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EVOLUTION OF POINT DEFECT STRUCTURE OF CdTe CRYSTALS DURING LASER IRRADIATION, INDUCED DOPING AND HIGH ENERGY RADIATION DETECTION

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High resistivity CdTe semiconductor is widely used in the production of X-and γ-ray detectors. Electrical and spectral properties of CdTe-based devices strongly depend on the nature of point defects in the initial crystals and also on evolution of the semiconductor defect structure during fabrication and operation of detectors. Recently, we have shown that the nanosecond laser procedure can be successfully used for surface processing of CdTe crystals, doping of a thin surface layer and producing diode structures which are sensitive to X- and γ-ray radiation [1-5]. However, the laser action is accompanied by the formation of native point defects, complexes as well as extended defects in the semiconductor. High energy radiation also results in transformation of the point defect structure during detector operation.

We have analyzed the experimental results on laser-induced defect formation and doping of commercial (111) oriented Cl-compensated semi-insolating *p*-like CdTe single crystals [1-5]. The model of laser-stimulated evolution of the point defect structure has been developed. We have also performed simulation studies of CdTe crystals and diode-based detectors using the commercial SDEVICE simulator by SYNOPSYS. The appropriate energy levels and defect concentrations in the band gap of CdTe were incorporated using the investigation results of electrical, photoelectric and luminescent properties of CdTe crystals and diode structures and also information on published compensation models. We have performed *I-V* simulation and comparison with experimental data and also the transient behavior of the detectors due to bombardment with alpha particles and X-ray photons have been simulated.

Keywords: *CdTe, Laser irradiation, Doping, Point defects, Radiation detectors*

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