# Electronic Supplementary Information

# One-pot gradient solvothermal synthesis of the Au-Fe$_3$O$_4$ hybrid nanoparticles for magnetically recyclable catalytic applications

*Xianwei Meng,[a] Bo Li,[a,b] Xiangling Ren,[a] Longfei Tan,[a] Zhongbing Huang[b*] and Fangqiong Tang[a]\**

[a] Laboratory of Controllable Preparation and Application of Nanomaterials, Technical Institute of Physics and Chemistry, Chinese Academy of Sciences, Beijing, 100190, China. E-mail: tangfq@mail.ipc.ac.cn; Fax: +86-10-62554670; Tel: +86-10-82543521

[b] College of Materials Science and Engineering, Sichuan University, Chengdu, 610065, China. E-mail: zbhuang@scu.edu.cn; Fax: +86-28-85413003; Tel: +86--28-85413003
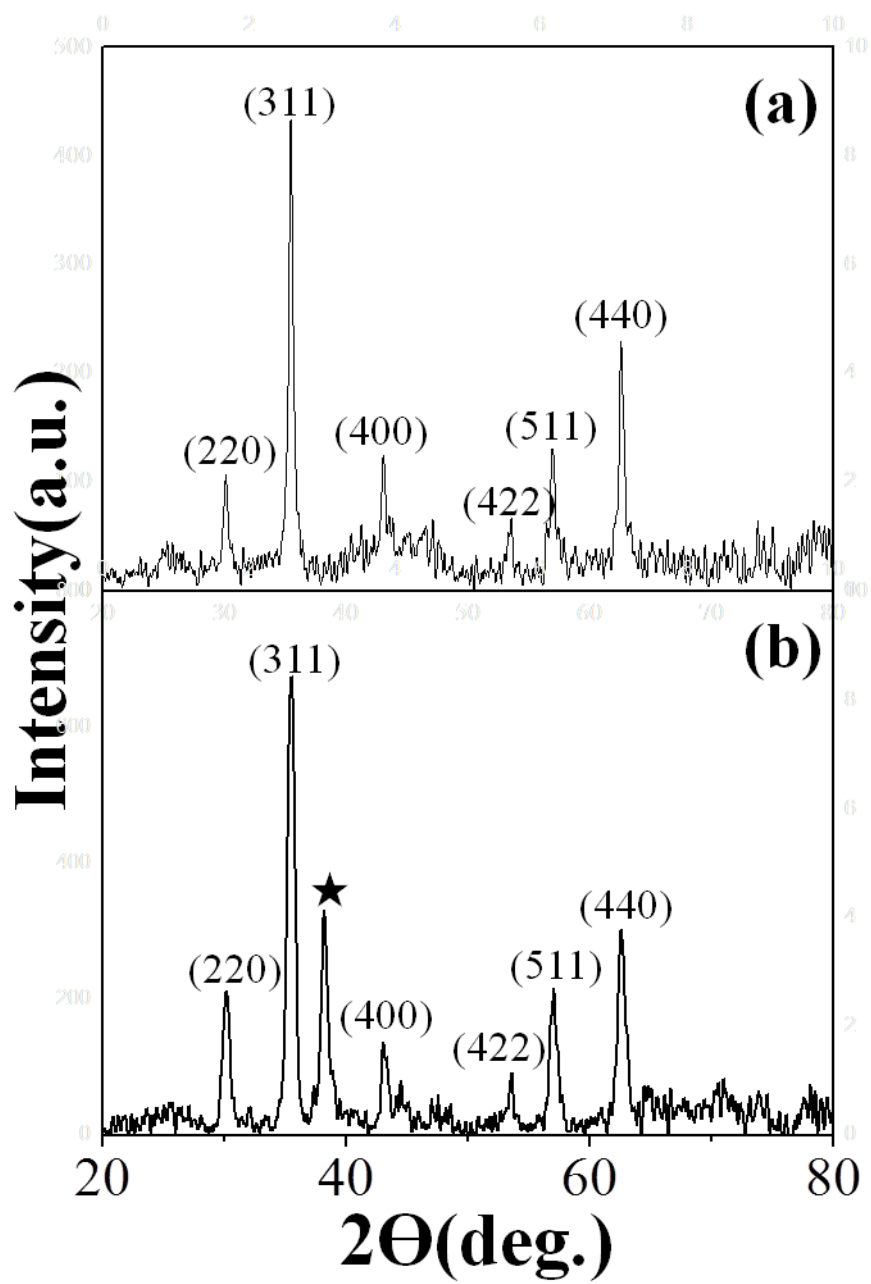
Figure S1. The XRD patterns of the synthesized $Fe_3O_4$ and $Au$-$Fe_3O_4$ hybrid NPs, with ★ identifying the Au peak and the numbers indexing the $Fe_3O_4$ peaks.
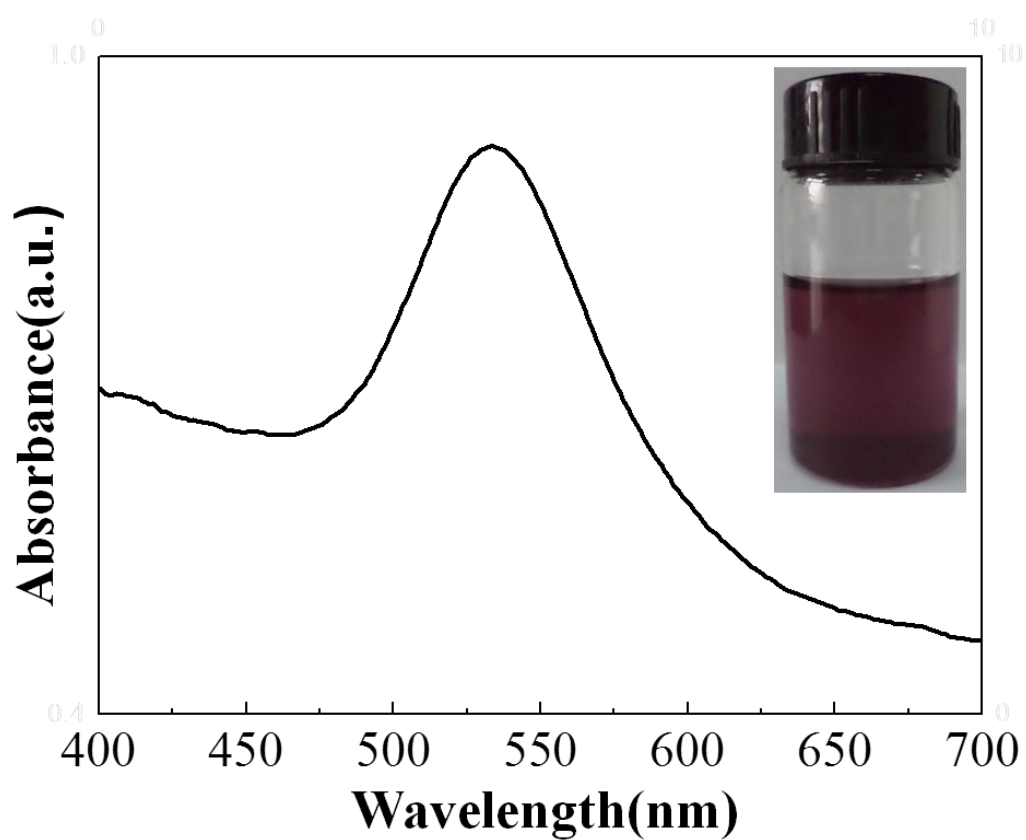
Figure S2. UV/Vis absorption spectrum of the Au NPs; the inset is a digital photograph of the Au NPs dispersed in PG.
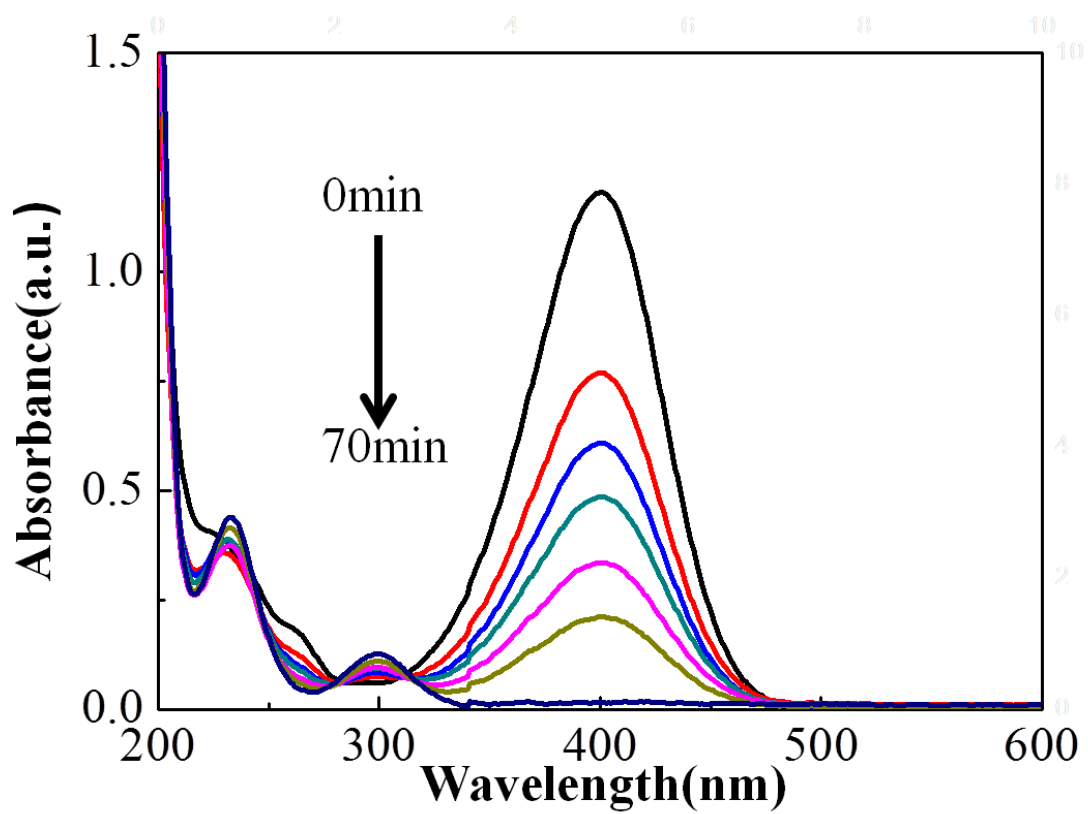
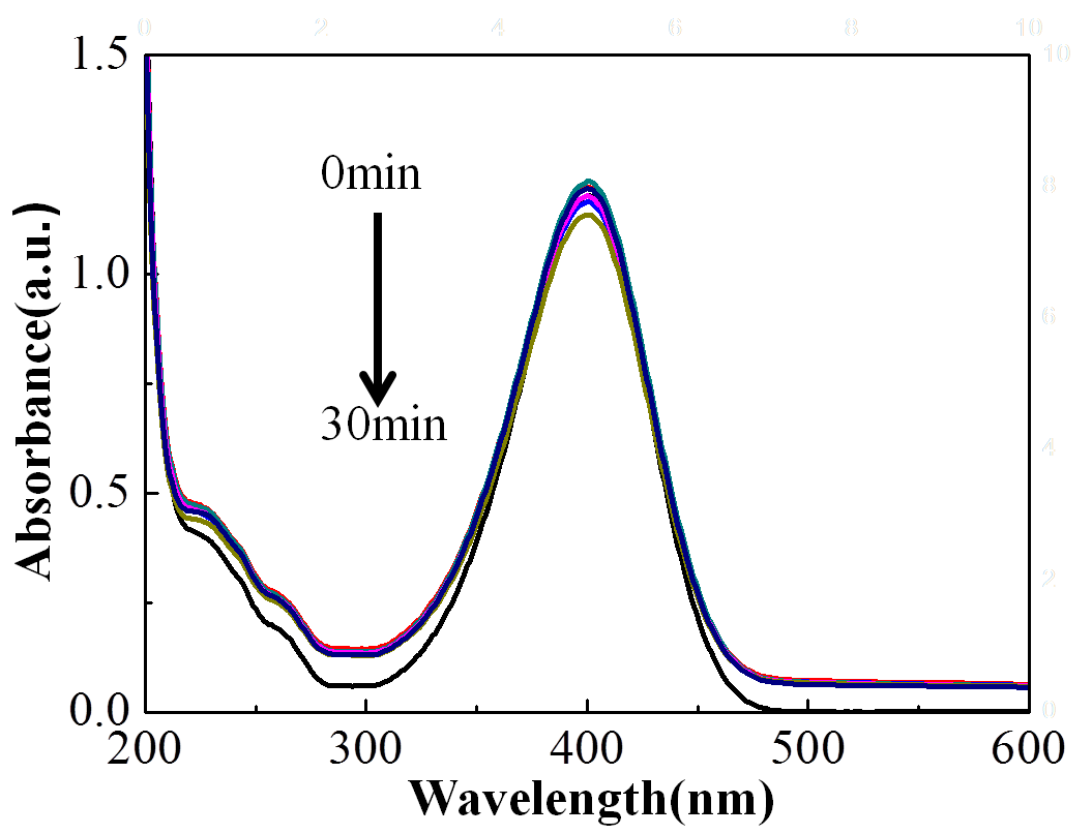Figure S3. UV/Vis absorption spectrum of 4-NP catalyzed by the Au NPs.

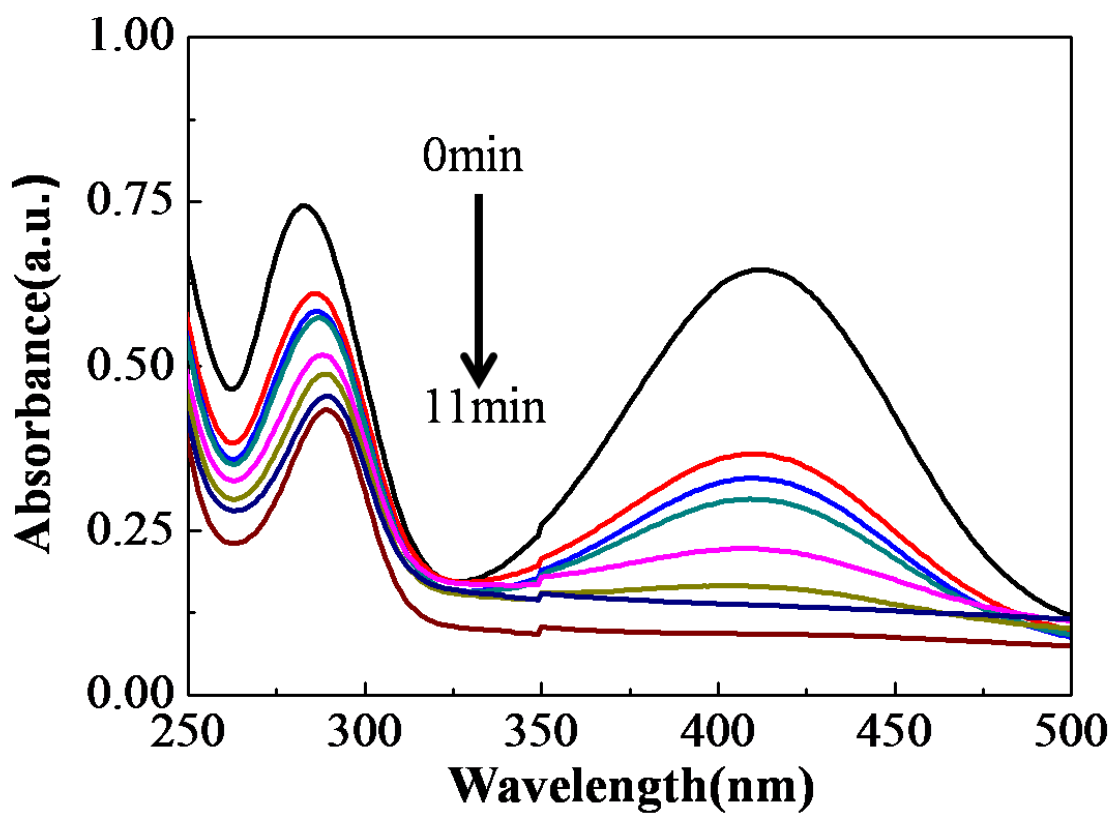Figure S4. UV/Vis absorption spectrum of 4-NP catalyzed by the $Fe_3O_4$ NPs.

Figure S5. UV/Vis absorption spectrum of 2-NA catalyzed by the Au-Fe$_3$O$_4$ hybrid NPs.
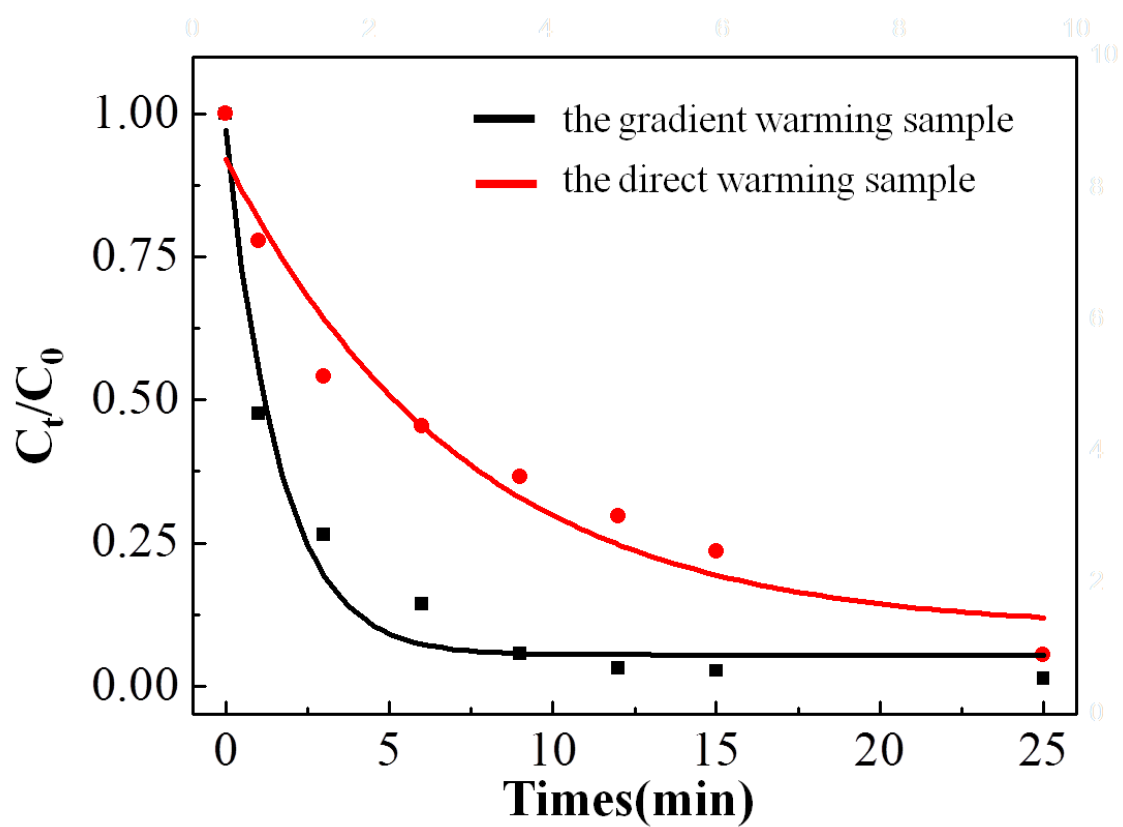
Figure S6. The $C_t/C_0$ concentration of the 4-NP catalyzed by the Au-Fe$_3$O$_4$ hybrid NPs under the gradient temperature or constant temperature, respectively.