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Critical heat flux enhancement of nanofluids and effect of nucleate pool boiling time on CHF using Alumina nanoparticles

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Nanofluids are nanometer sized suspended particles in water or other base fluids. They are used for their increased nucleate boiling critical heat flux (CHF) values far beyond compared to pure water or base fluid. Therefore pool boiling heat transfer tests are performed to understand increase in CHF. The pool boiling characteristics and critical heat flux enhancement using nanofluids of dilute dispersions of alumina and titania are studied. High heat transfer rates with high critical heat flux achieved with modest nanoparticle concentrations (<0.1% by volume). Change in surface structure of heater wire causes increase in CHF. Surface of the heater is covered with porous layer of nanoparticles during nucleate boiling. It is determined to investigate the effects of nucleate boiling time (coating time) during which the heater wire is exposed to deposition of nanoparticles.

The reported values for CHF can vary among researchers. Majority of reported values of CHF increase is between 50-150%, in this study CHF increases above 200% was observed. This study represents an important step in understanding the relationship between CHF and the optimum amount of nanoparticle deposition or amount of porous layer of nanoparticles formed on heater surface with respect to nucleate boiling (coating)/time dependency.

Biography

Mehmed Sitki Ulcay has completed his B.Sc. and M.Eng. degree at RPI in 2011. He is currently pursing Ph.D. at RPI in the same field. He has published another conference paper in heat transfer area, regarding piezoelectric fans and their performance in comparison with conventional fans and synthetic jets. Mr. Ulcay also has industrial experience with mainly GE GRC at Niskayuna, NY as a consultant and is part of two GE internal publications.

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