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Study of defects in TlBr, InI as potential semiconductor radiation detectors[1] KOUSHIK BISWAS, MAO-HUA DU, Materials Science and Technology Division and Center for Radiation Detection Materials and Systems, Oak Ridge National Laboratory, Oak Ridge, TN 37831 — Group III-halides such as TlBr and InI are receiving considerable attention for application in room temperature radiation detector devices. It is however, essential that these detector materials have favorable defect properties which enable good carrier transport when operating under an external bias voltage. We have studied the properties of native defects of InI and Tlbr and several important results emerge: (1) Schottky defects are the dominant low-energy defects in both materials that can potentially pin the Fermi level close to midgap, leading to high resistivity; (2) native defects in TlBr are benign in terms of electron trapping. However, anion-vacancy in InI induces a deep electron trap similar to the F-centers in alkali halides. This can reduce electron mobility-lifetime product in InI; (3) low diffusion barriers of vacancies and ionic conductivity could be responsible for the observed polarization phenomenon in both materials at room temperature.

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