Defining the kinetic constants of heterogeneous carbon oxidation under the sublimational condition of its ablation according to the results of the combined ablative experiments

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Nowadays carbon-based materials are widely used in the ablating shell structures applied in the rocket and space equipment. In this regard, the analysis of their thermochemical destruction, including the destruction under high-temperature exposure (sublimational condition), is essential. It is very expensive and in many cases impossible to conduct full-scale experiments in order to obtain the data concerning the behaviour of the material in the particular conditions. The bench scale testing resulting in the relocation to the full-scale conditions is an alternative way of studying the mechanism of the carbon-based materials destruction. We introduce a full-scale ablation experiments framework for the dense of carbon material. The article describes a theoretically-calculated model of the carbon ablation determined by the process of the material heterogeneous oxidation under sublimational condition. We present a strategy for defining the kinetic constants comprised into the accepted ablation model and an example of solving the optimization problem of defining the kinetic constants of the carbon heterogeneous oxidation. The proposed strategy allows determining the characteristics of carbon destruction due to its heterogeneous oxidation under sublimational condition that can be used for forecasting the burn of the rocket and space equipment thermal-protective coating when it is exploited in the presence of oxygen under the impact of high temperatures.

Keywords: *carbon, ablation, oxidation, kinetic constants, Arrhenius law*

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