

## High energy density cathode materials and advanced characterization



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Hosted by: Prof. Kwun Nam HUI

### Abstract

The development of new energy vehicles has imposed higher requirements for lithium-ion batteries in terms of energy density and cycle life. However, the unclear failure mechanisms of current battery materials have introduced significant uncertainties into material design and modification. In the development of next-generation high-specific-energy cathode materials, we systematically investigated the performance failure mechanisms of layered cathode materials by combining multiple advanced synchrotron radiation characterization techniques. We revealed the intrinsic correlation between stress-strain and lattice microcracks in layered cathode materials, elucidating that localized stress and strain during lithium intercalation and deintercalation are the root causes of structural distortion and performance degradation. This breakthrough has resolved a long-standing global challenge that has puzzled researchers for years, establishing a novel strategy for structural stress regulation. Through innovative material structural design at the lattice scale, we have effectively mitigated this intrinsic defect and achieved the development of ultra-low strain layered cathode materials.

### Biography

Prof. Jun LU is a Chair Professor at Zhejiang University and the Dean of Quzhou Power Battery and Energy Storage Research Institute. His research interests focus on the electrochemical energy storage and conversion technology, with main focus on beyond Li-ion battery technology. He has published more than 600 papers including Nature, Science, Nature Energy, Nature Nanotechnology, Nature Catalysis, Nature Sustainability, Nature Review Material, Nature Communication, Chemical Reviews, etc. (Google Scholar, Total citations: >99,000 times, H-index 141). He also filed more than 30 US patents and patent applications. He also received numerous awards throughout his career including IBA Research Award (2022), ECS Battery Division Technology Award (2022); Research Excellence Award in Electrochemical Energy Storage (EES Award), ACS ENFL Division (2022); IBA Early Career Award (2020); R&D 100 Award (2019); Emerging Researcher Award of ACS ENFL (2019). He was ranked as the Global Highly Cited Researchers by Clarivate Analytics in 2018–2024. He also serves as Editor-in-Chief of Battery Energy and Associate Editor of ACS Applied Materials & Interfaces.