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Optimized RbGeI3 based perovskite solar cell with efficiency exceeding 29%

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Recent achievements based on lead halide (Pb) perovskites have prompted extensive research on low cost photovoltaics to avoid the main challenges in this regard: Stability and toxicity. In this study, the modeling of the lead-free (Pb) perovskite solar cell device was carried out by considering (RbGeI3) as the absorbing layer of the perovskite. The objective of this work, is to study and optimize the electrical characteristics of the solar cell based on RbGeI3 perovskite materials for AM1.5 illumination.
Method/Analysis: The analysis of the architecture of the solar cell is carried out using the Solar Cell Capacitance Simulator (SCAPS). This is a computer software tool well suited for the analysis of homo- and heterojunctions, multijunctions and Schottky barrier photovoltaic devices. This software tool works and simulates based on the Poisson equation and continuity of electrons and holes. For this model, it is used to optimize the different parameters such as the thickness of (FTO,TiO2,RbGeI3,Spiro-ometad,CuSCN), the defect density of the absorbing layer and their doping (NA), the doping concentrations (ND and NA) of the electron transport material (ETM) and the hole transport materials (HTM),
Improvements: With the proposed simulated model, the efficiency of the perovskite solar cell reaches 30%, which is an improvement of 5-6% over previous models, with the optimization of some material parameters. Therefore, this simulation work will provide practical information for the fabrication of perovskite solar cells to reasonably choose the material parameters and achieve high efficiency.

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