Electronic Supplementary Material (ESI) for Green Chemistry.

Low Toxicity Functionalised Imidazolium Salts for Task Specific Ionic Liquid Electrolytes in Dye-Sensitised Solar Cells: A Step Towards Less Hazardous Energy Production.

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Supporting Information

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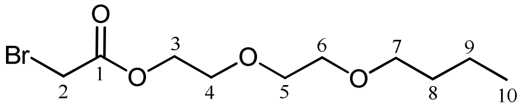


To a stirred solution of di(ethyleneglycol)-*n*-butylether (23.83 g, 146.9 mmol) in CH_2Cl_2 (100 mL) at -5°C was added sodium carbonate (23.35 g, 220.3 mmol) followed by bromoacetyl bromide (15.4 mL, 176 mmol). The reaction mixture was allowed to warm to room temperature and stirred for 12 h. Then reaction mixture was filtered and washed with saturated sodium bicarbonate (50 mL) and brine solution (3 × 50 mL). The organic phase was then concentrated by rotary evaporation and crude product was purified by column chromatography (SiO_2, EtOAc:Hexane, 20:80) to obtain the title compound as a colourless liquid in 98 % yield (40.82 g, 144.2 mmol).

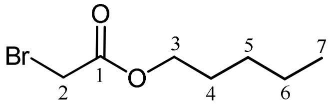
^{1}H NMR (400 MHz, $CDCl_3$, δ): 4.26 (t, *J* = 4.8 Hz, 2H, *H3*), 3.82 (s, 2H, *H2*), 3.67 (t, *J* = 4.8 Hz, 2H, *H4*), 3.60-3.57(m, 2H, *H5*), 3.53-3.50 (m, 2H, *H6*), 3.39 (t, *J* = 6.8 Hz, 2H, *H7*), 1.50 (tt, *J* = 7.4, 6.8 Hz, 2H, *H8*), 1.30 (qt, *J* = 7.4, 7.2 Hz, 2H, *H9*), 0.85 (t, *J* = 7.2 Hz, 3H, *H10*).

^{13}C NMR (100 MHz, $CDCl_3$, δ): 167.19 (*C*OO, *C1*), 71.18 (O*C*H_2, *C7*), 70.63 (O*CH*$_2$, *C5*), 70.01 (O*CH*$_2$, *C6*), 68.70 (O*CH*$_2$, *C4*), 65.31 (O*CH*$_2$, *C3*), 31.65 (N*C*H_2, *C8*), 25.85 (*C*H_2, *C2*), 19.23 (*C*H_2, *C9*), 13.89 (*C*H_3, *C10*).

IR (neat, cm^{-1}): 2958, 2933, 2867, 1738, 1279, 1107, 1035, 962, 864, 666.

^{1}H and ^{13}C-NMR spectra are in agreement with the literature data.[1]

Pentyl 2-bromoacetate (11)[1]



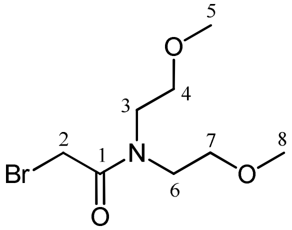
The title compound was prepared from pentan-1-ol (44.00 g, 500 mmol) and bromoacetyl bromide (101.00 g, 500 mmol) according to the general procedure A to obtain a pale yellow liquid in 64 % yield (66.88 g, 320 mmol).

^{1}H NMR (400 MHz, $CDCl_3$) ppm: 4.09 (t, *J* = 6.8 Hz, 2H, *H3*), 3.75 (s, 2H, *H2*), 1.61-1.54 (m, 2H, *H4*), 1.28-1.23 (m, 4H, *H's 5 and 6*), 0.84 (t, *J* = 7.0 Hz, 3H, *H7*).

^{13}C NMR (100 MHz, CDCl$_3$) ppm: 167.35 (*C*O, *C1*), 66.45 (O*C*H$_2$, *C3*), 28.09 (*C*H$_2$, *C2*), 27.87 (*C*H$_2$, *C4*), 26.01 (*C*H$_2$, *C5*), 22.27 (*C*H$_2$, *C6*), 13.94 (*C*H$_3$, *C7*).

^{1}H and ^{13}C-NMR spectra are in agreement with the literature data.[1]

2-Bromo-*N*,*N*-*bis*(2-methoxyethyl)acetamide (12)[2]



To a stirred solution of *bis*(2-methoxyethyl)amine (40.10 g, 301.1 mmol) in CH$_2$Cl$_2$ (500 mL) at −78 °C was added triethylamine (48.51 g, 479.4 mmol) followed by bromoacetyl bromide (34.8 mL, 400 mmol). The reaction mixture was stirred at −78 °C for 5 h. Then reaction mixture was washed with 10 % NH$_4$Cl solution (200 mL), 10 % sodium bicarbonate (200 mL), water (200 mL) and brine solution (200 mL). The organic phase was then dried over anhydrous MgSO$_4$, filtered and concentrated under high vacuum to obtain the title compound as a brown liquid in 76 % yield (58.15 g, 228.8 mmol).

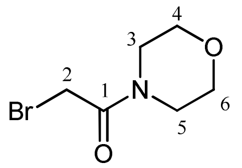
^{1}H NMR (400 MHz, CDCl$_3$) ppm: 3.96 (s, 2H, *H2*), 3.59 (t, *J* = 5.2 Hz, 2H, *H3/H6*), 3.52-3.48 (m, 4H, *H3/H6, H4/C7*), 3.48 (t, *J* = 5.2 Hz, 2H, *H4/H7*), 3.28 (s, 6H, *H5, H8*).

^{13}C NMR (100 MHz, CDCl$_3$) ppm: 167.66 (*C*OO, *C1*), 70.70 (O*C*H$_2$, *C4/C7*), 70.28 (O*C*H$_2$, *C4/C7*), 59.09 (O*C*H$_3$, *C5/C8*), 58.89 (O*C*H$_3$, *C5/C8*), 50.05 (N*C*H$_2$, *C3/C6*), 46.83 (N*C*H$_2$, *C3/C6*), 27.25 (*C*H$_2$, *C2*).

IR (neat, cm^{-1}): 2984, 2929, 2890, 1643, 1456, 1419, 1365, 1189, 1112, 1012, 964, 825, 708.

^{1}H and ^{13}C-NMR spectra are in agreement with the literature data.[2]

2-Bromo-1-(morpholin-4-yl)ethan-1-one (**13**)



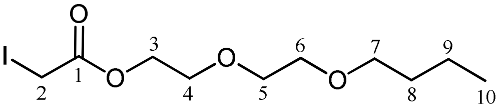
The title compound was prepared from morpholine (30.12 g, 345.7 mmol), sodium carbonate (54.97 g, 518.59 mmol) and bromoacetyl bromide (36.2 mL, 415 mmol) according to the general procedure A as a colourless liquid in 85 % yield (61.06 g, 293.5 mmol).

^{1}H NMR (400 MHz, $CDCl_3$) ppm: 3.78 (s, 2H, *H2*), 3.63 (t, J = 4.8 Hz, 2H, *H4/H5*), 3.58 (t, J = 4.8 Hz, 2H, *H4/H5*), 3.51 (t, J = 4.8 Hz, 2H, *H3/H6*), 3.42 (t, J = 4.8 Hz, 2H, *H3/H6*).

^{13}C NMR (100 MHz, $CDCl_3$) ppm: 165.27 (*C*OO, *C1*), 66.35 (OCH_2, *C4/C5*), 66.14 (OCH_2, *C4/C5*), 46.92 (NCH_2, *C3/C6*), 42.19 (NCH_2, *C3/C6*), 25.48 (CH_2, *C2*).

IR (neat, cm^{-1}): 2966, 2857, 1636, 1459, 1436, 1361, 1274, 1217, 1109, 1068, 1036, 964, 846, 719.

2-(2-Butoxyethoxy)ethyl-2-iodoacetate (**14**)[3]

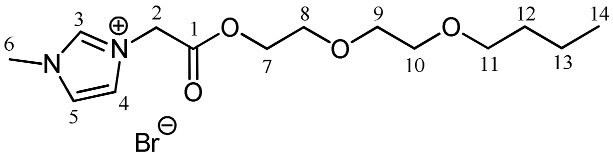


To a stirred solution of di(ethyleneglycol)-*n*-butylether (0.95 g, 5.87 mmol) in CH_2Cl_2 (10 mL) at 0°C was added sodium carbonate (0.65 g, 6.16 mmol) followed by iodoacetyl chloride (0.55 mL, 1.26 g, 6.16 mmol). The reaction mixture was allowed to warm to room temperature and stirred for 12 h. Then reaction mixture was filtered and washed with saturated sodium bicarbonate (10 mL) and brine solution (5 mL). The organic phase was then concentrated by rotary evaporation and crude product was purified by column chromatography (SiO_2, EtOAc:Hexane, 10:90) to obtain the title compound as a brown liquid in 68 % yield (1.31 g, 3.97 mmol).

^{1}H NMR (400 MHz, $CDCl_3$, δ): 4.27 (t, J = 4.8 Hz, 2H, *H3*), 3.70 (s, 2H, *H2*), 3.69 (t, J = 4.8 Hz, 2H, *H4*), 3.63-3.62(m, 2H, *H5*), 3.57-3.55 (m, 2H, *H6*), 3.44 (t, J = 6.6 Hz, 2H, *H7*), 1.54 (tt, J = 7.4, 6.6 Hz, 2H, *H8*), 1.34 (qt, J = 7.4, 7.2 Hz, 2H, *H9*), 0.89 (t, J = 7.2 Hz, 3H, *H10*).

^{13}C NMR (100 MHz, CDCl$_3$, δ): 168.82 (*C*OO, *C1*), 71.33 (O*C*H$_2$, *C7*), 70.80 (O*CH$_2$*, *C5*), 70.17 (O*CH$_2$*, *C6*), 68.84 (O*CH$_2$*, *C4*), 65.29 (O*CH$_2$*, *C3*), 31.80 (N*C*H$_2$, *C8*), 19.36 (*C*H$_2$, *C9*), 14.00 (*C*H$_3$, *C10*), -5.50 (*C*H$_2$, *C2*).

General procedure B: Bromide Ionic Liquids:3-{2-[2-(2-Butoxyethoxy)ethoxy]-2-oxoethyl}-1-methyl-1H-imidazol-3-ium bromide (6a)[1]



To a stirred solution of **10** (20.18 g, 71.3 mmol) in diethyl ether (100 mL), 1-methylimidazole (5.85 g, 71.3 mmol) was added dropwise at RT under a N_2 atmosphere. After stirring overnight the white solid of product was separated from the solvent by decantation. The solid was washed with diethyl ether (5 x 100 mL) and dried under high vacuum to obtain **6a** as a white solid in 90 % yield (23.5 g, 63.3 mmol). Melting Point: 78-80°C

^{1}H NMR (400 MHz, CDCl$_3$) ppm: 10.13 (s, 1H, *H3*), 7.68 (t, *J* = 1.8, Hz, 1H, *H4/H5*), 7.51 (t, *J* = 1.8, Hz, 1H, *H4/H5*), 5.50 (s, 2H, *H2*), 4.33 (t, *J* = 4.8 Hz, 2H, *H7*), 4.06 (s, 3H, *H6*), 3.71 (t, *J* = 4.8 Hz, 2H, *H8*), 3.61 (t, *J* = 5.2 Hz, 2H, *H9*), 3.55 (t, *J* = 5.2 Hz, 2H, *H10*), 3.42 (t, *J* = 6.8 Hz, 2H, *H11*), 1.51 (tt, *J* = 7.6, 6.8 Hz, 2H, *H12*), 1.31 (tq, *J* = 7.6, 7.4 Hz, 2H, *H13*), 0.87 (t, *J* = 7.4 Hz, 3H, *H14*).

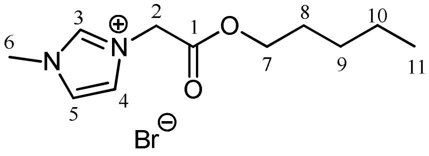
^{13}C NMR (100 MHz, CDCl$_3$) ppm: 166.19 (*C*OO, *C1*), 138.05 (Ar*CH*, *C3*), 123.91 (Ar*C*H, *C4/C5*), 123.15 (Ar*CH*, *C4/C5*), 71.09 (O*C*H$_2$, *C11*), 70.49 (O*CH$_2$*, *C9*), 69.84 (O*CH$_2$*, *C10*), 68.45 (O*CH$_2$*, *C8*), 65.53 (O*CH$_2$*, *C7*), 50.14 (N*C*H$_2$, C2), 36.84 (N*C*H$_3$, *C6*), 31.53 (*C*H$_2$, *C12*), 19.14 (*C*H$_2$, *C13*), 13.86 (*C*H$_3$, *C14*).

IR (neat, cm^{-1}): 3134, 3094, 2954, 2871, 1752, 1577, 1567, 1448, 1370, 1341, 1281, 1236, 1219, 1193, 1169, 1128, 1096, 1044, 967, 881, 850, 770, 713.

HRMS (ESI$^+$,*m/z*): Calculated for [M-Br$^-$]$^+$, $C_{14}H_{25}N_2O_4^+$, requires = 285.1814, found = 285.1803.

^{1}H, ^{13}C-NMR spectra and melting point are in agreement with the literature data.[1]

3-Methyl-1-(pentoxycarbonylmethyl)imidazolium bromide (7a)$^{1, 4}$



The title compound **7a** was prepared from 1-methylimidazole (3.69g, 45.0 mmol) and **11** (54.0 mmol, 11.29 g) according to the general procedure B to afford a pale yellow liquid in 97 % yield (12.76 g, 43.8 mmol).

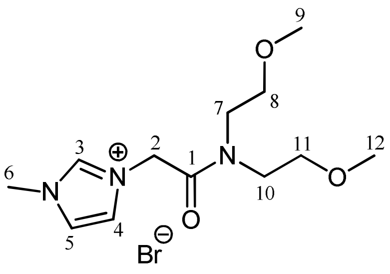
^{1}H NMR (400 MHz, CDCl$_3$) (ppm): 8.79 (s, 1H, *H3*), 7.30 (t, *J* = 1.8 Hz, 1H, *H4/H5*), 7.23 (t, *J* = 1.8 Hz, 1H, *H4/H5*), 4.95 (s, 2H, *H2*), 4.16 (t, *J* = 6.8 Hz, 2H, *H7*), 3.90 (s, 3H, *H6*), 1.65 (tt, *J* = 6.8, 7.2 Hz, 2H, *H8*), 1.30-1.23 (m, 4H, *H's 9 and 10*), 0.86 (t, *J*= 7.0 Hz, 3H, *H11*).

^{13}C NMR (100 MHz, CDCl$_3$) (ppm): 166.16 (*C*O, *C1*), 138.39 (N*C*H$_2$N, *C3*), 123.79 (N*C*H, *C4*), 123.08 (N*C*H, *C5*), 67.07 (O*C*H$_2$, *C7*), 50.30 (N*C*H$_2$, *C2*), 36.92 (N*C*H$_3$, *C6*), 28.00 (CH$_2$, *C8*), 27.79 (*C*H$_2$, *C9*), 22.21 (*C*H$_2$, *C10*), 13.19 (*C*H$_3$, *C11*).

IR (cm^{-1}): 3095, 2959, 2931, 1750, 1578, 1569, 1559, 1495, 1455, 1398, 1230, 1177.

HRMS *m/z*: Found 211.1440 [M-Br$^-$]$^+$, Calcd. $C_{11}H_{19}N_2O_2$ = 211.1447

3-{[*bis*(2-Methoxyethyl)carbamoyl]methyl}-1-methyl-1H-imidazol-3-ium bromide (8a)^1



The title compound **8a** was prepared from 1-methylimidazole (23.06 g, 280.8 mmol) and **12** (71.37 g, 280.9 mmol) according to the general procedure B to obtain a yellow solid in 83 % yield (78.04 g, 232.1 mmol). Melting Point: 68-70 °C

<u>^{1}H NMR (400 MHz, CDCl$_3$) ppm:</u> 9.76 (s, 1H, *H3*), 7.47 (t, *J* = 1.6 Hz, 1H, *H4/H5*), 7.41 (t, *J* = 1.6 Hz, 1H, *H4/H5*), 5.57 (s, 2H, *H2*), 3.98 (s, 3H, *H6*), 3.62 (t, *J* = 4.8 Hz, 2H, *H7/H10*), 3.49 (t, *J* = 4.8 Hz, 2H, *H8/H11*), 3.47 (t, *J* = 4.8 Hz, 2H, *H8/H11*), 3.41(t, *J* = 4.8 Hz, 2H, *H7/H10*), 3.28 (s, 3H, *H9/H12*), 3.23 (s, 3H, H9/*H12*).

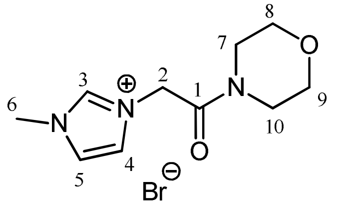
<u>^{13}C NMR (100 MHz, CDCl$_3$) ppm:</u> 165.62 (*C*OO, *C1*), 138.01 (Ar*C*H, *C3*), 123.99 (Ar*C*H, *C4/C5*), 122.61 (Ar*C*H, *C4/C5*), 70.30 (O*C*H$_2$, *C8/C11*), 70.04 (O*C*H$_2$, *C8/C11*), 59.19 (O*C*H$_3$, *C9/C12*), 58.80 (O*C*H$_3$, *C9/C12*), 50.61 (N*C*H$_2$, *C2*), 48.59 (N*C*H$_2$, *C7/C10*), 46.68 (N*C*H$_2$, *C7/C10*), 36.73 (N*C*H$_3$, *C6*).

<u>IR (neat, cm^{-1}):</u> 3420, 3078, 2930, 1651, 1570, 1470, 1424, 1350, 1175, 1111, 1014, 922, 827, 727.

<u>HRMS (ESI$^+$, *m/z*)</u>: Calculated for [M-Br$^-$]$^+$, $C_{12}H_{22}N_3O_3^+$, requires = 256.1661, found = 256.1653.

^{1}H, ^{13}C-NMR spectra and melting point are in agreement with the literature data.[1]

1-Methyl-3-[2-(morpholin-4-yl)-2-oxoethyl]-1H-imidazol-3-ium bromide (**9a**)



The title compound **9a** was prepared from 1-methylimidazole (23.37 mL, 293 mmol) and **13** (61.06 g, 293.5 mmol) according to the general procedure B to obtain a white solid in 85 % yield (72.29 g, 249.1 mmol). <u>Melting Point:</u> 170-172°C

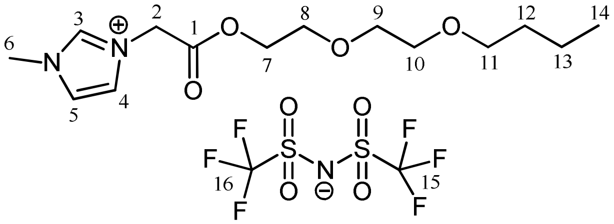
<u>^{1}H NMR (400 MHz, CDCl$_3$) ppm:</u> 9.65 (s, 1H, *H3*), 7.64 (t, *J* = 1.6 Hz, 1H, *H4/H5*), 7.38 (t, *J* = 1.6 Hz, 1H, *H4/H5*), 5.75 (s, 2H, *H2*), 3.98 (s, 3H, *H6*), 3.76 (t, *J* = 4.8 Hz, 2H, *H8/H9*), 3.64 (t, *J* = 4.8 Hz, 2H, *H8/H9*), 3.59 (t, *J* = 4.8, Hz, 2H, *H7/H10*), 3.52 (t, *J* = 4.8, Hz, 2H, *H7/H10*).

^{13}C NMR (100 MHz, CDCl$_3$) ppm: 163.34 (*C*ON, *C1*), 137.94 (N*C*HN, *C3*), 124.56 (N*C*H, *C4/C5*), 122.33 (N*C*H, *C4/C5*), 66.50 (O*C*H$_2$, *C8/C9*), 66.40 (O*C*H$_2$, *C8/C9*), 50.75 (N*C*H$_2$CO, C2), 45.51 (N*C*H$_2$, *C7/C10*), 42.67 (N*C*H$_2$, *C7/C10*), 36.83 (N*C*H$_3$, *C6*).

IR (neat, cm^{-1}): 3364, 3076, 2864, 1640, 1574, 1425, 1242, 1165, 1113, 1042, 959, 857.

HRMS (ESI$^+$, *m/z*): Calculated for $[M\text{-}Br^-]^+$, $C_{10}H_{16}N_3O_2^+$, requires = 210.1237, found = 210.1232.

General procedure C: [NTf$_2$] Ionic Liquids: 3-{2-[2-(2-Butoxyethoxy)ethoxy]-2-oxoethyl}-1-methyl-1H-imidazol-3-ium *bis*(trifluoromethylsulfonyl)imide (6b)^1



To a stirred solution of bromide salt **6a** (126.03 g, 345.0 mmol) in distilled water (500 mL), LiNTf$_2$ was added (108.97 g, 379.6 mmol) at RT. After stirring for 4 h at RT the liquid product was separated from the water by decantation. The liquid was washed with distilled water (3 × 500 mL) and dried under high vacuum to obtain **6b** as a colourless oil in 80 % yield (155.39 g, 274.8 mmol).

^{1}H NMR (400 MHz, CDCl$_3$) ppm: 8.74 (s, 1H, *H3*), 7.39 (t, *J* = 1.6 Hz, 1H, *H4/H5*), 7.34 (t, *J* = 1.6 Hz, 1H, *H4/H5*), 5.00 (s, 2H, *H2*), 4.33 (t, *J* = 4.8 Hz, 2H, *H7*), 3.92 (s, 3H, *H6*), 3.70 (t, *J* = 4.8 Hz, 2H, *H8*), 3.61 (t, *J* = 4.8 Hz, 2H, *H9*), 3.56 (t, *J* = 4.8 Hz, 2H, *H10*), 3.43 (t, *J* = 6.8 Hz, 2H, *H11*), 1.52 (tt, *J* = 7.6, 6.8 Hz, 2H, *H12*), 1.32 (tq, *J* = 7.6, 7.2 Hz, 2H, *H13*), 0.88 (t, *J* = 7.2 Hz, 3H, *H14*).

^{13}C NMR (100 MHz, CDCl$_3$) ppm: 165.84 (*C*OO, *C1*), 137.49 (Ar*C*H, *C3*), 123.97 (Ar*C*H, *C4/C5*), 123.44 (Ar*C*H, *C4/C5*), 119.76 (q, *J* = 320 Hz, 2*C*F$_3$, *C15, C16*), 71.18 (O*C*H$_2$, *C11*), 70.56 (O*C*H$_2$, *C9*), 69.92 (O*C*H$_2$, *C10*), 68.43 (O*C*H$_2$, *C8*), 65.74 (O*C*H$_2$, *C7*), 49.86 (*C*H$_2$, *C2*), 36.47 (N*C*H$_3$, *C6*), 31.66 (*C*H$_2$, *C12*), 19.25 (*C*H$_2$, *C13*), 13.90 (*C*H$_3$, *C14*).

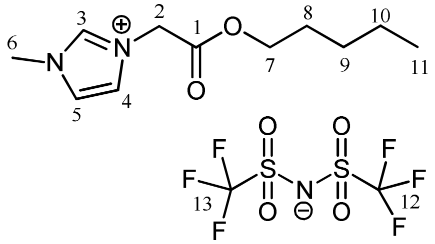
^{19}F NMR (376 MHz, CDCl$_3$) ppm: -79.20 (6*F*).

IR (neat, cm^{-1}): 3162, 2964, 2873, 1765, 1569, 1348, 1331, 1177, 1133, 1053, 976, 789, 740.

MS (*m/z*): 285.15 (M-NTf_2^-)$^+$

^{1}H and ^{13}C-NMR spectra are in agreement with the literature data.[1]

3-Methyl-1-(pentoxycarbonylmethyl)imidazolium *bis*(trifluoromethylsulfonyl)imide (7b)[2]



The title compound **7b** was prepared from **7a** (19.15 g, 39.0 mmol) and LiNTf2 (13.49 g, 47.0 mmol) according to the general procedure C as a colourless liquid in 93 % yield (17.78 g, 36.2 mmol).

^{1}H NMR (400 MHz, CDCl$_3$) (ppm): 8.67 (s, 1H, *H3*), 7.32 (t, *J* = 1.6 Hz, 1H, *H4/H5*), 7.27 (t, *J* = 1.6 Hz, 1H, *H4/H5*), 4.91 (s, 2H, *H2*), 4.11 (t, *J* = 6.8 Hz, 2H, *H7*), 3.85 (s, 3H, *H6*), 1.65-1.57 (m, 2H, *H8*), 1.24-1.23 (m, 4H, *H9, H10*), 0.82 (t, *J* = 6.8 Hz, 3H, *H11*).

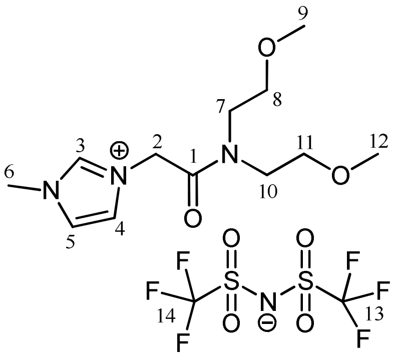
^{13}C NMR (100 MHz, CDCl$_3$) (ppm): 165.76 (*C*O, *C1*), 137.52 (N*C*H$_2$N, *C3*), 123.85 (N*C*H, *C4*), 123.25 (N*C*H, *C5*), 122.20 (q, *J* = 319 Hz, 2*C*F3's, *C12, 13*), 67.20 (O*C*H$_2$, *C7*), 49.88 (N*C*H$_2$, *C2*), 36.48 (N*C*H$_3$, *C6*), 27.91 (CH$_2$, *C8*), 27.73 (*C*H$_2$, *C9*), 22.18 (*C*H$_2$, *C10*), 13.82 (*C*H$_3$, *C11*).

IR (cm^{-1}): 3164, 3124, 2963, 2928, 2862, 1750, 1582, 1569, 1558, 1495, 1455, 1354, 1197, 1136.

MS *m/z*: 211.2 [M-NTf_2^-]$^+$

^{1}H and ^{13}C-NMR spectra are in agreement with the literature data.[2]

3-{[*bis*(2-Methoxyethyl)carbamoyl]methyl}-1-methyl-1H-imidazol-3-ium *bis*(trifluoromethylsulfonyl)imide (8b)



The title compound **8b** was prepared from bromide salt **8a** (74.99 g, 223 mmol) and $LiNTf_2$ (66.82 g, 232.7 mmol) according to the general procedure C to obtain a yellow oil in 74 % yield (88.64 g, 165.2 mmol).

^{1}H NMR (400 MHz, $CDCl_3$) ppm: 8.63 (s, 1H, *H3*), 7.27 (t, *J* = 1.8 Hz, 1H, *H4/H5*), 7.26 (t, *J* = 1.8 Hz, 1H, *H4/H5*), 5.24 (s, 2H, *H2*), 3.91 (s, 3H, *H6*), 3.58 (t, *J* = 4.8 Hz, 2H, *H7/H10*), 3.57-3.52 (m, 4H, *H7/H10*, *H8/H11*), 3.49 (t, *J* = 4.8 Hz, 2H, *H6/H11*), 3.34 (s, 3H, *H9/H12*), 3.30 (s, 3H, *H9/H12*).

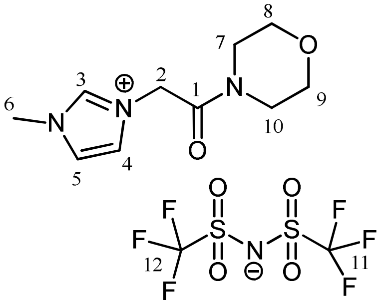
^{13}C NMR (100 MHz, $CDCl_3$) ppm: 165.17 (*C*OO, *C1*), 137.68 (Ar*C*H, *C3*), 124.26 (Ar*C*H, *C4/C5*), 122.72 (Ar*C*H, *C4/C5*), 119.86 (q, *J* = 319 Hz, 2CF_3's, *C13, C14*), 70.52 (OCH_2, *C8/C11*), 69.99 (OCH_2, *C8/C11*), 59.16 (OCH_3, *C9/C12*), 58.89 (OCH_3, *C9/C12*), 50.52 (NCH_2, *C2*), 48.63 (NCH_2, *C7/C10*), 46.89 (NCH_2, *C7/C10*), 36.45 (NCH_3, *C6*).

^{19}F NMR (376 MHz, $CDCl_3$) ppm: -78.97 (6*F*)

IR (neat, cm^{-1}): 3161, 2938, 2898, 1659, 1575, 1473, 1427, 1348, 1330, 1175, 1133, 1116, 1052, 830, 789, 739.

MS (*m/z*): 256.15 $(M\text{-}NTf_2^-)^+$

1-Methyl-3-[2-(morpholin-4-yl)-2-oxoethyl]-1H-imidazol-3-ium *bis*(trifluoromethylsulfonyl)imide (9b)



The title compound **9b** was prepared from bromide salt **9a** (88.12 g, 303.7 mmol) and $LiNTf_2$ (95.93 g, 334.1 mmol) according to the general procedure C to afford a crystalline white solid 62 % yield (92.30 g, 188.2 mmol). Melting Point: 63-65°C

^{1}H NMR (400 MHz, DMSO-d_6): 9.41 (s, 1H, *H3*), 8.16 (t, *J* = 1.6 Hz, 1H, *H4/H5*), 8.10 (t, *J* = 1.6 Hz, 1H, *H4/H5*), 5.95 (s, 2H, *H2*), 4.57 (s, 3H, *H6*), 4.14 (t, *J* = 4.8 Hz, 2H, *H8/H9*), 4.08 (t, *J* = 4.8 Hz, 2H, *H8/H9*), 4.03-3.99 (m, 4H, *H7, H10*).

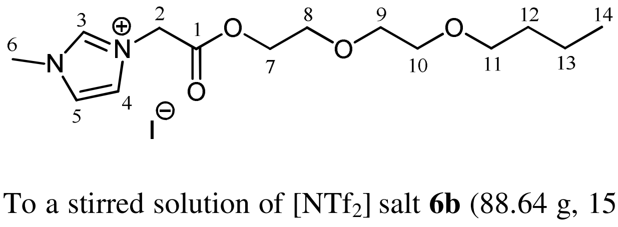
^{13}C NMR (100 MHz, DMSO-d_6): 163.93 (*C*ON, *C1*), 137.91 (N*C*HN, *C3*), 124.04 (N*C*H, *C4/C5*), 123.00 (N*C*H, *C4/C5*), 119.56 (q, *J* =320 Hz, 2CF_3's, *C11, C12*), 65.95 (OCH_2, *C8/C9*), 65.83 (OCH_2, *C8/C9*), 49.99 (NCH_2CO, *C2*), 44.70 (NCH_2, *C7/C10*), 42.14 (NCH_2, *C7/C10*), 35.87 (NCH_3, *C6*).

^{19}F NMR (376 MHz, $CDCl_3$) ppm: -78.99 (6*F*)

IR (neat, cm^{-1}): 3164, 3109, 3000, 2872, 1656, 1579, 1564, 1475, 1440, 1348, 1328, 1275, 1184, 1136, 1108, 1050, 1033, 975, 845, 807, 771, 740.

MS (*m/z*): 210.10 $[M-NTf_2^-]^+$

General procedure D: Iodide Ionic Liquids: 3-{2-[2-(2-Butoxyethoxy)ethoxy]-2-oxoethyl}-1-methyl-1H-imidazol-3-ium iodide (6c)



To a stirred solution of $[NTf_2]$ salt **6b** (88.64 g, 156.7 mmol) in DCM (100 mL) was added a solution of tetrabutylammonium iodide (63.69 g, 172.4 mmol) in DCM (100 mL) slowly at

RT. After stirring for 3 h at RT the solvent was evaporated completely, the residue was dissolved in distilled water (100 mL). The aq. solution was washed with DCM (50 mL) and then evaporated on rota evaporator, dried under high vacuum to afford **6c** as yellow solid in 66 % yield (42.81 g, 103.8 mmol). Melting Point: 52-54°C

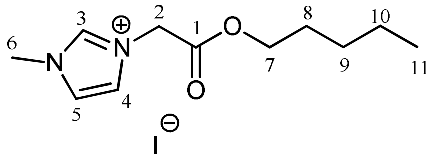
^{1}H NMR (400 MHz, CDCl$_3$) ppm: 9.63 (s, 1H, *H3*), 7.68 (t, *J* = 1.8 Hz, 1H, *H4/H5*), 7.58 (t, *J* = 1.8 Hz, 1H, *H4/H5*), 5.37 (s, 2H, *H2*), 4.29 (t, *J* = 4.8 Hz, 2H, *H7*), 4.02 (s, 3H, *H6*), 3.67 (t, *J* = 4.8 Hz, 2H, *H8*), 3.56 (t, *J* = 4.4 Hz, 2H, *H9*), 3.50 (t, *J* = 4.4 Hz, 2H, *H10*), 3.36 (t, *J* = 6.8 Hz, 2H, *H11*), 1.45 (tt, *J* = 7.6, 6.8 Hz, 2H, *H12*), 1.25 (tq, *J* = 7.6, 7.2 Hz, 2H, *H13*), 0.82 (t, *J* = 7.2 Hz, 3H, *H14*).

^{13}C NMR (100 MHz, CDCl$_3$) ppm: 165.86 (*C*OO, *C1*), 137.53 (Ar*C*H, *C3*), 123.93 (Ar*C*H, *C4/C5*), 123.24 (Ar*C*H, *C4/C5*), 71.03 (O*C*H$_2$, *C11*), 70.45 (O*C*H$_2$, *C9*), 69.80 (O*C*H$_2$, *C10*), 68.42 (O*C*H$_2$, *C8*), 65.63 (O*C*H$_2$, *C7*), 50.46 (*C*H$_2$, *C2*), 37.21 (N*C*H$_3$, *C6*), 31.48 (*C*H$_2$, *C12*), 19.09 (*C*H$_2$, *C13*), 13.83 (*C*H$_3$, *C14*).

IR (neat, cm^{-1}): 3131, 3100, 2955, 2934, 2869, 1751, 1633, 1577, 1565, 1450, 1430, 1340, 1220, 1196, 1172, 1127, 1094, 1044, 969, 869, 841, 765.

MS (*m/z*): 285.20 (M-I$^-$)$^+$

3-Methyl-1-(pentoxycarbonylmethyl)imidazolium iodide (7c)



The title compound **7c** was prepared using [NTf$_2$] salt **7b** (4.18 g, 9.26 mmol), tetrabutylammonium iodide (3.42 g, 9.26 mmol) and DCM (40 mL) according to the general procedure D to obtain a brown liquid in 72 % yield (2.25 g, 6.65 mmol).

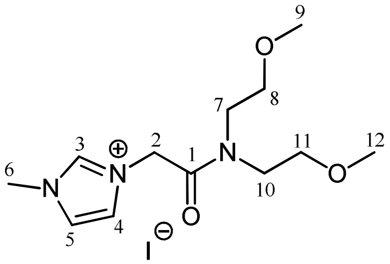
^{1}H NMR (400 MHz, CDCl$_3$) (ppm): 9.81 (s, 1H, *H3*), 7.65 (t, *J* = 1.8 Hz, 1H, *H4/H5*), 7.55 (t, *J* = 1.8 Hz, 1H, *H4/H5*), 5.39 (s, 2H, *H2*), 4.17 (t, *J* = 6.8 Hz, 2H, *H7*), 4.07 (s, 3H, *H6*), 1.65 (tt, *J* = 6.8, 7.2 Hz, 2H, *H8*), 1.31-1.27 (m, 4H, *H's 9 and 10*), 0.87 (t, *J*= 7.0 Hz, 3H, *H11*).

^{13}C NMR (100 MHz, $CDCl_3$) (ppm): 165.92 (*C*O, *C1*), 137.81 (N*C*H_2N, *C3*), 123.96 (N*C*H, *C4*), 123.24 (N*C*H, *C5*), 67.23 (O*C*H_2, *C7*), 50.59 (N*C*H_2, *C2*), 37.29 (N*C*H_3, *C6*), 28.05 (CH_2, *C8*), 27.83 (*C*H_2, *C9*), 22.26 (*C*H_2, *C10*), 13.99 (*C*H_3, *C11*).

IR (cm^{-1}): 3091, 2948, 1757, 1559, 1534, 1489, 1423, 1388, 1229, 1167, 1023.

MS *m/z*: 211.2 $[M-I^-]^+$

3-{[*bis*(2-Methoxyethyl)carbamoyl]methyl}-1-methyl-1H-imidazol-3-ium iodide (8c)



The title compound **8c** was prepared from [NTf_2] salt **8b** (99.8 g, 186.0 mmol), tetrabutylammonium iodide (77.6 g, 210.1 mmol) and DCM (300 mL) according to the general procedure D to obtain a brown solid in 74 % yield (52.97 g, 138.3 mmol). Melting Point: 48-50°C

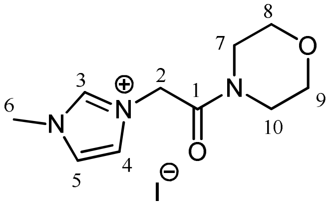
^{1}H NMR (400 MHz, $CDCl_3$) ppm: 9.54 (s, 1H, *H3*), 7.45 (d, *J* = 2.4 Hz, 1H, *H4/H5*), 7.44 (d, *J* = 2.4 Hz, 1H, *H4/H5*), 5.59 (s, 2H, *H2*), 4.03 (s, 3H, *H6*), 3.67 (t, *J* = 4.8 Hz, 2H, *H7/H10*), 3.55-3.52 (m, 4H, *H7/H10, H8/H11*), 3.48 (t, *J* = 4.8 Hz, 2H, *H8/H11*), 3.35 (s, 3H, *H9/H12*), 3.29 (s, 3H, H9/*H12*).

^{13}C NMR (100 MHz, $CDCl_3$) ppm: 165.12 (*C*OO, *C1*), 137.66 (Ar*C*H, *C3*), 124.10 (Ar*C*H, *C4/C5*), 122.60 (Ar*C*H, *C4/C5*), 70.44 (O*C*H_2, *C8/C11*), 70.05 (O*C*H_2, *C8/C11*), 59.32 (O*C*H_3, *C9/C12*), 58.88 (O*C*H_3, *C9/C12*), 50.85 (N*C*H_2, *C2*), 48.84 (N*C*H_2, *C7/C10*), 46.87 (N*C*H_2, *C7/C10*), 37.07 (N*C*H_3, *C6*).

IR (neat, cm^{-1}): 3149, 3101, 2921, 2889, 1662, 1651, 1562, 1472, 1423, 1341, 1195, 1169, 1118, 1095, 1069, 1031, 1003, 831, 804, 751.

MS (*m/z*): 256.10 $[M-I^-]^+$

1-Methyl-3-[2-(morpholin-4-yl)-2-oxoethyl]-1H-imidazol-3-ium iodide (9c)



The title compound **9c** was prepared using [NTf$_2$] salt **9b** (5.61 g, 11.30 mmol), tetrabutylammonium iodide (4.18 g, 11.30 mmol) and DCM (50 mL) according to the general procedure D to obtain a yellow solid in 87 % yield (3.30 g, 9.79 mmol). Melting Point: 135-137°C

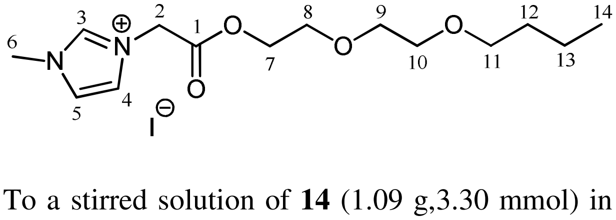
^{1}H NMR (400 MHz, CDCl$_3$) ppm: 9.48 (s, 1H, *H3*), 7.69 (t, *J* = 1.6 Hz, 1H, *H4/H5*), 7.40 (t, *J* = 1.6 Hz, 1H, *H4/H5*), 5.78 (s, 2H, *H2*), 4.02 (s, 3H, *H6*), 3.83 (t, *J* = 4.8 Hz, 2H, *H8/H9*), 3.70 (t, *J* = 4.8 Hz, 2H, *H8/H9*), 3.64 (t, *J* = 4.8, Hz, 2H, *H7/H10*), 3.57 (t, *J* = 4.8, Hz, 2H, *H7/H10*).

^{13}C NMR (100 MHz, CDCl$_3$) ppm: 163.03 (*C*ON, *C1*), 137.59 (N*C*HN, *C3*), 124.66 (N*C*H, *C4/C5*), 122.42 (N*C*H, *C4/C5*), 66.71 (O*C*H$_2$, *C8/C9*), 66.48 (O*C*H$_2$, *C8/C9*), 51.33 (N*C*H$_2$CO, C2), 45.59 (N*C*H$_2$, *C7/C10*), 42.82 (N*C*H$_2$, *C7/C10*), 37.21 (N*C*H$_3$, *C6*).

IR (neat, cm^{-1}): 3351, 2938, 2861, 1631, 1572, 1435, 1212, 1175, 1111, 1045, 979.

MS (*m/z*): 210.09 [M-I$^-$]$^+$

Synthesis of 3-{2-[2-(2-Butoxyethoxy)ethoxy]-2-oxoethyl}-1-methyl-1H-imidazol-3-ium iodide (6c) from (14).[1]



To a stirred solution of **14** (1.09 g,3.30 mmol) in diethyl ether (10 mL), 1-methylimidazole (0.27 g, 3.30 mmol) was added dropwise at RT under a N$_2$ atmosphere. After stirring overnight the yellow solid of product was separated from the solvent by decantation. The solid was washed with diethyl ether (5 x 10 mL) and dried under high vacuum to obtain **6c** as a yellow solid in 82 % yield (1.11 g, 2.69 mmol).

^{1}H NMR (400 MHz, $CDCl_3$) ppm: 9.79 (s, 1H, *H3*), 7.66 (t, *J* = 1.8 Hz, 1H, *H4/H5*), 7.48 (t, *J* = 1.8 Hz, 1H, *H4/H5*), 5.45 (s, 2H, *H2*), 4.36 (t, *J* = 4.8 Hz, 2H, *H7*), 4.08 (s, 3H, *H6*), 3.74 (t, *J* = 4.8 Hz, 2H, *H8*), 3.63 (m, 2H, *H9*), 3.58 (m, 2H, *H10*), 3.44 (t, *J* = 6.8 Hz, 2H, *H11*), 1.53 (tt, *J* = 7.6, 6.8 Hz, 2H, *H12*), 1.33 (tq, *J* = 7.6, 7.2 Hz, 2H, *H13*), 0.89 (t, *J* = 7.2 Hz, 3H, *H14*).

^{13}C NMR (100 MHz, $CDCl_3$) ppm: 165.92 (*C*OO, *C1*), 137.90 (Ar*C*H, *C3*), 124.02 (Ar*C*H, *C4/C5*), 123.22 (Ar*C*H, *C4/C5*), 71.18 (O*C*H_2, *C11*), 70.62 (O*C*H_2, *C9*), 69.96 (O*C*H_2, *C10*), 68.56 (O*C*H_2, *C8*), 65.77 (O*C*H_2, *C7*), 50.60 (*C*H_2, *C2*), 37.28 (N*C*H_3, *C6*), 31.64 (*C*H_2, *C12*), 19.22 (*C*H_2, *C13*), 13.91 (*C*H_3, *C14*).

MS *m/z*: 285.19 [M-I$^-$]$^+$

DSSC fabrication procedure:

The TiO_2 electrodes used for fabricating DSSC were manufactured by screen-printing,[5] which is based on a layer-by-layer deposition of TiO_2 on fluorine doped tin oxide (FTO) conducting transparent glass substrates. In all cases, a non-porous dense blocking under-layer of TiO_2 was deposited on the FTO substrate via $TiCl_4$ treatment[6] in order to reduce charge recombination and dark currents. TiO_2 paste was then printed on the $TiCl_4$ treated glass using a TIFLEX Ltd manual screen-printer and involved several cycles. After each TiO_2 paste deposition, the films were kept in an ethanol chamber for 6 mins followed by drying at 125 °C for 6 min, while the final sintering involved gradual heating in an oven at 325°C (5 min), 375°C (5 min), 450°C (15 min) and 500°C (30 min). After sintering, the electrodes were again treated with $TiCl_4$ followed by another sintering at 500°C for 30 min. The TiO_2 active area was 0.28 cm^2 (consisting of a 6 mm diameter circular spot). The sintered electrodes were placed in a dye bath of N719 dissolved in acetonitrile:*tert*-butylalcohol:THF (vol 4.5:4.5:1) for 16-20 h. N719 [di-tetra butylammonium *cis*-bis(isothiocyanato)bis(2,2'-bipyridyl-4,4'-dicarboxylato)ruthenium(II)] dye was procured from a commercial supplier (DyeSol Ltd) and used without further purification. The counter electrode was prepared with a thin film of Pt catalyst deposited *via* a drop of H_2PtCl_6 solution (2 mg Pt in 1 mL ethanol) and heat treated at 400°C for 15 min. The dye coated TiO_2 electrode and Pt coated counter electrode were then sandwiched together and sealed using a Bynel® polymer gasket (50 micron thick). This is followed by the electrolyte filling into the space between the two electrodes through a hole in the counter electrode *via* vacuum back filling. The back hole was sealed with a thin piece (0.1 mm thick) of glass heat sealed with Bynel® to complete the solar cell device fabrication.

Two TiO_2 printing pastes were employed: one is a “transparent” paste containing TiO_2 particles of average size 20 nm formed from P25 powder using a standard fabrication procedure.[5] Ethyl cellulose (Fluka, #46080 and #46070) and anhydrous Terpineol (Sigma-Aldrich, 86480) were used as received in making this paste. A second “scattering” paste was purchased from DyeSol Ltd (WER 2-0), which contains TiO_2 particles of size in the range of 150 nm to 250 nm, formulated to provide an opaque white scattering layer. Both pastes were screen printed with a 90 T mesh to yield a 7 + 2 electrode configuration (7 transparent layers + 2 scattering layers, total thickness = 15-16 micron after sintering).

***DSSC measurement system*:**

Electro-optical characterization including: current/voltage (I-V) curves, open circuit voltage (V_{oc}), short circuit current density (J_{sc}) and fill factor (FF), were studied using a *Newport 91195A-1000* solar simulator and *Newport 69920* Arc Lamp Power Supply and recorded with a GAMRY Instruments Potentiostat. A *Newport 81088A* Air Mass Filter was placed before the output of the solar simulator to simulate AM 1.5 spectrum with irradiance powers of 1000 W/m^2.

Table S1: Results from Karl Fischer analysis – after drying for 24 h under high vacuum (0.05 mBar).

Ionic Liquid	**Water (% w/w)**	**ppm**
1,3-Diethylimidiazolium iodide (DmimI) (**1**)	0.07	700
1-Ethyl-3methylimidiazolium iodide (EmimI) (**2**)	0.02	200
1-Ethyl-3-methylimidiazolium tetracyanoborate (EmimTCB) (**3**)	0.17	1700
N-Butyl-1H-benzimidazole (NBB) (**4**)	0.51	5100
Guanadinium thiocyanate (GNCS) (**5**)	0.07	700
6a	0.22	2200
6b	0.42	4200
6c	0.17	1700
7a	0.15	1500
7c	0.17	1700
8a	0.45	4500
8b	0.16	1600
8c	0.6	6000
9a	1.07	10700
9b	0.43	4300
9c	0.43	4300

Table S2: Photovoltaic parameters percentage change of the DSSC devices made with DmimI /**X**/EmimTCB/I_2/NBB/GNCS electrolyte following a small amount of moisture ingress tested at 1 sun (1000 Wm^{-2}) incident intensity of AM1.5 simulated solar light.

	% change			
Compound (X)	J_{sc}	V_{oc}	FF	η
2	*8.7*	*8.4*	*9.4*	*28*
6c	*38.5*	*6.6*	*7.5*	*61.3*
6a	*34.7*	*3.6*	*15.4*	*62.6*
6b	*41.9*	*4.96*	*-11.3*	*32.3*
7c	*13.5*	*-2.1*	*7.1*	*18.1*
7a	*47.2*	*6.6*	*-26.2*	*15.2*
8c	*31.1*	*7.9*	*6.5*	*49.9*
8a	*39.7*	*6.2*	*-1.7*	*46.2*
8b	*53.5*	*9.4*	*-1.7*	*66.3*
9c	*18.7*	*1.2*	*9.4*	*31.1*
9a	*42.8*	*3.9*	*1.9*	*34.8*
9b	*85.6*	*8.5*	*-20.8*	*58.5*

References:

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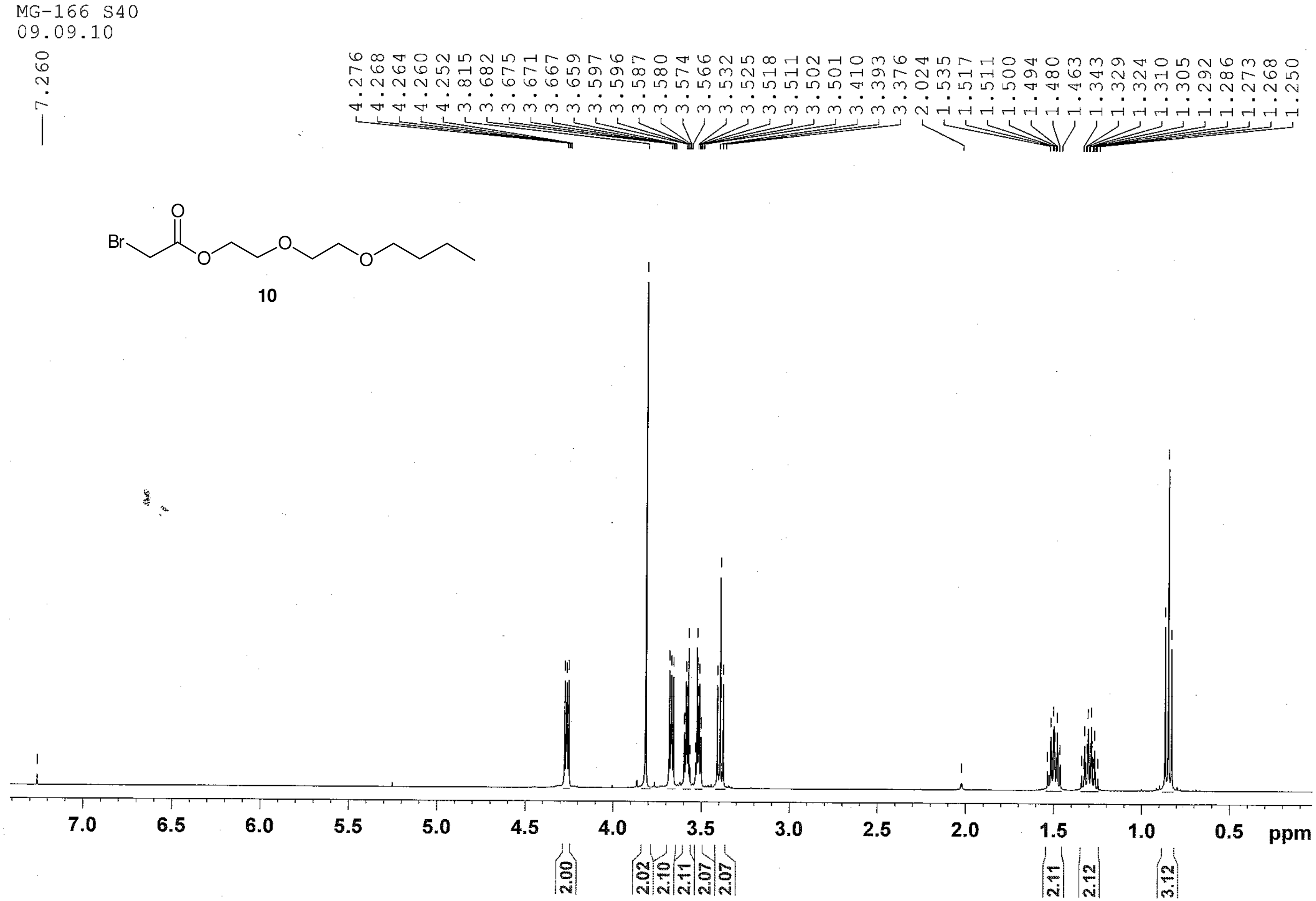
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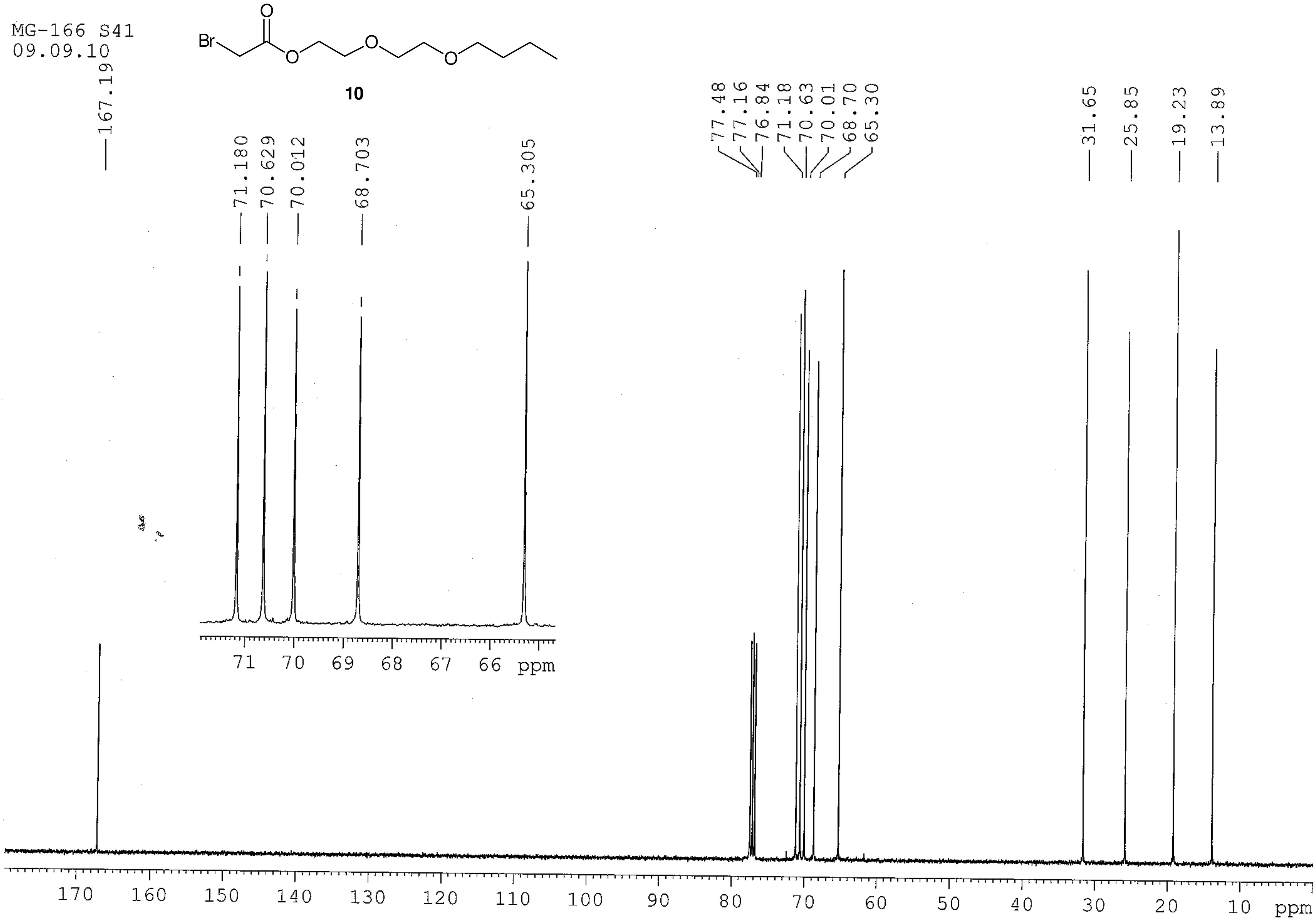
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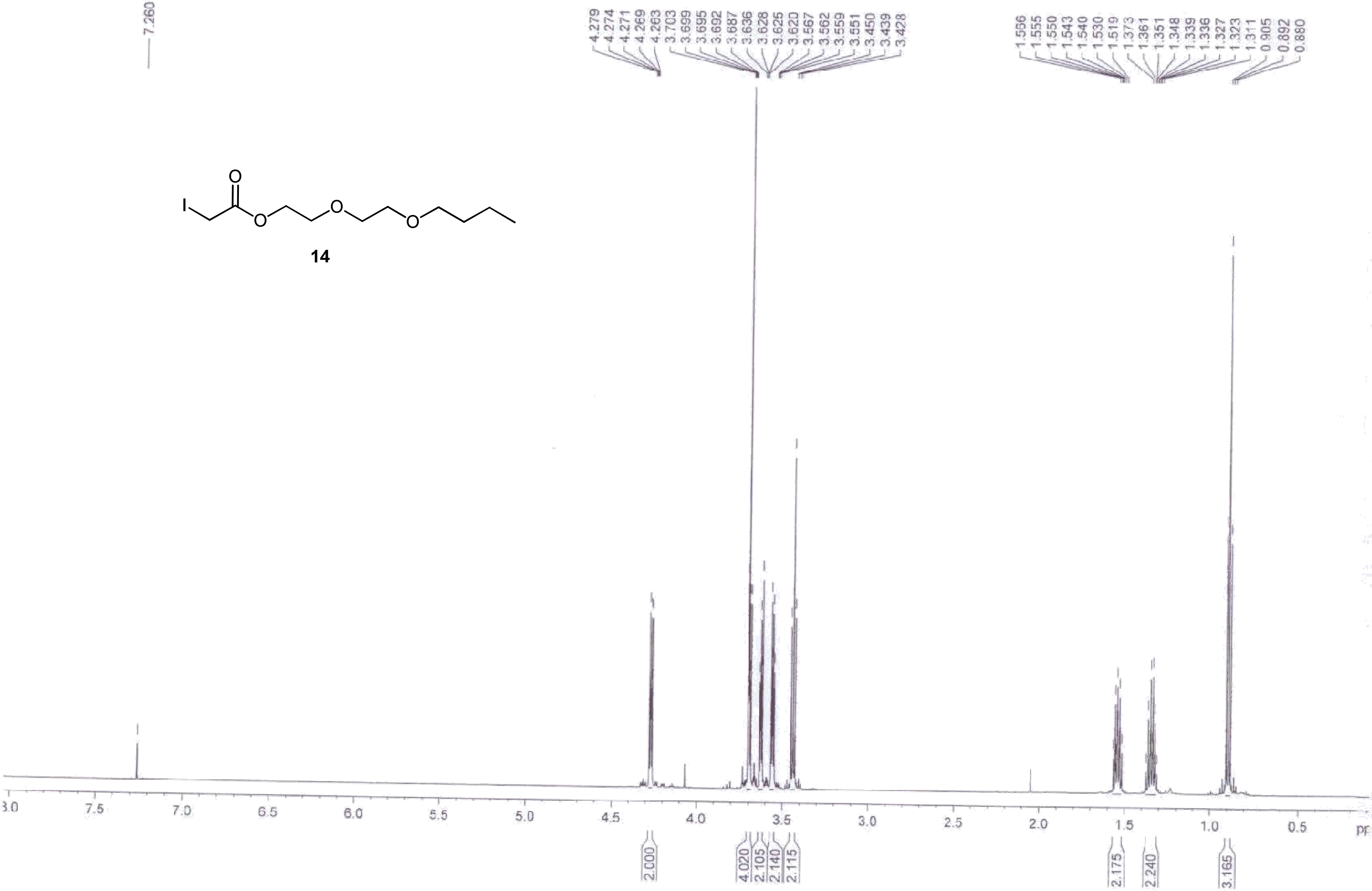
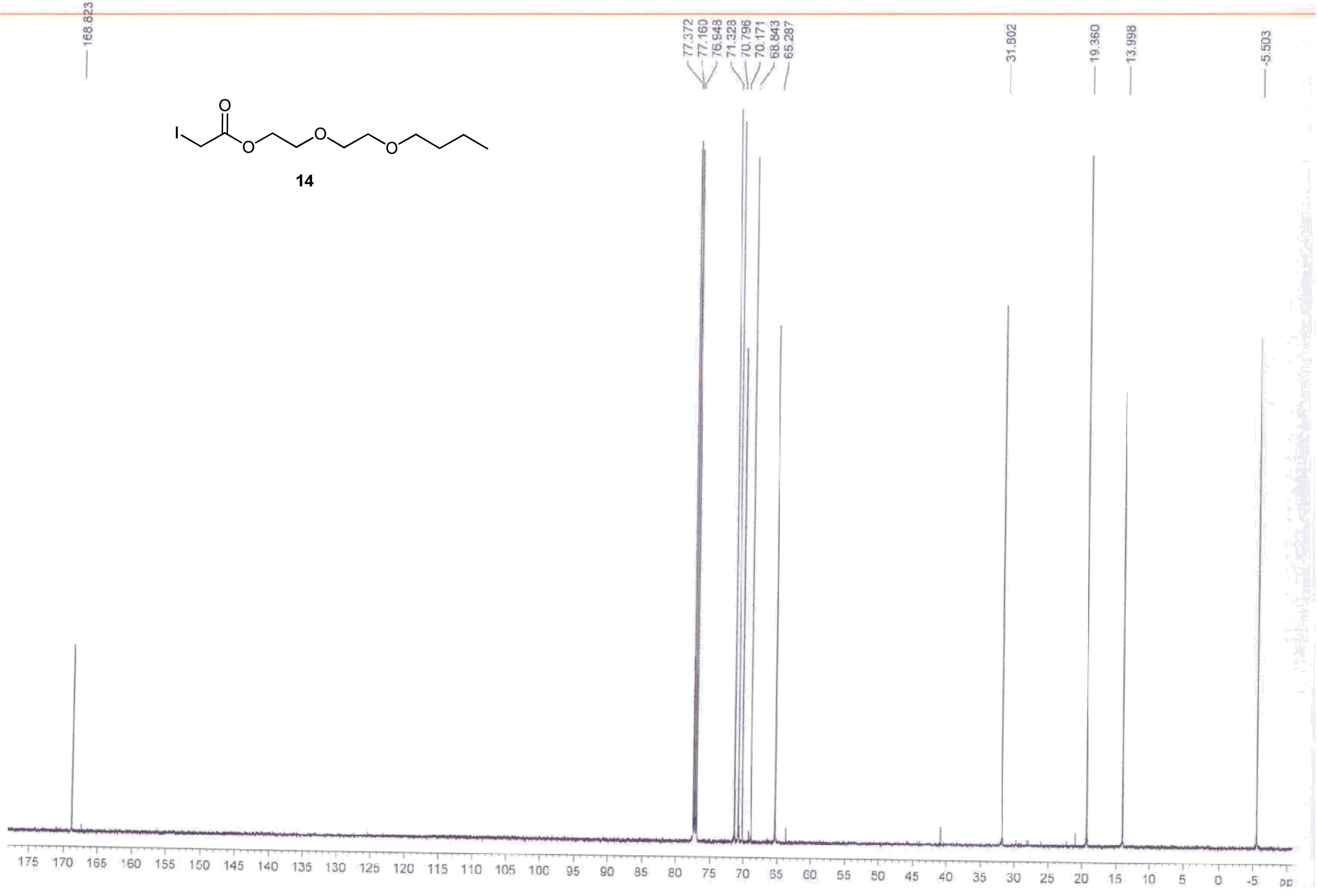
50
40
30
20
10
ppm

MG-122 S60
14.04.10

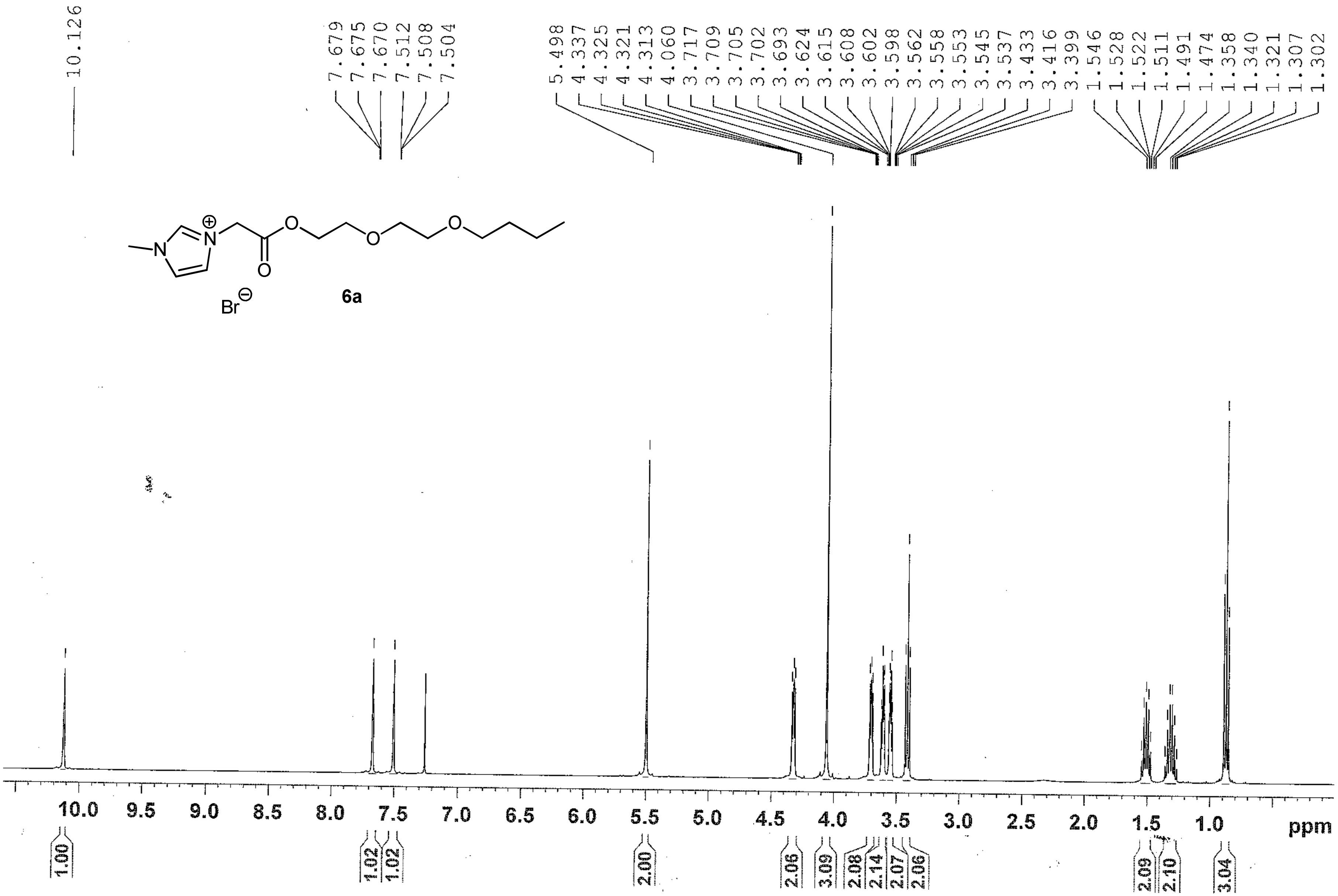

14

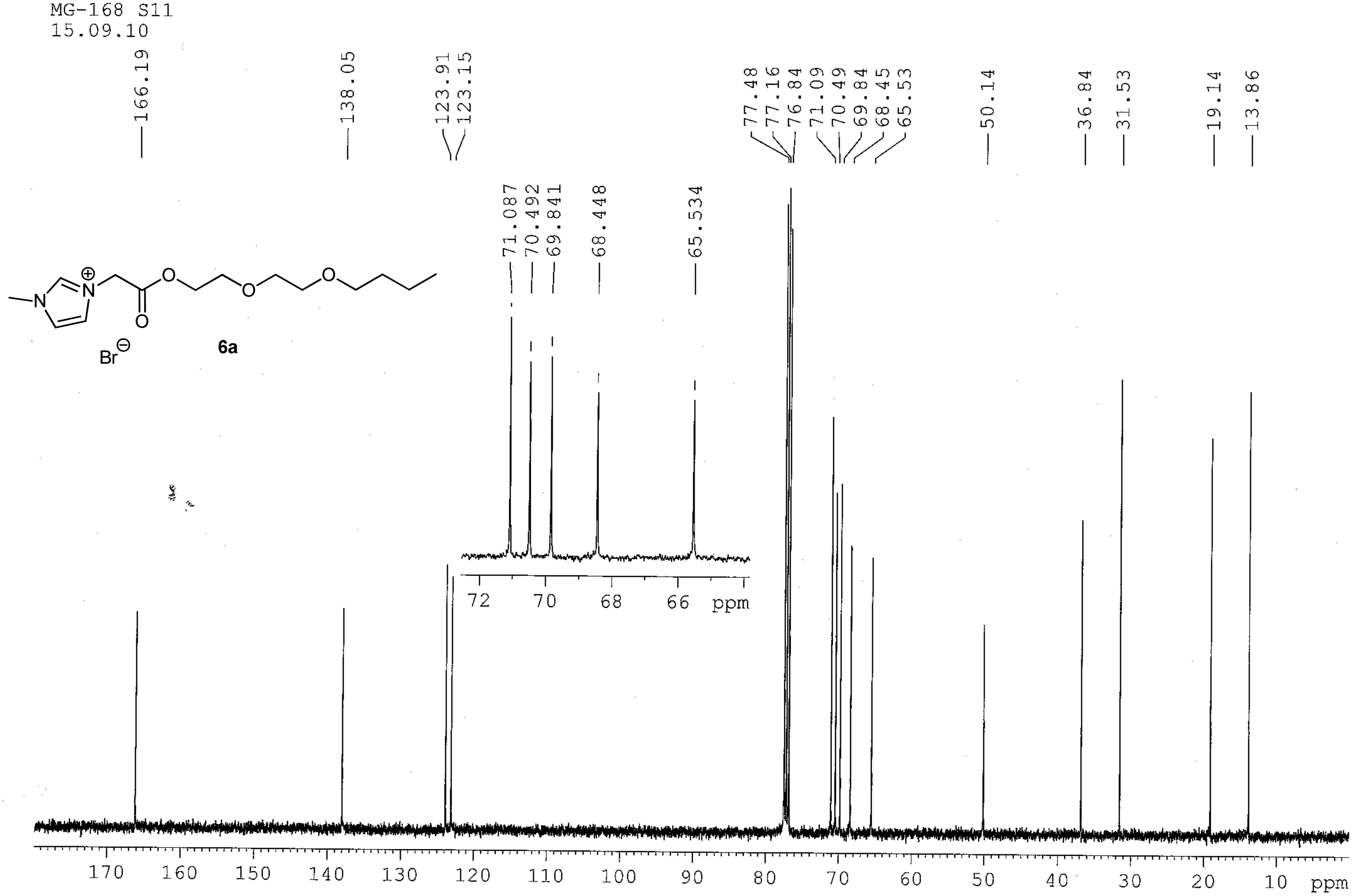
MG-122 S61
14.04.10



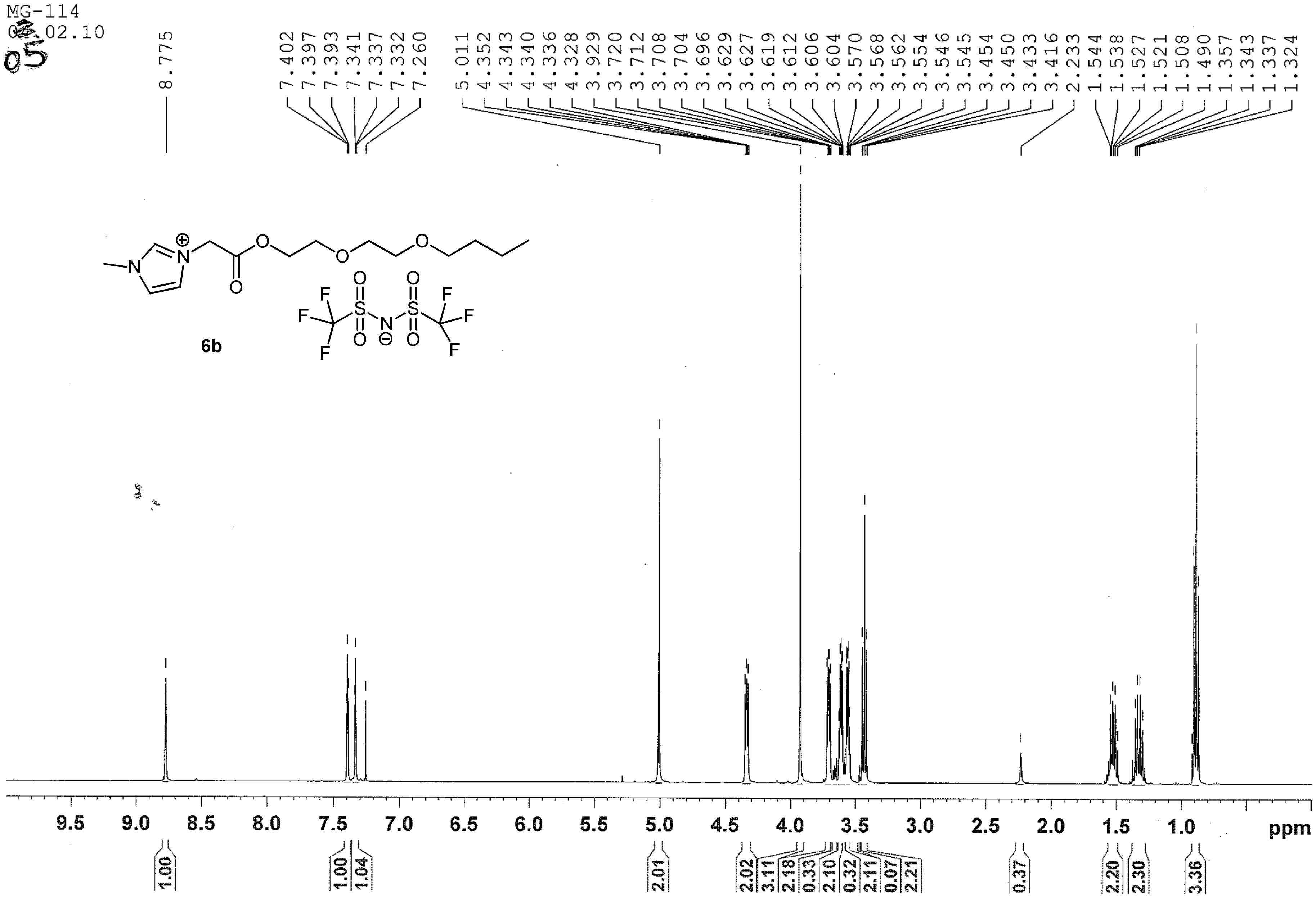
14

MG-168
11.09.10



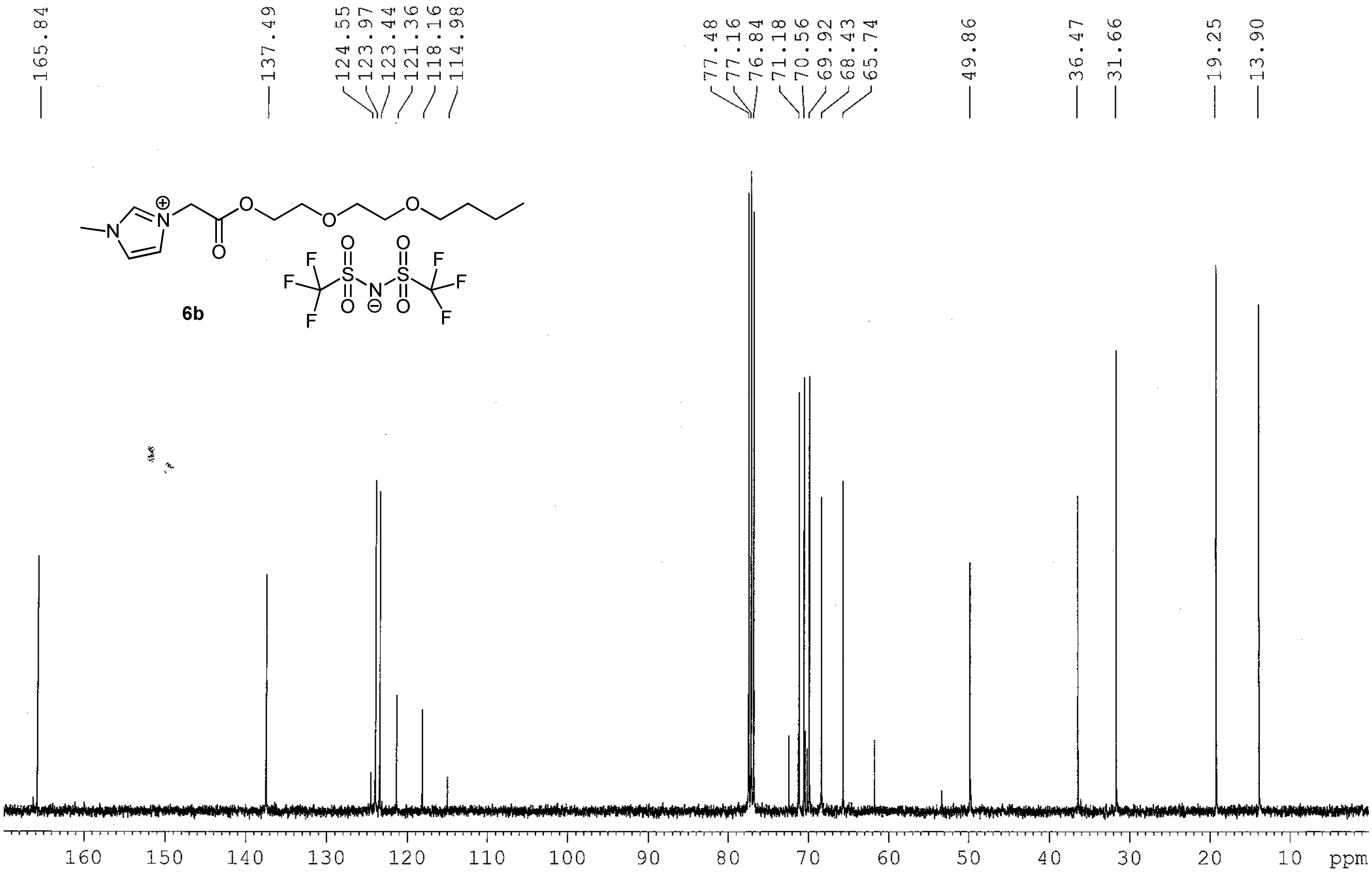

6a
MG-168 S11
15.09.10
166.19
138.05
123.91
123.15
77.48
77.16
76.84
71.09
70.49
69.84
68.45
65.53
50.14
36.84
31.53
19.14
13.86
71.087
70.492
69.841
68.448
65.534
72
70
68
66
ppm
N
N
O
O
O
O
Br⊖
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
ppm

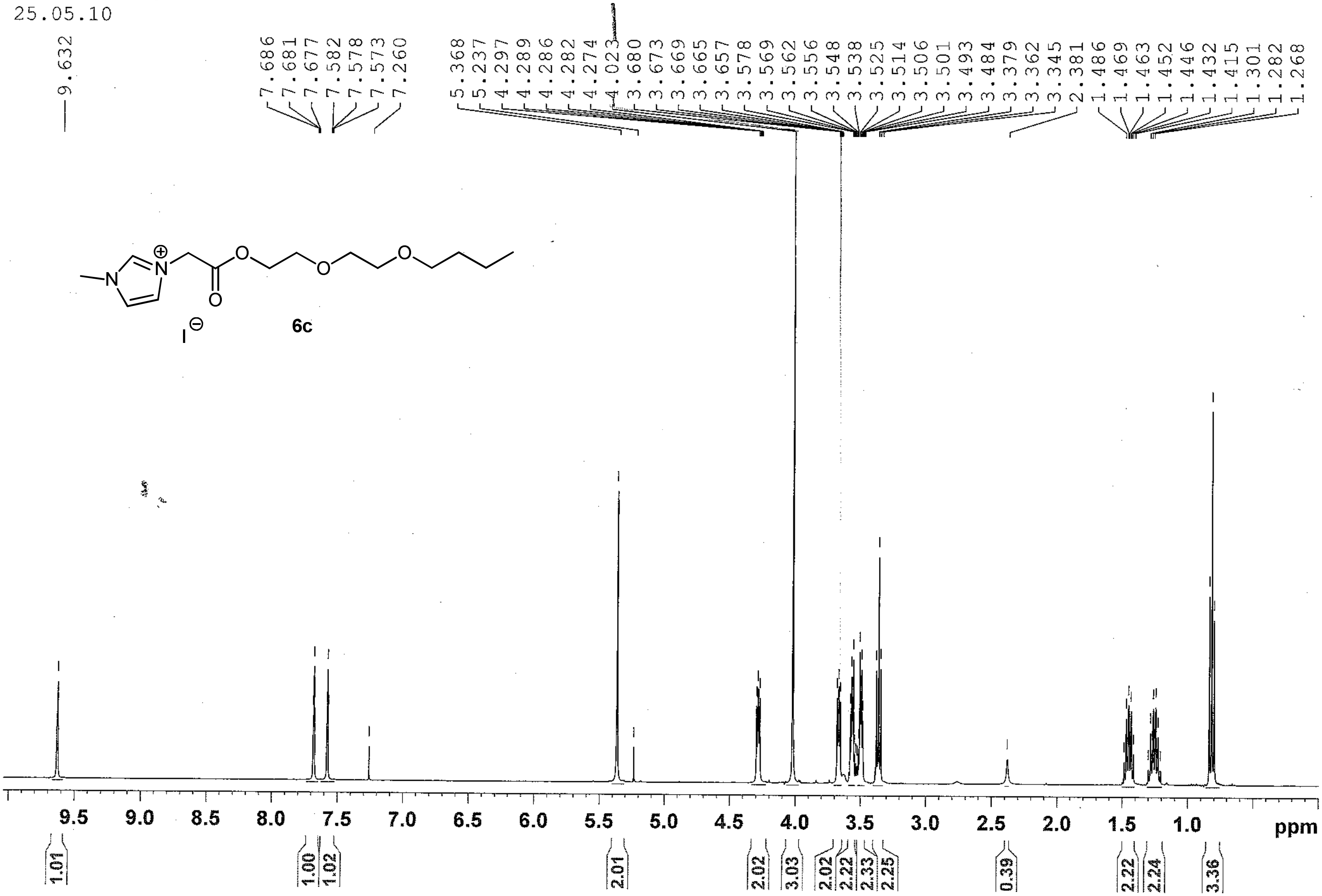
MG-114
0~~4~~.02.10
05



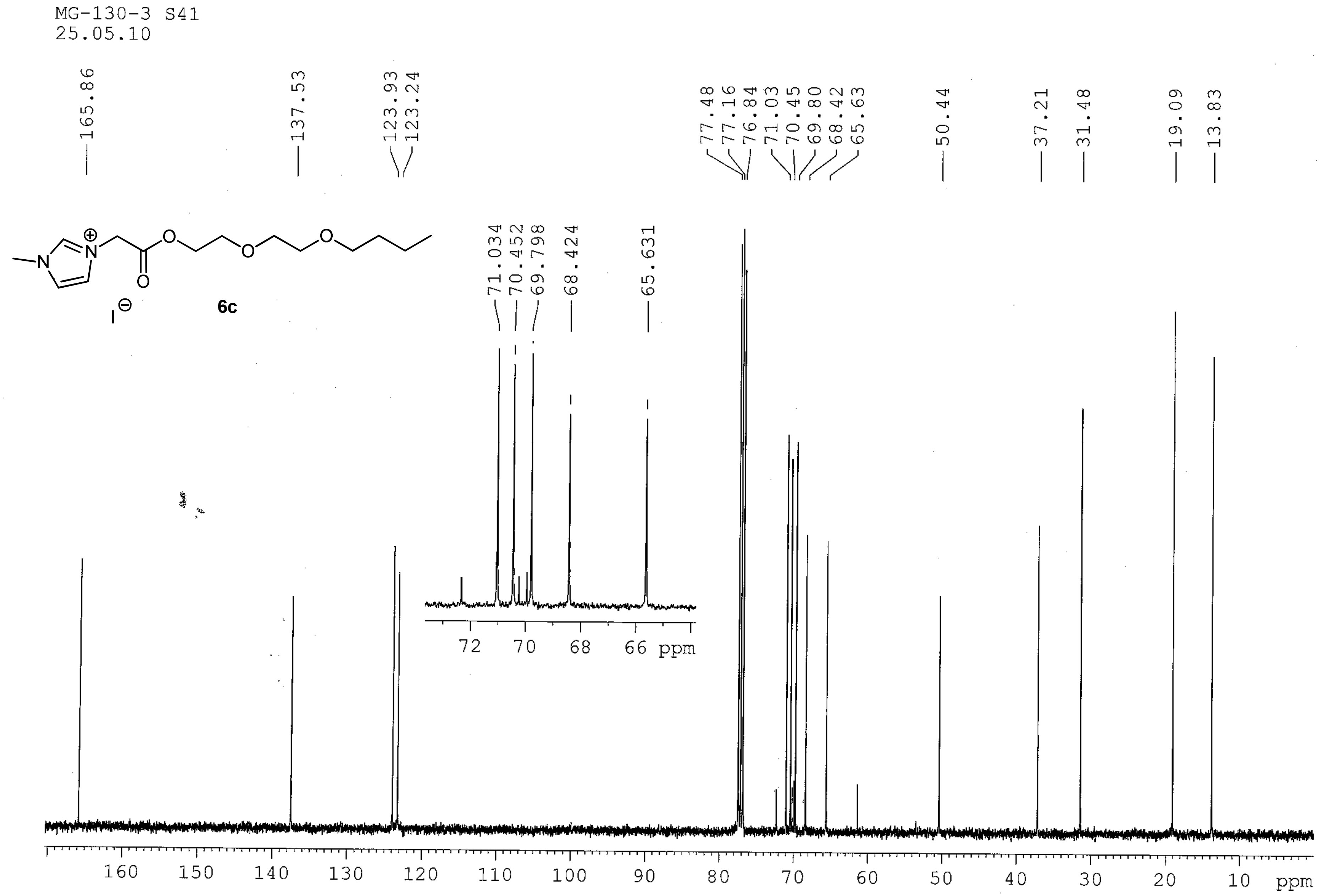
6b

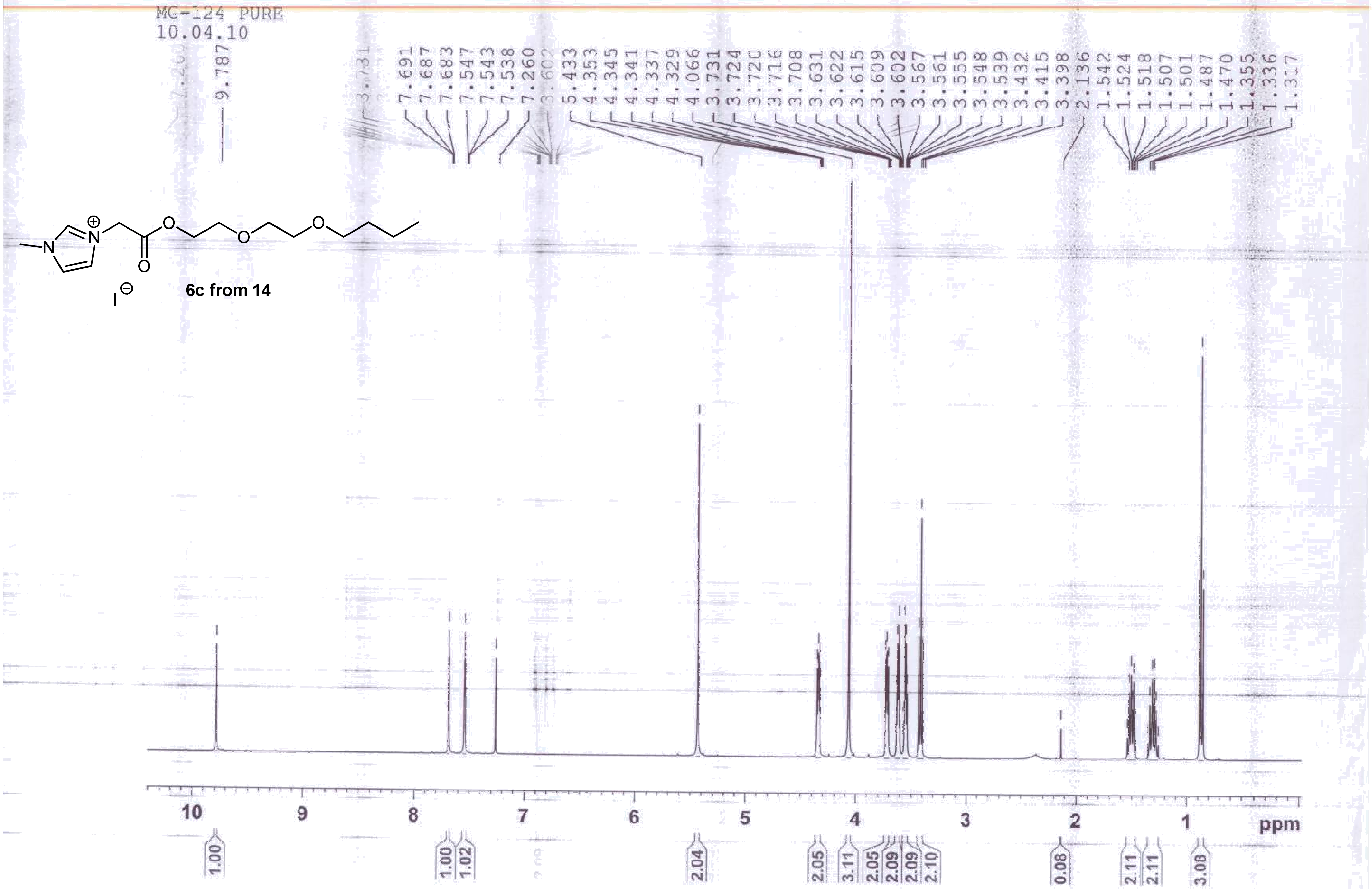
MG-114 S91
19.02.10



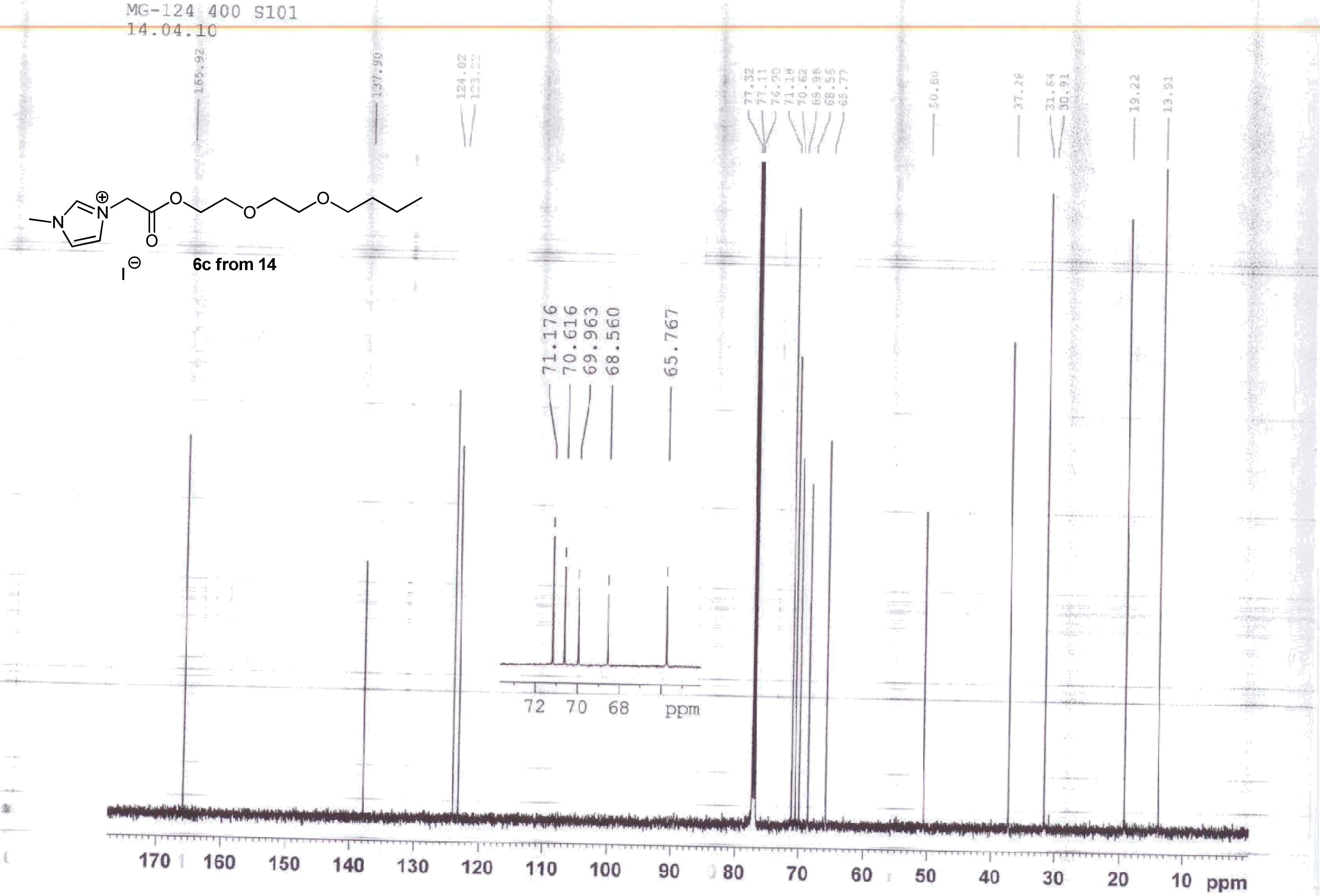

MG-130-3 S40
25.05.10
9.632
7.686
7.681
7.677
7.582
7.578
7.573
7.260
5.368
5.237
4.297
4.289
4.286
4.282
4.274
4.023
3.680
3.673
3.669
3.665
3.657
3.578
3.569
3.562
3.556
3.548
3.538
3.525
3.514
3.506
3.501
3.493
3.484
3.379
3.362
3.345
2.381
1.486
1.469
1.463
1.452
1.446
1.432
1.415
1.301
1.282
1.268
N
N
⊕
O
O
O
O
I⊖
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
ppm
1.01
1.00
1.02
2.01
2.02
3.03
2.02
2.22
2.33
2.25
0.39
2.22
2.24
3.36

6c

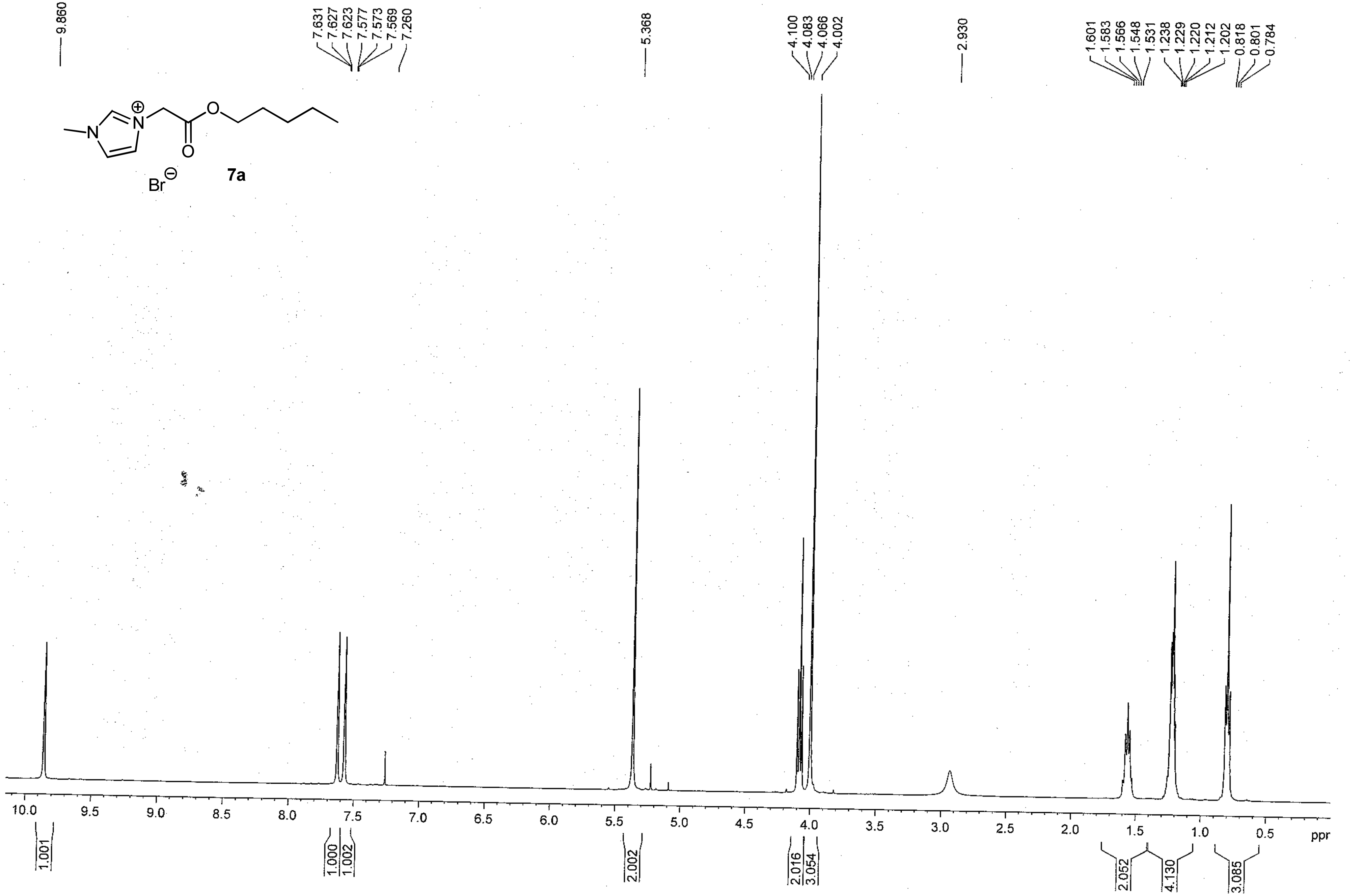

MG-130-3 S41
25.05.10
165.86
137.53
123.93
123.24
77.48
77.16
76.84
71.03
70.45
69.80
68.42
65.63
50.44
37.21
31.48
19.09
13.83
71.034
70.452
69.798
68.424
65.631
72
70
68
66
ppm
N
N
O
O
O
O
I
6c
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
ppm


MG-124 PURE
10.04.10
9.787
7.691
7.687
7.683
7.547
7.543
7.538
7.260
5.433
4.353
4.345
4.341
4.337
4.329
4.066
3.731
3.724
3.720
3.716
3.708
3.631
3.622
3.615
3.609
3.602
3.567
3.561
3.555
3.548
3.539
3.432
3.415
3.398
2.136
1.542
1.524
1.518
1.507
1.501
1.487
1.470
1.355
1.336
1.317
N
N
O
O
O
O
I
10
9
8
7
6
5
4
3
2
1
ppm
1.00
1.00
1.02
2.04
2.05
3.11
2.05
2.09
2.09
2.10
0.08
2.11
2.11
3.08

6c from 14

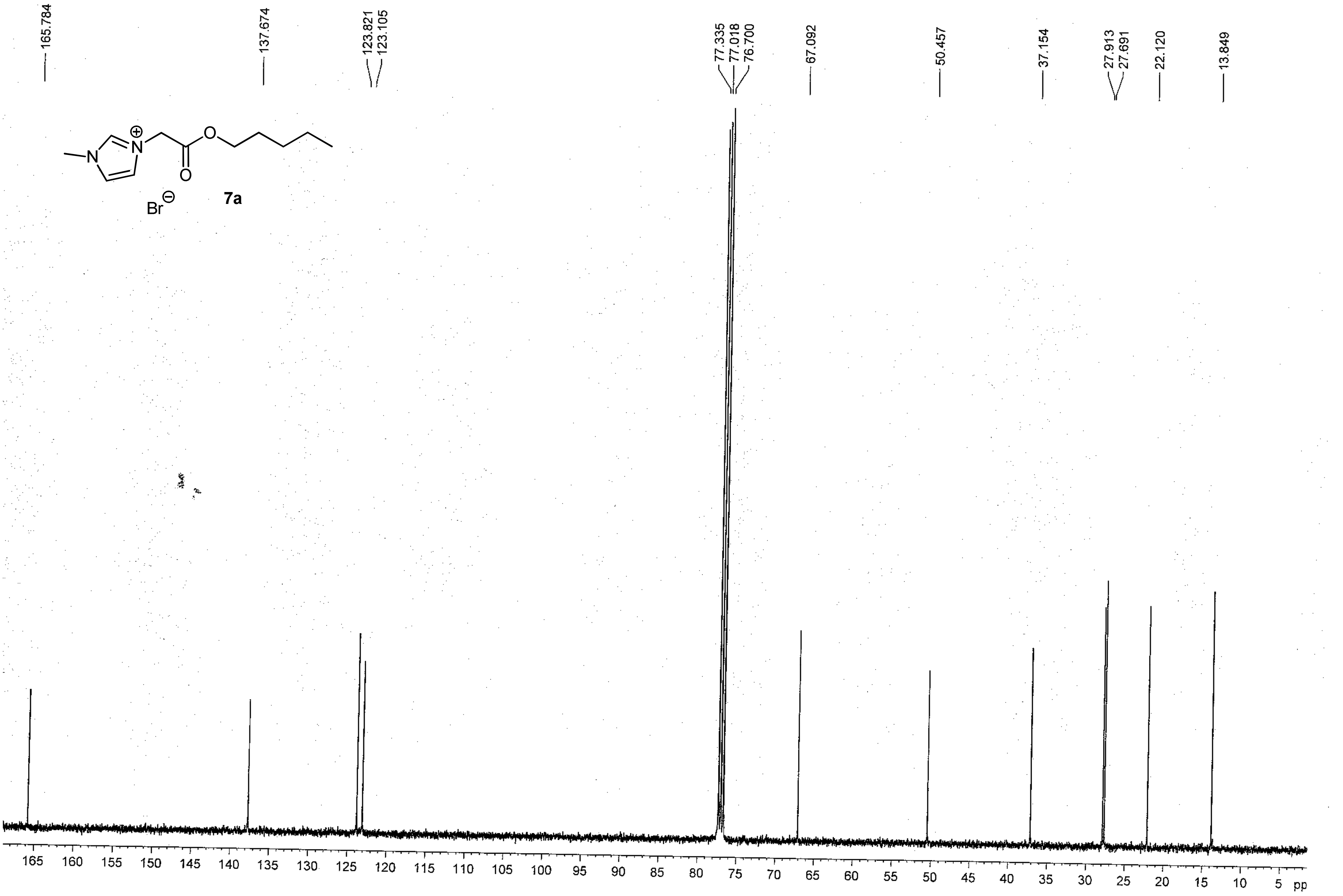
MG-124 400 S101
14.04.10
165.92
137.90
124.02
123.22
77.32
77.11
76.90
71.18
70.62
69.96
68.56
65.77
50.60
37.28
31.64
30.91
19.22
13.91
N
N
⊕
O
O
O
O
I⊖
6c from 14
71.176
70.616
69.963
68.560
65.767
72
70
68
ppm
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
ppm

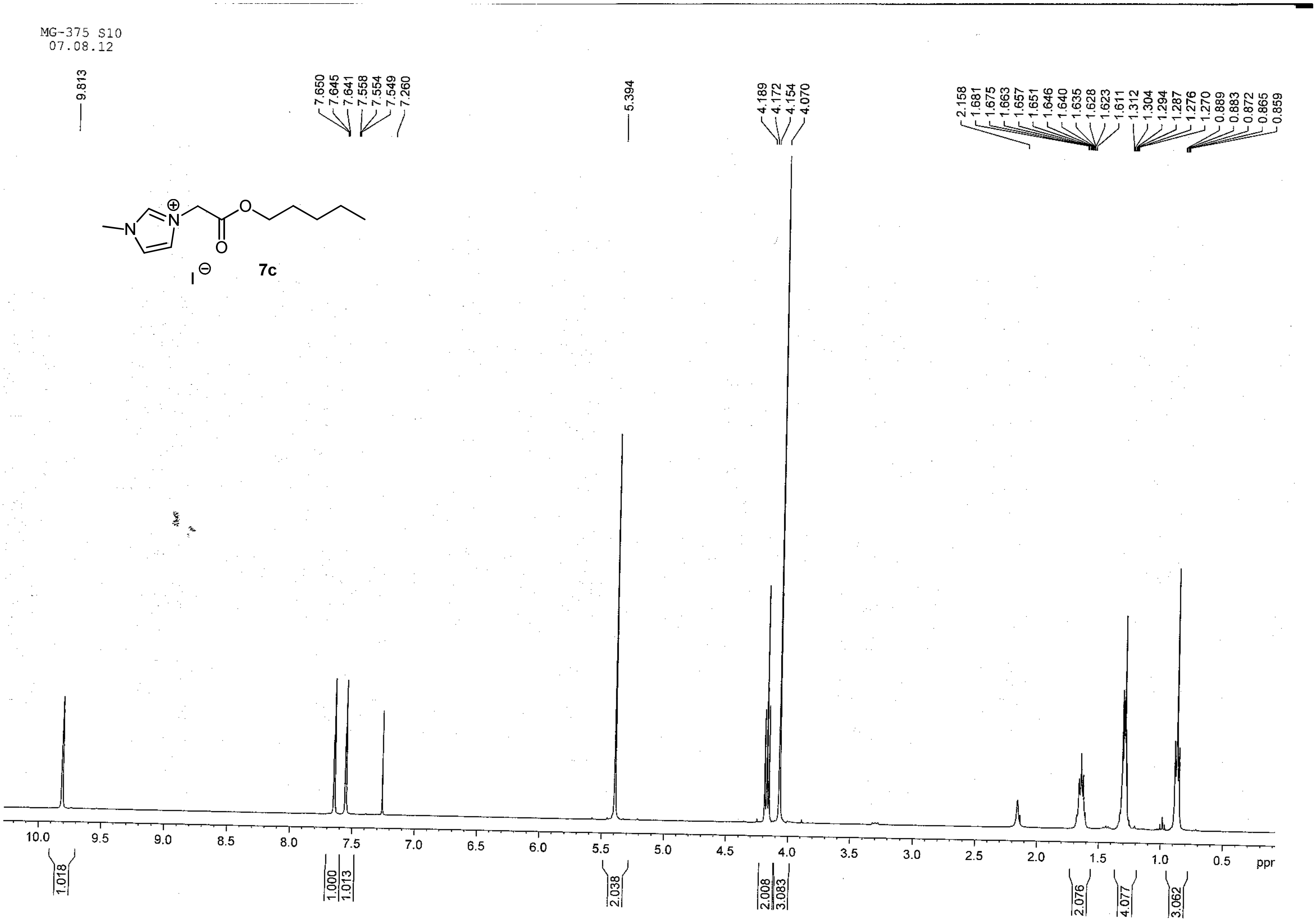
HB-15
15.12.12



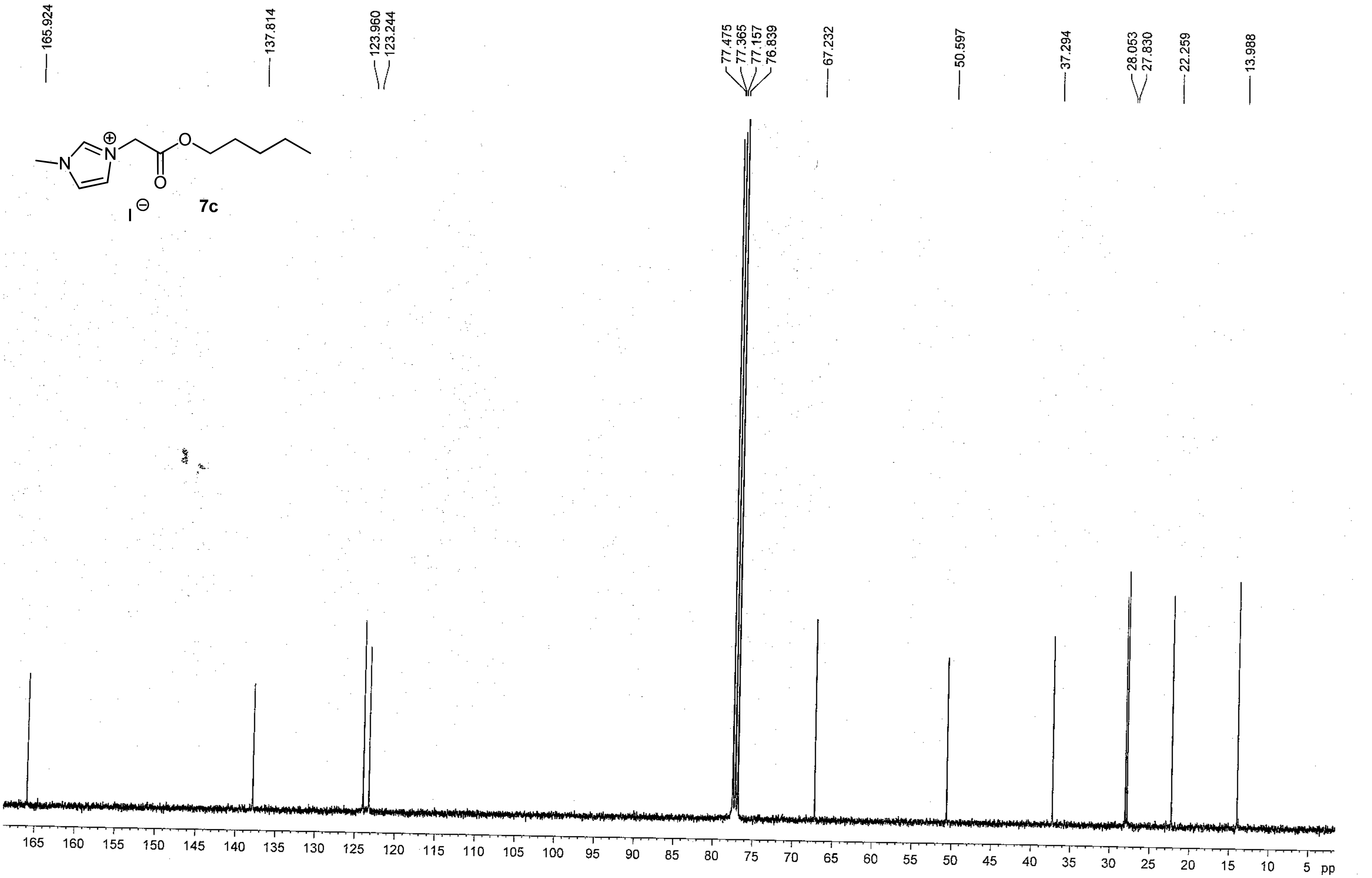
7a

HB-15 C-NMR
15.12.12

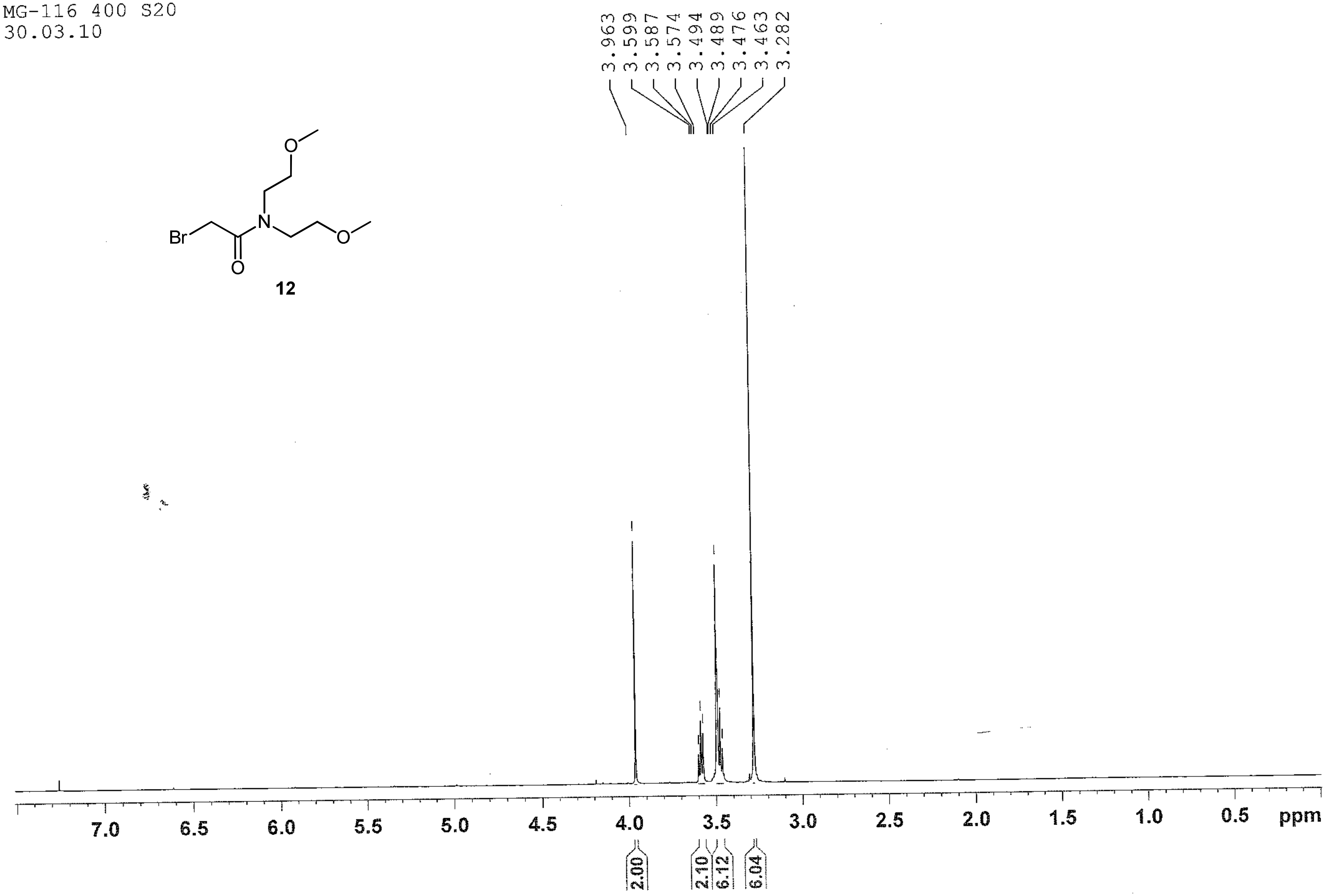

7a


MG-375 S10
07.08.12
9.813
7.650
7.645
7.641
7.558
7.554
7.549
7.260
5.394
4.189
4.172
4.154
4.070
2.158
1.681
1.675
1.663
1.657
1.651
1.646
1.640
1.635
1.628
1.623
1.611
1.312
1.304
1.294
1.287
1.276
1.270
0.889
0.883
0.872
0.865
0.859
N
N
O
O
I
7c
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppr
1.018
1.000
1.013
2.038
2.008
3.083
2.076
4.077
3.062

MG-375 S11
07.08.12



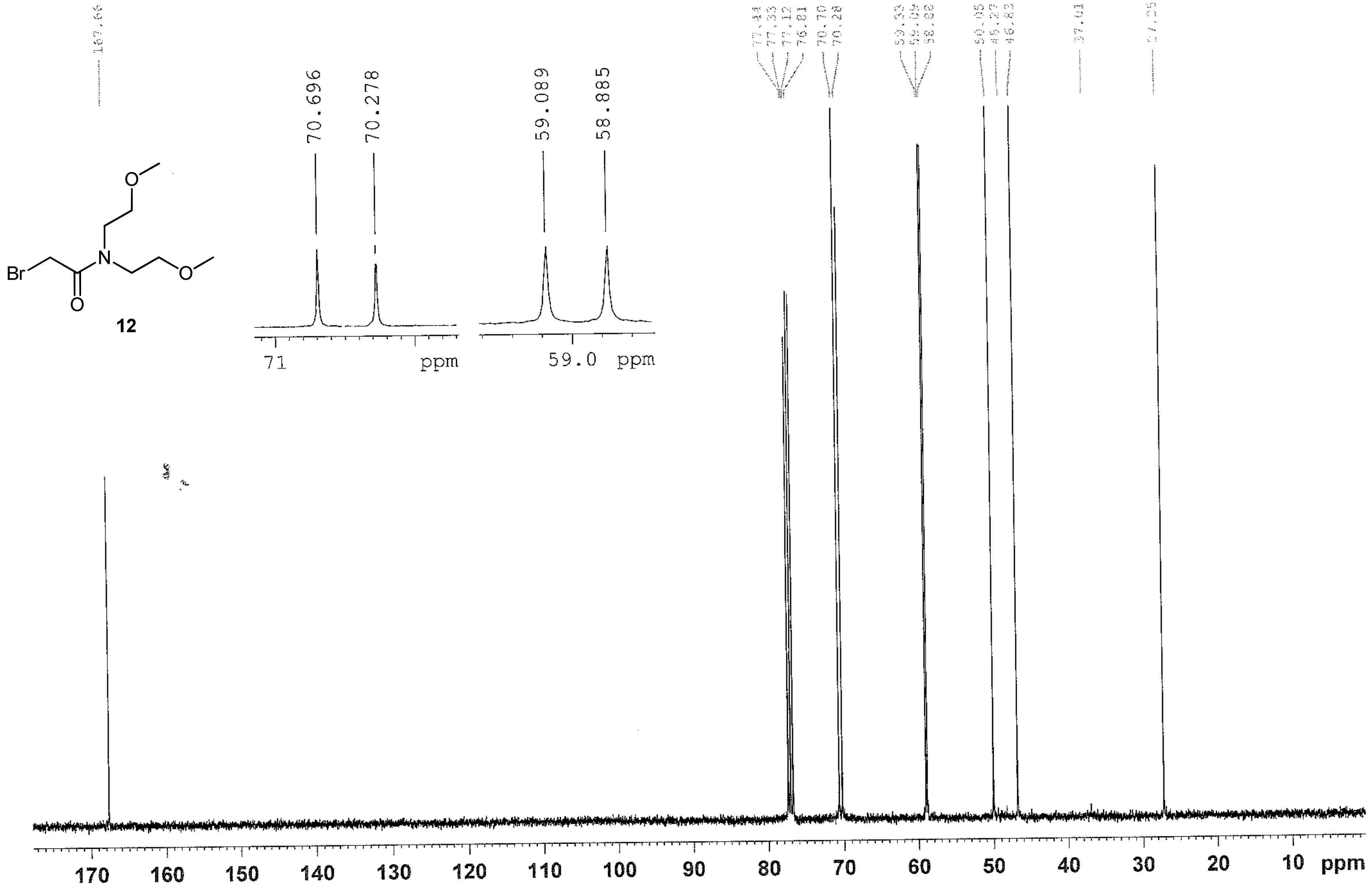
7c



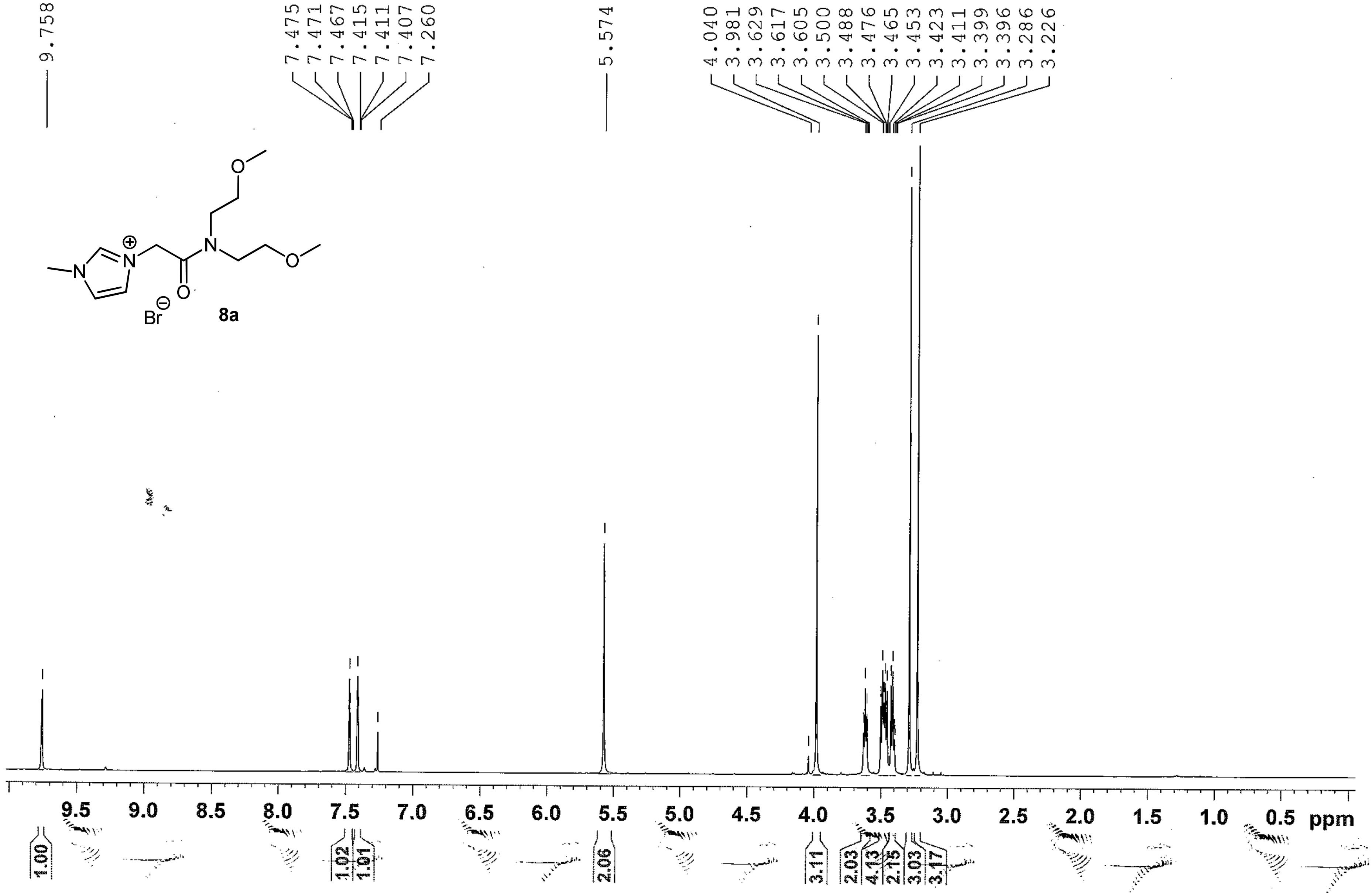
MG-116 400 S20
30.03.10

12

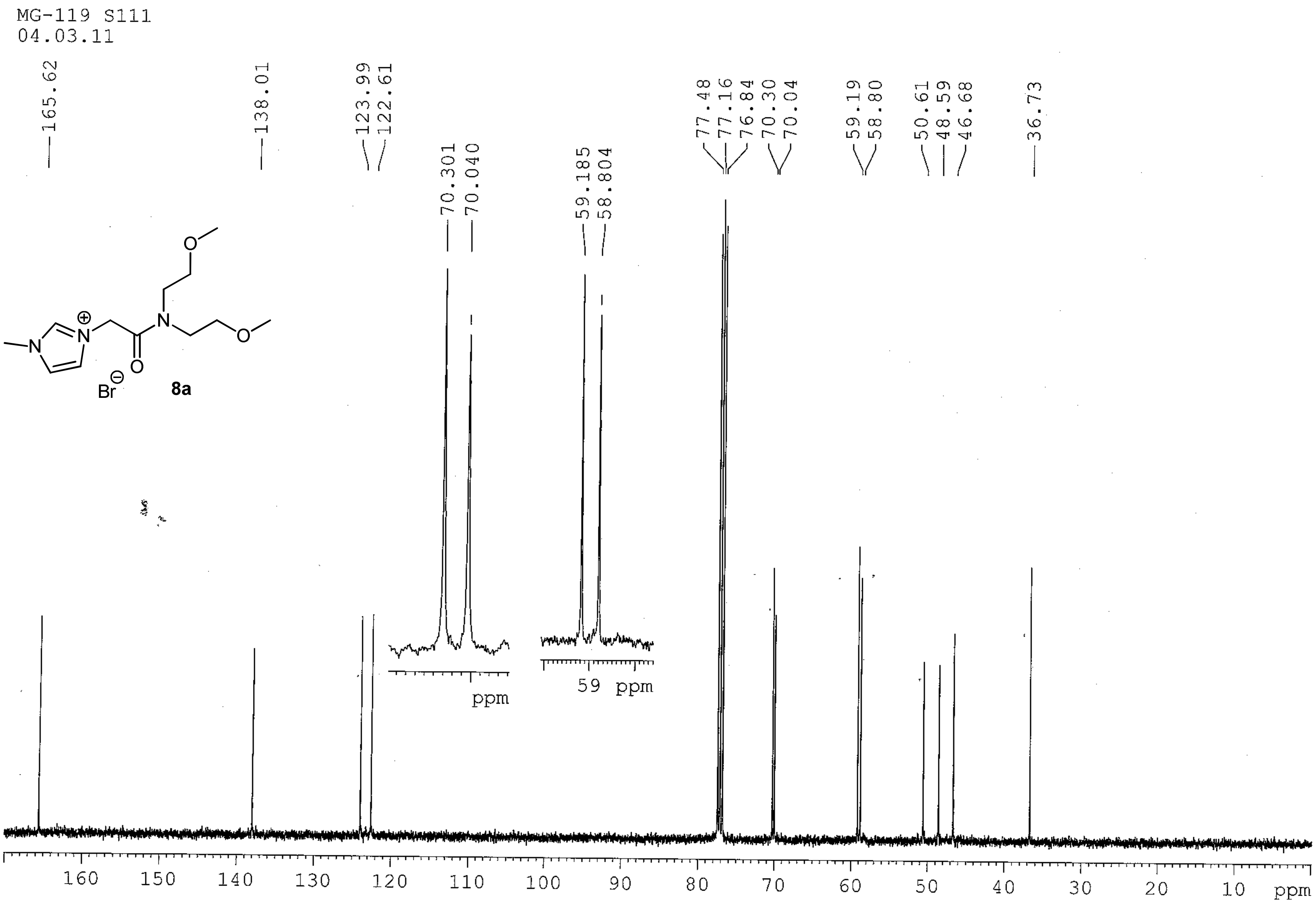
MG-116 400 S21
30.03.10

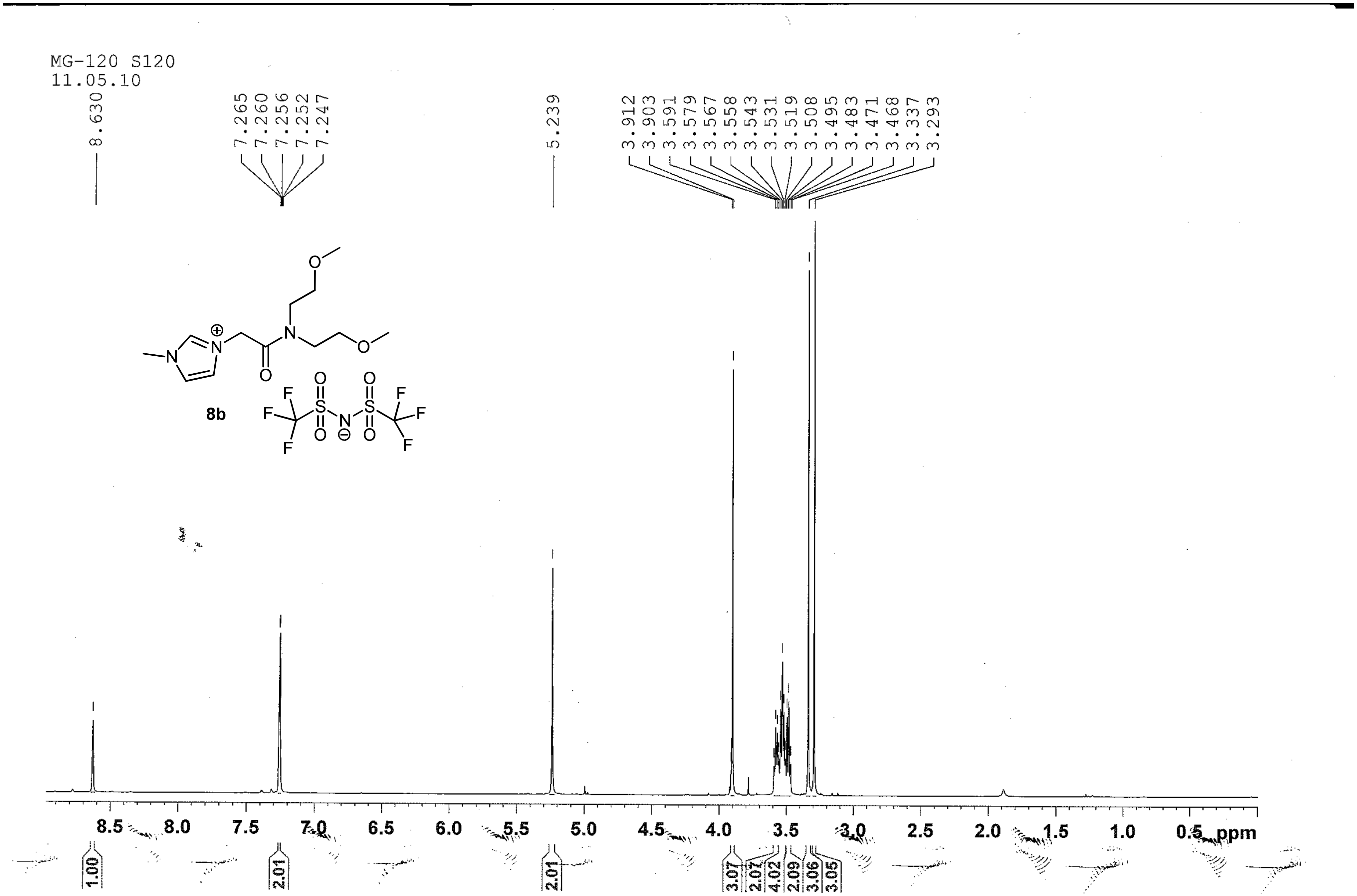


MG-119
11.05.10



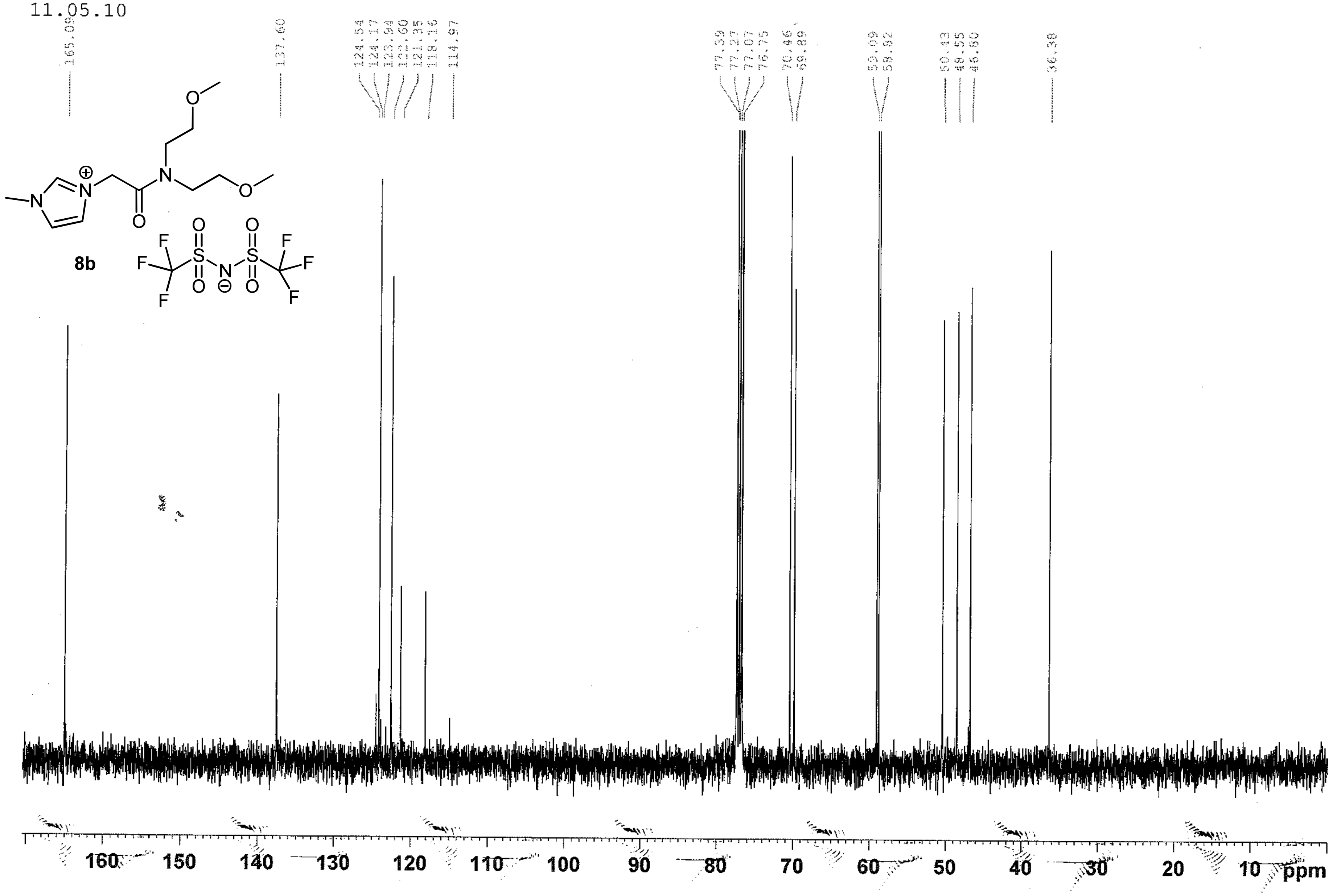
8a


MG-119 S111
04.03.11
165.62
138.01
123.99
122.61
70.301
70.040
59.185
58.804
77.48
77.16
76.84
70.30
70.04
59.19
58.80
50.61
48.59
46.68
36.73
8a
Br
ppm
59 ppm
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
ppm

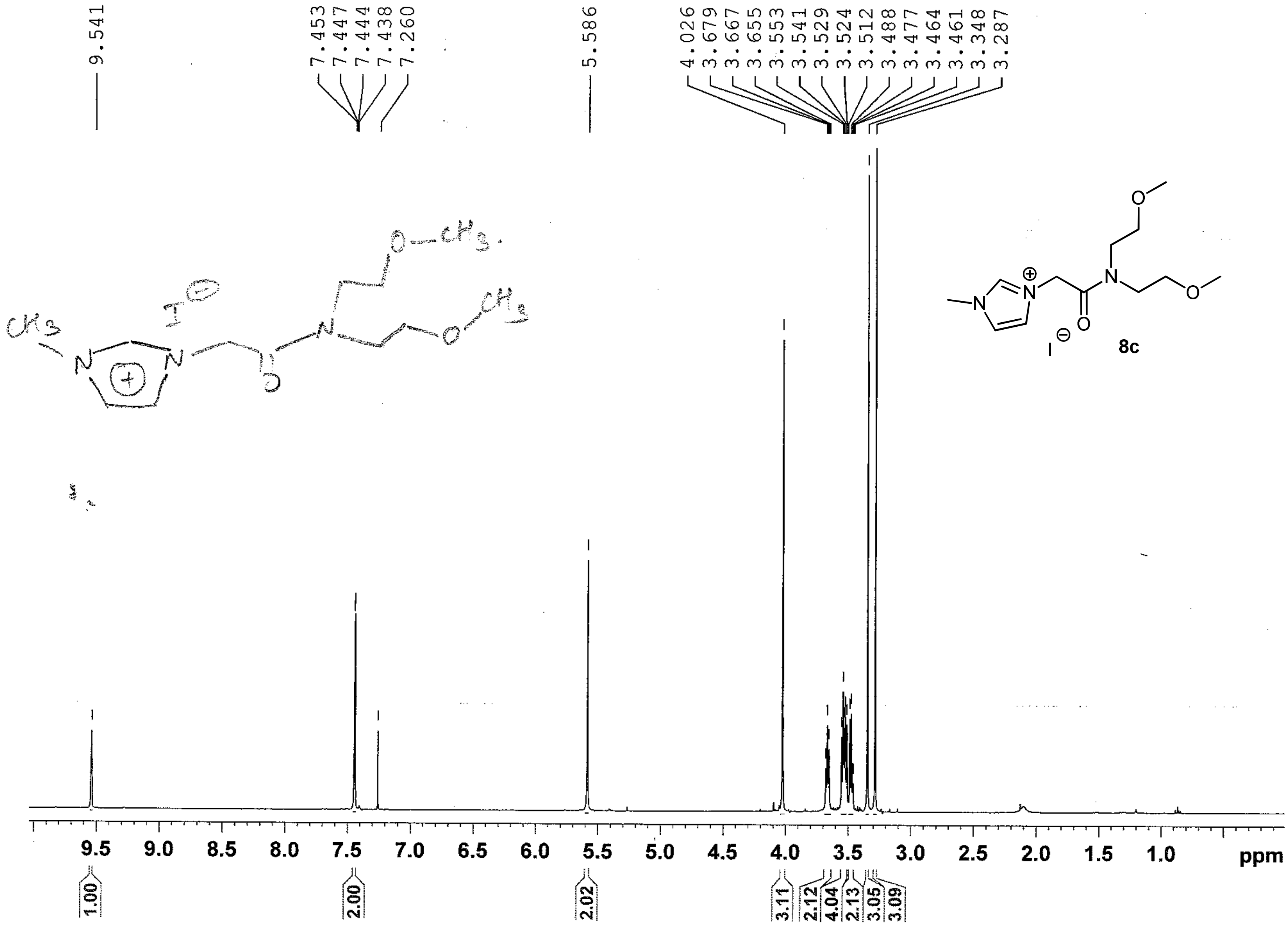

MG-120 S120
11.05.10
8.630
7.265
7.260
7.256
7.252
7.247
5.239
3.912
3.903
3.591
3.579
3.567
3.558
3.543
3.531
3.519
3.508
3.495
3.483
3.471
3.468
3.337
3.293
F
F
F
O
O
O
O
S
S
N
F
F
F
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
1.00
2.01
2.01
3.07
2.07
4.02
2.09
3.06
3.05

8b

MG-120 S121
11.05.10

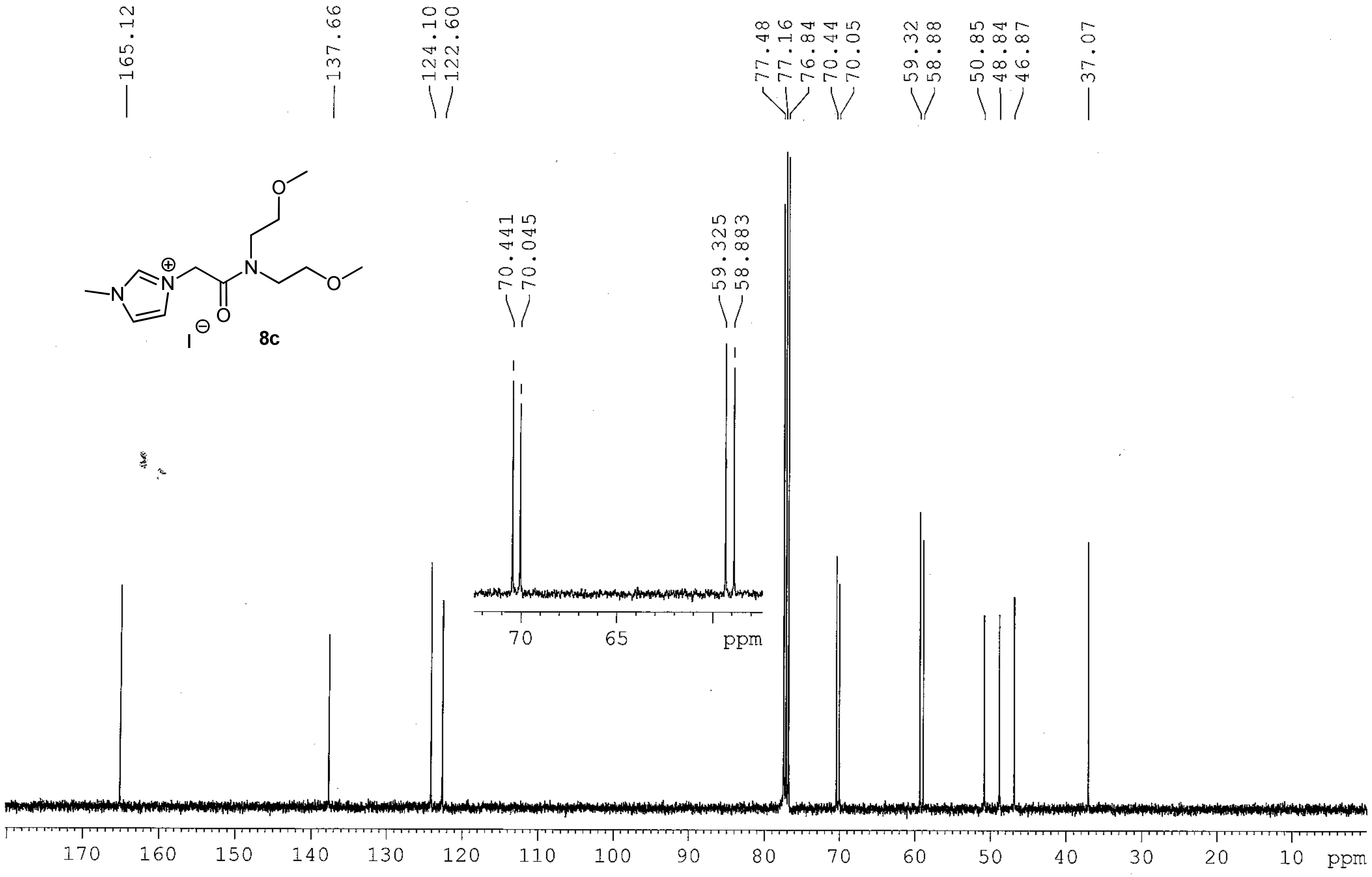


MG-131
20.05.10

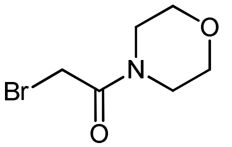


8c

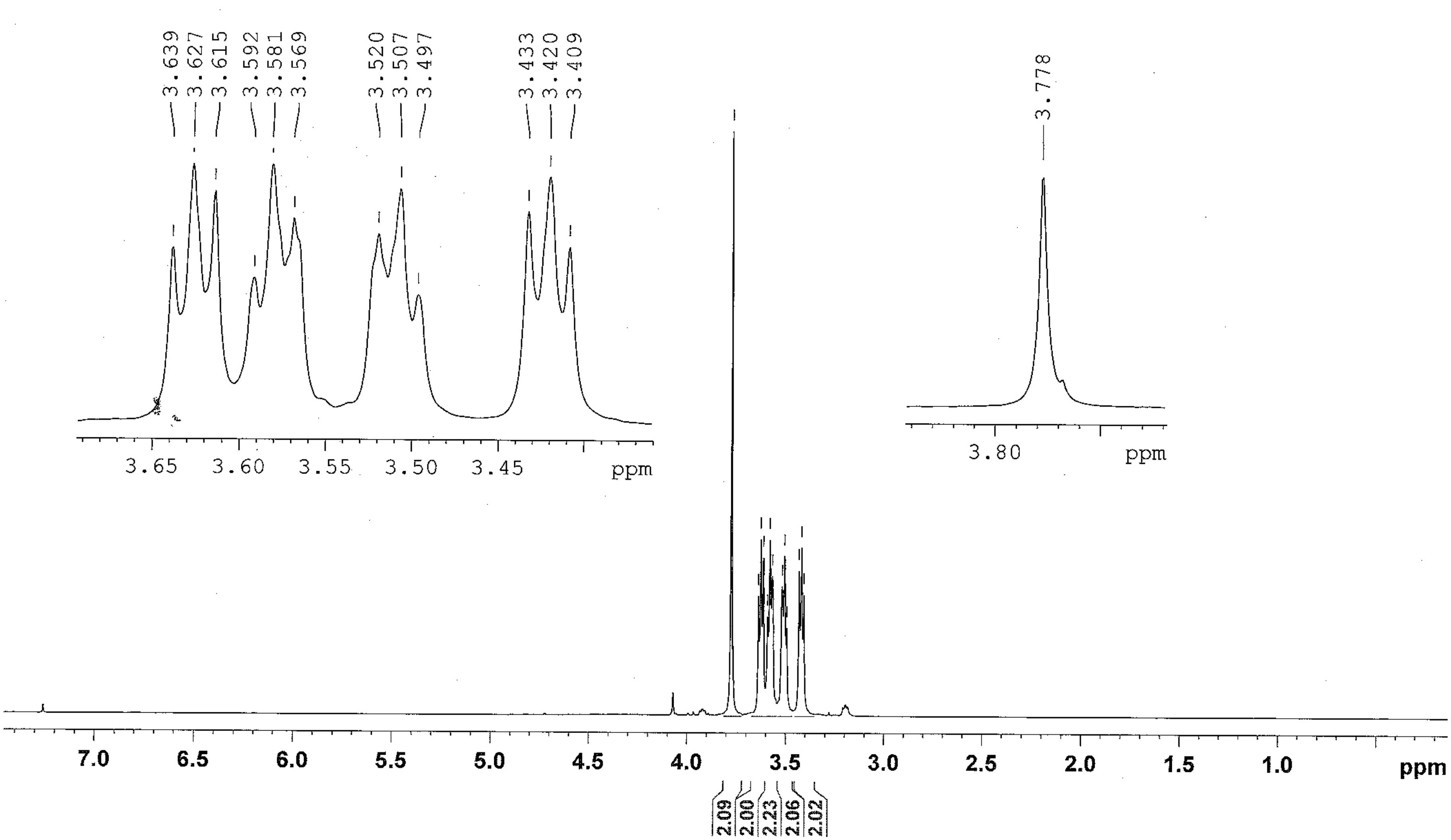
MG-131 P S41
28.05.10



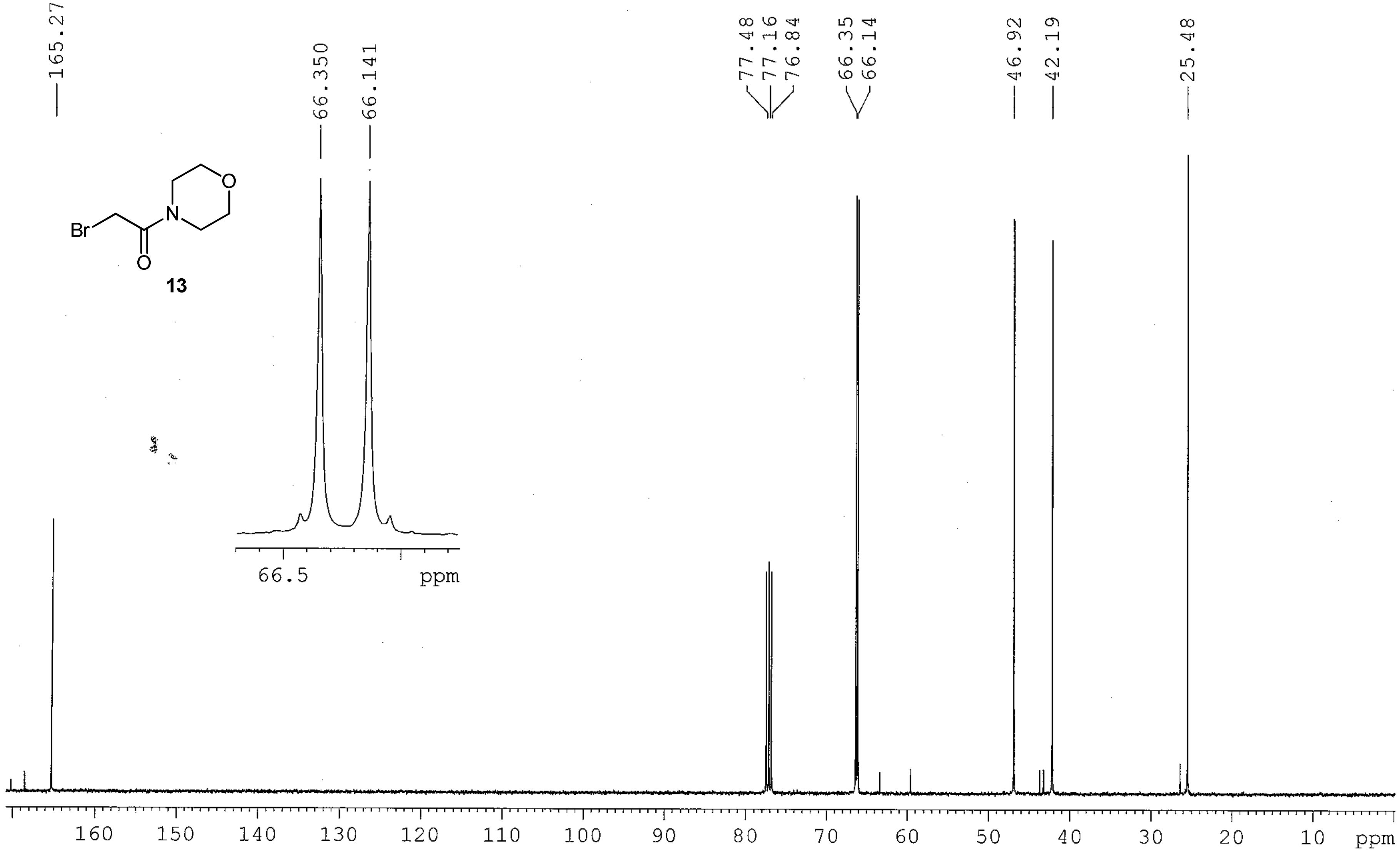
MG-108 S90
04.03.11



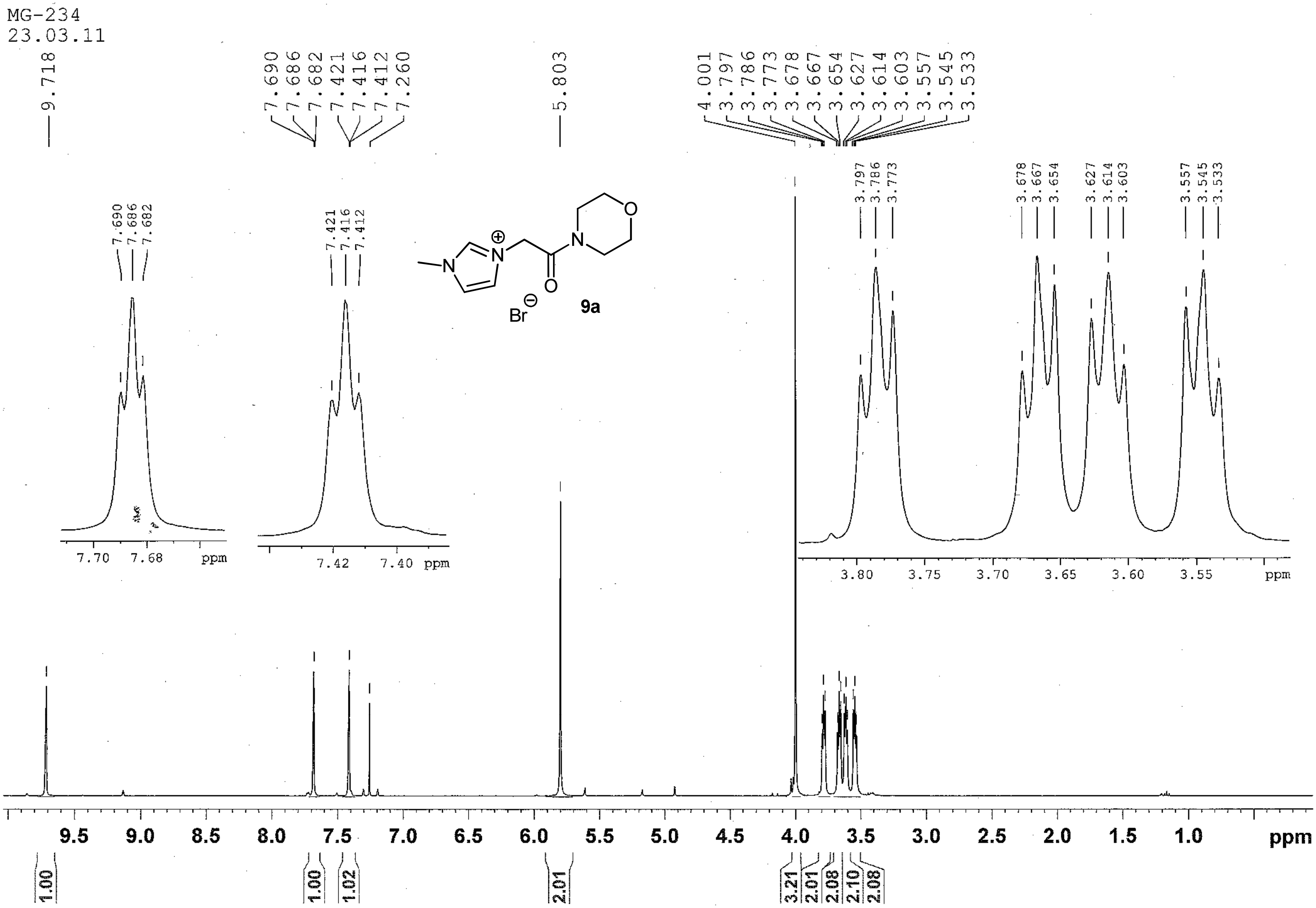
13



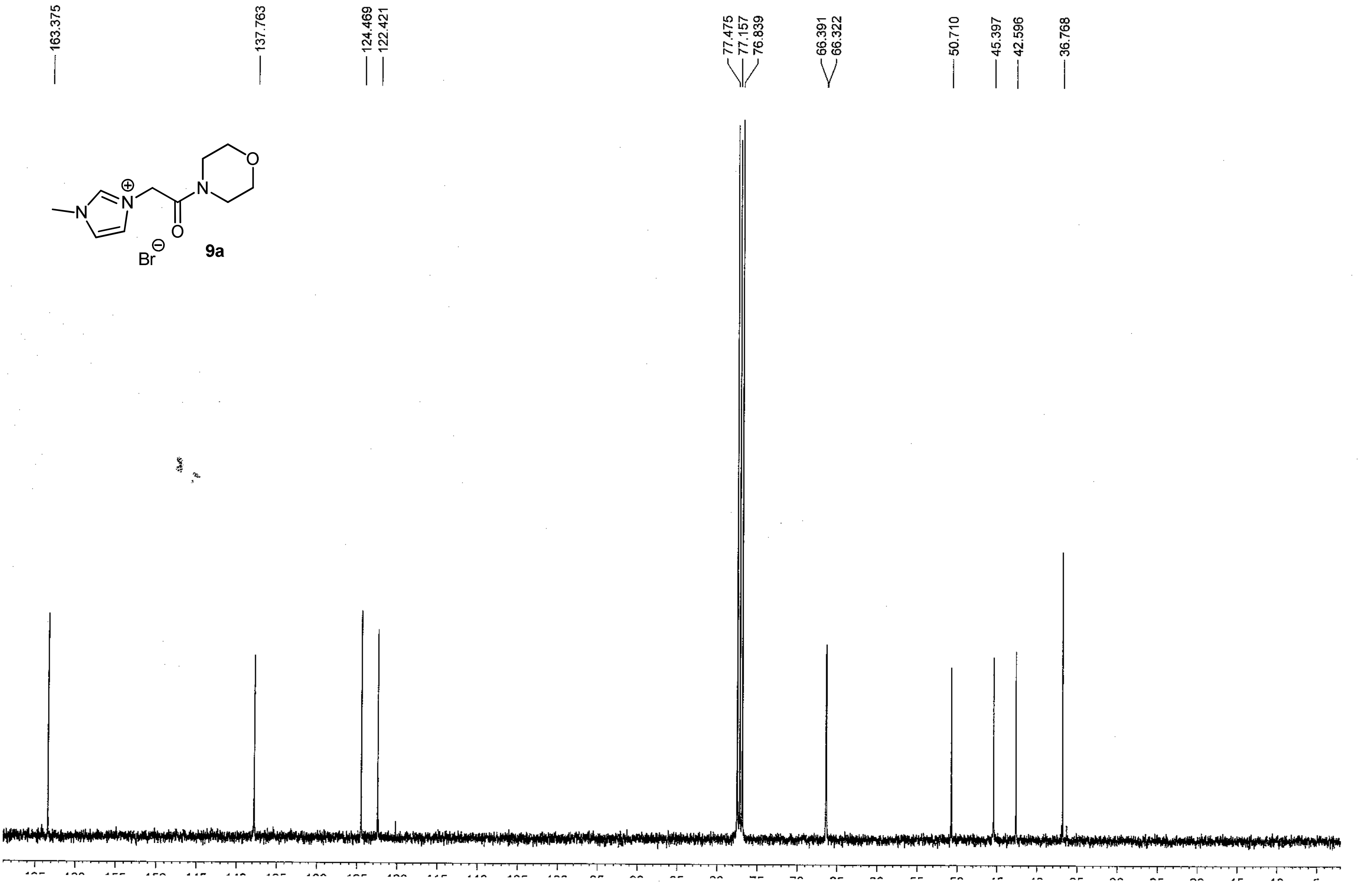
MG-108 S91
04.03.11



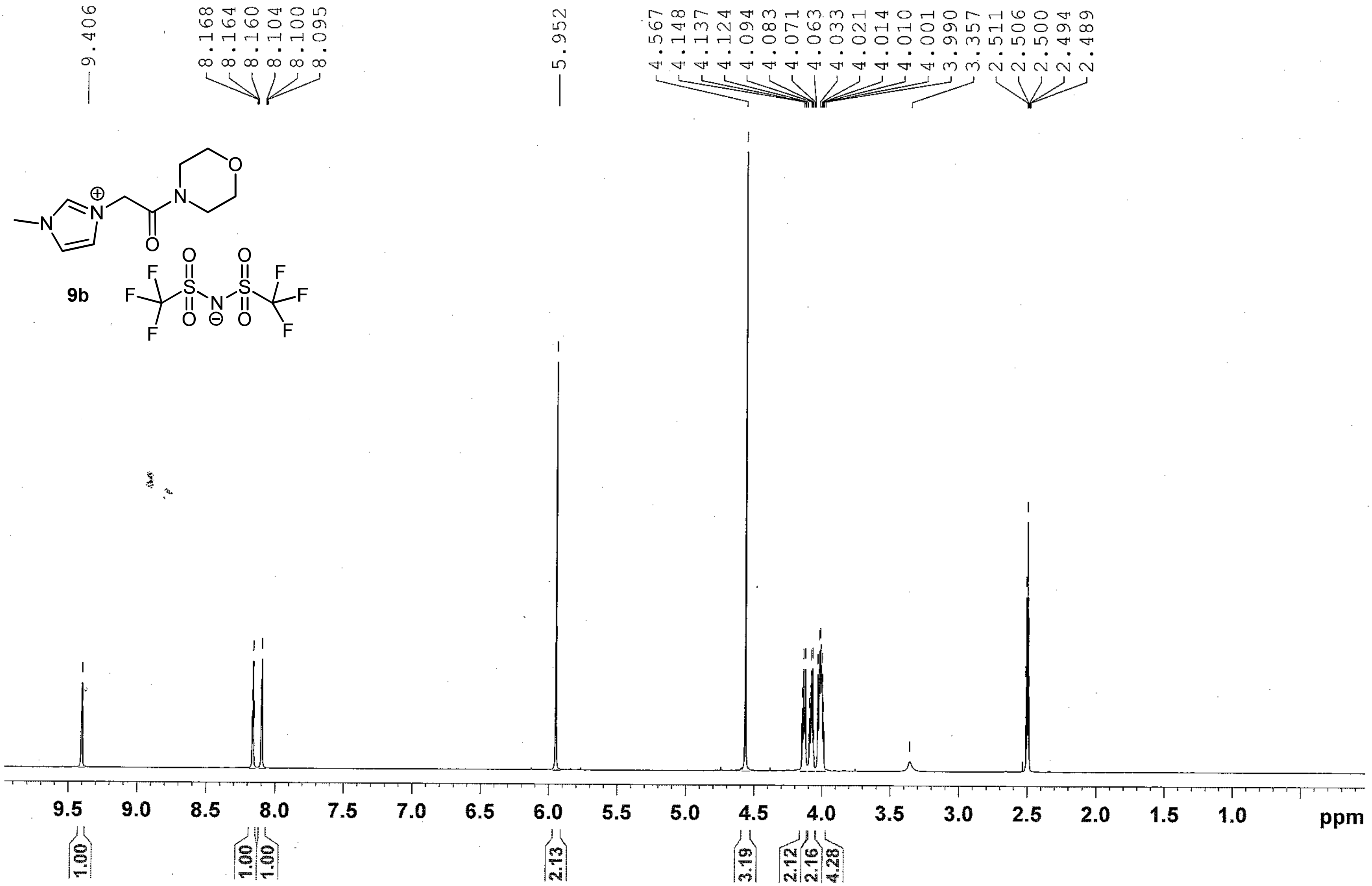
13

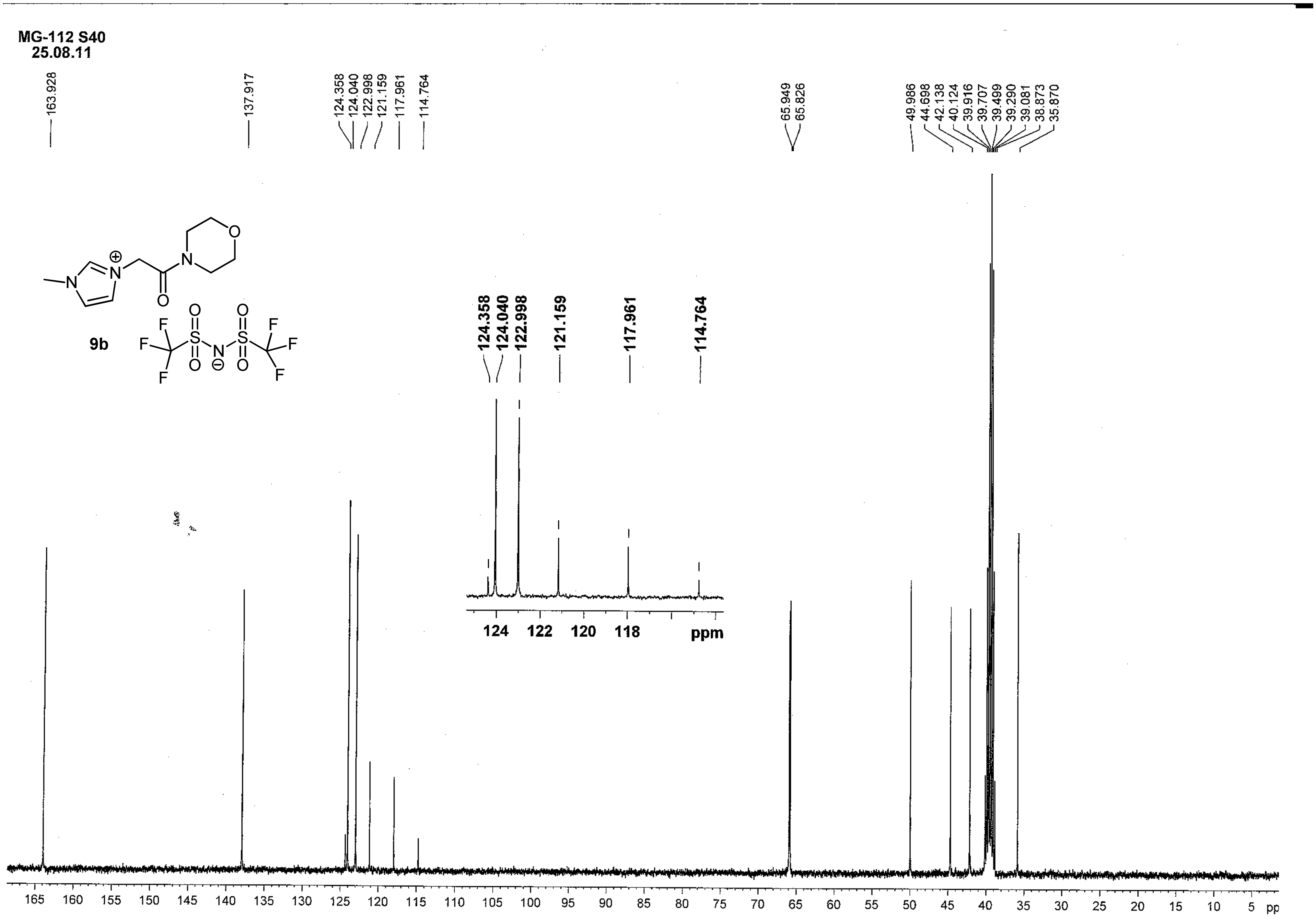

MG-234
23.03.11
9.718
7.690
7.686
7.682
7.421
7.416
7.412
7.260
5.803
4.001
3.797
3.786
3.773
3.678
3.667
3.654
3.627
3.614
3.603
3.557
3.545
3.533
7.70
7.68
ppm
7.42
7.40
ppm
3.80
3.75
3.70
3.65
3.60
3.55
ppm
N
N
O
N
O
Br
9a
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
ppm
1.00
1.00
1.02
2.01
3.21
2.01
2.08
2.08
2.10
2.08

MG-234 S11
31.03.11

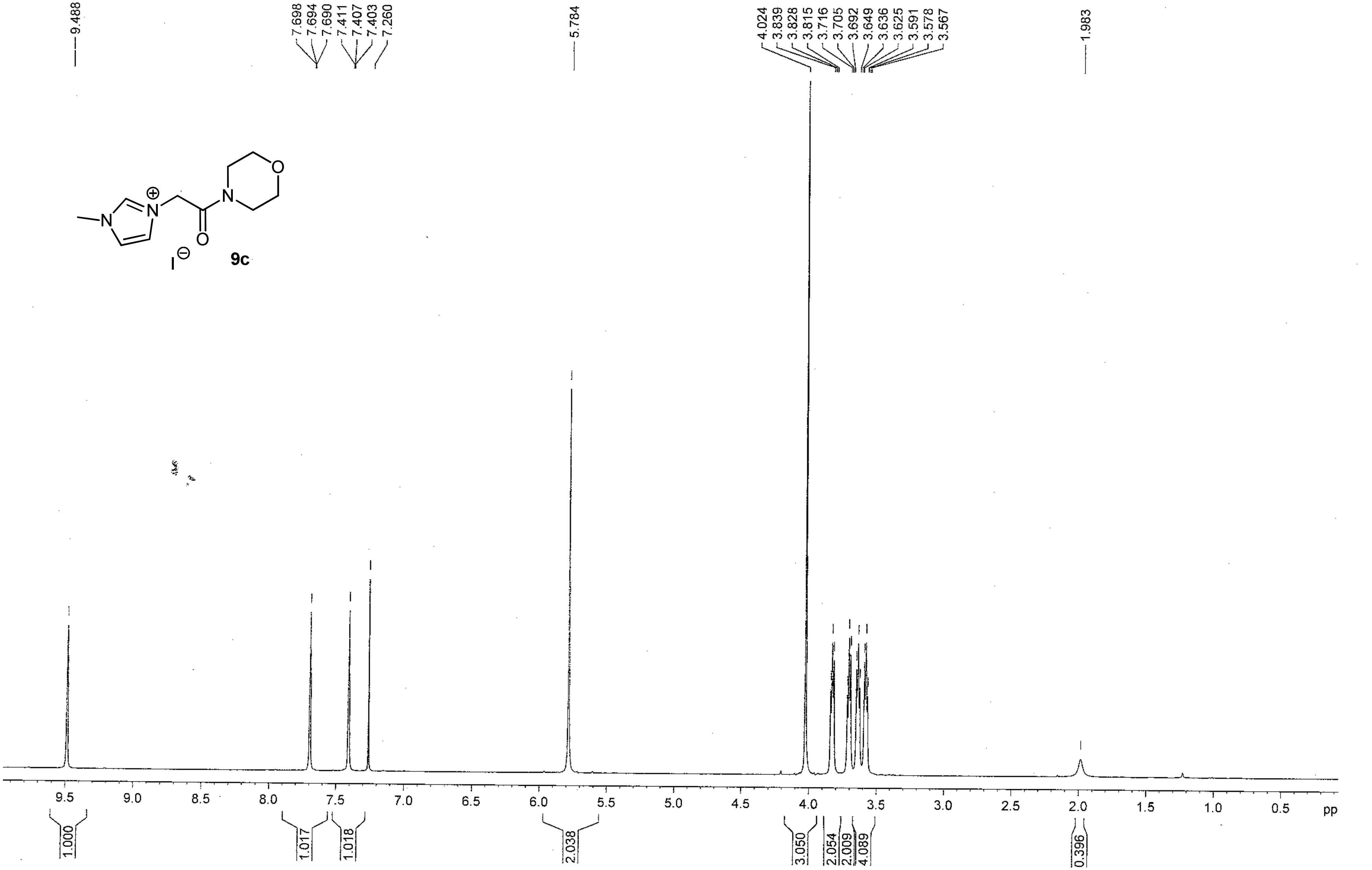


MG-112 S10
22.03.11




MG-112 S40
25.08.11
163.928
137.917
124.358
124.040
122.998
121.159
117.961
114.764
65.949
65.826
49.986
44.698
42.138
40.124
39.916
39.707
39.499
39.290
39.081
38.873
35.870
9b
124.358
124.040
122.998
121.159
117.961
114.764
124
122
120
118
ppm
165
160
155
150
145
140
135
130
125
120
115
110
105
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
pp

MG-376
07.08.12



9c

MG-376 S21
07.08.12