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(54) Title: FABRIC CONDITIONING COMPOSITION

(57) Abstract: The present invention relates to fabric conditioning compositions and processes for cleaning and conditioning. The invention especially relates to processes for easier cleaning of the fabric onto which a stain or soil is deposited after treating a fabric with the composition of the invention. It is an object of the present invention to provide a fabric cleaning and/or conditioning composition that utilizes less (or no) surfactant and less energy. It is a further object of the invention to provide a composition that is biodegradable, to meet every increasing demand to provide environmentally friendly detergent products that are required by both consumers and legislators throughout the world. Surprisingly it has been found that the combination of a protein and a carboxylic polymeric acid or a polysaccharide or a gum polymer and a protein in an aqueous medium provide a secondary cleaning benefit (next-time-cleaning-benefit) to fabrics.



FABRIC CONDITIONING COMPOSITION

Field of the Invention

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The present invention relates to fabric conditioning compositions and processes for cleaning and conditioning. The invention especially relates to processes for easier cleaning of the fabric onto which a stain or soil is deposited after treating a fabric with the composition of the invention.

10

Background of the Invention

Cleaning and conditioning of fabrics is widely practiced throughout the world.

15

Modern day consumers are more and more interested in preventing fabrics from getting dirty and modifying fabrics for easier cleaning. This can for instance be done by modifying the fabric itself during the production of the fabric.

20

Various industrial treatments for fabric modification are known to render the fabric less prone to soiling. The fabric modification of this type is normally carried out during textile manufacture and such industrial treatments are relatively difficult to practise in household as they involve use of corrosive/unsafe chemicals and/or hazardous process conditions.

25

For existing fabrics a treatment that enables easier cleaning after treatment of a fabric with a composition and subsequent deposition of a soil or stain onto said fabric remains to be desired. Such treatment and benefit is generally referred to in the art as a secondary cleaning benefit or next-time-cleaning-benefit. In co-pending Indian Patent Application No 1225/MUM/2008 a composition comprising non-ionic surfactant and a cross-linked carboxylic acid is proposed for providing a

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secondary cleaning benefit. However, this invention requires a surfactant, which is not always suitable, especially in conditioner compositions.

5 The use of a protein and a polysaccharide polymer in a fabric cleaning composition or conditioning composition has been disclosed in e.g. US-A-2008-229,514 and US-B-6,465,410. However these documents do not teach the use of specific polymers and proteins for providing a secondary cleaning benefit.

10 It is an object of the present invention to provide a fabric cleaning and/or conditioning composition that utilizes less (or no) surfactant and less energy.

It is a further object of the invention to provide such a composition that is effective at a pH of less than 5.

15 It is a further object of the invention that the treated fabric further exhibits reduced soil pick-up.

20 It is yet a further object of the invention to provide a composition that is biodegradable, to meet the ever increasing demand to provide environmentally friendly detergent products that are required by both consumers and legislators throughout the world.

25 Surprisingly it has been found that the combination of a protein and a carboxylic polymeric acid or a polysaccharide or a gum polymer in an aqueous medium provides a secondary cleaning benefit (next-time-cleaning-benefit) to fabric.

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Summary of the Invention

Accordingly the invention provides a fabric conditioning composition comprising a carboxylic polymeric acid, a polysaccharide or a gum polymer; a protein; and
5 a carrier composition comprising a pH adjustment agent.

The invention further provides a process for treatment of a fabric comprising the consecutive steps of:

- 10 a) contacting the fabric with a carboxylic polymeric acid, a polysaccharide or a gum polymer and a protein in presence of an aqueous medium having pH less than 5;
- b) drying the fabric;
- c) leaving a stain or soil to deposit onto the fabric; and
- d) washing the fabric

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wherein the fabric is not further rinsed between the steps (a) and (b).

These and other aspects, features and advantages will become apparent to those of ordinary skill in the art from a reading of the following detailed description and
20 the appended claims. For the avoidance of doubt, any feature of one aspect of the present invention may be utilised in any other aspect of the invention. It is noted that the examples given in the description below are intended to clarify the invention and are not intended to limit the invention to those examples per se. Similarly, all percentages are weight/weight percentages unless otherwise
25 indicated. Numerical ranges expressed in the format "from x to y" are understood to include x and y. When for a specific feature multiple preferred ranges are described in the format "from x to y", it is understood that all ranges combining the different endpoints are also contemplated.

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Detailed Description

Without wishing to be bound by any particular theory it is believed that at a pH of less than 5 the composition comprising the polymer and the protein precipitates
5 onto the fabric. After drying the material is still present on the fabric. When a stain or soil is deposited onto the fabric thereafter and the fabric is subsequently washed (generally at a pH above 7), the polymer and protein dissolve from the fabric thereby releasing also the deposited stain or soil.

10 Fabric

In the context of the invention, the fabric may include synthetic as well as natural textiles. Fabrics may be made of cotton, poly/cotton, polyester, silk or nylon. It is envisaged that the method of the present invention may be used to treat garments
15 and other clothing and apparel materials that form typical wash load in household laundry. Other household materials that may be treated according to the process of the present invention include, but are not limited to, bedspreads, blankets, carpets, curtains and upholstery. Although the process of the present invention is described primarily for treatment of a fabric, it is envisaged that the process of the
20 present invention can be advantageously used to treat other materials such as jute, leather, denim and canvass. It is envisaged that the process of the present invention can be used to treat articles such as shoes, rain-wear and jackets.

Composition

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In one aspect, the present invention provides a fabric conditioning composition comprising a carboxylic polymeric acid, a polysaccharide or a gum polymer; a protein; and a carrier formulation comprising a pH adjustment agent.

30 It is preferred that the polymers and proteins according to the invention are naturally occurring and biodegradable.

Form of the Composition

The composition of the invention may be either in liquid, gel, paste or solid form.

5

When the composition is a liquid, the viscosity may be ranging from a water thin liquid composition, to a viscous liquid. The viscosity of such liquids may preferably range from water-thin (1 mPa·s) or preferably from at least 50 mPa·s as measured at a shear rate of 21 s^{-1} at room temperature (using Haake Model RT20 viscometer), but preferably no more than 5,000 mPa·s.

10

Alternatively, when the composition is in solid form, or in the form of a gel or paste, it is preferred that it dissolves in water of room temperature within 5 minutes, more preferably within 1 minute, still more preferably within 30 seconds.

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When a viscous liquid, gel or paste is preferred, the viscosity may be increased by one or more other components in the system, for example an 'external polymeric thickener', which may be a synthetic polymer. The polymer of the invention may also contribute to the viscosity of the composition. Alternatively, an 'internal structuring' system may be used, employing one or more surfactants and optionally electrolyte, to create an ordered or liquid crystalline phase within the composition. These various techniques for increasing viscosity are all very well known to those skilled in the art.

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The composition may for instance be added to the water of the last rinse cycle of an automatic washing machine or last manual rinse cycle of a manual washing process. This water is also referred to rinse liquor. Alternatively the composition maybe applied directly onto the fabric (wet or dry).

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The composition may for instance be packaged in a pouch, box or bottle, or even in a trigger spray dispenser or aerosol spray can for direct application.

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Protein

The protein can be any protein that can precipitate onto a fabric at a pH of less than 5 and can be re-suspended in the presence of above mentioned polymer,
5 dissolved or otherwise removed (at least in part) from the fabric at a pH above 7.

The protein is preferably selected from the group consisting whey protein, soy protein, egg albumin, casein, serum albumin, lacto globulin, fibroin, myosin, keratin, wheat gluten, collagen, gelatin and mixtures and/or modified derivatives
10 thereof. Most preferred are whey protein, soy protein and egg albumin and/or mixtures and/or modified derivatives thereof. It is further preferred that the proteins or modified derivatives thereof have an average molecular mass of 10 kD to 100 kD.

15 The protein is preferably present in the rinse liquor of the wash in a concentration of between 0.001 and 5 grams per litre based on the rinse liquor. More preferably the protein is present in a concentration of at least 0.01 grams per litre, or even at least 0.1 grams per litre, while the protein is preferably present in a concentration of less than 2 grams per litre, or even less than 1 gram per litre.

20

When in a liquid conditioning composition, the protein is preferably present in a concentration of between 10 and 50 grams per litre based on the composition. More preferably the protein is present in a concentration of at least 25 grams per litre, or even at least 30 grams per litre, while the protein is preferably present in a
25 concentration of less than 40 grams per litre.

When in a solid composition, gel or paste, the protein is preferably present in a concentration of between 20 and 40 % by weight based on the composition, more preferably between 25 and 35%.

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In a washing rinse process the amount of protein contacted per cm² area of the fabric is preferably from between 0.1 and 200 mg, more preferably the protein contacted per cm² is at least 1 mg or even at least 2 mg; while the amount of protein contacted per cm² is preferably not more than 100 mg, still more
5 preferably not more than 50mg, or even not more than 15mg.

Polymer

Suitable polymers for the present invention are polyacrylic acid, carboxymethyl
10 cellulose, gum acacia, starch, modified starch, hydroxylpropylmethyl cellulose, hydroxyethyl cellulose, guar gum, arabic gum, corn fiber gum, amylose, dextrin, pectin, chitin, chitosan and mixtures thereof. Most preferred are polyacrylic acid, carboxymethyl cellulose, gum acacia and mixtures thereof. It is further preferred that the polymers have an average molecular mass of 1 kD to 500 kD.

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Without wishing to be bound to any theory, it is found that cross-linked polymers, work slightly less good than non-cross-linked polymers. It is noted that cross-linked polymers still work, and are not excluded from the scope of the invention, however, it is preferred that the polymers are not cross-linked.

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The polymer is preferably present in the rinse liquor of the wash in a concentration of between 0.001 and 5 grams per litre based on the rinse liquor. More preferably the polymer is present in a concentration of at least 0.01 grams per litre, or even at least 0.1 grams per litre, while the polymer is preferably present in a
25 concentration of less than 2 grams per litre, or even less than 1 gram per litre.

When in a liquid conditioning composition, the polymer is preferably present in a concentration of between 10 and 100 grams per litre based on the composition. More preferably the polymer is present in a concentration of at least 25 grams per
30 litre, or even at least 30 grams per litre, while the polymer is preferably present in a concentration of less than 80 grams per litre.

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When in a solid composition, gel or paste, the polymer is preferably present in a concentration of between 40 and 70 % by weight based on the composition, more preferably between 50 and 65%.

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In a washing rinse process the amount of polymer contacted per cm^2 area of the fabric is preferably from between 0.1 and 400 mg, more preferably the polymer contacted per cm^2 is at least 1 mg, or even at least 5 mg; while the amount of polymer contacted per cm^2 is preferably not more than 200 mg, still more

10 preferably not more than 100 mg, still more preferably not more than 50 mg, or even not more than 20 mg.

It is further preferred that the ratio of protein to polymer is in the range of between 2 and 0.25, more preferably between 1 and 0.5.

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Carrier Formulation Comprising A Ph Adjustment Agent

When the composition of the invention is a liquid composition, a paste or a gel, the carrier formulation comprising the pH adjustment agent is preferably an aqueous composition comprising a pH adjustment agent and optionally one or more benefit agents.

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When the composition of the invention is a solid, the formulation comprising the pH adjustment agent is preferably a solid composition comprising a pH adjustment agent and optionally one or more benefit agents and/or fillers.

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The pH adjustment agent can be any acid, base or buffer that is compatible with the protein and polymer. The pH adjustment agent is preferably present in the composition in such an amount that when dosed to washing rinse liquor a pH of less than 5 is obtained. More preferably the pH of the rinse liquor is between 2 and 5, still more preferably the pH is between 3 and 5, even more preferably the pH is between 4 and 5.

30

The pH of the solution may be adjusted with organic or inorganic acids or bases. Preferred inorganic bases are preferably alkali or alkaline earth hydroxides, ammonia, carbonates or bicarbonates. The alkali metal preferably being Sodium (Na⁺) or Potassium (K⁺) or the alkaline earth metal preferably being Calcium (Ca²⁺) or Magnesium (Mg²⁺). The organic bases are preferably amines, alkanolamines and other suitable amino compounds. Inorganic acids may include hydrochloric acid, sulphuric acid or phosphoric acid, and organic acids may include acetic acid, or formic acid as well as dicarboxylic acid mixtures such as Radimix (trade mark, Radici Group) and Sokalan DCS (trade mark, BASF), Radimix being particularly preferred.

Examples of suitable buffers are biphthalate buffer, acetate buffer and/or citrate buffer.

The carrier formulation may further comprise a benefit agent. The benefit agent that may be included in the carrier formulation may be selected from ingredients such as perfume, fluorescence agent, deodorant, antibacterial agent, shading dye and bluing agent. One of the advantages of the present invention is that the deposition of benefit agent is enhanced. The aqueous medium may also contain detergent ingredients like builders.

When the composition of the invention is a solid composition, the formulation comprising a pH adjustment agent, may further comprise fillers, such as filler salts.

Bleaches preferably not present in the composition and/or the rinse liquor, as they may degrade the protein.

The conditioner composition may further comprise common rinse conditioning ingredients such as quaternary ammonium salts or imidazolinium compounds

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having at least one long chain hydrocarbyl group or polysiloxane based compounds.

When the composition of the invention is a solid composition or a paste or gel, the
5 formulation comprising a pH adjustment agent is preferably present in a concentration of between 5 and 30% based on the composition, preferably between 5 and 20%.

When the composition of the invention is a liquid composition, the formulation
10 comprising a pH adjustment agent, optionally further ingredients as indicated above and a balance of water, wherein the pH adjustment composition is present in an amount suitable for obtaining a pH of between 2 and 5 in the rinse liquor.

Process

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In a second aspect the invention provides a process for the treatment of a fabric comprising the consecutive steps of:

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- a) contacting the fabric with a carboxylic polymeric acid or polysaccharides or any gum polymer and a protein in the presence of an aqueous medium having pH less than 5;
- b) drying the fabric;
- c) leaving a stain to deposit onto the fabric; and
- d) washing the fabric,

25

wherein the fabric is not further rinsed between the steps (a) and (b).

Step a: contacting the fabric with the protein and polymer

30 Contacting the fabric with the protein and the polymer may be done in any suitable manner and may be done simultaneous (polymer and protein together) or

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sequential in any order (one first and then the other). However it shall be done in the presence of an aqueous medium having a pH of less than 5. It is preferred that the pH of the aqueous medium is at least 2, more preferably at least 3.

5 The contacting may for instance be done in the last rinse cycle of a washing machine, including both horizontal axis and vertical axis washing machines. Alternatively contacting may take place in a manual washing process in the last rinse step.

10 In yet another way, the protein and polymer may be sprayed onto the fabric after the last rinse step. The composition may even be sprayed onto the fabric after drying, or on new fabric.

Step b: drying the fabric

15 The step of drying can be done in any conventional manner. The fabric may be dried on a cloths line, or in an automatic dryer. The fabric may be subjected to manual or automatic wringing or spinning in a centrifuge to remove excess water before drying.

Step c: allowing soil or a stain to deposit onto the fabric

The step of allowing the stain or soil to deposit onto the fabric may be done in any conventional manner. This step preferably refers to a stain or soil depositing onto
5 the fabric during use, such as wearing a garment or using a table cloth on a table.

The soil or stain may be any soil or stain, including fatty, non-fatty, organic and inorganic, particulate or non-particulate soils or stains.

10 Step d: washing the fabric

The fabric can be washed in any conventional manner, for instance in a washing machine (vertical or horizontal axis) or by manual washing. The washing process is preferably done at a pH above 7, typically above 10.

15 Optionally the protein and polymer of the invention may be added again in the rinse step of the washing process to treat the fabric, thereby starting the process of the invention again.

20 The invention will now be illustrated by means of the following non-limiting examples.

Examples

25 In the examples all parts and percentages are by weight unless otherwise indicated, as already specified above.

Example 1: Cleaning benefit of the invention

In this example a cleaning process using the conditioner compositions of the invention are compared with a cleaning process without treatment, and a cleaning
5 process using a conditioner composition with either polymer or protein at pH of between 4 and 5.

Materials and Methods

10 Following materials were used in the examples.

Table 1: Materials used in the examples

Material	Source/ Supplier
Water	Deionized water
Carbopol 980	Noveon
Whey Protein (WP)	Aldrich
Soya Protein (SP)	Aldrich
Sodium carbonate	Merck
Fe ₃ O ₄	Aldrich
Poly acrylic acid (PAA)	Aldrich
Carboxy methyl cellulose (CMC)	Aldrich
citric acid	Merck
Cotton fabric	Bombay Dyeing
Polyester fabric	Bombay Dyeing
Polycotton fabric	Bombay Dyeing 67/33
Carbon soot	Cabot India N220

Fabrics

Fabric swatches of size 10 cm x 10 cm, weighing about 1 g were used. All the reflectance measurement results are based on average 5 swatches.

5

Desizing Protocol:

Fabrics were desized by soaking them overnight in a 3:1 mixture of chloroform and methanol, followed by two hot water washes in 3 g/l of a commercially available surfactant SURF EXCEL (trade mark, Unilever).

10

Process of treating fabric

Various polymers and protein mixtures were used in the experiments as per the details given in the experiments. Following procedure was followed in all the experiments. An aqueous solution of the protein and polymer mixture was prepared prior to contacting with the fabric. The pH of the aqueous medium was adjusted to a value of between 4 and 5.

15

20 Soiling Protocol

Composite soil: Composite soil was prepared by mixing 50mL of Triolein and 4 mg each of carbon-soot (N220, Cabot India) and Fe_3O_4 . It was then sonicated in an ultrasonic bath for two and a half hours. 400 μl of this composite soil was pipetted onto the fabric. This resulted into a stain of about 3 cm diameter on the fabric. The fabric was dried at room temperature (ca 24°C) for 15-20 hours.

25

Washing

Dried fabric was loaded with composite soil. The fabric was then redried overnight. The redried fabric was cleaned in a hand wash, at a liquid:cloth ratio of 5.

The cleaning medium further comprises sodium carbonate (0.05% by weight), sodium tripolyphosphate (0.05 % by weight), sodium silicate. Higher values of reflectance indicate better cleaning. The pH of this washing solution was 11.

Instruments:

Reflectometer-Gretag Macbeth Colour Eye 7000A was used for measurement of reflectance. Initial reflectance of fabric before treatment was measured.

Reflectance was also measured at a wavelength of 460 nm after soiling (AS) and after washing the soiled fabric (AW).

Table 2a: Results – Cotton

		AS	AW
A	Without Treatment (reference)	40	60
B1	0.5 g/l WP (22 kD)	40	60
B2	0.5 g/l SP (15 kD)	40	60
C	0.5 g/l PAA (2 kD)	40	64
D	0.2 g/l CMC-Na (250 kD)/Citric acid	40	65
E	0.2 g/l PAA (450 kD)	40	64
1	0.5 g/l WP (22 kD)+0.5 g/l PAA (2 kD)	40	72
2	0.5 g/l WP (22 kD)+0.5 g/l PAA (450 kD)	40	73
3	0.5 g/l WP (22 kD)+0.5 g/l CMC-Na (250 kD)/citricA	40	73
4	0.5g/l SP (15 kD)+ 0.5 g/l PAA (2 kD)	40	65
5	0.5 g/l WP (22 kD)+0.2 g/l PAA (450 kD)	40	71
6	0.5 g/l WP (22 kD)+0.2 g/l CMC-Na (250 kD)/CitricA	40	74
7	0.5 g/l SP (15 kD)+0.2 g/l PAA (450 kD)	40	67
8*	0.2g/l PAA(2KD) + 0.5g/l WP (22 kD)	40	72
9*	0.2g/l crosslinked PAA(500KD) +0.5g/l WP (22 kD)	40	68

* Instead of the cleaning protocol indicated above, the swatches of examples 8 and 9 were cleaned using only 0.5 g/l Soda solution.

- 5 As shown in the table above, all examples according to the invention are showing a benefit, compared to the reference (without treatment) and also compared to treatment with either protein or polymer. Examples 8 and 9 show that cross linked polymers work as well, albeit slightly less good than non-cross-linked polymers.
- 10 Similar results were obtained on polyester swatches.

Table 2b: Polyester examples

		AS	AW
10	0.5g/l CMC-Na (250 kD)/citric acid + 0.5g/l WP (22 kD)	45	63
11	0.5g/l PAA(2KD)+0.5g/l WP (22 kD)	45	63
F	Untreated	45	58

In these examples the same methods were used as above, but the treated fabric was cleaned (after applying the protein/polymer and soiling) with 1.5g/l of commercial grade detergent (Surf Excel, ex Unilever), while the untreated fabric was cleaned with 3g/l of commercial grade detergent (Surf Excel, ex Unilever). Still the treated fabric gives substantially better results than the untreated material.

Example 2: Precipitation

In this example it is demonstrated that the protein / polymer mixture of the invention precipitates at the indicated pH. The whey protein had a molecular mass of 22 kD and the poly acrylic acid 2 kD.

Table 3: Turbidity data

	Turbidity (NTU)	Turbidity (NTU)
pH	0.1 g/l WP + 0.5g/l PAA	0.5g/l WP + 0.1 g/l PAA
2	150	119
3	547	315
4	565	616
5	136	450
7	2	60

As demonstrated in the table above, the composition works best at a pH below 5 especially at a pH of between 2 and 5 and even better at pH 3-5.

Example 3: Soil pick-up

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In this example it is demonstrated that the composition and method of the invention not only have a secondary cleaning benefit, but also result in reduced soil pick-up.

10 Materials used:

- 1) Cotton fabric swatches, size 10 cm/ 10 cm.
- 2) Polyester fabric swatches, size 10 cm/ 10 cm.
- 3) Carbon soot slurry (37.5 ppm carbon soot & 50 ppm SDS in water).

15 Four cotton and four polyester swatches were treated with a composition according to the invention with the method as explained in example 1, using 0.2 g/l WP and 0.2 g/l PAA (2 kD).

20 Four untreated cotton and four untreated polyester swatches were used in the reference examples

Method

25 The fabric swatches were quickly submerged (dipped) in the carbon soot slurry (treated and untreated fabrics of each kind were treated separately) at room temperature (24°C). Thereafter the swatches were taken out and washed with clean water to remove the free carbon particle from the fabric surface, then measured the reflectance after drying.

Results

The reflectance was measured according to the method of example 1. The results are shown in the table below.

5

Table 4: Soil pick-up data

Fabric type	Reflectance 460nm
Cotton treated	71
Cotton untreated	61
Polyester treated	78
Polyester Untreated	70

The results in the table show that the treated fabric swatches pick up less soil and
10 therefore show a higher reflectance than the untreated fabric swatches.

CLAIMS

1. A process for treatment of a fabric comprising the consecutive steps of:
 - a. contacting the fabric with a carboxylic polymeric acid, a polysaccharide
5 and/or a gum polymer and a protein in the presence of an aqueous medium having pH less than 5;
 - b. drying the fabric;
 - c. leaving a stain or soil to deposit onto the fabric; and
 - d. washing the fabric,
- 10 wherein the fabric is not further rinsed between the steps (a) and (b).
2. A process according to claim 1, wherein the contacting of fabric with the polymer and the protein is simultaneous or sequential in any order.
- 15 3. A process according to anyone of claims 1 or 2, wherein the amount of polymer contacted per cm² area of the fabric is 0.1 to 200 mg.
4. A process according to anyone of claims 1 to 3, wherein the amount of protein contacted per cm² area of the fabric is from 0.1 to 400 mg.
- 20 5. A process according to anyone of claims 1 to 4, wherein the step of washing the fabric (step d) is done at a pH above 7.
6. A liquid fabric conditioning composition comprising:
 - 25 a. 10 – 100 g/l of the carboxylic polymeric acid, polysaccharide and/or gum polymer;
 - b. 10 – 50 g/l of the protein; and
 - c. the carrier formulation comprising:
 - i. a pH adjustment agent; and
 - 30 ii. water.

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7. A fabric conditioning composition in the form of a solid, a gel or a paste comprising:
- a. 40 – 70 % of the carboxylic polymeric acid, polysaccharide and/or gum polymer;
 - 5 b. 20 – 40 % of the protein; and
 - c. 5 – 30 % of the carrier formulation comprising:
 - i. a pH adjustment agent.
- 10 8. A composition according to anyone of claims 6 or 7, wherein the carrier formulation (c) further comprises a benefit agent selected from perfume, fluorescence agent, deodorant, antibacterial agent, shading dye and/or blueing agent.