## Розроблення застосунку “e-mail Hub”

## Development of the “e-mail Hub” application

## MATHEMATICAL MODEL OF THE HEAT TRANSFER IN ANISOTROPIC MATERIALS TAKING INTO ACCOUNT THE BOUNDARIES OF PHASE TRANSITION

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**Abstract** – Constructed are mathematical models of nonisothermal moisture transfer in anisotropic porous materials taking into account the motion of phase transition boundary. The analytical-numerical method has been developed for the realization of such models with variable temperature conditions of the environment. The results of the study can be used in information technologies for designing and modeling hydrothermal processes in anisotropic materials, as well as for the implementation of similar mathematical models in biology, medicine, geophysics, and ecology.

**Keywords** – ***mathematical model, heat transfer, analytical-numerical method, anisotropy, phase transitions***.

The intensification of the technology of drying colloidal capillary-porous materials leads to further development of mathematical modeling of heat-and-mass transfer processes, phase transformations taking into account the deepening of the moisture evaporation zone, which would adequately describe the laws of moisture removing in the materials being dried. The presence of a moving boundary of phase transformations at the interface between phases with different thermophysical and mechanical characteristics considerably complicates the mathematical models of heat-and-mass transfer processes during the drying of capillary-porous materials [2]. The simulation of heat-and-mass transfer with phase transitions in the drying process is reduced to solving Stefan's problems which are the most complicated even for minor changes in the density of the material in the evaporation zone [1]. The aim of the work is to construct mathematical models of nonisothermal moisture transfer in capillary-porous bodies with phase transformations, to develop and improve analytical-numerical methods.

Consequently, the solution of a problem satisfying the boundary condition on the moving boundary of the phase transition takes the form [2]:

(1)

Integrals on the boundary of the phase transition are determined by the numerical method. All the other values included in this equation are calculated according to the physical and thermal characteristics of a particular material.

**Conclusion**. A two-dimensional nonlinear mathematical model of nonisothermal moisture transfer in anisotropic porous materials is constructed, taking into account the motion of the phase transition boundaries. Developed is an analytical-numerical method for determining heat transfer in an orthotropic plate with a moving boundaries of phase transitions and for the establishment of moving boundaries of phase transition in a rectangular region taking into account the main axes of anisotropy. Numerical simulation of heat transfer dynamics in an orthotropic plate with a moving boundary of phase transitions is carried out.

**References**

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