Journal Name

ARTICLE

Supporting Information

Fast Fabrication of Nano-particle Photo-catalyst SnO_2: Computational Understanding and Photocatalytic Degradation of Organic Dye

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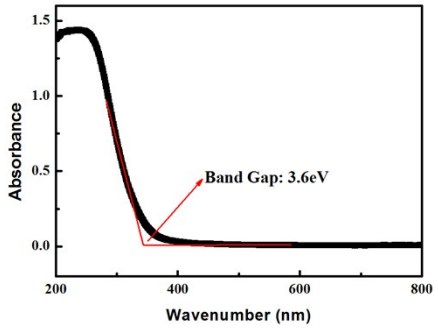

Figure S1 UV-vis spectrum of SnO_2.

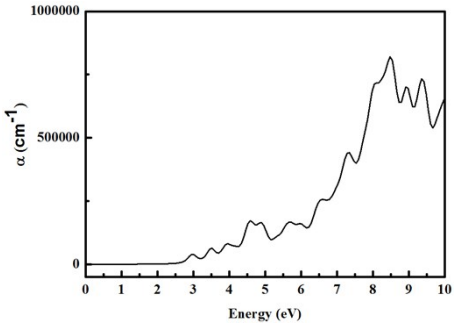

Figure S2 The theoretical Absorption spectrum of SnO_2 by HSE06.

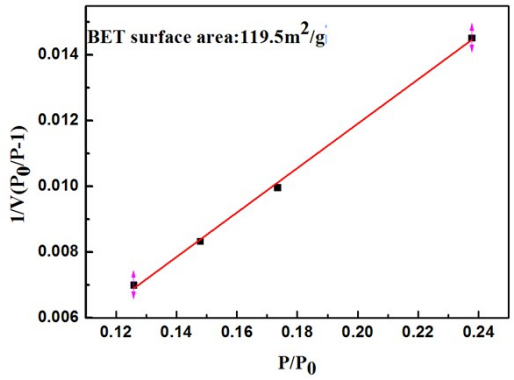

Fig S3. The specific surface area determination is performance by BET measurement with N_2 absorption at 77K.

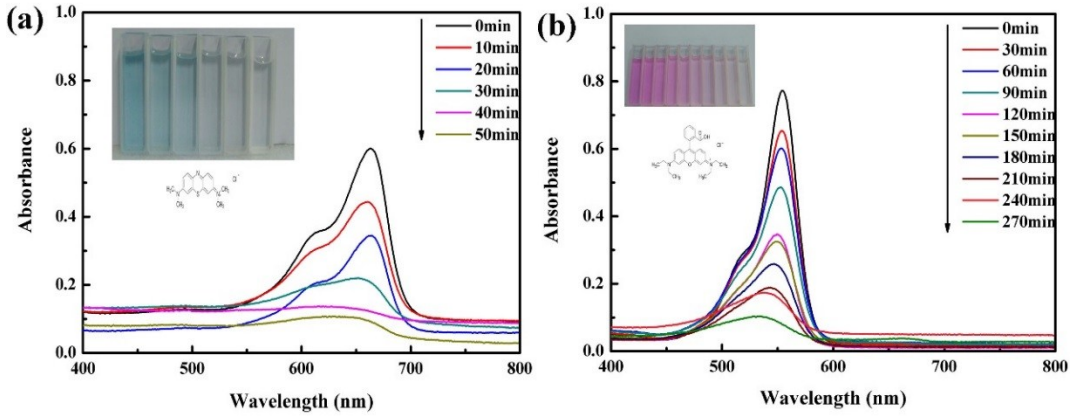

Figure S4 (a) and (b) UV visible absorption of MB and RhB as function of irradiation time for amorphous SnO_2, respectively(inset: the photograph for different irradiation time).

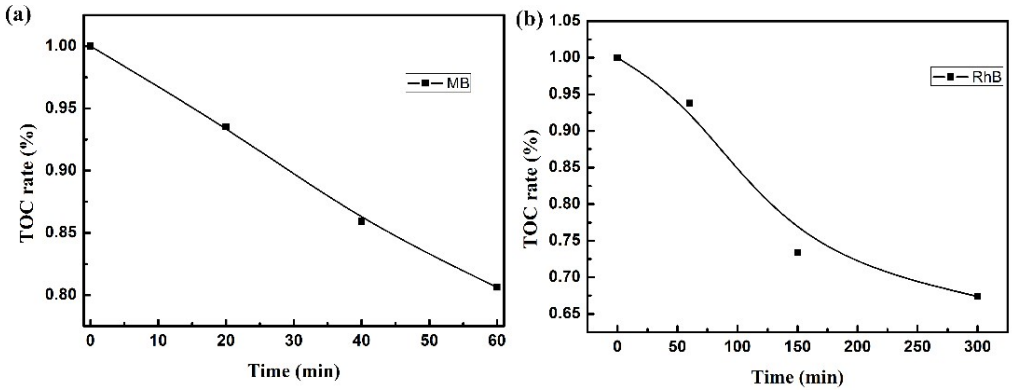

Figure S5 (a) and (b) TOC curve of MB and RhB photocatalytic degradation by nano particle SnO_2, respectively.

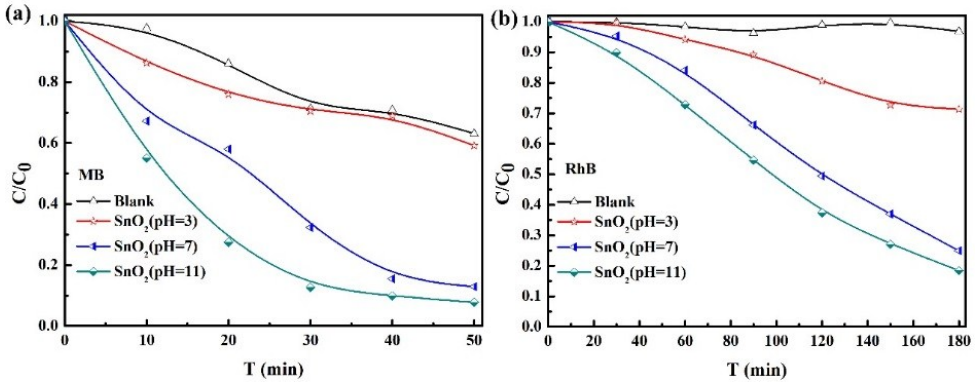

Figure S6 (a) and (b) Photocatalytic degradation curves of MB and RhB at pH (= 3, 7, 11), respectively.

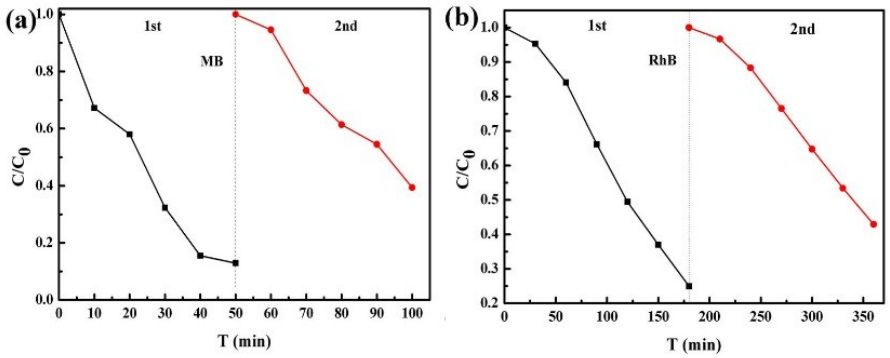

Figure S7 (a) and (b) the cycle performance of amorphous SnO_2 for photo-degradation of MB and RhB, respectively.

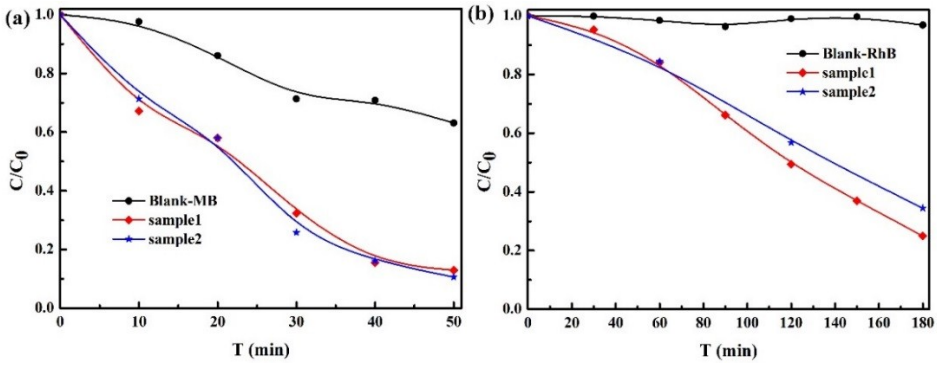

Figure S8 (a) and (b). Photocatalytic degradation curves of MB and RhB using different batches of SnO_2, respectively.

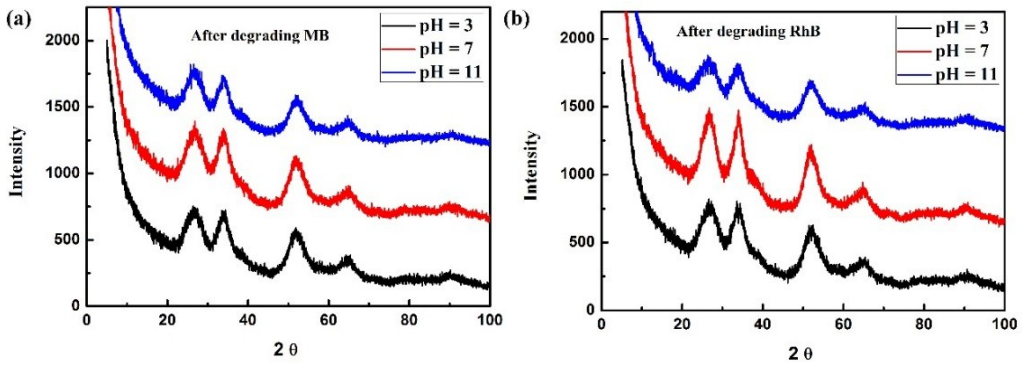

Figure S9 (a) and (b) XRD patterns of SnO_2 after the photocatalytic reaction of degrading MB and RhB (pH=3, 7, 11), respectively.

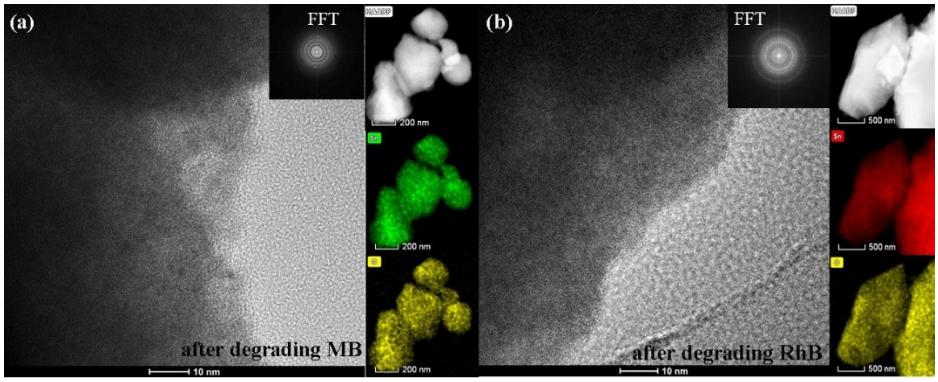

Figure S10 (a) and (b). TEM image, Elemental mapping in HADDF image and Electron diffraction image of photo-catalyst SnO_2 after degrading MB and RhB (pH=7), respectively.

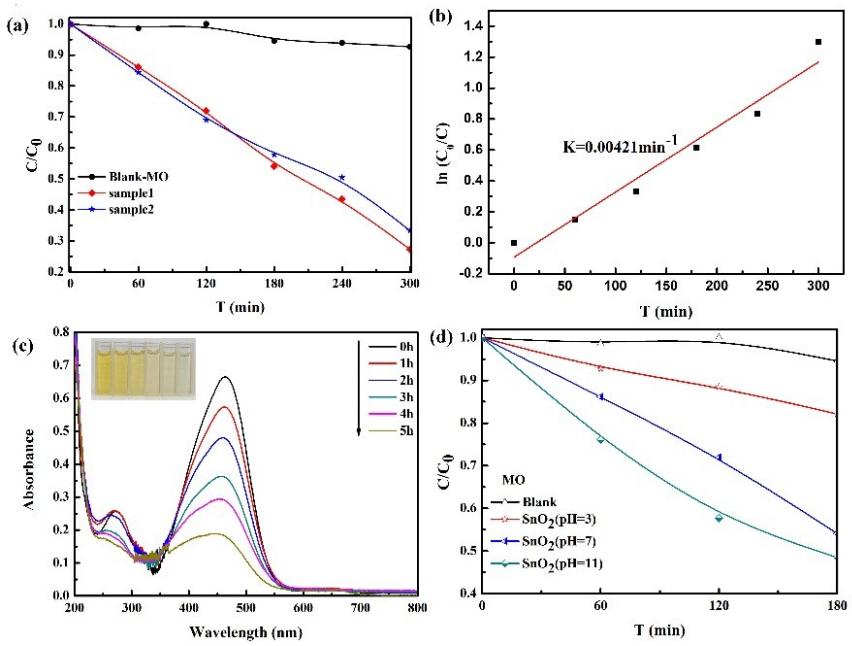

Figure S11 (a) photocatalytic degradation curves of MO. (b) The corresponding lnC_0/C as a function of time. (c) UV visible absorption of MO as function of irradiation time for nano-particle SnO_2 (inset: the photograph for different irradiation time). (d) Photocatalytic degradation curves of MO at pH (=3, 7, 11).

MB an RhB are the classical cationic dyes, it is very essential to test the anionic dye. Here, we apply the methyl orange (MO, an classical anionic dye) to evaluate the photocatalytic performance of our prepared nanoparticle SnO_2. As shown in Figure S11(a) and (c), when the nano-particles SnO_2 are used as the photo-catalyst, the degradation rate could reach 73% within 300min for MO. UV-visible absorption and photo-graph manifest that the original colored solution is decolorized effectively. The obtained pseudo first order rate constant k is $0.00421min^{-1}$ for MO (Figure S11(b)). The photocatalytic degradation of MO are also studied at different pH values (pH=3, pH=7 and pH=11) under constant catalyst dose (45mg/L) and constant dye concentration (10mg/L) (Figure S11(d)). The results demonstrate that alkaline solution environment is benefit for catalyst SnO_2 to degrade the dye MO than that of neutral and acid solution environment.

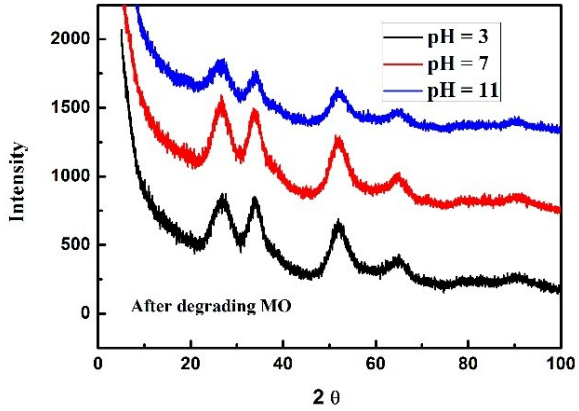

Figure S12 XRD patterns of SnO_2 after the photocatalytic reaction of degrading MO (pH=3, 7, 11), respectively.

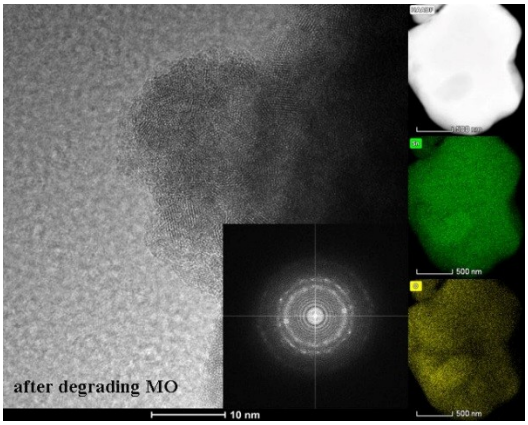

Figure S13 TEM image, Elemental mapping in HADDF image and Electron diffraction image of photo-catalyst SnO_2 after degrading MO (pH=7), respectively.

We also study the photocatalytic reaction of degrading the MO solution at different pH values (pH=3, 7 and 11). As indicated from the XRD patterns after photo-catalysis, the samples are all stable and match well with the SnO_2 (Figure S12). Further TEM-HADDF analysis (pH=7) indicate that these samples

are still oriented randomly nano-particles and exhibit the poly-crystal character after photocatalytic reaction (Figure S13), which indicate the stability of the nanoparticles SnO_2.

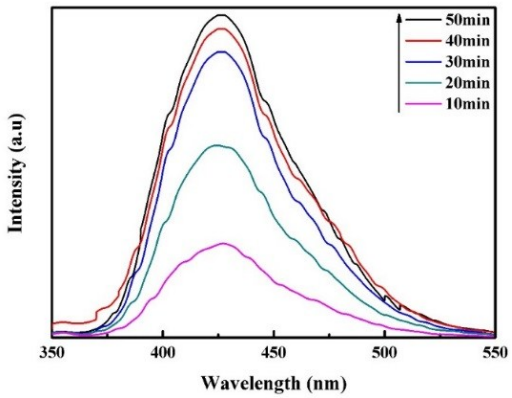

Figure S14. Hydroxyl radical ·OH detecting photoluminescence (PL) spectra of SnO_2 in TA solution under UV light irradiation.