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An azine-based carbothioamide chemosensor for selective and sensitive turn-on-off sequential detection of Zn(II) and H₂PO₄⁻, live cell imaging and INHIBIT logic gate

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Abstract

Hydrazino-carbothioamide, **1**, serves as a turn-on fluorescent chemosensor to Zn²⁺ and the mixture shows green emission (λ_{em} 492) in presence of large number of ions with impressive limit of detection (LOD), 0.59 nM. Intense fluorescence of Zn-complex is selectively turn-off upon adding H₂PO₄⁻ only to the limit of detection, 26 μ M, while other anions remain silent. The sensing mechanism of **1** is established by suppressing the ESIPT of **1** and complexation with Zn²⁺ (CHEF) is supported by Job's plot, ¹H-NMR, and HR-MS data. Turn-on-off sequential detection of Zn²⁺ and H₂PO₄⁻ also have successfully been employed for the engineering of INHIBIT molecular logic gate. The sensor is non-toxic and has been used in identifying Zn²⁺ in the intracellular region of African green monkey kidney cells (Vero cells).

Keywords : Hydrazino-carbothioamide sensor; turn-on-off detection, Zn(II) and H₂PO₄⁻, INHIBIT logic gate, live cell imaging.

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