Interfacial stability of Ni-rich layered oxide cathodes

Aude Hubaud[a], Fulya Dogan[a], Cameron Pebbles[a], Chen Liao[a], John Vaughey[a]
[a] *Chemical Science and Engineering Division*
Argonne National Laboratory (Argonne, IL USA)

aahubaud@anl.gov

Ni-rich NCM materials ($LiNi_xCo_yMn_zO_2$, $x \geq 0.5$) have been considered as some of the most promising alternative cathodes to $LiCoO_2$ for Li-ion batteries due to their higher capacity, lower cost and improved safety. However, the operation at high voltage required for high capacity results in rapid capacity fade.

We have been investigating the degradation mechanisms of selected Ni-rich NCM cathode materials at high voltage. The surface of the material appeared to suffer from an irreversible transformation with the formation of an ionically insulating rock salt phase. The presence of the rock salt phase could result in sluggish kinetics, thus causing the capacity fade. This suggests that preventing the surface degradation of NCM materials could help retaining high capacity during the operation at high voltage.

One approach to prevent the surface degradation of the cathode material is to change the surface properties by coating the particles. We have been developing a variety of ceramic coatings, as well as novel organic and composite coatings. We have been investigating the effect of the various coatings on the stability of the cathode surface as well as the effect on the electrochemical performance of the materials.