

PRESS INFORMATION

PRESS INFORMATIONJune 17, 2020 || Page 1 | 4

New Research Project for Sustainable Polymer-Bonded Magnets



Melt-spinner at the technical center of Fraunhofer IWKS. © Fraunhofer IWKS

Rare earth high-performance magnets are indispensable for a wide range of applications: from industrial motors, electronics, e-bikes to wind turbines and electric vehicles. Polymer-bonded rare earth magnets are becoming increasingly popular because they offer several advantages over conventionally manufactured magnets: they can be produced more efficiently and are compatible with injection molding and 3D printing. This makes them more flexible in their shape and more resistant to corrosion. However, the rare earths they contain are imported from countries outside Europe. So far, there is no industrial recycling process to recycle these magnets and the valuable materials they contain at their end of life.

Editor

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In the project "SupplyPBM - Securing the Supply Chain for Rare Earth Polymer-Bonded Magnets by Recycling", a German-French consortium consisting of five research institutions and industrial partners is now investigating possibilities to generate an industrially feasible recycling process in order to ensure the supply of industry with rare earth-containing polymer-bonded magnets independent of imports. At the same time, the formulation of the magnets is to be made more sustainable.

PRESS INFORMATION

June 17, 2020 || Seite 2 | 4

Under the lead of the Fraunhofer Research Institution for Materials Recycling and Resource Strategies IWKS in Alzenau and Hanau, the partners are working on the development of new value chains. The project is funded by both German and French authorities. In the case of the German partners, the funding is provided by the Federal Ministry of Education and Research.

In the project, scrap magnets are first recycled at Fraunhofer IWKS by means of rapid solidification. For this purpose, the scrap magnets are melted and subsequently quenched on a metal surface. The resulting magnetic material from rapidly solidified flakes can be processed into new polymer-bonded magnets, which in terms of performance are equal to those made from primary material. For the first time, the researchers are investigating the usage of biopolymers to further increase the sustainability of the materials used. Another advantage is that the process does not require any changes to existing production systems for the polymer-bonded magnets, which enables an upscaling to industrial standards. The process can thus be tested directly at the industrial partners Arelec and Veekim involved in the project.



Scheme of the project flow. © Fraunhofer IWKS

In order to close the loop completely, a further milestone in the project is the development of an efficient process for recycling the polymer-bound magnets produced from scrap material to return the magnet material into the value chain. The French project partner ICMCB - Institut de Chimie de la Matière Condensée de Bordeaux is responsible for the development of a continuous technology for the recycling of polymer-bonded

magnets based on the use of supercritical fluids for the separation of the polymer from the magnetic particles.

PRESS INFORMATION

June 17, 2020 || Seite 3 | 4

In order to evaluate the profitability and sustainability of the applied processes, a comprehensive life cycle assessment is prepared for the project in addition to a business plan. The project partner ISM - Institut des Sciences Moléculaires on the French side and the Fraunhofer IWKS on the German side will be in charge of evaluating both the environmental impact of the materials and processes used and their efficiency. The aim is to achieve an efficient closed-loop recycling of recyclable materials.

Project partners:

Fraunhofer Research Institution for Materials Recycling and Resource Strategies IWKS
Veekim AG
ARELEC
ICMCB / CNRS - Institut de Chimie de la Matière Condensée de Bordeaux
ISM – Institut des Sciences Moléculaires

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PRESS INFORMATIONJune 17, 2020 || Seite 4 | 4

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The Fraunhofer Research Institution for Materials Recycling and Resource Strategies IWKS at the two locations Alzenau and Hanau was founded in 2011 by the Fraunhofer-Gesellschaft under the umbrella of the Fraunhofer ISC. In the fields of Resource Strategy, Recycling and Recycling and Substitution, the researchers aim to secure the supply of raw materials to our industry in the long term and thus enable us to maintain a leading position in high technology in the future. To this end, innovative separation, sorting, processing and substitution processes and technologies are being developed together with industry partners.

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