

1. Record Nr.	UNINA9910830737303321
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Titolo	Mesocrystals and nonclassical crystallization // Helmut Colfen, Markus Antonietti
Pubbl/distr/stampa	West Sussex, England : , : John Wiley & Sons Ltd, , 2008 ©2008
ISBN	1-281-84131-5 9786611841317 0-470-99460-6 0-470-99459-2
Descrizione fisica	1 online resource (296 p.)
Disciplina	548 548.5
Soggetti	Colloidal crystals Crystal growth Nanostructured materials
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 and index.
Nota di contenuto	Mesocrystals and Nonclassical Crystallization; Contents; Preface; 1 Mesocrystals and Nonclassical Crystallization; 1.1 Introduction; References; 2 Physico-Chemical Principles of Crystallization; 2.1 Classical Crystallization; 2.2 Definition of a Crystal and Crystal Growth; 2.3 Nucleation Theories; 2.3.1 Classical Nucleation Theory; 2.3.2 Experimental Tests of Nucleation Theories; 2.4 Some Points towards a More Realistic View of Supersaturation and Crystallization; 2.4.1 Concentration Fluctuations and Spinodal Crystallization 2.4.2 Reduction of Supersaturation by the Formation of Clusters and Amorphous Intermediates 2.5 Thermodynamic and Kinetic Crystallization Pathways; 2.6 Polymorph Control; 2.7 Crystal Morphology and the Role of Additives and Selective Adsorption; 2.7.1 Crystal Morphology; 2.7.2 What Determines Adsorption of an Additive?; 2.8 Properties of Single Crystals and Polycrystals; 2.8.1 Electrical Polarization; 2.8.2 Light Refraction and Birefringence; 2.8.3 Mechanical Properties; References; 3 Examples of Crystals Challenging the Classical

Textbook Mechanism; 3.1 Some Biomineral Examples
3.1.1 Elongated Magnetite Nanocrystals in Magnetotactic Bacteria
3.1.2 Calcite with Complex Form and Single Crystal Behavior in Foraminifera;
3.1.3 Calcite with Complex Form and Single Crystal Behavior in Sea Urchin Spines; 3.1.4 Calcite Single Crystals with Complex Form in Coccoliths; 3.1.5 Morphological Complexity Develops with Time; 3.2 From Biology to Biomimetics: In Vitro Mineralization Examples; 3.3 Biomorphs; 3.4 Other Synthetic Examples; References; 4 Nonclassical Crystallization; 4.1 Amorphous Precursors; 4.2 Liquid Precursors; 4.3 Oriented Attachment; 4.4 Mesocrystals; References
5 Self-Assembly and Self-Organization References; 6 Colloidal Crystals with Spherical Units: Opals and Colloidal Nanocrystals; References; 7 Mesocrystal Systems; 7.1 Mesocrystals and Their Properties; 7.2 Early Reports on Mesocrystals; 7.3 One-Dimensional Mesocrystals; 7.4 Two-Dimensional Mesocrystals; 7.5 Mesocrystals in Biomineralization; 7.6 Mesocrystals in Gels; 7.7 Mesocrystals Formed without Additives; 7.8 Mesocrystals Formed with Simple Ion Additives; 7.9 Mesocrystals Formed with Polymer Additives; 7.10 Mesocrystals in Nonaqueous Systems
7.11 Mesocrystals Formed via Solid-State Reactions
7.11.1 Solid Matrices for Mesocrystal Formation; 7.11.2 Topotactic Reactions; 7.12 Liquid Crystals, Tactoids, Somatoids, and Schiller Layers; References; 8 Mechanisms of Mesocrystal Formation; 8.1 Principal Mechanisms Leading to Mesocrystals; 8.2 Conditions for Mesocrystal Formation; 8.3 Alignment by Colloidal Forces, Capillarity and Other Short-Ranged Physical Fields; 8.3.1 Alignment by Capillary Forces; 8.3.2 Alignment by Hydrophobic Forces and Interface Energies; 8.3.3 Alignment by Minimization of the Interfacial Energy
8.3.4 Alignment by Additive Coding of Nanoparticles

Sommario/riassunto

Through both explanation and discussion, this title presents a complete review into mesocrystals, and accurately describes this relatively new study of established materials. This book also provides an introduction to other areas of crystallisation including self-assembly, classical crystallisation and colloidal crystals. Key features: Description of crystals as well as their formation processes and ways to modify them. Examines new ways towards the design of new materials and aids comprehension of the building principles of biominerals. Helps to explain many unus
