CdZnTe crystals for the realization of x-ray and gamma ray detectors

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CdZnTe is a particularly suited material for the realization of room temperature x-ray and gamma ray detector.
The properties that make CdZnTe (CZT) so promising are the high resistivity of the material ($\rho \geq 10^{10}$ Ω·cm), combined with a relatively small band gap (~1.6 eV at RT). Moreover the high atomic number (Z) of the material determines the application on a large range of energies.
In this work the authors report on the crystal growth of several crystals of high resistivity $Cd_{1-x}Zn_xTe$ (x=0.1) by two vertical Bridgman technique: with and without the boron oxide encapsulation[1].
The ingots obtained have been extensively studied on both the crystal qualities and the detector performances.
Using the PL mapping technique the interface shape was studied on many ingots, together with an accurate analysis of the Zn segregation along the growth axis [2].
The resistance of the devices was studied using the current-voltage characteristic in the low voltage range.
The spectroscopic result of the CZT detector is satisfactory for both the growth techniques. Several x-ray sources have been used to characterize the ingots, ranging from 10 KeV up to 300 KeV.
The μτ product, a good indicator of the device transport properties, was measured with an alpha particle source, giving good results for the electronic μτ, while holes μτ still need to be improved.

[1] M.Zha, A.Zappettini, et al., Journal of Crystal Growth, 2008, 310
[2**]** L. Marchini, N. Zambelli, et al. Nuclear Instruments and Methods A, 2010

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