Si/C anode from oil asphalt for lithium-ion battery

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At present, the theoretical carbon specific capacity of the most widely used carbon anode materials in lithium ion batteries is relatively low. This has gradually failed to meet the growing demand for energy. The volume effect and conductivity of silicon anode can be improved by the combination of carbon material and silicon material not only to increase the capacity of carbon anode but also to improve the volume effect and conductivity of silicon anode. As a result, it has attracted widespread attention from the industry.

In this experiment, micron SiO and petroleum asphalt produced in China are used as silicon source and carbon source respectively. The Si/C anode materials for lithium ion batteries were fabricated by technique of ball-milling and subsequent pyrolysis at high temperature. The effect of raw material ratio on material structure and electrochemical performance of the anode materials is researched. The structure and the properties of anode materials are characterized by XRD, SEM, TGA, and electrochemical workstation. Then, three kinds of electrolyte additives (FEC, VC and FEC+VC) were selected as additives to study the effects of additives on electrochemical properties. The results shown that Si/C anode materials of lithium-ion batteries can be successfully obtained by a simple process. The initial coulombic efficiency of sample with the ratio of raw material of 20% SiO @ C is 76.86%, the charge specific capacity at a high current density of 2A/g is 321.4mAh/g. And the retention capacity is 93.89% at 2A/g after 100 cycles. All of the three additives can increase the specific capacity of the batteries. And FEC is better in improving specific capacity at high current density. The specific capacity is improved from 236.6mAh/g to 328.3mAh/g at 5A/g.

Key Words：Petroleum asphalt; Preparation; Si/C anode materials；Electrolyte additives