SPECIMEN FORMAT FOR THESES OF MONTH

Faculty	**:**	**Science**
Department	**:**	Physics
Branch/ Area:	**:**	Physics
Sub Subject Heading:	**:**	Nanotechnology
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Title of the thesis	**:**	Preparation and Characterization of pure and Doped Zinc Oxide Nanocrystalline Films by Chemical Bath Deposition Technique
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Abstract within 300 words:

In recent years, there has been considerable interest generated in the study of compound semiconductors with dimensions in the nanometer range. In the present work, we have attempted to prepare and characterize ZnO and ZnO doped with Mn^{2+}, Cu^{2+} and Pb^{2+} (2.5, 5.0, 7.5 and 10.0 mole %) nanocrystalline thin films (a total of thirteen samples) by the simple chemical bath deposition technique with the easily available chemicals. The prepared thin films were annealed at 600 ºC for about 30 min. X-ray powder diffraction (PXRD) and energy dispersive X-ray absorption (EDAX) analysis were carried out to characterize the prepared samples chemically and structurally. Atomic force microscopic (AFM), Scanning electron microscopy (SEM) and Transmission electron microscopic (TEM) analyses were also carried out. The prepared samples were optically characterized by carrying out UV-Vis absorption spectra and photoluminescence spectra. Photo conductivity analyses were carried out to characterize the photo conducting nature of the materials. All the samples prepared were subjected to DC and AC electrical measurements in order to characterize them electrically.

The results obtained in the present study indicate the possibility to prepare good quality pure and 2.5, 5.0, 7.5 and 10.0 mole % Mn^{2+}, Cu^{2+} and Pb^{2+} doped ZnO nanocrystalline films by using simple chemical bath deposition method. Also, the method is found to be fast and high purity. The unit cell volume expansion is found to be increased with the increasing dopant concentrations for the Mn^{2+}, Cu^{2+} and Pb^{2+} added nanocrystalline film. It reveals that the dopant Mn^{2+}, Cu^{2+} and Pb^{2+} incorporated with the host ZnO matrix. The present study shows a significant increase in bandgap energy when compared to that observed for bulk. The addition of Mn^{2+}, Cu^{2+} and Pb^{2+} minutely tune the optical bandgap energies. The Mn^{2+}, Cu^{2+} and Pb^{2+} added nanocrystalline films have very high PL yield compared to pure ZnO film. The small amount of dopants in the host ZnO lattices highly enhances the photocurrent. The rise and decay of photocurrent of the ZnO nanocrystalline film is highly changed with the change in concentration of dopants in the host ZnO film.The results obtained

in the present electrical conductivity study indicate the occurrence of nano-confirned states in the case of all the thirteen systems studied which may substantially contribute to the electrical properties. Hence it is clearly understood that the space charge contribution plays an important role in charge transport process and polarizability in the case of all the systems considered in the present study. The prepared pure and doped ZnO nanocrystalline film shows a weak quantum confinement effect.

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