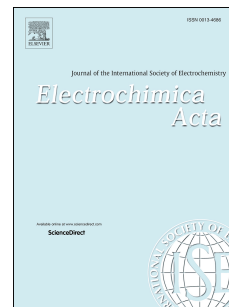


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# A comparative study of $\text{LiTi}_2(\text{P}_{8/9}\text{V}_{1/9}\text{O}_4)_3$ and $\text{LiTi}_2(\text{PO}_4)_3$ : synthesis, structure and electrochemical properties

Jianyu Pang<sup>a</sup>, Quan Kuang<sup>a,\*</sup>, Yanming Zhao<sup>a,b</sup>, Wei Han<sup>b</sup>, Qinghua Fan<sup>a</sup>

<sup>a</sup>School of Physics, South China University of Technology, Guangzhou 510641, P. R. China

<sup>b</sup>State Key Laboratory of Luminescent Materials and Devices, South China University of Technology, Guangzhou 510641, P. R. China

\* **Corresponding author.** Tel.: +86-20-87111963 E-mail address: sckq@scut.edu.cn

## Abstract

NASICON-type  $\text{LiTi}_2(\text{PO}_4)_3$  (LTP) is a representative solid-state electrolyte and promising anode for rechargeable Li batteries. However, the electronic conductivity and specific capacity of LTP anode are encumbered by its massy and sluggish phosphate groups. Herein, vanadium (V) substitution compound  $\text{LiTi}_2(\text{P}_{8/9}\text{V}_{1/9}\text{O}_4)_3$  (LTPV) has been synthesized by using a selective vanadic source of  $\text{Li}_3\text{VO}_4$  at an adjusted sintering temperature of 700 °C. The  $\text{PO}_4^{3-}$  radicals partly replaced by  $\text{VO}_4^{3-}$  radicals are confirmed via XRD refinement, SEM, Raman and infrared spectra. The electronic conductivity of LTPV is two orders of magnitude higher than that of the undoped one, and meanwhile the charge-transfer impedance observably decreases after V substitution. More importantly, the  $\text{V}^{5+}$  cations are electrochemical active in LTPV and contribute additional capacity during discharge and recharge processes. Benefitted from the increased electronic conductivity and the reduced charge-transfer impedance, the rate performance of LTPV is also distinctly improved when compared with the pristine LTP.

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