ON THE PERFORMANCE ANALYSIS OF ORGANIC/HYBRID SOLAR CELLS THROUGH RELIABLE PARAMETER EXTRACTION

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Abstract. *An analysis of three mathematical models of advanced solar cells was developed in order to evaluate and optimize device performance. We have considered the parameter extraction for specific experimental data for performance evaluation [1-4]. The following specific parameters: PCE (power conversion efficiency) I_{sc} (short circuit current), V_{oc} (open circuit voltage) and FF (fill factor) were discussed. This methodology could be used for performance optimization and a way to compare the simulated results with the experimental ones.*

Keywords: organic photovoltaics, parameter extraction, bulk heterojunction solar cell, polymeric materials

1. Introduction

Organic solar cells (OPV) represent a field in constant evolution and rapid development [1] for polymer photovoltaics due to their advantages, like the low production cost in high volumes, good optical absorption and flexibility, (Figure 1,a). State of the art leading conversion efficiency has been reported by Heliatek and confirmed by Fraunhofer-CSP at 13.2% for a multi-junction cell with an active layer comprised of 3 patented absorbers that cover green, red and near-Ir spectrum. Reliable parameter extraction is in demand as standardized methods for OPV comparison and performance optimization [2, 26] use parameter extraction via raw *I-V* data and numerical simulation. An analysis of three mathematical models of advanced solar cells was developed in order to evaluate and optimize device performance. Respectively, the first algorithm uses a Lambert function model which should be very precise with the analytical solution [3], the second one is a double fit model [4-6, 12], which should be faster, and the third algorithm makes use of a linear regression model [7, 27-30]. We have considered the parameter extraction for specific experimental data for performance evaluation The following specific parameters: PCE (power conversion efficiency) I_{sc} (short circuit current), V_{oc} (open circuit voltage) and FF (fill factor) were discussed. This methodology could be used for performance optimization and a way to compare the simulated results with the experimental ones.

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