

## How to continue with the batteries for mobile systems?



In this Tesla subfloor, around 8000 lithium-ion batteries provide high-performance data.

**For all kinds of mobile systems, the known lithium-ion batteries are still the first choice in many places.**

Lithium-ion batteries have a high specific energy compared to other types of batteries, but in most applications, they need sophisticated electronic protection circuits for safety (fire hazard, rigid transport regulations, etc.) because they react sensitively to both deep charge and overloading. Research is currently underway on alternatives, but it will take some time before they are actually used in practice. Here some examples of new battery types that are in the pipeline.

### **Tests with lithium-sulfur batteries**

Mid 2017 appeared from Paul Scherrer Institute (PSI) a highly interesting report on material research at PSI in the field of quartz powder for the battery of the future. In theory, lithium-sulfur batteries could provide more energy than the lithium-ion batteries that are often used today. The disadvantage, however, is that they already lose appreciably in capacity after a few charging cycles. The researchers went along with this fact and found that by adding quartz powder to the liquid component of the battery, this rapid loss of capacity slows down. The lithium-sulfur battery is therefore considered a promising solution for future energy storage. With this addition, a lithium-sulfur battery provides 25 to 30 percent more energy.

As of spring 2018: After question from the author of this report with the research team of the PSI, this tells that one has carried out further tests with other oxides at the PSI and has come to similar test results as with the quartz powder. Original-Statement: «We have made additional tests with other oxides and the conclusions are like to the one reported in the press release. Now we are trying to understand better what is the reaction mechanism at the Li counter electrode. »

## **Will in the future more efficient battery technologies soon be used and eliminate the certain disadvantages of the previous Li-ion batteries?**

### **Solid Lithium-ion batteries with ceramic**

Other research centres deal with the further development by using the solid ceramic instead of the liquid electrolytes. As you know, the electrolyte often has toxic and flammable liquids. In the laboratory, these innovative ceramic batteries have already been unloaded and



recharged about 400 times. The ceramic lithium ion battery is considered a forerunner of a new generation of lithium-ion batteries, but they are considered to be safe batteries of the future. In addition to a higher energy density, it has the advantage of not leaking, not overheating and avoiding burn and toxicity. The conventional lithium-ion batteries therefore have strict transport regulations and it has been possible to read more often that devices have been on fire and are causing huge damage. As a result, space-consuming cooling and protection devices are no more necessary.

### **In preparation: Glass batteries with great advantages**

Another application example is the use of glass instead of the liquid electrolytes. Researchers found that batteries with the solid glass are three times as powerful as conventional lithium-ion batteries. Glass allows more powerful cathodes and anodes of alkali metals. This reduces the cost of producing the cells and significantly increases their energy density. In addition, the costs can decrease considerably. A glass electrolyte allows the substitution of lithium with low-cost sodium, which is available for example in seawater indefinitely. The solid battery should also be charged more frequently without forfeit power. Up to now, the researchers have tested up to 1200 charging cycles and have not been able to determine any significant performance losses. The charging time is also minutes instead of hours! This would be outstanding for the much-discussed e-Mobile of the future.

The Tesla currently employs thousands of conventional Li-ion batteries, which have to be laboriously charged over a long period of time. Fast Super-Charger for the Teslas are not too numerous Glass electrolyte and can also work with a large cold (up to -20 degrees Celsius). Many advantages. Disadvantage: These glass batteries and other technologies currently exist only in the laboratory. Hopefully, this very powerful technology is advancing faster than we think. Good reasons for this are now more than enough. We will see which of these technologies come on the market first. Fortunately, there is a lot to be done. All talks about electro-mobility will sooner or later lead to a real game-changer.

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