Study on the thermal-hydraulics characteristics of a boiling two-phase natural circulation loop with nanofluids

Nayak, A.K., Garlia, M.R.
Reactor Engineering Division, Bhabha Atomic Research Centre, Trombay, Mumbai 400085, India

Abstract

In this paper, we present the steady state and stability behaviour of a boiling two-phase natural circulation loop with a small concentration of Al₂O₃ nanofluids. For this, experiments were conducted in a natural circulation loop at different operating powers, pressures, and water levels in the steam drum. The test results revealed that while the steady state natural circulation behaviour is similar, however, the buoyancy induced flow rates are found to be relatively higher with nanofluids than with water alone. In addition, with nanofluids, the amplitudes of the boiling induced Type I instabilities are found to be significantly reduced. However, the Type II instabilities are found to appear at relatively lower power with addition of nanofluids as compared to that with water alone. The most interesting result is that with addition of nanofluids, the amplitudes of Type II instabilities are found to get suppressed with increase in power similar to that of low quality Type I instability. © Carl Hanser Verlag.

Indexed Keywords

Engineering controlled terms: Concentration (process); Natural convection; Ozone water treatment; Phase stability; Power quality; Two phase flow; Water levels
Engineering uncontrolled terms: Induced flow rates; Low qualities; Nanofluids; Natural circulation loops; Natural circulations; Operating powers; Small concentrations; Steady states; Steam drums; Test results; Type II
Engineering main heading: Nanofluidics

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Nayak, A.K.; Reactor Engineering Division, Bhabha Atomic Research Centre, Trombay, Mumbai 400085, India; email: ananthb@barc.gov.in
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