Supporting Information (SI) for

Multi-step electrodeposited hierarchical Ni-Co-P@LDHs nanocomposites for high-performance interdigital asymmetric micro-supercapacitors

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1. synthesis of FeOOH on interdigital Au/PET substrate

The synthesis process of FeOOH, the anode material, is also via an electrodeposition step. Firstly, 0.86 g CH_3COONa and 0.98 g $(NH_4)_2Fe(SO_4)_2$ were added into 245 mL DI, 5 mL 1 M H_2SO_4 solution was also added for inhibiting the hydrolysis of Fe^{2+}. After stirring, excess reduced iron powder was added into the solution to adjust the pH. Then the depositing process was carried out via a standard three-electrode system, in which one finger of conductive Au/PET substrate was employed as the working electrode. FeOOH nanosheets were electrodeposited via potentiostatic method, under the potential of 0.8 V (vs. SCE) at 65℃ for 100 min. After deposition, the Au/PET substrate was slightly rinsed by DI and ethanol for three times respectively, then it was transferred into a vacuum oven and dried at 60 ℃ for 4 h.

2. preparation of PVA-KOH gel

PVA/KOH gel was prepared as the following method: 2.0 g PVA-1788 was firstly dissolved into 20 mL DI and kept stirring at low speed under 80 ℃ for 2 h. Then, a solution contains 1.68 g KOH and 10 mL DI was dropwise added into the transparent polymer solution under stirring. At last, the PVA/KOH gel was prepared after cooling and low-speed stirring at room temperature.

3. The low-scan rate CV curves of Ni-Co-P electrode and LDHs electrode

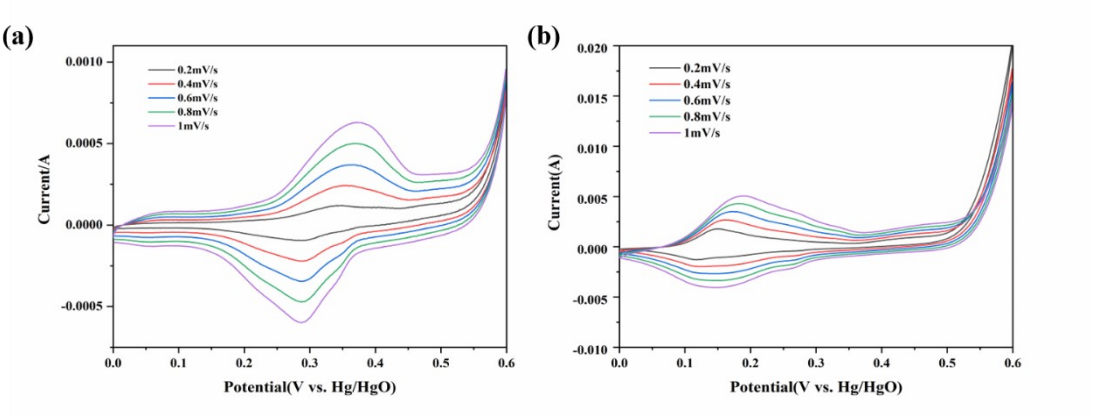

Fig S1. CV curves of (a) Ni-Co-P electrode, (b) LDHs electrode at low scan rates from 0.2 to 1 mV s^{-1}.

4.The i-t and CV curves of electrodepositing process

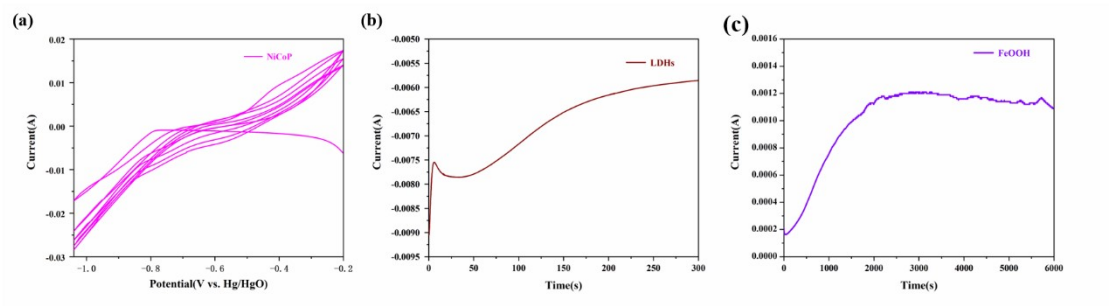

Fig S2. (a) CV curves of Ni-Co-P electrodeposition; (b) i-t curves of LDHs electrodeposition; (c) i-t curves of FeOOH electrodeposition.

5.The electrochemical performance of individual FeOOH electrode

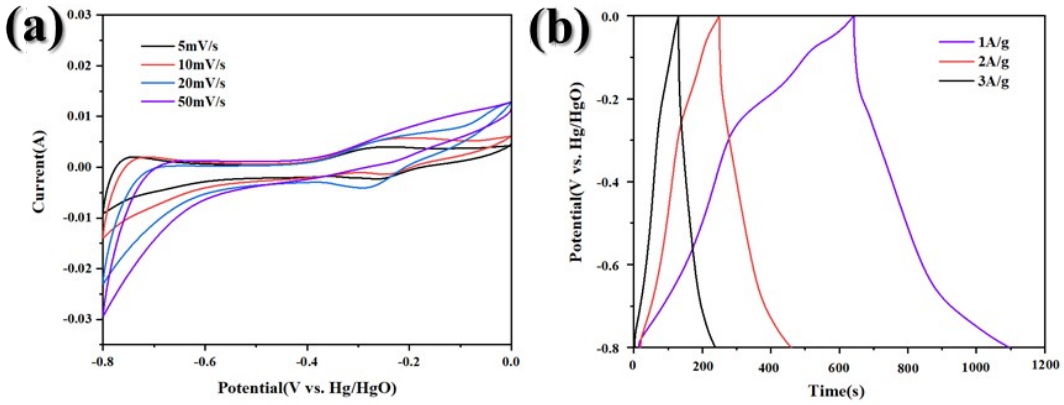

Fig S3. (a) CV curves at different scan rates, (b) GCD curves at different current density of individual FeOOH electrode.

6.The macro and micro appearances of AMSC Ni-Co-P//PVA-KOH//FeOOH

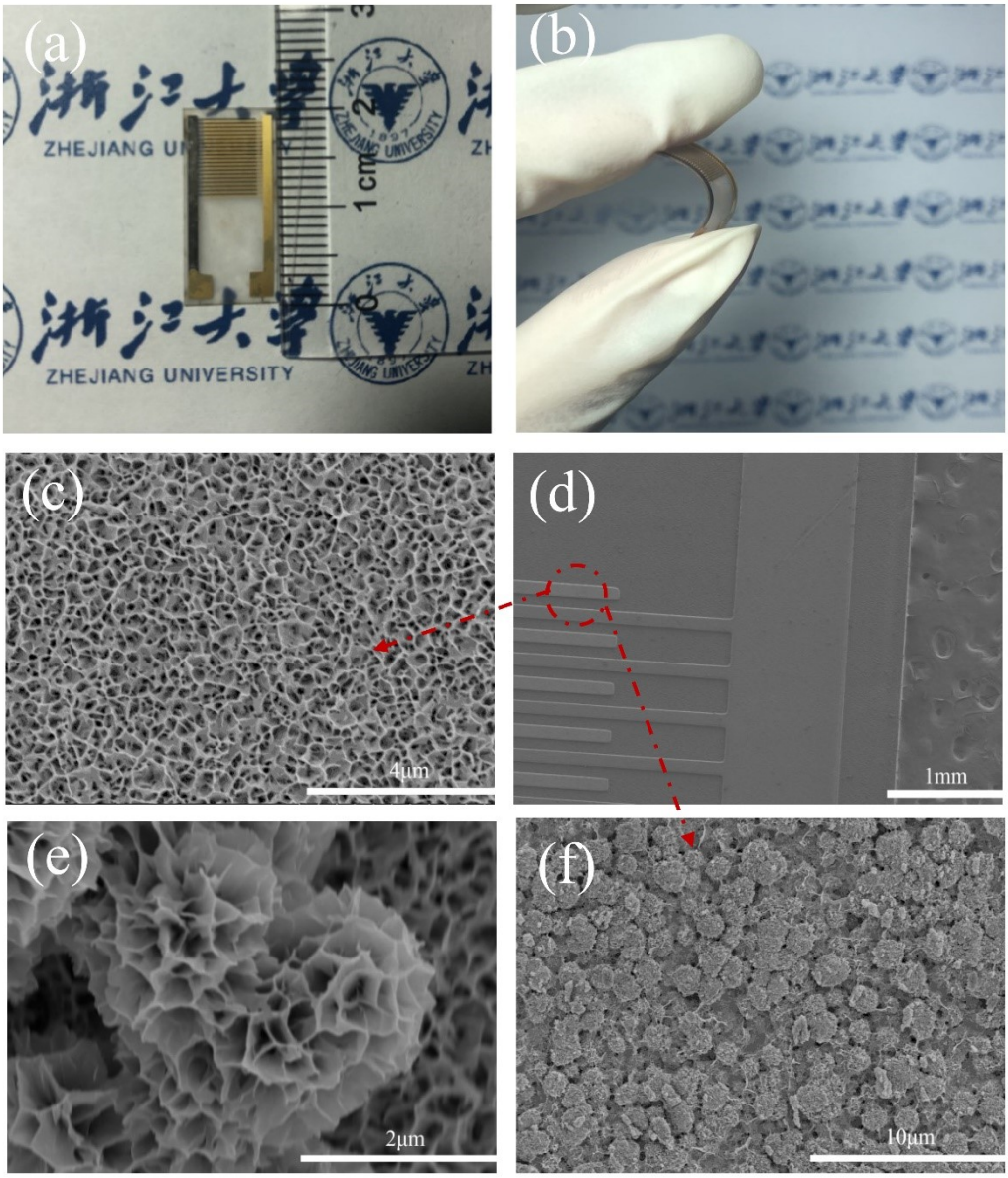

Fig S4. (a) The macro appearance and (b) The flexibility of as-prepared interdigital electrodes; (c) The SEM images of FeOOH nanosheets deposited on the Au finger; (d) The SEM images of the interdigital substrate; (e) A heart-shaped nanoflower of FeOOH; (f) The SEM images of Ni-Co-P@LDHs nanocomposites deposited on the Au finger

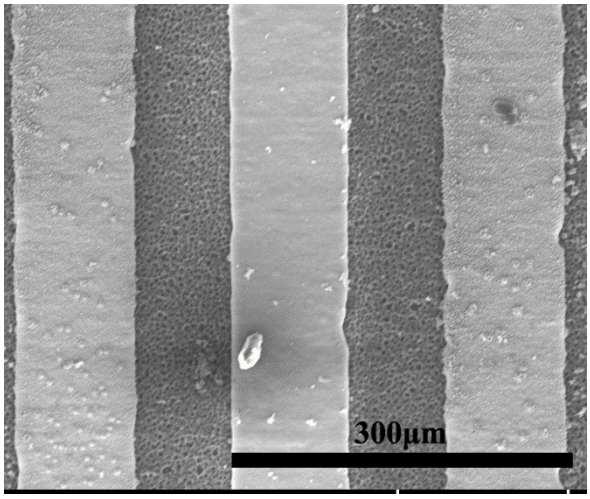

Fig S5. The SEM image of AMSC device.

7.The characterization of FeOOH

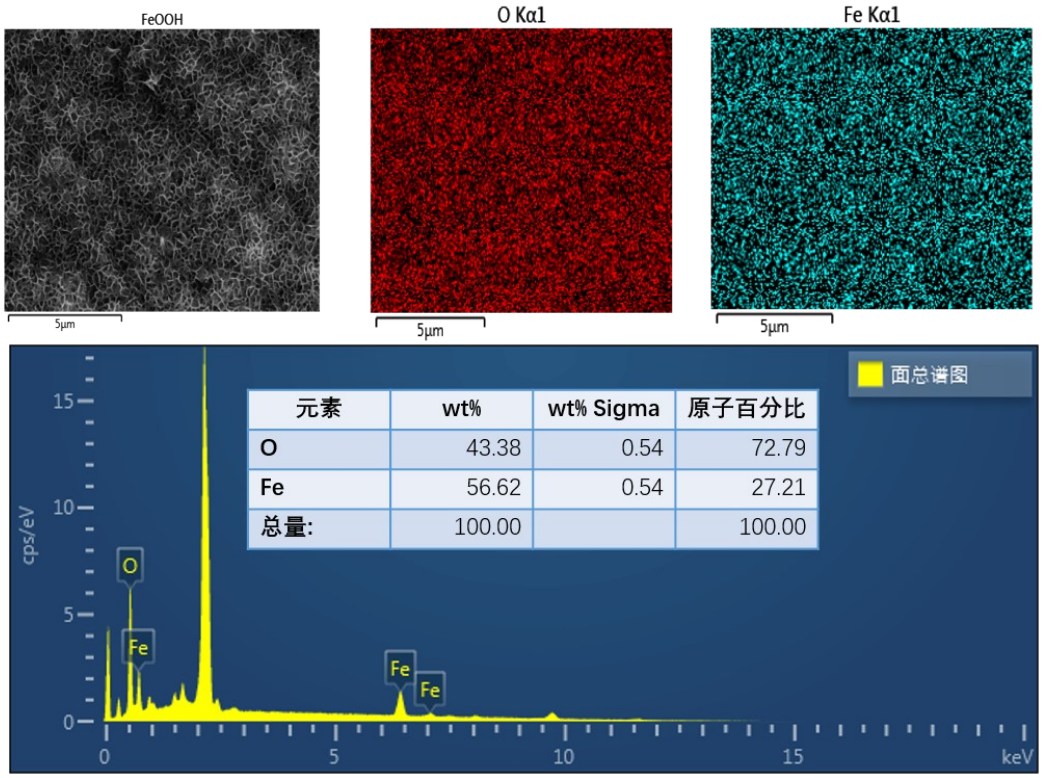

Fig S6. The EDS mapping images of FeOOH nanosheets.

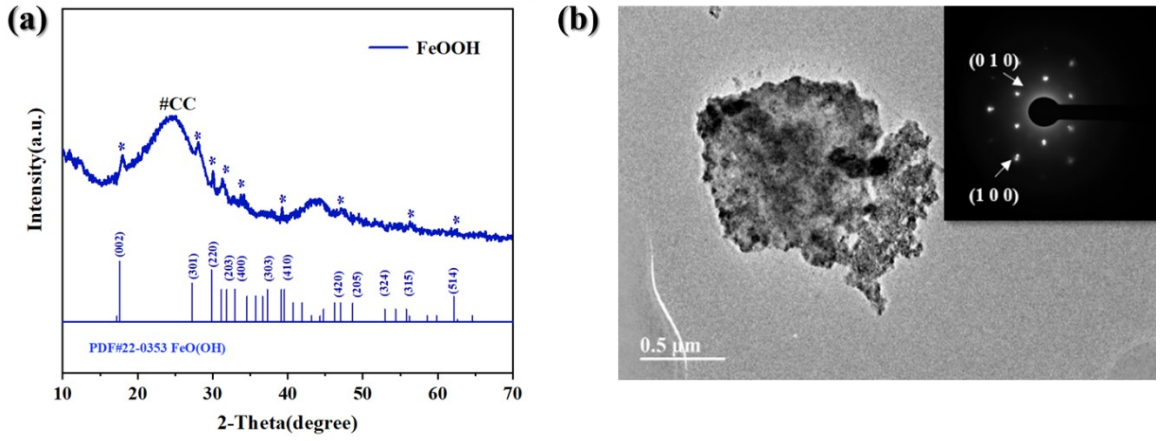

Fig S7. (a) The XRD pattern, (b) The TEM image and SAED pattern of FeOOH nanosheets.

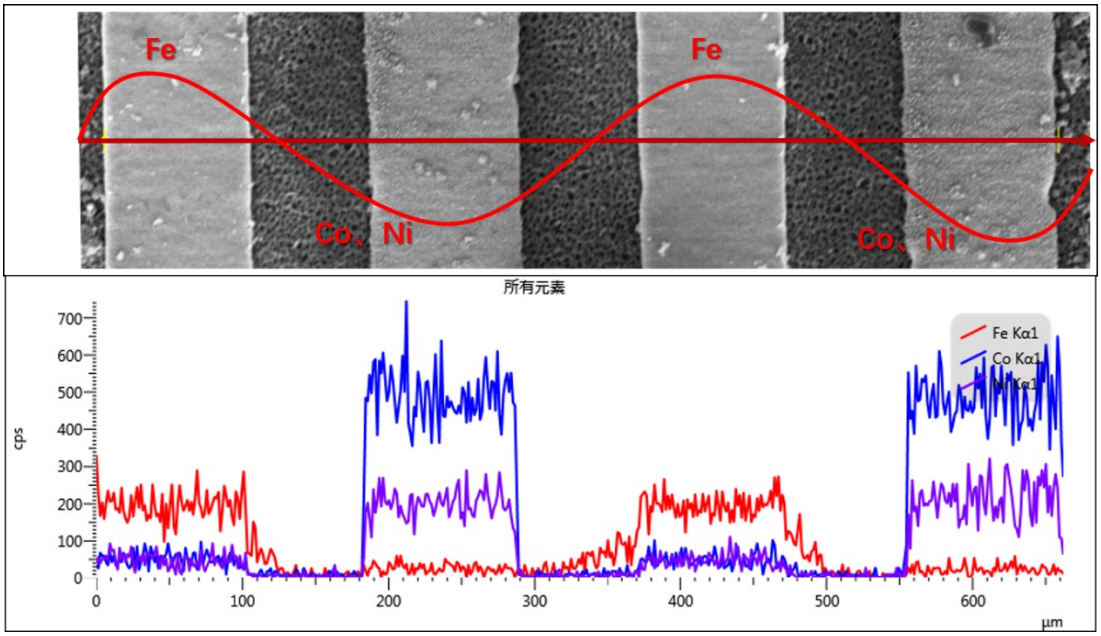

Fig S8. The EDS distribution of Fe, Co and Ni along the direction perpendicular to the fingers.

8.The equivalent circuit in fitting

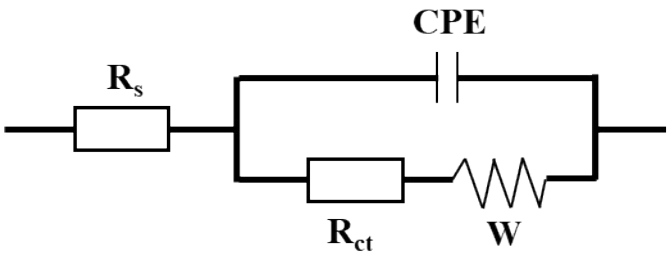

Fig S9. The equivalent circuit in EIS tests and fitting processes.

Table S1

Comparison on the working voltage and areal capacitance of different interdigital micro-supercapacitors.

Positive materials	**Negative materials**	**Electrolyte**	**Working voltage**	**Areal capacitance**	**Refs.**
ZIF-8 derived carbon	ZIF-8 derived carbon	PVA/KOH	0.8 V	—	1
MXene	RGO	PVA/H_2SO_4	1.0 V	2.4 mF cm^{-2}	2
MnO_2	Ag	PVA/KOH	1.0 V	**46.6 mF cm^{-2}**	3
CuSe@MnOOH	CuSe@FeOOH	PVA/LiCl	1.3 V	20.5 mF cm^{-2}	4
Ag@ppy	Ag@ppy	PVA/H_3PO_4	0.8 V	**47.5 mF cm^{-2}**	5
LIC-MOFs	LIC-MOFs	1M H_2SO_4	1.0 V	8.1 mF cm^{-2}	6
MWCNTs	MWCNTs	PVA/H_3PO_4	1.0 V	19.5 mF cm^{-2}	7
Ni@MnO_2	Ni@MnO_2	CMC/Na_2SO_4	0.8 V	10.8 mF cm^{-2}	8
B-doped Graphene	B-doped Graphene	PVA/H_2SO_4	1.0 V	16.5 mF cm^{-2}	9
$Co(OH)_2$	VN	PVA/KOH	**1.5 V**	21.0 mF cm^{-2}	10
CuSe@$Ni(OH)_2$	CuSe@$Ni(OH)_2$	PVA/LiCl	1.0V	11.6 mF cm^{-2} (38.9 F cm^{-3})	11
Ni-Co-P@LDHs	**FeOOH**	**PVA/KOH**	**1.4 V**	**24.0 mF cm^{-2}**	**Our Work**

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