

Supporting Information for *Journal Materials Chemistry A*

## Electronic Supporting Information

### **Fabrication of thermo-responsive polymer functionalized reduced graphene oxide@Fe<sub>3</sub>O<sub>4</sub>@Au magnetic nanocomposites for enhanced catalytic applications**

#### ***Preparation of Au NPs@ RGO@ Fe<sub>3</sub>O<sub>4</sub> and Au NPs@GO***

50 mg RGO@ Fe<sub>3</sub>O<sub>4</sub> or GO was first dispersed in 15 mL of ultrapure water. Then 2.5 mL of 0.01g mL<sup>-1</sup> HAuCl<sub>4</sub> was slowly added into the mixture and further reacted 2 h at room temperature. After 2 h under magnetic stirring, 1 mL NaBH<sub>4</sub> (0.144 M) solution was quickly added, and the stirring sustained for 24 h. The product was separated by a magnet and the supernatant was discarded, and then washed with ultrapure water and ethanol three times, and finally dried in vacuum.

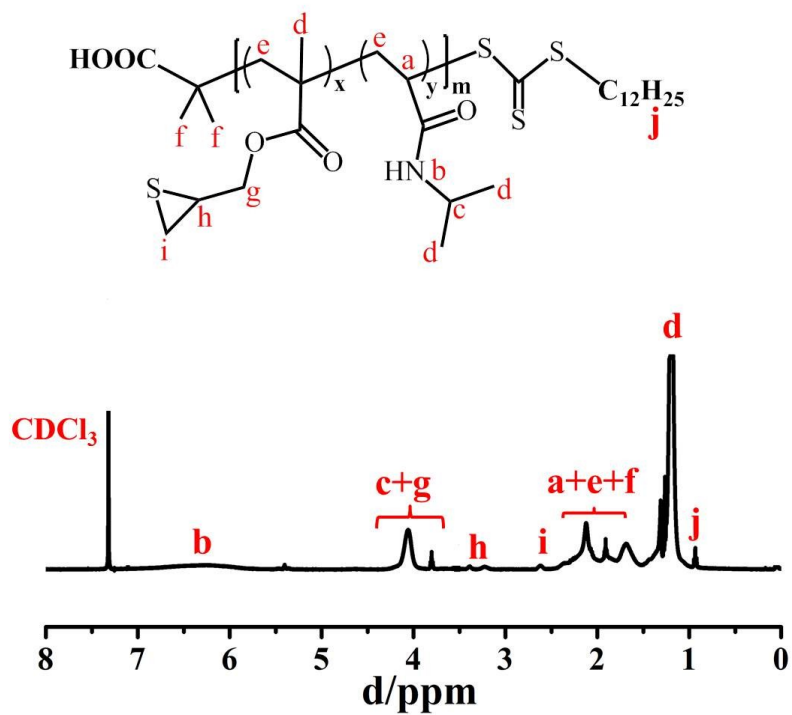


Fig. S1  $^1\text{H}$  NMR spectrum of P(NIPAM-co-ETMA)-CTA.



Fig.S2 Photograph of Au NPs@GFDP dispersed in aqueous solution after three weeks.

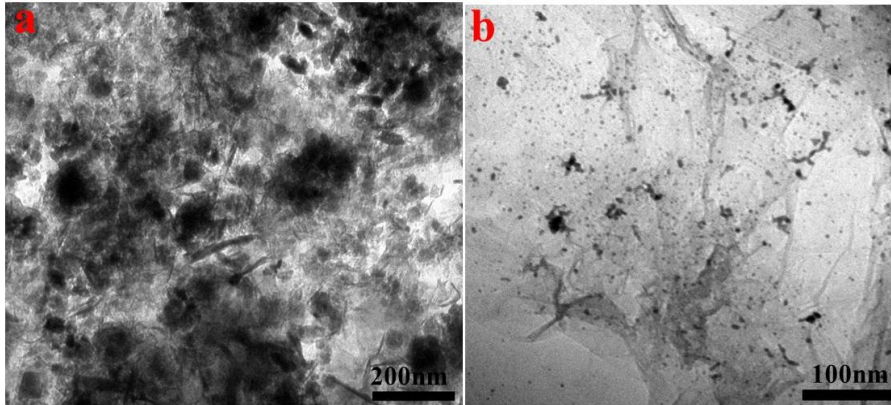


Fig. S3 TEM images of Au NPs@ RGO@ Fe<sub>3</sub>O<sub>4</sub> (a) and Au NPs@GO (b).

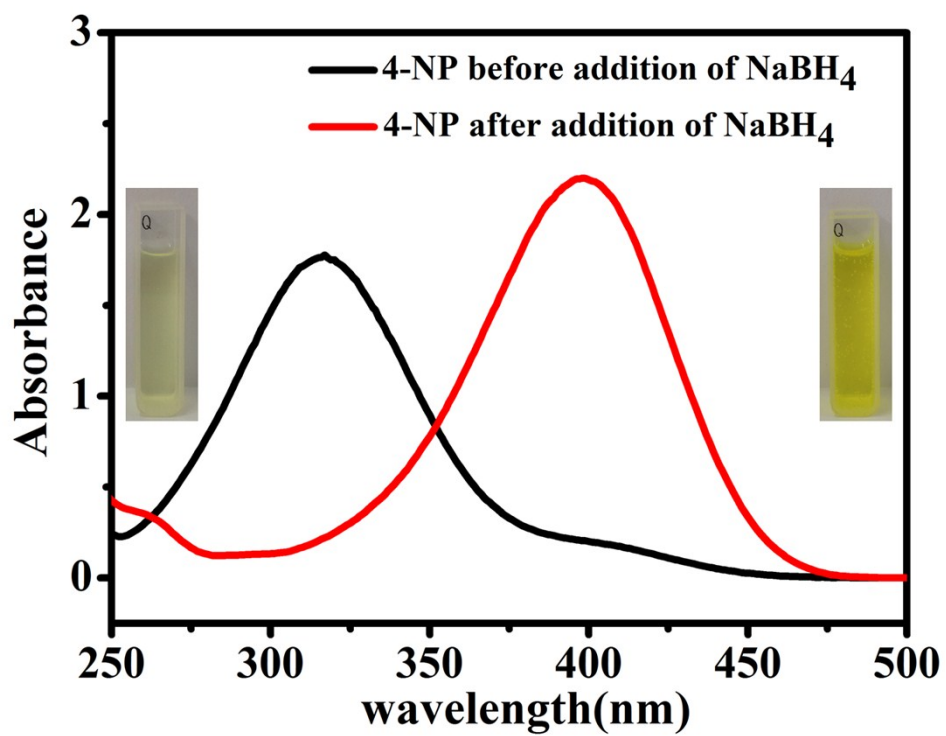


Fig. S4 UV-vis spectra of 4-nitrophenol solution before and after the addition of NaBH<sub>4</sub>.

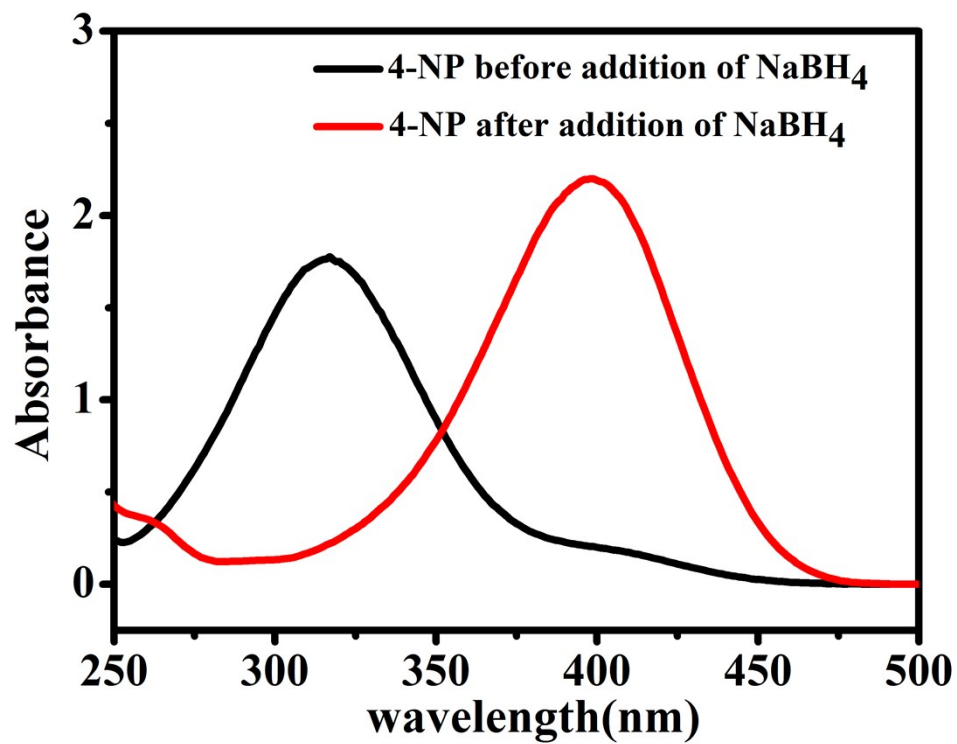


Fig. S5 UV-vis spectra of 4-nitrophenol solution with NaBH<sub>4</sub> without Au NPs@GFDP catalyst.

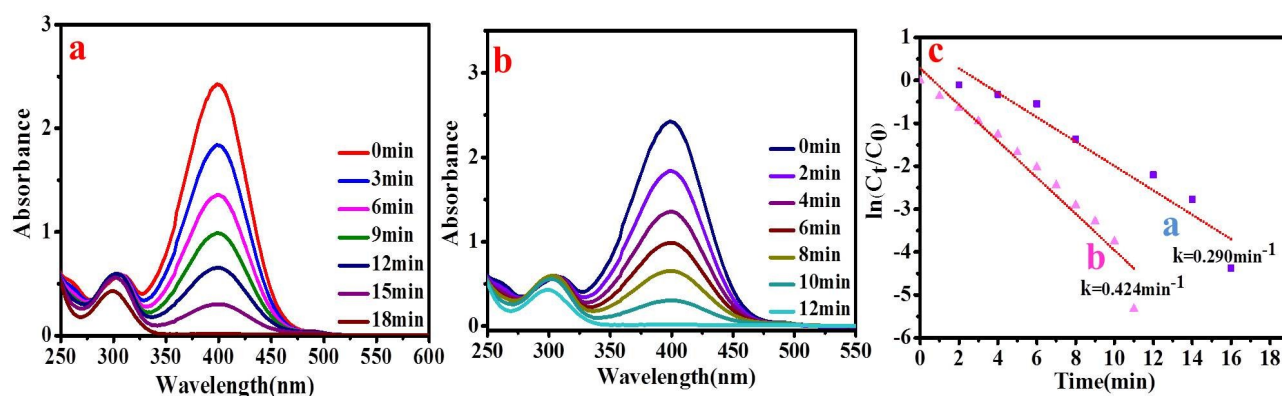


Fig. S6 Successive reductions of *p*-NP using (a) Au NPs@ RGO@ Fe<sub>3</sub>O<sub>4</sub> (4 mg) and AuNPs@GO (b) (4 mg), (c)  $\ln(C_t/C_0)$  vs reaction time (t) plots for Au NPs@ RGO@ Fe<sub>3</sub>O<sub>4</sub> (a)(4 mg) and Au NPs@GO (b) (4mg) catalysts.

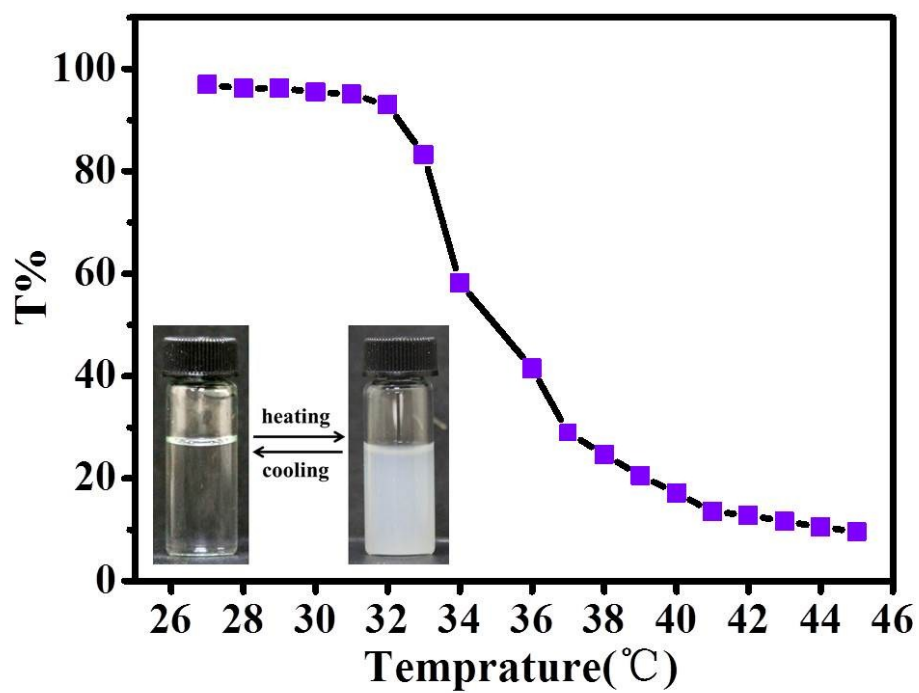


Fig.S7 Temperature dependence of optical transmittance at 550 nm for P(NIPAM<sub>52</sub>-co-ETMA<sub>10</sub>)<sub>62</sub>-CT.0.0A in water.



Table S1 Comparison of the ability of various catalysts for catalyzing the reduction of p-NP.

Samples	Support materials	$k$ (min <sup>-1</sup> )	TOF( h <sup>-1</sup> )	References
graphene/PDA–Au NPs	graphene/PDA	0.18	22.8	1
Au-PDA/RGO	PDA/RGO	0.012	42	2
Au/graphene	graphene	0.1902	12	3
GO/TWEEN 20-Au	GO/TWEEN 20	0.2537	126	4
Ag-Au-rGO	rGO	0.2082	152	5
Au NPs@GFDP	GFDP	0.665	439	In this work

## References

- 1 J. Luo, N. Zhang, R. Liu and X. Liu, *RSC Adv.*, 2014, 4, 64816-64824.
- 2 W. Ye, J. Yu, Y. Zhou, D. Gao, D. Wang, C. Wang and D. Xue, *Appl. Catal. B: Environ.*, 2016, 181, 371-378.
- 3 J. Li, C.-y. Liu and Y. Liu, *J. Mater. Chem.*, 2012, 22, 8426-8430.
- 4 W. Lu, R. Ning, X. Qin, Y. Zhang, G. Chang, S. Liu, Y. Luo and X. Sun, *J. Hazard. Mater.*, 2011, 197, 320-326.
- 5 H. K. R. P. Joshi, S. D.V, V. N. Bhoraskar and S. D. Dhole, *Appl. Surf. Sci.*, 2016, 389, 1050-1055.