

The Complete Technology Book on Wood and Its Derivatives

Author: NIIR Board of Consultants & Engineers

Format: Paperback

ISBN: 8186623922

Code: NI146

Pages: 502

Price: Rs. 1,100.00 US\$ 125.00

Publisher: National Institute of Industrial Research

Usually ships within 3 days

Wood has been used for hundreds of thousands of years for both fuel and as a construction material. Wood is an organic material, a natural composite of cellulose fibers (which are strong in tension) embedded in a matrix of lignin which resists compression. In the strict sense wood is produced as secondary xylem in the stems of trees (and other woody plants). Wood is used for millennia for many purposes, primarily as a fuel or as a construction material for making houses, tools, weapons, furniture, packaging, artworks, and paper. Wood is composed of cells, and the cell walls are composed of micro fibrils of cellulose and hemicellulose impregnated with lignin. The derivation of chemicals from wood is carried out wherever technical utility and economic conditions have combined to make it feasible. In a living tree it performs a support function, enabling woody plants to grow large or to stand up for themselves. It also mediates the transfer of water and nutrients to the leaves and other growing tissues. Wood may also refer to other plant materials with comparable properties, and to material engineered from wood, or wood chips or fiber. Wood and man have coexisted on this planet from the beginning and wood, as a renewable resource, has provided man with tools, weapons and shelter. Wood, when dry, has unique physical properties in that its tensile strength, bending strength, compression strength, impact resistance and hardness per unit weight are the highest of all construction materials. Wood polymer composites (WPC) are materials in which wood is impregnated with monomers that are then polymerized in the wood to tailor the material for special applications. The resulting properties of these materials, from lightness and enhanced mechanical properties to greater sustainability, has meant a growing number of applications in such areas as building, construction and automotive engineering. Other uses of wood in furniture, buildings, bridges, and as a source of energy are widely known. Wood is perhaps the most used component in our daily life, from home building and furnishings to everything from the tables to the doors are made of wood, and for the people living in colder climates, wood holds even greater importance.

Some of the fundamentals of the book are wood structure and chemical composition, chemical change in wood associated with wood fiberboard manufacture, chemical changes in wood effected by furnish preparation processes, bark extracts as bonding agent for particle board , wood polymer composites and their industrial applications , chemical reactions of preservatives with wood, activation of wood surface and nonconventional bonding , chemistry of weathering and protection , weathering of chemically modified woods, energy and chemicals from wood, charcoal and other chemicals, etc.

The developments in wood industry in the country are mainly attributed to the pioneering work carried in the field of wooden products. There are lots of chemicals and other products extracted from wood. This book contains processes of various wooden products and its derivatives. This is the first book of its kind which is invaluable resource to research scholars, entrepreneurs, technocrats, institutes, libraries and existing one.

Contents

1. Wood: Structure and Chemical Composition
 - Gross Anatomical Features
 - Softwood Anatomy
 - Hardwood Anatomy
 - Cell Wall Structure
 - Chemical Composition of Cell Wall
2. Chemical Change in Wood Associated with Wood Fiberboard Manufacture
 - Furnish Preparation Processes
 - Wet Form Process Using Pressurized Refining.
 - Chemical Changes in Wood Effected by Furnish Preparation Processes
 - Board Conversion Processes
 - Wet Strength Properties of Hot Pressed Boards
 - Mechanism of Wet Strength Properties
 - Chemical Changes in Wood Effected by Board Conversion
3. Review of Particleboard Manufacture and Processing
 - Definition
 - Materials
 - Manufacturing
 - Particle Drying
 - Blending
 - Mat Formation
 - Finishing
 - Conclusion
4. Bark Extracts as Bonding Agent for Particle board
 - Material and Preparation
 - Bark Extracts
 - Three Layer Particleboard
 - Testing
5. Composition Boards Containing Bark
 - Amounts of Bark Available
 - Review of Efforts to Use Bark in Composition Boards
6. Polyurethane Foams from the Reaction of Bark and Diisocyanate
7. Wood Polymer Composites and their Industrial Applications
 - Chemistry of the Process
 - Impregnation Process
 - Monomers For Wood Polymer Composites
 - Physical Properties
 - Commercial Applications
 - Radiation Process.
 - World Wide Production
8. Interaction of Preservatives with Wood
 - Major Use Wood Preservatives
 - Minor Use Wood Preservatives
 - Copper Naphthenate.
 - Copper 8 Quinolinolate (Copper 8)
 - Tributyltin Oxide.
 - New Wood Preservatives
 - Preservative Distribution in Wood
 - Macrodistribution
 - Chemical Reactions of Preservatives with Wood

Inorganic Salt Preservatives.

Organic Preservatives

9. Chemistry of Adhesion

Thermoplastic and Thermosetting Polymers

Molecular Forces Between Adherend and Adhesive

Adhesives for Wood

Phenolic Resin Adhesives

Resoles

Novolak

Resorcinol Resins

Durability and Fracture Toughness

Urea Formaldehyde and Melamine Formaldehyde Resins

Isocyanate Based Adhesives

Thermoplastic Adhesives

Hot Melt Adhesives

Acidity of Wood

10. Activation of Wood Surface and Nonconventional Bonding

Conditions and Methods of Wood Surface Formation.

Direct Covalent Wood to Wood Bonding

Bonding Through Intermediacy of Bifunctional Molecules

Bonding by Intermediacy of a Covalently Attached Polymer

Use of Oxidants

Fundamental Studies

Surface Activation.

Hydrogen Peroxide Activation

Plasma Activation

Other Oxidizing Activators

Nonconventional Bonding

Direct Bonding

Bifunctional Amines

Bifunctional Acids

Bifunctional Isocyanates

Polymers

Conclusions

Addenda

Wood Surface Studies

Nonconventional Bonding with Acid Activation

Nonconventional Bonding with Oxidant Activation

Isocyanates

Nonpolar Nonconventional Binders

Other Methods

Patents

11. Chemistry of Weathering and Protection

Backgrounds

General Aspects of Wood Weathering

Anatomic Structure of Wood and Its Weatherability

Weathering Factors

Other Factors

Penetration of Light and Wood Surface Deterioration

Property Changes During Weathering

Chemical Changes

Colour Changes

Physical Changes
Microscopic Changes
Transverse Section
Radial Section
Tangential Section
Weathering of Wood Based Materials
Plywood
Reconstituted Panel Products
Weathering of Chemically Modified Woods
Free Radical Reactions in Lignin
Free Radical Characteristics and Reactions in Weathered
Participation of Singlet Oxygen in the Weathering Process
Protection Against Weathering
Film Forming Finishes
Varnishes
Natural Wood Finishes
Film Forming
Penetrating
Transparent
Semitransparent
Protection of Wood Based Materials
Wood Coating Interactions
Summary and Future Considerations
12. Biological Decomposition of Solid Wood
Susceptibility and Resistance
Types of Wood Deterioration
Deterioration without Decomposition.
Deterioration with Decomposition
Mechanobiochemical Decomposition
Biochemical Decomposition: The Wood Decays
Types of Decay
Progressive Changes in Chemical Composition
Progressive Changes in Strength Properties
Cellulose Decomposition
Hemicellulose Decomposition
Lignin Decomposition
Control and Uses of Wood Decomposing Organisms
Uses and Potential Uses
13. The Chemistry of Pyrolysis and Combustion
Formation of Volatile Products from Cellulose
First Pathway

Second Pathway
Dehydration Reactions
Formation and Properties of Char
Char Formation
Char Reactivity
Combustion
Combustibility
14. Chemistry of Fire Retardancy
Early Studies
Protection of Wood with Fire Retardants
Thermogravimetric Analysis (TG).

Differential Thermal Analysis and Differential Scanning Calorimetry

Tunnel Flame Spread Tests

Critical Oxygen Index Test

Test Methods for Related Properties

Smoke Production.

Heat Release Rate

Toxicity

Meehanisms of Fire Retardancy

Chemistry of Burning

Vapor phase Combusttion

Smoldering And Glowing

Theories of Fire Retardancy

Barrier Theories

Thermal Ttheories

Dilution or Noncombustible Gases Theories

Free Radical Trap Theories

Increased Char/Reduced Volatiles Theories

Reduced Heat Content of Volatiles Theories

Phosphorus Nitrogen Synergism Theories

Smoldering Inhibition Theories

Fire Retardant Formulations

Major Chemicals

Aluminum Trihydrate

Miscellaneous Chemicals

Leach resistant Chemicals

Amino resins

Future Research

Leach Resistant Compounds

Improved Fire Retardant Treatments for Panel Products

Effective Coating Systems

Reduced Smoke and Toxicity

Basic Mechanisms. Finally, further work

Summary

Mechanism.

Formulations

Future Research

15. ENERGY AND CHEMICALS FROM WOOD

Alternate Energy Sources

Avaiilable Forest Residues

Energy and Fuels from Wood

Direct Combustion

Sacchari fication Fermentation

Ethanol from wood

Thermal Decomposition

Charcoal and other Chemicals

Thermochemical Liquefaction

Furfural from Wood

Fiberbooard, particleboard, and flskeboard

Plywood

Laminated Lumber

Industrial Use of Energy

Energy Plantations

About NIIR

NIIR PROJECT CONSULTANCY SERVICES (NPCS) is a reliable name in the industrial world for offering integrated technical consultancy services. NPCS is manned by engineers, planners, specialists, financial experts, economic analysts and design specialists with extensive experience in the related industries.

Our various services are: Detailed Project Report, Business Plan for Manufacturing Plant, Start-up Ideas, Business Ideas for Entrepreneurs, Start up Business Opportunities, entrepreneurship projects, Successful Business Plan, Industry Trends, Market Research, Manufacturing Process, Machinery, Raw Materials, project report, Cost and Revenue, Pre-feasibility study for Profitable Manufacturing Business, Project Identification, Project Feasibility and Market Study, Identification of Profitable Industrial Project Opportunities, Business Opportunities, Investment Opportunities for Most Profitable Business in India, Manufacturing Business Ideas, Preparation of Project Profile, Pre-Investment and Pre-Feasibility Study, Market Research Study, Preparation of Techno-Economic Feasibility Report, Identification and Section of Plant, Process, Equipment, General Guidance, Startup Help, Technical and Commercial Counseling for setting up new industrial project and Most Profitable Small Scale Business.

NPCS also publishes various process technology, technical, reference, self employment and startup books, directory, business and industry database, bankable detailed project report, market research report on various industries, small scale industry and profit making business. Besides being used by manufacturers, industrialists and entrepreneurs, our publications are also used by professionals including project engineers, information services bureau, consultants and project consultancy firms as one of the input in their research.

NIIR PROJECT CONSULTANCY SERVICES , 106-E, Kamla Nagar, New Delhi-110007, India. **Email:** npcs.india@gmail.com **Website:** NIIR.org

Mon, 23 Apr 2018 01:41:34 +0530