IBC bifAcial iNdustrial cells Using carrier Selective contacts (Janus)

Publieke samenvatting / Public summary

Aanleiding

The PV market is presently dominated by modules with p-type multi- and monocrystalline front-to-back contacted solar cells. The performance of these modules improves step by step by using new cell designs such as PERC and process and materials improvements like selective emitters and metal contacting. However, solar cells based on n-type materials are generally considered to enable significantly higher conversion efficiencies1, and hence open a route to modules with lower cost of ownership. The high conversion efficiency potential makes the n-type based cells most attractive for back-contact concepts requiring high-quality material, such as IBC cells.

Doelstelling

N-type cells are particularly suitable for bifacial application. A bifacial module will, in addition to the front, also convert the light that enters through the back side of the module into power. This brings about a gain of 10-30% in power compared to a monofacial module, depending on the albedo of the surroundings. For n-type PERT cells (n-type cells with a conventional H-pattern contact grid at the front and rear), bifaciality numbers have already been achieved and reported of 95% or even better2, compared to the values that have been reported for bifacial p-PERC cells of around 75%. In addition, high efficiency n-type modules have the additional benefit of a better temperature coefficient, converting a larger fraction of the incoming light to electricity instead of heat and leading to better

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kWh/kWp energy yield.

Korte omschrijving

In the JANUS project, we combine the high efficiency potential of n-type cells with the attractive high energy output of a bifacial cell to outline a route towards a novel, n-type high-efficiency and bifacial IBC cell concept. This route builds on two key technologies: - ECN's PERPoly concept: an n-PERT concept with passivating carrier selective contacts on one side, with recently published 21.5% efficiency, which is 0.5% absolute higher compared to conventional contacts; - ECN's IBC concept, which is a relatively low-complexity process and was successfully introduced in a pilot production environment at Yingli in 2016, demonstrating the industrial compatibility, and demonstrated already bifaciality factors of >80%; The IBC cell is targeted at 23% efficiency with industrially compatible processes. In the cell part of the project, one of the focus points is on narrow and well-aligned poly-Si passivating contacts with the metallization contacts to get the highest bifaciality.

Resultaat

We will realize patterned doped poly-Si layers with excellent contact properties, while the outstanding surface passivation quality will be maintained. Optical transparency at the rear, which is required for high bifaciality, will be realized on the cell by confining the non-transparent area to the metallized area and the use of highly transparent passivation layers. In a previous TKI-funded project IBCense, the same consortium of ECN, Tempress and Levitech started working on the integration of the concept of carrier selective passivating contacts into the industrial IBC cell. These results were very encouraging: it was demonstrated that the passivation level of this new cell type, before metallization, leads to high Voc values above 720 mV, and this concept attracted the interest from other industrial parties. In this project we will use the knowledge to bring the cell efficiency to a higher level and introduce bifaciality for a higher energy output.

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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