

Lignin-based copolymer adhesives for composite wood panels – a review

ABSTRACT

Lignin is a natural and renewable organic compound that can be easily obtained from spent pulping liquors. It can be used as feedstock for making wood adhesives. Nonetheless, lignins need to be modified to enhance reactivity prior to being used as feedstock for making wood adhesives. Appropriate crosslinkers are also needed to ensure the bonding quality of the lignin-based wood adhesives. In the present review, the drawbacks of using lignins alone as wood adhesives, modifications to enhance the reactivity of lignins and production of lignin-based copolymer adhesives for composite wood panels are reviewed and discussed. The objective of this review is to provide background information about the recent status on the development of lignin-based copolymer adhesives for the production of composite wood panels as well as the future prospects of these adhesives in industry. Several modifications such as demethylation, oxidation, methylolation, phenolation, reduction and hydrolysis have shown promising results for enhancing the reactivity of lignins. Several crosslinkers such as phenolic resin, tannin, polymethylene polyphenyl isocyanate (pMDI), furfural and ethylenimine are capable of copolymerizing with lignins to produce lignin-based wood adhesives. The performance of composite wood panels bonded with modified lignin-based copolymer adhesives have been shown to meet the requirements of relevant standards. The main obstacles for the composite wood panels industry to widely adopt to lignin-based copolymer adhesives are the economic and technical issues. Nevertheless, lignin modification methods are proving to enhance the reactivity of lignins and the optimization in such modification methods would justify the economic issue. Together with the public awareness on the safety, health and environment concerns, the utilization of lignin-based adhesives in the composite wood panels industry is feasible.

Keyword: Adhesive for wood; Lignin; Biodegradable adhesive; Composite wood panels