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(54) **Sanitising/destaining/rinsing process and compositions.**

(57) A sanitising/destaining/rinsing process for use in a spray washing machine characterised in that it comprises using a peroxy compound in rinse water, *inter alia*, is disclosed.

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SANITISING/DESTAINING/RINSING PROCESS AND COMPOSITIONS

This invention relates to a sanitising/destaining/rinsing process and compositions, more particularly for use in rinsing in spray washing machines, such as dish and glass washers.

In machine dish and glass washers, the wash programme conventionally comprises an alkaline wash, followed by a final rinse in hot water containing a rinse additive. There may be additional pre-washes or pre-rinses to these two basic operations and they may be sub-divided. In common practice, the wash temperature is 60-65°C and the rinse temperature is 80-85°C.

The use of such rinse temperatures was recommended by the National Sanitation Foundation in America in 1948/49 and the N.S.F. currently specify wash and rinsing conditions, including wash and rinse volumes, wash and rinse temperatures, wash and rinse pressures, together with minimum residence times in the rinse and wash processes for dish and glass washing machines. The recommendations on temperatures are based on the amount of heat required for thermal sanitisation. In America, the standards are often included in local regulations, but they have not per se been adopted outside North America. In many instances, the wash and rinse temperatures are alone specified in local regulations and the use of these temperatures has provided an acceptable level of sanitising.

With the increasing cost of energy, however, the use of these high temperatures has become very expensive and a considerable amount of effort has been directed towards providing dishwashing systems that will operate at lower temperatures. The sanitising action required once the temperatures have been reduced has been provided by the use of chlorine-release agents

which are accepted as being capable of providing the necessary sanitising action. The use of available chlorine as a sanitiser in the final rinse water has, however several drawbacks. The first drawback is that if not carefully regulated the residual chloride can cause an increased level of corrosion. Other drawbacks include the residues left on glassware and the odour in use. A further disadvantage is that chlorine-release agents cannot easily be included in the rinse additive that must in any case be injected into the rinse line and, therefore, two products are required to be injected into the final rinse water.

The only other chemicals that are, at present, recommended for use in dish and glass washing operations are quaternary ammonium compounds and iodine. Both are unsatisfactory for various reasons.

The concentration at which the quaternary compounds need to be used causes undesirable side effects in spray washing processes. These include generation of foam, poor rinsing effects, absorption onto the surfaces, followed by reaction with anionic materials, such as tannins, which causes staining, and reaction with food soils causing problems in the washing process. Iodine-based product cause problems due to the reaction thereof with starch, widely present in food soil, and the fact that iodine can vaporise when used at temperatures above 40-45°C.

It has now been unexpectedly found that the addition of peroxy compounds to the final rinse can provide the extra level of sanitisation required when spray washing machines are operated at lower temperatures. The present invention may, of course, also be applied at the conventional higher temperatures where it provides an additional safety factor should the temperatures not be met or maintained. Although peroxy compounds have been recognized as bactericides for over a century they have never been widely used

because of the slow rate of bacterial kill thereof and the high concentrations required. It was only following the production, or in situ generation, of peracid compounds, such as peracetic acid, that this type of chemical has become useful economically. However, it was quite unexpected that peroxy compounds would be effective at the low concentrations and short exposure times required for use in the rinsing sections of spray washing machines.

The present invention provides a sanitising/destaining/rinsing process for use in a spray washing machine characterised in that it comprises using a peroxy compound in rinse water. Generally, the rinse water also comprises a surfactant. However, particularly when the rinsing operation is sub-divided, the peroxy compound need not always be used with a surfactant.

In conventional operation, the peroxy compound, preferably hydrogen peroxide, is generally used following one or more alkaline wash cycles. Sufficient peroxy compound may be used to provide up to 500 ppm available oxygen, preferably up to 50 ppm available oxygen, typically about 20 ppm available oxygen.

The present invention also provides the use of a peroxy compound as a sanitising/destaining/rinsing agent in rinse water of a spray washing machine. Generally, the peroxy compound is used together with a surfactant- containing rinse aid following an alkaline wash.

The present invention further provides an aqueous sanitising/destaining/rinsing composition characterised in that it comprises a peroxy compound and a surfactant suitable for use in a rinse aid. The peroxy compound will generally be used in the form of a combined composition which includes a surfactant together with the peroxy compound. Such compositions when added to

the rinse water of spray washing machines may provide effective rinsing and drying properties, together with effective biocidal activity even when the machine is operated at reduced temperatures. The combination is preferably formulated as a liquid composition and the peroxy compound is preferably hydrogen peroxide. However, other peroxy compounds may be used, although for practical reasons they should be in a liquid form, and to prevent subsequent problems on rinsing should not include high levels or inorganic salts. It will generally be necessary to include a stabiliser for the peroxy compound in the liquid composition. The stabiliser will generally buffer the composition to a pH at which the peroxy compound is stable (generally 2 to 5) and will also scavenge for metal ions which tend to destabilise the peroxy compound. Suitable stabilisers include organic and inorganic acids, alkali metal pyrophosphates and salts of tin alone or together with compounds of magnesium or phosphorus. Any stabiliser is generally used in a conventional amount.

The peroxy compound is used in the combined composition together with a surfactant. Preferred surfactants are weakly foaming non-ionic wetting agents which are, for example, ethylene oxide adducts to fatty alcohols or alkyl phenols or ethylene oxide adducts to polypropylene oxides of molecular weight from 500 to 2000, commonly called the "PLURONICS", or adducts of ethylene oxide and propylene oxide with mono- or multifunctional initiators, commonly alcohols or amines as described in the book "Non-ionic Surfactants" by SCHICK (published by Marcel Dekker, 1966) or adducts of ethylene oxide, propylene oxide and/or butylene oxide with fatty alcohols or alkyl phenols.

It may also be necessary to include a solubiliser in the combined, preferably liquid, composition to maintain the remaining components in solution. Suitable solubilisers, which may be used in

conventional amounts, include the low molecular weight alcohols typified by methanol, ethanol, isopropanol, propylene glycol, hexylene glycol and low molecular weight adducts of ethylene oxide and propylene oxide with mono- or multi- functional initiators, low molecular weight anionic compounds typified by the xylene, toluene and cumene sulphonates and low molecular weight alcohol phosphate esters or the phosphate esters of alcohol/ethylene oxide adducts.

The compositions according to the present invention may contain sufficient peroxy compound to provide up to 20% available oxygen, preferably from 1 to 10% available oxygen, typically about 5% available oxygen. The surfactant component may be present in amounts of up to 60% w/w, preferably from 10 to 50% w/w, typically about 20% w/w.

Such compositions may be produced by conventional means involving mixing the components in an appropriate order.

These compositions are added to the rinse water of spray washing machines, thus providing in-use solutions. When diluted with water, generally at the time of use, up to 500 ppm, preferably about 20 ppm, available oxygen, would commonly be present. In use, generally up to 500 ppm, preferably about 75 ppm, surfactant would be provided.

The present invention is illustrated by the following Examples:

EXAMPLE 1

Various rinsing processes were investigated in the rinse cycle of a HOBART AME commercial dishwasher. This uses a 45 second wash with an alkaline detergent (DIVERSEY QED) used at the rate 3 grams/litre in the wash water. The wash was followed by a 5 second dwell and a 10 second rinse using 3 litres of water at 8 psi (0.56 kg/cm^2).

The machine was used to wash plates artificially soiled with the bacteria Micrococcus caseolyticus (NCIB 3251) in a starch-based soil and conditioned overnight. This ensured that the soil was not completely removed by the washing process. An unwashed control had a level of 10^5 to 10^6 bacteria. The washed plates were swabbed to measure residual bacteria and the log decimal reduction in the number of bacteria was calculated following each rinsing process.

The following rinsing processes were used, the surfactant being Ethylan CPG 660:-

(1) Surfactant alone, at a concentration of 80 ppm, used at a wash temperature of 60°C and a rinse temperature of 80°C. These are the standard conditions referred to above and it is to be assumed that they provide adequate sanitising.

(2) Surfactant alone, at a concentration of 80 ppm, used at a wash temperature of 50°C and a rinse temperature of 60°C.

(3) The surfactant together with 50 ppm chlorine (in the rinse water) at a wash temperature of 50°C and a rinse temperature of 60°C.

(4) Hydrogen peroxide alone, at a concentration of 20 ppm active oxygen (AvO_2), at a wash temperature of 50°C and a rinse temperature of 60°C.

(5) Hydrogen peroxide at various concentrations, in the presence of surfactant, at a concentration of 80 ppm, used at a wash temperature of 50°C and a rinse temperature of 60°C.

(6) Hydrogen peroxide at 20 ppm in the presence of surfactant, at a concentration of 80 ppm, used at a wash temperature of 60°C and a rinse temperature of 80°C.

The results were as follows:

		Mean Log Decimal Reduction
(1)	Surfactant alone (60/80°C)	4.90
(2)	Surfactant alone (50/60°C)	1.48
(3)	Surfactant + 50 ppm Cl_2 (50/60°C)	4.06
(4)	No surfactant + 20 ppm AvO_2 (50/60°C)	3.83
(5)	Surfactant + 10 ppm AvO_2 (50/60°C)	4.26
	+ 20 ppm AvO_2	4.69
	+ 50 ppm AvO_2	4.67
(6)	Surfactant + 20 ppm AvO_2 (60/80°C)	4.98

A value of at least 4 is desirable.

EXAMPLE 2

The following composition according to the present invention was evaluated:

Ethylan CPG 660	20.000 pbw
Hydrogen peroxide (as 27.5%, by weight, solution in water)	55.000 pbw
Propylene glycol (solubiliser)	20.000 pbw
Disodium dihydrogen pyrophosphate (stabiliser)	0.005 pbw
Water to	100 pbw

This composition was evaluated at an in-use concentration of 400 ppm, generating 30 ppm AvO_2, and its ability for rinsing, drying and sanitising measured and compared to a conventional system using the machine and wash programme detailed in Example 1.

The results are shown below:

	LDR	Rinsing Effect	Drying Time
Conventional Rinse Aid	0.86	Good	105/110 secs
Composition according to the present invention	4.74	Good	105/110 secs

EXAMPLE 3

Further examples of compositions according to the present invention:

(a)	Pluriol PE6200	16.000 pbw
	Pluriol PE6100	4.000 pbw
	Hydrogen peroxide (as 27.5% by weight, solution in water)	55.000 pbw
	Propylene glycol	5.000 pbw
	Disodium dihydrogen pyrophosphate	0.005 pbw
	Water to	100 pbw
(b)	Pluriol PE6200	14.000 pbw
	Triton CF32	6.000 pbw
	Hydrogen peroxide (as 27.5% by weight, solution in water)	55.000 pbw
	Propylene glycol	5.000 pbw
	Disodium dihydrogen phosphate	0.005 pbw
	Phosphoric acid to	pH 4
	Water to	100 pbw
(c)	Ethylan CPG 660	20.000 pbw
	Hydrogen peroxide (as 35% by weight, solution in water)	28.600 pbw
	Sodium xylene sulphonate (as 30%, by weight, solution in water)	7.000 pbw
	Disodium dihydrogen pyrophosphate	0.005 pbw
	Water to	100 pbw

EXAMPLE 4

The effect of the alkaline wash is demonstrated by the following:

The results were obtained using the method described previously, but instead of the alkaline detergent QED, mixtures of sodium tripolyphosphate, trisodium phosphate and sodium hydroxide were used to

generate washing solutions of varying pH. The rinsing solution contained a fixed level of 100 ppm non-ionic surfactant (Ethylan CPG 660) as rinse aid. The results are as follows:

	pH	Mean LDR
Rinse aid alone (60/80)	10	4.8
Rinse aid alone (50/60)	10	1.46
Rinse aid + 20 ppm AvO_2	7	3.88
	9	4.13
	11	4.73

This shows the improved sanitising achieved when the rinsing process according to the present invention is carried out following an alkaline wash. In all cases, destaining may be assessed visually.

In the Examples given above:

Ethylan CPG 660 (Diamond Shamrock) is a propoxylated alcohol ethoxylate.

Pluriol PE6200 and PE6100 (BASF) are block copolymers of the Pluronic type.

Triton CF32 (Rohm & Haas) is an amine polyglycol condensate.

Claims

1. A sanitising/destaining/rinsing process for use in a spray washing machine characterised in that it comprises using a peroxy compound in rinse water.

2. A process as claimed in claim 1 wherein a surfactant is also used in rinse water.

3. A process as claimed in claim 1 or claim 2 wherein the use of the peroxy compound follows an alkaline wash.

4. A process as claimed in any of claims 1 to 3 wherein the peroxy compound is hydrogen peroxide.

5. A process as claimed in any of claims 1 to 4 wherein sufficient peroxy compound is used to provide up to 500 ppm available oxygen.

6. A process as claimed in claim 5 wherein sufficient peroxy compound is used to provide up to 50 ppm available oxygen.

7. A process as claimed in claim 6 wherein sufficient peroxy compound is used to provide about 20 ppm available oxygen.

8. An aqueous sanitising/destaining/rinsing composition characterised in that it comprises a peroxy compound and a surfactant suitable for use in a rinse aid.

9. A composition as claimed in claim 8 wherein sufficient peroxy compound to provide up to 20% available oxygen is present and/or up to 60% w/w surfactant is present.

10. A composition as claimed in claim 9 wherein sufficient peroxy compound to provide from 1 to 10% available oxygen is present and/or from 10 to 50% w/w surfactant is present.

11. A composition as claimed in claim 10 wherein sufficient peroxy compound to provide about 5% available oxygen is present and/or about 20% w/w surfactant is present.

12. A composition as claimed in any of claims 8 to 11 wherein a stabilizer and/or a solubilizer is/are present.

13. An in-use sanitising/destaining/rinsing solution characterised in that it comprises a composition as claimed in any of claims 8 to 12 diluted with water to provide up to 500 ppm available oxygen and/or up to 500 ppm surfactant.

14. A solution as claimed in claim 13 wherein about 20 ppm available oxygen and/or about 75 ppm surfactant is/are provided.

15. The use of a peroxy compound as a sanitising/destaining/rinsing agent in rinse water of a spray washing machine.