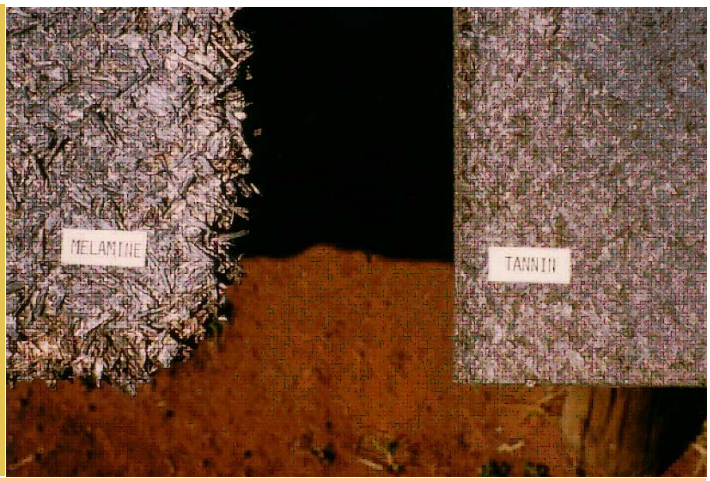
Success story

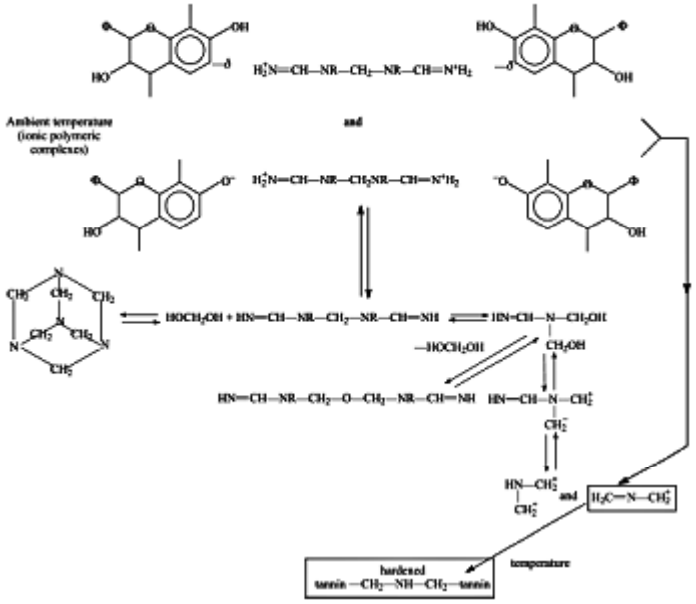
ENSTIB, Université Henri Poincare, Nancy, France

LOW AND NO EMISSION NATURAL TANNIN ADHESIVES

In order to enhance the environmental credentials of a material, there is a growing demand for increasing the use of naturally derived materials in many of today's products within the wood products industries. One area suited to this is the development of natural tannin adhesives in composite manufacture. The research team at ENSTIB, led by Professor Antonio Pizzi, have been active for some considerable time developing such adhesive systems that may be commercially developed.



The success of natural tannin adhesives for particleboard relies heavily on industrial application technology rather than just on the preparation technology of the adhesive itself. A considerable advantage is the much higher moisture content of the resinated chips tolerable with these adhesives than with any of the synthetic phenolic and aminoresin adhesives. Interior and water resistant-type adhesives presenting no formaldehyde emission can be obtained either by special hardeners, or by tannin autocondenstion without any hardener.



Among the first the use of hexamine as hardener is coupled with such a marked reduction in formaldehyde emission from the bonded wood panel to reduce emission exclusively to the formaldehyde emitted by heating just the wood (and slightly less, thus functioning as a mild depressant of emission from the wood itself). This system now in industrial use in a couple of countries has achieved to decrease considerably more the already low formaldehyde emission yielded by the use of tannin adhesives.

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The autocondensation reactions characteristic of polyflavonoid tannins have only recently been used to prepare adhesive polycondensates hardening in absence of aldehydes. Gelling occurs when the reaction occurs (i) in presence of small amounts of dissolved silica (silicic acid or silicates) catalyst and some other catalysts, and (ii) on a lignocellulosic surface. In the case of the more reactive tannins, such as pine tannin, cellulose catalysis from the wood surface is more than enough to cause hardening and to produce boards of strength satisfying the relevant standards for interior grade panels, such as those shown.

In the case of the less reactive tannins, such as mimosa and quebracho, the presence of a dissolved silica or silicate catalyst of some type is essential to achieve panel strength as required by the relevant standards. Autocondensation reactions have been shown to contribute considerably to the dry strength of wood panels bonded with tannins, but to be relatively inconsequential in contributing to the bonded panels exterior grade properties which are rather determined by polycondensation reactions with a hardener. This system eliminates completely formaldehyde emission from particleboard, especially if coupled with steam injection pressing.

Tannin adhesives appear to offer a viable alternative to conventional adhesives and companies are being approached to explore the commercial potential

The ENSTIB team present at the Descartes research prize awards in 2005

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