The Study of Coconut Fiber and Phenolic Resin Product Composite Material

侯建全、涂瑞澤 ; 涂耀國

E-mail: 9115136@mail.dyu.edu.tw

ABSTRACT

In this study, a blanket woven by coconut fiber has been used as a reinforcement and phenolic resin as a matrix. These two materials were formed through a hot press to become a composite board (coconut fiber board). Since coconut fiber has been recycled from agricultural wastes and reused to make composite boards, this study is significant to environmental protection. This thesis devoted two subjects: (1) porous composite boards made through a low-pressure molding, and (2) the coconut fiber reinforced phenolic resin product composite board. On the first subject, the temperature, time and pressure of the hot press were selected as the manipulating factors. Main effects as well as their interactions were taken into consideration. The Taguchi method was used to layout the experiment, and the results were analyzed through statistical software. The effect of manipulating factors on the physical properties of the composite board could be obtained through the ANOVA (analysis of variances). Experimental results shows that the higher the pressure or the temperature during the hot press, the higher the density. If the time of the hot press increases, the water absorption capability of the board tends decrease. The higher the temperature or the longer the time is, the higher the flexural strength is. From the analysis of variances, the combination of temperature, time and pressure of the hot press are 160°C, 16 min and 17kgf /cm2 to obtain an optimal composite board. Furthermore, all the composite boards produced by this study pass the combustion test (CNS 7774) and the flame-retardant test (CNS 10285-A4), and can be classified as flame-retardant grade 1. On the second subject, the temperature, time and pressure of the hot press, and the contents of curing agent and methanol were selected as the manipulating factors. Only main effects were considered due to too many factors. The fractional factorial design was used to guide the entire experiment, and the results were analyzed by using statistic software. The effect of manipulating factors on the physical properties of the composite board could be obtained through the ANOVA (analysis of variance). Experimental results show that the higher the temperature or the shorter the time of the hot press, the lower the density. When the temperature of the hot press is 200°C, the formation shrinkage becomes maximum. If the content of the curing agent increases, the formation shrinkage tends to be smaller. When the pressure of the hot press is near 100 kgf /cm2, the board with the highest hardness can be obtained. The higher the temperature of the hot press is, the higher the hardness will be. Furthermore, the higher the temperature, the lower the impact strength and the flexural strength. From the analysis of variances, the temperature should be 130°C in order to obtain a board with best impact strength and flexural strength. Keywords: coconut fiber, phenolic resin, composite material, hot press, Taguchi experiment design, fractional factorial design, analysis of variance

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