

FRAUNHOFER INSTITUTE FOR SILICATE RESEARCH ISC
WÜRZBURG, GERMANY

PRESS RELEASE

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Stepstone for sustainable batteries – greener carbons

Lithium-ion batteries require in addition to lithium metal a number of sophisticated functional materials for their performance. Some of them sound rather unspectacular: conductive additives. In fact, conductive additives like carbon black or carbon nanotubes are a decisive component for the performance and environmental benignity of lithium-ion batteries. The recently launched collaborative project HiQ-CARB aims to provide new carbons with a superior performance and a low carbon footprint for future green batteries in Europe. HiQ-CARB is receiving EU funding from EIT RawMaterials to scale up and validate this important battery material.

Meanwhile it's well known: Li-ion batteries are a key technology for trendsetting European industries such as electric vehicles, portable electronic devices or a wide range of other applications where renewable energy is stored and supplied. Large sectors of European industry, including the European automotive industry, are increasingly dependent on imported lithium-ion cells. The European Green Deal and various supporting actions aim to exploit the employment, growth and investment potential of batteries. A competitive manufacturing value chain in Europe is to be created – last but not least to foster green battery technologies with improved environmental performance.

What about carbon in lithium-ion batteries?

Carbon plays a critical role in improving the electronic conductivity of battery cathodes and thus is essential to achieve fast charging and discharging rates. In the growing battery market, the raw materials account for the biggest part of the costs in the production. "In order to sustainably supply the growing European battery industry with high-quality conductive additives, low carbon footprint and resource-efficient carbon materials have to be created, validated and economically produced in a sufficient volume in Europe" explains project coordinator Dr. Andreas Bittner from Fraunhofer Institute for Silicate Research ISC. That's what HiQ-CARB wants to achieve.

Smart combination, processing and learning

The project team of HiQ-CARB relies on very profiled companies as ARKEMA or ORION for the production of advanced additives and Customcells for the battery cell production. On the other side well-known R&D partners like Fraunhofer Institute for Silicate Research ISC, Aalto University and the University of Bordeaux are involved for the scientific part of evaluation and testing of the new material combinations themselves and the battery cells made from them.

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The HiQ-CARB approach for advanced carbon additives is the combination of thin carbon nanotubes and Acetylene black beads thus receiving high conductivity and low CO₂ emissions during fabrication. In combination, they form an ideally conducting network within the battery electrode. The project aims to build up production of these specialty materials on a ton-scale and megaton-scale as well as an efficient processing for the cathode fabrication on a pilot scale. The test specifications and routines for qualification and quality assurance have to be developed and established to provide effective quality management during production.

In addition, the HiQ-CARB team will provide knowledge and learning modules supporting the education of future experts on the lithium battery value chain and participation opportunities for industry and research according to the EIT RawMaterials' education recommendations.

How carbons go greener

Carbon black is usually produced with high amounts of energy and process materials. HiQ-CARB will substitute standard conductive carbon black by new and much greener high-quality acetylene black. This contributes greatly to improved environmental performance, e. g. the reduction of the CO₂ footprint of material production. In addition, the already commercialized standard carbon nanotubes will be replaced with much thinner carbon nanotubes. This leads to less amounts of carbon materials for the same or even better battery performance and leads to an improved resource efficiency. In addition, this is the only nanotube material worldwide produced from a renewable bioethanol feedstock. Furthermore, a life cycle analysis will be carried out during the project to assess the sustainability of the production process.



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

Project information on the EIT RawMaterials website

<https://eitrawmaterials.eu/project/hiq-carb>

HiQ-CARB. High-Quality Conductive Additives for Rechargeable Batteries

Duration 2021-01-01 – 2024-09-30

Partners

Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V. / Fraunhofer Institute for Silicate Research ISC, Germany (project coordinator)

Aalto University, Finland

Arkema France, France

Custom Cells Itzehoe GmbH, Germany

Orion Engineered Carbons GmbH, Germany

Université de Bordeaux, France

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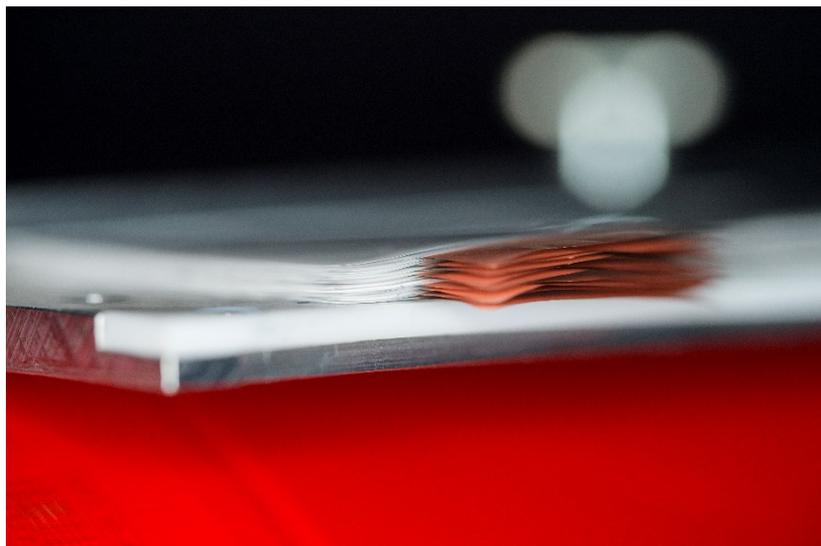
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Carbon Black © Orion Engineered Carbons GmbH



Cell production - electrode stack © K. Selsam, Fraunhofer ISC

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The **Fraunhofer-Gesellschaft**, headquartered in Germany, is the world's leading applied research organization. With its focus on developing key technologies that are vital for the future and enabling the commercial exploitation of this work by business and industry, Fraunhofer plays a central role in the innovation process. As a pioneer and catalyst for groundbreaking developments and scientific excellence, Fraunhofer helps shape society now and in the future. Founded in 1949, the Fraunhofer-Gesellschaft currently operates 75 institutes and research institutions throughout Germany. The majority of the organization's 29,000 employees are qualified scientists and engineers, who work with an annual research budget of 2.8 billion euros. Of this sum, 2.4 billion euros are generated through contract research.

The **Fraunhofer Institute for Silicate Research ISC** (director Prof. Dr. Gerhard Sextl) is one of the leading R&D centers for material-based research and development in the fields of resource efficiency, energy, environment and health. With a permanent staff of about 360 scientists and technicians the Institute works to develop innovative functional materials and technologies for more sustainable products with less resource input and make essential contributions to solving the major global issues and challenges of the future. With its parent Institute and the Translational Center in Würzburg, and its Center for High-Temperature Materials and Design HTL at Bayreuth Fraunhofer ISC combines first-rate expertise in materials science with long-standing experience in materials processing, industrial application and the upscaling of production and process technologies to pilot scale as well as in materials analysis and characterization. With a clear focus on sustainability, the Institute is a strong R&D partner for industrial partners and supports with its developments less resource consumption and responsible production.

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