Dialogue
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Lignin—Products With Many Uses

Lignins are derived from an abundant and renewable resource: trees, plants and agricultural crops. Lignins are nontoxic and extremely versatile in performance, qualities that have made them increasingly important in many industrial applications.

Commercial lignin is currently produced as a co-product of the paper industry, separated from trees by a chemical pulping process such as the one diagrammed on the reverse side. Lignosulfonates (also called lignin sulfonates and sulfite lignins) are products of sulfite pulping. Kraft lignins (also called sulfate lignins) are obtained from the kraft pulping process.

As a Dispersant

Lignosulfonates prevents the clumping and settling of undissolved particles in suspensions. By attaching to the particle surface, it keeps the particle from being attracted to other particles and reduces the amount of water needed to use the product effectively. The dispersing property makes lignosulfonate useful in:

- **cement mixes**
- **clay and ceramics**
- **dyes and pigments**
- **oil drilling muds**
- **leather tanning concrete admixtures**
- **gypsum board**
- **pesticides & insecticides**

As a Binder

Lignosulfonates are a very effective and economical adhesive, acting as a binding agent or "glue" in pellets or compressed materials. Lignosulfonate used on unpaved roads reduce environmental concerns from airborne dust particles and stabilize the road surface. This binding ability makes it a useful component of:

- **coal briquettes**
- **ceramics**
- **carbon black**
- **fertilizers & herbicides**
- **dust suppressants**
- **plywood & particle board**
- **animal feed pellets**
- **fiberglass insulation**
- **linoleum paste**
- **soil stabilizers**

As a Sequestrant

Lignosulfonates can tie up metal ions, preventing them from reacting with other compounds and becoming insoluble. Metal ions sequestered with lignosulfonates stay dissolved in solution, keeping them available to plants and preventing scaley deposits in water systems. As a result, they are used in:

- **micronutrient systems**
- **cleaning compounds**
- **water treatments for boilers and cooling systems**

Other delignification technologies use an organic solvent or a high pressure steam treatment to remove lignins from plants.

Because lignin is a very complex natural polymer with many random couplings, the exact chemical structure is not known. Physical and chemical properties differ depending on the extraction technology. For example, lignosulfonates are hydrophilic (will dissolve in water) and kraft lignins are hydrophobic (will not dissolve in water). The usefulness of commercial lignosulfonates products comes from their dispersing, binding, complexing and emulsifying properties.

As an Emulsifier

Lignosulfonate stabilizes emulsions of immiscible liquids, such as oil and water, making them highly resistant to breaking. Lignosulfonates are at work as emulsifiers in:

- **asphalt emulsions**
- **pigments and dyes**
- **pesticides**
- **wax emulsions**

Industry first began to use lignin in the 1880s when lignosulfonates were used in leather tanning and dye baths. Since then, lignosulfonates have even found applications in food products, serving as emulsifiers in animal feed and as raw material in the production of vanillin. (Vanillin is widely used as an ingredient in food flavors, in pharmaceuticals and as a fragrance in perfumes and odor-masking products.) Lignin uses have expanded into literally hundreds of applications - impacting on many facets of our daily lives.

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