

Upscalable Functional Layers and Encapsulants for R2R Compatible Perovskite PV Manufacturing

Publieke samenvatting / Public summary

Aanleiding

A process validation with industrially relevant equipment that is scalable to roll-to-roll (R2R) manufacturing for efficient and stable packaged perovskite PV cells has not been shown yet. The consortium has the know-how and infrastructure to realize this challenge.

Doelstelling

Validate processes in industrially relevant equipment for R2R compatible manufacturing and packaging of perovskite cells by combining R2R equipment and expertise of TNO, with the expertise of Unique Qolors (UQ) on curable polymers with in-depth material characterization capabilities of (TNO). Validated commercial viability and circularity aspects (HyET). External advisory board members Angstrom Engineering (AE) and VDL-Enabling Technologies Group (VDL-ETG) provide design specifications on R2R sputter process tool and blueprint of a complete R2R process line, respectively.

Korte omschrijving

- Validate a R2R compatible sputter process for NiOx deposition on a TCO layer. NiOx is deposited on flexible substrate (metal/TCO or PET/TCO) (TNO).
- R2R slot-die (SD) deposition of perovskite absorber and envelope (interface, passivation, electron transport) layers on sputtered NiOx layers (TNO)
- Validate a R2R compatible soft sputter process for SnO2 electron transport buffer layer (ETL-BL) directly on electron transport layer (ETL) and

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benchmark with state of the art spatial ALD SnO₂ deposition process. (TNO) - Validate a R2R compatible process for electrode deposition on ETL buffer layers via sputtering process (TNO) - Evaluate the viability of solution processing of UV curable polymers that act as an encapsulant (UQ). - Optical and electrical characterization of processed device stacks, validate efficiency and stability of devices made with developed processes for NiO_x, SnO₂, TCO, and UV curable encapsulant (TNO). - Evaluation of commercial viability (TEA) and analysis of circularity aspects (LCA) of R2R flexible solar modules manufactured via above process sequence. (HyET)

Resultaat

- Validated NiO_x and SnO₂ sputter processes for R2R compatibility. Design specifications of a R2R process line for sputtering equipment. - Selection of UV curable encapsulants with respect to state of the art encapsulants in terms of compatibility to R2R encapsulation process. - Large area, uniform slot-die coated perovskite, interface and electron transport layers. - Perovskite solar cells, targeting >17%, via validated processing routes. - Evaluated indoor & outdoor stability by following ISOS protocols and IEC standards. - Assessment of economic viability and circularity.

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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