Thermal and optical properties of mixed CdTe and ZnTe based crystals

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CdTe-based mixed compounds in bulk crystal form have a fairly long history. They are used in various applications as x-ray and gamma-ray detectors, in electro-optic and photorefractive devices, and as substrates for epitaxy in the case of infrared sensors. The variation in composition allows tuning of their fundamental parameters like energy band-gap and lattice constant, which is very important from the application point of view.

Investigated in this work, CdTe-based crystals were grown with the help of the vertical Bridgeman technique [1]. Zinc, Beryllium, and Magnesium atoms were incorporated into the matrix of CdTe. We examined their physical properties such as accurate composition, nature of the atom substitution, segregation coefficients, structural (XRD), thermal, optical (energy gap, energy structure), and defects (with photoluminescence spectroscopy) properties. The composition's energy gap as a function was determined from photoluminescence spectroscopy. The segregation coefficient of Zn in a CdTe matrix has been evaluated as being close to unity [2].

The thermal diffusivity and effusivity of the investigated crystals were derived from the experimental data and allowed the thermal conductivity to be calculated. To achieve this goal, a photopyroelectric technique in both, back (BPPE) and front (FPPE) configuration will be applied for thermal inspection of the samples. The critical property of materials used for detecting application is their quality. Since the efficiency and sensitivity of the potential detector strongly depend on the quality of the used crystal, it is essential to define its lattice disorder. It was shown how lattice disorder effects in CdTe-based mixed crystals affect their physical properties.

References

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