

## Supporting Information

### **Plasmonic rocks in Fenton reaction: catalytic sensing of organics in water via fullerene-decorated gold nanoparticles**

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## **Materials and apparatus**

Hydrogen tetrachloroaurate(III) trihydrate ( $\text{HAuCl}_4 \cdot 3\text{H}_2\text{O}$ ), 3-aminopropyltriethoxysilane (APTES) and potassium hydrogen phthalate were purchased from Sigma-Aldrich (USA). Fullerene ( $\text{C}_{60}$ ) was purchased from Suzhou DCN Co., Ltd. (China). Polyvinyl pyrrolidone (PVP-K30) was purchased from Hefei TNJ Chemical Industry Co., Ltd. (China). Rhodamine B (RhB) was purchased from Tokyo Kasei Kogyo Co., Ltd. (Japan). Sodium citrate, carbon disulfide ( $\text{CS}_2$ ) and other reagents were of analytical grade. Double-distilled water was used thoroughly. Phosphate buffer solutions (PB, 0.05M) with various pH values were prepared by mixing stock standard solutions of  $\text{Na}_2\text{HPO}_4$  and  $\text{NaH}_2\text{PO}_4$ .

An UV-Vis spectrophotometer (UV-2450, Shimadzu) and a visible range micro-spectrometer (homemade) were used to carry out spectral measurement, transmission electron microscopy (TEM, TECRAI20, Philips) and field emission scanning electron microscopy (JSM-7800F, JEOL) were used for characterization of gold nanoparticles and films prepared.

## **Preparation of AuNPs and $\text{C}_{60}$ solution**

Gold nanoparticles (AuNPs) with uniform size and monodispersion were prepared by the traditional Frens synthetic (citrate reduction) method.<sup>1</sup> The average diameter of the particle was determined by TEM to be  $10 \pm 1$  nm (see Fig. S1), the concentration of the particle was calculated from its absorption spectroscopy to be ca. 15 nM.<sup>2</sup>

$\text{C}_{60}$  solution (0.1 mg/mL) was prepared by the following:  $\text{C}_{60}$  was first solved in  $\text{CS}_2$  (1 mg/mL) and then mixed with ethanol (containing 0.1% PVP) at a volume ratio 1:10.

## **Fabrication of $\text{C}_{60}$ @AuNPs film**

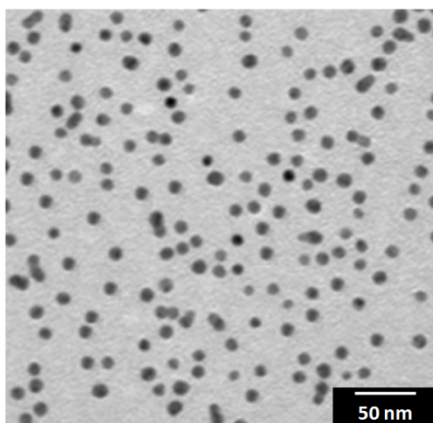
A glass slide pre-treated with Pinranha solution was immersed in an ethanol solution of APTES (5%, v/v) at 60°C for 30 min. After washed by ethanol 3 times, the slide was immersed in the AuNPs solution at 30°C for 30 min. Next, the slide was washed by water 3 times, and immersed in an ethanol solution of APTES (1%, plus 1% HCl) at 60°C for 30 min, and then after washed by ethanol 3 times, immersed again in the AuNPs solution at 30°C for 30 min. The above process was repeated to obtain 10 layers of assembled AuNPs, and the slide was annealed at 500°C for 240 min to get the AuNPs film. Then, the  $\text{C}_{60}$  solution (0.1 mg/mL) was spin-coated on the AuNPs film at 1000 rpm for 15 s, and the spin coating was repeated 5 times. Finally, the film was annealed at 500°C for 60 min to get the  $\text{C}_{60}$ @AuNPs film. The morphology of the AuNPs film and  $\text{C}_{60}$ @AuNPs film were determined by SEM (see Fig. S2 and S3).

## **Plasmonic monitoring of the Fenton reaction**

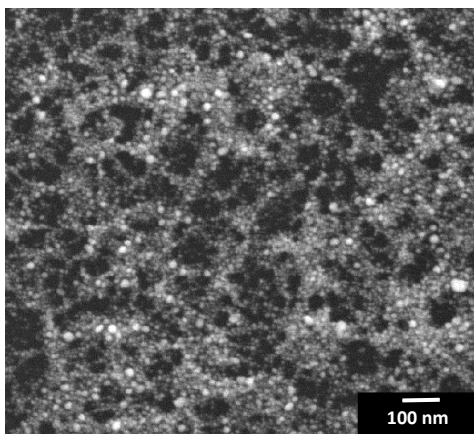
As shown in Fig. S4, the  $\text{C}_{60}$ @AuNPs film was inserted into the measuring cell, of which a 3 mL solution of organics was filled. A 100  $\mu\text{L}$  solution of 30 mM  $\text{H}_2\text{O}_2$  was pipetted, and simultaneously, a homemade micro-spectrometer was used to measure and collect the plasmonic spectra of AuNPs at every 6 second.

## **References**

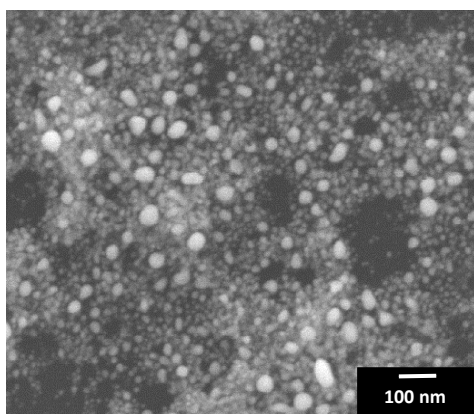
1. G. Frens, *Nat. Phys. Sci.*, 1973, **241**, 20.
2. P.K. Jain, K.S. Lee, I.H. El-Sayed and M.A. El-Sayed, *J. Phys. Chem. B*, 2006, **110**, 7238.



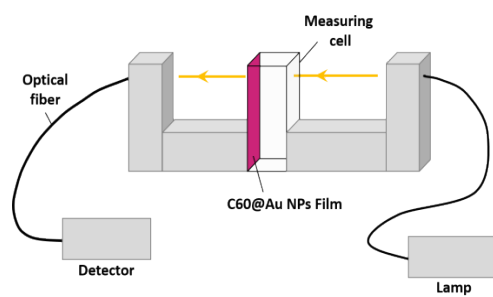
**Fig. S1** TEM image of the prepared 10 nm gold nanoparticles.



**Fig. S2** SEM image of the prepared AuNPs film.



**Fig. S3** SEM image of the prepared C<sub>60</sub>@AuNPs film.



**Fig. S4** Schematics of the measurement setup for plasmonic monitoring of the Fenton reaction.