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Highly sensitive and selective turn-on fluorescent chemosensors for Hg²⁺ based on thioacetal modified pyrene

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Abstract

This work reports a facile strategy for the synthesis of water-soluble fluorescent probes **Pyr1** and **Pyr2**, which have carboxyl and hydroxyl group in the side chain of thioacetal moiety, respectively. **Pyr1-2** exhibit exclusively selective turn-on fluorescence response towards Hg²⁺ over other cations, based on intramolecular charge transfer (ICT) mechanism. Upon addition of Hg²⁺, the thioacetal moiety in **Pyr1-2** can be converted to aldehyde group, which is confirmed by ¹H NMR titrations. The detection limits for **Pyr1-2** are less than 1.80 nM in aqueous media, lower than the maximum allowable level of Hg²⁺ in drinking water by EPA. Moreover, **Pyr2** have been successfully used for fluorescence imaging of Hg²⁺ in living cells, demonstrating potential application in biological science.

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