

Supporting information

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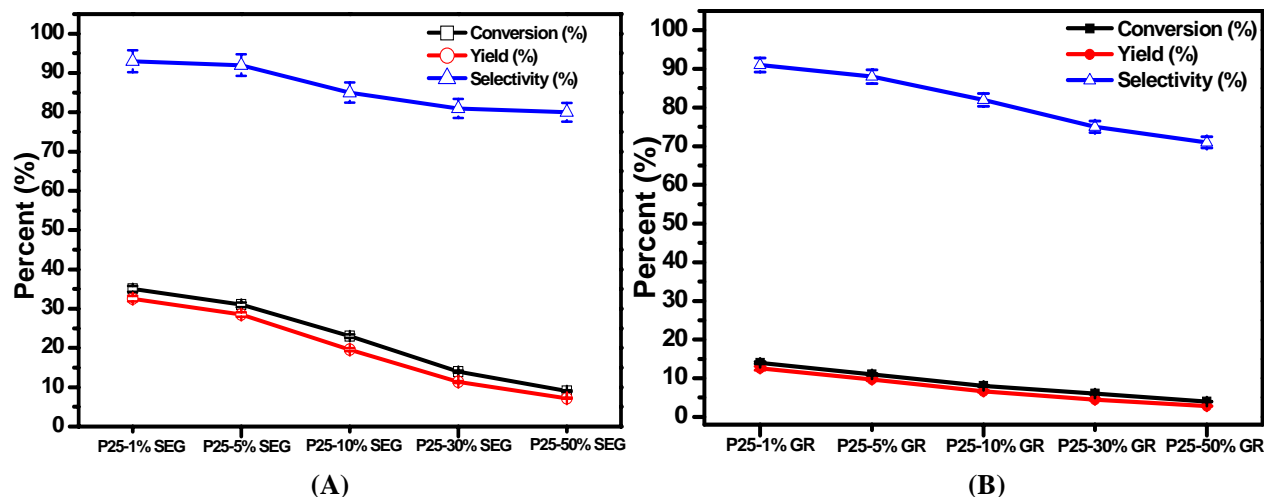


Figure S1. Photocatalytic activity of SEG-P25 (A) and GR-P25 (B) nanocomposites toward selective oxidation of benzyl alcohol to benzaldehyde under visible light irradiation of 4h.

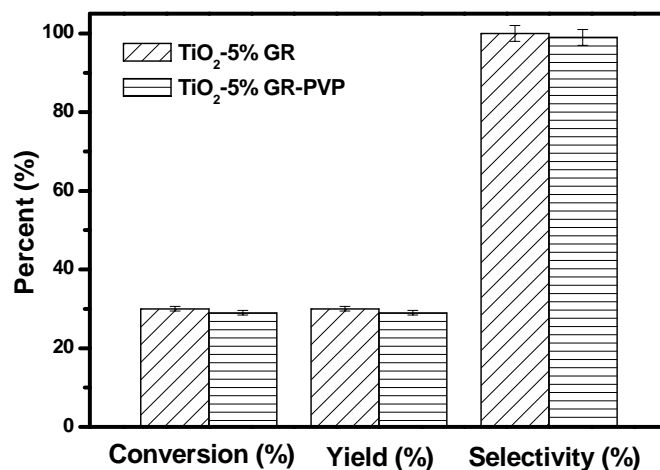


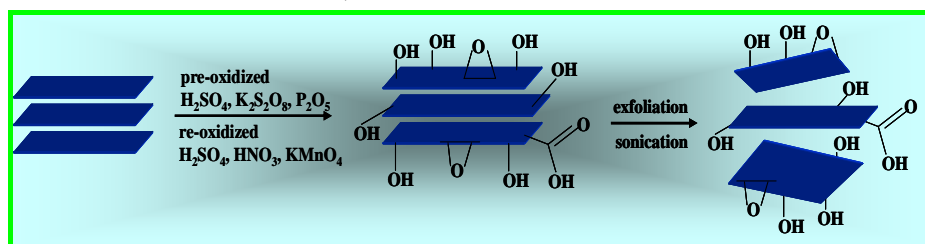
Figure S2. Contrast photocatalytic activity on investigating the influence of PVP modification toward selective oxidation of benzyl alcohol to benzaldehyde under visible light irradiation for 4 h over the photocatalyst of TiO₂-5% GR-PVP using PVP-modified GO as the precursor of GR.

Note: the preparation of TiO₂-5% GR-PVP nanocomposite is prepared using the similar approach to that of TiO₂-5% GR^{S1} using GO as the precursor of graphene except that GO is initially modified by PVP. The modification step by PVP is the same as that for PVP-modified SEG as described for the synthesis of SEG-TiO₂ nanocomposites in the section of catalyst preparation in the Experimental part of this work. It can be seen that the PVP modification plays a negligible effect on the photocatalytic performance of the nanocomposites of graphene and TiO₂.

Ref. S1: Y.Zhang, Z. R. Tang, X. Fu and Y. J. Xu, *ACS Nano*, 2011, **5**, 7426-7435.

Appendix. Synthesis of graphene oxide (GO) by a modified Hummers method

Graphene oxide (GO), the precursor of graphene (GR), was synthesized from natural graphite powder by a modified Hummers method, as illustrated in **Scheme 1**.



Scheme 1: The overall sketch for preparation of graphene oxide (GO).

Typically, 2 g of graphite powder (supplied from Sinopharm Chemical Reagent Co., Ltd., China) was put into a mixture of 12 mL of concentrated H_2SO_4 , 2.5 g of $\text{K}_2\text{S}_2\text{O}_8$, and 2.5 g of P_2O_5 . The solution was heated to 80°C in an oil-bath kept stirring for 24 h. The mixture was then carefully diluted with 500 mL of deionized (DI) water, filtered, and washed until the pH of rinse water became neutral. The product was dried under ambient condition overnight. This pre-oxidized graphite was then subjected to oxidation described as follows. In a typical procedure, pre-oxidized graphite powder was added to a mixture of 120 mL of concentrated H_2SO_4 and 30 mL HNO_3 under vigorous stirring, and the solution was cooled to 0°C . Then, 15 g of KMnO_4 was added gradually under stirring and the temperature of the mixture was kept to be below 20°C by cooling. Successively, the mixture was stirred at room temperature for 96 h, and then diluted with 1 L of DI water in an ice bath to keep the temperature below 50°C for 2 h. Shortly after the further diluted with 1 L of DI water, 20 mL of 30 % H_2O_2 was then added to the mixture and a brilliant yellow product was formed along with bubbling. The mixture was filtered and washed with 1:10 HCl aqueous solution to remove metal ions followed by DI water to remove the acid. The filter cake was then dispersed in water by a mechanical agitation. Low-speed centrifugation was done at 1000 rpm for 2 min. The supernatant then underwent two more high-speed centrifugation steps at 8000 rpm for 15 min to remove small GO pieces and water-soluble byproduct. The final sediment was redispersed in water with mechanical agitation or mild sonication using a table-top ultrasonic cleaner, giving a solution of exfoliated GO, which exhibits the brilliant yellow color.