DEFINITION OF THE TEMPERATURE CONDUCTIVITY OF A CARBON FILM BASED ON THE DATA OF PHOTOMETRIC ANALYSIS OF THE SPECTRA OF BRIGHTNESS OF THE REFLECTION FROM ITS SURFACE.

Ermishkin V.A., Minina N.A.,* Kudryavtsev E.M., Pokrasin M.A.

IMET RAS, Moscow, Russia
**minina1951@rambler.ru*

Based on the method of photometric analysis of structural images (PHASI), which was previously developed in the IMET RAS, a procedure was proposed for determining the coefficient of thermal diffusivity on samples from the foil of the materials under study. Using this technique, the process of heat propagation was analyzed and estimates of the thermal diffusivity of copper, aluminum and carbon in the present work, were obtained in which an inhomogeneous temperature field was excited by means of a single laser pulse emitted from a continuously operating laser on carbon dioxide directed to one of the foci of an elliptical target (sample). The target surface during the experiment was continuously recorded on a video camera. Single-frame processing of video recording with the selected periodicity by the PHASI method allowed, to analyze the propagation features over the target surface and to obtain quantitative characteristics of this process. According to these data, temporal and spatial local characteristics of their changes were obtained; first and second partial derivatives with respect to time and coordinates included in the heat equation, from which the thermal diffusivity of the target material was determined. The developed technique made it possible to directly determine the values of thermal diffusivity coefficients, in contrast to the standard method based on the separate determination of thermal conductivity, heat capacity, and density. A comparison of the values obtained for the thermal diffusivity coefficients for carbon with its values calculated from the reference data of thermophysical characteristics showed fairly good agreement between them. The work was carried out according to the state assignment No 007-00129-18-00 and with the financial support of the Russian Foundation for Basic Research (grant No. 17—08—00098a).