HIGH EFFICIENT AND STABLE LARGE-AREA ORGANIC SOLAR CELLS BY BLADE COATING

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The solution-processable organic photovoltaics (OPVs) has attracted interest because of its potential advantages, such as cost-effective manufacturing, large-scale roll-to-roll production possibilities, no environmentally harmful Heavy metals, and the ability to provide translucent (ST) equipment. In particular, integrating ST OPV into buildings (eg, external walls, roofs, windows, greenhouses) provides a new direction for future environmental protection. In recent years, there are several groups that have demonstrated promising results on large active areas over 10 cm². 6.5% efficiency is obtained for tandem structure with active area of 10.4 cm² [1]. 5.58% efficiency is reached with non-halogenated solvent for active area of 24 cm² [2]. In ITO-free device the efficiency is 3.17% for active area of 25 cm² [3]. With double donors the efficiency reaches 5.18% for active area of 20 cm² [4]. For even larger areas the efficiency reached 5.4% by spin coating for area of 50.4 cm² [5]. With double donors the efficiency reaches 5.18% for active area of 20 cm² [4]. For even larger areas the efficiency reached 5.4% by spin coating for area of 50.4 cm² [5].

In this work, we propose high-performance long-term stable large-area ST and opaque OPVs using blade coating technique. Blade coating has the advantages of having high film uniformity, high throughput due to its roll-to-roll potential and rapid-drying mechanism, and it is easily scalable to large area. We demonstrate a remarkably high efficiency of 5.2% for an opaque organic solar cell panel of 216 cm² active area including 16 cells connected in series using halogen lamp of 120,000 lux as the light source. The efficiency reaches 3.3% for semi-transparent panel of the same size, the J-V curves of these two devices are shown in Figure 1. In addition to the efficiency breakthrough, the panel shows good stability as well.

![Figure 1: The J-V curves of PBDTTT-EFT:PC71BM devices](image)

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References