1. Record Nr. UNINA9910814479203321

Autore	Kashchiev Dimo
Titolo	Nucleation : basic theory with applications / / Dimo Kashchiev
Pubbl/distr/stampa	Oxford ; ; Boston, : Butterworth-Heinemann, 2000
ISBN	1-281-04773-2 9786611047733 0-08-053783-9
Edizione	[1st ed.]
Descrizione fisica	1 online resource (551 p.)
Disciplina	548.5
Soggetti	Nucleation Chemistry, Physical and theoretical
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references (p. [495]-513) and indexes.
Nota di contenuto	Front Cover; Nucleation: Basic Theory with Applications; Copyright Page; Contents; Preface; Symbols and abbreviations; Part 1: Thermodynamics of nucleation; Chapter 1. First-order phase transitions; Chapter 2. Driving force for nucleation; Chapter 3. Work for cluster formation; 3.1 Homogeneous nucleation; 3.2 Heterogeneous nucleation; 3.3 General formulae; 3.4 Absence of one-dimensional nucleation; Chapter 4. Nucleus size and nucleation work; 4.1 General formulae; 4.2 Homogeneous nucleation; 4.3 Heterogeneous nucleation; 4.4 Atomistically small nuclei; Chapter 5. Nucleation theorem 5.1 Phenomenological proof 5.2 Thermodynamic proof; 5.3 Generalizations; 5.4 Integral form; Chapter 6. Properties of clusters; 6.1 Inside pressure; 6.2 Chemical potential; 6.3 Vapour pressure; 6.4 Solubility; 6.5 Melting point; 6.6 Specific surface energy; Chapter 7. Equilibrium cluster size distribution; 7.1 Equilibrium concentration of clusters; 7.2 Equilibrium concentration of nuclei; Chapter 8. Density-functional approach; 8.1 General considerations; 8.2 Gradient approximation; 8.3 Hard-sphere approximation; 8.4 Quasi-thermodynamics; 8.5 Quasi-thermodynamic formulation Part 2: Kinetics of nucleation Chapter 9. Master equation; 9.1 General formulation; 9.2 Nucleation stage; 9.3 Coalescence stage; 9.4 Ageing

stage; Chapter 10. Transition frequencies; 10.1 Monomer attachment frequency; 10.2 Monomer detachment frequency; 10.3 Multimer attachment frequency; 10.4 Multimer detachment frequency; 10.5 General formulae; Chapter 11. Nucleation rate; Chapter 12. Equilibrium; Chapter 13. Stationary nucleation; 13.1 Stationary cluster size distribution; 13.2 Stationary rate of nucleation; 13.3 Particular cases; 13.4 Concentration of supernucle
i
13.5 Comparison with experiment Chapter 14. First application of the nucleation theorem; Chapter 15. Non-stationary nucleation; 15.1 Non-stationary cluster size distribution; 15.2 Non-stationary rate of nucleation; 15.3 Time lag of nucleation; 15.4 Delay time of nucleation; 15.5 Concentration of supernuclei; 15.6 Suggestion; 15.7 Finding the equilibrium concentration of nuclei; Chapter 16. Second application of the nucleation theorem; Chapter 17. Nucleation at variable supersaturation; 17.1 Quasi-stationary cluster size distribution; 17.2 Quasi-stationary rate of nucleation
17.3 Condition for quasi-stationarity Part 3: Factors affecting nucleation; Chapter 18. Seed size; Chapter 19. Line energy; Chapter 20. Strain energy; Chapter 21. Electric field; 21.1 General formulae; 21.2 Nucleation on ions; 21.3 Nucleation in external electric field; Chapter 22. Carrier-gas pressure; Chapter 23. Solution pressure; Chapter 24. Pre-existing clusters; 24.1 Non-stationary cluster size distribution; 24.2 Non-stationary rate of nucleation; 24.3 Concentration of supernuclei; 24.4 Delay time of nucleation; Chapter 25. Active centres; Part 4: Applications
Chapter 26. Overall crystallization

Sommario/riassunto

This book represents a detailed and systematic account of the basic principles, developments and applications of the theory of nucleation. The formation of new phases begins with the process of nucleation and is, therefore, a widely spread phenomenon in both nature and technology. Condensation and evaporation, crystal growth, electrodeposition, melt crystallization, growth of thin films for microelectronics, volcano eruption and formation of particulate matter in space are only a few of the processes in which nucleation plays a prominent role.The book has four parts, which a