EFFECT OF BORON ADDITION ON THE ELECTROCHEMICAL PROPERTIES OF $LiFePO_4$

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$LiFePO_4$, a phosphate with structure related to olivine, is currently the most promising positive electrode for lithium ion batteries [1]. The competitiveness of this compound comes from both, the maximal capacity (170 mAh/g) and the flat potential (3.5V) that $LiFePO_4$ can supply. However, rate capability of this electrode is somewhat small due to the slow lithium insertion/deinsertion kinetics.

In order to save this drawback, several groups adopted the successful strategy of reducing the particle size of the material to a nanometric level. In this communication, we adopted a different approach: the modification of pristine $LiFePO_4$ by introducing B into the system. Samples were prepared by heating a mixture consisting of $LiFePO_4$ and BPO_4 in different doping levels (3, 6 and 9 % in weight ratio) at 700°C. On the one hand, X−rays diffraction patterns revealed a crystalline biphasic system when BPO_4 was added in 9% level. On the other hand, the phospholivine cell parameters remained unchanged for all the systems. Taking into account the ionic radii criterion, these results are likely to indicate that, up to a 9% B level, the materials are composites containing an amorphous boron−based phase and $LiFePO_4$. Transmission electron microscopy images (Fig.1) revealed the nanosized structure of the composites and suggested the amorphous phase to be surrounding the $LiFePO_4$ particles as a thin film.

Electrochemical measurements (galvanostatic, potentiostatic and electrochemical impedance spectroscopy) were carried out on cells based on the systems. An improved rate capability for the 3%B "doped" phosphate was observed and will be discussed on the basis of the electronic and ionic conductivities of this material.

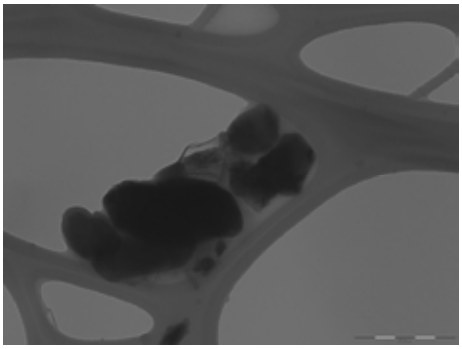

Figure 1. TEM image of 3%B−$LiFePO_4$ prepared in this work. Scale bar =500 nm.

[10] Nanjundaswamy K.S.; Goodenough J.B. *J. Electrochem. Soc.* **1997**, 144, 1188.