(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 167 732 B2**

(12) **NEW EUROPEAN PATENT SPECIFICATION**
After opposition procedure

(45) Date of publication and mention of the opposition decision:
02.11.2022 Bulletin 2022/44

(45) Mention of the grant of the patent:
01.10.2014 Bulletin 2014/40

(21) Application number: **08766718.4**

(22) Date of filing: **05.06.2008**

(51) International Patent Classification (IPC):
E01C 13/08 *(2006.01)* ***D01F 8/02*** *(2006.01)*
D01F 8/04 *(2006.01)* ***D06M 14/10*** *(2006.01)*
D06M 15/03 *(2006.01)* ***D06M 15/07*** *(2006.01)*
D06M 15/333 *(2006.01)* ***D06N 7/00*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
D01F 8/04; D01F 8/02; D06M 15/03; D06M 15/05; D06M 15/07; D06M 15/333; D06N 7/0065; E01C 13/08; D06M 2101/20; D06M 2101/34; D06N 2209/141

(86) International application number:
PCT/NL2008/000145

(87) International publication number:
WO 2008/150156 (11.12.2008 Gazette 2008/50)

(54) **ARTIFICIAL GRASS COMPOSED OF FIBRES COMPRISING OF A CORE AND A CLADDING, AS WELL AS AN ARTIFICIAL LAWN MADE UP THEREOF**

AUS EINEN KERN UND EINEN MANTEL UMFASSENDEN FASERN BESTEHENDES KUNSTGRAS SOWIE DARAUS HERGESTELLTER RASEN

GAZON ARTIFICIEL À BASE DE FIBRES CONSTITUÉES D'UNE ÂME ET D'UNE GAINE ET PELOUSE ARTIFICIELLE AINSI RÉALISÉE

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT RO SE SI SK TR

(30) Priority: **07.06.2007 NL 1033949**

(43) Date of publication of application:
31.03.2010 Bulletin 2010/13

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Description

[0001] The present invention relates to an artificial lawn comprising a substrate layer to which synthetic fibres projecting from the substrate layer are attached, wherein said synthetic fibres are composed of fibres comprising a core of a synthetic material and a cladding, which core and which cladding are made of different materials.

[0002] Such a type of artificial grass is known per se from European patent EP 0 996 781 granted to the present applicant, in which a yarn containing polyamide is used for producing artificial grass, wherein said yarn, in addition to polyamide, also contains a polyolefin compound selected from the group consisting of polypropylene, LLDPE and a block copolymer of polypropylene and polyethylene. In addition to the method of manufacturing a yarn that is known therefrom, in which the polymer is extruded to form monofilaments, which is subsequently processed into bands, with several bands being twisted to form a yarn, there is also disclosed a method in which the yarn is obtained by means of co-extrusion. During such co-extrusion the cladding consists of polyamide, whilst the core consists of one of the aforesaid synthetic materials.

[0003] From International application WO 2005/111281 there is known a method for producing a synthetic fibre for use in an artificial grass sports field, wherein the layer of synthetic material is composed of at least two layers of different synthetic materials, which co-extrusion step is claimed to accomplish a separation of the various properties of the synthetic materials that are used. According to a first functional embodiment, the layer of synthetic material is composed of a core layer of a first synthetic material, which core layer is surrounded on both sides by one or several outer layers, each consisting of a different synthetic material, whilst a hydrophilic additive, for example ethylene vinyl alcoholcopolymer or polyhydroxyethyl methylacrylate, can be used as the outer layer of the co-extrusion fibre.

[0004] From International application WO 2004/106601 there is known a yarn for an artificial lawn, wherein the yarn is a so-called tape filament consisting of a core layer and two outer layers of a material different from the material of the core layer, said core layer comprising polyester and/or polyolefin material and said outer layers comprising high density polyethylene.

[0005] Japanese patent publication JP 2003 342848 discloses a yarn for artificial turf, which consists of a conjugated yarn of a resin composition, comprising 70-99 wt.% nylon (polyamide) and 1-30 wt.% polyethylene as the inner layer and polyethylene as the outer layer.

[0006] A phenomenon that is known to occur with artificial grass, in particular when the artificial grass is used for playing soccer, is the fact that players sustain burns when making sliding tackles. This problem does not occur with natural grass, which natural material has a high water content and is soft to the touch, so that the friction with the skin will be high. Said high friction is disadvantageous from a viewpoint of sustaining skin damage, but because of the fact that natural grass will wear off slightly upon contact, burns do not occur upon contact between the skin and the natural grass. In addition to that, it can be said that natural grass is soft and will grow again after wearing off, in which connection it can moreover be noted that the relatively soft nature of natural grass also contributes towards obtaining a good resilience.

[0007] The selection of the materials used for the artificial grass, on the other hand, generally involves a controversy. The material used for the artificial grass is a soft material, for example, which has a large range of elasticity. Such a characteristic results in a good resilience, but also in a high degree of friction, which latter aspect will lead to an excessive adherence of the skin to the artificial grass upon making a sliding tackle, and thus inevitably to skin damage, which is undesirable. These materials are assessed as exhibiting disadvantageous heat development characteristics in the case of such sliding tackles, in spite of the fact that because of the high degree of friction, the contact time between the skin and the artificial grass remains limited. The material used for the artificial grass may also be a hard material having a small range of elasticity, which results in a poor resilience, but in which the amount of friction is limited. The limited amount of friction will lead to less skin damage. In addition to that, said hard materials are assessed as exhibiting advantageous heat development characteristics in the case of sliding tackles, because the contact time is longer.

[0008] The aforesaid artificial lawns have been known for many years, with field hockey being one of the most frequently practised sports on artificial grass. Also soccer, rugby, tennis, skiing and golf may be mentioned in this connection.

[0009] To avoid the aforesaid problems regarding the interaction between human skin and the artificial lawn large amounts of water are applied to the artificial lawn, in particular during important sporting contests. In the case of artificial lawns for practising field hockey the artificial lawn is practically completely inundated, which is undesirable for environmental reasons

[0010] It is an object of the present invention to provide a special type of artificial grass which imitates the advantageous characteristics of natural grass in particular as regards resilience and sliding tackles, as much as possible Another object of the present invention is to provide and artificial grass which exhibits a high degree of durability and which can be composed of commercially available materials.

[0011] Another object of the present invention is to provide a synthetic fibre which obviates the need to inundate the artificial lawn

[0012] The present invention as referred to in the introduction is characterised in that the material for the cladding has a hydrophilicity which is higher than the hydrophilicity of the material used for the core, and wherein the material for the cladding is selected from the group

consisting of polyurethane cellulose, chitosan, polyvinyl alcohol and derivatives thereof, or a combination thereof and wherein the derivatives of cellulose are chosen from the group consisting of viscose, ethyl cellulose cellulose acetate butyrate (CAB), cellulose acetate propionate (CAP), cellulose (di)acetate and cellulose (tri)acetate.

[0013] When such type of artificial grass is used, the artificial grass will exhibit a certain degree of moisture absorption thereby accomplishing one or more of the aforesaid objects Since the artificial grass according to the present invention feels slightly moist, a good ball roll will be obtained when playing a ball game, in particular field hockey Moreover, in the case of a contact sport, in particular soccer, the risk of harmful injuries, for example after a sliding tackle, will be minimized. The cladding-core structure ensures that the entire core area is surrounded by the cladding.

[0014] An artificial lawn comprises a substrate layer, to which synthetic fibres projecting from the substrate layer are attached, which has preferably been done by mechanically connecting the synthetic fibres to the substrate layer, for example by means of a weaving, knitting or tufting technique, so that the synthetic fibres more or less approximate the natural grass lawn with upright grass stalks.

[0015] The present inventors have found that the material for the cladding is selected from the group consisting of polyurethane, cellulose, chitosan, polyvinyl alcohol and derivatives thereof, or a combination thereof wherein one or more derivatives of cellulose belonging to the group consisting of viscose, ethyl cellulose, cellulose acetate butyrate (CAB), cellulose acetate propionate (CAP) cellulose (di)acetate and cellulose (tri)acetate are used. Chitosan is a linear polysaccharide, which is obtained from chitin. A special advantage of chitosan, is the fact that it exhibits a good adhesion to the core material, whilst in addition it has antibacterial characteristics.

[0016] A suitable material for the core is a material selected from the group consisting of polyesters, polypropylene, ethyl vinyl acetate (EVA), saturated styrene thermoplastic elastomer (SEBS), polyamides, polyethylene compounds and copolymer of ethylene and acrylate, or combinations thereof Especially suitable polyethylene compounds are selected from the group consisting of high density polyethylene (HDPE), medium density polyethylene (MDPE), low density polyethylene (LDPE), linear low density polyethylene (LLDPE) and anhydride modified polypropylene compounds and anhydride modified polyethylene compounds Suitable polyamides include polyamides type 6, 6.6, 6.10 en 6 12, or combinations thereof, in particular co-PA (6/66). Suitable polyesters are polybutylene terephtalate and polyethylene terephtalate, in particular poly(trimethylene terephthalate) (PTT).

[0017] An important parameter for the core material is the resilience, measured by means of a suitable measuring tool a cantilever. Thus, the fibre is pushed over and the force required for doing so is measured. The aforesaid operation is repeated 300 times and the force is measured again. The initial resilience value (F1) preferably ranges from 1-2 cN. The value after 300 times (F300) is expressed as a percentage of the first measurement and is preferably at least 50 %. Suitable materials for the core include in particular poly- (trimethylene terephthalate) (PTT) (F_1=1.5 (elongation 5 0), F_{300}=59), polyethylene terephthalate (PET) (F_1=1,2, F_{300}=84), co-polyamide (F_1=1.3 (elongation 3.3 + 10' at 140 °C), F_{300}=52) and polyamide 6 (F_1=1.6 (elongation:3.1+10' at 140 °C), F_{300}=51).

[0018] In a special embodiment an agent which promotes the adhesion between the core material and the cladding material is preferably present between the core material and the cladding material, whilst in a special embodiment the adhesion promoting agent is a copolymer of ethylene and methylacrylate.

[0019] Particularly suitable embodiments of the present artificial grass are made up of a combination of polyamide (core) and cellulose (tri)diacetate (cladding), LDPE (core) and cellulose (tri/di)acetate (cladding), polypropylene with SEBS (core) and cellulose (tri/di)acetate (cladding), PTT (core) and one of ethyl cellulose/CAB/CAP (cladding), co-polyamide (6/60) (core) and one of ethyl cellulose/CAB/CAP (cladding) and polyamide 6 (core) and one of ethyl cellulose/CAB/CAP (cladding). Another suitable core material is the material which, in addition to EVA, also comprises copolymers of ethylene and acrylate, polypropylene and/or polyethylene, or combinations thereof.

[0020] The material for the core as used in the present artificial grass fibre in particular has an elasticity modulus (measured according to ASTM D638) of maximally 500 MPa, in particular an elasticity modulus (measured according to ASTM D638) of maximally 300 MPa.

[0021] The material for the cladding preferably has an elasticity modulus (measured according to ASTM D638) of minimally 500 MPa, in particular an elasticity modulus (measured according to ASTM D638) of minimally 750 MPa.

[0022] In the present artificial grass, which is composed of fibres consisting of a core of a synthetic material and a cladding, the thickness of the cladding has a volume of 1-40 vol.%, based on the entire fibre.

[0023] Although mention has so far been made of a cladding, in a specific embodiment the cladding may also comprise a number of (sub)layers, in which case at least one of said layers comprises a material selected from the group consisting of polyurethane, cellulose, chitosan, polyvinyl alcohol and derivatives thereof, or a combination thereof, whilst in particular one or more derivatives of cellulose belonging to the group consisting of viscose, ethyl cellulose, cellulose acetate butyrate (CAB), cellulose acetate propionate (CAP), cellulose (di)acetate and cellulose (tri)acetate are used for the outermost cladding layer.

[0024] According to the present inventors, the present artificial grass can be produced in a number of ways. One

way is to first dissolve the cladding material, if possible, whereupon the thus obtained solution is applied to the core material, after which the solvent used is removed, whilst the core material may have been preactivated.

[0025] According to another possibility, a co-extrusion process is used, which possibility is contingent upon the cladding material being meltable, and thus extrudable. In addition to that it is possible to use a combined chemical/extrusion process, in which case the core material, possibly pre-activated with for example fumaric acid dissolved in ethanol, is coated with the cladding material Although mention has so far been made in the present application of coating a core of a synthetic material with a cladding, it is also possible in a special embodiment to use a material whose hydrophilicity is higher than the hydrophilicity of the material used for producing the artificial grass fibres, in particular the outermost layer thereof, as the usual filling material or infill used in an artificial lawn.

[0026] In a special embodiment of the present application it is possible to hydrophilize the core material so as to thus enhance the adhesion with water or to enhance the interaction with the hydrophilic cladding, (yet to be applied). Said hydrophilization preferably takes place by grafting one or more reactive groups on the core material, for example maleic acid anhydride to a core of polyethylene in particular LDPE, and LLDPE.

[0027] The material used for the cladding, may also comprise one or more additives, for example additives which lead to a better absorption and moisture release additives which inhibit the growth of algae and/or fungi, additives which influence the elasticity of the artificial grass fibre as such, additives which provide the UV resistance, additives which influence the rolling resistance of the fibre, additives which impart colour to the fibre.

[0028] The present invention will now be explained by means of a number of examples, in which connection it should be noted, however, that the present invention is by no means limited to such special examples.

Example 1

[0029] Polyamide 6 was extruded and the thus obtained core material, in the form of bands or monofilaments, was additionally washed with hot water so as to remove the so-called spin finish. The thus extruded core material was subsequently passed through a bath with a solution of an adhesion promoter, using a solution of fumaric acid, in particular 1 - 2 % fumaric acid in an azeotropic mixture of ethanol and water, and a residence time of 10 - 30 seconds. Another suitable adhesion promoting agent is terephthalic acid. After the aforesaid activation had been carried out, a commercially available viscose, rayon, was applied by means of a so-called spin coater. After the aforesaid coating step, a coagulation step was carried out, viz. passing the thus obtained material through a coagulation bath, in particular an aqueous composition comprising 9 wt.% sulphuric acid and 13 wt.% sodium sulphate, with the viscose being regenerated and thus converted into cellulose. The core material thus coated with the cladding layer was dried and washed with water, if necessary. The thus obtained artificial grass fibre can be described as a fibre which comprises a very resilient core and a very thin cladding, which is hydrophilic and which provides an improved sliding interaction in comparison with a commercially available artificial grass fibre which does not comprise a cladding that exhibits a hydrophilicity different from the hydrophilicity of the material used for the core.

Example 2

[0030] The same starting material as mentioned in Example 1 was used for the core, and after washing with hot water so as to remove the spin finish, the extruded material was passed through a bath with a solution of the cladding material to be applied. Suitable cladding materials include: cellulose (di)acetate dissolved in cold acetone, cellulose (tri)acetate dissolved in cold methylene chloride and polyvinyl alcohol dissolved in cold 6N hydrogen chloride. The former two cladding materials are preferred because of their good adhesion with polyamide. Furthermore, the thus obtained core materials coated with a cladding material can be dried in air in a simple manner, because the solvents used have a low boiling point. The artificial grass fibre obtained in Example 2 has a very resilient core, on which core a thin cladding is present, which cladding is hydrophilic, as a result of which the sliding interaction exhibits a distinct improvement over an artificial grass fibre that does not comprise the aforesaid cladding material.

Example 3

[0031] Polyamide 6.6 was used as the core material, and in this case the cladding material to be processed by co-extrusion must be meltable, with the following materials being used: cellulose (di)acetate, cellulose (tri)acetate and polyvinyl alcohol. The cladding material was coated onto the core material by co-extrusion. An advantage of said co-extrusion is that the use of (harmful) solvents is prevented, in addition to the possibility that the material for the core and the material for the cladding may mix slightly in the contact zone, thereby promoting the adhesion between the two materials. The thus obtained fibre has a very resilient core and a hydrophilic cladding, which leads to an improved sliding interaction in comparison with artificial grass fibres not having a hydrophilic outer layer.

Example 4

[0032] The core material extruded in Examples 1 was used, and the core material obtained in the form of filaments was immersed in a 1 N hydrogen chloride (HCl) solution for a prolonged period of time, maximally 24

hours, so as to effect partial hydrolysis of the amide functions in the polyamide. The thus treated filaments were washed with water repeatedly and subsequently exposed to an aqueous solution containing 9 parts by volume of di-epoxy butane, 1 part by volume of ethanol and 1 part by volume of sodium carbonate (0.025 M in water). Said exposure took place at a temperature of 80 °C for a period of 15 hours. After said treatment, the thus treated filaments were washed with water and dried in air, whereupon the activated filaments were contacted with an aqueous solution (1 volume % of acetic acid) containing 1.5 % chitosan, in particular by drawing the filaments through the aqueous solution, or by spraying the aqueous solution on the filaments. Finally, the filaments were dried for one hour so as to have the chitosan react with the polyamide. The thus obtained fibre, consisting of a core of polyamide and a cladding layer of chitosan, can be regarded as a fibre having a very resilient core provided with a thin, hydrophilic cladding, which fibre exhibits a distinct improvement as regards sliding interaction in comparison with an artificial grass fibre that does not comprise the aforesaid combination of cladding and core materials. Furthermore it can be noted that chitosan as the cladding layer exhibits an antibacterial action and inhibits the growth of algae.

Example 5

[0033] The same operations as mentioned in Examples 1-3 were carried out, except that a polyethylene compound, in particular LDPE and LLDPE, was used as the core material in each of said cases. The thus obtained fibre has a very resilient core and a hydrophilic cladding, which leads to an improved sliding interaction in comparison with artificial grass fibres not having a hydrophilic outer layer. The core materials used in this example can also be modified, as described below in Examples 6-8, so as to obtain a very good adhesion with the cladding material.

Example 6

[0034] An extruded polyethylene-, in particular LDPE or LLDPE, or polypropylene-type core material was hydrophylised by grafting a reactive group, in particular maleic acid anhydride, on the hydrophobic polymer chains. The polymer was dissolved in a suitable solvent, for example o-dichlorobenzene, and subsequently a suitable initiator, for example tertiary butyl peroxide, and maleic acid anhydride were admixed in an amount of 10 wt.% and 1 wt.%, respectively, based on the polymer. After heating for 1 hour at a temperature of 170 °C in an atmosphere of nitrogen, the reaction product was purified by precipitation in boiling acetone. Said purification step was repeated twice. The obtained product is a polymer chain, in which about 0.05 % of the carbon atoms present therein have a hydrophilic group. If desired, the grafts thus provided can be hydrolysed by maintaining the obtained filaments in boiling water for about 10 minutes. As a result of said hydrolysis, the anhydride functions will be converted into carboxyl functions, resulting in a smaller angle of contact with water, so that there will be a strong adhesion with water.

Example 7

[0035] A polyethylene compound, in particular LDPE, was extruded in a double screw extruder in the presence of 1 wt.% maleic acid anhydride and a suitable initiator, for example 0.15 wt.% dicumylperoxide, at a temperature of about 200 °C in an atmosphere of nitrogen. Using a residence time of about 5 minutes, 60 % of the thus added maleic acid anhydride was grafted on the carbon chain. The thus obtained filaments can be hydrolysed by maintaining the material in boiling water for about 10 minutes. As a result of said hydrolysis, the anhydride functions will be converted into carboxyl functions, resulting in a smaller angle of contact with water, so that there will be a strong adhesion with water.

Example 8

[0036] A polyethylene compound, in particular LDPE, was extruded, after which the thus obtained filaments were contacted with a solution of the following composition:

- maleic acid anhydride, preferably in an amount of 2 - 3 wt.%, based on the polymer,
- a photo initiator, preferably in an amount of 3 - 6 wt.% in relation to the anhydride, suitable photo initiators being benzophenone, benzoyl dimethyl dital and thioxanthane, preferably benzophenone,
- a solvent, such as acetone and ethyl acetate, preferably acetone.

[0037] After moisturisation of the filaments with the aforesaid solution, a treatment with UV radiation was carried out. The treatment thus used comprised exposure for 1 - 7 minutes to a UV lamp which also emits radiation in the wavelength range of 200-300 nm, using an intensity of 2500-6000 $\mu W/cm^2$ and a temperature of 35-85 °C, preferably a temperature higher than 60 °C, because maleic acid anhydride will melt at said temperature, enabling it to react better. Using said UV treatment, the present inventors concluded that 70-90 % of the added maleic acid anhydride had been grafted on the carbon chain. After termination of the photo grafting process, the unreacted reagents can be removed by washing with acetone, followed by water. In addition to that it was possible to hydrolyse the grafts thus provided by maintaining the filaments in boiling water for a period of about 10 minutes, as a result of which the anhydride functions were converted into carboxyl functions, resulting in a strong adhesion with water.

[0038] The present inventors have found that the hy-

drolysis step mentioned in the above Examples 5-8 is omitted if subsequently a cladding material is to be applied. More in particular, the hydrolysis step is carried out if the core material is not coated with a cladding. The above Examples 5-8 result in an artificial grass fibre having a very resilient core, whilst the grafts as such can already be regarded as a hydrophilic cladding on the core material, whilst it is also possible to coat the thus modified core material with a hydrophilic cladding yet, as described in Examples 1 - 4, resulting in an improved sliding interaction.

Claims

1. An artificial lawn comprising a substrate layer to which synthetic fibres projecting from the substrate layer are attached, wherein said synthetic fibres are composed of fibres comprising a core of a synthetic material and a cladding, which core and which cladding are made of different materials, **characterised in that** the material for the cladding has a hydrophilicity which is higher than the hydrophilicity of the material used for the core, and wherein the material for the cladding is selected from the group consisting of polyurethane, cellulose, chitosan, polyvinyl alcohol and derivatives thereof, or a combination thereof, and wherein the derivatives of cellulose are chosen from the group consisting of viscose, ethyl cellulose, cellulose acetate butyrate (CAB), cellulose acetate propionate (CAP), cellulose (di)acetate and cellulose (tri)acetate, wherein the thickness of the cladding has a volume of 1-40 vol.%, based on the entire fibre, wherein said cladding-core structure ensures that the entire core area is surrounded by the cladding.

2. Artificial lawn according to any one or more of the preceding claims, **characterised in that** the material for the core is selected from the group consisting of polyesters, especially polyethylene terephthalate and/or polytrimethylene terephthalate (PTT), polypropylene, ethyl vinyl acetate (EVA), saturated styrene thermoplastic elastomer (SEBS), polyamides, especially co-polyamide (6/66) and/or polyamide-6, polyethylene compounds, especially selected from the group consisting of high density polyethylene (HDPE), medium density polyethylene (MDPE), low density polyethylene (LDPE), linear low density polyethylene (LLDPE) and anhydride modified polyethylene compounds and anhydride modified polypropylene compounds and copolymers of ethylene and acrylate, or combinations thereof.

3. Artificial lawn according to any one or more of the preceding claims, **characterised in that** an agent which promotes the adhesion between the core material and the cladding material is present between the core material and the cladding material, especially that the adhesion promoting agent is a copolymer of ethylene and methylacrylate.

4. Artificial lawn according to any one or more of claims 1-3, **characterised in that** the material for the core and the material for the cladding is chosen from material combinations in the group consisting of: polyamide (core) and cellulose (tri/di)acetate (cladding), LDPE (core) and cellulose (tri/di)acetate (cladding), combination of polypropylene and SEBS (core) and cellulose (tri/di)acetate (cladding), ethyl vinyl acetate (core) and cellulose (tri/di) acetate (cladding) or combination of copolymers of ethylene and acrylate (core) and cellulose (tri/di) acetate (cladding).

5. Artificial lawn according to any one or more of the preceding claims, **characterised in that** the material for the core has an elasticity modulus (measured according to ASTM D638) of maximally 500 MPa, preferably that the material for the core has an elasticity modulus (measured according to ASTM D638) of maximally 300 MPa.

6. Artificial lawn according to any one or more of the preceding claims, **characterised in that** the material for the cladding has an elasticity modulus (measured according to ASTM D638) of minimally 500 MPa, preferably that the material for the cladding has an elasticity modulus (measured according to ASTM D638) of minimally 750 MPa.

7. Artificial lawn according to any one or more of the preceding claims, **characterised in that** the cladding comprises a number of layers, at least one of which layers comprises a material selected from the group consisting of polyurethane, cellulose, chitosan, polyvinyl alcohol and derivatives thereof, or a combination thereof, especially that one or more derivatives of cellulose belonging to the group consisting of viscose, ethyl cellulose, cellulose acetate butyrate (CAB), cellulose acetate propionate (CAP), cellulose (di)acetate and cellulose (tri)acetate are used for the outermost cladding layer.

Patentansprüche

1. Kunstrasen, umfassend eine Substratschicht, an welcher aus der Substratschicht herausragende Synthetikfasern angebracht sind, wobei die Synthetikfasern aus Fasern zusammengesetzt sind, die einen Kern aus einem Synthetikmaterial und einen Mantel umfassen, wobei der Kern und der Mantel aus unterschiedlichen Materialien hergestellt sind, **dadurch gekennzeichnet, dass** das Material für den Mantel eine Hydrophilie aufweist, die höher als die Hydrophilie des für den Kern verwendeten Ma-

terials ist, und wobei das Material für den Mantel aus der aus Polyurethan, Cellulose, Chitosan, Polyvinylalkohol und Derivaten davon oder einer Kombination davon bestehenden Gruppe ausgewählt ist, und wobei die Cellulosederivate aus der aus Viskose, Ethylcellulose, Celluloseacetatbutyrat (CAB), Celluloseacetatpropionat (CAP), Cellulose(di)acetat und Cellulose(tri)acetat bestehenden Gruppe ausgewählt sind, die Dicke des Mantels ein Volumen von 1-40 Vol.-Prozent, bezogen auf die gesamte Faser, aufweist, wobei die Mantel-Kern-Struktur dafür sorgt, dass der gesamte Kernbereich von dem Mantel umgeben ist.

2. Kunstrasen nach einem oder mehreren der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** das Material für den Kern ausgewählt ist aus der Gruppe bestehend aus Polyestern, insbesondere Polyethylenterephthalat und/oder Polytrimethylenterephthalat (PTT), Polypropylen, Ethylvinylacetat (EVA), gesättigtem thermoplastischen Styrolelastomer (SEBS), Polyamiden, insbesondere Copolyamid (6/66) und/oder Polyamid-6, Polyethylenverbindungen, insbesondere ausgewählt aus der aus Polyethylen mit hoher Dichte (HDPE), Polyethylen mit mittlerer Dichte (MDPE), Polyethylen mit niedriger Dichte (LPDE), linearem Polyethylen mit niedriger Dichte (LLDPE) und Anhydrid-modifizierten Polyethylenverbindungen, Anhydrid-modifizierten Polypropylenverbindungen und Copolymeren von Ethylen und Acrylat bestehenden Gruppe, oder Kombinationen davon.

3. Kunstrasen nach einem oder mehreren der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** ein die Haftung zwischen dem Kernmaterial und dem Mantelmaterial förderndes Mittel zwischen dem Kernmaterial und dem Mantelmaterial vorliegt, wobei das die Haftung fördernde Mittel insbesondere ein Copolymer von Ethylen und Methylacrylat ist.

4. Kunstrasen nach einem oder mehreren der Ansprüche 1-3, **dadurch gekennzeichnet, dass** das Material für den Kern und das Material für den Mantel ausgewählt ist aus Materialkombinationen in der Gruppe bestehend aus Polyamid (Kern) und Cellulose(tri/di)acetat (Mantel), LDPE (Kern) und Cellulose(tri/di)acetat (Mantel) oder einer Kombination von Propylen und SEBS (Kern) und Cellulose(tri/di)acetat (Mantel), Ethylvinylacetat (Kern) und Cellulose(tri/di)acetat (Mantel), oder einer Kombination von Copolymeren von Ethylen und Acrylat (Kern) und Cellulose(tri/di)acetat (Mantel).

5. Kunstrasen nach einem oder mehreren der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** das Material für den Kern ein Elastizitätsmodul (gemessen gemäß ASTM D638) von maximal 500 MPa aufweist, vorzugsweise dass das Material für den Kern ein Elastizitätsmodul (gemessen gemäß ASTM D638) von maximal 300 MPa aufweist.

6. Kunstrasen nach einem oder mehreren der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** das Material für den Mantel ein Elastizitätsmodul (gemessen gemäß ASTM D638) von minimal 500 MPa aufweist, vorzugsweise dass das Material für den Mantel ein Elastizitätsmodul (gemessen gemäß ASTM D638) von minimal 750 MPa aufweist.

7. Kunstrasen nach einem oder mehreren der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** der Mantel eine Anzahl von Schichten umfasst, wobei mindestens eine der Schichten ein Material umfasst, das aus der aus Polyurethan, Cellulose, Chitosan, Polyvinylalkohol und Derivaten davon, oder einer Kombination davon bestehenden Gruppe ausgewählt ist, insbesondere dass ein oder mehrere Cellulosederivate aus der aus Viskose, Ethylcellulose, Celluloseacetatbutyrat (CAB), Celluloseacetatpropionat (CAP), Cellulose(di)acetat und Cellulose(tri)acetat bestehenden Gruppe für die äußerste Mantelschicht verwendet werden.

Revendications

1. Pelouse artificielle comprenant une couche de substrat à laquelle sont attachées des fibres synthétiques faisant saillie à partir de la couche de substrat, dans laquelle lesdites fibres synthétiques sont composées de fibres comprenant une âme en un matériau synthétique et une gaine, laquelle âme et laquelle gaine sont composées de matériaux différents, **caractérisée en ce que** le matériau de la gaine présente un caractère hydrophile qui est supérieur au caractère hydrophile du matériau utilisé pour l'âme, et dans laquelle le matériau de la gaine est choisi dans le groupe constitué du polyuréthane, de la cellulose, du chitosane, de l'alcool polyvinylique et de dérivés de ceux-ci, ou d'une combinaison de ceux-ci, et dans laquelle les dérivés de cellulose sont choisis dans le groupe constitué de la viscose, de l'éthylcellulose, de l'acétobutyrate de cellulose (CAB), de l'acétopropionate de cellulose (CAP), du (di)acétate de cellulose et du (tri)acétate de cellulose, dans lequel l'épaisseur de la gaine a un volume de 1 à 40 vol. % en volume, sur la base de la fibre entière, dans laquelle ladite structure gaine-âme garantit que toute la zone de l'âme est entourée par la gaine.

2. Pelouse artificielle selon l'une quelconque ou plusieurs des revendications précédentes, **caractérisée en ce que** le matériau de l'âme est choisi dans le groupe constitué de polyesters, en particulier de polyéthylène térephtalate et/ou de polytriméthylène

térephtalate (PTT), de polypropylène, d'acétate éthylvinylique (EVA), d'élastomère thermoplastique de styrène saturé (SEBS), de polyamides, en particulier de copolyamide (6/66) et/ou de polyamide 6, de composés de polyéthylène, en particulier choisis dans le groupe constitué de polyéthylène haute densité (HDPE), de polyéthylène moyenne densité (MDPE), de polyéthylène basse densité (LDPE), de polyéthylène basse densité linéaire (LLDPE) et de composés de polyéthylène modifiés par de l'anhydride, de composés de polypropylène modifiés par de l'anhydride, et de copolymères d'éthylène et d'acrylate, ou de combinaisons de ceux-ci.

3. Pelouse artificielle selon l'une quelconque ou plusieurs des revendications précédentes, **caractérisée en ce qu'**un agent qui favorise l'adhérence entre le matériau d'âme et le matériau de gaine est présent entre le matériau d'âme et le matériau de gaine, en particulier **en ce que** l'agent promoteur d'adhérence est un copolymère d'éthylène et de méthylacrylate.

4. Pelouse artificielle selon l'une quelconque ou plusieurs des revendications 1 à 3, **caractérisée en ce que** le matériau de l'âme et le matériau de la gaine sont choisis parmi les combinaisons de matériau du groupe constitué de : polyamide (âme) et (tri/di)acétate de cellulose (gaine), LDPE (âme) et (tri/di)acétate de cellulose (gaine), ou d'une combinaison de polypropylène et SEBS (âme) et de (tri/di)acétate de cellulose (gaine), acétate éthylvinylique (âme) et (tri/di)acétate de cellulose (gaine), ou combinaison de copolymères d'éthylène et d'acrylate(âme) et (tri/di)acétate de cellulose (gaine).

5. Pelouse artificielle selon l'une quelconque ou plusieurs des revendications précédentes, **caractérisée en ce que** le matériau de l'âme présente un module d'élasticité (mesuré selon l'ASTM D638) de 500 MPa maximum, **en ce que**, de préférence, le matériau de l'âme présente un module d'élasticité (mesuré selon l'ASTM D638) de 300 MPa maximum.

6. Pelouse artificielle selon l'une quelconque ou plusieurs des revendications précédentes, **caractérisée en ce que** le matériau de la gaine présente un module d'élasticité (mesuré selon l'ASTM D638) de 500 MPa minimum, **en ce que**, de préférence, le matériau de la gaine présente un module d'élasticité (mesuré selon l'ASTM D638) de 750 MPa minimum.

7. Pelouse artificielle selon l'une quelconque ou plusieurs des revendications précédentes, **caractérisée en ce que** la gaine comprend un certain nombre de couches, au moins l'une desdites couches comprenant un matériau choisi dans le groupe constitué du polyuréthane, de la cellulose, du chitosane, de l'alcool polyvinylique et de dérivés de ceux-ci, ou d'une combinaison de ceux-ci, en particulier **en ce qu'**un seul ou plusieurs dérivés de cellulose appartenant au groupe constitué de la viscose, de l'éthylcellulose, de l'acétobutyrate de cellulose (CAB), de l'acétopropionate de cellulose (CAP), du (di)acétate de cellulose et du (tri)acétate de cellulose sont utilisés pour la couche de gaine la plus à l'extérieur.

REFERENCES CITED IN THE DESCRIPTION

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