Lithium Batteries: New Nanochannels Make Them Charge Faster

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A new technology to be used in lithium batteries can make them charge faster. The material graphite that was often used, already had a successor that could not further be improved, was the assumption. Until now, as researchers of the MESA+ Institute of the University of Twente found out that by nano structuring the material, new ‘paths’ will be created for lithium ions.

Lithium Ion batteries can be seen in a wide range of applications. They truly changed our information society and our mobility. Lithium moves, through liquid, between two electroede. One of the electrodes used to be very simple, and made of graphite.

The other, the cathode, consists of nickel, mangane and cobalt. The alternative for graphite, nowadays is niobium-tungsten-oxide. It has been shown that charging is faster with this. This is caused by the fact that the material has channels that give better access to the lithium ions: they move more easily than through graphite.

The researchers demonstrating these results earlier on, stated that NbWO already shows such excellent properties that nanostructuring it beforehand, would have no added value. The UT researchers now demonstrate that nanostructuring indeed has a substantial effect.

They create these structures by heating the substance, ‘calcinate’ it, in an oven, so nanoparticles remain. Their size can be between tens and hundreds of nanometers (a nanometer is a millionth of a millimeter). Many more 'exits' for lithium ions are created in this way, because all nanoparticles can conduct lithium ions at their boundaries.

Heavy users

A downside is that this approach doesn’t work for all types of applications. In electric cars, for example, you would need a larger battery pack, as every individual cell delivers less power with the new type of anode. But in ‘peak shaving’, compensating for an over- or

underproduction caused by solar and wind energy, batteries are needed that can be decharged fast, but have to be available fast again.

For these types of applications, including batteries in heavy machinery, the new electrode approach will work out fine, is the expectation of prof Mark Huijben. The next step is to discover what will be the best size of the nanostructured anode. The cathode is also subject of research, for example in looking at ways of lowering the amount of cobalt needed.

This research takes place in the Twente Centre for Advanced Battery Technology (TCABT), working on several aspects of energy storage solutions, new materials included. The researchers collaborated with two labs of the Wuhan University of Technology in China. TCABT is also connected to the German battery research centre MEET (Münster Electrochemical Energy Technology) in Münster.

The researchers published the results of their research in 'Journal of Power Sources'.

Read the original article on University of Twente (UT).