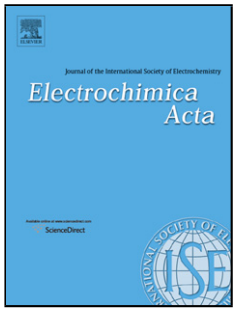

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Core-shell structured ZnS-C nanoparticles with enhanced electrochemical properties for high-performance lithium-ion battery anodes

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Abstract

Core-shell structured ZnS-C nanoparticles are successfully synthesized by a chitosan-assisted hydrothermal method followed by a chemical vapor deposition process using C_2H_2. The ZnS nanoparticles (c.a. 100-150 nm in size) are uniformly coated by a thin carbon shell with a thickness of about 10 nm, forming well-dispersed nano-powders. When applied as anode in lithium cells, the synthesized nano-ZnS-C composite exhibits a specific capacity of 565 mAh g^{-1} at 0.1 A g^{-1} and 363 mAh g^{-1} at 5 A g^{-1} current density. After 600 cycles at a current density of 0.5 A g^{-1}, the constructed electrode shows over 87% capacity retention, indicating excellent electrochemical performance. The outstanding properties of the obtained nano-ZnS-C can be attributed to the well-defined core-shell nanostructure, in which the nano-sized ZnS core provides short lithium ion diffusion pathways, while the carbon shell allows for a fast electron conduction, and at the same time accommodates the volume changes caused by the