Electronic Supplementary Information (ESI)

Green Synthetic Approach for Ti^{3+} Self-doped TiO_{2-x} Nanoparticles with Efficient Visible Light Photocatalytic Activity

Xin Liu,[a] Shanmin Gao,*[a,b] Hui Xu,[a] Zaizhu Lou,[b] Wenjun Wang,[b] Baibiao huang,*[b] and Ying Dai[b]

[a] *School of Chemistry and Material Sciences, Ludong University, Yantai, 264025, China*

[b] *State Key Laboratory of Crystal Materials, Shandong University, Jinan 250100, China*

E-mail: gaosm@ustc.edu

Fig. S1 Photos of TiH_2, P25 and the samples Ti-27, Ti-24.

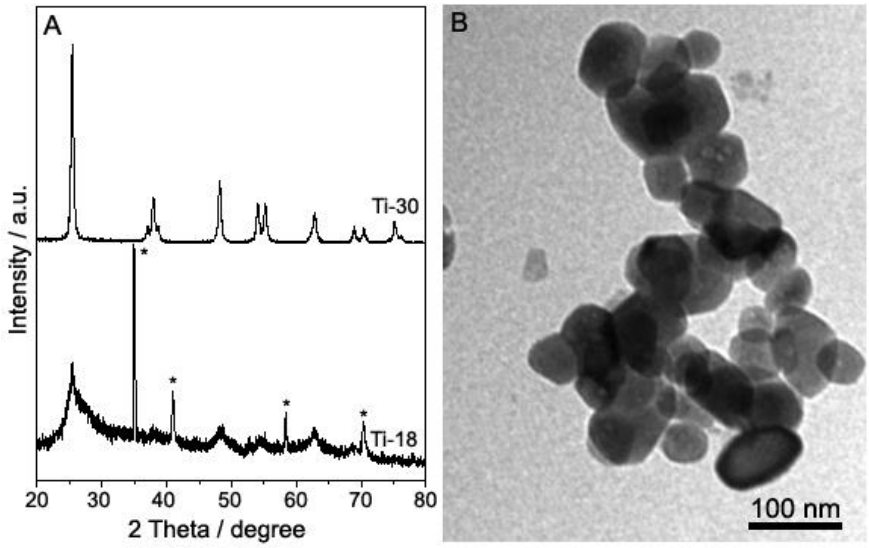

Fig. S2 (A) XRD patterns of the samples after reaction at 160°C for 18h (Ti-18) and 30h (Ti-30), respectively. The diffraction peaks of TiH_2 were indicated by *.

(B) TEM image of the Ti-30 sample.

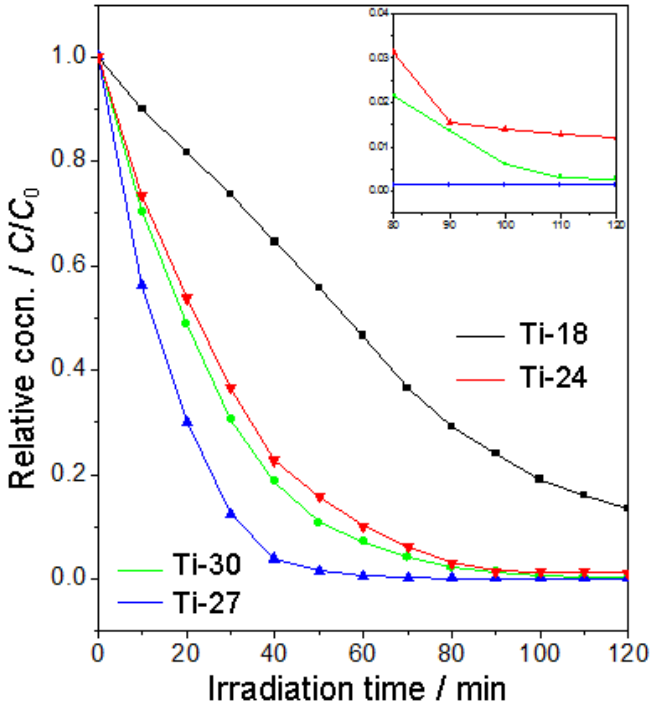

Fig. S3 Photodegradation of MB aqueous solutions by using the obtained samples at different time as photocatalysts under visible light irradiation in neutral suspension. Inset is the enlarger results from 80 min to 120 min.

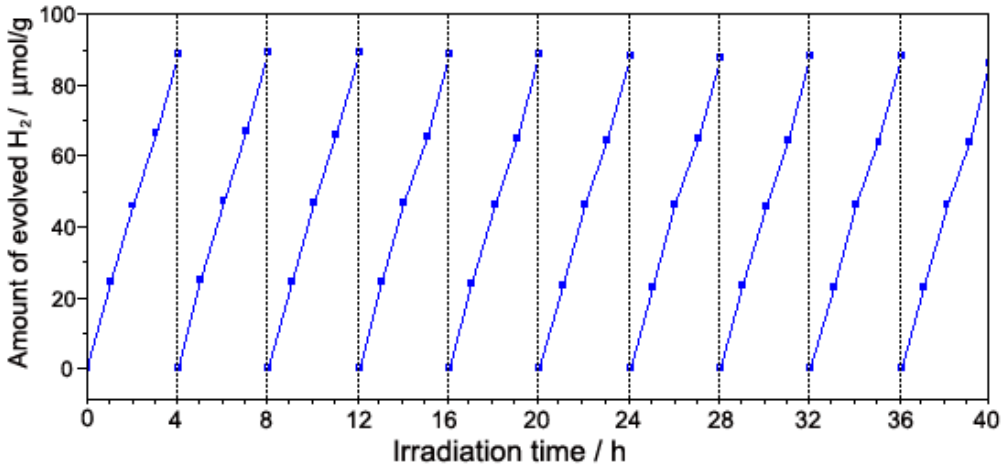

Fig. S4 Time course of evolved H_2 with Ti-27 under visible light irradiation for 40h.

The Ti^{3+} self-doped TiO_{2-x} nanoparticles exhibit the visible-light photocatalytic activity for H_2 production. This photocatalytic reaction exhibits H_2 release rate of ~22.5 μmol/h/1.0 g. The rate is lower in comparison with other doped or Ti^{3+} self-doped titania reported in literature. Chen reported that the H_2 production rate reach to 10mmol/1h/g by using black hydrogenated titanium dioxide nanocrystals[1], Huang reported the H_2 production rate is 2.15 mmol /h/g by using Hydrogenated titania under visible light irradiation[2]. We are making great efforts to improve the photocatalytic properties, such as reducing the particles sizes, increasing the surface area and controlling doping amounts.

References

[1] X. B. Chen, L. Liu, P. Y. Yu and S. S. Mao, *Science*, 2011, **331**, 746.

[2] Z. K. Zheng, B .B. Huang, J. B. Lu, Z. Y. Wang, X. Y. Qin, X. Y. Zhang, Y. Dai and M. –H. Whangbo, *Chem. Commun.*, 2012, **48**, 5733.