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SUPPLEMENTARY INFORMATION

Cylindrical Flexible Enzyme-Electrode Sensor Fabricated with Bigger Working Electrode of 3D nanostructure for Implantable Continuous Glucose Monitoring

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Fig. S1 shows the proposed rotated inkjet printing system for fabrication of the cylindrical flexible enzyme-nanomaterials electrode glucose sensor. A tri-axis positioning nozzle and a rotary chuck to fix the substrate are synchronized to print different functional materials onto the cylindrical surface. This system consists of a pump, an air pressure control module (MicroFab, Inc., USA), a rotary motor (ACS-150LP, Arotech, Inc., USA), a displacement stage (Ruidu Photoelectric, Inc., Shanghai), four printheads (MJ-AT-01, orifice: 30µm, MicroFab, Inc., USA), a printhead driver (MicroFab, Inc., USA), an observation module (Ruidu Photoelectric, Inc., Shanghai), a heater and a computer. The pump supplies the pressure power for the system. The air pressure control module is used to wash the printheads and maintain the air pressure within them such that successful printing is ensured. The rotary motor and the displacement stage are used to fix the printing substrates and keep its rotation concentric. Four printheads can be used to print different materials onto the target substrates. The printhead driver module is used to drive the printheads based on the corresponding printing signals. The observation module includes a horizontal camera with a strobe, which enables us to observe the printing status, as well as a vertical camera that enables us to calibrate the start-point for printing. The heater is used to heat the droplets as they are ejected to dry them rapidly. We used a computer to design the printing routes and supply the printing signals. The accuracy of this system was 10µm in the triaxial direction and 9" for the rotation.



Fig. S1 Schematic diagram of the rotated inkjet printing system.



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As shown in Fig. S2, the measurement system for *in vitro* experiments consists of an electrochemical workstation (CHI 660E, Shanghaichenhua Ltd. China) to supply the driving potential and to measure the output of the proposed sensor, a pump to provide different concentrations (hydrogen peroxide or glucose) of the determinand in the reaction tank with electrolyte solution, a computer to control and receive signals from the workstation.



Fig. S2 Schematic diagram of the set up for *in vitro* experiments.

Fig. S3 shows *in vivo* experimental set up including a fabricated cylindrical flexible enzyme-nanomaterials electrode glucose biosensor, a rat fixing table, a electrochemical workstation (CHI 660E) and a computer for recording the data.



Fig. S3 Photos of the set up for *in vivo* animal experiment.



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	5	动物实验伦理管	审查证明				
	Affidavit of Ap	proval of Anin	nal Ethics	and V	Welfare		
编号 Approval No.	DWLI-20171	126					
以下《动物》	实验方案》经过实验	脸动物伦理委员	员会审核,	符合	动物保护	、动物福利	间和伦理
原则,符合国家等	实验动物福利伦理	的相关规定, 学	持此证明。	0			
The animal use	e protocol listed bel	ow has been rev	viewed and	d appr	oved by t	he Animal E	Ethical
and Welfare Comr	nittee (AEWC),	Hereby certify.					
课题名称	用于植入式连续葡萄糖检测的具有大工作电极的圆柱形柔性酶电极传感器						
Protocol Title	Cylindrical Flexible Enzyme-Electrode Sensor with Bigger Working Electrode of						
	3D Nanostructure for Implantable Continuous Glucose Monitoring						
申请人	蒲治华	职称/学位	学生/硕士		邮箱		
Applicant	Zhihua Pu	Title/Degree	Student / Master		Email	puzhihua(<i>a</i>)tju.edu.cn
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	Dachao Li	Title/Degree	professo / P.hD	or	Email		
学校	天津大学				申请日期 Application date 2017-11		
University	Tianjin university						2017-11
动物种系	SD 大鼠 SD rats				动物数量 Quantity 8		
Species or Strains							8
执行时间 Period of Protocol	实验动物使用许可证				SCXK (津) 2014-0002		
	2017.12-2018.0 Number of Animal use						
	permit						
审查意见 Results	的合动物福利	伦理要求,可!	以进行实验	脸 Agr	·ee		
of inspection	□调整方案后,	可以进行实验。	Agree afte	er mod	lify		
设施负责人 Chief	73.22			日期	He 2017.11.26		
Facility Officer	(2) 9 2		Date				
备注:			签章 (实	;验动	物伦理委	员会):	
Supplement	Stamp						

Fig. S4 Affidavit of approval of Animal Ethics and Welfare for live rat experiments.