Single Crystalline $\beta$-Na$_{0.33}$V$_2$O$_5$ Nanowires Based Supercapacitor

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Supercapacitors, which can deliver significant energy with high power density, have attracted a lot of attention due to their potential application in energy storage. Among various oxide materials, sodium vanadate has been recognized as one of the most promising electrode materials because of high electrical conductivity. In addition, larger layer spacing of $\beta$-Na$_{0.33}$V$_2$O$_5$ compared to V$_2$O$_5$ makes easier Li$^+$ insertion. Moreover, $\beta$-Na$_{0.33}$V$_2$O$_5$ has a tunnel like structure along b axis with 3 kinds of V site allowing it to enhance the ion intercalation by introducing three different intercalation sites along the tunnel. The tunnel can act as a fast diffusion path for ion diffusion, which can improve the overall charge storage kinetics. In this study, high quality single crystalline sodium vanadate ($\beta$-Na$_{0.33}$V$_2$O$_5$) nanowires were grown directly on Pt coated SiO$_2$ substrate by a facile chemical solution deposition method without employing catalyst, surfactant or carrier gas. The results show that great enhancement in capacitance was observed compared with previous reports.

**Keywords:** Beta-sodium niobate, Supercapacitor