Investigation of Two-Phase Microchannel Flow Structures for Improved Predictive Models

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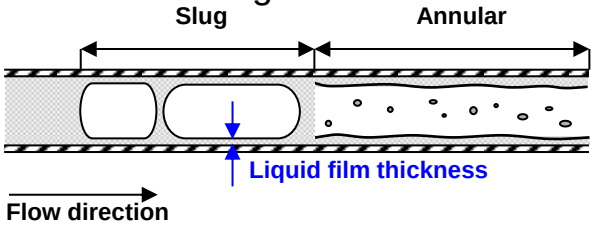
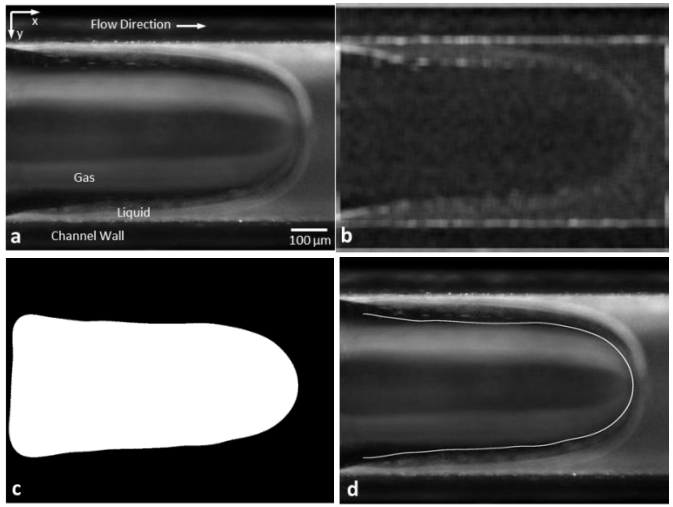
Objective

Refine mechanistic performance models for microchannel flow boiling by experimentally investigating liquid-gas interface structures in slug and annular flows.

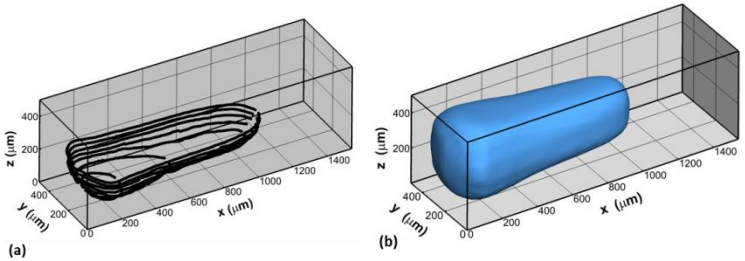


Approach

- Develop a measurement techniques to investigate liquid-gas interface structures
- Conduct parametric characterization of interface shape
- Determine impact of real interface structures on mechanistic models



Interface identification of a slug bubble from (a) raw image, (b) texture mapping, (c) binary conversion, and (d) raw image with interface overlaid.



(a) Slug bubble interface profiles identified at varying depths within the channel and (b) three-dimensional reconstruction of slug bubble.

Impact

- Improve predictive tools for flow boiling heat transfer in microchannel heat sinks
- Advance microfluidic metrology by developing the capability to investigate and characterize liquid-gas interfaces

Selected Publications

- R.S. Patel and S.V. Garimella, *ASME International Technical Conference and Exhibition on Packaging and Integration of Electronic and Photonic Microsystems (InterPACK),* 2013.
- R.S. Patel and S.V. Garimella, *Int. J. Multiphase Flow,* Vol. 62, 45-51, 2014
- T. Harirchian and S.V. Garimella, *Int. J. Heat and Mass Transfer*, Vol. 55, 1246-1260, 2012

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