

**Study of electric field in radiation detectors
by Pockels effect (Master Thesis)**

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Abstract

Cadmium Telluride (CdTe) is a convenient candidate for room temperature detection of X-ray and gamma radiation due to 1.5 eV bandgap energy and high atomic mass. Since CdTe has the highest linear electro-optical coefficient among II-VI compounds, the detector represents a Pockels cell. Transmittance of the crystal is modulated by the internal electric field. Processing of infrared camera photographs results in an electric field profile between biasing electrodes. The electric field in semi-insulating CdTe is influenced with deep level traps causing charge polarization under the electrodes. Occupation of traps is dependent on metal-semiconductor interface. Relation of charge accumulation and band bending for gold and indium contacts was studied. Repolarization/depolarization induced by additional illumination with sub/above bandgap excitation laser was observed and exploited for determination of the deep level energy. Results obtained by the Pockels-effect method were supported with luminescence measurements. Correlation between the occurrence of deep levels and surface point defects was discovered.

Keywords: Pockels electro-optical effect, Cadmium Telluride radiation detector, Electric field, Schottky contact