Electronic Supplementary Information

Engineering the Surface of Rutile TiO_2 Nanoparticles with Quantum Pits towards Excellent Lithium Storage

Jinglu Huang [a], Fang Fang [a], Guoyong Huang [b], Hongyu Sun [*c], Jing Zhu [a], Rong Yu [*a]

[a] Beijing National Center for Electron Microscopy, School of Materials Science and Engineering, The State Key Laboratory of New Ceramics and Fine Processing, Key Laboratory of Advanced Materials (MOE), Tsinghua University, Beijing 100084, China

[b] Institute of Nuclear and New Energy Technology, Tsinghua University, Beijing 100084, China; School of Metallurgy and Environment, Central South University, Changsha 410083, China

[c] Department of Micro- and Nanotechnology, Technical University of Denmark, 2800 Kongens Lyngby, Denmark

[*]Corresponding authors.
E-mail address: hsun@nanotech.dtu.dk (H. Sun); ryu@tsinghua.edu.cn (R. Yu)

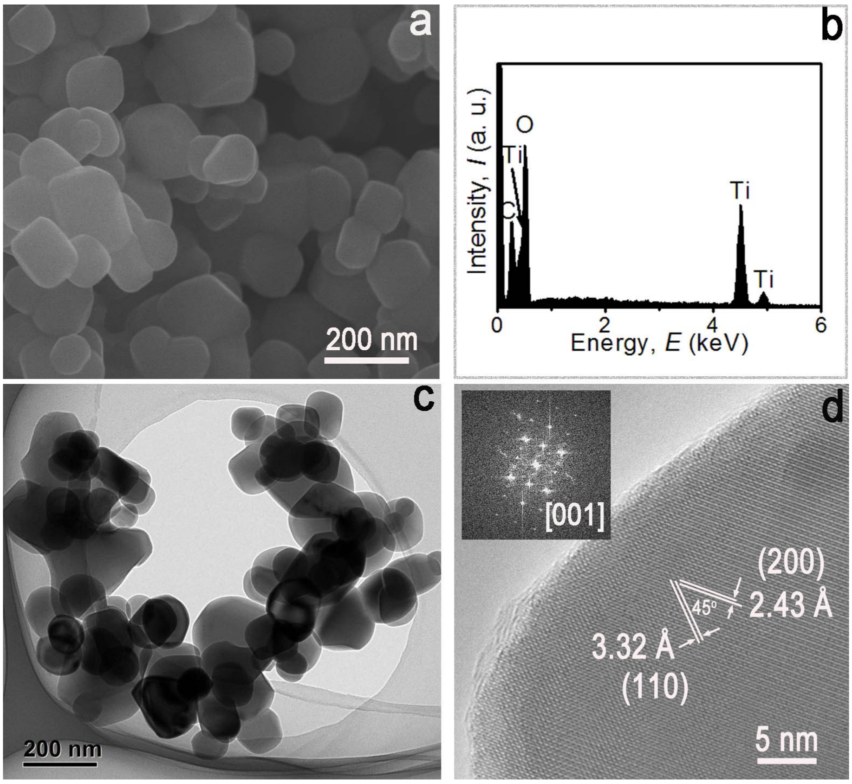

Fig. S1 (a) FESEM image, (b) EDX spectrum, (c) TEM image and (d) HRTEM image of the $rTiO_2$ NPs. The inset in (d) shows corresponding fast Fourier transform pattern. It can be clearly seen that the particle surface is smooth and there are no obvious pits on each $rTiO_2$ nanoparticle.

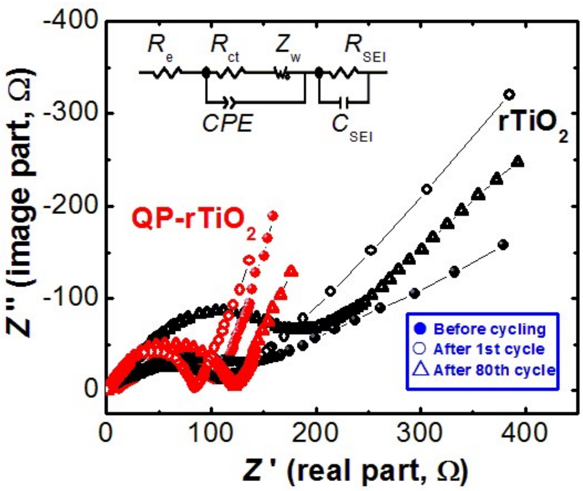

Fig. S2 Nyquist plots of the QP-rTiO_2 (red lines) and rTiO_2 (black lines) electrodes before testing, after 1st, and 80th cycle measured with an amplitude of 5 mV over the frequency range of 100 kHz and 0.01 Hz. The inset shows the equivalent electrical circuit. R_e is the electrolyte resistance, R_{ct} is the charge-transfer resistance, Z_w is the Warburg impedance related to the diffusion of Li ions into the bulk electrodes, *CPE* is the constant phase-angle element, R_{SEI} and C_{SEI} are the pseudocapacitance and resistance of SEI film, respectively.

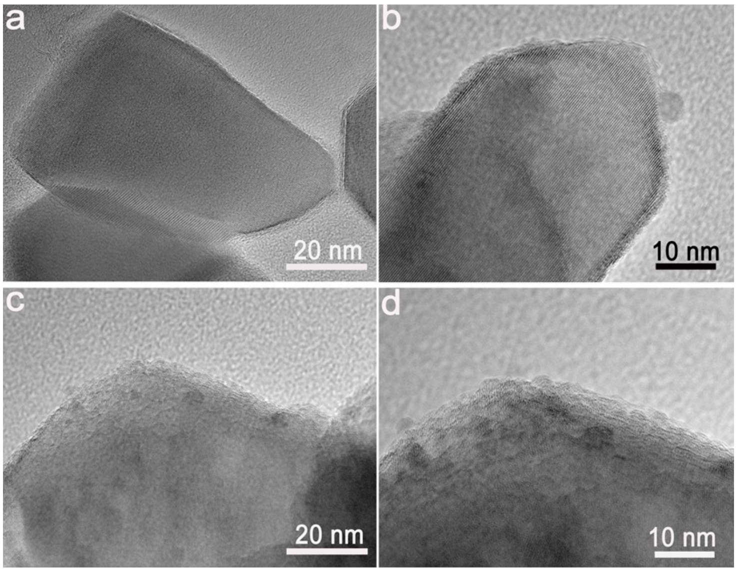

Fig. S3 TEM images of the (a, b) $rTiO_2$ and (c, d) QP-$rTiO_2$ electrodes after cycling performance testing (80 cycles, current rate 0.5 C, 1.0-3.0 V versus Li/Li^+).

Table S1 Performance comparison of some LIB anode materials based on typical rutile TiO_2 ($rTiO_2$) nanostructures

material	reversible capacity(cycles) /mAh g^{-1}	rate capability /mAh g^{-1}	voltage window /V (vs. Li^+/Li)	Ref
$rTiO_2$ nanoparticles	160 (50) @0.025 C	100 @5C	1.0 – 3.0	1
$rTiO_2$ nanoparticles	125 (100) @5C	——	1.0 – 3.0	2
	130 (100) @5C	——	0.1 – 3.0	2
$rTiO_2$ nanoparticles	186 (50) @0.25 C	125 @5C	1.0 – 3.0	3
$rTiO_2$ submicroboxes	141 (500) @2.5C	115 @5C	1.0 – 3.0	4
$rTiO_2$ necklace nanostructures	55.2 (50) @0.1 C	20 @5C	1.0 – 3.0	5
$rTiO_2$ sub-microflowers	150 (100) @0.5 C	50 @2.5C	1.0 – 3.0	6
dandelion-like $rTiO_2$ superstructures	242 @0.2C	170 @5C	1.0 – 2.5	7
boron-doped $rTiO_2$ submicrospheres	190 (500) @1 C	94 @5C	1.0 – 3.0	8
$r(Ti,Sn)O_2$ nanorods	217 (50) @0.09 C	75 @4.5C	0.1 – 3.0	9
$rTiO_2$/C nanoparticles	147 (50) @0.25 C	40 @5C	1.0 – 3.0	3
$rTiO_2$ mesocrystals/reduced graphene oxide	150 (1000) @20C	139.6 @40C	1.0 – 3.0	10
$rTiO_2$/graphene sheet composites	160 (100) @0.5C	118 @5C	1.0 – 3.0	11
$rTiO_2$ NPs	70 (80) @0.5 C	50 @5C	1.0 – 3.0	12
QP-$rTiO_2$ NPs	142 (80) @0.5 C	101 @5C	1.0 – 3.0	12

1 C = 335 mAg^{-1}.

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