热处理对蓝变杨木性能的影响研究

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摘 要:【目的】为探究不同热处理温度对蓝变杨木性能的影响，提高蓝变杨木的利用价值。【方法】采用水蒸气作为传热介质，将蓝变杨木置于 130□、160□、180□、200□的高温热处理实验箱中处理 2 小时，分析了热处理温度对蓝变杨木密度、热失重率、尺寸稳定性、吸水率以及抗弯、抗压等力学性能的影响，考察了杨木蓝变部位和正常部位表面颜色的变化规律，并利用热重分析热处理后杨木蓝变部位和正常部位木材的热稳定性。【结果】实验结果表明，随着热处理温度的升高，蓝变杨木的密度逐渐降低和热失重率逐渐升高，在 200□热处理条件下，试样热失重率 4.32%。在本次实验条件下，200□热处理条件下木材的尺寸稳定性最高，木材弦、径向抗胀缩率分别为 42.20%和 39.82%，热处理杨木的阻湿率随热处理温度的提高逐渐增加，其中 200□热处理杨木的阻湿率为 28.83%。与未处理材相比，200□热处理蓝变杨木的吸水率降低了 14.67%，而顺纹抗压强度、顺纹抗弯强度、抗弯弹性模量均有所下降，降幅分别为 18.47%、44.47%、45.87%。随着热处理温度的升高，木材蓝变部位和未蓝变部位的明度差值ΔL^*逐渐缩小，由-11.31 减少到-5.18，木材整体明度下降且在 180□和 200□之间下降幅度最大，其中蓝变部位明度值下降了 16.35%，杨木的蓝变部位和正常部位颜色差异随着热处理温度的增加而降低，200□热处理杨木蓝变部位与正常部位的色度差值与未处理材相比降低了 42.71%，木材表面颜色更加均匀。【结论】200□热处理 2 小时可以显著提高蓝变杨木的尺寸稳定性和降低蓝变杨木表面蓝变部位和正常部位的颜色差异，热处理可以拓展蓝变杨木的应用范围。

关键词：高温热处理；蓝变杨木；颜色；尺寸稳定性

Effect of Heat Treatment on the Performance of Blue-stained Poplar Wood

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Abstract:【Objective】In order to investigate the effect of different heat treatment temperatures on the performance of blue-stained poplar wood, and improve its the utilization value.【Method】 Water vapor was used as heat transfer medium, the blue-stained poplar wood was treated at temperatures of 130□, 160□, 180□, and 200□ for 2 hours in a high-temperature drying oven. The effect of heat treatment on the density, thermal weight loss rate, dimensional stability, water absorption, as well as bending and compression strength, and the color change of blue-stained and non-stained parts of the wood surface were analyzed. Additionally, thermogravimetric analysis was conducted to reveal the difference of thermal stability of blue-stained and non-stained parts of the heat-treated poplar wood.【Result】The results showed that the density of blue stained poplar wood decreased and the thermal weight loss rate increased with the increase of treatment temperature. Under the condition of 200□ heat treatment, the thermal weight loss rate was 4.32%. The dimensional stability of the 200□ heat-treated wood was the highest, the tangential and radial anti-shrink rate and anti-swell rate was 42.20% and 39.82%, respectively. The moisture resistance of the

heat-treated wood was improved with the increasing of treatment temperature, wherein the moisture resistance of 200□ heat-treated wood was 28.83%. Compared with untreated wood, the compressive strength, bending strength, and bending modulus of elasticity of the 200□ heat-treated wood decreased by 18.47%、44.47%、45.87%. As the heat treatment temperature increases, the lightness difference ΔL^* between the blue-stained and unstained parts of the wood gradually decreases from -11.31 to -5.18. The overall lightness of the wood also decreases, with the largest drop occurring between 180□ and 200□. The lightness of the blue-stained parts decreases by 16.35%. Additionally, the color difference between blue-stained and normal parts of poplar wood decreased with increasing heat treatment temperature,with the color difference between the blue-stained and non-stained parts of 200□ heat-treated wood reduced by 42.71% compared with that of untreated wood, the heat treatment made the color of the wood surface is more uniform.【Conclusion】2-hours heat treatment at 200□ could significantly improve the dimensional stability of the blue-stained poplar wood, and reduce the color difference between blue-stained and non-stained parts of the wood surface, thereby expanding the application range of blue stained poplar wood.

Keywords: heat treatment; blue-stain poplar wood; color; dimensional stability