Electronic Supplementary Information to

Facile and sensitive chemiluminescence detection of H_2O_2 and glucose by a gravity/capillary flow and cloth-based low-cost platform

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Table S1. Materials cost estimation for a single H_2O_2 or glucose assay

Material	Quantity used per device	Assay cost per device ($)
Cotton cloth ($2.7/m^2)	15.8 cm^2	0.0043
Solid wax ($0.02/g)	0.09 g	0.0018
HRP ($0.47/mg)	10.5 μg	0.0049
Luminol ($11.51/g)	6.2 μg	0.000071
PIP ($3.17/g)	1.54 μg	0.0000049
GOD ($0.00061/U)	3 U	0.00183
Total		0.011 (for H_2O_2 assay) or 0.013 (for glucose assay)

Table S2. Related parameters of white cloths with different components

Cloth material[a]	Weight of cloth (mg/cm^2)	Weight per meter of thread (mg)	Threads per inch of width	Thickness (μm)
Cotton cloth	~10.12	~16.85	~77	~120
Linen-silk cloth	~14.80	~18.00	~71	~200
Linen cloth	~20.25	~70.69	~41	~260
Corduroy cloth	~30.47	~31.58	~74 (crosswise), and ~43 (vertical)	~450

Note: [a] these cloth materials were purchased from Guangzhou Haiyin Cloth Confluence Co. Ltd. (Guangzhou, China); Cotton cloth-white plain weave cotton cloth; Linen-silk cloth-white linen-silk blended cloth; Linen cloth-white linen cloth; and Corduroy cloth-white corduroy weave cotton cloth.

Table S3. Detection of H_2O_2 in spiked milk samples.

[Added][a] (mM)	[Detected][b] (mM)	RSD[c] (%)	Recovery[d] (%)
1	0.9946	3.97	99.46
2	1.9535	2.96	97.68
3	3.1157	5.58	103.86
4	4.1077	5.81	102.69
5	4.834	3.23	96.68

[a] [Added] means the values that were added into the real sample. [b] [Detected] means the amount of H_2O_2 obtained according to the standard curve equation from five parallel detections. [c] The relative standard deviation (RSD) is calculated from five independent experiments. [d] Recovery means the [Detected]/[Added] ratio. Before the determination, the spiked samples were appropriately diluted with PBS.

Table S4. Comparison of the presented cloth-based CL and other CL platforms for the H_2O_2 determination.

Device types	CL reaction systems	Main apparatus used	LDR (mM)	LOD (μM)	References
Large-size system	Luminol/H_2O_2/ferricyanide	Spiral flow cell, Peristaltic pump, four three-way solenoid valves, Perspex joint point, electronic circuit, and photodiode	0.0022-0.45	1.8	[**1**]
Large-size system	Co(II)/H_2O_2/OH^-	Flow CL cell, and Biophysics CL analyzer with PMT detector	0.005-1	2.6	[**2**]
Large-size system	Luminol/H_2O_2/AuNFs	Flow injection CL system consisting of a peristaltic pump, a CL detector and a PMT	0.03-3	10	[**3**]
Large-size system	Co_3O_4-cored CDs/ H_2O_2	N/A	0.01-1	10	[**4**]
Large-size system	Luminol/H_2O_2/ferricyanide	Test tube, measuring cell of an Aminco Chem Glow Photometer, and pulse integrator	0.02-10	20	[**5**]

Large-size system	Luminol/H_2O_2/HRP	Perkin-Elmer fluorescence spectrophotometer with PMT detector, and silica fibre	N/A	52.2	[**6**]
Large-size system	Luminol/H_2O_2/HRP	Perkin-Elmer fluorescence spectrophotometer with PMT detector, and silica fibre	0.1-3	670	[**7**]
Lab-on-chip (microfluidic) system	CPPO/Cyalume green dye/H_2O_2/DMAP	PDMS chip, syringe pump, spring-loaded probes, and solution-processed thin-film organic photodiodes	0.01-1	10	[**8**]
Lab-on-chip (microfluidic) system	Luminol/H_2O_2/HRP	Single planar EWOD glass chip, photomultiplier, and amplifier circuit	0.01-100	10	[**9**]
Lab-on-chip (microfluidic) system	Luminol-H_2O_2-Co(II)	Silicon/glass chip, two syringe pumps, injector valve, fluid/electrical connectors, photodiodes, transconductance amplifier, and voltmeter	0.1-1	100	[**10**]
Lab-on-chip (microfluidic) system	CPPO/9,10-diphenylanthracene dye /H_2O_2/DMAP	PDMS chip, two syringes, syringe pump, thin-film organic photodiodes, and electrometer	~1-1000	~1000	[**11**]

Lab-on-chip (microfluidic) system	Luminol/H_2O_2/HRP	Wax-patterned cloth, and CCD camera	0.5-5	460	[**12**]
Lab-on-chip (microfluidic) system	Luminol/H_2O_2/HRP	Wax-patterned cloth, and CCD camera	0.01-10	9.07	**This work**

Note: CL: chemiluminescence; LDR: linear dynamic range; LOD: limit of detection; Luminol: 3-aminophthalhydrazide; ferricyanide: potassium hexacyanoferrate(III); PMT: photomultiplier tube; AuNFs-flowerlike gold nanostructures; CDs: carbon dots; N/A: not available; HRP: horseradish peroxidase; CPPO: bis(2-carbopentyloxy-3,5,6-trichlorophenyl) oxalate; Cyalume green dye: 9,10-bis(phenylethynyl)anthracene; DMAP: 4-dimethylaminopyridine; PDMS: poly(dimethyl-siloxane); EWOD: electrowetting-on-dielectrics; and CCD: charge-coupled device.

Table S5. Comparison of the presented cloth-based CL and other CL platforms for the glucose determination.

Device types	CL reaction systems	Main apparatus used	LDR (mM)	LOD (μM)	References
Large-size system	Luminol/H_2O_2[a]	Ten-port selection valve, peristaltic pump, optical flow-cell, PMT, and multi-function interface card	0.01-1	4	[**13**]
Large-size system	Luminol/H_2O_2/HRP-AuNPs	Peristaltic pump, six-way injection valve, U-shaped glass flow cell, and Biophysics CL analyzer with PMT detector	0.01-1	5	[**14**]
Large-size system	Luminol/H_2O_2/ferricyanide	Loop-type microdialysis probe, flow-through microdialyzer, microdialysis syringe pump, variable-speed peristaltic pump, eight-channel injector valve, and PMT	0-14	10	[**15**]
Large-size system	Luminol/H_2O_2/FRP	Flow cell, and photodiode with preamplifier	0.05-2	~10	[**16**]
Large-size system	Luminol/H_2O_2/ferricyanide	Ten-position valve, peristaltic pump, holding coil, photodiode, and Radiometer chart recorder,	0.03-0.6	15	[**17**]

Large-size system	Luminol/H_2O_2/HRP/ GO	Flow cell, peristaltic pump, six-way injection valve, Biophysics CL analyzer with PMT detector, and fluorescence spectrophotometer	0.05-5	44	[**18**]
Large-size system	Luminol/H_2O_2/HRP	Microdialysis syringe pump, microdialysis probe, peristaltic pump, injection valve, U-shaped glass flow cell, and Biophysics CL analyzer with PMT detector	0-12	50	[**19**]
Large-size system	Luminol/H_2O_2/HRP	CL cuvette, X-Y-t recorder, and PMT	0.2-2	120	[**20**]
Lab-on-chip (microfluidic) system	Luminol/H_2O_2/HRP-MNPs	Microchip, external magnet, vacuum pump, microscope, and luminescence spectrometer with PMT detector,	0.02-350	5.2	[**21**]
Lab-on-chip (microfluidic) system	Luminol/H_2O_2/ferricyanide	PDMS/glass chip, syringe pump, multi-position selector valve, and PMT	0.01-5	10	[**22**]
Lab-on-chip	Luminol/H_2O_2/ferricy	Glass chip, peristaltic pump, and Biophysics CL analyzer	1.1-110	100	[**23**]

(microfluidic) system	anide	with PMT detector			
Lab-on-chip (microfluidic) system	Luminol/H_2O_2/HRP	PMMA chip, two syringe pumps, microdialysis probe, and Biophysics CL analyzer with PMT detector	0.8-10	100	[**24**]
Lab-on-chip (microfluidic) system	Luminol/H_2O_2/HRP	PDMS/glass chip, two microdialysis syringe pumps, two-position actuator switching valve, silicon photodiode, multifunctional transimpedance amplifier, and multimeter	2-10	230	[**25**]
Lab-on-chip (microfluidic) system	Rhodanine derivative/H_2O_2	Paper chip fabricated by stacking one layer of assembled WCP#1s between two layers of water-impermeable single-sided adhesive tape, ultraweak luminescence analyzer with PMT detector	0.42-50	140	[**26**]
Lab-on-chip (microfluidic) system	Luminol/H_2O_2/ferricy anide	Paper chip fabricated by the photolithographical patterning or wax-printing technique	~0.3-1.2	~300	[**27**]

Lab-on-chip (microfluidic) system	Luminol/H_2O_2/HRP	Wax-patterned cloth, and CCD camera	0.1-100	94.8	[**28**]
Lab-on-chip (microfluidic) system	Luminol/H_2O_2	Wax-patterned cloth, and CCD camera	0.01-10	9.74	**This work**

Note: [a]: the catalyst is not available; CL: chemiluminescence; LDR: linear dynamic range; LOD: limit of detection; Luminol: 3-aminophthalhydrazide; PMT: photomultiplier tube; HRP-AuNPs: horseradish peroxidase (HRP) absorbed on the surface of gold nanoparticles; ferricyanide: potassium hexacyanoferrate(III); FRP: fungal peroxidase; GO: graphene oxide; HRP-MNPs: HRP immobilized on magnetic nanoparticles; PDMS: poly(dimethyl-siloxane); PMMA: poly(methyl methacrylate); WCP#1: whatman chromatography paper #1; and CCD: charge-coupled device.

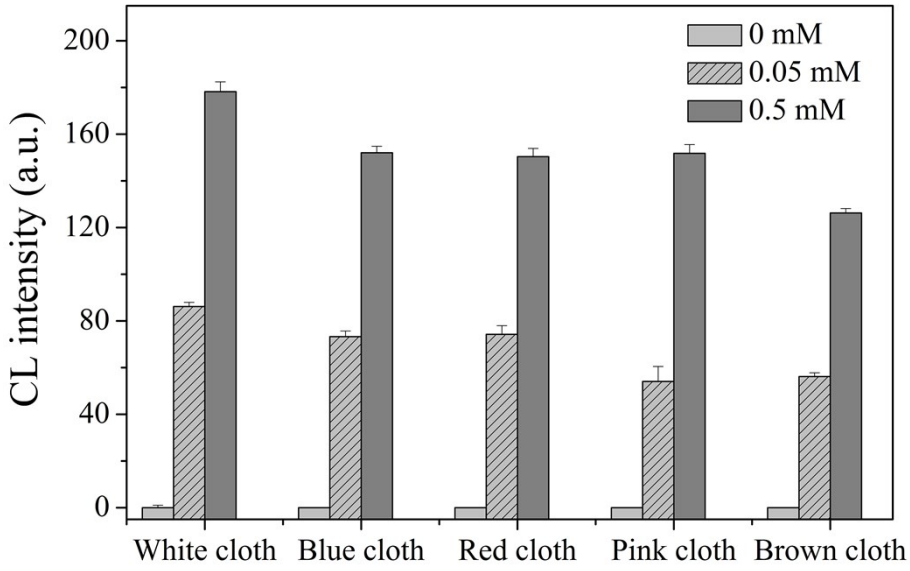

Fig. S1. The influence of cloth colors on the CL intensity. Here, the similar cloths had five different colors: white, blue, red, pink, and brown. And, the experimental conditions were as follows: pH of test/substrate solutions-7.5/8.0, [Luminol]-1.0 mM, [HRP]-0.3 g L^{-1}, [PIP]-0.2 mM, [H_2O_2]-0, 0.05 and 0.5 mM, Angle of inclination-50^o, and Volumes of test/substrate solutions-30 μL/35 μL. The error bars represent the standard deviations of five independent measurements.

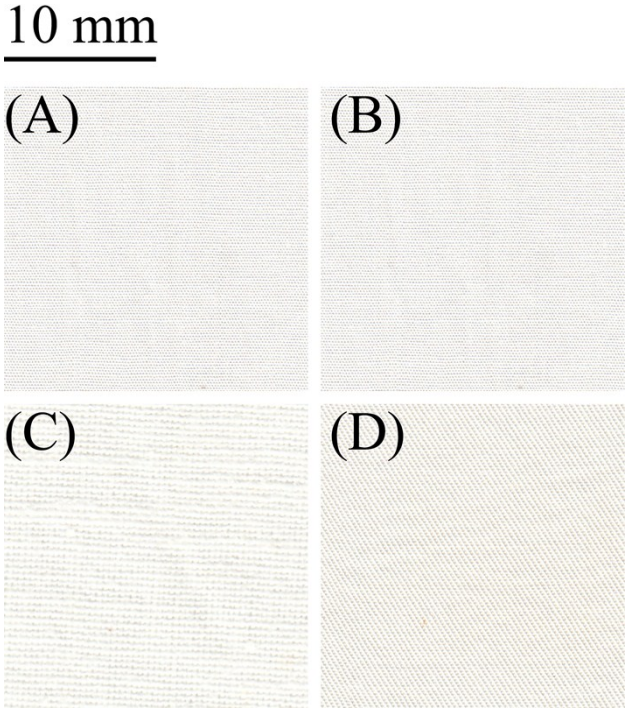

Fig. S2. Photos of four kinds of white cloths with different components. (**A**) white plain weave cotton cloth ("Cotton cloth"); (**B**) white linen-silk blended cloth ("Linen-silk cloth"); (**C**) white linen cloth ("Linen cloth"); and (**D**) white corduroy weave cotton cloth ("Corduroy cloth").

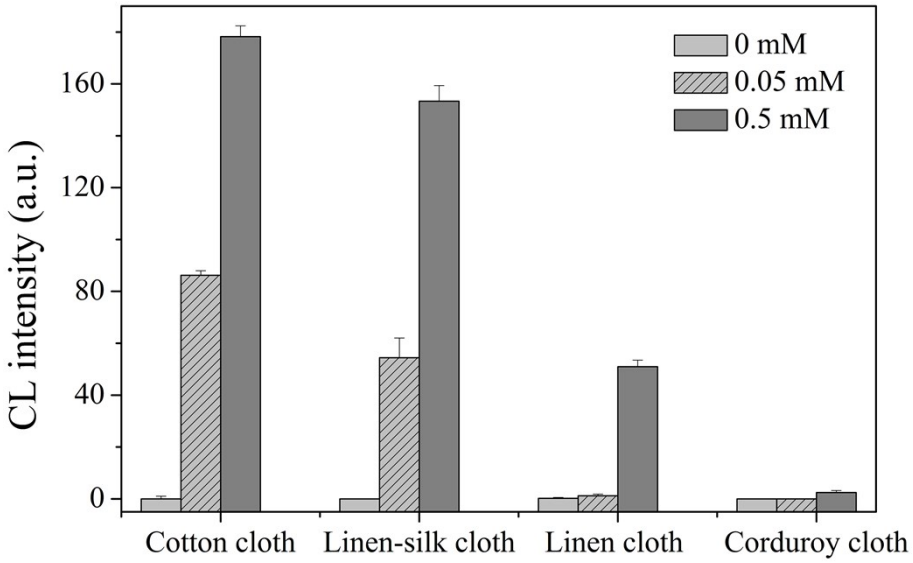

Fig. S3. Effect of white cloths with different components on the CL intensity. Here, the used cloth materials included white plain weave cotton cloth ("Cotton cloth"), white linen-silk blended cloth ("Linen-silk cloth"), white linen cloth ("Linen cloth"), and white corduroy weave cotton cloth ("Corduroy cloth"). And, the experimental conditions were as follows: pH of test/substrate solutions-7.5/8.0, [Luminol]-1.0 mM, [HRP]-0.3 g L^{-1}, [PIP]-0.2 mM, [H_2O_2]-0, 0.05 and 0.5 mM, Angle of inclination-50^o, and Volumes of test/substrate solutions-30 μL/35 μL. The error bars represent the standard deviations of five independent measurements.

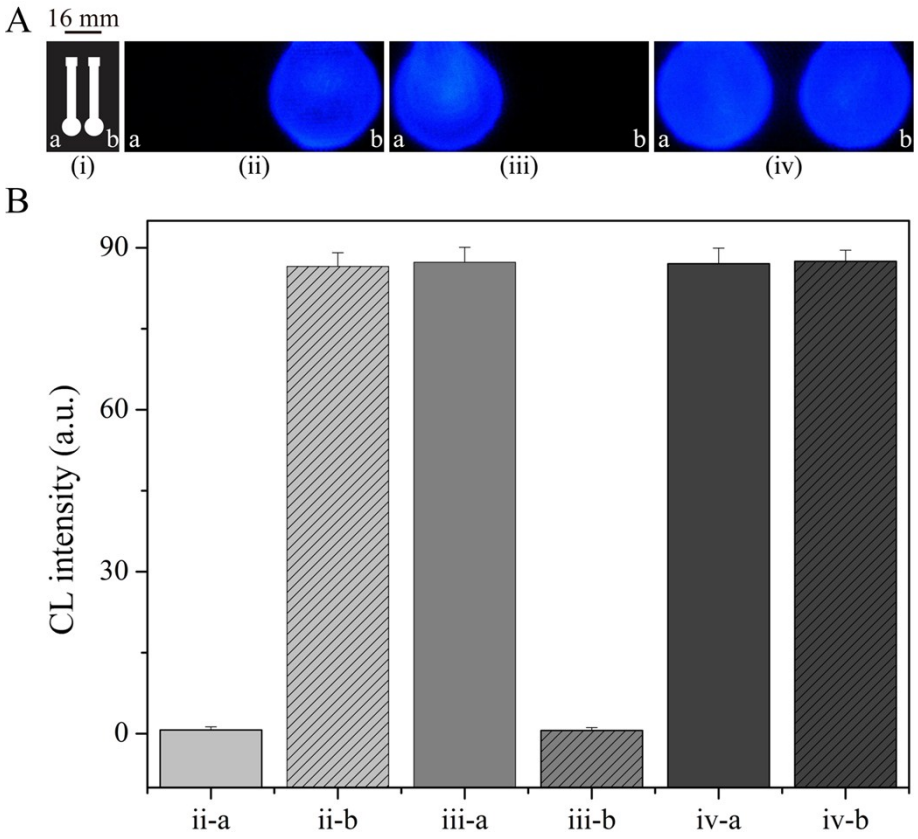

Fig. S4. Proof-of-concept demonstration of simultaneous detection within two different CL units on a single cloth piece. (**A**) The typical CL images: (i) the diagram of the device; (ii) the "a" detection zone was loaded with the test solution without H_2O_2, while the "b" detection zone was loaded with the H_2O_2-containing test solution; (iii) the "a" detection zone was loaded with the H_2O_2-containing test solution, while the "b" detection zone was loaded with the test solution without H_2O_2; and (iv) the "a" and "b" detection zones were loaded with the H_2O_2-containing test solution, respectively. In panels (ii), (iii) and (iv), the experimental conditions were as follows: pH of test/substrate solutions-7.5/8.0, [Luminol]-1.0 mM, [HRP]-0.3 g L^{-1}, [PIP]-0.2 mM, [H_2O_2]-0.05 mM, Angle of inclination-50^o, and Volumes of test/substrate solutions-30 μL/35 μL. (**B**) CL intensities within two detection zones according to the images in panels (ii)，(iii) and (iv). The error bars represent the standard deviations of five independent measurements.

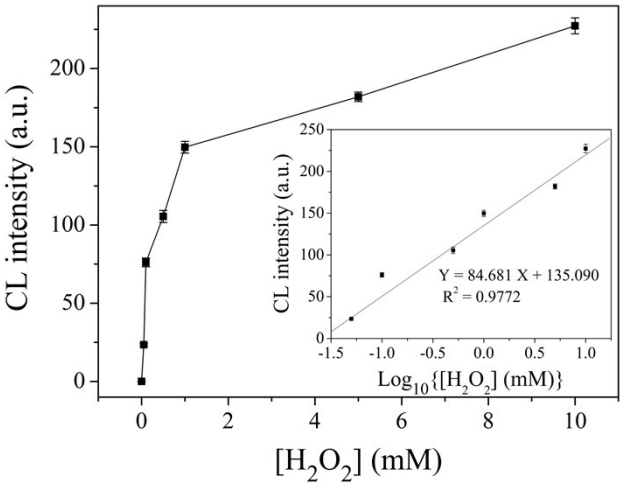

Fig. S5. CL determination of H_2O_2 using the similar paper-based devices. The experimental conditions were as follows: pH of test/substrate solutions-7.5/8.0, [luminol]-1.0 mM, [HRP]-0.3 g L^{-1}, [PIP]-0.2 mM, [H_2O_2]-0, 0.05, 0.1, 0.5, 1, 5 and 10 mM, Angle of inclination-50^o, and Volumes of test/substrate solutions-30 μL/35 μL. The insert showed that the CL intensities could be linearly proportional to the logarithms of H_2O_2 concentrations in the range of 0.05-10 mM. The error bar represents the standard deviation of five independent measurements.

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