Optoelectronic properties of $CH_3NH_3PbBr_3$ thick polycrystalline layers under X-rays and electron beam

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Metal Halide Perovskite (MPH) are semiconductor materials of interest in many optoelectronic fields, among them X-ray detection. This is due to their strong X-ray absorption (particularly with lead based MPH), their easy synthesis and their good charge carrier transport properties. Whereas most research these recent years focused on single crystal properties or thin polycrystalline layers for solar cells applications, few studies have been published on the effect of grain boundaries in thick and large polycrystalline layers necessary in medical X-ray imaging. Consequently, the influence and behaviour of grain boundaries in thick perovskite layers is still discussed. Using $MAPbBr_3$ polycrystalline samples synthetized in solution in collaboration with Néel Institute in Grenoble, we present recent works on these thick layers to characterize their optoelectronic properties. Macroscopic optoelectronic measurements (X-rays photocurrent, laser time of flight) are presented in regards of comparable monocrystalline samples to highlight the progress needed for operational perovskite X-rays imagers. To understand the link between macroscopic properties and grain boundaries, Electron Beam Induced Current measurements were performed on polished samples to characterize the carrier generation with high spatial resolution.