Oxidized $Ti_3Al_{(1-x)}Si_xC_2$ and $Ti_3Al_{(1-x)}Sn_xC_2$ MAX phases: innovative anodes of LIB and NIB

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In the last decade, RSE SpA has focused is research on innovative anodes for LIB and NIB in other to identify some alternatives to the more known materials, graphite and Hard Carbon, respectively. To furtherly improve the storage performance of Li-ion (LIB) and Na-ion (NIB) batteries, conversion/alloying mechanisms are a powerful option to store alkaline ions. Unfortunately, these processes induce in active materials (e.g.: oxides, pure metals) low mechanical stability and, consequently, a very short lifespan of the final devices. A way to overcome these main drawbacks is the nano-structuring of the materials used in the electrodes. Exploiting the spark plasma sintering (SPS) process, $Ti_3Al_{(1-x)}Si_xC_2$ and $Ti_3Al_{(1-x)}Sn_xC_2$ MAX phases have been sintered at RSE labs and their powders have been used like precursors to test a new approach to prepare nanocomposites based on the self-formation of nano $(Ti/Si)O_2$ and $(Ti/Sn)O_2$. After a strong activity to investigate the main parameter to improve the storage performances of Sn-based MAX phase, in this communications the preliminary results on the synthesis of $Ti_3Al_{(1-x)}Si_xC_2$ and the successive electrochemical test as anodes in half-cell vs Li/Li^+. The electrochemical performances as a function of concentration of silicon and the maximum temperature used for the oxidation in air of the powder has investigate to identify the optimal process parameters. Some preliminary electrochemical results will be presented and commented together with the data about the chemical-physical properties of precursor and post-oxidized MAX phases powder.

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