Supporting Information

A Generalized Strategy for Synthesis of Two-Dimensional Metal Oxide Nanosheets based on Thermoregulated Phase Transition

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Experimental Section

Synthesis of 2D Mn_3O_4 nanosheets: Manganese(II) acetate tetrahydrate (0.98 g) and 50 μL Acetic acid were added into 7.5 mL deionized water to form a clear solution with stirring. 1.875 g Pluronic P123 was dissolved in the solution under 10 °C. After the solution was stood at 50 °C for 2 hours, 1 mL Ethylenediamine was added into the solution under shaking for 1 minutes. Then, the solution was stood at 70 °C for 10 hours. The brown precipitate was collected by centrifugation, washed in deionized water and ethanol several times and dried at 80 °C.

Synthesis of 2D Fe_2O_3 nanosheets: Iron(III) chloride hexahydrate (1.08 g) was added into 7.5 mL deionized water to form a clear solution with stirring. 1.875 g Pluronic P123 was dissolved in the solution under 10 °C. After the solution was stood at 50 °C for 2 hours, 3 mL Ethylenediamine was added into the solution under shaking for 1 minutes. Then, the solution was stood at 80 °C for 24 hours. The rufous precipitate was collected by centrifugation, washed in deionized water and ethanol several times and dried at 80 °C.

Synthesis of 2D Co_3O_4 nanosheets: Cobalt(II) acetate tetrahydrate (0.996 g) was added into 7.5 mL deionized water to form a clear solution with stirring. 1.875 g Pluronic P123 was dissolved in the solution under 10 °C. After the solution was stood at 50 °C for 2 hours, 1.5 mL Ammonium hydroxide solution was added into the solution under shaking for 1 minutes.

Then, the solution was stood at 70 °C for 10 hours. The black precipitate was collected by centrifugation, washed in deionized water and ethanol several times and dehydrated at 250 °C.

Synthesis of 2D NiO nanosheets: Nickel(II) chloride hexahydrate (0.95 g) was added into 7.5 mL deionized water to form a clear solution with stirring. 1.875 g Pluronic P123 was dissolved in the solution under 10 °C. After the solution was stood at 50 °C for 2 hours, 1.2 mL Ammonium hydroxide solution was added into the solution under shaking for 1 minutes. Then, the solution was stood at 50 °C for 10 hours. The prasinous precipitate was collected by centrifugation, washed in deionized water and ethanol several times and dried at 80 °C.

Synthesis of 2D CuO nanosheets: Copper(II) acetate monohydrate (0.1-0.2 g) was added into 7.5 mL deionized water to form a clear solution with stirring. 1.875 g Pluronic P123 was dissolved in the solution under 10 °C. After the solution was stood at 50 °C for 2 hours, 50 μL Ammonium hydroxide solution was added into the solution under shaking for 1 minutes. Then, the solution was stood at 70 °C for 10 hours. The black precipitate was collected by centrifugation, washed in deionized water and ethanol several times and dehydrated at 200 °C.

Synthesis of 2D ZnO nanosheets: Zinc(II) acetate monohydrate (0.878 g) was added into 7.5 mL deionized water to form a clear solution with stirring. 1.875 g Pluronic P123 was dissolved in the solution under 10 °C. After the solution was stood at 50 °C for 2 hours, 300 μL Ethylenediamine solution was added into the solution under shaking for 1 minutes. Then, the solution was stood at 80 °C for 48-72 hours. The white precipitate was collected by centrifugation, washed in deionized water and ethanol several times and dried at 70 °C.

Synthesis of 2D SnO_2 nanosheets: Tin(II) chloride dihydrate (0.226 g) was added into the mixed solution of 5.625 mL deionized water and 1.6 mL Hydrochloric acid to form a clear solution with stirring. 1.875 g Pluronic P123 was dissolved in the solution under 10 °C. After the solution was stood at 50 °C for 2 hours, 3.5 mL Ammonium hydroxide solution was added into the solution under shaking for 1 minutes. Then, the solution was stood at 80 °C for 10 hours. The white precipitate was collected by centrifugation, washed in deionized water. Then,

the white precipitate was redispersed in 50 mL deionized water by ultrasonication. After the solution was stood at room temperature for 0.5 hours, the bottom precipitate was collected. The SnO2 nanosheets were obtained by annealing at 500 °C in air for 2 h with a heating rate of 2 °C min.

Synthesis of 2D Sb_2O_3 nanosheets: Antimony(III) chloride (0.35 g) was added into the mixed solution of 5.625 mL deionized water and 1.6 mL Hydrochloric acid to form a clear solution with stirring. 1.875 g Pluronic P123 was dissolved in the solution under 10 °C. After the solution was stood at 50 °C for 2 hours, 3.5 mL Ammonium hydroxide solution was added into the solution under shaking for 1 minutes. Then, the solution was stood at 80 °C for 10 hours. The white precipitate was collected by centrifugation, washed in deionized water. The white precipitate was collected by centrifugation, washed in deionized water and ethanol several times and dried at 80 °C.

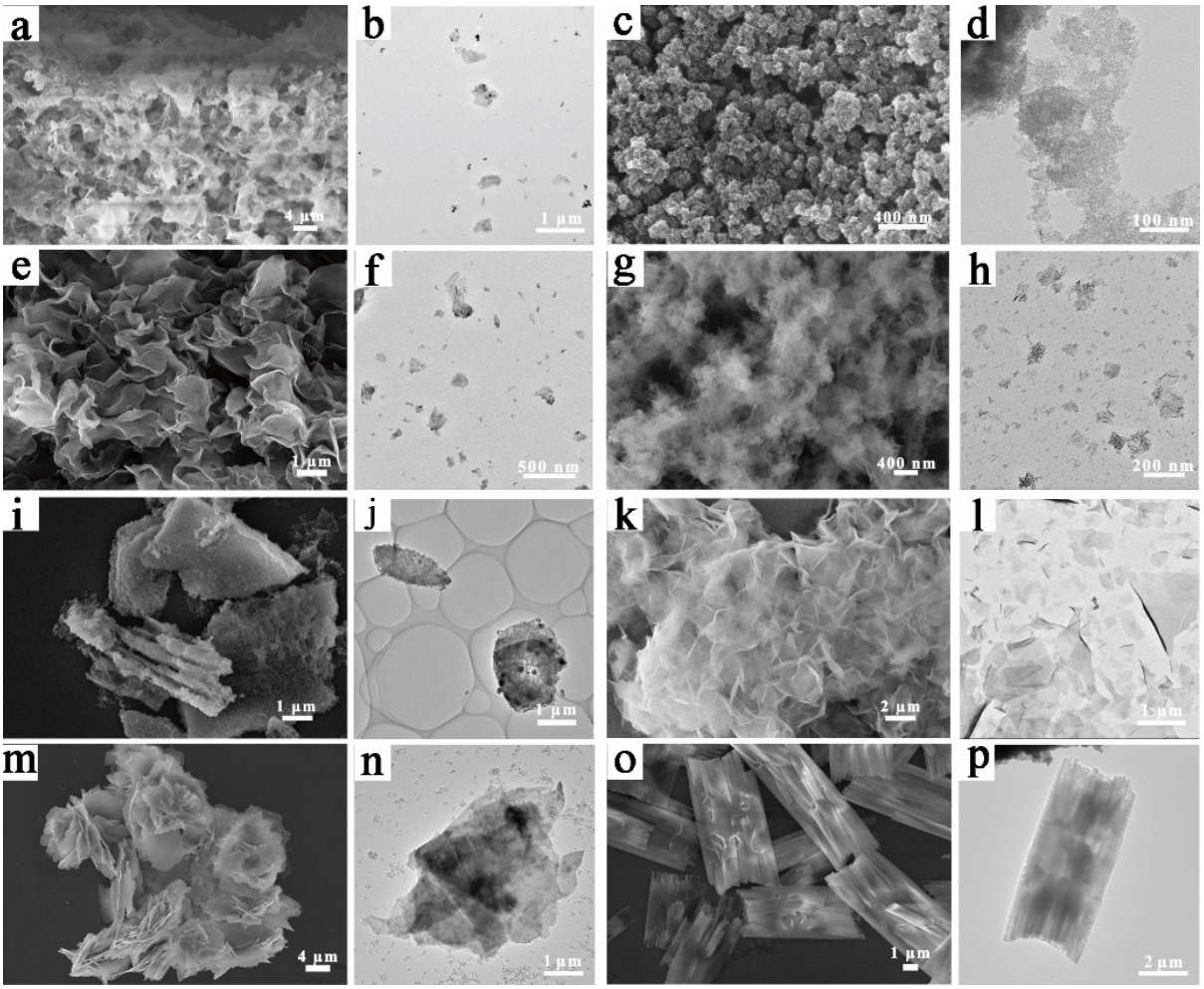

Figure S1 Electron microscopic images of 2D MO nanosheets. low-resolution SEM images (a,c,e,g,i,k,m,o), low-resolution TEM images (b,d,f,h,j,l,n,p) of 2D nanosheets for Mn_3O_4, Fe_2O_3, Co_3O_4, NiO, CuO, ZnO, SnO_2 and Sb_2O_3.

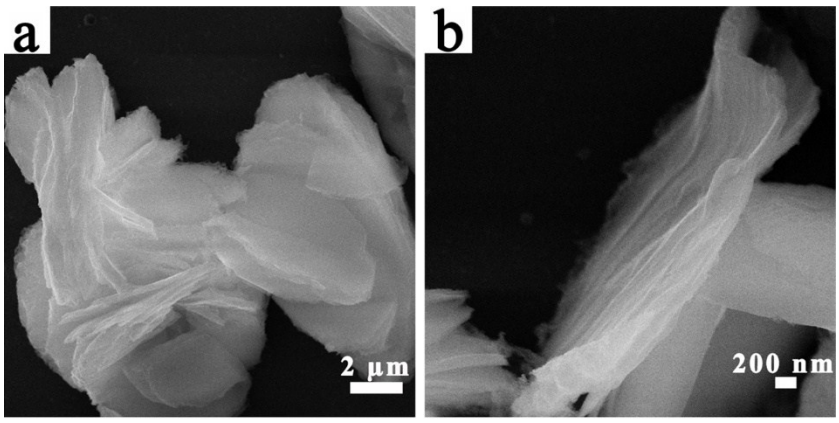

Figure S2 (a) Low-magnification SEM image and (b) high-magnification SEM image of 2D $Cu(OH)_2$ nanosheets.

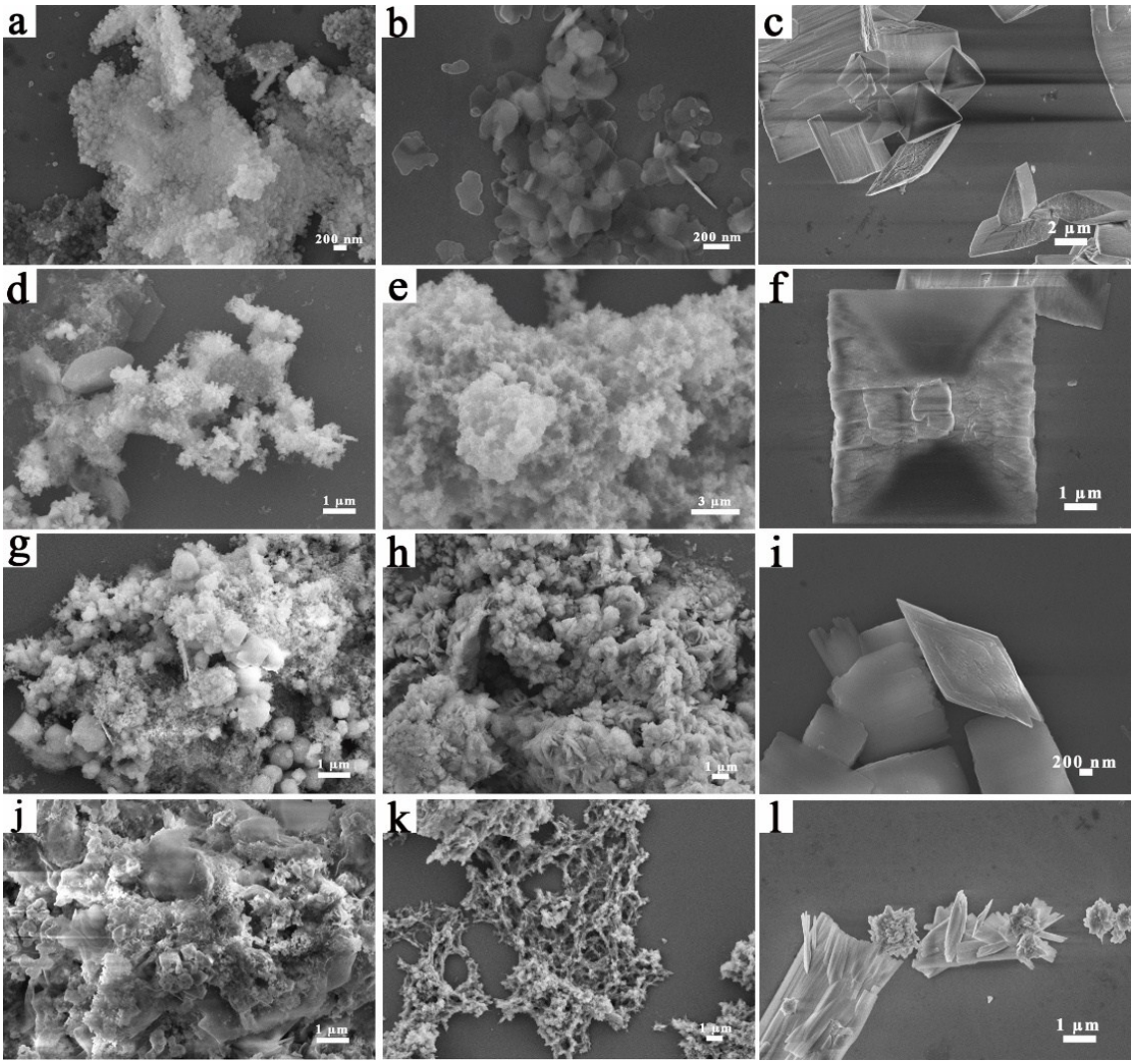

Figure S3 SEM are characterized the morphologies of Mn_3O_4, NiO and Sb_2O_3. Without the addition of P123 surfactant (a,b,c), with the addition of 10 wt.% P123 surfactant (d,e,f), the holding temperature changed from 50 °C to 40 °C (g,h,i), the holding time changed from 2 h to 1h (j,k,l).

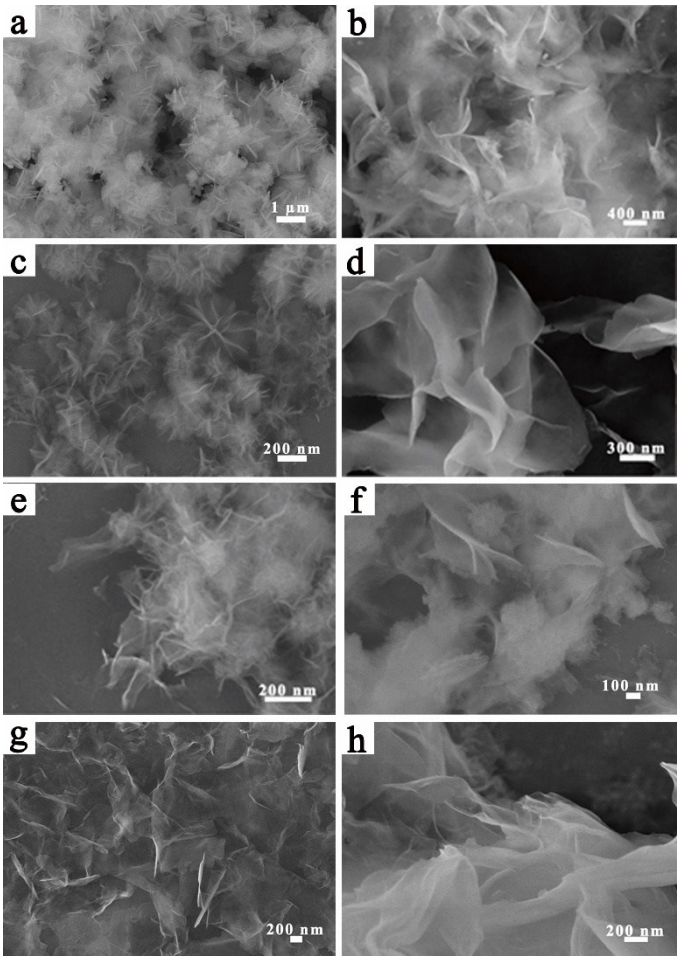

Figure S4 SEM are characterized the morphologies of MO nanosheets, chloride (a,c,e,g) and acetate (b,d,f,h) for Mn, Co, Ni and Zn.

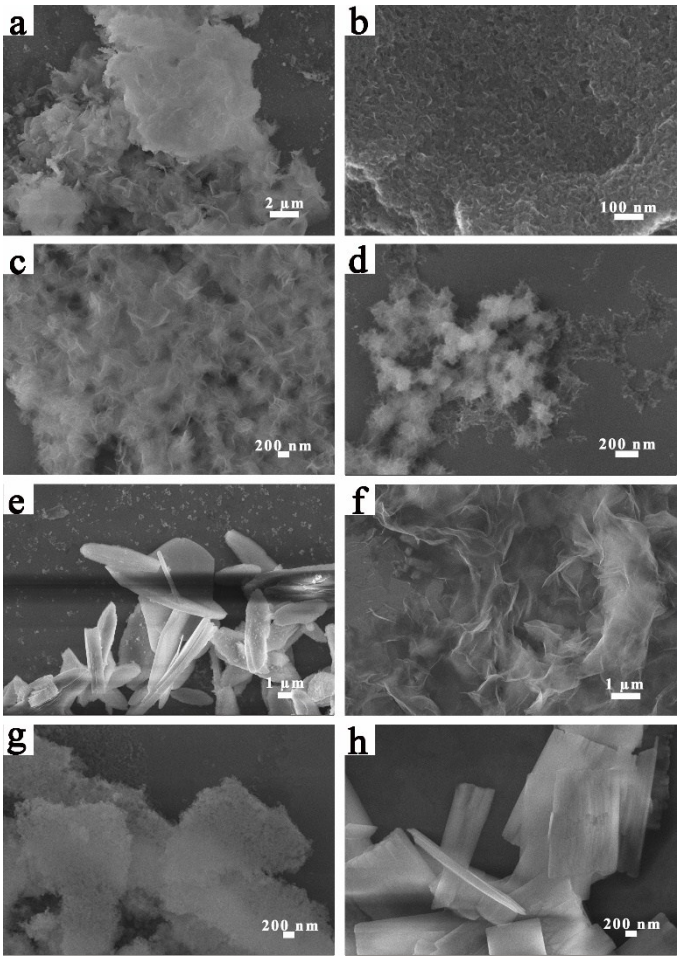

Figure S5 SEM are characterized the morphologies of intermediates of Mn_3O_4 (a), Fe_2O_3 (b), Co_3O_4 (c), NiO(d), CuO (e), ZnO (f), SnO_2 (g), Sb_2O_3 (h).

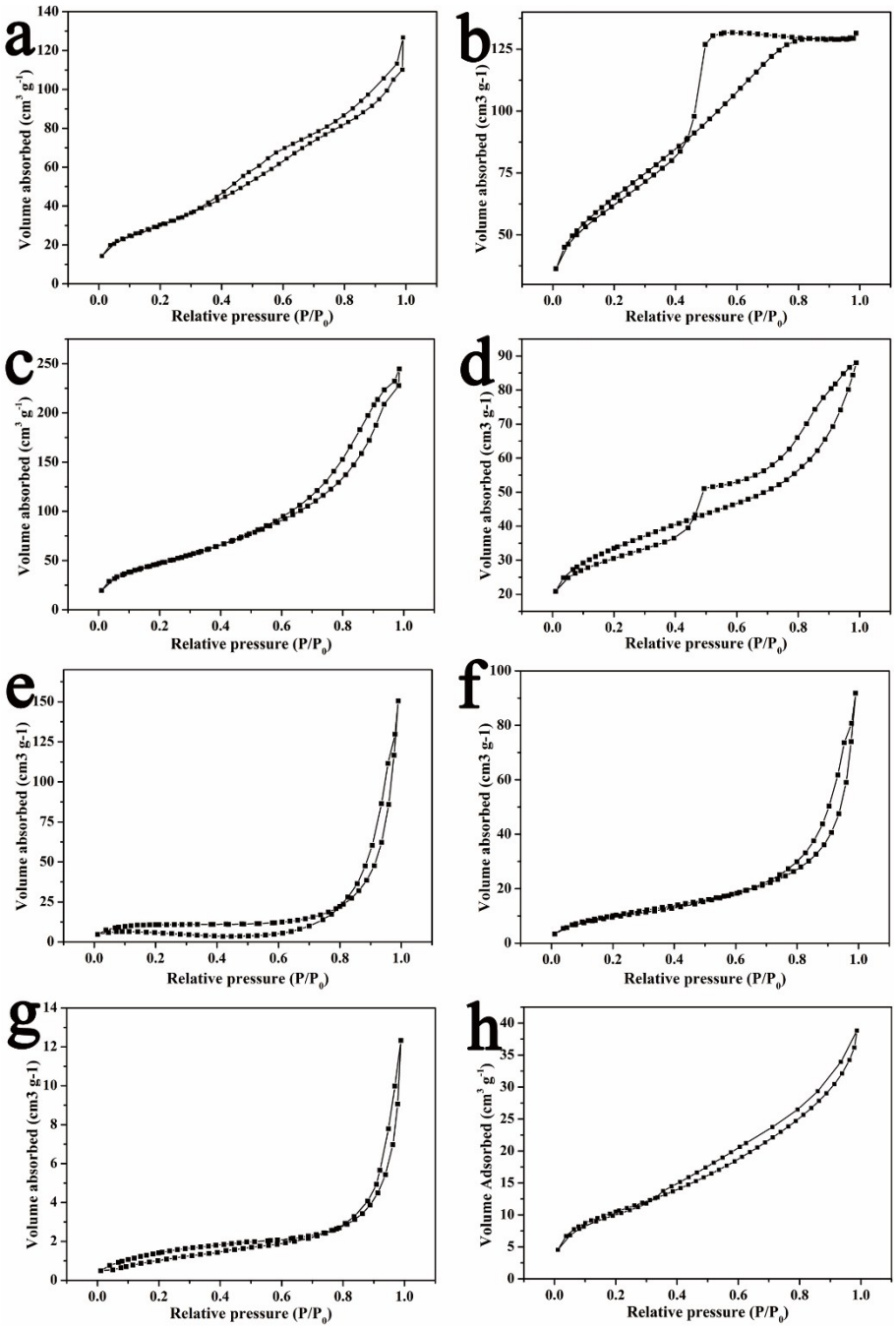

Figure S6 Nitrogen adsorption−desorption isotherms of Mn_3O_4 (a), Fe_2O_3 (b), Co_3O_4 (c), NiO (d), CuO (e), ZnO (f), SnO_2 (g), Sb_2O_3 (h).

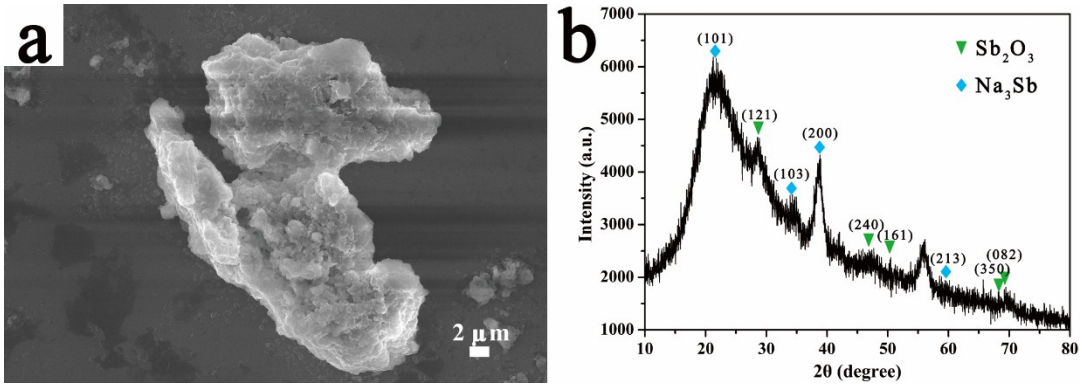

Figure S7 (a) SEM image and (b) XRD pattern of the Sb_2O_3-nanosheet electrode after 150 cycles at a current density of 100 mA g^{-1}.

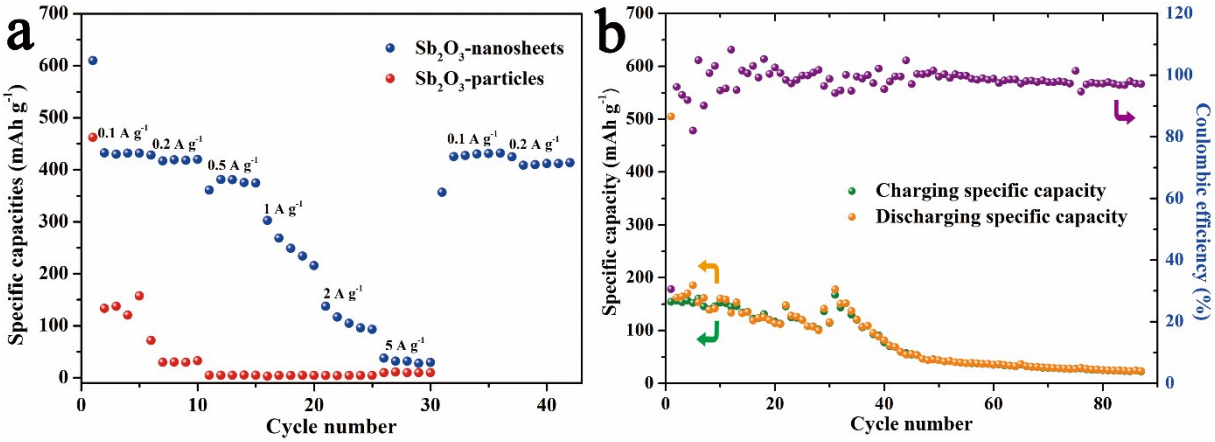

Figure S8 (a) Rate behaviors of Sb_2O_3-nanosheets and Sb_2O_3-polyhedron at different current density rates from 0.1 to 5 A g^{-1}. (b) Cycle performance of Sb_2O_3-polyhedron at a current density of 100 mA g^{-1} from 0.01 V to 2.5 V

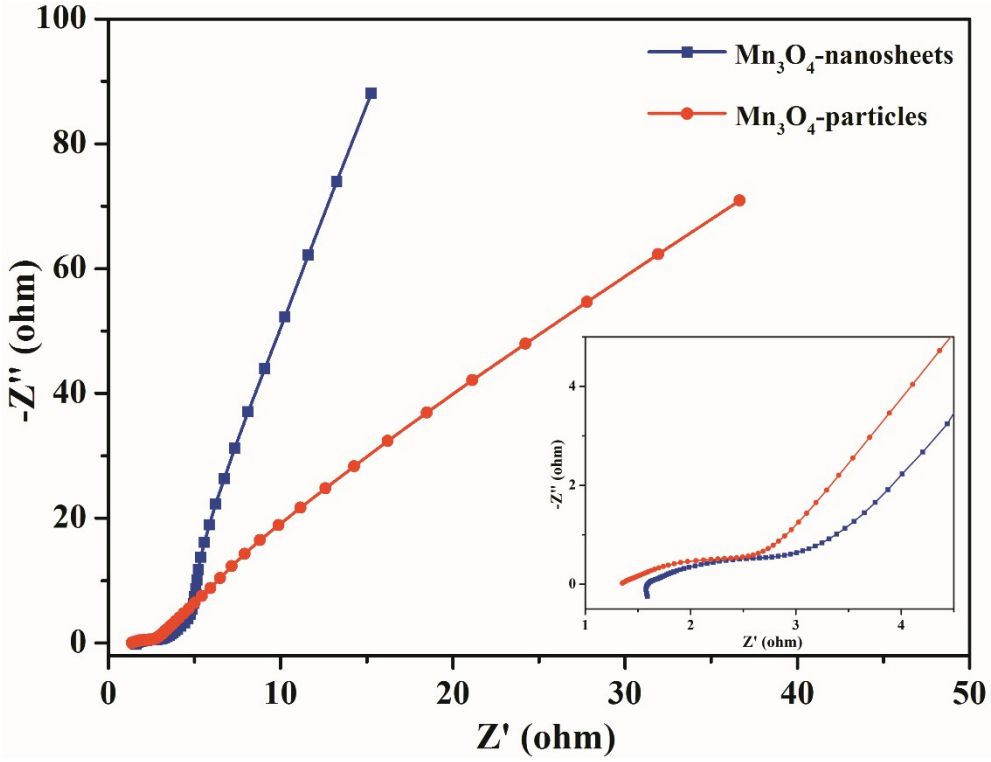

Figure S9 Nyquist plot of Mn_3O_4-nanosheets and Mn_3O_4-particles.