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SULFONATE DETERGENT BLEND

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8 Claims. (Cl. 252—161)

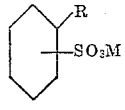
The invention relates to a novel detergent composition. More particularly the invention is concerned with a detergent comprising as active ingredients a blend of alkyl aryl sulfonates.

Alkyl aryl sulfonates prepared by the alkylation of an aromatic nucleus with branched-chain olefins (such as obtained by polymerizing low molecular weight olefins, e. g. propylene) and subsequent sulfonation of the alkylate are now established as good detergents for general purposes. However, these compounds possess only mediocre detersive properties at low concentrations (less than 0.25%).

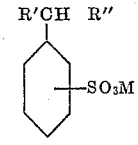
It is the purpose of this invention to prepare a detergent having good detersive properties at low concentrations.

It is also an object of this invention to modify the detersive activity of a branched-chain alkyl aryl sulfonate to confer upon it good detersive properties at low concentrations.

It has been found that a superior detergent is prepared by blending a detergent sulfonate of the type:



where R is a branched-chain alkyl radical of 9 to 18 carbon atoms and M is an alkali metal with 2.5 to 50 weight per cent or preferably, 5 to 50 weight per cent, based on the total sulfonate blend, of a straight-chain secondary alkyl aryl sulfonate of the formula:



where R' is a straight-chain alkyl radical of 1–5 carbon atoms, R'' is a straight-chain alkyl radical of 8–14 carbon atoms where the sum of R' and R'' is 9–15, and M is an alkali metal. The detersive power of the resulting blend of sulfonates is substantially superior at low concentrations (up to 0.25 gm./100 ml.) to that of the branched-chain detergent or the straight-chain detergent alone, and greater than the additive effect of both compounds.

Launder-Ometer data on the synergistic effect of typical blends are given in Table I. In the table data are given for a typical dodecylbenzene sulfonate prepared by alkylating benzene with a C_{12}-branched olefin (prepared by polymerizing propylene) and thereafter sulfonating the alkylate and neutralizing, as indicated by compound D. The presence of 25 weight per cent of a straight-chain secondary alkyl aryl sulfonate, compositions E, F, G, H, etc., in a blend with 75 weight per cent of D produces an unexpectedly large rise in detergency over that of D at concentrations below 0.2 gm./100 ml. At the same time the presence of these substances does not materially alter the detersive power of D at higher concentrations. It is also to be noted that blends of D with a branched-chain secondary alkyl aryl sulfonate possess no advantage over D alone and are exceedingly poor in hard waters (Blend N, Table I).

TABLE I

Launder-Ometer data

[Runs made on 40% active mixtures using United States Testing Co. cloth.]

240 p. p. m. Hard Water, Conc.[2]	Soil Removal[1]										
	.1			.15			.2			.35	.5
	A	B	C	A	B	C	A	B	C	A	A
D, C_{12} polypropyl benzene sulfonate	10			40			85			130	110
Blend Composition—75% of D and 25% Sodium Sulfonate of:											
E, 2-Phenyldodecane	75	10	65	115	25	90	105	50	55	90	105
F, 3-Phenylundecane	60	5	55	85	25	60	90	60	30	95	90
G, 3-Phenyldodecane	80	10	70	110	30	80	125	65	60	100	110
H, 3-Phenyltridecane	70	25	45	110	50	60	110	75	35	100	85
I, 4-Phenylundecane	40	5	35	80	20	60	95	45	50	115	100
J, 4-Phenyldodecane	25	10	15	65	25	40	100	50	50	110	115
K, 4-Phenyltridecane	35	10	25	55	35	20	80	60	20	100	85
L, 5-Phenyldodecane	20	5	15	50	15	35	80	40	40	95	95
M, 6-Phenyldodecane	50	5	45	80	15	65	120	40	80	110	95
N, 2-Methyl-5-phenylundecane	0			15			85			110	115
O, Dodecylbenzene[3]	35	25	10	95	50	45	100	90	10	110	90
P, Tetradecylbenzene[4]	40	5	35	65	15	50	75	40	35	95	100

A, Measured soil removal—Launder-Ometer Method.
B, Expected soil removal—Calculated from soil removal values for the individual components.
C, Difference—Measured soil removal minus expected soil removal.
[1] Soil removal relative to Dreft at 0.5% in 240 p. p. m. hard water as 100.
[2] Concentration expressed as g/100 ml.—40% active ingredients.
[3] Prepared by alkylating benzene with 1-dodecene (mixture of isomers).
[4] Prepared by alkylating benzene with 1-tetradecene (mixture of isomers).

The same synergistic effect is also noted when as little as 2.5% of the straight-chain secondary alkyl aryl sulfonate is used as shown in the following Table II.

TABLE II

Launder-Ometer data

[Runs made on 40% active mixtures using United States Testing Co. cloth]

240 P. P. M. Hard Water, Conc.[2] Blend Composition—Active Ingredients		Soil Removal [1]										
		.1			.15			.2			.35	.5
Percent C_{12} Polypropylbenzene Sulfonate	Percent 2-Phenyldodecane Sulfonate	A	B	C	A	B	C	A	B	C	A	A
100	0	10	--	--	40	--	--	85	--	--	130	110
97.5	2.5	50	10	40	75	40	35	105	80	25	100	90
95	5	70	10	60	125	35	90	120	70	50	110	100
90	10	65	5	60	120	35	85	120	70	50	115	95
85	15	80	5	75	110	30	80	115	65	50	110	105
75	25	75	10	65	115	25	90	105	50	55	90	105
65	35	90	10	80	100	15	85	90	30	60	85	85
50	50	80	10	70	85	5	80	105	25	80	85	80
0	100	15	--	--	--	--	--	50	--	--	--	----

A, Measured soil removal—Launder-Ometer Method.
B, Expected soil removal—Calculated from soil removal values for the individual components.
C, Difference—Measured soil removal minus expected soil removal (A minus B).
[1] Soil removal relative to dreft at 0.5% in 240 p. p. m. hard water as 100.
[2] Concentration expressed as g./100 ml.—40% active ingredients.

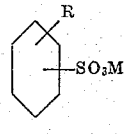
The straight-chain secondary alkyl benzenes are prepared according to well-known chemical reactions. One method involves the reaction of benzene with an acyl halide to produce an alkyl phenyl ketone which is further reacted with a normal alkyl halide in the presence of the Grignard reagent to yield the phenylalkanol. The latter is hydrogenated to the corresponding alkylbenzene which is sulfonated by any of several methods. The sulfonic acid is neutralized to produce the alkali metal salt. The straight-chain secondary alkyl benzenes are also prepared by alkylation of the aromatic nucleus with a straight-chain olefin or halide in the presence of a Friedel-Crafts type catalyst.

The sulfonates are prepared by reaction of the alkyl aryl hydrocarbons with SO_3, mixtures of SO_3 and SO_2, chlorosulfonic acid, fuming sulfuric acid, etc. followed by neutralization with the alkali whose sulfonate is desired.

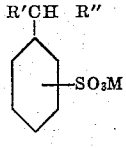
The reactions by which the components of the synergistic mixtures of this invention are prepared are well known in the art and form no part of this invention. It will also be understood that the recital of "consisting essentially of" leaves the appended claims open for the inclusion of unspecified ingredients which do not materially affect the basic and novel characteristics of the claimed compositions.

Having described the invention in a manner such that it may be followed by one skilled in the art, what is claimed is:

1. A detergent composition consisting essentially of a sulfonate compound (A) of the formula:



where R is a branched-chain alkyl radical of 9–18 carbon atoms and M is an alkali metal, and 2.5 to 50 wt. % based on the total sulfonate blend, of a sulfonate compound (B) of the formula:



where R' is a straight-chain alkyl radical of 1–5 carbon atoms, R'' is a straight-chain alkyl radical of 8–14 carbon atoms, where the sum of the carbon atoms in R' and R'' is 9–15, and M is an alkali metal.

2. A detergent composition consisting essentially of sodium C_{12}-polypropylbenzene sulfonate and 2.5 to 50 weight per cent, based on the total sulfonate blend, of the sodium sulfonate of 2-phenyldodecane.

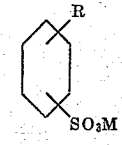
3. A detergent composition consisting essentially of sodium C_{12}-polypropylbenzene sulfonate and 2.5 to 50 weight per cent, based on the total sulfonate blend, of the sodium sulfonate of 4-phenylundecane.

4. A detergent composition consisting essentially of sodium C_{12}-polypropylbenzene sulfonate and 2.5 to 50 weight per cent, based on the total sulfonate blend, of the sodium sulfonate of 3-phenylundecane.

5. A detergent composition consisting essentially of sodium C_{12}-polypropylbenzene sulfonate and 2.5 to 50 weight per cent, based on the total sulfonate blend, of the sodium sulfonate of 3-phenyldodecane.

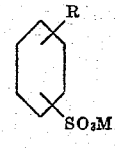
6. A detergent composition consisting essentially of sodium C_{12}-polypropylbenzene sulfonate and 2.5 to 50 weight per cent, based on the total sulfonate blend, of the sodium sulfonate of 3-phenyltridecane.

7. A detergent composition consisting essentially of a mixture of a sulfonate compound of the formula

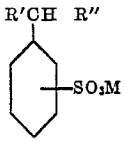


where R is a branched chain polypropylene radical of 9–18 carbon atoms and M is an alkali metal, and an alkali metal salt of a sulfonated 2-phenyl alkane, in which the alkane portion is a straight chain normal alkane containing from 10 to 16 carbon atoms, the sulfonated phenyl alkane being present in an amount from about 5% to about 50% by weight of said mixture.

8. An aqueous solution of a detergent mixture consisting essentially of a detergent sulfonate (A) of the formula:



where R is a branched-chain alkyl radical of 9–18 carbon atoms and M is an alkali metal, and 2.5 to 50 weight per cent, based on the total detergent sulfonate, of a detergent sulfonate (B) of the formula:



where R' is a straight-chain alkyl radical of 1–5 carbon atoms, R" is a straight-chain alkyl radical of 8–14 carbon atoms, where the sum of carbon atoms in R' and R" is 9–15, and M is an alkali metal, the detergent mixture being present in the aqueous solution in a detersive amount of up to about 0.25 gm. per 100 ml.

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