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IGNITION OF FUEL SPRAYS BY SHOCK WAVE NUMERICAL SIMULATION

Abstract

The paper presents the results of developing of physical and mathematical model making it possible to take into account the effect of droplets non-uniformity in space and size distribution on ignition conditions for fuel sprays. The influence of condensed phase volume fraction on ignition and combustion of sprays was studied, physical and mathematical models for multi-phase flows, mixture formation and combustion of liquid fuels based on solving Navier-Stokes equations for gas phase accounting for thermal and mechanical interaction with poly-dispersed droplets array. The problems of particulate phase dynamics are regarded accounting for the interaction with gas phase atomization, evaporation and combustion. It was shown that depending on droplet size distribution and aerosol cloud density different flow scenario were possible. Several ignition zones could be formed behind incident shock wave depending on mixture properties and initiation parameters. The possibility of numerical simulation permitting variation of definite parameters only made it possible to explain this fact. The authors wish to acknowledge the support by Russian Foundation for Basic Research (Grants 12-08-00804 and 13-07-00067).