Supporting information:

Magnetically separable nanocatalyst with Fe₃O₄ core and polydopamine-sandwiched-Au-nanocrystals shell

Jianfeng Zhang^a, Qunling Fang^a*, Jinyu Duan^a, Hongmei Xu^a, Huajian Xu^a, Shouhu Xuan^b*

^aSchool of Biological and Medical Engineering, Hefei University of Technology, Hefei, 230009, P.R. China.

^bCAS Key Laboratory of Mechanical Behavior and Design of Materials, Department of Modern Mechanics, University of Science and Technology of China, Hefei 230027, P.R. China.

*Corresponding author:

Asso. Prof. Qunling Fang

E-mail:fql.good@hfut.edu.cn Tel: 86-551-62904353 Fax: 86-551-62904353

Asso. Prof. ShouhuXuan

E-mail:xuansh@ustc.edu.cn Tel: 86-551-63601702 Fax: 86-551-63606382



Fig. S1 XRD diffraction pattern of the Fe₃O₄@PDA/Au/PDA/Pd/PDA.



Fig. S2 XRD diffraction pattern of the Fe₃O₄@PDA/Au/PDA/Ag/PDA.

Fig. S1 presents the XRD pattern of the Fe₃O₄@PDA/Au/PDA/Pd/PDA. Three broad peaks at 20 of 38°, 43°, and 65° were related to the (111), (200), and (220) lattice planes of the cubic phase Au (JCPDS Card no. 04-0784). Here, another diffraction peak at $2\theta = 40^{\circ}$ observed in spectrum was corresponded to Pd (111) crystalline plane. The above analysis indicated both the Au and Pd nanoparticles were in the Fe₃O₄@PDA/Au/PDA/Pd/PDA. presented Here, the Fe₃O₄@PDA/Au/PDA/Ag/PDA (Fig. S2) exhibited the similar XRD to the Fe₃O₄@PDA/Au/PDA/Au/PDA. However, because the size of the Ag nanocrystals was larger than the Au nanodots, the diffraction peak at $2\theta=38^{\circ}$ (Ag, JCPDS 04-0783) Fe₃O₄@PDA/Au/PDA/Ag/PDA in was sharper than the

 Fe_3O_4 @PDA/Au/PDA, which also indicated the well encapsulation of the Ag nanocrystals.



Fig. S3 TEM images of the Fe₃O₄@PDA/Au with different magnification.



Fig. S4 UV-Vis spectra of p-nitrophenol catalyzed by 3 mg Fe₃O₄ nanoparticles.



Fig. S5 UV-Vis spectra of p-nitrophenol catalyzed by 3 mg $Fe_3O_4@PDA$ nanoparticles.

As shown in Fig. S4, with increasing of the reaction time, the absorbance peak of intermediate at 400 nm has no obvious change. Similarly, no obvious change can be observed in Fig. S5. The slight decrease of the absorbance peak may be responded for the absorption of p-nitrophenol by Fe_3O_4 @PDA. Therefore, both of the Fe_3O_4 and Fe_3O_4 @PDA cannot catalyze the reduction of p-nitrophenol.



Fig. S6 UV-Vis spectra of p-nitrophenol catalyzed by $Fe_3O_4@PDA/Au/PDA$ nanocatalyst (3 mg).



Fig. S7 UV-Vis spectra of p-nitrophenol catalyzed by Au NPs (0.279 mg).



Fig. S8 UV-Vis spectra of p-nitrophenol catalyzed by Fe₃O₄@PDA/Au/PDA/ Pd/PDA nanocatalyst (3 mg).



Fig. S9 UV-Vis spectra of p-nitrophenol catalyzed by Fe₃O₄@PDA/Au/PDA/Au/PDA nanocatalyst (3 mg).