A simple, efficient, fluorine–free synthesis method of MXene/Ti3C2Tx anode through molten salt etching for sodium–ion batteries

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Abstract

MXenes are mentioned in many applications due to their unique properties. However, the traditional etching method has a long synthesis time, dangerous process and high cost. Molten salt etching is not only short in time, but also safe and simple, laying a good foundation for industrialization. Here, we compare the traditional F–containing etching method with the molten salt etching method. TEM elemental mapping images and XPS show that the Ti3C2Tx surface end of traditional etching is terminated by –F, while the Ti3C2Tx surface end of molten salt etching is terminated by –Cl. Finally, the sodium–ion batteries is fabricated and the performance difference of the three etching methods is compared, the results show that the capacity of 102.1 mAh g–1 can still be reached when the molten salt etching MXene material returns to 0.1 A g–1 after the current density of 5 A g–1. After 500 cycles at 1 A g–1, there is no significant loss of capacity and the coulomb efficiency is close to 100%. This work describes that molten salt etching MXene has comparable sodium storage capacity to conventional F–containing etched MXene, making it a potential candidate for large–scale sodium–ion batteries production.

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