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## Manipulating Bubble Dynamics with Microstructures, Nanostructures and Manifold Covers for Unprecedented Enhancement in Boiling

### ABSTRACT:

Boiling is one of the most efficient heat transfer processes. Bubbles nucleating on the surface of a heated surface are enablers of the enhanced heat transfer through three distinct modes: liquid microcirculation and macro-circulation, solid-liquid-vapor contact line motion and thin film evaporation at the base of the bubble. Specific enhancement mechanisms are identified for each of the modes. Innovative enhancement techniques are developed based on these enhancement mechanisms. Experimental investigation and theoretical analysis of the enhanced structures have resulted in a record heat flux dissipation – upwards of  $420 \text{ W/cm}^2$  - at a wall superheat of less than 5 degrees C. The insight gained through careful study of bubble-liquid-solid interfaces and an innovative approach are extremely valuable in developing such enhancement strategies.



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### BIOGRAPHY:

Satish G. Kandlikar is a Distinguished Institute Professor and the Gleason Professor of Mechanical Engineering at Rochester Institute of Technology, where he is working since 1980. He received his Ph.D. degree from the IIT Bombay in 1975. He has worked extensively in the area of flow boiling, pool boiling, CHF phenomena at microscale, single-phase flow in microchannels, electronics cooling, water management in PEM fuel cells and breast cancer detection. He has published over 400 journal and conference papers. He is the recipient of the 2012 ASME Heat Transfer Memorial Award. His recent work on pool and flow boiling has provided a mechanistic understanding of the boiling phenomena at microscale and nanoscale produced enhancement structures dissipating exceptionally high heat fluxes along with very high heat transfer coefficients. He started the ASME International Conference on Nanochannels, Microchannels and Minichannels and has been its chair for ten years. He is also recipient of numerous awards, including 2008 Engineer of the Year Award, 1996 Eisenhart Outstanding Teaching Award and RIT Trustee's Scholarship Award among others.