Book reviews

COTTON FIBER: PHYSICS, CHEMISTRY AND BIOLOGY, edited by David D. Fang, Springer, 2018, 222 pp., ISBN 978-3-030-00870-3

For hundreds of years, cotton was the world's most important manufacturing industry and has played a major role in the way we live today. It is hard to imagine a world without cotton, since grand transformations emerging around 1780 with the Industrial Revolution used the capital, skills, networks, and institutions of the cotton industry. Just to mention a few highlights from cotton's rich history, we have to mention that Boulton and Watt invented the steam engine that was used in a cotton mill; Edison carbonized cotton filament for the development of the electric lamp; Nobel succeeded in obtaining dynamite by the combination of nitroglycerine and nitrocellulose (cotton treated with nitric acid); the development of cellulose nitrate (also known as gun cotton thanks to its explosive nature) – the first artificial plastic material; cotton is used in papermaking for the fabrication of specialty papers and many currencies around the globe.

Cotton fiber is the most important natural fiber used in the textile industry. This book edited by David D. Fang is designed to update the current knowledge on cotton fiber physics, chemistry and biology, which lie at the basis of the three sections of the book. In the physics section, the physical structure of cotton fiber is first illustrated in great detail. In the chemistry section, the chemical composition and modification of cotton fibers are described in detail for better and broader utilization. In the biology section, the utilization of naturally occurring color cottons, molecular biology and genomics for fiber development are studied in great depth.

The introductory chapter, *General Description of Cotton*, discusses general knowledge about the life cycle (from seed to seed) of a cotton plant, fiber development in four distinctive yet overlapping stages (initiation, elongation, secondary cell wall biosynthesis and maturation), harvesting, ginning and cotton products. The origins, distributions and cultivated cotton species are described. In addition, this chapter also provides a brief view of new technologies, such as transgenes and fiber genomics.

The second chapter, *Cotton Fiber Structure*, covers the crystal and molecular structure, as well as some aspects of the supramolecular structure of cellulose in the secondary wall, important characteristics to understand the relations between the structure and performance properties of the fiber.

Chapter 3, *Physical Properties of Cotton Fiber and Their Measurement*, provides an overview of the most important fiber physical characteristics and how they are measured. These properties, *e.g*., length, strength, color, micronaire, fineness, and maturity, are transformed conventionally into parameters that can be measured and utilized in cotton assessment and classification. The advantages and disadvantages of the methods must be understood to properly apply the test methods and to interpret the results.

Chapter 4, *Chemical Composition and Characterization of Cotton Fibers*, outlines the characteristics of cotton fiber chemical composition and structural measurement, together with its physical properties and end-use qualities, and in addition, discusses direct and indirect instrumental methods developed to characterize the fiber cellulose quantitatively or qualitatively in a rapid and non-destructive way, to investigate fiber chemical composition and structure aspects for cotton fiber physiology and breeding applications.

Chapter 5, *Chemical Properties of Cotton Fiber and Chemical Modification*, reviews the chemical properties of cotton fibers and the preparation of cotton textiles for dyeing and chemical finishing, the most important steps to impart the desired functional properties. Treatments for water and oil repellency, antimicrobial properties, UV-protection, wrinkle-resistance and other beneficial treatments, including softening, flame retardancy and bio-polishing, are briefly presented.

Chapter 6, *Color Cotton and Its Utilization in China*, summarizes the progress and achievements of research, production and utilization of naturally colored cotton, which is typically grown as a source of fiber for niche textile markets that promote the use of ecologically friendly cotton in textiles, as an alternative to dying scoured and bleached cotton fibers, in China, USA, Russia, Central Asian Countries, Egypt and Peru. A special emphasis is made on China's case, where cotton scientists, producers and textile processors have made a lot of progress in improving the germplasm and varieties of color cottons, understanding the molecular mechanisms of both fiber color and quality development, optimizing cultivation and production practices, and manufacturing and marketing color cotton products.

The basic understanding of cotton fiber development is still in its infancy; however, in recent years, new information about the genes controlling cotton fiber development has become available.

Chapter 7, *Cotton Fiber Biosynthesis*, describes the recent adoptions of advanced phenotypic techniques, along with the conventional fiber-specific methods, for bridging the gap between the genotypic and phenotypic approaches. It also describes the recent advances in the understanding of upland cotton fiber developments that affect the phenotypes and commercial value of cotton fiber.

Chapter 8, *Cotton Fiber Genes and Stable Quantitative Trait Loci*, summarizes the accomplishments and progress in the area of identifying and characterizing fiber genes according to their primary roles in fiber development. Also, the identification of fiber quantitative trait locus or loci (QTL), which is valuable and practical to breeding, is described. The author also provides a future perspective and states some research gaps that should be future research priorities in order to better understand cotton fiber development and to translate the gained knowledge into practical utilization.

Chapter 9, *Advances in Understanding of Cotton Fiber Cell Differentiation and Elongation*, provides an update on the current understanding of cotton fiber differentiation and elongation, toward elucidating the genetic mechanism of cotton fiber development. A preliminary model of early cotton fiber development has been proposed, and networks of interactions between transcription factors are discussed in this chapter.

The last chapter, *Cotton Fiber Improvement through Breeding and Biotechnology*, summarizes the genetic improvement of cotton fiber quality and offers a glimpse on cotton's future, covering future perspectives of fiber quality improvement, contemporary and emerging technologies in plant breeding and biotechnology for cotton fiber improvement.

This extensive coverage, written by leading experts in the field, makes the book a standard work for students entering this fascinating field of research, but also for chemists, biologists, engineers and investors, who are active in cotton industry and research. All these up-to-date issues are very well structured in the contents of the book, and new information is given for a large area of scientific concern on cotton fiber improvement or use. The references from the various chapters comprise a good bibliography and offer new perspectives and resources for better understanding the field.

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ADVANCES IN NANOSTRUCTURED CELLULOSE-BASED BIOMATERIALS, Neftali L. V. Carreño, Ananda M. Barbosa, Bruno S. Noremberg, Mabel M. S. Salas, Susana C. M. Fernandes, Jalel Labidi, Springer, 44 pp., ISBN 978-3-319-58156-9

For the last decades, nanostructures in the form of nanoparticles, nanofibers, nanotubes, nanorods, nanodisks, nanoribbons, nanowhiskers *etc*., have been investigated with increased interest due to their enormous advantages, such as distinctive geometries, large surface areas and active surface sites, novel physical and chemical properties. Among all nano-scaled materials, cellulose-based resources have attracted tremendous interest in several fields, due to the development of nanotechnology and recent concern about environmental issues to utilize more bio-based nano-materials.

This book highlights the advances and relevant research in nanostructured cellulose in (1) isolation and functional modification, (2) physical, mechanical, thermal and biological properties, (3) development of biomedical application in delivery systems and tissue engineering, (4) potential applications in blood purification, cosmetics, biosensors, immobilization of enzymes, bio-marker, and (5) future perspectives in bioprinting, bioactive films, and other potential applications.

Cellulosic nanoparticles, or nanocellulose, have long been regarded as a laboratory curiosity, but in recent years, the topic has generated an exceptional appeal throughout the world and the body of research in this area has literally exploded, proving they have the potential to play a major role in the development of advanced materials in the 21st century.

Part of the Springer Briefs in Applied Sciences and Technology book series, this is a very important, valuable and concise contribution that ought to be read by all researchers and engineers, new to the field or veterans, who seek a broad understanding of the cellulose focusing on the nanosize world.

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