Accepted Manuscript

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PII: S0925-8388(17)33921-X

DOI: 10.1016/j.jallcom.2017.11.164

Reference: JALCOM 43857

To appear in: *Journal of Alloys and Compounds*

Received Date: 8 August 2017

Revised Date: 7 November 2017

Accepted Date: 13 November 2017

Please cite this article as: C. Shen, Y. Cao, A. Zhou, Q. Hu, G. Qin, Z. Yang, X. Liu, L. Wang, Novel $Li_4Ti_5O_{12}/Ti_3C_2T_x$ nanocomposite as a high rate anode material for lithium ion batteries, *Journal of Alloys and Compounds* (2017), doi: 10.1016/j.jallcom.2017.11.164.

Novel $Li_4Ti_5O_{12}/Ti_3C_2T_x$ nanocomposite as a high rate anode material for lithium ion batteries

Changjie Shen[1], Yule Cao[1], Aiguo Zhou[1], Qianku Hu[1], Gang Qin[1], Zhengpeng Yang[1], Xuqing Liu[2], Libo Wang[*1]

1. School of Materials Science and Engineering, Henan Polytechnic University, Jiaozuo, Henan 454000, China

2. School of Materials, University of Manchester, Oxford Road, Manchester, M13 9PL UK

Abstract: $Li_4Ti_5O_{12}/Ti_3C_2T_x$ nanocomposite was prepared by high temperature calcination method using $Ti_3C_2T_x$ 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 $Ti_3C_2T_x$ and $LiTiO_2$. The exceptional electrochemical performance of $Li_4Ti_5O_{12}/Ti_3C_2T_x$ electrode can be attributed to the improvement of electronic conductivity by $Ti_3C_2T_x$ and nano-size of $Li_4Ti_5O_{12}$ particles in the $Li_4Ti_5O_{12}/Ti_3C_2T_x$ composite.

Keywords: $Li_4Ti_5O_{12}$, $Ti_3C_2T_x$, 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 $Li_4Ti_5O_{12}$ 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]. $Li_4Ti_5O_{12}$ has “zero-strain” structure

* Corresponding author.
E-mail address: wanglibo537@hpu.edu.cn (L.B. Wang).