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Studies of Bulk Properties of CZT and CMT Crystals for X-Ray and Gamma-Ray Detection at Ambient Temperature[1] S.U. EGARIEVWE, A.E. BOLOTNIKOV, U.N. ROY, S.O. BABALOLA, A. KASSU, J. JOW, G. CAMARDA, P. FOCHUK, W. CHAN, K.H. KIM, J. STEIN, R.B. JAMES, A. BURGER, Alabama A&M University — Cadmium Zinc Telluride (CZT) and Cadmium Manganese Telluride (CMT) crystals have emerged as promising advanced materials for X-ray and gamma-ray detection at ambient temperature. An understanding of the bulk properties in relation to energy resolution and device performance has led to the development of CZT into commercial devices, and is contributing to the improvement of CMT. The key detector attributes are large band-gap energy ($\sim$1.6 eV, tunable by Zn or Mn concentration), high atomic number, and high density ($\sim$6 g/cm^3). The techniques used in this study include infrared transmission microscopy, synchrotron X-ray diffraction topography, micro-scale X-ray mapping, and Pockels effect. We found that point defects and Te inclusions in CZT and CMT can trap the charge carriers generated by the absorption of X-rays, gamma-rays, and charged particles. We propose the use of thermal annealing and doping techniques to eliminate the deleterious effects caused by Te inclusions.

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