Asymmetric Anatase TiO_2 Nanocrystals with Exposed High-index Facets and Their Excellent Lithium Storage Properties

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Experimental Section

The organic solvent used in this work was prepared by mixing acetic acid (HAc; Merck, 100%) and N, N-dimethylformamide (DMF; Alfa Aesar, 99%) with a molar ratio (HAc:DMF) of 1:1.1. In a typical synthesis, 0.5 mL of titanium butoxide (TB; Fluka, ≥ 97%) was added to 20 mL of the mixed solvent. The solution was then transferred to a Teflon-lined stainless steel autoclave, and heated in an oven at 200 ^{o}C for 2 – 24 h. Finally, the product was collected by centrifugation, washed thoroughly with ethanol and dried at 60 ^{o}C overnight.

Field-emission scanning electron microscopy (FESEM, JEOL, JSM-7600F, 5 kV) was used for morphology characterization. The morphology and structure of samples were further characterized by transmission electron microscopy (TEM) and high resolution transmission electron microscopy (HRTEM, JEOL, JEM-2010, 200 kV). The crystallographic information was collected by powder X-ray diffraction (XRD; Bruker, D8 Advance X-ray diffractometer, Cu Kα radiation, λ=1.5406 Å). The nitrogen adsorption-desorption isotherm was measured using a Micromeritics ASAP 2020 sorptometer.

Two-electrode Swagelok cells were used for electrochemical measurements. The working electrode was prepared by mixing the active material (dendalion-like TiO_2), conductive agent (carbon black, Super-P-Li),

and polymer binder [poly (vinylidene difluoride), PVDF, Aldrich] in a weight ratio of around 70:20:10. Half-cells were assembled in an Ar-filled glovebox, with lithium foil as both the counter and reference electrodes. The electrolyte was a solution of 1.0 M $LiPF_6$ in ethylene carbonate and diethyl carbonate (w/w=1:1). The charge/discharge measurements were performed in a voltage window of 1.0 – 3.0 V at a current density of 0.5 C (here 1 C = 170 mA g^{-1}) using a NEWARE battery tester.

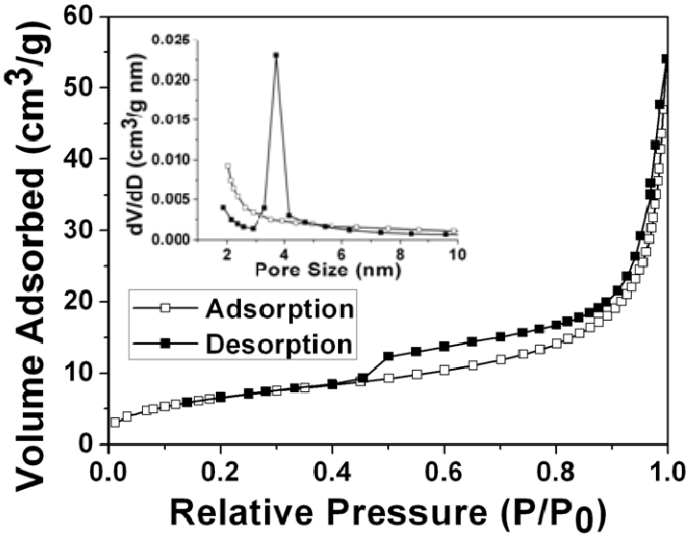

Figure S1. Nitrogen adsorption and desorption isotherm of dandelion-like TiO_2 at 77K (inset: pore-size distributions calculated by the BJH method).

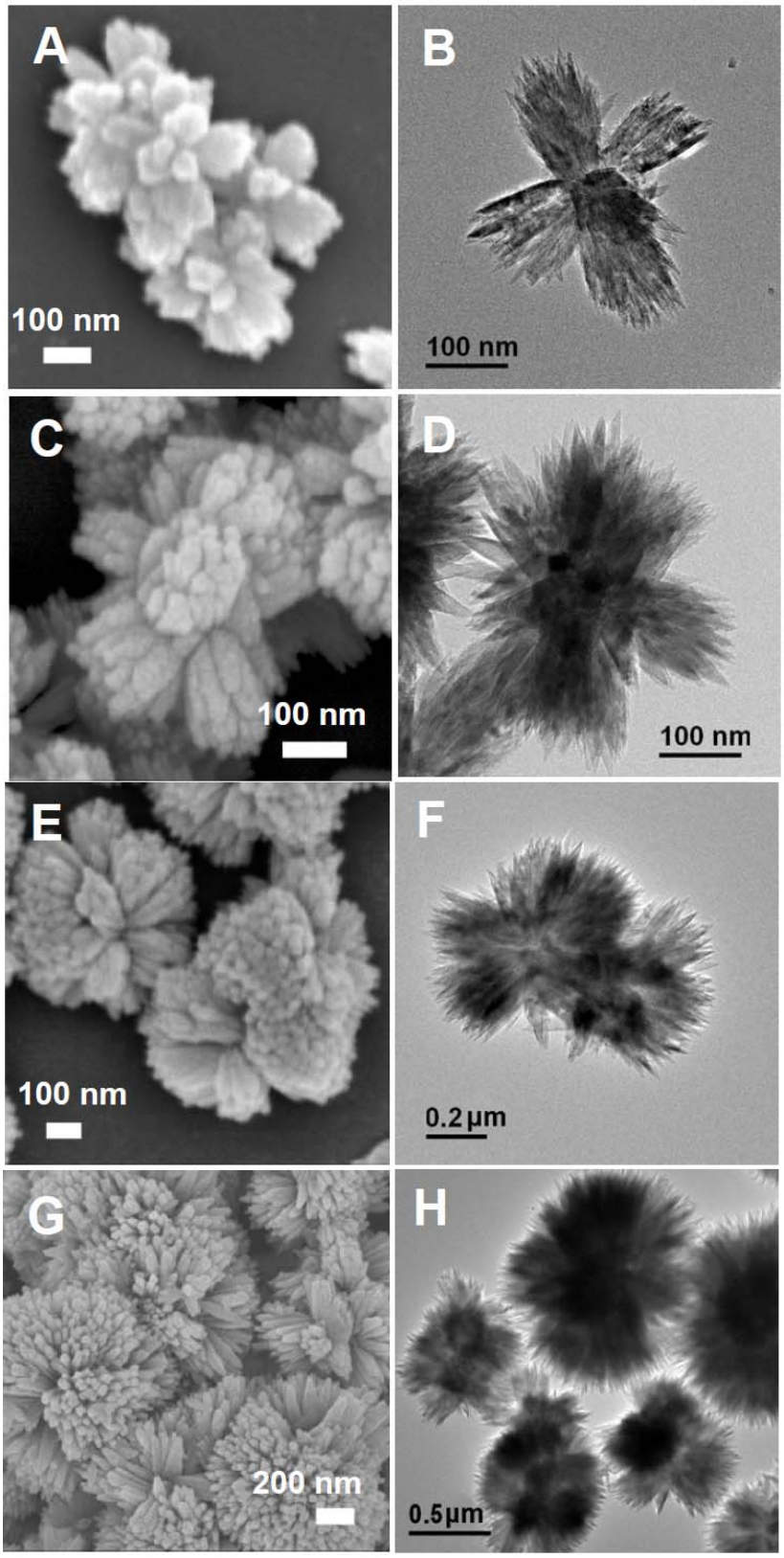

Figure S2. FESEM and TEM images of dandelion-like TiO_2 with different reaction durations: (A, B) 3h, (C, D) 4h, (E, F) 6h, and (G, H) 10h.

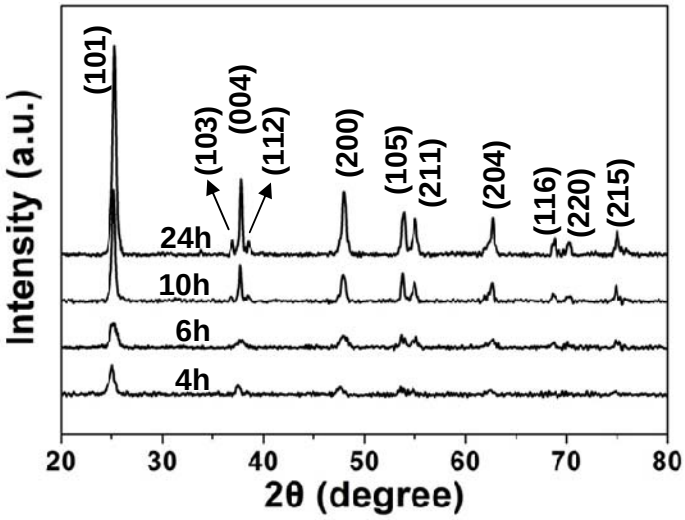

Figure S3. XRD patterns of dandelion-like TiO_2 with different reaction time.

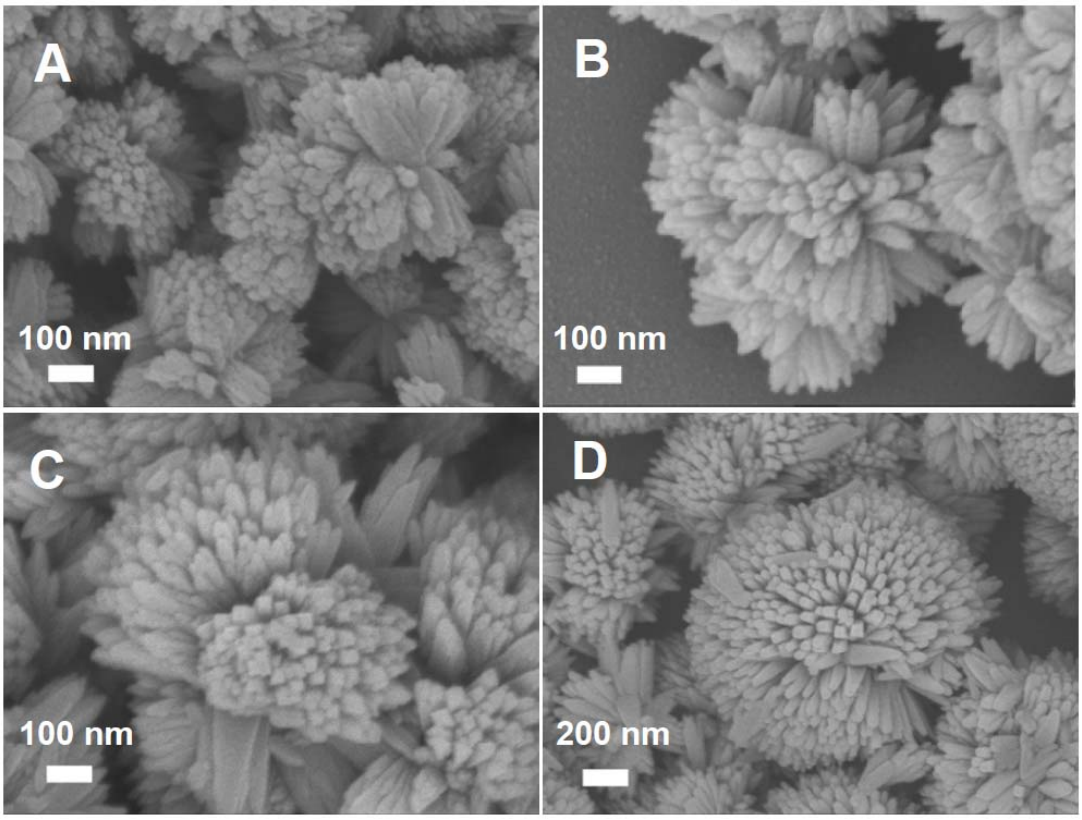

Figure S4. FESEM images of dandelion-like TiO_2 with different temperatures and reaction durations: 180°C for (A) 10h, (B) 24h, (C) 5d, and (D) 220°C for 10h.

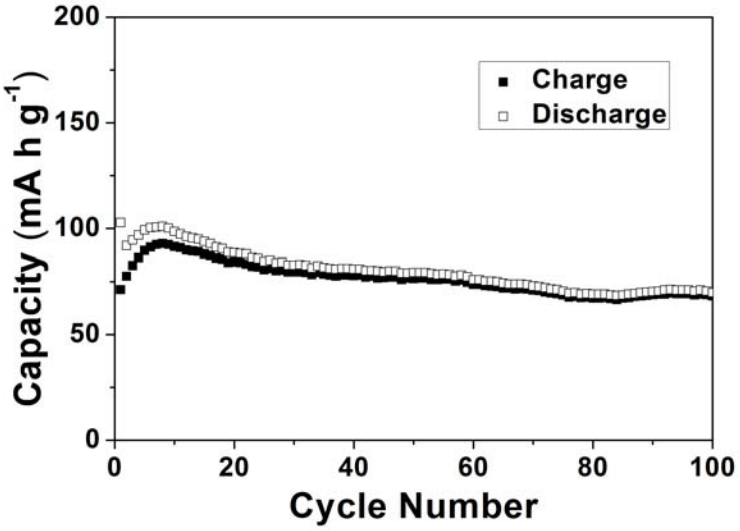

Figure S5. Cycling performance of the dandelion-like TiO_2 at current rate of 5 C.