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Supporting information

Copper mesh supported nickel nanowire array as catalyst for hydrogen evolution reaction in high current density water electrolysis

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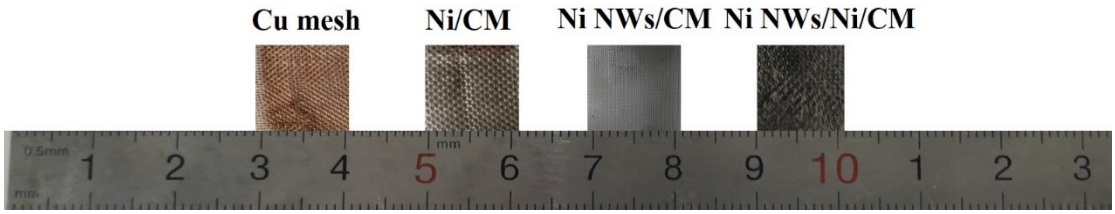

Figure S1. Picture of Cu mesh, Ni/CM, Ni NWs/CM, Ni NWs/Ni/CM.

Figure S2. Bionic model picture of Ni NWs/Ni/CM.

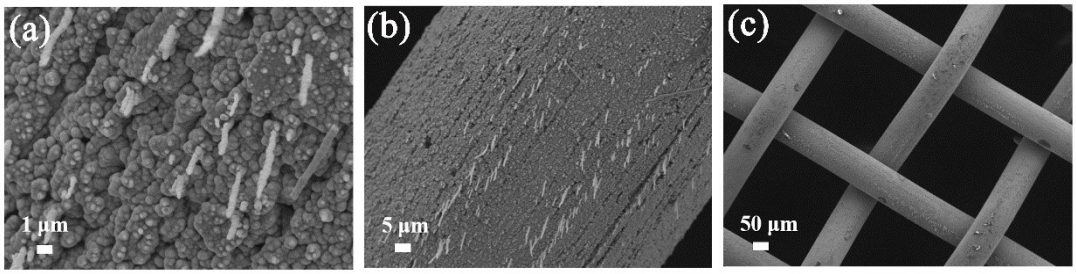

Figure S3. SEM images of Ni NWs/CM with different magnifications, respectively.

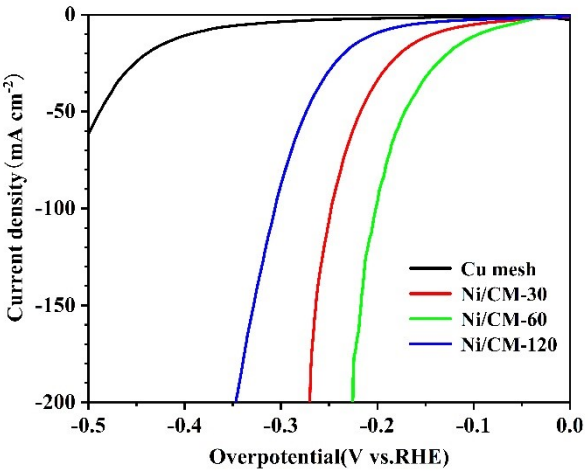

Figure S4. HER LSVs of Ni/CM-30、Ni/CM-60 and Ni/CM-120 with different deposition times, respectively.

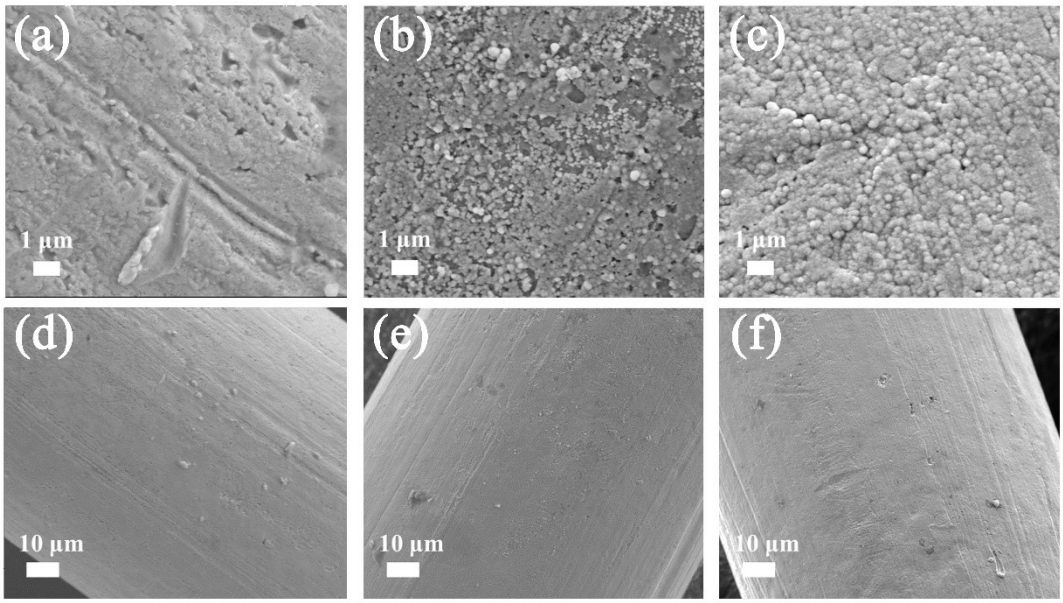

Figure S5. SEM images of Ni/CM-30、Ni/CM-60 and Ni/CM-120 with different deposition times, respectively.

Figure S6. Picture of Ni/CM-30、Ni/CM-60 and Ni/CM-120 with different deposition times, respectively.

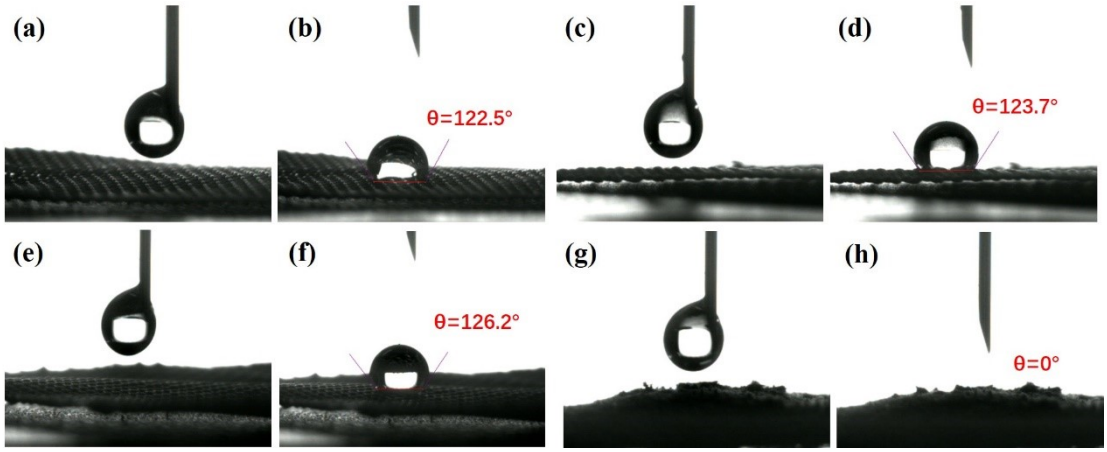

Figure S7. Contact angle measurements of the Cu Mesh (a)before (b)after; Ni/CM (c)before (d)after; Ni NWs/CM (e)before (f)after; Ni NWs/Ni/CM (g)before (h)after.

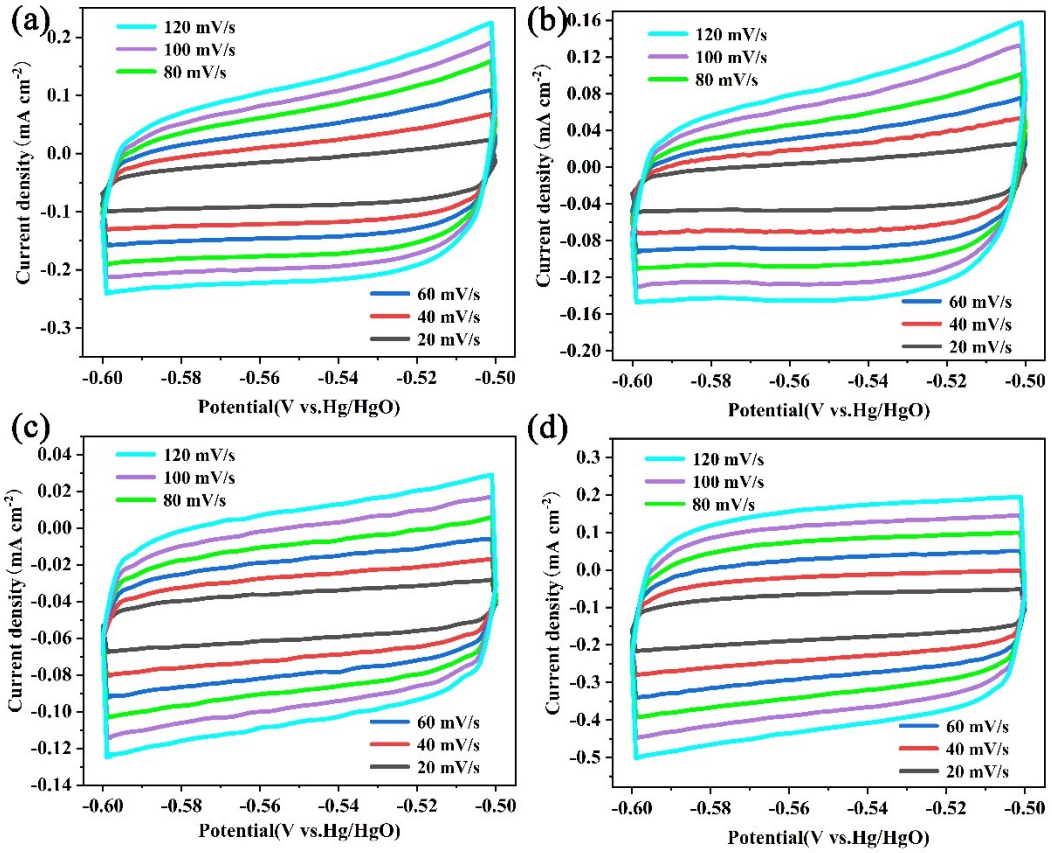

Figure S8. Cyclic Voltammetry plots of (a) Ni NWs/Ni/CM; (b) Ni/CM; (c) Ni NWs/CM; (d)Cu mesh.

Table S1. Fitting values of Pt/C, Ni NWs/E-NM, Ni NWs/NM, NM, E-NM electrochemical composition in Nyquist

Samples	R_s (**ohm**)	R_{ct} (**ohm**)
Ni NWs/Ni/CM	1.200	3.258
Ni/CM	1.231	8.815
Ni NWs/CM	1.147	11.900
Cu mesh	1.207	36.280

Table S2. HER activities of different catalysts were compared at the current density of 500 mA cm^{-2}.

Catalyst	**Electrolyte**	**Substrate**	**η_{500}(mV)**	**Reference**
Ni NWs/Ni /CM	**1 M KOH**	Cu mesh	248	**This work**
F-CoP/Fe_2P/IF	1 M KOH	Iron foam	260	[1]
MoS_2/M_2C	1 M KOH	Ti foil	191	[2]
MoS_2/Ni_3S_2 NW-NF	1 M KOH	Ni foam	182	[3]
Cu-m/Cu-W/NiCo-LDH	1 M KOH	Cu mesh	139	[4]
NiCo/NiCo-OH	1 M KOH	Ni foam	184	[5]
a-MoS_x/CC	0.5 M H_2SO_4	carbon cloth	250	[6]
Ni_2P/NF	1 M KOH	Ni foam	250	[7]
Co_4N-CeO_2/GP	1 M KOH	Graphite plate	190	[8]

References:

1. Y.-R. Z. Xin-Yu Zhang, Yue Chen, Shu-Yue Dou, Xin-Yao Chen, Bin Dong, Bao-Yu Guo, Da-Peng Liu, Chen-Guang Liu, Yong-Ming Chai, *Chem Eng J*, 2020, **399**, 125831.
2. Y. Luo, L. Tang, U. Khan, Q. Yu, H. M. Cheng, X. Zou and B. Liu, *Nat Commun*, 2019, **10**, 269.
3. S. Xue, Z. Liu, C. Ma, H.-M. Cheng and W. Ren, *Sci Bull*, 2020, **65**, 123-130.
4. S. Parvin, A. Kumar, A. Ghosh and S. Bhattacharyya, *Chem Sci*, 2020, **11**, 3893-3902.
5. W. Zhu, W. Chen, H. Yu, Y. Zeng, F. Ming, H. Liang and Z. Wang, *Appl Catal B: Environ*, 2020, **278**, 119326.
6. A. Y. Lu, X. Yang, C. C. Tseng, S. Min, S. H. Lin, C. L. Hsu, H. Li, H. Idriss, J. L. Kuo, K. W. Huang and L. J. Li, *Small*, 2016, **12**, 5530-5537.
7. X. Yu, Z. Y. Yu, X. L. Zhang, Y. R. Zheng, Y. Duan, Q. Gao, R. Wu, B. Sun, M. R. Gao, G. Wang and S. H. Yu, *J Am Chem Soc*, 2019, **141**, 7537-7543.
8. C. T. Hongming Sun, Guilan Fan, Jianing Qi, Ziting Liu, Zhenhua Yan, Fangyi Cheng, Jing Chen, Cheng-Peng Li, Miao Du, *Adv Funct Mater*, 2020, **30**, 1910596.