Electronic Supplementary Information (ESI) for:

Durian-like multi-functional Fe_3O_4/Au nanoparticles: synthesis, characterization and selective detection of benzidine

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1. Characterization of building blocks for the nanocomposites.

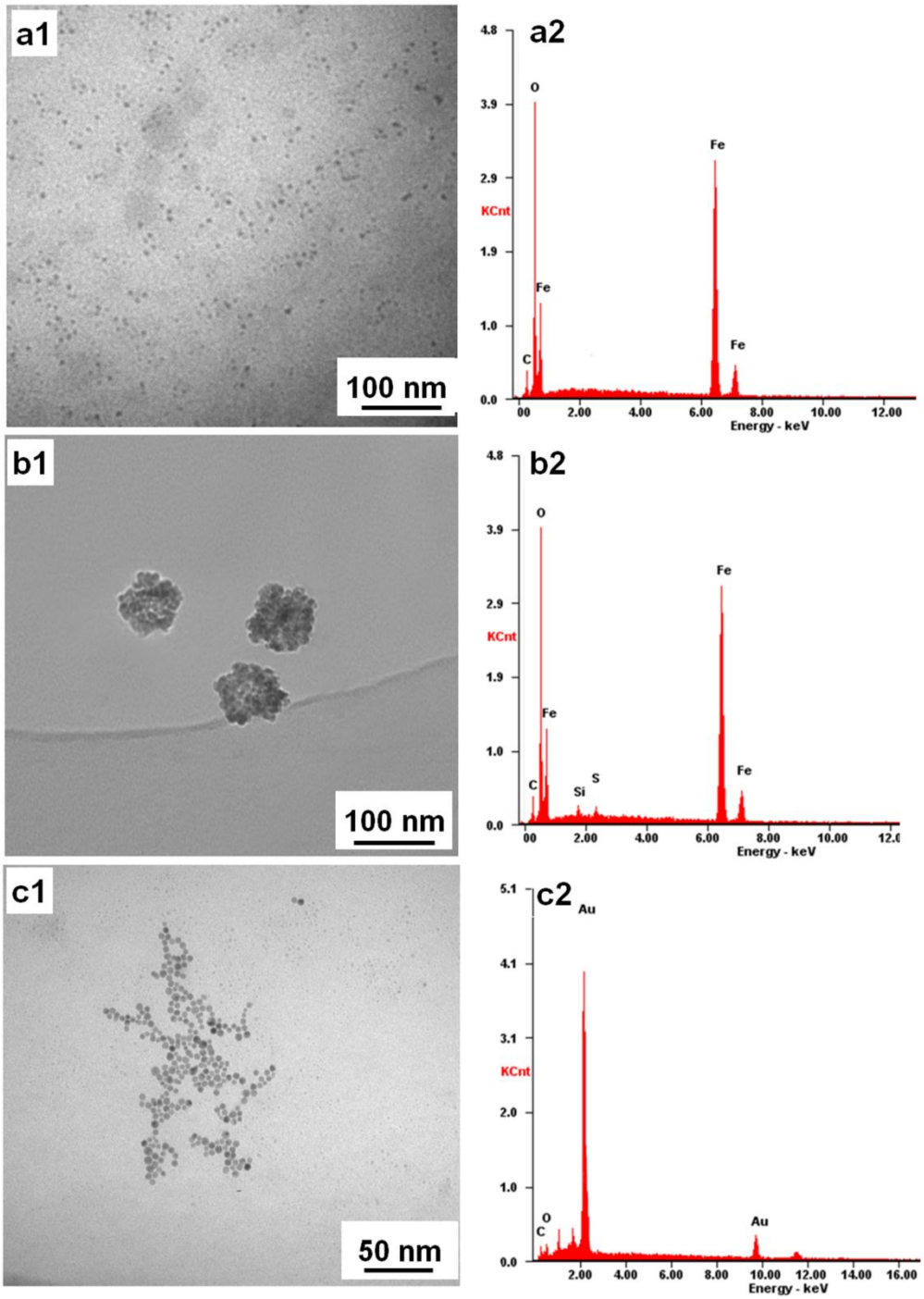

Figure S1. TEM and EDS analyses of Fe_3O_4 nanoparticles (a), mercapto-modified Fe_3O_4 nanoparticle clusters (b), and gold nanoparticles (c).

2. Influence of Au:Fe_3O_4 ratio on benzidine detecting.

Table S1. The code and molar ratio of materials in synthesis of Fe_3O_4/Au nanocomposites.

Code	Au nanoparticles (1.4×10^{-10} mol/L)	Fe_3O_4 nanoparticles (3.2×10^{-8} mol/L)	Molar ratio of Au to Fe_3O_4
NC1	4 mL	4 mL	1:208
NC2	4 mL	2 mL	1:104
NC3	4 mL	1 mL	1:57
NC4	4 mL	0.2 mL	1:12

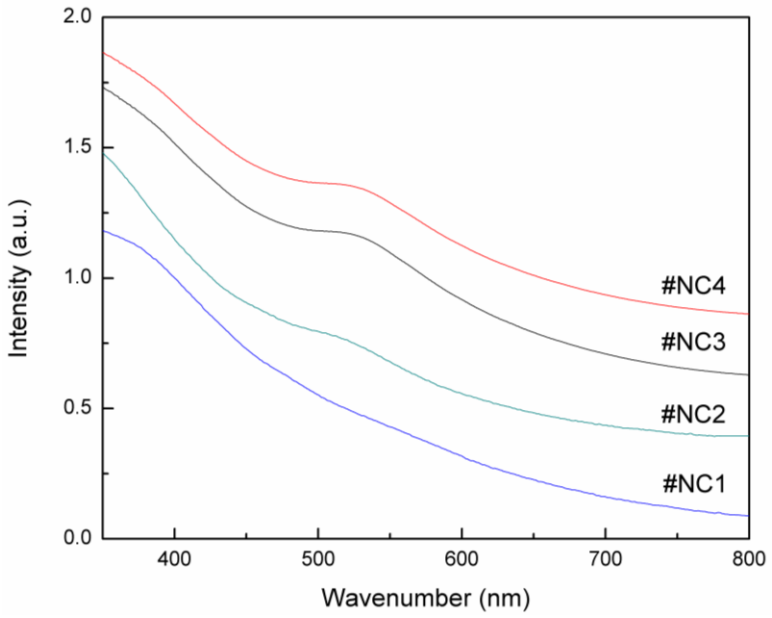

Figure S2. UV-vis absorption spectra of different nanocomposite samples. It can found that there is almost no difference between the UV-vis absorption spectra of samples #NC3 and #NC4, indicating that when the molar ratio of Au:Fe_3O_4 reaches 1:57, the nanocomposites achieve the highest gold loading amount by present developed method. The further ICP-MS analysis showing gold content within a 3% difference between these two samples confirms this speculation.

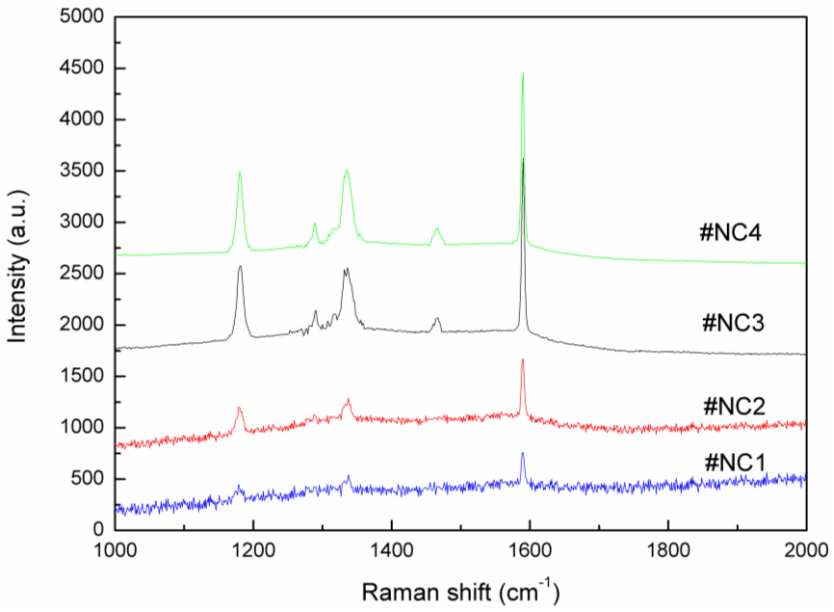

Figure S3. The Raman spectra of 10^{-4} M benzidine collected on different nanocomposite samples. More gold amount achieves better SERS performance. As the gold amount of samples #NC3 and #NC4 is similar, they have comparable SERS enhancement.

3. Influence of heavy metal ions on the selectivity of developed nanosensor.

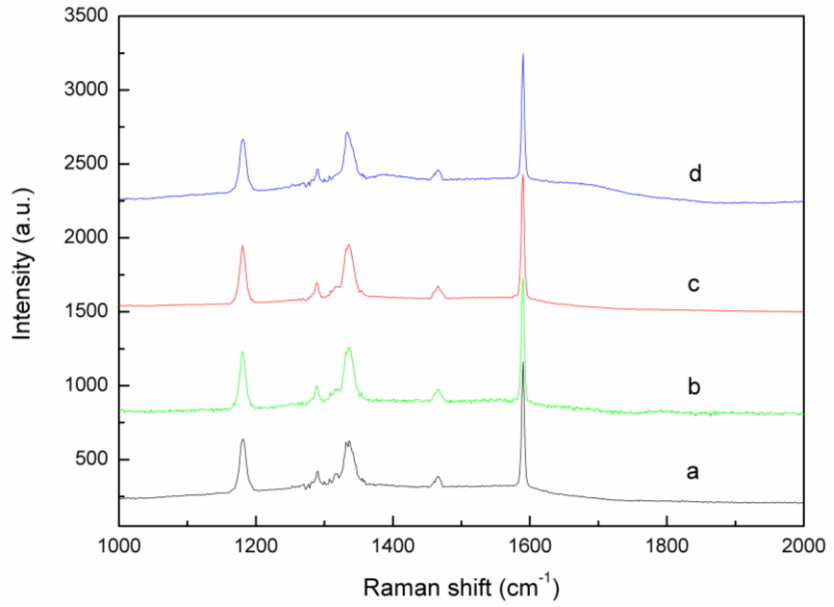

Figure S4. SERS spectra of 10^{-5} M benzidine recorded on the substrates of Fe_3O_4/Au nanocomposites, (a) without heavy metal ions, (b) with 10^{-5} M Hg^{2+}, (c) with 10^{-5} M Cd^{2+} and (d) with 10^{-5} M Pb^{2+}. As shown in this figure, there is no big difference observed in the Raman spectra. The Hg^{2+}, Cd^{2+} and As^{5+} ions have little influence on the selectivity of the sensing system.