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CAUSTIC ALKALI DETERGENT COMPOSITION

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The present invention is directed to detergent compositions, more particularly to compositions consisting essentially of a caustic alkali and containing other substances as modifying agents.

Caustic alkali such as sodium hydroxide has been and is now in common use as a detergent for many purposes. For instance, it is used as an important constituent in compositions for washing bottles commercially. It has been found in such use that while the detergent action on the glass is satisfactory, the compounds formed in the cleansing reactions cause the formation of relatively insoluble alkali earth metal compounds from the calcium, magnesium and other salts present either in the water or deposited on the glass to be cleaned. Such insolubles are probably hydrates or basic carbonates and they are often deposited on the glass, forming streaks similar to dirt. Such alkaline earth metal compounds are very adherent to metal and therefore a scale built up on the metal parts of the commercial washing machines for bottles and the like. In particular the scale was formed on the metal holders or pockets in which the bottles are held and transported during the washing steps. This necessitated frequent scaling operations to remove the deposits.

Attempts have been made heretofore to modify the characteristics of the caustic alkali in order to avoid these difficulties. One such attempt consisted in adding to the caustic alkali a water-soluble meta-silicate. This had some beneficial effect in aiding the cleansing operation but it resulted in the formation of a harder scale of the insoluble matter so that it became still more difficult to remove the scale from the metal parts of the washing machine.

The present invention is intended and adapted to overcome the difficulties and disadvantages inherent in detergent compositions containing major amounts of caustic alkali, it being among the objects of the present invention to provide a composition of the character described wherein insoluble alkali earth metal compounds are eliminated and the tendency of scale forming on metal parts of the washing apparatus is prevented.

It is also among the objects of the present invention to provide a caustic alkali detergent which avoids the formation of streaks on the articles cleansed therewith and to facilitate the rinsing of the articles to give a cleaner product.

It is still further among the objects of the present invention to provide a composition wherein there is obtained an increased wetting action of the caustic alkali on the articles being cleaned and improve the effectiveness of the caustic alkali.

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In practicing the present invention, applicant has discovered that adding a relatively small proportion of a polyphosphate or orthophosphate to a caustic alkali increases the efficiency thereof as a detergent. The amount of caustic alkali is in all cases the major constituent and usually is present in at least 75% to 80% of the mixture. The polyphosphate may be any one of the known compounds which are obtained by molecular dehydration of water-soluble phosphates of the alkali metals. Among such phosphates is hexasodium tetraphosphate.

Due to the great difficulty in specific gravity of caustic alkali such as sodium hydroxide and the polyphosphate such as the tetraphosphate, it is difficult to obtain and maintain a uniform mixture of said constituents. The polyphosphate is usually in the form of granules and of higher specific gravity and the sodium hydroxide is usually in the form of flakes and much lesser specific gravity. Therefore, it is likely that a uniform mixture of these two substances would after a small amount of handling separate out so that the user would not ordinarily obtain the desired uniform mixture. Therefore, the present invention contemplates not only a uniform mixture of the two substances but includes means whereby said mixture is maintained. To accomplish this, there is provided a relatively small amount of a water-soluble dispersible amine, liquid in form, at ordinary temperatures and which is non-volatile at temperatures encountered in storage and use, namely below say 150° to 180° F. Not only are the normal amines suitable for the purpose, but also the alkylol amines which are contemplated herein. The amine has a definite function in the mixture in that it causes adherence of the relatively heavy polyphosphate particles to the flakes of caustic alkali and cements the same together so that there can be no separation of the constituents due to the action of gravity.

The operation of the present invention is set forth more fully in the following examples:

Example 1

A mixture is made having the following proportions:

	Per cent
Flake caustic soda	85
Hexasodium tetraphosphate	10
Triethanolamine	5

The alkali and the phosphate are intimately mixed in the dry state and during the agitation the triethanolamine is added gradually with continued stirring. There is formed a relatively wet sticky mass which is allowed to dry to form a readily flowing product wherein the particles of polyphosphate and alkali held together in uniform admixture.

This mixture may be used for the cleaning of bottles in automatic machines or for other purposes. When used for cleaning, the mixture is considerably more effective than compositions heretofore used for the same purpose. Each of the elements has a specific function co-operating with the other elements to give a composite effect. The caustic soda has a powerful cleaning and germicidal action. The triethanolamine, even though present in relatively small amount, substantially increases the wetting action of the alkali and thus improves the cleansing action thereof. The polyphosphate is highly effective in the rinsing operation in cleaning off any traces of insoluble matter from the bottles. The composition as a whole prevents the formation of scale and deposition thereof on various parts of the washing apparatus.

Example 2

A mixture is made having the following constituents:

Caustic alkali containing—

	Per cent
Polyphosphate	1 –2
Amine	0.5 –1
Colloid	.01– .10

The colloid used in the composition is a hydrophilic colloid and is exemplified by algin, tannin, and others. The amine may be monobutyl amine and the mixture is made as set forth above.

A composition of this type is highly effective and has the additional property of rendering any scale which might be formed non-adherent to metal and to glass. Therefore, even if some scale tends to form, it cannot become caked on the apparatus. The presence of the hydrophilic colloid also reduces the amount of polyphosphate necessary to give the desired improvement in the rinsing operation.

Example 3

A mixture is made having the following constituents:

	Per cent
Flake caustic potash	88
Tetraphosphoric acid	11
Dipropanolamine	1

The polyphosphoric acid is intimately mixed with the caustic potash by continuous stirring and the amine is then added thereto while continuing the stirring. The soft sticky mass is allowed to dry, forming a freely flowing product.

The polyphosphoric acid coming in direct contact with the caustic alkali combines therewith chemically at the contact faces to form the potassium salt of the polyphosphoric acid. This firmly unites the polyphosphoric acid with the alkali and insures that there will be a uniform mixture maintained under all conditions of use.

In general, the invention comprises a detergent composition in which the principal constituents are in approximately the following proportions.

	Per cent
Caustic alkali	80 –98.5
Phosphate	1 –15
Amine	0.5– 5.0

In addition, a small amount of hydrophilic colloid may be added thereto to improve the qualities thereof. Such compositions are stable and do not deteriorate on long standing. Also they may be subjected to rough handling without any substantial separation of the constituents.

Although the invention has been described setting forth several specific embodiments thereof, the invention is not limited thereto as various changes in the details of the invention may be made within the principles herein set forth. For instance, the polyphosphate may be any of the well-known polyphosphates soluble in water such as the pyrophosphate, metaphosphate and various other compounds of this type may be considered as alkali metal ortho-phosphates from which varying amounts of H_2O have been removed. The free polyphosphoric acid may be used in whole or in part and mixtures of the various polyphosphates are suitable for the purpose. The proportions of the ingredients of the composition may be varied to some extent from the limits set forth herein. For instance, greater amounts of the amine may be used in the composition but it is unnecessary in order to obtain the desired results, and the additional amounts of amine would constitute excess material, increasing the cost thereof. The relative proportions of the several constituents may also be varied, but in general the lower the amount of polyphosphate present in the composition, the less of the amine will be necessary in order to obtain adherence thereof of the caustic alkali.

The present invention provides a simple means of obtaining a uniform mixture of a caustic alkali and a phosphate which will not separate in storage and transportation. It would be impractical to produce such a mixture during the making of the caustic alkali for the reason that such alkali is produced by fusion thereof and then flaking the molten material on drums. The operation is on a large scale and must be run substantially continuously. It could not be interrupted to make a large variety of mixtures with phosphates which would be required for various industrial applications and in relatively small amounts. Since the melting point of the caustic alkali is between 300° and 400° C., the organic substances used in the composition, such as the amine and the colloid, would become decomposed during the operation.

In the use of a colloid together with the other constituents, the colloid is used generally in weak aqueous solution wherein 1% to 5% of colloid are dissolved. Various other colloids than those specifically set forth herein, such as carboxy methyl cellulose, may be used and the relative proportions may be varied within wide limits. The amino compounds used may be of various types and include quaternary compounds and esters of the alkylolamines wherein an additional group is tacked onto the amino nitrogen or the OH group thereof. Examples of such compounds are the esters of alkylolamines with fatty acids having at least 8 carbon atoms and the alkyl aryl pyridinium halide salt thereof.

In the specification and claims, phosphates and polyphosphates have been referred to and compounds of this type are considered to be equivalents for the present invention. The terms as used include the free phosphoric acids, either the ortho or the polyphosphoric acids, and the water-soluble salts of either the ortho phosphates or the polyphosphates. These and other changes in the details of the invention may be made with-

in the spirit thereof and the invention is therefore to be broadly construed and not to be limited except by the character of the claims appended hereto.

I claim:

1. A detergent composition comprising a flake alkali metal hydroxide, particles of a water-soluble alkali metal polyphosphate in an amount less than the hydroxide, and a sufficient amount of a liquid, water-dispersible amine which is non-volatile at 150–180° F. to cause adherence of the polyphosphate to the hydroxide.

2. A detergent composition comprising a flake alkali metal hydroxide, particles of a water-soluble alkali metal polyphosphate in an amount less than the hydroxide, and a sufficient amount of a liquid, water-dispersible alkylolamine which is non-volatile at 150–180° F. to cause adherence of the polyphosphate to the hydroxide.

3. A detergent composition comprising a flake alkali metal hydroxide, particles of a water-soluble alkali metal polyphosphate in an amount less than the hydroxide, and a sufficient amount of a liquid, water-dispersible amine which is non-volatile at 150–180° F. to cause adherence of the polyphosphate to the hydroxide, said amine being triethanolamine.

4. A detergent composition comprising a flake alkali metal hydroxide, particles of a water-soluble alkali metal polyphosphate in an amount less than the hydroxide, and a sufficient amount of a liquid, water-dispersible amine which is non-volatile at 150–180° F. to cause adherence of the polyphosphate to the hydroxide, the proportions being approximately as follows:

	Per cent
Alkali metal hydroxide	80 –98.5
Alkali metal polyphosphate	1 –15
Water-dispersible amine	0.5– 5.0

5. A detergent composition comprising a flake alkali metal hydroxide, particles of a water-soluble alkali metal polyphosphate in an amount less than the hydroxide, and a sufficient amount of a liquid, water-dispersible amine which is non-volatile at 150–180° F. to cause adherence of the polyphosphate to the hydroxide, the proportions being approximately as follows:

	Per cent
Alkali metal hydroxide	85
Alkali metal polyphosphate	10
Water-dispersible amine	5

6. A detergent composition comprising a flake alkali metal hydroxide, particles of a water-soluble alkali metal polyphosphate in an amount less than the hydroxide, and a sufficient amount of a liquid, water-dispersible amine which is non-volatile at 150–180° F. to cause adherence of the polyphosphate to the hydroxide, said mixture containing less than 1% of a hydrophilic colloid.

7. A detergent composition comprising a flake alkali metal hydroxide, particles of a water-soluble alkali metal polyphosphate in an amount less than the hydroxide, and a sufficient amount of a liquid, water-dispersible amine which is non-volatile at 150–180° F. to cause adherence of the polyphosphate to the hydroxide, said mixture containing less than 1% of a hydrophilic colloid, the proportions being approximately as follows:

	Per cent
Alkali metal polyphosphate	1–2
Water-dispersible amine	0.5–1.0
Hydrophilic colloid	.01– .10

Balance, alkali metal hydroxide.

8. A detergent composition comprising a flake alkali metal hydroxide, particles of a water-soluble alkali metal orthophosphate in an amount less than the hydroxide, and a sufficient amount of a liquid, water-dispersible amine which is non-volatile at 150–180° F. to cause adherence of the orthophosphate to the hydroxide.

9. A detergent composition comprising a flake alkali metal hydroxide, particles of a water-soluble alkali metal phosphate in an amount less than the hydroxide, and a sufficient amount of a liquid, water-dispersible amine which is non-volatile at 150–180° F. to cause adherence of the phosphate to the hydroxide.

10. A detergent composition comprising a flake alkali metal hydroxide, particles of a water-soluble compound taken from the class consisting of phosphoric acid, alkali metal ortho-phosphates and alkali metal polyphosphates in an amount less than the hydroxide, and a sufficient amount of a liquid, water-dispersible amine which is non-volatile at 150–180° F. to cause adherence of the compound to the hydroxide.

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