

DESCRIPTION

Title of Invention: FIBER FOR HAIR AND HAIR DECORATIVE
PRODUCT

Technical Field

[0001]

The present invention relates to a fiber for hair
and a hair decorative product.

Background Art

[0002]

Fibers for hair (to be used for hair) can be used in
hair decorative products. Patent Literature 1 discloses a
technique for treating a substrate fiber with a
predetermined fiber treatment agent in order to provide a
fiber satisfactory in gloss and slipping, free of creaking
and excellent in volume even if the fiber is a vinyl
chloride resin fiber.

Citation List

Patent Literature

[0003]

Patent Literature 1: JP 2002-285470 A

Summary of Invention

Technical Problem

[0004]

With respect to fibers for hair, a bundle of the fibers is required to have combability and slip resistance in order to avoid giving users a discomfort feeling. Here, the combability of a fiber bundle refers to the degree of smoothness when the fiber bundle is combed with fingers, whereas the degree of slip resistance of a fiber bundle refers to a degree of slip resistance of fibers, for example, when the bundle is braided. If slippage is extremely good, there is a problem, for example, a braided fiber bundle slips and comes undone. Furthermore, it is required that a fiber for hair has combability and slip resistance and additionally required that a bundle of the fibers has excellent softness.

[0005]

The invention has been made in view of the above problems. An object of the invention is to provide a fiber for hair providing a fiber bundle excellent in combability, slip resistance and softness, and a hair decorative product having the fiber for hair.

Solution to Problem

[0006]

[1]

A fiber for hair having:
a substrate fiber, and
an oil that is present on at least a part of a
surface of the substrate fiber, wherein
a kinetic friction coefficient μ_k is 0.25 or more,
and
a difference $|\mu_s - \mu_k|$ between a static friction
coefficient μ_s and the kinetic friction coefficient μ_k is 0
to 0.05.

[2]

The fiber for hair according to [1], wherein
the oil comprises a fatty acid skeleton-containing
compound and a polyalkylene glycol.

[3]

The fiber for hair according to [2], wherein
a content of the polyalkylene glycol is 50 to 98
mass% based on a total amount of the oil.

[4]

The fiber for hair according to [2] or [3], wherein
an average polymerization degree of the polyalkylene
glycol is 4 to 40.

[5]

The fiber for hair according to any one of [2] to
[4], wherein
the fatty acid skeleton-containing compound

comprises at least one of a glyceride and an organic acid glyceride.

[6]

The fiber for hair according to any one of [1] to [5], wherein

a content of the oil is 0.05 to 2.0 mass% based on a total amount of the fiber for hair.

[7]

The fiber for hair according to any one of [1] to [6], further having

a nonionic surfactant that is present on at least a part of the surface of the substrate fiber, wherein

the nonionic surfactant comprises a polyoxyethylene fatty acid ester, and

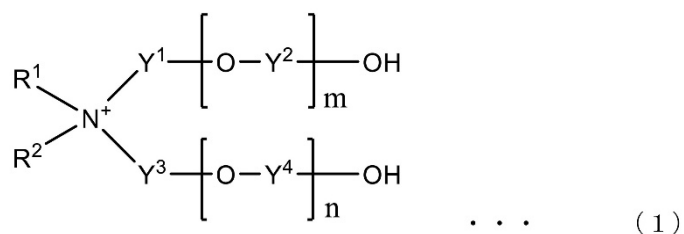
a content of the nonionic surfactant is 10 to 50 mass% based on a total content of the oil and the nonionic surfactant.

[8]

The fiber for hair according to any one of [1] to [7], further having

a cationic surfactant that is present on at least a part of the surface of the substrate fiber, wherein

the cationic surfactant comprises a quaternary ammonium salt represented by the following formula (1):



wherein R^1 and R^2 each independently represent an alkyl group, Y^1 , Y^2 , Y^3 , and Y^4 each independently represent an alkylene group, and m and n each independently represent an integer of 1 or more.

[9]

The fiber for hair according to any one of [1] to [8], wherein

the substrate fiber comprises at least one selected from the group consisting of a vinyl chloride homopolymer, a vinyl chloride-acrylonitrile copolymer, polyethylene terephthalate, a polyamide resin, polypropylene, and an acrylonitrile-styrene copolymer.

[10]

A hair decorative product having

the fiber for hair according to any one of [1] to [9].

Advantageous Effects of Invention

[0007]

According to the invention, it is possible to provide a fiber for hair providing a fiber bundle excellent

in combability, slip resistance and softness, and a hair decorative product having the fiber for hair.

Description of Embodiments

[0008]

Now, an embodiment of the invention (hereinafter, referred to as "the embodiment") will be described in detail, but the invention is not limited to this, and can be modified in various ways without departing from the gist of the invention.

[0009]

1. Fiber for Hair

A fiber for hair according to the embodiment has a substrate fiber and an oil that is present on at least a part of a surface of the substrate fiber, wherein a kinetic friction coefficient μ_k is 0.25 or more, and a difference $|\mu_s - \mu_k|$ between a static friction coefficient μ_s and the kinetic friction coefficient μ_k is 0 to 0.05.

[0010]

There are many cases in that the fibers for hair conventionally used provide a fiber bundle superior in combability but slippery and inferior in braiding performance, and in that a fiber bundle has resistance to slippage and superior in braiding performance but inferior in combability. In contrast, in the embodiment, an oil is

applied to the surface of a substrate fiber as described above, and the static friction coefficient μ_s and the kinetic friction coefficient μ_k are defined. As a result, combability and slip resistance can be achieved at the same time. Hereinafter, individual constitutions will be described in detail.

[0011]

1.1. Substrate Fiber

Examples of the substrate fiber include, but are not particularly limited to, a vinyl chloride resin, a polyolefin resin, a polyamide resin, a polyester resin, an ethylene vinyl alcohol resin and other resins.

[0012]

Examples of the vinyl chloride resin include, but are not particularly limited to, a vinyl chloride homopolymer and a vinyl chloride copolymer. A vinyl chloride resin may be used alone, or two or more types thereof may be used in combination

[0013]

Examples of the vinyl chloride copolymer include, but are not particularly limited to, a copolymer resin of vinyl chloride and a vinyl ester, such as a vinyl chloride-vinyl acetate copolymer resin and a vinyl chloride-vinyl propionate copolymer resin; a copolymer resin of vinyl chloride and an acrylic acid ester, such as a vinyl

chloride-butyl acrylate copolymer resin and a vinyl chloride-2-ethylhexyl acrylate copolymer resin; a copolymer resin of vinyl chloride and an olefin, such as a vinyl chloride-ethylene copolymer resin and a vinyl chloride-propylene copolymer resin; a vinyl chloride-acrylonitrile copolymer resin, a mixture of a vinyl chloride resin and a chlorinated vinyl chloride resin, and a vinyl chloride-acrylonitrile copolymer.

[0014]

Of them, a mixture of a vinyl chloride resin and a chlorinated vinyl chloride resin, and a vinyl chloride-acrylonitrile copolymer are preferable. When such a resin is used, quality such as processability, slipping performance and touch feeling, tends to be further improved.

[0015]

Examples of the polyolefin resin include, but are not particularly limited to, polyethylene, polypropylene, an ethylene-vinyl acetate copolymer, an ethylene-ethyl acrylate copolymer, and an ethylene-propylene copolymer.

[0016]

Examples of the polyamide resin include, but are not particularly limited to, nylon 6, nylon 66, nylon 11, nylon 12, nylon 6,10, nylon 6,12, and copolymers of these. The polyamide resin may be used alone, or two or more types

thereof may be used in combination.

[0017]

Examples of the polyester resin include, but are not particularly limited to, aromatic polyester resins such as polyethylene terephthalate, polytrimethylene terephthalate, polybutylene terephthalate and polyethylene naphthalate; and aliphatic polyester resins such as polylactic acid, polyhydroxybutyric acid, polycaprolactone, polybutylene succinate, polybutylene adipate, polyethylene succinate, polyglycolic acid, poly-3-hydroxypropionate, and poly-3-hydroxybutyrate.

[0018]

The ethylene vinyl alcohol resin is not particularly limited as long as it is a copolymer of ethylene and vinyl alcohol.

[0019]

Examples of the other resins include, but are not particularly limited to, an acrylonitrile-styrene copolymer, an acrylonitrile-styrene-butadiene terpolymer, and an ethylene-ethyl (meth)acrylate copolymer.

[0020]

Of them, the substrate fiber is preferably at least one selected from the group consisting of a vinyl chloride homopolymer, a vinyl chloride-acrylonitrile copolymer, polyethylene terephthalate, a polyamide resin,

polypropylene, and an acrylonitrile-styrene copolymer. When such a fiber is used, quality such as processability and touch feeling is further improved, and manufacturing cost tends to be further reduced. The fiber for artificial hair according to the embodiment may be used alone or two or more thereof may be used in combination.

[0021]

1.2. Oil

The fiber for hair according to the embodiment has an oil on at least a part of the surface of the substrate fiber. When the fiber has an oil, a bundle of the fibers does not slip easily and can be improved in softness. Examples of the oil include, but are not particularly limited to, fatty acid skeleton-containing compounds, polyalkylene glycols, silicones, and liquid paraffin. The oil may be used alone or two or more types thereof may be used in combination.

[0022]

Of them, a fatty acid skeleton-containing compound and a polyalkylene glycol are preferable as the oil, and a fatty acid skeleton-containing compound and polyalkylene glycol are more preferably contained in combination. When such an oil is used, the fiber bundle is further improved in combability and slip resistance, and tends to be further improved in softness.

[0023]

The oil content is preferably 0.05 to 2.0 mass%, 0.10 to 1.50 mass%, 0.15 to 1.00 mass%, or 0.20 to 0.50 mass% based on the total amount of the fiber for hair. When the oil content is 0.05 mass% or more, softness tends to be further improved. When the oil content is 2.0 mass% or less, the anti-tack property and the slip resistance tend to be further improved.

[0024]

1.2.1. Fatty Acid Skeleton-containing Compound

Examples of the fatty acid skeleton-containing compound include, but are not particularly limited to, a fatty acid, a glyceride, and an organic acid glyceride. Of them, it is preferable to contain at least one of the glyceride and the organic acid glyceride. When such a fatty acid skeleton-containing compound is used, a fiber bundle is further improved in combability and slip resistance, and tends to be further improved in softness.

[0025]

Examples of the fatty acid include, but are not particularly limited to, saturated fatty acids such as stearic acid, palmitic acid, myristic acid, lauric acid, and capric acid; and unsaturated fatty acids such as oleic acid.

[0026]

The glyceride according to the embodiment refers to a compound in which a fatty acid and one or more hydroxyl groups of glycerin are bound via an ester bond. The glyceride is also referred to as a monoglyceride, a diglyceride, or a triglyceride depending on the number of fatty acids to be bound. Examples of such glycerides include, but are not particularly limited to, glycerol monostearate, glycerol monopalmitate, glycerol monomyristate, glycerol monolaurate, glycerol monocaprate, and diglycerides and triglycerides of these.

[0027]

The organic acid glyceride according to the embodiment refers to a compound in which a fatty acid and an organic acid are each ester-bonded to a hydroxyl group of glycerin. Examples of the organic acid include, but are not particularly limited to, acetic acid, lactic acid, citric acid, succinic acid, and diacetyl tartaric acid. Examples of the organic acid glyceride include, but are not particularly limited to, monoglyceride citrate, monoglyceride succinate and monoglyceride lactate.

[0028]

The content of the fatty acid skeleton-containing compound is preferably 2 to 60 mass%, 3 to 50 mass%, 4 to 40 mass%, 5 to 30 mass%, 6 to 20 mass%, and 6 to 15 mass% based on the total amount of oils. When the content of the

fatty acid skeleton-containing compound falls within the above range, softness and slip resistance tend to be further improved.

[0029]

1.2.2. Polyalkylene Glycol

Examples of the polyalkylene glycol include, but are not particularly limited to, polyethylene glycol, polypropylene glycol, and a polyethylene glycol-polypropylene glycol copolymer.

[0030]

The average polymerization degree of a polyalkylene glycol is preferably 2 to 50, 3 to 40, 4 to 30, 4 to 20, 4 to 16, or 4 to 12. When the average polymerization degree of the polyalkylene glycol is 50 or less, the slip resistance tends to be further improved.

[0031]

The content of the polyalkylene glycol is preferably 40 to 98 mass%, 50 to 97 mass%, 60 to 96 mass%, 70 to 95 mass%, 80 to 94 mass%, and 85 to 94 mass% based on the total amount of oils. When the content of the polyalkylene glycol is 40 mass% or more, softness and slip resistance tend to be further improved.

[0032]

1.3. Surfactant

The substrate fiber according to the embodiment may

have a surfactant on at least a part of the surface thereof. When the substrate fiber has a surfactant, softness, slip resistance, combability, and anti-tack property tend to be further improved.

[0033]

Examples of the surfactant include, but are not particularly limited to, a nonionic surfactant, a cationic surfactant, and an anionic surfactant. Of them, at least one of the nonionic surfactant and the cationic surfactant is preferably contained.

[0034]

The total content of surfactants is preferably 5 to 40 parts by mass, 10 to 30 parts by mass, or 15 to 25 parts by mass based on 100 parts by mass of oils. When the content of the surfactant falls within the above range, softness, slip resistance, combability, and anti-tack property tend to be further improved.

[0035]

1.3.1. Nonionic Surfactant

Examples of the nonionic surfactant include, but are not particularly limited to, a polyoxyethylene fatty acid ester, a polyoxyalkylene alkyl ether, a polyoxyethylene-hydrogenated castor oil ether, a polyoxyethylene alkyl phenyl ether, a sorbitan fatty acid ester, a polyoxyethylene sorbitan fatty acid ester, a sucrose fatty

acid ester, a glycerin fatty acid ester, a polyoxyethylene polyoxypropylene block polymer, a polyoxyethylene alkylamine ether, and a fatty acid alkanolamide.

[0036]

Of them, a polyoxyethylene fatty acid ester is preferable. When such a nonionic surfactant is used, softness, slip resistance, combability, and anti-tack property tend to be further improved.

[0037]

The polyoxyethylene fatty acid ester is not particularly limited as long as it is a compound having a polyalkylene glycol skeleton and a fatty acid skeleton. Examples thereof include polyethylene glycol monostearate, polyethylene glycol distearate, polyethylene glycol monopalmitate, polyethylene glycol dipalmitate, polyethylene glycol monomyristate, polyethylene glycol monolaurate, and polyethylene glycol monocaprate.

[0038]

The average polymerization degree of the polyalkylene glycol skeleton to be bound to the polyoxyethylene fatty acid ester is preferably 5 to 80, 10 to 70, 15 to 60, or 20 to 50. When the average polymerization degree of the polyalkylene glycol falls within the above range, the slip resistance tends to be further improved.

[0039]

The content of the nonionic surfactant is preferably 5 to 60 mass%, 10 to 50 mass%, 10 to 40 mass%, or 10 to 30 mass% based on the total content of an oil and a nonionic surfactant. When the content of the nonionic surfactant falls within the above range, softness, slip resistance, combability, and anti-tack property tend to be further improved.

[0040]

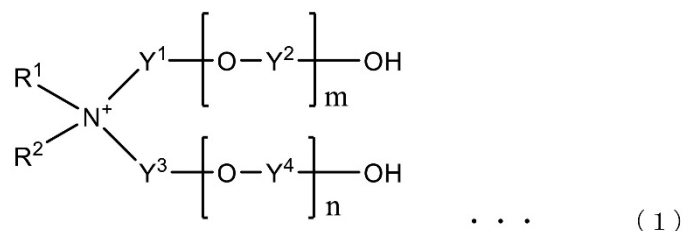
1.3.2. Cationic Surfactant

Examples of the cationic surfactant include, but are not particularly limited to, quaternary ammonium salts having an oxyalkylene group represented by the formula (1); quaternary ammonium salts having an alkyl group, such as an alkyltrimethylammonium salt, a dialkyldimethylammonium salt, and an alkyldimethylethylammonium salt; ammonium salts having an ester bond, such as stearoxyethylpyridinium salt, fatty acid triethanolamine, and fatty acid triethanolamine formate; and amine derivatives having an alkyl chain, such as polyoxyethylene alkyl amine, N-alkylpropylene amine, and N-alkylpolyethylene polyamine.

[0041]

Of them, a quaternary ammonium salt represented by the formula (1) is preferable. When such a cationic

surfactant is used, softness, slip resistance, combability, and anti-tack property tend to be further improved



wherein R¹ and R² each independently represent an alkyl group, Y¹, Y², Y³, and Y⁴ each independently represent an alkylene group, and m and n each independently represent an integer of 1 or more.

[0042]

Examples of the alkyl group in the formula (1) include, but are not particularly limited to, a methyl group, an ethyl group, an n-propyl group, an isopropyl group, an n-butyl group, an isobutyl group, a sec-butyl group, a t-butyl group, an n-pentyl group, a neopentyl group, an n-hexyl group, a texyl group, an n-heptyl group, an n-octyl group, an n-ethylhexyl group, an n-nonyl group, an n-decyl group, a cyclopropyl group, a cyclobutyl group, a cyclopentyl group, a cyclohexyl group, and a cyclooctyl group.

[0043]

Examples of the alkylene group in the formula (1) include, but are not particularly limited to, an ethylene group, a propylene group, a trimethylene group, a

tetramethylene group, and a hexamethylene group.

[0044]

In the above formula (1), m and n are each independently an integer of 1 or more, preferably 2 to 20.

[0045]

The content of the cationic surfactant is preferably 1.0 to 10 mass%, 2.00 to 7.5 mass%, or 3.0 to 5.0 mass% based on the total content of an oil and a nonionic surfactant. When the content of the cationic surfactant falls within the above range, softness, slip resistance, combability, and anti-tack property tend to be further improved.

[0046]

1.4. Other Additives

In the fiber for hair according to the embodiment, other additives may be used as necessary. The other additives may be attached to the surface of a fiber for artificial hair or mixed in the resin composition constituting the fiber. Examples of the other additives include, but are not particularly limited to, a light stabilizer, a flame retardant, and a heat stabilizer.

[0047]

1.5. Friction Coefficient

The kinetic friction coefficient μ_k of the fiber for hair is 0.25 or more, preferably 0.27 to 0.60, 0.29 to

0.55, 0.31 to 0.50, 0.33 to 0.45, or 0.35 to 0.40. When the kinetic friction coefficient μ_k is 0.25 or more, the slip resistance tends to be further improved.

[0048]

The static friction coefficient μ_s of the fiber for hair is preferably 0.24 to 0.55, 0.26 to 0.50, 0.28 to 0.45, 0.30 to 0.40, 0.32 to 0.38. When the static friction coefficient μ_s falls within the above range, softness, slip resistance, and combability tend to be further improved.

[0049]

Furthermore, the difference $|\mu_s - \mu_k|$ between the static friction coefficient μ_s and the kinetic friction coefficient μ_k is 0 to 0.05, preferably 0 to 0.04, 0 to 0.03, or 0 to 0.02. When the difference $|\mu_s - \mu_k|$ is 0.05 or less, softness, slip resistance, and combability tend to be further improved.

[0050]

The kinetic friction coefficient μ_k , the static friction coefficient μ_s , and the difference $|\mu_s - \mu_k|$ can be controlled by, for example, the compositions of an oil and a surfactant. Specifically, they can be appropriately controlled by the number of carbon atoms and amount of the polyalkylene glycol to be used, the number of carbon atoms and amount of the fatty acid of the fatty acid skeleton-containing compound to be used, and the type and amount of

the surfactant to be used.

[0051]

The kinetic friction coefficient μ_k and the static friction coefficient μ_s can be measured by the method described in Examples.

[0052]

1.6. Method for Producing Fiber for Hair

Examples of the method for producing the fiber for hair according to the embodiment include, but are not particularly limited to, a method having a spinning step of spinning a composition containing a resin constituting a substrate fiber and an optional additive to obtain a substrate fiber, and an application step of applying an oil and an optional surfactant to the obtained substrate fiber.

[0053]

In the spinning step, a composition containing a resin constituting a substrate fiber and an optional additive can be melt spun by extruding the composition at a cylinder temperature of 150°C to 190°C and a nozzle temperature of 180 ± 15°C. The cross-sectional shape of the nozzle to be used in this step can be appropriately set according to the cross-sectional shape of the fiber for artificial hair to be prepared.

[0054]

The undrawn substrate fiber melt-spun from the

nozzle can be introduced into a heating cylinder (heating cylinder temperature: 250°C), momentarily heat-treated, and wound up by a take-up machine disposed at a position of about 4.5 m immediately below the nozzle. During the winding-up process, the take-up speed can be controlled so as to obtain a desired fineness of the undrawn fiber.

[0055]

Note that, when an undrawn fiber is obtained from a resin composition, an extruder known in the technical field can be used. For example, a uniaxial extruder, a counter-rotating twin-screw extruder, or a conical biaxial extruder can be used.

[0056]

The undrawn substrate fiber obtained as described above can be drawn or heat-treated. As an example, an undrawn substrate fiber is drawn three times by a drawing machine (105°C under an air atmosphere), and then heat-treated up to 0.75 times (the fiber is thermally shrunk until the entire length of the fiber is reduced to 75% of the length before the treatment) by a heat treatment machine (110°C under an air atmosphere) so as to obtain a fineness of 48 to 62 denier. In this manner, a fiber for artificial hair can be prepared.

[0057]

In the application step, an oil and, if necessary, a

surfactant, are applied to the obtained substrate fiber. The application method is not particularly limited. A fiber treatment agent containing an oil and a surfactant may be applied to a substrate fiber in accordance with a roll transfer method. Alternatively, a substrate fiber may be soaked in a fiber treatment agent. Note that, the amount to be applied may be controlled by changing the concentrations of an oil and surfactant in a fiber treatment agent.

[0058]

2. Hair Decorative Product

The hair decorative product according to the embodiment has the aforementioned fiber for hair. Examples of the hair decorative product include, but are not particularly limited to, hair wigs, hairpieces, braids, and hair extensions.

Examples

[0059]

Now, the invention will be described more specifically by way of Examples and Comparative Examples. The invention is not limited at all by the following Examples.

[0060]

1. Preparation of Fiber Treatment Agent

An oil, a surfactant, a solvent, and water were mixed in accordance with each of the compositions shown in Tables 1 to 3 to obtain a fiber treatment agent. Note that, the contents of individual components of the fiber treatment agents shown in Tables 1 to 3 refer to wt% unless otherwise specified. In Tables 1 to 3, the contents (wt%) of only the oil and surfactant contained in each of the fiber treatment agents are shown. The other components are a solvent and water.

[0061]

<Preparation of Substrate Fiber>

The following fibers were prepared as substrate fibers.

Substrate fiber A: fiber obtained from a nozzle by spinning a raw material containing 70 mass% of polyvinyl chloride (TAIYO VINYL CORPORATION, trade name "TH-700") and 30 mass% of an acrylonitrile-styrene copolymer (Denka Company Limited, trade name "GR-AT-6S") in accordance with a melt spinning method

Substrate fiber B: fiber obtained from a nozzle by spinning a raw material, polyvinyl chloride (TAIYO VINYL CORPORATION, trade name "TH-700") in accordance with a melt spinning method

Substrate fiber C: fiber obtained from a nozzle by spinning a raw material, an acrylonitrile-styrene copolymer

(Denka Company Limited, trade name "GR-AT-6S") in accordance with a melt spinning method

Substrate fiber D: fiber obtained from a nozzle by spinning a raw material, PET (Mitsui Chemicals, Inc., trade name "J125S") in accordance with a melt spinning method

Substrate fiber E: fiber obtained from a nozzle by spinning a raw material, a polyamide resin (Asahi Kasei Chemicals Corporation, trade name "LEONA1500") in accordance with a melt spinning method

Substrate fiber F: fiber obtained from a nozzle by spinning a raw material, polypropylene (Sumitomo Chemical Co., Ltd., trade name "Sumitomo NOBLEN S131") in accordance with a melt spinning method

[0062]

2. Preparation of Fiber for Evaluation

After the substrate fibers were drawn at 100°C, the fiber treatment agent prepared as described above was applied to each of the substrate fibers in accordance with a roll transfer method. As conditions for roll transfer, the radius of the roll was 125 mm, the roll was soaked in a fiber treatment agent up to a height of 20 mm from the lower end of the roll, and the roll rotation speed was 0.2 to 8 m/min. Thereafter, annealing was performed at 110°C to obtain a single fiber having a single fineness of 20 to 100 decitex.

[0063]

The single fibers were processed into a shape using a gear machine (NEW YAKI BRAID CRIMPING M/C-2.5mm/SUNG JIN INDUSTRIAL CO., LTD.) under the conditions of a gear pitch of 2.5 mm, preheating of 90°C, a gear roll temperature of 90°C, and a gear roll rotation speed of 1 m/m to obtain fibers for evaluation (fiber for artificial hair).

[0064]

[Table 1]

				Example											
				1	2	3	4	5	6	7	8	9	10	11	12
Substrate fiber				A	A	A	A	A	A	A	A	A	A	A	A
Fiber treatment agent	Oil	Polyalkylene glycol	Polyethylene glycol (average polymerization degree 4)	10					10	10	10	10	10	10	10
			Polyethylene glycol (average polymerization degree 8)		10										
			Polyethylene glycol (average polymerization degree 12)			10									
			Polyethylene glycol (average polymerization degree 20)				10								
			Polyethylene glycol (average polymerization degree 30)					10							
	Fatty acid skeleton-containing compound	Glycerol monostearate	1	1	1	1	1	11	0.1	1	1	1	1	1	
	Nonionic surfactant	Polyethylene glycol monostearate (PEG-30)	2	2	2	2	2	2	2	2	2	1	12	2	
	Cationic surfactant	Quaternary ammonium salt base cationic surfactant	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		
	Polyethylene glycol/oil [%]			91%	91%	91%	91%	91%	48%	99%	91%	91%	91%	91%	
	Nonionic surfactant/ (oil + nonionic surfactant) [%]			15%	15%	15%	15%	15%	9%	17%	15%	15%	8%	52%	15%
Oil/fiber for hair (wt%)				0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.05	1.60	0.30	0.30	0.30
Friction coefficient		Static friction coefficient (μs)	0.37	0.37	0.37	0.32	0.30	0.29	0.4	0.38	0.33	0.38	0.30	0.37	
		Kinetic friction coefficient (μk)	0.36	0.36	0.35	0.30	0.26	0.26	0.36	0.35	0.32	0.34	0.28	0.36	
		μs-μk	0.01	0.01	0.02	0.02	0.04	0.03	0.04	0.03	0.01	0.04	0.02	0.01	
Evaluation		Softness	A	A	A	A	B	B	B	A	B	B	A	A	
		Slip resistance	A	A	B	B	C	C	A	A	B	B	C	A	
		Combability	A	A	A	A	A	A	B	B	A	B	A	A	
		Anti-tack property	A	A	A	A	A	A	B	A	C	B	A	A	

[0065]

[Table 2]

				Example							
				13	14	15	16	17	18	19	20
Substrate fiber				A	A	A	A	A	A	A	A
Fiber treatment agent	Oil	Polyalkylene glycol	Polyethylene glycol (average polymerization degree 4)	10	10	10	10	10	10	10	10
		Fatty acid skeleton-containing compound	Monoglyceride succinate	1							
			Monoglyceride citrate		1						
			Glycerol monostearate						1	1	1
			Glycerol monopalmitate			1					
			Stearic acid				1				
			Palmitic acid					1			
	Nonionic surfactant	Polyethylene glycol monostearate (PEG-30)	2	2	2	2	2				
		Polyethylene glycol monostearate (PEG-40)						2		2	
		Polyethylene glycol distearate (PEG-12)							2		
	Cationic surfactant		Quaternary ammonium salt base cationic surfactant	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	Polyethylene glycol/oil [%]			91%	91%	91%	91%	91%	91%	91%	91%
	Nonionic surfactant/(oil + nonionic surfactant) [%]			15%	15%	15%	15%	15%	15%	15%	15%
Oil/fiber for hair (wt%)			0.30	0.30	0.30	0.30	0.30	0.30	0.30	1.70	
Friction coefficient			Static friction coefficient (μs)	0.37	0.37	0.37	0.39	0.39	0.37	0.37	0.32
			Kinetic friction coefficient (μk)	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.3
			μs-μk	0.01	0.01	0.01	0.03	0.03	0.01	0.01	0.02
Evaluation			Softness	A	A	A	B	B	A	A	A
			Slip resistance	A	A	A	A	A	A	A	A
			Combability	A	A	A	B	B	A	A	A
			Anti-tack property	A	A	A	A	A	A	A	D

[0066]

[Table 3]

				Example					Comparative Example	
				21	22	23	24	25	1	2
Substrate fiber				B	C	D	E	F	A	A
Fiber treatment agent	Oil	Polyalkylene glycol	Polyethylene glycol (average polymerization degree 4)	10	10	10	10	10	10	
			Glycerol monostearate	1	1	1	1	1		1
	Nonionic surfactant		Polyethylene glycol monostearate (PEG-30)	2	2	2	2	2		
			Polyethylene glycol monostearate (PEG-40)						2	2
	Cationic surfactant		Quaternary ammonium salt base cationic surfactant	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	Polyethylene glycol/oil [%]			91%	91%	91%	91%	91%	100%	0%
	Nonionic surfactant/(oil + nonionic surfactant) [%]			15%	15%	15%	15%	15%	17%	67%
	Oil/fiber for hair (wt%)			0.30	0.30	0.30	0.30	0.30	0.30	0.30
Friction coefficient		Static friction coefficient (μ s)		0.37	0.36	0.37	0.33	0.37	0.42	0.27
		Kinetic friction coefficient (μ k)		0.36	0.35	0.36	0.32	0.36	0.35	0.2
		μ s- μ k		0.01	0.01	0.01	0.01	0.01	0.07	0.07
Evaluation		Softness		A	A	A	A	A	D	D
		Slip resistance		A	A	A	B	A	A	D
		Combability		A	B	B	B	B	C	A
		Anti-tack property		A	A	A	A	A	B	A

[0067]

The details of individual components listed in Tables 1 to 3 are shown below.

(Polyalkylene Glycol)

•Polyethylene glycol (average polymerization degree 4): PEG-200 manufactured by AOKI OIL INDUSTRIAL Co., Ltd.

•Polyethylene glycol (average polymerization degree 8): PEG-400 manufactured by AOKI OIL INDUSTRIAL Co., Ltd.

•Polyethylene glycol (average polymerization degree 12): PEG-600 manufactured by AOKI OIL INDUSTRIAL Co., Ltd.

•Polyethylene glycol (average polymerization degree 20): PEG-1000 manufactured by AOKI OIL INDUSTRIAL Co., Ltd.

•Polyethylene glycol (average polymerization degree 30): PEG-1540 manufactured by AOKI OIL INDUSTRIAL Co., Ltd.

(Fatty Acid Skeleton-containing Compound)

•Monoglyceride succinate: B-10 manufactured by Riken Vitamin Co., Ltd.

•Monoglyceride citrate: K-30 manufactured by Riken Vitamin Co., Ltd.

•Glycerol monostearate: EMALLEX GMS-B manufactured by Nihon Emulsion Co., Ltd.

•Glycerol monopalmitate: W01COBQC-0880 manufactured by FUJIFILM Wako Pure Chemicals Corporation

•Stearic acid: Lunac S-98 manufactured by Kao Corporation

•Palmitic acid: Palmitic acid P manufactured by New Japan Chemical Co., Ltd.

[Nonionic Surfactant]

•Polyethylene glycol monostearate (PEG-30): EMALLEX830 manufactured by Nihon Emulsion Co., Ltd.

•Polyethylene glycol monostearate (PEG-40): EMALLEX840 manufactured by Nihon Emulsion Co., Ltd.

•Polyethylene glycol distearate (PEG-12): EMALLEX

600di-S manufactured by Nihon Emulsion Co., Ltd.

[Cationic Surfactant]

•Quaternary ammonium salt base cationic surfactant
(satisfying the formula (1)): F-20 manufactured by
Yoshimura Oil Chemical Co., Ltd.

[0068]

3. Evaluation

3.1. Friction Coefficient

The fibers for evaluation described above were bundled to obtain a fiber bundle having a length of 300 mm and a mass of 10 g. Then, from a position of 100 mm from one of the ends of the fiber bundle toward the other end thereof, a probe made of urethane (tactile-contact finger model manufactured by TRINITY-LAB. Inc.) was moved at a moving speed of 10 mm/sec, a moving distance of 45 mm, and a load of 200 g to measure a static friction coefficient and a kinetic friction coefficient by a static/kinetic friction measuring machine (trade name "TL201Tt" manufactured by TRINITY-LAB).

The friction at the initiation time of sliding was taken as the static friction coefficient, and the average value of friction after sliding was taken as the kinetic friction coefficient.

[0069]

3.2. Softness

The fibers for evaluation described above were bundled to obtain a fiber bundle having a length of 600 mm and a mass of 120 g. Ten technicians engaged in fiber treatment for hair (having work experience for 5 years or more) touched the fiber bundle with hand (so as to compress the bundle with the palm) and evaluated the feeling as "soft" or "hard". After the two-rank test, softness was evaluated based on the following criteria.

A: 9 or more technicians evaluated as soft

B: 5 to 8 technicians evaluated as soft

C: 1 to 4 technicians evaluated as soft

D: None of the technicians evaluated as soft

[0070]

3.3. Slip Resistance

The fibers used in the above evaluation were bundled and then folded in the middle to obtain a fiber bundle having a length of 600 mm and a mass of 120 g. Ten technicians engaged in fiber treatment for hair (having work experience for 5 years or more) braided the fibers for hair and evaluated the degree of resistance of the fibers to slipping as "not slippery" and "slippery". After the two-rank test, the finger-combing smoothness was evaluated based on the following criteria.

A: None of the technicians evaluated as slippery

B: 1 to 4 technicians evaluated as slippery

C: 5 to 8 technicians evaluated as slippery

D: 9 or more technicians evaluated as slippery

[0071]

3.4. Combability

The fibers for evaluation described above were bundled to obtain a fiber bundle having a length of 600 mm and a mass of 120 g. Ten technicians engaged in fiber treatment for hair (having work experience for 5 years or more) combed the fiber bundle with fingers and evaluated the degree of smoothness during combing with fingers as "not smoothly combing" and "smoothly combing". After the two-rank test, the smoothness of combing with finger was evaluated based on the following criteria.

A: None of the technicians evaluated as "not smoothly combing"

B: 1 to 4 technicians evaluated as "not smoothly combing"

C: 5 to 8 technicians evaluated as "not smoothly combing"

D: 9 or more technicians evaluated as "not smoothly combing"

[0072]

3.5. Anti-tack Property

The fibers used in the above evaluation were bundled and then folded in the middle to obtain a fiber bundle

having a length of 600 mm and a mass of 120 g. Ten technicians engaged in fiber treatment for hair (having work experience for 5 years or more) touched the fiber bundle with hand (so as to compress the bundle with the palm) and evaluated the feeling as "not tacky" and "tacky". After the two-rank test, the anti-tack property was evaluated based on the following criteria.

- A: 9 or more technicians evaluated as not tacky
- B: 5 to 8 technicians evaluated as not tacky
- C: 1 to 4 technicians evaluated as not tacky
- D: 0 technicians evaluated as not tacky

Industrial Applicability

[0073]

The invention has industrial applicability as a fiber for artificial hair to be used in detachable artificial hair products such as wigs, hair wigs, and hair extensions.

CLAIMS

[Claim 1]

A fiber for hair comprising:
a substrate fiber; and
an oil that is present on at least a part of a surface of the substrate fiber, wherein
a kinetic friction coefficient μ_k is 0.25 or more,
and
a difference $|\mu_s - \mu_k|$ between a static friction coefficient μ_s and the kinetic friction coefficient μ_k is 0 to 0.05.

[Claim 2]

The fiber for hair according to claim 1, wherein
the oil comprises a fatty acid skeleton-containing compound and a polyalkylene glycol.

[Claim 3]

The fiber for hair according to claim 2, wherein
a content of the polyalkylene glycol is 50 to 98 mass% based on a total amount of the oil.

[Claim 4]

The fiber for hair according to claim 2, wherein
an average polymerization degree of the polyalkylene glycol is 4 to 40.

[Claim 5]

The fiber for hair according to claim 2, wherein

the fatty acid skeleton-containing compound comprises at least one of a glyceride and an organic acid glyceride.

[Claim 6]

The fiber for hair according to claim 1, wherein a content of the oil is 0.05 to 2.0 mass% based on a total amount of the fiber for hair.

[Claim 7]

The fiber for hair according to claim 1, further comprising

a nonionic surfactant that is present on at least a part of the surface of the substrate fiber, wherein

the nonionic surfactant comprises a polyoxyethylene fatty acid ester, and

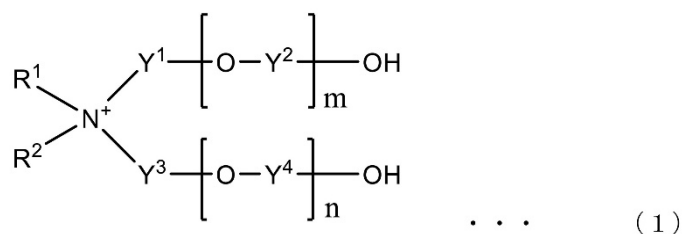
a content of the nonionic surfactant is 10 to 50 mass% based on a total content of the oil and the nonionic surfactant.

[Claim 8]

The fiber for hair according to claim 1, further comprising

a cationic surfactant that is present on at least a part of the surface of the substrate fiber, wherein

the cationic surfactant comprises a quaternary ammonium salt represented by the following formula (1):



wherein R^1 and R^2 each independently represent an alkyl group, Y^1 , Y^2 , Y^3 , and Y^4 each independently represent an alkylene group, and m and n each independently represent an integer of 1 or more.

[Claim 9]

The fiber for hair according to claim 1, wherein the substrate fiber comprises at least one selected from the group consisting of a vinyl chloride homopolymer, a vinyl chloride-acrylonitrile copolymer, polyethylene terephthalate, a polyamide resin, polypropylene, and an acrylonitrile-styrene copolymer.

[Claim 10]

A hair decorative product comprising the fiber for hair according to any one of claims 1 to 9.