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Electronic supplementary information for

Self-stacked Co_3O_4 nanosheets for high-performance lithium ion batteries

Xi Wang,[a] Hasigaowa Guan,[b] Shimou Chen,[a] Huiqiao Li,[c] Tianyou Zhai,[a] Daiming Tang,[a] Yoshio Bando,[a] and Dmitri Golberg[a]

[a]International Center for Materials Nanoarchitectonics (MANA), National Institute for Materials Science (NIMS), Namiki 1-1, Tsukuba, Ibaraki, 305-0044, Japan.

[b] Key Laboratory of Marine Chemistry Theory and Technology, Ministry of Education, Ocean University of China, Qingdao, China, 266100.

[c]Energy Technology Research Institute, National Institute of Advanced Industrial and Technology (AIST), Umezono, 1-1-1, Tsukuba, 305-8568, Japan.

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Experimental

Synthesis of self-stacked Co_3O_4 nanosheets: 1 g of $Co(CH_3COO)_2$ $4H_2O$, and 0.05 g of PVP (Mw = 30000 g/mol) were loaded into a 100 mL poly(tetrafluoroethylene) (PTFE)-lined stainless steel autoclave, which was then filled with 80 mL mixture solution of ethylene glycol and water. The autoclave was sealed and maintained at 180-200 ˚C for 12-24 h, and then cooled down to room temperature. The final products were centrifuged, rinsed with distilled water and ethanol several times to remove any impurities. The as-prepared precursors were finally calcined at 350 °C in N_2 for 3 h.

Synthesis of Co_3O_4 hollow spheres: 1 g of $Co(CH_3COO)_2$ $4H_2O$ and 0.05 g of PVP (Mw = 30000 g/mol) were loaded into a 100 mL poly(tetrafluoroethylene) (PTFE)-lined stainless steel autoclave, which was then filled with 80 mL ethylene glycol. The autoclave was sealed and maintained at 180-200 ˚C for 12-24 h, and then cooled down to room temperature. The final products were centrifuged, rinsed with distilled water and ethanol several times to remove any impurities. The as-prepared precursors were finally calcined at 350 °C in N_2 for 3 h.

Synthesis of Co_3O_4 nanoplates: 1 g of $Co(CH_3COO)_2$ $4H_2O$ were loaded into a 100 mL poly(tetrafluoroethylene) (PTFE)-lined stainless steel autoclave, which was then filled with 80 mL ethylene glycol. The autoclave was sealed and maintained at 180-200 ˚C for 12-24 h, and then cooled down to room temperature. The final products were centrifuged, rinsed with distilled water and ethanol several times to remove any impurities. The as-prepared precursors were finally calcined at 350 °C in N_2 for 3 h.

Synthesis of Co_3O_4 nanoflowers: 1 g of $Co(CH_3COO)_2$ $4H_2O$ were loaded into a 100 mL poly(tetrafluoroethylene) (PTFE)-lined stainless steel autoclave, which was then

filled with 80 mL mixture solution of ethylene glycol and water. The autoclave was sealed and maintained at 180-200 ˚C for 12-24 h, and then cooled down to room temperature. The final products were centrifuged, rinsed with distilled water and ethanol several times to remove any impurities. The as-prepared precursors were finally calcined at 350 °C in N_2 for 3 h.

Characterization. X-ray powder diffraction (XRD) patterns were recorded on a Philips X´Pert PRO MPD X-ray diffractometer operated at 35 kV and 45 mA with Cu Kα radiation. Transmission electron microscopy (TEM) images were taken on a JEOL JEM-2010 transmission electron microscope with an accelerating voltage of 200 kV. FE-SEM measurement was carried out with a field-emission microscope (JEOL S-F4800) operated at an acceleration voltage of 10 kV. The nitrogen adsorption-desorption spectra of the samples were determined by nitrogen adsorption-desorption isotherm measurements at 77 K (Micromeritics Automatic Surface Area Analyzer Gemini 2360, Shimadzu).

Electrochemical Characterization: Electrochemical experiments were performed using Swagelok-type cells and 2032-type coin cells. The working electrodes prepared by mixing the Co_3O_4 samples, acetylene black, and poly (vinyl difluoride) (PVDF) at a weight ratio of 70:20:10, were pasted on pure Cu foil (99.6%, Goodfellow). Glass fiber (GF/D) from Whatman was used as a separator. Lithium foil was used as the counter electrode. The electrolyte consisted of a solution of 1 M $LiPF_6$ in ethylene carbonate (EC)/dimethyl carbonate (DMC)/diethyl carbonate (DEC) (1:1:1, in wt %) obtained from Novolyte Technologies (Suzhou) Co. Ltd. A galvanostatic cycling test of the assembled cells was carried out on an LAND CT2001A system in the voltage range of 0.01-3.0 V (vs. Li^+/Li) at different current density.

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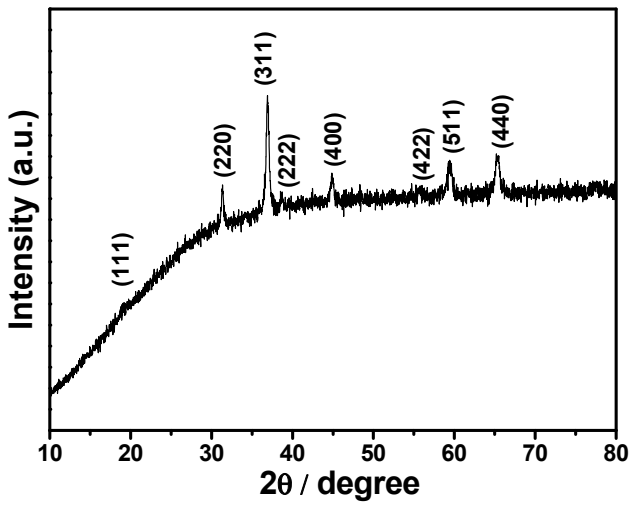

Fig. S1 XRD pattern of the obtained stacked Co_3O_4 nanosheets calcined at 350°.

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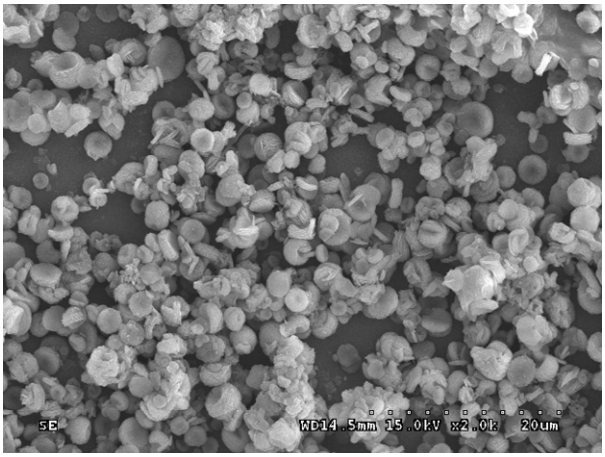

Fig. S2 A low-magnification SEM image of the self-stacked Co_3O_4 nanosheets.

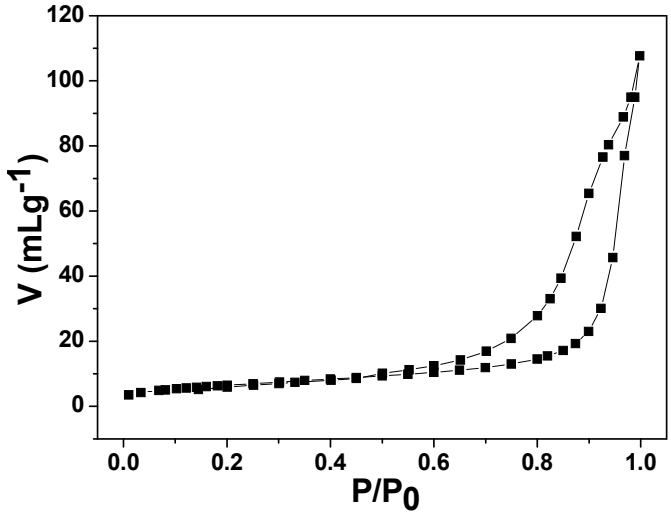

Fig. S3 N_2 adsorption–desorption isotherm of the self-stacked Co_3O_4 nanosheets.

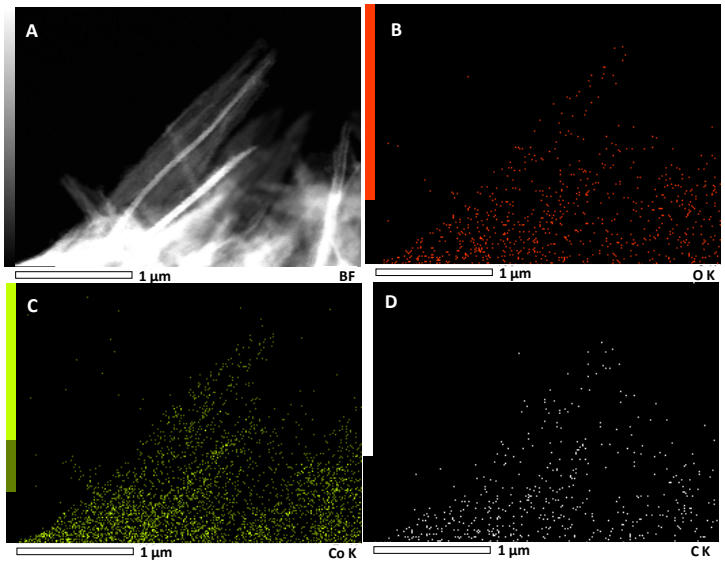

Fig. S4 The dark-field TEM image of Co_3O_4 nanosheets and EDX mapping images of O, Co, and C elements.

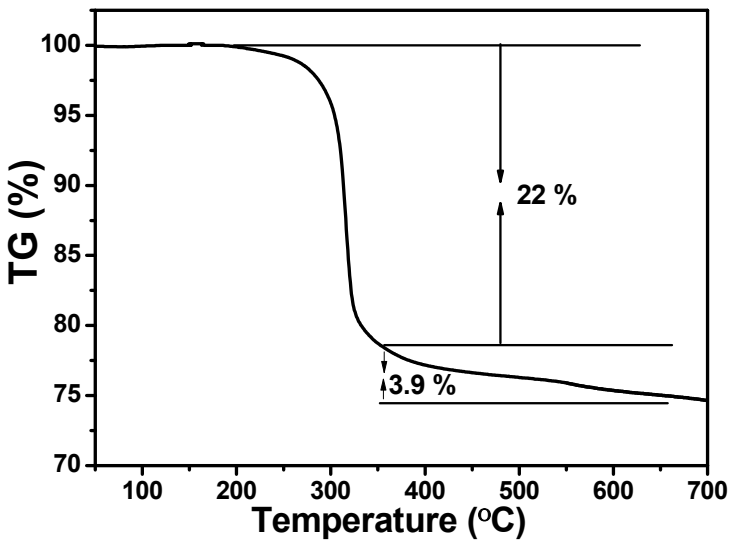

Fig. S5 TG curve of precursors calcined in air.

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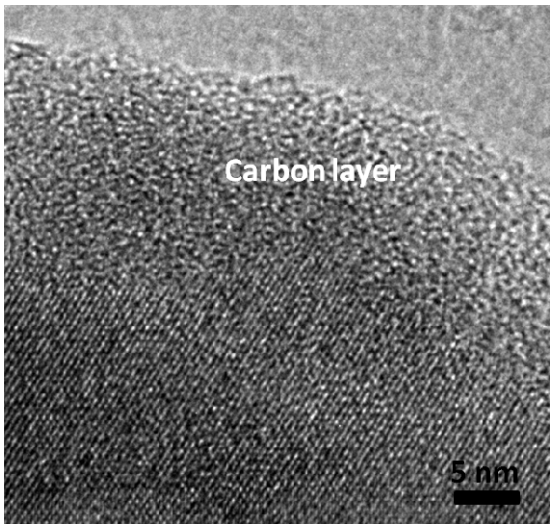

Fig. S6 HRTEM image of a Co_3O_4 nanoplate.

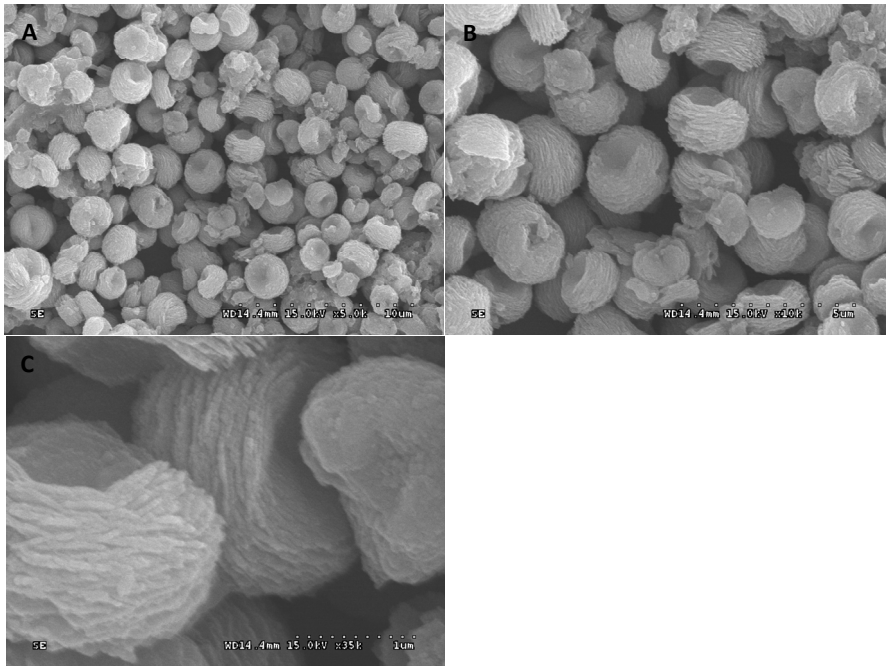

Fig. S7 Low- and high-magnification SEM images of the self-stacked Co_3O_4 nanosheets exhibiting highly curved nanoplates.