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MULTIPHASE MEDIA IN OSCILLATING MICROFORCE FIELD

Abstract

Multiphase media under microgravity conditions have not been properly investigated yet. However constantly growing space explorations and industrialization of space, what is possible in the nearest time, make the mentioned problem extremely important at the moment. Multiphase media are wide spread in usual terrestrial conditions, however they are relatively seldom in space technologies because there is not effective tools for control of them in microgravity conditions. Thus, multiphase media under microgravity conditions can be rather considered as negative phenomena in the correspondent space technology. To avoid possible difficulties caused by the considered phenomena, it is necessary to investigate it and to develop proper mathematical models and computational tools. The object of the present investigation is multiphase media in a field of small body forces, which are changeable in time by absolute value and force direction, in particular, the case of oscillating microforce will be considered. The considered changes of body forces can have periodical or non-periodical modes. Let us assume that the absolute values of the body forces are so small that the correspondent fluid flows, caused by motions of disperse objected, can be described by Stokes flow model. Then, non-periodical modes of force changes under generally arbitrary initial positions of particles require direct calculations, for example by boundary element method; however correspondent analysis is rather far from aims of the present investigation. Periodically oscillating body forces are considered here. It is shown, that the oscillating force field does not lead to periodical motions of particles. This paradox result is obtained by numerical simulation of multiphase system evolutions. It can be explained by hydrodynamic interaction between individual objects of disperse phase. As a result, it is proved by numerical experiments that motions of multiphase media in microgravity conditions are always irreversible (the case of non-periodical force field evidently belongs to irreversible phenomena). This result is quite interesting from the point of view of complex hydrodynamic system evolution.