

MICROGRAVITY SCIENCES AND PROCESSES (A2)
Microgravity Processes onboard Large Space Platforms (7)

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THE LIGHT SCATTERING UNIT FOR THE ICAPS-IPE FACILITY ON BOARD THE ISS

Abstract

Simulating the agglomeration of dust particles under long duration microgravity conditions, while monitoring the light scattering properties of the aggregates, leads to better insights on the formation of planetesimals in the young solar system and stellar systems. Up to now, such properties have mostly been estimated through very short duration microgravity experiments (in, e.g., drop towers) and through observations of the very evolved remnants of pristine aggregates (e.g., dust particles in comets, primitive asteroids and zodiacal cloud).

Such simulations are the main objective of Interactions in Cosmic and Atmospheric Particle System (ICAPS), a multi-users facility proposed to ESA for the International Space Station. In 2010, the phase B for the ICAPS Precursor Experiment (IPE), which includes the Light Scattering Unit (LSU), has been completed. The LSU is both a diagnostic tool for ICAPS-IPE, and an experiment that will allow the interpretation of available observations of dust scattered by solar and stellar light in terms of physical properties of the scattering media.

The preliminary experimental LSU setup, which had been validated through the ESA MASER-8 rocket flight, has been updated and improved for IPE. It will allow measurements of the light scattered, consecutively by at least twenty samples of particles of different shapes, sizes and compositions, while they aggregate under Brownian motion and van der Waals forces. More specifically, the intensity and polarization of the scattered light will be measured over 24 phase angles and three wavelengths, and the whole Stokes vector will be derived near 90 degrees phase angle. The experimental results should contribute to a better understanding of the formation and evolution of comets and asteroids, and of the properties of their refractory components.