Supporting Information for

Photocatalytic hydrogen peroxide production with an external quantum yield of almost 500%

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Table of Contents

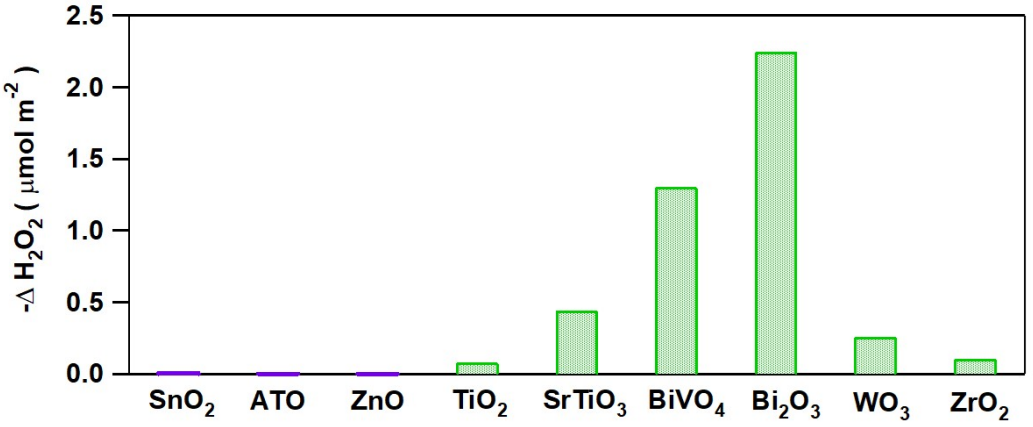

Fig. S1. Reduced amounts of H_2O_2 in the solution (0.1 mM, 10 mL) with various metal oxide particles (100 mg) at 298 K.

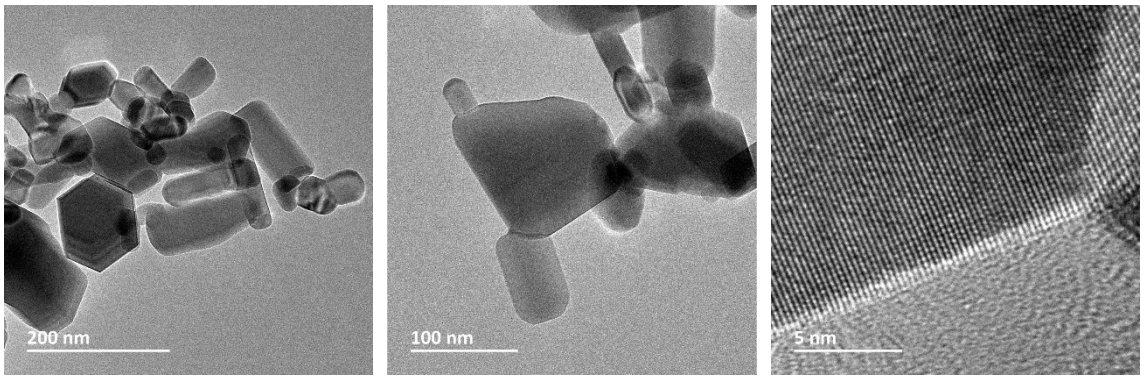

Fig. S2. TEM images of ZnO particles observed at different magnifications.

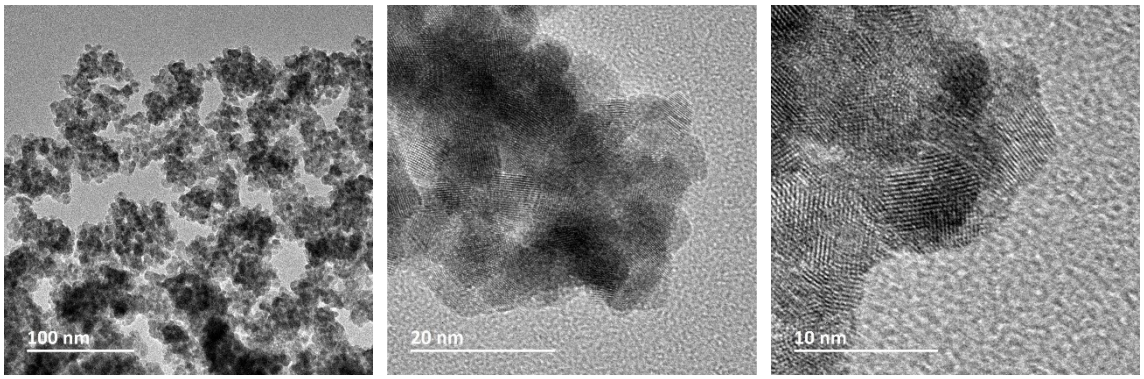

Fig. S3. TEM images of ATO particles observed at different magnifications.

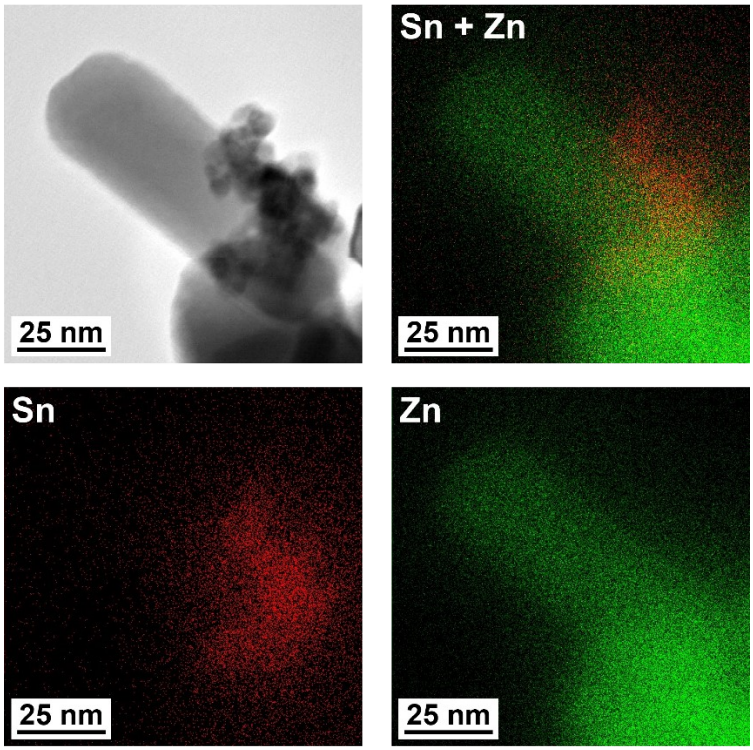

Fig. S4. TEM-EDS analysis for ht-ATO-CL/ZnO particles.

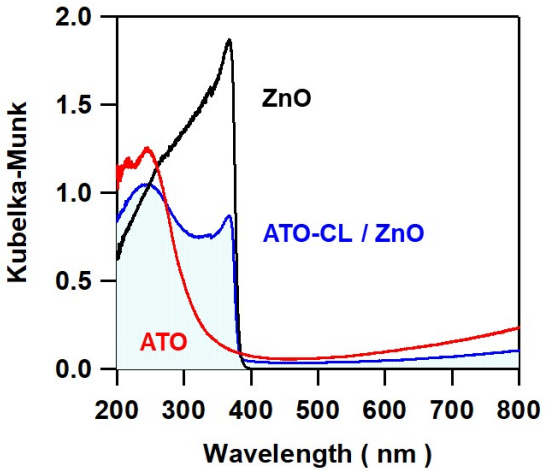

Fig. S5. Kubelka-Munk-transformed UV-Vis-NIR absorption spectra of ZnO, ATO, and ATO-CL(100)/ZnO(50).

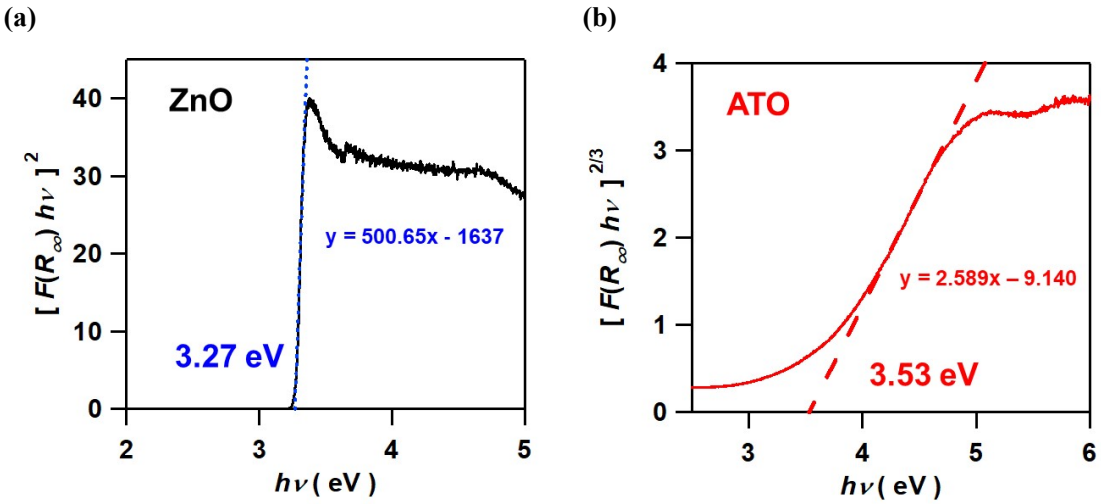

Fig. S6. Tauc plots of ZnO (a) and ATO (b).

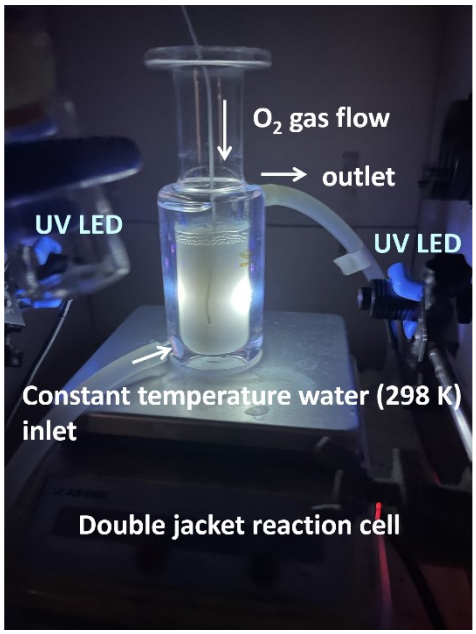

Fig. S7. Photo of the reactor used for photocatalytic H_2O_2 production.

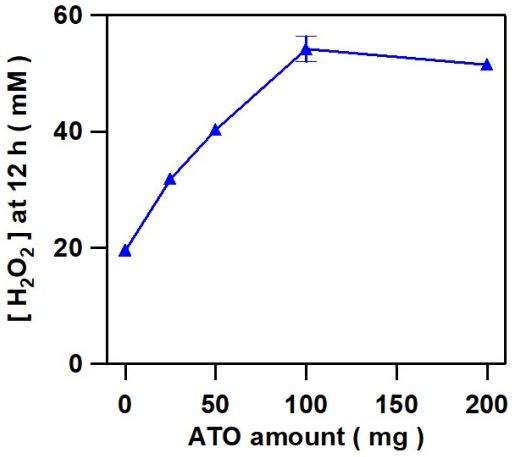

Fig. S8. Plots of the H_2O_2 concentration generated after 12 h irradiation vs. ATO content. The values in the abscissa show the *x* values with the *y* value fixed at 50 mg.

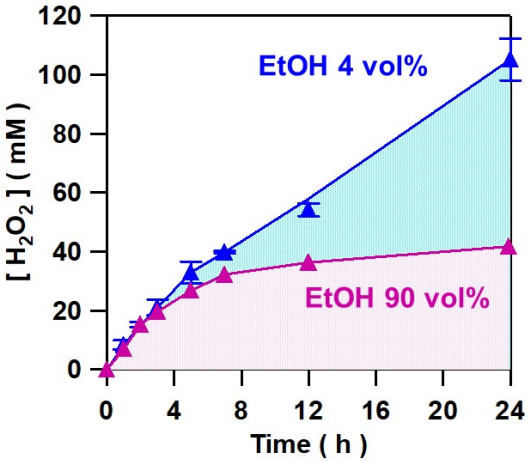

Fig. S9. Time courses for H_2O_2 generation from 4 vol% and 90 vol% ethanol aqueous solutions (pH 6.4, 50 mL) in the ATO-CL(100)/ZnO(50) system under UV-light irradiation (λ = 365 nm) using two LED lamps (each light intensity = 120 mW cm^{-2}).

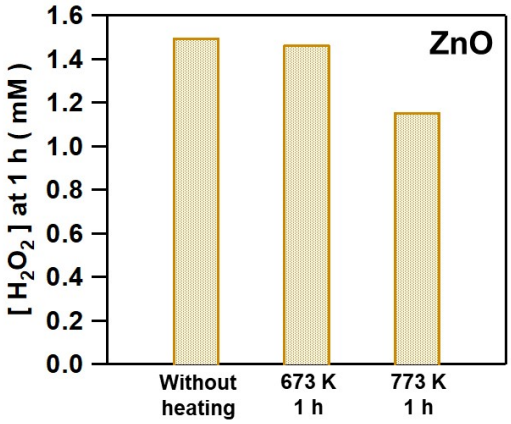

Fig. S10. Concentration of H_2O_2 generated after 1 h from an O_2-saturated 4 vol% EtOH solution (50 mL) with ZnO particles (50 mg) under UV-light irradiation (λ = 365 nm) using two LED lamps (each light intensity = 120 mW cm^{-2}).

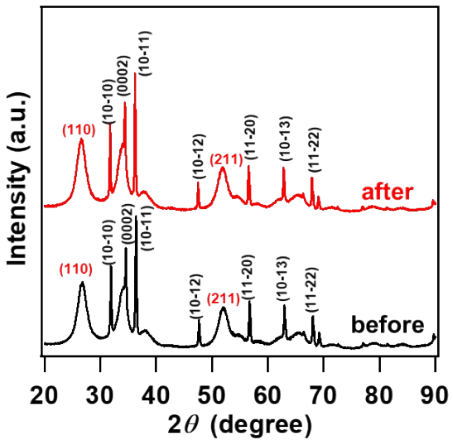

Fig. S11. XRD patterns of ht-ATO-CL(100)/ZnO_2(50) before and after 24 h reaction under UV-light irradiation (λ = 365 nm) using two LED lamps (each light intensity = 120 mW cm^{-2}).

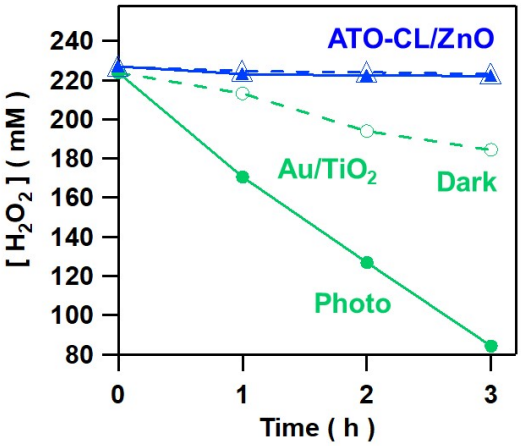

Fig. S12. Time courses for the H_2O_2 concentration in the presence of Au/TiO_2 and ATO-CL(100)/ZnO_2(50) in dark and under UV-light irradiation (λ = 365 nm) using two LED lamps (each light intensity = 120 mW cm^{-2}).

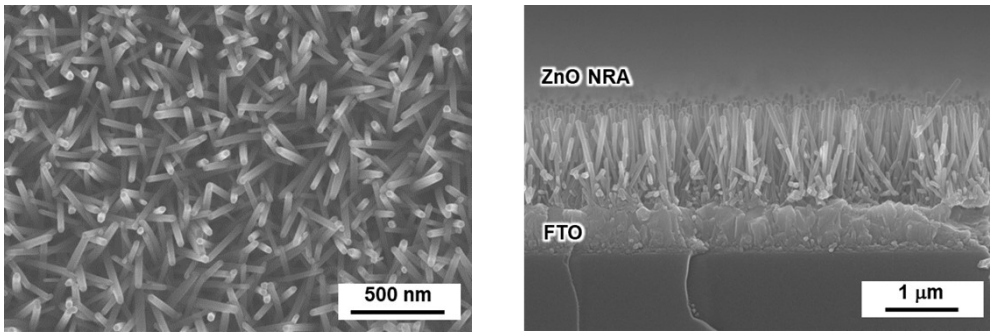

Fig. S13. SEM images of ZnO nanorod array electrode.

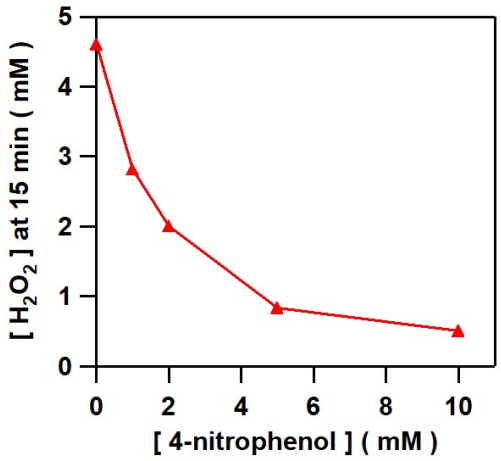

Fig. S14. Additive effect of 4-nitrophenol on the ATO-CL/ZnO-photocatalyzed H_2O_2 production under UV-light irradiation (λ = 365 nm, light intensity = 120 mW cm^{-2}). Photoirradiation time was fixed at 15 min.