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Boosting the performance of planar heterojunction perovskite solar cell by controlling the precursor purity of perovskite materials †

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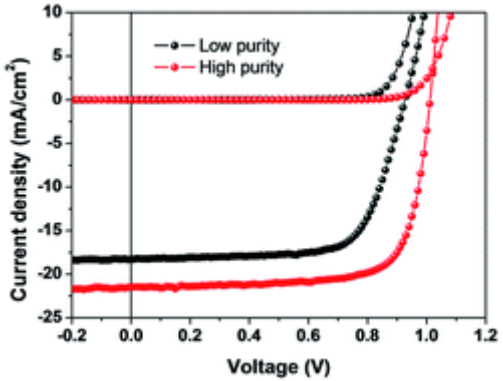
Abstract

Perovskite solar cells (PSCs) have received great attention due to their high power conversion efficiency and low fabrication cost. The perovskite layer is usually prepared from a solution of precursors. We found that the PbI_2 purity has a significant effect on the crystallinity, charge carrier dynamics, and photovoltaic properties of the perovskite films. Planar heterojunction PSCs using highly pure PbI_2 showed a high power conversion efficiency (PCE) of 16.4%, which was higher than that of control PSCs with low purity PbI_2 by 30–40%. Steady-state photoluminescence (PL), time-resolved PL (TR-PL) and femtosecond transient absorption measurements (FS-TA) revealed that impurities

can lower the electron lifetime and increase the non-radiative recombination. This study implies that the PCEs of the perovskite solar cell devices could be further boosted by controlling the precursor purity.



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