IAF MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)
Fluid and Materials Sciences (2)

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EXPERIMENT OF FC-72 CONDENSATION HEAT TRANSFER ENHANCEMENT ON PIN-FIN SURFACES IN MICROGRAVITY

Abstract

FC-72 condensation heat transfer on elliptical pin-fin surfaces was experimented on the drop tower platform. The influence of pin-fin geometry, thermal conductivity, mass flow and gravitational force on FC-72 condensation heat transfer was investigated. Moreover, high speed camera was used to observe the condensate dynamic behaviors. Due to the low surface tension, a thin and uniform liquid film was formed on the cold surface. After the test chamber was released, conspicuous fluctuations occurred at the gas-liquid interface and condensate climbing upward along the wall was observed. The flow pattern in steam generator evolved from stratified flow to plug-annular flow, which greatly increased the contact area between liquid and the high-temperature copper tube, thereby improving the teat transfer efficiency of steam generator. Effect of microgravity on steam temperature was significant before the copper tube of steam generator and FC-72 fluid reached thermal equilibrium. For the unsteady state, the temperature rise of condensate substrate was obvious due to the higher steam temperature in microgravity. In contrast, microgravity had no impact on the steam temperature in quasi-steady and pulsating state. Short-term microgravity reduced the condensation heat transfer coefficient by 20