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Synthesis and characterization of carbon supported V_2O_5 nanotubes and their electrochemical properties

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Abstract Vanadium pentoxide (V_2O_5), as one of the most important electrode materials for lithium ions batteries, attracts tremendous attention. Here, carbon supported V_2O_5 hollow nanotubes are synthesized using carbon fibers as templates through solvothermal reaction with subsequent annealing treatment. Morphological features of the samples are investigated by field-emission scanning electron microscopy (FESEM) and transmission electron microscopy (TEM). X-ray diffraction (XRD) patterns confirm the formation of phase-pure structure. Elemental mapping and XPS studies are used to confirm the existence of carbon and V^{4+} in nanotubes. Electrochemical Li insertion behavior of nanotubes are explored as cathode in half cell configuration (vs. Li) using cyclic voltammetry, galvanostatic charge-discharge studies and rate tests. The V_2O_5 hollow nanotubes display a good cycling performance with a specific capacity of 237 mA h g^{-1} after 50 cycles at 100 mA g^{-1} in the voltage range of 2.0-4.0 V. Moreover, the