Parametric study of condensed phase particles interaction with a high-enthalpy air flow in a co-current combustion chamber

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The article considers mathematical modeling working process problems in perspective energy-power plants for intra-atmospheric aircraft using fuel based on high-metallized energy-intensive compositions (VEK). The mathematical model developed and realized in the specialized module allows us to adapt the software package ANSYS Fluent for simulating a two-phase gas-dynamic flow taking into account the condensed BEC particles combustion in a high-enthalpy air stream. The article gives the parametric calculations, which result in obtaining some regularity in the particles combustion completeness coefficient and its changing dependence on the ratio of components, two-phase mixing conditions, and empirical constants in the combustion law. The article considers the cases of particle feeding both from the combustion chamber wall and along the flow axis. The obtained data can be used to refine the condensed particles combustion empirical laws, to predict the physical and chemical processes completeness in real chambers and to develop recommendations for improving the work process efficiency in advanced power-generating plants.

Keywords*: mathematical modeling, condensed fuel particles, air flow, mixture formation scheme, empirical combustion law*

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