# DIMENSIONAL STABILITY AND WATER REPELLENT EFFICIENCY MEASUREMENT OF CHEMICALLY MODIFIED TROPICAL LIGHT HARDWOOD

Md. Saiful Islam,[a,*] Sinin Hamdan,[a] Mohamad Rusop,[b] Md. Rezaur Rahman,[a] Abu Saleh Ahmed,[a] and M. A. M. Mohd Idrus [a]

Chemical modification is an often-followed route to improve physical and mechanical properties of solid wood materials. In this study five kinds of tropical light hardwoods species, namely jelutong (*Dyera costulata),* terbulan *(Endospermum diadenum*), batai (*Paraserianthes moluccana),* rubberwood (*Hevea brasiliensis)*, and pulai (*Alstonia pneumatophora*), were chemically modified with benzene diazonium salt to improve their dimensional stability and water repellent efficiency. The dimensional stability of treated samples in terms of volumetric swelling coefficient (S) and anti-swelling-efficiency (ASE) were found to improve with treatment. The water repellent efficiency (WRE) values also seemed to improve considerably with treatment of wood samples. Furthermore, treated wood samples had lower water and moisture absorption compared to that of untreated ones.

*Keywords: Chemical modification; Moisture content; Dimensional stability; Water repellent efficiency*

*Contact information: a: Department of Mechanical and Manufacturing Engineering, Faculty of Engineering, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia; b: Faculty of Electrical Engineering, Universiti Technology Mara (UiTM), Shah Alam, Selangor, Malaysia.*

## INTRODUCTION

Wood is a natural polymeric composite material, made up mainly of cellulose, hemicellulose, and lignin, and it possesses unique structural and chemical characteristics that render it desirable for a wide variety of end uses. Structural wood, despite its many valuable properties, also displays some disadvantages, such as a poor dimensional stability and a high moisture absorption, which results in rapid deterioration by rotting (Devi et al. 2003; Kumar 1994; Galperin et al. 1995). These effects are especially pronounced in tropical areas where wood suffers from exposure to sunlight and to a high humidity. The presence of hydrophilic hydroxyl groups (-OH) in the three major wood polymeric components (cellulose, hemicellulose, and lignin) is the main factor responsible for the unfavourable attributes. The hydroxyl group of wood attracts water molecules through hydrogen bonding from the surrounding environment, causing swelling, and making it dimensionally unstable.

The dimensional changes of wood due to atmospheric moisture can be minimized by appropriate chemical treatment, which is a promising way to improve wood properties (Schneider and Brebner 1985; Hartely and Schender 1993; Rowell 1983; Pandey et al. 2009). Chemically modified woods, which are environmental friendly, have high