

Supplementary information for

**Photocatalytic chemoselective reduction of epoxides to alkenes along with
formation of ketones in alcoholic suspensions of silver-loaded titanium(IV) oxide at
room temperature without use of reducing gas**

Experimental

Preparation of TiO₂ and Ag/TiO₂

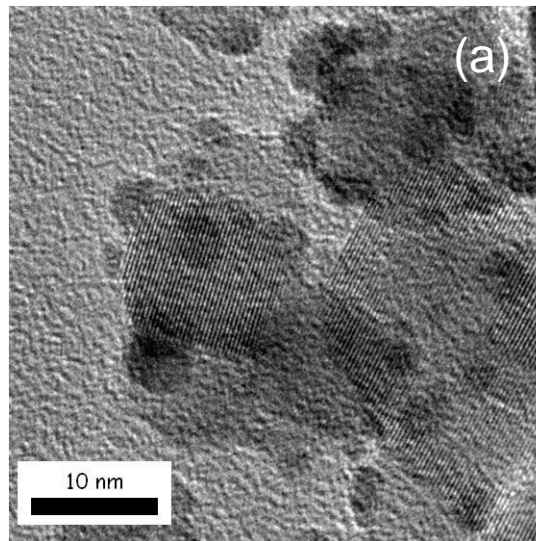
Nanocrystalline TiO₂ powder was prepared using the HyCOM (hydrothermal crystallization in organic media) method at 573 K.¹⁾ Titanium(IV) butoxide and toluene were used as the starting material and solvent, respectively. The product was calcined at various temperatures for 1 h in a box furnace. The crystallinity of HyCOM-TiO₂ samples was improved by calcination and the samples still possessed a large specific surface area of 102 m²g⁻¹ even after calcination at 723 K. Silver (Ag, mainly 1.5 wt%) as a co-catalyst was loaded on TiO₂ by using the photodeposition method. TiO₂ powder was suspended in 5 cm³ of an aqueous solution of silver nitrate in a test tube. The test tube was sealed with a rubber septum under argon (Ar) and then photoirradiated for 30 min at $\lambda > 300$ nm by a 400-W high-pressure mercury arc (Eiko-sha, Osaka) with magnetic stirring in a water bath continuously kept at 298 K. To complete Ag deposition onto the surface of TiO₂, 2-propanol (5 cm³) was injected into the mixture and the mixture was photoirradiated again for 90 min. The resulting powder was washed repeatedly with distilled water and dried for 1 h *in vacuo*.

Photocatalytic reaction

In a typical run, Ag-TiO₂ (50 mg) was suspended in 5 cm³ of 2-propanol containing 50 μ mol of EPB in a test tube, sealed with a rubber septum and then photoirradiated under Ar at 298 K with the same high-pressure mercury arc. The amounts of ALB and EPB were determined with an FID-type gas chromatograph equipped with a DB-1 column and acetone with a fused silica column. The amount of H₂ as the reduction product of proton (H⁺) was determined with a TCD-type gas chromatograph equipped with an MS-5A column. To obtain apparent quantum efficiency, a UV light-emitting diode (UV-LED, PJ-1505-2CA, CCS Inc., Kyoto,

maximum energy at $\lambda = 366$ nm) was used as the light source and the light intensity was determined using a spectroradiometer USR-45D (Ushio).

Results



Ag-average particle size: 2.4 nm

Standard deviation: 0.85 nm

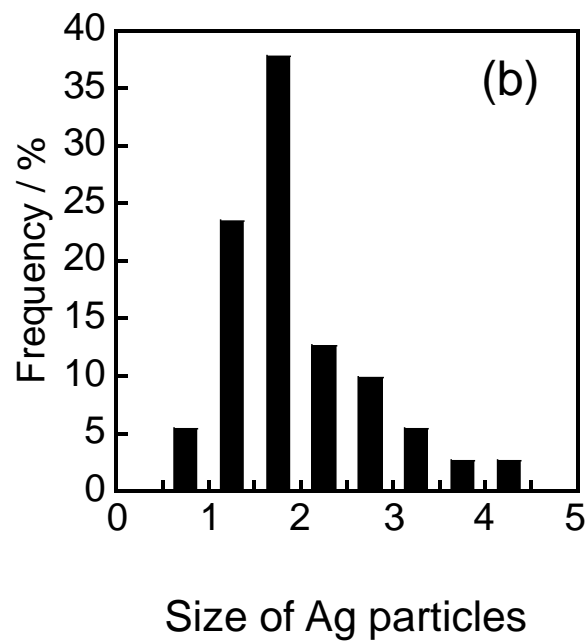


Figure S1 (a) A transmission electron microscope image and (b) Ag-particle size distribution of 1.5 wt% Ag-TiO₂.

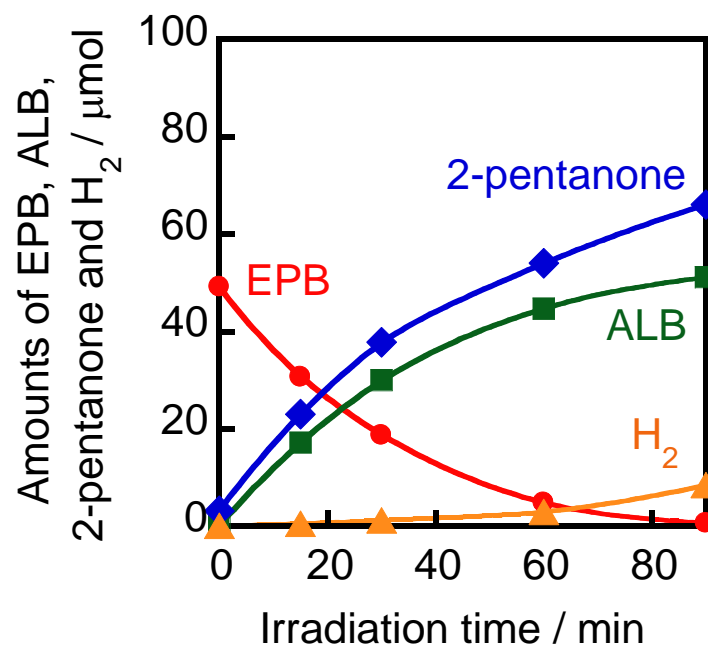


Figure S2 Time courses of the amounts of EPB, ALB, H₂ and 2-pentanone in a 2-pentanol suspension of 1.5 wt% Ag-TiO₂ photocatalyst under deaerated conditions.