Lithium insertion properties of α'-NaV_2O_5 prepared by electrochemistry.

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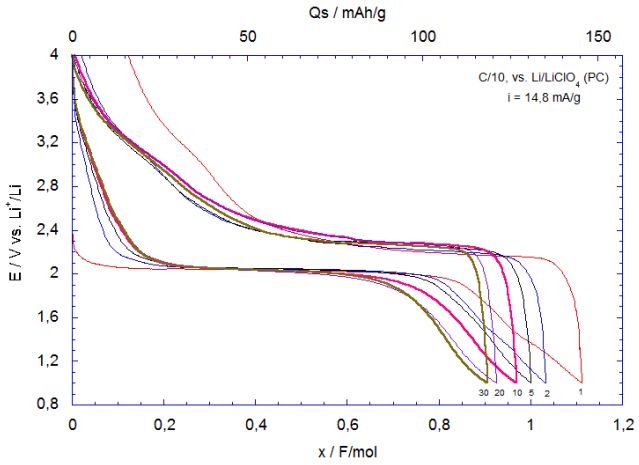
V_2O_5 and its derivatives like $M_xV_2O_5$ mixed oxides and bronzes have received continued interest as host lattice for Li insertion reactions. Indeed the strategy of introducing another metallic cation in V_2O_5 structure leads to various 2D or 3D structures depending the cationic species (Li^+, Na^+, Ag^+, Ni^{2+}, Cr^{3+} etc..). Among them, the layered α'-NaV_2O_5 bronze has been little investigated as a possible cathodic material. Only a cursory analysis of the Li insertion properties α'-NaV_2O_5 has been performed but contradictory curves for the potential dependence vs. Li uptake are reported without any reliable structural investigation [1, 2]. α'-NaV_2O_5 is the highest member of the α'-$Na_xV_2O_5$ ($0.7 \leq x \leq 1$) sodium vanadium bronzes [3]. This compound is now mostly prepared by a hydrothermal process at 180-200°C but we recently reported the electrochemical formation of NaV_2O_5, isostructural to the high temperature α'-NaV_2O_5 orthorhombic bronze [4]. This recent finding combined with the lack of data on the Li insertion process α'-NaV_2O_5 prompted us to investigate in details this material towards Li insertion. Here we report the Li insertion properties of α'-NaV_2O_5 including cycling and kinetic data. In addition, the structural response of the host lattice studied by XRD and Raman spectroscopy allows to elucidate the Li insertion mechanism. We show a rechargeable behavior is achieved around 2V with a stable specific capacity of 120 mAh g^{-1} for 50 cycles at C/10. A ball milling process allows to optimize the capacity, the rate capability and cycle life with 200 mAh g^{-1} at C/5 and still 120 $mAhg^{-1}$ at C rate.



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