High efficient perovskite solar cells via two-steps growth approach of perovskite film

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Organic-inorganic perovskite solar cells (PSCs) have attracted enormous attention, as the power conversion efficiency (PCE) has boosted to over 20.0%[1,2]. The drastic development stems from the superior properties of perovskite materials, including long carrier diffusion length and strong light absorption. The performance of PSCs mainly limits by perovskite film and the ratio of PbI_2 seriously effects the quality of perovskite layer as a doubled edged sword[3,4].

In this study, we successfully achieved high efficient PSCs by employing two-step growth of perovskite crystals, including the $Cs_{0.05}(MA_{0.17}FA_{0.83})_{0.95}Pb(I_{0.83}Br_{0.17})_3$ was designed as main photo-active layer and removed too excess PbI_2 of perovskite film surface by halide solutions, respectively. Figure 1(a) shows current density-voltage curves of PSCs without and with two steps processing. The performance of PSCs has been much enhanced in comparison without treatment devices, especially the improvement of FF, J_{SC} and PCE. Figure 1(b) depicts the anti-humidity stability of PSCs without and with after processing. The treated PSCs sustained over 76.0% of initial PCE even at high humidity of ~60.0% under continuous light soaking, which was much higher stability than without treated PSCs of 50.0% under humidity of ~50.0%. The excellent performance and enhancement mechanism of PSCs will be discussed.

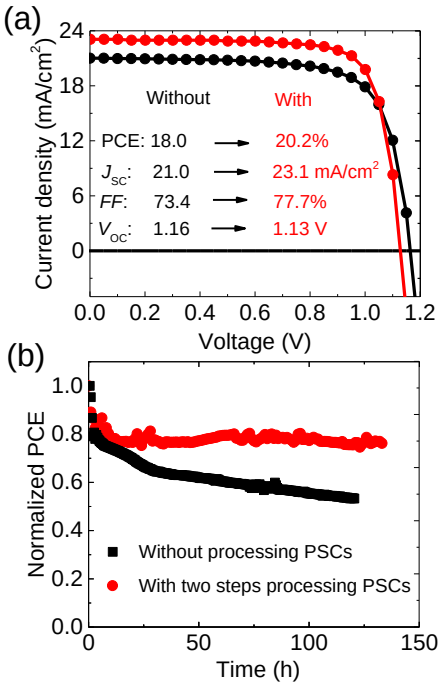

Figure 1 (a) *J-V* curves of PSCs. (b) Anti-humidity stability testing curve of PSCs.

References

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