

Electrochemical Devices for Energy Storage Applications

Layered, spinel, olivine, and silicate as cathode materials for lithium-ion battery
(Chapter 1)

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Abstract

The lithium ion battery has been offering a tremendous benefit and contribution to the technological development of humankind by serving as an efficient power source for electronic devices, mobile power stations, and electrical automotive vehicles since its introduction. The three major components of a lithium ion battery: the cathode, anode, and electrolyte have a crucial role in the electrochemical performance of the battery. The layered LiMO_2 (M = Co, Mn, Ni), spinel LiMn_2O_4 , olivine LiFePO_4 , and silicates Li_2MSiO_4 (M = Fe, Mn) structures are the famous categories of cathodes of lithium ion batteries. These categories of cathode materials have their own advantages, as well as associated intrinsic challenges in terms of capacity retention and rate capabilities. Recently, many efforts were employed to understand the fundamental electrochemistry, and they used various strategies to solve the challenges of these cathode materials and enhance their electrochemical performances. In this chapter, we discussed in detail the fundamental electrochemical mechanism of the cathode part (the positive electrode) of the lithium ion battery and summarised the relevant research findings related to the cathode materials.