



南京林业大学·材料科学与工程学院

*Nanjing Forestry University College of Materials Science and Engineering*

# **Producing medium density fibreboard based on bamboo-willow**

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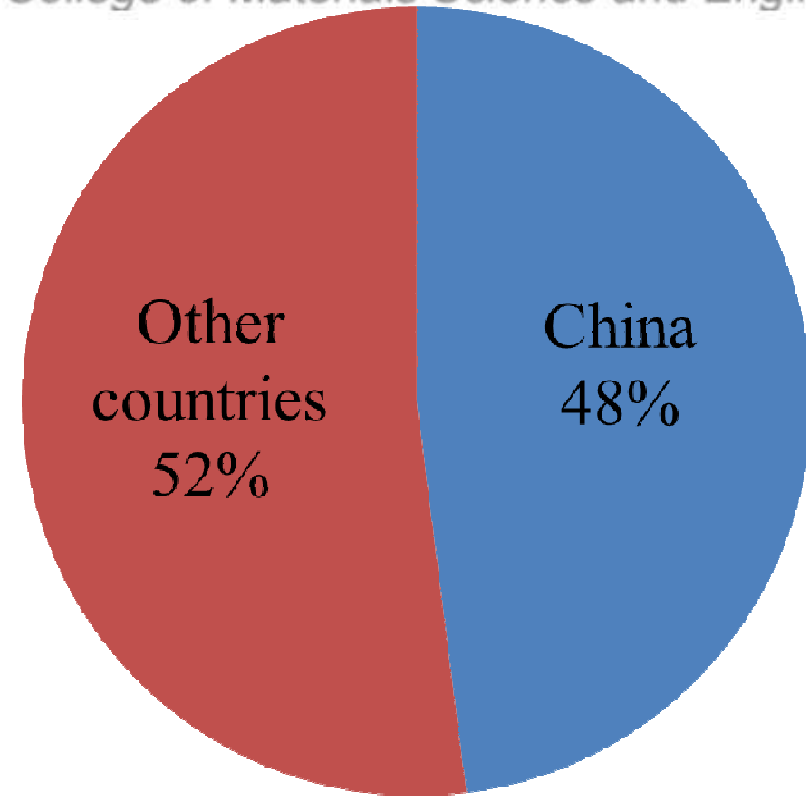


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- China has been the largest country in the world for WBP production and exportation.
- Raw material supply is the big issue for the sustainable development of wood industry in China.
- Fast-growing tree plantation will be the only solution.



Global WBP production in 2013



- ❑ 6 years ago, Bamboo-willow was introduced into China.
- ❑ It grows faster than poplar



**Bamboo-willow plantation in China**

The aim of this study is to study the possibility of using fibers made from bamboo-willow to produce MDF.

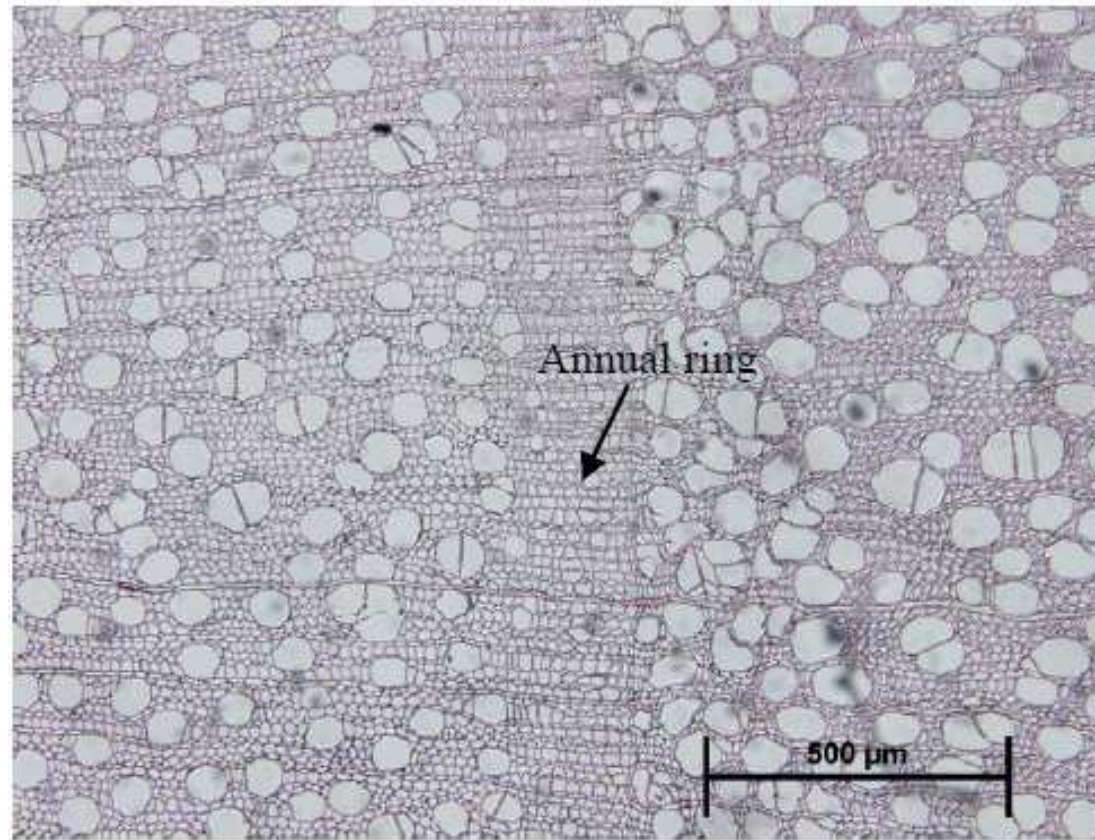




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# Micro-structure and Wettability of bamboo-willow wood



Cross-sectional detailed micro-structure of bamboo-willow wood

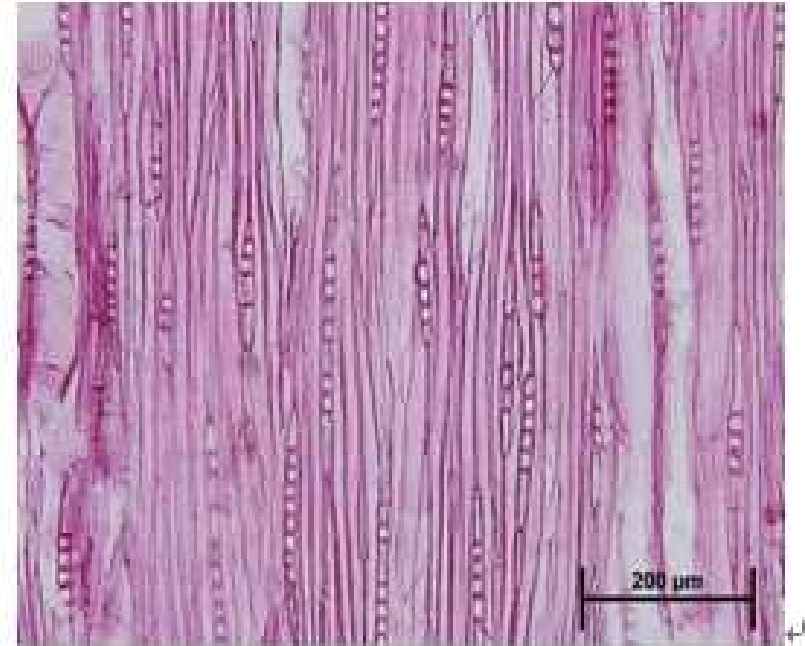


图 3.4 竹柳弦切面

Tangential section detailed micro-structure of bamboo-willow wood



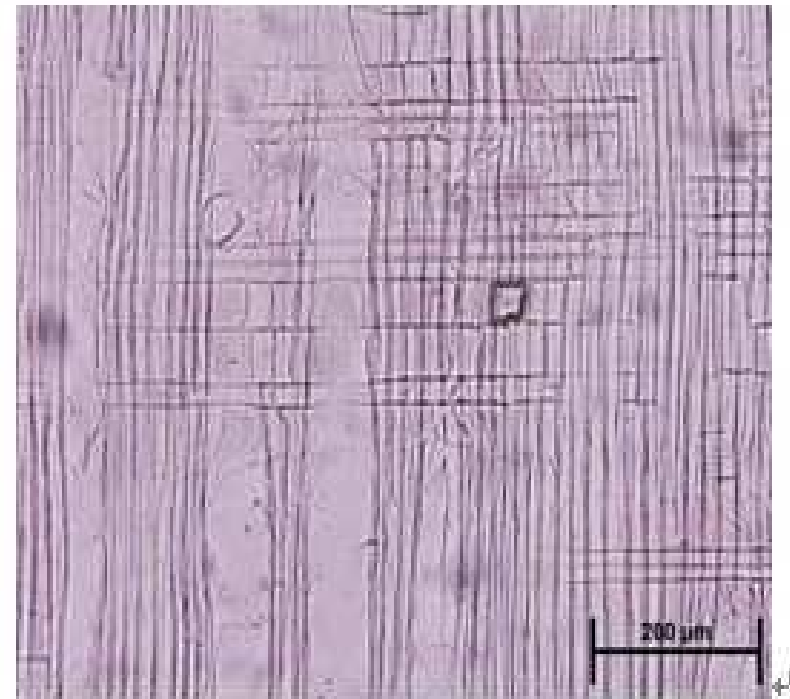
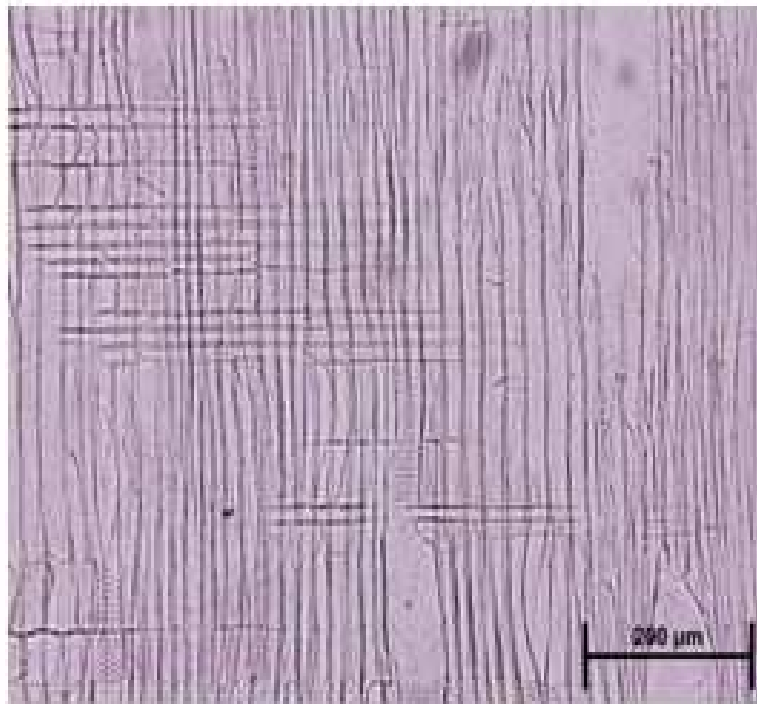
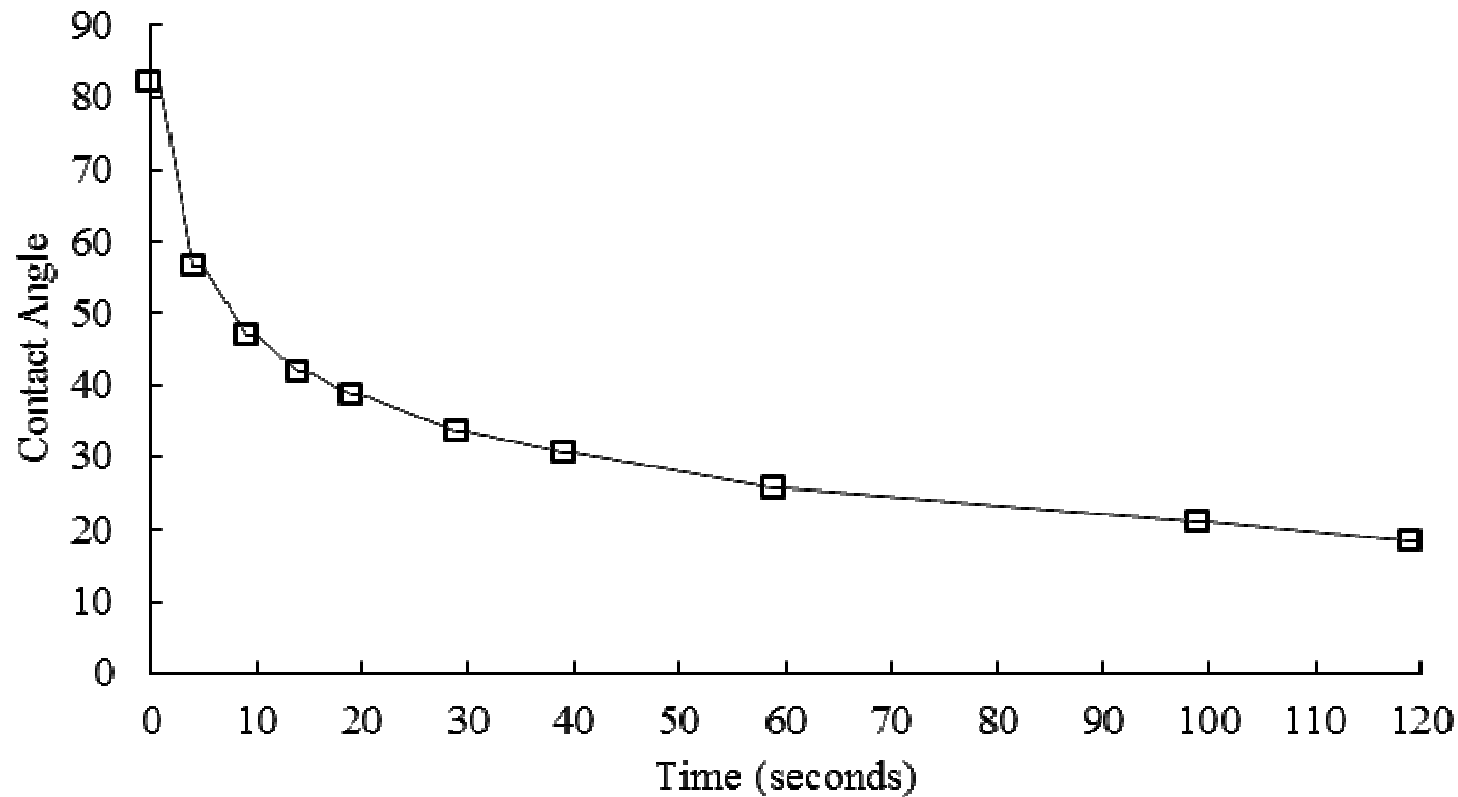


图 3.3 竹柳径切面

Radial section detailed micro-structure of bamboo-willow wood



The relationship between wetting time and water contact angle on bamboo-willow

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# Processing fibres with different morphology



Temperature settings in refining process:

- 1) Room temperature refining (25 °C)
- 2) Pressurized refining (140 °C)
- 3) Pressurized refining (160 °C)



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The image of one fibre obtained with FQA

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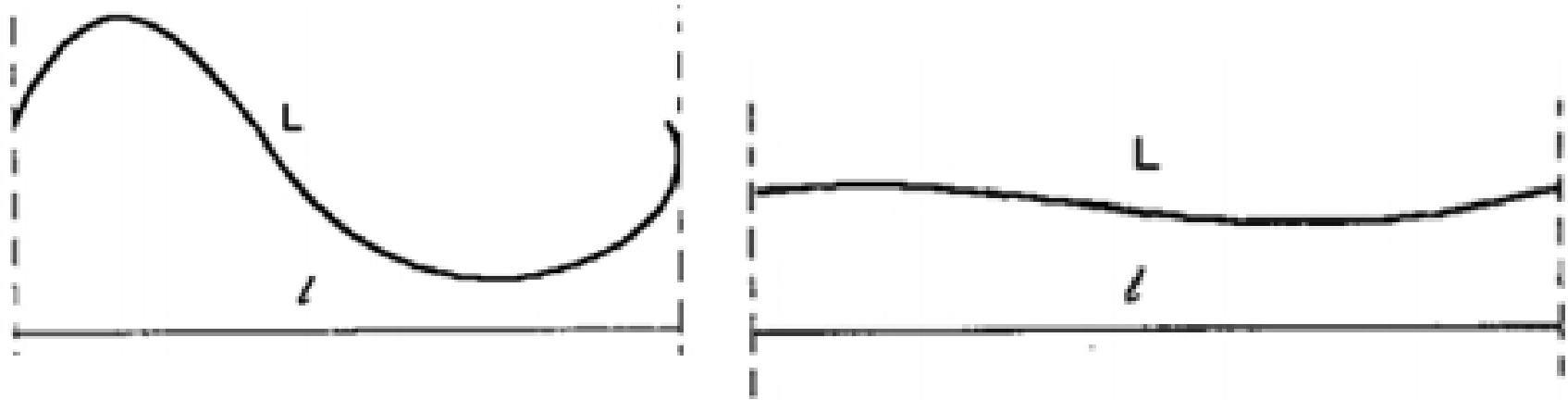
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# Fibre Quality Analyser





The relationship between actual length and projective length of the fibre.

$L$  = actual length;

$l$  = projective length



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$$\text{Curl Index} = (L/l) - 1$$





The average length, width and curl index of fibres processed in three temperature conditions in refining process

Temperature(°C)	Length (mm)	Width (mm)	Curl index
25	0.42	0.026	0.0488
140	0.33	0.025	0.0488
160	0.3	0.025	0.0524



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# MDF production and properties measurement



## Parameters for board manufacturing:

- ❑ Target density: 850 kg/m<sup>3</sup>
- ❑ Board thickness: 12mm
- ❑ UF glue application: 14%
- ❑ Pressing temperature: 180°C
- ❑ Pressing time: 360s

**The properties of MDF produced with fibres that are prepared in three different temperature conditions in refining process**

Temperature(°C)	MOE <sup>a</sup> (MPa)	MOR <sup>b</sup> (MPa)	IB <sup>c</sup> (MPa)	TS <sup>d</sup> (%)
25	2895.32	34.07	0.56	12.7
140	2921.02	28.99	0.56	13.1
160	2495.32	24.77	0.51	14.3

*<sup>a</sup>Modulus of elasticity, <sup>b</sup>Modulus of rupture, <sup>c</sup>Internal bond, <sup>d</sup>Thickness swell*



## Conclusions

- Bamboo-willow is suitable to be a raw material for MDF production.
- High processing temperature can decrease the length of fibers.
- MDF produced with relatively long fiber has higher mechanical strength.



## Future work

- Mixing bamboo-willow with other wood species to produce MDF.
- Using bamboo-willow in MDF industry.
- The possibility of using bamboo-willow in OSB industry.