Supplementary Information

A self-contained and integrated microfluidic nano-detection system for biosensing and analysis of molecular interactions

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1. Temperature stability.

As the actual human sample temperature is approximately 37 ℃, we need to control the sample temperature to 37 ℃ when performing the test. As shown in Figure S1, the sample temperature can be maintained at 37 ℃ when the control meter temperature is approximately 42 ℃. The temperature rise time is approximately 25 min.

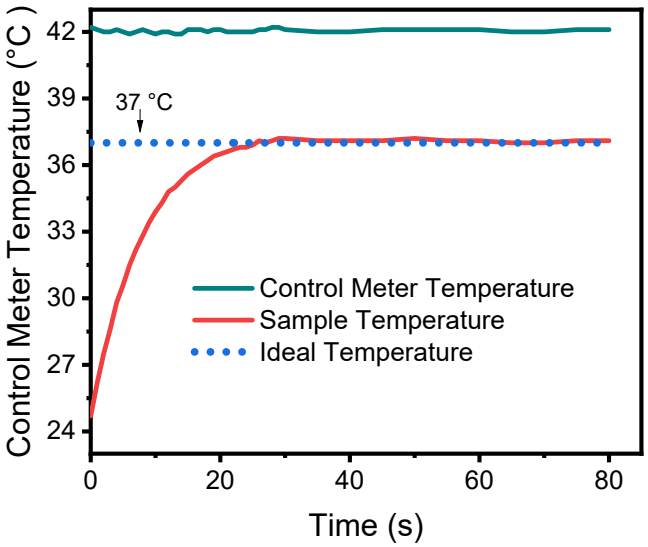

Figure S1. Temperature stability test.

2. Effect of UV glue.

Although we have circumvented the negative effects of UV on biological samples by adjusting the functional steps of the biosensor, more detailed testing is required.

We tested the effect of the UV glue on the electrical signal of the biosensor itself. To test the biosensor signal in real time, a 0.01 x PBS buffer solution was passed over the surface of the biosensor; the UV glue was then applied along the perimeter of the biosensor and left to cure before being passed through the 0.01 x PBS buffer solution. As shown in Figure S2, there was no effect on the electrical signal of the biosensor before and after the application of the UV glue.

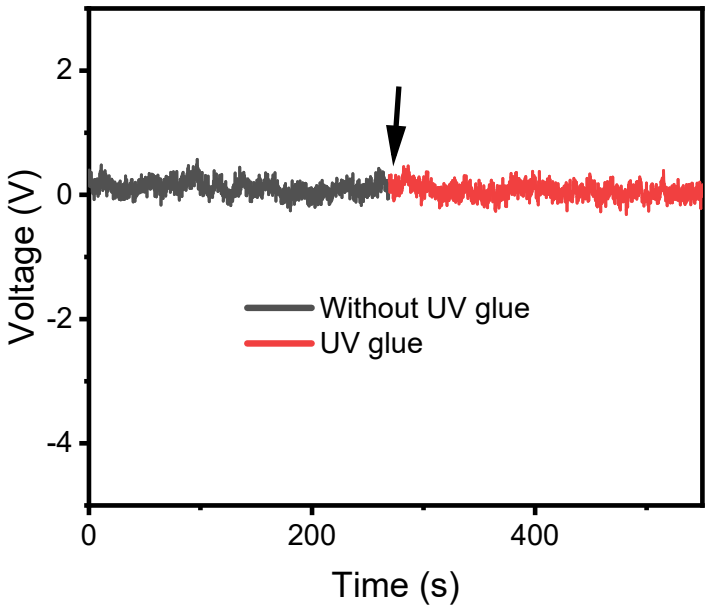

Figure S2. Effect of UV glue on electrochemical signal of SINW-FET biosensor.

We used FITC fluorescein to couple to the Ag85B protein, which was used to characterise the affinity activity between the protein and the antibody. Six silicon wafers of the same material as the biosensor were then selected for fluorescence testing after surface functional. The silicon wafers were divided into two groups. We added the fluorescent protein to the surface of the wafer and left it for 15 min to fluorescence excitation then rinsed it three times with 0.01 x PBS. As shown in Figure S3, the fluorescence images of the silicon wafers with (a-c) and without (d-f) UV glue applied around them were similar and not significantly different. Therefore, UV glue had no effect on the affinity between the biomolecules.

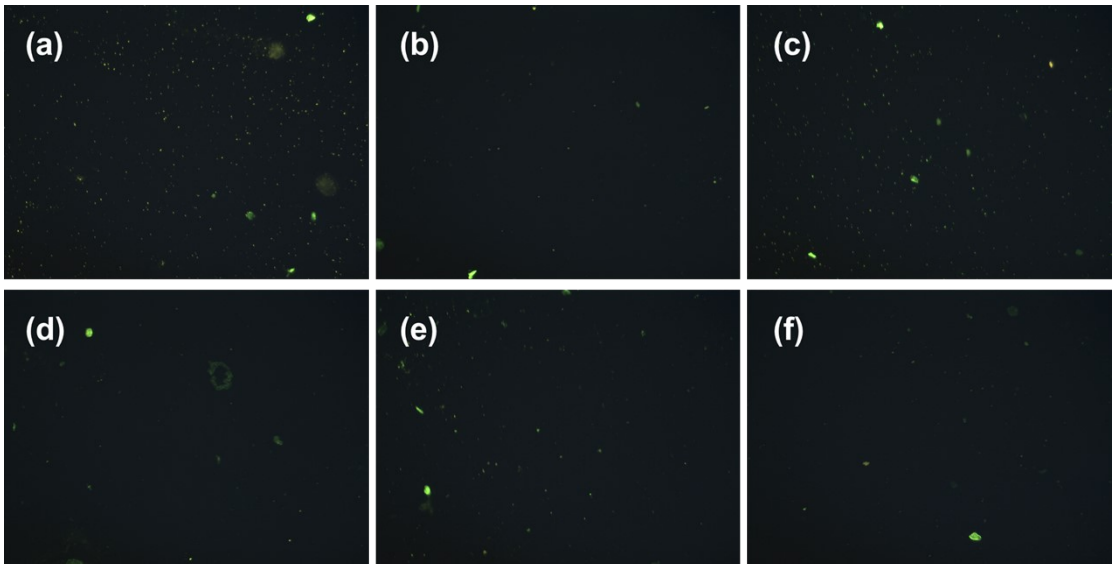

Figure S3. Effect of UV glue on the activity of biological samples. Bioactive fluorescence testing of three different sensors (a-c) with and (d-f) without the use of UV glue.

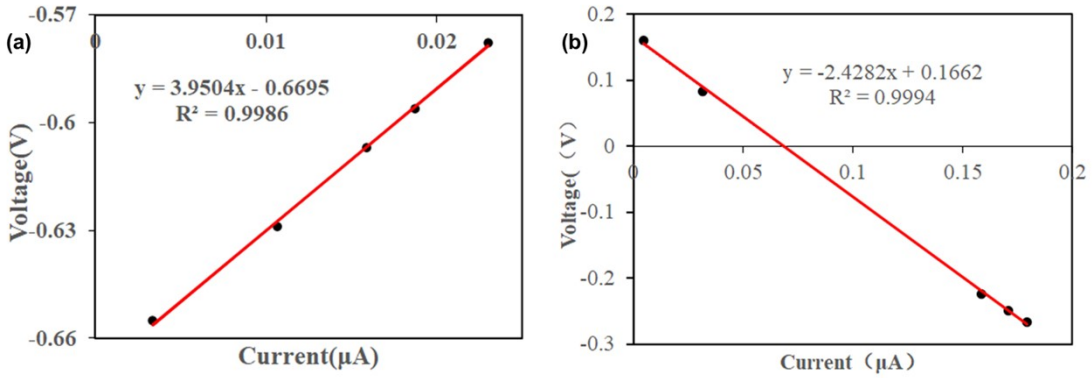

Figure S4. Sensor calibration result using commercially available instruments.

Table.S1. The significance analysis of specificity detection

Differences between the source		**SS**	**MS**	**F**	**P-value**	**F crit**
Ag85B	Ag85A	0.393736654	0.393737	150.1185	0.000255	7.708647
	Ag85C	0.474488392	0.474488	98.79198	0.000575	7.708647
	IgG	0.64295631	0.642956	210.6327	0.000131	7.708647
	CEA	0.668741233	0.668741	322.1783	0.000057	7.708647