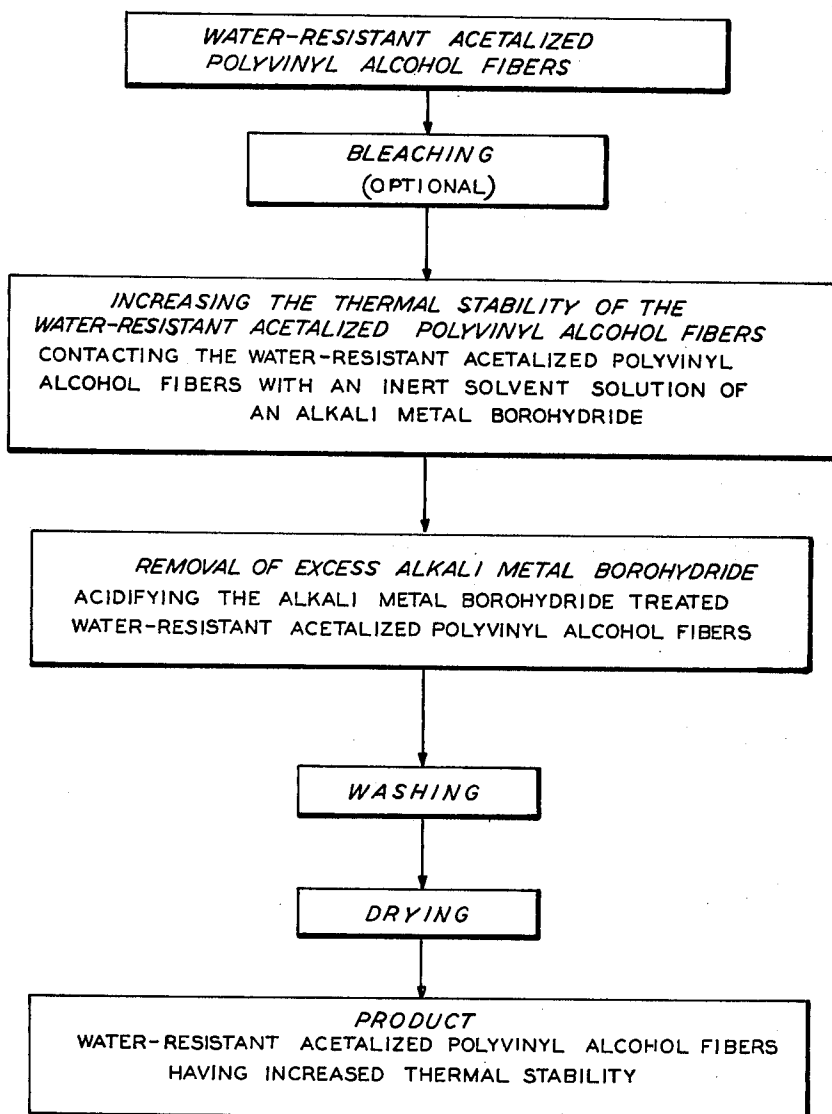


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TREATMENT OF WATER-RESISTANT ACETALIZED POLYVINYL
ALCOHOL FIBERS WITH ALKALI METAL BORO HYDRIDE
FOR IMPROVED THERMAL STABILITY
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TREATMENT OF WATER-RESISTANT ACETALIZED POLYVINYL ALCOHOL FIBERS WITH ALKALI METAL BORO HYDRIDE FOR IMPROVED THERMAL STABILITY

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6 Claims. (Cl. 117-47)

This invention relates to the treatment of acetalized polyvinyl alcohol fibers or filaments and is more particularly concerned with a process of treating such fibers or filaments to prevent them from becoming discolored.

Acetalized polyvinyl alcohol fibers, known commercially under the generic designation "vinylon," and which are normally white or colorless, tend to yellow when heated to relatively high temperatures or when subjected to contact with high-temperature surfaces, as when ironed with a flat iron, especially if they have been bleached. This tendency is generally regarded as a drawback of acetalized polyvinyl alcohol fibers or vinylon in comparison with cotton.

It is accordingly an object of this invention to provide a process for treating acetalized polyvinyl alcohol fibers to make them resistant to discoloration under the influence of heat.

It is a further object of the invention to provide acetalized polyvinyl alcohol fibers having good heat stability.

Vinylon or acetalized polyvinyl alcohol fibers are, more particularly, polyvinyl alcohol fibers which have been acetalized in accordance with known procedures by means of aldehydes, such as formaldehyde, acetaldehyde, benzaldehyde, and the like, to render them resistant to water. Acetalized polyvinyl alcohol fibers are described, for example, in vol. 13 of the "Encyclopedia of Chemical Technology" by Kirk and Othmer (1954) and in the "Man-made Textile Encyclopedia" edited by J. J. Press (1959).

In accordance with the present invention, discoloration of acetalized polyvinyl alcohol fibers caused by the action of heat can be prevented by treating the fibers with a solution of an alkali metal boro hydride, such as sodium boro hydride or boro potassium hydride. In carrying out the treatment of this invention, the acetalized polyvinyl alcohol fibers are immersed in a solution of the alkali metal boro hydride in any inert solvent for the hydride which has no adverse effect upon the fibers. Generally, water is the most suitable and convenient solvent. Relatively dilute solutions of the alkali metal boro hydride are fully effective and concentrations of 0.05 to 0.1 percent by weight are, for example, preferred, although greater or lesser concentrations can be used, if desired.

Treatment in accordance with the invention is generally applied to the fibers as a final step and, if the fibers are bleached in accordance with conventional practice, e.g. with bleaching powder, peroxides, or other like known bleaching agents, treatment with the alkali metal boro hydride suitably immediately follows the bleaching step. Treatment with the hydride can be effectively carried out at room temperature, e.g. 20-25° C., and heating is not necessary, although higher or lower temperatures may be employed, if desired. The procedures of the invention are illustrated in the accompanying drawing.

The nature and features of the invention will be further apparent from the following specific examples of practical application. However, it will be understood that

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these examples are not to be construed as limiting the scope of the present invention in any manner. In the examples, all parts are by weight unless otherwise indicated.

Example 1

Two grams of vinylon fibers were soaked in 100 cc. of a 0.1% aqueous solution of sodium boro hydride at room temperature for five hours. The fibers were removed and immersed in 100 cc. of a 5% acetic acid solution, followed by washing with water, and drying.

When this treated vinylon and a corresponding sample of the original, non-treated vinylon were heated at 200° C. for 5 minutes, the former remained white while the latter became slightly yellow in color.

Example 2

Five grams of formalized vinylon fibers were bleached at 25° C. for 2 hours in 250 cc. of a bleaching powder solution containing 2.5 g./liter of effective chlorine and the fibers were thoroughly washed with water. The fibers were then immersed briefly in water acidified with dilute hydrochloric acid, and the fibers again thoroughly washed in water. The thus-bleached vinylon fibers were soaked for 6 hours at room temperature in 200 cc. of water to which had been added 0.1 g. of sodium boro hydride. Ten cc. of 5% acetic acid were then added to the solution to decompose the sodium boro hydride. The fibers were removed, rinsed thoroughly with water acidified with acetic acid, and then with neutral water, followed by drying.

The vinylon treated in the foregoing manner with sodium boro hydride and a corresponding sample of the original, non-treated vinylon were heat-treated in dry air at 185° C. for 5 minutes. The non-treated fibers became slightly yellow, but the fibers treated with sodium boro hydride remained completely white.

Example 3

Five grams of vinylon fibers were bleached at 40° C. for one hour in 250 cc. of 1% hydrogen peroxide, and were then washed with water. The bleached fibers were treated with sodium boro hydride in the manner described in Example 2. When the thus-treated fibers were heat-treated as in Example 2 along with a non-treated sample, no yellowing was observed in the case of the fibers treated with sodium boro hydride and the appearance of the fibers was not altered, whereas the fibers of the non-treated sample became yellow.

As will be seen from the foregoing examples, the fibers are maintained in the treating bath for a substantial period of time sufficient to insure full interaction, and the excess treating agent is removed from the fibers by acidification. Any acid may be used for the purpose, such as a mineral acid, e.g. hydrochloric acid or sulfuric acid, or an organic acid, such as acetic acid, the last-named acid being preferred. As shown in Example 2, the acid may be added to the treating bath as well as to the fibers after removal from the bath. In any case, the fibers are finally washed thoroughly with water.

It will be understood that, unless otherwise indicated, conventional techniques used in the treatment of acetalized polyvinyl alcohol fibers are employed in carrying out the process of this invention and that conventional equipment suited to the conditions of treatment is utilized.

While reference has been specifically made to vinylon, it will be understood that the invention is applicable to all water-resistant acetalized polyvinyl alcohol fibers, such as fibers produced in accordance with the disclosures of Cline et al. U.S. Patent 2,636,803, and Osugi et al. U.S. Patent 2,906,594.

The conditions and relative relationships set forth above are those preferred in carrying out the process of the in-

vention but it will be understood that other conditions and relationships may be used within the scope of the invention.

It will thus be understood that various changes and modifications may be made without departing from the scope of the invention as defined in the appended claims and it is intended, therefore, that all matter contained in the foregoing description shall be interpreted as illustrative only and not as limitative of the invention.

I claim:

1. The method of improving the thermal stability of water-resistant acetalized polyvinyl alcohol fibers which comprises,

contacting water-resistant acetalized polyvinyl alcohol fibers with a treating agent consisting essentially of an inert solvent solution of an alkali metal boro hydride for a duration of time sufficient to render said treated fibers free from yellowing when subjected to relatively high temperatures,

acidifying said treated fibers to remove excess alkali metal boro hydride from said treated fibers, washing said acidified fibers thoroughly with water, and drying said washed fibers to obtain said water-resistant acetalized polyvinyl alcohol fibers having improved thermal stability.

2. The method according to claim 1, wherein said water-resistant acetalized polyvinyl alcohol fibers are bleached by treatment with a bleaching agent prior to said contacting of said fibers with said inert solvent solution of alkali metal boro hydride.

3. The method according to claim 2, wherein said alkali metal boro hydride is present in said inert solvent solution in an amount of 0.05% to about 0.1% by weight of said solution.

4. The method according to claim 2, wherein said treating agent is an aqueous solution of alkali metal boro hydride.

5. The method according to claim 2, wherein said alkali metal boro hydride is sodium boro hydride.

6. The method according to claim 2, wherein said alkali metal boro hydride is potassium boro hydride.

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