

## Electronic Supplementary Information

### **A facile one-step solvothermal synthesis of graphene/rod-shaped TiO<sub>2</sub> nanocomposite and its improved photocatalytic activity**

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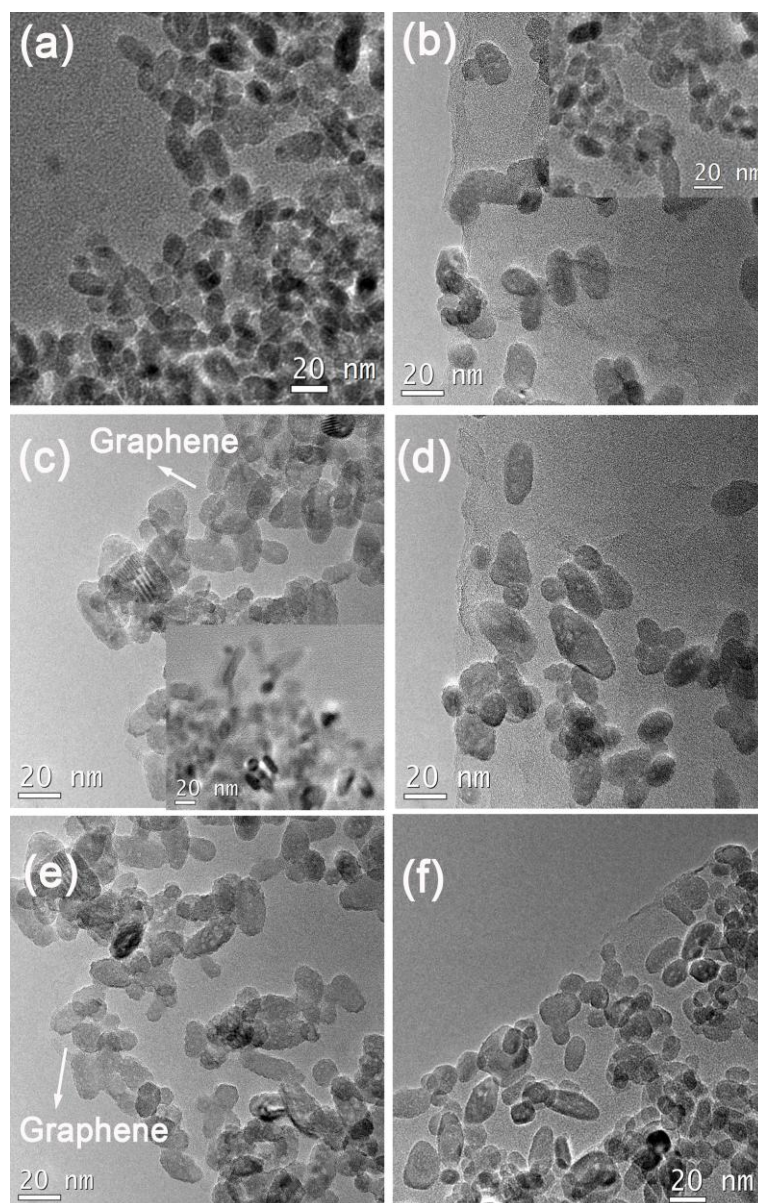


Fig. S1 TEM images of (a) the as-prepared pure rod-shaped TiO<sub>2</sub> nanocrystals, (b) 0.16% GR/RT, (c) 0.32% GR/RT, (d) 0.64% GR/RT, (e) 0.8% GR/RT, and (f) 1.6% GR/RT. The insets of (b) and (c) show the undecorated TiO<sub>2</sub>.

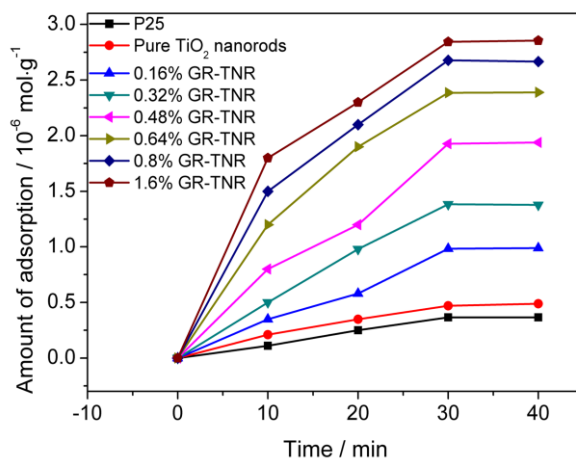


Fig. S2 The MO adsorption isotherms of P25, pure rod-shaped TiO<sub>2</sub> nanocrystals, and graphene/rod-shaped TiO<sub>2</sub> nanocomposites with various graphene contents.

The amounts of MO adsorbed were calculated as follows:

$$n(ads) = \frac{V \cdot \Delta C}{m_0 \cdot M} \quad (1)$$

where  $n(ads)$  is the number of moles of adsorbed MO per gram of photocatalyst,  $V$  is the volume (300 mL) of MO,  $\Delta C$  is the difference between the initial concentration ( $C_0$ , 10 g/mL) and remaining concentration ( $C_s$ , g/mL) of MO,  $m_0$  is the weight (0.02 g) of photocatalyst, and  $M$  is the molecular weight (327.5 g/mol) of MO.

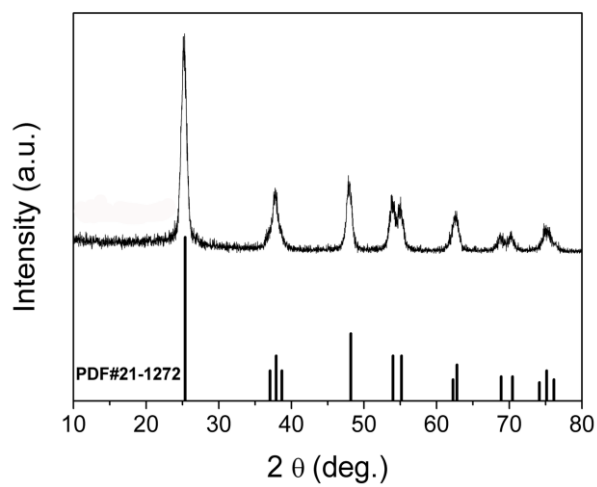


Fig. S3 XRD pattern of graphene/spherical TiO<sub>2</sub> nanocomposite with the graphene content of 0.48 wt%

The XRD pattern (Fig. S3) of graphene/spherical TiO<sub>2</sub> nanocomposite shows the anatase phase of TiO<sub>2</sub>.

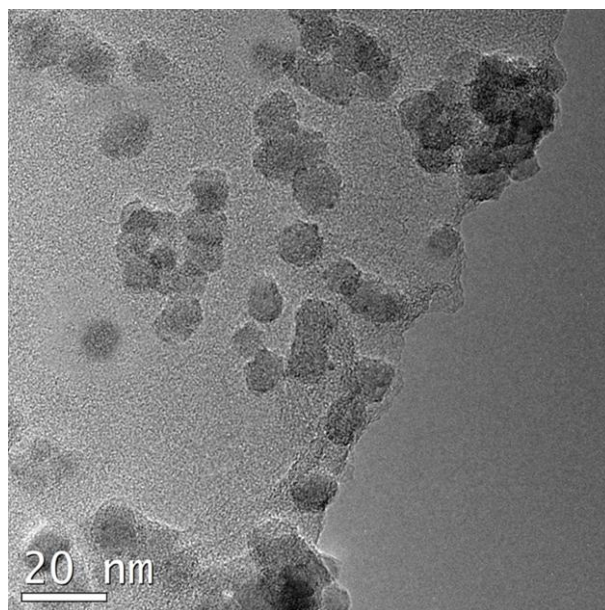


Fig. S4 TEM image of graphene/spherical TiO<sub>2</sub> nanocomposite with the graphene content of 0.48 wt%

Fig. S4 indicates the graphene/spherical TiO<sub>2</sub> nanocomposite was successfully prepared. The spherical nanoparticles with a mean size of 10 nm were dispersed on the graphene sheets. The small particle size of TiO<sub>2</sub> nanoparticles is favorable for the photocatalysis reaction.

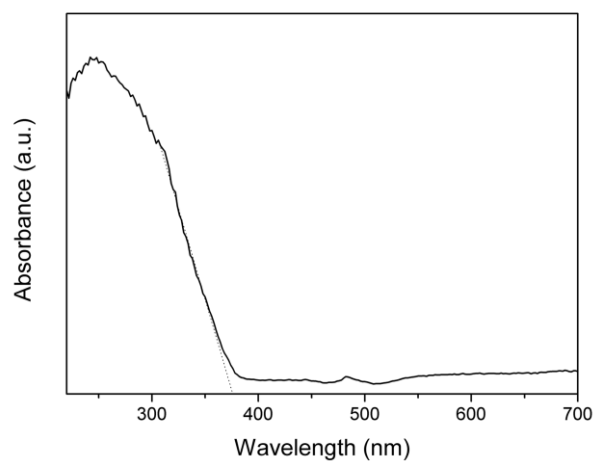


Fig. S5 UV-vis diffuse reflectance spectra of graphene/spherical TiO<sub>2</sub> nanocomposite with the graphene content of 0.48 wt%

Fig. S5 indicates the absorption edge of graphene/spherical TiO<sub>2</sub> nanocomposite is 382 nm.

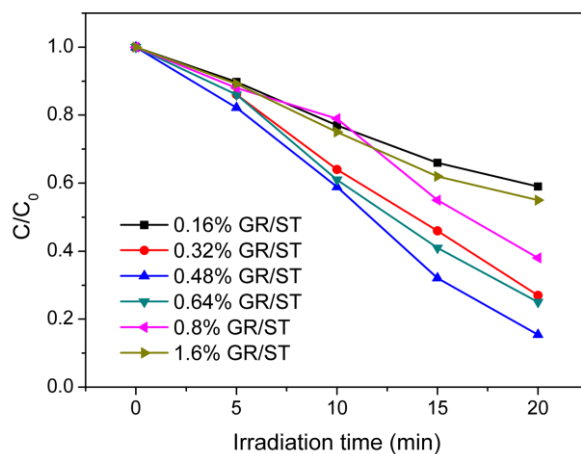


Fig. S6 Photocatalytic degradation of MO solution over graphene/spherical TiO<sub>2</sub> nanocomposites with various graphene contents.

The photocatalytic activity of graphene/spherical TiO<sub>2</sub> nanocomposites with various graphene contents was measured. The photocatalytic degradation efficiency follows the order 0.48% GR/ST > 0.64% GR/ST > 0.32% GR/ST > 0.8% GR/ST > 1.6% GR/ST > 0.16% GR/ST, as shown in Fig. S6. Obviously, the 0.48% GR/ST composite shows the best photocatalytic activity among these graphene/spherical TiO<sub>2</sub> nanocomposites.

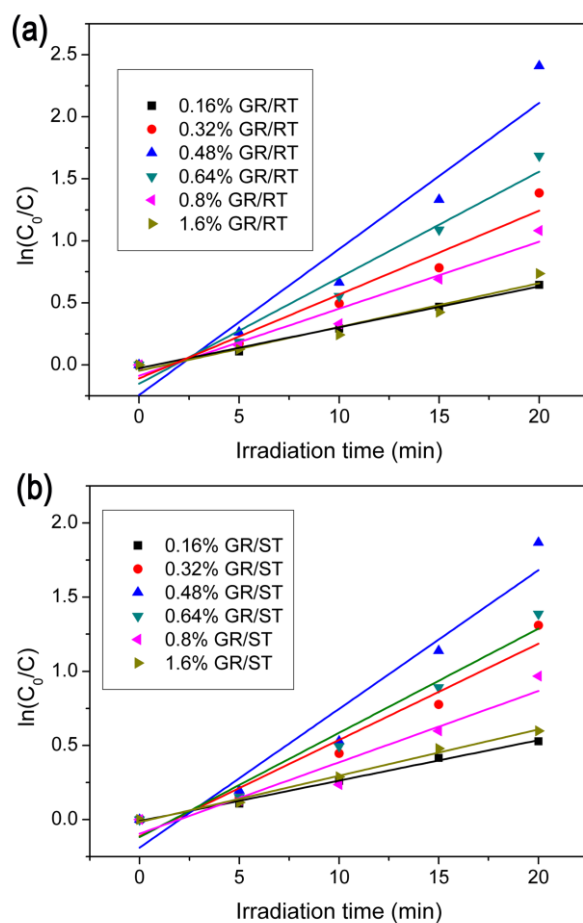


Fig. S7 Plots of  $\ln(C_0/C)$  versus irradiation time for (a) graphene/rod-shaped  $\text{TiO}_2$  nanocomposites and (b) graphene/spherical  $\text{TiO}_2$  nanocomposites.

On the basis of previous study by Wang et al., [1] the degradation of dyes can be ascribed to a pseudo-first order reaction with a Langmuir–Hinshelwood model when the concentration of dye solution is small:

$$\ln(C_0 / C) = kt \quad (2)$$

where  $C_0$  and  $C$  is the concentration of the primal and remaining dye solution, respectively,  $k$  is the apparent rate constant, and  $t$  is the irradiation time. As displayed in Fig. S7, good linear plots can be observed, indicating that all the reactions follow the first-order kinetics. The apparent rate constant ( $k, \text{min}^{-1}$ ) is determined from the slopes of  $\ln(C_0/C)$  versus irradiation

time. Higher slope indicates the faster rate of degradation. The apparent rate constant ( $k$ ) and standard error (SE) for graphene/rod-shaped  $\text{TiO}_2$  and graphene/spherical  $\text{TiO}_2$  nanocomposites are summarized in Table 2.

### Reference

- [1] X.H. Wang, J.G. Li, H. Kamiyama, Y. Moriyoshi and T. Ishigaki, *J. Phys. Chem. B*, 2006, **110**, 6804.