

PerOvskite Photovoltaic device chActeRization & stabiliTy

Publieke samenvatting / Public summary

Aanleiding

Organic-inorganic lead halide perovskite solar cells attract growing attention from industry as the emerging photovoltaic (PV) technology continues to show fast progress. Since about two years, perovskite solar cells started to reach efficiencies of over 20%. One year ago, Stanford University reported on perovskite solar cells being stable under accelerated lifetime tests. This month Solliance reported roll-to-roll processed perovskite modules with 12 % efficiency, thus demonstrating the scalability of the technology. The realization of these major milestones increases the expectations for a rapid market introduction of this attractive, new PV technology. However, it is important to realize that significant progress is needed before this emerging PV technology is mature enough to enter the market. At the same time, the huge interest in this emerging PV technology is an opportunity for the Dutch test equipment companies ReRa Solutions and Eternal Sun to develop new products suitable to characterize perovskite solar cells and modules (PSCMs).

Doelstelling

The two major and linked objectives of POP-ART are, firstly, the development of new test equipment by both ReRa solutions and Eternal Sun to determine the lifetime of perovskite based photovoltaic devices under various stress conditions. Secondly, the development of stable perovskite PV modules by ECN-Solliance. The development of stable perovskite modules will be based on upscaling cell

Projectinformatie / Project information

Projectnummer / Project number
TKITOE1621103

Subsidiebedrag / Grant amount
€ 398.606,00

Algemene informatie / General information

Penvoerder / Secretariat
ECN

Publicaties en materialen / Publications and attachments

- 23.10.2020

**Eindrapport POP-ART 2020
(TKITOE1621103)**

**Volg Topsector Energie op X / Follow
Topsector Energie on X**

@TSEnergie

stacks which were already proven to be stable under thermal and light soak stress tests. The modules will be used as test samples for the new test equipment. The first objective is particularly challenging since dynamic processes within PSCMs lead to significant hysteresis which makes characterization complicated or even impossible with current characterization routines and equipment.

Korte omschrijving

The development of stable PSCMs and suitable test equipment to accurately determine the lifetime of perovskite PV devices will be realized by executing the following main activities: - Development of electrical components and open source measurement routines to accurately characterize PV devices with significant hysteretic behavior. The characterization routine also covers the preconditioning step of the device under test. - Improve the uniformity of a newly developed AAA LED solar simulator to allow characterization of research cells and modules (active area: 0.1 – 2000 cm²). - Develop a tunable solar simulator spectrum, for both the UV and IR region. - Develop stable, efficient, encapsulated, perovskite modules. The module architecture is based on cell stacks with proven stability during light soak and thermal stress tests.

Resultaat

1. Prototype test equipment to accurately determine the lifetime of perovskite solar modules under well-defined conditions. The illuminated area is 50 x 50 cm² (AAA); the spectrum is tunable in the UV and IR region. 2. Developed scripts of measurement routines will be open source; scripts developed by others can be easily included in the software to increase measurement accuracy. 3. 6 Inch² perovskite modules prepared with scalable processes, with 15% efficiency and less than 20% efficiency loss after 1000 hrs. light soaking (AM1.5, 1000 W/m²) or 1000 hrs. damp-heat testing (at 85 °C and 85% relative humidity).

De data in deze applicatie is afkomstig van de Rijksdienst voor Ondernemend Nederland (RVO) en wordt in samenwerking met de Topsector Energie ontsloten.

Voor meer informatie over de Topsector Energie, ga naar www.topsectorenergie.nl.

Voor meer informatie over de TSE / Energie-Innovatie regelingen die RVO aanbiedt, ga naar www.rvo.nl/tse.