PHOTOSTABILITY OF MODIFIED WOOD*

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Summary

Chemical modification of the molecular structure of polymers is a fundamental approach to improving the resistance of materials to photodegradation, but it is seldom employed because other techniques, such as the use of additives (UV absorbers and hindered amine light stabilisers), can provide adequate levels of protection. Wood is an exception to this general rule because the additives that can protect polymers from photodegradation are less effective at photostabilising wood. Conversely, the chemical modification of wood surfaces with chromic acid is remarkably effective at photostabilising wood, and this led to significant interest in chemical modification as a way of protecting wood from photodegradation. Early research focussed on understanding why chemical modification with chromic acid was so effective at protecting wood from photodegradation, and a great deal of effort was also directed towards finding equally effective and less toxic alternatives to chromic acid. This search was largely unsuccessful and hence attention then shifted to the development of alternative methods of chemically modifying wood to improve its photostability. Research was also performed to examine the extent to which chemical and other modification systems designed to improve dimensional stability and decay resistance could protect wood from weathering.

Most modification systems are able to impart some degree of dimensional stability and biological resistance to wood. Very few of these systems, however, are able protect wood from weathering, and only a handful can photostabilise lignin. The modification systems that have shown promise at photostabilising wood all appear to either modify lignin to make it less photolabile, or graft large amounts of UV absorbing compounds on or in wood cell walls (benzoylation, esterification with vinyl benzoate and various procedures for grafting UV absorbers). The chemicals used for these processes are more expensive than those used to esterify wood for improved dimensional stability and biological resistance. Furthermore, relatively high weight gains are required to protect wood from photodegradation even with the more effective systems. For these reasons modification technologies designed to impart photo-resistance to wood are most likely to be successful when used as surface treatments or for the modification of veneer, which could then be applied as a photoprotective overlay on to moisture and decay resistant wood or polymeric substrates. Either of these approaches could create new wood-based materials that better match market requirements for attractive, durable and low maintenance exterior residential and industrial building products.

Keywords: Weathering, photostability, chromic acid, esterification, thermal modification, resin treatments, grafting.

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