Solar cell capacity algorithm

How to design and optimize a solar cell structure?
When designing and optimizing a solar cell structure,we use two light-trapping methods: light-trapping BR layer and nano-texturing. Metals like silver (Ag) maybe used as a BR layer,while alkaline solutions like KOH or NaOH are used for nano-texturing of layer's interfaces.

What are the objectives of solar cell structure design?
Maximization of solar cell quantum eficiency (Qe) [28, 32] and minimization of microcrystalline silicon layer thickness (d c-Si) are two objectives of the cell struc-ture design.

Can solar energy improve light harvesting eficiency and production capacity maximization?
Since solar energy is the most used green energy method, many research works (e.g., [2, 14, 30]) have been done on solar cell design and cell structure optimization to improve cells light-harvesting eficiency and solar energy production capacity maximization.

Can optia-II improve quantum efficiency of solar cells?
We optimized,evaluated,and characterized 15 cell designs. We present a new algorithm called OptIA-II for MOO of solar cells. We show that our two-stage MOO can improve the quantum efficiency of cellsand characterize cell designs into clusters concerning to trade-off between cells fabrication cost and cells quantum efficiency.

What is quantum efficiency of a solar cell?
The quantum efficiency (\ (Q_e\)) of a solar cell is the ratio of charge carrier produced at the external circuit of the cell (electronic device) to the number of photons received (or absorbed) by the cell. There are two ways this quantum efficiency ratio is calculated: (i) external quantum efficiency and (ii) internal quantum efficiency.

Does optia-II Algo-rithm improve solar cell design costs?
In our two-stage MOO,the Pareto-fronts of three select best cell designs of NSGA-II based MOO stage were fine-tuned by our designed multi-objective opti-mization-immunological algorithm (OptIA-II). We observed that OptIA-II algo-rithm improved both costsassociated with solar cell design.

IChOA is compared with six competing algorithms, including the standard chimp optimization algorithm (ChOA), 25 whale optimization algorithm (WOA), 26 grey wolf optimization algorithm (GWO), 27 opposition-based sine cosine algorithm (OBSCA), 28 and harris hawks optimization (HHO). 29 Meanwhile, for a fair comparison, IChOA utilizes a population size ...

The proposed approach is realized using Solar Cell Capacitance Simulator (SCAPS-1D) software incorporated with a hybrid L32 Taguchi DoE-based Genetic Algorithm. ...

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Additionally, for the comparative analysis, the modified one diode model (MODM) of solar PV cell has been used to obtain the output characteristic of PV cell. The ...

One of the most important and challenging issues with PV systems is the accurate and efficient modeling of solar cells (and PV modules). These issues are mainly caused by the nonlinear characteristics of solar cells, as well as the unavailability of all their parameters (Yousri et al., 2020, Chenche et al., 2018) order to properly analyze and evaluate the actual ...

Additionally, for the comparative analysis, the modified one diode model (MODM) of solar PV cell has been used to obtain the output characteristic of PV cell. The metaheuristic algorithm namely ...

Identifying the parameters of solar photovoltaic (PV) cell models accurately and reliably is crucial for simulating, evaluating, and controlling PV systems. For this reason, we present an improved chimp optimization ...

To tackle this challenge, this paper introduces the adaptive sine-cosine particle swarm optimization algorithm (ASCA-PSO) as a method for estimating the parameters of solar cells and photovoltaic modules. The ASCA-PSO approach combines the strengths of the SCA and PSO algorithms in a two-tier process.

Perovskite solar cells are revolutionizing the field of renewable energy with their remarkable properties and engineering applications [11].These solar cells offer high power conversion efficiencies, rivaling traditional silicon-based cells while being significantly cheaper to produce [12].Their low cost is due to the use of abundant and inexpensive raw materials and ...

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357 1 3 Design and characterization of eective solar cells o We optimized, evaluated, and characterized 15 cell designs. o We present a new algorithm called OptIA-II for MOO of solar cells. o We show that our two-stage MOO can improve the quantum eciency of cells and characterize cell designs into clusters concerning to trade-o between cells

Our solar cells design characterization enables us to perform a cost-benefit analysis of solar cells usage in real-world applications. We propose a two-stage multi-objective optimization framework for full scheme solar cell ...

ABC-PSO algorithm predicts 106 k W PV capacity, 8 k W FC, 45 k W electrolyzer with a hydrogen tank of 150 k g. The system shows grid sale and purchase capacity of 25 and 30 k W, respectively. The initial cost of 1,29,824 $ is required to set up the project.

The experimental results obtained from three algorithms have been compared in terms of cost effectiveness of the system. The hybrid system has been designed to cater the total electricity demand of 135 M W h / y r of a small community center. It has emerged from the simulation results that the total electricity demand could be met with a 106 k W solar photovoltaic, 8 k W ...

3 ???· Fig. 3 illustrates the interactions between the design parameters--solar collector area, fuel cell capacity, solar collector type, and cooling system type--and the 3E performance indicators: energy, economic, and environmental outcomes. The flowchart identifies how each design factor influences key interaction metrics, such as energy output ...

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Introducing a hybrid PSO-GA method to provide a robust optimization solution. This study proposes a novel approach to evaluate the integration of solar photovoltaic (PV) and wind turbine renewable energy systems (RES) with Electrolyzer-Fuel Cell Energy Storage System (EFCS) and Battery Energy Storage System (BESS).

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