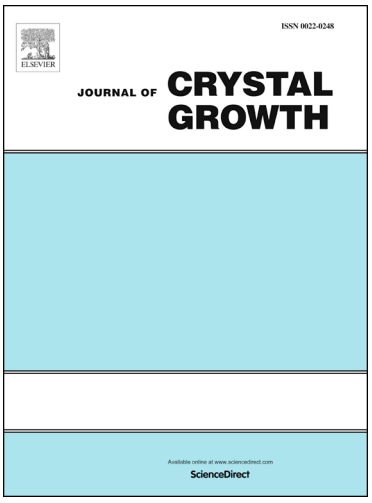

Large-size TlBr single crystal growth and defect study

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Large-size TlBr single crystal growth and defect study

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Abstract: Thallium bromide (TlBr) is an attractive semiconductor material for fabrication of radiation detectors due to its high photon stopping power originating from its high atomic number, wide band gap and high resistivity. In this paper the vertical Bridgman method was used for crystal growth and TlBr single crystals with diameter of 15 mm were grown. X-ray diffraction (XRD) was used to identify phase and orientation. Electron backscatter diffraction (EBSD) was used to investigate crystal microstructure and crystallographic orientation. The optical and electric performance of the crystal was characterized by infrared (IR) transmittance spectra and I-V measurement. The types of point defects in the crystals were investigated by thermally stimulated current (TSC) spectra and positron annihilation spectroscopy (PAS). Four types of defects, with ionization energy of each defect fitting as follows: 0.1308, 0.1540, 0.3822 and 0.538 eV, were confirmed from the TSC result. The PAS result showed that there were Tl vacancies in the crystal.

Keywords: Thallium bromide; Bridgman crystal growth; large size; defects.