Supporting information for

Copper-nanoparticle-dispersed amorphous BaTiO$_3$ thin films as

hole-trapping centers: Enhanced photocatalytic activity and stability

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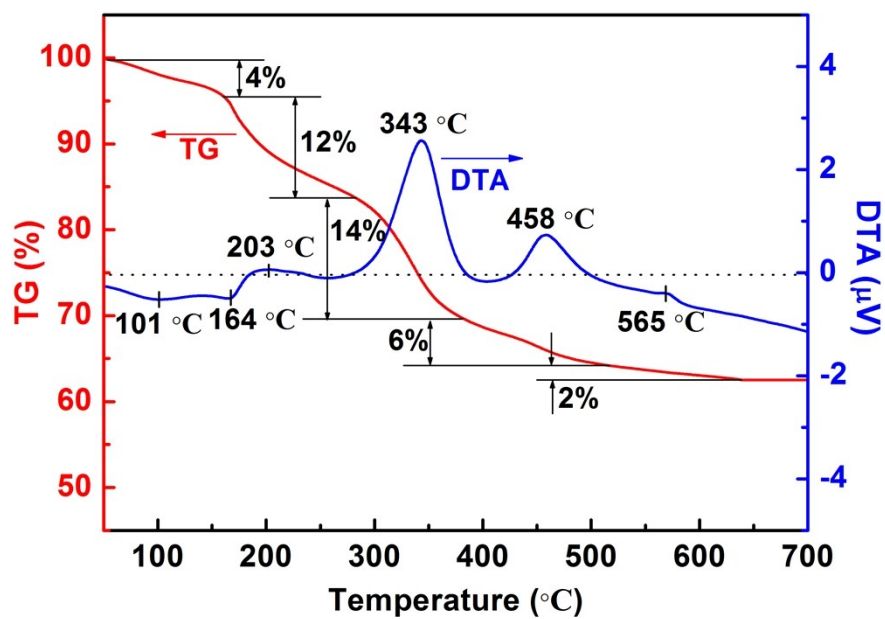
[†] These authors contributed equally to this work.

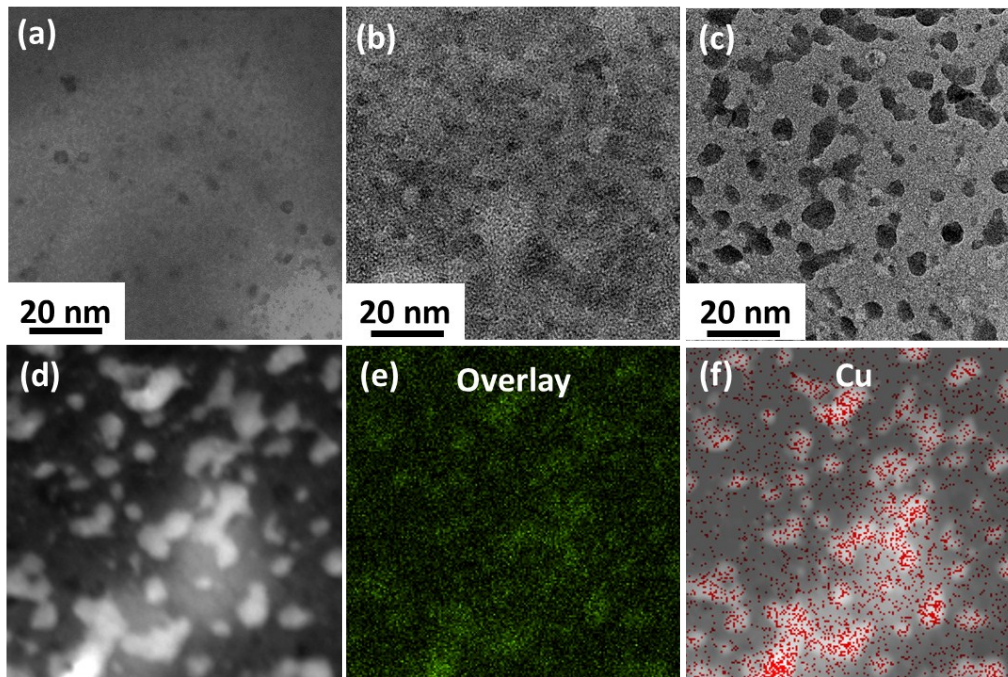**Fig. S1**. TG-DTA curves of the Cu_{25}/BTO precursor powders.

Fig. S2. (a-c) TEM micrographs for the Cu_x/BTO samples with x = 10, 15 and 35, respectively. (d) HAADF-STEM image and corresponding EDX mappings of the Cu_{35}/BTO sample: (e) overlay and (f) Cu.
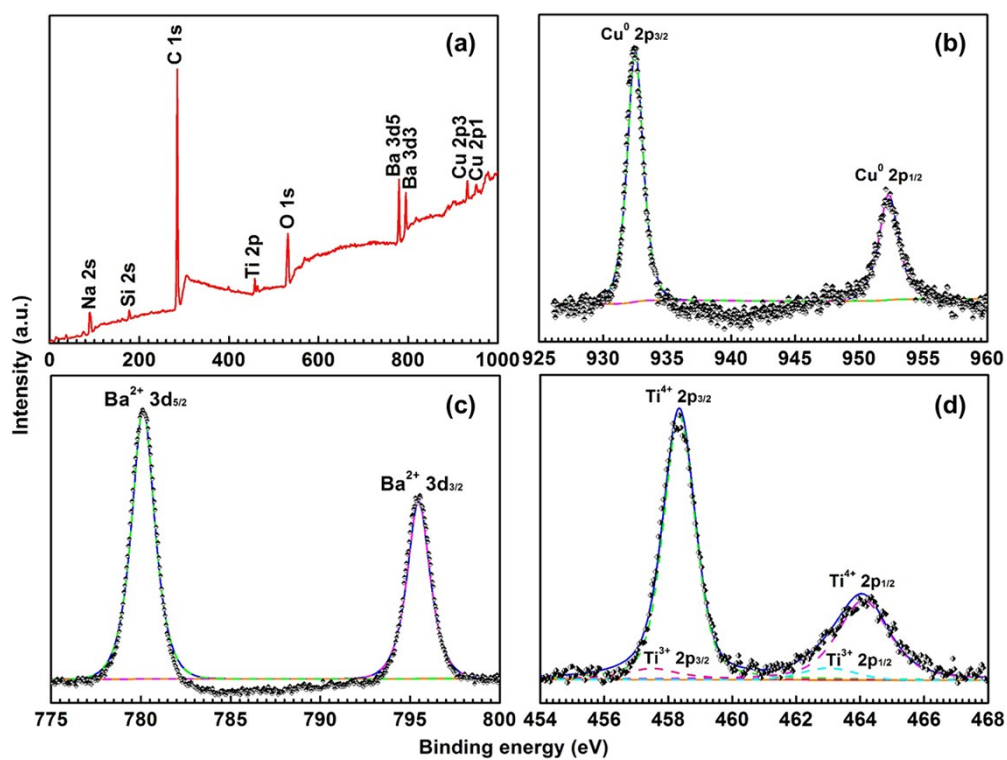
Fig. S3. (a) XPS survey spectra and High-resolution XPS spectra of (b) Cu 2p, (c) Ba 3d and (d) Ti 2p of the Cu$_{25}$/BTO sample
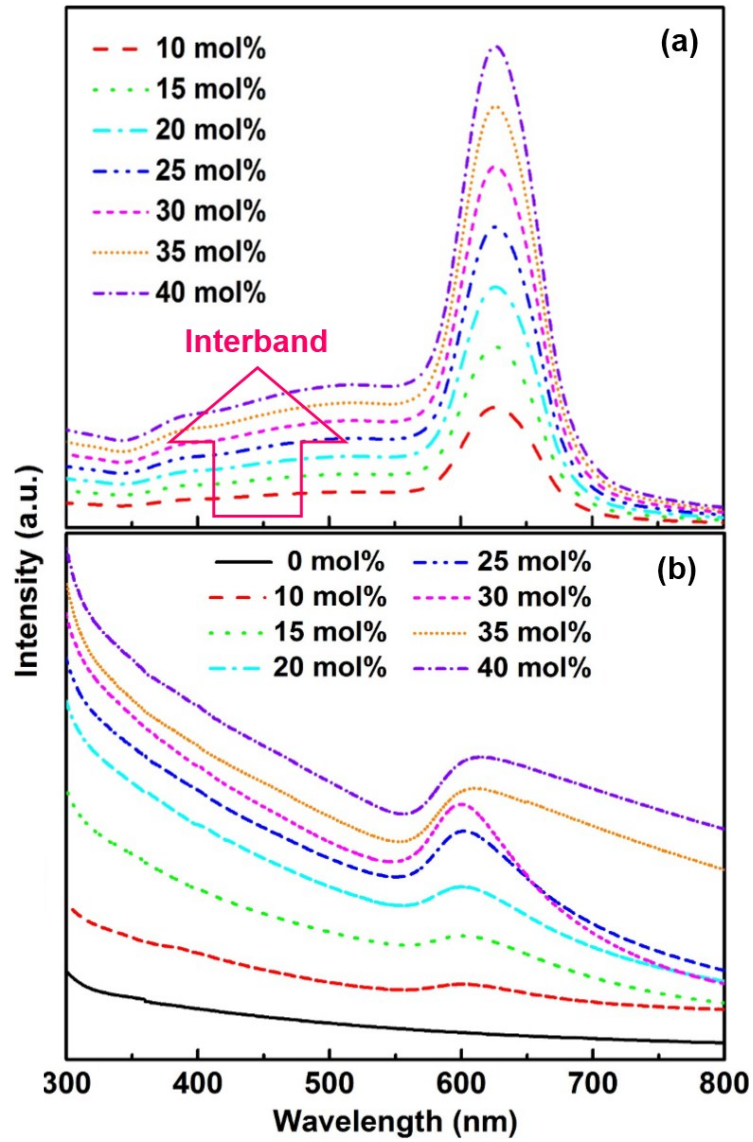
Fig. S4. (a) Theoretical optical absorption spectra of the Cu_x/BTO thin films calculated by Mie theory. (b) Experimtenal optical absorption spectra obtaiend for the Cu_x/BTO thin films.
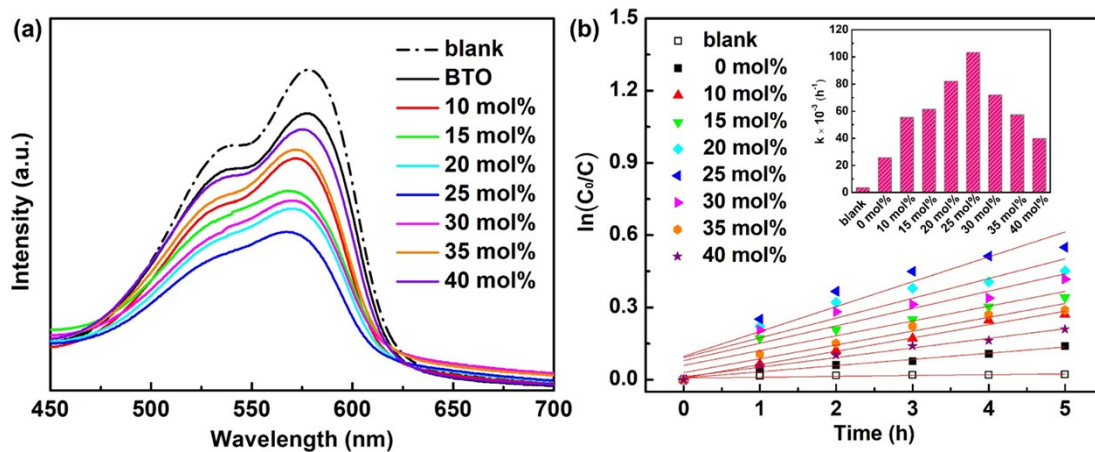
Fig. S5. (a) The absorption spectra of RhB after photocatalytic degradation by various samples for 300 min. (b) Fitted plot of $\ln(C_0/C)$ versus the degradation time according to the first order kinetics. Inset of (b) shows the histogram of the degradation rates.