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Handbook of Crystal Growth, Second Edition: Fundamentals

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Volume IA Handbook of Crystal Growth, 2nd Edition (Fundamentals: Thermodynamics and Kinetics)
Volume IA addresses the present status of crystal growth science, and provides scientific tools for the following volumes: Volume II (Bulk Crystal Growth) and III (Thin Film Growth and Epitaxy). Volume IA highlights thermodynamics and kinetics. After historical introduction of the crystal growth, phase equilibria, defect thermodynamics, stoichiometry, and shape of crystal and structure of melt are described. Then, the most fundamental and basic aspects of crystal growth are presented, along with the theories of nucleation and growth kinetics. In addition, the simulations of crystal growth by Monte Carlo, ab initio-based approach and colloidal assembly are thoroughly investigated.

Volume IB Handbook of Crystal Growth, 2nd Edition (Fundamentals: Transport and Stability)
Volume IB discusses pattern formation, a typical problem in crystal growth. In addition, an introduction to morphological stability is given and the phase-field model is explained with comparison to experiments. The field of nanocrystal growth is rapidly expanding and here the growth from vapor is presented as an example. For the advancement of life science, the crystal growth of protein and other biological molecules is indispensable and biological crystallization in nature gives many hints for their crystal growth. Another subject discussed is pharmaceutical crystal growth. To understand the crystal growth, in situ observation is extremely powerful. The observation techniques are demonstrated.

Volume IA

- Explores phase equilibria, defect thermodynamics of Si, stoichiometry of oxides and atomistic structure of melt and alloys
- Explains basic ideas to understand crystal growth, equilibrium shape of crystal, rough-smooth transition of step and surface, nucleation and growth mechanisms
- Focuses on simulation of crystal growth by classical Monte Carlo, ab-initio based quantum mechanical approach, kinetic Monte Carlo and phase field model. Controlled colloidal assembly is presented as an experimental model for crystal growth.

Volume IIB

- Describes morphological stability theory and phase-field model and comparison to experiments of dendritic growth
- Presents nanocrystal growth in vapor as well as protein crystal growth and biological crystallization
- Interprets mass production of pharmaceutical crystals to be understood as ordinary crystal growth and explains crystallization of chiral molecules
- Demonstrates in situ observation of crystal growth in vapor, solution and melt on the ground and in space

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