

# Controlling the Structural and Optical Properties of Nanostructured ZnO Thin Films by Cadmium Content

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**Abstract:** Thin films of Cd(ZnO) (with Cd content ranged from 0.0 and 10.63wt.%) were grown onto glass substrate using sol-gel spin coating technique. The XRD patterns of the films indicate the formation of ZnO as a single phase with a hexagonal wurtzite structure. The crystallinity is gradually deteriorated with increasing the Cd content. AFM images of the films show that the surface of the undoped ZnO film is consisted of nanorods turned into nanoclusters after Cd incorporation leading to an increasing in the surface roughness. The optical band gap is red-shifted from 3.3 eV to 3.18 eV. This is attributed to that the ionic nature of ZnO is larger than that of CdO and to the formation of Cd 5s state below the CB edge. The Urbach energy values changed inversely with optical band gaps of the films. The optical constants of the films are changed with the Cd content. The correlation between the structural modifications and the resultant optical properties are reported. Results of the present system are compared with those of similar materials.

**Keywords:** Spin coating; ZnO; thin films; nanoclusters; Roughness; Refractive index; Optical conductivity.