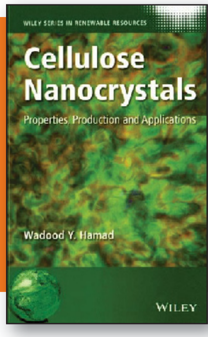


Cellulose Nanocrystals: Properties, Production and Applications

Wadood Y. Hamad

Wiley, 2017
312 pages, $140.00 (e-book $112.99)
ISBN 978-1119968160

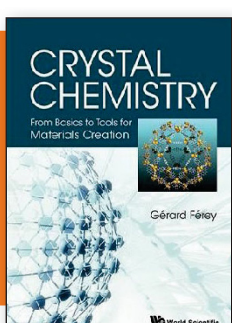
This book is part of the Wiley Series in Renewable Resources. It is an excellent introduction for students, researchers, and newcomers in the field of cellulose material chemistry, properties, and applications as a renewable and green resource. The text introduces readers to the structure, extraction, properties, and applications of the different types of cellulosic nanomaterials processing techniques. The book thoroughly explains the distinct chemistry of cellulose, including the different extraction processing techniques. It provides researchers with comprehensive knowledge supported with illustrations and includes tables of useful materials properties, in particular, mechanical properties. The references are adequate and up to date, and the text is written from the combined perspective of physical chemistry and materials engineering.

The first chapter introduces the historical background of cellulose biopolymer and hierarchical materials as green nanostructured materials that can replace different types of toxic nanostructured materials. The second chapter deals with physical, chemical, anisotropic, and mechanical properties of cellulose fibers and their relationships with structure and morphology. Chapter 3 delves into the fundamentals of hydrolytic extraction of cellulose nanocrystals and their stability. It also introduces reaction kinetics, yield optimization, reproducibility, and different conditions of the extraction processes.

Chapter 4 details different characterization techniques, such as x-ray diffraction, ultraviolet spectroscopy, and nuclear magnetic resonance of cellulose crystalline solids and the relationship between their properties and structure. The chapter also describes the effects of different conditions and/or parameters on the morphology and microstructure of cellulose nanocrystals, such as the effects of sonication, solution concentration, temperature, surface charge, and ionic strength of their suspensions. Chapter 5 covers the different applications of cellulose nanocrystals as a type of green reinforcement in compatible polymer matrix and other composite systems. The chapter also introduces different physical, chemical, and physiochemical methods of surface functionalization of cellulose nanocrystals to increase compatibility with the polymer matrix, depending on the polymer matrices to be used. The chapter includes comments on different modeling theories and factors affecting the mechanical properties of cellulose nanocrystals that reinforce different types of polymer nanocomposites. The book does not include problem sets or homework for students.

Compared to other books on the topic, this book is different in that it focuses on a new type of material dependent on the natural resources of cellulose nanofibers as a kind of green composite material. Overall, this book will serve as an important addition to the libraries of those interested in green composites and renewable resources, and will stimulate interest in a new generation of materials such as green composites and bioinorganic materials friendly to the environment.

***Reviewer: Walid M. Daoush**, Helwan University, Egypt.*



Crystal Chemistry: From Basics to Tools for Materials Creation

Gérard Férey

World Scientific, 2017
200 pages, $98.00 (softcover $55.00)
ISBN 978-981-3144-18-7

This is a book for crystal chemistry lovers. It is beautifully produced and is comprised of seven chapters. The first four are a useful introduction to the topic, and the remaining three delve into different ways of looking at structures, with an emphasis on the concepts of the author and some colleagues (in particular, Michael O'Keeffe, Bruce Hyde, and Sten Andersson). All of the figures are available on the Internet if you show proof of purchase of the book.

Chapter 1 begins with the polyhedral approach to structure building, which is familiar to chemistry undergraduates. This leads to building blocks, cubes, and unit cells. The chapter clearly explains simple cubes, body-centered cubes, face-centered cubes, the seven crystalline systems, and the idea of interstitial sites and radius ratios. Chapter 2 describes symmetry, space groups, and miller indices. This is a good introduction for the following chapters.

A discussion of various common structures begins in chapter 3, starting with rutile. The description includes the joining of polyhedra and the calculation of bond distances. The author is somewhat dismissive of computer programs, and there is no mention of Crystallographic Information Files (CIFs). The latter omission is surprising, as they are required by most publications that include new structures. Today's students need to understand the fundamentals, but also modern methods of crystal chemistry. There is also no mention of TiO_2 polymorphs, anatase and