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Synthesis and characterization of Ag, Cu and Al doped Zno thin Films

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Abstract: In this work pure and transition elements (Ag, Cu and Al) doped Zinc Oxide is prepared. All the samples were prepared through chemical co-precipitation method, by using sulfates of metallic precursors. We have doped pure ZnO with Ag, Cu and Al by 3% by weight concentration. Further the structural, Crystallite size and band gap approximation studies were performed by utilizing X-ray diffraction and spectroscopic techniques respectively.

Keywords: zinc oxide, SEM, XRD, EDAX, AFM, UV-Vis absorption spectroscopy, Raman Spectroscopy, nanocomposites, absorption, Doping.

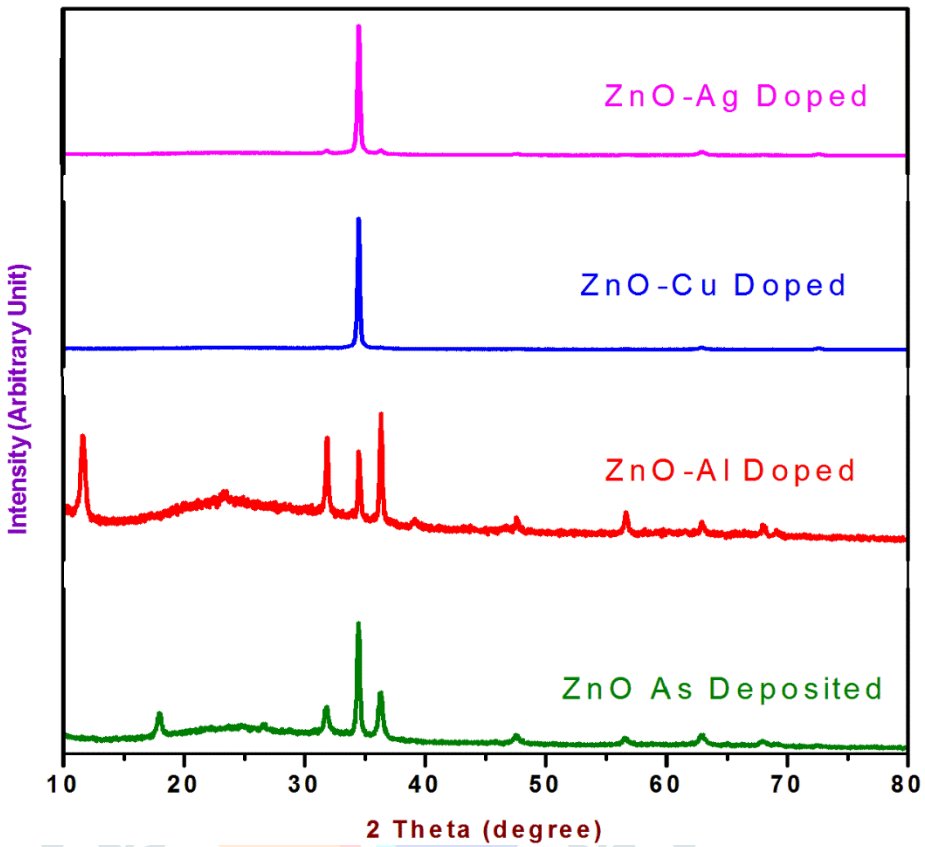
Introduction: ZnO is indeed a key element in many industrial manufacturing processes including paints, cosmetics, pharmaceuticals, plastic, batteries, electrical equipment, rubber, soap, textile, floor covering etc. with improvement in growth technology of ZnO nanostructures, single crystal and nanoparticles, ZnO devices will become increasing functional in the near future.The piezoelectric and pyroelectric properties of ZnO mean that it can be used as a sensor, converter, energy generator and photo catalyst in hydrogen production. The physical and chemical properties of ZnO nano materials can be easily tailored as per the demand of device fabrication.

ZnO is a relatively very soft material with approximate hardness just 4.5. Its elastic constants are relatively smaller than those of other III-V semiconductors, e.g. GaN. The high heat capacity and high heat conductivity, low values of thermal expansion and high melting points are 11 some of the characteristics of ZnO.

The band gap energy (between valence and conducting bands) is 3.2eV. Under ultra violet light zinc oxide is photoconductive. The combination of optical and semiconductor properties of doped Zinc oxide make a contender for new generations of devices. absorption of solar radiation in photovoltaic cells is much higher in materials composed of nanoparticles than it is in thin films of continuous sheets of material it means that they increase the efficiency, the smaller the particles, the greater the solar absorption.

Experimental work: Several eminent research groups were studied and analyzed that metal-modified oxide semiconductor material have the potential to act and used as catalysts, sensors, substrates for surface-enhance

Raman scattering and colloidal entities with unique optical properties. For synthesis of the ZnO nanoparticles first we have to take two materials that are precursor one is of zinc precursor and other is of Oxygen.



Result and discussion:

X-ray diffraction study (XRD)

X-ray diffraction study confirms that the synthesized material was ZnO with wurtzite phase and the entire diffraction peaks are in agreement with the standard JCPDS data (card No.36-1451). The average grain size was calculated with the help of Scherrer equation using the FWHM of all peaks. Most importantly, all of the XRD peaks were attributed to ZnO and no other undesired peaks were observed due to secondary phases or impurity phases within the detection limit of the X-ray diffractometer.

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