Electronic Supplementary Information

Ni-MOF nanosheet array: an efficient non-noble-metal electrocatalyst for non-enzymatic monosaccharide sensing

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Experimental section

Materials: Ni foam was purchased from Shenzhen Green and Creative Environmental Science and Technology Co. Ltd. $NiCl_2 \cdot 6H_2O$, Hydrochloric acid (HCl), N, N-dimethylformamide (DMF), and terephthalic acid ($C_8H_6O_4$) were purchased from Beijing Chemical Works. Sodium lactose, fructose, and glucose were purchased from Beijing Chemical Works. Glutamic acid (GA), uric acid (UA), NaOH, L-cysteine (L-C), vitamin (VC), urea, glycine, acetonitrile and ethanol were purchased from The Regent Chemicals Co. Ltd. (Tianjin, China). All chemicals were used as received without further purification. Deionized (DI) water use throughout all experiments was purified through a Millipore system.

Preparation of Ni-MOF/NF: A piece of Ni foam was washed in 2 M HCl for 15 min and then cleaned by sonication in water and ethanol to ensure the clean surface. The growth of the Ni-MOF/NF was conducted via a facile one step hypothermal method. $NiCl_2 \cdot 6H_2O$ (0.237g) and terephthalic acid (0.166 g) were mixed with 35 ml DMF, 2.5 ml ethanol, 2.5 ml deionized water to obtain a target mixture. After stirring for 30 minutes, Then the solution was transferred into a clear 50 ml Teflon-lined stainless-steel autoclave with Ni foam (2 cm × 3 cm). Then, reaction underwent in an electric oven at 125 ℃ for 12 h without any moving or stirring. After the sample naturally cooled down slowly at room temperature, being washed with distilled water and ethanol several times, and dried at 60 ℃ for 2 h, the Ni -MOF/NF was finally

obtained.

Preparation of human blood serum: The liquid human blood was put into indoor temperature for about 30 minutes and then turbid liquid centrifuged constantly at 5000 r/min for 8 minutes. Supernate was collected, the disposed human serum is kept in -8 °C.

Characterizations: Powder X - ray diffraction (XRD) pattern was performed using a RigakuD/MAX 2550 diffractometer with Cu Kα radiation (λ=1.5418 Å). Scanning electron microscope (SEM) measurements were recorded on a XL30 ESEM FEG scanning electron microscope at an accelerating voltage of 20 kV. The structures of the sample were determined by Transmission electron microscopy (TEM) image on a HITACHI H-8100 electron microscopy (Hitachi, Tokyo, Japan) operated at 200 kV. X-ray photoelectron spectroscopy (XPS) data of the samples was collected on an ESCALABMK II X-ray photoelectron spectrometer using Mg as the exciting source. Inductively coupled plasma atom emission spectrometry (ICP-AES) analysis was performed on Model ARCOS FHS12 (SPECTRO Analytical Instruments Inc., Germany).

Electrochemical measurements: Electrochemical measurements were performed with a CHI 660E electrochemical work station (CH Instruments, Inc., Shanghai) in a standard three-electrode system containing 0.1 M NaOH solution at room temperature, using Ni-MOF/NF as working electrode (0.2 cm × 0.2 cm), platinum wire as counter electrode and saturated calomel electrode (SCE) as reference electrode.

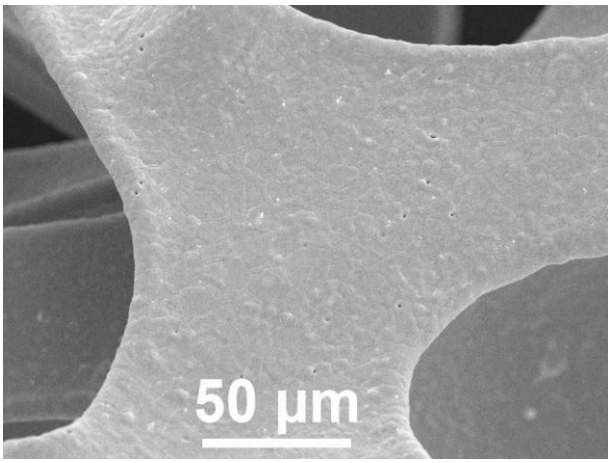

Fig.S1. SEM of bare Ni foam with 50 µm.

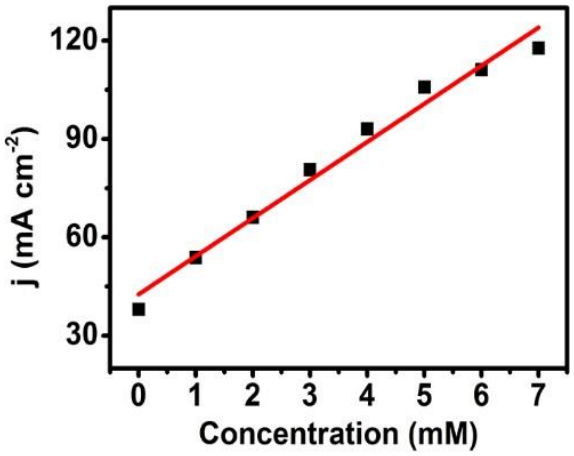

Fig.S2. The corresponding calibration plots of current densities and glucose.

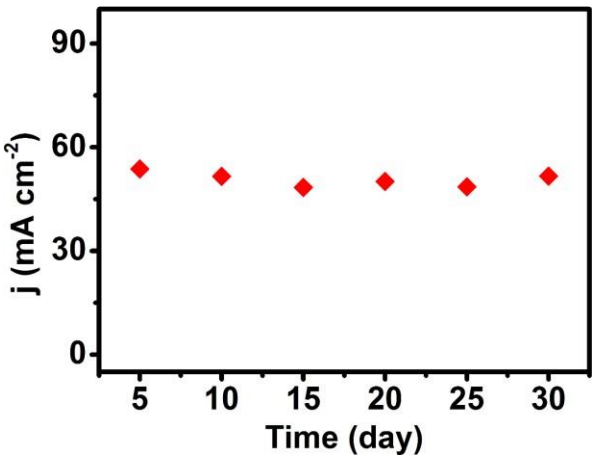

Fig.S3. The scatter gram in the current response of Ni-MOF/NF toward 1 mM glucose for 30 days (NaOH concentration: 0.1 M).

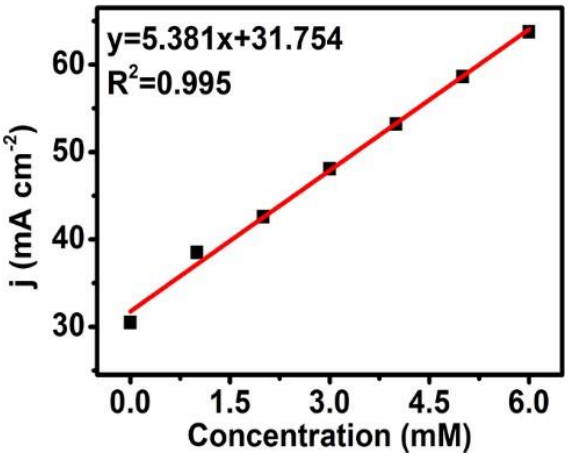

Fig.S4. Calibration curve in the diluted blood serum sample.

Table S1. Performance comparison different catalyst materials of glucose detection

Type of Electrode	**Line range (up to mM)**	**sensitivity ($\mu A\ mM^{-1}\ cm^{-2}$)**	**LOD (μM)**	**Ref.**
$Ni(OH)_2$/NF	0.002-1.05	2617.4	2.5	1
$Ni(OH)_2$ NPs/RGO/GCE	0.002-3.1	11.4	0.6	2
α-$Ni(OH)_2$/FTO	0.01-0.75	446	0.75	3
Ni NPs/carbon nanofiber	0.002-2.5	10509	1	4
CNT-Ni-GCE	0.005-2.0	1384.1	2	5
$Ni(OH)_2$/Au	0.005-2.2	371.2	0.92	6
$NiCoO_2$@CNT	0.01-1.55	1424.4	1.14	7
NiO-CdO	Up to 1.94	-	1.28	8
600-NiO/SiC	0.004-7.5	2.037	0.32	9
Ni-Co NSs/RGO	0.0-2.65	1773.6	3.97	10
Gold nanoshell (SERS detection)	2.7-8.3	-	2.7	11
GK-Pd NPs (colorimetric detection)	0.01-1	-	6.0	12
MIL-53(Fe) MOFs	0.00025-0.01	-	0.13	13
Cu-MOFs ($[Cu_3(btc)_2]$)	0.000125-2.25	549	0.125	14
Iridium(III)-MOFs	0.05-5.0	-	10.0	15
Ni-MOF NA/NF	0.04-2.0	14845	0.085	This work

Reference

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