ZnO, CdO, and ZnO coated CdO core-shell nanoparticles: Their Preparation and Characterization via sol-gel route and the effects of temperature and frequency on their electric conductivity

Abstract

In this research work, sol-gel method, it is a low cost and simplest successful method, was used to synthesized nano sized of ZnO, CdO and ZnO coated CdO nanocomposites. Zinc acetate hydrate and Cadmium acetate dihydrate dissolution ( 0.2 M ) have been dissolved in ethanol separately and formed precursors at about 80-90 °C by continuous stirred for 2 hours. The mono ethanolamine had used in the sol-gel reaction as stabilizer. The precursor formed was decomposed to ZnO and CdO nanoparticles after calcined at 500 °C for duration time of 1 hour, and gave a single phase of samples as shown and confirm by the XRD patterns. The three powder samples ZnO, CdO NPs and ZnO as core and CdO as shell were characterized using X-ray diffraction (XRD), scanning electron microscope (SEM) and Energy – Dispersive X-ray spectroscopy (EDAX) for crystalline structure characterization, morphology and elemental analysis, respectively. XRD results revealed that the prepared ZnO and CdO samples are highly crystallize, having wurtzite crystal structure and the ZnO and CdO nanoparticles average size were found by XRD data and Scherer equation to be (76 nm) and (80 nm), respectively. The SEM image shows that ZnO nanoparticles prepared in this study are spherical in shape with smooth surface. Electrical conductivity on as prepared and annealed samples at 500 °C were performed in the temperature range (30 – 115°C) and with applied frequencies from (50 Hz to 2000 Hz). From the electrical conductivity curves, activation energies are obtained with the assumption of Arrhenius behavior over the entire temperature range from (30 to 115 °C).

ZnO NPs, CdO NPs , Sol-gel, SEM, EDX and XRD