



Structure characteristics of self-bonding boards during hot press for leukemia inhibition



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Formaldehyde free;
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Abstract 80% leukemia was caused by indoor formaldehyde pollution. And the results have shown that the absorbances of many connection bonds (such as C—O—C, and C—OOC) increased. It could be inferred that a lot of bonds were produced and played the role of molecular crosslinking. After hot press, the content of lignin in *Eucalyptus* wood fiber was all lower than the ones of self-bonding boards. And the change of content of lignin was closely related to time and temperature of hot press.

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1. Introduction

Leukemia, which was a group of cancers and was caused by the high numbers of abnormal white blood cells, was named as a family of diseases in 1900 (Vardiman et al., 2009; Colvin and Elfenbein, 2013; Else et al., 2005). Aminopterin could potentially cure leukemia in children in 1947 (Colvin and Elfenbein, 2013; Else et al., 2005; Valbuena et al., 2005; Ross et al., 2002). However, at present, there were about 245,000 people in the United States; for example, approximately 44,270 new cases of leukemia were diagnosed only in 2008 in the US. What's worse, there are also about 5,000,000 patients with leukemia in China. Leukemia developed to 352,000

people globally and caused 265,000 deaths in 2012. Leukemia was the most common type of cancer in children, with 75% leukemia cases in children being ALL (Eichhorst et al., 2006; Shapira et al., 2008). It was proved that 80% leukemia was caused by indoor formaldehyde pollution (Riquelme-Valdés et al., 2008).

The indoor formaldehyde pollution comes mainly from the formaldehyde in wood-based panels. Wood-based panels were bound by urea–formaldehyde resin. Formaldehyde emissions from products made by urea–formaldehyde resins are the most common (Riquelme-Valdés et al., 2008; Xiao et al., 2014). The formaldehyde concentrations should be below the levels known to cause health or comfort effects. However, formaldehyde concentrations exceeded national guideline values (Riquelme-Valdés et al., 2008; Xiao et al., 2014; Sun et al., 2014; Peng et al., 2014). In particular, the excessive wood-based panel products were indoor used (Sun et al., 2014; Peng et al., 2014, 2012). It will be resulted that formaldehyde has been more than national guideline. In high formaldehyde air, children and old people are easier to have leukemia. And the key to solve this problem is that urea–formaldehyde resin will not be used. Therefore, the *Eucalyptus* urophydis fiber was self-bonded dur-

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ing hot press, in which group characteristics were detected by FT-IR and UV for nontoxic medicine package.

2. Materials and methods

2.1. Materials

The *Eucalyptus urophydis* wood, which was 4.5-years-old, was collected from Yangjiang Forestry Bureau. *Eucalyptus urophydis* wood was cut into wood chips, dried to oven dry, and mechanically powered to 40–60 μ short fiber.

2.2. Experimental methods

2.2.1. Self-bonding process

The 90 g above fiber was pressed to self-bond under the gauge pressure of 15 MPa, at 170 °C, 160 °C, 150 °C, 140 °C, for 50 min, 40 min, 30 min, 20 min, and 10 min, respectively. The self-bonding boards were obtained.

2.2.2. FT-IR detection

FT-IR spectra of the aforesaid samples were obtained using a Thermo Scientific Nicolet iN10 FT-IR microscope as previously (Wen et al., 2013; Xue et al., 2014).

2.2.3. UV detection

The samples were prepared by Acetyl bromide method, and detected as the same as the reference Peng et al. (2013).

3. Results and analysis

3.1. FTIR spectra of *Eucalyptus* wood fiber

FT-IR spectra could be used to investigate the structural groups of the self-bonding boards. For comparison, the spectra of the self-bonding boards were plotted in supporting information Fig. 1. The spectra of all samples showed the

3345 cm^{-1} (O—H stretch), 2916 cm^{-1} ($-\text{CH}_2$ stretch), 1735 cm^{-1} (unconjugated C=O stretch), 1459 cm^{-1} (C—H deformation vibration), 1372 cm^{-1} (C—H bending vibration), 1235 cm^{-1} (C—C, C—O plus C=O stretch), 1160 cm^{-1} (C—O—C stretch), 1113 cm^{-1} (C—O or C—C stretch), 1032 cm^{-1} (C—O—C stretch), 898 cm^{-1} (cellulose beta glycosidic bond stretching vibration). Particularly, the conjugated units in lignin were probably related to oxidation at α -position of side-chain of lignin during hot press. The similar spectra patterns of aromatic skeletal vibrations in the lignin samples (1591 cm^{-1} , 1504 cm^{-1} , and 1423 cm^{-1}) suggested that the basic aromatic structures of lignin were not changed during these processes. The syringyl lignin stretching vibration was at 1325 cm^{-1} .

3.2. FT-IR spectra of self-bonding boards

The samples were pressed at 140 °C, 150 °C, 160 °C, and 170 °C, respectively. And their FT-IR spectra are protracted in Figs. 2–6, respectively.

Fig. 2 shows that change regulation was FT-IR spectra of the self-bonding boards with the hot press time of 10 min. The absorbance of the peak at 3362 cm^{-1} firstly increased from 0.570 (0 min) to 1.141 (140 °C), and then decreased to 0.929 (170 °C). The absorbance of the peak at 2904 cm^{-1} firstly increased from 0.512 to 0.839 (140 °C), and then decreased to 0.799 (170 °C). The absorbance of the peak at 1737 cm^{-1} increased from 0.493 to 0.765 (170 °C). The absorbance of the peak at 1594 cm^{-1} reached the maximum 0.776 (170 °C). The absorbance of the peak at 1503 cm^{-1} reached the maximum 0.757 (170 °C). The absorbance of the peak at 1458 cm^{-1} reached the maximum 0.765 (170 °C). The absorbance of the peak at 1369 cm^{-1} reached the maximum 0.814 (170 °C). The absorbance of the peak at 1325 cm^{-1} reached the maximum 0.824 (170 °C). The absorbance of the peak at 1230 cm^{-1} reached the maximum 0.861 (170 °C). The absorbance of the peak at 1154 cm^{-1} reached the maximum 0.840 (170 °C). The absorbance of the peak at 1109 cm^{-1} reached the maximum 0.942 (170 °C). The absorbance of the peak at

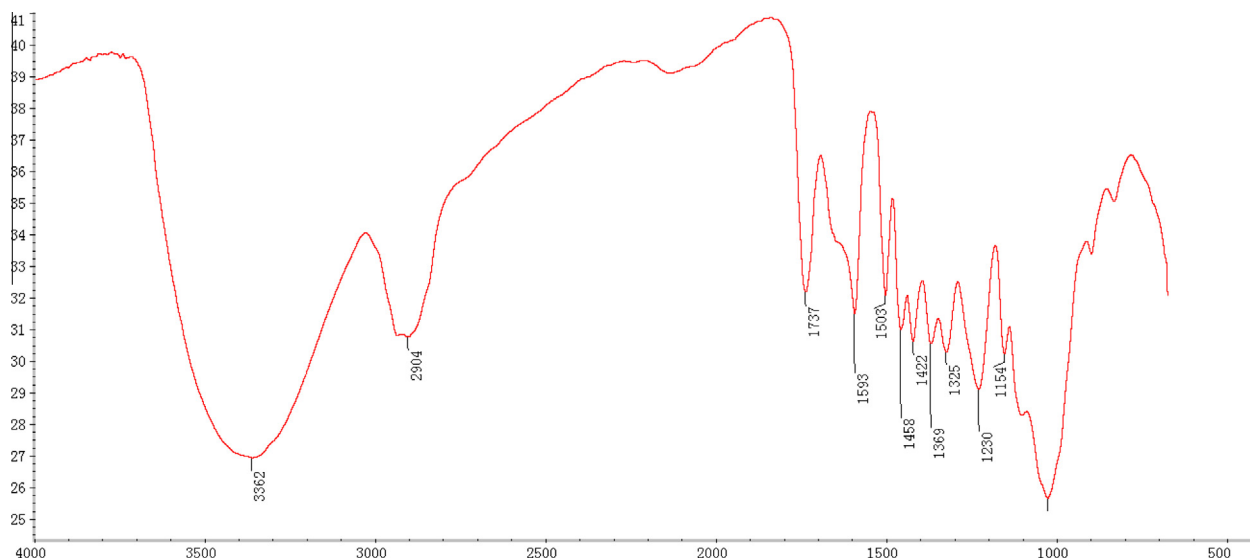


Figure 1 FTIR spectra of *Eucalyptus* wood fiber.

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