



Showcasing research from Professor Jinwoo Lee's laboratory, School of Chemical and Biomolecular Engineering, Korea Advanced Institute of Science and Technology, South Korea.

Concurrent electrode-electrolyte interfaces engineering *via* nano-Si₃N₄ additive for high-rate, high-voltage lithium metal batteries

We developed a nano-Si₃N₄ multifunctional electrolyte additive: (1) modifying the Li⁺ solvation to form an anion-derived SEI layer, (2) forming a Si₃N₄-based fast Li⁺-conductive SEI layer, (3) mitigating H-transfer through EC-Si₃N₄ interactions, and (4) scavenging HF to minimize corrosive side reactions. (1) and (2) enhance Li metal cyclability, and (2) provides fast interfacial kinetics, overcoming the trade-off between cyclability and rate performance. (3) and (4) improve the oxidation stability of electrolytes. Consequently, nano-Si₃N₄ improves cyclability, rate performance, and high-voltage and high-temperature tolerance.

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