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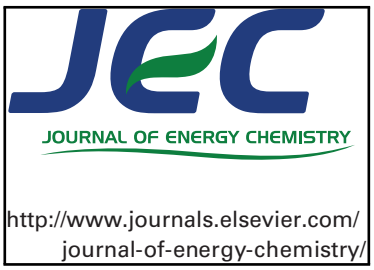

Research progress on silicon/carbon composite anode materials for lithium-ion battery

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Review

Research progress on silicon/carbon composite anode materials for lithium-ion battery

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Abstract：Silicon (Si) has been considered as one of the most promising anode material for the next generation lithium-ion batteries (LIBs) with high energy densities, due to its high theoretical capacity, abundant availability and environmental friendliness. However, silicon materials with low intrinsic electric and ionic conductivity suffer from huge volume variation during lithiation/delithiation processes leading to the pulverization of Si and subsequently resulting in severe capacity fading of the electrodes. Coupling of Si with carbon (C) realizes a favorable combination of the two materials properties, such as high lithiation capacity of Si and excellent mechanical and conductive properties of C, making silicon/carbon composite (Si/C) ideal candidates for LIBs anodes. In this review, recent progresses of Si/C materials utilized in LIBs are summarized in terms of structural design principles, material synthesis methods, morphological characteristics and electrochemical performances by highlighting the material structures. The mechanisms behind the performance enhancement are also discussed. Moreover, other factors that affect the performance of Si/C anodes, such as prelithiation, electrolyte additives, and binders, are also discussed. We aim to present a full scope of the Si/C-based anodes, and help understand and design future structures of Si/C anodes in LIBs.

Keywords：Lithium-ion batteries; Anodes; Silicon/carbon composite

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