

Potential of using natural and synthetic binder in wood composites

ABSTRACT

The physical and mechanical properties of particleboard bonded with different cooking percentages of seaweed (*Kappaphycus alvarezii*), with different percentages of starch and different percentages of adhesives, and wood plastic composite (WPC) from High-Density Polyethylene (HDPE) with *Acacia mangium* wood powder were determined in this study. Seaweed mixed with different percentages of sulfuric acid (30%, 50%, 70%) and Sodium Hydroxide (70%, 50%, 30%) were prepared as a binder for particleboard. For a starch-based binder, different percentages of starch (10%, 15%, 20%) were prepared, before producing particleboard with different amounts of binder (20%, 25%, 30%). As for WPC, wood powders were bonded with different percentages of HDPE content (70%, 80%, 90%). Results indicated that WPC at 90% HDPE shows the best performance in the water absorption (0.07%) and thickness swelling test (2.54%). Starch-based particleboard recorded the highest Modulus of Elasticity (MOE) value (1115.07 N/mm² at 15% starch with 30% amount of binder), while WPC (90% HDPE) and starch-based particleboard (10% starch with 20% amount of binder) both recorded the highest Modulus of Rupture (MOR) at the same value, which is 7.84 N/mm². Starch-based particleboard has a better internal bond, which is 0.05 N/mm². However, seaweed-based particleboard has a higher density value, which is 0.6 g/cm³.