OPTIMIZATION OF THE AMOUNT OF FERROELECTRIC INORGANIC PEROVSKITE NANOPARTICLES FOR HIGH EFFICIENCY INDOOR PHOTOVOLTAIC CELLS

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Abstract

In the search for higher efficiency, perovskite solar cells are the focus of attention in the photovoltaic community. Compared to other technologies (amorphous silicon (a-Si), organic photovoltaics (OPV), dye-sensitized solar cells (DSSC)), perovskite-based solar cells have an efficiency of more than 25% during a record time of 5 years [1]. On the other hand, these types of cells have shown excellent efficiencies in recent years when exposed to low light, with records of around 40% [2]. However, these materials have a real problem with the stability of their performance over time and under extreme conditions. They also have the misfortune of containing lead in their formulation. One solution seems to be the use of other types of perovskites such as ferroelectric ones. Ferroelectric perovskite such as PZN-4.5PT is a promising material offering high performance and low cost for indoor application. Thus, in this work, we developed organic-inorganic hybrid solar cells with perovskite nanoparticles dispersed in a biopolymer. The amount of nanoparticles was optimised for a more efficient performance. I-V measurements showed, for a 2.4 cm2 cell on ITO substrate, an efficiency of 30% at an irradiance of 1092.71 Lux with a very high open circuit voltage VOC, a short circuit current of 1.61.10-4 A and a form factor FF of 0.46. Apart from the use of Ferrophotovoltaic perovskites, the use of local plant-based molecules as a matrix and charge transport material had a real impact on this performance and could be safe to reduce the adverse environmental effects with the low amount of perovskites used.

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