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Measurement of Liquid Film Thickness in a Vertical Annular Two Phase Flow Changing the Gas-Liquid Density Ratio

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Abstract : Annular two phase flow is encountered in many industrial equipments, including flow near nuclear fuel rods in boiling water reactor (BWR). Especially, disturbance waves play important roles in the pressure drop, the generation of entrainments, and the dryout of the liquid film. Therefore, it is important to clarify the behavior of disturbance waves and base film. However, most of the previous studies have been performed under atmospheric pressure conditions that provides the properties of liquid and gas which are significantly different from those of a BWR. Therefore, the effect of properties in gas and liquid on liquid film characteristics should be clarified. In this paper we focus on the effect of gas-liquid density ratio on liquid film thickness characteristics. The experiments have been conducted at four density ratio conditions (ρL/ρG =763, 451, 231, and 31). As a result, it is found that and interfacial shear stress collapse not only tF ave but also tF max and tF min successfully under the same liquid mass flow rate conditions irrespective of ρL/ρG, and moreover a non-dimensional parameter tends to collapse tF max□tF ave□and tF min in the wide range of experimental conditions (ρL/ρG□31□763□We□10□1800□ReL:500 □ 2200).

Keywords : two phase flow, liquid film, annular flow, disturbance wave
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