# Electronic Supporting Information:

## Copper-Based Nanostructures: Promising Antibacterial Agents and Photocatalysts

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### Experimental:

**Synthesis of nanorods and nanoplatelets:** In a typical synthesis, 0.24 g $Cu(OAc)_2$ and 0.15 g Gly were added into 10 mL water. After a blue transparent solution was obtained, 5 mL $CH_3CH_2OH$ was added into the solution, resulting in the formation of a mushily blue dispersion. After centrifuged, the precursor nanorods were obtained by drying in the air at 35 °C for 1 hour and nanoplatelets were obtained by drying in the air at 35 °C for 12 hours. For the preparation of Cu/C nanosystems, the precursors were heated under $N_2$ to 600 °C and maintained for 30 minutes, while copper oxide nanostructures can be synthesized by calcining the precursors in the air at 600 °C for an hour.

**Characterizations:** Scanning electron microscopy (SEM) characterization was performed on Hitachi S-4800 at 10 kV and Hitachi S-3400 scanning electron microscopes. Powder X-ray diffraction (XRD) patterns were collected using a SHIMADZU, XRD-6000 with Cu $K_\alpha$ radiation ($\lambda$ = 1.5418 Å).

**Antimicrobial Test:** The antibacterial activity of the synthesized nanostructures was tested against B. subtilis, S. aureus, S. faecalis, P. aeruginosa, and E. cloacae by determining the MICs (minimum inhibitory concentrations, μg/mL) through a colorimetric method using the dye MTT (3-(4,5)-dimethylthiahiazo (-z-y1)-3,5-di-phenytetrazoliumromide). A stock solution of the synthesized nanosystems (50 μg / ml) was prepared in dimethyl sulfoxide (DMSO) and graded quantities of the test nanostructures were incorporated in specified quantity of sterilized liquid medium. Then the solutions were poured into microtitration plates and suspension of the microorganism with an approximate concentration of $10^5$ cfu/mL was added. After incubation at 37 °C for 24 h, 50 μL of PBS (Phosphate Buffered Saline 0.01 mol / L, pH 7.4 : $Na_2HPO_4 \cdot 12H_2O$ 2.9 g, $KH_2PO_4$ 0.2 g, NaCl 8.0 g, KCl 0.2 g, distilled water 1000 mL) containing 2 mg/mL of MTT was added to each well. Incubation was continued at room temperature for 4 ~ 5 h, followed by the addition of 100 μL of isopropanol containing 5 % 1 mol/L HCl to extract the dye. At last,

the optical density (OD) was measured with a microplate reader at 570 nm to determine the MICs.

**Measurement of Photocatalytic Activity:** The evaluation of photocatalytic activity of the as-prepared samples for the photocatalytic decolorization of methyl orange (MO) aqueous solution was performed at ambient temperature. The photocatalytic reaction system consists of a 300 W Xe lamp, a cutoff filter (providing visible light, $\lambda \geq 420$ nm), a Pyrex glass filter with water (removing the infrared ray irradiation and preventing from thermal catalytic effect) and a reaction cell. The photocatalytic degradation experiments of MO were carried out with 20 mg of Cu/C nanosystems or 100 mg of CuO nanostructures suspended in 100 mL MO solution (4 mg/L) in a Pyrex glass cell under irradiation. For CuO nanostructures, 0.1 mL of hydrogen peroxide solution ($H_2O_2$, 30 wt %) was added into the cell. Before irradiation the suspensions were magnetically stirred in the dark for several hours to ensure establishment of an adsorption/desorption equilibrium of dye on the sample surface. After the suspension was irradiated for a certain time, the suspension samples including the photocatalyst and MO solution were separated by the centrifugal machine, and the solution samples were analyzed by the UV-vis spectrophotometer (Varian, CARY 50 Probe, America). The MO degradation percentage was calculated as below: at the irradiation time *t* min, the solution samples (a certain volume, about 3 mL) after centrifugal treatment were measured by the UV-vis absorbance spectra, and their UV-vis absorbance spectra presented a characteristic peak at 457 ~ 464 nm; As the absorbance value of the 0 min solution sample was $A_0$, and the absorbance value of the *t* min solution sample was $A_t$, at the time of *t* min, the MO degradation percentage D.P.($t$) = $A_t/A_0 \times 100$ %.

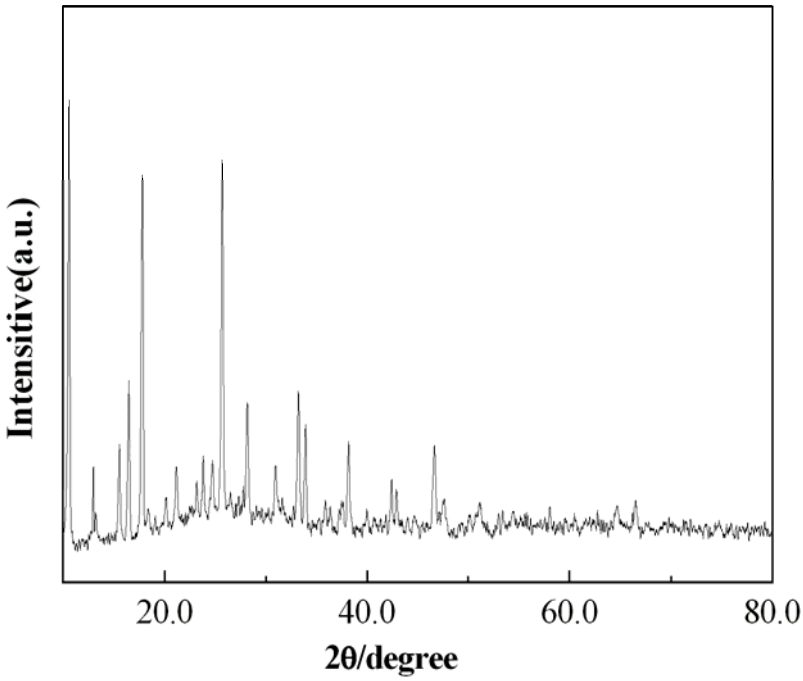


Figure SI1 XRD pattern of the coordination bis-(glycine)Cu(II)$H_2O$

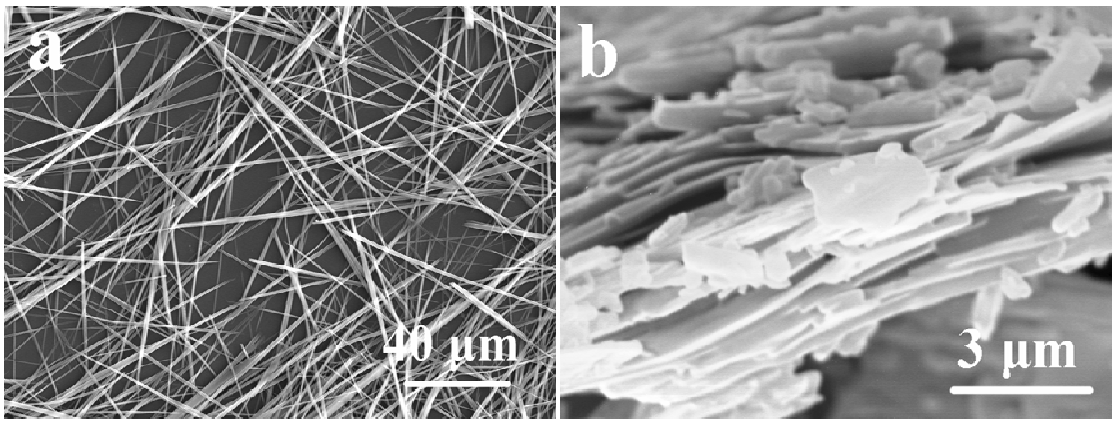


Figure SI2 SEM images of the coordination precursors: (a) nanorod precursor; (b) nanoplatelet precursor.

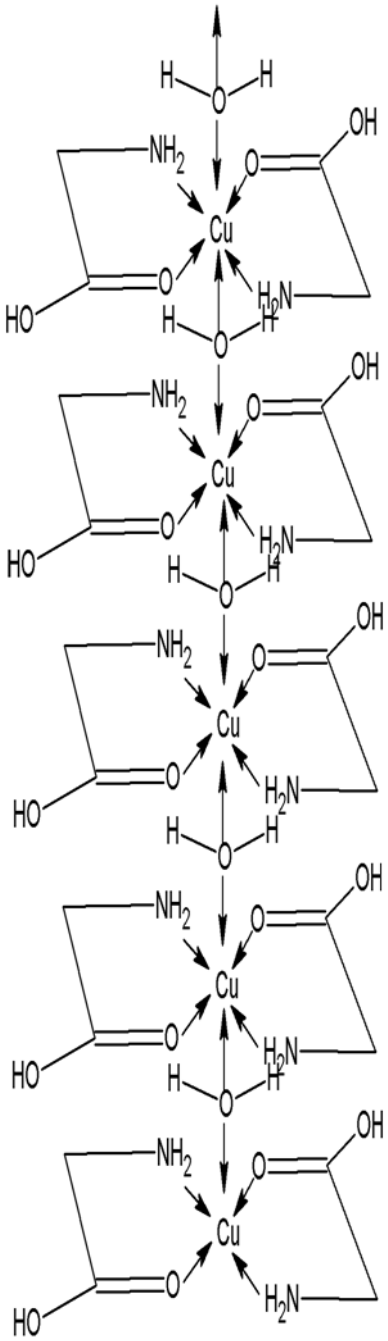


Figure SI3 One-dimensional chain structure of the precursor bis-(glycine)Cu(II)$H_2O$

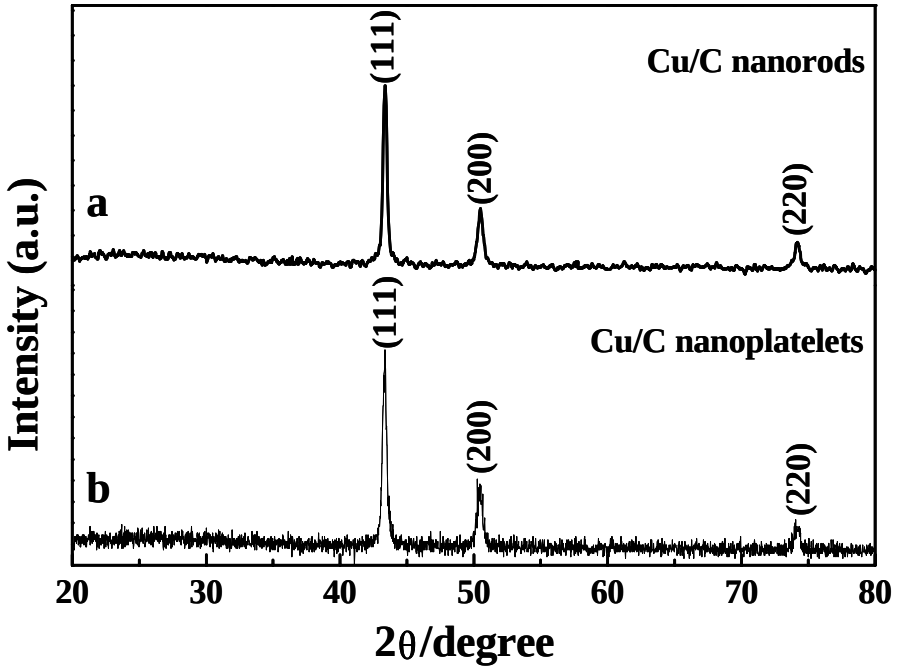


Figure SI4 XRD pattern of the Cu/C nanosystems

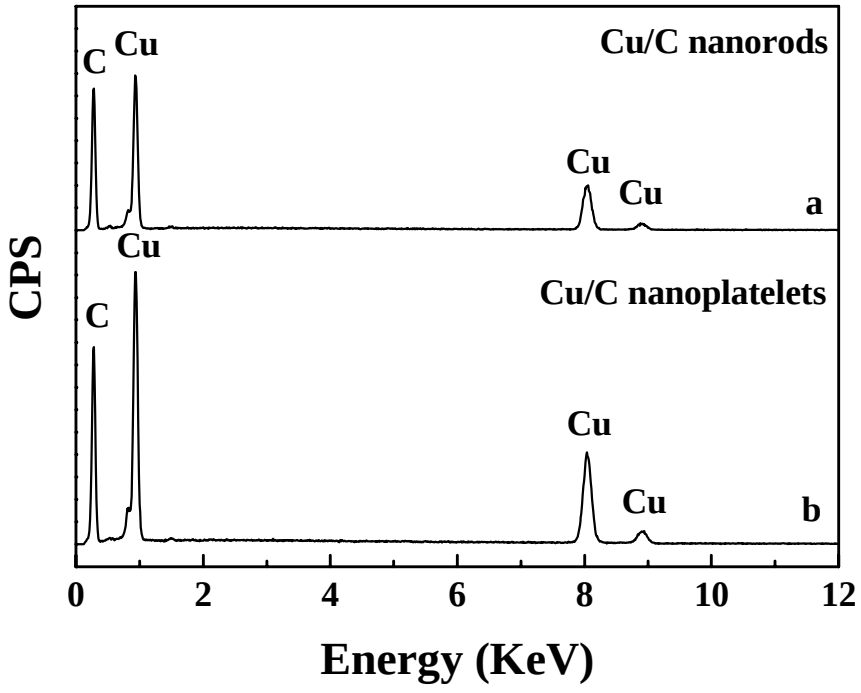


Figure SI5 EDX patterns of the Cu/C nanosystems

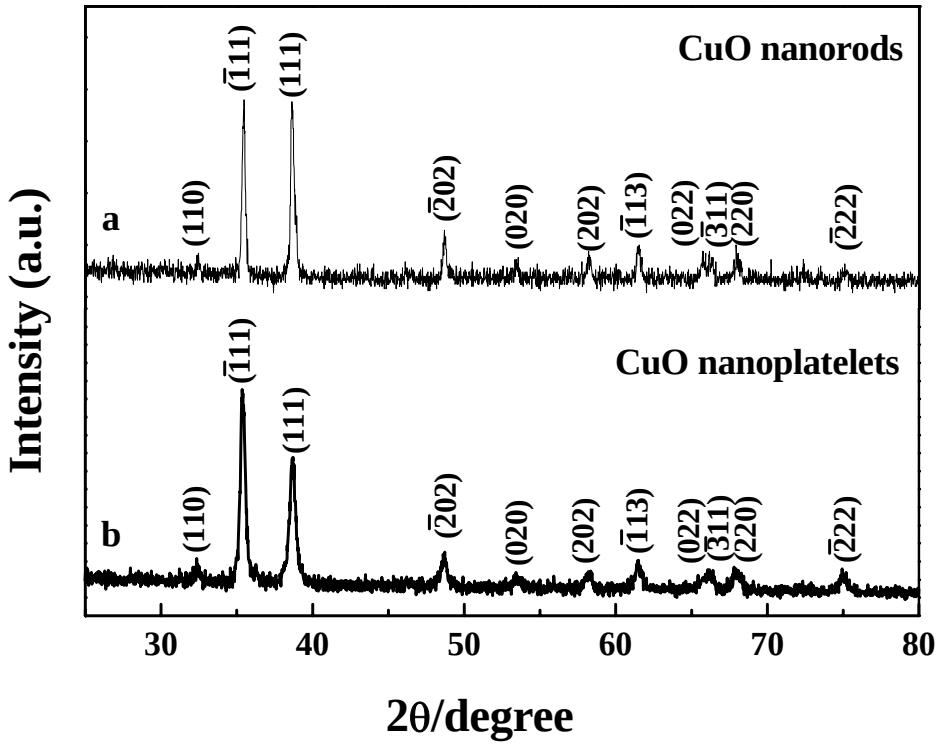


Figure SI6 XRD pattern of the CuO nanostructures