Thermal Characterization of Intrinsic and Extrinsic InP using a Photoacoustic Technique

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Thermal diffusivity depends on how heat diffuses through the sample and this diffusion of heat in semiconductors is an important transport property, which is of major consideration in semiconductor technology [1-2]. Physically, the inverse of thermal diffusivity is a measure of the time required to establish the thermal equilibrium in systems in which a transient temperature change has occurred.

During the last two-decades, the laser induced photoacoustic and photothermal methods are extensively used for the characterization of thermal, transport and optical properties of a variety of materials such as semiconductors, ceramics, liquid crystals etc [1-5]. Recent studies shows that doping can influence the thermal and transport properties of semiconductors [6]. In this work, we report the investigation of influence of doping with Sn, S and Fe on the thermal diffusivity value of InP using an open photoacoustic cell. The present experimental set up is calibrated by the evaluation of thermal diffusivity of Si and GaAs. The thermal diffusivity value is evaluated over a range of frequency in which only thermal diffusion is the dominating process of heat diffusion mechanism. The present study shows that the doped samples show a reduced value for thermal diffusivity in comparison with intrinsic sample. From the analysis of data, it is seen that even the nature of dopant influences the thermal diffusivity value. The results are interpreted in terms of phonon assisted heat diffusion mechanism in semiconductors.

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