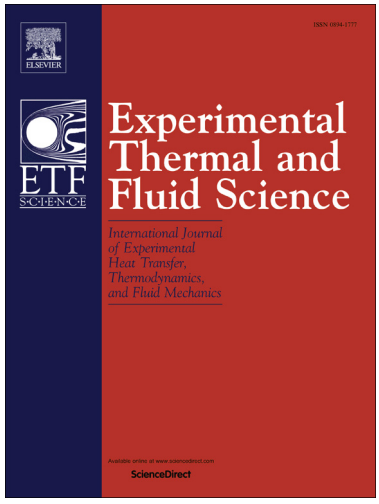

Effect of Heating Surface Morphology on Active Site Density in Subcooled Flow Nucleated Boiling

C. Paz, M. Conde, J. Porteiro, M. Concheiro

PII: S0894-1777(16)30319-3
DOI: http://dx.doi.org/10.1016/j.expthermflusci.2016.11.011
Reference: ETF 8933

To appear in: *Experimental Thermal and Fluid Science*

Received Date: 10 June 2016
Revised Date: 8 October 2016
Accepted Date: 12 November 2016

Please cite this article as: C. Paz, M. Conde, J. Porteiro, M. Concheiro, Effect of Heating Surface Morphology on Active Site Density in Subcooled Flow Nucleated Boiling, *Experimental Thermal and Fluid Science* (2016), doi: http://dx.doi.org/10.1016/j.expthermflusci.2016.11.011

Effect of Heating Surface Morphology on Active Site Density in Subcooled Flow Nucleated Boiling

C. Paz*, M. Conde, J. Porteiro, M. Concheiro

School of Industrial Engineering – University of Vigo, Lagoas-Marcosende, 36310-E (Spain)

(*) Corresponding author: cpaz@uvigo.es

Abstract

This paper presents a combination of experimental work and the data analysis used to develop a set of morphology-dependent correlations, in order to determine the active nucleation site density, in a heat flux partitioning model for subcooled flow boiling. Three copper parts with different surface finishes (fine sanding, electrical discharge machining and a combination of both) were tested under several experimental conditions: bulk temperature, 76.5–93.5 [°C]; absolute pressure, 110–190 [kPa]; mass flux, 96.9–871.8 [kg/s-m²]; and wall heat flux, 400–650 [W/m²]. Automatic high-speed video was processed using third-party image recognition libraries. Functional dependencies for the nucleation site density were presented for the tested range after data processing and analysis. The inclusion of additional morphological parameters was found to considerably reduce error when compared to values obtained with the best previously available correlations and models, in which the contact angle was the sole parameter for modelling the surface-fluid interaction.

Keywords

Subcooled flow boiling, heat flux partitioning, active nucleation site density, surface morphology, copper surface