

Evonik wants to facilitate bulk production of composites

- New technology is designed to significantly reduce manufacturing costs for composites
- Hybrid polymer systems form the technology base and are scheduled to be launched on the market in late 2018
- In the composites business, Evonik aims for medium-term sales in the lower triple-digit million € range

With a chemical trick, Evonik Industries combines the best from two worlds—the characteristics of two types of plastic which were said to be incompatible until now. In doing so, the specialty chemicals company wants to provide an answer for one of the central questions of the composites industry: How can we succeed in producing composites more efficiently? Composites are made of extremely strong fibers embedded in a polymer (plastic). The polymer primarily determines the composite processing. Hybrid polymer systems are the heart of Evonik’s innovation—they combine good processability of thermoplastic polymers and good mechanical properties of thermosetting plastics.

Composites are already in great demand in many different application fields: In lightweight design in the automotive and aviation industry, for example, they reduce the fuel consumption. According to experts, every 100 kilogram of weight saved in a car saves around 0.3 to 0.5 liters of fuel per 100 kilometers. In wind turbines, composites guarantee enormous stability and make bigger and thus more efficient energy plants possible.

But, the production of composites is still complex and costly. Since late 2014, Evonik demonstrates in pilot plants at its Marl site that the material concept of hybrid polymer systems can save time and costs in manufacturing composites. First potential customers have already received samples for testing. First hybrid polymer systems are expected to be ready for the market in 2018.

“Our technology will help to significantly reduce manufacturing costs for composites,” says Chief Innovation Officer Ulrich Küsthardt with conviction, adding that “We want to contribute to leading the way to bulk production of composites.” Evonik that

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Contact Person Economic Press
Edda Schulze
Corporate Press
Phone +49 201 177-2555
Fax +49 201 177-3030
edda.schulze@evonik.com

Contact Person Specialized Press
Karin Assmann
Innovation Networks &
Communications
Phone +49 61 81 59-12230
Fax +49 61 81 59-712230
karin.assmann@evonik.com

Evonik Industries AG
Rellinghauser Straße 1-11
45128 Essen
Germany
Phone +49 201 177-01
Telefax +49 201 177-3475
www.evonik.de

Supervisory Board
Dr. Werner Müller, Chairman
Executive Board
Dr. Klaus Engel, Chairman
Christian Kullmann
Thomas Wessel
Patrik Wohlhauser
Ute Wolf

Registered office Essen
Registered court
Essen local court
Commercial registry B 19474
VAT ID no. DE 811160003

already offers numerous innovative products for composites wants to continue strengthening its position in this growth market.

The company is aiming for sales in the lower triple-digit million € range in the composites market in the medium term. For the market of carbon fiber-reinforced plastics alone, CCEV, a network of companies and research institutes in the fiber composites field, is expecting stable annual growth of an average of 9 percent by 2020.

Composites are a key technology for lightweight design because of their ability to combine very good mechanical properties and low weight. Their processing properties are mainly determined by the polymer. Thermosetting plastics have very good mechanical properties but do require longer processing times compared to thermoplastic materials. But then again, thermoplastic polymers are easy to process, quick to reshape and to recycle, however, they rarely demonstrate the excellent mechanical properties of thermosetting plastics.

There is a reason for the very different properties: polymer chains in thermosetting plastics are crosslinked whereas in thermoplastics they are not. Switching between crosslink and no link is usually not possible because a chemical crosslinking process is irreversible.

Special Diels–Alder reaction as chemical switch

However, this is exactly what Evonik achieved in cooperation with the Karlsruhe Institute of Technology in producing hybrid polymer systems. They are able to crosslink without using catalysts in a completely reversible process. Heating causes de-crosslinking and allows the system to be reshaped. During the cooling phase, the crosslink is created again and its shape becomes stable.

A special Diels–Alder reaction causes this phenomenon where the crosslink is almost chemically switched on and off. Material properties are maintained even with repeated heating and cooling.

“We’re cooperating closely with suppliers of semifinished products, plant producers, and processing companies of fiber-reinforced plastics to develop appropriate processing chains for our hybrid

polymers,” explains Sandra Reemers, head of Evonik’s Composites Project House. “We aim at offering system solutions that enable an efficient production process for semifinished products as well as final parts.”

The Composites Project House founded in April 2013 develops new materials, processes, and system solutions for composite materials. Project houses are a part of Evonik’s strategic innovation unit Creavis. In the project houses, the company pools expertise from various operative units, bringing in additional external experts. Together, they research topics that expand the existing product and technology portfolio and advance these projects to application stage.

Company information

Evonik, the creative industrial group from Germany, is one of the world leaders in specialty chemicals. Profitable growth and a sustained increase in the value of the company form the heart of Evonik’s corporate strategy. Its activities focus on the key megatrends health, nutrition, resource efficiency and globalization. Evonik benefits specifically from its innovative prowess and integrated technology platforms.

Evonik is active in over 100 countries around the world. In fiscal 2014 more than 33,000 employees generated sales of around €12.9 billion and an operating profit (adjusted EBITDA) of about €1.9 billion.

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