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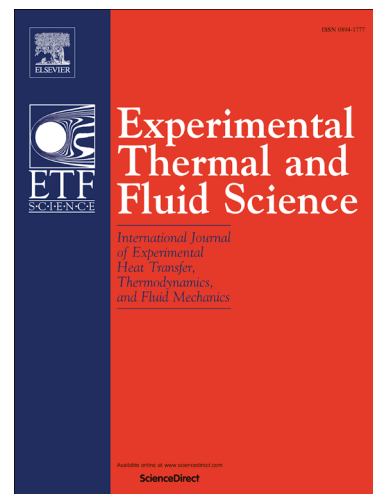
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Visualization of liquid distribution and dry-out in a single-channel heat pipes with different wettability

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Abstract

In this work, the dry-out conditions of two-phase heat transfer devices were investigated using copper modified V-shaped channels having different wettability properties, embedded in a semitransparent liquid cell. The wettability of copper surface was modified by alumina nanoparticle deposition, which, depending on the processing steps involved, is suitable to provide either hydrophilic or super-hydrophobic surfaces. Both these surface treatments have been performed and their effects investigated measuring the contact angles of ethanol, water and a water/butanol mixture having in a certain range of temperature an increase of surface tension with temperature (called self-rewetting fluid). The durability of the surface treatments has been investigated monitoring the contact angle in time. An optical diagnostic system allowed to visualize the distribution of liquids inside the channel. The power input of the dry-out phenomenon, i.e. the power when the liquid film dries, has been evaluated for the different investigated functionalized surfaces by means of flow visualization.

Keywords: Self Rewetting Fluids; Heat pipe; Two-phase flow; Superhydrophobic and hydrophilic copper surfaces.

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