

## Development of acacia mangium bark molded products

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Biopolymers are seen as a potentially greener alternative to petroleum based plastics which are non-biodegradable. In order to reduce synthetic polymers for more environmental friendly products, utilization of various renewable resources have been the object of intensive academic and industrial research. Recently, the utilization of acacia mangium bark added with citric acid for the production of molded products was investigated. Utilization of bark has become an important goal because bark disposal has been threat to environmental quality. As byproducts from utilization of trees on the production of pulp paper and boards, bark has very potential as raw material.

### Molded product from acacia mangium bark only

Fig. 1 shows the effect of pressing temperatures, times and pressures on the tensile properties of molded products. The higher values of MOR were 22.8 MPa and 22.1 MPa for molded products that made at 260°C, 8 MPa, 10 min and at 280°C, 8 MPa, 20 min, respectively. Moreover, an increase in temperatures, pressures and pressing times, the tensile properties were effectively increased, except for molded products that manufactured at 280°C, 12 MPa and 10-20 min.

Based on TG analysis, the rate of weight loss increased rapidly above 225°C for molded products made at 140-220°C and above 275°C for molded products made at 260-280°C, and attains a maximum at 350°C. After decreased of 40% and 50% for molded products that made at 280°C and 260°C, respectively, and decreased of 65% for others, the reaction rate decreased again above 400°C.

### Molded product from acacia mangium bark added with citric acid

The effects of citric acid content and pressing temperatures on the tensile properties of the molded products are showed in Fig.2. The molded products that produced at 180°C showed higher in tensile properties than other pressing temperature conditions. By adding citric acid, the tensile strength of acacia molded products increase about 40%. The highest tensile strength obtained on the products that made by adding 25% of citric acid. The pressing temperature of acacia molded products can be reduced from 260-280°C to 180-200°C when citric acid was added. It's because by influence of the melting and boiling temperature of citric acid, that was found around 157°C and 175°C, respectively.

Therefore, it was made clear that the citric acid is a promising substitute for curing accelerator and binder in producing high performance molded products. This may be due to the carboxyl groups in the citric acid moieties that get bound to the hydroxyl groups on the bark via esterification process.

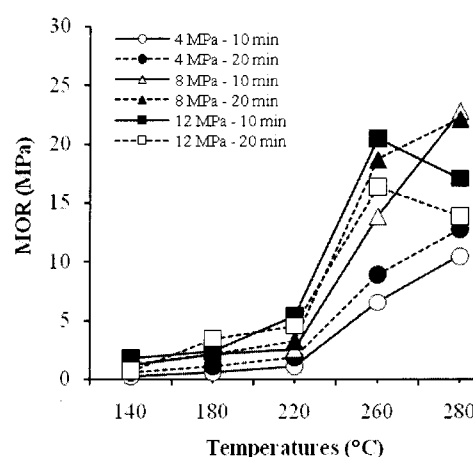


Fig 1. Tensile strength of molded products made from acacia bark only.

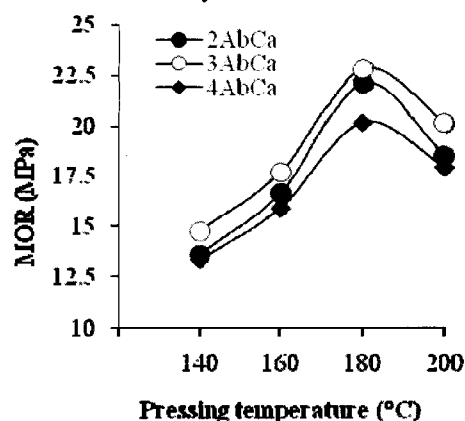


Fig 2. Tensile strength of molded products made from acacia bark (Ab) reinforced with citric acid (Ca) and pressed on 4 MPa for 10 mins. 2AbCa = 33.33% of Ca; 3AbCa = 25% of Ca and 4AbCa = 20% of Ca.