

Press Release

Freiburg
May 19, 2010
No. 13/10
Page 1

Fraunhofer-Gesellschaft Awards Science Prize to Solar Researchers in Freiburg

Joseph von Fraunhofer Prize for highest efficiency multi-junction solar cells and concentrator modules

Hugo von Geiger Prize for diploma thesis project on innovative cell concept

Dr. Andreas Bett and Dr. Frank Dimroth of the Fraunhofer Institute for Solar Energy Systems ISE in Freiburg develop solutions to make the conversion from sunlight to electricity cheaper and more efficient for the future. To this end, they and their team have been working for over ten years on solar modules which concentrate solar radiation by a factor of 500 onto tiny solar cells. This procedure reduces the area of the semiconductor material required and enables the use of novel, extremely efficient solar cells.

The researchers in Freiburg received huge recognition last year for their development of a metamorphic triple-junction solar cell which achieved a record efficiency of 41.1%. Together with a concentrating optic, the highly efficient multi-junction solar cells were implemented in now market-ready concentrator modules. In recognition of these achievements, Dr. Andreas Bett and Dr. Frank Dimroth receive the highest distinction of the Fraunhofer Gesellschaft, the 2010 Joseph von Fraunhofer Prize, today in Leipzig.

Optimizing the Optics and Material

“We substitute costly semiconductor material with inexpensive optics. In addition, we use extremely efficient solar cells and thus reduce the solar electricity costs,” explains Dr. Andreas Bett, Head of the Department of Materials – Solar Cells and Technologies. This technology produces more power per area than conventional flat plate PV technology. Under favourable conditions, electricity costs

**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

Freiburg
May 19, 2010
No. 13/10
Page 2

of just ten to fifteen cents per kilowatt are possible for systems located in Southern Europe.

Due to the concentrating optics, the systems make use of only the direct solar radiation and therefore the systems must track the sun. Since the radiation scattered by clouds or water droplets can not be concentrated, such systems are not particularly suitable in countries like Germany or as roof top systems, but rather as large commercial power stations in sunny countries having a large fraction of direct radiation, e.g. in Southern Europe. Due to the two-axis tracking mechanism installed in the systems, a high power output can be achieved even in the morning and the evening hours.

An advantage of concentrator systems is their modular construction, which allows them to be arbitrarily expanded to the kilowatt or even gigawatt range at will. A further advantage is that the capital needs and investment for building up an automated series production are comparatively low. Also, this is a very green technology. The energy consumption for the manufacture and installation of the concentrator systems is amortized within a few months.

From the Laboratory to the Market

Using highly efficient multi-junction solar cells and a concentrating optic, the researchers and their team in Freiburg developed the FLATCON® concentrator module. The efficiency of this module is presently at 29%. The technology was commercialized in 2005 with the spin-off company Concentrix Solar GmbH. Today Concentrix Solar employs over 60 persons. It operates a production line for concentrator modules in Freiburg and ships its highly concentrating solar PV modules primarily to Southern Europe and the USA. To date, this young company has installed more than 600 kW of concentrator systems in Spain.

“Manufacturing concentrator technology is like manufacturing cars,” says Frank Dimroth, Head of the Group

**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

Freiburg
May 19, 2010
No. 13/10
Page 3

“III-V – Epitaxy and Solar Cells” at Fraunhofer ISE. “Mass production reduces costs. First at that point can a new technology unfold its full potential. On the long-term, we calculate that this technology will be about 20 to 30 percent more economical than silicon technology.” To reach this goal, a team of 50 people are working at Fraunhofer ISE to optimize the many partial aspects of the system, i.e. from the solar cell through the measurement technology and the process technology and up to the modules. It shall be demonstrated how to manufacture the systems in large numbers at a low cost and also that the systems produce energy reliably over a period of 20 years. Currently the AC system efficiency of a complete 5 kW concentrator system is 25 percent. “We are incredibly proud of our young team and its untiring dedication to solar energy. Winning the Joseph von Fraunhofer Prize confirms our motivation to make solar energy competitive on the market through new technologies,” says Andreas Bett.

From Space to the Earth

Originally highly efficient multi-junction solar cells were developed for space applications. Only by combining these cells with Fresnel lenses, a cost-effective alternative was found for manufacturing that also could be used on earth. In the record solar cell from Fraunhofer ISE with an efficiency of 41.1 percent, three subcells made out of gallium indium phosphide, gallium indium arsenide and germanium are stacked on top of one another. Each of the III-V compound semiconductors utilizes a different wavelength range in the solar spectrum. By looking at the ultra thin solar cell of only a few μm , one cannot perceive the complexity of the inner structure. Special Fresnel lenses concentrate the incident sunlight by a factor of 500 and focus it onto the tiny 3 mm² cells. To avoid overheating, each cell is mounted on a copper plate which dissipates the heat well enough to make a passive cooling of the cells sufficient. Prof. Eicke R. Weber, Director of Fraunhofer ISE is convinced: “We expect that high efficiency concentrator technology – in addition to

**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

Freiburg
May 19, 2010
No. 13/10
Page 4

photovoltaics using crystalline silicon and the classic thin-film technology – will become established as a third technology for cost-efficient generation of solar electricity in the sunny regions of the world.”

Hugo Geiger Prize 2010 for novel cell concept

The physicist Nils Brinkmann, former diploma student at the Fraunhofer ISE in Freiburg, is awarded the 3rd Hugo Geiger Prize at the Fraunhofer Annual Meeting 2010 in Leipzig for his diploma thesis “Epitaxy through holes: Process development and characterization.” Nils Brinkmann developed an approach to make market-competitive electricity production from inexpensive photovoltaic modules. He brought the advantages of two technologies together and added a decisive new concept: Current conducting back-side contacts are applied to thin film solar cells – cells in which a thin film of highly pure silicon is applied to an inexpensive wafer substrate. Decisive in the new cell concept are the minute holes through which epitaxial layers on both sides of the thin silicon substrate grow.

The prizes

Joseph von Fraunhofer Prize: Research for practical uses

Since 1978, The Fraunhofer-Gesellschaft has awarded prizes each year for the outstanding scientific accomplishments of its employees who solve applications-based problems. Since its inception, more than 200 researchers have won this prize. Each of the three 20,000 euro prizes will be awarded this year.

Hugo Geiger Prize: Cultivating future scientific talent

The 50-year anniversary of the Fraunhofer-Gesellschaft inspired the government of Bavaria to endow this prize in 1999. It is named after Bavarian State Secretary Hugo Geiger, sponsor of the inaugural meeting of March 26, 1949. This prize is awarded in recognition of outstanding and applications-oriented diploma and doctoral work from

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

Freiburg
May 19, 2010
No. 13/10
Page 5

all areas of research of the Fraunhofer-Gesellschaft. Judgment criteria are: scientific quality, economic relevance, novelty and the interdisciplinary nature of the approaches applied. The projects must bear a direct relationship to a Fraunhofer institute, or have been developed there. This year, the first prize winner will receive an award of 5000 euros; second prize is 3000 euros and the third prize is 2000 euros.



Dr. Andreas Bett (left) and Dr. Frank Dimroth (right) receive the Joseph von Fraunhofer Prize 2010 for the development of highly efficient multi-junction solar cells and concentrator modules. ©Fraunhofer/Dirk Mahler

Text of the PI and photos can be downloaded from our website:
www.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

Contact persons for further information:

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

Press Release

Freiburg
May 19, 2010
No. 13/10
Page 6

Dr. Andreas Bett, Fraunhofer ISE
Phone +49 761 4588-5257
Fax +49 761 4588-9250
andreas.bett@ise.fraunhofer.de

Dr. Frank Dimroth, Fraunhofer ISE
Phone +49 761 4588-5258
Fax +49 761 4588-9250
frank.dimroth@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