

## **Supplementary Information**

### **Synthesis of three-layered SiO<sub>2</sub>@Au nanoparticles@polyaniline nanocomposite and its application in simultaneous electrochemical detection of uric acid and ascorbic acid**

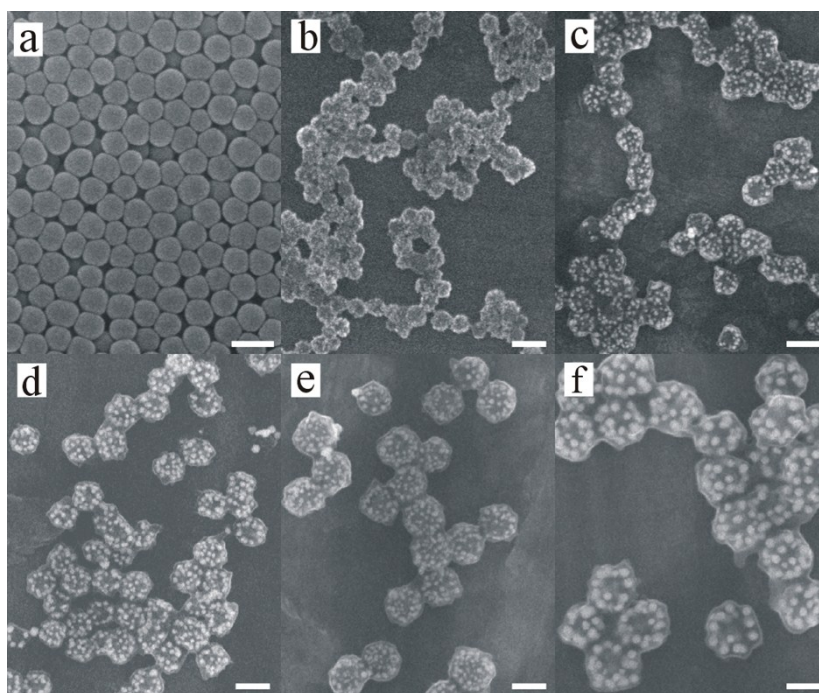
**Ting Hou, Panpan Gai, Mengmeng Song, Shuhan Zhang and Feng Li\***

College of Chemistry and Pharmaceutical Sciences, Qingdao Agricultural University

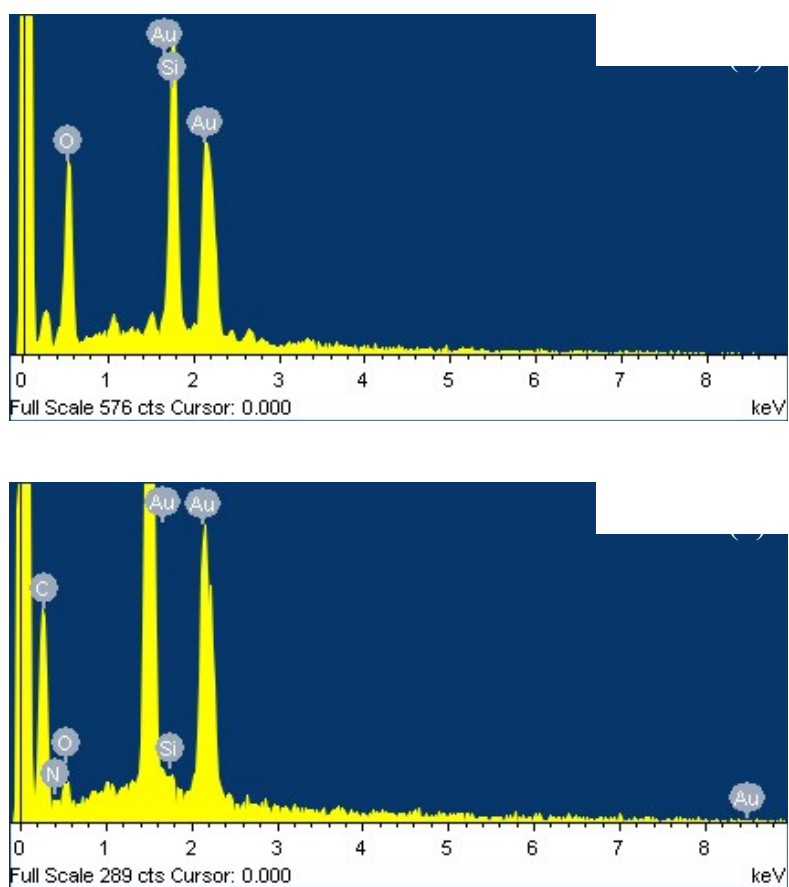
Qingdao 266109, People's Republic of China

\*Corresponding author. Tel/Fax: 86-532-86080855.

E-mail address: [lifeng@qust.edu.cn](mailto:lifeng@qust.edu.cn) (F. Li)

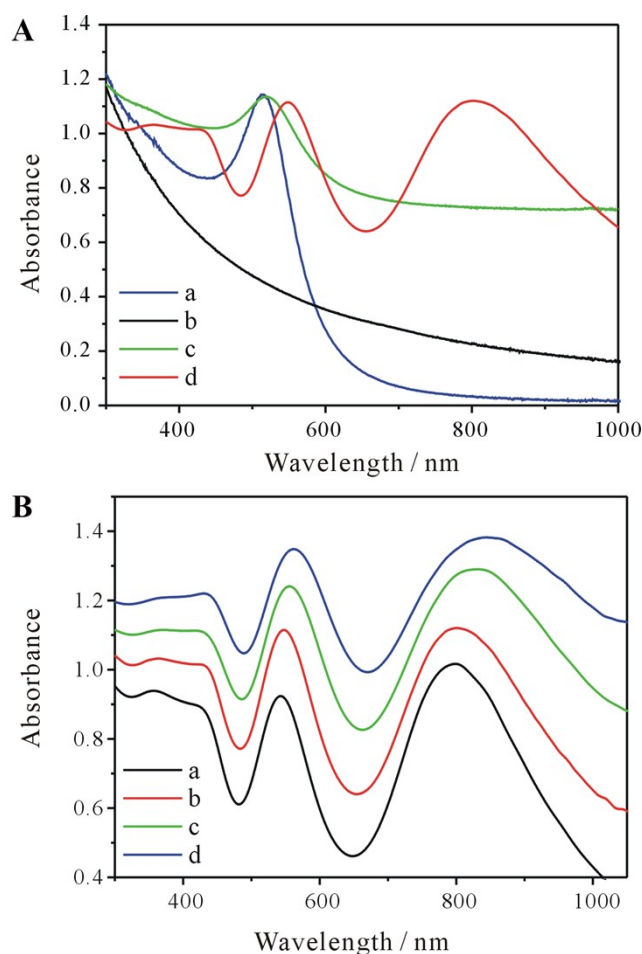


**Fig. S1.** SEM images of (a)  $\text{SiO}_2$ , (b)  $\text{SiO}_2@\text{AuNPs}$  and  $\text{SiO}_2@\text{AuNPs}@\text{PANI}$  formed using  $\text{SiO}_2@\text{AuNPs}$  seeds with different volumes: (c) 1 mL, (d) 0.8 mL, (e) 0.4 mL and (f) 0.2 mL. Scale bar: 100 nm.



**Fig. S2.** EDX elemental composition analysis results of (a)  $\text{SiO}_2@\text{AuNPs}$  and (b)  $\text{SiO}_2@\text{AuNPs}@PANI$ .

The volume of  $\text{SiO}_2@\text{AuNPs}$  seeds was 0.8 mL.

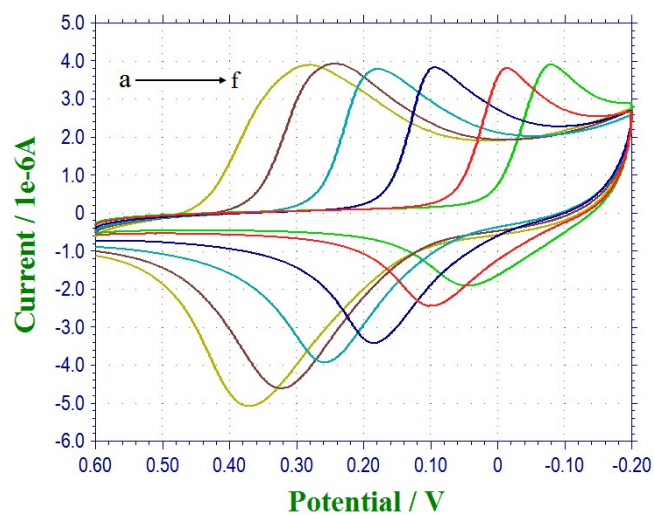


**Fig. S3.** (A) UV-vis spectra of (a) AuNPs, (b) amino-functionalized SiO<sub>2</sub>, (c) SiO<sub>2</sub>@AuNPs and (d) SiO<sub>2</sub>@AuNPs@PANI. The volume of SiO<sub>2</sub>@AuNPs seed solution was 0.8 mL. (B) UV-vis spectra of SiO<sub>2</sub>@AuNPs@PANI formed using SiO<sub>2</sub>@AuNPs seed solution with different volumes: (a) 1.0 mL, (b) 0.8 mL, (c) 0.4 mL and (d) 0.2 mL.

As shown in Fig. S3A, AuNPs alone exhibited an absorption peak at 510 nm (curve a), which is consistent with what was known for AuNPs smaller than 10 nm. The amino-functionalized SiO<sub>2</sub> showed no absorption peak (curve b). Upon the assembly of AuNPs on SiO<sub>2</sub> nanoparticles, the plasmon band of Au seeds appeared at about 520 nm (curve c), which slightly red-shifted as compared to that of the free Au seeds. The redshift of the plasmon band is due to the partial colloidal aggregation of the Au seeds on the surface of the SiO<sub>2</sub> nanoparticles. The typical absorption peaks at 553 nm and 839 nm of SiO<sub>2</sub>@AuNPs@PANI nanocomposites (curve d) corresponded to the AuNPs

and PANI, respectively.

The effect of the amount of  $\text{SiO}_2@\text{AuNPs}$  seeds on the absorption spectra of the as-produced nanocomposites were investigated by varying the volume of the  $\text{SiO}_2@\text{AuNPs}$  seed solution when preparing the products. As shown in Fig. S3B, when the volume of  $\text{SiO}_2@\text{AuNPs}$  seed solution was 1 mL, the absorption peak of AuNPs red-shifted to about 543 nm (curve a), and with the volume of  $\text{SiO}_2@\text{AuNPs}$  seed solution further decreased to 0.8 mL, 0.4 mL, and 0.2 mL, the absorption peaks red-shifted continuously to about 553 nm (curve b), about 556 nm (curve c), and about 564 nm (curve d), respectively. This strongly indicated that the growth of AuNPs occurred during the polymerization process of aniline, which was in good agreement with the TEM and SEM results. It was also observed that, as the volume of the  $\text{SiO}_2@\text{AuNPs}$  seed solution decreased, the polaron band at about 798 nm related to the absorption of PANI became broader and shifted to longer wavelengths. Since the absorption of the polaron band is strongly dependent on the molecular weight and the protonation level of the PANI, this indicates the molecular weight change of the polymers as the volume of  $\text{SiO}_2@\text{AuNPs}$  seed solution varies.



**Fig. S4.** CVs of SiO<sub>2</sub>@AuNPs@PANI/CS/GCE in 0.1 M PBS at pH of (a) 4.0, (b) 5.0, (c) 6.0, (d) 7.0, (e) 8.0, and (f) 9.0 at a scan rate of 0.05 V s<sup>-1</sup>.