

6・2 スラウェシー産材のひき板接着適性

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Bond Strength of Sulawesi Woods

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6・2・1 はじめに

トギアン産材 28 樹種の接着適性の試験を行った。供試ひき板は 5, 6, 7 船の樹種のうち、各属の一個体ずつよりとったが、試験片の樹幹内の位置等は特に考慮に入れていない。

6・2・2 測定方法

供試材は各樹種毎に 3 組ずつの板を用意した。材は気乾材で板目ないし追柂の材面を接着面とし、材面をプレナー加工後 1 ～ 2 週間後に接着した。板の大きさは $8^{(T)} \times 30^{(L)} \times 1^{(R)} \text{ cm}$ を原則としたが、樹種によっては小さな材、或は 2 組の板しかとれなかったものも混じた。

接着には常温硬化のレゾルシノール・フェノール共縮合樹脂：松栄化学 SR-160 を用いた。接着剤の配合割合は接着剤 100 部に対し硬化剤 15 部である。硬化剤は松栄化学 NA である。

接着条件は次の通りである。

接着剤塗布量	20 g / 30 × 30 cm
圧 縮 圧 力	10 kg / cm ²
温 度	20 °C
圧 縮 時 間	24 時間

接着剤塗布後ひき板を堆積しネジ・クランプを用い圧縮した。トルクレンチにより圧縮圧力を調整する。

接着力試験は JIS Z 2114：木材のせん断試験に準じたイス型ブロックせん断試験とし、初期接着力としてせん断強さを求めた。試験期間は接着後 1 ないし 2 週間であった。使用した試験機は木材せん断試験機で、インストロン型の材料試験機により荷重ヘッド移動速さ 3 mm/min で試験した。

$$\text{接着面せん断強さ} = P/A \text{ kg/cm}^2$$

但し、P は破壊荷重、A は接着面せん断面積である。

6・2・3 結果の検討

結果を表 1 に示す。

(1) 接着の適性

比重の高い材で木部破断率（木破率）の低い結果を示したが接着力（せん断強さ）は 65 kg/cm² 以上を示し、接着としての一定水準に達しているものと思われる。高比重の材に対しては、接着に際しより大きな圧縮力が必要であったものと思われ、高圧縮圧力による接着力の増大は十分に期待出来よう。

また比重の低い材では接着力が小さい結果が得られたが、これらの木破率は大きく、接着に障害

があったとは思われない。これらよりこの試験に用いたトギアン産材には特に接着に支障のある樹種は含まれていないものと思われる。

(2) 比重と接着力

木破率の小さかった材，すなわち木破率 5 % 以下の材を除き，気乾比重を接着力（せん断強さ）との相関を求めた結果次式を得た。

$$Y = 14.2 X + 51.6$$

（Y）は接着力（せん断強さ），（X）は気乾比重で相関係数は， $r = 0.73$ であった。

除外した木破率の低い高比重の材，すなわち Koordersiodendron, Terminalia- (B), Eugenia, Madhuca, Heritiera では比重に相当するせん断強さが，高圧締圧力等接着操作の改良によっても得られない可能性が残っている。

References

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- Togian Wood, Sulawesi, Indonesia.

6.2.4 Summary

Studies on the Bonding of Some Togian Wood

Introduction

The increase of the need of wood in the world consumption has led technologists to develop any possible process in wood utilization and to use lesser known species. Bonding a kind of wood is one of the example.

The advantages of bonding a wood are many and significant. They include the following:

1. Ease of manufacturing large structural elements from standard commercial size of lumber.
2. The possible use of lower grade material for less highly stressed laminations, without adversely affecting the structural integrity of the member.

There are many mechanical & physical properties such as strength, density etc., which affect the use of a given wood. Wood failure and strength of the bonding are the satisfactory measurements which had been used by Truax,⁷ Browne⁴ and many other technologists to assess properties of wood bonding.

According to Brown³ the strength of the joint and the characteristics of the failure are affected not only by the adhesives used in bonding but, likewise, by other factors. Of these the most important are the kind of wood bonded, its density and moisture content, direction of the grain and the condition of the wood surface, and the procedures under which the joints were formed. Wangaard⁸ stated that Phenol formaldehyde and Resorcinol synthetic resin are the adhesives characterized by high durability under all conditions of exposure. Strength of the glue joints formed with these adhesives is to a large extent limited only by the ability of the wood itself to resist the conditions of exposure.

The objective of this preliminary study is to get to know the possibility of bonding some Togian Wood, Sulawesi, Indonesia.

Material & procedures

Twenty eight of Togian wood species had been chosen in this study. Each of them are listed in Table 1. Lumbers were as free as possible of any visible defects. Selected lumbers were sawn into a size of 30 cm x 8 cm x 1 cm in length, width and thickness respectively. Six pieces of lumbers of this size were taken from each species.

Surfaced lumbers were done before each pair of those lumbers were glued by a Phenol Resorcinol Formaldehyde Resin Adhesives. Gluing conditions:

Adhesives: Phenol Resorcinol Formaldehyde Resin (SR 160)

Glue spread: 20 g/0.09m²

Pressure applied: 10 kg/cm²

Assembly time: 24 hours

Hardener: 15%

Minimum temp.: 20°C

A cold press was used to assembly all of the pairs of lumbers. Pressure had been maintained at a constant rate for 24 hours. All of those pairs were then cut into the sample size. (See Fig. 1). Each pair can be cut into five samples. Specific gravity and the actual size of those sample had been measured before all of it were stored at a room of 25°C – 30°C. This was kept until the tests would be done.

Shearing strength tests were done according to the modification of JIS Z 2114 and JIS K 6810 using Instron type machine with the speed of load of 3 mm/min.¹

Table 1. Specific Gravity, Shearing Strength & Wood Failure of Twenty Eight Togian Bonded Wood.

No.	Wood Species	Family	SG	SS (kg/cm ²)	Wood Failure (%)		
					Min.	Av.	Max.
1.	Artocarpus	Moraceae	0,29	48	90	95	100
2.	Sterculia	Sterculiaceae	0,37	41	100	100	100
3.	Ailanthus	Simarubaceae	0,43	61	20	68	100
4.	Sandoricum	Meliaceae	0,43	74	50	82	100
5.	Sapium	Euphorbiaceae	0,44	53	75	95	100
6.	Duabanga	Sonneratiaceae	0,47	74	70	98	100
7.	Calophyllum	Guttiferae	0,48	66	10	68	95
8.	—	Myristicaceae	0,48	71	70	95	100
9.	Spondias	Anacardiaceae	0,48	73	0	38	100
10.	Terminalia	Combretaceae	0,48	84	70	97	100
11.	Litsea	Lauraceae	0,51	79	0	17	45
12.	Lophopetalum	Celastraceae	0,51	93	80	92	100
13.	Podocarpus	Podocarpaceae	0,53	98	80	89	95
14.	Ficus	Moraceae	0,56	77	35	61	95
15.	Palaquium	Sapotaceae	0,57	87	5	46	100
16.	Octomeles	Datiscaceae	0,58	88	30	53	100
17.	Aglaia	Meliaceae	0,58	90	10	29	50
18.	Dysoxylum	Meliaceae	0,58	96	70	81	90
19.	Gonystylus	Gonystylaceae	0,59	84	20	45	80
20.	Heritiera	Sterculiaceae	0,61	68	0	0	0
21.	Dracontomelon	Anacardiaceae	0,61	90	20	39	60
22.	Santiria	Burseraceae	0,62	124	0	84	100
23.	Canarium	Burseraceae	0,63	70	0	17	60
24.	Terminalia	Combretaceae	0,69	95	0	0	0
25.	Koordersiodendron	Anacardiaceae	0,70	80	0	0	0
26.	Pometia	Sapindaceae	0,70	80	0	42	90
27.	Eugenia	Myrtaceae	0,77	82	0	4	10
28.	Madhuca	Sapotaceae	1,09	61	0	0	0

Notes:

SG : Specific Gravity.

SS : Shearing Strength

Min. : Minimum

Av. : Average of 15 samples.

Max. : Maximum.

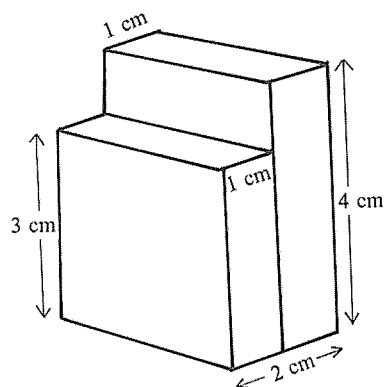


Fig. Sample of shearing strength test.