Electronic Supplementary Information

Experimental section

Materials: Sodium hydroxide (NaOH, >96%), nickel nitrate (Ni(NO$_3$)$_2$, 99.9%), potassium chloride (KCl, >99.5%), hydrochloric acid (HCl, 12 M), and ethanol (99%) were obtained from Beijing Chemical Reagent Co. Ltd. Glucose (99.99%), ascorbic acid (AA, >99.99%), sodium chloride (NaCl, >99.5%), calcium chloride (CaCl$_2$, >99.5%), uric acid (UA, >99.99%), dopamine (DA, >99%), and gibberellic acid (GA, >99%) were acquired from Aladdin Ltd. All reagents are analytical grade. Titanium plate (TP) (0.4 mm thick) was supplied by China Qingyuan Metal Materials Co. Ltd.

Ni@TiO$_2$/TP synthesis: Initially, TP underwent ultrasonic treatment in HCl, ethanol, and water for 10 min each. Following our previous work[1-4], the treated TP was then soaked in 5 M NaOH and heated at 180°C in an autoclave for 24 h to obtain sodium titanate/TP. Next, sodium titanate/TP was immersed in 0.05 M Ni(NO$_3$)$_2$ to exchange Na$^+$ for Ni^{2+}. After rinsing and drying, it was annealed at 500°C under an Ar/H$_2$ atmosphere for 2 h, resulting in Ni@TiO$_2$/TP. For comparison, TiO$_2$/TP was synthesized similarly, using dilute HCl instead of Ni(NO$_3$)$_2$ to exchange Na$^+$ for H$^+$.

Characterizations: X-ray diffraction (XRD) analyses were conducted using a Rigaku D/MAX 2550 diffractometer. X-ray photoelectron spectroscopy (XPS) measurements were performed with a Thermo Scientific K-Alpha spectrometer, utilizing magnesium (Mg) for excitation. Scanning electron microscope (SEM) images were equipped with a Hitachi S-4800 field emission microscope. Transmission electron microscopy was carried out using an FEI Talos F200x microscope.

Electrochemical measurements: The electrochemical performance of Ni@TiO$_2$/TP and TiO$_2$/TP (0.2 ~ 0.5 cm) electrodes was studied using a conventional three-electrode system on a Chi660E electrochemical workstation. A platinum wire served as the counter electrode, an Ag/AgCl electrode as the reference, and the prepared Ni@TiO$_2$/TP electrode as the working electrode. Cyclic voltammetry (CV) scans were performed within a potential range of 0.2 to 0.6 V. Glucose sensing via chronoamperometry (CA) was conducted at 0.50 V, with 0.1 M NaOH as the

electrolyte for both CV and CA measurements. All potentials were referenced to the Ag/AgCl electrode without correction.
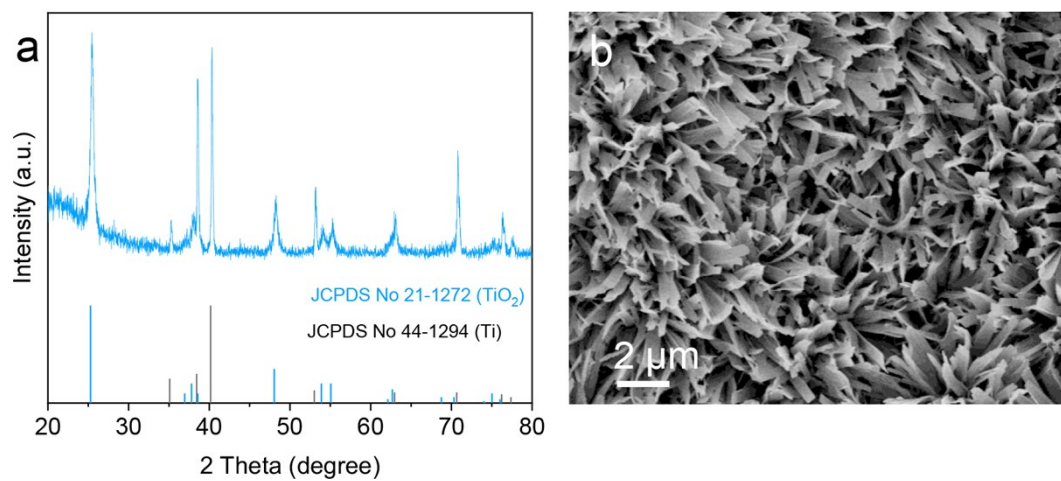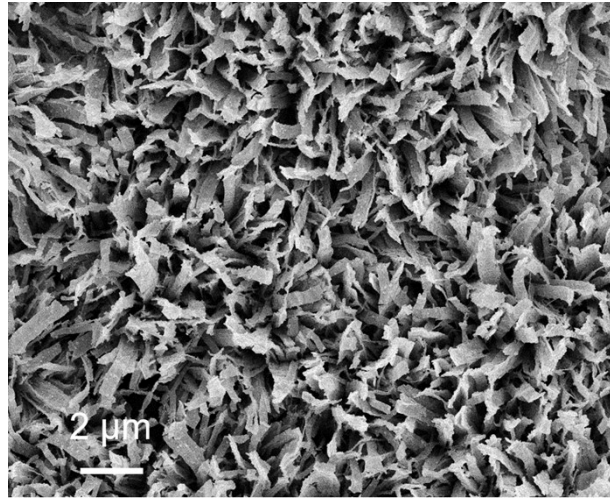
Fig. S1. (a) XRD pattern and (b) SEM image of TiO$_2$/TP.
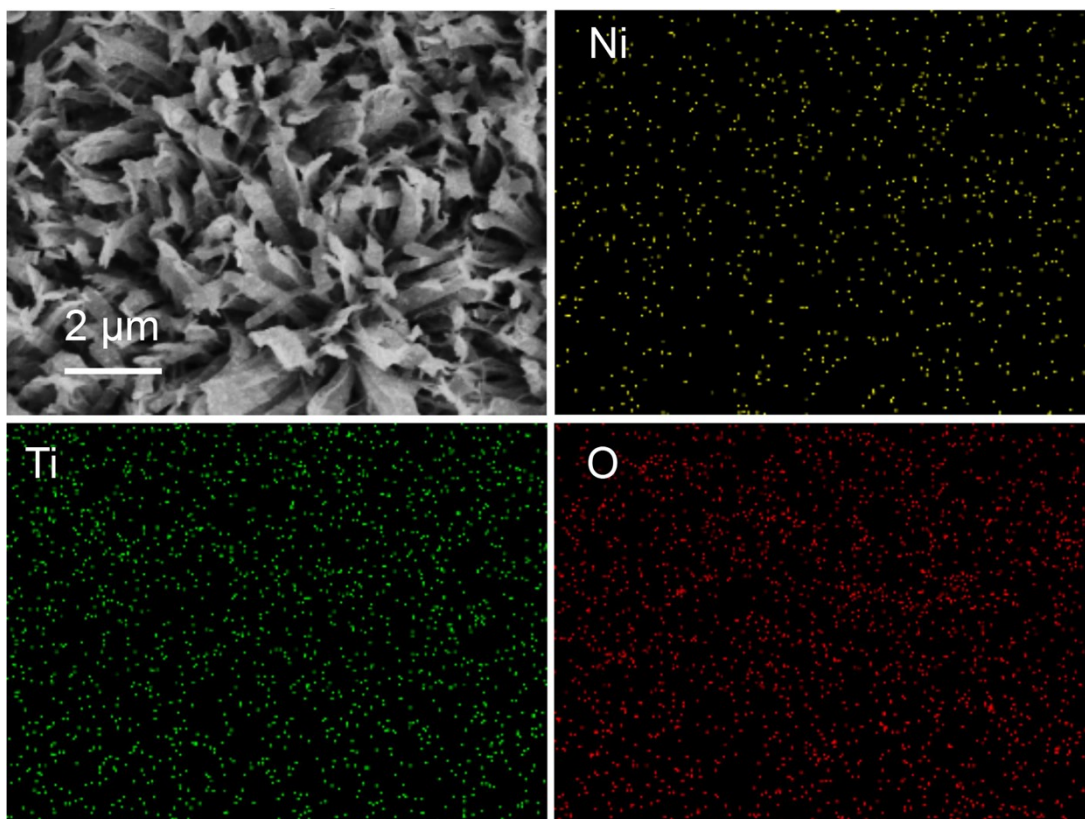
Fig. S2. SEM image of Ni@TiO$_2$/TP

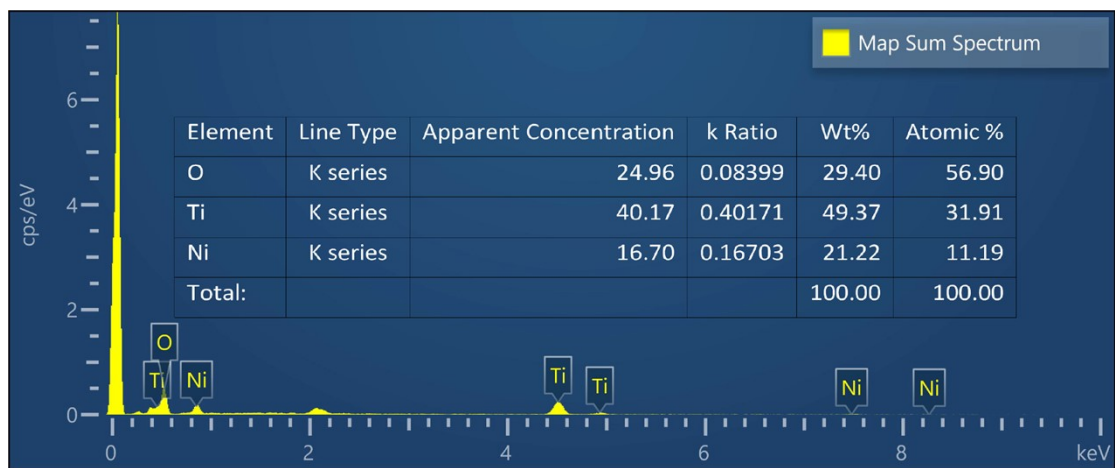**Fig. S3.** SEM and corresponding EDX elemental mapping images of Ni@TiO$_2$.

Fig. S4. EDX spectrum of Ni@TiO$_2$.

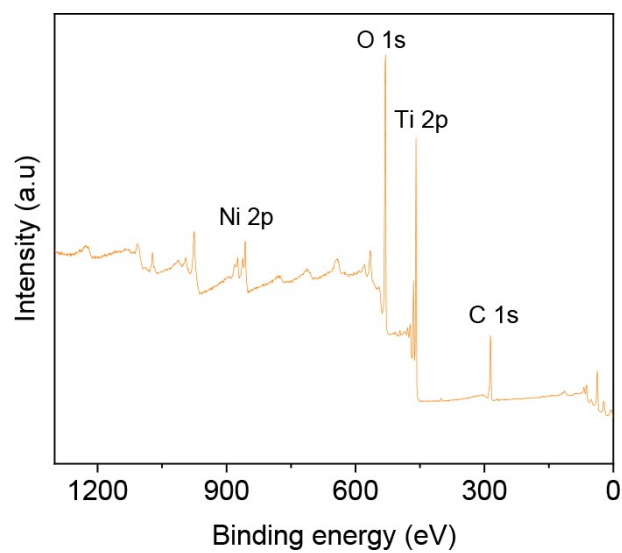| Element	Line Type	Apparent Concentration	k Ratio	Wt%	Atomic %
O	K series	24.96	0.08399	29.40	56.90
Ti	K series	40.17	0.40171	49.37	31.91
Ni	K series	16.70	0.16703	21.22	11.19
Total:				100.00	100.00

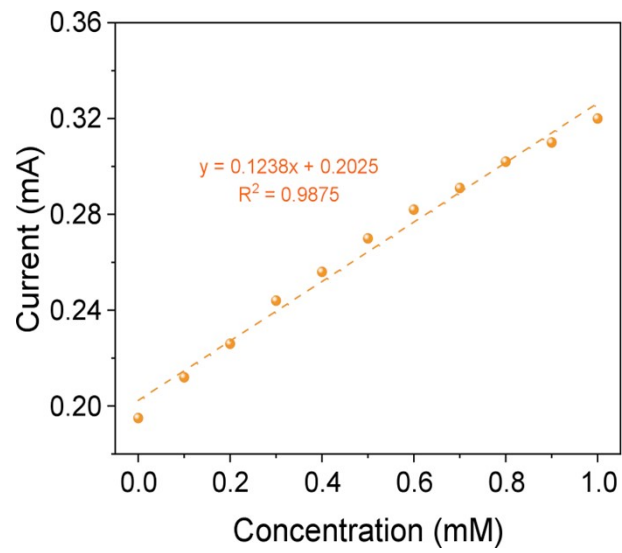**Fig. S5.** XPS survey spectrum of Ni@TiO$_2$.

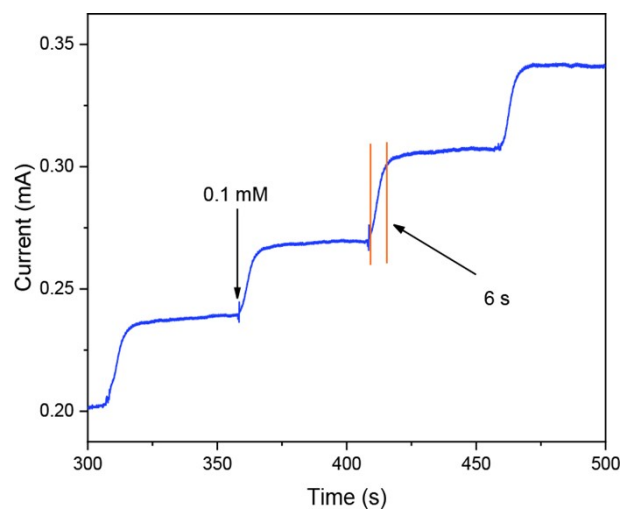**Fig. S6.** Plot of the current vs. the concentration of glucose for Ni@TiO$_2$/TP.

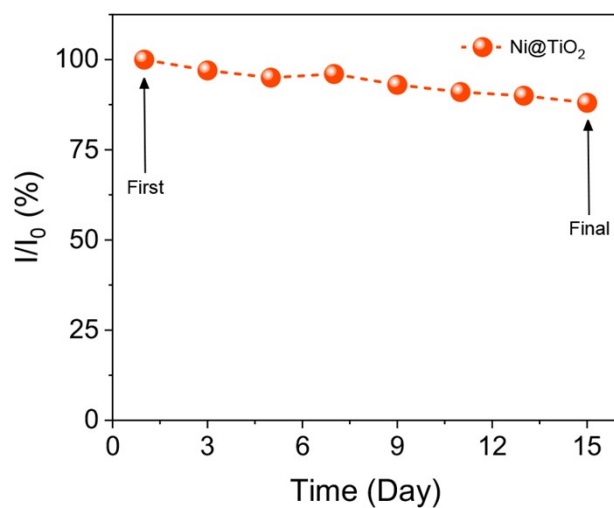**Fig. S7.** Current response time of Ni@TiO$_2$/TP.

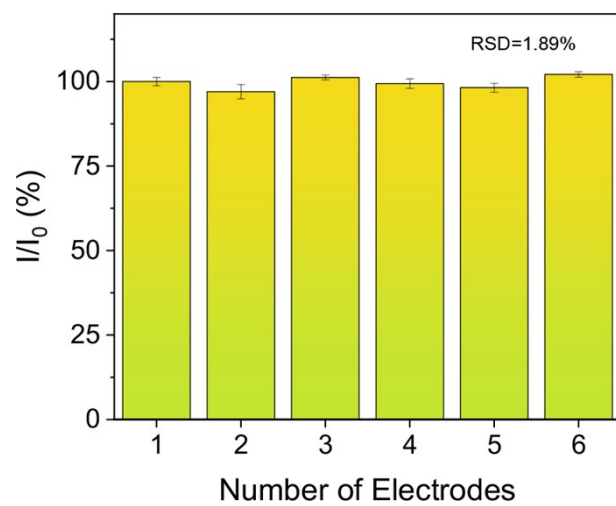**Fig. S8.** Relative current response of the Ni@TiO$_2$/TP electrode towards 0.1 mM glucose after 15 days of storage.
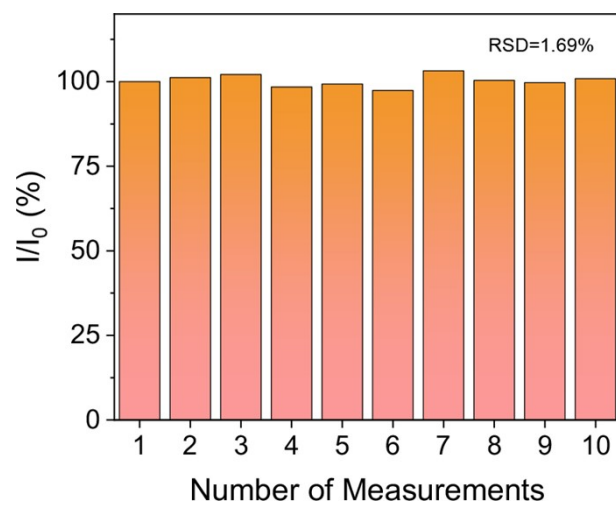
Fig. S9. Inter-electrode repeatability of Ni@TiO$_2$/TP.

Fig. S10. Intra-electrode repeatability of Ni@TiO$_2$/TP.

Table S1. Comparison of the performances of Ni@TiO$_2$/TP with other reported non-enzymatic electrode for glucose detection.

Electrodes	Sensitivity (μA mM^{-1}cm^{-2})	Linger range (mM)	LOD (μM)	Ref.
Ni@TiO$_2$/TP	10060 3940	0.001-1	0.08	This work
Ni–TiO$_2$/XC72R	3300 273.7	0.05-1 1-20	0.144	5
NiO-TiO$_2$/GCE	24.85	0.002-2	0.7	6
Ni(OH)$_2$/TiO$_2$	192	0.03-14	8	7
NPs/TiO$_2$NTs	700	0.004-4.8	2	8
WO$_3$ doped TiO$_2$ nanotubes with Ni(OH)$_2$ nanoparticles	70	/	28	9
Ni-MOF NSAs/CC	13428.89	0.001-7	0.57	10
Conductive Ni-MOF	21744	0.001-8	0.66	11
Ni-DLC/TiO$_2$	1063.78	0.99-22.9	0.53	12
Ni/rGO/PP	/	0.0005-1	0.36	13
NiCo-LDH/MWCNTs	2.55 1.15	0.0001-3 3-9.23	0.03	14

Table S2. Recovery tests for Ni@TiO$_2$/TP glucose biosensor in human blood serum and cell culture fluid.

Sample	Added (mM)	Found (mM)	Recovery (%)	RSD (%) (n=3)
	0.1	0.097	97.4	1.5
Human blood serum	0.3	0.294	98.3	2.7
	0.5	0.508	101.5	2.2
	0.1	0.096	96.1	3.4
Cell culture fluid	0.3	0.307	102.3	2.1
	0.5	0.494	98.8	4.2

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