**Link:** <https://solar-power-tech.com/e-posters/psc_eposter_13/>

**Abstract**

Perovskite solar cell (PSC) fabrication using solution-based approaches is prone to the appearance of pinholes and other defects, which reflect adversely on the device's performance and stability.

The interfacial carrier recombination in PSCs is one of the dominant efficiency loss mechanisms, which also results in the simultaneous loss of potential efficiency [1]. To achieve a stable long-term conversion of energy and good performance of organometal halide PSC, interface passivation between perovskite and charge transporting materials is required. The insertion of a polymeric interlayer permit to passivate defects, suppress the current leakage, and align energy level, maximizing the VOC of devices [2]. In this work, we developed planar p-i-n PSCs with a polymer interlayer (PEO and PMMA) between perovskite (CH3HN3PbI3) and inorganic hole transporting layer (NiOx). We provided a comparison of device performance fabricated on different concentrations of polymers interlayers to define the impact of thickness on output characteristics, to evaluate the environmental conditions of polymer deposition (ambient vs. inert atmosphere in glove-box) and influence of organic PCBM and inorganic thermal evaporated C60 electron transporting layers on stability. Finally, we fabricated up-scaled passivated by PMMA cells and modules by increasing photoactive area from 0.09 cm2 to 1 cm2 for single cells and 2.3 cm2 and 10 cm2 for minimodules. Passivated devices have hysteresis-free behavior which is related to the reduction interfacial defects.

PSCs with PEO and PMMA interlayer exhibit a promising power conversion efficiency of 18.32% and 18.61%, respectively which is higher than pristine PSC value of 17.89% for 0.09 cm2 lab-scaled devices, 15.21% for 1 cm2 passivated by PMMA cells (instead of initial 14,97%), 14.37% for passivated (PMMA) minimodules of 2.3 cm2 and 8.01% for minimodules of 10 cm2. Maximum power point tracking (MPPT) shows satisfactory light stability of up-scaled PSCs with polymer interlayers in comparison with pristine perovskite solar cells for 180 hours of measurements under continuous light soaking (LED source, 50°C). Light soaking analysis demonstrates the improved stability of PSCs fabricated with polymers (PEO and PMMA) which lost 20% of initial power conversion after 140 hours instead of the 10 hours of control devices. Photovoltaic measurements (JV, TPV, charge extraction, dark JV, IPCE) confirmed that polymer passivation leads to a lower concentration of defects at the interface that corresponds to higher values of parameters and lower dynamic of degradation.