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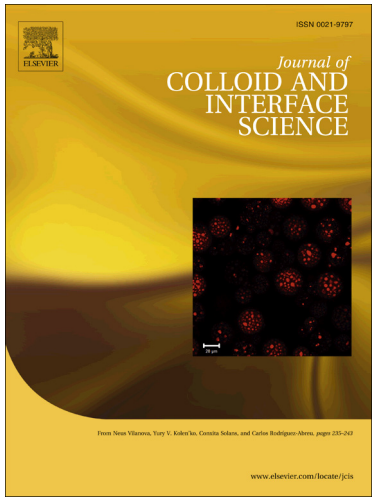

Vanadium pentoxide nanochains for high-performance electrochemical supercapacitors

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Vanadium pentoxide nanochains for high-performance electrochemical supercapacitors

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Abstract

We have synthesized unique hierarchical one dimensional (1D) nanochains of V_2O_5 by employing simple hydrothermal method using cetyltrimethylammonium bromide (CTAB) as a soft template. The electrochemical performance of resulting V_2O_5 electrode materials was evaluated by cyclic voltammetry, galvanostatic charge-discharge and electrochemical impedance spectroscopy techniques. The V_2O_5 nanochains (V_2O_5-ctab) show maximum specific capacitance of 631 F g^{-1} at a current density of 0.5 A g^{-1} and retain 300 F g^{-1} even at high current density of 15 A g^{-1}. In addition the V_2O_5 nanochains show good cyclic stability with 75% capacitance retention after 1200 charge-discharge cycles. The order of specific capacitance is commercial bulk-V_2O_5 (160 F g^{-1}) < agglomerated V_2O_5 particles (395 F g^{-1}) < V_2O_5 nanochains (631 F g^{-1}). The interconnected nanochain-like morphology and high specific surface area are the main factors which contribute to higher electrochemical performance to V_2O_5 nanochains and promote facile exchange of Li^+ ions during the charge-discharge processes.

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