STUDY OF CONDITIONS FOR HIERARCHICAL CONDENSATION NEAR THE PHASE EQUILIBRIUM

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S u m m a r y

A new mechanism of phase formation has been proposed and studied, both experimentally and theoretically, using quasiequilibrium stationary condensation in an ion-plasma atomizer as an example. Copper condensates were obtained, which testifies that a self-assembling mode is realized in the course of sputtering, giving rise to the appearance of a characteristic grid structure. The obtained fractal pattern of the condensate nucleus distribution over the substrate surface is similar to that observed in the course of diffusion-limited aggregation. The condensate nuclei were shown to form a statistical ensemble of hierarchically constrained objects distributed in an ultrametric space. The Langevin and Fokker–Planck equations describing the behavior of this ensemble were derived, which allowed the stationary distribution of thermodynamic condensation effect values and the corresponding probability flow to be determined. The time dependences for the formation probability of branched condensate structures are obtained, which allowed the formation of the grid structure to be explained.