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HOUSEHOLD CLEANING AND POLISHING COMPOSITION

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ABSTRACT OF THE DISCLOSURE

Highly satisfactory household cleaning and polishing compositions may be obtained by employing therein a mixture of lava pumice and zirconium silicate, $ZrSiO_4$, as a cleaning component and at least one member selected from the group consisting of zirconium silicate, tin dioxide, SnO_2 , aluminum hydroxide, $Al(OH)_3$, and calcium pyrophosphate, $Ca_2P_2O_7$, primarily as a polishing component. Such compositions may be employed with other conventional ingredients (e.g., soaps, detergents, and bleaches) in household cleansers, or they may be provided in a carried vehicle such as a steel wool or woven fiber scouring pad.

BACKGROUND OF THE INVENTION

Field of the invention

The present invention relates to new cleaning and polishing agents and to the formulation and utilization of preparations incorporating such cleaning and polishing agents. In particular, the invention relates to household cleaning and polishing preparations comprising a mixture of lava pumice and zirconium silicate, $ZrSiO_4$, as a cleaning component and at least one member selected from the group consisting of zirconium silicate, tin dioxide, SnO_2 , aluminum hydroxide, $Al(OH)_3$, and calcium pyrophosphate, $Ca_2P_2O_7$, primarily as a polishing component.

Description of the prior art

An ideal household cleaning and polishing composition would have superior cleaning properties, minimum abrasiveness, superior polishing qualities, and an ability to prevent or retard reformation of recurring surface films. Exhaustive research has shown that available household cleaners generally possess adequate cleaning ability, but are uniformly deficient with regard to the other properties of an ideal composition. More specifically, commercially available household cleaners and metal polishing preparations are typically very abrasive, hardly polish at all, and encourage subsequent reformation of surface films because of the scratches they induce in the porcelain or metal surface. The poor performance of such cleaners may be due in large part to the substantial amounts of quartz, SiO_2 , they contain. It has been repeatedly shown that these agents function poorly in each of the criterion possessed by an ideal composition, except cleaning. Moreover, even the cleaning properties of the agents tends to be due to excessive abrasiveness, which results in scratches and surface deterioration, rather than any inherent cleaning ability. As is well known in the art, the use of an agent having excessive abrasive properties on metal surfaces results in low luster and a propensity to reaccumulate various types of stain and surface films.

SUMMARY OF THE INVENTION

In accordance with the present invention, it has been found that new and more effective cleaning and polishing compositions may be obtained by incorporating therein primarily as a cleaning agent a mixture of about 5–30%

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lava pumice and about 30–65% zirconium silicate, $ZrSiO_4$, by weight of the cleaning and polishing composition. The total cleaning component is preferably present in the cleaning and polishing composition at a level of about 50–85% by weight. The lava pumice particles are preferably substantially all less than about 90 microns particle size, with at least about 85% being less than about 40 microns particle size. The zirconium silicate particles are preferably substantially all less than about 90 microns particle size, with about 30–60% of the particles being less than about 40 microns particle size. The cleaning and polishing composition further comprises primarily as a polishing component about 15–50% by weight of the cleaning and polishing composition of at least one member selected from the group consisting of zirconium silicate, $ZrSiO_4$, tin dioxide, SnO_2 , calcium pyrophosphate, $Ca_2P_2O_7$, and aluminum hydroxide, $Al(OH)_3$, with no more than about 30% of any one such member being utilized. The zirconium silicate particles used primarily for polishing are significantly smaller than the zirconium silicate employed primarily as a cleaning agent, with substantially all being less than about 10 microns particle size and in excess of about 95% being less than 3 microns particle size. The tin dioxide particles are preferably substantially all less than about 20 microns particle size with about 75% being less than about 10 microns particle size. The calcium pyrophosphate particles are substantially all less than about 20 microns particle size, with about 75% thereof being less than about 10 microns. The aluminum hydroxide particles are substantially all less than about 75 microns, with over 80% thereof being less than 10 microns. The described cleaning and polishing composition is preferably provided in a household cleanser preparation at a level of about 30–80% by weight of the preparation, which may further comprise suitable amounts of soaps, detergents, bleaches, and the like.

Through the use of the cleaning and polishing agents of the present invention, the difficulties experienced with prior art cleaning and polishing compositions may be overcome, and compositions with superior cleaning and polishing capabilities with low abrasives and less scratches may be formulated. Whereas prior art cleaners typically excelled only in cleaning ability, compositions made according to the teachings of the present invention also possess polishing properties previously unattained. Moreover, compositions made according to the present invention tend to prevent, or retard, the subsequent reformation of films such as oxides, sulfides, and the like, and achieve all of the foregoing properties with an absence of abrasiveness heretofore unattained.

Accordingly, it is a primary object of the present invention to provide improved household cleaning and polishing compositions.

Another object of the present invention is to provide an improved cleaning and polishing composition having a minimum abrasiveness.

Another related object of the present invention is to provide an improved cleaning and polishing composition which tends to prevent or retard the reformation of films on surfaces treated therewith.

Another object of the present invention is to provide a composition with a minimum of abrasiveness which excels in both cleaning and polishing, and, at the same time, prevents or retards the subsequent reformation of films on surfaces treated therewith.

Yet another object of the present invention is to provide an agent with a particular particle size distribution which will maximize all of the properties described in the preceding objects.

These and other objects, advantages, and features of the present invention will hereinafter appear, and, for

purposes of illustration, but not of limitation, exemplary embodiments of the subject invention are hereinafter described in detail.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In accordance with the subject invention, it has been found that optimal cleaning, polishing, and film inhibiting characteristics for a household cleaning and polishing preparation are obtained where such preparation comprises about 30–80% by weight of a cleaning and polishing composition comprising as a cleaning component a mixture of about 5–30% lava pumice and about 30–65% zirconium silicate, ZrSiO_4 , by weight of the cleaning and polishing composition. The total cleaning component is preferably present in the cleaning and polishing composition at a level of about 50–85% by weight. The lava pumice particles are preferably substantially all less than about 90 microns particle size, with at least about 85% being less than about 40 microns particle size. The zirconium silicate particles are preferably substantially all less than about 90 microns particle size, with about 30–60% of the particles being less than about 40 microns particle size.

The cleaning and polishing composition further comprises primarily as a polishing component about 15–50% by weight of the cleaning and polishing composition of at least one member selected from the group consisting of zirconium silicate, ZrSiO_4 , tin dioxide, SnO_2 , calcium pyrophosphate, $\text{Ca}_2\text{P}_2\text{O}_7$, and aluminum hydroxide, $\text{Al}(\text{OH})_3$, with no more than about 30% of any one such member being utilized. The zirconium silicate particles used especially for polishing are significantly smaller than the zirconium silicate employed primarily as a cleaning agent, with substantially all being less than about 10 microns particle size and in excess of about 95% being less than 3 microns particle size. The tin dioxide particles are preferably substantially all less than about 20 microns particle size with about 75% being less than about 10 microns particle size. The calcium pyrophosphate particles are substantially all less than about 20 microns particle size, with about 70% thereof being less than about 10 microns. The aluminum hydroxide particles are substantially all less than about 75 microns, with over 80% thereof being less than 10 microns.

Household cleanser preparations produced in accordance with the present invention may further comprise additional suitable components such as soaps, detergents, bleaches, coloring agents, and the like. Such cleanser preparations containing the cleaning and polishing composition of the present invention may be provided in powder form for direct application to the surface to be cleaned and polished, or, alternatively, the preparation or composition may be carried by a steel wool or woven fiber scouring pad.

It has been found that the superior properties of a preparation made according to the present invention can be achieved on all hard surfaces such as metals (e.g., stainless steel and aluminum), glass, stone, porcelain, and the like.

The size of particles in a cleaning and polishing composition can be expressed in a number of different ways, one of the most common of which is "mean diameter" (i.e., the arithmetical average of the diameters of particles in a representative sample). As hereinafter utilized, the term "particle size" refers to a mean diameter value.

The preparation of suitably sized particles of the constituents of the compositions of the present invention may be accomplished by conventional techniques well known to the art. Basically these techniques involve milling an appropriate ore, followed by standard screen sifting (or air separation) to segregate the desired particle sizes. Various milling techniques (e.g., hammer and ball milling) may be utilized in order to obtain the desired surface configurations.

As is well known in the art, hammer mills utilize a high speed rotary shaft having a plurality of hammers or beaters mounted thereon. The hammers may be T-shaped elements, bars, or rings fixed or pivoted to the shaft or to disks pivoted to the shaft. The shaft runs in a housing containing grinding plates or liners. The grinding action results from the impact between the material being milled and the moving hammers. When the ore is milled by attrition techniques such as hammer milling, relatively rough, jagged particles are produced. Particles having such jagged surface configurations generally function, from a surface cleaning standpoint, in a relatively superior manner as compared to more smoothly configured particles.

Similarly, a ball mill comprises a cylindrical or conical shell rotating on a horizontal axis which is charged with a grinding medium such as balls of steel, flint, or porcelain. The grinding is accomplished by the tumbling action of the balls on the material to be ground. Particles of ore treated in a ball mill of the character described have relatively smooth surface configurations and function relatively better from a polishing standpoint than more jaggedly configured particles.

In addition to the described milling and sieving techniques, the ores in question may be physically or chemically treated (e.g., by acid washing) in order to remove undesirable impurities prior to compounding.

The lava pumice is employed in the cleaning component of the present invention at a level of about 5–30% by weight of the cleaning and polishing composition. The bulk of the lava pumice particles (i.e., preferably about 85% or more) are less than 40 microns particle size, with substantially all of the lava pumice particles being less than 90 microns particle size.

The zirconium silicate cleaning component is provided at a level of about 30–65% by weight of the cleaning and polishing composition. The exact particle sizes for the zirconium silicate cleaning component may be varied depending on the particular cleaning use to which it may be put (i.e., the particular particle size range employed depends on the variation in properties of the surfaces to be cleaned and polished). Between about 30–60% of the zirconium silicate cleaning particles are preferably of medium size (i.e., in the range of up to about 40 microns particle size), with substantially all of the particles being less than about 90 microns particle size (i.e., between about 40% and 70% of the zirconium silicate are between about 40–90 microns particle size).

A preferred zirconium silicate cleaning agent comprises about 60% particles between 40 and 90 microns and about 40% particles under 40 microns particle size, such composition being especially useful for cleaning aluminum and stainless steel.

Satisfactory aluminum cleaning compositions preferably comprise about equal numbers of particles in the up to 40 micron range and in the 40–90 micron range, and satisfactory porcelain cleaning compositions comprise about 55% particles in the 40–90 micron ranges and about 45% in the up to 40 micron range.

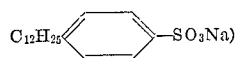
The constituents of the over-all cleaning and polishing composition primarily responsible for polishing are present in the composition at levels of about 15–50% by weight of the composition. The zirconium silicate polishing agent employed is substantially all less than 10 microns particle size, with preferably at least 95% or greater of less than 3 microns particle size. The calcium pyrophosphate employed is preferably about 75% less than 10 microns particle size, with substantially all being less than 20 microns particle size. The tin dioxide is about 75% less than 10 microns particle size with substantially all being less than 20 microns particle size. The particles of aluminum hydroxide are substantially all less than about 75 microns, with over 80% being in the range of up to about 10 microns. Each of these separate polishing constituents may be present at a level of up to about

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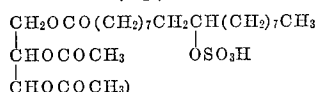
30% by weight of the over-all cleaning and polishing composition.

The components primarily responsible for cleaning are present in the over-all cleaning and polishing compositions in accordance with the present invention at a level of about 50–85% by weight of the composition, with the components primarily responsible for polishing being present at a level of about 15–50% by weight of the composition. In turn, this cleaning and polishing composition is present in an over-all commercial preparation at a level of about 30–80% by weight of the preparation, depending on the particular end use to which the preparation will be put.

In addition to its cleaning and polishing constituents, such a commercial preparation also typically includes additional ingredients which render the product commercially acceptable to consumers. For example, typical household cleansers would also include soaps or detergents amounting to 20–50% and preferably about 33% by weight of the total preparation. Suitable detergents include alkali metal salts of straight chain alkylated aromatic sulfonic acids (e.g.,



sulfonated fats and oils (e.g.,



sodium salts of secondary alkyl hydrogen sulfonates having from 8–18 carbon atoms; and the like.

In addition, a commercial household cleanser preparation usually includes about 15% by weight and preferably about 10% by weight of bleaching agents such as chlorinated trisodium phosphate, sodium hypochlorite and the like.

Compositions of exemplary cleaning and polishing compositions employing the cleaning and polishing agents of the subject invention are given in the following examples.

Examples I and II utilize a zirconium silicate cleaning component about 45% of which is in the range of up to about 40 microns, with about 55% being in the range of 40–90 microns. A preparation made according to Example I has been found to be particularly well suited for the cleaning and polishing of porcelain, while Example II performs well as an aluminum cleaning and polishing preparation.

EXAMPLE I

Constituent	Parts by weight
Detergent (linear alkyl aromatic sulfonate)-----	33
Bleach (chlorinated trisodium phosphate)-----	10
Cleaning and polishing composition:-----	57
Zirconium silicate (<90μ)-----	46
Lava pumice (<90μ)-----	18
Zirconium silicate (<10μ)-----	18
Tin dioxide (<20μ)-----	9
Calcium pyrophosphate (<20μ)-----	9
Total-----	100

EXAMPLE II

Constituent	Parts by weight
Detergent (linear alkyl aromatic sulfonate)-----	33
Bleach (chlorinated trisodium phosphate)-----	10
Cleaning and polishing composition:-----	57
Zirconium silicate (<90μ)-----	46
Lava pumice (<90μ)-----	18
Zirconium silicate (<10μ)-----	18
Aluminum hydroxide (<75μ)-----	9
Tin dioxide (<20μ)-----	9
Total-----	100

Example III gives the formulation of a suitable cleaning and polishing preparation that will have utility in aluminum polishing properties. The zirconium silicate clean-

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ing agent has about 48% of the particles less than about 40 microns with about 52% falling between 40 and 90 microns.

EXAMPLE III

Constituent:	Parts by weight
Zirconium silicate (<90μ)-----	54
Lava pumice (<90μ)-----	18
Zirconium silicate (<10μ)-----	18
Calcium pyrophosphate (<20μ)-----	10

Example IV illustrates an exemplary formulation employing a zirconium silicate cleaning agent having a particle size distribution as follows: about 59% in the range of 40–90 microns and about 41% in the range of up to about 40 microns. A household cleanser preparation incorporating the cleaning and polishing composition of Example IV has been found especially well adapted for cleaning and polishing stainless steel.

EXAMPLE IV

Constituent:	Parts by weight
Zirconium silicate (<90μ)-----	59
Lava pumice (<90μ)-----	18
Calcium pyrophosphate (<20μ)-----	23

Example V gives an aluminum and stainless steel polishing composition utilizing a zirconium silicate cleaner having about 61% of its particles in the 40–90 micron range and about 39% in the up to 40 micron range.

EXAMPLE V

Constituent:	Parts by weight
Zirconium silicate (<90μ)-----	64
Lava pumice (<90μ)-----	18
Tin dioxide (<20μ)-----	18

EXPERIMENTAL EVALUATION

It has been demonstrated that household cleanser preparations containing the cleaning and polishing compositions of the present invention are superior to conventional commercially available household cleanser preparations having as their abrasive constituents quartz, SiO₂. Porcelain was stained through the use of a mixture of KMnO₄ and NaClO₃. The stain was applied to the porcelain surface and allowed to dry thoroughly, and the various cleanser preparations were then evaluated in their ability to remove the stain. The number of strokes required to completely remove the stain was recorded. These data are given in Table I.

TABLE I

Preparation:	Number of strokes
Invention Mixture (Example I)-----	12–13
Commercial Cleanser I-----	16–17
Commercial Cleanser II-----	17–18
Commercial Cleanser III-----	21–22
Commercial Cleanser IV-----	19–20

The data of Table I verify the effectiveness of preparations produced employing the cleaning and polishing agents of the subject invention.

The gross scratching properties of the cleanser composition of the present invention have been comparatively evaluated, as follows. A glass plate was treated with simulated hand rubbing technique with the composition of the present invention and, for comparative purposes, with Commercial Cleanser I. The results of visual observations for scratching are given in Table II.

TABLE II

Preparation:	Scratches (visual observation)
Invention Mixture (Example I)-----	Fine
Commercial Cleanser I-----	Coarse

The ability of the composition of the present invention to remove stain from the pits in a porcelain surface, as compared with a commercially available cleanser, has been evaluated as follows. Manganese dioxide, MnO₂,

was deposited in the pits of porcelain slabs, and the respective cleaning abilities of the cleansers determined using a simulated hand scrubbing technique. The results are expressed in Table III in terms of a pit scouring score which is a measure of pit cleaning effectiveness. A higher number is representative of greater effectiveness.

TABLE III

Preparation:	Pit scouring score
Invention Mixture (Example I)-----	2.5
Commercial Cleanser I -----	1.0

Further studies concerning the polishing effectiveness of the compositions of the present invention have been carried out. A simulated hand brushing technique was employed on small sections of various types of surfaces. Polishing effectiveness was determined through the use of a reflectometer (a more reflective surface being indicative of a higher degree of polish). The results of this test are reported in Table IV in terms of reflectometer units, a measure of the change in surface reflectance due to the polishing, a higher number being representative of greater effectiveness.

TABLE IV

Preparation	Reflectance units			
	Stainless steel	Copper	Silver	Aluminum
Invention mixture (Example I)-----	5.10	3.50	5.30	1.30
Commercial cleanser I-----	2.80	3.00	2.45	0.65
Commercial cleanser V----	2.20	1.40	2.20	0.60

In each instance, the product of the present invention exhibits the best performance.

In accordance with the present invention, a cleaning and polishing component for everyday use in the home has been developed. This cleaning and polishing component may be employed in powder type cleansers or in fiber or steel wool scouring pads. Alternatively, the compositions may be provided in paste or liquid polish form, and of course other conventional ingredients such as detergents, soaps, bleaches, coloring agents, inert carriers, and the like may be used.

I claim:

1. A cleaning and polishing composition adapted for incorporation in a household cleanser preparation comprising:

as a component primarily adapted for cleaning, a mixture of about 5-30% lava pumice having particles in the range of up to about 90 microns and about 30-65% zirconium silicate, $ZrSiO_4$, having particles in the range of up to about 90 microns, by weight of the composition, between about 30 and 60% of the zirconium silicate particles lying in the range of up to about 40 microns, with about 40-70% of the particles lying in the range between about 40 and 90 microns particle size, the cleaning component being present in the cleaning and polishing composition at a level of about 50-85% by weight of the composition; and

as a component primarily adapted for polishing, about 15-50% by weight of the composition of at least one member selected from the group consisting of zirconium silicate, $ZrSiO_4$, having particles in the range of up to about 10 microns particle size, tin dioxide, SnO_2 , having particles in the range of up to about 20 microns particle size, calcium pyrophosphate, $Ca_2P_2O_7$, having particles lying in the range of up to about 20 microns particle size, and aluminum hydroxide, $Al(OH)_3$, having particles lying in the range of up to about 75 microns, with no more than about 30% by weight of any one such member being present in the composition.

2. A cleaning and polishing composition, as claimed in claim 1, wherein:

at least about 85% of the lava pumice particles are less than about 40 microns particle size;

at least about 95% of the zirconium silicate particles of the polishing component are less than 3 microns particle size;

at least about 75% of the calcium pyrophosphate particles are less than 10 microns particle size;

at least about 75% of the tin dioxide particles are less than 10 microns particle size; and

at least about 80% of the aluminum hydroxide particles are less than about 10 microns particle size.

3. A composition, as claimed in claim 2, and especially adapted for use on porcelain, wherein:

about 45% of the zirconium silicate particles of the cleaning component are less than about 40 microns, with about 55% thereof lying in the range of about 40-90 microns; and

the polishing component comprises zirconium silicate, tin dioxide, and calcium pyrophosphate.

4. A composition, as claimed in claim 2, and especially adapted for use on aluminum, wherein:

about 45% of the zirconium silicate particles of the cleaning component are less than about 40 microns, with about 55% thereof lying in the range of about 40-90 microns; and

the polishing component comprises zirconium silicate, tin dioxide, and aluminum hydroxide.

5. A composition, as claimed in claim 2, and especially adapted for use on aluminum, wherein:

about 48% of the zirconium silicate particles of the cleaning component are less than about 40 microns particle size, with about 52% thereof lying in the range of about 40-90 microns particle size; and

the polishing component comprises zirconium silicate and calcium pyrophosphate.

6. A composition, as claimed in claim 2, and especially adapted for use on stainless steel, wherein:

about 41% of the zirconium silicate particles of the cleaning component are less than about 40 microns particle size, with about 59% thereof lying in the range of about 40-90 microns; and

the polishing component comprises calcium pyrophosphate.

7. A composition, as claimed in claim 2, and especially adapted for use on aluminum and stainless steel, wherein:

about 39% of the zirconium silicate particles of the cleaning component are less than about 40 microns particle size, with about 61% thereof lying in the range of about 40-90 microns particle size; and the polishing component comprises tin dioxide.

8. A household cleanser preparation comprising:

up to about 15% by weight of a bleaching component; about 20-50% of a detergent component; and

about 30-80% by weight of a cleaning and polishing composition, the said composition comprising:

as a component primarily adapted for cleaning, a mixture of about 5-30%, by weight of the composition, lava pumice having particles in the range of up to about 90 microns and about 30-65%, by weight of the composition, zirconium silicate, $ZrSiO_4$, having particles in the range of up to about 90 microns, between about 30 and 60% of the zirconium silicate particles lying in the range of up to about 40 microns, with about 40-70% of the particles lying in the range between about 40 and 90 microns particle size, the cleaning component being present in the cleaning and polishing composition at a level of about 50-85% by weight of the composition; and

as a component primarily adapted for polishing, about 15-50% by weight of the composition of at least one member selected from the group consisting of zirconium silicate, $ZrSiO_4$, having particles in the range of up to about 10 microns particle size, tin dioxide, SnO_2 , having particles in the range of up to about 20 microns particle size, calcium pyrophosphate, $Ca_2P_2O_7$, having

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particles lying in the range of up to about 20 microns particle size, and aluminum hydroxide, $\text{Al}(\text{OH})_3$, having particles lying in the range of up to about 75 microns, with no more than about 30% by weight of any one such member being present in the composition.

9. A composition, as claimed in claim 8, wherein:
 at least about 85% of the lava pumice particles are less than about 40 microns particle size;
 at least about 95% of the zirconium silicate particles of the polishing component are less than 3 microns particle size;
 at least about 75% of the calcium pyrophosphate particles are less than 10 microns particle size;
 at least about 75% of the tin dioxide particles are less than 10 microns particle size; and
 at least about 80% of the aluminum hydroxide particles are less than about 10 microns particle size.
10. Each and every novel feature substantially as

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shown and described in the foregoing specification and claims.

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