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Supporting Information

Cu nanoparticle decorated sulfur-based polymers for highly sensitive nonenzymatic glucose detection

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Supplementary Text

Preparation of [BIM]Br

1,4-Bis(3-carboxymethyl-imidazolium)-1-yl butane chloride ([BIM]Br) was synthesized according to literature. In brief, VIM (4.00 g, 42.5 mmol) and 1,4-dibromobutane (4.75 g, 20 mmol) were dissolved in methanol (50 mL) in a round-bottom flask fitted with a condenser and N_2 bubbler. Subsequently, the mixture was stirred at 70 ºC for 48 h under a nitrogen atmosphere. The reaction mixture was precipitated from diethyl ether (100 mL), and recrystallized twice in diethyl ether. The products were dried under a vacuum for 24 h at R.T. [BIM]Br was obtained as white solid.

Optimization on Cu NPs electrodeposition parameters:

Parameters including the deposition time and deposition potential were optimized using CV curves after addition of 5mM glucose in 0.1M NaOH solution. With the increase of deposition time from 120s to 480s, the current response increased accordingly. However, when deposition time exceeded 480s, the current response increases slowly. Therefore, 480s was selected for further experiment. Based on the same consideration as above, -0.4 V was selected as the optimal deposition potential. (Fig.S5)

XRD patterns of the Cu@S-co-BIM/GCE:

Fig. S6 shows the XRD patterns of the Cu@S-co-BIM/GCE. For the Cu@S-co-BIM/GCE, there are three diffraction peaks at 43.7°, 50.6° and 73.8°, corresponding to

the (111), (200), and (220) lattice planes of Cu (JCPDS: No. 04-836). This result confirms that the Cu-NPs are successfully deposited onto the S-co-BIM/GCE. Unfortunately, due to the instruments, we didn't obtain XPS characterization results in situ.

The response of Cu@S-co-BIM/GCE to glucose in NaOH and PBS:

We investigated the response of Cu@S-co-BIM/GCE to 5 mM glucose in 0.1 M NaOH and pH 7.4 PBS by cyclic voltammetry. Compared to the PBS (pH 7.4), Cu@S-co-BIM/GCE has better response to glucose in 0.1 M NaOH. Therefore, 0.1 M NaOH was selected as experimental medium for glucose catalysis. (Fig.S7)

Study the stability of Cu@S-co-BIM and Cu-NPs modified electrodes:

In the same experimental conditions, we prepared the Cu@S-co-BIM and Cu-NPs modified electrodes. The porous structure of S-co-BIM could make the catalytic nanoparticles adsorbed firmly on the S-co-BIM matrix, thereby effectively protecting Cu-NPs from migration, agglomeration, and dis-solution in the course of the electro-catalytic process. As shown in Fig.S8, there is almost no change in the current response of the Cu@S-co-BIM/GCE with the increase of time. In contrast, current response of the Cu/GCE has been decreasing over time. Therefore, the glucose response difference on Cu/GCE and Cu@S-co-BIM/GCE was due to synergistic effect of S-co-BIM and Cu-NPs on the electrode.

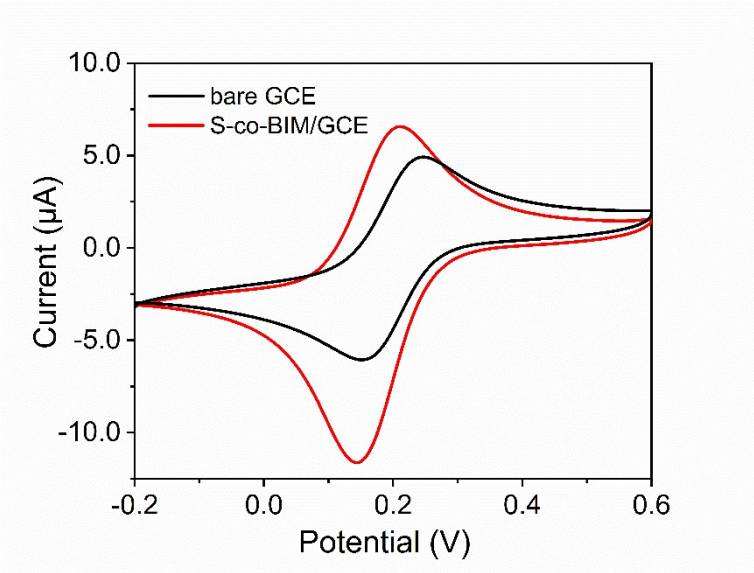

Fig. S1. CVs of bare GCE and S-co-BIM/GCE in the solution of 0.5 mM $[Fe(CN)_6]^{3-/4-}$and 0.1 M KCl, at 100 mV/s.

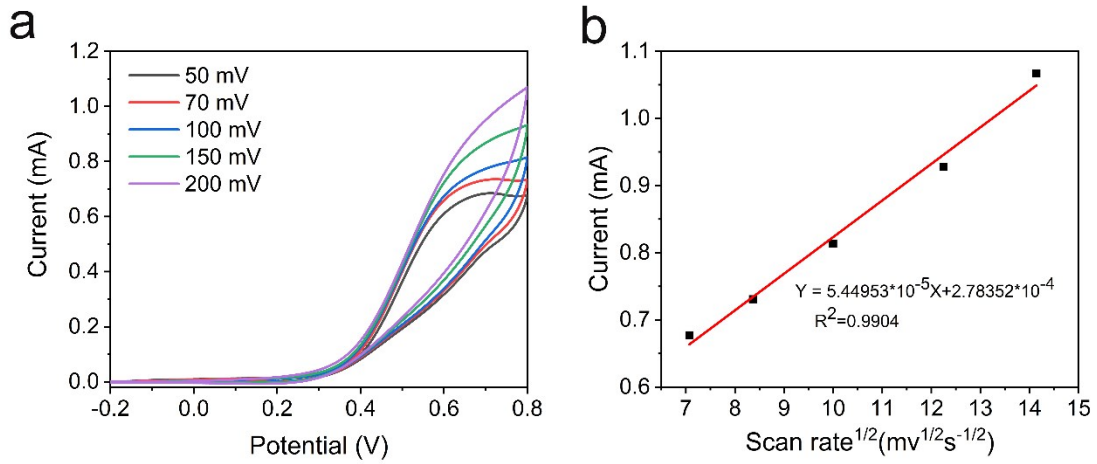

Fig. S2. (a) Cyclic voltammograms of S-co-BIM@Cu/GCE under various scan rates, including 50, 70, 100,150 and 200 mV s^{-1}, respectively. (b) Plot of peak current vs. the square root of scan rate;

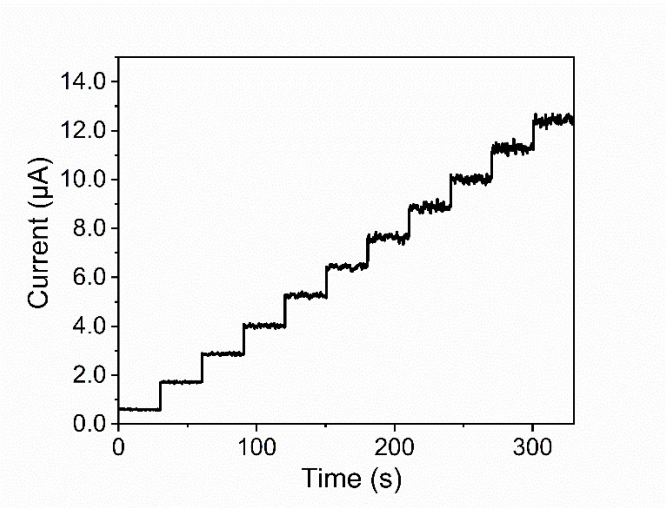

Fig. S3. Amperometric responses of Cu@S-co-BIM/GCE electrode with ten successive addition of 20 μM glucose at 0.50 V in 0.1 M NaOH.

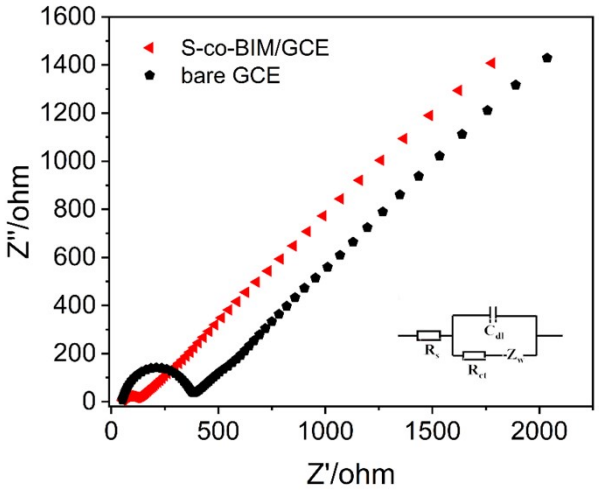

Fig. S4. EIS of bare GCE and S-co-BIM/GCE in the solution of 5.0 mM $[Fe(CN)_6]^{3-/4-}$and 0.1 M KCl.

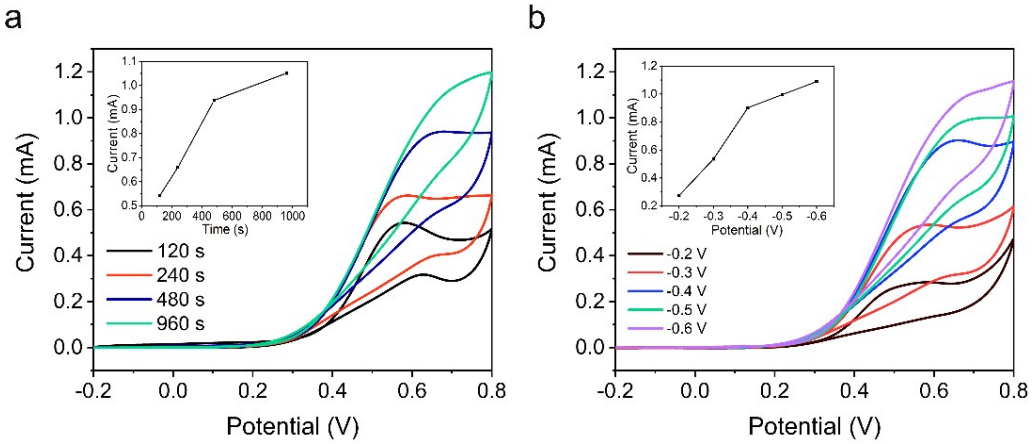

Fig.S5. (a) CV curves of Cu@S-co-BIM/GCE to 5 mM glucose at different deposition times. (b)

CV curves of Cu@S-co-BIM/GCE to 5 mM glucose at different deposition potentials. Scan rate: 100 mV/s.

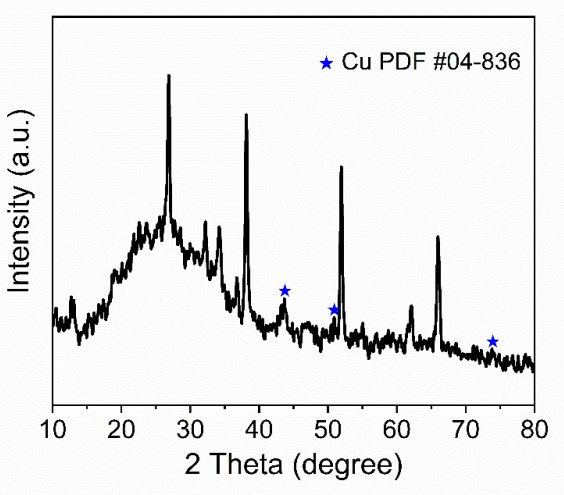

Fig. S6. XRD spectra of Cu@S-co-BIM/GCE.

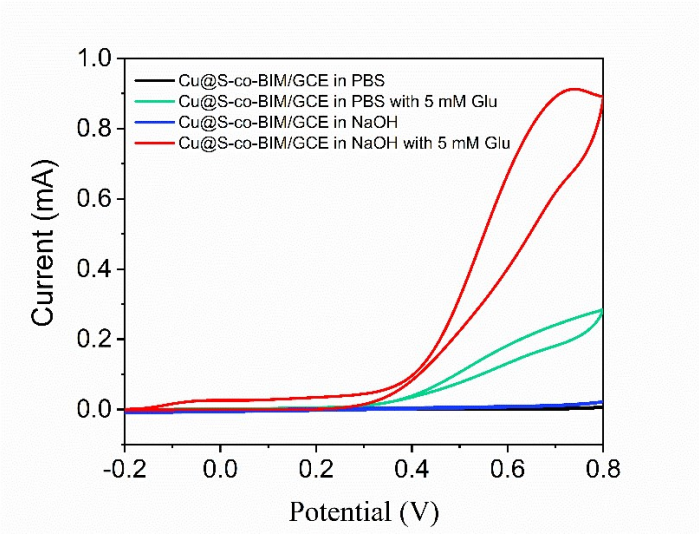

Fig. S7. CV curves of Cu@S-co-BIM/GCE in the absence and presence of 5 Mm glucose in 0.1 M NaOH and PBS (pH 7.4) solution. Scan rate of 100 mV/s.

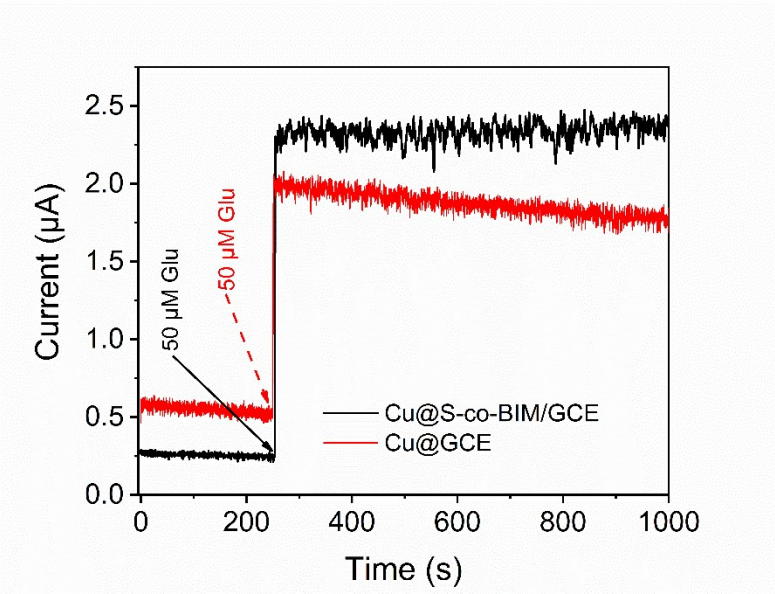

Fig.S8. I-t curve of 50 μM glucose at Cu@S-co-BIM/GCE in 10 mL of 0.1 M NaOH.