Enhanced Electrochemical Performance of Nickel-rich Layered Oxide Battery Cathode via Surface Stabilization

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Nickel-rich three-components oxides of $Li(Ni_{1-x-y}Co_xMn_y)O_2$ (NCM, $1-x-y \geq 0.5$) are one of the promising cathode active materials of high-energy density Li-ion batteries because of higher capacity, operation to higher charge cut-off voltage, lower cost and less toxicity than $LiCoO_2$. However, their high-voltage performance is difficult to achieve due to limited anodic stability of conventional electrolyte above 4.2 V vs. Li/Li^+. At such an aggressive charge condition, cathode-electrolyte interfacial reactions often cause a degradation of cathode material and electrolyte consumption by oxidative decomposition, resulting in a rapid performance fade. Here we report the surface stabilization of Nickel-rich $LiNi_{0.6}Co_{0.2}Mn_{0.2}O_2$ cathode to the charge cut-off voltage of 4.6 V by electrolyte control. Surface chemistry and its relation to cycling performance would be discussed.