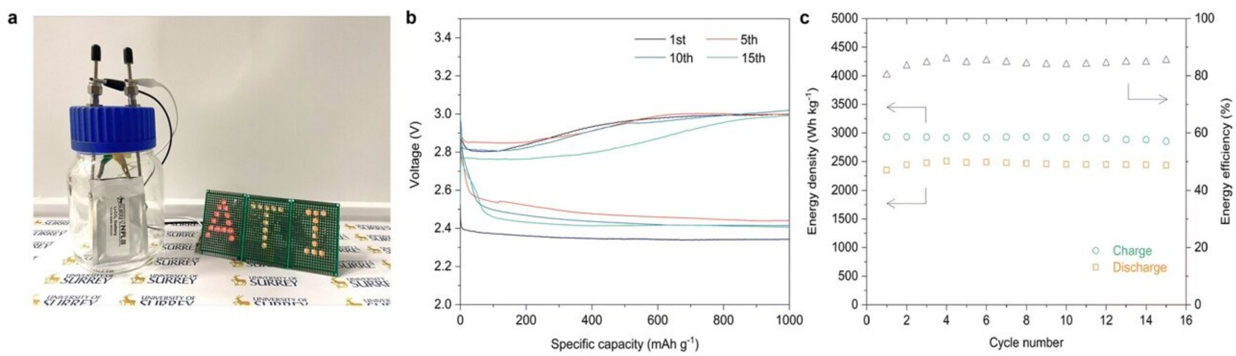
New platform could boost development of carbon-capturing batteries

August 22 2023



LCB pouch cell performance. (a) Photograph of the Pt-based LCB pouch cell lighting up the LED array. Discharge–charge curves (b) and energy density and energy efficiency versus cycle number profiles (c) of the Pt-based LCB pouch cell with a limiting capacity of 1000 mA h g^{-1} . Credit: *Energy & Environmental Science* (2023). DOI: 10.1039/D3EE00794D

Efficient and cheap batteries that can also capture harmful emissions could be right around the corner, thanks to a new system that speeds up the development of catalysts for lithium-CO_2 (Li-CO_2) batteries.

The technology has been developed by the University of Surrey, Imperial College London, and Peking University to address the slow and inefficient methods currently used to produce catalysts for Li-CO_2 batteries.

In the study, researchers used their tool to test and screen materials like platinum, gold, silver, copper, iron and nickel to easily investigate whether they would be suitable candidates for developing high-performing Li-CO_2 batteries. The study has been published in *Energy & Environmental Science*.

Dr. Kai Yang, corresponding author of this work, project co-leader and Lecturer from the Advanced Technology Institute at the University of Surrey, explained, "We have created a cutting-edge lab-on-a-chip electrochemical testing platform that can do multiple things at the same time. It helps evaluate electrocatalysts, optimize operation conditions, and study CO_2 conversion in high-performance lithium-CO_2 batteries. This new method is more cost-effective, efficient, and controllable than traditional ways of making these materials."

Li-CO_2 batteries are a promising new type of battery that work by combining lithium and carbon dioxide; they not only store energy effectively but also offer a way to capture CO_2, potentially making a dual-contribution to the fight against climate change.

Dr. Yunlong Zhao, the lead corresponding author of this study and a Senior Lecturer at Imperial College London, the National Physical Laboratory, and visiting academic from the University of Surrey, said, "It is crucial that we develop new negative emissions technologies. Our lab-on-a-chip platform will play a crucial role in advancing this goal. It will not only enhance our understanding of novel batteries, but it can also be applied to other systems like metal-air batteries, fuel cells, and photoelectrochemical cells.

"This new tool will enable quick screening of catalysts, studying reaction mechanisms, and practical applications, from nanoscience to cutting-edge carbon removal technologies."

More information: Manman Wang et al, Developing highly reversible Li–CO_2 batteries: from on-chip exploration to practical application, *Energy & Environmental Science* (2023). DOI: 10.1039/D3EE00794D

Provided by University of Surrey