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STEPS TOWARDS THE DEVELOPMENT OF A PAYLOAD DEDICATED TO THE STUDY OF THE
EVAPORATION OF A SESSILE DROP

Abstract

Heat transfer during the process of evaporation is much important than that obtained with traditional techniques without phase change. On the other hand, heat and mass transfer take place in the vicinity or along the fluid interfaces and their optimization is often an essential objective.

The experiments in a space flight should allow to isolate and better highlight the role of the Marangoni effect, the contact angle along the triple line, the curvature of the interfaces, the physical parameters such as viscosity, various interface instabilities and the overall effect of gravity on heat and mass transfer.

Here are the goals of the IMPACT experiment, which has been selected within the framework of the China- France Space Cooperation Committee to be conducted onboard a Chinese automatic satellite.

The instrument will basically consist in creating drops by the mean of a syringe injecting a liquid through the substrate. The evaporation of the drop will then be observed using a video camera (seeing the drop from the side in order to record geometric parameters like the size and contact angle) and an infrared camera (seeing the drop from the top in order to detect thermal motions inside the drop). A heat fluxmeter, integrated just below the evaporation surface, will allow to measure the drop evaporation dynamics.

In order to validate the feasibility, and to identify the best parameters to be used on the definitive instrument (evaporation surface material, kind of liquid, drop volume, temperatures), a preliminary model to be flown in the spring 2012 CNES parabolic flight campaign has been developed.

The paper will show what has been done during the first phases of the project and will specifically emphasise the development of the model dedicated to the parabolic flights.

The results from the parabolic flight campaign will also be presented.