Title: Structural defects in II-VI semiconductors

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Abstract: The single crystalline $CdTe$ doped by chlorine is an excellent material for manufacturing x-ray and gamma-ray room-temperature semiconductor detectors thanks to the large linear attenuation coefficient, the possibility to make it high-resistive at the room temperature, and good electron mobility and the lifetime. This thesis aimed to examine the effect of annealing in well-defined ambient component pressure, Cd or Te, on the crystal's defect structure. The first experimental is devoted to eliminating the second phase defects - inclusions - present in $CdTe : Cl$, which significantly decay the crystal quality and detection performance. The following experimental parts are focused on the detailed investigation of the point defect structure of $CdTe : Cl$. The annealing interval bisection method for reaching high resistivity material is introduced. The equilibrium defect structure is investigated using the *in-situ* high-temperature Hall effect measurements. The results are interpreted through an advanced model of the defect structure considering also dissociation of neutral defect complex affecting the defect self-compensation. Two independent experimental methods, *in-situ* high temperature Hall effect measurements and Positron annihilation spectroscopy, prove the existence of this neutral defect. The dynamic of point defect structure and the chemical diffusion coefficient are studied measuring the temporal evolution of the conductivity after the step-like change of Cd pressure. The validity of the classical Meyer-Neldel rule is critically discussed and its extension to a triangle-shaped Meyer-Neldel rule is introduced.

Keywords: CdTe Inclusions Point defects Annealing Defect dynamic