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A DSE-ESIPT-Active Organic Luminogen for Ratiometric Detection of Cu (II) Ions with "Off-On" Enantioselective Recognition of Amino Alcohols and Selective Hydrazine Sensing

The development of dual-state emissive organic luminogens has elevated the ease of recognition of various biological analytes, which demonstrates the multifaceted potential of dual-state emitters. Therefore, in this study we have synthesized a dual state emissive-excited state intermolecular proton transfer based organic luminogen (E)-4-(5-bromo-2-hydroxybenzylideneamino)-2,3-dimethyl-1-phenyl-1,2-dihydropyrazol-5-one (ANMB) exhibiting excitation depend phototunability with a large stork shift of 109 nm and 155 nm in both solution and solid state, underscoring its potential as biosensor. The metal-chelating ability of ANMB was investigated, revealing significant fluorescence quenching upon coordination with Cu^{2+} ions, leading to a 96% reduction in emission intensity. Introduction of biological analytes, such as amino alcohols, enabled fluorescence recovery, where ANMB demonstrated enantioselective recognition: a single emission peak for the S-enantiomer and dual emission peaks for the R-enantiomer. Furthermore, ANMB demonstrated high selectivity for hydrazine detection in both solution and solid states, with new emission bands observed at 411 nm and 432 nm, indicating a fluorescence shift from green to blue. Complementarily, ANMB was successfully applied for real-time imaging of hydrazine in food and plant samples, showcasing its practical adaptability. Overall, this work highlights the multifunctionality and tunability of DSE–ESIPT-based organic luminogens, positioning ANMB as a promising candidate for the selective recognition of biologically significant analytes in analytical and real-world contexts.

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