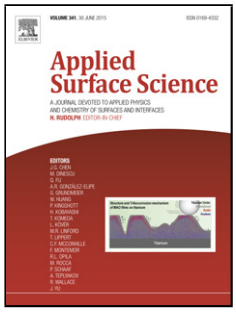

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One-step synthesis of 3D sulfur/nitrogen dual-doped graphene supported nano silicon as anode for Li-ion batteries

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Highlights

- 3D SN-G/Si anode composite was synthesized by one-step hydrothermal method.
- The SN-G/Si composite anode exhibits high capacity, good cyclic and rate performance.
- The improvement is attributed to the 3D SN-G as the superior conductive skeleton and flexible loader with well-distributed Si nanoparticles.

Abstract:

Silicon is one of the most promising candidates for next-generation anode of Lithium-ion batteries. However, poor electrical conductivity and large volume change during alloying/dealloying hinder its practical use. Here we reported a three-dimensional (3D) nitrogen and sulfur codoped graphene supported silicon nanoparticles composite (SN-G/Si) through one-step hydrothermal self-assembly. The obtained SN-G/Si was investigated in term of instrumental characterizations and electrochemical properties. The results show that SN-G/Si as a freestanding anode in LIBs delivers a reversible capacity of 2020 mAh g^{-1} after 100 cycles with coulombic efficiency of nearly 97%. The excellent electrochemical performance is associated with the unique structure and the synergistic effect of SN-G/Si, in which SN-G provides volume buffer for nano Si as the flexible loader, short paths /fast