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Stability Analysis of Superhydrophobic Friction Reduction Polymeric Microchannels TAE JIN KIM, CARLOS HIDROVO, The University of Texas at Austin — Superhydrophobic surfaces are surfaces where fluid contact angle is larger than 150°. Superhydrophobic states which allow water droplets to fall off at low sliding angles are termed as Cassie state. It is widely known that drag/friction reduction is closely related to liquid under Cassie state, and studies have been widely performed to achieve such effects. Our research goal is to develop superhydrophobic microfluidic channels with trenches on the side walls and observe the stability of the air pockets formed within these trenches. We have prepared PDMS(poly-dimethylsiloxane) substrates with different trench aspect ratio of 1:1, 1:2, 1:500 and 1:3000. As the aspect ratio of the trench decreases, the pressure in the air pockets tends to resist wetting. However, once penetration of the water into the air pocket occurred, the shallow trenches were wetted in a rapid fashion while the deep trenches were wetted at a slower rate. A compression model of the air pockets as a function of pressure difference and volume change of the air pockets was also developed. In the theoretical model, the air in the pockets is assumed to be an ideal gas. This model was compared and validated against the experimental results.

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