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(54) **SPRAYABLE LAUNDRY PRE-TREATMENT COMPOSITION**

(57) The present invention refers to a sprayable aqueous laundry pre-treatment composition comprising a multi-enzyme blend and Xanthan gum, a method for and the use of the inventive composition in stain removal as well as an aerosol dispenser comprising the inventive composition.

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Description

[0001] The present invention refers to a sprayable aqueous laundry pre-treatment composition comprising a multi-enzyme blend and Xanthan gum, a method for and the use of the inventive composition in stain removal as well as an aerosol dispenser comprising the inventive composition.

[0002] Removal of difficult stains is usually attempted in two steps. In the first step, the stained fabric is contacted with a stain-removing pretreatment composition. In a second step, the pretreated fabric is then washed with a laundry detergent composition or dry cleaned.

[0003] In this regard US 4,648,987 introduces a laundry prewash composition having a suitable detergency for dealing with a variety of spots and stains normally encountered in various fabrics, the composition being thickened to enhance its localized application to the fabric spots and stains. The suggested aqueous laundry prewash composition comprises a cosurfactant system including a first hydrophobic nonionic surfactant for loosening oil soluble material from the fabric and a second hydrophilic nonionic surfactant for loosening water soluble material from the fabric, the hydrophobic nonionic surfactant being an oil soluble ethoxylated alcohol with about eight to eighteen carbon atoms and an average of about two to five ethylene oxide groups per molecule, the hydrophilic nonionic surfactant being a water soluble ethoxylated alcohol with about eight to eighteen carbon atoms and an average of about five to fifteen ethylene oxide groups per molecule, the cosurfactant system forming about 3.7-10.5 wt.-% of the composition, a hydrotrope selected for stabilizing the cosurfactant system and particularly the first hydrophobic nonionic surfactant in the prewash composition, the hydrotrope being a benzene or naphthalene sulfonate derivative containing one or more short chain alkyl substituents with about one to four carbon atoms, the hydrotrope forming about 1.6-10.0 wt.-% of the composition, Xanthan gum as a thickener for maintaining viscosity of the composition in a thickened condition and for achieving localized engagement of the composition on the fabric spots and stains, the thickener forming about 0.1-2 wt.-% of the composition, and water forming the balance of the compositions as a predominant component thereof, the hydrotrope being present in the composition in a ratio of at about three parts for each part of the first hydrophobic nonionic surfactant in order to assure stability of the thickened prewash composition. The prewash composition may further comprise an insoluble particle component such as enzyme prills which are suspended in the Xanthan gum.

[0004] WO 2016/202572 relates to a laundry pretreatment composition which is claimed to be especially useful against stained cotton or polycotton fabrics. The pretreatment composition disclosed comprises 0.5 to 15 wt.-% of a surfactant which is a non-ionic surfactant or an ethoxylated anionic surfactant; 0.5 to 8 wt.-% of at least one non-neutralized fatty acid having a pKa greater than 5 at 20 °C, 0.5 to 5 wt.-% of at least one organic acid having a pKa of 2 to 5 at 20 °C; and 0.5 to 10 wt.-% of a water-insoluble fatty acid ester.

[0005] Increased legislation led to a limit on the laundry detergent use of environmental-unfriendly synthetic surfactants and phosphate salts. As an alternative, many manufacturers increased their use of enzymes in detergents which are believed to produce less chemical pollution.

[0006] Detergent enzymes are biological enzymes that are used with detergents. They catalyze the reaction between stains and water, thus aiding in stain removal. The use of enzymes in detergents has a number of advantages. For example, the water temperature for washing can be reduced by using detergent enzymes which perform well in cold water, allowing low-temperature washes and eliminating the need for heated water. Further, delicate materials such as wool or silk can be damaged or fade in high-temperature washes. Low-temperature washes with detergent enzymes can prevent such damages, allowing the consumer to choose clothes from a wider range of materials.

[0007] Enzymes can act as respiratory sensitizers and at high concentrations proteolytic enzymes can also irritate skin and eyes. Thus, enzyme-containing spray products for household cleaning must meet various REACH requirements and suppliers of enzymes as well as downstream users have obligations related to these requirements. In particular, an assessment of the airborne enzyme exposure must be conducted when including enzymes in sprayable products. Enzyme exposure, expressed as concentration of airborne enzyme protein, of consumers and professionals derived from use of spray products must be evaluated to demonstrate safety prior to marketing.

[0008] D.A. Basketter et al conducted several studies which are summarized in "Studies conducted for defining occupational and consumer exposure limits for enzyme protein respiratory allergens under REACH", Toxicology 268 (2010) 165-170. According to the conducted studies, the highest levels of exposure were observed with laundry trigger sprays.

[0009] One approach to reduce the generation of enzyme-bearing aerosols is the use of foams. However, foam products tend to sit on the surface of the fabric rather than penetrating the stain and are thus less effective as stain removers for fabrics.

[0010] In light of recent developments, there thus exists the need for enzymatic laundry pre-treatment sprays which deliver an improved stain removal but also pass the enzyme exposure test of the *International Association for Soaps, Detergents and Maintenance Products* (AISE), which sets the limit of airborne enzyme exposure to 15 ng/m³.

[0011] This need is addressed by the present invention which aims at providing an enzymatic laundry pre-treatment spray which allows for effective stain removal and low enzyme exposure.

[0012] It was surprisingly found that the above-mentioned need is solved by a sprayable laundry pre-treatment com-

position which comprises a multi-enzyme blend for effective stain removal while the formation of aerosols is decreased by incorporating Xanthan gum.

[0013] A first object of the present invention is therefore a sprayable aqueous laundry pre-treatment composition comprising:

- 0.5 to 15 wt.-% of a non-ionic surfactant;
- 0.2 to 1.5 wt.-% of glycerin;
- more than 0.1 wt.-% of Xanthan gum;
- 0.1 to 1.0 wt.-% of a multi-enzyme blend; and
- 0.1 to 1 wt.-% of an organic acid,

wherein the wt.-% are based on the total weight of the composition.

[0014] It was surprisingly found that the exposure to airborne enzymes could be reduced to 15 ng/m³ by the composition according to the invention while at the same time an enhancement in Primary Stain Removal (PSR) was observed.

[0015] Laundry pre-treatment sprays should generally be able to remove different kinds of stains. As a guideline for determining the effectiveness of a pre-treatment spray, stain sheets have been established which comprise stains of natural oils such as olive oil, mechanical oils, sebaceous stains as well stains caused by everyday occurrences such as coffee or make-up. It was surprisingly found that the variety of stains could be effectively removed using a multi-enzyme blend which comprises multiple enzymes which target different stain sources such as protein, starch, pectin, gum, fat, oil, and grease, with protein being one of the major concerns as they are found in sweat, blood, grass, chocolate, dairy products and coffee. Therefore, in a preferred embodiment of the present invention, the multi-enzyme blend comprises protease and at least one further enzyme selected from the group consisting of amylase, lipase, pectate lyase, serine endoprotease, cellulase and mannanase.

[0016] Examples of proteases to be used in the present invention are the subtilisins BPN' from *Bacillus amyloliquefaciens* and Carlsberg from *Bacillus licheniformis*, the protease PB92, the subtilisins 147 and 309, the protease from *Bacillus lentus*, subtilisin DY and the enzymes thermitase, proteinase K and the proteases TW3 and TW7, which can be assigned to subtilases but no longer to subtilisins in the narrower sense. Subtilisin Carlsberg is available in a further developed form under the trade name Alcalase® from the company Novozymes. Subtilisins 147 and 309 are marketed under the trade names Esperase® and Savinase®, respectively, by Novozymes. Protease variants are derived from the protease from *Bacillus lentus* DSM 5483. Other useful proteases are e.g. the proteases marketed under the trade names Durazym®, Relase®, Everlase®, Nafizym®, Natalase®, Kannase®, Progress Uno 101L® and Ovozyme® by the company Novozymes, the proteases marketed under the trade names Purafect®, Purafect® OxP, Purafect® Prime, Excellase®, Properase®, Preference P100® and Preference P300® from Danisco/DuPont, Laverge pro 104 LS® from BASF, Protosol® from Advanced Biochemicals Ltd., the enzymes available under the trade name Wuxi® from Wuxi Snyder Bioproducts Ltd, the enzymes available under the trade names Proleather® and Protease P® from Amano Pharmaceuticals Ltd, and the enzyme available under the trade name Proteinase K-16 from Kao Corp. Particularly preferred are also the proteases from *Bacillus gibsonii* and *Bacillus pumilus*, which are disclosed in WO 2008/086916, WO 2007/131656, WO 2017/215925, PCT/EP2021/054688 and PCT/EP2021/054689. Further advantageously applicable proteases are disclosed in, for example, WO 91/02792, WO 2008/007319, WO 93/18140, WO 01/44452, GB 1243784 A, WO 96/34946, WO 02/029024 and WO 03/057246. Other usable proteases are those naturally present in the microorganisms *Stenotrophomonas maltophilia*, in particular *Stenotrophomonas maltophilia* K279a, *Bacillus intermedius*, *Bacillus licheniformis* as well as *Bacillus sphaericus*.

[0017] Suitable lipases to be used in the present invention include those of bacterial or fungal origin. Chemically modified or protein engineered mutant enzymes are included. Examples include lipase from *Thermomyces*, e.g. from *T. lanuginosus* (previously named *Humicola lanuginosa*) as described in EP 0258068 and EP 0305216, lipase from strains of *Pseudomonas* (some of these now renamed to *Burkholderia*), e.g., *P. alcaligenes* or *P. pseudoalcaligenes* (EP 0218272), *P. cepacia* (EP 0331376), *P. sp.* strain SD705 (WO 95/06720 & WO 96/27002), *P. wisconsinensis* (WO 96/12012), GDSL-type *Streptomyces* lipases (WO 2010/065455), lipase from *Thermobifida fusca* (WO 2011/084412), *Geobacillus stearothermophilus* lipase (WO 2011/084417), lipase from *Bacillus subtilis* (WO 2011/084599), and lipase from *Streptomyces griseus* (WO 2011/150157) and *S. pristinaespiralis* (WO 2012/137147).

[0018] Preferred lipases include, for example, those originally obtainable from *Humicola lanuginosa* (*Thermomyces lanuginosus*) or further developed therefrom, in particular those with one or more of the following amino acid exchanges starting from the said lipase in positions D96L, T213R and/or N233R, particularly preferably T213R and N233R. Lipases are marketed, for example, by the company Novozymes under the trade names Lipolase®, Lipolase® Ultra, LipoPrime®, Lipozyme® and Lipex®. Another advantageously applicable lipase is available under the trade name Lipoclean® from the company Novozymes. Preferred commercial lipase products include Lipolase™, Lipex™, Lipolex™ and Lipoclean™ (Novozymes A/S), Lumafast (Genencor / DuPont) and Lipomax (Gist-Brocades).

[0019] Suitable pectate lyases for use in the present invention are in particular pectate lyase (EC 4.2.2.2) which

catalyzes the eliminative cleavage of (1,4)-alpha-D-glacturonan to give oligosaccharides with 4-deoxy-alpha-D-galact-4-enuronosyl groups at their non-reducing ends. Examples of other names are: pectate transeliminase, polygalacturonic transeliminase and endopectin methyltranseliminase. The systematic name is (1,4)-alpha-D-galacturonan lyase. In a particular embodiment, preference is given to pectate lyase derived from *Bacillus*. Particular preference is given to XPECT 1000L as commercially available from Novozymes, Denmark.

[0020] Amylases for use in the present invention may also be referred to by synonymous terms, for example, 1,4- α -D-glucan glucanohydrolase or glycogenase. Amylases preferred according to the invention are alpha-amylases. The decisive factor in determining whether an enzyme is an alpha-amylase within the meaning of the invention is its ability to hydrolyze α -(1,4)-glycoside bonds in polysaccharides, in particular amylose and starch. In this way, they cause the degradation of starch-containing soils on the cleaning material. The decomposition products are dextrans and maltose, glucose and branched oligosaccharides. Examples of amylases are the α -amylases from *Bacillus licheniformis*, *Bacillus amyloliquefaciens* or *Bacillus stearothermophilus* and, in particular, their further developments improved for use in detergents or cleaning agents. The enzyme from *Bacillus licheniformis* is available from the company Novozymes under the name Termamyl® and from the company Danisco/Genencor under the name Purastar® ST. Further development products of this α -amylase are available from Novozymes under the trade names Duramyl® and Termamyl® ultra, from Danisco/Genencor under the name Purastar® OxAm and from Daiwa Seiko Inc. as Keistase®. The α -amylase from *Bacillus amyloliquefaciens* is marketed by the company Novozymes under the name BAN®, and derived variants of the α -amylase from *Bacillus stearothermophilus* under the names BSG® and Novamyl®, also from the company Novozymes. Furthermore, the α -amylase from *Bacillus* sp. A 7-7 (DSM 12368) and the cyclodextrin-glucanotransferase (CGTase) from *Bacillus agaradherens* (DSM 9948) should be highlighted for this purpose. Furthermore, the amylolytic enzymes disclosed in international patent applications WO 2003/002711, WO 2003/054177 and WO 2007/079938 are applicable, the disclosure of which is therefore expressly referred to or the disclosure content of which is therefore expressly included in the present patent application. Likewise, fusion products of all the molecules mentioned are applicable. In addition, the further developments of α -amylase from *Aspergillus niger* and *A. oryzae* available under the trade names Fungamyl® from the company Novozymes are suitable. Other advantageously applicable commercial products are, for example, Amylase-LT® and Stainzyme® or Stainzyme ultra® or Stainzyme plus® as well as Amplify™ or Amplify Prime™, also from the Novozymes company. Variants of these enzymes obtainable by point mutations can also be used according to the invention.

[0021] The term "mannanase" is defined in the context of the present invention as an enzyme that hydrolyses compounds known as mannans. Mannanases are enzyme catalyzing hydrolyses of 1,4-beta-D-mannosidic linkages in mannans, galactomannans, glucomannans, and galactoglucomannans. Mannans are polysaccharides with a backbone of β -1,4-linked D-mannopyranosyl residues, which can contain galactose or acetyl substitutions and may have glucose residues in the backbone. The main enzyme type participating in the degradation of mannans are endo-1,4- β -mannanases (EC 3.2.1.78), which hydrolyze the internal glycoside bonds in the mannan backbone. Within the present invention a mannanase enzyme comprising a polypeptide having mannan endo-1,4-beta-mannosidase activity (EC 3.2.1.78) that catalyzes the hydrolysis of 1,4-beta-D-mannosidic linkages in mannans, galactomannans and/or glucomannans is preferred. According to CAZY (www.cazy.org), endo-1,4- β -mannanases can be found in glycoside hydrolase families 5, 26 and 113. Suitable mannanases include those of bacterial or fungal origin. Chemically or genetically modified mannanases are included. The mannanase may be an alkaline mannanase of Family 5 or 26. It may be a wild-type from *Bacillus* or *Humicola*, particularly *B. agaradhaerens*, *B. licheniformis*, *B. halodurans*, *B. clausii*, or *H. insolens*. Commercially available mannanases are Mannaway (Novozymes A/S), and EFFECTENZ™ M1000 from Dupont. Preferred mannanases include the GH5 mannanase obtained from *Bacillus bogoriensis* described in WO 1999/064619. Other preferred mannanases include any of the GH26 Mannanases, mannanase from *Preussia aemulans* mature sequence of SEQ ID NO: 2 of WO 2017/021515, mannanase from *Yunnania penicillata* mature sequence of SEQ ID NO: 2 of WO 2017/021516, mannanase from *Myrothecium roridum* mature sequence of SEQ ID NO: 2 of WO 2017/021517, mannanase from *Chaetomium brasiliense* mature sequence of SEQ ID NO: 2 of WO 2017/021518, mannanases from *Ascobolus stictodeus* or mannanase from *Chaetomium virescens* SEQ ID NO: 3 and 6 from WO 2015/040159.

[0022] Within the course of the present invention, it was surprisingly found that stain removal could be improved by employing a multi-enzyme blend. In a preferred embodiment of the present invention, the multi-enzyme blend comprises a mixture of protease, lipase, amylase, pectate lyase and mannanase.

[0023] By employing a multi-enzyme blend according to the present invention, stains such as sweat stains, blood, grass, chocolate, dairy products, ready-made sauces, baby foods, dressings, fruit stains, tooth paste, body lotion, grease and oil could be effectively removed.

[0024] Compositions according to the present invention comprise at least one organic acid in an amount of 0.1 to 1.0 wt.-%, based on the total weight of the inventive composition. It is preferred that the organic acid is selected from the group consisting of glycolic acid, citric acid, acetic acid, maleic acid, lactic acid and mixtures thereof. In an especially preferred embodiment, citric acid is used due to its favorable chelating properties and odor characteristics.

[0025] The laundry pre-treatment composition of the present invention is in particular designed for the removal of

organic stains. In this regard, alkaline pH was found to be most effective. Therefore, the inventive composition preferably has a pH of 6 to 10, more preferably 6 to 9.

[0026] Preferred non-ionic surfactants in the inventive composition are alkoxyated alcohols in which the alkanol is a C9 to C20-alkanol, preferably C12 to C18-alkanol, wherein the number of moles alkylene oxide is from 5 to 20. Of such materials, it is preferred to use those wherein the alkanol is a fatty alcohol with 10 to 20 carbon atoms, preferably 12 to 18 carbon atoms, and which contain 5 to 9, preferably 5 to 8, alkoxy groups per mole.

[0027] The composition according to the invention comprises Xanthan gum. It was surprisingly found that by adding Xanthan gum to the composition according to the present invention, the enzyme exposure could be significantly reduced and kept below the threshold of 15 ng/m³ while at the same time the composition remained sprayable. Xanthan gum is generally believed to have a cellulose-like backbone or chain composed of repeating β -D-(1,4) glucose units. A side chain is connected to the number three position of every other glucose unit. The side chains consist of a terminal β -D-mannose unit glycosidically linked to the number 4 position of a β -D-glucuronic acid which in turn is linked to the number 2 position of an α -D-mannose unit that contains an acetyl group at the number 6 position. In addition, a portion of the terminal mannose units have a pyruvate ketal attached to the number 4 and number 6 positions. Alternative thickeners such as carboxymethylcellulose, hydroxyethylcellulose and C10-C30 alkyl acrylate crosspolymers were tested, however, none was capable of reducing the enzyme exposure to below the threshold of 15 g/m³. In a preferred embodiment, the composition according to the invention comprises Xanthan gum in an amount of at least 0.15 wt.-%, preferably in an amount of 0.2 to 1.0 wt.-%, based on the total weight of the sprayable composition. It was surprisingly found that keeping the content of Xanthan gum within the claimed range, enzyme exposure could be kept secularly below the threshold of 15 ng/m³ while at the same time maintaining the composition in a sprayable form without any foaming tendencies.

[0028] The composition according to the invention further comprises at least one preservative, preferably in an amount of 0.2 to 2.0 wt.-%, more preferably 0.5 to 1.5 wt.-%, based on the total weight of the inventive composition, respectively.

[0029] In a preferred embodiment, the preservative belongs to the group of isothiazolinones. In an especially preferred embodiment, the preservative is selected from methylisothiazolinone and benzisothiazolinone.

[0030] A further object of the present invention is the use of a composition according to the present invention for removing stains from fabrics, in particular for the removal of oily stains and/or sebaceous stains.

[0031] Another object of the present invention is a method for removing stains from fabric comprising contacting the stain with 0.5 to 5 ml of a composition according to the present invention, followed by cleaning the fabric with aqueous laundry detergent or by dry cleaning. The composition employed in the method according to the invention is sprayable. Therefore, the composition is preferably applied by spraying the composition onto the stain. The pre-treatment is followed by a further washing step. This washing step may be a manual washing or washing in a machine or dry cleaning. Any suitable detergent may be used.

[0032] The composition of the present invention is preferably ambient-active. Accordingly, the second step of the method according to the invention is preferably carried out at temperatures of less than 40 °C, preferably less than 30 °C. Further, the temperature is preferably more than 15 °C, preferably more than 20 °C.

[0033] The composition according to the invention is provided as a spray as this was found to be the most effective method of application. Therefore, another object of the present invention is an aerosol dispenser comprising the composition according to the present invention. In a preferred embodiment, the dispenser according to the invention is rechargeable.

[0034] The invention will be illustrated in more detail by the following examples which by no means are to be understood as limiting the scope and spirit of the invention.

Examples

[0035] Table 1 shows an example of a pre-treatment laundry composition in line with the present invention.

Table 1: Laundry pre-treatment composition

Component	[wt.-%]
water	92.4
preservative *	0.1
citric acid	0.5
Xanthan gum	0.2
sodium hydroxide	0.6
Glycerin	0.5

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(continued)

Component	[wt.-%]
non-ionic surfactant	5.0
perfume	0.1
multi-enzyme blend	0.5
total	100
*) 2-methyl-2H-isothiazol-3-one/1,2-benzisothiazol-3(2H)-one	

[0036] As multi-enzyme blend, Medley Pure 300 L, available from Novozymes A/S, Denmark, was used.

[0037] The prepared composition was obtained as a clear and colorless liquid with a pH of 8.0 and a viscosity (RV, 20 °C) of 500 to 700 MPas.

a) Stain removal

[0038] The effectiveness of the composition of Table 1 with regard to stain removal was tested using a stain sheet with 15 stains which were determined by consumer use and habit survey to be the most common stains and most difficult stains to remove. The stains are summarized in Table 2. All stains are commercially available from CFT Center for Testmaterials, Vlaardingen, Netherlands.

Table 2: Stain set

coffee w/ milk	sauce: spaghetti	starch: rice (coloured)	blood, milk, ink ENZ	pigment, oil, low milk content
motor oil/ pigments	clay: yellow, modelling	sebum w/ carbon black	clay (standard)	make-up (fluid)
olive oil w/ carbon black GCS	red wine (not aged) GCS	lipstick: red (diluted) GCS	grass GCS	ice cream: chocolate GCS

[0039] Each individual stain of the stain set was dried and sprayed with the composition of Table 1. After 2 minutes the stain set was loaded into a washing machine with the addition of a common detergent (Fab detergent, commercially available from Henkel & Co. KGaA) and after a further 5 minutes, the washing machine cycle was initiated. After the washing cycle was completed, the stain set was removed and air dried. The washing conditions are summarized in Table 3.

Table 3: Washing cycles

Parameter	Pre-Treater PSR	
Machine Type	Front	Top
Cycle	Cotton	Regular
Water Temperature Setting	Cold	Cold
Water Setting	Automatic	Low/Medium
Wash Water Volume (litres)	15 to 16	45 to 47
Water Hardness (ppm as Ca ²⁺)	50 to 80	50 to 80
Wash Temperature (°C)	19 to 21	19 to 21
Wash Time (minutes)	65 to 70	10 to 12
Spin Speed (rpm)	1200	1000
Total Cycle Time (minutes)	127 to 137	47 to 50
Appendix Cloth	2kg White mixed fabric	

[0040] After the stain set was dried, each stain was scanned using a Datacolor600 Spectrometer and the reflectance

L* or ΔL was measured, which in turn determines the amount of soil removed from the stain. The device parameters are given in Table 4.

Table 4: Device parameter

Specular	Exclude
Aperture	LAV (30mm)
Auto Zoom	Enabled
UV Filter	Filter FL42

[0041] The pretreatment composition according to the invention was compared with several comparative compositions:

Sample 1: comparative composition 1, comprising 6.7% Nonionic surfactant (FAEO, C12-18 7EO); 5.3% Anionic surfactant (NaLAS); 0.25% GLDA (Glutamic Acid, N,N-diacetic acid, tetrasodium salt); 0.5% HEDP (1-hydroxyethylidene-1,1-diphosphonic acid); 0.1% Preservative (Acticide MBR1); -1.6% 50% NaOH; 0.14% Fragrance (Rebirth LF 850414) and balance water.

Sample 2: pre-treatment composition according to the invention

Sample 3: "Preen Vanish Oxy Action Fabric Stain Remover Spray", commercially available from Reckitt, Netherlands, mentioning a content of hydrogen peroxide of 35 g/L

Sample 4: "Di-San Oxy Action with Enzyme Pre-Wash Stain Remover", commercially available from Aldi Australia, generally disclosing the presence of enzymes

Sample 5: Fab-detergent as commercially available from Henkel & Co. KGaA employed in the washing cycles

[0042] The results are shown in Figures 1 to 5. The testing was performed under the conditions as listed in Table 3.

Figure 1 shows the results of a comparison of a common pretreatment composition (sample 1) and the pretreatment composition according to the invention (sample 2) performed in a top loader (TL).

Figure 2 shows the results of the comparison of the composition according to the invention (sample 2) with several common pretreatment compositions (samples 1, 3 and 4) with the stain removal activity of the detergent used in the washing cycles (sample 5). The washing cycles were carried out in a top loader. As can be seen, a significant improvement in stain removal could be achieved by the pretreatment composition.

Figure 3 shows the results of the comparison of the composition according to the invention (sample 2) with several common pretreatment compositions (samples 1, 3 and 4) with the stain removal activity of the detergent used in the washing cycles (sample 5). The washing cycles were carried out in a front loader. As can be seen, a significant improvement in stain removal could be achieved by the pretreatment composition.

Figure 4 shows the combined results of Figures 2 and 3.

Figure 5 shows the stain removal activity of the inventive pretreatment composition on a freshly applied stain and a stain which was left to dry for 1 week. As can be seen, the inventive pretreatment composition is also highly effective in the removal of dried stains.

b) Enzyme exposure tests

[0043] Exposure measurements were carried out according to "Exposure measurements of enzymes for risk assessment of household cleaning spray products" of the International Association for Soaps, Detergents and Maintenance Products (AISE) of July 2020. A schematic representation of the distances between spray bottle, textile target and air filter is shown in Figure 6.

[0044] The test protocol is as follows:

1. Pumps are started
2. After 1 minute: spray 5 times on the framed textile with a frequency of 1 spray per second
3. Rest for 10 seconds, during this time change the framed textile
4. Repeat the spray cycle 5 times, resulting in a total of 6 cycles
5. Leave the last framed textile and let the pump run
6. Turn off the pumps after a total of 10 minutes from the first spray cycle.

[0045] Air-sampling equipment is used to collect airborne enzymes during the application of the spray on the textile. After air sampling, the filters are analyzed for enzyme protein collected during the air sampling. The testing showed that already the addition of 0.1 wt.-% of Xanthan gum reduced the enzyme exposure significantly, addition of 0.2 wt.-% of Xanthan gum kept the exposure securely below the critical threshold of 15 ng/m³ without affecting the spraying properties of the pre-treatment composition according to the invention.

Claims

1. A sprayable aqueous laundry pre-treatment composition comprising
 - 0.5 to 15 wt.-% of a non-ionic surfactant;
 - 0.2 to 1.5 wt.-% of glycerin;
 - more than 0.1 wt.-% of Xanthan gum
 - 0.1 to 1 wt.-% of a multi-enzyme blend;
 - 0.1 to 1 wt.-% of an organic acid,
 wherein the wt.-% are based on the total weight of the composition.
2. The composition of claim 1, **characterized in that** the multi-enzyme blend comprises protease and at least one further enzyme selected from the group consisting of amylase, lipase, pectate lyase, serine endoprotease, cellulase and mannanase.
3. The composition of any of the forgoing claims, **characterized in that** the composition comprises Xanthan gum in an amount of at least 0.15 wt.-%, preferably in an amount of 0.2 to 1.0 wt.-%, based on the total weight of the sprayable composition.
4. The composition of any of the forgoing claims, **characterized in that** the organic acid is selected from the group consisting of glycolic acid, citric acid, acetic acid, maleic acid, lactic acid and mixtures thereof.
5. The composition of any of the forgoing claims, **characterized in that** the composition has a pH of 6 to 10, preferably 6 to 9.
6. The composition of any of the forgoing claims, **characterized in that** the multi-enzyme blend comprises a mixture of protease, lipase, amylase, pectate lyase and mannanase.
7. The composition of any of the forgoing claims, **characterized in that** the composition further comprises at least one preservative, preferably in an amount of 0.2 to 2 wt.-%, preferably 0.5 to 1.5 wt.-%, based on the total weight of the composition.
8. The composition of claim 7, **characterized in that** the preservative is selected from the group of isothiazolinones, preferably methylisothiazolinone or benzisothiazolinone.
9. Use of a composition according to any of claims 1 to 8 for removing stains from fabrics.
10. Use of claim 9, wherein the stains are oily stains and/or sebaceous stains.
11. Method for removing stains from fabrics comprising a step of contacting the stain with 0.5 to 5 ml of a composition of any of claims 1 to 8, followed by cleaning the fabric with aqueous laundry wash liquor or by dry cleaning.
12. Aerosol dispenser comprising a composition of any of claims 1 to 8.

13. The dispenser of claim 12, **characterized in that** the dispenser is rechargeable.

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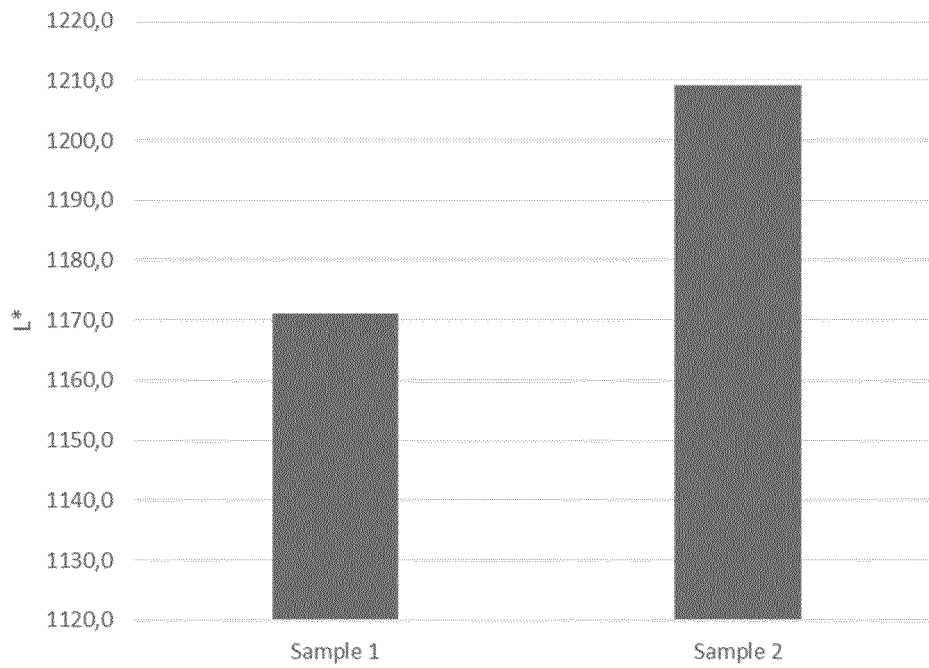


Figure 1

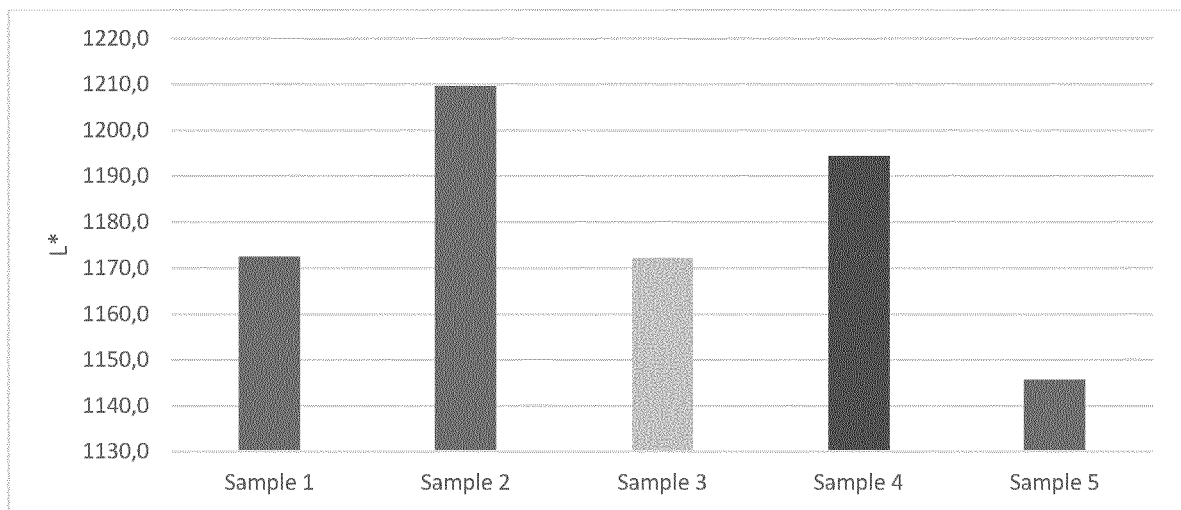


Figure 2

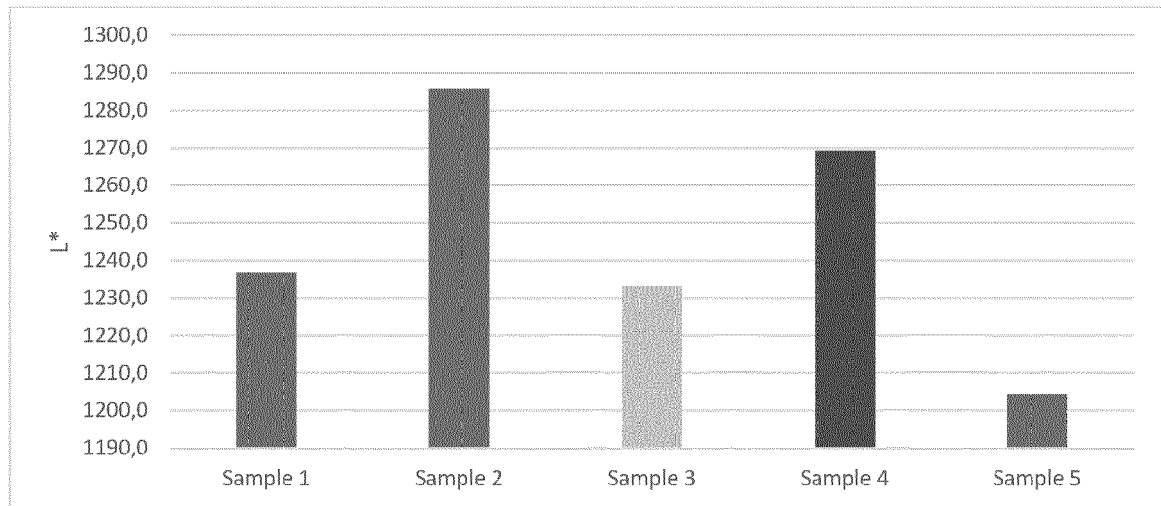


Figure 3

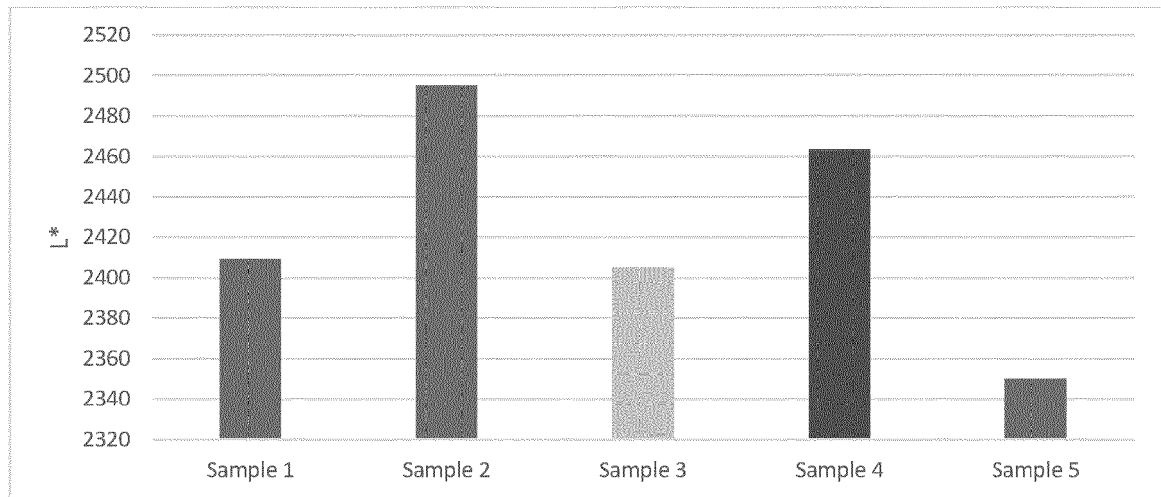


Figure 4

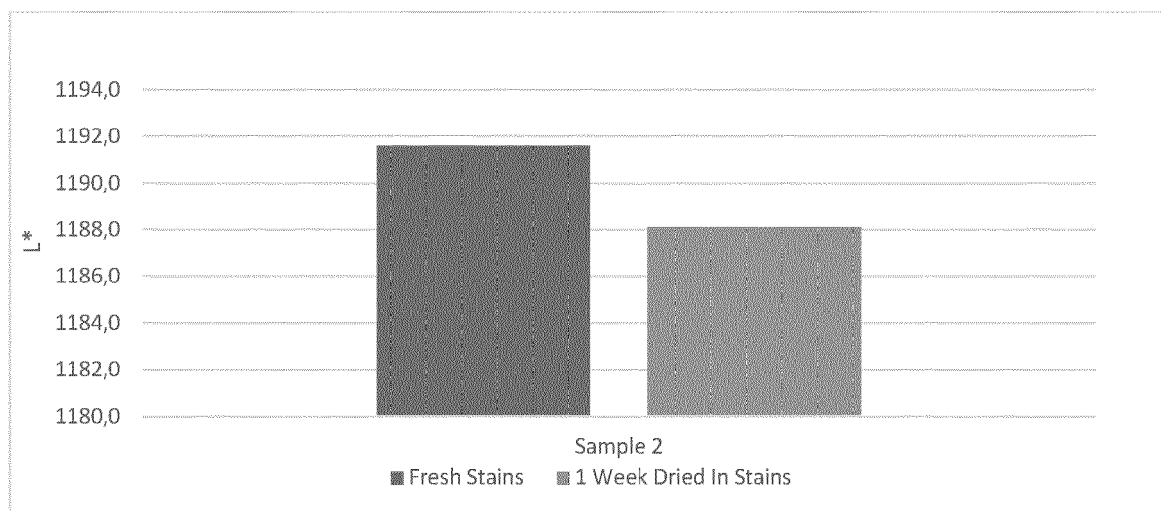


Figure 5

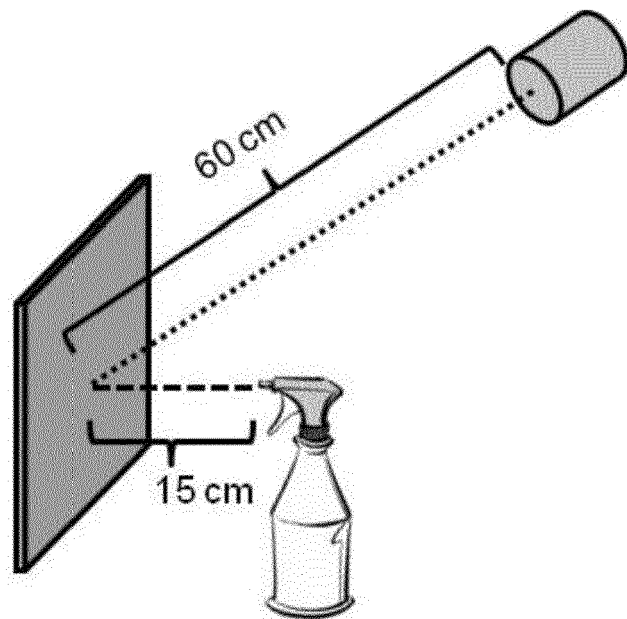


Figure 6



EUROPEAN SEARCH REPORT

Application Number

EP 21 19 0970

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 26 January 2022	Examiner Grittern, Albert
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