

Supplementary Information for

Rational Selection of Substrates to Improve Color Intensity and Uniformity on Microfluidic Paper-Based Analytical Devices

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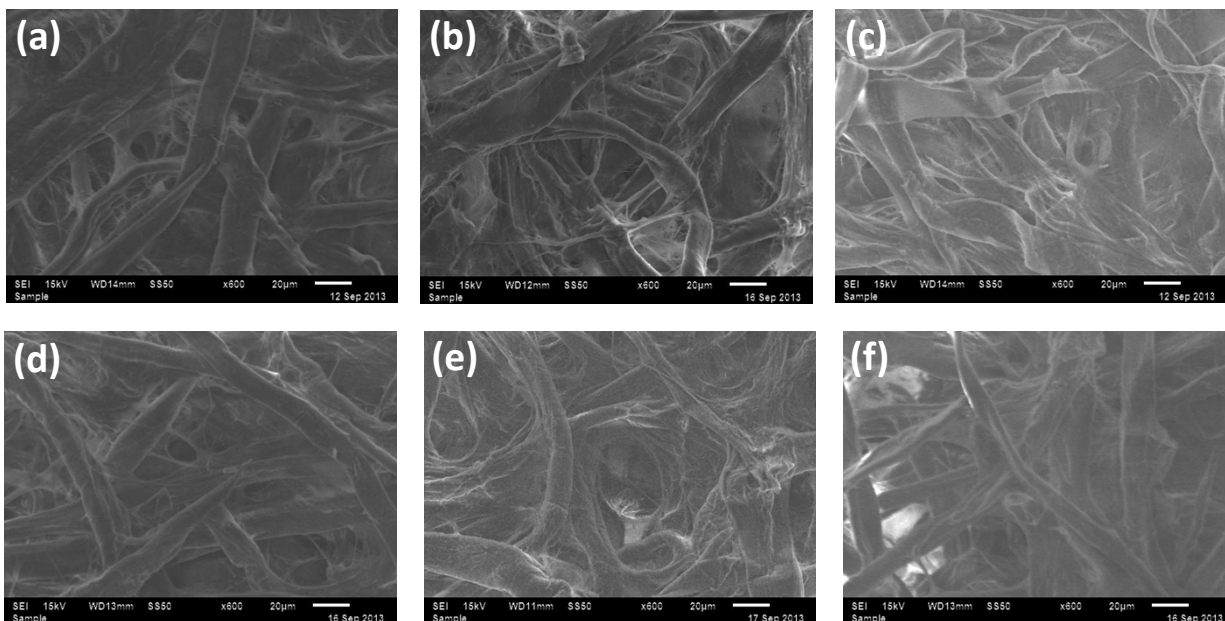
Typical composition of Whatman Filter Papers (Grade F)

Cellulose	Cellulose 0.98 (alpha cellulose content minimum)
Other components	Aluminum: <0.5 µg/g Antimony: <0.02 µg/g Arsenic: <0.02 µg/g Barium: <1 µg/g Boron: 1 µg/g Bromine: 1 µg/g Calcium: 185 µg/g Chlorine: 130 µg/g Chromium: 0.3 µg/g Copper: 1.2 µg/g Fluorine: 0.1 µg/g Iron: 5 µg/g Lead: 0.3 µg/g Magnesium: 7 µg/g Manganese: 0.06 µg/g Mercury: <0.005 µg/g Nitrogen: 23 µg/g Potassium: 3 µg/g Silicon: 20 µg/g Sodium: 160 µg/g Sulfur: 15 µg/g Zinc: 2.4 µg/g
Ashes	< 0.06%

Typical composition of Whatman Chromatography Papers (grade CHR)

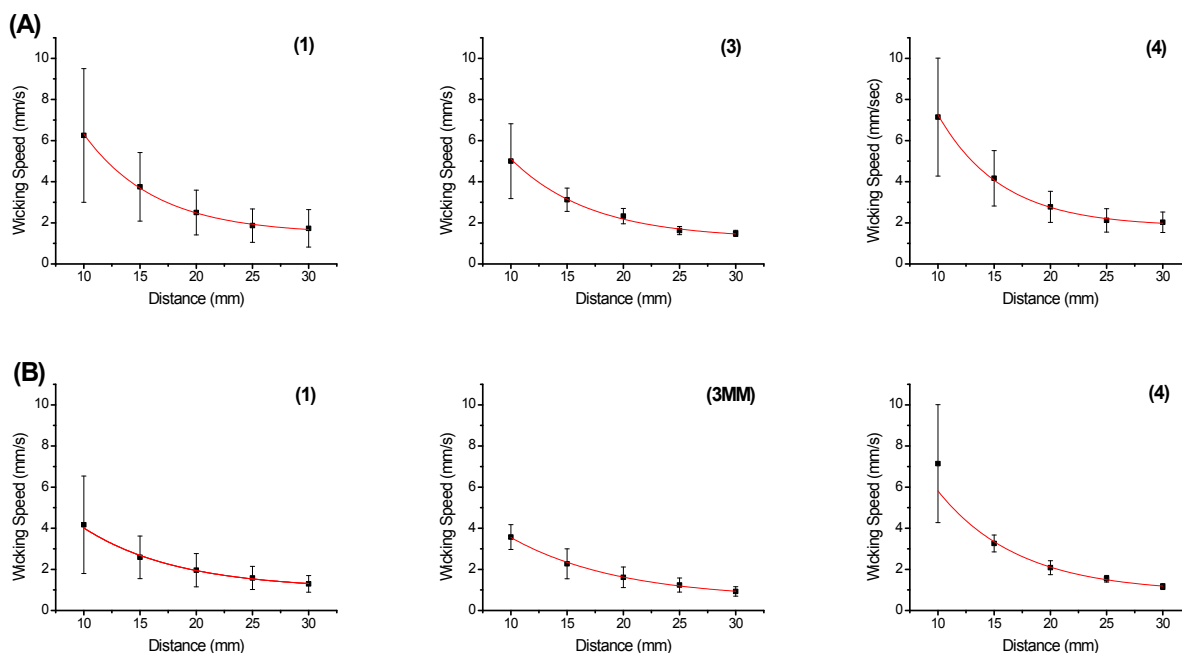
Cellulose	Cellulose 0.98 (alpha cellulose content minimum)
Ashes	< 0.06%

Scanning Electron Microscopy of the selected papers



SI Fig. 1: SEM images taken at 600x of (a) Grade 1 filter paper, (b) Grade 3 filter paper (fiber thickness of $14.8 \pm 1.4 \mu\text{m}$), (c) Grade 4 filter paper (fiber thickness of $20.4 \pm 3.6 \mu\text{m}$), (d) Grade 1 CHR chromatography paper, (e) Grade 3MM CHR chromatography paper (fiber thickness of $10.1 \pm 2.7 \mu\text{m}$), and (f) Grade 4 CHR chromatography paper (fiber thickness of $11.9 \pm 2.2 \mu\text{m}$).

Wicking speed of the selected papers



SI Fig. 2. A flow rate comparison between all 6 grades of Whatman paper. The flow rates of (A) Whatman Grade 1, 3, and 4 filter papers, and (B) Whatman Grade 1 CHR, 3MM CHR and 4 CHR chromatography papers.

$$y = A * e^{-x/t} + y_0$$

Equation S1

Table S1. Parameters used to determine the wicking speed for each paper. Fitting parameters correspond to: y = Wicking speed (mm/sec), x = Wicked distance (mm), A = Amplitude, t = Decay constant, y_0 = y offset.

Paper	Filter 1	Filter 3	Filter 4	1 CHR	3MM CHR	4 CHR
y_0	1.4 ± 0.1	1.2 ± 0.2	1.7 ± 0.1	1.0 ± 0.1	0.6 ± 0.1	0.9 ± 0.2
A	23 ± 4	16 ± 7	32 ± 7	10 ± 2	8.4 ± 0.7	20 ± 8
t	6.4 ± 0.6	7 ± 2	5.7 ± 0.6	8 ± 1	10 ± 1	7 ± 1
R²	0.99	0.95	0.98	0.98	0.99	0.97