Supplementary Information

High performance Pb (II) electrochemical sensor based on spherical CuS nanoparticles anchored g-C_3N_4

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1. Experimental section

1.1 Materials and reagents

All chemicals and reagents are of analytical grade, and all water used in this study is produced by ultrapure water equipment (Eco-S system, 18.2 MΩcm^{-1}, Shanghai High-tech Instrument Co., Ltd., Shanghai, China). Copper acetate, thiourea, melamine, acetic acid, sodium acetate trihydrate, silver nitrate, sodium nitrate, lead nitrate, copper nitrate, zinc nitrate, aluminum nitrate nonahydrate, nickel nitrate hexahydrate, barium chloride, ferric chloride, sodium chloride, potassium chloride, manganese acetate, cadmium nitrate, mercury nitrate, absolute ethanol, potassium ferricyanide, potassium ferrocyanide, concentrated nitric acid, concentrated hydrochloric acid and sodium hydroxide, were purchased from Shanghai Sinopharm Chemical Reagent Co., Ltd. (Shanghai, China). All the above reagents were used without further purification.

1.2 Apparatus

The electrochemical test was carried out using CHI660E electrochemical workstation (Shanghai Chenhua Instrument Co., Ltd., Shanghai, China), using a conventional three-electrode system, with glassy carbon electrode (diameter 3 mm) as the working electrode, platinum wire (φ0.5 mm × 37 mm) as the counter electrode, and Ag/AgCl electrode as the reference electrode.

The Fourier transform infrared spectrum (FT-IR) of the prepared material in the range of 4000 cm^{-1} - 400 cm^{-1} was tested by Thermo Nicolet S10 infrared spectrometer (Nicolet Instruments Co., Ltd., Madison, USA). A Hitachi S-4800 scanning electron microscope (Hitachi, Tokyo, Japan) was used for scanning electron microscopy (SEM) characterization. Transmission electron microscopy (TEM) and element mapping (Element mapping) characterization were completed by Titan G260 - 300 (FEI Company, Hillsboro, USA). Atomic absorption spectroscopy was performed by PerkinElmer PinAAcle 900F (PerkinElmer, Massachusetts, USA). The pH value of the buffer was measured using a pH tester (PHS-3E, Shanghai Keyou Instrument Co., Ltd., Shanghai, China). Ultrasonic cleaning is performed using an ultrasonic cleaning machine (KQ-50B, Kunming Ultrasonic Instrument Co., Ltd., Kunming, China),

2. Results and discussion

2.1 CV and EIS investigations of the bare and modified electrodes

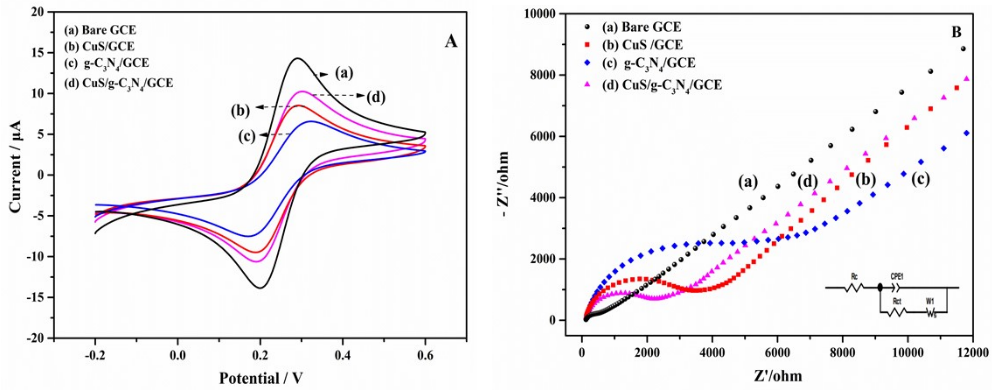

Fig.S1 (A) Cyclic voltammograms of bare GCE (a), CuS/GCE (b), g-C_3N_4/GCE (c) and CuS/g-C_3N_4/GCE (d) in 1 mM $K_3Fe(CN)_6$ solution containing 0.1 M KCl. (B) Nyquist diagrams of EIS for bare GCE (a), CuS/GCE (b), g-C_3N_4/GCE (c) and CuS/g-C_3N_4/GCE (d). The amplitude of the sine voltage 5 mV, the frequency 0.01 Hz ~ 100 kHz and the open circuit potential 0.223 V.

2.2 Reproducibility and repeatability of the proposed sensor

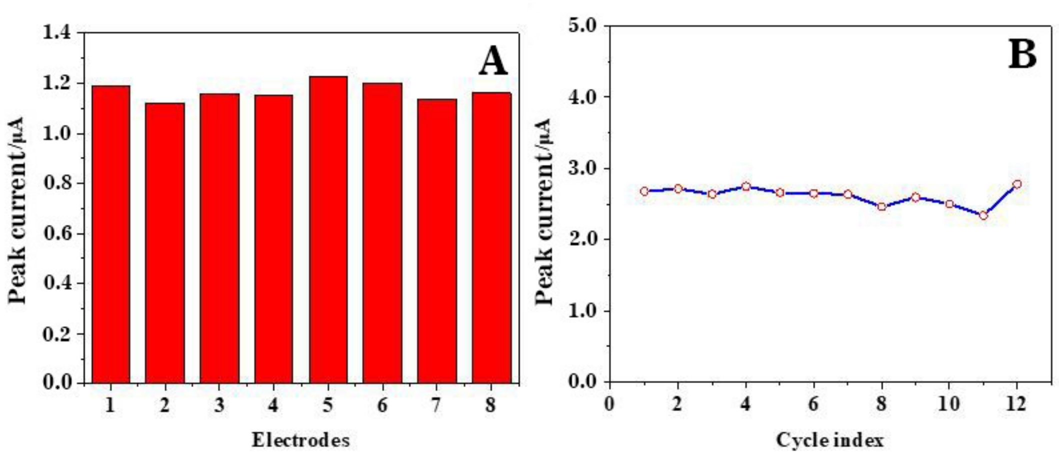

Fig.S2 (A) Stripping peak currents obtained on 8 electrodes (CuS/g-C_3N_4/GCE) for 0.2 μM of Pb^{2+} solution. (B) The repeatability of the proposed sensor by repeatedly measuring the stripping peak current 12 times on the same modified electrode (CuS/g-C_3N_4/GCE) in 0.20 μM of Pb^{2+} solution. Modifier concentration 1.5 mg/mL, accumulation potential − 1.3 V, accumulation time 150 s and buffer pH 5.0.