COATED CURRENT COLLECTOR FOR LITHIUM-ION BATTERIES

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Through the challenges of electric mobility and renewable energy storage like solar or wind energy, lithium-ion batteries are growing up in interest and are one of the most acclaimed devices. Requirements of this technology are to achieve high specific energy density and specific power in order to fit the various applications. Since the 90's a lot of studies on lithium-ion energy storage devices are focused on the optimization of electrolytes, active materials and also on the electrode formulation. Although they are effective ways to improve the performance of these systems, they usually put aside the current collector influence. Several shortened lifetime, failures, or reduced performance can be ascribed to the metallic current collector. We can take as an example the electrode delamination [1], the metallic corrosion [2] or the electrical contact resistivity between the current collector and the electrode [3]. To avoid these problems, a conductive and protective coating of the metallic current collector (fig.1) can be added to obtain a better interface between the electrode and its substrate. Armor company is specialized in complex liquid formulations and thin coating industrial processes, and has a growing interest in producing such coated current collectors for energy storage devices (batteries/ultracapacitors). In this work, various types of carbon coated aluminum current collectors for positive electrodes will be presented and compared to battery grade aluminum. Their characteristics such as physical properties, chemical resistivity, electrode affinity or electric resistivity will be presented. The influence of these current collectors on the electrochemical performance will be assessed in half cells with a standard $LiFePO_4$ – polyvinylidene fluoride electrode and carbonate-based electrolyte. Results of electrochemical impedance spectroscopy, cycling and ageing experiments will be discussed. Both the coating formulation and properties have a great influence on the electrode performance, and an adapted coating allows achieving better performance of a given system.

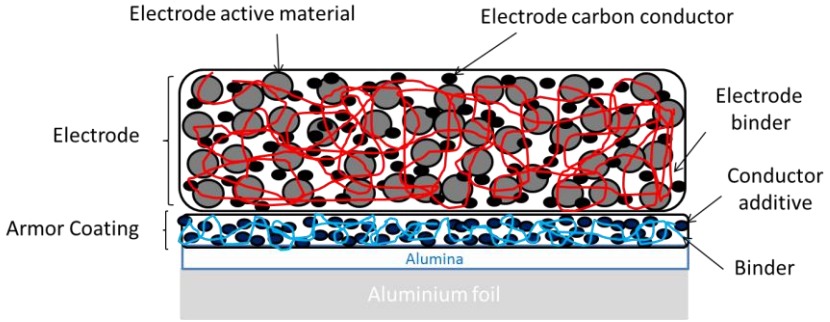

Figure 1 : Schematic coating on aluminum current collector

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[2] I. Doberdò, N. Löffler, N. Laszczynski, *et al.*, J. Power Sources 248 (2014), 1000-1006.
[3] S. Wennig, U. Langklotz, G-M. Prinz, *et al.*, J. Appl. Electrochem 45 (2015), 1043-1055