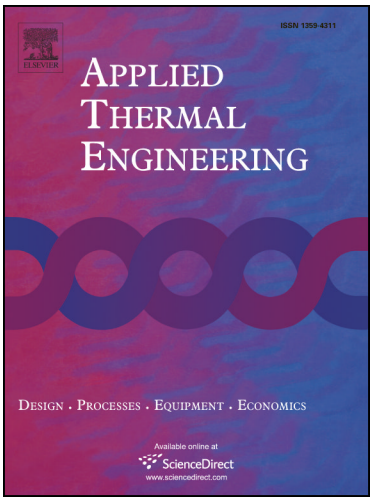

Pool Boiling Heat Transfer Enhancement by Twisted-Tape Fins

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Abstract

The boiling phenomena in a quiescent fluid is the nucleate pool boiling which has attracted much interest in the thermal management studies. This paper investigates the effect of the installed Twisted Tape Fins (TTFs) on the heat transfer from a surface with a temperature above the water saturation point to a coil condenser. Four different arrangements of TTFs (1, 3, 5, and 9 TTFs) are fabricated and their boiling performance in distilled water at atmospheric pressure is experimentally tested. It was observed that the increase in the boiling heat transfer coefficient of the plate with nine TTFs compared to that of the plain one is 15.5 %. Furthermore, the effect of TTFs heights on the heat transfer is studied. The obtained results showed that by increasing the TTF height the heat transfer is enhanced. The boiling heat transfer coefficient obtained for the case with the longest TTFs, shows an average improvement of approximately 23% in comparison to the plane case. The observations revealed that the TTFs exhibit two different enhancement mechanisms: (i) the near surface mechanism, and (ii) the far surface mechanism. In the first mechanism, the TTFs separate bubble-liquid pathways and hence reduce their interaction. In the far surface mechanism, the TTFs induce a more chaotic bubbly rising flow and as a result a better heat transfer is achieved.

Keywords: Pool-boiling, Heat transfer enhancement, Twisted-Tape, Fin, Boiling heat transfer coefficient