

One-step synthesis of spherical Si/C composite with onion-like buffer structure as a high-performance anode material for lithium-ion batteries

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Silicon (Si) is the most promising anode material for next-generation lithium-ion batteries. However, there are still many obstacles hindering its development such as low conductivity and extremely large volume change during the lithiation and delithiation processes. Recently, many different micro/nano structures of Si/C composites have been designed to overcome these problems. But most synthesis methods are complicated and difficult to large-scale preparation. In this work, we designed the onion-like Si/C composites through a simple one-step injection pyrolysis. Silicon nanoparticles were successfully encapsulated in onion-like carbon shells. This unique structure has higher stability and better buffer effect for expanded silicon particles. This composites exhibit outstanding cycling stability of 1350 mAh g⁻¹ after 300 cycles at a current density of 0.2 A g⁻¹ and show good rate capability benefiting from the onion-like structure. In addition, we can control the lithium storage capacity by simply changing the raw material ratio of Si/C. Hence, we have explored a facile pathway to product onion-like Si/C anodes that can effectively improve the capacity and cycle life of commercial lithium ion batteries.