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Supporting Information

$Cu(OAc)_2$-Promoted Reaction [60]Fullerene with Primaryamines and Diamines

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General Procedure for the $Cu(OAc)_2$-Promoted Reaction of C_{60} with Alkyl Amines 1a-f

C_{60} (72.0 mg, 0.1 mmol) and 20 mL of dry chlorobenzene was added to a big tube (Φ 2.5 cm × 18 cm). After ultrasonic dissolution, DMAP (24.4 mg, 0.2 mmol), $Cu(OAc)_2$ (36.2 mg, 0.2 mmol), and alkyl amines (**1a-f**, 0.2 mmol) was added sequentially. The mixture was vigorously stirred at 80 ºC for 3-6 h. The solvent was evaporated *in vacuo*, and the residue was purified on a silica gel column using CS_2/toluene as the eluent to give unreacted C_{60} and the products **2a-f** and **3a-d**.

2a (brown solid, 7.8 mg, 9%, mp > 300 °C): ^{1}H NMR (500 MHz, $CDCl_3$-CS_2) δ 7.61 (d, J = 8.5 Hz, 2H), 6.95 (d, J = 8.6 Hz, 2H), 4.71 (s, 2H), 3.83 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$-CS_2) δ 159.42, 145.10, 145.06, 144.59, 144.49, 144.43, 143.74, 143.03, 142.85, 142.26, 142.11, 140.74, 130.32, 129.02, 114.28, 85.27 (sp^3-C of C_{60}), 55.03, 53.99.

3a (brown solid, 15.9 mg, 16%, mp > 300 °C): ^{1}H NMR (500 MHz, $CDCl_3$-CS_2) δ 7.46 (d, J = 8.5 Hz, 4H), 6.82 (d, J = 8.6 Hz, 4H), 4.54 (d, J = 13.4 Hz, 2H), 4.19 (d, J = 13.4 Hz, 2H), 3.81 (s, 6H); ^{13}C NMR (100 MHz, $CDCl_3$-CS_2) δ 159.06, 153.38, 149.64, 148.02, 147.02, 146.10, 146.04, 145.73, 145.66, 145.64, 145.21, 145.09, 144.66, 144.07, 144.00, 143.80, 143.50, 143.42, 143.30, 142.87, 142.46, 142.00, 141.67, 141.51, 141.47, 141.24, 140.64, 140.07, 139.70, 129.94, 129.11, 114.15, 77.26 (sp^3-C of C_{60}), 72.82 (sp^3-C of C_{60}), 55.06, 52.82; UV-vis ($CHCl_3$) λ_{max}/nm 258, 327, 426, 471, 686; HRMS (MALDI-TOFMS) m/z: $[M+Na]^+$ Calcd for $C_{76}H_{18}N_2O_2Na$ 1013.1266, found 1013.1260.

2b (brown solid, 11.8 mg, 14%, mp > 300 °C): ^{1}H NMR (500 MHz, $CDCl_3$-CS_2) δ 8.00 (d, J = 7.6 Hz, 2H), 7.73 (t, J = 7.4 Hz, 2H), 7.66 (t, J = 7.6 Hz, 1H), 5.07 (s, 2H).

3b (brown solid, 15.2 mg, 16%, mp > 300 °C): ^{1}H NMR (500 MHz, $CDCl_3$-CS_2) δ 7.56-7.62 (m, 4H), 7.28-7.34 (m, 6H), 4.58 (d, J = 13.8 Hz, 2H), 4.31 (d, J = 13.8 Hz, 2H).

2c (brown solid, 16.9 mg, 21%, mp > 300 °C): ^{1}H NMR (500 MHz, $CDCl_3$-CS_2) δ 3.66 (t, J = 7.1 Hz, 2H), 2.13 (quint, J = 7.3 Hz, 2H), 1.79 (sextet, J = 7.5 Hz, 2H), 1.15 (t, J = 7.4 Hz, 3H).

3c (brown solid, 11.3 mg, 13%, mp > 300 °C): ^{1}H NMR (500 MHz, $CDCl_3$-CS_2) δ 3.41 (ddd, J = 11.8, 8.0, 6.3 Hz, 2H), 3.20 (ddd, J = 11.8, 7.9, 6.3 Hz, 2H), 1.93-2.07 (m, 4H), 1.64-1.75 (m, 4H), 1.08 (t, J = 7.4 Hz, 6H).

2d (brown solid, 12.4 mg, 14%, mp > 300 °C): ^{1}H NMR (500 MHz, $CDCl_3$-CS_2) δ 7.56 (d, J = 8.2 Hz, 1H), 7.34 (d, J = 2.1 Hz, 1H), 7.24 (dd, J = 8.2, 2.1 Hz, 1H), 3.94 (t, J = 6.6 Hz, 2H), 3.57 (t, J = 6.6 Hz, 2H). ^{13}C NMR (100 MHz, $CDCl_3$-CS_2) δ 145.22, 145.18, 144.68, 144.61, 144.58, 143.83, 143.13, 143.11, 142.90, 142.25, 142.16, 140.71, 135.35, 135.09, 133.71, 132.81, 129.62, 127.64, 84.43 (sp^3-C of C_{60}), 49.77, 33.69; UV-vis ($CHCl_3$) λ_{max}/nm 258, 325, 424, 500, 682; HRMS (MALDI-TOFMS) m/z: $[M+H]^+$ Calcd for $C_{68}H_8Cl_2N$ 908.0034, found 908.0022.

3d (brown solid, 23.4 mg, 21%, mp > 300 °C): ^{1}H NMR (500 MHz, $CDCl_3$-CS_2) δ 7.55 (d, J = 8.2 Hz, 2H), 7.26 (d, J = 2.1 Hz, 2H), 7.20 (dd, J = 8.2, 2.1 Hz, 2H), 3.40-3.63 (m, 8H); ^{13}C NMR (125 MHz, $CDCl_3$-CS_2) δ 153.19, 148.93, 147.53, 147.02, 146.05, 145.69, 145.50, 145.10, 144.96, 144.61, 143.98, 143.90, 143.71, 143.40, 143.35, 143.19, 142.73, 142.32, 142.27, 141.91, 141.52, 141.33, 141.25, 141.22, 140.60, 140.29, 139.62, 138.91, 135.26, 134.96, 133.61, 132.46, 129.45, 127.43, 75.63 (sp^3-C of C_{60}), 71.95 (sp^3-C of C_{60}), 48.45, 33.45; UV-vis ($CHCl_3$) λ_{max}/nm 258, 327, 426, 470, 686; HRMS (MALDI-TOFMS) m/z: $[M+H]^+$ Calcd for $C_{69}H_{11}N$ 1094.9989, found 1094.9983.

2e (brown solid, 14.2 mg, 17%, mp > 300 °C): ^{1}H NMR (400 MHz, $CDCl_3$-CS_2) δ 4.17 (q, J = 7.1 Hz, 2H), 3.70 (t, J = 6.6 Hz, 2H), 2.81 (t, J = 7.2 Hz, 2H), 2.42 (quint, J = 6.9 Hz, 2H), 1.31 (t, J = 7.1 Hz, 3H). ^{13}C NMR (100 MHz, $CDCl_3$-CS_2) δ 172.52, 145.13, 145.09, 144.62, 144.51, 144.48, 143.76, 143.06, 142.85, 142.24, 142.12, 140.78, 85.03 (sp^3-C of C_{60}), 60.54, 50.12, 31.94, 24.92, 14.48; UV-vis ($CHCl_3$) λ_{max}/nm 258, 325, 424, 500, 682; HRMS (MALDI-TOFMS) m/z: $[M]^+$ Calcd for $C_{66}H_{11}NO_2$ 849.0790, found 849.0773.

2f (brown solid, 11.1 mg, 14%, mp > 300 °C): ^{1}H NMR (500 MHz, $CDCl_3$-CS_2) δ 3.84 (t, J = 6.1 Hz, 2H), 3.77 (t, J = 6.8 Hz, 2H), 3.45 (s, 3H), 2.40 (quint, J = 6.4 Hz, 2H); ^{13}C NMR (125 MHz, $CDCl_3$-CS_2) δ 145.22, 145.18, 144.69, 144.61, 144.57, 143.86, 143.15, 142.95, 142.38, 142.22, 140.86, 85.36 (sp^3-C of C_{60}), 70.44, 58.88, 48.34, 30.07; UV-vis ($CHCl_3$) λ_{max}/nm 258, 325, 424, 499, 682; HRMS (MALDI-TOFMS) m/z: $[M]^+$ Calcd for $C_{64}H_9NO$ 807.0684, found 807.0663.

General Procedure for the $Cu(OAc)_2$-Promoted Reaction of C_{60} with Aryl Amines 1g-n

C_{60} (72.0 mg, 0.1 mmol) and 20 mL of dry chlorobenzene was added to a big tube (Φ 2.5 cm × 18 cm). After ultrasonic dissolution, DMAP (24.4 mg, 0.2 mmol), $Cu(OAc)_2$ (36.2 mg, 0.2 mmol), and aryl amines (**1g-n**, 0.2 mmol) was added sequentially. Then the mixture was vigorously stirred at 80 ºC for 8-12 h. The solvent was evaporated *in vacuo*, and the residue was purified on a silica gel column using CS_2/toluene as the eluent to give unreacted C_{60} and the products **2g-n**.

2g (brown solid, 10.1 mg, 12%, mp > 300 °C): ^{1}H NMR (500 MHz, $CDCl_3$-CS_2) ^{1}H NMR (500 MHz, $CDCl_3$-CS_2) δ 7.54 (d, J = 8.3 Hz, 2H), 7.31 (d, J = 8.4 Hz, 2H), 2.96 (heptet, J = 6.9 Hz, 1H), 1.33 (d, J = 7.0 Hz, 6H); ^{13}C NMR (125 MHz, $CDCl_3$-CS_2) δ 145.24, 145.16, 145.01, 144.81, 144.76, 144.74, 144.59, 144.53, 144.11, 143.89, 143.34, 143.12, 142.86, 142.32, 142.21, 140.94, 140.76, 127.14, 121.34, 83.75 (sp^3-C of C_{60}), 33.85, 24.20; UV-vis ($CHCl_3$) λ_{max}/nm 258, 326, 405, 423, 454, 507, 683; HRMS (MALDI-TOFMS) m/z: $[M]^+$ Calcd for $C_{69}H_{11}N$ 853.0891, found 853.0895.

2h (brown solid, 14.6 mg, 18%, mp > 300 °C): ^{1}H NMR (500 MHz, $CDCl_3$-CS_2) δ 7.43 (s, 1H), 7.42 (d, J = 7.6 Hz, 1H), 7.34 (t, J = 7.6 Hz, 1H), 7.01 (d, J = 7.4 Hz, 1H), 2.47 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$-CS_2) δ 145.52, 145.23, 145.14, 144.91, 144.80, 144.73, 144.72, 144.57, 144.09, 143.86, 143.09, 142.85, 142.29, 142.19, 140.94, 140.71, 139.05, 129.03, 125.17, 121.95, 118.64, 83.59 (sp^3-C of C_{60}), 21.80; UV-vis ($CHCl_3$) λ_{max}/nm 258, 325, 405, 424, 455, 510, 683; HRMS (MALDI-TOFMS) m/z: $[M]^+$ Calcd for $C_{67}H_7N$ 825.0578, found 825.0592.

2i (brown solid, 11.9 mg, 14%, mp > 300 °C): ^{1}H NMR (500 MHz, $CDCl_3$-CS_2) δ 7.40 (d, J = 2.1 Hz, 1H), 7.35 (dd, J = 8.0, 2.3 Hz, 1H), 7.20 (d, J = 8.0 Hz, 1H), 2.37 (s, 3H), 2.32 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$-CS_2) δ 145.28, 145.20, 145.15, 144.83, 144.82, 144.78, 144.63, 144.16, 143.93, 143.47, 143.16, 143.14, 142.91, 142.39, 142.25, 140.97, 140.76, 137.52, 132.42, 130.25, 122.63, 118.98, 83.80 (sp^3-C of C_{60}), 20.28, 19.41; UV-vis ($CHCl_3$) λ_{max}/nm 258, 326, 405, 423, 455, 508, 684; HRMS (MALDI-TOFMS) m/z: $[M]^+$ Calcd for $C_{68}H_9N$ 839.0735, found 839.0753.

2j (brown solid, 8.5 mg, 10%, mp > 300 °C): ^{1}H NMR (400 MHz, $CDCl_3$-CS_2) δ 7.55 (d, J = 8.9 Hz, 2H), 6.99 (d, J = 8.9 Hz, 2H), 3.85 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$-CS_2) δ156.32, 145.27, 145.18, 145.00, 144.84, 144.76, 144.75, 144.60, 144.10, 143.91, 143.12, 143.10, 142.89, 142.33, 142.21, 140.94, 140.74, 138.86, 122.52, 114.49, 83.82 (sp^3-C of C_{60}), 55.43; UV-vis ($CHCl_3$) λ_{max}/nm 258, 326, 405, 423, 457, 510, 684; HRMS (MALDI-TOFMS) m/z: $[M]^+$ Calcd for $C_{67}H_7NO$ 841.0528, found 841.0523.

2k (brown solid, 12.6 mg, 14%, mp > 300 °C): ^{1}H NMR (500 MHz, $CDCl_3$-CS_2) δ 7.70 (d, J = 8.8 Hz, 2H), 7.68 (d, J = 8.8 Hz, 2H), 7.60 (d, J = 7.4 Hz, 2H), 7.42 (t, J = 7.7 Hz, 2H), 7.32 (t, J = 7.4 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$-CS_2) δ 145.25, 145.16, 144.85, 144.81, 144.75, 144.69, 144.58, 144.08, 143.87, 143.12, 143.10, 142.85, 142.26, 142.19, 140.98, 140.76, 140.37, 137.24, 128.90, 127.86, 127.26, 126.97, 121.88, 83.55 (sp^3-C of C_{60}); UV-vis ($CHCl_3$) λ_{max}/nm 258, 324, 405, 424, 458, 510, 684; HRMS (MALDI-TOFMS) m/z: $[M]^+$ Calcd for $C_{72}H_9N$ 887.0735, found 887.0717.

2l (brown solid, 14.1 mg, 16%, mp > 300 °C): ^{1}H NMR (500 MHz, $CDCl_3$-CS_2) δ 7.59 (d, J = 8.4 Hz, 2H), 7.39 (d, J = 8.4 Hz, 2H), 4.18 (q, J = 7.1 Hz, 2H), 3.65 (s, 2H), 1.29 (t, J = 7.1 Hz, 3H). ^{13}C NMR (125 MHz, $CDCl_3$-CS_2) δ 171.04, 145.25, 145.17, 144.84, 144.77, 144.73, 144.69, 144.59, 144.51, 144.08, 143.88, 143.12, 143.11, 142.86, 142.27, 142.20, 140.97, 140.74, 130.05, 129.97, 121.55,

83.53 (sp^3-C of C_{60}), 60.92, 40.85, 14.39; UV-vis ($CHCl_3$) λ_{max}/nm 258, 324, 404, 424, 455, 510, 684; HRMS (MALDI-TOFMS) m/z: $[M]^+$ Calcd for $C_{70}H_{11}NO_2$ 897.0790, found 897.0785.

2m (brown solid, 6.9 mg, 8%, mp > 300 °C): ^{1}H NMR (300 MHz, $CDCl_3$-CS_2) δ 8.38 (d, J = 8.8 Hz, 2H), 7.79 (d, J = 8.9 Hz, 2H).

2n (brown solid, 6.5 mg, 7%, mp > 300 °C): ^{1}H NMR (500 MHz, $CDCl_3$-CS_2) δ 8.16 (d, J = 8.6 Hz, 2H), 7.69 (d, J = 8.6 Hz, 2H), 4.38 (q, J = 7.1 Hz, 2H), 1.41 (t, J = 7.1 Hz, 3H).

$Cu(OAc)_2$-Promoted Reaction of C_{60} with 4-Isopropylaniline 1g at 120 ºC

C_{60} (72.0 mg, 0.1 mmol) and 20 mL of dry chlorobenzene was added to a big tube (Φ 2.5 cm × 18 cm). After ultrasonic dissolution, DMAP (24.4 mg, 0.2 mmol), $Cu(OAc)_2$ (36.2 mg, 0.2 mmol), and 4-isopropylaniline **1g** (0.2 mmol) was added sequentially. Then the mixture was vigorously stirred at 120 ºC for 8 h. The solvent was evaporated *in vacuo*, and the residue was purified on a silica gel column using CS_2/toluene as the eluent to give unreacted C_{60} and the products **2g** (8.6 mg, 10%) and **3g** (7.1 mg, 7%).

3g: ^{1}H NMR (500 MHz, $CDCl_3$-CS_2) ^{1}H NMR (500 MHz, $CDCl_3$-CS_2) δ 7.35 (d, J = 8.4 Hz, 4H), 7.21 (d, J = 8.4 Hz, 4H), 2.91 (heptet, J = 6.9 Hz, 2H), 1.28 (d, J = 6.9 Hz, 12H); ^{13}C NMR (125 MHz, $CDCl_3$-CS_2) δ 152.06, 149.27, 147.64, 147.06, 146.19, 145.98, 145.70, 145.50, 145.42, 145.22, 144.88, 144.62, 144.03, 144.02, 143.94, 143.87, 143.41, 143.38, 143.23, 142.79, 142.62, 142.36, 142.29, 142.26, 142.02, 141.84, 141.67, 141.65, 141.25, 140.09, 140.05, 139.63, 126.86, 121.30, 75.96 (sp^3-C of C_{60}), 70.32 (sp^3-C of C_{60}), 33.79, 24.15, 24.14; UV-vis ($CHCl_3$) λ_{max}/nm 258, 325, 424, 470, 683; HRMS (MALDI-TOFMS) m/z: $[M]^+$ Calcd for $C_{78}H_{22}N_2$ 986.1783, found 986.1770.

General Procedure for the $Cu(OAc)_2$-Promoted Reaction of C_{60} with Diamines 4a-e

C_{60} (72.0 mg, 0.1 mmol) and 20 mL of dry chlorobenzene was added to a big tube (Φ 2.5 cm × 18 cm). After ultrasonic dissolution, DMAP (24.4 mg, 0.2 mmol), $Cu(OAc)_2$ (36.2 mg, 0.2 mmol), and

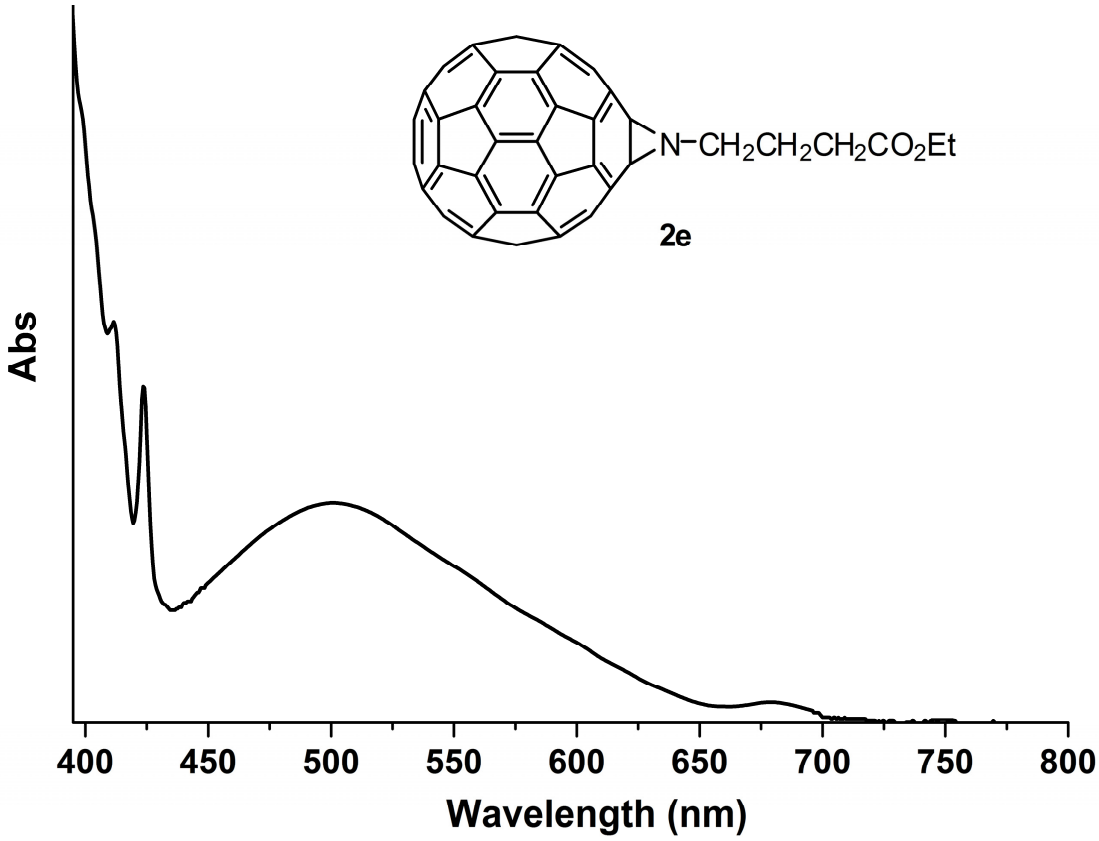
diamines (**4a-e**, 0.2 mmol) was added sequentially. The mixture was vigorously stirred at 80 ºC for 2.5-4 h. The solvent was evaporated *in vacuo*, and the residue was purified on a silica gel column using CS_2/toluene as the eluent to give unreacted C_{60} and the products **5a-d**.

5a (brown solid, 11.1 mg, 14%, mp > 300 °C): ^{1}H NMR (500 MHz, $CDCl_3$) δ 3.92 (s, 4H), 3.41 (s, 6H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 1151.33, 148.22, 146.60, 146.27, 145.88, 145.76, 145.66, 145.38, 144.86, 142.95, 142.78, 142.45, 141.64, 141.53, 138.88, 137.22, 80.64 (sp^3-C of C_{60}), 48.62, 44.26.

5b (brown solid, 34.4 mg, 43%, mp > 300 °C): ^{1}H NMR (500 MHz, $CDCl_3$) δ 4.48-4.61 (m, 4H), 3.53-3.65 (m, 4H).

5c (brown solid, 44.7 mg, 55%, mp > 300 °C): ^{1}H NMR (500 MHz, $CDCl_3$) δ 4.64 (ddd, J = 15.8, 11.6, 5.0 Hz, 2H), 4.45-4.56 (m, 2H), 3.94 (ddd, J = 15.8, 6.1, 2.3 Hz, 2H), 3.79-3.90 (m, 2H), 2.63 (dtt, J = 15.0, 11.5, 6.0 Hz, 1H), 2.63 (dtt, J = 15.0, 5.0, 2.5 Hz, 1H).

5d (brown solid, 8.5 mg, 10%, mp > 300 °C): ^{1}H NMR (500 MHz, $CDCl_3$-CS_2) δ 4.39 (t, J = 13.5 Hz, 2H), 3.65 (d, J = 14.7 Hz, 2H), 3.57 (s, 6H), 2.84 (qt, J = 13.0, 4.1 Hz, 1H), 1.93 (dt, J = 13.8, 2.5 Hz, 1H). ^{13}C NMR (100 MHz, $CDCl_3$-CS_2) δ 154.91, 154.57, 148.39, 146.70, 146.55, 146.24, 146.18, 145.63, 145.62, 145.60, 145.54, 145.46, 145.43, 145.40, 144.94, 143.01, 142.93, 142.77, 142.73, 142.59, 141.66, 141.64, 141.47, 141.19, 139.31, 138.92, 136.71, 136.10, 83.69 (sp^3-C of C_{60}), 55.85, 43.08, 27.37; UV-vis ($CHCl_3$) λ_{max}/nm 257, 312, 698; HRMS (MALDI-TOFMS) m/z: $[M+H]^+$ Calcd for $C_{65}H_{13}N_2$ 821.1079, found 821.1099.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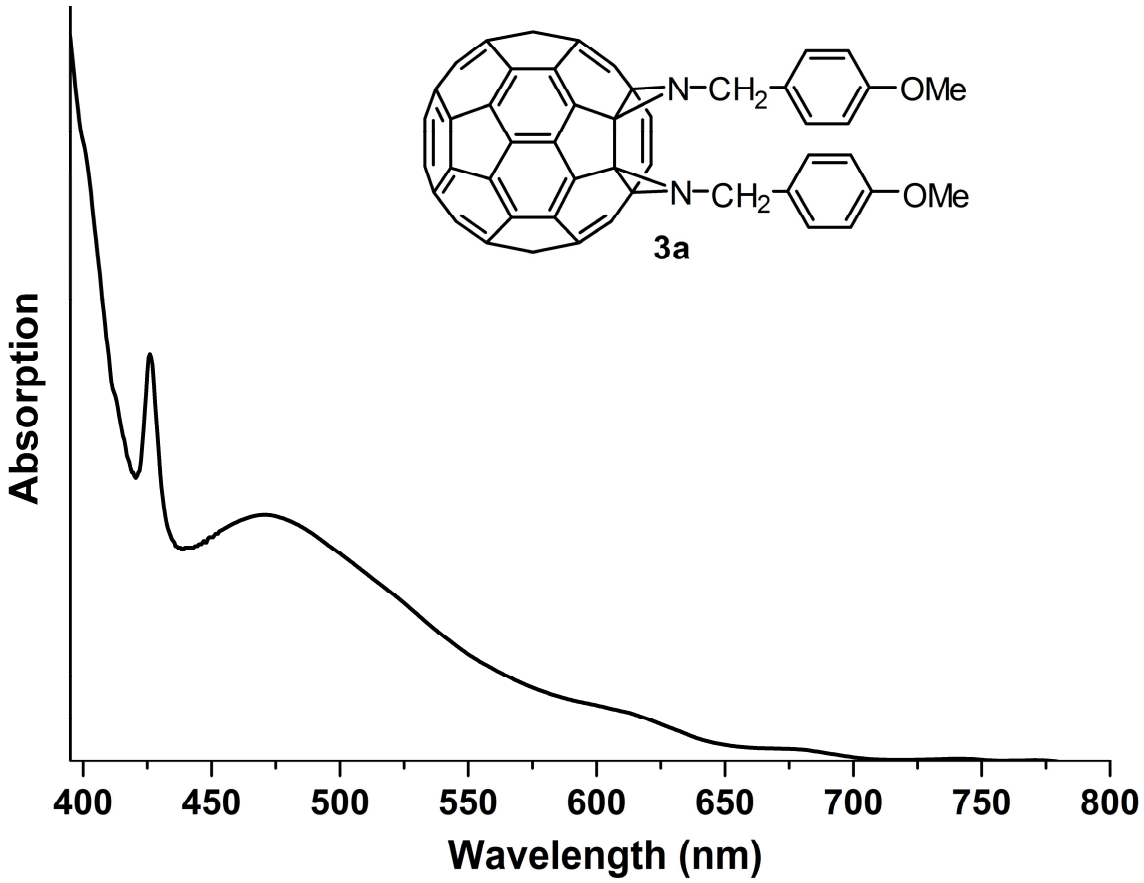
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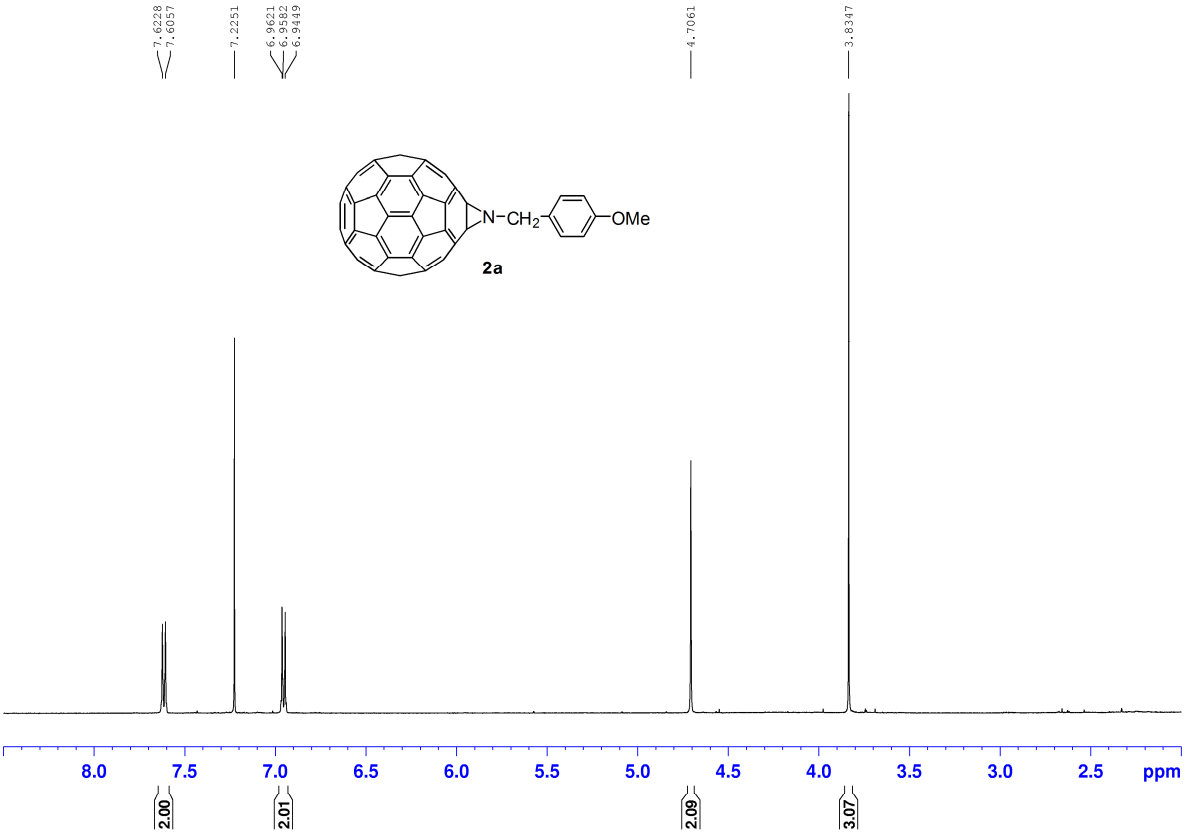
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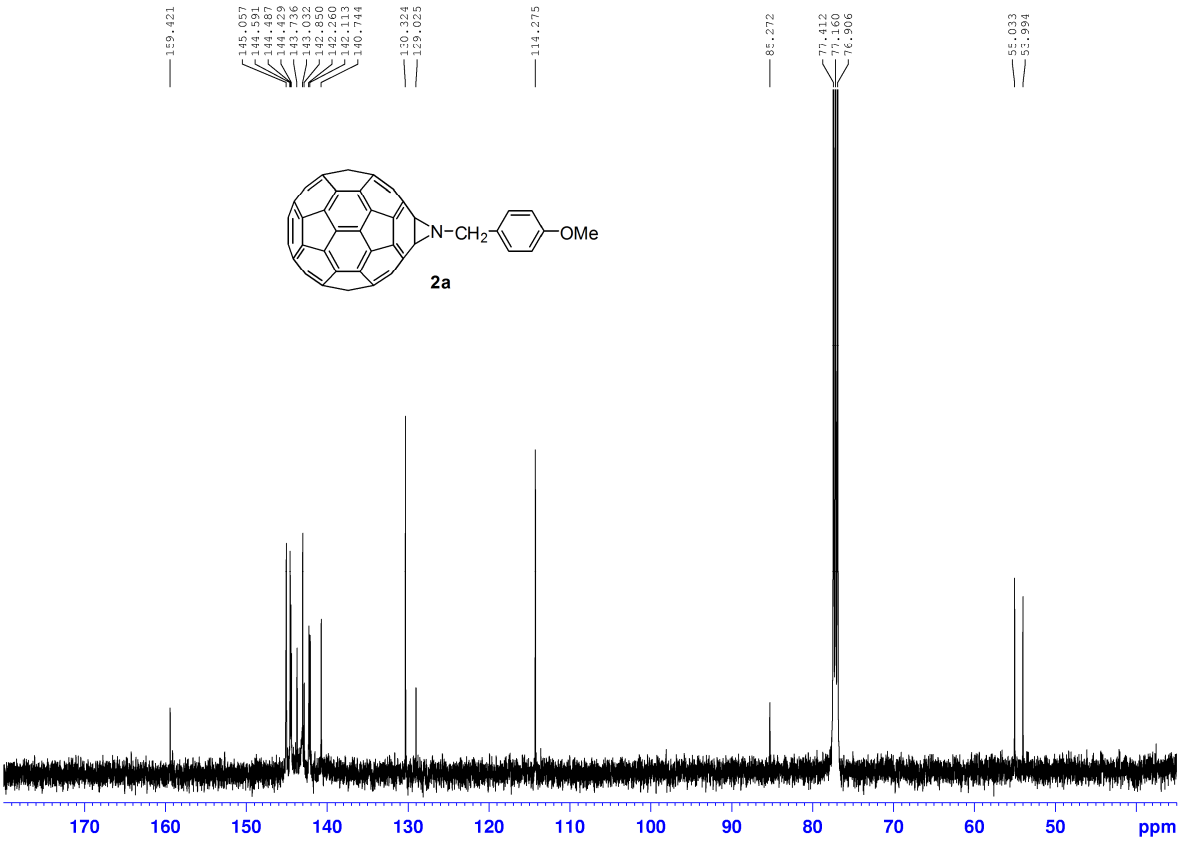
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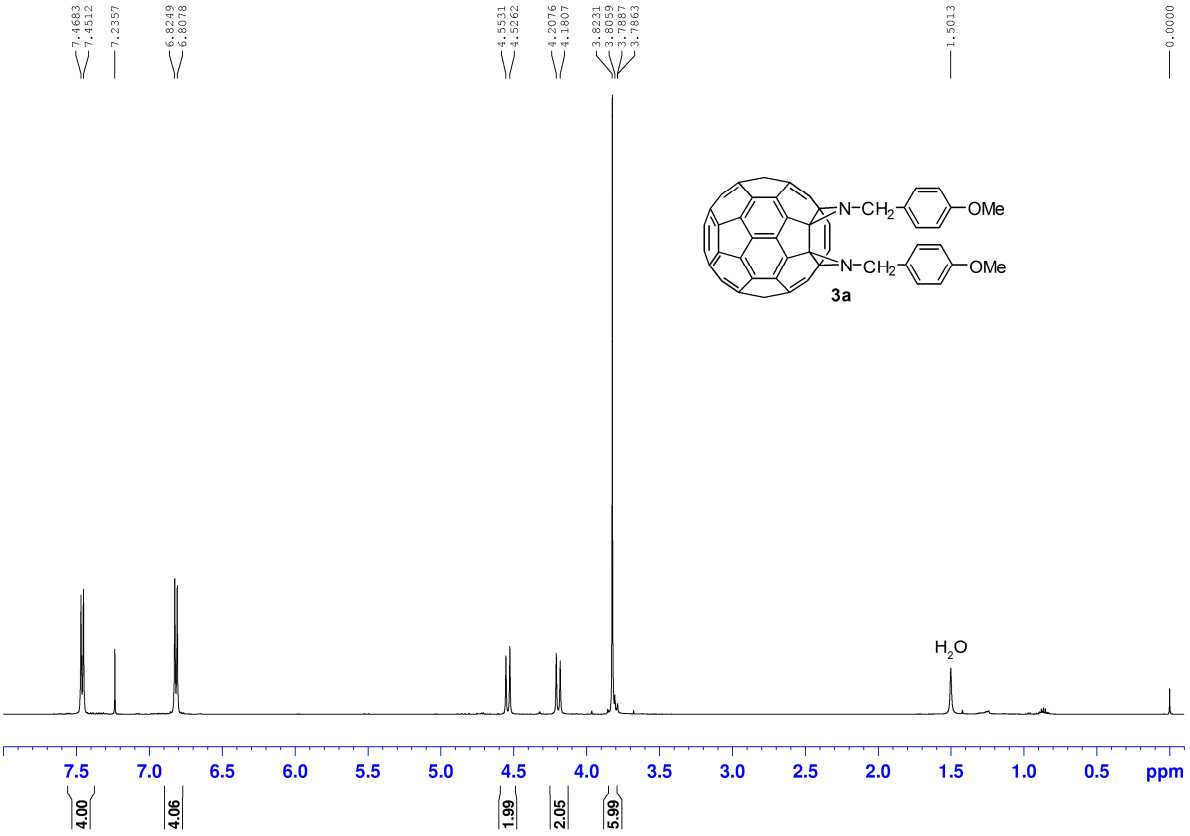
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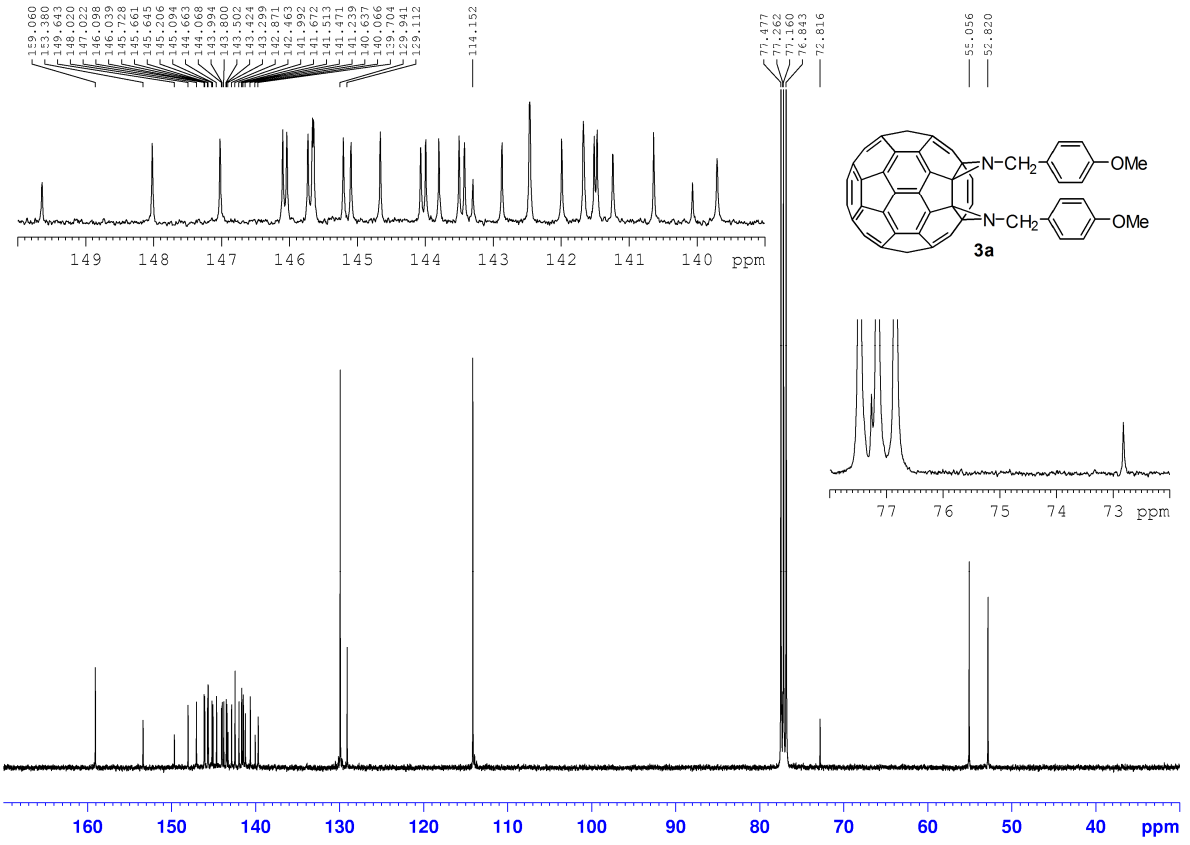
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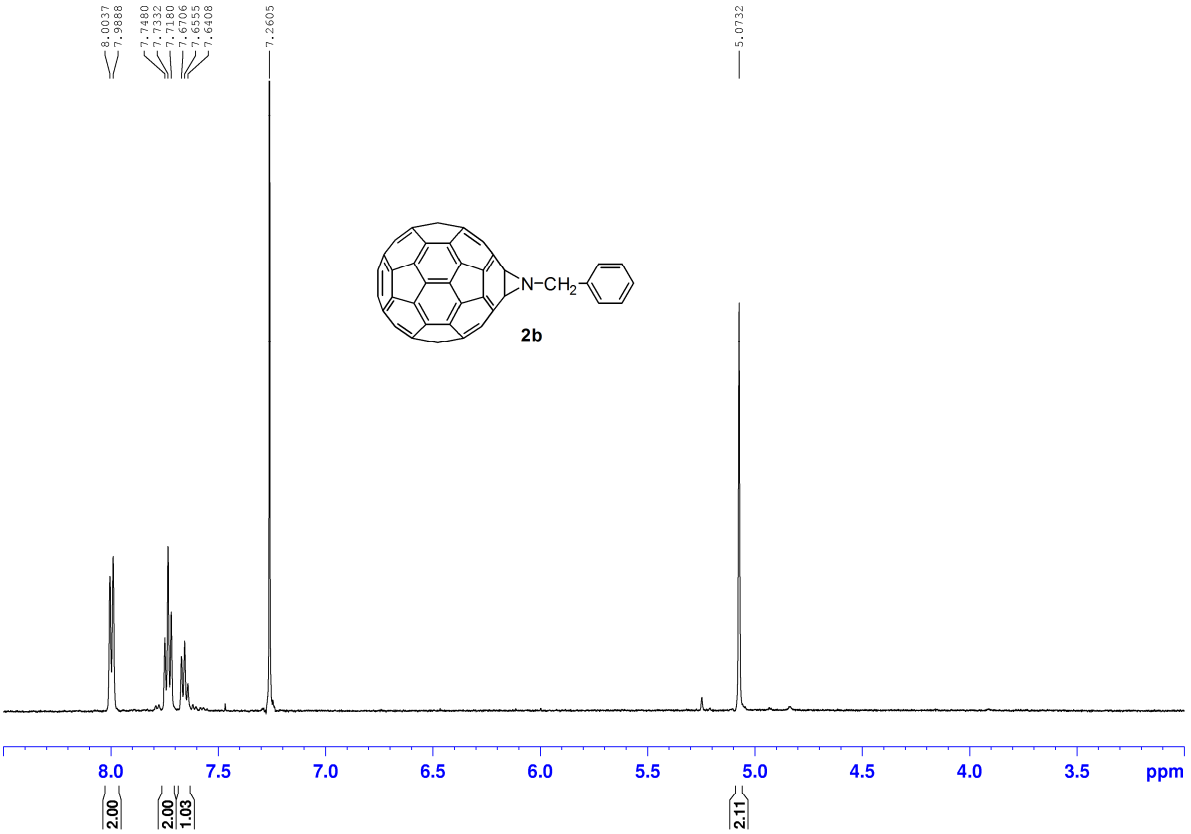
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N–CH2
2b
8.0
7.5
7.0
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5.5
5.0
4.5
4.0
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ppm
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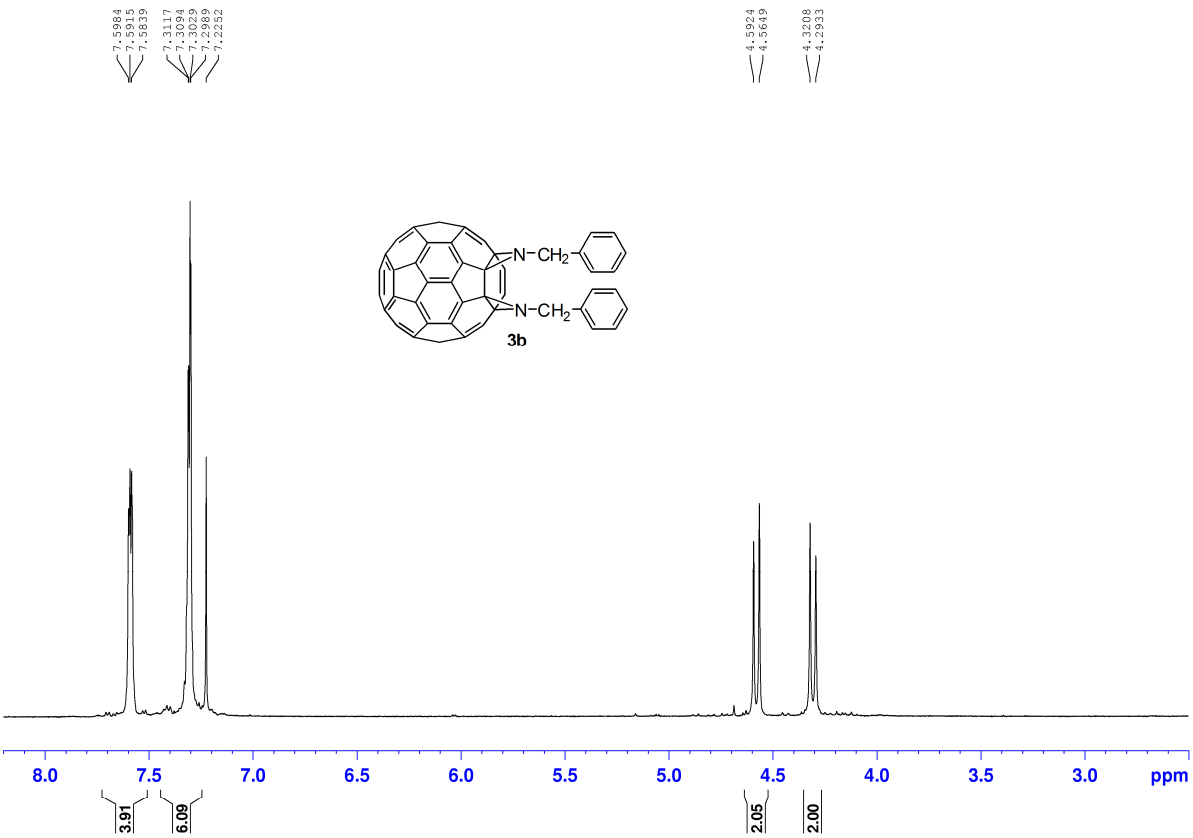
2.00
1.03
2.11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7.2989
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4.5924
4.5649
4.3208
4.2933
N–CH2
N–CH2
3b
8.0
7.5
7.0
6.5
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5.0
4.5
4.0
3.5
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ppm
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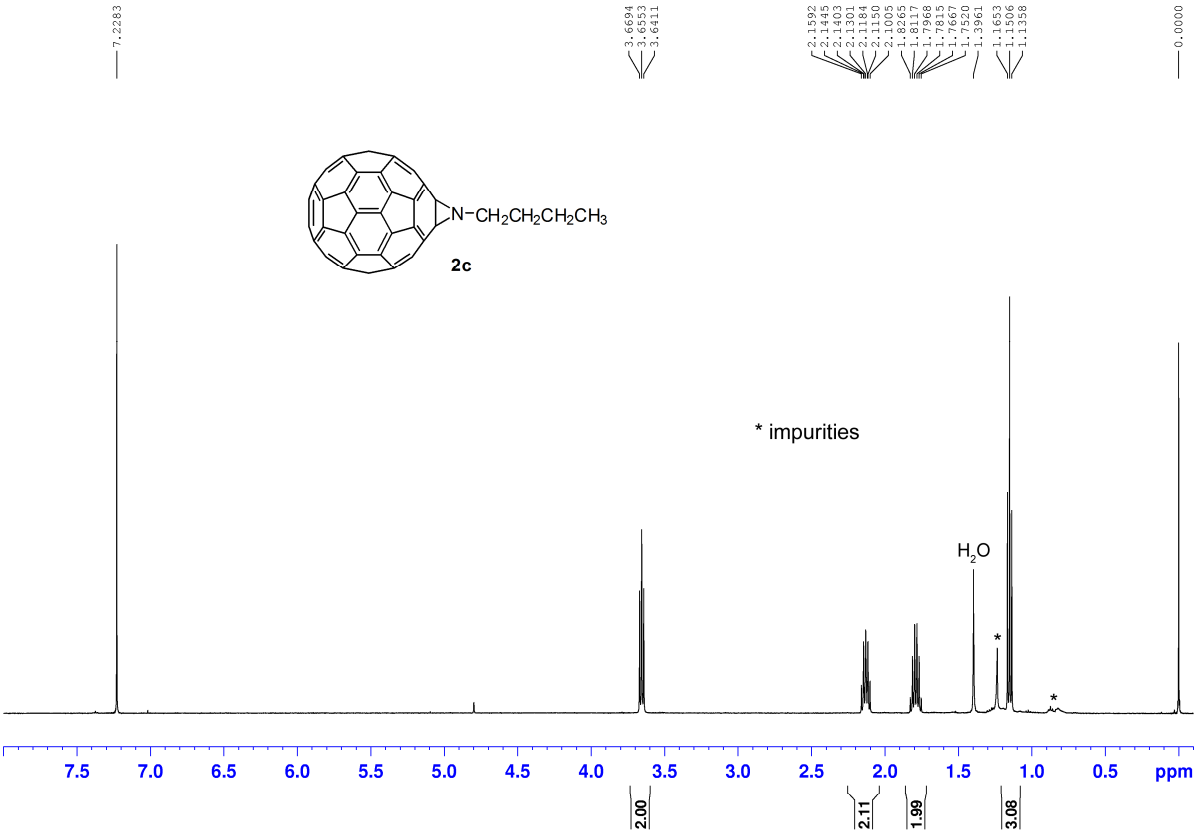
2.05
2.00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2.1150
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1.8265
1.8117
1.7968
1.7815
1.7667
1.7520
1.3961
1.1653
1.1506
1.1358
0.0000
N−CH2CH2CH2CH3
2c
* impurities
H2O
*
*
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
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2.5
2.0
1.5
1.0
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ppm
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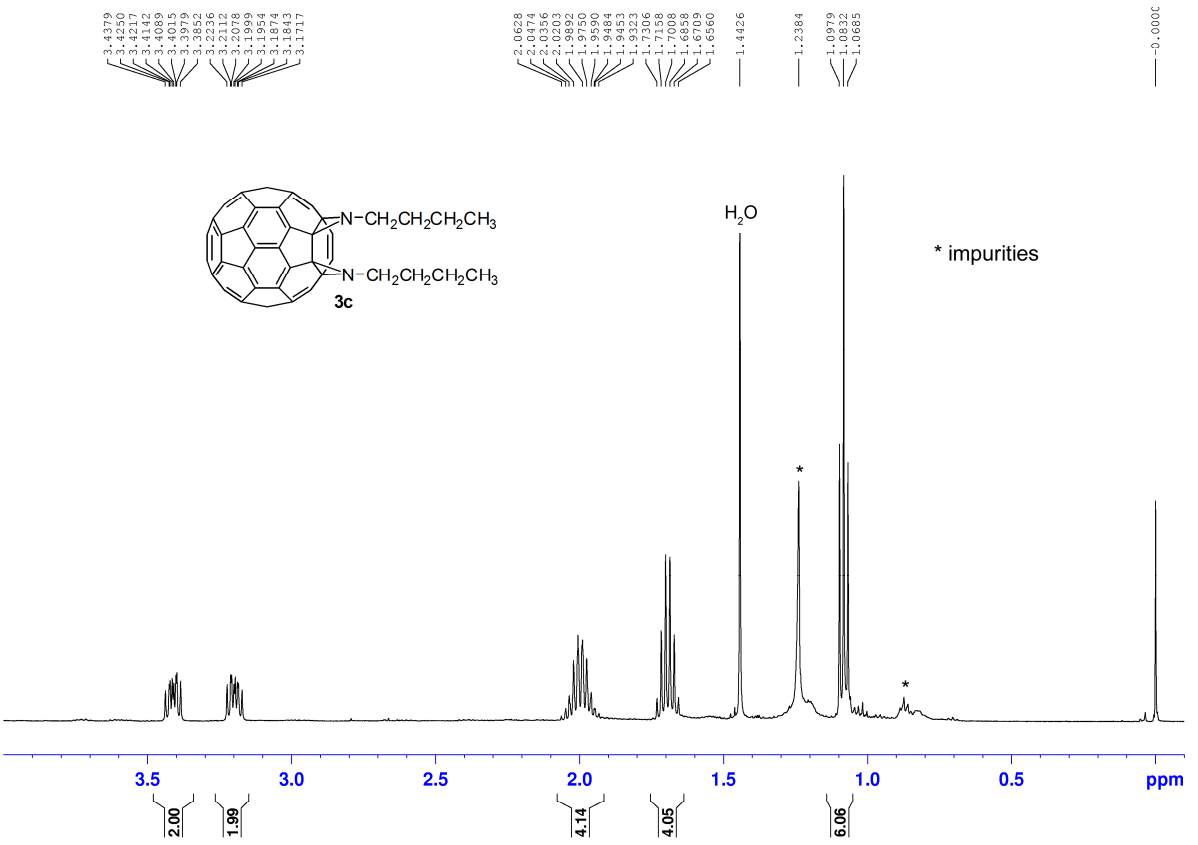
2.11
1.99
3.08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3.2078
3.1999
3.1954
3.1874
3.1843
3.1717
2.0628
2.0474
2.0356
2.0203
1.9892
1.9750
1.9590
1.9484
1.9453
1.9323
1.7306
1.7158
1.7008
1.6858
1.6709
1.6560
1.4426
1.2384
1.0979
1.0832
1.0685
-0.0000
N−CH2CH2CH2CH3
N−CH2CH2CH2CH3
3c
H2O
* impurities
*
*
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2.0
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1.0
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ppm
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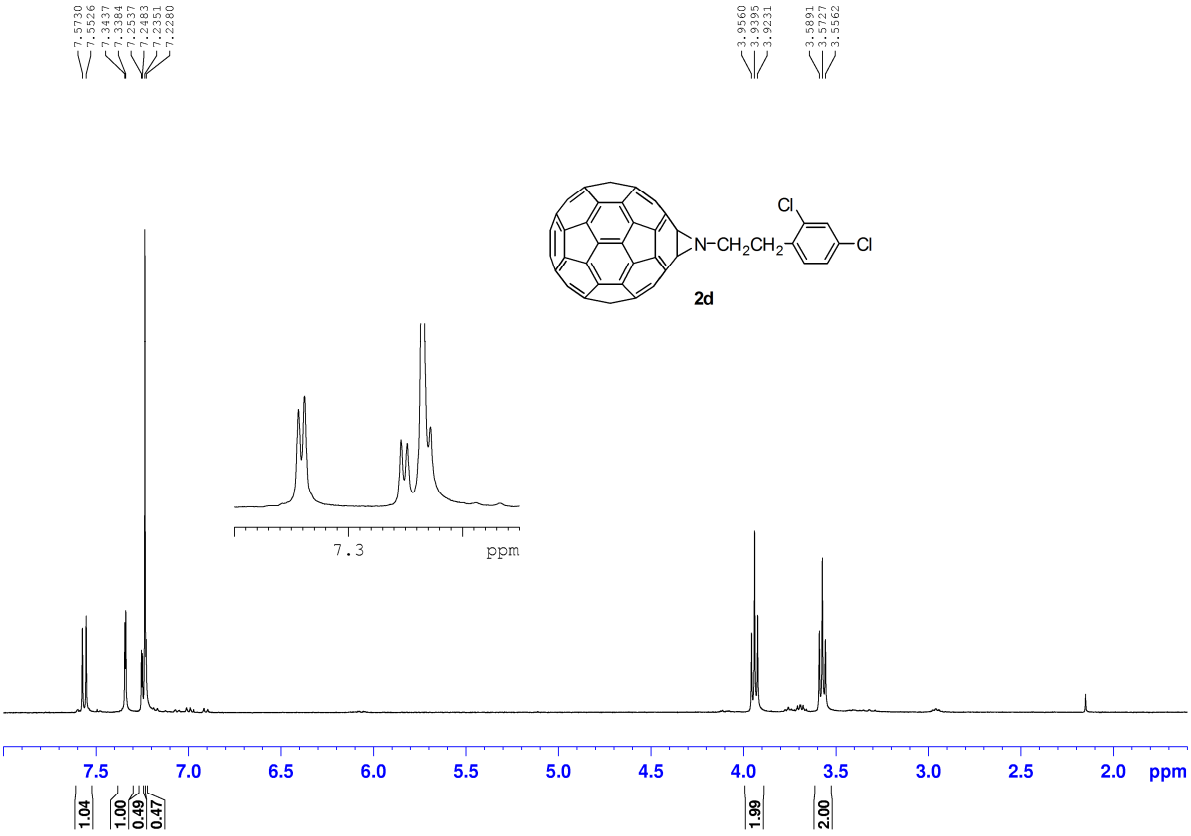
6.06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7.2351
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3.9231
3.5891
3.5727
3.5562
Cl
N-CH2CH2
Cl
2d
7.3
ppm
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
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3.0
2.5
2.0
ppm
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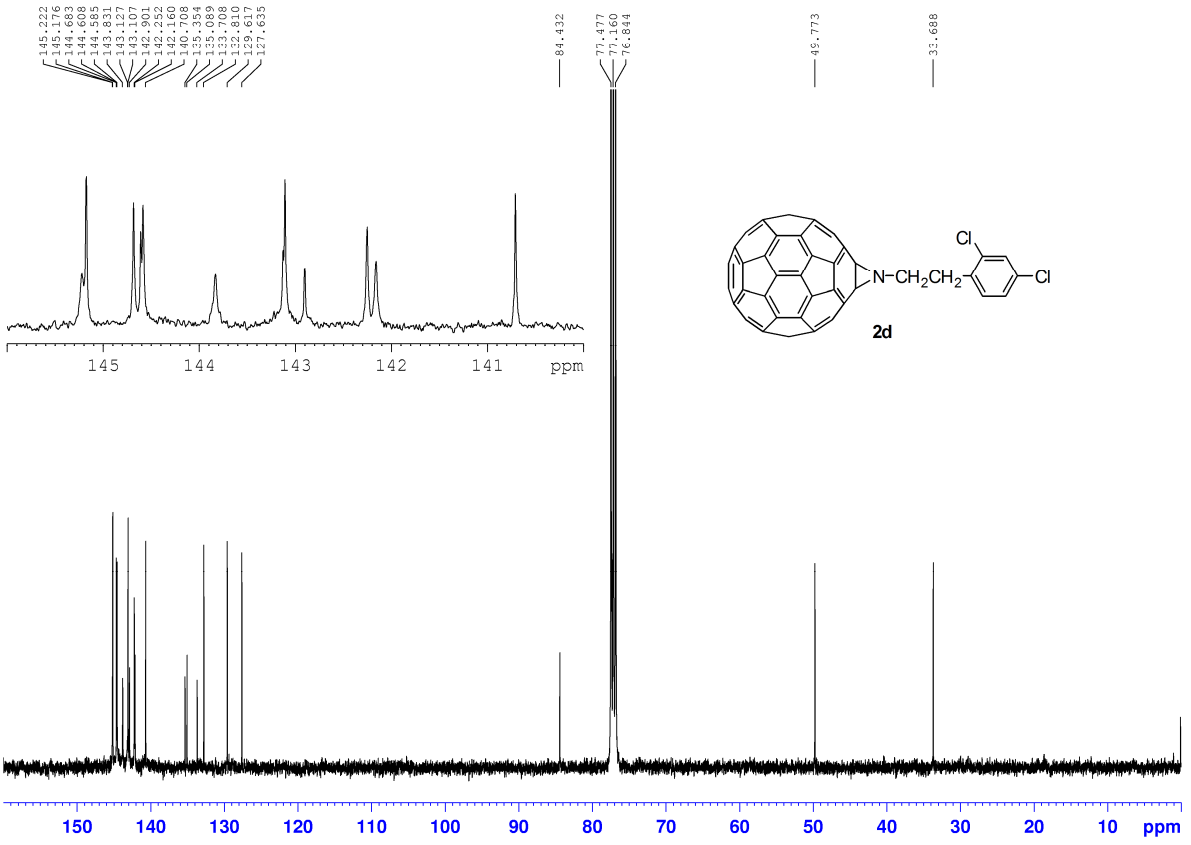
1.00
0.49
0.47
1.99
2.00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143.127
143.107
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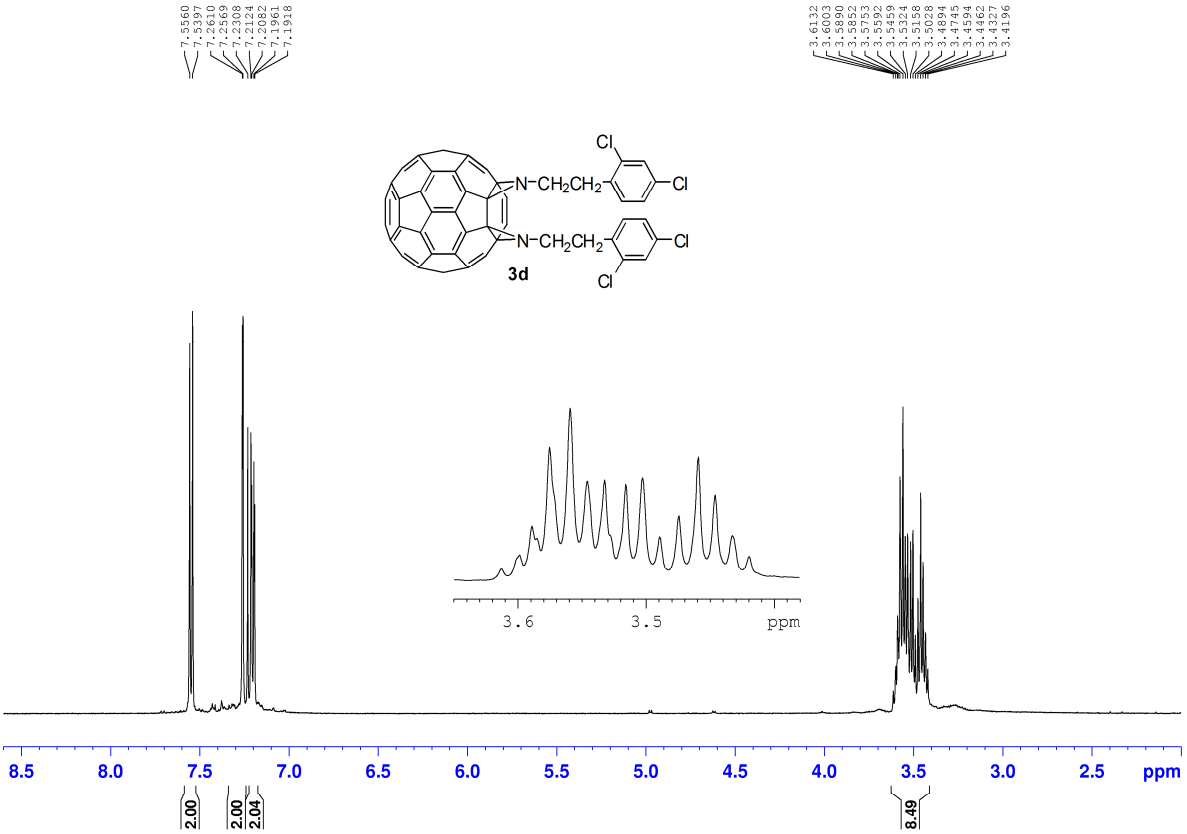
142.252
142.160
140.708
135.354
135.089
133.708
132.810
129.617
127.635
84.432
77.477
77.160
76.844
49.773
33.688
Cl
N-CH2CH2
Cl
2d
145
144
143
142
141
ppm
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
ppm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7.2308
7.2124
7.2082
7.1961
7.1918
3.6132
3.6033
3.5890
3.5852
3.5753
3.5592
3.5459
3.5324
3.5158
3.5028
3.4894
3.4745
3.4594
3.4462
3.4327
3.4196
Cl
N-CH2CH2
Cl
N-CH2CH2
Cl
Cl
3d
3.6
3.5
ppm
8.5
8.0
7.5
7.0
6.5
6.0
5.5
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4.5
4.0
3.5
3.0
2.5
ppm
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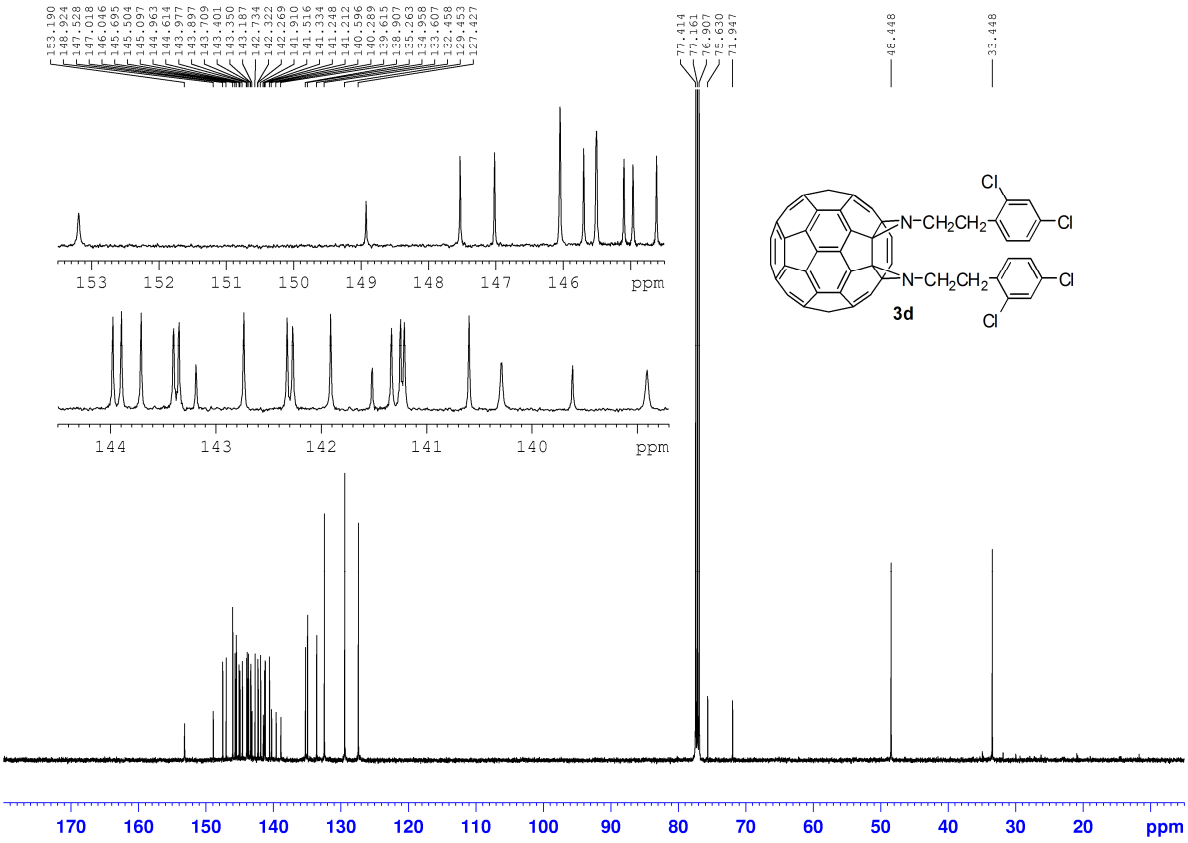
2.00
2.04
8.49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148.924
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146.046
145.695
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145.097
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144.614
143.977
143.897
143.709
143.401
143.350
143.187
142.734
142.322
142.269
141.910
141.516
141.334
141.248
141.212
140.596
140.289
139.615
138.907
135.263
134.958
133.607
133.458
129.453
127.427
77.414
77.161
76.907
75.630
71.947
48.448
31.448
153
152
151
150
149
148
147
146
ppm
144
143
142
141
140
ppm
Cl
N-CH2CH2
Cl
N-CH2CH2
Cl
Cl
3d
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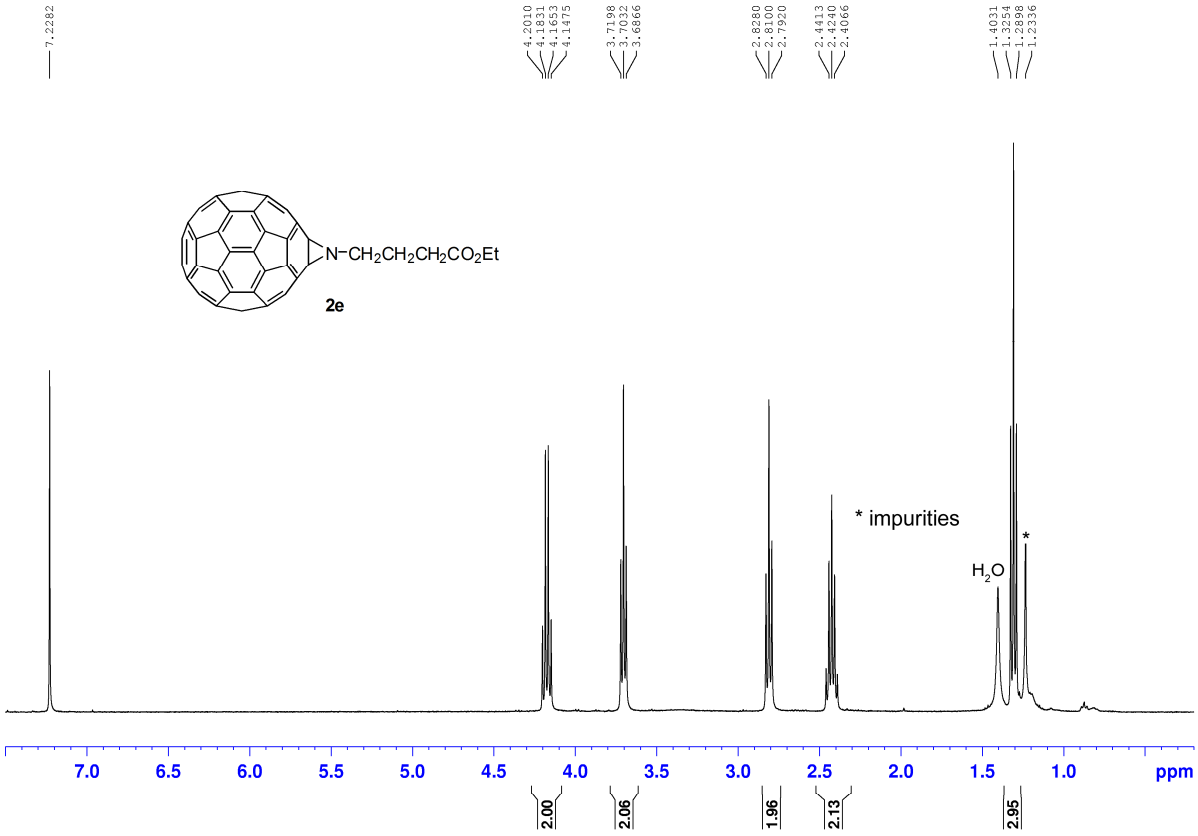
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
ppm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4.1831
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4.1475
3.7198
3.7032
3.6866
2.8280
2.8100
2.7920
2.4413
2.4240
2.4066
1.4031
1.3254
1.2898
1.2336
N−CH2CH2CH2CO2Et
2e
* impurities
H2O
*
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
2.00
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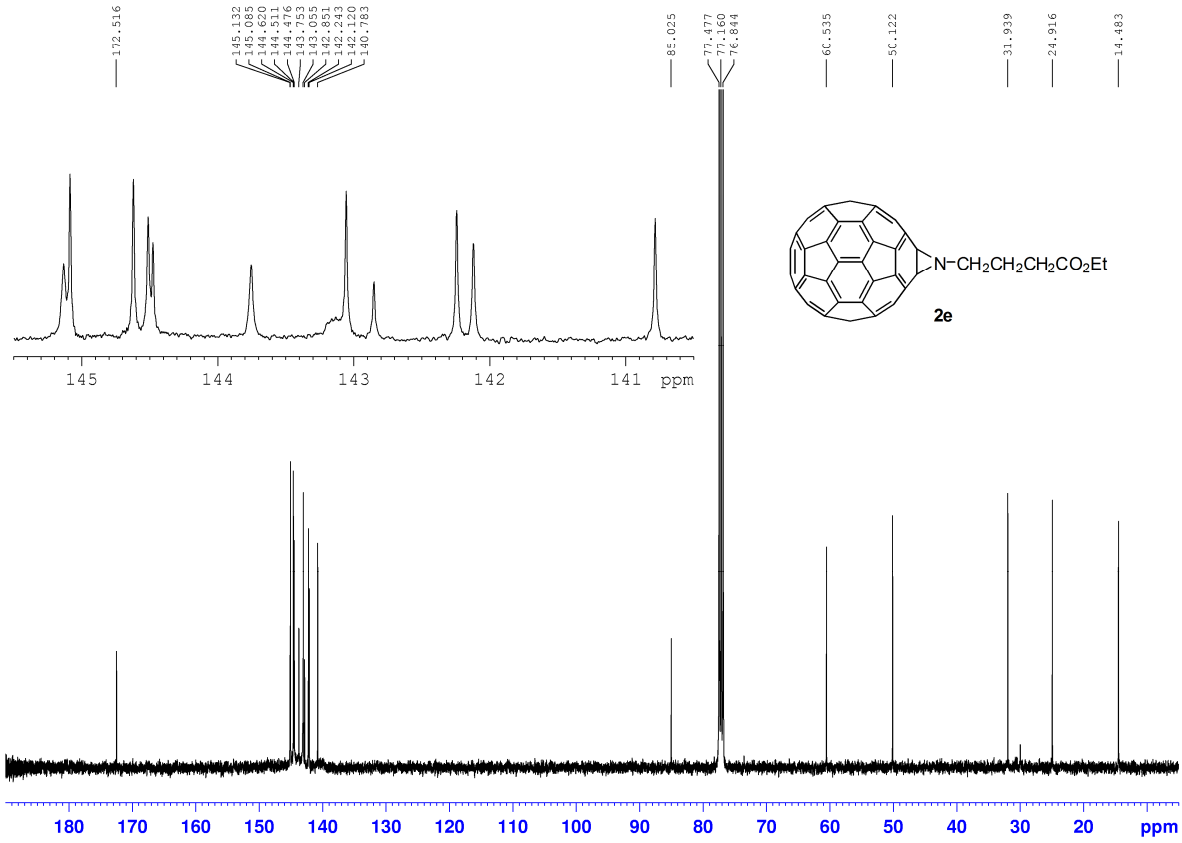
1.96
2.13
2.95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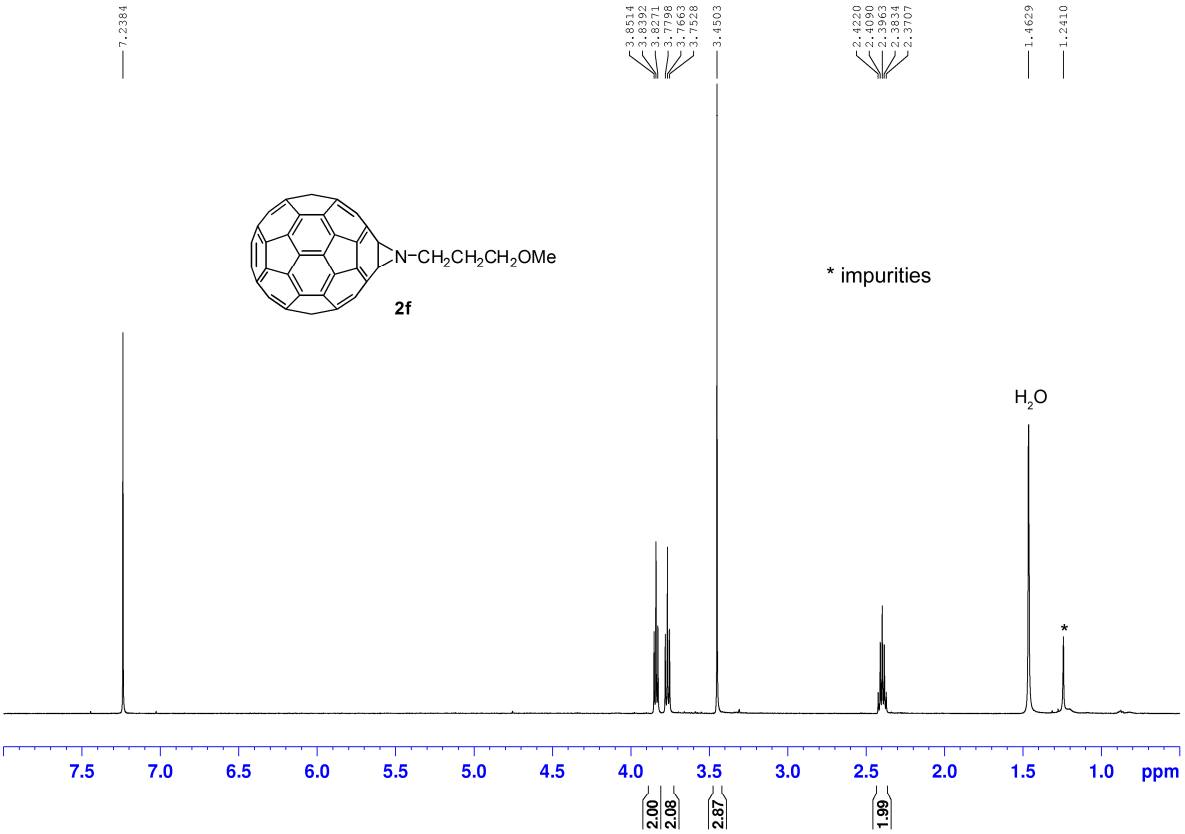
144.511
144.476
143.753
143.055
142.851
142.243
142.120
140.783
85.025
77.477
77.160
76.844
66.535
52.122
31.939
24.916
14.483
N−CH2CH2CH2CO2Et
2e
145
144
143
142
141
ppm
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
ppm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3.8392
3.8271
3.7798
3.7663
3.7528
3.4503
2.4220
2.4090
2.3963
2.3834
2.3707
1.4629
1.2410
N−CH2CH2CH2OMe
2f
* impurities
H2O
*
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
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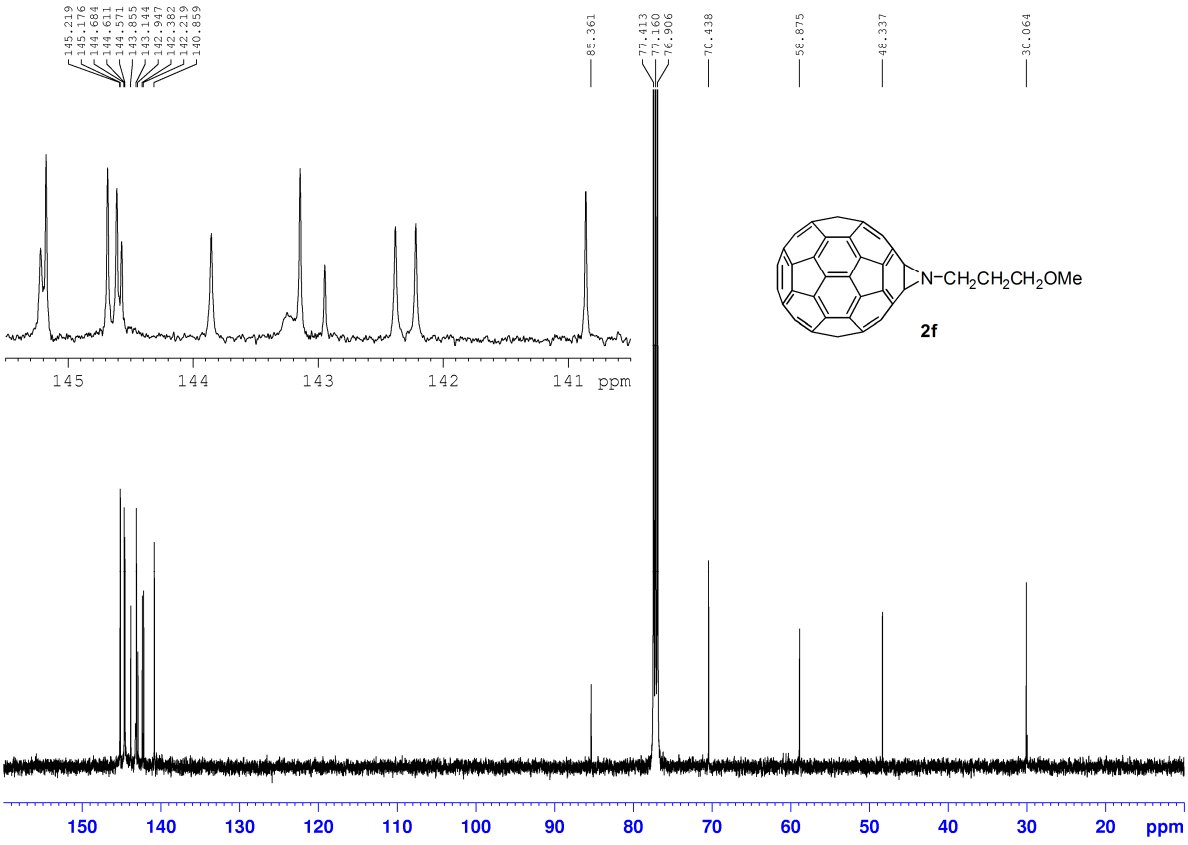
1.99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143.144
142.947
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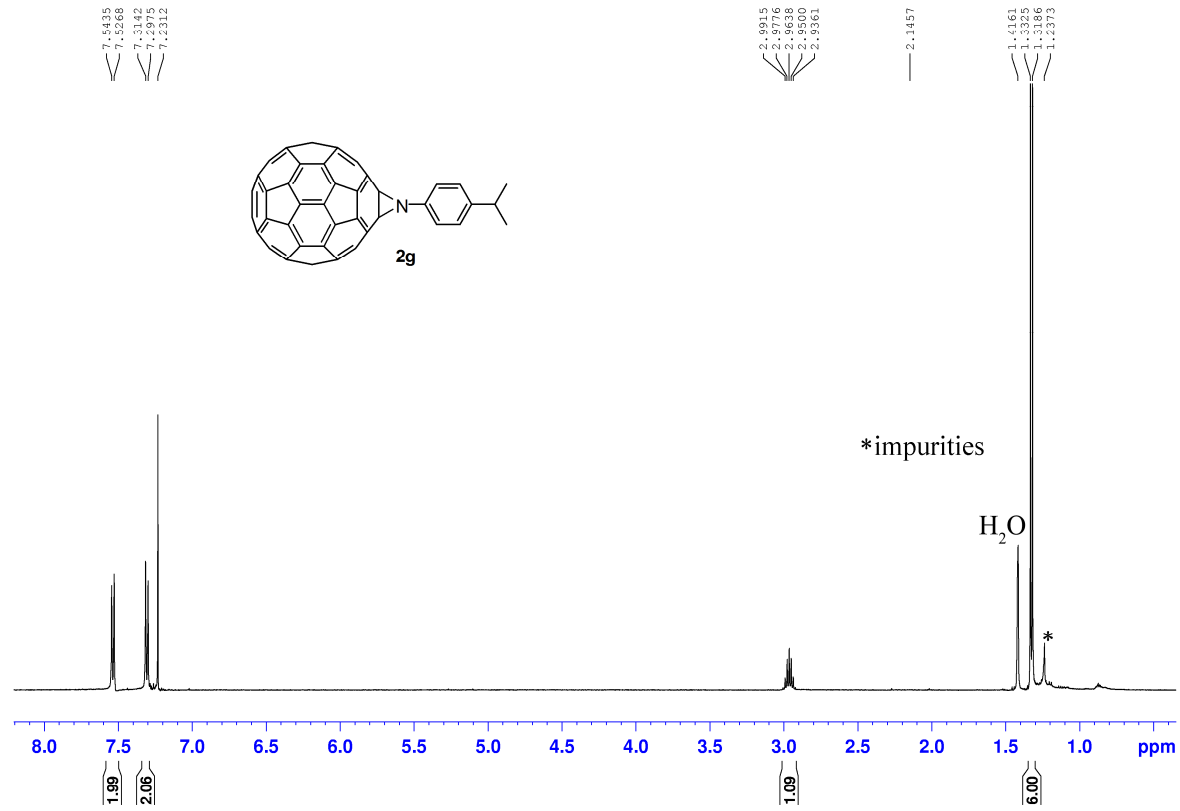
142.219
140.859
85.361
77.413
77.160
76.906
70.438
56.875
46.337
30.064
145
144
143
142
141
ppm
N−CH2CH2CH2OMe
2f
150
140
130
120
110
100
90
80
70
60
50
40
30
20
ppm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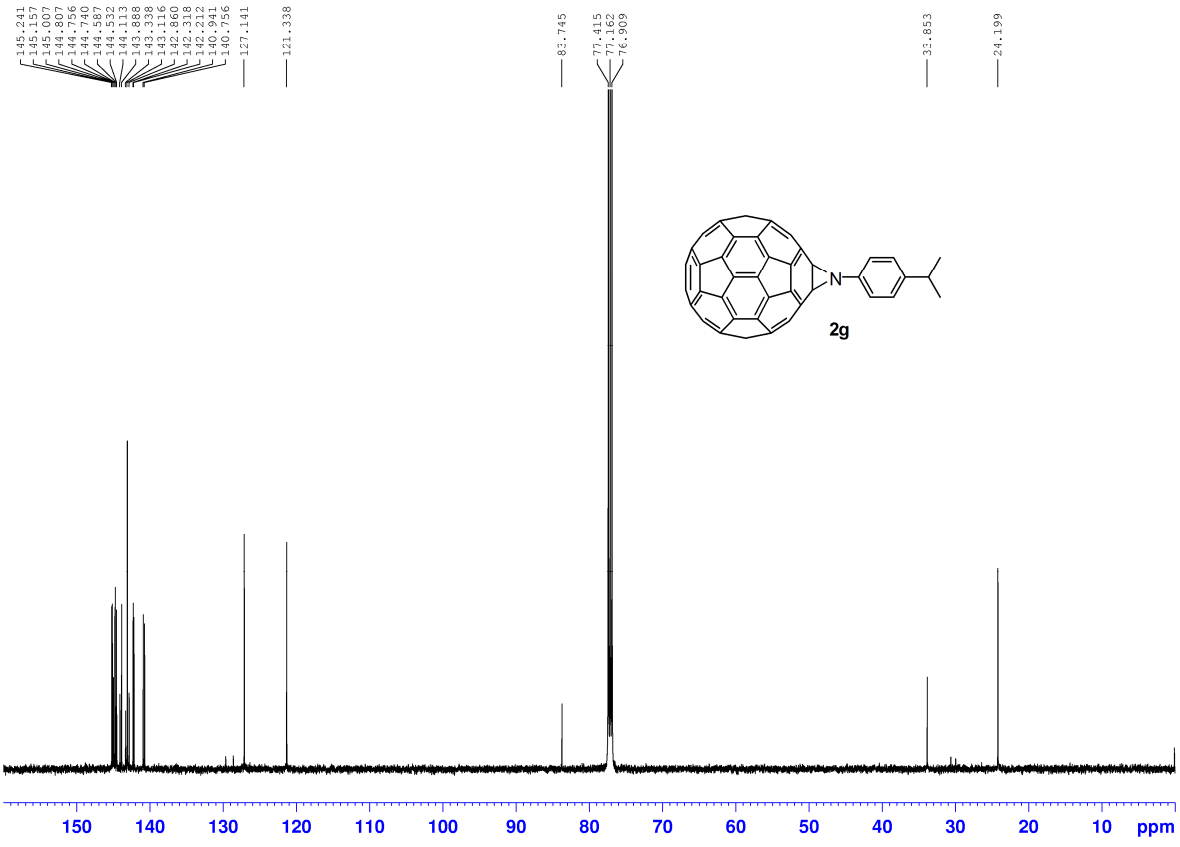
2.9776
2.9638
2.9500
2.9361
2.1457
1.4161
1.3325
1.3186
1.2373
2g
*impurities
H2O
*
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
ppm
1.99
2.06
1.09
6.00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144.532
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143.888
143.338
143.116
142.860
142.318
142.212
140.941
140.756
127.141
121.338
83.745
77.415
77.162
76.909
33.853
24.199
2g
150
140
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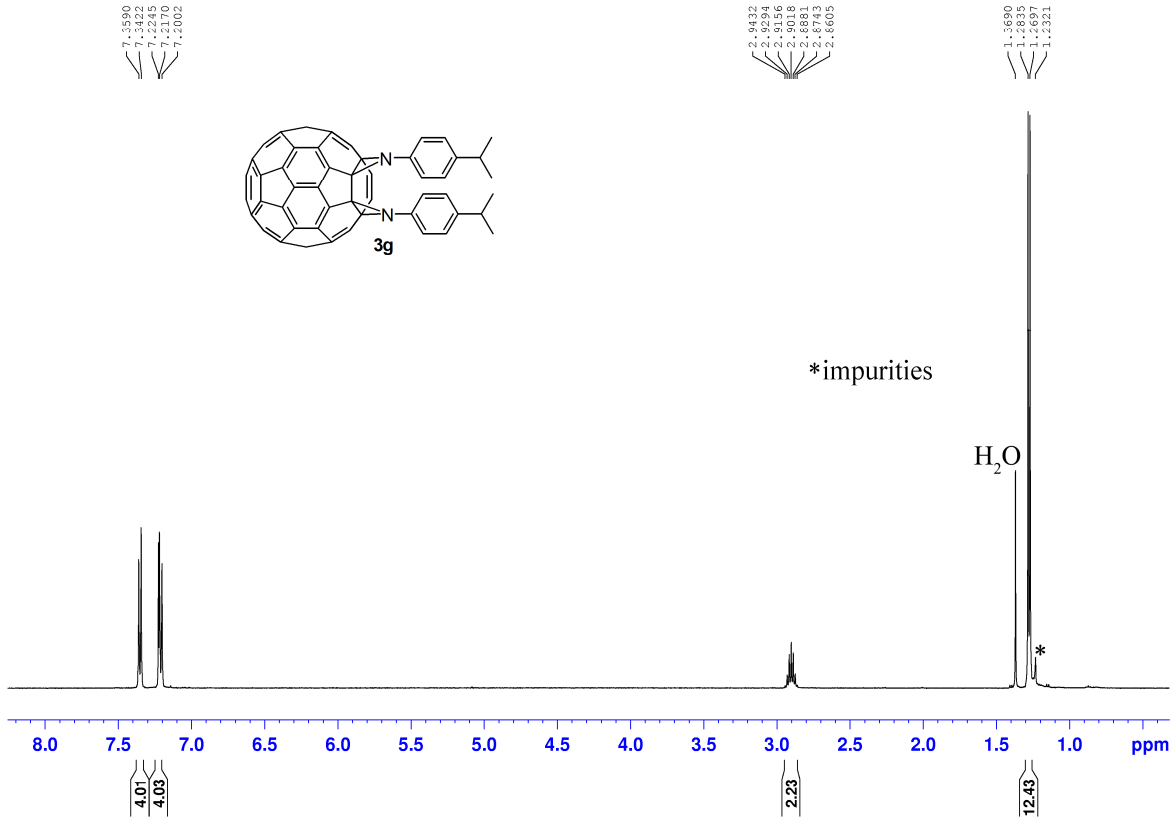
120
110
100
90
80
70
60
50
40
30
20
10
ppm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2.8881
2.8743
2.8605
1.3690
1.2835
1.2697
1.2321
3g
*impurities
H2O
*
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
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3.0
2.5
2.0
1.5
1.0
ppm
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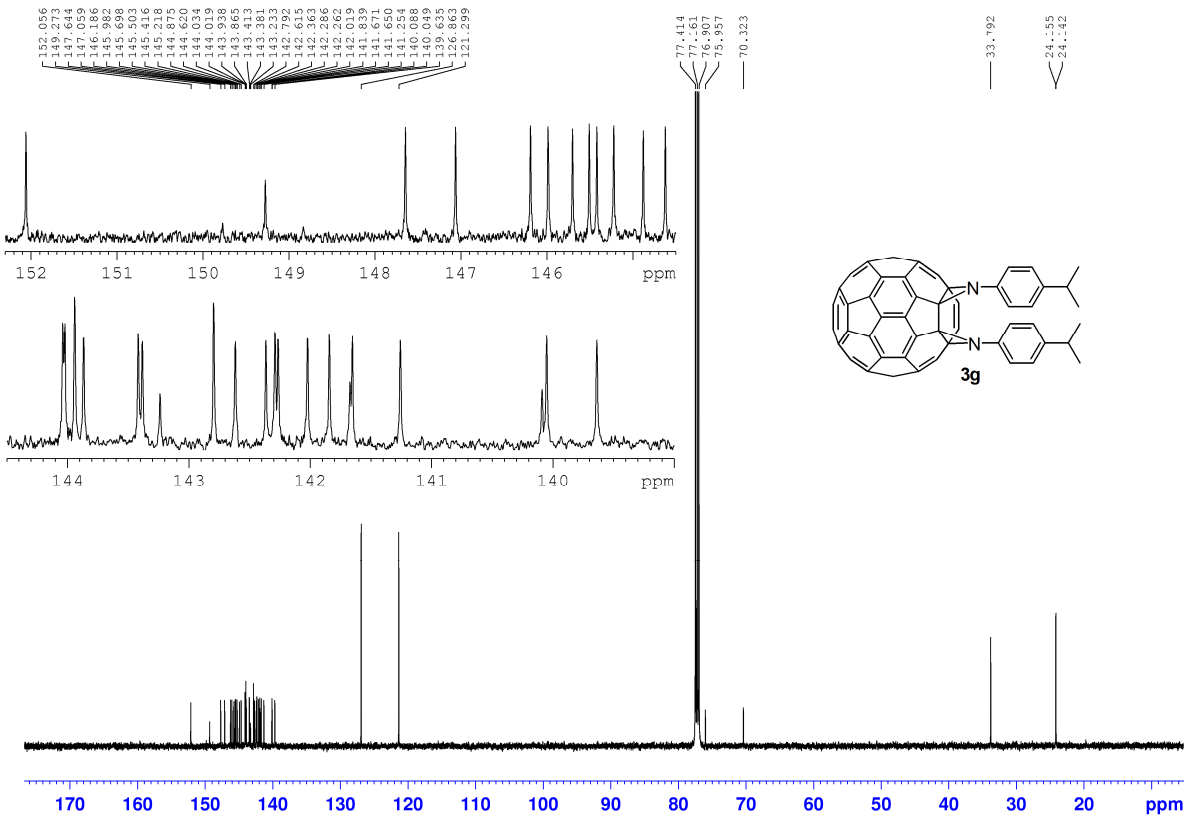
4.03
2.23
12.43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144.034
144.019
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143.865
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142.286
142.262
142.019
141.839
141.671
141.650
141.254
140.088
140.049
139.655
126.863
121.299
77.414
77.161
76.907
75.957
70.323
33.792
24.55
24.42
152
151
150
149
148
147
146
ppm
144
143
142
141
140
ppm
3g
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160
150
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120
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80
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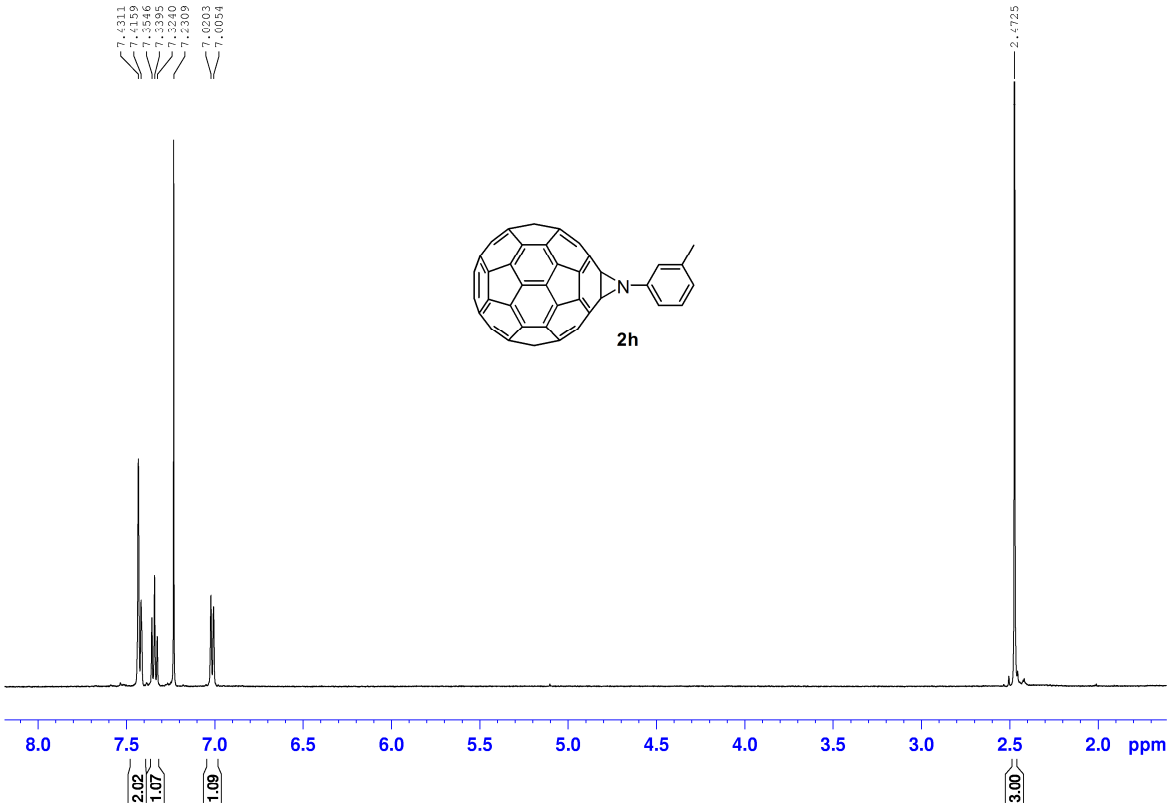
40
30
20
ppm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N
2h
8.0
7.5
7.0
6.5
6.0
5.5
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4.0
3.5
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2.5
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ppm
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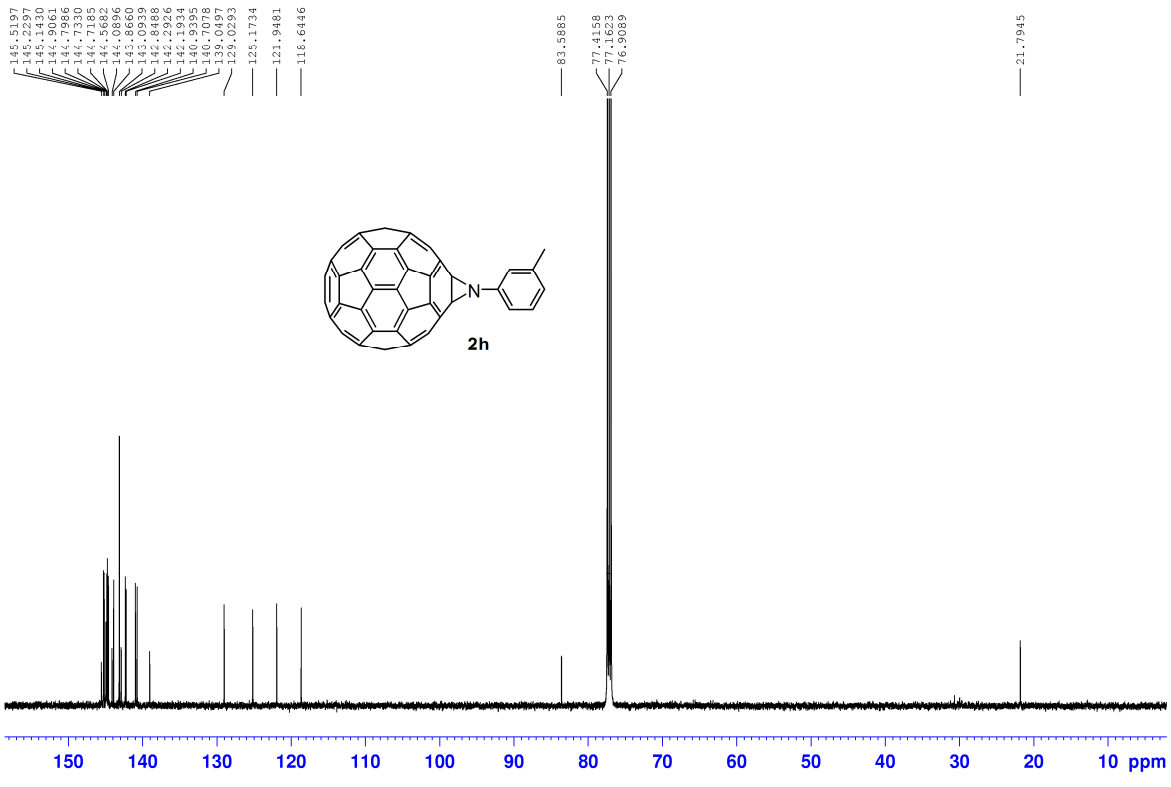
1.09
3.00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139.0497
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125.1734
121.9481
116.6446
83.5885
77.4158
77.1623
76.9089
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30
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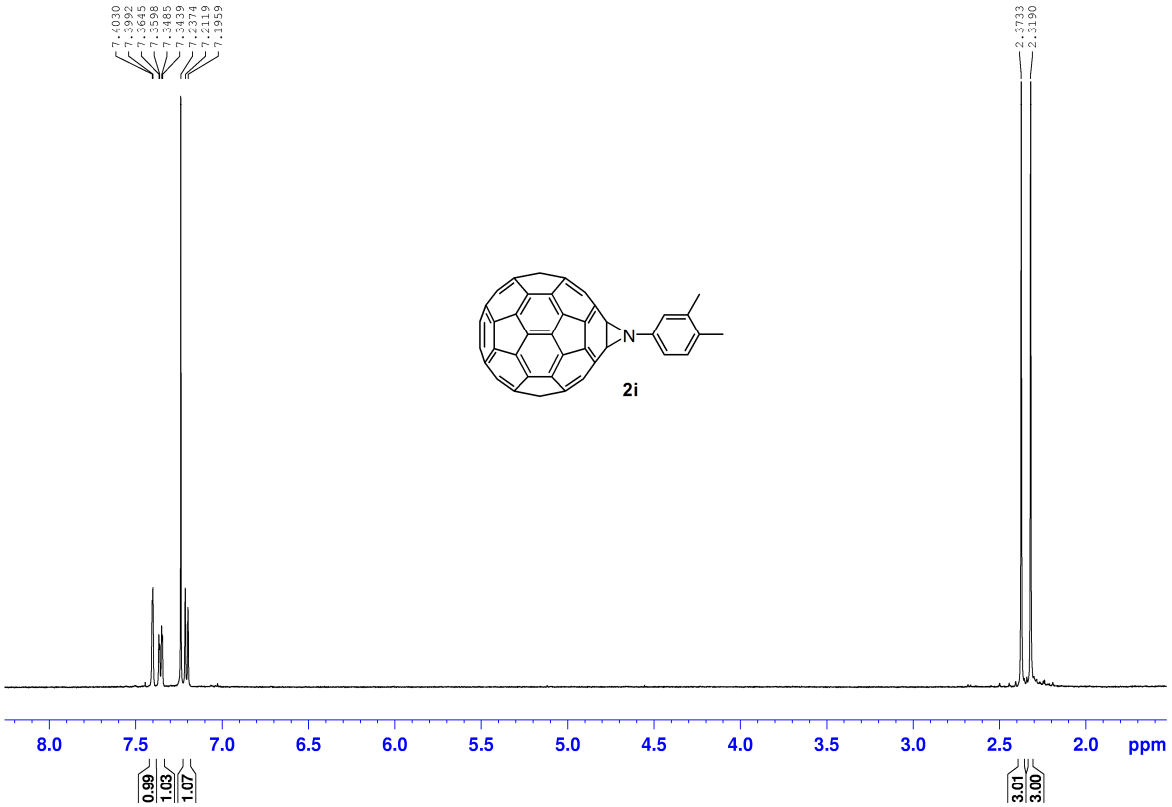
10
ppm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7.2374
7.2119
7.1959
2.3733
2.3190
N
2i
8.0
7.5
7.0
6.5
6.0
5.5
5.0
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3.5
3.0
2.5
2.0
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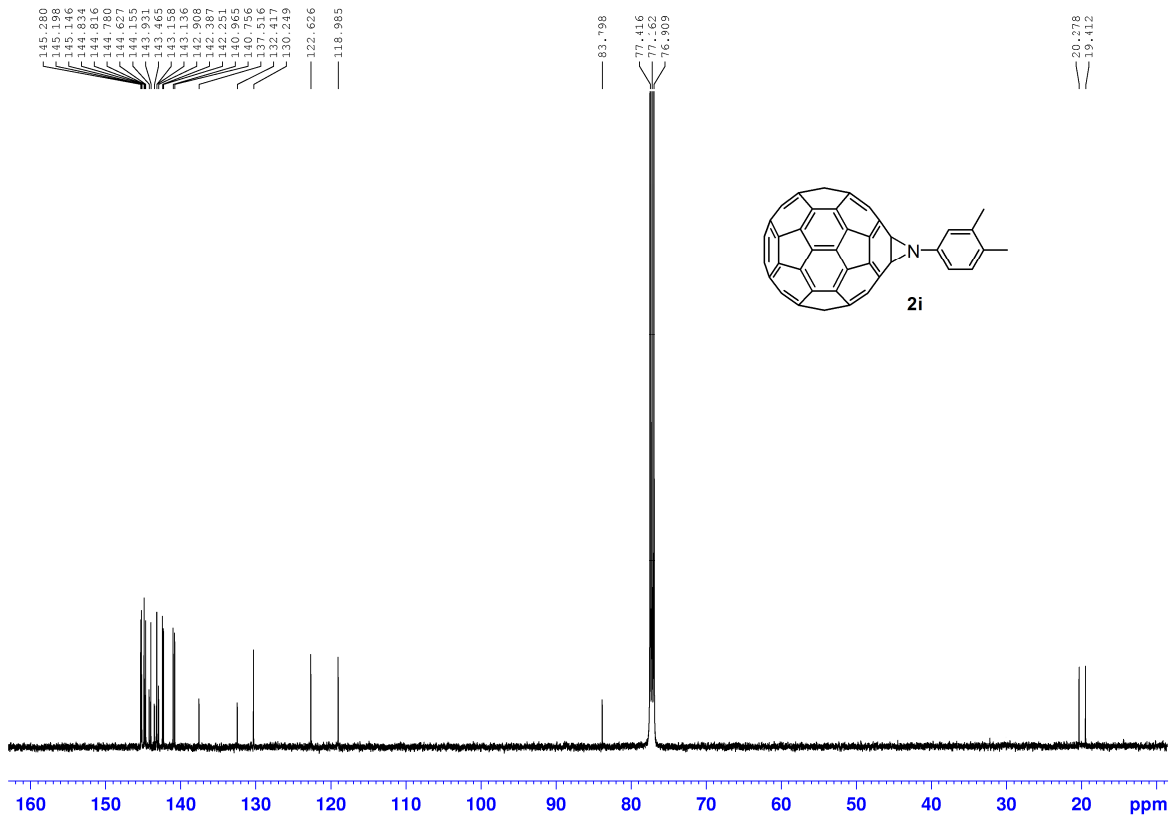
1.07
3.01
3.00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142.908
142.387
142.251
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140.756
137.516
132.417
130.249
122.626
118.985
83.798
77.416
77.162
76.909
20.278
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150
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80
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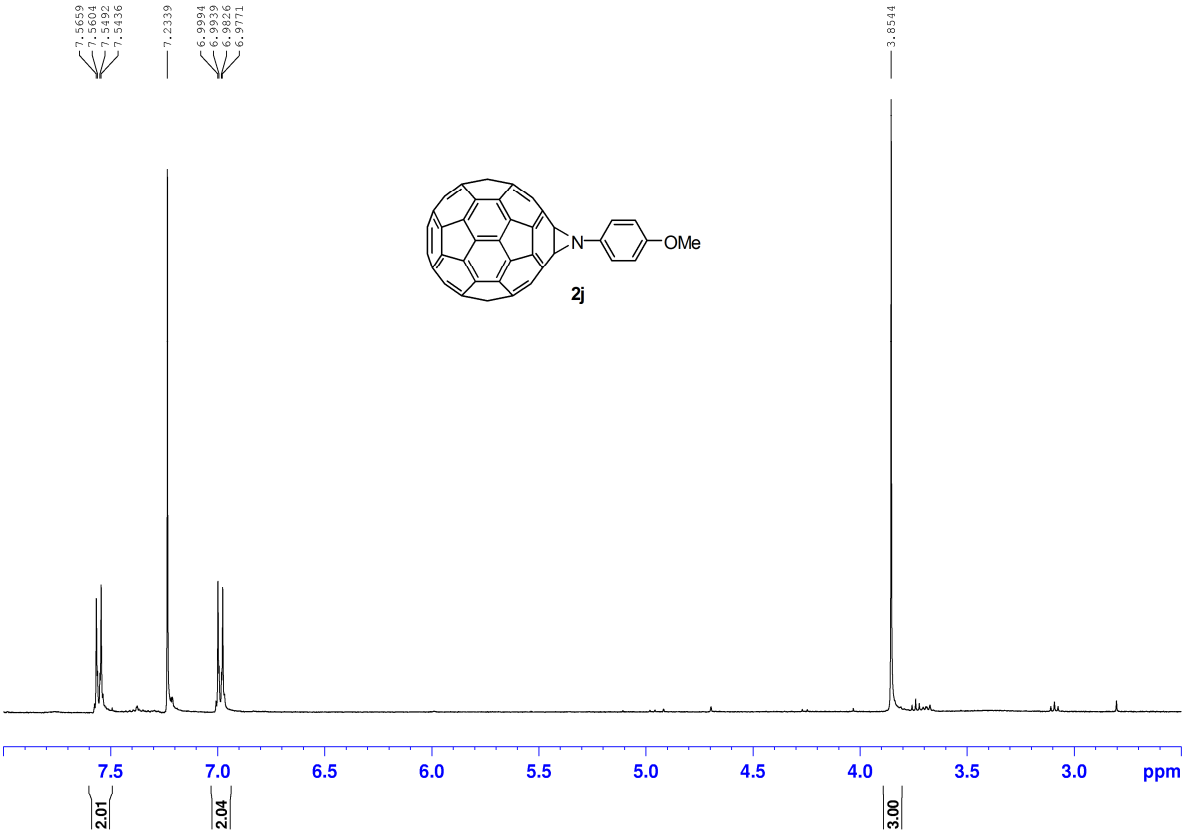
40
30
20
ppm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6.9939
6.9826
6.9771
3.8544
N
OMe
2j
7.5
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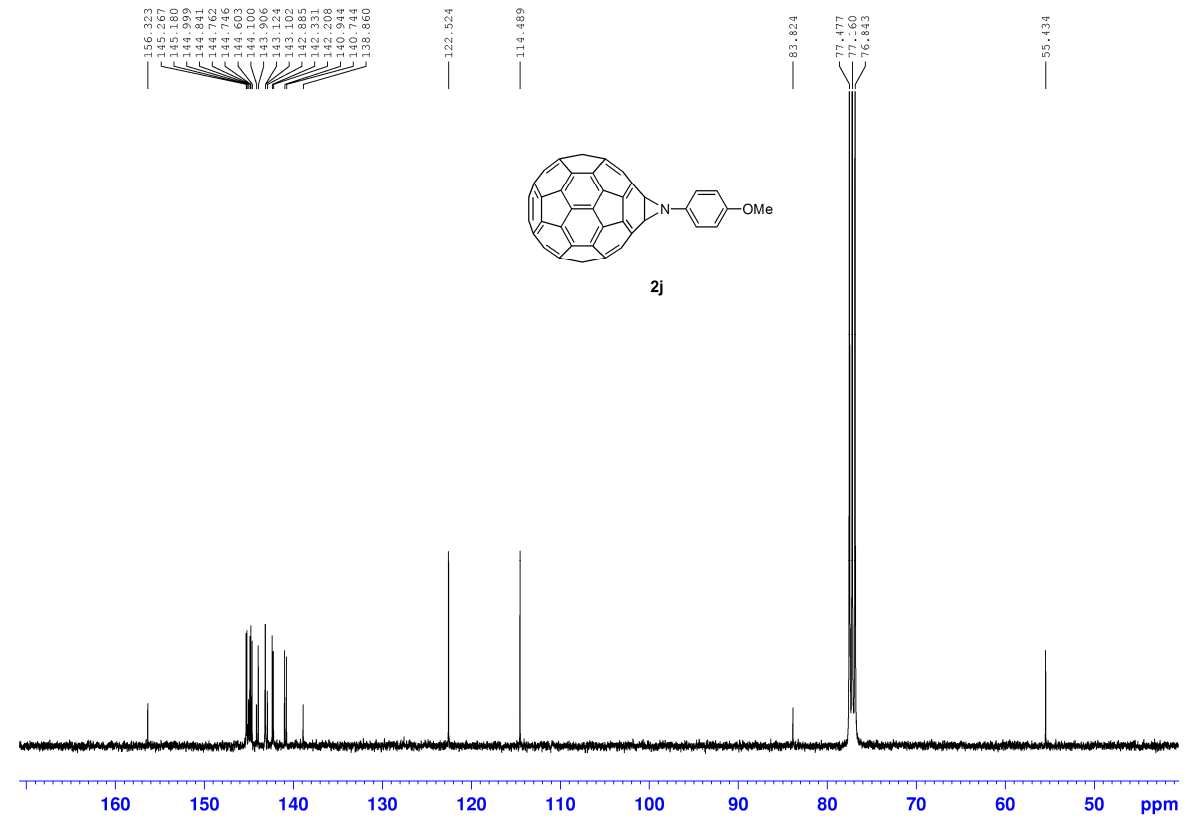
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
ppm
2.01
2.04
3.00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142.331
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138.860
122.524
114.489
83.824
77.477
77.160
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N
OMe
2j
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150
140
130
120
110
100
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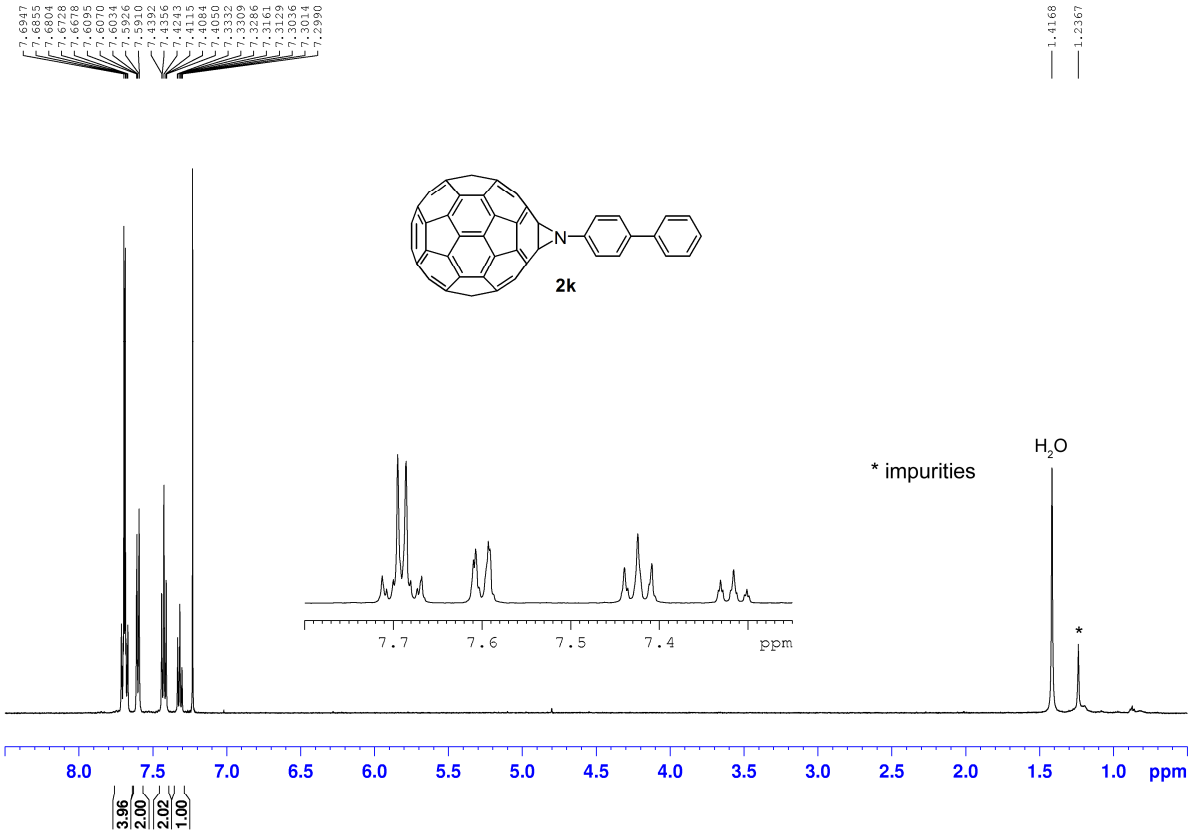
80
70
60
50
ppm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7.4392
7.4356
7.4243
7.4115
7.4084
7.4050
7.3332
7.3309
7.3266
7.3151
7.3129
7.3036
7.3014
7.2990
1.4168
1.2367
2k
* impurities
H2O
*
7.7
7.6
7.5
7.4
ppm
8.0
7.5
7.0
6.5
6.0
5.5
5.0
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ppm
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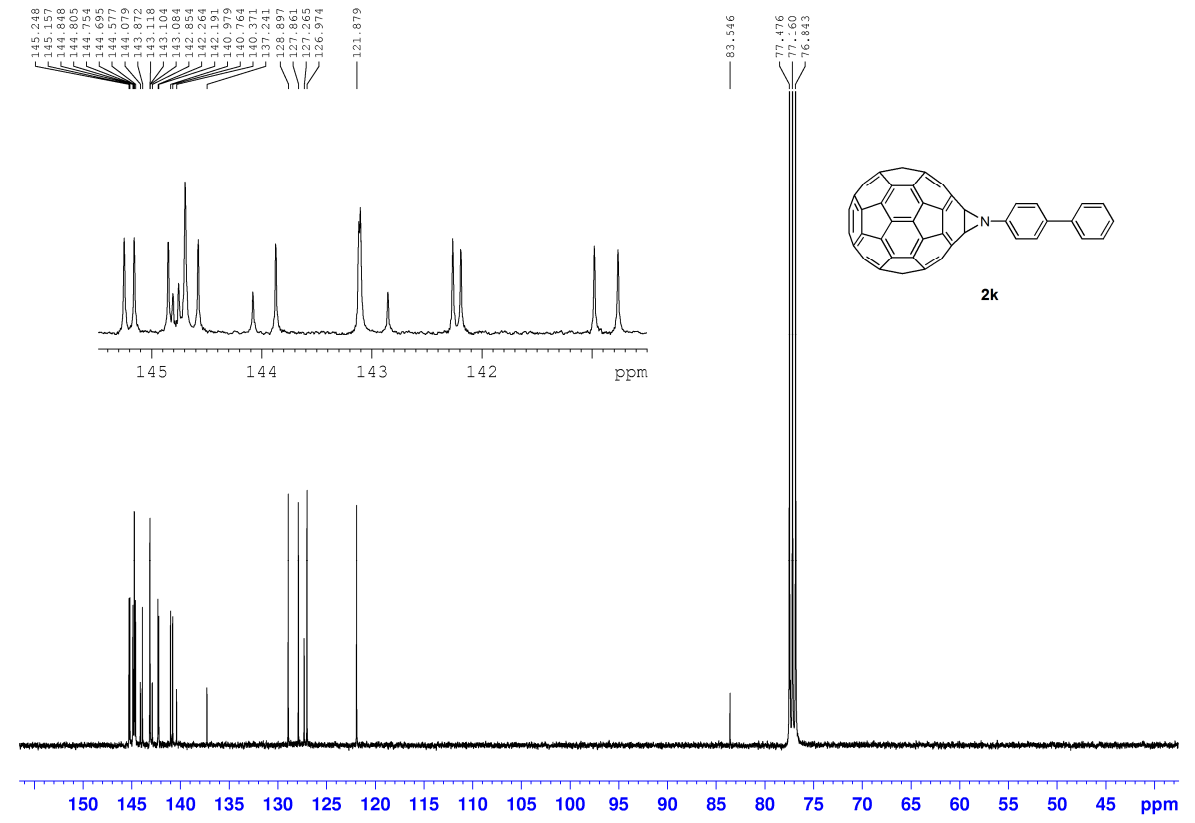
1.00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144.805
144.754
144.695
144.577
144.079
143.872
143.118
143.104
143.084
142.854
142.264
142.191
140.979
140.764
140.371
140.211
128.897
127.861
127.265
126.974
121.879
83.546
77.476
77.160
76.843
2k
145
144
143
142
ppm
150
145
140
135
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115
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95
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85
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75
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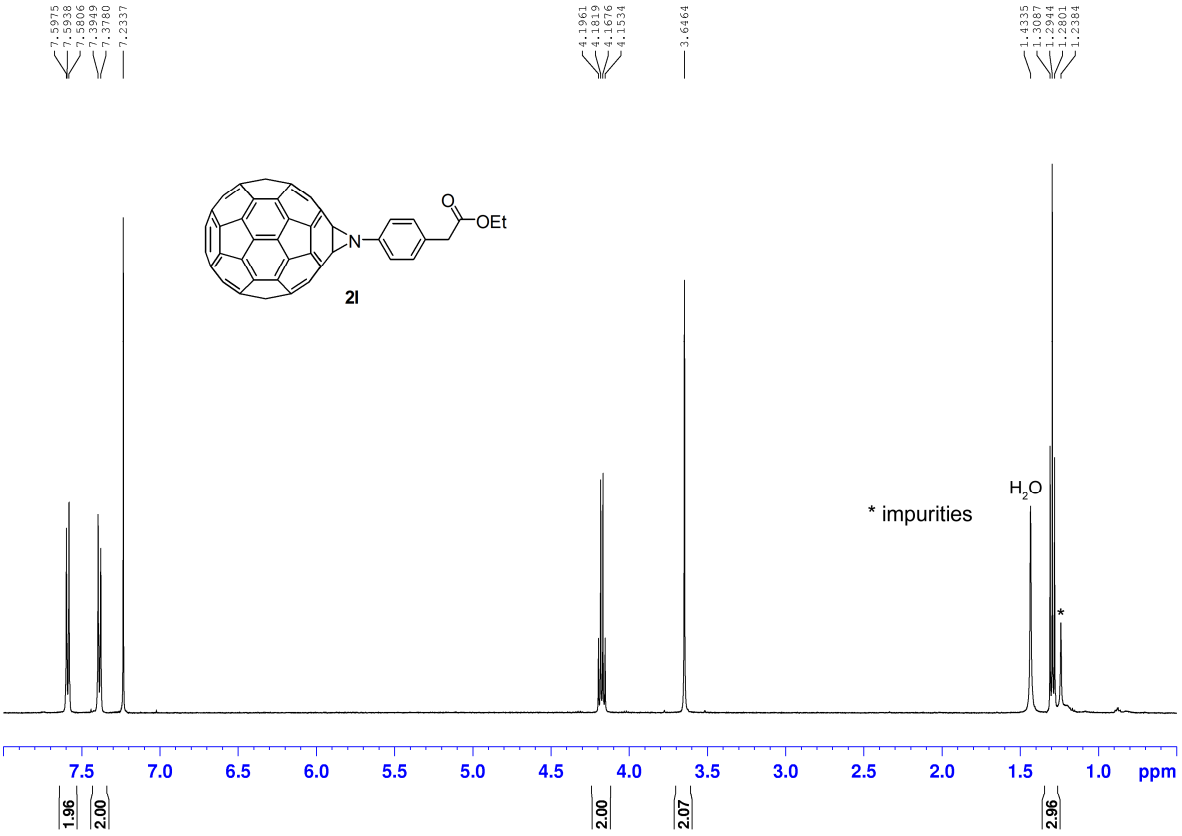
65
60
55
50
45
ppm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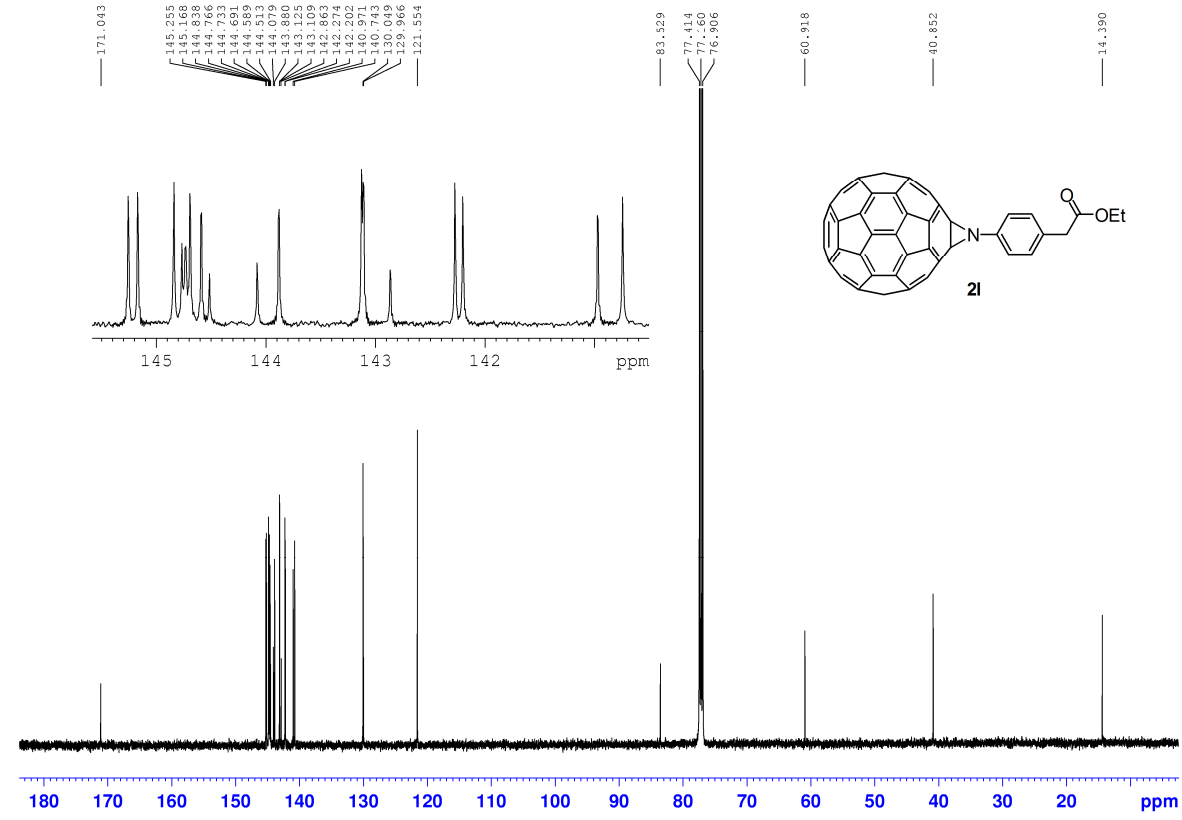
7.3949
7.3780
7.2337
4.1961
4.1819
4.1676
4.1534
3.6464
1.4335
1.3037
1.2944
1.2801
1.2384
O
OEt
N
2l
* impurities
H2O
*
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
ppm
1.96
2.00
2.00
2.07
2.96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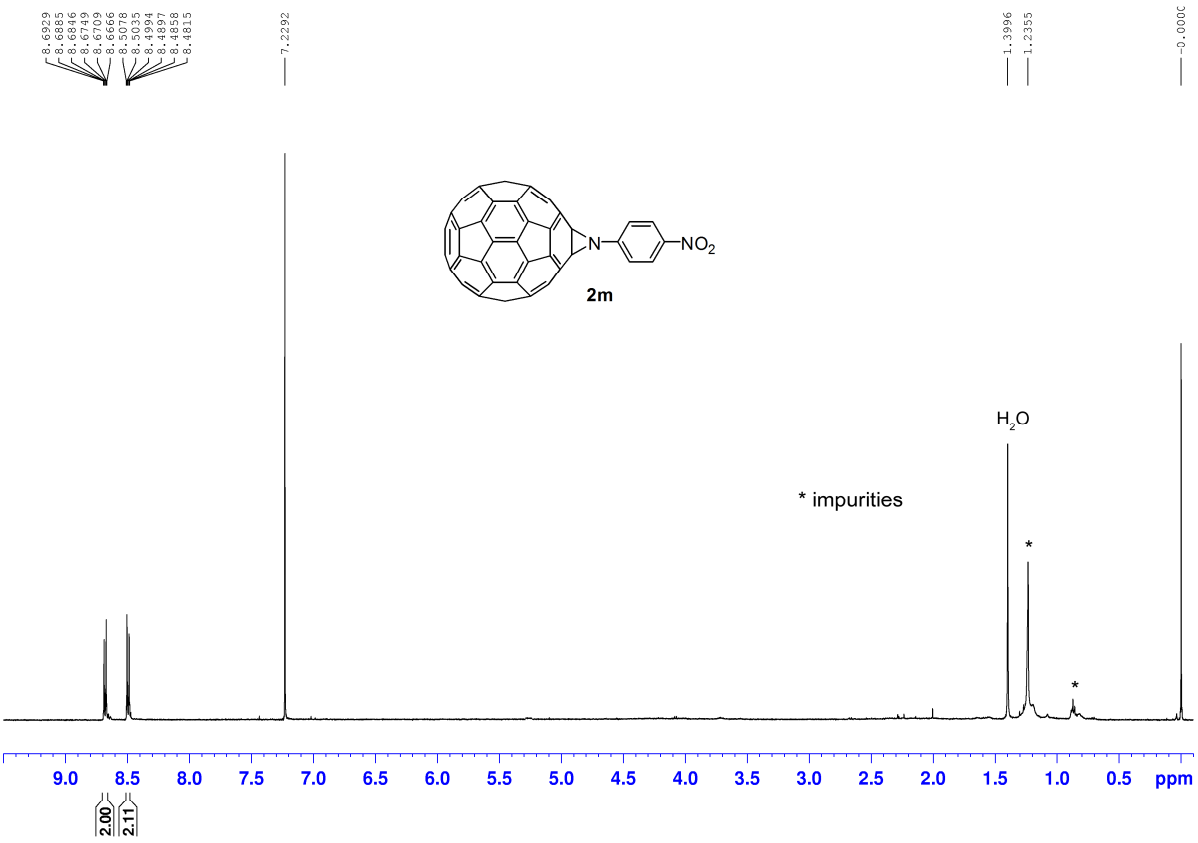
145.188
144.838
144.766
144.733
144.691
144.589
144.513
144.079
143.880
143.125
143.109
142.863
142.274
142.202
140.971
140.743
130.049
129.966
121.554
83.529
77.414
77.160
76.906
60.918
40.852
14.390
O
OEt
N
2l
145
144
143
142
ppm
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
ppm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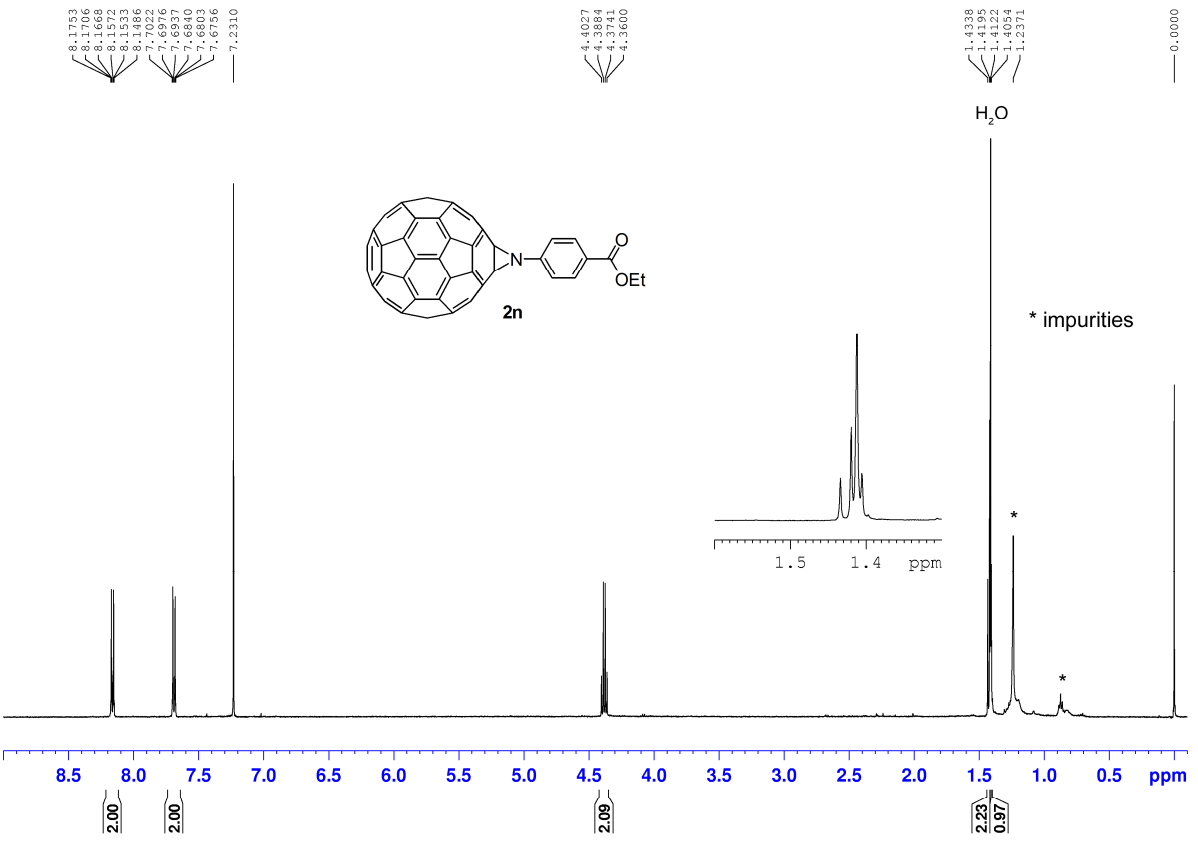
8.6749
8.6709
8.6666
8.5078
8.5035
8.4994
8.4897
8.4858
8.4815
7.2292
1.3996
1.2355
0.0000
N
NO2
2m
H2O
* impurities
*
*
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm
2.00
2.11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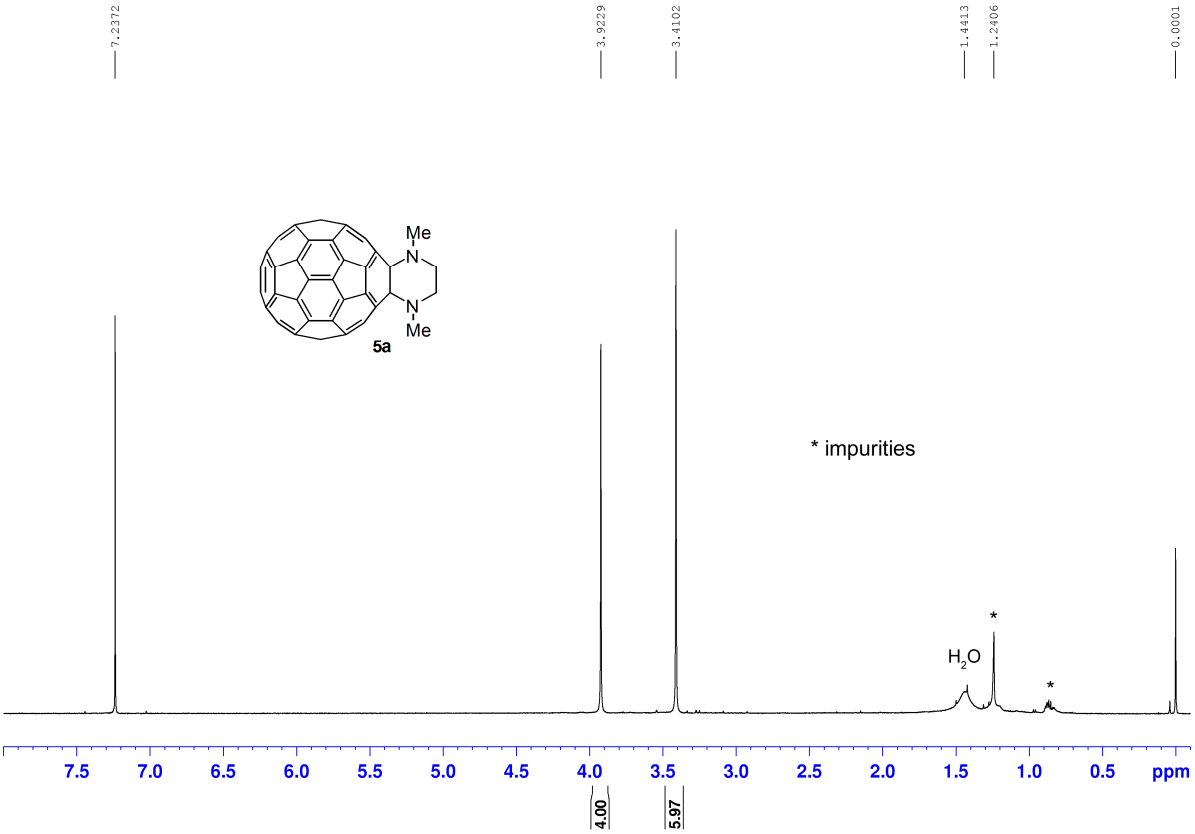
8.1706
8.1668
8.1572
8.1533
8.1486
7.7022
7.6976
7.6937
7.6840
7.6803
7.6756
7.2310
4.4027
4.3884
4.3741
4.3600
1.4338
1.4195
1.4052
1.4054
1.2371
0.0000
N
O
OEt
2n
H2O
* impurities
*
*
1.5 1.4 ppm
8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm
2.00
2.00
2.09
2.23
0.97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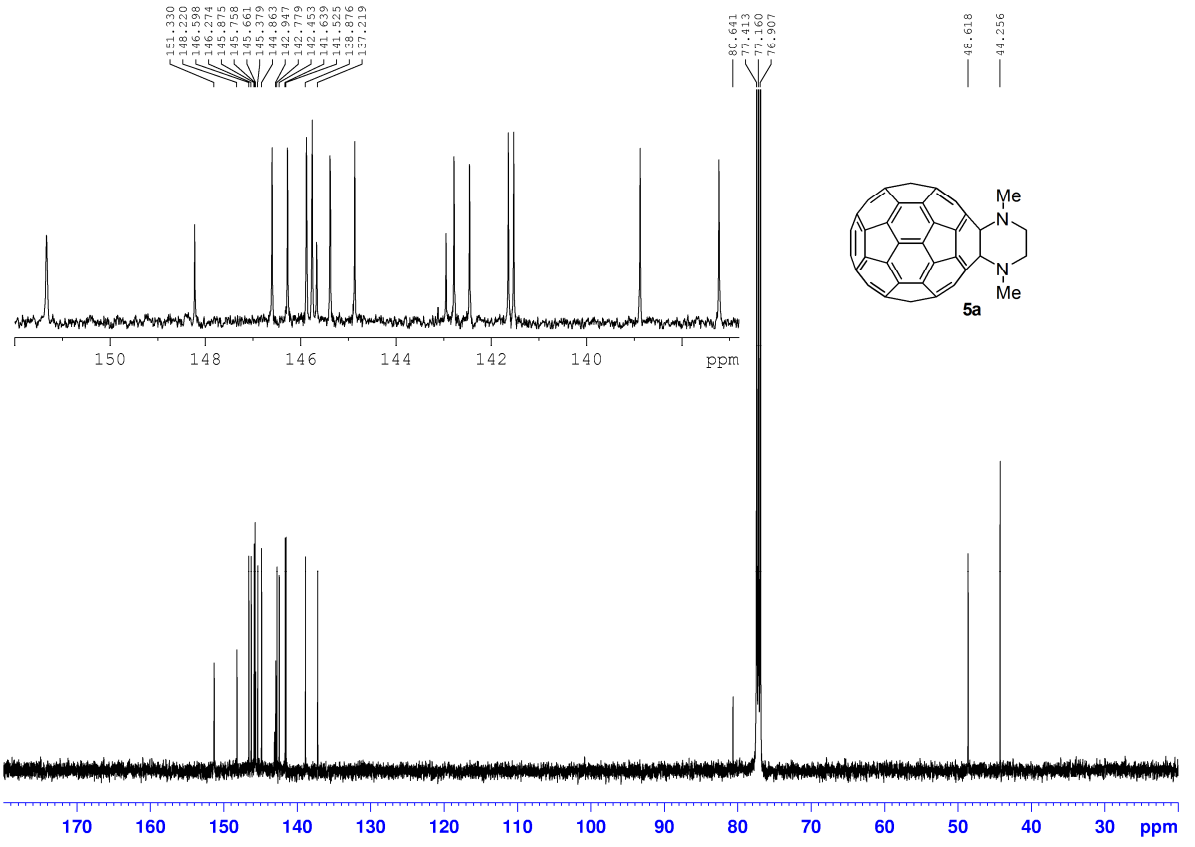
3.9229
3.4102
1.4413
1.2406
0.0001
Me
N
N
Me
5a
* impurities
H2O
*
*
7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm
4.00
5.97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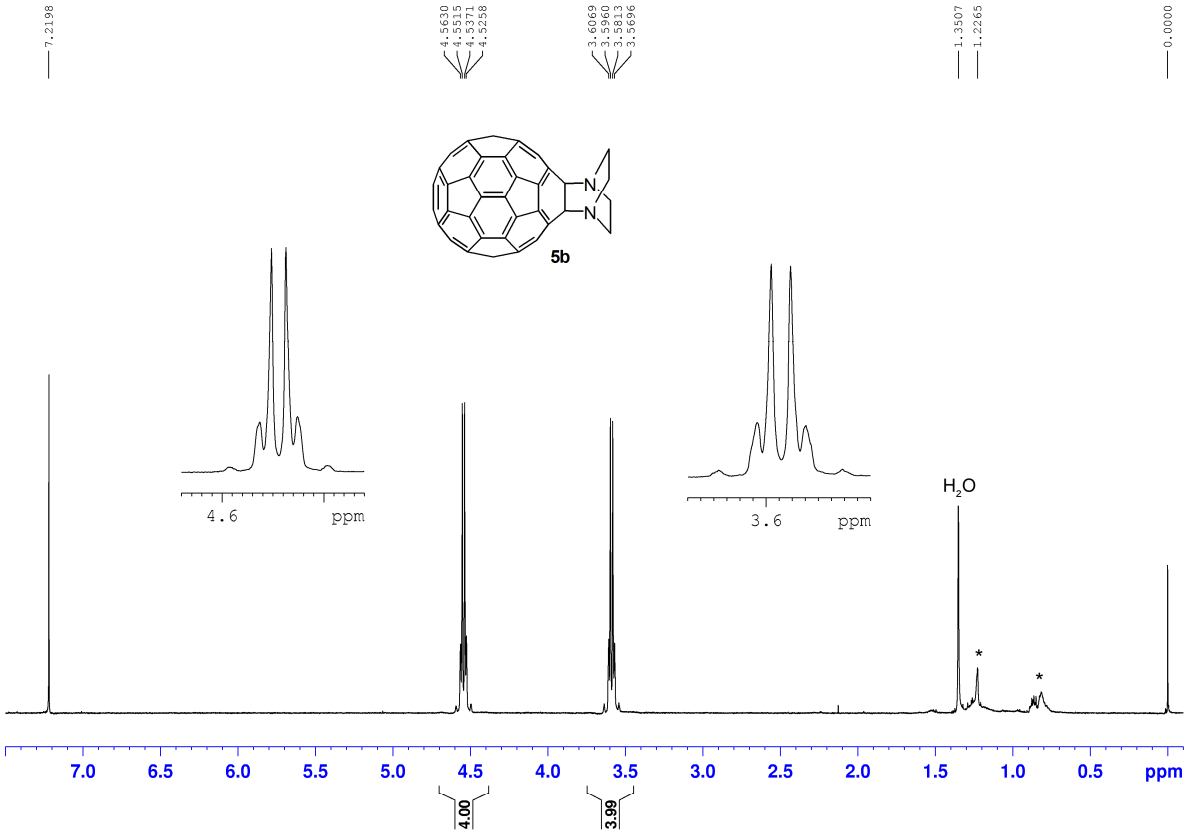
148.220
146.598
146.274
145.875
145.758
145.661
145.379
144.863
142.947
142.779
142.453
141.639
141.535
138.876
137.219
80.641
77.413
77.160
76.907
46.618
44.256
Me
N
N
Me
5a
150 148 146 144 142 140 ppm
170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 ppm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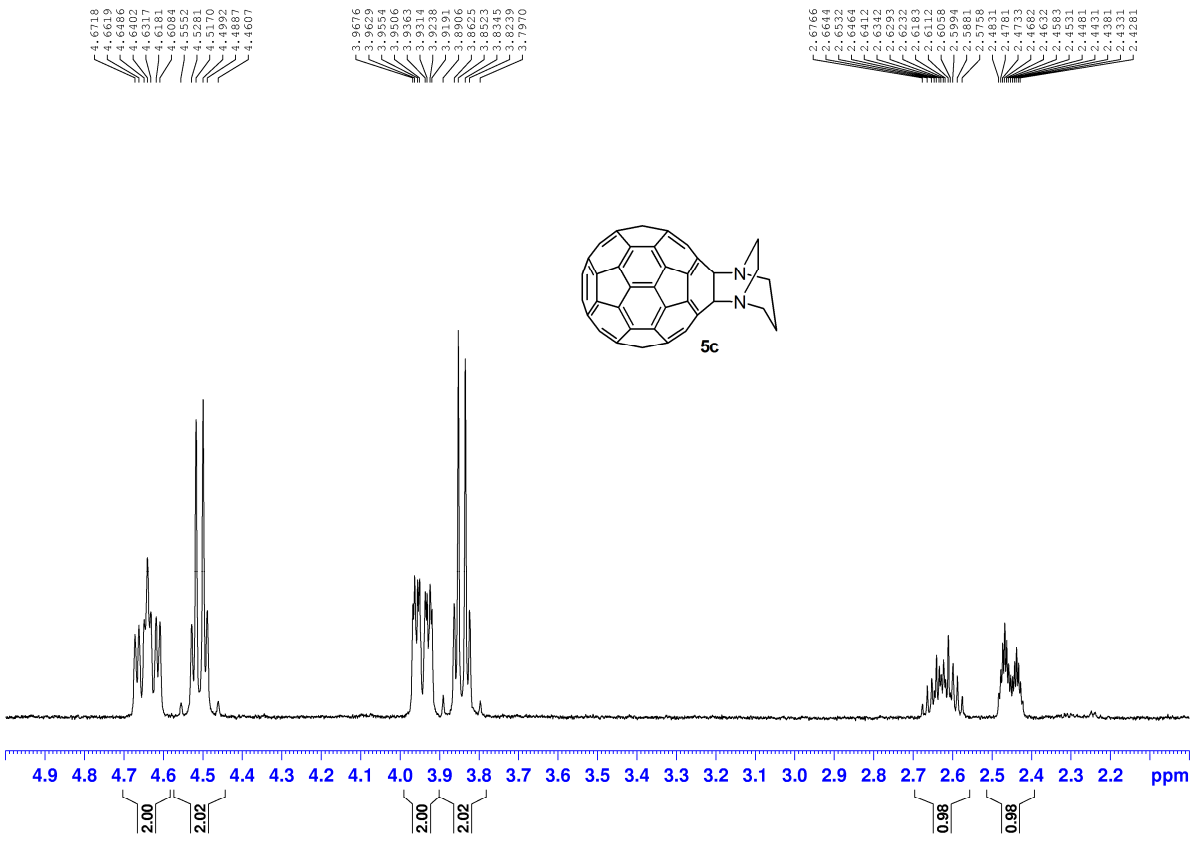
4.5630
4.5515
4.5371
4.5258
3.6069
3.5960
3.5833
3.5696
1.3507
1.2265
0.0000
N
N
5b
4.6
ppm
3.6
ppm
H2O
*
*
7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm
4.00
3.99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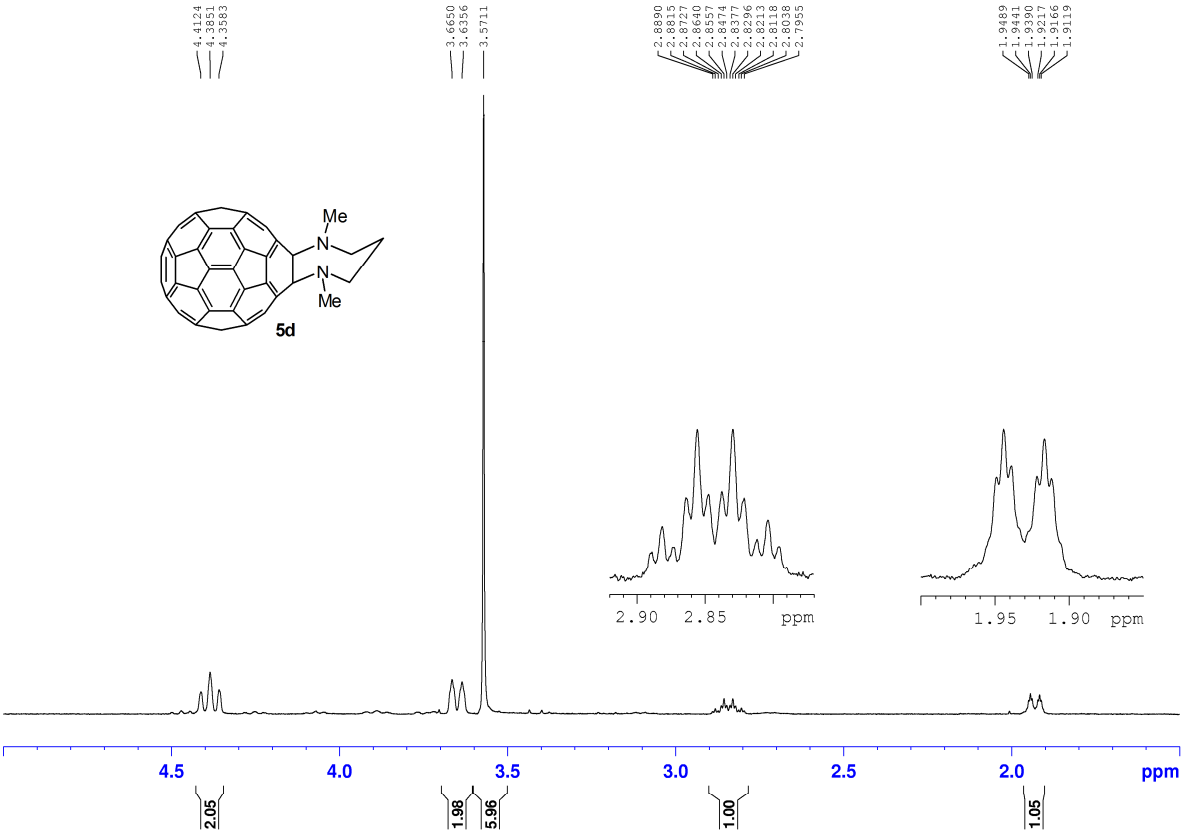
4.6402
4.6317
4.6181
4.6084
4.6052
4.5281
4.5170
4.4992
4.4887
4.4607
3.9676
3.9629
3.9554
3.9506
3.9363
3.9314
3.9238
3.9191
3.8906
3.8625
3.8523
3.8345
3.8239
3.7970
2.6766
2.6644
2.6532
2.6464
2.6412
2.6342
2.6293
2.6232
2.6183
2.6112
2.6054
2.5994
2.5881
2.5758
2.4831
2.4781
2.4733
2.4682
2.4632
2.4583
2.4531
2.4481
2.4431
2.4381
2.4331
2.4281
N
N
5c
4.9 4.8 4.7 4.6 4.5 4.4 4.3 4.2 4.1 4.0 3.9 3.8 3.7 3.6 3.5 3.4 3.3 3.2 3.1 3.0 2.9 2.8 2.7 2.6 2.5 2.4 2.3 2.2 ppm
2.00
2.02
2.00
2.02
0.98
0.98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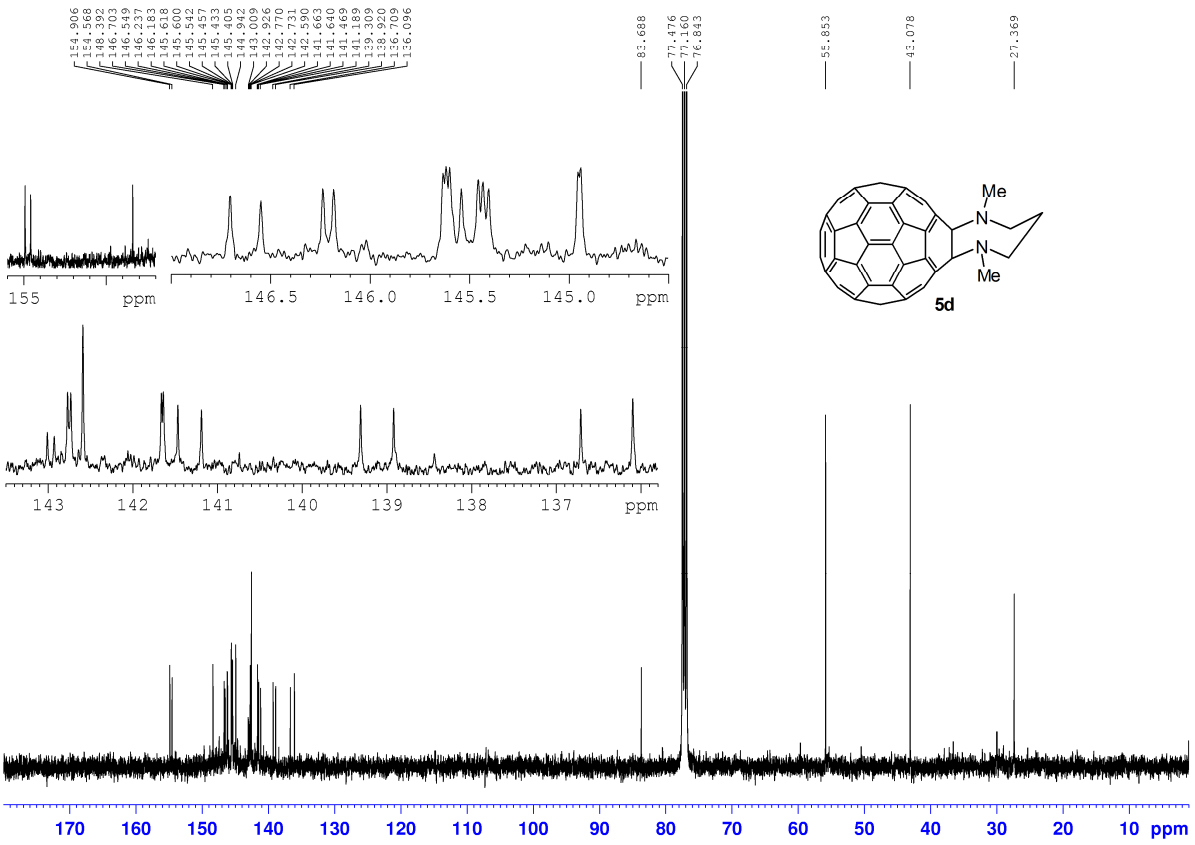
4.3583
3.6650
3.6356
3.5711
2.8890
2.8815
2.8727
2.8640
2.8557
2.8474
2.8377
2.8296
2.8213
2.8118
2.8038
2.7955
1.9489
1.9441
1.9390
1.9217
1.9166
1.9119
Me
N
N
Me
5d
2.90
2.85
ppm
1.95
1.90
ppm
4.5
4.0
3.5
3.0
2.5
2.0
ppm
2.05
1.98
5.96
1.00
1.05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146.703
146.549
146.237
146.183
145.618
145.600
145.542
145.457
145.433
145.405
144.942
143.909
143.096
142.770
142.731
142.590
141.663
141.640
141.469
141.189
139.309
138.920
136.709
136.096
81.688
71.476
71.160
76.843
55.853
41.078
27.369
155
ppm
146.5
146.0
145.5
145.0
ppm
143
142
141
140
139
138
137
ppm
Me
N
N
Me
5d
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
ppm