Micro lenses in thin film organic photovoltaic cells

In this report, plasmonic effects in organic photovoltaic cells (OPVs) are systematically analyzed using size-controlled silver nanoparticles (AgNPs, diameter: 10 ~ 100 nm), which were ...

Multi-scale and angular analysis of ray-optical light trapping schemes in thin-film solar cells: Micro lens array, V-shaped configuration, and double parabolic trapper. Changsoon Cho and Jung ...

A hybrid of microlens structure and curved surface may produce high value-added micro-optic performance. Hence, the microlens array is proposed on macro curved glass substrate of thin film solar cell.

Precision and mirror micro-grinding of micro-lens array on macro-freeform glass substrate for micro-photovoltaic performances. Int. J. Adv. Manuf. Technol., 86 (2016), pp. 87-96. ... Trapping light with micro lenses in thin film organic photovoltaic cells. Opt. Expr., 16 (2008), pp. 21608-21615. View in Scopus Google Scholar [41]

A hybrid of micro-lens array and freeform surface produces a novel micro-optic and micro-photovoltaic behaviors, but it is difficult to control both micro-form and macro-form accuracies in micro-machining of brittle photovoltaic glass. ... (2008) Trapping light with micro lenses in thin film organic photovoltaic cells. Opt Express 16(26):21608 ...

Thin-film solar cells are a type of solar cell made by depositing one or more thin layers (thin films or TFs) of photovoltaic material onto a substrate, such as glass, plastic or metal. Thin-film solar cells are typically a few nanometers to a few microns thick-much thinner than the wafers used in conventional crystalline silicon (c-Si) based solar cells, which can be up to 200 mm thick.

Thin film solar cells are one of the important candidates utilized to reduce the cost of photovoltaic production by minimizing the usage of active materials. However, low light absorption due to low absorption coefficient and/or insufficient active layer thickness can limit the performance of thin film solar cells. Increasing the absorption of light that can be converted into electrical ...

Organic photovoltaic (OPV) cells and organic light-emitting diodes (OLEDs) are energy harvesting and generation devices that have attracted great attention ... TVINGSTEDT K, ZILIO S D, INGANÄS O, et al. Trapping light with micro lenses in thin film organic photovoltaic cells [J]. Optics Express, 2008, 16(26): 21608-21615. Article Google Scholar

A novel light trapping configuration based on an arrays of micro lenses in conjunction with a self aligned array of micro apertures located in a highly reflecting mirror that ...

Micro lenses in thin film organic photovoltaic cells

The bulk morphology of the active layer of organic solar cells (OSCs) is known to be crucial to the device performance. The thin film device structure breaks the symmetry into the in-plane ...

In this paper, an optimal design method of micro-lens light trapping structure for thin film solar cells applied to building integrated photovoltaic (BIPV) is proposed.

In recent years, remarkable progress in thin-film photovoltaic cells (PVs) has been made based on novel materials including organic molecules [1-4], quantum-dots [5, 6], and perovskite structured materials [7, 8].Their power conversion efficiencies (PCEs) have already broken the 10% barrier, and even higher PCEs (>20%) are being anticipated as the next ...

At present, Building integrated photovoltaic (BIPV) has become a research hotspot in the field of building energy conservation [[1], [2], [3]]. And it has been one of the most widely application scenarios of thin film solar cells, because thin film solar cells have excellent power generation performance under low light conditions, and their materials are flexible and light [4,5].

When locating the light trapping element, that displays strong directional asymmetric transmission, in front of thin film organic photovoltaic cells, an increase in cell absorption is ...

As thin active organic films often are desired due to electrical limitations such as poor mobilities and low built in electric fields, the light trap can be a tool to remedy the mismatch of...

To investigate the performance of the proposed thin-film solar cell, we have performed full wave numerical simulation using COMSOL, a commercial numerical solver working based on finite element method. ... Trapping light with micro lenses in thin film organic photovoltaic cells. Opt. Express, 16 (26) (2008), pp. 21608-21615. View in Scopus ...

Previously, a light trap incorporating a micro-lens array has been shown to be successful on an organic solar cell [19], [20]. Here, a low cost fabrication method is presented that requires less fabrication steps and is industrially scalable. ... Trapping light with micro lenses in thin film organic photovoltaic cells. Opt. Express, 16 (2008 ...

We demonstrate a novel light trapping configuration based on an array of micro lenses in conjunction with a self aligned array of micro apertures located in a highly reflecting mirror.

micro-lens solar cell with a vertex angle of 110°and a groove depth of 300mm. The second is a non-micro-lens solar cell. Under the existing micro-lens processing conditions, a micro-lens light trapping structure with a vertex angle of 60° and a groove depth of 400mm has a nearly optimal performance for different wavelength light [6].

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Tvingstedt, K., Zilio, S. D., Inganäs, O. & Tormen, M. Trapping light with micro lenses in thin film organic photovoltaic cells. Optics Express 16, 21608-21615 (2008).

When the size of thin film solar cell is determined, the number of micro-lens of V-shaped light trapping structure are the dependent variables of its vertex angle and groove ...

Different strategies have been suggested to enhance the light absorption in organic thin-film solar cells. Grating structures, micro-lenses and anti-reflection coatings have been proposed to improve the light ... Trapping light with micro lenses in thin film organic photovoltaic cells. Opt. Express, 16 (2008), pp. 21608-21615. View in Scopus ...

Could nanostructures act as lenses to focus incident light for efficient utilization of photovoltaics? ... band light trapping in thin film solar cell. Opt. Express 20, A560-A571 (2012 ...

Here, thin film organic photovoltaics with nano-sized phase separation integrated in micro-sized surface topology is demonstrated as an ideal solution to proposed applications.

Thin-film cells are another type of photovoltaic cells made from materials like CdTe, CIGS, and amorphous silicon. The first thin-film solar cell, made from CdTe, was developed by the U.S. government"s National Renewable Energy Laboratory in 1981. 59 Thin-film cells are cheaper to produce and have a lower environmental impact than silicon-based ...

Then we highlight recent progress in different types of TPVs, with a particular focus on solution-processed thin-film photovoltaics (PVs), including colloidal quantum dot PVs, metal halide perovskite PVs and organic PVs. ... the common way to enhance transparency is to increase the gap between micro-sized cells or create larger micro-holes ...

Organic solar cells have been attracting considerable attention owing to their potential merit of low cost energy conversion. The power conversion efficiency (PCE) of organic solar cells has been increased up to 9.2% for a single junction configuration [1] and over 12% for a tandem structure [2].Due to limited charge carrier mobilities in organic materials, the optimized ...

Trapping light with micro lenses in thin film organic photovoltaic cells. Article. Full-text available. Jan 2009; OPT EXPRESS; ... in front of thin film organic photovoltaic cells, an increase in ...

Extending the insufficient optical path length (OPL) in thin-film photovoltaic cells (PVs) is the key to achieving a high power conversion efficiency (PCE) in devices. Here, we introduce the apparent OPL (AOPL) as a figure of merit for light absorbing capability in thin-film PVs. The optical characteristics such as the structural effects and angular responses in thin ...

Micro lenses in thin film organic photovoltaic cells

We demonstrate a novel light trapping configuration based on an array of micro lenses in conjunction with a self aligned array of micro apertures located in a highly reflecting mirror. When locatin ...

In 2018, Robert L. Z. Hoye et al. [49] demonstrated the first two terminal (2T) perovskite tandem with p-type Si solar cell that enables the voltage addition between p-type Si bottom solar cell and perovskite top solar cell in a 2T tandem structure. Calvin S Fuller from Bell Lab demonstrated the first Si solar cell in 1954 which has a PCE of 8%.

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