

Furfurylation of *Pinus pinaster* Wood

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ABSTRACT

Furfurylation was tested with maritime pine wood (*Pinus pinaster* Aiton,) which is the most important pine species in Portugal. The wood was treated with a furfuryl alcohol mixture (FA 70 mix) at Kebony Products DA in Norway, in an autoclave using vacuum and pressure stages and subsequently cured and dried in a vacuum drying kiln. Both heartwood and sapwood were treated, with weight percent gains of 38% and 23% respectively. There were no significant changes on MOE and bending strength. Janka hardness increased 56% and 49%, on radial and tangential sections, respectively. Equilibrium moisture content decreased in the sapwood from 8.9 to 5.1% (at 35% relative humidity), from 12.9 to 7.3% (at 65%) and from 17.3 to 9.0% (at 85%). In heartwood the moisture decrease was very small. The dimensional stability of sapwood increased with ASE35 35.6 and 41.8%, ASE65 29.0 and 43.4% and ASE85 31.4 and 45.1% for radial and tangential directions respectively. The improvements for heartwood were smaller and only significant in the tangential direction and at the higher relative humidity values: ASE65 was 12.3 and 22.4% and ASE 85 10.5 and 24.8% for radial and tangential directions, respectively.

INTRODUCTION

Wood modification by either thermal, chemical, surface or impregnation modification processes has grown significantly in the last few years. Furfurylation is often considered an impregnation modification since it is believed, although not unanimously, that there are no chemical bonds between furfuryl alcohol and wood. Lande *et al.* (2004a) suggested the grafting between lignin and furfuryl alcohol but Venås *et al.* (2006) found no proof of such linkages on treated wood using ATR-IR spectroscopy. Alfred Stamm (1977) first suggested the use of furfuryl alcohol to modify wood but the process used zinc chloride as catalyst and was not suitable for lumber-size material due to a chromatographic separation when the catalyst solution penetrated the wood. Recently Schneider (1995) and Westin (1995) developed similar processes with new catalysts based on cyclic carboxylic anhydrides. *Pinus pinaster* is the most important forest species in Portugal and pine wood is considered as having low durability and high dimensional instability. It is commonly preserved by traditional impregnation with biocides but the increased restrictions cause apprehension on preservation companies. Furfurylation is one of the potentially more competitive wood modification processes. Because furfuryl alcohol can be obtained from furfural which is a secondary product in the production of bioethanol, its price is expected to lower considerably with increasing