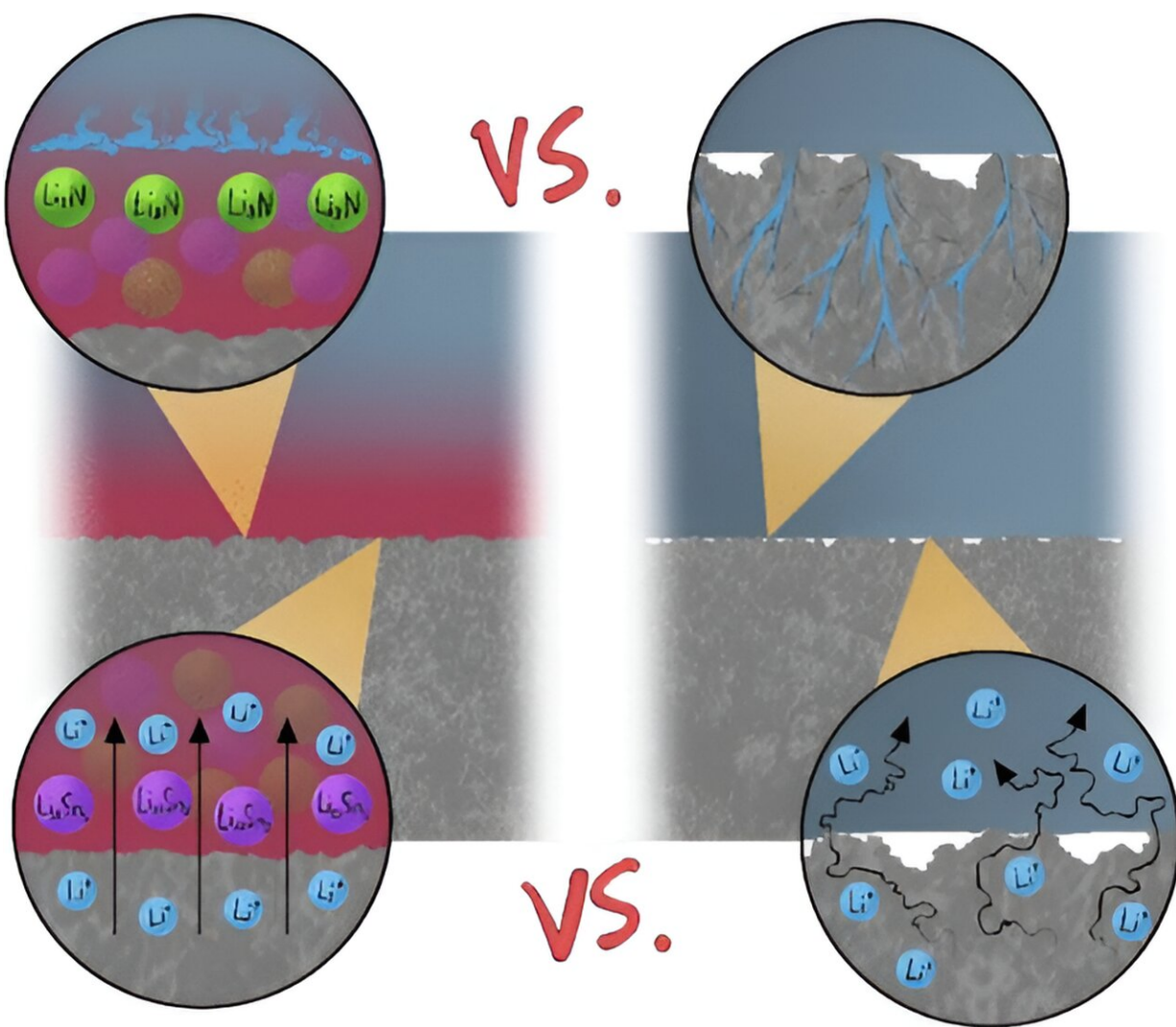


# Adding thin layer of tin prevents short-circuiting in lithium-ion batteries

July 31 2024, by Greg Basky



Credit: *ACS Applied Materials & Interfaces* (2024). DOI: 10.1021/acsami.4c05227

Lithium-ion batteries have a lot of advantages. They charge quickly, have a high energy density, and can be repeatedly charged and discharged.

They do have one significant shortcoming, however: they're prone to short-circuiting. This occurs when a connection forms between the two electrodes inside the cell. A short circuit can result in a sudden loss of voltage or the rapid discharge of high current, both causing the battery to fail. In extreme cases, a short circuit can cause a cell to overheat, start on fire, or even explode.

A leading cause of short circuits are rough, tree-like crystal structures called [dendrites](#) that can form on the surface of one of the electrodes. When dendrites grow all the way across the cell and make contact with the other electrode, a [short circuit](#) can occur.

Using the Canadian Light Source (CLS) at the University of Saskatchewan (USask), researchers from the University of Alberta (UAlberta) have come up with a promising approach to prevent formation of dendrites in solid-state lithium-ion batteries. They found that adding a tin-rich layer between the electrode and the electrolyte helps spread the lithium around when it's being deposited on the battery, creating a smooth surface that suppresses the formation of dendrites.

The results are [published](#) in the journal *ACS Applied Materials and Interfaces*. The team also found that the cell modified with the tin-rich structure can operate at a much higher current and withstand many more charging-discharging cycles than a regular cell.

Researcher Lingzi Sang, an assistant professor in UAlberta's Faculty of Science (Chemistry), says the CLS played a key role in the research.

"The HXMA beamline enabled us to see at a material's structural level

what was happening on the surface of the lithium in an operating battery," says Sang. "As a chemist, what I find the most intriguing is we were able to access the exact tin structure that we introduced to the interface which can suppress dendrites and fix this short-circuiting problem."

In a related paper the team published earlier this year, they showed that adding a protective layer of tin also suppressed the formation of dendrites in liquid-electrolyte-based [lithium-ion batteries](#).

This novel approach holds considerable potential for [industrial applications](#), according to Sand. "Our next step is to try to find a sustainable, cost-effective approach to applying the [protective layer](#) in battery production," adds Sang.

**More information:** Xiang You et al, Dual-Component Interlayer Enables Uniform Lithium Deposition and Dendrite Suppression for Solid-State Batteries, *ACS Applied Materials & Interfaces* (2024). [DOI: 10.1021/acsami.4c05227](#)

Provided by Canadian Light Source

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