Supplementary Information

## Non-Layered Ti<sub>2</sub>N Synthesized by Plasma Process for the Anodes of Lithium Ion Batteries

Hsu-Sheng Tsai,<sup>1†\*</sup> Chih-Hao Hsu,<sup>2†</sup> Chi-Chong Chi,<sup>2</sup> Yi-Chung Wang,<sup>2</sup> Fan-Wei Liu,<sup>2</sup> Shin-Yi Tang,<sup>2</sup> Cho-Jen Tsai,<sup>2</sup> Hao Ouyang,<sup>2</sup> Yu-Lun Chueh,<sup>2</sup> Jenq-Horng Liang<sup>3\*</sup>

<sup>1</sup> Institute of Ion Beam Physics and Materials Research, Helmholtz-Zentrum Dresden-Rossendorf, 01328, Dresden, Germany
<sup>2</sup> Department of Material Science and Engineering, National Tsing Hua University, Hsinchu 30013, Taiwan, R.O.C.
<sup>3</sup> Institute of Nuclear Engineering and Science, National Tsing Hua University, Hsinchu 30013, Taiwan, R.O.C.

\*Correspondence to: h.tsai@hzdr.de and jhliang@ess.nthu.edu.tw

## **Estimation of Work Functions**

- $\varphi_d$ : The average difference of work function between Au and the probe.
- $\varphi_{Au}$ : The work function of Au.
- $\varphi_p$ : The work function of the probe.

 $\varphi_m$ : The average difference of work function between Ti<sub>2</sub>N and the probe.

 $\varphi_{Ti_2N}$ : The work function of Ti<sub>2</sub>N

$$\varphi_d = \varphi_p - \varphi_{Au} \tag{S1}$$

$$\varphi_m = \varphi_p - \varphi_{Ti_2N} \tag{S2}$$

The Au is first analyzed by KPFM to obtain the value of  $\varphi_d$ , thus the  $\varphi_d$  can be derived by using Eq. S1 since the  $\varphi_{Au}$  is already known. Then the Ti<sub>2</sub>N samples can be analyzed to acquire the values of  $\varphi_m$ . Finally, the values of  $\varphi_{Ti_2N}$  can be derived by using Eq. S2.



Fig. S1 (a) The cross-sectional TEM image of the  $\varepsilon$ -Ti<sub>2</sub>N obtained by the process with the plasma exposure time of 45 minutes. (b) The cross-sectional TEM image of the  $\varepsilon$ -Ti<sub>2</sub>N obtained by the process with the plasma exposure time of 60 minutes.