

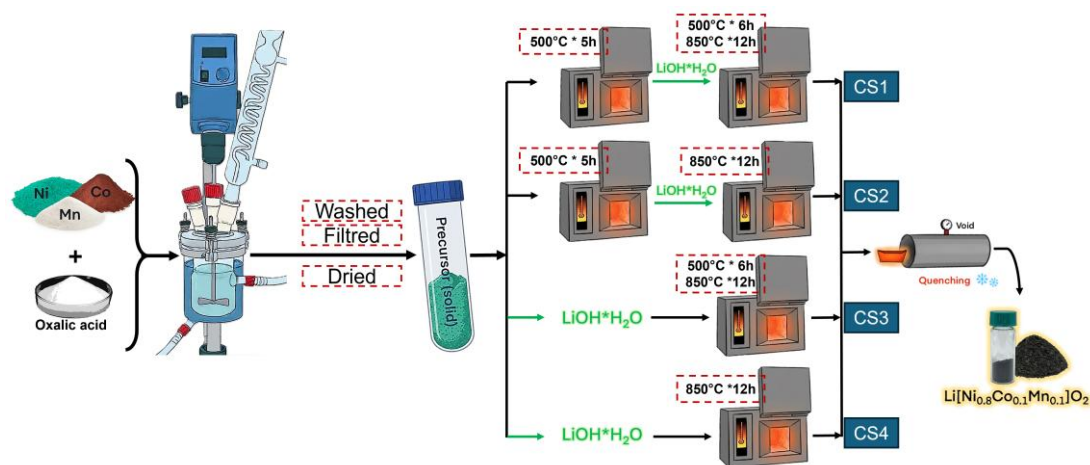
Comparative Analysis of Calcination Strategies for NMC811 Synthesized via Oxalic Coprecipitation

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Ni-rich ternary layered oxide cathodes, $\text{LiNi}_{0.8}\text{Co}_{0.1}\text{Mn}_{0.1}\text{O}_2$ (NMC811), are highly promising for high-performance Lithium-Ion Batteries (LIBs) due to their high energy density [1]. Among various synthesis methods, the Hydroxide Co-precipitation (HCP) is the most common. However, this method generally requires rigorous control of multiple parameters which makes the production process time- and energy-consuming [2]. Therefore, exploring easier and cheaper new approaches to synthesize NMC811 is mandatory to accelerate their use in LIBs. Oxalate Co-Precipitation (OCP) emerges as a simpler, cost-effective alternative, ensuring atomic-level mixing with lower energy demands [3]. The OCP process consists of two main steps: coprecipitation of transition metals and calcination process. Because calcination plays a crucial role in determining the final crystal structure and electrochemical performance of NMC811, extensive research has been conducted to optimize this step. However, the existing literature presents different calcination strategies, making it challenging to discern an optimal approach. This study provides a comprehensive comparative analysis of prevalent calcination strategies, evaluating their direct impact on the composition, morphology and electrochemical properties of the cathode. Through advanced physicochemical techniques (ICP, HE-XRD, SEM-EDX, FTIR-ATR, XPS and granulometry) combined with rigorous electrochemical testing, we demonstrate that the performance variations depending on the chosen calcination route. These findings aim to identify the most effective calcination strategy and highlight the significance of optimized calcination in enhancing NMC811 cathode stability and efficiency for high-energy-density LIBs.



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