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The Influence Of Ni Doping On Structural and Optical Properties Of Lanthanum Oxide (La2O3) Thin Films Synthesized Through Sol-gel Spin Coating Technique.

Lanthanum Oxide (La2O3), a well-recognized wide band gap rare-earth oxide, distinguished by its exceptional structural stability, high dielectric constant and notable optical properties, making them suitable for advanced thin film devices. In the present work, Ni doped La2O3 thin films with varying dopant concentration (La2(1-x)NixO3: x=0, 0.01, 0.03 & 0.05) were fabricated through conventional sol-gel spin deposition technique on the ultrasonically cleaned glass substrate. The effect of 'Ni'incorporation on the intrinsic properties of the La2O3 matrix were systematically characterized using XRD, Raman Spectroscopy, FTIR, SEM and UV-Visible spectroscopy to assess their structural, morphological and optical modifications. XRD results has exhibited enhanced crystallinity, pronounced effect of doping on lattice parameters and the coexistence of cubic and hexagonal structures. Raman and FTIR spectroscopy confirmed the phase purity and revealed the vibration modes associated with La-O bonds affirmed the integration of 'Ni'into the La2O3 lattice. The morphological properties and elemental composition were examined through SEM-EDX, which has demonstrated the formation of granular structures with average particle size ranging from ⊠84nm to ⊠126nm. The optical characterization has shown ⊠90% of transmittance in the UV-region, while the energy band gap calculated using tauc's plot analysis has yielded values of 4.01eV, 4.035eV, 4.051eV and 4.056eV for pure, 1% Ni, 3% Ni and 5% Ni doped La2O3 thin films respectively. These findings highlight the significant impact of Ni doping on the structural and optical properties of the prepared films, revealing their potential utility for photocatalytic and optoelectronic applications.

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