Selective Modifications of Hydrophobic Vitamin B_{12} Derivatives at *c*-and *d*-Positions

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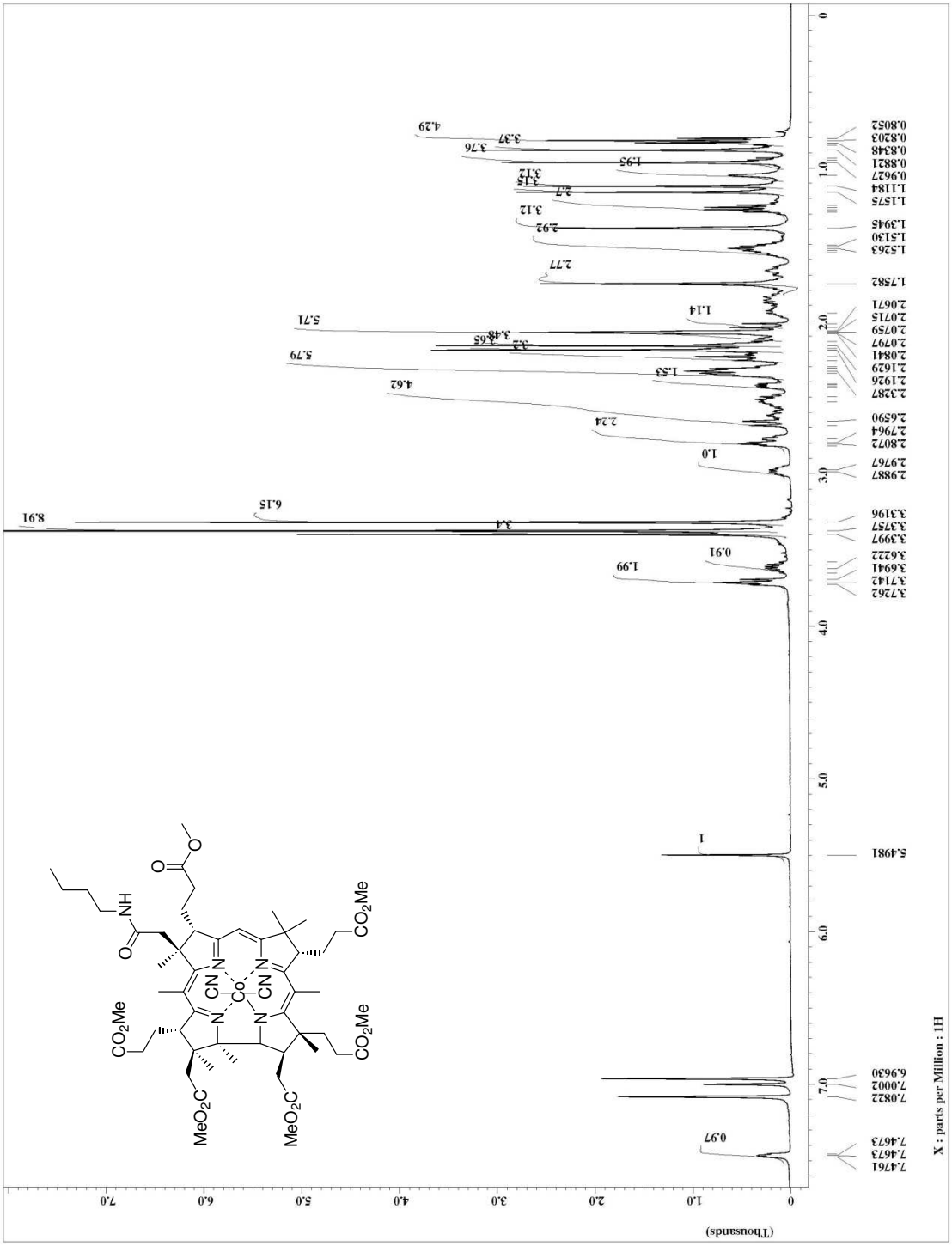
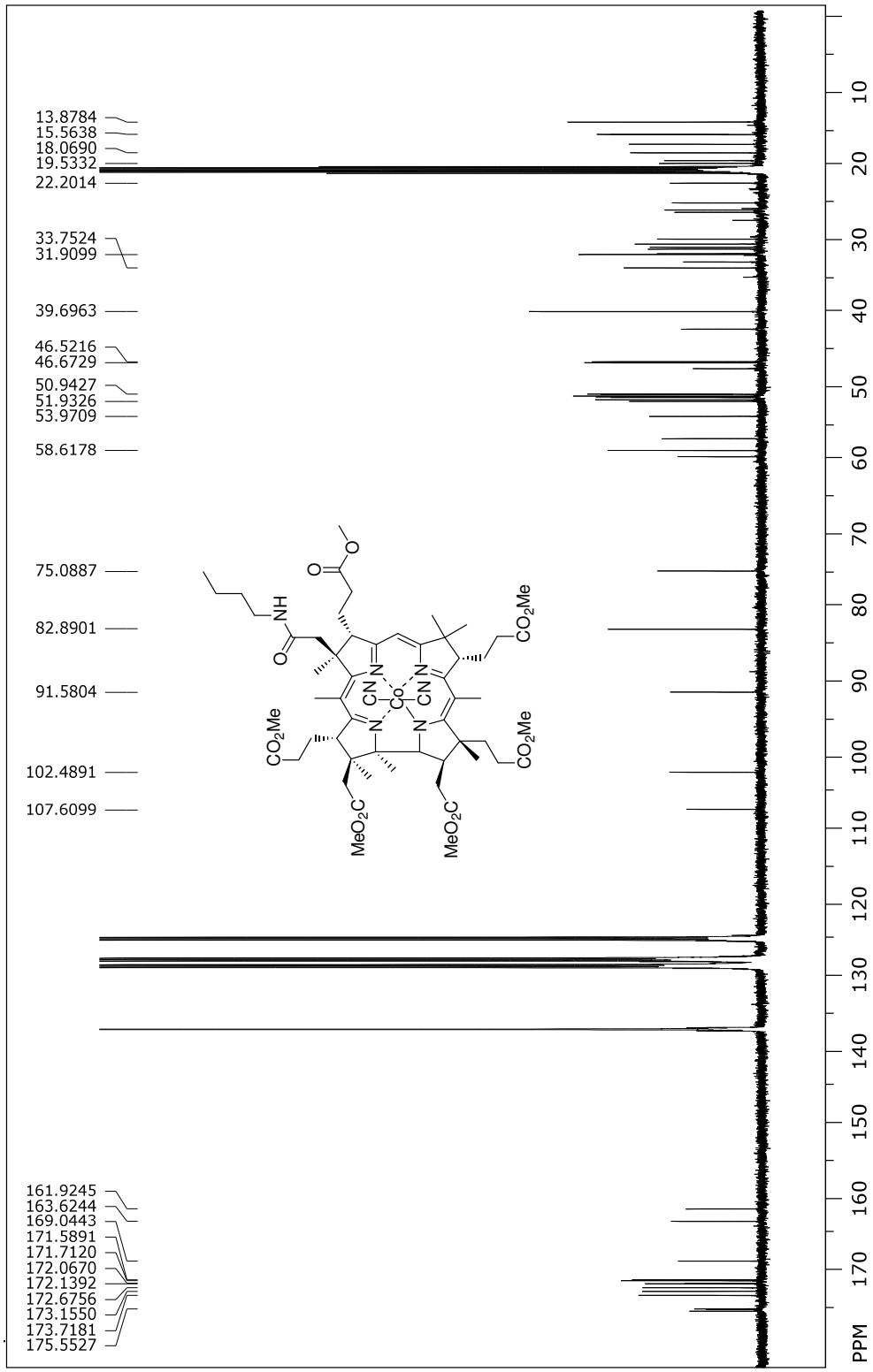
$(CN)_2$Cob(III)C1(*n*-butylamide) 3

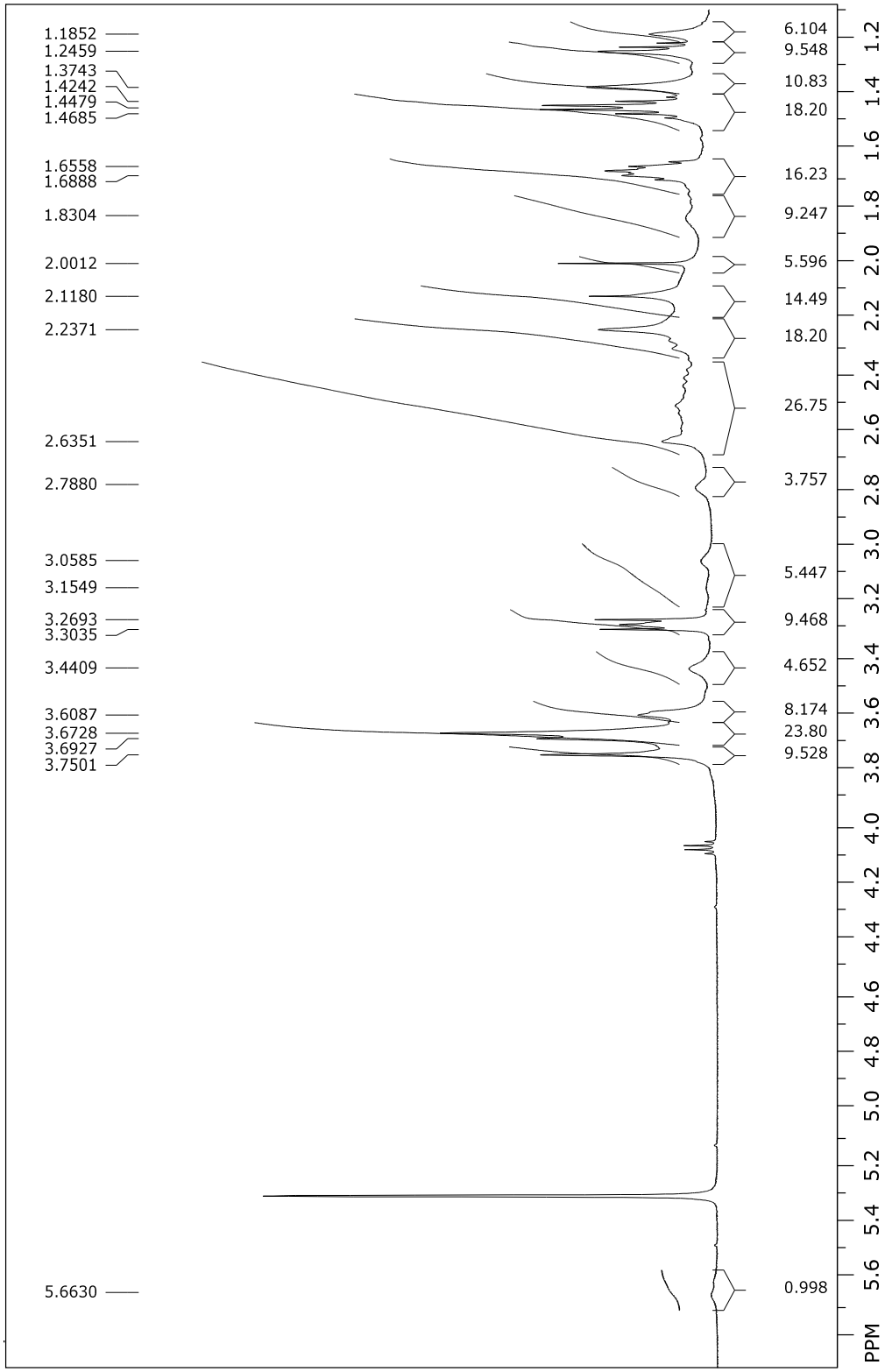


$(CN)_2$Cob(III)C1(*n*-butylamide) 3

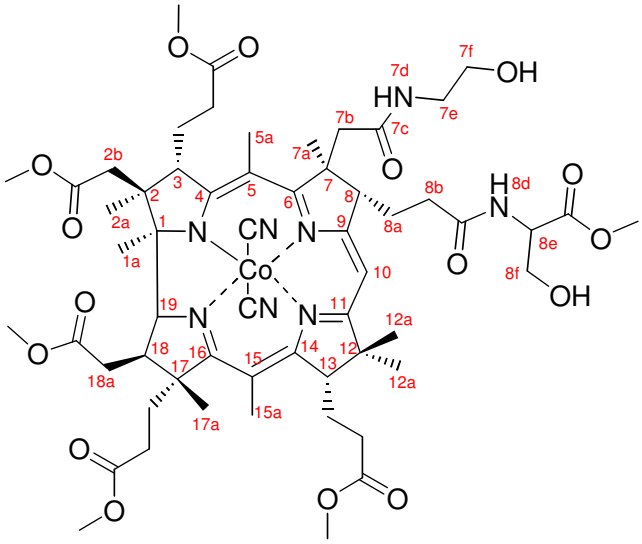


$(CN)_2$Cob(III)C1(ethanolamide)(-COOH) 5a

Note: The broadening of peaks in the ^{1}H NMR spectrum made it impossible to decipher and consequently high resolution ^{13}C spectra could not be obtained. This was caused by the presence of the acid group.



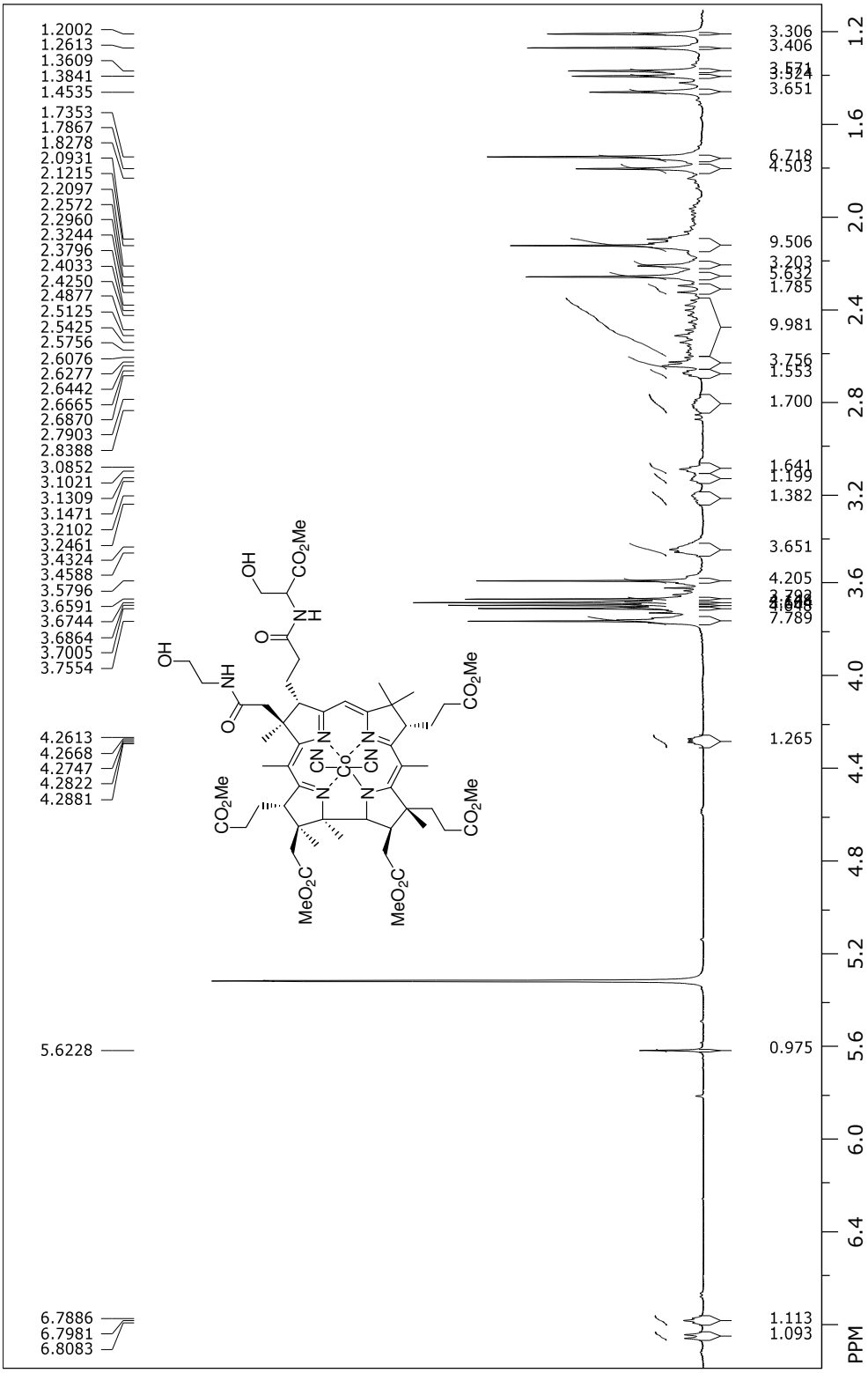
$(CN)_2$Cob(III)C1(ethanolamide)(NH-Serine-OMe) 6



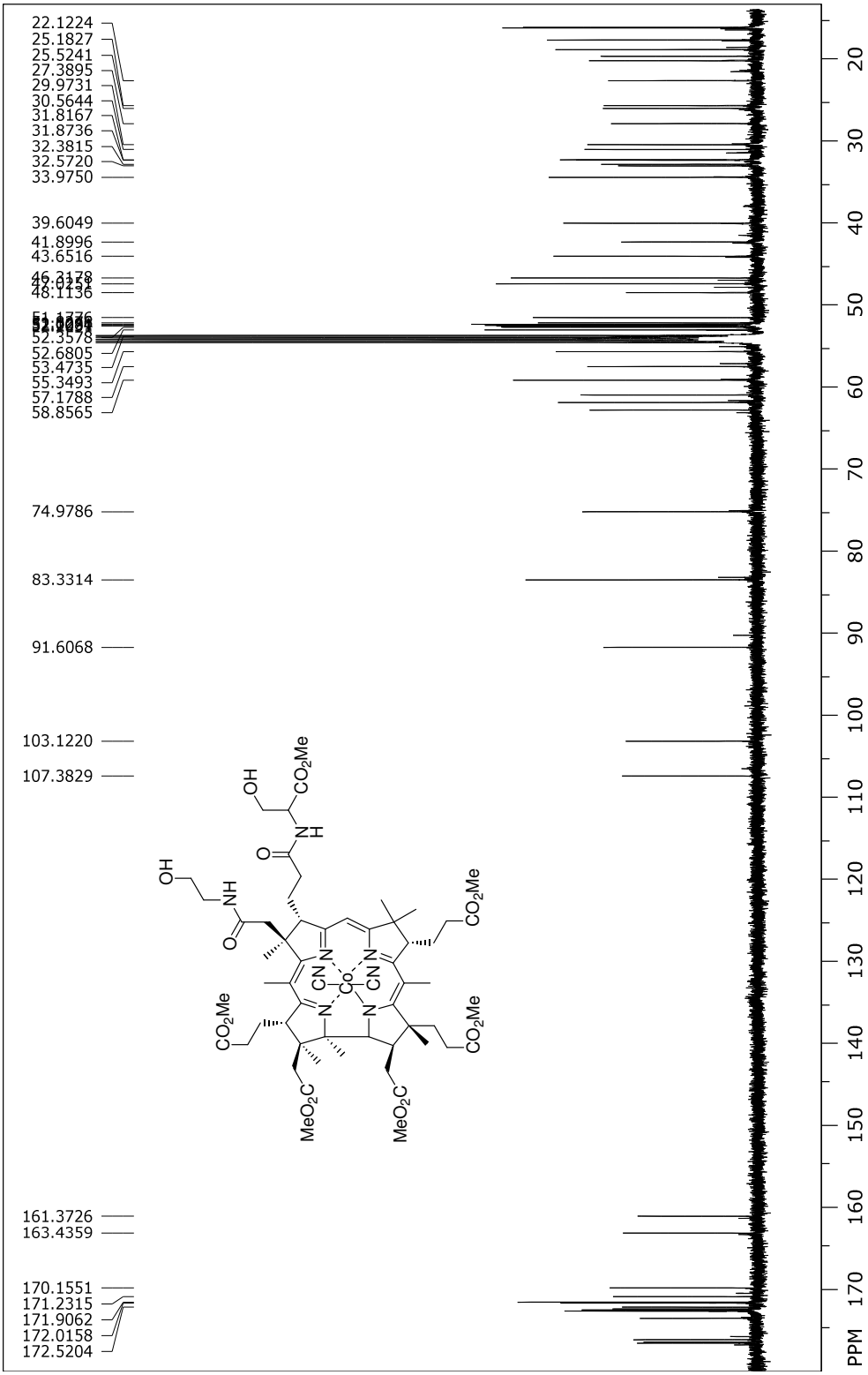
^{1}H NMR (500 MHz, CD_2Cl_2) δ (ppm); 6.86 (d, *J* = 6.8 Hz, 1H, 8d), 6.79 (t, *J* = 4.8 Hz, 1H, 7d), 5.62 (s, 1H, 10), 4.27 (dd, *J* = 2.9 and 3.9 Hz, 1H, 8e), 3.75 (s, 7H, 8f, 19 and -OC**H$_3$**), 3.70 (s, 3H, -OC**H$_3$**), 3.68 (s, 3H, -OC**H$_3$**), 3.67 (s, 3H, -OC**H$_3$**), 3.65 (s, 3H, -OC**H$_3$**), 3.57 (s, 4H, 8f and -OC**H$_3$**), 3.47-3.40 (m, 4H, 7f and 7b), 3.25-3.19 (m, 1H, 7e), 3.15-3.12 (m, 1H, 7e), 3.09 (t, *J* = 4.9 Hz, 1H, 13), 2.87-2.79 (m, 1H, 18), 2.67 (dd, *J* = 4.3 and 2.2 Hz, 1H, 3), 2.64-2.63 (m, 2H, 18a), 2.62-2.55 (m, 2H, C**H$_2$**), 2.54-2.51 (m, 1H, 2b), 2.48-2.35 (m, 4H, 8b and C**H$_2$**), 2.30 (d, *J* = 14.6 Hz, 1H, 2b), 2.25 (s, 5H, 15a, 8 and C**H$_2$**), 2.20 (s, 2H, C**H$_2$**), 2.12 (s(br), 7H, 5a, 8a and C**H$_2$**), 2.11-2.05 (m, 2H, C**H$_2$**), 1.87-1.82 (m, 1H, C**H$_2$**), 1.78 (s, 3H, 7a), 1.45 (s, 3H, 2a), 1.38 (s, 3H, 1a), 1.36 (s, 3H, 12a), 1.26 (s, 3H, 17a), 1.20 (s, 3H, 12a).

^{13}C NMR (125 MHz, CD_2Cl_2) δ (ppm); 177.1 (11), 176.9 (16), 176.4 (4), 173.8 (**C**=O), 173.0 (**C**=O), 172.8 (**C**=O), 172.7 (**C**=O), 172.5 (**C**=O), 172.0 (**C**=O), 171.9 (7c), 171.2(9), 170.8, 170.1, 163.4 (14), 161.3 (6), 107.3 (15), 103.1 (5), 91.6 (10), 83.3 (1), 74.9 (19), 62.5 (8f), 61.5 (7f), 60.6 (3), 58.8 (17), 57.1 (8), 55.3 (13), 53.4 (-O**C**H$_3$), 52.6 (-O**C**H$_3$), 52.3 (-O**C**H$_3$), 52.1 (-O**C**H$_3$), 51.9 (-O**C**H$_3$), 51.8 (-O**C**H$_3$), 51.1 (7), 48.1 (2b), 47.0 (12), 46.3 (2), 43.6 (7e), 41.9 (7c), 39.9 (18), 33.9 (8b), 32.5, 32.3, 31.9 (12a), 31.8 (19), 30.5 (8a), 29.9, 27.3, 25.7, 25.1, 22.1 (2a), 19.6 (12a), 19.1, 18.3 (17a), 17.1 (7a), 15.6 (15a), 15.5 (5a).

$(CN)_2$Cob(III)C1(ethanolamide)(NH-Serine-OMe) 6



$(CN)_2$Cob(III)C1(ethanolamide)(NH-Serine-OMe) 6



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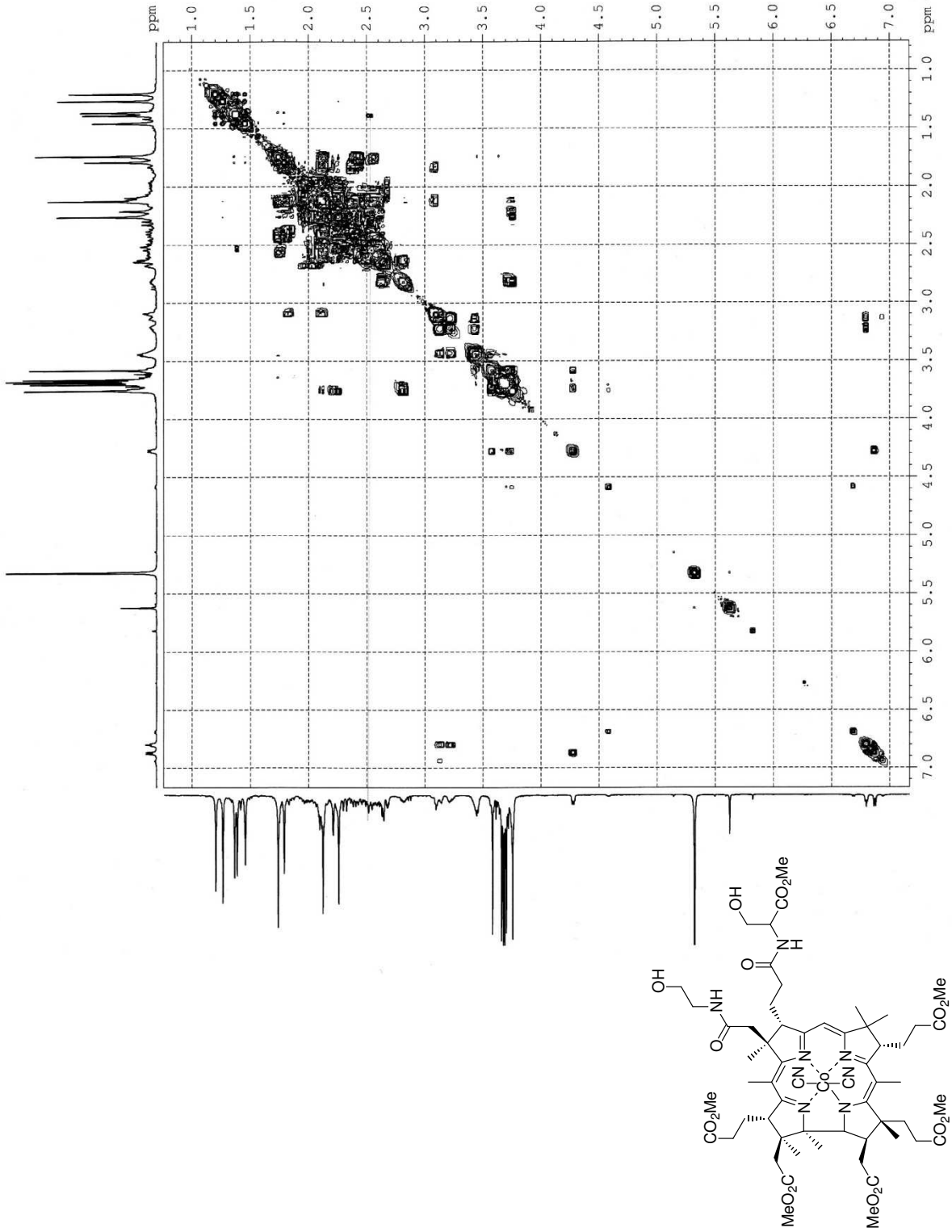

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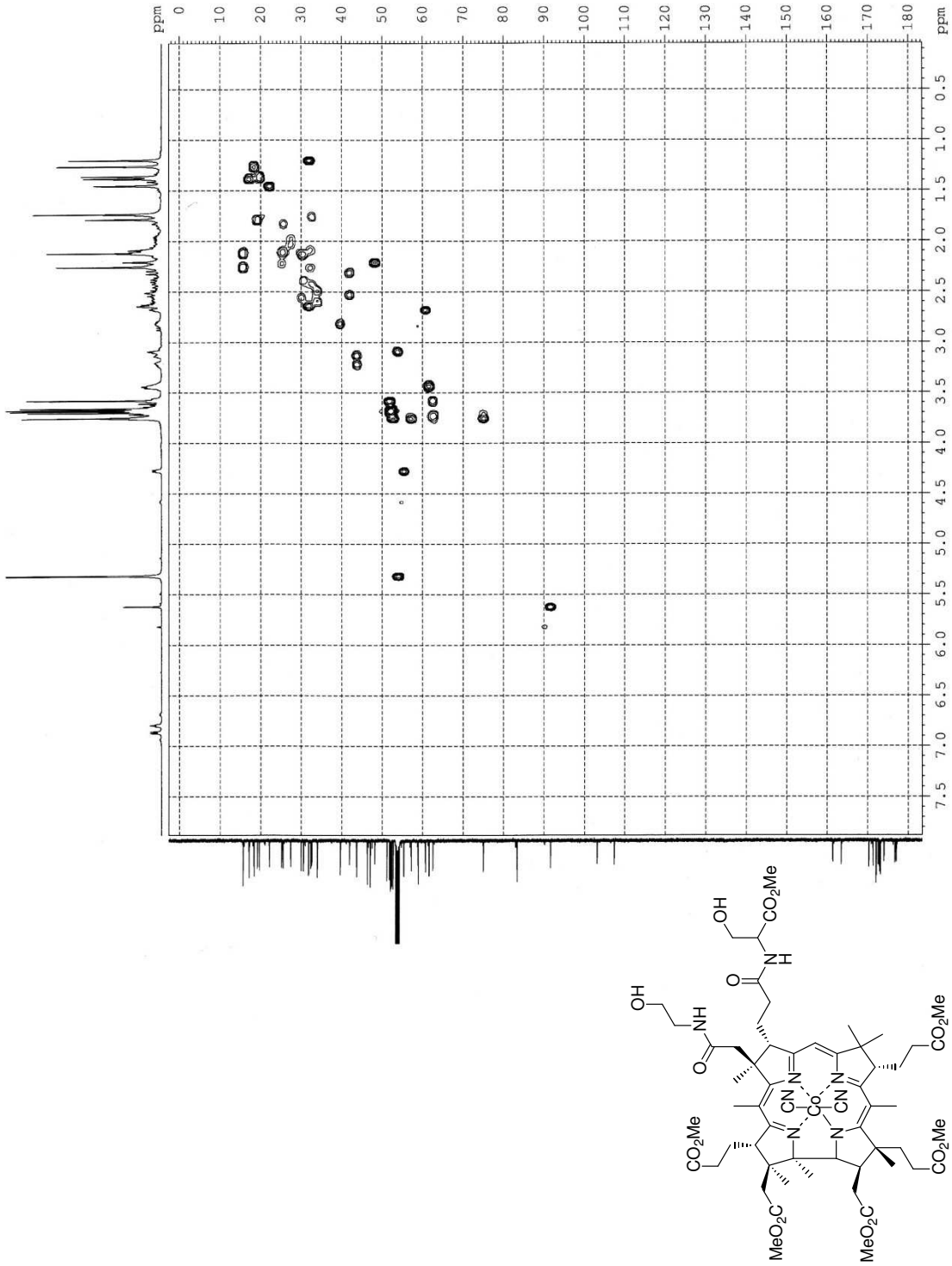
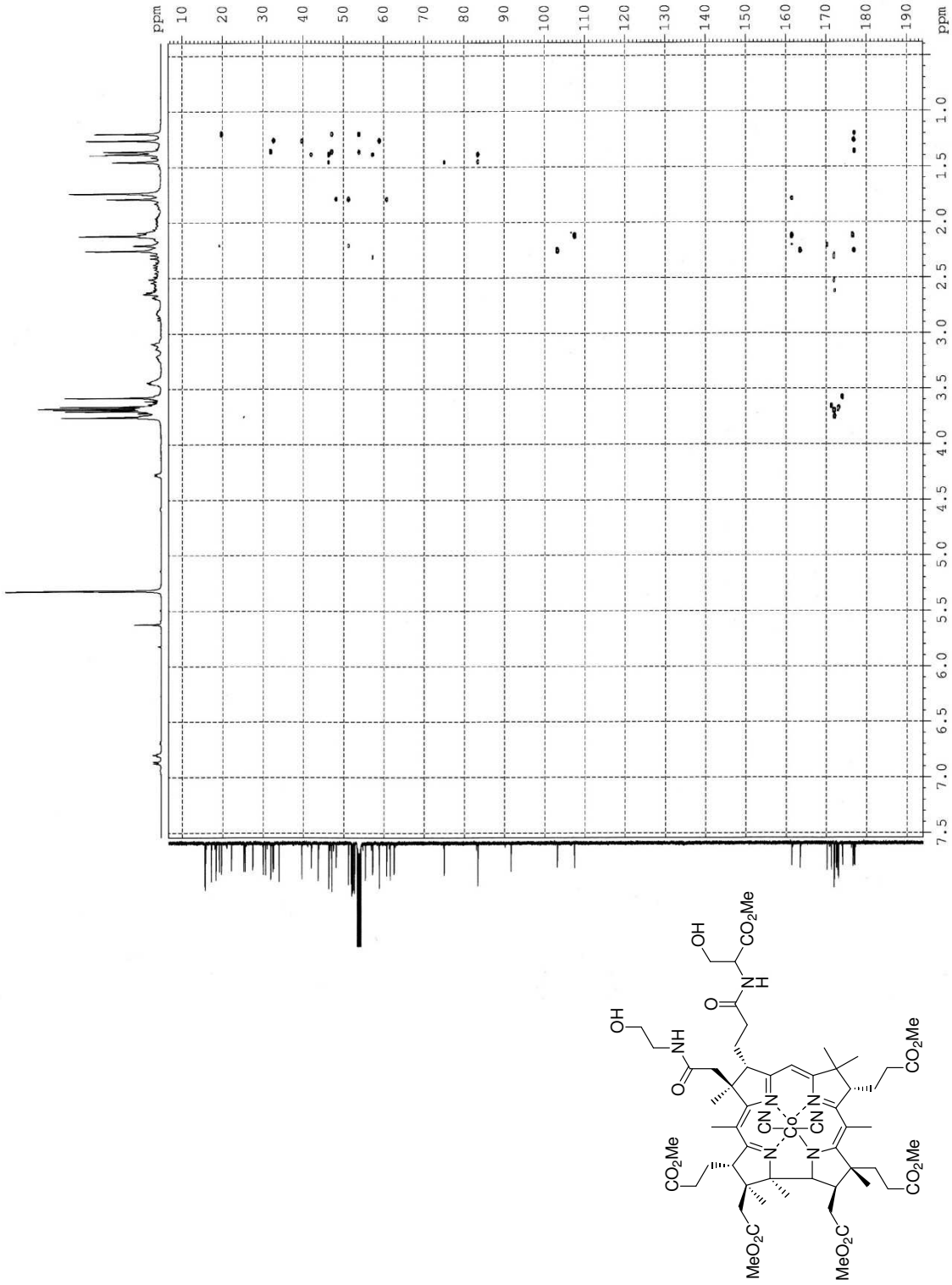
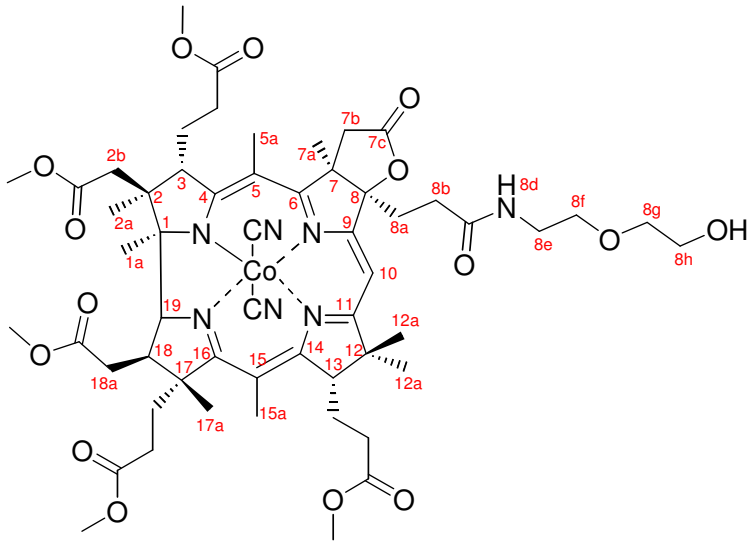


$(CN)_2$Cob(III)C1(ethanolamide)(NH-Serine-OMe) 6



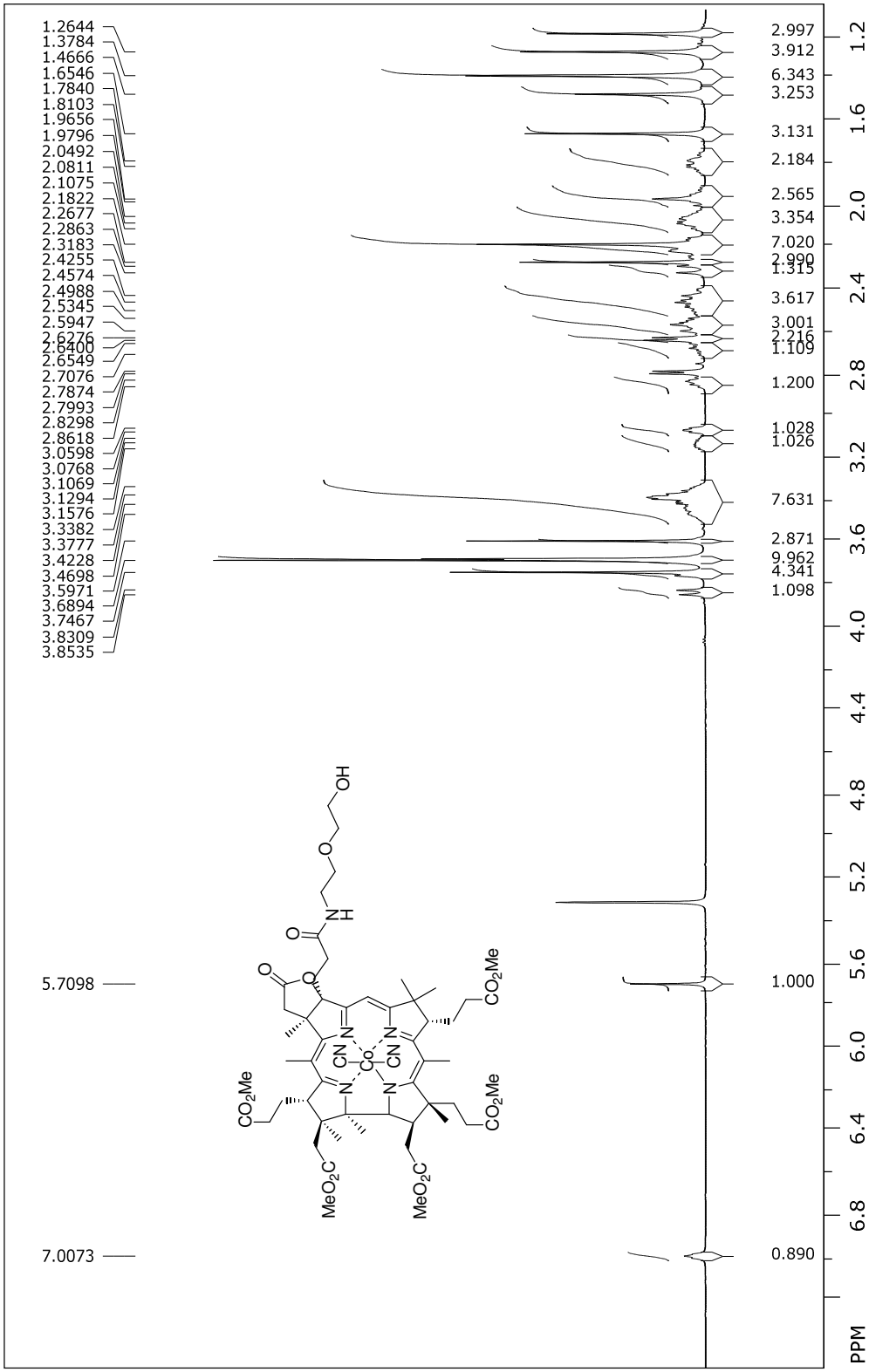
$(CN)_2$Cob(III)C1(lactone)(diglycolamide) 8



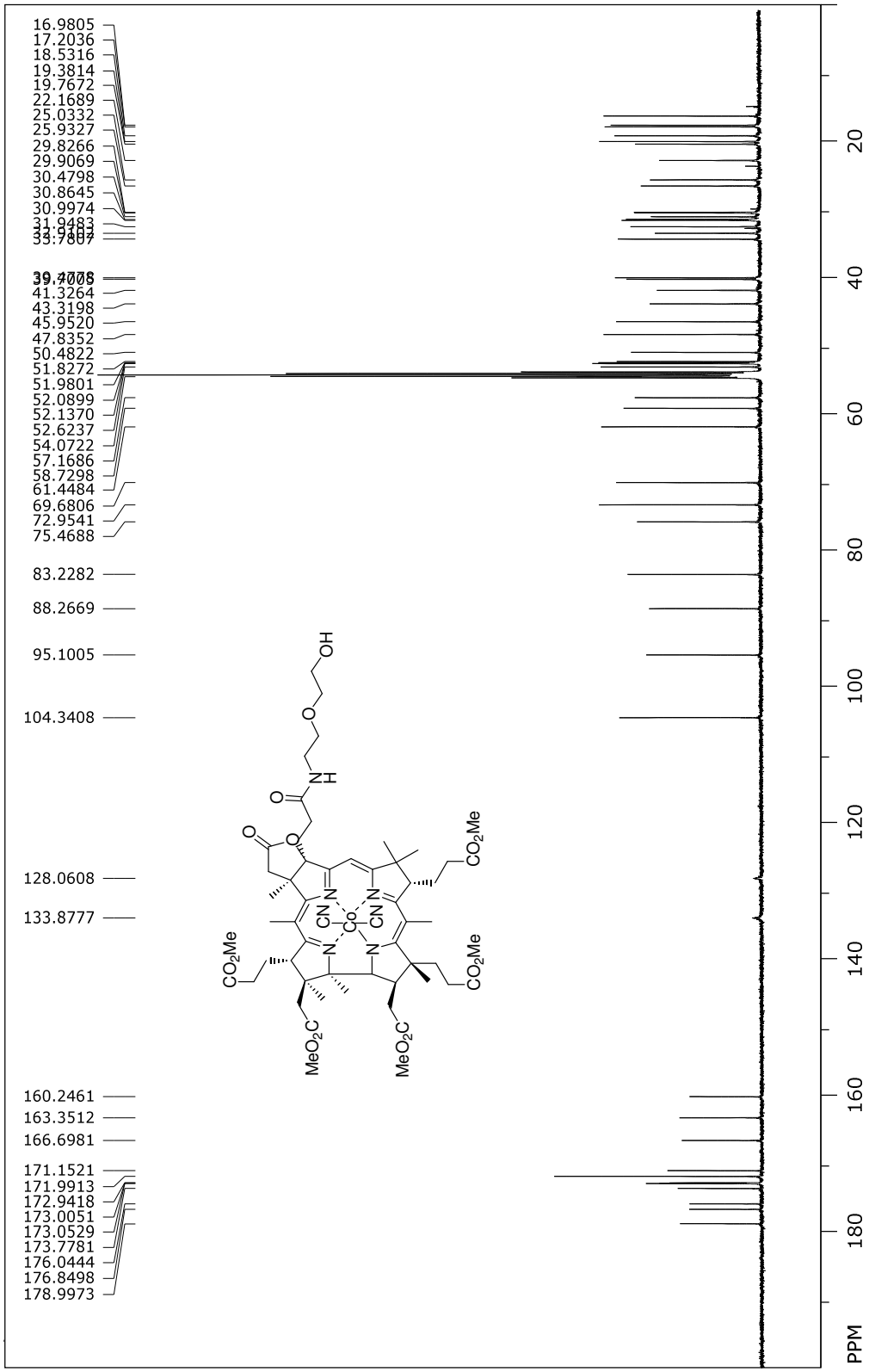
^{1}H NMR (500 MHz, CD_2Cl_2) δ (ppm); 7.00 (t, *J* = 5.0 Hz, 1H, 8d), 5.70 (s, 1H, 10), 3.84 (d, *J* = 10.8 Hz, 1H, 19), 3.76-3.74 (m, 4H, -OC**H₃** and 3), 3.69 (s, 7H, -OC**H₃** and 8f), 3.68 (s, 3H, -OC**H₃**), 3.59 (s, 3H, -OC**H₃**), 3.50-3.32 (m, 7H, 8e, 8f, 8g and 8h), 3.15-3.10 (m, 1H, 8e), 3.06 (dd, 1H, *J* = 4.5 and 1.4 Hz, 13), 2.86-2.82 (m, 1H, 18), 2.79 (d, 2H, *J* = 5.9 Hz, 7b), 2.70-2.65 (m, 1H, 8b), 2.63 (d, 2H, *J* = 6.2 Hz, 18a), 2.59-2.53 (m, 4H, 2b, 8b and C**H₂**), 2.50-2.39 (m, 2H, 8a and C**H₂**), 2.30 (d, 1H, *J* = 15.8 Hz, 2b), 2.26 (s, 3H, 15a and C**H₂**), 2.21-2.15 (m, 7H, C**H₂**, 5a and 8a), 2.11-2.02 (m, 3H, C**H₂**), 1.99-1.91 (m, 1H, C**H₂**), 1.84-1.74 (m, 2H, C**H₂**), 1.65 (s, 3H, 7a), 1.46 (s, 3H, 1a), 1.37 (s, 6H, 12a and 2a), 1.26 (s, 3H, 17a), 1.17 (s, 3H, 12a).

^{13}C NMR (125 MHz, CD_2Cl_2) δ (ppm); 178.9 (11), 176.8 (16), 176.0 (4), 173.7 (**C**=O), 173.05 (**C**=O), 173.01 (7c), 172.9 (**C**=O), 171.9 (**C**=O), 171.1 (**C**=O), 166.7 (9), 163.3 (14), 160.2 (6), 133.8 (CN), 128.0 (CN), 104.3 (5 and 15), 95.1 (8), 88.2 (10), 83.2 (1), 75.4 (19), 72.9 (8f), 69.6 (8f), 61.4 (8f), 58.7 (17), 57.1 (3), 54.0 (13), 52.6 (-OC**H₃**), 52.1 (-OC**H₃**), 52.0 (-OC**H₃**), 51.9 (-OC**H₃**), 51.8 (-OC**H₃**), 50.4 (7), 47.8 (12), 45.9 (2), 43.3 (7b), 41.3 (2b), 39.7 (18), 39.4 (8e), 33.7 (8b), 32.9, 31.9 (18a), 31.0 (8a), 30.8 (12a), 30.4, 29.9, 29.8, 25.9, 25.0, 22.1 (1a), 19.7 (12a), 19.3 (7a), 18.5 (17a), 17.2 (5a), 16.9 (2a), 15.6 (15a).

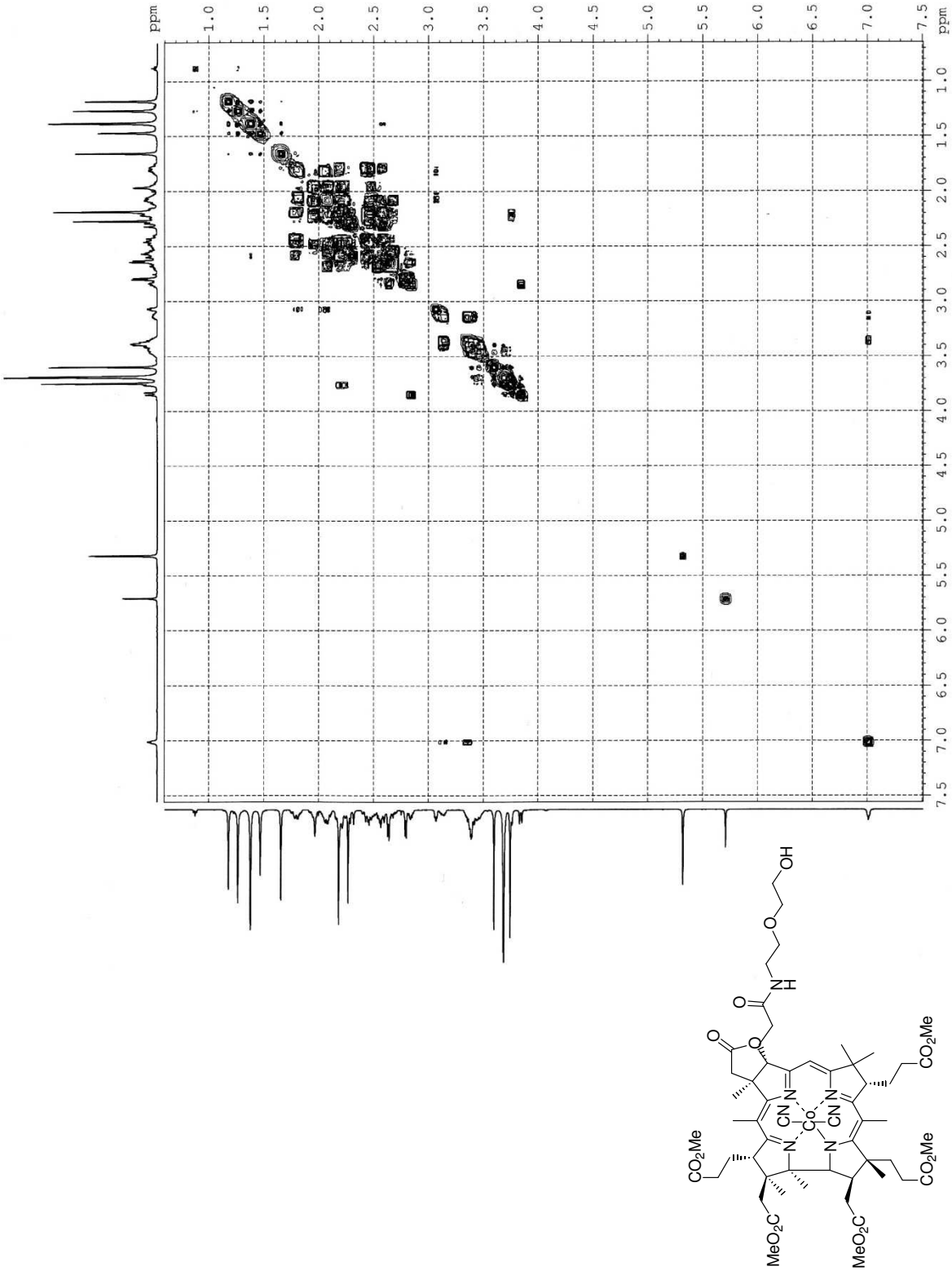
$(CN)_2$Cob(III)C1(lactone)(diglycolamide) 8



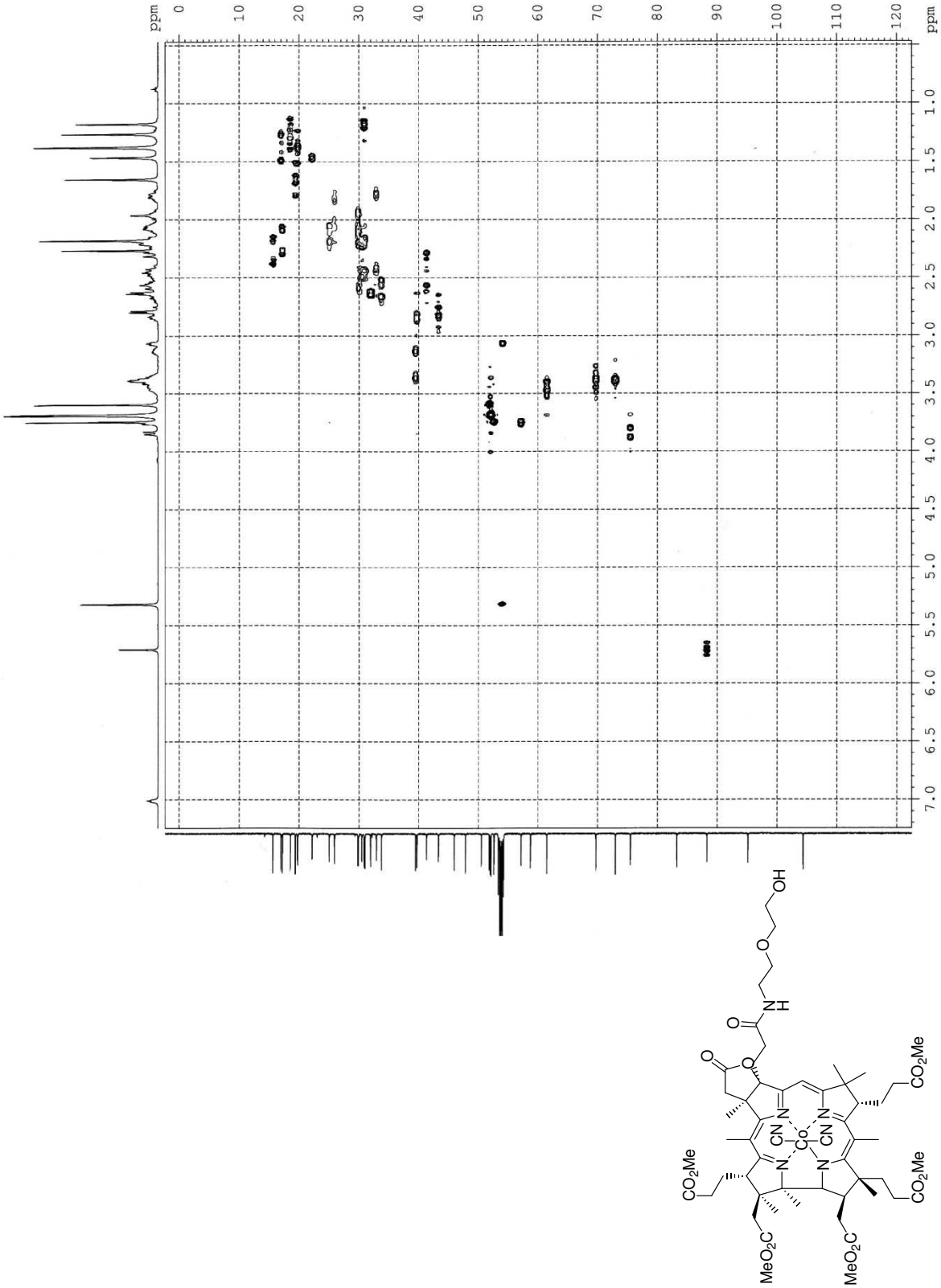
$(CN)_2$Cob(III)C1(lactone)(diglycolamide) 8



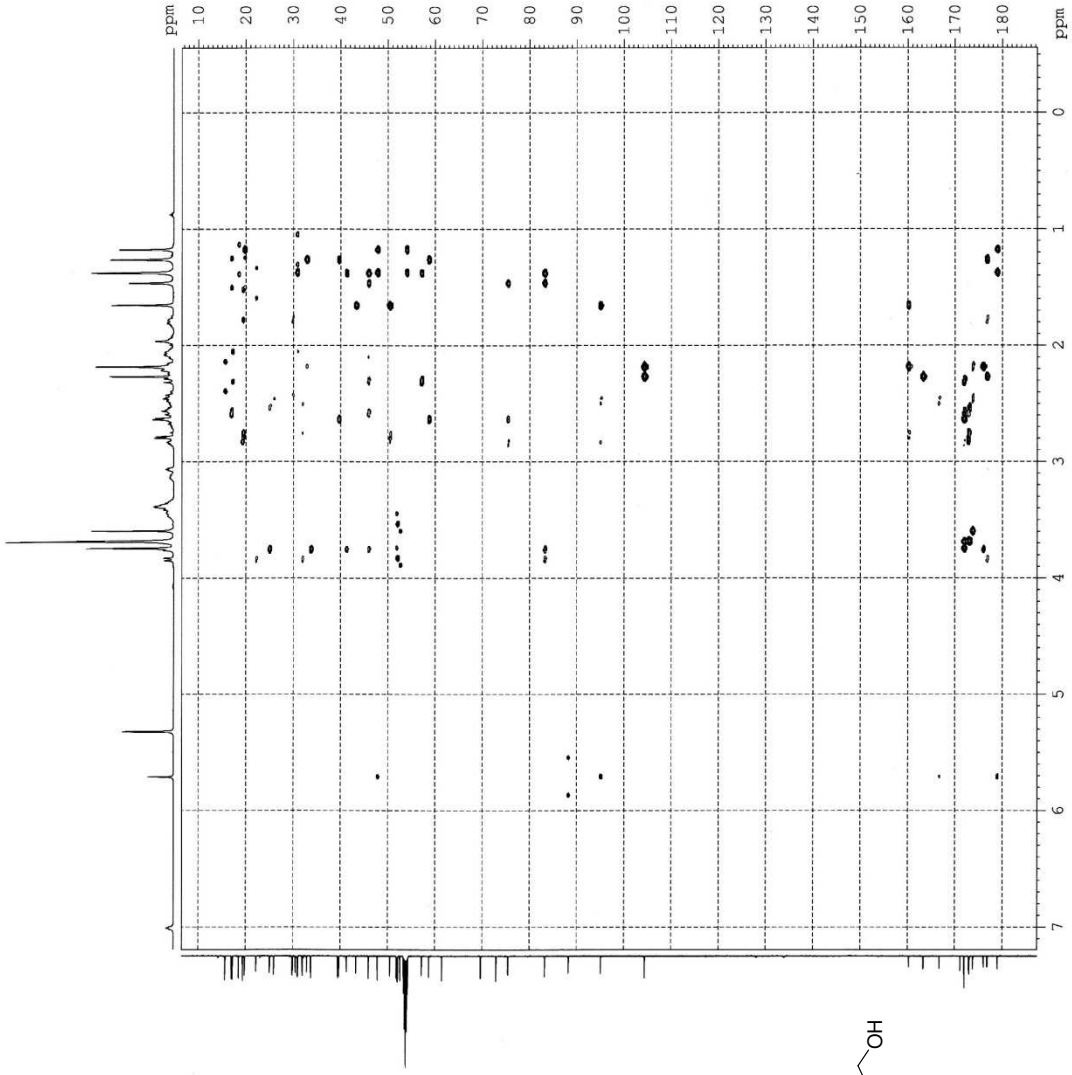
$(CN)_2$Cob(III)C1(lactone)(diglycolamide) 8

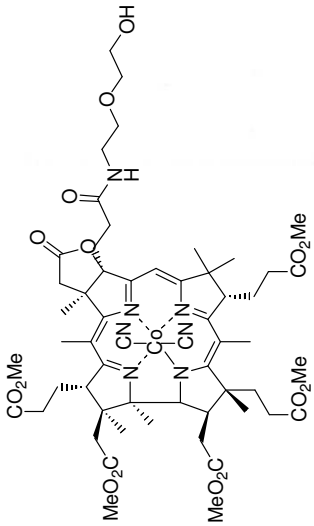


$(CN)_2$Cob(III)C1(lactone)(diglycolamide) 8



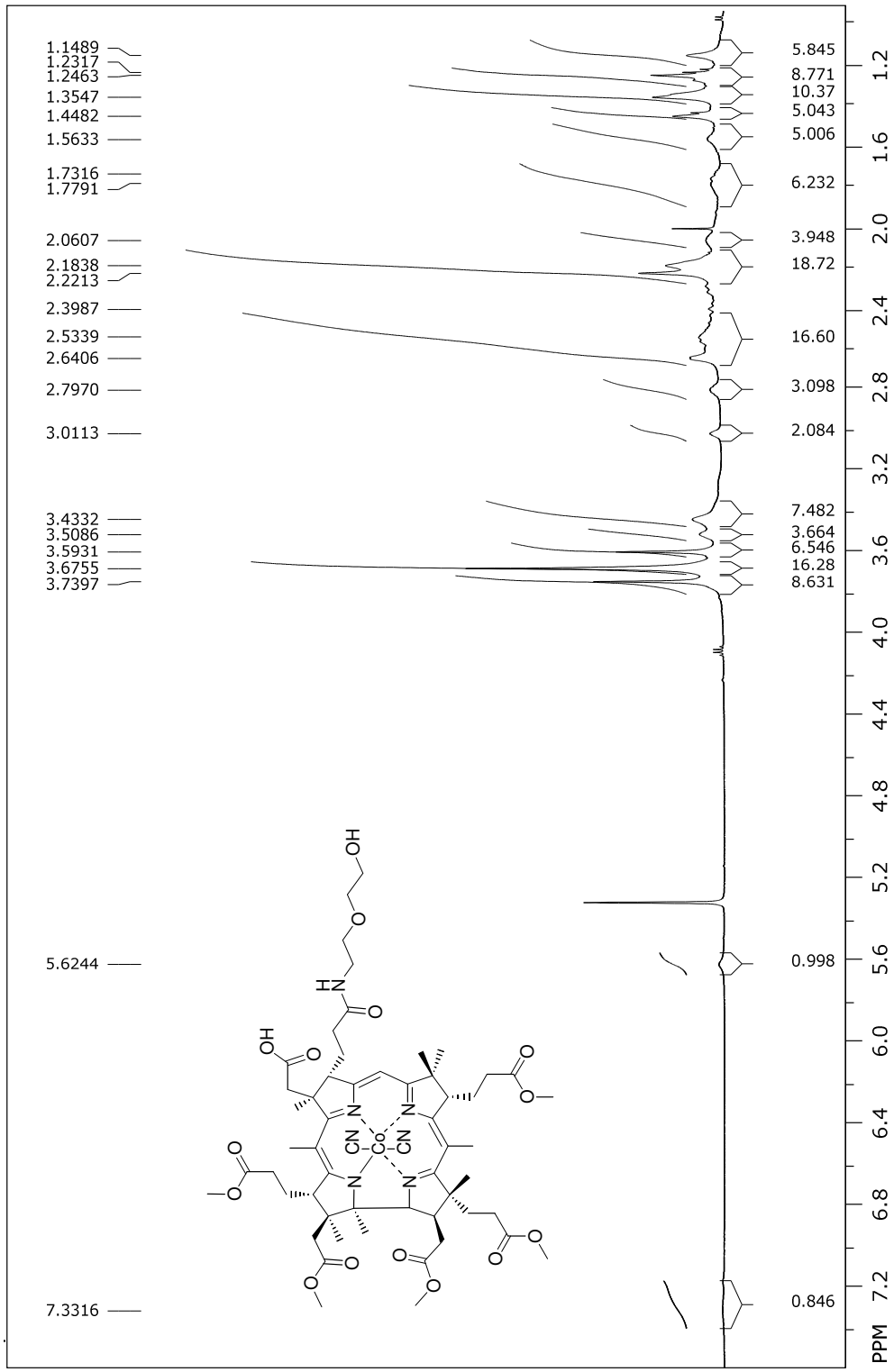
$(CN)_2$Cob(III)C1(lactone)(diglycolamide) 8



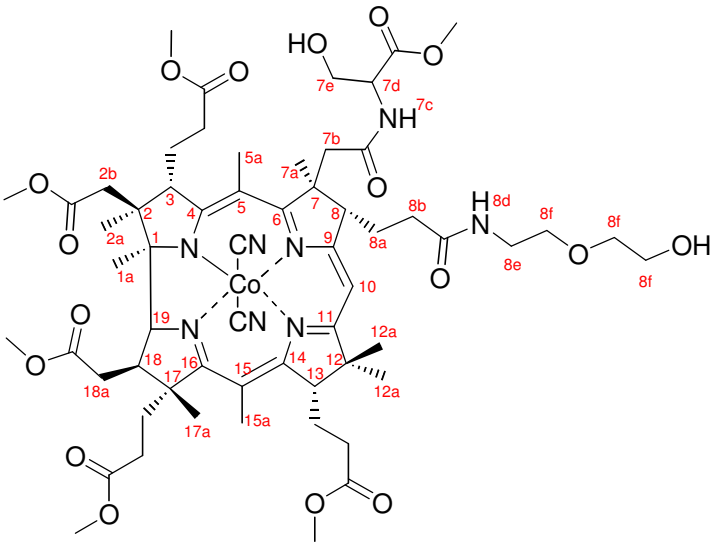


$(CN)_2$Cob(III)C1(ethionic acid)(diglycolamide) 9

Note: The broadening of peaks in the ^{1}H NMR spectrum made it impossible to decipher and consequently high resolution ^{13}C spectra could not be obtained. This was caused by the presence of the acid group.



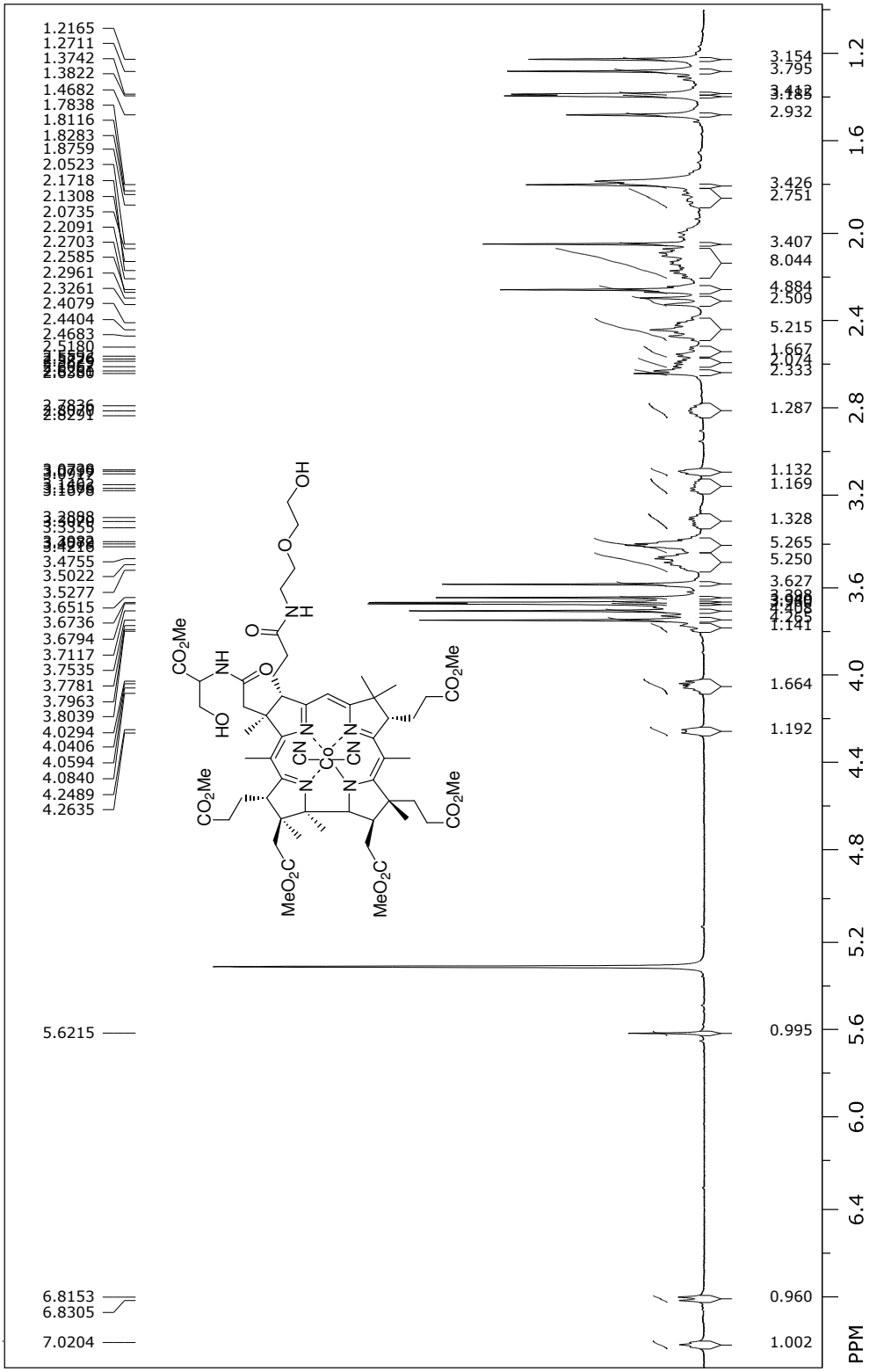
$(CN)_2$Cob(III)C1(NH-Serine-OMe)(diglycolamide) 10



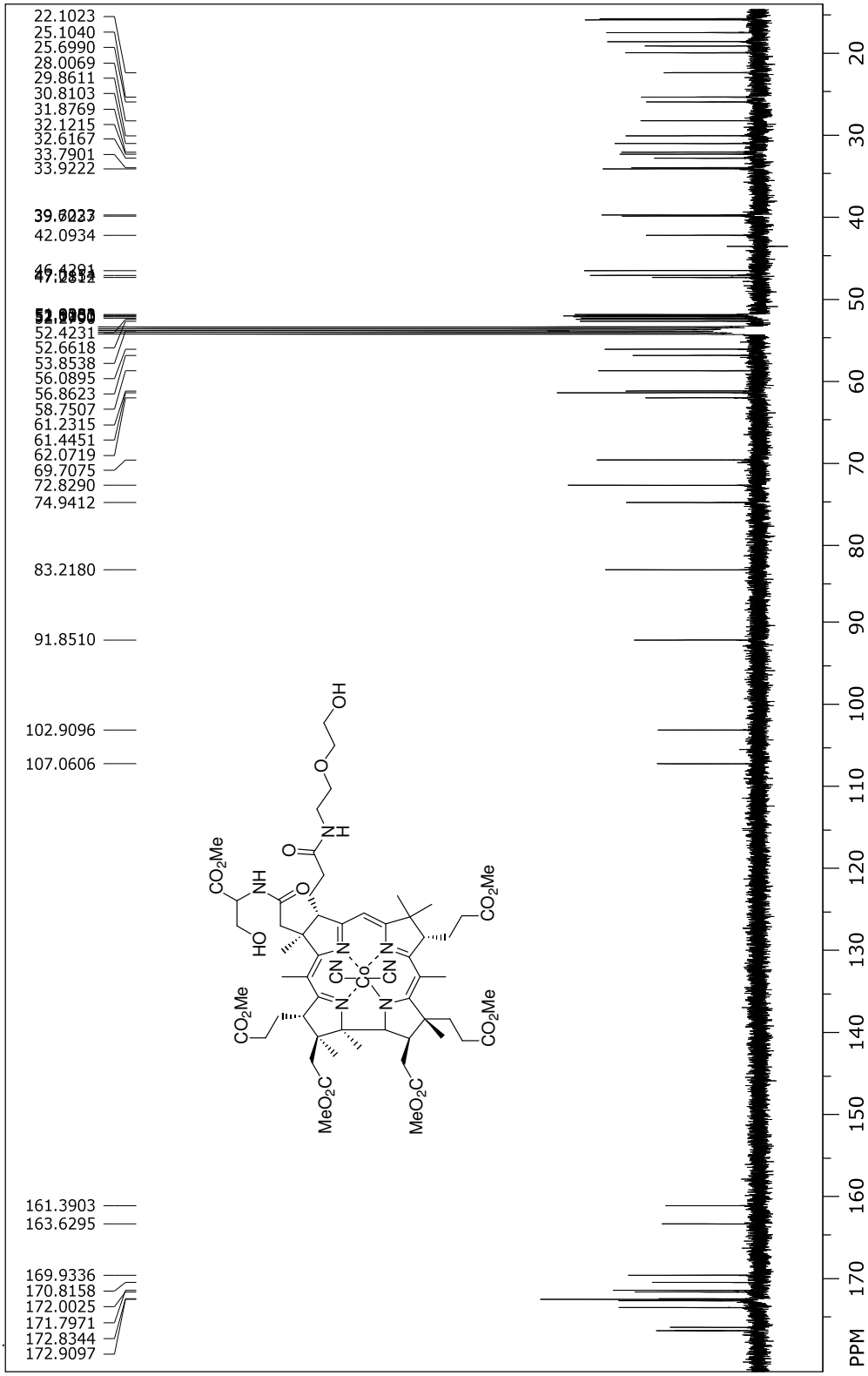
^{1}H NMR (500 MHz, CD_2Cl_2) δ (ppm); 7.02 (t, *J* = 4.9 Hz, 1H, 8d), 6.82 (d, *J* = 7.7 Hz, 1H, 7c), 5.62 (s, 1H, 10), 4.26-4.24 (m, 1H, 7d), 3.80-3.77 (m, 1H, 19), 3.75 (s, 4H, -OC**H$_3$** and 7b), 3.71 (s, 4H, -OC**H$_3$**), 3.68 (s, 4H, -OC**H$_3$** and 3), 3.67 (s, 3H, -OC**H$_3$**), 3.65 (s, 3H, -OC**H$_3$**), 3.59 (s, 3H, -OC**H$_3$**), 3.52-3.45 (m, 4H, 7e and 7b), 3.43-3.38 (m, 5H, 8f), 3.33-3.27 (m, 1H, 8e and 8f), 3.17-3.11 (m, 1H, 8e), 3.09-3.07 (m, 1H, 13), 2.82-2.78 (m, 1H, 18), 2.63-2.62 (m, 2H, 18a), 2.61-2.51 (m, 4H, 8a and C**H$_2$**), 2.48-2.38 (m, 5H, 2b, 8b and C**H$_2$**), 2.30 (d, *J* = 15.3 Hz, 1H, 2b), 2.25 (s, 4H, 15a, 8 and C**H$_2$**), 2.20-2.07 (m, 7H, 8a and C**H$_2$**), 2.05 (s, 3H, 5a), 1.87-1.81 (m, 2H, C**H$_2$**), 1.78 (s, 3H, 7a), 1.46 (s, 3H, 2a), 1.38 (s, 3H, 1a), 1.37 (s, 3H, 12a), 1.27 (s, 3H, 17a), 1.21 (s, 3H, 12a).

^{13}C NMR (125 MHz, CD_2Cl_2) δ (ppm); 176.77 (16), 176.73 (11), 176.3 (3), 173.9 (**C**=O), 173.0 (**C**=O), 172.9 (**C**=O), 172.0 (**C**=O), 171.8 (**C**=O), 170.8 (**C**=O), 169.9 (9), 163.6 (14), 161.3 (6), 107.0 (5), 102.9 (15), 91.8 (10), 83.2 (1), 74.9 (19), 72.9, 72.8 (8f), 69.7 (8f), 62.0 (8f), 61.4 (7e), 61.2 (7b), 58.7 (17), 56.8 (3), 56.0 (7d), 53.8 (13), 52.6 (-OC**H$_3$**), 52.4 (-OC**H$_3$**), 52.2 (-OC**H$_3$**), 52.1 (-OC**H$_3$**), 52.0 (-OC**H$_3$**), 51.9 (-OC**H$_3$**), 51.8 (7), 47.2 (8), 47.0 (12), 46.4 (2), 42.0 (2b), 39.7, 39.6 (8e), 33.9 (18), 33.7, 32.6 (12a), 32.1, 31.8, 30.0 (8a), 29.8, 28.0, 25.7, 25.1, 22.1 (2a), 19.6 (12a), 18.8 (7a), 18.2, 17.1 (19), 15.6 (15a), 15.4 (5a).

$(CN)_2$Cob(III)C1(NH-Serine-OMe)(diglycolamide) 10



$(CN)_2$Cob(III)C1(NH-Serine-OMe)(diglycolamide) 10



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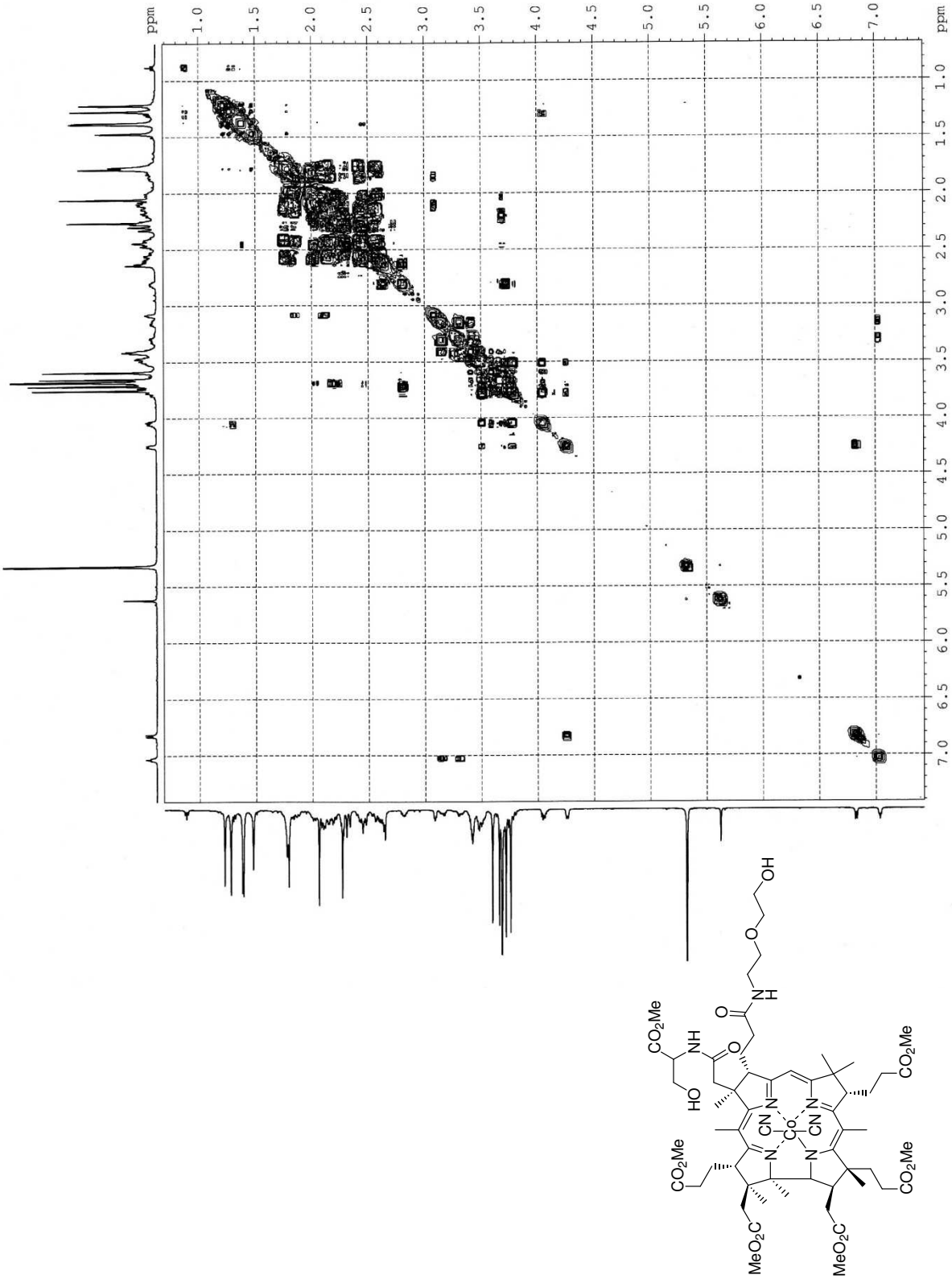

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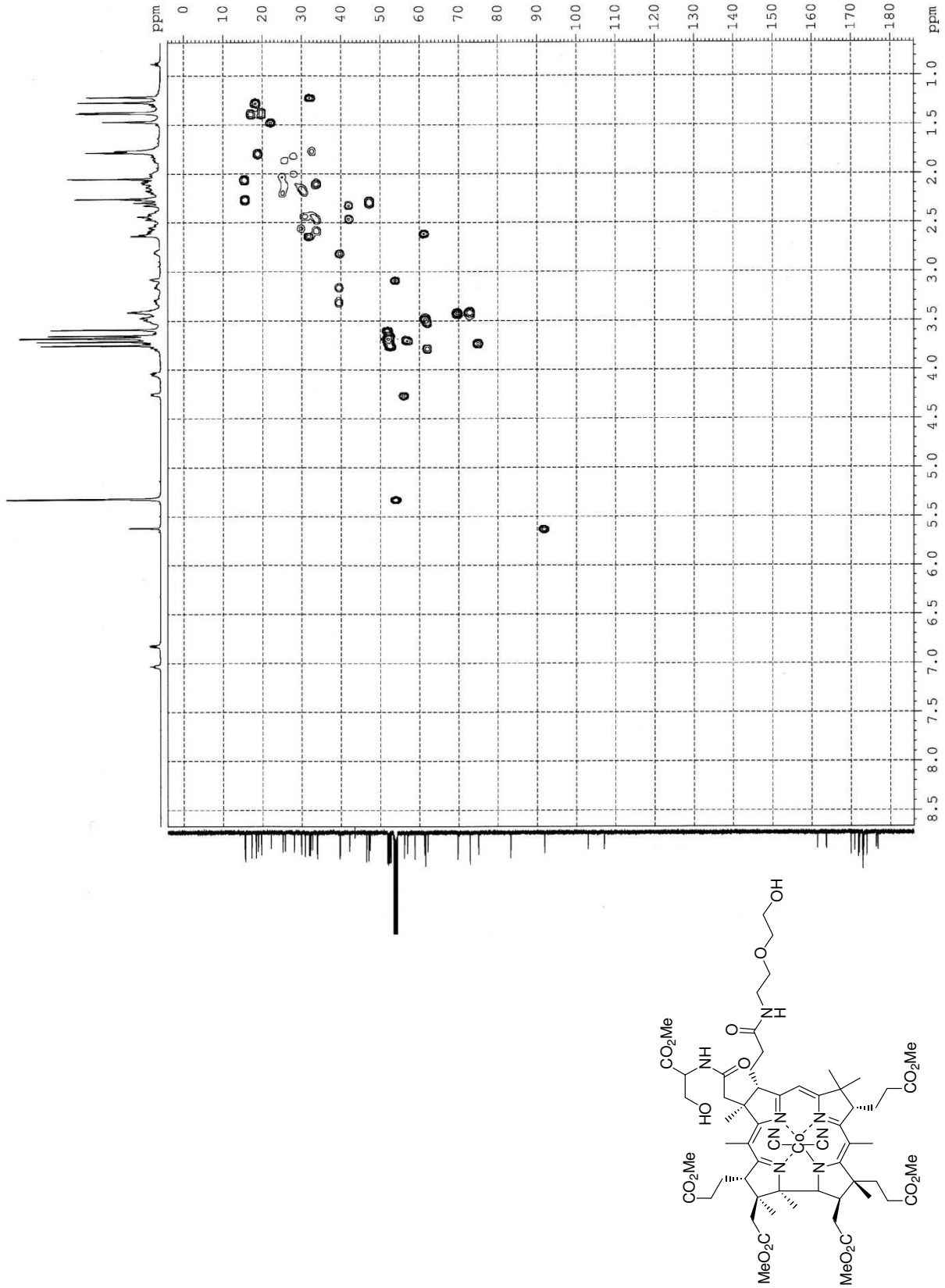
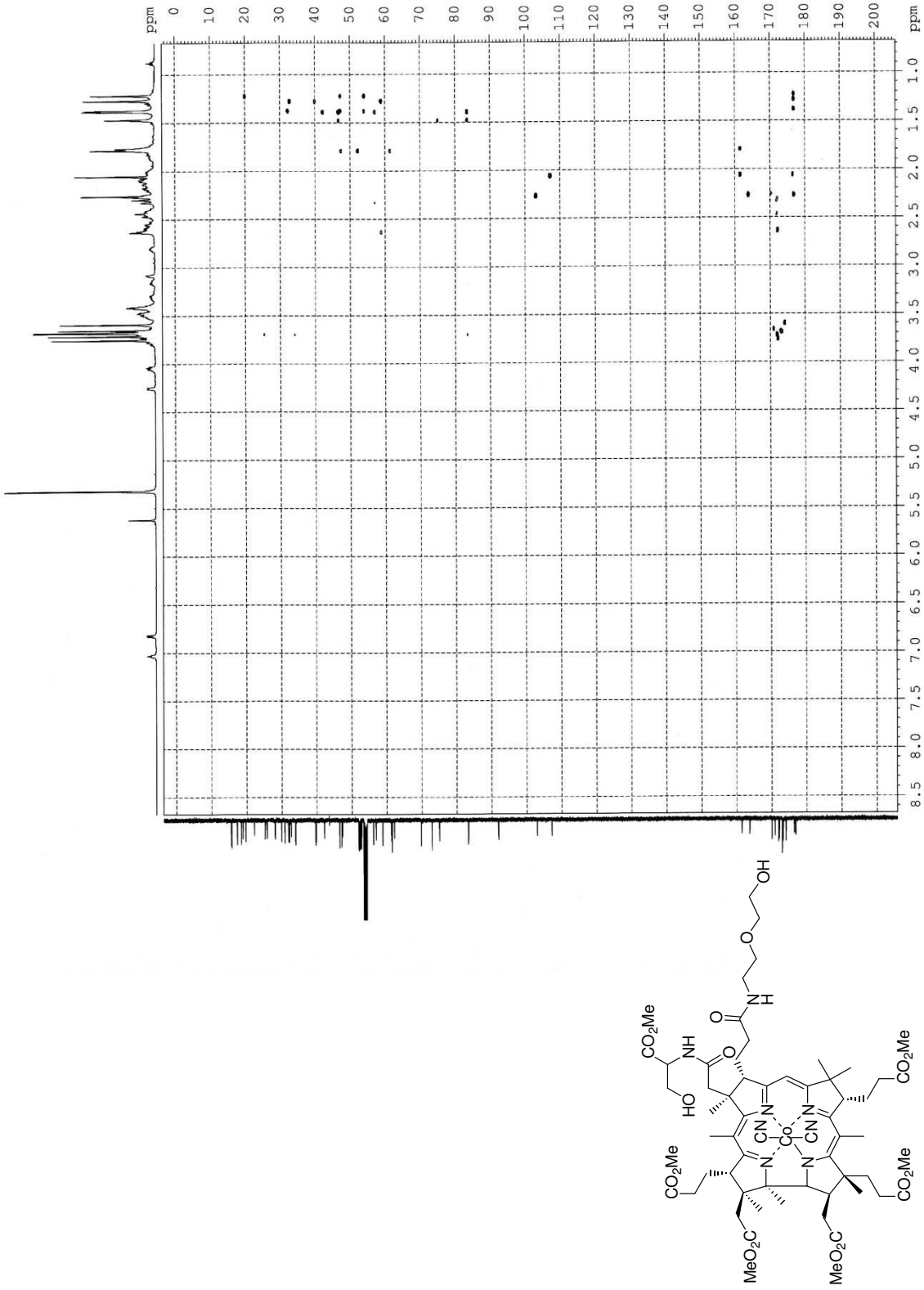
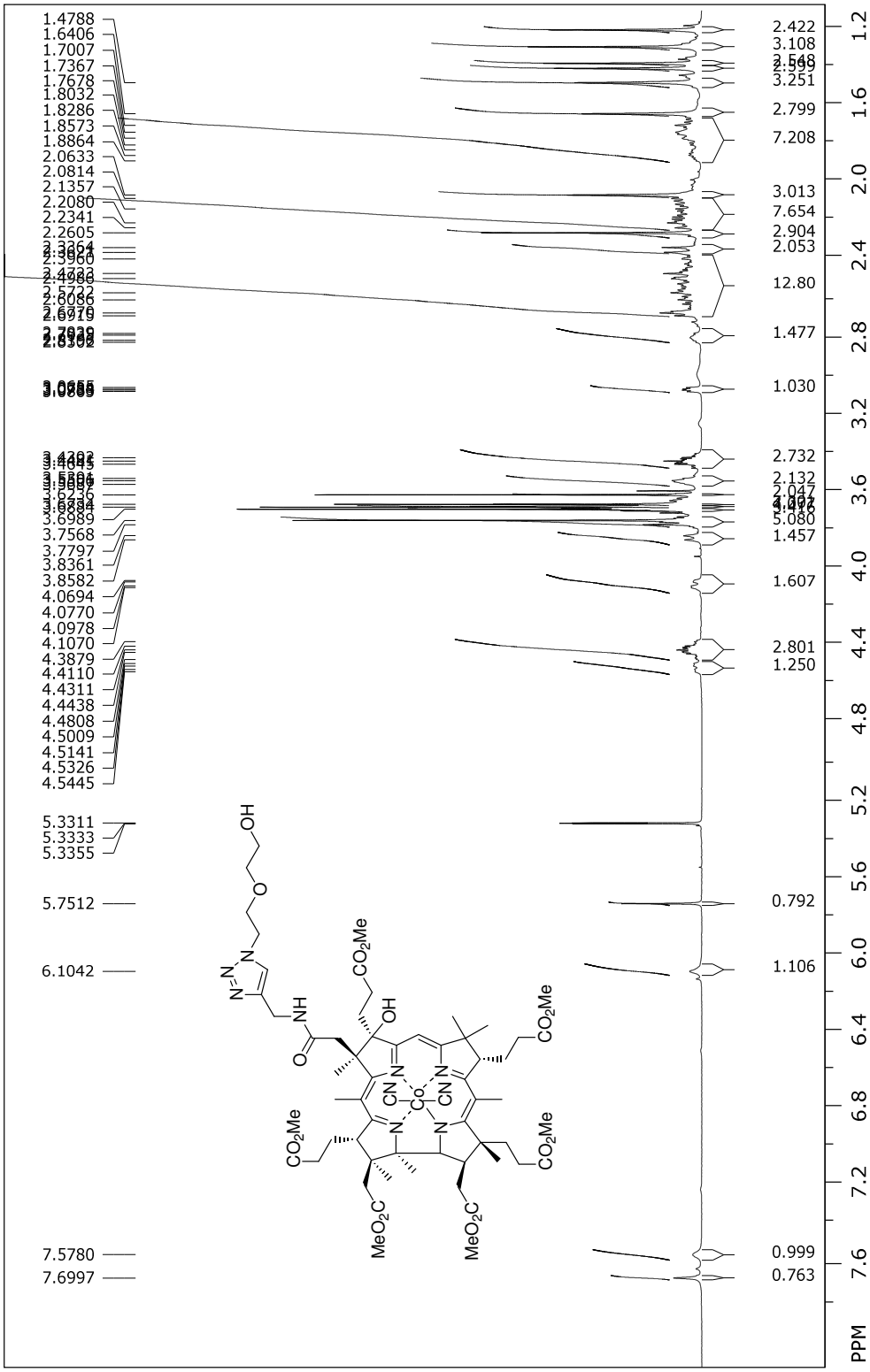


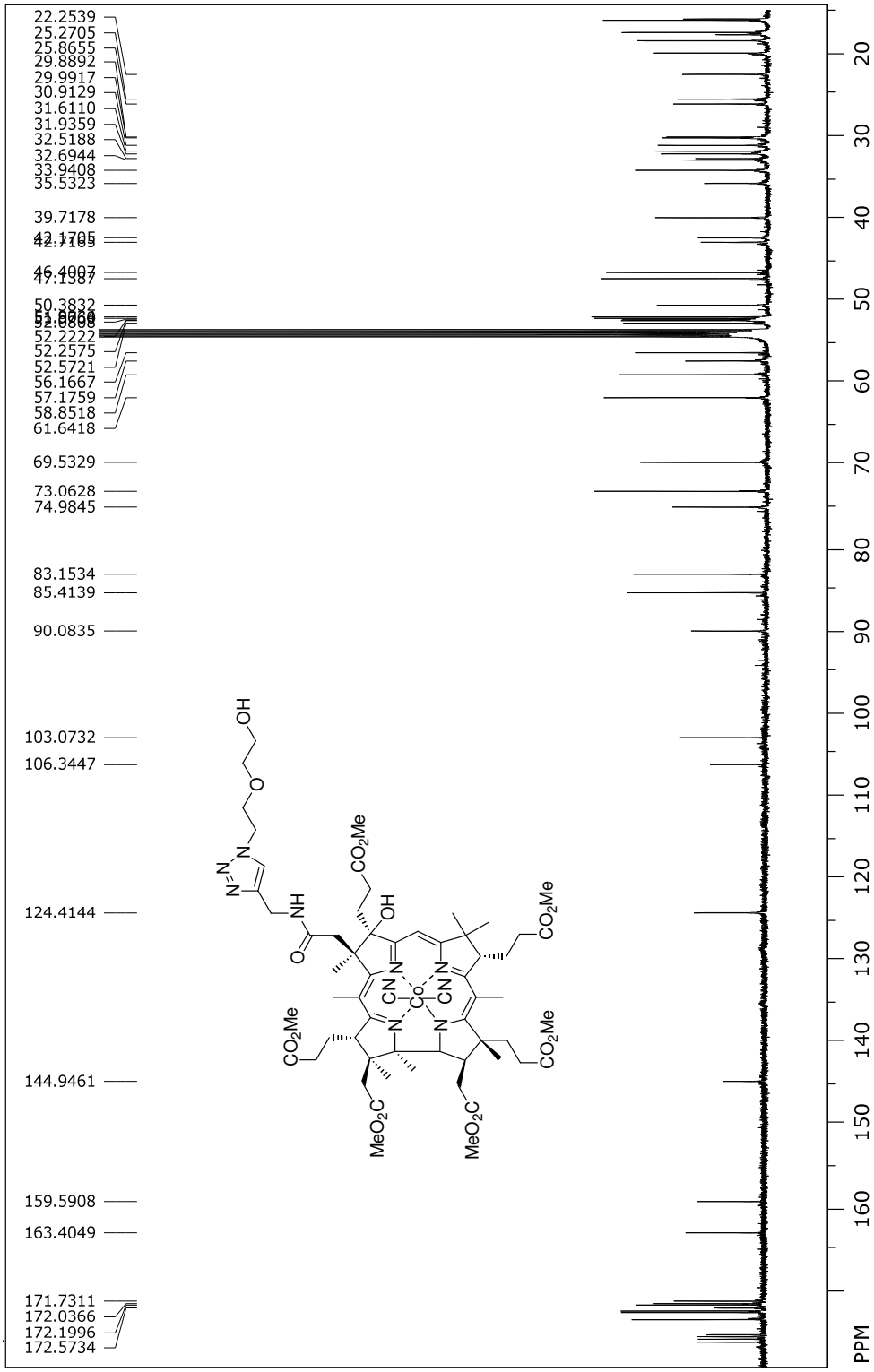
$(CN)_2$Cob(III)C1(NH-Serine-OMe)(diglycolamide) 10



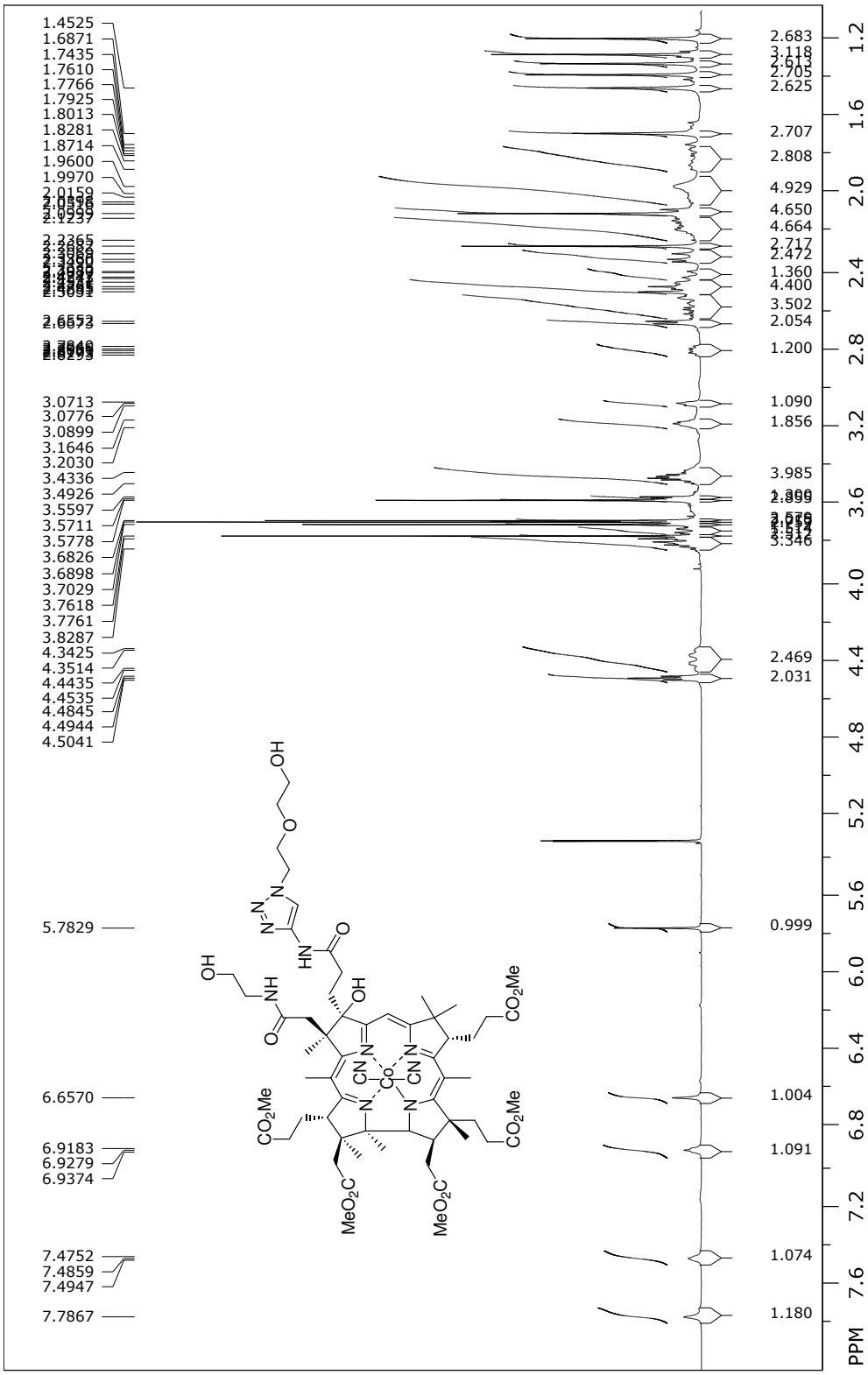
$(CN)_2$Cob(III)C1(2-{1-[2-(2-Hydroxy-ethoxy)-ethyl]-1H-[1,2,3]triazol-4-yl}-amide) 12



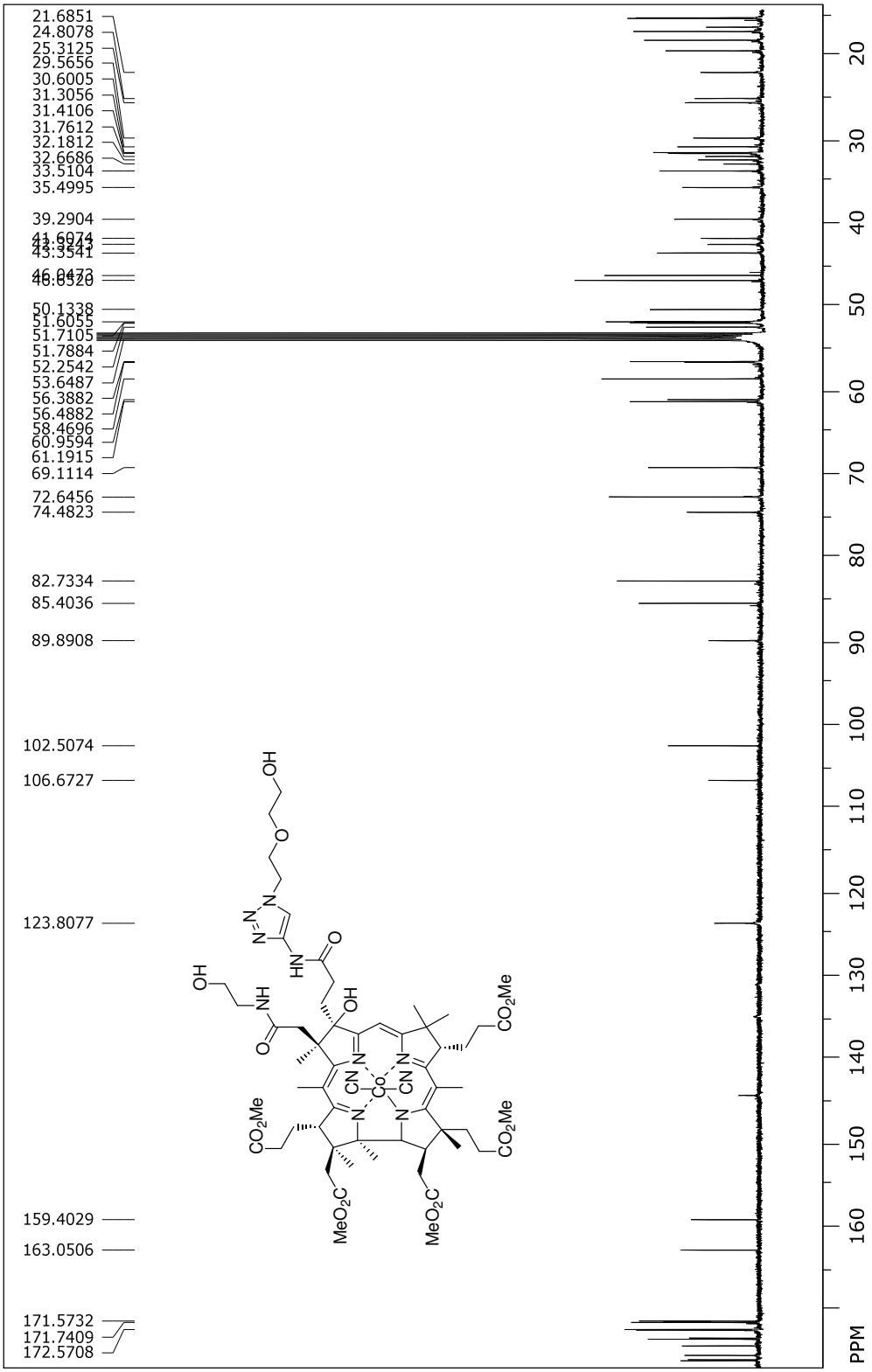
$(CN)_2$Cob(III)C1(2-{1-[2-(2-Hydroxy-ethoxy)-ethyl]-1H-[1,2,3]triazol-4-yl}-amide) 12



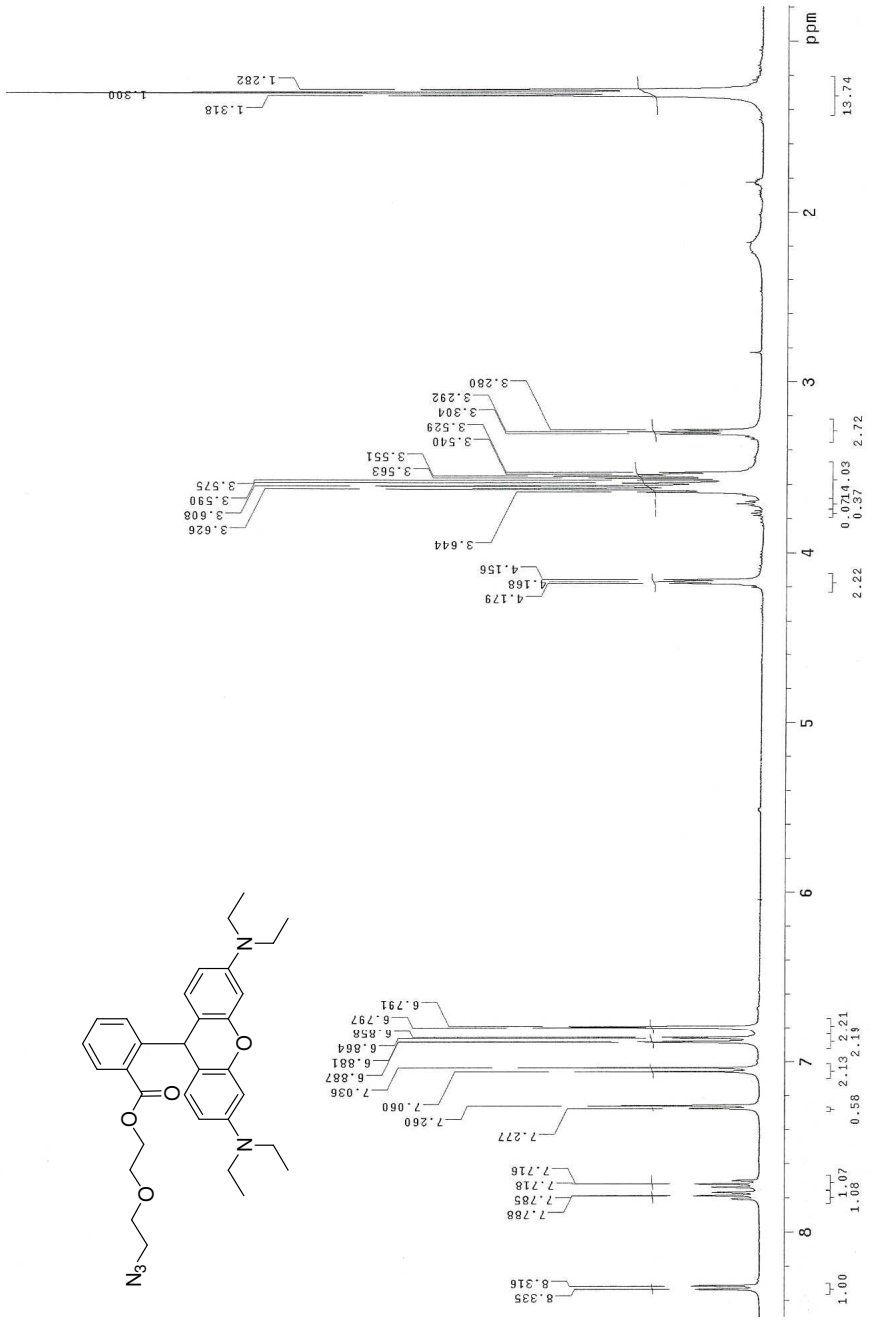
$(CN)_2$Cob(III)C1(ethanolamide)(2-{1-[2-(2-Hydroxy-ethoxy)-ethyl]-1H-[1,2,3]triazol-4-yl}-amide) 15



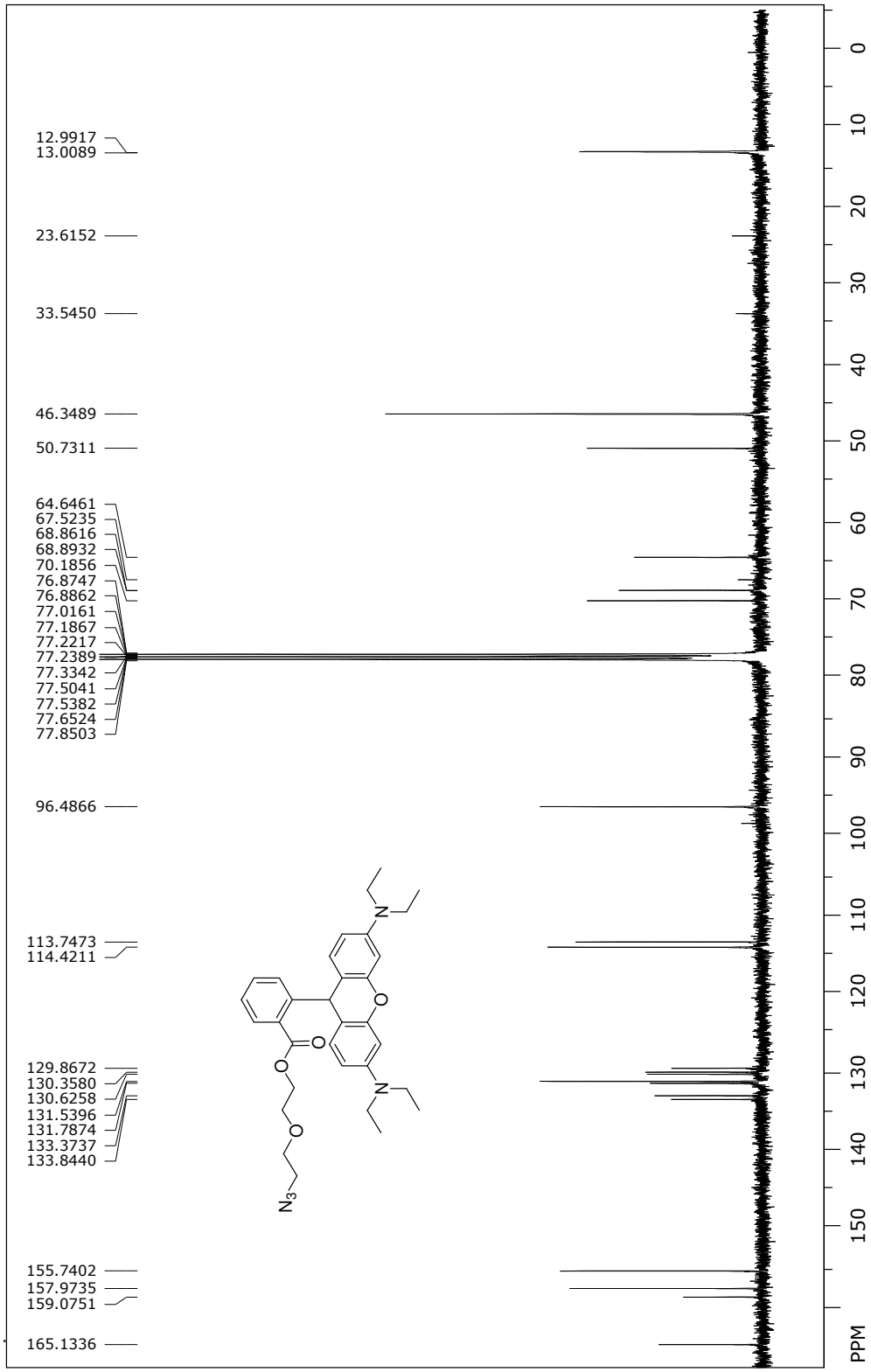
$(CN)_2$Cob(III)C1(ethanolamide)(2-{1-[2-(2-Hydroxy-ethoxy)-ethyl]-1H-[1,2,3]triazol-4-yl}-amide) 15



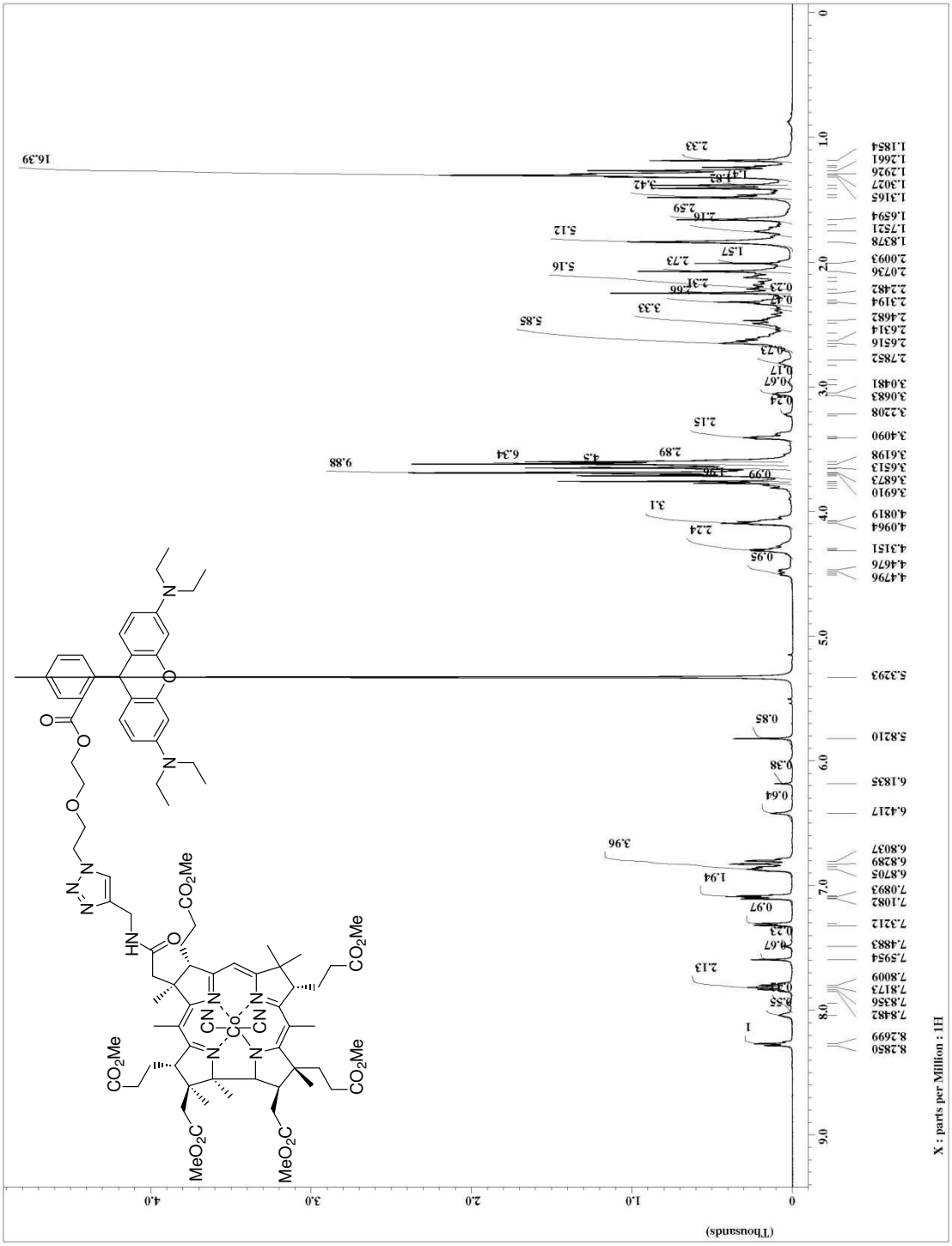
Rhodamine-2-(2-azido-ethoxy)-ethyl ester 16



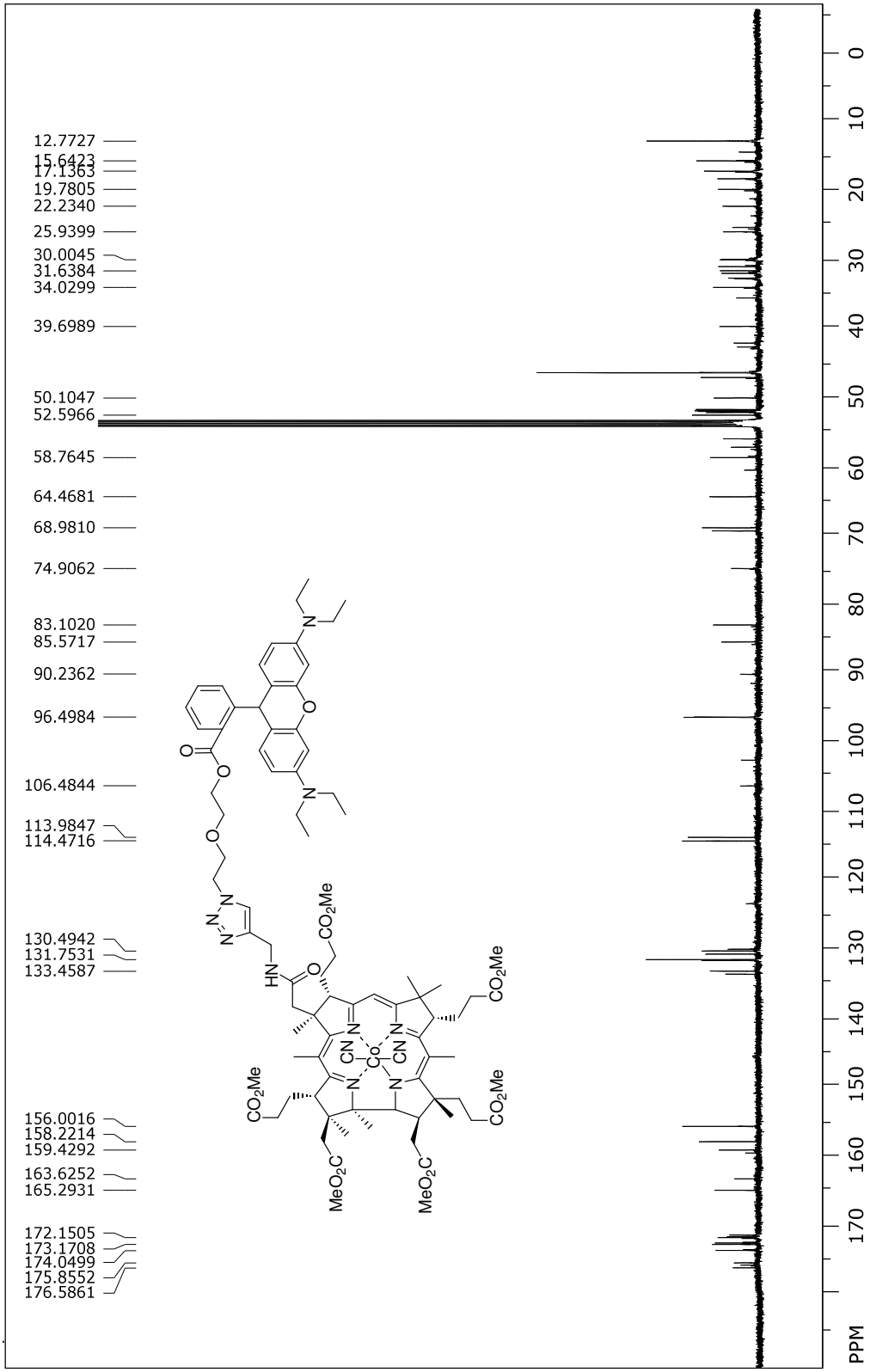
Rhodamine-2-(2-azido-ethoxy)-ethyl ester 16



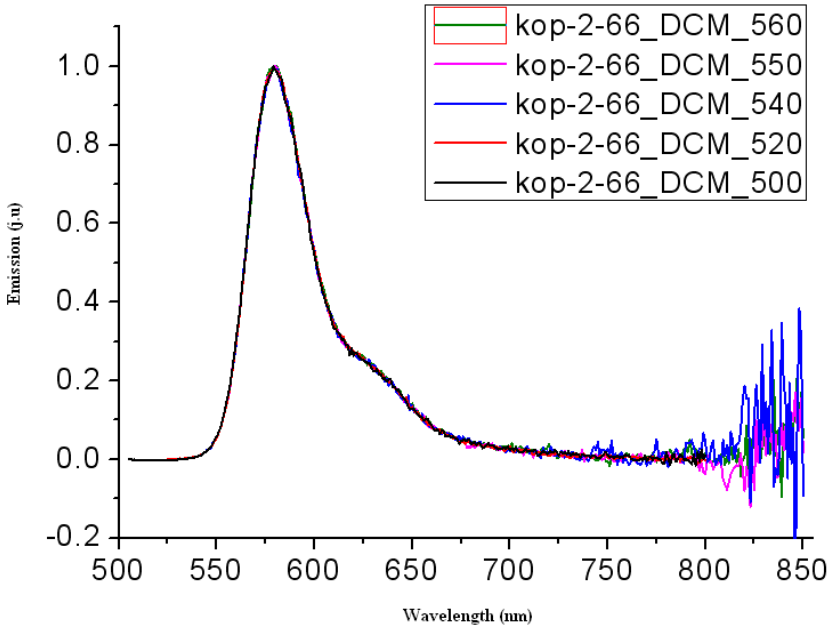
$(CN)_2$Cob(III)C1(2-{1-[rhodamine-2-(2-azido-ethoxy)-ethyl ester]-1H-[1,2,3]triazol-4-yl}-amide) 17



$(CN)_2$Cob(III)C1(2-{1-[rhodamine-2-(2-azido-ethoxy)-ethyl ester]-1H-[1,2,3]triazol-4-yl}-amide) 17

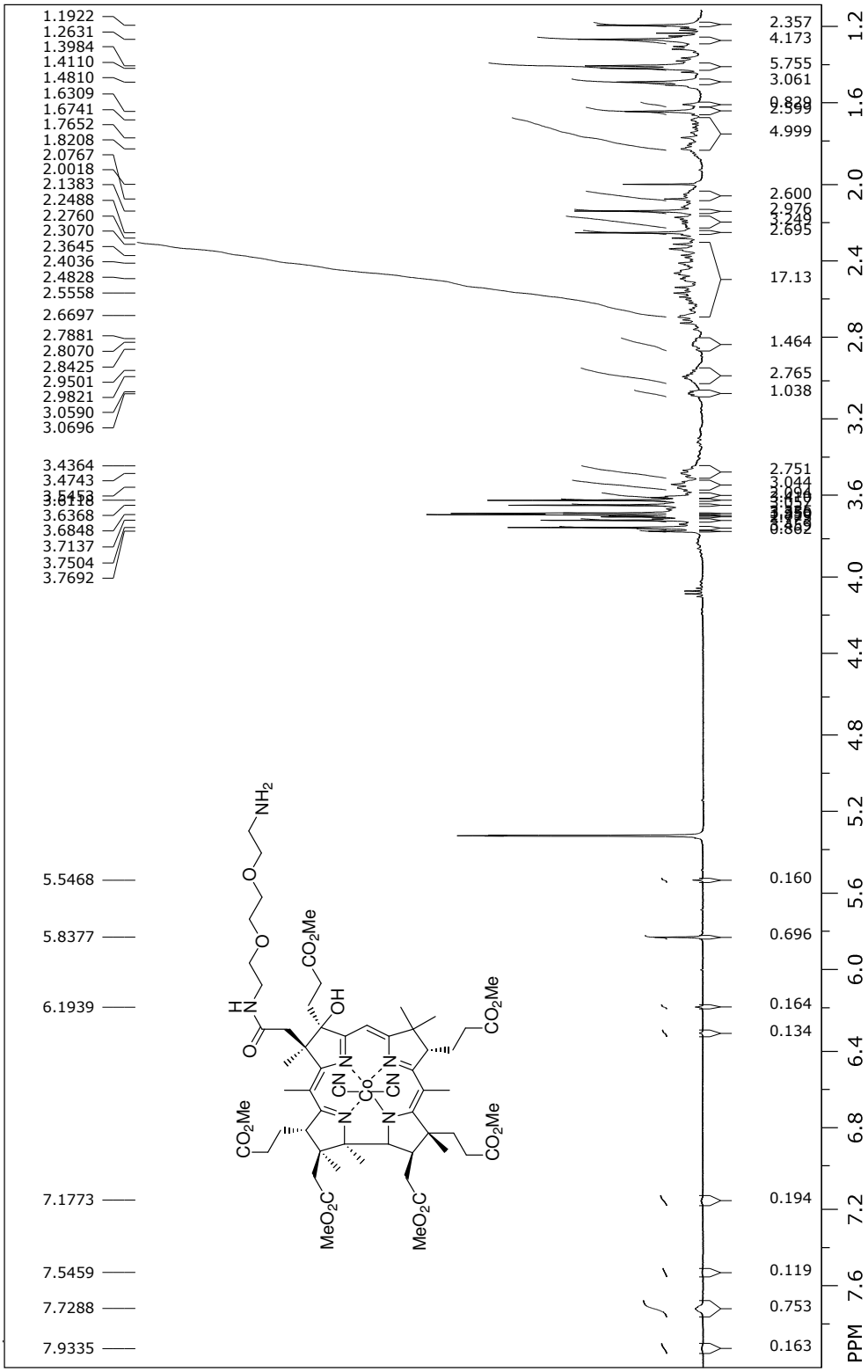


Fluorescence spectra of 17

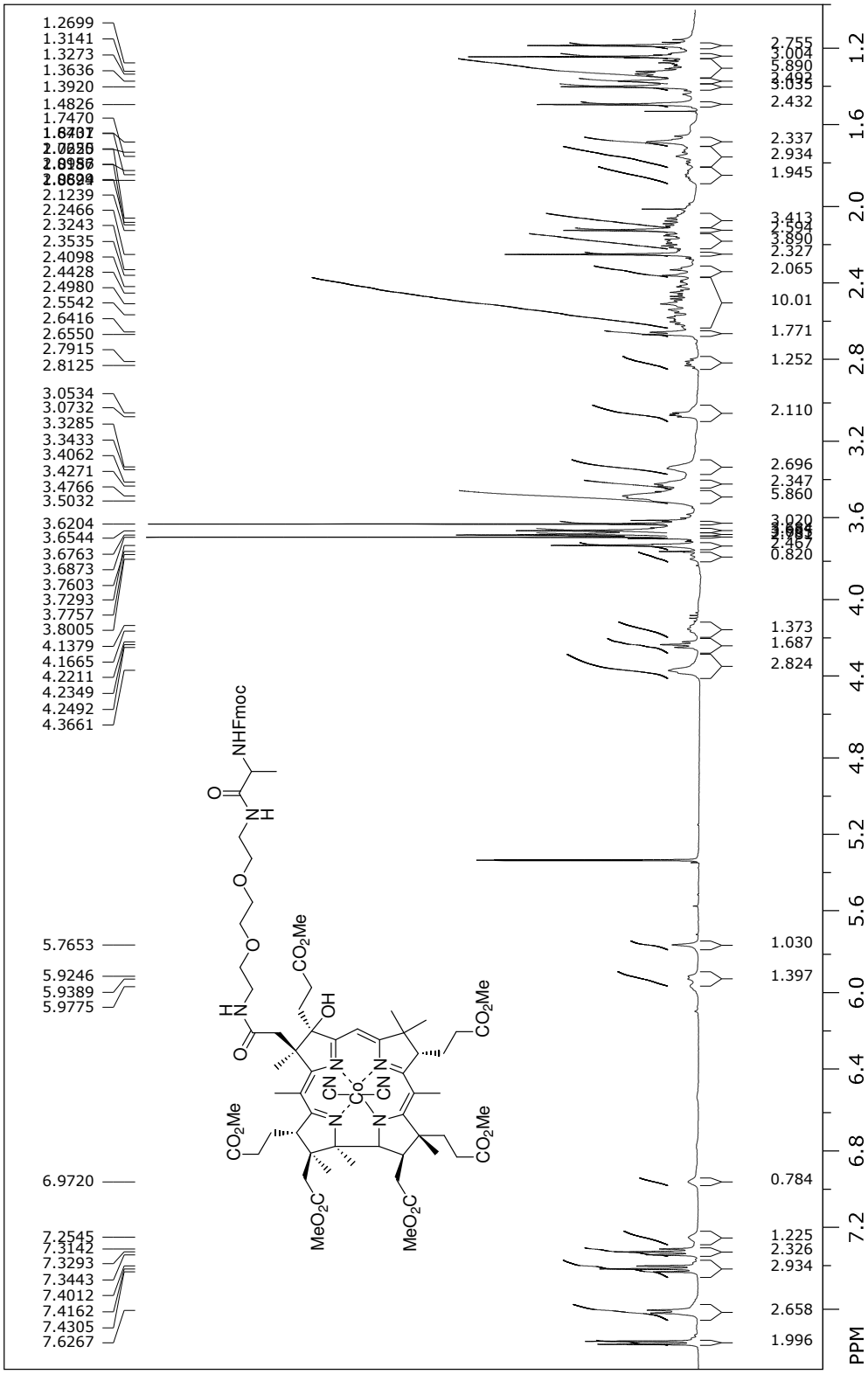


$(CN)_2$Cob(III)C1(N-[2-(2-amino-ethoxy)ethoxylethyl]-amide) 18

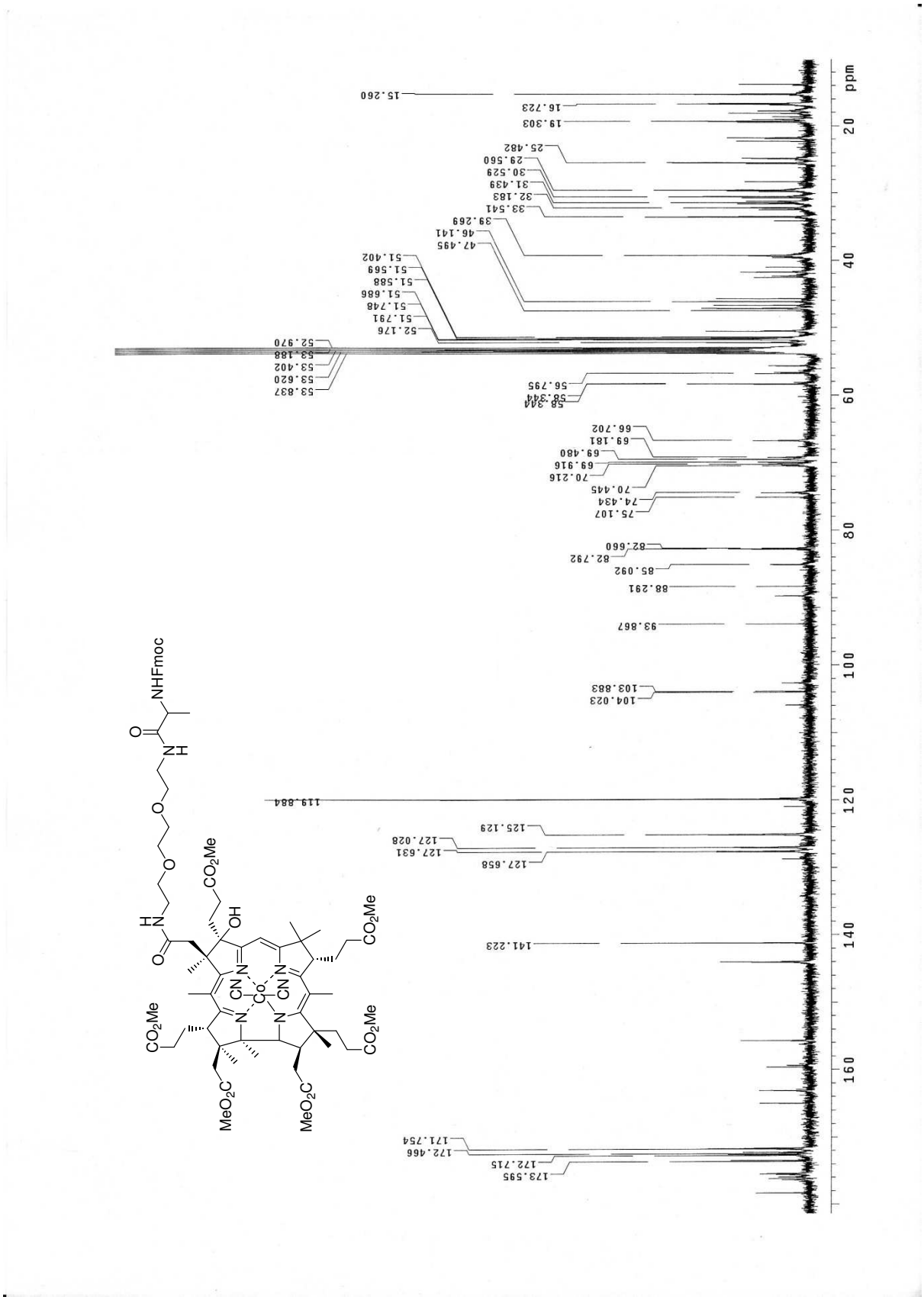
Note: Due to severe splitting of peaks in these spectra, caused by the presence of the terminal amine, the ^{1}H NMR spectra are very complicated, which made it difficult to obtain high resolution ^{13}C spectra.



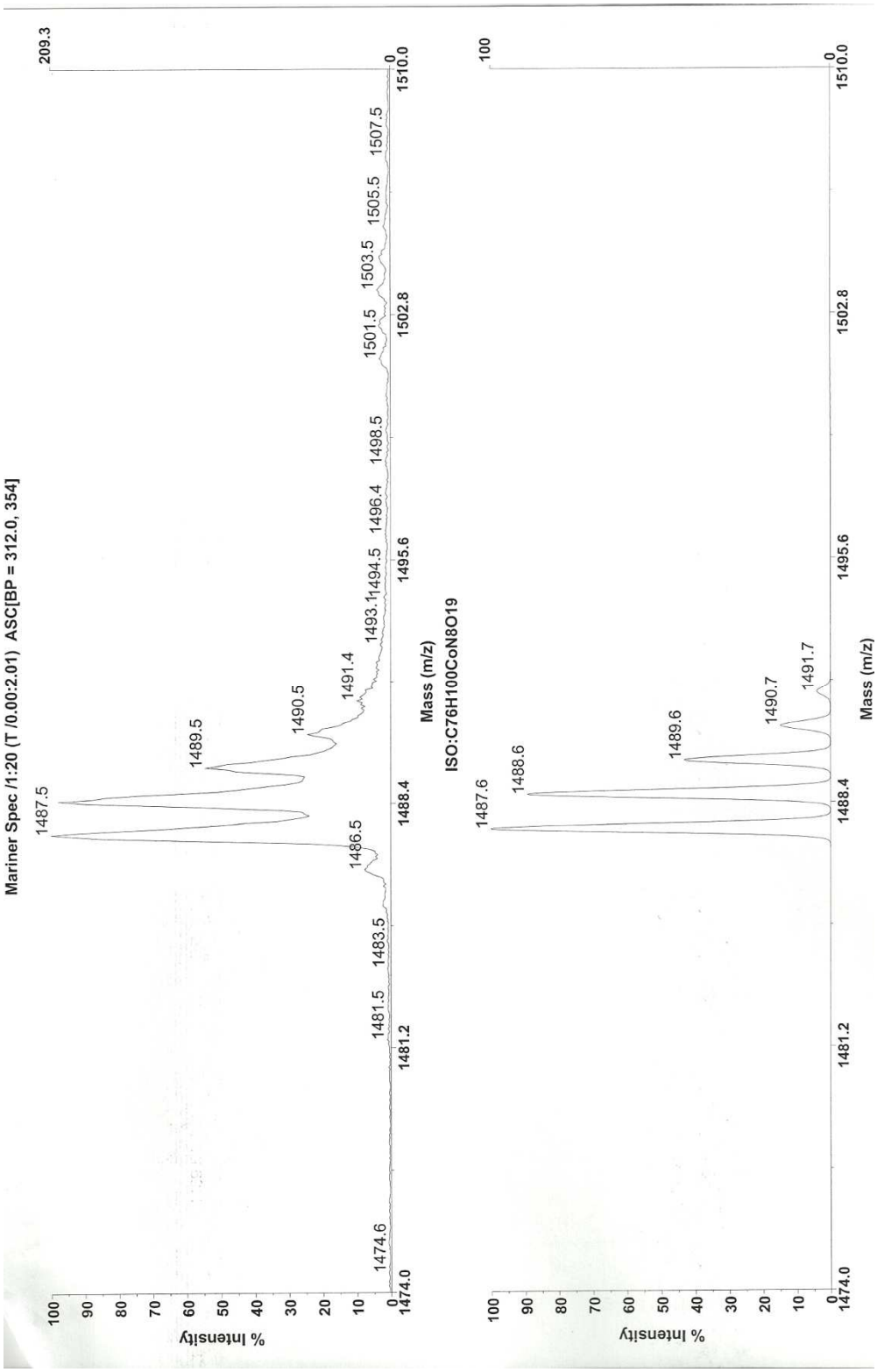
$(CN)_2$Cob(III)C1(1-{2-[2-(amino-methoxy)-ethoxy]-ethylcarbamoyl}-ethyl)-carbamic acid 9H-fluoren-9-yl methyl ester 19

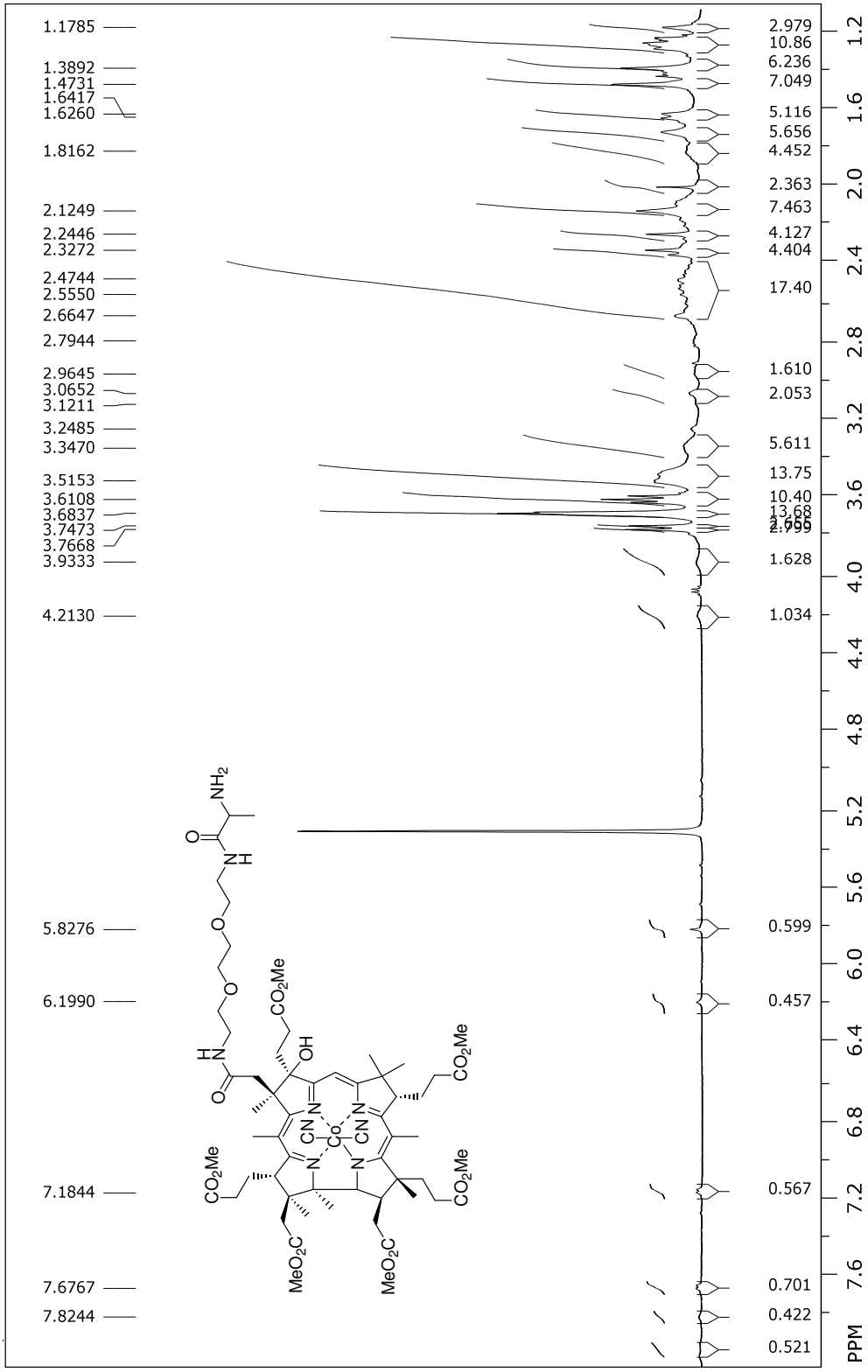


$(CN)_2$Cob(III)C1(1-{2-[2-(amino-methoxy)-ethoxy]-ethylcarbamoyl}-ethyl)-carbamic acid 9H-fluoren-9-yl methyl ester 19



$(CN)_2$Cob(III)C1(1-{2-[2-(amino-methoxy)-ethoxy]-ethylcarbamoyl}-ethyl)-carbamic acid 9H-fluoren-9-yl methyl ester 19



$(CN)_2$Cob(III)C1(*N*-{2-[2-(amino-methoxy)-ethoxy]-ethyl}-2-amino-propionamide) 20

Note: Due to severe splitting of peaks in these spectra, caused by the presence of the terminal amine, the ^{1}H NMR spectra are very complicated, which made it difficult to obtain high resolution ^{13}C spectra.