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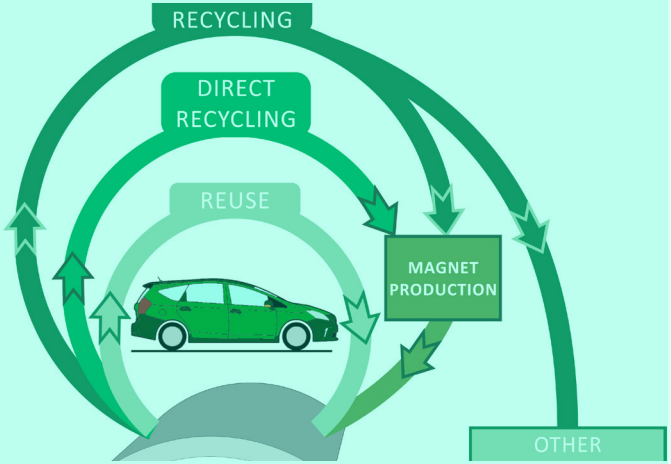
EU MSCA-ETN DEMETER

European Training Network for the Design and Recycling of Rare-Earth Permanent Magnet Motors and Generators in Hybrid and Full Electric Vehicles.

Introducing DEMETER

The project focuses on the recovery of large (i.e. > 30 g) NdFeB and SmCo permanent magnets in the drive motor, the power-steering motor, the stop-start motor, and the regenerative braking and range extender generators in (H)EVs and in highly Advanced ICEVs. In DEMETER the first aim is to develop strategies based on Design-for-Reuse with new generations of motors/generators that incorporate standard sizes of magnets that can be easily removed for re-use in new (H)EVs (and Advanced ICEVs). The second option is direct recycling, in which case the magnets are treated as a raw material for the production of new magnets.



DEMETER's specific objectives

- Develop innovative, eco-efficient direct and indirect recycling routes of NdFeB and SmCo magnets motors and generators from End-of-Life (H)EVs and Advanced ICEVs;
- Develop innovative processing techniques for production of high performance NdFeB and SmCo magnets;
- Design electric motors and generators for the next generation of (H)EVs and Advanced ICEVs to enable easy future reuse of NdFeB and SmCo magnets;
- Develop a complete, "(urban) mine-to-machine", lifecycle assessment (LCA) and lifecycle costing (LCC) methodology for REE permanent magnets to ensure the most environmentally-friendly and economical routes are applied for recycling.

Meet DEMETER's 15 Researchers

ESR 1 [Anas Eldosouky]
(Hydrogen Decrepitation Processing of SmCo magnets)
Host: Magneti Ljubljana (Slovenia)
Supervisor: Dr. Irena Skulj (Magneti),
Prof. Tina Zuzek (Jozef Stefan Institute)

ESR 2 [Muhammad Awais]
(Extraction of NdFeB magnets from EoL (H)EVs/Advanced ICEVs and conversion into master alloys)
Host: University of Birmingham (UK)
Supervisor: Dr. Allan Walton (UOB)

ESR 3 [Martina Orefice]
(Recovery of metal values from SmCo and NdFeB magnets by ionometallurgical methods)
Host: KU Leuven (Belgium)
Supervisor: Prof. Koen Binnemans (KU Leuven)

ESR 4 [Simona Sobekova] (Sm/Co and Nd/Dy/Fe separation by solvent extraction with ionic liquids)
Host: KU Leuven (Belgium)
Supervisor: Prof. Koen Binnemans (KU Leuven)

ESR 5 [N/A]
(Electrodeposition of SmCo alloys from ionic liquids)
Host: KU Leuven (Belgium)
Supervisor: Prof. Jan Fransaer (KU Leuven)

ESR 6 [Xuan Xu] (Development of novel hard magnetic Nd-Fe12Nx-based magnets by electrodeposition)
Host: Jozef Stefan Institute (Slovenia)
Supervisor: Prof. Tina Zuzek (Jozef Stefan Institute),
Prof. Jan Fransaer (KU Leuven)

ESR 7 [Awais Ikram]
(Metal bonded magnets from Hydrogen Decrepitated materials using spark plasma sintering)
Host: Jozef Stefan Institute (Slovenia)
Supervisor: Prof. Tina Zuzek (Jozef Stefan Institute)

ESR 8 [Arnab Chakraborty]
(Exchange coupled Sm-Co magnets with high remanence)
Host: Magneti Ljubljana (Slovenia)
Supervisor: Dr. Irena Skulj (Magneti),
Prof. Tina Zuzek (Jozef Stefan Institute)

ESR 9 [Amit Kumar Jha] (Design of Halbach permanent magnet outer rotor machine for electro-mobility)
Host: Grenoble INP (France)
Supervisor: Dr. Afef Kedous-Lebouc (Grenoble INP),
Prof. Peter Rasmussen (Aalborg University)

ESR 10 [Adolfo Garcia] (Recyclable electrical machine designs with 3D flux and non-traditional materials)
Host: Aalborg University (Denmark)
Supervisor: Prof. Peter Rasmussen (Aalborg University),
Dr. Afef Kedous-Lebouc (Grenoble INP)

ESR 11 [Pranshu Upadhayay] (Electrical machine designs based on 3D flux paths for new generation HEVs)
Host: Valeo Electrical Systems (France)
Supervisor: Dr. Jean-Claude Mipo (Valeo),
Dr. Afef Kedous-Lebouc (Grenoble INP)

ESR 12 [Ziwei Li]
(Electrical radial flux machine design for new generation (H)EVs)
Host: Valeo Electrical Systems (France)
Supervisor: Dr. Jérome Legranger (Valeo), Dr. Afef Kedous-Lebouc (Grenoble INP), Prof. Peter Rasmussen (Aalborg University)

ESR 13 [Muhammad Farhan Mehmood] (Nanoscale characterisation and in-situ dynamic electrochemical TEM studies of recycled magnets)
Host: Jozef Stefan Institute (Slovenia)Supervisor: Prof. Saso Sturm (Jozef Stefan Institute)

ESR 14 [Fernando Coelho] (Characterisation and modelling of Automotive Scrap Residue (ASR) feeds to improve recycling efficiency)
Host: University of Birmingham (UK)
Supervisor: Prof. Neil Rowson (UOB), Prof. Karel Van Acker (KU Leuven)

ESR 15 [Gwendolyn Bailey] (Life cycle assessment of new recycling and reuse routes for REE magnet machines in (H)EVs)
Host: KU Leuven (Belgium)
Supervisor: Prof. Karel Van Acker (KU Leuven), Prof. Neil Rowson (UOB)

BENEFICIARIES

KU LEUVEN SUSTAINABLE INORGANIC MATERIALS MANAGEMENT
MAGNETI LJUBLJANA, d.d.
AALBORG UNIVERSITY DENMARK
UNIVERSITY OF BIRMINGHAM
Valeo
Grenoble INP

PARTNER ORGANISATIONS

LCM less common metals
GRANTA MATERIAL INTELLIGENCE
ENSICAEN