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Supporting Information

Fabrication and study of a high output power flexible fabric hydrovoltaic generator

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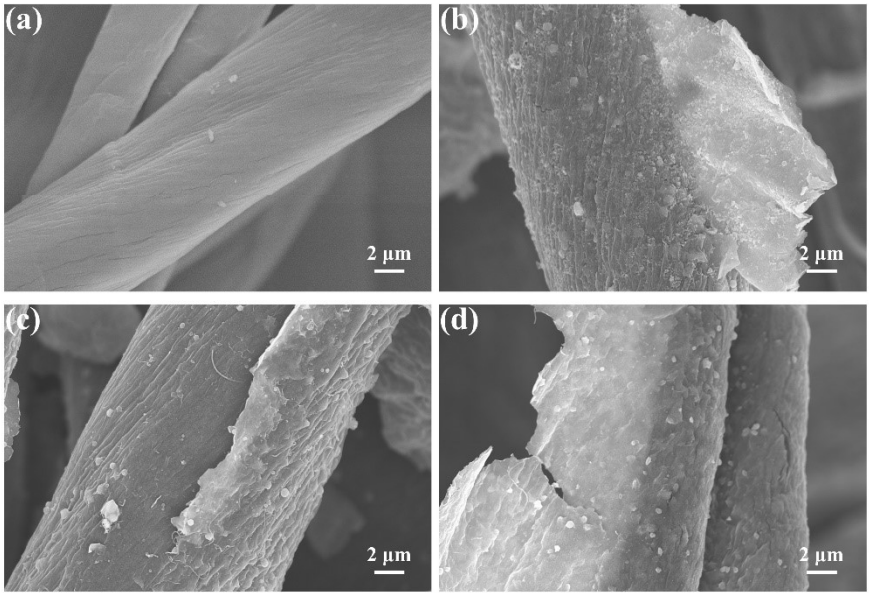

Fig. S1 SEM images of (a) cotton fabric, (b) MXene/Cotton fabric and (c) CNT/MXene/Cotton fabric and (c) GO/CNT/MXene/Cotton fabric.

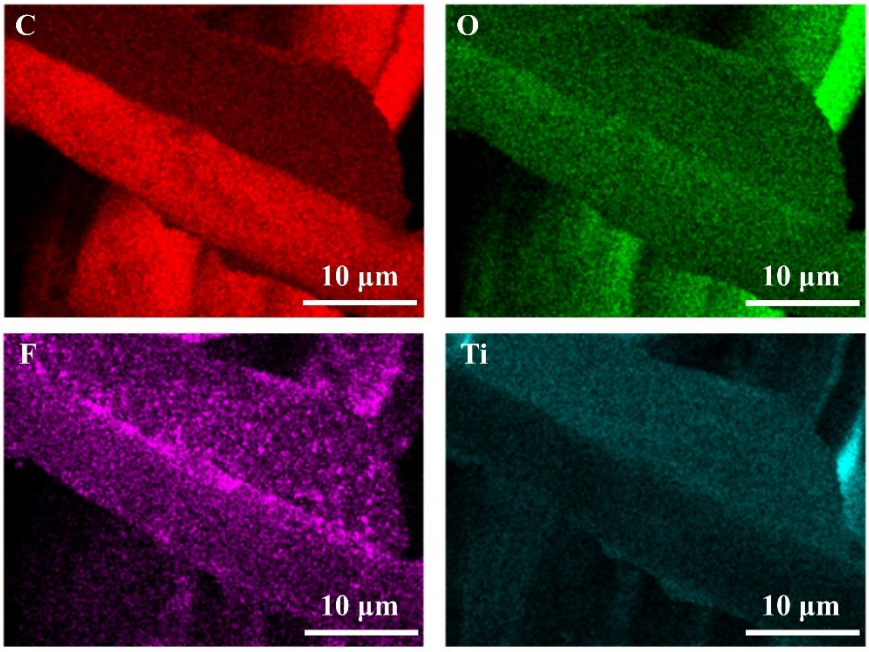

Fig. S2 EDS elemental mapping images of C, O, F, Ti for GCMHEG.

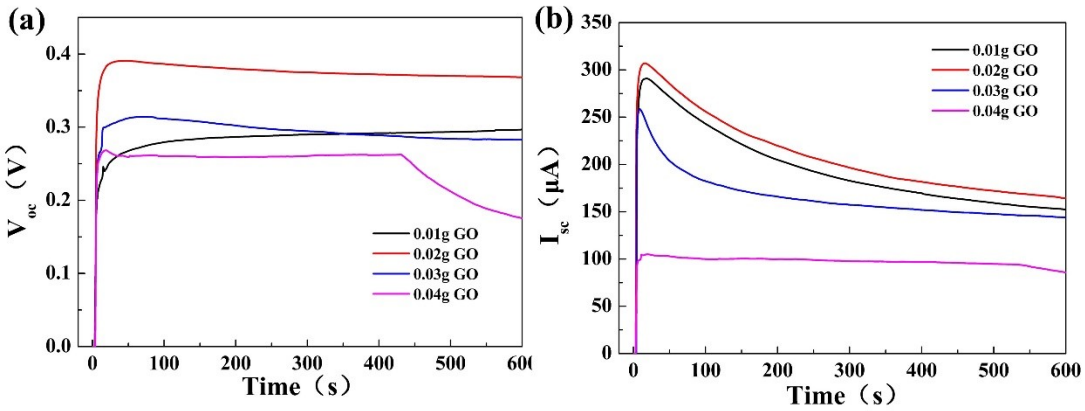

Fig. S3 Voc and Isc of GCMHEG with different GO contents.

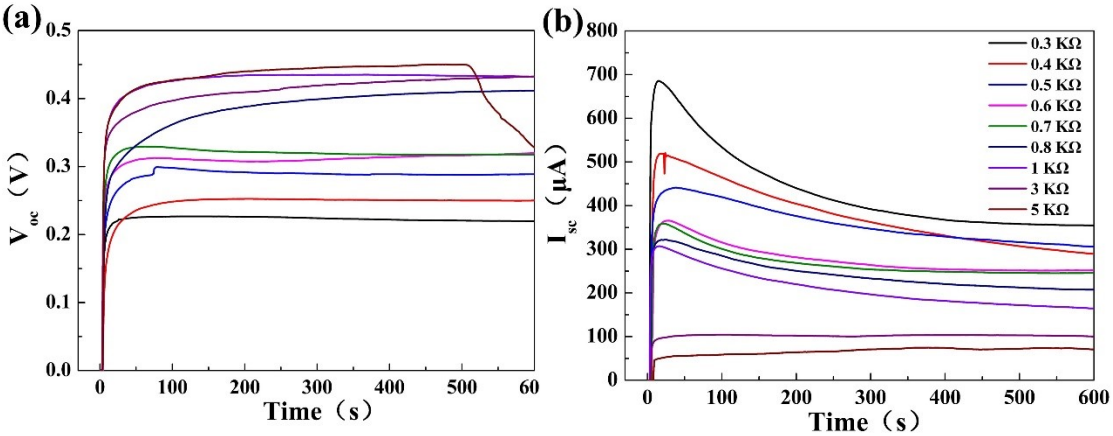

Fig. S4 Voc and Isc of GCMHEG with different resistances.

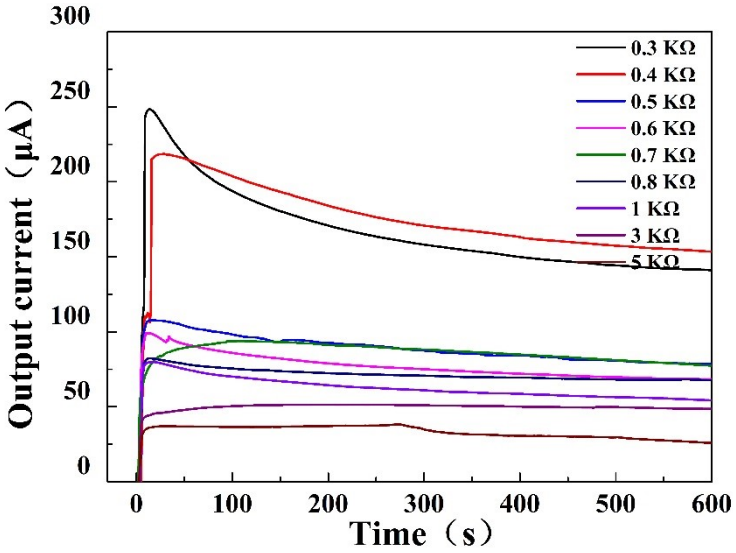

Fig. S5 Actual output current of GCMHEG with different resistances.

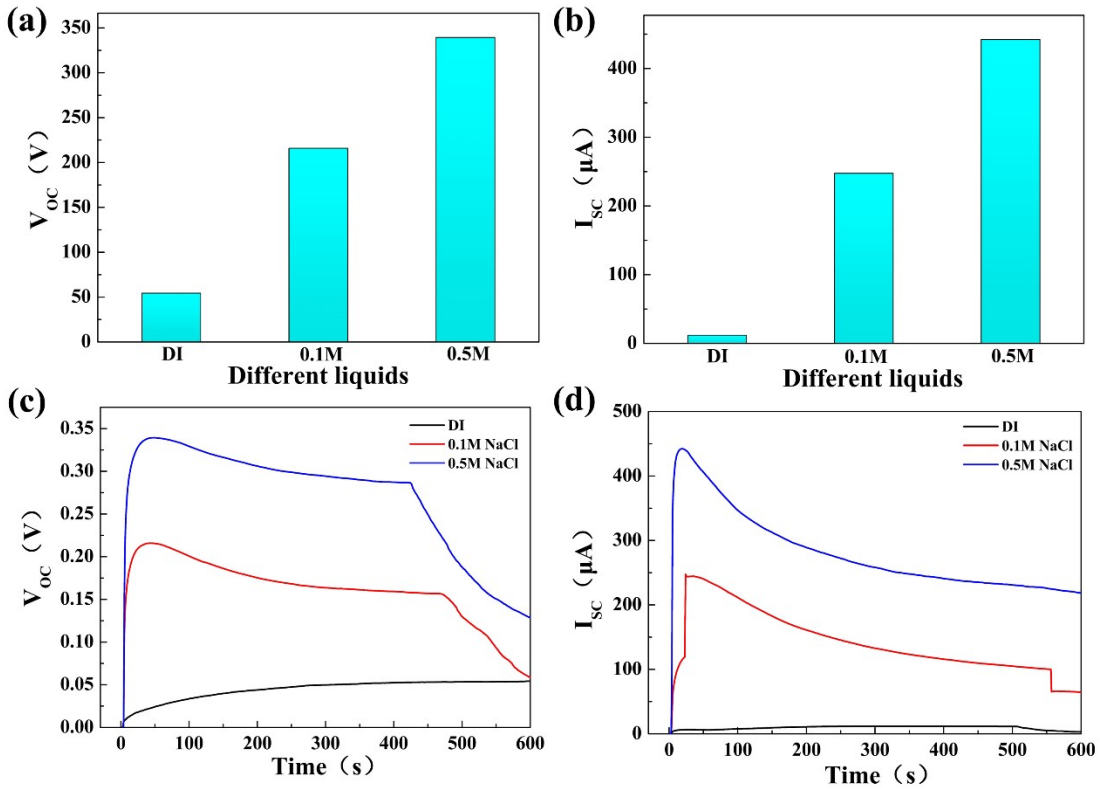

Fig. S6 Power generation performance of GCMHEG in lower concentrations of salt solutions and DI.

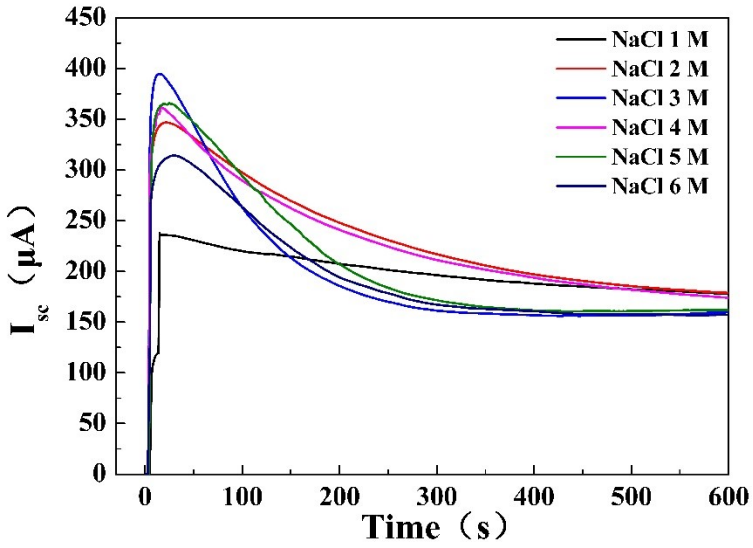

Fig. S7 Actual output current and actual output power of GCMHEG in different concentrations of NaCl solution.

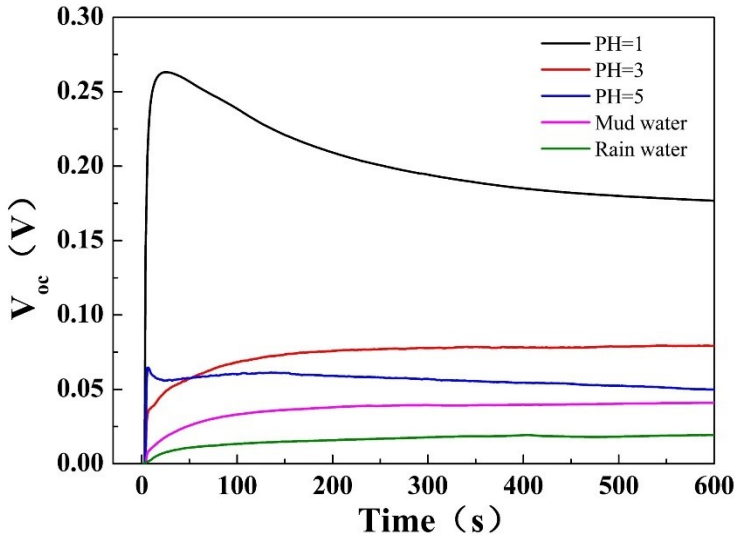

Fig. S8 Voc of GCMHEG in different pH solutions, rain water and mud water.

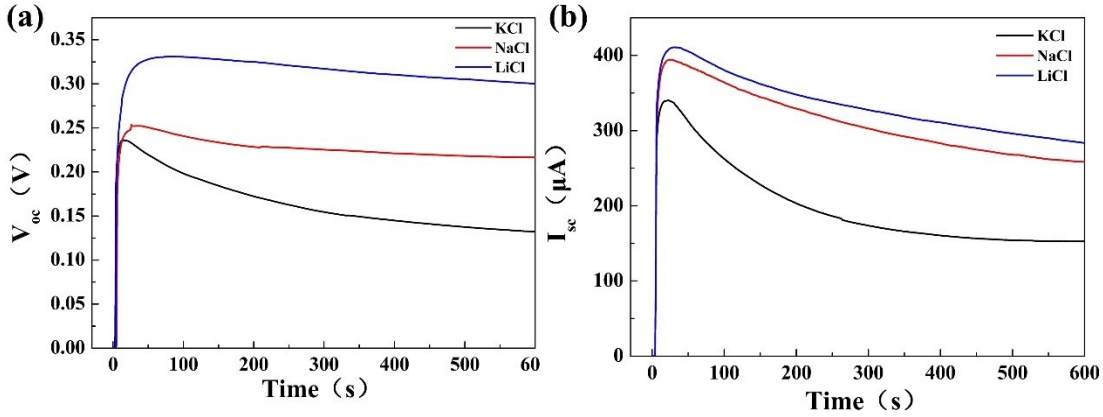

Fig. S9 Voc and Isc of GCMHEG in 1M different salt solutions.

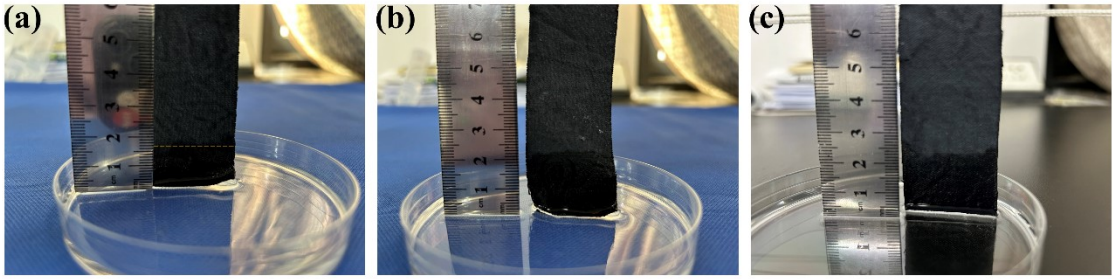

Fig. S10 The height of rise of the sample in different salt solutions under the same time.

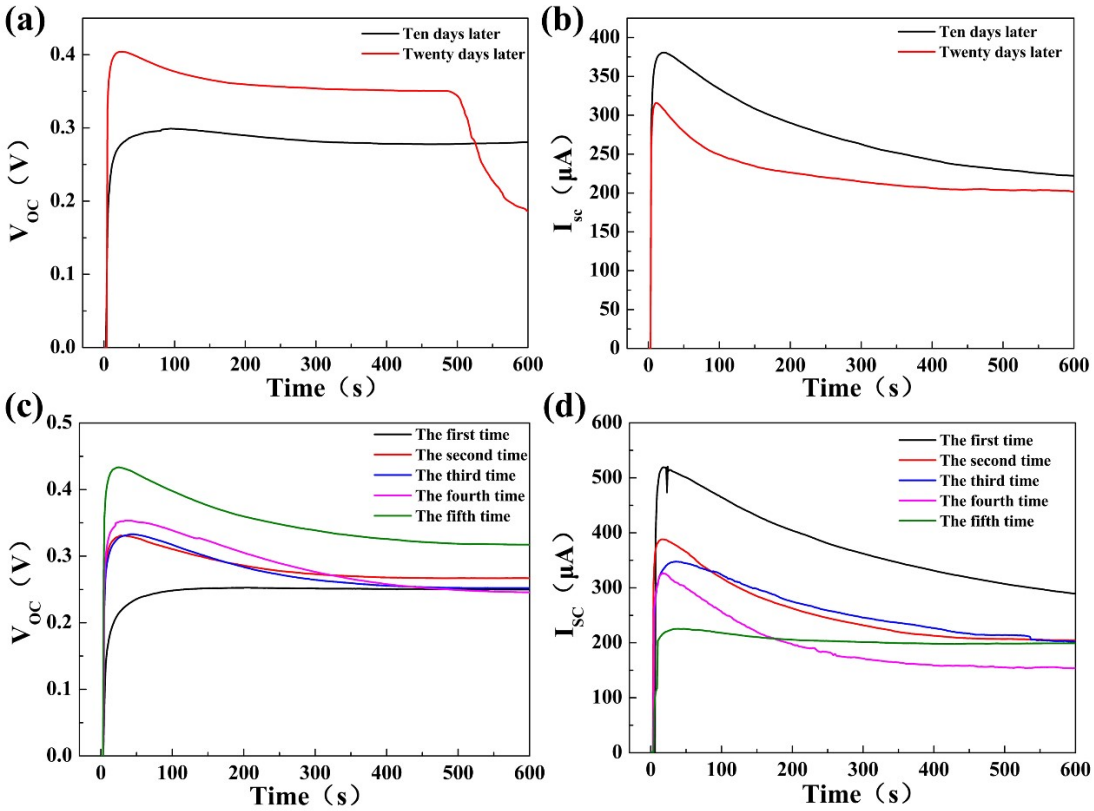

Fig. S11(a-b) Long-term stability and (c-d) cyclability testing of GCMHEG.

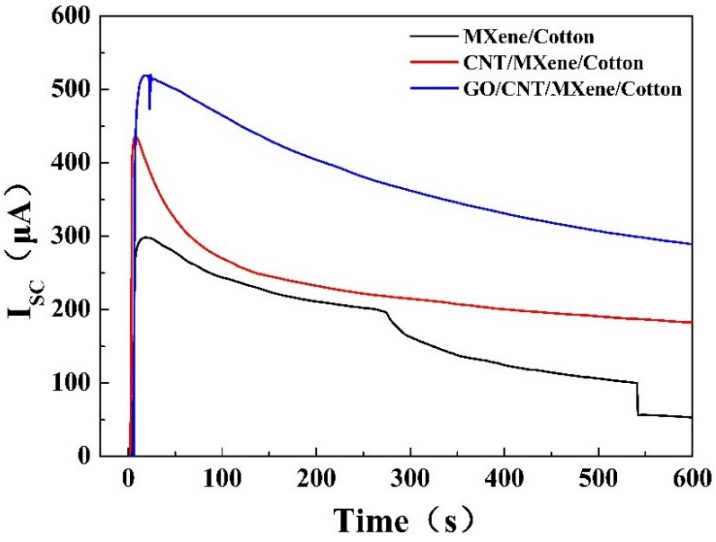

Fig. S12 Isc of different samples.

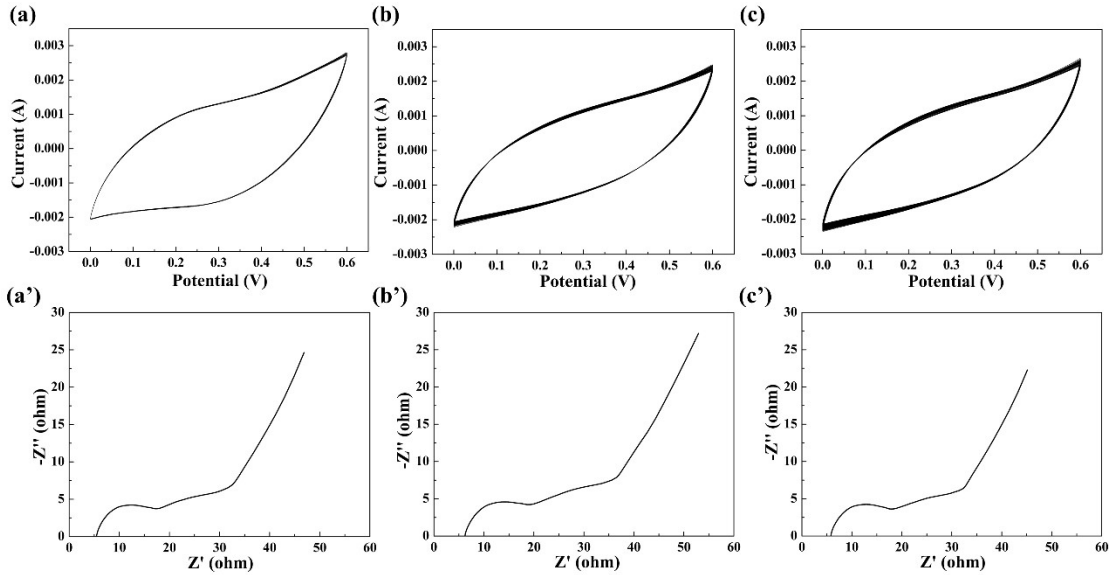

Fig. S13 CV curves and corresponding Nyquist curves of GCMHEG samples after different cycles (10 (a-a'), 30 (b-b'), and 50 (c-c'), cycles).

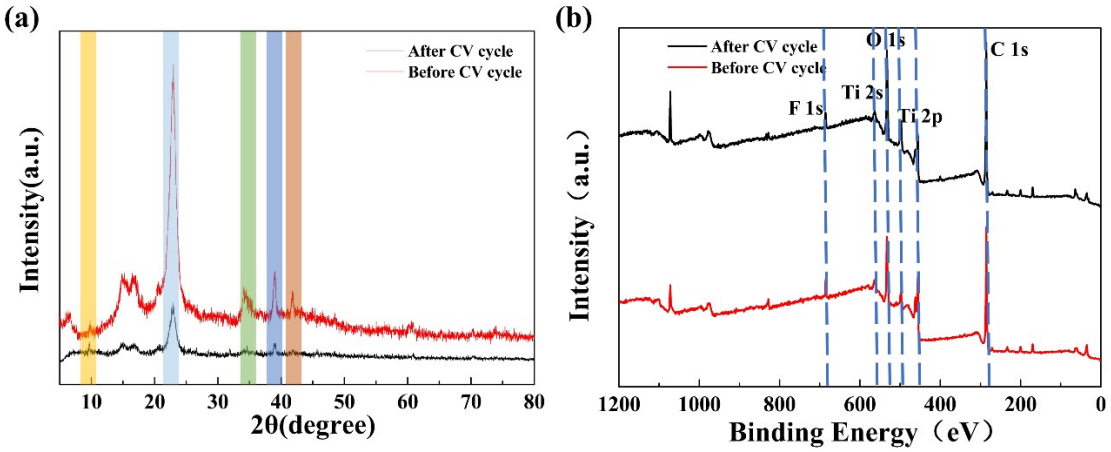

Fig. S14 Comparison of (a) XRD and (b) XPS characterization of GCMHEG samples

before and after CV cycling.

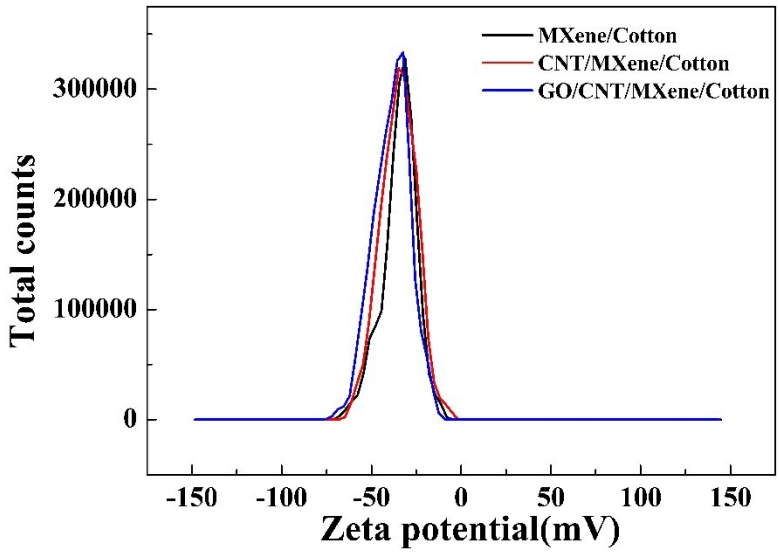

Fig. S15 Zeta of different samples

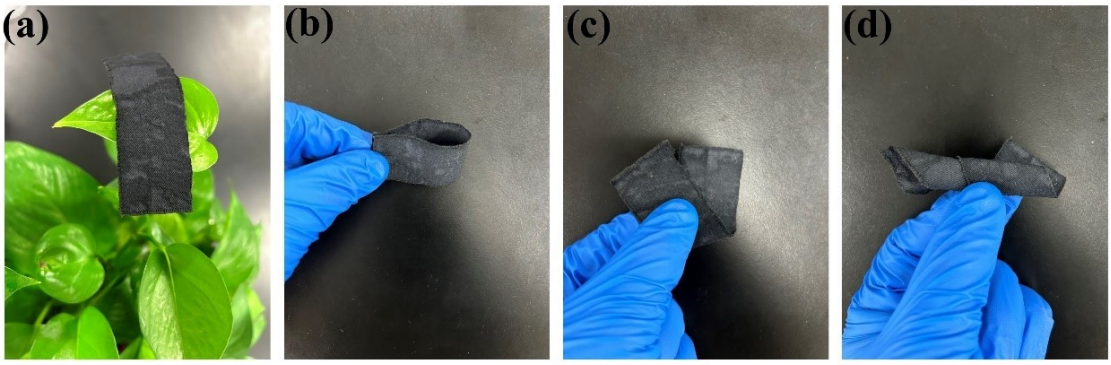

Fig. S16 Pictures of GCMHEG samples in light and different forms of presentation.

Table.S1 Summary and comparison of energy harvesting for different hydrovoltaic power generation

Materials	Mechanism	Power density	Ref.
Biological nanofibrils	Streaming potential	0.63 nW/cm^2	1
GO/PAAS	Ion diffusion	0.07 μW/cm^2	2
GO membrane	Ion diffusion	0.1 μW/cm^2	3
PANI/PVA/$Ti_3C_2T_X$	Ion diffusion	0.18 μW/cm^2	4
P(MEDSAHco-AA)	Redox reaction	0.6 μW/cm^2	5
CNT/AAO/In-Ga	Redox reaction	1.3 μW/cm^2	6
CNT/ $Ti_3C_2T_X$	Streaming potential	1.56 μW/cm^2	7
Porous GO membrane	Ion diffusion	2.02 μW/cm^2	8
GO/CNT/ $Ti_3C_2T_X$	Streaming potential	2.08 μW/cm^2	This work
PVA/OCB/AP film	Streaming potential	2.45 μW/cm^2	9
TiO_2 nanowire	Streaming potential	4 μW/cm^2	10
Protein wires	Ion diffusion	5 μW/cm^2	11
LiCl/Carbon ink	Ion diffusion	5.65 μW/cm^2	12

Supplementary References

1. M. Li, L. Zong, W. Yang, X. Li, J. You, X. Wu, Z. Li and C. Li, Advanced Functional Materials, 2019, 29, 1901798.
2. Y. X. Huang, H. H. Cheng, C. Yang, H. Z. Yao, C. Li and L. T. Qu, Energy & Environmental Science, 2019, 12, 1848-1856.
3. F. Zhao, H. H. Cheng, Z. P. Zhang, L. Jiang and L. T. Qu, Advanced Materials, 2015, 27, 4351-4357.
4. Y. Li, Y. Wu, B. Shao, Z. Song, Y. Wang, J. Qiao, J. Di, W. Wei, T. Song and B. Sun, ACS Applied Materials & Interfaces, 2021, 13, 17902-17909.
5. Y. Long, P. He, Z. Shao, Z. Li, H. Kim, A. M. Yao, Y. Peng, R. Xu, C. H. Ahn, S.-W. Lee, J. Zhong and L. Lin, Nat. Commun., 2021, 12, 5287.
6. Y. Zhang, T. Yang, K. Shang, F. Guo, Y. Shang, S. Chang, L. Cui, X. Lu, Z. Jiang, J. Zhou, C. Fu and Q.-C. He, Nat. Commun., 2022, 13, 3484.
7. X. Zhang, Y. Wang, X. Zhang, C.-W. Lou, J.-H. Lin and T.-T. Li, Chemical Engineering Journal, 2023, 465, 142582.
8. H. Cheng, Y. Huang, F. Zhao, C. Yang, P. Zhang, L. Jiang, G. Shi and L. Qu, Energy & Environmental Science, 2018, 11, 2839-2845.
9. L. Li, S. Gao, M. Hao, X. Yang, S. Feng, L. Li, S. Wang, Z. Xiong, F. Sun, Y. Li, Y. Bai, Y. Zhao, Z. Wang and T. Zhang, Nano Energy, 2021, 85, 105970.
10. D. Shen, M. Xiao, G. Zou, L. Liu, W. W. Duley and Y. N. Zhou, Advanced Materials, 2018, 30, 1705925.
11. X. Liu, H. Gao, J. E. Ward, X. Liu, B. Yin, T. Fu, J. Chen, D. R. Lovley and J. Yao, Nature, 2020, 578, 550-554.
12. Y. Lv, F. Gong, H. Li, Q. Zhou, X. Wu, W. Wang and R. Xiao, Applied Energy, 2020, 279, 115764.