

High quality Perovskite Single Crystal X-ray Detectors

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In this study, we have investigated the impact of ligand-assisted Inverse Temperature Crystallisation (ITC) growth of FAPbBr₃ perovskite single crystals on X-ray sensitivity and the charge transport properties. The ligand 3-(Decyldimethylammonio)propane-sulfonate inner salt (DPSI) was used to synthesise these perovskite single crystals from solution and the initial impact of the ligand on the nucleation rate and the growth speed of the single crystals were investigated. The presence of strains in the perovskite single crystals was studied using cross-polar microscopy and the emission properties were investigated using photoluminescence (PL) measurements.

The bulk resistivities of these devices were obtained using IV measurements and the resistivities reached 0.5 GΩcm. The Amptek Mini-X2 X-ray tube with an Au anode and an acceleration voltage of 40kVp was used for X-ray sensitivity measurements of these devices. These devices showed X-ray sensitivities reaching $(54.94 \pm 0.7) \mu\text{CGyair-1cm}^{-2}$. We will further discuss the impact of the DPSI ligand on crystal growth, charge transport and X-ray sensitivity of perovskite single-crystal detectors.

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