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The effect of channel height on bubble nucleation in superhydrophobic microchannels due to subcritical heating[1] ADAM COWLEY, DANIEL MAYNES, JULIE CROCKETT, BRIAN IVERSON, Brigham Young Univ - Provo — This work experimentally investigates the effects of heating on laminar flow in high aspect ratio superhydrophobic (SH) microchannels. When water that is saturated with dissolved air is used, the unwetted cavities of the SH surfaces act as nucleation sites and air effervesces out of solution onto the surfaces. The microchannels consist of a rib/cavity structured SH surface, that is heated, and a glass surface that is utilized for flow visualization. Two channel heights of nominally 183 and 366 μm are considered. The friction factor-Reynolds product (fRe) is obtained via pressure drop and volumetric flow rate measurements and the temperature profile along the channel is obtained via thermocouples embedded in an aluminum block below the SH surface. Five surface types/configurations are investigated: smooth hydrophilic, smooth hydrophobic, SH with ribs perpendicular to the flow, SH with ribs parallel to the flow, and SH with both ribs parallel to the flow and sparse ribs perpendicular to the flow. Depending on the surface type/configuration, large bubbles can form and adversely affect fRe and lead to higher temperatures along the channel. Once bubbles grow large enough, they are expelled from the channel. The channel size greatly effects the residence time of the bubbles and consequently fRe and the channel temperature.

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Adam Cowley
Brigham Young Univ - Provo

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