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Synthesis of V_2O_5/C core/shell arrays on graphene foam for electrochemical energy storage

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Abstract

V_2O_5-based materials are regarded as promising cathode materials for lithium-ion batteries (LIBs) because of their larger theoretical capacities than commercial cathode materials. Herein we develop a united solvothermal-chemical vapor deposition method for construction of bind-free V_2O_5/C core/shell arrays on the graphene foams positive electrodes of LIBs. Active V_2O_5 nanoflakes with thicknesses of 10-15 nm are wrapped by ultrathin carbon layer of 2-4 nm forming core/shell arrays on the GF skeleton. The unique core/shell architecture can provide short ion/electron diffusion paths and substantial protection shell for the active materials, thus leading to accelerated electrochemical kinetics and enhanced cycling stability. A noticeable initial capacity of 290 mAh g^{-1} at 1C in the voltage range of 2.0-4.0 V and 217 mAh g^{-1} at 6C after 1000 cycles could be obtained for the GF+V_2O_5/C electrode, much better than its GF+ V_2O_5 counterpart.

Graphical abstract

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