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(54) **BIODEGRADABLE GLOVE AND A PREPARATION METHOD THEREOF**

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(57) **ABSTRACT**

The present invention belongs to the technical field of gloves, and relates to a biodegradable glove and a preparation method thereof. It comprises the following steps: S1, passing a glass fiber or steel yarn metal through a yarn tension controller and the spindle hole as the yarn core, and winding and wrapping the biodegradable filament yarn as the outer yarn to form the coated yarn for gloves, then weaving into textile gloves on a glove knitting machine; S2. gum dipping the textile gloves to form the degradable gloves. The preparation method is simple and easy to operate, and is suitable for large-scale production.

| | Type of gloves | Basic fiber | Core material | Weaving method | Type of gum dipping | Anti-skid treatment |
|---|---|---|---|---|---|---|
| Example 1 | Ordinary gloves | Chinlon DTY | No | knitting | butyronitrile glue | sodium chloride |
| Example 2 | Ordinary gloves | dacron staple fiberyarn | No | knitting | PU glue | No |
| Example 3 | Cutting gloves | high strength Dacron FDY/glass fiber | glass fiber | knitting | butyronitrile glue | sodium chloride |
| Example 4 | Cutting gloves | high strength Dacron FDY/glass fiber/ Steel yarn/ spandex/HPPE | glass fiber/ Steel yarn/ spandex | knitting | butyronitrile glue | sodium sulfate |
| Example 5 | Cutting gloves | high strength chinlon DTY/HPPE/Tungsten yarn | Tungsten yarn | knitting | PU glue | No |

| | Type of gloves | Basic fiber | Core material | Weaving method | Type of gum dipping | Anti-skid treatment |
|---|---|---|---|---|---|---|
| Example 1 | Ordinary gloves | Chinlon DTY | No | knitting | butyronitrile glue | sodium chloride |
| Example 2 | Ordinary gloves | dacron staple fiberyarn | No | knitting | PU glue | No |
| Example 3 | Cutting gloves | high strength Dacron FDY/glass fiber | glass fiber | knitting | butyronitrile glue | sodium chloride |
| Example 4 | Cutting gloves | high strength Dacron FDY/glass fiber/ Steel yarn/ spandex/HPPE | glass fiber/ Steel yarn/ spandex | knitting | butyronitrile glue | sodium sulfate |
| Example 5 | Cutting gloves | high strength chinlon DTY/HPPE/Tungsten yarn | Tungsten yarn | knitting | PU glue | No |

Fig. 1

# BIODEGRADABLE GLOVE AND A PREPARATION METHOD THEREOF

## TECHNICAL FIELD

**[0001]** The present invention belongs to the technical field of gloves, in particular to a biodegradable glove and a preparation method thereof.

## BACKGROUND

**[0002]** For skid resistance and wear resistance, gloves for industrial or civil uses on the market at present will use high-molecular polymers such as synthetic nitrile, and polyurethane, etc., as raw materials, however, gloves are consumables with high replacement frequency, and waste gloves will pollute the environment. With the national attention to environmental problems, people have a deeper understanding of clean production methods and environment-friendly materials. Therefore, while solving the wear resistant and skid resistance, how to improve the degradation performance of gloves has become an urgent problem to be solved.

## SUMMARY

**[0003]** In order to overcome the shortcomings and deficiencies existing in the prior art, the object of the present invention is to provide a preparation method of biodegradable gloves. The preparation method is simple and easy to operate, and the prepared gloves not only have good skid resistance, wear resistance and dust-prevention properties, but also have degradable properties. Another object of the present invention is to improve the biodegradability of gloves.

**[0004]** The objects of the present invention are realized by the following technical solution: a preparation method of a biodegradable glove, comprising the following steps:

**[0005]** S1, fixing an aluminum cup of the wound yarn on the spindle, passing a glass fiber or steel yarn metal through a yarn tension controller and the spindle hole as the yarn core, winding and wrapping the biodegradable filament yarn as the outer yarn to form the coated yarn for gloves, then weaving into textile gloves on a glove knitting machine;

**[0006]** S2. gum dipping the textile gloves to form the degradable gloves;

**[0007]** the gum dipping process comprises the following steps,

**[0008]** S21, mixing materials;

**[0009]** S22, preheating of hand mold: putting gloves on the hand mold, then preheating the hand mold to 40-90° C.;

**[0010]** S23, dip coating and glue evening;

**[0011]** S24, baking: putting the hand mold covered with gloves into an environment at a temperature of 90-120° C. and baking for 1-20 minutes;

**[0012]** S25, rinsing with clean water and soaking;

**[0013]** S26, baking: putting the rinsed and soaked gloves into an environment at a temperature of 90-120° C. and baking for 1-20 minutes.

**[0014]** S21, in the mixing materials, the raw materials in the mixture comprising water, polyurethane, dimethylformamide and biodegradable additives or water, butyronitrile and biodegradable additives, the biodegradable additives being at least one of natural cellulose, synthetic polycaprolactone, polyvinyl alcohol, biodegradable oligomer polyester, aromatic-aliphatic ester polymer, maleic anhydride-based modified polylactic acid (MPLA), butanediamine modified polylactic acid (BMPLA), monosaccharide and aldohexose.

**[0015]** Ceramic parts are blended into the spindle hole.

**[0016]** The yarn will have uneven tension during spooling and yarn feeding. The problem of uneven tension can be effectively avoided through a tension controller.

**[0017]** Blending ceramic parts into the spindle hole can increase the fluency in the yarn wrapping process and play the role of lubrication. Reduce the metal friction between glass fiber, steel yarn metal, etc., and spindle, and reduce the yarn breakage rate and yarn abrasion.

**[0018]** The preparation method is simple and easy to operate, and the prepared gloves not only have good skid resistance, wear resistance and dust-prevention properties, but also have degradable properties.

**[0019]** The preparation method of the biodegradable filament yarn in step S1 is as follows: baking the biodegradable additive in an environment of 50-90° C. for 2-6 hours, blending into the pre-crystallized and dried polyethylene terephthalate, spinning the primary fiber and then drafting to obtain the pre-drafted filament yarn, and then subjecting same to hot-drafting and false twist crimping process to prepare the biodegradable filament yarn; the preparation method of the staple fiber yarn in step S1 is as follows: baking the biodegradable additive in an environment of 50-90° C. for 2-6 hours, blending into the pre-crystallized and dried polyethylene terephthalate, spinning the primary fiber and then drafting, crimping and cutting to obtain the staple fiber, then spinning to obtain the staple fiber yarn; and the biodegradable additives being at least one of natural cellulose, synthetic polycaprolactone, polyvinyl alcohol, biodegradable oligomer polyester, aromatic-aliphatic ester polymer, maleic anhydride-based modified polylactic acid (MPLA), butanediamine modified polylactic acid (BMPLA), monosaccharide and aldohexose.

**[0020]** Polyester fiber spinning requires very low moisture content; however, the biodegradable masterbatch is a hydrophilic masterbatch, which contains a certain amount of water, and will lead to the hydrolysis of polyester macromolecules in the spinning stream. After oven-drying for 2-6 hours at 50-90° C., it can be ensured that the moisture content of spinning meets the requirements of polyester spinning without hydrolysis of polyester molecules.

**[0021]** The biodegradable additive accounts for 0.5% to 10% of the total weight of the biodegradable additive and the polyethylene terephthalate.

**[0022]** Preferably, the biodegradable additive is a composition composed of biodegradable oligomer polyester, butanediamine modified polylactic acid (BMPLA) and aldohexose in 1: (1-3): (1-3).

**[0023]** The present invention uses the mixture in the above proportion as a biodegradable additive to make the prepared gloves easier to degrade and maintain good skid resistance, wear resistance and high elasticity.

**[0024]** More preferably, the biodegradable additive is a composition composed of biodegradable oligomer polyester, butanediamine modified polylactic acid (BMPLA) and aldohexose in 1:1:1.

**[0025]** In another technical solution, the preparation method of the biodegradable filament yarn in step S1 is as

follows: blending the biodegradable additive into the chinlon, spinning the primary fiber and then drafting to obtain the pre-drafted filament yarn, and then subjecting same to hot-drafting and false twist crimping process to prepare the biodegradable chinlon filament yarn, wherein, the first roller during drafting is composed of a yarn feeding roller and an apron, the false twister in the false twist crimping process is a polyurethane flexible disk; the preparation method of short fiber yarn in step S1 is as follows: blending the biodegradable additives into nylon, spinning the primary fiber and then drafting, crimping and cutting to obtain the staple fiber, then spinning to obtain the degradable chinlon staple fiber yarn; and the biodegradable additives being at least one of natural cellulose, synthetic polycaprolactone, polyvinyl alcohol, biodegradable oligomer polyester, aromatic-aliphatic ester polymer, maleic anhydride-based modified polylactic acid (MPLA), butanediamine modified polylactic acid (BMPLA), monosaccharide and aldohexose.

**[0026]** Since the surface of chinlon fiber is covered by boot layer and the chinlon fiber is hydrophilic, when hydrophilic biodegradable fiber is blended, the surface friction coefficient of POY is very small and easy to skid. In order to ensure the force of holding fiber during drafting, the first roller (feeding roller) is composed of a yarn feeding roller and an apron instead of leather roller; and the false twister adopts flexible disk, such as polyurethane PU.

**[0027]** The biodegradable additive accounts for 0.5% to 10% of the total weight of the biodegradable additive and polyamides.

**[0028]** Preferably, the biodegradable additive is a composition composed of biodegradable oligomer polyester, and aldohexose in 1: (1-3).

**[0029]** The present invention adopts the degradable additive in the above proportion, which not only maintains the good skid resistance and wear resistance of the gloves, making the gloves have better degradability, but also has low production cost and is suitable for mass production.

**[0030]** More preferably, the biodegradable additive is a composition composed of polyvinyl alcohol and aldohexose in 1:1.

**[0031]** In another technical solution, the preparation method of the biodegradable filament yarn in step S1 is as follows: blending the biodegradable additive into the polypropylene chips, spinning the primary fiber and then drafting to obtain the pre-drafted filament yarn, and then subjecting same to hot-drafting and false twist crimping process to prepare the biodegradable polypropylene filament yarn; the preparation method of short fiber yarn in step S1 is as follows: blending the biodegradable additives into polypropylene chips, spinning the primary fiber and then drafting, crimping and cutting to obtain the staple fiber, then spinning to obtain the staple fiber yarn; and the biodegradable additives being at least one of natural cellulose, synthetic polycaprolactone, polyvinyl alcohol, biodegradable oligomer polyester, aromatic-aliphatic ester polymer, maleic anhydride-based modified polylactic acid (MPLA), butanediamine modified polylactic acid (BMPLA), monosaccharide and aldohexose.

**[0032]** The biodegradable additive accounts for 0.5% to 10% of the total weight of the biodegradable additive and polypropylene fiber.

**[0033]** The mixing materials step in step S21 is to mix water, polyurethane, dimethylformamide and biodegradable additives, then stir at high speed for 10-60 minutes, and then stand for 1-120 minutes, and the water, polyurethane, dimethylformamide and biodegradable additives are calculated according to parts by weight as:

**[0034]** water 10-80 parts

**[0035]** polyurethane 20-80 parts

**[0036]** dimethylformamide 10-50 parts

**[0037]** biodegradable additives 0.5-10 parts

**[0038]** As the solvent of polyurethane PU, dimethylformamide is difficult to volatilize and remove under normal conditions. Therefore, water is used as a diluent to speed up the removal of dimethylformamide DMF and make the gloves shape up as soon as possible.

**[0039]** The biodegradable additive is at least one of natural cellulose, synthetic polycaprolactone, polyvinyl alcohol, biodegradable oligomer polyester, aromatic-aliphatic ester polymer, maleic anhydride-based modified polylactic acid (MPLA), butanediamine modified polylactic acid (BMPLA), monosaccharide and aldohexose.

**[0040]** In another technical solution, the mixing materials step in step S21 is to mix water, butyronitrile and biodegradable additives, then stir at high speed for 10-60 minutes, and then stand for 1-48 minutes, and the water, butyronitrile and biodegradable additives are calculated according to parts by weight as:

**[0041]** water 5-80 parts

**[0042]** butyronitrile 15-94.5 parts

**[0043]** biodegradable additives 0.5-10 parts

**[0044]** After the glue evening in S23, blending and adding to the salt spraying step. The salt spraying is spraying sodium chloride or sodium sulfate.

**[0045]** After blending and adding biodegradable additives, the surface of butyronitrile is smooth, the surface of butyronitrile is sprayed salt, which is then removed to form anti-skid gloves with rubber surface forming concave-convex structure, so as to increase the anti-skid performance of gloves.

**[0046]** The biodegradable additive is at least one of natural cellulose, synthetic polycaprolactone, polyvinyl alcohol, biodegradable oligomer polyester, aromatic-aliphatic ester polymer, maleic anhydride-based modified polylactic acid (MPLA), butanediamine modified polylactic acid (BMPLA), monosaccharide and aldohexose.

**[0047]** Compared with the prior art, the present invention has the advantages in that:

**[0048]** the preparation method is simple and easy to operate, and is suitable for mass production, the prepared gloves not only have good skid resistance, wear resistance and dust-prevention properties, but also have degradable properties.

## DESCRIPTION OF DRAWINGS

**[0049]** FIG. **1** is the Table of test parameters in the embodiments of this application.

## DETAILED DESCRIPTION

**[0050]** The present invention will be further described in detail below in conjunction with embodiments, but this does not limit the implementation of the present invention.

### Example 1

**[0051]** A preparation method of a biodegradable glove, including the following steps:

[0052] 1. Passing polyamide chips into the screw melt spinning area, and subjecting the biodegradable additives to the drafting and false twisting process in a proportion of 1% by weight to obtain 150D/48F DTY fiber. The fiber strength was 3.8 cn/dtex and the elongation at break was 25%. The biodegradable additive was a composition composed of biodegradable oligomer polyester, and aldohexose in 1: 1.

[0053] 2. Using ordinary glove machine to weave gloves, with a weight 10-15 g of a single glove.

[0054] 3. Mixing water, butyronitrile and biodegradable additives, then stirring at high speed for 60 minutes, and then standing for 60 minutes to fully vulcanize to obtain usable butyronitrile glue.

[0055] The water, butyronitrile and biodegradable additives were calculated according to parts by weight as: 5 parts of water, 30 parts of butyronitrile and 1 part of biodegradable additive. The biodegradable additive was a composition composed of biodegradable oligomer polyester, and aldohexose in 1:1.

[0056] 4. Putting the gloves on the hand mold, preheating the hand mold to 40° C. for glue dipping, wherein, after the surface of the hand core was dip bonded with butyronitrile glue; 2 g of sodium chloride was evenly sprayed on the butyronitrile glue through the salt pool to form adhesion, and then the hand mold covered with gloves was put into an environment of a temperature of 120° C. to bake for 5 minutes; which was then rinsed with clean water and soaked; the rinsed and soaked gloves were put into an environment of a temperature of 90° C. to bake for 5 minutes. Biodegradable butyronitrile anti-skid gloves of ordinary chinlon DTY were obtained.

Example 2

[0057] A preparation method of a biodegradable glove, including the following steps:

[0058] 1. After pre-crystallizing and drying the polyethylene terephthalate chips, passing same to a screw, at the mouth of the screw, injecting a biodegradable additive baked at 50° C. for 6 hours at a weight ratio of 1.5% with a syringe, wherein the biodegradable additive was a composition composed of a biodegradable oligomer polyester, butanediamine modified polylactic acid (BMPLA), monosaccharide and aldohexose in 1:1:1; in the heating box, blending the two into a molten spinning fluid, subjecting it to conventional spinning processes such as spinning primary fiberboard and drafting, crimping and cutting etc., to prepare the biodegradable dacron staple fiber with a specification of 38 mm*1.5 dtex. The fiber strength was 4.0 cn/dtex and the elongation was 25%. The biodegradable dacron staple fiber was spun by ring spinning cotton spinning system and conventional spinning process to obtain the biodegradable dacron staple fiber yarn.

[0059] 2. Using ordinary glove machine to weave gloves, with a weight 10-15 g of a single glove.

[0060] 3. Blending and adding dimethylformamide and water as solvent in the polyurethane, blending and adding a content of 2% biodegradable additive at the same time, stirring at high speed for 30 minutes, and then standing for 48 minutes for defoaming, so as to prepare a glue dipping material for standby. The water, polyurethane, dimethylformamide and biodegradable additives were calculated according to parts by weight as: 10 parts of water, 20 parts of polyurethane, 10 parts of dimethylformamide and 2 parts of biodegradable additives. The biodegradable additive was a composition composed of biodegradable oligomer polyester, butanediamine modified polylactic acid (BMPLA) and aldohexose in 1:1:1.

[0061] 4. Putting the gloves on the hand mold, preheating the hand mold to 40° C. for glue dipping, after the surface of the hand core was dip bonded with polyurethane glue. Rolling-over the hand mold for glue evening, then passing into the water tank, soaking with running water for 1 hour to dilute the dimethylformamide, and solidify and shape up the polyurethane. Then oven-drying in oven at 80° C. The biodegradable dacron PU anti-skid gloves were obtained.

Example 3

[0062] A preparation method of a biodegradable glove, including the following steps:

[0063] 1. After pre-crystallizing and drying the polyethylene terephthalate chips, passing same to a screw, at the mouth of the screw, injecting a biodegradable additive baked at 50° C. for 6 hours at a weight ratio of 1.5% with a syringe, wherein the biodegradable additive was a composition composed of a maleic anhydride-based modified polylactic acid (MPLA), biodegradable oligomer polyester and aldohexose in 1:3:3; in the heating box, blending the two into a molten spinning fluid, subjecting it to conventional high strength dacron spinning processes such as spinning primary fiberboard and drafting etc., to prepare the FDY dacron filament yarn of 400D/96F. The strength of the filament yarn was 7.5 cn/dtex and the elongation was 20%.

[0064] Fixing the aluminum cup of the wound 400D high-strength dacron filament yarn on the spindle, passing the 200D glass fiber filament yarn through the yarn tension controller and the spindle hole as the yarn core, winding and wrapping the high-strength dacron filament yarn as the outer yarn, and twisting it for about 500 twists to prepare the coated yarn for gloves of high-strength dacron wrapped glass fiber filament yarn.

[0065] 2. Using ordinary glove machine, and spandex yarn being wrapped with knitted fabric and chinlon. Gloves were woven with U2 double-layer structure, with 20 g of a single glove.

[0066] 3. Mixing water, butyronitrile and biodegradable additives, then stirring at high speed for 60 minutes, and then standing for 48 minutes to fully vulcanize to obtain usable butyronitrile glue.

[0067] The water, butyronitrile and biodegradable additives were calculated according to parts by weight as: 5 parts of water, 50 parts of butyronitrile and 1 part of biodegradable additive. The biodegradable additive was a composition composed of a maleic anhydride-based modified polylactic acid (MPLA), biodegradable oligomer polyester and aldohexose in 1:3:3.

[0068] 4. Putting the gloves on the hand mold, preheating the hand mold to 60° C. for glue dipping, after the surface of the hand core was dip bonded with butyronitrile glue; 3 g of sodium chloride was evenly sprayed on the butyronitrile glue through the salt pool to form adhesion, and then the hand mold covered with gloves was put into an environment of a temperature of 100° C. to bake for 5 minutes; which was

then rinsed with clean water and soaked; the rinsed and soaked gloves were put into an environment of a temperature of 90° C. to bake for 120 minutes. The biodegradable high-strength dacron anti-cutting butyronitrile anti-skid gloves were obtained.

Example 4

**[0069]** A preparation method of a biodegradable glove, including the following steps:

**[0070]** Passing polyamide chips into the screw melt spinning area, blending the biodegradable additive into the spinning fluid through syringe a proportion of 2%; subjecting it to conventional high strength chinlon spinning process to obtain the high-strength chinlon filament yarn of 100D/48F. The fiber strength was 7 cn/dtex and the elongation at break was 110%. The biodegradable additive was a composition composed of a maleic anhydride-based modified polylactic acid (MPLA) and aldohexose in a mass ratio of 1:1.

**[0071]** Fixing the aluminum cup of the wound 100D/48F high-strength chinlon filament yarn and the aluminum cup of the wound 400D high-strength polyethylene HPPE on the spindle up and down, and passing the 100D glass fiber filament yarn and 0.05 mm specification of 304/316L steel yarn through the yarn tension controller and spindle hole as the yarn core. Winding and wrapping the high strength chinlon filament yarn (s direction, 800 twists) and high strength polyethylene (z direction, 300 twists) as outer yarn. High-strength chinlon wrapped glass fiber/steel yarn/HPPE cutting wrapped yarn for gloves was formed.

**[0072]** 2. Using ordinary glove machine, and spandex yarn being wrapped with knitted fabric and chinlon. Gloves were woven with U2 double-layer structure, with 30 g of a single glove.

**[0073]** 3. Mixing water, butyronitrile and biodegradable additives, then stirring at high speed for 60 minutes, and then standing for 48 minutes to fully vulcanize to obtain usable butyronitrile glue.

**[0074]** The water, butyronitrile and biodegradable additives were calculated according to parts by weight as: 30 parts of water, 90 parts of butyronitrile and 1 part of biodegradable additive. The biodegradable additive was a composition composed of a maleic anhydride-based modified polylactic acid (MPLA) and aldohexose in a mass ratio of 1:1.

**[0075]** 4. Putting the gloves on the hand mold, preheating the hand mold to 60° C. for glue dipping, after the surface of the hand core was dip bonded with butyronitrile glue; 3 g of sodium sulfate was evenly sprayed on the butyronitrile glue through the salt pool to form adhesion. After preliminary oven-drying and vulcanization shaping at 90° C., rinsing with water and soaking the sodium sulfate attachments adhered to the butyronitrile glue. Completely removing the sodium sulfate and oven-drying at 85° C. for two hours. The biodegradable high-strength chinlon anti-cutting butyronitrile anti-skid gloves were obtained.

Example 5

**[0076]** A preparation method of a biodegradable glove, including the following steps:

**[0077]** 1. Passing polyamide chips into the screw melt spinning area, blending the biodegradable additive into the spinning fluid through syringe a proportion of 1.5%; subjecting it to conventional spinning process to prepare POY fiber, and then subjecting to conventional DTY drafting and false twisting process to obtain the 200D/96F DTY fiber. The fiber strength was 4.2cn/dtex and the elongation at break was 19%. The biodegradable additive was a mixture of a maleic anhydride-based modified polylactic acid (MPLA) and butanediamine modified polylactic acid (BMPLA) in a mass ratio of 1:2.

**[0078]** Fixing the aluminum cup of the wound 70D chinlon DTY filament yarn and the aluminum cup of the wound 200D high-strength polyethylene HPPE on the spindle up and down, and passing the 0.02 mm specification of tungsten yarn through the yarn tension controller and spindle hole as the yarn core. Winding and wrapping the chinlon DTY filament yarn (s direction, 700 twists) and high strength polyethylene HPPE (z direction, 300 twists) as outer yarn. chinlon DTY wrapped/HPPE/tungsten yarn cutting wrapped yarn for gloves were prepared.

**[0079]** 2. Using ordinary glove machine, and spandex yarn being wrapped with knitted fabric and chinlon. Gloves were woven with U2 double-layer structure, with 20 g of a single glove.

**[0080]** 3. Blending and adding dimethylformamide and water as solvent in the polyurethane, blending and adding a content of 2% biodegradable additive at the same time, stirring at high speed for 30 minutes, and then standing for 3 hours for defoaming, so as to prepare a glue dipping material for standby. The water, polyurethane, dimethylformamide and biodegradable additives were calculated according to parts by weight as: 10 parts of water, 20 parts of polyurethane, 10 parts of dimethylformamide and 2 parts of biodegradable additives. The biodegradable additive was a composition composed of maleic anhydride-based modified polylactic acid (MPLA), butanediamine modified polylactic acid (BMPLA), and aldohexose in 1:1:1.

**[0081]** Putting the gloves on the hand mold, preheating the hand mold to 40° C. for glue dipping, after the surface of the hand core was dip bonded with polyurethane glue. Rolling-over the hand mold for glue evening, then passing into the water tank, soaking with running water for 1 hour to dilute the dimethylformamide, and solidify and shape up the polyurethane. Then oven-drying in oven at 80° C. Light, thin and comfortable biodegradable PU anti-skid gloves with high anti-cutting properties were obtained.

Comparative Example 1

**[0082]** A preparation method of gloves including the following steps:

**[0083]** 1. subjecting to conventional spinning process to prepare POY fiber, and then subjecting to conventional DTY drafting and false twisting process to obtain the 200D/96F DTY fiber.

**[0084]** Fixing the aluminum cup of the wound 70D chinlon DTY filament yarn and the aluminum cup of the wound 200D high-strength polyethylene HPPE on the spindle up and down, and passing the 0.02 mm specification of tungsten yarn through the yarn tension controller and spindle hole as the yarn core. Winding and wrapping the chinlon DTY filament yarn (s direction, 700 twists) and high strength polyethylene HPPE (z direction, 300 twists) as outer yarn. chinlon DTY wrapped/HPPE/tungsten yarn cutting wrapped yarn for gloves were prepared.

**[0085]** 2. Using ordinary glove machine, and spandex yarn being wrapped with knitted fabric and chinlon. Gloves were

woven with U2 double-layer structure, with 20 g of a single glove.

**[0086]** 3. Blending and adding dimethylformamide and water in the polyurethane, stirring at high speed for 30 minutes, and then standing for 3 hours for defoaming, so as to prepare a glue dipping material for standby. The water, polyurethane and dimethylformamide were calculated according to parts by weight as: 10 parts of water, 20 parts of polyurethane, and 10 parts of dimethylformamide.

**[0087]** Putting the gloves on the hand mold, preheating the hand mold to 40° C. for glue dipping, after the surface of the hand core was dip bonded with polyurethane glue. Rolling-over the hand mold for glue evening, then passing into the water tank, soaking with running water for 1 hour to dilute the dimethylformamide, and solidify and shape up the polyurethane. Then oven-drying in oven at 80° C. Light, thin and comfortable PU anti-skid gloves with high anti-cutting properties were obtained.

Comparative Example 2

**[0088]** A preparation method of a biodegradable glove, including the following steps:

**[0089]** 1. subjecting to conventional spinning process to prepare POY fiber, and then subjecting to conventional DTY drafting and false twisting process to obtain the 200D/96F DTY fiber.

**[0090]** Fixing the aluminum cup of the wound 70D chinlon DTY filament yarn and the aluminum cup of the wound 200D high-strength polyethylene HPPE on the spindle up and down, and passing the 0.02 mm specification of tungsten yarn through the yarn tension controller and spindle hole as the yarn core. Winding and wrapping the chinlon DTY filament yarn (s direction, 700 twists) and high strength polyethylene HPPE (z direction, 300 twists) as outer yarn. chinlon DTY wrapped/HPPE/tungsten yarn cutting wrapped yarn for gloves were prepared.

**[0091]** 2. Using ordinary glove machine, and spandex yarn being wrapped with knitted fabric and chinlon. Gloves were woven with U2 double-layer structure, with 20 g of a single glove.

**[0092]** 3. Blending and adding dimethylformamide and water as solvent in the polyurethane, blending and adding a content of 2% biodegradable additive at the same time, stirring at high speed for 30 minutes, and then standing for 3 hours for defoaming, so as to prepare a glue dipping material for standby. The water, polyurethane, dimethylformamide and biodegradable additives were calculated according to parts by weight as: 10 parts of water, 20 parts of polyurethane, 10 parts of dimethylformamide and 2 parts of biodegradable additives. The biodegradable additive was a composition composed of maleic anhydride-based modified polylactic acid (MPLA), butanediamine modified polylactic acid (BMPLA), and aldohexose in 1:1:1.

**[0093]** Putting the gloves on the hand mold, preheating the hand mold to 40° C. for glue dipping, after the surface of the hand core was dip bonded with polyurethane glue. Rolling-over the hand mold for glue evening, then passing into the water tank, soaking with running water for 1 hour to dilute the dimethylformamide, and solidify and shape up the polyurethane. Then oven-drying in oven at 80° C. Light, thin and comfortable biodegradable PU anti-skid gloves with high anti-cutting properties were obtained.

**[0094]** The performance of the biodegradable gloves prepared in examples 1-5 and comparative examples 1-2 were tested, respectively, in which the wear resistance test standard was The European Union EN388; The skid resistance evaluation was to let 5 employees wear gloves and hold a 30 mm diameter stainless steel rod. The evaluation was rated as 1-5 points. 5 points indicated very high clamping force, 4 points indicated high clamping force, 3 points indicated slight clamping force, 2 points indicated that it was not easy to slide, and 1 point indicated low clamping force; Degradability test; Biodegradation rate: ISO: 14855.

**[0095]** The test results are shown in the Table below: Skid resistance Wear resistance Degradable rate Example 1 4 Level 4 greater than 80%, Example 2 4 Level 4 greater than 80%, Example 3 5 Level 4 greater than 75%, Example 4 5 Level 4 greater than 75%, Example 5 4 Level 4 greater than 75%, Comparative Example 1 4 Level 4 not easy to degrade Comparative Example2 4 Level 4 not easy to degrade.

**[0096]** It can be seen from the above Table that the biodegradable gloves prepared by the invention not only maintain good skid resistance and wear resistance, but also have good biodegradability.

**[0097]** In addition, in this specific embodiment, a biodegradable polyurethane disposable glove can be further provided, the steps comprising:

**[0098]** S21 mixing materials, the raw materials in the mixing materials comprise water, polyurethane, dimethylformamide and biodegradable additives, the mixing materials step is to mix water, polyurethane, dimethylformamide and biodegradable additives, stir at high speed for 10-60 minutes, and then stand for 1-48 minutes, and the water, polyurethane, dimethylformamide and biodegradable additives are calculated according to parts by weight as:

**[0099]** water 10-80 parts

**[0100]** polyurethane 20-80 parts

**[0101]** dimethylformamide 10-50 parts

**[0102]** biodegradable additives 0.5-10 parts;

**[0103]** the biodegradable additive is at least one of natural cellulose, polyvinyl alcohol, biodegradable oligomer polyester, maleic anhydride modified polylactic acid (MPLA), butanediamine modified polylactic acid (BMPLA) and monosaccharide;

**[0104]** S22, preheating of hand mold: preheating the hand mold to 40-90° C.;

**[0105]** S23, first cleaning the glove model with acid and alkali, and then washing with water, first immersing the cleaned model in hot water to be heated, then in immersion coagulant, and drying for glue dipping;

**[0106]** S24, baking: putting the hand mold covered with gloves into an environment at a temperature of 90-120° C. and baking for 1-20 minutes;

**[0107]** S25, rinsing with clean water and soaking;

**[0108]** S26, baking: putting the rinsed and soaked gloves into an environment at a temperature of 90-120° C. and baking for 1-20 minutes.

**[0109]** S27, demoulding the gloves and then subjecting to inflation inspection, low temperature setting, medium temperature drying, water washing, dehydration, oven-drying to obtain the qualified biodegradable polyurethane disposable gloves.

**[0110]** As an alternative embodiment, a biodegradable butyronitrile disposable glove can be further provided, the steps comprising:

**[0111]** step S21 mixing materials,the mixing materials step is to mix water, butyronitrile and biodegradable additives, stir at high speed for 10-60 minutes, and then stand for 1-48 minutes, and the water, butyronitrile and biodegradable additives are calculated according to parts by weight as:

**[0112]** water 5-80 parts

**[0113]** butyronitrile 15-94.5 parts

**[0114]** biodegradable additives 0.5-10 parts

**[0115]** the biodegradable additive is at least one of natural cellulose, polyvinyl alcohol, biodegradable oligomer polyester, maleic anhydride modified polylactic acid (MPLA), butanediamine modified polylactic acid (BMPLA) and monosaccharide;

**[0116]** S22, preheating of hand mold: preheating the hand mold to 40-90° C.;

**[0117]** S23, first cleaning the glove model with acid and alkali, and then washing with water, first immersing the cleaned model in hot water to be heated, then in immersion coagulant, and drying for glue dipping;

**[0118]** S24, baking: putting the hand mold covered with gloves into an environment at a temperature of 90-120° C. and baking for 1-20 minutes;

**[0119]** S25, rinsing with clean water and soaking;

**[0120]** S26, baking: putting the rinsed and soaked gloves into an environment at a temperature of 90-120° C. and baking for 1-20 minutes.

**[0121]** S27, demoulding the gloves and then subjecting to inflation inspection, low temperature setting, medium temperature drying, water washing, dehydration, oven-drying to obtain the qualified biodegradable butyronitrile disposable gloves.

**[0122]** The specific embodiments of the present invention are described above. It should be understood that the present invention is not limited to the above specific embodiments, and those skilled in the art can make various variations or modifications within the scope of the claims, which does not affect the substantive content of the present invention.

**1**. A preparation method of a biodegradable glove, comprising the following steps:

S1, fixing an aluminum cup of the wound yarn on the spindle, passing a glass fiber or steel yarn metal through a yarn tension controller and the spindle hole as the yarn core, or passing a glass fiber or steel yarn metal through a yarn tension controller and then threading it into a twisting machine as the yarn core, and winding and wrapping the biodegradable filament yarn or staple fiber yarn as the outer yarn to form the coated yarn for gloves, then weaving into textile gloves on a glove knitting machine; S2. gum dipping the textile gloves to form the biodegradable gloves.

**2**. The preparation method of a biodegradable glove according to claim **1**, wherein, the preparation method of the biodegradable filament yarn in step S1 is as follows: baking the biodegradable additive in an environment of 50-90° C. for 2-6 hours, blending into the pre-crystallized and dried polyethylene terephthalate, spinning the primary fiber and then drafting to obtain the pre-drafted filament yarn, and then subjecting same to hot-drafting and false twist crimping process to prepare the biodegradable filament yarn;

the preparation method of the staple fiber yarn in step S1 is as follows: baking the biodegradable additive in an environment of 50-90° C. for 2-6 hours, blending into the pre-crystallized and dried polyethylene terephthalate, spinning the primary fiber and then drafting, crimping and cutting to obtain the staple fiber, then spinning to obtain the staple fiber yarn.

**3**. The preparation method of a biodegradable glove according to claim **1**, wherein, the preparation method of the biodegradable filament yarn in step S1 is asfollows: baking the biodegradable additive in an environment of 50-90° C. for 2-6 hours, blending into the pre-crystallized and dried chinlon, spinning the primary fiber and then drafting to obtain the pre-drafted filament yarn, and then subjecting same to hot-drafting and false twist crimping process to prepare the biodegradable filament yarn;

the preparation method of the staple fiber yarn in step S1 is as follows: baking the biodegradable additive in an environment of 50-90° C. for 2-6 hours, blending into the pre-crystallized and dried chinlon, spinning the primary fiber and then drafting, crimping and cutting to obtain the staple fiber, then spinning to obtain the staple fiber yarn.

**4**. The preparation method of a biodegradable glove according to claim **1**, wherein,

the gum dipping process comprises the following steps,

S21, mixing materials;

S22, preheating of hand mold: putting gloves on the hand mold, then preheating the hand mold to 40-90° C.;

S23, dip coating and glue evening;

S24, baking: putting the hand mold covered with gloves into an environment at a temperature of 90-120° C. and baking for 1-20 minutes;

S25, rinsing with clean water and soaking;

S26, baking: putting the rinsed and soaked gloves into an environment at a temperature of 90-120° C. and baking for 1-20 minutes.

**5**. The preparation method of a biodegradable glove according to claim **4**, wherein,

in step S21, the raw materials in the mixing materials comprise water, polyurethane, dimethylformamide and biodegradable additives, the mixing materials step is to mix water, polyurethane, dimethylformamide and biodegradable additives, stir at high speed for 10-60 minutes, and then stand for 1-48 minutes, and the water, polyurethane, dimethylformamide and biodegradable additives are calculated according to parts by weight as:

water 10-80 parts

polyurethane 20-80 parts

dimethylformamide 10-50 parts

biodegradable additives 0.5-10 parts;

the biodegradable additive is at least one of natural cellulose, polyvinyl alcohol, biodegradable oligomer polyester, MPLA, BMPLA and monosaccharide.

**6**. The preparation method of a biodegradable glove according to claim **4**, wherein,

in step S21, the raw materials in the mixing materials comprise water, butyronitrile, and biodegradable additives, the mixing materials step is to mix water, butyronitrile and biodegradable additives, stir at high speed for 10-60 minutes, and then stand for 1-48 minutes, and the water, butyronitrile and biodegradable additives are calculated according to parts by weight as:

water 5-80 parts

butyronitrile 15-94.5 parts

biodegradable additives 0.5-10 parts;

the biodegradable additive is at least one of natural cellulose, polyvinyl alcohol, biodegradable oligomer polyester, MPLA, BMPLA and monosaccharide.

**7**. (canceled)

**8**. (canceled)

**9**. A biodegradable glove, wherein, it is prepared with the preparation method of claim **1**.

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