PerTPV – Perovskite thin film photovoltaics

Grant agreement 763977

Deliverable 2.8

25% single junction cell

Lead beneficiary: [IIT]

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The PerTPV project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 763977.

Revision History

Author Name, Partner short name	Description	Date
MK Nazeeruddin	Draft deliverable	28/06/2021
H J Snaith	Revision 1	29/06/2021
H J Snaith	Final version	30/6/21

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This work builds upon previous work in the project incorporating ionic liquids and large ionic salts into the perovskite absorber material to deliver enhanced voltage efficiency and stability. Here, we have found that a specific ionic liquid, which we term IL-X, has extremely positive influence upon controlling the crystallinity and reproducibility of perovskite film formation. We find that IL-X interacts with the perovskite precursor components in the solution, contributes to forming stable large colloidal particles in the perovskite precursor solution, stabilizing the solution. Furthermore, this promotes the direct transformation from intermediate phase to a stable $FAPbI_3$ black phase perovskite, thus enhancing the crystallinity and reproducibility of perovskite films. We fabricated perovskite solar cells (PSCs) with power conversion efficiency (PCE) of 24.33% (PCE of 24.00% certified by Newport). The residual IL-X interacts with perovskite components and suppresses the degradation of perovskite films under operation conditions, enabling excellent operational stability under exposure to moisture, heat and light irradiation. Based on the crystallographic studies, we conclude that IL-X in the perovskite precursor solution promotes the preferential orientation of perovskite films and results in highly crystalline films.

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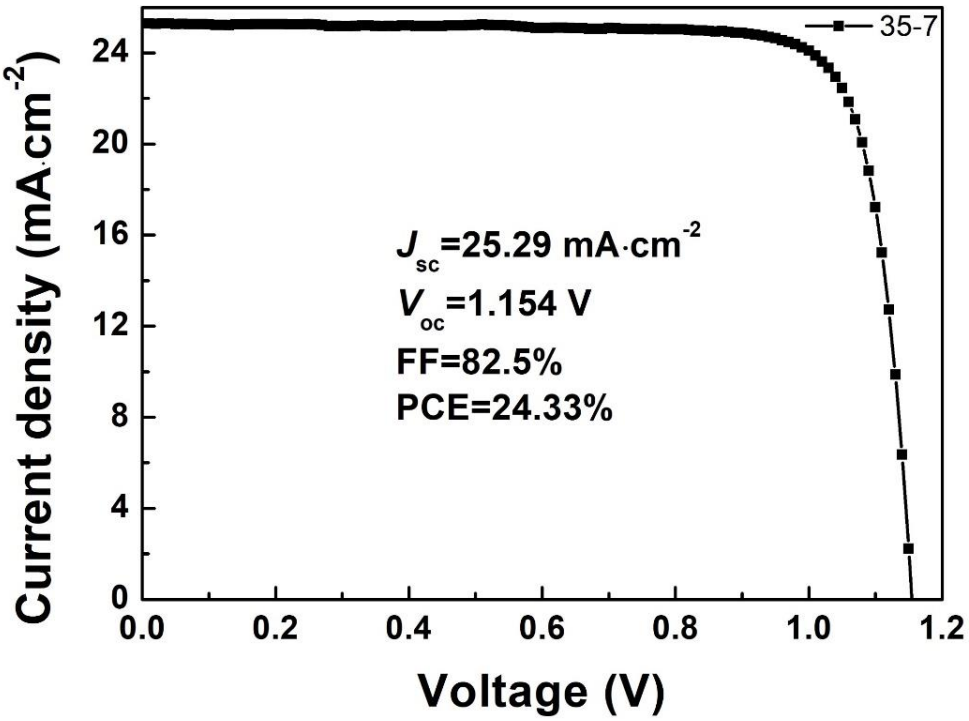

Figure 1. Current voltage curve for a record efficiency n-i-p single junction perovskite cell, incorporating IL-X, measured under AM1.5 simulated sun light.

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