Supplementary Information

Improving quantitative control and homogeneous distribution of sample on paper-based analytical devices via drop-on-demand inkjet printing

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[1]Meng-Meng Liu and Xin Lian contributed equally to this work.

Figures

FigureS1

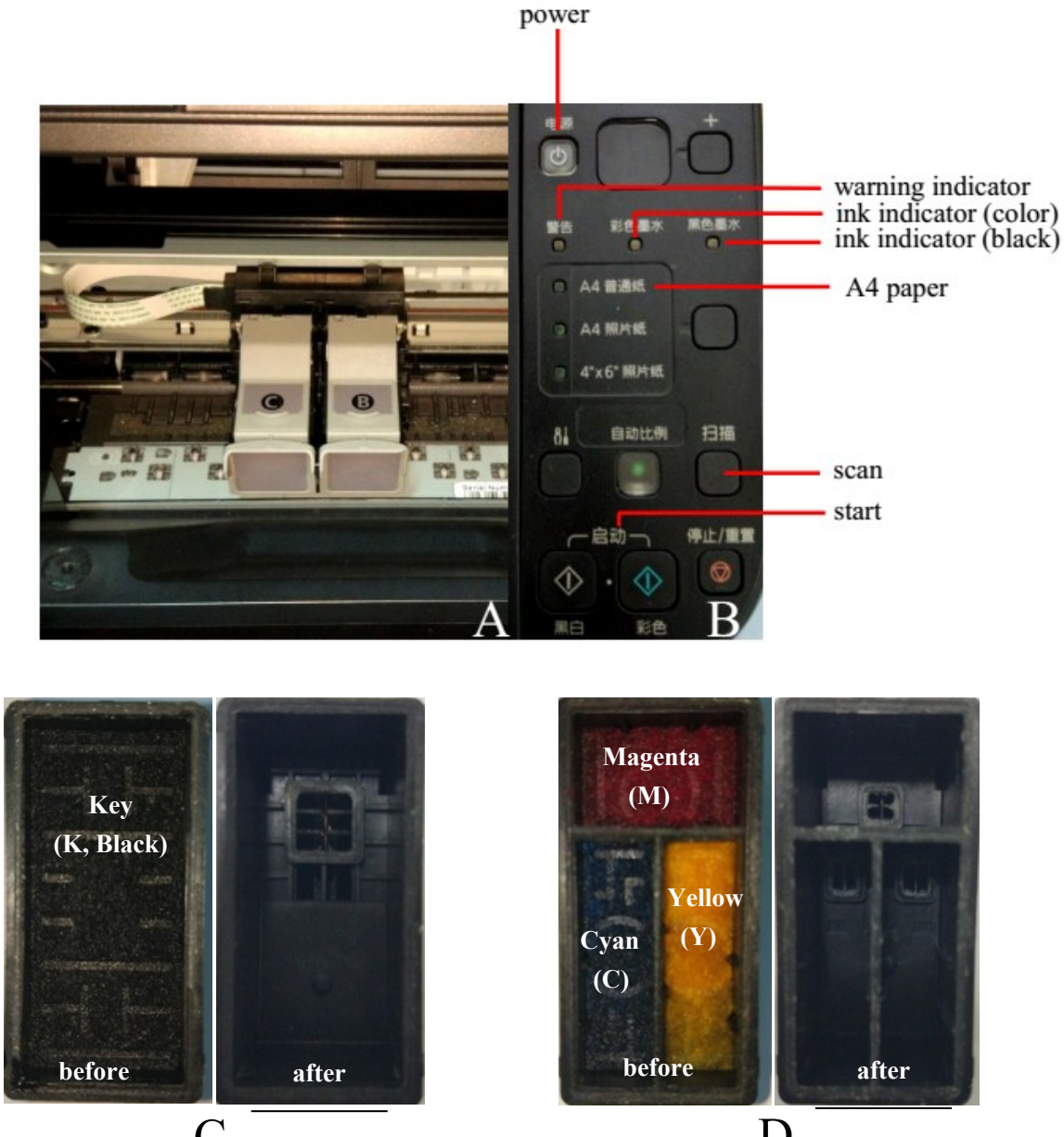
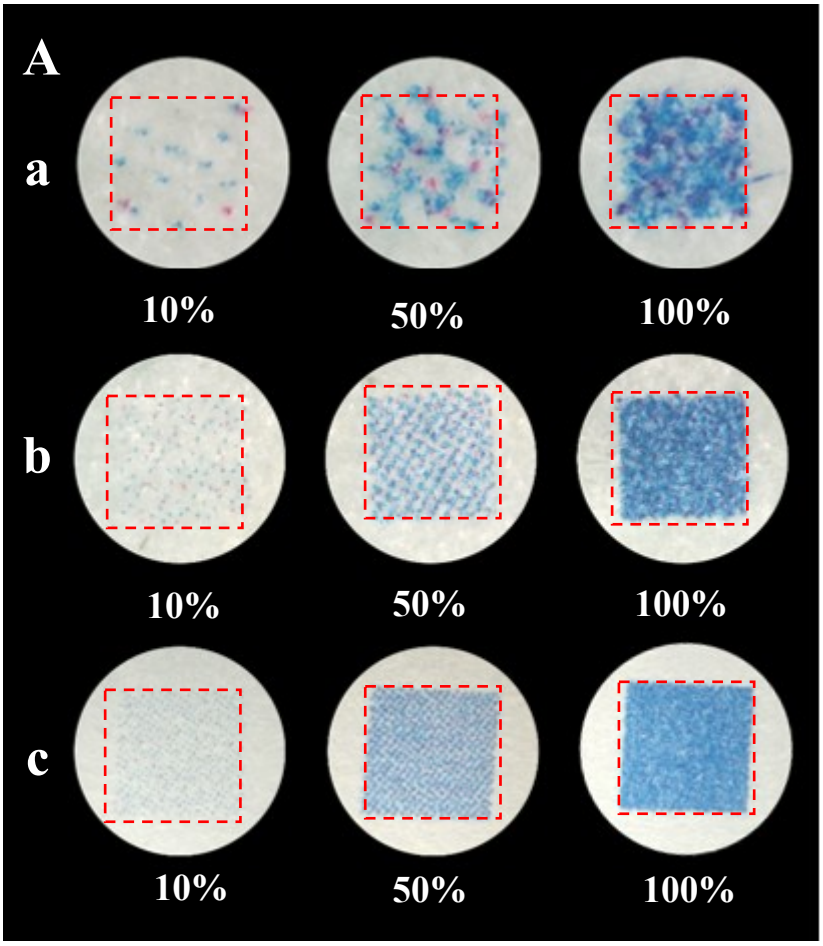


Fig. S1 Photos for the inside structure (A) and operational panel (B) of a commercialCanon MP288piezoelectric inkjet printer. Photos of the black cartridge (C) and the color cartridge (D) before (left) and after (right) disassembly.
Black cartridge (PG-815): Key (K, Black); Color cartridge (CL-816): Cyan (C); Yellow (Y) and Magenta (M).

Figure S2



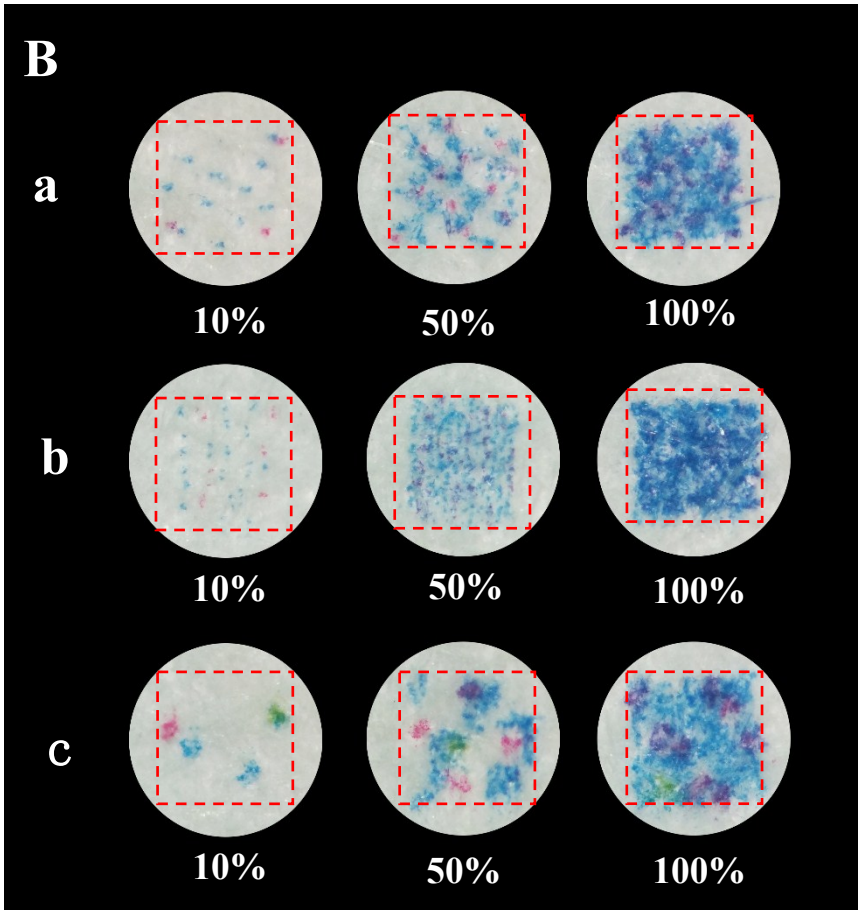
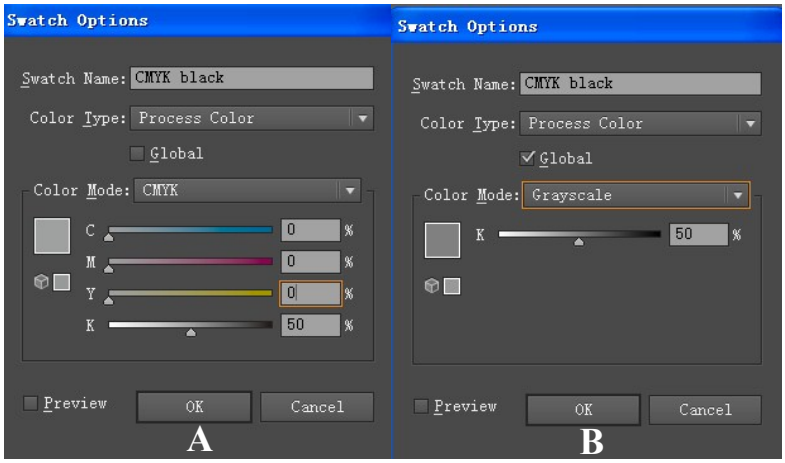


Fig. S2 Optimization of the printed area and print quality. (A) Optical micrographs of the different printed areas with various magnification. a: 0.25 mm^2 with magnification of 45 times. b: 2.25 mm^2 with magnification of 15 times. c: 9.0 mm^2 with magnification of 7 times. (B) Optical micrographs of the cyan ink dots at C value range from 10 % to 100 % with different print quality. a: Standard printing. b: High-quality printing. c: Fast printing.

Figure S3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Global
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M 0 %
Y 0 %
K 50 %
Preview
OK
Cancel
A
Swatch Options
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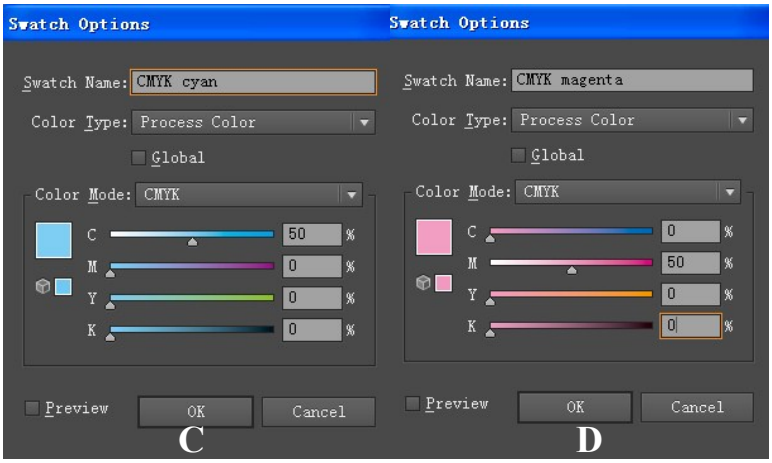
Color Type: Process Color
Global
Color Mode: Grayscale
K 50 %
Preview
OK
Cancel
B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Y 0 %
K 0 %
Preview
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Cancel
C
Swatch Options
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M 50 %
Y 0 %
K 0 %
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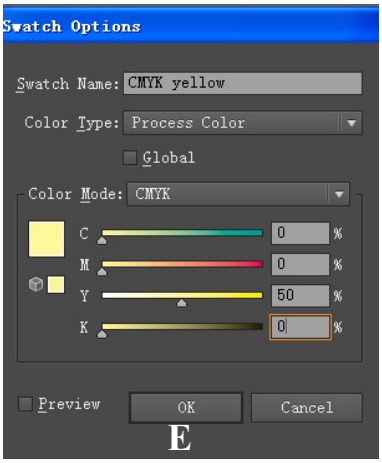
OK
Cancel
D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Preview
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Cancel
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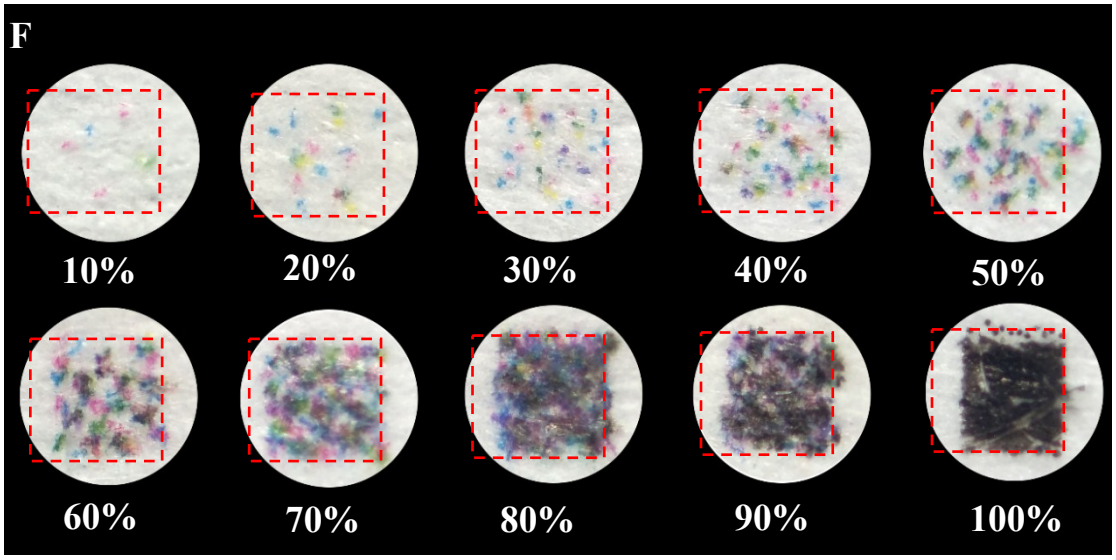


Fig. S3 Parameters setting of CMYK in the regularity research of single color. The setting of K value in the grayscale printing (A) and CMYK mode (B). The setting of C (C), M (D) and Y (E) values in the CMYK mode. (F) Optical micrographs of the black ink dots in the CMYK mode at various K values.

Figure S4

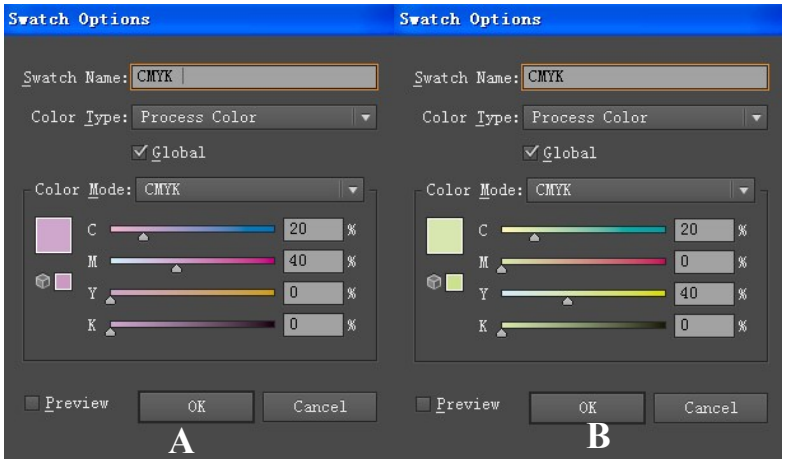
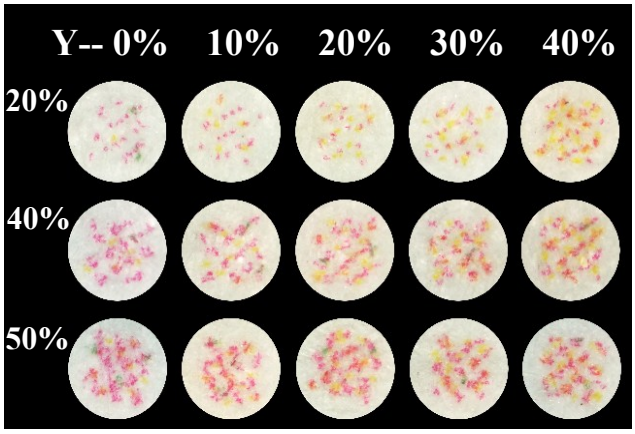


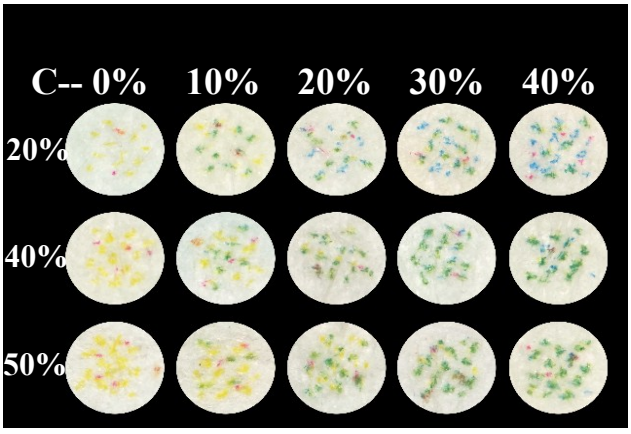
Fig. S4 Parameters setting of CMYK in the regularity research of two-colors. (A) C-M pairs. (B) C-Ypairs.

Figure S5

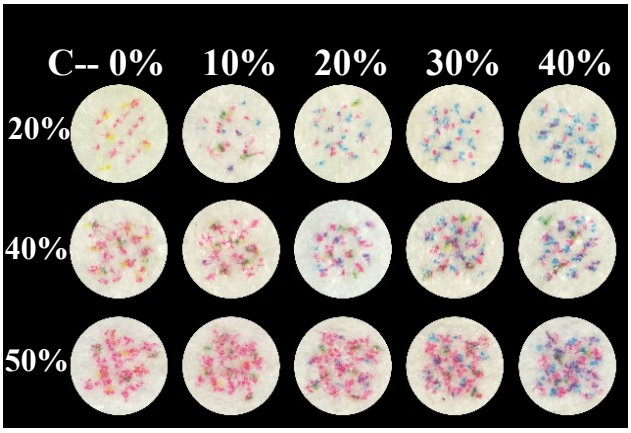
a



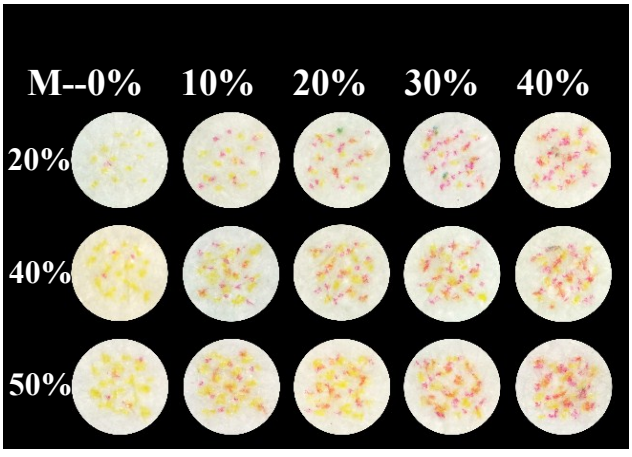
b

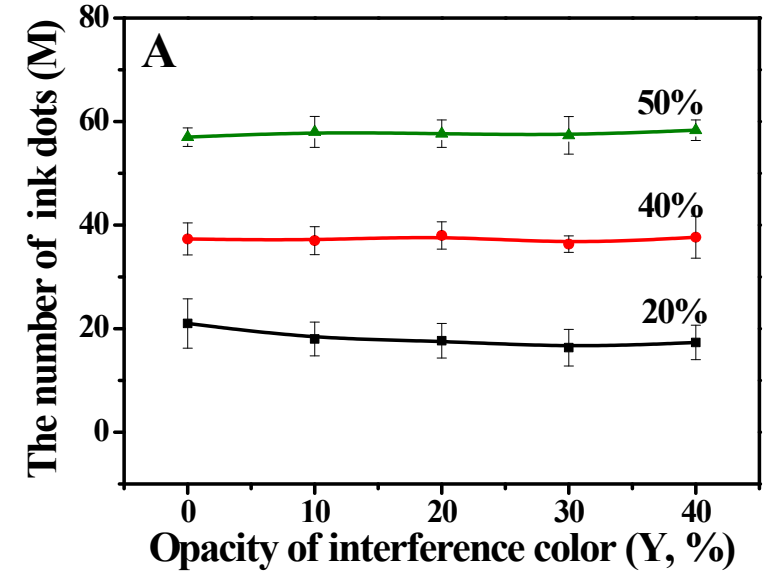


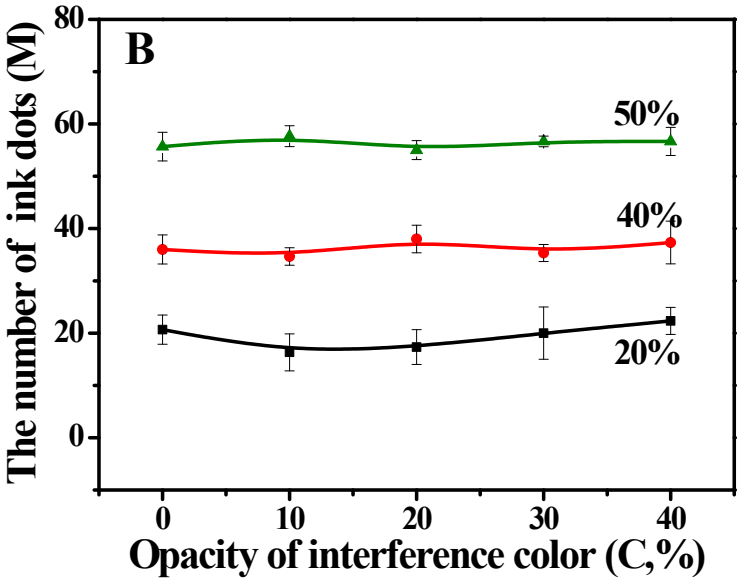
c



d




A
50%
40%
20%
The number of ink dots (M)
Opacity of interference color (Y, %)
0
20
40
60
80
0
10
20
30
40


B
50%
40%
20%
The number of ink dots (M)
Opacity of interference color (C,%)
0
20
40
60
80
0
10
20
30
40

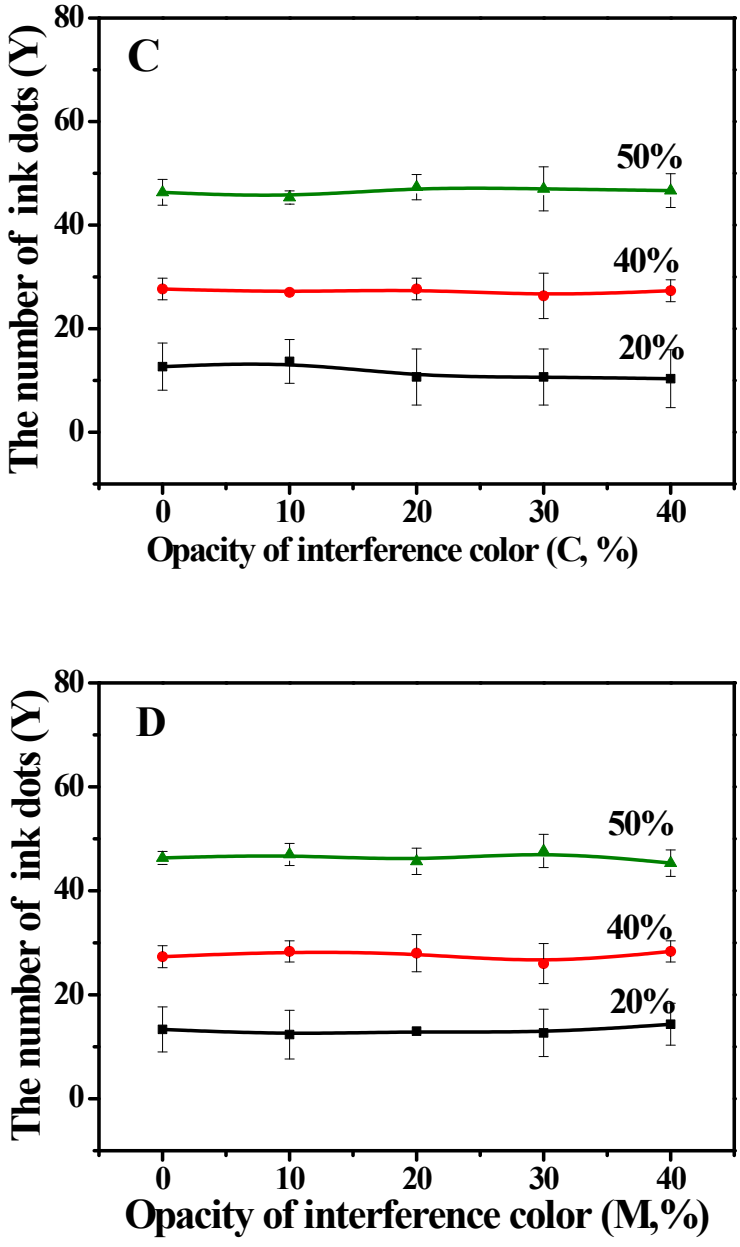


Fig. S5 Regularity research of two-color. Optical micrographs of M-Y pairs (a), M-C pairs (b), Y-C pairs (c) and Y-M pairs (d) showing the number change of studied color ink dots at specific opacity value with the value of interference color. Effects of (A) Y value and (B) C value on the number change of the magenta ink dots. Effects of (C) C value and (D) M value on the number change of the yellow ink dots. Error bars represent the standard deviations for three replicates.

Figure S6

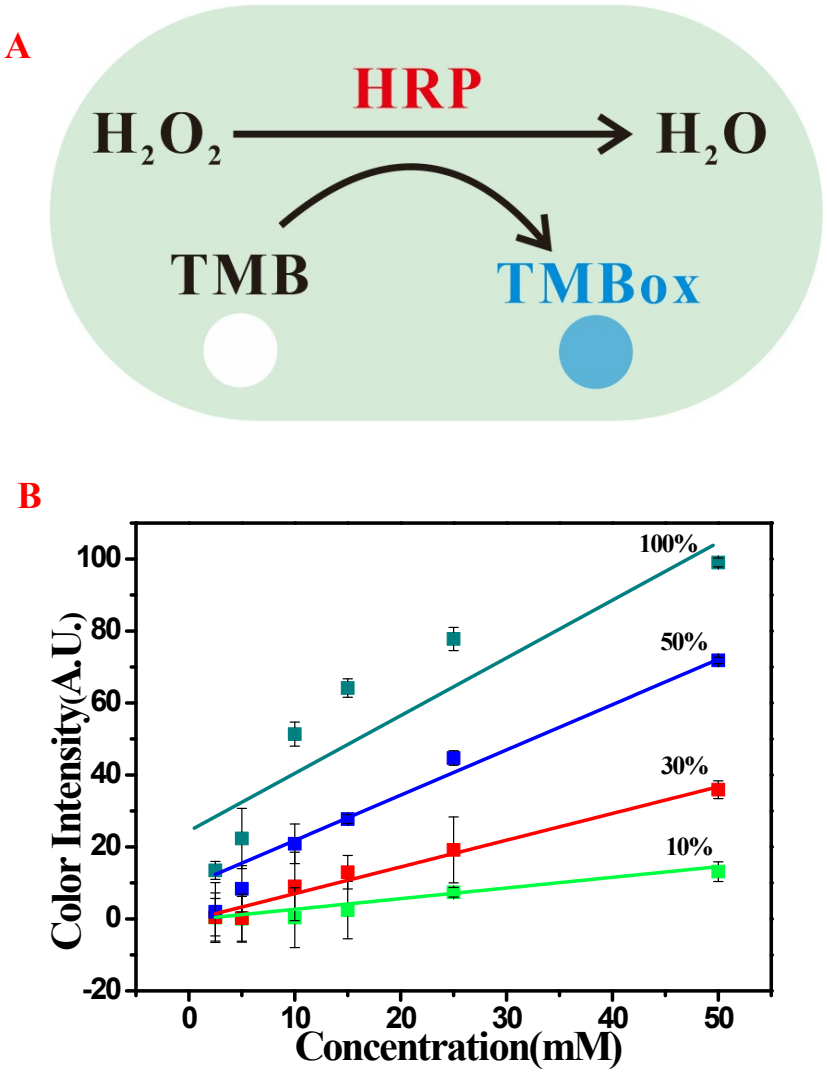


Fig. S6 (A) Oxidation reaction catalyzed by HRP. (B) Linear relationship between color intensity and H_2O_2 concentration at various K values (gray value: 10%, 30%, 50% and 100%). H_2O_2 concentration: 2.5, 5, 10, 15, 25 and 50 mM. Error bars represent the standard deviations for three replicates.

Figure S7

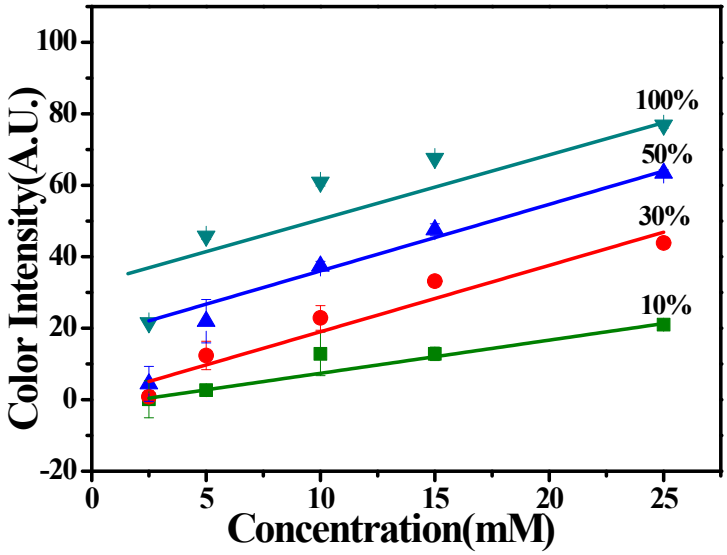


Fig. S7 Linear relationship between color intensity and H_2O_2 concentration at various C values (opacity value: 10%, 30%, 50% and 100%). H_2O_2 concentration: 2.5, 5, 10, 15 and 25 mM. Error bars represent the standard deviations for three replicates.

Table S1 Comparison of results for determination of glucose in real serum samples using the four ink cartridges printing approach and biochemical instrument.

Serum samples	μPADs(μM)		Biochemical instrument IT3000 (μM)
	Mean(n=5)	RSD(%)	
1	3.433	5.366	3.60
2	5.571	2.337	5.11
3	11.049	1.970	10.50

Table S2 Recovery tests of glucose in real serum samples based on four ink cartridges.

	Added (μmol)	Mean value (μmol) (n=3)	Recovery (%)	RSD (%)
Serum samples	0	2.652	-	-
	2.5	5.391	109.60	1.405
	5	7.442	95.81	1.152
	10	13.627	109.76	0.851