Zinc-air batteries: Three-stage method could revolutionise rechargeability

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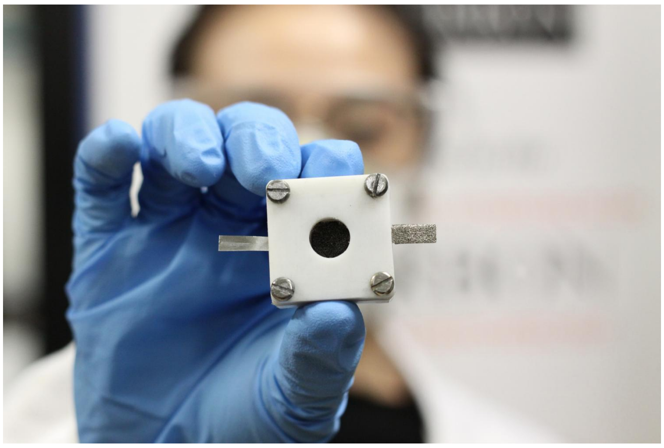

A University of Sydney researcher holds up a rechargeable zinc-air battery. Credit: The University of Sydney

University of Sydney researchers have found a solution for one of the biggest stumbling blocks preventing zinc-air batteries from overtaking conventional lithium-ion batteries as the power source of choice in electronic devices.

Zinc-air batteries are batteries powered by zinc metal and oxygen from the air. Due to the global abundance of zinc metal, these batteries are much cheaper to produce than lithium-ion batteries, and they can also store more energy (theoretically five times more than that of lithium-ion batteries), are much safer and are more environmentally friendly.

While zinc-air batteries are currently used as an energy source in hearing aids and some film cameras and railway signal devices, their widespread use has been hindered by the fact that, up until now, recharging them has proved difficult. This is due to the lack of electrocatalysts that successfully reduce and generate oxygen during the discharging and charging of a battery.

Published in *Advanced Materials* today, a paper authored by chemical engineering researchers from the University of Sydney and Nanyang Technological University outlines a new three-stage method to overcome this problem.

According to lead author Professor Yuan Chen, from the University of Sydney's Faculty of Engineering and Information Technologies, the new method can be used to create bifunctional oxygen electrocatalysts for building rechargeable zinc-air batteries from scratch.

"Up until now, rechargeable zinc-air batteries have been made with expensive precious metal catalysts, such as platinum and iridium oxide. In contrast, our method produces a family of new high-performance and low-cost catalysts," he said.

These new catalysts are produced through the simultaneous control of the: 1) composition, 2) size and 3) crystallinity of metal oxides of earth-abundant elements such as iron, cobalt and nickel. They can then be applied to build rechargeable zinc-air batteries.

Paper co-author Dr Li Wei, also from the University's Faculty of Engineering and Information Technologies, said trials of zinc-air batteries developed with the new catalysts had demonstrated excellent rechargeability - including less than a 10 percent battery efficacy drop over 60 discharging/charging cycles of 120 hours.

"We are solving fundamental technological challenges to realise more sustainable metal-air batteries for our society," Professor Chen added.

More information: Li Wei et al, Amorphous Bimetallic Oxide-Graphene Hybrids as Bifunctional Oxygen Electrocatalysts for Rechargeable Zn-Air Batteries, *Advanced Materials* (2017). DOI: 10.1002/adma.201701410

Provided by University of Sydney

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