Excellent Cyclic Stability of Pre-lithiated VO₂(B) Nanorods as a Cathode Material for Lithium Ion Batteries

Shuchao Zhang, Zhengguang Zou^{*}, Tingting Lv, Shengyu Li, Yanjiao Zhang

College of Materials Science and Engineering, Guilin University of Technology,
Guilin, China.

^{*}E-mail: zouzgglut@163.com

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Two-dimensional pre-lithiated VO₂(B) nanorods have been prepared via a facile hydrothermal method with vanadium pentoxide (V₂O₅), lithium nitrate (LiNO₃) and maltose (C₁₂H₂₂O₁₁) as raw materials. The crystal structure and micromorphology of the prepared sample were characterized by XRD, FESEM, TEM, SAED, BET, Raman spectroscopy, and XPS. It revealed that pre-lithiation significantly reduced its thickness (10–20 nm), and showed a more regular rectangular plane at the display. Furthermore, the lithium storage performance of the sample was investigated through CV, EIS, and charge/discharge tests. The results manifested that the pre-lithiated VO₂(B) exhibited a much-enhanced electrochemical performance. For instance, the capacity retention rate of pre-lithiated VO₂(B) is 72.7% after 100 cycles at 0.1C, significantly higher than that (43.8%) of the pure VO₂(B). The improvement of the cycle performance of VO₂(B) after pre-lithiation can be mainly attributed to its excellent structural reversibility, shortened lithium ion transmission distance and enhanced electrical conductivity. The pre-lithiation method provides an insight to improve the cycling performance of lithium-ion batteries.

Keywords: Lithium ion battery; Hydrothermal method; Pre-lithiated VO₂(B); Cycle performance.

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