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3,222,213

RINSING FORMULATION

Salem T. Clark, Grand Island, N.Y., assignor to Union Carbide Corporation, a corporation of New York
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This invention relates to preparations for treating cleaned surfaces. In one aspect, this invention relates to emulsified formulations for rinsing previously cleaned automobiles.

Automobiles and the like are commonly washed and cleaned with highly alkaline "built" detergents or anionic detergents. A very good cleaning action and effective removal of grease spots can be achieved in this manner. After application of the detergent the automobile finish is rinsed and dried in the conventional manner, i.e., with a cloth or by means of an air blast.

It is an object of the present invention to provide formulations that facilitate the rinsing and drying of cleaned surfaces.

It is another object of this invention to provide formulations that deposit a water-repellent film on the treated surfaces.

Still further objects will readily present themselves to one skilled in the art upon reference to the ensuing specification and claims.

These objects are achieved by an oil-in-water emulsion which contains effective amounts of an organic cationic surfactant, an emulsifiable mineral oil, and water. Optionally, an organic non-ionic surfactant can be added to the formulation in order to promote uniform deposition of a water-repellent film.

The present formulations possess what is referred to in the art as a fast water break. This property manifests itself as a beading of water droplets on the treated surface during and after application of the formulation. When the treated surface is dried, the water droplets can be removed by the relatively simple expedient of blowing air over the surface. As compared to cleaned but untreated surfaces an air blast of much lower intensity is required for drying a surface.

The primary ingredients of the formulation of this invention are a cationic surfactant and an emulsifiable mineral oil. The cationic surfactant emulsifies the mineral oil in water, thereby forming an oil-in-water emulsion. Upon application to a cleaned surface these primary ingredients substantively plate out on the surface and deposit a water-repellent film on the latter. The non-ionic surfactant is believed to promote the plating out of a more nearly uniform water-repellent film and its presence in the formulation is preferred for this reason.

The broad group of compounds known in the art as surfactants is further broken down into three distinct categories—non-ionic surfactants, cationic surfactants, and anionic surfactants. The non-ionic surfactants do not ionize in water and are long molecules which on one end are hydrophilic and lipophobic and on the other end hydrophobic and lipophilic. The cationic surfactants and the anionic surfactants ionize in water to provide charged ions of long molecular structure. In cationic surfactants the hydrophobic lipophilic end is on the positively charged cation and in anionic surfactants the hydrophobic lipophilic end is on the negatively charged anion.

Specifically contemplated organic cationic surfactants are nitrogen-containing compounds which are the reaction products of long-chain fatty acids containing from 8 to 22 carbon atoms with alkylene polyamines, alkylol amines or ammonia, the condensation products of a primary fatty amine containing from 8 to 22 carbon atoms with an alkylene oxide, such as ethylene oxide or other

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active epoxides such as propylene oxide and the like, and the quaternary ammonium salts of fatty amines having at least one alkyl substituent containing from 8 to 22 carbon atoms such as fatty amine acetates, fatty amine chlorides, fatty amine bromides and the like.

Typical illustrative nitrogen-containing compounds which are the reaction products of long-chain fatty acids containing from 8 to 22 carbon atoms with alkylene polyamines are 1-(2-aminoethyl)-2-heptadecenyl-2-imidazoline, 1-(2-aminoethyl)-2-heptadecadienyl-2-imidazoline, and the like.

Typical reaction products of long-chain fatty acids containing from 8 to 22 carbon atoms with alkylol amines are 1-(2-hydroxyethyl)-2-heptadecenyl-2-imidazoline, 1-(2-hydroxyethyl)-2-heptadecadienyl-2-imidazoline, and the like.

Typical reaction products of long-chain fatty acids containing from 8 to 22 carbon atoms with ammonia are octadecylamide, hexadecylamide, docosylamide, octylamide, and the like.

Typical condensation products of a primary fatty amine with an alkylene oxide or the like are the N,N-di(mono- and polyalkyleneoxyalkylol)-octadecylamines, the N,N-di(mono- and polyalkyleneoxyalkylol)-heptadecylamines, the N,N-di(mono- and polyalkyleneoxyalkylol)-hexadecylamines, the N,N-di(mono- and polyalkyleneoxyalkylol)-tetradecylamines, the N,N-di(mono- and polyalkyleneoxyalkylol)-dodecylamines, and the like.

Typical quaternary ammonium salts are the coconut oil quaternary amine acetates, octadecyltrimethylammonium chloride, octadecylbenzyltrimethylammonium chloride, hexadecyltrimethylammonium bromide, dodecyltrimethylammonium bromide, dodecyltrimethylammonium chloride, and the like.

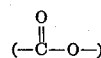
Preferred cationic surfactants for the instant formulations are mixtures of nitrogen-containing compounds which are the reaction products of fatty acids containing from 8 to 22 carbon atoms with ethylene polyamines and condensation products of a primary fatty amine with ethylene oxide wherein the mole ratio of ethylene oxide to fatty amine is from about 4 to about 7.

Particularly preferred cationic surfactant is a mixture of 1-(2-aminoethyl)-2-heptadecenyl-2-imidazoline, 1-(2-aminoethyl)-2-heptadecadienyl-2-imidazoline, and condensation products of tallow amines with ethylene oxide in a mole ratio of ethylene oxide to tallow amines of about 5.

Emulsifiable mineral oils suitable for the formulations of the present invention are the paraffinic and the naphthenic mineral oils having a viscosity in the range from about 20 to about 200 Saybolt Universal seconds (SUS) at 100° F. A viscosity below about 20 SUS results in a less durable coating on the treated surface, and viscosity above about 200 SUS causes smear and promotes emulsion instability.

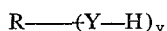
Paraffin oils within the aforesaid viscosity range and particularly those having a viscosity in the range from about 70 to about 100 SUS at 100° F. are preferred in the instant formulations.

By the term "non-ionic surfactant" as used herein and in the appended claims is meant an organic compound of a relatively high molecular weight and which consists of a hydrophobic portion to which is attached a solubilizing or hydrophilic portion containing groups such as ether links ($-\text{C}-\text{O}-\text{C}-$), hydroxyl groups ($-\text{OH}$), carbonyloxy groups



and the like. With very few exceptions the non-ionic surfactants contain at least one hydroxyl group.

Specifically contemplated within the above definition are surfactants having as the hydrophilic moiety one or more chains containing one or more alkyleneoxy groups. These surfactants have the general formula



wherein R is the hydrophobic portion of an aliphatic alcohol containing from about 8 to about 22 carbon atoms or an alkylated phenol containing from about 4 to about 22 carbon atoms in the alkyl group thereof, Y is an alkyleneoxy chain, H is a hydrogen atom bonded to an oxygen atom of the alkyleneoxy chain, and y is an integer from 1 to about 6, and preferably from 1 to 4.

Typical aliphatic alcohols are octyl alcohol, nonyl alcohol, decyl alcohol, "coco" alcohol (a mixture of C₁₀ to C₁₆ alcohols), dodecyl alcohol, oleyl alcohol, tallow alcohol (a mixture of C₁₆ to C₁₈ alcohols), octadecyl alcohol, 2,6,8-trimethyl-4-nonyl alcohol, and the like.

Typical alkylated phenols are butylphenol, pentylphenol, hexylphenol, octylphenol, nonylphenol, dodecylphenol, hexadecylphenol, octadecylphenol, nonadecylphenol, and the like.

By the term "alkyleneoxy chain" as used herein and in the appended claims is meant a chain containing one or more alkyleneoxy groups which are divalent alkylene groups such as methylene, ethylene, propylene, butylene, and the like, bonded to an oxygen atom in a manner such that one of the valences of the alkyleneoxy group is from an oxygen atom and the other is from a carbon atom. Typical alkyleneoxy groups are methyleneoxy (—CH₂O—), ethyleneoxy (—C₂H₄O—), propyleneoxy (—C₃H₆O—), butyleneoxy (—C₄H₈O—), and the like.

Preferred non-ionic surfactants for the instant formulations are the polyalkylene glycol ethers containing from about 4 to about 80 moles of alkylene oxide. Illustrative preferred non-ionic surfactants are the nonylphenyl polyethylene glycol ethers containing about 4 moles of ethylene oxide, the trimethylnonyl polyethylene glycol ethers containing about 6 moles ethylene oxide, the nonylphenyl polyethylene glycol ethers containing about 7 moles of ethylene oxide, mixed polyalkylene glycol ethers containing about 60 moles of a mixture of ethylene oxide and 1,2-propylene oxide in a mole ratio of about 2:1, and the like.

In a concentrated formulation, i.e., a rinsing concentrate, the cationic surfactant is present usually in an amount in the range from about 1 to about 20 percent by weight of the concentrate. Preferably the cationic surfactant is present in an amount in the range from about 5 to about 17 percent by weight.

The emulsifiable mineral oil is present in the formulation usually in an amount in the range from about 5 to about 35 percent by weight of the formulation, and preferably in an amount from about 10 to about 30 percent by weight. Oil in an amount in excess of about 12 percent by weight tends to decrease the stability of the emulsion.

The optional non-ionic surfactant is present in these formulations usually in an amount in the range up to about 15 percent by weight. The preferred range for the non-ionic surfactant is from about 3 to about 12 percent by weight.

The concentrated formulation is prepared by blending together at about room temperature a cationic surfactant and a mineral oil. To this blend water is added with agitation in predetermined amounts. This is the preferred method of compounding the formulation since an emulsion inversion is obtained in the process. An emulsion inversion improves dispersion and promotes the stability of the final product. If a non-ionic surfactant is also employed, it preferably is blended together with the cationic surfactant and the mineral oil prior to the addition of water.

When the aforesaid formulation is employed as a rinse after an automobile has been cleaned in the conventional

manner, the concentrated formulation is extended with additional amounts of water in a ratio from about 100 to about 5000 parts of water to 1 part of concentrate. The extended formulation is then sprayed onto or otherwise contacted with the cleaned surface until a water "break" is observed. An automobile so treated can then be rapidly dried by means of an air blast, or the like.

Typical rinse formulations employing a mixture of cationic surfactants are illustrated below.

Formulation No. 1

Component:	Weight percent
Cationic surfactant—	
A mixture of 1-(2-aminoethyl)-2-heptadecenyl-2-imidazoline and 1-(2-aminoethyl)-2-heptadecadienyl-2-imidazoline	10
Ethylene oxide condensation products of primary fatty amines	5
Paraffin oil, 86 SUS @ 100° F.	15
Water	25
	60
	100

The above formulation can then be extended with additional water in a ratio of about 1000 parts of water to 1 part of the formulation and sprayed on a cleaned automobile finish prior to drying.

Formulation No. 2

Component:	Weight percent
Cationic surfactant—	
A mixture of 1-(2-aminoethyl)-2-heptadecenyl-2-imidazoline and 1-(2-aminoethyl)-2-heptadecadienyl-2-imidazoline	10
Ethylene oxide condensation products of primary fatty amines	5
Paraffin oil, 86 SUS @ 100° F.	15
Non-ionic surfactant:	25
Nonylphenyl polyethylene glycol ether containing 7 moles of ethylene oxide	6
Water	54
	100

The above formulation can then be extended with additional water in a ratio of about 1000 parts of water to 1 part of the formulation and sprayed on a cleaned automobile finish prior to drying.

The foregoing discussion and exemplary formulations are intended as illustrative of the present invention. Other modifications within the spirit and scope of this invention will readily present themselves to one skilled in the art.

I claim:

1. A method for drying a cleaned surface which comprises applying thereto an oil-in-water emulsion consisting essentially of effective amounts of an organic cationic surfactant, an emulsifiable mineral oil, and water until a beading of water droplets on said surface is observed, and thereafter removing said droplets from said surface; said amounts being effective to produce beading of water on the surface.

2. A method for drying a cleaned surface which comprises applying thereto an oil-in-water emulsion consisting essentially of effective amounts of an organic cationic surfactant, an emulsifiable mineral oil, and water until a beading of water droplets on said surface is observed, and thereafter subjecting said surface to a blast of air; said amounts being effective to produce beading of water on the surface.

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3. A method for drying a cleaned surface which comprises applying thereto, until a beading of water droplets on said surface is observed, an emulsified formulation consisting of one part of a rinsing concentrate and from about 100 to about 5000 parts of water, and thereafter subjecting said surface to a blast of air; said rinsing concentrate being an oil-in-water emulsion consisting essentially of about 1 to about 20 percent by weight an organic cationic surfactant, about 5 to about 35 percent by weight an emulsifiable mineral oil, and the remainder water.

4. A method for drying a cleaned surface which comprises applying thereto, until a beading of water droplets on said surface is observed, an emulsified formulation consisting of one part of a rinsing concentrate and from about 100 to about 5000 parts of water, and thereafter subjecting said surface to a blast of air; said rinsing concentrate being an oil-in-water emulsion consisting essentially of about 1 to about 20 percent by weight an organic cationic surfactant, about 5 to about 35 percent by weight an emulsifiable mineral oil, up to about 15 percent by weight an organic non-ionic surfactant, and the remainder water.

5. A method for drying a cleaned surface which comprises applying thereto, until a beading of water droplets on said surface is observed, an emulsified formulation consisting of one part of a rinsing concentrate and about 1000 parts of water, and thereafter subjecting said surface to a blast of air; said rinsing concentrate being an oil-in-water emulsion consisting essentially of about 5 to about 17 percent by weight an organic cationic surfactant, about 10 to about 30 percent by weight an emulsifiable mineral oil, about 3 to about 12 percent by weight an organic non-ionic surfactant, and the remainder water.

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JOSEPH B. SPENCER, *Primary Examiner*.

RICHARD D. NEVIUS, *Examiner*.