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PHYSICAL AND MECHANICAL PROPERTIES OF BIO-BASED COMPOSITION BOARDS MADE FROM COTTON GIN AND GUAYULE WASTES

Greg Holt
USDA-ARS, Cotton Production and Processing Research Unit
Lubbock, TX
Terry A. Coffelt
USDA-ARS, U.S. Arid Land Ag. Res. Center
Maricopa, AZ
Poo Chow
Urbana, IL
Francis S. Nakayama
USDA-ARS, U.S. Arid Land Ag. Res. Center
Maricopa, AZ

Abstract

Vast quantities of cotton wastes are being produced annually. Similarly, guayule wastes after rubber latex production is expected to increase as this industry begins to expand. Use of these waste materials into value-added products can help the economics of the crops, and importantly, aid in alleviating waste management and environmental problems. Waste guayule bagasse has been shown to have termite control properties so that a combination of cotton gin and guayule wastes could also have such valuable properties.

This preliminary study investigated some of the important physical and mechanical properties of composition boards made from cotton gin waste particles and guayule bagasse wastes with bio-control termite resistant properties. Ten percent of a commercial melamine modified urea-formaldehyde adhesive (MUF), and one percent of wax emulsion were used in all boards. Two 7/16" by 16" by 17" boards (with an average density of about 52 lbs/cu.ft. or a specific gravity of 0.83) each were made from five different ratios of cotton gin waste to guayule bagasse wastes: 100:0, 75:25, 50:50, 25:75, and 0:100. Board composition was homogenous with no orientation of fibers in the boards. For comparison purpose, two 3-layered boards consisting of a board construction of 25% guayule wastes at upper layer, 50% cotton gin wastes at middle layer, and 25% guayule wastes at bottom layer were also made. Boards with cotton gin to guayule wastes ratios of 25:75, 0:100, and 50:50(3-layered) produced modulus of rupture (MOR) and modulus of elasticity in bending values comparable to some grades of the commercial particleboard and hardboard. All experimental composition boards produced good average internal bond (IB) values except the 3-layered (guayule waste face and cotton gin core board). In the 24-hour water-soak test, both the 3-layered cotton gin and guayule waste board and the 100% guayule bagasse board produced the lowest average water absorption values (less than 20%) and the average thickness swelling values of less than 10%. All boards were tested for linear expansion, face hardness and the screw holding properties. Phase 2 of this investigation will evaluate the termite resistance property of these boards made from cotton gin and guayule wastes materials.