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Effect of $LiPF_6$-based Electrolyte Composition on the Electrochemical Performance and Thermal stability of $Li(Ni_{0.6}Co_{0.2}Mn_{0.2})O_2$ Cathode

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The $Li(Ni_xCo_yMn_z)O_2$ has been considered as the most promising cathode material for the large-scale applications of lithium secondary batteries such as: electric vehicles (EVs) and energy storage systems (ESSs) because of its high capacity and low price comparing to $LiCoO_2$. As a result, the cathode market share of $Li(Ni_{1/3}Co_{1/3}Mn_{1/3})O_2$ has already been similar or more than that of $LiCoO_2$ since 2011[1]. Especially, for the higher energy density, Ni-rich $Li(Ni_xCo_yMn_z)O_2$ such as $Li(Ni_{0.6}Co_{0.2}Mn_{0.2})O_2$ has been evaluated for large-format applications. However, as the Ni content becomes higher, the operating voltage is also increased, which can result in poor cycle life and safety.

In this work, we try to find the effect of $LiPF_6$-based electrolyte composition on the electrochemical performance and thermal stability of $Li(Ni_{0.6}Co_{0.2}Mn_{0.2})O_2$ during cycling and storage at high temperature. First of all, the concentration of $LiPF_6$ and the ratio of ethylene carbonate to linear carbonate are varied and tested for $Li(Ni_{0.6}Co_{0.2}Mn_{0.2})O_2$/graphite battery system at different temperature and state-of-charge (SOC). The electrochemical performance is evaluated by capacity retention during cycling and storage and the thermal stability of cathode by differential scanning calorimetry (DSC).

Reference

1. Institute of Information Technology Report, 2011 3Q