Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Characteristics of wetting distance in multilayered paper-based channel.[1] HYUNWOONG KANG, Dept. of Mechanical Engineering, Hanyang University, ILHOON JANG, Institute of Nano Science and Technology, Hanyang University, SIMON SONG, Dept. of Mechanical Engineering, Hanyang University
— A multilayered paper-based device which has a gap between paper layers can generate much greater flow velocity than a typical single layer paper-based device. This feature enables quick analysis in applications utilizing paper-based devices. Predicting the time to reach the detection point and the amount of sample fluid is critical to improving detection accuracy and manufacturing the multi-functional device. However, the multilayered paper-based device has a more complicated fluid flow than the conventional device resulting in the different flow with the single-layer device that can be described by the Lucas-Washburn equation. These are due to the simultaneous sample flow flowing through both gap and paper layer. For example, since the paper internal flow is much slower than the gap internal flow, the fluid can be absorbed into the paper layer in the thickness direction, and it reduces a flow rate, especially at the initial stage of the fluid flow. In this study, we analyze the characteristics of the flow mainly focused on the differences between the existing capillary driven flow model and explain the factors that affect the wetting distance in the multilayer paper-based channel.

[1]This work was supported by the Human Resources Program in Energy Technology of the Korea Institute of Energy Technology Evaluation and Planning (KETEP), granted financial resource from the Ministry of Trade, Industry Energy, Republic of Korea (No. 20184010201710)

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Date submitted: 01 Aug 2019 Electronic form version 1.4