PRODUCTION AND PROPERTY CHARACTERIZATION OF FIBER REINFORCED WASTE PLASTIC FOR ARCHITECTURAL INTERIORS

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ABSTRACT

This study is focused on the investigation on the properties of composite boards which were made from rice straws, coconut husk fiber wastes, and polypropylene thermoplastic wastes due to the rapidly growing demand on wood products. Furthermore, this study aimed to promote the growing awareness on sustainability and environmental issues through the utilization of the aforementioned natural fiber wastes. The said natural fiber wastes served as reinforcements for the production of composite boards where polypropylene thermoplastic wastes were used as binder.

A total of 13 specimens were produced from 3 batches using 3 variations of plastic-fiber mixtures (50:50, 60:40, and 70:30), 3 varying length of fibers (10 mm, 20mm and 25mm), 4 variations of weight (230g, 300g, 450g and 500g), and 4 variations of thickness (5mm, 6mm, 10mm and 12mm). All the samples were tested for their physical property (Water Absorption, Thickness Swelling, Density, and Moisture Content),mechanical property (Modulus of Rupture, Screw Holding strength, and Internal Bond Strength), and fire resistance rating (Melting Point and Burning Point). Results of the various tests were based and compared with the Philippine Standard Association (PhilSA 105) and Philippine Agricultural Engineering Standards (PAES 320).

Furthermore, a statistical analysis was conducted to measure the level of acceptability of the fiber reinforced waste plastic using analysis of variance or F-test (ANOVA) among 3 groups of respondents (Professionals, Paraprofessionals, and

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Students). Based on the results of the testing conducted, the physical and mechanical properties were influenced by the higher percentage of thermoplastic (PP) resin contents that made the samples more resistant to water and made the thin samples brittle as compared to thicker samples (10mm and 12mm). However, the use of long and short fibers and the inclusion of grinded fiber particles at a certain percentage reinforced the samples. Short fibers and grinded particles increased their mass density, thereby making the samples more solid, and less compression time was required for the process.

All the samples which were processed using a hot compression machine evidently showed voids along their edges and in their internal sections that affected their physical and mechanical properties. On fire resistance rating, thicker and high density samples had longer time to reach their melting point (56 and 81 seconds) and burning point (93 and 112 seconds) while thin samples had shorter time to reach their melting point (24 and 45 seconds) and burning point (90 and 97 seconds).

Generally, the first batch of specimens (10mm thick) having a resin-fiber ratio of 60:40 with 25mm fiber length contents and the last batch (5mm thick) having a resin-fiber ratio of 70:30 with 20mm fiber length showed a promising results among the 13 specimens. These results satisfied the standards of Phil-SA 105 and PAES 320 for high density board category.

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