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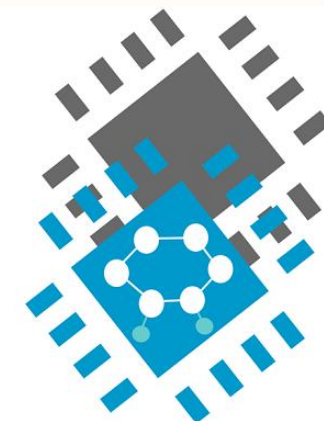


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Imidazole-based probe for the selective chromo-fluorogenic detection of Cu(II) in aqueous medium

Hazem Okda



XI International Workshop
On Sensors
And Molecular Recognition

Introduction

- ▶ **Cu(II)** is a vital metal ion in our life because of its biological and environmental importance. Also it is widely used in the metallurgical, pharmaceutical and agrochemical industries.
- ▶ **Cu(II)** abnormal levels cause toxicity and serious health problems on human beings due to its ability to displace other vital metal ions in some enzyme-catalysed reactions.

S. Goswami, et. al.; *Tetrahedron Lett.*, **2010**, 51, 5563-5566.

Q. Xie, et. al.; *Nutr Diet. Suppl.*, **2013**, 5, 1-6.

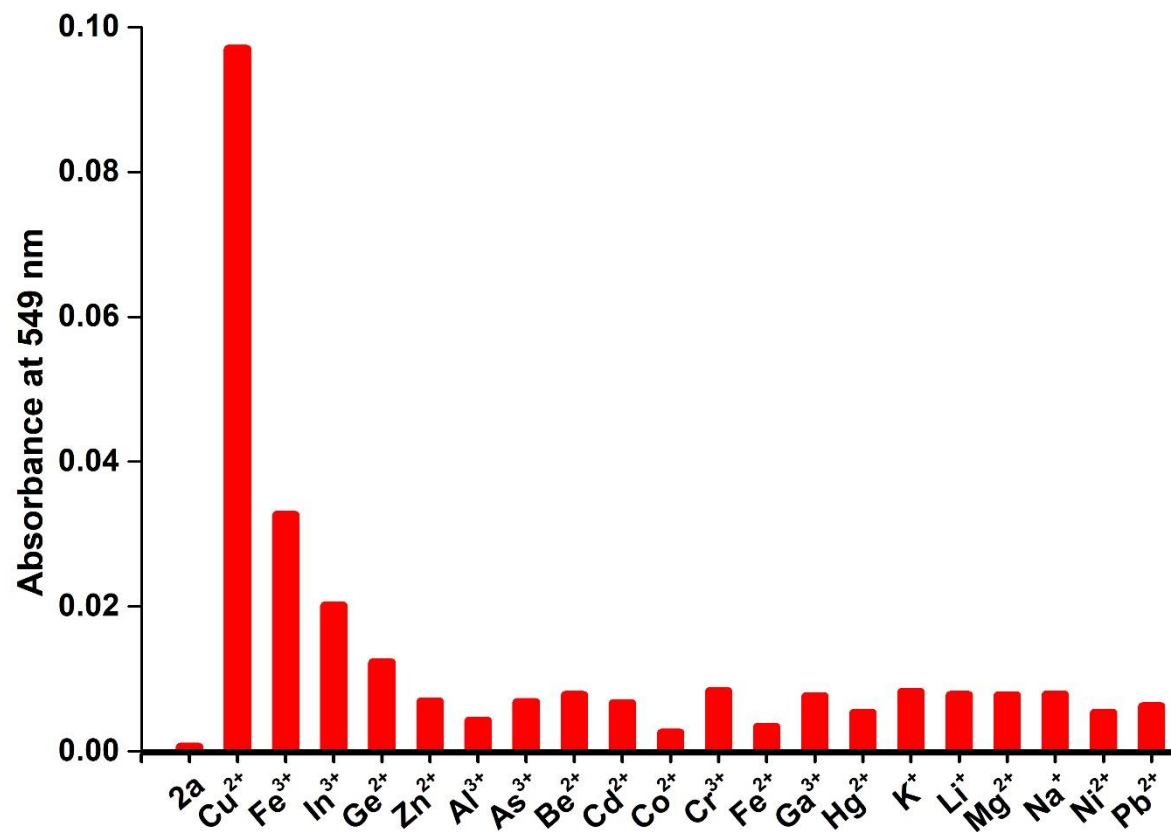
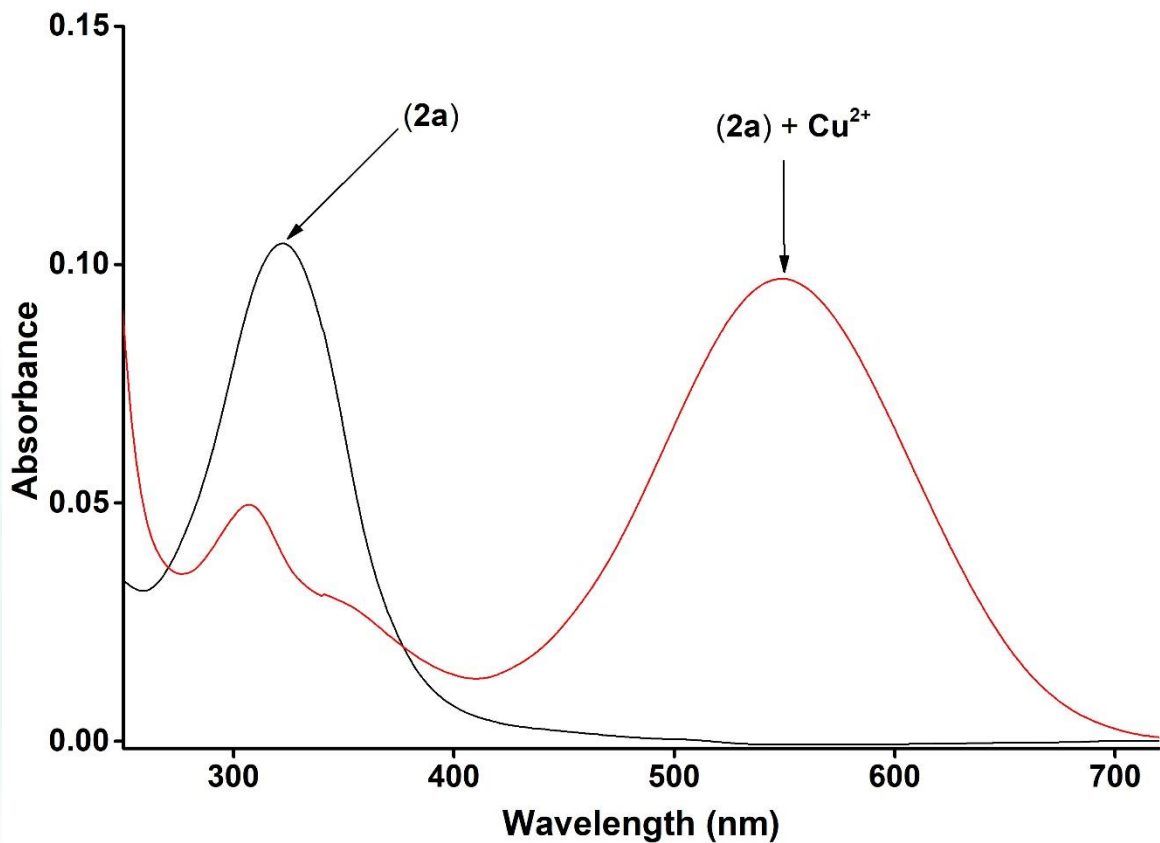
Our objective

- Development of highly selective chromo-Fluorogenic molecular probe for **Cu(II)** Detection in biological and environmental mediums.
- The probe should be easy to prepare, sensitive and present a rapid sensing behaviour towards **Cu(II)**.



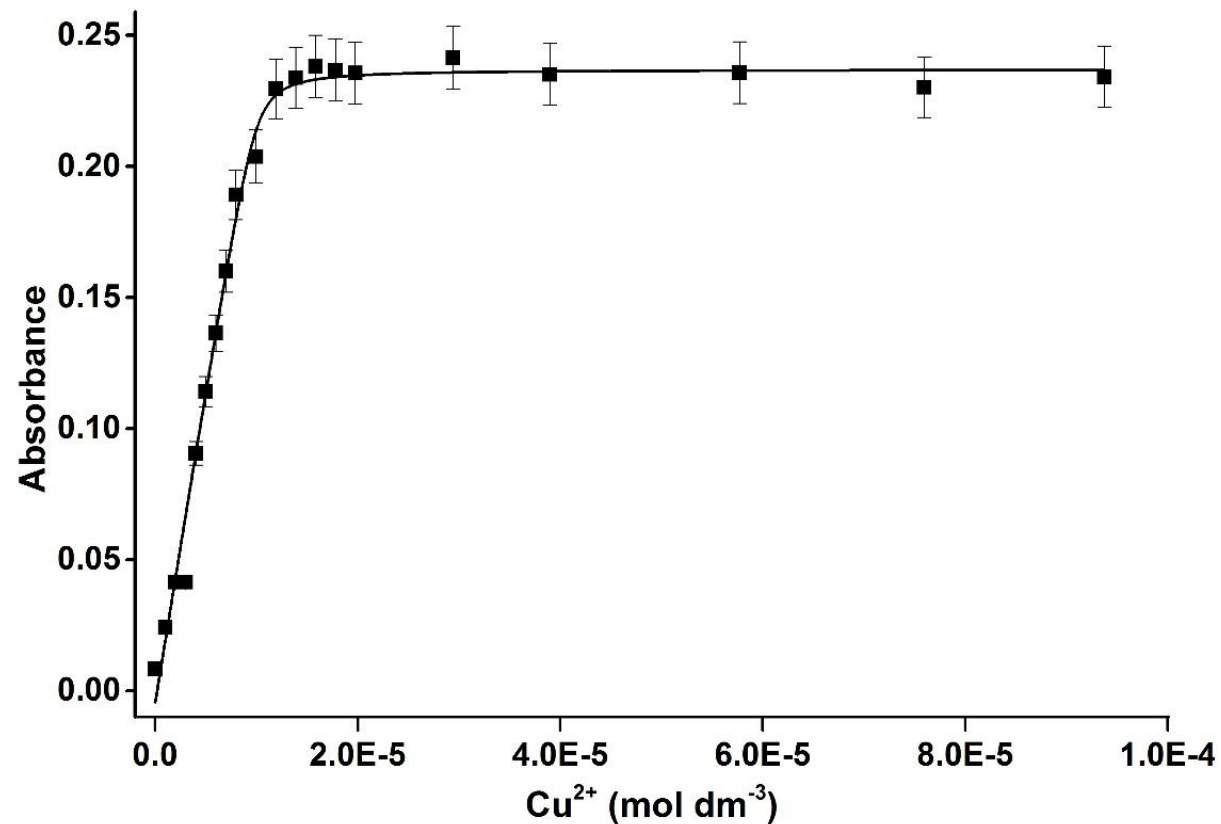
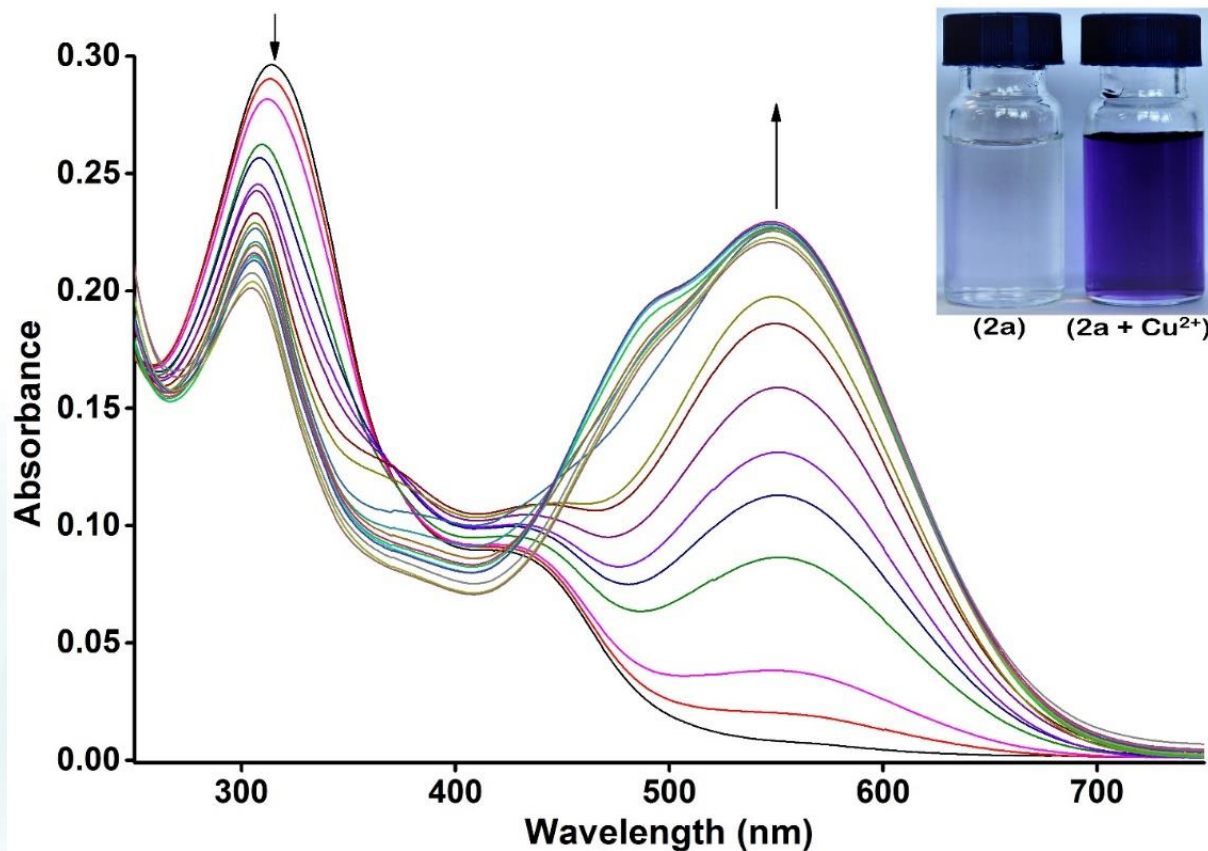
RESULTS AND DISCUSSION

Selectivity of (2a) in Acetonitrile (UV/Vis)



Absorbance at 549 nm of Probe (2a) (1.0×10^{-5} mol L⁻¹) in MeCN in the presence of 10 equivalents of different metal ions.

Sensitivity of (2a) in Acetonitrile (UV/Vis)



Probe **(2a)** was colourless in MeCN solution with absorption band at 314 nm.

Upon Cu(II) addition the colour changed to deep violet and new band appeared at 549 nm.

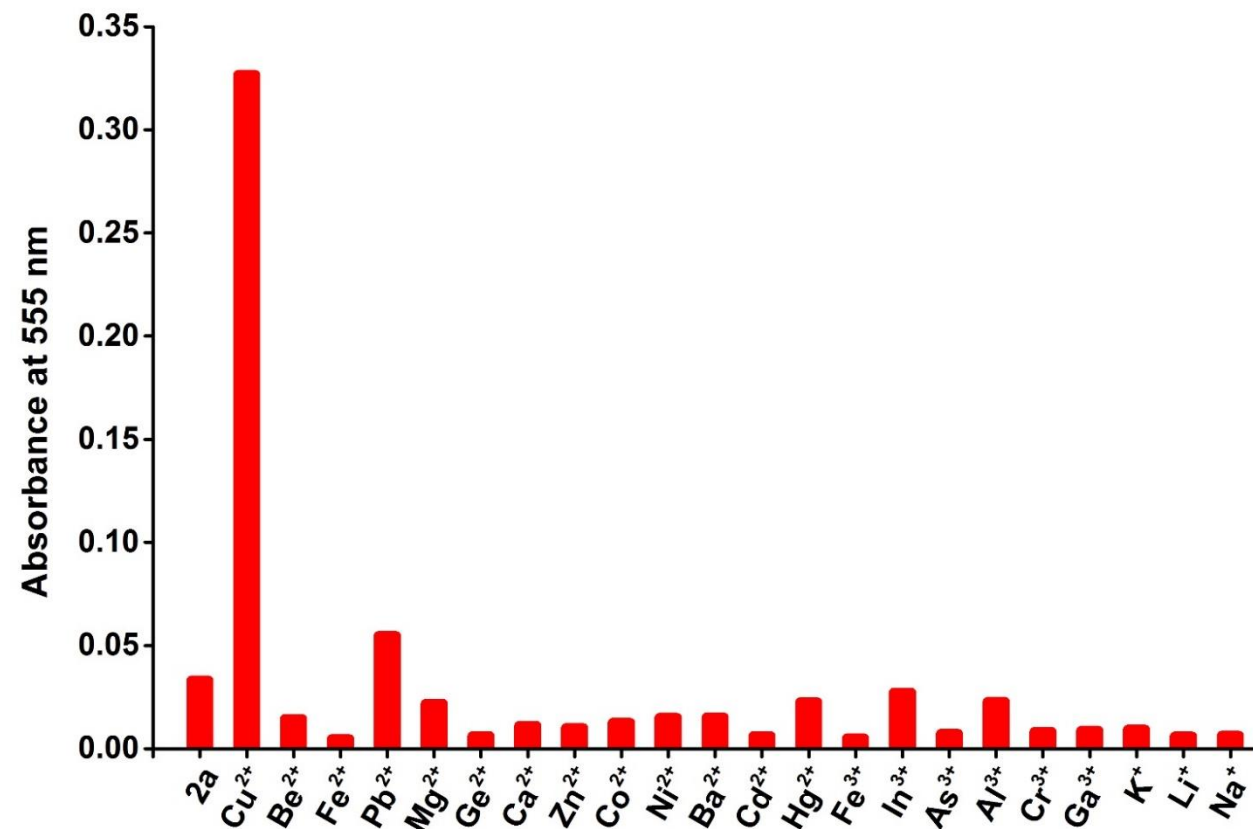
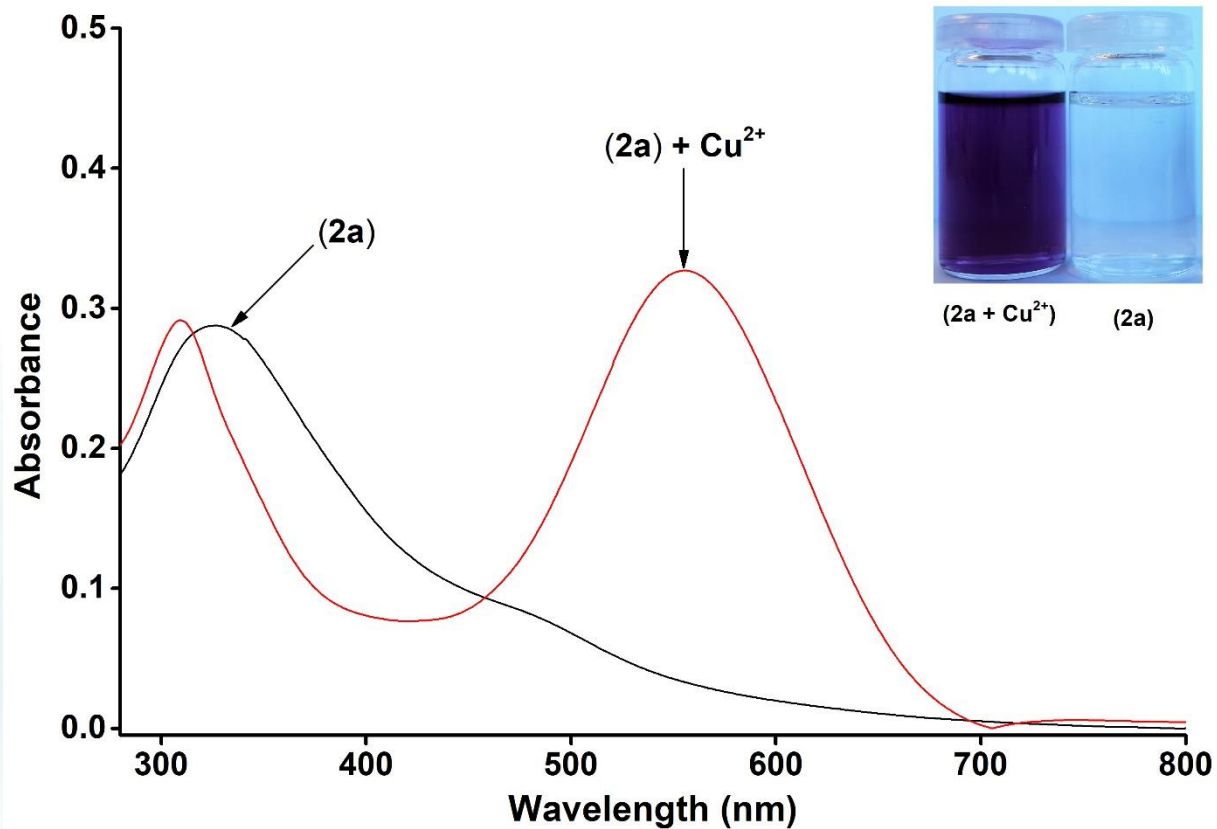
From the calibration curve the limit of detection was calculated to be 100 nM.

Selectivity of (2a) in aqueous media

- ▶ Probe **(2a)** in (1.0×10^{-5} mol L⁻¹) in H₂O – MeCN 90:10 v/v, pH 7.4) in the presence of 10 equivalents of selected cations.
- ▶ Only the addition of copper cation Cu(II) induced a remarkable colour modulation from colourless to deep violet.

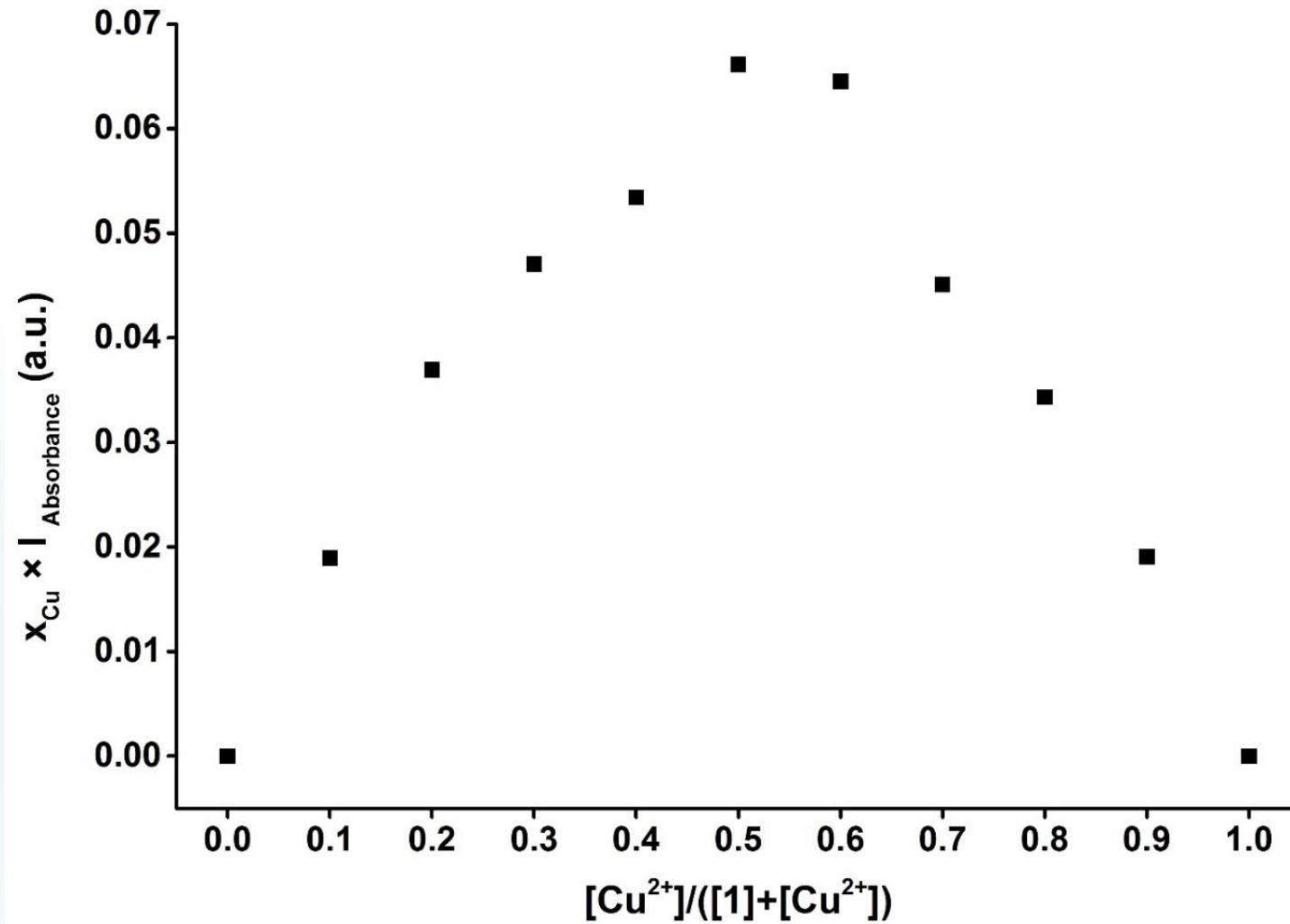


Selectivity of (2a) in aqueous media



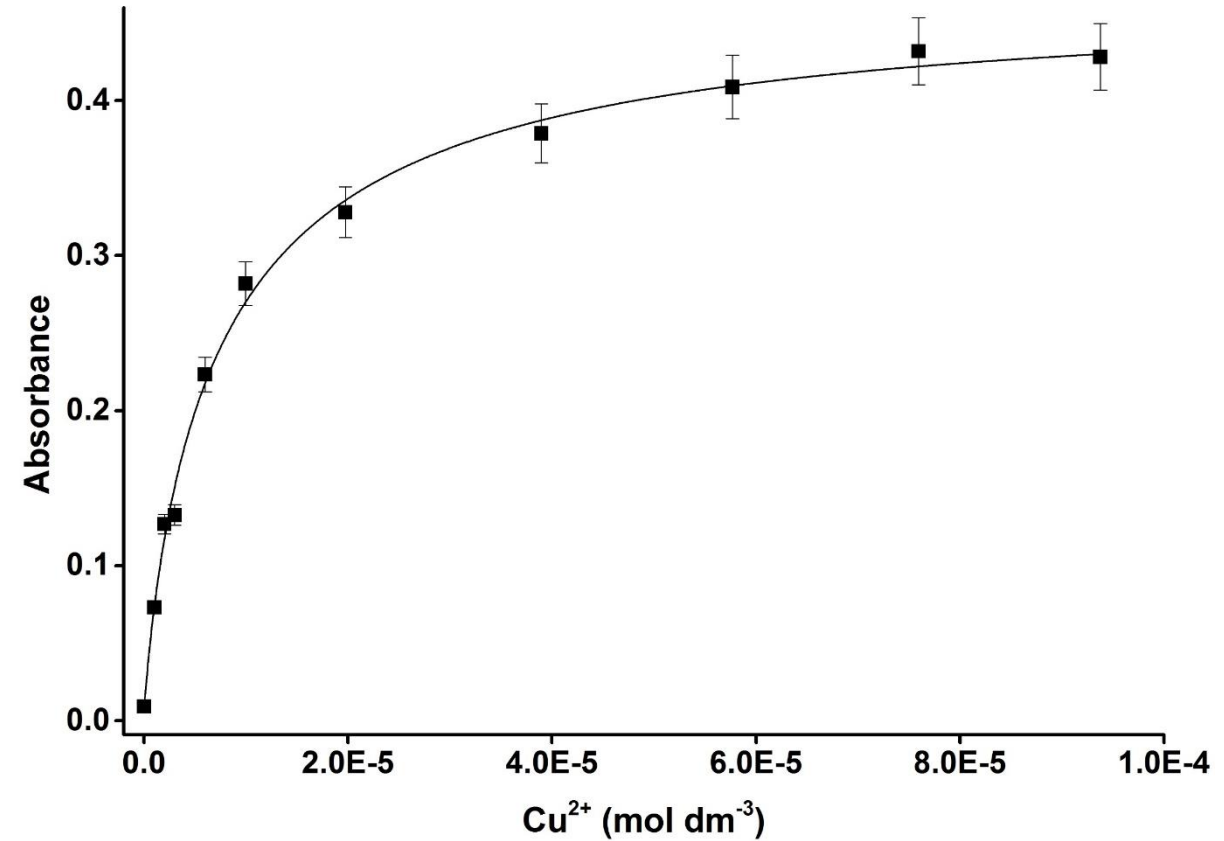
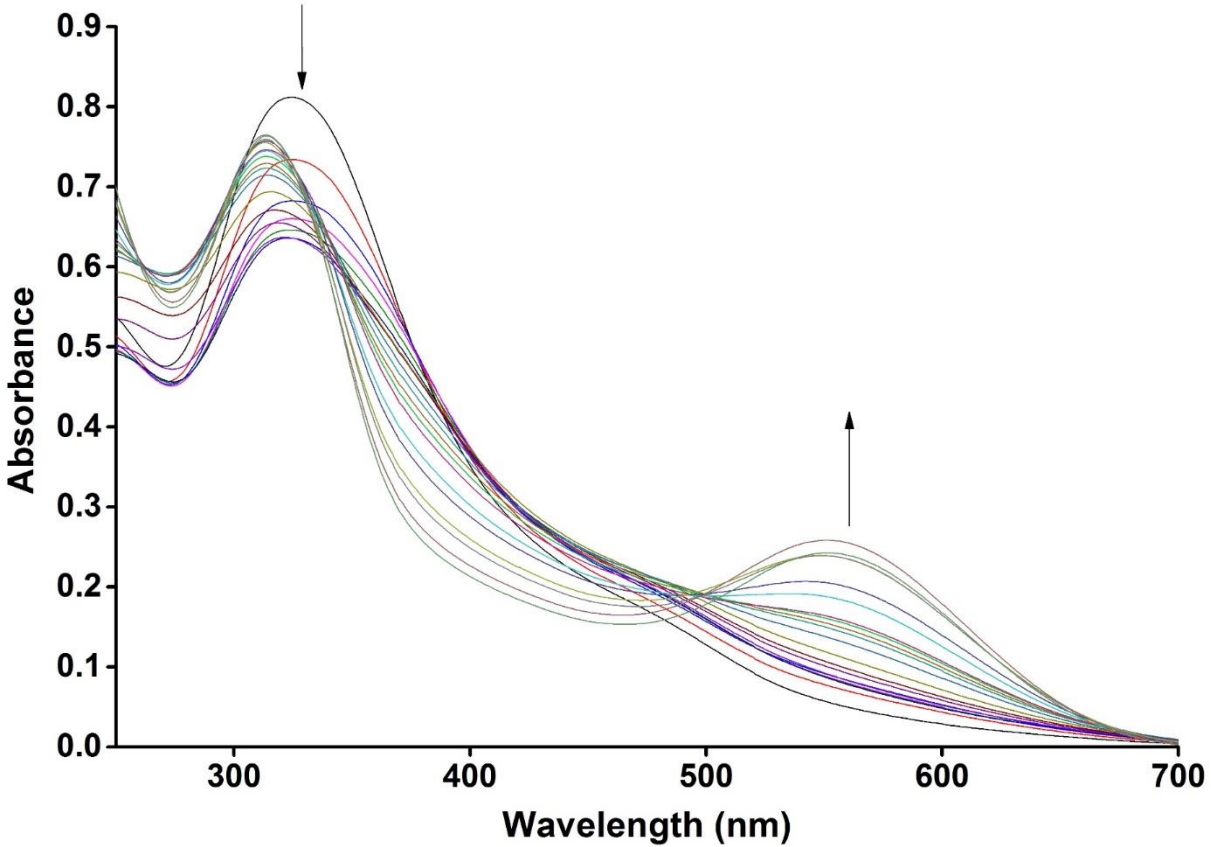
Absorbance at 555 nm of Probe (2a) (1.0×10^{-5} mol L⁻¹) in H₂O - MeCN 90:10 v/v at pH 7.4 in the presence of 10 equivalents of different metal ions.

Job's Plot



Job's plot for complexation between Probe **(2a)** and Cu(II) and showed 1:1 stoichiometric ratio.

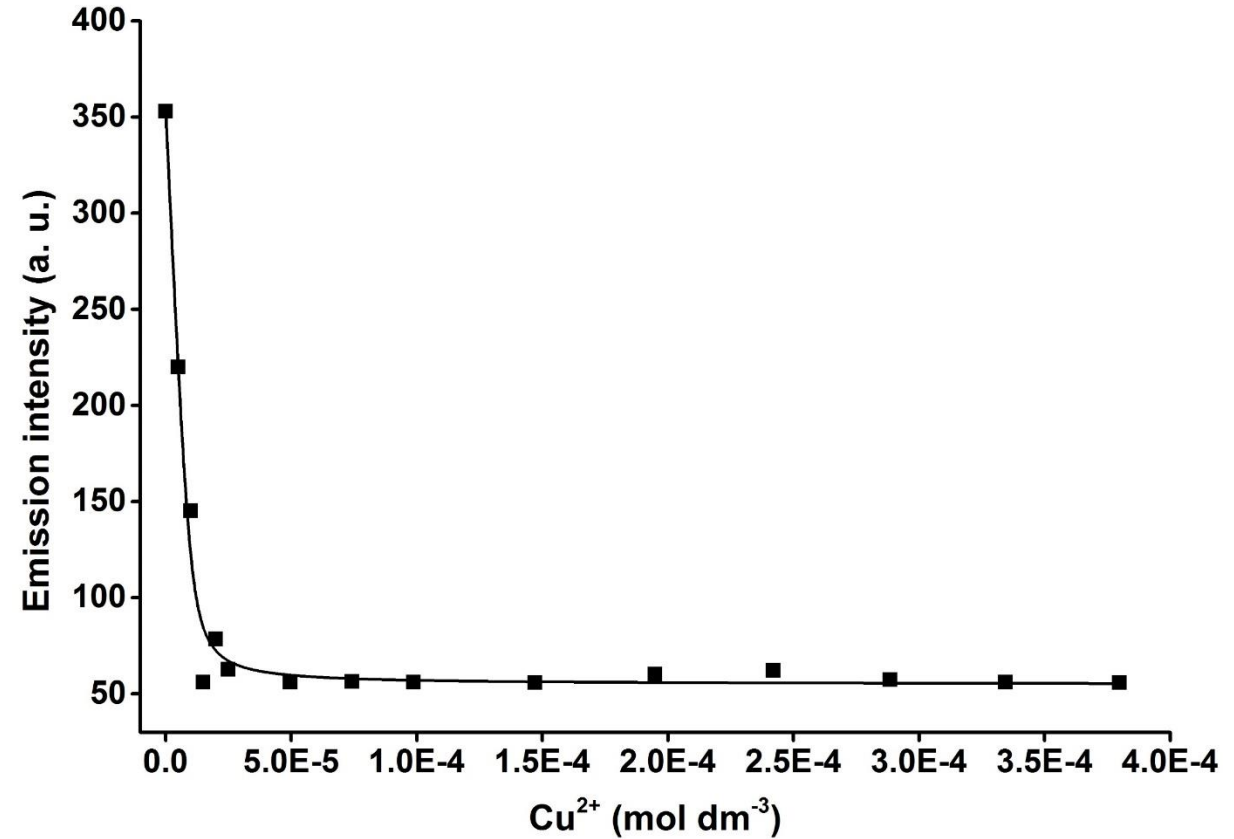
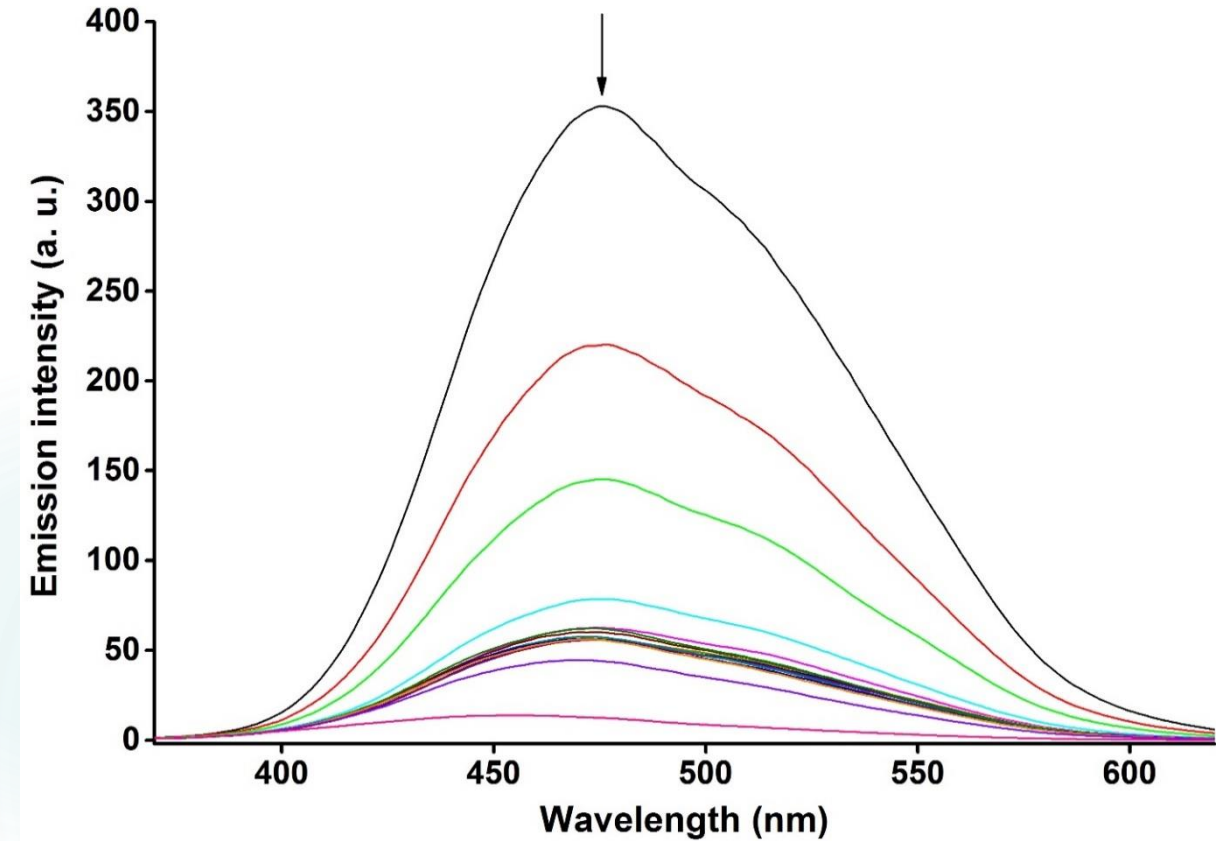
Sensitivity of (2a) in aqueous media (UV/Vis)



UV-visible titration profile of Probe (2a) (1.0×10^{-5} mol L⁻¹ in H₂O - MeCN 90:10 v/v at pH 7.4) upon addition of increasing concentration of Cu(II) cation (0 -10 equivalents).

Limit of detection was calculated to be 0.7 μ M.

(2a) in aqueous media (fluorescence studies)



The changes in the emission intensity of **(2a)** ($1.0 \times 10^{-5} \text{ mol L}^{-1}$ in $\text{H}_2\text{O} - \text{MeCN}$ 90:10 v/v at pH 7.4) toward the concentration of $\text{Cu}(\text{II})$ (0 -10 equivalents).

Limit of detection was calculated to be $3.2 \mu\text{M}$.

Conclusions

- In summary, we have developed a new chromo-fluorogenic **Cu(II)** probe as imidazole derivative bearing with two thiophene rings.
- Only **Cu(II)** was able to induce the appearance of new red shifted absorption band, which was responsible for colour modulation from colourless to deep violet.
- Our probe (**2a**) is very sensitive for **Cu(II)** detection in the aqueous environment (H₂O - MeCN 90:10 v/v at pH 7.4) with a limit of detection reaches to 0.7 μM.

Acknowledgement



Prof. Maria Manuela Raposo



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THANKS FOR ATTENTION!

HAZEM OKDA