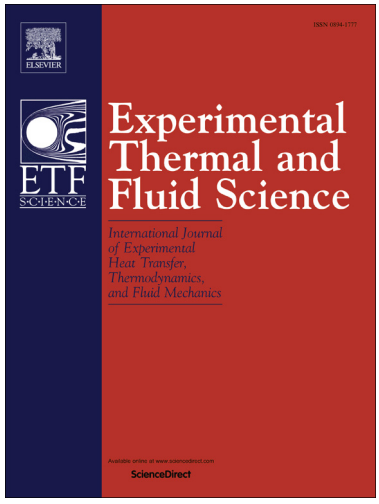

The Boiling Performance of ZnO, α-Al_2O_3 and MWCNTs/Water Nanofluids: An Experimental Study

Sina Nabati Shoghl, Masoud Bahrami, Mohammad Jamialahmadi

PII: S0894-1777(16)30205-9
DOI: http://dx.doi.org/10.1016/j.expthermflusci.2016.07.024
Reference: ETF 8838

To appear in: *Experimental Thermal and Fluid Science*

Received Date: 4 February 2016
Revised Date: 17 June 2016
Accepted Date: 30 July 2016

Please cite this article as: S. Nabati Shoghl, M. Bahrami, M. Jamialahmadi, The Boiling Performance of ZnO, α-Al_2O_3 and MWCNTs/Water Nanofluids: An Experimental Study, *Experimental Thermal and Fluid Science* (2016), doi: http://dx.doi.org/10.1016/j.expthermflusci.2016.07.024

The Boiling Performance of ZnO, α-Al_2O_3 and MWCNTs/Water Nanofluids: An Experimental Study

Sina Nabati Shoghl, Masoud Bahrami*, Mohammad Jamialahmadi

Petroleum University of Technology, P.O. Box 63431, Ahwaz, Iran

Abstract

In this study, a new method is presented for analyzing the boiling performance of three different water based nanofluids. Three types of boiling experiments are arranged and performed sequentially. First the boiling of pure water on a clean surface is performed and based on this data the Gorenflo correlation is found to be the most accurate correlation for subsequent steps. Then, the boiling behavior of each nanofluid is investigated to evaluate the overall effect of nanoparticle addition to water as a base fluid. Experiments show that the overall effect of ZnO and Al_2O_3 nanoparticles is the deterioration of heat transfer while the addition of CNTs results in improving heat transfer. Finally, boiling experiments for pure water on the surfaces coated by each nanoparticle are carried out to distinguish the roles of surface and fluid and the effect of surface change during nanofluid boiling was revealed. The third type of experiment reveals that ZnO and Al_2O_3 deteriorate the surface while the CNTs improve the surface roughness. The inherent effect of nanofluid which is attributed to the reference heat transfer coefficient, h_0, in Gorenflo correlation, is improved by ZnO and Al_2O_3 while deteriorated by CNTs at low concentrations (0.01 wt%).

Keywords: Boiling, nanofluid, Gorenflo correlation, heat transfer coefficient.

*Corresponding author, Email: m.bahrami@put.ac.ir