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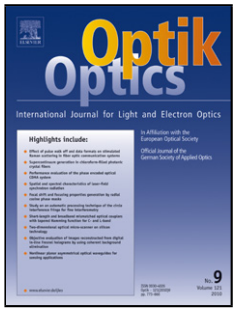

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Efficiency Enhancement of Novel CNTS/ZnS/Zn (O, S) Thin Film Solar Cell

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Abstract:

Cu_2NiSnS_4 is non-toxic earth abundant material and a promising quaternary semiconductor compound. It is conspicuous and suitable class of material for the manufacturing of high efficiency, low cost and sustainable thin film photovoltaic cell. A novel structure $CNTS/ZnS/Zn(O,S)/FTO$ is proposed in this work for the efficiency enhancement of CNTS based photovoltaic cell. Up till now there has been no model proposed to use $Zn(O,S)$ as electron transport layer for CNTS based device. In this work we proposed for the first time a novel $Zn(O,S)$ electron transport layer for the efficiency enhancement of CNTS thin film photovoltaic cell. Device modeling is performed on solar cell capacitance simulator (SCAPS) program under 1.5 AM illumination spectrum. Promising optimized functional parameters had been achieved with the conversion efficiency of 17.06%, open circuit voltage (V_{oc}) of 664mV ,short-circuit current (J_{sc}) of 31.19 mA/cm^2 and fill factor (FF) of 82.37%. The above results will give an imperative guideline for the feasible fabrication of high efficiency CNTS based photovoltaic cells.

Keywords:

SCAPS, Solar cell, Efficiency Enhancement, Numerical Analysis, Cu_2NiSnS_4, CNTS, $Zn(O,S)$