International Symposium on Wood Science and Technology

IAWPS 2008

International Association of Wood Products Societies (IAWPS)

Proceedings

Harbin, P.R. China
September 27 - 29

2008

Introduction to IAWPS 2008

International Association of Wood Products Societies (IAWPS) is an international organization founded in 1995 from the contribution of relevant societies to the better understanding and to the better utilization of wood resources in harmony with global and local environment.

The International Symposium on Wood Science and Technology 2008 (IAWPS2008) is co-organized by International Association of Wood Products Societies and Northeast Forestry University in Harbin from September 27 to 29, 2008.

Organizer:
International Association of Wood Products Societies (IAWPS)

Co-organizer and Supporting Organization:
Northeast Forestry University
Key Lab of Bio-based Material Science and Technology of Ministry of Education, China
Chinese Wood Science Society
National Natural Science Foundation of China
Division 5, International Union of Forestry Research Organizations
International Wood Culture Society

Conference Time: September 27th~29th, 2008

Conference Venue: Northeast Forestry University in Harbin

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Conference Vice Chairman:
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Jun Cao, China

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From the Conference Chairman

Dear friends and colleagues,

The International Association of Wood Products Societies (IAWPS) is an international organization founded in 1995 from the contribution of relevant societies to the better understanding and utilization of wood resources. The IAWPS Conferences serve as a forum for the exchange of knowledge and experience in forest products research at national and international levels.

IAWPS2008 is an International Symposium on Wood Science and Technology, which will be held at Northeast Forestry University, Harbin, China from September 27 to 29, 2008. Domestic and overseas experts, scholars, and enterprisers from various fields are invited. The call for papers is well responded, and a total of 311 papers are received. Research papers will be presented at ten scientific sessions. I believe that each session will be very exciting and rewarding to participants from all over the world.

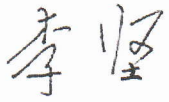
I would like to express my gratitude to all the authors and attendees, and your participation is highly appreciated. In China, we have an old saying, which is "We are always pleased with the coming of friends from far distance". We will do our best to host you comfortably, and to assist the organizer to provide you a good service. We hope all of you feel home, happy and convenient.

I would also like to thank the organizing committee members for their diligent work, especially Professor Gyosuke Meshitsuka, also I'd like to thank National Natural Science Foundation of China, all sponsors and Woodlab website.

Finally, hope the meeting to be successful!

Thank you!

Sincerely yours,
Jian Li



Chairman
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About NEFU

Founded in 1952, Northeast Forestry University (NEFU) was formed by the combination of both Zhejiang University and Northeast Agricultural College's forestry departments. It is currently one of the key universities of Chinese Ministry of Education and is also one of the universities in the "211 Project".

NEFU is presently a multidisciplinary university with forestry as its leading field and offers a unique specialization in forestry engineering. The university is comprised of sixteen schools and two departments. There are five post-doctoral scientific research programs, four first-level and thirty-two second-level doctoral degree programs. In addition, there are two national first-level key disciplines and more than twenty Provincial subordinate key disciplines. Also, it operates the teaching and research centers of basic sciences particularly in biology, which are also approved by the Chinese Ministry of Education.

NEFU now has more than 28,000 students of various backgrounds. Since the founding of the university, it has trained over 70,000 students and has become the largest national training center for the personnel engaged in advanced sciences relating to forestry. The university has 1,269 full-time teachers, including academicians of the Chinese Academy of Engineering and specially invited professors of Changjiang Scholar Program.

NEFU has excellent facilities for teaching, research and practice. It has one national scientific observation key station, three key laboratories of Chinese Ministry of Education, four key laboratories of the National Bureau of Forestry, and forty-nine research institutions. There are also nine experimental sites within the school and 180 bases outside the school.

Since 2001, NEFU has won more than 140 awards of varying levels in scientific research, including two National second-place awards for Technology Innovation, three National second-place awards for Advancements in Science and Technology, two Heliang Heli Fund awards for Advancements in Science and Technology, and eighty other provincial and departmental awards.

Northeast Forestry University has made great development in international communication and cooperation. It has established intercollegiate cooperative relations with fifty-eight universities and institutions. In recent years, NEFU has invited more than 300 foreign experts and scholars from more than thirty countries and regions to teach, and conduct research in the university.

NEFU will carry on the spirit of "working hard in unity, self-inspiration, and utilizing advantages to the fullest and competing for the top" and seek to try to build itself into a nationally top-ranked research-oriented university.

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Strength of Acacia Wood with Polyurethane Adhesive

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Introduction

Acacia (Acacia mangium) as a medium density wood is one of fast growing species of Industrial Plantation Forest that has been developed in Indonesia. The connection system with glue is more compatible when applied on wood with medium density. The adhesive was used Polyurethane as Water Based Polymer Isocyanate, which was used in cold press application. The polyurethane adhesive product has wide commercial aplication, well known for their excellent adhesion, flexibility, high cohessive strength, low temperature performance, and has amenable curing speeds. Shear strength of Polyurethane was signficantly stronger than recorcinol (Vick, 1998). Burdulu *et all.*, (2006) expressed that it was necessary to sand the surfaces prior to the bonding process to have a higher shear strength. Wood relies on both interlocking and charge interactions to create a proper adhesive bond (Gardner, 2008). The most important factor in forming strong bonds is the achievment of high level of adhesion between adhesive molecules and wood molecules, cohesion is force that is expressed internally, while adhesion is a force that is expressed externally (Mara, 1992). To predict the bond quality of polyurethane adhesive on Acacia wood requires investigation on the reaction of them.

The purpose of this study was to determine the dry shear strength of polyurethane adhesive in bonds of heartwood, sapwood and combination of heartwood-sapwood with different amount of glue spread.

Materials and Methods

Acacia of about 8 years old was cut from logs grown in Bogor, West Java, Indonesia. Lamina thicknesses were prepared with the width and length from a solid beam. All of the laminas were then kiln dried to an equilibrium moisture content of about 14 percent. Specimens were arranged from two two-ply laminates with different dimensions. One side of lamina was 3.2 mm thick, 5.1 mm width, and 6.4 mm length, and other lamina was 1.9 mm thick, 5.1 mm width, and 6.4 mm length. All of the specimens were prepared and their surfaces were attenuated. The grain direction of wood was parallel in both laminas and shearing stress in specimens. Polyurethane as Water Based Polymer Isocyanate was used for adhesive. The ratio of resin and hardener was 100:15 by weight. The procedure of investigation in the laboratory was tested in accordance with ASTM D905-94, Standard Test Method for Strength Properties of Adhesive Bonds in Shear by Compression Loading. The loading rate was 3 mm/minute, and the test was conducted until the specimen experienced a failure. The cross section of each specimen shear surface area was measured before the test. The surface of shear area was categorized into heartwood, sapwood, and combination of heartwood - sapwood. Each category of shear area surface was glued with 200, 250, 300, and 350 g/m^2 double spread. The pressure of cold press was 1.0 Mpa. It was done in cold press apllication for 20 hours. After pressing, the test examined 7 days after the aging. Dry shear strength was measured from compression loaded block shear specimen of two-ply lamina of about 26.01 cm^2 of glue line area. The test of specimens was examined with Universal Testing Machine, Instron 330 Type.

Statistical method in experimental design was used to determine the influence of four adhesive glue spreads and three kinds of shear area surface as heartwood, sapwood and combination of heartwood and sapwood. The experimental design was factorial 4 by 3 in completely randomized model, and the execution of statistical process was carried out by SAS program. Duncan's Multiple Range Test (DMRT) for variable glue spread and kind of the wood shear surface was

used to determine the dry shear strength interaction which significantly different in 0.05 level of probability.

Results and Discussion

The value of dry shear strength is shown in Table 1. The highest value of dry shear strength with 200g/m^2 glue spread was obtained from heartwood (5.3MPa), sapwood had lesser (5.1 MPa), and the smallest one was heartwood-sapwood (5.1 MPa). The heartwood surface area with glue spread of 250 g/m^2 has almost the same value of dry shear strength as sapwood (4.8 MPa and 4.9 MPa), but the surface area of heartwood-sapwood was smaller (4.4 MPa). By adding amount of adhesive of 300 g/m^2 and 350 g/m^2, its result did not show the same value trend if compared with the two types above. The surface area of heartwood-sapwood with 300 g/m^2 has the highest (6.3 MPa), and sapwood showed the smallest (3.9 MPa), and the dry shear strength value of heartwood (4.6 MPa) was between sapwood and heartwood-sapwood. The sapwood surface area with glue spread of 350 g/m^2 has the highest (5.8 MPa), the second value was 4.6 MPa for heartwood-sapwood, and heartwood showed the smallest (3.9 MPa). Regardless the amount of glue spread, the average values of dry shear strength were 4.6 MPa, 4.9 MPa, and 5.1 MPa for heartwood, sapwood, and combination of heartwood-sapwood respectively.

Table 1 The value of dry shear strength with different glue spread

Glue Spread	Dry Shear Strength (MPa)		
(g/m^2)	Heartwood	Sapwood	Heartwood-Sapwood
200	5.3	5.1	5.0
250	4.8	4.9	4.4
300	4.6	3.9	6.3
350	3.9	5.8	4.6
Average	4.6	4.9	5.1
STDEV	0.6	0.8	0.9
COV (%)	12.1	16.2	16.9

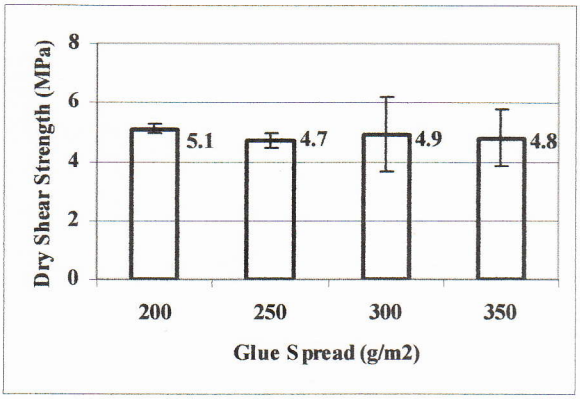

Figure 1 Dry Shear Strength with different amount of glue spread

Figure 1 represents a diagram of the application of less glue resulting in bigger dry shear strength tendency regardless of the kind surface of the wood.

Statistical evaluation found that the dry shear strength interaction of glue spread on kind of the wood shear surface was not significantly different. The treatment of glue spread on shear dry strength was not significantly different, and kind of the wood shear surface on dry shear strength was not also significantly different.

Based on the result of this research which has been obtained, hence it suggested do not use an excessive amount of adhesive. The higher amount of adhesive does not guarantee the higher dry strength. This matter require to be performed a research continuation for the other wood species and type of adhesive.

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