Theoretical simulation of solar cells

A theoretical model for GaAs-based solar cells with PIN structure is proposed herein. The effect of varying key parameters on the conversion efficiency is investigated. The simulations are performed using COMSOL Multiphysics software. The mobilities of electrons and holes are varied in combination with the lifetime (LT). As a result, a maximum efficiency of ...

In this study, the theoretical modelling of perovskite solar cells (PSCs) aimed at achieving high performance is explored using the SCAPS-1D simulator.

Hydrogenated amorphous silicon (a-Si:H) is a promising material for low-cost photovoltaic technology. In this study, different optimization processes were used to investigate the best p-i-n configuration of the a-Si:H-based ultrathin-film solar cells using SCAPS-1D ...

Device structure and simulation. There are different types of software used for simulation of solar cells such as PC1D, ASA, Amps-1D, WxAMPS, SCAPS-1D, SETFOS, Gpvdm, AFORS-het, Aspin-2D, PECSIM ...

We approach the electronic properties of a simple model of organic solar cells, a binary mixture of ???-oligothiophenes and buckminsterfullerene, from a theoretical and numerical perspective.

Perovskite solar cells have demonstrated remarkable progress in recent years. However, their widespread commercialization faces challenges arising from defects and environmental vulnerabilities ...

In this study, the theoretical modelling of perovskite solar cells (PSCs) aimed ...

Different parameters like absorbance coefficient, defect capture cross section and defect position are examined on proposed solar cell performance. Optimised cell performance is also presented in J-V and QE curves. In this work, a triple cation mix halide perovskite solar cell is explored to improve its stability and efficiency.

The Transfer Matrix Method (TMM) has become a prominent tool for the optical simulation of thin-film solar cells, particularly among researchers specializing in organic semiconductors and perovskite materials. As the commercial viability of these solar cells continues to advance, driven by rapid developments in materials and production ...

2 ???· In another study the one-dimensional solar cell capacitance simulator (SCAPS) was applied to investigate the influence of absorber"s thickness and carrier diffusion length (L n) on the performance of an FTO/TiO 2 /CH 3 NH 3 PbI 3-x Cl 3 /Spiro-OMeTAD cell. Figure 4a depicts PSC"s photovoltaic parameters with respect to the absorber"s L n and thickness. It is evident ...

Theoretical simulation of solar cells

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The selected solar cells were cut into square sheets of 20 mm × 20 mm, and the surface of the primary monocrystalline silicon solar cells was acidly etched and weaved to create a surface pyramidal structure, Si 3 N 4 film was deposited with a passivation treatment, and metal silver grid screen printing to form electrodes [40].The monocrystalline solar cell"s back was ...

Solar cell simulation software offers an intuitive platform enabling researchers to efficiently model, simulate, analyze, and optimize photovoltaic devices and accelerate desired innovations in solar cell technologies. This paper systematically reviews the numerical techniques and algorithms ...

Herein, we have used an advanced version of one-dimensional multijunction solar cell simulator, MSCS-1D:V2 for attaining high efficiencies of triple-junction solar cells constructed of...

This work optimizes the design of single- and double-junction crystalline silicon-based solar cells for more than 15,000 terrestrial locations. The sheer breadth of the simulation, coupled with the vast dataset it generated, makes it possible to extract statistically robust conclusions regarding the pivotal design parameters of PV cells, with a particular emphasis on ...

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