Micro-Analysis of Copper-Chrome-Arsenic Preservative Treated Malaysian Hardwoods by Nuclear Microscopy

by

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SUMMARY

The novel nuclear microscopy, essentially the particle-induced X-ray emission (PIXE) system, was used to study the macro-distribution and micro-analysis of copper-chrome-arsenic (CCA) preservative in Malaysian hardwoods *Koompassia malaccensis*, *K. excelsa, Alstonia* spp. and *Dipterocarpus* spp., and a temperate pinewood *Pinus sylvestris*, where the preservative retention varied between these timbers. The results revealed that preservative macro-distribution patterns and the relative quantities of the constituent elements copper, chromium and arsenic deposited in the parenchymatous tissues, fibres and tracheids of these timbers support the general observations in wood using electron-induced X-ray emission (EIXE) linked with electron microscopy. However, the considerably greater analytical sensitivity of PIXE, among other advantages of the novel system, would make it a potentially valuable tool for wood preservation research.

Key words: Nuclear microscopy, PIXE, CCA preservative, micro-analysis, Malaysian hardwoods.

INTRODUCTION

The electron-induced X-ray emission (EIXE) imaging and analysis of heavy metal-based wood preservatives in anatomical sections of wood has greatly facilitated an understanding of preservative distribution in treated wood in relation to susceptibility to fungal attack, mainly soft rot (e.g. Greaves & Nilsson 1982, Daniel & Nilsson 1987). The energy-dispersion X-ray analysis (EDXA or EDX) in conjunction with electron microscopy (SEM or TEM) is a predominant EIXE tool for such applications (e.g. Drysdale *et al.* 1980). However, the inherently high background characteristics of EDXA systems on bulk wood sections, affecting the sensitivity of low level detection of copper-chrome-arsenic (CCA) preservative in the anatomical wood structure, makes comparative CCA preservative micro-distributions between anatomical features of a wood material inconclusive.

While TEM-EDXA, using ultra-thin sections, is preferred to SEM-EDXA in overcoming the above resolution problems caused by complicating electron backscattering (bremsstrahlung

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