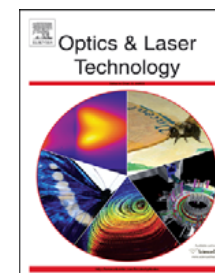




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Synthesis of CdZnO thin film as a potential candidate for optical switches

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ABSTRACT

Cadmium doped zinc oxide thin films have been prepared using a thermal decomposition technique. The influence of Cd as a doping agent on the structure, optical and nonlinear optical properties was carefully investigated using X-ray diffraction (XRD), scanning electron microscopy (SEM) and a UV–vis spectrophotometer. A deep correlation has been found between the surface roughness and the optical properties. The roughness is found to deteriorate the nonlinear response, such that the highest nonlinear susceptibility $\chi^{(3)}$ is obtained for the smoothest layer. The third-order nonlinear susceptibility $\chi^{(3)}$ has been calculated using the Frumer model, and is estimated to be 3.37×10^{-10} esu. The dispersion of the refractive index of the prepared thin film is shown to follow the single electronic oscillator model. From the model, the values of oscillator strength (E_d), oscillator energy (E_o) and dielectric constant (ϵ_∞) have been determined. The conductivity has been measured as a function of the energy of the photons, revealing marginal change at energies below 3.15 eV, while above this value there is a large increase in the conductivity. This suggests that CdZnO is a potential candidate for applications in optical devices such as optical limiter and optical switching.