

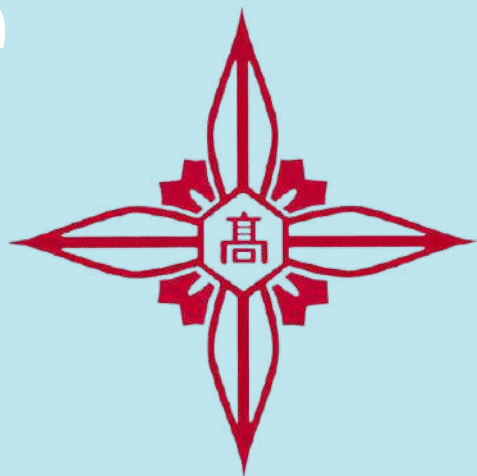


How to strengthen wood

combining wood and lignin to enhance the strength

[W202012-2]

Kaohsiung Municipal Kaohsiung Senior High School



**This project is a collaboration between KSHS
and Miyazaki Omiya High School.**

Why using wood?

1

RENEWABLE & RECYCLABLE

2

LESS CARBON EMISSIONS

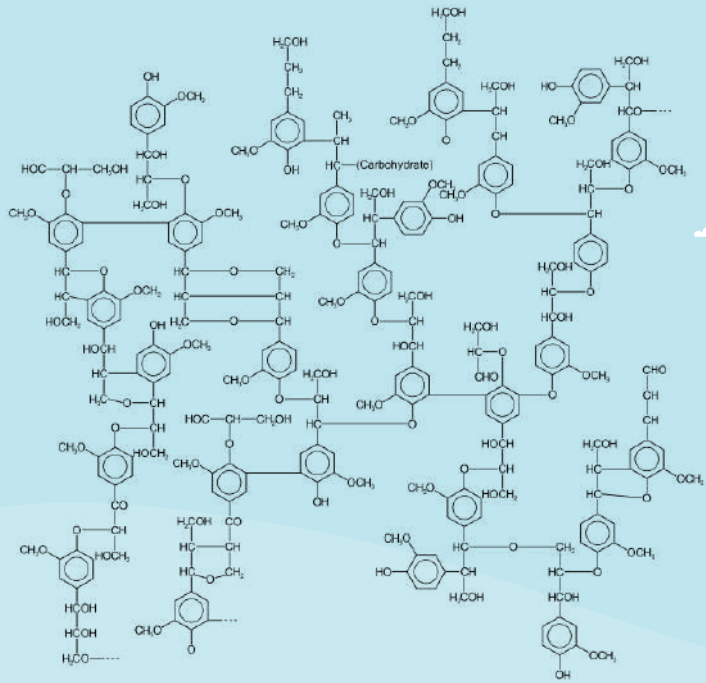
3

BIODEGRADABLE



However, concrete is still the most common building material.





1

2

3

Lignin

A BIOPOLYMER

NATURAL BINDER

HELP KEEP THE WOOD STRONG





1

Materials

Things we use in the experiment

Chemicals



1. **A (DMSO+PB) : 0.1 M PB (pH 7.2) 30 mL + DMSO 970 mL**
2. **B (Lignin+DMSO+PB) : Lignin 3 g + 0.1 M PB (pH 7.2) 30 mL + DMSO 970 mL**
3. **C (Lignin+paraformaldehyde+DMSO+PB) : Lignin 3 g + 10% paraformaldehyde in 0.1 M PB (pH 7.2) 30 mL + DMSO 970 mL**



Equipment

wood tester



vacuum bucket





2

Experiment

The process

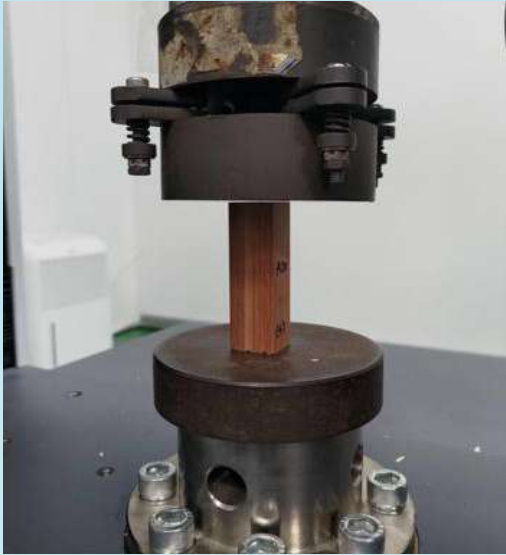
Process



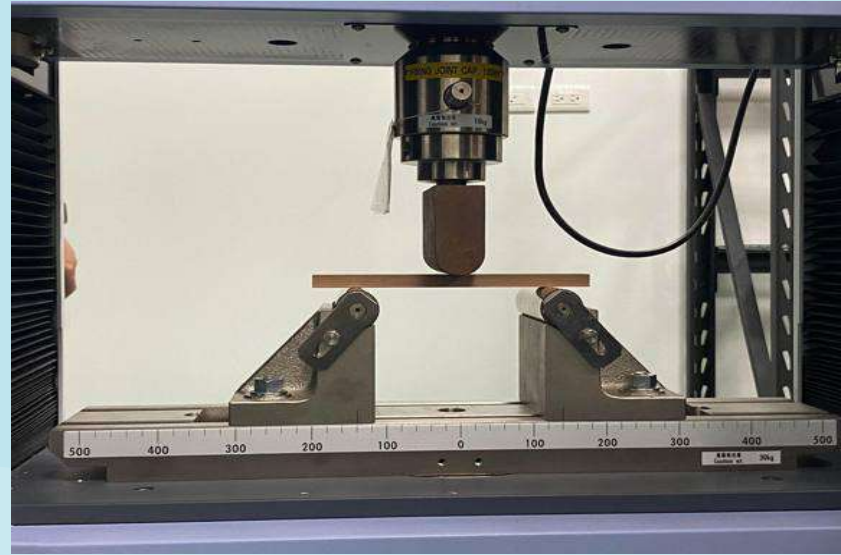
- 1. Soak the wood with different chemicals**
- 2. Dry the wood in heating machine**
- 3. Test the wood's strength and bending resistance**



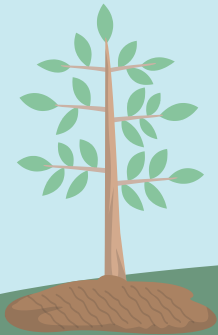
Measuring



Strength



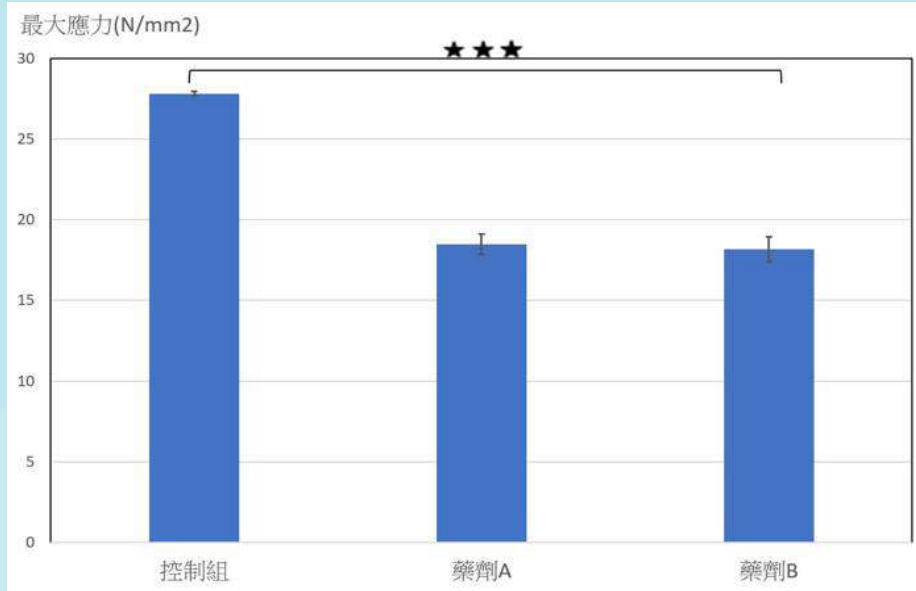
Bending resistance





Data

Data in Taiwan

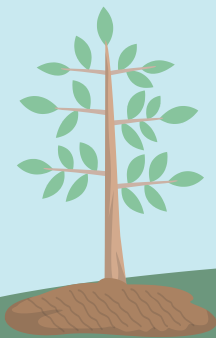


No add

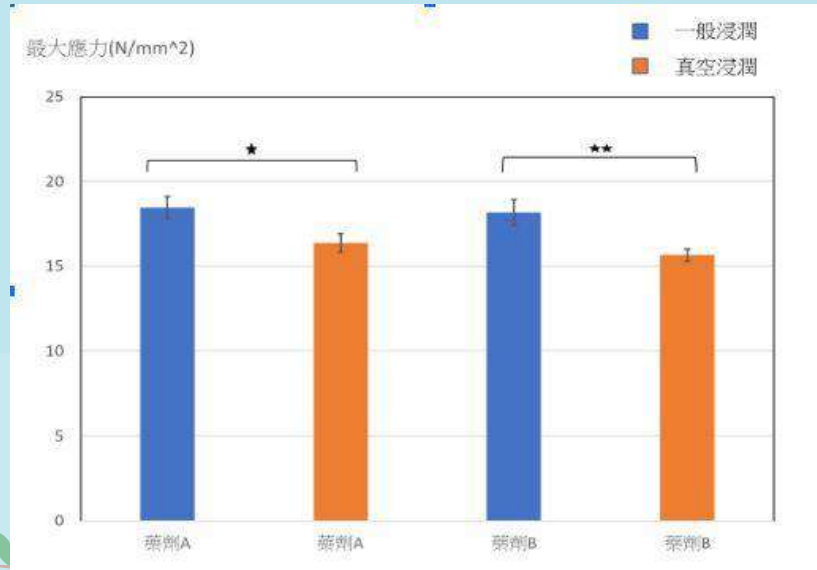
Soak A

Soak B

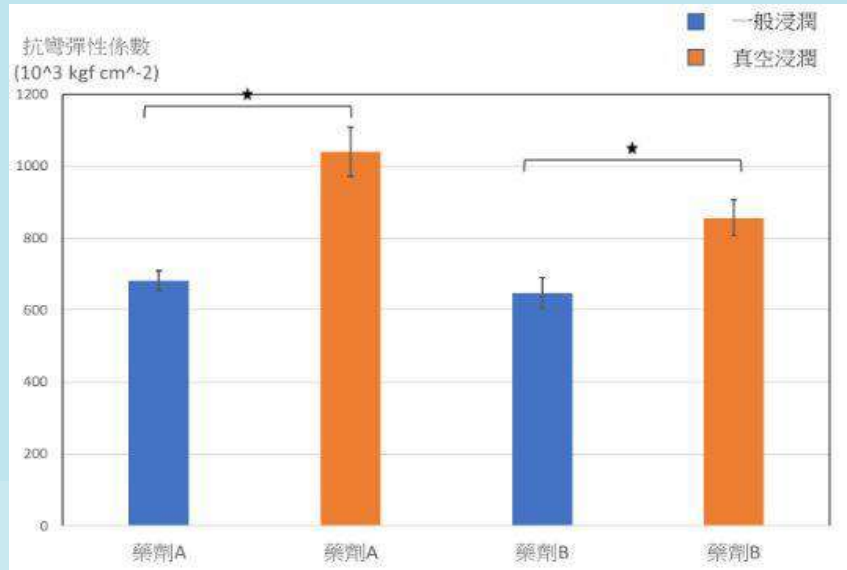
Vacucity-soaked



Data in Taiwan



Soak A Soak B Soak A Soak B



Soak A Soak B Soak A Soak B

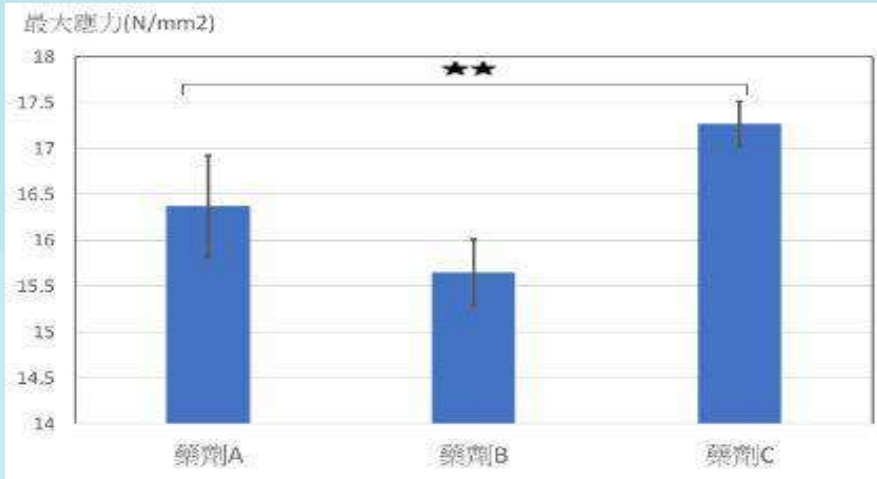


Data in Taiwan

Paraformaldehyde + Lignin

----> Form new substance!

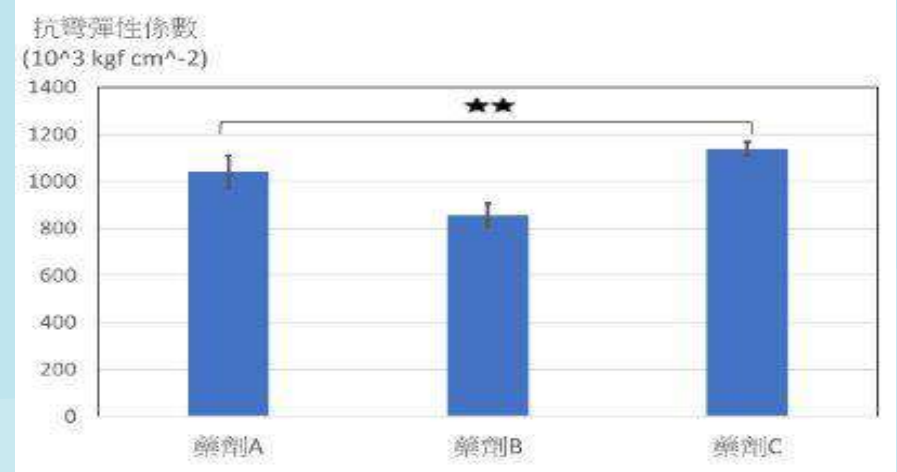
Data in Taiwan



Soak A

Soak B

Soak C



Soak A

Soak B

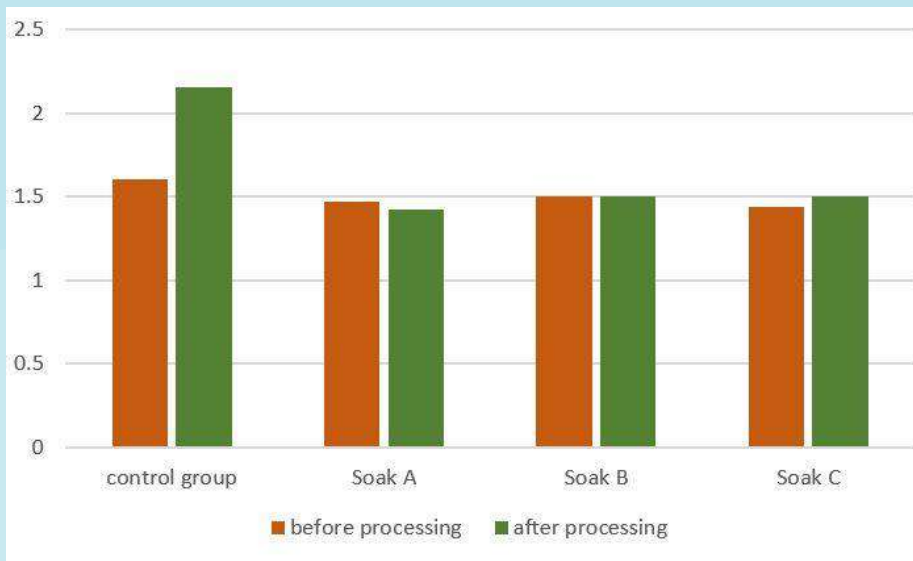
Soak C



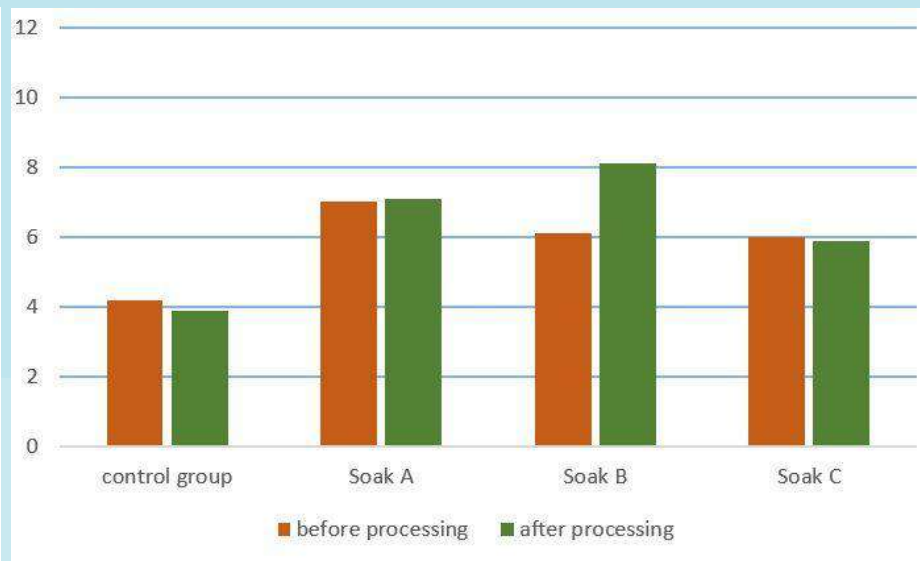
Data in Japan



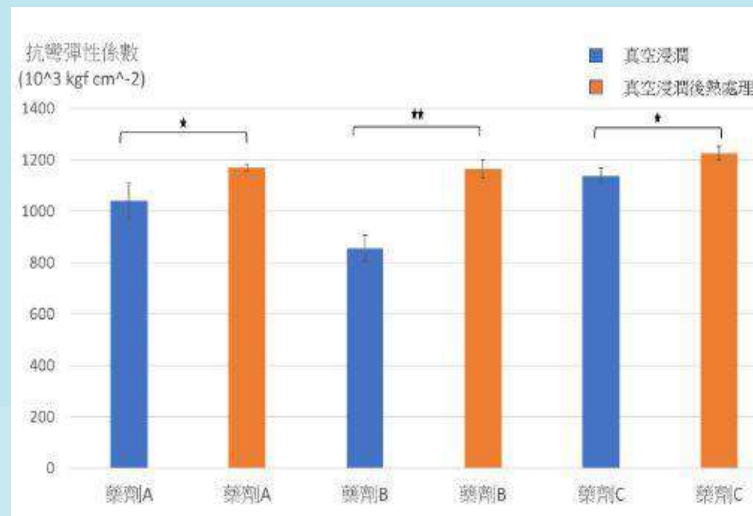
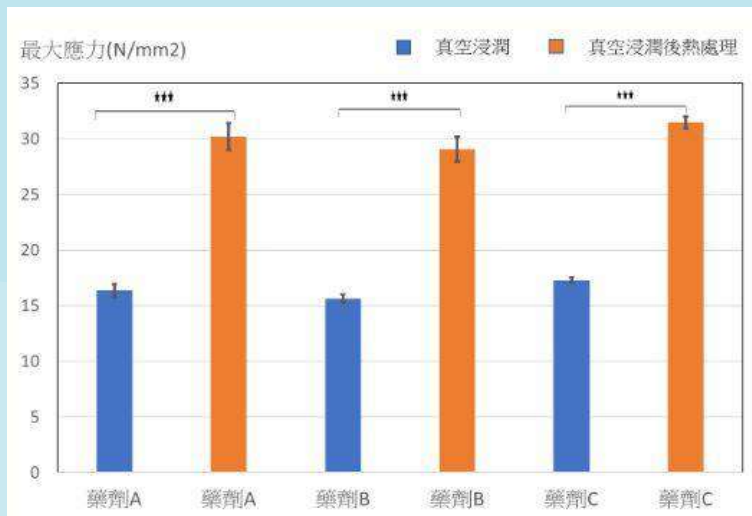
Strength



Bending resistance



Heat wood





4

Conclusion

Comparison in strength

Taiwan

Japan

Chem A

Worse

NSD

Chem B

Worse

NSD

Chem C

Better

NSD

NSD: No significant difference

Comparison in bending

Taiwan

Japan

Chem A

Worse

NSD

Chem B

Better

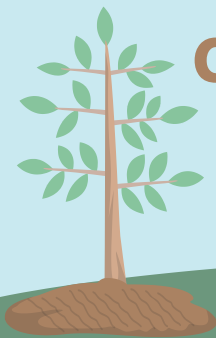
Better

Chem C

Better

NSD

NSD: No significant difference



Wood difference

Taiwan



Taiwania cryptomerioides

Japan



Cryptomeria japonica



**thanks for
listening!**

