

Roll-to-Roll production of Organic Solar Cells

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Heliatek GmbH produces organic solar cells using a roll to roll manufacturing process with a maximum size of 30cm width a length of up to 6 meters. Tandem Solar Cells from this production line show efficiencies above 7% (active area). The solar cells are deposited on a flexible PET substrate in a continuous fully integrated vacuum process. These small molecule solar cells can be semitransparent and can be produced in various colors. Due to their low weight of only 500 g/m² and the very low thickness Heliatek's HeliaFilm[®] can be used in numerous fields of application such as between glass, in facades or on inflatable air domes. By using doped transport layers it is easy to stack two or more individual sub cells on top of each other.

We will report about the latest progress on oligomer based vacuum deposited tandem and triple junction solar cells. Efficiencies above 12% together with excellent durability are now routinely achieved for lab scale triple junction cells. The EQE measurement of pin triple junctions and optical calculation based on n and k values of the organic materials and a simulation program based on the transfer matrix formalism is discussed (Figure 1). With the help of these calculations we analyze the optical losses of the solar cell and show ways for further optimization. Furthermore, we will present the world's first fully integrated roll-to-roll-production tool for organic tandem junction solar cells.

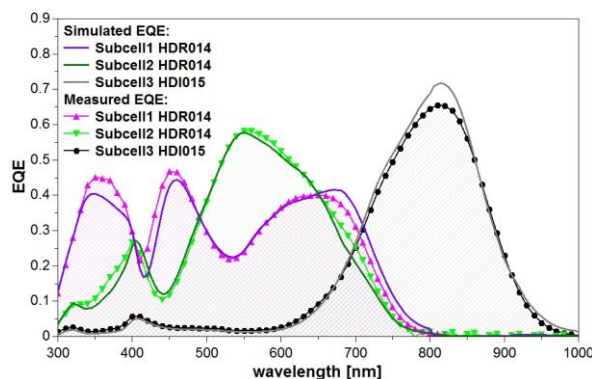


Figure 1 IPCE measurement and optical calculation of organic pin triple solar cell with complementary sub-cells.

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