

PHENOTAN AG

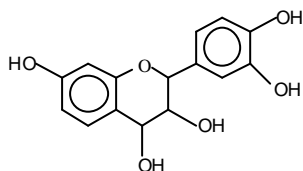
PARTICLEBOARD

PHENOTAN AG is a resin of a vegetable origin developed for particleboard manufacture.

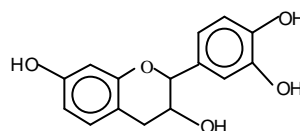
CHEMICAL CONSTITUTION

PHENOTAN AG consists of a chemical modification of the Wattle bark extract, designed to reduce gums and sugar content, which improves its performance in terms of viscosity, reactivity, strength and water resistance.

Generally, Wattle bark extracts (commonly known as tannin extracts or Mimosa extracts) are composed of flavonoid units (polyphenolic compounds) which have various degrees of condensation, and have been associated with flavan 3-ol, flavan-3, 4-diol, carbohydrates (pinitol, sucrose, glucose) and small amounts of amino/imino-acids (l – pipecolic acid, l – proline).



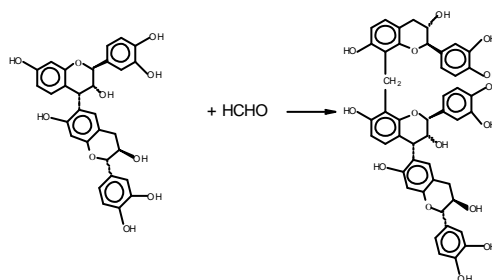
FLAVAN-3,4-DIOL



FLAVAN-3-OL

Considering the structures shown above are similar to phenolic compounds, Mimosa extracts or their modifications (like **PHENOTAN AG**) undergo the same well-known reaction with formaldehyde.

Formaldehyde reacts with tannin to produce polymerization through methylene bridge linkages into reactive positions of the flavonoids molecules, mainly the A-rings.





THE USE OF PHENOTAN AG IN PARTICLEBOARD MANUFACTURE

PHENOTAN AG is presented in a liquid form (45% solid content in aqueous solution) or in a brownish powder.

The pH range of the product varies from 6.6 to 6.9 and its viscosity in the liquid form is 700 cP (25°C) at the maximum.

Suggestion for the Particleboard Adhesive Formulation

	INNER LAYER (w/w)	OUTER LAYER (w/w)
PHENOTAN AG (aq.sol. 45%)	100	100
Ethanol	5	10
Formalin (37%)	10	10

The particleboard pressing conditions follow the usual industrial indications, as for example:

Time (for thickness of 16 mm)	4,2 minutes
Pressure	25 kgf/cm ²
Temperature	160°

Adhesive (% of solid content on mass of dry-wood chips)	8 – 9 (inner layer) 12 – 13 (outer layer)
--	--

The reaction of formaldehyde with **PHENOTAN AG** may be controlled by addition of alcohols to the system. Under these circumstances some of formaldehyde is stabilized by the formation of hemi-acetals like CH₂(OH)(OCH₃) if methanol is used or like CH₂(OH)(OC₂H₅) in case of ethanol.

When the adhesive is cured at a high temperature (like 160°C) the alcohol is driving off at a fairly constant rate and formaldehyde is progressively released from the hemi-acetals. This ensures both that less formaldehyde is volatilized when the reactant reach curing temperature, and also that the pot-life of the adhesive is extended.

In order to obtain a weatherproof exterior grade particleboard (V100-DIN standard) it is necessary to increase the amount of adhesive (in terms of solid content) to 13-15% for inner layer and 15-17% for outer layer based on the mass of dry-wood chips. This



increase serves to improve the internal bond strength and the percentage swelling to levels which comply with the standard weatherproof particleboard.

At the same time, an increase on depressurization time becomes important to assure the complete release of steam without damage to the board quality.

Use of Phenotan AG- formaldehyde adhesive leads to a product less susceptible to excessive swelling in water than in the case with UF resins, due to its chemical constitution (polyphenolic structures). While UF contains hydrophilic amino groups, moisture friendly, PHENOTAN AG presents on its composition hydrophobic chains reducing the risk of swelling.

Addition of 1% by mass of wax-emulsion to the wood chips (calculated on dry basis) improves the weatherproofing qualities of the board.

THE MAIN ADVANTAGES OF USING PHENOTAN AG IN PARTICLEBOARD MANUFACTURE

↳ Low levels of formaldehyde release:

PHENOTAN AG imparts particleboard with low formaldehyde release which is an interesting aspect when the board is used for interior grade.

↳ Easy handling and non-corrosive:

The pH range of **PHENOTAN AG** varies from 6.6 to 6.9. The neutrality of such adhesive presents handling and non-corrosion advantages.

↳ Longer Shelf-Life:

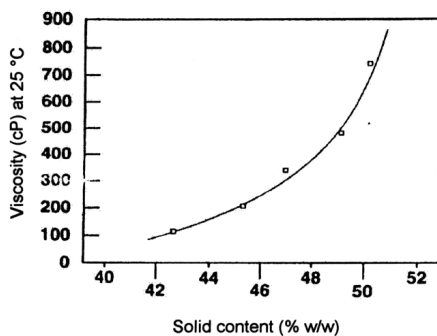
The use of separate hardener, which is not incorporated in the resin, allows the formulation of **PHENOTAN AG** adhesive for particleboard with a longer shelf-life.

Other considerable advantage is the possibility to store the product in powder form for long periods (more than 6 months). It will be feasible to proceed the powder hydration in water according to the amount and consumption needed.



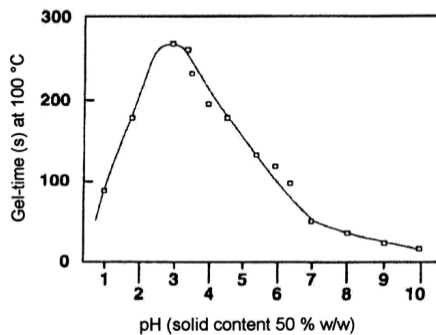
PHENOTAN AG

EFFECT OF SOLID CONTENT ON THE VISCOSITY



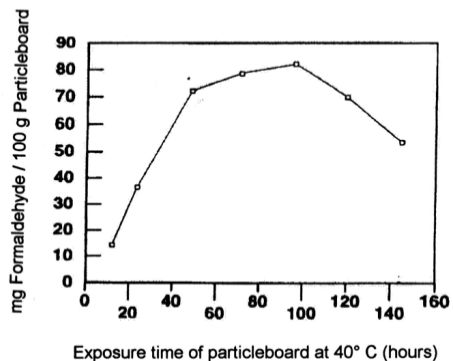
PHENOTAN AG

EFFECT OF THE pH ON THE GEL-TIME



PHENOTAN AG

RATE EVOLUTION OF FORMALDEHYDE RELEASE





The suggestions and recommendations given are based on our experience but do not constitute a warranty from our part. Our clients shall conveniently adjust the recommended products to their working conditions as well as to the other products applied during the process.

Revision: AB1005