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Breakthrough in solar cell efficiency results in multiple equipment sales



Oxford Instruments' FlexAL[®] ALD Tool

Researchers have developed a novel thin-film coating providing an unparalleled level of surface passivation of crystalline silicon solar cells. Using Oxford Instruments' FlexAL[®] ALD tool, the team from the Eindhoven University of Technology (TU/e) showed that ultra-thin aluminium oxide layers deposited by remote plasma ALD outperform existing passivation coatings in terms of eliminating the – normally significant – electronic losses at solar cells' back and front surfaces.

Oxford Instruments customised its popular FlexAL and OpAL[™] tools for this specific application, which has resulted in multiple sales to the rapidly growing solar cell industry.

The development facilitates breakthrough efficiencies for an important class of solar cells. This was recently demonstrated in collaboration between TU/e and the leading Fraunhofer Institute for Solar Energy Research (ISE) in Germany. An efficiency of 23.2% was obtained for PERL solar cells based on n-type silicon by the application of an ultra-thin aluminium oxide layer at the front of the solar cell. To date the p-type front of this class of solar cells was hard to passivate and the relative efficiency improvement of 6% is therefore a significant advance.

Chris Hodson, ALD Product Manager at Oxford Instruments Plasma Technology is delighted with this research, "Dr. Kessels and the Plasma & Materials Processing (PMP) group at TU/e are pushing the



boundaries of ALD research into new application areas. This key technology breakthrough using our ALD tools is creating real interest, and I am confident our continued collaboration with TU/e will bring further advances in this and other technology areas.

Dr. Kessels comments, "Surface passivation is a major issue for crystalline silicon solar cell technology, a type of solar cell that dominates 90% of the photovoltaic market. Many thin film coatings have been studied to reduce electronic losses at the front and rear surfaces of the solar cells. Until recently none were found to satisfactorily passivate the highly doped p-type surfaces of next-generation solar cells based on the more cost-effective n-type base material. During the recent PhD research of Dr. Hoex, we have shown the unprecedented high level of built-in negative charges in an ultra-thin aluminium oxide layer deposited by plasma ALD can almost entirely eliminate electronic losses at the solar cell surfaces. Aluminium oxide has recently gained the attention of the photovoltaics community as a versatile and compatible material that is expected to facilitate several advances in solar cell design and technology."

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Issued for and on behalf of Oxford Instruments Plasma Technology Limited

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Notes to editors

About Oxford Instruments plc

Oxford Instruments designs, supplies and supports high-technology tools, processes and solutions with a focus on physical science, bioscience, environmental and industrial research and applications. It provides solutions needed to advance fundamental nanoscience research and its transfer into commercial nanotechnology applications. Innovation has been the driving force behind Oxford Instruments' growth and success for over 40 years, and its strategy is to effect the successful commercialisation of these ideas by bringing them to market in a timely and customer-focused fashion.

The first technology business to be spun out from Oxford University over forty years ago, Oxford Instruments is now a global company with over 1,300 staff worldwide and a listing on the London Stock Exchange (OXIG). Its objective is to be the leading provider of new generation tools and systems for the Physical Science and Bioscience sectors.

This involves the combination of core technologies in areas such as low temperature and high magnetic field environments, Nuclear Magnetic Resonance, X-ray electron and optical based metrology, and advanced growth,

deposition and etching. Our products, expertise, and ideas address global issues such as energy, environment, terrorism and health and are part of the next generation of telecommunications, energy products, environmental measures, security devices, drug discovery and medical advances.

About Oxford Instruments Plasma Technology

Oxford Instruments Plasma Technology offers flexible, configurable process tools and leading-edge processes for the precise, controllable and repeatable engineering of micro- and nano-structures. Our systems provide process solutions for nanometre layer epitaxial growth of compound semiconductor material, etching of nanometre sized features and the controlled growth of nanostructures. These solutions are based on core technologies in plasma-enhanced deposition and etch, ion-beam deposition and etch, atomic layer deposition and hydride vapour phase epitaxy. Products range from compact stand-alone systems for R&D, through batch tools and up to clustered cassette-to-cassette platforms for high-throughput production processing.

About Eindhoven University of Technology (TU/e)

The TU/e is a research-driven university with the primary objective of providing young people with an academic education within the engineering science & technology domain. In the research field the TU/e has the objective to play a leadership role in the international scientific world and prefers to focus on areas in which it can make contributions to the knowledge-intensive industries and other sectors of the community with a high, or rapidly developing, technology intensity. The TU/e strives to ensure that its research results are translated into successful innovations and serve as a basis of new enterprises. Within the Plasma & Materials Processing group chaired by Prof.dr. Van de Sanden, Dr. Kessels covers the field of plasma-based synthesis of thin films, nanostructures, and devices using methods such as plasma-enhanced chemical vapour deposition, atomic layer deposition, and plasma etching. In his research he focuses particularly on the development of new thin-film techniques and processes – in collaboration with several industrial partners – and on investigations of the plasma-surface interaction.

About Fraunhofer Institute for Solar Energy Research (ISE)

With a staff of approximately 830, Fraunhofer ISE is the largest solar energy research institute in Europe. The work at the Institute ranges from the investigation of scientific and technological fundamentals for solar energy applications, through the development of production technology and prototypes, to the construction of demonstration systems. Fraunhofer ISE was founded in 1981 by Prof. Adolf Goetzberger and has been involved in PV technology ever since. More than 180 employees are working in the field of crystalline silicon based photovoltaics. Fraunhofer ISE holds numerous records in the field of solar cells from crystalline silicon wafers, including the world record on multi-crystalline silicon solar cells (20.2 % efficiency). In March 2006 the Photovoltaic - Technology Evaluation Center (PV-TEC) has been inaugurated, being the largest non-commercial R&D laboratory for PV technology world wide.