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PREPARATION OF SPACE EXPERIMENTAL STUDIES ON DROPLET EVAPORATION ONBOARD
CHINESE SCIENTIFIC SATELLITE

Abstract

The space experimental investigation of the drop evaporation process will be conducted onboard the Chinese Scientific Satellite SJ10 to be launched in the end of 2015. The EFILE (Evaporation and Fluid Interfacial Effects) experiment is selected as the first fluid physics experiment of SJ10 satellite (SJ-10-A1-1) and it is also a China-French joint project of IMPHACT in cooperation of the Chinese Science Academy (CAS) and the Centre National d'Etudes Spatiales (CNES). The EFILE experiment will be emphasized to study the thermocapillary effect at the liquid-gas phase changed interface on the evaporation in space environment. By injection of a liquid droplet on the heating substrate, two kinds of sessile drop evaporation processes are planned to investigate during the experimental runs: (i) a free evaporation of an injected drop while the drop shape and its contact angle along the triple line changes or contact line moves; (ii) an evaporation of a sessile drop with a constant volume controlled by feedback system while the shape and contact angle of the drop do not vary as expected. The space facility consists mainly of the high resolution CCD camera, an infrared camera, thermal image processing unit and liquid injection servo system. The preparation of the EFILE experiment including theoretical analysis and experimental technology of droplet evaporation process has been performed both on the ground and in the short-duration microgravity condition. The formation of sessile drop on the heat substrate injected automatically before and during microgravity are observed in comparison in Beijing drop tower and CNES parabolic flights, and the optical visualization system of CCD and Infra camera are tested. The space experimental model developed in phase B and preliminary results of drop evaporation of different liquids as candidates for the space experiment will be presented in present paper.