

C. Mattheck · H. Kubler

WOOD — The Internal Optimization of Trees



Springer

Wood The Internal Optimization Of Trees Springer Series In Wood Science

Voichita Bucur



Wood The Internal Optimization Of Trees Springer Series In Wood Science:

Wood - The Internal Optimization of Trees Claus Mattheck,Hans Kubler,2012-12-06 Here are two physicists looking over the fence of physics getting thrilled by the life and growth of trees taking an altogether different exciting view of wood trees produce wood for their own benefit They do not live for the benefit of man who builds his world using wood as a raw material Timber is revealed in a different light and the reader is taught to stop thinking of it in terms of defective beams and boards Wood only fails as a part of the living tree To us the tree and wood biologists this new definition is a real inspiring challenge which is just what Kubler and Mattheck intended it to be Their answers may seem too simple or little logical to some of us but the authors are not at a loss for sound and solid arguments Their field studies prove the incredible their hypotheses makes us want to get to the bottom of the un proven unbelievable The authors answers and arguments are bold and courageous They arouse our curiosity and force us to fathom the facts It seems as if Kubler and Mattheck wanted to trick us into believing that trees only live and react following mechanical rules and strategies To tell the truth that was what I first suspected the authors of but I was wrong

Springer Handbook of Wood Science and Technology Peter Niemz,Alfred Teischinger,Dick Sandberg,2023-04-01 This handbook provides an overview on wood science and technology of unparalleled comprehensiveness and international validity It describes the fundamental wood biology chemistry and physics as well as structure property relations of wood and wood based materials The different aspects and steps of wood processing are presented in detail from both a fundamental technological perspective and their realisation in industrial contexts The discussed industrial processes extend beyond sawmilling and the manufacturing of adhesively bonded wood products to the processing of the various wood based materials including pulp and paper natural fibre materials and aspects of bio refinery Core concepts of wood applications quality and life cycle assessment of this important natural resource are presented The book concludes with a useful compilation of fundamental material parameters and data as well as a glossary of terms in accordance with the most important industry standards Written and edited by a truly international team of experts from academia research institutes and industry thoroughly reviewed by external colleagues this handbook is well attuned to educational demands as well as providing a summary of state of the art research trends and industrial requirements It is an invaluable resource for all professionals in research and development and engineers in practise in the field of wood science and technology

The Biology of Reaction Wood Barry Gardiner,John Barnett,Pekka Saranpää,Joseph Gril,2014-01-08 The book is a fundamental reference source on reaction wood for wood scientists and technologists plant biologists silviculturists forest ecologists and anyone involved in the growing of trees and the processing of wood It brings together our current understanding of all aspects of reaction wood and is the first book to discuss both compression wood and tension wood Trees produce reaction wood to maintain the vertical orientation of their stems and the optimum angle of each branch They achieve this by laying down fibre cell walls in which differences in physical and chemical structure from those of normal fibres are

expressed as differential stresses across the stem or branch. This process while of obvious value for the survival of the tree causes serious problems for the utilisation of timber. Timber derived from trees containing significant amounts of reaction wood is subject to dimensional instability on drying causing twisting, bending and splitting. It is also difficult to work as timber and for the pulp and paper industry the cost of removing the increased amount of lignin in compression wood is substantial. This has both practical and economic consequences for industry. Understanding the factors controlling reaction wood formation and its effect on wood structure is therefore fundamental to our understanding of the adaptation of trees to their environment and to the sustainable use of wood. The topics covered include Morphology, anatomy and ultrastructure of reaction wood; Cell wall polymers in reaction wood and their biosynthesis; Changes in tree proteomes during reaction wood formation; The biomechanical action and biological functions of reaction wood; Physical and mechanical properties of reaction wood from the scale of cell walls to planks; The detection and characterisation of compression wood; Effects of reaction wood on the performance of wood and wood based products; Commercial implications of reaction wood and the influence of forest management on its formation.

Biochemistry and Molecular Biology of Wood Takayoshi Higuchi, 2012-12-06

Progress in wood chemistry has been related mainly to chemical wood pulping and bleaching and chemical utilization of wood and wood extractives. Methods of wood analysis were developed by Schorger: proximate analysis in 1917 and Dore summative analysis in 1919 and standard methods based on Schorger's method e.g. TAPPI standards. Technical Association of the Pulp and Paper Industry have been widely used for chemical analysis of woods in many countries. Thus it is generally known that wood is composed of about 50% cellulose, 20-35% of lignin, 15-25% of hemicelluloses and variable amounts of extractives. Chemical characterization and efficient utilization of these wood components have been studied in laboratories of wood chemistry and technology in universities and government institutions. In the last decade, biochemistry and molecular biology of microorganisms, animals and plants have greatly progressed. At the same time wood has been recognized as a unique renewable ecomaterial produced by trees using solar energy. In addition, many desirable properties of wood and wood components as biomaterial that affects physiology and psychology in humans have recently attracted attention.

Analytical Methods in Wood Chemistry, Pulping, and Papermaking Eero Sjöström, Raimo Alen, 2013-03-09

In its broadest sense and according to the traditional conception wood chemistry is a comprehensive discipline ranging from fundamental studies to practical applications. The manifold constituents located in different morphological regions in the wood results in an extreme complexity of wood chemistry. Ever more sophisticated endeavors needing fundamental studies and advanced analytical methods are necessary in order to delve deeper into various problems in pulping and papermaking. Gradually new improved analytical methods originally developed for research purposes are currently replacing many of the old routine methods in practical applications. Because of the expanse of the subject an attempt to write a book of this size about analytical methods seems perhaps too ambitious. Of course a whole book series of several volumes would be necessary to cover this topic.

completely However there is undoubtedly a need for a more condensed presentation which does not go into experimental details but is limited to the basic principles of the analytical methods and illustrates their applications The emphasis is on more advanced and potential methods and particularly on those based on different types of spectroscopy and chromatography

Juvenile Wood in Forest Trees Bruce J. Zobel, Jerry R. Sprague, 2012-12-06 The trend in forestry is toward shorter rotations and more complete utilization of trees The reasons are 1 financial pressures to obtain rapid returns on the forestry investment made possible by an earlier harvest 2 enforced harvest of young plantations to maintain a continuing supply of cellulose for mills where wood shortages are experienced 3 thinning young plantations both because they were planted too densely initially and because thinning is done where long rotation quality trees are the forestry goal 4 more intensive utilization is being done using tops and small diameter trees and 5 there is interest in using young juvenile wood for special products because of its unique characteristics and the development of new technologies The largest present day source of conifer juvenile wood is from thinnings of plantations where millions of hectares of pine were planted too densely Because of the better growth rate resulting from improved silviculture and good genetic stock plantations will need to be thinned heavily As a result of this trend young wood makes up an increasingly larger proportion of the total conifer wood supply each year Large amounts of juvenile wood from hard woods are also currently available especially in the tropics and subtropics because of the fast growth rate of the species used which results in shorter rotations and essentially all juvenile wood

Nondestructive Characterization and Imaging of Wood Voichita Bucur, 2013-03-14 This book on the Nondestructive Characterization and Imaging of Wood by Professor Voichita Bucur is truly the most outstanding reference on the subject ever written Since the origins of mankind wood has played a key role in the history of humans and other living creatures ranging from provision of life from trees giving air heat light and food to nourish their bodies to structures to protect them from the elements Wood has also played a key role in one of the world's primary religions Nondestructive diagnostics methods have long found application in medical practice for examination of the human body in order to detect life threatening abnormalities and permit diagnosis to extend life Nondestructive testing has been used for many years to insure the safety of machinery air craft railroads tunnels buildings and many other structures Therefore it is timely for a treatise like the present one to be written describing how wood can be characterized without employing destructive test methods Since wood is so valuable to mankind it is important to know the latest methods to nondestructively characterize wood for all practical applications

Comparative Wood Anatomy Sherwin Carlquist, 2013-03-09 This book is not concerned directly with wood identification although ability to recognize the wood features discussed in the preceding chapters is essential for work in wood identification The present chapter is concerned with how wood characters have been and can be used in taxonomic and phylogenetic studies and also which wood characters are likely or not likely to be useful in general In wood identification a match of an unknown wood with known woods is usually attempted In systematic application of wood

data similarities and differences among species genera and families are assessed usually today in terms of a cladistic analysis. One should be especially cautious in interpreting relation between taxa the woods of which have attained similar evolutionary levels. This possibility is a very real one because so many wood features have evolved similarly in phylads that are not closely related to each other. For example storied wood structure has been attained in a number of phylads independently. By itself storied wood structure cannot be used as an indicator of relationship between two families but a cladogram using a range of phylogenetically reliable features might demonstrate that two families acquired storied structure before divergence a synapomorphy and thereby a strong case for relationship of the two families is made. *Tree Structure and Mechanics Conference Proceedings* Edgar Thomas Smiley, Kim Dean Coder, 2002. *Association Between Lignin and Carbohydrates in Wood and Other Plant Tissues* Tetsuo Koshijima, Takashi Watanabe, 2013-03-09. Throughout the world 10 million tons of wood are used every year for paper making cellulose preparations tobacco filters cloth and dietary supplements. Wood is mainly composed of polysaccharides and lignin which are hydrophilic and hydrophobic respectively. This book describes the academic approaches to native bonds between lignin and the carbohydrates in wood and other plants. The roles of lignin carbohydrate complexes are discussed for practical use and wood processing. The authors describe the close relationship between lignin carbohydrate complexes and biobleaching of kraft pulp and the residual lignin in kraft pulp and their contribution to benzylated wood foaming. In addition they introduce the artificial lignin carbohydrate bond formation and an enzymic degradation of lignin carbohydrate bonds.

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