Electronic Supplementary Information (ESI)

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

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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 $\sim$22.5 $\mu$mol/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