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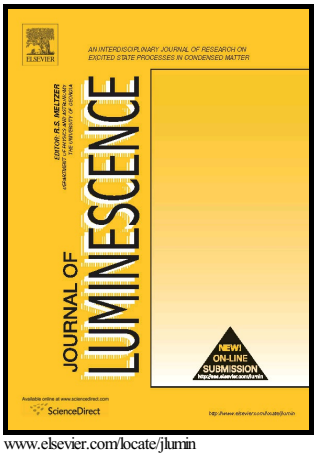

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Thiazolidine based differential chromo-fluorescent sensor for Cu^{2+} and CN^- ions: Elaboration as logic devices

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Abstract**: Thiazolidine based probe** 1 **h1as been synthesized for selective estimation of Cu^{2+} ions amongst other metal ions viz., Zn^{2+}, Co^{2+}, Ca^{2+}, K^+, Ni^{2+}, Mn^{2+}, Fe^{2+}, Hg^{2+}, Na^+, Pb^{2+}, Ba^{2+}, Fe^{3+}, Al^{3+}, Cr^{3+}. The probe** 1 **has opened new absorption channels at 300 nm and 500 nm in the presence of Cu^{2+} ions. The ratiometric response has been observed in the presence of Cu^{2+} ions due to emission quenching at 425 nm and enhancement at 485 nm that resulted in "ON-OFF-ON" type sensing. The probe** 1 **has been used to estimate Cu^{2+} ions between 50 nM - 15 µM, which is much lower than recommended by WHO in drinking water (30 µM). The probe** 1 **has also shown selective ratiometric absorption behavior towards CN^- ions in CH_3CN: H_2O:: 1:1. The ratiometric behavior of the probe** 1 **in the presence of Cu^{2+} and CN^- ions has mimicked as XOR logic function at λ_{em} 485 nm and YES logic gate at λ_{abs} 300 nm. The sensing mechanisms of the probe** 1 **toward Cu^{2+} and CN^- ions have been theoretically supported by DFT and TD-DFT calculations. Probe** 1 **has been used for its practical aplicability to sense Cu^{2+} and CN^- through dip coating method.**

Keywords**: Thiazolidine, Chemosensor, Logic gates, DFT-calculations**

Introduction

The fluorescent chemosensor is considered as a useful analytical tool, with the advantage of good selectivity, high sensitivity, quick response time and low response consistency. The development of fluorescent chemosensor for the detection of cations and anions, harmful to the environment or human health, is an area of emerging interest [1]. Presently, numbers of organic molecules have been designed and used as fluorescent chemosensors for different metal ions [2-4] and anions [5-7]. Some of metal ions or anions are responsible for the dysfunction in biological systems, creating challenge to detect such analytes [8].

Among the different metal ions, Cu^{2+} is the third most abundant metal and plays an important role in various physiological processes, but excess of Cu^{2+} ions responsible for the damage of central nervous system, affect kidneys, liver, lungs, blood composition and other parts of human body. So, detection of such toxic metal ion such as Cu^{2+} ions selectivity becomes an important area of research [9]. On the other, cyanide anion, a toxic, hazardous pollutant, is widely spread in the environment due to its use in industries. Cyanide ions inhibit cellular respiration in mammals and also absorb through the lungs, gastrointestinal track, skin and responsible for vomiting, convulsions, loss of consciousness or death. So,