

Wet coated and Atomic Layer deposited functional Layers for Solar modules processed Under Normal atm

Publieke samenvatting / Public summary

Aanleiding

A decade ago, thin film metal-organic-halide solar cells or 'perovskite' solar cells did not exist. Now perovskite solar cells have been realized with power conversion efficiencies of up to 22%, which is in the same range as the record efficiencies of current commercial PV technologies (CdTe, CIGS, mc-Si). Very recent results from scientific literature as well as internal Solliance and Greatcell Solar results show that perovskite solar cells can pass critical stability tests. The unprecedented progress of this young photovoltaic technology is due to the enormous research efforts from both academic and commercial parties. The motivation to develop perovskite solar cells is based on the opportunity to turn abundant and inexpensive materials, processed at low temperature and in high volumes against low cost, in high quality semiconductor films, suitable for efficient solar modules. A combination of low cost, high efficiency, stable performance and low temperature processing will enable entrepreneurs to open new markets.

Doelstelling

ALLSUN connects Dutch industry (Smit Thermal Solutions and MeyerBurger) via Solliance with a global frontrunner (Greatcell Solar, formerly Dyesol Ltd) in perovskite solar cells. Greatcell Solar and Solliance have already joined forces to develop process flows to scale up perovskite solar modules towards an industrial level. The complete process

Projectinformatie / Project information

Projectnummer / Project number
TEUE117074

Subsidiebedrag / Grant amount
€ 999.933,00

Algemene informatie / General information

Penvoerder / Secretariat
Nederlandse Organisatie voor toegepast-natuurwetenschappelijk onderzoek TNO

Publicaties en materialen / Publications and attachments

- 27.02.2023

Eindrapport TEUE117074

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flow can be executed on existing equipment with the exception of two process steps: a) the perovskite film drying/annealing step and, b) the plasma enhanced atomic layer deposition of transport layers. Equipment for these processes is non-existent today. The goal of ALLSUN is to develop these tools and the corresponding processes.

Korte omschrijving

Based on the combined knowledge of processes, equipment engineering and cost calculations, the consortium will develop equipment to transfer the laboratory scale processes to sheet-to-sheet and at a later stage roll-to-roll. Smit Thermal Solutions will realize a sheet-to-sheet process tool consisting of a slot die deposition stage and an in-line perovskite drying/annealing station to obtain high quality perovskite films. The modular tool consists of several chambers. In the first chamber, the wet perovskite precursor ink is deposited by a slot die coater. In the subsequent stations, the wet film is cured under well-controlled conditions, resulting in formation of high quality perovskite films. With this tool, Solliance and GSL will transfer laboratory scale processes to an industrial sheet-to-sheet level. Developed equipment and processes will be transferable to roll-to-roll scale. In parallel, Meyer Burger and Solliance will develop plasma enhanced spatial atomic layer deposited (PE sALD) metal-oxides. The sheet-to-sheet plasma source has been recently installed. Solliance and Greatcell Solar will develop recipes on laboratory scale and transfer these to the sheet-to-sheet tool.

Resultaat

ALLSUN enables the development of: 1) A novel sheet-to-sheet process tool which allows control over the perovskite film formation step leading to high quality perovskite films suitable for integration in perovskite modules. The developed processes and equipment designs will be transferable to roll-to-roll. 2) A novel sheet-to-sheet plasma enhanced, spatial ALD tool will be commissioned and recipes developed to process suitable metal-oxide layers, for incorporation in perovskite photovoltaic devices.

Based on the results on sheet-to-sheet, designs will be made to introduce PE sALD on roll-to-roll scale. The project represents a great opportunity for Dutch equipment manufacturers to position themselves in this new market together with an end-user. The project connects to the strengths of Solliance to transfer lab-scale processes from lab to fab scale. As such, this project fits the ambition of TKI UE to support the Dutch economy and, concomitantly support the development and scale up of new thin PV technologies.

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

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