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КАИ

АНГЛИЙСКИЙ ЯЗЫК В СФЕРЕ ПРОФЕССИОНАЛЬНОЙ КОММУНИКАЦИИ

Материалы VIII Всероссийской молодежной научной конференции

10 ноября 2022 г., Казань

Казань
2022

References:
1. Gurevich, V. Cyber and Electromagnetic Threats in Modern Relay Protection / V. Gurevich. – Boca Raton – New York – London: CRC Press (Taylor & Francis Group), 2014. – 195 p.
2. Keller, K. Electrical Safety Code Manual / K.Keller. – Oxford: Butterworth–Heinemann, 2010. – 397 p.
3. Pooler, W.J.R.H. Electrical Power / W.J.R.H. Pooler. – London: Ventus Publishing, 2011. – 221 p.

УДК 536.2.022

EVALUATION OF THE THERMAL CONDUCTIVITY COEFFICIENT OF THIN-FILM THERMAL INSULATION WITH MICROSPHERES

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Abstract: The paper compares the thermal conductivity coefficients of a thin-film coating obtained by modeling the heat transfer process in a COMSOL Multiphysics medium and found experimentally. Thermal insulation in the form of energy-saving paint with hollow microspheres acted as a thin-film coating.
Keywords: energy saving, microspheres, COMSOL Multiphysics, thermal conductivity.

Currently, more and more attention is being paid to the problem of energy saving [1]. In the Russian Federation, the urgency of this problem is explained by the low average annual ambient temperature (-5.5 ° C), the long heating season, as well as a large proportion of physically and morally outdated equipment.

To date, there are a large number of various thermal insulation materials that differ in cost, composition, and scope of application. For example, styrofoam, mineral wool thermal insulation coatings have become very popular among them.

Simultaneously with traditional materials, a fundamentally new thermal insulation consisting of hollow microspheres and binding components is being introduced in the domestic market - the so-called energy-saving paint. The advantages of such paints are high adhesion, mechanical strength, moisture and vapor resistance, cheapness [2-4].

The authors calculated the specific heat flow through a plate coated with a thin-film thermal insulation material with microspheres by modeling a stationary heat transfer process in a COMSOL Multiphysics medium.

The aim of the work is to compare the thermal conductivity coefficients of the thermal insulation material with hollow microspheres obtained by modeling the heat transfer process in the COMSOL Multiphysics environment and experimentally.

Research methodology

The study of the thermophysical characteristics of porous materials was carried out on the basis of an analytical solution to the problem of heat propagation in a porous body. A step forward in this process is the Laue theory, according to which a porous body with uniformly distributed porosity is divided into elementary tubes in a direction parallel to the direction of the heat flow. Some of them contain pores, while the other does not [5].

Based on this theory, the authors of this work modeled the geometry of the arrangement of hollow microspheres inside a thin-film coating (Figure 1).