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Infrared Measurements of Multiphase Flow Phenomena[1]
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— Understanding of phase change heat transfer mechanisms remains elusive due its sensitivity to many variables, but also due to the lack of reliable local information that can enable models to be tested. Although point measurements of variables such as local film thickness and heat transfer have been made, techniques whereby these quantities can be measured over the large areas have been lacking. IR thermometry is an established technology that can be used where optical access to the surface is available in the wavelength of interest. The use of IR measurements is demonstrated in this work to measure the inner and outer wall temperatures of an electrically heated silicon tube during flow boiling of FC-72. The electrical conductivity of silicon can be varied over a broad range by controlling the dopant concentration. Since silicon is largely transparent to IR radiation, the temperature of the inner and outer walls can be measured by coating selected areas with IR opaque thin films. FC-72 is also partially transparent to IR radiation over a broad range of wavelengths, allowing the flow to be visualized. Details of the proposed technique, test apparatus, data reduction, and model development are presented.

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