VANADIUM OXIDE AEROGEL - A FLEXIBLE MATERIAL FOR Li- AND Na-BATTERies

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There is a renewed interest on energy storage systems alternative to lithium-ion batteries. One of the main research stream, pushed by costs and safety benefits, regards the improvement of room temperature sodium-ion batteries for stationary applications. In this contest, taking advantage of the solid knowledge acquired over the years on Li-based systems, sensible efforts are ongoing to develop suitable electrode materials with high Na storage capability and satisfactory electrochemical performance. Among the others, vanadium oxides are particularly interesting due to the rich electrochemistry derived by various accessible oxidation states. Our interest is mainly focused on V_2O_5 layered amorphous compounds which demonstrated to reversibly host and release several cationic species [1]. Herein we present a V_2O_5 aerogel obtained via supercritical CO_2 extraction and its use as electrode material for lithium and sodium batteries. The aerogel is able to insert up to 2.3 eq. of Li^+ (that correspond to 340 $mAhg^{-1}$) and about 1 eq. of Na^+ (150 $mAhg^{-1}$) showing, in both cases, promising rate capabilities (Figure 1) [2]. The aerogel is additionally exploited as negative electrode for sodium-ion batteries possessing propitious electrochemical performance also in full cell configuration [3]. The use of ionic liquids based electrolytes in combination with the aerogel is also proposed. This overview of our recent findings highlights the versatility of V_2O_5 aerogel as one of the few "multipurpose" electrode materials suitable to be employed in different cell chemistries without major structural or chemical modifications.

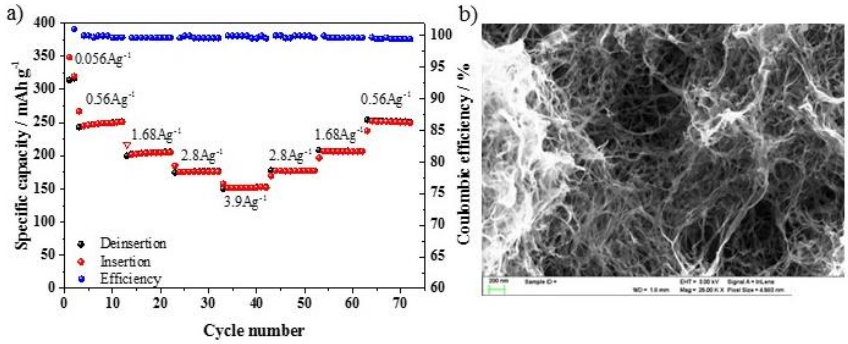

Figure 1. a) Electrochemical performance of V_2O_5 aerogel vs Lithium. b) Entangled ribbon network of V_2O_5 aerogel [2]

References:

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