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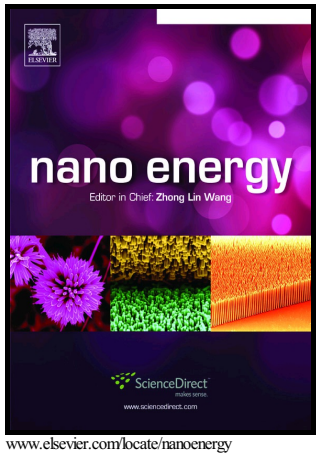


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# Towards 3D organic solar cells

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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/cm$^2$ 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*