Short Communication

Facile Synthesis of Silicon Nanoparticles Embedded in 3D N-doped Graphene as Anode Materials for High-Performance Lithium Ion Batteries

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The Si nanoparticle embedded in three dimensional nitrogen-doped graphene (Si-NG) composite was synthesized by a facile one-step hydrothermal method using urea as nitrogen source and vitamin C as reducing agent of graphene oxide. The composites were investigated with regard to the composition and structure by various instrumental methods and the electrochemical performances as the freestanding anode of LIBs. The results show that the Si-NG composite anode affords high storage energy and rate capability. A high discharge capacity of 1373 mAhg^{-1} over 100 cycles is obtained at 400 mA g^{-1}, with coulombic efficiency of 98.3%. The excellent electrochemical performance is associated with high electrical conductivity of N-doped 3D graphene, short transportation path for both lithium-ions and electrons due to nanocrystallization of Si, and elastomeric space to accommodate volume changes during alloying /dealloying.

FULL TEXT