Paper ID: 55161
oral

IAF MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)
Science Results from Ground Based Research (4)

Author: Prof. Stefan Van Vaerenbergh
Université Libre de Bruxelles, Belgium

PREPARATION OF THE DCMIX4 EXPERIMENT - MEASUREMENT OF THE DIFFUSION COEFFICIENTS OF THE TERNARY SYSTEMS WITH C60 FULLERENE WITH THE OPEN ENDED CAPILLARY AND NMR

Abstract

The DCMIX research program aims investigating the diffusive properties of ternary liquid mixtures under microgravity conditions. A series of experimental campaigns are conducted aboard the International Space Station. During DCMIX4, systems containing C60 Fullerene in Tetralin-Toluene have been investigated. In parallel with the ISS experiments, ground measurements of the Soret and diffusion coefficients are being performed.

The Open Ended Capillary (OEC) is a well kwon technique for the experimental determination of molecular diffusion coefficients. Provided a suitable concentration analysis technique is available, the OEC can be used to investigate multicomponent diffusion, as proposed in [1]. The entire matrix of diffusion coefficients is estimated by fitting the temporal evolution of the composition, as detailed in [2]. However, the complexity of the multicomponent mass transfers can limit the precision on the obtained coefficients. The experimental plan can be adapted and the use of several experimental runs with different initial conditions [3] sometimes allows obtaining the cross diffusion coefficient with accuracy.

In the present paper, we report the experimental investigation of a ternary system of 1,2,3,4-Tetrahydronaphtalene, Toluene and C60 Fullerene at 25C. A series of experimental runs were performed in order to obtain the full diffusion matrix. Concentration measurements were obtained by 1H and 13C NMR, using an experimental protocol similar to the one used in [2]. We describe the experimental set-up and methodology, we report experimental data and we discuss the accuracy of the fitting of the cross diffusion coefficients.