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Ball Milling Treatment Effects on the Electrochemical Capacity of the P2-Na0.7MnO2 cathode material

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Nowadays there is a huge demand of current sources for portable electronics. Sodium ion batteries seem to be a real alternative to Li-ion batteries. Therefore, energy materials for Na-ion current sources are now in need to be widely and carefully investigated. P2-layered oxide cathodes are cheap and have desirable Na-ion diffusion channels. Moreover, their structural stability is relatively high.
Ball milling treatment is inevitably employed to break down the large particles to realize the gravimetric specific capacity closer to the theoretical calculation [1-3]. It also can be used to solve the sluggish kinetics of Na+ diffusion. A decrease in particle sizes leads to shortening of the diffusion paths.
In this work we investigated how ball milling treatment would affect electrochemical properties of P2-Na0.7MnO2 cathode material. Grinding of the NMO powder itself (p-milled) and the cathode mixture (s-milled) was carried out. The results showed that grinding of the cathode slurry provides significantly more efficient particle size reduction as well as homogenization. During electrochemical tests at cycling rate of 0.1C both p-milled and s-milled electrodes revealed capacities of 180 and 193 mAh/g, respectively, which are greater than the theoretical one, 170 mAh/g. At high cycling speeds, the s-milled sample showed more stable operation than p-milled one.

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