ABSTRACT

The Humidity Characterisation and Dimensional Stabilisation of some Tropical Woods

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The use of indigeneous materials and in particular the development of techniques to utilise such materials are critical factors to the economies of most developing countries. In Trinidad and Tobago there are over thirty (30) species of timber of economic importance but there is a general reluctance to use local timber largely because of warping and splitting in spite of the application of conventional seasoning and drying techniques. The short-term effects of Relative Humidity (RH) changes on several species of local timber have been studied experimentally and analytically. The results have shown that they may be dimensionally stabilised by heat treatment.

Whereas increasing RH generally leads to expansion and decreasing RH leads to contraction it has been found that under certain conditions increase in relative humidity leads to contraction. This is attributed to the nature of internal stresses in the samples. In addition, it has been shown that the adsorption and desorption curves both for moisture content (MC) and dimensional change (DC) exhibit

hysteresis effects on cycling the RH. These effects are not only species specific but also anisotropic. Cross-correlation of the MC and DC data with microscopic parameters obtained from the light and electron microscopic studies show that pores are more important to the adsorption/desorption process than fibres. The results of this project show that the reduction in adsorption/desorption which is responsible for dimensional stabilisation can be achieved both by heat treatment and multiple cycling of RH at room temperature.

Application of analytical techniques; 'best' fit curves, A-index, characteristic vector analysis and Hailwood - Horrobin (HH) theory to the data indicates that the moisture adsorption and desorption processes are mediated by distinctly different mechanisms. This has been confirmed by diffusion studies which indicates that the diffusion coefficients are larger for desorption than for adsorption.