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Abstract

Two-phase flows under microgravity conditions play a crucial role in Space technology and science. Studying the behavior of dispersed droplets suspended in a gas flow and their influence on the characteristics of the carrier flow is the main task of computational modeling of turbulent two-phase flows. To understand the features and predict the behavior of such flows, along with experimental studies, it is necessary to develop mathematical models, which adequately describe all the basic physical and chemical processes in a gas-droplet environment at different scales. In this paper we obtain solutions for the problem of two droplets collision, using solutions for cumulative jets, and propose droplet collision outcome criterion. This research will focus on the process of two interacting droplets coalescence into one and coalescence with subsequent separation into two or more droplets. A semi-analytical method has been developed for application of the solution of the cumulative jet problem to the problem of droplet collision. A differential equation has been obtained that describes the following possible outcomes of droplet collision: coalescence and coalescence with subsequent separation. A criterion for determining the outcome of on-head droplet collision has been obtained. In accordance with the developed criterion, the number and size of formed droplets are obtained. A good coincidence of the developed criterion, experimental data and calculation results was obtained. Russian Science Foundation is acknowledged for support Project 23-71-10024.