Electronic Supplementary Information (ESI) for

# Synthesis of phase-pure $SnO_2$ nanosheets with different organized structures and their lithium storage properties

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## Experimental Section

*Materials Synthesis*. In a typical synthesis, 0.22 g of ammonium fluoride ($NH_4F$, Sigma-Aldrich) was dissolved in 50 mL of de-ionized water, followed by the addition of 0.45 g of tin(II) chloride dihydrate ($SnCl_2{\cdot}2H_2O$, Simga-Aldrich). The solution was then transferred into an 80 mL Teflon-lined stainless steel autoclave, and kept at 200 $^oC$ for 20 h. The autoclave was then taken out and cooled down to room temperature. The yellow-green precipitate was collected by centrifugation and washed thoroughly with water, before being dried at 60 $^oC$ overnight. The synthesis of the other sample is very similar, except that 0.5 g of Polyvinylpyrrolidone (PVP; Sigma-Aldrich, MW ~1,300,000) was added and the temperature is lowered to 170 $^oC$.

*Materials Characterization*. The morphology of products was examined by transmission electron microscope (TEM; JEOL, JEM-2100F, 200 kV, with electron diffraction), field-emission scanning electron microscope (FESEM; JEOL, JSM-6700F, 5 kV). Crystallographic information of the samples was investigated with X-ray powder diffraction (XRD; Bruker, D8 - Advance X-Ray Diffractometer, Cu K$\alpha$, $\lambda$ = 1.5406 Å).

*Electrochemical Measurement*. The electrochemical measurements were carried out using two-electrode Swagelok-type cells (X2 Labwares, Singapore) with pure lithium metal as both the counter and the reference electrodes at room temperature. The working electrode consisted of active material (e.g., $SnO_2$ nanosheets), a conductive agent (carbon black, Super-P), and a polymer binder (poly(vinylidene difluoride), PVDF, Aldrich) in a 70:20:10 weight ratio. The electrolyte used was 1.0 M $LiPF_6$ in a 50:50 (w/w) mixture of ethylene carbonate and diethyl carbonate. Cell assembly was carried out in an Ar-filled glovebox with concentrations of moisture and oxygen below 1.0 ppm. Cyclic voltammetry was performed using an electrochemical workstation (CHI 660C). The charge/discharge tests were performed using a NEWARE battery tester with a voltage window of 0.01–1.2 V at a current density of 400 mA $g^{-1}$.

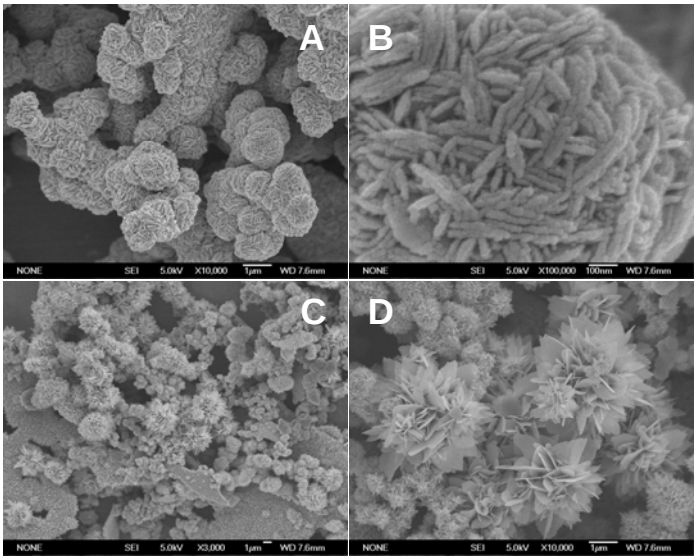


**Figure S1**. FESEM images of $SnO_2$ NSs prepared with different amounts of $SnCl_2{\cdot}2H_2O$ while other conditions remained unchanged: (A, B) 0.30 g, (C, D) 0.5 g.

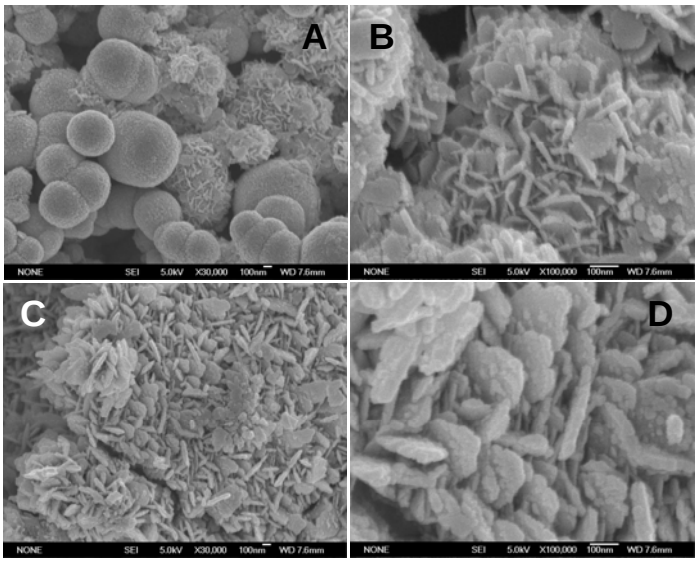


**Figure S2**. FESEM images of $SnO_2$ nanosheets prepared with different amounts of $NH_4F$ while other conditions remained unchanged: (A, B) 0.15 g, (C, D) 0.3 g.

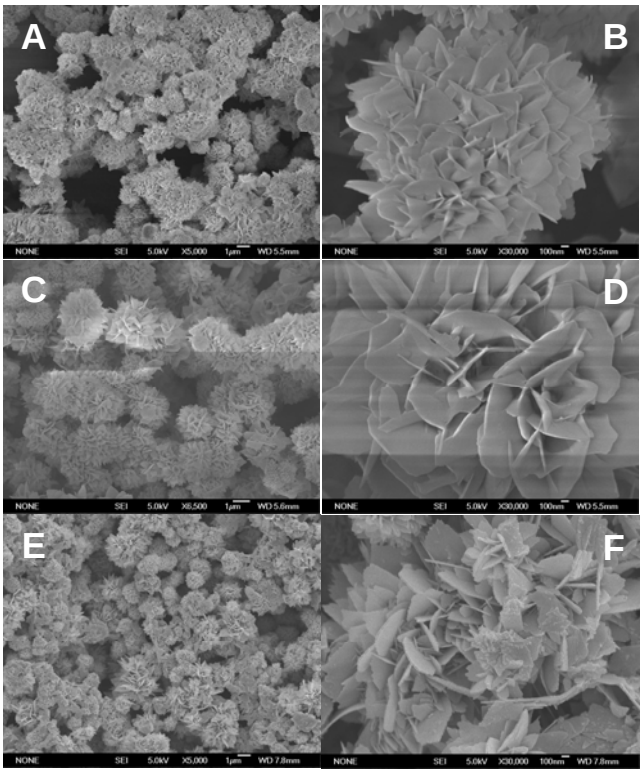


**Figure S3**. FESEM images of $SnO_2$ nanosheets prepared with different reaction durations while other conditions remained unchanged: (A, B) 5 h, (C, D) 10 h, (E, F) 30 h.

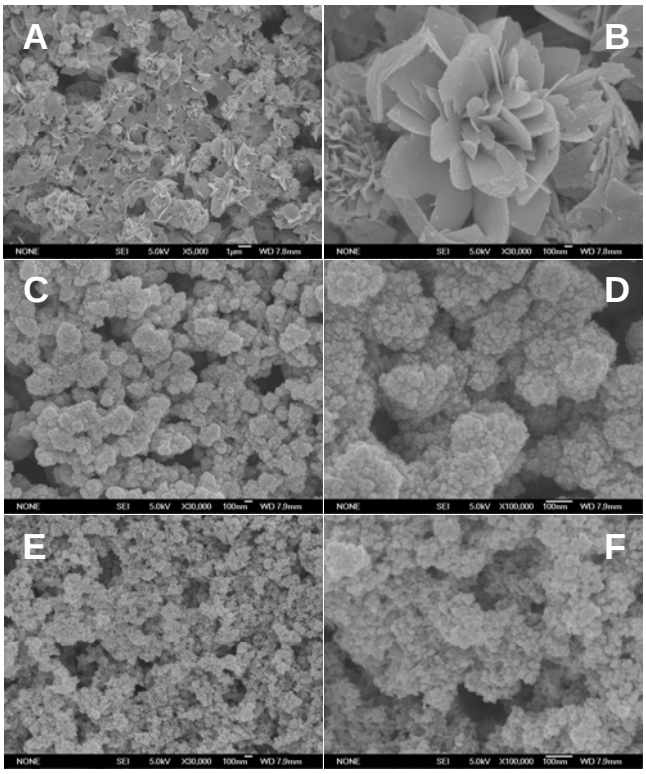


**Figure S4**. FESEM images of $SnO_2$ nanosheets prepared with different tin precursors while the concentrations of Sn and F ions, as well as other conditions remained unchanged: (A, B) $SnF_2$, (C, D) $SnCl_4$, (E, F) $K_2SnO_3 \cdot 3H_2O$.

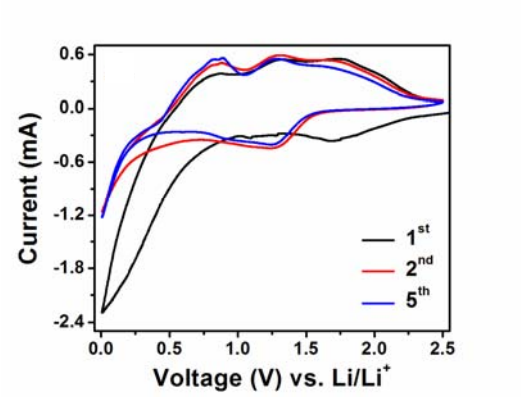


**Figure S5**. CV curves of $SnO_2$ NSs prepared without PVP.