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# Flow Patterns During Convective Boiling in Microchannels

T. Harirchian

S V. Garimella

*Purdue University*, [sureshg@purdue.edu](mailto:sureshg@purdue.edu)

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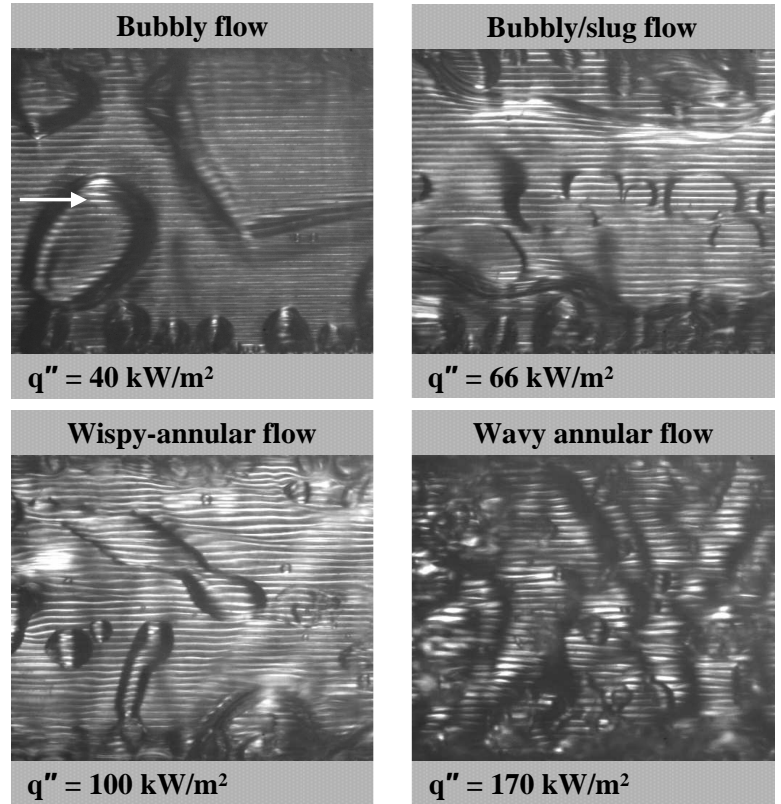
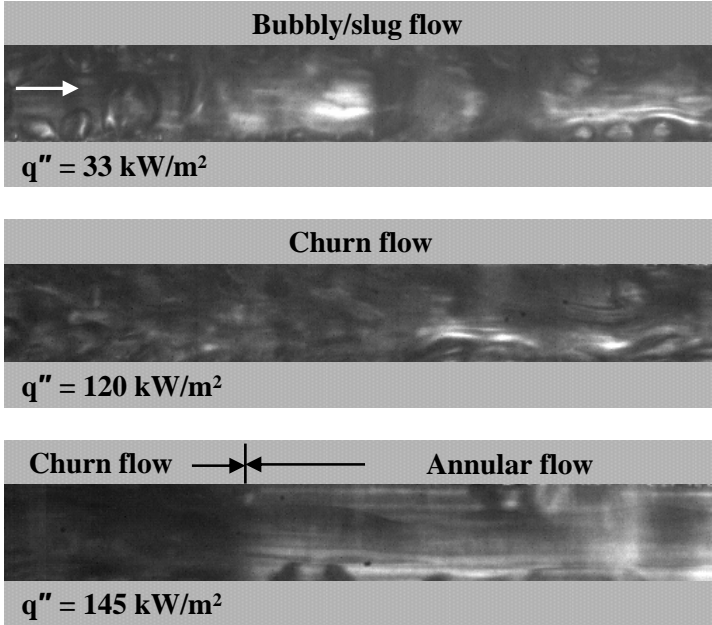
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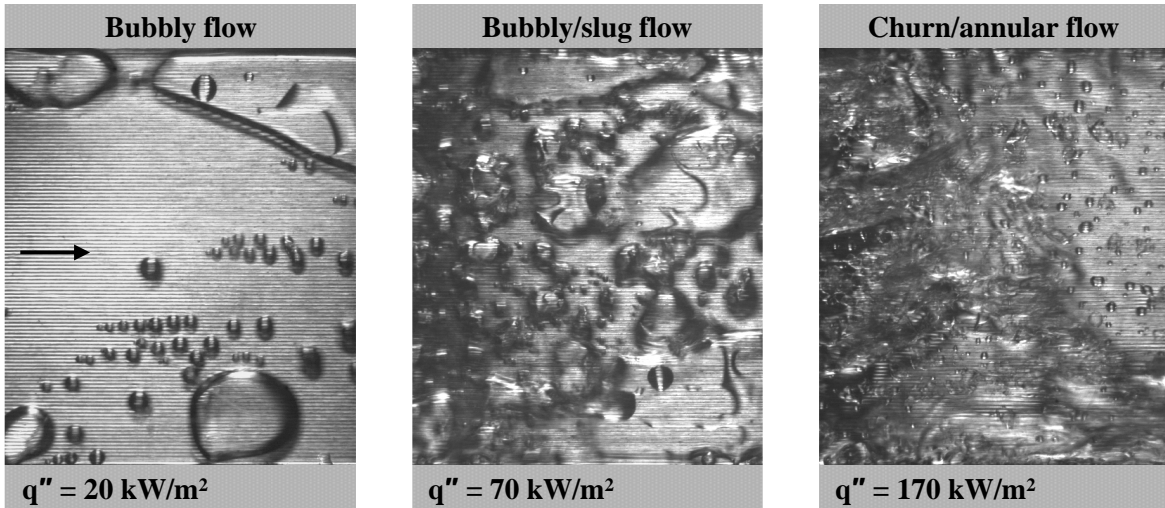
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Flow patterns in 2200  $\mu\text{m}$  x 400  $\mu\text{m}$  microchannels (6000 fps)

Flow patterns in 400  $\mu\text{m}$  x 400  $\mu\text{m}$  microchannels (8000 fps)



Flow patterns in 5850  $\mu\text{m}$  x 400  $\mu\text{m}$  microchannels (2000-4000 fps)



## Flow Patterns During Convective Boiling in Microchannels

T. Harirchian and S. V. Garimella

NSF Cooling Technologies Research Center

School of Mechanical Engineering, Purdue University, West Lafayette, IN 47907-2088

To develop a flow regime map for convective boiling in microchannels and to propose flow pattern-based models to predict the corresponding heat transfer coefficients, a thorough understanding of the existing flow patterns and their transitions is necessary. In the present study, high-speed photography is employed to observe the flow patterns in flow boiling of a dielectric liquid, FC-77, in parallel silicon microchannels of depth 400  $\mu\text{m}$  and widths ranging from 100 to 5850  $\mu\text{m}$ . In each test, liquid mass flux and inlet subcooling are fixed at 250  $\text{kg/m}^2\text{s}$  and 5 $^\circ\text{C}$ , respectively, while the heat flux to the bottom of the heat sink is increased from zero to a value near the critical heat flux. Temperature and pressure are measured at several locations. A high-speed digital video camera is used to observe boiling patterns at frame rates ranging from 2000 to 24000 frames per second (fps). The images presented show a top view of the horizontal microchannels, at a location along the heat sink centerline and near the flow exit.