After Liquid Follows Solid More powerful and safer: BiSSFest research project on solid-state batteries launched

Solid-state batteries are lithium-ion batteries that have a solid electrolyte instead of a liquid electrolyte and can be used, for example, in electromobility. While considerable progress has been made in the field of conventional lithium-ion batteries in recent years, a further increase in terms of energy and power density is only possible to a very limited extent. In addition, there are safety risks that can be minimised by using a solid as the electrolyte. In addition to its non-flammability, a solid electrolyte offers the additional advantage that it does not leak in the event of a battery leak. In order to pave the way for industrial production, research is carried out on high-performance and safe solid-state batteries in a joint project funded by the Federal Ministry of Education and Research (BMBF). In this context, EL-CELL is developing a new test cell for safety tests of solid electrolytes.

In December 2021, the BiSSFest project was launched**,** which is investigating scalable processes from laboratory to pilot scale for the production of solid-state batteries. Specifically, it is about bipolar-stacked, sulphidic solid-state batteries. Individual cell units are connected in series with the help of bipolar plates. The advantage of sulphidic solid electrolytes is their high ionic conductivity – a prerequisite for good battery performance.

The process steps from material synthesis to the processing of the electrodes and the separator to the assembly of multilayer, bipolar cells are considered. The construction of bipolar battery cells, which is not feasible for conventional lithium-ion batteries with liquid electrolyte, allows an additional increase in energy density and thus improved battery performance.

Adaptations at the material level are also intended to improve the interface properties between the active material used, which is responsible for the intercalation of the lithium ions, and the electrolyte. On the cathode side, different current conductors are also being considered that are suitable for the construction of the bipolar cells. On the anode side, the use of lithium metal, which cannot be used in conventional batteries but which in principle promises a further increase in energy density, is examined in more detail.

In addition, a central content of the project is safety tests of the individual components and the finished battery cells as well as their electrochemical evaluation.

Overall, the BiSSFest project (Bipolar Stacking of Solid State Sulphide Batteries, funding code: 03XP0412A) has set itself the overarching goal of producing safe and high-performance lithium-ion solid state batteries in a bipolar arrangement on a pilot scale in order to be able to initiate industrial production and further strengthen Germany as a location for leading battery development.

Project data:

The following partners from the German industrial and research landscape are involved in the BMBF-funded project: NETZSCH-Feinmahltechnik GmbH, IBU-tec advanced materials AG, Customcells Holding GmbH, EL-CELL GmbH, the Battery LabFactory Braunschweig of TU Braunschweig, represented by the Institutes for Machine Tools and Manufacturing Technology and for Particle Technology, as well as the Fraunhofer Institute for Surface Engineering and Thin Films IST, the Institute for Inorganic and Analytical Chemistry of the Westphalian Wilhelms University Münster and BASF SE as an associated partner. The project started in December 2021 and will end in November 2024. The total amount of funding from the BMBF is over 3.4 million euros.