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CHEMICAL SEASONING OF WOOD

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The present invention is concerned with an improvement in the chemical seasoning of wood and is particularly directed to a new process and product adapted to be employed in the treatment of unseasoned lumber.

When freshly cut lumber is seasoned it tends to undergo a surface drying and shrinking which results in splitting, warping, and checking. Hygroscopic chemicals have the property of attracting and holding moisture. Green lumber that has been treated with a hygroscopic chemical holds enough surface moisture so that the outside dries and shrinks slowly. The penetration of the chemical into the outer portion of green lumber forms a solution with the moisture of the wood. This solution has a lower vapor pressure than has water contained in the untreated core of the piece whereby the water in the untreated core moves outward in a tendency to equalize the vapor pressure and incidentally the concentration of dissolved materials in the various layers of cellulosic structure. This movement of water keeps the surfaces of the piece relatively moist while seasoning is progressing and reverses the normal seasoning process, in which the surface dries faster than the core of the lumber. The surface strains which cause checking and splitting are thereby avoided.

Among the hygroscopic chemicals which have been suggested for use in the chemical seasoning of green lumber are such inorganic salts as sodium chloride, ferrous sulfate, sodium sulfate, aluminum sulfate, calcium acetate, sodium phosphate, barium chloride, magnesium sulfate, and the like. These materials are commonly applied by soaking the green lumber in a tank or other suitable container containing the chemical in solution. The time of treatment is preferably one day for each inch of thickness of the lumber piece. Following treatment, the treated lumber is generally kiln dried at 75–85 per cent relative humidity.

More recently it has been suggested to use hygroscopic organic chemicals such as urea, invert sugar, and the like, for the treatment of wood. A serious disadvantage in this practice resides in the fact that deposits of such organic products in and on wood surfaces provide additional nutrient material for the growth of molds, yeasts, and other organisms. The spores and mycelia of the organisms frequently build up to high concentrations in the vat solution whereby each piece of lumber is inoculated with the organisms as treated. Thus, while urea, for example, is considered as having a fungistatic effect on the molds and fungi ordinarily attacking green wood, moist and semi-solid residues of urea on the wood surfaces are themselves subject to attack by an entirely different group of microorganisms. This tendency is accentuated by the relatively high temperatures and humidities prevailing during the kiln drying and seasoning of the wood whereby the growths supported by the urea may result in even worse discoloration than is obtained when the wood itself is attacked by mold and fungi.

According to the present invention small percentages of a water-soluble salt of a chlorophenol are included in wood treating solutions comprising hygroscopic organic chemicals. The presence of the phenolate inhibits the development of mold and yeast growths both in the treating solutions before application to the wood and on the moist or syrupy residues of treating material deposited in and on the surfaces of the lumber. The inhibition so obtained is not equivalent to that resulting from a two-step process in which the lumber is first subjected to treating with an aqueous solution of a chlorophenolate and thereafter with the chemical seasoning mixture. In such two-step treatment the small amounts of phenolate initially deposited in and on the wood surfaces tend to be extracted by the second treating solution. Being present in an infinitesimal amount the phenolate thereby becomes incapable of controlling organism growth either in the treating solution or on the wood surfaces.

The preferred concentrations of hygroscopic organic chemical in the treating solutions vary from about 25 to 75 per cent by weight depending upon the solubility of the particular chemical employed, the particular wood to be treated, and the conditions of temperature and humidity prevailing during the kiln drying or other seasoning procedure. The preferred amounts of water-soluble chlorophenolate required with such mixtures vary between 0.25 and 5 per cent by weight of the hygroscopic chemical employed. The exact amount used depends upon the particular wood to be treated and the climatic conditions under which the treating and seasoning operations are carried out. Somewhat higher or lower concentrations may be used, depending upon whether the conditions are more or less favorable for mold growth. In certain instances as, for example, when molasses or invert sugar are employed as the seasoning agent, small amounts of alkali are added to the treating solutions to reduce the tendency of the phenolate to dissociate and precipitate free phenol.

In operating according to the present invention the phenolate and hygroscopic organic

chemical may be mixed together to form a concentrate which is later dissolved in water in the required amounts. An alternate procedure comprises dissolving the phenolate in a previously prepared solution of the hygroscopic chemical.

The following examples are illustrative with respect to the particular phenolates and seasoning agents employed but are not to be construed as limiting.

Example 1

A freshly cut poplar log was ripped into boards ⅜ inch thick and 2 inches wide. 5 inch sections of these boards were submerged for 8 hours in 50 per cent by weight urea solutions containing various concentrations of sodium-pentachlorophenolate. The treated board sections were then stored out of contact, one with the other at an average relative humidity of 95 per cent and at 25° C. in a humidity chamber contaminated with the spores and mycelia of mixed colonies of wild yeast, molds, and fungi. Control sections of the poplar board dipped in water alone and in the seasoning solution without preservative where included in the incubation chamber.

After 60 days incubation the untreated sections were covered with black wood-staining growth. The sections treated with urea solution alone and with a urea solution containing 0.1 per cent by weight of phenolate on the basis of the urea showed an abundant white growth. The sections treated with concentrations of 0.25, 0.5, and 0.75 per cent by weight of phenolate in urea solution showed scattered and isolated colonies of a white microorganism. No growth was discernible on samples treated with solutions containing from 1 to 5 per cent of phenolate. The sections were returned to the humidity chamber and incubation continued for an additional 30 days. At the end of this time the test boards treated with 1 per cent phenolate in urea solution showed a few scattered colonies of white growth.

No staining of the treated surface was observed for test sections subjected to treatment with seasoning solutions containing in excess of 0.25 per cent by weight of the phenolate on the basis of urea content.

Example 2

In a similar manner sections of the poplar board were subjected to treatment with a 40 per cent molasses solution containing up to 5 per cent by weight of sodium-pentachlorophenolate on the basis of the solid content of the molasses. At the end of 2 weeks incubation under the conditions described in Example 1 the samples treated with the molasses alone were completely overgrown with black sooty mold. Samples containing 0.25 per cent or more by weight on the solid basis of the sodium-pentachlorophenolate were clean and unattacked by organisms. Test sections treated with as little as 1.0 per cent by weight of the phenolate on the solid basis were substantially completely protected over a period of 12 weeks under the conditions of the test.

Example 3

In a further series of treatments coincidental with those described in Example 2, a 60 per cent by weight sodium-tetrachlorophenolate-40 per cent by weight sodium-monochloro-2-phenylphenolate mixture was substituted for the sodium-pentachlorophenolate. Concentrations as low as 0.25 per cent by weight of the solid content gave complete protection of the treated wood over the two week period. A concentration of 0.5 per cent was adequate over the 12 week period. In this series of determinations, it was found advisable to add a small amount of sodium hydroxide to the several treating solutions to stabilize the phenolate mixture employed.

Example 4

In a similar manner a 40 per cent by weight aqueous solution of invert sugar was employed with both the sodium-pentachlorophenolate and mixture of sodium-tetrachlorophenolate and sodium-monochloro-2-phenyl-phenolate. A 0.25 per cent by weight concentration of sodium-pentachlorophenolate gave complete protection over a 12 week period. Complete inhibition of growth with the phenolate mixture was obtained at a concentration between 0.25 and 0.5 per cent by weight. Here, as in Example 3, small amounts of free caustic were added to the solutions comprising the phenolate mixture.

Example 5

Other determinations were carried out in the manner described above in which the basic treating solution consisted of 60 parts by weight of urea, 40 parts by weight of raw molasses, and 40 parts by weight of water. Test sections treated with this mixture of materials showed heavy black mold growth within 6 weeks. Sodium-pentacholorphenolate gave complete protection for 6 weeks at a concentration between 0.25 and 0.5 per cent by weight on the solid basis. The mixture of sodium-tetrachloro- and sodium-monochloro-2-phenyl-phenolates gave complete control for a six weeks' period at a concentration of 0.25 per cent by weight on the solid basis. Here, again, it was found desirable to add small amounts of alkali to compositions comprising the higher percentages of the mixed phenolates.

While the foregoing examples have been concerned with the sodium salts of certain chlorophenolates, it is to be understood that the water-soluble potassium, calcium, barium, ammonium, and lithium salts, etc. may be similarly employed. Likewise, the water-soluble 2.4.5-trichlorophenolates, 2.4.6-trichlorophenolates, 2.5-dichlorophenolates, 2-chloro-6-cyclohexyl-phenolates, tetrachlorocresolates, 4-chloro-s-xylenolates, etc. may be substituted for those heretofore disclosed.

If desired, various wetting and detergent agents may be incorporated into the seasoning solutions as disclosed above. Also mixtures of organic and inorganic hygroscopic chemicals may be employed along with the water-soluble chlorophenolates to obtain compositions falling within the scope of the present invention.

I claim:

1. In the chemical seasoning of wood with aqueous solutions of hygroscopic organic chemicals the step which consists of incorporating a water-soluble chlorophenolate in the treating solution in amount sufficient to prevent the growth of microorganisms in and on residues of the hygroscopic chemical as deposited on the surface of the wood.

2. In the chemical seasoning of wood with aqueous solutions of urea the step which consists of incorporating a water-soluble chlorophenolate in the treating solution in amount sufficient to prevent the growth of microorganisms in and on residues of urea as deposited on the surface of the wood.

3. In the chemical seasoning of wood with aqueous solutions of urea the step which consists of incorporating a water-soluble chlorophenolate in the treating solution in amount of from 0.25 to 5 per cent by weight of the urea.

4. In the chemical seasoning of wood with aqueous solutions of urea the step which consists of incorporating sodium-pentachlorophenolate in the treating solution in amount of from 0.25 to 5 per cent by weight of the urea.

5. A chemical seasoning agent for wood consisting essentially of a concentrated aqueous solution of a hygroscopic organic chemical subject to attack by microorganisms and sufficient of a water-soluble chlorophenolate to prevent the growth of microorganisms in and on residues of the hygroscopic chemical as deposited on the surface of the wood.

6. A chemical seasoning agent for wood consisting essentially of a concentrated aqueous solution of urea and sufficient of a water-soluble chlorophenolate to prevent the growth of microorganisms in and on residues of the urea as deposited on the surface of the wood.

7. A chemical seasoning agent for wood consisting essentially of a concentrated aqueous solution of urea and a water-soluble chlorophenolate in amount of from 0.25 to 5 per cent by weight of the urea.

8. A chemical seasoning agent for wood consisting essentially of a concentrated aqueous solution of urea and sodium-pentachlorophenolate in amount of from 0.25 to 5 per cent by weight of the urea.

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