Improved *co*-Catalyst-Free Solar Photocatalytic H_2 Production Activity in Defective Anatase TiO_2 Nanosheet Assembly

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Abstract
Introducing oxygen vacancies (Vo) into TiO_2 photocatalyst has been considered an effective strategy for improving co-catalyst-free solar photocatalytic activity.[1] However, the methods used to synthesize it require high pressure/temperature and/or hazardous/costly reagents. Here we propose Vo introduction, concomitant with N-doping in TiO_2, as an alternative strategy for achieving efficient co-catalyst-free solar photocatalytic activity under less extreme conditions.[2,3] After calcination at 450 ˚C of mesoporous spherical assemblies of a layered titanate nanosheet containing N,N-dimethylformamide as its synthesis solvent in the structure, we successfully synthesized mesoporous spherical assemblies of nanosheets composed of anatase TiO_2 nanoparticles with Vo mediated by N doping. This material exhibits good co-catalyst-free solar photocatalytic activity for hydrogen evolution via water splitting under irradiation with simulated solar light, which is considerably higher than that of typical co-catalyst-free defective TiO_2 materials.[4] We discuss the possible role of the introduced Vo in facilitating charge separation and raising photocatalytic efficiency.

REFERENCES

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FIGURES

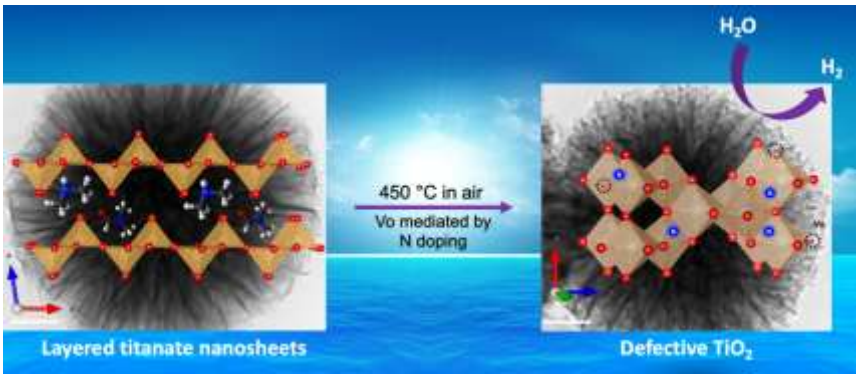

Figure 1: Schematic illustration for the topochemical conversion of layered protonated titanate (LPT) to anatase TiO_2 (LPT-450) with both nitrogen (N) dopant and oxygen vacancies (Vo).

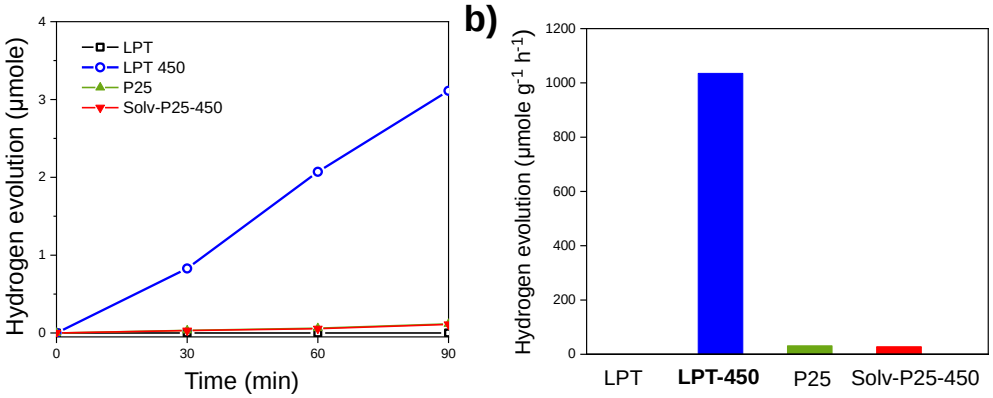

Figure 2: Photocatalytic hydrogen production activity of LPT, LPT-450, P25, and Solv-P25-450.