DYNAMIC YOUNG'S MODULUS, MORPHOLOGICAL, AND THERMAL STABILITY OF 5 TROPICAL LIGHT HARDWOODS MODIFIED BY BENZENE DIAZONIUM SALT TREATMENT

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In this study the tropical light hardwood species jelutong (*Dyera costulata),* terbulan *(Endospermum diadenum*), batai (*Paraserianthes moluccana),* rubberwood (*Hevea brasiliensis)*, and pulai (*Alstonia pneumatophora*) were treated with benzene diazonium salt to improve their dynamic Young's modulus (E_d), and thermal stability. Benzine diazonium salt reacted with cellulose in wood and produced 2,6-diazocellulose by a coupling reaction, as confirmed by Fourier transform infrared (FTIR) spectroscopy. Values of E_d were calculated from the free-free flexural vibration method and found to increase on treatment. The morphological properties were studied by FTIR and scanning electron microscopy (SEM) and found to be changed. Thermal properties of treated wood samples were evaluated by thermogravimetric analysis (TGA) and differential scanning calorimetry (DSC). The treated wood samples exhibited an increased thermal stability relative to the untreated wood samples; this increase may be related to the formation of 2, 6-diazo cellulose compound.

Keywords: *Dynamic Young's modulus; Thermal stability; FTIR; Tropical wood*

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INTRODUCTION

Wood is a renewable resource and one of the most fascinating materials because of its complex structure and wide application on earth. Solid wood is a preferred building and construction material due to its physical, mechanical, and very aesthetically pleasing performances. But wood has some drawbacks: its physical and chemical properties readily are changed through environmental factors such as light, water, temperature, and biological organisms, which are the main limits for its outdoors and indoors application (Yalinkilic et al. 1999; Chao et al. 2003; Brelid et al. 2000; Deka et al. 2002). These inherent defects have primarily been ascribed to the presence of hydroxyl groups (-OH) in the three major wood components, namely cellulose, hemicelluloses, and lignin. The hydroxyl groups attract water molecules from the surrounding environment for hydrogen bonding, causing swelling, and changing the physical, chemical, and thermal properties of wood. These effects are especially pronounced in tropical areas, where wood suffers from exposure to sunlight and high hygroscopicity, causing swelling and deformation.