

## Electronic Supplementary Information

### Nanostructured NiO electrode for high rate Li-ion batteries

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### Experiments details

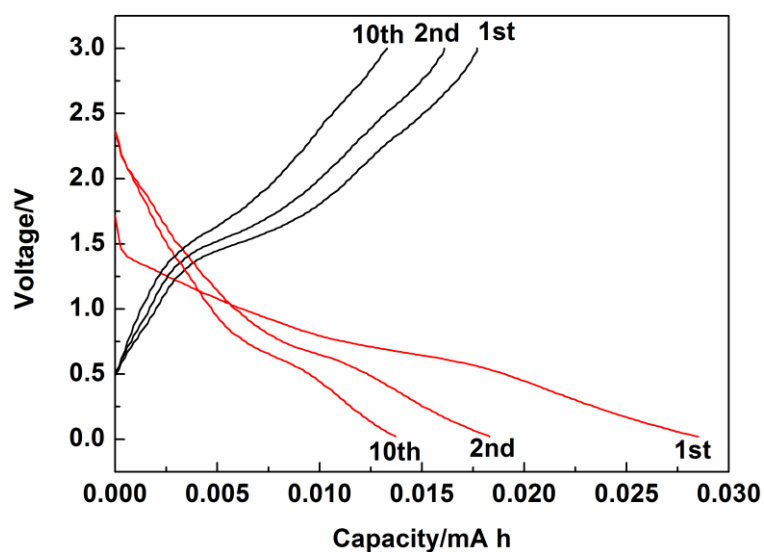
**Fabrication procedure:** Nanostructured NiO electrodes were fabricated by a direct thermal oxidation of Ni foams in air. The Ni foams (100 PPI pore size, 380 g m<sup>-2</sup> surface density, and 1.5 mm thick) were purchased from Changsha Lyrun New Material Co. Ltd., China. In a typical procedure, Ni foams were first sonicated in high purity ethanol for 30 minutes and dried in a vacuum oven at 60 °C for 3 h. Then the pretreated Ni foams were heated at a rate of 25 °C min<sup>-1</sup> to 400 °C and held for 1 h by a tube furnace. The mass of Ni foams before and after oxidation were weighed by a microbalance (Mettler, XS105DU) with an accuracy of 0.01 mg. According to the reaction of  $2\text{Ni} + \text{O}_2 = 2\text{NiO}$ , the active weights of NiO ( $m_{\text{NiO}}$ ) are derived from  $m_{\text{NiO}} = \Delta m \times 74.69/16$ , where  $\Delta m$  is the weight difference of Ni foam before and after oxidation reaction.

**Structural Characterization:** The structure and morphology of the NiO electrodes were characterized by X-ray powder diffraction (XRD, Rigaku D/Max-2400 with Cu K $\alpha$  radiation) and field-emission scanning electron microscopy (FE-SEM S-4800, Hitachi).

**Electrochemical Characterization:** Electrochemical characterizations were carried out using

the CR-2032-type coin cells, which were assembled in a high purity argon filled glove box ( $\text{H}_2\text{O} < 0.5$  ppm,  $\text{O}_2 < 0.5$  ppm, MBraun, Unilab, Germany) by using the NiO electrodes as the working electrode and lithium foil as the counter and reference electrodes. Celgard 2320 was used as the separator membrane. The electrolyte was 1 M lithium hexafluorophosphate ( $\text{LiPF}_6$ ) dissolved in ethylene carbonate : dimethyl carbonate : ethyl methyl carbonate in a 1:1:1 volume ratio. The galvanostatic discharge-charge cycling and cyclic voltammetry were carried out at room temperature by using a multichannel battery tester (Neware BTS-610) and an electrochemical workstation (CHI 660C), respectively.

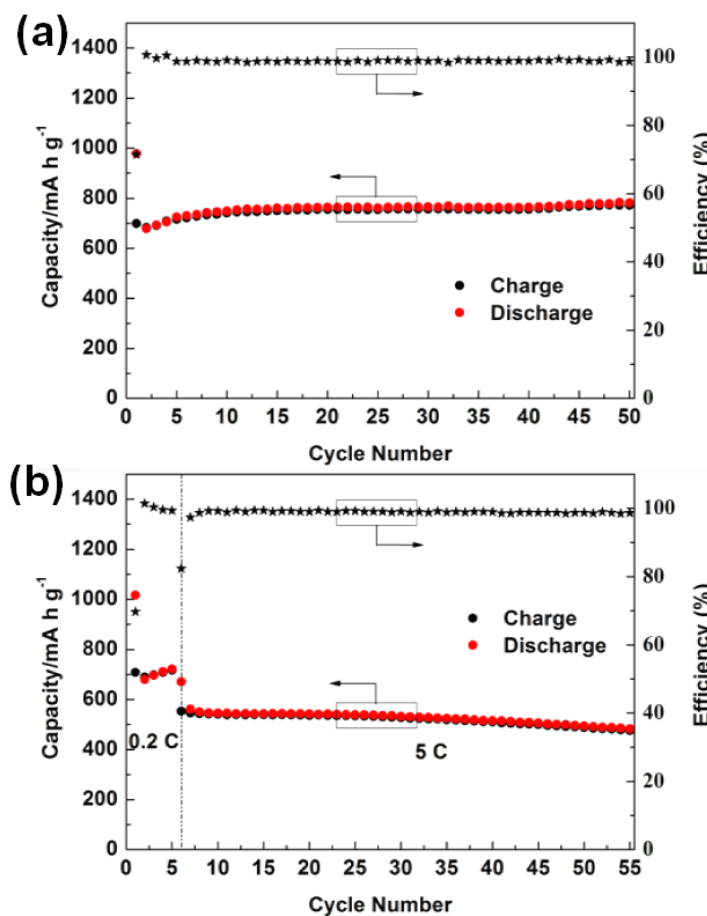
### Capacity correction



**Figure S1.** Galvanostatic discharge/charge curves of Ni foam before oxidation.

Figure S1 shows the representative galvanostatic discharge/charge curves of Ni foam before oxidation at a current density of  $0.1 \text{ mA cm}^{-2}$  between 0.02 and 3.0 V. The first charge capacity of the Ni foam without oxidation (0.0177 mA h) was deducted from the capacities of the oxidized Ni foam.

### Cycling stability of the nanostructured NiO electrode



**Figure S2.** Cycling stability and coulombic efficiency of the nanostructured NiO electrode at 0.2 C (a) and 5 C (b).

Cycling stability and coulombic efficiency of the nanostructured NiO electrode at 0.2 C and 5 C are shown in Figures S2 (a) and (b), respectively. At the low rate of 0.2 C, a reversible capacity of 679 mA h g<sup>-1</sup> was achieved in the 2nd cycle, which gradually increased to about 783 mA h g<sup>-1</sup> after 50 cycles, whereas the coulombic efficiency steadily kept the values higher than 98.5%. After the first five cycles at the low rate of 0.2 C, with an increase of the rate to 5 C, the electrode can deliver a capacity of 561 mA h g<sup>-1</sup> in the initial cycle and retain a capacity of 482 mA h g<sup>-1</sup> after 50 cycles.