Crystalline silicon material for lithium battery negative electrode

Is silicon a good negative electrode material for lithium ion batteries?
Silicon (Si) is a promising negative electrode materialfor lithium-ion batteries (LIBs),but the poor cycling stability hinders their practical application. Developing favorable Si nanomaterials i...

Can silicon improve cyclability of lithium-ion batteries?
Silicon (Si) is a promising negative electrode material for lithium-ion batteries (LIBs),but the poor cycling stability hinders their practical application. Developing favorable Si nanomaterials is expected to improve their cyclability.

What are the advantages of silicon based negative electrode materials?
The silicon-based negative electrode materials prepared through alloying exhibit significantly enhanced electrode conductivity and rate performance,demonstrating excellent electrochemical lithium storage capability. Ren employed the magnesium thermal reduction method to prepare mesoporous Si-based nanoparticles doped with Zn .

What type of electrode does a lithium ion cell use?
Conventional Li-ion cells use a layered lithium transition metal oxidepositive electrode (e.g. LiCoO 2) and a graphite negative electrode. When a Li-ion cell is charged,Li +ions deintercalate from the cathode and simultaneously intercalate into the graphite electrode.

Can Si nanomaterials be used as negative electrode materials for LIBS?
Besides,when serving as negative electrode materials for LIBs,Si nanotubes exhibit better Li storage performancethan Si nanoparticles and Si nanowires,showing a capacity of 3044 mAh g -1 at 0.20 A g -1 and 1033 mAh g -1 after 1000 cycles at 1 A g -1. This work provides a controllable approach for the synthesis of Si nanomaterials for LIBs.

Can silicon be used in lithium-ion battery anodes?
The substantial volume expansion of silicon (approximately 400%) and inadequate electrical contact during the lithium-insertion process present constraints on its utilityin the prospective generation of optimal lithium-ion battery anodes. Numerous innovative strategies have been proposed by researchers to address this issue ,.

Silicon (Si) is recognized as a promising candidate for next-generation lithium-ion batteries (LIBs) owing to its high theoretical specific capacity (~4200 mAh g-1), low working potential (<0.4 V vs. Li/Li+), and ...

The current state-of-the-art negative electrode technology of lithium-ion batteries (LIBs) is carbon-based (i.e., synthetic graphite and natural graphite) and represents >95% of the negative electrode market [1].Market

demand is strongly acting on LIB manufacturers to increase the specific energy and reduce the cost of their products [2].Therefore, identifying ...

Silicon (Si) negative electrode has high theoretical discharge capacity (4200 mAh g-1) and relatively low electrode potential (< 0.35 V vs. Li + / Li) [3]. Furthermore, Si is one of the promising negative electrode materials for LIBs to replace the conventional graphite (372 mAh g-1) because it is naturally abundant and inexpensive [4]. The ...

Abstract Among high-capacity materials for the negative electrode of a lithium-ion battery, Sn stands out due to a high theoretical specific capacity of 994 mA h/g and the presence of a low-potential discharge plateau. However, a significant increase in volume during the intercalation of lithium into tin leads to degradation and a serious decrease in capacity. An ...

In the past decades, much effort has been paid to developing high performance negative electrode materials. Silicon is one promising negative electrode material due to its high theoretical specific capacity of 4200 mAh g -1 [4], low discharge voltage (~0.4 V versus Li + /Li) and highly abundant resource.

There has been considerable research on two or three multicomponent alloys with Li for the negative electrode ... HEAs offer new opportunities to solve the challenges ...

Silicon-carbon (S/C) composites, as a new type of anode material in lithium-ion batteries, combine the advantages of both silicon and carbon, aiming at solving the problems existing in ...

Abstract The silicon-based materials were prepared and examined in lithium cells for high-capacity lithium-ion batteries. Among the ...

The silicon-based negative electrode materials prepared through alloying exhibit significantly enhanced electrode conductivity and rate performance, demonstrating excellent ...

In this work, a series of phosphorus (P)-doped silicon negative electrode materials (P-Si-34, P-Si-60 and P-Si-120) were obtained by a simple heat treatment method, ...

An investigation of Li-Si alloys using density functional theory is presented. Various calculation methods and pseudopotentials are analyzed to best reproduce the potential versus composition curve of a Li/LixSi electrochemical cell at high temperature using the experimentally observed Li-Si phases. Total energy calculations, structural optimizations, and bulk modulus estimations ...

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