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(54) Title: METHOD FOR PROVIDING FAST DRY TO FABRIC

(57) Abstract: A method for reducing time needed for drying fabric comprising laundering the fabric at least 3 times with a composition comprising a linear polyether having a weight average molecular weight less than 5000 that is terminated with -N-CH₂-CH(OH)-CH₂-Cl, wherein the linear polyether is deposited on the fabric and reduces the time needed for drying.



WO 2013/032479 A1

METHOD FOR PROVIDING FAST DRY TO FABRIC

FIELD OF THE INVENTION

[0001] The present invention relates to a method for providing fast dry property to fabric.

BACKGROUND OF THE INVENTION

[0002] After laundering of fabric, fabric is dried. Drying can be done by line drying or dryer drying. In a dryer, the longer the drying time, the more energy that is used to dry the fabric. It would be desirable to reduce the time needed to dry fabric.

BRIEF SUMMARY OF THE INVENTION

[0003] A method for reducing time needed for drying fabric comprising laundering the fabric at least 3 times with a composition comprising a linear polyether having a weight average molecular weight less than 5000 that is terminated with $-N-CH_2-CH(OH)-CH_2-Cl$, wherein the linear polyether is deposited on the fabric and reduces the time needed for drying.

[0004] In certain embodiments, the molecular weight is less than 2000.

[0005] Further areas of applicability of the present invention will become apparent from the detailed description provided hereinafter. It should be understood that the detailed description and specific examples, while indicating the preferred embodiment of the invention, are intended for purposes of illustration only and are not intended to limit the scope of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0006] The following description of the preferred embodiment(s) is merely exemplary in nature and is in no way intended to limit the invention, its application, or uses.

[0007] Provided is a method for reducing time needed for drying fabric comprising laundering the fabric at least 3 times with a composition comprising a linear polyether having a weight average molecular weight less than 5000 that is terminated with $-N-CH_2-CH(OH)-CH_2-Cl$, wherein the linear polyether is deposited on the fabric and reduces the time needed for drying.

[0008] The laundering can start with machine washing or hand washing. Washing typically includes using a detergent in a wash cycle. Washing is usually followed by a rinse cycle. After washing and rinsing, fabrics can be dried by hanging on a line or in a dryer. The fabric can be ironed after drying.

[0009] The method can be used on any type of fabric. In certain embodiments, the fabric is in need of a reduced time for drying. Typical fabrics include any fabric used to make clothing, such as cotton, polyester, elastane, or denim. In certain embodiments, the fabric is denim.

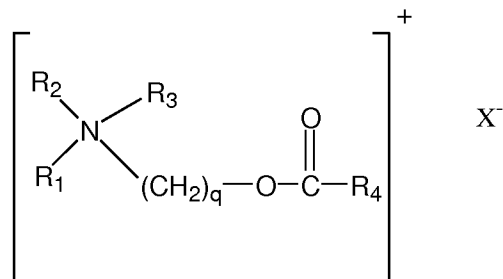
[0010] The composition used in the method can be used during any step of the laundering method. In one embodiment, the composition is added during the wash cycle. In one embodiment, the composition is added during the rinse cycle. It has been found that multiple launderings can increase the reduction of the time needed for drying. The fabric can be laundered with the composition for at least 3 times, at least 4 times, or at least 5 times.

[0011] The composition contains a linear polyether having a weight average molecular weight less than 5000 that is terminated with $-N-CH_2-CH(OH)-CH_2-Cl$. In other embodiments, the molecular weight is less than 4000, less than 3000, or less than 2000. In certain embodiments, the polymer has a molecular weight less than 2000. This polymer having a molecular weight less than 2000 is available from Devan Chemical under the Passerelle™ trademark as DP5270 or DFD. DP5270 is sold as an aqueous composition that contains 20% polymer with a total solids of 23-24%, with the other solids being surfactants. The DFD product contains 82% of the DP5270 product and further contains ethoxylated fatty-quaternary softeners. The amount of the polymer in the composition is 0.08 to 0.4% by weight of the composition. In certain embodiments, the amount is 0.1, 0.2, 0.3, or 0.4 % by weight of the composition. Based on as supplied weight, the DP5270 composition can be used in an amount of 0.5 to 1.5 % by weight of the composition, optionally at 0.5, 1, or 1.5 % by weight. The DFD composition can be used in an amount of 0.5 to 2 % by weight of the composition, optionally at 0.5, 1, 1.5, or 2 % by weight.

[0012] The Passerelle™ polyethers are used to treat fabrics during the manufacture of the fabrics by direct application of the polyethers to the fabric to provide fast dry to the fabrics. The method of the invention allows the polyether to be added to fabrics that were never treated or to reapply the polyethers during home use.

[0013] In one embodiment, the polyether is included in a fabric conditioner. A fabric conditioner composition contains a fabric softener material. In certain embodiments, the softener is a cationic softener selected from among esterquats, imidazolinium quats, difatty diamide ammonium methyl sulfate, ditallow dimethyl ammonium chloride, and mixtures thereof.

[0014] In certain embodiments, the cationic fabric softener is an esterquat. The esterquats of the following formula:

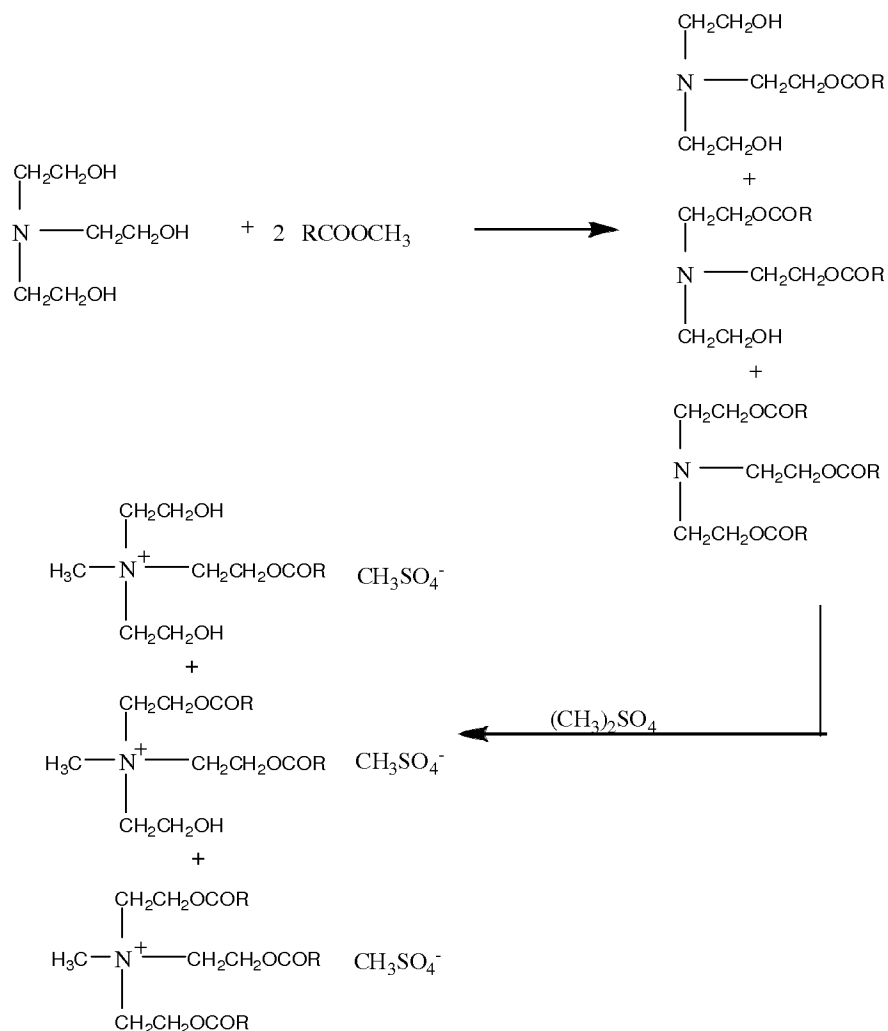


wherein R₄ is an aliphatic hydrocarbon group having from 8 to 22 carbon atoms, R₂ and R₃ represent (CH₂)_s-R₅, where R₅ is an alkoxy carbonyl group containing from 8 to 22 carbon atoms, benzyl, phenyl, C₁-C₄ alkyl substituted phenyl, OH or H; R₁ is (CH₂)_t-R₆, where R₆ is benzyl, phenyl, C₁-C₄ alkyl substituted phenyl, OH or H; q, s, and t, each independently, are an integer from 1 to 3; and X⁻ is a softener compatible anion.

[0015] The esterquat is produced by reacting about 1.65 (1.5 to 1.75) moles of fatty acid methyl ester with one mole of alkanol amine followed by quaternization with dimethyl sulfate (further details on this preparation method are disclosed in US-A-3,915,867). Using this ratio controls the amount of each of monoesterquat, diesterquat, and triesterquat in the composition. In certain embodiments, the alkanol amine comprises triethanolamine. In certain embodiments, it is desirable to increase the amount of diesterquat and minimize the amount of triesterquat to increase the softening capabilities of the composition. By selecting a ratio of about 1.65, the triesterquat can be minimized while increasing the monoesterquat.

[0016] Monoesterquat is more soluble in water than triesterquat. Depending on the AI, more or less monoesterquat is desired. At higher AI levels (usually at least 7%), more monoesterquat as compared to triesterquat is desired so that the esterquat is more soluble in the water so that the esterquat can be delivered to fabric during use. At lower AI levels (usually up to 3%), less monoesterquat is desired because during use, it is desired for the esterquat to leave solution and deposit on fabric to effect fabric softening. Depending on the AI, the amount of monoesterquat and triesterquat are adjusted to balance solubility and delivery of the esterquat.

[0017] In certain embodiments, the reaction products are 50-65 weight% diesterquat, 20-40 weight% monoester, and 25 weight% or less triester, which are shown below:



In other embodiments, the amount of diesterquat is 52-60, 53-58, or 53-55 weight %. In other embodiments, the amount of monoesterquat is 30-40 or 35-40 weight%. In other embodiments, the amount of triesterquat is 1-12 or 8-11 weight %.

[0018] The percentages, by weight, of mono, di, and tri esterquats, as described above are determined by the quantitative analytical method described in the publication "Characterisation of quaternized triethanolamine esters (esterquats) by HPLC, HRCGC and NMR" A.J. Wilkes, C. Jacobs, G. Walraven and J.M. Talbot - Colgate Palmolive R&D Inc. - 4th world Surfactants Congress, Barcelone, 3-7 VI 1996, page 382. The percentages, by weight, of the mono, di and tri esterquats measured on dried samples are normalized on the basis of 100%. The normalization is required due to the presence of 10% to 15%, by weight, of non-quaternized species, such as ester

amines and free fatty acids. Accordingly, the normalized weight percentages refer to the pure esterquat component of the raw material. In other words, for the weight % of each of monoesterquat, diesterquat, and triesterquat, the weight % is based on the total amount of monoesterquat, diesterquat, and triesterquat in the composition.

[0019] In certain embodiments, the percentage of saturated fatty acids based on the total weight of fatty acids is 45 to 75%. Esterquat compositions using this percentage of saturated fatty acids do not suffer from the processing drawbacks of 100% saturated materials. When used in fabric softening, the compositions provide good consumer perceived fabric softness while retaining good fragrance delivery. In other embodiments, the amount is at least 50, 55, 60, 65 or 70 up to 75%. In other embodiments, the amount is no more than 70, 65, 60, 55, or 50 down to 45%. In other embodiments, the amount is 50 to 70%, 55 to 65%, or 57.5 to 67.5%. In one embodiment, the percentage of the fatty acid chains that are saturated is about 62.5% by weight of the fatty acid. In this embodiment, this can be obtained from a 50:50 ratio of hard:soft fatty acid.

[0020] By hard, it is meant that the fatty acid is close to full hydrogenation. In certain embodiments, a fully hydrogenated fatty acid has an iodine value of 10 or less. By soft, it is meant that the fatty acid is no more than partially hydrogenated. In certain embodiments, a no more than partially hydrogenated fatty acid has an iodine value of at least 40. In certain embodiments, a partially hydrogenated fatty acid has an iodine value of 40 to 55. The iodine value can be measured by ASTM D5554-95 (2006). In certain embodiments, a ratio of hard fatty acid to soft fatty acid is 70:30 to 40:60. In other embodiments, the ratio is 60:40 to 40:60 or 55:45 to 45:55. In one embodiment, the ratio is about 50:50. Because in these specific embodiments, each of the hard fatty acid and soft fatty acid cover ranges for different levels of saturation (hydrogenation), the actual percentage of fatty acids that are fully saturated can vary. In certain embodiments, soft tallow contains approximately 47% saturated chains by weight.

[0021] The percentage of saturated fatty acids can be achieved by using a mixture of fatty acids to make the esterquat, or the percentage can be achieved by blending esterquats with different amounts of saturated fatty acids.

[0001] The fatty acids can be any fatty acid that is used for manufacturing esterquats for fabric softening. Examples of fatty acids include, but are not limited to, coconut oil, palm oil, tallow, rape oil, fish oil, or chemically synthesized fatty acids. In certain embodiments, the fatty acid is tallow.

[0022] While the esterquat can be provided in solid form, it is usually present in a solvent in liquid form. In solid form, the esterquat can be delivered from a dryer sheet in the laundry. In certain embodiments, the solvent comprises water.

[0023] AI refers to the active weight of the combined amounts for monoesterquat, diesterquat, and triesterquat. Delivered AI refers to the mass (in grams) of esterquat used in a laundry load. A load is 3.5 kilograms of fabric in weight. As the size of a load changes, for example using a smaller or larger size load in a washing machine, the delivered AI adjusts proportionally. In certain embodiments, the delivered AI is 2.8 to 8 grams per load. In other embodiments, the delivered AI is 2.8 to 7, 2.8 to 6, 2.8 to 5, 3 to 8, 3 to 7, 3 to 6, 3 to 5, 4 to 8, 4 to 7, 4 to 6, or 4 to 5 grams per load.

[0024] The composition can be provided as a fragrance free composition, or it can contain a fragrance. The amount of fragrance can be any desired amount depending on the preference of the user. In certain embodiments, the total amount of fragrance oil is 0.3 to 3 weight % of the composition. The fragrance can be in free form, encapsulated, or both.

[0025] Fragrance, or perfume, refers to odoriferous materials that are able to provide a desirable fragrance to fabrics, and encompasses conventional materials commonly used in detergent compositions to provide a pleasing fragrance and/or to counteract a malodor. The fragrances are generally in the liquid state at ambient temperature, although solid fragrances can also be used. Fragrance materials include, but are not limited to, such materials as aldehydes, ketones, esters and the like that are conventionally employed to impart a pleasing fragrance to laundry compositions. Naturally occurring plant and animal oils are also commonly used as components of fragrances.

[0026] The composition can contain any material that can be added to fabric softeners. Examples of materials include, but are not limited to, surfactants, thickening polymers, colorants, clays, buffers, silicones, fatty alcohols, and fatty esters.

[0027] The fabric conditioners may additionally contain a thickener. In one embodiment, the thickening polymer is the FLOSOFT™ DP200 polymer from SNF Floerger that is described in United States Patent No. 6,864,223 to Smith et al., which is sold as FLOSOFT™ DP200, which as a water soluble cross-linked cationic polymer derived from the polymerization of from 5 to 100 mole percent of cationic vinyl addition monomer, from 0 to 95 mole percent of acrylamide, and from 70 to 300 ppm of a difunctional vinyl addition monomer cross-linking agent. A

suitable thickener is a water-soluble cross-linked cationic vinyl polymer which is cross-linked using a cross-linking agent of a difunctional vinyl addition monomer at a level of from 70 to 300 ppm, preferably from 75 to 200 ppm, and most preferably of from 80 to 150 ppm. These polymers are further described in U.S. Pat. No. 4,806,345, and other polymers that may be utilized are disclosed in WO 90/12862. Generally, such polymers are prepared as water-in-oil emulsions, wherein the cross-linked polymers are dispersed in mineral oil, which may contain surfactants. During finished product making, in contact with the water phase, the emulsion inverts, allowing the water soluble polymer to swell. The most preferred thickener is a cross-linked copolymer of a quaternary ammonium acrylate or methacrylate in combination with an acrylamide comonomer. The thickener in accordance provides fabric softening compositions showing long term stability upon storage and allows the presence of relatively high levels of electrolytes without affecting the composition stability. Besides, the fabric softening compositions remain stable when shear is applied thereto. In certain embodiments, the amount of this thickening polymer is at least 0.001 weight %. In other embodiments, the amount is 0.001 to 0.35 weight %.

[0028] The fabric conditioner may further include a chelating compound. Suitable chelating compounds are capable of chelating metal ions and are present at a level of at least 0.001%, by weight, of the fabric softening composition, preferably from 0.001% to 0.5%, and more preferably 0.005% to 0.25%, by weight. The chelating compounds which are acidic in nature may be present either in the acidic form or as a complex/salt with a suitable counter cation such as an alkali or alkaline earth metal ion, ammonium or substituted ammonium ion or any mixtures thereof. The chelating compounds are selected from among amino carboxylic acid compounds and organo aminophosphonic acid compounds, and mixtures of same. Suitable amino carboxylic acid compounds include: ethylenediamine tetraacetic acid (EDTA); N-hydroxyethylenediamine triacetic acid; nitrilotriacetic acid (NTA); and diethylenetriamine pentaacetic acid (DEPTA). Suitable organo aminophosphonic acid compounds include: ethylenediamine tetrakis (methylenephosphonic acid); 1-hydroxyethane 1,1-diphosphonic acid (HEDP); and aminotri (methylenephosphonic acid). In certain embodiments, the composition can include amino tri methylene phosphonic acid, which is available as Dequest™ 2000 from Monsanto. In other embodiments, the composition can include glutamic acid, N,N-diacetic acid, tetra sodium salt, which is available as Dissolvine™ GL from AkzoNobel.

[0029] In certain embodiments, the composition can include a C₁₃–C₁₅ Fatty Alcohol EO 20:1, which is a nonionic surfactant with an average of 20 ethoxylate groups. In certain embodiments, the amount is 0.05 to 0.5 weight%.

[0030] In certain embodiments, the composition can contain a silicone as a defoamer, such as Dow Corning™ 1430 defoamer. In certain embodiments, the amount is 0.05 to 0.8 weight%.

[0031] In certain embodiments, the composition can be an aqueous composition that contains the linear polyether and water. In other embodiments, the linear polyether can be added directly to the laundering method.

[0032] In certain embodiments, the method reduces the time needed for drying by at least 5, at least 10, or at least 20% as compared to a time for drying without the use of the linear polyether.

SPECIFIC EMBODIMENTS

[0033] In the examples below, the amounts of material are based on the as supplied weight of the material. For each of the examples, the amount of water is reduced by the amount of polyether added.

Material (weight %)	Comparative	Example
Tetranyl™ AHT5090 Esterquat from Kao	7.8	7.8
Lactic acid (80% active)	0.0625	0.0625
Dequest™ 2000 amino trimethyl phosphonic acid	0.05	0.05
FLOSOFT™ DP200 thickening polymer	0.135	0.135
DPD or DP5270 linear polyether having a weight average molecular weight less than 2000 that is terminated with –N–CH ₂ –CH(OH)–CH ₂ –Cl	0	0.5, 1, 1.5, or 2
Water and minors (fragrance, preservative, color) about 85.5% water for the comparative	Q.S. to 100	Q.S. to 100

[0034] Preparation Method

[0035] Weigh required amount of distilled water in a beaker. Add amino trimethyl phosphonic acid and lactic acid to water and mix. Heat to 40°C. Stir the solution using an overhead stirrer at 250 RPM for 2 minutes. In a beaker, heat esterquat to 65°C. Add esterquat into solution while stirring at 400 RPM. Mix the solution for 10 minutes. Add SNF™ polymer into the solution and stir for 10 minutes. Add the polyether polymer into solution while stirring at 250 RPM. Mix the solution for 5 minutes. Check the temperature of the mixture. On cooling to room temperature, add any fragrance drop wise.

[0036] Fabric Treatment with Fabric Softener

[0002] Prepare an approximate 1.8 kg load containing 5 denim swatches (100% cotton denim, 35 X 35 cm long, approximately 50 g per swatch) with 1.6 kg of ballast load , per product to be tested (washing machine).

- Weigh each Swatch and record measurement
- Using a marking pen, label swatches with respective product identification code.
- Weigh out detergent samples and fabric softener for each wash.
- Washing machine(s) should be cleaned by conducting a wash cycle.

Washer Type	Top Load
Wash Cycle	Normal Cycle
Wash Time	55 minutes
Water Level	43 liters used for each wash and rinse cycles
Wash Temperature	Room Temperature
Rinse Temperature	Room Temperature
Laundry Load Size	1.8 Kg
Detergent	Ariel™ Oxianillos detergent from Mexico
Dosage	90 g
Fabric Softener	110 g

- Set wash controls for custom cycle with specified wash period. Add detergent and fabric softener to respective compartments in washing machine. Add swatches and ballast load to washing machine.
- Start wash cycle
- Wash for specified amount of time
- Remove wash load & swatches for hand wash rinsing.

[0037] All the garments treated are rinsed and hung to dry without wriggling. The garment are allowed to hang for 5 Minutes to drip the excess of water and then weighed. Once completed, they are weighed each at fixed time interval (every 30 minutes) in order to assess the speed of drying.

[0038] 35 cm denim swatches are evaluated during the experiment (35 cm x 35 cm). Up to 5 denim swatches are evaluated per treatment as repetitions in order to avoid the experimental error. The following treatments are tested during the experiment:

[0039] The Passerelle TM DFD polymer is tested at 0.5, 1, 1.5, and 2 weight % as supplied in the fabric conditioner composition. The percent water retained is shown below compared to a fabric conditioner without the polymer.

Polymer Weight %	Water Retention (%)
0.5 %	105.767
1.5 %	106.47
1 %	107.689
2 %	108.767
Control without polymer	111.831

[0040] The Passerelle TM DP5270 polymer is tested at 0.5, 1, 1.5, and 2 weight % as supplied in the fabric conditioner composition. The percent water retained is shown below compared to a fabric conditioner without the polymer.

Polymer Weight %	Water Retention (%)
1 %	105.452
1.5 %	105.62
2 %	106.822
Control without polymer	107.1
0.5 %	108.563

[0041] The reduction of drying time in a tumble drier is determined by measuring the % water retention of denim swatches during drying.

[0042] In order to plot the speed of drying the % Water Retention is calculated based in the following formula

$$\% \text{Water Retention} = \frac{(\text{WeightWet} - \text{WeightDry})}{\text{WeightDry}}$$

The % Water Retention is plotted during the time of the experiment (Every 30 min).

[0043] Fabric Treatment with Fabric Softener

[0003] Prepare an approximate 2 kg load containing 5 denim swatches (100% cotton denim, 175 cm long, approximately 400 g per swatch) without ballast, per product to be tested (washing machine).

- Using a marking pen, label swatches with respective product identification code.
- Weigh out detergent samples and fabric softener for each wash.
- Washing machine(s) should be cleaned by conducting a wash cycle.

Washer Type	Front Loading
Wash Cycle	Custom – 40°C, “Fast” Centrifugation
Wash Time	77 minutes
Water Level	23 liters used for all wash and rinse cycles
Wash Temperature	40°C
Rinse Temperature	Room Temperature
Spin Speed	1200 RPM
Laundry Load Size	2 Kg
Drying	Dryer
Detergent	Ariel™ Professional detergent from Europe
Dosage	80 g
Fabric Softener	110 g

- Set wash controls for custom cycle with specified wash period. Add detergent and fabric softener to respective compartments in washing machine. Add swatches to washing machine.
- Start wash cycle
- Wash for specified amount of time

[0044] The test is run for 50 minutes, and the percent water retention is measured. Three samples are prepared: a swatch that has no treatment, a swatch treated with fabric conditioner, and a swatch with fabric conditioner containing Passerelle™ DFD at 2% by weight. After 20 minutes of drying, the swatches with Passerelle™ DFD at 2% are almost dry and statistically different versus conditioner treated and water only treatments that are dried for 50 minutes. See data below.

Sample	Water Retention (%)
Passerelle™ DFD at 2%	3.723
Fabric Conditioner only	15.892
Water only	19.345

[0045] As used throughout, ranges are used as shorthand for describing each and every value that is within the range. Any value within the range can be selected as the terminus of the range. In addition, all references cited herein are hereby incorporated by referenced in their entireties. In the event of a conflict in a definition in the present disclosure and that of a cited reference, the present disclosure controls.

[0046] Unless otherwise specified, all percentages and amounts expressed herein and elsewhere in the specification should be understood to refer to percentages by weight. The amounts given are based on the active weight of the material.

CLAIMS

WHAT IS CLAIMED IS:

1. A method for reducing time needed for drying fabric comprising laundering the fabric at least 3 times with a composition comprising a linear polyether having a weight average molecular weight less than 5000 that is terminated with $-N-CH_2-CH(OH)-CH_2-Cl$, wherein the linear polyether is deposited on the fabric and reduces the time needed for drying.
2. The method of claim 1, wherein the molecular weight is less than 4000, or optionally less than 3000.
3. The method of any preceding claim, wherein the molecular weight is less than 2000.
4. The method of any preceding claim, wherein the fabric is laundered at least 5 times.
5. The method of any preceding claim, wherein the composition is an aqueous composition.
6. The method of any preceding claim, wherein the composition is added during a rinse cycle during laundering.
7. The method of any preceding claim, wherein the laundering comprises washing the fabric and rinsing the fabric.
8. The method of any preceding claim further comprising drying the fabric.
9. The method of claim 8, wherein the drying is line drying.
10. The method of claim 8, wherein the drying is dryer drying.
11. The method of any preceding claim, wherein the polyether is present in the composition in an amount of 0.08 to 0.4 % by weight of the composition.
12. The method of any preceding claim, wherein the composition further comprises a fabric softener.
13. The method of claim 12, wherein the fabric softener is present in an amount for a delivered AI of 2.8 to 8 grams per load, optionally 2.8 to 7, 2.8 to 6, 2.8 to 5, 3 to 8, 3 to 7, 3 to 6, 3 to 5, 4 to 8, 4 to 7, 4 to 6, or 4 to 5 grams per load.

14. The method of any preceding claim, wherein the composition further comprises a surfactant.
15. The method of any preceding claim, wherein the method reduces the time needed for drying by at least 5, at least 10, or at least 20% as compared to a time for drying without laundering with the linear polyether.

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2011/050113

A. CLASSIFICATION OF SUBJECT MATTER

INV. C11D3/37

ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

C11D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 01/27232 A1 (UNILEVER PLC [GB]; UNILEVER NV [NL]; LEVER HINDUSTAN LTD [IN]) 19 April 2001 (2001-04-19) page 9, line 12 - page 10, line 30 page 11, lines 21-27 page 12, line 18 - page 13, line 8 page 15, line 28 - page 16, line 11 page 22, line 24 - page 23, line 2 claims; examples -----	1-15
A	US 2003/162689 A1 (SCHYMITZEK TATIANA [DE] ET AL) 28 August 2003 (2003-08-28) claims; examples -----	1-15
A	US 2007/021315 A1 (WEBER RUDOLF [DE]) 25 January 2007 (2007-01-25) paragraphs [0047] - [0049] -----	1-15



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search

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Date of mailing of the international search report

13/06/2012

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