Photovoltaic devices opto-electro-thermal physics and modeling

An opto-electro-thermal simulation of solar cells (SCs) is presented by addressing optoelectronic and thermodynamic responses simultaneously. The photocurrent losses due to carrier recombinations ...

Photovoltaic Devices: Opto-Electro-Thermal Physics and Modeling. A Shang, X Li. Advanced Materials 29 (8), 1603492, 2017. 127: 2017: ... Radiative cooling of solar cells: Opto-electro-thermal physics and modeling. Y An, C Sheng, X Li. Nanoscale 11 ...

A fully coupled opto-electro-thermal model to investigate silicon solar cells under real operating conditions. ... they do not achieve a full coupling between the optical and electro-thermal physics which is found to be of great importance. ... Photovoltaic devices: opto-electro-thermal physics and modeling, Adv. Mater. 29, 1-8 (2017) ...

coupled opto-electro-thermal (OET) model of PSC. We select the (MA) 0.7 (FA) 0.3 PbI 3 as the baseline composition to prepare high-performance PSC, its temperature-dependent electrical parameters are listed in Table S1 and thermal simulation parameters (e.g., density, thermal conductivity/capacity) are listed in the Table S2. It should

Utilizing a coupled opto-electro-thermal modeling we evaluate our nano-micro-scale cooler also in the case of selected, highly-efficient Si-based photovoltaic architectures, where ...

A comprehensive opto-electro-thermal study on the heterojunction PSCs by quantitatively addressing the coupled optical, carrier transport and thermodynamic behaviors within the device is presented. Organic-inorganic heterojunction perovskite solar cell (PSC) is promising for low-cost and high-performance photovoltaics. To further promote the ...

The solar cells (SCs) are the most typical devices used to convert the solar energy into electricity to help relieving the energy shortage crisis. In the photovoltaic (PV) communities, improving the power-conversion efficiency (PCE) of SC keeps to be a long-term objective. In the past decades, enormous efforts have been paid on exploring various new structural scenarios ...

Utilizing a coupled opto-electro-thermal modeling we evaluate our nano-micro-scale cooler also in the case of selected, highly-efficient Si-based photovoltaic architectures, where we achieve an ...

The comprehensive multidimensional and multiphysical opto-electro-thermal (OET) modeling was used to design a silicon-based radiative cooling system for a solar cell (SC) and revealed that the SC temperature can be reduced by over 10 °C and the absolute power conversion efficiency can be increased by 0.45% after employing a photonic radiative ...

Photovoltaic devices opto-electro-thermal physics and modeling

Abstract. A one-dimensional opto-electro-thermal simulator for an a-Si:H-based thin-film solar cell is developed. The simulator includes optical, electrical, and thermal modeling for a complete modeling of energy conversion in a-Si:based solar cells. Particularly, the thermal impact on the performance of the cell has been studied. Cell performance is worse when ...

However, as we know, most of the solar energy reaching the earth occurs at small incidence angles in summer, e.g. from 10:00 to 14:00, when the temperature in the solar cells is very high. ... which is very suitable for passive cooling of curved surfaces, such as lasers, detectors, and other devices. ... opto-electro-thermal physics and ...

Photocurrent and voltage losses are the fundamental limitations for improving the efficiency of photovoltaic devices. It is indeed that a comprehensive ... Photovoltaic Devices: Opto-Electro-Thermal Physics and Modeling. ... 2017; TLDR. An opto-electro-thermal simulation of solar cells is presented by addressing optoelectronic and ...

For thermal modeling of photovoltaic panels, it is recommended to calculate the characteristic length in the correlations from Eq. (11). (11) L = 4 A P where A and P are the area and perimeter of the photovoltaic solar panel, respectively. However, some researchers consider the characteristic length in the wind direction as the length of the ...

As outlined above, the electrio-thermal model (macrocircuit) of a photovoltaic system can be built by interconnecting a proper number of subcircuits representing the elemental solar cells and by integrating a thermal feedback block.The model adopted in this paper is show in Fig. 1, where the electrical subcircuit and the associated thermal feedback block are reported.

Photovoltaic Devices: Opto-Electro-Thermal Physics and Modeling. Aixue Shang and Xiaofeng Li* Nano-/micro-structured thin-film solar cells (SCs) under advanced light management...

Photovoltaic Devices: Opto-Electro-Thermal Physics and Modeling An opto-electro-thermal simulation of solar cells (SCs) is presented by address-ing optoelectronic and thermodynamic responses simultaneously. The photo-current losses due to carrier recombina-

Black silicon (b-Si)-assisted photovoltaic cells have textured b-Si surfaces, which have excellent light-trapping properties. There has been a limited amount of work performed on the theoretical modelling of b-Si photovoltaic cells, and hence, in this work, a coupled optical-electrical-thermal model has been proposed

for the simulation of b-Si photovoltaic cells. In ...

Shang A, Li X. Photovoltaic devices: opto-electro-thermal physics and modeling. Adv Mater, 2017, 29(8), 1603492 [5] Shang A, An Y, Ma D, et al. Optoelectronic insights into the photovoltaic losses from photocurrent, voltage, and energy per-spectives. AIP Adv, 2017, 7(8), 085019 [6] Li X, Hylton N P, Giannini V, et al. Bridging electromagnetic and

A.D. Jones, C.P. Underwood, A thermal model for photovoltaic systems, Solar Energy 70, 349-359 (2001) [CrossRef] [Google Scholar] O. Dupré, R. Vaillon, M.A. Green, A full thermal model for photovoltaic devices, Solar Energy 140, 73-82 (2016) [CrossRef] [Google Scholar]

Here, we performed comprehensive multidimensional and multiphysical opto-electro-thermal (OET) modeling, which was used to design a silicon-based radiative cooling system for a solar cell (SC).

An opto-electro-thermal simulation of solar cells (SCs) is presented by addressing optoelectronic and thermodynamic responses simultaneously. ... Photovoltaic Devices: Opto-Electro-Thermal Physics and Modeling. Aixue Shang, Aixue Shang. College of Physics, Optoelectronics and Energy and Collaborative Innovation Center of Suzhou Nano Science and ...

Passive radiative cooling technology has attracted extensive attention as it addresses the potential applications in effectively cooling photovoltaics and related systems. Here, we performed comprehensive multidimensional and multiphysical opto-electro-thermal (OET) modeling, which was used to desig ...

Supporting Information Heterojunction Perovskite Solar Cells: Opto-Electro-Thermal Physics, Modeling, and Experiment Yidan An,a,b,# Changlei Wang,a,b,# Guoyang Caoc and Xiaofeng Lia,b,* a School of Optoelectronic Science and Engineering & Collaborative Innovation Center of Suzhou Nano Science and Technology, Soochow University, Suzhou 215006, China; b Key ...

Heterojunction Perovskite Solar Cells: Opto-Electro-Thermal Physics, Modeling, and Experiment ACS Nano. 2020 Apr 28;14(4):5017-5026. doi: 10.1021/acsnano.0c01392. ... PSCs by quantitatively addressing the coupled optical, carrier transport, and thermodynamic behaviors within the device. With achieving a good agreement with the experiment, we ...