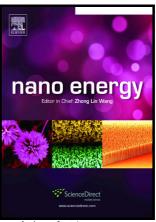
Author's Accepted Manuscript

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www.elsevier.com/locate/nanoenergy

PII: S2211-2855(16)30564-X

DOI: http://dx.doi.org/10.1016/j.nanoen.2016.11.059

Reference: NANOEN1651

To appear in: Nano Energy

Received date: 15 September 2016 Revised date: 15 November 2016 Accepted date: 30 November 2016

Cite this article as: Dietmar Knipp, Vladislav Jovanov, Asman Tamang, Veit Wagner and Alberto Salleo, Towards 3D organic solar cells, *Nano Energy* http://dx.doi.org/10.1016/j.nanoen.2016.11.059

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Towards 3D organic solar cells

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Abstract: The short circuit current density of organic solar cells can be distinctly

increased by using a 3D device geometry. The proposed device consists of an organic

solar cell layer stack prepared on the surface of a metal oxide nanowire array. The

interface morphologies of the individual organic layers are described by a 3D

morphological algorithm. The optical wave propagation in the 3D solar cell is simulated

by Finite Difference Time Domain simulations. By introducing the nanowire architecture

the short circuit current density is increased by more than 45 % resulting in an absolute

increase of more than 5 mA/cm² compared to a solar cell on a smooth substrate with

identical nominal thickness of the active layer. The increased short circuit current

density is caused by the realization of a solar cell structure on a 3D surface which

allows for the light trapping between the nanowires. The influence of the nanowire

dimensions on the quantum efficiency and short circuit current density of the solar cells

is discussed.

Keywords: solar cell; organic solar cell; nanowire; 3D surfaces; light trapping

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