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SORET, DIFFUSION AND THERMODIFFUSION COEFFICIENTS OF THE TERNARY SYSTEMS
1,2,3,4-TETRAHYDRONAPHTALENE, ISOBUTYL BENZENE, N-DODECANE MEASURED IN THE
DCMIX1 EXPERIMENT

Abstract

The DCMIX1 experiment was performed on the International Space Station to obtain the Soret and molecular diffusion coefficients for a series of ternary systems of 1,2,3,4-Tetrahydronaphtalene, Isobutylbenzene and n-Dodecane. In this paper, we describe the experimental hardware and protocols, we detail the data processing methodology and we report the transport coefficients for all binary and ternary systems and we discuss the obtained coefficients in comparison with literature data.

A fundamental step in the further developments of comprehensive modeling of the diffusive processes in liquids is based on the possibility of obtaining reliable and accurate experimental data of the diffusion and thermodiffusion coefficients in multicomponent systems. In the DCMIX1 (Diffusion Coefficients in MIXtures) experiment [1], an interferometric technique was implemented aboard the International Space Station to obtain accurate experimental observations of those coefficients for five ternary and one binary liquid systems, composed of 1,2,3,4-Tetrahydronaphtalene, Isobutylbenzene and n-Dodecane. During the DCMIX1 campaign, for each system, several experimental runs were performed, in order to evaluate the reproducibility of the technique. In the present paper, we provide a detailed description of the experimental set up and protocols, we report the measured temperature and interferometric data, we describe the methodology developed in the processing of the interferometric data, we explain the mathematical procedure implemented to retrieve the Soret and coefficients and the full matrix of ternary diffusion coefficients. The thermodiffusion coefficients are also reported. The obtained coefficients are compared with data available in literature [2 to 5]. For the diffusion coefficients, the comparison is also performed for the eigenvalues of the diffusion matrix.

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