The Complete Technology Book on Wood and Its Derivatives

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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.

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 Blendina 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 Bifungtional 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 Mecha nobiochemical 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 Patbway 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 Theories 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 Trihvdrate **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 Fiberboaard, particleboard, and flskeboard Plywood Laminated Lumber Industrial Use of Energy **Energy Plantations**

About NIIR

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

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