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PHOSPHATE DETERGENT COMPOSITION IN HOMOGENEOUS LIQUID FORM

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The invention relates to a composition of matter having detergent properties. More particularly, it pertains to a composition in liquid form and includes correlated improvements and discoveries whereby preparation and utilization thereof are enhanced.

It has previously been proposed to prepare detergent compositions containing synthetic compounds which have synergistic characteristics. Further, alkali metal phosphates have been found to improve the detergent value of synthetic mixtures. However, all of such previously prepared combinations have consisted of mixtures of dry powders inasmuch as it has not been possible to form homogeneous compositions of synthetic detergents having a significant concentration in solution of an alkali metal phosphate. It is the principal object of the invention to provide a detergent composition which does not possess the foregoing disadvantages.

An object of the invention is the provision of a detergent composition containing an alkali metal phosphate and a plurality of synthetic organic detergents in a homogeneous liquid state which is readily soluble in water.

Another object of the invention is to provide a liquid detergent composition containing synthetic organic detergents having synergistic properties but which are not among themselves miscible to form homogeneous compositions.

A further object of the invention is the provision of a composition of matter having detergent properties which may be readily, effectively and economically prepared.

A more particular object of the invention is to provide a detergent composition in liquid form and containing complex polyphosphates which are substantially stabilized so that they do not revert to the simpler orthophosphates which have a lower detergent value.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises a composition of matter possessing the characteristics, properties and the relation of constituents which will be exemplified in the composition hereinafter described and the scope of the invention will be indicated in the claims.

In the practice of the invention, a composition of matter having detergent properties may be prepared which comprises an alkali metal phosphate, more particularly, a polyphosphate and specifically a pyrophosphate, a plurality of synthetic organic detergents having synergistic properties, an alkali metal aryl sulfonate, and

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water. The alkali metal phosphate may be present in an amount from about 5% to about 30% and utilization may be made of sodium hexametaphosphate, tetrasodium pyrophosphate, tetrapotassium pyrophosphate, sodium tripolyphosphate, sodium tetrphosphate and trisodium phosphate. We have found that where a complex polyphosphate is included in the composition, its value as measured by calcium ion sequestration, does not dissipate on storage, although, it is present in an aqueous solution.

The synthetic organic detergents may include an amide of a sulfonated higher fatty acid, as those present in cocoanut oil, viz: lauric, myristic, palmitic, stearic and oleic; a sulfated higher aliphatic monohydric alcohol, which may be lauryl, myristyl or stearyl, and an alkyl aryl sulfonate having the general formula $R-R'-SO_3M$ in which R represents an alkyl group containing from 12-15 carbon atoms, R' represents an aromatic residue as a benzene, naphthalene and anthracene residue and M represents sodium and potassium. The alkali metal aryl sulfonate may be a sodium or potassium xylene sulfonate, toluenesulfonate, cumene sulfonate and tetrahydronaphthalene sulfonate. It will be realized that the synthetic organic detergents and the other constituents as the higher fatty acid amides may be employed alone and in compatible admixtures.

It has been our finding that solutions containing more than 5% of an alkali metal phosphate are of value as detergent compositions in the event that such compositions also contain significant amounts of certain synthetic organic detergents having synergistic properties. Mention may specially be made of an amide of sulfonated cocoanut oil fatty acids. However, when this amide is added to an alkali metal phosphate solution of more than 5% concentration there is an immediate separation into two layers which renders the composition useless as a detergent. In the event that certain sodium aryl sulfonates are added, such as sodium xylene sulfonate, the solution containing the phosphate and amide no longer separates into two layers or phases but in contradistinction thereto forms a clear homogeneous solution having distinctive detergent qualities.

Further, we have found that the composition may include also more than 1% of a sulfated higher aliphatic monohydric alcohol, as sodium lauryl sulfate, since the sulfated alcohol becomes readily soluble although such a concentration thereof will not form a homogeneous solution

in water. Consequently, the composition contains an alkali metal phosphate in combination with a plurality of synthetic organic detergents having synergistic properties, and we have found that the detergent qualities of such a composition exhibit values markedly in excess of the additive values of the individual constituents. This was demonstrated by a detergency study of the following compositions;

	Per cent
a. Tetrapotassium pyrophosphate.....	15
Water	85
b. Sodium lauryl sulfate.....	2
Alkyl aryl sulfonate.....	2
Sulfonated cocoanut oil fatty acid amide... 5	15
Water	91
c. Tetrapotassium pyrophosphate.....	13
Sulfonated cocoanut oil fatty acid amide... 5	5
Alkyl aryl sulfonate.....	2
Sodium lauryl sulfate.....	2
Sodium xylene sulfonate.....	4.5
Water	73.5

The detergency study was made on soiled glass wicking according to the method described in Soap and Sanitary Chemicals, September 1948, using a concentration of 0.2% with the following results:

Per cent detergency

a—20
b— 7
c—48

When *a* and *b* are combined the detergency is almost double the additive value, hence a synergistic effect.

As an illustrative embodiment of a manner in which the invention may be practiced, the following examples are presented.

Example 1

	Per cent
Tetrapotassium pyrophosphate.....	13
Sulfonated cocoanut oil fatty acid amide... 5	5
Alkyl aryl sulfonate.....	2
Sodium lauryl sulfate.....	2
Sodium xylene sulfonate.....	4.5
Water	73.5

Example 2

	Per cent
Tetrapotassium pyrophosphate.....	26
Sulfonated cocoanut oil fatty acid amide... 10	10
Alkyl aryl sulfonate.....	4
Sodium lauryl sulfate.....	4
Sodium xylene sulfonate.....	10
Water	46

Example 3

	Per cent
Tetrapotassium pyrophosphate.....	13
Polymerized ethylene oxide condensation product	5
Alkyl aryl sulfonate.....	2
Sodium lauryl sulfate.....	2
Sodium xylene sulfonate.....	4.5
Water	73.5

The detergent compositions conform with the following percentage tabulation:

	Per cent
Tetrapotassium pyrophosphate.....	5-30
Sulfonated cocoanut oil fatty acid amide... 3-25	3-25
Alkyl aryl sulfonate.....	1-15
Sodium lauryl sulfate.....	1- 5
Sodium xylene sulfonate.....	2-10

The compositions herein described have dis-

tinctive detergent properties, and the phosphate which is a significant part of the composition, together with the synthetic organic detergents yields a composition of which the use is economically feasible. Moreover, the utilization of these liquid detergent compositions provides values which have not been attained previously in the employment of detergents. Further, since synthetic organic detergents are usually prepared in the liquid state, in fact, many of them being liquids normally, the cost of drying these compounds to a free-flowing powder is obviated by the present invention, and thereby a raw material of lower cost is provided.

Additionally, the ultimate use of a detergent is in a dilute aqueous solution. Solid detergents require time and effort to disperse or dissolve them to form a solution, and especially so since some are poorly soluble whereas others due to their affinity for water form lumps and gelled masses which are difficult to handle.

Furthermore, powdered detergents vary greatly in density and in bulk which leads to inaccuracies in use unless special care is taken with respect to the amounts being employed. Also, neither weighing facilities nor time therefor are readily available either in the household or in the plant where the detergent is being used. This consequently leads to waste which is entirely and readily overcome when a homogeneous liquid composition as provided by the present invention is employed, due to the fact that the liquid can be measured accurately by volume. Another advantage of the composition in homogeneous liquid form is that it may easily be utilized in automatic dispensing apparatus.

Since certain changes may be made in the above composition of matter and different embodiments of the invention could be made without departing from its scope, it is intended that all matter contained in the above description shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

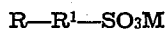
Having described our invention, what we claim as new and desire to secure by Letters Patent is:

1. A composition in the form of a homogeneous liquid having detergent properties and consisting essentially of an aqueous medium containing an alkali metal phosphate in an amount from about 13 to about 26%, a sulfonated higher fatty acid amide in an amount from about 5 to about 10%, an alkyl aryl sulfonate having the general formula $R-R^1-SO_2M$ in which R represents an alkyl group containing from 12-15 carbon atoms, R^1 represents an aromatic residue of the group consisting of a benzene, naphthalene and anthracene residue and M represents a metal of the group consisting of sodium and potassium in an amount from about 2 to about 4%, a sulfated higher aliphatic monohydric alcohol in an amount from about 2 to about 4% and an alkali metal aryl sulfonate in an amount from about 4.5 to about 10%, said composition retaining its homogeneity upon standing.

2. A composition in the form of a homogeneous liquid having detergent properties and consisting essentially of an aqueous medium containing tetrapotassium pyrophosphate in an amount from 13 to about 26%, a sulfonated higher fatty acid

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amide from about 5 to about 10%, an alkyl aryl sulfonate having the general formula



in which R represents an alkyl group containing 5 from 12-15 carbon atoms, R¹ represents an aromatic residue of the group consisting of a benzene, naphthalene and anthracene residue and M represents a metal of the group consisting of sodium and potassium in an amount from about 2 to about 4%, a sulfated higher aliphatic monohydric alcohol in an amount from about 2 to about 4%, and sodium xylene sulfonate in an amount from about 4.5 to about 10%, said composition retaining its homogeneity upon standing. 15

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,981,792	Orelup -----	Nov. 20, 1934
1,999,631	Friesenhahn -----	Apr. 30, 1935
2,184,770	Katzman -----	Dec. 26, 1939
2,396,278	Lind -----	Mar. 12, 1946
2,500,024	Cornell et al. -----	Mar. 7, 1950

FOREIGN PATENTS

Number	Country	Date
547,688	Great Britain -----	Sept. 7, 1943