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Supporting Information

A unique porous architecture built by ultrathin wrinkled $NiCoO_2$/rGO/$NiCoO_2$ sandwich nanosheets for pseudocapacitance and Li-ion storage

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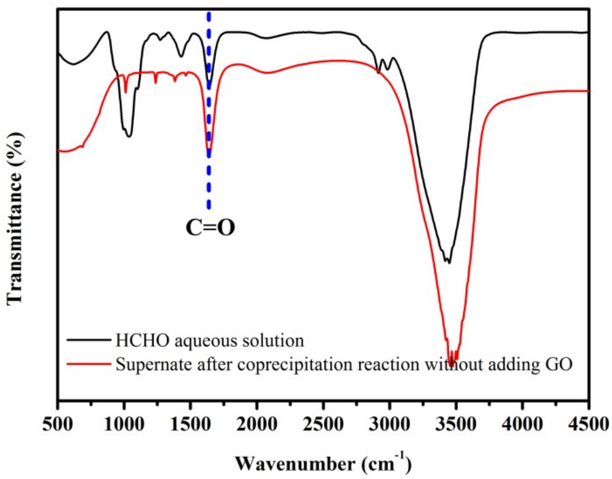
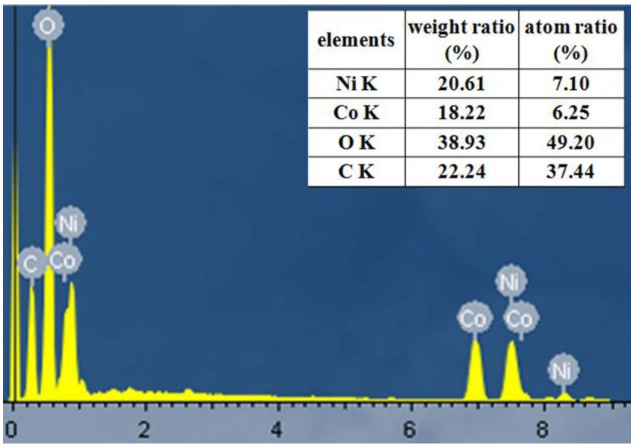


Fig. S1 FTIR spectra of pure HCHO aqueous solution (the black curve) and supernate after the co-precipitation reaction at 90 °C for 6 h without GO (the red curve).

We have carefully investigated chemical state of the HMT solution during co-precipitation reaction without GO. After co-precipitation reaction at 90 °C for 6 h, HCHO was generated which is proved by the FTIR spectra. This demonstrates the hydrolysis of HMT which is described by the chemical equation (1). The generated HCHO can act as a strong reluctant under a condition of weak alkaline to reduce GO.



elements	weight ratio (%)	atom ratio (%)
Ni K	20.61	7.10
Co K	18.22	6.25
O K	38.93	49.20
C K	22.24	37.44

Fig. S2 EDX spectrum of the $NiCoO_2$/rGO/$NiCoO_2$ electrode composite and the inset is the table of elements ratio.

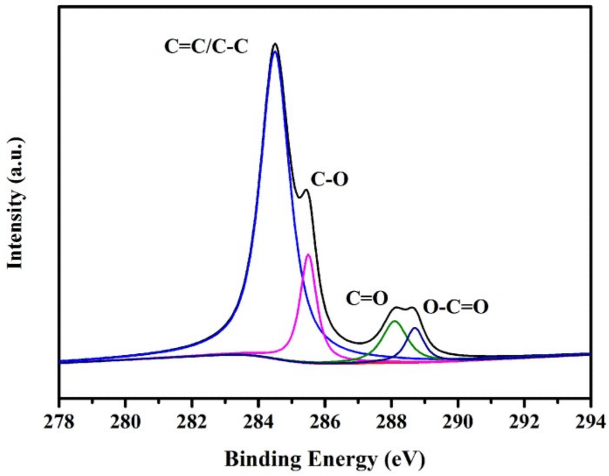


Fig. S3 XPS spectra of C 1s of thermally reduced GO at 500 °C for 2 h in flowing N_2.

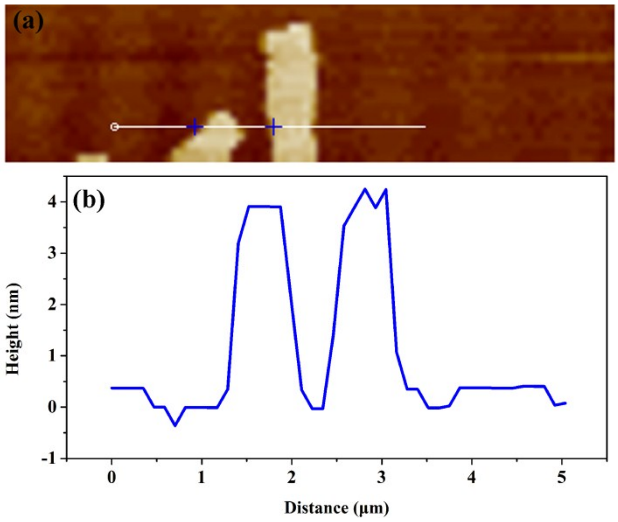


Fig. S4 (a) AFM image of $NiCoO_2$ sheet; (b) the corresponding depth profiles of the white line on the image. The height difference of ~ 4 nm, indicating the thickness of $NiCoO_2$ sheet is ~ 4 nm.

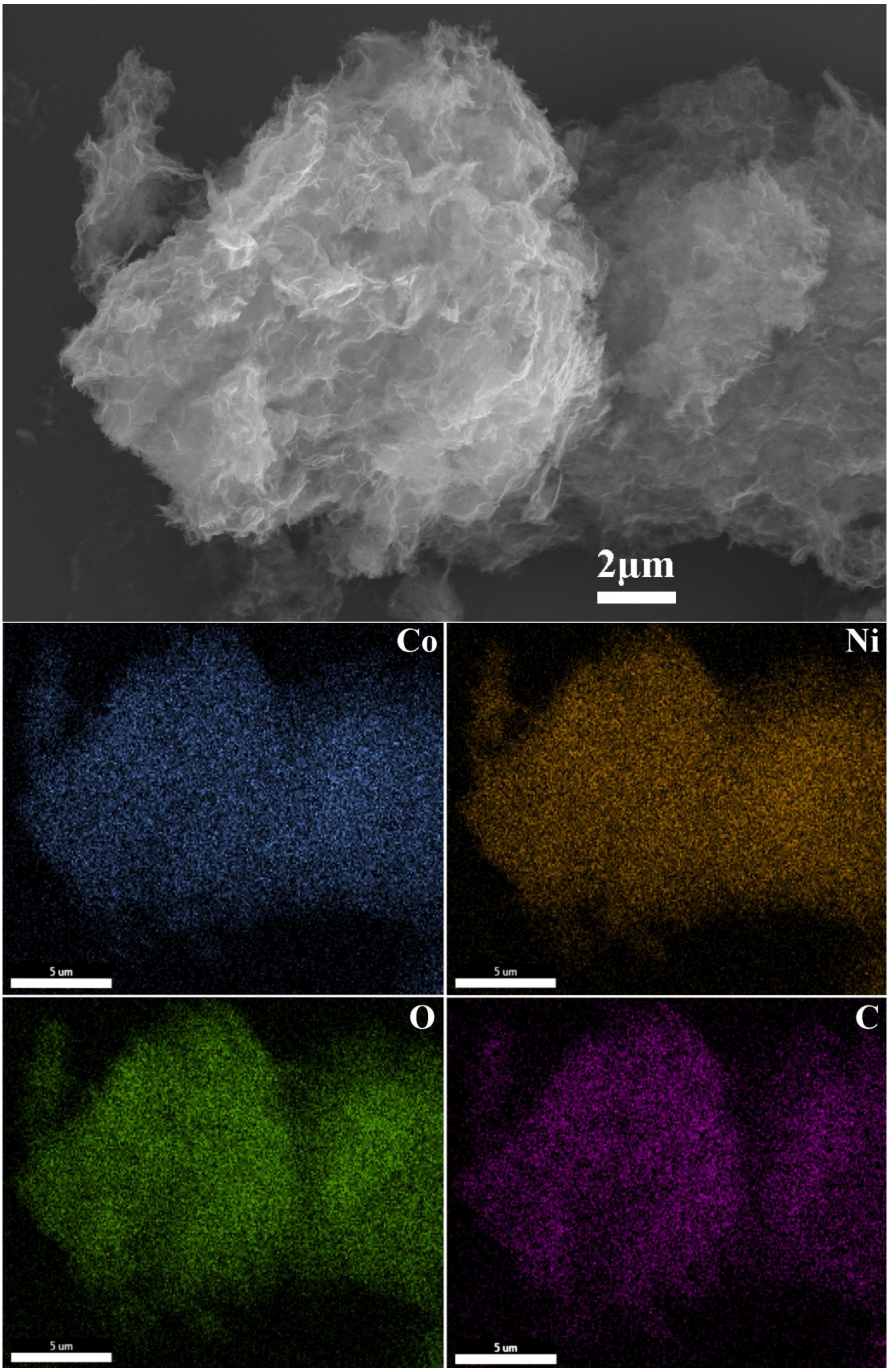


Fig. S5 FESEM image of the $NiCoO_2$/rGO/$NiCoO_2$ composite along with the corresponding elemental maps of Co, Ni, O, and C.

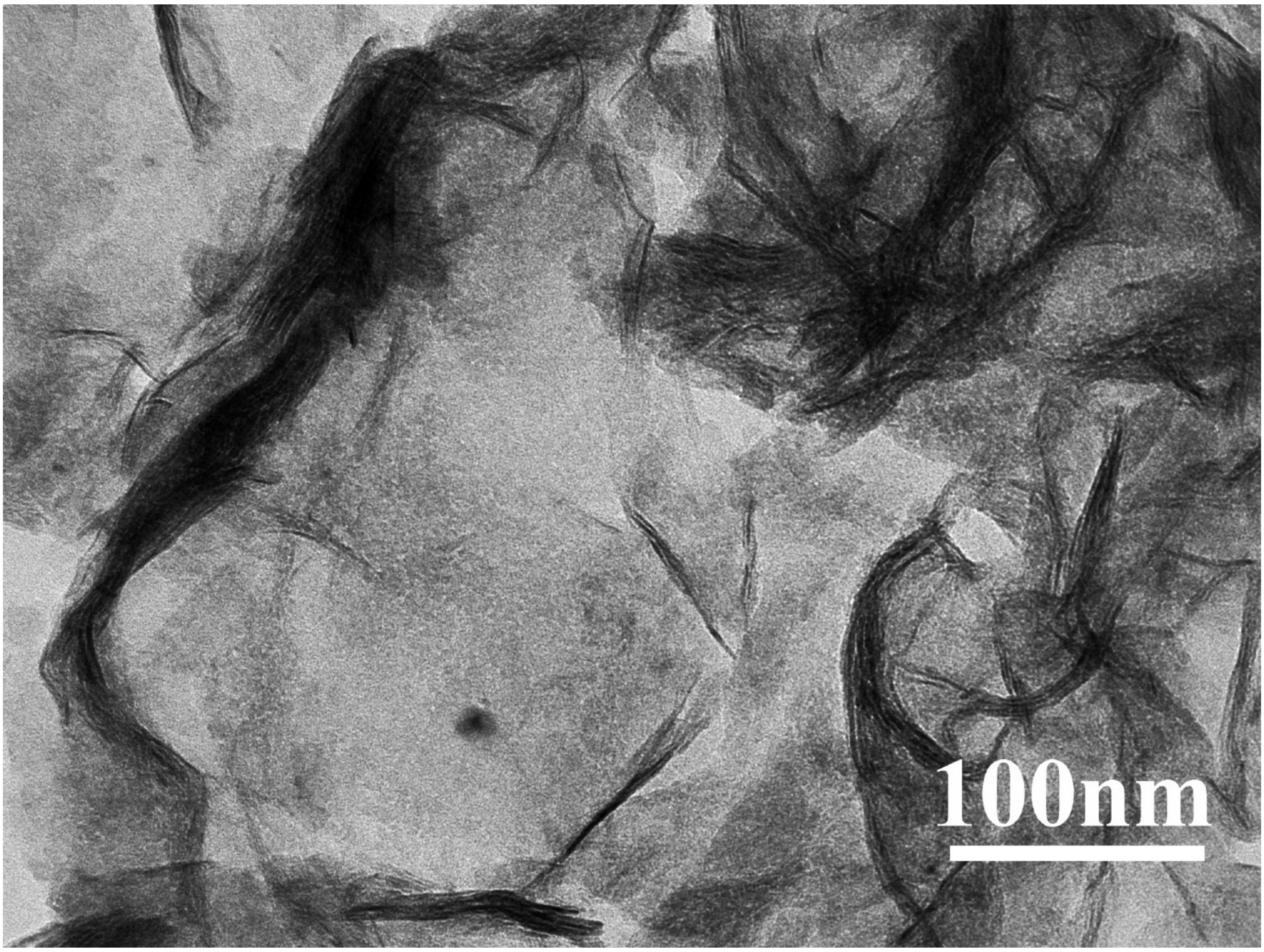


Fig. S6 TEM image of the $NiCoO_2$/rGO/$NiCoO_2$ composite.

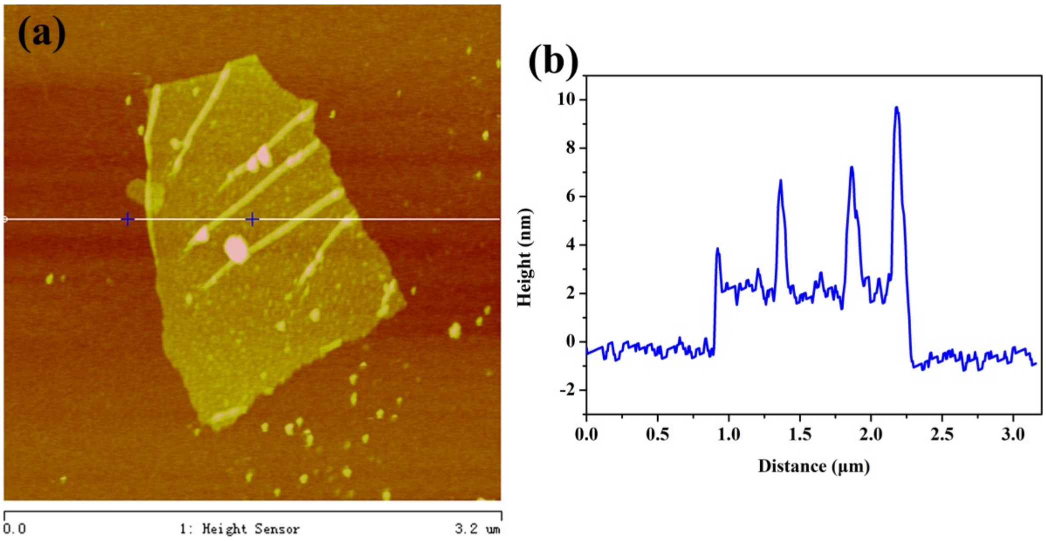


Fig. S7 (a) AFM image of GO sheet; (b) the depth profile of the line of interest on the GO sheet. The height difference of ~ 2 nm, and the height difference more than 2 nm can be attributed to the wrinkle.

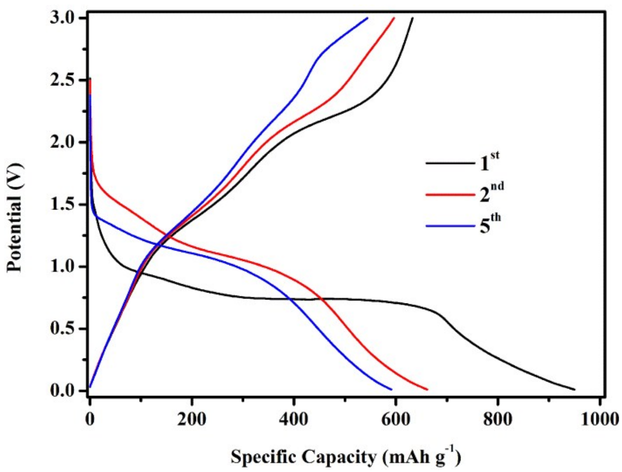


Fig. S8 Representative charge/discharge voltage profiles at a current density of 0.1 A g^{-1} of the pure $NiCoO_2$ electrode.

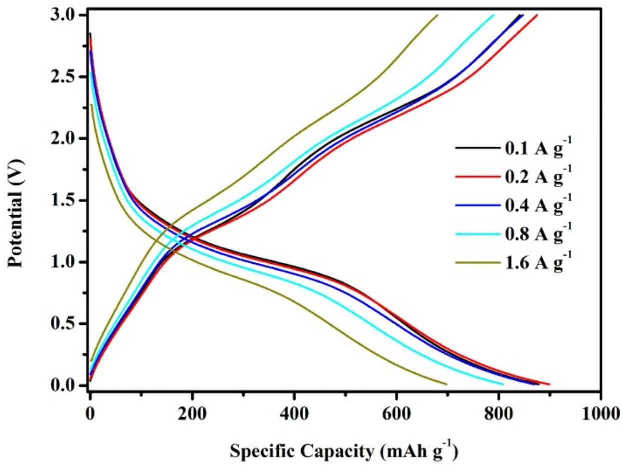


Fig. S9 Representative charge/discharge curves at current densities from 0.1 to 1.6 A g^{-1} for the $NiCoO_2$/rGO/$NiCoO_2$ electrode.

Table S1. Synthesis methods and electrochemical properties of typical Ni-Co-O based anodes for LIBs reported in previous literatures.

Materials	Synthesis method	Rate capacity	cycling performance	Reference
CoO@N−C nanocubes	Hydrothermal	309 mA h g^{-1} at 1 A g^{-1}	598 mA h g^{-1} in 50^{th} cycle at 0.1 A g^{-1}	Ref. [35]
CoO/graphene nanosheets	Precipitation	531.2 mA h g^{-1} at 1.6 A g^{-1}	1018 mA h g^{-1} in 520^{th} cycle at 0.2 A g^{-1}	Ref. [20]
$CoNiO_2$ microflower	Hydrothermal	228.4 mA h g^{-1} at 1 A g^{-1}	397.4 mA h g^{-1} in 110^{th} cycle at 0.1 A g^{-1}	Ref. [12]
$NiCoO_2$/CNT	Precipitation	933 mA h g^{-1} at 0.8 A g^{-1}	~ 750 mA h g^{-1} in 150^{th} cycle at 0.4 A g^{-1}	Ref.[17]
NiO-wrapped graphene	Reflux	403.3 mA h g^{-1} at 1.6 A g^{-1}	704.8 mA h g^{-1} in 50^{th} cycle at 0.2 A g^{-1}	Ref. [27]
NiO microspheres	Thermal decomposition	621 mA h g^{-1} at 1 A g^{-1}	800 mA h g^{-1} in 100^{th} cycle at 0.5 A g^{-1}	Ref. [46]
NiO_x–carbon	Electrospinnin g	423 mA h g^{-1} at 1 A g^{-1}	676 mA h g^{-1} in 200^{th} cycle at 0.5 A g^{-1}	Ref. [47]
NiO nanofiber	Electrospinnin g	409 mA h g^{-1} at 2 A g^{-1}	~ 583 mA h g^{-1} in 100^{th} cycle at 0.08 A g^{-1}	Ref. [48]
CoO–G–C nanofiber mats	Electrospinnin g	400 mA h g^{-1} at 2 A g^{-1}	690 mA h g^{-1} in 352^{nd} cycle at 0.5 A g^{-1}	Ref. [49]
Mesoporous Co-Ni-O nanorod	Microwave-irradiation	812 mA h g^{-1} at 2 A g^{-1}	656 mA h g^{-1} in 500^{th} cycle at 5 A g^{-1}	Ref. [52]
Co doped NiO nanoflakes	Chemical bath deposition	471 mA h g^{-1} at 2 A g^{-1}	589.5 mA h g^{-1} in 50^{th} cycle at 0.1 A g^{-1}	Ref. [50]
NiO hollow microspheres	Soft-template	610 mA h g^{-1} at 3.6 A g^{-1}	393 mA h g^{-1} in 50^{th} cycle at 0.2 A g^{-1}	Ref. [51]
rGO/$NiCoO_2$	Co-precipitation	706 mA h g^{-1} At 1.6 A g^{-1}	595 mA h g^{-1} in 350^{th} cycle at 1 A g^{-1}	This work