PROCESS FOR PREPARING ANTIMICROBIAL ELASTIC FIBER

Technical Field

The present invention relates to a process for preparing an antimicrobial elastic fiber, and more particularly to a process for preparing an antimicrobial elastic fiber comprising mixing a glass compound, as an antimicrobial agent, containing ZnO, SiO_2 and an alkali metal oxide, and having an average particle size of 0.1 μm to 5 μm, with a dispersant, sand grinding or milling the mixture, and adding the ground or milled mixture to a solution of a segmented polyurethane polymer.

Background Art

Polyurethane elastic fibers are superior in elasticity and elastic recovery. Due to these advantages, polyurethane elastic fibers are widely used as materials for stockings, women's underwear and flexible fabrics, and their applications continue to be extended to aerobic clothing and swimming suits.

Various kinds of bacteria and mildew adhere to

clothes and live on a variety of substances secreted from the human body. Of these, some bacteria and mildew adhere to fabrics and then spoil, discolor and/or contaminate the clothes, giving off a bad smell without doing direct harm to the body. In severe cases, some bacteria and mildew directly damage the body. Particularly, in the case of women's underwear, such as girdles and braziers, made of elastic fibers, bacteria and mildew live on secretions, such as sweat, and grow in the elastic fibers.

Some attempts to impart antimicrobial properties to polyurethane elastic fibers have been proposed. For example, U.S. Pat. No. 4,837,292 discloses a process for imparting antimicrobial properties to an elastic fiber by using poly(pentane-1,5-carbonate)diol or poly(hexane-1,6-carbonate)diol, which is a polycarbonate diol selected among aliphatic diols, or a copolymer thereof, as a soft segment. Although this process has the advantage that antimicrobial properties are achieved by utilizing the physical properties inherent to the raw materials without adding an additional antimicrobial agent, it has the problem of poor antimicrobial effect.

Further, Korean Patent Publication No. 93-5099 teaches an ion exchange of a porous crystalline aluminosilicate zeolite as an inorganic antimicrobial

agent with bactericidal metal ions in order to impart antimicrobial properties to a polyurethane elastic fiber. However, since the zeolite has strong adsorption of water, it functions to crosslink an elastic fiber polymer (i.e. polyurethane) during preparation of the elastic fiber. This crosslinking increases the viscosity of the polymerization product and causes the formation of a gel, resulting in a sharp rise in filtration pressure and frequent occurrence of yarn breakage upon spinning.

Thus, Korean Patent No. 103406 describes the use of a non-porous inorganic ceramic containing silver or zirconium as antimicrobial components in order to impart antimicrobial properties to an elastic fiber. However, the silver causes undesirable yellowing of the elastic fiber during spinning at a high temperature of 200°C or more.

Further, Korean Patent No. 445313 describes the use of a glass metal compound, as an antimicrobial agent, containing ZnO, SiO_2 and an alkali metal oxide in order to impart antimicrobial properties to an elastic fiber. Although no yellowing of the elastic fiber occurs during spinning at a high temperature of 200°C or more, the antimicrobial agent tends to agglomerate in dimethylacetamide or dimethylformamide as a polar solvent

for polyurethane, which is a material for the elastic fiber. As a consequence of the agglomeration, an increase in discharge pressure is caused and yarn breakage frequently occurs during spinning, making it difficult to maintain stable spinning of the antimicrobial fiber for a long period of time. So the antimicrobial agent must undergo milling or sand grinding to control the size of the antimicrobial agent particles so that the size is suitable for addition to the polyurethane. Specifically, the antimicrobial agent particles must have a secondary agglomerated particle size of 15 μm or less. To this end, extensive and time consuming milling of the antimicrobial agent is required. At this step, the antimicrobial agent is discolored to gray, which renders the color of the final antimicrobial elastic fiber gray.

Therefore, there is a need to develop a process for preparing an antimicrobial elastic fiber without affecting the spinnability or the color of the fiber while maintaining superior antimicrobial properties.

Disclosure of the Invention

Therefore, the present invention has been made in

view of the above problems, and it is an object of the present invention to provide an antimicrobial elastic fiber having excellent spinnability while maintaining superior antimicrobial properties and remaining unchanged in the color of yarn by using a glass metal compound, as an antimicrobial agent, containing ZnO, SiO_2, an alkali metal oxide and the like, and using a dispersant during milling or sand grinding the antimicrobial agent.

In accordance with one aspect of the present invention for achieving the above object, there is provided a process for preparing an antimicrobial elastic fiber which comprises: mixing a glass compound, as an antimicrobial agent, containing 50~78 mole% of ZnO, 21~49 mole% of SiO_2 and 1~10 mole% of an alkali metal oxide, and having an average particle size of 0.1 μm to 5 μm, with a dispersant; sand grinding or milling the mixture; and adding the ground or milled mixture to a solution of a segmented polyurethane polymer to prepare an elastic yarn.

In accordance with another aspect of the present invention, there is provided an antimicrobial elastic fiber prepared by the process.

The present invention will now be described in more detail.

The antimicrobial agent used in the process of the

present invention is characterized in that it is a glass metal compound containing ZnO, SiO_2 and an alkali metal oxide, and having an average particle size of 0.1 μm to 5 μm.

It is preferred that the antimicrobial agent is non-porous. In the case where a porous antimicrobial agent having strong adsorption of water is used, an elastic fiber polymer (i.e. polyurethane) is crosslinked during preparation of an elastic fiber. This crosslinking increases the viscosity of the polymerization product and causes the formation of a gel, resulting in a sharp rise in filtration pressure and frequent occurrence of yarn breakage upon spinning.

Specifically, the antimicrobial agent preferably contains 50~78 mole% of ZnO. When the ZnO content exceeds 78 mole%, it is difficult to form the antimicrobial agent into a glass compound. On the other hand, when the ZnO content is below 50 mole%, the antimicrobial properties of the antimicrobial agent are insufficient.

The antimicrobial agent preferably contains 21~49 mole% of SiO_2, which is a component for glass formation. When the SiO_2 content exceeds 49 mole%, the water solubility of the antimicrobial agent is high, thus causing poor antimicrobial properties. Meanwhile, when

the SiO_2 content is less than 21 mole%, it is difficult to obtain a stable glass compound.

SiO_2 is used as an essential component for glass formation in the antimicrobial agent, but a portion of SiO_2 may be replaced with other components for glass formation. As such components, there can be used, for example, P_2O_5, Al_2O_3, TiO_2, and ZrO_2. Preferred amounts of the components range from 0.1 to 19 mole%.

The antimicrobial agent preferably contains 1~10 mole% of an alkali metal oxide. When the content of the alkali metal oxide is less than 1 mole%, the antimicrobial properties of the antimicrobial agent are degraded. On the other hand, when the content of the alkali metal oxide exceeds 10 mole%, the water solubility of the antimicrobial agent is high and thus poor antimicrobial properties are caused with impairing the discoloration resistance of the antimicrobial agent.

Examples of alkali metal oxides usable in the process of the present invention include oxides of Na, K, and Li. These oxides can be alone or in combination as a mixture of two or three oxides.

In the process of the present invention, the antimicrobial agent is preferably added in an amount of 0.2 to 5% by weight, relative to the weight of yarn. If

the antimicrobial agent is added in an amount of less than 0.2% by weight, the antimicrobial effects cannot be ensured. If the antimicrobial agent is added in an amount exceeding 5% by weight, the physical properties of the antimicrobial elastic fiber may be deteriorated.

Since the antimicrobial agent is an inorganic material, dispersion of the antimicrobial agent is required before addition to an elastic fiber polymer (polyurethane). Since the antimicrobial agent tends to agglomerate in dimethylacetamide, dimethylformamide or dimethylsulfoxide as a polar solvent for the elastic fiber polymer (polyurethane), there is a large possibility that a rise of extrusion pressure may be caused and yarn breakage may frequently occur during spinning. Accordingly, in order to maintain the secondary agglomerated particle size of the antimicrobial agent at 15 μm or less before addition of the antimicrobial agent to the polyurethane solution, extensive and time consuming milling or sand grinding of the antimicrobial agent is required. At this step, the antimicrobial agent may be discolored to gray, as described above.

According to the process of the present invention, a dispersant, such as a fatty acid, a fatty acid salt, a fatty acid ester or an aliphatic alcohol, is added to

improve the dispersibility of the antimicrobial agent in the polar solvent, thereby shortening the milling time of the antimicrobial agent and preventing the discoloration of the antimicrobial agent. That is, the dispersant reduces the friction against the antimicrobial agent created during milling, and improves the flowability and dispersibility of the antimicrobial agent. In addition, the dispersant may be coated on the surface of the antimicrobial agent, enhancing the above effects.

As suitable fatty acids, there can be exemplified monocarboxylic and dicarboxylic acids having a $C_{3\sim40}$ linear or branched hydrocarbon. Specific examples include capric acid, lauric acid, myristic acid, palmitic acid, stearic acid, and behenic acid.

The fatty acid salt is a compound that can be represented by the formula RCOOM (wherein R is an alkyl or alkenyl group, and preferably a $C_{3\sim40}$ linear or branched hydrocarbon; and M is a metal, and preferably an alkali metal or alkaline earth metal). Specific examples include sodium stearate, lithium stearate, zinc stearate, magnesium stearate, calcium stearate, potassium oleate, and aluminum stearate.

Examples of preferred fatty acid esters include glycerin monostearate, and glycerin oleate.

The aliphatic alcohol is a monovalent or polyvalent aliphatic alcohol of a $C_{3\sim40}$ linear or branched hydrocarbon. Examples of preferred aliphatic alcohols include: alkanols, e.g., n-hexanol, n-heptanol, n-octanol, 2-ethyl hexanol, isooctyl alcohol, 2-octanol, methyl heptanol, decyl alcohol, isodecyl alcohol, capryl alcohol, lauryl alcohol, myristyl alcohol, palmityl alcohol, oleyl alcohol, behenyl alcohol, cetyl alcohol, and stearyl alcohol; cycloalkanols, e.g., cyclohexanol and methyl cyclohexanol; alkanediols, e.g., propylene glycol, trimethylene glycol, 1,2-butylene glycol, 2,3-butylene glycol, 1,4-butylene glycol, 1,6-hexanediol, pinacol, 1,2-pentanediol, 2-methyl-2,4-pentanediol, 1,3-butylene glycol, neopentyl glycol, 2-ethyl-1,3-hexanediol, 2,4-pentanediol, 2,4-heptanediol, 2,2-diethyl-1,3-propanediol, 2-ethyl-2-butyl-1,3-propanediol, and 2-methyl-2-butyl-1,3-propanediol; polyols, e.g., pentaerythritol and dipentaerythritol; and mixtures thereof.

Examples of more preferred aliphatic alcohols include stearyl alcohol, lauryl alcohol, capryl alcohol, oleyl alcohol, pentaerythritol, and mixtures thereof.

It is preferred that the dispersant, selected from the fatty acids, fatty acid salts, fatty acid esters and aliphatic alcohols, and the antimicrobial agent are added

in a weight ratio between 1 : 10 and 1 : 1 during the milling or sand grinding process. Since the content of the antimicrobial agent in a yarn is in the range of 0.2% to 5% by weight, the content of the dispersant in the yarn is between 0.02% and 5% by weight, in proportion to that of the antimicrobial agent. When the weight ratio is below 1 : 10, the dispersion effects are negligible. Meanwhile, when the weight ratio exceeds 1 : 1, the excess dispersant does not contribute to further improvement of dispersion effects.

As is well known in the art, a segmented polyurethane polymer used to prepare the elastic yarn by the process of the present invention is produced by reacting an organic diisocyanate with a polymeric diol to obtain a polyurethane precursor, dissolving the precursor in an organic solvent, and reacting the precursor with a diamine and a monoamine.

As suitable organic diisocyanates, there can be mentioned, for example, diphenylmethane-4,4'-diisocyanate, hexamethylenediisocyanate, toluenediisocyanate, butylenediisocyanate, and hydrogenated p,p'-methylenediisocyanate. As suitable polymeric diols, there can be mentioned, for example, polytetramethylene ether glycol, polypropylene glycol, and polycarbonate diol. The

diamines are used as chain extenders, and their specific examples include ethylenediamine, propylenediamine, and hydrazine. On the other hand, the monoamines are used as chain terminators, and their specific examples include diethylamine, monoethanolamine, and dimethylamine.

As other additives, UV stabilizers, antioxidants, NO_x gas anti-yellowing agents, dyeing promoters, anti-chlorine agents, and the like, can be additionally used.

These additives may be added in a mixture with the antimicrobial agent. More preferably, the additives are first added and then the antimicrobial agent is added just before spinning.

Best Mode for Carrying Out the Invention

The present invention will now be described in more detail with reference to the following examples. However, these examples are given for the purpose of illustration and are not to be construed as limiting the scope of the invention.

Antimicrobial agents A-F were prepared in Preparative Examples 1 to 6, respectively. The size of secondary agglomerated particles of the antimicrobial agents was evaluated by the following procedure.

<Evaluation of the size of secondary agglomerated particles of antimicrobial agents>

After an antimicrobial agent slurry was prepared by milling, 2 kg of the slurry was sampled. The sampled slurry was fed into a closed tank in which a pneumatic pressure could be applied from the top and a stainless sieve (pore size: 15 μm) having a diameter of 3.6 cm was installed at a lower outlet. Pressure was applied in such a manner that the slurry could be discharged only through the sieve. The amount of the slurry passing through the sieve for 2 minutes was measured while applying a pneumatic pressure of 1.5 kgf/cm^2. When the whole amount(2kg) of the slurry was passed through the sieve, the antimicrobial agent was considered as having a secondary agglomerated particle size of 15 μm or less. If the whole amount (2kg) of a slurry sample was passed through the sieve, the sample was judged to have "passed". If a portion of a slurry sample remained, the sample was judged to have "failed".

Preparative Example 1: Antimicrobial agent slurry A

A solution of 9.76 wt% of an antimicrobial agent and 2.44 wt% of stearic acid in dimethylacetamide was milled

in a machine (DCP-SUPERFLOW 170, Drais Mannheim, Germany) with zirconia balls (diameter: 0.5 mm) to disperse the antimicrobial agent slurry. The antimicrobial agent used herein was a glass metal compound containing 62.1 mole% of ZnO, 31.1 mole% of SiO_2, 2.5 mole% of P_2O_5, 2.3 mole% of Al_2O_3 and 2.0 mole% of Na_2O, and had an initial average particle diameter of 3.5 μm. Specifically, 0.1 tons of the antimicrobial agent, 0.025 tons of stearic acid and 0.9 tons of dimethylacetamide were added to a slurry preparation tank. Thereafter, the dispersion of the slurry was performed in the milling machine at 600 rpm while circulating the slurry at a rate of 24 kg/min. through a pipe between the tank and the milling machine. After milling for 40 hours, the filterability test was conducted by passing the dispersed slurry through the sieve. As a result, the amount of the antimicrobial agent slurry passing through the sieve was 2 kg, and thus the antimicrobial agent slurry was judged to have "passed". The color of the slurry was white.

Preparative Example 2: Antimicrobial agent slurry B

A solution of 9.76 wt% of an antimicrobial agent and 2.44 wt% of magnesium stearate in dimethylacetamide was milled in a machine (DCP-SUPERFLOW 170, Drais Mannheim,

Germany) with zirconia balls (diameter: 0.5 mm) to disperse the antimicrobial agent slurry. The antimicrobial agent used herein was a glass metal compound containing 62.1 mole% of ZnO, 31.1 mole% of SiO_2, 2.5 mole% of P_2O_5, 2.3 mole% of Al_2O_3 and 2.0 mole% of Na_2O, and had an initial average particle diameter of 3.5 μm. Specifically, 0.1 tons of the antimicrobial agent, 0.025 tons of magnesium stearate and 0.9 tons of dimethylacetamide were added to a slurry preparation tank. Thereafter, the dispersion of the slurry was performed in the milling machine at 600 rpm while circulating the slurry at a rate of 24 kg/min. through a pipe between the tank and the milling machine. After milling for 45 hours, the filterability test was conducted by passing the dispersed slurry through the sieve. As a result, the amount of the antimicrobial agent slurry passing through the sieve was 2 kg, and thus the antimicrobial agent slurry was judged to have "passed". The color of the slurry was white.

Preparative Example 3: Antimicrobial agent slurry C

A solution of 9.76 wt% of an antimicrobial agent and 2.44 wt% of sodium stearate in dimethylacetamide was milled in a machine (DCP-SUPERFLOW 170, Drais Mannheim,

Germany) with zirconia balls (diameter: 0.5 mm) to disperse the antimicrobial agent slurry. The antimicrobial agent used herein was a glass metal compound containing 62.1 mole% of ZnO, 31.1 mole% of SiO_2, 2.5 mole% of P_2O_5, 2.3 mole% of Al_2O_3 and 2.0 mole% of Na_2O, and had an initial average particle diameter of 3.5 μm. Specifically, 0.1 tons of the antimicrobial agent, 0.025 tons of sodium stearate and 0.9 tons of dimethylacetamide were added to a slurry preparation tank. Thereafter, the dispersion of the slurry was performed in the milling machine at 600 rpm while circulating the slurry at a rate of 24 kg/min. through a pipe between the tank and the milling machine. After milling for 48 hours, the filterability test was conducted by passing the dispersed slurry through the sieve. As a result, the amount of the antimicrobial agent slurry passing through the sieve was 2 kg, and thus the antimicrobial agent slurry was judged to have "passed". The color of the slurry was white.

Preparative Example 4: Antimicrobial agent slurry D

A solution of 9.76 wt% of an antimicrobial agent and 2.44 wt% of stearyl alcohol in dimethylacetamide was milled in a machine (DCP-SUPERFLOW 170, Drais Mannheim, Germany) with zirconia balls (diameter: 0.5 mm) to

disperse the antimicrobial agent slurry. The antimicrobial agent used herein was a glass metal compound containing 62.1 mole% of ZnO, 31.1 mole% of SiO_2, 2.5 mole% of P_2O_5, 2.3 mole% of Al_2O_3 and 2.0 mole% of Na_2O, and had an initial average particle diameter of 3.5 μm. Specifically, 0.1 tons of the antimicrobial agent, 0.025 tons of stearyl alcohol and 0.9 tons of dimethylacetamide were added to a slurry preparation tank. Thereafter, the dispersion of the slurry was performed in the milling machine at 600 rpm while circulating the slurry at a rate of 24 kg/min. through a pipe between the tank and the milling machine. After milling for 45 hours, the filterability test was conducted by passing the dispersed slurry through the sieve. As a result, the amount of the antimicrobial agent slurry passing through the sieve was 2 kg, and thus the antimicrobial agent slurry was judged to have "passed". The color of the slurry was white.

Preparative Example 5: Antimicrobial agent slurry E

A solution of 9.76 wt% of an antimicrobial agent and 2.44 wt% of glycerin monostearate in dimethylacetamide was milled in a machine (DCP-SUPERFLOW 170, Drais Mannheim, Germany) with zirconia balls (diameter: 0.5 mm) to disperse the antimicrobial agent slurry. The

antimicrobial agent used herein was a glass metal compound containing 62.1 mole% of ZnO, 31.1 mole% of SiO_2, 2.5 mole% of P_2O_5, 2.3 mole% of Al_2O_3 and 2.0 mole% of Na_2O, and had an initial average particle diameter of 3.5 μm. Specifically, 0.1 tons of the antimicrobial agent, 0.025 tons of glycerin monostearate and 0.9 tons of dimethylacetamide were added to a slurry preparation tank. Thereafter, the dispersion of the slurry was performed in the milling machine at 600 rpm while circulating the slurry at a rate of 24 kg/min. through a pipe between the tank and the milling machine. After milling for 43 hours, the filterability test was conducted by passing the dispersed slurry through the sieve. As a result, the amount of the antimicrobial agent slurry passing through the sieve was 2 kg, and thus the antimicrobial agent slurry was judged to have "passed". The color of the slurry was white.

Preparative Example 6: Antimicrobial agent slurry F

A solution of 10 wt% of an antimicrobial agent in dimethylacetamide was milled in a machine (DCP-SUPERFLOW 170, Drais Mannheim, Germany) with zirconia balls (diameter: 0.5 mm) to disperse the antimicrobial agent slurry. The antimicrobial agent used herein was a glass

metal compound containing 62.1 mole% of ZnO, 31.1 mole% of SiO_2, 2.5 mole% of P_2O_5, 2.3 mole% of Al_2O_3 and 2.0 mole% of Na_2O, and had an initial average particle diameter of 3.5 μm. Specifically, 0.1 tons of the antimicrobial agent and 0.9 tons of dimethylacetamide were added to a slurry preparation tank. Thereafter, the dispersion of the slurry was performed in the milling machine at 600 rpm while circulating the slurry at a rate of 24 kg/min. through a pipe between the tank and the milling machine.

After milling for 72 hours, the filterability test (for the evaluation of the size of secondary agglomerated particles of the antimicrobial agent) was conducted by passing the dispersed slurry through the sieve. As a result, the amount of the antimicrobial agent slurry passing through the sieve was 200g, and thus the antimicrobial agent slurry was judged to have "failed". The color of the slurry was gray.

Example 1

518g of diphenylmethane-4,4'-diisocyanate was reacted with 2,328g (molecular weight: 1,800) of polytetramethylene ether glycol under a stream of nitrogen gas at 85°C with stirring for 90 minutes to prepare a polyurethane precursor having isocyanate groups at both

terminals. After the polyurethane precursor was allowed to cool to room temperature, it was dissolved in 4,643g of dimethylacetamide to prepare a polyurethane precursor solution. Subsequently, a solution of 54g of propylenediamine, 9.1g of diethylamine and 1,889g of dimethylacetamide was added to the polyurethane precursor solution at a temperature of 10°C or less to prepare a solution of a segmented polyurethane polymer. 1.5% by weight of ethylenebis(oxyethylene)bis-(3-(5-t-butyl-4-hydroxy-m-tolyl)-propionate), 0.5% by weight of 5,7-di-t-butyl-3-(3,4-dimethylphenyl)-3H-benzofuran-2-one, 1% by weight of 1,1,1',1'-tetramethyl-4,4'-(methylene-di-p-phenylene)disemicarbazide, 1% by weight of poly(N,N-diethyl-2-aminoethyl methacrylate), and 0.1% by weight of titanium dioxide were added to the polyurethane polymer solution. The weight percentages of these additives were based on the total weight of the solids of the polyurethane polymer solution. Then, the antimicrobial agent slurry prepared in Preparative Example 1 was added to the polyurethane polymer solution, and so the content of the antimicrobial agent in the yarn was 1.5% by weight and the content of the dispersant(stearic acid) in the yarn was 0.375% by weight. The obtained spinning stock solution was defoamed, and was then dry spun at a spinning

temperature of 250°C to produce 40 denier/4 filament elastic yarns. The elastic yarns were knitted into a tubular knitted fabric with 100% spandex using a circular knitting machine (KT-400, diameter: 4 inch, 400 needles, Nagakaseiki, Japan). A common scouring process was used to scoure the spandex tubular knitted fabric. The physical properties of the scoured fabric were evaluated by the following respective procedures. The results are shown in Table 1.

(1) Evaluation of antimicrobial activity

The antimicrobial activity of the tubular knitted fabric was evaluated in accordance with the following procedure. *Staphylococcus aureus* (ATCC6538) and *Escherichia coli* (ATCC8739) were employed as test bacteria for the evaluation of antimicrobial activity. The antimicrobial activity was determined in accordance with the test method of Korean Industrial Standard (KS) K 0693-2001.

Antimicrobial activity (bacteriostatic rate, %)

= [(Number of living bacteria after 18 hour incubation in control sample - Number of living bacteria after 18 hour incubation in test sample) / (Number of living bacteria after 18 hour incubation in control

sample)] x 100

- Test sample: Spandex tubular knitted fabric
- Control sample: Cotton (defined in Korean industrial standards K 0905-1996)

(2) Evaluation of whiteness

The whiteness of the tubular knitted fabric was evaluated in accordance with the following procedure. The lightness ("L") value of the tubular knitted fabric was measured using a color-view spectrophotometer (BYK-Gardener, U.S.A.) under the following test conditions: Instrument Geometry = $45^0/0^0$, Illuminant/Observer = $D65/10^0$, 11 mm sample port aperture, Number of measurements: 3)

Examples 2 to 5

Spandex tubular knitted fabrics were produced in the same manner as in Example 1, except that the antimicrobial agents prepared in Preparative Examples 2 to 5 were used. The physical properties of the fabrics were evaluated and the obtained results are shown in Table 1.

Comparative Example 1

A spandex tubular knitted fabric was produced in the same manner as in Example 1, except that the antimicrobial agent prepared in Preparative Example 6 was used. The physical properties of the fabric were evaluated and the obtained results are shown in Table 1.

[Table 1]

Ex. No.	Antimicrobial slurry	Spinnability (Yarn breakage: frequency/time)	Yarn color (L value)	Antimicrobial activity (bacteriostatic rate) (%)	
				Staphylococcus aureus	*Escherichia coli*
Ex. 1	A	0.01	89.1	99.4	99.3
Ex. 2	B	0.02	89.2	99.5	99.3
Ex. 3	C	0.01	89.1	99.4	99.3
Ex.	D	0.01	89.3	99.1	99.3

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Ex. 5	E	0.01	89.1	99.5	99.4
Comp. Ex. 1	F	3	85.4	99.1	99.2

* The higher the "L value", the better the whiteness

As can be seen from the results shown in Table 1, the spandex fabrics using the antimicrobial slurries prepared by the process of the present invention were superior in antimicrobial activity, spinnability, and yarn color.

As apparent from the above description, the antimicrobial elastic fiber prepared by the process of the present invention exhibits excellent spinnability while maintaining superior antimicrobial properties and remaining unchanged in the yarn color.

Although the preferred embodiments of the present invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible,

without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

Claims:

1. A process for preparing an antimicrobial elastic fiber, comprising:

mixing a glass compound, as an antimicrobial agent, containing 50~78 mole% of ZnO, 21~49 mole% of SiO_2 and 1~10 mole% of an alkali metal oxide, and having an average particle size of 0.1 μm to 5 μm, with a dispersant in a solvent;

sand grinding or milling the mixture; and

adding the ground or milled mixture to a solution of a segmented polyurethane polymer to prepare an elastic yarn.

2. The process according to claim 1, wherein the glass compound further comprises 0.1~19 mole% of at least one material selected from the group consisting of P_2O_5, Al_2O_3, TiO_2, and ZrO_2.

3. The process according to claim 1, wherein the antimicrobial agent is non-porous.

4. The process according to claim 1, wherein the dispersant is at least one compound selected from the

group consisting of fatty acids, fatty acid salts, fatty acid esters, and aliphatic alcohols.

5. The process according to claim 1, wherein the solvent is at least one solvent selected from the group consisting of dimethylacetamide, dimethylformamide, and dimethylsulfoxide.

6. The process according to claim 1, wherein the antimicrobial agent is added in an amount of 0.2 to 5% by weight, relative to the weight of the elastic fiber.

7. The process according to claim 1, wherein the dispersant and the antimicrobial agent are used in a weight ratio between 1 : 10 and 1 : 1 during the mixing and the milling or sand grinding.

8. The process according to claim 1, wherein the antimicrobial agent has a secondary agglomerated particle size of 15 μm or less, after the mixing and the milling or sand grinding and prior to the addition to the solution of a segmented polyurethane polymer.

9. An antimicrobial elastic fiber prepared by the

process according to any one of claims 1 to 8.