

MICROGRAVITY SCIENCES AND PROCESSES (A2)
Microgravity Sciences onboard the International Space Station and Beyond (6)

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THE EFFECTS OF VARIOUS ASPECT RATIOS ON CRITICAL MARANGONI NUMBER WITH
HIGH PRANDTL FLUIDS AND ITS THEORETICAL ANALYSIS

Abstract

Many experiments to determine the critical Marangoni number at the onset of oscillatory flows for high Prandtl number (Pr) fluids have showed dependence of the diameter of the liquid column, although the aspect ratio of the column is the same. This fact contradicts the similarity principle in fluid physics. The Marangoni experiments have been being done to make clear what is Marangoni transition behavior by using Silicone oil with 50mm diam. by different lengths from aspect ratio(Liquid length/Diam.) of 0.1 to 1.25 of liquid bridges. The experiments has tried to define Critical Marangoni number from laminar to Oscillatory flow by decreasing temperature as steps with 0.5 to 1 K holding time of almost 60 min this method of which is to get stable condition. The experimental started on the end of January 2011 and schedules more than 30 times experiments until May. The experiments always have done during the crews sleeping. Because many and dangerous G-jitter sometimes happens by crews activities. The following results already obtained so far. The experiments have measures the effects of aspect ratio of liquid bridge on non-dimensional frequency and Critical Marangoni number from laminar to oscillatory flow. The Prandtl number used in this experiments is 68, which is the as previous JAXA experiments, MEIS1 and 2. This experiments is also one of experiments of JAXA Marangoni research project, the purpose of which is to make clear Marangoni behavior with higher Prandtl number liquid. The results that can conclude at present are as follows:

1) The results on Non-dimensional frequency vs Aspect ratio were almost the same as previous MEIS2 with 30mm diam. experiments. 2) The critical Marangoni number vs aspect ration curves shows as follows; Firstly, critical Marangoni numbers decreases with increasing aspect ratio until 0.4 aspect ratio, and after that increases with increasing aspect ration having maximum value at around 1.2 aspect ratio.