MICROGRAVITY SCIENCES AND PROCESSES (A2)
Facilities and Operations of Microgravity Experiments (5)

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DECLIC FIRST RESULTS ON ORBIT

Abstract

1. Introduction

DECLIC is a multi-user facility to investigate critical fluids behavior and directional solidification of transparent alloys. As part of a joint NASA/CNES research program, the DECLIC facility was launched with 17-A shuttle flight (August 2009) and is being operated in an EXPRESS RACK onboard ISS.

2. The DECLIC inserts

Three inserts have been developed.

ALI insert is dedicated to the study of SF6 as a near-ambient temperature critical fluid. It is made of two cells, one dedicated to direct observation, the other one dedicated to interferometry observation.

HTI insert is dedicated to the study of pure water as a critical fluid.

DSI insert is dedicated to the study of the solidification of transparent alloys (succinonitrile based), analog of metallic ones.

3. The operations concept

The main instrument monitoring is made from the CADMOS center of CNES (France). NASA's TReK tool was chosen in order to send commands and receive telemetry. Received real time data is then forwarded to an archiving system and to a web-server so that the scientists can look after their experiments from their own laboratory. In order to cope with communications limitations onboard the ISS, images storage on DECLIC removable hard-disks to be returned to ground is foreseen.

4. Supercritical water first results

After two experimental sequences with the HTI insert, the first results already are available, like a first approach of the water critical temperature, for the first time in microgravity. But, as we have had to face an unexpected radial gradient over the cell, which origin is not yet well defined, other sequences will be needed, first to fix this issue, then to perform complementary scientific tests.

5. Directional Solidification first results

To this day, only the commissioning has been performed with the DSI insert. By the way, it allowed the scientists to confirm the very good behavior of the instrument with outstanding optical quality of the taken images.

6. Program status

Experimental sequences with the DSI and HTI inserts are in progress while the ALI insert will be launched in April 2010. The HTI insert is to be returned to the ground with the shuttle and refurbished in order to put salted water into it, and will be launched again as soon as possible.

When the IAC takes place, extended DSI and HTI results and first ALI results should be available.