Electronic Supplementary Information

Development of an exogenous coreactant-free electrochemiluminescent sensor for sensing glucose

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Reagents and materials

Glucose oxidase (GO_x), glucoses, 1,3,6,8-Tetrakis(4-formylphenyl)pyrene (TFPPy), 2,5-dimethoxyterephthalohydrazide (DMeTHz), 1,4-dioxane, 1,3,5-trimethylbenzene were obtained from Sigma-Aldrich Co., Ltd. (Shanghai, China). Phosphate buffer saline (0.1 M PBS, pH 7.4) was prepared by mixing the stock solutions of NaH_2PO_4 and Na_2HPO_4. All other reagents were of analytical grade and used as received. All aqueous solutions were prepared using ultrapure water obtained from a Millipore water purification system (≥18 MΩ, Milli-Q, Millipore, USA).

Apparatus and characterization

Electrochemiluminescent (ECL) experiments were performed using an MPI-EII multifunctional electrochemical and chemiluminescent analytical system (Xi'an Remex Analytical Instrument Co., Ltd. China) with a modified glassy carbon electrode (GCE, 4 mm in diameter, Gaoss Union, Wuhan, China) as the working electrode, a platinum wire as the counter electrode, and an Ag/AgCl electrode (saturated KCl) as the reference electrode. The scanning electron microscope (SEM) images were obtained by using a Sirion-100 (FEI) and a SU-8010 (Hitachi) scanning electronic microscope. The crystal structure was obtained by X-ray diffraction (XRD) (Philips, Rigaku D/MAX 2200PC X-ray diffractometer, Cu Kα radiation, Holland). The FT-IR spectra were obtained by Thermo Scientific Nicolet iS50 FT-IR spectrophotometer (Hitachi, Japan) equipped with a xenon lamp. X-Ray photoelectron spectroscopy (XPS) was performed on ESCALab 250 X-ray photoelectron spectrometer with a monochromatized Al Ka X-ray source (1486.71 eV). Nitrogen sorption isotherm measurements experiments were performed on a Kubo-X1000 multi-analysis station automatic physical adsorption analyzer (Beijing Builder Electronic Technology Co., Ltd. Beijing, China) at 77 K. The obtained nitrogen sorption isotherms were evaluated to determine the pore properties including BET specific surface area, pore size distribution, and total pore volume. UV-vis diffuse reflectance spectrum (DRS) was obtained by using UV-2450 UV-vis spectrophotometer (Shimadzu, Tokyo, Japan). All calculations were carried out with the Gaussian 16 software. The B3LYP functional was adopted for all calculations in combination with the D3BJ dispersion correction. The geometry optimization, frequency and singlet point energy calculations were performed with basis set of the 6-311G(d). The excited

properties were calculated using TDDFT method under the B3LYP /6-311G(d) level.

Characterization of the synthesized materials.

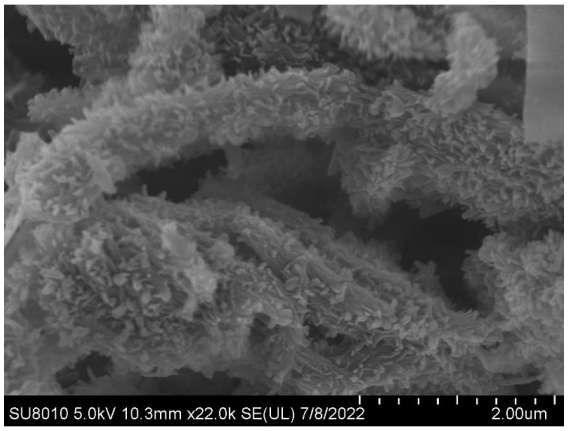

Figure S1. SEM image of the TFPPy-DMeTHz-COF.

The band gap is calculated by DFT

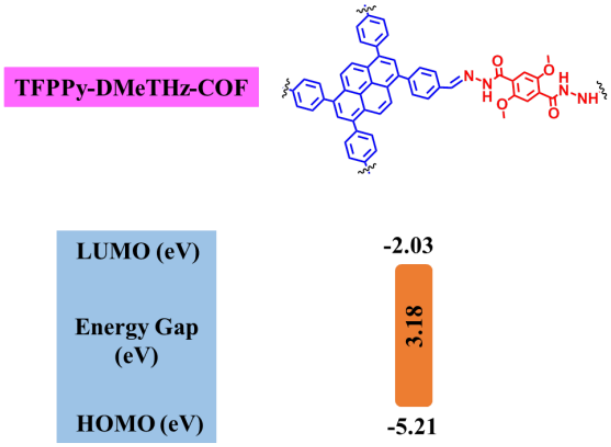

Figure S2. DFT calculation of the building blocks of the TFPPy-DMeTHz-COF. The values of HOMO, LUMO, and calculated energy gaps are indicated.

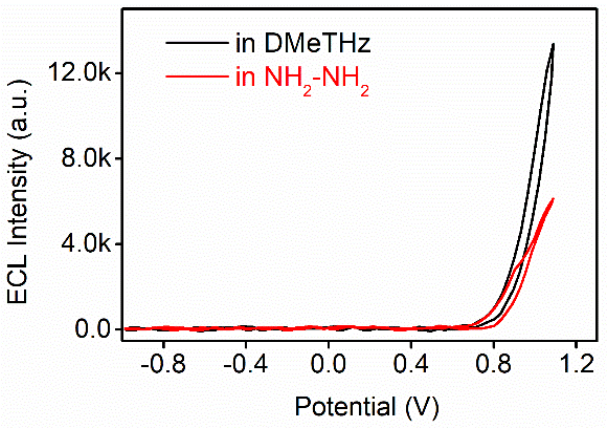

Figure S3. ECL curves of TFPPy-modified GCEs in 0.1 M PBS containing 0.4 mM NH_2-NH_2 (red) and DMeTHz (black).

Table S1. Comparison of the proposed ECL sensor with the reported sensors for glucose detection.

Detection methods	Linear range (μM)	Detection limit (μM)	References
Electrochemiluminescence	0.1-500	0.031	This work
Colorimetry	1–100	0.2	[1]
Colorimetry	1–20	1	[2]
Colorimetry	10–500	4	[3]
Colorimetry	100–2000	100	[4]
Fluorescence	0.1–45	0.03	[5]
Fluorescence	50-5000	0.05	[6]
Fluorescence	9-300	0.1	[7]
Fluorescence	1–1000	0.8	[8]
Electrochemistry	20–7400	0.1	[9]
Electrochemistry	2–30	0.5	[10]
Electrochemistry	5–1270	1.73	[11]
Electrochemistry	50–10000	10.69	[12]

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