ELECTRONIC SUPPLEMENTARY INFORMATION (ESI)

Temperature and solvent structure dependence of VO^{2+} complexes of pyridine-*N*-oxide derivatives and their interaction with human serum transferrin

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Table S1 EPR parameters of VO^{2+} species formed by Hmpo, calculated at the level of theory BHandHLYP/6-311g(d,p) with Gaussian and PBE0/VTZ with ORCA.[a]

Complex	Software	A_{iso}^{calcd}	A_{iso}^{exptl}	A_x^{calcd}	A_y^{calcd}	A_z^{calcd}	A_z^{exptl}	$\%\left|A_z\right|$[b]
$[VO(mpo)_2]$[c]	Gaussian	-84.5	-79.6[d]	-55.2	-48.0	-150.5	-144.3[d]	4.3
$[VO(mpo)_2]$[e]	Gaussian	-85.8	-79.6[d]	-55.9	-49.7	-151.8	-144.3[d]	5.2
cis-$[VO(mpo)_2(H_2O)]$[f]	Gaussian	-92.4	g	-60.7	-57.7	-158.7	-154.3	2.9
cis-$[VO(mpo)_2(H_2O)]$[h]	Gaussian	-90.8	g	-60.1	-55.1	-157.1	-154.3	1.8
cis-$[VO(mpo)_2(H_2O)]$[i]	Gaussian	-95.8	g	-65.2	-59.6	-162.4	-154.3	5.3
cis-$[VO(mpo)_2(H_2O)]$[l]	Gaussian	-94.4	g	-63.7	-58.2	-161.4	-154.3	4.6
cis-$[VO(mpo)_2(1\text{-MeIm})]$[m]	Gaussian	-85.5	–	-53.7	-51.5	-151.3	-149.7	1.1
cis-$[VO(mpo)_2(1\text{-MeIm})]$[n]	Gaussian	-84.1	–	-53.2	-49.3	-149.8	-149.7	0.0
cis-$[VO(mpo)_2(1\text{-MeIm})]$[o]	Gaussian	-89.8	–	-58.6	-54.7	-156.2	-149.7	4.3
cis-$[VO(mpo)_2(1\text{-MeIm})]$[p]	Gaussian	-88.6	–	-56.6	-53.9	-155.4	-149.7	3.8
$[VO(mpo)_2]$[c]	ORCA	-76.3	-79.6[d]	-39.7	-47.9	-141.4	-144.3[d]	-2.0
$[VO(mpo)_2]$[e]	ORCA	-77.8	-79.6[d]	-41.4	-49.2	-142.9	-144.3[d]	-0.9
cis-$[VO(mpo)_2(H_2O)]$[f]	ORCA	-88.8	g	-53.6	-57.6	-155.1	-154.3	0.5
cis-$[VO(mpo)_2(H_2O)]$[h]	ORCA	-87.3	g	-51.6	-56.6	-153.7	-154.3	-0.4
cis-$[VO(mpo)_2(H_2O)]$[i]	ORCA	-91.7	g	-54.7	-61.8	-158.7	-154.3	2.9
cis-$[VO(mpo)_2(H_2O)]$[l]	ORCA	-91.5	g	-54.5	-61.2	-158.8	-154.3	2.9
cis-$[VO(mpo)_2(1\text{-MeIm})]$[m]	ORCA	-81.9	–	-48.0	-50.8	-146.8	-149.7	-1.9
cis-$[VO(mpo)_2(1\text{-MeIm})]$[n]	ORCA	-80.5	–	-46.3	-50.0	-145.3	-149.7	-2.9

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cis-[VO(mpo)$_2$(1-MeIm)]^o	ORCA	-86.5	–	-51.4	-55.7	-152.4	-149.7	1.8
cis-[VO(mpo)$_2$(1-MeIm)]^p	ORCA	-85.7	–	-51.1	-54.2	-151.8	-149.7	1.4

^{a} All the values are in 10^{-4} cm^{-1}. ^{b} Percentage deviation respect to the absolute experimental value calculated as: $(|A_z|^{calcd} - |A_z|^{exptl})/|A_z|^{exptl}$.

^{c} *SPY*-5-21 structure. ^{d} Measured in CHCl$_3$/toluene 60/40 v/v. ^{e} *SPY*-5-23 structure. ^{f} Coordination mode (S$^-$, O$_{N\text{-ox}}$); (S$^-$, O$_{N\text{-ox}}$^{ax}); H$_2$O, with H$_2$O in *trans* to S$^-$. ^{g} *cis*-octahedral species with an equatorial water is not formed at room temperature; A_{iso}^{calcd} can be compared with that of *cis*-[VO(mpo)$_2$(DMSO)] of 87.1×10^{-4} cm^{-1}. ^{h} Coordination mode (S$^-$, O$_{N\text{-ox}}$); (S$^-$, O$_{N\text{-ox}}$^{ax}); H$_2$O, with H$_2$O in *trans* to O$_{N\text{-ox}}$. ^{i} Coordination mode (S$^-$, O$_{N\text{-ox}}$); (S$^{-\ ax}$, O$_{N\text{-ox}}$); H$_2$O, with H$_2$O in *trans* to S$^-$. ^{l} Coordination mode (S$^-$, O$_{N\text{-ox}}$); (S$^{-\ ax}$, O$_{N\text{-ox}}$); H$_2$O, with H$_2$O in *trans* to O$_{N\text{-ox}}$. ^{m} Coordination mode (S$^-$, O$_{N\text{-ox}}$); (S$^-$, O$_{N\text{-ox}}$^{ax}); N$_{imid}$, with N$_{imid}$ in *trans* to S$^-$. ^{n} Coordination mode (S$^-$, O$_{N\text{-ox}}$); (S$^-$, O$_{N\text{-ox}}$^{ax}); N$_{imid}$, with N$_{imid}$ in *trans* to O$_{N\text{-ox}}$. ^{o} Coordination mode (S$^-$, O$_{N\text{-ox}}$); (S$^{-\ ax}$, O$_{N\text{-ox}}$); N$_{imid}$, with N$_{imid}$ in *trans* to S$^-$. ^{p} Coordination mode (S$^-$, O$_{N\text{-ox}}$); (S$^{-\ ax}$, O$_{N\text{-ox}}$); N$_{imid}$, with N$_{imid}$ in *trans* to O$_{N\text{-ox}}$.
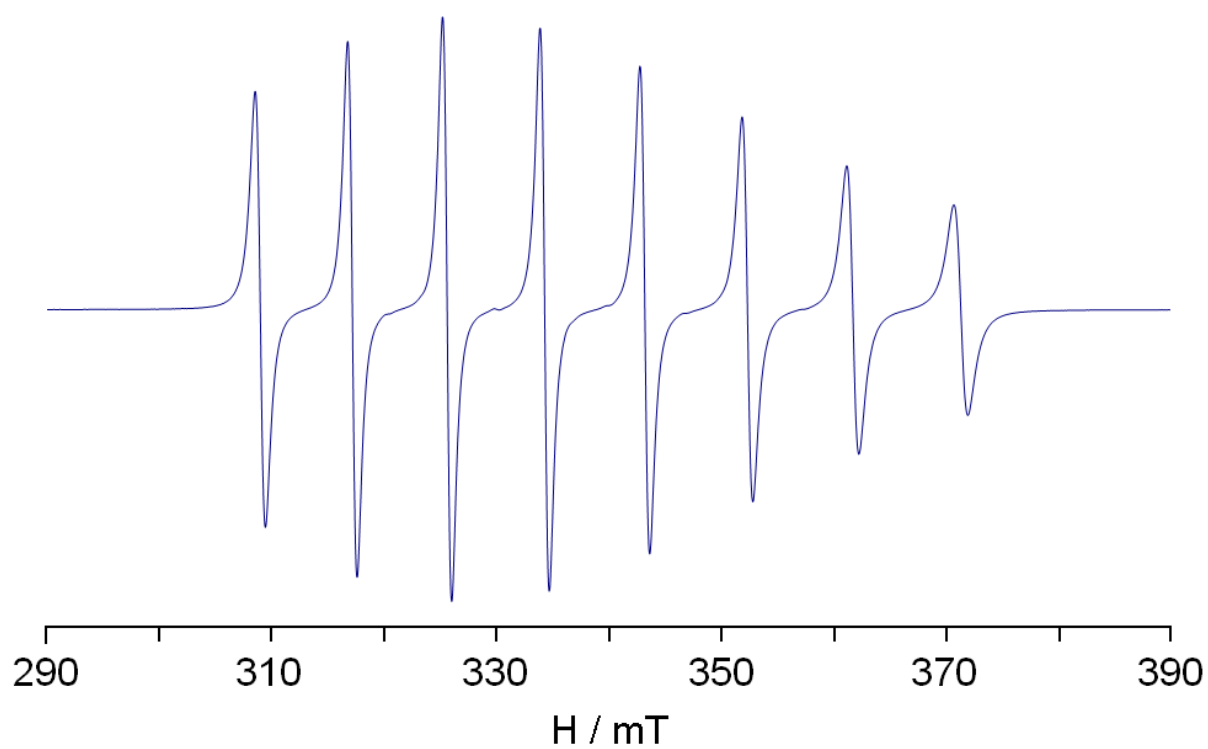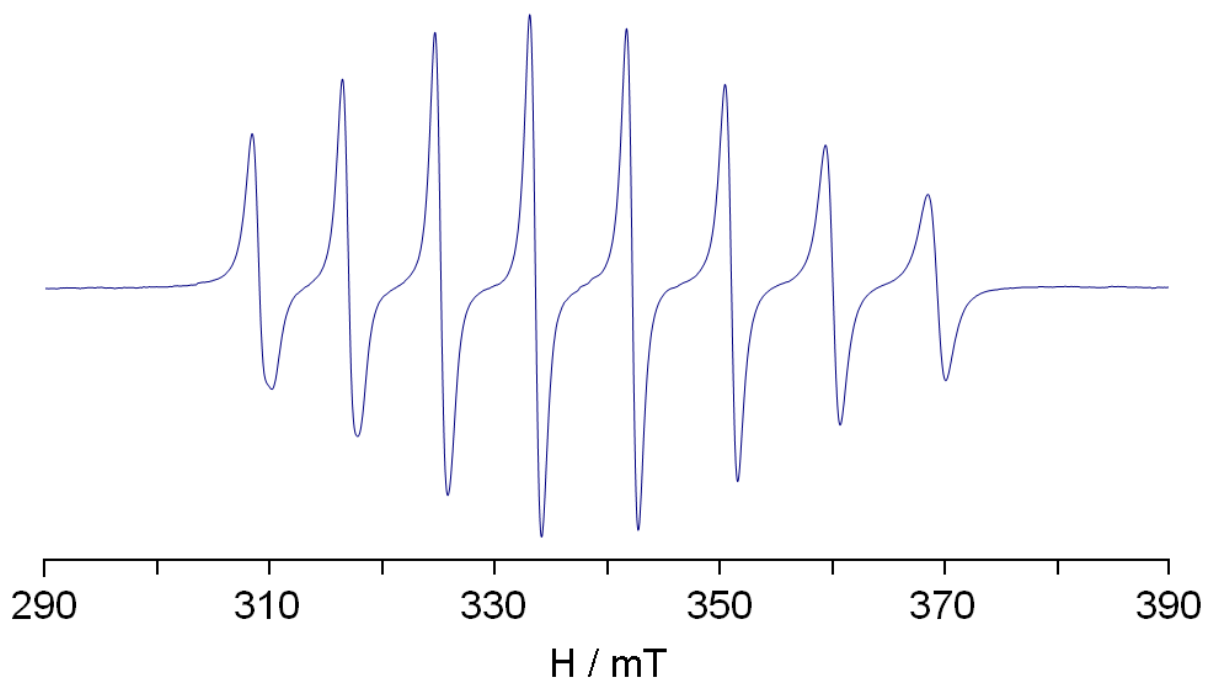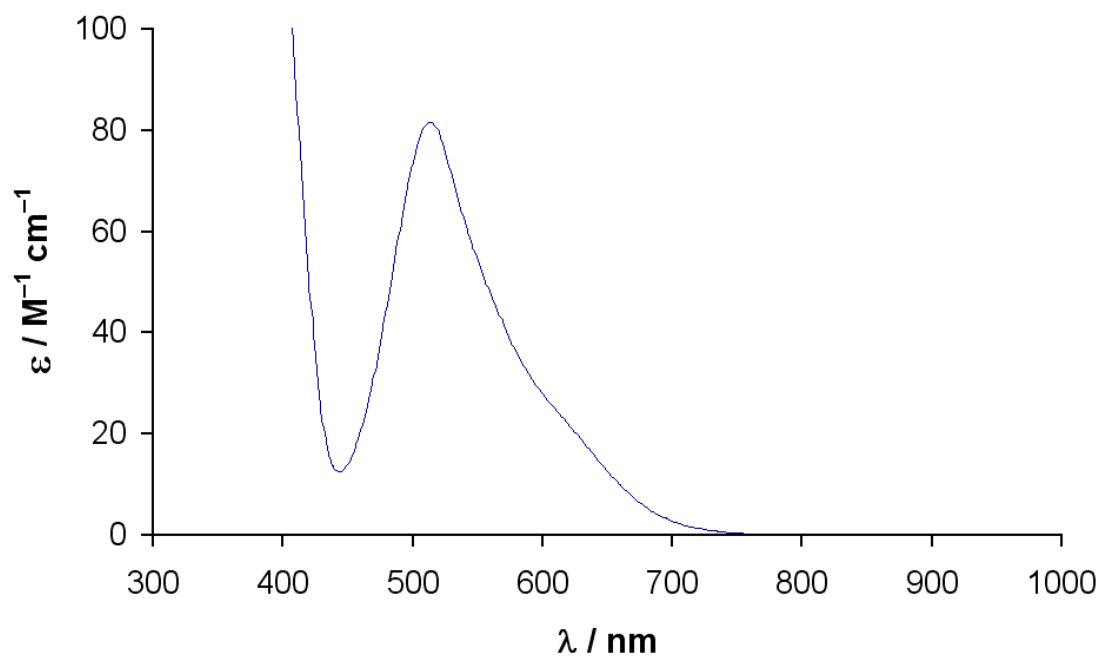
Fig. S1 X-and isotropic EPR spectrum recorded at RT on a solution obtained dissolving [VO(hpo)$_2$] in CH$_2$Cl$_2$. The spectrum belongs to [VO(hpo)$_2$].
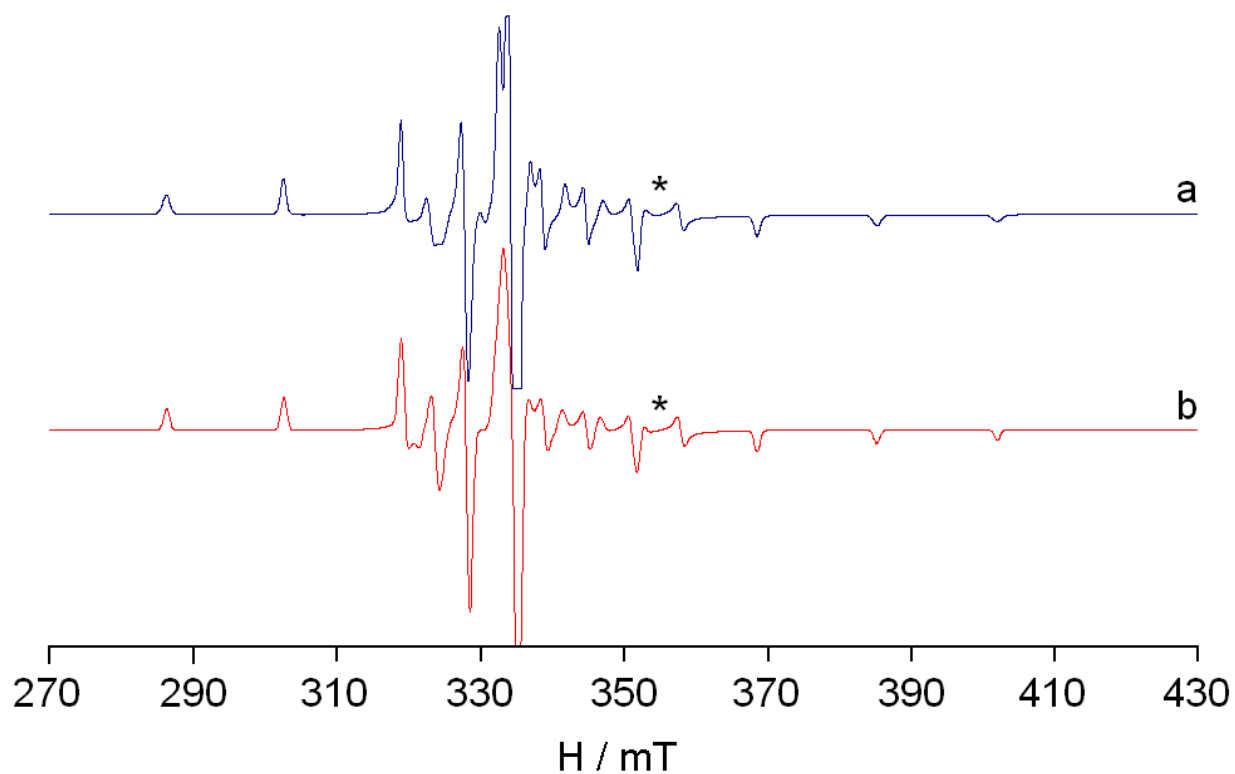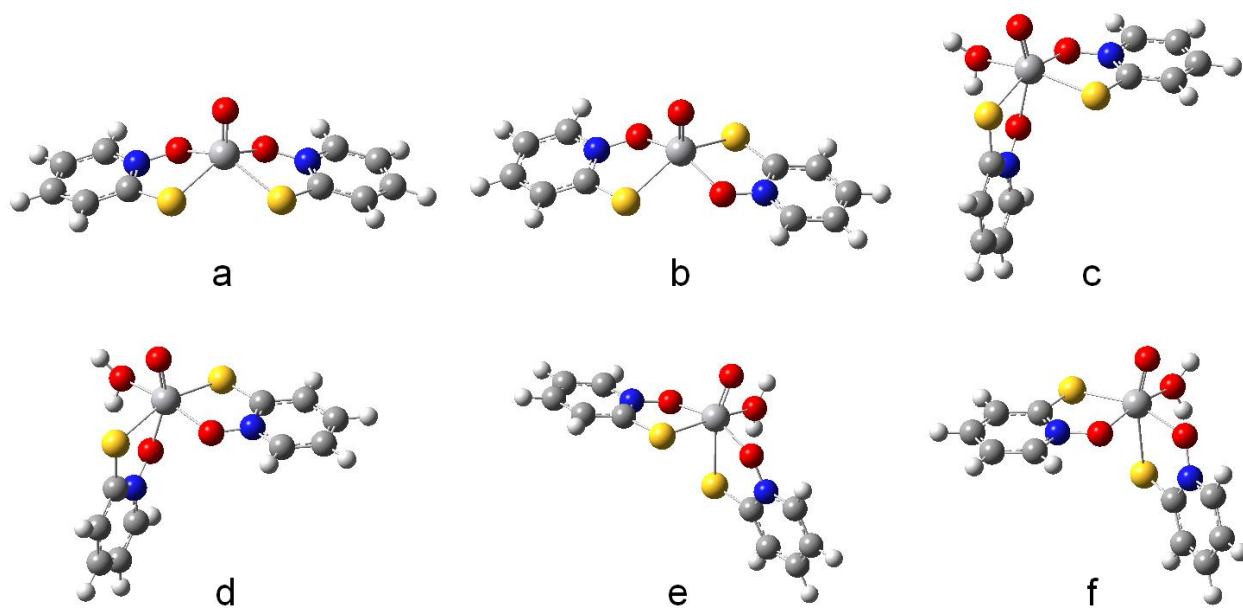
Fig. S2 X-band anisotropic EPR spectrum recorded at 120 K obtained dissolving [VO(hpo)$_2$] in CH$_2$Cl$_2$: (a) experimental spectrum and (b) simulated spectrum. The spectrum belongs to square pyramidal specie and was simulated with g_x = 1.991, g_y = 1.981, g_z = 1.953, A_x = -41.0x10^{-4} cm^{-1}, A_y = -51.0x10^{-4} cm^{-1}, A_z = -150.6x10^{-4} cm^{-1}. The marked x,y anisotropy is observable in the region denoted by the asterisk.

Fig. S3 X-band isotropic EPR spectrum recorded at RT on a solution obtained dissolving [VO(mpo)$_2$] in a mixture CHCl$_3$/toluene 60:40 v/v. The spectrum belongs to [VO(mpo)$_2$].
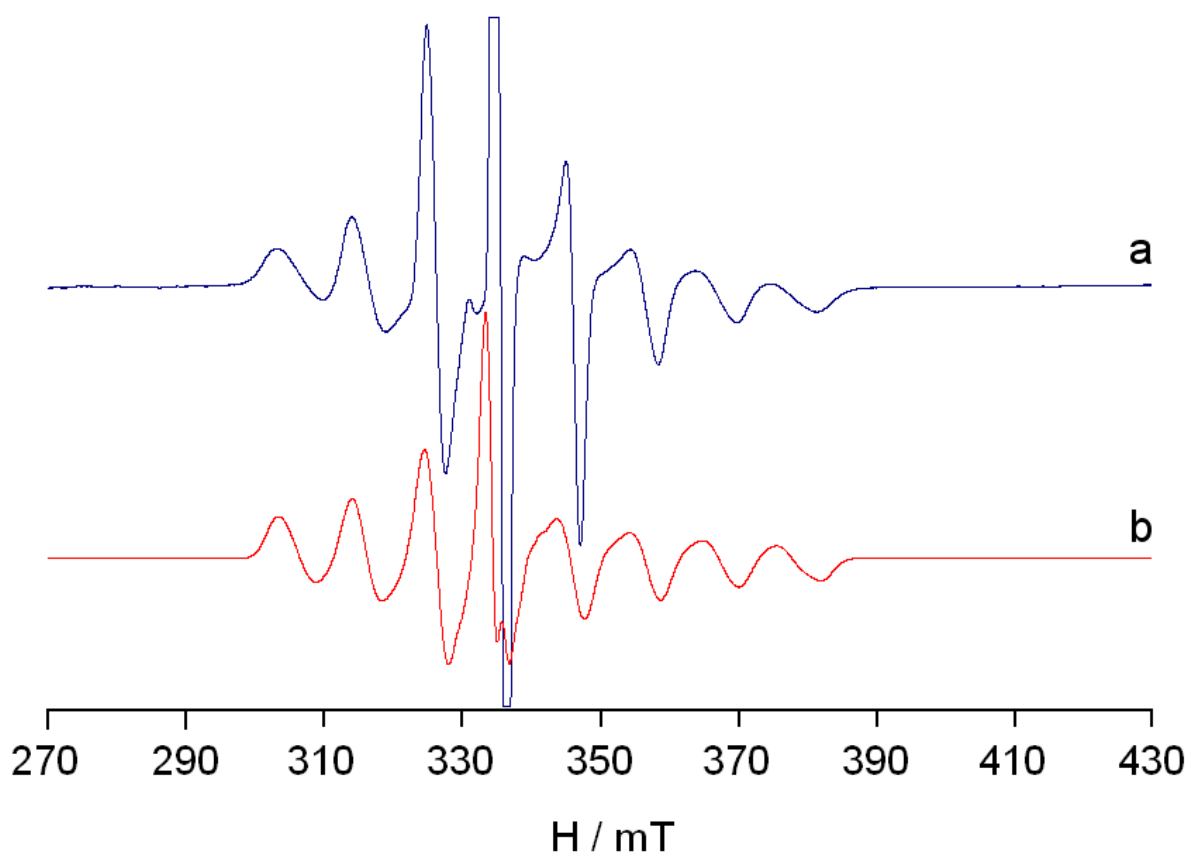
Fig. S4 Electronic absorption spectrum of [VO(mpo)$_2$] recorded in CH$_2$Cl$_2$.
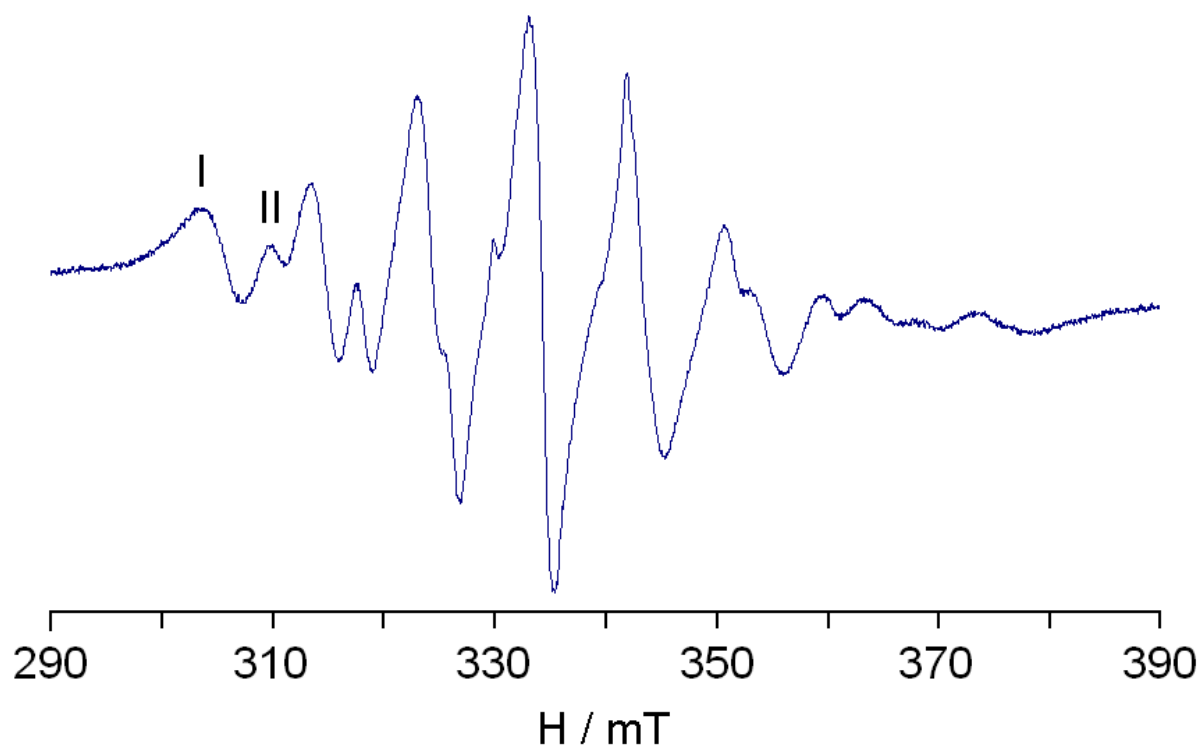
**Fig. S5**   Optimised structure of the possible isomers of [VO(mpo)$_2$] (a-b) and of *cis*-[VO(mpo)$_2$(H$_2$O)] (c-f).

Fig. S6 X-band anisotropic EPR spectrum of $[V(mpo)_3]^+$ recorded at 120 K: (a) experimental and (b) simulated. The spectrum was simulated with $g_x = 1.961$, $g_y = 1.963$, $g_z = 1.999$, $A_x = -104.0 \times 10^{-4}$ cm^{-1}, $A_y = -93.0 \times 10^{-4}$ cm^{-1}, $A_z = 2.6 \times 10^{-4}$ cm^{-1}.
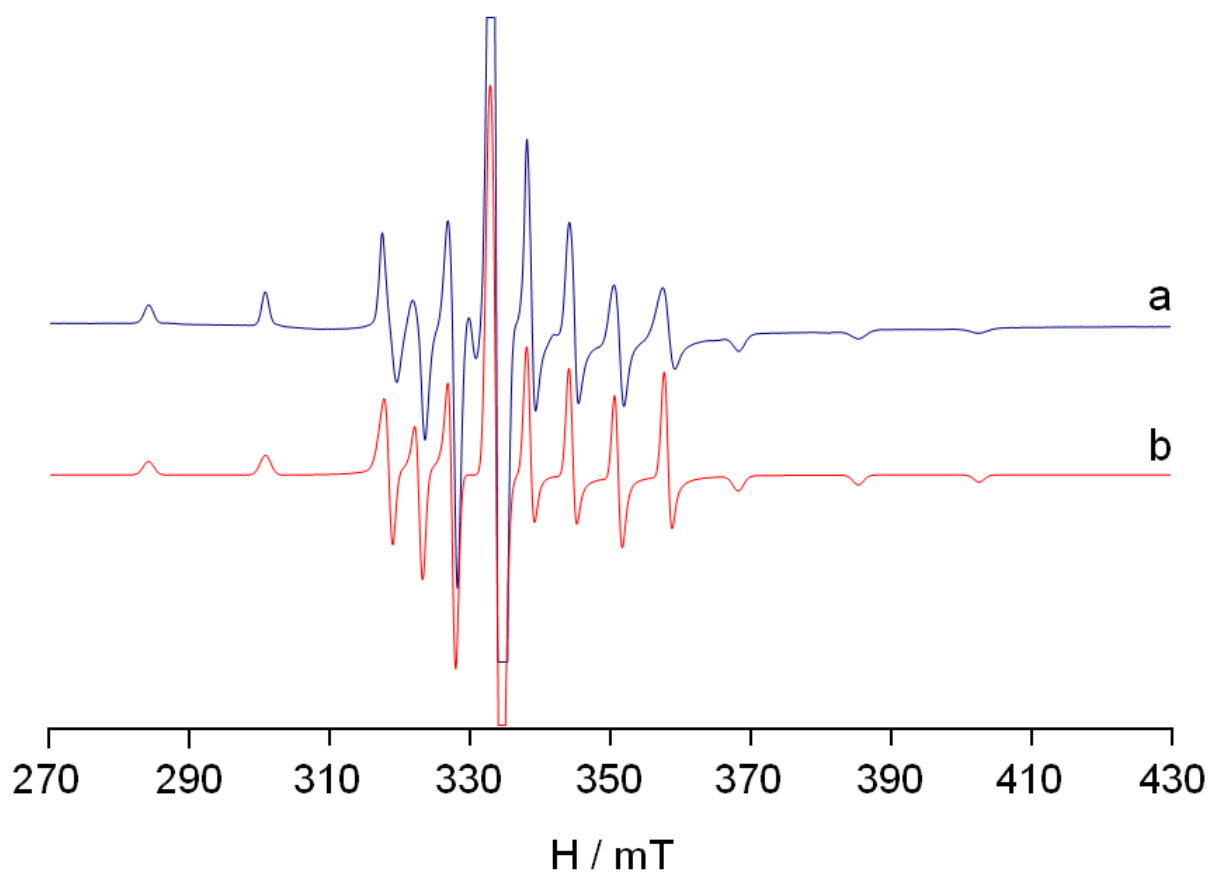
Fig. S7 X-band isotropic EPR spectrum recorded at RT and pH 7.4 on a solution DMSO/H_2O 50:50 v/v with ratio VO^{2+}/Hhpo 1:2 and concentration of VO^{2+} ion 1×10^{-3} M. With **I** and **II** are indicated the resonances M_I = -7/2 of *cis*-[VO(hpo)$_2$(H$_2$O)] and [VO(hpo)$_2$], respectively.
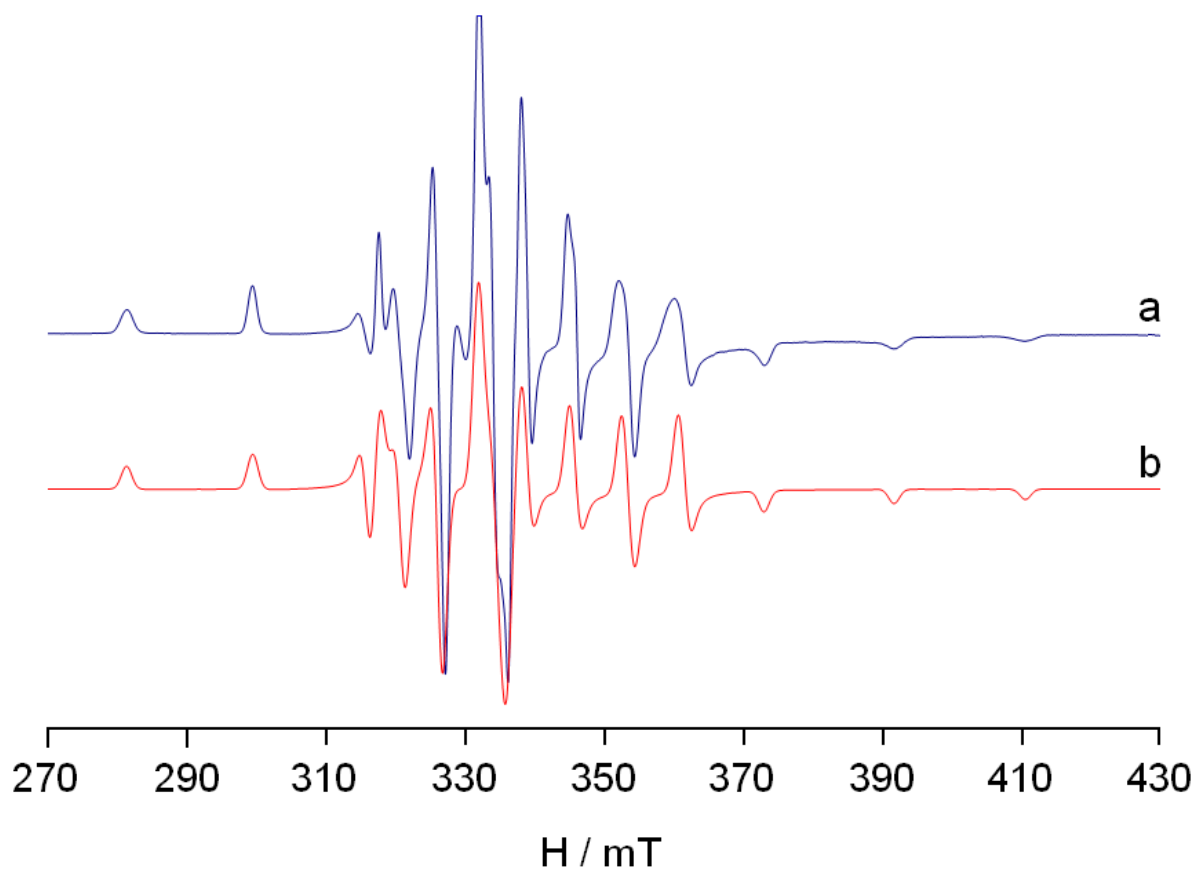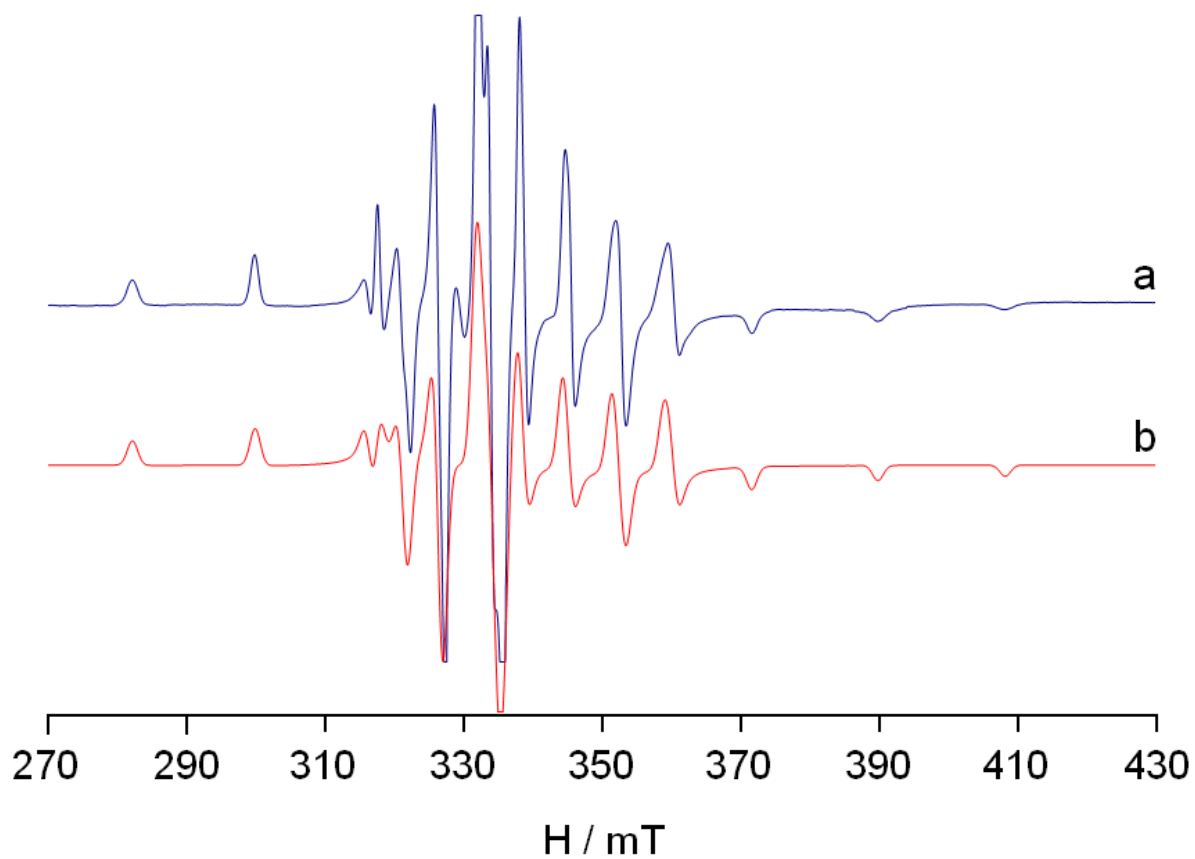
Fig. S8 X-band anisotropic EPR spectrum recorded at 120 K and pH 7.4 on a solution DMSO/H_2O 50:50 v/v with ratio VO^{2+}/Hhpo = 1:2 and concentration of VO^{2+} = 1x10^{-3} M: (a) experimental and (b) simulated. The spectrum belongs to *cis*-[VO(hpo)$_2$(H$_2$O)] and was simulated with g_x = 1.980, g_y = 1.976, g_z = 1.940, A_x = -59.0x10^{-4} cm^{-1}, A_y = -60.0x10^{-4} cm^{-1}, A_z = -168.2x10^{-4} cm^{-1}.
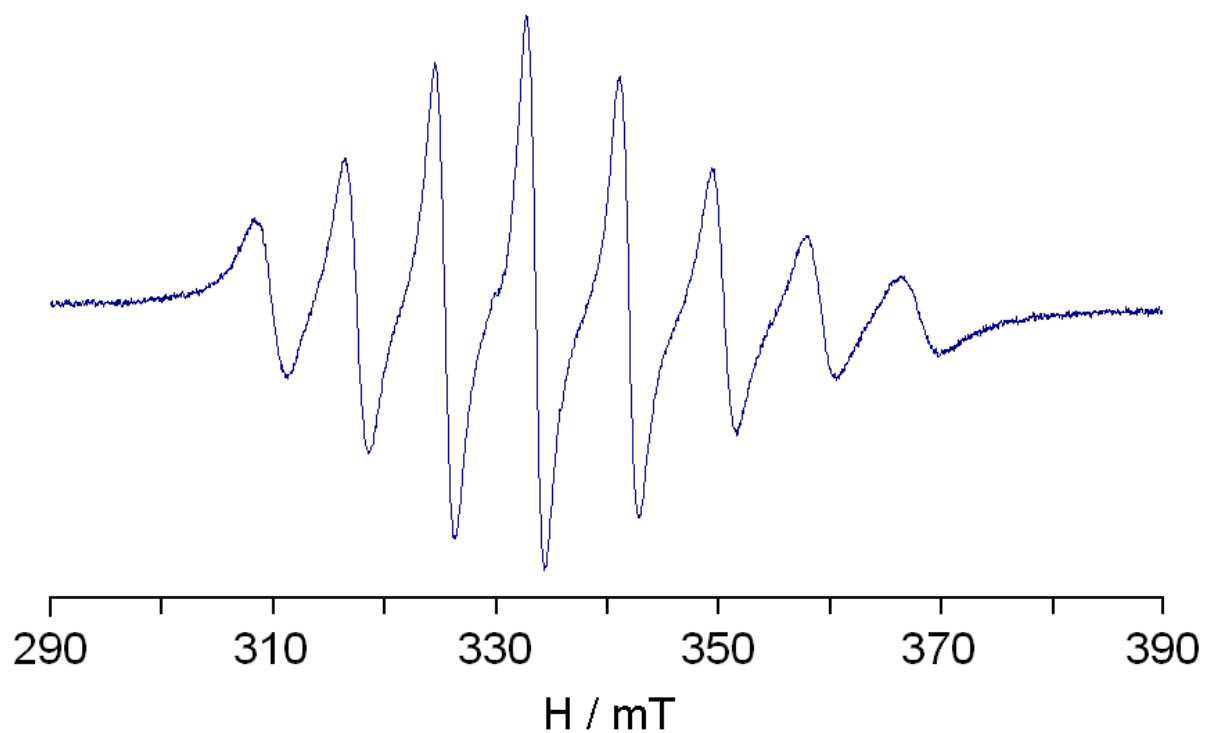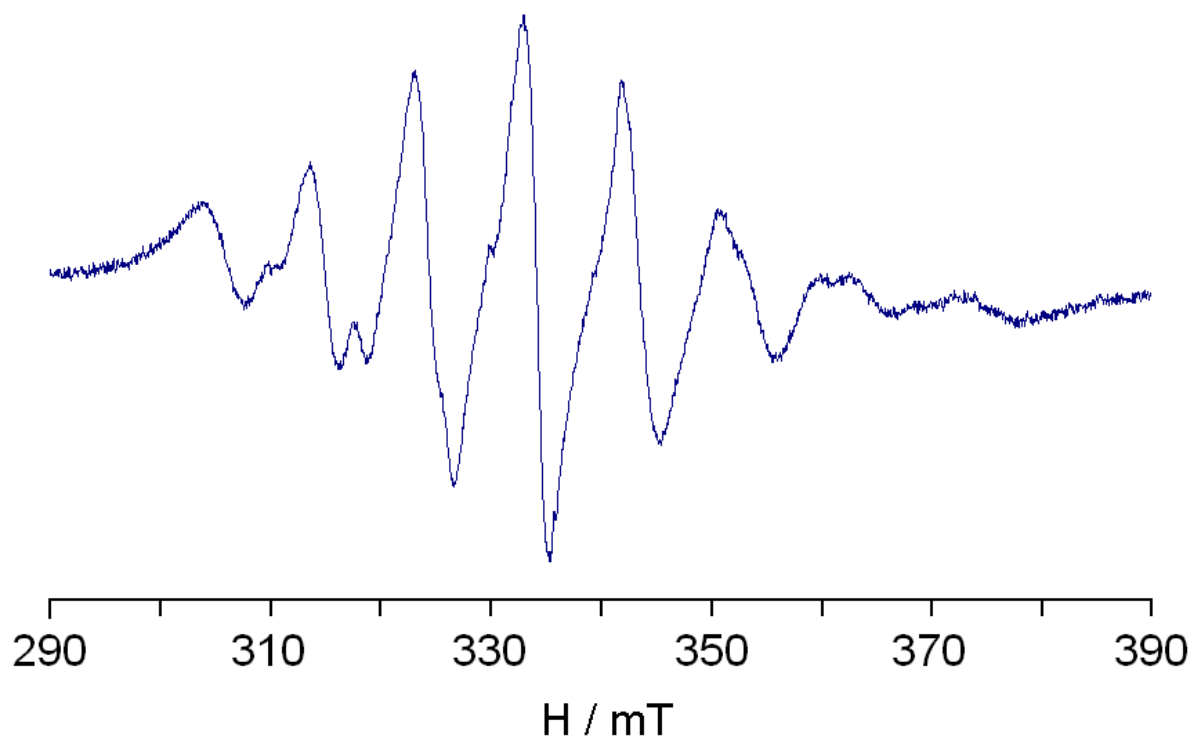
Fig. S9 X-band isotropic EPR spectrum recorded at RT and pH 7.4 on a solution DMSO/H_2O 50:50 v/v with ratio VO^{2+}/Hmpo 1:2 and concentration of VO^{2+} ion 1×10^{-3} M. The spectrum belongs to [VO(mpo)$_2$].
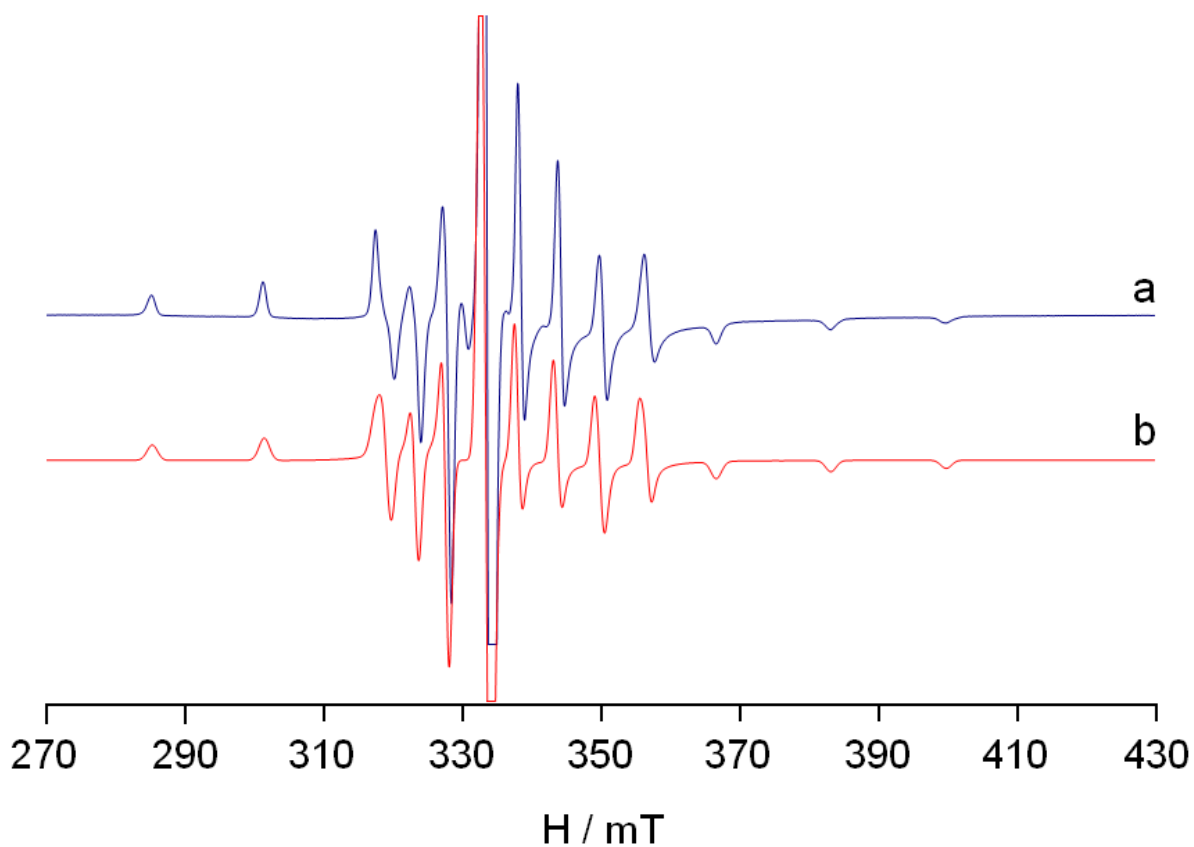
Fig. S10 X-band anisotropic EPR spectrum recorded at 120 K and pH 7.4 on a solution DMSO/H_2O 50:50 v/v with ratio VO^{2+}/Hmpo 1:2 and concentration of VO^{2+} 1×10^{-3} M: (a) experimental and (b) simulated. The spectrum belongs to *cis*-[VO(mpo)$_2$(H_2O)] and was simulated with $g_x = 1.980$, $g_y = 1.980$, $g_z = 1.955$, $A_x = -52.0 \times 10^{-4}$ cm^{-1}, $A_y = -52.0 \times 10^{-4}$ cm^{-1}, $A_z = -154.3 \times 10^{-4}$ cm^{-1}.

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Fig. S11 Anisotropic EPR spectrum recorded at 120 K and pH 7.4 on a solution DMSO/H_2O 50:50 with ratio VO^{2+}/Hhpo/1-MeIm 1:2:4 and concentration of VO^{2+} 1×10^{-3} M: (a) experimental and (b) simulated. The spectrum belongs to *cis*-[VO(hpo)$_2$(1-MeIm)] and was simulated with $g_x = 1.984$, $g_y = 1.982$, $g_z = 1.947$, $A_x = -55.0 \times 10^{-4}$ cm^{-1}, $A_y = -58.0 \times 10^{-4}$ cm^{-1}, $A_z = -163.7 \times 10^{-4}$ cm^{-1}.
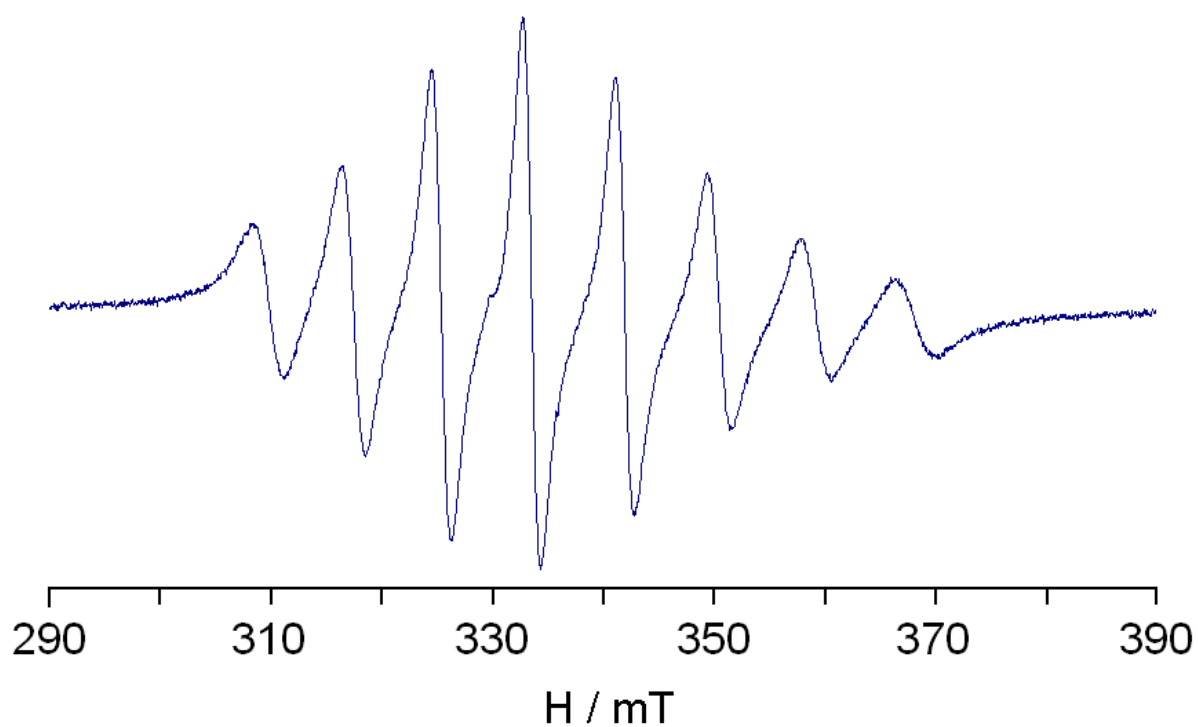
Fig. S12   X-band isotropic EPR spectrum recorded at RT and pH 7.4 on a solution DMSO/H_2O 50:50 v/v with ratio VO^{2+}/Hhpo/1-MeIm 1:2:4 and concentration of VO^{2+} ion 1×10^{-3} M.

Fig. S13 Anisotropic EPR spectrum recorded at 120 K and pH 7.4 on a solution DMSO/H_2O 50:50 with ratio VO^{2+}/Hmpo/1-MeIm 1:2:4 and concentration of VO^{2+} 1×10^{-3} M: (a) experimental and (b) simulated. The spectrum belongs to *cis*-[VO(mpo)$_2$(1-MeIm)] and was simulated with $g_x = 1.985$, $g_y = 1.984$, $g_z = 1.960$, $A_x = -47.0 \times 10^{-4}$ cm^{-1}, $A_y = -50.0 \times 10^{-4}$ cm^{-1}, $A_z = -149.7 \times 10^{-4}$ cm^{-1}.
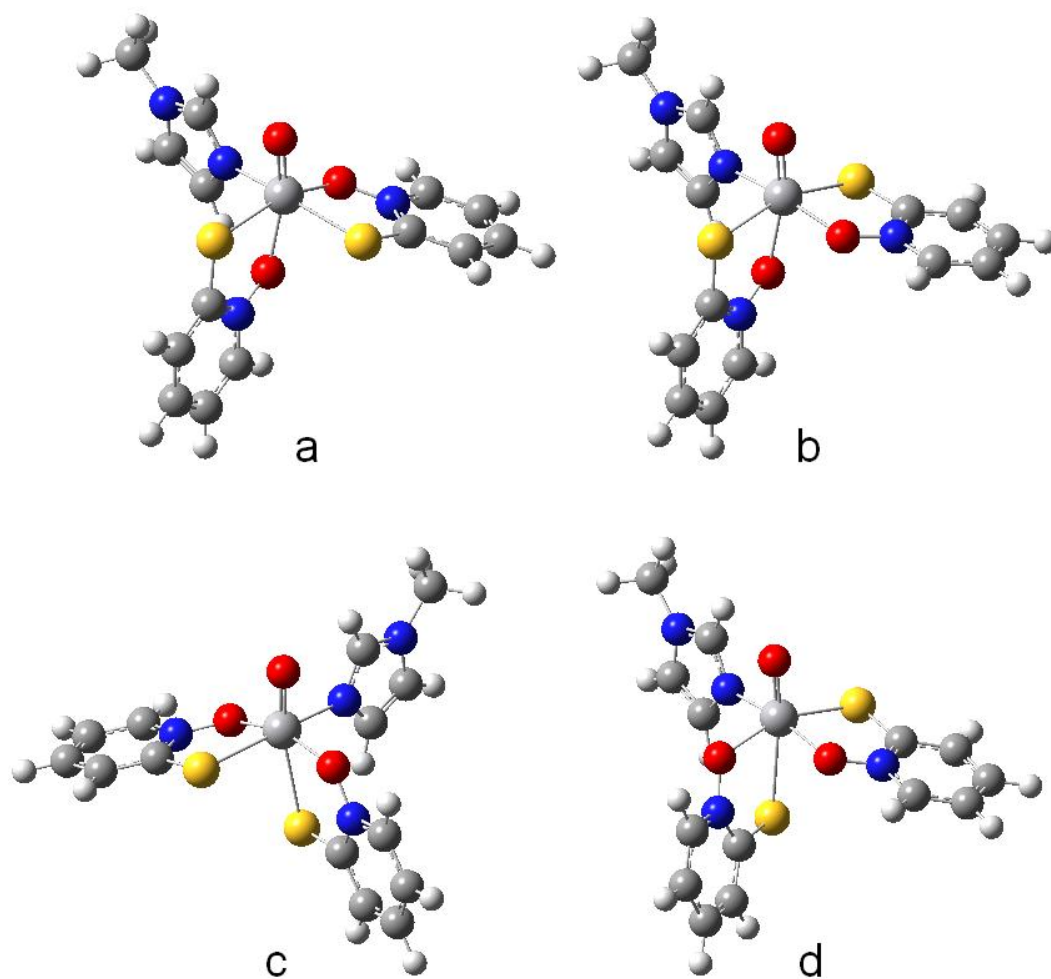
Fig. S14   X-band isotropic EPR spectrum recorded at RT and pH 7.4 on a solution DMSO/H_2O 50:50 v/v with ratio VO^{2+}/Hmpo/1-MeIm 1:2:4 and concentration of VO^{2+} ion 1×10^{-3} M. The spectrum belongs to [VO(mpo)$_2$].
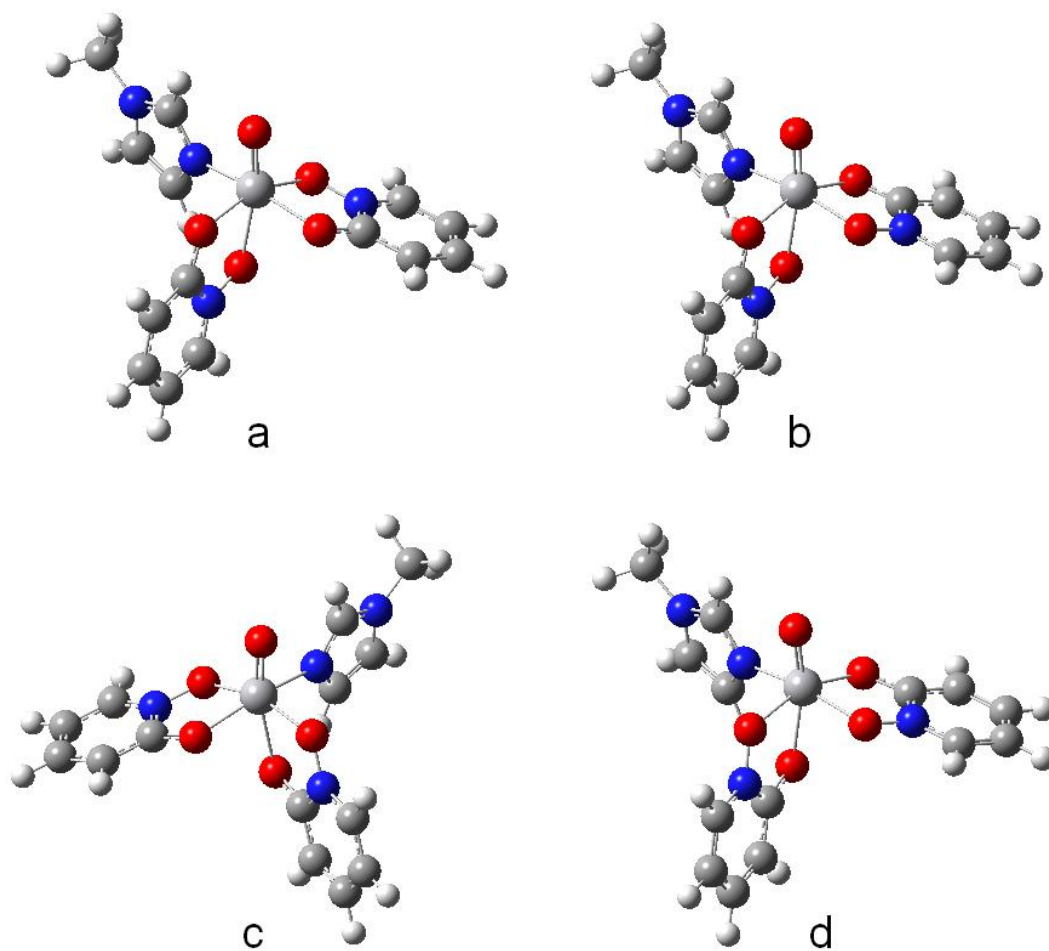
Fig. S15 Optimised structure of the possible isomers of *cis*-[VO(hpo)$_2$(1-MeIm)], calculated with DFT methods at the level of theory B3P86/6-311g.

Fig. S16 Optimised structure of the possible isomers of *cis*-[VO(mpo)$_2$(1-MeIm)], calculated with DFT methods at the level of theory B3P86/gen (the basis set 6-311+g(d) for S and 6-311g for the other atoms was used).