

Abstract:

The purpose of this study, in addition to enhance the internal bond of the particleboards, was to make a new natural adhesive from the mixture of corn flour and Soy Flour. The variable factors for this study of the natural combination adhesive were: corn flour/ soy flour; press pressure at four levels and press time in seven levels. In performing this study different percentage of sodium hydroxide (NaOH) and sulfuric acid were used as an additive. For making the adhesive, corn flour, soy flour and water were mixed and the percentage of the corn flour to soy flour with the certain ratio of 50/50 was considered in the study. To reduce the viscosity of this mixture, various percentages of sulfuric acid 98% in proportion to the weight of dry corn flour/ soy flour were added to the mixture and a mechanical stirrer was used to blend the mixture and it was heated with a microwave. To increase the bonding properties of the corn flour and soy flour mixture, different percentages of sodium hydroxide (NaOH) 33% to the proportion of the weight of dry corn flour/ soy flour were added to the mixture and it stirred with the mechanical stirrer. After preparation of the adhesive, wood chips were mixed mechanically and uniformly with the adhesive and then a wood chip cake was formed manually. Wood chip cake was pressed in three degrees with a laboratory hydraulic press and some boards by the name of green boards, which do not have the formaldehyde emission, were made. In this study, to enhance the Physical and mechanical properties of the boards, wood chips were sprayed with sodium hydroxide with different ratios. Variable factors were combination adhesive of corn flour/ soy flour + ethanol with sodium hydroxide spray, press time in six levels, press heat in two levels and the ratio of sodium hydroxide spray to wood chips in four levels which were sprayed as an 50% solution of sodium hydroxide (NaOH). Also in this study, in order to increase the strength of the particleboards with the combination adhesive of corn flour/ soy flour, they mixed with different ratio with PF, MF, UF, and PMDI resins. Variable factors in making these adhesives are the ratio of combination adhesive of corn flour/ soy flour with synthetic resins in four levels, press time in three levels, and a fixed pressure. Mechanical and Physical strength of these boards were measured according to the EN standard (310, 317, and 319). The obtained data were analyzed according to One way ANOVA and randomized factorial design. The results showed that the boards made with these adhesives have a high mechanical strength, so that in corn flour/ soy flour combination adhesive, the press pressure of 17.5 kg/cm², press heat of 190 degree Celsius, press time of 600 and 660 seconds, and an amount of 18.5% sulfuric acid and 14% sodium hydroxide, it showed the best performance of mechanical properties. The lowest water absorption and thickness swelling were related to 3.8% sodium hydroxide spray, press time of 550 seconds, and press heat of 220 degree Celsius. In the combination adhesive with synthetic resins, the best formulation for reaching the highest mechanical strength is in this way that these boards produced by corn flour/ soy flour combination adhesive + synthetic resins, with the ratio of 60% corn flour/ soy flour to 40% MF, UF synthetic resins and also the ratio of 70% corn flour/ soy flour to 30% PMDI synthetic resins with the press pressure of 17.5 kg/cm² and press time of 480 seconds for UF, PMDI resins and 600 seconds for MF resins. Due to the created properties, it can be said that the corn flour/ soy flour natural combination adhesive has a high potential for replacing the synthetic resins.

Key words: Particleboard ,Natural adhesive ,Corn Flour , Soy Flour , Adhesion



University of Zabol
Graduate school
Faculty of Natural resources
Department of Wood Science and Technology

**The Thesis Submitted for the Degree of M.Sc
(In wood Composite products)**

**Study and manufacturing green Particleboard
with the natural Adhesive combination of Corn
Flour/ Soy Flour.**

Supervisor:
Dr. H.R. Mansouri

Advisor:
MSc. E. Sanei

By:
A. Falahat Nezhad

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