Improvement of Crystalline Vanadium Oxide Anode for Lithium Ion Battery by Amorphous Vanadium Oxide

Chien-Min Chang[1], Yu-Hua Lee[1], Yui Whei Chen-Yang[1,2,*]

[1]Department of Chemistry and [2]Center for Nanotechnology,

Chung Yuan Christian University, 200 Chung-Pei Rd.,

Chung-Li, Taiwan 32023, R.O.C.

Abstract

In this study, an amorphous vanadium oxide (AVO) with high surface area (152.3m^2/g) has been prepared by the sol-gel process with an ionic liquid as the template, followed by Soxhlet extraction and freeze-drying process. The as-prepared AVO was then added to the commercial crystalline vanadium oxide (CVO) in various weight ratios to form a series of vanadium oxide composites (VOCs) and their corresponding anodes (VOCAs). The electrochemical properties were measured by galvanostatic charge/discharge test. The results showed that the VOCA with 10wt% AVO exhibited the highest initial specific capacity (410mAh/g), which is about 10% higher than that with the pure CVO (371mAh/g) at 0.2C rate in the voltage range of 1.5-4.3V. Besides, after 40 cycles, the specific capacity of the anode with the pure CVO was less than 150mAh/g due to formation of the irreversible phase when it was discharged to 1.5V, while that of the VOCA was higher than 200mAh/g with good cycle stability at 0.2C. This is ascribed to the possible mending of the defect structure in CVO by the AVO particles, leading to the improvement in the stability of the structure. The detail of the electrochemical properties for performance of the lithium ion battery will be discussed.

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