ARTICLE

3D Pore-Nest Structured Silicon-Carbon Composite as Anode Material for High Performance Lithium-Ion Batteries

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Supporting Information

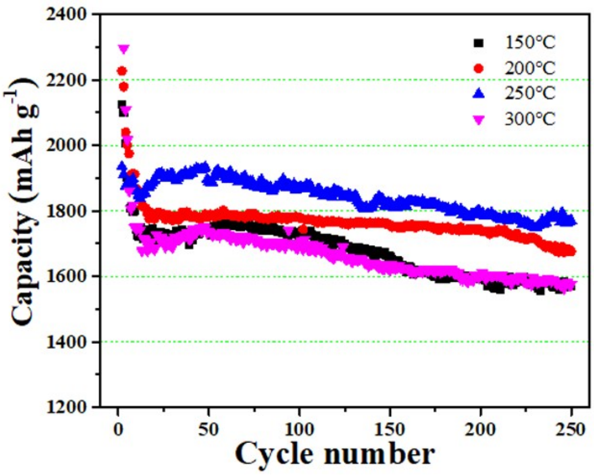

Fig. S1. Cycling performance of composite material with different oxidation temperatures at current density of 0.42 A g^{-1}

We have designed different oxidation temperature gradient experiments at 150 ℃, 200 ℃, 250 ℃ and 300 ℃ for 2 h, respectively. The results show that the cycle stability of the composite was gradually increased from 150 ℃ to 250 ℃. However, the charge/discharge capacity of the composite material became low and the stability was deteriorated when the oxidation temperature reached 300 °C, which can be attributed to the extent of oxidation on the surface of Si, affecting its electrochemical activity, so we chose 250 ℃ as the oxidation temperature.

As the Si@SiO$_x$/CNTs@C composite consists of quite a few components, it is needed to analyse the effect of each component on its electrochemical properties. The composite materials have been prepared with different component connections. In the Fig. S2, the composite electrode without graphite has poor cycle stability, indicating that the graphite in the composite material increases the conductivity of the entire electrode and the lamellar structure absorbs stress generated by the volume effect of Si NPs to maintain the stability of electrode structure. The composite without CNTs has a large difference in stability compared to Si@SiO$_x$/CNTs@C electrode, because CNTs contributes to the formation of porous, spring-loaded nest structures in composite to accommodate the volume change of silicon during the lithiation and delithiation processes. Therefore, the various components jointly contributed to the excellent electrochemical performance of the composite.

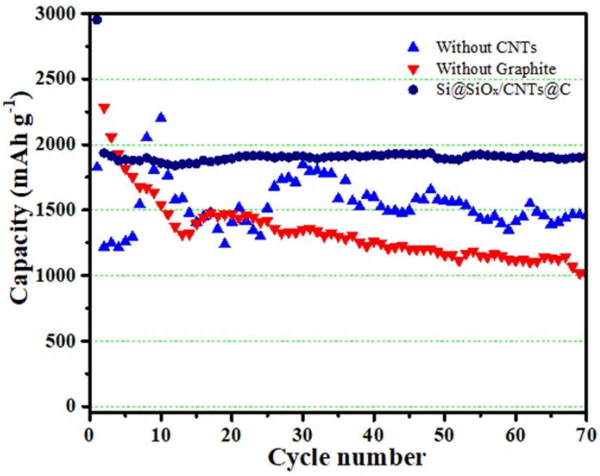

Fig. S2. Cycling performance of composite material with various component combinations at current density of 0.42 A g−1.

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