Hysteresis-free perovskite solar cells with low-temperature processing

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Inorganic-organic lead halide perovskite photovoltaic (PV) technologies have recently attracted great interest as a promising low-cost renewable energy source. With the intense efforts devoted to this emerging PV technologies, their power conversion efficiency (PCE) has rapidly soared to a value comparable to those of established thin-film PV such as CIGS and CdTe. However, high-temperature processes are required for sintering of TiO_2 layers, hindering them from being applied in flexible devices.

In this work, we report on methylammonium lead iodide ($MAPbI_3$) based perovskite PV cells[3] in which TiO_2 layers are replaced with C_{60}-based electron transport layer (ETL) that are thermally evaporated onto PEIE-coated ITO substrates. Experimental results show the proposed devices exhibit a resonable PCE over 10% with virtually no hysteresis problem (see Fig. 1 shown below). It is noteworthy that high temperature process is not requried for the proposed PVs because substrates are held almost at room temperature during deposition of C_{60} layers. For this reason, we believe the proposed device structure may open up an effective pathways towards highly efficient yet flexible PVs.

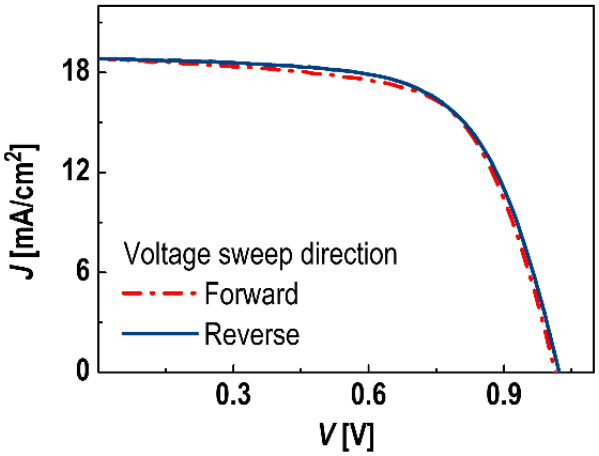

Fig. 1. *J-V* curves obtained under AM1.5G (1 Sun) condition with forward (short circuit → open circuit) and reverse (open circuit → short circuit) sweeps.

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References

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