



# Presseinformation

Freiburg,  
June 4, 2013  
Nr. 09/13

## **Fraunhofer ISE Teams up with EV GROUP to Enable Direct Semiconductor Wafer Bonds for Next-Generation Solar Cells**

**Freiburg, Germany, June 4, 2013** – The Fraunhofer Institute for Solar Energy Systems ISE today announced that it has joined forces with EV Group (EVG) to develop equipment and process technology to enable electrically conductive and optically transparent direct wafer bonds at room temperature. The new solutions, developed in partnership with Fraunhofer ISE based on EVG's recently announced ComBond® technology, aim to enable highly mismatched material combinations like gallium arsenide (GaAs) on silicon, GaAs on indium phosphide (InP), InP on germanium (Ge) and GaAs on gallium antimonide (GaSb). Direct wafer bonding provides the ability to combine a variety of materials with optimal properties for integration into multi-junction solar cells, which can lead to new device architectures with unparalleled performance.

“Using direct semiconductor bond technology developed in cooperation with EVG, we expect that the best material choices for multi-junction solar cell devices will become available and allow us to increase the conversion efficiency toward 50 percent,” stated Dr. Frank Dimroth, Head of department “III-V – Epitaxy and Solar Cells” of Fraunhofer ISE. “We are excited to partner with EVG, a leading supplier of wafer bonding equipment, to develop industrial tools and processes for this application.”

### **Fraunhofer Institute for Solar Energy Systems ISE**

Heidenhofstrasse 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](http://www.ise.fraunhofer.de)

Fraunhofer ISE has developed III-V multi-junction solar cells for more than 20 years and has reached record device efficiencies of up to 41 percent with its metamorphic triple-junction solar cell technology on Ge. Higher efficiencies require the development of four- and five-junction solar cells with new material combinations to span the full absorption range of the sun's spectrum between 300-2000 nm. Integration of

# Press Release

**Freiburg**  
**June 4, 2013**  
**No. 09/13**  
**Page 2**

III-V solar cells on silicon opens another opportunity to reduce manufacturing cost, especially when combined with modern substrate lift-off technologies. Direct wafer-bonding is expected to play an important role in the development of next-generation III-V solar cell devices with applications in space as well as in terrestrial concentrator photovoltaics (PV).

“We are excited about refining our new process technology together with Fraunhofer ISE, the largest solar energy research institute in Europe,” stated Markus Wimplinger, corporate technology development and IP director for EVG. “Fraunhofer ISE’s broad expertise in the area of PV, specifically in concentrated PV cell manufacturing and photonics, will allow us to characterize bonding interfaces with respect to PV applications on our new ComBond® equipment platform.”

EVG’s ComBond® technology has been developed in response to market needs for more sophisticated integration processes for combining materials with different lattice constant and coefficient of thermal expansion (CTE). The process and equipment technology enables the formation of bond interfaces between heterogeneous materials – such as silicon to compound semiconductors, compound semiconductors to compound semiconductors, Ge to silicon and Ge to compound semiconductors – at room temperature, while achieving excellent bonding strength. The ComBond® technology will be commercially available later this year on a new 200-mm modular platform currently in development, called EVG580® ComBond®, which will include process modules that are designed to perform surface preparation processes on both semiconductor materials and metals.

In addition to PV, other potential application areas for processes developed in cooperation between EVG and Fraunhofer ISE include light emitting diodes (LEDs) and silicon photonics.

**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](http://www.ise.fraunhofer.de)

# Press Release

**Freiburg**  
**June 4, 2013**  
**No. 09/13**  
**Page 3**

## **About EV Group**

EV Group (EVG) is a leading supplier of equipment and process solutions for the manufacture of semiconductors, microelectromechanical systems (MEMS), compound semiconductors, power devices, and nanotechnology devices. Key products include wafer bonding, thin-wafer processing, lithography/nanoimprint lithography (NIL) and metrology equipment, as well as photoresist coaters, cleaners and inspection systems. Founded in 1980, EV Group services and supports an elaborate network of global customers and partners all over the world. More information about EVG is available at [www.EVGroup.com](http://www.EVGroup.com).

## **About Fraunhofer ISE**

With a staff of 1270, the Fraunhofer Institute for Solar Energy Systems ISE, based in Freiburg, is the largest solar energy research institute in Europe. Fraunhofer ISE is committed to promoting energy supply systems which are sustainable, economic, safe and socially just. It creates the technological foundations for supplying energy efficiently and on an environmentally sound basis in industrialized, threshold and developing countries. To this end, the institute develops materials, components, systems and processes for a total of eight different business areas: Energy-Efficient Buildings, Applied Optics and Functional Surfaces, Solar Thermal Technology, Silicon Photovoltaics, Photovoltaic Modules and Systems, Alternative Photovoltaic Technology, Renewable Power Supply and Hydrogen Technology. Fraunhofer ISE also has numerous accredited test facilities. For more information, visit [www.ise.fraunhofer.de](http://www.ise.fraunhofer.de).

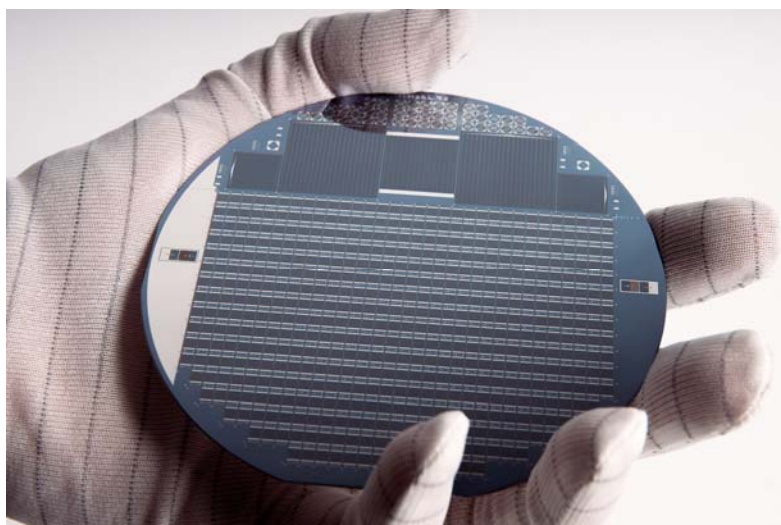
### **Fraunhofer Institute for Solar Energy Systems ISE**

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](mailto:info@ise.fraunhofer.de)

[www.ise.fraunhofer.de](http://www.ise.fraunhofer.de)

# Press Release

Freiburg  
June 4, 2013  
No. 09/13  
Page 4



III-V multi-junction concentrator solar cells on 4-inch diameter wafer. ©Fraunhofer ISE

Text of the PR and photos can be downloaded from our web page: [www.ise.fraunhofer.de](http://www.ise.fraunhofer.de)

**EVG Contacts:**

Clemens Schütte,  
Director Marketing and Communications EV Group  
Phone +43 7712 5311 0  
C.Schuette@EVGroup.com

David Moreno, Vice President, MCA, Inc.  
Phone +1 650 968 8900, ext. 125  
dmoreno@mcapr.comtext

**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](http://www.ise.fraunhofer.de)

**Fraunhofer ISE Contact:**

Dr Frank Dimroth, Fraunhofer ISE  
Phone +49 761 4588-5258  
frank.dimroth@ise.fraunhofer.de