Micro-structural and Thermoelectric Characterization of Zinc-Doped $In_{0.6}Se_{0.4}$ Crystal Grown by Direct Vapour Transport Method

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Crystal of zinc-doped $In_{0.6}Se_{0.4}$ was successfully grown by direct vapour transport (DVT) method. Grown $In_{0.6}Se_{0.4}$: Zn crystal has been characterized by energy dispersive X-ray (EDAX) and powder X-ray diffractometer (XRD) techniques for compositional and micro-structural analysis, respectively. The EDAX spectra represent the grown $In_{0.6}Se_{0.4}$: Zn crystal enriched with excess indium doped with Zn, which consecutively shows enhanced n-type conductivity. The powder XRD spectrum signified that the grown sample was crystalline and had hexagonal structure. The micro-structural parameters: average crystallite size, average lattice strain, dislocation density, and domain population were determined from powder XRD spectra. The thermoelectric properties such as Seebeck coefficient (S), electrical resistivity (σ^{-}), and thermal conductivity (κ) were measured in the temperature range of 313 to 368 K. Grown $In_{0.6}Se_{0.4}$: Zn crystal reported Seebeck coefficient (S) as high as $-548\,\mu VK^{-1}$ and figure of merit of 1.14 at 368 K.

Keywords: DVT method, X-ray diffraction, micro-structural parameters, Seebeck coefficient, figure of merit.

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