Supplementary Information (SI) for Nanoscale Advances.

CuNi-PTC Metal-Organic Framework: Unveiling Pseudocapacitive Energy Storage and Water Splitting Capabilities

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Supporting Information

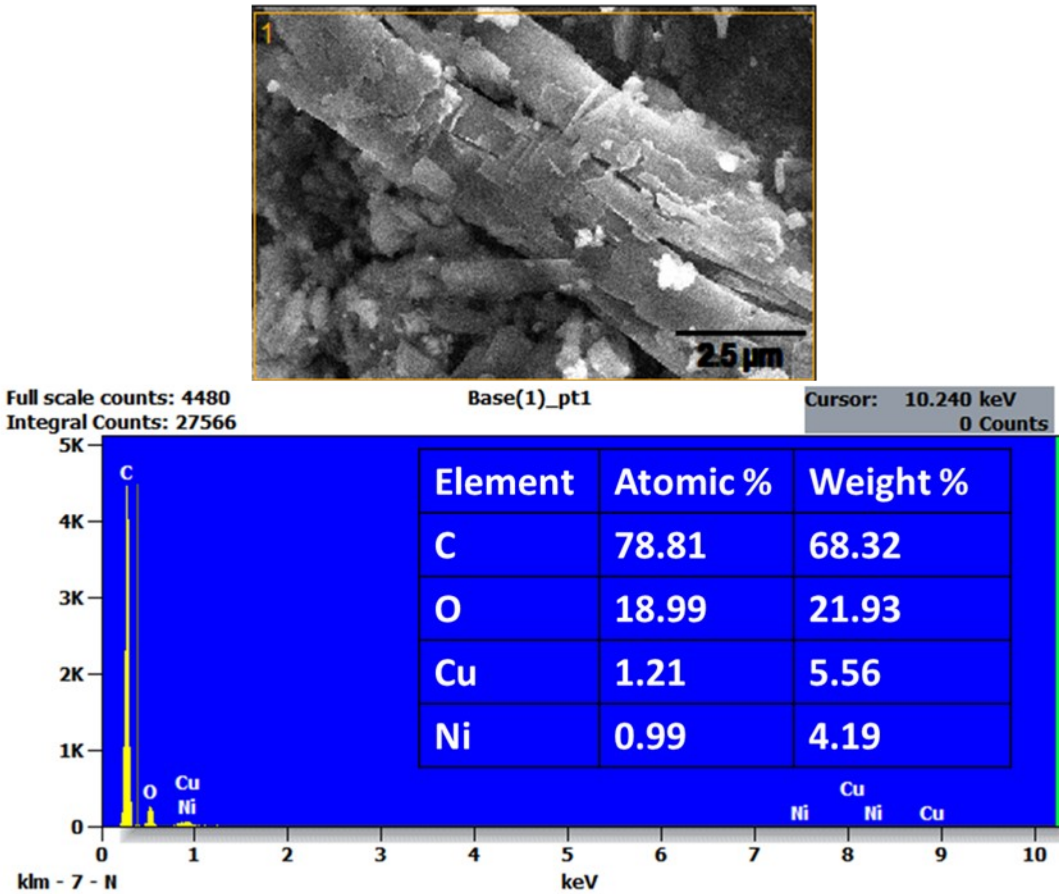

Figure S1. EDS spectrum of CuNi-PTC

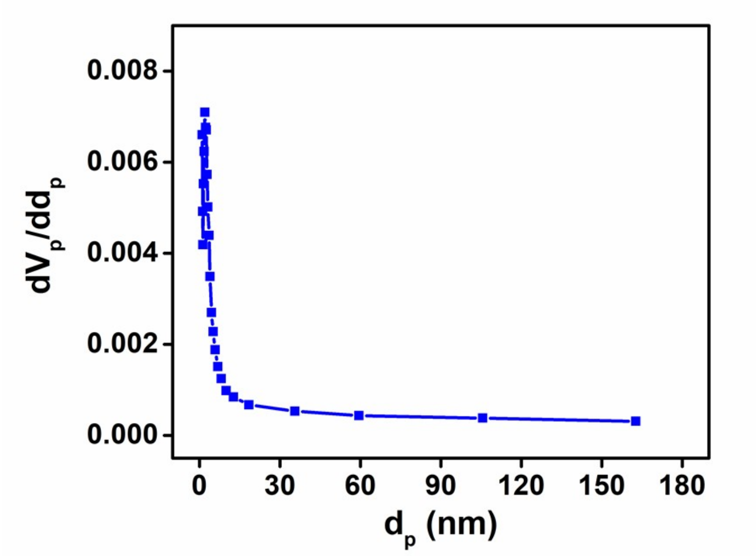

Figure S2. BJH pore size distribution of CuNi-PTC

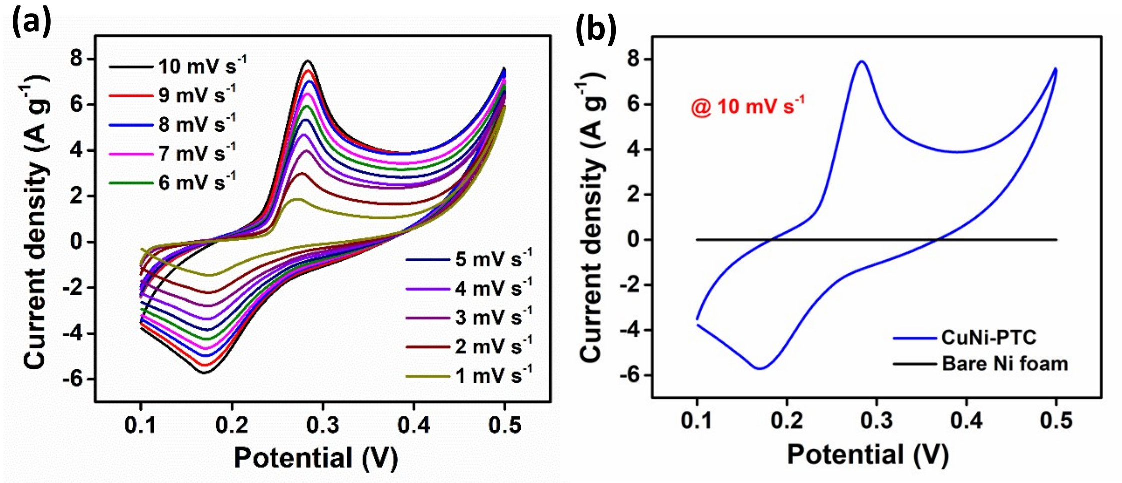

Figure S3. CV curves of (a) CuNi-PTC with scan rates varying from 10 mV s^{-1} to 1 mV s^{-1} (b) CuNi-PTC and bare Ni foam at 10 mV s^{-1}.

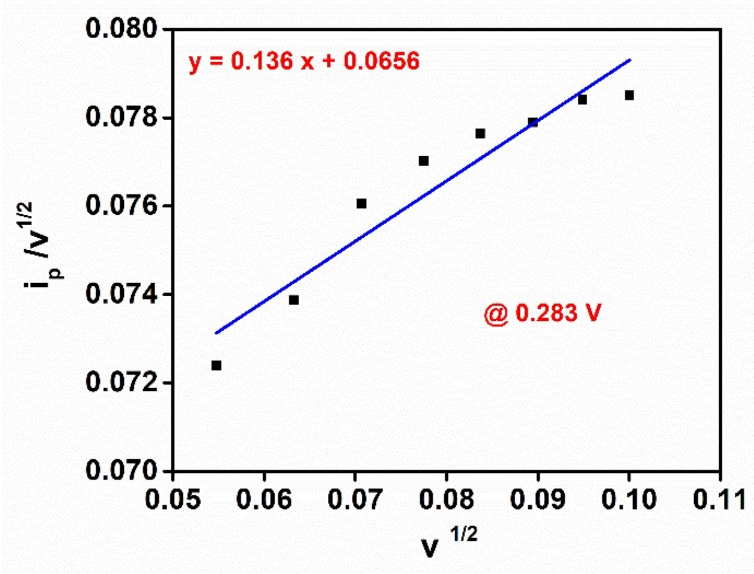

Figure S4. Linear plot of $^{i_p}/_{v^{1/2}}\ vs\ v^{1/2}$.

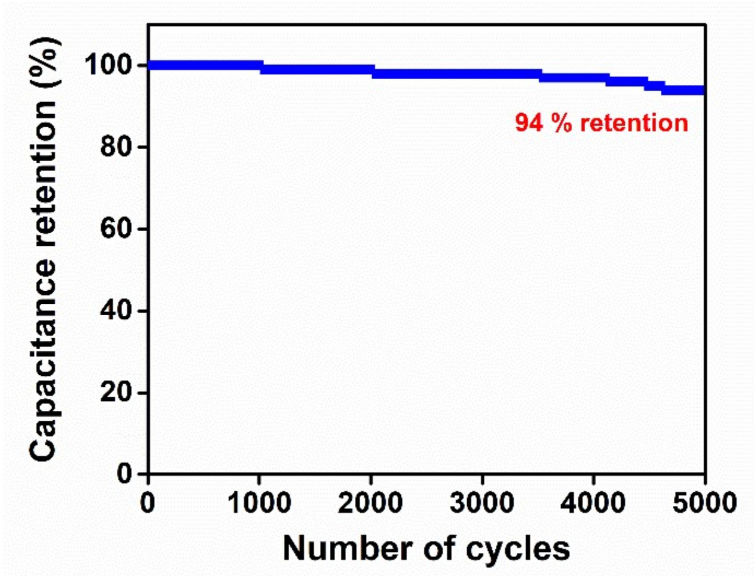

Figure S5. Stability test of CuNi-PTC.

Table S1. Summary of literature reports based on Ni-based bimetallic MOFs for supercapacitors

Sl. No	MOF	Specific capacitance	Capacitance retention	Reference
1.	Fe/Ni-BDC	1190.88 F/g @1 mV/s	93.7 % after 5000 cycles	[1]
2.	Co/Ni-MOF-2:1	610 F/g @0.5 A/g	95.5 % after 5000 cycles	[2]
3.	Zn-doped Ni-MOF	1620 F/g @0.25 A/g	91 % after 3000 cycles	[3]
4.	CoNi-ZIF@N-CNT-2	1118 F/g @1 A/g	72.5 % after 10000 cycles	[4]
5.	Mn/Ni-MOF@MWCNTs	793.6 F/g @1 A/g	78.3 % after 2000 cycles	[5]
6.	Co/Ni-MOF	2608 F/g @1 A/g	88 % after 5000 cycles	[6]
7.	Zn-Ni MOF	466.5 F/g @0.5 A/g	44 % after 2500 cycles	[7]
8.	**CuNi-PTC**	**1066.24 F/g @1 A/g**	**94 % after 5000 cycles**	**This work**

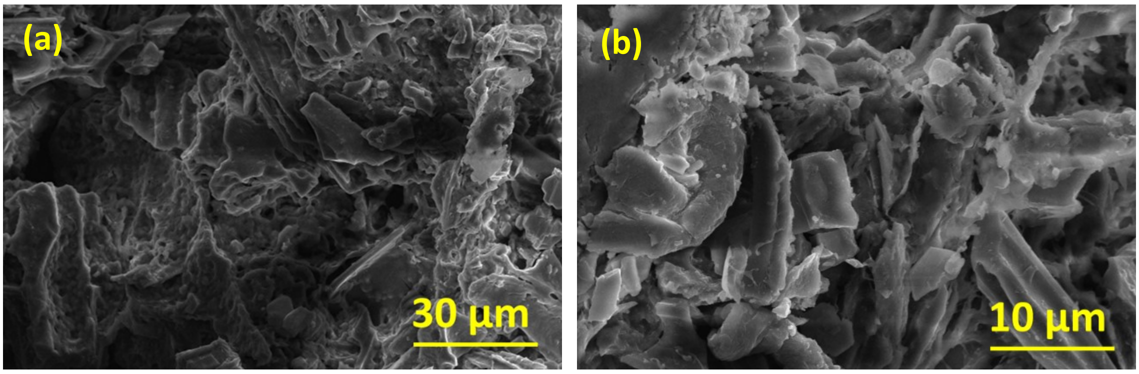

Figure S6. FESEM images of CuNi-PTC after 5000 charge-discharge cycles.

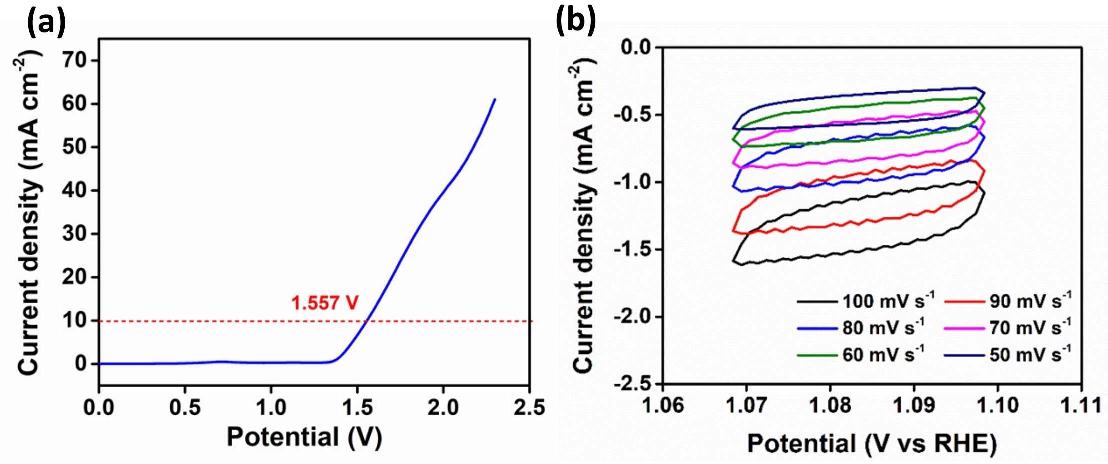

Figure S7. (a) LSV curve for overall water splitting (b) Non faradic cyclic voltammograms with scan rates varying from 100 mV s^{-1} to 50 mV s^{-1}.

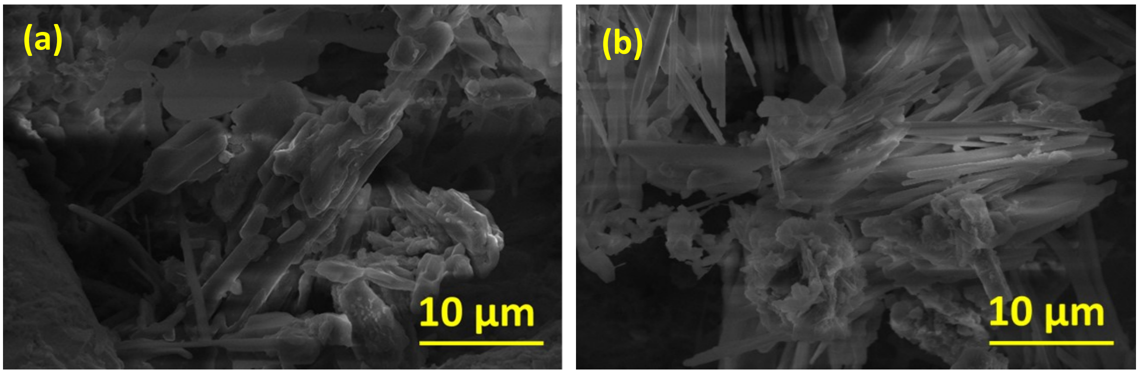

Figure S8. FESEM images of CuNi-PTC after Bulk electrolysis for 2 h.

References

1 R. Nivetha, J. Jana, S. Ravichandran, H. N. Diem, T. Van Phuc, J. S. Chung, S. G. Kang, W. M. Choi and S. H. Hur, Two-dimensional bimetallic Fe/M- (Ni, Zn, Co and Cu) metal organic framework as efficient and stable electrodes for overall water splitting and supercapacitor applications, *J. Energy Storage*, 2023, **61**, 106702.

2 X. Hang, J. Zhao, Y. Xue, R. Yang and H. Pang, Synergistic effect of Co/Ni bimetallic metal–organic nanostructures for enhanced electrochemical energy storage, *J. Colloid Interface Sci.*, 2022, **628**, 389–396.

3 J. Yang, C. Zheng, P. Xiong, Y. Li and M. Wei, Zn-doped Ni-MOF material with a high supercapacitive performance, *J. Mater. Chem. A*, 2014, **2**, 19005–19010.

4 A. Zhang, H. Zhang, B. Hu, M. Wang, S. Zhang, Q. Jia, L. He and Z. Zhang, The

intergrated nanostructure of bimetallic CoNi-based zeolitic imidazolate framework and carbon nanotubes as high-performance electrochemical supercapacitors, *J. Colloid Interface Sci.*, 2022, **608**, 1257–1267.

5 Y. Han, J. Zhou, L. Wang, L. Xing, Z. Xue, Y. Jiao and Y. Pang, Redox-active nanostructure electrode of Mn/Ni bimetal organic frameworks anchoring on multi-walled carbon nanotubes for advanced supercapacitor, *J. Electroanal. Chem.*, 2021, **882**, 114993.

6 H. Chen, Y. Huo, K. Cai and Y. Teng, Controllable preparation and capacitance performance of bimetal Co/Ni-MOF, *Synth. Met.*, 2021, **276**, 116761.

7 Y. Zhu, Z. Tao, C. Cai, Y. Tan, A. Wang and Y. Yang, Facile synthesis Zn-Ni bimetallic MOF with enhanced crystallinity for high power density supercapacitor applications, *Inorg. Chem. Commun.*, 2022, **139**, 109391.