

1

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METHOD FOR DECREASING FRICTION IN MOPPING

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5 Claims

ABSTRACT OF THE DISCLOSURE

Water-soluble acrylamide polymers and copolymers may be added to cleaning solutions to substantially decrease the amount of work expended in mopping without deleterious effects on cleaning ability.

This invention relates to a method for decreasing friction when mopping with an aqueous cleaning solution. More particularly it relates to the use of cleaning solutions containing a small amount of an acrylamide polymer.

The desirability of decreasing friction between a mop, whether attached to a handle or held in the hand, and the surface to be cleaned is obvious. Some decrease in friction over the use of water alone is obtained when soap and/or other detergent is employed in the cleaning solution.

It has now been discovered that superior reduction in friction may be accomplished by adding to the cleaning solution used for mopping at least about 0.001 percent by weight and preferably from about 0.001 to 0.2 percent by weight of an acrylamide (hereinafter AA) polymer having a molecular weight of at least about one-half million as determined by viscosity measurement. Such cleaning solutions also advantageously contain a soap and/or detergent. There is some indication that the presence of the AA polymer also enhances the cleaning properties of the solution, as well as reducing friction. Best results in reducing friction are obtained with from about 0.01 to 0.1 percent of the polymer. Above 0.1 percent by weight, the additional decrease in friction is not sufficient to justify the addition of more acrylamide polymer.

As used herein, the term "acrylamide polymer" encompasses water-soluble polymers and copolymers of acrylamide having a preponderance of amide groups, i.e., having at least 50 mol percent acrylamide moieties. A portion of the amide groups can be hydrolyzed to anionic carboxyl groups with, for example, an alkali metal hydroxide; these polymers are referred to as partially hydrolyzed polyacrylamides. Representative polymers for the practice of this invention include homopolymers of acrylamide and copolymers of acrylamide with other suitable monomers such as acrylic acid, methacrylic acid, methacrylamide and the like.

Also suitable are cationic AA polymers. Representative are copolymers of acrylamide and aminomethyl acrylates (e.g., dimethyl aminomethyl acrylate, N-dimethyl aminomethyl acrylate, and N-vinyl pyridine); copolymers of acrylamide and a secondary amine (e.g., methyl aminomethyl methacrylate); and copolymers of acrylamide and vinylbenzyl trimethylammonium chloride.

Best results are obtained with AA polymers having molecular weights between about one-half million and three million. However, other water-soluble AA polymers

2

having molecular weights up to 15 million and higher are operable.

The advantageous effects of the AA polymers are obtained whether the cleaning solution contains a soap and/or a synthetic detergent. Suitable soaps include the amine soaps, alkali metal soaps (e.g., sodium and potassium) and ammonium soaps. In general, anionic, non-ionic, and cationic synthetic detergents are suitable. Representative of suitable anionic synthetic detergents are the organic sulfonates and sulfates containing from 7 to 20 carbon atoms, e.g., alkyl sulfonates, alkyl sulfates, arylalkyl sulfonates, arylalkyl sulfates, sulfonated alkylamides, sulfonated alkyl-substituted diphenyloxides, sulfonated alkyl substituted succinamates and phosphates and carboxylate substituted sulfonated diphenyloxides and alkyl succinamates. Operable nonionic detergents include alkylene oxide condensation products of branched monohydric primary alcohols (e.g., ethylene oxide and tridecanol) and alkylene oxide condensation products of other hydroxy organic compounds, such as alkylphenols (e.g., ethylene oxide and nonylphenol). Cationic surface active agents, such as long chain quaternary ammonium salts or salts of higher alkylamines, are also operable. Typical examples include cetyltriethylammonium chloride and similar compounds and the alkylbenzyl-dimethylammonium chlorides in which the alkyl groups correspond to those derived from coconut oil fatty acids.

Advantageously, the cleaning solutions used in this invention are prepared by diluting a concentrated aqueous solution containing from about 0.1 percent to 2 percent by weight of an AA polymer with water to give an aqueous solution having the desired concentration of AA polymer, i.e., at least about 0.001 percent by weight of the polymer. In this manner a cleaning solution having the desired concentration of AA polymer may be easily prepared from the concentrate at the point of use. Alternatively, a sufficient amount of the polymer may be incorporated into a soap or detergent powder to give the desired concentration of AA polymer in the solution when the soap or detergent is used as directed. The solutions are used for wet mopping in the usual manner.

While the following examples represent specific embodiments of the invention, the scope of the invention is limited only by the claims appended hereto.

EXAMPLE 1

A cotton cloth was weighted with approximately 350 grams and wet with water. The cloth was pulled across a smooth surface at a constant speed and was found to require 375 grams of pull, as measured by a spring gauge.

The cloth was then wet with water containing about 0.001 percent by weight of a partially hydrolyzed polyacrylamide having an estimated molecular weight between 2 and 3 million as determined by viscosity measurement. 200 grams of force was now required to move the weighted cloth across the same smooth surface. This is about 54 percent of the force required when the cloth was wet with water alone.

EXAMPLE 2

Acrylamide polymers were evaluated as friction reducing agents in aqueous soap and synthetic detergent cleaning solutions. The mop fiber used in these evaluations was a terry cloth and the mopped surface was a vinyl linoleum. The solutions were evaluated by measuring the driving force required to move the mop across a 25-inch zone in 0.6 second compared with water alone as a standard. Table I shows first, the amount of AA

polymer in each solution; secondly, the reduction in driving force using a water solution containing only the AA polymer, and finally, the reduction in driving force using a solution containing both the soap or detergent and the AA polymer.

TABLE I.—REDUCTION IN DRIVING FORCE WITH ACRYLAMIDE POLYMERS COMPARED TO WATER ALONE

Amount AA Polymer in Aqueous Solution, Wt. percent	With No Soap or Detergent, Percent Reduction	AA Polymer+ "Ivory" Soap ¹ by Wt. Solution in Water, Percent Reduction	AA Polymer+ "Mr. Clean" Detergent ² , ½ cup/ gal. Water, Percent Reduction	AA Polymer+ "Spic and Span" Detergent, ³ ½ cup/ gal. Water, Percent Reduction
		Percent Reduction	Percent Reduction	Percent Reduction
0.01 ⁴	41.2	78.0	56.0	50.0
0.025 ⁴	53.0	85.4	60.3	60.4
0.05 ⁴	61.8	89.3	70.6	63.3
0.1 ⁴	70.6	94.0	85.4	70.6
0.01 ⁵	30.9	78.0	63.2	61.8
0.025 ⁵	61.8	82.5	79.4	82.5
0.05 ⁵	78.0	97.0	85.3	92.7
0.1 ⁵	95.6	98.5	95.6	95.6

¹ Identified as a sodium soap of vegetable oil fatty acids.

² Identified as an aqueous solution containing pine oil, tetrapotassium pyrophosphate, a fatty acid alkanolamide, and potassium toluene sulfonate.

³ Identified as a mixture of polyphosphates, sodium sulfate, and a sodium alkyl aryl sulfonate.

⁴ Polyacrylamide with a molecular weight of about one million.

⁵ Partially hydrolyzed polyacrylamide with an estimated molecular weight between two and three million.

A solution containing only the "Ivory" soap and water in a .06 percent by weight solution gave a reduction in driving force of 70.6 percent. A solution containing only "Mr. Clean" detergent (½ cup/gal. water) gave a reduction in driving force of 48.5 percent. A solution containing only "Spic and Span" detergent gave a reduction of 26.5 percent. Thus, in each instance, solutions containing both the AA polymer and the soap or detergent gave a substantially greater reduction in friction than either alone. The partially hydrolyzed polyacrylamide appears to give better results than the unhydrolyzed polyacrylamide used.

Similar reduction in driving force is obtained by using copolymers of acrylamide and aminomethyl acrylates (e.g., dimethyl aminomethyl acrylate), copolymers of acrylamide and a secondary amine (e.g., methyl aminomethyl methacrylate), and the like polymers as set forth in the preceding definition of "acrylamide polymers."

What is claimed is:

1. The method of cleaning a surface by mopping the surface with an aqueous cleaning solution wherein said solution comprises (1) water, (2) soap or synthetic detergent and (3) at least 0.001% by weight of a water-soluble acrylamide polymer having a molecular weight of

at least 0.5 million, which polymer contains at least 50 mol percent of acrylamide moieties.

2. The method of claim 1 wherein said acrylamide polymer has a molecular weight of from about one-half million to three million and is present in said cleaning

solution in an amount of from about 0.001 to 0.2 percent by weight.

3. The method of claim 1 wherein said acrylamide polymer is a homopolymer of acrylamide.

4. The method of claim 1 wherein said acrylamide polymer is a partially hydrolyzed polyacrylamide.

5. The method of claim 1 wherein the acrylamide polymer is the polymer formed by copolymerizing acrylamide and acrylic acid, methacrylic acid, methacrylamide, N-dimethyl aminomethyl acrylate, N-vinyl pyridine, methyl aminomethyl methacrylate or vinylbenzyl trimethylammonium chloride.

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