Fraunhofer
ISE

Press Release

Freiburg
June 9, 2011
No. 19/11

Cooperative Project "SolarWinS" Explores Efficiency Potential of Multicrystalline Silicon Solar Cells

First Multicrystalline Blocks Crystallized at Fraunhofer ISE

More than four out of ten solar cells manufactured today are made from multicrystalline silicon. This material is relatively inexpensive. Conventionally manufactured multicrystalline solar cells available on the market convert around 17% of the incident solar energy into electricity. Another 40% of the solar cells integrated into PV modules are made from monocrystalline silicon. At efficiencies around 19%, monocrystalline solar cells perform better but are more costly to manufacture due to the more elaborate crystal growing procedure. Which type of silicon solar cell will produce electricity more cost-effectively in the future is still an open issue today. In order to spur on the research in this area, eleven companies and thirteen research institutes have come together to form the cooperative research project SolarWinS (Solar Research Cluster to Determine the Maximum Level of Efficiency for Multicrystalline Silicon). Over the next three years, this group, sponsored by the German Federal Ministry for the Environment, Conservation and Nuclear Safety (BMU), will explore the efficiency potential of multicrystalline silicon as compared to monocrystalline silicon.

Preparation of high-purity silicon blocks started

The theoretical limiting efficiency for monocrystalline silicon solar cells is well known. Therefore, the researchers have decided to concentrate their analysis on multicrystalline silicon material. During the manufacture of multicrystalline silicon blocks, crystalline defects often occur on which

Fraunhofer Institute for Solar Energy Systems ISE
Heidenhofstr. 2
79110 Freiburg
Germany
Press and Public Relations
Karin Schneider
Phone +49 761 4588-5150
Fax +49 761 4588-9342
info@ise.fraunhofer.de

www.ise.fraunhofer.de

impurities accumulate. These, in turn, cause the electrical output and thus the solar cell efficiency to decrease.

As a rule, the impurities do not originate from the highly pure silicon raw material, but rather, are being continually transported into the silicon melt from the oven and the crucible. As a first step in this cooperative project, the contamination occurring in the production of the silicon blocks shall be monitored and systematically reduced at both the Silicon Material Technology and Evaluation Center (SIMTEC) at Fraunhofer ISE in Freiburg and the Leibniz Institute for Crystal Growth (IKZ) in Berlin. "Due to their relatively low purity, the crucibles and coatings used today are not sufficient to meet our goals. The challenge lies in producing silicon blocks with very high crystalline quality in crucibles with coatings that have a very high purity. Possibly these may be constructed from materials that are totally different than those used today," reports Dr. Stephan Riepe, Team Leader at SIMTEC. Presently, the first blocks are being produced at SIMTEC.

The impacts on the material characteristics are to be investigated in detail by the other partners in the cooperation. From the silicon wafers produced, high efficiency solar cells are to be fabricated in the laboratory clean rooms at Fraunhofer (ISE), the University of Constance and the Institute for Solar Energy Research Hameln (ISFH) and used as test cases. These results will provide information about the level of efficiency which can be achieved under optimal conditions. The researchers also aim to measure the basic parameters during crystal growth. These parameters shall be implemented into simulation calculations and thus enable the physical processes during the block crystallization to be described in detail.

Equipped for the Future

If the results of the cooperative project indicate that the limits of multicrystalline silicon are no different, in principle,

Fraunhofer Institute for Solar Energy Systems ISE
Heidenhofstr. 2
79110 Freiburg
Germany
Press and Public Relations
Karin Schneider
Phone +49 761 4588-5150
Fax +49 761 4588-9342
info@ise.fraunhofer.de

www.ise.fraunhofer.de

than its counterpart monocrystalline silicon, then it should be possible to manufacture multicrystalline silicon solar cells in the medium term which show an energy yield comparable to monocrystalline solar cells. This result would have a large effect on the PV industry, Dr. Kai Petter, project leader of the joint partner Q-Cells SE, explains: "Through this project we hope to gain information about the future path of photovoltaics. In development and production, the strategic decision of emphasizing mono- or multicrystalline silicon is of immense importance for investments as well as the long-term direction and competitive power of the companies involved."

Further information as well as a list of all institutes and companies involved in the project can be found on the project home page: www.solarwins.de

Information material:
Fraunhofer ISE, Press and Public Relations
Phone +49 761 4588-5150
Fax +49 761 4588-9342
info@ise.fraunhofer.de

Text of the PR and photos can be downloaded from our web page: www.ise.fraunhofer.de

Contact Person for further information:
Wilhelm Warta, Fraunhofer ISE
Phone +49 761 4588-5192
Fax +49 761 4588-9250
wilhelm.warta@ise.fraunhofer.de

Stephan Riepe, Fraunhofer ISE
Phone +49 761 4588-5636
Fax +49 761 4588-9579
stephan.riepe@ise.fraunhofer.de

Fraunhofer Institute for Solar Energy Systems ISE
Heidenhofstr. 2
79110 Freiburg
Germany
Press and Public Relations
Karin Schneider
Phone +49 761 4588-5150
Fax +49 761 4588-9342
info@ise.fraunhofer.de

www.ise.fraunhofer.de

Press Release

Multicrystalline silicon block (13kg) manufactured at SIMTEC Fraunhofer ISE using the Vertical Grade Freeze technique. The edge length of the block measures about 22cm; out of which a single column with the format 156 x 156 mm² can be sawn. ©Fraunhofer ISE

Crystallization unit for producing multicrystalline silicon blocks. ©Fraunhofer ISE

Fraunhofer Institute for Solar Energy Systems ISE
Heidenhofstr. 2
79110 Freiburg
Germany
Press and Public Relations
Karin Schneider
Phone +49 761 4588-5150
Fax +49 761 4588-9342
info@ise.fraunhofer.de

www.ise.fraunhofer.de