Numerical modeling of combustion and electrization processes in a solid-fueled ramjet afterburning chamber

Yagodnikov D A, Shukhov A V, Bernikov V V and Papyrin P V[@]

Bauman Moscow State Technical University, 2nd Baumanskaya Street 5, Moscow 105005, Russia

[@] papyrin_pv@bmstu.ru

A numerical model of internal processes in a solid-fuel ramjet combustion chamber was developed. The model takes into account two way interaction between fluid and condensed phase (particles of aluminum diboride, AlB_2) during stages of ignition and combustion. The electrophysical effects caused by chemical ionization of gas and the charging of dispersed phase were considered. The temperature and velocity fields of the high-speed two-phase flow in the ramjet afterburning chamber were determined in dependence of the particle size of the condensed phase, the air-to-fuel ratio and the initial parameters of the air flow. The electrical charges of moving condensed phase particles were calculated based on a thermionic emission model. The verification of the suggested model was performed, which showed the reliability of the obtained data and an acceptable level of accuracy. This work was supported by the Ministry of Science and Higher Education of the Russian Federation (project No. 0705-2020-0044).