Electronic Supplementary Information

Photocatalytic H_2 Generation on Macro-Mesoporous Oxide-Supported Pt Nanoparticles

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KEYWORDS: macro-mesoporous oxides, Pt nanoparticles, water splitting, hydrogen evolution, photocatalytic activity

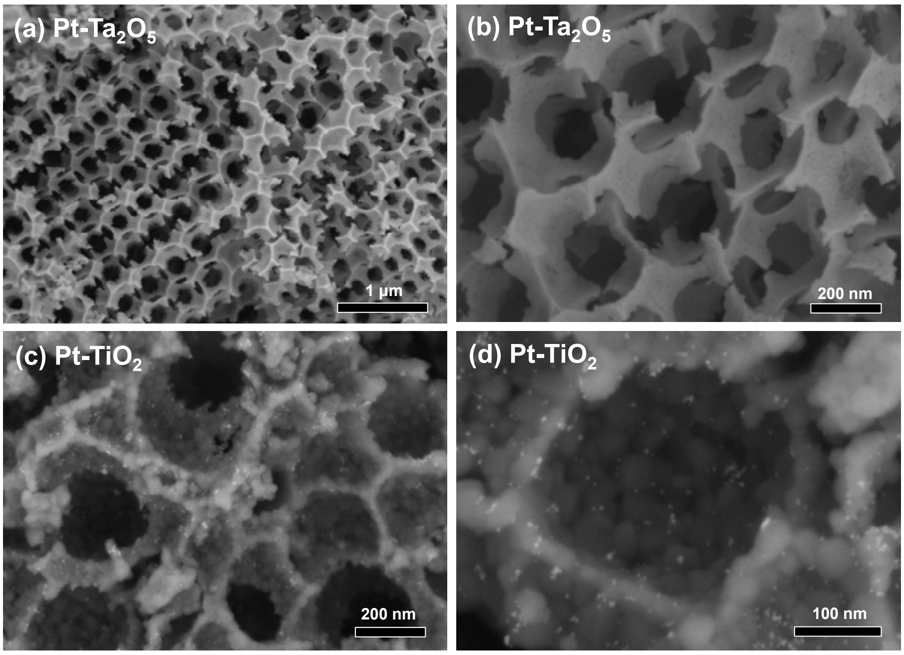

Fig. S1 (a, b) FE-SEM images of Pt-Ta$_2$O$_5$ showing ordered structures. (c, d) FE-SEM images of Pt-TiO$_2$ showing meso- and macroporous structures where Pt nanoparticles are distributed in the walls of the pores.

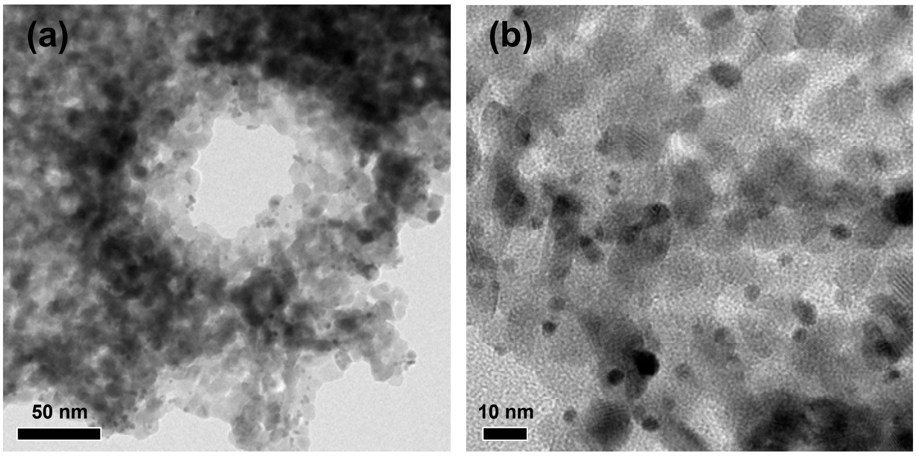

Fig. S2 TEM images of TiO$_2$-supported Pt-nanoparticle photocatalysts showing mesopores composed of agglomerated TiO$_2$ nanoparticles.

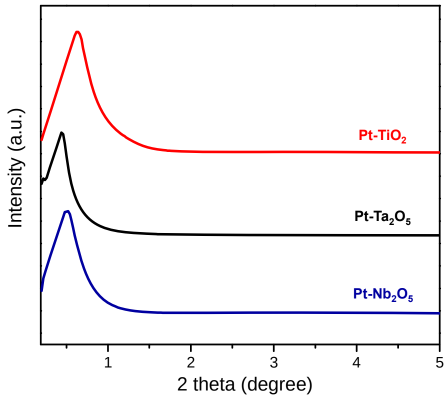

Fig. S3 Small-angle X-ray diffraction (XRD) patterns of the calcined Pt-oxide photocatalysts: Pt-TiO_2, Pt-Ta_2O_5, Pt-Nb_2O_5.

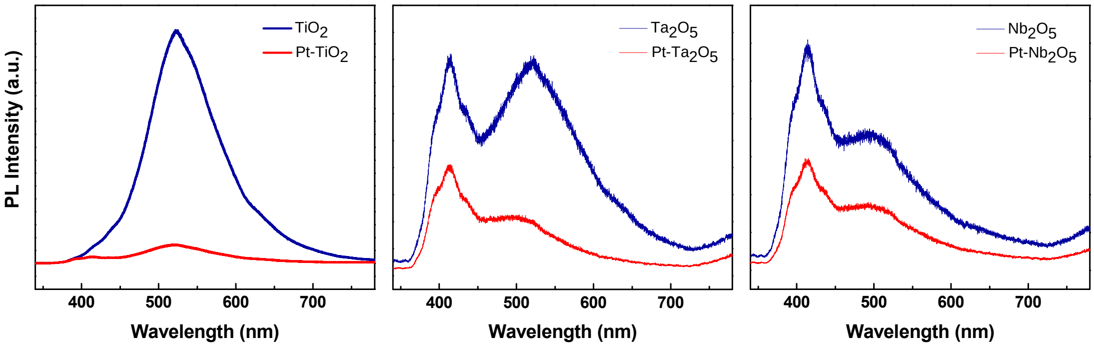

Fig. S4 Photoluminescence (PL) spectra of Pt-TiO_2, Pt-Ta_2O_5, and Pt-Nb_2O_5 exhibit quenching behavior, in comparison with the oxide support.

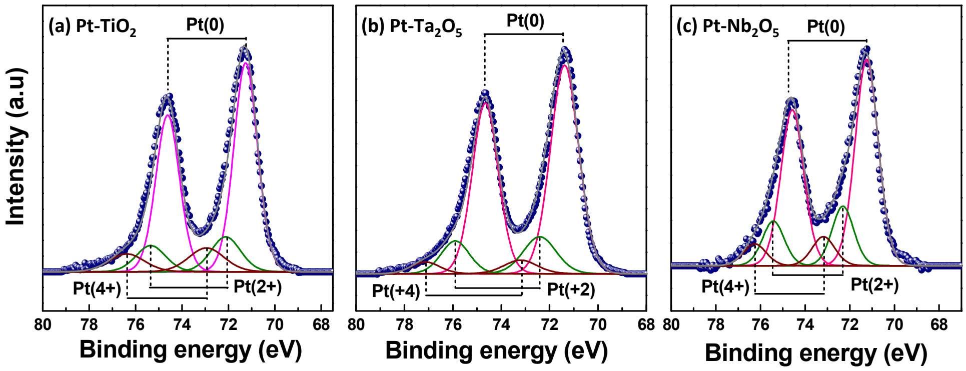

Fig. S5 XPS peaks of Pt in the oxide-supported Pt-nanoparticle photocatalysts. Pt 4f peaks from (a) Pt-TiO_2, (b) Pt-Ta_2O_5, and (c) Pt-Nb_2O_5.

The XPS spectra have been analyzed for the oxidation states of Pt 4f. For peak deconvolution, the C1s peak centered at 284.6 eV was used as the reference for the binding energy scale calibration. In all of the oxide-supported Pt-nanoparticle photocatalysts, Pt is present in its metallic state. Moreover, there is also a mixture of oxidized states (+2 and +4 oxidation states) at low concentrations. The presence of a high percentage of metallic Pt nanoparticles acts as a co-catalyst for efficient charge transfer.