

174366
D
19/07/2001

P. 3000

DEVELOPMENT OF AN ENVIRONMENTALLY
FRIENDLY SOYA HYDROLYSIS RESIN FOR BINDING
PARTICLE BOARDS AND THEIR PROPERTIES.

BY

THEIVANDRAN PARAPARAN

174366

This is submitted
partial fulfillment

MSc (Polymer Science & Technology) – 1999 / 2001

ABSTRACT

Fear of environmental impact of timber production has spurred exploration of alternative fiber sources for the production of wood based material. fast growing trees and agriculture residues are the two key alternative fiber sources. For reducing dependency on petrochemicals, development of adhesive resins from renewable resources has gained importance and become inevitable. Natural adhesive resins are free of health risks. Nowadays soya based adhesives are utilized for bonding of wood materials (particle boards)

Some of the factors that give rise to failure in adhesion of wood particles in composite board are poor chemical and physical interfacial interaction between the wood surface and resin and dissimilar swelling of resin and wood due to moisture absorption. Improvements to adhesive can be affected by way of changing the chemical nature of the polymer in the wood cell wall. The changes so effected trigger modification of properties such as dimensional stability, moisture absorption and compatibility with other materials.

Soya based bonding particle board possess high strength and moderate water resistance property. Because of this inherent property, soya based resins particle boards are used for interior applications.

TABLE OF CONTENTS

Table of Contents	Page
	I-II
Acknowledgement	III
Abstract	IV
1.0 Chapter One - Introduction	1
1.1 Type of Resins use for Wood Industry	3
1.1.1 Phenolics	4
1.1.2 Isocyanatics	5
1.1.3 Urea formaldehyde	6
1.2 Chemistry of Phenolic Resins	6
1.2.1 Novolac Type	6
1.2.2 Resole Type	7
1.3 Preparation PF Glue and its Method of Application	10
2.0 Chapter Two – Material and Experimental Method	
2.1 What is Particle Board	12
2.2 Wood Polymer Composite Board	13
2.3 Particle Board Processing	15
2.3.1 Wet-Process Fiber Board	15
2.3.2 Extruded Particle Board	16
2.3.3 Platen Pressed Particle Board	17
2.3.4 Dry Proces Hard Board	18
2.4 Experimental Method	19
2.4.1 PF Resin Preparation	20
2.4.2 Soy Resin Preparation	22
2.4.3 Copolymerizing Resins synthesis procedure	23
2.4.4 <i>Procedure of Particle Board Preparation in Laboratory Scale</i>	24

3.0	Chapter Three – Test Procedure	
3.1	Testing on Resins Viscosity	25
3.2	Physical Testing of Adhesives Bonds	26
3.2.1	Determination of Density	26
3.2.2	Determination of Increase in Thickness	27
3.2.3	Determination Increase in Mass	28
3.2.4	Determination of Tensile Strength (Internal Bond Strength)	29
3.2.5	Determination of Impact Strength	30
3.2.6	Determination of modulus of elasticity	31
4.0	Chapter Four – Test Results & Discussion, Conclusion & Suggestions	32
4.1	Test Results and Discussion	32
4.1.1	Test Result of Density in Relation to Varied Resin Content	32
4.1.2	Test Results of Weight Changes (Water Absorption) of Particle Board Samples (w/w 100 % Soy, w/w 100 % PF, w/w 60 % Soy + w/w 40 % PF)	32
4.1.3	Test Results of Volumetric Swelling in % of Original Volume in Relation to Varied Samples	32
4.1.4	Bond Strength vs Resin Content (w/w 100 % Soy, w/w 100 % PF, w/w 60 % Soy + w/w 40 % PF)	33
4.1.5	Impact Strength vs Resin Content (w/w 100 % Soy, w/w 100 % PF, w/w 60 % Soy + w/w 40 % PF)	33
4.1.6	Modulus of Elasticity	33
4.1.7	Discussion	34
4.2	Conclusion and Suggestion for further Development	39
4.2.1	Conclusion	
4.2.2	Suggestions for further Development	

