

PRESS RELEASE

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Fraunhofer ISE Sets Efficiency Record for Multicrystalline Solar Cells Made of Polysilicon from WACKER

Munich, September 25, 2017 – German-based Fraunhofer Institute for Solar Energy Systems ISE has further improved the efficiency of multicrystalline solar cells, thereby setting a new record. The most recent measurements confirm an efficiency of 22.3 percent. Reference studies such as the International Technology Roadmap for Photovoltaic (ITRPV) only show efficiencies of around 19.5 percent for standard production solar cells. With this new record, multicrystalline cells are venturing into performance areas previously reserved for monocrystalline technologies. As a starting material, the researchers used hyperpure polysilicon from WACKER, the Munich-based chemical company.

In order to achieve the new efficiency record, important steps of the crystallization and cell manufacturing processes were optimized individually to the requirements of the multicrystalline starting material. Apart from an optimized plasma texture the researchers also used the so called Tunnel Oxide Passivated Contact technology (TOPCon) for rear side cell connectivity. Developed by Fraunhofer ISE, this process involves applying the electrical contacts to the passivated cell surface without patterning. This reduces electrical current losses and significantly enhances the efficiency of generating electricity.

“Optimizing all manufacturing steps from crystallization to the individual solar cell processes were key to our success”, emphasizes Martin Hermle, Head of the High Efficiency Solar Cells Department at Fraunhofer ISE. “Close collaboration between characterization, crystallization and solar cell technology experts made it possible to reduce loss mechanisms and establish an optimized process chain.”

As a starting material for the record breaking cells, the researchers used hyperpure polycrystalline silicon from WACKER. The material is heated, melted and crystallized in a crucible. After cooling, the silicon ingot is cut into wafers that are, in turn, used to manufacture solar cells.

“We found out that cells made of hyperpure polysilicon from WACKER best fulfill the specific requirements of the solar cell structure”, stresses Stephan Riepe, Head of Group Silicon Crystallization and Epitaxy Materials at Fraunhofer ISE. “By systematically developing a high-performance material, we were able to achieve significantly higher cell efficiencies. In this process, the structure of only partially melted seed material is applied to the crystal. Our trials have shown that ultrapure granules from WACKER are particularly well-suited for this.”

The efficiency record is a key milestone for WACKER, too. “As a technology leader, we have been collaborating with the Fraunhofer ISE for many years now with the goal of promoting the development and characterization of solar cells and wafers for new, highly efficient solar installations,” says Karl Hesse, Head of WACKER POLYSILICON’s R&D unit. “The new record-breaking cells also contain one hundred percent polysilicon from WACKER.”

For the experiments, the chemical company provided granular silicon and other materials from its Burghausen plant. “The experiments at Fraunhofer ISE show that the multicrystalline technology based on high-quality polysilicon is nowhere near reaching its limits”, Karl Hesse notes. “It is possible to realize significant efficiency and cost-saving potentials even with established solar technologies based on multicrystalline silicon. The developments of the past few months make us confident that further increases are to be expected in the future, too.”

Fraunhofer ISE

With a staff of over 1,100, Fraunhofer ISE is the largest solar research institute in Europe. The institute’s work spans from researching the technological foundations of solar energy use and developing prototypes through to constructing demonstration plants. It generates around 84 percent of its financing needs itself from contracts for applied research, development and high-technology services. Fraunhofer ISE is integrated into a network of national and international cooperations such as the German Research Association for Renewable Energy (ForschungsVerbund Erneuerbare Energien – FVEE) and the European Renewable Energy Centres Agency EUREC.

WACKER POLYSILICON

WACKER POLYSILICON is a global leader in the production of hyperpure polysilicon. Its polysilicon – which is used in semiconductors and the growing solar market – meets the extremely high quality standards required by customers in these application areas. In 2016, WACKER POLYSILICON generated some 24 percent of Group sales.



Polycrystalline silicon from WACKER, the Munich-based chemical company. The ultrapure material is used to produce silicon wafers for the solar and computer industries. (Photo: WACKER)



WACKER, the Munich-based chemical company, is a leading producer of polycrystalline silicon. The ultrapure material is the preferred choice for use in very efficient crystalline solar cells. (Photo: WACKER)

Note:

These photos are available for download at:

<http://www.wacker.com/pressreleases>

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The company in brief:

WACKER is a globally-active chemical company with some 13,450 employees and annual sales of around €4.6 billion (2016, without Siltronic). WACKER has a global network of 23 production sites, 19 technical competence centers and 49 sales offices.

WACKER SILICONES

Silicone fluids, emulsions, rubber grades and resins; silanes; pyrogenic silicas; thermoplastic silicone elastomers

WACKER POLYMERS

Polyvinyl acetates and vinyl acetate copolymers and terpolymers in the form of dispersible polymer powders, dispersions, solid resins and solutions

WACKER BIOSOLUTIONS

Biotech products such as cyclodextrins, cysteine and biologics, as well as fine chemicals and PVAc solid resins

WACKER POLYSILICON

Polysilicon for the semiconductor and photovoltaic industries