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Grain-boundary effect and post treatment of active layer for efficient inverted planar perovskite solar cells

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ABSTRACT: Organometal halide perovskite ($CH_3NH_3PbI_3$) solar cells with excellent photovoltaic performance have obtained great attention. In this work, conductive atomic force microscopy is used to investigate the conduction mechanism of perovskite film, and the results clearly show that grain boundaries are beneficial to the charge transport in perovskite solar cells. However, there are large gaps between grains in some as-prepared perovskite films, and the related grain boundaries or grains have poor charge transport capability, which leads to undesirable photovoltaic performance. After iso-propyl alcohol treatment, the charge transport capabilities of both grain boundaries and grains are improved. The power conversion efficiency of related device using PEDOT:PSS as hole transport material is increased from 13.72% to 15.65% with concurrently improved open circuit voltage, short circuit current density and fill factor. This research addresses that