

Electronic Supplementary Information (ESI)

Direct splitting of pure water into hydrogen and oxygen using
rutile titania powder as a photocatalyst

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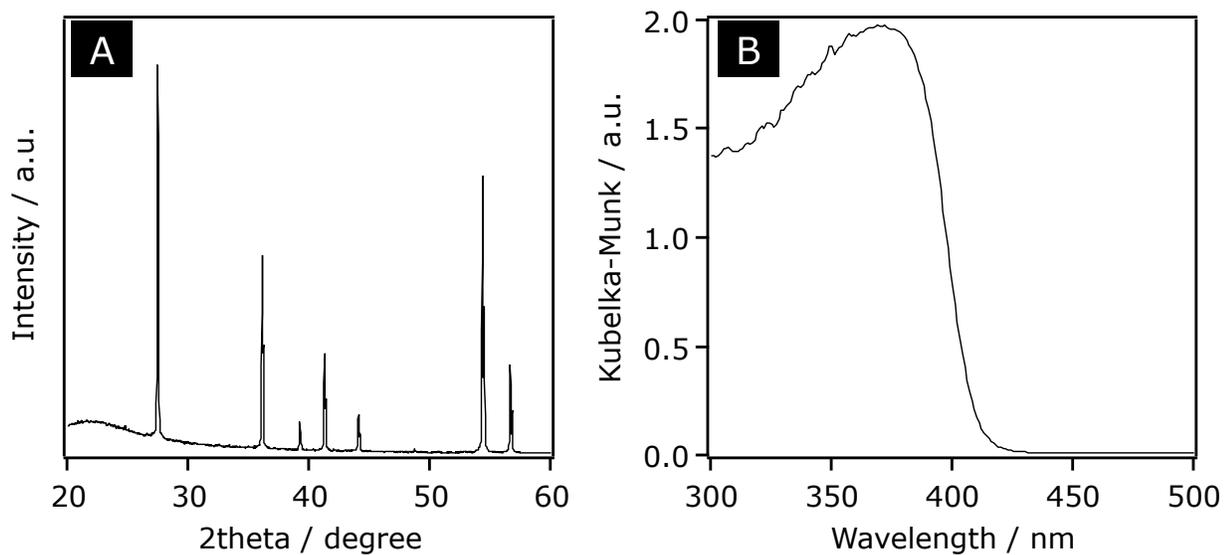


Fig. S1. (A) XRD pattern and (B) DRS of R-TiO₂.

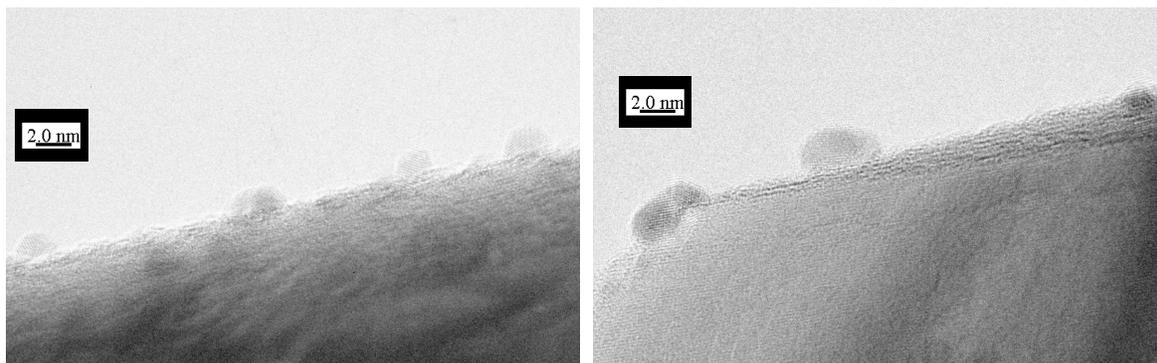


Fig. S2. TEM images of 0.1 wt% Pt-loaded HT0210.

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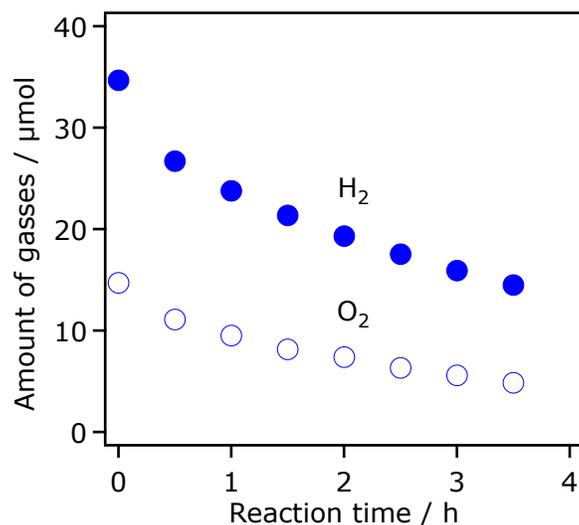


Fig. S3. Water formation from H₂ and O₂ in the dark on 0.1 wt% Pt-loaded HT0210 (100 mg). This experiment was carried out in pure water (100 mL) using a closed-gas circulation system containing a stoichiometric mixture of H₂ and O₂ gases.

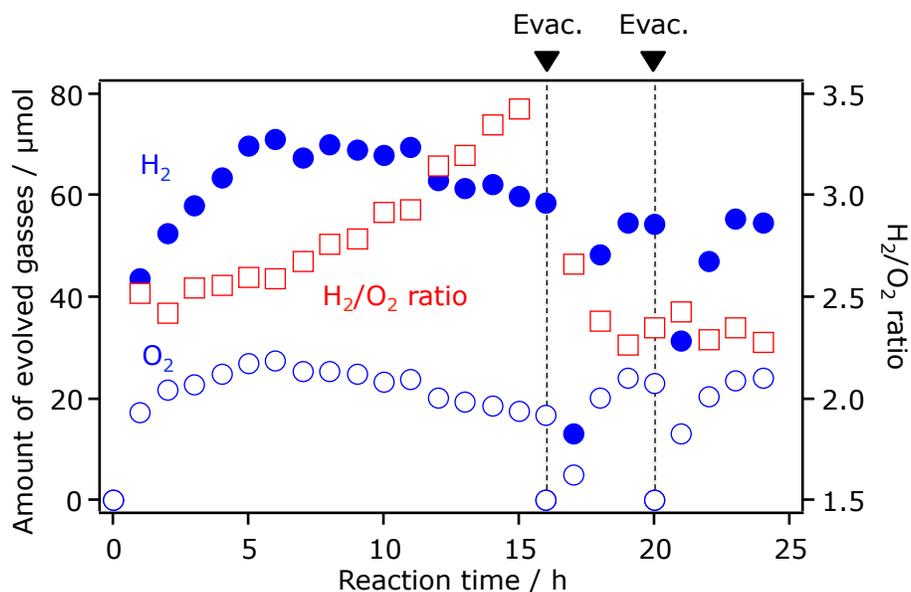


Fig. S4. Time course of overall water splitting on Pt-loaded HT0210 under UV irradiation ($\lambda > 300$ nm). Reaction conditions: catalyst, 300 mg (0.1 wt% Pt loaded); reactant solution, pure water (100 mL); light source, xenon lamp (300 W); reaction vessel, top-irradiation type.

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Fig. S5. Photographs of the reaction vessel after 16 h of water-splitting reaction (see also Fig. S4).

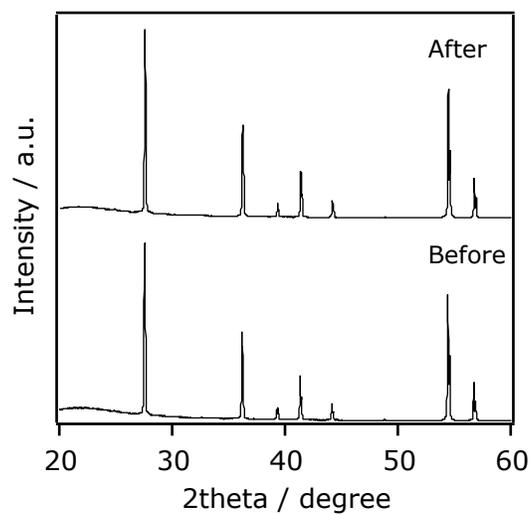


Fig. S6. XRD patterns of Pt/HT0210 before and after the 24 h of water-splitting reaction (see also Fig. S4).

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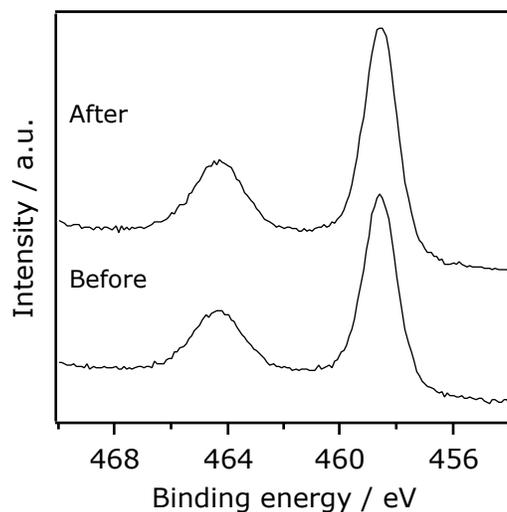


Fig. S7. XPS spectra for Ti2p of Pt/HT0210 before and after the 24 h of water-splitting reaction (see also Fig. S4). The position of the Ti2p_{3/2} peak (458.6 eV) is well consistent with that of TiO₂ rutile (U. Diebold, *Surf. Sci. Reports*, 2003, **48**, 53.).

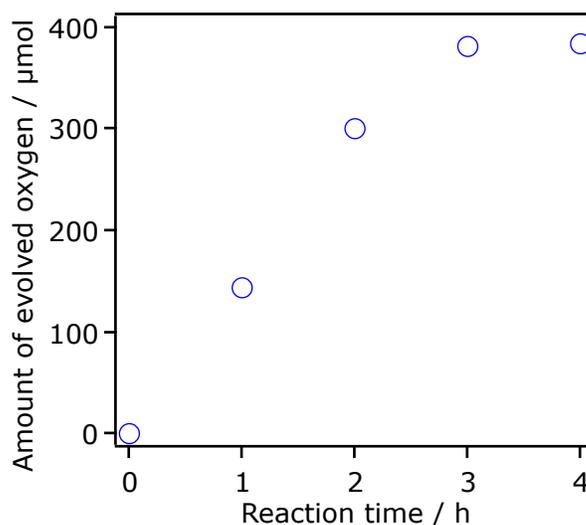


Fig. S8. Time course of O₂ evolution over unmodified HT0210 under UV irradiation ($\lambda > 300$ nm). Reaction conditions: catalyst, 300 mg; aqueous NaIO₃ solution, 100 mL (2.5 mM, pH 11); light source, xenon lamp (300 W); reaction vessel, Pyrex top-irradiation type. O₂ evolution ceased after 3 h of irradiation, because all IO₃⁻ ions (250 μmol) in the reactant solution was consumed. The total amount of O₂ (ca. 380 μmol) was consistent with that expected from the stoichiometry (375 μmol).

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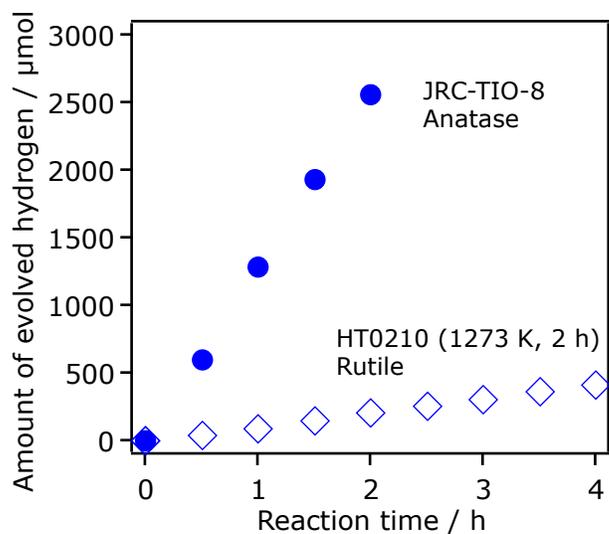


Fig. S9. Time courses of H₂ evolution from an aqueous solution containing 10 vol.% methanol on HT0210 (rutile) and JRC-TiO-8 (anatase) under UV irradiation ($\lambda > 300$ nm). Reaction conditions: catalyst, 100 mg (0.1 wt% Pt loaded in-situ); reactant solution, 100 mL; light source, xenon lamp (300 W); reaction vessel, top-irradiation type.