# Supporting information

# $MoS_2$-Au@Pt nanohybrid as a sensing platform for electrochemical nonenzymatic glucose detection

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## Synthesis of Au nanoseeds, $MoS_2$-Au and $MoS_2$-Au@Pt nanocomposite

Au nanoseeds were prepared by using $Na_3C_6H_5O_7 \cdot 2H_2O$ and $HAuCl_4$. First, 700 μL $HAuCl_4$ (10 mM) was added into 49.3 mL ultrapure water. Then, the mixture was heated to approximately 150 °C on a hotplate. After that, 5 mL $Na_3C_6H_5O_7 \cdot 2H_2O$ (10 mM) was inject into the solution for reacting 25 minutes to get the Au nanoparticles.

For $MoS_2$-Au nanocomposite synthesis, 4 mL (0.025 mg $mL^{-1}$) of $MoS_2$ nanosheet dispersion was mixed with 400 μL of PVP (5%) under vigorous stirring for 2 min to obtain a stable mixture. Then, 200 μL $HAuCl_4 \cdot 3H_2O$ (10 mM) was dropped into the mixture and mixed for 10 minutes. After this, the reaction mixture was heated to 60 ºC for 5 minutes in the microwave reactor. Finally, the product of $MoS_2$-Au nanocomposite was purified at least twice by centrifugation.

For $MoS_2$-Au@Pt nanocomposite synthesis. First, 0.3 mL aqueous $MoS_2$-Au seed solution was added to 2 mL ultrapure water. Then 0.5 mL 10 mM CTAB solution was mixed with the seed solution for 5 min under vigorous stirring. After that, 1 mL AA (100 mM) was injected quickly into the mixed solution. At intervals of 5 s, 100 μL 5 mM $H_2PtCl_6$ was added to the solution under stirring. Then, the mixture was heated on a hotplate at approximately 100 °C for 6 min to grow Pt nanoshells. Finally, the product of $MoS_2$-Au@Pt nanocomposite was purified by washing and centrifugation (5000 rpm for 10 min) to remove excess reagent three times with acetone and water.

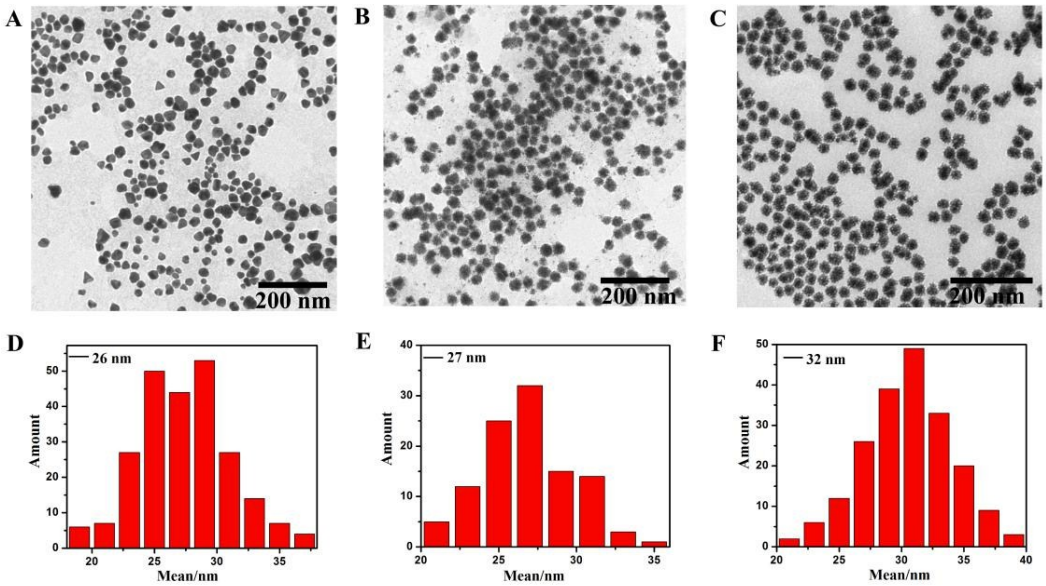


**Fig. S1.** TEM images of the (A) $MoS_2$-Au nanocomposite, (B) $MoS_2$-Pt nanocomposite and (C) Au@Pt nanocomposite. Histograms of nanoparticles' size corresponding to (D) $MoS_2$-Au nanocomposite, (E) $MoS_2$-Pt nanocomposite and (F) Au@Pt nanocomposite.

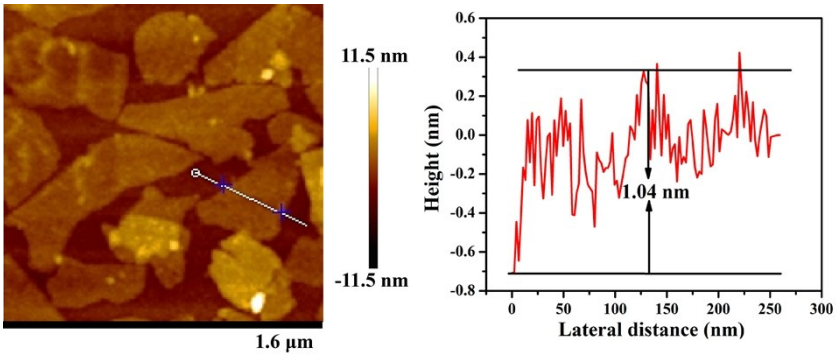


**Fig. S2.** AFM images of $MoS_2$ nanosheet.

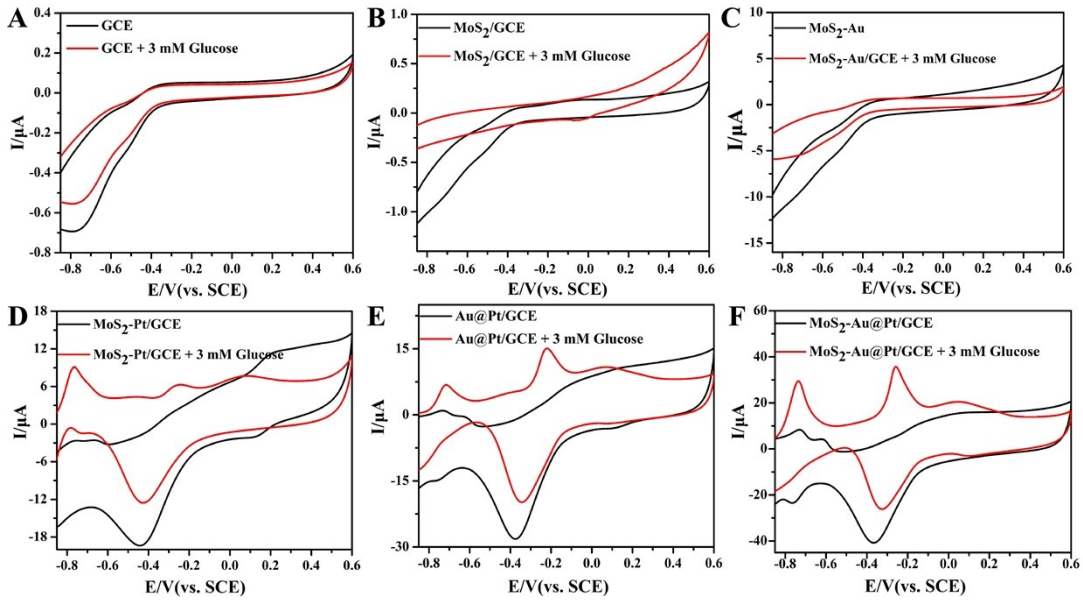


**Fig. S3.** Cyclic voltammograms of six modified electrodes in 0.1 M NaOH without and with 3 mM glucose at a scan rate of 100 mV $s^{-1}$.

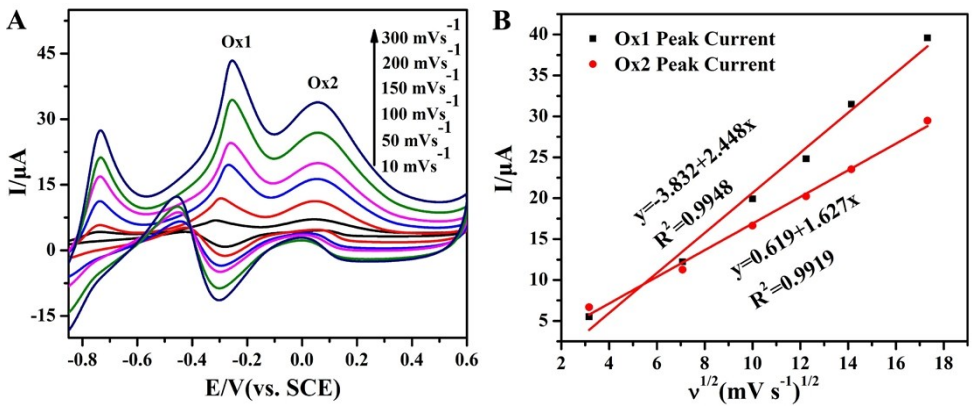


**Fig. S4.** (A) Cyclic voltammograms of $MoS_2$-Au@Pt/GCE in 0.1 M NaOH containing 3 mM glucose at various scan rates ranging from 10, 50, 100, 150, 200 to 300 mV $s^{-1}$. (B) The plot of glucose oxidation peak currents versus the square root of scan rate.

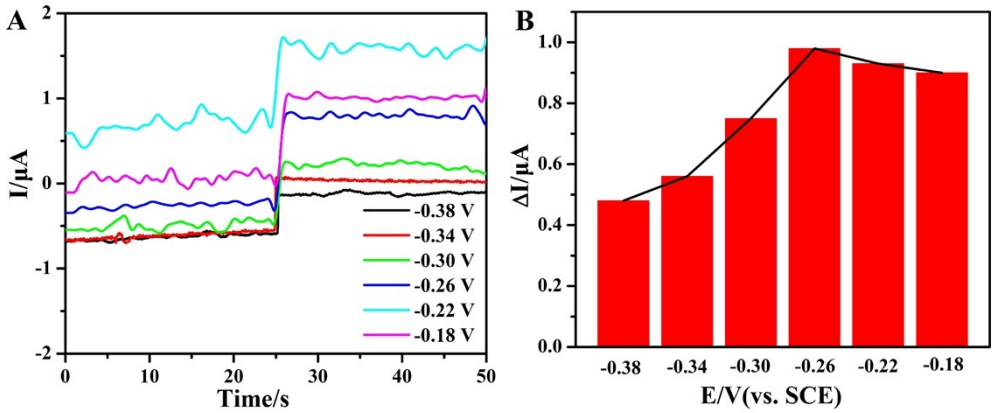


**Fig. S5.** (A) Amperometric responses of $MoS_2$-Au@Pt/GCE in 0.1 M NaOH containing 1 mM glucose by using different applied potentials. (B) The peak current increment versus the applied potential.

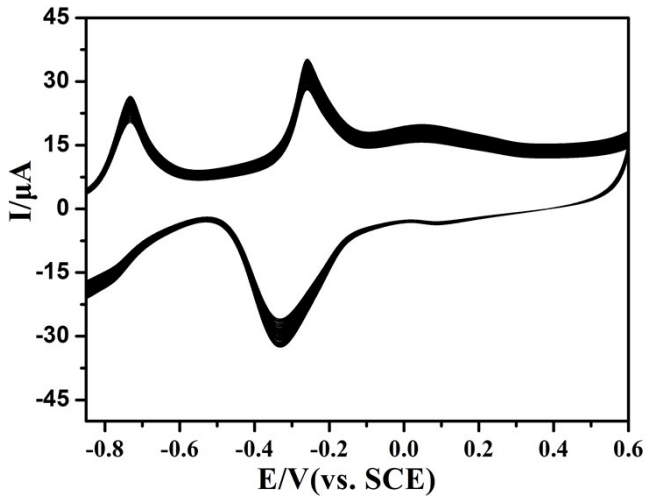


**Fig. S6.** Successive 200 Cyclic voltammograms of $MoS_2$-Au@Pt/GCE in 0.1 M NaOH containing 3 mM glucose at a scan rate of 100 mV $s^{-1}$.

**Table S1** Comparison of different electrode materials for nonenzymatic glucose determination.

| Electrode material | Detection limit (μM) | Linear range (mM) | References |
|---|---|---|---|
| Pt–Au alloy | 6 | 0.006-11 | [1] |
| PtNi-ERGO | 10 | 0.5-35 | [2] |
| Pt-Pd nanoflakes | 20.6 | 0-16 | [3] |
| Pt-Au/MWCNT | 10 | 0-24.44 | [4] |
| Macroporous Au-Pt | 25 | 1-20 | [5] |
| NiO/Pt/ERGO | 0.2 | 0.05-5.66 | [6] |
| PtNCs/GR | 30 | 1–25 | [7] |
| Ni-$MoS_2$ | 0.31 | 0-4 | [8] |
| Au-Pd-$MoS_2$ | 400 | 0.5-20 | [9] |
| $MoS_2$-Au@Pt | 1.08 | 0.01-3 | our work |

ERGO: electrochemically reduced graphene oxide. MWCNT: multi-wall carbon nanotubes. PtNCs: Pt nanoclusters. GR: graphene.

## References


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