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WASH FASTNESS OF SIZES WITH CHLORAL
ADDITION PRODUCTSLouis H. Bock and Alva L. Houk, Philadelphia,
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Philadelphia, Pa.No Drawing. Application April 11, 1939,
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9 Claims. (Cl. 91—70)

This invention relates to a process whereby water-soluble or water-dispersible sizing materials which are compounds of high molecular weight and which contain a multiplicity of hydroxyl groups are rendered fast to washing by reaction with a chloral derivative.

High molecular weight, hydroxyl-containing sizing materials, such as starches, water-soluble cellulose ethers, and polyvinyl alcohol, are easily applied to fabrics and yarns from aqueous baths to give films or coatings which impart such desirable properties as bulk, weight, resiliency and stiffness. Such properties are lost, however, when the fabrics or yarn are wet again as in laundering. For example, starch, as is well known, is easily applied by dipping, spreading, coating, spraying, etc. but is easily removed on laundering. Yet it is frequently desirable to retain the original properties, which are not easily duplicated on re-starching. For many purposes it is advantageous to apply to fabric a finish which is retained in spite of the fabric being wet or cleaned.

It is accordingly an object of this invention to provide a method for fixing sizing materials. It is also an object to stiffen fabrics and yarn permanently. It is a further object to provide a one-bath process for producing on fabrics a wash-resistant coating or sizing.

In this invention these objects are accomplished by heating together a size and a chloral addition product having an organic group containing at least two carbon atoms, thereby causing the chloral addition product to react with the hydroxyl-containing, sizing material to render it relatively insoluble.

In the preferred application of size and a chloral addition product to textile fabrics, yarns, and the like, a sizing bath is prepared in the usual way for the particular size used and to this bath is added the chloral addition product selected. The preferred compositions contain about two parts of a chloral addition product to one to ten parts of sizing material. The chloral addition product is dissolved or dispersed in the sizing bath or it may be dissolved in an organic solvent and the solution dispersed in the bath. It is often advisable to add a catalyst in the form of a salt of a weak acid and a strong base or of a strong acid and a weak base such as ammonium chloride, sodium bicarbonate, borax, etc., or in the form of a weak acid or base itself, such as acetic acid or an organic amine. The basic catalysts are preferred.

The sizing bath is used to impregnate or coat yarn or fabric by any of the usual sizing methods, such as dipping or spreading followed by squeezing with rolls or scraping with a doctor knife. The yarn or fabric may then be dried if desired. The impregnated fabric or yarn must

be heated to a temperature sufficiently high to bring about the condensation between the chloral derivative and the polyhydroxy sizing agent. The temperature required depends in part upon the particular compound used and the time available for heating the treated fabric. In general, temperatures above 100° C. are necessary. At 120° C. fifteen or more minutes may be required to obtain the proper degree of insolubility of the sizing. At higher temperatures shorter times are effective. In plant practice the heating step may be accomplished while the cloth is passing over heated rollers or through a hot oven such as a loop drier, closed tenter or the like.

Variations in this application of chloral derivatives for the fixation of sizing materials are possible. They include a process in which fabric or yarn is impregnated with size and fixing agent in separate baths. Thus, a previously sized fabric may be impregnated with a solution or dispersion of a chloral derivative or fabric may be impregnated with the derivative and subsequently sized. Again, a composition may be prepared which contains a sizing agent such as starch and a chloral derivative in proper proportion and which may be used in the same manner as other prepared sizes.

After the size has been set or reacted with the fixing agent, it is frequently desirable to wash the treated fabric, yarn, or material to remove salts, unreacted material or decomposition products from the reaction. Washing, however, is not essential.

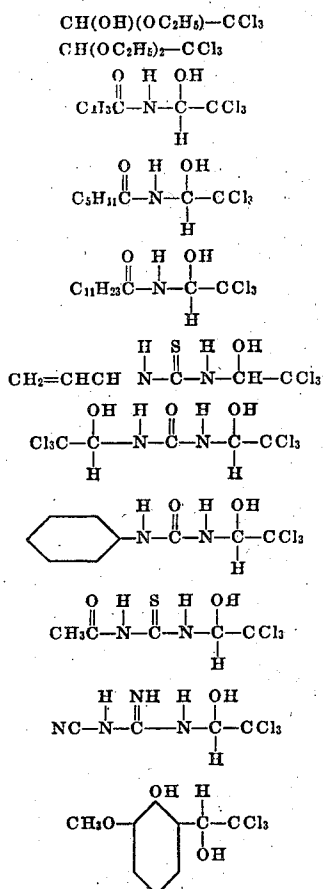
The process of insolubilizing sizes or improving the fastness of water-dispersible sizes herein disclosed may be applied to yarn, fabric, thread, or fibers of any material which may be heated over 100° C. without damaging the treated material. The process is thus applicable to such materials as cotton, linen, paper, straw, jute, hemp, the various synthetic fibers, etc. Sizing is of particular importance with the cellulosic fabrics or materials.

The sizing materials which are useful in this process are those high molecular weight compounds containing a multiplicity of hydroxyl groups. Without doubt, the water-soluble or water-dispersible properties of these sizes are due to the hydroxyl groups, which can react with such compounds as the chloral derivatives herein shown useful for fixing sizes. The useful sizing agents include cellulose ethers, such as water-soluble methyl or ethyl cellulose, hydroxyethyl cellulose and the like, polyvinyl alcohol, and starch, such as corn, rice, tapioca, sago, wheat, or potato starch, flours which contain a high percentage of starch, and the modified forms of starch. The size may be modified with filler, pigments, softeners, resins, etc.

While the various chloral compounds herein

disclosed are applicable for the processes outlined, they give somewhat different effects depending upon their molecular weight and molecular arrangement. Relatively small molecules give stiffer and harsher finishes than those of larger molecular size. The compounds containing long chain substituents give soft, smooth finishes which are highly desirable, and a certain degree of water-repellency may in some cases be secured. Stiffness of finish will, of course, also depend upon the kind, type and amount of sizing agent used.

Suitable chloral addition products include types of chlorals, such as—



These compounds are made by the addition of chloral to an alcohol, amide, carbamide, thiocarbamide, guanidine, phenol, or other reactive organic substance which contains at least two carbon atoms. Apparently the hydroxyl groups of water-dispersible, sizing materials condense with these chloral addition products, thereby blocking the hydroxyl groups and overcoming the water-solubility which is imparted by free hydroxyl groups.

Typical applications of these chloral derivatives for the insolubilizing of hydroxyl-containing, sizing materials are shown in the following illustrative examples—

Example 1.—Cotton sheeting was coated with a paste consisting of 20 parts of an 8% paste of potato starch and 1 part of the reaction product obtained from 1 mol of chloral and 1 mol of phenyl urea. The cloth was baked at 130° C. for 30 minutes. A stiff, wash-resistant finish was obtained.

Example 2.—Broadcloth was treated with a solution consisting of 20 parts of a 7.5% solution

of water-soluble, hydroxyethyl cellulose, 1 part of a 5% solution of sodium carbonate, and 1 part of the reaction product obtained from 1 mol of chloral and 1 mol of acetamide. The cloth was baked as in Example 1. A permanent, stiff finish resulted.

Example 3.—Spun rayon fabric was coated with a mixture consisting of 10 parts of an 8% paste of potato starch, 1 part of a 5% solution of sodium carbonate and 1 part of chloral alcoholate. The cloth was baked as in Example 1. A wash-resistance, stiff finish was obtained.

Example 4.—Example 3 was repeated except that in place of chloral alcoholate the reaction product obtained from 1 mol of chloral and 1 mol of allyl thiourea was used.

Example 5.—Cotton sheeting was coated with a mixture consisting of 10 parts of a 7½% solution of water-soluble hydroxyethyl cellulose, 1 part of 5% sodium carbonate solution, and 1 part of the reaction product obtained from 1 mol of guaiacol and 1 mol of chloral. The cloth was pressed with a medium hot iron for 3 minutes. A permanent, stiff finish was obtained.

We claim:

1. A process for improving the wash-fastness of water-dispersible, hydroxyl-containing size on textile material, which comprises treating the textile material with said size and with a chloral addition product having an organic group containing at least two carbon atoms, and subsequently heating said treated material to effect reaction between the size and the chloral addition product.

2. A process for improving the wash-fastness of water-dispersible, hydroxyl-containing size on a cellulose fabric, which comprises treating said fabric with said size and a chloral addition product having an organic group containing at least two carbon atoms, and subsequently heating said treated fabric to effect reaction between the size and the chloral addition product.

3. A process of improving the wash-fastness of starch on cellulosic fabric which comprises impregnating the cellulosic fabric with a starch size and a chloral addition product having an organic group containing at least two carbon atoms, and subsequently heating the impregnated fabric to effect reaction between the size and the chloral addition product.

4. Textile material carrying a complex reaction product of a water dispersible hydroxyl-containing, sizing material selected from the group consisting of starch, water-soluble cellulose ethers, and polyvinyl alcohol and a chloral addition product having an organic group containing at least two carbon atoms.

5. The textile material of claim 4 in which the sizing material is a water-soluble cellulose ether.

6. The textile material of claim 4 in which the sizing material is polyvinyl alcohol.

7. Cellulosic fabric carrying a complex reaction product of starch and a chloral addition product having an organic group containing at least two carbon atoms.

8. Cellulosic fabric carrying a complex reaction product of a water-soluble cellulose ether and a chloral addition product having an organic group containing at least two carbon atoms.

9. Cellulosic fabric carrying a complex reaction product of polyvinyl alcohol and a chloral addition product having an organic group containing at least two carbon atoms.

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