

## Supplementary Material

### On the copper(II) binding of asymmetrically functionalized tripodal peptides: solution equilibrium, structure, and enzyme mimicking

Ágnes Dancs<sup>a,b</sup>, Katalin Selmeczi<sup>b</sup>, Nóra May<sup>c</sup>, Tamás Gajda<sup>a,\*</sup>

<sup>a</sup> Department of Inorganic and Analytical Chemistry, University of Szeged, Dóm tér 7,  
H-6720 Szeged, Hungary

<sup>b</sup> Université de Lorraine – CNRS, UMR 7565 SRSMC, BP 70239, 54506  
Vandœuvre-lès-Nancy, France

<sup>c</sup> Institute of Organic Chemistry, Research Centre for Natural Sciences HAS, Magyar tudósok  
körùtja 2, H-1117 Budapest, Hungary

#### Supplementary Information content:

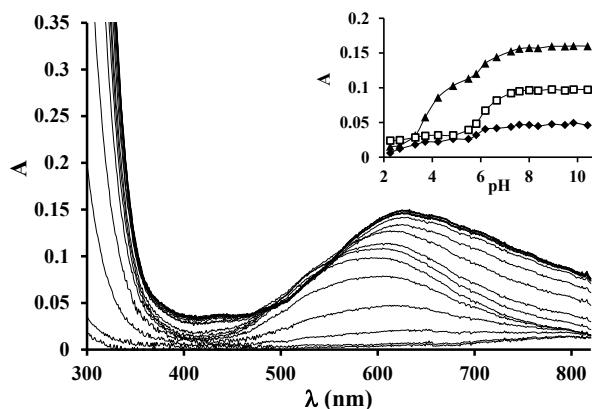
Measured UV-Vis and CD spectra of Cu(II)-L<sup>1</sup> and Cu(II)-L<sup>2</sup> systems (Figs. S1-S4)

Measured and calculated EPR spectra (Fig. S5) and table of corresponding parameters (Table S1)

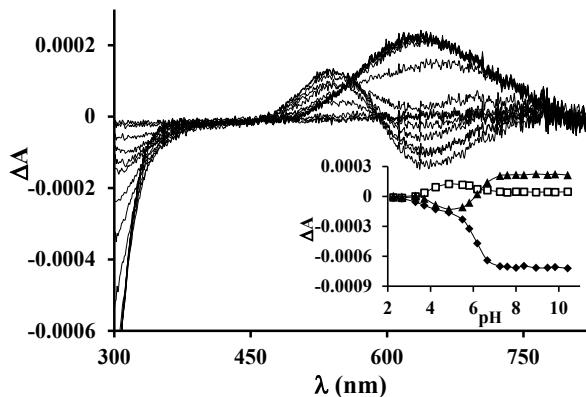
<sup>13</sup>C NMR spectra recorded in Cu(II)-L<sup>1</sup> system (Fig. S6)

pH, [complex]<sub>tot</sub> and [O<sub>2</sub>]<sub>tot</sub> dependence of observed pseudo-first order rate constants ( $k_{\text{obs,corr}}$ ) in H<sub>2</sub>DTBC oxidation by Cu(II)-L<sup>2</sup> 1:1 and 2:1 systems (Figs. S7-S8)

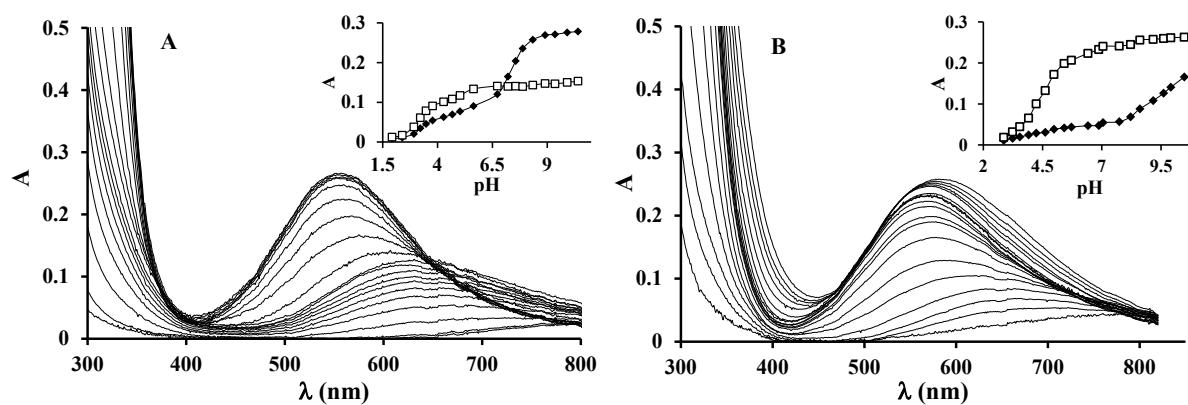
Substrate binding followed by CD spectroscopy (catechol, 4-nitrocatechol, Fig. S9)



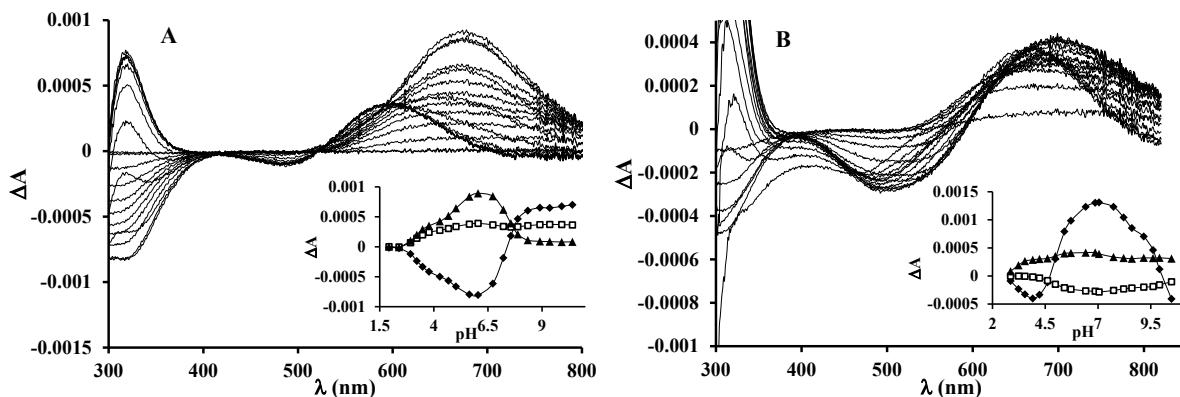
**Fig. S1.** pH-dependent UV-Vis spectra of Cu(II)-L<sup>1</sup> 1:1 system ( $[\text{L}^1]_{\text{tot}} = [\text{Cu(II)}]_{\text{tot}} = 8.8 \times 10^{-4}$  M,  $I = 0.1$  M NaCl,  $T = 298$  K). Insert: pH-dependent absorbances at 400 nm (♦), 630 nm (▲) and 800 nm (□).



**Fig. S2.** pH-dependent CD spectra of Cu(II)-L<sup>1</sup> 1:1 system ( $[L^1]_{\text{tot}} = [\text{Cu(II)}]_{\text{tot}} = 8.8 \times 10^{-4}$  M,  $I = 0.1$  M NaCl,  $T = 298$  K). Insert: pH-dependent  $\Delta A$  at 305 ( $\blacklozenge$ ), 535 nm ( $\square$ ) and 635 nm ( $\blacktriangle$ ).



**Fig. S3.** pH-dependent UV-Vis spectra of Cu(II)-L<sup>2</sup> 1:1 (**A**) and 2:1 (**B**) systems ( $[L^2]_{\text{tot}} = 1.7 \times 10^{-3}$  M,  $[\text{Cu(II)}]_{\text{tot}} = 1.7 \times 10^{-3}$  M and  $2.4 \times 10^{-3}$  M, respectively,  $I = 0.1$  M NaCl,  $T = 298$  K). Insert: pH-dependent absorbances at **A**: 550 ( $\blacklozenge$ ) and 640 nm ( $\square$ ), **B**: 400 nm ( $\blacklozenge$ ) and 565 nm ( $\square$ ).

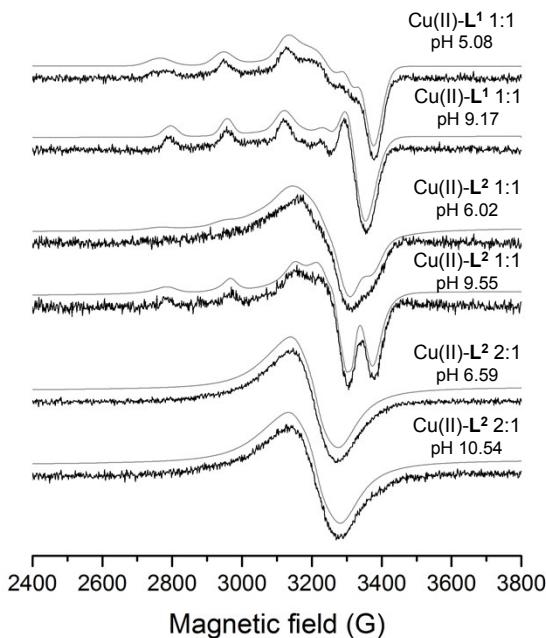


**Fig. S4.** pH-dependent CD spectra of Cu(II)-L<sup>2</sup> 1:1 (**A**) and 2:1 (**B**) systems ( $[L^2]_{\text{tot}} = 1.7 \times 10^{-3}$  M,  $[\text{Cu(II)}]_{\text{tot}} = 1.7 \times 10^{-3}$  M and  $2.4 \times 10^{-3}$  M, respectively,  $I = 0.1$  M NaCl,  $T = 298$  K). Insert: pH-dependent absorbances at **A**: 325 nm ( $\blacklozenge$ ), 595 nm ( $\square$ ) and 675 nm ( $\blacktriangle$ ), **B**: 325 nm ( $\blacklozenge$ ), 510 nm ( $\square$ ) and 700 nm ( $\blacktriangle$ ).

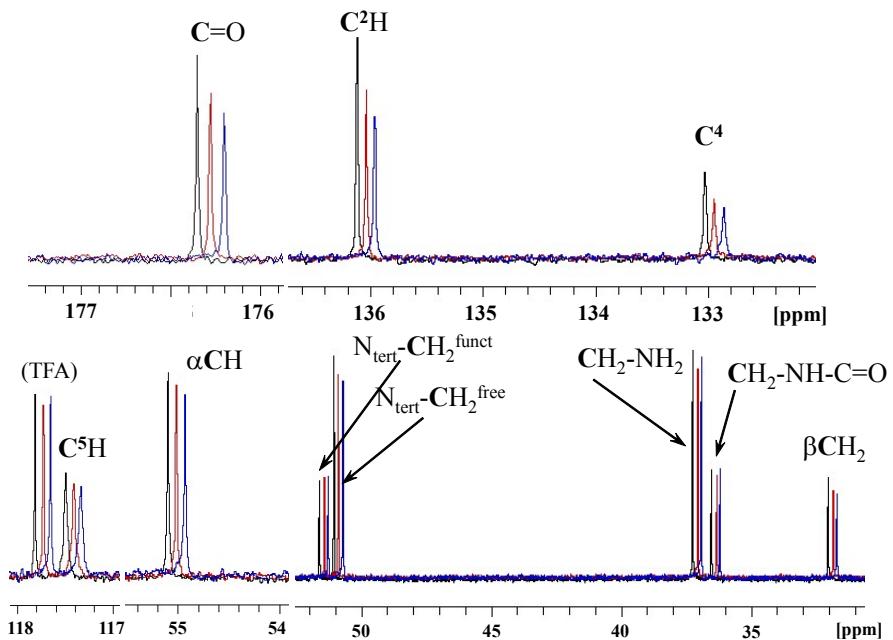
**Table S1.** Calculated EPR parameters of individual samples of Cu(II)-**L**<sup>1</sup> and Cu(II)-**L**<sup>2</sup> recorded at 77 K.

|                                   | Anisotropic parameters <sup>a</sup> | Calculated parameters <sup>a</sup> |          |          |           |                     |           |     |                    |
|-----------------------------------|-------------------------------------|------------------------------------|----------|----------|-----------|---------------------|-----------|-----|--------------------|
|                                   |                                     | $g_x$                              | $g_y$    | $g_z$    | $A_x / G$ | $A_y / G$           | $A_z / G$ | %   | $g_o, \text{calc}$ |
| Cu(II)- <b>L</b> <sup>1</sup> 1:1 | pH 5.08                             | 2.036(1)                           | 2.090(1) | 2.212(1) | 32(1)     | 25(3)               | 177.9(6)  | 100 | 2.113              |
| Cu(II)- <b>L</b> <sup>1</sup> 1:1 | pH 9.17                             | 2.053(2)                           | 2.072(2) | 2.210(1) | 41(2)     | 46(5)               | 157(1)    | 100 | 2.112              |
| Cu(II)- <b>L</b> <sup>2</sup> 1:1 | pH 6.02                             | 2.036(1)                           | 2.090(1) | 2.212(1) | 32(1)     | 25(3)               | 177.9(6)  | 15  | 2.113              |
|                                   |                                     |                                    |          | 2.096(2) |           | 153(5) <sup>b</sup> |           |     | 85                 |
| Cu(II)- <b>L</b> <sup>2</sup> 1:1 | pH 9.55                             | 2.033(1)                           | 2.063(1) | 2.197(2) | 4(3)      | 19(3)               | 178(2)    | 100 | 2.097              |
| Cu(II)- <b>L</b> <sup>2</sup> 2:1 | pH 6.59                             | 2.106(1)                           |          |          |           | 128(5) <sup>b</sup> |           |     | 100                |
| Cu(II)- <b>L</b> <sup>2</sup> 2:1 | pH 10.54                            | 2.108(1)                           |          |          |           | 137(5) <sup>b</sup> |           |     | 100                |

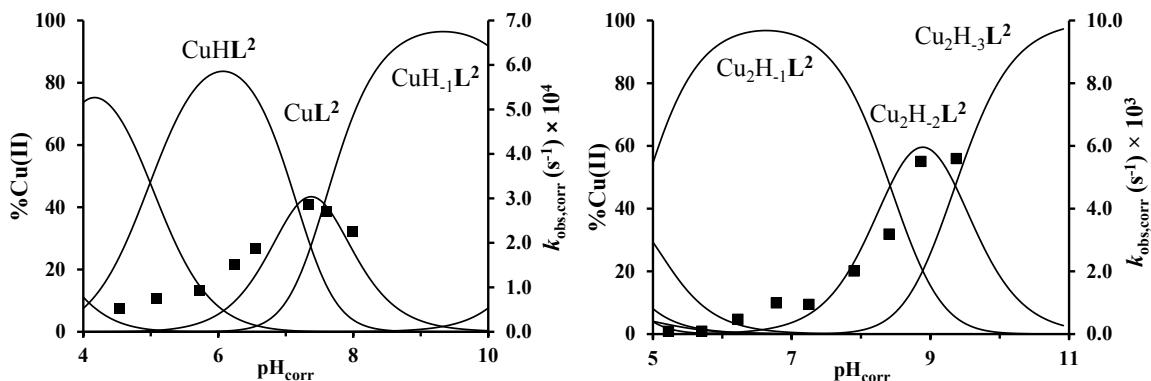
<sup>a</sup>  $g_o, \text{calc} = (g_x + g_y + g_z)/3$ , <sup>b</sup> full width at half maximum



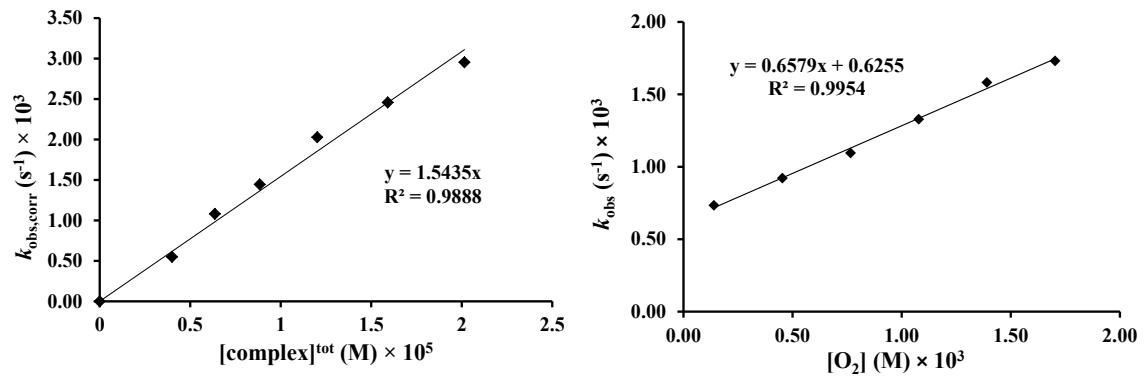
**Fig. S5.** Anisotropic EPR spectra recorded at 77 K in Cu(II)-**L**<sup>1</sup> and Cu(II)-**L**<sup>2</sup> systems ( $[L^1]_{\text{tot}} = [\text{Cu(II)}] = 0.0016 \text{ M}$  in Cu(II)-**L**<sup>1</sup> system,  $[L^2]_{\text{tot}} = 0.0018 \text{ M}$ ,  $[\text{Cu(II)}]_{\text{tot}} = 0.0018 \text{ M}$  or  $0.0036 \text{ M}$  in Cu(II)-**L**<sup>2</sup> systems,  $I = 0.1 \text{ M NaCl}$ , grey: simulated, black: measured). Calculated parameters are listed in Table S1.



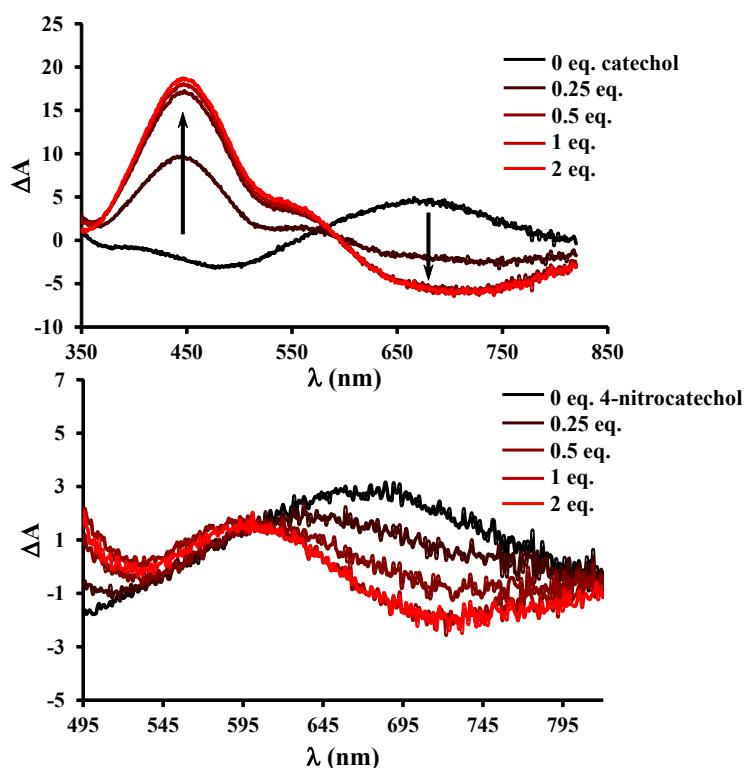
**Fig. S6.**  $^{13}\text{C}$  NMR spectra of  $\text{L}^1$  in presence of 0% (black), 5% (red) and 10% (blue) Cu(II) (in  $\text{H}_2\text{O}$ , pH 8.5,  $[\text{L}^1]_{\text{tot}} = 0.05 \text{ M}$ ,  $T = 298 \text{ K}$ ). Axis is scaled to the spectrum of the free ligand.



**Fig. S7.** pH-dependent reaction rate constants ( $k_{\text{obs,corr}}$ , secondary axis) in Cu(II)- $\text{L}^2$  1:1 (left) and 2:1 (right) systems with the corresponding speciation diagrams (primary axis) (in EtOH/ $\text{H}_2\text{O}$  50/50%,  $\text{pH}_{\text{corr}} = 8.7$ ,  $[\text{H}_2\text{DTBC}]_o = 8.0 \times 10^{-4} \text{ M}$  and  $4.0 \times 10^{-4} \text{ M}$ , respectively,  $[\text{complex}]_{\text{tot}} = 5.0 \times 10^{-5} \text{ M}$  and  $1.0 \times 10^{-5} \text{ M}$ , respectively).



**Fig. S8.** Dependence of reaction rate constants on complex (left) and dioxygen concentrations (right) in Cu(II)-L<sup>2</sup> 2:1 system (in EtOH/H<sub>2</sub>O 50/50%, pH<sub>corr</sub> = 8.7, [H<sub>2</sub>DTBC]<sub>o</sub> = 5.4 × 10<sup>-4</sup> M and 5.5 × 10<sup>-4</sup> M, respectively; at [O<sub>2</sub>] dependence [complex]<sub>tot</sub> = 9.9 × 10<sup>-6</sup> M).



**Fig. S9.** Catechol (up) and 4-nitrocatechol (down) dependent CD spectra of Cu(II)-L<sup>2</sup> 2:1 system under anaerobic conditions ([complex]<sub>tot</sub> = 5.4 × 10<sup>-4</sup> M and 3.5 × 10<sup>-4</sup> M, respectively, in EtOH/H<sub>2</sub>O 50/50, pH<sub>corr</sub> = 8.7).