Supporting Information for

Poly(3,4-ethylenedioxythiophene) Bearing Fluoro-containing Phenylboronic Acid For Specific Recognition of Glucose

Wenji Bao[1] Wenfeng Hai[1*], Layue Bao[1], Fan Yang[1], Yushuang Liu[1*] Tatsuro Goda[1,2] Jinghai Liu[1*]

1. Inner Mongolia Key Laboratory of Carbon Nanomaterials, Nano Innovation Institute (NII), College of Chemistry and Materials Science, Inner Mongolia University for Nationalities, Tongliao 028000, China

2. Department of Biomedical Engineering, Faculty of Science and Engineering, Toyo University, 2100 Kujirai, Kawagoe, 350-8585 Saitama, Japan

Fig. S1 ^{1}H-NMR spectra of EDOT-FPBA (500 MHz in D_2O)

^{1}H NMR (500 MHz, D_2O) δ 7.35 (t, *J* = 7.5 Hz, 1H), 7.35 (t, *J* = 7.5 Hz, 1H), 7.22 (d, *J* = 7.6 Hz, 1H), 7.22 (d, *J* = 7.6 Hz, 1H), 7.11 (d, *J* = 12.7 Hz, 1H), 7.11 (d, *J* = 12.7 Hz, 1H), 6.24 (s, 2H), 6.24 (s, 2H), 4.25 – 4.16 (m, 1H), 4.08 (dd, *J* = 11.9, 2.1 Hz, 1H), 3.85 (dd, *J* = 12.0, 6.7 Hz, 1H), 3.49 (d, *J* = 5.7 Hz, 2H), 3.16 (s, 2H).

Fig. S2 High-resolution ESI-MS for EDOT-FPBA. Calculated m/z for $C_{14}H_{14}BFNO_5S^+$ ($M+H^+$) at 338.07, peak found at 338.26.

Figure S3 (a) The oxidation current of EDOT-FPBA and capacitance of poly(EDOT-FPBA)/GCE when the constant voltage of 1.5 V is applied to GCE working electrode for 10 seconds in the dichloromethane solution containing 10 mM EDOT-FPBA and 100 mM ammonium perchlorate. (b) EIS Nyquist curve of GCE, PEDOT/GCE, poly(EDOT-FPBA)/GCE in PBS containing a redox couple of 5 mM $K_3Fe(CN)_6/K_4Fe(CN)_6$) redox pairs.

Fig.S4 (a) The XPS broad spectrum and the corresponding high-resolution XPS spectra of Poly (EDOT-FPBA) and PEDOT films prepared from CH_2Cl_2. The Poly (EDOT-FPBA) film shows that in addition to O1, C1s, and S2p peaks, it also shows (b) F1, (c) B1, (d) N1 (red) peaks.

Table S1. The atomic percentage of poly(EDOT-FPBA) and PEDOT films.

	F	B	C	N	O	S
Poly(EDOT-FPBA)	2.95%	6.00%	46.68%	5.52%	35.39%	3.46%
PEDOT	0%	0%	68.19%	0.88%	23.77%	7.16%

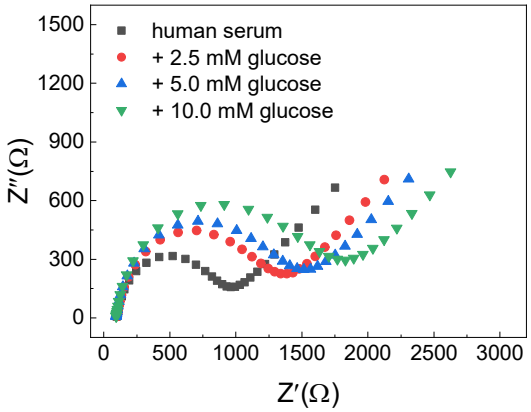

Figure S5. EIS Nyquist curves showing continuous monitoring of glucose concentration in the human serum sample using poly(EDOT-FPBA)/GCE.

Table S2. Comparison of glucose selective binding-based electrochemical non enzymatic glucose sensors

Ref	Glucose Biding moiety	Substrate/ Electrode	Method of detection	Chemical Environment	Real Sample Test	Linear Range (mM)	LOD (mM)	sensitivity	Selectivity
1	BA	f-PEI-Au NP/GCE	PT	BB (0.1M, pH9)	HBS (diluted)	0.5-50	0.025	N/A	AA,DA,UA
2	BA	PABA NT Array/Au	PT	PBS (0.1M, Ph7.4)	-	2-14	0.50	1.5mV mM^{-1}	N/A
3	BA	MIP/GCE	PT	PB (0.1M, pH7.4)	Frult Juiice(unspecified)	0.75-18	0.23	0.686mV mM^{-1}	Fru,Gal,Suc,Xyl
4	BA	f-Au NP/PazA/GCE	CV	PBS (0.1M, pH7.4)	-	0.00001-0.01	0.000004	N/A	AA,DA,UA,NaCl
5	BA	f-Au NP/PANI/Pt	PT	BRB (0.008M, Ph12)	-	0.31-33	0.20	+47mV $Decade^{-1}$	DA,UA
6	BA	f-PTh/GCE	DPV	PB (0.1M, pH7.4)	HS (diluted)	0.0009-0.0091	0.00045	N/A	N/A
7	BA	f-polymer NF/ITO	CA	PB (Unspecifled.pH7.5)	HBS (unspecified)	1-15	N/A	N/A	AA,AP,UA,Fru, Gal,Mal,Man
This Work	BA	PFBA/GCE	EIS	1×DPBS(pH 7.0)	Human Serum (diluted)	0.05-25	0.05	66.4 $\Omega \cdot cm^{2} \cdot Decade^{-1}$	Gal, Man, DA, UA, Na^{+}, and K^{+}

[a] BA = boronic acid.

[b] f- = functionalized (with Glucose Binding Moieties a), PEI = polyethyleneimine, NP = nanoparticle, GCE = glassy carbon electrode, PABA = poly(4-amino -phenylboronic acid), NT = nanotube, PTh = polythiophene, PANI = poly(aniline), MIP =molecularly-imprinted polymer film, ITO = indium tin oxide, PFBA= poly(EDOT-FPBA), [c] PT = potentiometry, DPV = differential pulse voltammetry, CV = cyclic voltammetry, EIS = electrochemical impedance spectroscopy, CA = chronoamperometry. [d] BB = borate buffer, BRB = Britton-Robinson buffer, PBS = phosphate buffered saline, PB = phosphate buffer. [d] HBS = human blood serum, HS = human saliva. [e] AA = ascorbic acid, AP = 4-acetamidophenol, DA = dopamine, UA = uric acid, Fru = fructose, Gal = galactose, Xyl = xylose, Mal = maltose, Man = mannose, CA = citric acid

[1]H. Ciftci, E. Alver, F. Celik, A.U. Metin, U. Tamer, Non-enzymatic sensing of glucose using a glassy carbon lectrode modified with gold nanoparticles coated with polyethyleneimine and 3-aminophenylboronic acid, Microchim Acta, 183 (2016) 1479-1486.

[2] J. Li, L.L. Liu, P.G. Wang, J.B. Zheng, Potentiometric Detection of Saccharides Based on Highly Ordered Poly(aniline boronic acid) Nanotubes, Electrochim Acta, 121 (2014) 369-375.

[3] Y. Wu, Q. Wang, M. Chen, C. Dong, X. Zhang, S. Wang, An Enzyme Free Potentiometric Detection of Reducing Sugars Based on a Poly(3-hydroxyphenylboronic acid-co-phenol) Molecularly Imprinted Polymer Modified Electrode, Am J Biomed Sci, 8 (2016) 82-96.

[4] W. Wang, L.Y. Kong, J.M. Zhu, L. Tan, One-pot preparation of conductive composite containing boronic acidderivative for non-enzymatic glucose detection, Colloid Interf Sci, 498 (2017) 1-8.

[5] T.V. Shishkanova, P. Fitl, V. Kral, J. Barek, Nanoparticles functionalized with phenylboronic acid for the potentiometric detection of saccharides, J Electroanal Chem, 761 (2016) 106-111.

[6] D. Das, D.M. Kim, D.S. Park, Y.B. Shim, A Glucose Sensor Based on an Aminophenyl Boronic Acid BondedConducting Polymer, Electroanal, 23 (2011) 2036-2041.

[7] K.M. Manesh, P. Santhosh, A. Gopalan, K.P. Lee, Electrospun poly(vinylidenefluoride)/poly(aminophenylboronic acid) composite nanofibrous membrane as a novel glucose sensor, AnalBiochem, 360 (2007) 189-195.