STUDY OF THE RADIATION COMPONENT INFLUENCE ON THE EFFECTIVE HEAT CONDUCTIVITY OF COMPOSITE-POROUS BUNDLE

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The paper deals with a number of issues related to the heat exchange processes which occur in industrial charring plants. The research is aimed to finding a calculation algorithm that can equivalently take into account the influence of the composite-porous body structure on the thermal conductivity coefficient of a bundle formed by wood logs in a trolley' space. It is shown that the phenomenological model of the heat conductivity process, which is based on the concept of solids continuity, is not suitable for use in the context of calculating the degree of material porosity contribution to its thermal conductivity. It is specified that such a model ignores not only the structural content of real materials, but also the possibility of forming anisotropic cluster formations in their thickness. It is found that simplification of the microscopic structure is not allowed for a wooden bundle that takes part in the charcoal production using pyrolysis method. There are analyzed several methods of wooden raw materials loading into a trolley and a percentage of volume that can be usefully used in each of them. The most technologically and operationally expedient way of wooden raw materials loading is chosen. A well-known calculation model, which is based on the equable solid phase distribution along the boundaries of structural element, is considered. It is established that this model demonstrates results that do not correspond to physical reality for the boundary values. The reasons of model inadequacy to real objects are revealed on the example of a wooden log bundle. An improved calculation model, which involves replacing the linear contact between the elements to the surface one, is presented. There are considered the artificial conditions of the calculated assumption that an infinitely thin material layer is located along the boundaries of a structural element, and the entire material mass is centered in the form of a square-section object. There is given a detailed algorithm for calculating the equivalent value of the wooden bundle thermal conductivity coefficient. The appropriateness of applying a new approach is confirmed based on these studies, which allows taking into account the magnitude of the radiation component effect on the total value of the effective thermal conductivity of composite-porous material.