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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : C11D	A2	(11) International Publication Number: **WO 00/02980**
		(43) International Publication Date: 20 January 2000 (20.01.00)

(21) International Application Number: PCT/GB99/02048

(22) International Filing Date: 8 July 1999 (08.07.99)

(30) Priority Data:
9814968.5 10 July 1998 (10.07.98) GB

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(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
Without international search report and to be republished upon receipt of that report.

(54) Title: DETERGENT

(57) Abstract

A detergent composition comprising a granulated percarbonate and a blend which encapsulates the percarbonate is described. The blend comprises a sulphate, carboxymethyl cellulose and a nonionic surfactant. The detergent composition comprises sodium metasilicate and does not include a zeolite, a perborate or a phosphate. The composition is capable of being stored in a water–soluble PVA film packaging for at least nine months and wherein the composition comprises between 1 % and 15 % percarbonate. The composition can include a phosphate substitute such as a polyacrylate. The composition can be compressed into a tablet format and used as a laundering product.

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"Detergent"

This invention relates to a detergent product formulations which can be packaged in water soluble film. The invention also relates to detergent formulations excluding phosphates.

A product of the invention is ideally for use in the laundering and conditioning of industrial and domestic man-made and/or natural fabrics in semi-automatic or automatic washing machines. It may also be used in dishwashers. For convenience purposes it is useful if this can be achieved by means of a soluble single compartment sachet containing varying amounts of bleaching detergents including for example sodium percarbonate. Typically a sachet may be made from a water soluble film such as PVA.

Conventional laundering detergents comprise perborates and zeolites and these compounds are not stable in water soluble film. Previous attempts have been made to manufacture fully built detergent and conditioner systems in a sachet have required a twin compartment sachet manufactured from a perforated film. These fully built detergent and conditioner systems generally

contain bleaching agents. Sodium percarbonate is recognised in this field as a bleaching agent. However, use of percarbonate in sachets is not popular as it is unstable when combined with other components of a high moisture content.

Twin compartment sachets have a disadvantage in that they require greater mechanical action to dissolve the sachet and thus have long dispersion times. Also, they are expensive to manufacture.

Additionally, the perforated film used in these twin compartment sachets does not confer a significant shelf life to the components contained within the sachet, wherein the oxidising power of the bleaching agent is reduced.

Also, typically these formulations contain zeolites. These have high moisture content which affects the mechanical properties of the film e.g. the pliability.

Pollution problems arise from the use of phosphates in detergent compositions. Phosphates are required as solubilisers and aid detergency. However, they have a detrimental effect on the environment. Forthcoming European legislation will require the amount of phosphate released into the environment to be minimised.

It is an object of the present invention to provide a detergent or bleaching agent for cleaning in laundries, or in domestic washing machines or dishwashers which is phosphate free.

According to one aspect of the present invention there is provided a detergent composition comprising a

granulated percarbonate and a blend which encapsulates the percarbonate, the blend comprising a sulphate, carboxymethyl cellulose and a nonionic surfactant, wherein the detergent composition comprises sodium metasilicate and does not include a zeolite, a perborate or a phosphate, and wherein the composition is capable of being stored in a water-soluble PVA film packaging for at least nine months and wherein the composition comprises between 1% and 15% percarbonate.

Preferably the detergent formulation uses sodium percarbonate, carboxy methyl cellulose, sodium sulphate, a nonionic surfactant blend, sodium silicate and a phosphate substitute, ie an alternative to the phosphates used in detergent formulations.

The phosphate substitute may be selected from the group comprising silicates, carbonates and polycarboxylates, which should be wholly or substantially anhydrous.

The invention specifically excludes polyphosphates and preferably includes polyacrylates in powdered or liquid form. In particular formulations the amount of emulsifier metasilicate is also increased and the amount of carboxymethyl cellulose is decreased and bleach activator is added when liquid polyacrylate is used.

Preferably the detergent further comprises bleach activator such as TAED.

The detergent may further comprise at least one ingredient chosen from the group comprising linear alkylbenzene sulphonate, sodium lauryl sulphate, sodium carbonate, low foam wetting agent, perfumes, optical brighteners, salts, pigments and enzymes.

In one embodiment the detergent formulation is a laundering product.

In an alternative embodiment the detergent is a machine dishwashing product.

Suitably the laundry or dishwashing product according to the present invention is packaged in PVA film. A product of the invention is stable in PVA film compared to other products containing zeolites and perborates.

Suitably the film is 20-80 microns thick.

The product may be incorporated into a tablet form.

The granulated form of percarbonate in the above permits efficient bleaching action of the laundry product whilst not effecting the stability of the product in storage.

While modifications and improvements may be made without departing from the scope of this invention, the following is a description of the invention, with reference to the accompanying diagrams:

Figures 1a and 1b illustrate a soluble single compartment sachet produced from a polyvinyl alcohol (PVA) film filled with product and heat sealed.

Figures 2a and 2b illustrate a soluble single compartment sachet produced from PVA film by thermoforming.

The sachets are sealed such that they contain a laundry and conditioning powder without spillage or air borne contamination which can cause irritation to eyes and/or

skin etc.

Example 1

The laundry and conditioning powder can be in the form of a super concentrate with a bulk density of not less than 0.75kg/l. The laundry and conditioning powder is preweighed and packed in 50g batches which is sufficient to launder 4.5kg dry weight of mixed fibres (normal soiling) in either hard or soft water conditions.

In order to determine the storage and durability of sachets containing laundry and conditioner, the sachets were treated as follows:

1. Laundry and conditioner products including the granulated percarbonate compound were sealed in PVA sachets under atmospheric conditions and stored in various temperatures.

2. Sachets containing the laundry and conditioner products were sealed in a PVC container under atmospheric conditions as stored at various temperatures.

The samples of both 1 and 2 above were stored for nine months whereupon they were added to separate washing cycles. In both cases the samples were found to be stable (both before use and after storage) with no deterioration of the product or the sachet containing the product.

Sachets were dissolved in cold water (20°C) using a combination of water flow and mechanical agitation whereupon sachets and contents were typically

completely dissolved with no residue within 90 seconds.

The polyvinyl alcohol film was 30-85 microns (+/- 10-15%) thick. The polyvinyl alcohol film is both biodegradable and nonhazardous.

The process for producing the sachets according to figures 1a and b containing the dishwashing, laundry and/or conditioner product requires a form filling machine modified such that the sachet is produced with a minimum number of folds and seals.

Alternatively thermoforming of film can be used to produce filed sachets as illustrated in Figure 2.

Example 2

Typical detergent product formulations

Linear alkylbenzene sulphonate (LABS)	0.5%
Sodium Percarbonate	1-15%
Carboxy Methyl Cellulose (CMC)	1-5%
Sodium Sulphate Anhydrous	5-35%
Sodium Carbonate	0-35%
Nonionic Surfactant Blend	1-10%
Low Foam Wetting Agent	0-2%
Sodium Metasilicate	1-30%
Perfumes	0-1.5%
Optical Brighteners	0-1%
Salts	0-10%
Enzymes (blended)	0-5%
Copolymer	0-10%
Water Soluble Dye Pigment	0-2%
Sodium Polyacrylate (eg Sandoperol)	1-30% (preferably 2-12%)
Bleach Activator	0.1-2%

Minor ingredients as required.

Linear alkylbenzene sulphonate may be replaced with 0.5 to 10% sodium lauryl sulphate to produce a more environmentally friendly product.

Varying amounts of the above components may be used depending on the type of product required, i.e. for laundering, dishwashing or conditioning.

In the following examples nonoinic surfactant blend and low foam wetting agent are together referred to as liquid blend.

Example 3

Laundry Product using Liquid Polyacrylate

A laundering product was prepared and packaged in PVA film.

The formulation consisted of

Linear alkylbenzene sulphate	2%
Sodium Percarbonate	3%
Carboxy Methyl Cellulose	1%
Sodium Sulphate Anhydrous	25%
Sodium Carbonate	28%
Liquid blend	2%
Sodium Metasilicate	30%
Anionic Sodium Polyacrylate	10%
Perfumes	0.8%
Optical Brighteners	0.5%
Salts	2%
Enzymes (blended)	1.5%
Copolymer	2%
Bleach Activator (TAED)	1%

Prior to mixing the liquid polyacrylate is blended with approximately 60% of the anhydrous sulphate and dried.

Alternatively, the polycrylate may be mixed with any of the powdered materials, dispersed through the powder.

Example 4

Laundry Product

A laundering product was prepared and packaged in PVA film.

The formulation consisted of

Linear alkylbenzene sulphate	2%
Sodium Percarbonate	5.1%
Carboxy Methyl Cellulose	1.0%
Sodium Sulphate Anhydrous	20%
Sodium Carbonate	33.0%
Liquid blend	2.0%
Sodium Metasilicate	30%
Perfumes	0.8%
Optical Brighteners	0.5%
Salts (NTA Powder)	2%
Enzymes (blended)	1.5%
Copolymer	2.0%
Bleach Activator (TAED)	1%

Inclusion of copolymer improved redeposition.

Production of Formulation

The percarbonate was added to the sachet as shown in Figure 1 in the form of granules. These granules comprised percarbonate, sulphate and carboxy methyl cellulose in varying amounts together with a blend of nonionic surfactants to create a binding agent. These components were processed in order to produce a dust free granule of a diameter not less than 150 microns.

In order to produce the granules a horizontal type mixer was used. A liquid blend of the abovementioned laundry components was added to the mixer from a high pressure vessel incorporating an agitator. The liquid blend was fed in at a pressure of 60 pounds per square inch.

The finished granulated detergent is fully biodegradable and has a stable pH range of 10-11, which does not affect the PVA film stability as used in this invention.

Trials have shown that using nonionic surfactants comprising alkyl aryl polyglycol ethoxylates through the alkyl group C_{6-12} (typically C_{8-10}) is stable and gives the best results even after storage in excess of 9 months.

A typical encapsulation blend is as follows:

Sodium Sulphate (Anhydrous)	5-98%
Carboxy Methyl Cellulose	1-25%
Nonionic Surfactant blends	1-40%

Alternative nonionic surfactant blends comprising alcohol polyglycol ethoxylate oxide in the range of 0.5-5% have been used successfully.

The advantages of the invention and of the ways in which the disadvantages of the previously known arrangements are overcome include encapsulation of a percarbonate with a powder/liquid blend forming a granular product of suitable size and strength for use in a hot or cold process.

A single component sachet sealed such that the percarbonate does not decompose in the detergent contained within the sachet.

Upon dissolution the PVA leaves no residues i.e. it is fully dissolved.

No mechanical action is required to dissolve the PVA film.

The encapsulation process extends the shelf life of fully built detergent within the PVA sachet.

In the super concentrated form, a laundering formulation normally requires 50g per 4.5kg (dry weight) wash with normal soiling.

Example 5(a)

Sodium Sulphate	20 %
Sodium Carbonate	40 %
Sodium Metasilicate Anhydrous	15 %
Sodium Percarbonate Peroxyhydrate	10 %
CMC	1 %
Alcohol Polyglycol Ethoxylate Oxide + Cationic Resin Dye Transfer Inhibitor	5 %
LABS	1.2%
NTA Powder/EDTA Powder	5 %
Enzymes (optional)	0.5%
Co Polymer	1 %
TAED	1 %
OBA (optional)	0.3%
Perfume (optional)	-

Example 5(b)

Sodium Sulphate	14 %
Sodium Carbonate Dense	50 %
Sodium Metasilicate Anhydrous	10 %
Alcohol Polyglycol ether + Cationic resin Dye Transfer Inhibitor	10 %

CMC	2 %
Percarbonate	4.5%
Optical Brightners	0.3%
LABS	1.2%
NTA Powder (salts)	5 %
Perfumes	0.5%
Enzymes	0.5%
Co Polymer	1 %
TAED	1 %

In the above Examples, no phosphate or phosphate substitute is used. The level of sodium carbonate is increased in Example 5(b) to act as a filler and provides the alkalinity previously provided by phosphate. An increased level of percarbonate acts similarity.

Example 6

Sodium Metasilicate	18 %
Sodium Carbonate	40 %
Sodium Sulphate	14 %
Sodium Polyacrylate Acid	6 %
Sodium Percarbonate	8 %
CMC	1 %
NTA/EDTA Powder	4 %
LABS	2 %
Perfume	0.8%
Liquid Alcohol Polyglycol Ether + Dye Transfer Inhibitor	3 %
Enzymes	0.6%
OBAs	0.3%
Co Polymer	1 %
TAED	1.3%

Example 7

Sodium Metasilicate	20 %
Sodium Sulphate	20 %
Sodium Carbonate Dense	30 %
Sodium Percarbonate	10 %
LABS	1.5%
CMC	2 %
NTA/EDTA	5 %
Perfume	0.5%
TAED	2 %
Co Polymer	2 %
Liquid Ethoxylate Alcohol/Alcohol Polyglycol Oxide Dye Transfer Inhibitor	7 %

This formulation uses no OBAs for use on coloured fabrics, and no enzymes, such that it is non-biological.

The formulations in Examples 5(a), (b), 6 and 7 can be prepared and packaged in PVA film in a similar manner to that in Examples 1-4.

CLAIMS

1. A detergent composition comprising a granulated percarbonate and a blend which encapsulates the percarbonate, the blend comprising a sulphate, carboxymethyl cellulose and a nonionic surfactant, wherein the detergent composition comprises sodium metasilicate and does not include a zeolite, a perborate or a phosphate, and wherein the composition is capable of being stored in a water-soluble PVA film packaging for at least nine months and wherein the composition comprises between 1% and 15% percarbonate.

2. A composition as claimed in claim 1 wherein the percarbonate is sodium percarbonate.

3. A composition as claimed in claim 1 or claim 2 wherein the sulphate is sodium sulphate.

4. A composition as claimed in any of the preceding claims wherein the surfactant is alkyl (C_6 to C_{12}) aryl polyglycol ethoxylate.

5. A composition as claimed in any of the preceding claims wherein the composition further comprises at least one of the ingredients chosen from the group comprising linear alkylbenzene sulphonate, sodium carbonate, low foam wetting agent, perfumes, cationic surfactant, optical brighteners, salts and enzymes.

6. A composition as claimed in any one of the preceding Claims wherein the composition further includes a phosphate substitute.

7. A composition as claimed in Claim 6 wherein the phosphate substitute is selected from the group comprising silicates, carbonates and polycarboxylates.

8. A composition as claimed in Claim 7 wherein the phosphate substitute is a polyacrylate.

9. A composition as claimed in Claim 8 wherein the phosphate substitute is sodium polyacrylate.

10. A composition as claimed in any of the preceding claims wherein the composition is a laundering product.

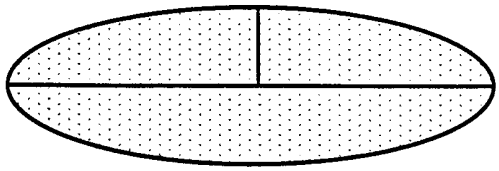
11. A composition as claimed in any of the preceding claims wherein the composition is a machine dishwashing product.

12. A composition as claimed in any one of the preceding claims wherein the PVA film is 20-80 microns thick.

13. A composition as claimed in any one of the preceding claims wherein the product is compressed into a tablet format.

Figure 1

(a)



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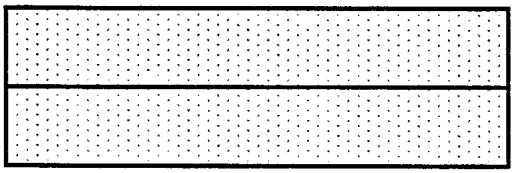
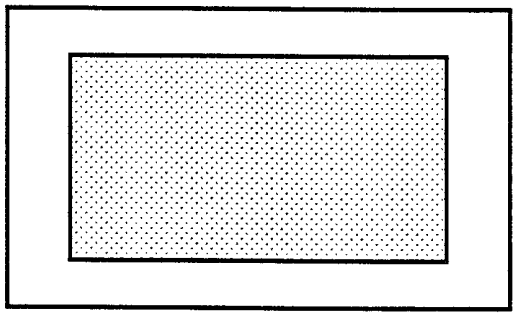


Figure 2

(a)



(b)