

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

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IVIDIL EXPERIMENT ON THE ISS

Abstract

ESA's SODI multi-user facility (Selectable Optical Diagnostics Instrument) was installed inside the The Microgravity Science Glovebox (MSG) on the 23rd of September 2009. SODI was developed as a multi purpose Facility for conducting initially three experiments: IVDIL, DSC and Colloid. Hardware development was provided by Verhaert Space NV (Kruibeke, Belgium) and optical development was provided by Lambda-X (Nivelles, Belgium). The first in the sequence, the experiment IVIDIL (Influence of Vibration on Diffusion in Liquids) started on the 5th October 2009. In total 55 experimental runs (41 original runs and 14 re-runs) were successfully completed by January 20, 2010. Each original run lasted 18 hours and all of them were controlled via telepresence provided by the Spanish User Support Center (E-USOC, Madrid).

Scientific and applied interests are aimed at a detailed knowledge and a quantitative theoretical description of the influence of vibration on diffusion related phenomena.

The objective of the experiment is three-fold: (1) To perform precise measurements of diffusion and thermodiffusion coefficients for binary mixtures with positive and negative Soret coefficient. (2) To identify the limit level of vibrations from the International Space Station below which g-jitter does not play a role for the diffusion controlled experiment. (3) To investigate vibration-induced convection and, particularly, the heat and mass transfer under controlled vibrations.

Each experimental run is performed in two steps. During the first step (duration of 12 hours) a concentration gradient is established by imposing a temperature gradient across the experimental cell to a uniform mixture. Due to the Soret effect, the concentration profile is slowly generated in initially homogeneous binary mixture. After 12h the temperature gradient is removed and diffusion occurs during 6 hours. The vibrations of different amplitude and frequency are applied during these 18 hours. The level of onboard g-jitters was recorded by SAMS and decoded by science team.