Int. J. Electrochem. Sci., 12 **(2017)** 8381 – 8398

International Journal of
ELECTROCHEMICAL
SCIENCE
www.electrochemsci.org

High Performance of Pb-doped $Li_4Ti_5O_{12}$ as an Anode Material for Lithium Ion Batteries

Keqiang Ding[1,*], *Binjuan Wei*[1], *Yan Zhang*[1], *Chenxue Li*[1], *Xiaomi Shi*[1], *Junqing Pan*[2,*]

[1] College of Chemistry and Materials Science, Hebei Normal University, Shijiazhuang, Hebei 050024, P.R. China
[2] State Key Laboratory of Chemical Resource Engineering, Beijing University of Chemical Technology, Beijing, 100029, P.R. China
[*]E-mail: dkeqiang@263.net, jqpan@mail.buct.edu.cn

doi: 10.20964/2017.09.40

Received: 13 May 2017 / *Accepted:* 6 July 2017 / *Published:* 13 August 2017

For the first time, Pb-doped $Li_4Ti_5O_{12}$ (Pb-LTO) was prepared by a solution-drying-calcination (SDC) method in which lead acetate was employed as a dopant. In the present work, the effect of Pb to Ti atomic ratio on the physicochemical properties as well as the electrochemical performance of the synthesized materials was systematically investigated. X-ray diffraction (XRD), scanning electron microscopy (SEM), cyclic voltammometry (CV), electrochemical impedance spectroscopy (EIS) and galvanostatic charge-discharge test were mainly used to examine the as-prepared samples. XRD results not only effectively demonstrated the formation of $Li_4Ti_5O_{12}$ but also indicated that the crystallinities of the resultant samples were closely related to the Pb to Ti atomic ratio used. Also, SEM images indicated that relatively regular particles with an average size of 0.5 μm could be prepared when the Pb to Ti atomic ratio was 0.01 (sample b). The results of electrochemical measurements indicated that the initial discharge capacity of sample b was as high as 185 mAh g^{-1} at 0.2C rate and sample b could show a high specific capacity of 169 mAh g^{-1} after 20 cycles at 0.2 C rate. Using a very cheaper dopant of lead acetate to prepare the high performance Pb-doped LTO was the main contribution of this preliminary work, which was believed to be very beneficial to the further commercialization of LTO.

Keywords: $Li_4Ti_5O_{12}$; lead acetate; Pb doping; anode materials; lithium ion batteries

FULL TEXT