Vienna battery technologies

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Lithium-ion batteries are ubiquitous today - from electric cars to smartphones. But that does not mean that they are the best solution for all areas of application. TU Wien has now succeeded in developing an oxygen-ion battery that has some important advantages. Although it does not allow for quite as high energy densities as the lithium-ion battery, its storage capacity does not decrease irrevocably over time: it can be regenerated and thus may enable an extremely long service life.

In addition, oxygen-ion batteries can be produced without rare elements and are made of incombustible materials. A patent application for the new battery idea has already been filed together with cooperation partners from Spain. The oxygen-ion battery could be an excellent solution for large energy storage systems, for example to store electrical energy from renewable sources.

"We have had a lot of experience with ceramic materials that can be used for fuel cells for quite some time," says Alexander Schmid from the Institute for Chemical Technologies and Analytics at TU Wien. "That gave us the idea of investigating whether such materials might also be suitable for making a battery."

The ceramic materials that the TU Wien team studied can absorb and release doubly negatively charged oxygen ions. When an electric voltage is applied, the oxygen ions migrate from one ceramic material to another, after which they can be made to migrate back again, thus generating electric current.

"The basic principle is actually very similar to the lithium-ion battery," says Prof. J?rgen Fleig. "But our materials have some important advantages." Ceramics are not flammable - so fire accidents, which occur time and again with lithium-ion batteries, are practically ruled out. In addition, there is no need for rare elements, which are expensive or can only be extracted in an environmentally harmful way.

But perhaps the most important advantage of the new battery technology is its potential longevity: "In many

batteries, you have the problem that at some point the charge carriers can no longer move," says Alexander Schmid. "Then they can no longer be used to generate electricity, the capacity of the battery decreases. After many charging cycles, that can become a serious problem."

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