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Experimental study on flow characteristics of vertical upward annular flow boiling in an annulus JOSEPH SEO, SAYA LEE, DANIEL WACKER, JUNHO LEE, YASSIN HASSAN, Texas AM University — Hydraulic parameters such as outer and inner film thickness, entrainment rate, droplet deposition rate, and droplet velocity of vertical upward annular flow boiling in an annulus have been measured and studied in the present study. The experiment is performed by observing the annular flow boiling in a vertical annular tube by evaporating refrigerant (hydrofluoroether-7000) with a central heating rod. The outer film thickness is measured using planer laser induced fluorescence (PLIF) with Rhodamine-6G as a fluorescence dye while thickness of inner film which is formed at the surface of the heater is visualized and captured by shadowgraph method. The entrainment rate and deposition rate of droplets are also calculated from the image obtained by shadowgraph. Four high-speed cameras with 3000 fps of frame rate are used. The result of the measurement shows that entrainment and deposition rate of droplets is highly related with not only the wave characteristics on the film but also the onset of burn up at the surface of heating rod which are similar with the results from the studies on annular flow. The set of measurement presented in this study is expected to provide a better understanding and insight of the annular flow boiling phenomena in annuli.

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