# Some strategies to stabilize the nickel-rich cathode with high capacity

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Ni-rich layered oxides have attracted a wide interests in the last decades due to its big potential as a high-capacity cathode materials for Li-ion batteries. However, if we want to get higher capacity of Ni-rich cathode with good cyclic stability and thermal stability, we still need a systematic understanding of these materials either in structural evolution and interfacial behavior during charging/discharging process.

In this presentation, some of new results about synthesis optimization, structural evolution and interfacial modulation of Nickel-rich layered oxide materials such as NMC 532/622/71515 cathode will be presented[1-3]. A series of advanced techniques such as In-situ XRD, Neutron and solid state NMR have been used to investigate the phase changes and ordering/disordering during calcination process. Similar strategy are also used to study the phase-diagram, local environment of lithium ions in the bulk materials and solid electrolyte interface(SEI) on the electrodes before and after cycling. The bulk/local structural changes, the Li+-diffusion behavior at different current and functional additives such as $LiPO_2F_2$ and LiBOB on the electrochemical performance of nickel-rich cathode materials will be presented and discussed.

**References:**

1) D. W. Wang, et al; Advanced Materials, 2017, 1606715
2) W. M. Zhao, et al; J Power Sources, 380(2018)149-157
3) W.M. Zhao, et al; Current Opinion on Electrochemistry, 6(2017)84-91
4) W. G. Zhao, et al; submitted;