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WOOD BLEACHING

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The present invention relates to bleaching wood and woody materials and more particularly to a method of bleaching and lightening the color of wood and woody materials by subjecting such materials at elevated temperatures to the action of a bleaching bath containing or generating hydrogen peroxide.

It has been recommended heretofore that wood and woody materials be bleached by the use of oxidizing agents such as hydrogen peroxide. The wood or woody material to be bleached was immersed in the hydrogen peroxide containing an alkali such as sodium silicate but such procedure has proven expensive and uneconomical due to the excessive losses of active oxygen. It has also been proposed to lighten the color of wood and woody materials by treating such materials with hydrogen peroxide and potassium permanganate. Reducing agents such as soluble hydrosulfites have been suggested for bleaching woods as has oxalic acid.

In these prior methods of wood treatment the wood or woody material was often stained and discolored due to the precipitation of various chemicals in or upon the pores of the woody fiber, an unsightly and unwanted unevenness being thus produced that followed the grain of the wood more or less and thus in many instances defeated the very purpose of the treatment, that is, the production of an even color throughout, minimizing the excessive contrast in woody materials often caused by deposition of foreign matter in the grain.

An object of the present invention is the provision of a bleaching method for wood and woody materials that produces a product having an even color throughout and without a deposit of foreign matter due to grain structure of the wood. A further object of the invention is to provide a hydrogen peroxide bleaching solution, or solution generating active oxygen that is relatively stable at the temperatures at which it is employed. A still further object of the invention is the provision of a bleaching method for wood or woody fibers that will bleach to a considerable depth and will bleach ply wood and veneer strips throughout the body of the strip as well as the superficial surface thereof.

In accordance with the procedures of the present invention the wood and woody material is saturated and impregnated with the bleaching agent while immersed in the bleaching solution which is maintained at elevated temperatures. In order to obtain evenness of bleach the solution is circulated over and about the wood and woody material. This treatment is facilitated by heating to temperatures of from about 50 to 80° C. or higher and maintained in this temperature range during the bleaching. Impregnation of the wood is effected while the wood is immersed in the solution since at temperatures above about 50° C. any included or dissolved gaseous material is driven out of the wood and the bleaching solution permitted to diffuse slowly in the pores of the wood and impregnation obtained to a considerable depth in large pieces such as mop handles and the like, while veneer strips are bleached throughout.

Depending upon the type of wood, its thickness, structure, density and the condition of its sap content, that is to say, whether sap laden or seasoned, the material is immersed in the heated bleaching solution and the treatment continued for from about one to about ten hours. In general, the desired results are obtained in about six hours.

Although for purposes of illustration it has been indicated that hydrogen peroxide is employed as the bleaching agent, it will be apparent that materials producing hydrogen peroxide in aqueous solution can also be employed, as, for instance, certain per salts such as the perborates, percarbonates, and the like, as well as the metallic peroxides, as, for instance, sodium peroxide and other soluble peroxides of similar type. This class of materials is designated herein as soluble peroxides. It will, of course, be understood that hydrogen peroxide is the preferred bleaching agent since by its employment no residue is left on the bleached material nor is a strong alkali produced in solution by its employment.

Illustrative of the composition suitable for bleaching wood may be mentioned the following in which one liter of solution contains 160 cc. hydrogen peroxide of 100 volume strength, 15 cc. of aqueous ammonia, 6 g. of anhydrous sodium pyrophosphate and a wetting out agent capable of reducing the surface tension of the solution.

A remarkable feature of the present invention is that these alkaline hydrogen peroxide solutions containing a pyrophosphate such as the tetrasodium pyrophosphate or disodium pyrophosphate are extraordinarily stable in the presence of wood within the range of temperature employed for bleaching the wood. It is a recognized fact in bleaching of textiles that soluble pyrophosphates stabilize hydrogen peroxide solutions only on the acid side or if the solution have a pH higher than about 7, then only at temperatures lower than about 45° C.

The following table sets forth the active oxygen content of baths of the composition outlined above at various times indicated. In one bath 58.7 g. of a burl myrtle veneer were immersed at 60 to 65° C. with approximately an 8 to 1 liquor ratio, while in another 56.0 g. of boiled cotton goods were immersed in a solution of the same composition, the temperature of which was 60 to 65° C. and a liquor ratio of approximately 8 to 1. The volume of solution used in each case was 450 cc. The active oxygen content is expressed in terms of one-half normal potassium permanganate.

Table I

Time in minutes	Cubic centimeters of ½N $KMnO_4$	
	Wood	Cotton
30	10.0	10.5
60	9.3	7.9
90	9.1	5.9
120	8.8	3.6
150	8.7	2.8
180	8.7	2.2

The strength of the original solution in terms of active oxygen expressed in cc. of

$$\frac{N}{2}KMnO_4$$

was 11.2. It will be noted that the active oxygen content of the bath when used on cotton goods decreases very rapidly, while there is only a slight decrease in active oxygen content in the bath in contact with wood.

In comparing the stabilizing action of sodium pyrophosphate with that of sodium silicate a sample of 58.8 g. of burl myrtle veneer and 58.0 g. boiled cotton goods were separately immersed in 450 cc. of the following solution and treated for the time indicated in the table below at a temperature of 60 to 65° C. The oxygen content of the original solution expressed in terms of cc. of

$$\frac{N}{2}KMnO_4$$

was 11.2. The composition of the solution was as follows: 100 cc. of the aqueous solution contain 160 cc. of hydrogen peroxide, 100 volume, 15 cc. aqueous ammonia, 23 cc. silicate (42° Bé.) and the same quantity of the wetting out agent as specified above.

Table II

Time in minutes	Cubic centimeters of ½N $KMnO_4$	
	Wood	Cotton
30	8.2	9.1
60	6.1	7.9
90	4.7	7.2
120	4.4	7.0
150	3.7	6.1

An examination of the above tables will point out strikingly the advantages of pyrophosphate used in connection with hydrogen peroxide solution in wood bleaching. When it is recalled that pyrophosphate is recognized as being unsuitable for addition to alkaline peroxide baths for use at elevated temperatures, the remarkable advantage of pyrophosphate addition to alkaline peroxide solutions for bleaching wood is strikingly shown. Thus, Table II indicates that wood degrades peroxide solutions stabilized with silicate more rapidly than does cotton, and similar action might be expected irrespective of the stabilizer used in the solution due to the presence in wood of substantially larger quantities of catalytic materials decomposing hydrogen peroxide than are present in the purer material, cotton. However, Table I shows a remarkable superiority of pyrophosphate as a stabilizer for peroxide solutions for wood over silicate and shows further that the pyrophosphate enervates or destroys the excess catalytic action of wood over cotton.

I claim:

1. The process of bleaching wood which comprises treating the wood with a solution of a peroxide containing a pyrophosphate.

2. The process of bleaching wood which comprises immersing the wood in a solution of a peroxide containing a pyrophosphate.

3. The process of bleaching wood which comprises immersing the wood in a solution of a peroxide containing a pyrophosphate and heating the solution to a temperature of between about 45–85° C.

4. The process of bleaching wood which comprises treating the wood with a solution of a soluble peroxide and containing at least 0.6% of a pyrophosphate.

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