A high sensitive fluorescence turn-on probe for imaging Zn$^{2+}$ in aqueous solution and living cells

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Fig. S1 UV-vis spectral changes of compound L (5×10$^{-5}$ M) in the HEPES buffer solution (pH = 7.2, 50% CH$_3$CH$_2$OH, v/v) upon additions of various metal ions (25×10$^{-5}$ M).
**Fig. S2** UV-vis spectrum of L in HEPES buffer solution (20 mM HEPES, pH 7.2, EtOH : H$_2$O = 1 : 1) with different concentration

**Fig. S3** Linear relation of the absorbance and L concentration at 355 nm. $R^2 = 0.999$
Fig. S4 The ratio of absorbance (354 nm/410 nm) of \( L \) (50 \( \mu \)M) as a function of \( \text{Zn}^{2+} \) concentration. The inset shows the ratio of absorbance at 354 nm and 410 nm (\( A_{354}/A_{410} \)). \( R^2 = 0.960 \).

Fig. S5 Linear regression equation of \( L \) (10 \( \mu \)M) upon addition of \( \text{Zn}^{2+} \) (0.1–1.0 equiv.) in EtOH/HEPES (1:1, v/v, pH 7.2). \( R^2 = 0.995 \).

\( \sigma_{\text{bi}} = 4.67; \quad m = 1.14 \times 10^8; \quad \text{LOD} = 3\sigma_{\text{bi}}/m = 1.23 \times 10^{-7} \text{ M} \)
**Fig. S6** Benesi–Hildebrand plot of L (10 μM) in EtOH/HEPES (1:1, v/v, pH 7.2) buffered solution in the presence of Zn$^{2+}$ (0.1–50 equiv.). $R^2 = 0.999$.

**Fig. S7** Fluorescence emission spectra of L-Zn$^{2+}$ (1.0×10$^{-5}$ M) in the presence of Al$^{3+}$, Cr$^{3+}$, Fe$^{3+}$, Co$^{2+}$, Cu$^{2+}$, Ba$^{2+}$, Pb$^{2+}$, Na$^+$, Mg$^{2+}$, K$^+$ and Ca$^{2+}$ (50×10$^{-5}$ M) in the HEPES buffer solution (20 mM HEPES, pH = 7.2, EtOH : H$_2$O = 1 : 1). (Excitation wavelength: 410 nm).
**Fig. S8** Fluorescence emission spectra of free probe L (10 μM) in buffered EtOH/HEPES (20 mM, pH = 7.2, 1:1, v/v) upon addition of 5 equiv. of different zinc salts.

**Fig. S9** Job’s plot evaluated from the fluorescence spectra of L and Zn$^{2+}$ at 410 nm in buffered EtOH/HEPES (1/1, v/v, pH 7.2) solution (the total concentration of L and Zn$^{2+}$ is 1.0×10^{-5} M).

**Fig. S10** Proposed complex structure of L with Zn$^{2+}$. 
**Fig. S11** Fluorescence spectra of compound 6 (1.0×10⁻⁵ M) in the absence and presence of 5 equiv. of Zn²⁺ in the HEPES buffer solution (20 mM HEPES, pH = 7.2, EtOH : H₂O = 1 : 1). (Excitation wavelength: 410 nm).

**Fig. S12** HRMS spectra of L-Zn²⁺ complex.

**Fig. S13** Optimized structure of L-Zn²⁺ by DFT calculation.
Fig. S14 $^1$H NMR spectra of L with 0, 5.0 equiv. Zn$^{2+}$ in $d$-CH$_3$CN. (a) Free probe L. (b) [Zn$^{2+}$]/[L] equals 5 : 1.

Fig. S15 Reversibility of L-Zn$^{2+}$ binding (Slit: 10 nm/5 nm).
**Fig. S16** Effect of pH on the fluorescence intensity ($\lambda_{ex} = 410$ nm, $\lambda_{em} = 472$ nm) of L (10 $\mu$M) in EtOH/HEPES (1/1, v/v, pH = 7.2) buffered solution measured with and without Zn$^{2+}$ (5 equiv.).

**Fig. S17** Time course of the response of L (10 $\mu$M) in the presence of Zn$^{2+}$ (5 equiv.) in EtOH/HEPES (1/1, v/v, pH = 7.2) buffered solution. Excitation wavelength was 410 nm.
**Fig. S18** SRB assay in HeLa cells with probe concentration of 5 μM at 6 h.

**Fig. S19** $^1$H NMR of 1-(3-hydroxynaphthalen-2-yl)-5-phenyl-4,5-dihydro-1H-pyrazol-1-yl)ethanone (L)
**Fig. S20** $^{13}$C NMR of 1-(3-hydroxynaphthalen-2-yl)-5-phenyl-4,5-dihydro-1H-pyrazol-1-yl)ethanone (L)

**Fig. S21** HRMS of 1-(3-hydroxynaphthalen-2-yl)-5-phenyl-4,5-dihydro-1H-pyrazol-1-yl)ethanone (L)