

ABSTRACTS (MASTER THESIS)

Study on production of high strength material by using of kozo (*Broussonetia kazinoki* × *B. papyrifera*)

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Introduction

Natural fiber composite materials, made from natural fibers and resins, have recently been studied. It has been required for reducing the environmental loading to increase the ratio of fibers to resins in the materials. The influence of contact, interlocking, and voids among fibers, on the material strength is expected to increase with the increase in the fiber ratio. Single fiber (pulp) is therefore required to have high strength, moderate length, and flexibility. The raw material of Japanese paper, pulp of kozo (*Broussonetia kazinoki* × *B. papyrifera*) is expected to be suitable for these requirements. The purpose of this study is to establish the process of producing the high strength materials by using the kozo pulp. In this report, the influence of the contact and voids among fibers on the mechanical properties of the material was examined.

Materials and methods

Kozo pulp was purchased from Kurotani Washi Cooperative Association (Ayabe, Japan). Specimens numbered from ① to ④ were prepared according to the manufacturing procedure as shown in Fig.1. Part of this procedure was based on the general method to produce fiber board in wet forming process. In the impregnation step (Fig.1), methyl methacrylate (MMA) with 1 wt% azo type polymerization initiator was impregnated into the squeezed cake, and was polymerized at 85 °C for 24h in the polymerization step. Density of each specimen was evaluated by external dimensions and mass of the specimens. Bending modulus of elasticity (MOE) and modulus of rupture (MOR) were evaluated by three point bending test.

Results and discussion

All the physical properties (density, MOE, and MOR) of specimen ② were higher than those of specimen ①. This indicates the contact among fibers was promoted by vacuum drying of the squeezed cake with the clamping pressure maintained. All the physical properties of specimen ③ were higher than those of specimen ②. This indicates that the MMA filled the residual voids without dissolving the contact among fibers. MOE and MOR of specimen ④ was lower than those of specimen ③, while density of ④ was higher than ③. This may be due to both the breakage and separation of the fibers.

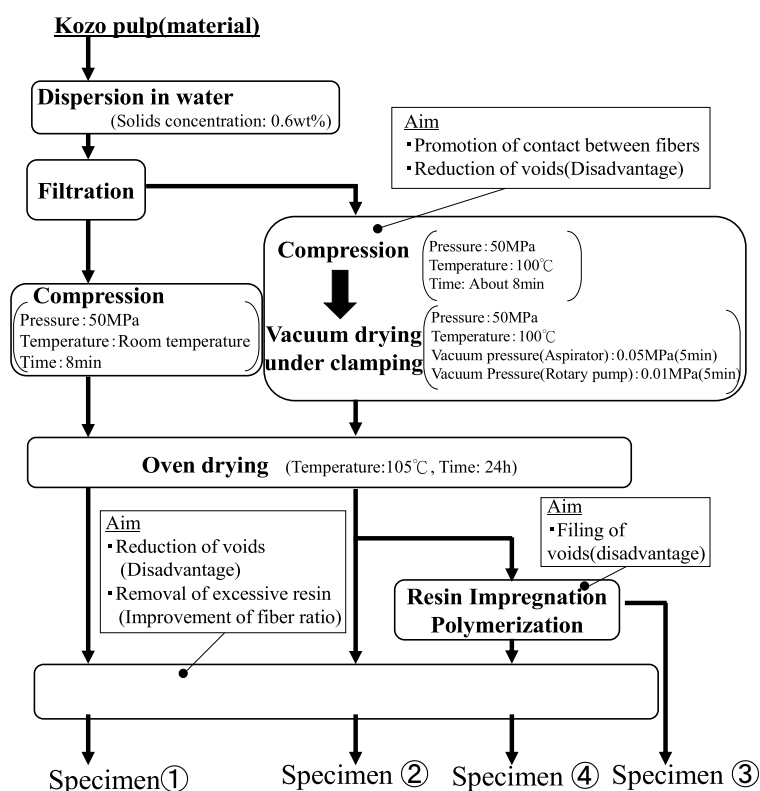


Figure 1. Manufacturing procedure