

UNDERSTANDING OF THE MECHANISM OF SODIATION OF p-BLOCK ELEMENT BASED ELECTRODES

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Na-based storage systems working at ambient temperature have lately regained interest. Recent research on Na-ion systems was focused on the development of negative electrode materials, firstly based on the insertion of Na into hard carbon structures able to develop a capacity as high as ~300 mAh/g, but limited volumetric energy density.[1]The large ionic radius of Na with respect to Li leads to a higher volume expansion upon cycling, which is expected to strongly affect insertion as well as alloying or conversion reactions. Surprisingly, p-element-based electrodes have shown to be viable alternatives to hard carbon, providing very interesting performances with reversible capacities largely exceeding 400 mAh/g.[2-3]We have investigated several phases containing P, Sb, Pb and/or Sn as electrode materials for Na batteries. The thorough investigation of both mechanism (through in situ XRD and Mössbauer spectrometry) and performances of Sband Pb will be presented (Figure 1). The good electrochemical performances of such electrode materials arevery surprising if one take into account the huge volume expansion expected from the reaction with Na (200-400 %). An XPS analysis will be presented to compare the solid electrolyte interphase (SEI) formed in the Sb based battery versus Li and Na.[4]

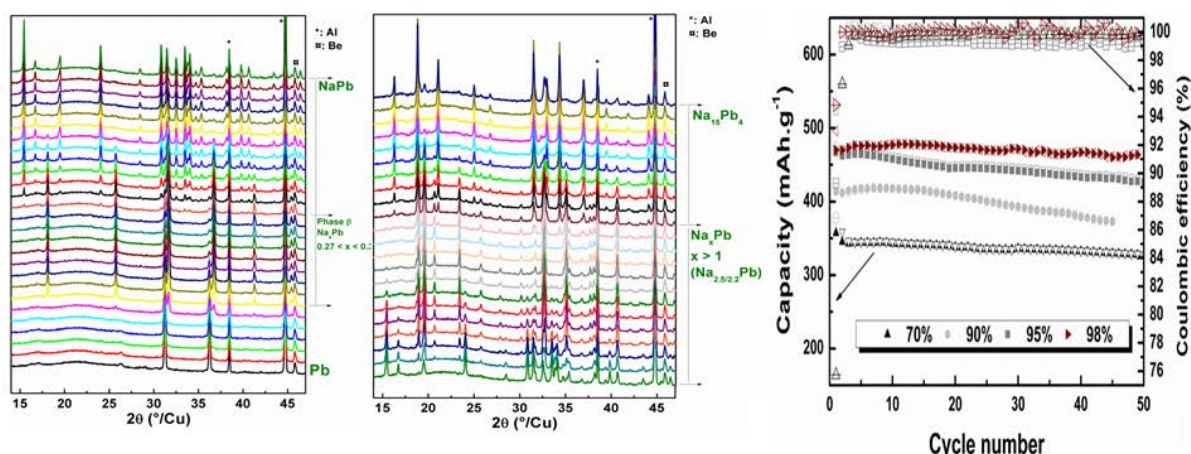


Fig. 1: a) XRD *in situ* of Pb/Na and b) capacity as function of number of cycles for various electrode formulations and coulombic efficiency.

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