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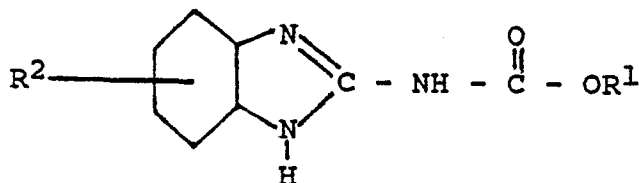
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Fabric treatment composition.

Fabric treatment composition comprising a fabric-softening material and a benzimidazolyl-alkyl-carbamate of the following formula:



where R¹ is a C₁₋₄ alkyl, alkoxy or phenoxy alkyl; and R² is a C₁₋₄ alkyl, hydrogen, nitrogen or halogen. Compositions as claimed are particularly efficient in inhibiting microbial growth on fabrics which have been rinsed with said fabric treatment composition.

FABRIC TREATMENT COMPOSITION

This invention relates to a fabric treatment composition for treating fabrics during the rinse step of a fabric laundry process, and to a method for using said composition. In particular, the invention relates to a fabric treatment composition comprising a fabric-softening material, which is preferably a cationic fabric softening material and an antimicrobial agent.

5 It is known that fungal growth can develop on fabrics stored under certain physiological conditions, such as in a humid atmosphere or where there is poor air circulation. These growths can damage the fabrics by causing them to discolour. The fabrics can also develop an unpleasant smell. It has been found that the discolouration or staining of the fabrics is difficult to remove either by normal laundering or after treatment with a strong bleaching agent.

10 It has previously been proposed (EP 86 423, Henkel KGaA) to incorporate specific antimicrobial substances in fabric treatment compositions.

We have now surprisingly discovered that benzimidazolyl-alkyl-carbamates, when combined with fabric-softening materials into a fabric treatment composition, are particularly effective in inhibiting fungal growth on fabrics which have been rinsed with said fabric treatment composition.

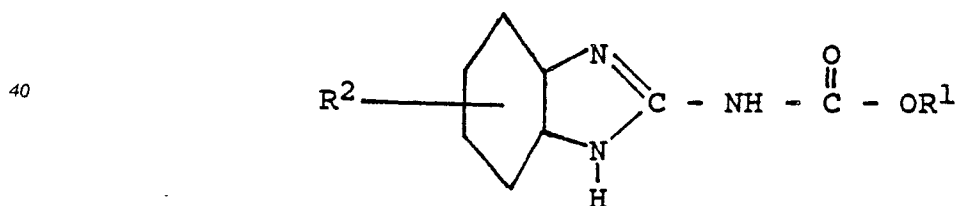
15 The incorporation of benzimidazolyl-alkyl-carbamates in textile treatment compositions according to the invention has also been found advantageous in that benzimidazolyl-alkyl-carbamates are:

1. effective against a wide range of micro-organisms, particularly fungi;
2. active during the life of the product;
3. of low mammalian toxicity and non-toxic to humans at the concentrations used;
- 20 4. colourless and odourless;
5. effective at low concentrations;
6. inexpensive and easy to apply;
7. resistant to sunlight;
8. not affecting fabric handle or strength;
- 25 9. compatible with water-repellent and flame-retardant agents, dyes and other textile auxiliaries; and
10. do not sensitize the fabric to damage by light or other influences.

Thus, according to the invention there is provided a fabric treatment composition comprising a softening material and a benzimidazolyl-alkyl-carbamate. Preferably the softening material comprises a cationic fabric softener.

30 Benzimidazolyl-alkyl-carbamates are well-known fungicides for use in agriculture. It has also been suggested in Japanese patent application 49 093 537 (Yoshitomi) to treat textiles with a composition containing Me-2-benzimidazole-carbamate in a solvent. This treatment, however, requires a separate processing step for applying the benzimidazolyl-alkyl-carbamate and a further separate processing step for removing the undesirable solvent compound.

35 The benzimidazolyl-alkyl-carbamate as used in a textile treatment composition of the invention is preferably of the following formula:



wherein:

R¹ is a C₁₋₄ alkyl, alkoxy or phenoxy alkyl; and

R² is a C₁₋₄ alkyl, hydrogen, nitrogen or halogen.

50 Particular examples of suitable benzimidazolyl-alkyl-carbamate substances are: benzimidazolyl-methyl-carbamate, benzimidazolyl-ethyl-carbamate, 5-ethyl-benzimidazolyl-ethyl-carbamate, benzimidazolyl-isopropyl-carbamate, 4-ethyl-benzimidazolyl-isopropyl-carbamate, 4-propyl-benzimidazolyl-isopropyl-carbamate, 4-butyl-benzimidazolyl-isopropyl-carbamate, 4-isobutyl-benzimidazolyl-isopropyl-carbamate, benzimidazolyl-ethylmethoxy-carbamate, 4-ethyl-benzimidazolyl-ethylmethoxy-carbamate, 5-ethyl-benzimidazolyl-ethylmethoxy-carbamate, benzimidazolyl-ethylethoxy-carbamate, benzimidazolyl-ethyl-

propoxy-carbamate, benzimidazolyl-ethylphenoxy-carbamate, 4-ethyl-benzimidazolyl-ethylphenoxy-carbamate and 5-ethyl-benzimidazolyl-ethylphenoxy-carbamate.

The preferred benzimidazolyl-alkyl-carbamate is benzimidazolyl-methyl-carbamate.

It is also possible to employ mixtures of different benzimidazolyl-alkyl-carbamates.

5 Particularly preferred is the use of Intace B 350 (75% carbendazim ex Intace), and Intace B 300 (100% carbendazim ex Intace).

Other antimicrobial substances may be incorporated in a fabric treatment composition according to the invention. By antimicrobial substances are meant both antibacterial and antifungal products. Examples of such material are formaldehyde, halogenated phenols, nitrated mono- or polyalcohols and antimicrobial surface-active tensides.

10 Particularly suitable for use in conjunction with benzimidazolyl-alkyl-carbamates are tetra-methylthiuram-disulphid, 1-methylol-2-thiono-2-dihydrobenzthiazol, N-dimethyl-N'-phenyl-(N'-fluordichloromethyl-thio) sulfphamid and 3-isothiazolone compounds such as for instance described in US 4,424,134. Generally, the amount of additional antimicrobial substances in the textile treatment composition is less than two times the amount of benzimidazolyl-alkyl-carbamate.

The fabric softening materials may be selected from cationic, nonionic, amphoteric or anionic fabric softening materials.

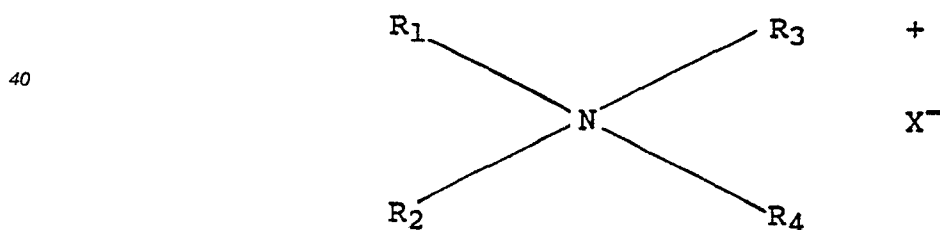
Suitable amphoteric fabric conditioning material for use in a composition according to the invention are fabric substantive amphoteric materials forming a particulate dispersion at a concentration of less than 1 g/l at at least one temperature between 0 and 100 °C. Preferably at at least one temperature between 10 and 90 °C, more preferred between 20 and 80 °C. For the purpose of this invention a fabric substantive amphoteric material is preferably an amphoteric or zwitterionic tertiary or quaternary ammonium compound having either one single long hydrocarbyl side chain or two long hydrocarbyl chains. From these compounds the use of amphoteric or zwitterionic ammonium compounds having two long hydrocarbyl chains is particularly preferred for many reasons including costs, ease of processing and better stability and performance. Suitable amphoteric materials are for example disclosed in EP 89200545.5.

In this specification the expression hydrocarbyl chain refers to linear or branched alkyl or alkenyl chains optionally substituted or interrupted by functional groups such as -OH, -O-, -CONH-, -COO-, etc.

30 Preferably the amphoteric fabric substantive materials are water insoluble and have a solubility in water at pH 2.5 at 20 °C of less than 10 g/l. The HLB of the amphoteric fabric substantive material is preferably less than 10.0.

Suitable cationic fabric softener materials for use in a composition according to the present invention are cationic materials which are water-insoluble in that the material has a solubility in water at pH 2.5 and 20 °C of less than 10 g/l. Highly preferred materials are cationic quaternary ammonium salts having two C12-24 hydrocarbyl chains.

Well-known species of substantially water-insoluble quaternary ammonium compounds have the formula



wherein R₁ and R₂ represent hydrocarbyl groups from about 12 to about 24 carbon atoms; R₃ and R₄ represent hydrocarbyl groups containing from 1 to about 4 carbon atoms; and X is an anion, preferably selected from halide, methyl sulfate and ethyl sulfate radicals.

50 Representative examples of these quaternary softeners include ditallow dimethyl ammonium chloride; ditallow dimethyl ammonium methyl sulfate; dihexadecyl dimethyl ammonium chloride; di(hydrogenated tallow) dimethyl ammonium methyl sulfate; dihexadecyl diethyl ammonium chloride; di(coconut) dimethyl ammonium chloride. Ditallow dimethyl ammonium chloride, di(hydrogenated tallow) dimethyl ammonium chloride, di(coconut) dimethyl ammonium chloride and di(coconut) dimethyl ammonium methosulfate are preferred.

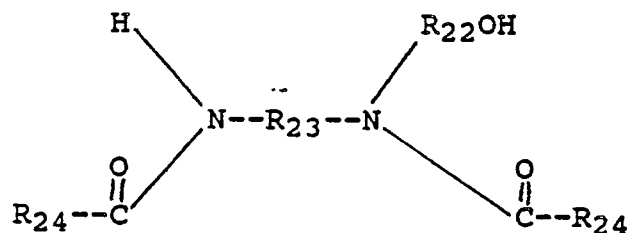
Suitable materials also include dialkyl ethoxyl methyl ammonium methosulphate based on soft fatty acid, dialkyl ethoxyl methyl ammonium methosulphate based on hard fatty acid, and a material in which R₃ and R₄ represent methyl, R₁ is C₁₃₋₁₅, R₂ is CH₂CH₂OCOR, Where R is stearyl, and X is methosulphate.

group of formula $-(\text{CH}_2\text{CH}_2\text{O})_y\text{H}$, where y is within the range from 0 to 6, R_{20} is an alkoxyated group of formula $-(\text{CH}_2\text{CH}_2\text{O})_z\text{H}$ where z is within the range from 0 to 6 and m is an integer within the range from 0 to 6, and is preferably 3. When m is 0, it is preferred that R_{18} is a C_{16} to C_{22} alkyl and that the sum total of z and y is within the range from 1 to 6, more preferably 1 to 3. When m is 1, it is preferred that R_{18} is a C_{16} to C_{22} alkyl and that the sum total of x and y and z is within the range from 3 to 10.

Representative commercially available materials of this class include Ethomeen (ex Armour) and Ethoduomeen (ex Armour).

Preferably the amines of type (ii) or (iii) are also protonated for use in the fabric conditioning compositions of the invention.

When the amine is of type (iv) given above, a particularly preferred material is



where R_{22} and R_{23} are divalent alkenyl chains having from 1 to 3 carbon atoms, and R_{24} is an acyclic aliphatic hydrocarbon chain having from 15 to 21 carbon atoms. A commercially available material of this class is Ceranine HC39 (ex Sandoz).

The compositions according to the invention may also contain nonionic fabric-softening agents. Suitable nonionic fabric-softening agents include glycerol esters, such as glycerol monostearate, fatty alcohols, such as stearyl alcohol, alkoxyated fatty alcohols, fatty acids, lanolin and derivatives thereof. Suitable materials are disclosed in European Patent Applications 88 520 (Unilever), 122 141 (Unilever) and 79 746 (Procter & Gamble), the disclosures of which are incorporated herein by reference. Preferably, such materials are included at a level within the range of from 0.5% to 10% by weight of the composition.

The compositions can also contain one or more optional ingredients selected from non-aqueous solvents such as C_1 - C_4 alkanols and polyhydric alcohols, pH-buffering agents such as weak acids, e.g. phosphoric, benzoic or citric acids (the compositions preferably have a pH of less than 6.0 more preferred between 2.0 and 5.0), rewetting agents, viscosity modifiers such as electrolytes, included at levels from about 20 to 6000 ppm, aluminium chlorohydrate, antigelling agents, perfumes especially body odour reducing perfumes, perfume carriers, hydrocarbons, fluorescers, colourants, hydrotropes, antifoaming agents, antiredeposition agents, enzymes, optical brightening agents, opacifiers, stabilisers such as guar gum and polyethylene glycol, anti-shrinking agents, anti-wrinkle agents, soil-release agents, antioxidants, anti-corrosion agents, preservatives such as Bronopol (Trade Mark), a commercially available form of 2-bromo-2-nitropropane-1,3-diol, to preserve the fabric treatment composition, dyes, bleaches and bleach precursors, drape-imparting agents, antistatic agents and ironing aids.

Silicones can be included in the compositions as the ironing aid, re-wetting agent or the antifoaming agent. Suitable silicones for use in the compositions according to the invention include predominantly linear polydialkyl or alkylaryl siloxanes in which the alkyl groups contain one to five carbon atoms. The siloxanes can be amido- or amino-substituted. When the siloxane is amine-substituted the amine group may be quaternised.

These optional ingredients, if added, are each present at levels up to 5% by weight of the composition.

The compositions according to the invention may take a variety of forms. They may for example be liquids containing an aqueous base.

Alternatively, the compositions according to the invention may be in the form of a powder, creams, pastes, a block or a tablet. Suitable types of blocks and tablets are disclosed in European Patent Specification EP-A-255 779 (Unilever).

When the compositions are in the form of liquid products, the total level of the fabric softening material and the benzimidazolyl-alkyl-carbamate is preferably from 1 to 30% by weight. Based on the total weight of the composition, the weight of the fabric-softening agent is preferably from 1 to 20% and the weight of the benzimidazolyl-alkyl-carbamate is preferably from 0.05 to 10%, more preferably from 0.1 to 5%, most preferably from 0.5 to 1.5%. The weight ratio of softening agent to benzimidazolyl-alkyl-carbamate is preferably between 10:1 and 100:1, more preferably around 20:1. Preferably more than 50 wt % of the softening materials are cationic softening materials.

When the compositions are in the form of powders, blocks or tablets, they may contain means for restraining the release of the cationic fabric-softening agent and benzimidazolyl-alkyl-carbamate in water, such as paraffin and tallow alcohol. Other suitable materials are disclosed in the European Patent Specification EP-A-255 779 (Unilever), the disclosure of which is incorporated herein by reference. The compositions may also contain an electrolyte to aid dispersion of the cationic fabric-softening agent and the benzimidazolyl-alkyl-carbamate, after the release inhibitor has ceased to have effect, and an antifoam material. A suitable antifoam granule may be of the type described in our European Patent Specification EP-A-94 250.

In use, the compositions are preferably added to a large volume of water to form a liquor with which the fabrics to be treated are contacted. The liquor can be formed by adding the fabric treatment composition to water during the rinse stage of a hand-washing process.

Alternatively, the composition can be added by hand or by way of an automatic dispensing device to rinse water in the tub of a washing machine of the type which is common in Europe, that is a machine in which the fabrics are rinsed in a tub which is filled with rinse water, agitated to achieve efficient rinsing and then drained. Generally, the total concentration of the fabric-softening agent and the benzimidazolyl-alkyl-carbamate in the rinse liquor will be between 30 and 500 ppm.

Alternatively, the compositions, especially when being in the form of a tablet or block, can be used in a washing machine which is designed in such a manner that the fabrics are rinsed in running water. With a machine of this type, the fabrics will normally have been previously washed in the same tub of the machine, or they may be placed in the tub specifically for rinsing. When previously washed, they will have at least some of the wash liquor containing a detergent active still adsorbed on or otherwise associated with them, the running water then serving to flush this wash liquor out of the fabrics. The rinse water running into the tub will be substantially free of any detergent actives. The composition can be added to the fabrics in the tub before the rinse water flows into the tub, simultaneously with the rinse water or part-way through the rinse cycle.

The invention will now be illustrated by the following non-limiting examples. In these examples, all parts and percentages are by weight. Where commercially available materials are referred to, the percentages quoted are those of the active detergent therein.

EXAMPLES 1-6

Aqueous compositions were prepared according to the formulations in the following tables. The compositions were prepared by co-melting the cationic fabric-softening agent and benzimidazolyl-alkyl-carbamate at 80 °C. The co-melt thus formed was added to water at 80 °C to form a dispersion. In examples containing 2.5 and 5.0% carbendazim respectively, the benzimidazolyl-alkyl-carbamate was post-dosed to a dispersion containing the cationic fabric-softening agent.

The compositions were tested by the following method.

Two pieces of a 50/50 resinated polyester cotton fabric and two pieces of a 100% cotton poplin fabric (each measuring 20 cm x 20 cm) were washed at 50 °C with 5 grams of a commercially available washing powder, Persil Automatic, in a litre of water in a tergotometer. After the wash liquor was separated, the fabrics were rinsed twice with a litre of demineralised water. 2 ml of an aqueous test composition was added to the second rinse. After line drying, the treated fabrics were assessed, as follows, to evaluate the microbial activity present.

Two pieces, each measuring 5 cm x 5 cm, were cut from each piece of treated fabric. Both pieces were placed on Petri dishes containing nutrient agar. 0.1 ml of an inoculum of either *Aspergillus niger* or *Penicillium* spores was spotted onto the centre of each piece. Care was taken not to allow the inoculum to spread onto the surrounding agar. The inoculum concentration was 10⁸ spores ml⁻¹. The plates were incubated at 28 °C and evaluation of fungal growth assessed after 3 days.

The scale used to assess fungal growth was:

0 = No growth on fabric.

10 = Very slight growth.

20 = Visible, light, patchy growth.

30 = Moderate growth on whole sample.

40 = Heavy growth on most of sample.

50 = Completely overgrown.

Owing to discolouration of the fabric, caused by spore inoculum, a fungal growth score of 0 is never

attained. A score of less than 10 is indicative of no growth.

EXAMPLE N°	50/50 POLYESTER COTTON		COTTON POPLIN	
	A. niger	Penicillium	A. niger	Penicillium
Reference				
Water	41	39	50	49
1. 5% Arquad 2HT	40	37	44	49
2. 5% 2HT + 0.1% C*	35	28	40	15
3. 5% 2HT + 0.25% C	30	30	35	< 10
4. 5% 2HT + 0.50% C	25	< 10	30	< 10
5. 5% 2HT + 2.5% C	18	< 10	< 10	< 10
6. 5% 2HT + 5.0% C	< 10	< 10	< 10	< 10

* C = Carbendazim (Intace B 350)

The results show that even if carbendazim is incorporated in a fabric treatment composition containing Arquad 2HT, at low levels, such as 0.1%, there is a significant reduction in fungal growth.

EXAMPLES 7-11

Compositions according to the following tables were prepared as described in Example 1. Fabrics were evaluated as described for Example I. The following results were obtained.

EXAMPLE N°	50/50 POLYESTER COTTON		COTTON POPLIN	
	A. niger	Penicillium	A. niger	Penicillium
Water	50	47.5	50	50
7. 5% Arquad 2HT	37.5	35	50	50
8. 5% Arquad 2HT + 0.5% C*	25	< 10	30	< 10
9. 5% Arquad 2HT + 0.5% K**	32.5	42.5	42.5	47.5
10. 5% Arquad 2HT + 10% A***	25	25	47.5	47.5
11. 5% Arquad 2HT + 0.5% P****	35	35	50	50

* C = Carbendazim (Intace B 350)

** K = Kathon (2-n-octyl-4-isothiazolin-3-one ex Rohm & Haas)

*** A = Actifresh L 8110, which comprises benzyl-alkyl-bis(hydroxy alkyl)ammonium, ex British Sanitized

**** P = Preventol R 89 (alkyl dimethyl benzyl ammonium chloride, ex Bayer)

These examples clearly show the surprisingly better performance of textile treatment compositions comprising benzimidazolyl-alkyl-carbamate antimicrobial substances.

EXAMPLES 12-16

Tablets comprising 8 g sodium bicarbonate, 2 g Adogen and 0.4 g carbendazim (Intace B 300) were prepared and compared with tablets comprising 8 g sodium bicarbonate and 2 g Adogen.

5 Pieces of 50/50 resinated polyester cotton fabrics and pieces of a 100% cotton poplin fabric were washed in a Japanese washing machine at room temperature with 31 g of a commercially available wash powder. After a 1 minute spin to separate the wash liquor, the fabrics were rinsed for ten minutes in running water. One tablet was added and the rinse continued for a further 5 minutes. After line drying, the treated fabrics were assessed for microbial activity as in Example 1.

70 The results were the following:

Fabric	Treatment	Fungal Growth	
		Aspergillus	Penicillium
50/50 Polycotton	Control*	40-45	40
100% Cotton poplin	Control	50	50
50/50 PC	Softener + 0.4 g Carb.	< 10	< 10
100% CP	Softener + 0.4 g Carb.	< 10	< 10

20 * Control = Tablet containing Adogen and NaHCO₃.

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Examples 17-30

The following aqueous compositions were prepared as in examples 1-6 and tested on cotton as in these examples. The carbendazim used was Intace B300. These examples again show a reduction in fungal growth when carbendazim is added to fabric softening compositions of the invention.

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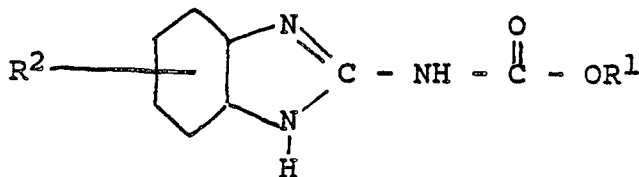
		Fungal Growth	
Product		A Niger	Penicillium
5	17. Water	50	50
	18. 7.56% Stepantex VRH 90	50	50
	19. 7.56% Stepantex VRH 90 + 1.0% Carbendazim	0-10	5
	20. 5% DTTMAPC	50	50
10	(1,2 ditallow oxytrimethylammonium propane chloride)		
	21. 5% DTTMAPC + 1% Carbendazim	0-10	0
	22. 5% Imidazolinium (Rewoquat W7500H)	50	50
	23. 5% Imidazolinium + 1.0% Carbendazim	0-5	0
15	24. 10.8% Dihardened tallow dimethyl ammonium chloride (DHTMAC) 2.7% Hardened tallow fatty acid	40	50
	25. 10.8% DHTMAC 2.7% Hardened tallow fatty acid 1.0% Carbendazim	20	0-10
20	26. 6% DHTDMAC	50	50
	27. 6% DHTDMAC + 1.0% Aluminium Chlorohydrate (ACH)	50	50
	28. 6% DHTDMAC + 1.0% ACH + 1.0% Carbendazim	10	0
25	29. 3.8% DHTDMAC 1.9% Ceranine HC39 (ex Sandoz) 1.9% DHTM amine oxide (Lilaminox M44, ex Berol Nobel)	50	50
30	30. 3.8% DHTDMAC 1.9% Ceranine HC39 1.9% DHTM Amine Oxide 0.38% Orthophosphoric Acid	30	10-15
35	+ 1.0% Carbendazim		

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Claims

1. Fabric treatment composition comprising a fabric-softening material and a benzimidazolyl-alkyl-carbamate.
2. Fabric treatment composition according to Claim 1, characterised in that the benzimidazolyl-alkyl-carbamate is of the following formula:

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where R¹ is a C₁₋₄ alkyl, alkoxy or phenoxy alkyl; and
R² is a C₁₋₄ alkyl, hydrogen, nitrogen or halogen.

3. Fabric treatment composition according to Claim 1 characterised in that it comprises:

1 - 30% by weight of the fabric-softening material, and
0.1 - 5% by weight of the benzimidazolyl-alkyl-carbamate.

4. Fabric treatment composition according to claim 1 comprising a cationic fabric softening material.

5. Fabric treatment composition according to Claim 1,
5 characterised in that it further comprises at least one other antimicrobial substance.

6. Method for treating fabrics by rinsing the fabrics in an aqueous bath comprising a textile treatment composition comprising a fabric-softening material and a benzimidazolyl-alkyl-carbamate, wherein the concentration of the fabric softening material plus benzimidazolyl-alkyl-carbamate composition in the bath is from 30 to 500 ppm.

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