HIPPO:
High-efficiency poly-Si passivated contact solar cells and modules

Project Duration: 07.2016 to 06.2019
Initital report submitted: 11.2016

Summary

The actual tendency of the PV market is to focus on higher cell and module efficiency, which to a large extent is currently being done with the introduction of passivated emitter and rear (PERC) p-type solar cells in production. However, to overcome limitations of the PERC structure, new technologies need to be implemented that enable both higher efficiency and stronger cost reduction, although these new technologies should utilize existing tools and processes to a large extent to reduce the time to market.

In this project, a strong consortium has formed to develop large area p-type silicon solar cells with a full area passivated rear contact and wire interconnected solar modules with bifacial properties. The passivated rear contact consists of a tunnel oxide layer, upon which a LPCVD poly-Si layer is deposited.

The implementation of passivated contacts by deposition of a poly-Si layer was shown to allow for very low recombination values and thus high open circuit voltages. In addition, the current flow at the rear side of a passivated contact structure is strictly one-dimensional, like for solar cells with a full area aluminium back surface field rear contact. Thus, the poly-Si passivated rear contact combines the advantages of PERC and Al-BSF concepts in one structure, which is highlighted by a demonstrated high efficiency of 25.3% (calibrated measurement) at lab level on an n-type wafer.

In this project, however, the partners will fabricate high-efficiency bifacial p-type solar cells with a conversion efficiency of over 22%. Finally, we aim to fabricate bifacial modules with over 20% efficiency (STC conditions, front illumination) to prove the efficiency and reliability of our concept.

The implementation of a passivated rear contact will allow the production of bifacial solar cells while decreasing the specific cost.

For module fabrication, combining the novel cell technology with the wire interconnection concept will additionally lower the fabrication costs by reduced silver consumption due to less required conductivity for the front and back fingers and will improve the reliability due to a reduced risk of power loss by micro cracks. Furthermore, for a bifacial module the power output will be increased significantly by harvesting irradiation from the rear side as well.

Project consortium

Coordinator and contact details:

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Participating countries and financing:

Country	**Number of organisations involved**	**Project costs in EUR**	**Public funding in EUR**
Germany	2	1’402’051	802’051
The Netherlands	1	800’000	0
Finland	1	100’000	50’000
Spain	1	N/A	0
Total	*5*	*2’302’051*	*852’051*

Funding agencies involved and contracts

Funding Agency	**Contract N° and Title**
Projektträger Jülich	0324086A Prozessintegration Solarzellen und Module
Projektträger Jülich	0324086B Einseitenätzen und Modulverschaltung
TEKES	58/31/2016