

Supplementary materials

A dual-emission ratiometric fluorescent sensor based on copper nanoclusters encapsulated zeolitic imidazolate framework-90 for rapid detection and imaging of adenosine triphosphate

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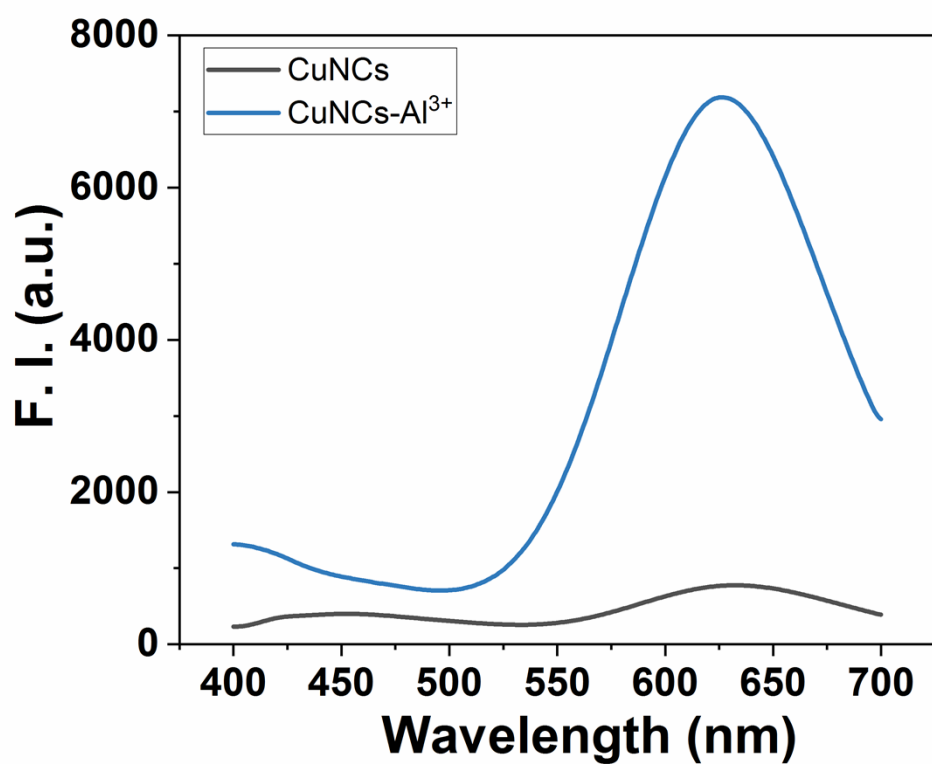


Fig. S1 The fluorescence emission spectra of Cu NCs and Cu NCs-Al³⁺ under the excitation of 360 nm

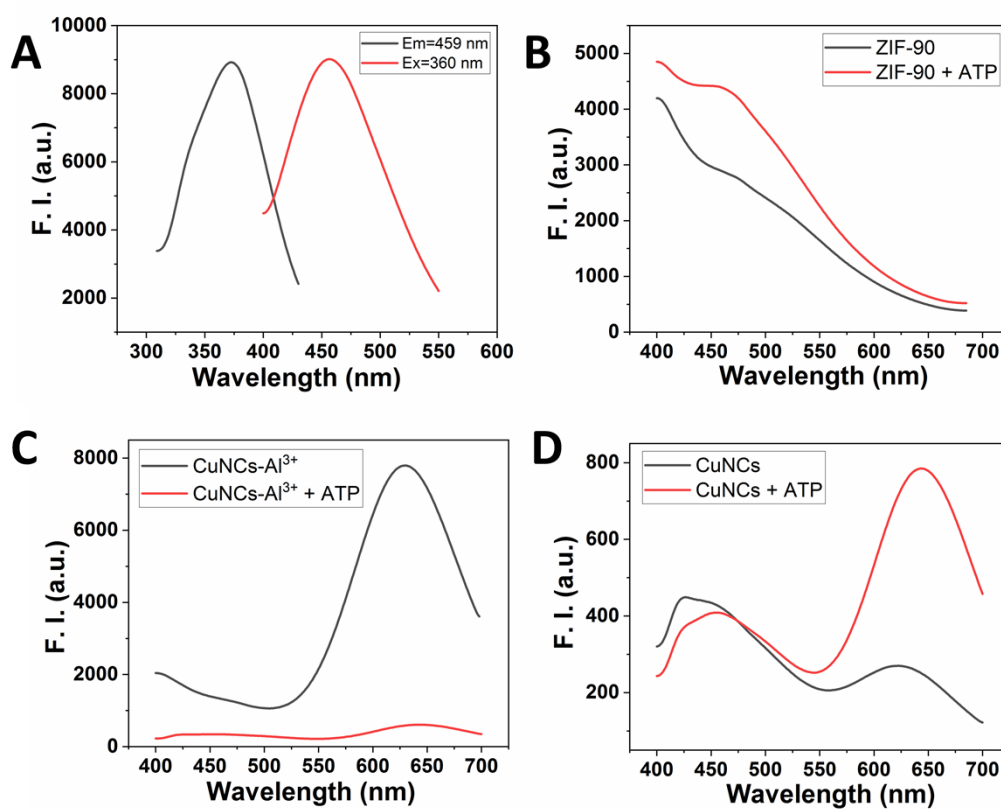


Fig. S2 Excitation and emission fluorescence spectra of ICA (A), emission spectra of ZIF-90 (B), Cu NCs-Al³⁺ (C) and Cu NCs in the absence and presence of ATP. The concentrations of ZIF-90, Cu NCs-Al³⁺, Cu NCs and ATP were 5 g L⁻¹, 5 mM, 5 mM and 1 mM, respectively.

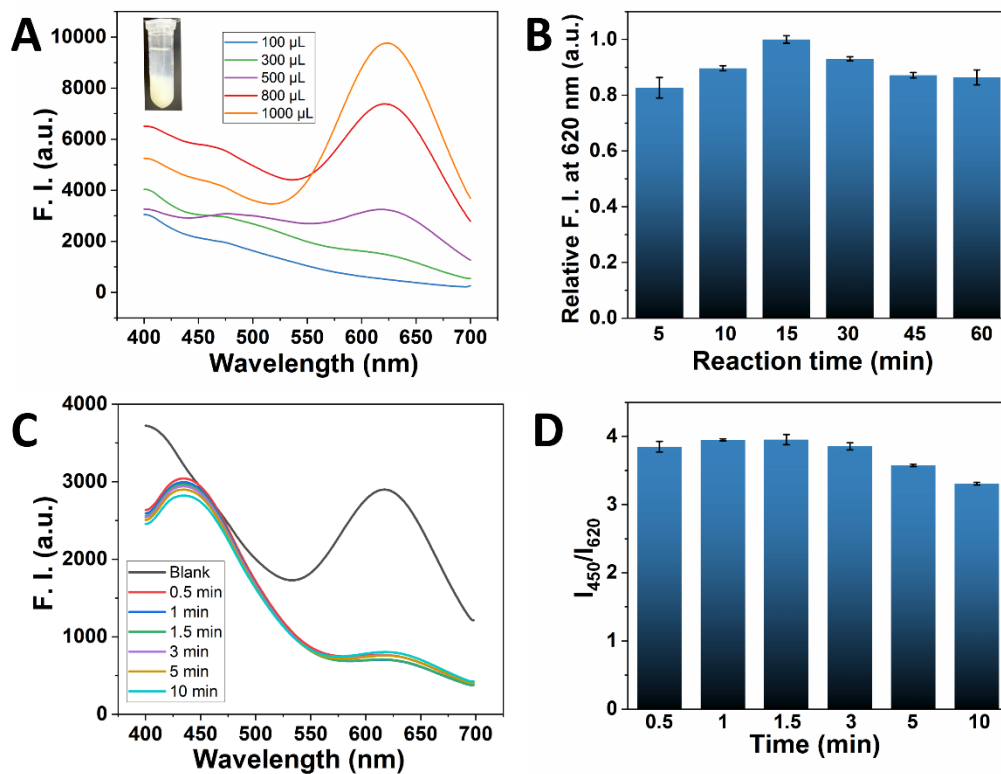


Fig. S3 Fluorescence emission spectra of Cu NCs-Al@ZIF-90 prepared with different volumes of Cu NCs-Al³⁺ solutions (A), normalized fluorescence emission at 620 nm of Cu NCs-Al@ZIF-90 prepared from different reaction time (B), fluorescence emission spectra (C) and the $I_{450\text{ nm}}/I_{620\text{ nm}}$ changes (D) of Cu NCs-Al@ZIF-90 after incubation with 0.6 mM ATP for different times.

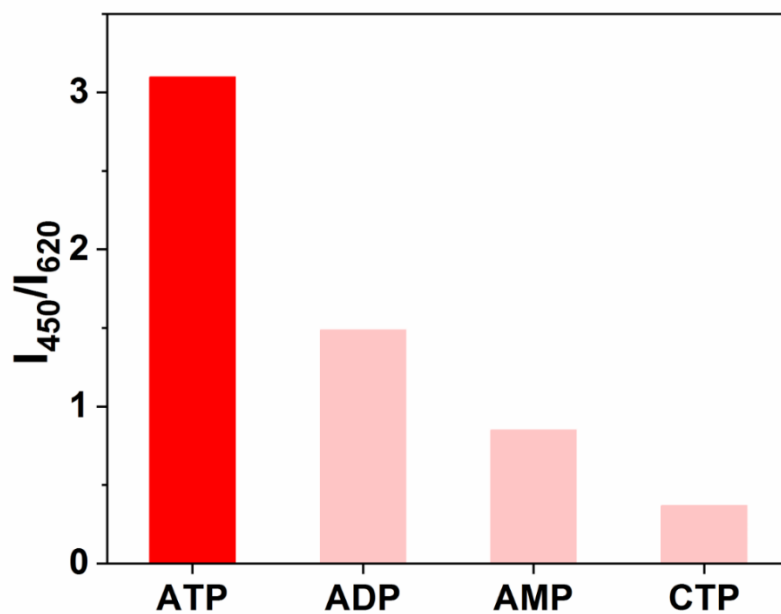


Fig. S4 The $I_{450\text{ nm}}/I_{620\text{ nm}}$ changes of the ratiometric Cu NCs-Al@ZIF-90 probe towards 0.5 mM ATP, 0.5 mM ADP, 0.5 mM AMP and 0.5 mM CTP.

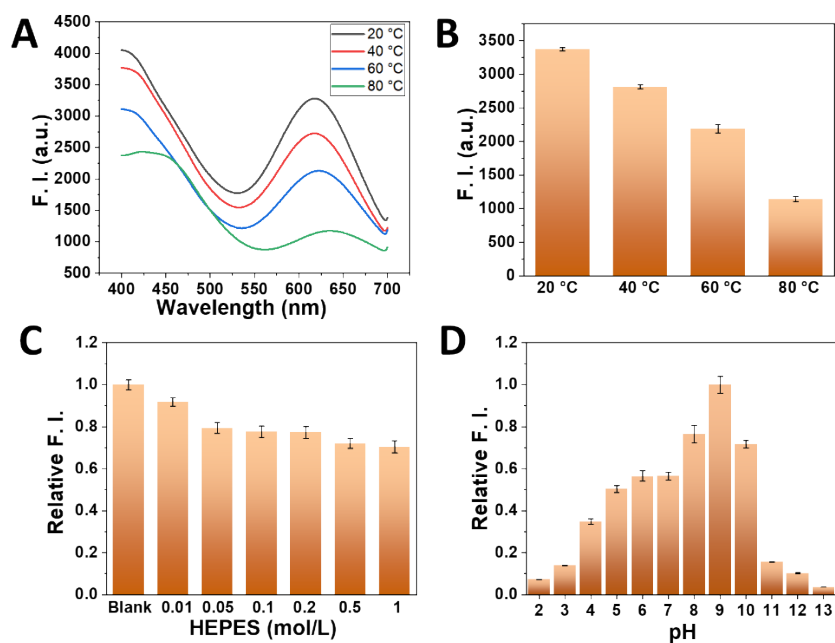


Fig. S5. Fluorescence spectrum (A) and fluorescence intensity at 620 nm of Cu NCs (B) at different temperature. (C) Salt stability. (D) pH effect on Cu NCs-Al@ZIF-90.