MICROGRAVITY SCIENCES AND PROCESSES (A2)
Microgravity Experiments from Sub-orbital to Orbital Platforms (3)

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

Dr. Rui HOU
National Microgravity Laboratory, Institute of Mechanics, Chinese Academy of Sciences., China, hourui@imech.ac.cn
Prof. Li DUAN
National Microgravity Laboratory, Institute of Mechanics, Chinese Academy of Sciences., China, duanli@imech.ac.cn
Dr. Liang HU
Institute of Mechanics, Chinese Academy of Sciences, China, hl@imech.ac.cn

EFFECT OF ROUNDED INTERIOR CORNER ON CAPILLARY FLOW

Abstract

In many instances, the interior corners are not ideally sharp but rather possess a degree of roundedness because of the design or fabrication. In this work, the problem of capillary flows along rounded interior corners is revisited experimentally. Capillary rise experiments reported here are conducted by 3.5s drop tower facility which provides low-g environment of 10-5g. The test cells with different corners radius R in a right-angle part are designed. Besides, in order to study the impact of the fluid physical properties, a lot of liquids are used in the tests, i.e. KF96-5 Silicone Oil, KF96-10, KF96-50 and Fluorinert liquid FC-70. The four test cells are installed simultaneously in a drop tower capsule. A series of microgravity tests are performed using partially-filled pentagonal containers, which are made of PMMA. The advancing meniscus tip location of the fluid in the corner is measured from the video records. Prior to release of the apparatus into free fall, a certain amount of test fluid is injected into the cells. Upon release, capillary driven flows along interior corner. The flow process is recorded with two CCD cameras at 25 fps. Quantitative data of meniscus tip location are digitized directly from the video and then analyzed using image software. It is found that the meniscus tip location and flow rate is a function of containers' geometry and fluid properties through the analysis and the comparison of the raw data for the different corners' tip location This work is valuable to better understand the capillary flow and also can provide scientific guidance for the design and analysis of space fluid management systems.