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Abstract

The hollow Si nanospheres modified by the mechanically robust titanium dioxide (TiO_2) shell and the uniform carbon layer are intentionally designed and successfully prepared as the anode active material of high performance lithium-ion batteries. The effects of the robust TiO_2 shell and the uniform carbon layer on the structure and electrochemical performances for the Si@TiO_2@C nanospheres are studied in detail by X-ray photoelectron spectroscopy, transmission electron microscopy, X-ray diffraction and charge/discharge tests. The results show that the hollow structure of the Si core can spontaneously absorb the huge volume expansion stress, the robust TiO_2 shell is used as a compact fence to promote the expansion towards the interior of the Si cavity instead of the exterior in the processes of charge/discharge, and the uniform carbon layer can effectively enhance the electrical conductivity and further control the integrity and stability of the well-wrapped core-shell-shell framework. Typically, the resultant hollow Si@TiO_2@C nanospheres exhibit a high initial

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