Supporting Information

Fabrication of one-dimensional heterostructured TiO_2@SnO_2 with enhanced photocatalytic activity

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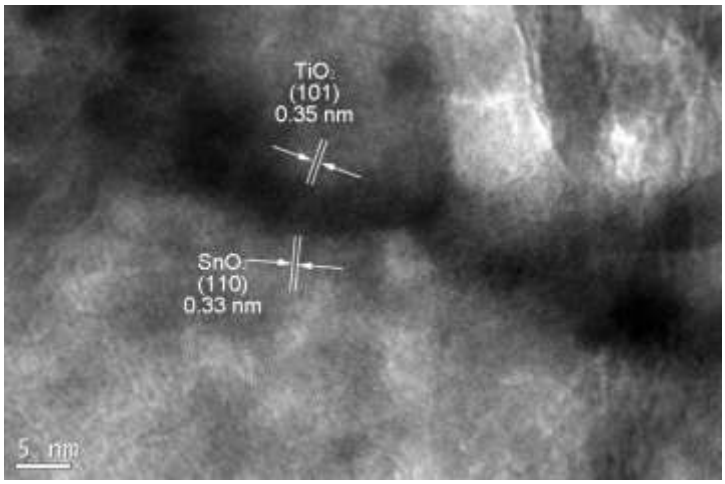
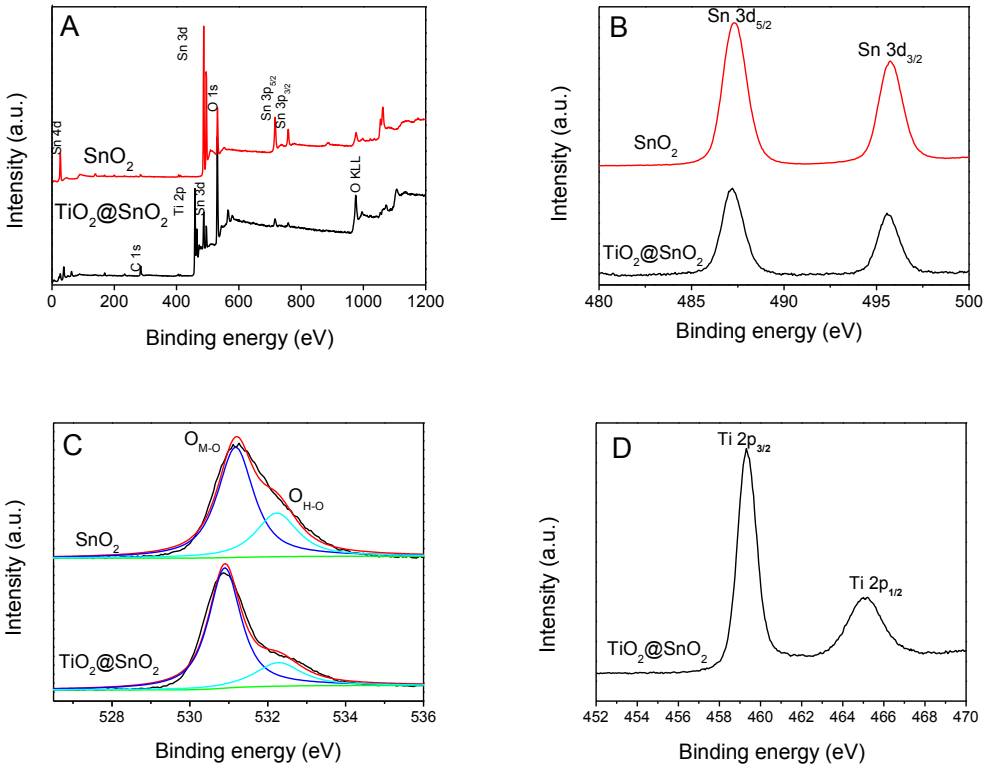


Fig. S1 HRTEM image of TiO_2@SnO_2 composite.

The chemical compositions and electronic structures of TiO_2@SnO_2 composite and SnO_2 nanotubes were analyzed by XPS, respectively. Fig. S2 A exhibits the survey spectra of TiO_2@SnO_2 composite and SnO_2 nanotubes, from which it can be clearly observed that the peaks of Sn, Ti and O exist in sample TiO_2@SnO_2 composite. In contrast, only the peaks belonging to Sn and O exist in SnO_2 nanotubes. The high-resolution XPS spectrum of Ti 2p orbital region (Fig. S2 B) for TiO_2@SnO_2 composite shows the binding energies of Sn $3d_{5/2}$ and Sn $3d_{3/2}$ peaks at 487.2eV and 495.5 eV, respectively. The splitting energy of 8.3eV between Sn $3d_{5/2}$ and Sn $3d_{3/2}$ is a typical value for Sn^{4+} in SnO_2 nanotubes. Similar as pure SnO_2 nanotubes, the peaks for Sn 3d in the sample TiO_2@SnO_2 composite and pristine SnO_2 nanotubes show no obvious shift (Fig. S2 B), suggesting that the structure of SnO_2 nanotubes remained intact after the hydrothermal treatment. However, the intensities of the characteristic peaks of the Sn 3d became lower obviously after hydrothermal process because of the presence of TiO_2 coating layer, since the XPS spectra only reveals the material properties with depth of nanometers from the surface. The spectra of O1s, Ti 3d 2p

and VB are also shown in Fig. S2 C, D and E, respectively. As shown in Fig. S2 C, the shape of asymmetric peaks of O 1s spectrum indicate that crystal lattice oxygen (O_{M-O}), surface hydroxyl groups (O_{O-H}) and adsorbed water presented simultaneously in the as-fabricated samples. The peaks located at 459.3 and 465.1eV correspond to the Ti $2p_{3/2}$ and Ti $2p_{1/2}$ states (Fig. S2 D), indicating the presence of Ti^{4+}. As shown in Fig. S2 E, the valence band edge of SnO_2 is derived by the linear extrapolation method to be 3.45eV. The valence band edge of TiO_2@SnO_2 composite is estimated to be 3.05 eV due to the e^- transformation from TiO_2 to the SnO_2, which can lead to the increasing of the Fermi level in SnO_2, consequently the valence band edge also raises up.



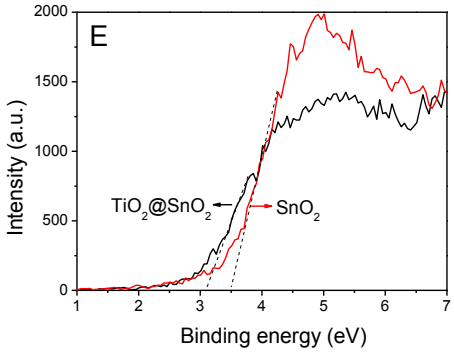


Fig. S2 XPS test of SnO_2 nanotubes and TiO_2@SnO_2 composite: (A) survey, (B) Sn 3d, (C) O 1s, (D) Ti 2p, (E) valence band (VB).

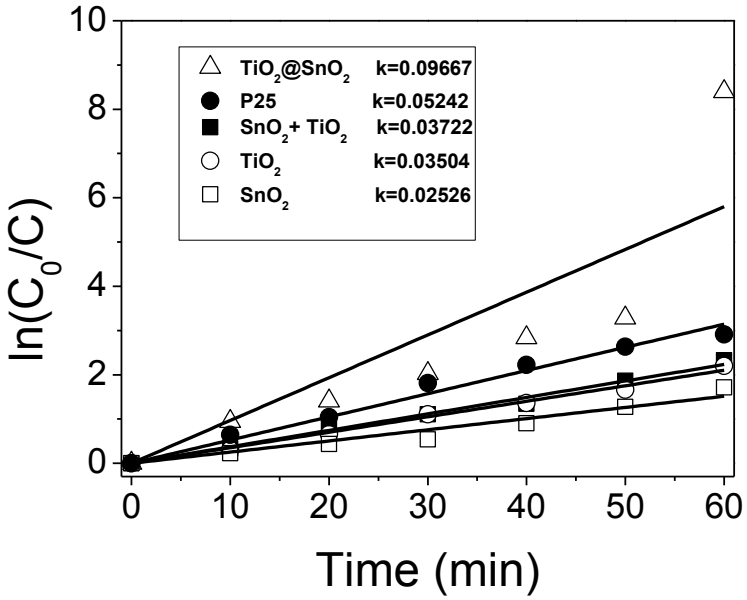
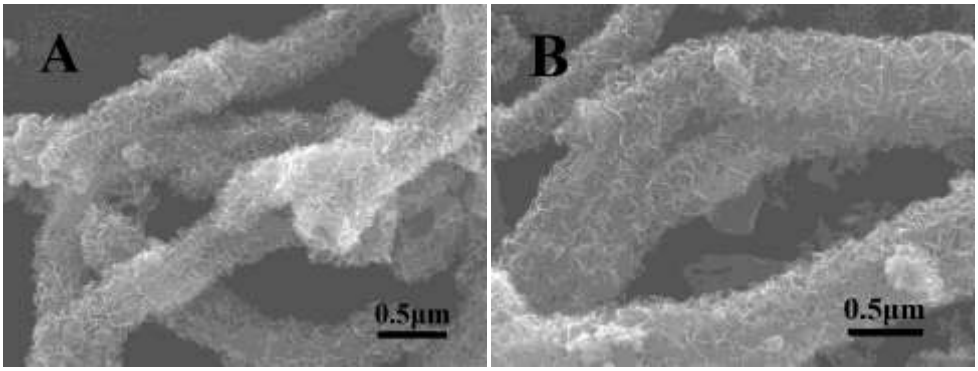


Fig. S3 The pseudo first order kinetics of degradation of RhB over TiO_2@SnO_2 composite, P25, TiO_2+SnO_2 mixture, TiO_2 nanosheets and SnO_2 nanotubes samples with time of irradiation (min).



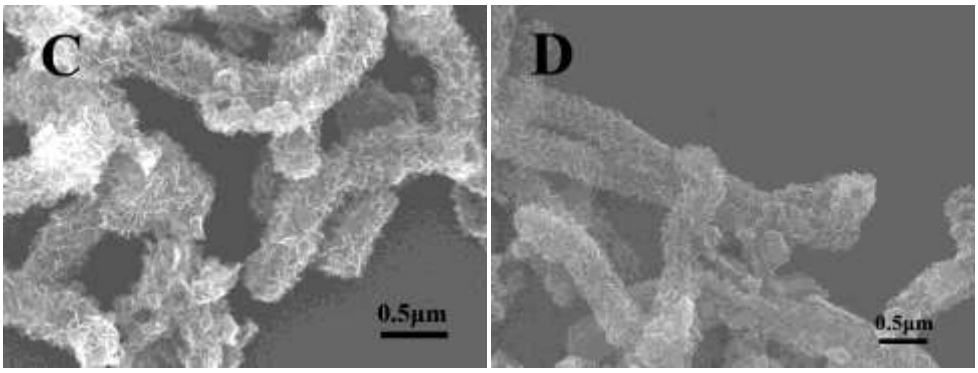


Fig. S4 The morphology of the sample after catalytic reaction at different reaction time: (A) 6h, (B) 12h, (C) 18h, (D) 24h.