NUMERICAL METHOD OF DETERMINATION OF SORBTION ISOTHERM CAPILLARY-POROUS MATERIALS

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Goal. In the calculations of heat and mass transfer in the processes of drying or moisture of porous bodies, the heat-water state of the enclosing building structures, it is necessary to have the sorption isotherms are available. For a wide range of materials, isotherms are empirically obtained and presented in the form of tables or graphic dependences $W_e(\varphi, T)$. However, the temperature interval of the data on the equilibrium moisture content of W_e is substantially limited. The methods of the experimental determination of W_e are rather long and complex in terms of ensuring the maintenance of a steady state of the environment and the accuracy of measuring the change in mass of the material.

Results of work. The values of W_e are usually calculated using ratios approximating experimentally found isoterms. The dependence of $W_e(\varphi, T)$ is determined by the nature, structure and energy state of the pores of the material. The most complete characteristic of the structure of porous bodies is the differential and integral functions of pore size distribution. The latter determines the fraction of the porosity pr, which corresponds to the pores with radii from the minimum r_{min} to the current r. If $r = r_{max}$, Π_r is equal to the porosity of the Π body.

In this paper, an algorithm for numerical determination of the sorption and desorption isotherms is presented based on the data on the integral pore size distribution function for this material and proposed by [1] professor N.I. Nikitenko formulas for the thickness of the condensate layer, depending on the humidity φ of the contact medium. Numerous experiments with various porous materials [2] and comparisons of the obtained isotherms with experimentally found ones, which testify to the effectiveness of the proposed method, have been carried out.

Conclusions. The method allows to determine the equilibrium moisture content of any porous materials for which the integral pore size distribution function is known throughout the range φ at a given temperature.

Literature.

1. Nikitenko N.I. Investigation of the evolution dynamics of condensed bodies based on the law of the intensity of the spectral radiation of particles. Engineering Physical Journal. 2002. T.75, No. 3. P. 128 – 134.
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