

A ultra-sensitive “turn-off” fluorescent sensor for trace detection of rifampicin based on glutathione-stabilized copper nanoclusters

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Supporting details for experiments

Reagents and chemicals

Glutathione (GSH), levofloxacin (LVFX) and Tris-HCl were bought from Beijing Dingguo Changsheng Biological technology Co., Ltd. (Beijing, China). Ascorbic acid (AA) was bought from Tianjin Kemiou Chemical Reagent Co., Ltd. (Tianjin, China) Rifampicin (RFP), isoniazide (INH), pyrazinamide (PZA), and clarithromycin (CLR) were purchased from Shanghai Yuanye Biological technology Co., Ltd. (Shanghai, China) Ultrapure water was obtained from Wahaha Co., Ltd. (Hangzhou, China). NaOH, $\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$, NaCl, KCl were purchased from Tianjin Guangfu Fine Chemical Research Institute. (Tianjin, China) All of the chemicals were analytical pure at least and they were applied without any further purification.

Apparatus and characterization

Transmission electron microscopy (TEM) observations for the morphology of Cu NCs were captured using a Tecnai G2 F20 microscopy (FEI, USA), which was operated at an accelerating voltage of 200 kV. Ultraviolet-visible (UV-vis) absorption spectra were obtained from a UV-2450 spectrophotometer (Shimadzu, Japan) with the wavelength range of 200-600 nm. The Fourier transform infrared (FT-IR) spectra ($4000\text{-}500\text{ cm}^{-1}$) were recorded using a NICOLET 6700 FT-IR spectroscope with KBr pellets (NICOLET, USA). The X-ray photoelectron spectroscopy (XPS) measurements were obtained from a Kratos Axis Ultra DLD spectrometer (Kratos, UK) employing a monochromated Al-K α X-ray source ($h\nu=1486.6\text{ eV}$), hybrid (magnetic/electrostatic) optics and a multi-channel plate and delay line detector

(DLD). The XPS spectra were made on an aperture slot of 300×700 microns, survey spectra were recorded with a pass energy of 160 eV, and high resolution spectra with a pass energy of 40 eV. The Zeta potential was performed using a Malvern Zetasizer Nano ZS (red badge, Malvern, UK) with a 633nm He-Ne laser. The fluorescent quantum yield (QY) and the lifetime of the GSH-Cu NCs were tested in an FLS-920 spectrophotometer (Edinburgh Instrument, UK) under excitation at 405 nm. A Cary Eclipse Fluorescence spectrophotometer (Agilent Technologies, USA) was adopted to observe the fluorescence emission and excitation spectra. It equipped with a plotter unit and a quartz cell ($1 \text{ cm} \times 1 \text{ cm}$) in the fluorescence mode. The fluorescence emission spectra were performed in the wavelength range of 370-900 nm upon excitation at 354 nm. The slit widths for excitation and emission were both 10 nm, as well as the photomultiplier tube (PMT) voltage was set at 750 V.

Supporting Figures

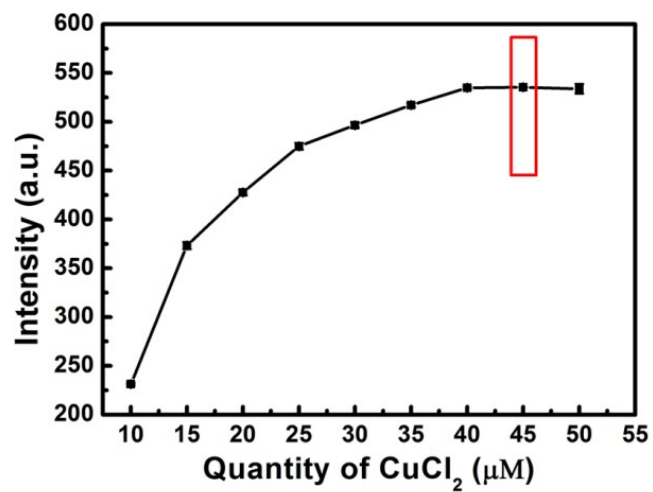


Fig. S1 The fluorescent intensity of GSH-Cu NCs under different dosages of CuCl_2 (solution).

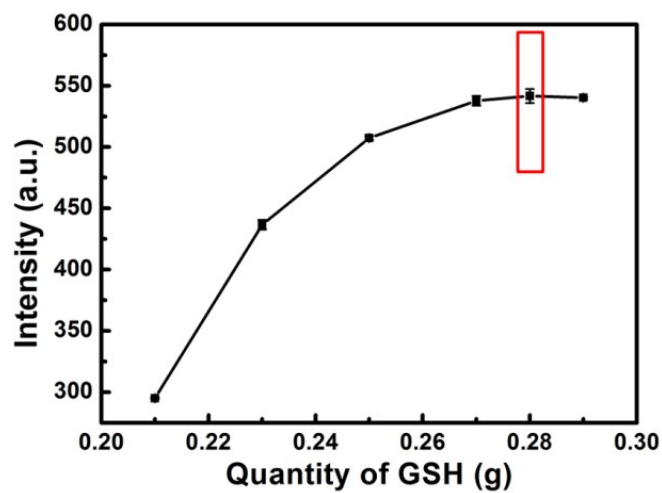


Fig. S2 The fluorescent intensity of GSH-Cu NCs under different quantities of GSH.

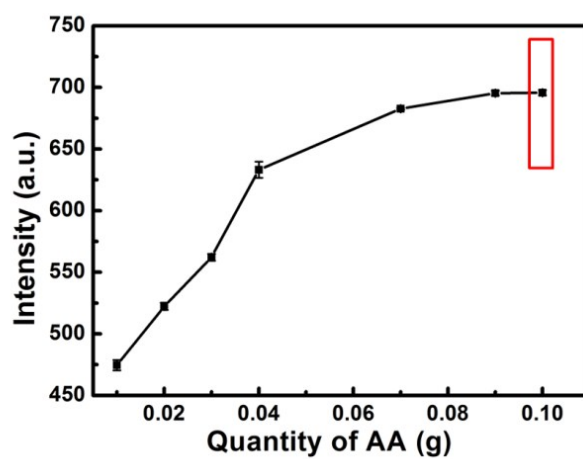


Fig. S3 The fluorescent intensity of resultant GSH-Cu NCs under different quantities of AA.

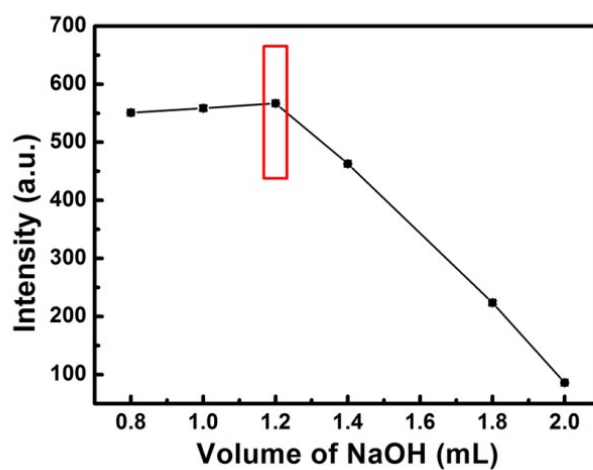


Fig. S4 The fluorescent intensity of resultant GSH-Cu NCs under different volumes of NaOH.

1 Table S1. Comparison of different synthesis methods

Temperature (°C)	Synthetic time	λ_{em} (nm)	Reference
40	14 h	430	S1
80	20 min	588	S2
65	6 h	422	S3
90	9 h	445	S4
37	45	625	S5
Room Temperature	nr ^a	600	S6
Room Temperature	1 h	632	This work

2 ^a nr = not reported

3 Reference

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