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Fabrication of Perovskite Solar Cell via Rapid Convective Deposition Technique

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Here, we introduce a new technique, called rapid convective deposition, to fabricate planar perovskite solar cells. This technique uses a reclining blade to draw a liquid droplet across a substrate thus advancing thin film can be deposited on a substrate. Thickness and morphology of the thin film can be controlled by deposition speed and blade angle as well as liquid volume and concentration. Unlike the conventional spin coating, the convective deposition consumes much less material in fabrication process. Recently, we have demonstrated high efficiency and low cost fabrication of perovskite solar cell with ITO/PEDOT:PSS/Perovskite/PCBM/TiO_x/Al structure. Except the ITO and Al metal electrode, all the solid films were deposited layer by layer via the convective deposition. In addition, the low temperature treatment less than 120 °C were conducted in this experiment. Recently, more than 10% solar cell efficiency has been achieved. Furthermore, this rapid and scalable deposition technique has been used in fabrication of electrochromic windows, polymer/hybrid solar cell and anti-reflective glass.

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