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One-Step Roll-to-Roll Air Processed High Efficiency Perovskite Solar Cells

Chuantian Zuo^{a,b,c}, Doojin Vak^a, Dechan Angmo^a, Liming Ding^{b,c}, and Mei Gao^{a*}*^aC. Zuo, Dr. D. Vak, Dr. D. Angmo, Dr. M. Gao

CSIRO Manufacturing, Bag 10, Clayton South, Victoria 3169, Australia

E-mail: Mei.Gao@csiro.au

^bC. Zuo, Prof. L. Ding

Center for Excellence in Nanoscience (CAS), Key Laboratory of Nanosystem and Hierarchical Fabrication (CAS), National Center for Nanoscience and Technology, Beijing 100190, China

E-mail: ding@nanoctr.cn

^cC. Zuo, Prof. L. Ding

University of Chinese Academy of Sciences, Beijing 100049, China

Abstract:

The rapid improvement in power conversion efficiencies (PCE) to record high levels have highlighted perovskite solar cells' great potential to be commercialized in the near future. Continuous roll-to-roll (R2R) processing on flexible substrates enables ultra low-cost and high throughput manufacturing, which is essential for perovskite solar cells to make a breakthrough in cost per Watt compared to commercially established solar cells technologies. Here we demonstrate a facile spin-coating-free and R2R compatible blowing-assisted drop-casting (BADC) method to prepare CH₃NH₃PbI₃ films for perovskite solar cells. The crystallinity and morphology of CH₃NH₃PbI₃ films and device performance are significantly improved by optimization of the formulation with an NH₄Cl additive. The perovskite solar cell prepared in air with a maximum PCE of 19.48% is obtained using modified poly(3,4-ethylenedioxythiophene):polystyrene sulfonate (m-PEDOT:PSS) as the hole transport layer (HTL). The cells based on the structure of

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