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Enhancement of pool boiling heat transfer using innovative non-ionic surfactant on a wire heater

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Abstract

Saturated pool boiling of aqueous Nicotine (an innovative non-ionic surfactant) solutions, on a Nichrome wire heater was studied experimentally. Pool boiling experiments were started by boiling pure (distilled) water. After that, pure water was replaced by the aqueous surfactant solutions by 100, 500, 1000, 1500, 2000, 2500, 3000, 3500 and 4000 ppm on weight basis. The drop volume method was used to measure surface tension of aqueous solutions. The experiments of aqueous surfactant solutions were conducted under the same conditions of baseline (water) experiment. The boiling behaviour was studied by using high speed video technique. Pool boiling curves for various concentrations were obtained, and compared. Pool boiling performance was found to be enhanced significantly by the addition of Nicotine relative to pure water. An optimum level of enhancement was observed in solutions at 2500 ppm, which was critical micelle concentration (cmc) of the surfactant. No enhancement was observed in higher concentration solutions. It was observed that addition of Nicotine into pure water reduces its surface tension considerably which in turn enhances heat transfer.

Keywords: pool boiling heat transfer; surfactant; enhancement; nicotine

1. Introduction

Boiling has been found in a wide range of applications of heating, cooling and electric power generation. It is one of the major research topics because it involves transfer of large amount heat

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