# Nanoscale engineering of heterostructured anode materials for boosting lithium ion storage

Rechargeable lithium ion batteries (LIBs), as one of the most important electrochemical energy storage devices, currently provide the dominant power source for a range of devices including portable electronic devices and electric vehicles due to their high energy and power densities. The interest in exploring new electrode materials for LIBs has been drastically increasing due to the surging demands for clean energy. However, the challenging issues essential to the development of electrode materials are their low lithium capacity, poor rate ability and low cycling stability, strongly limiting their practical applications. Recent remarkable advances in material sciences and nanotechnology enable rational design of heterostructured nanomaterials with optimized composition and fine nanostructure, providing new opportunities for enhancing electrochemical performance.

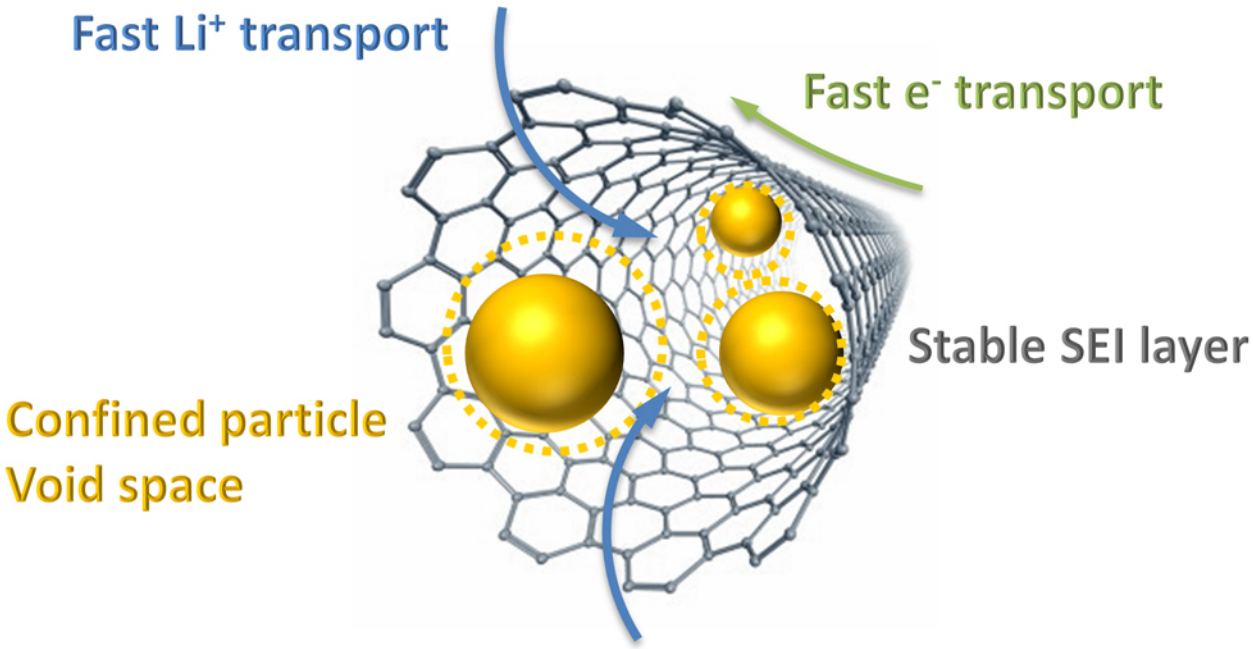


Fig. 1.

This review highlights the progress in how to design new types of heterostructured anode materials for enhancing LIBs in the terms of capacity, rate ability and cycling stability: (1) Carbon nanomaterials supported heterostructured anode materials; (2) Conducting polymer coated electrode materials; (3) Inorganic transition–metal compounds with core@shell structures; (4) Combined strategies to novel heterostructures. By applying different strategies, nanoscale

heterostructured anode materials with reduced size, large surfaces area, enhanced electronic conductivity, structural stability, fast electron and ion transport, were successfully explored for boosting LIBs in terms of high capacity, long cycling lifespan, and high rate durability. Finally, we will look into the challenges and perspectives of future materials design for high-performance LIBs anodes. We believe the strategies discussed in the review not only provide the promising electrode materials for energy storage, but also offer opportunities in being applied for making a variety of novel heterostructured nanomaterials for practical renewable energy applications.

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## Publication

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