1 Image analysis procedure

This section is an extension of subsection 2.5 of the main article. A step-by-step graphical explanation is presented.

1.1 Cropping

First step consists in cropping the picture to select one paper strip. A typical picture is shown below (left). A cropped image containing only the selected paper strip is shown (right) indicating the hydrophobic barrier, the inlet area and the initial position.

1.2 Subtraction

The first image is substracted to each frame and the green channel of the RGB image is selected.
1.3 Lateral averaging

Each image is laterally averaged obtaining a grey-scale vector for each frame. The figure below shows a condensed image where each column is one of this intensity profile vectors.

1.4 Intensity normalization

The last profile is used to normalize all profile vectors. The results for some frames are presented in the next figure. The cut-off values of 10% and 60% are highlighted in the figure. It can be observed that in this range the visual front position is insensitive to the particular chosen cut-off value.
2 Complemental experiments

In this section we present the results of additional experiments in order to show the repeatability of wetting-drying process and validate the proposed protocol.

2.1 Additional experiments in chromatography paper

Another two sets S2 and S3 of six paper strips were prepared using only cross-direction strips. Then, this sets were independently subjected to the wetting-drying process in similar conditions to the described in the main article. Before the 8th cycle, the samples was stored in a plastic box overnight, then two new cycles was performed. Additionally, set S3 was stored for two month after 10th cycle at the same conditions, then a new cycle was performed in order to test long term stability.

Analogous to figures 6 and 7 of the main article, the figures below show the position at 5 minutes and the errors $e$ and $\epsilon$ as a function of cycle number for this additions sets.

For the set S2:

For the set S3, including a long term test:

2.2 Experiments in filter paper

An additional set of 5 filter paper strips (cut in machine direction) was subjected to the proposed protocol in order to check the improvement in predictability in this substrate. The figures below are analogous to Fig. 6 and 7 of the main article. The overall results are essentially the same for both pure cellulose papers.
2.3 Pre-heating

Additional experiments were carried out over eight chromatography paper strips (cut in cross direction). Half of them were subjected to heating (20 min at 90°C) prior to capillary imbibitions, and the other ones were tested under normal conditions. The resulting curves cannot be statistically differentiated each other, which suggest that the imbibition dynamics is not altered by the preceding heating. In analogy to Fig. 3 of the main article, the figure below shows filling curves for this experiment.