Sodium sulfur battery breakthrough

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Led by Dr Shenlong Zhao from the University"s School of Chemical and Biomolecular Engineering, the battery has been made using sodium-sulphur - a type of molten salt that can be processed from sea water - costing much less to produce than lithium-ion.

Dr Zhao"s Na-S battery has been specifically designed to provide a high-performing solution for large renewable energy storage systems, such as electrical grids, while significantly reducing operational costs.

According to the Clean Energy Council, in 2021 32.5 percent of Australia"s electricity came from clean energy sources and the industry is accelerating. Household energy storage is also growing. According to a recent report a record 33,000 batteries were installed in 2021.

"Our sodium battery has the potential to dramatically reduce costs while providing four times as much storage capacity. This is a significant breakthrough for renewable energy development which, although reduces costs in the long term, has had several financial barriers to entry," said lead researcher Dr Zhao."When the sun isn"t shining and the breeze isn"t blowing, we need high-quality storage solutions that don"t cost the Earth and are easily accessible on a local or regional level.

"We hope that by providing a technology that reduces costs we can sooner reach a clean energy horizon. It probably goes without saying but the faster we can decarbonise -- the better chances we have of capping warming.

"Storage solutions that are manufactured using plentiful resources like sodium - which can be processed from sea water - also have the potential to guarantee greater energy security more broadly and allow more countries to join the shift towards decarbonisation."The lab-scale batteries (coin batteries) have been successfully fabricated and tested in the University of Sydney"s chemical engineering facility. The researchers now plan to improve and commercialise the recently fabricated Ah-level pouch cells.

The researchers declare no competing interests. The research involved contributions from researchers at Chongqing University, University of Adelaide, University of Wollongong, Chinese Academy of Sciences, Beijing, and the University of Science and Technology China. It was funded by The Australian Research Council, National Natural Science Foundation of China, Fundamental Research Funds for the Central Universities and the Ministry of Science and Technology China.

AUSTIN, Texas -- A sodium-sulfur battery created by engineers at The University of Texas at Austin solves one of the biggest hurdles that has held back the technology as a commercially viable alternative to the ubiquitous lithium-ion batteries that power everything from smartphones to electric vehicles.

Sodium and sulfur stand out as appealing materials for future battery production because they are cheaper and more widely available than materials such as lithium and cobalt, which also have environmental and human rights concerns. Because of this, researchers have worked for the past two decades to make room-temperature, sodium-based batteries viable.

“I call it a dream technology because sodium and sulfur are abundant, environmentally benign, and the lowest cost you think of,” said Arumugam Manthiram, director of UT"s Texas Materials Institute and professor in the Walker Department of Mechanical Engineering. “With expanded electrification and increased need for renewable energy storage going forward, cost and affordability will be the single dominant factor.”

In one of two recent sodium battery advances from UT Austin, the researchers tweaked the makeup of the electrolyte, the liquid that facilitates movement of ions back and forth between the cathode and anode to stimulate charging and discharging of the batteries. They attacked the common problem in sodium batteries of the growth of needle-like structures, called dendrites, on the anode that can cause the battery to rapidly degrade, short circuit, and even catch fire or explode.

In previous electrolytes for sodium-sulfur batteries, the intermediate compounds formed from sulfur would dissolve in the liquid electrolyte and migrate between the two electrodes within the battery. This dynamic, known as shuttling, can lead to material loss, degradation of components, and dendrite formation.