DysCovery:
Sustainable REE, Co supply from magnet recycling: closing the loop

Press release for Project Kick Off

Why "DysCovery"?

The European Raw Materials Alliance (ERMA) task force "Magnets and Motors" submitted an action plan to the EU in 2021 for alerting on the needs on high performant magnets and the necessary raw materials for future growth in the electric vehicle (EV) market. Neodymium magnets (also known as "NdFeB" magnets) are permanent magnets made of neodymium, iron and boron. They belong to the rare-earth magnet family and have the highest magnetic properties of all permanent magnets – stronger than magnets composed of samarium and cobalt (SmCo), aluminium, nickel and cobalt (AlNiCo), and ferrite. In addition to their high magnetic strength, they are relatively inexpensive, making them an ideal choice for a wide range of applications. Today, the NdFeB magnets are the most powerful type of permanent magnets for use in lightweight mobile applications, while SmCo and AlNiCo are used to a lesser extend (Figure 1). End use applications employing state of art technologies reported in 2020, contain the following amounts: 1-5 g of NdFeB in consumer electronics; 1.4 kg in electric passenger vehicles and 1-2 ton(s) in wind turbines.

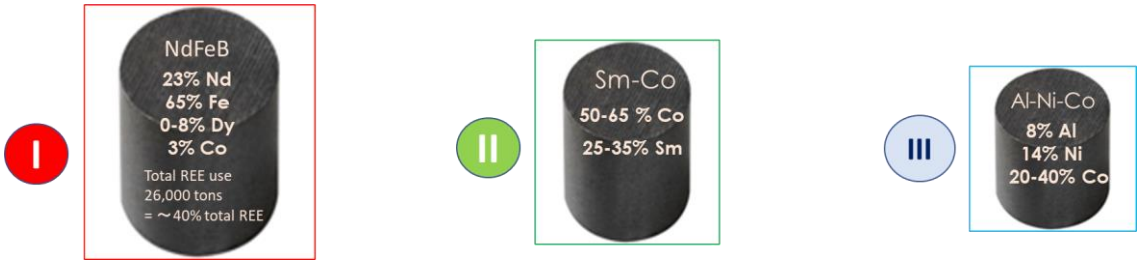


Figure 1: Permanent magnet types and compositions

The growing EV market, as an excellent key indicator, expects to increase ten-fold (to about 50 kt) up to 2030, corresponding to a conservative scenario for the market size projected at about 700 bn €. Europe is almost entirely dependent on China for Rare Earth Elements (REE) and refined products, including primary and recycled materials, magnet compounds and magnets.

Currently, 16,000 tons of magnets are imported every year from China. The EU customers buy these materials at dumped prices and simple tax legislations established by the Chinese government to ensure the entire value chain for the EU market. Moreover, the Chinese products do not necessarily meet EU environmental and societal standards.

Europe needs to produce its own magnet materials and magnets at European standards to sustainably serve the growing market. Magnet recycling is one of the promising ways. The "DysCovery" project (Figure 2) is part of this action plan to increase the EU magnet recycling capacity and reduce the importing rate.

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This activity has received funding from the European Institute of Innovation and Technology (EIT), a body of the European Union, under the Horizon 2020, the EU Framework Programme for Research and Innovation

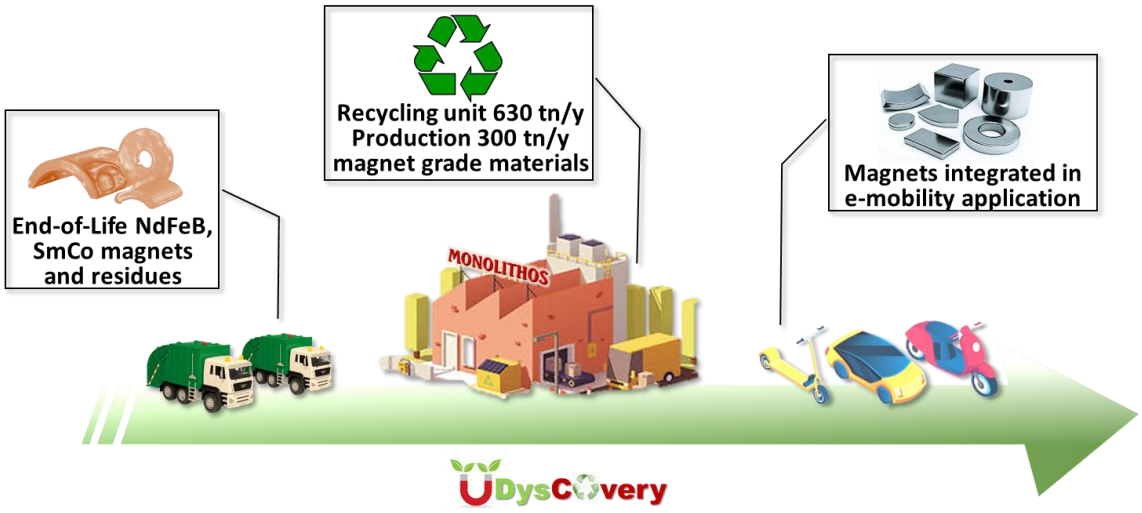


Figure 2: DysCovery recycling scheme

The future "DysCovery" recycling operation in Greece

MONOLITHOS Catalysts and Recycling Ltd. (Greece) will increase its portfolio and construct a new pilot recycling plant (Athens, Greece) for intermediate and refined products with a recycling capacity of 630 tons per year of end-of-life (EoL) material. Thus, DysCovery will enhance the EU recycling capacity by minimum 23%, to produce magnet-specification metals (300 tons per year). These metals will be sold at 30% lower than current market prices and be used for e-mobility applications.

Sustainable magnet recycling and production – challenging steps

Upscaling of the magnet recycling steps from dismantling to partial dissolution will be performed from 2022 until 2024. The raw materials will be end-of-life magnets, but also swarf, scrabs and sludges from recycling steps performed at magnet producer sites.

MONOLITHOS (Greece), MEAB (Germany), KTH (Sweden) and TU-Freiberg (Germany) will demonstrate at preindustrial scale all steps, including innovative hydrometallurgical solutions and molten salt electrolysis, to reach magnet quality (> 95% purity) recycled metals at >90 % recovery rates. These materials are then ready-to-be-used for green magnet manufacturing and be utilized in end-use applications. Besides, residual ferrous materials will be produced and sold to the close-by steel producer.

NdFeB and SmCo magnets from recycled materials will be manufactured at Magneti (Slovenia), while CRF (Italy) will test the performance of the green magnets for potential application in electromobility.

Partners

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