Supplementary Information

A facile one-pot route for the controllable growth of the small size and well-dispersed ZnO particles on GO-derived graphene

Qi Zhang, Chungui Tian*, Aiping Wu, Taixing Tan, Li Sun, Lei Wang, Honggang Fu*

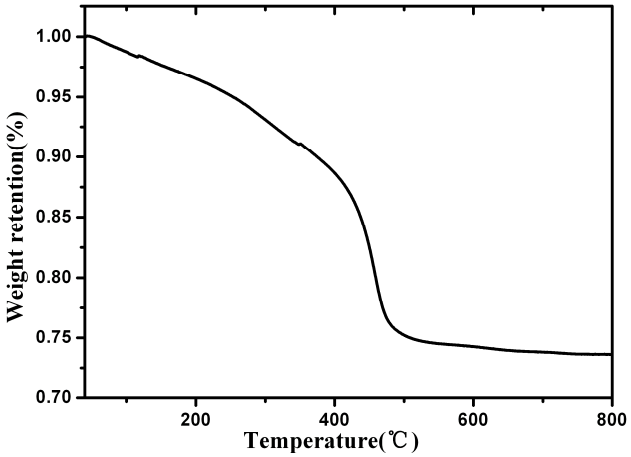

Fig. S1 TG curves for the as-formed ZnO/graphene composite

Thermogravimetric analysis was conducted to investigate the content of ZnO in the as-prepared ZnO/graphene composite in air. The weight loss of ~25% from 25 to 800 °C can be attributed to the loss of graphene in the hybrid composite. Therefore the TG data show that the graphene content is ~25%, the ZnO content is ~75% in the nanocomposite.

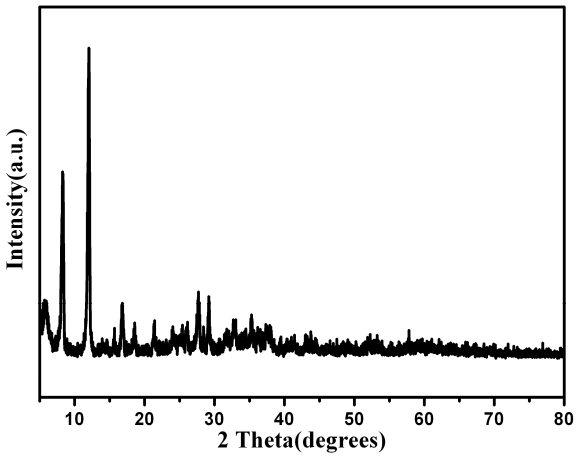

Fig. S2 XRD patterns of Zn-EG-Ac precursor

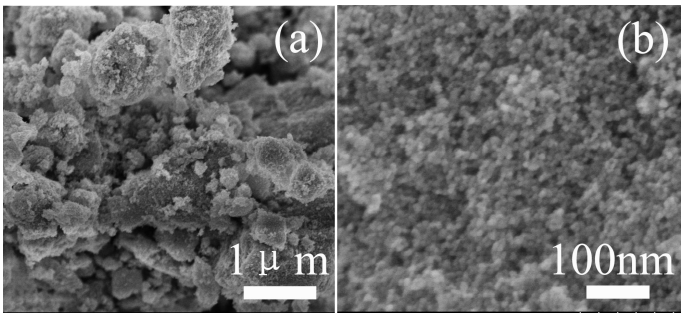

Fig. S3 SEM images of the ZnO prepared by the solvothermal treatment of Zn-EG-Ac in ethanol.

The SEM images show the obtained ZnO particles with only adding the zinc presursor in the ethanol-thermal reaction. Figure S3 (a) give the image of ZnO particles in the form of aggregation. From the magnified picture (Figure S3b), we can see the size of monomer is ~10nm, agree with the ZnO NPs in the ZnO/graphene composite. That is, the added GO can not affect on the emergement of ZnO NPs. In addition, with the help of useful groups, GO could be used as substrate to boost the formation of high-disperse ZnO nanoparticles.

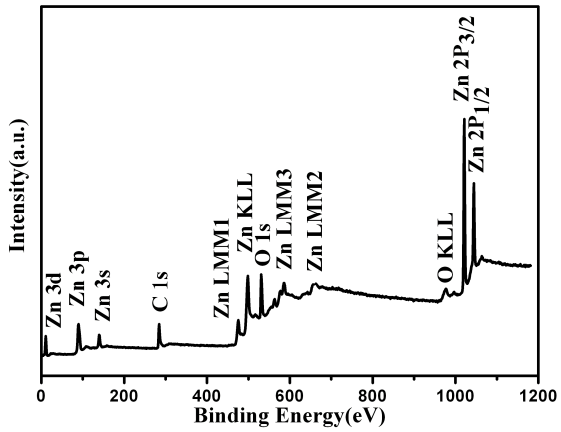

Fig. S4 XPS spectra of the as-prepared ZnO/graphene composite

Table S1 the relative content of the C species in the ZnO/graphene composite and GO

samples		C 1	C 2	C 3
ZnO/graphene composite	BE value	284.6	285.7	287.4
	Relative content	52.28	29.04	18.68
GO	BE value	284.6	286.8	288.3
	Relative content	41.58	46.46	11.96

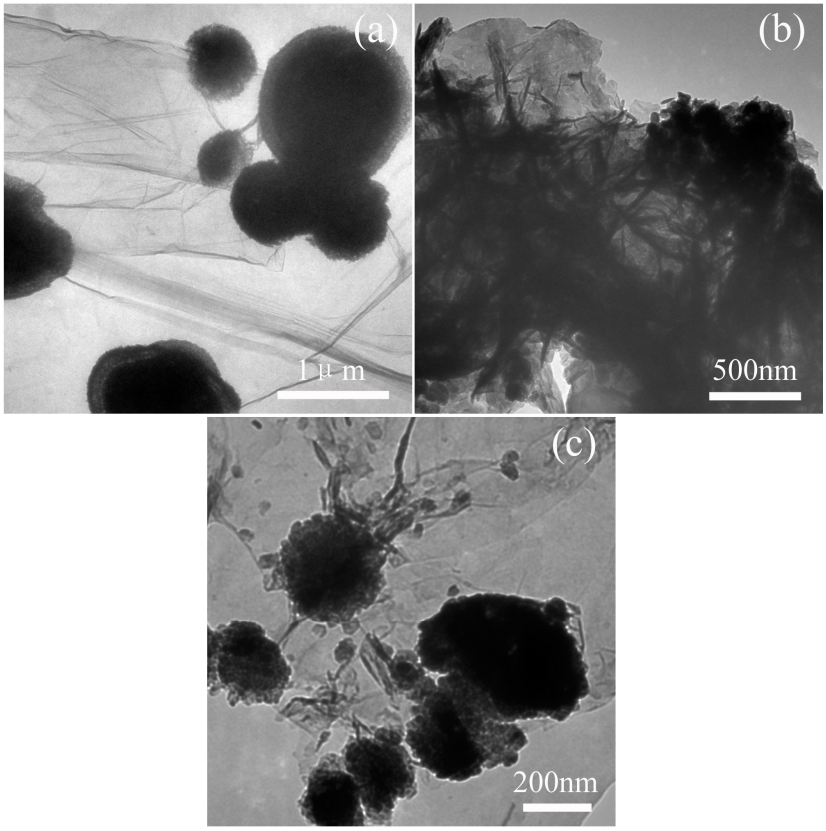

Fig. S5 TEM images of the ZnO/graphene composite prepared by replacing Zn-EG-Ac precursor with $Zn(Ac)_2 \cdot 2H_2O$ (a) and by replacing the ethanol solvent with water (b) and EG (c).

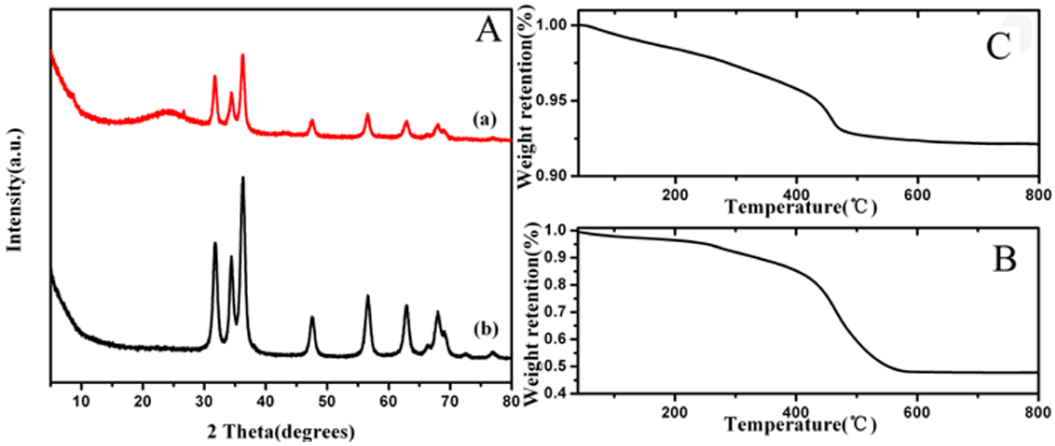

Fig. S6 A: XRD patterns of the ZnO/composite composite prepared by controlling the content of zinc precursor as (a) 0.1g (b) 0.2g, B: the corresponding TG curve of sample A (a), C: the corresponding TG curve of sample A (b)

The XRD patterns of A(a) show that, when the R value decrease (using 0.1g of Zn-EG-Ac), the ZnO content in the composite decrease from 75% reduce to 48% (Fig.

S6B). The peak around 23º belong to graphene is appear gradually. A tiny sharp peaks in 26.6 º, is also visualize, implying the aggregation of graphene layer. The XRD data agree with SEM result showed in Fig. 7(a) well. While increasing the R value, the ZnO content in the composite increase from 75% to 92% (Fig. S6C). At the same time, the intensity of peaks belong to ZnO is strengthen relatively, meaning the improved ZnO element in the composite.

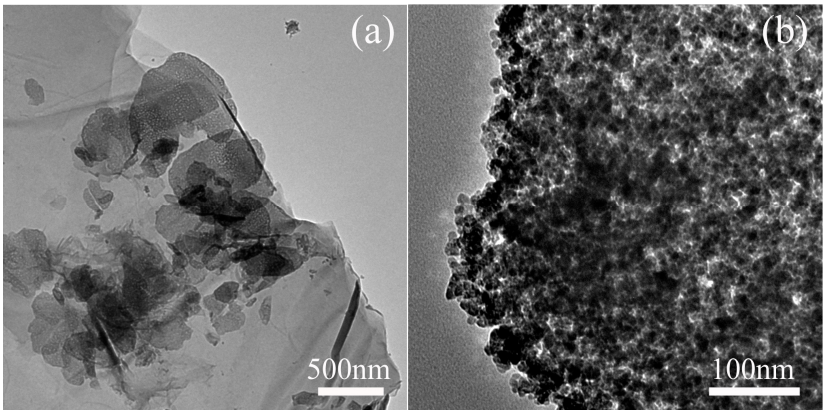

Fig. S7 TEM images of the ZnO/graphene composite formed by adjusting the content of zinc precursor as (a) 0.1g (b) 2g.

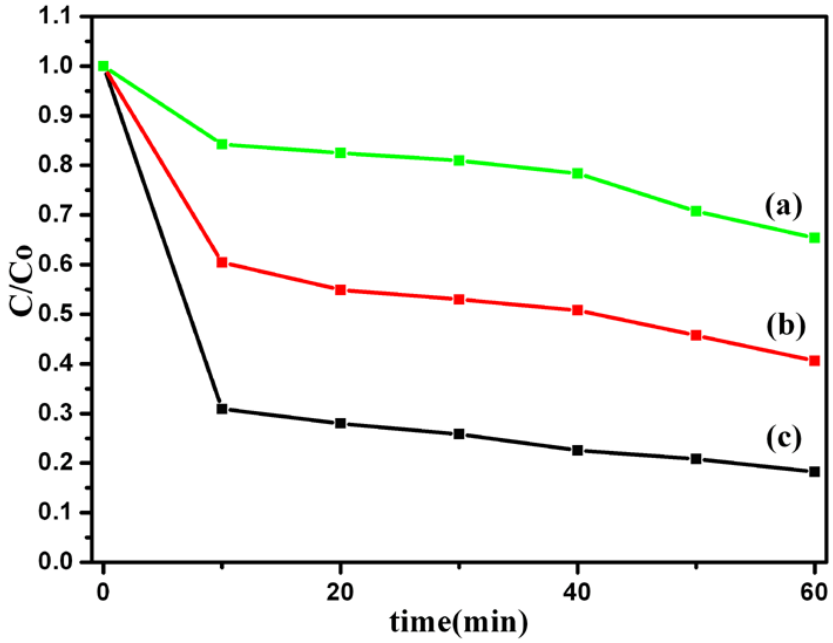

Fig. S8 photodegradation of RhB(10mg/L 40mL) under visible light over (a) ZnO nanoparticles (b) mixture of ZnO nanoparticles and graphene (c) the ZnO/graphene composite phtocatalysts, respectively.

We have also performed the photocatalytic test under visible light irradiation. The photocatalytic activity in visible light is showed in **Fig. S8**. In the case of visible light irradiation of 1h, the removal percentage of RhB dye is about 82%, 60% and 35% for the ZnO/graphene, mixture of ZnO+graphene and pure ZnO, respectively. We can seen that ZnO/graphene also show enhanced photocatalytic activity compared with pure ZnO and mixture of ZnO and graphene. The results further demonstrated the improved activity of the ZnO/graphene composite.