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METAL CLEANING COMPOSITIONS

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The present invention relates to an improved metal cleaning composition and it particularly relates to a composition for cleaning aluminum household utensils.

Although the present invention will be particularly described in its application to the cleaning of aluminum articles and aluminum household utensils, it is to be understood that it has other applications to the cleansing of similar metal and alloy articles and plated metal surfaces.

It has not been found most satisfactory to clean aluminum articles and particularly aluminum household utensils by alkalies, or alkali metal salts, since these materials have an undesirable solvent and corrosive action and frequently leave a badly eroded, pitted and discolored surface. Furthermore these caustic and alkaline agents are often poisonous and injurious to the skin or body tissues.

The alkali metal salts, such as sodium carbonate, tri-sodium phosphate, ortho-sodium silicate, and metal-sodium silicate, although they are not as alkaline as the hydroxides and therefore are not as caustic in their action, nevertheless also exhibit a corrosive action, though less intense, which tends to cause the metal after cleansing to oxidize and discolor, particularly upon exposure to air.

Moreover these alkali metal salts also tend to set up a dermatitis and to cause excessive skin chafing and dryness. Moreover, these alkali metal salts usually require the use of hard abrasives.

It is among the objects of the present invention, therefore, to provide an improved cleansing composition especially useful for cleansing household aluminum utensils, which will be inexpensive, non-corrosive and non-toxic and non-injurious to the hands or body tissues, and which at the same time may be stored and shipped without difficulty and without excessive precautions.

Still further objects and advantages will appear in the more detailed description set forth below, it being understood, however, that this more detailed description is given by way of illustration and explanation only, and not by way of limitation, since various changes therein may be made by those skilled in the art without departing from the scope and spirit of the present invention.

In accomplishing these objects, it has been found most satisfactory to use certain types of organic compounds and particularly organic carboxylic acids.

It has been found that such organic carboxylic acids as oxalic, maleic, fumaric, tartaric, citric, phthalic, benzoic, citraconic and mesaconic acids do not most efficiently remove scale and stains from aluminum and similar metal objects and surfaces.

In certain instances these acids form an insoluble or difficultly soluble metallic salt, with the metal being cleansed which inhibits further cleansing action.

Moreover, many of these acids, particularly oxalic acid, fumaric acid, phthalic acid, benzoic acid, maleic acid, citraconic acid, and mesaconic acid are very toxic and cannot be safely used for cleaning household aluminum utensils, since they frequently induce dermatitis.

It has now been found that certain polyhydroxy organic acids and the salts or esters of these polyhydroxy organic acids are efficient metal cleaning agents.

As a general rule, these compounds should contain at least 3 carbon atoms and generally not more than 10 to 12 carbon atoms and the acids most desirably have a straight or branched aliphatic chain. At the same time the acids so selected should have more than 2 and up to 6 hydroxy groups and a smaller number of carboxy groups than hydroxy groups and preferably at least two hydroxy groups for each carboxy group. The most useful compounds have only one carboxy group and from 2 to 6 hydroxy groups.

In the preferred composition, however, the material preferably has slight reducing properties and is utilized in a composition slightly on the acid side, but not having a pH lower than about 4.5 to 5.5.

Among the preferred polyhydroxy carboxylic acids is gluconic acid and its lactone, namely glucono-delta-lactone. Gluconic acid and its useful derivatives, such as the ammonium, sodium, potassium or lithium salts, or less preferably the water soluble alkyl esters, amides or esters, are non-toxic to humans and non-injurious to tissues. These compounds areactive solvents for aluminum tannates and other aluminum stain and scale substances. Further, gluconic acid and the gluconates reduce metallic oxides, leaving a bright surface.

The useful gluconic derivatives form soluble aluminum salts in their reactions with the metal and the metallic stain and scale substances. These soluble salts remain in solution even in the presence of alkalies and fatty acid soaps and the removal of these substances is thereby facilitated. Gluconic acid is non-corrosive and non-destructive to all common metals and alloys.

The effective cleansing, reducing, and scale and stain solvent action of the gluconates make

it possible to incorporate mild abrasive and polishing agents such as bentonite and infusorial earth in cleaning compositions without inclusion of hard abrasives, such as pumice, silex and Carborundum. Such hard abrasives tend to scratch and damage metallic surfaces.

Gluconic acid, glucono delta-lactone, and soluble alkali metal and ammonium gluconates may be used alone or with auxiliary cleaning materials, such as diatomaceous earth or bentonite, as well as with other nonabrasive forms of silica, and wetting agents, such as fatty alcohol sulfates, alkyl sulfonates, high molecular weight aryl-alkyl sulfonates, e. g., sodium lauryl sulfate, benzene octyl sodium sulfonate, dibutyl naphthylene sodium sulfonate, sodium ethyl naphthylene sulfonate, sodium tetrahydro naphthylene sulfate, monobutyl diphenyl sodium monosulfonate, myricyl alcohol sulfate, amyl naphthylene sulfonate, sulfonate of stearyl alcohol, sodium oleyl sulfate, sodium salt of sulfonated myristyl collamide and so forth.

A typical composition of a metal cleaner embodying gluconic acid may be made up as follows—all parts by weight:

	Preferred	Range
Tripoli	20	0–50
Infusorial earth	20	0–50
Bentonite	20	10–30
Glucono delta-lactone	15	10–20
Aryl-alkyl sulfonate	2	0–5

Such a composition is typical and illustrative of the use of gluconic derivatives for metal cleaning operations. The proportions are not intended to be limiting.

Gluconic acid in solution may be absorbed on infusorial earth in a paste or powdered composition, as in the following example:

	Preferred	Range
Tripoli	20	10–50
Infusorial earth	20	0–50
Bentonite	20	0–50
Gluconic acid 50% solution	30	10–30
Sodium lauryl sulfonate	2	0–5

As another paste composition there may be used:

	Preferred	Range
Tripoli	10	5–20
Infusorial earth	30	10–50
Bentonite	20	0–50
Gluconic acid 50% solution	30	10–50
Sodium gluconate	2	0–5
Dibutyl naphthalene sodium sulfonate	2	0–5
India gum	1	0–5
Preservative (as isothymol)	1/10	0–1
Water	200	100–300

It is also possible to incorporate other polyhydroxy acids in cleaning compositions, for example trihydroxy glutaric acid in addition to or in lieu of gluconic acid:

	Preferred	Range
Infusorial earth	40	0–60
Bentonite	20	0–50
Starch	2	0–5
Trihydroxy glutaric acid	10	5–15
Alcohol sulfate	1	0–5

Among the other acids which may be used are arabonic, xylonic, heptonic, hexonic, mannonic, saccharic, galactonic and mucic.

In the above compositions the tripoli and infusorial earth serve as mild abrasives and may be replaced by other mild abrasives or omitted if desired.

The bentonite serves as a gel-forming material, as well as an abrasive, which makes the gluconic or other acid adhere to the surface being cleansed.

The India gum or starch serve as protective colloids and may be replaced by other protective colloids, such as pectin, gum tragacanth, gum arabic, agar-agar, dextrin, locust bean gum.

In lieu of isothymol as a non-irritating preservative, there also may be employed amyl phenol, sodium furoate, furoic acid, hexamethylene tetramine, butyl benzoate, sodium salicylate and sodium benzoate.

If desired, alkali metal phosphates may be added to the above compositions to expedite removal of iron discoloration.

It has been found that highly colored complex iron compounds tend to form and stain aluminum and similar metal surfaces and that most of these compounds are rendered colorless by alkali metal phosphates and particularly by sodium hexametaphosphate and especially the form of sodium hexametaphosphate having the formula $(NaPO_3)_6$.

Although the present invention has a preferred application to the cleansing of aluminum vessels or utensils, it can also be used in connection with the cleansing of objects or articles made of or plated with nickel, tin, chromium, copper, silver, steel, brass, Monel metal, pewter and various combinations thereof.

Many other changes could be effected in the particular features of the method disclosed, and in specific details thereof, without substantially departing from the invention intended to be defined in the claims, the specific description herein merely serving to illustrate certain elements by which, in one embodiment, the spirit of the invention may be effectuated.

What is claimed is:

1. A composition for cleansing of aluminum utensils which comprises by weight about 20 parts of tripoli, about 20 parts of infusorial earth, about 20 parts of bentonite, about 15 parts of glucono delta-lactone and about 2 parts of a wetting agent.

2. A composition for cleansing of aluminum utensils which comprises by weight about 20 parts of tripoli, about 20 parts of infusorial earth, about 20 parts of bentonite, about 30 parts of gluconic acid in an aqueous 50% solution and about 2 parts of a wetting agent, the acidity of such composition being solely due to the presence of said acid.

3. A metal cleaning composition for the removal of metallic oxide, tarnish, or scale, comprising by weight:

	Parts
Bentonite	10 to 30
Glucono delta-lactone	10 to 20
Wetting agent	about 2

admixed with tripoli and infusorial earth, each of the latter in substantial proportions to make up a total of 100 parts.

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