EFFECT OF CALCINATION ON FULL-CELL PERFORMANCE OF P2-NaxFe1/2Mn1/2O2 CATHODE

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The effects of calcination temperature, duration, atmosphere, and Fe0.5Mn0.5CO3 precursor1 particle size on the sodium-ion battery cathode P2-NaxFe1/2Mn1/2O2 were investigated in full cells paired with commercial hard carbon. The calcination reaction was studied using thermogravimetric analysis and high-temperature X-ray diffraction. The results indicate that the formation of layered P2 oxide proceeds through intermediate metal oxides formed from the carbonate precursors. Optimized long-term cycling performance was achieved without pre calcination by employing an oxygen atmosphere, a calcination temperature of 850 °C, and a calcination time between 0 and 6 h. Additionally, the influence of the negative to positive (N/P) capacity ratio on full cell performance was examined. N/P ratios close to 1.0 delivered higher initial capacities, while higher ratios up to 1.4 enhanced long term cycling stability. The effect of anode slurry compositions 80:10:10 and 96:00:04 was also evaluated. The results show that the 96:00:04 composition, which excludes conductive carbon, yields higher capacity. This improvement is attributed to the reduced surface area, resulting in lower sodium consumption for solid electrolyte interphase formation during the initial cycles.

References

1. Leinonen, Jere; Laine, Petteri; Hu, Tao; Kankaanpää, Timo; Kervinen, Immo; Tynjala, Pekka; Lassi, Ulla, 2025, Effect of Coprecipitation Conditions on the Properties of Fe0.5Mn0.5CO3 Sodium-Ion Cathode Precursors, ACS omega, 10, 33, 37128−37140, DOI: 10.1021/acsomega.5c01869

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