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$_2$SO$_4$ (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$_2$O$_2$ solution (1 % in water) was added to the dark brown 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.

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 ($\lambda = 532$ 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\textsubscript{12} aqueous solution (black line) and the aqueous solution containing both 0.1 mg/mL GO and 2.5 mM PW\textsubscript{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\textsubscript{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).