

ISFH and SoLayTec demonstrate 20.1% PERC cell efficiency with spatial ALD Al₂O₃ rear passivation

ISFH and SoLayTec have achieved a conversion efficiency of 20.1% applying a 5nm thin spatial ALD Al₂O₃ layer as rear passivation of industrial-type PERC solar cells.

So far, the spatial ALD process involved a Post Deposition Anneal (PDA) after the Al₂O₃ deposition. However, now ISFH and SoLayTec have proven that >20% PERC cells can be made without any additional PDA process.

SoLayTec installed in May 2012 an InPassion LAB tool at their research partner Institute for Solar Energy Research in Hamelin (ISFH), funded by the German Ministry for the Environment, Nature Conservation and Nuclear Safety, and since then ISFH has optimized the Al₂O₃ layer which is deposited in the spatial ALD (atomic layer deposition) tool.

“The optimized Al₂O₃ layer has been applied with a SiN capping layer as rear passivation stack to ISFH’s industrial-type passivated emitter and rear cells (PERC). The PERC cell processing includes a homogeneously POCl₃-diffused emitter, screen-printed front and rear metal contacts and uses industry-standard 156x156mm² mono-crystalline boron-doped Czochralski p-type silicon wafers.” Comment by Dr. Dullweber, leader of ISFH’s solar cell production processes group. “Our advanced device simulations show that efficiencies up to 21% will be achievable in short term using an industrial PERC cell process in combination with the ultrathin Al₂O₃ rear passivation layers deposited by means of spatial ALD” comments Prof. Dr. Jan Schmidt, who is the Head of the Photovoltaic Department of ISFH.

“This will enable the PV market to lower the costs for implementing Al₂O₃ on two aspects. Firstly, as no additional PDA process is needed, the costs for an additional PDA furnace can be saved. Secondly, the excellent quality of SoLayTec’s Al₂O₃ allows outstanding chemical and fixed charge passivation already at 5 nm Al₂O₃ layer thickness compared to 20 to 25 nm required with a PECVD system. This means with mass production InPassion ALD from SoLayTec, the customer can reach costs for Al₂O₃ layers below 2 €ct per wafer.” Comment by ing. Roger Görtzen, manager marketing and sales and co-founder of SoLayTec.

SoLayTec

SoLayTec is a spin-off company from the Dutch research organisation TNO and established in 2010. The company develops, delivers and services machines for atomic layer deposition (ALD) on solar cells worldwide. The SoLayTec ALD machines are intended for research and industrial mass production in the solar market. SoLayTec high volume production equipment will be exclusively sold by RENA GmbH on the market. RENA GmbH is a leading equipment manufacturer in the field of wet chemical processing for the PV industry and major shareholder of SoLayTec.

ISFH

The Institute for Solar Energy Research in Hamelin (ISFH) is a non-profit organization of the German State of Lower Saxony (Niedersachsen). The ISFH is affiliated to the Leibniz Universität Hannover and conducts research in photovoltaics and solar thermal. This includes basic research of material properties, the development of processes and equipment for the fabrication of next-generation silicon solar cells and the development of novel solar cell and module architectures. Superior aim is a significant cost reduction of PV-generated electricity. ISFH presented the world-first high-efficiency silicon solar cell with ALD-Al₂O₃ surface passivation in 2008 and is since then intensely working towards the introduction of Al₂O₃ into industrial solar cell production.

For more information, visit the SoLayTec website www.solaytec.com or at our booth at EUPVSEC Paris H2 / B9:

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