Core-shell structured silicon@$TiO_{1-x}N_y$ nanoparticles for high performance composite anode in Li-ion batteries

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To improve the performance of silicon (Si) anodes in LIB, a variety of silicon nanostructures and composites are developed, which can effectively minimize the mechanical strains to extend cycle life of Si anodes. However, the fabrications require toxic reagents, advanced techniques which will lead to high costs. As a promising approach, simple surface coating with conductive materials is preferred to reduce unnecessary growth of SEI films and also improve the conductivity of electrodes. Most conductive coating materials, however, do not accommodate the volume expansion. Herein, we report $TiO_{1-x}N_y$ for coating materials of Si NP anodes. $TiO_{1-x}N_y$ considered to be solid solutions of cubic TiN and TiO with rock-salt structure, which have much larger bulk modulus than TiO_2 with acting as buffer layers to effectively suppress the volume change of Si anode. Also nitrogen atom substituted for the oxygen vacancy of TiO_{1-x} phase improves electrical conductivity.

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