ABSTRACT

This work deals with the investigation of different effects on the structural, morphological, electronics and electrical properties of Ni doped ZnTe semiconductor material by taking fix ratio of Te and varying Ni ratio as x=0.00, 0.06, 0.12 ,0.18 and 0.24. The structural and surface morphological studies of the samples before and after doping were conducted using the X-rays diffraction (XRD) and scanning electron microscope (SEM) respectively. XRD results revealed a cubic in structure. Energy-dispersive X-rays spectroscopy (EDX's) is an analytical technique used for the elemental analysis or chemical characterization of a sample. Fourier-transform infrared spectroscopy (FTIR) is a technique used to obtain an infrared spectrum of absorption or emission of a solid, liquid or gas. It is observed that the incorporation of Ni into ZnTe semiconductor has strong influence on the structural and optical properties of the material. For XANES study, it was found that the oxidation state of Ni in ZnTe showed mixture of different nickel ion which conform the formation of oxygen vacancies or lattice defect. XANES spectra shifts to lower energy and the white line intensity decreases, suggesting the reduction of Ni (II) to Ni (I) via the removal of surface lattice oxygen to oxidized ZnTe. The XAFS results indicated that large Ni ions were incorporated in ZnTe lattices and the structure of Ni doped ZnTe deviated from the cubic symmetry on the Te site surrounded by six O atoms. Zn K-Edge XAFS oscillations curves provide the information about the distance between the central atom and surrounded atoms. It is observed that the incorporation of Ni into ZnTe semiconductor has strong influence on the structural and electronic properties of the material. From all the analysis it is concluded that Ni doped zinc telluride particles are most favorable and promising candidate to be used in applications such as solar cells and optoelectronic devices like LEDs as well as spintronics.