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PROCESSING OF VISCOSE RAYON

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This invention relates to the processing of viscose-rayon, and deals more particularly with the treating operations to which crude viscose-rayon yarn (i. e., yarn coming from the spinning bath) is subjected before being used as a raw material in the manufacture of rayon goods.

Crude rayon yarn contains considerable sulphur and an appreciable amount of organic coloring matter, even after it has been washed and dried. In order to produce yarn of the desired luster and whiteness, it has been found necessary to subject the crude yarn to desulphurizing and decolorizing treatments. Desulphurization is usually accomplished by treating the yarn with dilute solutions of sodium sulphide at about 80° to 100° C., whereupon after washing and souring to remove traces of sodium sulphide, the desulphurized yarn is decolorized by bleaching as with dilute chlorine water. The decolorized yarn is then washed, treated with antichlor solution, e. g., sulphurous acid, again washed, and finally dried. This sequence of treating operations heretofore commonly practised in the industry involves considerable handling of wet rayon yarn, and accordingly is time-consuming and expensive.

We have discovered that it is possible to desulphurize and decolorize crude viscose-rayon yarn to the desired condition, if such yarn is immersed in an alkaline bath and oxygen in suitable form is supplied to the bath. Thus, we have found that the yarn may be desulphurized and decolorized in a single step, if it is immersed in a hot, dilute alkaline solution and a current of oxygen-containing gas, e. g., air or oxygen, passed into the solution. We have further found that similar results may be obtained by dissolving ferric or manganese salts in the hot alkaline solution, with or without the introduction of oxygen-containing gas into the solution, and then removing the colored ferric or manganese salts fixed to the yarn. The resulting product is snow-white in color, lustrous, and soft. Its strength and elongation, both wet and dry, are in many instances superior to that possessed by yarn resulting from the processes heretofore employed. The process of the present invention thus makes possible the removal of sulphur and coloring mater from crude viscose-rayon yarn by a simpler, less expensive process, comprising fewer steps, consuming much less time, and yielding a product of excellent characteristics.

While we do not know precisely the action of the ferric or manganese salts on the yarn, in view of the fact that organic coloring matter is removed therefrom, it is highly probable that these salts slowly furnish nascent oxygen, which exerts a bleaching effect. The salts, however, are not reduced during the treatment, doubtless being kept in their oxidized condition by the oxygen of the surrounding atmosphere or by the oxygen-containing gas passed into the solution. It is for this reason that we shall hereafter term such salts "catalytic oxidizing agents," as they apparently merely serve as carriers of oxygen, without themselves undergoing a chemical change.

The process of the present invention may be successfully carried out as follows:

Example 1

Crude rayon yarn, say in skein form or wound on a reel, is immersed in a hot, dilute solution of sodium hydroxide, preferably a 0.2% solution, at 80° to 100° C. A current of air or oxygen is passed into the solution until the yarn is thoroughly desulphurized (about 30 minutes), at which time it is also bleached to snow-whiteness. The yarn is then removed from the solution, thoroughly washed with water, and dried.

Example 2

Crude rayon yarn is immersed in a hot, dilute solution of sodium hydroxide containing ferric or manganese salts, preferably in a 0.2% solution containing about 0.2% ferric nitrate or manganese sulphate and at 80° to 100° C. The solution is maintained at this temperature and is stirred until desulphurization is complete (about 30 minutes), whereupon the yarn is removed from the bath. The colored ferric or manganese salts deposited

upon the yarn are then removed by suitable treatment. If ferric salts are used, the yarn may be treated for about five minutes, in a 1% oxalic acid solution at, say, 30° to 60° C., but if manganese salts are used, the treatment may be for about five minutes at atmospheric temperature in 1% sulphurous acid solution. Such treatment effects a removal of the colored salts from the yarn, so that when it is subsequently washed and dried, a pure white product is obtained.

Example 3

Crude rayon yarn is immersed in a hot, dilute solution of sodium hydroxide containing ferric or manganese salts, preferably in a .2% solution containing about 0.2% ferric nitrate or manganese sulphate and at 80° to 100° C. Into the solution is passed a current of air or oxygen, until desulphurization is complete (about 30 minutes). The yarn is then removed from the solution, treated as described in Example 2 for the removal of the colored iron or manganese salts deposited thereon, and then washed and dried.

The foregoing examples are merely illustrative, as there are various other alkaline compounds and catalytic oxidizing agents which may be used in the treating bath. For instance, in lieu of caustic soda, we may use such alkaline salts as sodium carbonate, sodium phosphate, borax, or the like, and in lieu of ferric or manganese salts, we may use other salts, such as those of cobalt, nickel, chromium, and vanadium, which in the presence of organic reducing agents tend to change valence from higher to lower form, the concentration of solution and the temperature and time of treatment being such as will best suit the yarn being treated.

Having thus described the process of the present invention and certain modes of practising the same, it should be evident to those skilled in the art that various changes and modifications might be made therein without departing from the spirit or scope of invention as defined by the appended claims.

We claim:

1. A process which comprises treating crude viscose-rayon yarn with an alkaline solution while progressively furnishing the solution with oxygen from an outside source until the yarn has been desulphurized.

2. A process which comprises maintaining crude viscose-rayon yarn in contact with an alkaline solution while progressively furnishing the solution with oxygen from an outside source until the yarn has been desulphurized, and washing the product.

3. A process which comprises maintaining crude viscose-rayon yarn in contact with a hot, dilute alkaline solution while progressively furnishing the solution with oxygen from an outside source until the yarn has been desulphurized.

4. A process which comprises immersing crude viscose-rayon yarn in an alkaline solution containing a catalytic oxidizing agent, and passing an oxygen-containing gas into the solution.

5. A process which comprises immersing crude viscose-rayon yarn in an alkaline solution, and passing an oxygen-containing gas into the solution.

6. A process which comprises maintaining crude viscose-rayon yarn in contact with an alkaline solution containing a catalytic oxidizing agent until the yarn has been desulphurized, said agent being selected from a group consisting of iron, manganese, cobalt, nickel, chromium, and vanadium salts.

7. A process which comprises maintaining crude viscose-rayon yarn in contact with an alkaline solution containing a colored catalytic oxidizing agent selected from a group consisting of iron, manganese, cobalt, nickel, chromium and vanadium salts, until the yarn has been desulphurized, and removing the colored agent deposited on the yarn.

8. A process which comprises maintaining crude viscose-rayon yarn in contact with an alkaline solution containing a ferric salt until the yarn has been desulphurized, and removing the salt deposited on the yarn.

9. A process which comprises maintaining crude viscose-rayon yarn in contact with an alkaline solution containing a ferric salt until the yarn has been desulphurized, treating with oxalic acid solution to remove the salt deposited on the yarn, and washing.

10. A process which comprises maintaining crude viscose-rayon yarn in contact with an alkaline solution containing ferric nitrate until the yarn has been desulphurized, treating with oxalic acid solution to remove the salt deposited on the yarn, and washing.

11. A process which comprises maintaining crude viscose-rayon yarn in contact with an alkaline solution containing a manganese salt unitl the yarn has been desulphurized, and removing the salt deposited on the yarn.

12. A process which comprises maintaining crude viscose-rayon yarn in contact with an alkaline solution containing a manganese salt until the yarn has been desulphurized, treating with sulphurous acid solution to remove the salt deposited on the yarn, and washing.

13. A process which comprises maintaining crude viscose-rayon yarn in contact with an alkaline solution containing manganese sulphate until the yarn has been desulphurized, treating with sulphurous acid solution to remove the salt deposited on the yarn, and washing.

14. A process which comprises maintaining crude viscose-rayon yarn in contact with an alkaline solution containing the compound of an element having more than one valence and tending to change from higher

to lower valence form in the presence of organic reducing agents, said element being selected from a group consisting of iron, manganese, cobalt, nickel, chromium, and vanadium and being in higher valence form, until the yarn has been desulphurized.

In testimony whereof we have affixed our signatures.

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