

New Generation Functional Surfaces with Biocoatings for Boiling Heat Transfer and Anti-Freezing

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Abstract

Boiling, droplet condensation and freezing are basic phase change phenomena. Performance enhancements can be achieved with surface modification for these phase change phenomena. As a result, many surface modification techniques have been proposed and investigated in the literature. One of the most promising approaches include the use of biphilic surfaces, which have mixed wettability (hydrophobic-hydrophilic, superhydrophobic-hydrophobic etc.) along the surface. The optimization efforts for various biphilic surfaces in boiling, dropwise condensation and freezing could be made. With the optimum configurations of biphilic surfaces depending on the application and phase change phenomenon, it will then be possible to have significant energy saving and efficiency in thermal-fluids systems involving phase change. In this talk, research efforts and recent developments in this field will be discussed.

The second part of the talk will focus on an effective and practical method for surface enhancement of thermal fluid systems via next generation bio-coatings based on hyperthermophilic archaea and antifreeze proteins, which are durable, environmentally friendly, inexpensive, have unique structures and offer surface modification without the use of any cleanroom fabrication techniques. The results of fundamental studies on bio-coated surfaces will be presented for boiling, dropwise condensation and freezing.