Supporting Information

Novel Aligned Sodium Vanadate Nanowire Arrays For High-performance Lithium-Ion Batteries Electrode

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Experimental

The $Na_5V_{12}O_{32}$ nanowire arrays were fabricated through a hydrothermal method with calcinations. First, NH_4VO_3 and NaCl (molar ratio of 1:6) were dissolved in deionized water under room temperature. Next, the blue-green solution was transferred into Teflon lined stainless steel autoclave. Ti foil has good conductivity and high stability during the hydrothermal reaction, which is used as a current collector. A piece of Ti foil was put into the solution. The autoclave was tightly sealed and kept in an oven at 150 °C for different time. After cooling the autoclave down to room temperature, the Ti foil was rinsed with deionized water. The powder products in the solution were also collected, washed with deionized water three times, and dried at 100 °C overnight. The as-prepared samples were annealed from room temperature to 200, 250 and 300 °C for 4 h at the rate of 1 °C $\cdot min^{-1}$ in air.

The morphology of the sample was investigated by field-emission scanning electron microscopy (FE-SEM) using Hitachi S-4800 apparatus. X-ray diffraction was measured on a powder X-ray

diffractometer (XRD) using Cu Kα radiation. Transmission electron microscopy (TEM) images were obtained using JEOL-2100F at 200 kV. The chemical composition of the sample was analyzed by X-ray photoelectron spectroscopy (XPS, KAlpha 1063, Thermo Fisher Scientific, UK). For organic Li^+ battery, lithium foil was used as the counter and reference electrode, and 1.0 M $LiPF_6$ in ethyl carbonate/dimethyl carbonate (1:1 volume ratio) was used as the electrolyte. Cyclic voltammetric (CV) experiments were recorded at a scan rate of 0.5 $mV \cdot s^{-1}$ within the potential range of 2.0 V and 4.0 V. Galvanostatic discharge-charge measurements were performed in the same potential range. The specific capacity and current density were weight of the active material ($Na_5V_{12}O_{32}$) only. CV measurements were performed on an AUTOLAB electrochemical workstation (PG302N). Galvanostatic charging/discharging was conducted on a battery tester (Land CT2001). The electrochemical impedance measurements (EIS) were carried out by applying 100 kHz to 0.001 Hz frequency ranges with acoscillation amplitude of 5 mV. All the measurements were conducted at room temperature.

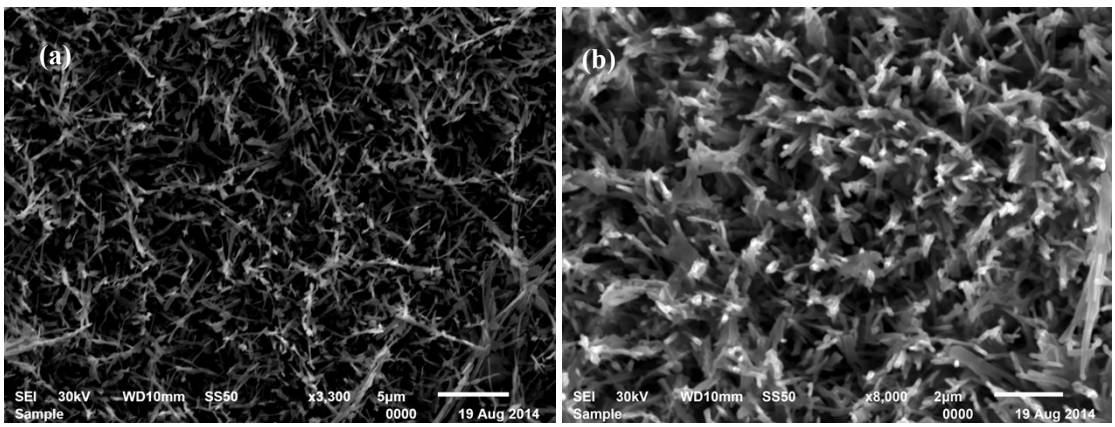

Figure S1 SEM images of the as-prepared samples annealed at 300 °C.

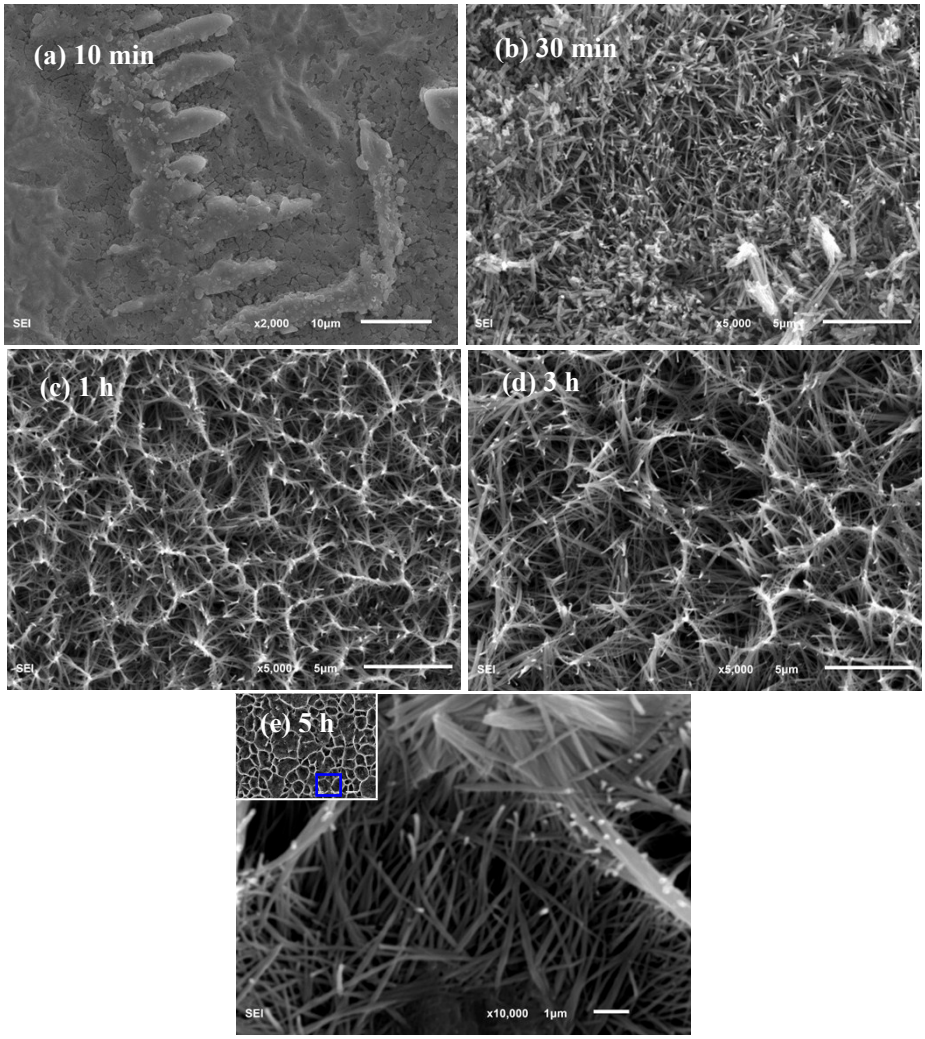

Figure S2 SEM images of five hydrothermally prepared samples in (a) 10 min, (b) 30 min, (c) 1 h, (d) 3 h and (e) 5 h. Inset in (e) is a low magnification SEM image.

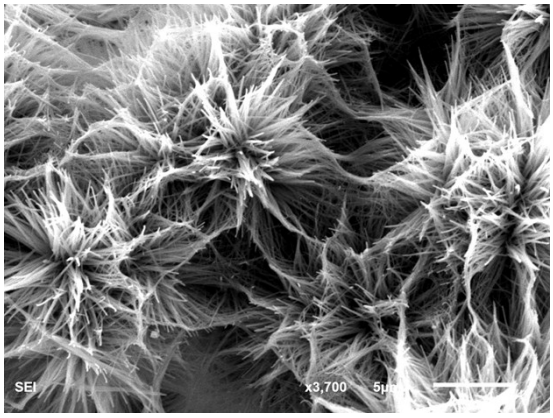

Figure S3 SEM image of the as-prepared powders obtained in 3 h.

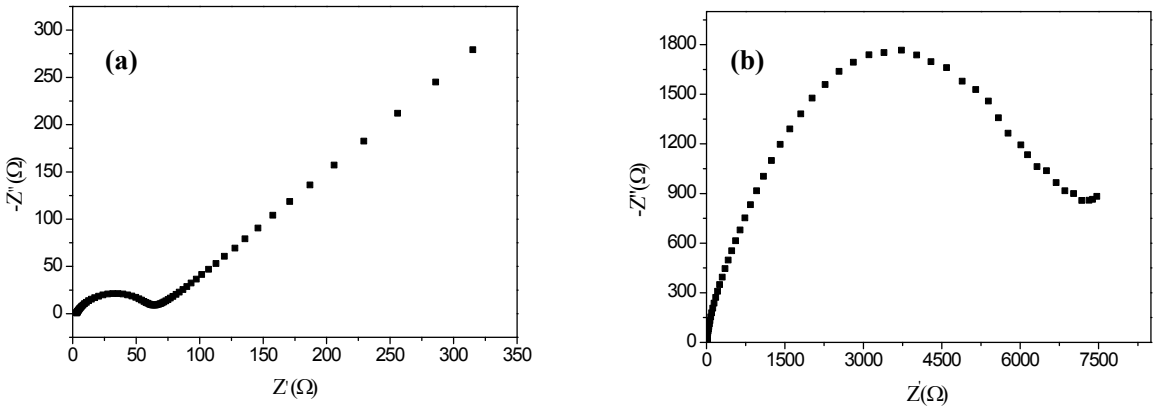

Figure S4 Impedance measurement of the $Na_5V_{12}O_{32}$ nanowires on Ti foil (a) and $Na_5V_{12}O_{32}$ nanowire powder electrodes (b).