

Reinventing Batteries through Nanotechnology



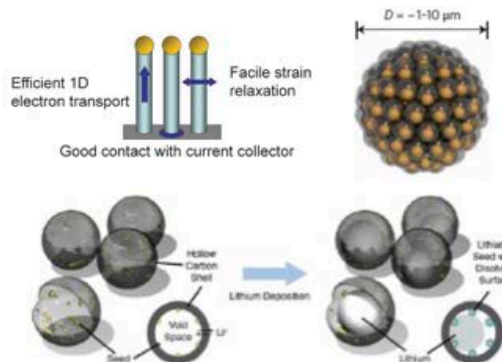
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Abstract:

The fast growth of portable power sources for transportation and grid-scale stationary storage presents great opportunities for battery development. The invention of lithium ion batteries has been recognized with Nobel Prize in 2019. How to increase energy density, reduce cost, speed up charging, extend life, enhance safety and reuse/recycle are critical challenges. Here I will present how we utilize nanotechnology to reinvent batteries and address many of challenges by understanding the materials and interfaces through new tools and providing guiding principles for design. The topics to be discussed include: 1) A breakthrough tool of cryogenic electron microscopy, leading to atomic scale resolution of fragile battery materials and interfaces. 2) Materials design to enable high capacity materials: Si and Li metal anodes and S cathodes. 3) Interfacial design with polymer and inorganic coating to enhance cycling efficiency of battery electrodes. 4) Materials design for safety enhancement. 6) Lithium extraction from sea water and for battery recycling. 7) New battery chemistry for grid scale storage.

Materials Design



Tool Development

