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Book review

Chimie du bois

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According to the importance of global climate change and the necessity to accelerate the use of renewable resources, the opportunity to offer the scientific community an educational book on the last knowledge of wood chemical components has to be appreciated. "*Chimie du bois*" is the first wood chemistry book written in French. It permits a better access to wood chemistry for many actors from the French community like undergraduate and postgraduate students but also engineers, scientists... Authors have focused their interest on the "pedagogical" (educational) descriptions of the main wood constituents with a high scientific level. The book is divided in six chapters.

The first one is a summary of the basic chemical structure properties. Authors briefly describe the main properties of molecules (stereoisomerisms, optical activity, configuration and nomenclature). Stereochemistry information gives basic knowledge to understand following molecular properties of chemical components of wood. Because sugars are the most important molecules in nature and represent up to 75% of wood, authors have chosen to give details on their main monomers properties: from their structure and origin, until their most important reactions (carbonile reactivity, hemiacetal and ether formations, oxidations...). The sugar description is followed by an introduction to polysaccharide. Polymer properties and analytical methods are described at the end of the first chapter. Authors clearly summarise each technology, from chromatography to spectroscopy until microscopy. For complementary information readers may improve their knowledge on each method mentioned in specialized analytical chemistry books.

The second chapter describes wood anatomy, from macroscopic level to ultra structure. Differences of organisation between softwood and hardwood are clearly described. Authors insist on the anatomical variability between species and intra tree, indicating the high level of complexity of wood materials. For each level of description (from macro to microscopy), authors argue descriptions through various experimental results obtained on softwood or hardwood research. Original photography helps to understand the interrelationship between fibers, parenchyma and also micro fibrils orientation and its rule in cell walls. The different kinds of wood (sapwood, heartwood, reaction wood) are described and complementary information on the relationship between mechanical properties, polymer and ultra structure are mentioned.

The third chapter concerns the most important natural polymer in the world: cellulose. It is also the first polymer in wood with 40 to 50% (w/w) of constituents. Last knowledge on descriptive models of cellulose ultra structure is clearly represented. Conditioned by hydrogen links between hydroxyl groups, crystalline structures explain the high level of performance of microfibrils. The authors give details on crystalline organisations and the influence of cellulose on it at a molecular level. They also present the association of cellulose chains to elementary "fibril", protofibril and microfibril. After explaining properties of solubilisation by alkali treatment, authors complete this chapter by cellulose reactivity (oxidation, estherification, etherification).

Hemicelluloses are described in the fourth chapter. Opposite to cellulose, these polysaccharides are more complex and built with different kinds of elementary sugars such as pentose, hexose, uronic acid and desoxyaldoses. They constitute between 25 to 30% (w/w) of wood materials. The most important hemicelluloses observed in temperate trees (hardwood and softwood) are described. For each category authors detail chemical structures and properties. As in the previous chapter, they illustrate descriptions by many examples observed in various species and its importance in systems of wood transforming (like pulp production or thermal treatment). Last knowledge on localization in wood and exudates are also mentioned.

Chapter 5 is dedicated to the second most important wood polymer (25–35% w/w): lignin. If the biosynthesis of lignin is coming from glucose by a shikimic acid pathway the three basic phenolic alcohols (synapil, para-coumaryl and coniferyl alcohols) constitutive of lignin have particular properties. Authors give many details on polymerisation pathways and specific links inside lignin and between lignin and polysaccharides. These descriptions allow to clearly understand the importance of lignin in wood mechanical properties and durability. This chapter also describes major lignin photo degradation mechanisms and its different industrial uses. Authors mention the main interest of bio refinery using formic acid and alcohol (or acetic acid). The last

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innovating approach in that field on hardwood and agriculture wastes (for example, Delmas, 2008) may give new opportunities for improvement of paper production and wood polymers valorisation.

The last chapter is dedicated to extractives. A detailed description of polar and no polar compounds, monomers and higher molecular weight compound is done. Authors have focused their interest on tannins (condensed and hydrolysable) and terpenes. As for the other chapters, extractives localization in wood, their role and potential uses for economy or medicine are mentioned.

Readers, student or professional, will find in this book the main parts of wood chemistry knowledge. The authors have made an important effort to give an up to date synthesis on wood chemistry and more widely basic knowledge for bio valorisation of lignocellulosic renewable material.

Delmas M., 2008. Vegetal refining and agrichemistry. Chem. Eng. Technol. 31: 792–797.

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