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POS-38 Investigating the Removal of Layered Double Hydroxides in $[\text{Ni}_{0.80}\text{Co}_{0.15}]_{0.95-x}\text{Al}_{0.05+x}(\text{OH})_2$ ($x = 0, 0.05$) Prepared by Coprecipitation

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As lithium ion battery technology expands into more demanding applications such as electric vehicles, attention has shifted away from the conventional LiCoO_2 positive electrode material. Instead, nickel-rich materials such as $\text{LiNi}_{1-x-y}\text{Mn}_x\text{Co}_y\text{O}_2$ (NMC) and $\text{LiNi}_{1-x-y}\text{Co}_x\text{Al}_y\text{O}_2$ (NCA) have become attractive due to their lower cost, increased lifetime and increased safety.

Coprecipitation is a common method to synthesize mixed metal hydroxides ($\text{M}(\text{OH})_2$: M = divalent transition metals) as the precursor materials to the lithiated metal oxides. While the syntheses of divalent NMC precursor materials are well understood, the introduction of a trivalent cation, such as Al^{3+} , complicates the synthesis and affects the products significantly.¹ In order to balance the charge, an extra anion needs to be incorporated into the layered structure, and resulting in the formation of a new layered double hydroxide (LDH) phase.

LDH phases have been widely reported in supercapacitor research, even $\text{NiCoAl}(\text{OH})_2$.² However, there has been little to no work reported on the conversion of LDH phases with trivalent cations to phases with no intercalated molecules.³ NCA literature often omits precursor characterization. Even when a group reported precursors with no LDH₄ and with LDH₅ using the same synthesis method, there was only a brief mention on LDH presence.

In this work, $[\text{Ni}_{0.80}\text{Co}_{0.15}]_{0.95-x}\text{Al}_{0.05+x}(\text{OH})_2$ ($x = 0, 0.05$) precursor materials were prepared by the coprecipitation method. The precursor materials were then washed in a solution of NaOH, filtered and dried. NaOH concentration, initial solution temperature, stirring temperature and stirring time were varied to study their impact on LDH removal. Unwashed and washed samples were characterized by XRD, ICP-OES, TGA-MS, SEM and photographs. Recommended recipes for the production of competitive NCA hydroxide precursors are reported.

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