MICROGRAVITY SCIENCES AND PROCESSES (A2)
Fluid and Materials Sciences (2)

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THERMODIFFUSION IN THE SYSTEM PARTLY FILLED WITH POROUS MEDIA

Abstract

Diffusion is a molecular transport of mass in mixtures, which occurs in the presence of a concentration gradient and tends to eliminate concentration variations. Mass transport of species caused by thermal gradient is known as thermodiffusion, or the Soret effect. Here, the term "species" may refer to molecules, polymers, or small particles (colloids). There are many important processes in nature and technology, where these phenomena play a crucial role and knowing the transport coefficients is a necessity. Although several theoretical approaches have been presented in the literature there is no unambiguous theory for thermal diffusion in liquids. Thus, advanced experimental techniques and accurate data on both diffusion and Soret coefficients are of great importance for further theoretical development and applications.

There are at least two reasons to study thermodiffusion in porous media. First, for measurements of the Soret coefficient it is necessary to use thermal gradients in gravity field which leads to undesirable convection. The porous media can essentially damp the convective flows. Second, in oil reservoirs the hydrocarbons trapped in porous media are subjected to the geothermal gradient and, correspondingly, to the Soret effect. In this respect more studies should be done to clarify the question: whether the Soret and diffusion coefficients are the same in porous media and in the fluid, which saturates the porous matter.

In realistic systems the porous medium is often in contact with layers of liquid. Presence of local flow in the liquid can drastically affect the transport of heat and mass through the porous medium. We investigate the convective heat and mass transfer in the multi-domain system: liquid - saturated porous media - liquid. This kind of system is considered as one of candidates for development of an instrument to measure transport coefficients on the ground.