



ZIM Success Story

What Was Old Is New Again: Recycling Solar Panels

Solar energy is some of the most important renewable energy sources of our time. Like most things, however, solar installations don't last forever. The question of how to deal with photovoltaic waste and in particular with used silicon was answered in a transnational ZIM cooperation project.

The warm June that Germany witnessed in 2019 led to a number of new records in the solar industry. That month, solar installations generated 7.17 terawatt-hours of electricity, accounting for 19.2% of the country's entire net production. According to a study by the Fraunhofer Institute for Solar Energy Systems (ISE), this marked the first time that solar generation surpassed the amount of energy produced by lignite coal. That said, it wasn't just the many hours of sunshine that ushered in this boom in the solar industry; the lower costs of corresponding investments is also increasing the use of photovoltaic installations in green energy production.

Along with the rising utilisation of solar technology, however,

the number of modules that will eventually require disposal is growing, as well. Solar panels have a limited lifespan, after all, and modules made of crystal-line silicon cells make up 90% of the waste produced. Up to this point, recycling these panels has mainly involved breaking them down mechanically, separating their organic and inorganic components, and reusing them as a mixed material group in the glass industry. It has not been possible to separate the individual components of solar modules.

Since the energy required to recycle silicon solar cells amounts to around only a third of what is needed to manufacture new cells from natural raw materials, salvaging used cells is a worthy

pursuit in the effort to achieve sustainability.

The product and its innovation

In the German-Korean ZIM cooperation project in question, the goal was to find efficient ways to reintegrate silicon and other used, but valuable elements (tin, silver, and aluminium, for instance) into the recycling economy.

The project, which focused on used silicon panels, developed a water jet technique that makes it possible to break down end-of-life modules into high-purity glass suitable for direct use as a secondary raw material in the plate glass industry. The same process is also capable of isolating silicon granulate and removing the metal it contains using hydrometallurgical methods.

This material – along with various types of treated cell breakage and production waste – then served as “feedstock” for a final cleansing procedure that was developed by the Korean partner in the project. The main objective of this procedure is to remove dopants from the silicon. All this has resulted in a means of collecting the highly pure silicon so prized by the solar industry and using it to manufacture new photovoltaic installations.

Market and customers

Meanwhile, a technical pilot facility that commenced operations at the beginning of the year is helping to stoke interest in the new procedure among customers and other prospective parties and drive sales of the corresponding

Project information

Project duration: 01/2015 to 02/2017

Project form: Cooperation Projects

Technology field: Production technology

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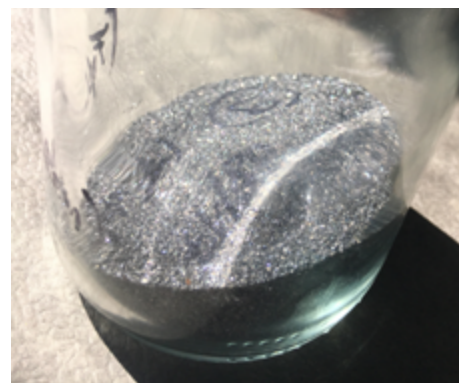


Part treated photovoltaic module

equipment in both countries. International marketing efforts are then to follow in Asia and North America. In addition to the production and sale of entire recycling installations, plans are in place to build a number of systems that will be used within the corporate group behind the project. This joint endeavour will thus have the opportunity to generate revenue as an operator of its innovative recycling system, as well.

The partners

Founded more than 20 years ago as a company focused solely on chemical trading company, Loser Chemie GmbH now covers the entire range of activities related to salvaging valuable raw materials. It considers itself a partner for zero-waste concepts that facilitate a real recycling economy for a wide variety of semiconductor materials – including those found in used hightech products such as photovoltaic modules, wafers,



Silicon recyclete

and targets, but also in devices and production refuse.

The CEOs of Loser Chemie GmbH have founded a new company called LuxChemtech GmbH on the basis of their ZIM project's results.

TSM Co. Ltd. of South Korea is primarily involved in recycling indium, gallium, and other special metals. www.tsm-tech.com

The Korea Institute of Industrial Technology (KITECH) is an international research organisation, also contributed to this project. www.kitech.re.kr/main/

ZIM project of the year

On 11 November 2020, the successful implementation of the project results was honoured as „ZIM Cooperation Project of the Year“ with a certificate of the Federal Minister of Economics Affairs and Energy.



This project was carried out as a result of the first German-Korean call for proposals for research and development projects.

Information about the program

The Central Innovation Programme for SMEs (ZIM) of the Federal Ministry for Economic Affairs and Energy provides funding to all technologies and sectors:

- Individual projects
- Cooperation projects
- Innovation networks and feasibility studies prior to R&D projects.

Information and advice on cooperation projects

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