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Evaluation of a compact model for prediction of liquid film thickness in stratified two-fluid microchannel flows JULIE E. STEINBRENNER, SÉBASTIEN VIGNERON, FU-MIN WANG, CARLOS H. HIDROVO, JAE-MO KOO, EON-SOO LEE, CHING-HSIANG CHENG, JOHN K. EATON, KENNETH E. GOODSON, Stanford University — Interaction between gas and liquid phases in separated flow through a channel governs flow regimes and influences the behavior of each phase. However, this interaction is not well modeled by traditional single-phase parameters. A compact model is presented which accounts for the interaction of the two phases by employing a modification to the single-phase friction factor formulation for rectangular channels. The modification represents the interaction between phases using a multiplicative factor derived from an analytical solution to stratified flow between parallel plates. Film thickness and pressure drop predictions from the model are compared with analytical solutions to two-fluid flow in a rectangular duct. Computational results are compared with experimental measurements of the liquid film thickness in stratified two-phase flow in rectangular microchannels (D = 50-500 μm) for various aspect ratios. A physical interpretation of experimental and computational results is presented.

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