Extended device test stability of high-efficiency perovskite solar cell

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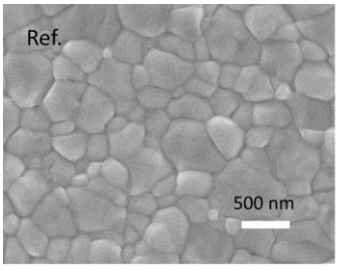
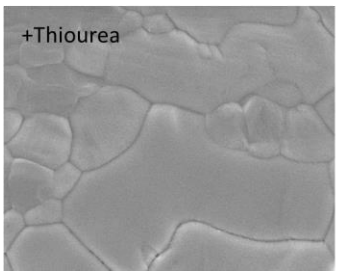
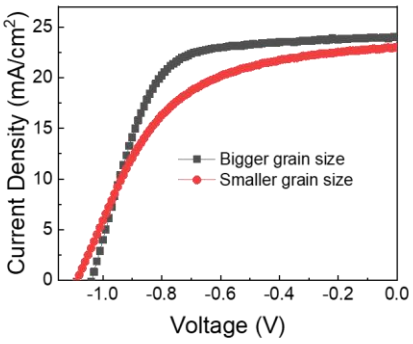
Introduction: In the past years, although perovskite solar cells are fast developed as the excellent photovoltaic properties and the photoelectric conversion efficiency (PCE) has been quickly over 25%, the device lifetime is still need to be improved because of the inevitable ion migration. Normally, the ion migration seriously occurs at the grain boundaries where the first position start to deteriorate, thus, reducing the grain boundary is a considerable and efficient method to prolong the device lifetime, and a lot of evidences shows that less grain boundary is good for device photovoltaic[1].

Results and discussion: It has been proved that Thiourea could modify perovskite crystallinity by forming intermediate phase in the perovskite precursor as Lewis acid-base adduct[2]. Here, we use Thiourea as dopant into perovskite films, where the doping concentration is 10% molar ratio, and compared the influence of grain size on the device test stability. It is suggested that bigger grain size could improve the grain size above 1μm, and extend *J-V* test stability. We also applied this method in different perovskite systems and compare their universality, which is attributed to the suppressed ion migration among the grain boundaries. The morphologies of perovskite film and corresponding device photovoltaic performance are shown as followed.







	V_{OC} (V)	J_{SC} (mA/cm²)	FF	PCE (%)
Bigger grain size	1.03	24.02	0.66	16.29
Smaller grain size	1.08	23.04	0.53	13.23

Fig. 1. The morphologies of perovskite film and device photovoltaic performance.

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References

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2) Wang S, Ma Z, Liu B, *et al*. Solar RRL, **2** (2018), 1800034.