THE SOLUTION OF THE INVERSE COEFFICIENT PROBLEM FOR THE SEARCH FOR REFLECTIVE-RADIATIVE CHARACTERISTICS BY TIKHONOV'S REGULARIZATION METHOD

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When carrying out a thermophysical experiment, it is difficult to determine the various characteristics of the material at any point in space, it is necessary to install a huge number of thermocouples, accurately know the error of the measured equipment, the method of modeling the temperature field, etc.The aim of this paper is to create a stable algorithm for determining the radiative-reflective characteristics in the region under consideration using the Tikhonov regularizing algorithm [1].

The first stage of the study is to determine the theoretical fields by the method of finite elements, where the step in space is chosen in such a way that the experimental and theoretical temperatures are in one node.

The second stage is the assignment of basis functions to time and coordinates, thus allowing calculation with respect to some constant value of the flow. The third step is the formulation of the residual functional between the theoretical and calculated temperature values. The minimum of the functional is equated to the zero vector and the system of linear algebraic equations, from which the constant values of effective flows on the boundary are found, the required heat fluxes are added to the corresponding basis functions.

The fourth step is to determine the effective degree of blackness and the diffuse reflectance of the material, solving the classical Stefan-Boltzmann equation for a gray body.

Thus, the dependences of the temperature nonstationary field on the degree of blackness[2] and the coefficient of diffuse reflection of the material in diffuse high-intensity radiant heating, the sensitivity coefficients on the characteristics of space are constructed.

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1. Tikhonov AN, Goncharovsky AV Numerical methods for solving ill-posed problems. Ed. M. 2012.
2. AG Bloch, Yu.A. Zhuravlev, LN Ryzhov. Heat exchange by radiation. Ed. Moscow: Energoatomizdat. 1991.