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WATER-TREATING AGENT

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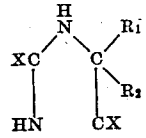
(3 Claims. (Cl. 252—175)

This invention relates to water-treating agents, and more particularly to hard-water treating agents, for the purpose of converting hard water to water having the inherent advantages of soft water, the invention likewise relating to the agents per se and the use of the agents as detergent assistants.

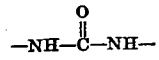
The water-treating agents of the invention may be characterized as detergent assistants, hard-water softening agents, dye assistants, and the like and are employed for the purpose of avoiding or delaying the formation of hard-water precipitates, redissolving the precipitates already formed, or alternatively forming precipitates of such nature that they have no deleterious effect on the particular operation of cleaning, dyeing, foaming, or the like.

An object of the present invention is to provide new water-treating agents. A further object of the invention is to provide a process for cleaning textiles, clothes, comestibles, ceramics, and all materials, articles, or products contaminated with fats, oils, dirt, and the like. Another object is to provide highly efficient detergent assistants. Yet another object of the invention is to provide new compositions which may be effectively used in dye baths to aid in the dyeing of natural or artificial fibers or fabrics without streaking and/or discoloration due to insoluble metal salts. Other objects and advantages of the invention will hereinafter appear.

The invention is based on the discovery of new water-treating agents which include the water-soluble 5 and 6 membered heterocyclic rings containing at least two nitrogen atoms, such, for example, as pyrimidine and its derivatives, e. g. uracil, thymine, and cytosine, as well as purine and its derivatives, such as xanthine, quanine, adenine, and the like and more specifically the hydantoins which may be represented by the empirical formula,



wherein X is oxygen and R_1 and R_2 are hydrogen or monovalent aliphatic or cycloaliphatic groups such as methyl, ethyl, ethoxyethyl, cyclohexyl, keto-cyclohexyl, etc. Alternatively, R_1 may be hydrogen and R_2 any of the aforementioned substituent groups, or R_1 and R_2 may together form a divalent aliphatic or cycloaliphatic group, as in the 5-disubstituted hydantoin derived from cyclohexanone or cyclopentanone. Specific examples of these hydantoins are the 5,5-dialkyl hydantoins as 5,5-dimethyl hydantoin, 5,5-methylethyl hydantoin, and 5,5-methyl-ethoxy hydantoin. Similar thio compounds are designated by substituting one or both of the X's by sulfur. Of the class of compounds designated those containing the group



are most effective.

Accordingly, the invention comprises essentially a process involving the addition of the above designated compounds as water-treating agents to water and especially hard water to be used for cleaning, dyeing, and other purposes. Moreover, these agents may be used alone as detergents, in some instances, or combined with detergents as detergent assistants in others. They may be used in either capacity in hard or soft water. More marked effect is noticeable, however, when they are used with hard water. When used with detergents as detergent assistants, a sufficient amount of a base should be present to give a pH of from 9 to 12, i. e., the range in which detergents generally are most effective. These agents may be used in conjunction with a suitable detergent such as, for example, ordinary soaps; that is, the alkali salts of the higher fatty acids. They may also be used with such detergents as the salts of the sulfonic acid derivatives of aliphatic or aromatic hydrocarbons, for instance, alkylated naphthalene sulfonic acids, water-soluble salts of acid sulfuric acid esters of higher aliphatic alcohols, such as, of lauryl, cetyl, or oleyl alcohol and the like, and similar salts of condensation products of fatty acids with, for instance, hydroxy acids or aminoalkylsulfonic acids and the like. Other ingredients may also bo added, if desired, to the detergent assistant and the detergent, such, for example, as sodium sulfate, sodium carbonate, the silicates, or phosphates together with oxidizing or reducing agents such as the perborates, hydrosulfides, and organic solvents.

These agents if used with detergents may, if desired, be added with the detergent prior to or during the washing operation, or may be added during the final rinsing operation. Such agents may also be previously mixed with the detergent and the resulting mixture then added to the water or the single ingredients may be added in any sequence and in suitable proportions by weight.

Furthermore, these water-treating agents may be employed for preventing the precipitation of insoluble salts from hard waters, during dyeing; as a water softener for boiler-feed water or in other operations where hard water forms contaminating or undesirable insoluble salts. In other words, these agents, while mainly used for the purpose of and as an aid in cleaning and in the prevention of the precipitation of lime, calcium, aluminum, iron, zinc, or magnesium salts and the like from solution during cleaning and dyeing, are applicable to all processes wherein these salts precipitate, and it is desirable to prevent their precipitation, or if this is not possible precipitate them in an unobjectionable form. It is not known what is the exact nature of the reaction taking place between the water-treating agent and the metal ions present in the water, but these agents do have the effect of preventing objectionable precipitation.

While it is possible, by analysis of hard water, to calculate the amount of the agent to be added, this amount in practice can be readily determined by experience in its addition to the point which observation indicates that the calcium and/or magnesium or other metal salts are rendered unobjectionable.

Examples will now be given illustrating by specific embodiments the use and outstanding advantages of the water-treating agents. Unless otherwise indicated, parts given are by weight.

Example 1.—To 20 ml. of hard water of about 21 grains per gallon total hardness was added 0.1 gram of 5,5-dimethyl hydantoin and sufficient alkali to raise the pH to 10.5. The solution was heated to 120° F. and then titrated with a 1% solution to a permanent foaming end point. Less than 1 ml. of the soap solution (i. e. less than 0.01 gram of soap) was required to give a clear, strongly foaming, detergent solution. In the absence of the 5,5-dimethyl hydantoin, 7 ml. of soap solution was required to give permanent foaming.

The above process was repeated with uracil which required less than 1 ml. of the soap solution and with 5,5-methyl ethoxy hydantoin, 5,5-methyl ethyl hydantoin and 5,5-phenyl thio hydantoin, each one of which required approximately ½ ml. of soap solution to give a clear, strongly foaming, detergent solution.

Example 2.—2.5 grams of 5,5-dimethyl hydantoin was added to 500 ml. of hard water of about 21 grains per gallon total hardness, the resulting solution being treated with sufficient sodium hydroxide to raise the pH of the solution to 9.9. The solution was heated to 150° F. and ½ gram of soap added with stirring. A clear, strongly foaming, solution with good detergent properties was obtained. A piece of standard soiled blanket felt was cleaned easily by washing at 150° F.

The above process was repeated utilizing 1 gram of uracil and the same amount of hard water which was neutralized with sodium hydroxide to give a solution having a pH of 10.5. 1.0 gram of soap was sufficient to give a solution having similar detergent properties.

In the absence of these water-treating agents, 1 gram of soap in 500 ml. of hard water containing 21 grains per gallon total hardness produced a typical calcium soap precipitate and no lather could be obtained even with violent agitation.

The water-treating agents may be used for, in addition to the uses described above, wetting out of gray goods, assistant in peroxide bleaching, scouring rayon yarns and fabrics, wetting out of cotton goods that are to be pre-shrunk, scouring of lime-pulled wool, degumming, preparation of raw stock for dyeing, as a dispersing and penetrating agent in dyeing, penetrating agent in warp sizing, and in alkaline fulling.

They may also be used, preferably with a detergent, in removing grease from other grease-laden articles. For example, the palm oil used in the cold-rolling of steel sheets may be removed by scrubbing the sheets with hot water containing a detergent and the treating agent. In this case the detergent has a saponifying action upon the palm oil and the water-treating agent used here as a detergent assistant prevents the formation of objectionable calcium or magnesium precipitates. A similar bath may be used for the washing of parts prior and/or subsequent to electroplating, painting, lacquering, finishing, and the like.

I claim:

1. Hard water having incorporated therein a precipitate-inhibiting amount of pyrimidine as a water-softening agent.

2. Hard water having incorporated therein a precipitate-inhibiting amount of uracil as a water-softening agent.

3. Hard water having incorporated therein a precipitate-inhibiting amount of a water-softening agent selected from the group consisting of pyrimidine, uracil, thymine, cytosine, purine, xanthine, quanine and adenine.

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