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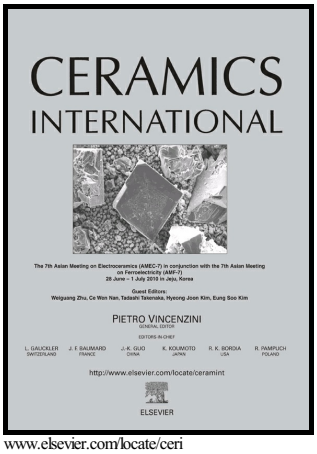

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PII: S0272-8842(17)30498-4
DOI: http://dx.doi.org/10.1016/j.ceramint.2017.03.125
Reference: CERI14894

To appear in: *Ceramics International*

Received date: 11 March 2017
Revised date: 18 March 2017
Accepted date: 20 March 2017

Cite this article as: Yong Yang, Zhixing Wang, Guochun Yan, Huajun Guo, Jiexi Wang, Xinhai Li, Yu Zhou and Rong Zhou, Pitch carbon and LiF co-modified Si-based anode material for lithium ion batteries, *Ceramics International*, http://dx.doi.org/10.1016/j.ceramint.2017.03.125

Pitch carbon and LiF co-modified Si-based anode material for lithium ion batteries

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Abstract

To improve the electrochemical performance of silicon-based anode material, lithium fluoride (LiF) and pitch carbon were introduced to co-modify a silicon/graphite composite (SG), in which the graphite acts as a dispersion matrix. The pitch carbon helps to improve the electronic conductivity and lithium ion transport of the material. LiF is one of the main components of the solid electrolyte interphase (SEI) formed on the silicon surface, helping to tolerate the large volume changes of Si during lithiation/delithiation. The modified SG sample delivered a capacity of over 500 mAh g^{-1}, whereas unmodified SG delivered a capacity of lower than 50 mAh g^{-1} after 100 cycles at 100 mA g^{-1}. When performed at 4 A g^{-1}, the reversible capacity of the modified SG was 346 mAh g^{-1}, much higher than that of SG (only 37 mAh g^{-1}). The enhanced cycling and rate properties of the modified SG can be attributed to the synergetic contribution of the pitch carbon and LiF which help accommodate the volume change, reduce the side reaction, and form a stable solid electrolyte interface layer.

Keywords: Lithium ion batteries; Silicon anode; Lithium fluoride; Carbon

1. Introduction

Lithium ion batteries (LIBs) have wide applications in the portable electronic devices due to their high energy density, high working potential and long cycle life