"Latent" Phase Clusters (Kvatarons) as Growth Units

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In a number of our works (Askhabov, 1998-2004) we have described a set of ideas and principles dealing with structural organization of substance in the nanorange. This ideas have been collectively referred to as "kvataron concept". Central in this new concept is the idea that there are specific nanosize clusters, which we call kvatarons, arising under non-equilibrium conditions. Physically, kvatarons are pre-crystallization clusters of the transient ("latent") phase. It has been found that clusters more than ~1.2 nm in size can become potential centers of crystallization. Only such clusters contain a minimal number of atoms necessary for crystal nucleation. At the same time, crystals grow by smaller clusters (kvatarons), which are transformed to "two-dimensional" nuclei already on the growing crystal surface. We have proposed a new theory of crystal growth, were kvatarons are the basic growth units. Kvatarons are ideal as growth units. Chemical composition of kvatarons is the same as that of crystals. Topologically kvatarons are close to structural modules of crystals. Variability of the structure allows kvatarons to join any crystal surface. A growing crystal itself actively influence on kvataron crystallization on the crystal. The kvataron model accounts for all fundamental aspects of crystal growth: growth kinetics, surface evolution, defects formation, impurity entrapment, etc.

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