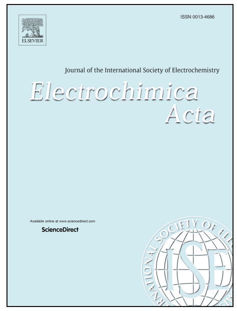
Accepted Manuscript



A comparative study of $LiTi_2(P_{8/9}V_{1/9}O_4)_3$ and $LiTi_2(PO_4)_3$: Synthesis, structure and electrochemical properties

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PII: S0013-4686(17)32633-6

DOI: 10.1016/j.electacta.2017.12.073

Reference: EA 30861

To appear in: *Electrochimica Acta*

Received Date: 19 August 2017

Revised Date: 21 November 2017

Accepted Date: 10 December 2017

A comparative study of $LiTi_2(P_{8/9}V_{1/9}O_4)_3$ and $LiTi_2(PO_4)_3$: synthesis, structure and electrochemical properties

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Abstract

NASICON-type $LiTi_2(PO_4)_3$ (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 $LiTi_2(P_{8/9}V_{1/9}O_4)_3$ (LTPV) has been synthesized by using a selective vanadic source of Li_3VO_4 at an adjusted sintering temperature of 700 °C. The PO_4^{3-} radicals partly replaced by 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 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.