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Feasibility study on three furfurylated non-durable tropical wood species evaluated for resistance to brown, white and soft rot fungi

Thomas Mark Venås
Danish Technological Institute
Timber & Textile
Gregersensvej
DK-2630 Taastrup, Denmark

Andrew H. H. Wong
Universiti Malaysia Sarawak
Faculty of Resource Science and Technology
94300 Kota Samarahan
Sarawak, Malaysia

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IRG SECRETARIAT
Box 5609
SE-114 86 Stockholm
Sweden
www.irg-wp.com

Feasibility study on three furfurylated non-durable tropical wood species evaluated for resistance to brown, white and soft rot fungi

Thomas Mark Venås[1] and Andrew H. H. Wong[2]

[1]Danish Technological Institute, Timber & Textile, Gregersensvej, DK-2630 Taastrup, Denmark, thomas.venaas@teknologisk.dk

[2]Universiti Malaysia Sarawak, FRST, 93400 Kota Samarahan, Sarawak, Malaysia, awong.unimas@gmail.com

ABSTRACT

Furfurylation can protect non-durable wood species against biological degradation, but the method used today cannot fully protect the heartwood of Scots pine due to insufficient penetration. In order to test alternative wood substrates for furfurylation, three Malaysian grown wood species (Kelempayan, Rubberwood and Sena) were furfurylated and subjected to soil block decay testing. Their performance was compared to furfurylated Scots pine and furfurylated Beech modified using the same process. In addition, treatment characteristics were evaluated. One of the species tested, Kelempayan, seems to be a promising substrate for furfurylation. Kelempayan is easy to impregnate in both sap- and heartwood, and a 50% higher weight gain was reached using equivalent amounts of impregnation solution compared to Scots pine. Sena, Rubberwood and Beech returned weight gains 40-60% lower than Scots pine. Decay protection was largely comparable at equivalent weight percent gains for all wood species tested, although differences appeared. Generally, a weight gain of approximately 25% by furfurylation seems to offer good protection in the chosen soil block test.

Keywords: Kelempayan, Sena, Rubberwood, furfurylation substrate, decay resistance

1. INTRODUCTION

Modification of solid wood with an initiated furfuryl alcohol monomer that is subsequently cured to yield an inert polymer resin inside the cell wall structure, has for a long time been known to provide changes in wood properties. Increased durability towards acids and alkali was one of the first fields of interest (Goldstein 1955), but also improved mechanical properties (Goldstein and Dreher 1960), dimensional stability (Stamm 1964) and thereby improved biological durability was found some forty to fifty years ago in several studies. A lot of effort was put into development of a stable, low viscosity impregnation solution which could penetrate evenly into the wood cell wall (Goldstein and Dreher 1960). A range of acidic catalysts was tested, but $ZnCl_2$ was superior concerning storage life of the mixed solution (Goldstein and Dreher 1960) and because of this - combined with a reasonable polymer yield - it was the preferred choice. This metal salt however had a negative influence on the long term strength properties of cellulose (Schneider 1995). Moreover, the distribution of polymeric furfuryl alcohol in the wood cell wall was uneven in larger samples (Schneider 2002b). In the 1990's two research groups simultaneously developed new and better adapted catalytic systems for furfurylation which later on made it possible to market furfurylated wood (Lande *et al.* 2004b).