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An Experimental Study

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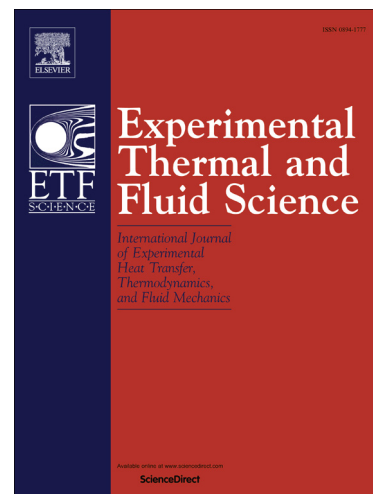
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The Boiling Performance of ZnO, α -Al₂O₃ and MWCNTs/Water

Nanofluids: An Experimental Study

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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 Al₂O₃ 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 Al₂O₃ 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 Al₂O₃ while deteriorated by CNTs at low concentrations (0.01 wt%).

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

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