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SiO₂@C Hollow Sphere Anodes for Lithium-ion Batteries

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As anode materials for lithium-ion batteries, SiO₂ is of great interest because of its high capacity, low cost and environmental affinity. A facile approach has been developed to fabricate SiO₂@C hollow spheres by hydrolysis of tetraethyl orthosilicate (TEOS) to form SiO₂ shells on organic sphere templates followed by calcinations in air to remove the templates, and then the SiO₂ shells are covered by carbon layers. Electron microscopy investigations confirm hollow structure of the SiO₂@C. The SiO₂@C hollow spheres with different SiO₂ contents display gradual increase in specific capacity with discharge/charge cycling, among which the SiO₂@C with SiO₂ content of 67 wt% exhibits discharge/charge capacities of 653.4/649.6 mA h g⁻¹ over 160 cycles at current density of 0.11 mA cm⁻². The impedance fitting of the electrochemical impedance spectroscopy shows that the SiO₂@C with SiO₂ content of 67 wt% has the lowest charge transfer resistance, which indicates that the SiO₂@C hollow spheres is promising anode candidate for lithium-ion batteries.

Key words: Silica; Hollow spheres; Carbon coating; Anode; Lithium-ion batteries

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