Effect of the precursors morphologies on the electrochemical properties of NMC811

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Lithium-ion batteries are important in exploiting renewable sources as wind or solar energies, as they are intermittent. There are several cathodes materials that are appropriate for different applications, in the case of electric vehicles (EV) the most used cathode materials are the layered nickel-manganese-cobalt oxides (NMC), which can be made from calcinating $Ni_{1-x-y}Mn_xCo_y(OH)_2$ with a Li source, which in turn is traditionally obtained by co-precipitation in a continuous stirred tank reactors (CSTR).

We focus on studying the effect of different precursors structure of NMC811, and its influence on their electrochemical properties. To prepare $Ni_{0.8}Co_{0.1}Mn_{0.1}(OH)_2$ and ensure a correct reactants mixing, it was employed a micromixer, which enable us to collect the precipitated metal hydroxide suspension within a few seconds after its precipitation, and to age the material with a top stirrer for different times, at 60°C under N_2 atmosphere, more experimental details can be found in [1]. Then, the NMC811 cathode material is obtained by calcinating the precursor with a Li source. These materials are tested electrochemically in coin cells (2032) and their morphology analyzed by SEM. The NMC material synthesized from the overnight aged precursor have smoother primary particles, exposing clearer crystalline planes (Figure 1 a, b). The well-ordered structure impacts the electrochemical performance; indeed the aged precursor produces NMC with higher specific capacity, better cyclability and lower capacity fade (Figure 1 c, d).

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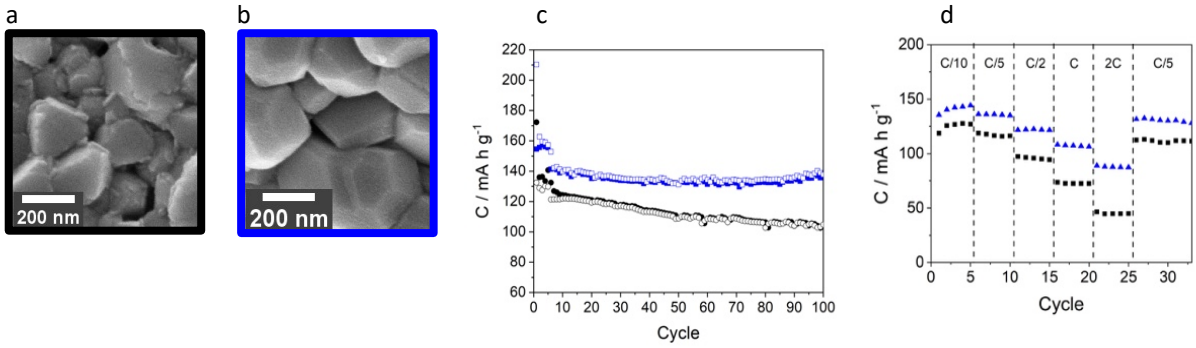

Figure 1: Primary particles SEM images of NMC811 from no aged precursor (a, black) and overnight aged precursor (b, blue). Cycling at C/10, first 5 cycles, and C/5 (c), and C-Rate capability (d) for a no aged precursor (black) and overnight aged precursor (blue).

References

[1] Para et al. *Chem. Eng. Sci* **2022**, 1, 117634.