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(54) Title: CLEANING PRODUCT

(57) Abstract: A cleaning product comprising a spray dispenser and a cleaning composition suitable for spraying and foaming, the composition housed in the spray dispenser wherein the composition comprises: i)from about 5 to about 15% by weight of the composition of a surfactant system; and ii) a glycol ether solvent selected from the group consisting of glycol ethers of Formula I: R1O(R2O)nR3, Formula II: R4O(R5O)nR6 and mixtures thereof wherein R1 is a linear or branched C4, C5 or C6 alkyl or a substituted or unsubstituted phenyl, R2 is ethyl or isopropyl, R3 is hydrogen or methyl and n is 1, 2 or 3, R4 is n-propyl or isopropyl, R5 is isopropyl, R6 is hydrogen or methyl and n is 1, 2 or 3 and and a specific cyclic diamine.

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CLEANING PRODUCT

FIELD OF INVENTION

The present invention relates to a cleaning product. In particular, it relates to a cleaning product comprising a spray dispenser and a cleaning composition. The product makes the cleaning of dishware easier and faster.

BACKGROUND OF THE INVENTION

Traditionally manual dishwashing has been performed by filling a sink with water, adding a dishwashing detergent to create a soapy solution, immersing the soiled articles in the solution, scrubbing the articles and rinsing to remove the remaining soils and remove the suds generated from the soapy solution from the washed articles. Traditionally an entire load of soiled dishware has usually been washed in one go. Nowadays some users prefer to clean articles as soon as they have finished with them rather than wait until they have a full load. This involves washing one article or a small number of articles at the time. The washing is usually performed under running water rather than in a full sink. The cleaning should be fast and involve minimum effort from the user.

Nowadays, a high number of users prefer to do the washing under the tap. This usually involves the use of a cleaning implement, such as a sponge. The user delivers detergent to the sponge. When the number of items to be cleaned is small, there is the risk of dosing more detergent than required, this will require the need for more rinsing for the dishware and the cleaning implement. Another disadvantage associated to this method, is that some time is required to mix the detergent with water in the sponge, this can slow down the cleaning process.

The level and type of soil found on dishware varies considerably depending on the use of the dishware. Dishware can be lightly soiled or can have hard to remove soils such as baked-, cooked- and/or burnt-on soils. It might be easier to design different products for different types/degrees of soils however this might not be very practical because the user would have to have a large number of dishwashing products.

When the cleaning of a lightly soiled article is done under running water, it is desirable that the cleaning is performed quickly and with minimum effort. Ideally, the product should be applied and then immediately rinsed obviating or reducing the need for scrubbing.

When articles are soiled with difficult to remove soils, it is desirable that the product facilitates the cleaning task by softening the well-attached soils. It is desirable that the softening takes place in a short time. In cases in which the soils are really tough it is common practice to soak the items before cleaning. The soaking time should be short.

Spray products are well liked by users. A sprayable composition for use in hand dishwashing should be easy to spray, deliver fast and long lasting suds, easy to rinse and at the same time should provide fast and good cleaning of a variety of soils. The composition should be such that when sprayed onto the dishware spreading to the surrounding atmosphere should be minimised or avoided. Spreading to the surrounding atmosphere can not only give rise to waste of the product but it can also have inhalation risks associated to it.

The object of the present invention is to facilitate cleaning, especially the manual dishwashing task, in particular by reducing the time and effort needed to achieve the cleaning.

SUMMARY OF THE INVENTION

According to a first aspect of the invention, there is provided a cleaning product. The product is suitable for the cleaning of any kind of surfaces but preferably the product is a hand dishwashing cleaning product. The product comprises a spray dispenser and a cleaning composition. The composition is a foaming composition and it is suitable for spraying. The composition is housed in the spray dispenser. The "composition" of the cleaning product of the invention is herein sometimes referred to as "the composition of the invention".

By "spray dispenser" is herein meant a container comprising a housing to accommodate the composition and means to spray that composition. The preferred spraying means being a trigger spray. The composition foams when it is sprayed. Foaming is a property that users associate with cleaning therefore it is important that the composition of the invention foams to send the user the signal that the composition is cleaning.

The composition of the invention comprises:

i) from about 5 to about 15%, preferably from about 7 to about 12% by weight of the composition of a surfactant system; and

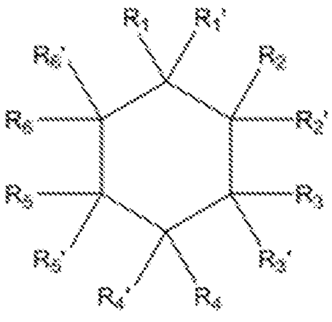
ii) a glycol ether solvent selected from the group consisting of glycol ethers of Formula I: R1O(R2O)nR3, Formula II: R4O(R5O)nR6 and mixtures thereof

wherein

R1 is a linear or branched C4, C5 or C6 alkyl or a substituted or unsubstituted phenyl, R2 is ethyl or isopropyl, R3 is hydrogen or methyl and n is 1, 2 or 3

R4 is n-propyl or isopropyl, R5 is isopropyl, R6 is hydrogen or methyl and n is 1, 2 or 3; and

iii) a cyclic diamine of Formula(I):



(I)

wherein two of the Rs, are selected from the group consisting of NH2, (C1-C4)NH2 and mixtures thereof and the remaining Rs are independently selected from H, linear or branched alkyl or alkenyl having from 1 to 10 carbon atoms.

Compositions having the combination of glycol ethers and cyclic diamine of the invention provide improved cleaning. Without wishing to be bound by theory, it is believed that the glycol ether solvent improves swelling of soil and spreding of the surfactant and the cyclic amine, thereby faciliting the accesability of the surfactant and the cyclic amine to the soil resulting in improved cleaning. In addition the cyclic diamine facilitates the breakdown of polymerised grease helping the surfactant and glycol ether to perform the cleaning task.

Preferably, the surfactant system and the glycol ether solvent are in a weight ratio of from about 5:1 to about 1:1, preferably from about 3:1 to about 1:1. The surfactant system seems to help with the cleaning and foam generation. With the claimed level of surfactant, the specific solvent and the surfactant:solvent weight ratio flash suds and long lasting suds are generated. The suds generated when spraying the composition of the invention are strong enough to withstand the impact force when the foam contact the article to be washed but at the same time the composition is easy to rinse.

Furthermore, the composition of the invention provides good cleaning, including cleaning of though food soils such as cooked-, baked- and burnt-on soils and good cleaning of light oily soils. The composition of the invention not only provides outstanding cleaning but also very fast cleaning, requiring reduced scrubbing effort by the consumer. Thus the product of the invention is especially suitable for cleaning dishware under the tap. When the dishware is only lightly soiled the composition of the invention provides very good cleaning with reduced scrubbing or in the absence of scrubbing. The dishware can be cleaned by simply spraying the composition followed by a rinse with water, optionally aided by a low force wiping action.

In the case of heavily soiled dishware the product of the invention is very good to facilitate the removal of the soil when the product is used to pre-treat the dishware. Pre-treatment usually involves leaving the soiled dishware with the neat product.

Compositions having the claimed level of surfactant system and the claimed weight ratio of surfactant system to glycol ether solvent when sprayed provide good coverage on the dishware with minimum over spray, thereby avoiding wasting product or the risk of inhalation.

Compositions having a surfactant:solvent weight ratio lower than 1:1 do not seem to be able to foam and/or tend to phase separate creating physical instability in the product. Compositions having a surfactant:solvent weight ratio higher than 5:1 are difficult to spray and are prone to gelling when in contact with greasy soils in the presence of the low levels of water typically present when the product of the invention is used. Gel formation would inhibit the spreading of the composition negatively impairing on the cleaning.

Preferably, the composition of the invention has a pH greater than 8, more preferably from 10 to 12, most preferably from 10.5 to 11.5 as measured at 10% solution in distilled water at 20°C and a reserve alkalinity of from about 0.1 to about 1, more preferably from about 0.1 to about 0.5. Reserve alkalinity is herein expressed as grams of NaOH/100 ml of composition required to titrate product from a pH 10 to the pH of the finished composition. This pH and reserve alkalinity further contribute to the cleaning of tough food soils.

Compositions having a surfactant system comprising an anionic surfactant and a co-surfactant have been found to be very good from a cleaning and sudsing viewpoint. They have also been found very good from a spray pattern view point. The presence of small droplets (and therefore the risk of inhalation) is minimized when the surfactant system of the composition of the invention contains anionic surfactant. By co-surfactant is herein meant a surfactant that is present in the composition in an amount lower than the main surfactant. By main surfactant is herein meant the surfactant that is present in the composition in the highest amount. Preferably the anionic surfactant is a sulfate surfactant, more preferably an alkyl ethoxylate sulfate or a branched short chain alkyl sulfate. It has been found that alkyl ethoxylated sulfate with an average degree of ethoxylation from about 2 to about 4, more preferably about 3, performs better in terms of cleaning and speed of cleaning than other ethoxylate alkyl sulfate surfactants with a lower degree of ethoxylation.

By a “branched short chain alkyl sulfate” is herein meant a surfactant having a linear alkyl sulfate backbone, the backbone comprising from 4 to 8, preferably from 5 to 7 carbon atoms, substituted with one or more C1-C5 preferably C1-C3 alkyl branching groups in the C1, C2 or C3, preferably C2 position on the linear alkyl sulfate backbone. This type of anionic surfactant has been found to deliver strong grease cleaning as well as good foaming performance, especially immediate foaming performance upon spraying when the composition comprises amine oxide or betaine, preferably amine oxide as co-surfactant. Preferred branched short chain alkyl sulfate for use herein is a branched hexyl sulfate, more preferably 2-ethyl hexyl sulfate.

Preferably, the co-surfactant is selected from the group consisting of betaine, amine oxide and mixtures thereof. Amine oxide is the preferred co-surfactant for use herein. The co-surfactant seems to help with the sudsing of the product. Particularly good performing products are those in which the anionic surfactant and the co-surfactant are present in a weight ratio of about 4:1 to about 1:1, preferably in a weight ratio of from about 3:1 to about 1:1, most preferably in a weight ratio from about 2:1 to about 1:1. When the anionic surfactant comprises an alkoxylated alkyl sulphate the preferred anionic surfactant:co-surfactant weight ratio is from 3:1 to 2:1. When the anionic surfactant comprises a short chain branched alkyl sulphate surfactant the preferred anionic surfactant:co-surfactant weight ratio is from 2:1 to 1:1. Especially preferred are compositions in which the co-surfactant comprises amine oxide.

Alternatively, composition comprising a main surfactant selected from the group consisting of betaine, amine oxide and mixtures thereof have been found to provide good performance. Amine oxide is the preferred main surfactant for use herein. The co-surfactant is selected from the group consisting of non-ionic surfactant, anionic surfactant and mixtures thereof. Particularly good performing products are those in which the primary surfactant and the co-surfactant are present in a weight ratio of about 10:1 to about 4:1, preferably in a weight ratio of from about 8:1 to about 3:1, most preferably in a weight ratio from about 7:1 to about 2:1. Especially preferred are compositions in which the co-surfactant comprises a non-ionic surfactant.

Compositions having a surfactant system comprising a non-ionic surfactant and a co-surfactant, preferably a mixture of an anionic surfactant and an amine oxide surfactant as co-surfactant have been found to be very good from a cleaning viewpoint. They have also been found good from a spray pattern view point. The presence of small droplets (and therefore the risk of inhalation) is minimized when the surfactant system of the composition of the invention contains anionic surfactant. Preferably, the co-surfactant is selected from the group consisting of from anionic, amphoteric, zwitteronic and mixtures thereof. Preferred co-surfactant for use herein is a mixture of amine oxide surfactant and linear alkyl benzene sulfonate. The co-surfactant seems to help with the sudsing of the product. Particularly good performing products are those in which the non-ionic surfactant and the co-surfactant are present in a weight ratio of about 6:1 to about 1:1, preferably in a weight ratio of from about 5:1 to about 1:1, most preferably in a weight ratio from about 4:1 to about 1.5:1. Especially preferred are compositions in which the co-surfactant comprises amine oxide and a linear alkyl benzene sulfonate.

The composition of the invention comprises glycol ethers selected from the group consisting of glycol ethers of Formula I, Formula II and mixtures thereof. It has been found that these glycol ethers help not only with the speed of cleaning of the product but also with the cleaning, especially greasy soils cleaning. This does not seem to happen with glycol ethers having a different formula to Formula I and Formula II.

Preferred cyclic diamines for use herein include 1,3-bis (aminomethyl) cyclohexane (1,3-BAC), 2-methylcyclohexane-1,3-diamine, 4-methylcyclohexane-1,3-diamine and mixtures thereof. Compositions comprising 1,3-BAC, 2-methylcyclohexane-1,3-diamine, 4-methylcyclohexane-1,3-diamine and mixtures thereof, provide very good grease removal from dishware and the dishware does not feel slippery during rinse. Especially preferred are composition comprising 2-methylcyclohexane-1,3-diamine, 4-methylcyclohexane-1,3-diamine and mixtures thereof.

Preferably, the composition of the invention further comprises a chelant, preferably an aminocarboxylate chelant, more preferably GLDA. The aminocarboxylate not only act as a chelant but also contributes to the reserve alkalinity, this seems to help with the cleaning of cooked-, baked- and burnt-on soils. Preferably, the composition of the invention comprises bicarbonate and/or monoethanol and/or carboxylate builder preferably citrate builder, that as in the case of the of the aminocarboxylate chelant also contribute to the reserve alkalinity.

The composition of the invention can be Newtonian or non-Newtonian. Preferably the composition is a shear thinning fluid. This is important to allow the composition to be easily sprayed. The viscosity of the composition of the invention should also make the fluid to stay in vertical surfaces to provide cleaning and at the same time be easy to rinse. Especially suitable have been found compositions having a starting viscosity at high shear (10,000 s-1) of from about 1 to about 10 mPa s. Preferably, the composition is a shear thinning composition having a low shear (100 s-1) to high shear (10,000 s-1) viscosity ratio of from about 10:1 to about 1.5:1 at 20°C as measured using the method defined herein below. Preferably the composition of the invention comprises a rheology modifier, more preferably xanthan gum.

A preferred composition has a pH of from 10 to 11.5 as measured in a 10% solution in distilled water at 20°C, a reserve alkalinity of from 0.1 to 0.3 expressed as g NAOH/ 100ml of composition at a pH of 10, the composition comprising:

i) from about 4 to about 10%, preferably from about 5 to about 8% by weight of the composition of an alkyl ethoxylate sulfate, preferably the alkyl ethoxylate sulfate having an average degree of ethoxylation of about 3;

ii) from about 1 to about 5% by weight of the composition of amine oxide surfactant;
iii) from about 3% to about 8%, preferably from about 4 to about 7% by weight of the composition of glycol ether solvent, preferably dipropylene glycol n-butyl ether; and
iv) from about 0.1% to from about 2%, preferably from about 0.2 to about 1% by weight of the composition of a cyclic diamine preferably selected from the group consisting of 2-methylcyclohexane-1,3-diamine, 4-methylcyclohexane-1,3-diamine and mixtures thereof.

Another preferred composition has a pH of from 10 to 11.5 as measured in a 10% solution in distilled water at 20°C, a reserve alkalinity of from 0.1 to 0.3 expressed as g NAOH/ 100ml of composition at a pH of 10, the composition comprising:

i) from about 4 to about 10%, from about 5 to about 8% by weight of the composition of a branched short chain sulfate, preferably 2-ethyl hexyl sulfate,
ii) from about 1 to 5% by weight of the composition of amine oxide surfactant; and

iii) from about 3% to 8%, preferably from about 4 to about 7% by weight of the composition of glycol ether solvent, preferably dipropylene glycol n-butyl ether; and

iv) from about 0.1% to from about 2%, preferably from about 0.2 to about 1% by weight of the composition of a cyclic diamine preferably selected from the group consisting of 2-methylcyclohexane-1,3-diamine, 4-methylcyclohexane-1,3-diamine and mixtures thereof.

According to the second aspect of the invention, there is provided a method of cleaning soiled dishware using the product according to any of the preceding claims comprising the steps of:

a) optionally pre-wetting the soiled dishware
b) spraying the cleaning composition onto the soiled dishware;
c) optionally adding water to the soiled dishware during a period of time;
d) optionally scrubbing the dishware; and
e) rinsing the dishware.

The method of the invention allows for faster and easier cleaning of dishware under running tap, especially when the dishware is lightly soiled. When the dishware is soiled with tough food soils such as cooked-, baked- or burnt-on soils the method of the invention facilitates the cleaning when the soiled dishware is soaked with the product of the invention in neat form or diluted in water.

DETAILED DESCRIPTION OF THE INVENTION

The present invention envisages a cleaning product, preferably a hand dishwashing cleaning product, the product comprises a spray dispenser and a cleaning composition. The cleaning composition comprises a surfactant system, a specific glycol ether solvent and a specific cyclic diamine. The product of the invention simplifies the cleaning task, in particular the manual cleaning task, by making the task easier and faster. The product of the invention is particularly suitable for the manual cleaning of dishware.

For the purpose of the present invention "dishware" encompasses all the items used to either cook or used to serve and eat food.

Cleaning composition

The cleaning composition is preferably a hand dishwashing cleaning composition, preferably in liquid form.

Preferably the pH of the composition is greater than 8, more preferably from about 10 to about 12 and most preferably from about 10.5 to about 11.5, as measured at 20°C and 10% concentration in distilled water. Preferably, the composition has a reserve alkalinity of from about 0.1 to about 1, more preferably from about 0.1 to about 0.5 measured as detailed herein below.

Reserve alkalinity is defined as the grams of NaOH per 100 g of composition required to titrate the test composition at pH 10 to come to the test composition pH. The reserve alkalinity for a solution is determined in the following manner.

A pH meter (for example An Orion Model 720A) with an Ag/AgCl electrode (for example an Orion sure flow Electrode model 9172BN) is calibrated using standardized pH 7 and pH 10 buffers. A 100g of a 10% solution in distilled water at 20°C of the composition to be tested is prepared. The pH of the 10% solution is measured and the 100g solution is titrated down to pH

10 using a standardized solution of 0.1 N of HCl. The volume of 0.1N HCl required is recorded in ml. The reserve alkalinity is calculated as follows:

Reserve Alkalinity = ml 0.1N HCl x 0.1 (equivalent / liter) x Equivalent weight NaOH (g/equivalent) x 10

Surfactant system

The cleaning composition comprises from about 5% to about 15%, preferably from about 6% to about 14%, more preferably from about 7% to about 12% by weight thereof of a surfactant system. The surfactant system preferably comprises an anionic surfactant, more preferably a sulfate surfactant. The system preferably comprises a co-surfactant preferably selected from the group consisting of amphoteric surfactants, zwitterionic surfactants and mixtures thereof. The system can optionally comprise a non-ionic surfactant.

Alkyl sulfates are preferred for use herein, especially alkyl ethoxy sulfates; more preferably alkyl ethoxy sulfates with an average degree of ethoxylation from about 2 to about 5, most preferably about 3. Branched short chain alkyl sulfate surfactant are also preferred for use herein.

The composition of the invention preferably comprises an amphoteric and/or zwitterionic surfactant, preferably the amphoteric surfactant comprises an amine oxide and the zwitteronic surfactant comprises a betaine surfactant.

Preferably, the anionic surfactant and the co-surfactant are present in the composition of the invention in a weight ratio of about 4:1 to about 1:1, preferably from 3:1 to 1:1 and more preferably from 2.8:1 to 1.3:1.

The most preferred surfactant system for the detergent composition of the present invention comprise: (1) 4% to 10%, preferably 5% to 8% by weight of the composition of an anionic surfactant, preferably an alkyl alkoxy sulfate surfactant or a branched short chain alkyl sulfate; (2) 1% to 5%, preferably from 1% to 4% by weight of the composition of a surfactant selected from the group consisting of amphoteric surfactant, zwitterionic surfactant and mixtures thereof, preferably an amine oxide surfactant. It has been found that such surfactant system in combination with the glycol ether and the cyclic diamine of the invention provides excellent cleaning and good foaming profile.

Anionic surfactant

Anionic surfactants include, but are not limited to, those surface-active compounds that contain an organic hydrophobic group containing generally 8 to 22 carbon atoms or generally 8 to 18 carbon atoms in their molecular structure and at least one water-solubilizing group preferably selected from sulfonate, sulfate, and carboxylate so as to form a water-soluble compound. Usually, the hydrophobic group will comprise a linear or branched C8-C22 alkyl, or acyl group. Such surfactants are employed in the form of water-soluble salts and the salt-forming cation usually is selected from sodium, potassium, ammonium, magnesium and mono-, di- or tri-alkanolammonium, with the sodium, cation being the usual one chosen.

The anionic surfactant is preferably a sulfate surfactant. A preferred sulfate surfactant is alkyl ethoxy sulfate, more preferably an alkyl ethoxy sulfate with an average degree of ethoxylation from about 2 to about 5, most preferably about 3. Another preferred sulfate surfactant is a branched short chain alkyl suphate, in particular 2-ethyl hexyl sulfate.

Sulfate anionic surfactant

A preferred sulfate anionic surfactant is an alkoxylated, more preferably, an alkoxylated sulfate anionic surfactant having an average alkoxylation degree from about 2 to about 5, most preferably about 3. Preferably, the alkoxy group is ethoxy. When the sulfate anionic surfactant is a mixture of sulfate anionic surfactants, the average alkoxylation degree is the weight average alkoxylation degree of all the components of the mixture (weight average alkoxylation degree). In the weight average alkoxylation degree calculation the weight of sulfated anionic surfactant components not having alkoxylate groups should also be included.

Weight average alkoxylation degree = (x1 * alkoxylation degree of surfactant 1 + x2 * alkoxylation degree of surfactant 2 + ...) / (x1 + x2 + ...)

wherein x1, x2, are the weights in grams of each sulfate anionic surfactant of the mixture and alkoxylation degree is the number of alkoxy groups in each sulfate anionic surfactant.

If the surfactant is branched, the preferred branching group is an alkyl. Typically, the alkyl is selected from methyl, ethyl, propyl, butyl, pentyl, cyclic alkyl groups and mixtures thereof. Single or multiple alkyl branches could be present on the main hydrocarbyl chain of the starting alcohol(s) used to produce the sulfate anionic surfactant used in the detergent of the invention.

The branched sulfate anionic surfactant can be a single anionic surfactant or a mixture of anionic surfactants. In the case of a single surfactant the percentage of branching refers to the weight percentage of the hydrocarbyl chains that are branched in the original alcohol from which the surfactant is derived.

In the case of a surfactant mixture the percentage of branching is the weight average and it is defined according to the following formula:

Weight average of branching (%)= [(x1 * wt% branched alcohol 1 in alcohol 1 + x2 * wt% branched alcohol 2 in alcohol 2 + ...) / (x1 + x2 + ...)] * 100

wherein x1, x2, are the weight in grams of each alcohol in the total alcohol mixture of the alcohols which were used as starting material for the anionic surfactant for the detergent of the invention. In the weight average branching degree calculation the weight of anionic surfactant components not having branched groups should also be included.

When the surfactant system comprises a branched anionic surfactant, the surfactant system comprises at least 50%, more preferably at least 60% and preferably at least 70% of branched anionic surfactant by weight of the surfactant system, more preferably the branched anionic surfactant comprises more than 50% by weight thereof of an alkyl ethoxylated sulfate having an average ethoxylation degree of from about 2 to about 5 and preferably a level of branching of from about 5% to about 40%.

Suitable sulfate surfactants for use herein include water-soluble salts of C8-C18 alkyl, preferably C8-C18 alkyl comprising more than 50% by weight of the C8 to C18 alkyl of C12 to C14 alkyl or hydroxyalkyl, sulfate and/or ether sulfate. Suitable counterions include alkali metal cation earth alkali metal cation, alkanolammonium or ammonium or substituted ammonium, but preferably sodium.

The sulfate surfactants may be selected from C8-C18 alkyl alkoxy sulfates (AExS) wherein preferably x is from 1-30 in which the alkoxy group could be selected from ethoxy, propoxy, butoxy or even higher alkoxy groups and mixtures thereof. Especially preferred for use herein is a C12-C14 alkyl ethoxy sulfate with an average degree of ethoxylation from about 2 to about 5, preferably about 3.

Alkyl alkoxy sulfates are commercially available with a variety of chain lengths, ethoxylation and branching degrees. Commercially available sulfates include, those based on Neodol alcohols ex the Shell company, Lial – Isalchem and Safol ex the Sasol company, natural alcohols ex The Procter & Gamble Chemicals company.

If the anionic surfactant is branched, it is preferred that the branched anionic surfactant comprises at least 50%, more preferably at least 60% and especially at least 70% of a sulfate surfactant by weight of the branched anionic surfactant. Preferred from a cleaning view point are those branched surfactants in which the branched anionic surfactant comprises more than 50%, more preferably at least 60% and especially at least 70% by weight thereof of sulfate surfactant and the sulfate surfactant is selected from the group consisting of alkyl sulfate, alkyl ethoxy sulfates and mixtures thereof. Even more preferred are those in which the branched anionic surfactant has an average degree of ethoxylation of from about 2 to about 5, more preferably about 3 and even more preferably when the anionic surfactant has an average level of branching of from about 10% to about 35%, %, more preferably from about 20% to 30%.

Linear alkyl alkoxylate sulfate surfactants are preferred for use in the composition of the invention.

Branched short chain alkyl sulfate surfactant

This type of anionic surfactants has been found to deliver strong grease cleaning. They also present good foaming performance, when used in combination with amine oxide or betaine especially amine oxide surfactants, especially immediate foaming performance upon spraying.

The branched short chain alkyl sulfate surfactants according to the current invention have a linear alkyl sulfate backbone comprising from 4 to 8 carbon atoms, substituted with one or more C1-C5 alkyl branching groups in the C1, C2 or C3 position on the linear alkyl sulfate backbone. The sulfate group within the branched short chain alkyl sulfate surfactant is bonded directly to said C4-C8 linear backbone in terminal position.

Preferably the linear alkyl sulfate backbone comprises from 5 to 7 carbon atoms. Preferably the one or more alkyl branching groups are selected from methyl, ethyl, propyl or isopropyl. Preferably the branched short chain alkyl sulfate surfactant has only one branching group substituted on its linear backbone chain. Preferably the alkyl branching group is on the C2 position in the linear alkyl sulfate backbone.

More preferably the branched short chain alkyl sulfate according to the current invention has a linear alkyl backbone comprising from 5 to 7 carbons, substituted on the C2 position in the linear alkyl sulfate backbone with one alkyl branching group selected from methyl, ethyl, propyl. Most preferably the branched short chain alkyl sulfate surfactant is 2-ethylhexylsulfate.

The composition of the present invention might further comprise a fraction of the corresponding non-sulfated branched short chain alcohol feedstock material of the formulated branched short chain alkyl sulfate surfactant.

Suitable branched short chain alkyl sulfate surfactants include 1-methylbutylsulfate, 1-ethylbutylsulfate, 1-propylbutylsulfate, 1-isopropylbutylsulfate 1-methylpentylsulfate, 1-ethylpentylsulfate, 1-propylpentylsulfate, 1-isopropylpentylsulfate 1-butylpentylsulfate, 1-methylhexylsulfate, 1-ethylhexylsulfate, 1-propylhexylsulfate, 1-isopropylhexylsulfate 1-butylhexylsulfate, 1-pentylhexylsulfate, 1-methylheptylsulfate, 1-ethylheptylsulfate, 1-propylheptylsulfate, 1-isopropylheptylsulfate, 1-butylheptylsulfate, 1-pentylheptylsulfate, 1-hexylheptylsulfate, 1-methyloctylsulfate, 1-ethyloctylsulfate, 1-propyloctylsulfate, 1-isopropyloctylsulfate, 1-butyloctylsulfate, 1-pentyloctylsulfate, 1-hexyloctylsulfate, 1-heptyloctylsulfate, 2-methylbutylsulfate, 2-ethylbutylsulfate, 2-propylbutylsulfate, 2-isopropylbutylsulfate 2-methylpentylsulfate, 2-ethylpentylsulfate, 2-propylpentylsulfate, 2-

isopropylpentylsulfate, 2-butylpentylsulfate, 2-methylhexylsulfate, 2-ethylhexylsulfate, 2-propylhexylsulfate, 2-isopropylhexylsulfate, 2-butylhexylsulfate, 2-pentylhexylsulfate, 2-methylheptylsulfate, 2-ethylheptylsulfate, 2-propylheptylsulfate, 2-isopropylheptylsulfate, 2-butylheptylsulfate, 2-pentylheptylsulfate, 2-hexylheptylsulfate, 2-methyloctylsulfate, 2-ethyloctylsulfate, 2-propyloctylsulfate, 2-isopropyloctylsulfate, 2-butyloctylsulfate, 2-pentyloctylsulfate, 2-hexyloctylsulfate, 2-heptyloctylsulfate, 3-methylbutylsulfate, 3-ethylbutylsulfate, 3-propylbutylsulfate, 3-isopropylbutylsulfate, 3-methylpentylsulfate, 3-ethylpentylsulfate, 3-propylpentylsulfate, 3-isopropylpentylsulfate, 3-butylpentylsulfate, 3-methylhexylsulfate, 3-ethylhexylsulfate, 3-propylhexylsulfate, 3-isopropylhexylsulfate, 3-butylhexylsulfate, 3-pentylhexylsulfate, 3-methylheptylsulfate, 3-ethylheptylsulfate, 3-propylheptylsulfate, 3-isopropylheptylsulfate, 3-butylheptylsulfate, 3-pentylheptylsulfate, 3-hexylheptylsulfate, 3-methyloctylsulfate, 3-ethyloctylsulfate, 3-propyloctylsulfate, 3-isopropyloctylsulfate, 3-butyloctylsulfate, 3-pentyloctylsulfate, 3-hexyloctylsulfate, 3-heptyloctylsulfate, and mixtures thereof.

More preferably the branched short chain alkyl sulfate surfactant is selected from the list of 1-methylpentylsulfate, 1-ethylpentylsulfate, 1-propylpentylsulfate, 1-butylpentylsulfate, 1-methylhexylsulfate, 1-ethylhexylsulfate, 1-propylhexylsulfate, 1-butylhexylsulfate, 1-pentylhexylsulfate, 1-methylheptylsulfate, 1-ethylheptylsulfate, 1-propylheptylsulfate, 1-butylheptylsulfate, 1-pentylheptylsulfate, 1-hexylheptylsulfate, 2-methylpentylsulfate, 2-ethylpentylsulfate, 2-propylpentylsulfate, 2-butylpentylsulfate, 2-methylhexylsulfate, 2-ethylhexylsulfate, 2-propylhexylsulfate, 2-butylhexylsulfate, 2-pentylhexylsulfate, 2-methylheptylsulfate, 2-ethylheptylsulfate, 2-propylheptylsulfate, 2-butylheptylsulfate, 2-pentylheptylsulfate, 2-hexylheptylsulfate, 3-methylpentylsulfate, 3-ethylpentylsulfate, 3-propylpentylsulfate, 3-butylpentylsulfate, 3-methylhexylsulfate, 3-ethylhexylsulfate, 3-propylhexylsulfate, 3-butylhexylsulfate, 3-pentylhexylsulfate, 3-methylheptylsulfate, 3-ethylheptylsulfate, 3-propylheptylsulfate, 3-butylheptylsulfate, 3-pentylheptylsulfate, 3-hexylheptylsulfate, and mixtures thereof.

Even more preferably the branched short chain alkyl sulfate surfactant is selected from the list of 2-methylpentylsulfate, 2-ethylpentylsulfate, 2-propylpentylsulfate, 2-butylpentylsulfate, 2-methylhexylsulfate, 2-ethylhexylsulfate, 2-propylhexylsulfate, 2-butylhexylsulfate, 2-pentylhexylsulfate, 2-methylheptylsulfate, 2-ethylheptylsulfate, 2-propylheptylsulfate, 2-butylheptylsulfate, 2-pentylheptylsulfate, 2-hexylheptylsulfate, and mixtures thereof.

Even more preferably the branched short chain alkyl sulfate surfactant is selected from the list of 2-methylpentylsulfate, 2-ethylpentylsulfate, 2-propylpentylsulfate, 2-methylhexylsulfate, 2-ethylhexylsulfate, 2-propylhexylsulfate, 2-methylheptylsulfate, 2-ethylheptylsulfate, 2-propylheptylsulfate, and mixtures thereof.

Most preferred branched short chain alkyl sulfate surfactant is 2-ethylhexylsulfate. This compound is commercially available under the Syntapon EH tradename from Enaspol and Empicol 0585U from Huntsman.

The branched short chain alkyl sulfate surfactant will be formulated from about 3% to about 10%, preferably from about 4% to about 8% by weight of the composition.

The branched short chain alkyl sulfate surfactant will be formulated from about 50% to about 100%, preferably from about 55% to about 75% by weight of the total surfactant composition.

Amphoteric surfactant

Preferably the amphoteric surfactant is an amine oxide. Preferred amine oxides are alkyl dimethyl amine oxide or alkyl amido propyl dimethyl amine oxide, more preferably alkyl dimethyl amine oxide and especially coco dimethyl amino oxide. Amine oxide may have a linear or mid-branched alkyl moiety. Typical linear amine oxides include water-soluble amine oxides containing one R1 C8-18 alkyl moiety and 2 R2 and R3 moieties selected from the group consisting of C1-3 alkyl groups and C1-3 hydroxyalkyl groups. Preferably amine oxide is characterized by the formula R1 – N(R2)(R3) O wherein R1 is a C8-18 alkyl and R2 and R3 are selected from the group consisting of methyl, ethyl, propyl, isopropyl, 2-hydroxethyl, 2-hydroxypropyl and 3-hydroxypropyl. The linear amine oxide surfactants in particular may include linear C10-C18 alkyl dimethyl amine oxides and linear C8-C12 alkoxy ethyl dihydroxy ethyl amine oxides. Preferred amine oxides include linear C10, linear C10-C12, and linear C12-C14 alkyl dimethyl amine oxides. As used herein "mid-branched" means that the amine oxide has one alkyl moiety having n1 carbon atoms with one alkyl branch on the alkyl moiety having n2 carbon atoms. The alkyl branch is located on the α carbon from the nitrogen on t he alkyl moiety. This type of branching for the amine oxide is also known in the art as an internal amine oxide. The total sum of n1 and n2 is from 10 to 24 carbon atoms, preferably from 12 to 20, and more preferably from 10 to 16. The number of carbon atoms for the one alkyl moiety (n1) should be approximately the same number of carbon atoms as the one alkyl branch (n2) such that the one alkyl moiety and the one alkyl branch are symmetric. As used herein "symmetric" means that $| n1 – n2 |$ is less than or equal to 5, preferably 4, most preferably from 0 to 4 carbon atoms in at least 50 wt%, more preferably at least 75 wt% to 100 wt% of the mid-branched amine oxides for use herein.

The amine oxide further comprises two moieties, independently selected from a C1-3 alkyl, a C1-3 hydroxyalkyl group, or a polyethylene oxide group containing an average of from about 1 to about 3 ethylene oxide groups. Preferably the two moieties are selected from a C1-3 alkyl, more preferably both are selected as a C1 alkyl.

Zwitterionic surfactant

Other suitable surfactants include zwitterionic surfactants, preferably betaines, such as alkyl betaines, alkylamidobetaine, amidazoliniumbetaine, sulfobetaine (INCI Sultaines) as well as the Phosphobetaine and preferably meets formula (I):

R1-[CO-X (CH2)n]x-N+(R2)(R3)-(CH2)m-[CH(OH)-CH2]y-Y-

(I)

wherein

R1 is a saturated or unsaturated C6-22 alkyl residue, preferably C8-18 alkyl residue, in particular a saturated C10-16 alkyl residue, for example a saturated C12-14 alkyl residue;

X is NH, NR4 with C1-4 Alkyl residue R4, O or S,

n a number from 1 to 10, preferably 2 to 5, in particular 3,

x 0 or 1, preferably 1,

R2, R3 are independently a C1-4 alkyl residue, potentially hydroxy substituted such as a hydroxyethyl, preferably a methyl.

m a number from 1 to 4, in particular 1, 2 or 3,

y 0 or 1 and

Y is COO, SO3, OPO(OR5)O or P(O)(OR5)O, whereby R5 is a hydrogen atom H or a C1-4 alkyl residue.

Preferred betaines are the alkyl betaines of the formula (Ia), the alkyl amido propyl betaine of the formula (Ib), the Sulfo betaines of the formula (Ic) and the Amido sulfobetaine of the formula (Id);

R1-N+(CH3)2-CH2COO- (Ia)

R1-CO-NH(CH2)3-N+(CH3)2-CH2COO- (Ib)

R1-N+(CH3)2-CH2CH(OH)CH2SO3- (Ic)

R1-CO-NH-(CH2)3-N+(CH3)2-CH2CH(OH)CH2SO3- (Id) in which R11 as the same meaning as in formula I. Particularly preferred betaines are the Carbobetaine [wherein Y-=COO-], in particular the Carbobetaine of the formula (Ia) and (Ib), more preferred are the Alkylamidobetaine of the formula (Ib).

Examples of suitable betaines and sulfobetaine are the following [designated in accordance with INCI]: Almondamidopropyl of betaines, Apricotam idopropyl betaines, Avocadamidopropyl of betaines, Babassuamidopropyl of betaines, Behenam idopropyl betaines, Behenyl of betaines, betaines, Canolam idopropyl betaines, Capryl/Capram idopropyl betaines, Carnitine, Cetyl of betaines, Cocamidoethyl of betaines, Cocam idopropyl betaines, Cocam idopropyl Hydroxysultaine, Coco betaines, Coco Hydroxysultaine, Coco/Oleam idopropyl betaines, Coco Sultaine, Decyl of betaines, Dihydroxyethyl Oleyl Glycinate, Dihydroxyethyl Soy Glycinate, Dihydroxyethyl Stearyl Glycinate, Dihydroxyethyl Tallow Glycinate, Dimethicone Propyl of PG-betaines, Erucam idopropyl Hydroxysultaine, Hydrogenated Tallow of betaines, Isostearam idopropyl betaines, Lauram idopropyl betaines, Lauryl of betaines, Lauryl Hydroxysultaine, Lauryl Sultaine, Milkam idopropyl betaines, Minkamidopropyl of betaines, Myristam idopropyl betaines, Myristyl of betaines, Oleam idopropyl betaines, Oleam idopropyl Hydroxysultaine, Oleyl of betaines, Olivamidopropyl of betaines, Palmam idopropyl betaines, Palm itam idopropyl betaines, Palmitoyl Carnitine, Palm Kernelam idopropyl betaines, Polytetrafluoroethylene Acetoxypropyl of betaines, Ricinoleam idopropyl betaines, Sesam idopropyl betaines, Soyam idopropyl betaines, Stearam idopropyl betaines, Stearyl of betaines, Tallowam idopropyl betaines, Tallowam idopropyl Hydroxysultaine, Tallow of betaines, Tallow Dihydroxyethyl of betaines, Undecylenam idopropyl betaines and Wheat Germam idopropyl betaines.

A preferred betaine is, for example, Cocoamidopropylbetaine.

Non ionic surfactant

Nonionic surfactant, when present, is comprised in a typical amount of from 0.1% to 10%, preferably 0.2% to 8%, most preferably 0.5% to 6% by weight of the composition. Suitable nonionic surfactants include the condensation products of aliphatic alcohols with from 1 to 25 moles of ethylene oxide. The alkyl chain of the aliphatic alcohol can either be straight or branched, primary or secondary, and generally contains from 8 to 22 carbon atoms. Particularly preferred are the condensation products of alcohols having an alkyl group containing from 10 to 18 carbon atoms, preferably from 10 to 15 carbon atoms with from 2 to 18 moles, preferably 2 to 15, more preferably 5-12 of ethylene oxide per mole of alcohol. Highly preferred nonionic surfactants are the condensation products of guerbet alcohols with from 2 to 18 moles, preferably 2 to 15, more preferably 5-12 of ethylene oxide per mole of alcohol.

Other suitable non-ionic surfactants for use herein include fatty alcohol polyglycol ethers, alkylpolyglucosides and fatty acid glucamides.

Glycol ether solvent

The composition of the invention comprises a glycol ether solvent selected from glycol ethers of Formula I or Formula II.

Formula I = R1O(R2O)nR3

wherein

R1 is a linear or branched C4, C5 or C6 alkyl, a substituted or unsubstituted phenyl, preferably n-butyl. Benzyl is one of the substituted phenyls for use herein.

R2 is ethyl or isopropyl, preferably isopropyl

R3 is hydrogen or methyl, preferably hydrogen

n is 1, 2 or 3, preferably 1 or 2

Formula II = R4O(R5O)nR6

wherein

R4 is n-propyl or isopropyl, preferably n-propyl

R5 is isopropyl

R6 is hydrogen or methyl, preferably hydrogen

n is 1, 2 or 3 preferably 1 or 2

Suitable glycol ether solvents according to Formula I include ethyleneglycol n-butyl ether, diethyleneglycol n-butyl ether, triethyleneglycol n-butyl ether, propyleneglycol n-butyl ether, dipropyleneglycol n-butyl ether, tripropyleneglycol n-butyl ether, ethyleneglycol n-pentyl ether, diethyleneglycol n-pentyl ether, triethyleneglycol n-pentyl ether, propyleneglycol n-pentyl ether, dipropyleneglycol n-pentyl ether, tripropyleneglycol n-pentyl ether, ethyleneglycol n-hexyl ether, diethyleneglycol n-hexyl ether, triethyleneglycol n-hexyl ether, propyleneglycol n-hexyl ether, dipropyleneglycol n-hexyl ether, tripropyleneglycol n-hexyl ether, ethyleneglycol phenyl ether, diethyleneglycol phenyl ether, triethyleneglycol phenyl ether, propyleneglycol phenyl ether, dipropyleneglycol phenyl ether, tripropyleneglycol phenyl ether, ethyleneglycol benzyl ether, diethyleneglycol benzyl ether, triethyleneglycol benzyl ether, propyleneglycol benzyl ether, dipropyleneglycol benzyl ether, tripropyleneglycol benzyl ether, ethyleneglycol isobutyl ether, diethyleneglycol isobutyl ether, triethyleneglycol isobutyl ether, propyleneglycol isobutyl ether, dipropyleneglycol isobutyl ether, tripropyleneglycol isobutyl ether, ethyleneglycol isopentyl ether, diethyleneglycol isopentyl ether, triethyleneglycol isopentyl ether, propyleneglycol isopentyl ether, dipropyleneglycol isopentyl ether, tripropyleneglycol isopentyl ether, ethyleneglycol isohexyl ether, diethyleneglycol isohexyl ether, triethyleneglycol isohexyl ether, propyleneglycol isohexyl ether, dipropyleneglycol isohexyl ether, tripropyleneglycol isohexyl ether, ethyleneglycol n-butyl methyl ether, diethyleneglycol n-butyl methyl ether triethyleneglycol n-butyl methyl ether, propyleneglycol n-butyl methyl ether, dipropyleneglycol n-butyl methyl ether, tripropyleneglycol n-butyl methyl ether, ethyleneglycol n-pentyl methyl ether, diethyleneglycol n-pentyl methyl ether, triethyleneglycol n-pentyl methyl ether, propyleneglycol n-pentyl methyl ether, dipropyleneglycol n-pentyl methyl ether, tripropyleneglycol n-pentyl methyl ether, ethyleneglycol n-hexyl methyl ether, diethyleneglycol n-hexyl methyl ether, triethyleneglycol n-hexyl methyl ether, propyleneglycol n-hexyl methyl ether, dipropyleneglycol n-hexyl methyl ether, tripropyleneglycol n-hexyl methyl ether, ethyleneglycol phenyl methyl ether, diethyleneglycol phenyl methyl ether, triethyleneglycol phenyl methyl ether, propyleneglycol phenyl methyl ether, dipropyleneglycol phenyl methyl ether, tripropyleneglycol phenyl methyl ether, ethyleneglycol benzyl methyl ether, diethyleneglycol benzyl methyl ether, triethyleneglycol benzyl methyl ether, propyleneglycol benzyl methyl ether, dipropyleneglycol benzyl methyl ether, tripropyleneglycol benzyl methyl ether, ethyleneglycol isobutyl methyl ether, diethyleneglycol isobutyl methyl ether, triethyleneglycol isobutyl methyl ether, propyleneglycol isobutyl methyl ether, dipropyleneglycol isobutyl methyl ether, tripropyleneglycol isobutyl methyl ether, ethyleneglycol isopentyl methyl ether, diethyleneglycol isopentyl methyl ether, triethyleneglycol isopentyl methyl ether, propyleneglycol isopentyl methyl ether, dipropyleneglycol isopentyl methyl ether, tripropyleneglycol isopentyl methyl ether, ethyleneglycol isohexyl methyl ether, diethyleneglycol isohexyl methyl ether, triethyleneglycol isohexyl methyl ether, propyleneglycol isohexyl methyl ether, dipropyleneglycol isohexyl methyl ether, tripropyleneglycol isohexyl methyl ether, and mixtures thereof.

Preferred glycol ether solvents according to Formula I are ethyleneglycol n-butyl ether, diethyleneglycol n-butyl ether, triethyleneglycol n-butyl ether, propyleneglycol n-butyl ether, dipropyleneglycol n-butyl ether, tripropyleneglycol n-butyl ether, and mixtures thereof.

Most preferred glycol ethers according to Formula I are propyleneglycol n-butyl ether, dipropyleneglycol n-butyl ether, and mixtures thereof.

Suitable glycol ether solvents according to Formula II include propyleneglycol n-propyl ether, dipropyleneglycol n-propyl ether, tripropyleneglycol n-propyl ether, propyleneglycol isopropyl ether, dipropyleneglycol isopropyl ether, tripropyleneglycol isopropyl ether, propyleneglycol n-propyl methyl ether, dipropyleneglycol n-propyl methyl ether, tripropyleneglycol n-propyl methyl ether, propyleneglycol isopropyl methyl ether, dipropyleneglycol isopropyl methyl ether, tripropyleneglycol isopropyl methyl ether, and mixtures thereof.

Preferred glycol ether solvents according to Formula II are propyleneglycol n-propyl ether, dipropyleneglycol n-propyl ether, and mixtures thereof.

Most preferred glycol ether solvents are propyleneglycol n-butyl ether, dipropyleneglycol n-butyl ether, and mixtures thereof, especially dipropyleneglycol n-butyl ether.

Suitable glycol ether solvents can be purchased from The Dow Chemical Company, more particularly from the E-series (ethylene glycol based) Glycol Ethers and the P-series (propylene glycol based) Glycol Ethers line-ups. Suitable glycol ether solvents include Butyl Carbitol, Hexyl Carbitol, Butyl Cellosolve, Hexyl Cellosolve, Butoxytriglycol, Dowanol Eph, Dowanol PnP, Dowanol DPnP, Dowanol PnB, Dowanol DPnB, Dowanol TPnB, Dowanol PPh, and mixtures thereof.

The glycol ether of the product of the invention can boost foaming.

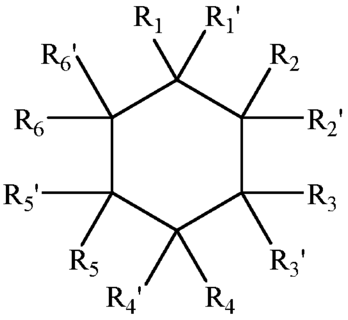
The glycol ether solvent typically is present from about 1% to about 10%, preferably from about 2 to about 8%, most preferably from about 3% to about 7% by weight of the composition.

Cyclic diamine

The composition of the invention preferably comprises from about 0.1% to about 10%, more preferably from about 0.2% to about 5%, and especially from about 0.3% to about 2%, by weight of the composition, of a cyclic diamine of Formula (I).

The term "cyclic diamine" herein encompasses a single cleaning amine and a mixture thereof. The amine can be subjected to protonation depending on the pH of the cleaning medium in which it is used.

Cyclic diamine of Formula (I):

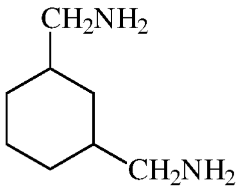


(I)

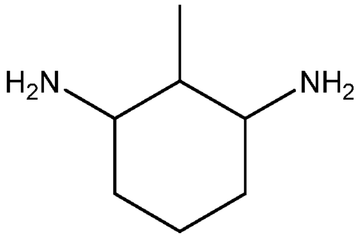
two of the substituents R_s(R_1-R_6, R_1'-R_6') are independently selected from the group consisting of NH2, (C1-C4)NH2 and mixtures thereof and the remaining substituents R_s are independently selected from H, linear or branched alkyl or alkenyl having from 1 to 10 carbon atoms.

The amine of Formula (I) is a cyclic amine with two primary amine functionalities. The primary amines can be in any position in the cycle but it has been found that in terms of grease cleaning, better performance can be obtained when the primary amines are in positions 1,3. It has also been found advantageous in terms of grease cleaning amines in which one of the substituents is -CH3 and the rest are H.

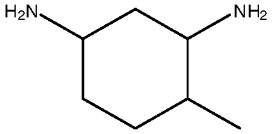
Preferred cyclic diamines for use herein are selected from the group consisting of:



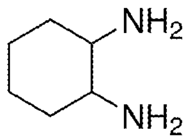
1, 3-bis(methylamine)-cyclohexane,



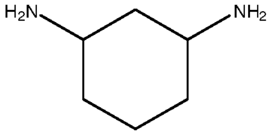
2-methylcyclohexane-1,3-diamine,



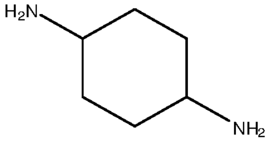
4-methylcyclohexane-1,3-diamine,



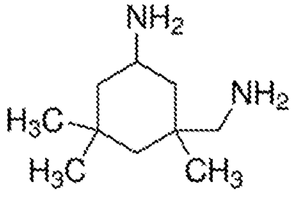
Cyclohexane-1,2-diamine



Cyclohexane-1,3-diamine,



Cyclohexane-1,4-diamine,



Isophorone diamine; and a mixture thereof.

Especially preferred for use herein are cyclic diamines selected from the group consisting of 1, 3-bis(methylamine)-cyclohexane, 2-methylcyclohexane-1,3-diamine, 4-methylcyclohexane-1,3-

diamine and mixtures thereof. 1, 3-bis(methylamine)-cyclohexane is especially preferred for use herein. Mixtures of 2-methylcyclohexane-1,3-diamine, 4-methylcyclohexane-1,3-diamine are also preferred for use herein.

Chelant

The composition herein may optionally further comprise a chelant at a level of from 0.1% to 10%, preferably from 0.2% to 5%, more preferably from 0.2% to 3%, most preferably from 0.5% to 1.5% by weight of the composition.

Suitable chelating agents can be selected from the group consisting of amino carboxylates, amino phosphonates, polyfunctionally-substituted aromatic chelating agents and mixtures thereof.

Amino carboxylates include ethylenediaminetetra-acetates, N-hydroxyethylethylenediaminetriacetates, nitrilo-triacetates, ethylenediamine tetraproprionates, triethylenetetraaminehexacetates, diethylenetriaminepentaacetates, and ethanoldiglycines, alkali metal, ammonium, and substituted ammonium salts therein and mixtures therein, as well as MGDA (methyl-glycine-diacetic acid), and salts and derivatives thereof and GLDA (glutamic-N,N- diacetic acid) and salts and derivatives thereof. GLDA (salts and derivatives thereof) is especially preferred according to the invention, with the tetrasodium salt thereof being especially preferred.

Builder

The composition herein may comprise a builder, preferably a carboxylate builder. Salts of carboxylic acids useful herein include salts of C1-6 linear or at least 3 carbon containing cyclic acids. The linear or cyclic carbon-containing chain of the carboxylic acid or salt thereof may be substituted with a substituent group selected from the group consisting of hydroxyl, ester, ether, aliphatic groups having from 1 to 6, more preferably 1 to 4 carbon atoms, and mixtures thereof.

Preferred salts of carboxylic acids are those selected from the salts from the group consisting of salicylic acid, maleic acid, acetyl salicylic acid, 3 methyl salicylic acid, 4 hydroxy isophthalic acid, dihydroxyfumaric acid, 1,2, 4 benzene tricarboxylic acid, pentanoic acid, citric acid, and mixtures thereof, preferably citric acid.

Alternative carboxylate builders suitable for use in the composition of the invention includes salts of fatty acids like palm kernel derived fatty acids or coconut derived fatty acid, or salts of polycarboxylic acids.

The cation of the salt is preferably selected from alkali metal, alkaline earth metal, monoethanolamine, diethanolamine or triethanolamine and mixtures thereof, preferably sodium.

The carboxylic acid or salt thereof, when present, is preferably present at the level of from 0.1% to 5%, more preferably from 0.2% to 1% by weight of the total composition.

Shear thinning rheology modifier

The composition according to the invention might further comprise a rheology modifying agent, providing a shear thinning rheology profile to the product. Preferably the rheology modifying agent is a non crystalline polymeric rheology modifier. This polymeric rheology modifier can be a synthetic or a naturally derived polymer.

Examples of naturally derived polymeric structurants of use in the present invention include: hydroxyethyl cellulose, hydrophobically modified hydroxyethyl cellulose, carboxymethyl cellulose, polysaccharide derivatives and mixtures thereof. Polysaccharide derivatives include but are not limited to pectine, alginate, arabinogalactan (gum Arabic), carrageenan, gum karaya, gum tragacanth, gellan gum, xanthan gum and guar gum. Examples of synthetic polymeric structurants of use in the present invention include polymers and copolymers comprising polycarboxylates, polyacrylates, polyurethanes, polyvinylpyrrolidone, polyols and derivatives and mixtures thereof.

Preferably the composition according to the invention comprises a naturally derived rheology modifying polymer, most preferably Xanthan Gum.

Generally, the rheology modifying polymer will be comprised at a level of from 0.001% to 1% by weight, alternatively from 0.01% to 0.5% by weight, more alternatively from 0.05% to 0.25% by weight of the composition.

Further optional ingredients

The composition herein may comprise a number of optional ingredients such as rheology trimming agents selected from inorganic salts preferably sodium chloride, C2-C4 alcohols, C2-C4 polyols, poly alkylene glycols, hydrotropes, and mixtures thereof. The composition might also comprise pH trimming and/or buffering agents such as sodium hydroxyde, hydrogen chloride, alkanolamines including monoethanolamine, and bicarbonate inorganic salts. The composition might comprise further minor ingredients selected from preservatives, UV stabilizers, antioxidants, perfumes, coloring agents and mixtures thereof.

Viscosity

The flow curve of products is measured with the use of a Rheometer (TA instruments – model DHR1), a Peltier concentric cylinder temperature system (TA instruments) and a double gap cup and rotor (TA instruments). The flow curve procedure comprises a conditioning step and a flow ramp step at 20°C, the conditioning step comprising a 30s pre-shear step at a shear rate of 10s-1 followed by a 120s zero shear equilibration time. The flow ramp step comprises a Logarithmical shear rate increase from 0.001 s-1 to 10000 s-1 in a time span of 300s. A data filter is set at the instrument recommended minimum torque value of 20μNm.

"Low shear viscosity" is defined as the viscosity measured at a shear rate of 100 s-1. "High shear viscosity" is measured at a shear rate of 10000 s-1.

Spray dispenser

The spray dispenser comprises a housing to accommodate the composition of the invention and spraying means. Suitable spray dispensers include hand pump (sometimes referred to as "trigger") devices, pressurized can devices, electrostatic spray devices, etc. Preferably the spray dispenser is non-pressurized and the spray means are of the trigger dispensing type.

Examples :

Polymerized grease cleaning test

A soil composition comprising 75% of a blend of vegetable based cooking oils - by weight, 1/3 Wheat germ, 1/3 Sunflower oil,1/3 Peanut oil - Source : VANDEMOORTELE Belgium), 25% of Albumin powder from Chicken Egg, (Source : White, Grade II - SIGMA) and 0.05% of Oil Red Dye (Lumogen F Rot 305 – Source : BASF) was prepared through homogeneously mixing the individual components at room temperature. New tiles were first preconditioned through soiling them as described below, baking them at 135°C during 2hrs and consequently cleaning them first with Dreft Original (Belgium) dishwashing liquid detergent followed by a cleaning step with ethanol. This preconditioning process was repeated 4 times prior to using the tiles for polymerized grease cleaning assessment. To evaluate polymerized grease cleaning performance, 0.6-0.7g of this soil composition was homogeneously applied with a Paint Roller (7cm length x 6cm diameter) made from synthetic sponge, over stainless steel tiles (grade is AISI 304, Source : Lasertek, Belgium) of 8*25cm. The soiled tiles were consequently baked for 2h 45 minutes in an oven set at 135 degrees C, followed by cooling for 24h at a relative humidity of 70% and 25°C. The tiles were placed on a four cleaning tracks and four sponge holders straight-line sheen machine tester (Wet Abrasion Scrub Tester Ref. 903PG/SA/B – Source : Sheen Instruments Limited). 1.2 ml of the compositions are sprayed onto the soiled tiles, using the same type of trigger spray across test products, the composition was applied directly on the tile, directed on the area to be cleaned. Cellulosic sponges (Artikel Nr. 33100200 Materialnummer Z 1470000 Zuschnitt Schwamm, feinporig 90x40x40 - Source : MAPA GmbH - Bereich SPONTEX Industrie Germany), were pre-wetted with demi water (20°C) and squeezed till no water drained from the sponge anymore (weight sponge : 21g +/- 1g). Sponges were cut by the supplier to dimensions to fit sponge holders of the cleaning apparatus (9 cm * 4 cm). New sponges were boil washed in a washing machine in absence of detergent 3 times prior to use. Four sponges were placed under normal lab conditions (20°C, 40% rH) on the sponge holder of the sheen machine on to the soiled tiles over the areas where respective detergent products were applied. A weight of 200g was placed on top of the sponges and the sheen machine was set at a moving speed of 20 cycles/minute. The number of strokes required to clean the soiled tile were counted (end point = visual assessment) and the test result of 8 replicates (2 internal replicates * 4 external replicates, i.e. 4 tiles each product tested twice on a tile) were averaged and reported as a grease cleaning index versus a reference product (grease cleaning index test product = (# strokes test product / # strokes reference product) * 100). A lower grease cleaning index represents improved grease cleaning efficacy. Testing products were rotated over the different sponge slots between external replicates.

Test products and test result :

The polymerized grease cleaning performance of spray compositions with and without cyclic diamine technology (Baxxodur ECX210 ex BASF) according to the invention, and with and without glycol ether solvent (Dowanol DPnB Glycol Ether ex Dow) according to the invention, were tested following the test method described herein. The testing results showed the polymerized grease cleaning impact to be approximately 2.5 times more effective when formulating the glycol ether solvent on top of a cyclic diamine containing formulation (cleaning index of 30), compared to when formulating the glycol ether solvent on top of a nil cyclic diamine formulation (cleaning index of 77).

% active by weight of the composition	Example 1	Comparative Example 1	Comparative Example 2	Comparative Example 3
Water and minors (preservative, perfume, dye)	To 100 parts	To 100 parts	To 100 parts	To 100 parts
Sodium bicarbonate	0.1	0.1	0.1	0.1
Ethanol	0.34	0.34	0.34	0.34
Polypropylene glycol	0.05	0.05	0.05	0.05
Dowanol DPnB Glycol Ether	5	5	-	-
Baxxodur ECX210	0.5	-	0.5	-
L-glutamic acid N,N-diacetic acid, tetra sodium salt	1	1	1	1
Alkyl Ethoxy Sulphate (C24EO3)	6.55	6.55	6.55	6.55
Alkyl Dimethyl Amine Oxide (C12-14)	2.45	2.45	2.45	2.45
Xanthan Gum	0.10	0.10	0.10	0.10
pH (10% dilution in distilled water – through trimming with MEA / HCl)	10.9	10.9	10.9	10.9

Dowanol DPnB Glycol Ether : Di-Propylene Glycol n-butyl glycol ether, available from Dow.

Baxxodur ECX210: mixture of 4-methylcyclohexane-1,3-diamine and 2-methylcyclohexane-1,3-diamine, available from BASF.

The dimensions and values disclosed herein are not to be understood as being strictly limited to the exact numerical values recited. Instead, unless otherwise specified, each such dimension is intended to mean both the recited value and a functionally equivalent range surrounding that value. For example, a dimension disclosed as “40 mm” is intended to mean “about 40 mm”

CLAIMS

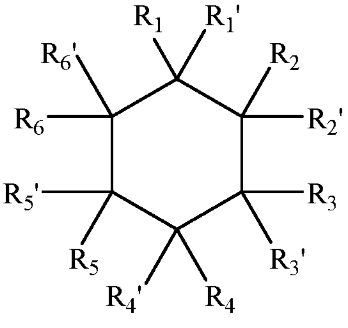
What is claimed is:

1. A cleaning product comprising a spray dispenser and a cleaning composition suitable for spraying and foaming, the composition housed in the spray dispenser wherein the composition comprises:

   i) from about 5 to about 15% by weight of the composition of a surfactant system;

   ii) a glycol ether solvent selected from the group consisting of glycol ethers of Formula I: R1O(R2O)nR3, Formula II: R4O(R5O)nR6 and mixtures thereof

   wherein
   R1 is a linear or branched C4, C5 or C6 alkyl or a substituted or unsubstituted phenyl, R2 is ethyl or isopropyl, R3 is hydrogen or methyl and n is 1, 2 or 3
   R4 is n-propyl or isopropyl, R5 is isopropyl, R6 is hydrogen or methyl and n is 1, 2 or 3; and
   iii) a cyclic diamine of Formula(I):



(I)

   wherein two of the Rs, are selected from the group consisting of NH2, (C1-C4)NH2 and mixtures thereof and the remaining Rs are independently selected from H, linear or branched alkyl or alkenyl having from 1 to 10 carbon atoms.

2. A product according to claim 1 wherein the composition has a pH greater than 8, preferably from 10.5 to 11.5 as measured at 10% solution in distilled water at 20°C and a reserve alkalinity of from about 0.1 to about 1 expressed as g NAOH/ 100ml of composition at a pH of 10.

3. A product according to any of the preceding claims wherein the composition has a reserve alkalinity of from about 0.1 to about 0.5 expressed as g NAOH/ 100ml of composition at a pH of 10.

4. A product according to any of the preceding claims wherein the surfactant system and the glycol ether solvent are in a weight ratio of from about 5:1 to about 1:1.

5. A product according to any of the preceding claims wherein the glycol ether solvent and the cyclic diamine are in a weight ratio of from about 20:1 to about 1:1, preferably from 15:1 to 5:1.

6. A product according to any of the preceding claims wherein the surfactant system comprises an anionic surfactant and a co-surfactant.

7. A product according to the preceding claim wherein the anionic surfactant comprises a sulfate surfactant, preferably an alkyl ethoxylated sulfate surfactant, more preferably an alkyl ethoxylate sulfate having an average degree of ethoxylation of from about 2 to about 5.

8. A product according to claim 6 wherein the sulfate surfactant comprises a branched short chain alkyl sulfate, preferably the branched short chain alkyl sulfate is a hexyl sulfate, preferably 2-ethyl hexyl sulfate.

9. A product according to the preceding claim wherein the surfactant system comprises a non-sulfated branched short chain alcohol.

10. A product according to the preceding claim where the anionic surfactant and the co-surfactant are present in a weight ratio of about 4:1 to about 1:1 and wherein the co-surfactant is selected from the group consisting of amphoteric surfactant, zwitteronic sufactant and mixtures thereof.

11. A product according to any of the preceding claims wherein the composition comprises from about 1% to about 7% by weight of the composition of the glycol ether solvent.

12. A product according to any of the preceding claims wherein the glycol ether solvent is selected from the group consisting of dipropylene glycol n-butyl ether, propyleneglycol n-butyl ether and mixtures thereof.

13. A product according to any of the preceding claims wherein the remaining Rs, are selected from H, CH3 and mixtures thereof and preferably two Rs are selected from the group consisting of NH2, (C1-C4)NH2 and mixtures thereof and are in positions 1 and 3.

14. A product according to any of the preceding claims wherein the cyclic diamine is selected from the group consisting of 1, 3-bis(methylamine)-cyclohexane, 2-methylcyclohexane-1,3-diamine, 4-methylcyclohexane-1,3-diamine and mixtures thereof, preferably the cyclic diamine is selected from the group consisting of 2-methylcyclohexane-1,3-diamine, 4-methylcyclohexane-1,3-diamine and mixtures thereof.

15. A product according to claim 1 wherein the composition has a pH of from 10 to 11.5 as measured in a 10% solution in distilled water at 20°C, a reserve alkalinity of from 0.1 to 0.3 expressed as g NAOH/ 100ml of composition at a pH of 10, the composition comprising:
    i) 4 to 10% by weight of the composition of an alkyl ethoxylate sulfate, preferably the alkyl ethoxylate sulfate having an average degree of ethoxylation of about 3;
    ii) 1 to 5% by weight of the composition of amine oxide surfactant;
    iii) 3% to 8% by weight of the composition of glycol ether solvent, preferably dipropylene glycol n-butyl ether; and
    iv) 0.1% to 2% by weight of the composition of a cyclic diamine preferably selected from the group consisting of 2-methylcyclohexane-1,3-diamine, 4-methylcyclohexane-1,3-diamine and mixtures thereof.

16. A product according to claim 1 wherein the composition has a pH of from 10 to 11.5 as measured in a 10% solution in distilled water at 20°C, a reserve alkalinity of from 0.1 to 0.3 expressed as g NAOH/ 100ml of composition at a pH of 10, the composition comprising:
    i) 4 to 10% by weight of the composition of a branched short chain sulfate, preferably 2-ethyl hexyl sulfate,
    ii) 1 to 5% by weight of the composition of amine oxide surfactant; and

iii) 3% to 8% by weight of the composition of glycol ether solvent, preferably dipropylene glycol n-butyl ether; and

iv) 0.1% to 2% by weight of the composition of a cyclic diamine preferably selected from the group consisting of 2-methylcyclohexane-1,3-diamine, 4-methylcyclohexane-1,3-diamine and mixtures thereof.

17. A product according to any of the preceding claims wherein the composition further comprises an alkanol amine, preferably monoethanol amine.

18. A product according to any of the preceding claims wherein the composition further comprises a further solvent selected from the group consisting of C2-C4 alcohols, C2-C4 polyols, poly alkylene glycol and mixtures thereof.

19. A product according to any of the preceding claims wherein the composition has a high shear viscosity (at 10,000 s-1) of from about 1 to about 20 mPa s at 20°C as measured using the method defined herein.

20. A product according to the preceding claim wherein the composition has a low shear (at 100 s-1) to high shear viscosity ratio of from about 10:1 to about 1.5:1 at 20°C as measured using the method defined herein.

21. A product according to any of the preceding claims wherein the composition comprises a rheology modifier, preferably xanthan gum.

22. A method of cleaning soiled dishware using the product according to any of the preceding claims, the method comprising the steps of:
   a) optionally pre-wetting the soiled dishware;
   b) spraying the cleaning composition onto the soiled dishware;
   c) optionally adding water to the soiled dishware during a period of time;
   d) optionally scrubbing the dishware; and
   e) rinsing the dishware.

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2016/058735

A. CLASSIFICATION OF SUBJECT MATTER
INV. C11D3/20 C11D3/30 C11D11/00 C11D17/04
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
C11D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2004/078902 A1 (PROCTER & GAMBLE) 16 September 2004 (2004-09-16) claims; examples	1-22
Y	WO 98/01530 A1 (COLGATE PALMOLIVE CO) 15 January 1998 (1998-01-15) page 15, line 16 - line 20; claims; examples	1-22
Y	DE 101 62 648 A1 (HENKEL KGAA) 10 July 2003 (2003-07-10) paragraphs [0001], [0023], [0078] - [0086], [0128]; claims; examples	1-22
Y	DE 10 2006 017315 A1 (HENKEL KGAA) 18 October 2007 (2007-10-18) paragraphs [0032] - [0042], [0124]; claims; examples	1-22
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☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search
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INTERNATIONAL SEARCH REPORT

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2007/135645 A2 (PROCTER & GAMBLE) 29 November 2007 (2007-11-29) page 12, last paragraph; claims; examples page 13, last paragraph -----	1-22

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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