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Novel Cathode Design Makes Batteries More Powerful

The demand for high efficiency batteries is high. Efficient energy storage is an important goal, not only because of their need in electric cars. Other industrial sectors are also looking for new ways of storing electrical energy more efficiently. Examples of applications other than electric transport solutions are mobile IT applications, aerospace and battery storage power plants.

At the Aalen University of Technology and Business, a novel cathode design has been developed by Professor Timo Sörgel, Dr Seniz Sörgel and Dr Sandra Mainhard. The new design concept is equally suited to Lithium-Sulfur and Lithium-Ion batteries. It exhibits not only an increased capacity, energy efficiency and cycle stability, but also an increased energy storage density. In addition, the production costs of the novel cathodes are lower than for traditional cathodes. The Technologie-Lizenz-Büro (TLB) GmbH manages the patent protection of the invention and is in charge of the licensing and marketing of the innovation.

If the electrochemically active material of a cathode by itself has an electric conductivity that is too low, it is customary to use a mixture of several components for the manufacture of the cathode. Carbon particles are for example added to increase conductivity and binding compounds are included to stabilize the cathode composite. The mixture is then applied to the current collector which conducts the electrons to the external electrical circuit.

Adding binding compounds and additives is not only expensive but also limits the energy density of the cathode because the volume taken up by these compounds reduces the amount of active material forming part of the cathode. A further problem is the relatively high electrical resistance between the surfaces of the conducting fill particles of the cathode composite material.

The three researchers developed a new concept for cathodes based on a novel mixture which renders the structural and compositional separation of current collector and cathode material unnecessary. The cathode material can be produced in a single step continuous electroplating process or can be applied by a strip electroplating machine. The novel production process allows an increase in the proportion of active material in the cathode since there is no longer any need to include binders and electrically conductive fill particles.

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