

# Improved high temperature electrochemical properties of ALD-Coated NCA Electrodes for Li-Ion Pouch Cell

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The  $\text{LiNi}_{0.8}\text{Co}_{0.15}\text{Al}_{0.05}\text{O}_2$  (NCA) cathodes have reversible capacities of  $\sim 180$  mAh/g in the range of 2.75-4.3V. The NCA cathodes have lower cost and are more environmentally friendly comparing to other cathodes. However, NCA cathodes show structural instability, poor cycling behavior at elevated temperatures and in wide potential ranges. There is a consensus in the literature that the above drawbacks on account of the unstable  $\text{Ni}^{4+}$  ions in the charge process. One of the promising methods to overcome the drawbacks of NCA cathodes is the surface modification. The atomic layer deposition (ALD) is the efficient method for coating. Therefore, one of the aims of the present work was to understand the influence of nano-sized  $\text{Al}_2\text{O}_3$  coatings prepared by ALD onto the NCA electrodes on the electrochemical properties at  $55^\circ\text{C}$ . The NCA electrodes were coated by  $\text{Al}_2\text{O}_3$  layers of 50 and 300 ALD cycles (ALD-50-S and ALD-300-S), respectively by ALD method. The pouch cells were fabricated with the NCA cathodes and the graphite anodes. The capacity retention of the bare NCA cathodes was 80% after 200 cycles at  $55^\circ\text{C}$ . However, the 400 cycles were obtained with the ALD- $\text{Al}_2\text{O}_3$  coated NCA cathodes with 80% capacity retention at  $55^\circ\text{C}$  as shown in Figure 1, which was ascribed to the better thermal stability of the ALD- $\text{Al}_2\text{O}_3$  coated NCA cathodes as shown in Figure 2.

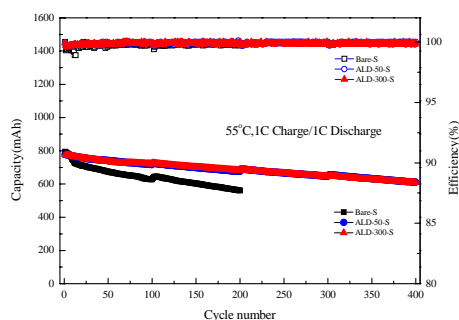


Figure 1. The cycles properties with the NCA cathodes of the pouch cells

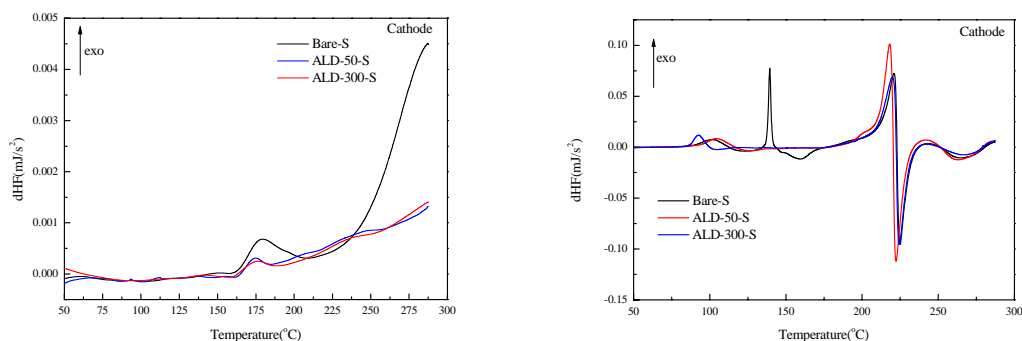


Figure 2. The thermal stability of the NCA cathodes with the electrolytes

## References:

[1] Onit Srur-Lavi, Ville Miikkulainen, Boris Markovsky, Judith Grinblat, Michael Talianker, Yafit Flegler, Gili Cohen-Taguri, Albert Mor, Yosef Tal-Yosef, Doron Aurbach, J. Electrochem. Soc. 164 (2017) A3266-A3275.