

*Supporting Information for*

**Synthesis of Gold@Carbon Dots Composite Nanoparticles  
for Surface Enhanced Raman Scattering**

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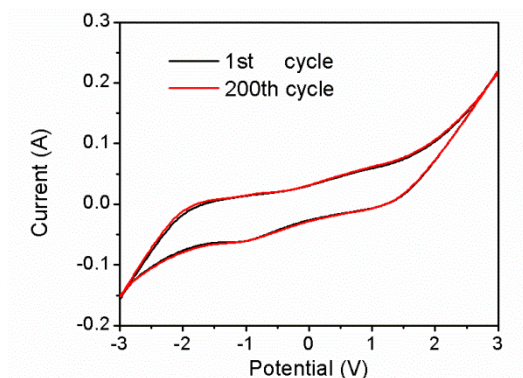
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**Quantum yield measurements:** Quantum yield (QY) was measured according the method reported in literature.<sup>S1, S2</sup> Optical density and photoluminescence (PL) intensity were measured by using a U-3010 UV-visible spectrometer (Hitachi, Japan) and a LS 55 fluorescence spectrometer (PerkinElmer), respectively. Quinine sulfate dissolved in 0.1 M H<sub>2</sub>SO<sub>4</sub> aqueous solution (QY is 0.54) was selected as the reference.

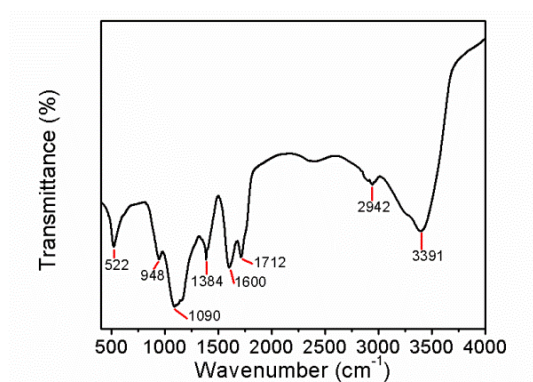
The following equation was used to calculate QY:

$$QY_s = QY_r(m_s / m_r)(n_s / n_r)^2$$

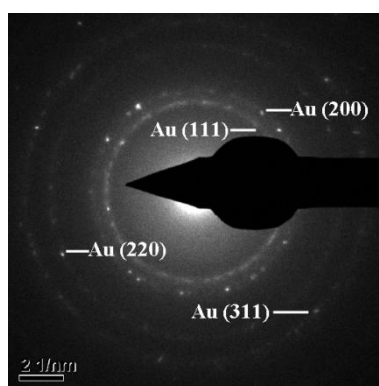
Where QY is quantum yield,  $m$  is the slope read from the linear plot of integrated PL intensity versus absorbance (Figure S9) and  $n$  is the refractive index of solvent. The subscript “s” and “r” refer to the sample and reference, respectively.



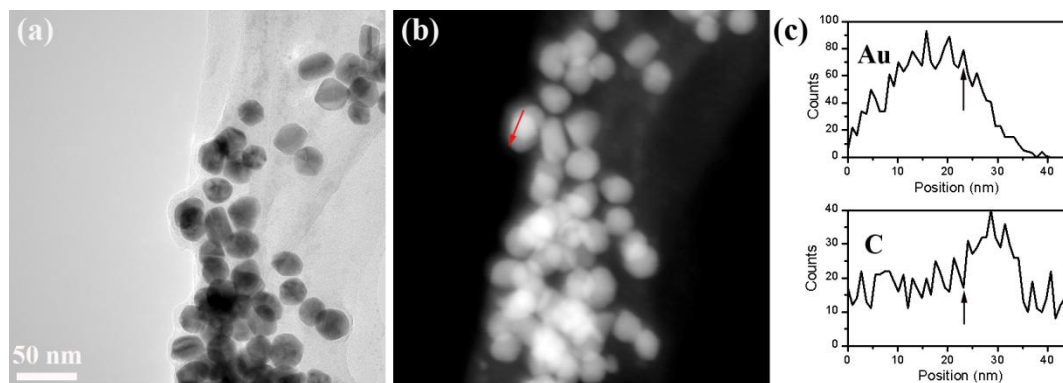
**Figure S1.** Cyclic voltammograms of graphite rod in 0.1 M PBS at a scan rate of 0.1 V/s.



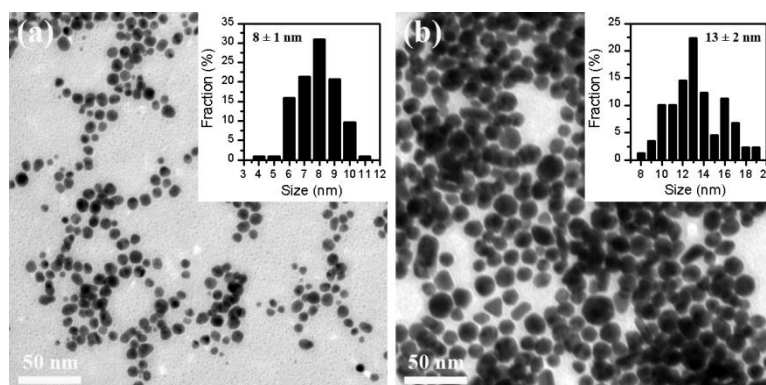
**Figure S2.** FTIR spectrum of CDs.



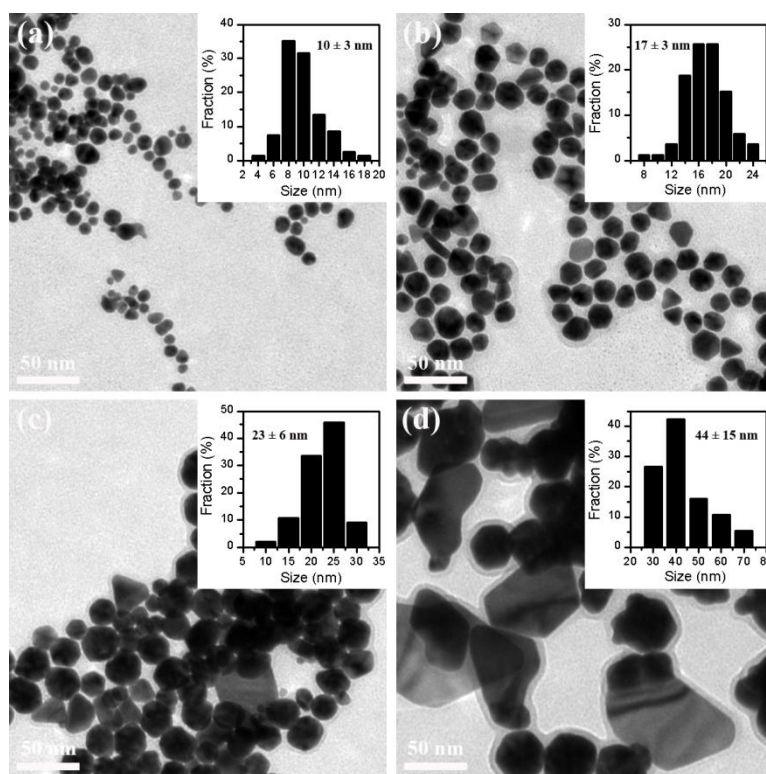
**Figure S3.** SAED pattern of typical Au@CDs.



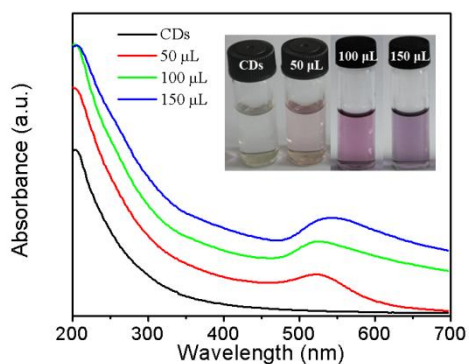
**Figure S4.** (a) HRTEM image of typical Au@CDs on carbon nanotube grid. STEM image of typical Au@CDs. (c) Cross-sectional compositional line profiles of a typical Au@CDs nanoparticle shown in (b).



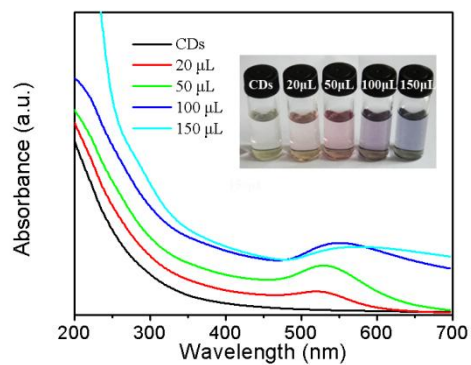
**Figure S5.** TEM images of the Au@CDs synthesized at 100  $^{\circ}\text{C}$  by using 50  $\mu\text{L}$  (a) or 100  $\mu\text{L}$  (b)  $\text{HAuCl}_4$  as the starting material; Inset: corresponding size distribution histogram.



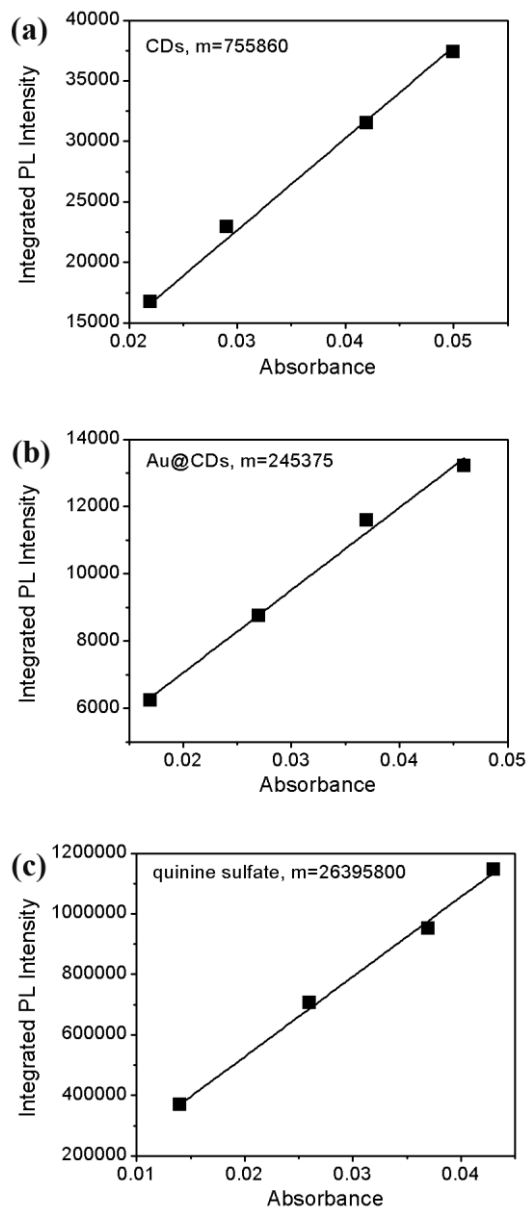
**Figure S6.** TEM images of Au@CDs synthesized at 60 °C by using 20 μL (a), 50 μL (b), 100 μL (c) or 150 μL (d) HAuCl<sub>4</sub> as the starting material, respectively. The inset is the corresponding size distribution histogram.



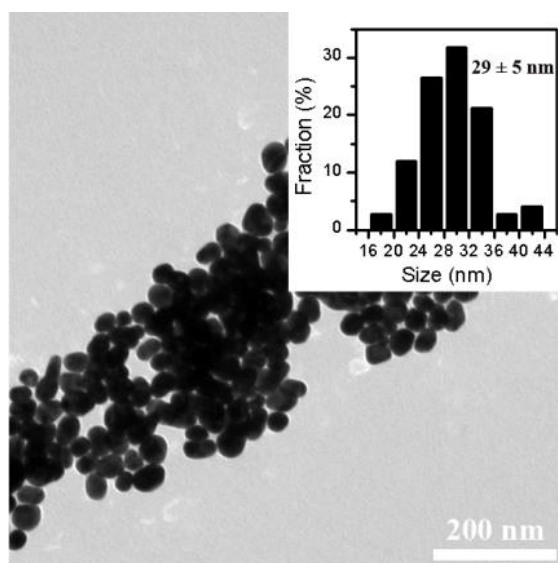
**Figure S7.** UV-visible absorption spectra of Au@CDs synthesized at 100 °C by using different volumes of HAuCl<sub>4</sub> as the starting materials.



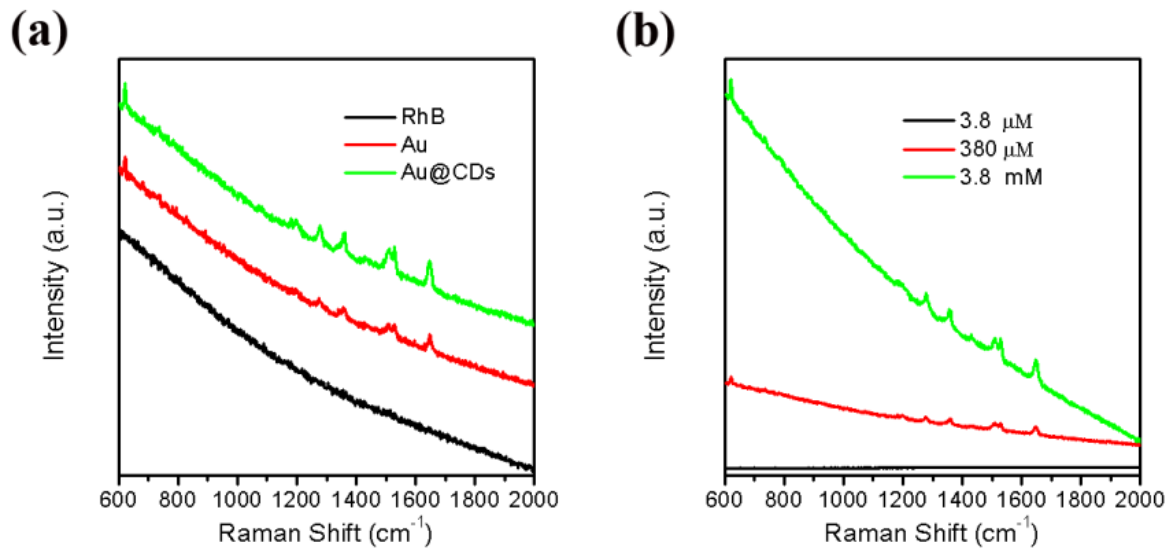
**Figure S8.** UV-visible absorption spectra of Au@CDs synthesized at 60 °C by using different volumes of HAuCl<sub>4</sub> as the starting materials.



**Figure S9.** Plot of integrated PL intensity versus absorbance for CDs (a), Au@CDs (b) or quinine sulfate (c). The integrated PL intensities were measured by excitation at 330 nm.



**Figure S10.** SEM image of the Au nanoparticles synthesized according to Frens' method.



**Figure S11.** (a) Raman spectrum of pure 3.8 mM RhB solution and SERS spectrum of 3.8 mM RhB in 0.044 mg/mL suspension of Au@CDs or Au nanoparticles. (b) SERS spectra of RhB with different concentrations in 0.044 mg/mL Au@CDs suspension.

### Supplementary References

S1. H. Zheng, Q. Wang, Y. Long, H. Zhang, X. Huang and R. Zhu, *Chem. Commun.*, 2011, **47**, 10650–10652.

S2. D. Pan, J. Zhang, Z. Li, C. Wu, X. Yan and M. Wu, *Chem. Commun.*, 2010, **46**, 3681–3683.