

Development of Particleboard using Citric Acid and Sucrose.

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Introduction

In the wood industry, various kinds of synthetic resins derived from fossil resources are used as binders. However these resources are not renewable and are being steadily exhausted. Therefore, the alternative adhesives derived from non-fossil resources are required. In this study, new natural adhesive composed of citric acid and sucrose was used as an adhesive for particleboard, and physical properties were examined.

Materials and Methods

Recycled chips with the moisture content (MC) of 4-8 %, citric acid and sucrose were used in this experiment. A certain weight ratio of citric acid and sucrose was dissolved in water, and the solution was used as an adhesive. The weight ratios of citric acid and sucrose were adjusted to 100:0, 75:25, 50:50, 25:75, 0:100. The adhesive was sprayed onto recycled chips in a weight ratio of 5 to 40 wt%, and then MC of chips were conditioned by air drying or oven drying at 40 °C. After forming a mat, the mat was hot-pressed. The pressing temperature and time were adjusted to 140 to 240 °C, 10 minutes, respectively. For comparison, the particleboards using an isocyanate resin were manufactured in the same condition (adhesive content=8 wt%, temperature=200 °C). The bending test, internal bond test, and water resistance test based on JIS A 5908 were performed to evaluate the physical and mechanical properties of particleboards.

Results and discussion

Fig. 1 shows the bending properties of particleboards. Mechanical properties were improved with the increase of pressing temperature up to 200 °C, and the modulus of rupture (MOR) and the modulus of elasticity (MOE) pressed at 200 °C achieved 22 MPa, and 4.8 GPa, respectively. This value of MOR and MOE exceeded the standard level of JIS 18type, and the value of MOE was higher than that of the board bonded with the isocyanate resin. The water resistance was also similar to that using the isocyanate resin.

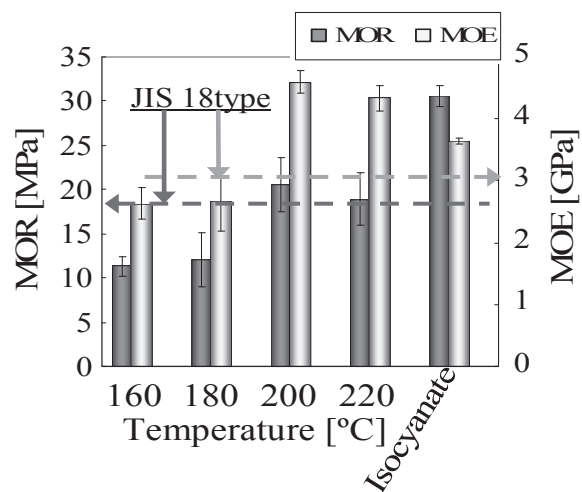


Fig1. Effects of the pressing temperature on bending properties
The weight ratio of citric acid and sucrose is 25:75.
Adhesive content is 20 wt%.