Novel Solution Processes for Low-cost and High-efficiency Polymer Solar Cells

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Spray coating and brush painting are widely used for painting in commercial production and is one of the cheapest processes for coating of polymer solutions. Combining the roll-to-roll process and these low-cost processes for the fabrication of active materials of OSCs could be ideal solutions for low-cost power generation. We report on a spray coating method and a brush painting as a cost-efficient methods for the fabrication of efficient and flexible solar cells. Although the spray deposited film showed a relatively rougher surface than spin coated ones, an sprayed OSC showed 2.83 % of power conversion efficiency and 52 % of incident photon to current conversion efficiency even though the device was fabricated in air. The brushed polymer films showed comparable rms roughness with spin coated ones and the optimized brushed OSC showed even higher efficiency than spin coated devices. The brushed OSC fabricated in a glove box showed 5.4 % of power conversion efficiency, 0.66 V of open circuit voltage, 11.65 mA/cm^2 of short circuit current, 70.1 % of fill factor under 100 mW/cm^2 illuminations with air mass (AM) 1.5 G condition.