**Link:** <https://solar-power-tech.com/e-posters/psc_eposter_19/>

**Abstract**

To improve the efficiency of hybrid perovskite solar cells an understanding of the fundamental process of the material is needed. In particular, the role of grain boundaries has been shown to assist ion migration, allowing ions to travel more freely than in the bulk crystal defects[1]. Increased ion migration will lead to a decrease in the device’s performance and electrical stability by increasing the severity of J-V hysteresis and anomalous behaviour. In this work, the role of ion mobility in perovskite devices is investigated, in particular on perovskite films with large crystal sizes (several micrometres) and orientated crystal facets ( (100) plane, (001) plane and mixed-orientation). Control over the size and orientation of the perovskite crystals changes the way ions behave in the grain boundaries. It is found that when the crystal facets are orientated in the (100) plane a pronounced s-shape is observed in the current-voltage scans, unseen in other orientations. Using Driftfusion[2], (a Drift-Diffusion simulation package) these solar cell devices are simulated and it is found that a reduction in ion mobility leads to this pronounced s-shaped JV curve. Furthermore, it is shown that due to the lower ion mobility, there is a reduction in the ion accumulation density at the perovskite/ETL (Electron transport Layer) boundary which in turn affects the electrostatic potential through the device along with the electron and hole concentration distribution within the perovskite layer. The s-shaped JV curves are attributed to an increase in recombination at the interfaces which causes a reduction in current, all due to these slower moving ions. The role of ions controlling charge transfer rate across perovskite interfaces seen here also agrees with work done by Moia et al[3].