Development of nanostructured Sn/SnSb/Cu composite anode and their characterization via ESEM

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Tin based anode materials for Li-Ion battery, especially tin/carbon composites achieved an commercial state of development. In order to achieve high rate application, excellent conductivity, high energy density and mechanical stability are the basic requirements to the active material. A nano-structured Sn/SnSb alloy on copper nanowire current collector was prepared and the material disintegration mechanism [1, 2] thereof was studied by *in situ* ESEM [3].
The copper nanowire current collector was synthesised via a wet chemical route [4]. Precipitation of Sn/SnSb from complex-stabilized salt solution in presence of the copper substrate led to a nano-structured composite material with an average grain size of 80 nm. SBR/CMC binder in aqueous solution was used for electrode preparation [5]. Final heat treatment at 230°C resulted in formation of a stabilizing Cu/Sn alloy interface.
ESEM is an SEM technology where a separated specimen chamber with lower vacuum (< 10 torr) allows the use of liquid electrolytes. Carbonate solvents with high boiling point and low vapour pressure (EC and PC) were used in order to inhibit impurification of the imaging Ar gas with simultaneous running dry of the cell.
The characterisation of composite electrodes via *in situ* ESEM shows that cracking of µm-sized tin particles during electrochemical lithiation occurs. This leads to material disintegration, contact loss of grains with the current collector and increased capacity fading. At the contrary to the µm-sized tin, nano-structured Sn/SnSb deposited on a finely structured copper current collector exhibits much better performance.

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