DIFFUSION AND CHEMICAL ATTACHMENT OF SUBSTANCES WITH SIMPLE MOLECULAR STRUCTURE IN WOOD

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Abstract

The saturating of wood with various chemical substances is a significant way for wood protection. As far as it is not clear how diffusion and chemical attachment processes in wood develops, because of their diversity, recommendations for saturating optimization in practice is complicated.

We considered a mathematical model of the saturating process in wood, which is based on the equation of diffusion with respect to concentration in the wood cavities with nonlinear concentration-depending diffusion coefficients and source function which are depending also on the cell-wall concentration. In addition, since the real saturating process usually is nonisothermal we took into account the principles on nonequilibrium thermodynamics including the chemical potential coefficient.

The behavior of solutions of the obtained mathematical model in accordance with a hypothesis on the conduct of the diffusion and chemical potential coefficients was numerically investigated. In this investigation we used the schemes of the finite differences. The specific character of these problems requires to solve the 3–D or 2–D initial-boundary-value problem for parabolic type nonlinear partial differential equations. This involves additional difficulties for the applications of general finite difference methods. Therefore it is important to work out special methods for solutions based on the method of finite volumes.

In the case of constant diffusion coefficients or in the case of simple nonlinear concentration-depending coefficient in the boundary layer approach analytical solutions exist.

The received results were compared with experimental practice.