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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  $631 \text{ F g}^{-1}$  at a current density of  $0.5 \text{ A g}^{-1}$  and retain  $300 \text{ F g}^{-1}$  even at high current density of  $15 \text{ A g}^{-1}$ . 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- $V_2O_5$  ( $160 \text{ F g}^{-1}$ ) < agglomerated  $V_2O_5$  particles ( $395 \text{ F g}^{-1}$ ) <  $V_2O_5$  nanochains ( $631 \text{ F g}^{-1}$ ). 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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