Electronic Supplementary Material (ESI) for RSC Advances.

Supplementary Information

Li-rich Layered $Li_{1.2}Mn_{0.54}Ni_{0.13}Co_{0.13}O_2$ Derived from Transition Metal Carbonate with Micro-nano Structure as Cathode Material for High-performance Li-ion Batteries

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S1

From the followed images, we can see the secondary particles of sample ST-LMNCO are composed by adhered primary particles. These secondary particles are with high tap density as they are apt to keep the ball-like structure of precursor carbonate during the process of sintering. But, why the secondary particles of sample CP-LMNCO lost their ball-like structure and result in a relative low tap density? Such results are came from two reasons. One is from the irregular morphology of co-precipitated precursor carbonate, and the other (more important) is from the primary particles of the precursor carbonate. The neat nanosheets (primary particles) of solvothermal synthesized carbonate would have a neat reaction temperature with Li2CO3 and the adhered nanosheets is benefit to form an adhered layered structure. However, the small nanoparticles (primary particles) of co-precipitated carbonate wouldn't possess the same reaction temperature as the sizes of primary particles are different and thus the secondary particle would break into small particles during sintering process.

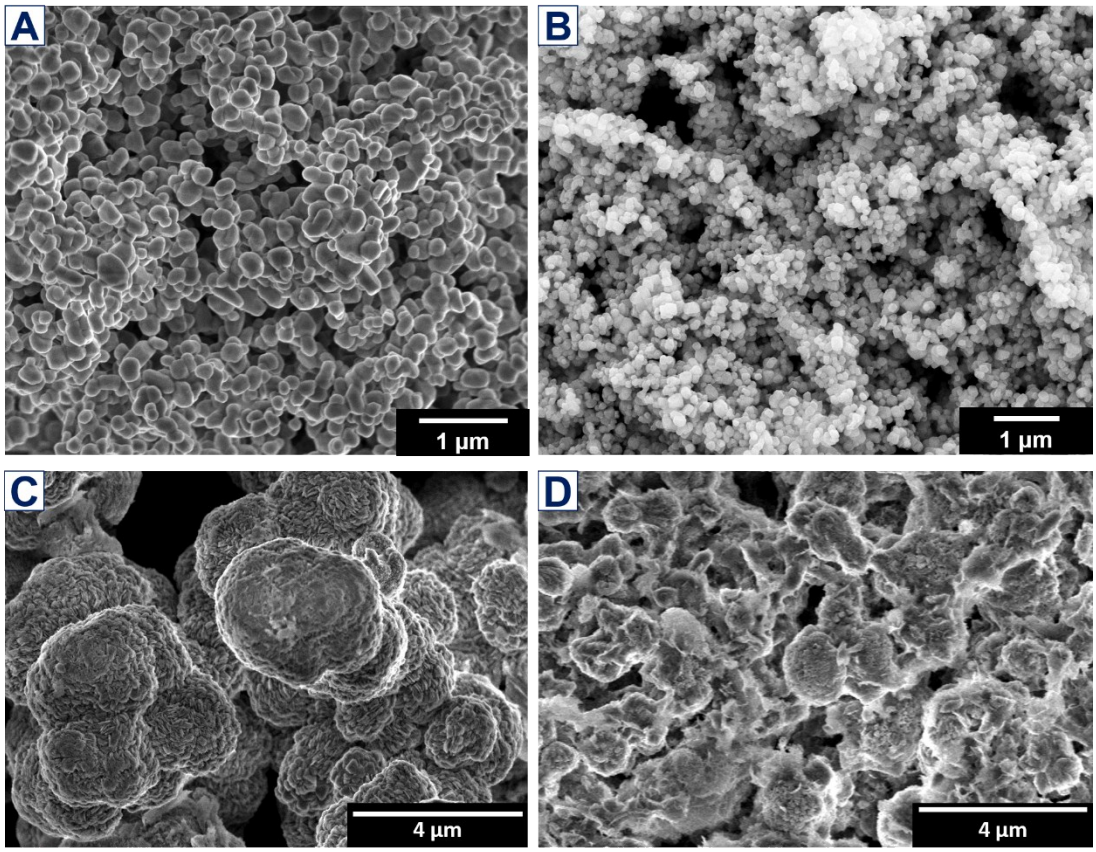

Figure S1: The original SEM images (before tailored) of Li-rich layered cathode material (A: ST-LMNCO and B: CP-LMNCO) and corresponding precursor carbonates (C: solvothermal synthesized carbonate and D: co-precipitated carbonate).

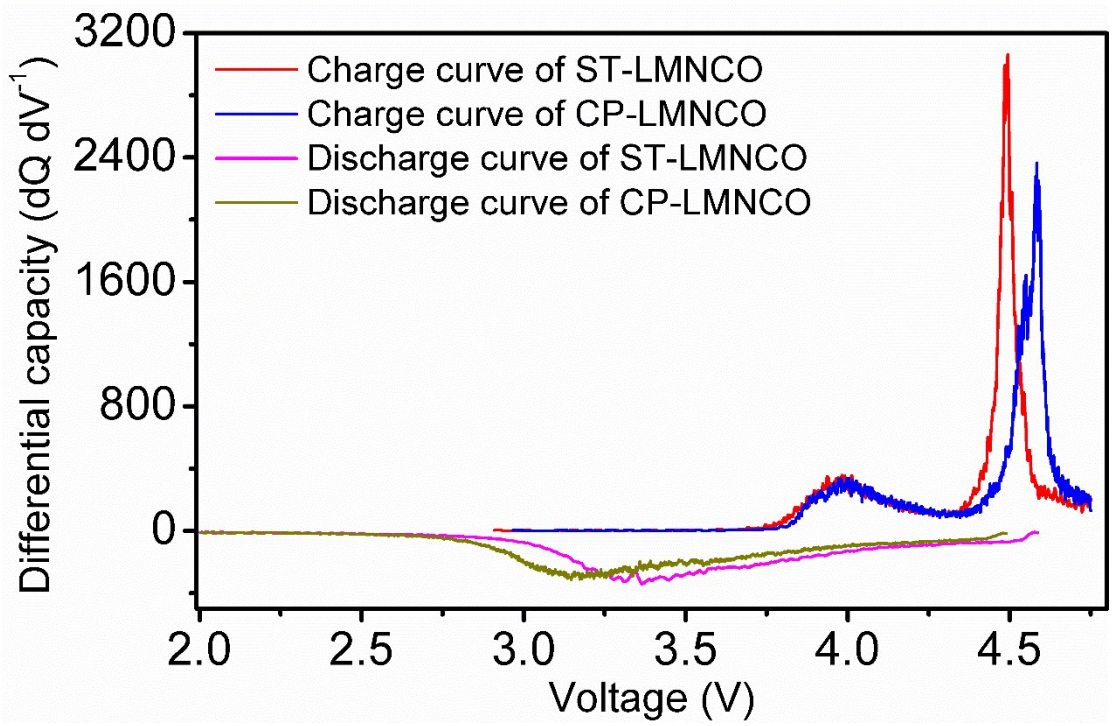

Figure S2: The dQ/dV plots of Li-rich layered cathode materials obtained from the corresponding galvanostatic charge-discharge curves (initial charge/discharge cycle).

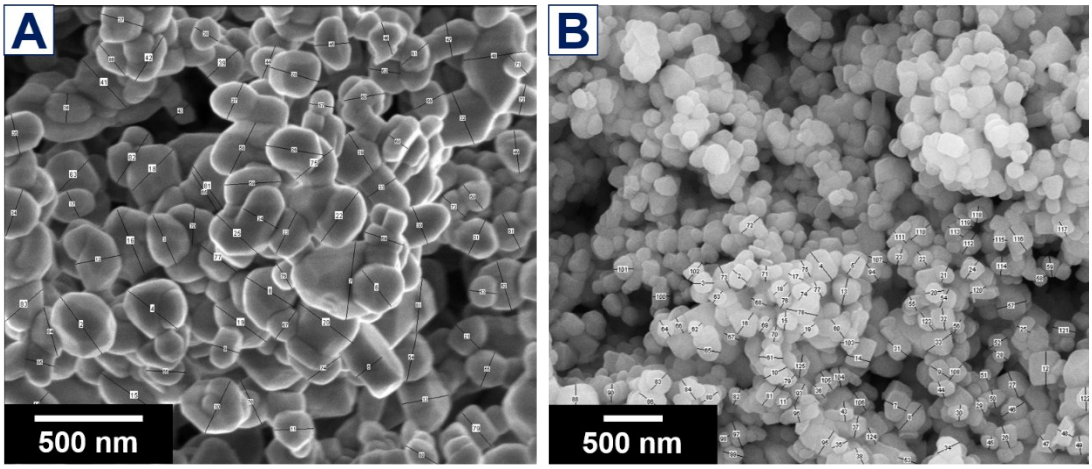

Figure S3: The SEM images used for the particle size calculation by a statistical method: A for ST-LMNCO sample and B for CP-LMNCO)sample.