

RECENT RESEARCH ACTIVITIES

Development of particleboard made from bagasse of sweet sorghum (*Sorghum bicolor* L. Monech) and citric acid

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Development of wood-based composite made from wood material and citric acid has been researched in recent years^[1-3]. However, wood resources have been continuously decreased year by year due to decreasing of forest land. Therefore, agricultural wastes such as sugarcane bagasse, rice straw, and sorghum bagasse become important resources as alternative raw materials of wood-based composite^[4]. In Indonesia, new kind of sweet sorghum called “super hybrid sweet sorghum” has been especially planted in large field as multipurpose plant. Hence, the large quantities of sorghum bagasse will be generated and cause the greenhouse gas emission. As one of the effort to resolve the problem, there is a utilization of sorghum bagasse as raw material for wood-based composite such as particleboard. In this study, the manufacture of particleboard using super hybrid sweet sorghum bagasse (SHSSB) and citric acid was attempted. The effects of citric acid content on the physical properties were investigated.

Materials

The SHSSB particles as raw materials were obtained from Innovation Center, Indonesian Institute of Sciences (LIPI). The particles remaining between aperture size of 5.9 and 0.9 mm of sieving machine were dried in an oven at 80 °C for 12 h. Citric acid was dissolved in water until the solution concentration of 59 wt%.

Production and evaluation of particleboard

Particleboards bonded with citric acid in the several of resin contents i.e. 0~30 wt% were manufactured under a press condition of 200 °C for 10 min. The particleboard size and target density were 300 x 300 x 9 mm and 0.8 g/cm³, respectively. The board were conditioned at 20 °C and 60% of relative humidity for 1 week. The bending properties, internal bonding (IB) strength, and thickness swelling (TS) of the board were investigated according to JIS A 5908 (2003) standard^[5].

Effect of citric acid contents

The bending properties, IB strength, and TS of the particleboard were improved with increasing citric acid content. The board bonded with 20 wt% citric acid had maximum average values of modulus of rupture (MOR) and modulus of elasticity (MOE) i.e. 19.60 MPa and 4.67 GPa, respectively. Meanwhile, IB of the board bonded with 20 wt% citric acid was lower than 30 wt% citric acid. The board bonded with 30 wt% citric acid had lowest TS (13.45%). Mechanical properties of particleboards bonded with 20 and 30 wt% citric acid were comparable to the standard of JIS A 5908 (2003) 18 type, whereas TS of particleboards didn't satisfied with JIS standard. Further study will be performed to clarify the effect of manufacturing conditions on the physical properties of the particleboard.

References

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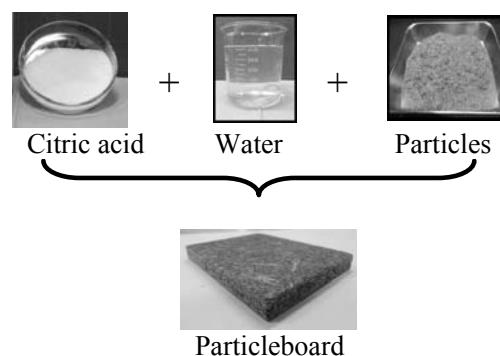


Figure 1. The production of particleboard from super sweet sorghum bagasse and citric acid.