Visualizing batteries discharge products at Mistral

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In many applications the precise knowledge of composition and morphology of materials is a key information to control performance and reliability. This is especially true for battery materials: detailed information of the complex morphology and composition of the discharge products on the cathode as a function of their charging state are crucial for the identification and the understanding of the involved processes. Energy resolved full field transmission soft X-ray microscopy (TXM), is able to give a full picture at the nanometer scale of the chemical state and spatial distribution of many interesting elements, providing pixel-by-pixel absorption spectrum. This technique can be successfully performed at the Mistral beamline of the ALBA light source [1] where tomography complements the 2D chemical information with a 3D morphological description of the discharged products. In this work, after a description of the beamline and of the method of application of the technique to electrode materials, we will present the results from the studies we performed on discharge products of Li/O_2 and Na/O_2 batteries [2-5]. Also some new recent measurements performed on Ca -ion batteries will be briefly discussed.

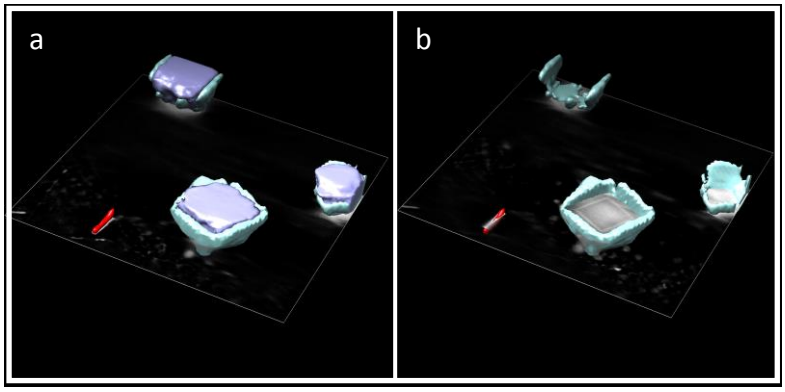

Figure: Three-dimensional reconstruction of some discharged particles of Na/O_2 battery. The images stress the carbonate distribution (green) with respect the main discharged species (NaO_2 and Na_2O_2, violet). (a) with and (b) without the oxydes "nucleous". The 2D field of view is 10 µm x 10 µm. From I. Landa-Medrano *et. al.* [4].

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