Supplementary Information for publication

Synthesis of 5,10,15,20-*meso*-unsubstituted and 5,10,15,20-*meso*-substituted-21,23ditellura/diselena core-modified porphyrinogens: oxidation and detection of mercury(II)

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S6



















S15











X : parts per Million : 13C













S26



















NH HN Te															
	والتجدالية						-								-
70.0 160.0	150.0	140.0) +122.201	130.0 84 84	120.0	110.0	100.0 10	90.0	80.0 70.0 99167 12 99167 12	60.0	50.0	42 2083 0	30.7382 30.3568 30.3568	20.0	10.0	0 -10.




































































The absorption spectra of **7g** (2.0×10^{-3}) in acetonitrile upon the addition of 20 µl stock solution (2×10^{-3}) of mercuric perchlorate.



The absorption spectra of **8g** (1.8×10^{-3}) in acetonitrile upon the addition of 20 µl stock solution (1.8×10^{-3}) of mercuric perchlorate.



Job's plot for determining the stoichiometry (1:1) of **5g** and Hg²⁺ ions in acetonitrile



 125 Te NMR spectra in CDCl₃, relative to 125 TeMe₂ (δ 0.0 ppm).







¹²⁵Te NMR spectra of **5g** with and without Hg^{2+} in CDCl₃, relative to ¹²⁵TeMe₂ (δ 0.0 ppm).


S73



S74



S75



Crystal data of 5g

Table 1. Crystal data and structure refinement for 1. Identification code shelxl Empirical formula C28 H32 N2 Te2 Formula weight 293(2) K Temperature Wavelength 0.71073 A Crystal system, space group Triclinic, P-1 $a = 10.361(2) \ A \quad alpha = 101.396(15) \ deg. \\ b = 11.572(3) \ A \quad beta = 90.972(13) \ deg.$ Unit cell dimensions c = 11.8258(15) A gamma = 104.51(2) deg. Volume 1342.3(5) A^3 Z, Calculated density 2, 1.613 Mg/m^3 Absorption coefficient 2.191 mm^-1 F(000) 636 Crystal size x x mm Theta range for data collection 3.52 to 29.04 deg. Limiting indices -14<=h<=13, -15<=k<=15, -15<=l<=16 Reflections collected / unique 13052 / 6096 [R(int) = 0.0748] Completeness to theta = 29.0485.1 % Refinement method Full-matrix least-squares on F^2 Data / restraints / parameters 6096 / 0 / 290 Goodness-of-fit on F^2 0.656 Final R indices [I>2sigma(I)] R1 = 0.0713, wR2 = 0.1865 $R_1 = 0.0848$, wR2 = 0.2017 R indices (all data) 0.0069(9) Extinction coefficient Largest diff. peak and hole 2.490 and -2.417 e.A^-3

Table 2. Atomic coordinates ($x \ 10^{4}$) and equivalent isotropic displacement parameters (A² $x \ 10^{3}$) for 1. U(eq) is defined as one third of the trace of the orthogonalize Uij tensor.

	x y	Z	U(eq)		
Te(1)	1005(1)	6023(1)	1687(1)	44(1)	
Te(2)	-3599(1)	4740(1)	1379(1)	39(1)	
C(6)	2131(10)	3411(9)	1096(15)	85(5)	
C(21)	-4761(9)	7342(8)	1838(10)	50(2)	
N(1)	-1301(6)	2904(5)	2247(6)	30(1)	
C(15)	-3845(6)	3532(6)	2503(6)	26(1)	
C(18)	-3873(6)	5952(6)	2830(6)	26(1)	
C(25)	-175(7)	8554(6)	2963(7)	31(1)	
C(8)	-214(7)	2742(7)	1636(7)	35(2)	
C(24)	-526(8)	9249(7)	2262(8)	40(2)	
N(2)	-1338(6)	7811(5)	3221(5)	29(1)	
C(22)	-2426(7)	7990(6)	2665(6)	26(1)	
C(11)	-2466(7)	2179(6)	1638(6)	28(1)	
C(12)	-3803(7)	2205(6)	2110(6)	29(1)	
C(10)	-2104(9)	1549(9)	655(8)	47(2)	
C(4)	1221(7)	4764(7)	2681(9)	42(2)	
C(19)	-3834(7)	7286(6)	2827(7)	31(1)	
C(9)	-697(10)	1880(9)	660(9)	51(2)	
C(23)	-1929(8)	8907(7)	2079(7)	37(2)	
C(1)	1183(7)	7165(7)	3296(8)	36(2)	
C(17)	-4024(10)	5381(8)	3742(7)	45(2)	
C(14)	-4940(8)	1512(8)	1170(9)	48(2)	
C(5)	1207(7)	3440(7)	2114(9)	44(2)	
C(27)	2294(9)	9230(9)	2826(12)	64(3)	
C(7)	1666(11)	2820(10)	3036(13)	76(4)	
C(26)	1163(7)	8516(7)	3462(8)	39(2)	
C(16)	-4002(10)	4138(8)	3577(7)	43(2)	
C(3)	1360(10)	5379(12)	3805(9)	58(3)	
C(13)	-4016(9)	1539(8)	3131(8)	43(2)	
C(20)	-4296(10)	7896(8)	3976(9)	50(2)	

C(2)	1340(10)	6465(12)	4096(8)	57(3)
C(28)	1336(10)	9127(9)	4757(10)	62(3)

Table 3. Selected bond lengths [A] and angles [deg] for 1.

Symmetry transformations used to generate equivalent atoms:

Table 4. Bond lengths [A] and angles [deg] for 1.

Te(1)-C(1)	2.067(9)
Te(1)-C(4)	2.095(8)
Te(2)-C(18)	2.064(7)
Te(2)-C(15)	2.086(7)
C(6)-C(5)	1.551(15)
C(21)-C(19)	1.522(11)
N(1)-C(8)	1.380(9)
N(1)-C(11)	1.380(9)
C(15)-C(16)	1.358(10)
C(15)-C(12)	1.525(9)
C(18)-C(17)	1.364(11)
C(18)-C(19)	1.535(9)
C(25)-C(24)	1.367(11)
C(25)-N(2)	1 371(9)
C(25)-C(26)	1.511(10)
C(8)-C(9)	1 362(13)
C(8)-C(5)	1.502(15) 1.528(11)
C(24)- $C(23)$	1.020(11) 1.408(11)
N(2)-C(22)	1 375(9)
C(22) - C(23)	1.379(10)
C(22)- $C(23)$	1.579(10)
C(22)-C(19) C(11) C(10)	1.316(9) 1.356(11)
C(11) - C(10)	1.550(11)
C(11)-C(12) C(12)-C(12)	1.307(9) 1.547(11)
C(12)-C(13)	1.34/(11) 1.549(10)
C(12)-C(14)	1.548(10)
C(10)-C(9)	1.412(13) 1.2(5(14))
C(4) - C(3)	1.365(14)
C(4)-C(5)	1.543(11)
C(19)-C(20)	1.545(11)
C(1)-C(2)	1.393(13)
C(1)-C(26)	1.543(10)
C(17)-C(16)	1.419(12)
C(5)-C(7)	1.547(15)
C(27)-C(26)	1.552(12)
C(26)-C(28)	1.542(14)
C(3)-C(2)	1.241(16)
C(1)-Te(1)-C(4)	82.3(4)
C(18)-Te(2)-C(15)	83.3(3)
C(8)-N(1)-C(11)	109.9(6)
C(16)-C(15)-C(12)	128.7(7)
C(16)-C(15)-Te(2)	108.8(5)
C(12)-C(15)-Te(2)	122.4(5)
C(17)-C(18)-C(19)	128.2(7)
C(17)-C(18)-Te(2)	108.9(5)
C(19)-C(18)-Te(2)	122.9(5)
C(24)-C(25)-N(2)	107.0(6)
C(24)-C(25)-C(26)	132.2(7)
N(2)-C(25)-C(26)	120.8(7)
C(9)-C(8)-N(1)	106.9(7)
C(9)-C(8)-C(5)	132.1(7)
N(1)-C(8)-C(5)	120.9(7)
C(25)-C(24)-C(23)	108.0(7)

110.7(6)
106.1(6)
120.8(6)
132.9(6)
106.7(7)
132.8(7)
120.4(6)
108.7(6)
110.0(6)
110.6(6)
110.0(6)
110.7(6)
106.8(7)
108.5(8)
132.7(9)
105.8(7)
121.5(7)
108.6(7)
110.2(5)
109.9(6)
109.2(6)
108.5(7)
110.5(7)
107.8(7)
108.2(7)
131.1(9)
106.0(7)
122.9(6)
119.9(7)
109.2(6)
109.3(7)
109.1(9)
108.1(9)
110.9(7)
110.3(9)
109.3(7)
107.7(6)
110.5(8)
109.3(8)
108.9(8)
111.1(7)
119.1(7)
123.2(10)
122.6(10)

 $\label{eq:symmetry} \hline Symmetry transformations used to generate equivalent atoms: Table 5. Anisotropic displacement parameters (A^2 x 10^3) for 1. The anisotropic displacement factor exponent takes the form: -2 pi^2 [h^2 a *^2 U11 + ... + 2 h k a* b* U12]$

	U11	U22	U33	U23	U13	U12
$\overline{\text{Te}(1)}$	46(1)	34(1)	53(1)	11(1)	3(1)	10(1)
Te(2)	55(1)	32(1)	30(1)	10(1)	12(1)	8(1)
C(6)	38(5)	36(5)	171(15)	4(7)	49(7)	2(4)
C(21)	33(4)	36(4)	77(7)	8(4)	-20(4)	5(3)
N(1)	20(3)	26(3)	40(3)	6(2)	10(2)	-3(2)
C(15)	18(3)	24(3)	34(3)	8(3)	4(2)	-2(2)
C(18)	15(3)	20(3)	39(4)	10(3)	6(2)	-6(2)
C(25)	20(3)	23(3)	43(4)	3(3)	5(3)	-2(3)
C(8)	21(3)	27(3)	58(5)	16(3)	19(3)	3(3)
C(24)	37(4)	27(4)	53(5)	18(3)	11(3)	-5(3)
N(2)	23(3)	29(3)	38(3)	16(3)	4(2)	3(2)
C(22)	22(3)	23(3)	30(3)	6(3)	2(2)	2(3)
C(11)	26(3)	23(3)	34(3)	9(3)	7(3)	1(3)
C(12	22(3)	24(3)	36(4)	6(3)	5(3)	-2(3)
C(10)	46(5)	48(5)	40(4)	-3(4)	4(4)	11(4)
C(4)	12(3)	28(4)	87(7)	27(4)	5(3)	-4(3)

C(19)	24(3)	26(3)	43(4)	9(3)	6(3)	5(3)
C(9)	51(5)	51(5)	52(5)	1(4)	19(4)	20(4)
C(23)	34(4)	32(4)	45(4)	15(3)	-2(3)	3(3)
C(1)	14(3)	29(3)	61(5)	10(3)	6(3)	-1(3)
C(17)	62(6)	45(5)	32(4)	9(3)	16(4)	20(4)
C(14)	32(4)	36(4)	60(6)	-7(4)	-7(4)	-6(3)
C(5)	18(3)	23(3)	93(7)	16(4)	12(4)	1(3)
C(27)	25(4)	39(5)	123(10)	24(6)	19(5)	-5(4)
C(7)	48(6)	43(5)	138(12)	26(7)	-20(7)	14(5)
C(26)	19(3)	27(3)	64(5)	5(4)	0(3)	0(3)
C(16)	62(5)	39(4)	30(4)	13(3)	18(4)	15(4)
C(3)	41(5)	80(8)	43(5)	25(5)	0(4)	-12(5)
C(13)	41(4)	33(4)	56(5)	23(4)	16(4)	0(3)
C(20)	52(5)	40(5)	62(6)	9(4)	22(4)	18(4)
C(2)	39(5)	92(8)	39(5)	30(5)	-3(4)	2(5)
C(28)	51(6)	47(5)	72(7)	-14(5)	-31(5)	10(4)

Table 6. Hydrogen coordinates (x 10⁴) and isotropic displacement parameters (A² x 10³) for 1.

	х	y z	U(eq)	
H(6A)	3030	3846	1378	127	-
H(6B)	1830	3790	526	127	
H(6C)	2103	2580	754	127	
H(21Å)	-5656	6900	1930	75	
H(21B)	-4472	6984	1116	75	
H(21C)	-4738	8178	1845	75	
H(1)	-1258	3385	2909	36	
H(24)	59	9843	1958	48	
H(2)	-1381	7303	3670	35	
H(10)	-2686	992	75	56	
H(9)	-189	1564	97	61	
H(23)	-2433	9242	1639	44	
H(17)	-4141	5806	4471	54	
H(14A)	-5788	1525	1480	72	
H(14B)	-4893	682	930	72	
H(14C)	-4844	1898	518	72	
H(27A)	3146	9208	3141	95	
H(27B)	2248	10062	2927	95	
H(27C)	2188	8861	2017	95	
H(7A)	2559	3256	3337	113	
H(7B)	1647	1992	2691	113	
H(7C)	1076	2828	3654	113	
H(16)	-4094	3744	4195	51	
H(3)	1475	4964	4382	70	
H(13A)	-4869	1559	3425	64	
H(13B)	-3322	1938	3732	64	
H(13C)	-3987	706	2868	64	
H(20A)	-5184	7450	4085	75	
H(20B)	-4292	8721	3952	75	
H(20C)	-3699	7895	4606	75	
H(2)	1433	6826	4879	68	
H(28A)	2186	9105	5076	92	
H(28B)	635	8696	5156	92	
H(28C)	1295	9960	4846	92	
· · · /					

Table 7. Selected torsion angles [deg] for 1.

Symmetry transformations used to generate equivalent atoms:

Table 8. Torsion angles [deg] for 1.

C(18)-Te(2)-C(15)-C(16)

C(18)-Te(2)-C(15)-C(12)	179.3(5)
C(15)-Te(2)-C(18)-C(17)	1.8(6)
C(15)-Te(2)- $C(18)$ - $C(19)$	179.3(5)
C(11)-N(1)-C(8)-C(9)	-2.2(9)
C(11)-N(1)-C(8)-C(5)	179.9(7)
N(2)-C(25)-C(24)-C(23)	-0.8(9)
C(26)-C(25)-C(24)-C(23)	-179.2(8)
C(24)-C(25)-N(2)-C(22)	2.1(8)
C(26)-C(25)-N(2)-C(22)	-179.4(6)
C(25)-N(2)-C(22)-C(23)	-2.4(8)
C(25)-N(2)-C(22)-C(19)	-179.1(6)
C(8)-N(1)-C(11)-C(10)	1.1(9)
C(8)-N(1)-C(11)-C(12)	-178.8(6)
C(10)-C(11)-C(12)-C(15)	-131.9(9)
N(1)-C(11)-C(12)-C(15)	47.9(9)
C(10)-C(11)-C(12)-C(13)	106.8(10)
N(1)-C(11)-C(12)-C(13)	-73.4(8)
C(10)-C(11)-C(12)-C(14)	-10.6(12)
N(1)-C(11)-C(12)-C(14)	169.2(7)
C(16)-C(15)-C(12)-C(11)	-119.1(9)
Te(2)-C(15)-C(12)-C(11)	59.1(7)
C(16)-C(15)-C(12)-C(13)	1.8(11)
1e(2)-C(15)-C(12)-C(13)	180.0(5)
C(16)-C(15)-C(12)-C(14) $T_{2}(2),C(15),C(12),C(14)$	120.0(9)
N(1) C(11) C(10) C(0)	-01.8(8)
C(12) C(11) C(10) C(9)	0.3(10) 170 7(8)
C(12)-C(11)-C(10)-C(3)	-1/9.7(8)
C(1)- $Te(1)$ - $C(4)$ - $C(5)$	179.9(6)
N(2)-C(22)-C(19)-C(21)	-1614(7)
C(23)-C(22)-C(19)-C(21)	230(11)
N(2)-C(22)-C(19)-C(18)	-41.0(9)
C(23)-C(22)-C(19)-C(18)	143.4(8)
N(2)-C(22)-C(19)-C(20)	80.5(8)
C(23)-C(22)-C(19)-C(20)	-95.1(10)
C(17)-C(18)-C(19)-C(22)	108.5(9)
Te(2)-C(18)-C(19)-C(22)	-68.4(7)
C(17)-C(18)-C(19)-C(21)	-132.0(9)
Te(2)-C(18)-C(19)-C(21)	51.1(8)
C(17)-C(18)-C(19)-C(20)	-12.2(11)
Te(2)-C(18)-C(19)-C(20)	170.8(5)
N(1)-C(8)-C(9)-C(10)	2.4(10)
C(3)- $C(8)$ - $C(9)$ - $C(10)$	180.0(9)
N(2) C(22) C(23) C(24)	-1.9(11) 1.8(0)
C(19) - C(22) - C(23) - C(24)	177 9(8)
C(25)-C(24)-C(23)-C(22)	-0.6(10)
C(4)-Te(1)-C(1)-C(2)	0.0(6)
C(4)-Te(1)-C(1)-C(26)	178.7(6)
C(19)-C(18)-C(17)-C(16)	-178.5(8)
Te(2)-C(18)-C(17)-C(16)	-1.2(11)
C(9)-C(8)-C(5)-C(4)	142.4(10)
N(1)-C(8)-C(5)-C(4)	-40.4(11)
C(9)-C(8)-C(5)-C(7)	-98.4(12)
N(1)-C(8)-C(5)-C(7)	78.9(10)
C(9)-C(8)-C(5)-C(6)	21.7(13)
N(1)-C(8)-C(5)-C(6)	-161.1(8)
C(3)-C(4)-C(5)-C(8)	108.4(10)
1e(1)-C(4)-C(5)-C(8)	-/1.8(8)
C(3) - C(4) - C(3) - C(7)	-11.0(12)
10(1)-U(4)-U(3)-U(7) C(3)-C(4)-C(5)-C(6)	108.8(0)
C(3) - C(4) - C(3) - C(0) Te(1) - C(4) - C(5) - C(6)	-132.0(11) A7.2(10)
C(24)-C(25)-C(26)-C(28)	105 2(11)
N(2)-C(25)-C(26)-C(28)	-73 0(9)
C(24)-C(25)-C(26)-C(1)	-134.7(9)
N(2)-C(25)-C(26)-C(1)	47.2(10)

Symmetry transformations used to generate equivalent atoms: Table 9. Hydrogen bonds for 1 [A and deg.].

D-H...A d(D-H) d(H...A) d(D...A) <(DHA