Supporting information

Polyoxometalate Assisted Photoreduction of Graphene Oxide and Its Nanocomposite Formation

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1. Preparation of graphene oxide (GO).

Graphene oxide (GO) was oxidized from natural graphite flakes by a modified Hummers method. Graphite flakes (10 g) were put into a solution of concentrated H_2SO_4 (300 mL) and $NaNO_3$ (7.5 g). $KMnO_4$ (40 g) was slowly added to the reaction mixture over 1 h. The mixture was stirred at room temperature for 3 days. Afterwards, 1 L of H_2O_2 solution (1 % in water) was added to the dark brawn paste. Then, the mixture was filtered and washed with Ultrapure Milli-Q (MQ) water. The resulting black cake was re-suspended in MQ water to give a dark brown dispersion, which was subjected to dialysis for 2 weeks to remove residual salts and acids. The brown suspension was dried under vacuum. Exfoliation was carried out by sonicating the as-prepared black solid under ambient condition for 30 min. The resulting homogeneous brown dispersion was tested to be stable for several months and used for reduction.

2. Measurement instruments.

UV-vis absorption spectra were measured on a Perkin-Elmer Lambda 900 UV-vis spectrometer. Raman spectra were obtained by using a Bruker SENTERRA dispersive Raman microscope (λ = 532 nm). XPS spectra were measured on a Thermo escalab 250 XPS instrument. TEM images were obtained with a Zeiss EM 902 electron microscope (80KV with Henry-Casting Energy Filter). AFM images were recorded by using a Dimensional 3100 instrument. Conductivity measurements were performed on a standard four point-probe system with a Keithley 2400.

3. Supporting data.

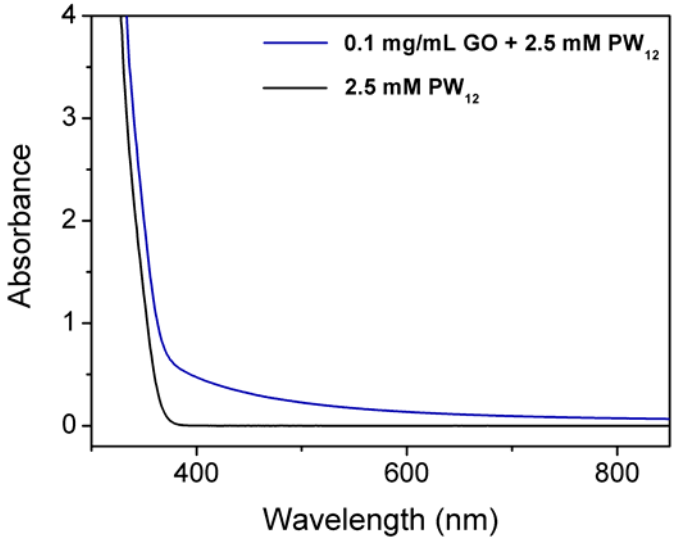

Fig. S1 UV-vis spectra of 2.5 mM PW_{12} aqueous solution (black line) and the aqueous solution containing both 0.1 mg/mL GO and 2.5 mM PW_{12} (blue line). All the solutions contain 0.25 mM isopropanol.

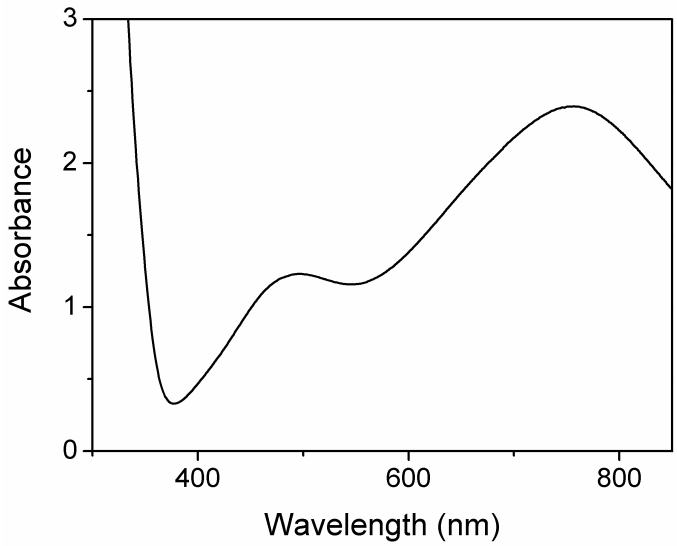

Fig. S2 UV-vis spectrum of an aqueous solution which contains 2.5 mM PW_{12} and 0.25 mM isopropanol after 10 min UV-irradiation.

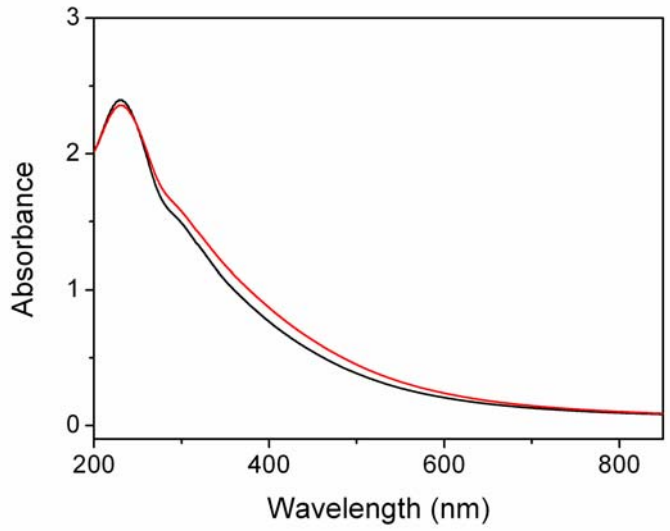

Fig. S3 UV-vis spectra of an aqueous solution which contains 0.1 mg/mL GO and 0.25 mM isopropanol before (black line) and after 10 min UV-irradiation (red line).

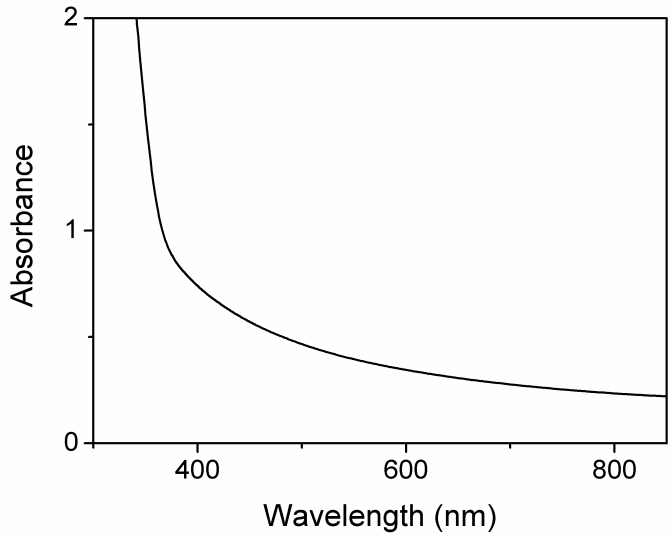

Fig. S4 UV-vis spectra of a reduced GO aqueous solution prepared by the indirect photoreduction method. Firstly, an aqueous solution which contains 5 mM PW_{12} and 0.25 mM isopropanol was irradiated by UV light for 10 min. A 0.2 mg/mL GO aqueous solution was added to the photoreduced solution for reduction. In the mixed solution, the concentrations of reduced PW_{12} and GO are 2.5 mM and 0.1 mg/mL, respectively. This is the same concentration as used in the direct photoreduction method.

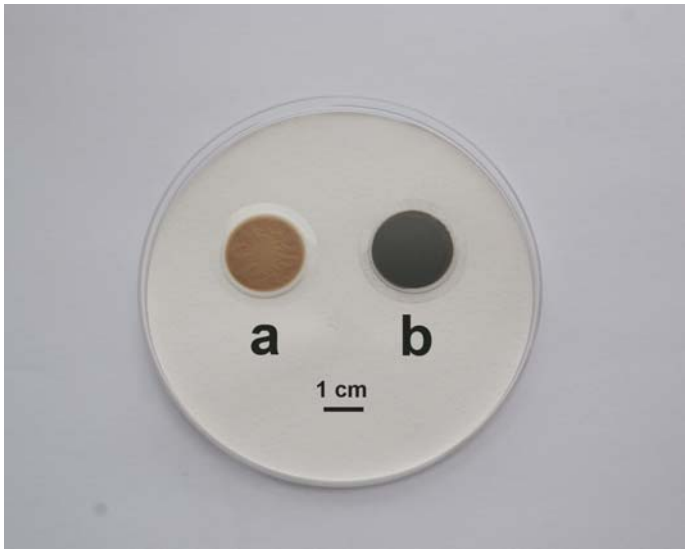

Fig. S5 Optical images of the thin papers of GO (a) and reduced GO prepared via 10 min PW_{12}-assisted photoreduction (b).