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Experimental Determination of Heat Transfer Coefficient in Two-phase Annular Flow KRISTOFER DRESSLER, University of Wisconsin at Madison, BRIAN FEHRING, ROMAN MORSE, SIMON LIVINGSTON-JHA, JAMES DOHERTY, JASON CHAN, COLBY BRUEGGEMAN, ARGANTHAEL BERSON, UW Madison — The goal of the presented work is to validate published mechanistic heat transfer models in two-phase annular flow under transient conditions. Annular flow occurs in many steam generation and refrigeration systems. Knowledge of the heat transfer coefficient (HTC) between the wall and the thin liquid film is critical to the design and safe operation of these systems. In heat exchangers with multiple parallel channels, thermal hydraulic instabilities often lead to unsteady flow conditions. The current study is performed in a facility capable of producing pulsed two-phase, single-species annular flow in a heated test section while simultaneously measuring local film thickness and wall temperature using non-intrusive optical techniques. Available correlations between the HTC and wall shear at steady state are compared to our measurements. The HTC can be derived from the known heating power and measured wall temperature, while wall shear is deduced from film thickness measurements. The validity of steady-state correlations under oscillating flow conditions is assessed by performing tests at a variety of pulse frequencies and amplitudes.

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