Electronic Supplementary Information

for

Synthesis of New Hydrophilic and Hydrophobic Cobinamides as NO-Independent sGC Activators

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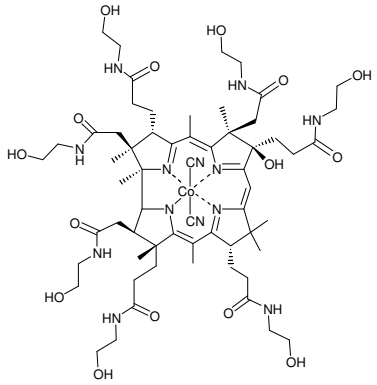
General Information

Analytical grade solvents were used as received. ^{1}H and ^{13}C NMR spectra were recorded at RT on Bruker 500 MHz or Varian 500 MHz with TMS as an internal standard. DCVC (dry column vacuum chromatography) was performed using Merck Silica Gel (200-300 mesh). Thin layer chromatography (TLC) was performed using Merck Silica Gel GF254, 0.20 mm thickness. High resolution ESI mass spectra were recorded on a Mariner spectrometer. UV/Vis absorption spectra were recorded in DCM on a Perkin Elmer λ-25.

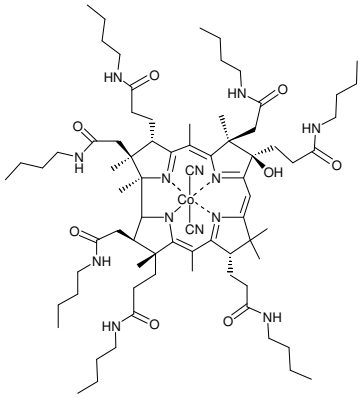
Note: In the case of compounds **1**, **2** and **4** due to overlapping of DMSO and EtOH or pentane peaks in the spectra the number of assigned protons is lower than the value stated in the molecular formula.

$(CN)_2$Cob(III)(*c*-hydroxy)heptakis(2-hydroxyethylamide) 1



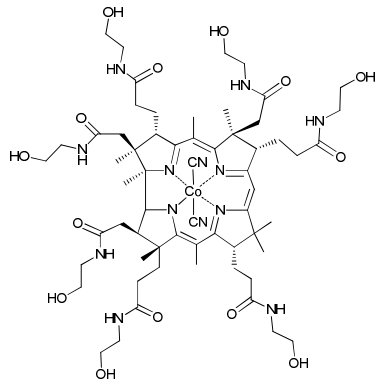
c-Lactone **7** (15 mg, 0.014 mmol) was dissolved in CCl_4 (1.0 mL) in a Schlenck tube under an argon atmosphere. Ethanolamine (0.1 mL, 1.6 mmol) and $Bu_4N^+CN^-$ (15 mg, 0.047 mmol) were then added. The mixture was stirred at 50°C for 24 h, after which it was diluted with water (10 mL) and washed with DCM (3 x 50 mL). The aqueous layer was concentrated *in vacuo* giving a purple residue, which was triturated with $Et_2O/CHCl_3$ (50 mL, 1:1) overnight. The crude product was purified using DCVC, 20-50% MeOH in DCM. Cobinamide **1** was redissolved in isopropanol, filtered through glass wool and the filtrate concentrated *in vacuo*. It was recrystalized from EtOH/Et_2O giving a purple solid (11 mg, 61%). M.p. 224-231°C. R_f 0.42, 50% MeOH in DCM. Anal. calcd. for $C_{61}H_{94}CoN_{13}O_{15}$ + EtOH + $2H_2O$: C 54.42, H 7.54, N 13.10; found: C 54.35, H 7.58, N 13.14. HRMS ESI (m/z) calcd. for $C_{60}H_{94}CoN_{12}O_{15}$ $[M\text{-}CN]^+$ 1281.6209; found 1281.6267. UV/Vis EtOH, λ_{max}, ε ($L \cdot mol^{-1} \cdot cm^{-1}$): 586 ($8.43x10^3$), 546 ($6.62x10^3$), 422 ($2.22x10^3$), 369 ($2.33x10^4$), 316 ($8.05x10^3$), 308 ($7.77.x10^3$), 280 ($8.04x10^3$). ^{1}H NMR (500 MHz, DMSO-d_6) δ (ppm): 8.24 (t, *J* = 5.3 Hz, 1H), 8.20 (t, *J* = 5.4 Hz, 1H), 7.96 (m, 2H), 7.89 (t, *J* = 5.5 Hz, 1H), 7.60 (t, *J* = 5.6 Hz, 1H), 7.37 (t, *J* = 5.4 Hz, 1H), 5.71 (s, 1H), 4.79 (t, *J* = 6.2 Hz, 1H), 4.76 (t, *J* = 6.2 Hz, 1H), 4.68 (m, 3H), 4.59 (t, *J* = 5.5 Hz, 2H), 4.52 (t, *J* = 5.5 Hz, 1H), 4.34 (d, *J* = 9.1 Hz, 1H), 3.63 (d, *J* = 10.3 Hz, 1H), 3.49 (t, *J* = 5.6 Hz, 1H), 3.46-3.44 (m, 4H), 3.40-3.90 (m, 6H), 3.27-3.24 (m, 4H), 3.15-3.06 (m, 8H), 3.03-3.00 (m, 4H), 2.93-2.87 (m, 1H), 2.76 (m, 1H), 2.36-2.31 (m, 3H), 2.24-2.21 (m, 3H), 2.19 (m, 4H), 2.16-2.13 (m, 3H), 2.09 (s, 3H), 2.04-1.97 (m, 6H), 1.80-1.71 (m, 4H), 1.49 (s, 3H), 1.43 (m, 2H), 1.34 (s, 3H), 1.29 (s, 3H), 1.22 (s, 3H), 1.15 (s, 3H), 1.07 (s, 3H). ^{13}C NMR (125 MHz, DMSO-d_6) δ (ppm): 179.6, 178.9, 178.2, 176.1, 175.9, 174.7, 173.9, 165.4, 165.2, 105.5, 104.7, 92.3, 88.2, 85.5, 77.8, 68.2, 63.1, 63.09, 63.07, 63.04, 63.03, 62.9, 62.8, 62.7, 61.3, 58.1, 56.5, 55.9, 49.4, 49.1, 49.0, 45.0, 44.9, 44.8, 44.7, 41.9, 38.7, 36.1, 35.1, 34.9, 34.6, 34.4, 34.1, 28.9, 28.8, 24.7, 22.7, 20.8, 20.7, 19.4, 18.6, 18.4, 18.2, 18.1.

$(CN)_2$Cob(III)(*c*-hydroxy)heptakis(*n*-butylamide) 2



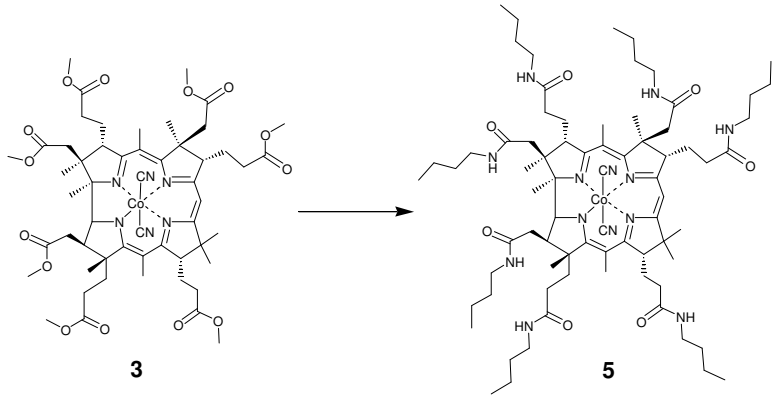
c-Lactone **7** (70 mg, 0.065 mmol) was dissoleved in CCl_4 (5.0 mL) in a Schlenck tube under an argon atmosphere. *n*-Butylamine (5.0 mL, 37 mmol) and NaN_3 (75 mg, 1.2 mmol) were then added. The mixture was stirred at 50°C for 72 h, after which it was diluted with water (20 mL) and washed with DCM (3 x 100 mL). The aqueous layer was concentrated *in vacuo* giving a purple residue, which was triturated with $Et_2O/CHCl_3$ (100 mL, 1:1) overnight. Cobinamide **2** was purified using DCVC, 2-10% EtOH in DCM. The product was recrystalized from AcOEt/pentane giving a purple solid (66 mg, 73 %). M.p. 145-148 ^oC. R_f 0.42, 5% EtOH in DCM. Anal. calcd. for $C_{75}H_{122}CoN_{13}O_8 + 3H_2O$: C 62.26, H 8.92, N 12.59; found: C 62.21, H 8.87, N 12.45. HRMS ESI (m/z) calcd. for $C_{75}H_{122}CoN_{13}O_8Na$ $[M+Na]^+$ 1414.8767; found 1414.8763. UV/Vis EtOH, λ_{max}, ε ($L \cdot mol^{-1} \cdot cm^{-1}$): 583 ($5.39x10^3$), 544 ($5.96x10^3$), 419 ($2.68x10^3$), 368 ($1.77x10^4$), 318 ($7.79x10^3$), 280 ($8.03x10^3$). ^1H NMR (500 MHz, DMSO-d_6) δ (ppm): 8.17 (t, *J* = 4.8 Hz, 1H), 8.13 (t, *J* = 5.3 Hz, 1H), 7.94 (t, *J* = 5.3 Hz, 1H), 7.82 (t, *J* = 5.7 Hz, 1H), 7.54 (t, *J* = 5.3 Hz, 2H), 7.33 (t, *J* = 4.4 Hz, 1H), 6.65 (s, 1H), 5.64 (s, 1H), 4.49 (d, *J* = 8.8 Hz, 0.8H), 4.40 (d, *J* = 4.4 Hz, 0.2H), 3.62 (m, 1H), 3.16-2.91 (m, 16H), 2.80-2.76 (m, 2H), 2.36-2.32 (m, 2H), 2.20 (m, 2H), 2.10-1.96 (m, 9H), 1.88-1.83 (m, 3H), 1.75-1.68 (m, 4H), 1.68 (m, 4H), 1.55-1.50 (m, 5H), 1.44-1.35 (m, 10H), 1.22-1.16 (m, 12H), 1.08 (s, 4H), 0.99 (d, *J* = 6.6Hz, 1H), 0.90-0.83 (m, 16H), 0.81-0.78 (m, 5H). ^{13}C NMR (125 MHz, DMSO-d_6) δ (ppm): 176.1, 175.7, 175.3, 172.3, 172.1, 171.6, 171.0, 170.7, 170.3, 170.2, 170.1, 162.1, 157.9, 105.8, 102.2, 88.6, 84.7, 82.4, 74.6, 67.2, 67.1, 58.3, 54.9, 54.8, 52.9, 46.0, 45.9, 38.8, 38.6, 38.3, 38.2, 38.18, 38.15, 31.3, 31.2, 31.18, 31.12, 31.0, 30.9, 30.8, 30.5, 19.9, 19.8, 19.7, 19.6, 19.56, 19.50, 19.4, 19.3, 17.4, 15.9, 15.8, 15.0, 14.6, 13.7, 13.6, 13.57, 13.56.

$(CN)_2$Cob(III)heptakis(2-hydroxyethylamide) 4



Heptamethylester **3** (15 mg, 0.014 mmol) was dissolved in toluene (1.0 mL) in a Schlenck tube under an argon atmosphere. Ethanolamine (1.0 mL, 1.6 mmol) and $Bu_4N^+CN^-$ (15 mg, 0.047 mmol) were then added. The mixture was stirred at 50°C for 24 h, after which it was diluted with water (10 mL) and washed with DCM (3 x 50 mL). The aqueous layer was concentrated *in vacuo* giving a purple residue, which was triturated with Et_2O/chloroform (50 mL, 1:1) overnight. The crude product was purified using DCVC, 20-50% MeOH in DCM. Cobinamide **4** was redissolved in isopropanol, filtered through glass wool and the filtrate concentrated *in vacuo*. Cobinamide **4** was then recrystalized from EtOH/Et_2O and dried under vacuum giving a purple solid (11 mg, 60%). M.p. 182-192°C. R_f 0.48, 50% MeOH in DCM. Anal. calcd. for $C_{61}H_{94}CoN_{13}O_{14}$ + EtOH + $2H_2O$: C 55.05, H 7.63, N 13.25; found: C 54.82, H 7.60, N 13.19. HRMS ESI (m/z) calcd. for $C_{61}H_{94}CoN_{13}O_{14}Na$ $[M+Na]^+$ 1314.6267; found 1314.6209. UV/Vis CH_3OH, λ_{max}, ε ($L \cdot mol^{-1} \cdot cm^{-1}$): 278 ($5.93x10^3$), 317 ($6.37x10^3$), 367 ($8.74x10^3$), 473 ($4.23x10^3$), 541 ($3.19x10^3$), 583 ($3.02x10^3$). ^{1}H NMR (500 MHz, DMSO-d_6) δ (ppm): 8.35 (t, *J* = 5.1 Hz, 1H), 8.31 (t, *J* = 5.3 Hz, 1H), 7.99 (m, 2H), 7.91 (t, *J* = 5.3 Hz, 1H), 7.67 (t, *J* = 5.3 Hz, 1H), 7.62 (t, *J* = 5.5 Hz, 1H), 5.64 (s, 1H), 4.83 (s(br), 2H), 4.69 (s(br), 2H), 4.61 (m(br), 3H), 4.41 (d, *J* = 9.3 Hz, 1H), 3.59 (m, 2H), 3.45-3.41 (m, 4H), 3.33 (m, 11H), 3.26-3.22 (m, 1H), 3.16-3.09 (m, 8H), 3.04-3.03 (m, 6H), 2.78 (s(br), 1H), 2.63-2.56 (m, 1H), 2.46-2.37 (m, 3H), 2.30-2.25 (m, 1H), 2.18 (s, 5H), 2.14 (s, 3H), 2.09-1.99 (m, 6H), 1.93-1.72 (m, 6H), 1.51 (s, 3H), 1.33 (s, s, 6H), 1.22 (s, 3H), 1.14 (s, 3H), 1.07 (m, 3H). ^{13}C NMR (125 MHz, DMSO-d_6) δ (ppm): 175.8, 175.7, 175.3, 172.5, 172.1, 171.6, 171.4, 171.3, 170.7, 170.5, 169.2, 162.8, 162.3, 103.5, 101.6, 90.0, 82.4, 74.7, 64.7, 59.8, 59.79, 59.77, 59.71, 59.5, 59.1, 54.8, 54.3, 52.8, 50.4, 48.6, 46.0, 45.7, 43.6, 41.7, 41.6, 41.5, 41.4, 38.5, 35.3, 32.7, 32.1, 32.0, 31.9, 31.2, 30.8, 27.4, 25.6, 25.2, 21.5, 19.4, 18.2, 17.5, 16.1, 15.2, 15.1, 14.9.

Attempted synthesis of hydrophobic cobinamide 5 from heptamethylester 3

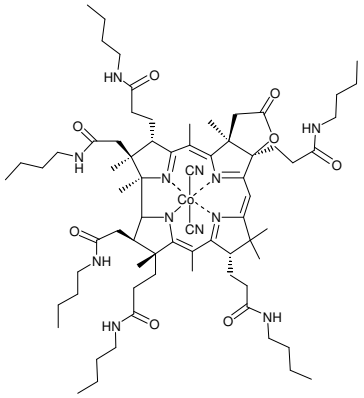


3 **5**

Heptamethylester **3** (15 mg, 0.014 mmol) was dissolved in an appropriate solvent (1.0 mL). A catalyst and *n*-butylamine (1.0 mL) were then added and the mixture was stirred at an appropriate temperature for the given time. All reactions were worked-up as described in the synthesis of cobinamide **2**.

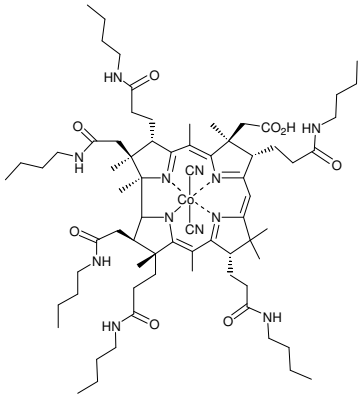
Solvent	Catalyst [eq.]	Time [h]	Temperature [^{o}C]	Yield [%] of 5
Toluene	$Bu_4N^+CN^-$; 0,5eq.	24	50	-
Toluene	$Bu_4N^+CN^-$; 0,5eq.	72	50	-
CCl_4	$Bu_4N^+CN^-$; 0,5eq.	24	RT	-
CCl_4	$Bu_4N^+CN^-$; 0,5eq.	24	50	-
CCl_4	NaN_3	72	50	-
CCl_4	NaN_3 and NaCN	72	50	-
EtOH	NaCN, excess	24	RT	-
EtOH	$Bu_4N^+CN^-$; 0,5eq.	24	RT	-
EtOH	$Bu_4N^+CN^-$; 0,5eq.	24	50	-
EtOH	$Bu_4N^+CN^-$; 0,5eq.	72	50	-
EtOH	NaN_3, excess	72	50	-
MeOH	$Bu_4N^+CN^-$; 0,5eq.	24	50	-
MeOH	$Bu_4N^+CN^-$; 0,5eq.	48	50	-
H_2O	NaCN, excess	24	50	-
Brine	$Bu_4N^+CN^-$; 0,5eq.	72	50	-

$(CN)_2$Cob(III)hexakis(*n*-butylamide)(*c*-lactone) 9



Cobinamide **2** (80 mg, 0.057 mmol) was dissolved in DCM (3.0 mL) and treated with TFA (3.0 mL, 39 mmol). The mixture was stirred at RT for 1 h, after which the acid was neutralized using $NaHCO_3$. The aqueous layer was washed with DCM and the combined organic layers were washed with aq. NaCN, dried over Na_2SO_4, filtrated and concentrated *in vacuo.* The crude product was purified using DCVC, 2-5 % EtOH in DCM. *c*-Lactone **9** was recrystalized from AcOEt/pentane and dried under vacuum giving a purple solid (55 mg, 56%). M.p. 147-150°C. R_f 0.31, 4% EtOH in DCM. Anal. calcd. for $C_{71}H_{111}CoN_{12}O_8$ + $2H_2O$: C 62.90, H 8.55, N 12.40; found: C 62.81, H 8.56, N 12.29. HRMS ESI (m/z) calcd. for $C_{70}H_{111}CoN_{11}O_8$ $[M\text{-}CN]^+$ 1292.7944; found 1292.7944. UV/Vis CH_3OH, λmax, ε ($L \cdot mol^{-1} \cdot cm^{-1}$): 280 ($9.56x10^3$), 305 ($7.64x10^3$), 317 ($8.71x10^3$), 366 ($2.82x10^4$), 419 ($2.47x10^3$), 547 ($8.11x10^3$), 856 ($9.52x10^3$). ^{1}H NMR (500 MHz, DMSO-d_6) δ (ppm): 8.13 (t, *J* = 5.4 Hz, 2H), 7.92 (t, *J* = 5.4 Hz, 1H), 7.85 (t, *J* = 5.4 Hz, 1H), 7.58 (t, *J* = 5.5 Hz, 1H), 7.49 (t, *J* = 5.5 Hz, 1H), 5.60 (s, 1H), 4.40 (d, *J* = 8.7 Hz, 1H), 3.64-3.60 (m, 1H), 3.29 (d, *J* = 6.3 Hz, 1H), 3.25 (s, 1H), 3.21-3.14 (m, 1H), 3.09-2.91 (m, 12H), 2.82 (s(br), 1H), 2.61 (d, *J* = 18.7 Hz, 1H), 2.38-2.35 (m, 1H), 2.26-2.16 (m, 12H), 2.07-1.92 (m, 6H), 1.88-1.67 (m(br), 4H), 1.60 (s, 3H), 1.43-1.20 (m, 35H), 1.13 (s, 3H), 1.06 (s, 3H), 0.89-0.84 (m, 12H), 0.82-0.79 (m, 6H). ^{13}C NMR (125 MHz, DMSO-d_6) δ (ppm): 177.7, 176.5, 175.8, 173.3, 171.8, 170.9, 170.6, 170.5, 170.3, 170.1, 164.5, 162.0, 159.5, 103.9, 103.4, 94.5, 87.0, 82.6, 75.3, 58.4, 55.2, 52.9, 49.8, 46.8, 45.8, 41.7, 38.6,38.4, 38.3, 38.2, 38.1, 35.5, 32.6, 32.2, 32.0, 31.2, 31.17, 31.5, 31.1, 30.9, 30.4, 30.0, 29.5, 26.2, 25.2, 21.6, 19.7, 19.6, 19.5, 19.3, 18.8, 17.8, 16.1, 16.0, 15.0, 13.7, 13.63, 13.60, 13.58, 13.56.

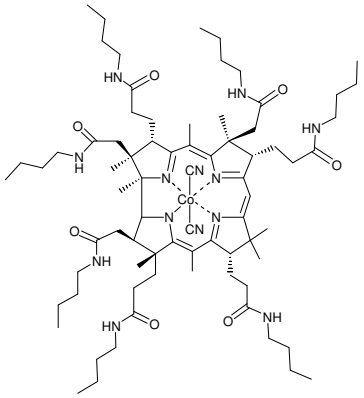
$(CN)_2$Cob(III)hexakis(*n*-butylamide)(*c*-acid) 10



c-Lactone **9** (15 mg, 0.011 mmol) was dissoleved in a degased 15 % AcOH/toluene solution (1.0 mL). Activated zinc (22 mg, 0.34 mmol) was added and the mixture was vigorously stirred at RT for 30 min. The solution was neutralized using phosphate buffer (5.0 mL) and washed with DCM. The combined organic layers were washed with aq. NaCN, dried over Na_2SO_4, filtrated and concentrated *in vacuo.* *c*-Acid **10** was crudely purified using DCVC, 5-10% MeOH in DCM, in which the most intense band was isolated. *c*-Acid **10** was recrystalized from AcOEt/pentane and dried under vacuum giving a purple solid. R_f 0.47, 10% EtOH in DCM. HRMS ESI (m/z) calcd. for $C_{70}H_{113}CoN_{11}O_8$ $[M\text{-}CN]^+$ 1294.8100; found 1294.8048.

c-Acid **10** was used without further purification. The broadening of peaks in the ^1H 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)heptakis(*n*-butylamide) 5



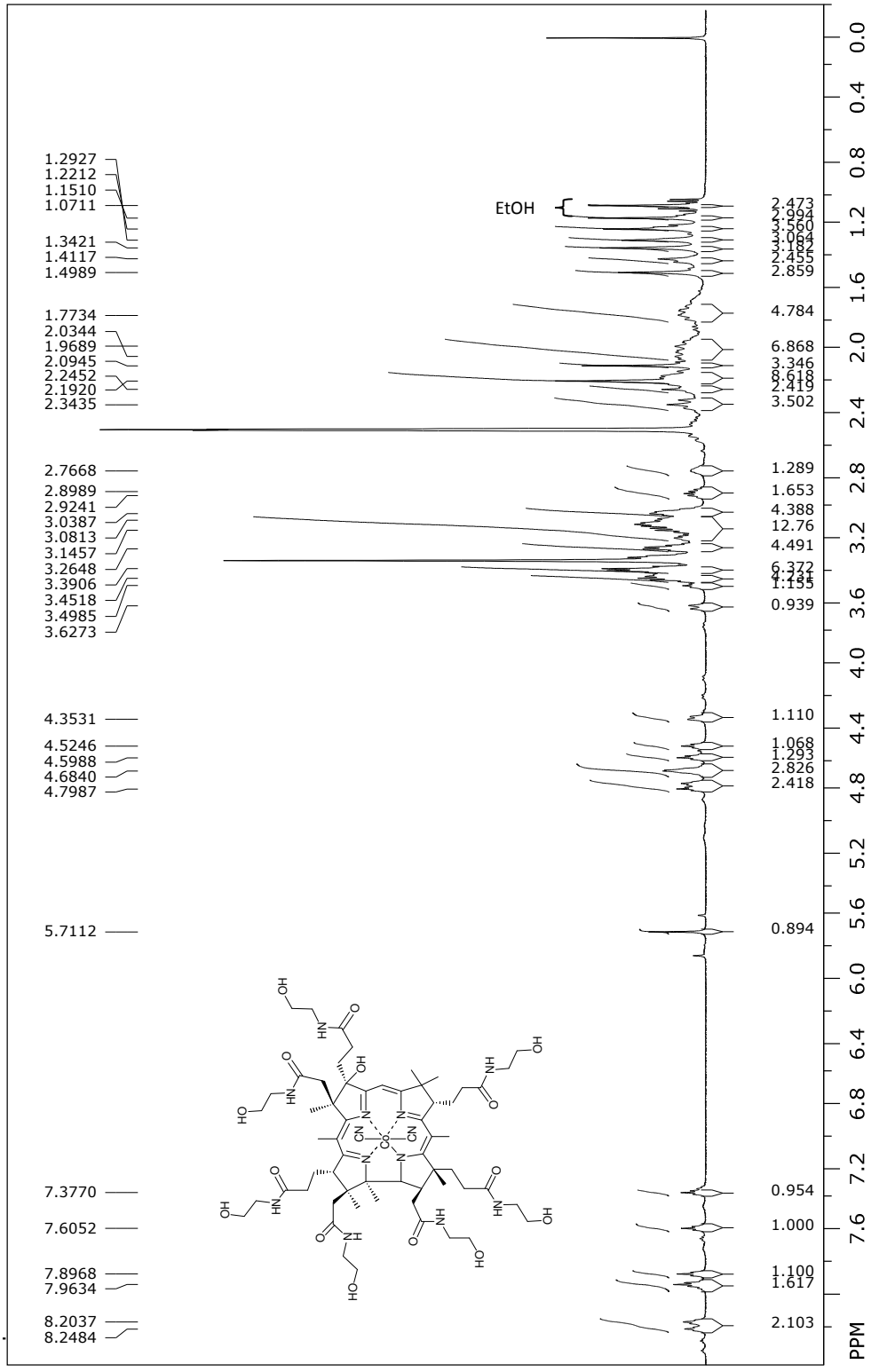
Cobinamide **10** (20 mg, 0.015 mmol) was dissolved in DMF (1.5 mL) under an argon atmosphere. *n*-Butylamine (12 µL), DIPEA (18 µL, 0.11 mmol) and DEPC (15 µL, 0.11 mmol) were then added and the mixture was stirred at RT for 24 h. The mixture was then diluted with DCM and washed with water. The organic layer was dried over Na_2SO_4, filtered and concentrated *in vacuo* giving a purple residue. The crude product was purified using DCVC, 2-10% EtOH in DCM. Cobinamide **5** was recrystalized using AcOEt/pentane and dried under vacuum giving a purple solid (13 mg, 62%). M.p. 142-146 ^oC. R_f 0.44, 5% EtOH in DCM. Anal. calcd. for $C_{75}H_{122}CoN_{13}O_7 + 2H_2O$: C 63.76, H 8.99, N 12.89; found: C 63.68, H 9.07, N 12.81. HRMS ESI (m/z) calcd. for $C_{74}H_{122}CoN_{12}O_7$ $[M\text{-}CN]^+$ 1398.8814; found 1398.8815. UV/Vis CH_3OH, λ_{max}, ε ($L{\cdot}mol^{-1}{\cdot}cm^{-1}$): 279 ($1.06x10^4$), 315 ($9.48x10^3$), 368 ($2.78x10^4$), 419 ($2.75x10^4$), 544 ($8.32x10^3$), 581 ($9.43x10^3$), 940 ($7.08x10^3$). ^1H NMR (500 MHz, DMSO-d_6) δ (ppm): 8.14-8.10 (m, 2H), 7.94 (t, *J* = 5.4 Hz, 1H), 7.84 (t, *J* = 5.4 Hz, 1H), 7.80 (t, *J* = 5.4 Hz, 1H), 7.55 (t, *J* = 5.4 Hz, 1H), 7.50 (t, *J* = 5.5 Hz, 1H), 5.65 (s, 1H), 4.45 (d, *J* = 9.0 Hz, 1H), 3.60 (d, *J* = 10.1 Hz, 1H), 3.47 (t, *J* = 5.5 Hz, 1H), 3.30 (s, 1H), 3.22-3.15 (m, 1H), 3.10-2.90 (m, 14H), 2.79 (s(br), 1H), 2.36-2.28 (m, 3H), 2.24-2.12 (m, 9H), 2.05-1.85 (m, 8H), 1.79-1.67 (m, 4H), 1.57-1.52 (m, 4H), 1.46-1.19 (m, 39H), 1.14 (s, 3H), 1.07 (s, 3H), 0.90-0.80 (m, 21H). ^{13}C NMR (125 MHz, DMSO-d_6) δ (ppm): 175.9, 175.7, 175.4, 172.1, 171.7, 171.6, 171.0, 170.8, 170.4, 170.2, 168.8, 162.5, 162.3, 103.8, 101.7, 82.4, 74.6, 58.2, 55.0, 48.9, 46.0, 45.8, 40.0, 39.84, 39.76, 39.7, 39.6, 39.5, 39.3, 39.2, 39.0, 38.6, 38.5, 38.33, 38.27, 38.18, 38.16, 38.1, 31.9, 31.8, 31.3, 31.18, 31.17, 31.15, 31.1, 31.0, 30.9, 21.6, 19.7, 19.59, 19.56, 19.53, 19.50, 19.4, 18.2, 17.6, 16.0, 15.0, 14.9, 13.66, 13.55, 13.62, 13.56, 13.54, 13.48

Preparation and in vitro assay of recombinant human sGC enzyme.

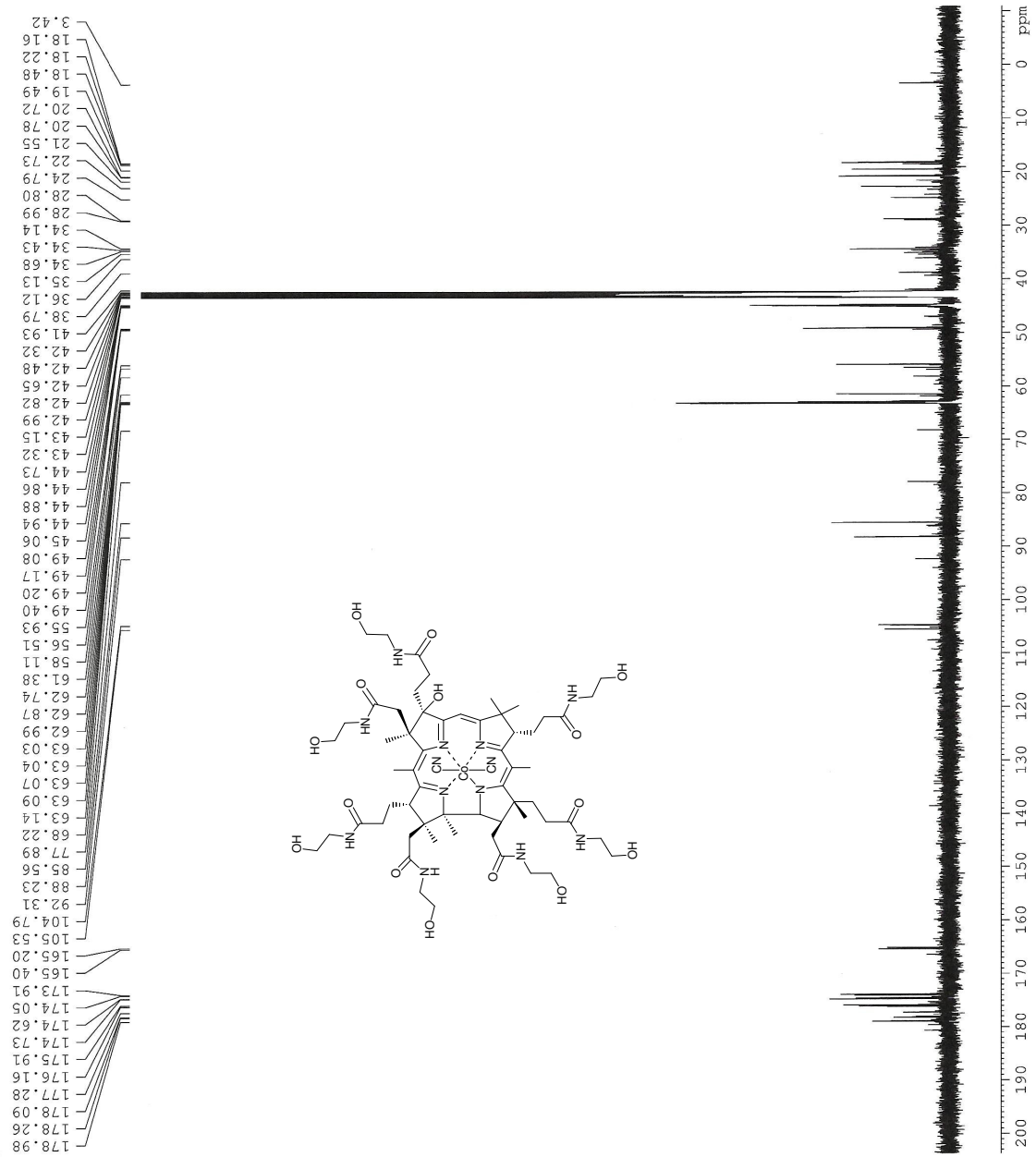
Full-length sGC was purified from Sf9 cells as described previously.[1] Enzymatic activity was assayed using [α-^{32}P]GTP to [^{32}P] cGMP conversion assay. To evaluate the effect of (CN2)Cbi or its derivatives on sGC activity, 0.5 μg sGC was preincubated for 10 min at room temperature with indicated concentration of the tested compound in 25 mM TEA, pH 7.5, 1 mg/ml BSA, 1 mM 3-isobutyl-1-methylxanthine (IBMX), 1 mM DTT, 1 mM cGMP, 3 mM $MgCl_2$, 0.05 mg/ml creatine phosphokinase and 5 mM creatine phosphate. To assay the cGMP-forming activity of treated sGC the reaction was initiated by adding 1 mM GTP/ [α-^{32}P]GTP (~ 150000 cpm) and incubated at 37^{o}C for 10 minutes. The reaction was stopped by 400 μl of 100 mM zinc acetate followed by 500 μl of 120 mM sodium carbonate. Unreacted GTP was precipitated by centrifugation and the supernatant containing cGMP was loaded onto a 2 ml Al_2O_3 column. cGMP was eluted with 10 ml of 50 mM Tris pH 7.5 and the amount of generated [^{32}P] cGMP was calculated based on the Cherenkov counts in a beta scintillation counter.

[1]Martin, E.; Berka, V.; Tsai, A.L.; Murad, F. *Methods Enzymol., 2005,* **396,** 478-492.

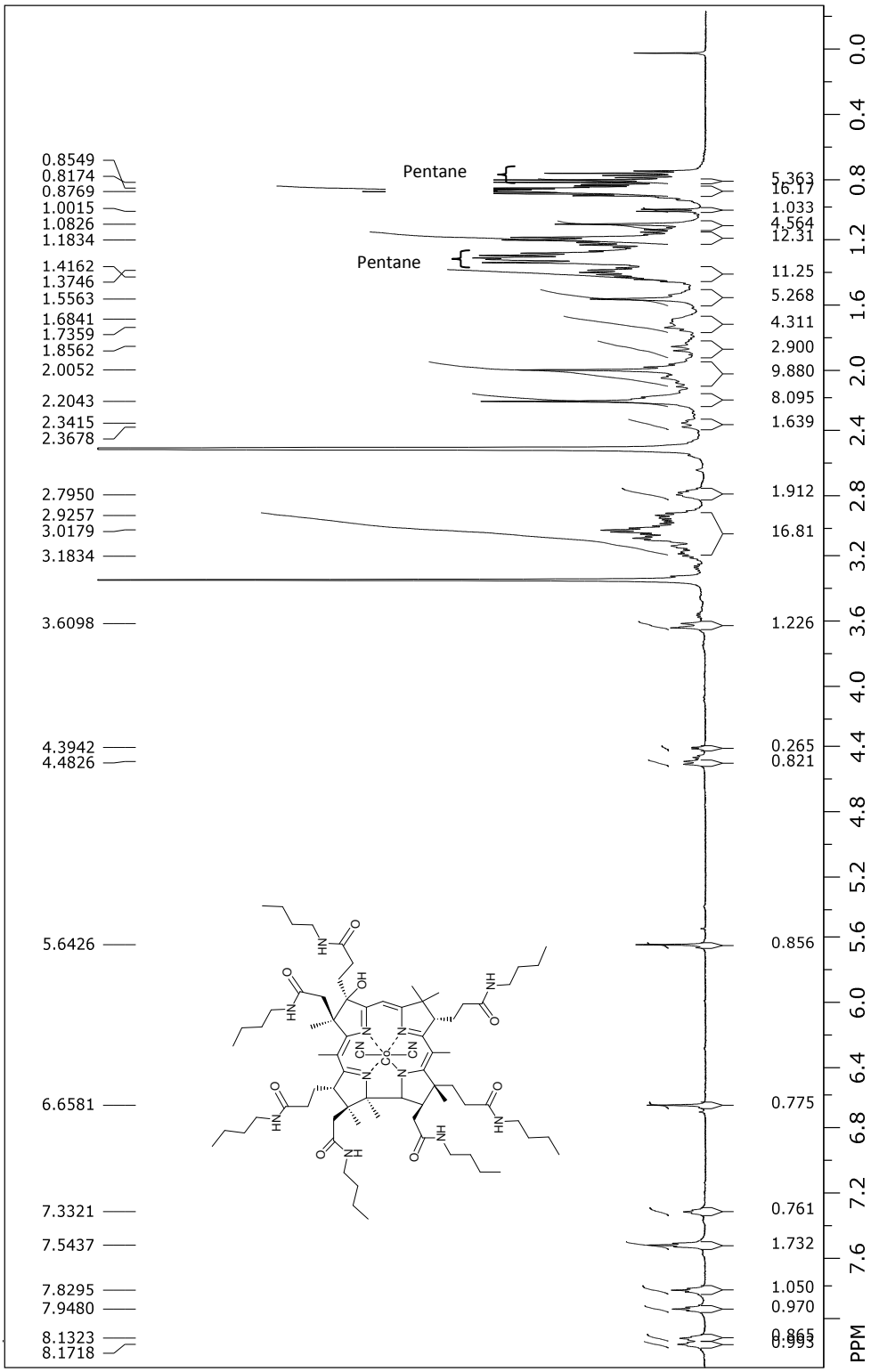
$(CN)_2$Cob(III)(*c*-hydroxy)heptakis(2-hydroxyethylamide) 1



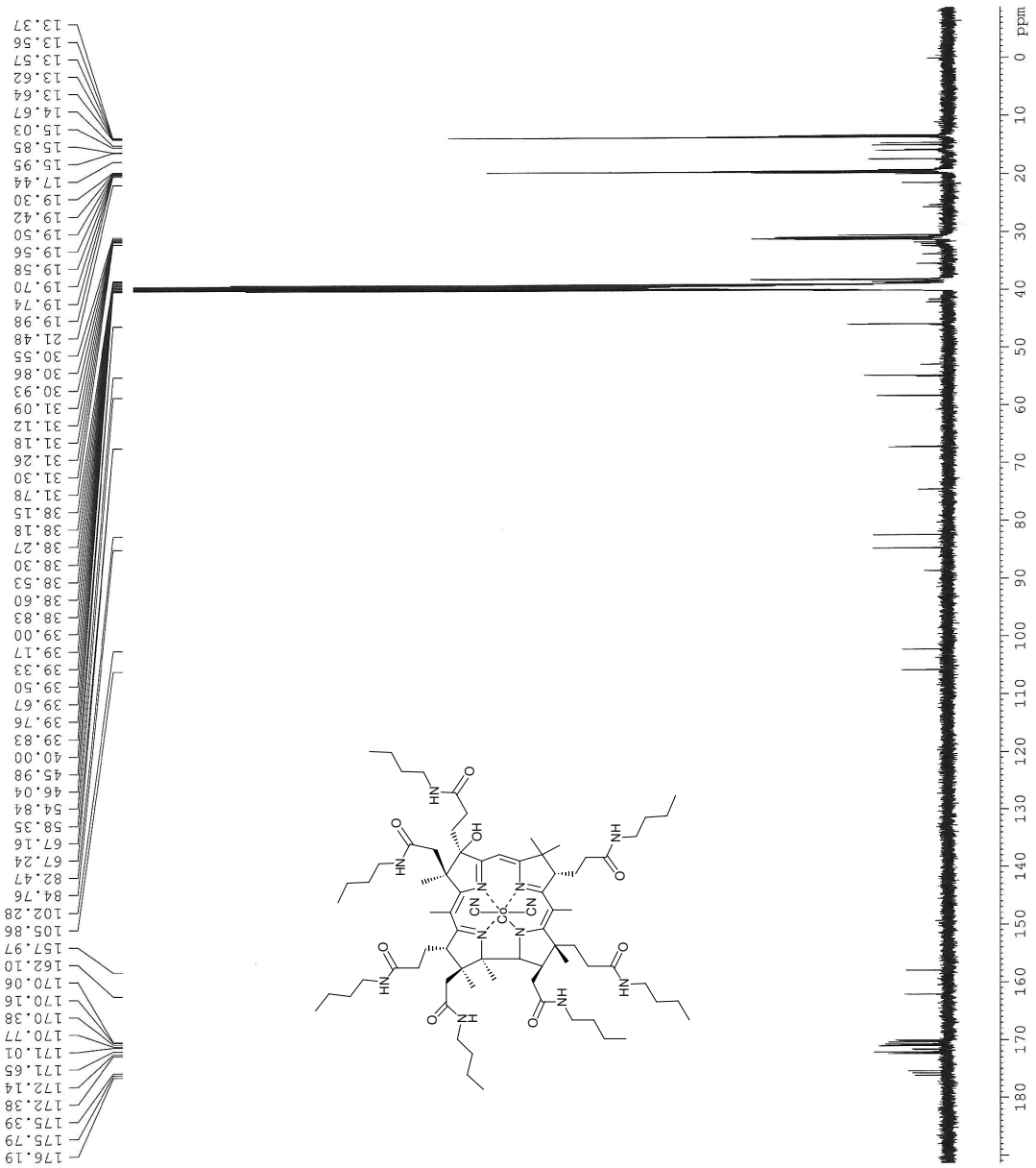
$(CN)_2$Cob(III)(*c*-hydroxy)heptakis(2-hydroxyethylamide) 1



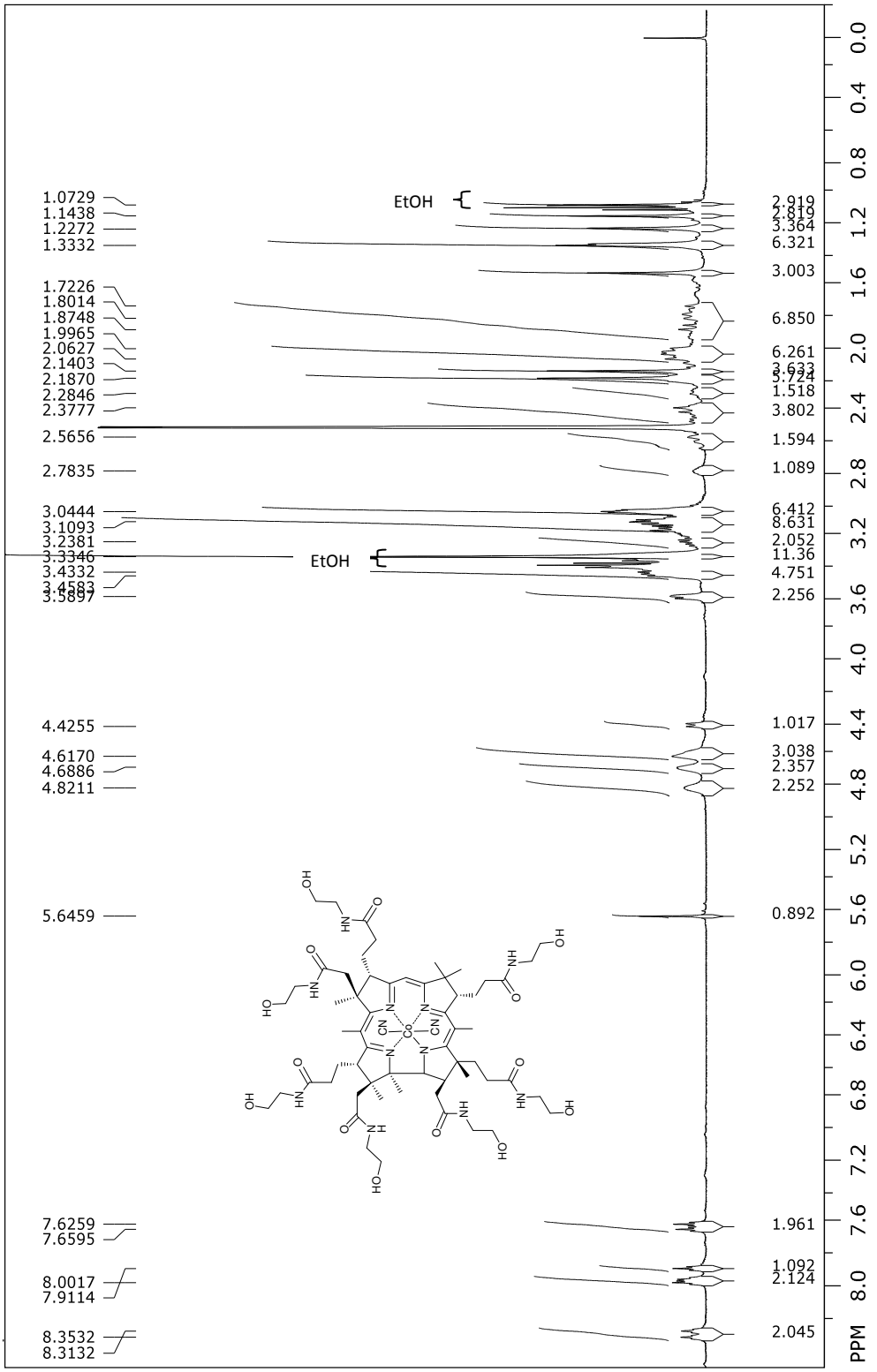
$(CN)_2$Cob(III)(*c*-hydroxy)heptakis(*n*-butylamide) 2



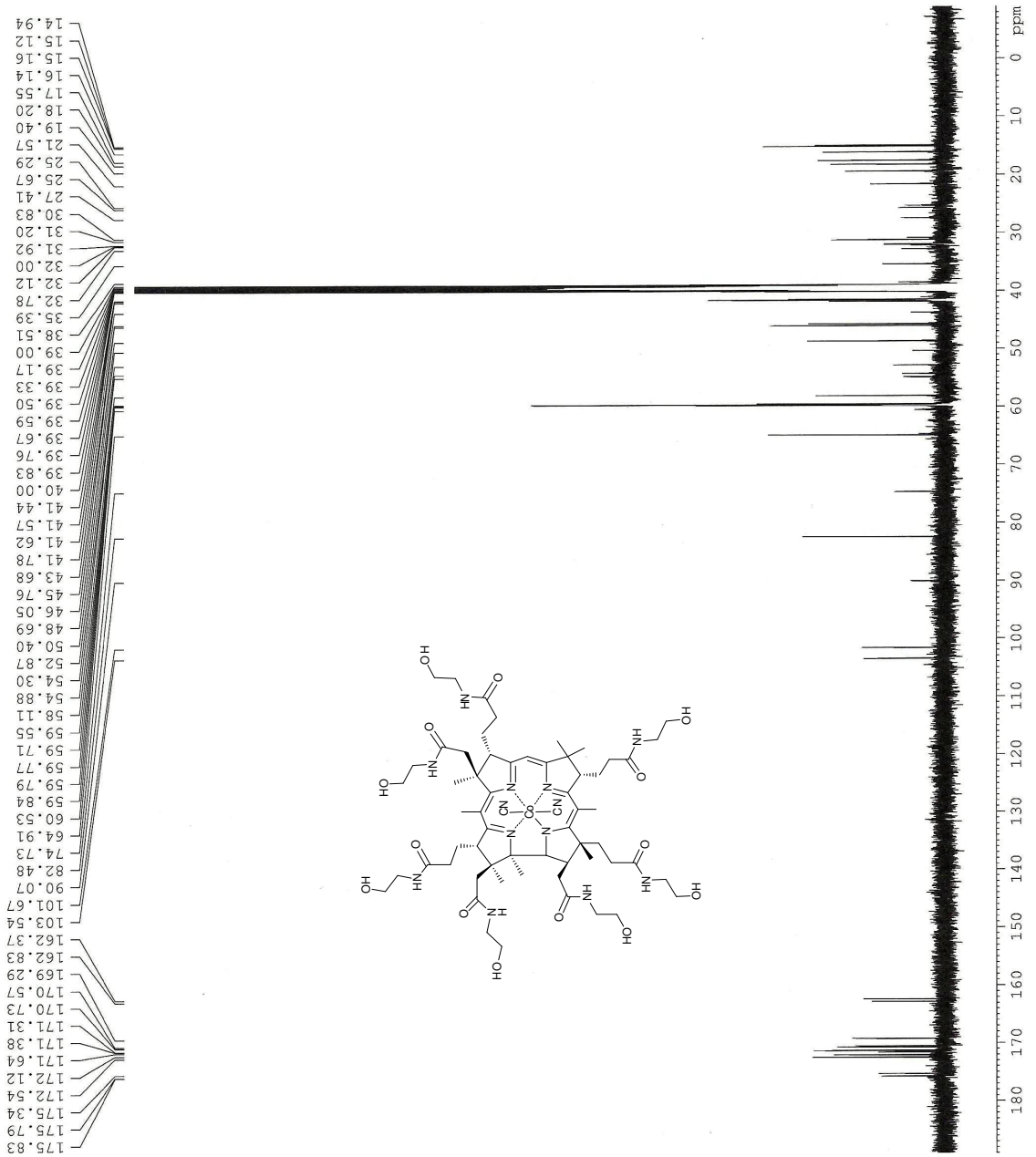
$(CN)_2$Cob(III)(*c*-hydroxy)heptakis(*n*-butylamide) 2



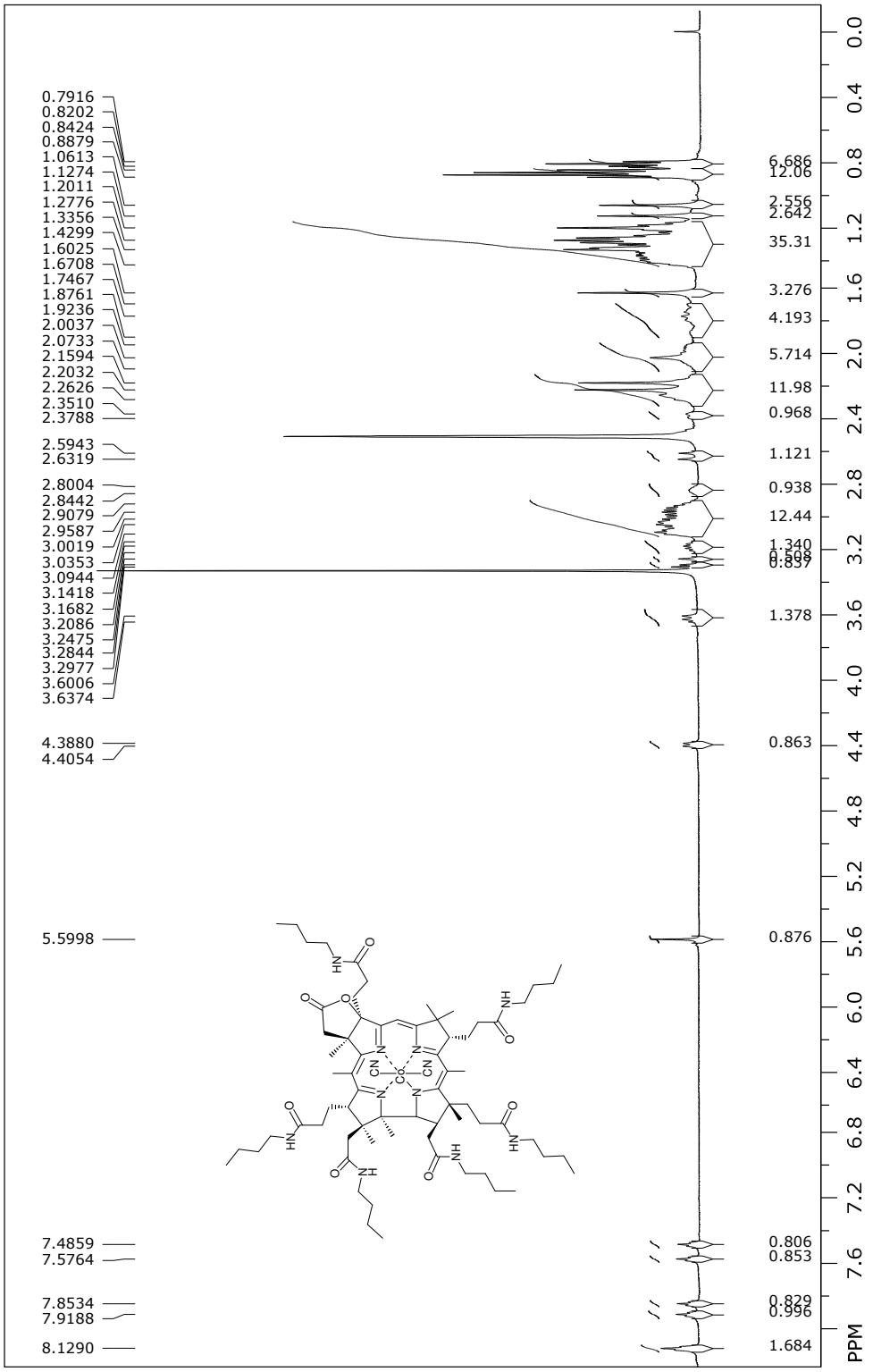
$(CN)_2$Cob(III)heptakis(2-hydroxyethylamide) 4



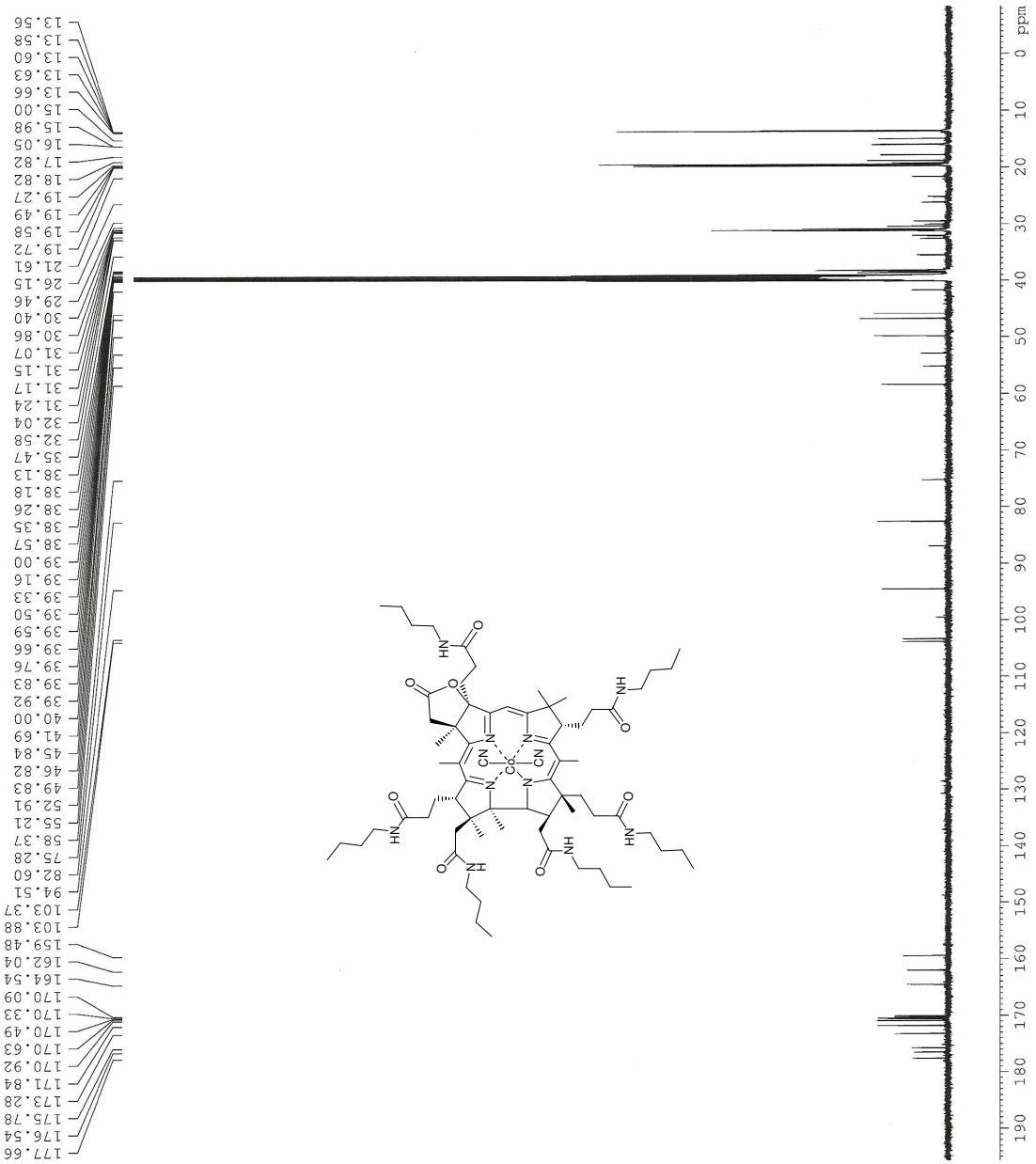
$(CN)_2$Cob(III)heptakis(2-hydroxyethylamide) 4



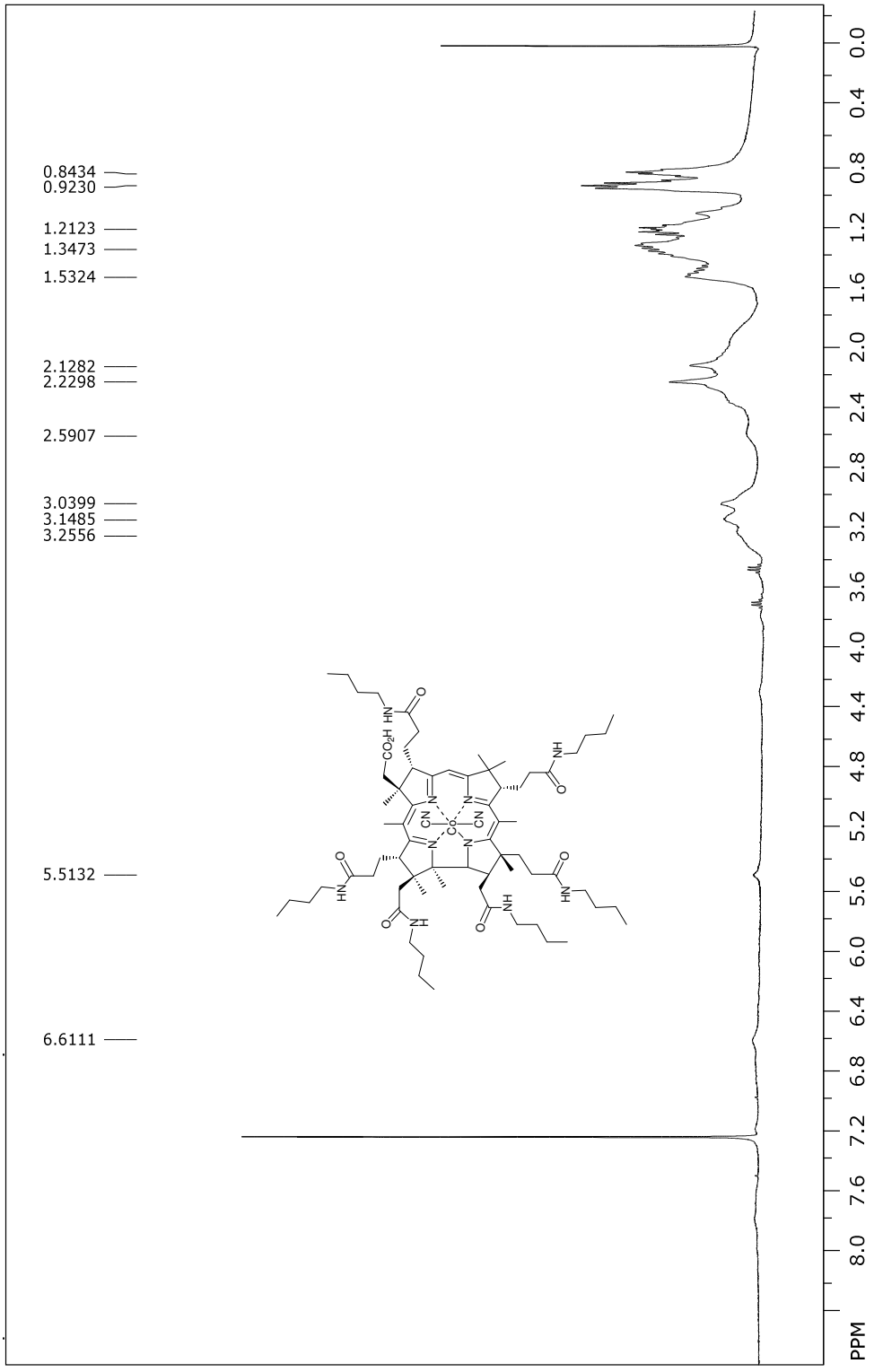
$(CN)_2$Cob(III)hexakis(*n*-butylamide)(*c*-lactone) 9



$(CN)_2$Cob(III)hexakis(*n*-butylamide)(*c*-lactone) 9



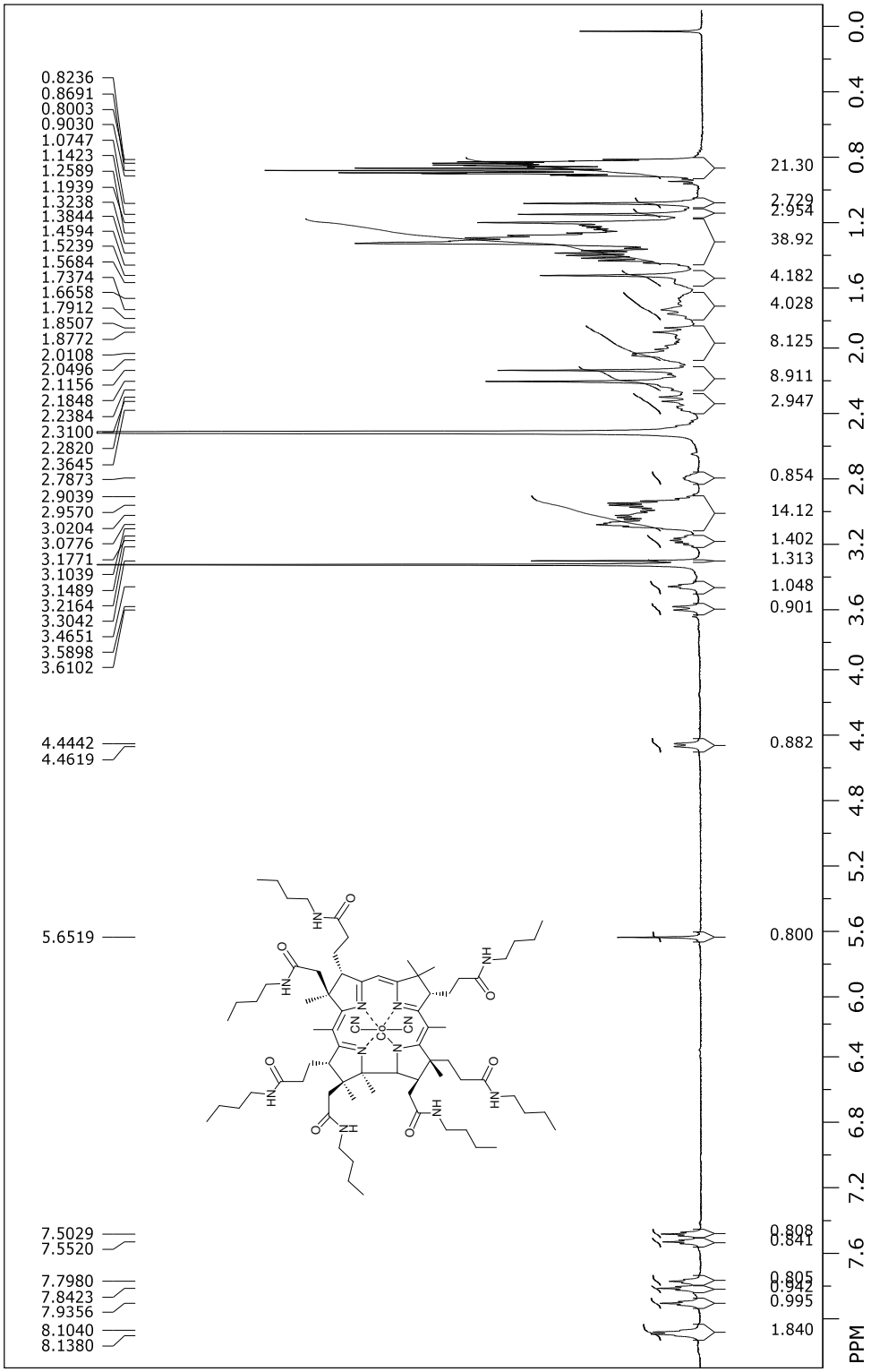
$(CN)_2$Cob(III)hexakis(*n*-butylamide)(*c*-acid) 10



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 *c*-acid group.

Varian 400MHz, DSMO-d_6 at 25^{o}C

$(CN)_2$Cob(III)heptakis(*n*-butylamide) 5



$(CN)_2$Cob(III)heptakis(*n*-butylamide) 5