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Electronic Supplementary Information for

Amorphous titanate-crosslinking N-rich carbon hybrid with 3D channels for fast lithium storage

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1. Experiments

Amorphous titanate-crosslinking N-rich carbon hybrid was synthesized by a facile one pot method including polymerization and then *in situ* carbonization at 500 and 650 ºC respectively. In a typical route, 0.1 mol of tetrabutyl titanate and 0.5 mol of H_2O were added into 0.4 mol of melamine in consequence with the aid of blender. The mixture was successively annealed under nitrogen at 200 ºC for 1 hour, 500 ºC for 2-5 hours, and 650 ºC for 1-2 hour in order to remove n-butyl alcohol and H_2O, C_3N_4 polymerization, and *in situ* carbonization respectively. The as-obtained

amorphous titanate-crosslinking N-rich carbon hybrid appeared as a black powder.

XRD patterns were performed with a D/MAX2500V diffractometer with Cu-Kα radiation (λ = 1.54056 Å). TEM were obtained with JEOL 2100F. Elemental maps were collected using a JEM 2100F with a HAADF-STEM detector and an Oxford EDS. N_2 adsorption-desorption isotherms were conducted at 77 K on an ASAP2020 analyzer. X-ray photoelectron spectroscopic (XPS, ESCLAB250) measurements were carried out by using a monochromated Al Kα X-ray source at power of 150 W.

Electrochemical tests were performed using two-electrode Swagelok-type cells with lithium serving as both the counter and reference electrodes under room temperature. The working electrode was composed of 80 wt.% of the active material, 10 wt.% of conductivity agent (carbon black, Super-P-Li), and 10 wt.% of binder (polyvinylidene difluoride, PVDF, Aldrich). The electrolyte used was 1 M $LiPF_6$ in a 1:1 (w/w) mixture of ethylene carbonate and diethyl carbonate. Cell assembly was carried out in an Argon-filled glove box. Galvanostatic charge/discharge cycling was conducted using a battery tester (NEWAER) at different current rates of 2.0 – 5.0 A g^{-1}.

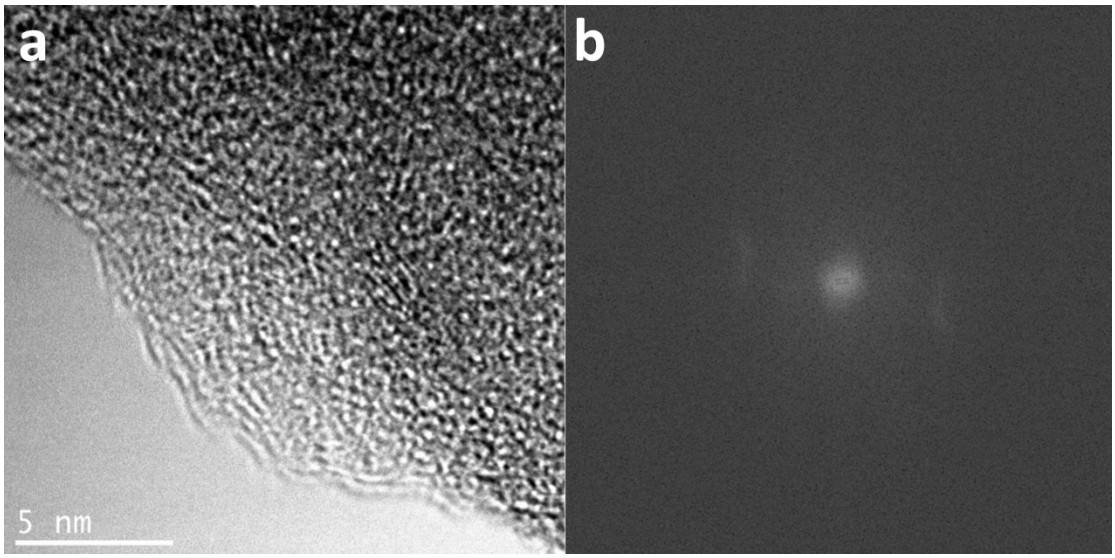

Fig. S1. HRTEM image (a) and its Fast Fourier Transform (FFT) image (b) of amorphous titanate-crosslinking N-rich carbon hybrid.

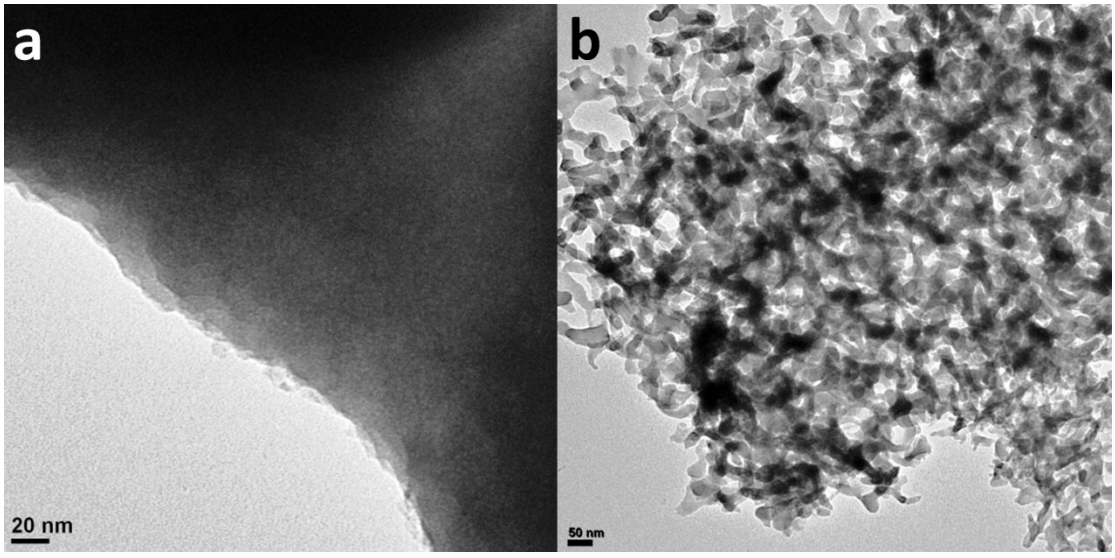

Fig. S2. TEM images of intermediates which annealed at 500 ºC for 2 hours (a) and 650 ºC for 1 hour (b).

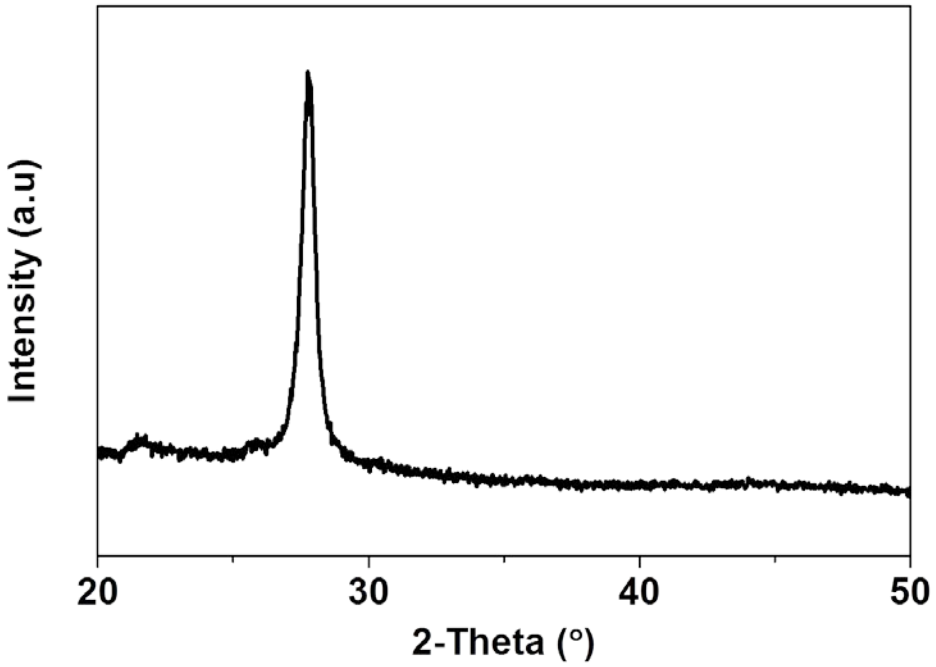

Fig. S3. XRD curve of g-C_3N_4 obtained at 650 ºC for 2 hour.

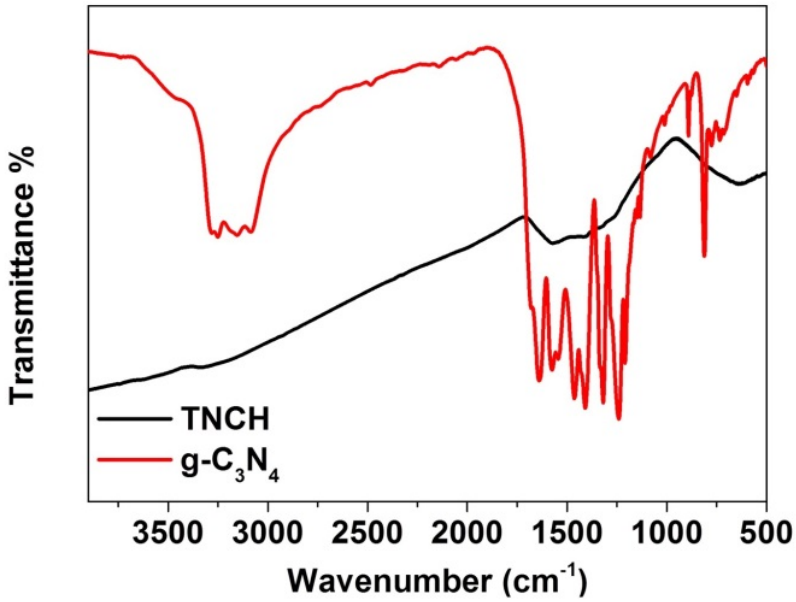

Fig. S4. FTIR spectra of g-C_3N_4 and TNCHs obtained at 650 ºC for 2 hours.

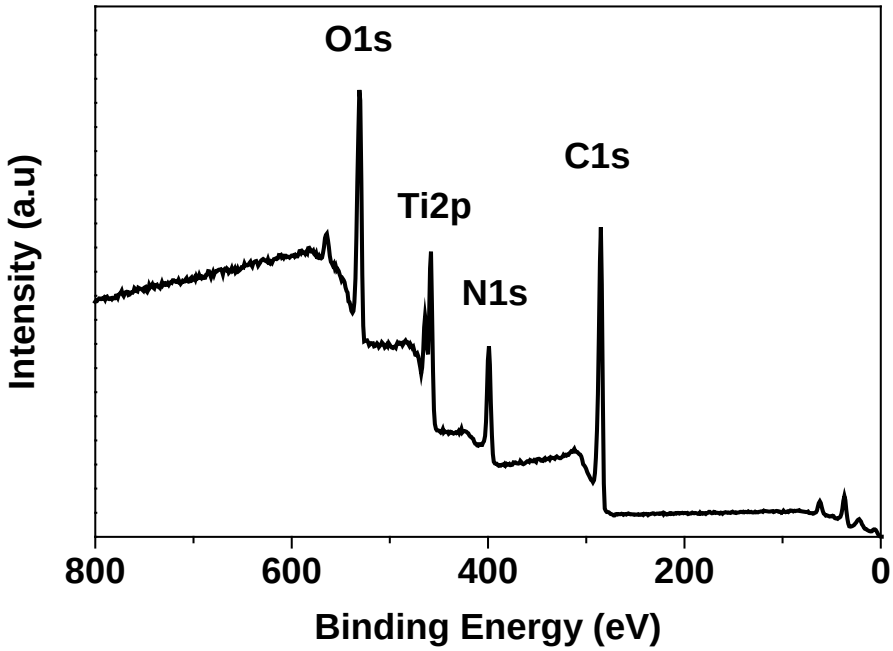

Fig. S5. Full XPS spectrum of amorphous titanate-crosslinking N-rich carbon hybrid.

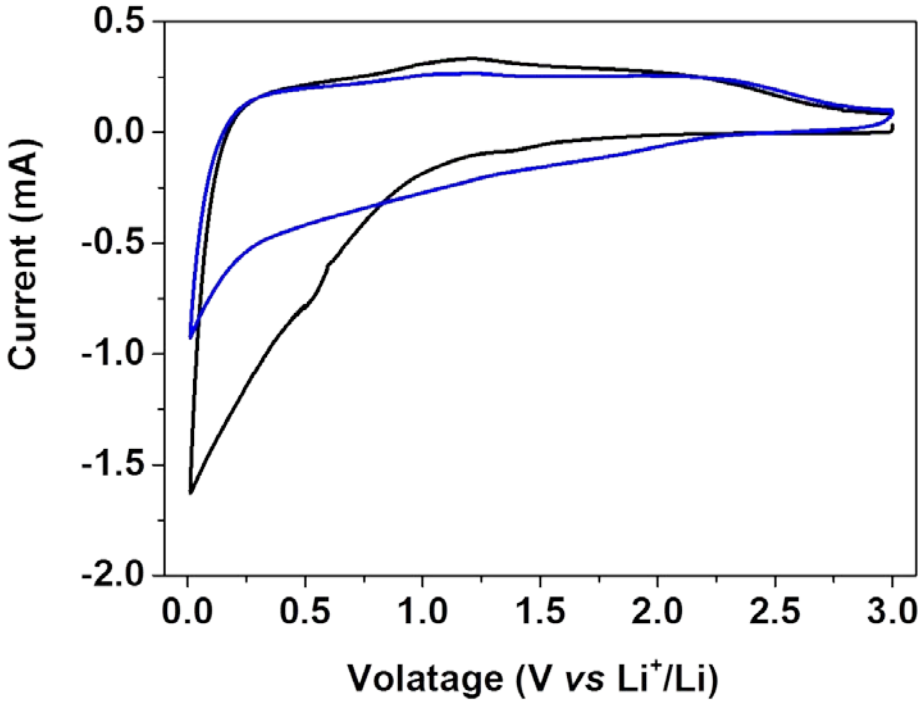

Fig. S6. Cyclic voltammogram of amorphous titanate-crosslinking N-rich carbon hybrid at a scan rate of 0.2 mV s^{-1}.