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MICROGRAVITY SCIENCES AND PROCESSES (A2)
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SURFACE TENSION EFFECTS ON MICROGRAVITY BOILING

Abstract

Pool boiling in microgravity presents many challenges due to the lack of gravity driving the bubble departure. This paper presents an instrument to test the effects of varying materials, and therefore the surface tension, in its contribution to heat transfer. Previous experiments by others show that in a microgravity environment, buoyancy is not a contributing factor in bubble departure. Surface tension drives this departure and affects the heat transfer. To better understand the effects of surface tension on boiling, a device has been designed to test multiple surface materials against a common fluid. The instrument allows for multiple samples to be tested using a common set of instrumentation.

The samples would be tested on orbit with critical measurements being fluid temperature, surface temperature, surface heat flux, fluid pressure and a supporting image of each test. The materials to be tested would be those commonly used for on orbit heat exchangers. Surface roughness comparisons of the same material can also be implemented. The fluid would be chosen based on that commonly used on orbit such as ammonia in the ISS. The instrument is being developed for a CubeSat platform. The platform has a total mass of 1kg and is sized to be a 10 cm cube. The test can be run quickly and packed in a very small instrument requiring a manageable amount of power and mass. The test for each material will be run individually and can be spaced an appropriate time apart for power and thermal management. The results of these tests will improve the understanding of the physics of boiling in microgravity.