MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)
Science Results from Ground Based Research (4)

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GROUND EXPERIMENTS ON A LIQUID BRIDGE FACILITY FOR TG-2 SPACE LABORATORY

Abstract

Thermocapillary convection has important application value in crystal growth and thin film science etc. Study on its instability can promote the understanding of nonlinear system, and chaos theory. The space experiment about a half floating zone thermocapillary convection in liquid bridge will be conducted in Chinese TG-2 space laboratory in 2015, We have already established a set of space experiment facility which includes liquid bridge controlling system, temperature measurement system, and experiment data processing system etc.

In order to inspect its function, the experiments on the ground have been done by the facility. The column diameter of the liquid bridge is 20mm and 2cSt silicone oil is used. We observed the onset of oscillation in the liquid bridge with smaller aspect ratio (A=l/d) and different volume ratio, analyzed the transition of temperature oscillation frequency and phase, discussed the problems of hydrothermal waves. Due to gravity we just constructed bridge with 3mm-4.25mm height. With the help of five azimuthal thermocouples inserted in the bridge interior, we observe the phase relationship of the five temperatures, and discovered that with the increase of temperature difference, the frequency approximately increases linearly, oscillation phase of each temperature oscillation curve continuously changes. And liquid bridges with different aspect ratio and different volume ratio have different flow mode. Bridges with different aspect ratio have different ways to chaos.