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Progress in silicon-based negative electrode materials for lithium batteries

Are silicon-based anode materials a promising material for next-generation lithium-ion batteries?
Silicon (Si)-based materials are intensively pursued as the most promisinganode materials for next-generation lithium-ion batteries (LIBs) owing to their high theoretical mass-specific capacity,moderate working potential,and high abundance in the earth's crust. Therefore,it has attracted widespread attention both from academia and industries.

Which negative electrode material should be used for a lithium battery?
The anode material currently used is mainly graphite, which has a low specific capacity and cannot meet the market demand for high-performance lithium batteries. Therefore, researchers have conducted extensive research on the selection of negative electrode materials.

Can silicon-based cathode materials be used for lithium-ion batteries?
This review summarizes the application of silicon-based cathode materials for lithium-ion batteries, summarizes the current research progress from three aspects: binder, surface function of silicon materials and silicon-carbon composites, and looks forward to the future research direction.

Are silicon anode lithium-ion batteries a good investment?
Silicon anode lithium-ion batteries (LIBs) have received tremendous attention because of their merits, which include a high theoretical specific capacity, low working potential, and abundant sources. The past decade has witnessed significant developments in terms of extending the lifespan and maintaining the high capacities of Si LIBs.

Should lithium battery electrodes be based on cathode and anode materials?
Anode materials cannot blindly pursue high capacity,and the synergy of cathode and anode can maximize the performance of the battery. Researchers should design lithium battery electrodes from the perspective of overall battery structural stability and high performance,and do not need to be limited to the current commercial cathode materials.

Is low grade silicon a good material for lithium-ion battery?
Recently,it is found that various low grade silicon 7,48,88 - 90 and natural sources 91 - 96 can serve as cost-effective sources to produce nanostructured silicon for lithium-ion battery. Low-grade silicon is an attractive material choice because of its abundance and cheap price.

Silicon is considered one of the most promising anode materials for next-generation state-of-the-art high-energy lithium-ion batteries (LIBs) because of its ultrahigh ...

In this progress report, the focus is on the challenges and recent progress in the development of Si anodes for

lithium-ion battery, including initial Coulombic efficiency, areal ...

Rechargeable solid-state batteries have long been considered an attractive power source for a wide variety of applications, and in particular, lithium-ion batteries are ...

Silicon-based negative electrode material is one of the most promising negative electrode materials because of its high theoretical energy density. This review summarizes the ...

Among all investigated anode materials, silicon (Si) has a theoretical capacity of 3590 mAh g -1 (almost ten times higher than that of graphite) based on the fully alloyed form ...

Silicon (Si)-based materials have become one of the most promising anode materials for lithium-ion batteries due to their high energy density, but in practice, lithium ions ...

During discharge, if the electrodes are connected via an external circuit with an electronic conductor, electrons will flow from the negative electrode to the positive one; at the ...

Research progress on silicon-based materials used as negative electrodes for lithium-ion batteries Liyun Du* School of Chemistry, Sun Yat-sen University, 510006 Guangzhou, China Abstract. ...

Nanotechnology and carbon coating have been applied to silicon anode to achieve excellent lithium-ion batteries, but the exclusive influence of carbon coating on solid ...

Silicon (Si)-based materials are intensively pursued as the most promising anode materials for next-generation lithium-ion batteries (LIBs) owing to their high theoretical mass ...

For silicon-based anode lithium-ion batteries, electrode material design, binder optimization, functional electrolytes, and prelithiation can significantly improve the battery"s ...

With the aim of providing an in-depth insight into rapidly growing accounts of electrolyte additives and binders for use with silicon anode-based LIBs, this Review assesses ...

Graphite, as a negative electrode material for commercial lithium batteries, has been developed and optimized for more than 20 years, and its electrochemical performance is ...

Large volume variation during charge/discharge of silicon (Si) nanostructures applied as the anode electrodes for high energy lithium-ion batteries (LIBs) has been ...

In this progress report, the focus is on the challenges and recent progress in the development of Si anodes for lithium-ion battery, including initial Coulombic efficiency, areal capacity, and material cost, which call for

more ...

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 ...

Compared with current intercalation electrode materials, conversion-type materials with high specific capacity are promising for future battery technology [10, 14].The rational matching of cathode and anode ...

Silicon (Si) with atomic number 14 belongs to group IVA and is one of the best alternates to graphite anode material, which has received widespread attention because of its ...

Silicon (Si)-based materials are intensively pursued as the most promising anode materials for next-generation lithium-ion batteries (LIBs) owing to their high theoretical mass-specific capacity, moderate working potential, ...

With the low redox potential of -3.04 V (vs SHE) and ultrahigh theoretical capacity of 3862 mAh g?¹, lithium metal has been considered as promising anode material.

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