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Bonding Flakeboard of Taiwanese Woods with Copolymer Resins of Peanut Hull Extracts, Phenol, and Formaldehyde[1]

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Summary

Fast growing trees can provide a large amount of wood fiber in a relatively short period of time. Thus, the utilization of fast growing tree species is an even more attractive alternative to a country with limited forest resources. The gluability of copolymer resins made of peanut hull extracts, phenol, and formaldehyde were evaluated as a binder for different density flakeboards of China fir (*Cunninghamia lanceolata*) and India-charcoal trema (*Trema orientalis*), tropical woods of Taiwan. The internal bond strength and modulus of elasticity were not influenced by the flakeboard density nor by the resin type, however, the modulus of rupture were proportionately influenced by the flakeboard density and their relationship was positive. The values of both internal bond strength and modulus of rupture meet the rquirements of CNS-2216 standard for wood particleboard. The values of water absorption and thickness swelling were somewhat higher than expected because there was no wax or other additives added to protect the flakeboard from the hygroscopic nature of wood flakes.

Introduction

The wood products industry is virtually dependent upon adhesives to utilize smaller trees, as well as forest and mill residues, in order to produce various products to meet the needs of consumers. As the quality of harvested timber declines, the future of wood utilization will require an even higher dependence upon adhesives to convert the limited timber resources into needed products. Presently, the wood products industry is almost entirely dependent on chemicals derived from petroleum and natural gas for adhesives. The 1991 hostilities in the Persian Gulf and the resulting petroleum price escalation are compelling reminders of the difficulties the forest products industry encountered during the energy crisis of the 1970's. Therefore, efforts to develop renewable sources of chemical raw materials and energy must be accelerated. The photosynthetic products of green plants, biomass, in its various forms, represents one of the truly renewable resources upon which the planet earth can and must build upon in order to ensure a sustainable future.

The growth of the world population has placed an even greater demand on the resources on earth. To meet the need for forest products, industry has had to become more efficient in production, not only in the manufacturing process, but also in the use of raw materials as well. Consequently, previously little used or unused wood raw materials have become an extremely important resource to the industry today. Fast growing trees can provide a large amount of wood fiber in a relatively short period of time. Thus, the utilization of fast growing tree species is an even more attractive alternative to a country with limited forest resources.

The need to increase the utilization of fast growing tree species of Taiwan has become a great concern to the forest products industries due to the restriction of exporting log from the Southeastern Asian countries. There were several published articles dealing with the utilization of Taiwanese fast growing trees as raw materials for manufacture of several wood products (Chen, T.Y. 1987, 1990; Liu and Lii 1987; Huang and Lan 1990). However, none of these reports commented upon the use of these fast growing trees as a possible raw material source of structural grade wood panels.

A family of phenolic copolymer resins containing extracts from forest and agricultural residues was developed for bonding structural grade exterior plywood and particleboard (Chen, C.M. 1982 a, b, c). These copolymer resins provided satisfactory bonding quality with a shorter press time than commercial phenolic

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