

纤维改性对柔性超薄木质复合材料性能影响研究*

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摘 要:【目的】超薄纤维板作为纤维板行业的新型产品,主要用于替代木单板作为胶合板的贴面材料从而避免木单板因各向异性而引起胶合板表面开裂问题,这进一步拓展了纤维板的应用领域。作为低质材高效利用的产品,超薄纤维板替代传统大幅面木质单板不仅能提供更好的综合性能,还可以节约大量优质木材资源,减少大径级原木砍伐,具有显著的生态效益。规格较大的超薄纤维板具备一定的弯曲能力,亦可用于微曲面的贴面等工作,但是即使凭借其本身微弱柔性进行贴面后也会回弹,导致贴面层开裂,对于曲面弧度较大、形状不规则的表面则更是无法适用。【方法】为了解决大弧度曲面、不规则表面的贴面问题,需要对超薄纤维板进行柔化改性。由于木纤维本身具有一定刚性,故我们从纤维角度入手,通过氢氧化钠(NaOH)和 γ -氨基丙基三乙氧基硅烷(KH550)对杨木纤维进行柔化改性并与聚氨酯弹性体热压制成柔性超薄纤维板。【结果】傅立叶变换红外光谱(FTIR)、X射线光电子能谱(XPS)和扫描电子显微镜(SEM)观察结果证实,NaOH改性后木纤维中的部分半纤维素和木质素被去除,KH550改性后成功接枝了烷氧基结构。NaOH&KH550协同改性改善了杨木纤维与聚氨酯的界面相容性。超薄纤维板的柔性得到改善(纤度值降低了113%),可实现弯曲、扭转和打结等柔性变形。此外,热稳定性、拉伸强度(提高105%)、断裂伸长率(提高125%)和耐水性能也得到了提高。【结论】这种柔性超薄纤维板有望应用于曲面材料和异型结构家具的贴面,为提高超薄纤维板产品的附加值提供理论依据。

关键词: 纤维改性; 木质复合材料; 柔性超薄纤维板; 物理性能;

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Study of the effect of fiber modification on the properties of flexible ultra-thin wood composites*

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Abstract:【Objective】Ultra-thin fiberboard, as a new product in the fiberboard industry, is mainly used to replace wood veneer as a veneer material for plywood, thus avoiding the problem of plywood surface cracking due to the anisotropy of wood veneer, which further expands the application fields of fiberboard. As a product of efficient use of low-quality materials, ultra-thin fiberboard to replace the traditional large-size wood veneer can not only provide better overall performance, but also save a lot of high-quality timber resources, reduce the logging of large diameter logs, with significant ecological benefits. Larger specifications of ultra-thin fiberboard with a certain degree of bending capacity, can also be used for micro-curved surfaces such as veneer, but even with its own weak flexibility for veneer will rebound, resulting in veneer layer cracking, for the curved surface curvature of the larger, irregularly shaped surfaces is even more inapplicable. 【Method】In order to solve the problem of veneering large curved surfaces and irregular surfaces, it is necessary to soften and modify the ultra-thin fiberboard. Since wood fiber itself has a certain degree of rigidity, we start from the fiber perspective, through the sodium hydroxide (NaOH) and γ -aminopropyltriethoxysilane (KH550) on poplar fiber softening modification and polyurethane elastomers hot-pressed to make a flexible ultra-thin fiberboard. 【Result】Fourier transform infrared spectroscopy (FTIR), X-ray photoelectron spectroscopy (XPS) and scanning electron microscope (SEM) observations confirmed that some hemicellulose and lignin in the wood fibers were removed by NaOH modification, and the alkoxy structure was

successfully grafted by KH550 modification, and the synergistic modification of NaOH&KH550 improved the interfacial compatibility of poplar wood fibers with polyurethane. NaOH&KH550 synergistic modification improved the interfacial compatibility between poplar fiber and polyurethane. The flexibility of the ultra-thin fiberboard was improved (113% reduction in fiber value), and flexible deformation such as bending, twisting and knotting could be achieved. In addition, thermal stability, tensile strength (105% improvement), elongation at break (125% improvement), and water resistance were improved. **【Conclusion】** This flexible ultra-thin fiberboard is expected to be applied to the veneer of curved materials and furniture with shaped structures, providing a theoretical basis for improving the added value of ultra-thin fiberboard products.

Key words: Fiber modification; wood-based composites; flexible ultra-thin fiberboard; physical properties;