Supplementary Information for

Novel Ligands from Direct Benzylic Functionalisation of Tris(2-pyridylmethyl)amine

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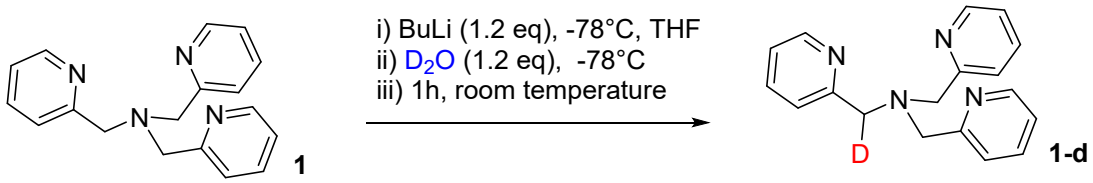
Summary

1. H/D exchange experiment



Under argon atmosphere, 1 (100 mg, 0.34 mmol) was dissolved in dry THF (3.5 ml) in a Schlenk flask. After cooling at -78°C, BuLi 2.5 M in hexanes was added (0.165 ml, 0.41 mmol) and the solution was stirreed for 30 min. Then, D_2O (7.0 µl, 0.41 mmol) was added and the solution was stirred for 1 h. The reaction was quenched with a saturated NH_4Cl aqueous solution. The solvent was removed under reduced pressure. The resulting brown oil was dissolved in CH_2Cl_2 (10 mL) and the solution washed with a saturated NH_4Cl aqueous solution (3×5 ml). The organic phase was dried over $MgSO_4$ and evaporated to dryness. The resulting yellow oil was precipitated by crystallization from THF/hexane to give a yellow solid (97.0 mg, 97 %).

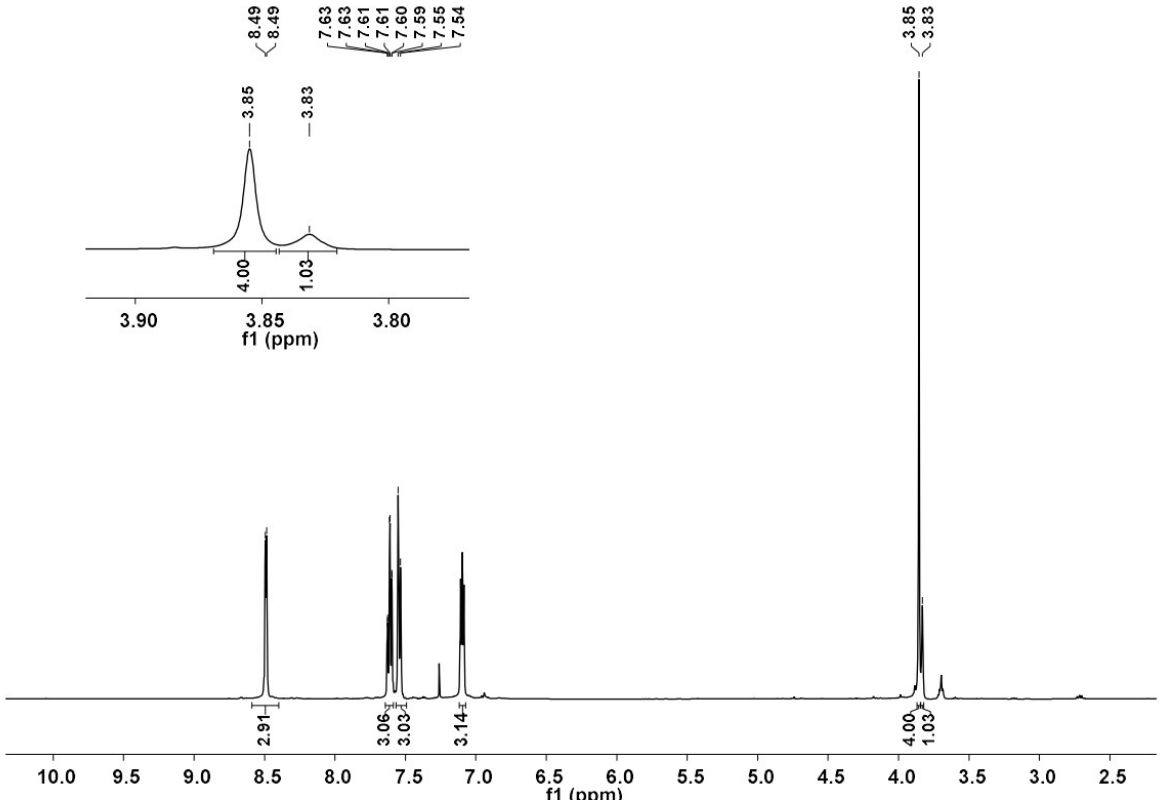


Figure S1. ^{1}H NMR spectrum of **1-d.**

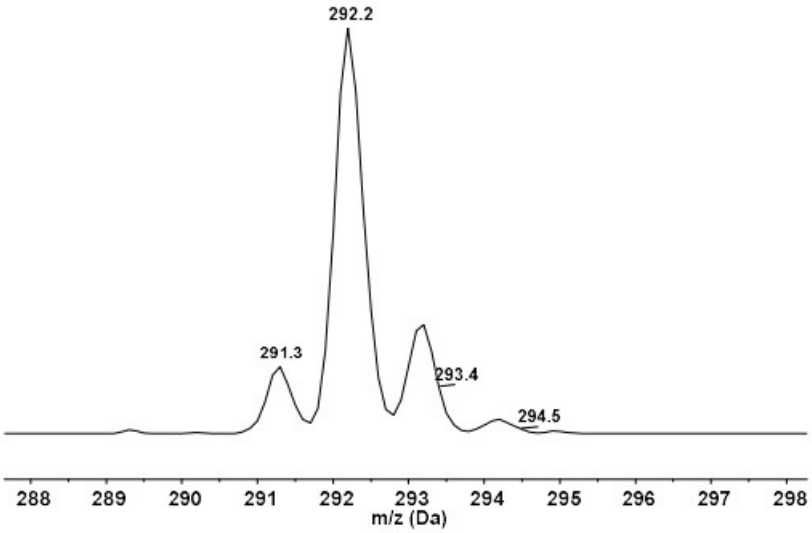
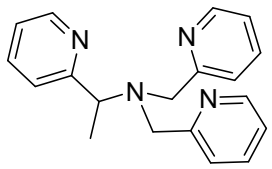


Figure S2. ESI-MS spectrum of **1-d.** Calcd for $C_{18}H_{18}N_4D$ [M+1] 292.1667

2. TPMA ligands characterization

2a



^{1}H NMR (400 MHz, $CDCl_3$) δ 8.56 (ddd, *J* = 4.9, 1.9, 0.9 Hz, 1H), 8.48 (ddd, *J* = 4.9, 1.8, 0.9 Hz, 2H), 7.63 (m, 3H), 7.55 (d, *J* = 7.9 Hz, 2H), 7.49 (d, *J* = 7.9 Hz, 1H), 7.12 (m, 3H), 4.08 (q, *J* = 6.8 Hz, 1H), 3.99 (d, *J* = 15.0 Hz, 2H), 3.78 (d, *J* = 14.9 Hz, 2H), 1.55 (d, *J* = 6.8 Hz, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 161.97 (C), 160.52 (C), 149.01 (CH), 148.99 (CH), 136.50 (CH), 136.23 (CH), 123.07 (CH), 122.85 (CH), 122.05 (CH), 121.94 (CH), 60.33 (CH), 56.78 (CH_2), 14.57 (CH_3).

HRMS (ESI): calcd for $C_{19}H_{21}N_4$ $[M+H]^+$ 305.1761, found 305.1763.

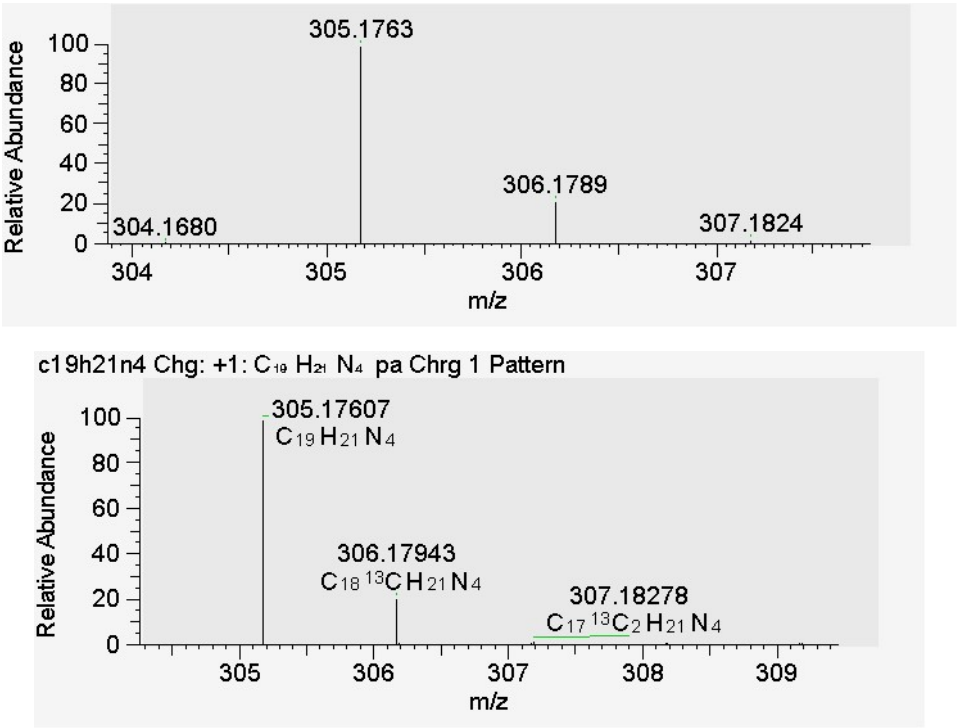
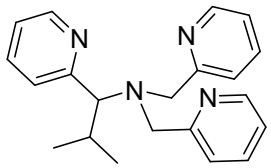


Figure S3. Experimental (top) and simulated (bottom) HR ESI-MS spectrum of **2a**.

2b



^{1}H NMR (600 MHz, $CDCl_3$) δ 8.67 (d, *J* = 4.8 Hz, 1H), 8.51 (d, *J* = 4.8 Hz, 2H), 7.66 (m, 5H), 7.17 (ddd, *J* = 7.6, 4.8, 1.2 Hz, 1H), 7.13 (m, 3H), 4.11 (d, *J* = 15.0 Hz, 2H), 3.43 (d, *J* = 15.0 Hz, 2H), 3.23 (d, *J* = 10.7 Hz, 1H), 2.69 (m, 1H), 1.23 (d, *J* = 6.6 Hz, 3H), 0.61 (d, *J* = 6.5 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 160.63 (C), 157.38 (C), 149.21 (CH), 148.79 (CH), 136.21 (CH), 135.45 (CH), 125.12 (CH), 122.71 (CH), 121.76 (CH), 121.66 (CH), 70.95 (CH), 56.45 (CH_2), 28.00 (CH), 20.62 (CH_3), 20.54 (CH_3).

HRMS (ESI): calcd for $C_{21}H_{25}N_4$ $[M+H]^+$ 333.2074, found 333.2071.

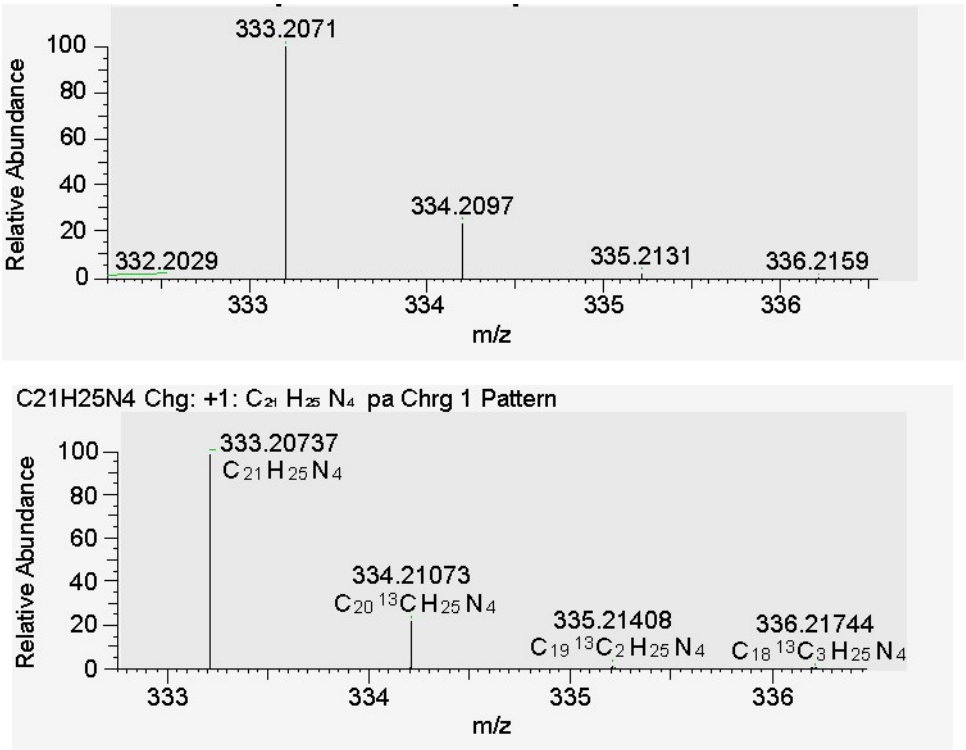
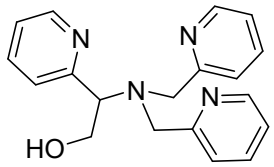


Figure S4. Experimental (top) and simulated (bottom) HR ESI-MS spectrum of **2b**.

2c



^{1}H NMR (600 MHz, $CDCl_3$) δ 8.59 (d, *J* = 4.9 Hz, 1H), 8.51 (d, *J* = 4.9 Hz, 2H), 7.67 (td, *J* = 7.7, 1.8 Hz, 1H), 7.51 (td, *J* = 7.7, 1.6 Hz, 2H), 7.32 (d, *J* = 7.8 Hz, 1H), 7.27 (d, *J* = 7.8 Hz, 2H), 7.20 (ddd, *J* = 7.5, 4.8, 0.9 Hz, 1H), 7.09 (m, 2H), 4.31 (m, 1H), 4.29 (d, *J* = 15.4 Hz, 2H), 4.16 (dd, *J* = 9.2, 4.9 Hz, 1H), 3.96 (dd, *J* = 12.0, 4.9 Hz, 1H), 3.84 (d, *J* = 15.2 Hz, 2H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 160.07 (C), 159.06 (C), 149.33 (CH), 148.91 (CH), 136.64 (CH), 136.43 (CH), 123.71 (CH), 123.20 (CH), 122.55 (CH), 122.07 (CH), 67.04 (CH), 61.84 (CH_2), 57.02 (CH_2).

HRMS (ESI): calcd for $C_{19}H_{21}N_4O$ $[M+H]^+$ 321.1710, found 321.1706.

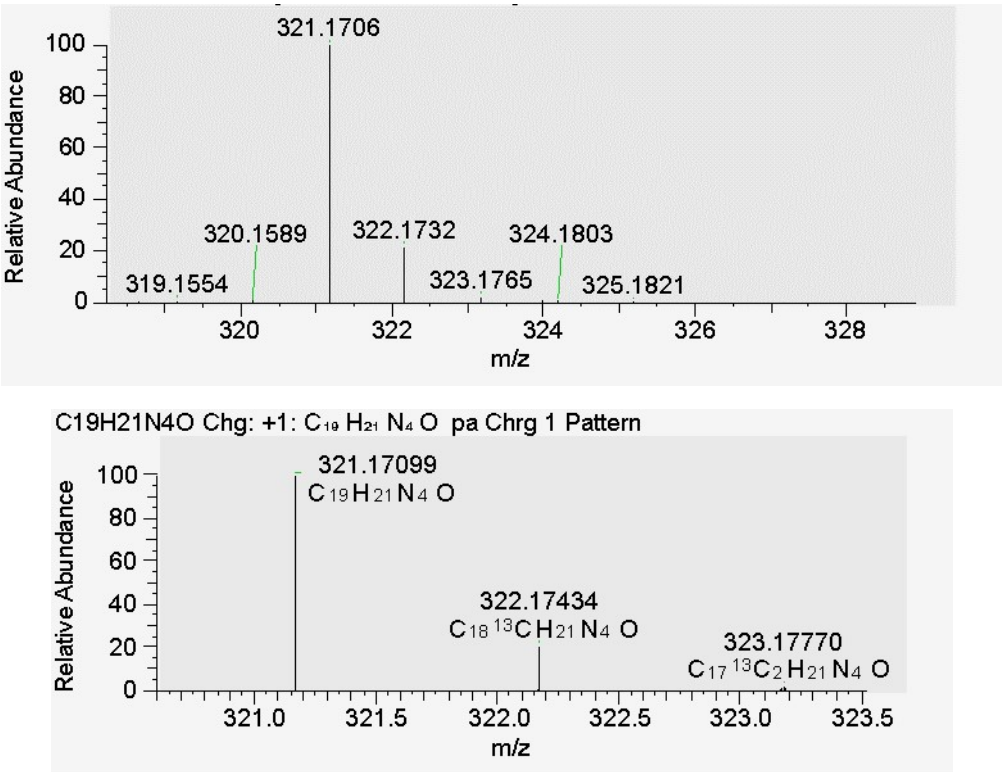
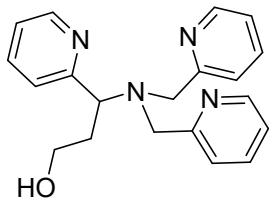


Figure S5. Experimental (top) and simulated (bottom) HR ESI-MS spectrum of **2c**.

2d



^{1}H NMR (400 MHz, $CDCl_3$) δ 8.64 (d, *J* = 4.9 Hz, 1H), 8.56 (d, *J* = 4.9 Hz, 2H), 7.68 (td, *J* = 7.6, 1.9 Hz, 1H), 7.63 (td, *J* = 7.7, 1.8 Hz, 2H), 7.46 (d, *J* = 7.8 Hz, 2H), 7.28 (d, *J* = 7.8 Hz, 1H), 7.21 (ddd, *J* = 7.6, 4.8, 1.2 Hz, 1H), 7.15 (m, 2H), 4.14 (d, *J* = 15.2 Hz, 2H), 4.11 (m, 1H), 3.97 (ddd, *J* = 11.0, 8.0, 2.8 Hz, 1H), 3.74 (ddd, *J* = 11.4, 6.6, 3.3 Hz, 1H), 3.58 (d, *J* = 15.1 Hz, 2H), 2.63 (m, 1H), 1.90 (m, 1H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 159.52 (C), 158.22 (C), 149.33 (CH), 149.10 (CH), 136.96 (CH), 136.21 (CH), 123.94 (CH), 123.25 (CH), 122.47 (CH), 122.28 (CH), 63.41 (CH_2), 61.26 (CH), 55.98 (CH_2), 32.68 (CH_2).

HRMS (ESI): calcd for $C_{20}H_{23}N_4O$ $[M+H]^+$ 335.1866, found 335.1859.

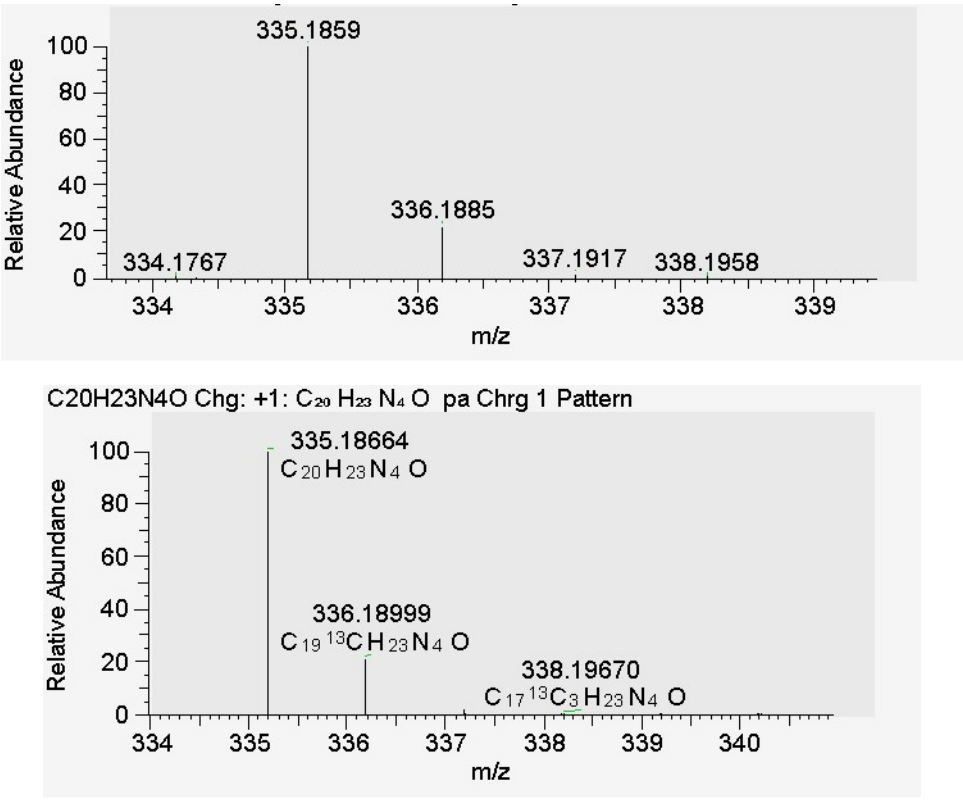
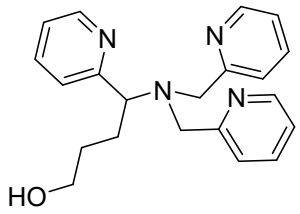


Figure S6. Experimental (top) and simulated (bottom) HR ESI-MS spectrum of **2d**.

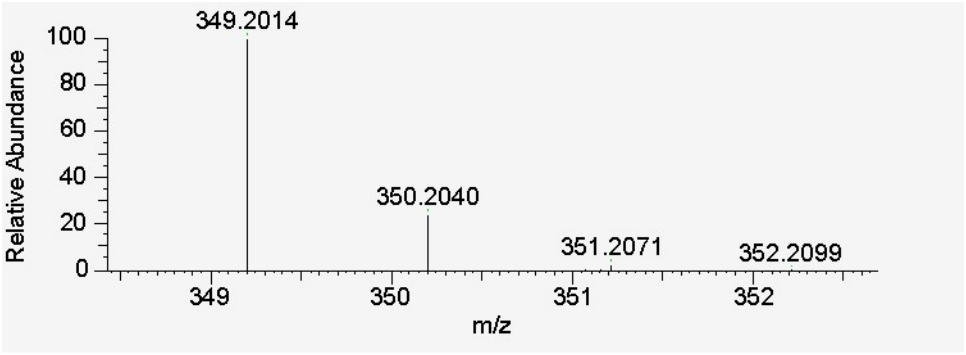
2e



^{1}H NMR (400 MHz, $CDCl_3$) δ 8.59 (d, *J* = 4.9 Hz, 1H), 8.49 (d, *J* = 4.9 Hz, 2H), 7.66 (td, *J* = 7.7, 1.9 Hz, 1H), 7.60 (td, *J* = 7.6, 1.8 Hz, 2H), 7.43 (d, *J* = 7.9 Hz, 2H), 7.34 (d, *J* = 7.8 Hz, 1H), 7.17 (ddd, *J* = 7.6, 4.9, 1.2 Hz, 1H), 7.12 (ddd, *J* = 7.5, 4.9, 1.2 Hz, 2H), 4.06 (d, *J* = 14.6 Hz, 2H), 3.92 (t, *J* = 7.0 Hz, 1H), 3.66 (d, *J* = 15.0 Hz, 2H), 3.65 (m, 1H), 3.55 (m, 1H), 2.34 (m, 1H), 2.11 (m, 1H), 1.61 (m, 2H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 159.85 (C), 159.55 (C), 149.10 (CH), 148.90(CH), 136.64(CH), 136.24(CH), 124.50(CH), 123.46(CH), 122.37(CH), 122.13(CH), 64.42 (CH_2), 61.73 (CH), 56.71 (CH_2), 30.06 (CH_2), 25.56 (CH_2).

HRMS (ESI): calcd for $C_{21}H_{25}N_4O$ $[M+H]^+$ 349.2023, found 349.2014.



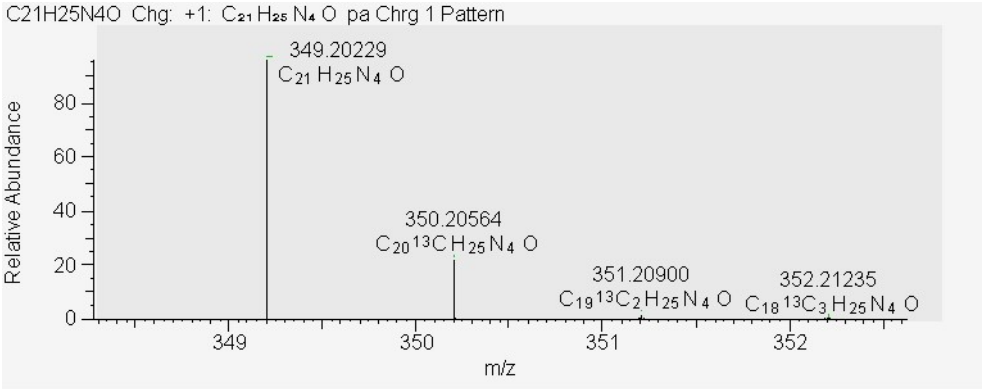
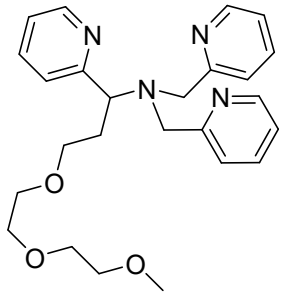


Figure S7. Experimental (top) and simulated (bottom) HR ESI-MS spectrum of **2e**.

2f



^{1}H NMR (400 MHz, $CDCl_3$) δ 8.60 (d, *J* = 4.9 Hz, 1H), 8.48 (d, *J* = 4.9 Hz, 2H), 7.64 (m, 3H), 7.55 (d, *J* = 7.8 Hz, 2H), 7.25 (d, *J* = 7.5 Hz, 1H), 7.16 (ddd, *J* = 7.6, 4.8, 1.2 Hz, 1H), 7.11 (ddd, *J* = 7.4, 4.9, 1.3 Hz, 2H), 4.07 (d, *J* = 15.0 Hz, 2H), 3.97 (t, *J* = 7.3 Hz, 1H), 3.59 (d, *J* = 15.2 Hz, 2H), 3.57 – 3.40 (m, 10H), 3.35 (s, 3H), 2.37 (m, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 160.63 (C), 158.50 (C), 149.22 (CH), 148.93 (CH), 136.50 (CH), 135.99 (CH), 124.73 (CH), 122.95 (CH), 122.27 (CH), 121.92 (CH), 72.05 (CH_3), 70.66 (CH_2), 70.63 (CH_2), 70.07 (CH_2), 68.82 (CH_2), 61.05 (CH), 59.15 (CH_2), 56.78 (CH_2), 30.60 (CH_2).

HRMS (ESI): calcd for $C_{25}H_{33}N_4O_3$ $[M+H]^+$ 437.2547, found 437.2547.

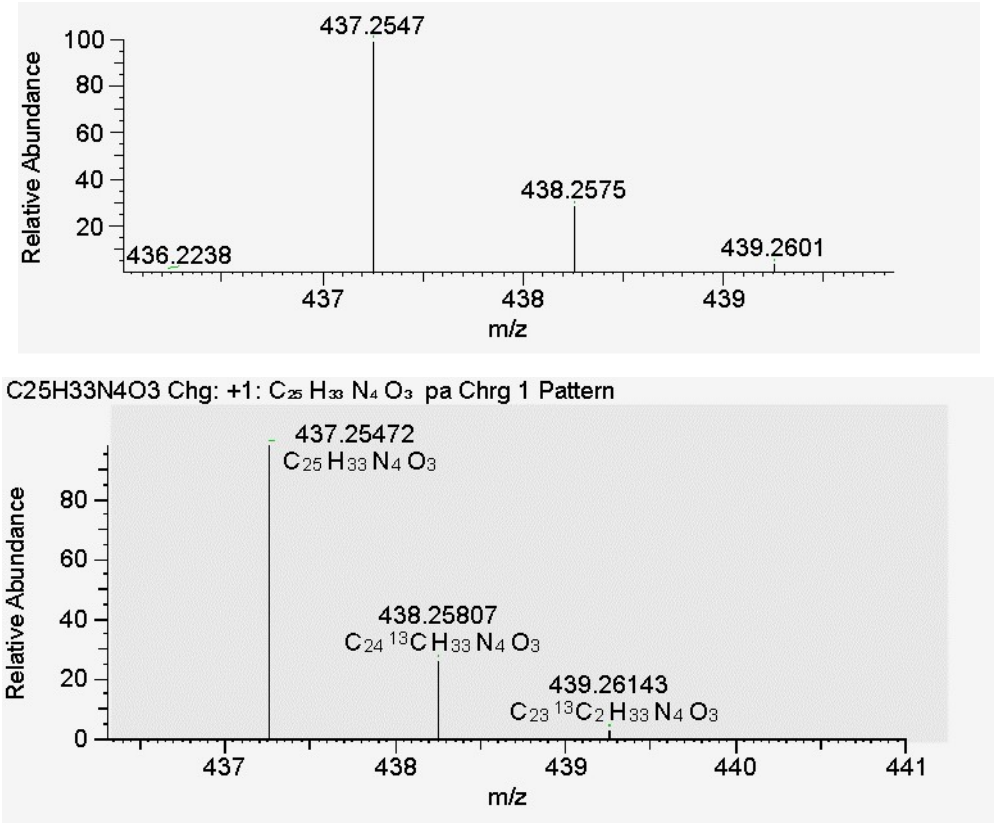
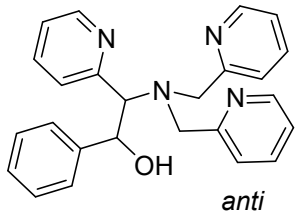


Figure S8. Experimental (top) and simulated (bottom) HR ESI-MS spectrum of **2f**.

2g



anti

^{1}H NMR (600 MHz, $CDCl_3$) δ 8.63 (d, *J* = 4.8 Hz, 1H), 8.54 (d, *J* = 4.9 Hz, 2H), 7.54 (td, *J* = 7.6, 1.8 Hz, 2H), 7.44 (td, *J* = 7.6, 1.9 Hz, 1H), 7.33 (d, *J* = 7.8 Hz, 2H), 7.17 – 7.04 (m, 8H), 6.77 (d, *J* = 7.8 Hz, 1H), 5.55 (d, *J* = 9.6 Hz, 1H), 4.45 (d, *J* = 15.0 Hz, 2H), 3.85 (d, *J* = 9.6 Hz, 1H), 3.65 (d, *J* = 15.0 Hz, 2H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 160.03 (C), 157.11 (C), 149.17 (CH), 148.98 (CH), 148.96 (CH), 142.11 (C), 136.60 (CH), 135.84 (CH), 127.83 (CH), 127.41 (CH), 127.09 (CH), 125.40 (CH), 123.34 (CH), 122.38 (CH), 122.07 (CH), 72.58 (CH), 72.25 (CH), 57.11 (CH_2).

HRMS (ESI): calcd for $C_{25}H_{25}N_4O_3$ $[M+H]^+$ 397.2023, found 397.2014.

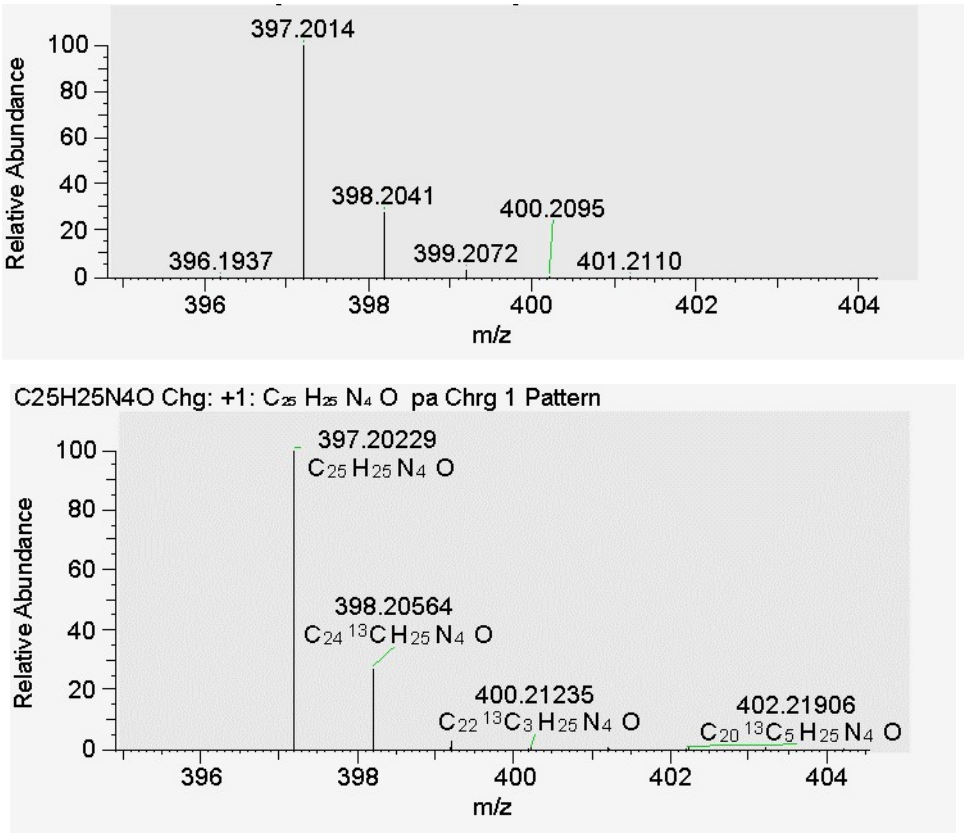
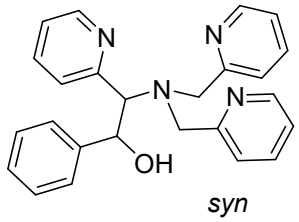


Figure S9. Experimental (top) and simulated (bottom) HR ESI-MS spectrum of **2g**.

2h



syn

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.58 (d, *J* = 4.9 Hz, 1H), 8.50 (d, *J* = 4.8 Hz, 2H), 7.66 (td, *J* = 7.7, 1.8 Hz, 1H), 7.54 (td, *J* = 7.7, 1.8 Hz, 2H), 7.38 (d, *J* = 7.9 Hz, 1H), 7.22 (m, 6H), 7.13 (m, 4H), 5.62 (d, *J* = 6.2 Hz, 1H), 4.17 (d, *J* = 15.1 Hz, 2H), 4.07 (d, *J* = 6.3 Hz, 1H), 3.66 (d, *J* = 15.1 Hz, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 159.76 (C), 157.84 (C), 148.69 (CH), 148.56 (CH), 142.98 (C), 136.77 (CH), 136.69 (CH), 128.04 (CH), 127.28 (CH), 127.15 (CH), 126.41 (CH), 123.21 (CH), 122.69 (CH), 122.15 (CH), 74.28 (CH), 68.89 (CH), 57.42 (CH_2).

HRMS (ESI): calcd for $C_{25}H_{25}N_4O_3$ $[M+H]^+$ 397.2023, found 397.2019.

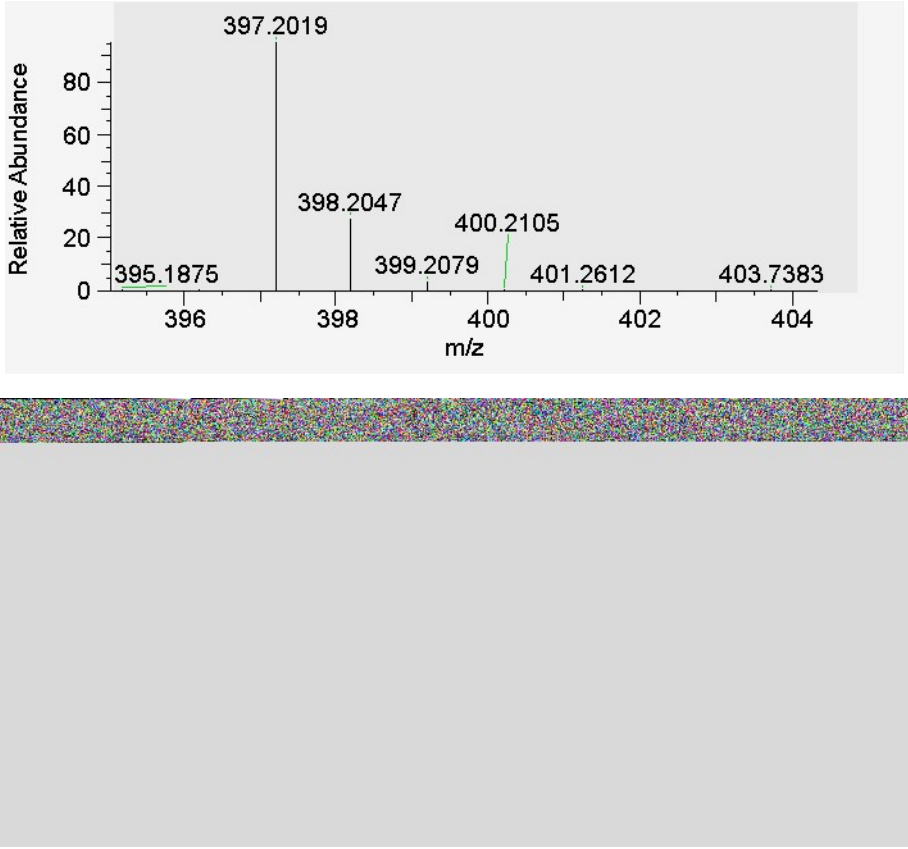
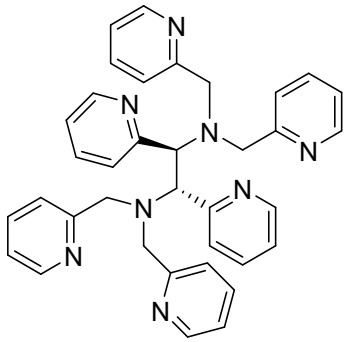


Figure S10. Experimental (top) and simulated (bottom) HR ESI-MS spectrum of **2h**.

2l



^{1}H NMR (400 MHz, $CDCl_3$) δ 8.68 (d, *J* = 4.6 Hz, m, 2H), 8.39 (d, *J* = 4.8 Hz, m, 4H), 7.61 (td, *J* = 7.6, 1.9 Hz, 2H), 7.44 (td, *J* = 7.7, 1.8 Hz, 4H), 7.26 (m, 2H), 7.12 (d, *J* = 7.6 Hz, 2H), 7.05 (dd, *J* = 6.6, 5.1 Hz, 4H), 6.79 (d, *J* = 7.9 Hz, 4H), 4.89 (s, 2H), 3.95 (d, *J* = 15.2 Hz, 4H), 3.45 (d, *J* = 15.2 Hz, 4H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 160.12 (C), 157.07 (C), 149.17 (CH), 148.47 (CH), 136.31 (CH), 135.60 (CH), 125.77 (CH), 123.09 (CH), 122.14 (CH), 121.87 (CH), 64.81 (CH), 57.28 (CH_2).

HRMS (ESI): calcd for $C_{36}H_{35}N_8$ $[M+H]^+$ 579.2979, found 579.2969. Calcd for $C_{36}H_{36}N_8$ $[M+2H]^{++}$ 290.1526, found 290.1520.

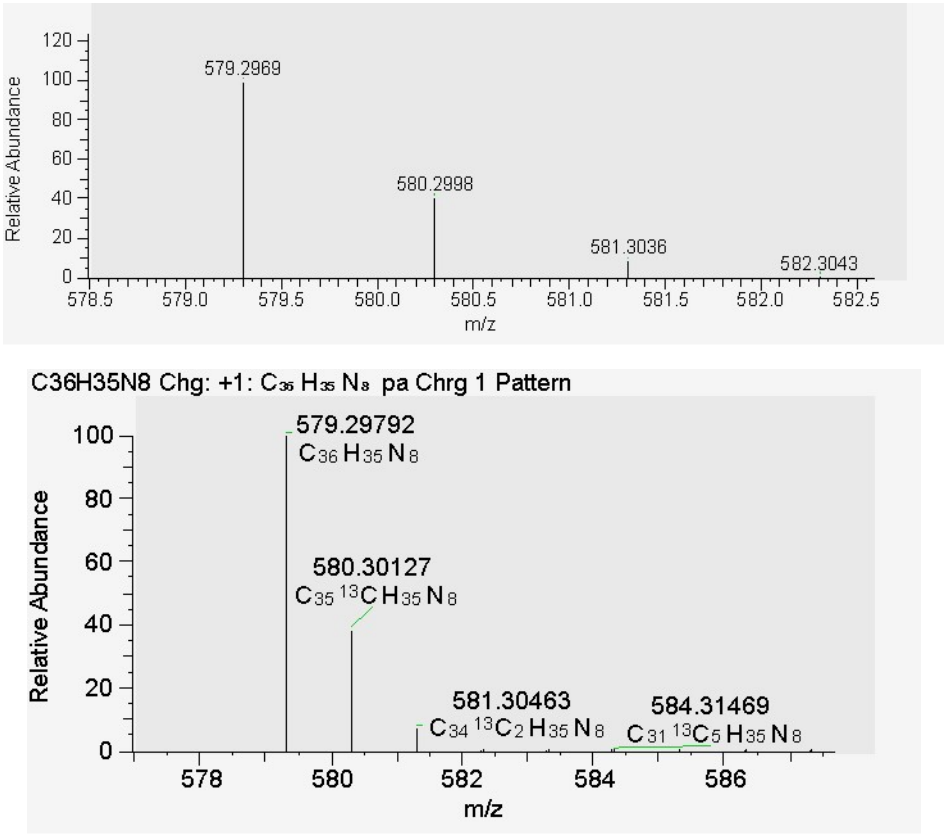
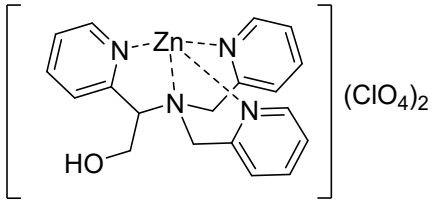


Figure S11. Experimental (top) and simulated (bottom) HR ESI-MS spectrum of **2l**.

3. Zinc complexes characterization

3c



^{1}H NMR (600 MHz, DMSO-d_6) δ 8.69 (d, J = 5.3 Hz, 1H), 8.61 (d, J = 5.3 Hz, 1H), 8.59 (d, J = 5.3 Hz, 1H), 8.15 (td, J = 7.8, 1.7 Hz, 1H), 8.03 (dt, J = 7.8, 4.7 Hz, 1H), 7.91 (t, J = 7.3 Hz, 1H), 7.81 (d, J = 8.0 Hz, 1H), 7.65 (t, J = 6.4 Hz, 1H), 7.57 (d, J = 7.5 Hz, 2H), 7.48 (t, J = 6.4 Hz, 1H), 7.38 (d, J = 7.9 Hz, 1H), 5.70 (s, 1H), 4.60 (d, J = 16.8 Hz, 1H), 4.48 (d, J = 16.9 Hz, 1H), 4.40 (m, 2H), 4.34 (d, J = 17.5 Hz, 1H), 4.25 (m, 1H), 4.20 (d, J = 17.6 Hz, 1H).

^{13}C NMR (151 MHz, DMSO-d_6) δ 155.54 (C), 154.81 (C), 154.54 (C), 147.69 (CH), 147.25 (2 CH), 140.93 (CH), 140.73 (CH), 140.33 (CH), 124.98 (CH), 124.89 (CH), 124.63 (CH), 124.50 (CH), 124.38 (CH), 123.83 (CH), 66.78 (CH), 59.43 (CH_2), 58.92 (CH_2), 54.71 (CH_2).

HRMS (ESI): calcd for $C_{20}H_{21}N_4O_3Zn$ [M - 2 ClO_4 + HCOO]$^+$ 429.0900, found 429.0897

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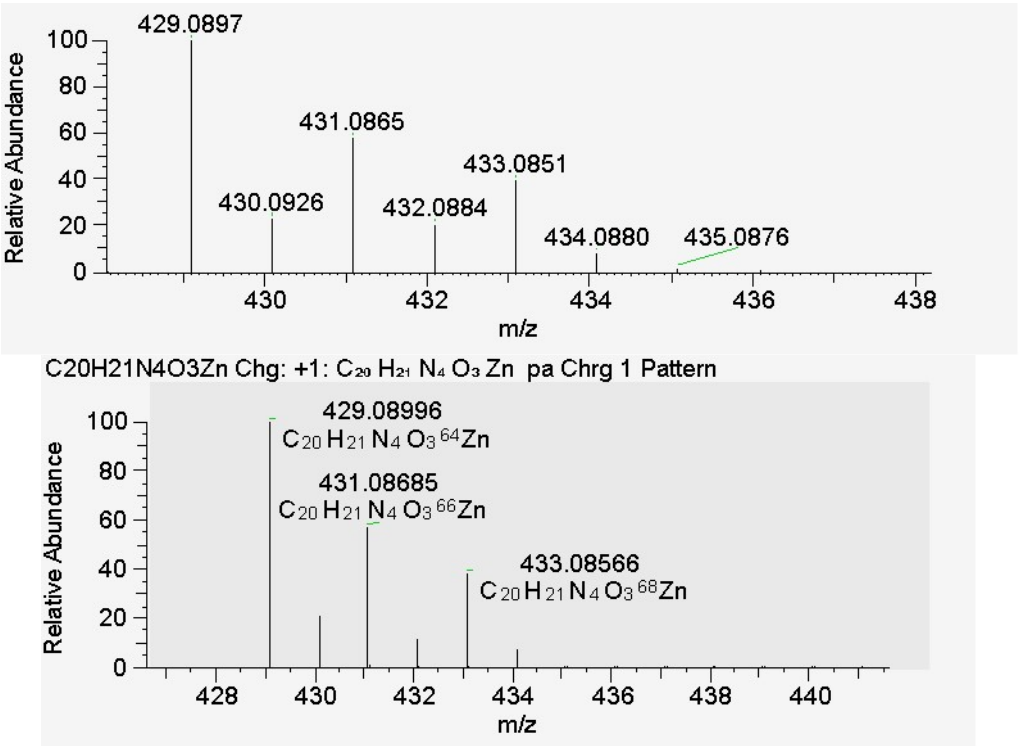
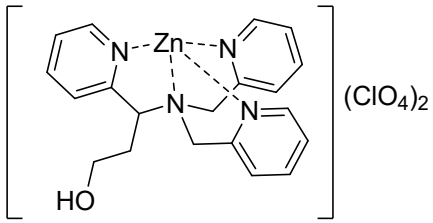


Figure S12. Experimental (top) and simulated (bottom) HR ESI-MS spectrum of **3c**.

3d



^{1}H NMR (600 MHz, DMSO-d_6) δ 8.70 (d, J = 5.2 Hz, 1H), 8.60 (br, 1H), 8.14 (td, J = 7.8, 1.7 Hz, 1H), 8.04 (td, J = 7.7, 1.6 Hz, 1H), 7.89 (t, J = 7.6 Hz, 1H), 7.80 (d, J = 8.1 Hz, 1H), 7.63 (t, J = 6.5 Hz, 1H), 7.56 (m, 2H), 7.46 (t, J = 6.5 Hz, 1H), 7.33 (d, J = 7.9 Hz, 1H), 5.19 (br, 1H), 4.46 (m, 3H), 4.16 (m, 2H), 3.80 (m, 1H), 3.67 (m, 1H), 2.44 (m, 1H), 2.35 (m, 1H).

^{13}C NMR (151 MHz, DMSO-d_6) δ 156.78 (C), 154.64 (C), 154.31 (C), 147.99 (CH), 147.21 (2CH), 141.09 (CH), 140.75 (CH), 140.22 (CH), 124.94 (CH), 124.91 (CH), 124.57 (CH), 124.30 (CH), 123.96 (CH), 123.70 (CH), 63.44 (CH), 58.73 (CH_2), 58.31 (CH_2), 54.18 (CH_2), 30.42 (CH_2).

HRMS (ESI): calcd for $C_{21}H_{23}N_4O_3Zn$ [M - 2 ClO_4 + HCOO]$^+$ 443.1056, found 443.1053.

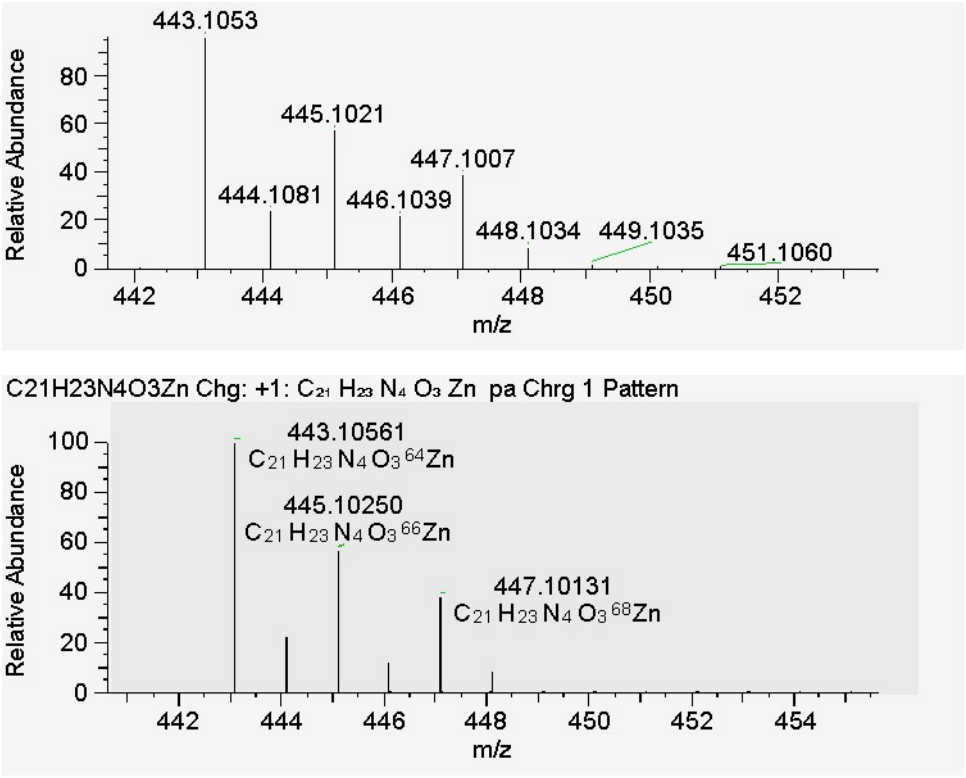
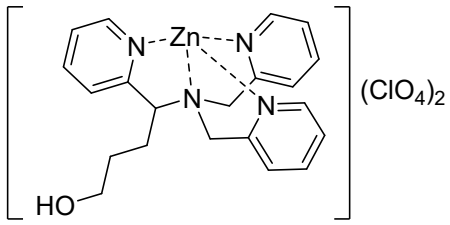


Figure S13. Experimental (top) and simulated (bottom) HR ESI-MS spectrum of **3d**

3e



^{1}H NMR (400 MHz, DMSO-d_6) δ 8.72 (d, J = 5.2 Hz, 1H), 8.61 (br, 2H), 8.15 (td, J = 7.8, 1.8 Hz, 1H), 8.05 (td, J = 7.7, 1.7 Hz, 1H), 7.88 (td, J = 7.7, 1.7 Hz, 1H), 7.77 (d, J = 8.0 Hz, 1H), 7.64 (dd, J = 7.6, 5.2 Hz, 1H), 7.58 (m, 2H), 7.46 (m, 1H), 7.32 (d, J = 8.0 Hz, 1H), 4.72 (t, J = 4.7 Hz, 1H), 4.55 (d, J = 16.5 Hz, 1H), 4.45 (d, J = 16.7 Hz, 1H), 4.26 (dd, J = 8.8, 3.7 Hz, 1H), 3.59 (m, 2H), 2.25 (m, 2H), 1.76 (p, J = 6.3 Hz, 2H).

^{13}C NMR (101 MHz, DMSO-d_6O) δ 156.85 (C), 154.74 (C), 154.36 (C), 148.11 (CH), 147.31 (CH), 147.25 (CH), 141.13 (CH), 140.79 (CH), 140.24 (CH), 124.99 (CH), 124.91 (CH), 124.67 (CH), 124.28 (CH), 124.05 (CH), 123.66 (CH), 66.40 (CH), 60.57 (CH_2), 58.73 (CH_2), 53.79 (CH_2), 30.35 (CH_2), 24.32 (CH_2).

HRMS (ESI): calcd for $C_{22}H_{25}N_4O_3Zn$ [M - 2 ClO_4 + HCOO]$^+$ 457.1213, found 457.1206.

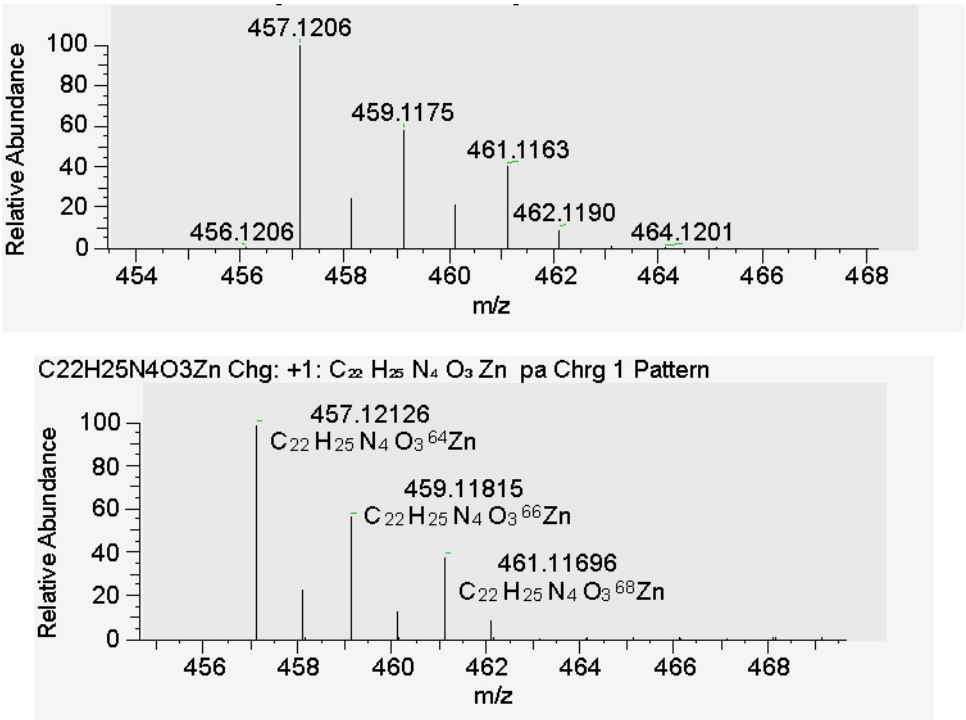
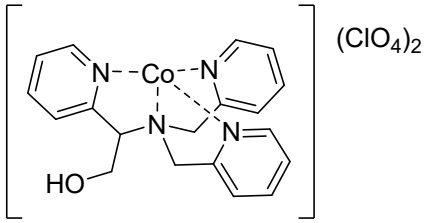


Figure S14. Experimental (top) and simulated (bottom) HR ESI-MS spectrum of **3e**

4. Cobalt complexes characterization

4c



Elemental analysis: calcd. for $C_{19}H_{20}N_4O_9Cl_2Co \cdot H_2O \cdot 0.5\ CH_3CN$: C, 38.95; H, 3.84; N, 10.22. Found: C, 39.10; H, 3.81; N, 10.03.

HRMS (ESI): calcd for $C_{19}H_{20}N_4O_5ClCo\ [M - ClO_4]^+$ 478.0449, found 478.0447.

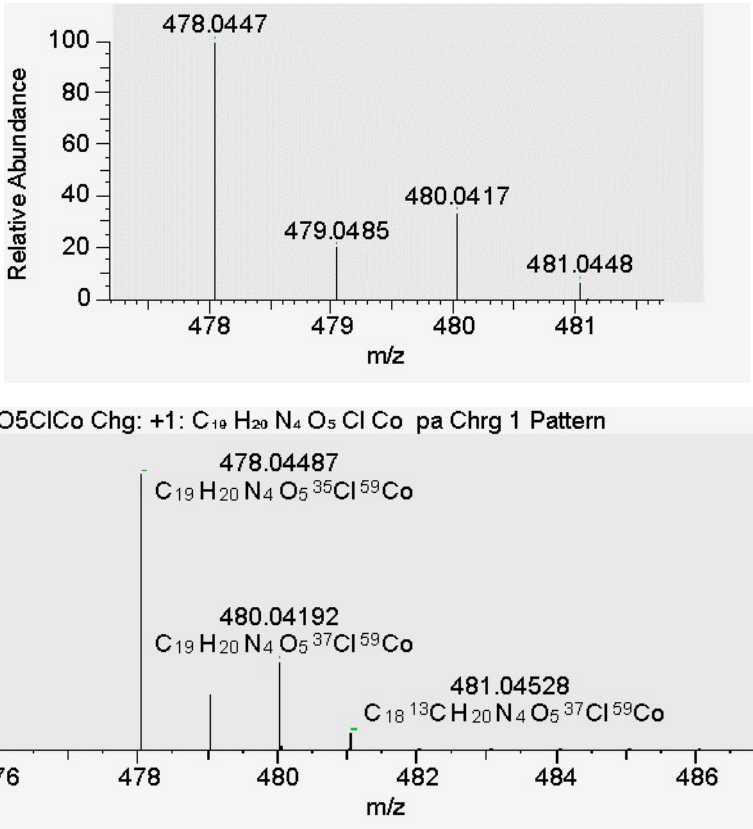
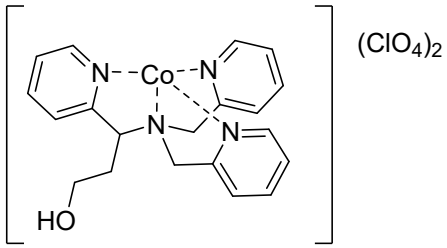


Figure S15. Experimental (top) and simulated (bottom) HR ESI-MS spectrum of **4c**

4d



Elemental analysis (%) calcd. for $C_{20}H_{22}N_4O_9Cl_2Co \cdot 0.33\ CH_3CN \cdot 1.67\ H_2O$: C, 39.03; H, 4.17; N, 9.54. Found: C, 38.60; H, 3.95; N, 9.71.

HRMS (ESI): calcd for $C_{20}H_{22}N_4O_5ClCo$ $[M - ClO_4]^+$ 492.0605, found 492.0608.

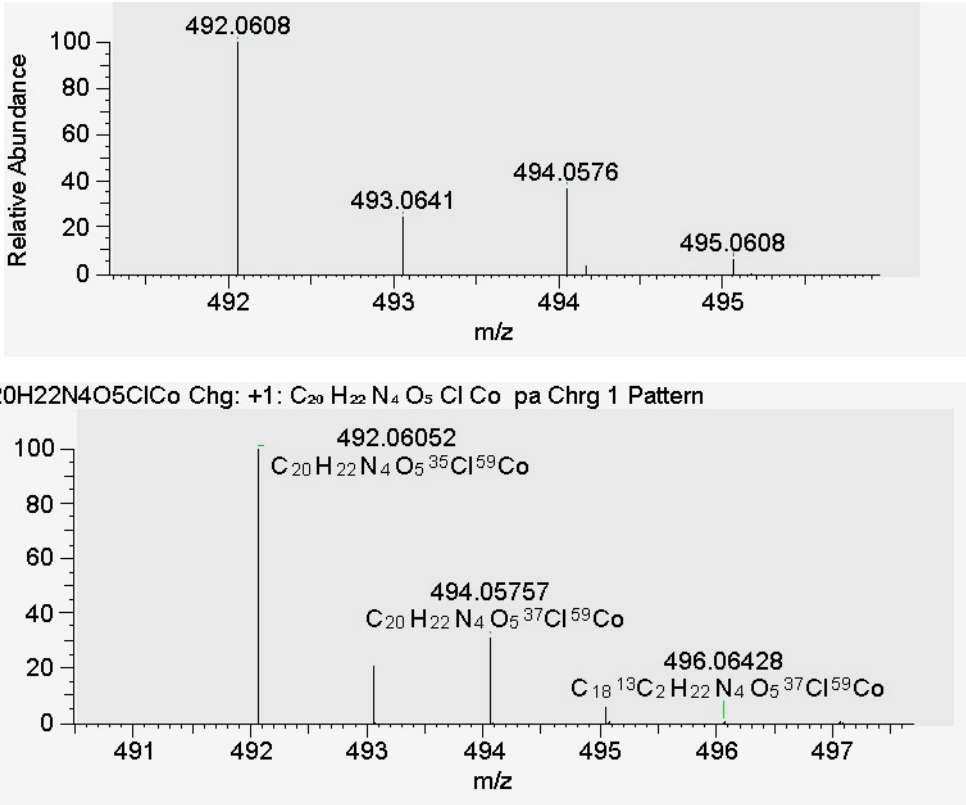
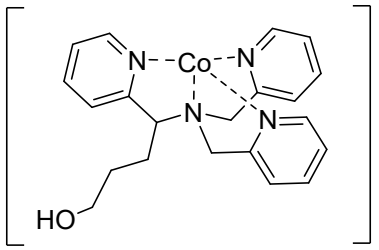


Figure S16. Experimental (top) and simulated (bottom) HR ESI-MS spectrum of **4d**

4e



$(ClO_4)_2$

Elemental analysis (%) calcd. for $C_{21}H_{25}N_4O_9Cl_2Co \cdot 0.67\ CH_3CN$: C, 42.33; H, 4.14; N, 10.32. Found: C, 42.72; H, 4.25; N, 9.81.

HRMS (ESI): calcd for $C_{21}H_{25}N_4O_5ClCo\ [M - ClO_4]^+$ 506.0762, found 506.0759.

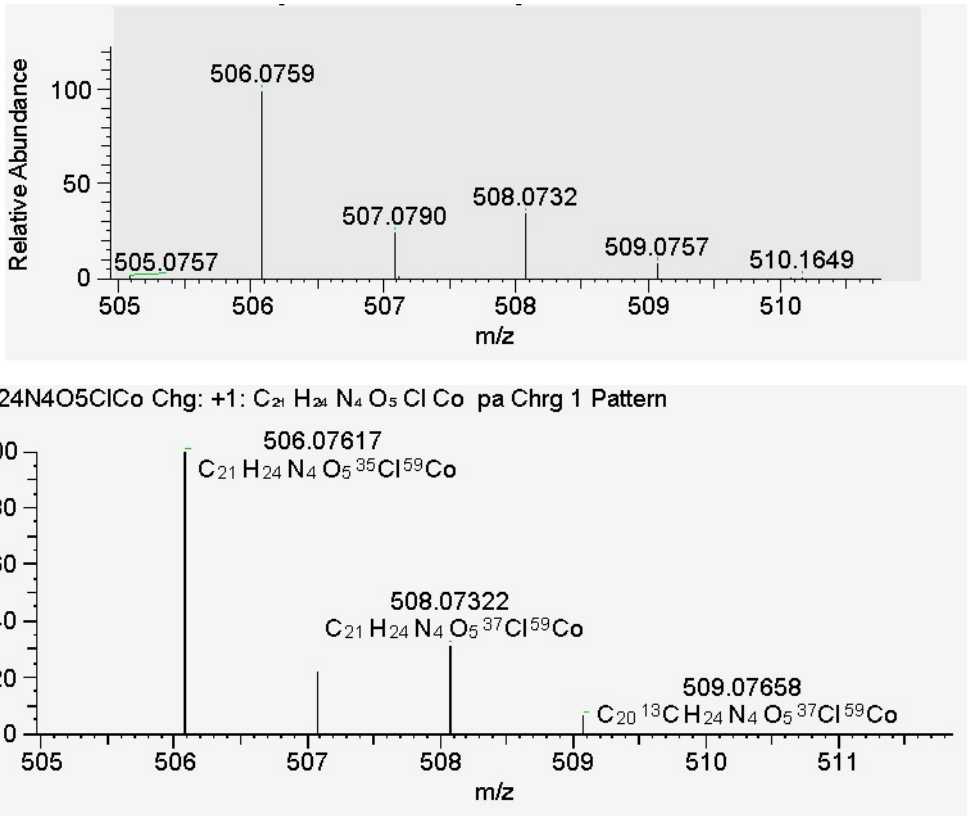
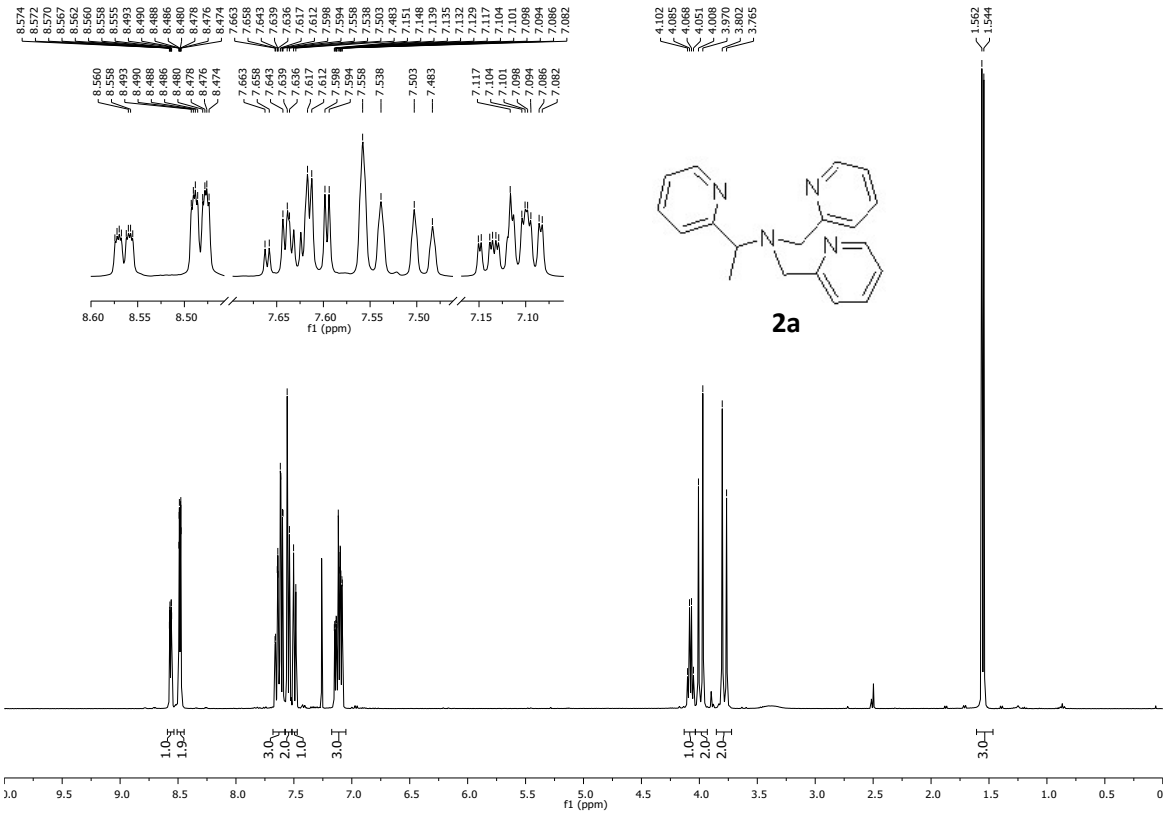
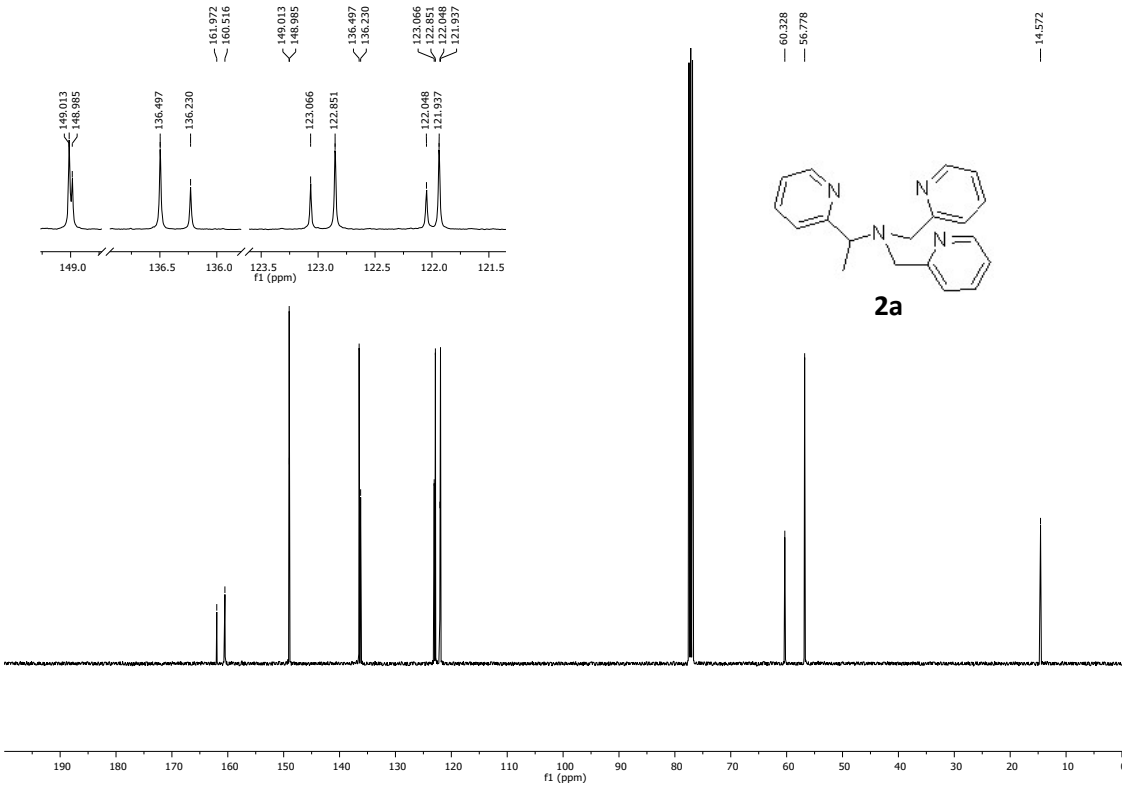
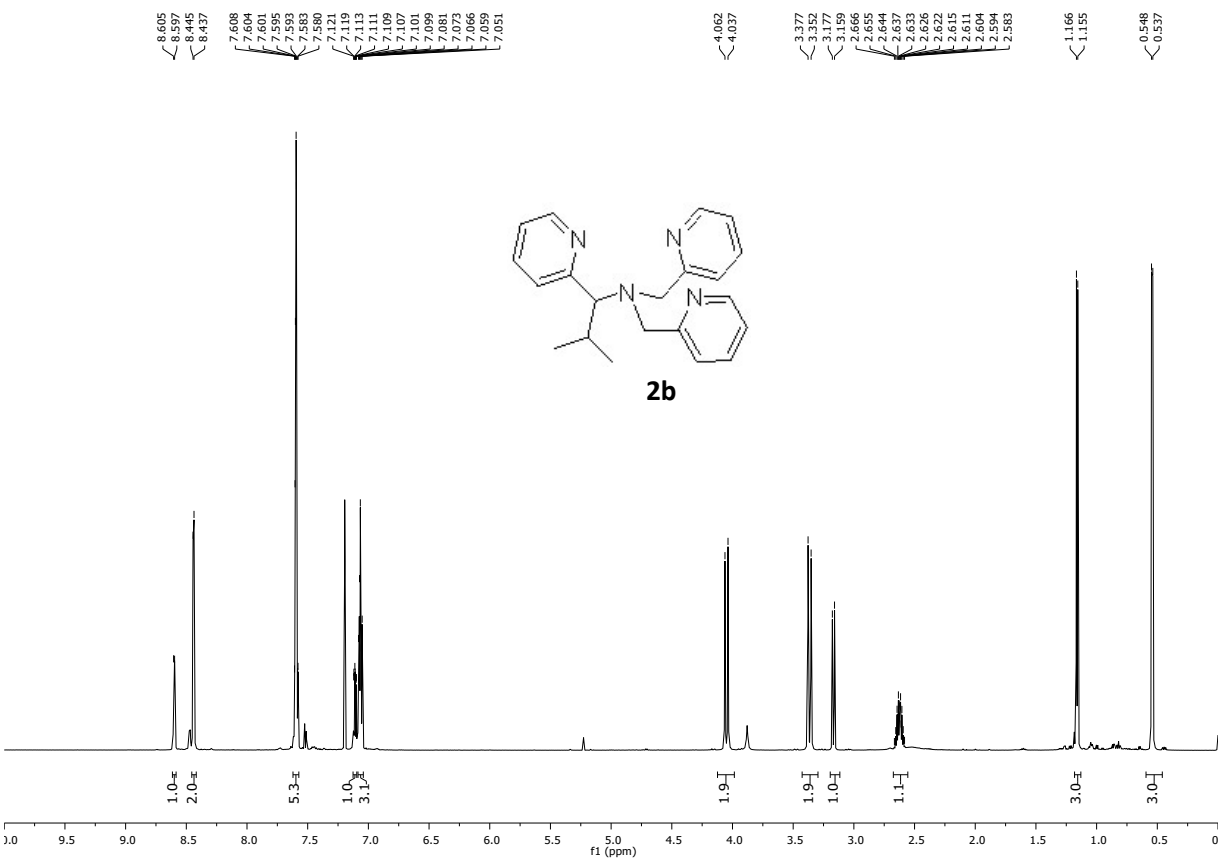


Figure S17. Experimental (top) and simulated (bottom) HR ESI-MS spectrum of **4e**

5. NMR spectra



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7.595
7.593
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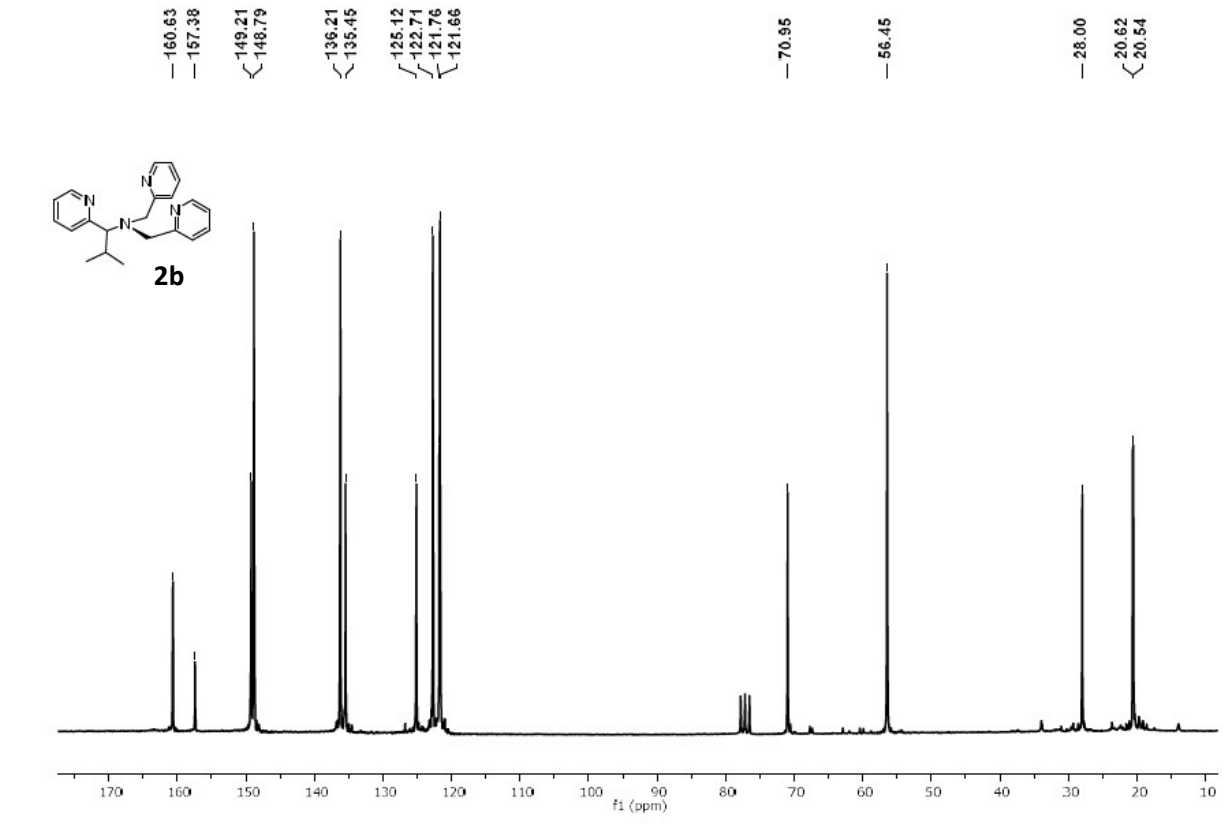
7.580
7.121
7.119
7.113
7.111
7.109
7.107
7.101
7.099
7.081
7.073
7.066
7.059
7.051
4.062
4.037
3.377
3.352
3.177
3.159
2.666
2.655
2.644
2.637
2.633
2.626
2.622
2.615
2.611
2.604
2.594
2.583
1.166
1.155
0.548
0.537
1.0
2.0
5.3
1.0
3.1
1.9
1.9
1.0
1.1
3.0
3.0
f1 (ppm)

2b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149.21
148.79
136.21
135.45
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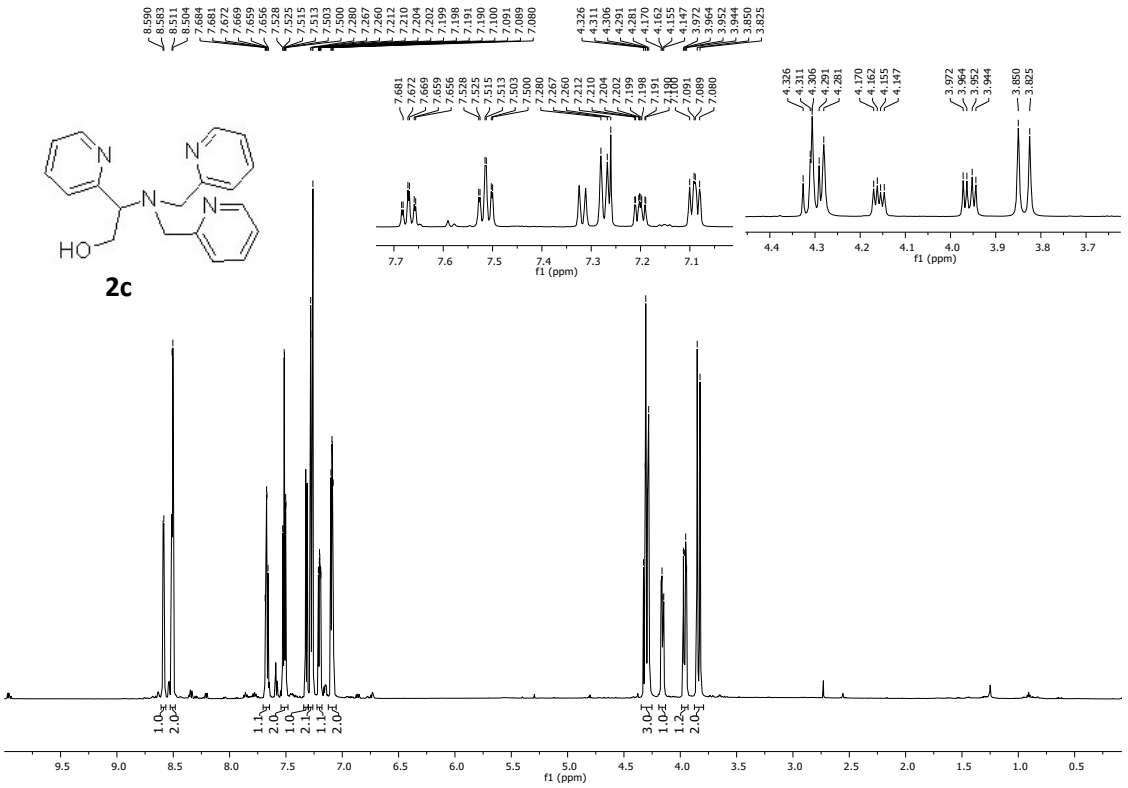
122.71
121.76
121.66
70.95
56.45
28.00
20.62
20.54
f1 (ppm)

2b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7.656
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7.513
7.503
7.500
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7.210
7.204
7.202
7.199
7.198
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7.190
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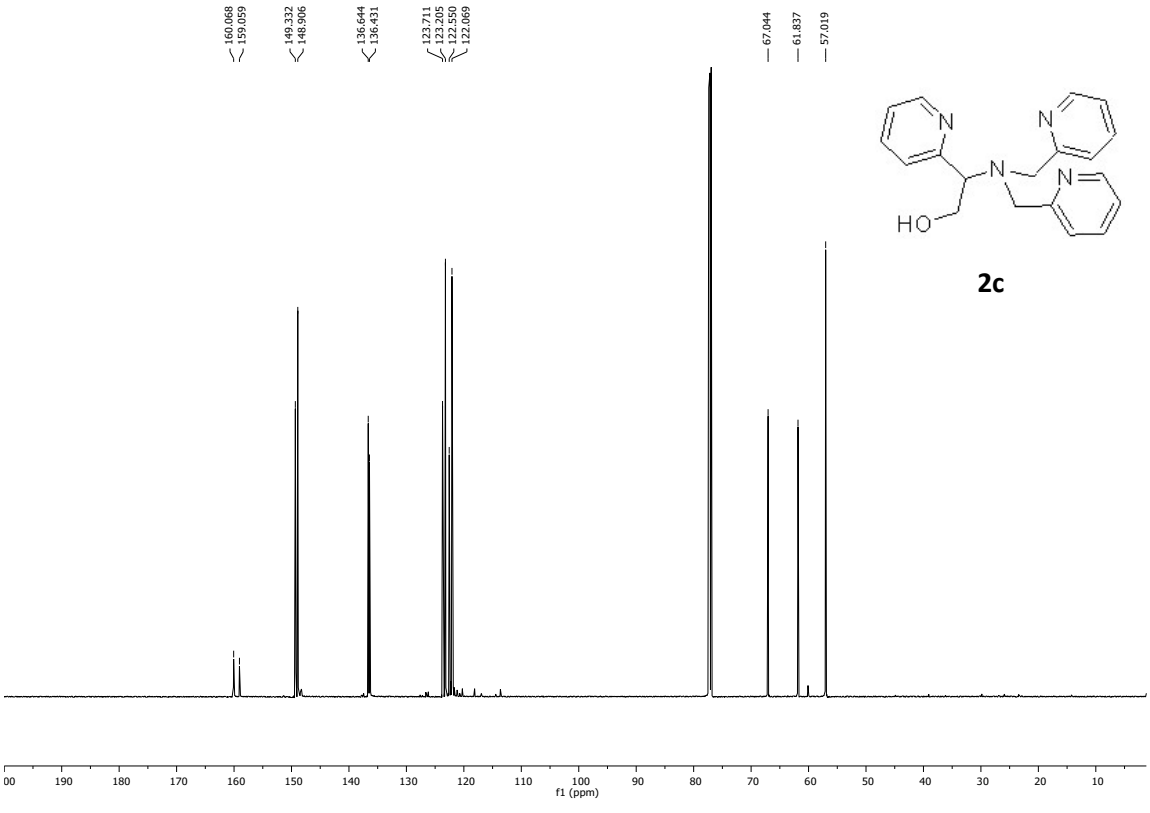
3.850
3.825
HO
2c
f1 (ppm)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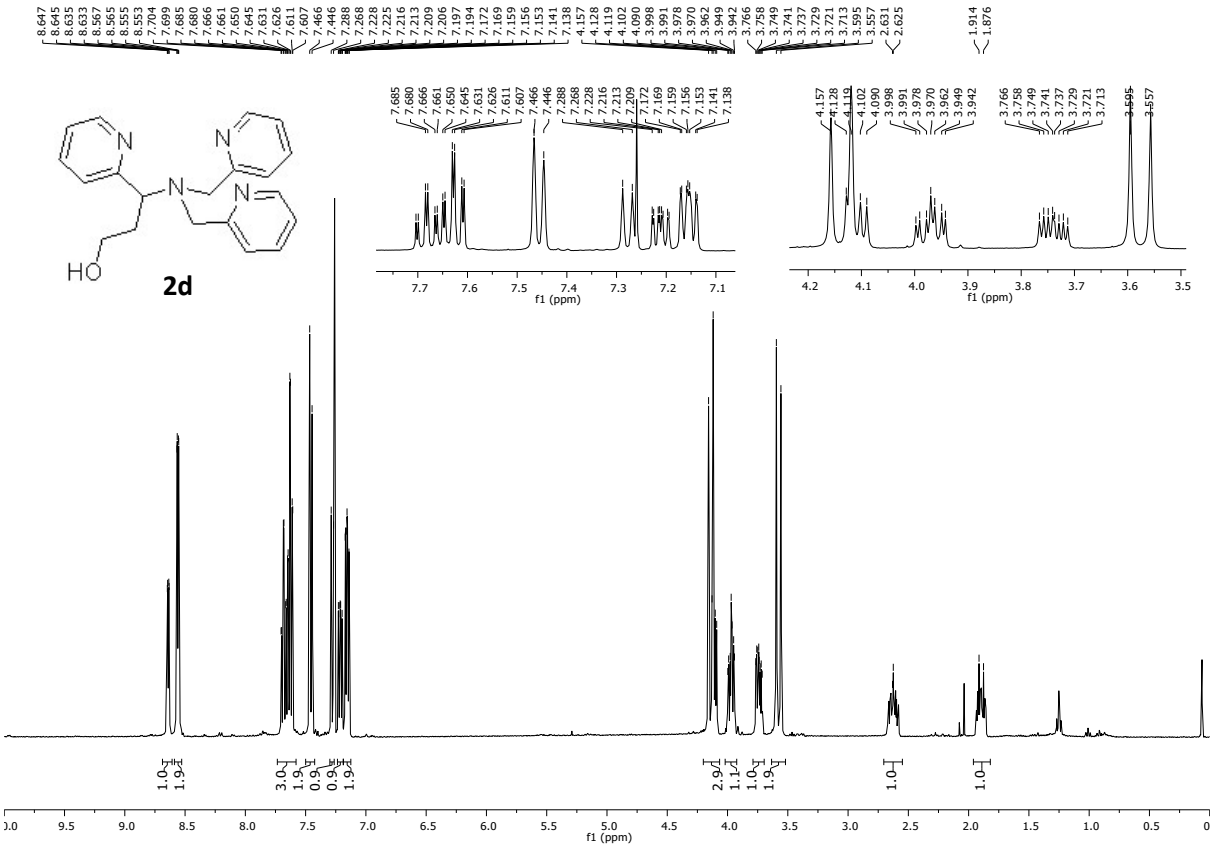
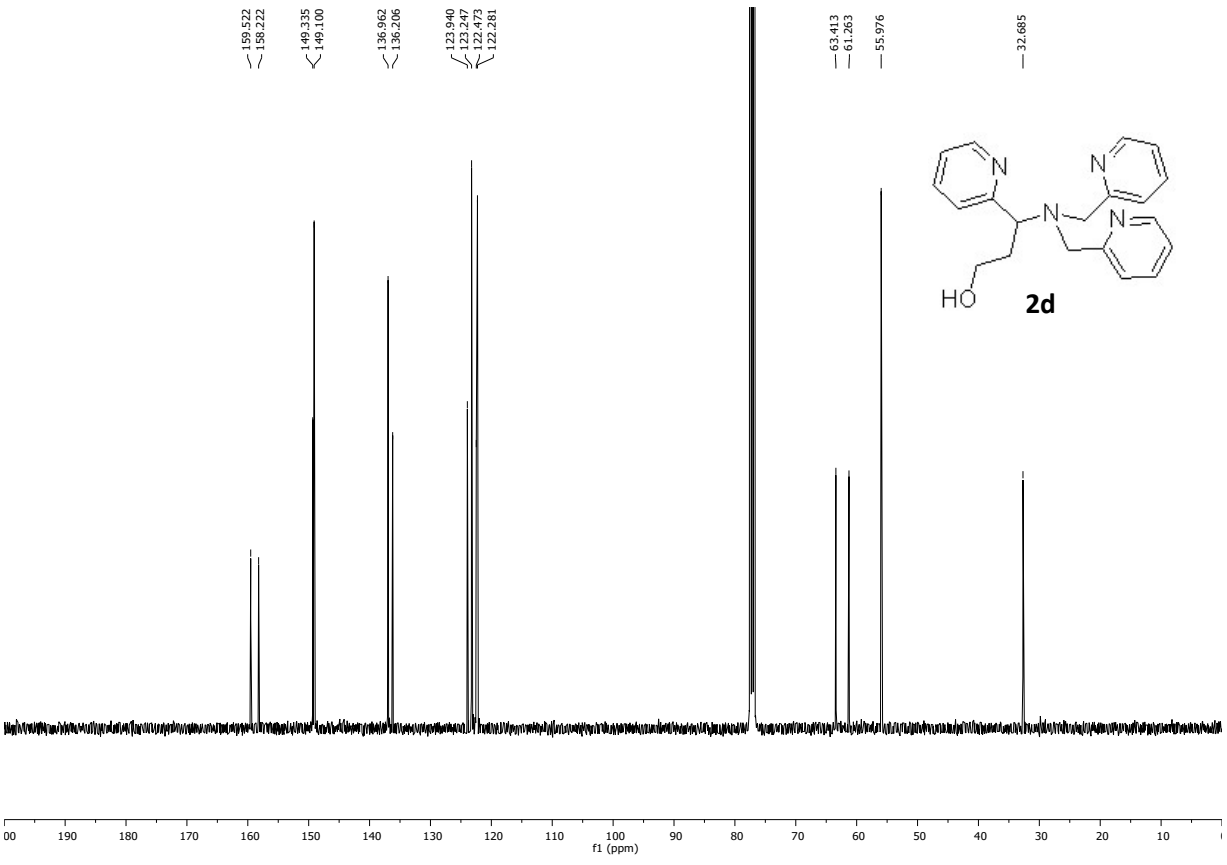
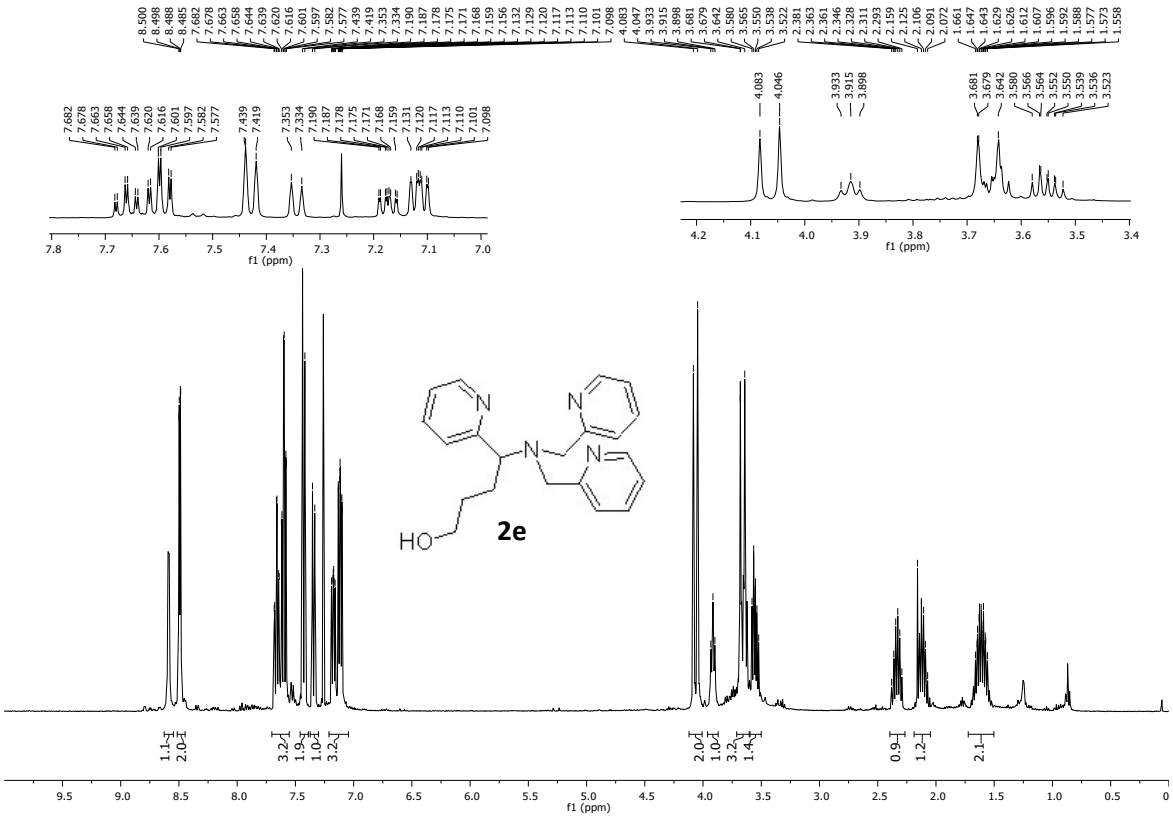
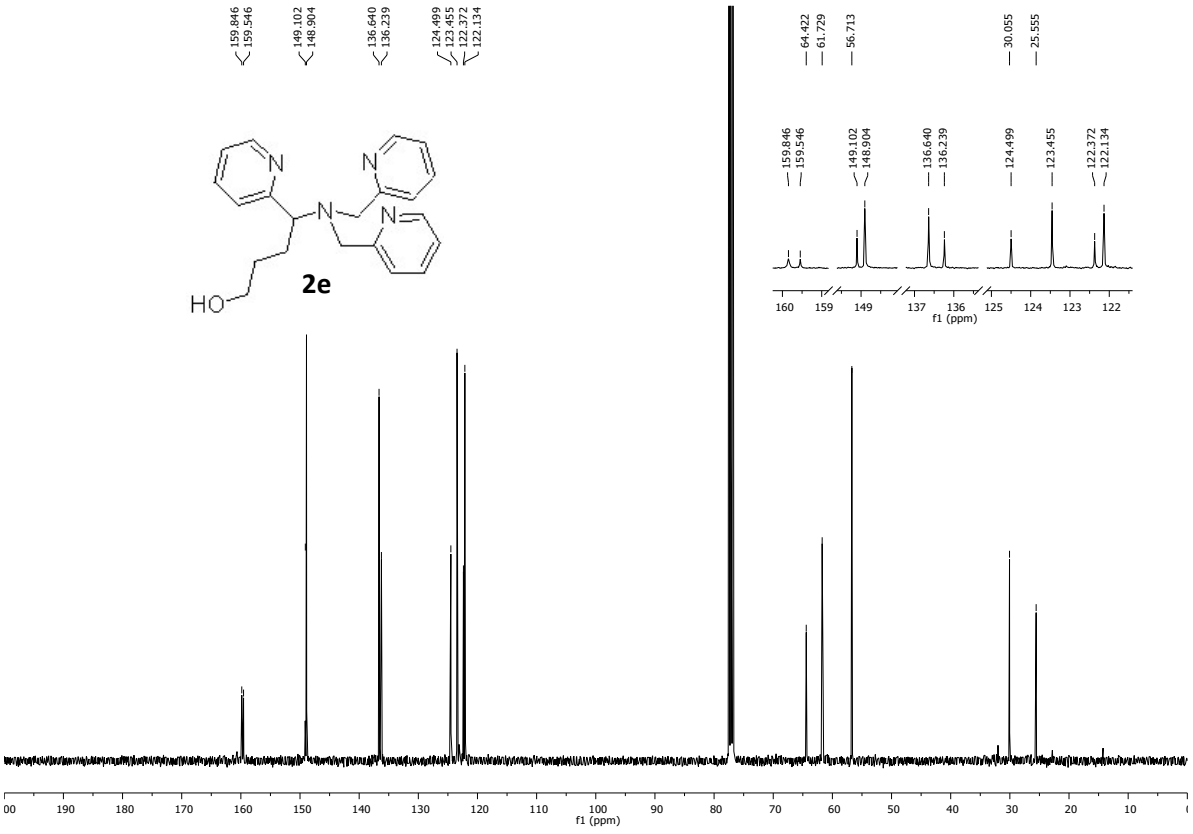
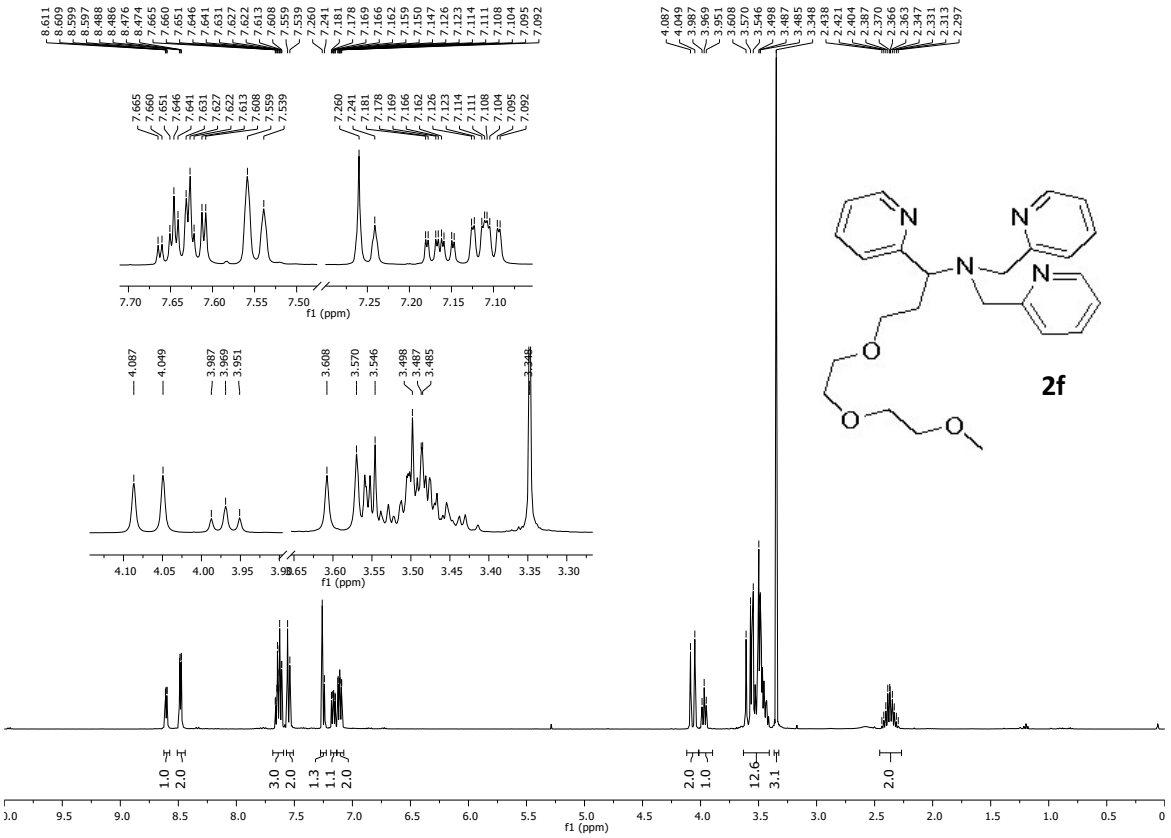
61.837
57.019
HO
2c
f1 (ppm)

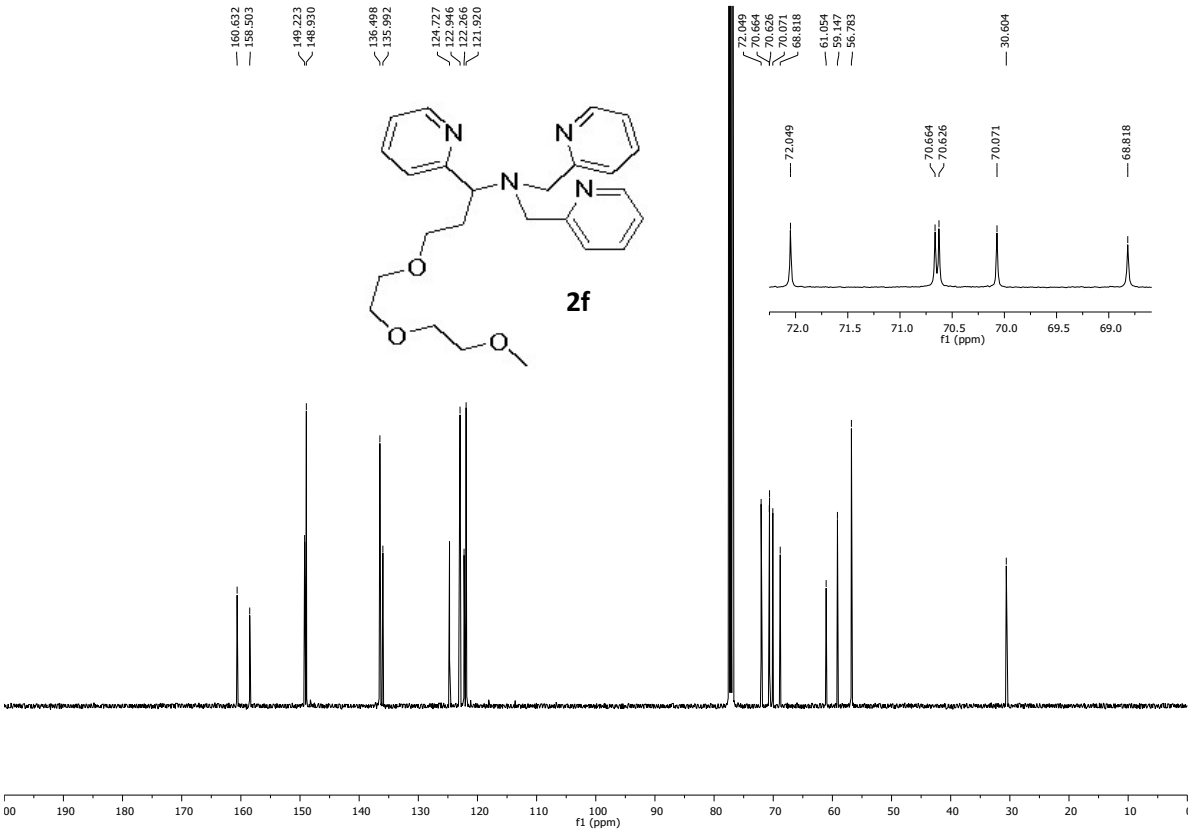

2d
f1 (ppm)

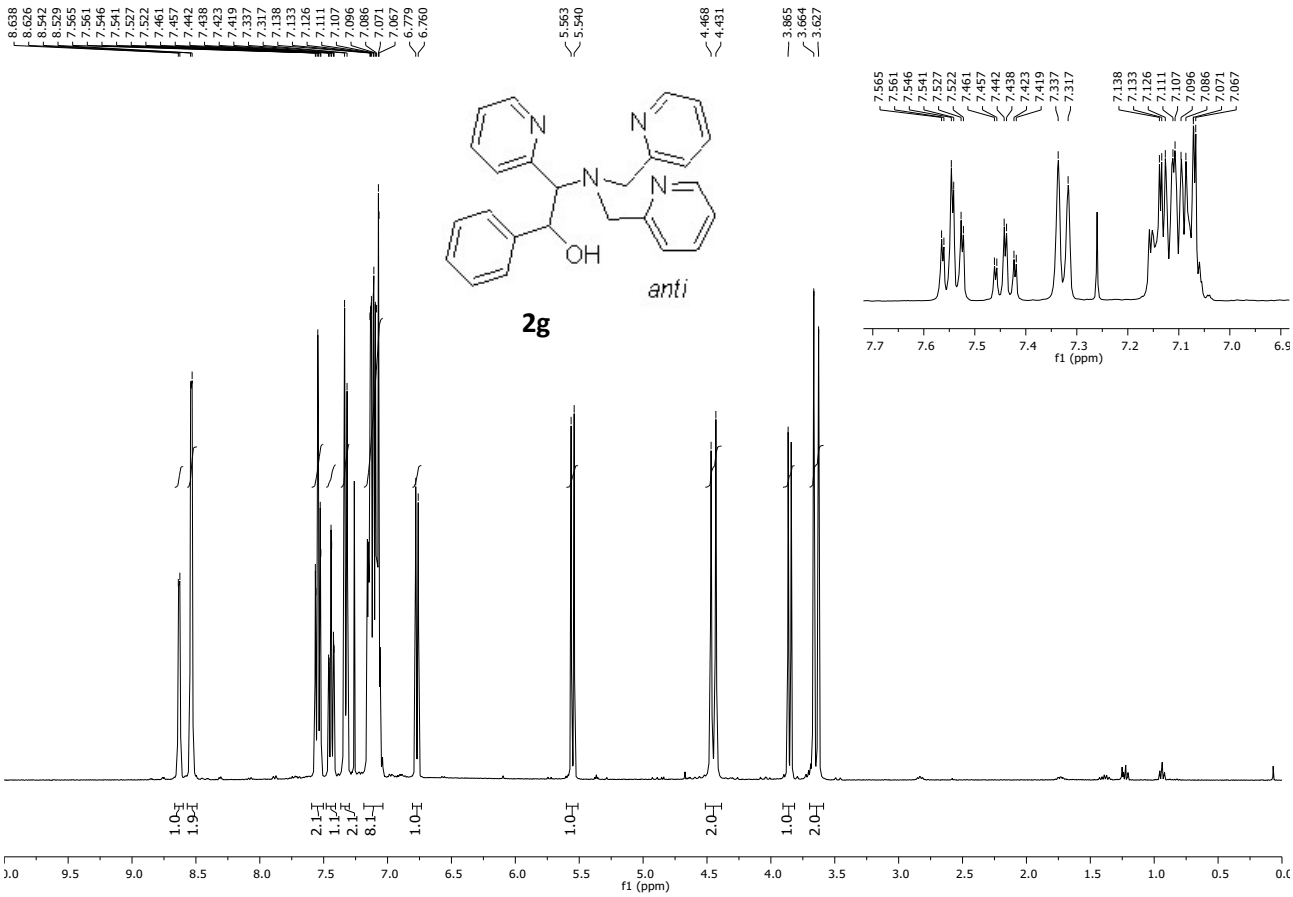

2d
f1 (ppm)


2e
f1 (ppm)


2e
f1 (ppm)


2f
f1 (ppm)


2f
f1 (ppm)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7.442
7.438
7.423
7.419
7.337
7.317
7.138
7.133
7.126
7.111
7.107
7.096
7.086
7.071
7.067
6.779
6.760
5.563
5.540
4.468
4.431
3.865
3.664
3.627
N
N
N
OH
anti
2g
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1.9
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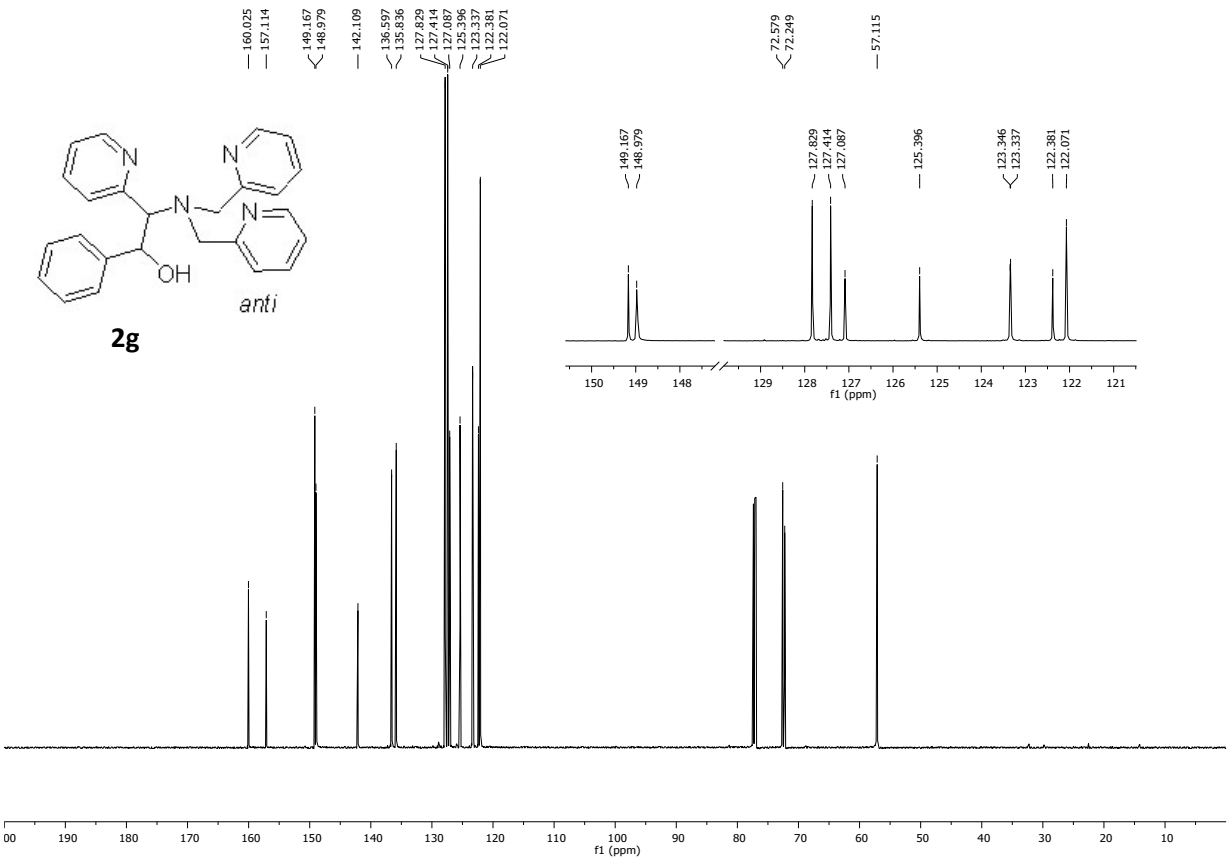
1.1
2.1
8.1
1.0
1.0
2.0
1.0
2.0
f1 (ppm)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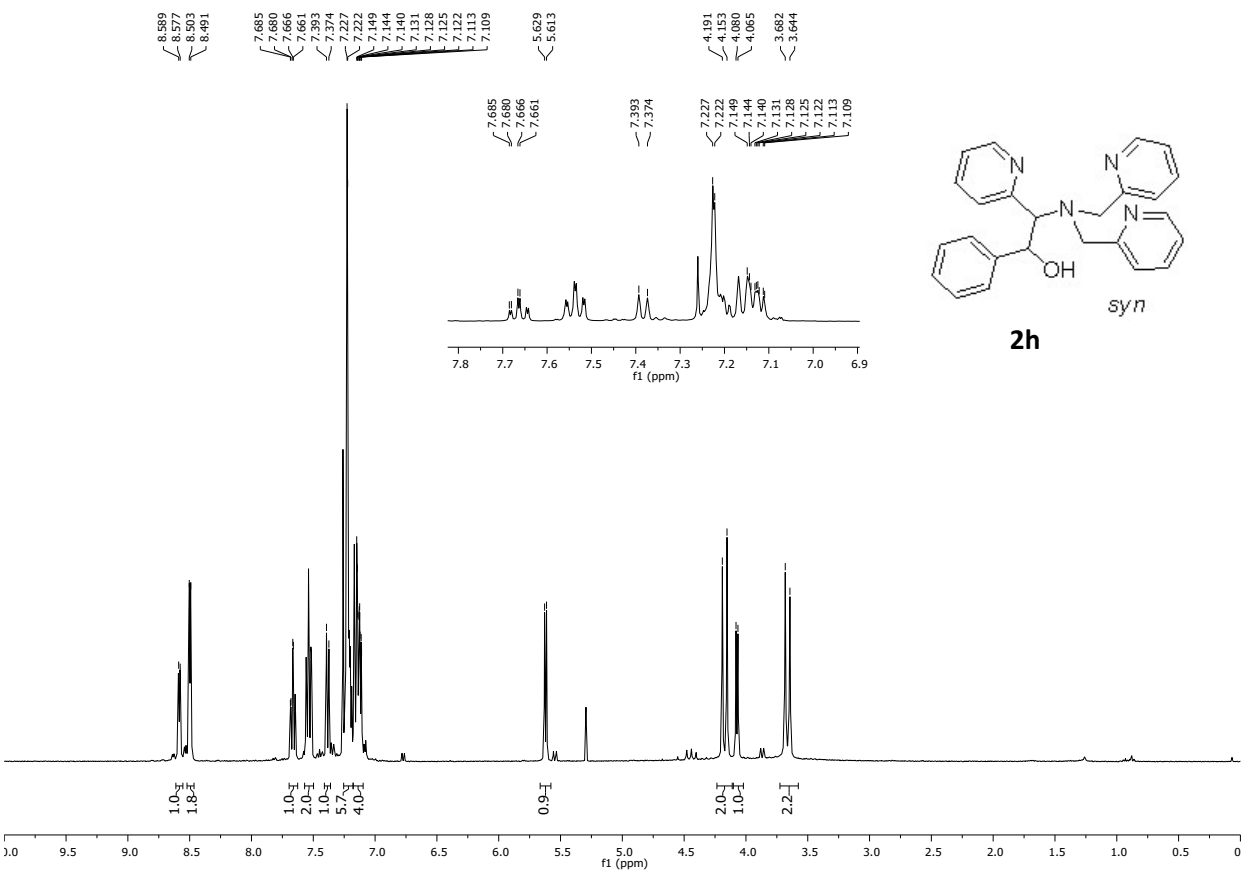
N
N
OH
anti
2g
f1 (ppm)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7.227
7.222
7.149
7.144
7.140
7.131
7.128
7.125
7.122
7.113
7.109
5.629
5.613
4.191
4.153
4.080
4.065
3.682
3.644
1.0
1.8
1.0
2.0
1.0
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0.9
2.0
1.0
2.2
f1 (ppm)
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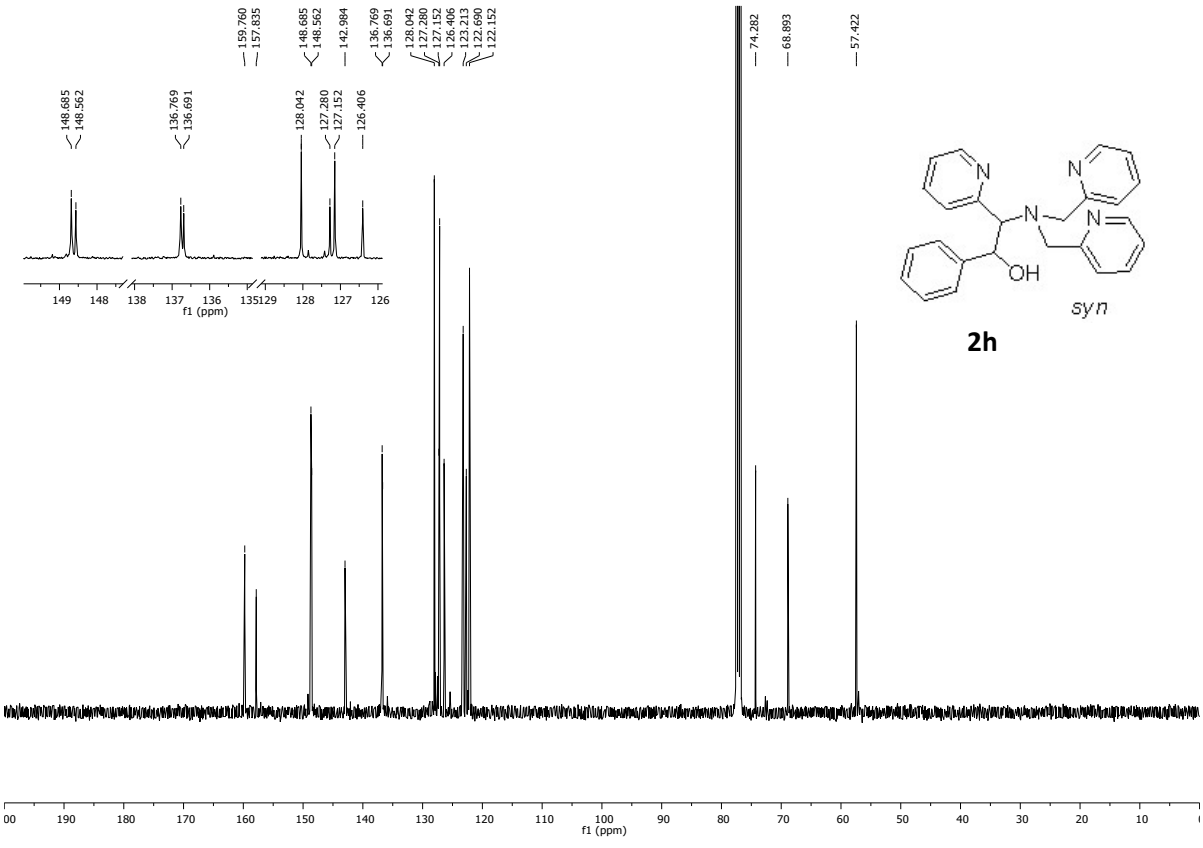
N
N
N
OH
syn

2h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127.280
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122.152
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57.422
f1 (ppm)
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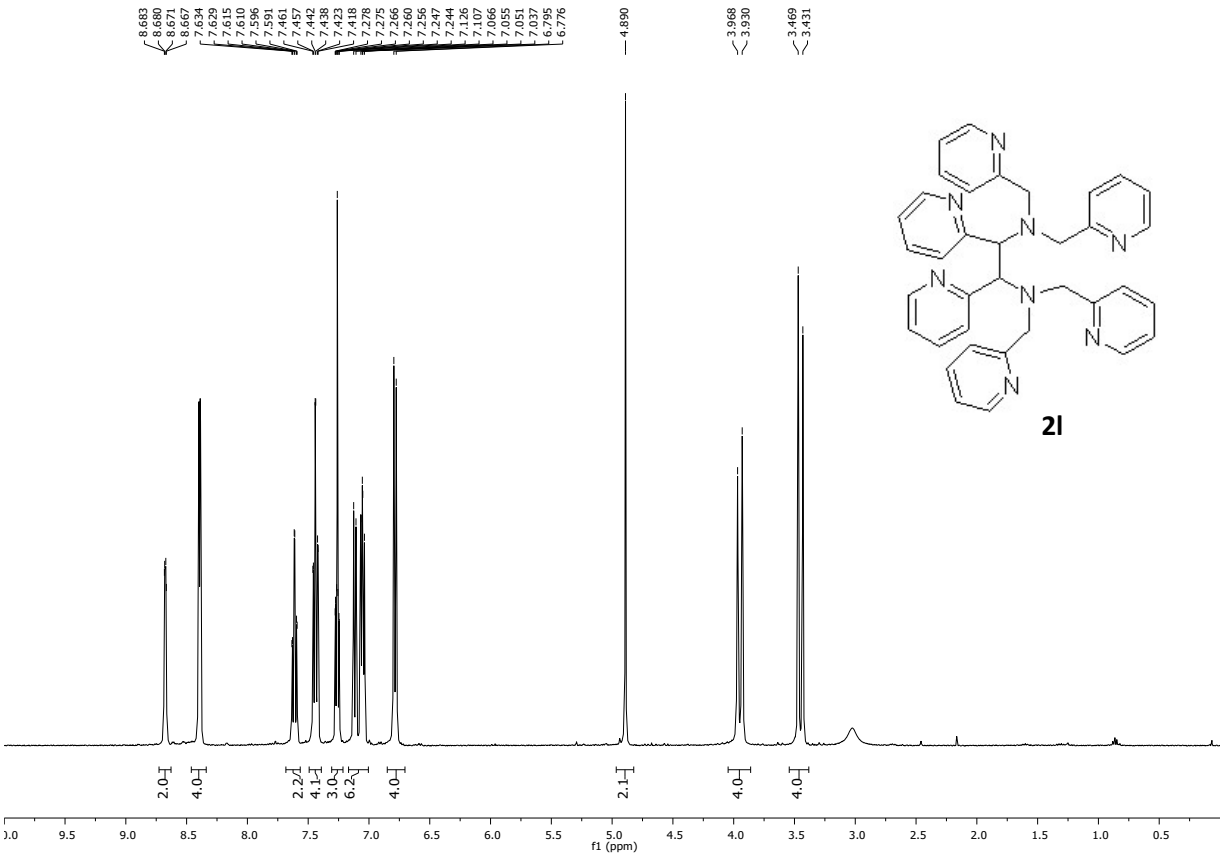
N
N
N
OH
syn

2h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7.442
7.438
7.423
7.418
7.278
7.275
7.266
7.260
7.256
7.247
7.244
7.126
7.107
7.066
7.055
7.051
7.037
6.795
6.776
4.890
3.968
3.930
3.469
3.431
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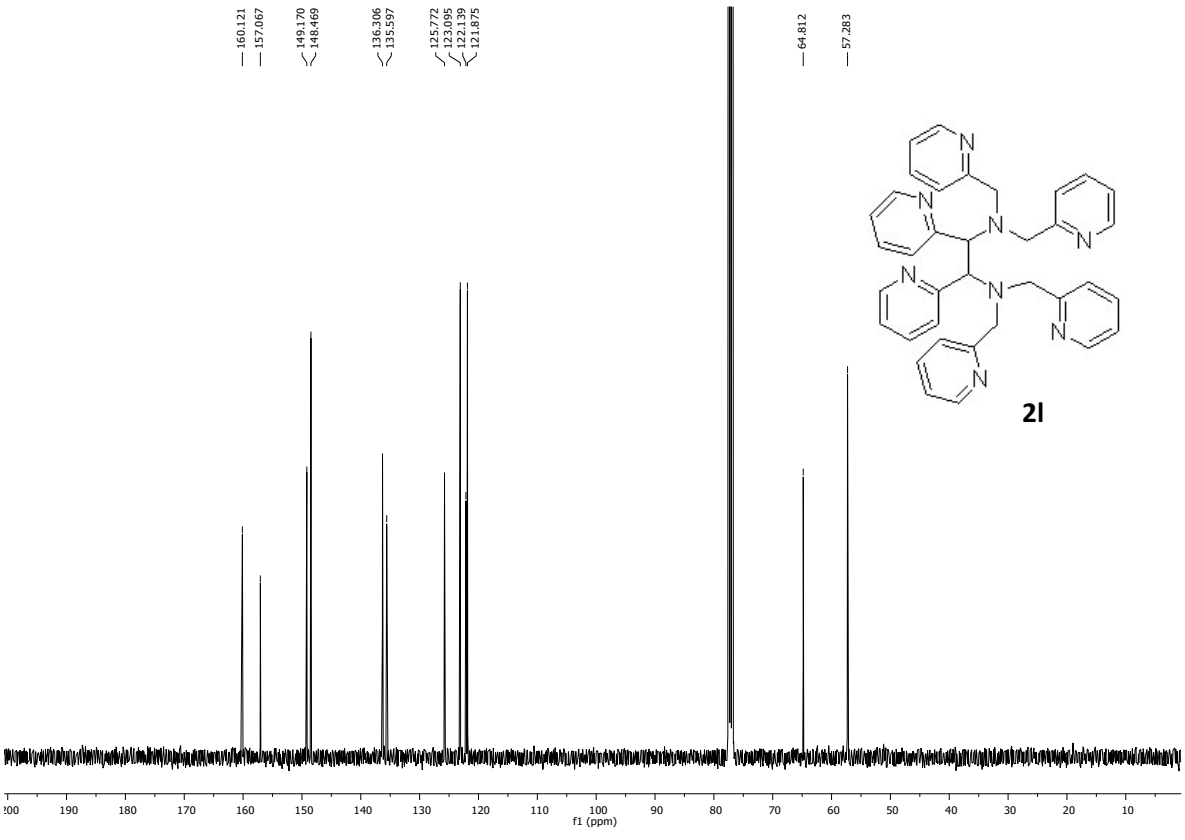
4.0
2.2
4.1
3.0
6.2
4.0
2.1
4.0
4.0
f1 (ppm)

2l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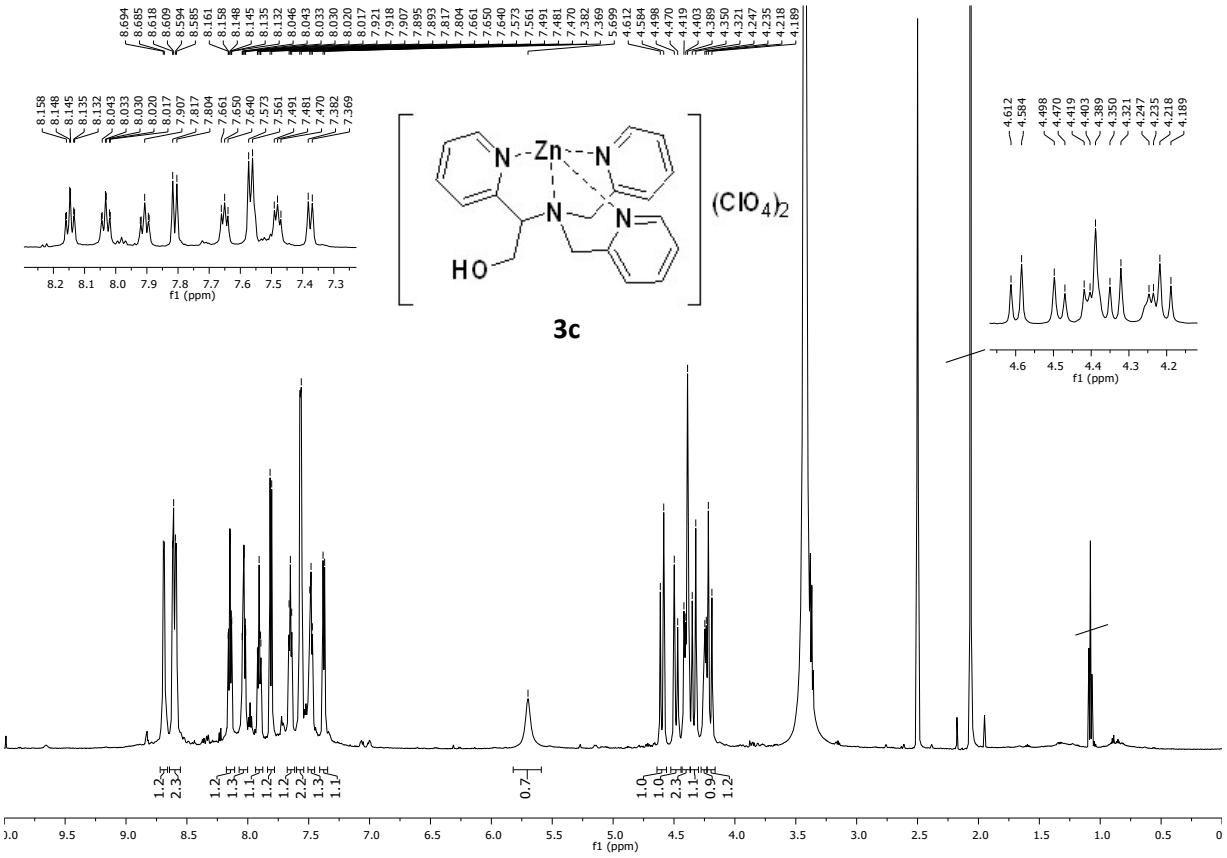
57.283
f1 (ppm)

2l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8.033
8.030
8.020
8.017
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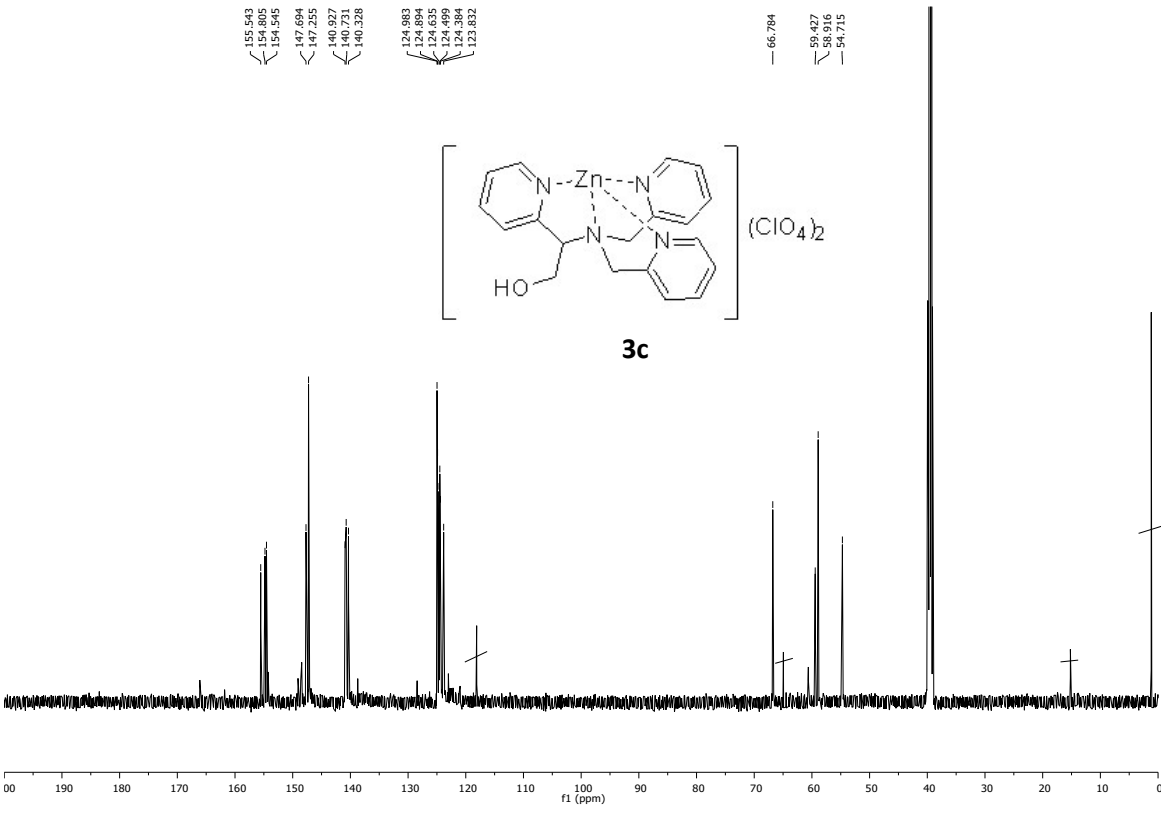
7.918
7.907
7.895
7.893
7.817
7.804
7.661
7.650
7.640
7.573
7.561
7.491
7.481
7.470
7.382
7.369
5.699
4.612
4.584
4.498
4.470
4.419
4.403
4.389
4.350
4.321
4.247
4.235
4.218
4.189
N
Zn
N
N
N
HO
(ClO4)2
f1 (ppm)

3c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140.328
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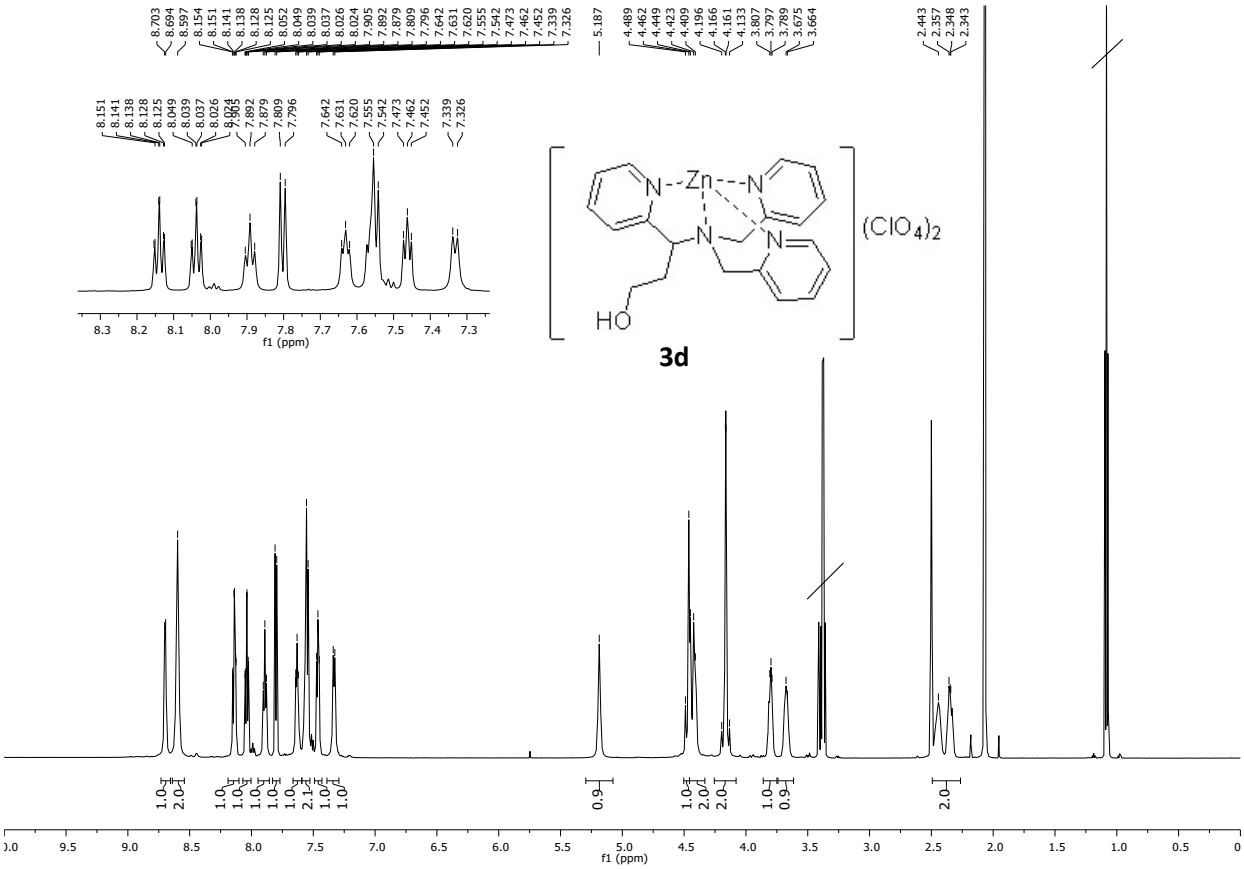
124.384
123.832
66.784
59.427
58.916
54.715
N
Zn
N
N
N
HO
(ClO4)2
f1 (ppm)

3c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7.642
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7.462
7.452
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7.326
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4.462
4.449
4.423
4.409
4.196
4.166
4.161
4.133
3.807
3.797
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3.664
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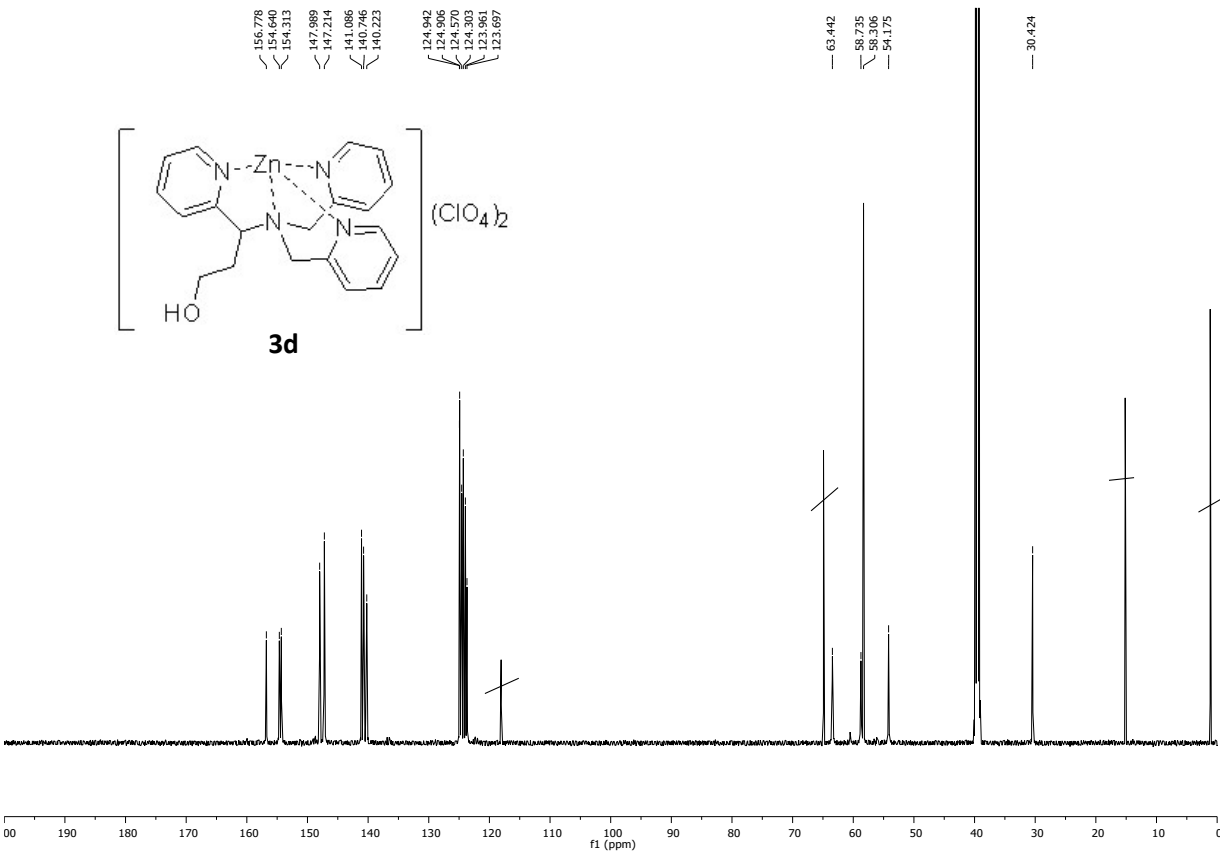
2.357
2.348
2.343
f1 (ppm)
(ClO4)2
HO
3d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147.214
141.086
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124.906
124.570
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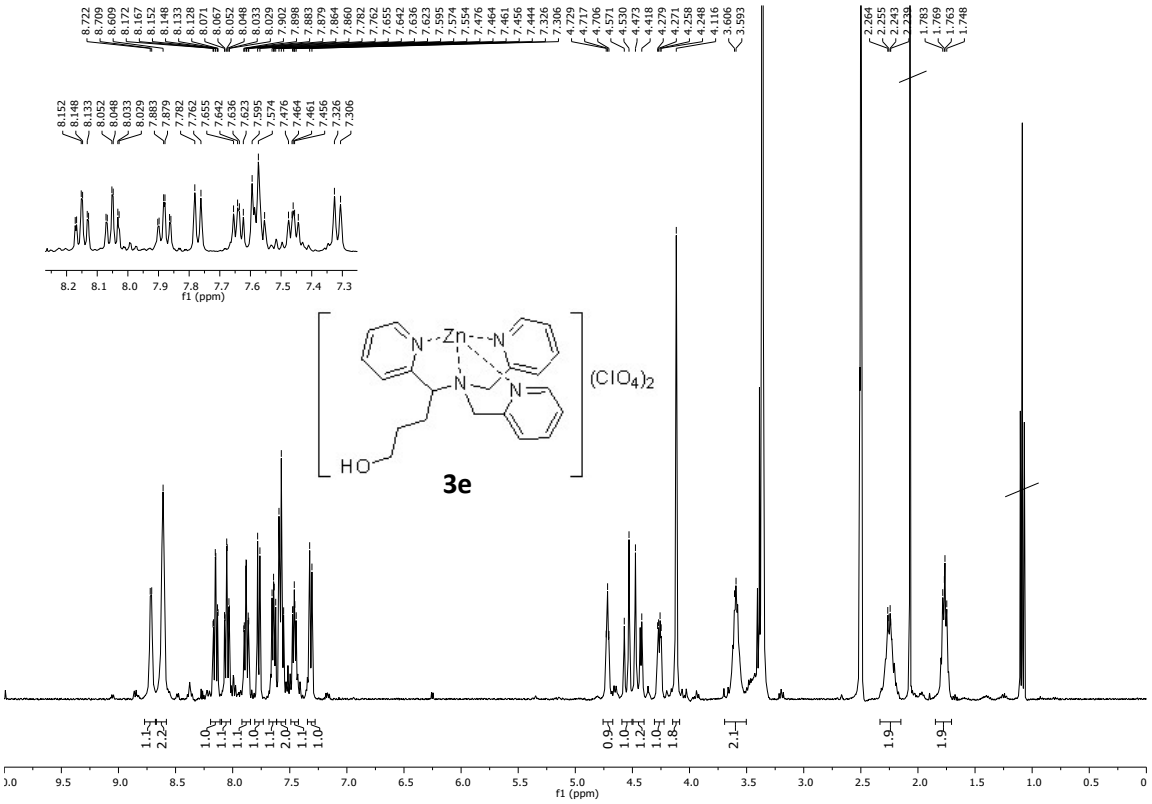
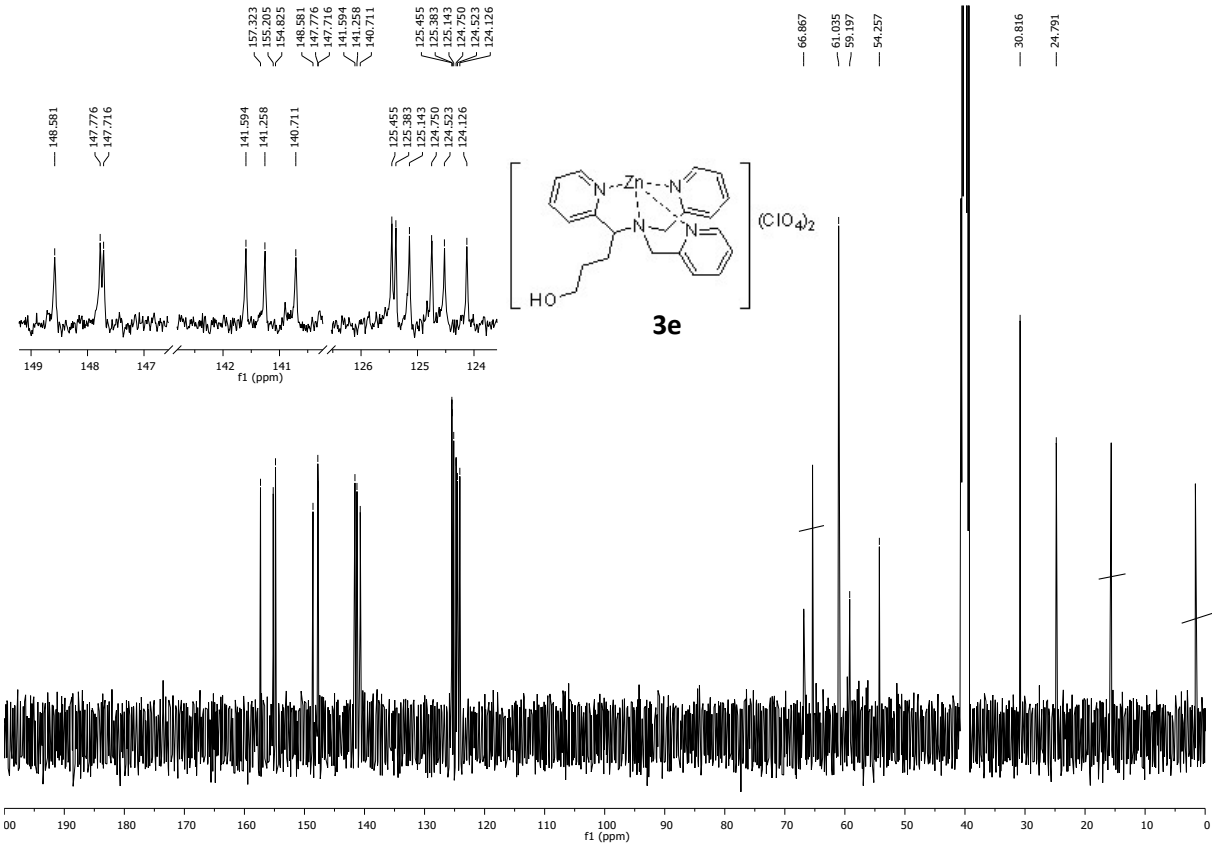
123.961
123.697
63.442
58.735
58.306
54.175
30.424
f1 (ppm)
(ClO4)2
HO
3d


8.722
8.709
8.609
8.172
8.167
8.152
8.148
8.133
8.128
8.071
8.067
8.052
8.048
8.033
8.029
7.902
7.898
7.883
7.879
7.864
7.860
7.782
7.762
7.655
7.642
7.636
7.623
7.595
7.574
7.554
7.476
7.464
7.461
7.456
7.444
7.326
7.306
4.729
4.717
4.706
4.571
4.550
4.473
4.418
4.279
4.271
4.258
4.248
4.116
3.606
3.593
2.264
2.255
2.243
2.232
1.783
1.769
1.763
1.748
f1 (ppm)
(ClO4)2
HO
3e


157.323
155.205
154.825
148.581
147.776
147.716
141.594
141.258
140.711
125.455
125.383
125.143
124.750
124.523
124.126
66.867
61.035
59.197
54.257
30.816
24.791
f1 (ppm)
(ClO4)2
HO
3e