THE MODELING OF OXIDE GROWTH PROCESS ON THE SURFACE DURING THE DIFFUSION IN THIN FILMS UNDER CONDITIONS OF "OXYGEN PUMP" ACTION

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S u m m a r y

We propose models which allow one to predict the growth kinetics for an oxide on the surface of thin films. It is assumed that, in a two-layer system, a material of the "lower" layer diffuses on the boundaries of grains of a material of the "upper" layer, and the reaction of its oxidation on the external surface creates an additional motive force of the diffusion. The amount of a diffusate spent on the formation of an oxide takes no participation further in the process of mass transfer. Therefore, the concentration gradient does not decrease. Under conditions of an additional influence of the "oxygen pump" on the surface of thin films, the motive force of the process caused by the concentration gradient continues to act for a sufficiently long time. We consider the process of growth of copper oxide on the nickel surface layer in the two-layer system Cu/Ni with regard for different mechanisms of diffusion of copper such as the volume diffusion through the oxide, the surface diffusion along the metal–oxide interface and the triple joints of the boundaries of grains, and the combined mechanism including the surface and volume diffusions. It is established that the mechanism of diffusion affects significantly the shape and size of the oxide layer and its effective thickness. We analyze the influence of parameters of the mass transfer on the effective index of growth of the oxide.