

1

2,962,448

DETERGENT COMPOSITION

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2 Claims. (Cl. 252—152)

This invention relates to additives that reduce the skin irritation that is normally associated with the use of detergent formulations, the commercial application of said additives and detergent formulations containing said additives.

We have discovered that when water-soluble acids such as a N-higher acyl sarcosin and/or water-soluble salts of said acids such as sodium N-lauroyl sarcosinate, as well as materials that form said salts and/or acids upon hydration or when in contact with the skin, are combined with detergents or detergent solutions (i.e., aqueous solutions, etc.), they tend to reduce the skin irritation that is normally associated with detergent formulations. The water-soluble salts include alkali metal, amine and ammonium salts; the salts have been found to be generally as effective as the corresponding free acid. These materials shall herein be referred to as "additive(s)."

The additives, as well as combinations of the additives, are particularly effective when used in conjunction with alkaline detergents; however, they may also be employed with substantially neutral detergents as well as detergent formulations containing mixtures of alkaline detergent(s) plus substantially neutral detergent(s).

The additives may be employed with alkaline detergents such as phosphates, complex phosphates, silicates, soda ash, caustic, borates and the like which may contain alkali metal, amine and ammonium substituents.

The term "substantially neutral detergents" includes anionic detergents such as exemplified by Oronite D-60 (about 60% sodium dodecyl benzene sulfonate and about 40% sodium sulfate) as well as nonionic detergents such as exemplified by Triton X-100 (isooctylphenyl ether of decaethylene glycol). Anionic detergents such as alkali metal, amine and ammonium salts of alkyl aryl sulfonic acids and nonionic detergents such as alkyl aryl ether alcohols are illustrative of the various substantially neutral detergents that may be employed in combination with one or more of the additives.

One of the conventional methods of studying skin irritation (e.g., in regard to humans) is to intradermally inject 0.5 cc. of the detergent formulation being tested into freshly shaved American chinchilla rabbits. Observations are made after 24 hours and readings are made on the basis of a scale of 0 (for no irritation) to 5 (for very bad irritation).

Tests were first started using male chinchilla rabbits for test animals in accordance with the above-mentioned conventional test procedure. It was found, however, that about 1/3 to about 1/2 of the test rabbits had large, dark pigmented areas of skin that made the interpretation of results difficult. Male albino rabbits were then obtained, and a series of conventional tests were made with both types of rabbits to determine if the same results, or at least the same relative results would be obtained with either kind of rabbit. The results of these comparison tests are shown in Table I. A series of raw

2

materials common to detergent formulations were injected at concentrations of 1/2 ounce per gallon with an injection pattern reading from the back of the rabbit to the front:

1	3	5	7
2	4	6	8

where 1-2 were saline solution controls, 3-4, 5-6 and 7-8 were duplicate injections of three raw materials (e.g., 3-4 were tetrasodium pyrophosphate, 5-6 were trisodium phosphate, etc.). Sterile solutions were used for all tests, and observations were made after 24 hours; a rating was given as an average of the two duplicate spots based on the scale of 0 (no irritation) to 5 (extremely bad and spreading irritation).

The data shown in Table I indicates that the degree of irritation was generally only slightly higher with the albino rabbits than with chinchilla rabbits. Thus, male albino rabbits were used in all subsequent tests.

TABLE I

Comparison of results obtained with male American chinchilla rabbits and male albino rabbits

Name of Material (Soln. at 1/2 Oz./Gal.)	Rating of Irritation on Rabbits	
	Chinchillas	Albinos
Tetrasodium Pyrophosphate.....	2	3+
Trisodium Phosphate, Fines.....	1	1 1/2
Tripolyphosphate.....	1	1/2
Soda Ash.....	3	3
Sodium Metasilicate.....	4	4
Sodium Sulfate.....	0	0
Niter Ca'ce.....	3	2
Oronite D-60.....	1	1/2
Sodium Gluconate.....	0	0
Triton X-100.....	2	3

In subsequent tests, our procedure consisted of injecting 0.5 ml. of solution intradermally into the side of a freshly clipped male albino rabbit. It was found that by carefully clipping the rabbits it was not necessary to shave the small amount of remaining hair. By wetting the area with alcohol, injections and observations were easily made. Tests were usually made at concentrations of 1/4, 1/2 and 1 ounce per gallon; these concentrations gave a degree of irritation that was definite, but not excessive. Eight injections were made to one rabbit side, and a replicate test was made in most cases on another rabbit. Observations were made after 24 hours and ratings were given on the basis of a scale wherein 0 represents no irritation and 5 represents very bad or maximum irritation. The effect of an additive on the detergents was best detected when the detergent alone (without the additive) had a rating of 2 to 3.

The tests tabulated in Tables II-V were made on albino rabbits. Additives of various concentrations were employed. The concentration of the detergent formulations were 1/4 ounce per gallon, 1/2 ounce per gallon and 1 ounce per gallon. Replicates were run in most tests. The injection pattern was from back to front:

1	3	5	7
2	4	6	8

where 1-2 were saline controls, 3-5-7 were injections wherein one concentration of the detergent was used,

70

3

4-6-8 were tests wherein the concentration of the detergent was the same as 3-5-7 and the concentrations of the additive were successively increased. Thus, injections 3-5-7 were identical control injections of detergent for the three different concentrations of additive employed in injections 4-6-8. The concentration of the additives in the tables is based upon the total solids in the detergent plus additive compositions.

Table II shows the results of testing Sarkosyl NL-100 (sodium N-lauroyl sarcosinate), in conjunction with solutions of detergents such as sodium metasilicate, soda ash, trisodium phosphate, Triton X-100 and Oronite D-60. The results of these tests are given as to degree of irritation and data is presented in the form of Treated Result and Untreated Result (e.g., 3-4 shows that the average degree of irritation with the indicated additive is 3 as compared with 4 for the detergent solution without the additive).

Since Oronite D-60 is only about 60% active, the solutions were made 100% active at the indicated concentrations (oz./gal.) in each of the subsequent tables.

TABLE II

Summary to the effect of Sarkosyl¹ NL-100 on reducing skin irritation caused by various detergent components

Concentration of Sarkosyl NL-100, Percent of Solids	Component Causing Irritation		Degree of Irritation, 24 Hrs. After Injection	
	Name	Conc., Oz./Gal.	Treated	Untreated
2.44	Sodium Metasilicate	1	3	4
4.76	do	1	2	4
9.1	do	1	0.5	4
2.44	do	0.5	1.5	2.5
4.76	do	0.5	1.5	2.5
9.1	do	0.5	1	2.5
1.0	do	0.5	3.5	5
0.5	do	0.5	2	4.5
0.1	do	0.5	2	4.5
2.44	do	0.25	0.5	1
4.76	do	0.25	0	1
9.1	do	0.25	1	1
2.44	Soda Ash	1	2.5	3.5
4.76	do	1	2.5	3.5
9.1	do	1	2.5	3.5
2.44	do	0.5	1.5	2.5
4.76	do	0.5	1.5	2.5
9.1	do	0.5	1.5	2.5
1.0	do	0.5	0.5	2.5
0.5	do	0.5	1	2.5
0.1	do	0.5	0.5	2.5
2.44	do	0.25	0	0.5
2.44	Trisodium Phosphate	1	3	4
2.44	do	0.5	0	3
4.76	do	0.5	1.5	3
9.1	do	0.5	1.5	3
2.44	do	0.25	0	1
4.76	do	0.25	0.5	1
9.1	do	0.25	0.5	1
2.44	Triton X-100	1	2	2.5
4.76	do	1	2	2.5
9.1	do	1	2	2.5
2.44	do	0.5	1.5	2
4.76	do	0.5	1.5	2
9.1	do	0.5	0.5	2
1.0	do	0.5	1	1.5
0.5	do	0.5	0.5	1.5
0.1	do	0.5	0.5	1.5
2.44	Oronite D-60	1	2.5	3
4.76	do	1	1.5	3
9.1	do	1	2.5	3
2.44	do	0.5	1.5	2
4.76	do	0.5	1	2
9.1	do	0.5	1	2
1.0	do	0.5	0.5	1

¹ Sodium N-lauroyl sarcosinate product distributed by Alrose Chemical Co. (contains at least 94% sodium N-lauroyl sarcosinate, less than 5% water, less than 0.4% sodium chloride and less than 0.4% sodium laurate).

4

rials were used as a basis for comparing their effectiveness with our additives. The cetyl alcohol-urea complex is described in U.S. Patent 2,675,356. Lecithin was used since it has been alleged that the presence of 0.005 to 0.1% of soybean lecithin in detergent solutions protects the cell membranes against the irritating action of the detergent.

TABLE III

Summary of the effect of lecithin on reducing skin irritation caused by various detergent components

Concentration of Lecithin, Percent of Solids	Component Causing Irritation		Degree of Irritation, 24 Hrs. After Injection	
	Name	Conc., Oz./Gal.	Treated	Untreated
1.24	Sodium Metasilicate	1	4.5	4.5
2.44	do	1	4	4
4.76	do	1	4	4
9.1	do	1	4	4
1.24	do	0.5	1.5	2.5
2.44	do	0.5	2.5	3
4.76	do	0.5	2.5	3
9.1	do	0.5	3	3.5
1.24	do	0.25	1	1.5
2.44	do	0.25	1	2
4.76	do	0.25	1.5	2
9.1	do	0.25	2	2
1.24	Soda Ash	1	3	3.5
2.44	do	1	3	3.5
4.76	do	1	3	3.5
1.24	do	0.5	1	2
2.44	do	0.5	1	2
4.76	do	0.5	1.5	2
1.24	do	0.25	0	0.5
2.44	do	0.25	0	0.5
4.76	do	0.25	0	0.5

TABLE IV

Summary of the effect of cetyl alcohol-urea complex on reducing skin irritation caused by various detergent components

Concentration of Cetyl Alcohol-Urea Complex, Percent of Solids	Component Causing Irritation		Degree of Irritation, 24 Hrs. After Injection	
	Name	Conc., Oz./Gal.	Treated	Untreated
1.24	Sodium Metasilicate	1	4	4
2.44	do	1	4	4
4.76	do	1	4	4
1.24	do	0.5	2	3
2.44	do	0.5	2.5	3
4.76	do	0.5	3	3
1.24	do	0.25	0.5	0.5
2.44	do	0.25	0.5	0.5
4.76	do	0.25	0.5	0.5
1.24	Trisodium Phosphate	1	1	3
2.44	do	1	2	3
4.76	do	1	2.5	3
1.24	do	0.5	0.5	1.5
2.44	do	0.5	1	1.5
4.76	do	0.5	1	1.5
1.24	do	0.25	0	0.5
2.44	do	0.25	0	0.5
4.76	do	0.25	0	0.5
1.24	Oronite D-60	1	1	2
4.76	do	1	1	2
9.1	do	1	1	2
2.44	do	0.5	0.5	1
4.76	do	0.5	0.5	1
9.1	do	0.5	0.5	1
2.44	do	0.25	0.5	0.5
4.76	do	0.25	0.5	0.5
9.1	do	0.25	0.5	0.5

Table V shows the effect of sodium N-lauroyl sarcosinate upon a composition that contains more than one detergent product.

Tables III and IV show the results of tests with lecithin and cetyl alcohol-urea complex, respectively; these mate-

75

5

TABLE V

Effect of additives on reducing skin irritation caused by detergent formulation XF-200¹

Additive	Conc. of Additive, Percent of Total Solids	Reaction at 1 Oz./Gal of Formulated Product			
		Replicate 1		Replicate 2	
		With-out	With	With-out	With-
Sarkosyl NL-100-----	2.44	2	1.5	2	1
Cetyl Alcohol-Urea Complex.	9.1	1.5	0	2	2
Do-----	4.76	1.5	0.5	2	1
Do-----	2.44	1.5	0	2	1

Formulation XF-200:	Percent by weight
Sodium tripolyphosphate-----	22.00
Sodium metasilicate-----	16.00
Sodium carboxymethylcellulose-----	0.23
Soda Ash-----	58.27
Sodium dodecyl benzene sulfonate-----	2.80
Ethylene glycol-----	0.70

The additives have been shown to be effective when employed with the detergent in quantities as low as about 0.1% by weight (based upon the weight of the total solids in the detergent plus additive compositions) as shown in Table II, but we do not limit the invention to this concentration, although in order to insure the most effective results, we prefer not to use less than this amount. However, it is desirable not to employ more than about 5% additive by weight. The term "N-higher acyl derivatives" shall hereinafter refer to water-soluble N-higher acyl sarcosin salts (i.e., amine salts, alkali metal salts, ammonium salts) and/or materials that form N-higher acyl sarcosins and/or water-soluble salts of said N-higher acyl sarcosins upon hydration or when in contact with the skin.

Although the present invention has been described in conjunction with preferred embodiments, it is to be understood that modifications and variations may be resorted

6

to without departing from the spirit and scope of the invention, as those skilled in the art will readily understand. Such variations and modifications are considered to be within the purview and scope of the invention and appended claims.

We claim:

1. A substantially non-skin irritating nonacid detergent composition having an additive which reduces the skin irritation that is normally induced by nonacid detergent compositions, said composition consisting essentially of: a synthetic organic detergent from the group consisting of sodium higher alkylbenzene sulfonates and higher alkylphenyl ethers of polyethylene glycol, and at least 0.1% by weight, based on the total solids, of a water-soluble additive which reduces the skin irritation normally induced by said organic detergents, said additive being a member from the group consisting of N-lauroyl sarcosin and water-soluble alkali salts thereof, said synthetic organic detergent being present in said composition in an amount in excess of said additive.

2. The composition of claim 1 which includes an alkaline inorganic detergent which serves as a detergent builder.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,962,448

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Vladimir Dvorkovitz et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, line 22, for "sarcosimate" read -- sarcosinate --; line 62, for "chincilla" read -- chinchilla --; column 2, line 19, for "arritation" read -- irritation --; line 61, for "Th" read -- The --; column 3, line 7, for "tables" read -- Tables --; column 5, TABLE V, in the heading to the last column thereof, for "With-" read -- With --.

Signed and sealed this 10th day of October 1961.

(SEAL)

Attest:

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