Electronic Supplementary Material (ESI) for RSC Advances.

Supporting information

General Fabrication of Mesoporous Nb_2O_5 Nanobelts for Lithium Ion Battery Anode

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The calculation of theoretical capacity of Nb_2O_5:

The electrochemical reaction of Li ions intercalation/deintercalation process can be expressed as follow:[1, 2]

$$xLi^+ + xe^- + Nb_2O_5 \leftrightarrow Li_xNb_2O_5 \qquad (1)$$

The maximum value of x in this formula is 4 according to the typical redox couple of Nb^{5+}/Nb^{3+}.[1,2] Thus, the theoretical capacity for 1 mol Nb_2O_5 can be calculated as follow:[3]

$$1 \text{ mA h} = 3.6 \text{ C} \qquad (2)$$

$$C_{(mAh\,g^{-1})} = n \times F / 3.6 / M_{(Nb2O5)} = 4 \times 96485 / 3.6 / 265.8 = 403.3 \text{ mAh g}^{-1} \qquad (3)$$

Where $C_{(mAh\,g^{-1})}$ is theoretical capacity, F is Faraday's constant, n is the valence charge, and $M_{(Nb_2O_5)}$ is the atomic mass of Nb_2O_5. By calculation, the theoretical capacity should be 403 mAh g^{-1}.

Structural characterization and discussion

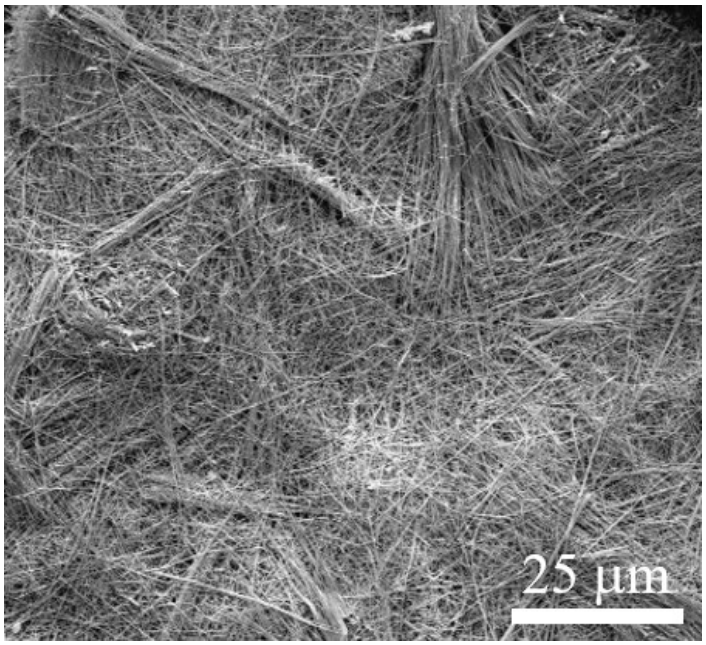

Fig. S1. SEM image of the solid T-Nb_2O_5NBs.

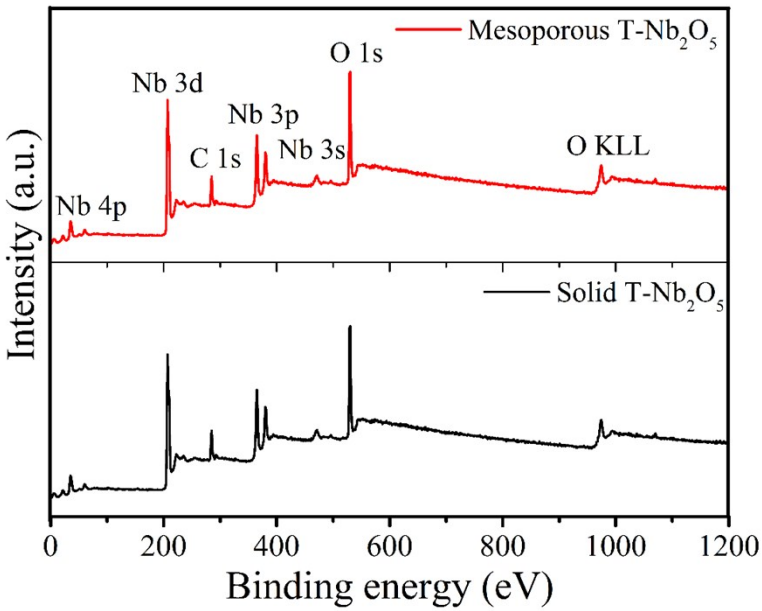

Fig. S2. Full-scan XPS spectra of mesoporous T-Nb_2O_5 and solid T-Nb_2O_5 NBs in the region from10 to 1200 eV.

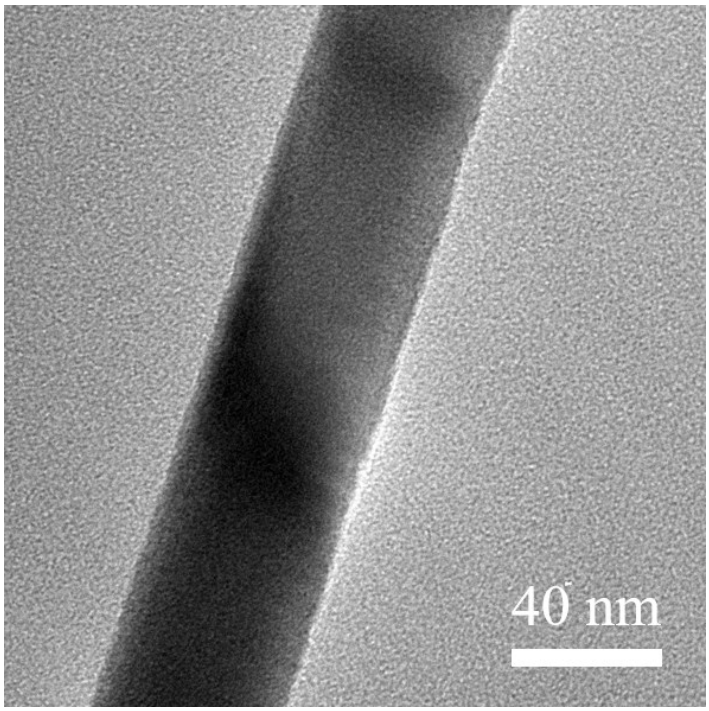

Fig. S3. TEM image of the solid T-Nb_2O_5 NBs.

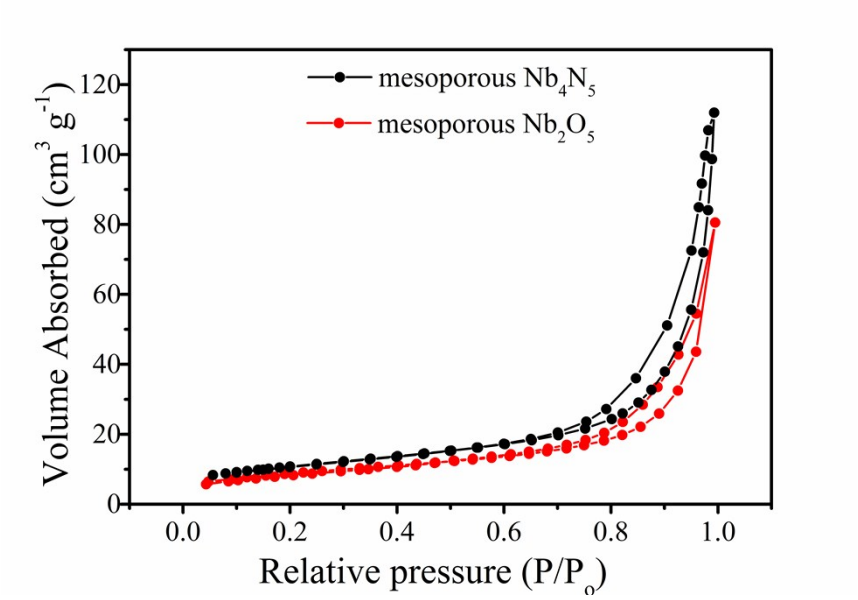

Fig. S4. N_2 adsorption-desorption isotherm of the mesoporous T-Nb_2O_5 NBs and Nb_4N_5 NBs

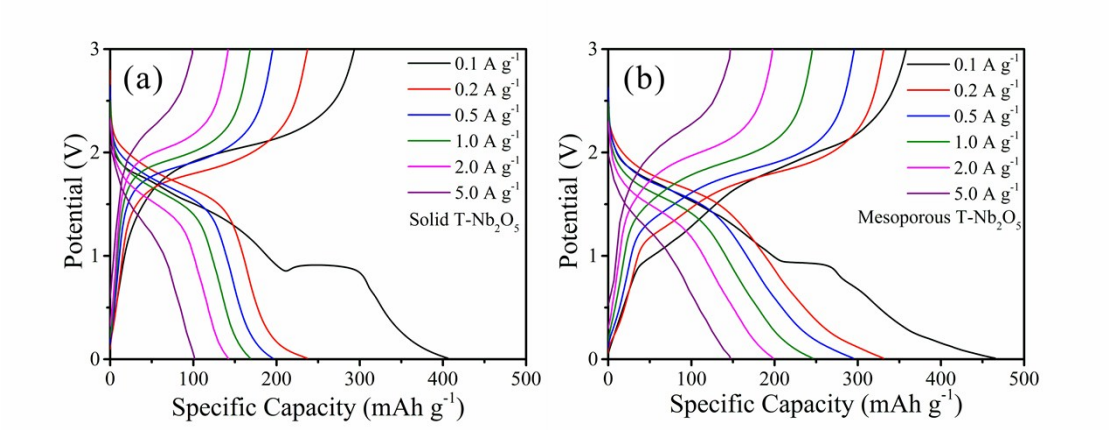

Fig. S5 The GCD curves of the electrodes of (a) solid T-Nb_2O_5 NBs and (b) mesoporous T-Nb_2O_5 NBs at different current densities from 0.1 A g^{-1} to 5.0 A g^{-1}.

References:

1. X. Wang, C. Yan, J. Yan, A. Sumboja and P.S. Lee, *Nano Energy*, 2015, **11**, 765-772.
2. H.Y. Lu, K.X. Xiang, N.B. Bai, W. Zhou, S.L. Wang and H. Chen, *Mater. Lett.*, 2016, **167**, 106-108.
3. J. Chen, L. Xu, W. Li and X. Gou, *Adv. Mate.*, 2005, **17**, 582-586.