Electronic Supplementary Information (ESI) available for:

# Water-titanate intercalated nanotubes: Fabrication, polarization, and giant dielectric property

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## Supporting Online Materials

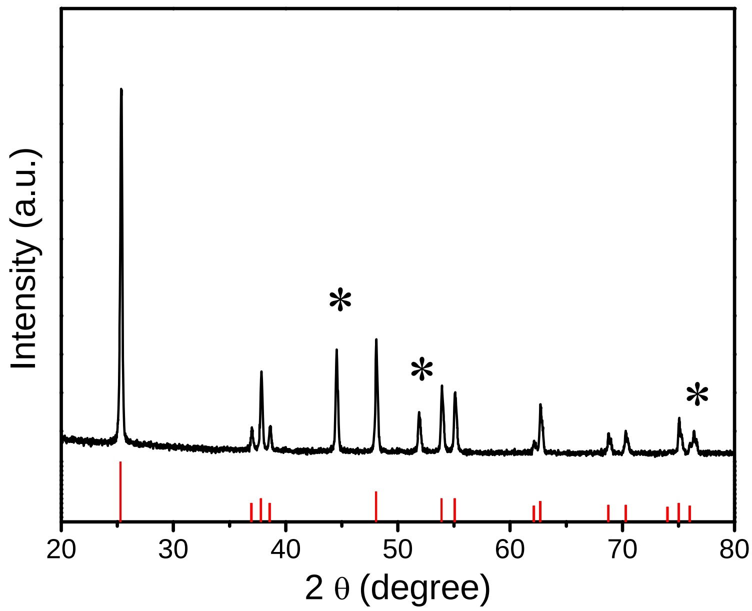


**Fig. S1** XRD pattern of the starting material of anatase $TiO_2$. Asterisks * denote the internal standard Ni. The bottom bars denote the standard diffraction data of anatase $TiO_2$ (JCPDS, No. 21-1272).

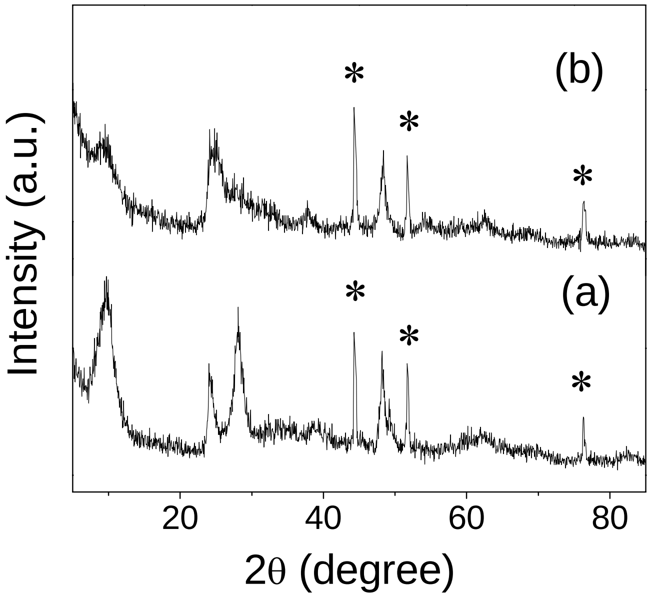


**Fig. S2** XRD patterns of (a) Na-TNT and (b) H-TNT. Symbols "*" denote the internal standard Ni.

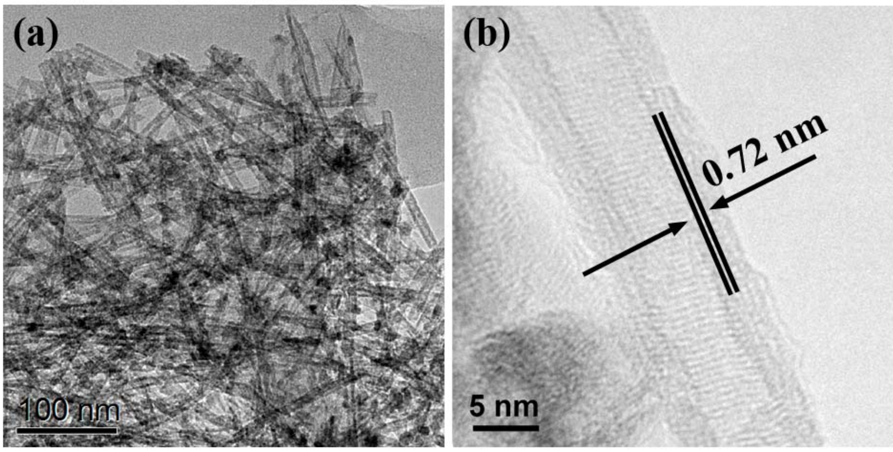


**Fig. S3** (a) TEM and (b) HRTEM images of H-TNT.

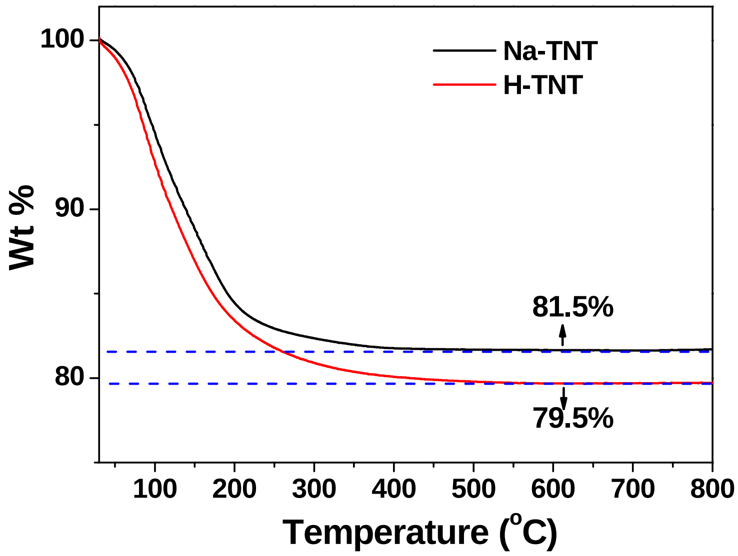


**Fig. S4** TG data of Na-TNT and H-TNT.

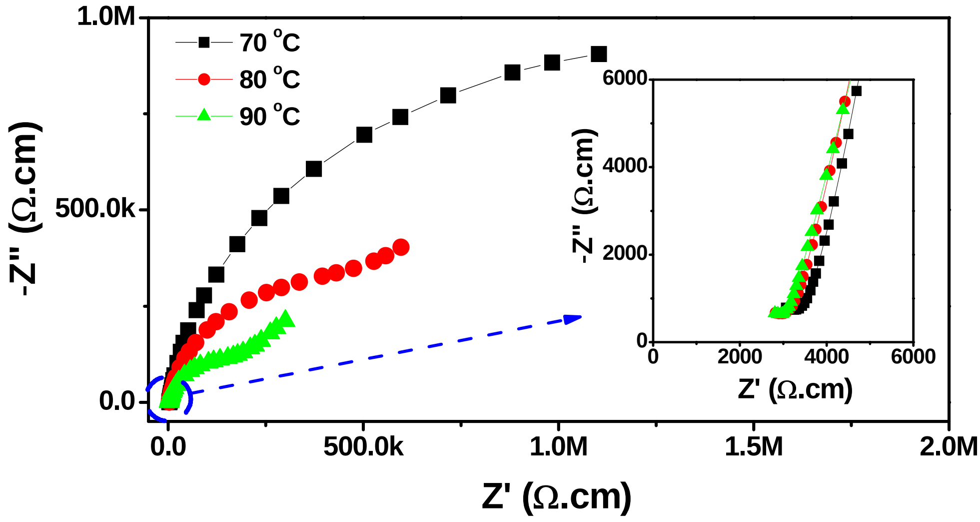


**Fig. S5** Impedance spectra of Na-TNT sample at selected temperature of 70, 80, and 90 °C. Inset shows the enlarged portion of the high frequency spectra, respectively. It is clear that three spectra exhibited similarly non-zero-intercepted tubers at high frequencies, which are related to the grain responses, respectively. At relatively low frequencies, the spectrum obtained at 70 °C only contains an arc, while the spectra obtained at 80 °C includes an arc, and also a short linear tail. When increasing the temperature to 90 °C, the tail becomes longer. The art and the tail denote the responses of grain boundary and electrode effect, respectively. Therefore, increasing the measurement temperature will enhance the electrode effect, which also imposes significant impact on the dielectric behaviors.

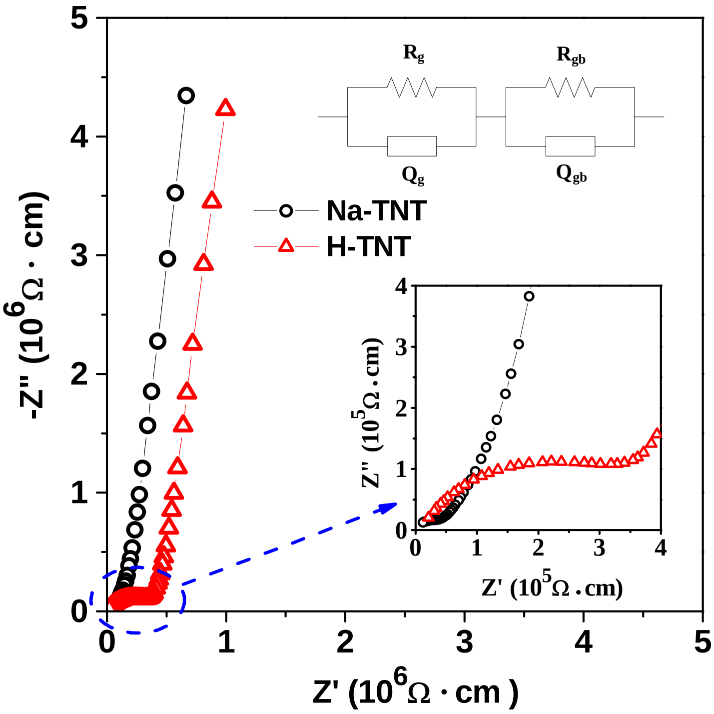


**Fig. S6** Room-temperature impedance spectra of Na-TNT and H-TNT. Insets are the enlarged high frequency spectra (bottom) and the equivalent circuit model (top), respectively. According to the equivalent circuit model, the grain resistivity ($R_g$) is fitted to be $5.8\times10^4$ Ω.cm for Na-TNT and $4.3\times10^5$ Ω.cm for H-TNT while their boundary resistivity ($R_{gb}$) is estimated to be $1.1\times10^8$ Ω.cm for Na-TNT and $1.2\times10^8$ Ω.cm for H-TNT. Obviously, for both Na-TNT and H-TNT, their $R_{gb}$ is three or four larger than respective $R_g$, which underlies the heterogeneous systems.

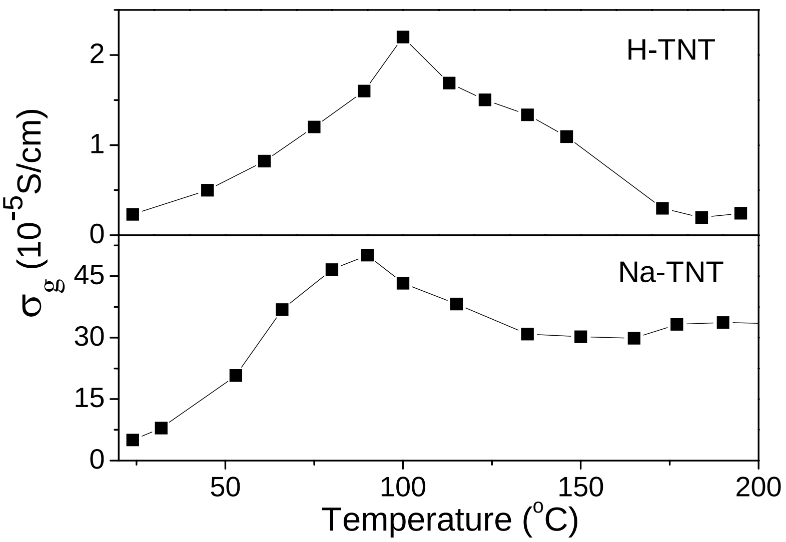


**Fig. S7** Temperature dependence of the grain conductivity ($\sigma_g$) for Na-TNT and H-TNT. For both Na-TNT and H-TNT, their grain conductivities, $\sigma_g$, have the similar features against temperature, i.e., it firstly increases and then decreases with increasing temperature, and finally keeps a near constant. However, there are 3 differences between Na-TNT and H-TNT: (1) the grain conductivity of former is one order larger than the latter in whole measured temperature region; (2) the maximum of conductivity is at 90 $^{o}$C for the former while 100 $^{o}$C for the latter; (3) conductivity begins to keep a constant at 135 $^{o}$C for the former while this temperature for the latter is 170 $^{o}$C. Excluding the effect from morphology and phase scale, such a giant conductivity discrepancy is attributed to the respective grain itself.