Parametric Study on Wood Impregnation Process

Mariana Frias[1], Pierre Blanchet[1], Andre Begin-Drolet[1]

[1]Laval University

Abstract :

Wood is a renewable resource that has been used as material in interior design products for years. Despite its superior mechanical resistance, different modification processes were developed in order to enhance wood's hardness and make it an even more durable material. Impregnating wood pores with a monomer solution is a common method for that purpose. However, most implemented impregnation processes can be considered wasteful both on used materials and process duration. The comprehension of the parameters that influence monomer penetration through wood may enable an optimization of the process and the chemical impregnation in a specific location of interest in wood instead of the entire piece.

For this study, monomer solutions were disposed on the surface of thin samples of hardwood species under different conditions. The analyzed parameters were the pore pattern of each species, the level of vacuum applied in the process and the viscosity of the monomer solution. After the impregnation process, the weight gain of the samples was calculated, and the penetration depth of the fluid was evaluated through density profiles and micro X-ray tomography imaging.

Results showed that surface density of wood was increased after the monomer impregnation for all conditions and that the introduction of a level of vacuum for a short period of time already enhanced the penetration depth. Samples imaging and 3D digital reconstruction allowed the comprehension of the process allied to the anatomy of wood. It made it possible to observe that the preferred path of a fluid in wood is through the longitudinal direction but that it can also permeate through the vessel's pits and flow into deeper vessels only with surface impregnation as opposed to industrial's current method of submerging wood pieces into chemicals. An improved impregnation process would make the use of wood products an even smarter and more sustainable choice.