

SPECIFICATION

SPLITTABLE CONJUGATE FIBER

TECHNICAL FIELD

[0001]

The present invention relates to a splittable conjugate fiber that is composed of a plurality of split components including a polyamide and that is useful for the production of a fiber structure being soft, rich in bulkiness and having a good hue.

BACKGROUND ART

[0002]

Splittable conjugate fibers composed of a polyamide and a polyester can be split into both the components by a physical or chemical treatment, and it is known that the fiber structures obtained therefrom have bulkiness, softness and good hue. Moreover, it is also known that if a component obtained by splitting is superfine, the effect is much more remarkable and a highly dense fiber structure can be obtained.

[0003]

As to a method for splitting a splittable conjugate fiber, JP S53-35633 B, JP S61-37383 B and JP H04-272223 A, for example, disclose methods including swelling and shrinking of a polyamide. In particular, the invention of JP S61-37383 B increases the density of a fiber structure by increasing the degree of swelling/shrinking of a polyamide. Moreover, it is disclosed that since the polyamide after being shrunk is not exposed in the surface of the fiber structure, the hue is clear when dyeing is performed.

[0004]

As to these, however, if the polyamide used is normal

one, the degree of the swelling/shrinking of the polyamide is limited and the splittability is not sufficient unless a special treating agent that can cause the polyamide to swell/shrink is used. Moreover, the denseness, bulkiness, dye-affinity, etc. of the resulting fiber structure are dissatisfied.

[0005]

Although benzyl alcohol is mainly used in the splitting method by swelling/shrinking of a polyamide, the benzyl alcohol remains in the knitted or woven fabric after treatment, resulting in occurrence of uneven dyeing. Moreover, it costs a lot because benzyl alcohol is expensive and waste liquid disposal is necessary.

[0006]

Patent document 1: JP S53-35633 B

Patent document 2: JP S61-37383 B

Patent document 3: JP H04-272223 A

DISCLOSURE OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0007]

The present invention has been made in order to solve the defects of such conventional techniques and an object thereof is to obtain a fiber structure that is soft and rich in bulkiness and has a good hue even if a low concentration of benzyl alcohol or no benzyl alcohol is used as a treating agent when an invented fiber is fabricated into a fiber structure and then is subjected to splitting treatment.

MEANS FOR SOLVING THE PROBLEM

[0008]

In order to attain the above-mentioned object, the first gist of the present invention is a splittable conjugate fiber, wherein one is made of a polyamide resin composition of an aromatic polyamide and an aliphatic polyamide and the other is made of a fiber-forming polymer having no affinity with the polyamide resin composition.

[0009]

A preferable embodiment of the present invention is that the aromatic polyamide is a polyamide that contains an aliphatic dicarboxylic acid and an aromatic diamine as main structural units.

[0010]

A preferable embodiment of the present invention is that the polyamide component of the splittable conjugate fiber is a polyamide resin composition in which a nylon MXD6 is used as the aromatic polyamide and a nylon 6 is used as the aliphatic polyamide.

[0011]

A more preferable embodiment of the present invention is that the weight mix ratios of a nylon MXD6 polymer and a nylon 6 polymer of the polyamide component are from 35:65 to 70:30, respectively. A particularly preferable embodiment is that the weight mix ratios of the nylon MXD6 polymer and the nylon 6 polymer of the polyamide component are from 14:44 to 44:45, respectively.

[0012]

A preferable embodiment of the present invention is that the fiber-forming polymer having no affinity with the polyamide resin composition is a polyester. If it is a polyester, when an alkali dissolving process is performed, the polyester is partly dissolved and a heated alkali solution

encloses the polyamide component, so that sufficient shrink performance can be obtained.

[0013]

A more preferable embodiment of the present invention is that the fiber-forming polymer having no affinity with the polyamide resin composition is a polyolefin. Since a polyolefin has low adhesiveness to a polyamide, it can be split easily with hot water.

EFFECTS OF THE INVENTION

[0014]

Since the splittable conjugate fiber of the present invention uses a polyamide resin composition of an aromatic polyamide and an aliphatic polyamide as a polyamide component, the shrink performance of the polyamide component is high. While the conventional benzyl alcohol treatment realizes splitting into a plurality of components by swelling/shrinking a polyamide, the splittable conjugate fiber of the present invention uses a polyamide component that is high in shrink performance and, therefore, it is high in shrink performance after swelling by benzyl alcohol treatment, so that it becomes prone to be split. Therefore, it exhibits good splittability even by using a low concentration of benzyl alcohol or a treating agent having no swelling action other than alcohols. The resulting fiber structure becomes rich in denseness and bulkiness and comes to feel good. Moreover, if fibers after splitting are super-thin fibers, a fiber product will become more flexible and denser.

[0015]

In addition, a fiber structure using the splittable conjugate fiber of the present invention has a good hue. When

a fiber structure using a splittable conjugate fiber composed of two or more usual components is dyed, it is difficult to match the hues of the individual components perfectly and a somber hue is produced. On the other hand, as to a fiber structure using the fiber of the present invention, the polyamide component shrinks so much that it is not exposed in a surface layer. Therefore, since no polyamide component can be seen in the surface layer of the fiber structure and the surface layer is covered with only other components, a fiber structure that has a clear hue can be obtained.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016]

[Fig. 1] A cross-sectional shape of a splittable conjugate fiber (side-by-side type).

[Fig. 2] A cross-sectional shape of a splittable conjugate fiber (side-by-side repetition type).

[Fig. 3] A cross-sectional shape of a splittable conjugate fiber (radial type).

[Fig. 4] A cross-sectional shape of a splittable conjugate fiber (radial type).

[Fig. 5] A cross-sectional shape of a splittable conjugate fiber (hollow radial type).

EXPLANATION OF REFERENCE NUMERALS

[0017]

1: Polyamide component

2: Fiber-forming polymer having no affinity with polyamide

BEST MODE FOR CARRYING OUT THE INVENTION

[0018]

The present invention will be described in detail hereinafter.

The polyamide resin composition to be used for the present invention must be a polyamide resin composition of an aromatic polyamide and an aliphatic polyamide. Since the polyamide resin composition has high shrink performance, it demonstrates good splittability even for a low concentration of benzyl alcohol or a treating agent having no swelling action other than alcohols (for example, alkali dissolving treatment, hot water treatment). Fiber structures after such treatment become rich in denseness and bulkiness and feel good. On the other hand, if the polyamide component includes only an aromatic polyamide or only an aliphatic polyamide, since the shrink performance is low, fiber structures having good feeling cannot be obtained.

[0019]

The aliphatic polyamide includes such as nylon 6, nylon 66, and nylon 4, and is a conventional polyamide having a fiber-forming molecular weight such as these individual polyamides or copolymerized polyamides containing those polyamides as a major ingredient. In particular, nylon 6 is produced in a large amount that it is advantageous in cost aspect and, therefore, it is used suitably for the present invention.

[0020]

From the viewpoint of the stability of melt spinning operational efficiency, the polyamide to be used for the polyamide resin composition preferably has a relative viscosity of 1.8 or more. The relative viscosity is more preferably 2.2 or more, and particularly preferably 2.5 or more. Although the upper limit of the relative viscosity is not

particularly limited, 3.5 is high enough from the viewpoint of the stability of melt spinning operational efficiency.

[0021]

It is desirable for the invented fiber that the aromatic polyamide is a polyamide containing an aliphatic dicarboxylic acid and an aromatic diamine as main structural units. Use of the aforementioned aromatic polyamide results in higher shrink performance and, therefore, a fiber structure obtained after splitting treatment becomes superior in density and bulkiness and good feeling.

[0022]

It is desirable for the polyamide resin composition to be used in the present invention that the aromatic polyamide is nylon MXD6 and the aliphatic polyamide is nylon 6. The aforementioned polyamide resin composition has particularly high shrink performance and, therefore, a fiber structure obtained after splitting treatment becomes superior in density and bulkiness and good feeling.

[0023]

In the case of using the aforementioned nylon MXD6 and nylon 6, it is more desirable that the weight mix ratios of the nylon MXD6 and the nylon 6 be, respectively, from 35:65 to 70:30, and particularly desirably from 45:55 to 55:45. The polyamide resin composition mixed in the above weight ratios has particularly high shrink performance and, therefore, a fiber structure obtained after splitting treatment becomes superior in density and bulkiness and good feeling.

[0024]

Among the polymers to be used suitably as a fiber-forming polymer having no affinity with the polyamide resin composition, there are included a polyester and a polyolefin.

[0025]

As the polyesters, there are known such as polyethylene terephthalate, polybutylene terephthalate, polyethylene oxybenzoate, poly-1,4-dimethylcyclohexane terephthalate, and copolyesters containing these as main ingredients. On the other hand, the polyolefins include such as polyethylene, polypropylene, and copolyolefins containing these as main ingredients. Other polymers can also be used.

[0026]

Polyester is preferred because when being subjected to an alkali dissolving process, the polyester is partly dissolved and a heated alkali solution encloses the polyamide component, so that sufficient shrink performance and sufficient split performance can be obtained. In particular, polyethylene terephthalate is preferably used.

[0027]

A polyolefin is preferred because it has low adhesiveness to a polyamide and therefore it is split easily with hot water. In particular, polypropylene is preferably used.

[0028]

In the case of using a polyester as a fiber-forming polymer having no affinity with a polyamide resin composition, the intrinsic viscosity is preferably 0.4 or more, more preferably 0.5 or more, and particularly preferably 0.6 or more from the viewpoint of the stability of melt spinning operational efficiency. Although the upper limit of the intrinsic viscosity is not particularly limited, 1.0 is high enough from the viewpoint of the stability of melt spinning operational efficiency.

When using a polyolefin, the melt mass flow rate (JIS K7210: 99 testing method) is preferably 5 g/10 min to 50 g/10

min, more preferably 10 g/10 min to 30 g/10 min.

[0029]

The moisture regains (ppm) of the polyamide used in the polyamide resin composition and the fiber-forming polymer having no affinity with the polyamide resin composition are not particularly limited and may be determined appropriately.

From the viewpoint of the spinning operational efficiency, it is preferable to use a polyamide having a moisture regain at the time of spinning of 500 ppm or less, more preferably 300 ppm or less, and particularly preferably 200 ppm or less. As to a polyester, the moisture regain thereof at the time of spinning is preferably 200 ppm or less, more preferably 100 ppm or less, and particularly preferably 50 ppm or less.

[0030]

In order to improve the spinning operational efficiency, it is desirable to allow the polymers to contain inorganic particles. Many kinds of inorganic particles can be used for this purpose and examples thereof include titanium oxide, zinc oxide, magnesium carbonate, silicon oxide, calcium carbonate, alumina and the like. While the inorganic particles to be added are not particularly restricted unless the spinning operational efficiency is impaired, it is desirable, from the viewpoints of dispersibility and cost performance, to use titanium oxide. It is desirable to add inorganic particles in an amount of 0.1% by weight to 3.0% by weight, and particularly desirably 0.3% by weight to 1.0% by weight relative to the yarn weight.

[0031]

In the case of using the aforementioned inorganic particles, the mean particle diameter of the powder or

particles is preferably 0.01 μm to 10 μm , and particularly preferably 0.05 μm to 2 μm . If the mean particle diameter is within such ranges, aggregation of particles occurs less frequently and, therefore, the occurrence of yarn evenness tends to be inhibited and stabilized strength can be obtained.

[0032]

According to necessity, conventional additives, such as matting agents, pigments, antistatic agents, antibacterial agents, and far-infrared radiation particles, may be incorporated to the polyamide component and/or other components.

[0033]

The mixing method to be used for producing the polyamide resin composition is not particularly restricted. For example, chips of the nylon MXD6 polymer and the nylon 6 polymer may be mixed in a container or kneaded.

[0034]

The spinning method and the draw-twisting method for obtaining the invented fiber are not particularly restricted. Draw-twisting after spinning by a conventional system, drawing immediately after spinning, or the like may be determined appropriately. The drawing method is not particularly restricted, and one-step drawing, multistep drawing, or the like may be determined appropriately.

[0035]

Spinning conditions may be determined appropriately from the viewpoint of the relative viscosities of the polymers or the operational efficiency. The following example is introduced as one example. A polymer resin composition is prepared by mixing a nylon 6 polymer having a relative viscosity of 3.0 and a nylon MXD6 polymer having a relative viscosity

of 2.7 as polyamide components. Melt-spinning is performed by a conventional method using polyethylene terephthalate having an intrinsic viscosity of 0.60 as a fiber-forming polymer having no affinity with the polyamide, so that an undrawn yarn is obtained. In this case, the extrusion temperature ($^{\circ}\text{C}$) is preferably from 280°C to 295°C , and particularly preferably from 283°C to 292°C . The spinning winding-up rate (m/min) is preferably from 500 m/min to 2000 m/min, and particularly preferably from 800 m/min to 1700 m/min.

[0036]

The draw-twisting conditions used after winding by the conventional method are not particularly restricted. One-step drawing, multistep drawing, roller heater/roller heater drawing, roller heater/plate heater drawing, or the like may be determined appropriately.

[0037]

For example, in the case of draw-twisting the undrawn yarn obtained through melt-spinning by the conventional method, if a roller heater and a plate heater are used, the temperature of the roller heater is preferably from 60°C to 90°C , and particularly preferably from 70°C to 85°C . The temperature of the plate heater is preferably from 130°C to 170°C , and particularly preferably from 145°C to 160°C .

[0038]

It is desirable to determine the draw ratio according to the spinning rate (m/min). Determination of a spinning rate and a draw ratio in good balance makes it possible to adjust the strength and the degree of elongation of the resulting fiber and, as a result, to obtain a fiber that is excellent in weaving ability. For example, when the spinning rate is adjusted at

1500 m/min, the draw ratio is preferably adjusted at 2.0 times to 2.4 times, and particularly preferably 2.1 times to 2.3 times.

[0039]

From the viewpoint of operational efficiency, the drawing rate (m/min) is preferably 500 m/min to 1000 m/min, and particularly preferably 600 m/min to 900 m/min. The spindle rotation speed (rpm) is preferably adjusted at a value that corresponds to the drawing rate. Appropriate determination of a spindle rotation speed balanced with a drawing rate results in a proper number of twist, so that good operational efficiency and good shrink performance can be obtained. The spindle rotation speed (rpm) is preferably adjusted at a rotation speed (rpm) as high as 8 times to 12 times the drawing rate (m/min).

[0040]

The fineness (dtex) of the invented fiber is not particularly limited and it may be determined appropriately as far as the fiber can be spun. In the production of a highly dense woven fabric, the total fineness of a warp and a weft is preferably 30 dtex to 300 dtex. It is more preferably 40 dtex to 200 dtex, and particularly preferably 50 dtex to 150 dtex. If the fineness is excessively low, the shrink performance as yarns may be low. Therefore, a fineness at which shrinkage occurs to a sufficient degree is preferably applied.

[0041]

While the invented fiber may have any fineness, the resulting fiber structure becomes superior in softness and density if at least part of, preferably the whole portion of the component after splitting is a superfine fiber having a

fineness of 0.5 dtex or less. The fineness is more preferably 0.3 dtex or less, and particularly preferably 0.2 dtex or less.

[0042]

The sectional shape of the invented fiber is preferably such a shape that one of the polyamide resin composition and the fiber-forming polymer having no affinity with the polyamide is not enclosed perfectly by the other in a cross section of a single fiber and both the components are joined together along the longitudinal direction of the single fiber. Specific examples include side-by-side type splittable conjugate fibers depicted in Fig. 1, side-by-side repetition type splittable conjugate fibers depicted in Fig. 2, radiately jointed splittable conjugate fibers depicted in Fig. 3 and Fig. 4, and hollow circular splittable conjugate fibers depicted in Fig. 5.

[0043]

The breaking strength (cN/dtex) of the invented fiber is preferably 3.50 cN/dtex or more, more preferably 4.00 cN/dtex or more, and particularly preferably 4.50 cN/dtex or more. Due to the fact that the fiber strength is high, it becomes possible, when fabricating the fiber into a woven fabric, to produce a woven fabric with a high density without causing yarn breakage.

[0044]

The elongation at break (%) of the invented fiber is preferably 25% to 55%. It is more preferably 25% to 45%, and particularly preferably 30% to 40%. Such an elongation at break results in good operational efficiency in weaving or the like.

[0045]

One example of a method for obtaining a fiber structure

by using the invented fiber is introduced below.

The fiber structure in the present invention includes woven fabric, warp knitted fabric, circular knitted fabric, nonwoven fabric, flocked fabric, and the like in which the splittable conjugate fiber of the present invention is used partly, preferably at 20% or more. The splittable conjugate fiber may be mix-spun, mix-twisted, mix-woven, or mix-knitted with a synthetic fiber composed of another single component. Similarly, it may be mix-twisted, mix-woven or mix-knitted with a natural fiber, such as cotton, wool, and silk.

[0046]

Various conventional methods can be used for splitting treatment of the splittable conjugate fiber of the present invention. For example, a method including splitting a polyamide and a fiber-forming polymer having no affinity with the polyamide by swelling/shrinking the polyamide with an aqueous emulsified solution of benzyl alcohol, phenylethyl alcohol, or the like, and a method including separating both the components with physical power, such as twisting, are known well.

[0047]

The physical splitting method includes various methods such as shearing, twisting, and impacting, and one example is a method including separating both the components by applying twist or heat to the fiber by false twisting. Since the polyamide resin composition to be used for the invented fiber is greatly swollen and shrunk by heat, splitting treatment can be performed efficiently also by false twisting.

[0048]

Another method is a method by alkali dissolution. This method is used when a polyester is used. It is a method that

includes immersing the invented fiber in a heated aqueous alkali solution to dissolve part of the polyester and simultaneously make the polyamide component to shrink, thereby splitting the fiber. When a polyolefin is used, it is possible to split the fiber only with hot water because the polyolefin is low in adhesiveness to a polyamide.

[0049]

As to the conditions of treatment with alkali dissolution, it is desirable to use a 0.5% to 5.0% sodium hydroxide solution. It is more preferably 1.0% to 3.0%, and particularly preferably 1.0% to 2.0%. The treating temperature is preferably 85°C to 100°C, more preferably 90°C to 98°C, and particularly preferably 95°C to 97°C. The treating time is preferably 5 min to 50 min, more preferably 10 min to 35 min, and particularly preferably 20 min to 30 min. If a high concentration alkali solution is used, the treatment time becomes short, whereas if a low concentration alkali solution is used, the treatment time becomes long.

[0050]

Moreover, a fiber structure using the splittable conjugate fiber of the present invention may, if necessary, be subjected to conventional post processing, such as hydrophilization, antistatic processing, water repellent finishing, oil repellent finishing, and stain-proofing.

[0051]

A fiber structure using the splittable conjugate fiber of the present invention is suitable for many applications including fashionable or functional garment applications, such as general garments like coats and blousons, and moisture-permeable water-proof garments, and industrial material applications, such as various wiping clothes

including eyeglass wipers, filter clothes, tents, and automotive air bags.

EXAMPLES

[0052]

The present invention is described below in detail with reference to Examples. However, the present invention is not limited to the following Examples.

[0053]

A. Measurement of relative viscosity and intrinsic viscosity

The measurement of viscosities is performed by the use of an automatic viscosity analyzer (model SS-600-L1) manufactured by Shibayama Scientific Co., Ltd. A polymer is dissolved at a concentration of 1 g/dl by using 95.8% concentrated sulfuric acid for a solvent, and a relative viscosity is measured at 25°C in a thermostatic bath. An intrinsic viscosity is measured using phenol/tetrachloroethane (volume ratio = 6/4) for a solvent, at 20°C in a thermostatic bath.

[0054]

B. Measurement of breaking strength and elongation at break

The measurement is performed by using an Autograph AGS-1KNG tensile tester manufactured by Shimadzu Corporation, under conditions including a sample yarn length of 20 cm and a fixed tensile rate of 20 cm/min according to JIS L-1013. The value obtained by dividing the maximum load in a load-elongation curve by the fineness is defined as a breaking strength (cN/dtex) and the elongation percentage at that time is defined as an elongation at break (%).

[0055]

C. Calculation of boiling water shrinkage

The calculation method of boiling water shrinkage is as follows. First, a fiber is folded and a weight of 0.2 g is hung on the folded position. The fiber is allowed to stand for 10 minutes at room temperature and measuring the fiber length. Then, the fiber is immersed in boiling water for 20 minutes. The fiber taken out of the boiling water was allowed to stand at room temperature for 10 minutes and then the fiber length after shrinkage is measured. The boiling water shrinkage Δw is calculated by the following formula.

$$\Delta w = [(L_0 - L_1)/L_0] \times 100 (\%)$$

L0: Fiber length before shrinkage at a load of 0.2 g

L1: Fiber length after shrinkage at a load of 0.2 g

[0056]

[Example 1]

A polyamide resin composition prepared by mixing nylon MXD6 having a relative viscosity of 2.7 and nylon 6 having a relative viscosity of 3.0 in a weight ratio of 50:50 is made to be component A. On the other hand, polyethylene terephthalate having an intrinsic viscosity of 0.61 is made to be component B.

[0057]

Melt conjugate spinning was performed at a component A : component B volume ratio of 1:2, a spinning temperature of 295°C and a spinning rate of 1500 m/min so that the component A would form a radial part, yielding an undrawn yarn having a cross section that was almost the same as that depicted in Fig. 4. At this time, the component A was supplied to a metering pump through a static mixer after melting. The resulting undrawn yarn was drawn at 85°C with a roller heater, at 150°C with a plate heater, and at a drawing rate of 2.50, so that a splittable conjugate fiber of 110 dtex/50 f was obtained.

[0058]

Using this drawn yarn, a cylindrical knitted fabric was produced with a cylindrical knitting machine of 28 gauges and a diameter of 10 cm. The resulting cylindrical knitted fabric was immersed in a 2% aqueous sodium hydroxide solution at 95°C for 30 minutes and then was washed with water, thereby being subjected to splitting/shrinking treatment. The resulting knitted fabric had bulkiness and exhibited good feeling.

[0059]

In order to examine the degree of sinking of the polyamide component, the L value (lightness) of the cylindrical knitted fabric in which only the polyamide component had been dyed into a deep color with an acidic dye was measured, so that the amount of polyamide fiber visible in the surface was examined. That is, if the shrinkage ratio of the polyamide component is high, the polyamide fiber sinks greatly and a large amount of polyethylene terephthalate that has not been dyed is present in the surface, so that the L value becomes large.

The shrinkage ratio and the L value of the resulting knitted fabric are shown in Table 1. As is clear from the table, the fabric shrinks greatly and has bulkiness. The dyed nylon component is hardly seen in the surface layer and the L value became large.

[0060]

<Evaluation of operational efficiency, physical properties and splittability due to variation of polyamide component>

[Examples 2 and 3, and Comparative Examples 1 and 2]

Fibers were produced in the same manner as in Example 1 except that the weight ratios of the nylon MXD6 and the nylon 6 of the polyamide component were changed, and various evaluations were carried out.

[0061]

[Table 1]

		Comparative Example 1	Example 2	Example 1	Example 3	Comparative Example 2
Polyamide component	Nylon MXD6/Nylon 6 (% by weight)	0/100	30/70	50/50	80/20	100/0
Yarn property	Strength (cN/dtex)	4.86	4.65	4.45	4.10	4.01
	Elongation at break (%)	33.4	33.3	35.3	33.2	30.8
	Boiling water shrinkage of splittable conjugate fiber (%)	9.4	12.1	14.7	11.2	9.1
	Boiling water shrinkage of polyamide component only (%)	15.2	39.3	52.7	29.0	15.3
Cylindrical knitted fabric	Area shrinkage (%)	31	43	47	42	29
	L value	67.3	77.9	78.9	77.5	65.2

[0062]

In Comparative Example 1, the polyamide component is composed only of an aliphatic polyamide (nylon 6), whereas in Comparative Example 2, the polyamide component is composed only of an aromatic polyamide (nylon MXD6). In such cases where a polyamide component was composed of a single component, the fiber was low in shrinkage and the fiber structure obtained after splitting treatment was poor in bulkiness. On the other hand, as is clear from the table, each of the knitted fabrics using Examples 1 to 3, which are according to the present invention, shrinks greatly and has bulkiness. The dyed nylon component is hardly seen in the surface layer and the L value becomes large.

[0063]

<Evaluation of feeling after treatment due to variation of polyamide component>

Each of the filaments of Examples 1 to 3 and Comparative Examples 1 and 2 was cylindrically knitted and then subjected

to alkali dissolving treatment in the same manner as in Example 1. The results of the evaluation of the feeling of the samples after treatment are shown in Table 2. The feeling was evaluated by sensory evaluation. A sample that was soft and had bulkiness was judged to be good in feeling. The evaluation is expressed by o (Good) and x (poor).

[0064]

[Table 2]

		Comparative Example 1	Example 2	Example 1	Example 3	Comparative Example 2	Example 4
Component A	Nylon MXD6/Nylon 6 (% by weight)	0/100	30/70	50/50	80/20	100/0	50/50
Component B		PET	PET	PET	PET	PET	PP
Alkali dissolving treatment	Area shrinkage (%)	31	43	47	42	29	44
	Feeling	x	○	○	○	x	○
Benzyl alcohol 5% treatment	Area shrinkage (%)	32	39	44	40	27	42
	Feeling	x	○	○	○	x	○
Hot water treatment	Area shrinkage (%)	25	28	30	26	24	40
	Feeling	x	x	x	x	x	○

PET: Polyethylene terephthalate

PP: Polypropylene

[0065]

Feeling evaluation of samples after alkali dissolving treatment was performed. As a result, in Comparative Examples 1 and 2, the fibers were not shrunk sufficiently by the alkali dissolving treatment, resulting in poor feeling. On the other hand, in Examples 1 to 3, which are according to the present invention, the fibers shrank much enough by alkali dissolving treatment, split, and exhibited good feeling with bulkiness.

[0066]

Next, benzyl alcohol 5% treatment was performed. As to the treatment conditions, the treatment was performed in a procedure including immersing a sample in an emulsified aqueous solution containing 5% by weight of benzyl alcohol and 0.5% by weight of SUNMORL BK-Conc (activating agent, produced

by Nicca Chemical Co., Ltd.), at 25°C for 3 minutes, then squeezing the sample to a pick-up of 80%, leaving it for 5 minutes, subjecting it to moist heat treatment with saturated steam at 102°C for 5 minutes, and then rinsing it. As a result, in Comparative Examples 1 and 2, the fibers were not split or shrunk sufficiently and felt poor. On the other hand, in Examples 1 to 3, which are according to the present invention, sufficient shrink performance was exhibited and good feeling was obtained even though benzyl alcohol of a concentration as low as 5% was used.

[0067]

<Evaluation of feeling after treatment due to variation of component B>

[Example 4]

Fibers were produced in the same manner as in Example 1 except that Component B was changed to a polypropylene and the treatment method was changed to immersion in hot water of 98°C for 10 minutes, and various evaluations were carried out. The results are shown in Table 2.

[0068]

The fiber was split and shrunk easily with hot water because a polyolefin has low adhesiveness to a polyamide. In addition, the fiber exhibited soft feeling with bulkiness.

INDUSTRIAL APPLICABILITY

[0069]

The fiber structure using the splittable conjugate fiber of the present invention is suitable for many applications including fashionable or functional garment applications, such as general garments like coats and blousons, and moisture-permeable water-proof garments, and industrial

material applications, such as various wiping clothes including eyeglass wipers, filter clothes, tents, and automotive air bags. Furthermore, since good feeling can be obtained even if a splitting method using a low concentration of alcohol or an agent other than alcohol is applied, the fiber structure is suitable for the production of low-cost, low environmentally loading products.

CLAIMS

[1] A splittable conjugate fiber, wherein one is made of a polyamide resin composition of an aromatic polyamide and an aliphatic polyamide and the other is made of a fiber-forming polymer having no affinity with the polyamide resin composition.

[2] The splittable conjugate fiber of claim 1, wherein the aromatic polyamide is a polyamide comprising an aliphatic dicarboxylic acid and an aromatic diamine as main structural units.

[3] The splittable conjugate fiber of claim 1, wherein the polyamide resin composition is composed of a nylon MXD6 polymer and a nylon 6 polymer.

[4] The splittable conjugate fiber of claim 3, wherein the weight ratios of the nylon MXD6 polymer and the nylon 6 polymer are from 35:65 to 70:30, respectively.

[5] The splittable conjugate fiber of any one of claims 1 to 4, wherein the fiber-forming polymer having no affinity with the polyamide resin composition is a polyester.

[6] The splittable conjugate fiber of any one of claims 1 to 4, wherein the fiber-forming polymer having no affinity with the polyamide resin composition is a polyolefin.