Abstract

The pure In2O3 and (In2O3: ZnO: Au) of different concentrations (5:5:0, 5:4:1, 5:3:2, 5:2:3, 5:1:4, 5:0:5 and 0:5:5 ml) nanocomposite thin films have been prepared by spray pyrolysis method. Laser Induced Forward Transfer LIFT technique was used to make multiple devices. The X-ray diffraction indicate that the formations of crystalline is cubic spinal phase for In2O3 and Au in (In2O3:ZnO:Au) nanocomposite thin films, while hexagonal phase structure appeared for ZnO. The existence of Miller indices conforms to (211), (222), (400), (333), (440) and (622) of In2O3. Also, secondary lattice planes of (100) and (002) of ZnO, (111) and (200) of Au were found. X-ray density increased with Au nanoparticles addition. The Atomic Force Microscope (AFM) micrographs show that the averages grain size decreases (93.57-70.48) nm with the increasing of Au nanoparticles concentration. Scanning Electron Microscopy (SEM) images of prepared thin films show that a polycrystalline film has been successfully grown. EDX spectra show the presence of amount of In2O3, ZnO and Au nanoparticles.

The optical measurements for pure In2O3, (In2O3:ZnO:Au) of different concentrations (5:5:0, 5:4:1, 5:3:2, 5:2:3, 5:1:4 5:0:5 and 0:5:5 ml) show that the absorption coefficient, extinctions coefficient, refractive index and dielectric constant are increased with the increase in Au nanoparticles concentration, while the transmittance were decreased with the increase in Au nanoparticles concentrations and energy gap were also decreased (3.05-2.90) nm with the increase in Au nanoparticles concentrations.

One of the most important applications of pure In2O3 and (In2O3:ZnO:Au) nanocomposite thin film of different concentrations is as a gas sensor. The applications of pure In2O3 and (In2O3:ZnO:Au) nanocomposite thin film of different concentrations show that the sensitivity to NO2 gas and the

responsitivity are decreased with the increase of Au nanoparticles concentration**.**

Hall Effect measurements of all thin films exhibit n-type conductivity and the Hall coefficients for all prepared thin films are negative, which means that the electrons are major charge carriers in the conduction process. The current–voltage characteristics of the samples show an enhancement in light photodetector when gold nanoparticles concentration increased because of the free electrons that increases the current.