

Fluorination Renders the Wood Surface Hydrophobic without Any Loss of Physical and Mechanical Properties

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Abstract : The availability, the ecologic and economic characteristics of wood are advantages which explain the very wide scope of applications of this material, in several domains such as paper industry, furniture, carpentry and building. However, wood is a hygroscopic material highly sensitive to ambient humidity and temperature. The swelling and the shrinking caused by water absorption and desorption cycles lead to crack and deformation in the wood volume, making it incompatible for such applications. In this study, dynamic fluorination using F₂ gas was applied to wood samples (douglas and silver fir species) to decrease their hydrophilic character. The covalent grafting of fluorine atoms onto wood surface through a conversion of C-OH group into C-F was validated by Fourier-Transform infrared spectroscopy and ¹⁹F solid state Nuclear Magnetic Resonance. It revealed that the wood, which is initially hydrophilic, acquired a hydrophobic character comparable to that of the Teflon, thanks to fluorination. A good durability of this treatment was also determined by aging tests under ambient atmosphere and under UV irradiation. Moreover, this treatment allowed obtaining hydrophobic character without major structural (morphology, density and colour) or mechanical changes. The maintaining of these properties after fluorination, which requires neither toxic solvent nor heating, appears as a remarkable advantage over other more traditional physical and chemical wood treatments.

Keywords : cellulose, spectroscopy, surface treatment, water absorption

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