THE QUATARON MECHANISM OF CRYSTAL NUCLEATION AND GROWTH

ASKHABOV, A. M.

The new model of crystal nucleation and growth is proposed, in which we show that nanosize hidden phase clusters, which we call quatarons, are bound to form and steadly exist in supersaturated environments. The nonactivational character of quataron formation accounts for the fact that most - if not all - substance in supersaturated media is found as hidden phas clusters. According to our estimates, from 50 to 90% of substance in aqueous salt solution is found as quataron.Spontaneous nucleation of crystals occurs when quatarons achieve certain limiting size At radius » 1.2nm the quataron becomes an electrically neutral particle with chemical bonds closed on itself. The inner topology of such quataron is analogous to that of a finite fragment of corresponding crystalline structure. That's why it is easily transformed to crystal nucleus. Crystallization of limiting quataron gives rise to the smallest possible (elementary) crystal. The number of unit cells in the minimum crystal for some minerals are: epsomite - 7, gipsum - 15,calcite - 20, halite - 40, quartz - 65.As the crystal growth, the quataron®crystal transition takes place on growing crystal face. Quatarons adsorbed on the crystal surface have everything necessary for structural transformation and crystallization (heterogeneous nucleation effect, growing effective size, symmetric effects of the lattice, etc.). The quataron mechanism of crystal growth occupies an intermediate position between the classical atom-molecular mechanism and microblock growth.