Dendrite initiation and propagation in lithium metal solid-state batteries

What causes dendrite failure in lithium metal solid-state batteries?
Analysis of dendrite initiation,owing to filling of pores with lithium by means of microcracks,and propagation,caused by wedge opening,shows that there are two separate processes during dendrite failure of lithium metal solid-state batteries.

What causes dendrite formation in solid-state batteries?
Dendrite formation in solid-state batteries arising from lithium plating and electrolyte reduction. All-solid-state batteries offer high-energy-density and eco-friendly energy storage but face commercial hurdles due to dendrite formation,especially with lithium metal anodes. Here we report that...

How do dendrites separate initiation from propagation?
Our model of dendrites not only separates initiation from propagation but the propagation part of the model also explains how, if stresses in the cell induce cracking of the electrolyte and lithium metal finds its way into such pre-existing cracks, the cracks would propagate and induce failure.

What causes dendrite cracks in lithium ion batteries?
The new imaging study revealed that the initiation and propagation of the dendrite cracks are separate processes,driven by a distinct underlying mechanism. Dendrite cracks initiate when lithium accumulates in sub-surface pores. When those pores become full,further charging of the battery increases the pressure,leading to cracking.

Does plating lead to dendrite formation in lithium anode solid electrolyte cells?
Ning, Z. et al. Visualizing plating-induced cracking in lithium-anode solid-electrolyte cells. Nat. Mater. 20, 1121-1129 (2021). Kasemchainan, J. et al. Critical stripping current leads to dendrite formation on plating in lithium anode solid electrolyte cells.

Can Li dendrites penetrate solid electrolytes?
Li dendrites penetration through solid electrolytes(SEs) challenges the development of solid-state Li batteries (SSLBs). To date,significant efforts are devoted to understand the mechanistic...In Situ Optical Observation of Lithium Dendrite Pattern in Solid Polymer Electrolytes.

Previous models of dendrite penetration have generally focused on a single process for dendrite initiation and propagation, with Li driving the crack at its tip 5-9. Here we show that initiation ...

Our model of dendrites not only separates initiation from propagation, but the propagation part of the model also explains how, if stresses in the cell induce cracking of the electrolyte and lithium ...

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Here we show that initiation and propagation are separate processes. Initiation arises from Li deposition into subsurface pores, by means of microcracks that connect the pores to the...

Additionally, the direct formation of the lithium electrode through the SE offers a scalable and efficient approach to suppress dendrite growth. These results support the development of high ...

A paper by Dominic Melvin and Professor Sir Peter Bruce reveals how X-ray tomography shows dendrite cracks initiate and propagate in solid-state batteries. The study suggests that pressure ...

Analysis of dendrite initiation, owing to filling of pores with lithium by means of microcracks, and propagation, caused by wedge opening, shows that there are two separate ...

The new imaging study revealed that the initiation and propagation of the dendrite cracks are separate processes, driven by a distinct underlying mechanism. Dendrite cracks initiate when ...

This article investigates the mechanisms and factors of dendrite formation in all-solid-state batteries with a Li anode and ceramic electrolyte. It shows that dendrite initiation and ...

4 · Garnet-type Li 6.5 La 3 Zr 1.5 Ta 0.5 O 12 (LLZTO) is a promising solid electrolyte for next-generation solid-state batteries, offering high stability against lithium and superior ionic ...

The comprehensive analysis further reveals that the designed bilayer SSE effectively harnesses the interface-generated pressure during battery cycling, achieving ...