Investigation of Boron Doping effect on Microstructure of Ni-Rich Li[$Ni_{1-x}Co_x$]O_2 Cathode Materials for Lithium Batteries

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Ni content has steadily been increased in layered NCA NCM cathode, currently deployed in current EVs, to increase energy density of lithium-ion batteries. However, this approach of simply increasing Ni content compromises battery lifetime and thermal stability due to rapid capacity fading and an abundance of unstable Ni4+ species. For a longer driving range of electric vehicles (EVs) per charge, the development of advanced cathode materials is necessary as they largely determine the capacity and service life of lithium-ion batteries. One of the main culprit for rapid capacity fading of Ni-rich layered cathodes is microcracking which accelerate interfacial side reactions by exposing internal surface of cathode particles. Here, we suggest a novel cathode material by introducing boron to the binary system Li[Ni0.9Co0.1]O2 (NC90) to create a new class of layered cathode materials, Li[Ni1−x−yCoxBy]O2 (NCB). A series of NCB cathodes with 0.5, 1.0, 1.5, and 2 mol% of B systematically characterized to investigate the capacity fading mechanism and to determine the optimal microstructure for better cycling stability.