

DEGRADATION OF CARBON-SUPPORTED TIN ALLOYS IN LiPF_6 EC:DEC ELECTROLYTE

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A composite anode material was prepared that contains nano-size (<100nm) particles of tin alloy $\text{Sn}_{65}\text{Sb}_{18}\text{Cu}_{17}$ and $\text{Sn}_{62}\text{Sb}_{21}\text{Cu}_{17}$. The alloys were electroplated at high current densities (above i_L) from aqueous solutions, directly onto the copper current collector, and were coated by a PVDF - graphite matrix at a ratio of alloy: graphite matrix 70:30 and 80:20 w/w respectively.

The processes involved in electrode production by this method are inexpensive, simple and fast. Over 40 (100% D.O.D) cycles were demonstrated, in half-cell, and over 30 with a LiCoO_2 battery containing LiPF_6 EC-DEC electrolyte. The faradaic efficiency

($Q_{\text{De-ins}}/Q_{\text{Ins}}$) is less than 100%.

Lithium is fully de-inserted from the host matrix only when the anode is cycled at low current densities. The kinetics of lithium insertion to and de-insertion from the composite anode material, slow gradually as the cycle number increases. XRD patterns of the anode material show that the alloy becomes amorphous during cycling, while the graphite does not. The electrochemical behavior of the alloy changes with cycle number, while that of the graphite do not. The decrease of the de-insertion capacity of the graphite from the first cycle to the 34th by more than 50% proves that the active material in the anode suffers from particle-to-particle break off