

Synthesis of Metal Nanoparticle@Graphene Hydrogel Composites by Substrate-enhanced Electroless Deposition and Their Application in Electrochemical Sensors

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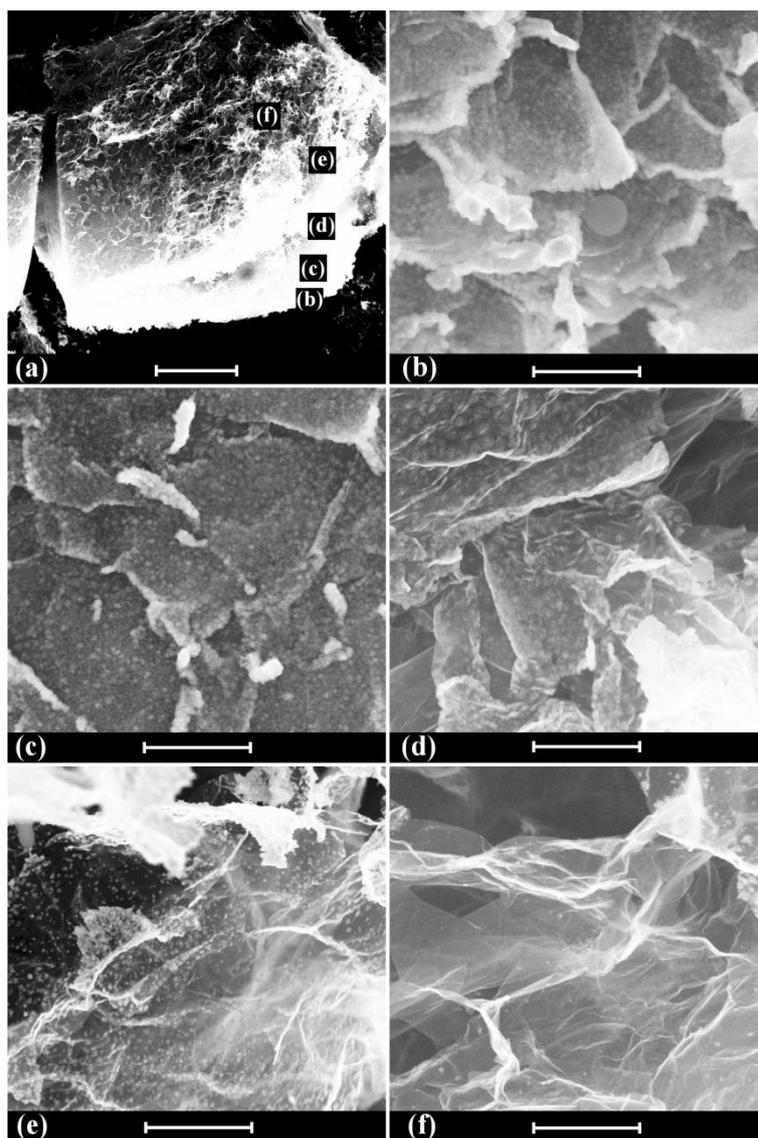


Fig. S1. SEM images of AuNP@GHG composites at different position. (a) Overall perspective of AuNP@GHG from the surface of NF to the center (from b to f). (b) ~ (f) The corresponding high magnification SEM images of AuNP/GHG composite. The AuNPs/GHG composite was obtained by immersing GHG@NF into an aqueous solution of HAuCl_4 (4 mM) for 30 s. To analyze the distribution of AuNPs inside GHG, AuNP/GHG was peeled off from NF with the help of conductive adhesive. Scale bar: (a) 50 μm , (b)-(f) 1 μm .

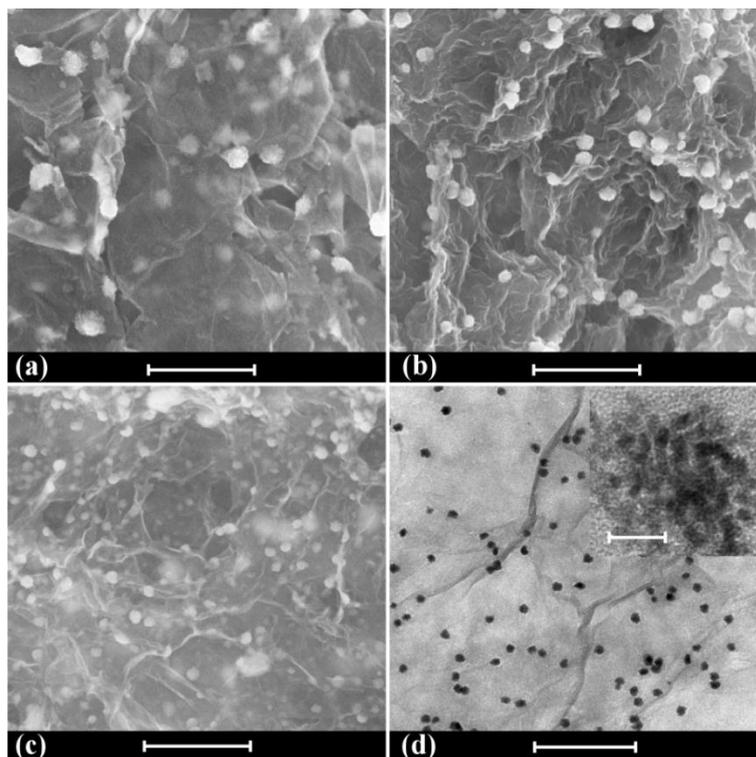


Fig. S2. SEM images of the obtained PtNP/GHG composites after immersing GHG@NF into an aqueous solution of H_2PtCl_6 (4 mM) for (a) 10 s, (b) 20 s and (c) 30 s. (d) The corresponding TEM image of Pt NPs/graphene composite. Inset: magnification of a single Pt nanoparticles. Scale bar: (a)-(c) 1 μm , (d) 500 nm, inset 10 nm.

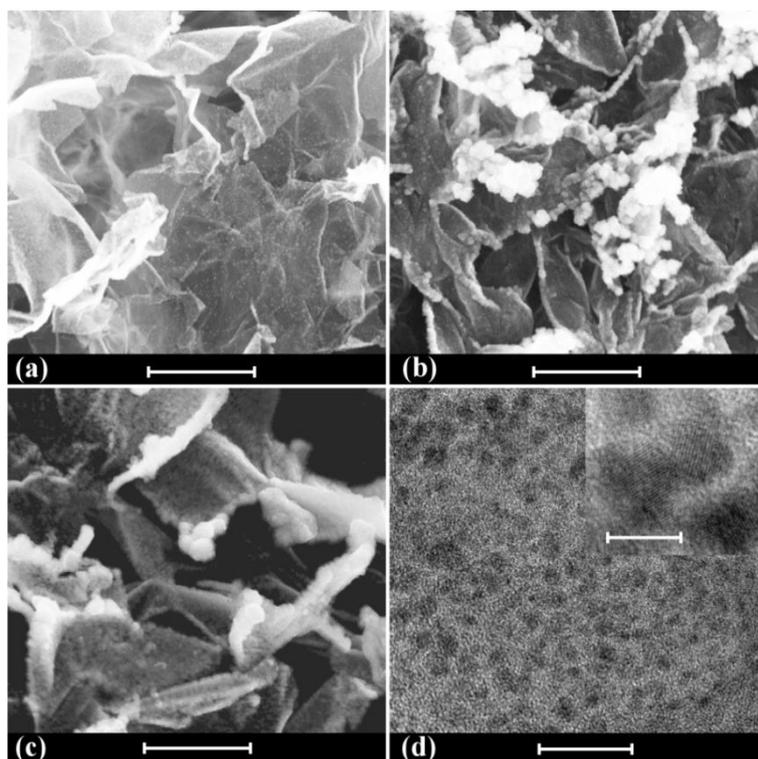


Fig. S3. SEM images of the obtained PdNP/GHG composites after immersing GHG@NF into an aqueous solution of H_2PdCl_4 (4 mM) for (a) 10 s, (b) 20 s and (c) 30 s. (d) The corresponding TEM image of PdNP/graphene composite. Inset: higher magnification of (d). Scale bar: (a)-(c) 1 μm , (d) 20 nm, inset 5 nm.

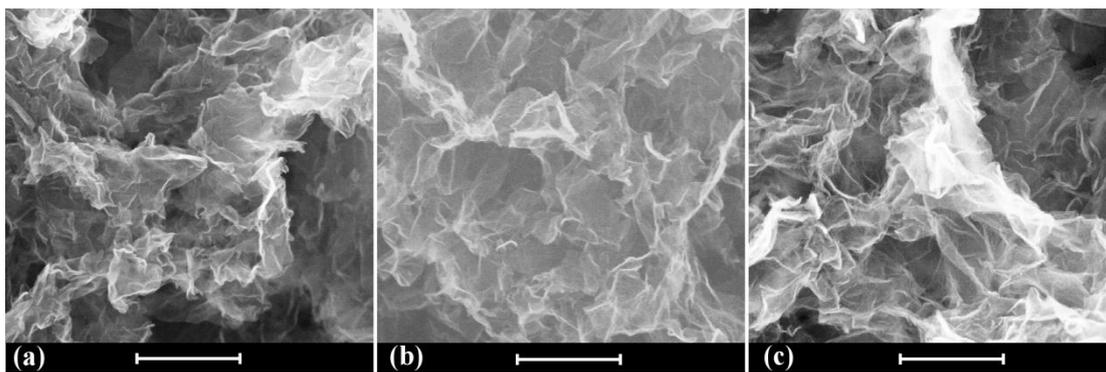


Fig. S4. SEM images of GHG after immersing GHG@NF into 4 mM aqueous solutions of (a) $\text{Co}(\text{NO}_3)_2$, (b) FeSO_4 , (c) $\text{Zn}(\text{CH}_3\text{COO})_2$ for 60 s, respectively. Scale bar: 1 μm

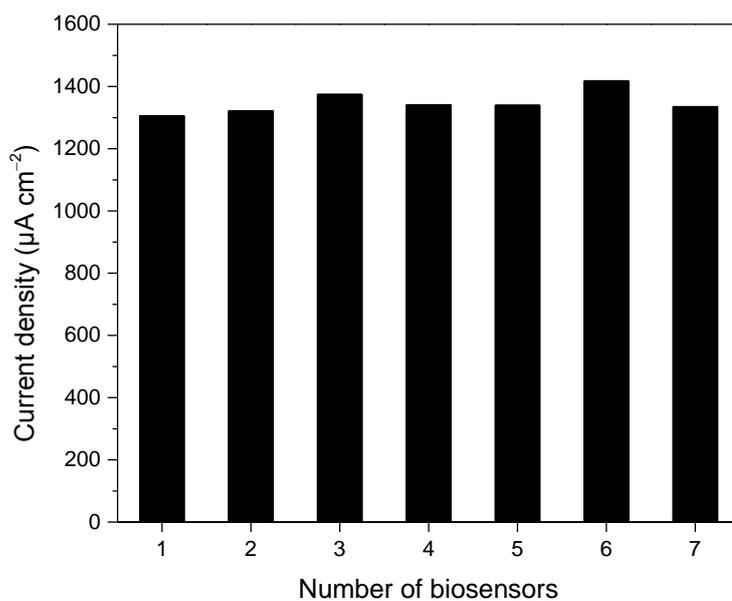


Fig. S5. The reproducibility of the AuNP@GHG modified electrode.

Seven electrodes were made under identical conditions within a week and electrochemical responds of 30 mM UA at these biosensors were detected by DPV.

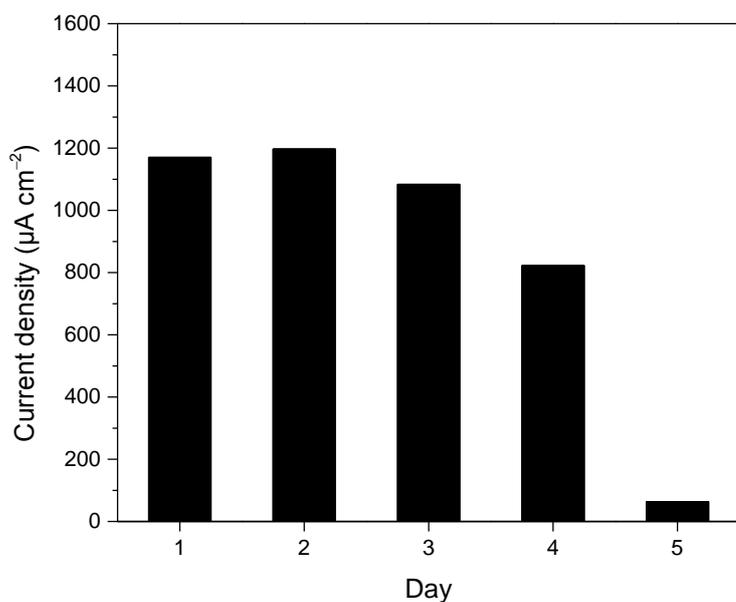


Fig. S6. The long term stability of the AuNP@GHG modified electrode.

DPV measurements were performed at an electrode for a period of 5 days and stored in air after each measurement. At the first three days, the currents were almost the same. The DPV current began to decline on the fourth day. However, the AuNP@GHG dispersion used for modifying GCE can be stored for more than a month without deterioration.

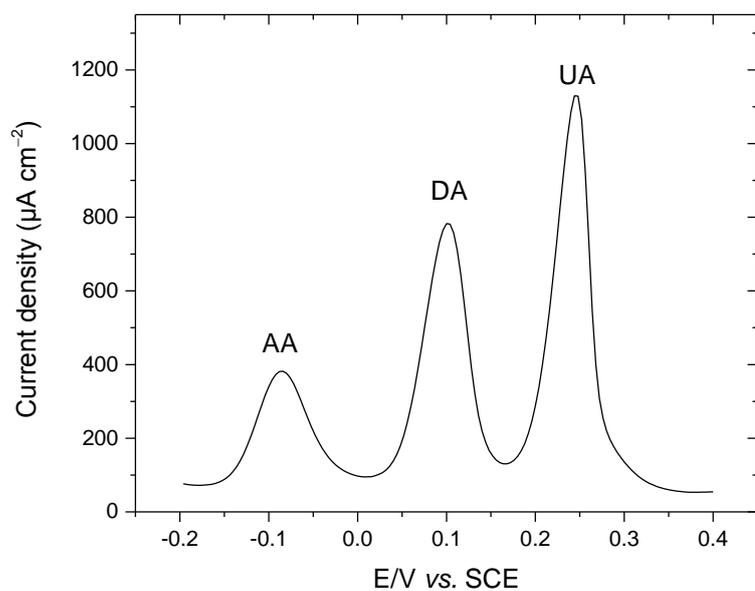


Fig. S7. DPV response of 1mM ascorbic acid (AA), 30 μM dopamine (DA) and 30 μM UA on AuNP@GHG modified GCE in 0.1 M PBS (pH=7.40).

From the DPV curve three different analytes can be distinguished by the peak potential.