

V. Description and Characteristics of Spent Sulfite Liquor

The following information presents a brief summary of the chemical and physical characteristics of wood, lignins, and lignosulfonates, and sulfite liquor.

A. Composition of Wood:

	<u>Average %</u>
Cellulose	45
Lignin	28
Hemicellulose	25
Extractives	2

Cellulose - Polymer of glucose units
 Lignin - Polymer of Phenyl Propyl units
 Hemicellulose - Polymer of mixed Hexose & Pentose units

B. Chemistry of lignin and lignosulfonate:

Lignosulfonates are complex polymeric materials obtained as by-products of wood pulping. The term "lignosulfonate" is a mixture of sulfonated lignin, sugars, sugar acids, resins, and inorganic chemicals. This complex and variable mixture is water-soluble and anionic, with certain surface-active characteristics.

In the sulfite pulping process, wood is debarked, chipped, and cooked in a digester. Under heat and pressure in a solution of sulfurous acid and either calcium, magnesium, sodium or ammonium bisulfite, the wood is transformed into pulp. During cooking the wood lignin is partially sulfonated. The sulfonation usually occurs on a carbon atom next to the ring structure:

Composition of Spent Sulfite Liquor Solids

	<u>% Range</u>	
	<u>Softwood</u>	<u>Hardwood</u>
Lignosulfonates	55	42
Hexose sugars	14	5
Pentose sugars	6	20
Miscellaneous:		
Hemicellulose, sugar acids and residues	12	20
Resins and extractives	3	3
Ash	10	10

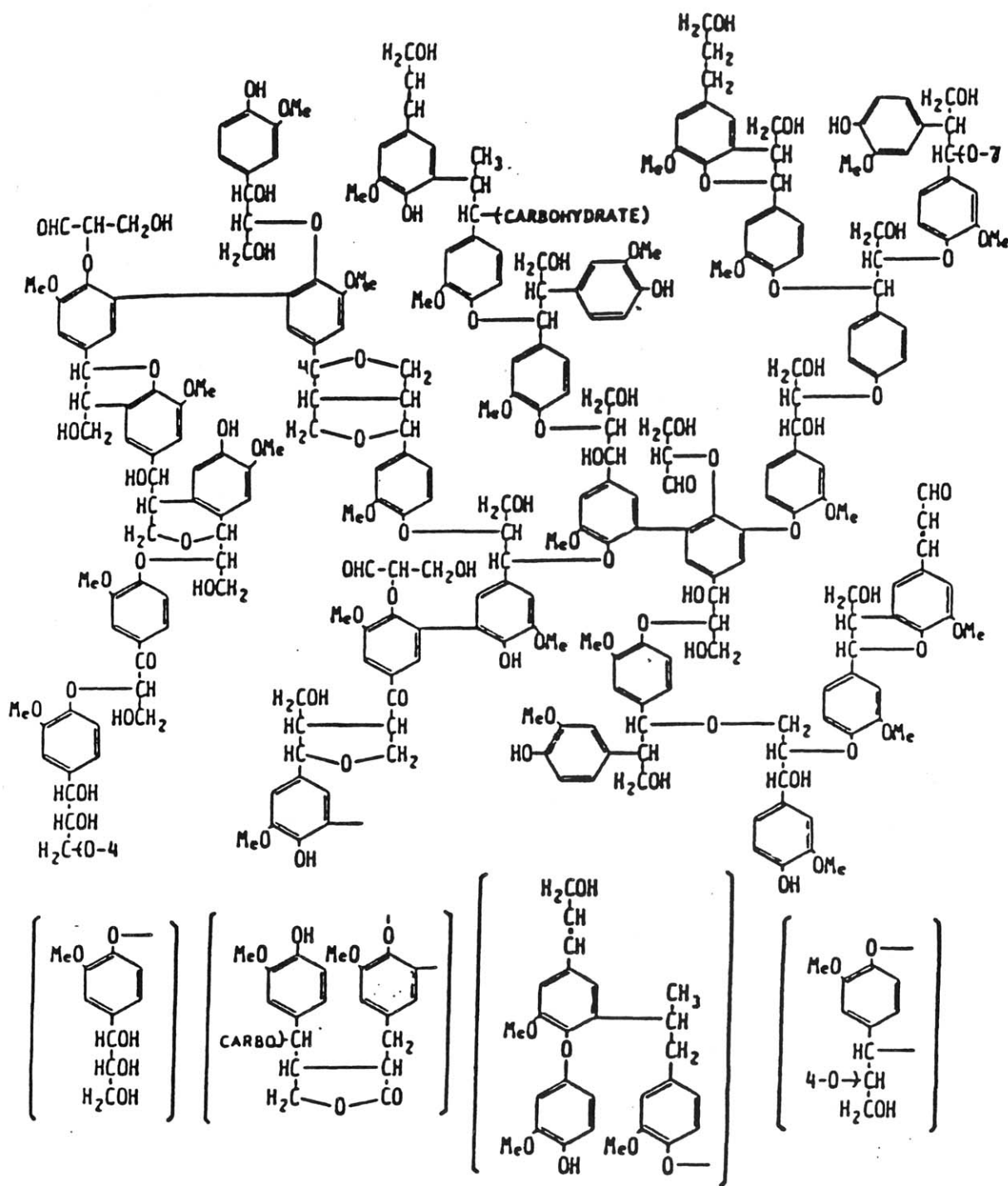
The lignins are quite variable in composition, depending on the tree species, location within the tree, geographic area, climatic conditions, age of the tree, and time of cutting. In general terms, the lignin is a heterogeneous ether polymer with several different aromatic components and numerous O_2 - containing functional groups.

The prominent aromatic constituents of lignins are guaiacyl, p-hydroxyphenyl and syringyl units. See Figure 1, 2, 3.

C. Physical features of Flambeau Paper Company Spent Sulfite Liquor

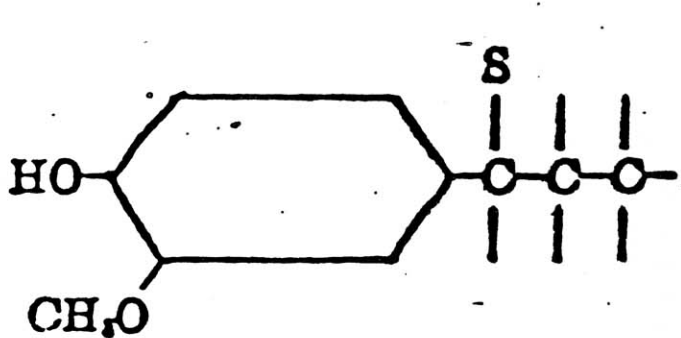
1. Dilute (from digester blow tanks)
Color = yellow to brown solution
Odor = sharp, sulfur dioxide
Concentration = 8-15% (usually 10-14%)
ph = 3 to 4
Viscosity = 10 to 50 cps at 25°C
Specific gravity = 1.02-1.08 g/cc at 25°C
lbs. solids/U.S. gal. = approx. 1.2

2. Concentrated (Plant evaporation)
Concentration = 50%
Color = Dark Brown
Odor = Burnt coffee
ph = 3 to 4
Viscosity = approx. .450 cps at 25°C
Specific gravity 1.255 g/cc at 25°C
lbs. solids/U.S. gal. = 5.3

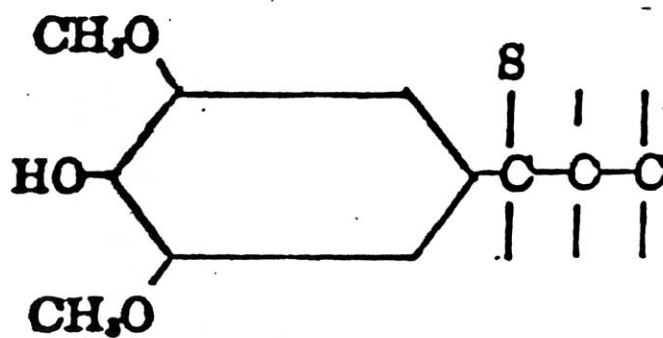


A structural model of softwood lignin.

FIGURE 1



Guaiacyl Unit



Syringyl Unit

FIGURE 3