Supporting Information

In-situ Growth of Binder-Free $CoNi_{0.5}$- MOF/ CC Electrode for High-Performance Flexible Solid-State Supercapacitor Application

Weijie Zhang#, Zhen Cao#, Yuying Li, Ruiting Li, Yanmei Zheng, Ping Su and Xinli Guo*

Dr. W.J Zhang
Chongqing Key laboratory of New Energy Storage Materials and Devices, School of Science, Chongqing University of Technology, Chongqing 40054, China
School of Materials Science and Engineering, Southeast University, Nanjing 211189, China
Dr. Z. Cao, Dr. Y. Y. Li, Dr. R.T. Li, Pro. X.L. Guo
School of Materials Science and Engineering, Southeast University, Nanjing 211189, China
Email: guo.xinli@seu.edu.cn
Dr. Y.M. Zheng
Jiangsu Co-Innovation Center of Efficient Processing and Utilization of Forest Resources, International Innovation Center for Forest Chemicals and Materials, College of Chemical Engineering, Nanjing Forestry University, Longpan Road 159, Nanjing 210037, China.
Dr. Ping Su
Chongqing Key laboratory of New Energy Storage Materials and Devices, School of Science, Chongqing University of Technology, Chongqing 40054, China

# These authors contribute equally

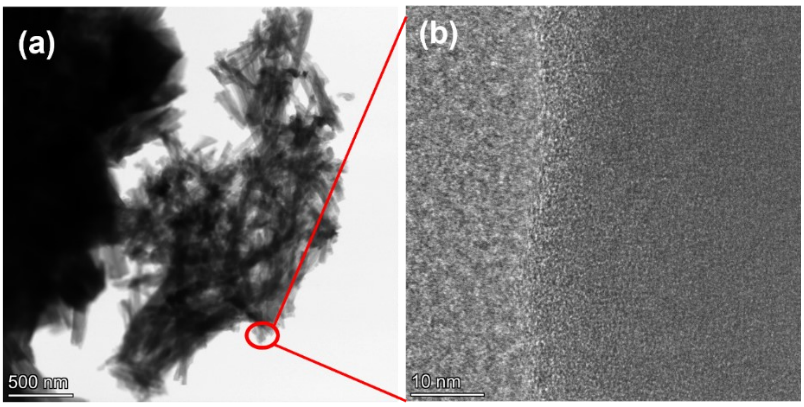

Figure S1 TEM image of $CoNi_{0.5}$-MOF/CC with different magnification

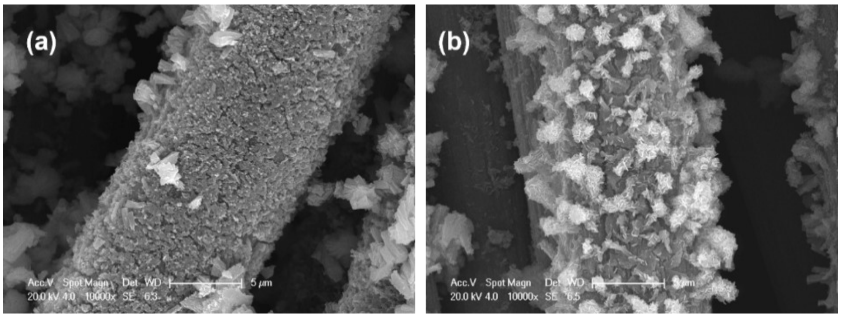

Figure S2 high resolution SEM image of $CoNi_{0.5}$-MOF before and after 6000 cycles test

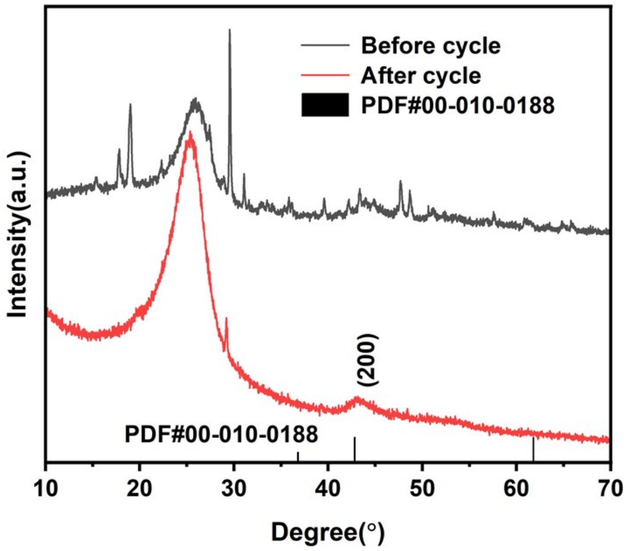

Figure S3 The XRD pattern of $CoNi_{0.5}$-MOF/CC before and after cycle test

To evaluate the stability of the $CoNi_{0.5}$-MOF structure during the electrochemical process, we fabricated electrodes and subjected them to 6000 cycles under a current density of 10 A g^{-1}. Comparative analysis of the scanning electron microscopy (SEM) results indicates that while there were slight changes in the morphology of $CoNi_{0.5}$-MOF due to expansion during the electrochemical process, the active material maintained good contact with the substrate without collapsing or detaching. This observation confirms the retention of cycle stability. Additionally, we examined the detailed structure of the electrode after cycling. Figure S3 illustrates that following electrochemical cycling, there were alterations in the lattice structure of $CoNi_{0.5}$-MOF, with the disappearance of typical MOF peaks and the emergence of $CoNiO_2$ peaks. This transformation is likely attributed to the following electrochemical reactions occurring during cycling**:**

$$Co^{2+} + 3OH^{-} \leftrightarrow CoOOH + H_2O + e^{-}$$

$$CoOOH + OH^- \leftrightarrow CoO_2 + H_2O + e^-$$

$$Ni^{2+} + 3OH^- \leftrightarrow NiOOH + H_2O + e^-$$

$$NiOOH + OH^- \leftrightarrow NiO_2 + H_2O + e^-$$

Electrode Material	Capacitor	Energy Density	Power Density	Reference
CoNi-MOF/AC	asymmetric	35 Wh kg^{-1}	1450 W kg^{-1}	2
Ni-MOF/AC	asymmetric	30.4 Wh kg^{-1}	407.4 W kg^{-1}	3
NiCo-LDH//AC	asymmetric	50.5 Wh kg^{-1}	750 W kg^{-1}	4
P-ZIF-67//AC	asymmetric	19.7 Wh kg^{-1}	500 W kg^{-1}	5
ZFO@NMO NSAs@rGO-NF// MDHPC	asymmetric	58.6 Wh kg^{-1}	799 W kg^{-1}	6
NiCo-MOF//(AC)	asymmetric	45.3 Wh kg^{-1}	847.8 W kg^{-1}	7
$CoNi_{0.5}$-MOF/CC// N-Gr	asymmetric	61.46 Wh kg^{-1}	1244.56 W kg^{1}	This work

Table.S1 Comparison of the performance of $CoNi_{0.5}$-MOF /CC// N-Gr asymmetric supercapacitors with other supercapacitors

Reference:

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