VNIVERSITAT DE VALÈNCIA

R+D result

Patent

Knowledge Area

- Solar Photovoltaics
- Molecular Chemistry
- Optoelectronics

Collaboration

- Technology available for Licensing in solar photovoltaic cell on any substrates different from plastic flexible substrates
- Other collaborations

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Inverted Solar Cell for thin film 3rd generation photovoltaics

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Background: The conversion of solar energy to electrical current using thin film third generation photovoltaics (PV) is being widely explored for the last two decades. Recently, the organometallic halide perovskite based on tin or lead have been introduced as light harvester to replace traditional metal-organic complex or organic molecules, leading to high power conversion efficiencies in solid state devices. These solid-state solar cells involve conventional device architecture that provides a limited number of configuration possibilities to be optimized. Main problems associated to these devices are their air-stability of the top electrode (metal layer), the poor long-term stability and life-time, and the efficiency and conductivity (separation of the charges) of such a device. Also, in these solid state devices, the perovskite pigment is usually applied from a solution by spin-coating on mesoporous TiO_2 film, followed by low temperature annealing step. From experience, the morphology of the perovskite crystals formed during this kind of solution processing cannot be well controlled, and is one of the reasons for the poor reproducibility of PV cell performance.

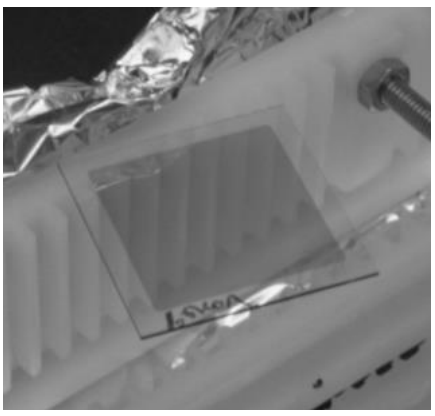
The invention: Researchers from the Universitat de València and the École Polytechnique Fédérale de Lausanne have developed a **new type of solid-state photovoltaic solar cell** that addresses the problems of corrosion and air-stability of the counter electrode or metal layer and of the contact between different organic layers to improve the conductivity without providing heterostructure.

The new solar cell involves an **inverted device architecture** instead of a conventional one, which results in the improvement of the efficiency as well as stability. The associated fabrication method allows the application of the perovskite layer in one step and without solubilizing, by co-deposition of sublimated components. This process allows a controlled deposition without heating the other layers of the partially assembled solar cell, and keeping them at comparatively low-temperatures manufacturing process.

Applications: The invention is applicable in solar photovoltaic cell on any substrates different from plastic flexible substrates manufacturing in the industrial sector of renewable energy.

Advantages: The new types of solar cells have the following advantages:

- Solid-state photovoltaic solar cell with inverted architecture (inverting the charges flow) to address the problems of corrosion and air-stability of the counter electrode (metal layer).
- High stability and life-time.
- High power conversion efficiencies, currently 15% with improvements options.
- Use of readily available and low cost organic and inorganic materials.
- Use of very thin films of material, with the consequent reduction of costs and environmental impact.
- Compatible with low-temperatures manufacturing process.



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