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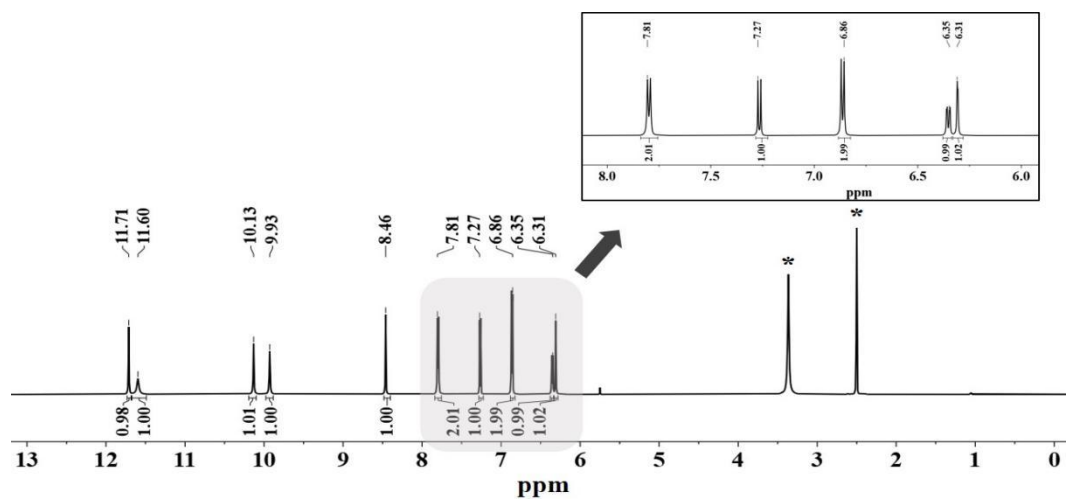


Fig. S1. ^1H NMR spectrum of AOH in $\text{DMSO}-d_6$ (the asterisks show the solvent peaks).

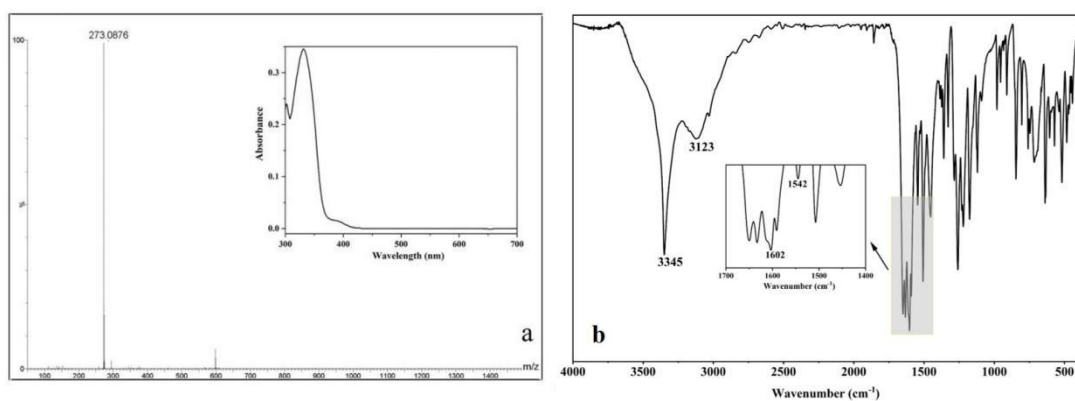


Fig. S2. (a) ESI-HRMS spectrum (inset is the UV-vis spectrum in ethanol) and (b) FTIR spectrum of AOH

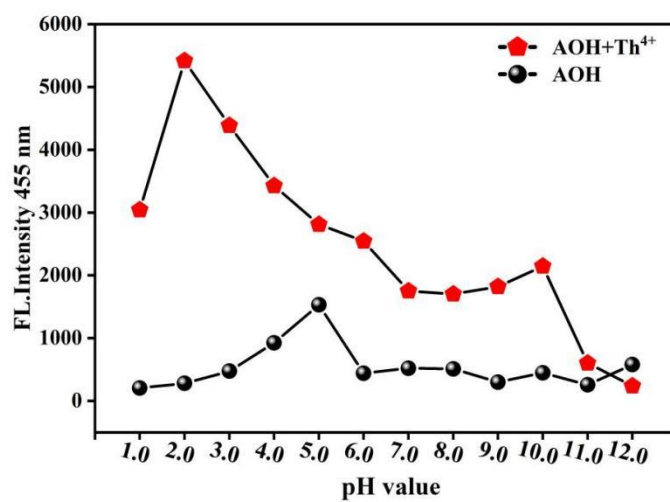


Fig. S3. The pH effects on fluorescence intensity of AOH with Th^{4+} respectively in $\text{EtOH}/\text{H}_2\text{O}$ (1/1, v/v).

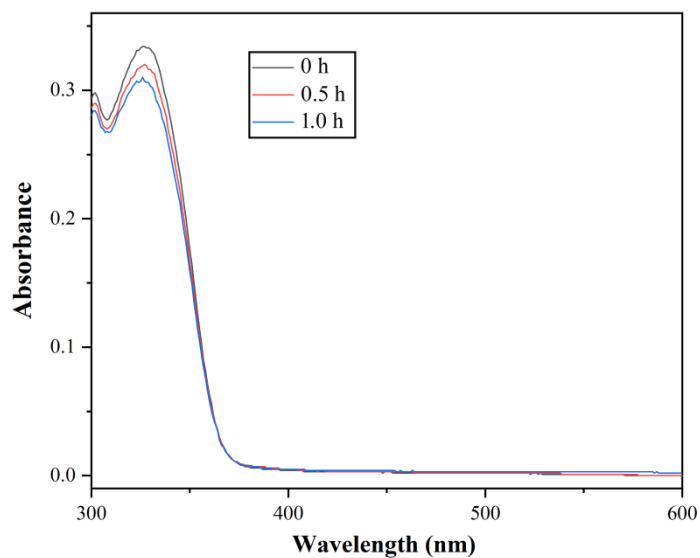


Fig. S4. The UV-vis spectra of **AOH** at different time in EtOH/H₂O (1/1, v/v, pH = 2.0).

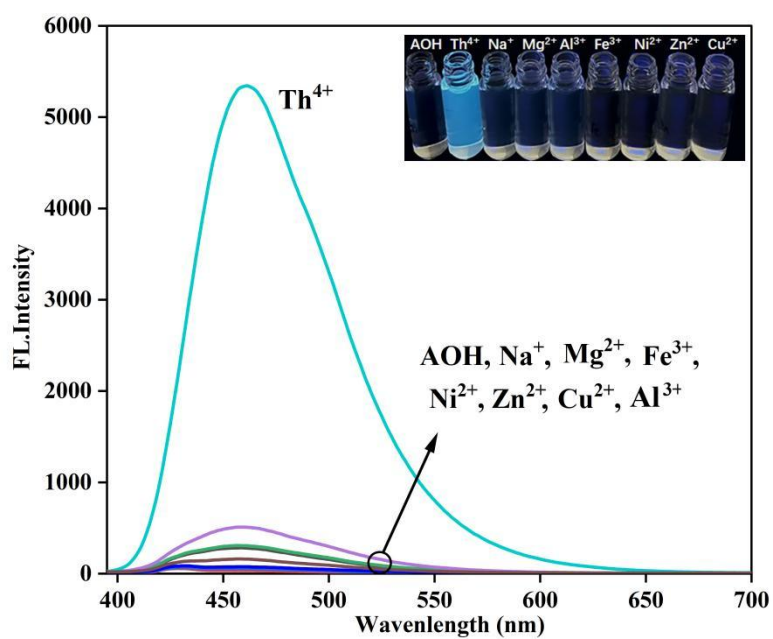


Fig. S5. Fluorescence selectivity of **AOH** (5 μ M) to **Th⁴⁺** (50 μ M) among common metal ions (50 μ M) in EtOH/H₂O (1/1, v/v, pH = 2.0). Inset is the corresponding image under 365 nm UV light.

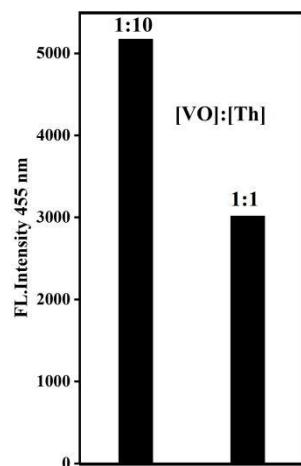


Fig. S6. The fluorescence intensity of VO^{2+} (2 μM and 20 μM , respectively) and Th^{4+} (20 μM) coexisting with **AOH** (10 μM) at different molar ratios.

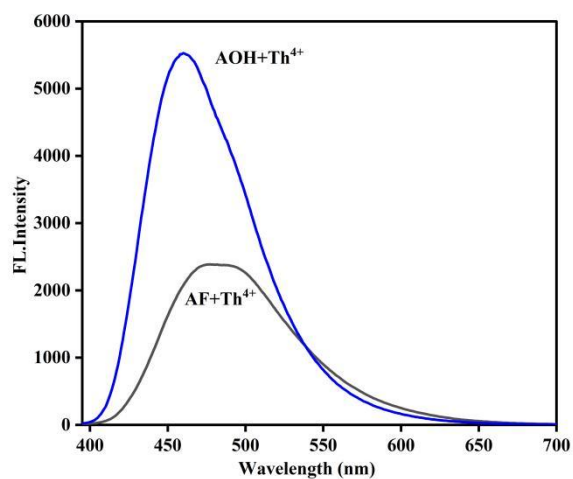


Fig. S7. Fluorescence spectrum comparison of **AOH** (5 μM) and our previous sesor **AF** (5 μM) in the existence of Th^{4+} (50 μM) at the same conditions in EtOH/H₂O (1/1, v/v, pH = 2.0).

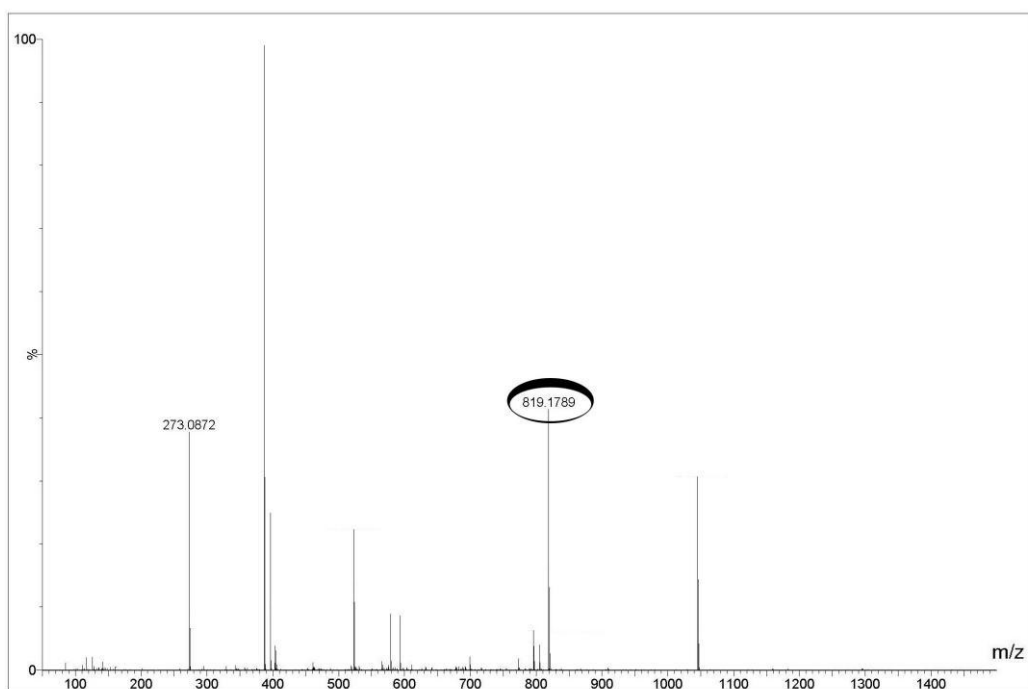


Fig. S8. HRMS spectrum of AOH mixed with Th^{4+}

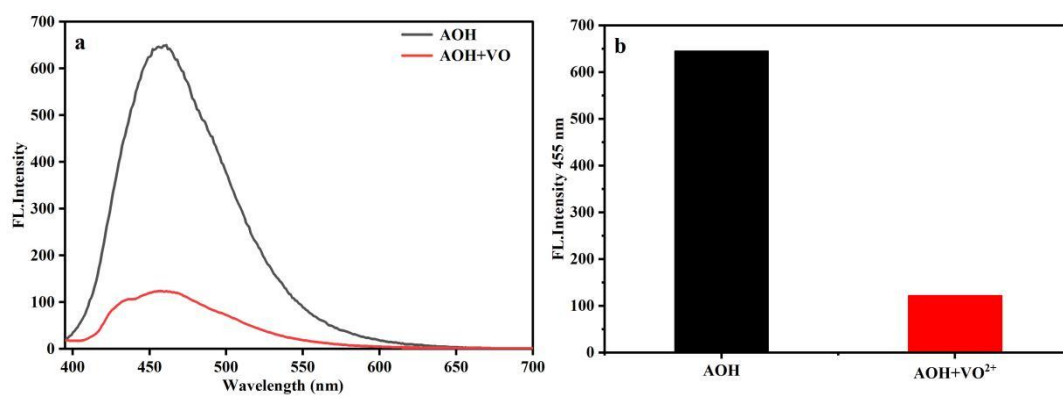


Fig. S9. (a) Fluorescence spectra of AOH (5 μM) alone and after the addition VO^{2+} (50 μM) in EtOH/H₂O (1/1, v/v, pH = 2.0). (b) The corresponding fluorescence intensity histogram at 455 nm

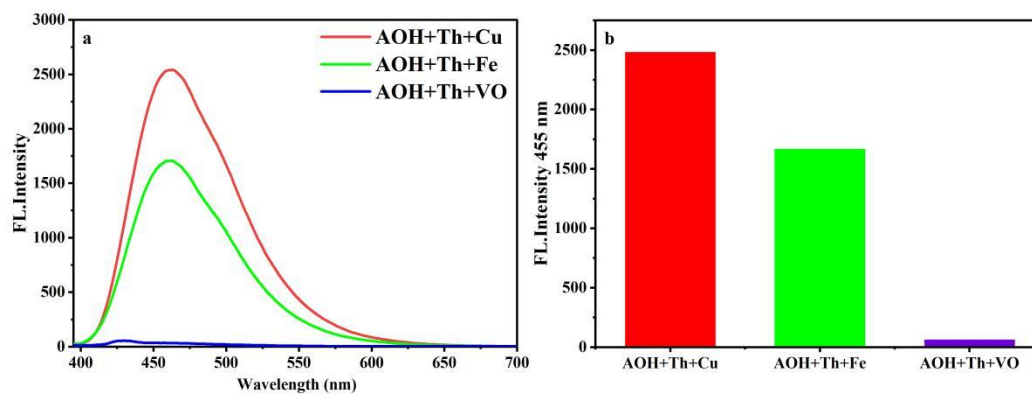


Fig.S10. (a) Fluorescence spectra of AOH (5 μM)-Th⁴⁺ (50 μM) coexisted with VO²⁺ (500 μM), Cu²⁺ (500 μM) and Fe³⁺ (500 μM) respectively in EtOH/H₂O (1/1, v/v, pH = 2.0). (b) The corresponding fluorescence intensity histograms at 455 nm

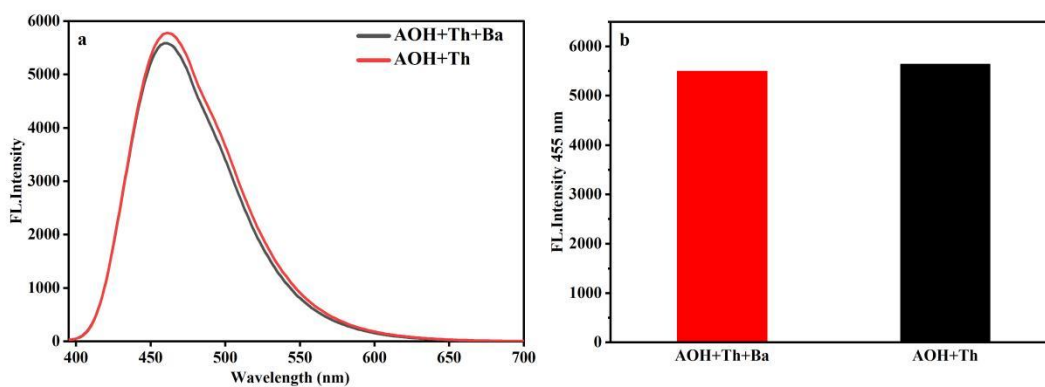


Fig. S11. (a) Fluorescence spectra of AOH (10 μM)-Th⁴⁺ (2 equiv., 20 μM) before and after adding BaCl₂ (10 equiv., 100 μM). (b) The corresponding fluorescence intensity histograms at 455 nm.

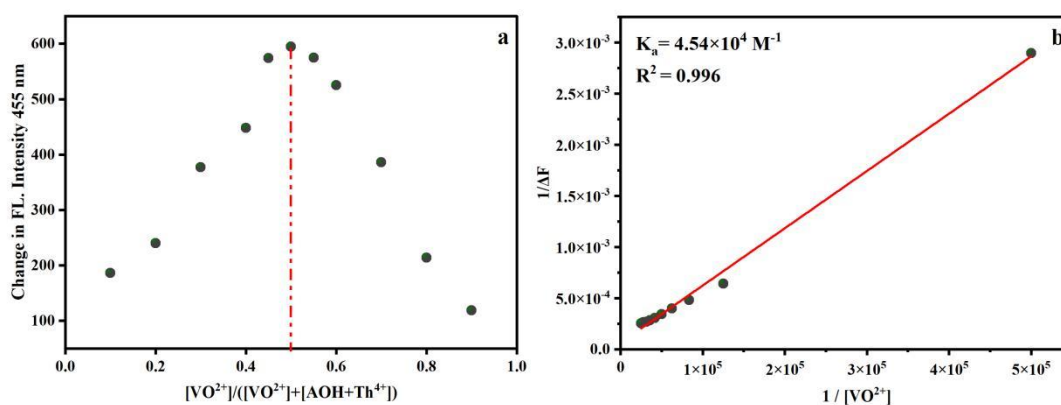


Fig. S12. (a) The job's plot of AOH-Th⁴⁺ to VO²⁺. (b) Binding constant (K_a) determination

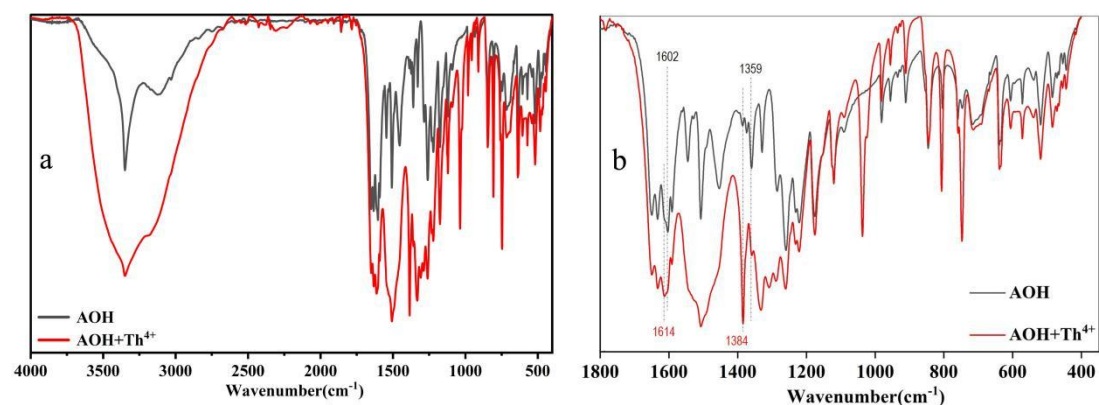


Fig. S13. FT-IR spectra of AOH before (black line) and after (red line) Th⁴⁺ addition. (a) The full spectrum and (b) the enlarged spectrum at 1800 - 400 cm⁻¹.

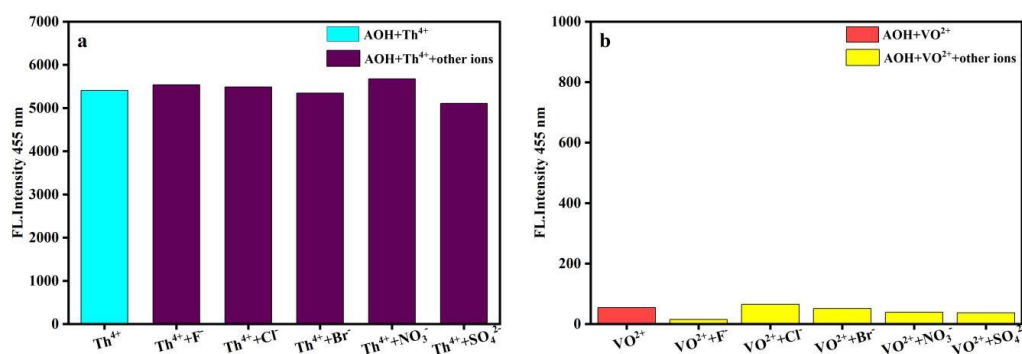


Fig. S14. Anions effect on the fluorescence intensity (455 nm) for Th⁴⁺ and VO²⁺ detection, with the coexistence of tested anions (50 μM) in EtOH/H₂O (1/1, v/v, pH = 2.0). (a) AOH (5 μM) -Th⁴⁺ (50 μM). (b) AOH (5 μM) -VO²⁺ (50 μM).