Grating Solar Cells

What are grating solar cells?

One category of these alternative devicesmay be generally classified as "grating" solar cells. While the conventional diffused p-n junction device itself requires a grating structure as an electrode to the heavily doped surface region,this grating is on a considerably coarser scale than those employed in the cells described here.

Are tapered gratings a good design concept for ultra-thin solar cells?

Tapered gratings have higher light absorption and lower structure sensitivity. In this paper,the cylindrical,conical and parabolic nanostructures inherited from self-organized anodic aluminum oxide (AAO) are applied to silicon-based ultra-thin solar cells aiming for a new design concept for low-cost,high-efficiency double-grating solar cells.

Are nanostructured gratings a good choice for ultra-thin solar cells?

Further results show that the conical and parabolic nanostructured gratings have higher light absorption efficiency and lower structure morphology-dependent sensitivity than the cylindrical nanostructured one,which is more conduciveto the application of high efficiency ultra-thin solar cells.

How do I create a solar cell based on a grating?

Open the solar_grating.ldev file. Under the CHARGE solver in the objects tree, right click on Gen_s, open the edit window, and then using the browse button, import the Gen_s.mat file. Click LOAD and OK. Repeat the same procedure for the Gen_p object and import the Gen_p.mat file. The solar cell has been fully modeled in the CHARGE simulation.

Do grating solar cells have dark currents?

We may further subdivide grating solar cells into two groups, depending on whether the dark currents in these devices are predominantly due to ma- jority or minority carriers in the silicon; we refer to these as majority and 0379-6787/83/$3.00 Elsevier Sequoia/Printed in The Netherlands 338 minority carrier grating solar cells.

Which grating is best for ultra-thin solar cell?

Numerical results reveal that the optimal bottom metal gratingcan enhance the absorption capacity of ultra-thin solar cell at 0.5 µm-1.1 µm waveband with a very small parasitic absorption. Meanwhile the surface grating with a period of 0.1 µm can strongly enhance the absorption of solar cell in 0.3 µm-0.5 µm waveband.

Solar energy is an endless, clean, renewable, and accessible source, which is known as alternative energy in the world. Even though, the Sun delivers more light power but thin film solar cells (SCs) have low absorption rates due to less absorption of the solar spectrum [1, 2].Most of the SCs used in the world are made of mineral materials such as Silicon, which ...

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Simultaneously enhanced solar absorption and radiative cooling with thin silica micro-grating coatings for silicon solar cells. Sol. Energy Mater. Sol. Cell, 197 (2019), pp. 19-24, 10.1016/j.solmat.2019.04.006. View PDF View article View in Scopus Google Scholar [17]

The importance of introducing surface grating has been studied in Yousif et al. (), the authors achieved significant improvements in terms of PV in case of triangle grating by 20% increase on photon absorbance in the modeled solar cell, simulation of dimensions (10 × 10 nm).The typical structure of the solar cell is shown in Fig. 1a, consists of five stacked layers ...

(a) The schematic unit cell structure of a plasmonic OSC with 2D periodic metallic back grating as an anode. The geometric parameters are set as: d 1 = 30 nm, d 2 = 70 nm, d 3 = 30 nm, W = 100 nm ...

Solar cells can harvest incident sunlight very efficiently by utilizing grating-based light trapping. As the working principle of such gratings strongly depends on the number as well as the ...

This work introduces a high-efficiency organic solar cell with grating nanostructure in both hole and electron transport layers and plasmonic gold nanoparticles (Au NPs) ...

Compared to the pristine perovskite solar cells (PSCs), the diffraction-grating perovskite devices with DVD obtain higher power conversion efficiency and photocurrent density, which are improved from 16.71% and 21.67 mA cm -2 to 19.71% and 23.11 mA cm -2. Moreover, the stability of the PSCs with diffraction-grating-structured perovskite active layer is greatly enhanced.

To effectively improve the power conversion efficiency (PCE) of Si solar cells, vibration-assisted UV nanoimprint lithography based on piezoelectric driving is proposed to ...

Hot-pressing transfer process is developed to fabricate a diffraction-grating (DG) perovskite layer to form a bifacial perovskite solar cell (PSC). The DG perovskite layer ...

Nanoscale grating-based perovskite solar cell with Improved efficiency, Ahmed Fathi Salem, Ramy Elbashar, Sanaa M. El-Rabaie, Hamdy Abdelhamid, Mohamed Farhat O. Hameed, Salah Obayya

Reducing the silicon surface area is expected to minimizes electrical surface recombination effects that lowered the efficiency of the 2D silicon grating solar cell described in the previous ...

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