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Boosting Electrical Performance of InGaN solar cells

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Abstract

Recent studies have shown that group III nitrides semiconductor has significant potential in the photovoltaic applications [1, 2] and among these, InGaN alloy is a promising candidate for thin film solar cell. It is also considered as the new super material that replace conventional silicon material and even graphene in the next generation nanoelcectronics devices due to its unique set of material, electrical and optical properties. The aim of this work is to simulate the maximum conversion efficiency of InGaN based thin film solar cell structure with the best junction configurations and parameters by SCAPS-1D software [3]. This computer simulation program was developed by Department of Electronics and Information Systems (ELIS), a University of Gent, Belgium. It has been extensively tested in solar cells by M. Burgelman et al. [4, 5]. SCAPS is capable of solving the basic semiconductor equations, the Poisson equation and the continuity equations for electrons and holes. SCAPS calculates solution of the basic semiconductor equations in one dimensional and in steady state conditions. These investigations provide a one alternative solution and identify the current research challenge that is anticipated new direction for solar cell technology. Figure 1 describes the different layers of the materials used in the part of a PV device and the conventions used in this study under the following parameters: solar spectrum AM1.5, P = 100 mW/cm2 and T = 300 K. The Shockley-Read-Hall (SRH) interface approach allows carriers from both conduction and valence bands to participate in the interface recombination process. The solar cell structure consists of three different layers: ZnO (antireflective), CdS or SnS (buffers), and InGaN monolayer (absorber). In this work we study the effects of CdS and SnS buffer layers on the electrical parameters, such as the short circuit current density (Jsc), open circuit voltage (Voc), fill factor (FF) and conversion efficiency (η).

Biography:

Beddiaf Zaidi working as Assoc. Prof. in Dept. of Physics at the University of Batna 1. He obtained a doctorate in Physics at the University of Annaba in 2014. He has published a number of research papers in reputed journals, has written two books. He acted as an Editor-in-Chief of IJMSA (From 2017 to 2018). He is a potential reviewer for reputed journal papers. He participated in many international conferences serving as a referee, PC member... etc. He is also an Editorial Board member of numerous journals and Lead Guest Editor of many special issues.

Speaker Publications:

1. Mesrane A, Rahmoune F, Mahrane A, Oulebsir A (2015) Design and Simulation of InGaN p-n Junction solar cell, International Journal of Photoenergy, 2015:1-9.
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