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(54) **REDUCTION OF MALODOUR FROM LAUNDRY**

(57) The invention provides the use of a nonionic soil release polymer (SRP) as an anti-malodour active for synthetic fabrics; the nonionic soil release polymer being a copolymer of at least alkylene glycol and aromatic dicarboxylic acid monomer units.

The invention also provides the use of a laundry detergent composition comprising:

from 3 to 80% (by weight based on the total weight of the composition) of one or more deterative surfactants, and a nonionic soil release polymer (SRP) being a copolymer of at least alkylene glycol and aromatic dicarboxylic acid monomer units;

for the reduction of malodour on synthetic fabrics laundered therewith.

EP 3 650 522 A1

DescriptionField of the Invention

5 **[0001]** The invention relates to the reduction of malodour on synthetic fabrics, especially those synthetic fabrics found in performance garments.

Background and Prior Art

10 **[0002]** Performance garments are garments that are configured so that a wearer may comfortably perform a range of exercises in the garment. Performance garments are also sometimes referred to as sportswear, activewear, or athletic wear. More recently, due to the popularity of wearing performance garments as casual wear in addition to during exercise, some performance garments have also begun to be referred to as athleisure garments. To render them particularly suitable for a range of exercise, performance garments are usually made of synthetic fabrics such as polyester, which
 15 excels at moisture wicking and helps to pull moisture away from the skin to keep the wearer dry and comfortable.

[0003] Unfortunately, malodours tend to impregnate synthetic fabrics such as polyester, and may persist and develop even after laundering. Studies have found that not only does polyester smell far worse than cotton following intensive exercise, its fibres may act as a better substrate for growth of malodorous bacteria such as *Staphylococcus* and especially *Micrococcus* species (in particular *M.luteus*).

20 **[0004]** Furthermore, many of the specialist fabrics used in performance garments require a tailored care regime to maintain good condition, with many manufacturers recommending low temperature washing (40°C or less), air or cool tumble drying, and avoidance of high detergent levels, oxidizing bleaches, harsh biocides and fabric softeners.

[0005] As such, there is a need in the art for effective solutions to the problem of malodour on fabrics used in performance garments, without resorting to aggressive washing or drying regimes which may damage or degrade the integrity or
 25 performance of such fabrics.

[0006] The present inventors have determined that certain soil release polymers (SRPs) have utility in the reduction of malodour from synthetic fabrics such as polyester.

Summary of the Invention

30 **[0007]** The invention provides the use of a nonionic soil release polymer (SRP) as an anti-malodour active for synthetic fabrics; the nonionic soil release polymer being a copolymer of at least alkylene glycol and aromatic dicarboxylic acid monomer units.

[0008] The invention also provides the use of a laundry detergent composition comprising:

35 from 3 to 80% (by weight based on the total weight of the composition) of one or more deterative surfactants, and a nonionic soil release polymer (SRP) being a copolymer of at least alkylene glycol and aromatic dicarboxylic acid monomer units;

40 for the reduction of malodour on synthetic fabrics laundered therewith.

Detailed Description and Preferred Embodiments

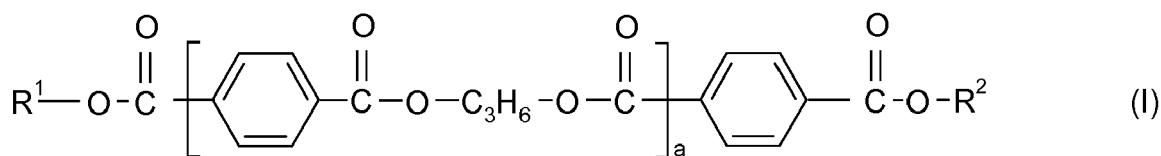
[0009] The term "anti-malodour active" in the context of this invention denotes an active which can reduce malodour on synthetic fabrics. Such actives may reduce the concentration of malodorous compounds in the air and/or reduce the
 45 perception of malodour to the human nose as measured by either chemical analysis or sensory methods.

[0010] SRPs for use in the invention may include a variety of nonionic monomer units and structures may be linear, branched or star-shaped. The SRP structure may also include capping groups (typically C₁₋₄ alkyl such as methyl) to control molecular weight. The weight average molecular weight (M_w) of the SRP may suitably range from about 1000 to about 20,000 and preferably ranges from about 1500 to about 10,000.

50 **[0011]** Nonionic SRPs for use in the invention may suitably be selected from copolyesters of aromatic dicarboxylic acids (for example furandicarboxylic acid, phthalic acid or terephthalic acid), alkylene glycol (for example ethylene glycol or propylene glycol) and polydiols (for example polyethylene glycol or polypropylene glycol). Examples of such materials include oligomeric esters produced by transesterification/oligomerization of poly(ethyleneglycol) methyl ether, dimethyl terephthalate ("DMT"), propylene glycol ("PG") and poly(ethyleneglycol) ("PEG"); nonionic-capped block polyester oligomeric compounds such as those produced from DMT, Me-capped PEG and EG and/or PG, and copolymeric blocks of ethylene terephthalate or propylene terephthalate with polyethylene oxide or polypropylene oxide terephthalate.

55 **[0012]** Preferred nonionic SRPs for use in the invention include copolyesters formed by condensation of terephthalic acid ester and diol, preferably 1,2 propanediol, and further comprising an end cap formed from repeat units of alkylene

oxide capped with an alkyl group. Examples of such materials have a structure corresponding to general formula (I):



in which R¹ and R² independently of one another are X-(OC₂H₄)_n-(OC₃H₆)_m;

in which X is C₁₋₄ alkyl and preferably methyl;

n is a number from 12 to 120, preferably from 40 to 50;

m is a number from 1 to 10, preferably from 1 to 7; and

a is a number from 4 to 9.

[0013] Because they are averages, m, n and a are not necessarily whole numbers for the polymer in bulk.

[0014] Mixtures of any of the above described materials may also be used.

[0015] In a laundry detergent composition that includes nonionic SRP for the reduction of malodour on synthetic fabrics laundered therewith, the level of nonionic SRP is suitably at least 0.5%, and is preferably at least 0.8%, such as from 0.8 to 10% and most preferably from 1 to 5% (by weight based on the total weight of the composition).

[0016] A laundry detergent composition for use in this invention is intended for and capable of wetting and cleaning synthetic fabrics as part of a domestic laundering process, either by hand or in the wash cycle of automatic washing machines.

[0017] Preferred synthetic fabrics in the context of this invention are those used in performance garments, such as polyester fabrics. Polyesters are a general group of polymers derived from terephthalic or adipic acids, for example polyethylene terephthalate. They can be melt spun into fibres or filaments which are then made into yarns for knitting or weaving into polyester fabrics.

[0018] A laundry detergent composition for use in this invention may suitably be in liquid or particulate form, or a mixture thereof.

[0019] The term "particulate" in the context of this invention denotes free-flowing or compacted solid forms such as powders, granules, pellets, flakes, bars, briquettes or tablets.

[0020] One preferred form for a particulate laundry detergent composition according to the invention is a free-flowing powdered solid, with a loose (unpacked) bulk density generally ranging from about 200g/l to about 1,300 g/l, preferably from about 400 g/l to about 1,000 g/l, more preferably from about 500g/l to about 900 g/l.

[0021] A laundry detergent composition for use in this invention is most preferably in liquid form.

[0022] To provide a wetting and cleaning effect, a laundry detergent for use in this invention will suitably comprise from 5 to 60% (by weight based on the total weight of the composition) of one or more deterative surfactants. The choice of deterative surfactant, and the amount present, will depend on the intended use of the laundry detergent. For example, different surfactant systems may be chosen for hand-washing products and for products intended for use in different types of automatic washing machine. The total amount of surfactant present will also depend on the intended end use and may, in fully formulated products, be as high as 60% (by weight based on the total weight of the composition) in a composition for washing fabrics by hand. In compositions for machine washing of fabrics, an amount of from 5 to 30% (by weight based on the total weight of the composition) is generally appropriate.

[0023] Deterative surfactants for use in the invention may suitably be selected from non-soap anionic surfactants, which are typically salts of organic sulfates and sulfonates having alkyl radicals containing from about 8 to about 22 carbon atoms, the term "alkyl" being used to include the alkyl portion of higher acyl radicals. Examples of such materials include alkyl sulfates, alkyl ether sulfates, alkaryl sulfonates, alpha-olefin sulfonates and mixtures thereof. The alkyl radicals preferably contain from 10 to 18 carbon atoms and may be unsaturated. The alkyl ether sulfates may contain from one to ten ethylene oxide or propylene oxide units per molecule, and preferably contain one to three ethylene oxide units per molecule. The counterion for anionic surfactants is generally an alkali metal such as sodium or potassium; or an ammoniacal counterion such as monoethanolamine, (MEA) diethanolamine (DEA) or triethanolamine (TEA).

[0024] Mixtures of any of the above described materials may also be used.

[0025] In a laundry detergent composition according to the invention, the total level of non-soap anionic surfactant may suitably range from 5 to 30% (by weight based on the total weight of the composition).

[0026] Further surfactants may also be selected from nonionic surfactants, which are typically aliphatic C₈ to C₁₈, more preferably C₁₂ to C₁₅, primary linear alcohol ethoxylates with an average of from 3 to 20, more preferably from 5 to 10 moles of ethylene oxide per mole of alcohol. Also suitable are sugar-derived nonionic surfactants such as alkyl polyglycosides corresponding to the general formula R₁O(R₂O)_b(Z)_a in which R₁ is a monovalent hydrocarbyl group having from 6 to 30 carbon atoms; R₂ is a divalent alkylene radical having from 2 to 4 carbon atoms; Z is a saccharide

(preferably glucose) residue having 5 or 6 carbon atoms; b is a number having a value from 0 to 12 (preferably 0) and a is a number having a value from 1 to 6.

[0027] Mixtures of any of the above described materials may also be used.

[0028] In a laundry detergent composition for use in the invention, the total level of nonionic surfactant may suitably range from 0 to 25% (by weight based on the total weight of the composition).

[0029] A liquid laundry detergent composition for use in the invention may generally comprise from 5 to 95%, preferably from 10 to 90%, more preferably from 15 to 85% water (by weight based on the total weight of the composition). The composition may also incorporate from 0.1 to 15% (by weight based on the total weight of the composition) of non-aqueous carriers such as hydrotropes, co-solvents and phase stabilizers.

[0030] A laundry detergent composition for use in the invention may contain one or more builders. Builders enhance or maintain the cleaning efficiency of the surfactant, primarily by reducing water hardness. This is done either by sequestration or chelation (holding hardness minerals in solution), by precipitation (forming an insoluble substance), or by ion exchange (trading electrically charged particles).

[0031] Builders for use in the invention can be of the organic or inorganic type, or a mixture thereof. Non-phosphate builders are preferred.

[0032] Preferred inorganic, non-phosphate builders for use in the invention may be selected from zeolites, sodium carbonate, δ -sodium disilicate and mixtures thereof.

[0033] Preferred organic, non-phosphate builders for use in the invention may be selected from polycarboxylates (e.g. citrates) in acid and/or salt form and mixtures thereof.

[0034] Mixtures of any of the above described materials may also be used.

[0035] The overall level of builder, when included, may range from about 0.1 to about 80%, preferably from about 0.5 to about 50% (by weight based on the total weight of the composition).

[0036] A particulate laundry detergent composition for use in the invention may include one or more fillers to assist in providing the desired density and bulk to the composition. Preferred fillers for use in the invention include alkali metal (more preferably sodium and/or potassium) sulfates and chlorides and mixtures thereof, with sodium sulfate and/or sodium chloride being most preferred. Filler, when included, may be present in a total amount ranging from about 1 to about 80%, preferably from about 5 to about 50% (by weight based on the total weight of the composition).

[0037] A laundry detergent composition for use in the invention may include one or more polymeric cleaning boosters such as antiredeposition polymers. Anti-redeposition polymers stabilise the soil in the wash solution thus preventing redeposition of the soil. A preferred material is ethoxylated polyethyleneimine, with an average degree of ethoxylation being from 10 to 30, preferably from 15 to 25 ethoxy groups per ethoxylated nitrogen atom in the polyethyleneimine backbone. Another type of suitable anti-redeposition polymer for use in the invention includes cellulose esters and ethers, for example sodium carboxymethyl cellulose.

[0038] Mixtures of any of the above described materials may also be used.

[0039] The overall level of anti-redeposition polymer, when included, may range from 0.05 to 6%, more preferably from 0.1 to 5% (by weight based on the total weight of the composition).

[0040] A laundry detergent composition for use in the invention may in some cases contain one or more fatty acids and/or salts thereof. Preferred examples of such materials include saturated C12-18 fatty acids such as lauric acid, myristic acid, palmitic acid or stearic acid; and fatty acid mixtures in which 50 to 100% (by weight based on the total weight of the mixture) consists of saturated C12-18 fatty acids. Such mixtures may typically be derived from natural fats and/or optionally hydrogenated natural oils (such as coconut oil, palm kernel oil or tallow). The fatty acids may be present in the form of their sodium, potassium or ammonium salts and/or in the form of soluble salts of organic bases, such as mono-, di- or triethanolamine.

[0041] Mixtures of any of the above described materials may also be used.

[0042] Fatty acids and/or their salts, when included, may be present in an amount ranging from about 0.25 to 5%, more preferably from 0.5 to 5%, most preferably from 0.75 to 4% (by weight based on the total weight of the composition).

[0043] For formula accounting purposes, in the formulation, fatty acids and/or their salts (as defined above) are not included in the level of surfactant or in the level of builder.

[0044] A liquid laundry detergent composition for use in the invention may comprise one or more rheology modifiers. Examples of such materials include polymeric thickeners, such as hydrophobically modified alkali swellable emulsion (HASE) copolymers; and/or structurants which form a network within the composition, such as hydrogenated castor oil, microfibrinous cellulose and citrus pulp fibre.

[0045] A liquid laundry detergent composition for use in the invention preferably has a pH in the range of 5 to 9, more preferably 6 to 8, when measured on dilution of the composition to 1% (by weight based on the total weight of the composition) using demineralised water.

[0046] A laundry detergent composition for use in the invention may contain further optional ingredients to enhance performance and/or consumer acceptability. Examples of such ingredients include fragrance, foam boosting agents, antioxidants, sunscreens, anticorrosion agents, colorants, pearlisers and/or opacifiers, and shading dye. Each of these

ingredients will be present in an amount effective to accomplish its purpose. Generally, these optional ingredients are included individually at an amount of up to 5% (by weight based on the total weight of the composition).

[0047] A laundry detergent composition of the invention for use in the invention generally contains no more than 0.2%, preferably no more than 0.1%, more preferably no more than 0.01% and most preferably 0% (by weight based on the total weight of the composition) of oxidising agents selected from halogen-based bleaches (e.g. alkali metal hypochlorites and alkali metal salts of di- and tri-chloro and di- and tri-bromo cyanuric acids), oxygen-based bleaches (e.g. sodium perborate (tetra- or monohydrate), sodium percarbonate and hydrogen peroxide) and mixtures thereof.

[0048] A laundry detergent composition for use in the invention generally contains no more than 0.2% and preferably no more than 0.1% (by weight based on the total weight of the composition) of biocides selected from quaternary ammonium salts (such as benzalkonium chloride, didecylmethylammonium chloride, didecylmethylpolyoxyethyleneammonium propionate, didecylmethylammonium carbonate, or benzethonium chloride); imidazolium derivatives (such as 1,10-di(3-decyl-2-methylimidazolium)decane dichloride, 1,10-di(3-decyl-2-methylimidazolium)decane dibromide, 1,12-di(3-decyl-2-methylimidazolium)dodecane dichloride, 1,12-di(3-octyl-2-methylimidazolium)dodecane dichloride, or 1,10-di(3-decyl-2-methylimidazolium)decane dichloride); biguanide compounds (such as polyaminopropyl biganide (PHMB); guanidine compounds such as ethoxyethylguanidine chloride and polyaminopropyl guanidine hydrochloride (PHMG)); and bis(aminoalkyl)alkylamine compounds (such as bis(aminoalkyl)dodecylamine) and mixtures thereof.

Packaging and dosing

[0049] A laundry detergent composition for use in the invention may be packaged as unit doses in polymeric film soluble in the wash water. Alternatively, the detergent composition of the invention may be supplied in multidose plastics packs with a top or bottom closure. A dosing measure may be supplied with the pack either as a part of the cap or as an integrated system.

[0050] The laundry detergent composition as described above is used for the reduction of malodour on synthetic fabrics laundered therewith.

[0051] A suitable laundering method for synthetic fabrics in the context of this invention comprises diluting a dose of the laundry detergent composition as described above to obtain a wash liquor, and soaking and/or agitating the fabrics with the wash liquor so formed in a laundry vessel, followed by rinsing the laundry in water. The duration of such a method is preferably in the range of from 10 minutes to 3 hours, more preferably from 10 minutes to 1 hour and most preferably from 15 to 45 minutes.

[0052] In such a method, the total quantity of fabric relative to wash liquor generally ranges from about 8 to about 20g fabric per litre of wash liquor and preferably ranges from about 10 to about 15g fabric per litre of wash liquor.

[0053] Preferably the fabrics are placed into the drum of an automatic washing machine, and a wash cycle is run.

[0054] In automatic washing machines, the dose of laundry detergent composition is typically put into a dispenser and from there it is flushed into the machine by the water flowing into the machine, thereby forming the wash liquor. Dosages for a typical front-loading washing machine (using 10 to 15 litres of water to form the wash liquor) may range from about 10 ml to about 100 ml, preferably about 15 to 75 ml. Dosages for a typical top-loading washing machine (using from 40 to 60 litres of water to form the wash liquor) may be higher, e.g. 100 ml or more. Lower dosages of detergent (e.g. 50 ml or less) may be used for hand washing methods (using about 1 to 10 litres of water to form the wash liquor).

[0055] An automatic washing machine for use in the invention may be any conventional automatic washing machine useful for the laundering of fabrics. Such automatic washing machines are those typically found in the home or in businesses such as self-service laundrettes where individual consumers can launder their own loads of fabrics.

[0056] Washing machines utilize a mechanical agitator to produce agitation of washing and rinsing solutions. Automatic washing machines are also fitted with means for controlling wash and rinse water temperatures and wash and rinse duration. Automatic washing machines can also provide the means for both forming and removing washing and rinsing solutions by using filling and draining apparatus and filling, draining and/or spin cycles.

[0057] An automatic washing machine for use in the method of the invention will generally comprise an external casing; a wash tub connected in floating manner to the casing by one or more suspension devices; a perforated laundry drum for housing laundry for washing, and which is mounted inside the wash tub to rotate about an axis of rotation; and a drive unit connected by a connecting member to the laundry drum to rotate it, on command, about the axis of rotation. A loading/unloading door ensures access to the drum. For domestic use, the drum capacity will generally range from about 2 up to about 10 kg, more typically up to about 6kg of dry cotton laundry.

[0058] Automatic washing machines are usually classified into two major groups in terms of the structures and mechanisms; top-loading and front-loading. Top-loading machines have an upright or vertical drum into which fabrics to be laundered are placed. Fabrics are added into the drum, which is usually cylindrical, from the lidded top of the machine. Top-loading machines frequently have a moving agitator element placed along the axis of the drum. Rotation and vertical motion of the agitator serves to intensify the laundering action. Front-loading machines have a drum, also generally cylindrical, which is positioned with the drum axis sideways or in a horizontal position. Fabrics are added into the drum

through a door on the front wall of the machine. Front-loading machines typically do not have an agitator element. Mechanical energy is instead imparted to the laundry by the tumbling action formed by the repeated lifting and dropping of the laundry which is implemented by the rotating drum. The drum may also incorporate lifting vanes or similar protrusions to lift the laundry. For domestic use, front-loading automatic washing machines are often preferred due to their superior water and energy efficiency.

[0059] The term "wash cycle" in the context of this invention denotes a cycle of operation generally employed in automatic washing machines, in which the machine goes through a series of stages during which water is added, contacted with fabrics being laundered and then extracted from the washing machine drum by spinning. A wash cycle will typically consist of at least a wash stage, a rinse stage and a spin stage. The wash stage, the rinse stage and the spin stage may themselves consist of several steps, such as a fill step, a drain step, a pause step, an agitation step, and any combination thereof. A user may select one of several laundering options (programmes) based upon the type of laundry load being placed in the washing machine (e.g. cotton, wool, synthetic, delicate) and/or the temperature at which the washing must be performed (typically between 30 °C and 90 °C). A wash cycle may also involve one or more additional wash and/or spin and/or rinsing stages respectively, depending on the programme selected.

[0060] A preferred type of wash cycle in the context of this invention would be a synthetics programme characterised by a wash temperature ranging from 20 to 40°C, from 1 to 3 rinses and a spin speed of less than 1000 rpm, such as from 500 to 800 rpm. The wash stage duration of a such a programme is usually from about 30 to 40 minutes with the wash cycle overall duration being from about 50 to 70 minutes.

[0061] A subsequent aqueous rinse step and drying the laundry is preferred. Any input of water during any optional rinsing step(s) is not included when determining the volume of the wash liquor. Drying of synthetic fabrics (particularly polyester) is most preferably carried out by air or cool tumble drying. Generally, the fabrics will be dried to a residual moisture level of no more than about 5% (based on dry fabric weight), preferably from 0 to 2.5% (based on dry fabric weight).

[0062] To measure efficiency of a laundering method used in this invention, sensory and/or chemical and/or microbiological assessments of the treated fabrics may be carried out at various stages of the laundering process. For example, assessment may suitably be carried out after completion of the laundering process (e.g. up to 2 hours after drying). and/or after the dried fabric is stored without further treatment for a storage period of at least 24 hours, preferably at least 3 days and more preferably from 4 to 8 days. Fabric malodour developing after storage is a particular problem for performance garments which may often accumulate in laundry baskets or sports bags.

[0063] A range of techniques are available to the skilled worker for the assessment of sensory, chemical and microbiological properties respectively. For example, malodour assessments may be carried out using trained panellists to determine hedonic value, intensity, and qualitative odour characteristics. Malodour causing substances may be quantitatively detected by using methods such as column chromatography. Microbial communities may be measured using plate count techniques involving the growth of colonies on a nutrient agar surface.

[0064] The invention will now be further described with reference to the following non-limiting Examples.

EXAMPLES:

[0065] Expert odour assessors trained to quantify body odour (following a methodology described in WO99/19452) were employed to assess malodour intensity at consumer important moments in the wash-wear cycle.

[0066] A panel of 32 women was divided into four groups of eight. Each was given a cotton T-shirt modified to accommodate knitted polyester swatches in the underarm region of the shirt. These swatches are 14 cm x 18cm and made from 100% knitted polyester (Phoenix Calico - polyester cross-tuck 144g/m²). Prior to first wear all the swatches are laundered in an unfragranced, bleach-containing detergent powder (SKIP™) at recommended dose (120gms) in a Zanussi™ front loading automatic washing machine at 60°C. None of the swatches are pre-washed in the products under evaluation. Each panellist has four swatches assigned to them. These are worn in rotation as pre-assigned.

[0067] On any day, each panellist would wear two swatches; that in the left armpit having been washed in one product whilst that in the right armpit was washed in a separate product. Swatches were rotated in such a way that all panellists are exposed to swatches washed in all four products. In the current study, the process was continued out to four cycles. Laundered swatches were given to the panellists at a set time on the morning of each day of the test; they then wear them throughout the day and return the soiled swatches the following morning when they are reissued with a clean T-shirt and second pair of swatches.

[0068] The fragrance-free liquid detergent formulations given in Table 1(a) were evaluated at recommended dose (35ml) in a Zanussi™ front loading automatic washing machine at 40°C, on a synthetics wash cycle in 26°FH water by washing the appropriately coded soil swatches in the corresponding formulation.

[0069] Each wash load also comprised 1 kg of clean 100% cotton and 1kg of 100% polyester together with 3 sheets of an industry recognised simulated soil-ballast (SBL-2004 ex. Krefeld test institute). The swatches were tumbled dried on cool setting following laundering and then assessed approximately 2 hours after drying.

EP 3 650 522 A1

[0070] Malodour intensity assessments were made on each of the soiled swatches and then again following washing and drying of swatches in the test products. Following the laundering, drying and odour assessment after the 4th cycle the swatches were stored (wrapped in aluminium foil) for 7 days prior to reassessment of any malodour that may have developed on storage. Results are given in Table 1(b).

[0071] The effect of the SRP on fragrance delivery for the four formulations is shown in Table 1(c). These results were obtained using a commercial sample of SURF™, "Small and Mighty with essential oils", "Tropical" variant.

Table 1(a)

Ingredient	wt% (as active ingredient)			
Formulation	A	B	1	2
Na LAS	11	11	11	11
Na LES (3EO)	6	6	6	6
C ₁₂₋₁₅ 7EO	17	17	17	17
Palm kernel soap	7	7	7	7
MPG	7	7	7	7
Glycerol	4	4	4	4
Sulfonated SRP	0	2	0	0
Nonionic SRP	0	0	2	0
Nonionic SRP	0	0	0	2
minors, water	To 100%			

Table 1(b)

Wash Wear Results - on polyester	A	B	1	2
% panel with malodour, averaged over cycles 1-4.	52	41	35	29
% panel with malodour, 7 days after cycle 4	70	63	55	50

Table 1(c)

Fragrance intensity	A	B	1	2
Fragrance intensity (0-5 scale) 2 hours after drying	1.9	1.4	1.4	1.2

[0072] These results show that the examples of the invention (1 and 2) show improved performance over the comparative examples (A and B). In the comparative examples using no SRP or anionic (sulfonated) SRP, over 60% of panellist swatches developed malodour during storage. In the examples of the invention, fewer developed malodour on storage.

[0073] Table 1(c) shows that while any SRP reduces the intensity of perfume, the effect on perfume is comparable for the sulfonated and nonionic SRP whereas their performance as regards malodour development is different.

Example 2

[0074] This test used the methodology of Example 1, except that a build-up in malodour on the polyester was encouraged by simply washing all the swatches in water-only during cycles 1 and 2. This simulates both soil build up during repeated wash-wear and creates an increase in malodour levels similar to that which would be achieved by boosting the panel with a disproportionate number of individuals more prone to intense BO. The panellists then wore the swatches for a third occasion and following collection they were stored for two days to simulate clothes being left in a laundry basket. Following this storage period, the soiled swatches were assessed by the expert odour assessors and then laundered in the test products as described in example 1.

[0075] In this study, the polyester used was Coolmax™ a rapid-wicking textile frequently used in sportswear.

[0076] The fragrance-free liquid detergent formulations given in Table 2 (a) were evaluated at recommended dose (35ml) in a Zanussi™ front loading automatic (FLA) washing machines at 40°C, on a synthetics wash cycle in 26°FH water by washing the appropriately coded soil swatches in the corresponding formulation. Each wash load also comprised 1 kg of clean 100% cotton and 1kg of 100% polyester together with 3 sheets of an industry recognised simulated soil-ballast (SBL-2004 ex. Krefeld test institute). The swatches were tumbled dried on cool setting following laundering and then assessed approximately 2 hours after drying.

Table 2(a)

Ingredient	wt% (as active ingredient)			
Formulation	C	D	3	4
Na LAS	11	5.5	5.5	5.5
Na LES (3EO)	6	3	3	3
C ₁₂₋₁₅ 7EO	17	8.5	8.5	8.5
Palm kernel soap	7	3.5	3.5	3.5
MPG	7	3.5	3.5	3.5
Glycerol	4	2	2	2
Nonionic SRP (PET-POET)	0	0	0.8	2
Minors, water	To 100%			

[0077] These results in Table 2 (b) show that the examples of the invention (3 and 4) show improved performance over the comparative examples (C and D), even at relatively low surfactant levels.

Table 2(b)

Wash-Wear results	C	D	3	4
Proportion of panel assessed as having NO OR VERY LOW residual malodour on polyester after washing and drying averaged over four cycles.	20%	35%	95%	98%
Proportion of panel assessed as having NO OR VERY LOW malodour on polyester 7 days after washing and drying following 4 th wash cycle	42%	17%	39%	56%

[0078] This shows that when the nonionic SRPs are used according to the invention in a detergent composition for the laundering of synthetic fabrics, there is a reduction in perceivable fabric malodour after drying of the laundered fabrics, a reduction in the perception in the development of fabric malodour during storage of the laundered fabrics and a significant increase in the number of users who perceive no residual fabric malodour on the laundered fabrics.

Claims

1. The use of a nonionic soil release polymer (SRP) as an anti-malodour active for synthetic fabrics; the nonionic soil release polymer being a copolymer of at least alkylene glycol and aromatic dicarboxylic acid monomer units.
2. The use of a laundry detergent composition comprising:
 - from 3 to 80% (by weight based on the total weight of the composition) of one or more deterative surfactants, and a nonionic soil release polymer (SRP) being a copolymer of at least alkylene glycol and aromatic dicarboxylic acid monomer units;
 - for the reduction of malodour on synthetic fabrics laundered therewith.
3. Use according to claim 1 or 2 in which the alkylene glycol is selected from ethylene glycol and propylene glycol or a mixture thereof.

EP 3 650 522 A1

4. Use according to any one of claims 1 to 3 in which the aromatic dicarboxylic acid is terephthalate.
5. Use according to any one of claims 1 to 4, in which fabric malodour developing after a storage period is reduced.
- 5 6. Use according to claim 5, in which the storage period ranges from 24 hours to 8 days.

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EUROPEAN SEARCH REPORT

Application Number
EP 18 20 5467

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EP 18 20 5467

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