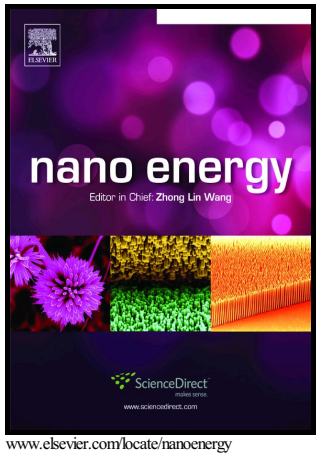

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The Interplay between Solid Electrolyte Interface (SEI) and Dendritic Lithium Growth

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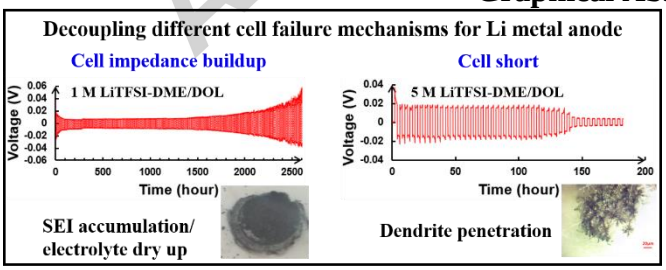
Abstract

Li dendrite formed in Li metal batteries can be categorized into two different types. One is the detrimental Li dendrite that heads towards the separator with a potential to short cell. The other is the ill-defined fibrous Li formed within bulk Li metal. The detrimental Li dendrite may cause cell short, while the other dendrites, covered by SEI, mainly increase cell impedance and terminate the cell operation, most often, before any "short" really happens. Without decoupling these two different Li dendrites, it is hard to develop any effective approach to realize both stable and safe Li metal batteries. Herein, a straightforward approach is proposed to induce the growth of detrimental dendritic Li so the cells are "shorted" frequently and consistently. Based on this new protocol, various electrolytes are revisited and the SEI derived are compared and quantified, providing new insights for addressing the challenges in rechargeable Li metal battery technologies.

Graphical Abstract



The conflicting requirements on SEI properties towards preventing the continuous Li dendrite growth and mitigating impedance accumulation are discussed and quantified for Li metal anode. A broadly applicable fundamental rule has been discovered to understand the morphology evolution of Li metal in different electrolytes, providing fundamentally new insights for addressing challenges in rechargeable Li metal batteries.