**Sol-gel synthesis and characterization of SnO2/ZnS nanocomposite for photocatalytic degradation of Crystal violet dye**

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**Abstract:**

The present article employs SnO2/ZnS nanospheres synthesized by a facile sol-gel method to investigate the UV light-assisted photodegradation of Crystal Violet (CV) dye as a model molecule. PL, UV-Vis spectroscopy, EDS, XPS, FESEM, and XRD were the techniques employed to characterize the samples. The formation of the test samples' crystallographic structural properties was documented by X-ray diffraction (XRD) analysis. Field emission scanning electron microscopic (FESEM) analysis could contribute to the SnO2/ZnS nanocomposite incorporating the shape of a nanosphere. In order to determine the chemical states of the constituent elements of the composite, X-ray photoelectron spectroscopy (XPS) was taken into consideration. Utilizing the Tauc plot relation, the optical band gaps of the individual constituent nanoparticles were determined. Specifically, for SnO2, ZnS, and SnO2/ZnS, the obtained values are 2.01, 1.65, and 1.54 eV, respectively. The reduction in peak intensity is observed for the composite sample, as indicated by the PL spectra. Furthermore, for instance, when it comes to disregarding crystal violet pollutants, the SnO2/ZnS photocatalyst exhibits more photocatalytic activity than that of the effects of pure SnO2 and ZnS nanomaterials. Its distinctive characteristics are attributed to enhanced charge separation and reduced charge recombination in the SnO2/ZnS photocatalyst activity, which suggests that it might be a material with potential ability for economically feasible water pollution reduction.

**Keywords:** Sol-gel, photocatalysis, nanocomposite, Crystal Violet