CIRCULAR E-CARS

A graduate school dedicated to developing a metal-focused circular economy for electric vehicles

The CIRCULAR E-CARS research graduate school investigates the fundamentals and strategies for establishing a sustainable, metal-focused circular economy for electric vehicles. Its aim is to supporting the structural transformation of the Rhineland mining region (Rheinisches Revier) in a sustainable way and to develop the region into a leading European location for researching, developing and innovating in circular value chains.

The technological process chain of the metal-focused circular economy for electric vehicles will be covered across the end-of-use and post-use phases: It ranges from dismantling vehicles and central assemblies (e.g. body structures, drive and chassis components) to processing metal-containing fractions and their metallurgical treatment, through to alloy design, metal extraction and refining. The recovered metal recyclates are conditioned in such a way that they can be used as feedstock for powder metallurgical or additive manufacturing processes. The aim is to systematically analyse, develop and redesign the value retention of products, components and materials – in particular metallic and metal-containing structures – throughout these phases of their life cycle. The core element are the R9 strategies, ranging from 'Rethink' to 'Recover', which seek to improve resource efficiency and develop circular value creation systems.

CIRCULAR E-CARS combines technical, economic and social perspectives in an agile innovation ecosystem that brings together stakeholders from science, industry and civil society. To this end, the expertise of scientific institutions, investment partners, and partners from the field is combined, synchronised, and continuously developed.

This interdisciplinary and transdisciplinary approach fosters dialogue between research and practice, enabling participatory transformation processes that actively drive change in the Rhineland mining region (Rheinisches Revier). CIRCULAR E-CARS aims to contribute to creating new jobs and to achieving the United Nations' Sustainable Development Goals (SDGs).

Based on the guidelines for research graduate schools of the German Research Foundation (Deutsche Forschungsgemeinschaft, DFG), the project meets the highest standards in the training of young scientists. As part of a structured, interdisciplinary doctoral programme, GRK CIRCULAR E-CARS is specifically designed to promote young talent in research and practice in the circular economy.The project is jointly supported by RWTH Aachen University, Münster University of Applied Sciences, the University of Siegen, and the Wuppertal Institute. It is funded by the Federal Ministry for Research, Technology and Space (Bundesministerium für Forschung, Technologie und Raumfahrt, BMFTR). Through lecture series, summer schools and mentoring programmes, CIRCULAR E-CARS offers young scientists a structured, practical qualification programme designed to enhance their expertise in the fields of the circular economy and transformation, and to support the development of the next generation of researchers.

AMT's topics in the project

The AMT's research focuses on how small and medium-sized enterprises (SMEs) in the Rhineland mining region (Rheinisches Revier) can be actively integrated into the metal-focused circular economy for electric

vehicles and equipped with relevant skills for future requirements. The aim is to systematically link innovation capability and the circular economy, supporting SMEs in developing new business models and future competencies. A particular focus lies on making existing knowledge bases and patterns of action in SMEs visible, making them usable for the metal-focused circular economy and transferring them into the new requirements of E-car engineering. Using the metal-focused circular economy for electric vehicles as a concrete application case, the following key areas are addressed:

- Analysis of existing and future obstacles and success factors for participatory innovation in SMEs along selected technical process chains in E-car engineering, including (reverse-) engineering steps,
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- _____
- Promotion of a regionally anchored innovation ecosystemin the Rhineland mining region that strengthens competitiveness, new (circular) business areas and start-up activities in the metal-focused circular economy for electric vehicles.

By combining participatory research with industrial practice, the AMT aims to contribute to transforming the regional economy and creating new jobs in the Rhineland mining region (Rheinisches Revier).

Objectives and expected results:

The concepts and models developed within the GRK, particularly within Work Package 12 carried out jointly by the AMT, in collaboration with the Controlling Chair (CON) and the Technology and Society Chair (SoTec) at RWTH Aachen, will be incorporated into regional innovation strategies, training programmes, and recommendations for companies in the Rhineland mining region (Rheinisches Revier). This will promote sustainable and resource-efficient business models, strengthening the competitiveness of the regional economy.

The Rhineland mining region as a whole benefits from new circular business models – through improved economic utilisation of resources and increased attractiveness as a business and innovation location, while scientific utilisation takes place through publications, practical formats and teaching programmes. In the long term, CIRCULAR E-CARS contributes to sustainable, robust, and competitive value creation in the Rhineland mining region (Rheinisches Revier) and actively shapes industrial structural change. This creates a sustainable, participatory, and networked innovation space that actively supports structural change in the region and sustainably strengthens the transformation in the area.

Further information on the CIRCULAR E-CARS project can be found on the CIRCULAR E-CARS website (Home - CIRCULAR E-CARS).

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