

The Lithium Battery: The Origins to Domination of Energy Storage - The Role of Structure and Disorder

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Lithium-ion batteries have come from an idea in 1972 to dominate electrochemical energy storage today. They are now in a position to enable the large-scale introduction of renewable energy, as well as electrifying transportation, which will leave a cleaner and more sustainable environment for the next generation. There are ample scientific opportunities to further improve their performance and safety. Today's cells attain only 25% of their theoretical value. However, as the energy density is increased, the safety tends to be compromised. Examples will include: the soft TiS_2 lattice, the layered oxides, LiMO_2 , and Li_2VOPO_4 , a proof of concept for a two-electron transfer. These opportunities and the technical challenges that need to be overcome will be described in order to open up a discussion. Emphasis will be placed on the role of structure and disorder.