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Supplementary information for

Preparation of Au/TiO_2 exhibiting strong surface plasmon resonance effective for photoinduced hydrogen formation from organic and inorganic compounds under irradiation of visible light

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Experimental Section

Preparation of Au/TiO_2

Nanocrystalline TiO_2 powder was prepared using the HyCOM method at 573 K.[6)] Titanium(IV) butoxide and toluene were used as the starting material and solvent, respectively. The product was calcined at 723 K for 2 h a box furnace. The crystallinity of HyCOM-TiO_2 sample was improved on calcination and the samples still possessed large specific surface area of 97 m^2g^{-1} even after calcination at 723 K. Loading of 1.0 wt% Au on TiO_2 was performed by the photodeposition method. The TiO_2 powder (198 mg) was suspended in 10 cm^3 of an aqueous solutions of methanol (50 vol%) in a test tube and the test tube was sealed with a rubber septum under argon (Ar). An aqueous solution of tetrachloroauric acid ($HAuCl_4$ as 0.25 wt% Au) was injected into the sealed test tube and then photoirradiated at λ>300 nm by a 400-W high-pressure mercury arc (Eiko-sha, Osaka) with magnetic stirring in a water bath

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continuously kept at 298 K. The Au source was reduced by photogenerated electrons, and Au metal was deposited on TiO_2 particles. Analysis of the liquid phase after each photodeposition revealed that the Au source had been almost completely (>99.9%) deposited as Au on the TiO_2 particles. The resultant powder was washed repeatedly with distilled water and then dried at 310 K overnight under air. This photodeposition of Au was repeated twice, third times and four times to obtain 0.50, 0.75 and 1.00 wt% Au/TiO_2 samples, respectively (multi-step photodeposition method). When an aqueous solution of $HAuCl_4$ corresponding to 1.0 wt% Au was injected and then photoirradiated, the Au source was almost completely (>99.9%) deposited as Au on the TiO_2 particles (single-step photodeposition method).

Photoinduced hydrogen formation from alcohols in aqueous suspensions of Au/TiO_2 under visible light irradiation

The dried Au/TiO_2 powder (50 mg) was suspended in 50 vol% alcohol-water solution (5 cm^3), bubbled with Ar, and sealed with a rubber septum. The suspension was irradiated with visible light of a 500 W xenon (Xe) lamp (Ushio, Tokyo) filtered with a Y-48 filter (AGC Techno Glass) (450-600 nm: 83 mW cm^{-2}) with magnetic stirring in a water bath continuously kept at 298 K. The amount of H_2 in the gas phase and the amount of oxidized products in the liquid phase were measured using gas chromatographs.

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Results and discussion

Size distribution diagram of the Au nanoparticles

Figure S1 shows particle size distribution of Au in MS-(1.0)Au/TiO_2 obtained from the TEM photograph. Bimodal particle distribution was clearly observed in the sample.

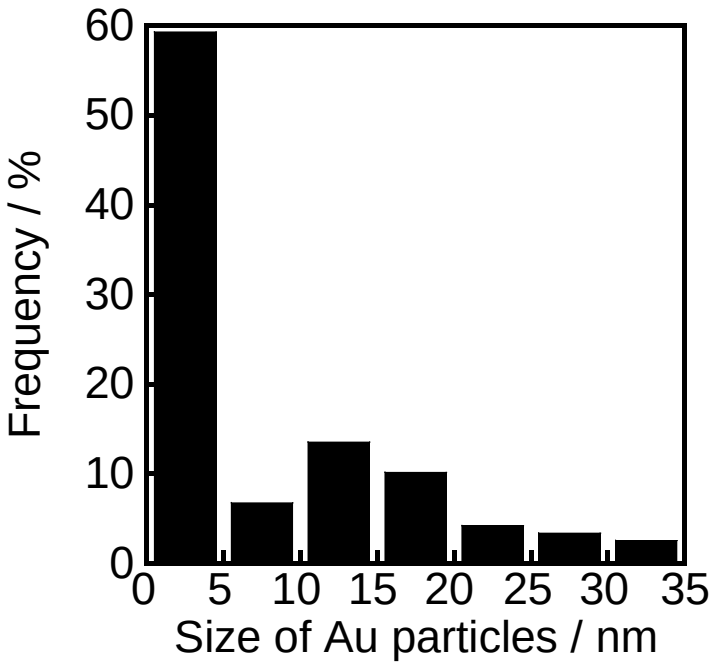

Figure S1 Particle size distribution of MS-(1.00)Au/TiO_2.