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(54) POLYESTER NONWOVEN FABRIC WITH SUPPRESSED REDUCTION IN PHYSICAL PROPERTIES BY TUFTING PROCESS, METHOD FOR MANUFACTURING SAME, AND BACKING FABRIC FOR CARPET COMPRISING SAME

(57) The present invention relates to a polyester nonwoven fabric with suppressed reduction in physical properties by a tufting process, a method for manufacturing same, and a backing fabric for a carpet, comprising same and, in particular, to: a polyester nonwoven fabric in which, by controlling the physical properties of fibers of a first component filament and a second filament, a reduction in physical properties is remarkably suppressed before/after a tufting process, thus enabling the manufacture of a carpet backing fabric with excellent mechanical properties; a method for manufacturing same; and a backing fabric for a carpet, manufactured thereby.

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Description

[TECHNICAL FIELD]

[0001] The present invention relates to a polyester nonwoven fabric with suppressed reduction in physical properties by a tufting process, a method for manufacturing same, and a backing fabric for a carpet, comprising same and, in particular, to: a polyester nonwoven fabric in which, by controlling the physical properties of fibers of a first component filament and a second filament, a reduction in physical properties is remarkably suppressed before/after a tufting process, thus enabling the manufacture of a carpet backing fabric with excellent mechanical properties; a method for manufacturing same; and a backing fabric for a carpet, manufactured thereby.

[BACKGROUND ART]

[0002] Generally, a polyester-based nonwoven fabric made of polyester filament fibers is widely used as a carpet backing fabric. When manufacturing a carpet using a carpet backing fabric, a tufting process of transplanting the carpet yarn into the carpet backing fabric by using a needle is essentially required.

[0003] In the tufting process, the filament fibers that make up the polyester nonwoven fabric are damaged by the needle, which causes a problem that the physical properties such as tensile strength and tearing strength of the nonwoven fabric are deteriorated. As one of the methods to solve these shortcomings, Korean Unexamined Patent Publication No. 1998-0061102 illustrates a method of manufacture A spunbond nonwoven fabric for a carpet backing fabric by forming a filament fiber and a web using two types of polyester polymers, followed by needle punching and passing through a calendar roll.

[0004] However, in such a method, not only the overall manufacturing process is complicated, but also damage to the filament fibers appear in the process of binding the filament fibers by needle punching, and the damage is even more serious after the tufting process of planting carpet yarns. Therefore, the nonwoven fabric manufactured by this method still exhibits the disadvantage of remarkably reducing the physical properties after tufting, and making it difficult to be applied to a carpet backing fabric.

[0005] In addition, Korean Unexamined Patent Publication No. 2001-0053138 discloses a method of manufacturing carpet backing fabric through a process of spinning polyester and polylactic acid (PLA) using a conjugate spinning method to produce irregular cross-section yarns. However, this method is prone to spinning defects due to poor spinning properties, and the high price of polylactic acid results in an increase of the manufacturing cost.

[0006] Therefore, there is a continued need for nonwoven fabrics that can be preferably used as a carpet backing fabric because they can be manufactured through a simpler process and at lower production costs, and have good physical properties even after the tufting process, and a method for manufacturing the same.

[DETAILED DESCRIPTION OF THE INVENTION]

[Technical Problem]

[0007] The present invention has been devised to solve the above-mentioned problems, and therefore, an object of the present invention is to provide a polyester-based nonwoven fabric that can remarkably suppress a reduction in physical properties before and after the tufting process by controlling the components and physical properties of a first component filament and a second component filament, a manufacturing method thereof, and a backing fabric for a carpet comprising the same.

[Technical Solution]

[0008] In order to achieve the above object, according to the present disclosure, provided herein is a polyester-based nonwoven fabric comprising:

a first component filament containing a first polyester having a melting point of 250°C to 300°C; and
a second component filament containing a second polyester having a melting point of 160°C to 220°C,
wherein the stiffness before tufting process measured by the measurement method specified in ASTM D 6125-97 is 100 mg to 300 mg in both the machine direction (MD) and the cross direction (CD).

[0009] In a preferred embodiment of the present disclosure, the machine direction stiffness(S_{MD}) and the cross direction stiffness(S_{CD}) of the polyester-based nonwoven fabric before tufting process may satisfy the following conditional expression 1).

$$1)\ 0.95 \leq S_{MD}/S_{CD} \leq 1.05$$

[0010] In a preferred embodiment of the present disclosure, the first polyester may have an intrinsic viscosity of 0.65 dl/g to 0.80 dl/g.

[0011] In a preferred embodiment of the present disclosure, the polyester-based nonwoven fabric may be formed by fusing the second component filament.

[0012] In a preferred embodiment of the present disclosure, the second polyester may be a copolyester formed by the copolymerization of at least one acid component selected from terephthalic acid, dimethyl terephthalate, isophthalic acid, and dimethyl isophthalate, and at least one diol component selected from 1,4-butanediol(BD), ethylene glycol(EG), and neopentyl glycol(NPG).

[0013] In a preferred embodiment of the present disclosure, the polyester-based nonwoven fabric may have a deviation between the machine direction (MD) tensile strength ($T_{MD,0}$) and the cross direction (CD) tensile strength ($T_{CD,0}$) before the tufting process of TCD,0×0.05 or less, and
have a reduction rate of tensile strength after the tufting process in both the machine direction and the cross direction of less than 60%.

[0014] In a preferred embodiment of the present disclosure, the polyester-based nonwoven fabric may have both $T_{MD,0}$ and $T_{CD,0}$ 5cm before the tufting process of 25kgf/5cm to 35kgf/5cm.

[0015] In a preferred embodiment of the present disclosure, the polyester-based nonwoven fabric may include the first component filament and the second component filament in a weight ratio of 85:15 to 90:10.

[0016] In a preferred embodiment of the present disclosure, the polyester-based nonwoven fabric may have a heat shrinkage rate in the machine direction of 1.5% or less and a heat shrinkage rate in the cross direction of 1.0% or less, as measured according to the following measurement method.

[Measurement Method]

[0017] A pattern with a size of 20cm X 20cm is drawn on a nonwoven fabric sample with a size 25cm X 25cm in both the machine direction and the cross direction, this is preheated and then removed on a preheating plate at 180°C for 3 minutes using a Mathis oven, and the shrunken length is measured to calculate the shrinkage rate.

[0018] In a preferred embodiment of the present disclosure, the polyester-based nonwoven fabric may have a tearing strength in both the machine direction and the cross direction before the tufting process of 7 kgf to 13 kgf.

[0019] In a preferred embodiment of the present disclosure, the polyester-based nonwoven fabric may satisfy the following conditional expressions 2) and 3).

$$2)\ I.V._2 > I.V._1$$

$$3)\ 0.05 \leq (I.V._2 - I.V._1)/I.V._1 \leq 0.50$$

in the conditional expressions 2) and 3), $I.V_1$ and $I.V_2$ respectively represent the intrinsic viscosity of the first polyester and the intrinsic viscosity of the second polyester.

[0020] In a preferred embodiment of the present disclosure, the first component filament has a fineness of 7 denier to 10 denier, and the second component filament has a fineness of 2 denier to 4 denier, and
the number of filaments of the first component filament may be included by a factor in the range of two to five times the number of filaments of the second component filament.

[0021] The present disclosure also provides a backing fabric for a carpet comprising the polyester-based nonwoven fabric.

[0022] Further, The present disclosure provides a method for manufacturing a polyester-based nonwoven fabric, the method comprising the steps of:

1) blend-spinning a first polyester with a melting point of 250°C to 300°C and a second polyester with a melting point of 160°C to 220°C and laminating the web to form a blended web; and
2) heat-bonding the blended web with hot air having a temperature of 0°C to 10°C or higher than the melting point of the second polyester;
thereby manufacturing a nonwoven fabric in which both a bending strength in the machine direction and a stiffness in the cross direction before the tufting process are 100 mg to 300 mg.

[0023] In a preferred embodiment of the present disclosure, in step 1), the first polyester and the second polyester may be stretched at a speed of 4,500 m/min to 5,200 m/min to form the first component filament and the second component filament, respectively.

[Advantageous Effects]

[0024] The polyester-based nonwoven fabric according to the present disclosure can provide a polyester-based non-woven fabric that maintains excellent tensile strength, tearing strength, and the like even after the tufting process. Therefore, the polyester-based nonwoven fabric of the present disclosure can be usefully used as a carpet backing fabric and can realize excellent mechanical properties.

[DETAILED DESCRIPTION OF THE EMBODIMENTS]

[0025] The detailed configuration and effects of the present invention will be described below.
[0026] As described above, a conventional nonwoven fabric for carpet backing fabric had the disadvantage in that the filaments are damaged during the tufting process in manufacturing carpets, so that the physical properties are deteriorated, the spinnability of fibers is poor or the manufacturing costs are high.
[0027] In order to solve such problems, the present disclosure provides a polyester-based nonwoven fabric comprising:

a first component filament containing a first polyester having a melting point of 250°C to 300°C; and
a second component filament containing a second polyester having a melting point of 160°C to 220°C,
wherein the stiffness before tufting process measured by the measurement method specified in ASTM D 6125-97 is 100 mg to 300 mg in both the machine direction (MD) and the cross direction (CD).

[0028] By providing a combination of fibers having the above physical properties and a nonwoven fabric having the above physical properties, the present disclosure can provide a polyester-based nonwoven fabric that can remarkably suppress reduction in physical properties such as tearing strength and tensile strength of a nonwoven fabric, despite the tufting process for manufacturing a carpet.
[0029] The first component filament is manufactured by spinning high-melting point polyester, which consequently plays the role of a matrix fiber (filament) in the process of manufacturing a nonwoven fabric.
[0030] In addition, the second component filament is manufactured by spinning low-melting point polyester, which consequently plays the role of a binder fiber (filament) in the process of nonwoven fabric manufacturing.
[0031] If the melting point of the first polyester of the first component filament is less than 250°C, a melting point difference from the second polyester functioning as a binder may be reduced, so that the usable temperature range at which spinning is possible may be reduced. Conversely, if the melting point is greater than 300°C, heat decomposition of the second polyester at the spinning temperature may occur.
[0032] Further, if the melting point of the second polyester of the second component filament is less than 160°C, heat shrinkage may occur in the process of post-processing the carpet backing fabric containing a polyester-based nonwoven fabric, which may result in a reduction of dimensional stability. Conversely, if the melting point is greater than 220°C, the heat shrinkage rate of the nonwoven fabric may be stable and no deformation of the sheet may appear during the carpet manufacturing process, but during the high-temperature coating, heat treatment, and drying process of a carpet, the flexibility of the non-woven fabric decreases, and thus shows a slight difference in elongation from the coating solution coated on the bottom edge of the nonwoven fabric. Such slight differences are not problematic in products immediately after manufacturing, but as the period of use of the carpet is made longer, the potential stress caused by the difference in elongation between the coating material and the nonwoven fabric may cause deformation of the carpet.
[0033] In addition, if the stiffness of the nonwoven fabric is less than 100 mg, it has characteristics that are excessively soft for use for carpets, and therefore, there is a problem that the shape is not maintained well and is inappropriate for use as a carpet. If the stiffness of the non-woven fabric is greater than 300 mg, there is a problem that the nonwoven fabric is too stiff, and therefore, the physical properties of the non-woven fabric are deteriorated due to damage or falling-off of the fibers, generation of fluff, etc. during the tufting process. In addition, when the stiffness is greater than 300 mg, the nonwoven fabric becomes stiff and lacks flexibility, and therefore, wrinkles may easily occur and workability may be reduced.
[0034] In a preferred embodiment of the present disclosure, the machine direction stiffness(S_{MD}) and the cross direction stiffness(S_{CD}) of the polyester-based nonwoven fabric before tufting process may satisfy the following conditional expression 1).

$$1)\ 0.95 \leq S_{MD}/S_{CD} \leq 1.05$$

[0035] That is, the polyester nonwoven fabric according to the present invention exhibits almost similar stiffness in the machine direction and the cross direction, and if the above conditional expression 1 is not satisfied, that is, if the S_{MD} is either greater than 1.05 times or less than 0.95 times the S_{CD}, the reduction in physical properties of the polyester-based nonwoven fabric in the tufting process may appear remarkably. Preferably, the S_{MD} and S_{CD} can satisfy the following conditional expression 1-1).

$$1\text{-}1)\ 0.98 \leq S_{MD}/S_{CD} \leq 1.03$$

[0036] In a preferred embodiment of the present disclosure, the first polyester may have an intrinsic viscosity of 0.65 dl/g to 0.80 dl/g. If the intrinsic viscosity is greater than 0.80 dl/g, the tensile strength of the first component filament and the tearing strength of the polyester-based nonwoven fabric increase, but the strength of the nonwoven fabric increases excessively or the pressure of the spinneret increases rapidly, which may cause problems such as leakage of the molten first polyester polymer. However, on the contrary, if the intrinsic viscosity is 0.65 dl/g or less, the tensile strength of the filament and the tearing strength of the nonwoven fabric are reduced, which may cause a problem that the tensile strength is greatly reduced after the tufting process.

[0037] In a preferred embodiment of the present disclosure, the polyester-based nonwoven fabric may be formed by fusing the second component filament. The second polyester has a relatively low melting point compared to the first polyester and thus, the second component filament formed therefrom can be easily fused with the first component filament when heat is applied. Therefore, according to the present disclosure in which the second component filaments are uniformly distributed within the nonwoven fabric together with the first component filaments, a nonwoven fabric can be manufactured by easily bonding first and second component filaments to each other even without advancing a separate process such as needle punching.

[0038] Therefore, according to the present disclosure, the nonwoven fabric manufacturing process can be simplified, and the first and second component filaments contained in the finally manufactured nonwoven fabric of the present disclosure may not have any damage caused by the needle punching process.

[0039] In a preferred embodiment of the present disclosure, the second polyester may be a copolyester formed by the copolymerization of at least one acid component selected from terephthalic acid, dimethyl terephthalate, isophthalic acid, and dimethyl isophthalate, and at least one diol component selected from 1,4-butanediol(BD), ethylene glycol(EG), and neopentyl glycol(NPG).

[0040] However, the compounds of acid component and diol component are not limited to the compounds listed above, and can be selected in compliance with the purpose of the present disclosure from the compounds of acid components and diol components for polyester polymerization commonly used in the art.

[0041] In a preferred embodiment of the present disclosure, the polyester-based nonwoven fabric may have a deviation between the machine direction (MD) tensile strength ($T_{MD,0}$) and the cross direction (CD) tensile strength ($T_{CD,0}$) before the tufting process of TCD,0×0.05 or less, and

have a reduction rate of tensile strength after the tufting process in both the machine direction and the cross direction of less than 60%.

[0042] According to the present disclosure, since the tensile strength size in the machine direction and the cross direction before the tufting process has a uniform tensile strength size of 5% or less of the cross direction tensile strength ($T_{CD,0}$), there is almost no difference in physical properties depending on the direction, and the defect rate during the tufting process can be greatly reduced, and after the tufting process, the reduction rate of tensile strength in both the machine direction and the cross direction is 60% or less, which may greatly suppress the reduction of physical properties.

[0043] If the reduction rate of tensile strength is greater than 60%, the tensile strength of the nonwoven fabric after the tufting process is remarkably lowered, so it may not be suitable for use as a carpet backing fabric.

[0044] In a preferred embodiment of the present disclosure, the polyester-based nonwoven fabric may have both $T_{MD,0}$ and $T_{CD,0}$ before the tufting process of 25kgf/5cm to 35kgf/5cm.

[0045] If the tensile strength in either the machine direction or the cross direction before the tufting process is 25kgf/5cm or less, the tensile strength after the tufting process decreases, so the nonwoven fabric may not be suitable for use as a carpet backing fabric. Further, on the contrary, if the tensile strength before the tufting process is greater than 35kgf/5cm in either the machine direction or the cross direction, the stiffness of the nonwoven fabric becomes too high, and therefore, rather, there is a problem that it is vulnerable to wrinkle, the workability is reduced or the physical properties before and after the tufting process are remarkably reduced.

[0046] In a preferred embodiment of the present disclosure, the polyester-based nonwoven fabric may include the first component filament and the second component filament in a weight ratio of 85:15 to 90:10. If the content ratio of the second component filament is less than 10% by weight, the physical properties become similar to those of a nonwoven fabric composed only of the high melting point first component filament, whereby a nonwoven fabric that satisfies the required strength cannot be manufactured by heat-bonding alone, and a separate process such as needle punching, which causes filament breakage, will be required to manufacture a nonwoven fabric.

[0047] On the other hand, when the content ratio of the second component filament is greater than 15% by weight, the adhesive component in the nonwoven fabric increases too much, and therefore, when the nonwoven fabric is used as a backing fabric for carpets, filament damage due to the tufting process will occur, and consequently, the reduction in physical properties of the backing fabric due to the tufting process becomes serious.

[0048] In a preferred embodiment of the present disclosure, the polyester-based nonwoven fabric may have a heat shrinkage rate in the machine direction of 1.5% or less and a heat shrinkage rate in the cross direction of 1.0% or less, as measured according to the following measurement method.

[Measurement Method]

[0049] A pattern with a size of 20cm × 20cm is drawn on a nonwoven fabric sample with a size 25cm × 25cm in both the machine direction and the cross direction, this is preheated and then removed on a preheating plate at 180°C for 3 minutes using a Mathis oven, and the shrunken length is measured to calculate the shrinkage rate.

[0050] If the heat shrinkage rate in the machine direction is greater than 1.5% or if the heat shrinkage rate in the cross direction is greater than 1.0%, the dimensional stability of the manufactured nonwoven fabric may be reduced, which may not be suitable for use as a carpet backing fabric.

[0051] In a preferred embodiment of the present disclosure, the polyester-based nonwoven fabric may have a tearing strength in both the machine direction and the cross direction before the tufting process of 7 kgf to 13 kgf.

[0052] If the tearing strength is less than 7kgf in the machine direction or the cross direction, there may be problems that the nonwoven fabric may be damaged during the tufting process, or the tearing strength after the tufting process may decrease, making it unsuitable for use as a backing fabric for carpets. If the tearing strength is greater than 13 kgf, problems such as excessive increase in stiffness and decrease in tensile strength may occur.

[0053] In a preferred embodiment of the present disclosure, the polyester-based nonwoven fabric may satisfy the following conditional expressions 2) and 3).

$$2)\ I.V._2 > I.V._1$$

$$3)\ 0.05 \leq (I.V._2 - I.V._1)/I.V._1 \leq 0.50$$

in the conditional expressions 2) and 3), $I.V_1$ and $I.V._2$ respectively represent the intrinsic viscosity of the first polyester and the intrinsic viscosity of the second polyester.

[0054] By satisfying the above conditional expressions 2) and 3), the bending strength, tensile strength, and tearing strength of the nonwoven fabric before the tufting process for achieving the purpose of the present disclosure can be satisfied. If the intrinsic viscosity of the second polyester is lower than that of the first polyester, the second polyester has a remarkably lower melt viscosity than the first polyester at the spinning temperature which causes a problem of spinnability due to the difference in viscosity, and its deviation may be 5% to 12% relative to the intrinsic viscosity of the first polyester. If the intrinsic viscosity of the second polyester is greater than 12% exceeding the intrinsic viscosity of the first polyester, in the process of melt-spinning the second component filament, the internal pressure of the extruder may increase and the nozzle may be blocked, which may cause a process problem. Further, the physical properties of a fiber are reduced by the breakage of the manufactured yarn, and the tearing strength of the nonwoven fabric may be reduced. In addition, if the deviation between the intrinsic viscosity of the second polyester and the intrinsic viscosity of the first polyester is less than 5%, the effect of improving the strength of the yarn due to the production of high-viscosity fiber may be slight.

[0055] In a preferred embodiment of the present disclosure, the first component filament has a fineness of 7 denier to 10 denier, and the second component filament has a fineness of 2 denier to 4 denier, and the number of filaments of the first component filament may be included by a factor in the range of two to five times the number of filaments of the second component filament.

[0056] If the fineness of the first component filament is less than 7 denier, the number of first component filaments per unit area increases, whereby when the aforementioned nonwoven fabrics are used as a backing fabric for carpets and undergo a tufting process, damage to the filament by a needle will occur remarkably. Consequently, the physical properties of the backing fabric are seriously degraded by the tufting process. On the other hand, if the fineness of the first filament is greater than 10 denier, the uniformity of the nonwoven fabric manufactured using this filament is severely impaired, which results in loss of commercial usefulness.

[0057] Therefore, if the fineness of the second component filament is less than 2 denier, cutting of the second component filament may occur during the cooling process. On the other hand, if the fineness of the second component filament is greater than 4 denier, the cooling of the second component filaments is not properly performed in the cooling process(e.g., cooling process performed immediately after web formation), whereby adhesion of the second component filaments will occur and the uniformity of the nonwoven fabric will deteriorate, which results in loss of commercial usefulness of the nonwoven fabric.

[0058] According to the present disclosure, there is also provided a backing fabric for carpets comprising the polyester-based nonwoven fabric.

[0059] By having the configuration as described above, the polyester-based nonwoven fabric of the present disclosure can appropriately suppress filament breakage during the tufting process for transplanting a carpet yarn, and exhibit excellent physical properties even after the tufting process, thereby providing a carpet backing fabric with excellent physical properties. In addition, the polyester-based nonwoven fabric can be easily manufactured by heat-sealing the filaments constituting the same, so that the manufacturing process is easy and simple, and the manufacturing cost can also be greatly reduced.

[0060] Below, the method for manufacturing the polyester-based nonwoven fabric will be described in detail.

[0061] According to the present disclosure, there is provided a method for manufacturing a polyester-based nonwoven fabric, the method comprising the steps of:

1) blend-spinning a first polyester with a melting point of 250°C to 300°C and a second polyester with a melting point of 160°C to 220°C and laminating the web to form a blended web; and
2) heat-bonding the blended web with hot air having a temperature of 0°C to 10°C or higher than the melting point of the second polyester; thereby manufacturing a nonwoven fabric in which both a bending strength in the machine direction and a stiffness in the cross direction before the tufting process are 100 mg to 300 mg.

[0062] A temperature of the hot air may preferably be 0°C to 5°C or higher than the melting point of the second polyester.

[0063] In a preferred embodiment of the present disclosure, in step 1), the first polyester and the second polyester may be stretched at a speed of 4,500 m/min to 5,200 m/min to form the first component filament and the second component filament, respectively.

[0064] By stretching at such a speed, the first component filament and the second component filament having the fineness in the range described above can be obtained.

[0065] The components and physical properties of each of the first component filament, the second component filament, the first polyester and the second polyester are the same as those described for the polyester nonwoven fabric, and therefore a description thereof will be omitted.

[0066] Other steps in the nonwoven fabric manufacturing process can be carried out through a general nonwoven fabric manufacturing process method, which are within the range that a person skilled in the art can easily select and implement.

[0067] Hereinafter, the specific effects of the invention will be described more specifically with reference to specific examples of the present disclosure. However, it should be understood that the following examples are merely exemplary embodiments provided to aid in the understanding of the invention, and the scope of the present invention is not limited by the examples.

<Example>

Example 1

[0068] Polyester for matrix filament having a melting point of 255°C and an intrinsic viscosity (I.V.) of 0.65 dl/g (manufactured by Kolon Industries, Inc., polymerization of terephthalic acid (TPA) and ethylene glycol (EG)) and low melting point copolyester for binder filament having a melting point of 212°C and an intrinsic viscosity of 0.82 dl/g (manufactured by Kolon Industries Ltd., copolymerization of terephthalic acid (TPA), isophthalic acid (IPA), adipic acid (AA) and ethylene glycol (EG)) were melted using a continuous extruder, then discharged through a spinning nozzle at the bottom end of the continuous extruder, and blend-spun to produce a first row of blend-spun yarn for webs. For the blend-spun yarn, the weight ratio of matrix filament and binder filament was set to 90: 10, and the fineness of the matrix filament and the binder filament was set to 8.5 denier and 3.5 denier, respectively.

[0069] Further, the continuous filament discharged from the spinning nozzle was solidified with cooling air and then stretched using a high-pressure air stretching device at a spinning speed of 5,000 m/min.

[0070] After that, the manufactured filament is laminated in the form of a web on a conveyor net by a conventional opening method, and then goes through a calendering process using a heated smooth roll to provide smoothness and an appropriate thickness, and A spunbond nonwoven fabric for a carpet backing fabric having a weight per unit area of 100 g/m^2 was manufactured by heat-bonding a low melting point copolyester for binder filament with hot air at a melting point of +3°C.

Example 2

[0071] A spunbond nonwoven fabric for a carpet backing fabric was manufactured in the same manner as in Example 1, except that the matrix filament was spun using polyester having an intrinsic viscosity of 0.78 dl/g.

Example 3

[0072] A spunbond nonwoven fabric for a carpet backing fabric was manufactured in the same manner as in Example 1, except that the binder filament was used as a low melting point copolyester having a melting point of 164°C (manufactured by Kolon Industries, Ltd., copolymerization of terephthalic acid (TPA), isophthalic acid (IPA), adipic acid (AA) and ethylene glycol (EG)), and heat-bonded with hot air at 167°C.

Example 4

[0073] A spunbond nonwoven fabric for a carpet backing fabric was manufactured in the same manner as in Example 1, except that the weight ratio of the matrix filament and the binder filament was adjusted to 85:15.

Examples 5 to 7

[0074] A spunbond nonwoven fabric for a carpet backing fabric was manufactured in the same manner as in Example 1, except that the polyesters of the matrix filament and the binder filament were changed as shown in Table 1 below, and the copolyester for binder filament was heat-bonded with hot air at a melting point of +3°C.

Comparative Example 1

[0075] A spunbond nonwoven fabric for a carpet backing fabric was manufactured in the same manner as in Example 1, except that polyester with an intrinsic viscosity of 0.57 dl/g was used as the matrix filament.

Comparative Example 2

[0076] A spunbond nonwoven fabric for a carpet backing fabric was manufactured in the same manner as in Example 1, except that the binder filament was changed to a copolyester (manufactured by Kolon Industries, Inc., copolymerization of terephthalic acid (TPA), isophthalic acid (IPA), adipic acid (AA) and ethylene glycol (EG)) with a melting point of 156°C, and heat-bonded with hot air at 159°C.

Comparative Example 3

[0077] A spunbond nonwoven fabric for a carpet backing fabric was manufactured in the same manner as in Example 1, except that the melting point of the binder filament was adjusted to 226°C and the filament was heat-bonded with hot air at 229°C.

Comparative Example 4

[0078] A spunbond nonwoven fabric for a carpet backing fabric was manufactured in the same manner as in Example 1, except that the weight ratio of the matrix filament and the binder filament was changed to 94:6.

Comparative Example 5

[0079] A spunbond nonwoven fabric for a carpet backing fabric was manufactured in the same manner as in Example 1, except that the weight ratio of the matrix filament and the binder filament was changed to 80:20.

<Experimental example>

Experimental Example 1: Measurement of nonwoven fabric stiffness (mg)

[0080] The stiffness of the polyester nonwoven fabric manufactured according to Examples and Comparative Examples was measured using a Bending Resistance Tester manufactured by Gurley Precision Instruments (Troy, New York) in accordance with to the method specified in ASTM D 6125-97.

Experimental Example 2: Measurement of tearing strength (kgf)

[0081] According to KS K 0536 (Single Tongue), a spunbond nonwoven fabric was cut into 7.6cm × 20cm sample, and the tearing strength was measured using a universal tensile tester (Instron) at a tensile speed of 300mm/min.

Experimental Example 3: Measurement of tensile strength (kgf/5cm)

[0082] The tensile strength before the tufting process was measured using the measurement method specified in KS K 0521.

[0083] Specifically, a sample with a size of width × height = 5 cm × 20 cm was fixed to a jig with a top and bottom of 5/5 cm using a measuring equipment from INSTRON (USA), and measured at a tensile speed of 200 mm/min.

[0084] The tensile strength after tufting was measured using the KS K 0521 method as described above after tufting using a small tufting machine with a width of 1.0 m.

[0085] At this time, the operating conditions of the tufting machine were a pile height of 5.0 mm, a gauge of 1.10 inches, a stitch of 1/13 inch, and an operating speed of 600 rpm. The carpet yarn (BCF) used at this time was 1200 denier 96 filament triangular cross-section yarn made of nylon 6 manufactured by Hyosung Co., Ltd., and a single-loop type carpet was manufactured.

Experimental Example 4: Measurement of heat shrinkage (%)

[0086] A pattern with a size of 20cm × 20cm was drawn on a nonwoven fabric sample with a size of 25cm×25cm. This was preheated and then removed on a preheating plate at 180°C for 3 minutes using a Mathis oven (Daelim Starlet), and the shrinkage rate was calculated based on the shrunken length.

[0087] The above experimental results are shown in Table 1 below.

[Table 1]

Category	First component melting point, I.V., content (°C, dl/g, wt%)			Second component, I.V., content (°C, dl/g, wt%)			Stiffness (mg) MD/CD	Tearing strength (kgf) MD/CD	Tensile strength(kgf/5cm) MD/CD			Heat shrinkage rate MD/CD
									Before tufting	After tufting	Reduction rate (%)	
Example 1	255	0.65	90	212	0.82	10	229/234	9.4/9.9	31.7/33.7	14.0/18.1	56/46	0.5/0.0
Example 2	255	0.78	90	212	0.82	10	254/269	10.5/10.9	32.5/33.9	16.6/18.3	49/46	0.4/0.0
Example 3	255	0.65	90	164	0.82	10	197/204	11.2/11.5	30.4/31.1	16.7/18.0	45/42	0.9/0.2
Example 4	255	0.65	85	212	0.82	15	265/273	8.4/8.6	33.2/32.1	13.6/13.8	59/57	0.6/0.0
Example 5	267	0.69	90	201	0.79	10	248/260	8.1/8.3	31.6/33.0	16.4/16.2	48/51	0.7/0.0
Example 6	258	0.68	90	193	0.64	10	216/231	7.3/7.5	29.8/30.9	16.7/13.3	44/57	0.8/0.0
Example 7	252	0.66	90	218	0.74	10	257/284	8.6/9.1	28.4/29.2	9.4/11.1	67/62	0.6/0.1
Comparative Example 1	255	0.57	90	212	0.82	10	279/287	6.4/6.7	30.5/30.1	8.8/9.3	71/69	2.5/1.8
Comparative Example 2	255	0.65	90	156	0.82	10	185/193	11.5/11.7	29.9/32.2	16.7/19.6	44/39	3.1/2.9
Comparative Example 3	255	0.65	90	226	0.82	10	305/321	5.9/6.4	29.5/31.7	6.8/7.6	77/76	0.3/0.0
Comparative Example 4	255	0.65	94	212	0.82	6	213/222	10.3/9.8	15.8/17.2	8.7/8.9	45/48	0.6/0.0
Comparative Example 5	255	0.65	80	212	0.82	20	298/303	5.4/5.2	29.4/30.1	8.5/7.5	71/75	1.5/0.2

[0088] Referring to Table 1, in Comparative Example 1, as the intrinsic viscosity of the first component filament is too low, the tearing strength is low, and the reduction rate of the tensile strength of the nonwoven fabric before and after tufting is remarkably high. Thus, it can be seen that it is not suitable for use as a polyester nonwoven fabric for a carpet backing fabric.

[0089] In addition, it can be seen that in Comparative Example 2, the melting point of the second component filament is remarkably low, the heat shrinkage rate is high, and therefore the dimensional stability of the nonwoven fabric is decreased.

[0090] It can be seen that in Comparative Example 3, the melting point of the second component filament is too high, and consequently, the stiffness of the nonwoven fabric is too high, the tearing strength is low, and the reduction rate of tensile strength after the tufting process is remarkably high.

[0091] It can be seen that in Comparative Example 4, the content of the second component filament is too low, and the tensile strength of the nonwoven fabric is remarkably low, resulting in poor physical properties.

[0092] It could be confirmed that in Comparative Example 5, the content of the second component filament is remarkably high, the tensile strength of the nonwoven fabric is high, the tearing strength is decreased, and the tensile strength is excessively reduced by the tufting process.

[0093] In addition, it could be seen that the nonwoven fabrics according to Examples had a small rate of reduction in tensile strength before and after tufting and a low heat shrinkage rate, making them suitable for use as a carpet backing fabric. However, it can be confirmed that in the case of Example 7, the difference in physical properties between the machine direction and the cross direction is large, and the reduction rate of tensile strength before and after tufting is large. Therefore, it can be confirmed that the physical properties are insufficient for use as a nonwoven fabric for a backing fabric as compared to Example 1. However, the heat shrinkage rate is small and the tearing strength is excellent. Thus, it can be seen that as the deviation in stiffness in the cross direction and the machine direction is smaller, the physical properties are more excellent.

Claims

1. A polyester-based nonwoven fabric comprising:

a first component filament containing a first polyester having a melting point of 250°C to 300°C; and
a second component filament containing a second polyester having a melting point of 160°C to 220°C,
wherein the stiffness before tufting process measured by the measurement method specified in ASTM D 6125-97 is 100 mg to 300 mg in both the machine direction (MD) and the cross direction (CD).

2. The polyester-based nonwoven fabric according to claim 1, wherein:
the machine direction stiffness(S_{MD}) and the cross direction stiffness(S_{CD}) of the polyester-based nonwoven fabric before tufting process satisfy the following conditional expression 1).

$$2)\ 0.95 \leq S_{MD}/S_{CD} \leq 1.05.$$

3. The polyester-based nonwoven fabric according to claim 1, wherein:
the first polyester has an intrinsic viscosity of 0.65 dl/g to 0.80 dl/g.

4. The polyester-based nonwoven fabric according to claim 1, which is formed by fusing the second component filament.

5. The polyester-based nonwoven fabric according to claim 1, wherein:
the second polyester is a copolyester formed by the copolymerization of at least one acid component selected from terephthalic acid, dimethyl terephthalate, isophthalic acid, and dimethyl isophthalate, and at least one diol component selected from 1,4-butanediol(BD), ethylene glycol(EG), and neopentyl glycol(NPG).

6. The polyester-based nonwoven fabric according to claim 1, wherein:

the polyester-based nonwoven fabric has a deviation between the machine direction (MD) tensile strength ($T_{MD,0}$) and the cross direction (CD) tensile strength ($T_{CD,0}$) before the tufting process of $T_{CD,0} \times 0.05$ or less, and has a reduction rate of tensile strength after the tufting process in both the machine direction and the cross direction of less than 60%.

7. The polyester-based nonwoven fabric according to claim 6, wherein:
the polyester-based nonwoven fabric has both $T_{MD,0}$ and $T_{CD,0}$ 5cm before the tufting process of 25kgf/5cm to 35kgf/5cm.

8. The polyester-based nonwoven fabric according to claim 1, wherein:
the polyester-based nonwoven fabric includes the first component filament and the second component filament in a weight ratio of 85:15 to 90:10.

9. The polyester-based nonwoven fabric according to claim 1, wherein:
the polyester-based nonwoven fabric has a heat shrinkage rate in the machine direction of 1.5% or less and a heat shrinkage rate in the cross direction of 1.0% or less, as measured according to the following measurement method.
[Measurement Method]
A pattern with a size of 20cm × 20cm is drawn on a nonwoven fabric sample with a size 25cm × 25cm in both the machine direction and the cross direction, this is preheated and then removed on a preheating plate at 180°C for 3 minutes using a Mathis oven, and the shrunken length is measured to calculate the shrinkage rate.

10. The polyester-based nonwoven fabric according to claim 1, wherein:
the polyester-based nonwoven fabric has a tearing strength before the tufting process of in both the machine direction and the cross direction of 7 kgf to 13 kgf.

11. The polyester-based nonwoven fabric according to claim 1, wherein:

the polyester-based nonwoven fabric satisfies the following conditional expressions 2) and 3).

$$2)\ I.V._2 > I.V._1$$

$$3)\ 0.05 \leq (I.V._2 - I.V._1)/I.V._1 \leq 0.50$$

in the conditional expressions 2) and 3), $I.V_1$ and L_{V2} respectively represent the intrinsic viscosity of the first polyester and the intrinsic viscosity of the second polyester.

12. The polyester-based nonwoven fabric according to claim 1, wherein:

the first component filament has a fineness of 7 denier to 10 denier, and the second component filament has a fineness of 2 denier to 4 denier, and
the number of filaments of the first component filament is included by a factor in the range of two to five times the number of filaments of the second component filament.

13. A backing fabric for a carpet comprising the polyester-based nonwoven fabric according to any one of claims 1 to 12.

14. A method for manufacturing a polyester-based nonwoven fabric, the method comprising the steps of:

1) blend-spinning a first polyester with a melting point of 250°C to 300°C and a second polyester with a melting point of 160°C to 220°C and laminating the web to form a blended web; and
2) heat-bonding the blended web with hot air having a temperature of 0°C to 10°C or higher than the melting point of the second polyester; thereby manufacturing a nonwoven fabric in which both a bending strength in the machine direction and a stiffness in the cross direction before the tufting process are 100 mg to 300 mg.

15. The method for manufacturing a polyester-based nonwoven fabric according to claim 14, wherein:
in step 1), the first polyester and the second polyester are stretched at a speed of 4,500 m/min to 5,200 m/min to form the first component filament and the second component filament, respectively.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2022/020817

A. CLASSIFICATION OF SUBJECT MATTER

D04H 1/55(2012.01)i; **D06N 7/00**(2006.01)i; **A47G 27/02**(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

D04H 1/55(2012.01); D04H 1/435(2012.01); D04H 1/4382(2012.01); D04H 3/011(2012.01); D04H 3/147(2012.01); D04H 3/153(2012.01); D05C 17/02(2006.01); D06N 7/00(2006.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models: IPC as above
Japanese utility models and applications for utility models: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS (KIPO internal) & keywords: 부직포 (nonwoven), 폴리에스테르 (polyester), 터프팅 (tufting), 융점 (melting point)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	KR 10-2014-0042379 A (KOLON INDUSTRIES, INC.) 07 April 2014 (2014-04-07) See claims 1 and 7; and paragraphs [0017], [0025], [0037], [0054]-[0055] and [0113].	1-15
Y	KR 10-2018-0097515 A (TORAY INDUSTRIES, INC.) 31 August 2018 (2018-08-31) See claim 1.	1-15
A	KR 10-1736421 B1 (KOLON INDUSTRIES, INC.) 17 May 2017 (2017-05-17) See claims 1, 3 and 8.	1-15
A	KR 10-2009-0067312 A (KOLON CORPORATION) 25 June 2009 (2009-06-25) See entire document.	1-15
A	WO 2014-016172 A1 (BONAR B.V.) 30 January 2014 (2014-01-30) See entire document.	1-15

☐ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:
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"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
29 March 2023	**31 March 2023**

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
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