

DESCRIPTION

Title of Invention

FIBER FOR ARTIFICIAL HAIR, AND HAIR ACCESSORY

Technical Field

5 [0001] The present invention relates to a fiber for artificial hair, a headdress article, and the like.

Background Art

[0002] Fibers for artificial hair (fibers used for artificial hair) can be used for headdress articles. In Patent Literature 1 below, a technique of
10 treating a base fiber using a fiber treating agent is disclosed.

Citation List

Patent Literature

[0003] Patent Literature 1: Japanese Unexamined Patent Publication No. 2002-285470

15 **Summary of Invention**

Technical Problem

[0004] Users of headdress articles are often troubled by contamination or the like caused by contaminants (dandruff, hair oil, and the like) adhering to fibers for artificial hair during use. Therefore, fibers for artificial hair
20 are required to be excellent in contamination resistance.

[0005] An object of an aspect of the present invention is to provide a fiber for artificial hair excellent in contamination resistance. An object of another aspect of the present invention is to provide a headdress article having such a fiber for artificial hair.

25 **Solution to Problem**

[0006] The present invention relates to the following [1] to [11], and the

like in some aspects.

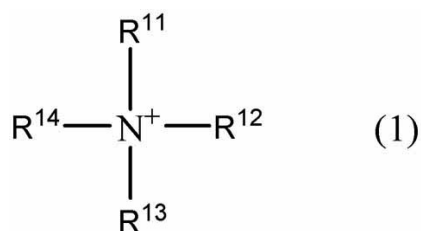
5 [1] A fiber for artificial hair, having a base fiber, a cationic polymer, a cationic surfactant, and a nonionic surfactant, in which the cationic polymer, the cationic surfactant, and the nonionic surfactant are present in at least a part of a surface of the base fiber, the cationic polymer has, as a monomer unit, a monomer having at least one selected from the group consisting of a primary amino group, a secondary amino group, a tertiary amino group, acid-neutralized groups of these groups, and a quaternary ammonium group, the cationic surfactant has a carbon chain 10 having 12 to 22 carbon atoms, the nonionic surfactant has a carbon chain having 10 to 20 carbon atoms, an HLB value of the nonionic surfactant is 13.0 or more, and a content of the cationic polymer is 0.005% by mass or more based on a total amount of the fiber for artificial hair.

15 [2] The fiber for artificial hair described in [1], in which the base fiber contains at least one selected from the group consisting of a homopolymer of vinyl chloride, a vinyl chloride-acrylonitrile copolymer, polyethylene terephthalate, a polyamide-based resin, polypropylene, and an acrylonitrile-styrene copolymer.

20 [3] The fiber for artificial hair described in [1] or [2], in which the cationic polymer further has an alkyl (meth)acrylate as a monomer unit.

[4] The fiber for artificial hair described in any one of [1] to [3], in which the cationic surfactant includes a quaternary ammonium salt having a cation with a structure represented by General Formula (1) below:

[Chemical Formula 1]



[in Formula (1), R¹¹ represents a group containing a carbon chain having 12 to 22 carbon atoms, and R¹², R¹³, and R¹⁴ each independently represent a monovalent group].

5 [5] The fiber for artificial hair described in any one of [1] to [4], in which the number of carbon atoms of the carbon chain of the cationic surfactant is 18 to 22.

[6] The fiber for artificial hair described in any one of [1] to [5], in which the HLB value of the nonionic surfactant is 13.0 to 19.0.

10 [7] The fiber for artificial hair described in any one of [1] to [6], in which the nonionic surfactant includes polyoxyalkylene alkyl ether.

[8] The fiber for artificial hair described in any one of [1] to [7], in which the content of the cationic polymer is 0.005 to 0.2% by mass based on the total amount of the fiber for artificial hair.

15 [9] The fiber for artificial hair described in any one of [1] to [8], in which a mass ratio of a total amount of the cationic surfactant and the nonionic surfactant with respect to the content of the cationic polymer is 3 to 160.

[10] The fiber for artificial hair described in any one of [1] to [9], in which a total amount of the cationic polymer, the cationic surfactant, and the nonionic surfactant is 0.1 to 4% by mass based on the total amount of the fiber for artificial hair.

20 [11] A headdress article having the fiber for artificial hair described in any one of [1] to [10].

Advantageous Effects of Invention

[0007] According to an aspect of the present invention, it is possible to provide a fiber for artificial hair excellent in contamination resistance. According to another aspect of the present invention, it is possible to provide a headdress article having such a fiber for artificial hair.

Description of Embodiments

[0008] Hereinafter, embodiments of the present invention will be described in detail.

[0009] The expression "A or more" of a numerical value range means A and a range of more than A. The expression "A or less" of a numerical value range means A and a range of less than A. With regard to a numerical value range described stepwise in the present specification, the upper limit value or the lower limit value of the numerical value range at a certain stage can be optionally combined with the upper limit value or the lower limit value of the numerical value range of another stage. With respect to a numerical value range described in the present specification, the upper limit value or the lower limit value of the numerical value range may be substituted with the values shown in Examples. The expression "A or B" may include either A or B and may include both of them. Unless particularly stated otherwise, the materials described as examples in the present specification can be used singly or in combination of two or more kinds thereof. In a case where a plurality of substances corresponding to each component in a composition is present, unless particularly stated otherwise, the content of each component in the composition means the total amount of the plurality of substances present in the composition. The term "step" means not only

an independent step, but even in a case where a step cannot be clearly distinguished from another step, the step is included in the present term as long as the predetermined action of the step is achieved. The term "(meth)acrylic acid" means at least one of acrylic acid and methacrylic acid corresponding thereto. The same also applies to other similar expressions such as "(meth)acrylamide". A "polyoxyalkylene group" and an "oxyalkylene group" are collectively referred to as a "(poly)oxyalkylene group". The same applies to other expressions including "(poly)".

[0010] A fiber for artificial hair of the present embodiment has a base fiber, a cationic polymer, a cationic surfactant, and a nonionic surfactant, and the cationic polymer, the cationic surfactant, and the nonionic surfactant are present in at least a part of a surface of the base fiber.

[0011] The cationic polymer has, as a monomer unit, a monomer having at least one selected from the group consisting of a primary amino group, a secondary amino group, a tertiary amino group, acid-neutralized groups of these groups, and a quaternary ammonium group, the cationic surfactant has a carbon chain having 12 to 22 carbon atoms, the nonionic surfactant has a carbon chain having 10 to 20 carbon atoms, an HLB value of the nonionic surfactant is 13.0 or more, and a content of the cationic polymer is 0.005% by mass or more based on a total amount of the fiber for artificial hair.

[0012] Hereinafter, in some cases, the above-mentioned cationic polymer is referred to as "cationic polymer P", the above-mentioned cationic surfactant having a carbon chain having 12 to 22 carbon atoms is referred to as "cationic surfactant A", and the above-mentioned

nonionic surfactant having a carbon chain having 10 to 20 carbon atoms and having an HLB value of 13.0 or more is referred to as "nonionic surfactant B".

5 [0013] The fiber for artificial hair of the present embodiment is excellent in contamination resistance. According to the fiber for artificial hair of the present embodiment, in evaluation in Examples described later, a dust detachment rate of, for example, 40% or more can be obtained.

10 [0014] One embodiment of the fiber for artificial hair of the present embodiment is excellent in softness. Another embodiment of the fiber for artificial hair of the present embodiment is excellent in stickiness resistance (can reduce stickiness).

15 [0015] A fiber treating agent of the present embodiment is a fiber treating agent for obtaining the fiber for artificial hair of the present embodiment, and contains the cationic polymer P, the cationic surfactant A, and the nonionic surfactant B. According to the fiber treating agent of the present embodiment, the fiber for artificial hair of the present embodiment can be obtained, and a fiber for artificial hair excellent in contamination resistance can be obtained.

20 [0016] The fiber for artificial hair of the present embodiment can be used as artificial hair and can also be used in order to obtain artificial hair. The fiber for artificial hair of the present embodiment may be a fiber obtained after a stretching treatment, and may be an unstretched fiber. The single fiber fineness of the fiber for artificial hair of the present embodiment may be 20 to 100 decitex after a stretching treatment.

25 [0017] Examples of the base fiber material in the fiber for artificial hair of the present embodiment include a vinyl chloride-based resin, a

- polyester-based resin, a polyamide-based resin, a polyolefin-based resin, an ethylene-vinyl acetate copolymer (EVA), an acrylonitrile-butadiene rubber (NBR), a thermoplastic polyurethane (TPU), a polyester-based thermoplastic elastomer (TPEE), a methyl methacrylate-butadiene-styrene resin (MBS), an acrylonitrile-butadiene-styrene resin (ABS), an acrylonitrile-styrene copolymer (AS), and polymethyl methacrylate (PMMA). In a case where a material that can correspond to a material other than the vinyl chloride-based resin has a monomer unit of vinyl chloride, this material is defined to be a material corresponding to the vinyl chloride-based resin. The base fiber may contain at least one of these materials as a main component (main resin raw material). That is, the content of at least one of these materials may be 50% by mass or more and may be more than 50% by mass based on the total amount of the base fiber.
- [0018] The vinyl chloride-based resin is a polymer having a structural unit derived from vinyl chloride (a monomer unit of vinyl chloride), and is a polymer having vinyl chloride as a monomer unit. The vinyl chloride-based resin can be obtained by bulk polymerization, solution polymerization, suspension polymerization, emulsion polymerization, or the like, and may be obtained by suspension polymerization from the viewpoint of excellent initial colorability of fibers or the like. The base fiber may contain a mixture of a vinyl chloride-based resin and a component (for example, an acrylonitrile-styrene copolymer) that can form a polymer alloy with the vinyl chloride-based resin.
- [0019] Examples of the vinyl chloride-based resin include a homopolymer of vinyl chloride (homopolymer, polyvinyl chloride) and

copolymers of vinyl chloride and other monomer, and a mixture thereof may be used. Examples of the copolymers of vinyl chloride and other monomer include a copolymer of vinyl chloride and vinyl esters (such as a vinyl chloride-vinyl acetate copolymer and a vinyl chloride-vinyl propionate copolymer); a copolymer of vinyl chloride and a (meth)acrylic acid compound (such as (meth)acrylic acid and a (meth)acrylic acid ester) (such as a vinyl chloride-butyl acrylate copolymer and a vinyl chloride-2-ethylhexyl acrylate copolymer); a copolymer of vinyl chloride and olefins (such as a vinyl chloride-ethylene copolymer and a vinyl chloride-propylene copolymer); and a vinyl chloride-acrylonitrile copolymer. The vinyl chloride-based resin may not have a structural unit derived from a (meth)acrylic acid compound (a monomer unit of a (meth)acrylic acid compound). In the copolymer, the content of the monomer different from vinyl chloride can be determined according to required qualities such as molding processability and fiber characteristics. From the viewpoint of easily obtaining excellent contamination resistance, softness, and stickiness resistance, the vinyl chloride-based resin may include at least one selected from the group consisting of a homopolymer of vinyl chloride and a vinyl chloride-acrylonitrile copolymer.

[0020] Examples of the polyester-based resin include polyethylene terephthalate (PET), polybutylene terephthalate, polyethylene-2,6-naphthalate, polymethylene terephthalate, and glycol-modified polyethylene terephthalate (PETG).

[0021] Examples of the polyamide-based resin include nylon 6, nylon 66, nylon 11, nylon 12, nylon 6/10, and nylon 6/12.

[0022] Examples of the polyolefin-based resin include polyethylene (PE)

and polypropylene (PP).

[0023] From the viewpoint of easily obtaining excellent contamination resistance, softness, and stickiness resistance, the base fiber may contain at least one selected from the group consisting of a vinyl chloride-based resin, a polyester-based resin, a polyamide-based resin, a polyolefin-based resin, and an acrylonitrile-styrene copolymer, and may contain at least one selected from the group consisting of a homopolymer of vinyl chloride, a vinyl chloride-acrylonitrile copolymer, polyethylene terephthalate, a polyamide-based resin, polypropylene, and an acrylonitrile-styrene copolymer.

[0024] The content of the vinyl chloride-based resin, the polyester-based resin, the polyamide-based resin, the polyolefin-based resin, or the acrylonitrile-styrene copolymer in the base fiber may be 50% by mass or more, more than 50% by mass, 60% by mass or more, 70% by mass or more, 80% by mass or more, 90% by mass or more, 95% by mass or more, 98% by mass or more, or 99% by mass or more, based on the total mass of the base fiber. The base fiber may be an embodiment composed of only a vinyl chloride-based resin, a polyester-based resin, a polyamide-based resin, a polyolefin-based resin, or an acrylonitrile-styrene copolymer (substantially 100% by mass of the base fiber is a vinyl chloride-based resin, a polyester-based resin, a polyamide-based resin, a polyolefin-based resin, or an acrylonitrile-styrene copolymer).

[0025] From the viewpoint of easily reducing the stretch ratio in order to obtain a fiber for artificial hair with a finer fiber degree, the average fineness of the base fibers at the time of being unstretched may be 300 decitex or less, 200 decitex or less, or 100 decitex or less.

[0026] The fiber for artificial hair of the present embodiment has the cationic polymer P, the cationic surfactant A, and the nonionic surfactant B which are present in at least a part of a surface of the base fiber. The cationic polymer P, the cationic surfactant A, and the nonionic surfactant B may be present at the mutually same place and may be present at mutually different places on the surface of the base fiber.

[0027] The cationic polymer P has, as a monomer unit, a monomer (hereinafter, referred to as "monomer P1") having at least one selected from the group consisting of a primary amino group, a secondary amino group, a tertiary amino group, acid-neutralized groups of these groups, and a quaternary ammonium group (a quaternary ammonium salt group). The cationic polymer P may not have a carbon chain having 12 to 22 carbon atoms.

[0028] In the fiber for artificial hair and the fiber treating agent of the present embodiment, at least one type of the cationic polymer P is present. In the fiber for artificial hair and the fiber treating agent of the present embodiment, in a case where the cationic polymer P and a cationic polymer not corresponding to the cationic polymer P are present, the content of the cationic polymer P may be 50% by mass or more and may be more than 50% by mass based on the total amount of the cationic polymers (the total amount of the cationic polymer P and the cationic polymer not corresponding to the cationic polymer P).

[0029] The primary amino group, the secondary amino group, and the tertiary amino group may have a hydrocarbon group bonded to a nitrogen atom. The hydrocarbon group may be linear, branched, or cyclic. Examples of the hydrocarbon group include an alkyl group, an alkenyl

group, and an aryl group. The number of carbon atoms of the hydrocarbon group may be 1 to 12, 1 to 10, 1 to 8, 1 to 5, 1 to 3, or 1 to 2. From the viewpoint of easily obtaining excellent contamination resistance, softness, and stickiness resistance, the tertiary amino group may have two hydrocarbon groups having the number of carbon atoms in the above-mentioned range.

[0030] The acid-neutralized groups of the primary amino group, the secondary amino group, and the tertiary amino group are acid addition salt groups in which a hydrogen ion (proton) and an anion are added to the amino group. The quaternary ammonium group is a group in which an anion is added to an ammonium cation. Examples of the anion in the acid addition salt group and the quaternary ammonium group include halide ions such as chloride ion, bromide ion, and iodide ion; alkyl sulfate ions such as methyl sulfate ion; and ions of organic acids such as acetate ion.

[0031] Examples of the monomer P1 include (dialkylamino)alkyl (meth)acrylate, and an acid-neutralized product and a quaternized product thereof; (dialkylamino)alkyl (meth)acrylamide, and an acid-neutralized product and a quaternized product thereof; (monoalkylamino)alkyl (meth)acrylate and an acid-neutralized product thereof; and (monoalkylamino)alkyl (meth)acrylamide and an acid-neutralized product thereof. Examples of the (dialkylamino)alkyl (meth)acrylate include (dimethylamino)ethyl (meth)acrylate, (diethylamino)ethyl (meth)acrylate, (dimethylamino)propyl (meth)acrylate, and (diethylamino)propyl (meth)acrylate. Examples of the (dialkylamino)alkyl (meth)acrylamide include (dimethylamino)ethyl

(meth)acrylamide, (diethylamino)ethyl (meth)acrylamide, (dimethylamino)propyl (meth)acrylamide, and (diethylamino)propyl (meth)acrylamide. Examples of the (monoalkylamino)alkyl (meth)acrylate include (monomethylamino)ethyl (meth)acrylate, (monoethylamino)ethyl (meth)acrylate, (monomethylamino)propyl (meth)acrylate, (monoethylamino)propyl (meth)acrylate, and 2-(tert-butylamino)ethyl (meth)acrylate. Examples of the (monoalkylamino)alkyl (meth)acrylamide include (monomethylamino)ethyl (meth)acrylamide, (monoethylamino)ethyl (meth)acrylamide, (monomethylamino)propyl (meth)acrylamide, and (monoethylamino)propyl (meth)acrylamide.

[0032] From the viewpoint of easily obtaining excellent contamination resistance, softness, and stickiness resistance, the cationic polymer P may have a monomer having a tertiary amino group as a monomer unit, may have (dialkylamino)alkyl (meth)acrylate as a monomer unit, and may have (dimethylamino)ethyl (meth)acrylate as a monomer unit.

[0033] From the viewpoint of easily obtaining excellent contamination resistance, softness, and stickiness resistance, the content of the monomer unit of the monomer P1 in the cationic polymer P may be in the following range based on the total amount of monomer units constituting the cationic polymer P. The content of the monomer unit of the monomer P1 may be 10% by mass or more, 20% by mass or more, 30% by mass or more, 35% by mass or more, 40% by mass or more, 45% by mass or more, or 50% by mass or more. The content of the monomer unit of the monomer P1 may be 100% by mass or less, less than 100% by mass, 99% by mass or less, 98% by mass or less, 96% by mass or less, or 95% by

mass or less. From these viewpoints, the content of the monomer unit of the monomer P1 may be 10 to 100% by mass, 10% by mass or more and less than 100% by mass, 10 to 99% by mass, 10 to 95% by mass, 30 to 100% by mass, 30% by mass or more and less than 100% by mass, 30 to 99% by mass, 30 to 95% by mass, 50 to 100% by mass, 50% by mass or more and less than 100% by mass, 50 to 99% by mass, or 50 to 95% by mass.

[0034] The cationic polymer P may have a monomer (hereinafter, referred to as "monomer P2") other than the monomer P1 as a monomer unit, and may be a copolymer having the monomer P1 and the monomer P2 as monomer units. Examples of the monomer P2 include (meth)acrylic acid ester; unsaturated monocarboxylic acids and salts thereof such as (meth)acrylic acid, crotonic acid, and α -allyloxyacrylic acid; aromatic vinyl-based monomers such as styrene; olefin-based monomers such as ethylene and propylene; vinyl halides such as vinyl chloride; alkyl vinyl ethers such as methyl vinyl ether and ethyl vinyl ether; and cyclic vinyl-based monomers such as N-vinylpyrrolidone. Examples of the salt of unsaturated monocarboxylic acid include alkali metal salts (such as lithium salt, sodium salt, and potassium salt).

[0035] The (meth)acrylic acid ester may have a substituent and may not have a substituent. Examples of the substituent include a hydroxyl group; alkoxy groups having 1 to 18 carbon atoms such as a methoxy group and an ethoxy group; oxo group-containing groups such as an oxyalkylene group, a sulfonic acid group, and a phosphoric acid group; halogeno groups such as a fluoro group; epoxy groups such as a glycidyl group; and carbonyl groups such as an aldehyde group.

[0036] From the viewpoint of easily obtaining excellent contamination resistance, softness, and stickiness resistance, the cationic polymer P may have an alkyl (meth)acrylate as a monomer unit. Examples of the alkyl (meth)acrylate include methyl (meth)acrylate, ethyl (meth)acrylate, n-propyl (meth)acrylate, isopropyl (meth)acrylate, n-butyl (meth)acrylate, isobutyl (meth)acrylate, tert-butyl (meth)acrylate, sec-butyl (meth)acrylate, 2-ethylhexyl (meth)acrylate, n-octyl (meth)acrylate, tridecyl (meth)acrylate, cycloalkyl (meth)acrylate (such as cyclohexyl (meth)acrylate), n-lauryl (meth)acrylate, dodecyl (meth)acrylate, stearyl (meth)acrylate, and isobornyl (meth)acrylate.

[0037] From the viewpoint of easily obtaining excellent contamination resistance, softness, and stickiness resistance, the content of the monomer unit of the monomer P2 in the cationic polymer P may be in the following range based on the total amount of monomer units constituting the cationic polymer P. The content of the monomer unit of the monomer P2 may be 90% by mass or less, 80% by mass or less, 70% by mass or less, 65% by mass or less, 60% by mass or less, 55% by mass or less, or 50% by mass or less. The content of the monomer unit of the monomer P2 may be more than 0% by mass, 1% by mass or more, 2% by mass or more, 4% by mass or more, or 5% by mass or more. From these viewpoints, the content of the monomer unit of the monomer P2 may be more than 0% by mass and 90% by mass or less, more than 0% by mass and 70% by mass or less, more than 0% by mass and 50% by mass or less, 1 to 90% by mass, 1 to 70% by mass, 1 to 50% by mass, 5 to 90% by mass, 5 to 70% by mass, or 5 to 50% by mass.

[0038] From the viewpoint of easily obtaining excellent contamination

resistance, softness, and stickiness resistance, the weight average molecular weight of the cationic polymer P may be in the following range. The weight average molecular weight may be 1000 or more, 3000 or more, 5000 or more, 8000 or more, 10000 or more, 12000 or more, 15000 or more, 18000 or more, or 20000 or more. The weight average molecular weight may be 500000 or less, 300000 or less, 200000 or less, 150000 or less, 100000 or less, 90000 or less, 80000 or less, 70000 or less, 60000 or less, or 50000 or less. From these viewpoints, the weight average molecular weight may be 1000 to 500000, 1000 to 100000, 1000 to 80000, 1000 to 50000, 10000 to 500000, 10000 to 100000, 10000 to 80000, 10000 to 50000, 20000 to 500000, 20000 to 100000, 20000 to 80000, or 20000 to 50000.

[0039] The weight average molecular weight (M_w) of the cationic polymer P can be measured by GPC (gel permeation chromatography) under the following conditions.

Apparatus: e2695 manufactured by Waters Corporation
 Detector: Differential refractometer (RI) detector
 Column: TSKgel α-M, α-2500 manufactured by Tosoh Corporation
 Column temperature: 40°C
 Flow rate: 0.8 mL/min
 Injection amount: 10 μL (eluent preparation solution with a sample concentration of 0.4% by mass)
 Calibration curve: Polyethylene glycol manufactured by GL Sciences Inc.
 GPC software: EMPOWER 3 manufactured by Waters

Corporation

Eluent: 0.5 M acetic acid + 0.2 M Na nitrate/acetonitrile = 50/50
(v/v)

5 [0040] The cationic surfactant A has a carbon chain (hereinafter, referred to as "carbon chain A") having 12 to 22 carbon atoms, and the nonionic surfactant B has a carbon chain (hereinafter, referred to as "carbon chain B") having 10 to 20 carbon atoms. The "carbon chain" is a molecular chain formed by continuous bonding of carbon atoms, and for example, the "carbon chain having 12 to 22 carbon atoms" is a molecular chain
10 formed by continuous bonding of 12 to 22 carbon atoms. The "carbon chain" may be linear, branched, or cyclic. The "carbon chain" may have an unsaturated bond or may not have an unsaturated bond.

[0041] In the fiber for artificial hair and the fiber treating agent of the present embodiment, at least one type of the cationic surfactant A and at
15 least one type of the nonionic surfactant B are present. In the fiber for artificial hair and the fiber treating agent of the present embodiment, in a case where the cationic surfactant A and the cationic surfactant not corresponding to the cationic surfactant A are present, the content of the cationic surfactant A may be 50% by mass or more and may be more than
20 50% by mass based on the total amount of the cationic surfactants (the total amount of the cationic surfactant A and the cationic surfactant not corresponding to the cationic surfactant A). In the fiber for artificial hair and the fiber treating agent of the present embodiment, in a case where the nonionic surfactant B and the nonionic surfactant not corresponding
25 to the nonionic surfactant B are present, the content of the nonionic surfactant B may be 50% by mass or more and may be more than 50% by

mass based on the total amount of the nonionic surfactants (the total amount of the nonionic surfactant B and the nonionic surfactant not corresponding to the nonionic surfactant B).

[0042] When the number of carbon atoms of the carbon chain A is 22 or less, excellent contamination resistance can be obtained, and excellent stickiness resistance is easily obtained. When the number of carbon atoms of the carbon chain B is 10 or more, excellent contamination resistance can be obtained, and excellent softness and stickiness resistance are easily obtained. When the number of carbon atoms of the carbon chain B is 20 or less, excellent contamination resistance can be obtained, and excellent stickiness resistance is easily obtained.

[0043] From the viewpoint of easily obtaining excellent contamination resistance, softness, and stickiness resistance, the number of carbon atoms of the carbon chain A in the cationic surfactant A may be 12 or more, 13 or more, 14 or more, 15 or more, 16 or more, 17 or more, 18 or more, 19 or more, 20 or more, or 21 or more. From the viewpoint of adjusting contamination resistance, softness, and stickiness resistance, the number of carbon atoms of the carbon chain A may be 21 or less, 20 or less, 19 or less, 18 or less, 17 or less, 16 or less, 15 or less, 14 or less, or 13 or less. From these viewpoints, the number of carbon atoms of the carbon chain A may be 12 to 20, 12 to 18, 12 to 16, 12 to 14, 16 to 22, 16 to 20, 16 to 18, 18 to 22, 18 to 20, or 20 to 22.

[0044] The cationic surfactant A is a surfactant having a cationic hydrophilic group, and is a surfactant having a hydrophilic group that dissociates into ions in water to become cations. Examples of the cationic surfactant A include a quaternary ammonium salt, an amine salt,

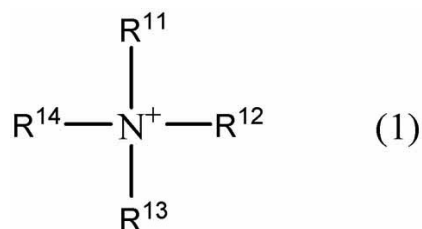
a pyridinium salt, and an imidazolinium salt. Examples of the salt include a halide salt, and examples thereof include a chloride salt, a bromide salt, and an iodide salt.

5 [0045] Examples of the quaternary ammonium salt include an aliphatic quaternary ammonium salt, an aromatic quaternary ammonium salt (excluding a compound corresponding to a heterocyclic quaternary ammonium salt), and a heterocyclic quaternary ammonium salt. Examples of the amine salt include an aliphatic amine salt, and examples thereof include a monoalkylamine salt, a dialkylamine salt, and a
10 trialkylamine salt.

[0046] From the viewpoint of easily obtaining excellent contamination resistance, softness, and stickiness resistance, the cationic surfactant A may include a quaternary ammonium salt, and may include a quaternary ammonium salt as a chloride salt (quaternary ammonium salt having a
15 chloride ion as a counter anion).

[0047] From the viewpoint of easily obtaining excellent contamination resistance, softness, and stickiness resistance, the cationic surfactant A may include a compound having a cation with a structure represented by General Formula (1) below, and may include a quaternary ammonium salt
20 having a cation with a structure represented by General Formula (1) below.

[0048] [Chemical Formula 2]



[In Formula (1), R^{11} represents a group containing a carbon chain having 12 to 22 carbon atoms, and R^{12} , R^{13} , and R^{14} each independently represent a monovalent group.]

5 [0049] Examples of R^{11} include an alkyl group having 12 to 22 carbon atoms. Examples of the monovalent group of R^{12} , R^{13} , and R^{14} include a hydrogen atom and a group containing a carbon atom (may contain an atom other than the carbon atom). In the quaternary ammonium salt, R^{12} , R^{13} , and R^{14} may each independently be a group containing a carbon atom.

10 [0050] Examples of the group containing a carbon atom include an alkyl group, an aryl group, a carboxy group, a carboxylate group, and an alkoxy group. From the viewpoint of easily obtaining excellent contamination resistance, softness, and stickiness resistance, the number of carbon atoms of the alkyl group may be 1 to 10, 1 to 8, 1 to 6, 1 to 5, 1 to 4, 1 to 3, or 1 to 2. Examples of the aryl group include a benzyl group, a phenyl group, and a naphthyl group.

[0051] From the viewpoint of easily obtaining excellent contamination resistance, softness, and stickiness resistance, the cationic surfactant A may satisfy at least one of the following conditions.

20 The cationic surfactant A may include a quaternary ammonium salt in which at least one selected from the group consisting of R^{12} and R^{13} is an alkyl group in General Formula (1), and may include a quaternary ammonium salt in which at least one selected from the group consisting of R^{12} , R^{13} , and R^{14} is an alkyl group in General Formula (1).

25 The cationic surfactant A may include a quaternary ammonium salt in which at least one selected from the group consisting of R^{12} and

R¹³ is a methyl group in General Formula (1), and may include a quaternary ammonium salt in which at least one selected from the group consisting of R¹², R¹³, and R¹⁴ is a methyl group in General Formula (1).

The cationic surfactant A may include a quaternary ammonium salt in which R¹² and R¹³ are a methyl group in General Formula (1), and may include a quaternary ammonium salt in which R¹², R¹³, and R¹⁴ are a methyl group in General Formula (1).

[0052] From the viewpoint of easily obtaining excellent contamination resistance, softness, and stickiness resistance, the cationic surfactant A may include at least one selected from the group consisting of cetyltrimethylammonium chloride, stearyltrimethylammonium chloride, oleyltrimethylammonium chloride, nonadecyltrimethylammonium chloride, icosyltrimethylammonium chloride, heneicosyltrimethylammonium chloride, and behenyltrimethylammonium chloride, and may include at least one selected from the group consisting of cetyltrimethylammonium chloride, stearyltrimethylammonium chloride, and behenyltrimethylammonium chloride.

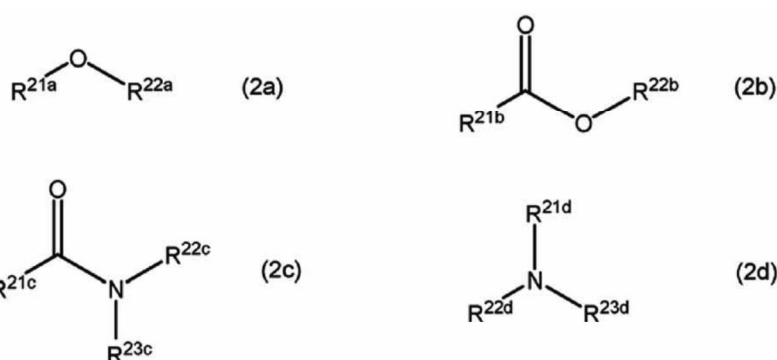
[0053] The molecular weight of the cationic surfactant A may be 10000 or less, less than 10000, 8000 or less, less than 8000, 5000 or less, less than 5000, 3000 or less, less than 3000, 1000 or less, or less than 1000.

[0054] The nonionic surfactant B is a surfactant not having a group that dissociates into ions in water. From the viewpoint of easily obtaining excellent contamination resistance and softness, the number of carbon atoms of the carbon chain B in the nonionic surfactant B may be 12 or more, 14 or more, or 16 or more. From the viewpoint of easily obtaining excellent softness, the number of carbon atoms of the carbon chain B may

be 18 or more. From the viewpoint of easily obtaining excellent contamination resistance and stickiness resistance, the number of carbon atoms of the carbon chain B may be 18 or less or 16 or less. From the viewpoint of easily obtaining excellent stickiness resistance, the number of carbon atoms of the carbon chain B may be 14 or less or 12 or less. From these viewpoints, the number of carbon atoms of the carbon chain B may be 10 to 18, 10 to 16, 10 to 14, 10 to 12, 12 to 20, 12 to 18, 12 to 16, or 12 to 14.

[0055] From the viewpoint of easily obtaining excellent contamination resistance and softness, the nonionic surfactant B may include at least one selected from the group consisting of an ether compound, an ester compound, an amide compound, and an amine compound, and may include a compound having at least one selected from the group consisting of a structure represented by General Formula (2a) below, a structure represented by General Formula (2b) below, a structure represented by General Formula (2c) below, and a structure represented by General Formula (2d) below.

[0056] [Chemical Formula 3]



[In the formula, R^{21a} , R^{21b} , R^{21c} , and R^{21d} each independently represent a hydrophobic moiety containing a carbon chain (carbon chain B) having

10 to 20 carbon atoms, R^{22a} , R^{22b} , R^{22c} , R^{23c} , and R^{22d} each independently represent a hydrophilic moiety, and R^{23d} represents a hydrophobic moiety or a hydrophilic moiety.]

5 [0057] Examples of the hydrophobic moiety containing a carbon chain (carbon chain B) having 10 to 20 carbon atoms include a hydrocarbon group such as an alkyl group. The hydrocarbon group (an alkyl group or the like) may be linear, branched, or cyclic.

10 [0058] The hydrophilic moiety may be a group having a hydrophilic group, or a hydrophilic group. Examples of the hydrophilic group include a (poly)oxyalkylene group, a hydroxyl group, a carboxy group, a carboxylate group, a phosphoric group, a phosphate group, a sulfonic group, and a sulfonate group. Examples of the (poly)oxyalkylene group include a (poly)oxyethylene group and a (poly)oxypropylene group.

15 [0059] From the viewpoint of easily obtaining excellent contamination resistance and softness, the nonionic surfactant B may include at least one selected from the group consisting of polyoxyalkylene alkyl ether, fatty acid monoalkanolamide, fatty acid dialkanolamide, polyoxyalkylene dialkylamine, dipolyoxyalkylene alkylamine, and polyoxyalkylene fatty acid ester, may include polyoxyalkylene alkyl ether, and may include at
20 least one selected from the group consisting of polyoxyethylene decyl ether, polyoxyethylene cetyl ether, and polyoxyethylene stearyl ether.

[0060] The HLB value of the nonionic surfactant B is 13.0 or more. That is, in the fiber for artificial hair and the fiber treating agent of the present embodiment, at least one type of nonionic surfactant B having an
25 HLB value of 13.0 or more is present. When the HLB value of the nonionic surfactant B is 13.0 or more, excellent contamination resistance

can be obtained, and excellent softness and stickiness resistance are easily obtained. In the fiber for artificial hair and the fiber treating agent of the present embodiment, a plurality of nonionic surfactants B each having a different HLB value may be present.

- 5 [0061] From the viewpoint of easily obtaining excellent contamination resistance, softness, and stickiness resistance, the HLB value of the nonionic surfactant B may be 13.5 or more, 14.0 or more, 14.5 or more, 15.0 or more, 15.5 or more, 16.0 or more, 16.5 or more, or 16.7 or more. From the viewpoint of easily obtaining excellent softness, the HLB value
- 10 of the nonionic surfactant B may be 17.0 or more, 17.5 or more, 18.0 or more, 18.5 or more, or 19.0 or more. From the viewpoint of easily obtaining excellent contamination resistance and stickiness resistance, the HLB value of the nonionic surfactant B may be 19.0 or less, 18.5 or less, 18.0 or less, 17.5 or less, 17.0 or less, or 16.7 or less. The HLB
- 15 value of the nonionic surfactant B may be 16.5 or less, 16.0 or less, 15.5 or less, 15.0 or less, 14.5 or less, or 14.0 or less. From these viewpoints, the HLB value of the nonionic surfactant B may be 13.0 to 19.0, 14.0 to 19.0, 15.0 to 19.0, 16.0 to 19.0, 13.0 to 17.0, 14.0 to 17.0, 15.0 to 17.0, 16.0 to 17.0, 13.0 to 16.0, or 14.0 to 16.0. The HLB value of the
- 20 nonionic surfactant B can be calculated based on the Griffin method using the formula weight of the hydrophilic moiety and the molecular weight of the nonionic surfactant B, and for example, can be calculated based on the Griffin method through molecular weight measurement by GPC, structure identification by NMR, or the like after extracting the nonionic
- 25 surfactant B as a measurement target. The HLB value of the nonionic surfactant B can be adjusted, for example, by the length of the hydrophilic

moiety ((poly)oxyalkylene group or the like).

[0062] In the fiber for artificial hair of the present embodiment, the content of the cationic polymer P is 0.005% by mass or more based on the total amount of the fiber for artificial hair. When the content of the cationic polymer P is 0.005% by mass or more, excellent contamination resistance can be obtained.

[0063] The content of the cationic polymer P may be in the following range based on the total amount of the fiber for artificial hair. From the viewpoint of easily obtaining excellent contamination resistance and softness, the content of the cationic polymer P may be 0.001% by mass or more, 0.002% by mass or more, 0.005% by mass or more, 0.008% by mass or more, 0.01% by mass or more, 0.02% by mass or more, 0.05% by mass or more, 0.08% by mass or more, 0.1% by mass or more, or 0.12% by mass or more. The content of the cationic polymer P may be 0.15% by mass or more or 0.2% by mass or more. From the viewpoint of easily obtaining excellent contamination resistance, softness, and stickiness resistance, the content of the cationic polymer P may be 1% by mass or less, 0.8% by mass or less, 0.6% by mass or less, 0.5% by mass or less, 0.4% by mass or less, 0.3% by mass or less, 0.25% by mass or less, 0.2% by mass or less, or 0.15% by mass or less. From the viewpoint of easily obtaining excellent stickiness resistance, the content of the cationic polymer P may be 0.12% by mass or less, 0.1% by mass or less, 0.08% by mass or less, 0.05% by mass or less, 0.02% by mass or less, 0.01% by mass or less, 0.008% by mass or less, or 0.005% by mass or less. From these viewpoints, the content of the cationic polymer P may be 0.001 to 1% by mass, 0.001 to 0.3% by mass, 0.001 to 0.2% by

mass, 0.001 to 0.15% by mass, 0.001 to 0.05% by mass, 0.005 to 1% by mass, 0.005 to 0.3% by mass, 0.005 to 0.2% by mass, 0.005 to 0.15% by mass, 0.005 to 0.05% by mass, 0.01 to 1% by mass, 0.01 to 0.3% by mass, 0.01 to 0.2% by mass, 0.01 to 0.15% by mass, 0.01 to 0.05% by mass, 0.1 to 1% by mass, 0.1 to 0.3% by mass, 0.1 to 0.2% by mass, 0.1 to 0.15% by mass, 0.15 to 1% by mass, 0.15 to 0.3% by mass, 0.15 to 0.2% by mass, 0.2 to 1% by mass, or 0.2 to 0.3% by mass.

[0064] In the fiber for artificial hair of the present embodiment, the content of the cationic surfactant A is more than 0% by mass based on the total amount of the fiber for artificial hair, and may be in the following range. From the viewpoint of easily obtaining excellent contamination resistance, softness, and stickiness resistance, the content of the cationic surfactant A may be 0.001% by mass or more, 0.005% by mass or more, 0.01% by mass or more, 0.015% by mass or more, 0.02% by mass or more, 0.025% by mass or more, 0.03% by mass or more, 0.035% by mass or more, 0.038% by mass or more, 0.04% by mass or more, or 0.042% by mass or more. From the viewpoint of easily obtaining excellent stickiness resistance, the content of the cationic surfactant A may be 0.045% by mass or more or 0.05% by mass or more. From the viewpoint of easily obtaining excellent contamination resistance and softness, the content of the cationic surfactant A may be 1% by mass or less, 0.5% by mass or less, 0.1% by mass or less, 0.08% by mass or less, 0.05% by mass or less, 0.045% by mass or less, or 0.042% by mass or less. The content of the cationic surfactant A may be 0.04% by mass or less, 0.038% by mass or less, or 0.035% by mass or less. From these viewpoints, the content of the cationic surfactant A may be 0.001 to 1%

by mass, 0.001 to 0.1% by mass, 0.001 to 0.05% by mass, 0.001 to 0.045% by mass, 0.001 to 0.04% by mass, 0.01 to 1% by mass, 0.01 to 0.1% by mass, 0.01 to 0.05% by mass, 0.01 to 0.045% by mass, 0.01 to 0.04% by mass, 0.04 to 1% by mass, 0.04 to 0.1% by mass, 0.04 to 0.05% by mass, 0.04 to 0.045% by mass, 0.05 to 1% by mass, or 0.05 to 0.1% by mass.

[0065] In the fiber for artificial hair of the present embodiment, the content of the nonionic surfactant B is more than 0% by mass based on the total amount of the fiber for artificial hair, and may be in the following range. From the viewpoint of easily obtaining excellent contamination resistance, softness, and stickiness resistance, the content of the nonionic surfactant B may be 0.01% by mass or more, 0.05% by mass or more, 0.1% by mass or more, 0.2% by mass or more, 0.3% by mass or more, 0.35% by mass or more, 0.4% by mass or more, 0.45% by mass or more, 0.5% by mass or more, 0.55% by mass or more, or 0.6% by mass or more. From the viewpoint of easily obtaining excellent stickiness resistance, the content of the nonionic surfactant B may be 0.65% by mass or more or 0.7% by mass or more. From the viewpoint of easily obtaining excellent contamination resistance and softness, the content of the nonionic surfactant B may be 5% by mass or less, 3% by mass or less, 1% by mass or less, 0.9% by mass or less, 0.8% by mass or less, 0.75% by mass or less, 0.7% by mass or less, or 0.65% by mass or less. The content of the nonionic surfactant B may be 0.6% by mass or less or 0.55% by mass or less. From these viewpoints, the content of the nonionic surfactant B may be 0.01 to 5% by mass, 0.01 to 1% by mass, 0.01 to 0.8% by mass, 0.01 to 0.7% by mass, 0.01 to 0.6% by mass, 0.1 to 5% by mass, 0.1 to

1% by mass, 0.1 to 0.8% by mass, 0.1 to 0.7% by mass, 0.1 to 0.6% by mass, 0.6 to 5% by mass, 0.6 to 1% by mass, 0.6 to 0.8% by mass, 0.6 to 0.7% by mass, 0.7 to 5% by mass, 0.7 to 1% by mass, or 0.7 to 0.8% by mass.

5 [0066] The content of each of the cationic polymer P, the cationic surfactant A, and the nonionic surfactant B can be measured by using NMR, GC-MS, HPLC, FT-IR, oil extraction, solvent extraction, or the like. There is a tendency that relative amounts among a plurality of components of the cationic polymer P, the cationic surfactant A, and the nonionic surfactant B in the fiber for hair are equivalent to relative amounts in the fiber treating agent.

10 [0067] In the fiber for artificial hair of the present embodiment, the total amount of the cationic surfactant A and the nonionic surfactant B may be in the following range based on the total amount of the fiber for artificial hair. From the viewpoint of easily obtaining excellent contamination resistance, softness, and stickiness resistance, the total amount may be 15 0.01% by mass or more, 0.05% by mass or more, 0.1% by mass or more, 0.2% by mass or more, 0.3% by mass or more, 0.4% by mass or more, 0.45% by mass or more, 0.5% by mass or more, 0.55% by mass or more, 0.6% by mass or more, or 0.65% by mass or more. From the viewpoint of easily obtaining excellent stickiness resistance, the total amount may be 0.7% by mass or more or 0.75% by mass or more. From the viewpoint of easily obtaining excellent contamination resistance and softness, the total amount may be 5% by mass or less, 3% by mass or less, 20 1% by mass or less, 0.95% by mass or less, 0.9% by mass or less, 0.85% by mass or less, 0.8% by mass or less, 0.75% by mass or less, or 0.7% by

mass or less. The total amount may be 0.65% by mass or less or 0.6% by mass or less. From these viewpoints, the total amount may be 0.01 to 5% by mass, 0.01 to 1% by mass, 0.01 to 0.8% by mass, 0.01 to 0.7% by mass, 0.01 to 0.65% by mass, 0.1 to 5% by mass, 0.1 to 1% by mass, 0.1 to 0.8% by mass, 0.1 to 0.7% by mass, 0.1 to 0.65% by mass, 0.65 to 5% by mass, 0.65 to 1% by mass, 0.65 to 0.8% by mass, 0.65 to 0.7% by mass, 0.7 to 5% by mass, 0.7 to 1% by mass, or 0.7 to 0.8% by mass.

[0068] In the fiber for artificial hair of the present embodiment, the total amount of the cationic polymer P, the cationic surfactant A, and the nonionic surfactant B may be in the following range based on the total amount of the fiber for artificial hair. From the viewpoint of easily obtaining excellent contamination resistance, softness, and stickiness resistance, the total amount may be 0.02% by mass or more, 0.05% by mass or more, 0.1% by mass or more, 0.2% by mass or more, 0.3% by mass or more, 0.4% by mass or more, 0.5% by mass or more, 0.6% by mass or more, 0.7% by mass or more, or 0.8% by mass or more. From the viewpoint of easily obtaining excellent contamination resistance and softness, the total amount may be 0.9% by mass or more, 1% by mass or more, more than 1% by mass, 2% by mass or more, 3% by mass or more, 4% by mass or more, or 5% by mass or more. From the viewpoint of easily obtaining excellent contamination resistance, softness, and stickiness resistance, the total amount may be 10% by mass or less, 8% by mass or less, 6% by mass or less, or 5% by mass or less. From the viewpoint of easily obtaining excellent stickiness resistance, the total amount may be 4% by mass or less, 3% by mass or less, 2% by mass or less, 1% by mass or less, less than 1% by mass, 0.9% by mass or less, or

0.8% by mass or less. The total amount may be 0.7% by mass or less, 0.6% by mass or less, 0.5% by mass or less, 0.4% by mass or less, 0.3% by mass or less, 0.2% by mass or less, or 0.1% by mass or less. From these viewpoints, the total amount may be 0.02 to 10% by mass, 0.02 to 4% by mass, 0.02 to 1% by mass, 0.02 to 0.8% by mass, 0.02 to 0.5% by mass, 0.1 to 10% by mass, 0.1 to 4% by mass, 0.1 to 1% by mass, 0.1 to 0.8% by mass, 0.1 to 0.5% by mass, 0.5 to 10% by mass, 0.5 to 4% by mass, 0.5 to 1% by mass, 0.5 to 0.8% by mass, 0.8 to 10% by mass, 0.8 to 4% by mass, 0.8 to 1% by mass, 1 to 10% by mass, or 1 to 5% by mass.

[0069] In the fiber for artificial hair and the fiber treating agent of the present embodiment, a mass ratio R1 of the content of the cationic polymer P with respect to the content of the cationic surfactant A (the content of the cationic polymer P/the content of the cationic surfactant A) may be in the following range. From the viewpoint of easily obtaining excellent contamination resistance and softness, the mass ratio R1 may be 0.01 or more, 0.05 or more, 0.1 or more, 0.5 or more, 1 or more, 1.5 or more, 2 or more, 2.5 or more, or 3 or more. The mass ratio R1 may be 3.5 or more, 4 or more, 4.5 or more, 5 or more, 5.5 or more, 6 or more, 6.5 or more, or 7 or more. From the viewpoint of easily obtaining excellent contamination resistance, softness, and stickiness resistance, the mass ratio R1 may be 50 or less, 30 or less, 20 or less, 10 or less, 8 or less, 7 or less, 6.5 or less, 6 or less, 5.5 or less, 5 or less, 4.5 or less, 4 or less, 3.5 or less, or 3 or less. From the viewpoint of easily obtaining excellent stickiness resistance, the mass ratio R1 may be 2 or less, 1.5 or less, 1 or less, 0.5 or less, or 0.1 or less. From these viewpoints, the mass ratio R1 may be 0.01 to 50, 0.01 to 10, 0.01 to 5, 0.01 to 3, 0.01 to

1, 0.1 to 50, 0.1 to 10, 0.1 to 5, 0.1 to 3, 0.1 to 1, 1 to 50, 1 to 10, 1 to 5, 1 to 3, 3 to 50, 3 to 10, 3 to 5, 5 to 50, or 5 to 10.

[0070] In the fiber for artificial hair and the fiber treating agent of the present embodiment, a mass ratio R2 of the content of the cationic polymer P with respect to the content of the nonionic surfactant B (the content of the cationic polymer P/the nonionic surfactant B) may be in the following range. From the viewpoint of easily obtaining excellent contamination resistance and softness, the mass ratio R2 may be 0.001 or more, 0.005 or more, 0.01 or more, 0.05 or more, 0.1 or more, 0.15 or more, or 0.2 or more. The mass ratio R2 may be 0.25 or more, 0.3 or more, 0.33 or more, 0.35 or more, 0.4 or more, or 0.45 or more. From the viewpoint of easily obtaining excellent contamination resistance, softness, and stickiness resistance, the mass ratio R2 may be 5 or less, 3 or less, 1 or less, 0.8 or less, 0.5 or less, 0.45 or less, 0.4 or less, 0.35 or less, 0.33 or less, 0.3 or less, 0.25 or less, or 0.2 or less. From the viewpoint of easily obtaining excellent stickiness resistance, the mass ratio R2 may be 0.15 or less, 0.1 or less, 0.05 or less, or 0.01 or less. From these viewpoints, the mass ratio R2 may be 0.001 to 5, 0.001 to 0.5, 0.001 to 0.3, 0.001 to 0.2, 0.001 to 0.1, 0.01 to 5, 0.01 to 0.5, 0.01 to 0.3, 0.01 to 0.2, 0.01 to 0.1, 0.1 to 5, 0.1 to 0.5, 0.1 to 0.3, 0.1 to 0.2, 0.2 to 5, 0.2 to 0.5, 0.2 to 0.3, 0.3 to 5, or 0.3 to 0.5.

[0071] In the fiber for artificial hair and the fiber treating agent of the present embodiment, a mass ratio R3 of the content of the cationic surfactant A with respect to the content of the nonionic surfactant B (the content of the cationic surfactant A/the content of the nonionic surfactant B) may be in the following range from the viewpoint of easily obtaining

excellent contamination resistance, softness, and stickiness resistance.

The mass ratio R3 may be 0.01 or more, 0.03 or more, 0.05 or more, 0.06 or more, or 0.07 or more. The mass ratio R3 may be 1 or less, 0.5 or less, 0.1 or less, 0.09 or less, 0.08 or less, or 0.07 or less. From these viewpoints, the mass ratio R3 may be 0.01 to 1, 0.03 to 1, 0.05 to 1, 0.07 to 1, 0.01 to 0.1, 0.03 to 0.1, 0.05 to 0.1, 0.07 to 0.1, 0.01 to 0.07, 0.03 to 0.07, or 0.05 to 0.07.

[0072] In the fiber for artificial hair and the fiber treating agent of the present embodiment, a mass ratio R4 of the total amount of the cationic surfactant A and the nonionic surfactant B with respect to the content of the cationic polymer P ((the total amount of the cationic surfactant A and the nonionic surfactant B)/the content of the cationic polymer P) may be in the following range. From the viewpoint of easily obtaining excellent contamination resistance, softness, and stickiness resistance, the mass ratio R4 may be more than 0, 0.1 or more, 0.5 or more, 1 or more, 1.5 or more, 2 or more, 2.5 or more, 3 or more, 3.5 or more, 4 or more, 4.5 or more, 5 or more, or 5.3 or more. From the viewpoint of easily obtaining excellent stickiness resistance, the mass ratio R4 may be 5.5 or more, 6 or more, 8 or more, 10 or more, 50 or more, 100 or more, 150 or more, or 160 or more. From the viewpoint of easily obtaining excellent contamination resistance and softness, the mass ratio R4 may be 300 or less, 250 or less, 200 or less, 160 or less, 150 or less, 100 or less, 50 or less, 10 or less, 8 or less, 6 or less, 5.5 or less, or 5.3 or less. The mass ratio R4 may be 5 or less, 4.5 or less, 4 or less, 3.5 or less, 3 or less, or 2.5 or less. From these viewpoints, the mass ratio R4 may be more than 0 and 300 or less, more than 0 and 160 or less, more than 0 and 10 or less,

more than 0 and 6 or less, more than 0 and 4 or less, more than 0 and 3 or less, 1 to 300, 1 to 160, 1 to 10, 1 to 6, 1 to 4, 1 to 3, 3 to 300, 3 to 160, 3 to 10, 3 to 6, 3 to 4, 4 to 300, 4 to 160, 4 to 10, 4 to 6, 10 to 300, or 10 to 160.

- 5 [0073] In the fiber treating agent of the present embodiment, the content of the cationic polymer P may be in the following range based on the total amount of the fiber treating agent. From the viewpoint of easily obtaining excellent contamination resistance and softness, the content of the cationic polymer P may be 0.06% by mass or more, 0.1% by mass or more, 0.5% by mass or more, 1% by mass or more, 2% by mass or more, 10 or 3% by mass or more. The content of the cationic polymer P may be 4% by mass or more, 5% by mass or more, 6% by mass or more, or 7% by mass or more. From the viewpoint of easily obtaining excellent contamination resistance, softness, and stickiness resistance, the content of the cationic polymer P may be 20% by mass or less, 15% by mass or less, 10% by mass or less, 8% by mass or less, 7% by mass or less, 6% by mass or less, 5% by mass or less, 4% by mass or less, or 3% by mass or less. From the viewpoint of easily obtaining excellent stickiness resistance, the content of the cationic polymer P may be 2% by mass or less, 1% by mass or less, 0.5% by mass or less, or 0.1% by mass or less. From these viewpoints, the content of the cationic polymer P may be 0.06 to 20% by mass, 0.06 to 8% by mass, 0.06 to 5% by mass, 0.06 to 3% by mass, 0.06 to 1% by mass, 0.1 to 20% by mass, 0.1 to 8% by mass, 0.1 to 5% by mass, 0.1 to 3% by mass, 0.1 to 1% by mass, 1 to 20% by mass, 1 to 8% by mass, 1 to 5% by mass, 1 to 3% by mass, 3 to 20% by mass, 3 to 8% by mass, 3 to 5% by mass, 5 to 20% by mass, or 5 to 8% by mass.
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[0074] In the fiber treating agent of the present embodiment, based on the total amount of the fiber treating agent, the content of the cationic surfactant A is more than 0% by mass, and may be in the following range from the viewpoint of easily obtaining excellent contamination resistance, softness, and stickiness resistance. The content of the content of the cationic surfactant A may be 0.1% by mass or more, 0.3% by mass or more, 0.4% by mass or more, 0.5% by mass or more, 0.8% by mass or more, or 1% by mass or more. The content of the cationic surfactant A may be 10% by mass or less, 8% by mass or less, 5% by mass or less, 3% by mass or less, 2% by mass or less, or 1% by mass or less. From these viewpoints, the content of the cationic surfactant A may be 0.1 to 10% by mass, 0.1 to 5% by mass, 0.1 to 3% by mass, 0.1 to 1% by mass, 0.5 to 10% by mass, 0.5 to 5% by mass, 0.5 to 3% by mass, 0.5 to 1% by mass, 1 to 10% by mass, 1 to 5% by mass, or 1 to 3% by mass.

[0075] In the fiber treating agent of the present embodiment, based on the total amount of the fiber treating agent, the content of the nonionic surfactant B is more than 0% by mass, and may be in the following range from the viewpoint of easily obtaining excellent contamination resistance, softness, and stickiness resistance. The content of the nonionic surfactant B may be 1% by mass or more, 3% by mass or more, 5% by mass or more, 6% by mass or more, 8% by mass or more, 10% by mass or more, 12% by mass or more, or 15% by mass or more. The content of the nonionic surfactant B may be 40% by mass or less, 35% by mass or less, 30% by mass or less, 25% by mass or less, 20% by mass or less, or 15% by mass or less. From these viewpoints, the content of

the nonionic surfactant B may be 1 to 40% by mass, 1 to 20% by mass, 1 to 15% by mass, 5 to 40% by mass, 5 to 20% by mass, 5 to 15% by mass, 10 to 40% by mass, 10 to 20% by mass, or 10 to 15% by mass.

5 [0076] In the fiber treating agent of the present embodiment, the content of water may be in the following range based on the total amount of the fiber treating agent from the viewpoint of easily obtaining excellent contamination resistance, softness, and stickiness resistance. The content of water may be 50% by mass or more, 55% by mass or more, 60% by mass or more, 65% by mass or more, 70% by mass or more, or 75% by mass or more. The content of water may be 95% by mass or less, 90% by mass or less, 85% by mass or less, or 80% by mass or less. From these viewpoints, the content of water may be 50 to 95% by mass, 50 to 90% by mass, 50 to 80% by mass, 70 to 95% by mass, 70 to 90% by mass, or 70 to 80% by mass.

15 [0077] The fiber for artificial hair of the present embodiment may have other additive (a component not corresponding to the cationic polymer P, the cationic surfactant A, or the nonionic surfactant B) present in at least a part of the surface of the base fiber, and the fiber treating agent of the present embodiment may contain other additive (a component not corresponding to the cationic polymer P, the cationic surfactant A, or the nonionic surfactant B). Examples of such an additive include a cationic polymer not corresponding to the cationic polymer P, a cationic surfactant not corresponding to the cationic surfactant A, a nonionic surfactant not corresponding to the nonionic surfactant B, a pH adjusting agent (for example, citric acid), an antibacterial processing agent, a deodorant processing agent, an antifungal processing agent, a UV cutting agent, a

softener, an SR processing agent, an aromatic processing agent, a flame retardant, an antifoaming agent, and fragrance. In the fiber for artificial hair of the present embodiment, at least one selected from the group consisting of zeolite and zirconium carbide may not be present in the surface of the base fiber, and the base fiber may not contain at least one selected from the group consisting of zeolite and zirconium carbide. In the fiber for artificial hair of the present embodiment, an alcohol composed only of a carbon atom, a hydrogen atom, and an oxygen atom may not be present in the surface of the base fiber, and the fiber treating agent of the present embodiment may not contain an alcohol composed only of a carbon atom, a hydrogen atom, and an oxygen atom.

[0078] In a method for producing a fiber for artificial hair of the present embodiment, the fiber treating agent of the present embodiment is brought into contact with a surface of a base fiber. That is, the method for producing a fiber for artificial hair of the present embodiment includes a fiber treating step of bringing the fiber treating agent of the present embodiment into contact with a surface of a base fiber.

[0079] In the fiber treating step, the fiber treating agent can be applied to at least a part of the surface of the base fiber. In this case, a conventionally known means for applying a liquid to a fiber can be used. Examples thereof include a means for applying the fiber treating agent to the base fiber by a roll having a surface to which the fiber treating agent has been attached (roll transfer method); a means for immersing the base fiber in a liquid tank storing the fiber treating agent (dipping method); a means for spraying the fiber treating agent to the base fiber; and a means for attaching the fiber treating agent to the base fiber with an applicator

such as a brush and a paint brush. For example, in the dipping method, the coating amount of the fiber treating agent can be adjusted by adjusting the number of times of application, the content of the active ingredient in the fiber treating agent, and the like.

5 [0080] The method for producing a fiber for artificial hair of the present embodiment may include a spinning step of spinning a composition containing a base fiber material to obtain a base fiber, before the fiber treating step. In the spinning step, the composition containing a base fiber material can be subjected to melt-spinning (melt-deformation).

10 [0081] The method for producing a fiber for artificial hair of the present embodiment may include a kneading step of melt-kneading a composition containing a base fiber material, before the spinning step. As an apparatus for performing melt-kneading, various general kneading machines can be used. Examples of the kneading machine include a
15 single-screw extruder, a twin-screw extruder, a roll, a Banbury mixer, and a kneader.

[0082] The method for producing a fiber for artificial hair of the present embodiment may include a stretching step of subjecting the fiber (unstretched fiber) obtained in the spinning step to a stretching treatment,
20 before the fiber treating step.

[0083] From the viewpoint that the strength development of the fiber is likely to occur, the stretch ratio in the stretching step may be 1.5 times or more or 2.0 times or more. From the viewpoint that fiber breakage is less likely to occur at the time of the stretching treatment, the stretch ratio
25 may be 5.0 times or less or 4.0 times or less. From these viewpoints, the stretch ratio may be 1.5 to 5.0 times or 2.0 to 4.0 times.

[0084] The stretching treatment may be carried out by a two-step method in which an unstretched fiber is first wound on a bobbin and then stretched in a step that is not continuous with the spinning step, or may be carried out by a direct spinning stretching method in which an unstretched fiber is stretched in a step continuous with the spinning step without being wound on a bobbin. The stretching treatment may be carried out by a one-stage stretching method of performing stretching once to a desired stretch ratio or may be carried out by a multistage stretching method of performing stretching to a desired stretch ratio by two or more times of stretching.

[0085] The temperature of the stretching treatment may be 80 to 120°C. When the temperature is 80°C or higher, the strength of the fiber is likely to be sufficiently secured and fiber breakage is less likely to occur. When the temperature is 120°C or lower, a suitable tactile sensation of the fiber is likely to be obtained.

[0086] The method for producing a fiber for artificial hair of the present embodiment may include a heat treatment step of heat-treating (annealing) the fiber (stretched fiber) obtained in the stretching step, after the stretching step. By performing the heat treatment step, the thermal shrinkage rate of the stretched fiber can be decreased. The heat treatment step can be performed before the fiber treating step.

[0087] The heat treatment temperature may be 100°C or higher or 110°C or higher. The heat treatment temperature may be 200°C or lower or 150°C or lower. The heat treatment may be carried out continuously after the stretching treatment and may be carried out after a while after winding the stretched fiber once.

[0088] The method for producing a fiber for artificial hair of the present embodiment may include a processing step of processing the fiber (stretched fiber) after the heat treatment step. In the processing step, for example, the fiber may be subjected to a shaping process. The heat treatment step can be performed before or after the fiber treating step.

[0089] A headdress article of the present embodiment has the fiber for artificial hair of the present embodiment. The headdress article of the present embodiment is an article that is wearable on and removable from the head portion, and the headdress article may be an embodiment composed of the fiber for artificial hair of the present embodiment (for example, a fiber bundle of the fiber for artificial hair). Examples of the headdress article include hairpieces, hair wigs, hair pieces, braid, hair extension hair, and attached hair.

Examples

[0090] Hereinafter, the present invention will be more specifically described by way of Examples; however, the present invention is not intended to be limited to these Examples.

[0091] <Preparation of base fiber>

The following fibers were prepared as base fibers.

Base fiber A: Fiber using polyvinyl chloride (TAIYO VINYL CORPORATION, trade name "TH-700"), a fiber spun from a nozzle having an outlet cross-section with a cross-sectional secondary moment of the weak axis of $10 \times 10^{-4} \text{ mm}^4$ (a fiber produced by a solution spinning method), average fineness: 40 to 70 decitex (average value of fineness of 100 fibers)

Base fiber B: Fiber using an acrylonitrile-styrene copolymer

(Denka Company Limited, trade name "GR-AT-6S"), a fiber spun from a nozzle having an outlet cross-section with a cross-sectional secondary moment of the weak axis of $10 \times 10^{-4} \text{ mm}^4$ (a fiber produced by a solution spinning method), average fineness: 40 to 70 decitex (average value of fineness of 100 fibers)

Base fiber C: Fiber using PET (Mitsui Chemicals, Inc., trade name "J125S"), a fiber spun from a nozzle having an outlet cross-section with a cross-sectional secondary moment of the weak axis of $10 \times 10^{-4} \text{ mm}^4$ (a fiber produced by a melt-spinning method), average fineness: 40 to 70 decitex (average value of fineness of 100 fibers)

Base fiber D: Fiber using a polyamide-based resin (Asahi Kasei Chemicals, trade name "LEONA 1500"), a fiber spun from a nozzle having an outlet cross-section with a cross-sectional secondary moment of the weak axis of $10 \times 10^{-4} \text{ mm}^4$ (a fiber produced by a solution spinning method), average fineness: 40 to 70 decitex (average value of fineness of 100 fibers)

Base fiber E: Fiber using polypropylene (Sumitomo Chemical Co., Ltd., trade name "SUMITOMONOBLEN S131"), a fiber spun from a nozzle having an outlet cross-section with a cross-sectional secondary moment of the weak axis of $10 \times 10^{-4} \text{ mm}^4$ (a fiber produced by a melt-spinning method), average fineness: 40 to 70 decitex (average value of fineness of 100 fibers)

Base fiber F: Fiber using a vinyl chloride-acrylonitrile copolymer (copolymerization ratio: 50 : 50, weight average molecular weight: 80000 to 130000), a fiber spun from a nozzle having an outlet cross-section with a cross-sectional secondary moment of the weak axis of $10 \times 10^{-4} \text{ mm}^4$ (a

fiber produced by a solution spinning method), average fineness: 40 to 70 decitex (average value of fineness of 100 fibers)

[0092] <Preparation of fiber treating agent>

5 The fiber treating agent was prepared by mixing a cationic polymer, surfactants shown in Tables 1 to 3, citric acid, and water. As the content based on the total amount of the fiber treating agent, the content of each of the cationic polymer, the surfactant, citric acid, and water in the fiber treating agent is shown in each table. The content of each of the cationic polymer, the cationic surfactant, and the nonionic
10 surfactant is the content as an active ingredient. As the cationic polymer and the surfactant, the following reagents were used.

[0093] (Cationic polymer)

Trade name "KP-C-1100-61-A" manufactured by NIPPON SHOKUBAI CO., LTD., weight average molecular weight: 20000 to
15 50000, polymer having, as monomer units, 50 to 95% by mass of 2-(dimethylamino)ethyl methacrylate and 5 to 50% by mass of ethyl methacrylate (basis of the content of the monomer units: total amount of monomer units constituting the polymer)

[0094] (Cationic surfactant)

20 ·Tetracosyltrimethylammonium chloride: the number of carbon atoms of carbon chain: 24, in-house preparation

·Mixture of behenyltrimethylammonium chloride and isopropyl alcohol: TOHO Chemical Industry Co., Ltd., trade name "CATINAL DC-80", the number of carbon atoms of carbon chain: 22, active ingredient amount:
25 about 80%

·Mixture of stearyltrimethylammonium chloride, isopropyl alcohol, and

- water: the number of carbon atoms of carbon chain: 18, TOHO Chemical Industry Co., Ltd., trade name "CATINAL STC-25W", active ingredient amount: about 25%
- 5 ·Cetyltrimethylammonium chloride aqueous solution: the number of carbon atoms of carbon chain: 16, Nikko Chemicals Co., Ltd., trade name "CA-2330", active ingredient amount: about 29%
- 10 ·Lauryltrimethylammonium chloride aqueous solution: the number of carbon atoms of carbon chain: 12, TOHO Chemical Industry Co., Ltd., trade name "CATINAL LTC-35A", active ingredient amount: about 35%
[0095] (Nonionic surfactant)
- 15 ·Polyoxyethylene behenyl ether: the number of carbon atoms of carbon chain: 22, HLB 16.1, AOKI OIL INDUSTRIAL Co., Ltd., trade name "BLAUNON BE-30"
- Polyoxyethylene stearyl ether: the number of carbon atoms of carbon chain: 18, HLB 16.0, in-house preparation
- 20 ·Polyoxyethylene cetyl ether: the number of carbon atoms of carbon chain: 16, HLB 19.0, in-house preparation
- Polyoxyethylene cetyl ether: the number of carbon atoms of carbon chain: 16, HLB 16.7, AOKI OIL INDUSTRIAL Co., Ltd., trade name "BLAUNON CH-330L"
- 25 ·Polyoxyethylene cetyl ether: the number of carbon atoms of carbon chain: 16, HLB 14.3, AOKI OIL INDUSTRIAL Co., Ltd., trade name "BLAUNON CH-315L"
- Polyoxyethylene cetyl ether: the number of carbon atoms of carbon chain: 16, HLB 12.0, in-house preparation
- Polyoxyethylene decyl ether: the number of carbon atoms of carbon

chain: 10, HLB 16.0, in-house preparation

·Polyoxyethylene octyl ether: the number of carbon atoms of carbon chain: 8, HLB 16.0, in-house preparation

[0096] <Production of fiber for evaluation>

- 5 The above-mentioned base fiber was stretched at 100°C, and then the above-mentioned fiber treating agent was applied to the base fiber by a roll transfer method. As roll transfer conditions, the radius of the roll was 125 mm, the roll was immersed in the fiber treating agent with a height of 20 mm from the lower end of the roll, and the roll rotation speed
- 10 was 0.2 to 8 m/min. Thereafter, annealing was performed at 110°C, and a fiber for evaluation having a single fiber fineness of 20 to 100 decitex was obtained. The stretch ratio was 3.25 times, and the relaxation ratio during annealing was 25%. The relaxation ratio during annealing is a value calculated by the formula: "(Circumference of the outlet nearest
- 15 portion of the roller of the annealing furnace)/(Circumference of the inlet nearest portion of the roller of the annealing furnace)". The content of the active ingredient in the fiber for evaluation was adjusted by the content of the active ingredient in the fiber treating agent, the roll rotation speed in the roll transfer method, and the like.
- 20 [0097] As the content of the active ingredient in the fiber for evaluation, the attached amount (unit: % by mass) of the cationic polymer and the surfactant on the surface of the fiber for evaluation was calculated. Since there is a tendency that relative amounts among a plurality of components of the cationic polymer, the cationic surfactant, and the
- 25 nonionic surfactant in the fiber for evaluation is equivalent to relative amounts in the fiber treating agent, the attached amount was calculated

by the following formula based on the solid content extracted from the fiber for evaluation using a hot water extraction method. The total amount of active ingredients (the total amount of the cationic polymer, the cationic surfactant, and the nonionic surfactant), the mass ratio of the total amount of the surfactants (the total amount of the cationic surfactant and the nonionic surfactant) with respect to the content of the cationic polymer, and the content of the cationic polymer are shown in each table.

Attached amount [% by mass] = (Mass [g] of extracted solid content/Mass [g] of fiber for evaluation before extraction) × (Active ingredient amount [% by mass] of evaluation item in fiber treating agent/Active ingredient amount [% by mass] of all components in fiber treating agent) × 100

[0098] In the above-mentioned hot water extraction method, 20 g of the fiber for evaluation was first weighed into a 300 mL beaker, and then 200 mL of pure water was added thereto. Subsequently, after the beaker was placed in a thermostat bath at 80°C, stirring was performed with a glass rod every 1 hour, and the extraction operation was performed for 4 hours in total, thereby obtaining an evaluation sample. Then, the evaluation sample was filtered with No. 5A filter paper, and then the beaker, the evaluation sample, and the filter paper were washed with a total of 100 mL of water in two portions. The moisture in the obtained filtrate was dried and solidified at 80°C. The mass of the dry solid after completely removing moisture was obtained as the mass of the extracted solid content.

[0099] <Evaluation of fiber for evaluation>

A wave shape was formed with respect to the above-mentioned

fiber for evaluation, and then contamination resistance, softness, and stickiness resistance were evaluated. As shaping process, yaki processing was performed by using a gear machine (NEW YAKI BRAID CRIMPING M/C-2.5 mm/SUNG JIN INDUSTRIAL CO., LTD.) under the conditions of gear pitch: 2.5 mm, preheating at 90°C, gear roll temperature: 90°C, and gear roll rotation speed: 1 m/m. Results are shown in each table.

[0100] (Contamination resistance)

The contamination resistance was evaluated according to the following procedure, with reference to the pollen release test QTEC method of Japan Textile Products Quality and Technology Center. First, the above-mentioned fibers for evaluation (after the shaping process) were bundled to obtain a fiber bundle having a length of 40 mm and a mass of 0.4 g. Next, 0.25 g of dust (pseudo dust, RIHITO Inc., trade name "Test (cotton) dust") was placed in a container A (cylindrical bottle) and stirred. Subsequently, five fiber bundles described above and wooden ball were placed in the container A. Then, after placing the container A in a rotating box used in JIS L 1076A method, the rotating box was rotated using a pilling tester to cause the dust to adhere to the fiber yarn.

[0101] Next, after removing the fiber bundles from the container A, three fiber bundles, which were determined by visual inspection that the dust was evenly attached to the fiber bundle, were selected. For the three fiber bundles, a ratio A (average value of the three fiber bundles) of the total area (projected area) of the dust with respect to the area (projected area) of a portion constituting the fiber bundle was calculated by visual

inspection.

[0102] Next, in a state where a longitudinal direction of the fiber bundle faced vertical direction, the fiber bundle was fixed to a position at a height of 20 cm from a support base by holding the fiber bundle using a support tool attached to a stand. Subsequently, the fiber bundle was released from the support tool to drop the fiber bundle. This operation was repeated five times in total for each of the three fiber bundles. For the three fiber bundles, a ratio B (average value of the three fiber bundles) of areas was calculated in the same manner as described above. As for the contamination resistance, a dust detachment rate (unit: %) was calculated using the following formula. As the dust detachment rate is larger, dust is likely to be detached, and the contamination resistance can be evaluated to be excellent.

$$\text{Detachment rate} = [(\text{Ratio A} - \text{Ratio B}) / \text{Ratio A}] \times 100$$

[0103] (Softness)

The above-mentioned fibers for evaluation (after the shaping process) were bundled to obtain a fiber bundle having a length of 600 mm and a mass of 120 g. Determination on two ranks of "soft" and "hard" was performed by touching (softness felt when touching the fiber bundle as if compressing with the palm) of ten technicians for treatment of the fiber for hair (work experience: 5 years or longer), and then the softness was determined based on the following criteria.

A: The fiber bundle was evaluated to be soft by 9 or more people.

B: The fiber bundle was evaluated to be soft by 5 to 8 people.

C: The fiber bundle was evaluated to be soft by 0 to 4 people.

[0104] (Stickiness resistance)

5 The above-mentioned fibers for evaluation (after the shaping process) were bundled to obtain a fiber bundle having a length of 600 mm and a mass of 120 g. Determination on two ranks of "not sticky" and "sticky" was performed by touching (the degree of stickiness felt when touching the fiber bundle as if compressing with the palm) of ten technicians for treatment of the fiber for hair (work experience: 5 years or longer), and then the stickiness resistance was determined based on the following criteria.

10 A: The fiber bundle was evaluated not to be sticky by 9 or more people.

 B: The fiber bundle was evaluated not to be sticky by 5 to 8 people.

 C: The fiber bundle was evaluated not to be sticky by 0 to 4 people.

[0105] [Table 1]

			Example											
			1	2	3	4	5	6	7	8	9	10	11	12
Content of each component of fiber treating agent [% by mass]	Cationic surfactant	Cationic polymer Behenyltrimethylammonium chloride Number of carbon atoms of carbon chain: 22	3.0	3.0	0.1	0.1	3.0	5.0	7.0	3.0	3.0	3.0	3.0	3.0
		Polyoxyethylene stearyl ether HLB: 16.0, number of carbon atoms of carbon chain: 18	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.4
		Polyoxyethylene cetyl ether HLB: 19.0, number of carbon atoms of carbon chain: 16	15.0											
		Polyoxyethylene cetyl ether HLB: 16.7, number of carbon atoms of carbon chain: 16		15.0			15.0	15.0	15.0			15.0	15.0	6.0
		Polyoxyethylene cetyl ether HLB: 14.3, number of carbon atoms of carbon chain: 16								15.0				
		Polyoxyethylene decyl ether HLB: 16.0, number of carbon atoms of carbon chain: 10									15.0			
		Citric acid	1.8	1.8	0.06	0.06	1.8	3.0	4.2	1.8	1.8	1.8	1.8	1.8
		Water	79.2	79.2	83.8	83.8	79.2	76.0	72.8	79.2	79.2	79.2	79.2	88.8
		Base fiber	A	A	A	A	A	A	A	A	A	A	A	A
		Total amount of active ingredient [% by mass]	0.8	0.8	0.8	4.0	0.8	0.8	0.8	0.8	0.8	0.8	0.1	5.0
Fiber for evaluation	Mass ratio of total amount of surfactants with respect to content of cationic polymer	5.3	5.3	160	160	5.3	3.2	2.3	2.3	5.3	5.3	5.3	5.3	2.1
	Content of cationic polymer [% by mass]	0.126	0.126	0.005	0.025	0.126	0.190	0.243	0.243	0.126	0.126	0.016	0.789	0.128
Evaluation result	Contamination resistance [%]	70	70	50	85	90	85	85	75	85	70	70	90	85
	Softness	A	A	B	A	A	A	A	C	B	B	B	A	C
	Stickiness resistance	B	B	A	B	A	B	A	C	B	A	A	C	B

[0106] [Table 2]

		Example											
		13	14	15	16	17	18	19	20	21	22	23	24
		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Content of each component of fiber treating agent [% by mass]	Cationic polymer												
	Behenyltrimethylammonium chloride												
	Number of carbon atoms of carbon chain: 22												
	Stearyltrimethylammonium chloride												
	Number of carbon atoms of carbon chain: 18												
	Cetyltrimethylammonium chloride												
	Number of carbon atoms of carbon chain: 16												
	Lauryltrimethylammonium chloride												
	Number of carbon atoms of carbon chain: 12							1.0					
	Polyoxyethylene stearyl ether												
Nonionic surfactant	HLB: 16.0, number of carbon atoms of carbon chain: 18	15.0											
	Polyoxyethylene cetyl ether												
	HLB: 19.0, number of carbon atoms of carbon chain: 16		15.0										
	Polyoxyethylene cetyl ether												
	HLB: 16.7, number of carbon atoms of carbon chain: 16			15.0				15.0	15.0	15.0	15.0	15.0	15.0
	Polyoxyethylene cetyl ether				15.0								
Fiber for evaluation	HLB: 14.3, number of carbon atoms of carbon chain: 16												
	Polyoxyethylene decyl ether												
	HLB: 16.0, number of carbon atoms of carbon chain: 10												
	Citric acid	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
	Water	79.2	79.2	79.2	79.2	79.2	79.2	79.2	79.2	79.2	79.2	79.2	79.2
	Base fiber	A	A	A	A	A	A	A	B	C	D	E	F
Evaluation result	Total amount of active ingredient [% by mass]	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
	Mass ratio of total amount of surfactants with respect to content of cationic polymer	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
	Content of cationic polymer [% by mass]	0.126	0.126	0.126	0.126	0.126	0.126	0.126	0.126	0.126	0.126	0.126	0.126
	Contamination resistance [%]	70	70	85	85	70	85	85	85	85	85	85	85
Evaluation result	Softness	B	B	B	B	B	C	C	A	A	A	A	A
	Stickiness resistance	B	B	A	B	A	B	B	A	A	A	A	A

[0107] [Table 3]

		Comparative Example						
		1	2	3	4	5	6	7
Content of each component of fiber treating agent [% by mass]	Cationic polymer	3.0	3.0	3.0	3.0	3.0	3.0	0.05
	Tetracosyltrimethylammonium chloride							
	Number of carbon atoms of carbon chain: 24							
	Behenyltrimethylammonium chloride		1.0					
	Number of carbon atoms of carbon chain: 22							
	Polyoxyethylene behenyl ether			15.0				
	HLB: 16.1, number of carbon atoms of carbon chain: 22							
	Polyoxyethylene cetyl ether		15.0				15.0	15.0
	HLB: 16.7, number of carbon atoms of carbon chain: 16				15.0			
	Polyoxyethylene cetyl ether							
Fiber for evaluation	HLB: 12.0, number of carbon atoms of carbon chain: 16							
	Polyoxyethylene octyl ether					15.0		
	HLB: 16.0, number of carbon atoms of carbon chain: 8							
	Citric acid	1.8	1.8	1.8	1.8	1.8	1.8	0.03
	Water	95.2	79.2	79.2	79.2	79.2	79.2	83.9
	Base fiber	A	A	A	A	A	A	A
	Total amount of active ingredient [% by mass]	0.8	0.8	0.8	0.8	0.8	0.01	0.8
	Mass ratio of total amount of surfactants with respect to content of cationic polymer	0	5.3	5.3	5.3	5.3	5.3	320
	Content of cationic polymer [% by mass]	0.800	0.126	0.126	0.126	0.126	0.002	0.002
	Contamination resistance [%]	30	10	10	10	10	10	10
Evaluation result	Softness	C	A	B	C	C	B	B
	Stickiness resistance	C	C	C	C	C	B	B

CLAIMS

[Claim 1] A fiber for artificial hair, comprising: a base fiber; a cationic polymer; a cationic surfactant; and a nonionic surfactant, wherein

5 the cationic polymer, the cationic surfactant, and the nonionic surfactant are present in at least a part of a surface of the base fiber,

the cationic polymer has, as a monomer unit, a monomer having at least one selected from the group consisting of a primary amino group, a secondary amino group, a tertiary amino group, acid-neutralized groups of these groups, and a quaternary ammonium group,

10 the cationic surfactant has a carbon chain having 12 to 22 carbon atoms,

the nonionic surfactant has a carbon chain having 10 to 20 carbon atoms,

15 an HLB value of the nonionic surfactant is 13.0 or more, and a content of the cationic polymer is 0.005% by mass or more based on a total amount of the fiber for artificial hair.

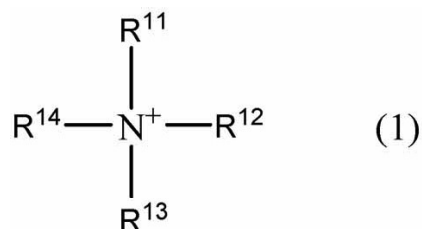
[Claim 2] The fiber for artificial hair according to claim 1, wherein the base fiber contains at least one selected from the group consisting of a homopolymer of vinyl chloride, a vinyl chloride-acrylonitrile copolymer, polyethylene terephthalate, a polyamide-based resin, polypropylene, and an acrylonitrile-styrene copolymer.

[Claim 3] The fiber for artificial hair according to claim 1, wherein the cationic polymer further has an alkyl (meth)acrylate as a monomer unit.

[Claim 4] The fiber for artificial hair according to claim 1, wherein

the cationic surfactant includes a quaternary ammonium salt having a cation with a structure represented by General Formula (1) below:

[Chemical Formula 1]



5 [in Formula (1), R¹¹ represents a group containing a carbon chain having 12 to 22 carbon atoms, and R¹², R¹³, and R¹⁴ each independently represent a monovalent group].

[Claim 5] The fiber for artificial hair according to claim 1, wherein the number of carbon atoms of the carbon chain of the cationic surfactant is 18 to 22.

[Claim 6] The fiber for artificial hair according to claim 1, wherein the HLB value of the nonionic surfactant is 13.0 to 19.0.

[Claim 7] The fiber for artificial hair according to claim 1, wherein the nonionic surfactant includes polyoxyalkylene alkyl ether.

15 [Claim 8] The fiber for artificial hair according to claim 1, wherein the content of the cationic polymer is 0.005 to 0.2% by mass based on the total amount of the fiber for artificial hair.

[Claim 9] The fiber for artificial hair according to claim 1, wherein a mass ratio of a total amount of the cationic surfactant and the nonionic surfactant with respect to the content of the cationic polymer is 3 to 160.

20 [Claim 10] The fiber for artificial hair according to claim 1, wherein a total amount of the cationic polymer, the cationic surfactant, and the nonionic surfactant is 0.1 to 4% by mass based on the total amount of the

fiber for artificial hair.

[Claim 11] A headdress article comprising the fiber for artificial hair according to any one of claims 1 to 10.