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An Enhanced CdS/TiO_2 Photocatalyst with High Stability and Activity: Effect of Mesoporous Substrate and Bifunctional Linking Molecule

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Synthesis of Mesoporous TiO_2. The procedure was as follows: (I) preparation of $K_2Ti_2O_5$ whisker: A reactant mixture with a TiO_2/K_2O molar value of 1.9 was prepared by uniformly adding K_2CO_3 to $TiO_2 \cdot nH_2O$ and then sintered at 810℃ for 2 h. (II) Hydration: The sintered product was soaked in distilled water at ambient temperature in a closed container for about 7 days. (III) Ion exchange: the hydration product was suspended in 100 mL of vigorously stirred 0.1 M HCl solution until K^+ ion was totally exchanged. The product was filtered and washed with distilled water and dried in a desiccator at 60℃ under vacuum. (IV) Calcination: ion exchange product was sintered in a muffle oven at 500℃ in the air for 2 h. After natural cooling, the mesoporous TiO_2 as photocatalyst carriers were synthesized, denoted as TiO_2(m).

Raman spectra characterization. Raman spectra were obtained with a Horiba HR 800 spectrometer. The 514.5 nm radiation from a 20 mW air-cooled argon ion laser was used as the exciting source. Data acquisition was the result of 2×3 accumulations for samples.

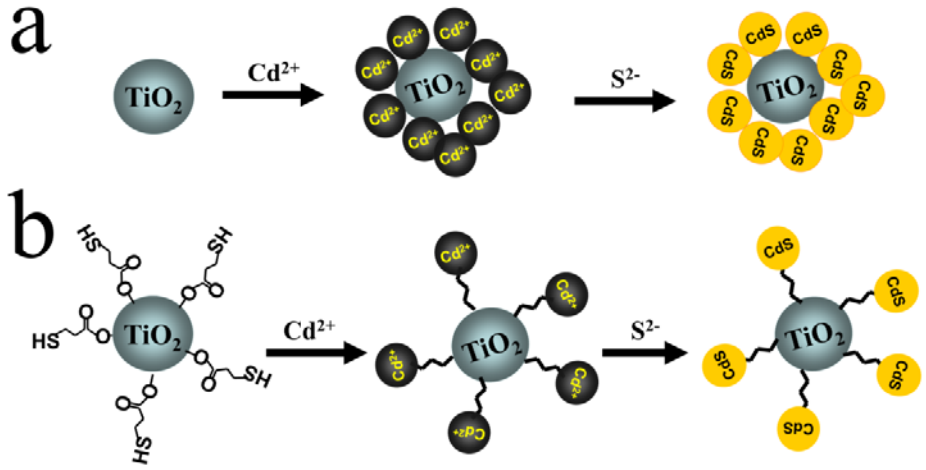

Figure S1. Schematic synthesis route of (a) CdS-TiO_2 and (b) CdS-MPA-TiO_2

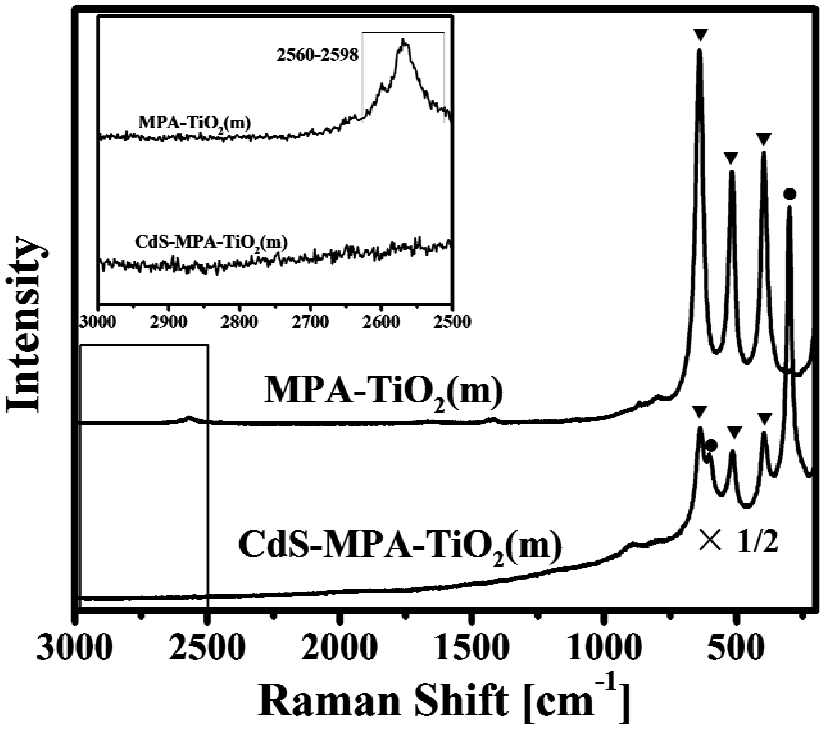

Figure S2. Raman spectra of (a) MPA-TiO_2(m) and (b) CdS-MPA-TiO_2(m). Inset: Characteristic stretching band of S-H. (● CdS ▼ TiO_2)

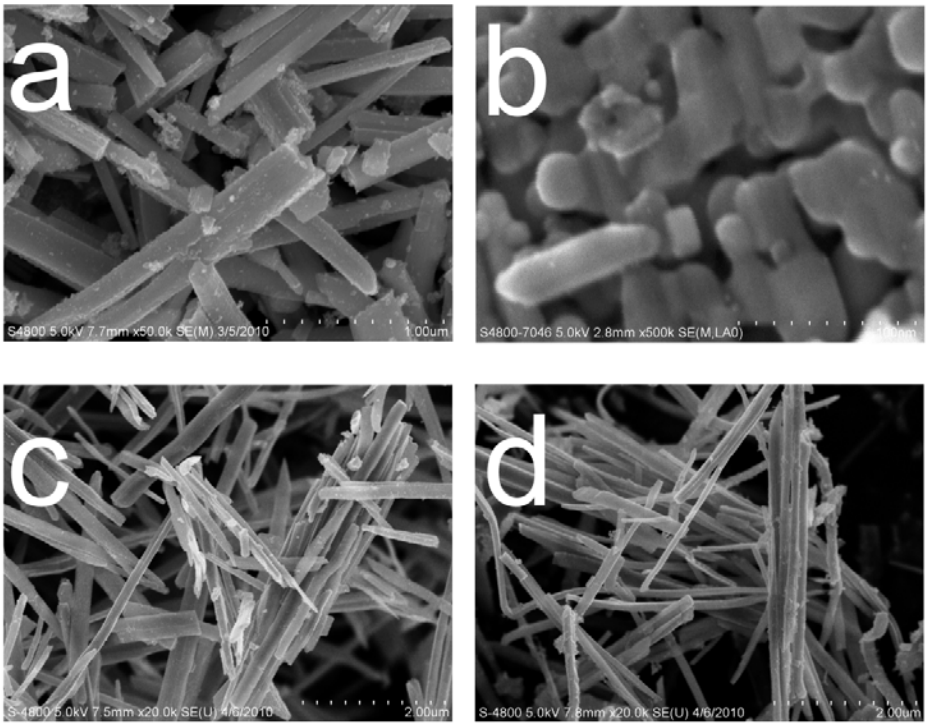

Figure S3. SEM images of (a) TiO_2(m), (c) CdS-TiO_2(m) and (d) CdS-MPA-TiO_2(m); FESEM image of (b) TiO_2(m).

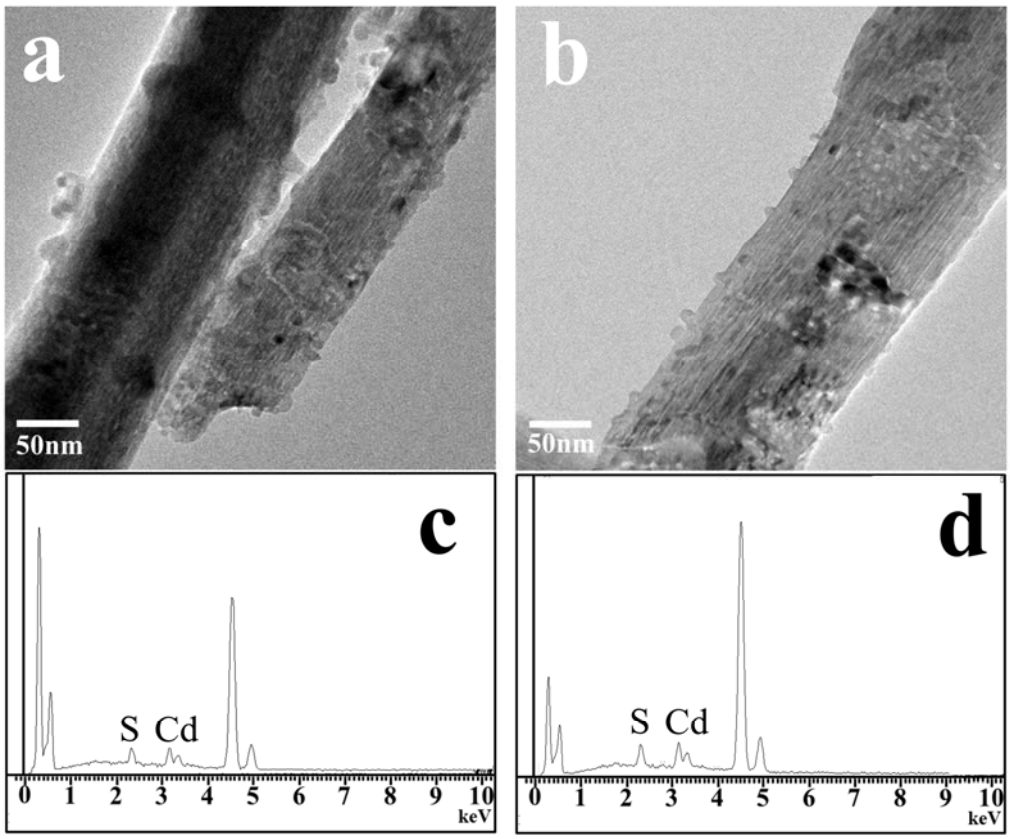

Figure S4. TEM images in larger scale (50nm) of (a) 3% CdS-TiO_2(m), (b) 3% CdS-MPA-TiO_2(m) and corresponding EDS analysis (c), (d).

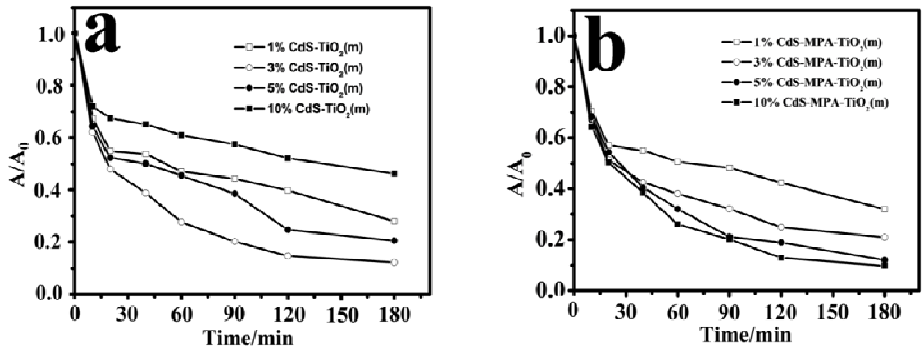

Figure S5. Dependence of methylene blue degradation rates on CdS-TiO_2(m) (a) and CdS-MPA-TiO_2(m) (b) with different CdS content