

INFLUENCE OF A VARIATION OF THE PHASE
COMPOSITION OF A MULTIPHASE DIFFUSION
LAYER ON THE EVOLUTION OF PHASE
BOUNDARIES ACCOMPANIED BY CHEMICAL
REACTIONS ON THEM. 1. A FORMULATION
OF THE PROBLEM

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S u m m a r y

A mathematical description of the evolution of the structure and composition of a multiphase diffusion layer in the process of diffusion of the element of saturation into a metal substrate is carried out. This description allows for the existence of the following possible situations: a) the appearance of a new phase layer in the composition of a multiphase diffusion layer and b) the disappearance of a layer of a phase present in a multiphase diffusion layer. The possibility of existence of non-ideal boundary conditions on the external surface of a metal is taken into account as well. It is shown that each phase of a multiphase diffusion layer has a region of homogeneity. It is proved that the coordinates of phase boundaries strongly depend on the correctness of the initial diffusion parameters, which are set at the formulation of the problem. Therefore, the dependence of the coordinates of phase boundaries on time is an integral indication which can be used when ascertaining the adequacy of results obtained from the simulation of the kinetics of diffusion processes and the experimental data of a microstructure analysis. The conditions of appearance and disappearance of a continuous phase layer are analyzed. The estimate of the critical thickness of a continuous phase layer appearing or disappearing during the diffusion experiment is conducted. The numerical solutions of the model problems concerning the evolution of the structure and composition of a multiphase diffusion layer during the diffusion saturation are obtained. The computer simulation results have shown a possibility of consideration of the following model situations: 1) appearance of a new phase layer; 2) disappearance of a phase layer; 3) consecutive appearance of phase layers.