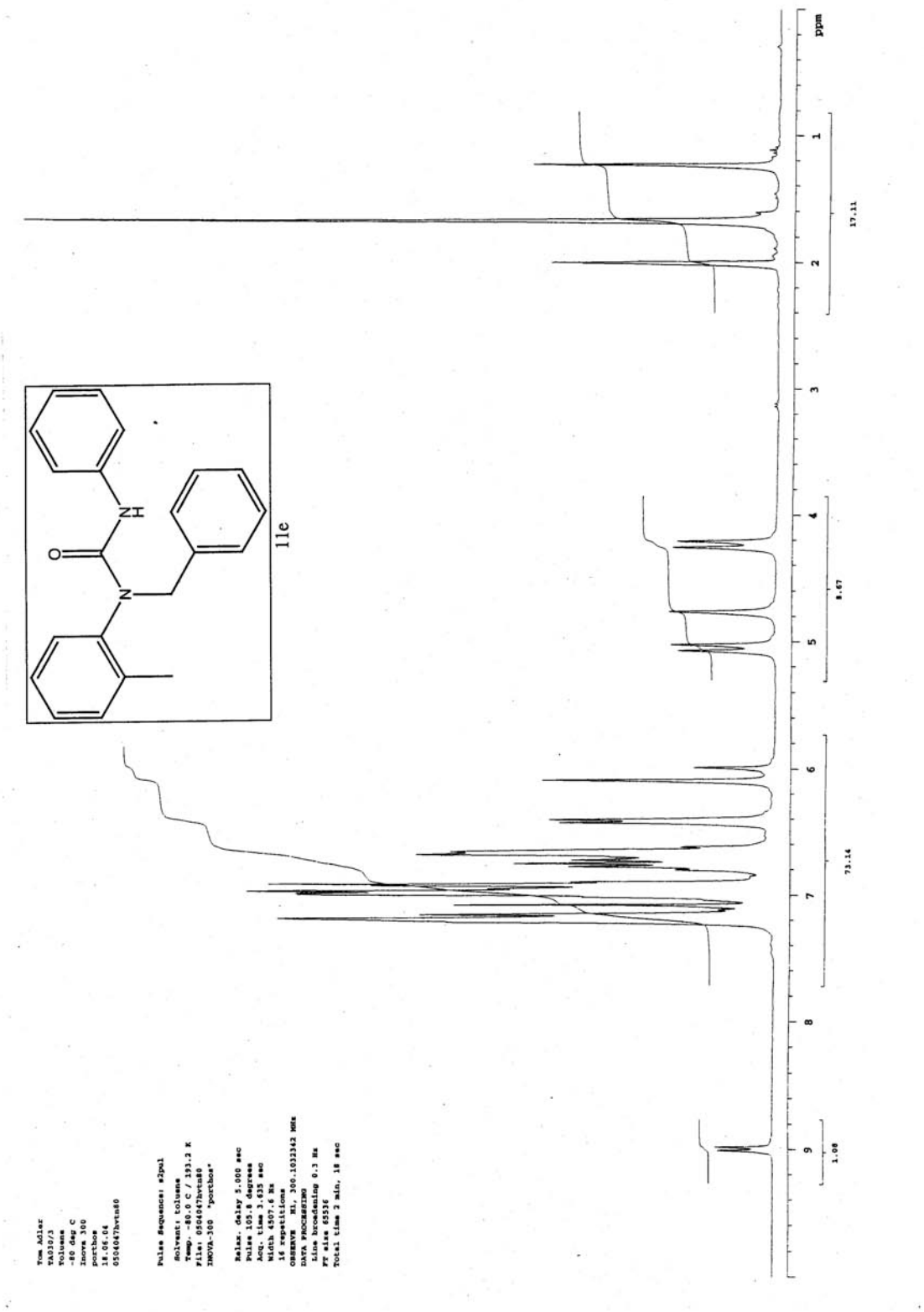
11d - H



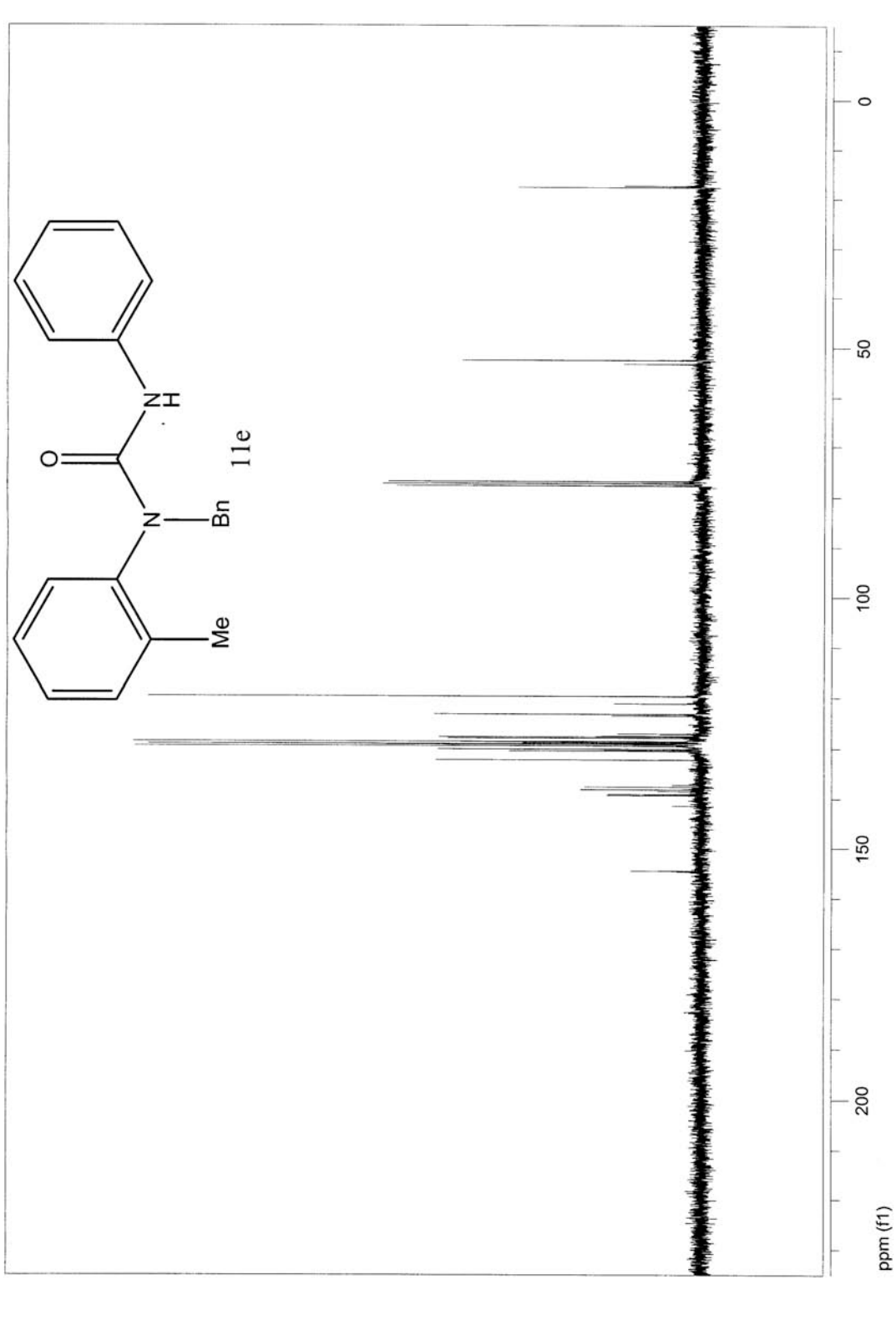
11d - C



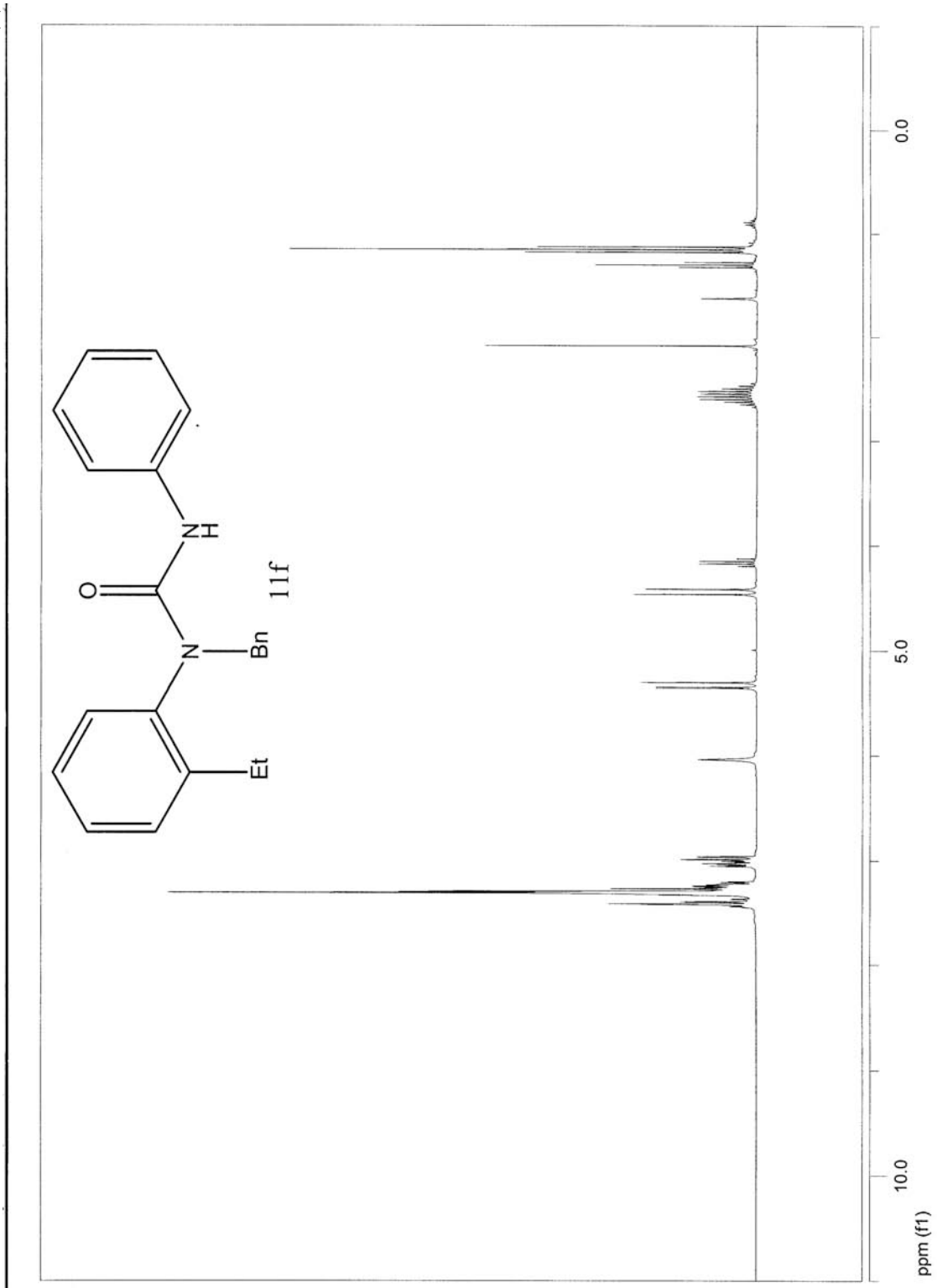
11e - H



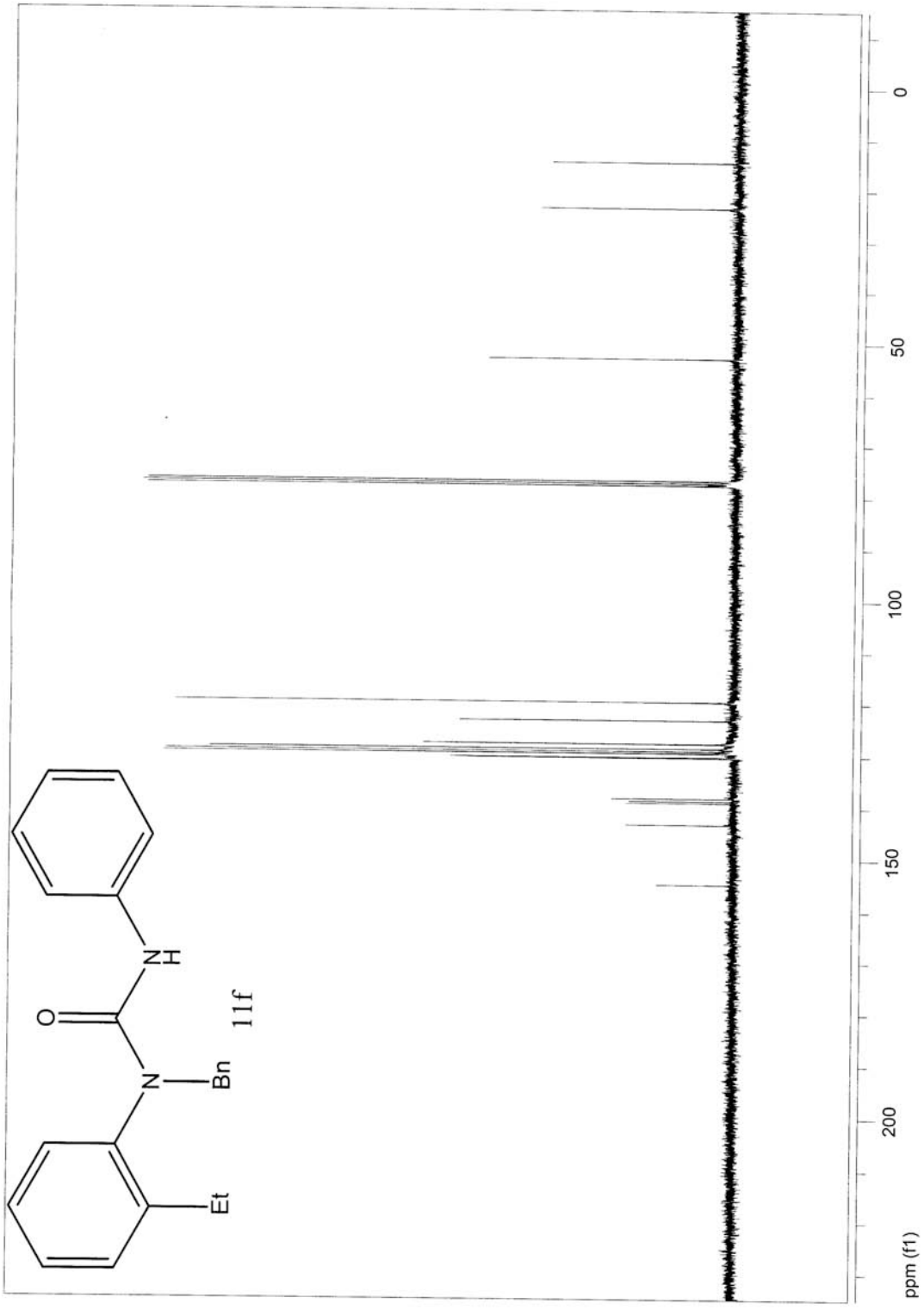
11e - C



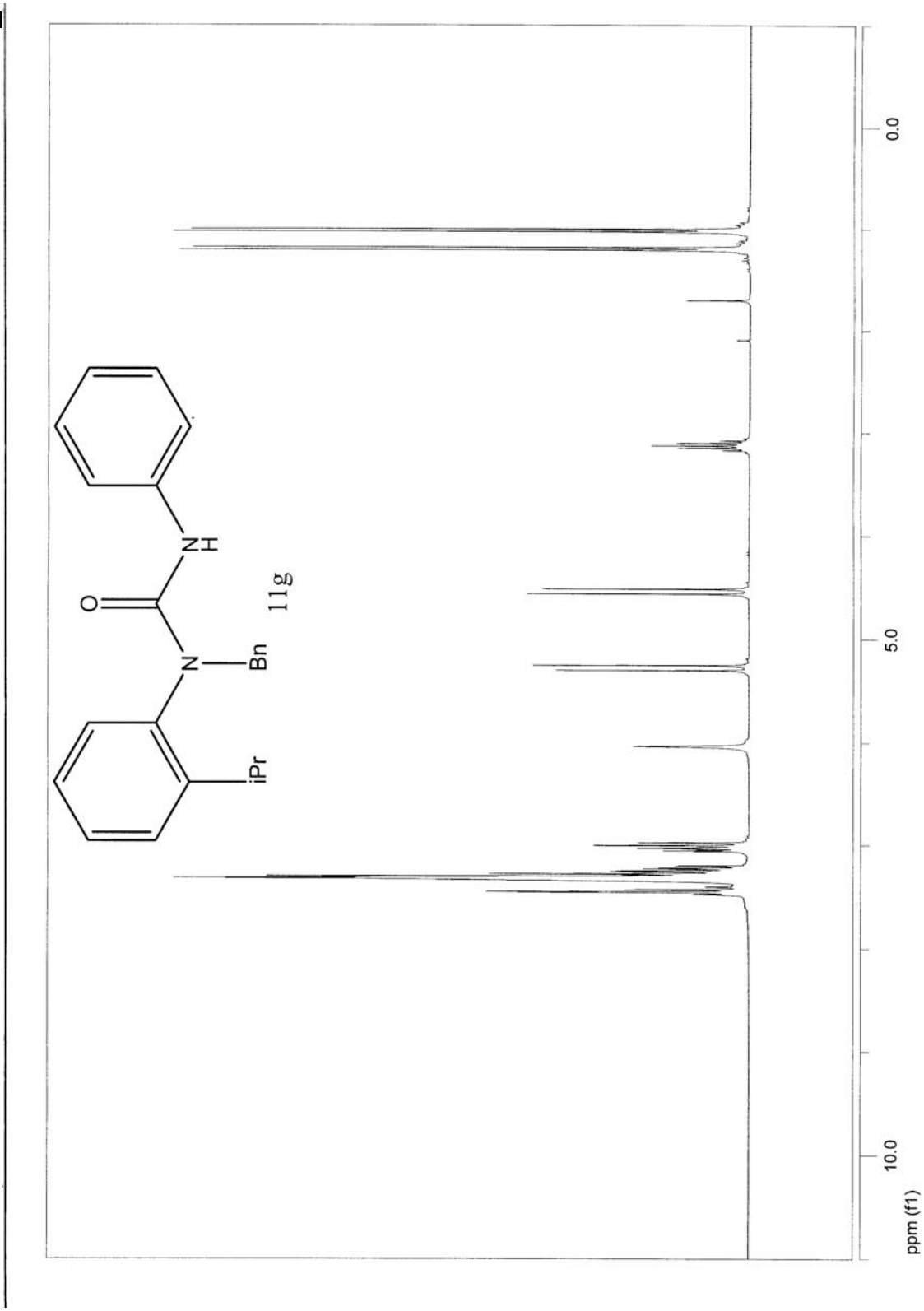
11f - H



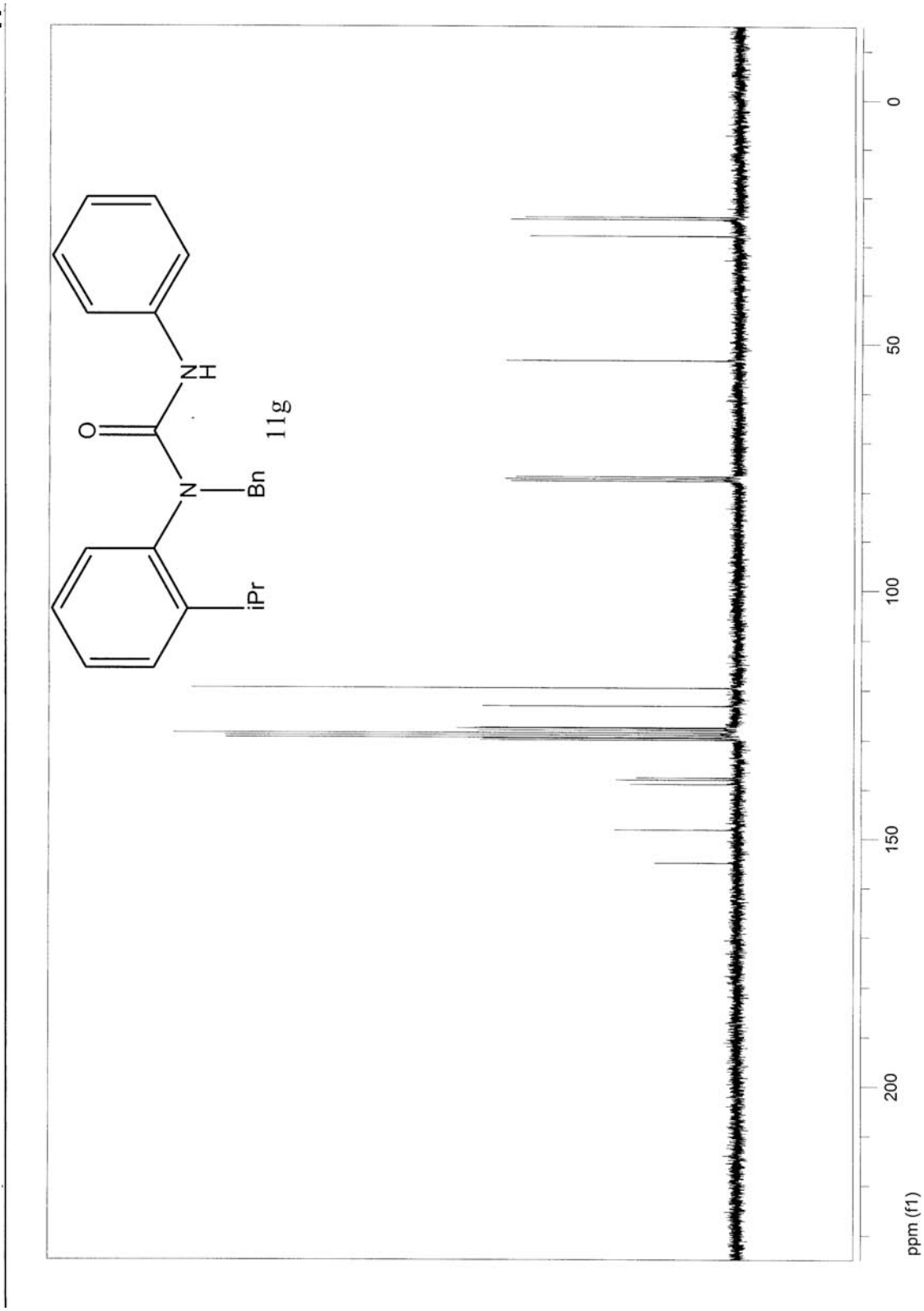
11f - C



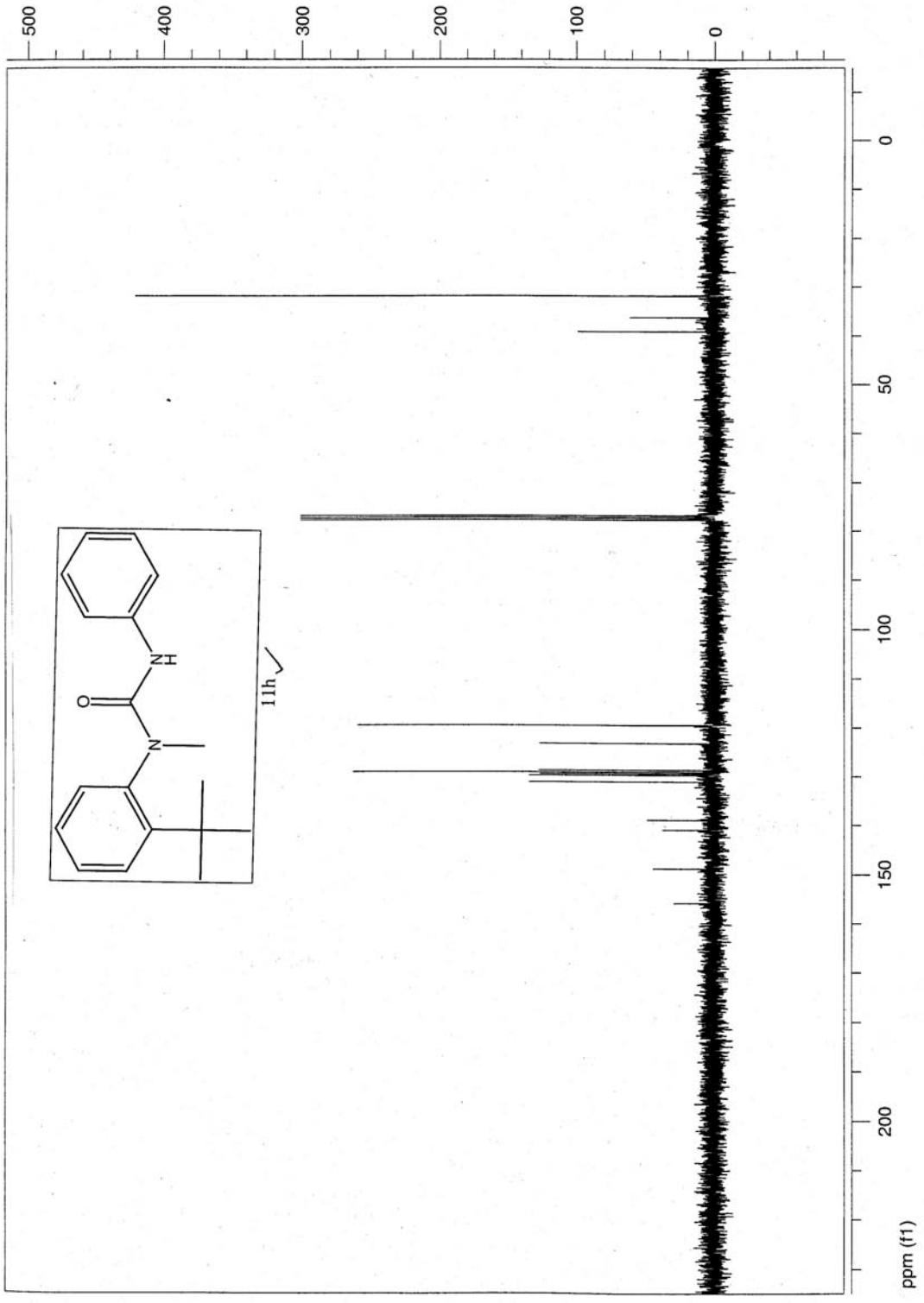
11g - H



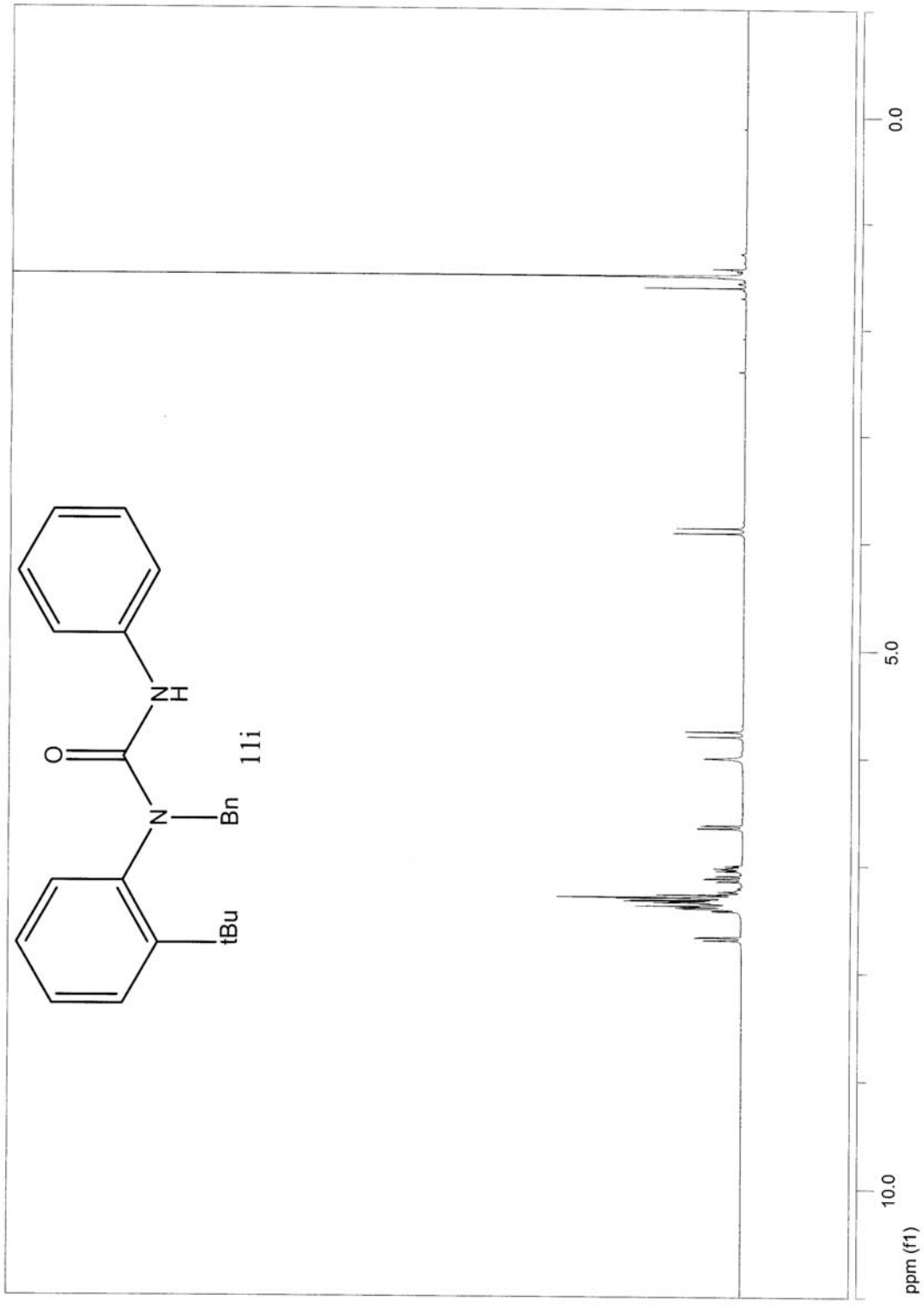
11g - C



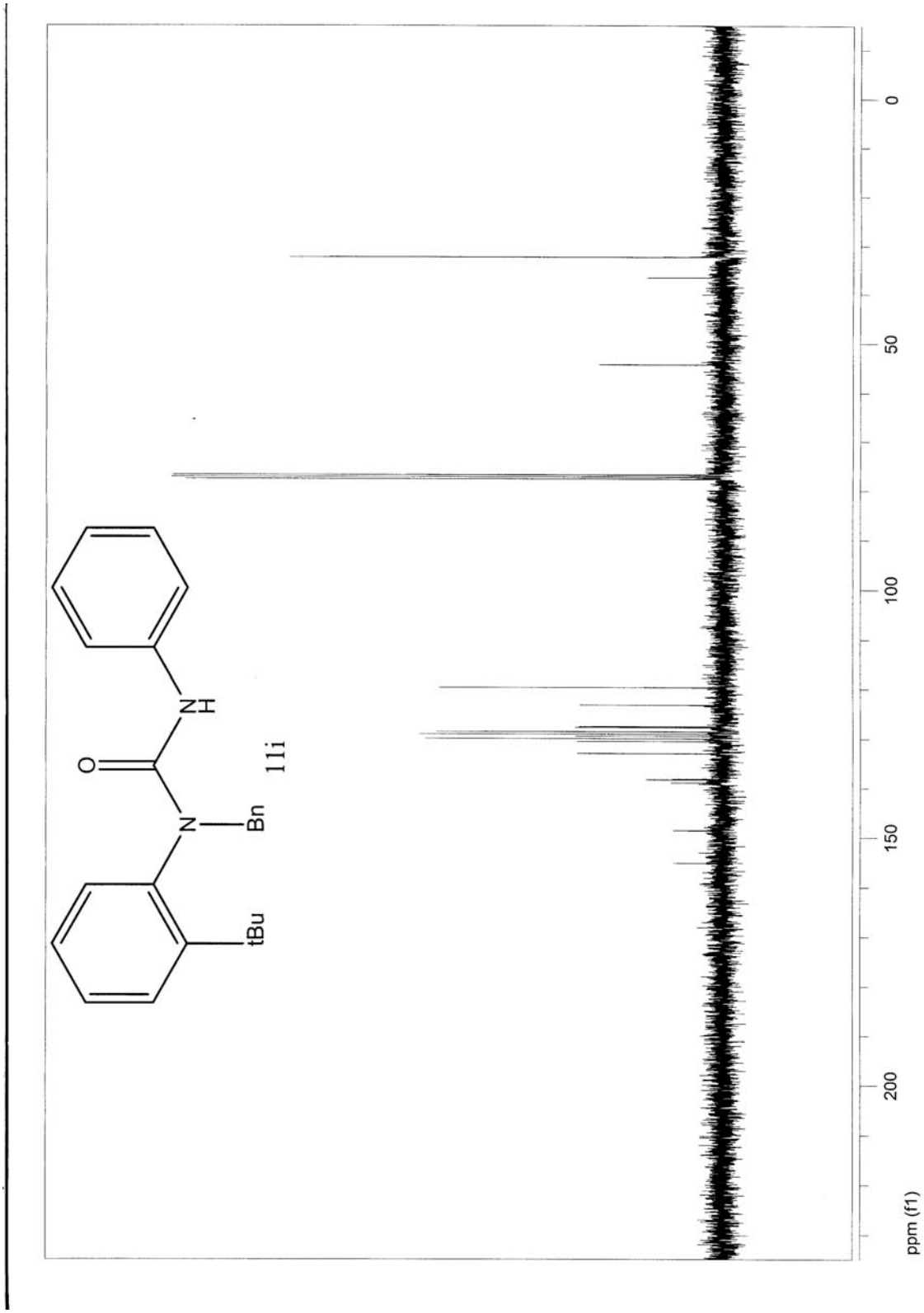
11h - C



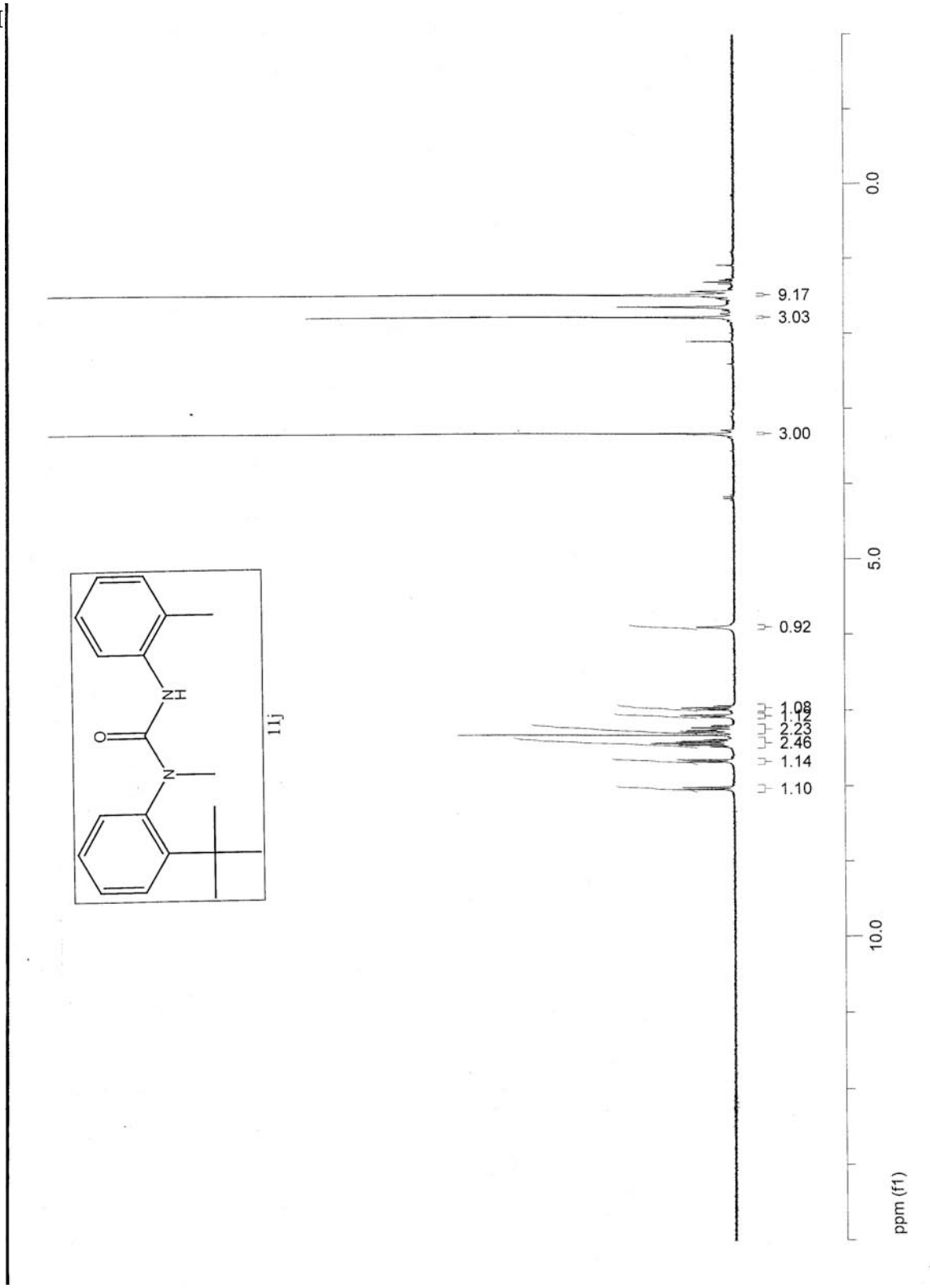
11i - H



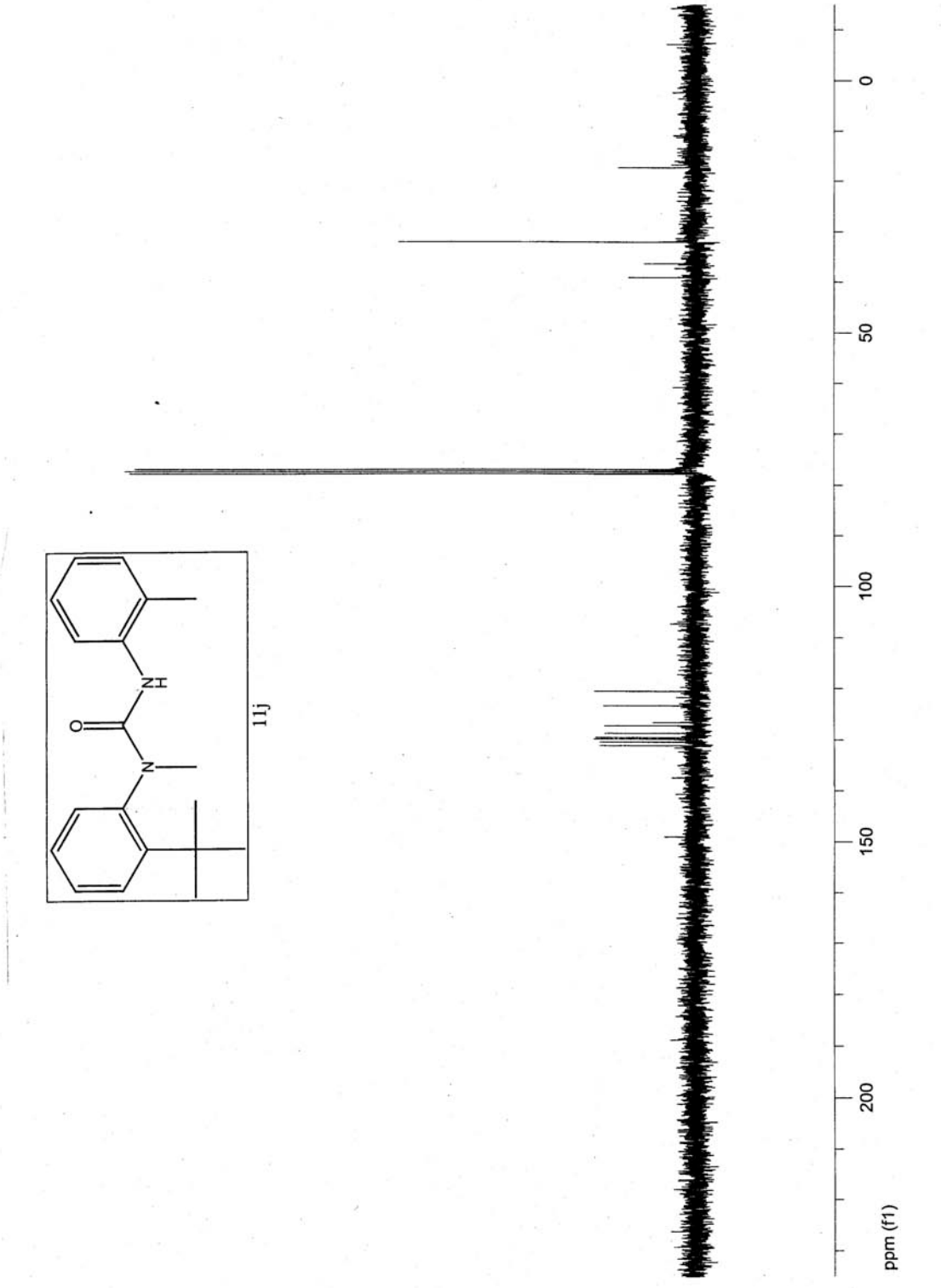
11i - C



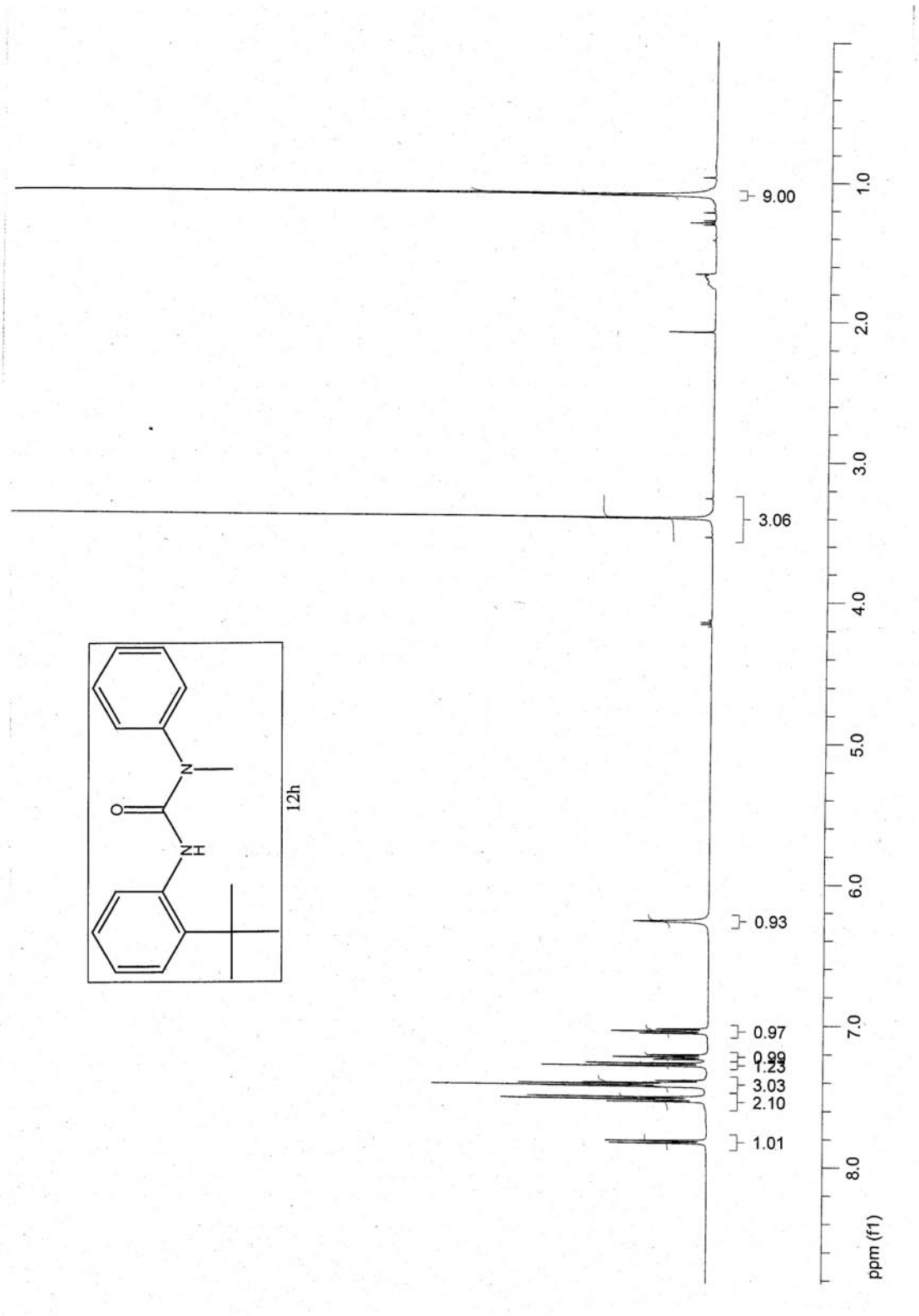
11j - H



11j - C



12h - H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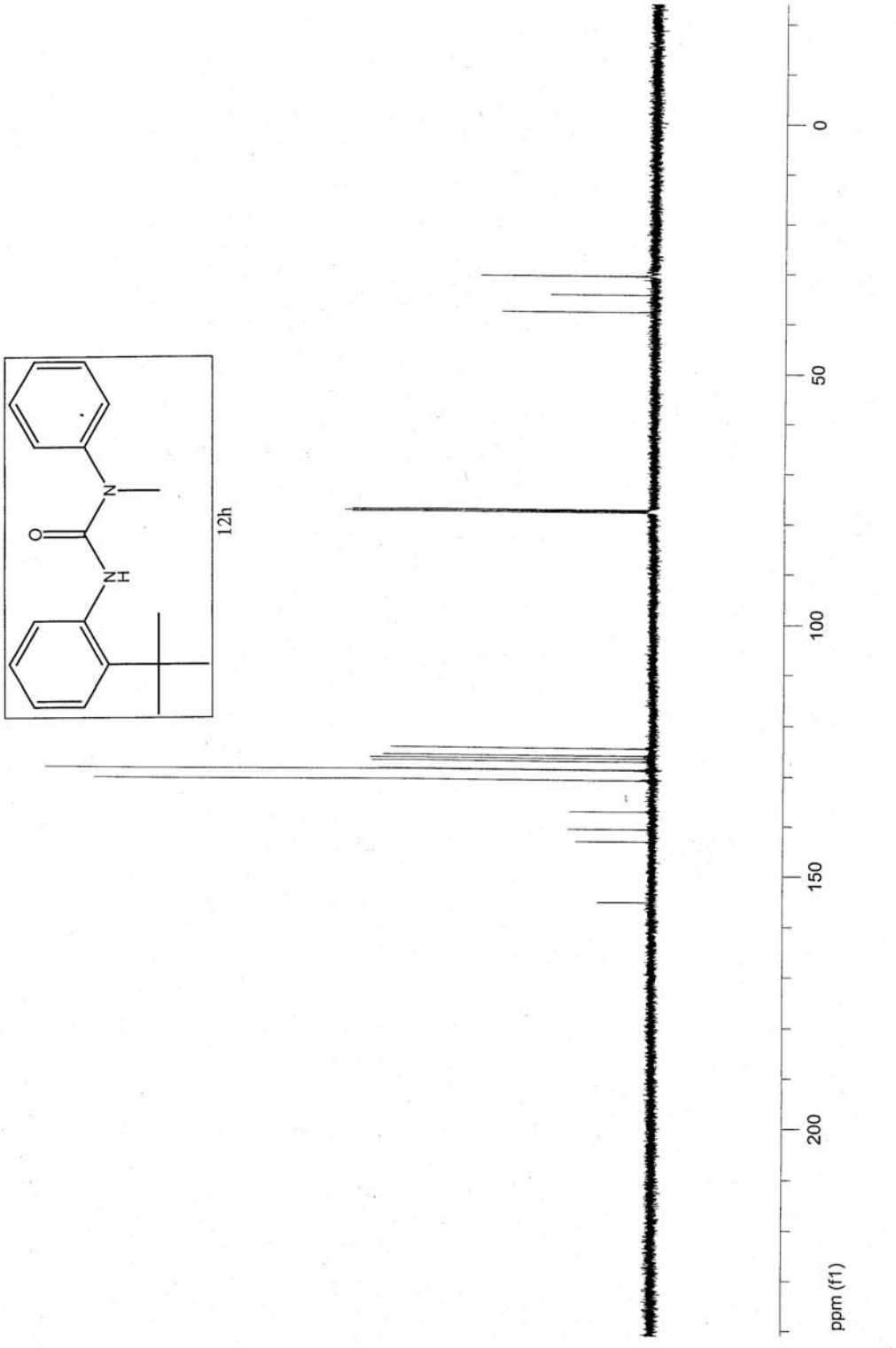
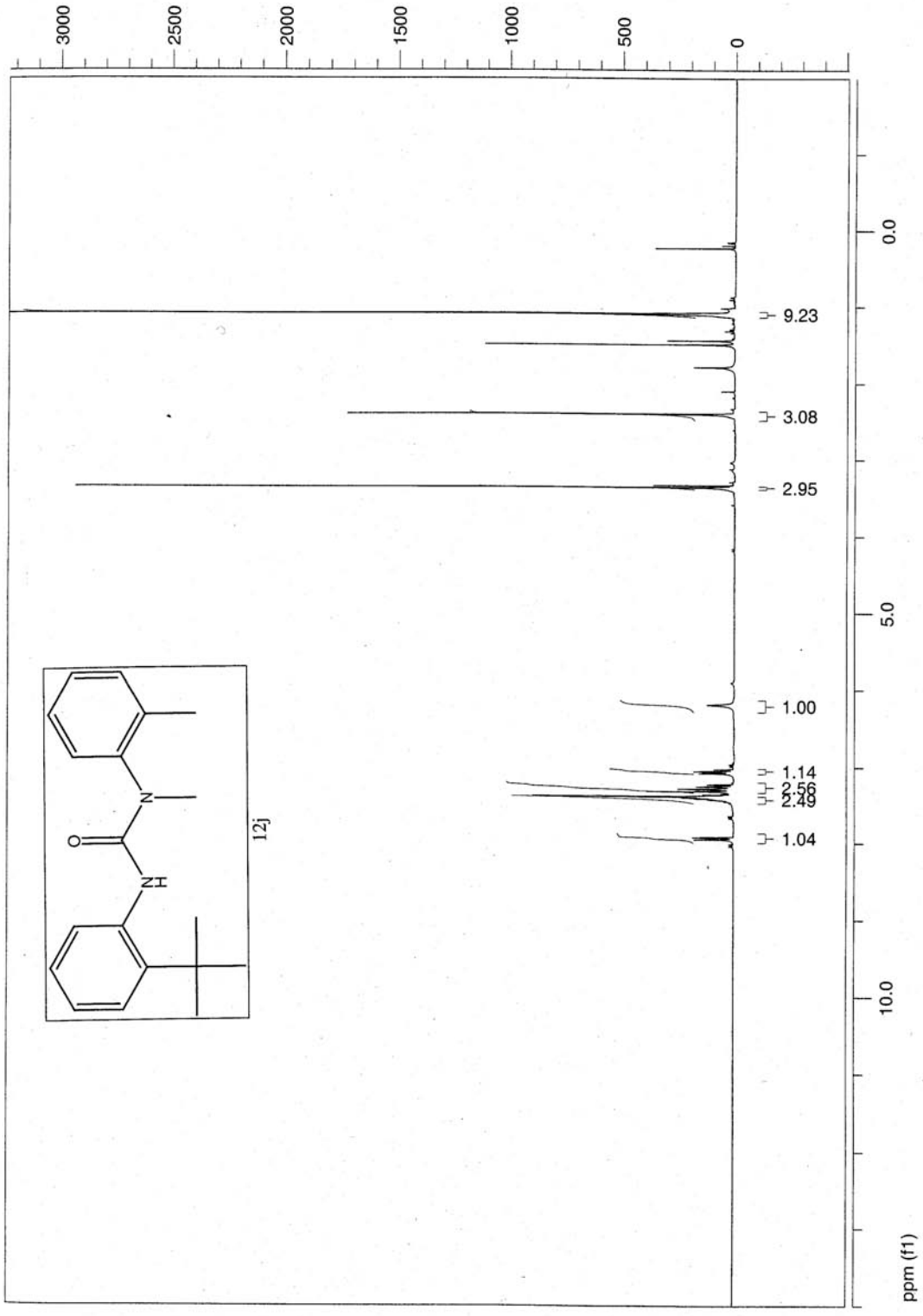
2.0
3.0
4.0
5.0
6.0
7.0
8.0
ppm (f1)

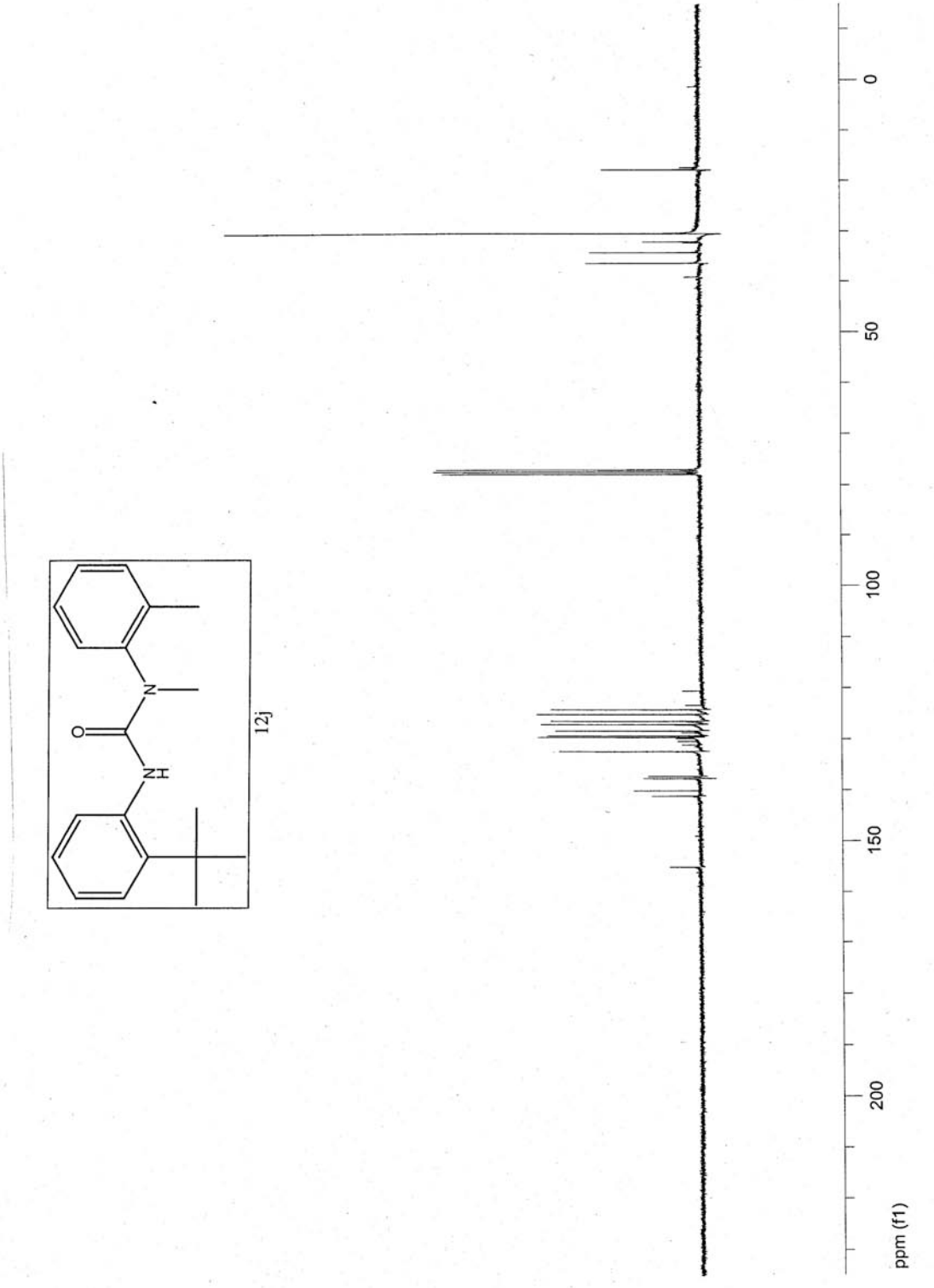
12h - C



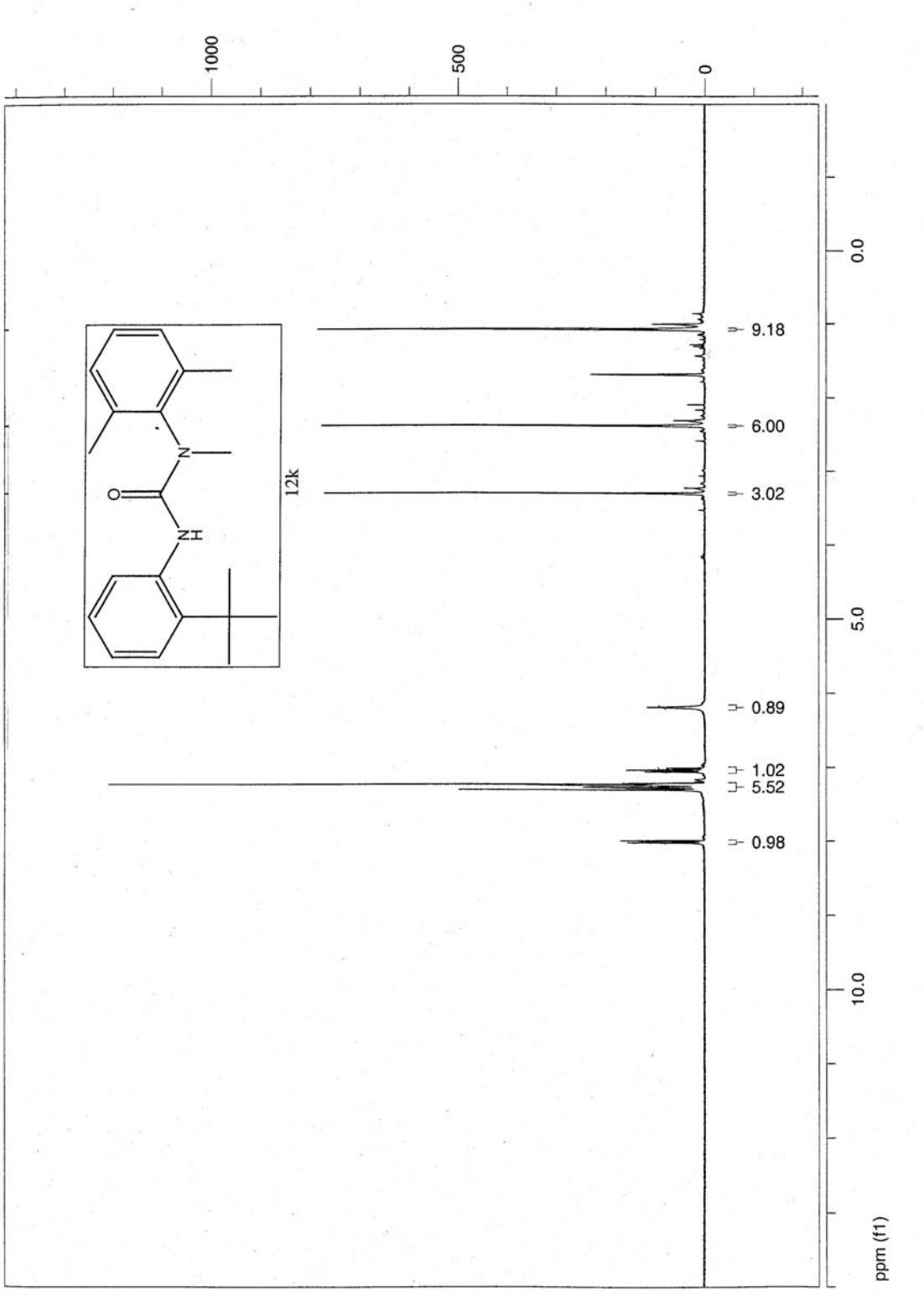
12j - H


3000
2500
2000
1500
1000
500
0
9.23
3.08
2.95
1.00
1.14
2.56
2.49
1.04
12j
0.0
5.0
10.0
ppm (f1)

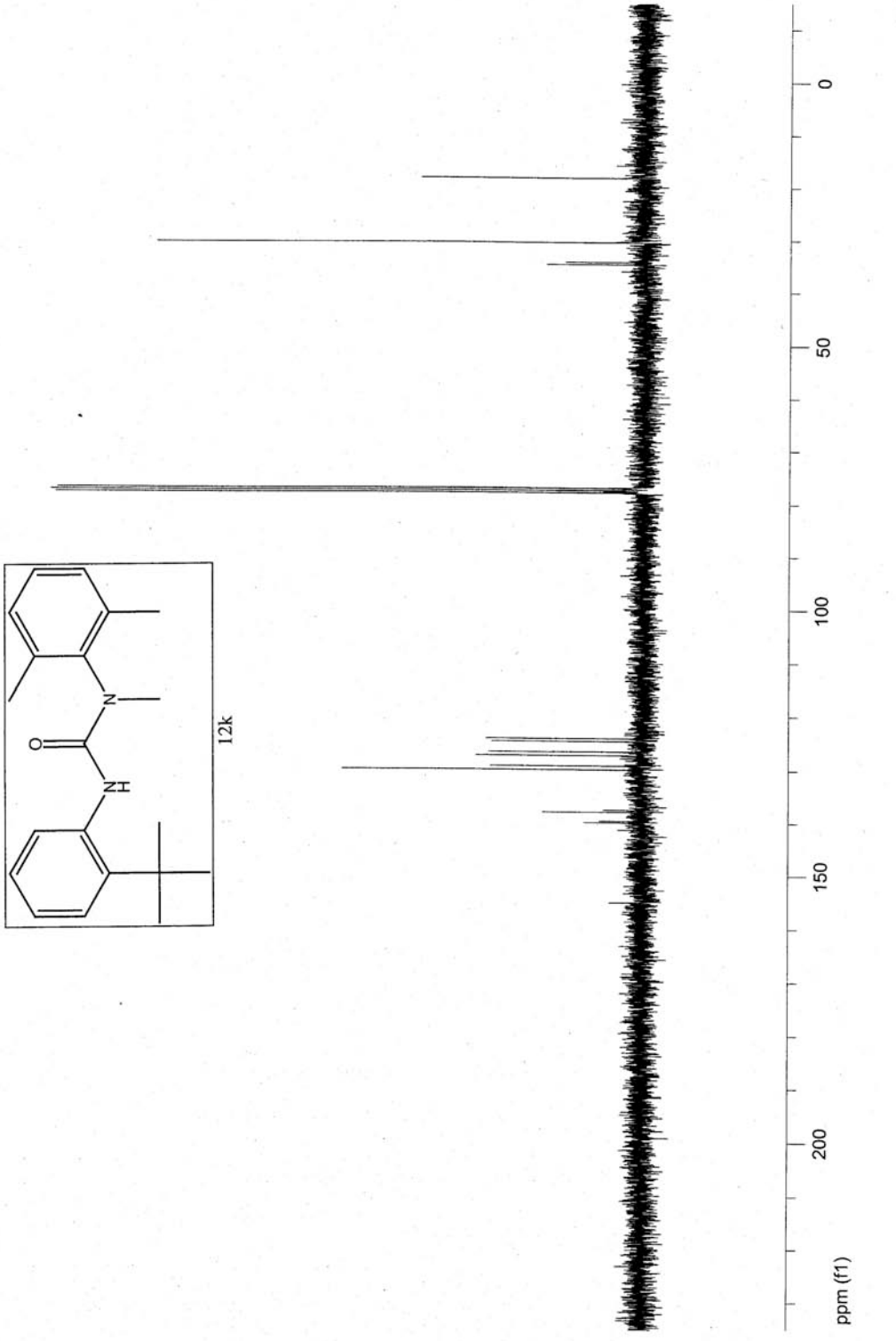
12j - C



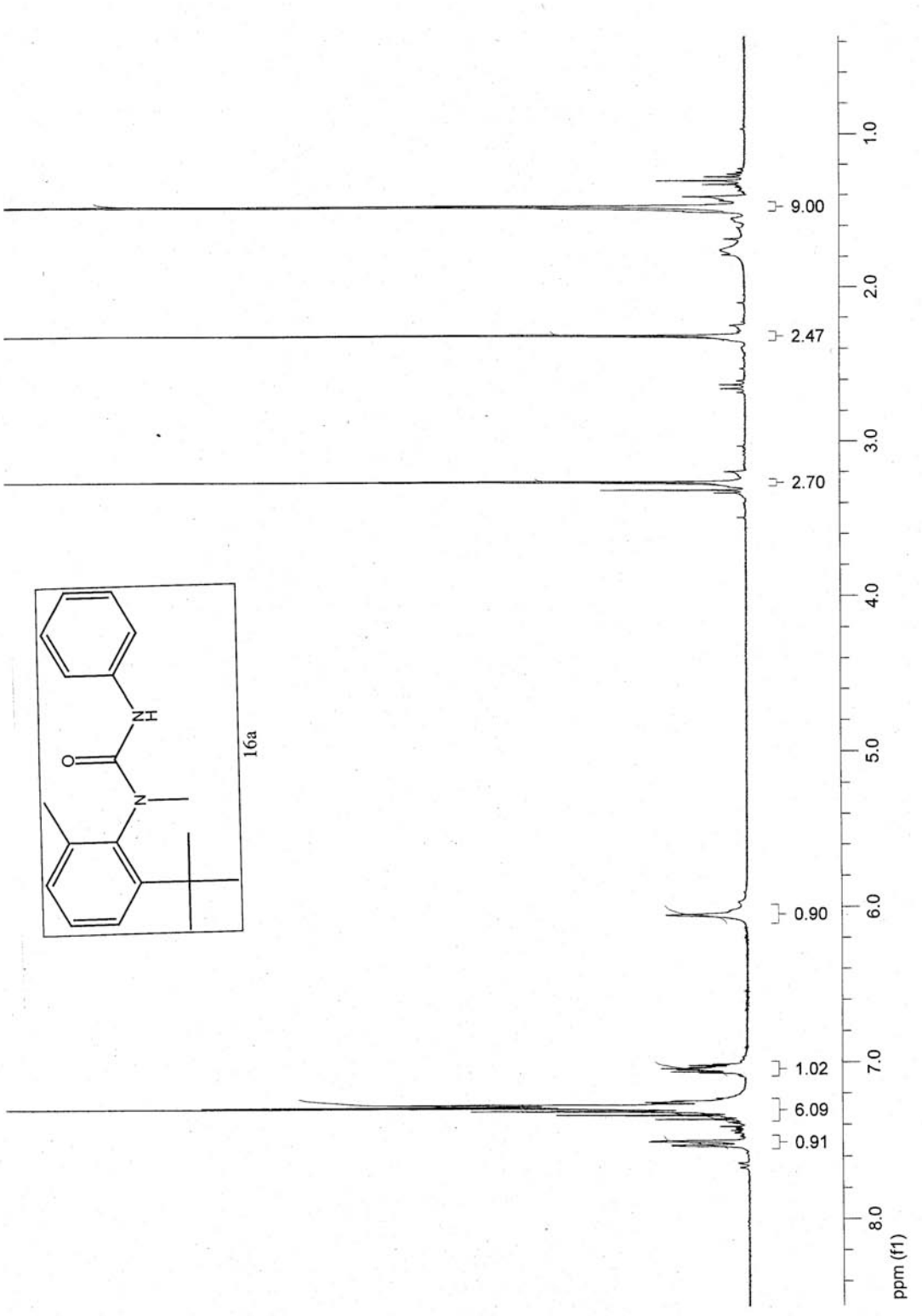
12k - H



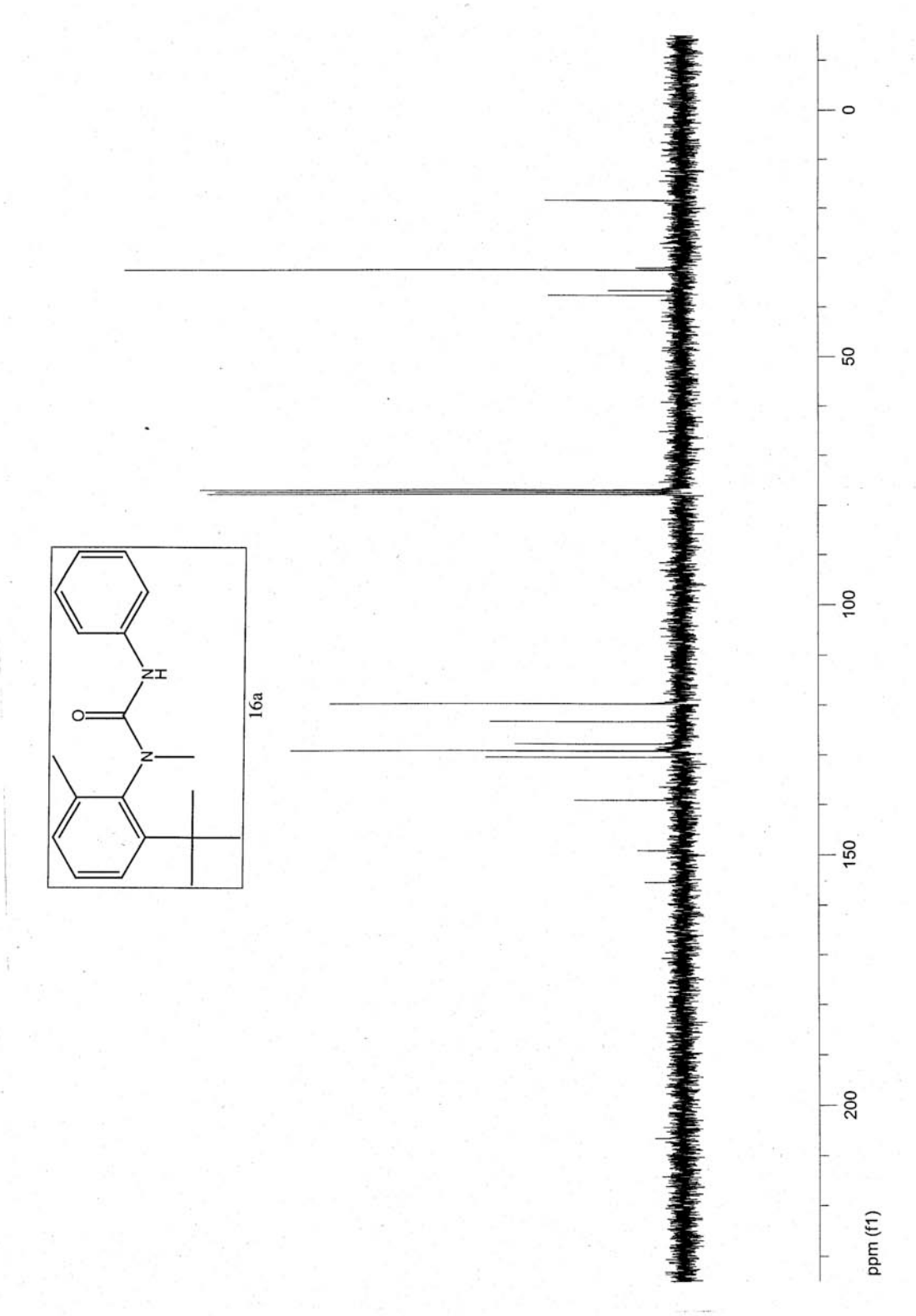
12k - C



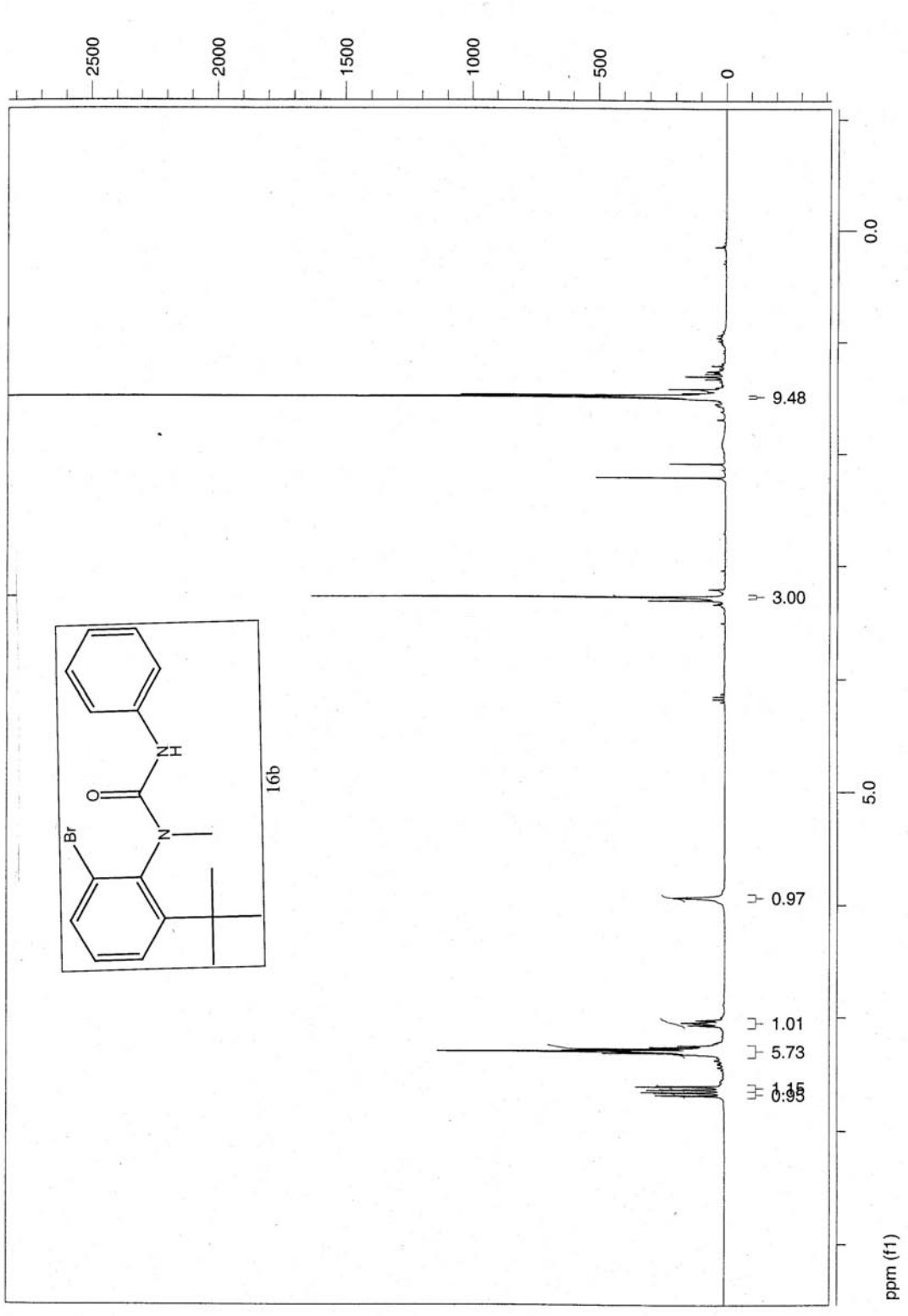
16a - H



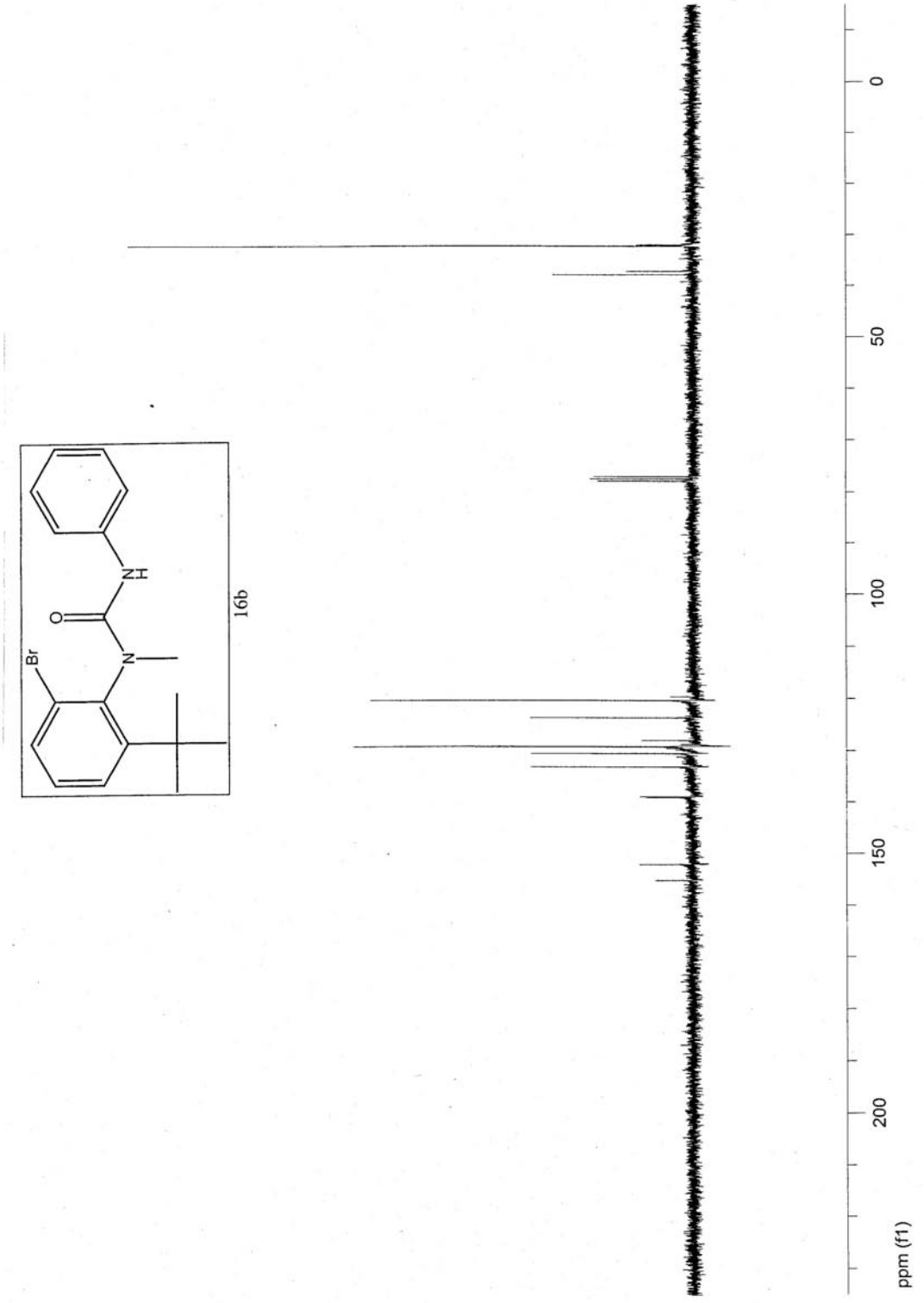
16a - C



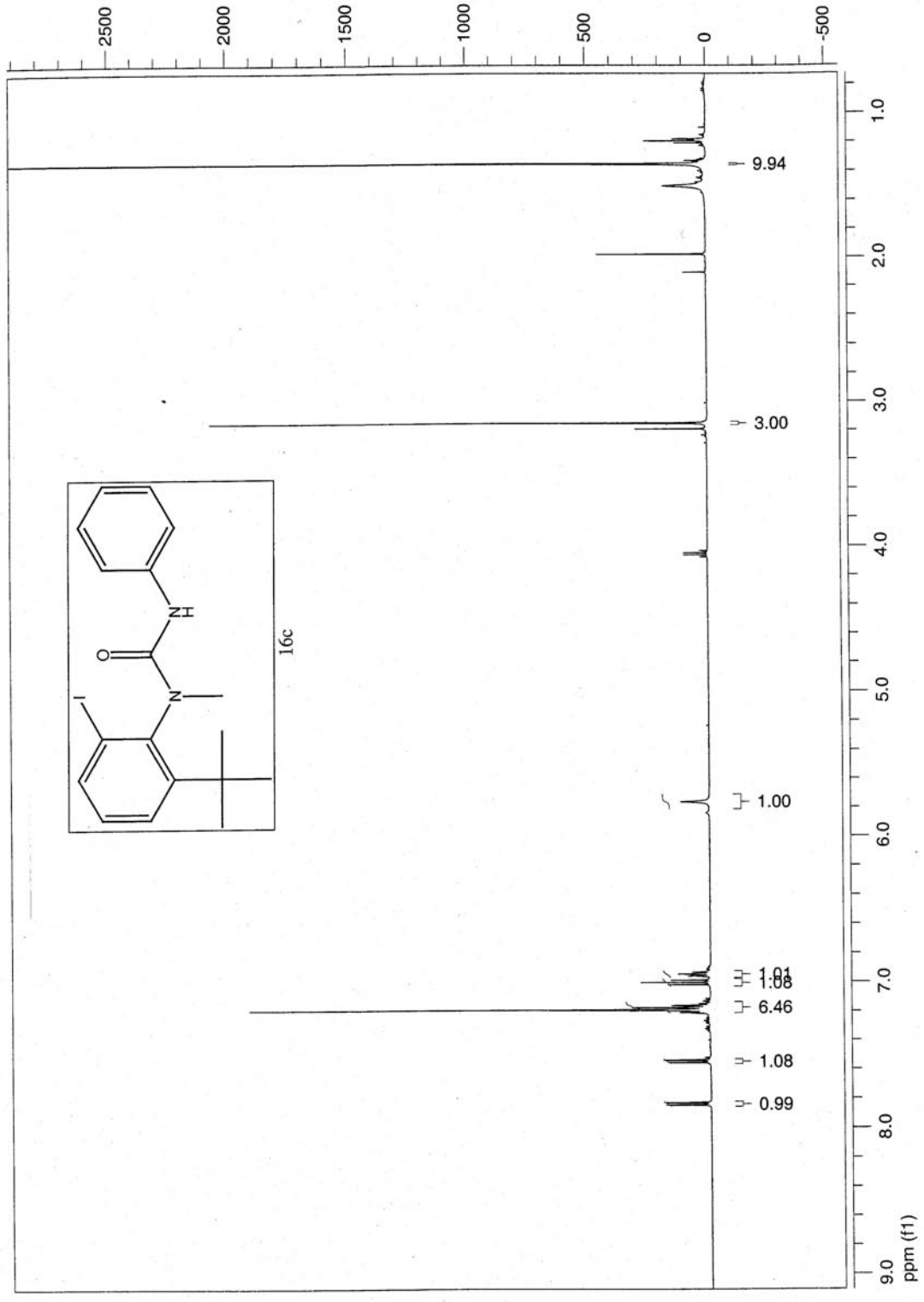
16b - H


2500
2000
1500
1000
500
0
0.0
9.48
3.00
5.0
0.97
1.01
5.73
1.15
0.95
ppm (f1)
16b
Br
O
N
H
N

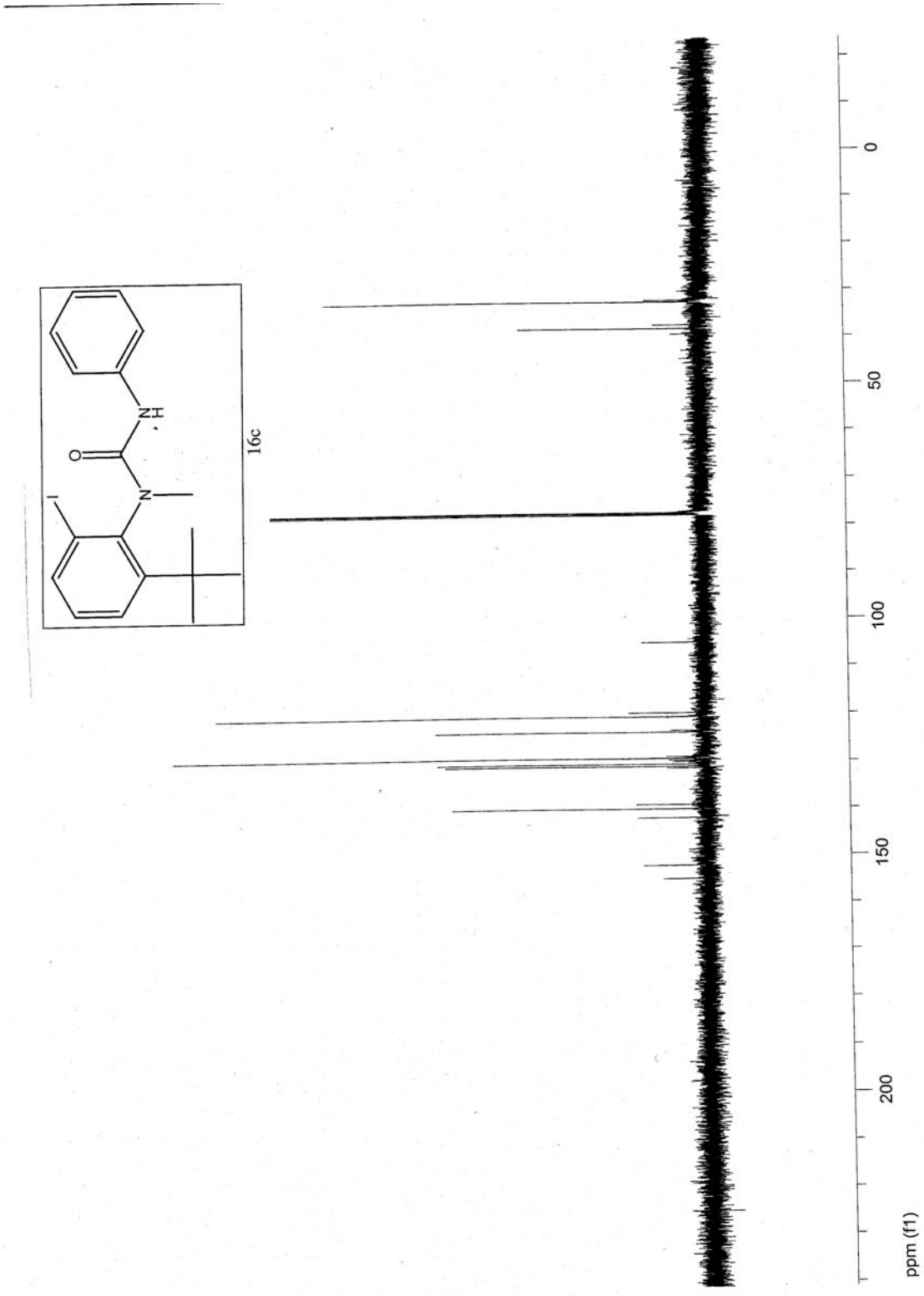
16b - C



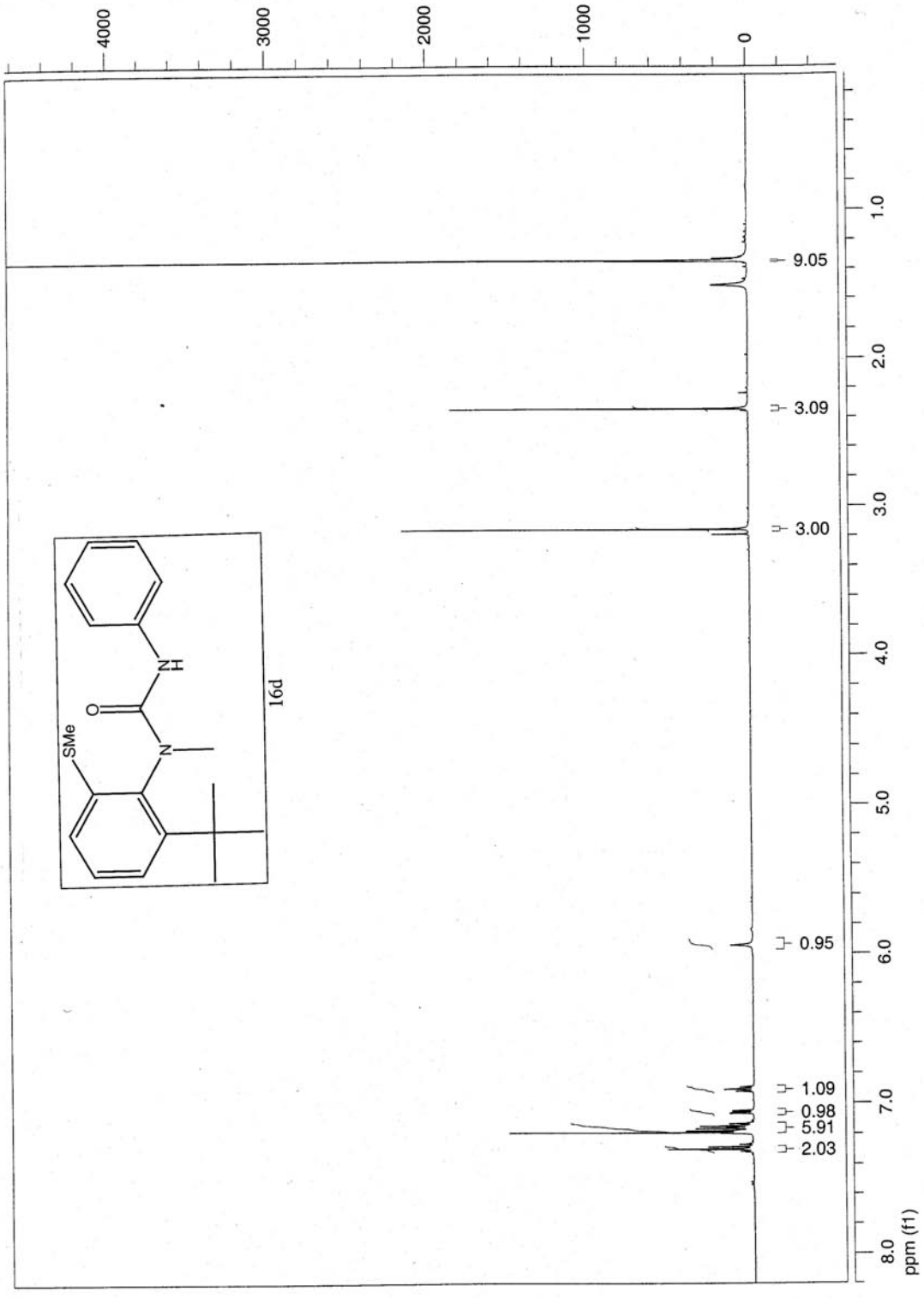
16c - H


2500
2000
1500
1000
500
0
-500
9.94
3.00
1.00
1.01
1.08
6.46
1.08
0.99
16c
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
ppm (f1)

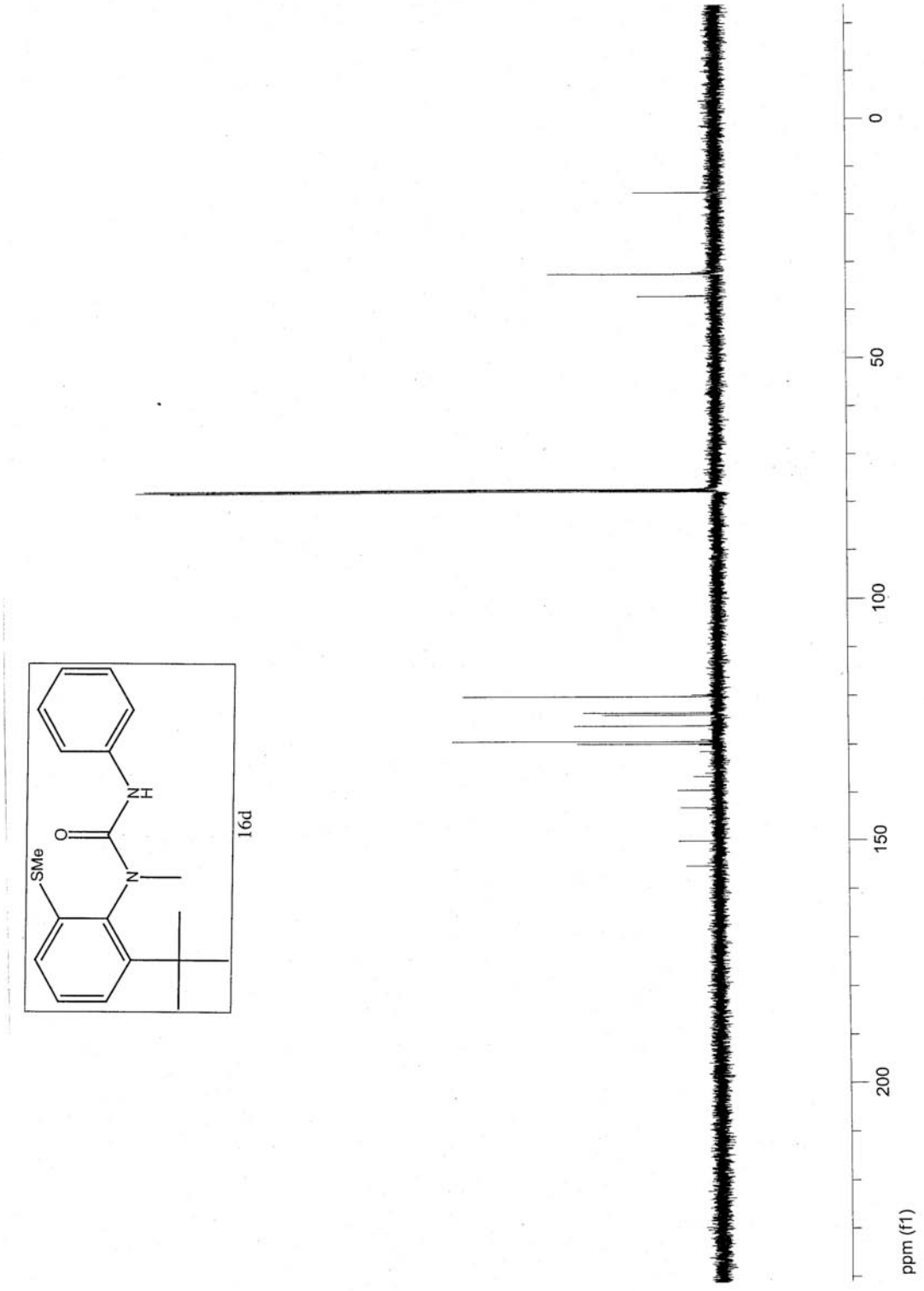
16c - C



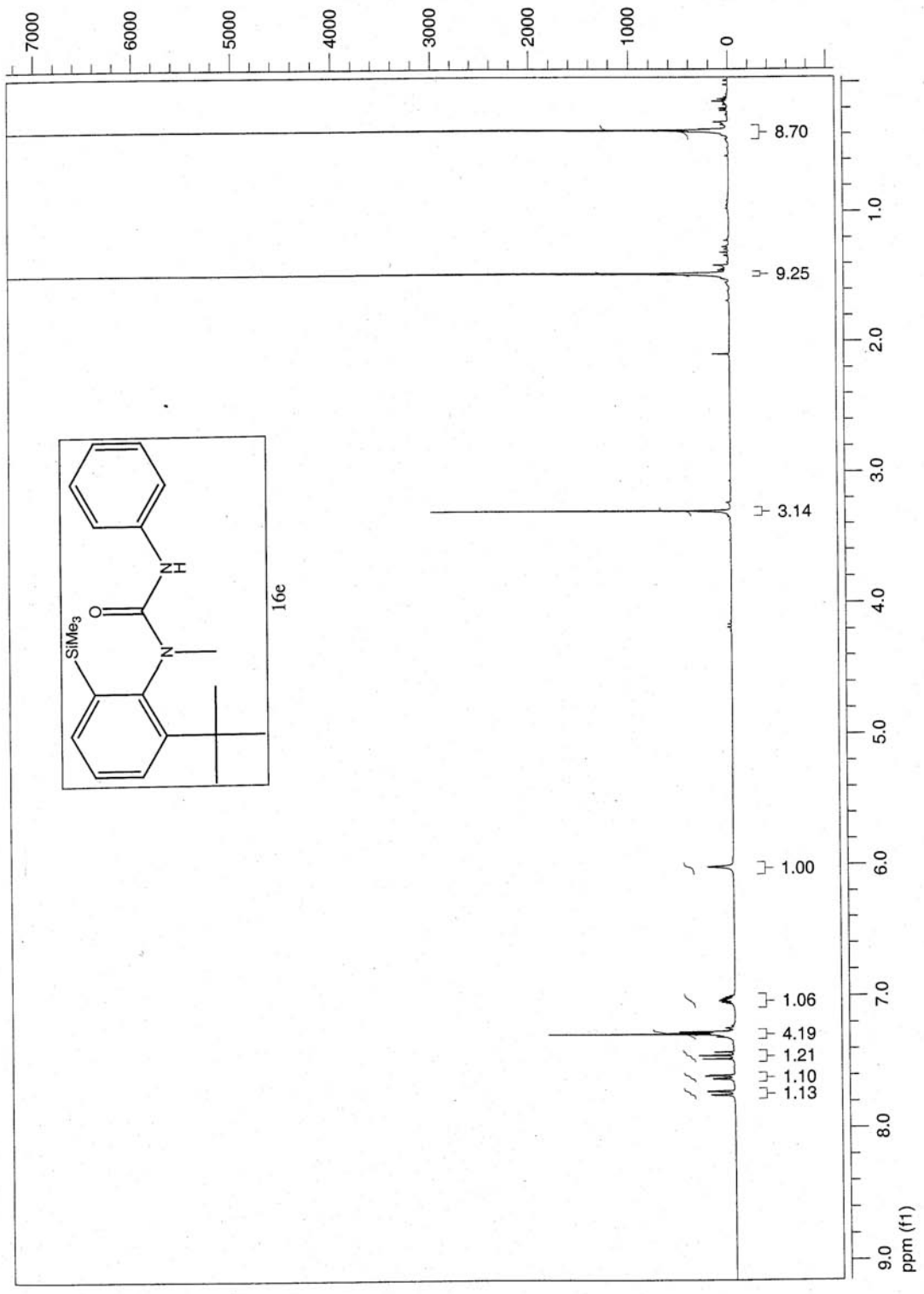
16d - H


4000
3000
2000
1000
0
9.05
3.09
3.00
0.95
1.09
0.98
5.91
2.03
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
ppm (f1)
16d
SMe
NH
O
N

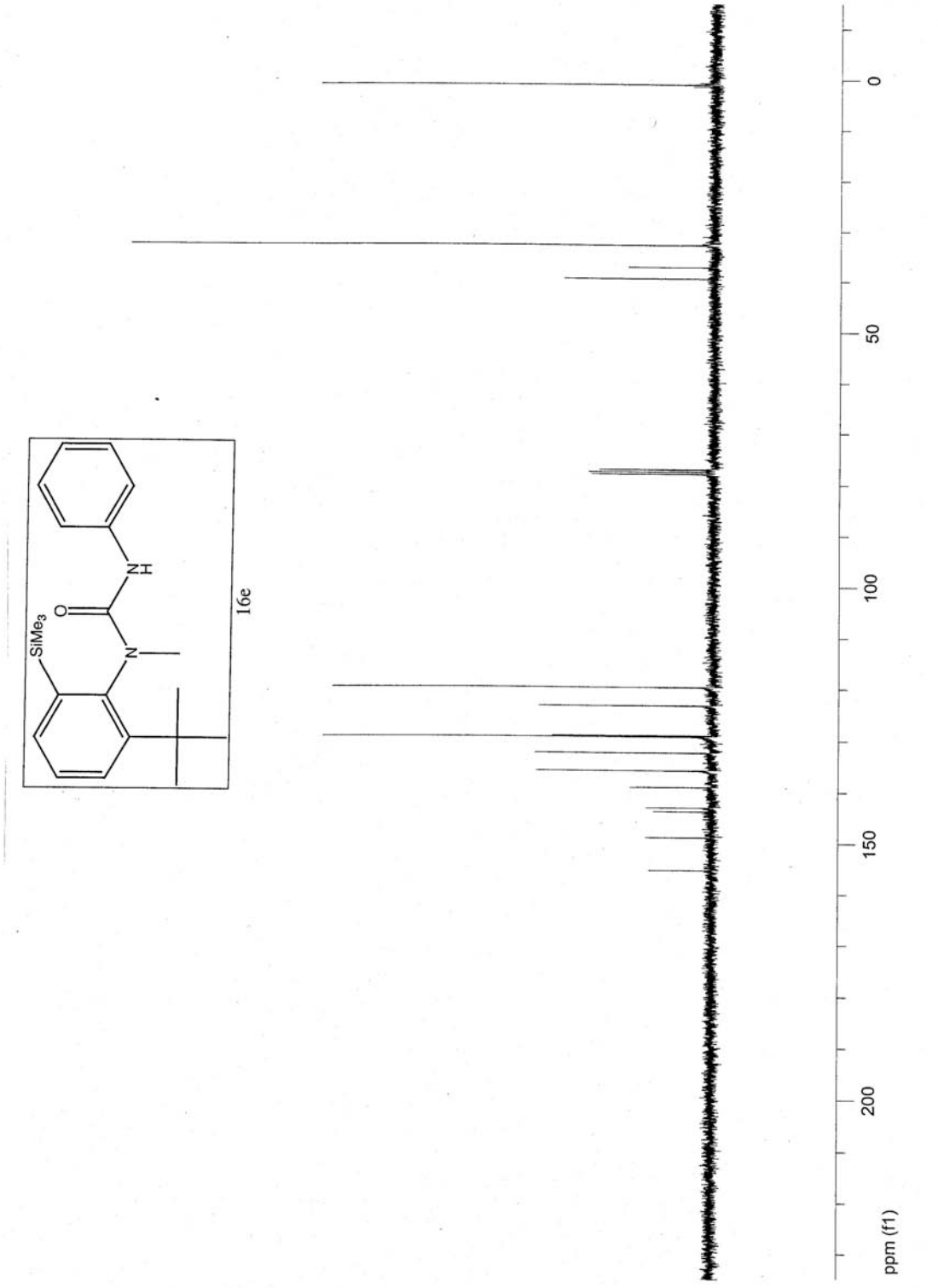
16d - C



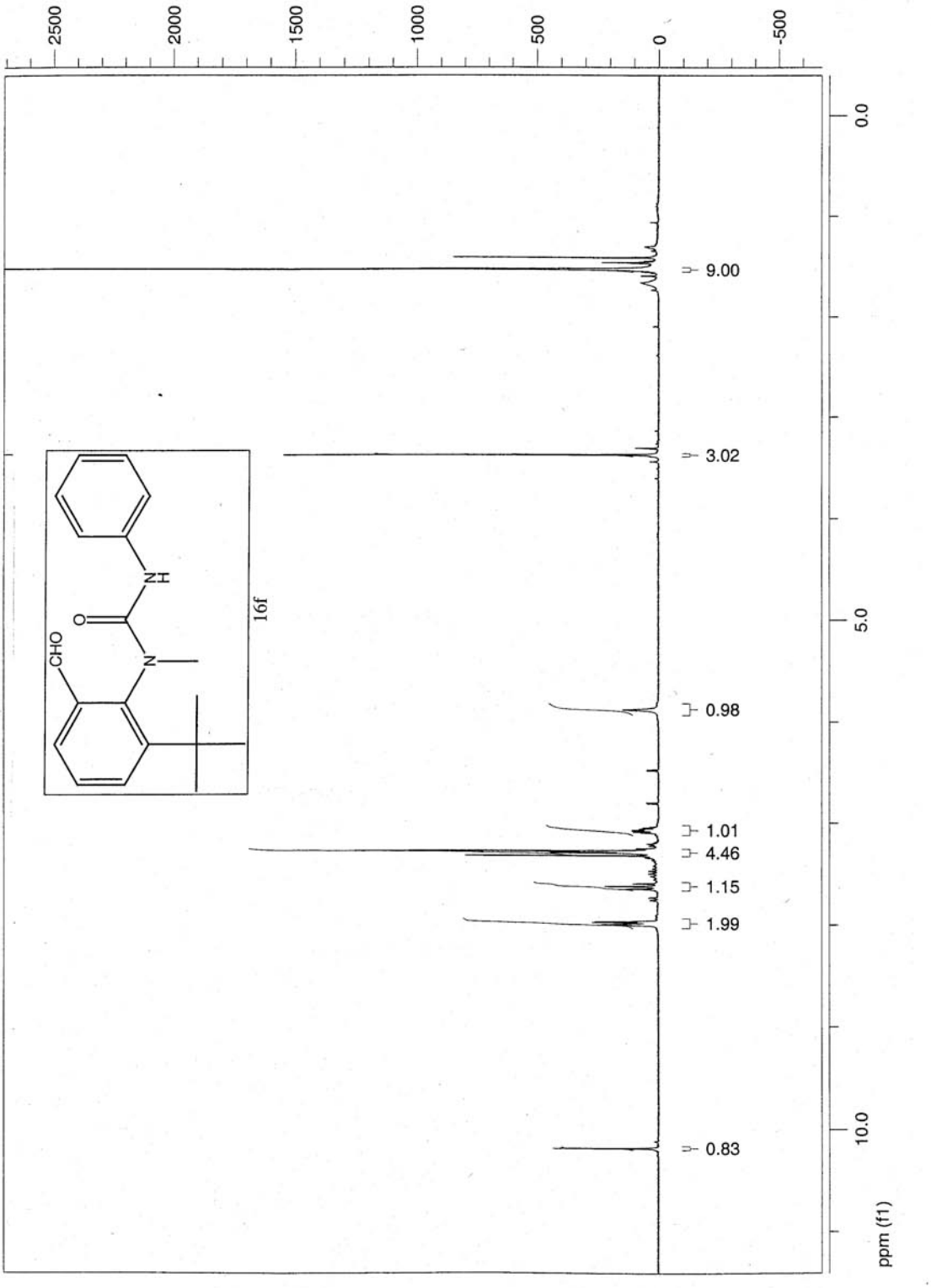
16e - H


7000
6000
5000
4000
3000
2000
1000
0
8.70
9.25
3.14
1.00
1.06
4.19
1.21
1.10
1.13
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
ppm (f1)
SiMe3
H
N
O
N
16e

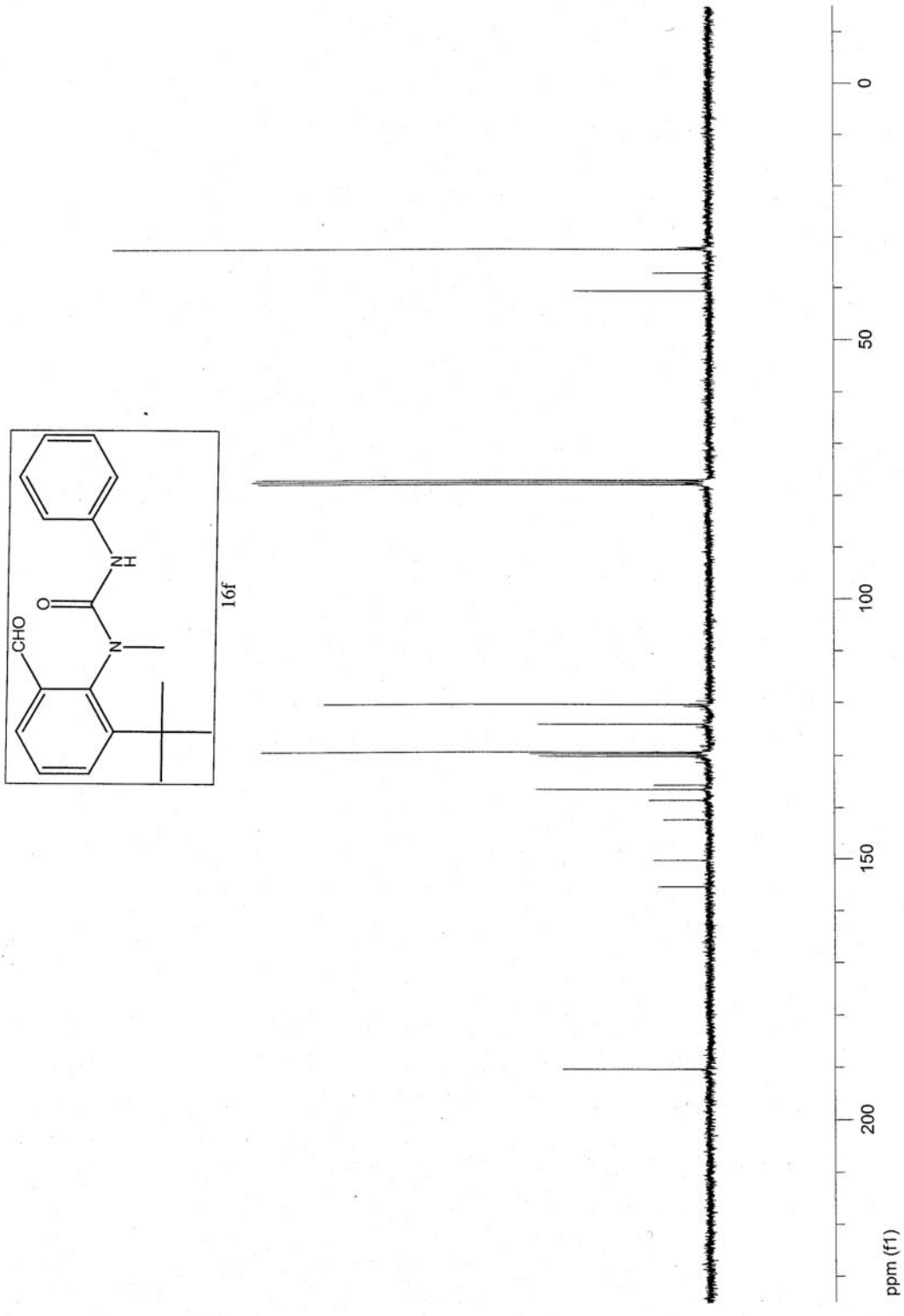
16e - C



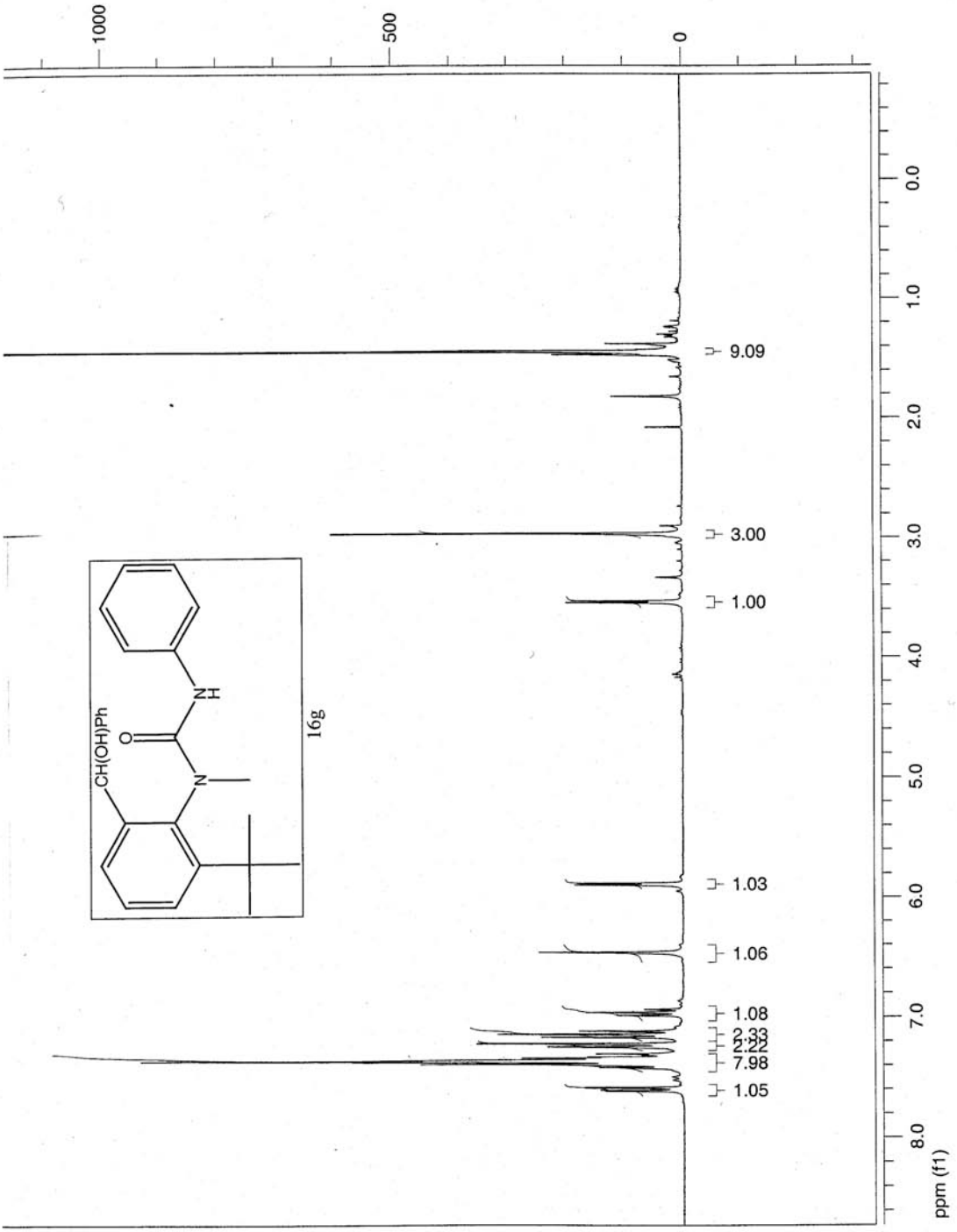
16f - H


2500
2000
1500
1000
500
0
-500
0.0
5.0
10.0
ppm (f1)
9.00
3.02
0.98
1.01
4.46
1.15
1.99
0.83
16f
CHO
NH
O
N

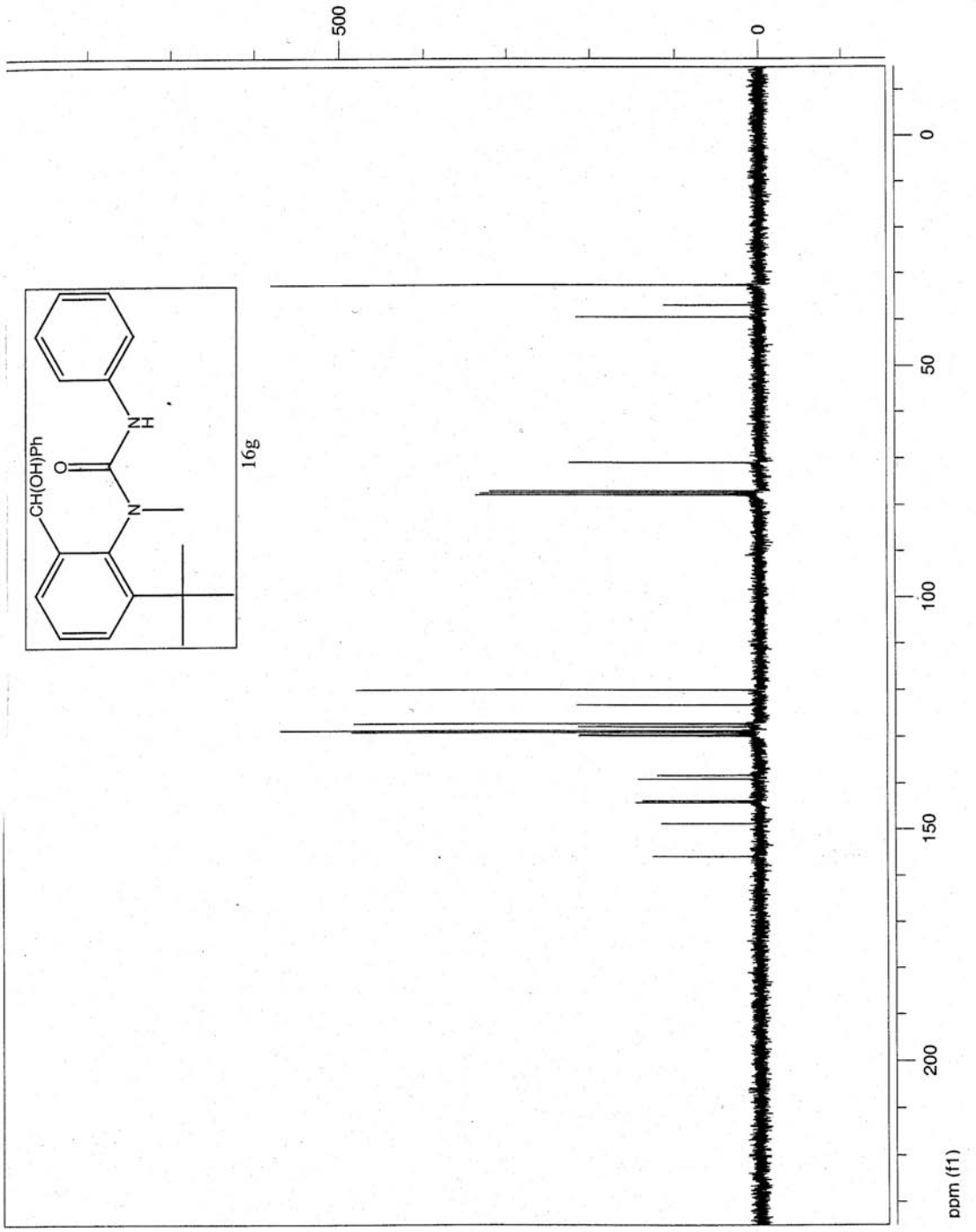
16f – C



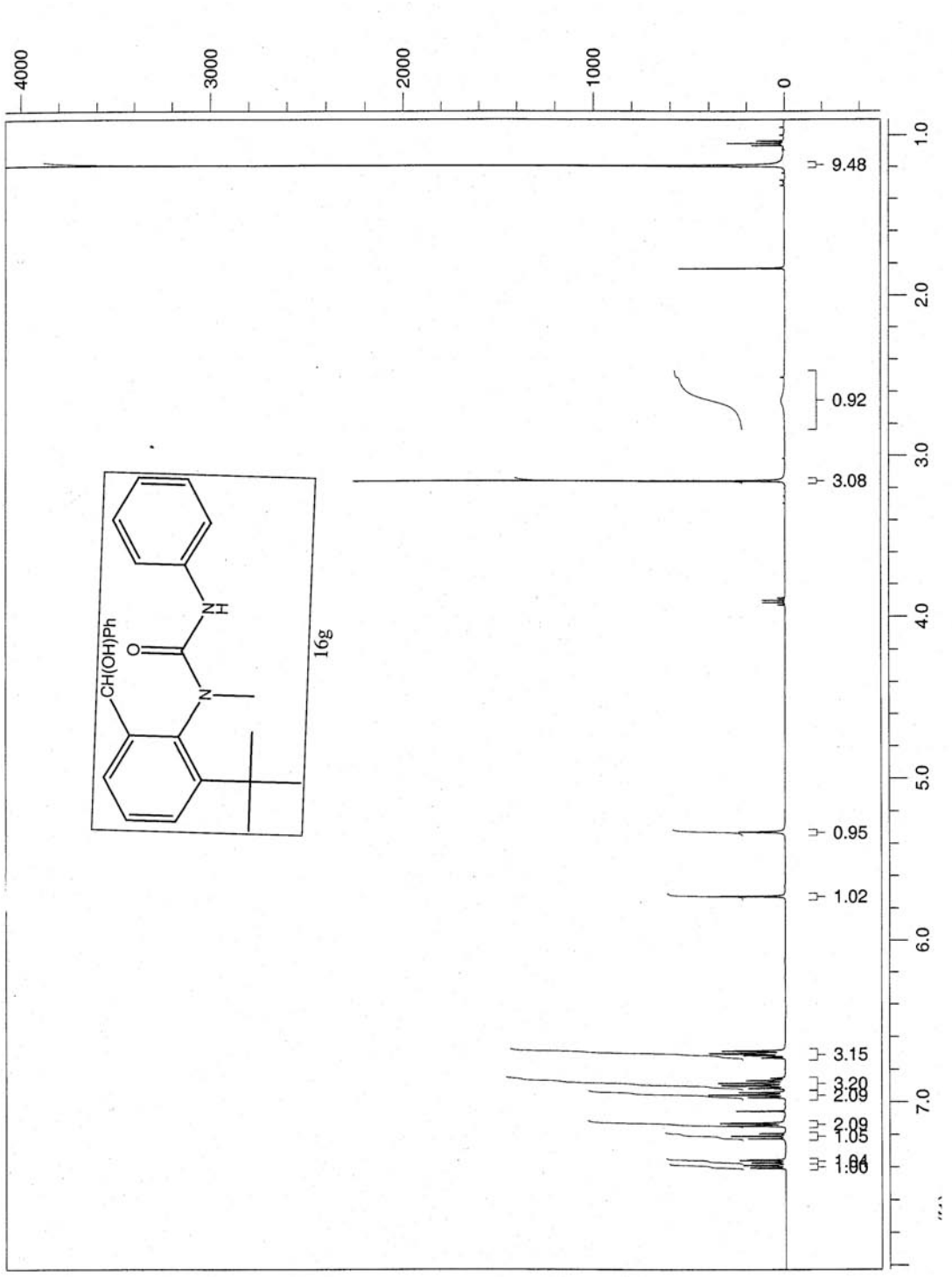
16g - H


1000
500
0
9.09
3.00
1.00
1.03
1.06
1.08
2.33
2.22
7.98
1.05
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
ppm (f1)
CH(OH)Ph
O
N
H
N
16g

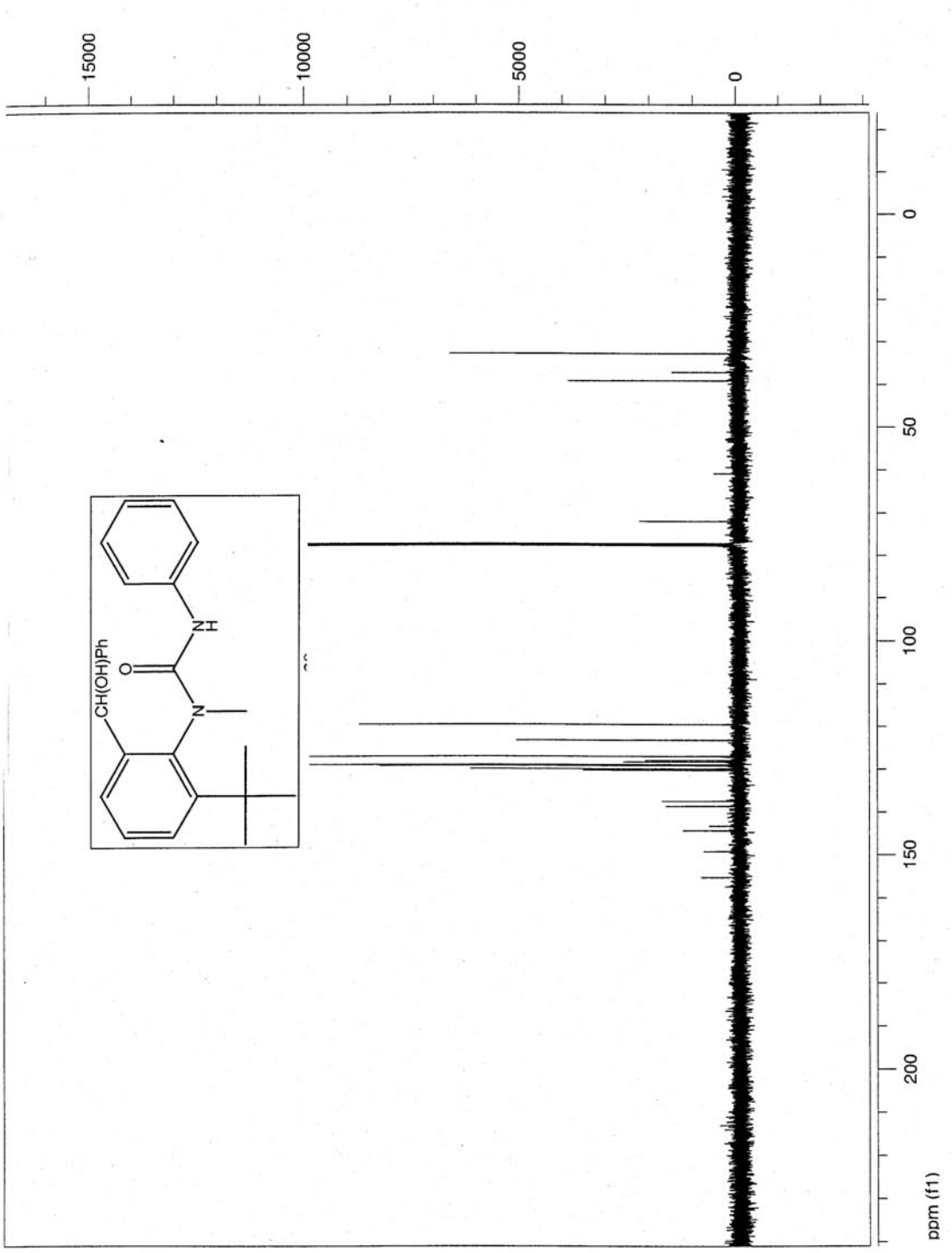
16g - C



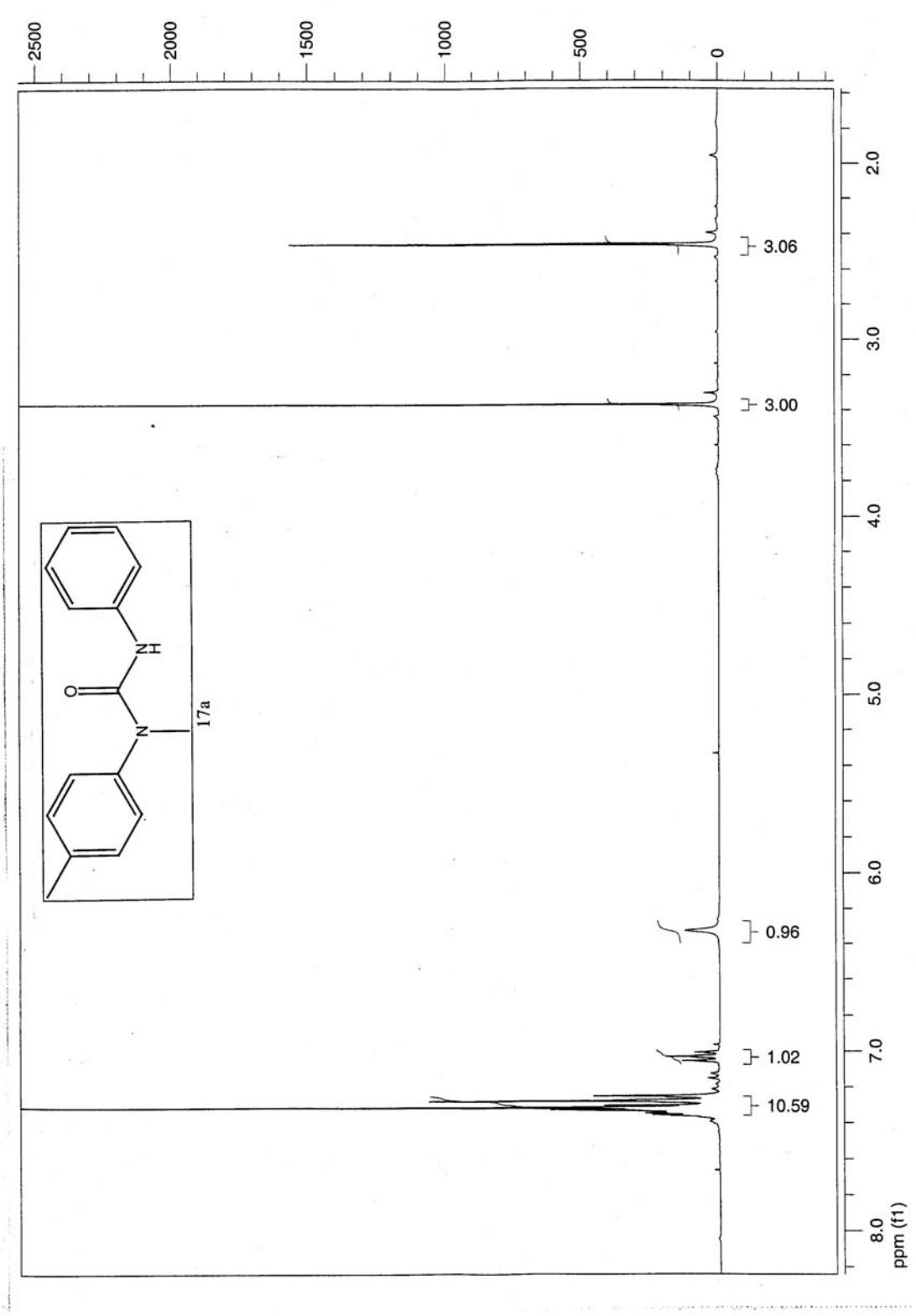
16g' - H


4000
3000
2000
1000
0
9.48
0.92
3.08
0.95
1.02
3.15
3.20
2.09
2.09
1.05
1.04
1.00
1.0
2.0
3.0
4.0
5.0
6.0
7.0
CH(OH)Ph
O
N
H
N
16g

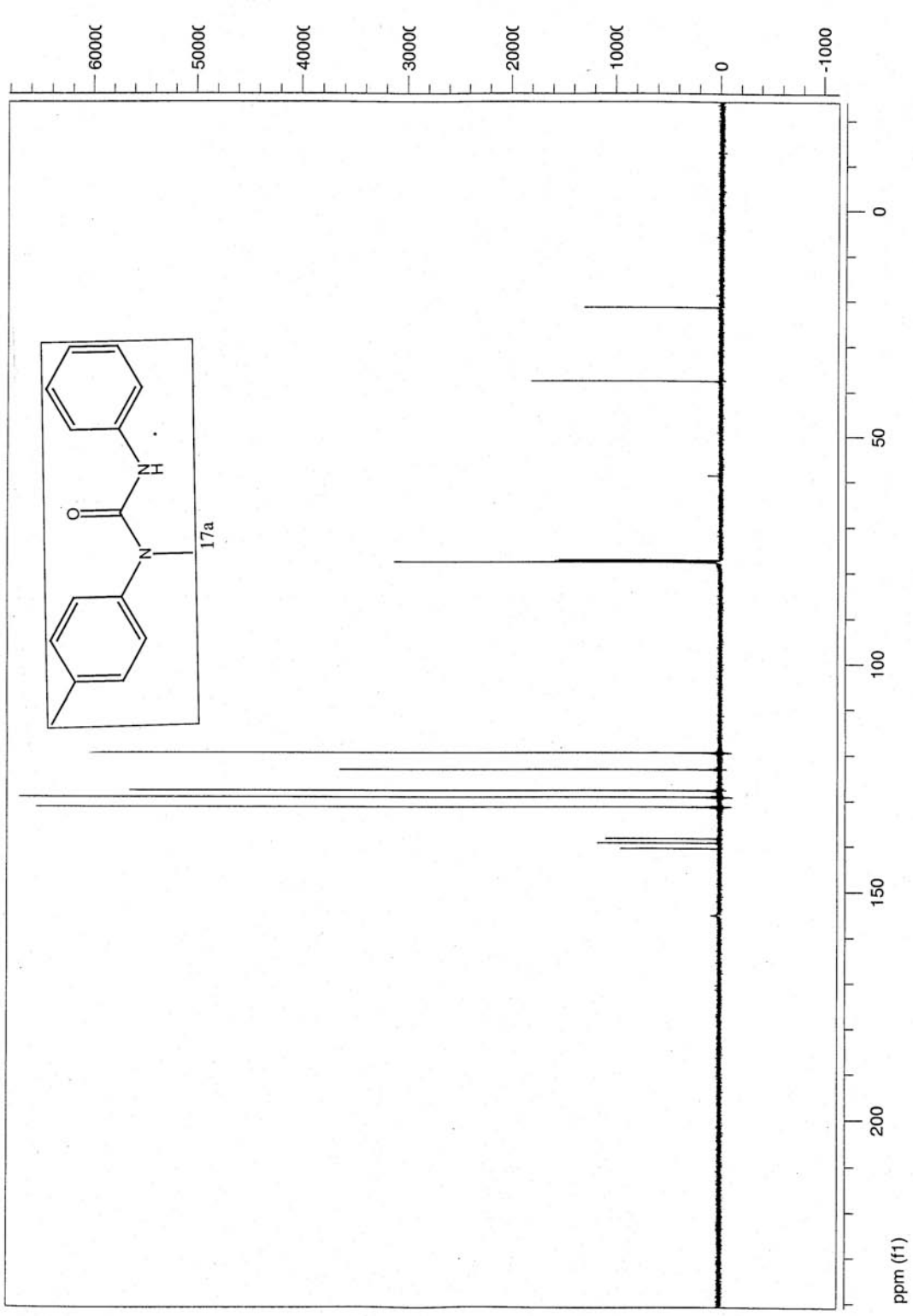
16g' - C



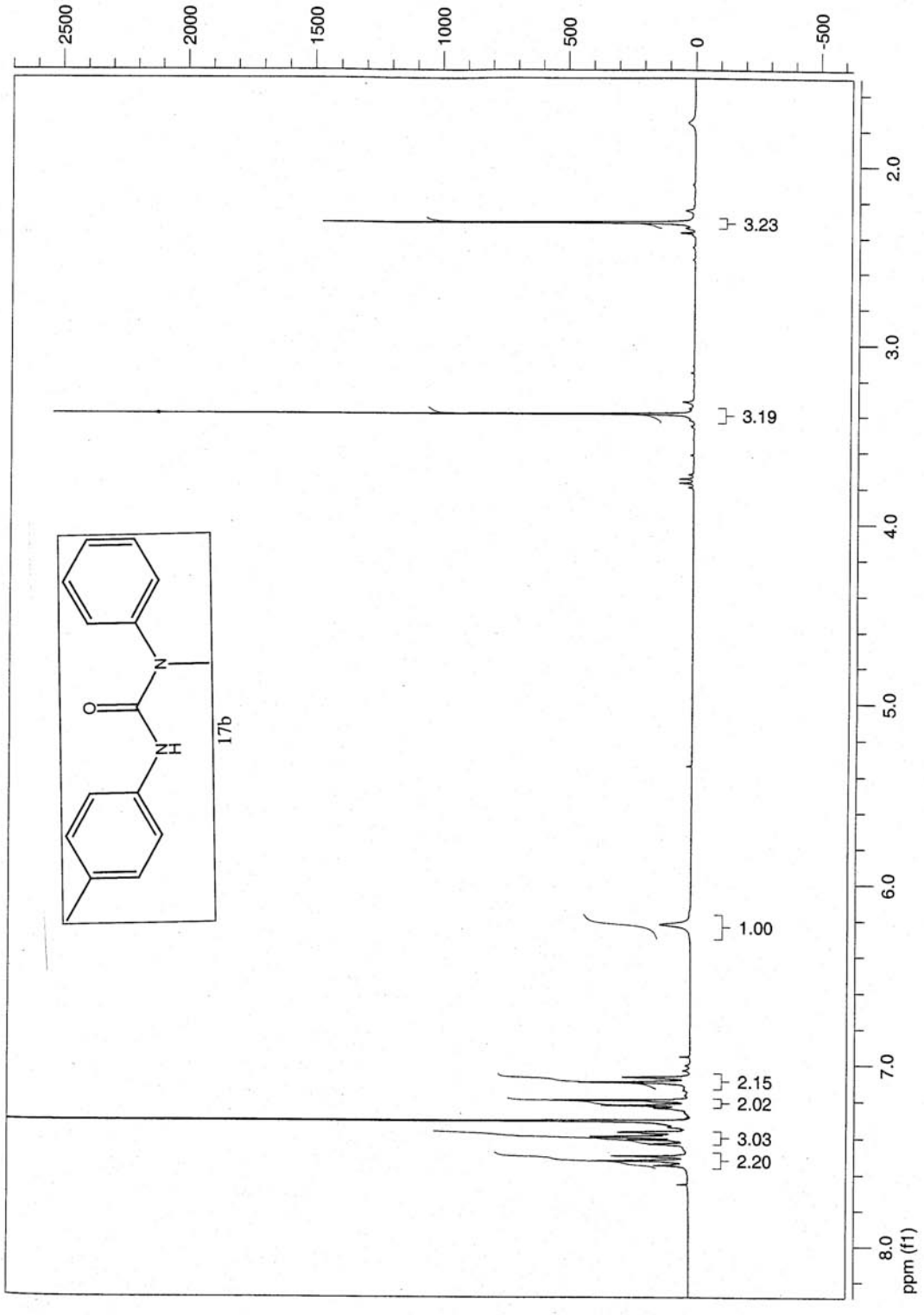
17a - H


2500
2000
1500
1000
500
0
3.06
3.00
0.96
1.02
10.59
2.0
3.0
4.0
5.0
6.0
7.0
8.0
ppm (f1)
NH
O
N
17a

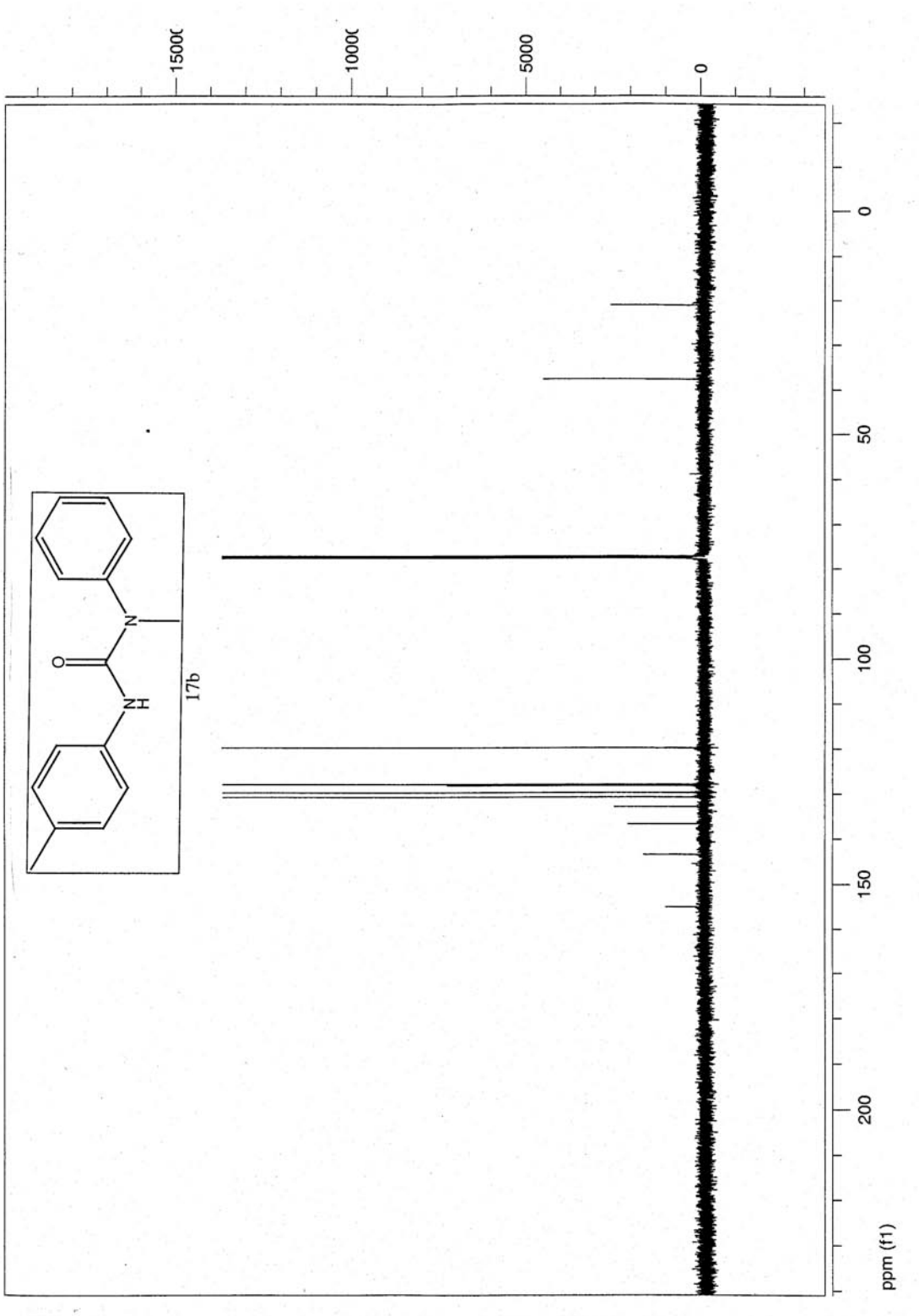
17a - C


6000
5000
4000
3000
2000
1000
0
-1000
0
50
100
150
200
ppm (f1)
NH
O
N
17a

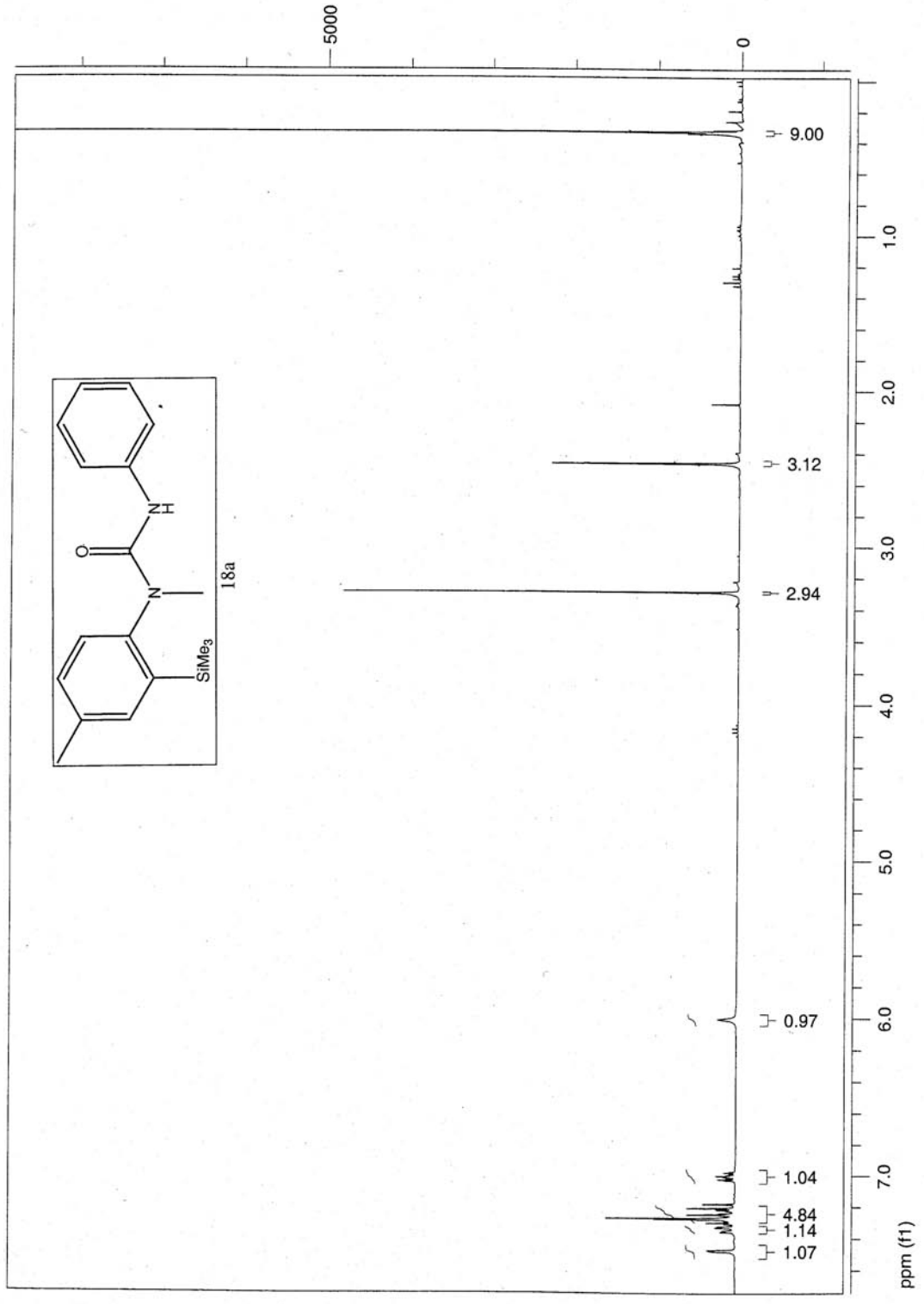
17b - H


2500
2000
1500
1000
500
0
-500
3.23
3.19
1.00
2.15
2.02
3.03
2.20
2.0
3.0
4.0
5.0
6.0
7.0
8.0
ppm (f1)
17b

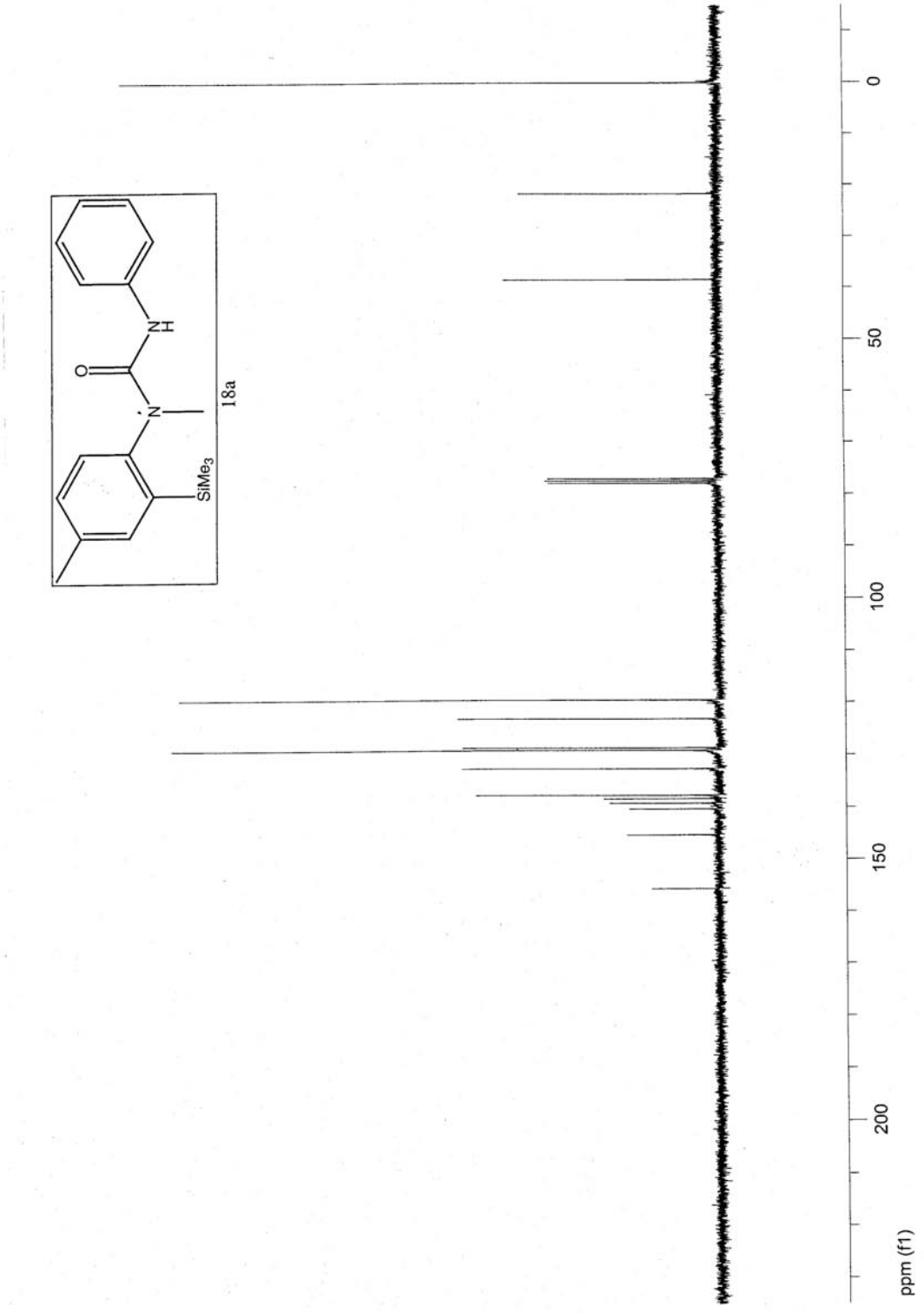
17b - C



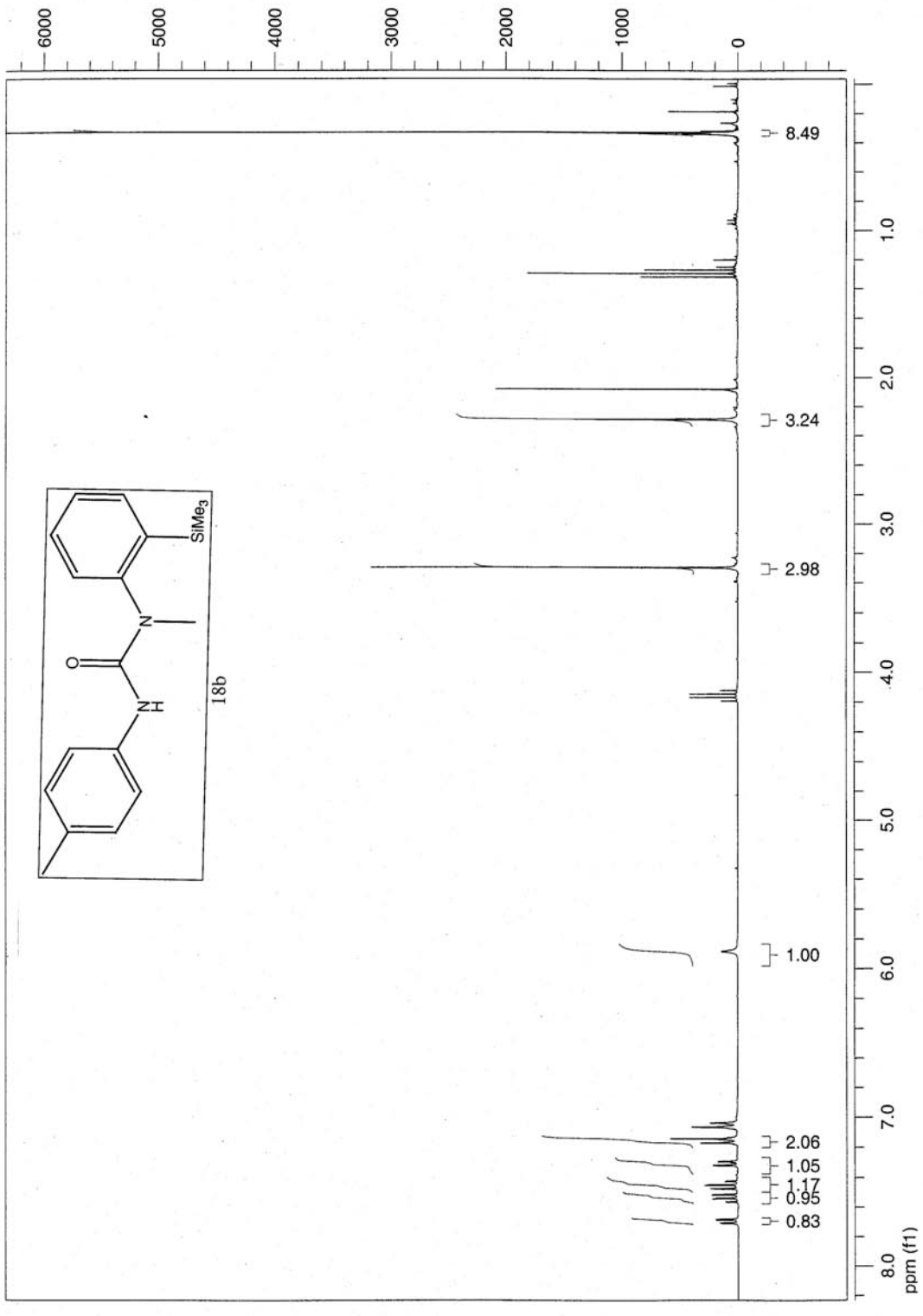
18a - H


5000
0
9.00
3.12
2.94
0.97
1.04
4.84
1.14
1.07
1.0
2.0
3.0
4.0
5.0
6.0
7.0
ppm (f1)
18a
SiMe3

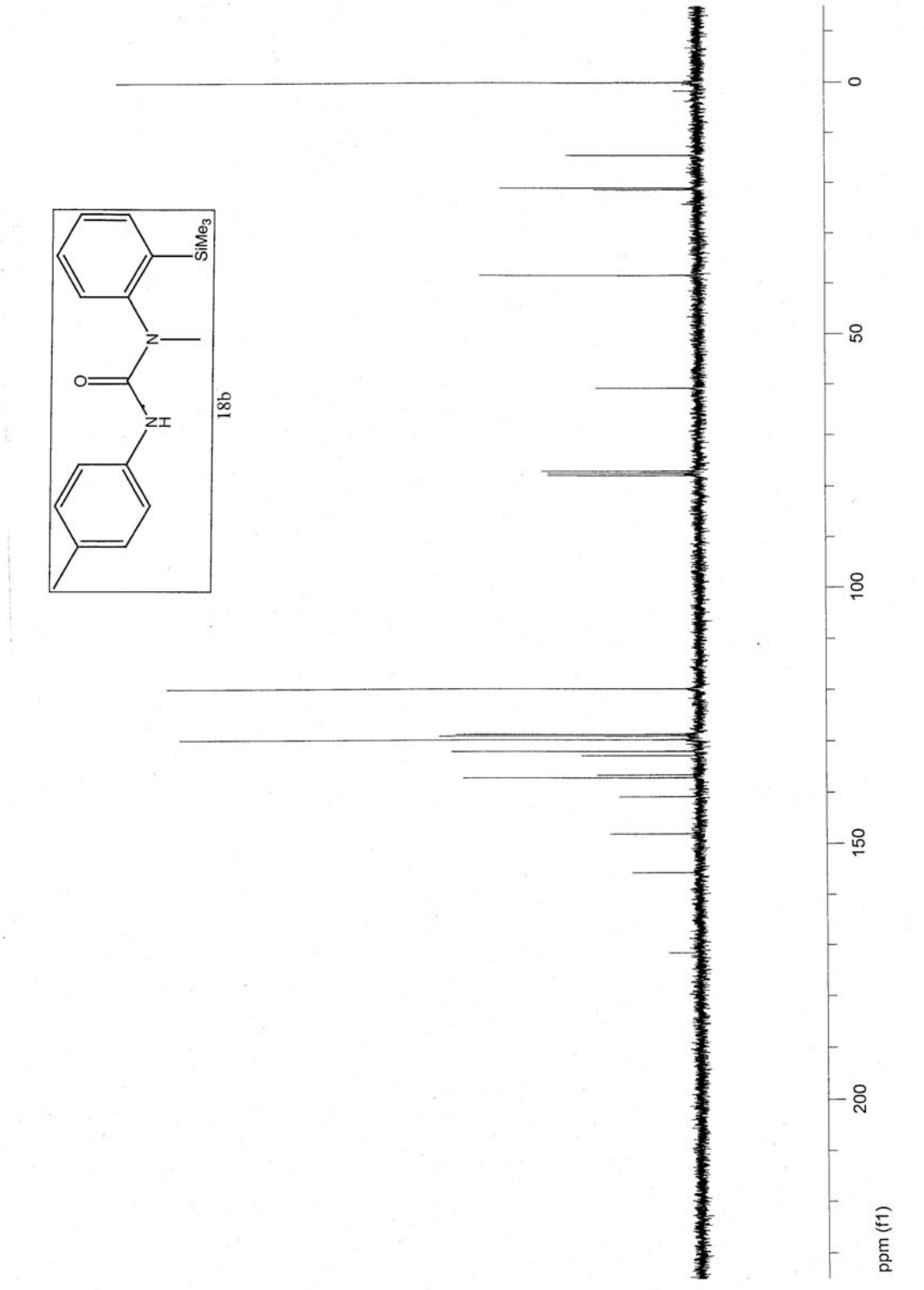
18a - C



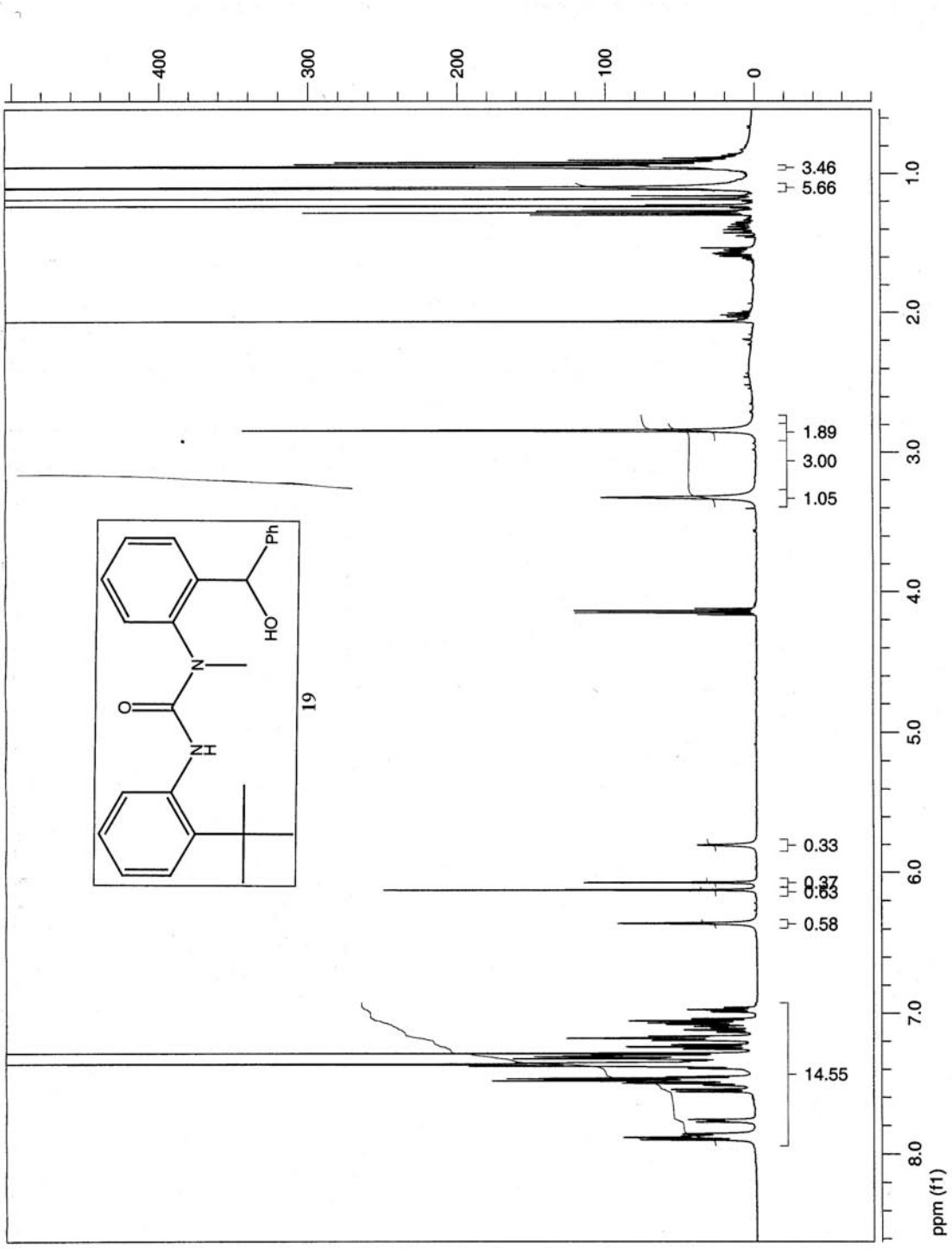
18b - H


6000
5000
4000
3000
2000
1000
0
8.49
3.24
2.98
1.00
2.06
1.05
1.17
0.95
0.83
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
ppm (f1)
SiMe3
N
O
NH
18b

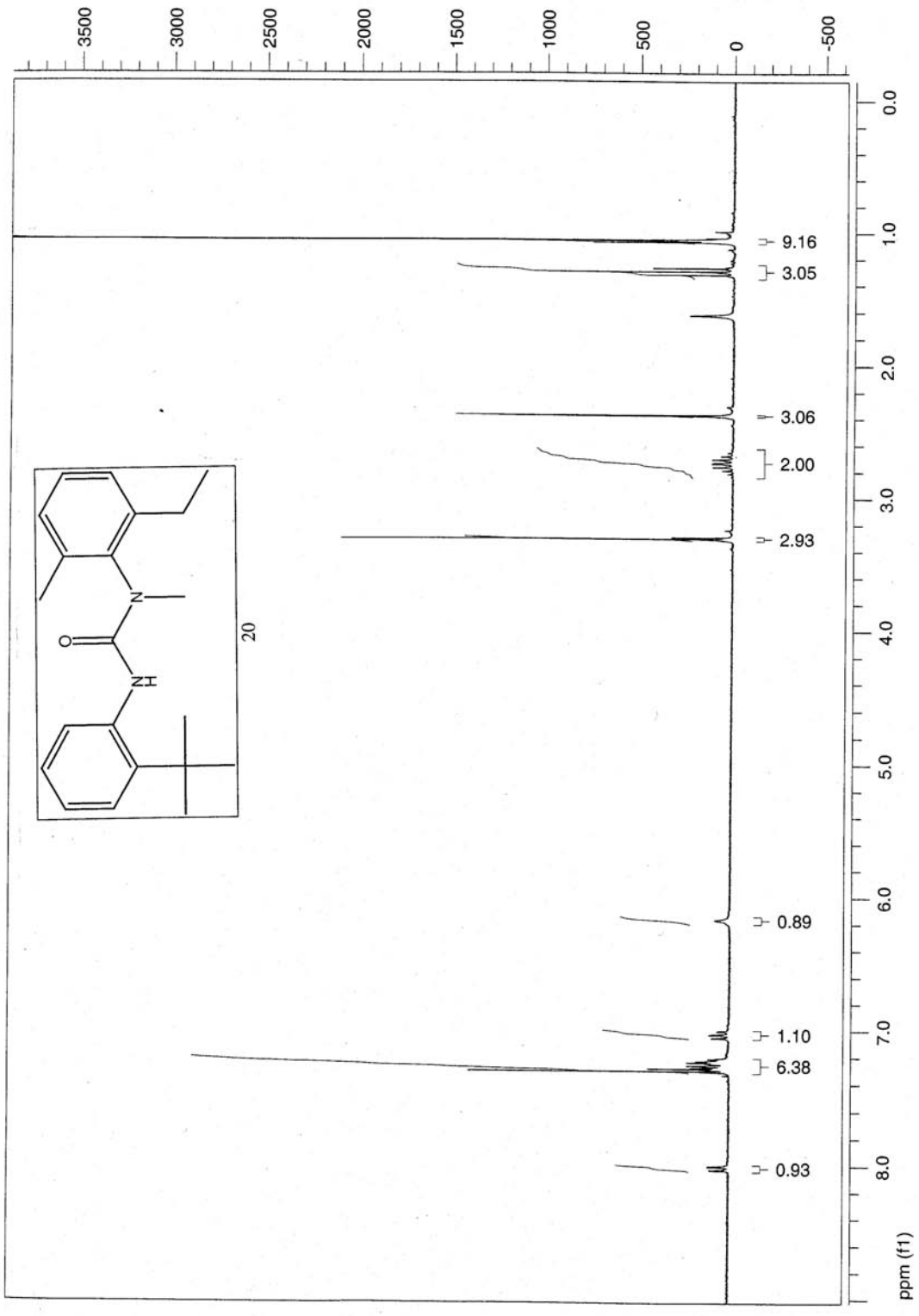
18b - C



19 - H


400
300
200
100
0
3.46
5.66
1.89
3.00
1.05
0.33
0.37
0.63
0.58
14.55
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
ppm (f1)
Ph
HO
N
O
NH
19

20 - H


3500
3000
2500
2000
1500
1000
500
0
-500
9.16
3.05
3.06
2.00
2.93
0.89
1.10
6.38
0.93
20
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
ppm (f1)

20 - C