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(54) **Fabric softening composition**

Wäscheweichmacher

Composition adoucissante pour textile

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(56) References cited:
EP-A- 0 043 622 **EP-A- 0 095 580**
EP-A- 0 111 984 **EP-A- 0 112 719**
EP-A- 0 220 156 **EP-A- 0 299 787**
EP-A- 0 301 882 **EP-A- 0 303 473**
EP-A- 0 346 995 **EP-A- 0 346 995**
EP-A- 0 385 749 **WO-A-90/12862**
WO-A-90/15857

- **Tensid Taschenbuch, H. Stacke, München & Wien, 1981, p. 370**
- **Surface Active Agents - Their Chemistry and Technology, 1949**
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Remarks:

The file contains technical information submitted after the application was filed and not included in this specification

Description

[0001] The present invention relates to fabric-softening compositions, in particular to fabric-softening compositions which comprise one or more fabric-softening materials and, optionally, sufficient dissolved electrolyte to result in a structure of lamellar droplets dispersed in a continuous aqueous phase.

[0002] Lamellar droplets are a particular class of surfactant structures which, *inter alia*, are already known from a variety of references, e.g. H.A.Barnes, 'Detergents', Ch.2. in K.Watter (Ed), 'Rheometry: Industrial Applications', J. Wiley & Sons, Letchworth 1980.

[0003] Lamellar fabric-softening compositions are for example known from EP-A-303 473 (Albright and Wilson). This patent application describes fabric-softening compositions comprising an aqueous base, a cationic fabric softener having two long alkyl or alkenyl groups and dissolved electrolyte to form an optically anisotropic spherulitic composition.

[0004] The presence of lamellar droplets in a fabric-softening product may be detected by means known to those skilled in the art, for example optical techniques, various rheometrical measurements, X-ray or neutron diffraction, and electron microscopy.

[0005] The droplets consist of an onion-like configuration of concentric bi-layers of molecules of fabric-softening material, between which is trapped water or electrolyte solution (aqueous phase). Systems in which such droplets are made of fully close-packed provide a very desirable combination of physical stability and useful flow properties.

[0006] The viscosity and stability of the product depend on the volume fraction of the liquid which is occupied by the droplets. Generally speaking, the higher the volume fraction of the dispersed lamellar phase (droplets), the better the stability. However, higher volume fractions also lead to increased viscosity which in the limit can result in an unpourable or gelled product. This results in a compromise being reached. When the volume fraction is around 0.6, or higher, the droplets are just touching (space-filling). This allows reasonable stability with an acceptable viscosity (say no more than 2.5 Pas, preferably no more than 1 Pas at a shear rate of 21s^{-1}). Conductivity measurements are known to provide a useful way of measuring the volume fraction, when compared with the conductivity of the continuous phase.

[0007] A complicating factor in the relationship between stability and viscosity on the one hand and, on the other, the volume fraction of the lamellar droplets, is the degree of flocculation of the droplets. When flocculation occurs between the lamellar droplets at a given volume fraction, the viscosity of the corresponding product will increase due to the formation of a network throughout the liquid. Flocculation may also lead to instability because deformation of the lamellar droplets, owing to flocculation, will make their packing more efficient. Consequently, more lamellar droplets will be required for stabilization by the space-filling mechanism, which will again lead to a further increase of the viscosity.

[0008] The volume fraction of droplets is increased by increasing the softener concentration, and may be reduced by increasing the electrolyte level, however, flocculation between the lamellar droplets may occur when a certain threshold value of the electrolyte concentration is crossed at a given level of fabric-softening material (and fixed ratio between any different softening components). Thus, in practice, the effects referred to above mean that there is a limit to the amounts of fabric-softening material and electrolyte which can be incorporated whilst still having an acceptable product. In principle, higher levels of fabric-softening materials are desired for convenience and for reduction of costs. Increased electrolyte levels can also be used for better performance, or are sometimes sought for secondary benefits such as carry-over protection.

[0009] We have now found that the dependency of stability and/or viscosity upon volume fraction of softening compositions can be favourably influenced by incorporating into the compositions a deflocculating polymer comprising a hydrophilic backbone and one or more hydrophobic side chains.

[0010] EP-A-0299 787 discloses concentrated fabric softener compositions containing viscosity modifying polymers which are copolymers of a cationic surfactant monomer and at least one other vinyl monomer. The comonomer may be a hydrophobic monomer and it may also include a hydrophilic monomer as well as a second cationic monomer which is relatively water-soluble compared to the first. The ratio of hydrophilic to hydrophobic comonomers in the polymers exemplified in the reference is 3.4:1 or below.

[0011] Each of EP-A-0 346 995, EP-A-0 385 749, WO-A-90/12862 and WO-A-90/15857 fall to be considered under Art 54(3)EPC. EP-A-0 346 995 discloses detergent, rather than fabric softener, compositions containing deflocculating polymers. EP-A-0 385 749 and WO-A-90/12862 disclose the inclusion, in fabric conditioning compositions of polymers which have the effect of increasing the viscosity of the composition. WO-A-90/15857 discloses heavy duty detergent compositions which contain, in addition to a bleach and a pH adjusting jump system, a stability enhancing polymer which is a copolymer of a hydrophilic and a hydrophobic monomer.

[0012] Accordingly, the present invention relates to a fabric-softening composition according to claim 1.

[0013] The deflocculating polymer allows, if desired, the incorporation of greater amounts of softening materials and/or electrolytes than would otherwise be compatible with the need for a stable, easily dispersable product of acceptable viscosity. It also allows (if desired) incorporation of greater amounts of certain other ingredients to which, hitherto, lamellar dispersions have been highly stability-sensitive.

[0014] The present invention allows formulation of stable, pourable products wherein the volume fraction of the dispersed phase is 0.5, 0.6 or higher, but with combinations or concentrations of ingredients not possible hitherto.

[0015] The volume fraction of the lamellar droplet phase may be determined by the following method. The composition is centrifuged, say at 40,000 G for 12 hours, to separate the composition into a clear (continuous aqueous) layer, a turbid active-rich (lamellar) layer and (if solids or liquids are suspended) a third layer. The conductivity of the continuous aqueous phase, the lamellar phase and of the total composition before centrifugation are measured. From these, the volume fraction of the lamellar phase is calculated or estimated, using the Bruggeman equation, as disclosed in American Physics, 24, 636 (1035).

[0016] Preferably, the viscosity of the aqueous continuous phase is less than 25 mPas, most preferably less than 15 mPas, especially less than 10 mPas, these viscosities being measured using a capillary viscometer, for example an Ostwald viscometer.

[0017] In practical terms, i.e. as determining product properties, the term 'deflocculating' in respect of the polymer means that the equivalent composition, minus the polymer, has a significantly higher viscosity and/or becomes unstable. It is not intended to embrace the use of polymers which would increase the viscosity. It is also not intended to embrace polymers which would lower the viscosity simply by a dilution effect, i.e. only by adding to the volume of the continuous phase but not enhance the stability of the composition. Although within the ambit of the present invention, relatively high levels of the deflocculating polymers can be used in those systems where a viscosity reduction is brought about; typically levels as low as from 0.01% by weight to 2.0% by weight can be capable of reducing the viscosity at 21 s^{-1} by up to 2 orders of magnitude.

[0018] Especially preferred embodiments of the present invention exhibit less phase separation on storage and have a lower viscosity than an equivalent composition without any of the deflocculating polymer.

[0019] Preferred embodiments of the invention exhibit smaller droplet size than an equivalent composition without any of the deflocculating polymer. From US-A-3 974 076 it is known that smaller droplet sizes enhance fabric softening, but in the past such small droplets were only obtainable by high energy processing.

[0020] Without being bound by a particular interpretation or theory, the applicants have hypothesised that the polymers exert their action on the composition by the following mechanism. The hydrophobic side chain(s) could be incorporated only in the outer bi-layer of the lamellar droplets, leaving the hydrophilic backbone over the outside of the droplets and additionally the polymers could also be incorporated deeper inside the droplet.

[0021] When the hydrophobic side chains are only incorporated in the outer bi-layer of the droplets, this has the effect of decoupling the inter- and intra-droplet forces, i.e. the difference between the forces between individual softener molecules in adjacent layers within a particular droplet and those between softener molecules in adjacent droplets could become accentuated in that the attractive forces between adjacent droplets are reduced. This will generally result in an increased stability due to less flocculation and a decrease in viscosity due to smaller forces between the droplets resulting in greater distances between adjacent droplets.

[0022] When the polymers are incorporated deeper inside the droplets, also less flocculation will occur, resulting in an increase in stability. The influence of these polymers within the droplets on the viscosity is governed by two opposite effects: first the presence of decoupling polymers will decrease the attractive forces between adjacent droplets resulting in greater distances between the droplets, generally resulting in a lower viscosity of the system; second the attractive forces between the layers within the droplets are equally reduced by the presence of the polymers in the droplet, this generally resulting in an increase in the water layer thickness, therewith increasing the lamellar volume of the droplets, therewith increasing the viscosity. The net effect of these two opposite effects may result in either a decrease or an increase in the viscosity of the product.

[0023] It is possible in patent specifications relating to aqueous fabric-softening compositions to define the stability of the composition in terms of the volume separation observed during storage for a predetermined period at a fixed temperature. In fact, this can be an over-simplistic definition of what is observed in practice. Thus, it is appropriate here to give a more detailed description.

[0024] For lamellar droplet dispersions, where the volume fraction of the lamellar phase is below 0.6 and the droplets are flocculated, instability is inevitable and is observed as a gross phase separation occurring in a relatively short time. When the volume fraction is below 0.6 but the droplets are not flocculated, the composition may be stable or unstable. When it is unstable, a phase separation occurs at a slower rate than in the flocculated case and the degree of phase separation is less.

[0025] When the volume fraction of the lamellar phase is below 0.6, whether the droplets are flocculated or not, it is possible to define stability in the conventional manner. In the context of the present invention, stability for these systems can be defined in terms of the maximum separation compatible with most manufacturing and retail requirements. That is, the 'stable' compositions will yield no more than 2% by volume phase separation as evidenced by appearance of 2 or more separate phases when stored at 25°C for 21 days from the time of preparation.

[0026] In the case of the compositions where the lamellar phase volume fraction is 0.6 or greater, it is not always easy to apply this definition. In the case of the present invention, such systems may be stable or unstable, according

to whether or not the droplets are flocculated. For those that are unstable, i.e. flocculated, the degree of phase separation may be relatively small, e.g. as for the unstable non-flocculated systems with the lower volume fraction. However, in this case the phase separation will often not manifest itself by the appearance of a distinct layer of continuous phase but will appear distributed as 'cracks' throughout the product. The onset of these cracks appearing and the volume of the material they contain are almost impossible to measure to a very high degree of accuracy. However, those skilled in the art will be able to ascertain instability because the presence of a distributed separate phase greater than 2% by volume of the total composition will readily be visually identifiable by such persons. Thus, in formal terms, the above-mentioned definition of 'stable' is also applicable in these situations, but disregarding the requirement for the phase separation to appear as separate layers.

[0027] Especially preferred embodiments of the present invention yield less than 0.1% by volume visible phase separation after storage at 25 ° C for 21 days from the time of preparation.

[0028] It must also be realised that there can be some difficulty in determining the viscosity of an unstable fabric-softening composition.

[0029] When the volume fraction of the lamellar phase is less than 0.6 and the system is deflocculated or when the volume fraction is 0.6 or greater and the system is flocculated, then phase separation occurs relatively slowly and meaningful viscosity measurement can usually be determined quite readily. For all compositions of the present invention it is usually preferred that their viscosity is not greater than 2.5 Pas, most preferably no more than 1.0 Pas, and especially not greater than 750 mPas at a shear rate of 21 s⁻¹.

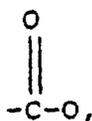
[0030] When the volume fraction of the lamellar phase is less than 0.6 and the droplets are flocculated, then often the rapid phase separation occurring makes a precise determination of viscosity rather difficult. However, it is usually possible to obtain a figure which, whilst approximate, is still sufficient to indicate the effect of the deflocculating polymer in the compositions according to the present invention. Where this difficulty arises in the compositions exemplified hereinbelow, it is indicated accordingly.

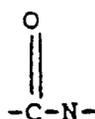
[0031] The compositions according to the invention may contain only one, or a mixture of deflocculating polymer types. The term 'polymer types' is used because, in practice, nearly all polymer samples will have a spectrum of structures and molecular weights and often impurities. Thus, any structure of deflocculation polymers described in this specification refers to polymers which are believed to be effective for deflocculation purposes as defined hereabove. In practice these effective polymers may constitute only part of the polymer sample, provided that the amount of deflocculation polymer in total is sufficient to effect the desired deflocculation effects. Furthermore, any structure described herein for an individual polymer type, refers to the structure of the predominating deflocculating polymer species and the molecular weight specified is the weight average molecular weight of the deflocculation polymers.

[0032] The hydrophilic backbone of the polymer generally is a linear, branched or cross-linked molecular composition containing one or more types of relatively hydrophilic monomer units, possibly in combination with minor amounts of relatively hydrophobic units. The only limitations to the structure of the hydrophilic backbone are that the polymer must be suitable for incorporation in an active-structured aqueous liquid softener composition and the hydrophilic backbone is relatively soluble in water in that the solubility in water of 20 ° C at a pH of 7.0 is more than 1 g/l, preferably more than 5 g/l, more preferably more than 10 g/l.

[0033] Preferably, the hydrophilic backbone is predominantly linear in that the main chain of the backbone constitutes at least 50% by weight, preferably more than 75%, most preferably more than 90% by weight of the backbone.

[0034] The hydrophilic backbone is constituted by hydrophilic monomer units, which can be selected from a variety of units available for the preparation of polymers. The hydrophilic monomers are linked by the following types of linkages





[0035] Water-soluble monomers suitably employed to form the hydrophilic backbone are for example those which are sufficiently water-soluble to form at least a one weight percent solution when dissolved in water and readily undergo polymerisation to form polymers which are water-soluble at ambient temperature and at a pH of 3.0 to 12.5, preferably more than 1 gram per litre, more preferably more than 5 grams per litre, most preferably more than 10 grams per litre. Exemplary water-soluble monomers include ethylenically unsaturated amides such as acrylamide, methacrylamide and fumaramide and their N-substituted derivatives such as 2-acrylamido-2-methylpropane sulphonic acid, N-(dimethylaminomethyl) acrylamide as well as N-(trimethylammoniummethyl) acrylamide chloride and N-(trimethylammoniumpropyl) methacrylamide chloride; ethylenically unsaturated carboxylic acids or dicarboxylic acids such as acrylic acid, maleic acid, methacrylic acid, itaconic acid, fumaric acid, crotonic acid, aconitic acid and citraconic acid; and other ethylenically unsaturated quaternary ammonium compounds such as vinylbenzyl trimethyl ammonium chloride; hydroxyethyl(meth) acrylate; sulfoalkyl esters of unsaturated carboxylic acids such as 2-sulphoethyl methacrylate; aminoalkyl esters of unsaturated carboxylic acids such as 2-aminoethyl methacrylate, dimethyl aminoethyl (meth)acrylate, diethyl aminoethyl (meth)acrylate, dimethyl aminomethyl (meth)acrylate, diethyl aminomethyl (meth)acrylate, and their quaternary ammonium salts; vinyl or allyl amines such as vinyl pyridine and vinyl morpholine or allylamine; diallyl amines and diallyl ammonium compounds such as diallyl dimethyl ammonium chloride; vinyl heterocyclic amides such as vinyl pyrrolidone; sodium alkyl sulphonate; vinyl aryl sulphonates such as vinylbenzyl sulphonate; vinyl alcohol obtained by the hydrolysis of vinyl acetate; acrolein; allyl alcohol; vinyl acetic acid; sodium vinyl sulphonate; sodium allyl sulphonate, as well as the salts of the foregoing monomers. These monomers may be used singly or as mixtures thereof.

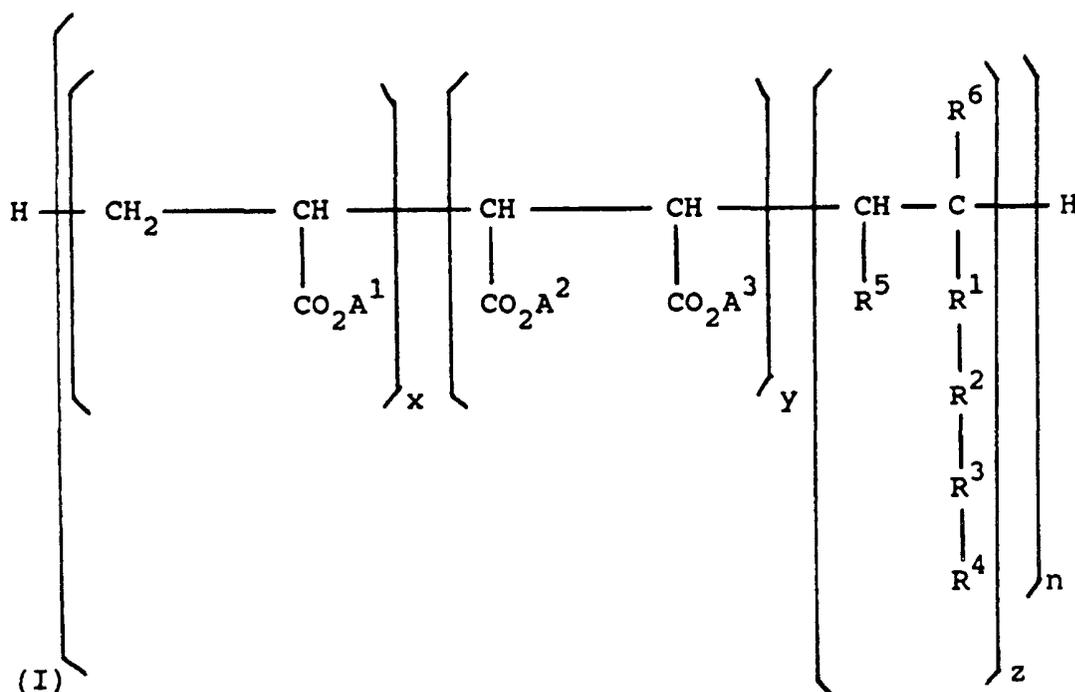
[0036] Optionally, the hydrophilic backbone may contain small amounts of relatively hydrophobic units, e.g. those derived from polymers having a solubility of less than 1 g/l in water, provided that the overall solubility of the hydrophilic polymer backbone still satisfies the solubility requirements as specified here above. Examples of relatively water-insoluble polymers are polyvinyl acetate, polymethyl methacrylate, polyethyl acrylate, polyethylene, polypropylene, polystyrene, polybutylene oxide, polypropylene oxide, polyhydroxypropyl acrylate.

[0037] Suitable hydrophobic monomers for forming the side chains include those which are (1) water-insoluble, i.e. less than 0.2 weight part of the hydrophobic monomer will dissolve in 100 weight parts water and (2) ethylenically unsaturated compounds having hydrophobic moieties. The hydrophobic moieties (when isolated from their polymerisable linkage) are relatively water-insoluble, preferably less than 1 g/l, more preferably less than 0.5 g/l, most preferably less than 0.1 g/l at ambient temperature and a pH of 3.0 to 12.5.

[0038] The hydrophobic moieties preferably have at least 5 carbon atoms and are most preferably pendant organic groups having hydrophobicities comparable to one of the following: aliphatic hydrocarbon groups having at least five carbons such as C₅ to C₅₀ alkyls and cycloalkyls; polynuclear aromatic hydrocarbon groups such as naphthyls; alkylaryls wherein the alkyl group has one or more carbons; haloalkyls of 5 or more carbons, preferably perfluoroalkyls; polyalkyleneoxy groups wherein alkylene is propylene or high alkylene and there is at least one alkyleneoxy unit per hydrophobic moiety; and siloxane moieties. Exemplary hydrophobic monomers include the higher alkyl esters of alpha, beta-ethylenically unsaturated carboxylic acids such as dodecyl acrylate, dodecyl methacrylate, tridecyl acrylate, tridecyl methacrylate, tetradecylacrylate, tetradecylmethacrylate, octadecyl acrylate, octadecyl methacrylate, octyl half ester of maleic anhydride, dioctyl diethyl maleate, and other alkyl esters and half esters derived from the reactions of alkanols having from 5 to 50 carbon atoms with ethylenically unsaturated carboxylic acids such as acrylic acid, methacrylic acid, maleic anhydride, fumaric acid, itaconic acid and aconitic acid; alkylaryl esters of ethylenically unsaturated carboxylic acids such as nonyl-phenyl methacrylate, dodecylphenyl acrylate and dodecylphenyl methacrylate; N-alkyl,

ethylenically unsaturated amides such as N-octadecyl acrylamide; N-octadecyl methacrylamide, N,N-dioctyl acrylamide and similar derivatives thereof, -olefins such as octene-1, decene-1, dodecene-1 and hexadecene-1; vinyl alkylates wherein alkyl has at least 4 carbon atoms such as vinyl laurate and vinyl stearate; vinyl alkyl ethers such as dodecyl vinyl ether and hexadecyl vinyl ether; N-vinyl amides such as N-vinyl lauramide and N-vinyl stearamide; and alkylstyrenes such as t-butyl styrene. The hydrophobic monomer may be used single or mixtures thereof may be employed. The ratio of hydrophilic to hydrophobic monomers varies from 500:1 to 5:1. The weight average molecular weights (Mw.) of the resultant polymers vary from 500 to 500,000 or above when measured by gel permeation chromatography using polyacrylate standards, or the polymers present a standard viscosity of from 1 to 100 mPas by standard viscosity (SV) measurements using polyacrylate standards.

[0039] Products of the invention preferably comprise polymers of the general formula:



wherein

z is 1; (x + y):z is from 5:1 to 500:1; in which the monomer units may be in random order; y being from 0 up to a maximum equal to the value of x; and n is at least 1;

R¹ represents -CO-O-, -O-, -O-CO-, -CH₂-, -CO-NH- or is absent;

R² represents from 1 to 50 independently selected alkyleneoxy groups, preferably ethylene oxide or propylene oxide groups, or is absent, provided that when R³ is absent and R⁴ represents hydrogen, then R² must contain an alkyleneoxy group with at least 3 carbon atoms;

R³ represents a phenylene linkage, or is absent;

R⁴ represents hydrogen or a C₅₋₂₄ alkyl or C₅₋₂₄ alkenyl group, with the provisos that:

a) when R¹ represents -O-CO-, R² and R³ must be absent and R⁴ must contain at least 5 carbon atoms and

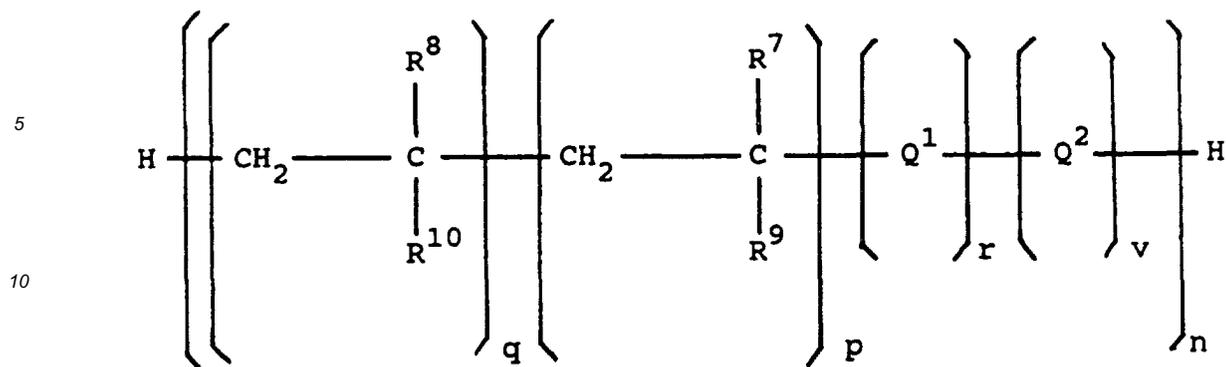
b) when R² is absent, R⁴ is not hydrogen and R³ is absent then R⁴ must contain at least 5 carbon atoms;

R⁵ represents hydrogen or a group of formula -COOA⁴;

R⁶ represents hydrogen or C₁₋₄ alkyl; and

A¹, A², A³ and A⁴ are independently selected from hydrogen, alkali metals, alkaline earth metals, ammonium and amine bases.

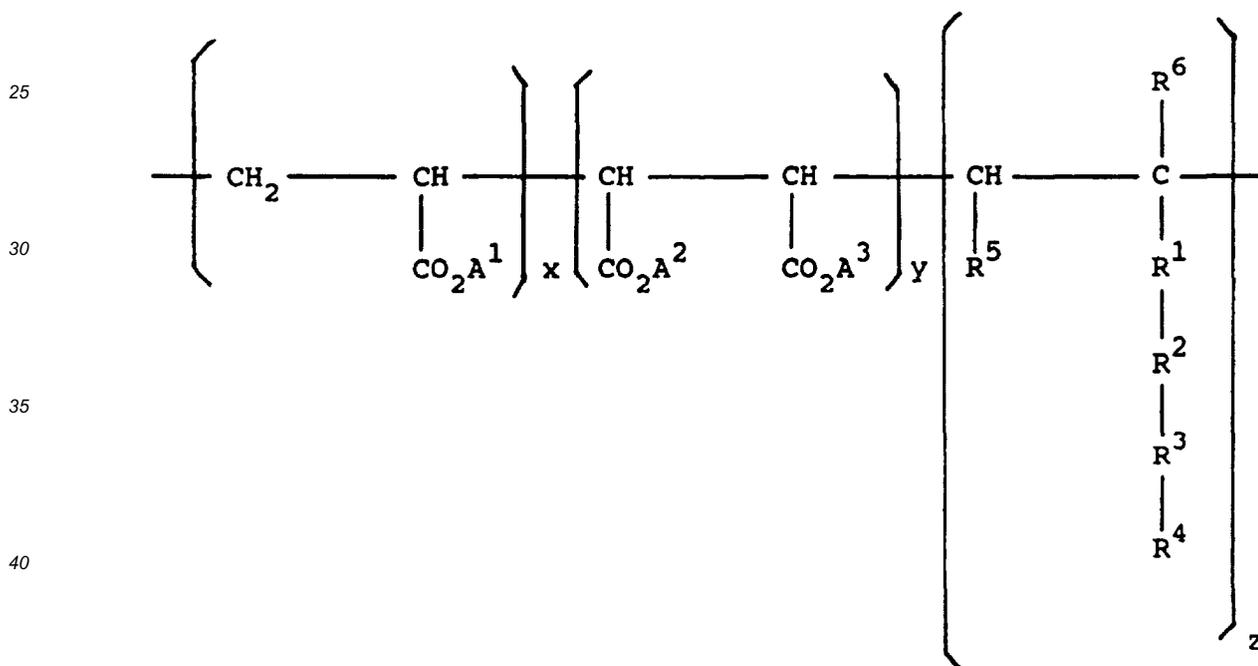
[0040] Another class of polymers in accordance with the present invention comprises those of formula II:



(II)

wherein:

20 Q² is a molecular entity of formula IIa:



(IIa)

wherein

50 z and R¹⁻⁶ are as defined for formula (I);

A¹⁻⁴ are as defined for formula (I);

Q¹ is a multifunctional monomer, allowing the branching of the polymer, wherein the monomers of the polymer may be connected to Q¹ in any direction, in any order, therewith possibly resulting in a branched polymer. Preferably Q¹ is trimethyl propane triacrylate (TMPTA), methylene bisacrylamide or divinyl glycol;

55 n and z are as defined above; v is 1; and (x + y + p + q + r):z is from 5:1 to 500:1; in which the monomer units may be in random order; and preferably either p and q are zero, or r is zero;

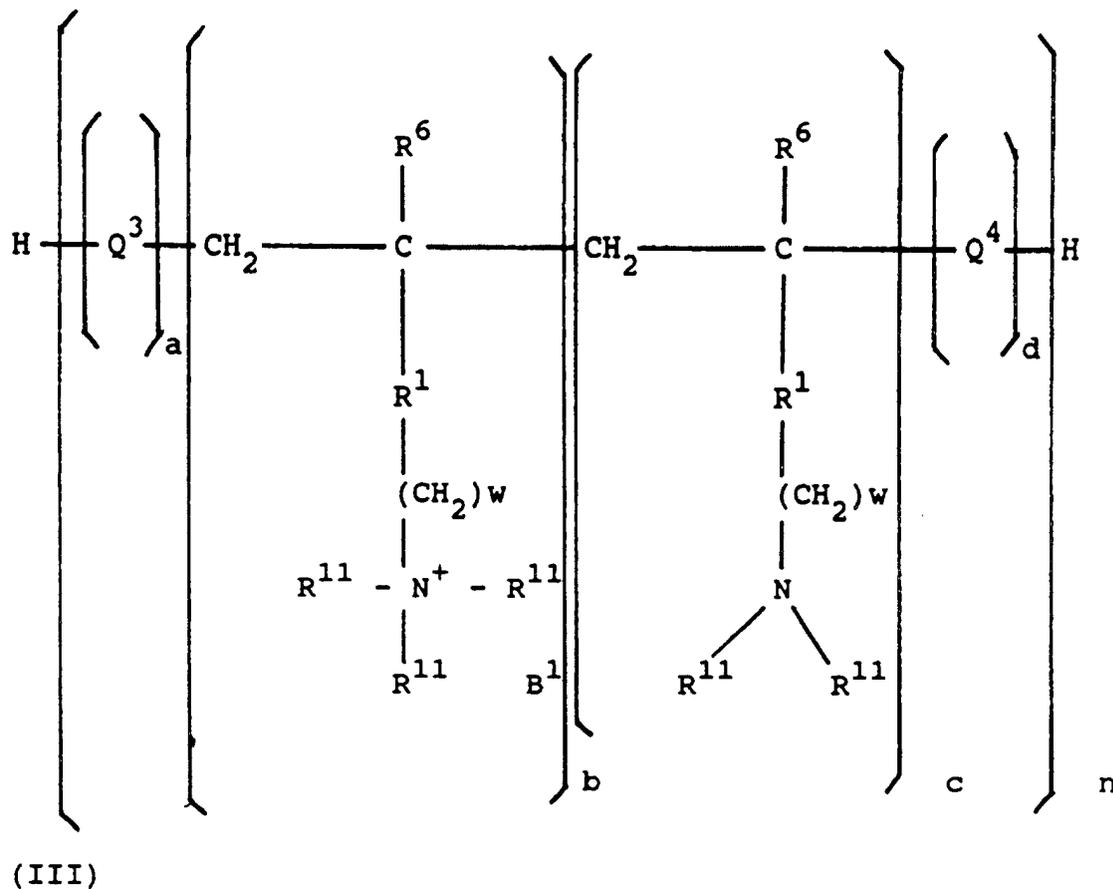
R⁷ and R⁸ represent -CH₃ or -H;

R⁹ and R¹⁰ represent substituent groups such as amino, amine, amide, sulphonate, sulphate, phosphonate, phos-

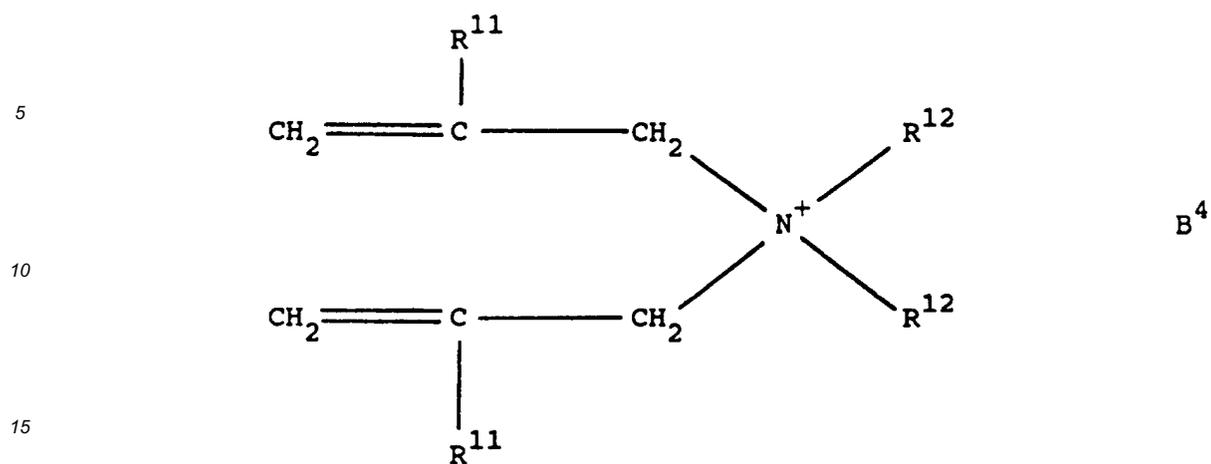
phate, hydroxyl, carboxyl and oxide groups, or $(C_2H_4O)_tH$, wherein t is from 1-50, and wherein the monomer units may be in random order. Preferably they are selected from $-SO_3Na$, $-CO-O-C_2H_4$, $-OSO_3Na$, $-CO-NH-C(CH_3)_2-CH_2-SO_3Na$, $-CO-NA_2$, $-O-CO-CH_3$, $-OH$. In any particular sample of polymer material in which polymers of formulae I and II are in the form of a salt, usually some polymers will be full salts (A^1-A^4 all other than hydrogen), some will be full acids (A^1-A^4 all hydrogen) and some will be part-salts (one or more A^1-A^4 hydrogen and one or more other hydrogen).

[0041] The salts of the polymers of formulae I and II may be formed with any organic or inorganic cation defined for A^1-A^4 and which is capable of forming a water-soluble salt with a low molecular weight carboxylic acid. Preferred are the alkali metal salts, especially of sodium or potassium.

[0042] Another class of polymers in accordance with the present invention comprises those of formula III:



wherein Q^3 is derived from a monomeric unit IIIa comprising:



(IIIc)

- 20 R¹-R⁶ are defined as in formula I;
 (a + b + c): d is from 5:1 to 500:1, in which the monomer units may be in random order, a, b, c, e, f, g, h may be an integer or zero, d is an integer and n is at least 1;
 B¹, B², B³, B⁴ are organic or inorganic anions;
 w is zero to 4;
- 25 R¹¹ and R^{11*} are independently selected from hydrogen or C₁-C₄ alkyl; and
 R¹² is independently selected from C₅ to C₂₄ alkyl or alkenyl, aryl cycloalkyl, hydroxyalkyl or alkoxyalkyl.
- [0043]** The anions represented by B¹, B², B³, B⁴ are exemplified by the halide ions, sulphate, sulphonate, phosphate, hydroxide, borate, cyanide, carbonate, bicarbonate, thiocyanate, sulphide, cyanate, acetate and the other common inorganic and organic ions. Preferred anions are chloride and methosulphate.
- 30 Another class of polymers in accordance with the present invention comprise those of formula IV.

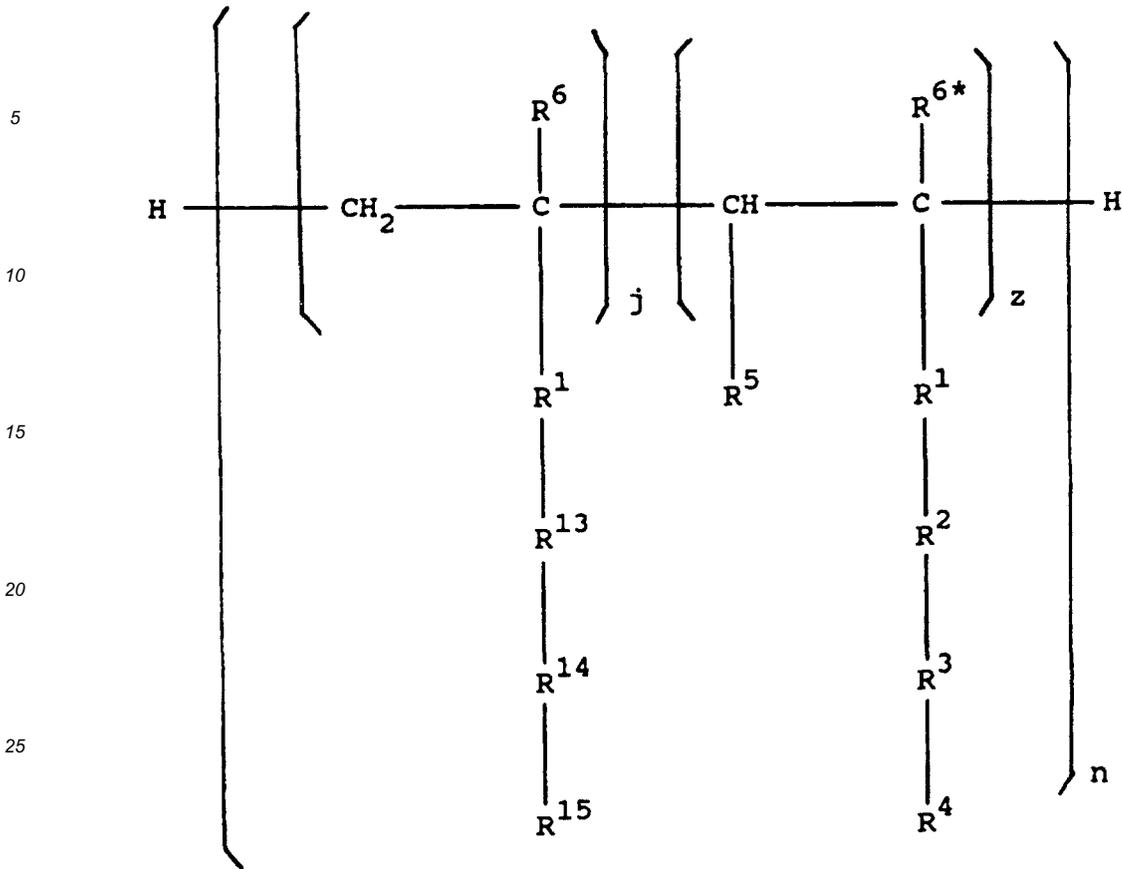
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IV

where R¹- R⁶ are defined as in formula I, R^{6*} represents H or C₁₋₄ alkyl, z is 1 and j:z is from 5:1 to 500:1, in which the monomer units may be in random order, and n is at least 1;

R¹³ represents -CH₂-, -C₂H₄-, -C₃H₆- or is absent.

R¹⁴ represents from 1 to 50 independently selected alkyleneoxy groups, preferably ethylene oxide groups, or is absent.

R₁₅ represents -OH or hydrogen.

[0044] The general formulae I, II, III and IV are to be construed as including those mixed copolymer forms wherein, within a particular polymer molecule where n is 2 or greater, R¹ - R¹⁵ differ between individual monomer units therein.

[0045] The polymers of formula I, II and IV and their salts have a weight average molecular weight in the region of from 500 to 500,000, preferably 1000 to 200,000, more preferably from 1500 to 50,000 when measured by GPC using polyacrylate standards. For the purposes of this definition, the molecular weights of the standards are measured by the absolute intrinsic viscosity method described by Noda, Tsuge and Nagasawa in Journal of Physical Chemistry, Volume 74, (1970), pages 710-719.

[0046] It is difficult to determine accurately the molecular weight distribution of polymers of Formula III, because of the highly cationic nature of these polymers and their subsequent adsorption on the GPC columns. Instead, a measure of molecular weight can be made by measuring a standard viscosity (S.V.), determined at 15.0% solids, 23 ° C in a 1.0 molar sodium chloride solution using a Brookfield Synchroelectric (R) viscometer, Model LVT with an LCP adaptor, at a speed of 60 PPM. Thus this polymer has an S.V. from 1 to 100 mPas, more preferably from 2-50 mPas, most preferably 3-25 mPas.

[0047] Empirically it has been found that the following relationship between SV and MW (polyacrylamate basis) exists:

$$\log_{10} MW = 1.4 \log_{10} SV + 2.5$$

[0048] Preferably the polymers for use in compositions of the present invention are prepared by the method as described in EP-A-346 834, published 20 December 1989.

[0049] The deflocculating polymer will be used at from 0.01% to 5.0% by weight in the composition, preferably from

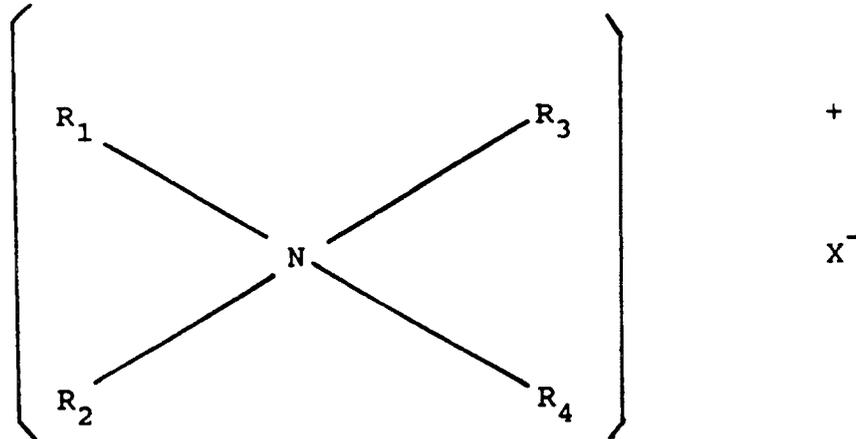
0.1% to 2.0%.

[0050] Although many softener materials form lamellar dispersions of softener in water alone, in some cases it is preferred for the aqueous continuous phase to contain dissolved electrolyte. As used herein, the term electrolyte means any ionic water-soluble material. However, in lamellar dispersions, not all the electrolyte is necessarily dissolved but may be suspended as particles of solid because the total electrolyte concentration of the liquid is higher than the solubility limit of the electrolyte. Mixtures of electrolytes also may be used, with one or more of the electrolytes being in the dissolved aqueous phase and one or more being substantially only in the suspended solid phase. Two or more electrolytes may also be distributed approximately proportionally, between these two phases. In part, this may depend on processing, e.g. the order of addition of components.

[0051] The only restriction on the total amount of softener material and electrolyte (if any) is that in the compositions of the invention, together they must result in formation of an aqueous lamellar dispersion. Thus, within the ambit of the present invention, a very wide variation in softener types and levels is possible. The selection of softener types and their proportions, in order to obtain a stable liquid with the required structure will be fully within the capability of those skilled in the art.

[0052] Compositions of the present invention comprise from 1 to 80% by weight of fabric-softening materials, preferably from 10 to 70% by weight, more preferably from 20 to 60% by weight of the composition. The fabric-softening materials are selected from cationic fabric-softener 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.

[0053] Well-known species of substantially water-insoluble quaternary ammonium compounds have the formula:



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

[0054] Representative examples of these quaternary softeners include ditallow dimethyl ammonium chloride; ditallow dimethyl ammonium methyl sulphate; dihexadecyl dimethyl ammonium chloride; di(hydrogenated tallow) dimethyl ammonium methyl sulphate; 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 methosulphate are preferred.

[0055] 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. Ditallow dimethyl ammonium chloride, di(hydrogenated tallow alkyl) dimethyl ammonium chloride, di(coconut alkyl) dimethyl ammonium chloride and di(coconut alkyl) dimethyl ammonium methosulfate are preferred.

[0056] Other preferred cationic compounds include those materials as disclosed in EP-A-239,910 (P&G).

[0057] Other preferred materials are the materials of formula:

containing from 8 to 25 carbon atoms, R_{14} is an hydrocarbyl group containing from 8 to 25 carbon atoms and R_{12} is hydrogen or an hydrocarbyl containing from 1 to 4 carbon atoms and A^- is an anion, preferably a halide, methosulphate or ethosulphate.

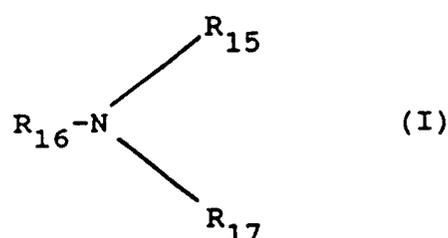
[0059] Preferred imidazolinium salts include 1-methyl-1-(tallowylamido-) ethyl -2-tallowyl-4,5-dihydro imidazolinium methosulphate and 1-methyl-1-(palmitoylamido) ethyl -2-octadecyl-4,5- dihydroimidazolinium chloride. Other useful imidazolinium materials are 2-heptadecyl-1-methyl-1 (2-stearyl-amido)ethylimidazolinium chloride and 2-lauryl-1-hydroxyethyl-1-oleyl-imidazolinium chloride. Also suitable herein are the imidazolinium fabric-softening components of US patent No. 4 127 489.

[0060] Representative commercially available materials of the above classes are the quaternary ammonium compounds Arquad 2HT (ex AKZO); Noranium M2SH (ex CECA) Aliquat-2HT (Trade Mark of General Mills Inc), Stepantex Q185 (ex Stepan); Stepantex VP85 (ex Stepan); Stepantex VRH90 (ex Stepan); Synprolam FS (ex ICI) and the imidazolinium compounds Varisoft 475 (Trade Mark of Sherex Company, Columbus Ohio) and Rewoquat W7500 (Trade Mark of REWO).

[0061] The compositions according to the invention may also contain, possibly in addition to the above mentioned softening agents, one or more amine softening materials.

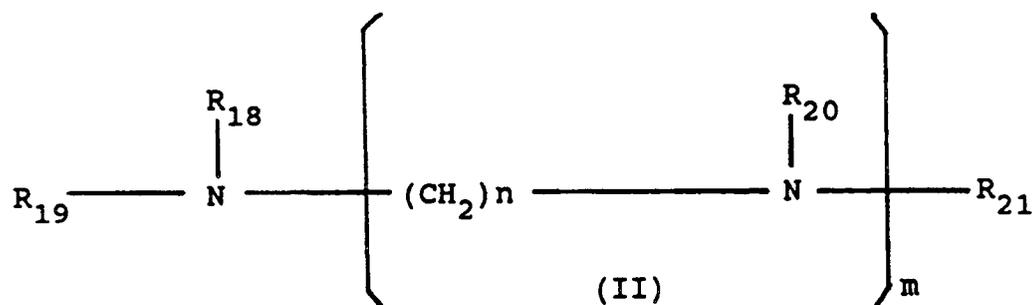
[0062] The term "amine" as used herein can refer to

(i) amines of formula:



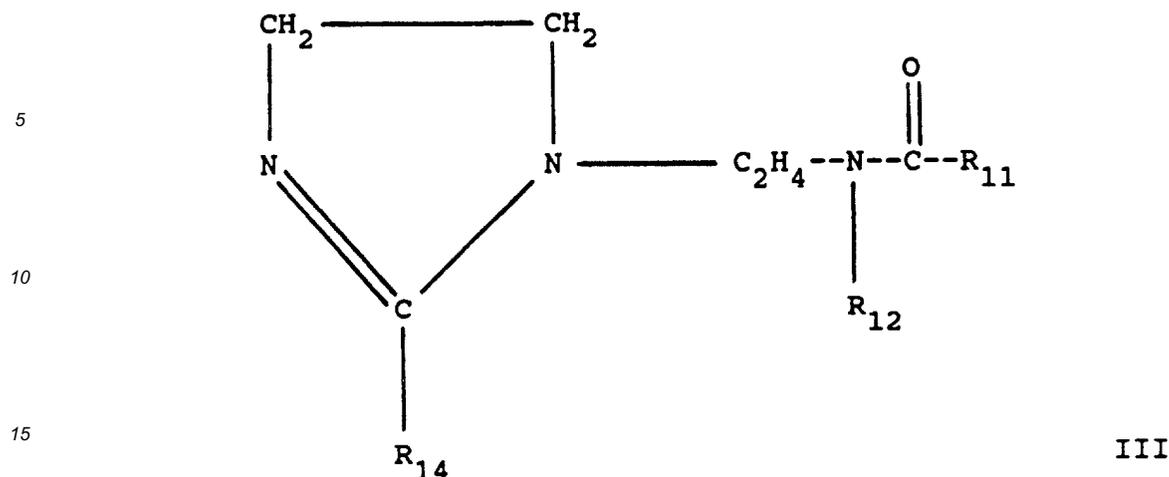
wherein R_{15} , R_{16} and R_{17} are defined as below;

(ii) amines of formula:



wherein R_{18} , R_{19} , R_{20} and R_{21} , m and n are defined as below.

(iii) imidazolines of formula:



wherein R_{11} , R_{12} and R_{14} are defined as above.

(iv) condensation products formed from the reaction of fatty acids with a polyamine selected from the group consisting of hydroxy alkylalkylenediamines and dialkylenetriamines and mixtures thereof. Suitable materials are disclosed in European Patent Application 199 382 (Procter and Gamble).

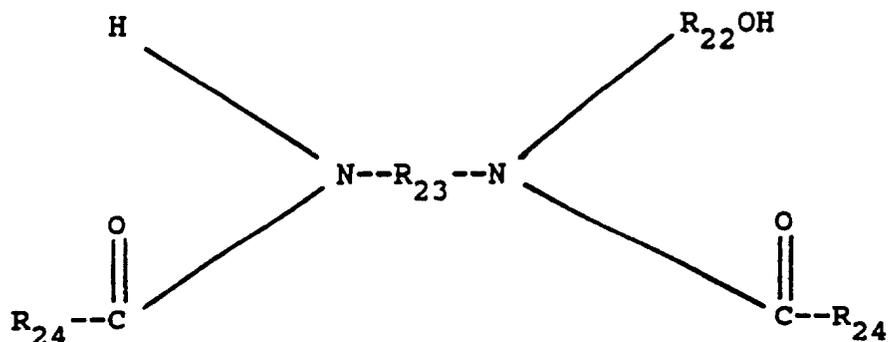
[0063] When the amine is of the formula I above, R_{15} is a C_6 to C_{24} , hydrocarbyl group, R_{16} is a C_1 to C_{24} hydrocarbyl group and R_{17} is a C_1 to C_{10} hydrocarbyl group. Suitable amines include those materials from which the quaternary ammonium compounds disclosed above are derived, in which R_{15} is R_1 , R_{16} is R_2 and R_{17} is R_3 . Preferably, the amine is such that both R_{15} and R_{16} are C_6 - C_{20} alkyl with C_{16} - C_{18} being most preferred and with R_{17} as C_{1-3} alkyl, or R_{15} is an alkyl or alkenyl group with at least 22 carbon atoms and R_{16} and R_{17} are C_{1-3} alkyl. Preferably these amines are protonated with hydrochloric acid, orthophosphoric acid (OPA), C_{1-5} carboxylic acids or any other similar acids, for use in the fabric-conditioning compositions of the invention.

[0064] When the amine is of formula II above, R_{18} is a C_6 to C_{24} hydrocarbyl group, R_{19} is an alkoxyated group of formula $-(CH_2CH_2O)_yH$, where y is within the range from 0 to 6, R_{20y} is an alkoxyated group of formula $-(CH_2CH_2O)_zH$ where z is within the range from 0 to 6 and m 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 is within the range from 3 to 10.

[0065] Representative commercially available materials of this class include Ethomeen (ex Armour) and Ethodomeen (ex Armour).

[0066] Preferably the amines of type (ii) or (iii) are also protonated for use in the fabric-conditioning compositions of the invention.

[0067] 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 carbons 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).

[0068] Compositions according to the present invention preferably have a pH of less than 6.0, more preferred less than 5.0, especially from 1.5 to 4.5, most preferred from 2.0 to 4.0.

[0069] The compositions can also contain one or more optional ingredients selected from non-aqueous solvents such as C₁-C₄ alkanols and polyhydric alcohols, pH-buffering agents such as weak acids, e.g. phosphoric, benzoic or citric acids, re-wetting agents, viscosity modifiers, 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, silicones, 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.

[0070] These optional ingredients, if added, are each present at levels up to 5% by weight of the composition.

[0071] The invention will be further illustrated by means of the following examples.

Examples I - XII

[0072] In examples I-XII the following polymers are used. Each polymer is obtained from National Starch and Chemical Ltd, Speciality Polymers Division as an aqueous solution of from 30-60% by weight solids level. All percentages for the polymer refer to 100% active polymers.

Basic Structures of Polymers: General Formula I

[0073] wherein R1 = COO, R2 is absent, R3 is absent, R5 = H, R6 = CH3 and y = 0 and A¹ = H.

Polymer	Al	x	R4	z	SV mPas
433/57	H	10	C18H37	1	3.9

Basic Structures of Polymers: General Formula II

[0074] wherein R8 = H, R = O, v = 1;

In Q2; x = y = 0, R1 = COO, R2, R3 absent, R5 = H, R6 = CH3.

Polymer	R10	q	R7	R9	p	R4	SV mPas
433/64	CONH ₂	20	-	-	0	C12H25	5.6
433/66	COOC ₂ H ₄ OH	7.5	H	SO3Na	2.5	C12H25	5.3
433/63	CONH ₂	20	-	-	0	C ₁₈ H ₃₇	6.5
433/59	CONH ₂	10	-	-	0	C ₁₈ H ₃₇	4.8
442/104	COOC ₂ H ₄ OH	10	-	-	0	C ₁₂ H ₂₅	4.1

Basic Structures of polymers: General Formula III

[0075] wherein b = c = 0, R6 = CH₃ d = 1.

In IIIa, R11 = H, R11*

= CH3, B2 = C1.

In IIIb, e = 1, f = g = h = i = 0, R1 = COO, R3 is absent, R5 = H, B3 = C1.

Polymer	a	d	R4	R6	SV mPas
422/60	10	1	CH ₂ (C ₂ H ₅)C ₅ H ₁₁	H	-
438/153	10	1	C ₁₂ H ₂₅	CH ₃	3.3
428/90	25	1	C ₁₂ H ₂₅	CH ₃	12.5
10425/157	25	1	C ₁₂ H ₂₅	CH ₃	12.9
425/167	25	1	C ₁₂ H ₂₅	CH ₃	19.4
425/169	10	1	C ₁₂ H ₂₅	CH ₃	5.4

EP 0 415 698 B2

(continued)

Polymer	a	d	R4	R6	SV mPas
425/176	15	1	C ₁₂ H ₂₅	CH ₃	8.0
425/183	5	1	C ₁₂ H ₂₅	CH ₃	4.5

Basic Structures of Polymers: General Formula IV

[0076] Wherein R₁ = 100, R₂ and R₃ are absent, R₆ = CH₃, R₁₃ is absent.

Polymer	R ₁₄	R ₁₅	R ₄	j	Z	SV mPas
433/65	C ₂ H ₄ O	H	C ₁₂ H ₂₅	25	1	6.9

Example I

[0077] Fabric-softening compositions were made by adding the deflocculating polymer and the electrolyte to water under stirring, followed by adding the softening material which has been preheated to 50°C. The fabric-softening material was Arquad 2T (a dimethyl ditallow ammonium chloride = DMDTAC ex Atlas). The pH of the compositions was adjusted to 4.0 with orthophosphoric acid.

[0078] The following compositions were obtained:

Ingredient	A	B	C
	% by weight		
DMDTAC*	30	30	30
CaCl ₂ (1 M)	11.9	11.9	-
Polymer 425/169	0.25	0.05	-
Water	----- balance -----		

* preheated to remove solvent

[0079] Compositions A and B were stable fabric-softening compositions which did not show any visible phase separation upon storage for several weeks at ambient temperature. They had a viscosity of about 400 mPas at 21 s⁻¹ and had a good dispersibility in water of ambient temperature. Composition C was gel-like, translucent and of unacceptable dispersibility in water.

Example II

[0080] The following compositions were prepared as in Example I, the fabric-softener material being an ester-linked quaternary ammonium material Stepantex VRH 90 which had been preheated to remove any solvent present.

Ingredient	A	B	C	D
	% by weight			
Stepantex VRH 90*	30	30	30	30
NaCl	1.8	2.0	2.0	2.0
Dobanol 91-6 **	1.0	1.5	1.5	1.0
Polymer 425/183	-	0.11	0.2	0.1
CaCl ₂ (1 M)	-	-	-	0.92

* preheated to remove solvent

** C₉₋₁₁ alcohol ethoxylated with 6EO groups (ex Shell)

EP 0 415 698 B2

[0081] Formulations A-D were stable fabric-softening compositions which did not show any visible phase separation upon storage for several weeks at ambient temperature. Compositions B-D were of acceptable viscosity and were well dispersible in water of ambient temperature. Composition A was unacceptably viscous and of poor dispersibility.

5 Example III

[0082] The following compositions were prepared as in Example I.

10

Ingredient	A	B	C	D
	% by weight			
DMDTAC **	24	24	24	24
Glycerol monostearate	6	-	6	6
Cithrol 2 M S *	-	6	-	-
Polymer 425/169	2.0	2.0	-	-
Polymer 425/183	-	-	2.0	-
Dobanol 91-6	2.0	2.0	2.0	2.0
CaCl ₂ (1 M)	11.9	11.9	11.9	11.9
Water	-----balance -----			

15

20

* polyethylene ex Croda of molecular weight 200

** preheated to remove solvent

25

[0083] Compositions A-D were stable fabric-softening compositions which did not show any visible phase separation upon storage at ambient temperature. Compositions A-C had a viscosity of about 400 mPas at 21s⁻¹ and were of good dispersibility. Composition D was unacceptably viscous.

30 Example IV

[0084] The following formulations were made by adding the citrate to the water of ambient temperature and subsequently adding the fabric-softening material. The polymer was added as the last ingredient at ambient temperature.

35

Ingredient	A	B	C
	% by weight		
DMDTAC**	50	50	50
Water	48	48	50
Trisodium citrate 2H ₂ O	2.0	2.0	2.0
Polymer 425/167*	0.3	-	-
Polymer 428/90*	-	0.3	-

40

* On top of formulation

** 70% active/20% isopropylalcohol/10% water

45

[0085] Compositions A and B were more stable than composition C. Compositions A and B were pourable milky liquids, while compositions C was a semi-translucent to milky gel which showed 12% by volume phase separation upon one-day storage at ambient temperature.

50

Example V

[0086] The following formulations were made as in Example I.

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EP 0 415 698 B2

Ingredient	A	B	C
	% by weight		
Trisodium citrate 2H ₂ O	1.96	1.96	1.96
Polymer 425/169	0.06	-	-
Polymer 425/183	-	0.06	-
DMDTAC*	47.8	47.8	47.8
Water	----- balance -----		

* 70% active/20% isopropylalcohol/10% water

[0087] Compositions A and B were stable, pourable milky liquids. Composition C was an unstable semi-translucent to milky gel.

Example VI

[0088] The following formulations were made as in Example I.

Ingredient	A	B	C	D
	% by weight			
STP	1.96	1.96	1.96	1.96
DMDTAC *	47.8	47.8	47.8	47.8
Polymer 425/167	0.25	-	-	-
Polymer 425/157	-	0.25	-	-
Polymer 425/176	-	-	0.25	-
Water	----- balance -----			

* 70% active/20% isopropylalcohol/10% water

[0089] Composition D was a pourable semi-translucent liquid which separated into two translucent layers with in 2 days. Compositions A-C were pourable milky liquids which were of acceptable stability.

Example VII

[0090] The following formulations were made as in Example I.

Ingredient	A	B	C	D
	% by weight			
DMDTAC *	49.2	49.2	49.2	49.2
CaCl ₂ , 2H ₂ O	0.98	0.98	0.98	0.98
Polymer 425/167	0.3	-	-	-
Polymer 425/157	-	0.3	-	-
Polymer 428/90	-	-	0.3	-
Water	----- balance -----			

* 70% active/20% isopropylalcohol/10% water

[0091] Composition D was a milky pourable liquid which separated into two layers in minutes. Compositions A-C

EP 0 415 698 B2

were of acceptable stability, pourable and did not show any discolouration upon storage.

Example VIII

5 **[0092]** The following fabric softening compositions were prepared as in Example 1. All compositions were stable translucent product having a viscosity of about 250 mPas at 21 s⁻¹ and were well dispersible in water of ambient temperature.

10

Ingredient	A	B	C	D	E
DMDTAC *	48.7	48.7	48.4	48.5	48.7
Trisodium citrate 2H ₂ O	1.95	1.95	1.0	1.5	1.0
Polymer 433/63	0.3	-	0.7	-	-
Polymer 433/65	-	0.3	-	-	-
Polymer 433/59	-	-	-	0.7	-
Polymer 433/57	-	-	-	-	0.7
Water	-----balance -----				

20 * 70% active/20% isopropylalcohol/10% water

Example IX

25 **[0093]** The following fabric softening compositions were prepared as in Example I. All compositions were stable, milky to semi-translucent products having a viscosity of about 400 mPas at 21 s⁻¹. The dispersability of the products in water of ambient temperature was good.

30

Ingredient	A	B	C	D
	% by weight			
DMDTAC *	49.0	49.0	49.3	49.2
STP	1.5	1.0	-	-
Polymer 433/63	0.3	-	0.3	-
Polymer 433/57	-	0.3	-	0.3
CaCl ₂ .H ₂ O	-	0.24	0.66	0.8
Water	----- balance -----			

40 * 70% active/20% isopropylalcohol/10% water

Example X

45 **[0094]** The following compositions were prepared as in Example I. All products were stable and of acceptable viscosity and dispersability.

50

55

Ingredient	A	B	C	D	E	F	G
	% by weight						
DTTMAPC *	21	21	22.5	22.5	22.5	22.5	20
DMDTAC **	-	-	7.5	7.5	7.5	7.5	-
NaCl	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Polymer 433/63	0.5	-	0.5	-	-	-	-
Polymer 433/64	-	0.5	-	0.5	-	-	-
Polymer 433/65	-	-	-	-	0.5	-	-
Polymer 433/66	-	-	-	-	-	0.5	-
Polymer 433/183	-	-	-	-	-	-	2.0
Dobanol 91-6	-	-	2.0	-	1.5	-	2.0
CaCl ₂ (IM)	-	-	2.0	-	-	-	1.0
Silicone anti-foam	-	-	-	-	-	1.0	-
Water	-----balance -----						

* 70/30 mixture of 1,2 ditallow oxytrimethyl ammonium propane chloride and 1 - tallow 2 - hydroxy trimethyl ammonium propane chloride.

** As in example I.

Example XI

[0095] Fabric softening compositions were made by adding calcium chloride to water, then adding a heated premix of fabric softener and nonionic and finally adding the polymer. The fabric softening material was Arquad 2HT (a dimethyl dihydrogenated tallow ammonium chloride DMDHTAC) ex Atlas. The nonionic was Genopol T050 a tallow alcohol ethoxylated with 5 moles of ethylene oxide ex Hoechst. The pH was adjusted to between 3.5 and 4 with orthophosphoric acid.

[0096] The following compositions were obtained:

Ingredient	A	B
DMDHTAC	22.35	18.0
Nonionic	3.0	3.0
CaCl ₂	5.4	-
Polymer 438/153	0.5	0.5
Water	balance	balance

[0097] Compositions A and B were stable fabric-softening compositions which did not show any visible phase separation on storage for several weeks at ambient temperature. They had a viscosity of about 400 mPas at 21s⁻¹.

Example XII

[0098] The following formulations were made by dispersing the polymer in an aqueous base before adding the fabric softener.

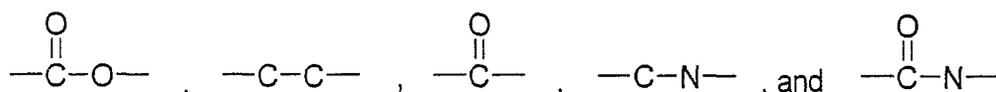
Ingredient	A	B
DMDHTAC	7.76	7.76
Polymer 442/104	0.1	0.25
CaCl ₂	0.005	0.06
Water	balance	balance

These formulations were found to have droplet sizes around 1 micron when measured by phase contrast microscopy. Formulations not containing polymer generally have droplet sizes of at least 3 microns.

Claims

1. A fabric softening composition comprising:

- 5 (a) an aqueous medium;
 (b) from 1% to 80% by weight of one or more fabric-softening materials in the aqueous medium, each of said materials being selected from cationic fabric softeners having a solubility in water at pH 2.5 and 20 ° C of less than 10g/l; and
 10 (c) from 0.01% to 5% by weight of a deflocculating polymer having a molecular weight of from 500 to 500,000 and/or a standard viscosity of from 1 to 100 mPas, said deflocculating polymer comprising a hydrophilic backbone and at least one hydrophobic side chain, the hydrophilic backbone having hydrophilic monomers, the hydrophilic monomers being linked by a linkage selected from:



20 such that the solubility of said hydrophilic backbone exceeds 1g/l in water at 20 ° C and pH 7.0, and said at least one hydrophobic side chain being supplied by at least one hydrophobic monomer included in said polymer, said hydrophilic monomers and said at least one hydrophobic monomer being in a ratio of from 5:1 to 500:1, and the hydrophobic monomer being selected from:

- 25 (i) water insoluble monomers having a solubility of less than 0.2 parts by weight per hundred parts water; and
 (ii) ethylenically unsaturated compounds having hydrophobic moieties, said hydrophobic moieties being selected from: (1) those having a solubility at ambient temperature of less than 1 g/l at a pH of between 3.0 and 12.5; and (2) those having at least 5 carbon atoms;

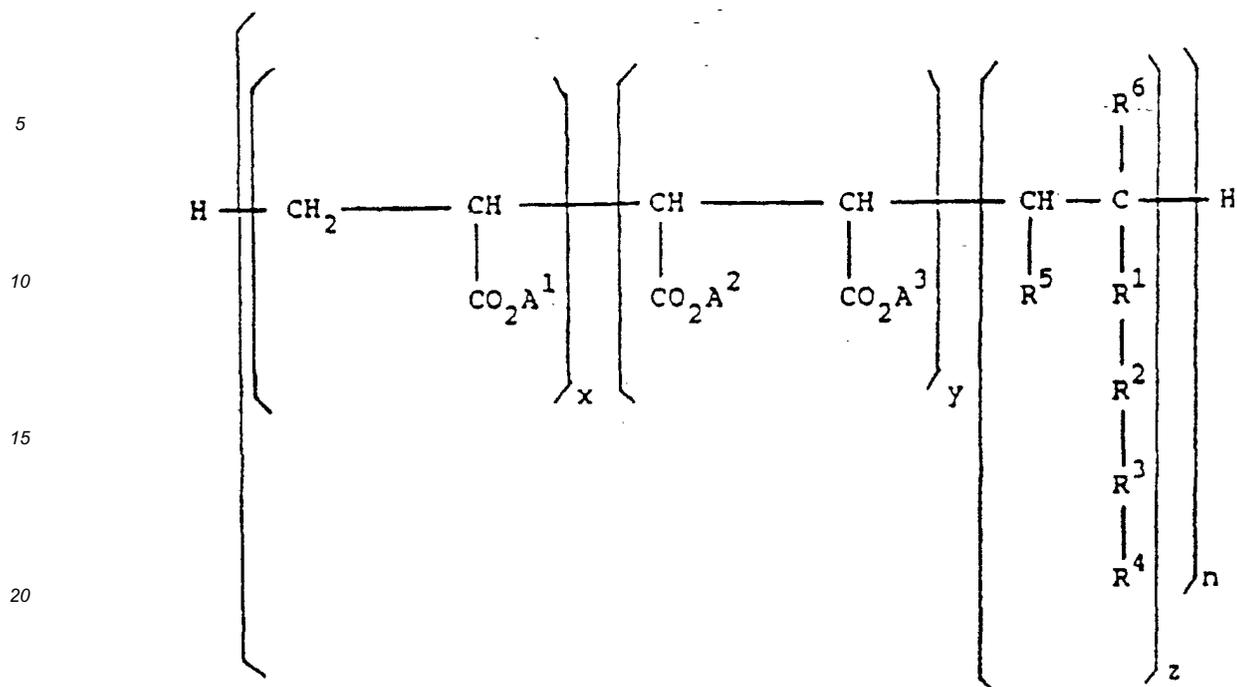
30 said fabric softening composition having a structure of lamellar droplets in the aqueous medium, and the viscosity of said composition being lower than that of the equivalent composition without said polymer; with the proviso that said fabric softening composition is not a structured aqueous heavy duty cleaning composition comprising:

- 35 (1) 1 to 40% by weight of a solid, particulate, substantially water-insoluble organic peroxy acid;
 (2) 10 to 50% by weight of a surfactant;
 (3) 1 to 40% by weight of a pH jump system comprising:

- 40 (a) a borate and;
 (b) a polyol, said polyol to borate being present in a weight ratio of 1:1 to 10:1; and

(4) from 0.1 to 5% by weight of a stability enhancing polymer which is a copolymer having a hydrophilic backbone and a hydrophobic side-chain.

45 2. A fabric softening composition according to claim 1, wherein the deflocculating polymer is of formula:



wherein

z is 1; (x + y):z is from 5:1 to 500:1; in which the monomer units may be in random order; y being from 0 up to a maximum equal to the value of x; and n is at least 1;

R¹ represents -CO-O-, -O- -O-CO-, -CH₂-, -CO-NH- or is absent;

R² represents from 1 to 50 independently selected alkyleneoxy groups, or is absent, provided that when R³ is absent and R⁴ represents hydrogen, then R² must contain an alkyleneoxy group with at least 3 carbon atoms;

R³ represents a phenylene linkage, or is absent;

R⁴ represents hydrogen or a C₅₋₂₄ alkyl or C₅₋₂₄ alkenyl group, with the provisos that:

(a) when R¹ represents -O-CO-, R² and R³ must be absent and R⁴ must contain at least 5 carbon atoms; and

(b) when R² is absent, R⁴ is not hydrogen and R³ is absent then R⁴ must contain at least 5 carbon atoms;

R⁵ represents hydrogen or a group of formula -COOA⁴;

R⁶ represents hydrogen or C₁₋₄ alkyl; and

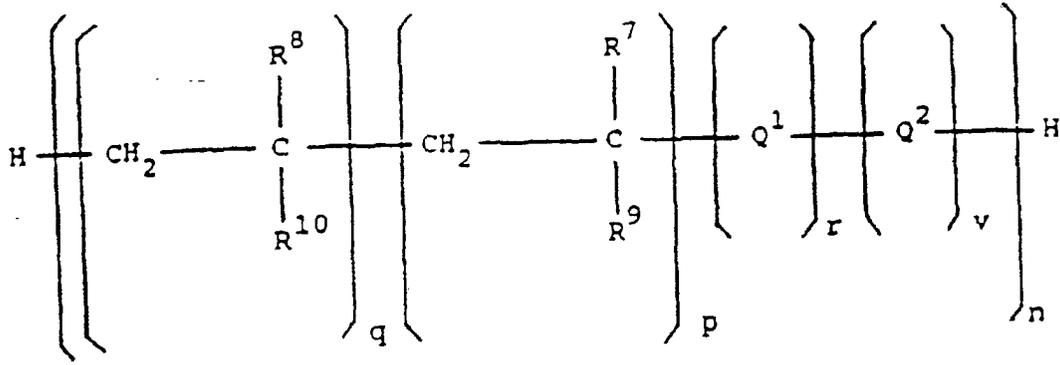
A¹, A², A³ and A⁴ are independently selected from hydrogen, alkali metals, alkaline earth metals, ammonium and amine bases.

3. A fabric softening composition according to claim 1 wherein the deflocculating polymer is of formula II:

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(II)

wherein:

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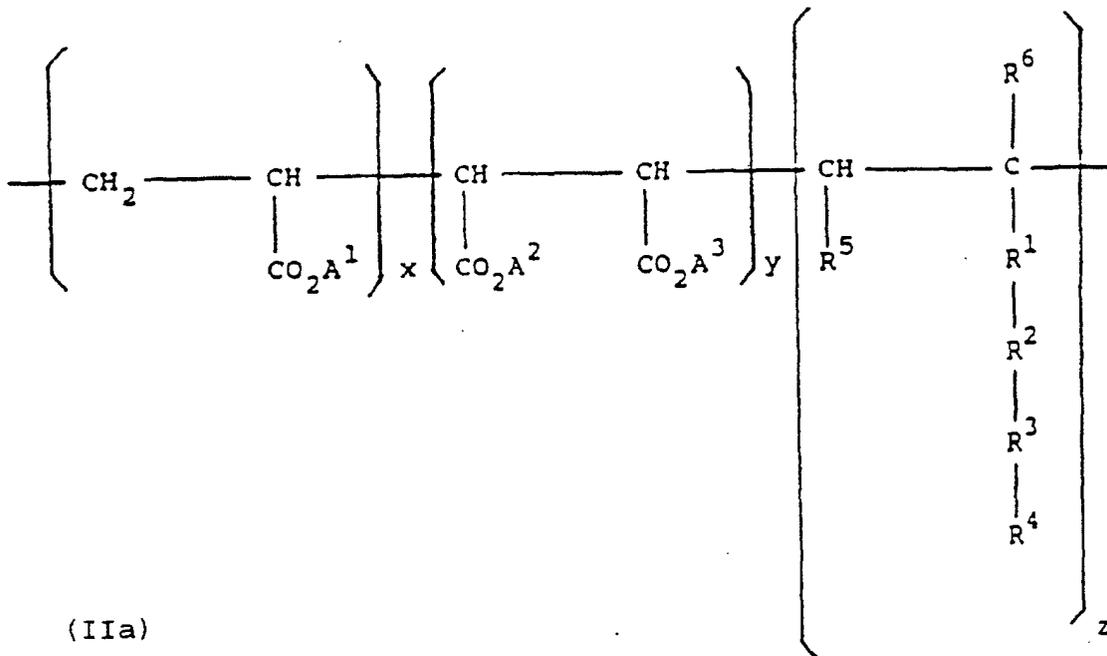
Q² is a molecular entity of formula IIa:

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30

35

40



(IIa)

45

wherein z and R¹⁻⁶ are as defined for formula (I);

A¹⁻⁴ are as defined for formula (I);

50

Q¹ is a multifunctional monomer, allowing the branching of the polymer, wherein the monomers of the polymer may be connected to Q¹ in any direction, in any order, therewith possibly resulting in a branched polymer; n and z are as defined above; v is 1; and (x + y + p + q + r): z is from 5:1 to 500:1; in which the monomer units may be in random order;

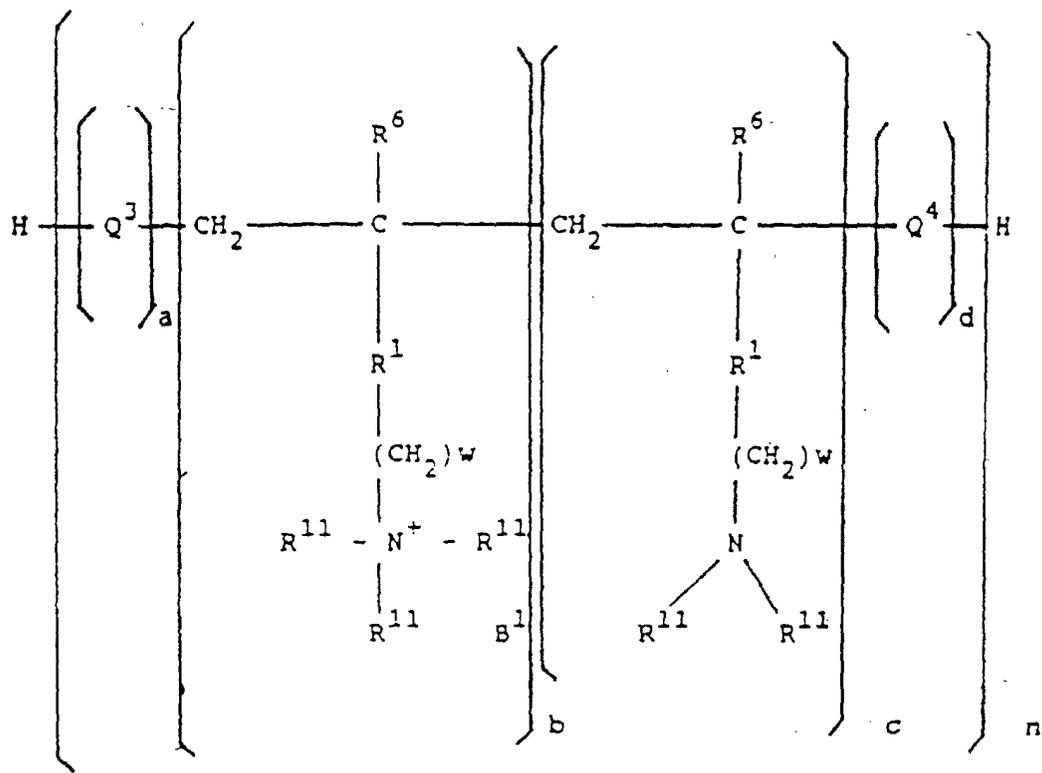
R⁷ and R⁸ represent -CH₃ or -H; and

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R⁹ and R¹⁰ each represent substituent groups such as amino, amine, amide, sulphonate, sulphate, phosphonate, phosphate, hydroxyl, carboxyl and oxide groups, or (C₂H₄O)_tH, wherein t is from 1-50, and wherein the monomer units may be in random order.

4. A fabric softening composition according to claim 1 wherein the deflocculating polymer is of formula III:

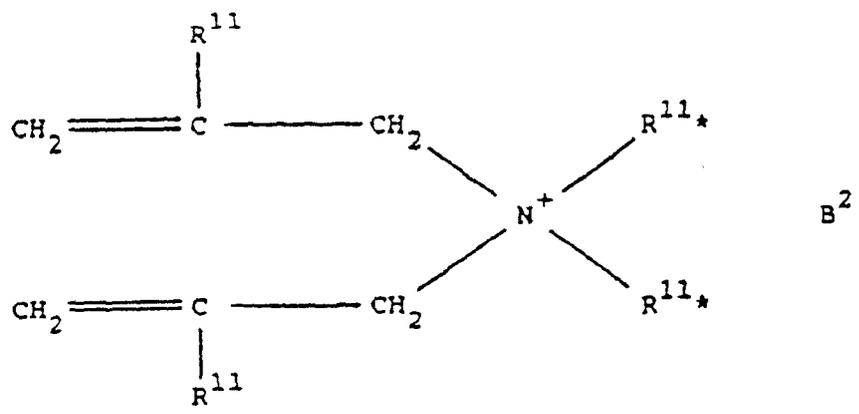
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(III)

30 wherein Q³ is derived from a monomeric unit IIIa comprising:

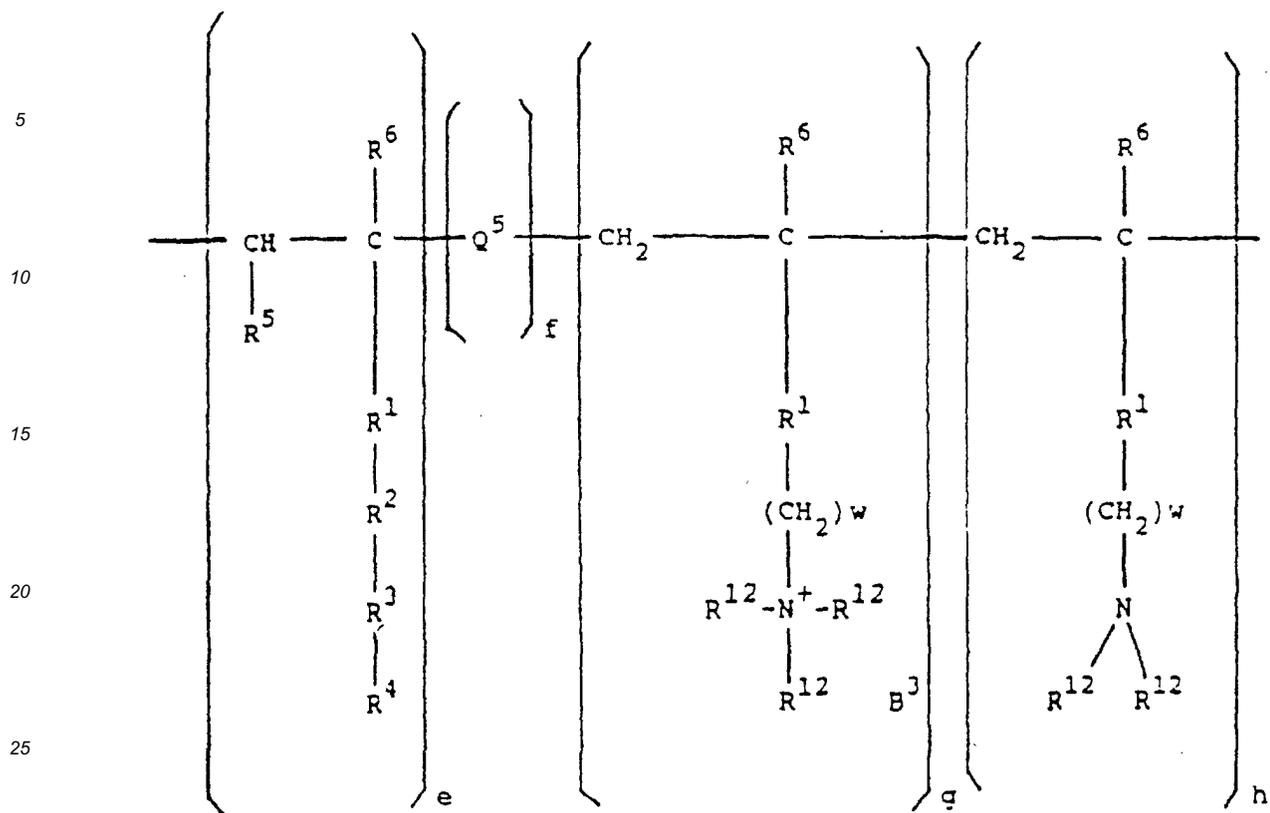
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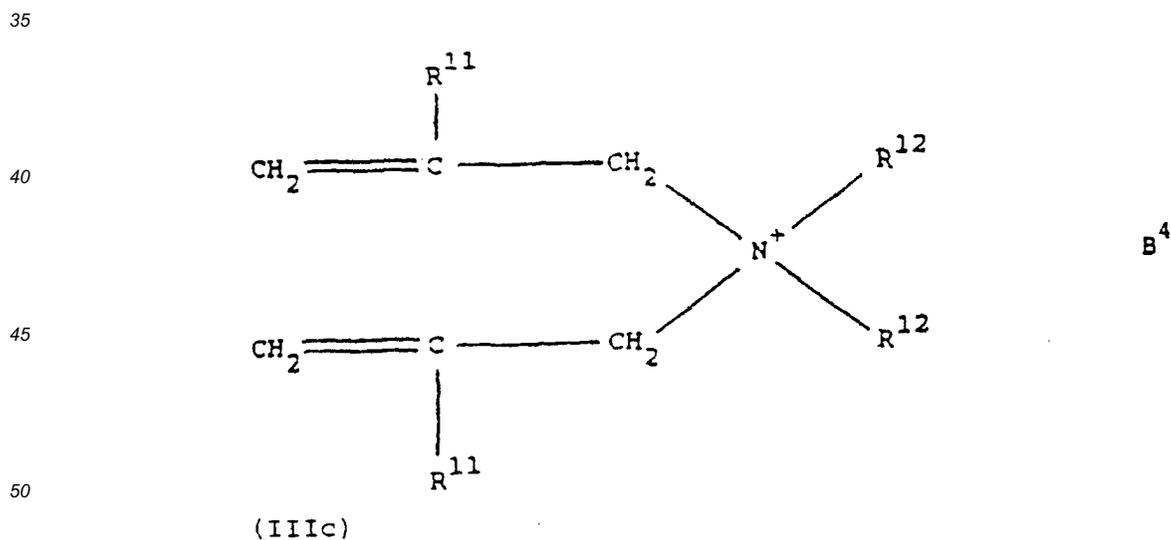
(IIIa)

50 Q⁴ is derived from the molecular entity IIIb:

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and Q⁵ is derived from a monomeric unit IIIc:



R¹-R⁶ are defined as in formula I;

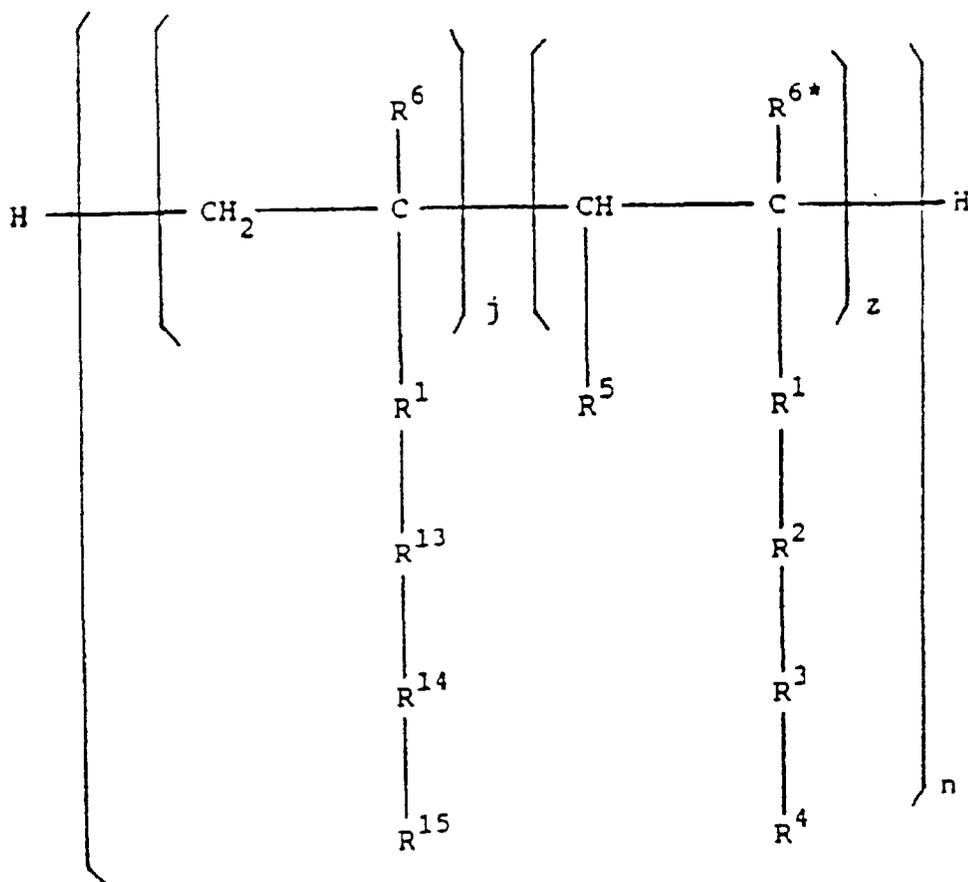
(a + b + c): d is from 5:1 to 500:1, in which the monomer units may be in random order, each of a,b,c,e,f,g,h is an integer or zero, d is an integer, and n is at least 1;

B¹,B²,B³,B⁴ are organic or inorganic anions;

w is zero to 4;

R¹¹ and R^{11*} are independently selected from hydrogen or C₁-C₄ alkyl; and
 R¹² is independently selected from C₅ to C₂₄ alkyl or alkenyl, aryl, cycloalkyl, hydroxyalkyl or alkoxyalkyl.

5. A fabric softening composition according to claim 1 wherein the deflocculating polymer is of formula IV.



45 where R¹ - R⁶ are defined as in formula I, R^{6*} represents H or C1-4 alkyl, z is 1 and j:z is from 5:1 to 500:1, in which the monomer units may be in random order, and n is at least 1;
 R¹³ represents -CH₂-, -C₂H₄-, -C₃H₆- or is absent,
 R¹⁴ represents from 1 to 50 independently selected alkyleneoxy groups, or is absent, and
 R¹⁵ represents -OH or hydrogen.

- 50 6. Fabric-softening composition according to any of the preceding claims, comprising from 0.1 to 2.0% by weight of the composition of deflocculating polymers.
7. Fabric-softening composition according to any of the preceding claims, comprising from 20-60% by weight of fabric-softening material.
- 55 8. Fabric-softening composition according to any of the preceding claims, also comprising from 0.1-5.0% by weight of dissolved electrolyte.

9. Fabric-softening composition according to any of the preceding claims, having a pH of less than 6.0.
10. Process for the preparation of a fabric softening composition according to any one of the preceding claims wherein the deflocculating polymer is dispersed in the aqueous base before addition of the fabric softening material thereto.
11. Method of treating fabrics comprising the contacting of fabrics with an aqueous liquor comprising a fabric-softening composition according to any of claims 1 to 9 at a concentration of from 1 to 1000 ppm of fabric-softener materials in the aqueous liquor.

12. Use of:

- (a) a deflocculating polymer as specified in claim 1; and
 (b) one or more cationic fabric softener having a solubility in water at pH 2.5 and 20 ° C of less than 10g/l;

in an aqueous medium; to produce a fabric softening composition having a structure of lamellar droplets dispersed in the aqueous medium, and a viscosity of below 2.5 Pas at a shear rate of 21s⁻¹, the viscosity of said composition being lower than that of the equivalent composition without said polymer; and with the proviso that the obtained composition is not a structured aqueous heavy duty cleaning composition comprising:

- (1) 1 to 40% by weight of a solid, particulate, substantially water-insoluble organic peroxy acid;
 (2) 10 to 50% by weight of a surfactant;
 (3) 1 to 40% by weight of a pH jump system comprising:

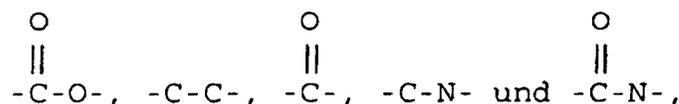
- (a) a borate and;
 (b) a polyol, said polyol to borate being present in a weight ratio of 1:1 to 10:1; and

- (4) from 0.1 to 5% by weight of a stability enhancing polymer which is a copolymer having a hydrophilic backbone and a hydrophobic side-chain.

Patentansprüche

1. Wäscheweichmacher, der folgendes enthält:

- (a) ein wäßriges Medium;
- (b) 1 Gew.-% bis 80 Gew.-% eines oder mehrerer Wäscheweichmacher-Substanzen in einem wäßrigen Medium, wobei jede dieser Substanzen aus kationischen Wäscheweichmachern ausgewählt ist, die in Wasser bei einem pH von 2,5 und bei 20°C eine Löslichkeit von weniger als 10 g/l besitzen; und
- (c) 0,01 Gew.-% bis 5 Gew.-% eines Entflockungs-Polymers mit einem Molekulargewicht von 500 bis 500 000 und/oder einer Standard-Viskosität von 1 bis 100 mPas, wobei das Entflockungs-Polymer eine hydrophile Hauptkette und mindestens eine hydrophobe Seitenkette aufweist, wobei die hydrophile Hauptkette hydrophile Monomere aufweist, wobei die hydrophilen Monomeren durch eine Bindung verbunden sind, ausgewählt aus:



so daß die Löslichkeit der hydrophilen Hauptkette in Wasser bei 20°C und bei einem pH von 7,0 1 g/l übersteigt, und wobei die mindestens eine hydrophobe Seitenkette durch mindestens ein hydrophobes Monomer bereitgestellt wird, das in dem Polymer enthalten ist, wobei die hydrophilen Monomeren und das mindestens eine hydrophobe Monomer in einem Verhältnis von 5:1 bis 500:1 vorliegen, und wobei das hydrophobe Monomer aus folgendem ausgewählt ist:

- (i) in Wasser unlöslichen Monomeren mit einer Löslichkeit von weniger als 0,2 Gew.-Teilen pro 100 Teile

R² für 1 bis 50 unabhängig voneinander ausgewählte Alkylenoxy-Gruppen steht, oder nicht vorhanden ist, mit der Maßgabe, daß, wenn R³ abwesend ist und R⁴ für Wasserstoff steht, R² dann eine Alkylenoxy-Gruppe mit mindestens 3 Kohlenstoffatomen enthalten muß;

5 R³ für eine Phenylen-Bindung steht, oder abwesend ist;

R⁴ für Wasserstoff oder eine C₅₋₂₄-Alkyl- oder C₅₋₂₄-Alkenyl-Gruppe steht, mit der Maßgabe, daß:

10 a) wenn R¹ für -O-CO- steht, R² und R³ abwesend sein müssen und R⁴ mindestens 5 Kohlenstoffatome enthalten muß, und

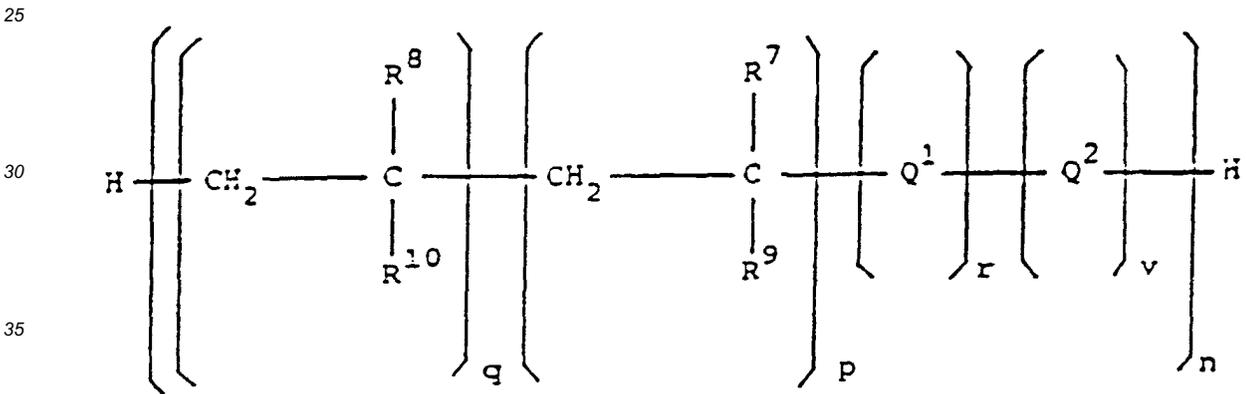
b) wenn R² abwesend ist, R⁴ nicht für Wasserstoff steht und R³ abwesend ist, R⁴ dann mindestens 5 Kohlenstoffatome enthalten muß;

15 R⁵ für Wasserstoff oder eine Gruppe mit der Formel -COOA⁴ steht;

R⁶ für Wasserstoff oder C₁₋₄-Alkyl steht; und

20 A¹, A², A³ und A⁴ unabhängig voneinander aus Wasserstoff, Alkalimetallen, Erdalkalimetallen, Ammonium und Amin-Basen ausgewählt sind.

3. Wäscheweichmacher nach Anspruch 1, wobei das Entflockungs-Polymer die folgende Formel II aufweist:



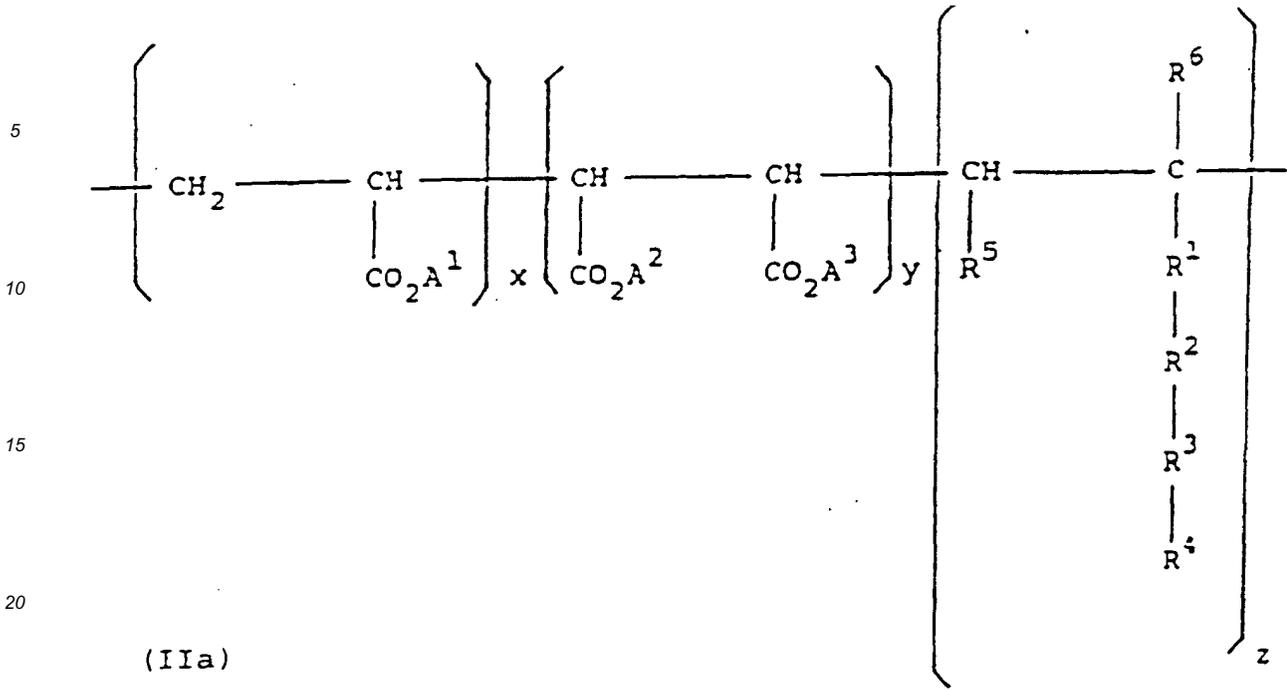
40 (II)

in der:

45 Q² für eine molekulare Entität mit der Formel IIa steht:

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25 in der z und R¹⁻⁶ wie in Formel (I) definiert sind;

A¹⁻⁴ wie in Formel (I) definiert sind;

30 Q¹ für ein multifunktionelles Monomer steht, das die Verzweigung des Polymers gestattet, wobei die Monomeren des Polymers in jeder Richtung und in jeder Reihenfolge an Q¹ gebunden sein können, wodurch sich möglicherweise ein verzweigtes Polymer ergibt; n und z wie oben definiert sind; v für 1 steht; und (x + y + p + q + r): z im Bereich von 5:1 bis 500:1 liegt; wobei die Monomer-Einheiten in zufälliger Reihenfolge vorliegen können;

35 R⁷ und R⁸ für -CH₃ oder -H stehen;

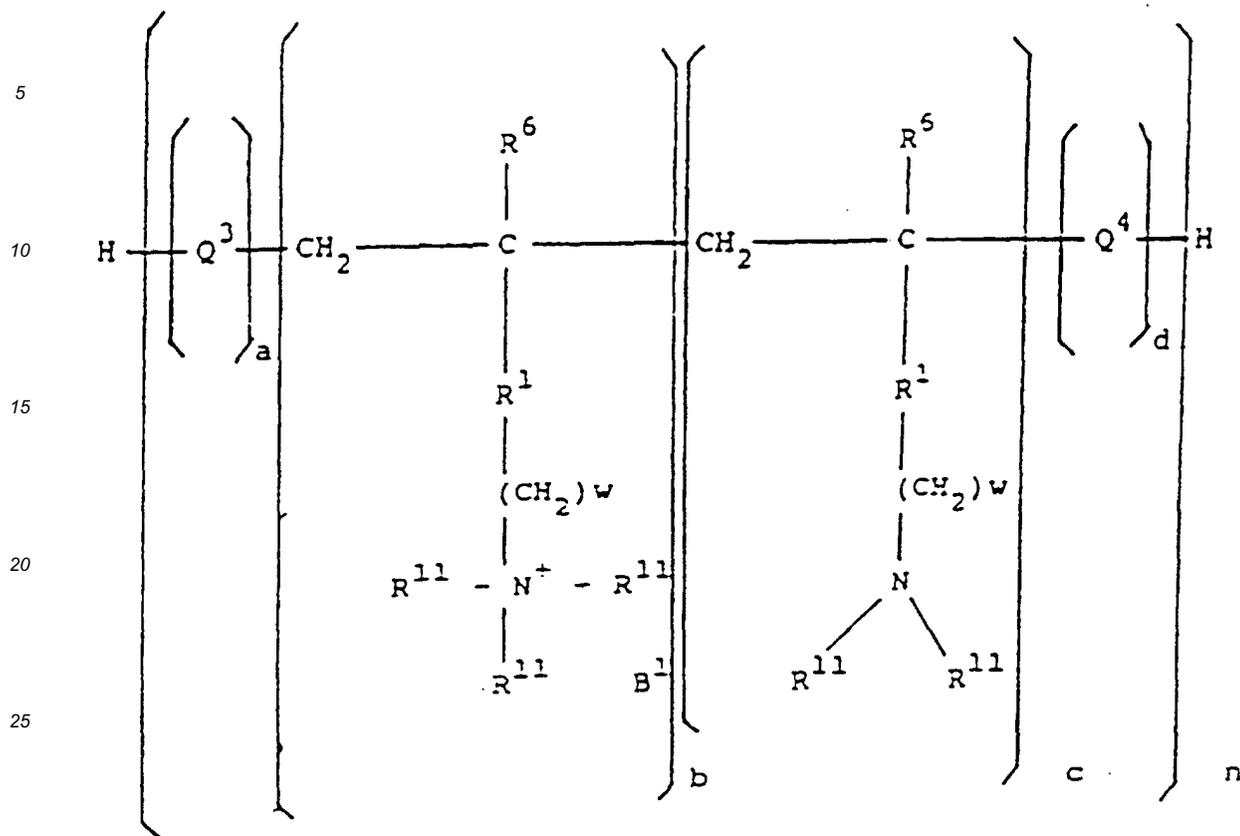
R⁹ und R¹⁰ jeweils Substituenten-Gruppen darstellen wie Amino-, Amin-, Amid-, Sulfonat-, Sulfat-, Phosphonat-, Phosphat-, Hydroxyl-, Carboxyl- oder Oxid-Gruppen oder (C₂H₄O)_tH, wobei t im Bereich von 1 - 50 liegt, und wobei die Monomer-Einheiten zufällig angeordnet sein können.

40 4. Wäscheweichmacher nach Anspruch 1, wobei das Entflockungs-Polymer die folgende Formel III aufweist:

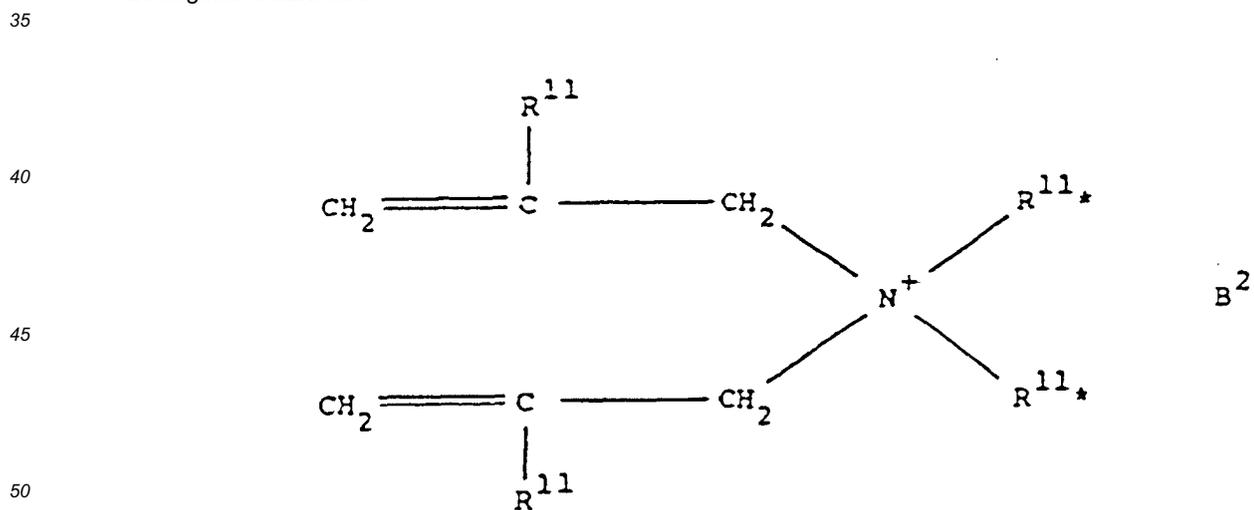
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in der Q³ von einer monomeren Einheit IIIa abstammt,
die folgendes aufweist:



wobei Q⁴ von der molekulaten Entität IIIb abstammt:

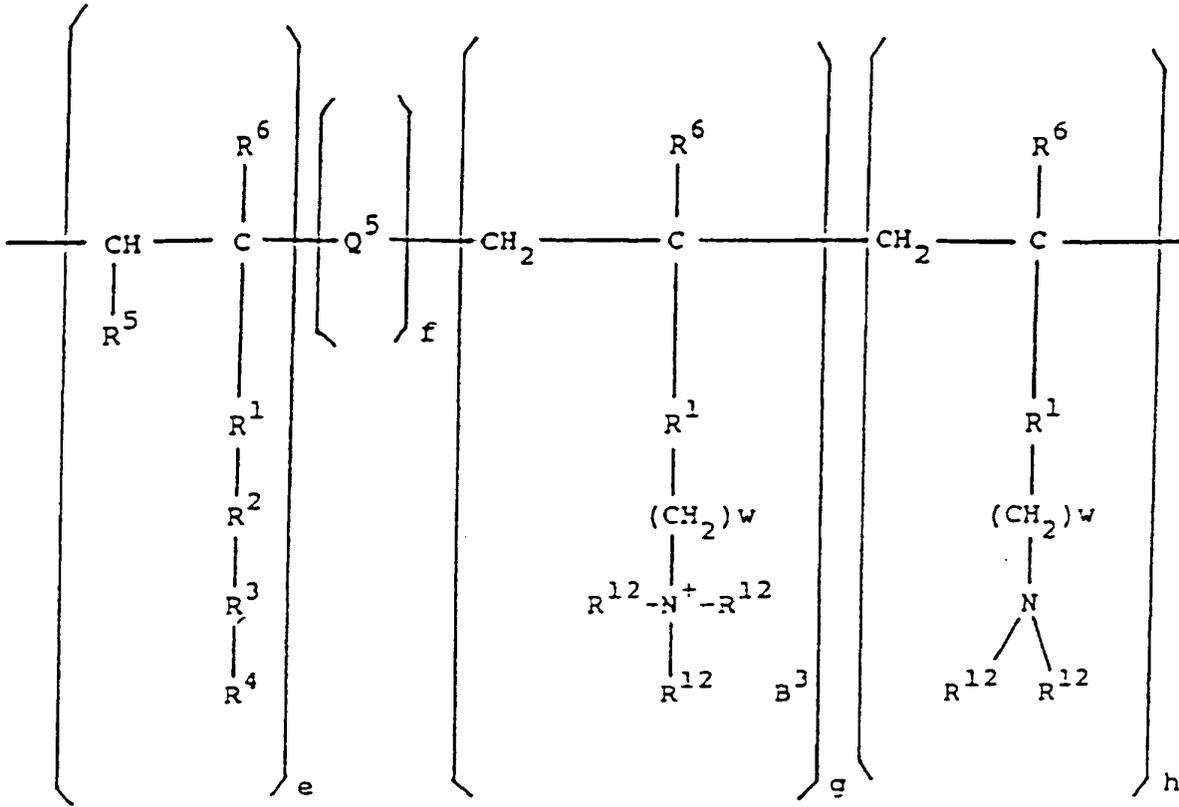
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(IIIb)

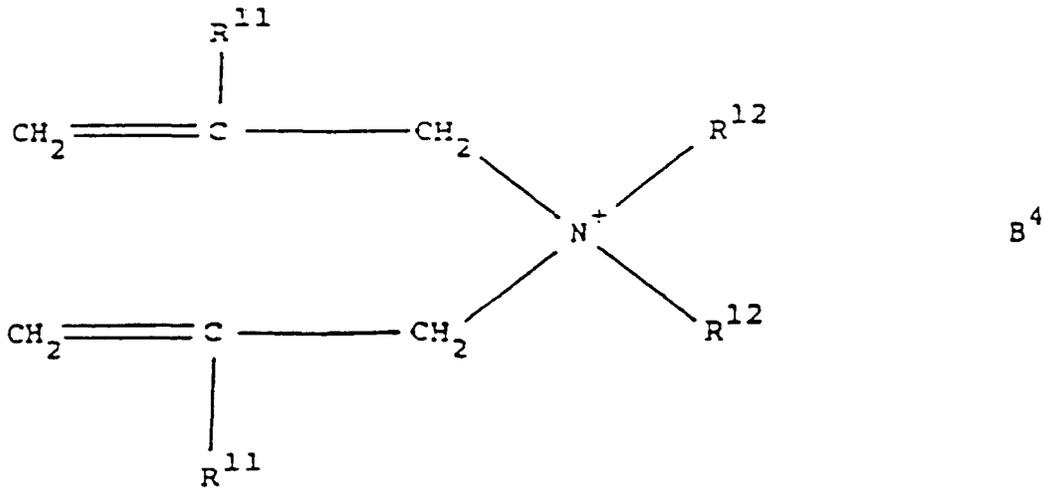
und Q⁵ von einer monomeren Einheit IIIC abstammt:

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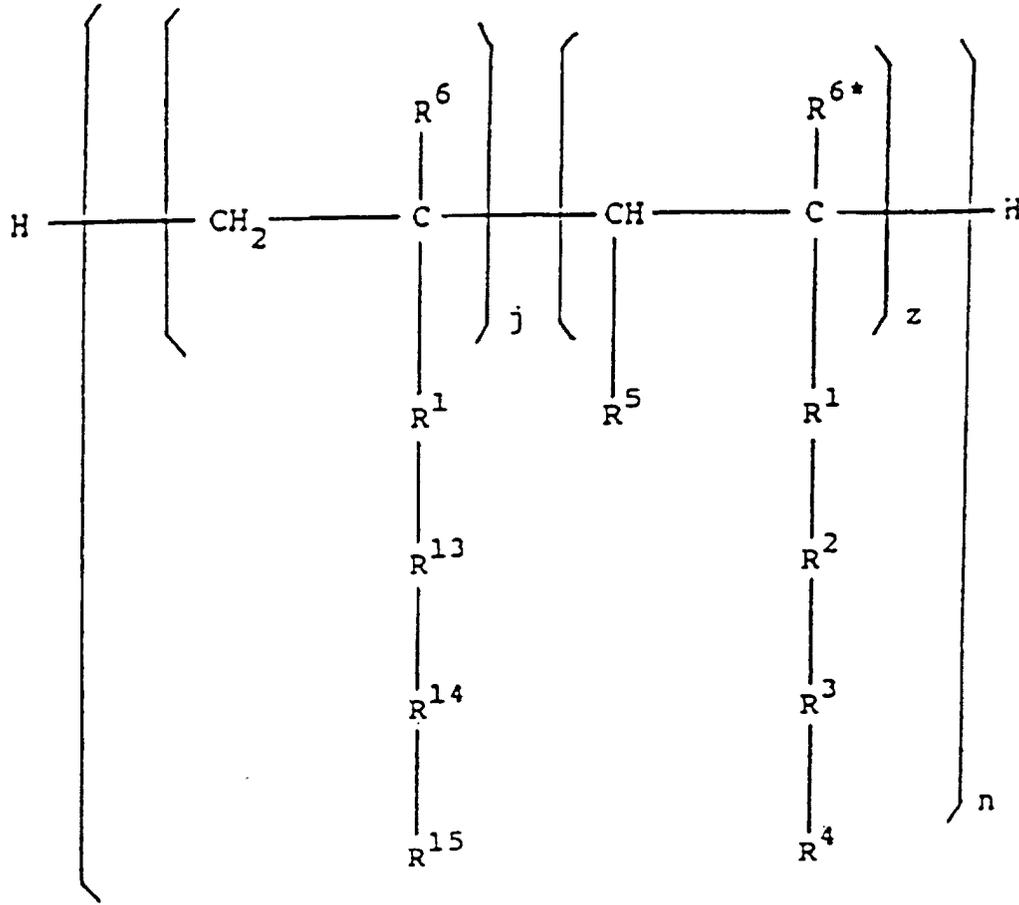
(IIIc)

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wobei R¹ - R⁶ wie in Formel I definiert sind;
 (a + b + c): d im Bereich von 5:1 bis 500:1 liegt, wobei die Monomer-Einheiten in zufälliger Reihenfolge vorliegen können, jedes a, b, c, e, f, g, h für eine ganze Zahl oder Null steht, d für eine ganze Zahl steht, und n mindestens 1 ist;

B¹, B², B³, B⁴ für organische oder anorganische Anionen stehen;
 w für Null bis 4 steht;
 R¹¹ und R^{11*} unabhängig voneinander aus Wasserstoff oder C₁-C₄-Alkyl ausgewählt sind; und
 R¹² unabhängig aus C₅-C₂₄-Alkyl oder -Alkenyl, -Aryl, -Cycloalkyl, -Hydroxyalkyl oder -Alkoxyalkyl ausgewählt ist.

5. Wäscheweichmacher nach Anspruch 1, wobei das Entflockungs-Polymer die folgende Formel IV aufweist:



(IV)

in der R¹ - R⁶ wie in Formel I definiert sind, R^{6*} für H oder C₁₋₄-Alkyl steht; z für 1 steht und j:z im Bereich von 5:1 bis 500:1 liegt, wobei die Monomer-Einheiten in zufälliger Reihenfolge vorliegen können, und n mindestens für 1 steht;

R¹³ für -CH₂-, -C₂H₄-, -C₃H₆- steht, oder abwesend ist;

R¹⁴ für 1 bis 50 unabhängig ausgewählte Alkylenoxy-Gruppen steht, oder abwesend ist;

R¹⁵ für -OH oder Wasserstoff steht.

6. Wäscheweichmacher nach einem der vorhergehenden Ansprüche, der 0,1 bis 2,0 Gew.-% der Zusammensetzung an Entflockungs-Polymeren enthält.
7. Wäscheweichmacher nach einem der vorhergehenden Ansprüche, der 20 - 60 Gew.-% Wäscheweichmacher-Substanz enthält.
8. Wäscheweichmacher nach einem der vorhergehenden Ansprüche, der außerdem 0,1 bis 5,0 Gew.-% gelösten Elektrolyt enthält.

9. Wäscheweichmacher nach einem der vorhergehenden Ansprüche, der einen pH von weniger als 6,0 besitzt.

10. Verfahren zur Herstellung eines Wäscheweichmachers nach einem der vorhergehenden Ansprüche, bei dem das Entflockungs-Polymer vor der Zugabe der Wäscheweichmacher-Substanz dazu in der wäßrigen Base dispergiert wird.

11. Verfahren zur Behandlung von Wäsche, bei dem die Wäsche mit einer wäßrigen Lauge in Kontakt gebracht wird, die einen Wäscheweichmacher nach einem der Ansprüche 1 bis 9 in einer Konzentration von 1 bis 1000 ppm der Wäscheweichmacher-Substanzen in der wäßrigen Lauge enthält.

12. Verwendung

- (a) eines Entflockungs-Polymers wie in Anspruch 1 ausgewiesen; und
- (b) eines oder mehrerer kationischer Wäscheweichmacher mit einer Löslichkeit in Wasser bei pH 2,5 und 20°C von weniger als 10 g/l;

in einem wäßrigen Medium; zur Herstellung eines Wäscheweichmachers mit der Struktur von in dem wäßrigen Medium dispergierten lamellaren Tröpfchen und einer Viskosität unterhalb 2,5 Pas bei einer Schergeschwindigkeit von 21 s⁻¹, wobei die Viskosität der Zusammensetzung niedriger ist als die der entsprechenden Zusammensetzung ohne das Polymer;

und mit der Maßgabe, daß es sich bei der erhaltenen Zusammensetzung nicht um eine strukturierte, wäßrige Hochleistungs-Wasch-Zusammensetzung handelt, die folgendes enthält:

(1) 1 bis 40 Gew.-% einer festen, teilchenförmigen, in Wasser im wesentlichen unlöslichen organischen Peroxysäure;

(2) 10 bis 50 Gew.-% eines oberflächenaktiven Mittels;

(3) 1 bis 40 Gew.-% eines pH-Sprungsystems, das folgendes enthält:

(a) ein Borat und;

(b) ein Polyol, wobei das Polyol und das Borat in einem Gewichtsverhältnis von 1:1 bis 10:1 vorhanden sind; und

(4) 0,1 bis 5 Gew.-% eines stabilitätserhöhenden Polymers, bei dem es sich um ein Copolymer mit einer hydrophoben Hauptkette und einer hydrophoben Seitenkette handelt.

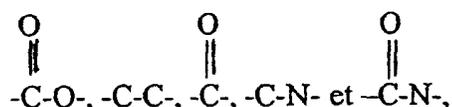
Revendications

1. Composition adoucissante pour textiles, qui comprend :

(a) un milieu aqueux ;

(b) de 1 à 80% en poids d'une (ou plusieurs) matière adoucissante pour textiles dans le milieu aqueux, chacune de ces matières étant choisie parmi les adoucissants cationiques de textiles ayant une solubilité dans l'eau à pH 2,5 et à 20°C de moins de 10 g/l ; et

(c) de 0,01 à 5% en poids d'un polymère défloculant ayant une masse moléculaire comprise entre 500 et 500.000 et/ou une viscosité normalisée de 1 à 100 mPas, ledit polymère défloculant comprenant un édifice de base hydrophile et au moins une chaîne latérale hydrophobe, l'édifice de base hydrophile comportant des monomères hydrophiles ces monomères hydrophiles étant liés par une liaison choisie parmi :



de telle sorte que la solubilité dudit édifice de base hydrophile dépasse 1 g/l dans l'eau à 20°C et à pH 7,0, et au moins une chaîne latérale hydrophobe étant constituée par au moins un monomère hydrophobe incorporé dans ledit polymère, lesdits monomères hydrophiles et ledit monomère hydrophobe étant dans un rapport compris entre 5:1 et 500:1, et le monomère hydrophobe étant choisi parmi :

- (i) des monomères insolubles dans l'eau ayant une solubilité inférieure à 0,2 partie en poids par 100 parties d'eau ; et
- (ii) des composés à insaturation éthylénique comportant des fragments hydrophobes, lesdits fragments hydrophobes étant choisis parmi (i) ceux dont la solubilité à la température ambiante est inférieure à 1 g/l à un pH entre 3,0 et 12,5 et (2) ceux contenant au moins 5 atomes de carbone,

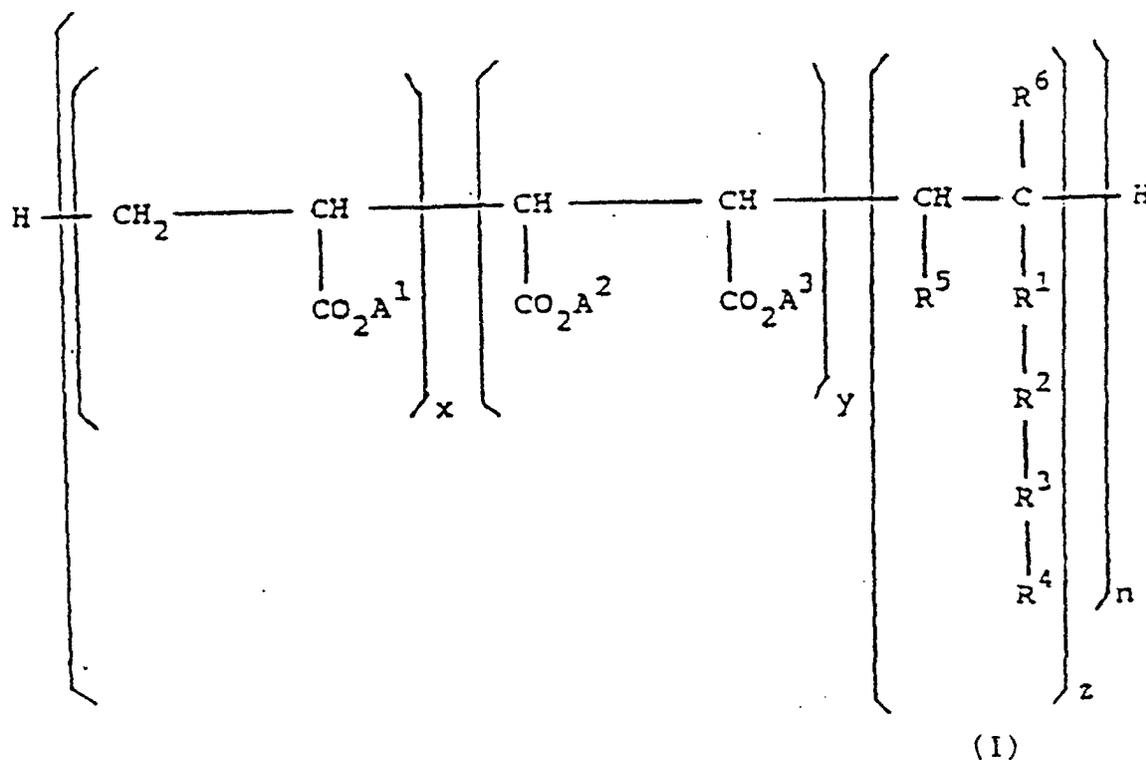
ladite composition adoucissante pour textiles ayant une structure de gouttelettes lamellaires dans le milieu aqueux et la viscosité de ladite composition étant inférieure à celle d'une composition équivalente sans un tel polymère ; à la condition que ladite composition adoucissante pour textiles ne soit pas une composition nettoyante aqueuse structurée pour gros lavages comprenant :

- (1) de 1 à 40% en poids d'un acide peroxydé organique particulaire, solide, sensiblement insoluble dans l'eau ;
- (2) de 10 à 50% en poids d'un tensioactif ;
- (3) de 1 à 40% en poids d'un système de débattement du pH comprenant :

- (a) un borate, et
- (b) le rapport pondéral du polyol au borate étant de 1:1 à 10:1 ; et

- (4) de 0,1 à 5% en poids d'un polymère de rehaussement de stabilité qui est un copolymère ayant un édifice de base hydrophile et une chaîne latérale hydrophobe.

2. Composition adoucissante pour textiles selon la revendication 1, dans laquelle le polymère défloculant répond à la formule :



dans laquelle z est 1 ; le rapport (x+y):z est compris entre 5:1 et 500:1 ; les motifs monomères peuvent être en un ordre fortuit quelconque ; y est compris entre 0 et un maximum égal à la valeur de x ; et n est au moins 1 ;

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R¹ représente -CO-O, -O-, -O-CO-, -CH₂, -CO-NH- ou est absent ;

R² représente de 1 à 50 groupes alkylénoxy indépendamment choisis ou est absent, à la condition que lorsque R³ est absent et R⁴ représente l'hydrogène, alors R² doit contenir un groupe alkylénoxy d'au moins trois atomes de carbone ;

R³ est une liaison phénylène ou est absent ;

R⁴ représente un atome d'hydrogène ou un radical alkyle ou alcényle en C₅₋₂₄, aux conditions que :

a) quand R¹ représente -O-CO-, R² et R³ doivent être absents et R⁴ doit contenir au moins 5 atomes de carbone et

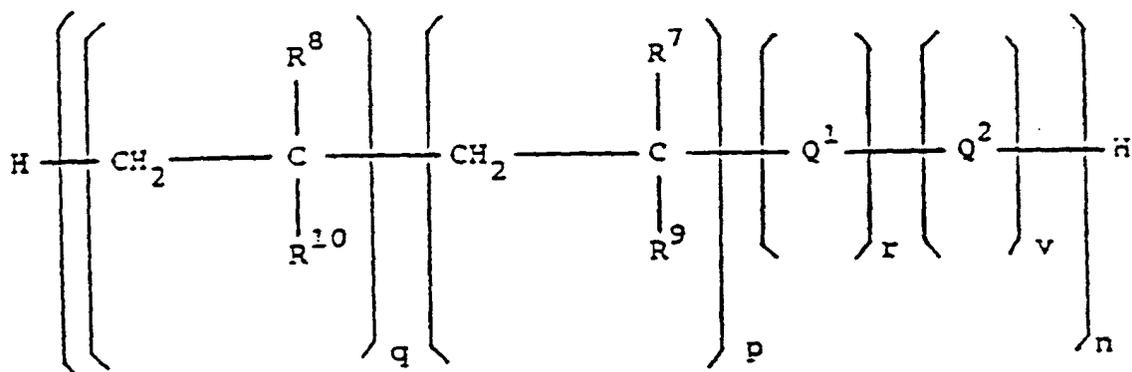
b) quand R² est absent, R⁴ n'est pas l'hydrogène et R³ est absent, alors R⁴ doit contenir au moins 5 atomes de carbone ;

R⁵ est un atome d'hydrogène ou un groupe de formule -COOA⁴;

R⁶ est un atome d'hydrogène ou un radical alkyle en C₁₋₄ ; et

A¹, A², A³ et A⁴ représentent indépendamment l'hydrogène, les métaux alcalins, alcalino-terreux ou des bases ammonium et amine.

3. Composition adoucissante pour textiles selon la revendication 1, dans laquelle le polymère défloculant répond à la formule II :



(II)

dans laquelle Q² est un ensemble moléculaire de formule IIa :

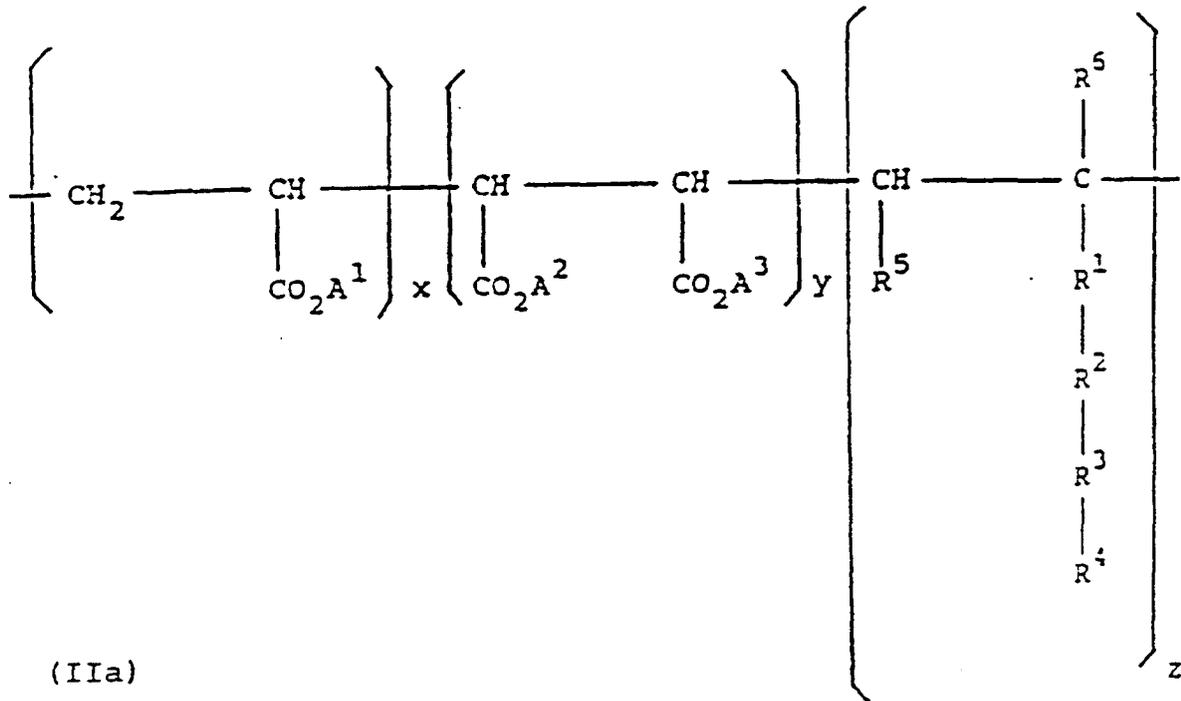
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dans laquelle z et R¹⁻⁶ sont tels que définis dans la formule (I) ;

A¹⁻⁴ sont tels que dans la formule (I) ;

Q¹ est un monomère multifonctionnel permettant la ramification du polymère, dans lequel les monomères du polymère peuvent être reliés à Q¹ dans une direction quelconque, dans un ordre quelconque, en permettant éventuellement l'obtention d'un polymère ramifié, n et z sont tels que définis plus haut ; v = 1 ; et le quotient (x+y+p+q+r) : z est compris entre 5:1 et 500:1 ; les motifs monomères pouvant être dans un ordre fortuit quelconque ;

R⁷ et R⁸ représentent -CH₃ ou -H ;

R⁹ et R¹⁰ représentent des groupes substituants tels qu' amino, amine, amide, sulfonate, sulfate, phosphonate, phosphate, hydroxyle, carboxyle et oxyde, ou bien (C₂H₄O)_tH dans lequel t est compris entre 1 et 50, les motifs monomères pouvant être dans un ordre fortuit.

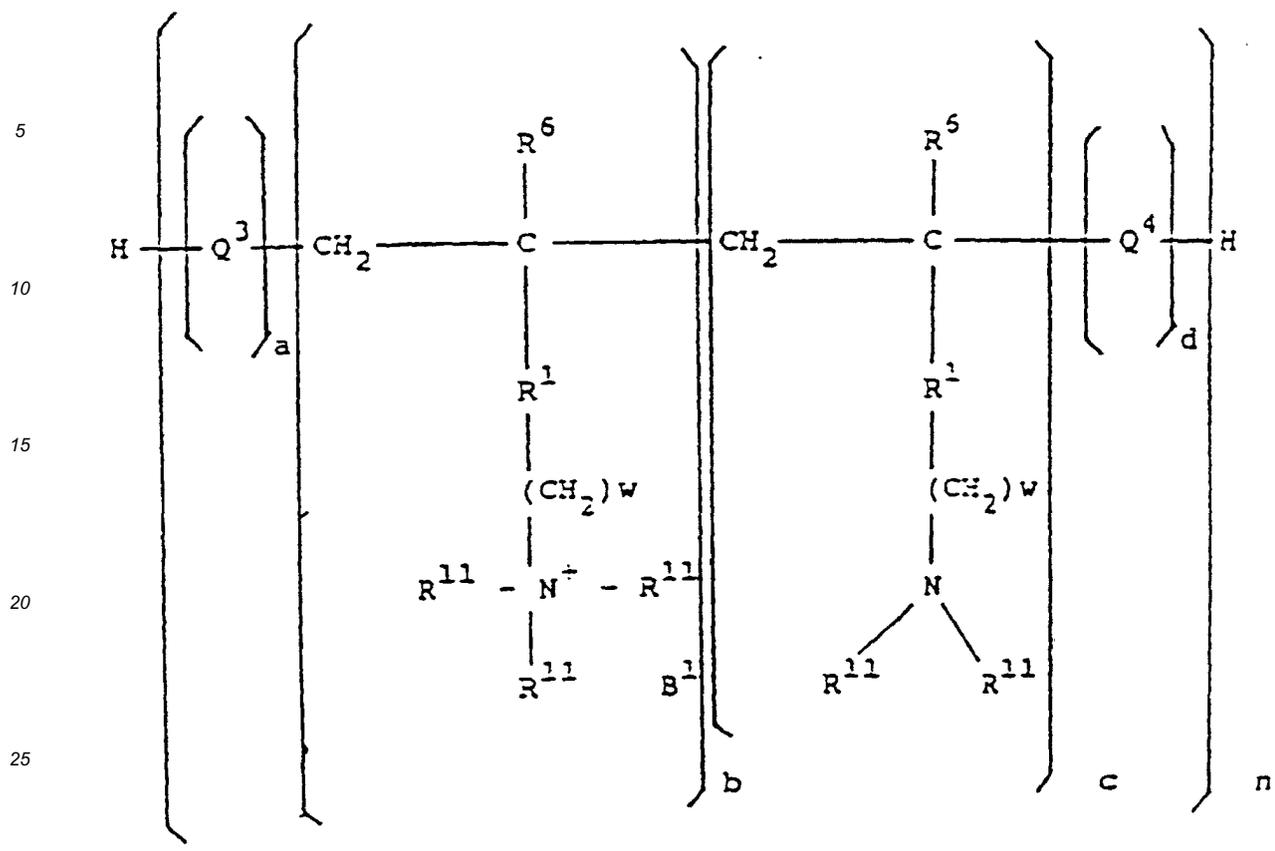
4. Composition adoucissante pour textiles selon la revendication 1, dans laquelle le polymère défloculant répond à la formule III :

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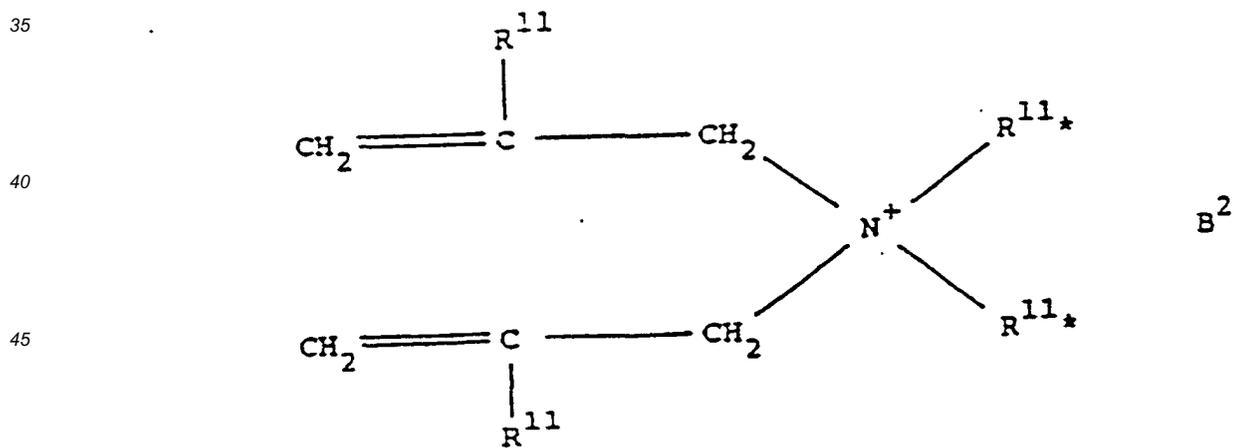
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(III)

dans laquelle Q³ est dérivé d'un motif monomère IIIa comprenant :



(IIIa)

Q⁴ est dérivé de l'ensemble moléculaire IIIb :

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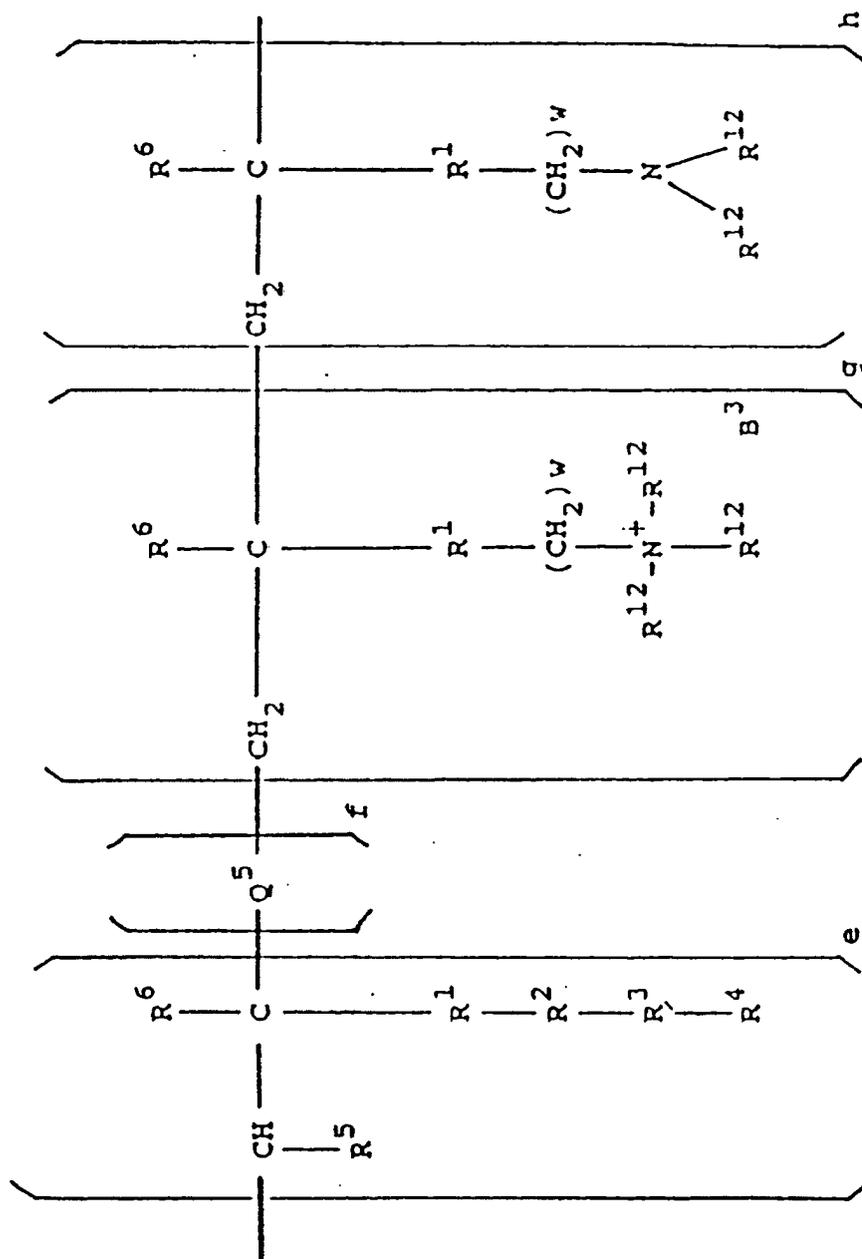
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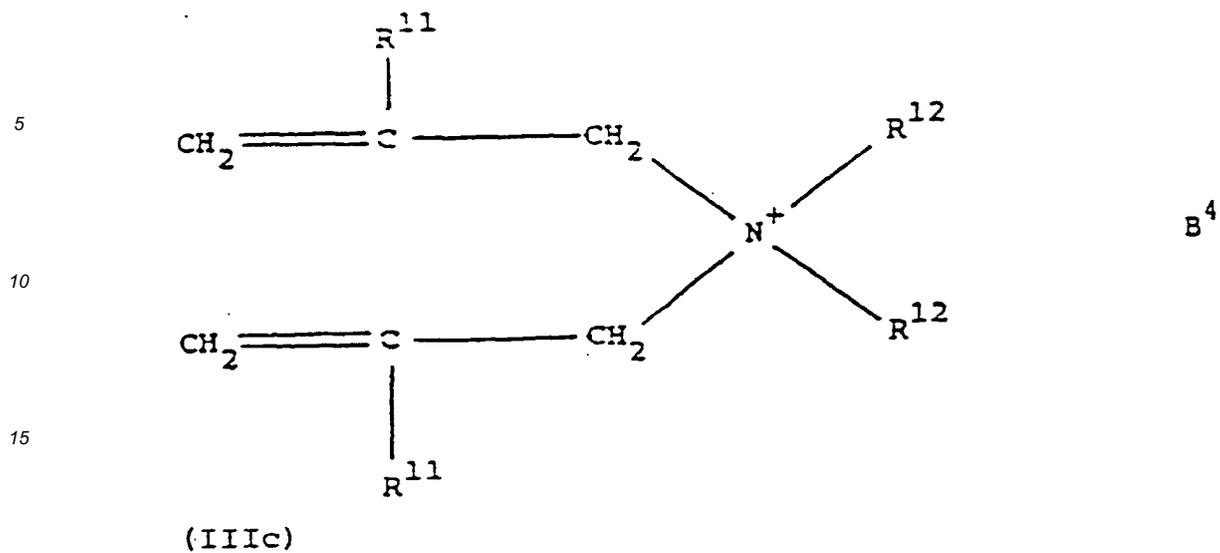
(IIIb)

et Q⁵ est dérivé d'un motif monomère IIIc :

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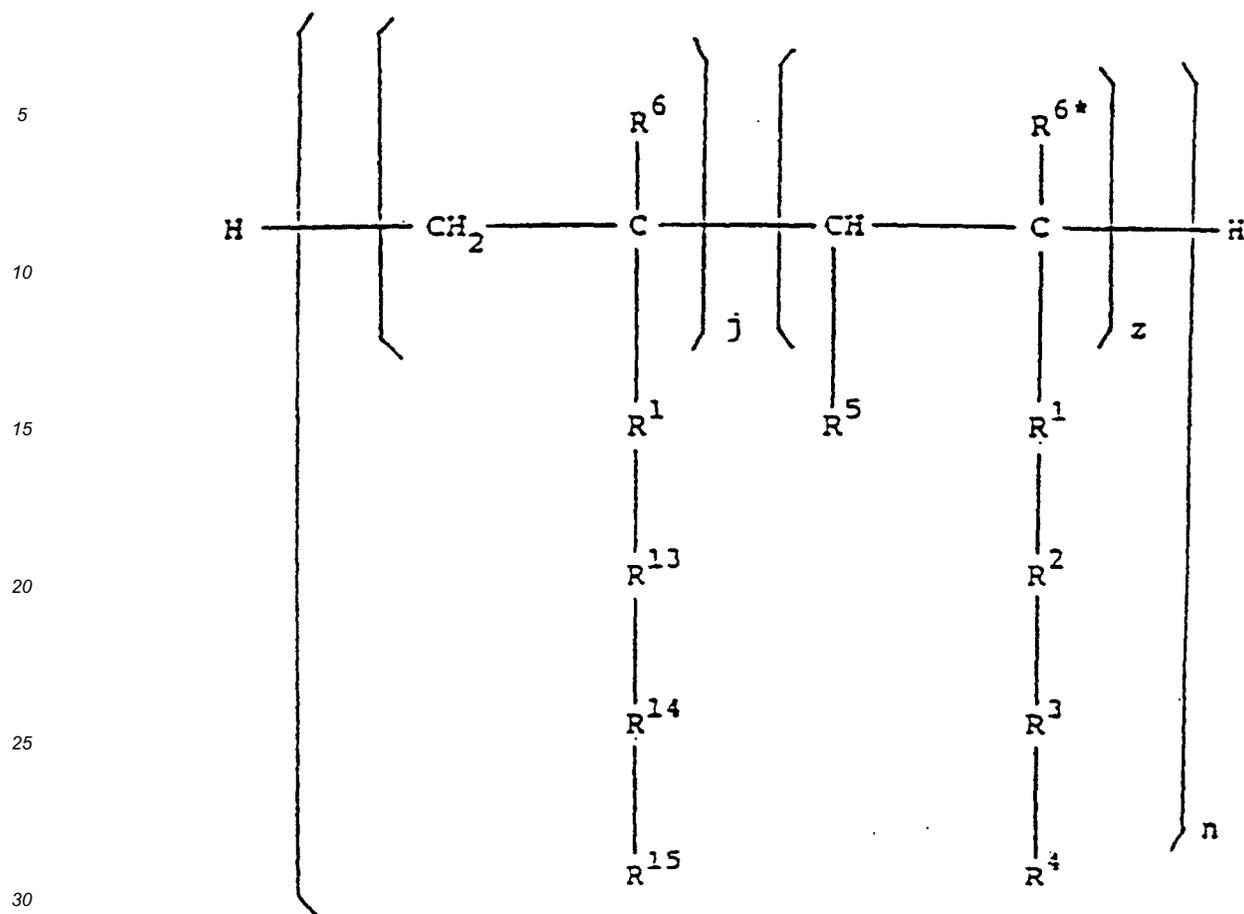


R¹-R⁶ sont tels que définis dans la formule I ;

le rapport (a + b + c):d est compris entre 5:1 et 500:1, dans lequel les motifs monomères peuvent être dans un ordre fortuit ; a, b, c, e, f, g et h peuvent être des nombres entiers ou 0, d est un nombre entier et n est au moins 1 ; B¹, B², B³ et B⁴ sont des anions organiques ou minéraux ; w est un nombre de 0 à 4 ;

R¹¹ et R^{11*} représentent indépendamment chacun un atome d'hydrogène ou un radical alkyle en C₁₋₄ ; et R¹² est choisi parmi un radical alkyle ou alcényle en C₅₋₂₄, aryle, cycloalkyle, hydroxyalkyle ou alcoxyalkyle.

5. Composition adoucissante pour textiles selon la revendication 1, dans laquelle le polymère défloculant répond à la formule IV :



(IV)

35 dans laquelle R^1 - R^6 sont tels que défini dans la formule I, R^{6*} représente H ou un radical alkyle en C_{1-4} , $z = 1$ et $j:z$ est compris entre 5:1 et 500:1, les motifs monomères pouvant être dans un ordre fortuit et n est d'au moins 1 ; R^{13} représente $-CH_2-$, $-C_2H_4-$, $-C_3H_6-$ ou est absent.

40 R^{14} représente 1 à 50 groupes alkylénoxy indépendamment choisis ou est absent, et R^{15} représente $-OH$ ou l'hydrogène.

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6. Composition adoucissante pour textiles selon l'une quelconque des revendications précédentes, comprenant de 0,1 à 2,0% en poids de la composition de polymère défloculant.
 7. Composition adoucissante pour textiles selon l'une quelconque des revendications précédentes, comprenant 20 à 60% en poids d'une matière d'adoucissement de textiles.
 8. Composition adoucissante pour textiles selon l'une quelconque des revendications précédentes, qui comprend également de 0,1 à 5,0% en poids d'un électrolyte dissous.
 9. Composition adoucissante pour textiles selon l'une quelconque des revendications précédentes, ayant un pH inférieur à 6,0.
 10. Procédé de préparation d'une composition adoucissante pour textiles selon l'une quelconque des revendications précédentes, dans lequel le polymère défloculant est dispersé dans la base aqueuse avant addition de la matière d'adoucissement de textiles.
 11. Procédé de traitement de textiles qui consiste à mettre en contact les textiles avec une liqueur aqueuse comprenant

une composition adoucissante pour textiles selon l'une quelconque des revendications 1 à 9 en une concentration de 1 à 1000 ppm des matières adoucissantes dans la liqueur aqueuse.

12. Utilisation de

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(a) un polymère défloculant comme spécifié dans la revendication 1 ; et

(b) un ou plusieurs adoucissant(s) cationique(s) de textiles ayant une solubilité dans l'eau à pH 2,5 et à 20°C de moins de 10 g/l ;

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dans un milieu aqueux ;

pour obtenir une composition adoucissante pour textiles ayant une structure de gouttelettes lamellaires dispersées dans le milieu aqueux, et une viscosité inférieure à 2,5 Pas à un taux de cisaillement de 21 s^{-1} , la viscosité de ladite composition étant plus basse que celle d'une composition équivalente sans ledit polymère ;

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et à la condition que la composition obtenue ne soit pas une composition nettoyante aqueuse structurée pour gros lavage, comprenant :

(1) 1 à 40% en poids d'un acide peroxydé organique solide, particulaire, sensiblement non hydrosoluble ;

(2) 10 à 50% en poids d'un tensioactif ;

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(3) 1 à 40% en poids d'un système de débattement du pH comprenant :

(a) un borate ; et

(b) un polyol,

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le rapport pondéral du polyol au borate étant de 1:1 à 10:1 ;

et

(4) 0,1 à 5% en poids d'un polymère qui rehausse la stabilité et qui est un copolymère comportant un édifice de base hydrophile et une chaîne latérale hydrophobe.

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