

Y-shaped Push-Pull Heterocyclic Dyes for 'Naked-eye' Detection of Environmental Toxins via Mild Chemical Reactions

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Organic dipolar molecules have recently captivated enormous attention due to their wide structural diversity and tunable optoelectronic properties. In a typical organic D- π -A molecule, the electron donor (D = NR₂ or OR groups) and acceptor (A = NO₂ or CN groups) moieties are connected via a π -conjugated spacer unit. The polarizability of such compounds depends on the overall chemical structure, such as the electronic characteristics of the donor and acceptor units, geometry, length, as well as nature of the π -conjugated linker. Thus, these photoresponsive materials are often utilized in two-photon-absorbing devices, optoelectronics and data storage systems, organic light-emitting diodes, organic photovoltaic cells, etc. Sometimes, five-membered heteroaromatic rings, such as thiophene or imidazole, are incorporated in the spacer unit to construct a robust π conjugated backbone with a larger hyperpolarizability. On the other hand, the fluorescence response of such dye molecules also depends on the nature of the π -linker (electronic characteristics, rigidity etc). Despite these, application of such systems in biomolecular analysis remained underexplored. Considering these, herein we have employed heterocycles-Functionalized Y-Shaped Push-Pull Dyes for reaction-based recognition of toxic ions (such as Cu²⁺, Hg²⁺ etc) and gaseous analytes (nerve gas mimics). Analyte-coordination at the heterocycle (thiophene or imidazole) residue of the π -linker diminishes the extent of the intramolecular charge-transfer (ICT) interaction, leading to hypsochromic shift in absorption maxima.

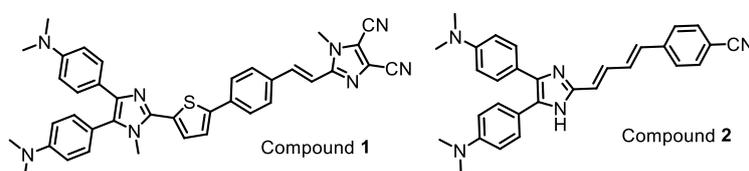


Figure 1. Push-Pull Heterocyclic Dyes involved in the optical sensing of environmental toxins.

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References:

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