We give an analysis of the results of complex determination of the thermophysical characteristics of isotropic and anisotropic materials, their junctions and coatings, and the thermoelastic characteristics of isotropic materials.

An important area application of exact solutions of three-dimensional and two-dimensional nonstationary problems of thermal conduction and quasistatic problems of thermomechanics is that of experimental thermomechanics directed toward the study of the thermomechanical characteristics of matter. Computational formulas for determining the complex of thermophysical characteristics of materials that follow from these solutions represent real experimental conditions [5]. The monographs [2, 5] open a cycle of studies in the area of inverse coefficient problems of thermophysics. A half-space to whose boundary surface heat is applied through a thin planar disk, a thin planar annulus, and two thin parallel strips is studied. Here the mathematical statement of the problem reduces to a system of two differential equations in the first kind of heating, and to a system of three differential equations in the second and third cases, since the region of the half-space decomposes into subregions that correspond to the region of heating and its exterior. In this situation the integral transforms of Fourier, Hankel, and Laplace are applied to obtain the solutions. The solution of the inverse coefficient problem of heat conduction for an isotropic half-space heated by a source of square shape was obtained in [9]. Conditions for uniqueness in the method of solving the coefficient inverse problem of heat conduction are stated in [1]. Linear heat conduction problems are considered for an isotropic half-space with discontinuous boundary conditions of second order applied to find the complex of thermophysical characteristics of isotropic materials. When this is being done, finding all the thermophysical characteristics from a single experiment does not require inserting probes into the interior of an isotropic body, i.e., carrying out complex measurements of the respective thermophysical quantities by methods of nondestructive control. Methods of nondestructive control will be called inaccessible in the cases when the heat flux is given over the region (strip, disk, square, rectangle) of the bounding surface at whose center the excess temperature is measured. But if the heat flux is given over an annular region or a region of a square or rectangular frame, and the excess temperature is measured at the center (outside the region of heating), methods of nondestructive control become accessible. The author and others [11, 17], applying elements of the theory of generalized functions and integral transforms, have proposed very simple expressions for the excess temperature at the center of an annular or rectangular-frame heater, and on the basis of that expression determined the complex of thermophysical characteristics of isotropic bodies by an accessible method of nondestructive control. Considering the practical applications of the solutions obtained in this way, it is important to note that these solutions are simple expressions in which the explicit dependence of temperature on the whole complex of thermophysical characteristics of isotropic bodies appears. This makes it possible to carry out the method of nondestructive control in studies of the thermophysical characteristics of materials. When this is done there is no need to partition the region into several subregions and apply the method of coupling, since thanks to the application of generalized functions a solution is obtained that is the same for the entire domain of definition.

The papers [3, 4] were devoted to the determination of the coefficients of thermal conductivity in bodies with rectilinear anisotropy. The whole complex of thermophysical characteristics in orthotropic and anisotropic bodies is determined in [13, 14]. Here three models were applied for orthotropic bodies and six for anisotropic. Under the direction of Ya. S. Pidstrigach a method of determining the complex of thermophysical characteristics with rectilinear anisotropy of the body was developed using only one model. In determining the complex of thermophysical characteristics of bodies with rectilinear anisotropy we used a model in the form of a layer heated by an instantaneous source of thermal energy. The excess temperature
was recorded on the upper and lower surfaces of the layer at a fixed distance from the center, and also at the center of the region of heating at several times in two mutually perpendicular directions. From the measured data we determined the required thermophysical characteristics by the formulas

\[ \lambda_{ij}^l = \frac{q \tau l}{\theta_0 \tau_1 k} F_{0 i} \theta_3(0, F_{0 i}) \left[ \frac{(n_j^i p_j^i + p_i^j p_j^i)^2}{(n_1^i n_2^i - (p_3^i)^2)^{3/2}} + \frac{kn_j^i - n_1^i n_2^i + (p_3^i)^2}{4F_{0 i}^2 k \sqrt{n_1^i n_2^i - (p_3^i)^2}} \right], \]

\[ \lambda_{ii}^l = \frac{q \tau l}{\theta_0 \tau_1 k} F_{0 i} \theta_3(0, F_{0 i}) \frac{n_j^j p_j^j + p_i^j p_j^j}{\sqrt{n_1^i n_2^i - (p_3^i)^2}}, \quad a_{ii} = \frac{F_{0 i}^2 n_j^j p_j^j + p_i^j p_j^j}{\tau_1 n_1^i n_2^i - (p_3^i)^2}, \]

\[ a_{ij} = \frac{F_{0 i}^2}{\tau_1} \left[ \left( \frac{(n_j^i p_j^i + p_i^j p_j^j)^2}{(n_1^i n_2^i - (p_3^i)^2)^{3/2}} + \frac{kn_j^i - n_1^i n_2^i + (p_3^i)^2}{4F_{0 i}^2 k (n_1^i n_2^i - (p_3^i)^2)} \right) \right], \quad i, j = 1, 2, \quad i \neq j, \]

\[ \lambda_{12}^l = \frac{q \tau l}{\theta_0 \tau_1 k} F_{0 i} \theta_3(0, F_{0 i}) \sqrt{n_1^i n_2^i - (p_3^i)^2}, \quad c_v = \frac{q \tau l}{\theta_0 \tau_1 k} \theta_3(0, F_{0 i}) \sqrt{n_1^i n_2^i - (p_3^i)^2}, \quad \lambda_{22}^l \lambda_{13}^l > \lambda_{12}^l \lambda_{23}, \]

\[ a_{12} = \frac{F_{0 i}^2}{\tau_1} \left[ \left( \frac{(n_j^i p_j^i + p_i^j p_j^j)(n_2^i p_2^i + p_1^i p_2^i)}{(n_1^i n_2^i - (p_3^i)^2)^{3/2}} + \frac{p_2^i}{4F_{0 i}^2 (n_1^i n_2^i - (p_3^i)^2)} \right) \right], \quad a_{33} = \frac{F_{0 i}^2}{\tau_1}, \]

where \( \theta_3(\xi, \eta) \) is the theta-function, \( \lambda_{ij}^l \) are the coefficients of thermal conductivity, \( a_{ij} \) are the coefficients of thermal diffusivity, \( c_v \) is the coefficient of solid thermal capacity, \( \tau_1 \) is the time the temperature is measured, \( q \) is the intensity of the heat pulse, \( l \) is the thickness of the layer, \( F_{0 i} \) is the Fourier criterion, \( k \) is the coefficient of concentration of the distribution of the current density transverse to the heat flow, and \( \theta_0 \) is the value of the excess temperature measured at the point \( \chi_1 = \chi_2 = \chi_3 = 0 \) of the surface of the layer at time \( \tau_1 \):

\[ n_1^i = n_1 \bigg|_{\chi_1 = \chi_2} = d^{-2} \ln \frac{\theta_0}{\theta_1}, \quad n_2^i = n_2 \bigg|_{\chi_1 = \chi_2} = d^{-2} \ln \frac{\theta_0}{\theta_2}, \]

\[ p_1' = p_1 \bigg|_{\chi_1 = \chi_2} = \frac{1}{2d} d \ln \frac{\theta_0}{\theta_3}, \quad p_2' = p_2 \bigg|_{\chi_1 = \chi_2} = \frac{1}{2d} d \ln \frac{\theta_0}{\theta_4}, \]

\[ p_3' = p_3 \bigg|_{\chi_1 = \chi_2} = d^{-2} \ln \frac{\theta_0}{\theta_5}, \quad n_1'' = n_1 \bigg|_{\chi_1 = \chi_2} = d^{-2} \ln \frac{\theta_0}{\theta_6}, \]

\[ n_0^0 = n_0 \bigg|_{\chi_1 = \chi_2} = d^{-2} \ln \frac{\theta_0}{\theta_9}, \quad n_0^0 = n_0 \bigg|_{\chi_1 = \chi_2} = d^{-2} \ln \frac{\theta_0}{\theta_9}, \]

\[ n_0 = 16(\alpha_{33} \tau \kappa)^2[(k_{11} - k_{22}^2)(k_{22}^2 - k_{23}^2) - (k_{12} - k_{13}^2)k_{23}] + 4\alpha_{33} \tau \kappa [k_{11} + k_{22} - k_{13}^2 - k_{23}^2] + 1, \]

\[ n_1 = [4\alpha_{33} \tau \kappa (k_{22}^2 - k_{23}^2) + \kappa] n_0, \]

\[ n_2 = [4\alpha_{33} \tau \kappa (k_{11} - k_{23}^2) + \kappa] n_0, \quad p_3 = 4\alpha_{33} \tau \kappa (k_{12} - k_{13}^2) n_0, \]

\[ p_1 = [4\alpha_{33} \tau \kappa (k_{11}^2 - k_{23}^2)] n_0, \quad k_{ij} = \lambda_{ij}^l, \]

\[ k_{ii} = \left( \frac{n_j^i p_j^i + p_i^j p_j^i}{n_1^i n_2^i - (p_3^i)^2} \right)^2 + \frac{1}{4\alpha_{33} \tau \kappa} \left( \frac{\kappa n_j^i}{n_1^i n_2^i - (p_3^i)^2} - 1 \right), \quad k_{ij} = \frac{n_j^i p_j^i + p_i^j p_j^i}{n_1^i n_2^i - (p_3^i)^2}, \quad i, j = 1, 2, \quad i \neq j, \]

\[ k_{12} = \frac{n_j^i p_j^i + p_i^j p_j^i}{(n_1^i n_2^i - (p_3^i)^2)^2} + \frac{1}{4\alpha_{33} \tau \kappa n_1^i n_2^i - (p_3^i)^2}. \]

The paper [10] is devoted to the complex determination of the thermophysical characteristics of bodies with cylindrical orthotropy. As a model we consider a layer subject to instantaneous vulcanizing annular