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Nota di contenuto	The Nanoscience and Technology of Renewable Biomaterials; Contents; Preface; Acknowledgements; Contributors; 1 A Fundamental Review of the Relationships between Nanotechnology and Lignocellulosic Biomass; 1.1 Introduction; 1.2 Use of Lignocellulosic-based Materials; 1.3 Green Chemistry and Green Engineering; 1.4 Nanotechnology; 1.5 Nanotechnology-enabled Product Possibilities; 1.6 Wood Nanodimensional Structure and Composition; 1.7 Nanomanufacturing; 1.8 Nanotechnology Health and Safety Issues; 1.9 Instrumentation, Metrology, and Standards for Nanotechnology 1.10 A Nanotechnology Agenda for the Forest Products Industry1.11 Forest Products Industry Technology Priorities; 1.12 Nanotechnology Priority Areas to Meet the Needs of the Forest Products Industry; 1.12.1 Achieving Lighter Weight, Higher Strength Materials; 1.12.2 Production of Nanocrystalline Cellulose and Nanofibrils from Wood; 1.12.3 Controlling Water/Moisture Interactions with Cellulose; 1.12.4 Producing Hyperperformance Nanocomposites from Nanocrystalline Cellulose; 1.12.5 Capturing the Photonic and Piezoelectric Properties of

Lignocelluloses

1.12.6 Reducing Energy Usage and Reducing Capital Costs in Processing Wood to Products
1.13 Summary; References; 2 Biogenesis of Cellulose Nanofibrils by a Biological Nanomachine; 2.1 Introduction; 2.2 Background; 2.3 Cesa Protein is a Major Component of the Plant CSC; 2.4 The Functional Operation of the CSC; 2.4.1 Assemble with Genetically Determined Morphology; 2.4.2 Stabilize in Operational Form in the Plasma Membrane; 2.4.3 Acquire UDP-Glucose Substrate; 2.4.4 Polymerize Glucose with -1,4-Linkage; 2.4.5 Operate so that Fibrils Emerge Outside the Plasma Membrane
2.4.6 Control Cellulose Chain Length
2.4.7 Control Cellulose Nanofibril Diameter; 2.4.8 Control Crystallization?; 2.4.9 Move in the Plasma Membrane as it Spins out Cellulose Nanofibrils; 2.5 Phylogenetic Analysis; 2.5.1 Possible Functional Diversification of CS Proteins; 2.6 Conclusion; References; 3 Tools for the Characterization of Biomass at the Nanometer Scale; 3.1 Introduction; 3.2 Water in Biomass; 3.3 Measurement of Specific Biomass Properties; 3.3.1 Pore Structure and Accessibility; 3.3.2 Cellulose Crystallinity; 3.4 Microscopy and Spectroscopy; 3.4.1 Specimen Preparation
3.4.2 Scanning Probe Microscopies
3.4.3 Focused Beam Microscopies; 3.4.4 Transmission Electron Microscopy; 3.5 Summary; References; 4 Tools to Probe Nanoscale Surface Phenomena in Cellulose Thin Films: Applications in the Area of Adsorption and Friction; 4.1 Introduction; 4.2 Polyampholytes Applications in Fiber Modification; 4.3 Cellulose Thin Films; 4.4 Friction Phenomena in Cellulose Systems; 4.5 Lubrication; 4.6 Boundary Layer Lubrication; 4.6.1 Thin Films: Property Changes and Transitions; 4.6.2 Orientation of Lubricant Films; 4.7 Techniques to Study Adsorption and Friction Phenomena
4.8 Surface Plasmon Resonance (SPR)

Sommario/riassunto

The unique nanoscale properties of renewable biomaterials present valuable opportunities in the field of nanoscience and technology. Lignocellulosic biomass is an important industrial resource which can be used for the production of highly efficient and environmentally sustainable nanomaterials. The Nanoscience and Technology of Renewable Biomaterials presents the latest advances in biomass nanotechnology, including leading research from academia and industry, as well as a future vision for the nanotechnology of forest products. Topics covered include: A fun
