

Electronic Supplementary Information

**Controllable Synthesis of Brookite/Anatase/Rutile TiO₂ Nanocomposites and
Single-crystalline Rutile Nanorods Array**

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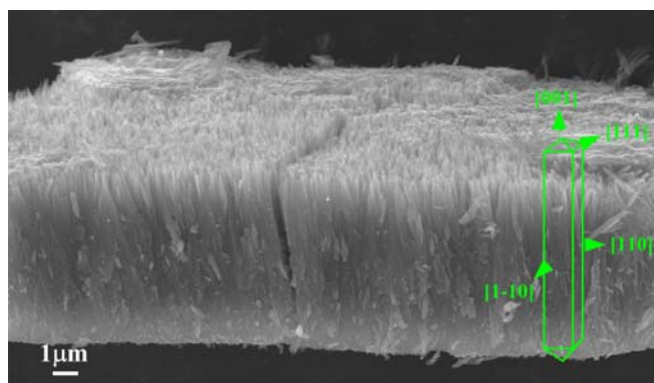


Figure S1. FESEM images of oriented rutile TiO_2 nanorod film grown on FTO substrate in 10.0 mL of toluene, 1.0 mL of hydrochloric acid, and 1 mL of TOBT at 180 °C for 20 h.

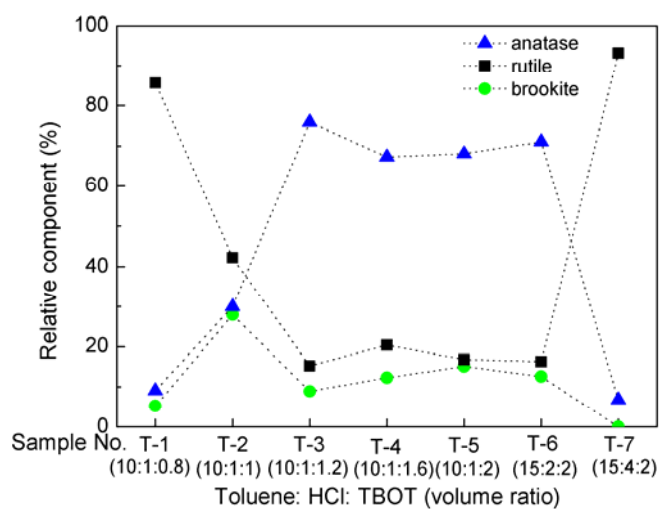


Figure S2. Relative components of anatase, brookite, rutile phase within all the as-prepared TiO_2 powders; labels T1~T7 corresponding to the sample No. as given in Table 1.

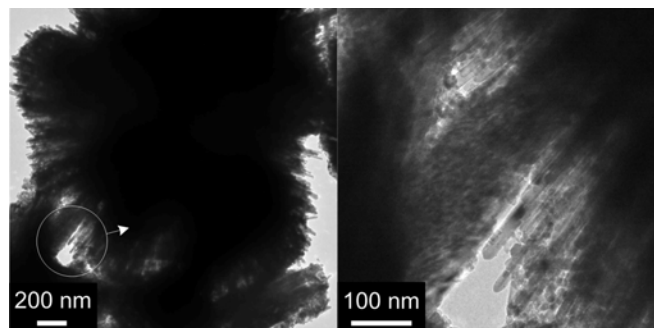


Figure S3. TEM images of the sample T7 (> 90% rutile), indicating the spherical aggregates consist of close-packed rutile nanorods.

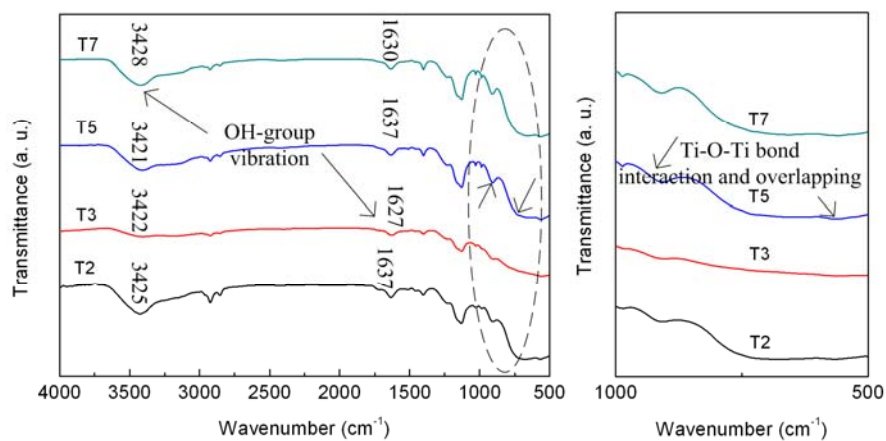


Figure S4. Typical FTIR spectra of the powders synthesized with various reagent ingredients.

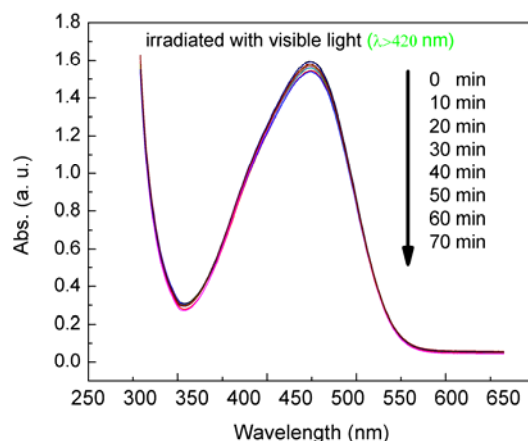


Figure S5. Absorption spectra of the MO aqueous solution (20 mg/L) under visible-light irradiation ($\lambda > 420$ nm, obtained from a 300 W high-pressure mercury lamp with colored glass filter) in the presence of the TiO_2 nanocomposites (0.3 g/L).

Discussion:

Although the TOC results have already proved the photo-catalytically decomposing of MO by TiO_2 , to exclude the self-sensitization of the dye, we also tested the solution containing both MO and TiO_2 under visible-light irradiation. Known that TiO_2 can not absorb visible light photons (down to $\lambda > 385$ nm), the photo-degradation observed should be mainly attributed to the electron transfer from the adsorbed dye in its singlet excited state to the conduction band of TiO_2 . As shown in Figure S5, the absorption spectra of the tested solution only show little change after 70 min irradiation, which indicates that the electron injection from photoexcited MO molecules to TiO_2 is poor and thus neglectable. This testing excludes the influence of the photoabsorption/photoexcitation by MO. Therefore, the UV-light-induced degradation of MO in this work can be attributed to the photocatalytic activity of the TiO_2 catalysts.

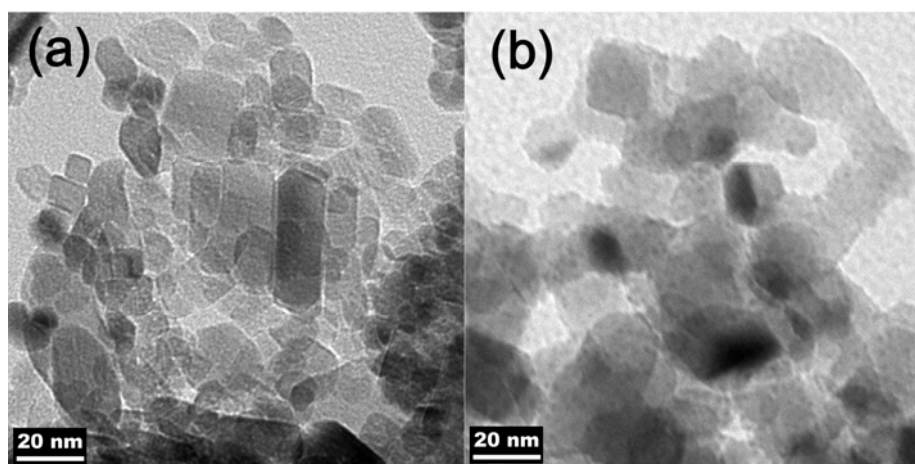


Figure S6. TEM images of (a) the sample T2 and (b) the commercial Degussa P-25 powders.

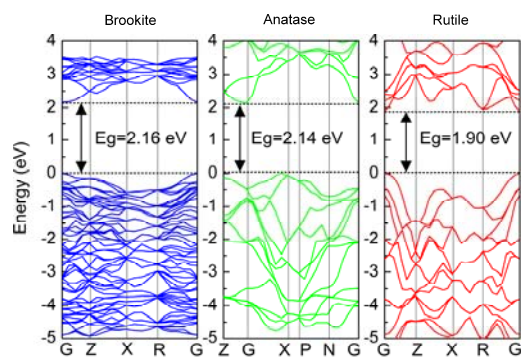


Figure S7. Calculated band structure plots for (a) brookite, (b) anatase, (c) rutile.

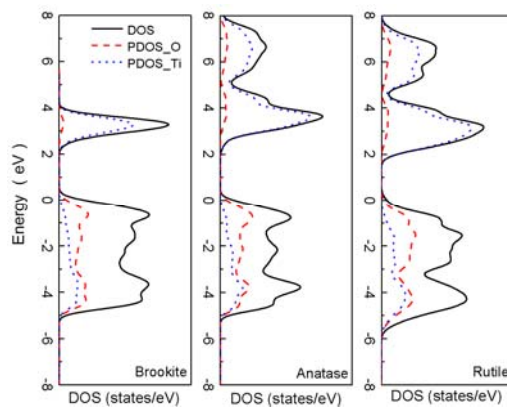


Figure S8. Total density of states (DOS) and the projected density of states (PDOS) of brookite, anatase, and rutile.