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New aluminium rechargeable battery charges in only minutes
“Wonder battery” won’t burst into flames even unintentionally

Researchers at Stanford University have developed an aluminium-ion rechargeable battery that charges in minutes. It also offers a very long durability. Another advantage is that aluminium batteries are relatively cheap, and compared to alkaline batteries, environmentally friendly. As opposed to lithium-ion rechargeable batteries, the development also offers benefits in terms of safety, because there is no danger of the batteries suddenly bursting into flames. “Our battery won't catch fire, even if you drill a hole into it,” said Hongjie Dai, professor of chemistry at Stanford.

Fires have constantly been a problem with electronic products that use common lithium-ion batteries. Exactly this problem doesn’t exist with the new aluminium-ion batteries. Of course, for there to be a chance for these to find their way into daily use, the performance has got to be right too. Not only does the new development charge extremely quickly, it can also withstand more than 7,500 charging cycles. With that, it trumps the common lithium-ion battery.

Actually, researchers have been working for decades on aluminium rechargeable batteries, because they promise a low price, a low fire-hazard, and high capacities. However, the durability is a problem. Most only withstand about 100 charging cycles, which is much too short for routine applications. “This is the first time that an ultra-fast aluminium-ion battery has been built with the stability needed for thousands of cycles,” writes the Stanford team. Moreover, they achieved to charge a prototype in only one minute.

A happy coincidence made this possible. Aside from an anode made of aluminium, a rechargeable battery also needs a cathode made of a material that provides the desired performance. “We accidentally discovered that a simple solution is to use graphite,” said Dai. In the study the team determined a few variants of the simple carbon material, which are suitable for aluminium batteries. Moreover, the prototype uses an electrolyte that is principally liquid salt at room temperature, so it is a flexible, polymer-coated jacket.

Another advantage is the flexibility of the battery, according to the researchers. “One can bend it and fold it, so it can potentially be used in flexible electronic devices, “ said Stanford graduate student Ming Gong. But the team is looking at application possibilities on a larger scale. Aluminium batteries are interesting for power grid intermediate storage for renewable energies. “That requires batteries with a long durability, which can store and release energy quickly,” said Dai. Yet-unpublished tests suggest that the aluminium-ion batteries could withstand tens of thousands of charging cycles, which would be tremendous for applications on the grid level.

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