Supporting Information

Experimental Section

Preparation of samples The $Zn_2Ti_3O_8$ nanowires were synthesized using titanate $Na_xH_{2-x}Ti_3O_7$ nanotubes as a precursor which was reported previously [8] and the characterization results are shown in Supporting Information. In a typical synthesis, excessive $ZnCl_2\cdot 6H_2O$ was dissolved in deionized water, and then an ammonia solution was added slowly. After the clear solution was formed, the precursor titanate nanotubes were dispersed into the solution and stirred for 24 h at 60 □. Finally, the products were carefully washed with deionized water several times, dried and calcined at 450-750 □ in air.

Characterizations of samples Scanning electron microscopy (SEM) and Transmission electron microscopy (TEM) were taken on a Philip-XL30 instrument and a JEOL 2010 instrument, respectively. X-ray diffraction (XRD) patterns were recorded on a PANalytical X'Pert spectrometer using the Co Kα radiation ($\lambda = 1.78897$ Å), and the data would be changed to Cu Kα data. The BET surface areas and pore size distributions were measured by N_2 adsorption at 77 K on a Micrometrics Coulter Ominsorp 100cx apparatus.

Electrochemical measurements For the electrochemical measurement, 50 wt % active material were mixed and grounded with 10 wt % polyvinylidene fluoride(PVDF) powder as a binder and 40 wt % acetylene back carbon (AB) powder as the conductive assistant materials. The mixture was spread and pressed on Cu foil circular flakes as the working electrode (WE), and dried at 120 ºC for 24 h under the vacuum conditions. Metallic lithium foils were used as the negative electrodes. The electrolyte was 1M $LiPF_6$ in a 1/1/1 (volume ratio) mixture of ethylene carbonate (EC), diethyl carbonate (DEC) and dimethyl carbonate (DMC). The separator was UP 3093 (Japan) micro-porous polypropylene membrane. The cells were assembled in a glove box filled with highly pure argon gas (O_2 and H_2O levels < 1 ppm), and charge/discharge tests were performed in the voltage range of 0.05 to 3 V (Li^+/Li) at current densities of 0.1, 0.3 and 0.5 Ag^{-1} on a Land automatic batteries tester (Land CT 2001A, Wuhan, China).

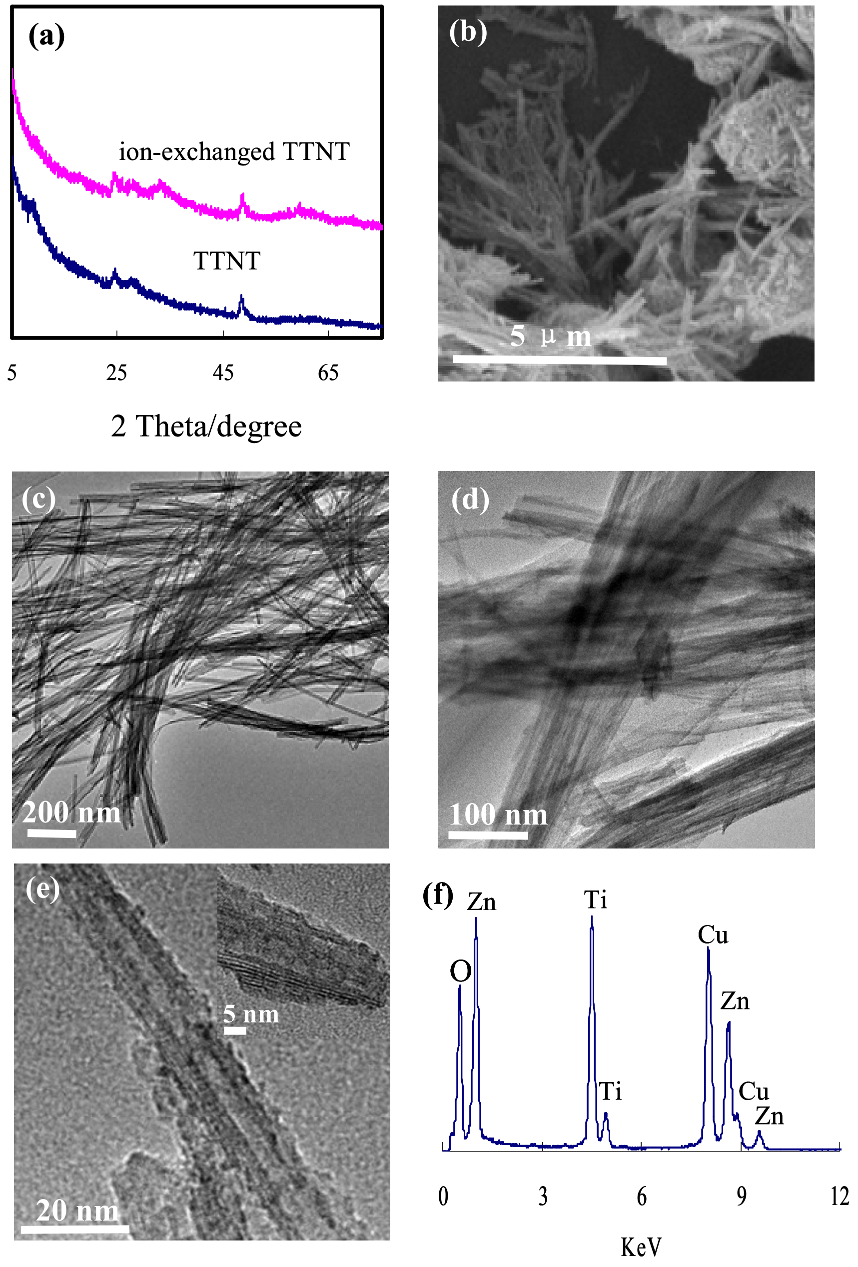
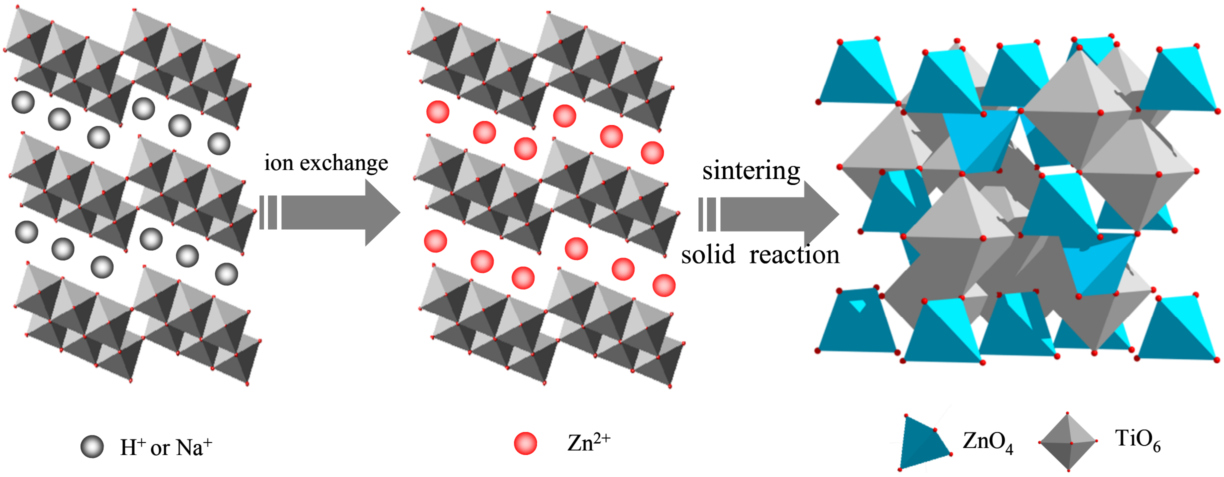


Figure S1. (a) XRD patterns of titanate nanotubes (TTNT) and titanate nanotubes after ion exchange in a aqueous ammonia solution with Zn^{2+} ions at 60 ℃ for 24 h, (b, c) SEM and TEM images of TTNT, (d, e) TEM and HRTEM images of ion-exchanged TTNT, and (f) EDX spectrum of ion-exchanged TTNT.



Scheme S1 A possible model for the transformation of titanate nanotubes to cubic $Zn_2Ti_3O_8$ phase.

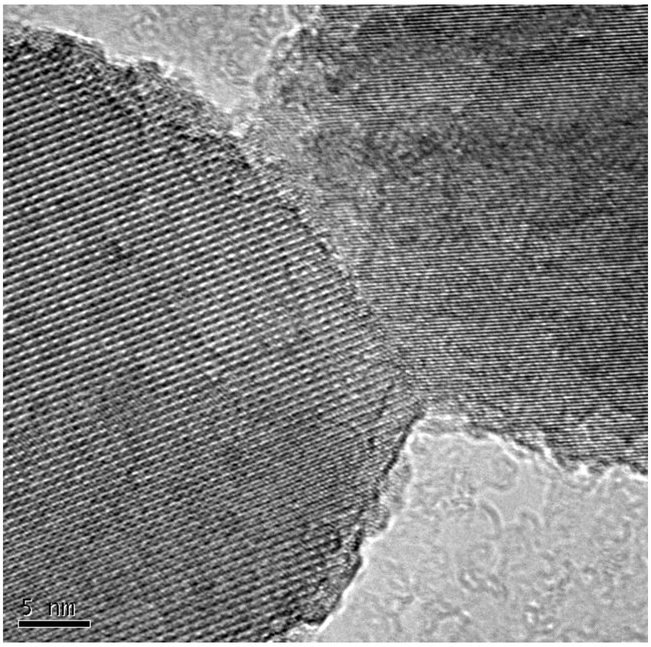


Figure S2 HRTEM of a grain boundary between two interconnected nanopariticles

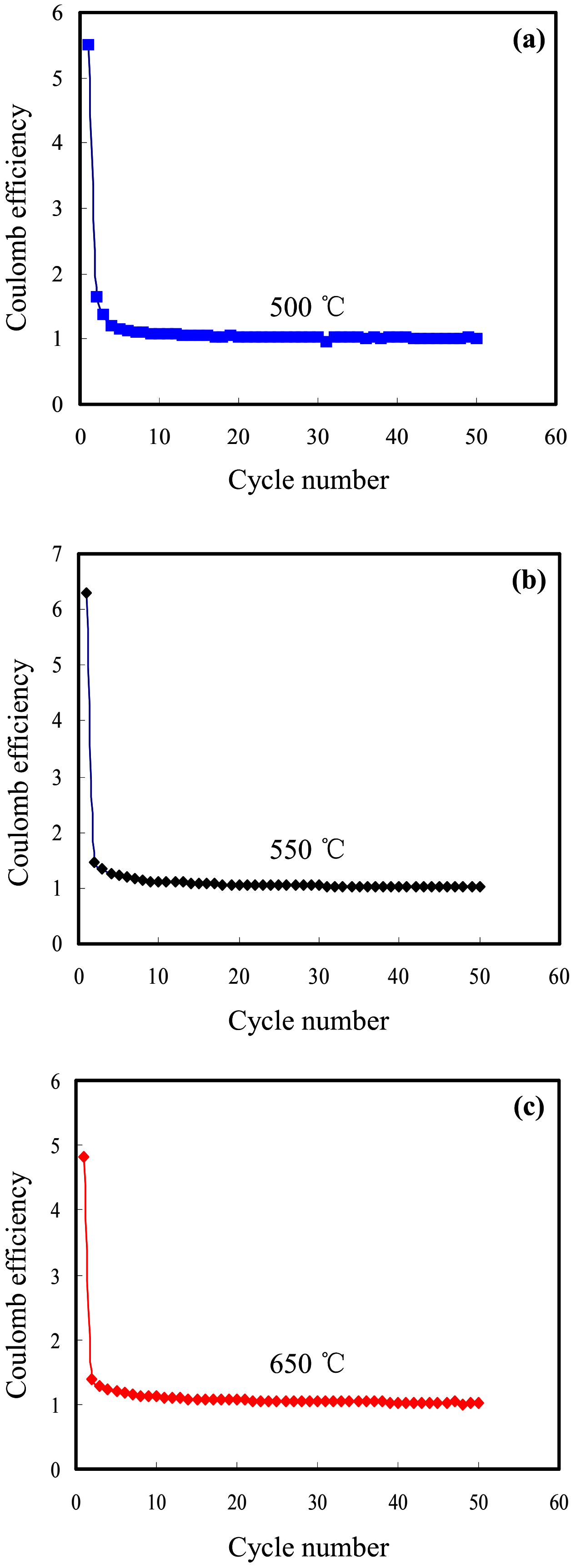


Figure S3 Coulomb efficiency of Zn2Ti3O8 nanowires obtained at different calcined temperatures.

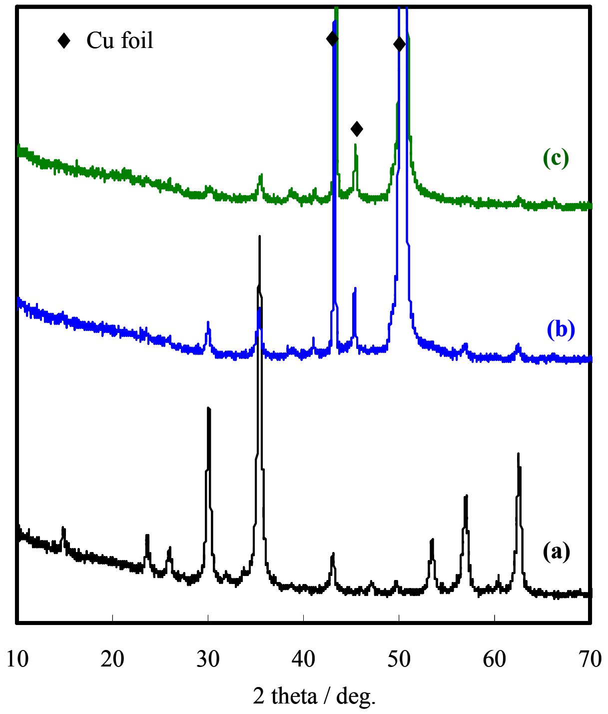


Figure S4 XRD patterns of the anode made of $Zn_2Ti_3O_8$ nanowires calcined at 650 ℃ before (a) and after cyclic measurement (b) 1st cycle and (c) 100th cycles.