

Concentration Dependent Structural, Morphological and Optoelectronic Properties of Sprayed Cadmium Based Transparent Conducting Oxide

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The effect of precursor concentration on the physico-chemical properties of cadmium oxide (CdO) thin films deposited using simple and effective chemical spray pyrolysis technique (SPT) is studied. The X-ray diffraction study shows polycrystalline, face centered cubic structure of CdO films. Field emission scanning electron micrographs and cross-sectional images of CdO thin films shows that morphology of films changes from rough to smooth and thickness of the films increases from 794 nm to 1523 nm, as cadmium content increased in spraying solution. X-ray photoelectron spectroscopy confirms presence of 4d, 4s, 3d_{5/2}, 3d_{3/2}, 3p_{3/2}, 3p_{1/2} fine structural states of cadmium and 1s fine structure state of oxygen. The optical study shows that the direct band gap energy values decreases from 2.58 to 2.42 eV with increase in precursor concentration which is attributed to B-M effect. The Hall Effect measurement indicates that all the films exhibit n-type semiconducting behavior, the electrical resistivity decreases from 34.5 x 10⁻⁴ to 2.7 x 10⁻⁴ Ω.cm for 0.025M to 0.1 M solution concentration and further increase to 12.5 x 10⁻⁴ Ω.cm for 0.125 M concentration. The CdO thin film deposited with 0.1 M precursor concentration exhibits the best optoelectronics properties amongst the all other CdO films. It shows transmittance of 74 %, high figure of merit of 25.3 x 10⁻³ (Ω)⁻¹, carrier concentration of 5.87 x 10²⁰ /cm³ and mobility of 40 cm²/Vs. Photoluminescence spectra of CdO thin film gives two significant photoemission peaks at 434 and 539.80 nm (green) when they are excited at 400 nm wavelengths.

Biography:

Dr. Sandeep Prakash desai is an Assistant Professor from KIT's College of Engineering, India; He has a Teaching Experience of 13 Years, Area of Specialization in Applied Physics, Material Science. He obtained his from Shivaji University, India with Title: Studies on Synthesis and Characterization of Cadmium Based Transparent Conductive Oxide Thin Films, under the guidance of Dr. A. V. Moholkar.

He attended various National / International Seminars, Conferences and also participated in many Workshops. He has published many Papers in International Journal. Dr. S.P Desai has published a Book: A text Book of Engineering Physics: 2K-Publication, ISBN No. 9788193077788