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TREATING CELLULOSIC MATERIALS

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1 Claim. (Cl. 8—118)

It has been common practice to treat cellulosic materials with strong acids to produce the so-called parchmentising effects, such as transparency, stiffening and deeper dyeing effects.

It has been proposed to treat the cloth with formaldehyde at the same time or before its treatment with parchmentising acid. This has the effect of controlling the action of the acid so that the cloth can be exposed to it for a longer time without fear of damage.

According to the present invention, cellulosic materials, preferably in the air-dry state, including paper and cellulose acetate but especially cotton, rayon of all descriptions and linen, whether in the form of fibres, yarns, filaments, films, fabrics etc., are treated with sulphuric acid of parchmentising strength (preferably having more H_2SO_4 than corresponds to 56% H_2SO_4) in which urea and formaldehyde or substance liberating formaldehyde have been dissolved, whereby the action of the acid is still more controlled than is possible with formaldehyde alone. We may introduce the urea, less advantageously, by adding condensation products soluble in sulphuric acid, such as methylol and dimethylol urea or methylene ureas. Thus, transparent, stiff, deeper dyeing and other parchmentising effects can be obtained with little risk of damaging the textile material due to exposure to acid for too long a time. It is possible, moreover, to vary the extent of the effects produced by varying the amounts of urea and formaldehyde or condensation products used (the greater the amount the less the parchmentising effect), as well as by varying the length of time of exposure to the acid. Thus, for example, slightly stiff or semi-stiff effects can be produced which are difficult to produce by the previous processes since the time of exposure even for full parchmentising effects is so small. By the present process it is possible to expose a woven cotton material to sulphuric acid of parchmentising strength for a minute without serious damage.

We generally use at least two per cent by weight of urea and paraformaldehyde, calculated on the weight of sulphuric acid, and preferably six per cent or more. Specially good results are obtained by using quantities sufficient to precipitate methylene urea and thus to give a delustring effect as hereafter described.

In a preferred method of carrying out the process paraformaldehyde is added to the sulphuric acid and urea is dissolved slowly in this mixture. The textile material is then treated with this solution at room temperature. A solution for the treatment of textile materials can, however, be obtained by dissolving condensation products of urea and formaldehyde such as methylol or dimethylol urea but this procedure is less advantageous since solution occurs but slowly.

It is possible to supplement this treatment by a treatment with ordinary acids of parchmentising strength before or after the treatment described, or two treatments may be given consecutively to improve the effect produced by a single treatment. The second treatment may be carried out using different proportions of urea and formaldehyde from the first.

It is much preferred to treat the textile material in the air-dry condition, since if it is previously wet with water or an aqueous solution, the reaction is difficult to control and also undesirable generation of heat would take place with risk of injury to the cloth.

We have found that under certain conditions precipitation of methylene ureas takes place during the washing with water after the treatment of the textile material with the acid so that the resulting material is opaque or delustred, instead of transparent, as well as stiffened and having deeper dyeing effects. If the urea is dissolved in the sulphuric acid and formaldehyde solution without cooling (a temperature of about 40° C. is attained), then only slight precipitation occurs on addition to water, but methylene ureas are precipitated if the solution is cooled. However, no precipitation occurs when the molecular proportions used of formaldhyde to urea are greater than 2 to 1.

It is possible to obtain pattern effects by printing on to the cloth beforetreatment one of the well-known acid resists, as for example wax. Excellent pattern effects can, however, be obtained by treating a cloth or yarn which has previously had a pattern applied by embossing by means of a calender with or without heat. The embossed portions of the cloth or yarn are less susceptible to the action of the acid. If at the same time there is precipitation of methylene ureas this takes place to a greater extent in the unembossed portions so that the embossed pattern is both stiffened and stands out white and opaque instead of the more usual transparent parchmentised effect.

The all-over or pattern effects produced by this process are very resistant to laundry processes and will withstand subsequent mercerisation. The materials can moreover be dyed, but in a further variation of this process we dissolve

or disperse a suitable dye or component of a dye which can be developed later, pigment or colouring matter in the sulphuric acid together with the urea and formaldehyde. Suitable colouring matters are, for example, Caledon Jade Green (Colour Index 1101), Indanthrene Turquoise Blue (I. G.) or Monastral Blue (I. C. I.). This enables the cellulosic textile materials to be both parchmentised and dyed at the same time and furthermore delustred if desired. In the same way attractive pattern effects can be obtained by the usual printing methods with or without a resist. Coloured pattern effects can also be obtained by the all-over treatment of a cloth or yarn bearing an embossed pattern. Not only are the embossed portions of the fabric acted on to a lesser degree by the acid than the remainder of the cloth as described above, but they are also acted upon to a lesser degree by the dye, so that a different dyeing effect results as well as that effect due to parchmentisation and under the special conditions mentioned above to the effect of the uneven precipitation of methylene ureas.

If a small amount of colouring matter is used it is possible to produce the unembossed portions of the cloth or yarn in a light colour while the remainder remains white or almost white. If, however, a strong or greater amount of colouring matter or a darker colour is used, it is possible to produce the unembossed portion of the cloth or yarn, in a dark colour, on a back-ground of the same colour only a lighter shade. It is also possible to use a dyed or embossed cloth or yarn, or one printed with a resist to the dye dissolved or dispersed in the sulphuric acid and produce on it a pattern in a different colour by treating it with sulphuric acid containing urea formaldehyde and colouring matter. In this way differential colour effects can be produced on the cloth or yarn while it is as a whole benefited by the action of the acid, for example, by being made stiff or slightly stiff.

Moreover, the more highly coloured portions of the cloth or yarn are at the same time more transparent than the remainder due to the action of the parchmentising acid or more delustred if methylene ureas have been precipitated from the acid.

Example I

13 grams of urea are added very slowly to 100 ccs. of 160° Tw. H_2SO_4 (86%) containing 26 grams of paraformaldehyde, the temperature being kept low. The resulting solution is still equivalent to about 130° Tw. (72.8% acid), but the parchmentising effect is considerably slowed down. The cotton yarn or fabric after treatment with this solution for from 30 secs. to 60 secs. is washed in cold water and is opaque, though parchmentised. This opacity is not removed by subsequent mercerisation.

Example II

11 grams of urea are added very slowly to 100 ccs. of H_2SO_4 (64%) containing 22 grams of paraformaldehyde, the temperature being kept low. The resulting solution is still equivalent to 86° Tw. (53%) acid. An artificial silk cloth is treated with this solution for 15 seconds. Similar effects to those described above are obtained.

Example III

15 grams of urea are added very slowly to 100 ccs. of 150° Tw. H_2SO_4 (81%) containing 10 grams of paraformaldehyde, the temperature being kept low. ½% Monastral Blue reckoned on the weight of the solution is added. A fabric bearing an embossed pattern is immersed in this solution for 20 seconds after which it is washed in cold water. The embossed portion now shows opaque and almost white in contrast with the unembossed portion which shows blue and more parchmentised.

Parchmentising acid may be used at low temperatures, about 0° C.. when it lessens or slows up the effect.

Example IV

8 grams of paraformaldehyde are added to 100 ccs. of 130° Tw. sulphuric acid. 4 grams of urea are dissolved slowly in this mixture without cooling. A cotton fabric is immersed in this solution for 30 seconds and then washed in cold water. The resulting fabric is parchmentised, being transparent and not delustred since very little methylene urea has been precipitated.

We declare that what we claim is:

Process of parchmentising and delustring air-dry cellulosic materials which comprises dissolving free urea and an aldehyde selected from the group comprising formaldehyde and paraformaldehyde in sulphuric acid of parchmentising strength without permitting the temperature of the solution to rise above 40° C. and using a total amount of at least 6% by weight of urea and aldehyde to sulphuric acid, and a molecular proportion of aldehyde to urea which is not greater than 2:1, treating at least part of the air-dry cellulosic material with the solution so obtained, and washing the treated cellulosic material with water to precipitate methylene urea.

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