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Decisive breakthrough for battery production: Storing and utilising energy with innovative sulphur-based cathodes

HU research team develops foundations for sustainable battery technology

Electric vehicles and portable electronic devices such as laptops and mobile phones are unthinkable without lithium-ion batteries. The problem: highly toxic materials such as cobalt are often used for the cathodes of these batteries, which jeopardise the environment and the health of people in the countries where they are mined. In addition, the reserves of these metals are very limited.

Sustainable and powerful with sulphur

A research team at Humboldt-Universität zu Berlin (HU) has now achieved a decisive breakthrough in battery technology. The team, led by Prof Dr Michael J. Bojdys, has developed a high-performance sulphur-based cathode. Sulphur is a sustainable alternative to the materials commonly used in lithium-ion batteries because it is less toxic and - unlike cobalt - is abundant. However, the storage capacity of batteries in which sulphur is used as a cathode material has so far declined rapidly. The researchers have now been able to solve this problem. The results of the study have been published in the renowned journal Angewandte Chemie.

"Our development paves the way for sulphur electrodes as a viable alternative to conventional metal-based cathodes. It could fundamentally change the way we store and use energy and represents an important step towards a more sustainable future," explains Prof Bojdys.

Solving the sulphur-shuttle problem using polymer chemistry

With sulphur-based cathodes, the mobility of the sulphur has so far led to a degradation of the battery - an effect known as the sulphur-shuttle. In the newly developed solution, the sulphur is encapsulated in a special microporous polymer network so that the sulphur particles are retained. This battery technology not only increases the performance and service life of batteries but also avoids the problem of scarce resources.

Prof Dr Michael J. Bojdys is an expert in sustainable energy materials and, as part of the GreenCHEM funding initiative of the German Federal Ministry of Education and Research, is helping to transform the chemical industry in the Berlin capital region by combining science and industry to create a circular economy based on sustainable raw materials.

Further information

Research article: Guiping Li, Ye Liu, Thorsten Schultz, Moritz Exner, Ruslan Muydinov, Hui Wang, Kerstin Scheurell, Jieyang Huang, Norbert Koch, Paulina Szymoniak, Nicola Pinna, Philipp Adelhlem, Michael Janus Bojdys: One-pot

Synthesis of High-capacity Sulfur Cathodes via In-situ Polymerization of a Porous Imine-based Polymer. Angew. Chem. Int. Ed. 2024, e202400382.

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