Supporting Information

Degradable ultrathin high-performance photocatalytic hydrogen generator from porous electrospun composite fiber membrane with enhanced light absorption ability

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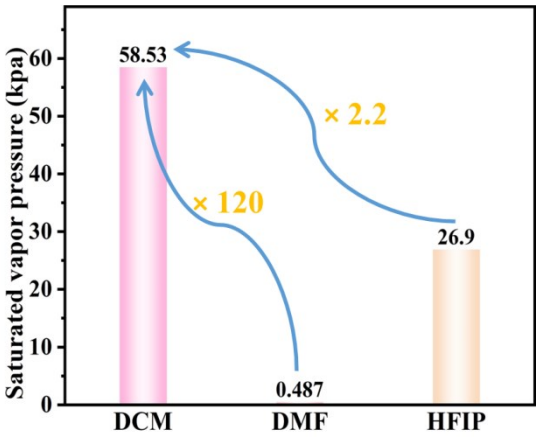

Fig. S1 Saturated vapor pressure of DCM, DMF and HFIP at 25 ˚C.

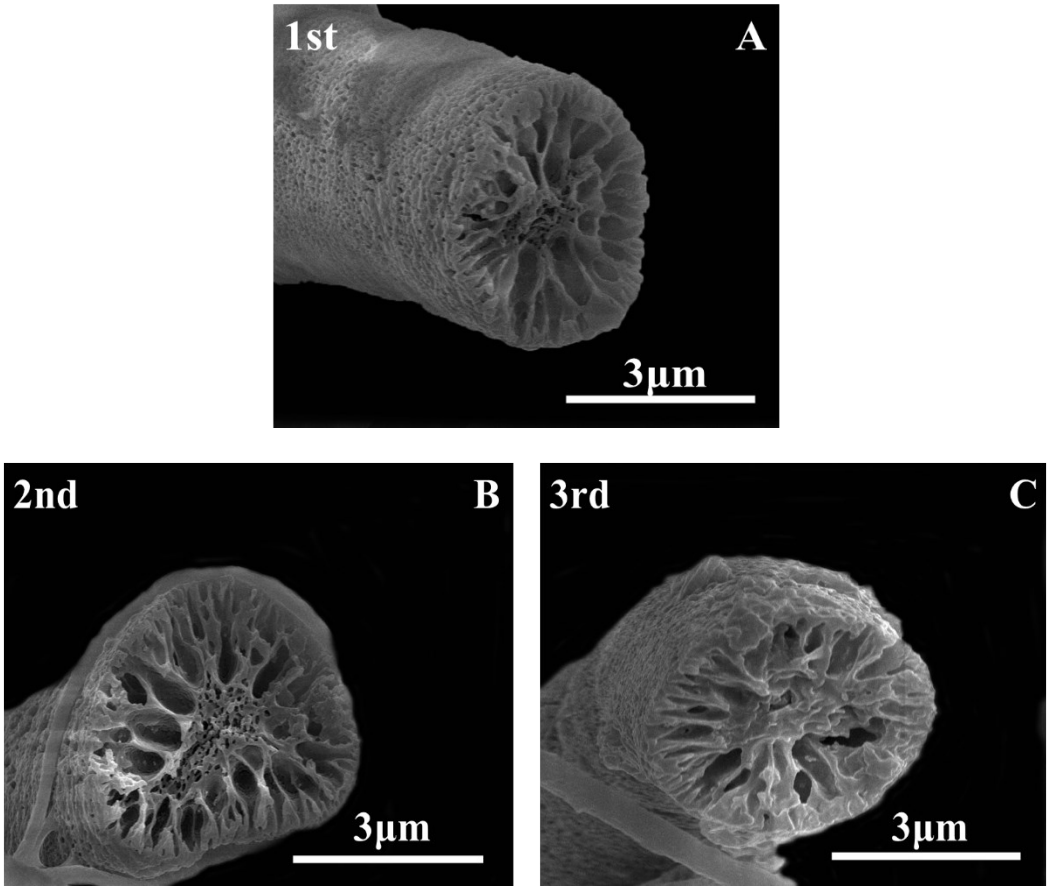

Fig. S2 SEM images of cross-section of repeatedly fabricate PT2 for the (A) first time, (B) second time and (C) third time.

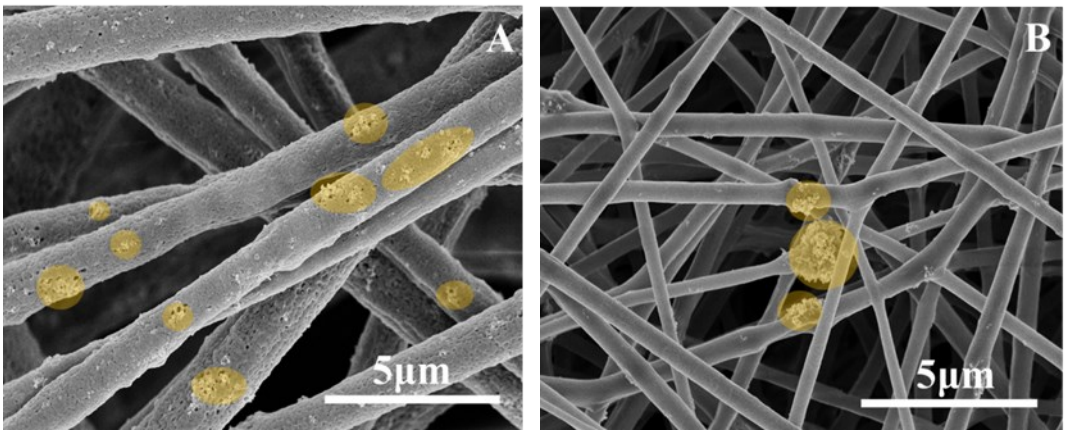

Fig. S3 SEM images of (A) porous composite fiber with 10wt% TiO_2 additive amount and (B) smooth solid composite fiber with 2wt% TiO_2 additive amount.

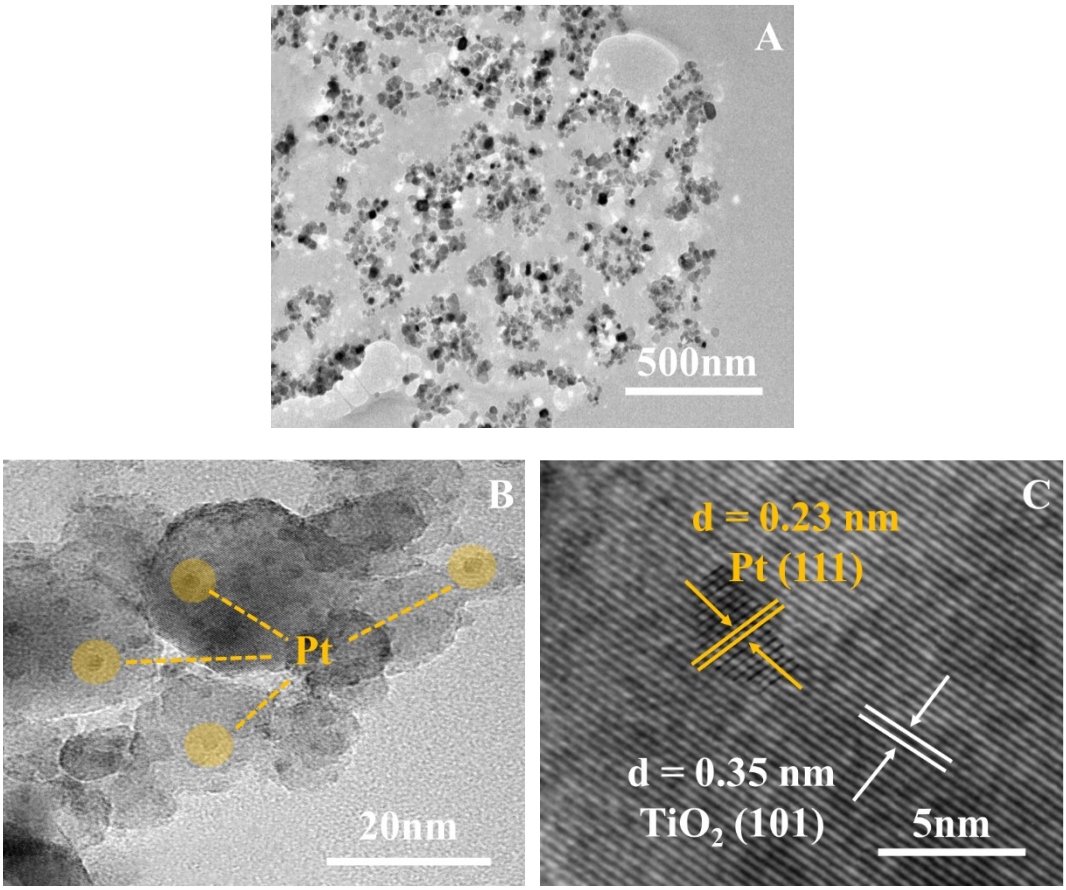

Fig. S4 TEM images of (A) cross-section of PT2 and (B) TiO_2-Pt nanoparticles dropped out from PLA matrix. (C) HRTEM image of TiO_2-Pt nanoparticles. (the black dots in **Fig. S4B** are the Pt nanoparticles on TiO_2 surface.)

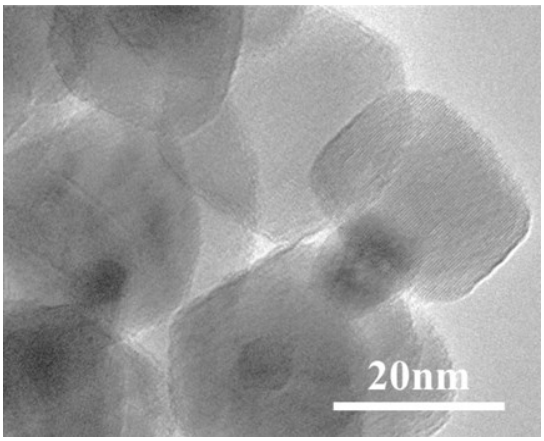

Fig. S5 TEM images of TiO_2 particles.

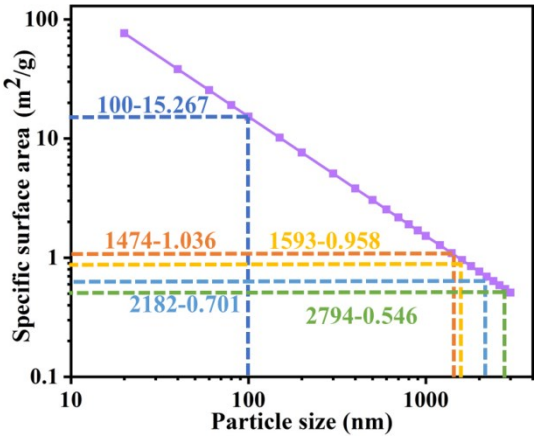

Fig. S6 The specific surface area of aqueous TiO_2 aggregate calculated by the size of aggregate from MLS test.

As shown in **Fig. S4**, the specific surface area and particle size is linear correlation under log-log coordinate. The specific surface area of TiO_2 aggregate with a size of 100nm is about 15 m^2/g, less than 16 m^2/g of PLA porous fiber, we can speculate that if the TiO_2 in the composites form some aggregates larger than 100nm, the specific surface areas of composites will decrease obviously.

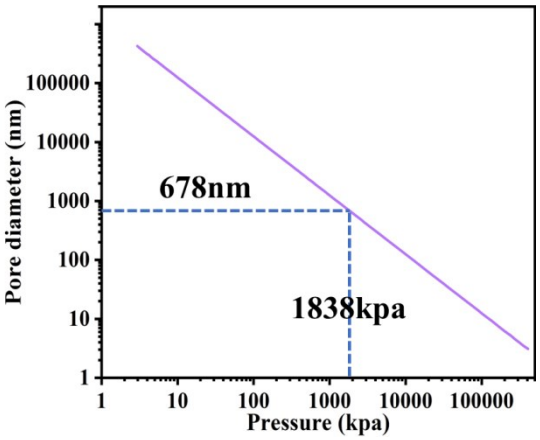

Fig. S7 The pore diameter of porous PLA fibers calculated by the mercury injection pressure.

In the mercury injection test, larger pressure can press mercury into pore with smaller size, and the pore diameter and mercury injection pressure is linear correlation under log-log coordinate.

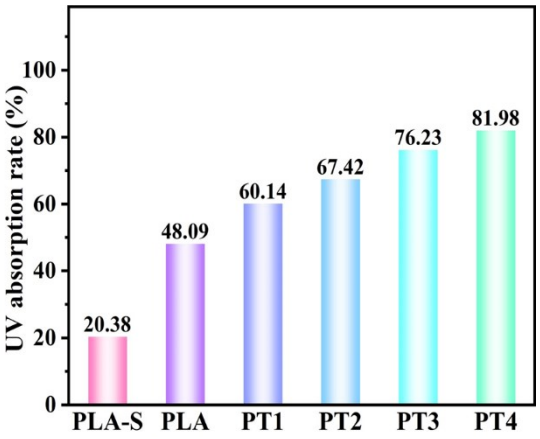

Fig. S8 UV adsorption rate of the composite fiber membranes, PLA fiber membrane and smooth solid fiber control sample.

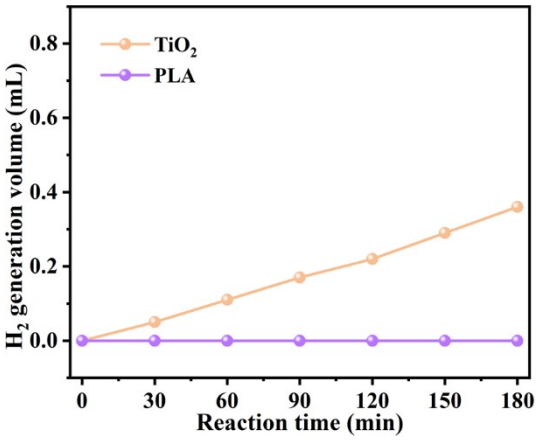

Fig. S9 Process of photocatalytic hydrogen production tests of TiO_2 and PLA samples.

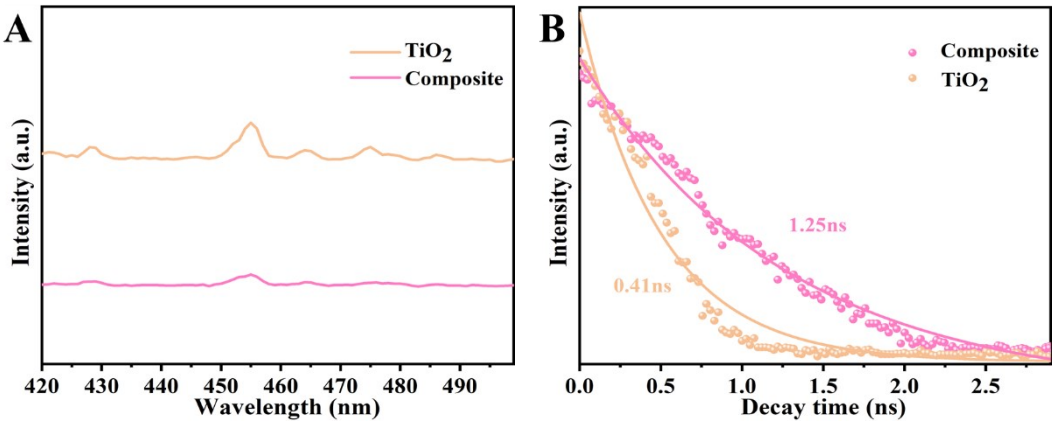

Fig. S10 (A) Photoluminescence (PL) spectrum and (B) time-resolution photoluminescence (TRPL) spectrum of TiO_2 and Pt loaded composite, the lifetime of photo-generated charges is obtain through data fitting.

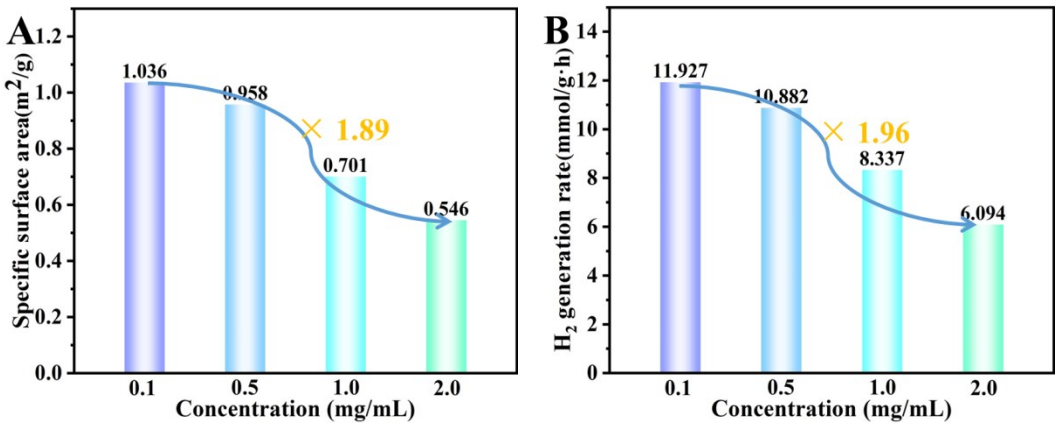

Fig. S11 (A) The specific surface areas of aqueous TiO_2 aggregates calculated by the size of aggregates from MLS test and (B) the hydrogen generation efficiency of these TiO_2 in aqueous reaction system.

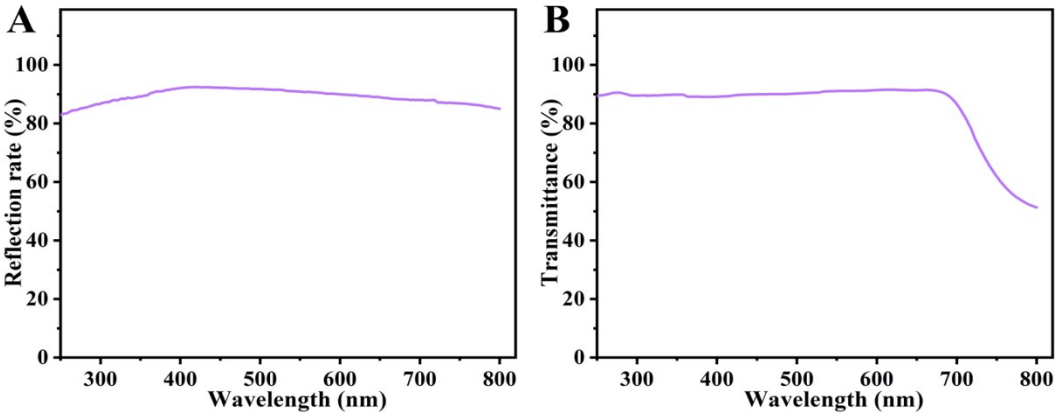

Fig. S12 (A) The reflection rate of used aluminum foil. (B) The transmittance of used PET membrane.

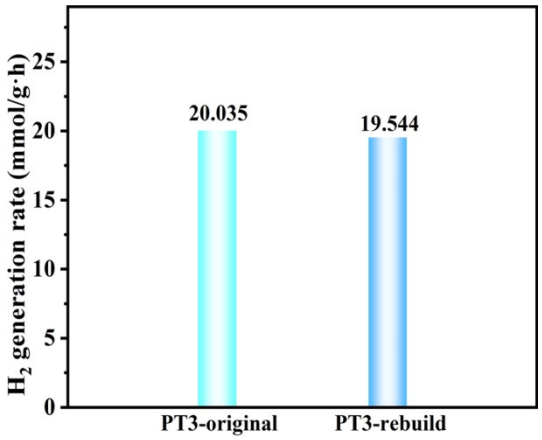

Fig. S13 Photocatalytic hydrogen production performance of original PT3 and PT3 rebuild by using recycled TiO_2 after the degradation of original PLA carrier.