

Hybrid TiO<sub>2</sub>-SiO<sub>2</sub> structure derived from rice straw and enhanced photocatalytic properties for dye wastewater treatment

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Rice straw, an agricultural bioresource, is utilized as a biotemplate in order to synthesize a hybrid TiO<sub>2</sub>-SiO<sub>2</sub> structure, and the resulting products were used for removing hazardous methylene blue dye from aqueous solutions. Samples of the as-prepared hybrid TiO<sub>2</sub>-SiO<sub>2</sub> structure are characterized by thermal gravity analysis, field emission scanning electron microscopy, X-ray diffraction, X-ray photoelectron spectroscopy, nitrogen gas adsorption/desorption measurement, and UV/vis spectroscopy. The results obtained show that the hybrid TiO<sub>2</sub>-SiO<sub>2</sub> structure possesses both anatase and rutile phases, along with amorphous SiO<sub>2</sub>. Its specific surface area is determined to be 141.1 m<sup>2</sup>/g, and its pore size to be 3.77 nm. Light harvesting within the visible-light range is found to be enhanced by the use of this hybrid TiO<sub>2</sub>-SiO<sub>2</sub> structure. Moreover, the photocatalytic activity and stability are also improved, as demonstrated by the degradation of methylene blue dye under UV irradiation.