Developing a Novel Phenanthroimidazole-based Fluorescent Sensor for Detecting Analytes in an Aqueous Medium

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Fluorescent sensors are organic fluorophores that detect specific analytes with quantitative fluorescence intensity changes. They have offered impressive benefits compared with instrumental techniques, such as low cost, high selectivity, and rapid responses. One issue that limits the fluorescent sensors for further application is their poor solubility in the aqueous medium, where most targeted analytes, including metal ions, inorganic anions, and neutral biomolecules, are readily soluble. When fluorescent sensors are utilized to detect these analytes, a heterogeneous phase is formed. In most cases, an extra water-miscible organic solvent is needed as an additive to facilitate the sensing process, which complicates the measurement operations and produces more waste. We aim to resolve this issue by skillful molecular design to add hydrophilic side chain to the fluorescent sensor, increasing its water solubility and facilitating its sensing process to analytes, like various protons, fluoride ions, and copper ions, in an aqueous medium. Simultaneously, its sensitivity and selectivity will be retained. This work will simplify the sensing operations and reduce the amount of organic waste produced during the measurement. This strategy will additionally be of broad interest to the chemistry community, as it introduces the idea of modifying the molecular structure to apply an initial hydrophobic compound under hydrophilic conditions in a feasible way.

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