Electronic Supplementary Information

Synthesis of uniformly dispersed Fe_2TiO_5 nanodisks: A super sensitive photoelectrochemical sensor for glucose monitoring in human blood serum

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Experimental section

Materials and reagents

Lactose, maltose, Terephthalic Acid, Titanium (IV) isopropoxide were purchased from Aladin Ltd. (Shanghai, China). Potassium ferricyanide trihydrate, Iron nitrate nonahydrate, Polyvinylpyrrolidone (PVP) were obtained from Guangfu Fine Chemical Research Institute (Tianjin, China). Cytosine, thymine, Sodium sulfate anhydrous were provided from Sinopharm Chemical Reagent Co. Ltd. (Shanghai, China). Potassium ferricyanide, Potassium chloride, Methanol, N,N-Dimethylformamide (DMF) were supplied by Tianjin Guangfu Technology Development Co. Ltd. (Tianjin, China). All reagents were used as received without further purification.

Apparatus

A typical three-electrode system was used to collect electrochemical data. To be specific, a platinum wire as a counter-electrode, the Ag/AgCl electrode was employed as the reference electrode and modified ITO electrode acted as the working electrode. Before preparation of PEC sensor, ITO substrates were cleaned by immersion for ultrasonically agitated in acetone, 1 M NaOH, deionized water solvents

Preparation of working electrode

Firstly, the conductive surface of ITO conductive glass electrode was measured by universal meter, and the non-conductive side was cut to ensure the integrity of the conductive side. Cut it into 2 cm × 1 cm using a glass knife. Then, the ITO conductive glass was treated with ultrasound in acetone solution, 1 M NaOH aqueous solution and deionized water for 15 minutes respectively. The paster was attached to the center of one end of ITO electrode, and the transparent surface was completely covered with glue. After the glue was dried, the paster was removed, and the transparent surface with the same size was retained. Then 5 mg Fe_2TiO_5 was completely dissolved in 20 μL ultrapure water and 20 μL 0.5% nafion, drop 1μL configured material on the ITO.

Preparation of human blood serum

The human blood was put into 45 °C water bath to maintain 10 minutes and then centrifuged at 4000 r/min for 5 minutes. Human blood serum was obtained by collected the supernate. The disposed serum is kept in -5 °C to -20 °C.

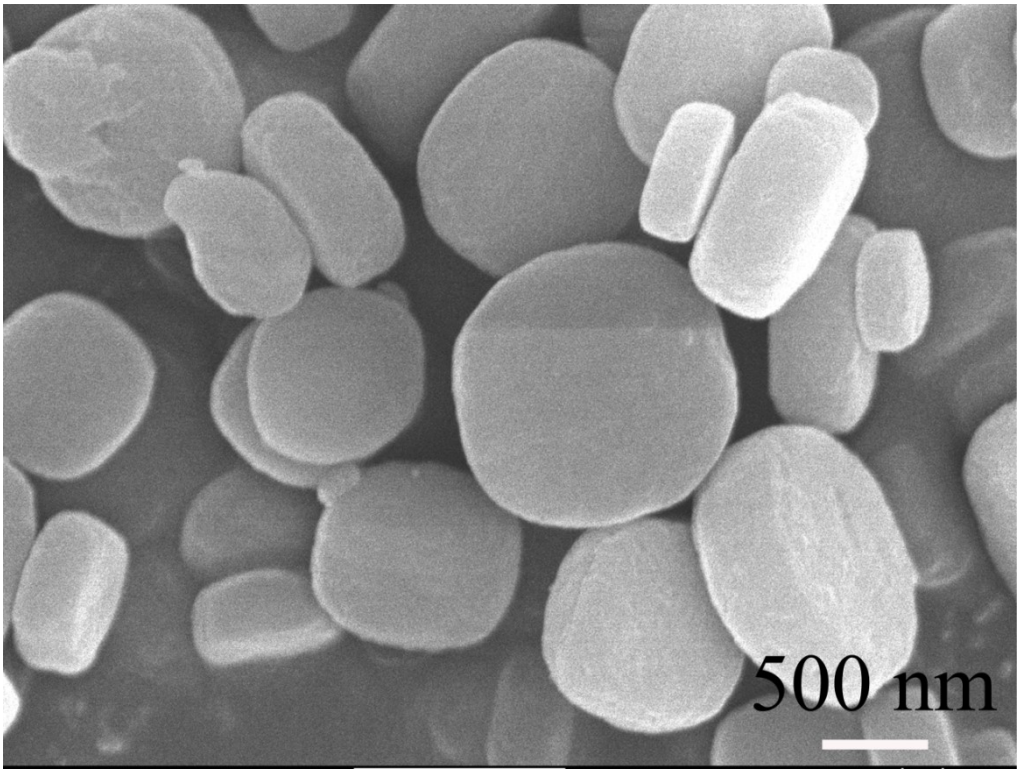

Fig. S1. SEM image of Fe-Ti-O nandisks.

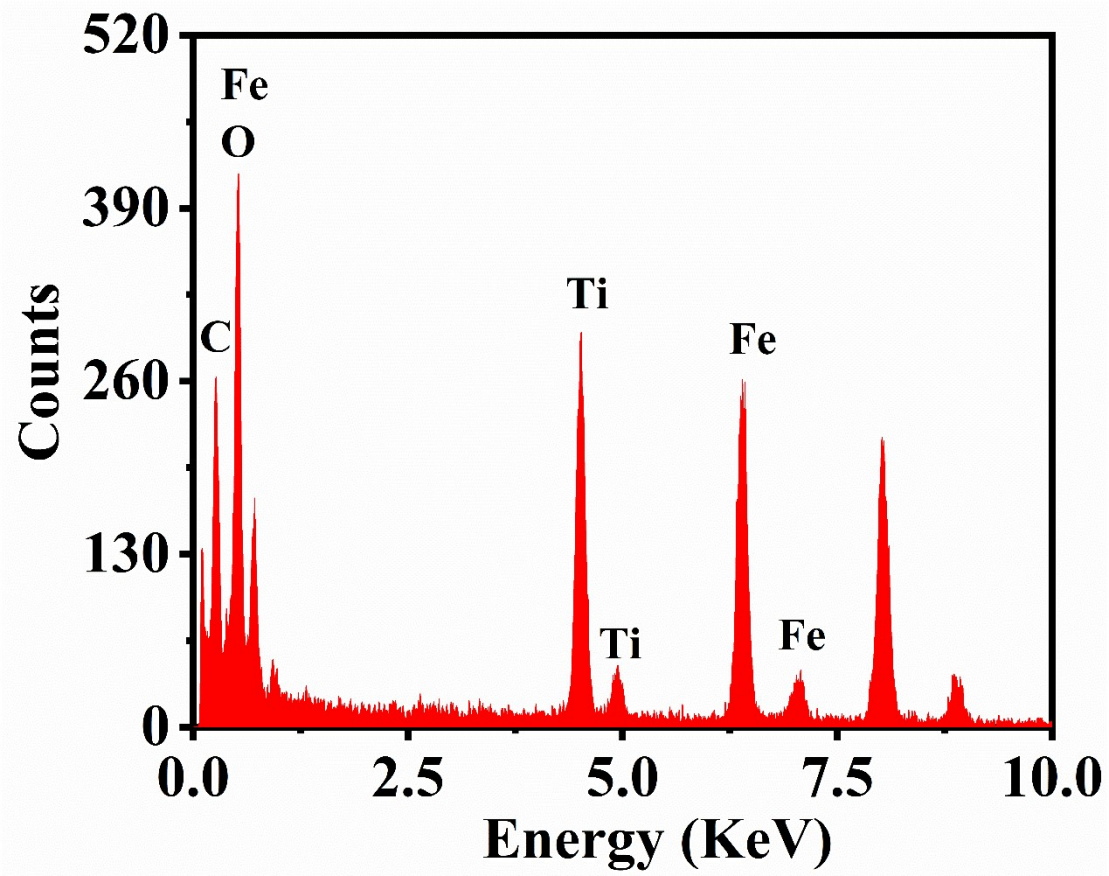

Fig. S2. EDS elemental mappings of Fe, Ti, and O elements in Fe_2TiO_5.

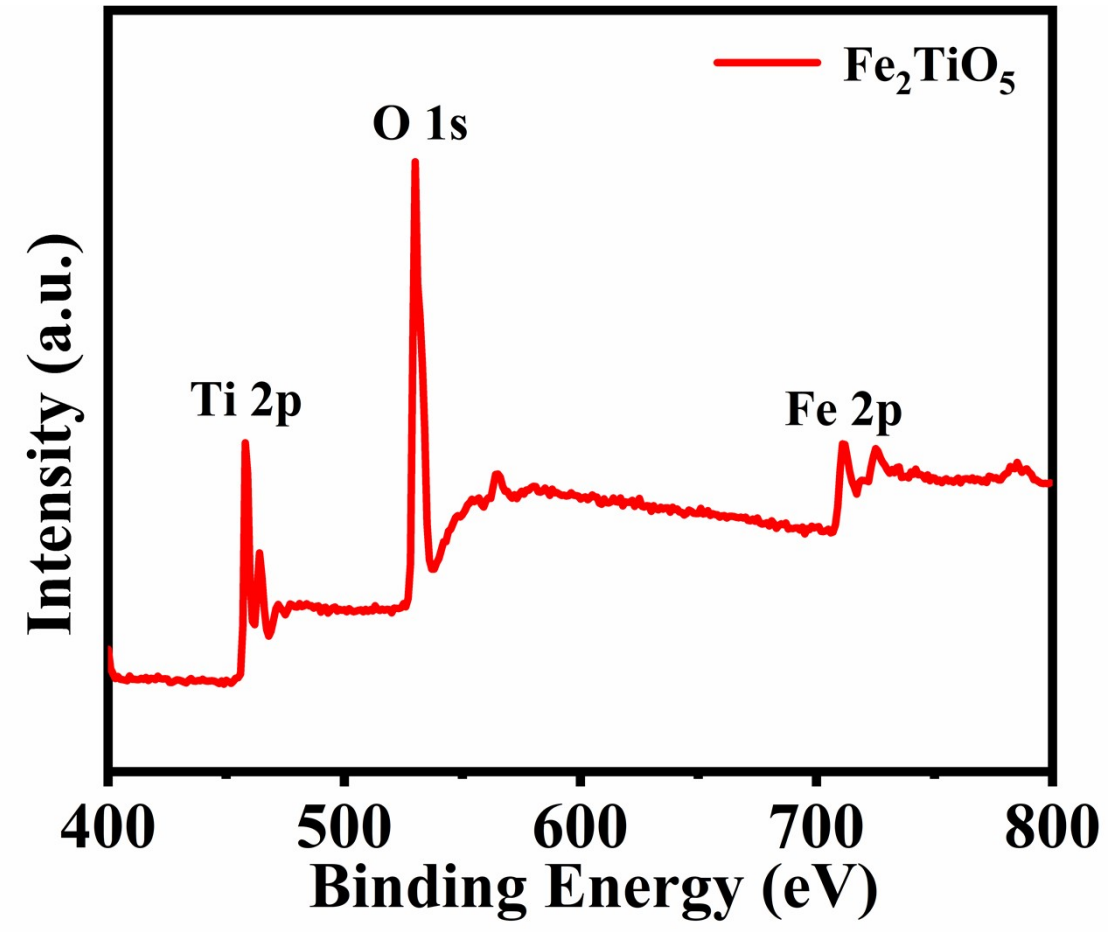

Fig. S3. XPS survey spectrum of Fe_2TiO_5 nanodisks.

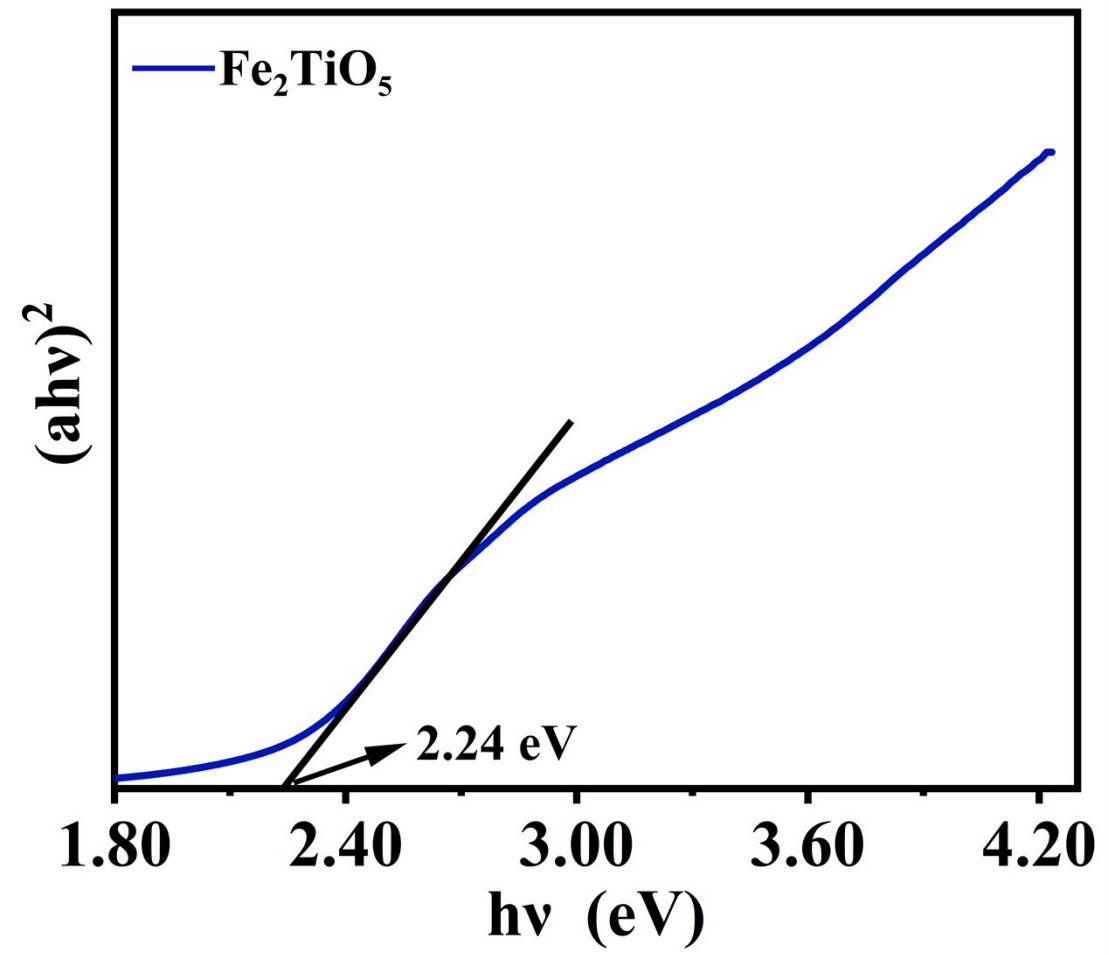

Fig. S4. Bandgap plots estimated by using **Tauc plot** for Fe_2TiO_5.

Tauc plot: the above cutting line method is applicable to the direct bandgap of transmission spectrum that limits its large application. Tauc plot is mainly based on the formula proposed by Tauc, Davis and Mott et al.

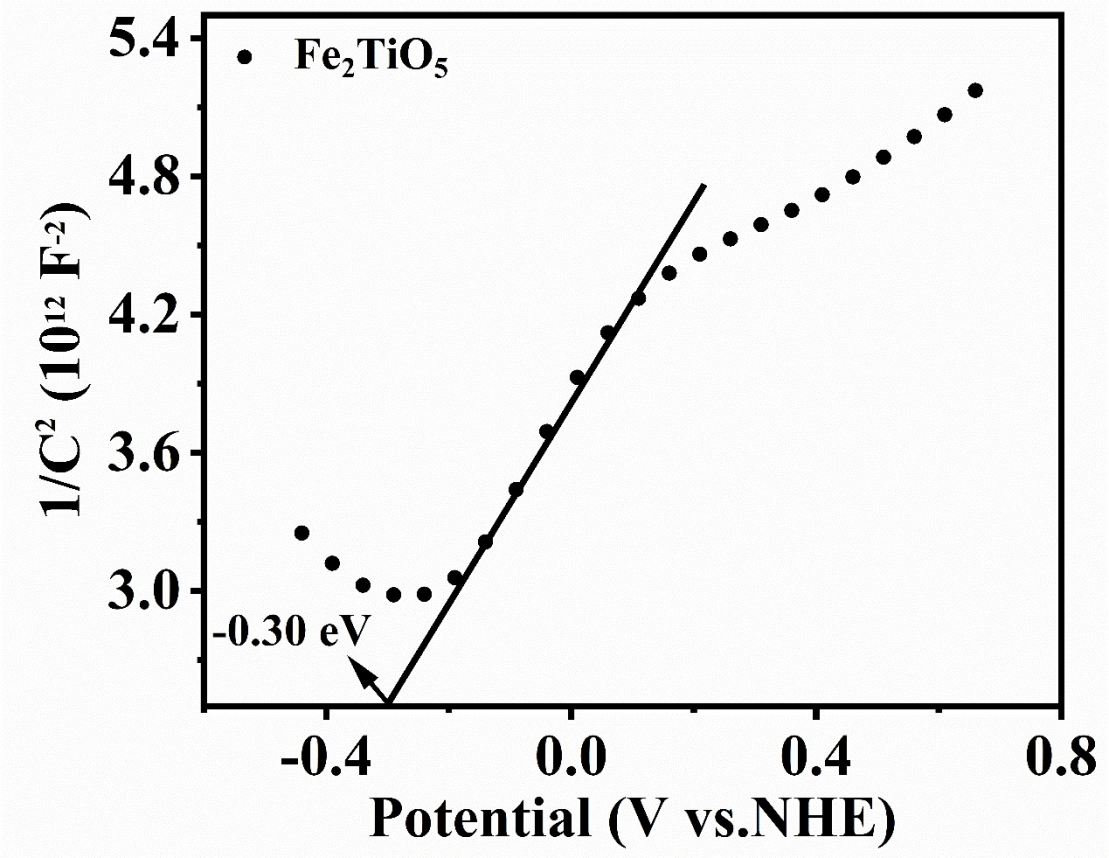

Fig. S5. Mott-Schottky plots of Fe_2TiO_5.

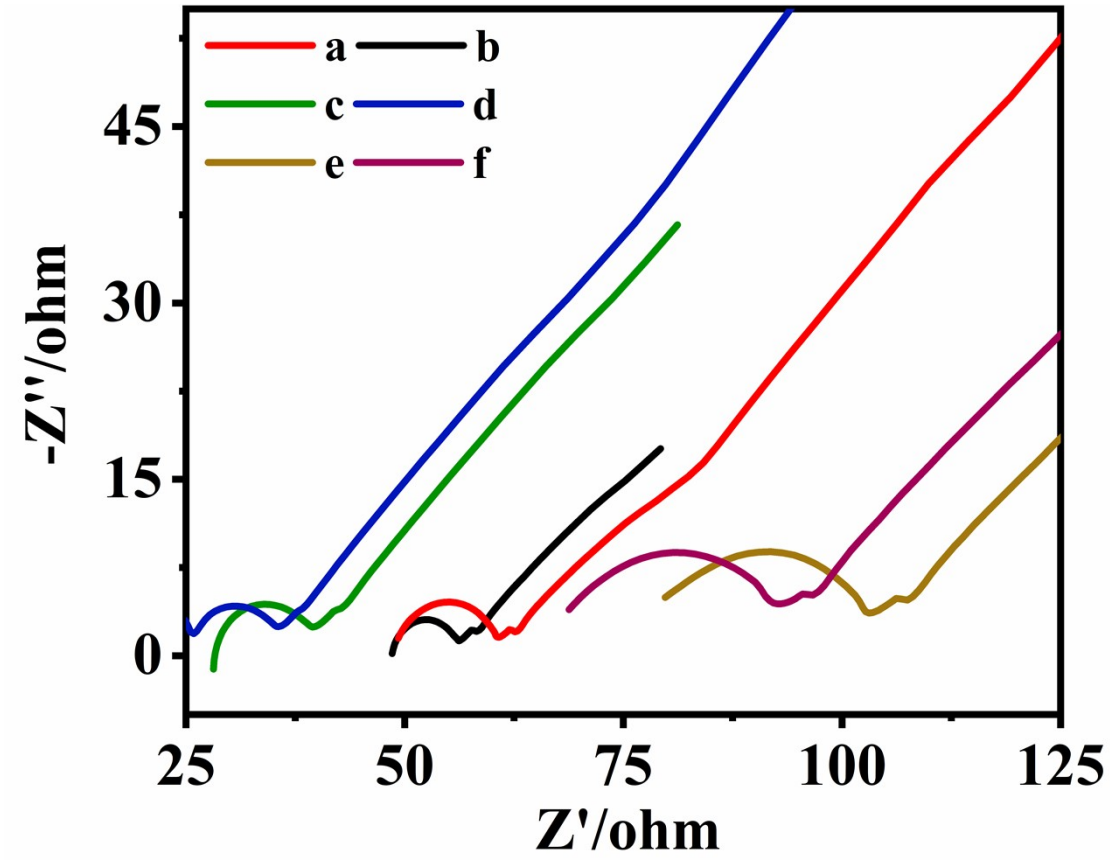

Fig. S6. EIS spectra in 0.1M KCl solution containing 5mM $[Fe(CN)_6]^{3-/4-}$ of Fe_2TiO_5 (a) and Fe_2TiO_5-Light (b) and Ti precursor (c) and Ti precursor-Light (d) and ITO (e) and ITO-Light (f).

Table S1

Atom parameters for Fe_2TiO_5 in the space group D_{2h}^{17}– Cmcm the following points occupied

Atom	Wyckoff position	x	y	z
Fe_1	(8f)	0	0.1360	0.5642
Ti_1	(8f)	0	0.1360	0.5642
Fe_2	(4c)	0	0.1890	0.2500
Ti_2	(4c)	0	0.1890	0.2500
O_1	(4c)	0	0.7660	0.2500
O_2	(8f)	0	0.0480	0.1170
O_3	(8f)	0	0.3110	0.0700

Table S2

Performance comparison of the different PEC biosensors for glucose detection.

Catalysts	Linear range (mM)	LOD(μM)	Ref.
BiOI/NiO/ITO	0-10	1.6	[1]
a-MoS_x/RGO/ITO	0.015-16	100	[2]
GOD/HNF-TiO_2/GC	0.002-3.17	0.8	[3]
TiO_2(G)	0.5-28	110	[4]
$ZnIn_2S_4$	0.08-30	27	[5]
NiO/CdS/GOD/ITO	0.05-7.1	10	[6]
AuNi NDAs	0.005-15	4	[7]
AuNPs/ZnO	1-6.917	0.1	[8]
Al/ZnO	0.02-2	20	[9]
Fe_2TiO_5 nanodisks	0-10	0.588	This work

Reference：

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