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(54) **Dishwasher detergent**

(57) The present invention relates to an enzyme-based, saline, water-based dishwasher detergent comprising from 0 to 2% enzymes of the type amylase and/or protease, from 5 to 10% inorganic salts, from 20 to 25%

formate and 60-75% water. The dishwasher detergent is gentle, efficient and environmentally friendly.

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Description

[0001] The present application relates to a dishwasher detergent for dishwashing as well as the use thereof for washing tableware. The dishwasher detergent is especially useable for dishwashing with a continuous feed during the washing process. Thus, the dishwasher detergent is particularly suitable for industrial use in e.g. industrial kitchens.

[0002] The novelty and the invention are based on:

- Using enzymes and salts in combination for dishwashing.
- Controlling the conductivity by means of salts so that feed takes place continuously and so that the wash effect is not reduced.
- Carrying out the wash at low temperatures, 40 °C, thus providing a financial, energy and environment-related advantage for the customers.
- Offering the industry a product which is not dangerous to safety, health or environment and thus not subjected to legislative restrictions for the use.

[0003] The dishwasher detergent according to the invention consists of a so far unknown combination of enzymes and salts.

[0004] The salts in the dishwasher detergent result in a specific conductivity of the dishwashing water used during the washing. During the dishwashing process, the dishwasher detergent is fed effectively on the basis of conductivity measurements, whereby it is ensured that the washing effect is not reduced due to lack of dishwasher detergent.

[0005] US 7211552 B1 discloses a non-toxic, environmentally friendly, enzymatic cleaning composition for cleaning surgical instruments. The composition contains from 64 to 68% water, from 1 to 2% sodium formate, from 4 to 6% sodium tripolyphosphate, from 0.1 to 0.3% calcium chloride, from 3 to 5% protease and from 1 to 3% amylase. The composition according to the present invention differs therefrom by containing substantially more formate and fewer enzymes.

[0006] WO 2008/116915 discloses an enzyme composition containing an enzyme, an inhibitor consisting of phenyl boronic acid or a derivate thereof and from 0.1 to 20% of a dissolved salt. The dissolved salt is used for increasing the effect of the phenyl boronic acid inhibitor. The composition may be used as dishwasher detergent. The composition according to the present invention differs therefrom in that it contains a limited amount of enzymes as well as at least 25% of a dissolved salt, where a formate salt constitutes at least 20% of the composition.

[0007] The invention relates to a fluid - a so-called dishwasher detergent for use in dishwashers. This concerns all types of machines having continuous feed during the washing process.

[0008] Thus, it was found that the specific combination of enzymes and salts in the dishwasher detergent according to the invention is especially suitable for controlling the conductivity and thus the continuous feed.

[0009] The dishwasher detergent may be used in machines in private homes, but mostly it will be used in large industrial dishwashers and dishwashing tunnels. Typically, they may be found in restaurants, cantinas, hotel kitchens and similar places. Thus, the dishwasher detergent according to the invention is especially suitable for dishwashing in industrial dishwashers. The dishwasher detergent according to the invention is especially suitable for dishwashing in machines with a short washing process such as between 30 seconds and 15 minutes, and where the washing process must be effective.

[0010] The dishwasher detergent has several functions in the process. It must reduce the surface tension of the water in order to increase the wash effect of the water. Further, it must contribute actively to loosen the various kinds of dirt consisting of the various substances contained in food and beverages, e.g. fat, proteins etc.

[0011] Also, the fluid must be able to remove layers emerging in coffee and tea cups after long-time use - without dishwashing - and it must ensure that the water and thus the chalk is not retained in the surface, whereby visible grey deposits are generated in e.g. drinking glasses.

[0012] Further, the fluid must ensure that loosened dirt does not stick to the washing subjects during the washing process and finally, potential residues must be harmless when using the tableware.

[0013] All said properties must be present regardless of the type of tableware, e.g. metal alloys such as stainless steel, aluminium pots, crockery, glass, plastic etc.

[0014] The effect of the fluid on said materials must be neutral so that no discolorations appear on the tableware.

[0015] Today, there are already agents fulfilling many of the above requirements - but all of these agents are based on highly alkaline substances (i.e. a pH of 14) and thus a very aggressive environment. Likewise, chlorine is added to many of the products in order to achieve additional cleansing effect. In addition to the high pH, the agents are thus also damaging to humans and the environment.

[0016] Thus, it is an object of the invention to provide an efficient dishwasher detergent functioning at a neutral pH level such as between 6 and 9.

[0017] A further object of the invention is to provide a dishwasher detergent, which does not use chlorine in order to achieve a cleansing effect.

- [0018]** A further object of the invention is to provide an environmentally friendly dishwasher detergent.
- [0019]** A further object of the invention is to provide a dishwasher detergent which does not contain ill health residues sticking to the washed tableware.
- [0020]** A further object of the invention is to provide a dishwasher detergent suitable for providing an easily measurable control, whereby the continuous feed can be controlled efficiently.
- [0021]** A further object of the invention is to provide a dishwasher detergent suitable for softening the water and for reducing the surface tension.
- [0022]** A further object of the invention is to provide a dishwasher detergent eliminating limescale deposits from the dishwashing water.
- [0023]** A further object of the invention is to provide a dishwasher detergent functioning at low temperatures, such as 40 °C.

Description of the invention

- [0024]** It has now been found that it is possible to prepare an environmentally friendly concentrate, which, contrary to previously known agents, may be used for all types of dishwashing without use of highly alkaline substances or chlorine.
- [0025]** Thus, it has surprisingly been found that the dishwasher detergents according to the invention, which are based on formate salts and enzymes, are usable for obtaining the objects of the invention.
- [0026]** Thus, the dishwasher detergent according to the invention is an enzyme-based, saline, water-based dishwasher detergent comprising: From 0 to 2% enzymes of the type amylase and protease, from 5 to 10% inorganic salts, from 20 to 25% formate, where water constitutes the rest.
- [0027]** Thus, the dishwasher detergent according to the invention typically contains between 60 and 75% water or between 60 and 70% water.
- [0028]** Potassium formate is the preferred formate salt.
- [0029]** In the present application, %-specifications are to be read as % by weight unless otherwise stated.
- [0030]** The concentrate consists of enzymes, salts and water adjusted to a pH between 6.5 and 9.5 such as between 7.5 and 9.0. In an especially preferred embodiment, the concentrate consists of enzymes, salts and water adjusted to a pH of approx. 8.5.
- [0031]** Thus, the invention relates to an enzyme-based saline dishwasher detergent consisting of up to 2% enzymes, from 5 to 10% inorganic salts, from 20 to 25% formate and the rest water.
- [0032]** In a preferred embodiment, from 0.1 to 2% enzyme is used, more preferred from 0.2 to 1.8% enzyme and even more preferred from 0.5 to 1.5% enzyme.
- [0033]** It is preferred that the enzymes used show optimum enzyme activity at a pH between 6 and 9.
- [0034]** Further, it is preferred that the enzymes used show optimum enzyme activity at low temperatures, such as temperatures between 30 and 50 °C, or at temperatures between 35 and 45 °C.
- [0035]** The enzymes usable according to the invention are chosen from the group consisting of amylases and proteases. In a preferred embodiment, the dishwasher detergent according to invention contains both amylase and protease. In a preferred embodiment, the amylase is an alpha-amylase. Inter alia WO 94/02597, WO 94/18314, WO 96/23873, and WO 97/43424 disclose usable amylases, incl. variants with substitutions in one or more of the following positions: 15, 23, 105, 106, 124, 128, 133, 154, 156, 181, 188, 190, 197, 202, 208, 209, 243, 264, 304, 305, 391, 408, and 444. Usable, commercially available amylases are inter alia DURAMYL(R), LIQUEZYME(R), TER-MA-MYL(R), NATALASE(R), SUPRAMYL(R), STAINZYME(R), FUNGAMYL (R) and BAN(R), RAPIDASE(R), PURASTAR(R) and PURASTAR OXAM (R).
- [0036]** In an especially preferred embodiment of the invention, the amylase STAINZYME™ is used. Said amylase has been found to be especially usable for the dishwasher detergent according to the invention.
- [0037]** In a preferred embodiment, the dishwasher detergent contains between 0.1 and 1% amylase. In a more preferred embodiment, the dishwasher detergent contains between 0.2 and 0.8% amylase.
- [0038]** In a preferred embodiment, the dishwasher detergent contains between 0.1 and 1% protease. In a more preferred embodiment, the dishwasher detergent contains between 0.2 and 0.8% protease.
- [0039]** According to a preferred embodiment, the protease is a serine protease such as subtilisin (EC 3.4.21.62). Usable, commercially available proteases are inter alia Alcalase(R), Savinase(R), Polarzyme(R), Kannase(R), Liquanase (R), Liquanase Ultra(R), Savinase Ultra(R), and Everlase(R)
- [0040]** In a preferred embodiment, the dishwasher detergent contains between 0.1 and 1% amylase and between 0.1 and 1% protease. In an even more preferred embodiment, the dishwasher detergent contains between 0.2 and 0.8% amylase and between 0.2 and 0.8% protease.
- [0041]** The dishwasher detergent according to the invention may also contain additional ingredients. In addition to amylase and protease, the dishwasher detergent according to the invention may e.g. also contain one or several additional enzymes such as lipase, peroxidase, cellulase, mannanase, pectinase, pectinlyase, cutinase and laccase

[0042] Inorganic salts usable according to the invention are water-soluble inorganic salts. According to the invention, water-soluble salts have a solubility in water at 40 °C of more than 5g per 100g water. Water-soluble salts usable according to the invention are generally alkali metal salts, ammonium salts, nitrate salts, chloride salts and sulphate salts.

[0043] In a preferred embodiment, an alkali metal salt is used.

[0044] In an even more preferred embodiment, the in-organic salt is chosen among chloride alkali metal salts and phosphate alkali metal salts.

[0045] In an even more preferred embodiment, the in-organic salt is chosen among sodium chloride and potassium tripolyphosphate ($K_5P_3O_{11}$) or mixtures thereof.

[0046] In an especially preferred embodiment, the dishwasher detergent contains potassium tripolyphosphate ($K_5P_3O_{11}$). It is preferred that the dishwasher detergent contains between 3 and 10% potassium tripolyphosphate ($K_5P_3O_{11}$), such as between 4 and 9% potassium tripolyphosphate ($K_5P_3O_{11}$), such as between 5 and 8% potassium tripolyphosphate ($K_5P_3O_{11}$).

[0047] Thus, it has surprisingly been found that such amounts of potassium tripolyphosphate ($K_5P_3O_{11}$) have an advantageous effect on the dishwasher detergent according to the invention.

[0048] The fluid is added to the dishwasher as a concentrate and is added to the washing process by way of the conductivity in the wash water. Thus, the dishwasher detergent is added as needed and is fed on the basis of continuous measurements of the conductivity of the wash water.

[0049] The fluid or the dishwasher detergent according to the invention has the advantage that it softens the water and reduces the surface tension. Further, the agent eliminates limescale deposits from the water. In addition, the dishwasher detergent is temperature-stable and is effective at low temperatures. It is stable during transport and storage and finally, it is non-corrosive. Further, the agent does not leave discolorations on various materials such as plastic, glass, crockery, various metal alloys etc.

Example:

[0050]

CONCENTRATE	% BY WEIGHT
Water	66.0
Sodium chloride,(salt)	2.0
Potassium formate (formate)	22.8
Potassium tripolyphosphate (salt)	6.4
Phosphoric acid (pH adjustment)	1.3
Stainzyme (amylase) (enzyme)	0.75
Everlase (protease) (enzyme)	0.75

[0051] The agent was used as dishwasher detergent and was found to have a very good wash effect. It was found that continuous feed of the agent was extremely easy as it was easy to control the agent by means of conductivity measurements of the wash water so that a change in the water conductivity resulted in adding of additional dishwasher detergent

Claims

1. Enzyme-based, saline, water-based dishwasher detergent comprising: From 0 to 2% enzymes of the type amylase and/or protease, from 5 to 10% inorganic salts, from 20 to 25% formate and 60-75% water.
2. Dishwasher detergent according to claim 1, **characterised in that** formate is defined as potassium formate.
3. Dishwasher detergent according to claim 1 or 2, **characterised in that** it does not contain chlorine.
4. Dishwasher detergent according to any of the preceding claims, **characterised in that** it has a pH between 6.5 and 9.5.

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5. Dishwasher detergent according to any of the preceding claims, **characterised in that** it contains between 0.1 and 1% amylase and between 0.1 and 1% protease.
6. Dishwasher detergent according to any of the preceding claims, **characterised in that** the enzymes has optimum enzyme activity at a pH level between 6.5 and 9.5.
7. Dishwasher detergent according to any of the preceding claims, **characterised in that** the enzymes have optimum enzyme activity at a temperature between 30 and 50 °C.
8. Use of a dishwasher detergent according to claim 1 or 2 for dishwashing.

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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