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Novel $\text{Li}_4\text{Ti}_5\text{O}_{12}/\text{Ti}_3\text{C}_2\text{T}_x$ nanocomposite as a high rate anode material for lithium ion batteries

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Abstract: $\text{Li}_4\text{Ti}_5\text{O}_{12}/\text{Ti}_3\text{C}_2\text{T}_x$ nanocomposite was prepared by high temperature calcination method using $\text{Ti}_3\text{C}_2\text{T}_x$ and LiOH as raw materials. The developed nanocomposite demonstrated excellent rate capability and capacity retention. It delivers a reversible capacity of 236 mAh/g at a current density of 50 mA/g and had a relatively high specific capacity of 500 mA/g and 4000 mA/g, which is significantly better than pure $\text{Ti}_3\text{C}_2\text{T}_x$ and LiTiO_2 . The exceptional electrochemical performance of $\text{Li}_4\text{Ti}_5\text{O}_{12}/\text{Ti}_3\text{C}_2\text{T}_x$ electrode can be attributed to the improvement of electronic conductivity by $\text{Ti}_3\text{C}_2\text{T}_x$ and nano-size of $\text{Li}_4\text{Ti}_5\text{O}_{12}$ particles in the $\text{Li}_4\text{Ti}_5\text{O}_{12}/\text{Ti}_3\text{C}_2\text{T}_x$ composite.

Keywords: $\text{Li}_4\text{Ti}_5\text{O}_{12}$, $\text{Ti}_3\text{C}_2\text{T}_x$, Nanocomposite, Lithium ion batteries

1. Introduction

Lithium ion batteries have received widespread attention due to their enormous advantages, such as high power density, high open-circuit voltage, large output power, no memory effect, long cycle life, low self-discharge, and so on [1]. The electrode materials have the most important influence on the electrochemical performance. Among the anode materials, spinel $\text{Li}_4\text{Ti}_5\text{O}_{12}$ is a promising alternative anode material to commercial carbon/graphite materials in lithium ion batteries, which can be synthesized by high temperature solid-phase reactions, sol-gel methods, hydrothermal method and template method [2, 3]. $\text{Li}_4\text{Ti}_5\text{O}_{12}$ has “zero-strain” structure

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