Crystal Defects and Charge Collection in CZT X-Ray and Gamma Detectors

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CdZnTe (CZT) is very promising material for room-temperature x-ray detectors proposed for medical, environmental and astrophysics applications.
CZT can potentially provide high resistivity, low leakage current and high charge-collection efficiency.
However, commercial CZT material is affected by crystal defects limiting the use of CZT in the large-scale production of x-ray and gamma detectors.
In this work we have tested several CZT samples grown at IMEM-CNR Institute, in order to understand the roles of defects on the charge transport.
Different optical and electrical techniques were used and the results will be reported. Te inclusions were studied with an IR microscope and accurate measurement of the electron mu-tau product u were conducted using an alpha particle source. We also studied the effect caused by grain boundaries and dislocations, which were identified using White beam X-ray Diffraction Topography.
The homogeneity of the device response and the uniformity of the electric field were examined in the National Synchrotron Light Source using a 25-KeV highly collimated X-ray beam and raster scanning the device.
A strong correlation between the extended defects and the detector response was found.