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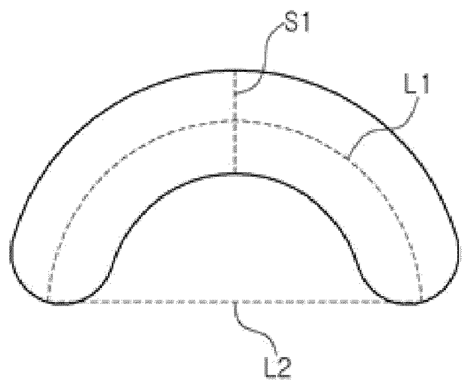
(54) LYOCELL FIBER, NONWOVEN FABRIC AGGREGATE COMPRISING SAME, AND MASK PACK SHEET COMPRISING SAME

(57) The present invention relates to lyocell fiber, a nonwoven fibrous aggregate containing the same, and a mask pack sheet containing the same.

The present invention provides lyocell fiber wherein a monofilament has a cross-section of a flat yarn or a flat yarn having a curvature, a nonwoven fibrous aggregate containing the same, and a mask pack sheet containing the same, thereby exhibiting physical properties that could not be provided in the existing lyocell fiber having a circular cross-section, and thus can afford excellent properties such as excellent bendability for industrial material application, good feel and soft gloss property for clothes or interior applications, and transparency, skin adhesion, absorption, and maintenance of a solvent such as moisture, and a smooth surface feel for a mask pack nonwoven fibrous aggregate application.

【FIG. 1】



EP 3 564 417 A1

Description

FIELD OF THE INVENTION

[0001] The present invention relates to lyocell fiber, a nonwoven fibrous aggregate containing the same, and a mask pack sheet containing the same.

BACKGROUND OF THE INVENTION

[0002] A fiber is a natural or synthetic object that is flexible and thin, and has large length to thickness ratio, in view of the shape. Such fiber is divided into filament fiber, medium length fiber, and staple fiber according to the shape, and is divided into natural fiber and man-made fiber according to the raw material.

[0003] From the past, fibers have had a close relationship to human life, and natural fibers such as cotton, linen, wool, and silk have been used as main materials for clothes. With the development of science and technology after the industrial revolution, the use of fibers was expanded to industrial applications in addition to clothing applications, and in order to fulfill a rapidly increasing demand for fibers according to the development of culture and an increase in population, the field of man-made fibers was developed for novel fiber materials.

[0004] Among the manmade fibers, regenerated fibers not only have excellent feel and wearability, but also have much quicker moisture absorption and discharge capacity than cotton, and thus have been frequently used as raw materials for clothes. Particularly, among the regenerated fibers, rayon fiber has excellent gloss and color formation properties, can realize feel equivalent to natural fiber, and is recognized as a material that is harmless to a human body, and thus was broadly used in the past. However, such rayon fiber is easily shrunken and wrinkled, the preparation process is complicated, and many chemicals are used in the process of dissolving wood pulp, and the like, thus causing environmental problems during the operation and environmental pollution during the processes of waste water treatment, and the like.

[0005] Thus, studies on fibers that are harmless to the environment and the human body and having much better properties than the existing fiber have progressed, and recently, lyocell fibers prepared from natural pulp and an amine oxide hydrate were introduced. Such lyocell fiber has excellent fiber properties such as tensile property and feel compared to the existing regenerated fiber, but does not generate pollutants during the production process, and an amine oxide solvent that is used can be recycled and be biodegraded during discardment, and thus it is being used in various fields as an environmentally friendly fiber.

[0006] However, currently, only the lyocell fiber having a circular cross-sectional shape can be produced, but it is expected that various properties may be exhibited according to the cross-sectional shape of lyocell fiber. Therefore, there is a demand for studies on the preparation technology of lyocell fiber having various cross-sectional shapes.

SUMMARY OF THE INVENTION

TECHNICAL PROBLEM

[0007] The present invention provides a lyocell fiber wherein a monofilament has a cross-section of a flat yarn or a flat yarn having a curvature, and thereby, can afford excellent properties such as excellent bendability for industrial material applications, good feel and soft gloss properties for clothes or interior applications, and transparency, skin adhesion, absorption, and maintenance of a solvent such as moisture, and smooth surface feel for a mask pack nonwoven fibrous aggregate application.

TECHNICAL SOLUTION

[0008] According to a preferable embodiment of the present invention, a lyocell fiber including a lyocell multifilament prepared by spinning a lyocell spinning dope including cellulose pulp and a solvent is provided, wherein a monofilament making up the multifilament has a cross-section having a central major axis (L1) and a central minor axis (S1), a ratio of lengths of the central major axis (L1) and the central minor axis (S1) is 1.5:1~10.5:1, and a ratio of the length of the central major axis (L1) and a length of a straight line (L2) between both ends of the central major axis is 1.0~1.5:1.

[0009] In the above embodiment, the length of the central major axis (L1) may be 12~42 μm, and the length of the central minor axis (S1) may be 4~7 μm.

[0010] In the above embodiment, the monofilament may have fineness of 1 .0~4.0 denier, and a value obtained by dividing the cross-sectional perimeter of the monofilament by the fineness may be 22 μm/denier or more.

[0011] According to another preferable embodiment of the present invention, a nonwoven fibrous aggregate containing a lyocell fiber is provided, wherein a monofilament making up the lyocell fiber has a cross-section having a central major axis (L1) and a central minor axis (S1), a ratio of lengths of the central major axis (L1) and the central minor axis (S1) is 1.5:1~10.5:1, and a ratio of a length of the central major axis (L1) and a length of a straight line (L2) between both ends of the central major axis is 1.0~1.5:1.

[0012] In the above embodiment, the length of the central major axis (L1) of the monofilament may be 12~42 μm, and the length of the central minor axis (S1) may be 4~7 μm.

[0013] In the above embodiment, the monofilament may have fineness of 1.0~4.0 denier, and a value obtained by dividing the cross-sectional perimeter of the monofilament by the fineness may be 24.5 to 32 μm/denier.

[0014] In the above embodiment, the fineness of the lyocell fiber may be 1.0 to 4.0 denier.

[0015] In the above embodiment, the fiber length of the lyocell fiber may be 36 to 40 mm.

[0016] In the above embodiment, a crimp number of the lyocell fiber may be 8 to 12 cpi.

[0017] In the above embodiment, the lyocell fiber may have an emulsion content of 0.1 to 0.4 wt%, based on 100 wt% of the lyocell fiber.

[0018] In the above embodiment, a basis weight of the nonwoven fibrous aggregate may be 30 to 60 g/m^2.

[0019] In the above embodiment, the thickness of the nonwoven fibrous aggregate may be 0.3 to 0.5 mm.

[0020] In the above embodiment, the nonwoven fibrous aggregate may have moisture absorption of 1000 to 1600 %, based on the weight of the lyocell fiber.

[0021] In the above embodiment, the nonwoven fibrous aggregate may have transparency after moisture treatment of 80 to 84 %.

[0022] In the above embodiment, the nonwoven fibrous aggregate may have transparency after essence treatment of 88 to 94 %.

[0023] In the above embodiment, the nonwoven fibrous aggregate may have skin adhesion after moisture treatment of 3.6 to 4.2 gf.

[0024] In the above embodiment, the nonwoven fibrous aggregate may have skin adhesion after essence treatment of 4.5 to 5.3 gf.

[0025] In the above embodiment, the nonwoven fibrous aggregate may have an emulsion content of 0.001 wt% or less, based on 100 wt% of the nonwoven fibrous aggregate.

[0026] According to yet another embodiment of the present invention, a mask pack sheet using the above-explained nonwoven fibrous aggregate is provided.

ADVANTAGEOUS EFFECTS

[0027] The present invention provides a lyocell fiber wherein a monofilament has a cross-section of a flat yarn or a flat yarn having a curvature, a nonwoven fibrous aggregate containing the same, and a mask pack sheet including the same, thereby exhibiting physical properties that could not be provided in the existing lyocell fiber having a circular cross-section, and thus, can afford excellent properties such as excellent bendability for industrial material application, good feel and soft gloss properties for clothes or interior applications, and transparency, skin adhesion, absorption and maintenance of a solvent such as moisture, and smooth surface feel for a mask pack nonwoven fibrous aggregate application.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028]

FIG. 1 shows the cross-section of a monofilament included in a lyocell fiber according to one embodiment of the present invention.

FIG. 2 is a photograph showing the cross-section of a lyocell fiber prepared according to an example of the present invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0029] Hereinafter, the present invention will be explained in more detail.

[0030] The present invention relates to a lyocell fiber including a lyocell multifilament prepared by spinning a lyocell spinning dope including cellulose pulp and a solvent, wherein a monofilament making up the multifilament has a cross-section having a central major axis (L1) and a central minor axis (S1), a ratio of lengths of the central major axis (L1) and the central minor axis (S1) is 1.5:1~10.5:1, and a ratio of the length of the central major axis (L1) and a length of a straight line (L2) between both ends of the central major axis is 1.0~1.5:1.

[0031] The lyocell fiber of the present invention includes monofilaments having a flat yarn cross-section, and the cross-section is as shown in FIG. 1.

[0032] That is, since the length of the central major axis (L1) is at least 1.5 times and at most 10.5 times the length of the central minor axis (S1), it becomes a flat yarn having a flat cross-section, and in case the ratio of the length of the central major axis (L1) and the length of a straight line (L2) between both ends of the central major axis is 1:1, a linear flat yarn is formed, while in case the ratio is greater than 1:1, a flat yarn having a curvature is formed.

[0033] As such, since the monofilament has a cross-section of a flat yarn or a flat yarn having a curvature, physical properties that could not be exhibited by the existing lyocell fiber having a circular cross-section may be exhibited, and particularly, excellent bendability may be exhibited for industrial material applications, good feel and soft gloss may be exhibited for clothes or interior applications, and transparency, skin adhesion, absorption and maintenance of a solvent such as moisture, and smooth surface feel may be exhibited for a mask pack nonwoven fibrous aggregate application.

[0034] Meanwhile, the cross-section has a central major axis (L1) and a central minor axis (S1), and the ratio of the lengths of the central major axis (L1) and the central minor axis (S1) should be 1.5:1~10.5:1, and if the ratio is less than 1.5:1, a flat yarn property may be insignificantly exhibited, and thus it may be difficult to exhibit properties that are significantly different from a yarn having a circular cross-section, and if it exceeds 10.5:1, it may be difficult to adjust desired fineness of the final fiber.

[0035] Further, the ratio of the length of the central major axis (L1) and the length of a straight line (L2) between both ends of the central major axis is 1.0~1.5:1, preferably 1.1:1~1.5:1. If the ratio is greater than 1.5:1, a curvature may become excessively large, and thus adhesion between fibers may be lowered and the effect of a flat yarn may be decreased.

[0036] In addition, the monofilament of the present invention is characterized in that the length of the central major axis (L1) is 12~42 μm, and the length of the central minor axis (S1) is 4~7 μm, which can be prepared in the monofilament fineness range of 1.0~4.0 denier as defined in the present invention.

[0037] That is, a length of the central minor axis (S1) of less than 4 μm is difficult to achieve due to the limitation in the technology of spinneret manufacture and processing, and fineness should be increased so that the length of the central major axis (L1) is greater than 42 μm, which is insignificant in terms of fiber fineness. In case the length of the central minor axis (S1) is greater than 7 μm and the length of the central major axis (L1) is less than 12 μm, a specific surface area may decrease and adhesion between fibers may be lowered.

[0038] Further, since the monofilament of the present invention has fineness of 1.0~4.0 denier, and a value obtained by dividing the cross-sectional perimeter of the monofilament by the fineness is 22 μm/denier or more, preferably 24.5 to 32 μm/denier, the cross-sectional perimeter per unit fineness increases and the specific surface area of the monofilament itself increases, and thus it may be applied in effective fields, and for example, it may have excellent absorption and maintenance of essence in a mask pack nonwoven fibrous aggregate.

[0039] The above-explained lyocell fiber is biodegradable and environmentally friendly, and the monofilament of the lyocell fiber has a cross-section of a linear flat yarn or a flat yarn having a curvature, and thus, compared to a common circular cross-section, bendability for withstanding to external force is strong, and the fiber strand specularly reflects light like a mirror, thus having a shiny gloss on the surface. In addition, the feel is rough yet soft due to a special cross-section effect, and thus it may be applied in various fields including industrial materials, cloth applications such as a car seat cover, a seat cover, a carpet, a curtain, various clothes, and the like.

[0040] Particularly, in case the lyocell fiber according to the present invention is prepared in the form of a short staple fiber and is used as a nonwoven fibrous aggregate for a mask pack, it may exhibit excellent properties of transparency, skin adhesion, essence absorption and maintenance, soft feel, and the like, which are very important properties of a nonwoven fibrous aggregate for a mask pack, compared to other materials.

[0041] If the cross-section of the fiber is flat, the thickness of the fiber decreases, and when prepared into a nonwoven fibrous aggregate, based on the same unit weight, the thickness of the nonwoven fibrous aggregate becomes thinner compared to a common circular cross-section fiber, and thus if dipped in a cosmetic solvent such as an essence, it may become transparent and have a soft feel and exhibit excellent skin adhesion.

[0042] Further, since the specific surface area is large compared to a circular cross-section fiber of the same fineness, absorption for solvents such as an essence is high, and thus essence maintenance is also excellent, thereby exhibiting large advantages compared to other materials applied for a nonwoven fibrous aggregate for a mask pack.

[0043] In case the lyocell fiber according to the present invention is used as a nonwoven fibrous aggregate for a mask pack, it may have fineness of 1.0 to 4.0 denier. Herein, a lyocell fiber having fineness of less than 1.0 denier may be difficult to prepare, and if the fineness of the lyocell fiber is greater than 4.0 denier, it is more than general fineness applied for a mask pack, and thus there is no distinction in skin adhesion or essence absorption and the like, and the properties of a general level may be exhibited.

[0044] The lyocell fiber may have a fiber length of 36 to 40 mm. In case the lyocell fiber is used as a nonwoven fibrous aggregate for a mask pack within the above fiber length range, during the preparation process of a nonwoven fibrous aggregate, processability in a carding process may be excellent.

[0045] The crimp number of the lyocell fiber may be 8 to 12 cpi. The crimp number may be 5 to 20 cpi, but preferably 8 to 12 cpi. Herein, if the crimp number is less than 5 cpi, during the preparation process of a nonwoven fibrous aggregate, in a carding process, fiber entanglement may be low, thus generating a process problem, and if it is greater than 20 cpi, due to too high a crimp number, opening may not be properly achieved in a carding process.

[0046] The emulsion content of the lyocell fiber may be 0.1 to 0.4 wt%, based on 100 wt% of the lyocell fiber. If the emulsion content is within the above wt% range, during the process of forming filaments into crimped tow as described below, generated friction may be reduced, and crimps between fibers may be properly formed. Further, cardability during the preparation of a nonwoven fibrous aggregate may be improved.

[0047] The basis weight of the nonwoven fibrous aggregate may be 30 to 60 g/m^2, and the thickness may be 0.3 to 0.5 mm. The above basis weight and thickness ranges mean optimum ranges for improving absorption of a liquid composition, transparency, and adhesion in a nonwoven fibrous aggregate containing the lyocell fiber fulfilling the above-described fineness, fiber length, crimp number, and emulsion content.

[0048] The moisture absorption of the nonwoven fibrous aggregate may be 1000 to 1600 %, based on the weight of the lyocell fiber. As explained above, although the lyocell fiber is hydrophilic and has relatively high moisture absorption compared to other fibers, in case the above-described properties of a lyocell fiber are fulfilled, and simultaneously the above-described basis weight and thickness ranges of a nonwoven fibrous aggregate are fulfilled, the moisture absorption of a nonwoven fibrous aggregate containing the lyocell fiber may be adjusted to the above range.

[0049] The nonwoven fibrous aggregate may have transparency after moisture treatment of 80 to 84 %, compared to before moisture treatment, and transparency after essence treatment of 88 to 94 %, compared to before essence treatment. Since the fineness of the lyocell fiber is 1.0 to 4.0 denier, and thus the thickness of the nonwoven fibrous aggregate containing the lyocell fiber becomes thinner than usual, if the nonwoven fibrous aggregate is dipped in a liquid composition such as moisture and an essence and the like, it may have transparency within the above range as well as a soft feel.

[0050] The skin adhesion after moisture treatment of the nonwoven fibrous aggregate may be 3.6 to 4.2 gf, and the skin adhesion after essence treatment of the nonwoven fibrous aggregate may be 4.5 to 5.3 gf. In case the properties of the lyocell fiber are fulfilled, and simultaneously the basis weight and thickness of the nonwoven fibrous aggregate containing the same are fulfilled, the nonwoven fibrous aggregate may fulfill skin adhesion of the above range.

[0051] The nonwoven fibrous aggregate may have an emulsion content of 0.001 wt% or less, based on 100 wt% of the nonwoven fibrous aggregate. The nonwoven fibrous aggregate exhibits the above emulsion content because most of the emulsion contained in the lyocell fiber is washed away during hydroentanglement of a spunlace process when preparing a nonwoven fabric.

[0052] Hereinafter, the nonwoven fibrous aggregate containing the lyocell fiber will be explained in detail through the preparation process of the nonwoven fibrous aggregate.

[0053] The nonwoven fibrous aggregate of the present invention may be prepared by a method including the steps of: (S1) spinning a lyocell spinning dope including cellulose pulp and a solvent; (S2) coagulating the lyocell spinning dope spun in the step (S1); (S3) washing the lyocell multifilament obtained in the step (S2); (S4) treating the lyocell multifilament washed in the step (S3) with an emulsion; (S5) crimping the lyocell multifilament emulsion-treated in the step (S4) through a stuffer box to obtain a crimped tow; (S6) drying and cutting the crimped tow obtained in the step (S5) to obtain lyocell staple fiber; and (S7) preparing the lyocell staple fiber obtained in the step (S6) into a nonwoven fibrous aggregate, wherein a monofilament making up the multifilament has a cross-section having a central major axis (L1) and a central minor axis (S1), the ratio of the lengths of the central major axis (L1) and the central minor axis (S1) is 1.5:1~10.5:1, and the ratio of the length of the central major axis (L1) and the length of a straight line (L2) between both ends of the central major axis is 1.0~1.5:1.

[0054] The lyocell fiber of the present invention may prepared by dissolving cellulose pulp in a solvent to prepare a lyocell spinning dope, and then, spinning the spinning dope, wherein the solvent may be selected from an aqueous solution of N-methylmorpholine N-oxide (NMMO) or an ionic solvent, and hereinafter, a method of preparing the lyocell fiber using an aqueous solution of NMMO will be explained in more detail.

[(S1) STEP]

[0055] In the (S1) step, a lyocell spinning dope including cellulose pulp and an aqueous solution of NMMO is spun.

[0056] The lyocell spinning dope may include: 6~16 wt% of cellulose pulp; and 84~94 wt% of N-methylmorpholine N-oxide, wherein the cellulose pulp may have an alpha-cellulose content of 85~97 wt% and a polymerization degree (DPw) of 600~1700.

[0057] In the lyocell spinning dope, if the content of cellulose pulp is less than 6 wt%, it may be difficult to realize fiber properties, and if it is greater than 16 wt%, it may be difficult to dissolve in an aqueous solution.

[0058] Further, in the lyocell spinning dope, if the content of N-methylmorpholine N-oxide is less than 84 wt%, the melt viscosity may significantly increase, which is not preferable, and if it is greater than 94 wt%, spinning viscosity may significantly decrease, and thus, it may be difficult to prepare homogeneous fiber in a spinning step.

[0059] In the aqueous solution of N-methylmorpholine N-oxide, the weight ratio of N-methylmorpholine N-oxide and water may be 93:7 to 85:15. If the weight ratio of N-methylmorpholine N-oxide and water exceeds 93:7, a melting temperature may increase, thus generating decomposition of cellulose when dissolving the cellulose, and if the weight ratio is less than 85:15, the dissolving performance of the solvent may be lowered, and thus it may be difficult to dissolve the cellulose.

[0060] The above-described spinning dope is discharged from a spinning nozzle of a spinneret. Herein, the spinneret performs a function for discharging the spinning dope in the form of a filament into a coagulation solution in a coagulation bath through an air gap section.

[0061] The spinneret may have a shape wherein spinneret holes in the form of flat and long slits are curved in a C-shape.

[0062] The arrangement of the spinneret holes in the spinneret is very important, and they should be designed so that all the holes may contact cooling air and may not interfere with each other during air quenching.

[0063] The step of discharging the spinning dope from the spinneret may be conducted at a spinning temperature of 80-130 °C.

[(S2) STEP]

[0064] In the step (S2), the lyocell spinning dope spun in the step (S1) is coagulated to obtain a lyocell multifilament, and the coagulation of the step (S2) may include a primary coagulation step of air quenching (Q/A) wherein cooling air is supplied to the spinning dope to coagulate, and a secondary coagulation step wherein the primarily coagulated spinning dope is dipped in a coagulation solution to coagulate.

[0065] In the step (S1), after discharging the spinning dope through a spinneret, it may be passed through an air gap section between the spinneret and the coagulation bath. In the air gap section, cooling air is supplied from an air cooling part positioned inside of a donut-shaped spinneret, from the inside to the outside of the spinneret, and primary coagulation may be conducted by air quenching wherein such cooling air is supplied to the spinning dope.

[0066] Herein, factors influencing the properties of the lyocell multifilament obtained in the step (S2) include the temperature and wind velocity of the cooling air in the air gap section, and in the coagulation of the step (S2), cooling air having a temperature of 4~15 °C and a wind velocity of 5~10 m/s may be supplied to the spinning dope to coagulate.

[0067] If the temperature of the cooling air during the primary coagulation is less than 4 °C, the surface of a spinneret may be cooled, the cross-section of the lyocell filament may become non-uniform, and spinnability may become inferior, and if it is greater than 15 °C, primary coagulation by cooling air may not be sufficiently achieved, and thus spinnability may become inferior.

[0068] Further, a flat yarn is very sensitive to the wind velocity of air quenching during spinning, and if the wind velocity of the cooling air during the primary coagulation is less than 5 m/s, primary coagulation by the cooling air may not be sufficiently achieved, and thus spinnability may become inferior and yarn cutting may be easily generated, and if it is greater than 10 m/s, the spinning dope discharged from the spinneret may have a flat yarn cross-section, and thus the length of the central minor axis may become small, spinnability may not be good due to shaking by air quenching, and yarn cutting may be generated.

[0069] After the primary coagulation by air quenching, the spinning dope may be fed to a coagulation bath containing a coagulation solution to progress secondary coagulation. In order to progress appropriate secondary coagulation, the temperature of the coagulation solution may be equal to or less than 30 °C. Such a secondary coagulation temperature is not higher than is necessary, and appropriately maintains a coagulation velocity. The coagulation solution may be prepared with a common composition in the technical field to which the present invention pertains, and thus is not specifically limited.

[(S3) STEP]

[0070] In the step (S3), the lyocell multifilament obtained in the step (S2) is washed.

[0071] Specifically, the lyocell multifilament obtained in the step (S2) is introduced into a tow roller, and then introduced into a washing bath to wash it.

[0072] In the filament washing step, considering easy recovery and reuse of a solvent after washing, a washing solution of a temperature of 0 to 100 °C may be used, and as the washing solution, water may be used, and if necessary, other additive ingredients may be further included.

[(S4) STEP]

[0073] In the step (S4), the lyocell multifilament washed in the step (S3) is treated with an emulsion, and after the emulsion treatment, it may be dried.

[0074] In the emulsion treatment, the multifilament is coated with an emulsion while passing through the surface of a roller coated with an emulsion, and the amount of an emulsion coated on the filament is controlled by the velocity of the roller of emulsion treatment equipment. The emulsion reduces friction generated during the contact of the filament in a drying roller and guide, in a winding or crimping step, and allows proper formation of crimp.

[(S5) STEP]

[0075] In the step (S5), the lyocell multifilament emulsion-treated in the step (S4) is crimped to obtain a crimped tow.
[0076] Crimping is a process of providing crimps to the multifilament, and specifically, a crimped tow having 8~12 crimps per inch may be obtained by crimping with a stuffer box.
[0077] In the step (S5), steam may be supplied to the lyocell multifilament and pressure may be applied to crimp.
[0078] Specifically, the lyocell multifilament is passed through a steam box, steam is supplied at a rate of 0.1~1.0 kgf/cm^2 to increase the temperature, and then is pressed using a press roller under pressure of 1.5~3.0 kgf/cm^2, thereby forming crimps in a stuffer box.
[0079] Herein, if the feed rate of steam is less than 0.1 kgf/cm^2, crimps may not be smoothly formed, and if it is greater than 1.0 kgf/cm^2, a temperature in the stuffer box may increase above 120 °C, and thus filaments may be adhered to each other and may not pass through the stuffer box. Further, if the pressure for pressing the press roller is less than 1.5 kgf/cm^2, a desired number of crimps may not be formed, and if it is greater than 3.0 kgf/cm^2, a pressing force may be too strong, and thus filaments may not pass through the stuffer box.

[(S6) STEP]

[0080] In the step (S6), the crimped tow obtained in the step (S5) is dried and cut to obtain lyocell staple fiber.
[0081] The crimped tow is dried using a lattice dryer, and is subjected to a cutting process to form lyocell staple fiber.

[(S7) STEP]

[0082] In the step (S7), the lyocell staple fiber obtained in the step (S6) is prepared into a nonwoven fibrous aggregate.
[0083] The lyocell staple fiber is hydroentangled by carding and spun lacing to prepare a nonwoven fibrous aggregate.
[0084] The present invention may be used as a cosmetic mask pack using a mask pack sheet. Since the mask pack uses the mask pack sheet as a support sheet, it has improved skin adhesion and wearability even in the face region having many curves, and has excellent absorption of a liquid composition such as moisture and essence, and the like, and thus can effectively supply nutrition to the face region.
[0085] Further, since it has improved wet transparency, when adhered to the face of a user, it appears similar to the face color of a user, makes an apparent sense of difference less, thus making the appearance after wearing the mask pack beautiful.
[0086] Hereinafter, the present invention will be explained in more detail through examples. These examples are presented only to explain the present invention in more detail, and it would be obvious to one of ordinary knowledge in the art that the scope of the present invention is not limited by these examples.

<Experimental Example 1>

Example 1

[0087] Cellulose pulp having a polymerization degree (DPw) of 820 and an alpha cellulose content of 93.9 % was mixed with a mixed solvent of NMMO/H_20 (weight ratio 90/10) having a propyl gallate content of 0.01 wt% to prepare a spinning dope for preparing lyocell fiber of a concentration of 10 wt%.
[0088] First, in the spinning nozzle of a spinneret in which multiple unit holes in the form of a flat slit having a curvature are formed, a spinning temperature was maintained at 110 °C, and the discharge amount of a spinning dope and the spinning velocity were controlled so that the fineness of the monofilament may became 2.0 denier. The filament-shaped spinning dope discharged from the spinning nozzle was passed through an air gap section and fed to a coagulation solution in a coagulation bath. Herein, the cooling air in the air gap section primarily coagulates the spinning dope at a temperature of 8 °C and a wind velocity of 5~7 m/s.
[0089] As the coagulation solution, a solution of a temperature of 25 °C including 85 wt% of water and 15 wt% of NMMO was used.
[0090] The filament drawn from the air layer through a tow roller was washed by a sprayed washing solution in a washing machine to remove remaining NMMO, and the filament was allowed to be uniformly coated with an emulsion to maintain the emulsion content of 0.2 %, and dried at 150 °C in a drying roller, thus preparing lyocell fiber including multifilaments consisting of monofilaments having a cross-section of flat yarn having a curvature.

Example 2

[0091] Lyocell fiber including multifilaments consisting of monofilaments having a cross-section of a flat yarn having a curvature was prepared by the same method as Example 1, except that the fineness of the monofilament was controlled to 1.6 denier.

Example 3

[0092] Lyocell fiber including multifilaments consisting of monofilaments having a cross-section of a flat yarn having a curvature was prepared by the same method as Example 1, except that the fineness of the monofilament was controlled to 2.4 denier.

Comparative Example 1

[0093] Lyocell fiber including multifilaments consisting of monofilaments having a circular cross-section with a diameter of 13.78 μm was prepared by the same method as Example 1, except that a spinneret having multiple circular unit holes was used, the wind velocity during air quenching was 15 m/s, and the fineness of the monofilament was controlled to 2.0 denier.

Comparative Example 2

[0094] Lyocell fiber including multifilaments consisting of monofilaments having a circular cross-section with a diameter of 15.06 μm was prepared by the same method as Comparative Example 1, except that the fineness of the monofilament was controlled to 2.39 denier.

Comparative Example 3

[0095] Lyocell fiber was prepared by the same method as Example 1, except that the ratio of the central major axis (L1) of the monofilament and the straight line (L2) between both ends of the central major axis was controlled to less than 1.0.

Comparative Example 4

[0096] Lyocell fiber including multifilaments consisting of monofilaments having a cross-section of a flat yarn having a curvature was prepared by the same method as Example 1, except that the ratio of the central major axis (L1) of the monofilament and the straight line (L2) between both ends of the central major axis was controlled to 2.8:1.

Comparative Example 5

[0097] Lyocell fiber was prepared by the same method as Example 1, except that the length of the central major axis (L1) of the monofilament was 11 μm and the length of the central minor axis (S1) was 3 μm.

Comparative Example 6

[0098] Lyocell fiber including multifilaments consisting of monofilaments having a cross-section of a flat yarn having a curvature was prepared by the same method as Example 1, except that the length of the central major axis (L1) of the monofilament was 43 μm and the length of the central minor axis (S1) was 8 μm.

[0099] For the lyocell fibers prepared in the examples and comparative examples, the cross-sectional shape of the monofilament included in the lyocell fiber, the cross-sectional area, fineness, and fiber thickness were measured and calculated as follows, and the results are shown in the following Table 1.

(1) The cross-sectional shape of the monofilament included in lyocell fiber

[0100] A small amount of fiber bundles were sampled, rolled together with black cotton and made thin, and inserted into the holes of a plate capable of cutting the cross-section, and then cut with a razor blade so that the cross-section may not be shaved.

[0101] Using an optical microscope (BX51, product from Olympus), the cross-section was observed with a magnification ($\times$ 500), and the image was stored with a digital camera. For the cross-section image of the fiber, using an Olympus soft imaging solution program, the cross-section to be obtained was designated, and the lengths of the major axis and minor axis and the area, fiber thickness, cross-sectional perimeter, and the like were analyzed.

(2) Fineness

[0102] Using the practical monofilament cross-sectional area of lyocell fiber obtained through the cross-section analysis and the density of lyocell fiber (1.49 g/cm^3), the fineness of the lyocell fiber was calculated by the following Equation 1.

<Equation 1>

Fineness (De) = [monofilament cross-sectional area of lyocell fiber (μm^2) × density of lyocell fiber (g/cm^3) × 9000 (m)]/1000000

[Table 1]

	Cross-sectional shape of monofilament					Fineness (De)	Cross-sectional perimeter (μm)/ fineness (De)	L1/S1	L1/L2	Note
	Length of central major axis (L1 ,μm)	Length of central minim axis (S1,μm)	Length of straight line connecting both ends of the major axis (L2,μm)	Cros s-sectional perimeter (μm)	Practical monofilament cross-sectional area of lyocell fiber (μm^2)					
Example 1	23.8	5.9	19.8	61.0	148.9	2.0	30.5	4.0	1.2	Flat yarn cross-section
Example 2	20.2	5.8	18.2	53.8	124.1	1.6	32.4	3.4	1.1	Flat yarn cross-section
Example 3	29.0	6.20	21.0	69.7	178.4	2.4	29.2	4.7	1.4	Flat yarn cross-section
Comparative Example 1	circular cross-section diameter: 13.7			43.2	149.0	2.0	21.6			Circular cross-section
Comparative Example 2	circular cross-section diameter: 15.0			47.3	178.0	2.4	19.8			Circular cross-section
Comparative Example 3	Not spun			Not measurable						
Comparative Example 4	34.5	4.22	12.2	77.8	146.4	1.95	39.9	8.1	2.8	Flat yarn cross-section
Comparative Example 5	Not spun			Not measurable						
Comparative Example 6	43.1	8.8	18.2	104.4	380.4	5.0	20.6	4.8	2.3	Flat yarn cross-section

[0103] As shown in Table 1, the lyocell fibers of Examples 1 to 3 consisting of monofilaments having a cross-section of a flat yarn and having a curvature have larger cross-sectional perimeters at the same fineness, compared to the lyocell fibers of Comparative Examples 1 and 2 consisting of monofilaments having a circular cross-section. This means that the specific surface area of the fiber is large, thus realizing excellent properties as described above. Further, since the fiber thickness is small at the same fineness, excellent properties may be exhibited. In addition, since the lyocell fibers of Examples 1 to 3 do not have excessively large curvatures compared to the lyocell fibers of Comparative Examples 3 to 6, they have excellent adhesion between fibers and thus have an improved flat yarn effect, and have an effective range exhibiting excellent effect in terms of fiber fineness.

[0104] Herein, the cross-sectional shape of the lyocell fiber of Example 1 is as shown in FIG. 2.

[0105] From these results, it can be seen that the lyocell fibers of Examples 1 to 3 have large specific surface areas and small fiber thicknesses, and may be broadly applied in fields requiring such properties.

<Experimental Example 2>

[0106] The lyocell fibers prepared in the examples and comparative examples were passed through a steam box (with a pressure condition of 0.2 kgf/cm^2) and preheated, and pressed under pressure of 2.0 kgf/cm^2 using a stuffer box press roller, thus preparing a crimped tow in a stuffer box, which is dried through a lattice dryer, and then finally cut to prepare a lyocell staple fiber having a fiber length of 38 mm.

[0107] The above-prepared lyocell staple fiber was finally prepared into a nonwoven fibrous aggregate through carding and spun lacing processes, the raw material input and process velocity were controlled to adjust the basis weight of the nonwoven fibrous aggregate to the numerical values of Table 2, and the deviation in the basis weight of the nonwoven fibrous aggregate was adjusted to ±10 %.

[0108] The properties of the above-prepared nonwoven fibrous aggregate were measured as follows and are shown in the following Table 2.

<Measurement method>

(1) Basis weight (gsm = g/m^2)

[0109] The nonwoven fibrous aggregate was sampled with a width of 5 cm and a length of 20 cm, the weight was measured, and the basis weight was calculated by the following Equation 2.

<Equation 2>

Basis weight = measured value of the weight of the nonwoven fibrous aggregate sample × 100

(2) Thickness

[0110] The thickness was measured using a No. 2046F dial indicator from Mitutoyo Corporation.

(3) Transparency

[0111] Sample pretreatment: The nonwoven fibrous aggregate was dipped in water or essence for 10 minutes.

[0112] In order to measure the transparency of the nonwoven fibrous aggregate, transmittance of a nanometer wavelength was measured using light transmittance measuring equipment, Haze Meter (Nippon Denshoku Industries, NDH-5000).

(4) Absorption

[0113] The weights before and after dipping the nonwoven fibrous aggregate in water or essence for 10 minutes were measured, and the capacity of the nonwoven fibrous aggregate for absorbing water or essence was calculated by the following Equation 3.

<Equation 3>

Absorption (%) = {(weight of nonwoven fibrous aggregate after dipping - weight of nonwoven fibrous aggregate before dipping)/weight of nonwoven fibrous aggregate before dipping}×100

(5) Skin adhesion

[0114] The nonwoven fibrous aggregate was cut to a 25 mm×150 mm size, and dipped in water or essence for 10 minutes, and then adhered to the upper limb of a person. Immediately after adhering, while tearing off the nonwoven fibrous aggregate from the skin using an Instron instrument (Instron-3365), adhesion force (unit of gf) was measured.

[Table 2]

	Basis weight (gsm)	Thickness (mm)	Transparency (%)	Absorption (%)	Skin adhesion (%)
Example 1	50	0.42	Water 82 Essence 90	Water 1200 Essence 1400	Water 3.8 Essence 4.9
Example 2	40	0.39	Water 84 Essence 92	Water 1100 Essence 1250	Water 3.7 Essence 4.7
Example 3	60	0.46	Water 81 Essence 88	Water 1300 Essence 1500	Water 4.0 Essence 5.1
Comparative Example 1	40	0.45	Water 79 Essence 88	Water 950 Essence 1000	Water 3.3 Essence 4.3
Comparative Example 2	50	0.5	Water 78 Essence 86	Water 1000 Essence 1100	Water 3.5 Essence 4.5
Comparative Example 3	Not measurable	-	-	-	-
Comparative Example 4	50	0.44	Eater 80 Essence 88	Eater 1200 Essence 1400	Eater 3.6 Essence 4.6
Comparative Example 5	Not measurable	-	-	-	-
Comparative Example 6	60	0.52	Water 74 Essence 82	Water 1400 Essence 1600	Water 3.8 Essence 4.8

[0115] As shown in the Table 2, Examples 1 to 3 had thinner thicknesses than the nonwoven fibrous aggregates of Comparative Examples 1 and 2, but exhibited excellent performances including transparency, absorption, and adhesion, due to the effect of the flat fiber cross-section having a curvature.

[0116] To the contrary, the fiber of Comparative Example 4 had an excessively high curvature of fiber, and thus the thickness increased during the preparation of the nonwoven fibrous aggregate, and the properties other than absorption were similar to those of Comparative Examples 1 and 2. In Comparative Example 6, the thickness of the fiber having a curvature increased and the thickness of the nonwoven fibrous aggregate increased, and thus, compared to Example 3, the properties may not be improved, and it is not expected to be useful for a mask sheet.

[0117] Although specific embodiments of the present invention have been described in detail, it would be obvious to one of ordinary knowledge in the art that such specific technologies are no more than preferable examples, and the scope of the present invention is not limited thereby. Therefore, the substantial scope of the present invention is defined by the claims attached hereto and equivalents thereof.

INDUSTRAIL AVAILABILITY

[0118] The present invention is applicable to a mask pack sheet.

Claims

1. A lyocell fiber comprising lyocell multifilaments prepared by spinning a lyocell spinning dope comprising a cellulose pulp and a solvent,
   wherein a monofilament making up the multifilament has a cross-section having a central major axis (L1) and a central minor axis (S1), a ratio of lengths of the central major axis (L1) and the central minor axis (S1) is 1.5:1~10.5:1, and a ratio of a length of a central major axis (L1) and a length of a straight line (L2) between both ends of the central major axis is 1.0~1.5:1.

2. The lyocell fiber according to claim 1, wherein the length of the central major axis (L1) is 12~42 μm, and the length of the central minor axis (S1) is 4~7 μm.

3. The lyocell fiber according to claim 1, wherein the monofilament has fineness of 1.0~4.0 denier, and a value obtained by dividing a cross-sectional perimeter of the monofilament by fineness is 24.5 to 32 μm/denier.

4. A nonwoven fibrous aggregate containing lyocell fiber,
   wherein a monofilament making up a lyocell fiber has a cross-section having a central major axis (L1) and a central minor axis (S1), a ratio of lengths of the central major axis (L1) and the central minor axis (S1) is 1.5:1~10.5:1, and a ratio of a length of the central major axis (L1) and the length of a straight line (L2) between both ends of the central major axis is 1.0~1.5:1.

5. The nonwoven fibrous aggregate according to claim 4, wherein the length of the central major axis (L1) of the monofilament is 12~42 μm, and the length of the central minor axis (S1) is 4~7 μm.

6. The nonwoven fibrous aggregate according to claim 4, wherein the monofilament has fineness of 1.0~4.0 denier, and a value obtained by dividing the cross-sectional perimeter of the monofilament by the fineness is 24.5 to 32 μm/denier.

7. The nonwoven fibrous aggregate according to claim 4, wherein the fineness of the lyocell fiber is 1.0 to 4.0 denier.

8. The nonwoven fibrous aggregate according to claim 4, wherein the fiber length of the lyocell fiber is 36 to 40 mm.

9. The nonwoven fibrous aggregate according to claim 4, wherein a crimp number of the lyocell fiber is 8 to 12 cpi.

10. The nonwoven fibrous aggregate according to claim 4, wherein the lyocell fiber has an emulsion content of 0.1 to 0.4 wt%, based on 100 wt% of the lyocell fiber.

11. The nonwoven fibrous aggregate according to claim 4, wherein a basis weight of the nonwoven fibrous aggregate is 30 to 60 g/m^2.

12. The nonwoven fibrous aggregate according to claim 4, wherein the thickness of the nonwoven fibrous aggregate is 0.3 to 0.5 mm.

13. The nonwoven fibrous aggregate according to claim 4, wherein the nonwoven fibrous aggregate has moisture absorption of 1000 to 1600 %, based on the weight of the lyocell fiber.

14. The nonwoven fibrous aggregate according to claim 4, wherein the nonwoven fibrous aggregate has transparency after moisture treatment of 80 to 84 %.

15. The nonwoven fibrous aggregate according to claim 4, wherein the nonwoven fibrous aggregate has transparency after essence treatment of 88 to 94 %.

16. The nonwoven fibrous aggregate according to claim 4, wherein the nonwoven fibrous aggregate has skin adhesion

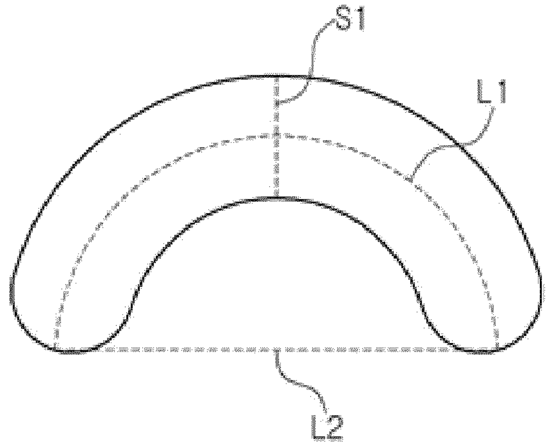
after moisture treatment of 3.6 to 4.2 gf.

17. The nonwoven fibrous aggregate according to claim 4, wherein the nonwoven fibrous aggregate has skin adhesion after essence treatment of 4.5 to 5.3 gf.

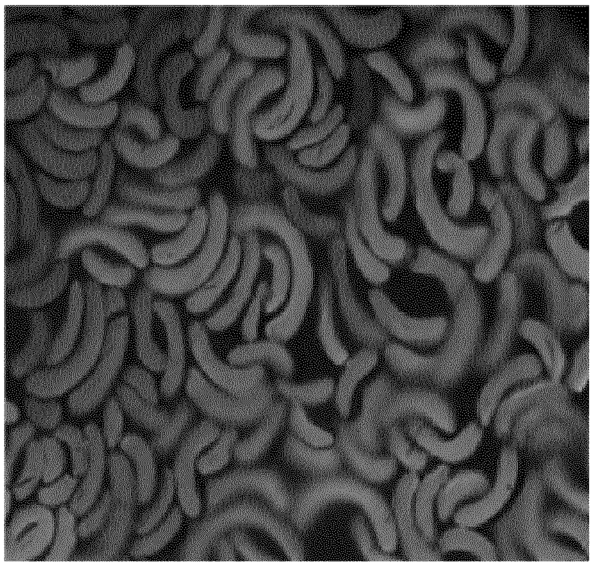
18. The nonwoven fibrous aggregate according to claim 4, wherein the nonwoven fibrous aggregate has an emulsion content of 0.001 wt% or less, based on 100 wt% of the nonwoven fibrous aggregate.

19. A mask pack sheet using the nonwoven fibrous aggregate according to any one of claims 4 to 18.

【FIG. 1】



【FIG. 2】



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2017/015775

A. CLASSIFICATION OF SUBJECT MATTER

D01F 2/00(2006.01)i, D01D 1/02(2006.01)i, D04H 1/425(2012.01)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)

D01F 2/00; D01D 5/253; D04H 1/498; D01D 13/00; D01D 4/00; D04H 1/4374; D01F 2/02; D21H 21/48; D01D 5/23; D01D 1/02; D04H 1/425

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: lyocell, filament, cross section, center long shaft, center short shaft, length ratio, non-woven fabric, mask pack

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Y	EP 1479797 A1 (LANDQART) 24 November 2004 See paragraph [0070]; claims 1-5; and figure 2.	1-19
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A	KR 10-0238506 B1 (EASTMAN CHEMICAL COMPANY) 01 April 2000 See pages 3, 4, 6; claims 1, 11; and figures 1, 2, 10.	1-19
A	KR 10-2015-0113902 A (KOLON INDUSTRIES, INC.) 08 October 2015 See the entire document.	1-19

☐ 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
03 MAY 2018 (03.05.2018)	**09 MAY 2018 (09.05.2018)**

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
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