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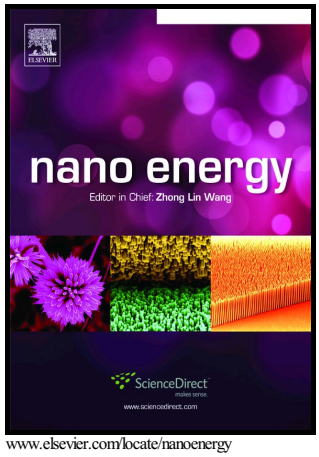

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Haojie Zhu, Xing Cheng, Haoxiang Yu, Wuquan Ye, Na Peng, Runtian Zheng, Tingting Liu, Miao Shui, Jie Shu*

Faculty of Materials Science and Chemical Engineering, Ningbo University, No. 818 Fenghua Road, Jiangbei District, Ningbo 315211, Zhejiang Province, People's Republic of China

*Corresponding author: Jie Shu, Tel.: +86-574-87600787; Fax: +86-574-87609987.

sergio_shu@hotmail.com

Abstract

Owing to the multiple redox couples of Nb^{5+}/Nb^{4+} and Nb^{4+}/Nb^{3+}, Nb-based compounds have attracted great attention to be promising high-capacity anode materials for rechargeable batteries. Here, $K_6Nb_{10.8}O_{30}$ groove nanobelts (GNB) are synthesized through heat-treating the adjustable electrospun potassium niobate nanofibers, thereupon the structural change in the lithiation and delithiation is evidently imaged via *in situ* transmission electron microscopy (TEM). From *in situ* observations, the $K_6Nb_{10.8}O_{30}$ GNB, in virtue of its stability, is ascertained to be adopted as anode material in lithium-ion batteries (LIBs). Evaluated as lithium storage host, GNB outstrip nanowires (NW) in cyclicity and in reversible capacity. Even after 1000 cycles, the retention capacity of $K_6Nb_{10.8}O_{30}$ GNB is as high as 69 %. Furthermore, the lithium-storage mechanism is also investigeted via *in situ* X-ray