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Review

Review on the paper Reversed Crystal Growth

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Abstract

Review on the paper Wuzong Zhou, Reversed Crystal Growth. *Crystals*. 2019; 9(1): 7 (16 pp). https://doi.org/10.3390/cryst9010007

Keywords

crystal growth, crystal morphology, electron microscopy, hollow crystal

The paper recommended for reviewing deals with the fundamentals of crystallography. From the beginnings of this science the key task has been to explain the regular shape of crystals and the regularities of their formation. It has been accepted as the basic axiom that the formation of crystals starts from a certain center and that the shape of the growing crystal is determined by the Curie–Wolf thermodynamic conditions with correction for the growth medium symmetry. The recent modification of the accepted crystal growth paradigm [1, 2] has introduced the possibility of non-classic crystal growth regularities, i.e., oriented attachment growth. Crystal precipitates growing under these conditions often have peculiar shapes and no facets [3] but the paper being reviewed deals with other paradoxical phenomena relating to the formation of crystalline polygons. Using high-resolution electron microscopic data with examples of a number of materials e.g. zeolites, metalloorganic compounds, zinc and iron oxides, perovskites and calcite, the Author demonstrate an unusual, paradoxical mechanism of polygon formation. At a very early stage of crystallization, nanocrystallite associations containing thousands of particles may aggregate into larger polycrystalline particles. These particles initially have a loose structure and often have a spherical shape. Then this large particle starts crystallizing from the surface which acquires crystallographic facets. Further crystal growth progresses from the surface in the depth, towards the particle center. At a certain stage, hollow crystals form having an external appearance of crystalline polygons.

Similar phenomena have been observed in other works dealing with other materials. For example, hollow hexagonal prisms of $NaYF_4$ have been observed [4].

The results of this paper require theoretical conceptualization, and appropriate models should be constructed. Earlier [5] a phase transition model of nanoparticle association was suggested, though for a two-dimensional case. Three-dimensional expansion of that model is an important task.

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