Investigation of structural and optical properties of near surface of CdTe film induced by nitrogen plasma immersion ion implantation

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ABSTRACT

Plasma immersion ion implantation (PIII) is an important technique for performing a shallow junction for microelectronic applications. This work describes the effect of nitrogen PIII on structural, morphological and optical properties of CdTe thin films. To optimize the implantation results, the experiments were carried out at different exposure times (0, 2.5, 5, 10, 15 min). Scanning electron microscopy (SEM) and energy dispersed x-ray (EDX) were used to investigate the surface morphology of CdTe implanted films. According to x-ray diffraction (XRD) analysis, a considerable change in structural parameters such as lattice parameter, internal stress, crystallite size and lattice strain are observed as a result of increasing the duration time of plasma immersion nitrogen ions implanted CdTe film. The energy gap (E_g^{opt}) values of implanted films were estimated in terms of the first derivative of absorbance with respect to wavelength and found to be decreased with increasing PIII exposure time. The reduction in E_g^{opt} values was explained and correlated with the change in microstructure parameters..

Keywords: CdTe Thin Films; Plasma Immersion Ion Implantation; Structure Parameters; Optical Constants; Energy Gap