MOF-derived porous ZnO-Co_3O_4 nanocages as peroxidase mimics for colorimetric detection of copper(II) ions in serum

Jie Lv[a,1], Cong Zhang[b,1], Shuangling Wang[a], Wei Guo[a]* and Meng Li[a]*

[a] *College of Pharmacy, Hebei Medical University, Shijiazhuang 050017, China*

[b] *Department of Chemistry, School of Sciences, Hebei University of Science and Technology, Shijiazhuang 050018, China*

[1] *Jie Lv and Cong Zhang contributed equally to this work.*

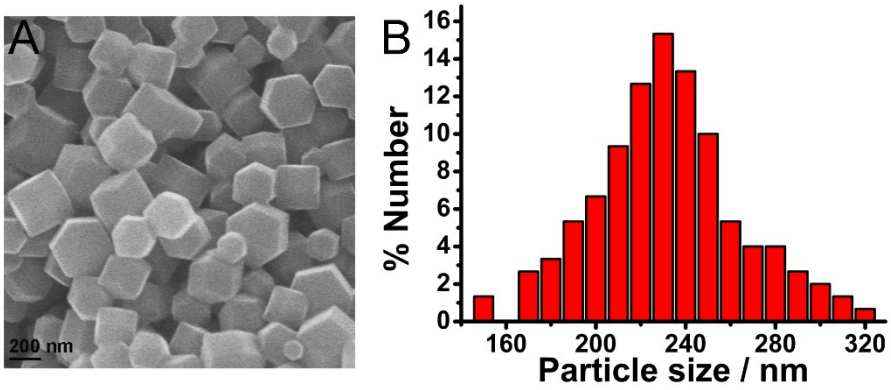

Figure S1 (A) The SEM image of ZnCo-ZIF. (B) Histogram of the size distribution of ZnCo-ZIF.

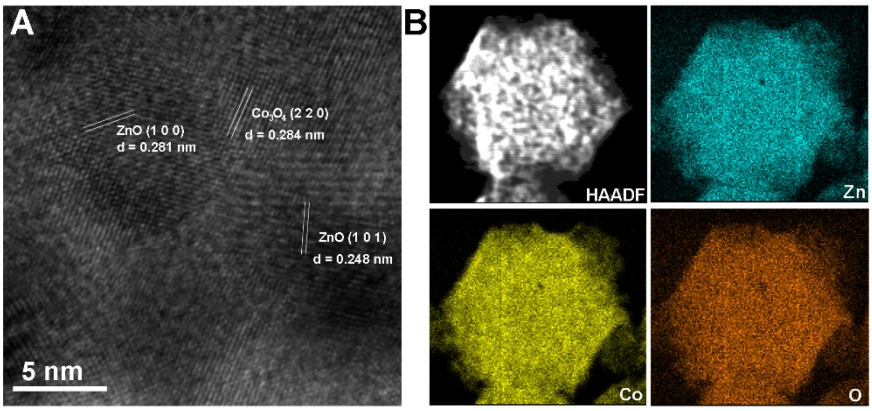

Figure S2 (A) HRTEM image of ZnO-Co_3O_4 NCs. (B) TEM elemental mappings of ZnO-Co_3O_4 NCs.

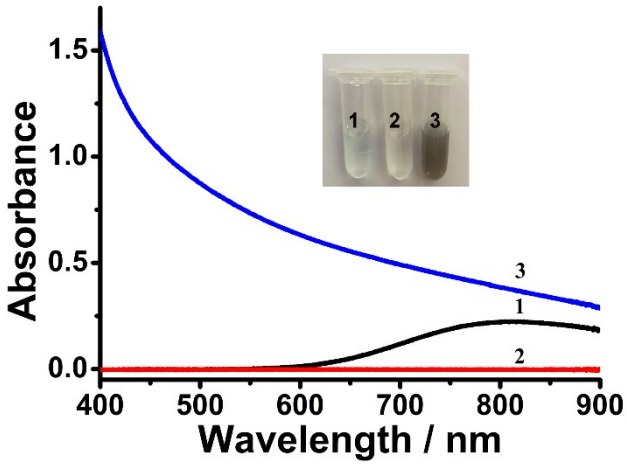

Figure S3 The UV-Vis spectra of Cu^{2+} and Cys at high concentrations. Insert were the corresponding photographs of different samples. 1: 20 mM Cu^{2+}, 2: 20 mM Cys, 3: 20 mM Cu^{2+} + 20 mM Cys.

As indicated in Figure S3, after mixing Cu^{2+} and Cys, the insoluble products were generated, demonstrating that Cys can react with Cu^{2+} to give mercaptide.

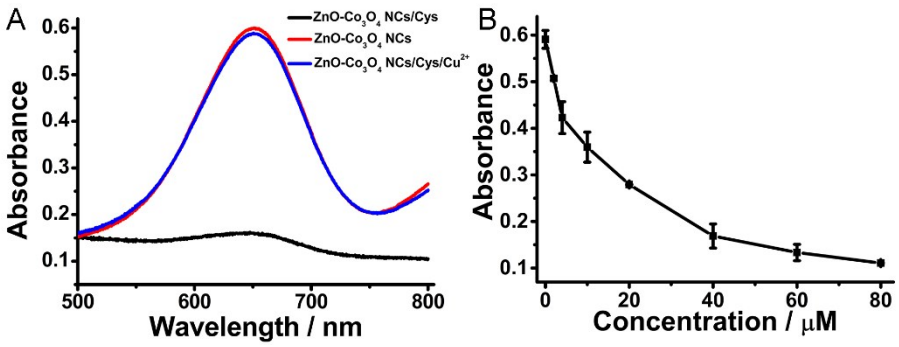

Figure S4 (A) The absorbance spectra of the different reaction systems containing ZnO-Co_3O_4 NCs, ZnO-Co_3O_4 NCs/Cys and ZnO-Co_3O_4 NCs/Cys/Cu^{2+}. (B) The change of peroxidase activity of ZnO-Co_3O_4 NCs in the presence of different concentrations of Cys.

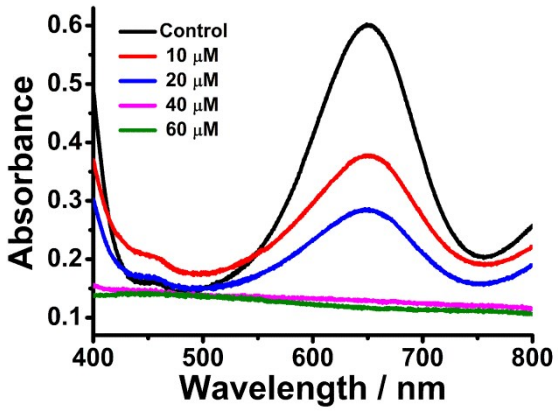

Figure S5 The reduction of oxidized TMB induced by different concentrations of Cys.

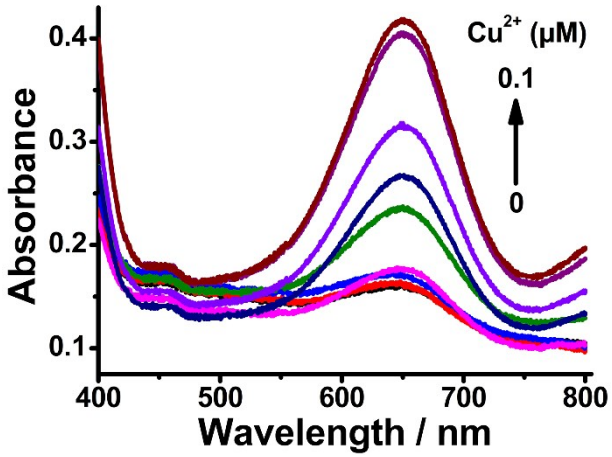

Figure S6 The absorbance spectra of TMB in the reaction systems of ZnO-Co_3O_4 NCs/Cys containing different concentrations of Cu^{2+}.

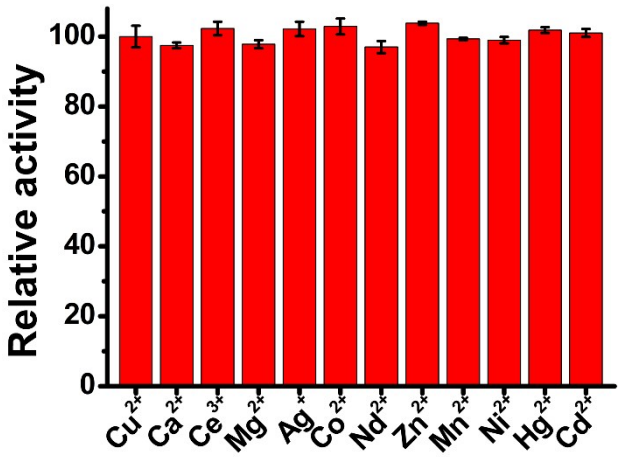

Figure S7 The responses of ZnO-Co_3O_4 NCs/Cys to Cu^{2+} in the presence of other metal ions. The concentrations of other metal ions and Cu^{2+} were 1 μM and 0.1 μM, respectively.

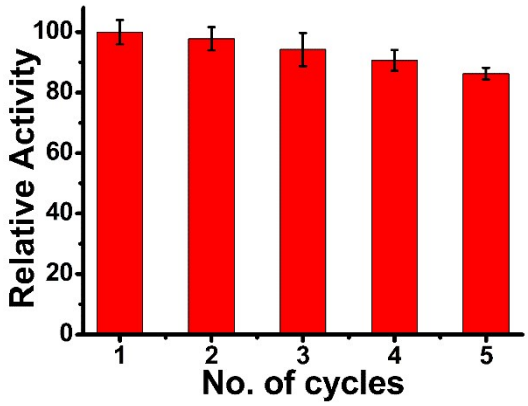

Figure S8 The responses of the ZnO-Co_3O_4 NCs to Cu^{2+} in five successive recycling catalysis.

Table S1 The comparison of the analytical performance of this method for Cu^{2+} detection with previous nanomaterials based colorimetric methods.

Nanomaterials	LOD (μM)	linear range (μM)	References
Urchin-like Co_9S_8	0.09	0.5-10	[45]
4-MBA modified AgNPs	0.025	0.1-100	[46]
GSH-AuNCs	0.011	0.1-1	[47]
rGO@AgNPs	0.0098	0.02-1.5	[48]
N-CDots/AuNCs	0.15	1-60	[49]
DNA modified AuNPs	20	20-100	[50]
ZnO-Co_3O_4 NCs	0.00108	0.002-0.1	This work