

Press Release

Heraeus Photovoltaics helps another customer in span of four months to set PERC world record

Significant R&D investments in Asia and Cell Optimization Service helps customers set new marks for efficiency

SHANGHAI, China- February 5, 2018 - For the fifth time in four months, Heraeus Photovoltaics, the worldwide leading supplier of metallization solutions to the PV industry, helped a customer achieve a validated world record in PERC (Passivated Emitter and Rear Contact) solar cell energy efficiency. The most recent customer achievement occurred in China, where a solar cell company reached 20.41% photovoltaic conversion efficiency, establishing a new monocrystalline PERC module conversion efficiency world record. In 2017, Heraeus pastes enabled two separate customers in four different instances to also achieve world records in PERC efficiency for their cells, as verified by accredited third-party testing organizations:

- In Oct 2017, Fraunhofer ISE CaLab of Germany certified a photovoltaic conversion efficiency of 22.71% on a monocrystalline PERC cell made using Heraeus front side metallization paste
- Also, in Oct 2017, Chinese Academy of Solar Sciences' Photovoltaic and Wind Power System Quality Test Center certified 22.04% and 22.78% conversion efficiency record on P-type polycrystalline PERC and P-type monocrystalline PERC solar cells made using Heraeus metallization paste
- In Nov 2017, the Chinese Academy of Sciences' Photovoltaic and Wind Power System Quality Test Center verified a world record cell efficiency milestone of 23.45% in a monocrystalline PERC cell made with Heraeus front side metallization paste

For Heraeus, the results are connected to the company's new innovation investment strategy, which began in late 2016. The two major pillars of this plan included:

- An aggressive talent acquisition campaign, which resulted in the hiring of over 120 scientists and solar energy technical experts in 2017. The additional workforce enabled Heraeus to establish R&D clusters close to customers located in China and other key markets in Asia. This enabled closer technical collaboration with customers, enabling them to accelerate their R&D and production speed-to-market.
- A new Cell Optimization Service enabling Heraeus to expand and enhance its industry-leading high performance screen printed front and rear silver pastes to give customers additional value beyond the printing and firing processes. This program, launched in April 2017, works with world-class research institutions to provide customers with a complete solar cell analysis, simulation and process optimization. Customers use these services to identify and implement that optimal processes for the customer's specific production and machine conditions.

Dr. Weiming Zhang, Executive Vice President and Chief Technology Officer for Heraeus Photovoltaics, noted that these customer world records are examples of the company's strategic philosophy that breakthrough innovation does not occur in isolation. While Heraeus has the capability to modify its paste formulations for special cell design characteristics, the close cooperation between the Heraeus and customer technical teams is a difference-maker. He said, "For our customers who want to be market

leaders, we do not believe in an off-the-shelf approach. That's why our investments in scientists, technical experts and services is paying dividends for them. The paste is just the first step." Accelerating innovation and production for customers, Dr. Zhang noted, "We're helping them identify and eliminate technical bottlenecks in their processes. Most importantly, we help them quickly transfer lab efficiency records in the lab to high-volume manufacturing environments."

##

##

##

About the Heraeus Photovoltaics Global Business Unit

The Heraeus Photovoltaics Global Business Unit is an industry leading developer and manufacturer of silver metallization pastes for the photovoltaic industry. For over 40 years, Heraeus has built a reputation of innovation, extensive research and new product development in thick film technologies for some of the most prominent companies within a variety of industries. In the field of photovoltaics, the Heraeus Photovoltaics Business Unit applies this history and its innovative technology to offer metallization pastes for solar cell applications. The Heraeus SOL Series of silver pastes is specially formulated to provide higher efficiencies and wider processing windows, resulting in better yields and higher output for cell manufacturers.

About Heraeus

Heraeus, the technology group headquartered in Hanau, Germany, is a leading international family-owned company formed in 1851. With expertise, a focus on innovations, operational excellence and an entrepreneurial leadership, we strive to continuously improve the businesses of our customers around the world.

We create high-quality solutions for our customers and strengthen their long-term competitiveness by combining material expertise with technological know-how. Our ideas are focused on important issues such as the environment, energy, health, mobility and industrial applications. Our portfolio ranges from components to coordinated material systems which are used in a wide variety of industries, including the steel, electronics, chemical, automotive and telecommunications industries.

In the 2016 financial year, the FORTUNE Global 500 listed company generated revenues without precious metals of €2.0 bn and a total revenue of €21.5 bn. With approximately 12,400 employees worldwide in more than 100 subsidiaries in 40 countries, Heraeus holds a leading position in its global markets. In 2016, the Foundation for Family Businesses named Heraeus as one of the "Top 10 Family Businesses" in Germany.

Media Contacts

Kevin Chen
Corporate Communications Manager
Heraeus Greater China Regional Headquarters
Heraeus (China) Investment Co., Ltd.
Phone: + 86 21 3357 5261
Fax: + 86 21 3357 5230
E-Mail: kevin.chen@heraeus.com
Website: www.heraeus.com

Fezan Sayed
Head of Strategy & Sales - Americas
Heraeus Photovoltaics
Phone: +1 (610) 825-6050 x291
E-Mail: Fezan.Sayed@heraeus.com
Website: www.pvsilverpaste.com