

Article

A Comparison of Uric Acid Optical Detection Using As Sensitive Materials an Amino-Substituted Porphyrin and Its Nanomaterials with CuNPs, PtNPs and Pt@CuNPs

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2.9. Obtaining of hybrid complex between CuNPs and TAmPP porphyrin

In order to confirm our presumptions, that a possible coordinations of CuNPs by nitrogen atoms in the core of porphyrin might take place, we synthesized Cu(II)-TAmPP metalloporphyrin by classical metalation reaction with dihydrated CuCl₂ [30-from main text].

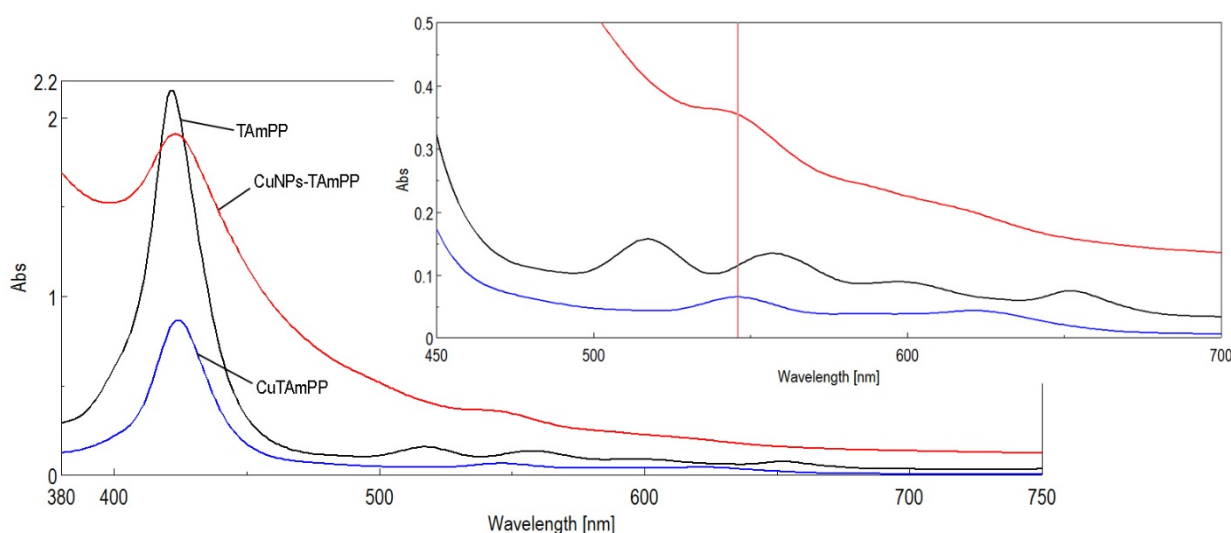


Figure S1. Overlapped UV-Vis spectra of 5,10,15,20-tetrakis(4-amino-phenyl)porphyrin (TAmPP), its complex with CuNPs and Cu(II)- 5,10,15,20-tetrakis(4-amino-phenyl)porphyrin (CuTAmPP).

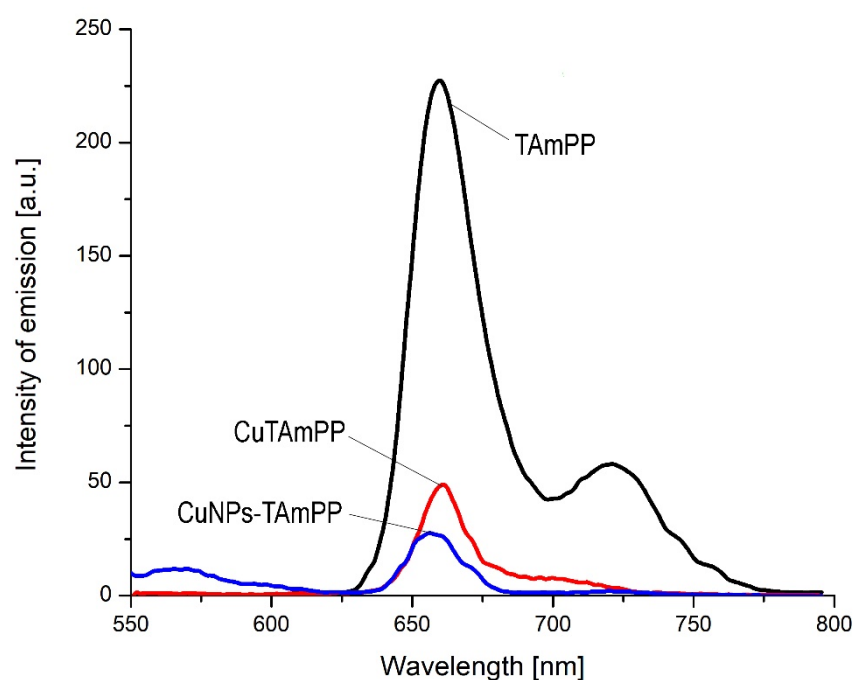


Figure S2. Emission spectra of TAMPP, CuNPs-TAMPP complex CuTAMPP.

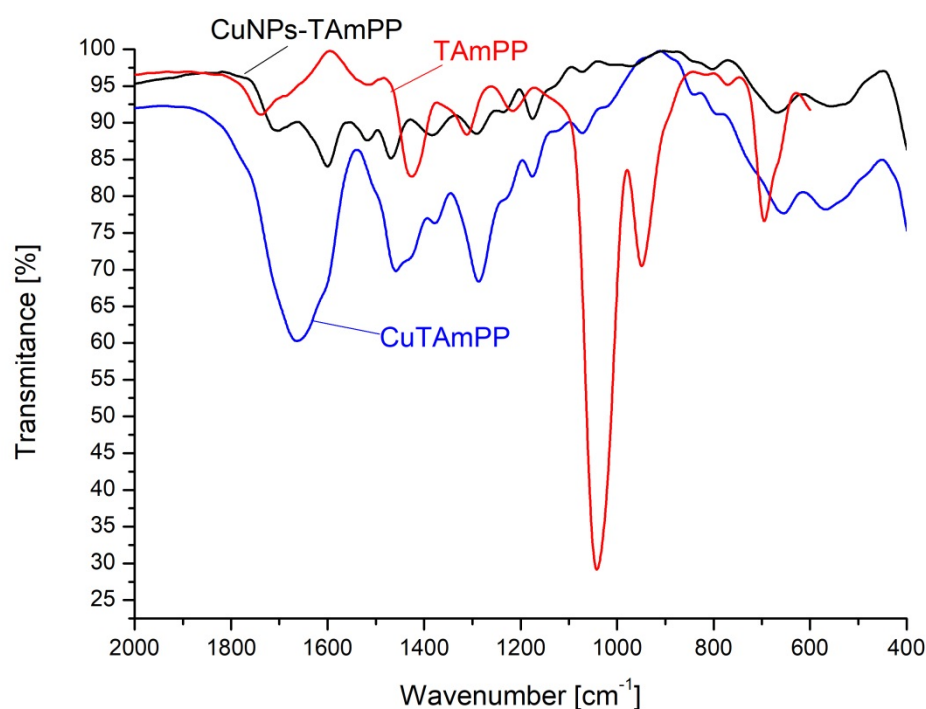


Figure S3. FT-IR superposed spectra of CuNPs-TAMPP complex and CuTAMPP metalloporphyrin.

3.2. Detection of uric acid with TAMPP-CuNPs hybrid material

To 5 mL TAMPP-CuNPs hybrid complex acidified with HCl ($c = 0.01$ M) to pH= 4.5 portions of 0.01 mL UA in DMSO ($c = 2.974 \times 10^{-4}$ M) were added and stirred for 1 minute, at room temperature. The UV-vis spectra were registered as represented in Figure S1. The QI band of the TAMPP-CuNPs hybrid is manifesting a significant hyperchromic effect and is hypsochromically shifted with 11 nm, and enlarged in the wavelength range of 700–860

nm. The QII band also has a hypsochromic shift of 7 nm. As can be seen from the AFM image of TAmPP-CuNPs hybrid complex after exposure to UA, the morphology of the surface is completely changed in comparison with the TAmPP-CuNPs hybrid complex. Triangular architectures of around 240 nm oriented in the same direction and completely covering the surface can be observed, due to both J and H-type aggregations produced by porphyrins in their interaction with UA.

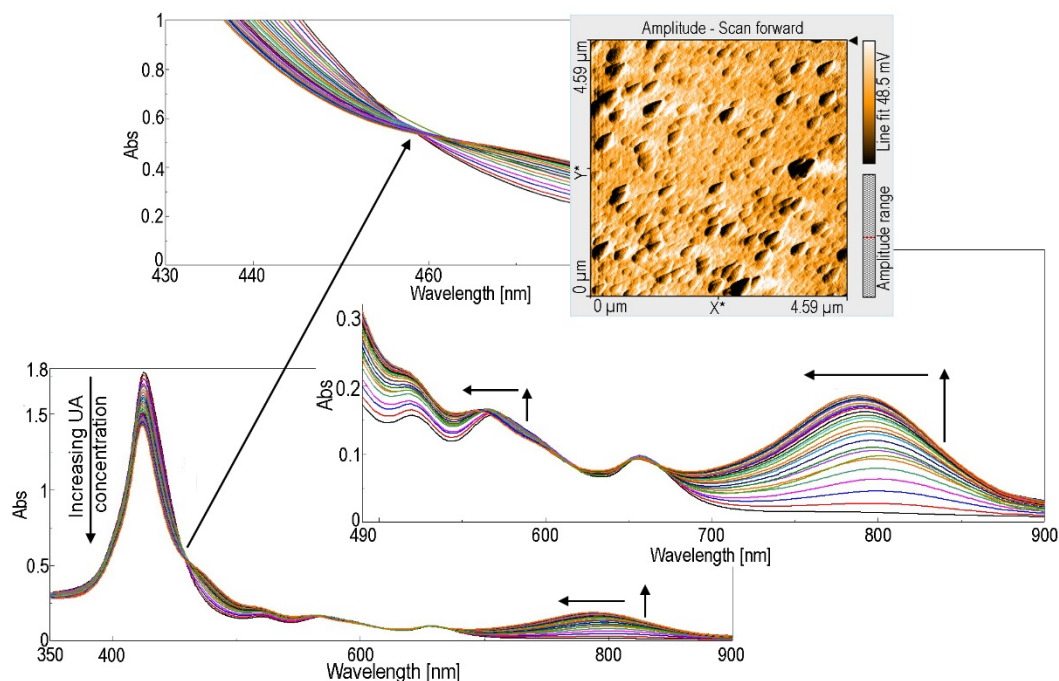


Figure S4. The UV-vis spectra registered by adding UA to TAmPP-CuNPs complex in DMSO solution; AFM image of TAmPP-CuNPs complex after exposure to UA.

The linear dependence between the intensity of the Soret band and the concentration of UA is linear in the range of 5.003×10^{-6} - 1.4008×10^{-5} M (Figure S2).

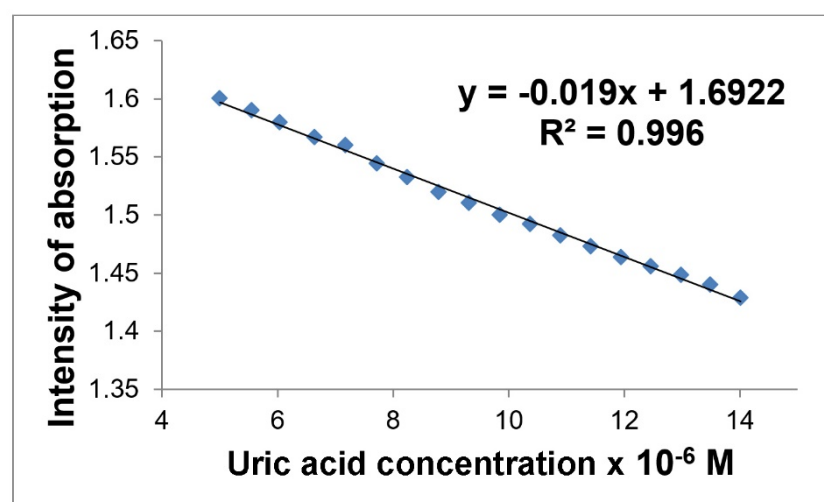


Figure S5. Linear dependence between the intensity of the Soret band and the concentration of UA using TAmPP-CuNPs hybrid complex as sensitive material.

3.2.1. Interference study

As described in Subsections 3.1.1, the effect of interfering species was investigated using the same ions and molecules at 1000-fold higher concentrations than the UA.

Figures S3 and S4 proved that the UV-vis spectrophotometric method is capable of good selectivity toward UA determination in the presence of glucose (Glu), ascorbic acid (AA), NaCl, KCl, MgSO_4 , KI, lactic acid (LA). The significant interference ion, is salicylate anion, and so that the analysis is not accurate in the presence of CH_3COONa and is critical in the presence of SS.

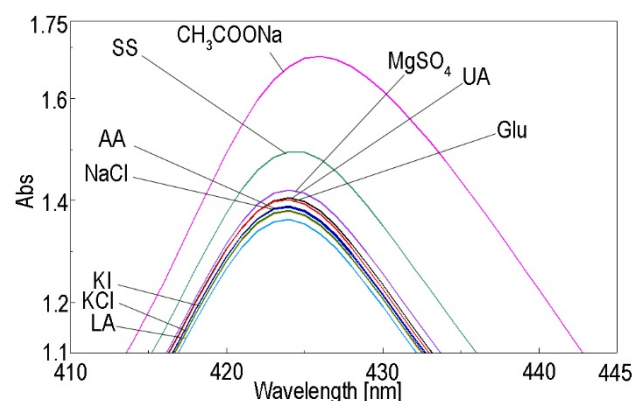


Figure S6. Overlapped UV-vis spectra representing the influence of diverse interfering species: glucose (Glu), ascorbic acid (AA), NaCl, KCl, CH_3COONa , MgSO_4 , KI, lactic acid (LA), sodium salicylate (SS), on the TAmPP-CuNPs hybrid complex at concentrations 1000-fold higher than UA.

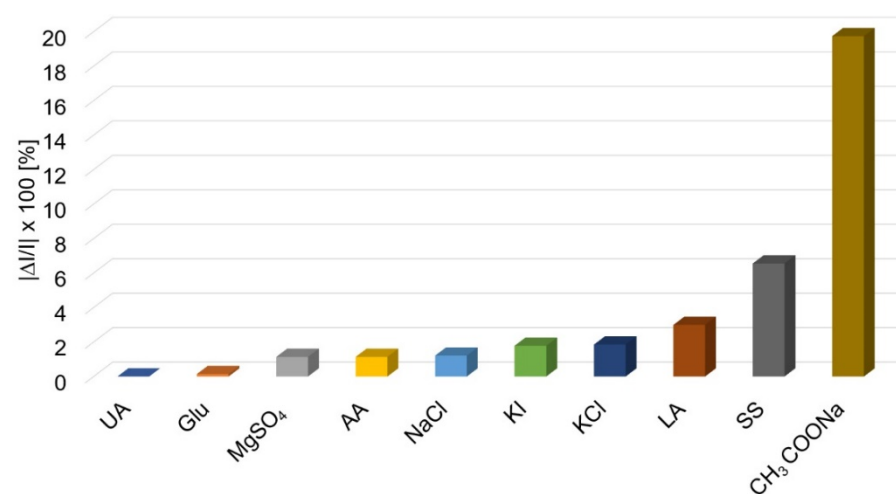


Figure S7. Average percentage errors for UA optical detection using TAmPP-CuNPs hybrid complex, introduced by different interferences.