Synthesis and characterization of a BODIPY probe for the chromogenic detection of Cu^{2+} and Fe^{3+}

Sónia C. S. Pinto, Raquel C. R. Gonçalves, Susana P. G. Costa, M. Manuela M. Raposo

Centre of Chemistry, University of Minho, Campus de Gualtar, 4710-057, Braga, Portugal
mfox@quimica.uminho.pt

In recent years, the development of chromo-fluorogenic chemosensors for metal cations has attracted the attention of researchers around the world. Among transition metal cations, Cu^{2+} is the third most abundant essential element in the human body and plays vital roles in several physiological processes. Nevertheless, abnormal levels of this cation can cause serious health problems on humans. In fact, high concentrations of Cu^{2+} in cells cause toxicity and different neurodegenerative diseases such as Menkes, Wilson's and Alzheimer [1]. Trivalent metal cations play also crucial roles in biological processes. For instance, iron is the most abundant transition metal in cellular systems. More specifically, Fe^{3+} is an essential element in the growth and development of living systems and its deficiency is associated with several diseases (anemia, hemochromatosis, diabetes, Parkinson's, and dysfunction of heart, pancreas, and liver) [2]. Therefore, simple and rapid sensing tools to monitor Cu^{2+} and Fe^{3+} levels in biological media are of importance. In this respect boron-dipyrromethene (BODIPY) derivatives have received great attention due to their advantageous features, such as fine tuning of the optical properties and facility of functionalization of the BODIPY core in order to be use as selective chromo-fluorogenic chemosensors for various analytes [3-4].

In continuation of the work developed in our research group [4-5], we report the synthesis and evaluation of the chemosensory ability of a carbazolyl-BODIPY derivative as a chromogenic probe for the detection Cu^{2+} and Fe^{3+} cations with biological and medicinal relevance.

Acknowledgements: Thanks are due to *Fundação para a Ciência e Tecnologia (FCT)* and FEDER for financial support through the Chemistry Research Centre of the University of Minho (Ref. UID/QUI/0686/2019). The NMR spectrometer Bruker Avance III 400 is part of the National NMR Network and was purchased within the framework of the National Program for Scientific Re-equipment, contract REDE/1517/RMN/2005 with funds from POCI 2010 (FEDER) and FCT.

References:

[1] X. Y. Choo, L. Alukaidey, A. R. White, A. Grubman, *Int. J. Alzheimer's Dis*. **2013**, *2013*, 145345.
[2] S. von Haehling, S. D. Anker, *Dtsch. Med. Wochenschr*. **2014**,*139*, 841.
[3] A. Loudet, K. Burgess, *Chem. Rev.* **2007**, *107*, 4891.
[4] M. L. Presti, R. Martínez-Máñez, J. V. Ros-Lis, R. M. F. Batista, S. P. G. Costa, M. M. M. Raposo, F. Sancenón, *New J. Chem.* **2018**, *42*, 7863.
[5] D. Collado, J. Casado, S. R. González, J. T. L. Navarrete, R. Suau, E. Perez-Inestrosa, T. M. Pappenfus, M. M. M. Raposo, *Chem. Eur. J.* **2011**, *17*, 498.