Supplementary Information

Controlled Au-coated PDMS microwells array for surface-enhanced DNA biochips

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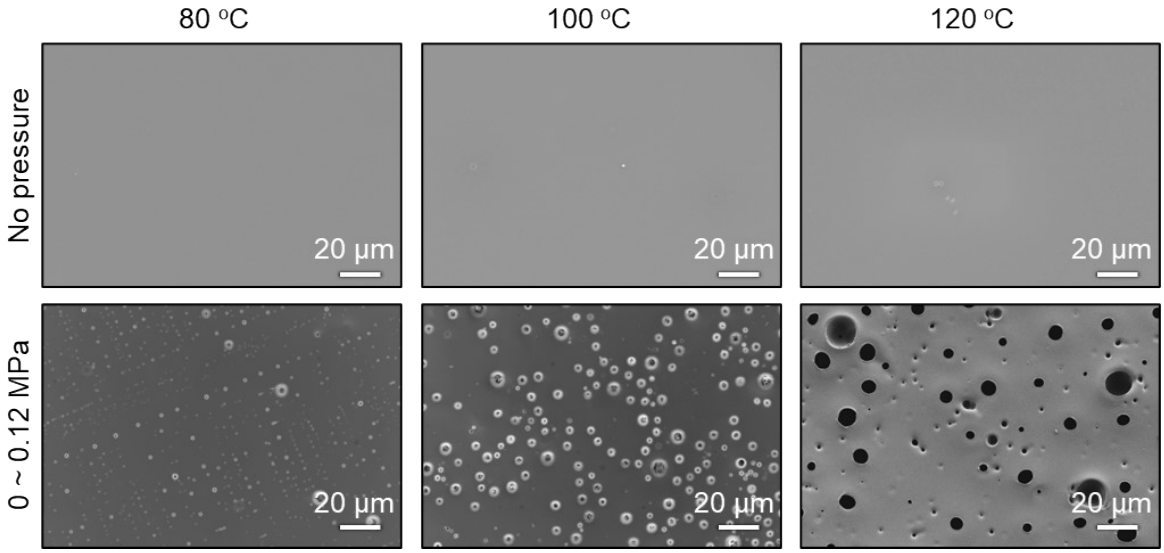

Fig. S1 Scanning electron microscope (SEM) observation of polydimethylsiloxane (PDMS) surfaces with 8 g elastomer base at different temperatures and pressure (same treatment time). Scale bar = 20 μm.

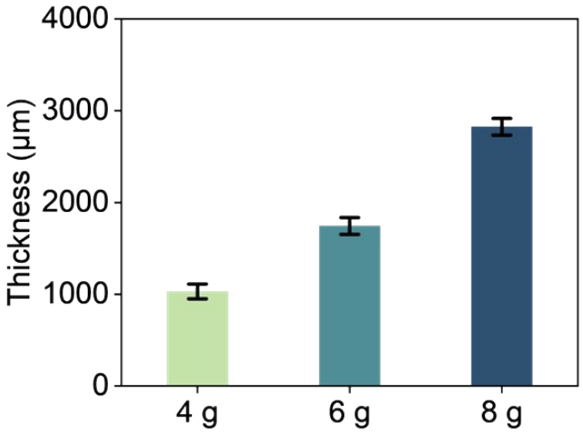

Fig. S2 Thickness of microwell membrane according to polydimethylsiloxane (PDMS) elastomer base weight.

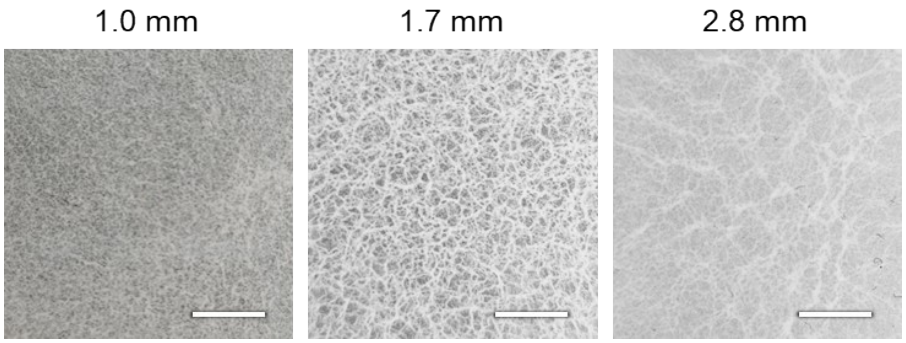

Fig. S3 Images of a large-scale fabricated microwell membrane. Scale bar = 1 cm.

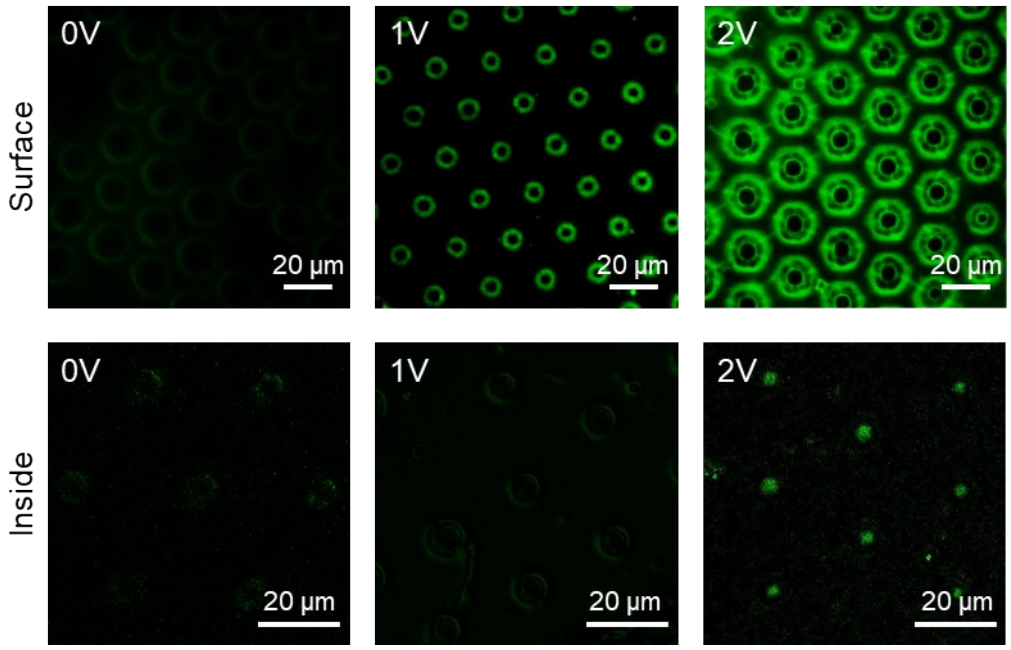

Fig. S4 Fluorescence images of detected DNA on the surface and inside of 2.8-mm microwells under 0, +1, and +2 voltages with a treatment time of 60 s at a concentration of 8.6 ng/μL. Scale bar = 20 μm.

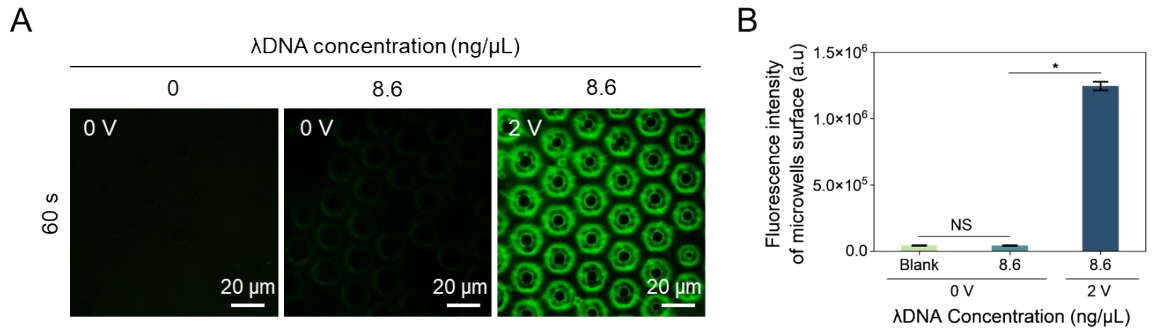

Fig. S5 (A) Fluorescence microscopy images, (B) Fluorescence intensity plots of detected DNA in 2.8-mm microwells for 60 s at a concentration of 0 ng/μL under 0 voltage and at a concentration of 8.6 ng/μL under 0 and +2 voltages. Scale bar = 20 μm.

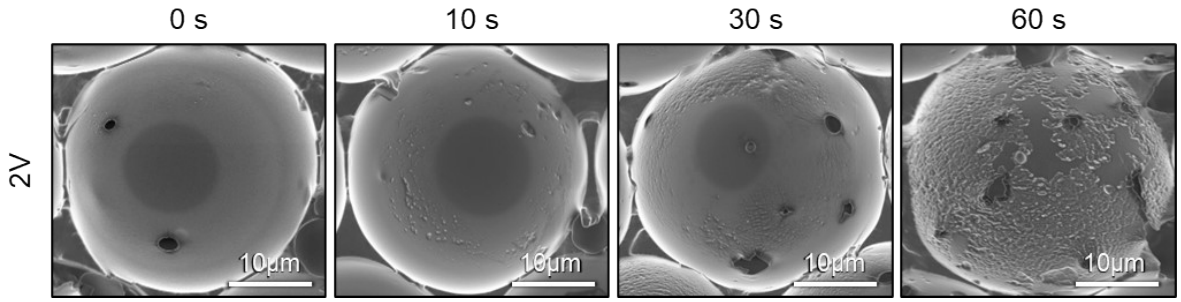

Fig. S6 Field-emission scanning electron microscope (FE-SEM) images of attached DNA inside microwells at 0, 10, 30, and 60 s under 2 V electrophoresis.

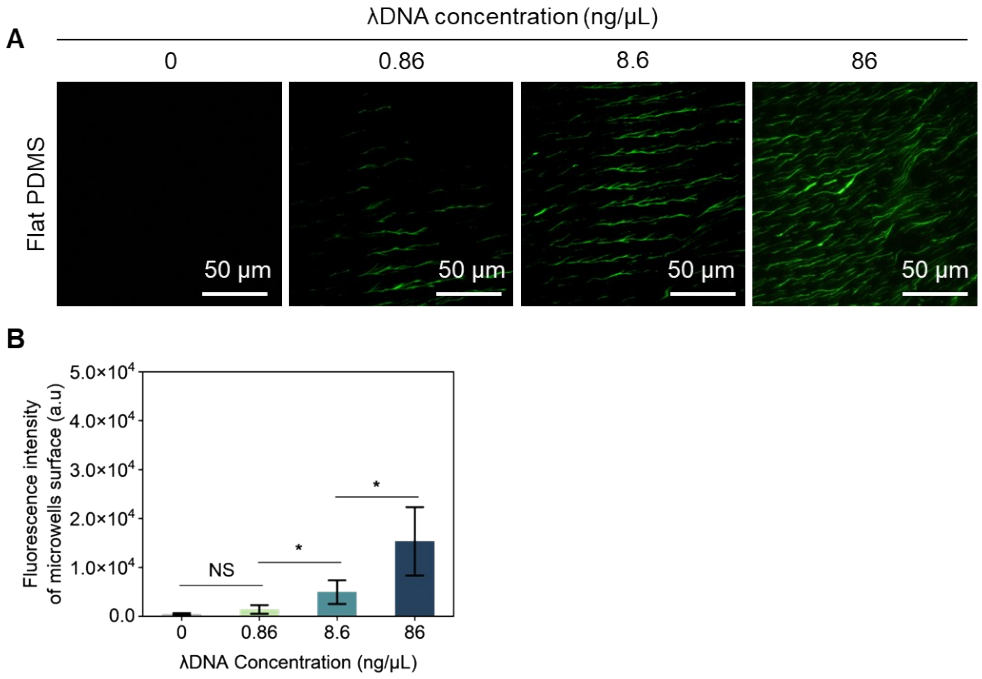

Fig. S7 (A) Fluorescence microscopy images, and (B) Quantitative analysis of fluorescence intensity on flat PDMS attached DNA at different concentrations (0, 0.86, 8.6, and 86 ng/μL) after electrophoresis for 60 seconds. Scale bar = 50 μm. *, $p < 0.05$; NS, not significant between groups.

Table S1. Performance comparison of DNA detection methods

Method	RSD (Relative Standard Deviation)	Fabrication	Target	Ref.
Photoelectrochemistry	< 10%	Commercial well plate	DNA	[1]
Fluorescence	3.2%	Soft lithography, Droplet array method	Lambda DNA	[2]
Electrochemistry	11.4%	Plastic mask	DNA	[3]
Fluorescence	**1.85 %**	**pressure-based steam technology**	**Lambda DNA**	**This work**

References

[1] Liu, Y., Jia, S., & Guo, L. H. (2012). Development of microplate-based photoelectrochemical DNA biosensor array for high throughput detection of DNA damage. Sensors and Actuators B: Chemical, 161(1), 334-340.

[2] Li, X., Zhang, D., Zhang, H., Guan, Z., Song, Y., Liu, R., ... & Yang, C. (2018). Microwell array method for rapid generation of uniform agarose droplets and beads for single molecule analysis. *Analytical chemistry*, *90*(4), 2570-2577.

[3] Kokkinos, C., Economou, A., Speliotis, T., Petrou, P., & Kakabakos, S. (2015). Flexible microfabricated film sensors for the in situ quantum dot-based voltammetric detection of DNA hybridization in microwells. *Analytical chemistry*, *87*(2), 853-857.