

MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)
Microgravity Experiments from Sub-Orbital to Orbital Platforms (3)

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NUMERICAL SIMULATIONS IN PREPARATION OF A LOW GRAVITY EXPERIMENT ONBOARD
REXUS 16: CHEMICAL WAVE IN SORLET EFFECT (CWIS)

Abstract

The purpose of the CWIS experiment is to visualize the chemical wave due to thermodiffusion in a liquid binary mixture. The chemical wave is represented by a strong concentration gradient given by thermodiffusion at the beginning of the process. The milligravity condition will allow to clearly see the effect in the mixture composed by water and ethylene glycol. This effect cannot be visualized on ground since it is masked by buoyancy. The concentration of each component of the mixture will be measured using a Mach Zehnder interferometer.

The very beginning of the phenomenon has never been observed experimentally, but S. Van Vaerenbergh and J. C. Legros in 1990 gave an analytical demonstration of the enhancing of the process at the boundaries during its initial phase.

The experiment will be performed during the REXUS 16 campaign in Kiruna (Sweden) in March 2014.

This paper shows the results of the numerical design process of the experiment. In order to clearly see what happens at the beginning of the process we should set the velocity of the image acquisition system according to the velocity of the process. Since the components of the mixture are fixed (and also their initial concentration) the main parameters that are affecting the velocity of the Soret effect are the intensity of the temperature gradient and the dimension of the liquid volume along the gradient direction. A large campaign of numerical simulations allowed to determine those values, in order to clearly see the variation of concentration due to thermodiffusion.