11th World Congress on Computational Mechanics (WCCM XI)
5th European Conference on Computational Mechanics (ECCM V)
6th European Conference on Computational Fluid Dynamics (ECFD VI)
July 20 - 25, 2014, Barcelona, Spain

A water state study in the wood structure of four hardwoods below fiber saturation point by NMR technique

Leandro Passarini[1], Cédric Malveau[2] and Roger Hernández[3]

[1] Ph.D. Student, Centre de recherche sur les matériaux renouvelables, Département des Sciences du bois et de la Forêt, Université Laval, Pavillon Gene-H. Kruger, 2425, rue de la Terrasse, Québec, QC, Canada, G1V 0A6. E-mail: leandro.passarini.1@ulaval.ca

[2] Research Assistant, Laboratoire de RMN, Département de Chimie, Université de Montréal, Pavillon Roger-Gaudry (PRG), 2900, boul. Édouard-Montpetit, Montréal, QC, Canada, H3T 1J4. Email: cedric.malveau@umontreal.ca

[3] Professor, Centre de recherche sur les matériaux renouvelables, Département des Sciences du bois et de la Forêt, Université Laval, Pavillon Gene-H. Kruger, 2425, rue de la Terrasse, Québec, QC, Canada, G1V 0A6. E-mail: roger.hernandez@sbf.ulaval.ca

Key Words: *Nuclear Magnetic Resonance, Hardwoods, Anatomical Structure, Fiber Saturation Point, Equilibrium Moisture Content, Bound Water, Liquid Water.*

The nuclear magnetic resonance (NMR) technique is a useful, powerful, and non-invasive tool to study the dynamics of the wood-water relations in detail, both quantitatively and qualitatively. The main objective of this work was to use the NMR technique to characterize the state of water below fiber saturation point (FSP). Two tropical hardwood species, namely huayruro (*Robinia coccinea* Aublet) and cachimbo (*Cariniana domesticata* (C. Martius) Miers), a plantation grown eucalyptus species (*Eucalyptus saligna* Smith), and a temperate species red oak (*Quercus rubra* L.) were used for this study. These species were chosen considering their diversity of anatomical and physical properties. Desorption tests were carried out at 21°C in a single step procedure from full saturation state for huayruro, cachimbo, and red oak and from green condition for *E. saligna*. Discrete T_2 times were obtained for each species and equilibrium moisture content (EMC). The results showed that even under EMC, there is a region in the hygroscopic range where the loss of bound water takes place before all liquid water was drained, contradicting the concept of FSP. This region will vary according to wood species. Furthermore, T_2 times can give information on how bound water is distributed and arranged in cell wall sorption sites.