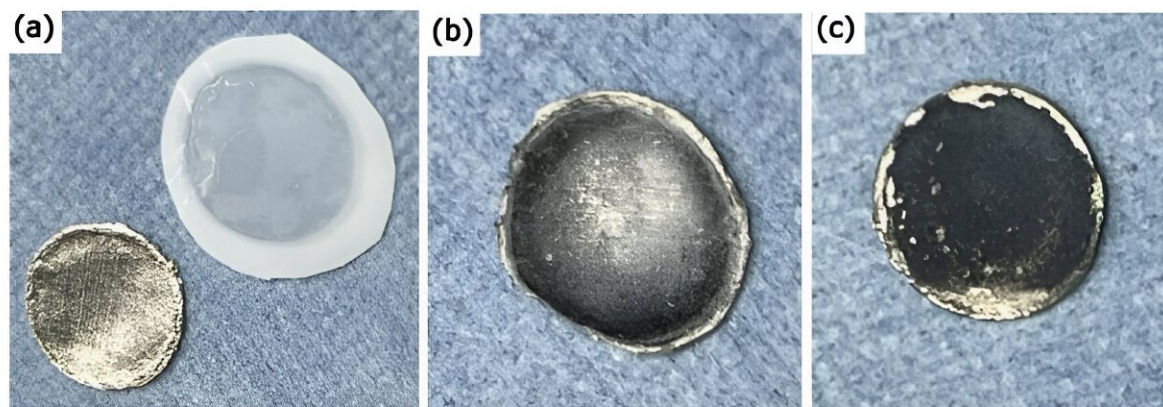


New study reports scalable and cost-effective method to assemble a safer and durable lithium metal battery

March 20 2024



Optical images of lithium under three conditions: a) lithium foil with no FG coating (with electrolyte), b) FG pressed on Li foil without electrolyte, c) SEI formed after 2 days rest in FG@CM cell (with electrolyte). Credit: *Small* (2023). DOI: 10.1002/sml.202308344

Lithium metal batteries (LMBs) can provide nearly 10 times higher energy density compared to the present Lithium-ion batteries (LIBs) and hence are identified as one of the potential future storage systems. However, LMBs pose certain safety concerns and cannot be used for fast-charging applications. Uncontrolled dendrite formation, leading to excessive heating and battery short circuit is one of the critical

challenges of its advancement.

Researchers have previously attempted to address the safety concerns in LMBs, but with methods that were laborious and money/time-intensive. Now T. N. Narayanan's lab at the Tata Institute of Fundamental Research, Hyderabad (TIFRH) reports a simple, scalable, cost-effective method to assemble a safer and durable lithium metal battery.

The research is [published](#) in the journal *Small*.

A porous separator membrane lies between the electrodes in a battery, keeping them apart, and is crucial to prevent a [short circuit](#). When a battery is used for some time, tree-like structures or whiskers called [dendrites](#) begin to form on one of the electrodes. If these dendrites grow uncontrollably, they may in some sense become a physical bridge between the two electrodes causing a short circuit.

Preeti Yadav and Pallavi Thakur, graduate students and lead authors of the study, used a commonly available graphite derivative powder to modify the separator membrane used in a typical battery. This modification suppresses dendrite formation and improves the longevity of the battery to a large extent. The researchers propose that this method of separator modification holds immense potential to be scaled up for industrial usage.

However, at a very high current density of 10 mA cm^{-2} , the battery seems to be deteriorating slowly. This could be because of the electroplating of lithium on the carbon (a component of the deposited graphite derivative layer). The researchers aim to investigate these challenges further and understand the role of interfaces in improving the performance of a battery from a fundamental standpoint.

More information: Preeti Yadav et al, High Rate, Dendrite Free Lithium Metal Batteries of Extended Cyclability via a Scalable Separator Modification Approach, *Small* (2023). [DOI: 10.1002/sml.202308344](https://doi.org/10.1002/sml.202308344)

Provided by Tata Institute of Fundamental Research

Citation: New study reports scalable and cost-effective method to assemble a safer and durable lithium metal battery (2024, March 20) retrieved 27 April 2024 from <https://techxplore.com/news/2024-03-scalable-effective-method-safer-durable.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.