Electronic Supplementary Information

Regular mesoporous nanoarchitectures with Fe-doped semiconducting framework and enhanced photocatalytic activity

*Zhengxin Ding, Jianhui Huang, and XinchenWang**

Preparation

A solution containing titanium tetroisopropoxide (TTIP) and concentrated HCl (37 %) was added into an ethanolic solution of the surfactant of Pluronic P123 (BASF Co.) and $FeCl_3$ in the molar ratio of 1 TTIP: 0.001 $FeCl_3$:15 ethanol: 0.01 P123: 1.6 HCl: 5.4 H_2O. The mole ratio of Fe/Ti is 0.1 %. The mixture was stirred at 277 K for 1 h, and then used for coating glass/quartz slides. Alternatively, the powder sample could be prepared by transferring the mixture to a Petri dish and underwent solvent evaporation. Calcination was done by heating the sample at 673 K for 4 h (ramp: 1 K /min). Samples containing 0.2 %, 0.5 %, 1.0 % and 3.0 % of Fe(III) were prepared similarly.

A series of other metal doped ordered mesoporous TiO_2 (M/TiO_2, M=Sn, Ni, Mn, Cr, Cu, Co, and Zn) was also fabricated by using this method. Precursors of the metals doped were their metal chlorides.

Activity Test

The photocatalytic activity was measured by the degradation of organic dye of modern yellow 10 (MY10). A 300W tungsten halogen lamp was positioned inside a cylindrical Pyrex vessel and surrounded by a circulating water jacket (Pyrex) to cool it. 0.5 g of catalyst was suspended in a 500 ml aqueous solution of 1.1×10^{-4} M MY10. Air was bubbled into the solution throughout the experiment. Prior to irradiation, the suspensions were stirred in the dark overnight. At given irradiation time intervals, 2 ml of sample was collected and then centrifuged to remove solids. The degraded MY10 solutions were analyzed by a Varian Cary 100 Scan UV/Visible spectrophotometer.

***Figure S1*. wide-angle XRD patterns of mesoporous TiO_2 without iron, with 0.1% iron and 3.0% iron.**

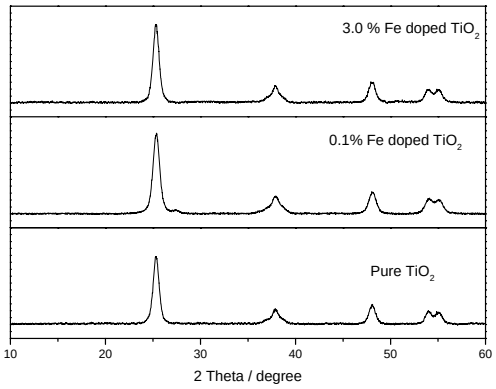

***Figure S2.* N_2 adsorption-desorption isothermal (inset) and corresponding BJH pore-size distribution curve of a 0.1%Fe/TiO_2 sample. The pore-size distribution was determined from the desorption branch of the isothermal.**

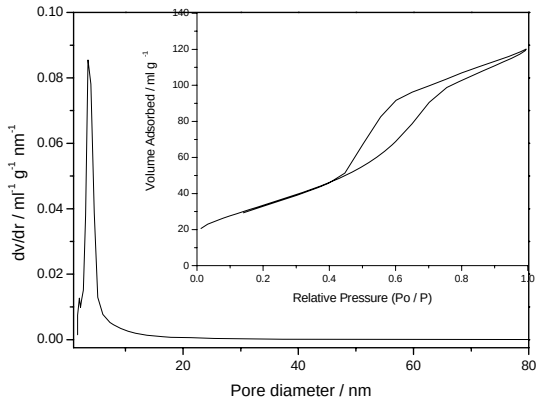

Table S1. **Effect of different iron cocentrations on the Pore-Wall Properties Obtained from N_2-Sorption and XRD Results of the Mesoporous TiO_2**

sample Fe/TiO_2	S_{BET} [a] m^2/g	V^b cm^3/g	D_{BJH}[c] nm
Pure	93.00	0.1329	4.0261
0.1%	116.66	0.1812	4.3118
0.2%	101.80	0.2705	7.7485
0.5%	103.80	0.2290	6.6476
1.0%	112.39	0.2278	5.5975
3.0%	101.89	0.2183	6.5551

BET surface area calculated from the linear part of the BET plot ((P/P_0)= 0.1-0.2). [b] Total pore volume, taken from the volume of N_2 adsorbed at $P/P0$) 0.976. [c] Average pore diameter, estimated using the desorption branch of the isotherm and the Barrett-Joyner-Halenda (BJH) formula.

Figure S3. Low-angle XRD patterns of other metal doped ordered mesoporous TiO_2. The molar ratio of metal/Ti is 0.1 %.

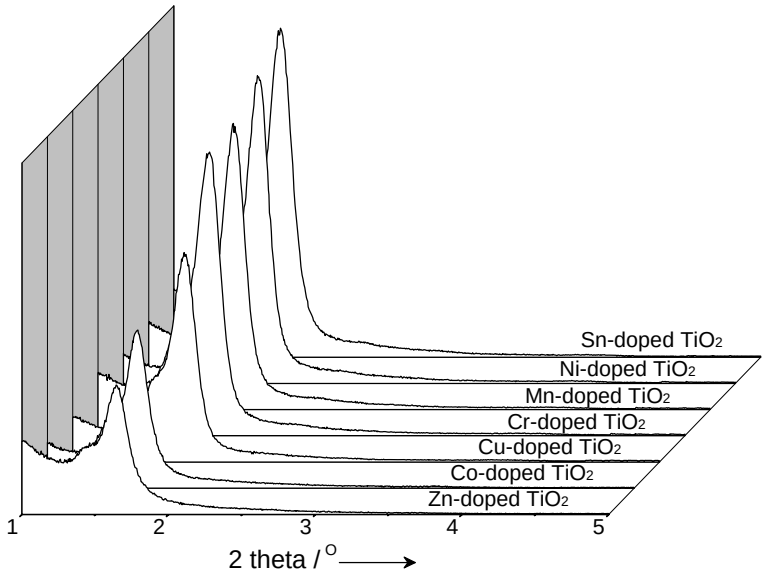

Figure S4.TEM images of the metal ion doped TiO_2. Metal/Ti=0.1at.%. Bar=100 nm.