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MOTHPROOFING

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This invention relates to a mothproofing solution.

An object of the invention is to provide a stable mothproofing solution.

Another object of the invention is to provide a mothproofing solution which, when applied to the fabric to be treated, will give to the same a soft feel.

Soluble fluorides and soluble silicofluorides have been used to mothproof animal fabrics, such as wool, hair, etc., the silicofluorides being preferable for this purpose, because the fluorides have a high toxicity to humans.

The silicofluorides may be applied to the fabric in various ways, for example, by spraying an aqueous solution of a silicofluoride on the fabric, or by immersing the fabric in an aqueous solution of the silicofluoride of such concentration that a sufficient amount of the salt will be adsorbed to render the fabric mothproof.

Another method of application is by treating the fabric with dry-cleaning fluids containing dissolved therein the necessary quantity of silicofluoride, which is adsorbed on the fabric during the dry-cleaning operation. In the latter case, however, only certain types of organic silicofluorides are suitable, in connection with specially selected solvents.

In the mothproofing of newly made articles, such as blankets, dress goods, carpets, upholstering materials, etc., aqueous solutions of the silicofluorides have been used for economic reasons. However, the silicofluorides are easily leached out from the fabrics during further processing in water solutions before finishing, and also upon washing for cleaning purposes after the articles have been in use for some time, so that the fabric is no longer protected against moths, carpet beetles, etc.

Another disadvantage inherent in the mothproofing of fabrics with the commonly used silicofluorides, especially of the inorganic salt type, lies in the fact that they generally afford a harsh feel to the fabric.

We have now discovered that a solution prepared by dissolving in water triethanolamine silicofluoride, aluminum sulfate, and a wetting agent, for example a sulphated primary alcohol having from 12 to 22 carbon atoms, sodium oleyl N-methyl aminoethane sulfate, or other wetting agents such as those sold under the trade names of "Igepon", "Tytrovon", "Avirol", "Gardinol", etc., are capable of permanently mothproofing animal fibres or fabrics without affording a harsh feel to the treated fabric.

We have found that fabrics treated with this solution may be washed repeatedly and still will be mothproof. This is due to the combined action of the triethanolamine silicofluoride and aluminum sulfate. In contradistinction to most other organic silicofluorides, triethanolamine silicofluoride does not readily crystallize and to this particular property we attribute the fact that the treated fabrics continue to have a soft feel after treatment because no crystals of the triethanolamine silicofluoride are formed on the fibre, but adhere to the same in the form of a film.

In order to apply our solution to the fabric, it is desirable to have on hand a stock solution with a high percentage of solids. We have found, however, that, in order to obtain such a stock solution of high concentration, it is necessary to prepare this solution from raw products, which should correspond to certain specifications, and it is also necessary to closely adhere to the method of compounding as disclosed in this example, in order that the product will remain permanently in a condition in which it can be readily used without adversely affecting the treated fabrics. We have noticed that otherwise the solution may show gelatinisation or precipitation upon standing.

The hydrosilicofluoric acid used in preparing the triethanolamine silicofluoride should be of about 27 to 35% strength, free of uncombined silicic acid, but may contain uncombined fluoric acid. If the hydrosilicofluoric acid contains uncombined silicic acid, the latter must be taken up by means of fluoric acid. The triethanolamine should be substantially free from the mono- and di-ethanolamines. The non-volatile residue of the triethanolamine-silicofluoric acid reaction should be, preferably, less than 0.1%. Inasmuch as the number of molecules of water of crystallization of aluminum sulfate may vary, such compound must be standardized for its $Al_2(SO_4)_3$ content, and its aqueous solution must be filtered clear.

It might be thought that other aluminum salts could be substituted for the aluminum sulfate, such as alum, aluminum chloride, aluminum acetate, etc., but contrary to expectation, other salts are not suitable, which is evidenced by the formation of precipitates upon standing of the solution. If economic considerations permit the use of stock solutions of lower concentration, it is possible to use raw materials of a less degree of purity than mentioned above.

Our preferred method for making this solution is as follows:

240 pounds of triethanolamine are run in a slow stream with stirring into about 330 pounds of accurately assayed 35% hydrosilicofluoric acid. An excess of the base should never be present, and the neutral or only very slightly acid solution should be clear or only slightly turbid. 20 pounds of 50% hydrofluoric acid are then added, followed by a clear solution of 140 pounds of $Al_2(SO_4)_3.16H_2O$ in 175 pounds of water. A solution of 5 pounds of lauryl sulfate in 25 pounds of water is then added, and the total weight of the solution brought up to 1000 pounds with water. The final pH of this solution should be about 2. Myristyl sulfate, sodium oleyl N-methyl aminoethane sulfonate, and other wetting agents may be substituted for the lauryl sulfate.

Such solution may be stored indefinitely in wooden or rubber containers. For use in mothproofing fabrics, the solution is further diluted with water, the final concentration varying over a wide range, usually containing between about 0.1% and 1% of solids, depending upon the type of fabric to be treated and the type of machine used for the purpose. It is advisable to use this mothproofing solution in sufficient quantity for the purpose, about 3% of the weight of the fibre giving good results.

It is understood that the above disclosure is by way of illustration and not of limitation, and that what we claim as our invention is a stable mothproofing solution containing an organic silicofluoride incapable of crystallizing on the fabric to be treated, aluminum sulfate, and a wetting agent, said solution being substantially free of uncombined silicic acid.

We claim:

1. A stable mothproofing solution containing triethanolamine silicofluoride, aluminum sulfate, and a sulfated primary alcohol having from 12 to 22 carbon atoms, said solution being substantially free of uncombined silicic acid.

2. A stable mothproofing solution containing triethanolamine silicoflouride, aluminum sulfate, and lauryl sulfate, said solution being free of uncombined silicic acid.

3. A stable mothproofing solution containing triethanolamine silicofluoride, aluminum sulfate, and myristyl sulfate, said solution being substantially free of uncombined silicic acid.

4. A stable mothproofing solution containing tri-ethanolamine silicofluoride, aluminum sulfate, and sodium oleyl N-methyl aminoethane sulfonate, said solution being substantially free of uncombined silicic acid.

5. A stable mothproofing solution containing triethanolamine silicofluoride, aluminum sulfate, and a wetting agent soluble in the solution, said solution being substantially free of uncombined silicic acid.

6. A stable mothproofing solution containing up to about 35% of triethanolamine silicofluoride, aluminum sulfate, and a wetting agent soluble in the solution, said solution being substantially free of uncombined silicic acid.

7. A stable mothproofing solution containing triethanolamine, silicofluoride, aluminum sulfate, hydrofluoric acid, and a wetting agent soluble in the solution, said solution being substantially free of uncombined silicic acid.

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