

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

Author: Ms. Li Zhang
China, zhangli2168811@163.com

Prof. Li DUAN
National Microgravity Laboratory, Institute of Mechanics, Chinese Academy of Sciences., China,
duanli@imech.ac.cn

Prof. Qi KANG
National Microgravity Laboratory, Institute of Mechanics, Chinese Academy of Sciences., China,
kq@imech.ac.cn

EXPERIMENTAL STUDY ON SURFACE TEMPERATURE OSCILLATION MODES FOR THIN
FLUID LAYERS IN AN OPEN ANNULAR POOL**Abstract**

A sensitivity of 0.05 infrared camera is used in our work to capture the surface temperature oscillation of thin fluid layers ($Pr=16,25,28$) in an open annular pool which is heated from inside. Seven kinds of azimuthal oscillatory modes are observed as well as a hydrothermal wave mode. The azimuthal wave number $m=0$ oscillation mode (referred to as $m=0$) is basically found as the first transition state under various conditions and its critical temperature differences raise gradually with Pr number for the test fluid. When the temperature difference increase, $m=0,6,7$ act as the dominant oscillation modes for 1.5cSt and 2cSt silicone oil while modes change frequently for 1cSt silicone oil. Further analysis show for 1cSt silicone oil, when $Bo > 0.3$, oscillatory flow will occur but when $Bo < 0.25$, that will be hydrothermal wave. Additionally, if $3500 < Ma < 10000$, there will be much more possibility for $m=6$ to show up.