



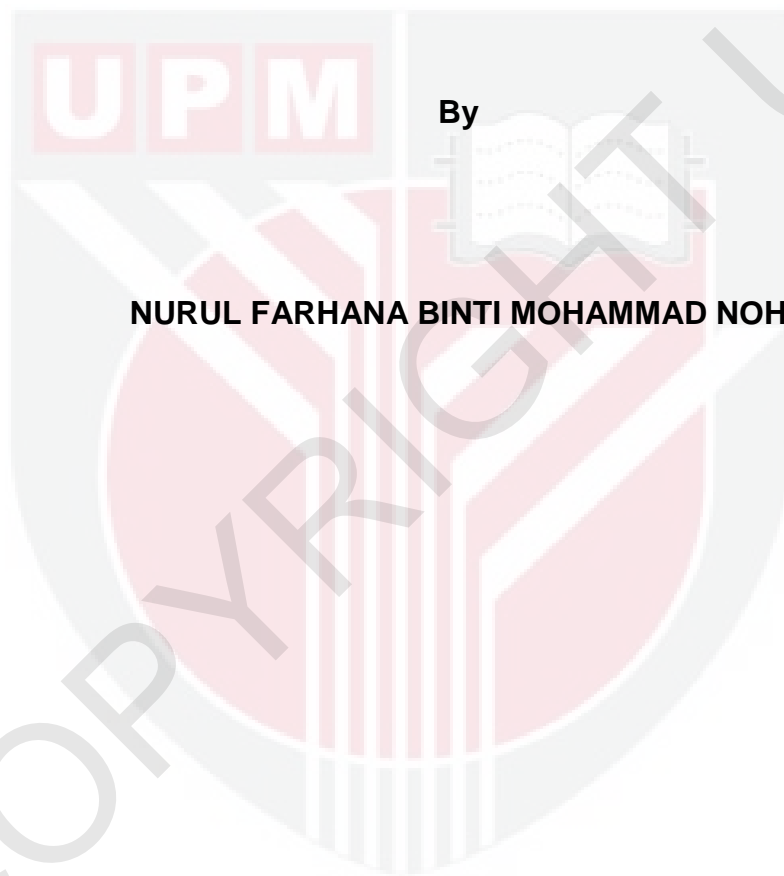
UNIVERSITI PUTRA MALAYSIA

***EFFECT OF RESIN UPTAKES FROM ACACIA MANGIUM ON THE
SURFACE PROPERTIES OF IMPREGNATED PAPER FROM TANNIN
PHENOL FORMALDEHYDE***

NURUL FARHANA BINTI MOHAMMAD NOH

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NURUL FARHANA BINTI MOHAMMAD NOH

**A Project Report Submitted in Partial Fulfillment of the Requirements
for the Degree of Bachelor of Wood Science Technology in the
Faculty of Forestry
Universiti Putra Malaysia**

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DEDICATION

Bismillahirrahmanirrahim,

I dedicate this thesis to my supervisor Dr Umami Hani Abdullah who truly responsible for my success upon finishing this thesis, because she gave me many provides guidance on the research I have done, without her i could not finish my studies that have been conducted.

Also, I would like to dedicate this thesis to my sibling Nurul Izzati binti Mohammad Noh and Liza Marziana binti Mohammad Noh because they help me in terms of how the actual to write the thesis besides that do not forgetting my parents Fatimah binti Alang and Mohammad Noh bin Abdullah and my husband Muhamad Rusli bin Ibrahim who gave a lot of moral support and motivation from the beginning until the end of my study and not letting me give up.

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ABSTRACT

Acacia mangium is a fast-growing dicotyledonous tree species and has become the dominating plantation in Malaysia. It was grown particularly as a raw material for veneer, pulp and paper industries. The chemical properties test in this study showed that the *A. mangium* tree bark contains higher extractive content as compared to the wood portion (sapwood). In this study, the solution with 30%± solid content was extracted from *Acacia* bark. The aim of this work was to determine the effect of resin uptakes on the surface properties of impregnated paper. Tannin has potential to be used as a good bonding agent due to their polyphenolic structure. Source of tannin can be found in various type of tree bark such as mangrove, *Acacia (A.mangium)*, mimosa (*Acacia mearnsii*), quabracho (*Schinopsis balansae*) and pine (*Pinus radiata*). Tannin (30% solid content) was mixed with phenol formaldehyde (PF) resin at three resin uptakes (250g/m², 300g/m², 350g/m²), then impregnated into filter paper. The impregnated paper was putted it onto the plywood and pressed under temperature of 180°C for 7 minutes. Impregnated papers were cutting into dimension according to TAPPI, (1996) for testing. The type of testing is water vapour resistance, cross-cut test and mark stain test. The result showed that, the surface quality on paper laminate is applicable and proven by the water vapour testing.

ABSTRAK

Acacia mangium adalah spesies pokok dikot yang berkembang pesat dan telah menjadi perladangan berkuasa di Malaysia. Ia ditanam terutamanya sebagai bahan mentah untuk venir, pulpa dan kertas. Sifat-sifat kimia ujian dalam kajian ini menunjukkan bahawa kulit pokok *Acacia mangium* mengandungi kandungan ekstraktif lebih tinggi berbanding dengan bahagian kayu (sapwood). Dalam kajian ini, 30% ± kandungan pepejal telah diekstrak daripada kulit kayu *Acacia mangium*. Tujuan projek ini adalah untuk menentukan kesan resin uptake pada permukaan kertas tapis. Tannin mempunyai potensi untuk digunakan sebagai ejen ikatan yang baik kerana struktur polifenolik mereka. Sumber utama tanin boleh didapati dalam pelbagai jenis kulit pokok seperti bakau, Acacia (*A. mangium*), Mimosa (*Acacia mearnsii*), quabracho (*Schinopsis balansae*), dan pain (*Pinus memancar*). Tannin (30% Kandungan pepejal) adalah bercampur dengan fenol formaldehid resin (PF) dengan tiga resin uptake yang berbeza iaitu (250g/m², 300g/m², 350g/m²), kemudian resin itu diletakkan dia atas permukaan kertas penapis. Kertas yang sudah diletakkan rasin akan diletakkan dia permukaan papan lapis di bawah suhu 180°C selama 7 minit. Kertas penapis yang di celup ke dalam resin telah diuji ke dalam dimensi TAPPI,(1996) untuk ujian. Jenis-jenis ujian water vapour resistance, ujian cross-cut dan ujian mark stain. Keputusan menunjukkan bahawa, kualiti permukaan pada kertas penapis berkenaan telah dibuktikan dengan ujian water vapour resistance.

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APPROVAL SHEET

I certify that this research project report entitled “Effect of Resin Uptakes from Acacia Mangium on The Surface Properties of Impregnated Paper from Tannin Phenol Formaldehyde” by “Nurul Farhana Binti Mohammad Noh” has been examine and approved as a partial fulfillment of the requirements for the degree of Bachelor of Wood Science Technology in the Faculty of Forestry, Universiti Putra Malaysia

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CHAPTER 1

INTRODUCTION

1.1 Background

Acacia mangium is a major plantation species in the humid tropical lowlands of Asia. Its success is due to its extremely vigorous growth rate, tolerance of highly acidic, low nutrient soils, ability to grow reasonably well where competition is severe relative freedom from disease, wood properties that make it suitable for a wide range of uses and ease of establishment in cultivation. Plantations in Indonesia and Malaysia are the resource base for a large pulp and paper industry. Other uses included fuel wood, timber for building and furniture and particle board (Maslin and McDonald 2004).

Tannins are one of the natural products which are widely distributed in plant kingdom which is they are composed of different phenolic compound. Tannins are generally classified into 2 major types: hydrolysable tannins and condensed tannins. The hydrolysable tannin is mixture of simple phenols while the condensed tannins are polymeric phenolic compounds comprising from flavon-3-ol repeating units (Feng et al. 2013). Feng et al. (2013) also mentioned that condensed tannins are known for their wide distribution in various softwood and hardwood, and it constitutes about 90% of the total world production of commercial tannin.

Pizzi et al. (1982) stated that the main sources that have been commercialize for condensed tannins are quebracho (*Schinopsis balansae*) wood and the barks of wattle (*Acacia mearnsii*) and chesnut (*Castanea Sativa*). These tannins can be found in trees, forbs and shrubs of dicotyledonous plants (Haslam 1989).

Tannin extract from *A.mangium* tree bark were found to be rich in phenolic compounds and had the potential to partially replace conventional phenol formaldehyde adhesive. Utilization of waste, in which tannin from *A.mangium* bark is extracted, can also be applied. Additionally, one of the methods to evaluate the effect of tannin addition is by impregnating paper with the tannin solution because this method is simple, fast and cheap. One of the advantage of applying this method is it is suitable for early stage of investigation where a number of working variables are understudied, for instance temperature, time, resin uptake, ratio, pH, concentration (Zhang 2010).

1.2 PROBLEM STATEMENT

Paper laminate is done with melamine formaldehyde (MF), urea-formaldehyde (UF) and melamine urea formaldehyde resin (MUF). However, these materials are expensive when used in great quantities. Besides that, the chemical mixture that used in the process of synthetic resin will be affected to the environmental pollution and human health.

Tannin-based rigid foams, prepared from 95% natural material, are suggested for replacing synthetic phenol–formaldehyde foams in various applications. For that purpose, a few physical properties were measured and reported here: resistance to fire and chemicals, absorption of various liquids, permeability, thermal conductivity and mechanical (compressive and tensile) strength. Modifying the composition through the use of boric and phosphoric acid allowed substantial increase of fire resistance.

The materials were also found to present good resistance to strong acid and bases, and to solvents. High affinity for water but limited one for organic liquids was also evidenced. Finally, slightly anisotropic mechanical properties were measured. The materials present a brittle behaviour, whether tested in compression or traction such as nevertheless, their strengths, as well as their thermal conductivities, are fully comparable with those of their phenolic counterparts. We show that such materials of vegetable origins can compete with synthetic ones for most of traditional applications (Tondi et al.2009).

Condensed tannins are natural, environment-friendly, phenolic materials extracted from the bark of trees that have now been used industrially for considerable time as wood panel adhesive (Pizzi 1983). To be accepted industrially, resin impregnated paper must have high resistance to abrasion, scratching, moisture, heat and some household chemicals (Istek et al.2010).

1.3 OBJECTIVES

The objectives of this research are as follows:

- i. To study the effect of resin uptake on the surface properties of impregnated paper.
- ii. To investigate the effect of surface properties by cross cut, water vapour and mark stain testing.



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