$SrZrO_3$/CdS heterostructure nanocomposite with improved photocatalytic and dielectric properties

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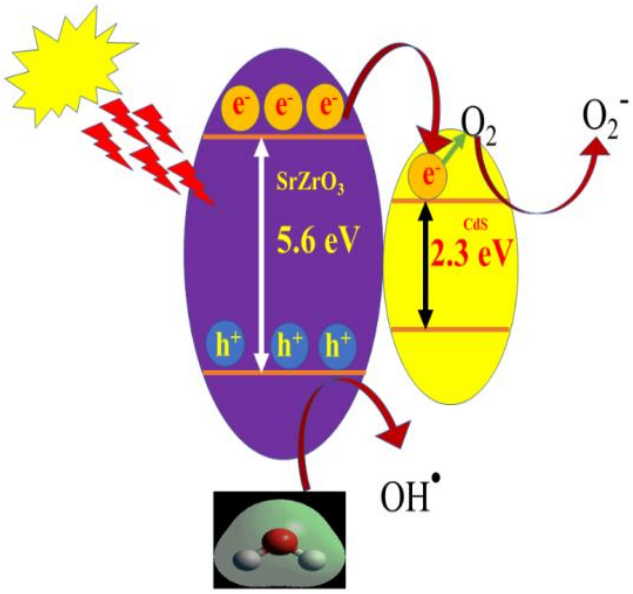
Abstract: Heterogenous nanostructured photocatalyst of CdS was synthesized by using $SrZrO_3$ as substrate. Polymeric citrate precursor and co-precipitation routes were primarily used for synthesis of bare $SrZrO_3$ and CdS nanoparticles respectively. CdS was deposited over the surface of the pre-synthesized $SrZrO_3$ nanoparticles by utilizing chemical deposition technique. To determine the phase structure, purity and crystallinity of the synthesized bare nanoparticles and their heterostructures XRD was used, which shows the formation of orthorhombic and face centered cubic (FCC) phases of $SrZrO_3$ and CdS, respectively. Morphology and particle size of as-synthesized nanoparticles was determined by using TEM, which shows the average particle size of 14, 24 and 25 nm for $SrZrO_3$, CdS and $SrZrO_3$/CdS, respectively. The BET surface areas of $SrZrO_3$, CdS and $SrZrO_3$/CdS were found to be 299, 304 and 312 m^2/g, respectively. The photocatalytic activity of the synthesized nanomaterials was determined by using Methylene blue was used as model pollutant. Compared to bare nanoparticles heterostructured photocatalyst shows enhanced photocatalytic activity.

Dielectric properties (dielectric constant and dielectric loss) of the nanoparticles was investigated as function of frequency at room temperature and as function of temperature at 500 kHz. The room temperature dielectric constant for $SrZrO_3$, CdS and $SrZrO_3$/CdS was found to be 13.2, 17.8 and 25.5 respectively at 100 kHz.



The principle of charge separation in the $SrZrO_3$–Fe_2O_3 photocatalyst.

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