EW-P029

The effect of film morphology by bar-coating process for large area perovskite solar modules

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Organic-inorganic metal halide perovskite solar cells have received attention because it has a number of advantages with excellent light harvesting, high carrier mobility, and facile solution processability and also recorded recently power conversion efficiency (PCEs) of over 20%. The major issue on perovskite solar cells have been reached the limit of small area laboratory scale devices produced using fabrication techniques such as spin coating and physical vapor deposition which are incompatible with low-cost and large area fabrication of perovskite solar cells using printing and coating techniques. To solution these problems, we have investigated the feasibility of achieving fully printable perovskite solar cells by the blade-coating technique. The blade-coating fabrication has been widely used to fabricate organic solar cells (OSCs) and is proven to be a simple, environment-friendly, and low-cost method for the solution-processed photovoltaic. Moreover, the film morphology control in the blade-coating method is much easier than the spray coating and roll-to-roll printing; high-quality photoactive layers with controllable thickness can be performed by using a precisely polished blade with low surface roughness and coating gap control between blade and coating substrate[1]. In order to fabricate perovskite devices with good efficiency, one of the main factors in printed electronic processing is the fabrication of thin films with controlled morphology, high surface coverage and minimum pinholes for high performance, printed thin film perovskite solar cells. Charge dissociation efficiency, charge transport and diffusion length of charge species are dependent on the crystallinity of the film [2].

We fabricated the printed perovskite solar cells with large area and flexible by the bar-coating. The morphology of printed film could be closely related with the condition of the bar-coating technique such as coating speed, concentration and amount of solution, drying condition, and suitable film thickness was also studied by using the optical analysis with SEM. Electrical performance of printed devices is gives hysteresis and efficiency distribution.

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Keywords: perovskite solar cells, large area, bar-coaing, perovskite solar modules