The Electrochemical Performance of Ferrosilicon Master Alloy as Anode Material for Lithium-Ion Batteries

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Alloy electrode has greatly improved the low Li^+ /electron conductivity and relieved the huge volume expansion of Si via using elastic inactive matrix to accommodate the active component. Here we choose ferrosilicon master alloy (FS) used widely in the metallurgical industry as possible negative electrode materials with Si as active center and highly conductive FeSi phase as elastic matrix. The carbon coating ferrosilicon (FSC) anode exhibits a good cycle performance of 430 mAh g^{-1} after 100 cycles and a good rate performance of 400 mAh g^{-1} at a current density of 1000 mA g^{-1} . To confirm the charge/discharge reaction mechanism, XRD was applied to detect the phase changes of the anode during the first three reaction processes. It can be seen from the results that the amorphous carbon layer and FeSi phase can act as a buffer layer to relax the stress of Si and improve the electrical conductivity among Si particles during cycling.

Keywords: ferrosilicon; lithium-ion batteries; reaction mechanism; anode

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