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Supporting Information

Structure-controlled Porous Films of Nanoparticulate Rh-doped $SrTiO_3$ Photocatalyst toward Efficient H_2 Evolution under Visible-light Irradiation

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1. Experimental

Preparation of $SrTiO_3$ films

An aqueous solution containing both of $Sr(OAc)_2$ (1.08 mol/L) and lactic acid (2.16 mol/L) and the AA-sol were mixed at the ratio of Sr:Ti = 1.02:1.00, and stirred for 1 hour at room temperature, yielding an yellow transparent sol. The sol was added by an acrylic emulsion and stirred for 15 minutes at room temperature, then dried at 80°C for 3 hours, and finally calcined at 1000°C for 10 hours, yielding $SrTiO_3$ powders samples. As an effective cocatalyst for water reduction, small amount (0.5 wt%) of platinum particles were loaded on all the samples by mean of in-situ photodeposition method.

The $SrTiO_3$ films were prepared by following process. The $SrTiO_3$-particles were first dispersed in methanol solution and then mixed with organic compounds (terpineol:butylcarbitol:ethylcellulose = 1:2:2) as vehicles, yielding the paste of $SrTiO_3$-particles (ca. 20 wt%) having an appropriate viscosity for printing. The films were prepared by screen-printing using pastes of $SrTiO_3$-particles, followed by calcinations at 500˚C for 30 min.

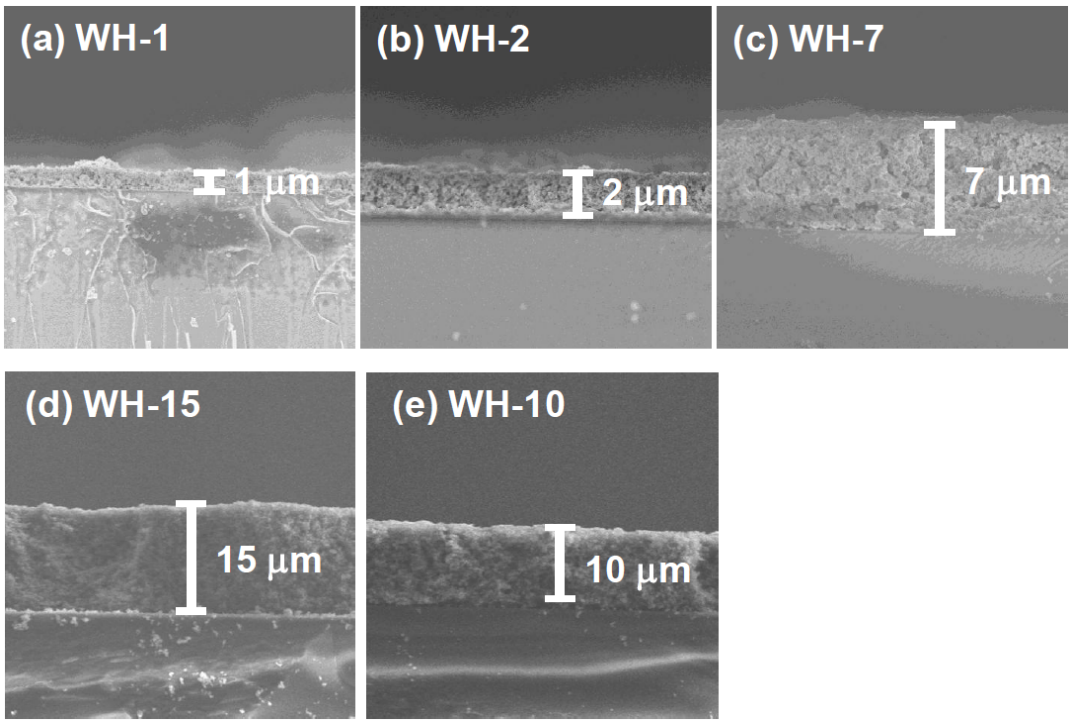

Fig. S1 Cross-sectional SEM images of WH-films.

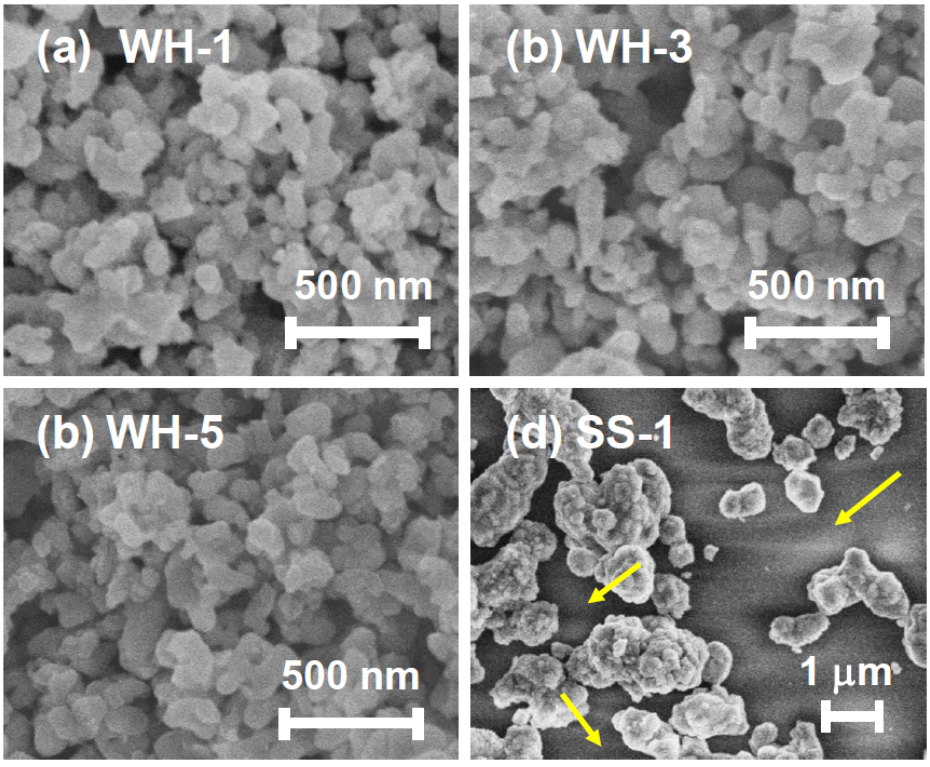

Fig. S2 Surface SEM images of WH- and SS-films.

Yellow arrowed lines show the uncovered parts of substrate.

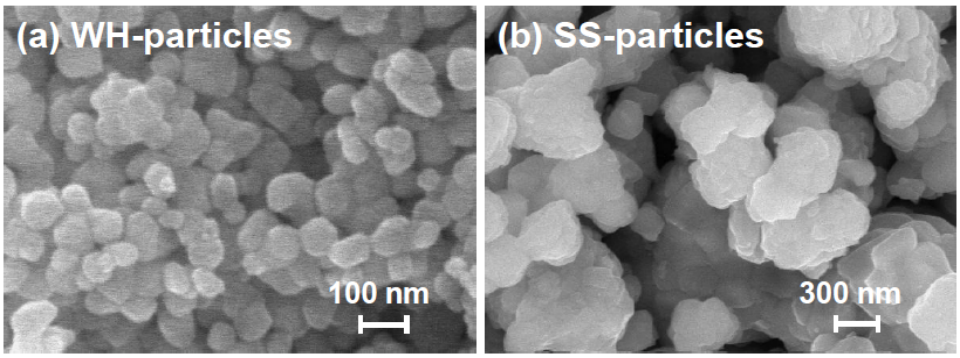

Fig. S3 SEM images of $SrTiO_3$:Rh particles ((a) WH-particles, (b) SS-particles)).

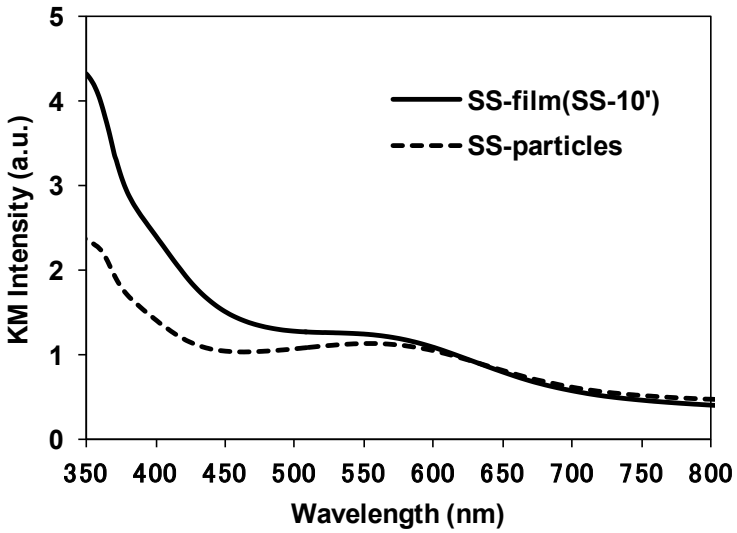

Fig. S4 UV-vis spectra of $SrTiO_3$:Rh films (SS-10') and $SrTiO_3$:Rh particles (SS-particles).

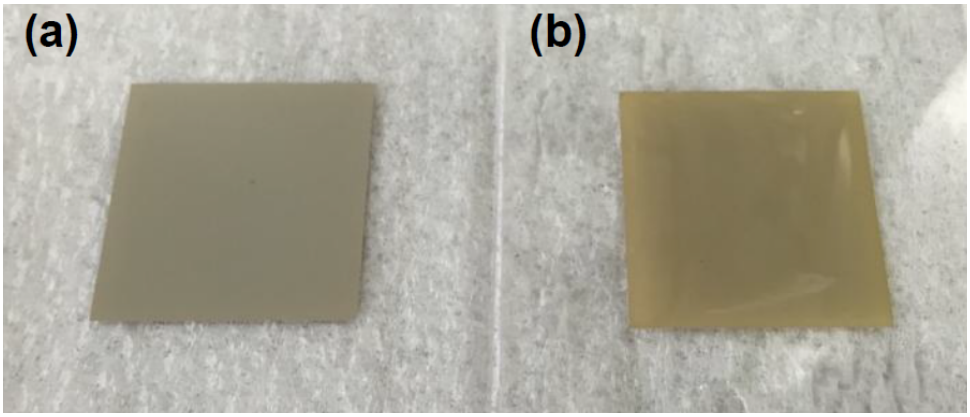

Fig. S5 Picture of WH-10' (a) before and (b) after photocatalytic reaction.

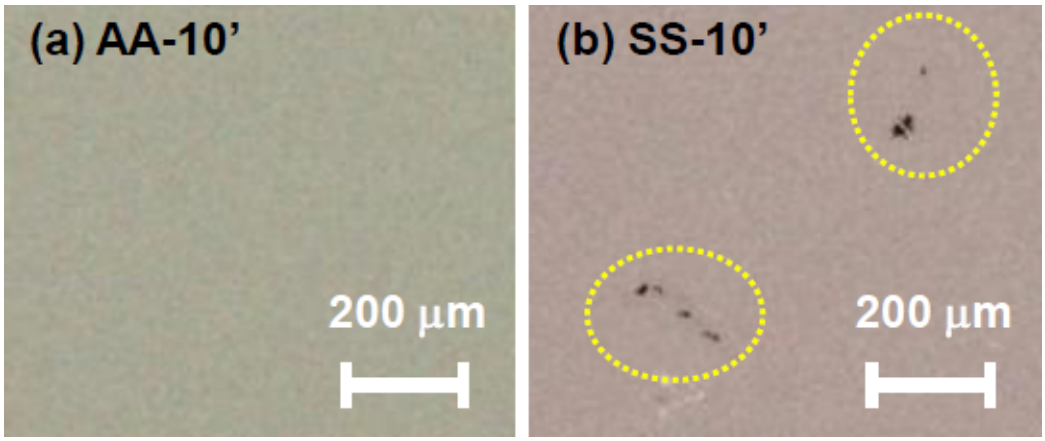

Fig.S6 Optical microscope images of $SrTiO_3$:Rh films ((a) WH-10' or (b) SS-10') after photocatalytic reaction.

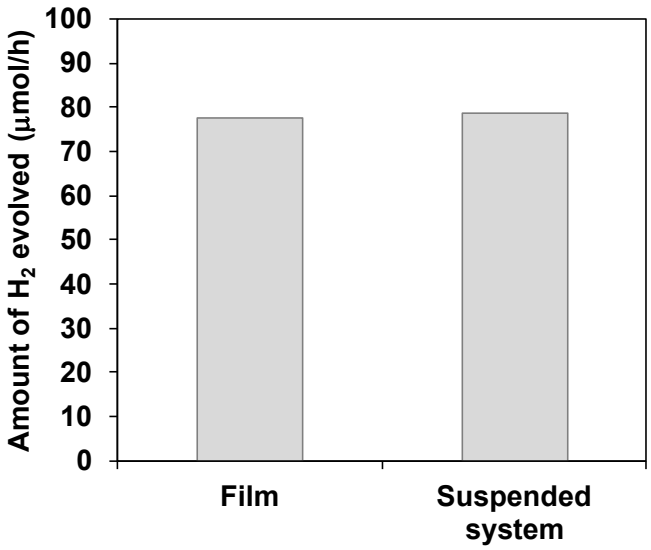

Fig.S7 Rate of H_2 evolution from an aqueous methanol solution under visible light irradiation on a $SrTiO_3$ film and from a $SrTiO_3$-suspended system containing $SrTiO_3$ particles with the same amount as the film contains.

Conditions: 3×3 cm film with 10 μm thickness, 16 mg particles; reactant solution, 100 mL of 10 vol% aqueous methanol solution; light source, 300 W Xe lamp without cut-off filters.

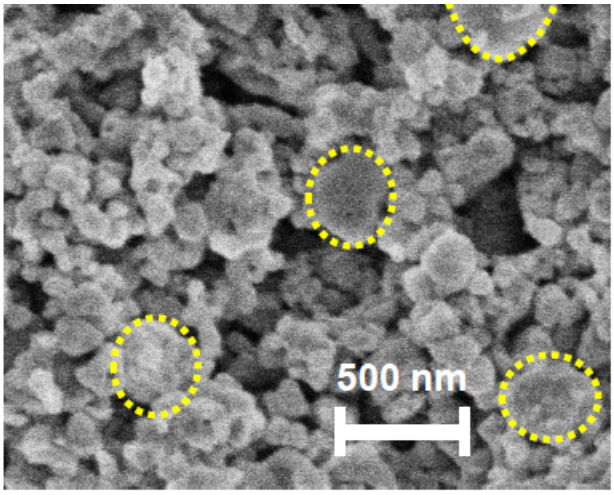

Fig. S8 SEM images of $SrTiO_3$:Rh film (WH+20-SS) prepared with a mixture of WH- and SS-particles (SS/(WH+SS) = 20 (wt%)) Yellow dashed line shows the SS-particles.