

Supplementary data

The peroxidase-like activity-based colorimetric sensor array of noble metal nanozymes to discriminate heavy metal ions

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Reagents and materials

3, 3', 5, 5'-tetramethylbenzidine (TMB), K_2OsCl_6 , H_2PtCl_6 , H_2AuCl_4 , and sodium borohydride ($NaBH_4$) were purchased from Aladdin Reagent Co. (Shanghai, China) (<http://www.aladdin-e.com/>). Trisodium citrate dihydrate ($Na_3C_6H_5O_7 \cdot 2H_2O$), and H_2O_2 (30%, wt.) were obtained from Sigma-Aldrich Reagent Co. (Shanghai, China) (<https://www.sigmaaldrich.com/>). All other chemicals and solvents were at analytical grade or the highest purity available. All solutions were prepared using deionized water, to avoid possible interferences from other analytes.

Instrumentation

Transmission electron microscopy (TEM) images were collected using a JEM-2100 microscope (JEOL, Japan). UV-vis absorption spectra were obtained with a UV-2600 UV-Vis spectrophotometer (Shimadzu, Japan). A microplate spectrophotometer (Epoch Microplate Spectrophotometer, BioTek Instruments, Inc.) was applied.

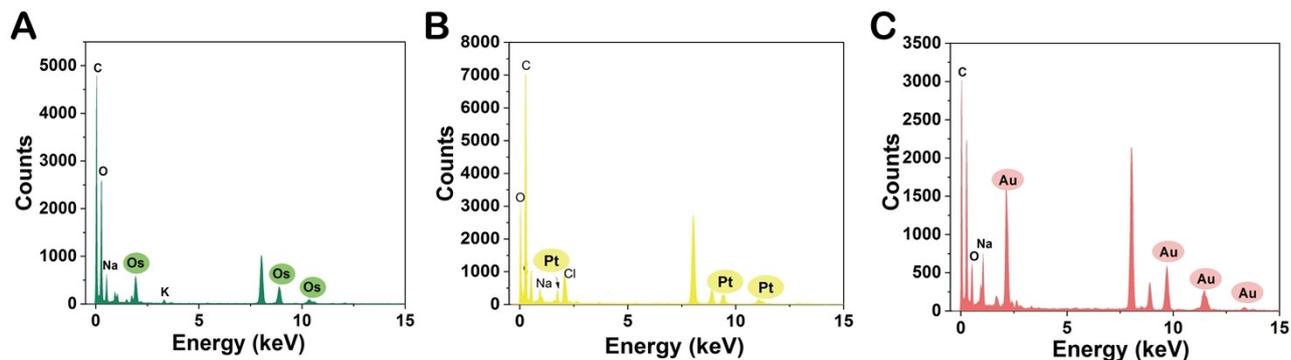


Fig. S1. EDS spectra of, (A) citrate-Os NPs, (B) citrate-Pt NPs, and (C) citrate-Au NPs.

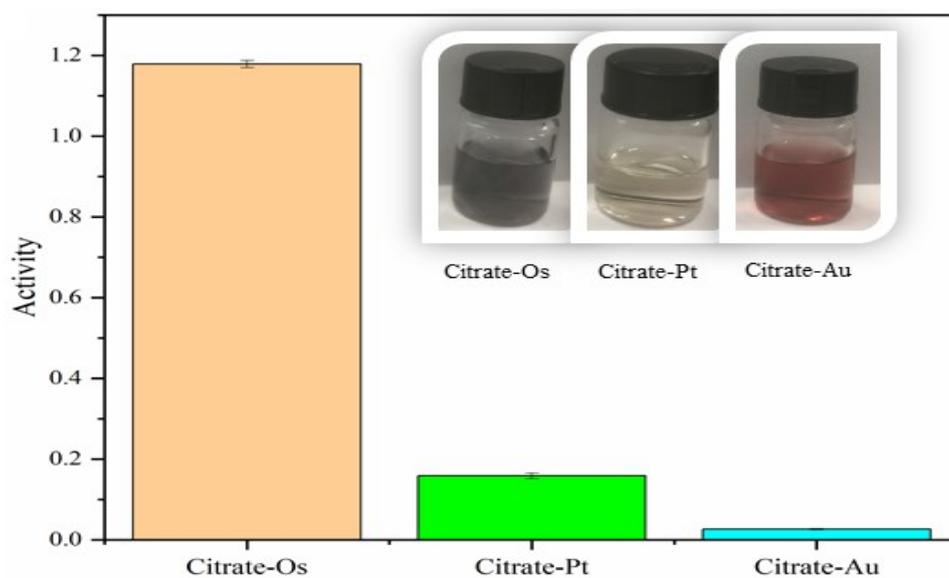


Fig. S2 The typical peroxide-like activity of citrate-capped nanozymes. Inset: the corresponding images after about 50 days from the preparation. Each error bar shows the standard errors of three measurements.

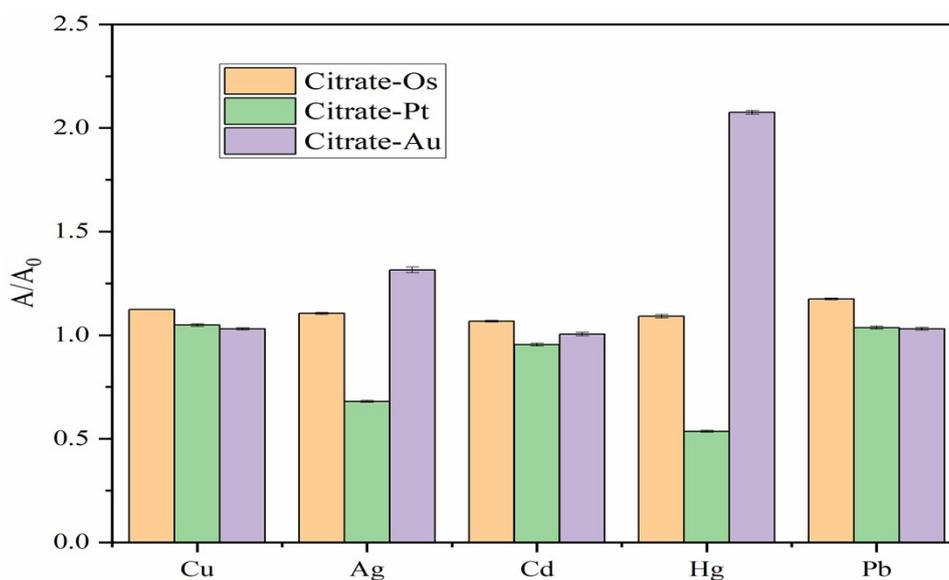


Fig. S3 Colorimetric response patterns of the three nanozymes towards 5 μM heavy metal ions.

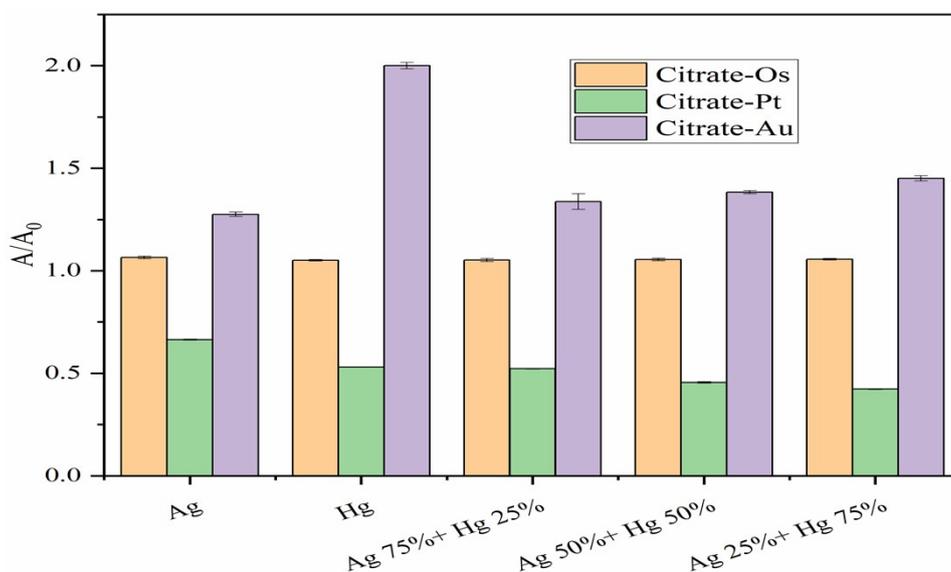


Fig. S4 Colorimetric response patterns (A/A_0) of nanozyme sensor array towards the mixtures of Ag^+ and Hg^{2+} at different molar ratios in DI water. Each error bar shows the standard errors of five measurements. A and A_0 were the absorption of oxidized TMB in the presence and absence of metal ions in the nanozyme reaction systems, respectively.

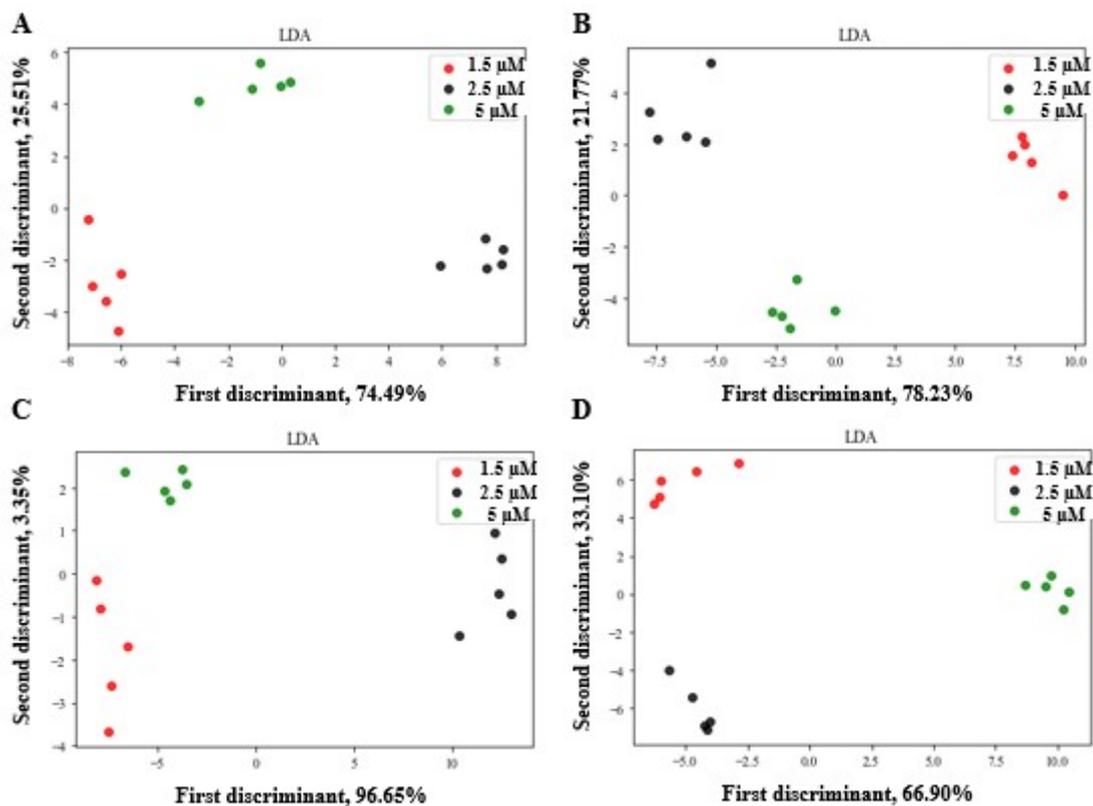


Fig. S5 Nanozyme sensor array for metal ions semi-quantification. Two-dimensional LDA score plots at different concentrations of 1.5 μM , 2.5 μM , and 5 μM of, (A) Cu^{2+} , (B) Ag^+ , (C) Cd^{2+} , and (D)

Pb²⁺ metal ions.

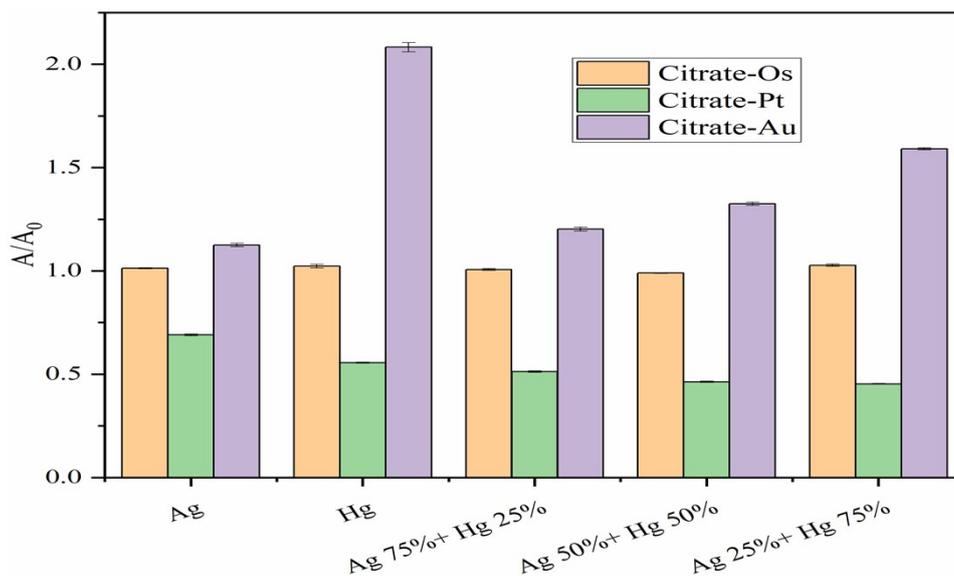


Fig. S6 Colorimetric response patterns (A/A_0) of nanozyme sensor array towards the mixtures of Ag^+ and Hg^{2+} at different molar ratios in tap water. Each error bar shows the standard errors of five measurements. A and A_0 were the absorption of oxidized TMB in the presence and absence of metal ions in the nanozyme reaction systems, respectively.

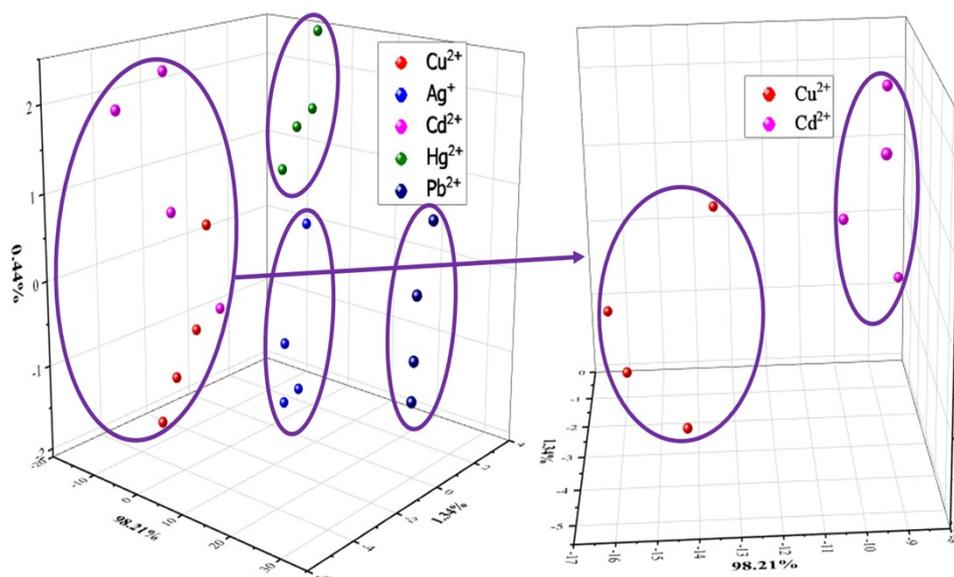


Fig. S7 Nanozyme sensor array for HMIs detection in SiYu lake water at 2.5 μM using three-dimensional LDA score plots.