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MODELING OF COMBUSTION OF SOLID FUEL IN HYBRID ENGINE SYSTEMS

Abstract

In this work the modeling the processes of unsteady combustion occurring in the combustion chamber of a hybrid solid-fuel engine in a three-dimensional statement were produced. In this formulation the combustion of solid fuel in a flow of gaseous oxidizer was considered. Two types of solid fuel the HTPB (Hydroxyl-terminated polybutadiene) and PMMA (Polymethyl methacrylate) were used. The work of the developed by the authors software for this simulation was verified by comparison with the data of physical experiments for similar problems. Based on this validation the used kinetic mechanisms of fuel combustion were corrected. For HTPB is the kinetic of combustion of 1,3-butadiene and for PMMA is kinetic mechanism of methyl methacrylate which enter in combustion chamber from surface of correspond solid fuel in result of decomposition of the last one. This mechanics was configured by comparing with analytical solution of the problem of evaporation of fuel from the surface of the burning material within the frame of the boundary layer approximation and diffusion flame. Different configurations of the solid fuel and its influence on the occurring in the chamber processes were considered. The distributions of the value of parameters in the combustion chamber were established. The unsteady nature of the combustion processes was testified.

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