



Press release 05/2009

Stuttgart, Germany, 11 May 2009

European record: CIS thin-film solar cell efficiency

The ZSW research institute achieves 19.6 percent efficiency with a multistage, pilot production line for CIS solar cells.

This latest achievement will accelerate the further progress of thin-film photovoltaics. The Centre for Solar Energy and Hydrogen Research, Baden-Württemberg, Germany (Zentrum für Sonnenenergie- und Wasserstoff-Forschung, ZSW) has successfully transferred a more efficient coating technology, which was previously only possible at the laboratory level, to a pilot production line. By utilising an inline multistage process in its automated coating plant, the institute has set a new European record by achieving an efficiency of 19.6 percent for thin-film solar cells from copper-indium-gallium-diselenide (CIS or CIGS for short).

“What’s really special about our success is not the actual efficiency level in itself,” says thin-film expert Dr. Michael Powalla, Member of the Board at ZSW. “The decisive fact is that we’re producing solar cells and small modules with a CIS plant designed to perform all process steps over the area of 30 cm by 30 cm, representing a pre-industrial scale. This level of development creates the prerequisites for cutting costs as well as increasing efficiency. For such a production-level plant, the 19.6 percent for an active cell area of almost 0.5 square centimetres is actually a world record.” The latest results have been certified by the Fraunhofer Institute for Solar Energy Systems (Fraunhofer-Institut für Solare Energiesysteme ISE).

Not every cell produced achieves the new record efficiency. Furthermore, a solar cell always has a somewhat greater efficiency than an interconnected and encapsulated module equipped with a connection box. For example, commercially available standard CIS thin-film modules currently have an average efficiency of between 11 and 12 percent. However, the new record value demonstrates the CIS technology’s potential for achieving lower-cost, efficient photovoltaics.

Today Würth Solar, for example, produces modules with an average efficiency of 12 percent. Michael Powalla assumes that efficiency levels between 14 and 15 percent can also be achieved for commercial modules within the next few years.

The ZSW is an international leader in the development of CIS thin-film modules. Together with the company Würth Solar, the institute successfully brought this alternative solar power technology into industrial production. In 2006, Würth Solar launched the world’s first mass production of CIS solar modules in Schwäbisch Hall, Germany. The production capacity is now 30 megawatts per year. ZSW continues to support the factory.

Zentrum für Sonnenenergie- und Wasserstoff-Forschung Baden-Württemberg (ZSW)

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Until now, manufacturers have produced almost 90 percent of all solar cells from crystalline silicon. However, thin-film technology is catching up. In 2008, it amounted to 12 percent of the total installed photovoltaic capacity. 20 to 30 percent is forecast for 2010.

The ZSW is one of the most renowned German research institutes in the fields of photovoltaics, energy system analysis, renewable fuels, battery technology and fuel cells. About 150 scientists, engineers and technicians are currently employed at its three facilities in Stuttgart, Widderstall and Ulm. They generate a turnover of around 20 million euros.

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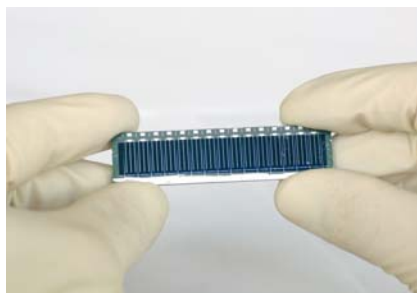
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These images, a datasheet, a portrait of the institute and further information can be obtained from:

Dr. Klaus Heidler Solar Consulting



Left: Test device with 15 CIS solar cells in a row. The record cell is in the middle.

Right: Automated coating plant for producing CIS thin-film solar cells in the ZSW laboratory.

Image left: ZSW
Image right: ZSW (www.morlok-fotografie.de)