Nucleation Theory [

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Physics | Chemistry, Physical organic | Physics | Soft and Granular Matter, Complex Fluids and Microfluidics | Physical Chemistry | Theoretical, Mathematical and Computational Physics | Classical Continuum Physics

Monografía

This monograph covers the major available routes of theoretical research of nucleation phenomena(QA(B(3C(B(QA(B(3C(Bphenomenological models, semi-phenomenological theories, density functional theories and microscopic approaches(QA(B(3C(B(QA(B(3C(Bwith emphasis on the formation of liquid droplets from a metastable vapor. It also illustrates the application of these various approaches to experimentally relevant problems. In spite of familiarity with the involved phenomena, it is still not possible to accurately calculate nucleation rate, as the properties of the daughter phase are insufficiently known. Existing theories based upon the classical nucleation theory have on the whole explained the trends in behavior correctly. However, they often fail spectacularly to account for new data, in particular in the case of binary or, more generally, multi-component nucleation. This book challenges such classical models and provides a more satisfactory description by using density functional theory and microscopic computer simulations to describe the properties of small clusters. Also, semi-phenomenological models are proposed that relate the properties of small clusters to known properties of the bulk phases. This monograph is an introduction as well as a compendium to researchers in the areas of soft condensed matter physics, chemical physics, graduate and post-graduate students in physics and chemistry starting on research in the area of nucleation, and to experimentalists wishing to gain a better understanding of the recent developments being made to account for their data

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Contenido: Thermodynamics of a two-phase system -- Classical nucleation theory -- Nucleation theorems -- Density functional theory -- Extended modified drop model and dynamic nucleation theory -- Semi-phenomenological approach: mean-field kinetic nucleation theory -- Computer simulations of nucleation --

Nucleation at high supersaturations -- Argon nucleation -- Binary nucleation - General case -- Binary nucleation with supercritical fluids: coarse-grained nucleation theory -- Multi-component nucleation -- Hetrogeneous nucleation

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