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REALIZATION OF CRYSTAL GROWTH CHARACTERIZATION TECHNIQUES

Dr. Shail Kumari
Dept. of Physics, Jagdam College, Chapra, Bihar.

ABSTRACT:

A crystal's characterization basically consists of determining the chemical composition, structure, defects, and studying their properties. Essentially, characterization includes determining the chemical composition, structure, optical, mechanical, electrical and thermal properties of the crystals produced. There are various types of characterization methods used to study the crystal's physical and chemical properties.

KEYWORDS: Crystal Growth, Crystal growth techniques, Characterization, Techniques.

INTRODUCTION:

Growth of crystals with low dislocation density is a difficult job, as dislocations can be easily compounded by thermal stresses during the near-perfect crystal cooling down process. It is similarly hard to oversee almost ideal pliable precious stones at room temperature, since separation augmentation of these gems can be started considerably under their own weight and especially by mechanical or electric release machining.

(Figure.1) The cycle of gem development can be started by utilizing a little seed precious stone of a similar material to characterize an appropriate crystallographic direction and to dodge enormous liquid stage supercooling that could deliver uncontrolled nucleation. By appropriate plan of the development framework, the levels of opportunity that the developing gem has on a minuscule and naturally visible scale should be diminished as much as possible.[1-5]

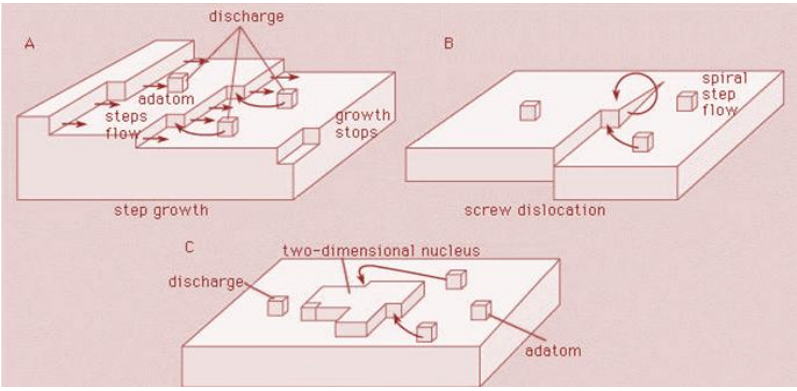

Figure 1: crystal growth.

Crystal Growth Strategies:

Crystal growth is a hard undertaking and the crystal growth approach observed depends on the traits of the materials underneath research[6], as an instance: its melting
Factor, unstable nature, solubility in water or other organic solvents and so on.
The simple increase techniques available for crystal boom are extensively.

- increase from melt.
- growth from vapour.
- growth from solution.
- boom from stable.

Growth from the Melt:

Melt boom is the process of fusion crystallization and resolidification of the natural substance, crystallization from a soften whilst the liquid below its freezing point is cooled down. On this method, apart from potential contamination of crustable substances and the encompassing atmosphere, no impurities are brought inside the growth segment and the charge of boom is normally a good deal better than different impurities are possibly.[2] melt boom is the simplest method of producing crystals commercially. The growth from melting can be further sub-grouped into different strategies: a) bridgmann approach b) czochralski approach c) vernuil approach d) sector melting approach e) kyropoulos approach f) skull melting.

Growth from Vapour:

Vapour crystallization is typically adopted for the processing of bulk crystal, epitaxial movies, and thin coatings. Strategies for the creation of vapor crystals are divided into two organizations,

A. Chemical Delivery Method:

This technique requires a chemical shipping wherein fabric is delivered to the increase region as a chemical compound (halide). In this situation the kind of the response concerned depends on. The growth location may both be hotter or fresher than the supply.

B. Bodily Transport Technique:

This technique includes the direct transport of substances by using evaporation or sublimation from a warm supply sector to a fab area of compounds ii-vi (zns, cds) which can be broadly grown both in vaccum or with a transferring gas circulation through this technique. In each cases, increase can be sufficient with seed crystals, that can either be the fabric being grown or some other cloth with comparable spacing of the lattice. In this example the substance evaporates and diffuses from hot end to a cooler boom stop. In then, deposits inside the form of single crystals.

Advantages :

- films can be acquired by means of a near spaced shipping system and compound decomposition.
- through this approach, silicone crystal, diamond, gasoline, and semiconductor compounds can be produced.

Increase from Solution:

Crystals are grown from aqueous answer the use of this procedure. This approach of growing bulk crystals is also commonly practiced. The four maximum vital forms are

A. Growing of the low-temperature .

That is a widely practiced approach; the techniques used here are,

- gradual cooling technique.
- solvent evaporation technique.
- temperature gradient method.

The solvent used here are water, ethy1 alcohol, acetone, and many others.,

B. Growing of the high temperature answer.

The solvents are usually taken into consideration powerful at temperatures above room temperature. Similarly properly practice are the ideas of low-temperature solution increase. The additives of the substance to be crystallized are dissolved within the growth of crystals from high-temperature solutions in a appropriate solvent, and crystallization happens as the answer is essentially supersaturated. The maximum commonly used method for the boom of excessive-temperature solutions is flux boom.

Summary:

Due to their importance for both academic and implemented studies, the growth of unmarried crystals and their characterization towards device manufacture have assumed splendid impetus. The fast developments in microelectronics, verbal exchange technology, medical instrumentation, electricity, and area technology are handiest possible after the wonderful trends inside the manufacture of massive ideal crystals.

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