

The failure mechanism of thick cathode electrodes for high energy density Li-ion batteries

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Ni-rich layered oxide materials ($\text{Li}[\text{Ni}_{1-x-y}\text{Co}_x\text{Mn}_y]\text{O}_2$) have been considered promising cathode materials for high energy density Li-ion batteries because of their high reversible capacity and stable capacity retention. Although remarkable improvements have been achieved in the development of Ni-rich layered oxide materials, they still have some challenging issues, such as the failure of thick electrodes. The energy density of Li-ion cells increases with increasing the thickness of electrodes. Therefore, the development of thick electrodes is required to improve the energy density of Li-ion batteries. However, thick electrodes usually show poor electrochemical performance compared to thin electrodes. In this regard, it is important to understand the failure mechanism of thick electrodes during cycling. In this presentation, we demonstrate the failure mechanism of thick Ni-rich layered oxide cathode electrodes, focusing on electrode degradation with respect to the vertical position of the electrode. Moreover, we suggest a promising strategy to mitigate the deterioration of thick cathode electrodes.