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. 2. A SIMULATION OF DIFFUSION

A.I. Nesterenko

Ukrainian State Chemical-Technological University
(*8, Gagarin Ave., Dnipropetrovsk 49005;*
e-mail: ugxtu@dicht.dp.ua)

S u m m a r y

We consider the features of the kinetics of the phase boundaries of a multiphase diffusion layer under the conditions of diffusion growth of phase layers and diffusion homogenization. A mathematical description of the evolution of the structure and composition of a multiphase diffusion layer is carried out allowing for non-ideal boundary conditions on the external surface of a metal. Consideration is given to a model problem concerning the formation and evolution of a multiphase diffusion layer in the "the saturation element — the substrate metal" system which consists of four phase layers. It is demonstrated that a multiphase diffusion layer can include two, three, or four phases depending on the boundary conditions on the external surface of a metal. It is proved that diffusion of the saturation element into the substrate metal is accompanied by the appearance of a new phase layer in the composition of the multiphase diffusion layer. In this case, a violation of the parabolic law of the growth of phases is observed. This law is also violated under the conditions of the disappearance of a phase layer during diffusion homogenization. The successive appearance of phases in the composition of a multiphase diffusion layer gives rise to a violation of the parabolic law of the growth of phases as well. We analyzed and generalized the features of the violation of this parabolic law in all these cases. The results of computer simulation in the "nitrogen — iron" and "silicon — molybdenum" systems are in good agreement with the experimental data.