

## Quartz iron phosphate as new lithium intercalation electrode

A. D'Epifanio<sup>1</sup>, F. Croce<sup>2</sup>, P. Reale<sup>1</sup>, L. Settimi<sup>1</sup> and B. Scrosati<sup>1</sup>

<sup>1</sup>Department of Chemistry, University of Rome "La Sapienza", (Italy)

<sup>2</sup>Department of Pharmacology Science, University "G. D'Annunzio", 66013 Chieti, (Italy)

FePO<sub>4</sub> is a very promising electrode material in metal lithium batteries due to its environmental friend character, the simplicity of the synthesis and the high theoretical specific capacity (178Ah/kg). Nevertheless, it has been reported that the insertion properties of such material is very poor. Here we report on the properties of  $\alpha$ -quartz iron phosphate synthesised by a wet chemistry route which produce fine grained and homogenous powders. Moreover, in order to try to cope with the very poor electronic conductivity of this compound, we have prepared composite samples formed by the dispersion, during the synthesis, of low particle size ruthenium oxide ( ) to the precursors solution.

The X-ray diffraction pattern of the FePO<sub>4</sub> sample (Fig.1) shows a well defined series of diffraction peaks indicating that the transformation from the amorphous to the crystalline phase had occurred at this temperature. These peaks were attributed to the crystalline anhydrous phase of FePO<sub>4</sub> which adopts the well known  $\alpha$ -quartz structure.

In the literature (1,2) the FePO<sub>4</sub> crystalline shows very low capacity while it possible to obtain better electrochemical performances for the amorphous anhydrous sample. We have attempted to improve the electrochemical activity by using  $\alpha$ -quartz FePO<sub>4</sub>-RuO<sub>2</sub> composites. The idea is that the network of finely dispersed RuO<sub>2</sub> may further increase the electronic conductivity of the electrode material, thus finally enhancing the kinetics of the Li intercalation process. This concept is not new since it has been successfully exploited in the case of other electrode materials such as V<sub>2</sub>O<sub>5</sub> (3) and LiMn<sub>2</sub>O<sub>4</sub> (4). The role of the RuO<sub>2</sub> additive is particularly evident when comparing the capacity delivered upon lithium intercalation-extraction cycles of pristine FePO<sub>4</sub> and of electrodes containing 5% w/w of dispersed RuO<sub>2</sub> (Fig.2). The capacity of the former averages around 90 mAh/g, i. e. a value well below the theoretical one of 178 mAh/g. while the capacity increases up to 110-120 mAh/g when passing to FePO<sub>4</sub> with dispersed RuO<sub>2</sub>. Furthermore, the capacity delivery upon cycling remains stable (5) at different C/rate.

References

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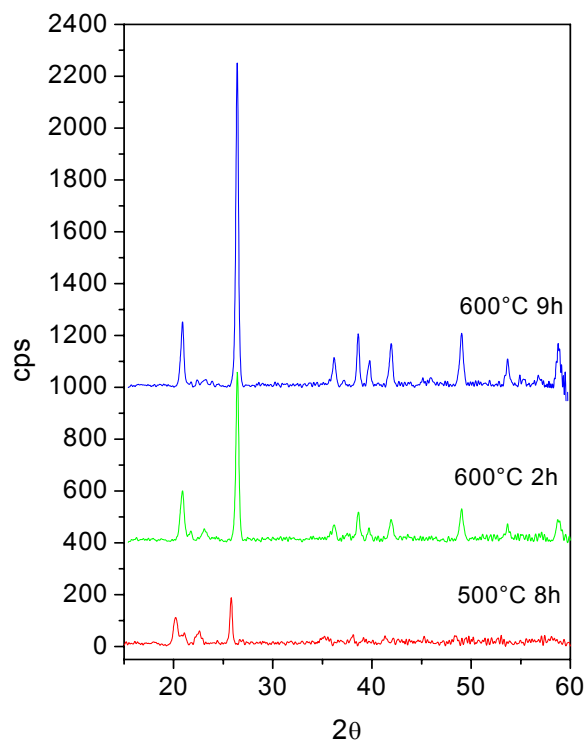


Fig.1 X-ray diffraction of the FePO<sub>4</sub> calcinated at different temperature

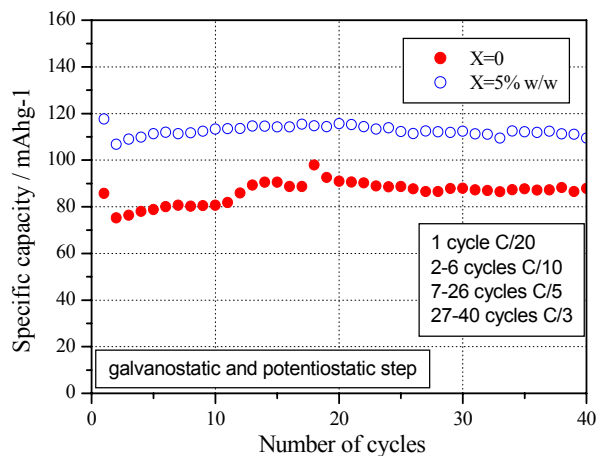


Fig.2- Specific capacity upon cycling of FePO<sub>4</sub> and FePO<sub>4</sub> 5% RuO<sub>2</sub> calcinated at 600°C for 2h. Galvanostatic and potentiostatic step