Electronic Supplementary Information

**TiO$_2$ Nanobundles on Reduced Graphene Oxides as Anode Materials with High-Rate Performance for Li Ion Batteries**

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**Experimental**

**Preparation of GO Nanosheets**

All the reagents are of analytic grade and were used without any purification. GO nanosheets were synthesized via the oxidation of graphite using the improved Hummers’ method. In detail, graphite powder (2.0 g) was dispersed into 100 ml cooled (0°C) H$_2$SO$_4$ (98%), followed by slow addition of KMnO$_4$ (6.0 g) under vigorous agitation. Then, the resultant solution was continually stirred at 35 °C for 3 days. Afterwards, 200 ml distilled water was added and kept at 98 °C for 2 h. When cooled to 60 °C, 10 ml H$_2$O$_2$ (30%) was injected into the suspension to completely react with the excess KMnO$_4$, and a bright yellow mixture was obtained. The suspension was centrifuged and washed with HCl (30%) and distilled water until the pH value was ~7. The precipitate was collected and stored for further use.

**Preparation of TiO$_2$/RGO Composites**

The TiO$_2$/RGO composites were synthesized by two steps of hydrothermal treatments. Briefly,
0.3g of Li₂SO₄•H₂O was re-dispersed in 25 mL of deionized water and 10 mL of concentrated HCl (37.5%). Then, 2 ml of TBT (1g/mL) as precursor of TiO₂ and 2 ml as-prepared GO (10 g/L) was gradually added into the mixed solution, followed by vigorous agitation for 1 h. The mixture was transferred into a 50 ml Teflon-sealed autoclave and maintained at 150 °C for 6 h. After the hydrothermally treated solution was cooled to room temperature, 0.5 g ascorbic acid was added under agitation and kept heating at 150 °C for another 4 h. The obtained products were centrifuged and washed with deionized water and ethanol at least 5 times separately, and dried at 80 °C overnight for further characterization. As references, pure RGO and TiO₂ were prepared under similar conditions but without Li₂SO₄•H₂O and TBT or GO, respectively.

**Materials Characterization**

The obtained samples were characterized by XRD (Rigaku D/Max III diffractometer with Cu K radiation, λ= 1.5418 Å), SEM (FEI Nanosem 430), HRTEM (FEI Tecnai G2F-20), and AFM (MMAFM/STM, D3100M, Digital Ltd.)

**Electrochemical Measurements**

For electrochemical tests, the working electrodes were comprised of active materials, acetylene black (AB), and polytetrafluoroethylene (PTFE) at the weight ratio of 80 : 10 : 10. The average weight of the electrodes was ~2 mg. In the test cells, lithium metal was used as the counter and reference electrode. The electrolyte was 1M LiPF₆ dissolved in a 1 : 1 : 1 mixture of ethylene carbonate (EC), ethylene methyl carbonate (EMC) and dimethyl carbonate (DMC). The cells were assembled in a glove box filled with high-purity argon. Discharge/charge tests of the cells were performed between 0.01-3.0 V (vs. Li/Li⁺) under a LAND-CT2001A instrument at room temperature. CV tests were performed at different scanning rates from 0.5 to 5 mV s⁻¹ between 0.01-3.0 V (vs. Li/Li⁺) after the initial 4 charge/discharge cycles. EIS was taken by using an IM6e electrochemical workstation at 25 °C with the frequency range from 10 kHz to 100 mHz and an AC signal of 5 mV in amplitude as the perturbation. The specific capacity was calculated according to the corresponding total weight of active materials in each electrode.
Figure S1. AFM images of GO nanosheets prepared through a modified Hummers’ method.

Figure S2. SEM characterization of products obtained at various reaction stages: 2h, 4h, 6h and 10h. (a) 2h of solvothermal reaction, most of the obtained products are regular clusters which had a larger size. (b) 4h of solvothermal reaction, most of the obtained products are regular clusters which had a smaller size on GO. (c) 6h of solvothermal reaction, the obtained products were more uniform. (d) Ascorbic acid (AA) was added and kept heating for 4 h, the obtained products grown into nanowires clusters.

Figure S3. XRD patterns of products obtained at various reaction stages: 2h, 4h, 6h and 10h.
Figure S4. Discharge/charge profiles of pure TiO$_2$ (a and b), cycling performance of pure TiO$_2$ (c and d) at 0.6 and 1.2 C.

Figure S5. CV curves of TiO$_2$/RGO composites at different scanning rates after the initial five cycles. Inset: the linear relationship between the peak current densities and scanning rates (in the cathodic process).