EVOLUTION OF NEW PHASE CLUSTERS AT THE INITIAL STAGES OF BINARY ALLOY DECOMPOSITION DESCRIBED IN TERMS OF A MODIFIED THEORY OF NUCLEATION

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S u m m a r y

The work considers the thermodynamics and the kinetics of initial decomposition stages in a supersaturated binary solid solution in the framework of the modified nucleation theory. The specific surface energy is considered as a function of intensive state parameters of both the cluster and the matrix, which allows one to uniformly describe clusters of critical, subcritical, and supercritical size. The analysis was performed in two stages. On the first one, the optimal size dependences of the compositions of new phase clusters were determined by analyzing the macroscopic equations of growth of nuclei. On the second stage, we solved a kinetic equation to describe the evolution of the size distribution function of new-phase clusters along this optimal composition line. The effect of various kinetic factors on the behavior of the distribution function and characteristics of new-phase clusters was studied. The obtained distributions demonstrate a possibility of the existence of bimodal size distributions of new-phase clusters.