SOLERTIX U-PV PROJECT – ROMETECHNOPOLE

Project Description

With the U-PV project, SOLERTIX aims to validate a pilot production to develop 4-terminal (4T) tandem solar cells combining perovskite and silicon. Pairing perovskite with silicon will allow for increased solar energy absorption: perovskite will operate in the visible spectrum, while silicon will work in the near-infrared spectrum; the 4T strategy will offer greater design flexibility by avoiding electrical connections between the two materials. SOLERTIX aims to create tandem panels by depositing perovskite, suitably separated, onto a commercial silicon cell using vacuum lamination. This approach will not only enhance panel efficiency but also reduce costs both for end users, who will be able to install panels capable of producing more energy on the same surface area, and for manufacturers, who will only need to partially adapt their production lines rather than completely overhaul them to produce the new panels.

Objectives

The objectives of the U-PV project are:

1. **Perovskite Crystallization**: Controlling the crystallization of perovskite over a large area is crucial for efficient scalability. SOLERTIX will focus on wet chemical deposition combined with vacuum cooling and gas cooling, which are highly effective and scalable methods, especially for perovskites with a bandgap of 1.72 electronvolts (eV).
2. **Laser Interconnection**: The new laser interconnection techniques developed by SOLERTIX can reduce dead area to less than 2%.
3. **Optical Management**: The use of transparent photovoltaic glass is already a standard for photovoltaic panels with commercial TCOs. We believe that standard polyolefins can provide a good optical match between perovskite and silicon cells. This approach could help improve the overall efficiency and transparency of the photovoltaic module, allowing for better integration between different technologies and optimizing energy production.
4. **Electrical Adaptation**: SOLERTIX will develop an integrated electronic solution to optimize energy production and simplify wiring, aiming for 2 terminals per tandem module. This solution will be developed in collaboration with industry specialists, leveraging the expertise and knowledge necessary to achieve the design goal. Optimizing and simplifying electronic solutions are crucial for improving the overall efficiency of photovoltaic systems.

5. **Stability**: The focus on stable perovskite absorbers, which are largely inorganic and free from methylammonium, along with the absence of metallic electrodes, will significantly boost device stability, as already demonstrated. Choosing more stable perovskite materials and eliminating components that may be prone to degradation will significantly enhance the durability and resilience of perovskite solar panels, making them more reliable over time.
6. **Cost**: By using the front glass of the silicon panel as a substrate, the 4T terminal requires only 2 TCOs and the layers that make up the perovskite structure. A new module concept will be used to avoid the need for additional inverters. This simplified design will help reduce production costs and improve the overall efficiency of the photovoltaic system, making the technology more competitive in the market.
7. **Demonstrator**: A 15x15 cm² 4T module with an efficiency over 15% higher than silicon alone.

Results

The results SOLERTIX aims to achieve with the U-PV project are:

- The production, through scalable techniques, of perovskite cells capable of operating for 1000 hours at 85°C under conditions of intense sunlight exposure and high humidity.
- The production of 5x5 cm² perovskite modules with series connection, encapsulated, that successfully pass tests of intense light exposure and hot-humid conditions, demonstrating remarkable resistance and stability (T90 > 1000h).
- The production of 15x15 cm² tandem cells with a PCE 15% higher than that of standard silicon cells.

Financial Support Received

The U-PV Project, CUP E89J24001850003, COR 22305202, has been approved and funded for an amount of €298,427.00, corresponding to a non-repayable grant of €155,179.79.

Contacts:

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