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A novel 2-(2-hydroxyphenyl)-benzimidazole-based ESIPT molecule for the selective detection of Al^{3+} and OCl^- by fluorescence in near perfect aqueous medium

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Earth's environment has been strongly polluted for decades by the use of heavy metals, pesticides, fertilizers, etc. produced in anthropological processes such as industry, agriculture, transportation, and the production and burning of fossil fuels, among others. Thus, it has become an absolute necessity to be able to determine in-situ the nature and quantity of those contaminants in order to bring solutions for eliminating them rapidly and effectively.

The determination of pollutants in the environment can be achieved by several well stablished analytical methods that often require expensive instrumentation and complicated manipulation techniques, and they are not suitable for use on-site, although having very low detection limits and high precision. Consequently, the development of rather simple devices that satisfy the same requirements listed above is worth studying. In this context, the use of optical chemosensors as cheap, portable and real-time response devices is a relatively convenient technique due to their ease of operation, design-dependent selectivity, fast response rate and ability to perform in-situ monitoring. [1] [2] [3]

With this in mind, we have designed and synthesized a novel Excited-State Intramolecular Proton Transfer (ESIPT) molecule, namely 2-(2-hydroxy-3-hydroxyiminomethyl-5-methylphenyl)-benzimidazole, that is shown to detect Al^{3+} and OCl^- in 99,5 % water medium with a good selectivity. Photophysical characterization of the sensing molecule as well as its detection capabilities towards the aforementioned species have been studied using UV-visible, steady-state and time-resolved fluorescence spectroscopy.

We will show how selective detection of these ions can be accomplished and we will particularly discuss the sensing mechanism leading to this selectivity.

Références

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