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(54) **METHOD FOR IMPROVING SPORTS FLOORING COMPRISING NATURAL GRASS**

(57) Method of improving sports flooring (100) comprising natural grass (112) by providing for a constant growth rate of the natural turf grass comprised in the sports flooring by applying a microporous zeolite mineral (103, 115, 130).

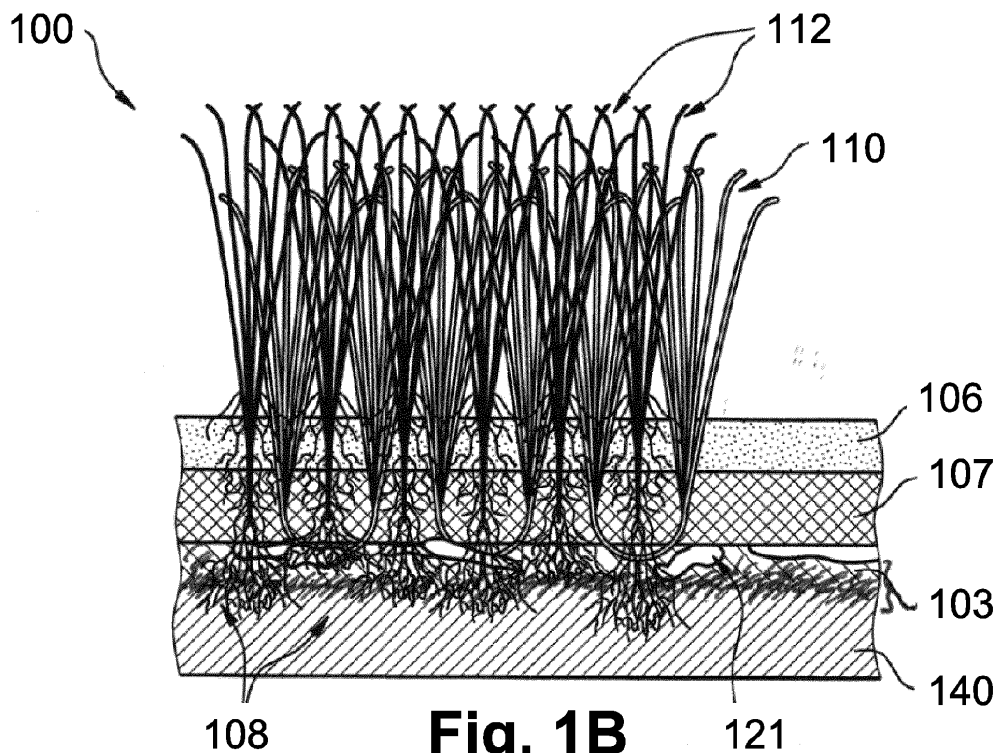


Fig. 1B

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Description**Field of the invention**

5 **[0001]** The invention relates to methods for improving sports floorings which comprise natural grass.

Background and related art

10 **[0002]** Hybrid turf and artificial turf are commonly used for sports flooring and are characterized by a grass-like look and feel, but at the same time require less water than sports flooring only comprised of natural grass. Hybrid turf is a combination of natural grass and artificial grass, where the artificial grass accounts for 3-5% of the surface. By adding artificial grass to the natural grass, the surface of the sports flooring surface becomes more durable and consistent. In addition, by adding artificial grass to the natural grass, the surface of the sports flooring becomes more resistant to tackling as the root systems of the natural grass can cling to the synthetic fibers of the artificial grass. Hybrid turf can be supplied in a turf roll that is prepared and grown off-site and then installed on-site as a 'lay and play' solution.

15 **[0003]** Despite their increased durability sports flooring comprising a natural grass component are dependent on a steady and constant growth of the natural turf grass component in the sports flooring to maintain the properties of the sports flooring. Environmental factors such as natural precipitation, drought and sunlight can negatively impact the growth rate of the natural grass component in sports flooring. For example, extreme surplus of rain can result in damage to the natural turf grass of the sports flooring when combined with physical stress as e.g. sports activities, in particular if the soil has become compacted through continued use such that water will accumulate on the surface. Also, extended periods of increased moisture or waterlogging in the soil surrounding the grass roots will result in damage to the roots by e.g. fungal growth which ultimately will impair turf grass growth. US2014/0314499 A1 discloses the use of a microporous zeolite mineral coated with a permeable film and which comprises about 10% w/w to 70% w/w salt to regulate the amount of water on surfaces.

25 **[0004]** During extended periods of low or no precipitation, a lack of water in combination with elevated temperatures can induce drought stress in the natural turf grass of the sports flooring which when combined with mechanical stress which may also negatively impact a steady growth and integrity of the natural turf grass and thereby reduce the overall quality of the sports flooring.

30 **[0005]** Drought stress and its negative effect on turf grass growth may be counter acted by irrigation; however, this requires the availability of sufficient quantities of water, as well as the use of irrigation systems. Environmentally, the use of irrigation systems can be problematic if water resources are limited and in particular if the water supplied by the irrigation system is not sufficiently taken up by the natural grass of the sports flooring, because most of the water seeps into deeper layers of the soil where it is no longer accessible by the root system of the natural turf grass. This will require more frequent irrigation intervals to ensure that sufficient amounts of water are provided to the natural grass in the sports flooring to ensure a steady growth rate. However, increased irrigation will increase the environmental burden as well as costs to maintain the natural grass component within the sports flooring.

35 **[0006]** There is thus a need for cost efficient and environmentally friendly methods to regulate water uptake by natural grass in sports flooring thereby enabling a steady growth rate and improving the sports flooring.

Summary

40 **[0007]** In one aspect, the invention relates to a method of providing a sports flooring. The sports flooring comprises a hybrid turf grass structure comprising at least a carrier structure, natural grass, artificial grass and a microporous zeolite mineral.

45 **[0008]** In some embodiments, the hybrid turf grass in the inventive method comprises a backing layer opposed to the lower face of the carrier structure and/or an infill layer opposed to the upper face of the carrier structure.

[0009] In some embodiments, the hybrid turf grass in the inventive method comprises a base layer, which is located below the carrier structure and above the soil layer.

50 **[0010]** In some embodiments, the hybrid turf grass in the inventive method comprises a reservoir layer, which is located below the carrier structure and above the soil layer. The reservoir layer may be composed of materials such as microporous zeolite mineral grains or granules, sphagnum, compacted rock wool, clay ball, calcined diatom or a mixture of these materials. These materials may store large amounts of water. Materials such as microporous zeolite mineral grains or granules, sphagnum, compacted rock wool, clay ball or calcined diatom may be granular materials which may have a grain size or diameter between 0.4 mm and 25 mm, preferably between 0.5 mm and 20 mm. Rock wool may further be in the form of thick slabs, which may be compacted over the entire surface of the soil layer of the sports flooring. These slabs may have a thickness between 6 and 9 cm, preferably between 7 and 8 cm.

55 **[0011]** In some embodiments, the materials such as sphagnum, compacted rock wool, clay ball, calcined diatom or a

mixture of these materials are mixed into the soil layer. These materials may store large amounts of water. These materials may be granular materials which may have a grain size or diameter between 0.4 mm and 25 mm, preferably between 0.5 mm and 20 mm. As described above, rock wool may in the form of thick slabs, which may be compacted over the entire surface of the soil layer of the sports flooring. These slabs may have a thickness between 6 and 9 cm, preferably between 7 and 8 cm.

[0012] According to one embodiment, the inventive method comprises applying the microporous zeolite mineral between the lower face of the backing layer and the upper face of a base layer.

[0013] For example, the zeolite can be applied between these two layers before or when the carrier structure of the hybrid turf is installed at the use site. In case the infill or the upper face of the infill also comprises the zeolite, the zeolite can be applied once or repeatedly on top of the infill after the hybrid turf carrier was installed at the use site.

[0014] According to one embodiment, the inventive method comprises applying the microporous zeolite mineral between the lower face of the backing layer and the upper face of the reservoir layer. The microporous zeolite minerals located between the lower face of the backing layer and the upper face of the reservoir layer may be in physical contact with the materials of the reservoir layer, thus may absorb water from the materials of the reservoir layer by capillarity and provide the water to the roots of the natural grass.

[0015] For some of the embodiments, the microporous zeolite mineral may be located at the level of the root system of the natural grass and may adsorb fertilizers. This may be advantageous in order to limit the leaching and thus to keep the fertilizers in the vicinity of the roots. The microporous zeolite mineral located at the level of the root system of the natural grass may also be a formidable cation exchanger with the roots of the grass.

[0016] In some embodiments, the inventive method comprises mixing the microporous zeolite mineral into the base layer, infill layer, or both base layer and infill layer.

[0017] In some embodiments, the inventive method comprises applying the microporous zeolite mineral to the upper face of the carrier structure, or to the upper face of the infill layer.

[0018] In some embodiments, the inventive method comprises mixing the microporous zeolite mineral into the base layer and applying it to at least one further face of the hybrid turf grass structure, wherein the at least one further face is the upper face of the base layer.

[0019] According to one embodiment, the backing layer of the hybrid turf grass in the inventive method is degradable.

[0020] In one embodiment, the backing layer of the hybrid turf grass in the inventive method is biodegradable.

[0021] In one embodiment, the hybrid turf grass comprises from about 0.1% to about 25% artificial fibers.

[0022] In some embodiments, according to the inventive method from about 25g/m² to about 8500g/m² of microporous zeolite mineral are applied to the hybrid turf grass.

[0023] In one embodiment, the microporous zeolite mineral of the inventive method has a selected grain size smaller than 20mm and a porosity of about 10% to about 40%, preferably from about 10% to about 35%.

[0024] In one embodiment, the microporous zeolite mineral used in the inventive method is characterized by a specific surface area of below 40m²/g.

[0025] According to some embodiments, the porosity of the microporous zeolite mineral used in the inventive method is from about 10% to about 20%, whereby 70-90% of the grains in the microporous zeolite mineral have a size in the range of about 0.4mm to about 20mm, preferably in the range of about 0.4mm to about 10mm, and about 10% to about 30% of the grains have a grain size smaller than about 0.4mm.

[0026] In some embodiments, the microporous zeolite mineral which is used in the inventive method is selected from the group of natural zeolite minerals comprising clinoptilolite, mordenite, phillipsite, chabazite, stilbite, or laumontite.

[0027] In one embodiment, the present invention provides for an improved sports flooring which is obtainable by the inventive method as disclosed herein.

[0028] In one embodiment, the invention provides improved sports flooring comprising natural grass, wherein the sports flooring comprises a microporous zeolite mineral at least between the lower face of the backing layer and the upper face of a base layer, whereby the abundance of said microporous zeolite mineral is from about 25g/m², 50g/m², 75g/m² to about 100g/m², 125g/m², 150g/m², 200g/m², 250g/m², 300g/m², 350g/m², 400g/m², 450g/m², 500g/m², 750g/m², 1000g/m², 1250g/m², 1500g/m², 2000g/m², 2250g/m², 2500g/m², 3000g/m², 3500g/m², 4000g/m², 4500g/m², 5000g/m², 5500g/m², 6000g/m², 6500g/m², 7000g/m², 7500g/m², 8000g/m², 8500g/m².

[0029] In some embodiments, the microporous zeolite mineral used in the inventive sports flooring has a porosity of about 15% to about 20%.

[0030] In some embodiments, the inventive sports flooring comprises artificial fibers contributing from about 0.5% to about 25% of the surface area of said sports flooring.

[0031] In one embodiment, the inventive sports flooring comprises a biodegradable backing layer.

[0032] In a further aspect, the invention relates to a sports flooring provided in accordance with any one of the embodiments and examples of the method for providing a sports flooring described herein.

[0033] In a further aspect, the invention relates to a sports flooring comprising hybrid turf grass. The hybrid turf grass comprises a carrier structure, natural grass, artificial grass, and a microporous zeolite mineral.

[0034] In some embodiments, the present invention pertains to the use of a microporous zeolite mineral to regulate the abundance of water in a sports flooring, whereby the microporous zeolite mineral is characterized by a selected grain size of smaller than 20mm, preferably smaller than 10mm, most preferred smaller than 2.5mm, and whereby the porosity of said microporous zeolite mineral is about 10% to about 20%. Preferably, the microporous zeolite mineral according to the invention is characterized by a grain size distribution of 70-90% of the grains having a size in the range of about 0.4mm to about 20mm and about 10% to about 30% of the grains having a grain size smaller than about 0.4mm, whereby the microporous zeolite mineral of the invention is selected from the group of clinoptilolite, mordenite, phillipsite, chabazite, stilbite, or laumontite.

[0035] In some embodiments, the present invention pertains to the use of microporous zeolite mineral to regulate the abundance of water in a sports flooring as disclosed herein, wherein the sports flooring is comprised in a sports field, or golf course, whereby the sports field is one of a football field, soccer field, hockey field, rugby field, tennis court, a recreation and playing area, or for athletics tracks.

[0036] In a further aspect, the invention relates to a method of regulating the biodegradation of organic matter within a sports flooring. The method comprises repeatedly applying a zeolite onto the infill layer after the carrier of the hybrid turf grass was installed at the use site.

[0037] In one embodiment, the backing layer in the inventive method of regulating the biodegradation of organic matter within a sports flooring is biodegradable.

[0038] In some embodiments, the microporous zeolite mineral used in the inventive method of regulating the biodegradation of organic matter within a sports flooring as disclosed herein has a selected grain size smaller than 20 mm and a porosity of about 15% to about 20%.

[0039] In some embodiments, the microporous zeolite mineral used in the method of regulating biodegradation of organic matter within a sports flooring is characterized by a grain size distribution of about 70-90% of the grains having a size in the range of about 0.4mm to about 20mm, preferably in the range of about 0.4mm to about 10mm, and about 10% to about 30% of the grains having a grain size smaller than about 0.4mm.

[0040] In one embodiment, the microporous zeolite mineral used in the method of regulating biodegradation of organic matter as disclosed above is selected from the group comprising clinoptilolite, mordenite, phillipsite, chabazite, stilbite, or laumontite.

[0041] According to embodiments, the inventive method of regulating biodegradation of organic matter in a sports flooring comprises applying from about 75g/m², 100g/m², 125g/m², 150g/m² to about 200g/m², 250g/m², 300g/m², 350g/m², 400g/m², 450g/m², 500g/m², 750g/m², 1000g/m², 1250g/m², 1500g/m², 2000g/m², 2250g/m², 2500g/m², 3000g/m², 3500g/m², 4000g/m², 4500g/m², 5000g/m², 5500g/m², 6000g/m², 6500g/m², 7000g/m², 7500g/m², 8000g/m², 8500g/m² of the microporous zeolite mineral as defined above between the lower face of the backing layer and the upper face of the base layer, e.g. applying the above amounts of the microporous zeolite mineral to the upper face of the carrier structure and between the lower face of the backing layer and the upper face of the base layer, or e.g. mixing the microporous zeolite mineral as disclosed above with the infill layer and applying it between the lower face of the backing layer and the upper face of the base layer.

Detailed Description

[0042] Although the present invention is described in detail below, it is to be understood that this invention is not limited to the particular methodologies, protocols described herein as these may vary. It is also to be understood that the terminology used herein is for the purpose of describing particular embodiments only and is not intended to limit the scope of the present invention which will be limited only by the appended claims. Unless defined otherwise, all technical and scientific terms used herein have the same meanings as commonly understood by one of ordinary skill in the art.

[0043] In the following, the elements of the present invention will be described. These elements are listed with specific embodiments; however, it should be understood that they may be combined in any manner and in any number to create additional embodiments. The variously described examples and preferred embodiments should not be construed to limit the present invention to only the explicitly described embodiments. This description should be understood to support and encompass embodiments which combine the explicitly described embodiments with any number of the disclosed and/or preferred elements. Furthermore, any permutations and combinations of all described elements in this application should be considered disclosed by the description of the present application unless the context indicates otherwise.

[0044] Throughout this specification and the claims which follow, unless the context requires otherwise, the term "comprise", and variations such as "comprises" and "comprising", will be understood to imply the inclusion of a stated member, integer or step and the optional inclusion of any other non-stated member, integer or step. The term "consist of" is a particular embodiment of the term "comprise", wherein any other non-stated member, integer or step is excluded. In the context of the present invention, the term "comprise" encompasses the term "consist of".

[0045] The terms "a" and "an" and "the" and similar references used in the context of describing the invention (especially in the context of the claims) are to be construed to cover both the singular and the plural, unless otherwise indicated

herein or clearly contradicted by context. Recitation of ranges of values herein is merely intended to serve as a shorthand method of referring individually to each separate value falling within the range. Unless otherwise indicated herein, each individual value is incorporated into the specification as if it were individually recited herein. No language in the specification should be construed as indicating any non-claimed element essential to the practice of the invention.

[0046] Several documents are cited throughout the text of this specification. Each of the documents cited herein (including all patents, patent applications, scientific publications, manufacturer's specifications, instructions, etc.), whether *supra* or *infra*, are hereby incorporated by reference in their entirety. Nothing herein is to be construed as an admission that the invention is not entitled to antedate such disclosure by virtue of prior invention.

[0047] The present invention is based on the surprising finding that growth rate variations due to variations in natural precipitation of natural grass in sports flooring can be reduced by applying a microporous zeolite mineral to at least between the lower face of the carrier structure and the upper face of the base layer of the hybrid turf grass of the sports flooring thereby buffering the water supply provided by natural precipitation and compensating variations in natural precipitation.

[0048] In a further aspect, the invention relates to providing a sports flooring comprising hybrid turf grass. The method comprises applying a microporous zeolite mineral to said hybrid turf grass.

[0049] The hybrid turf grass comprises at least a carrier structure, artificial turf fibers and natural grass fibers.

[0050] According to some embodiments, the zeolite is applied before or during installation of the carrier of the hybrid turf structure. For example, the zeolite can be mixed into a base layer onto which the carrier is to be installed before the carrier is placed on top of the base layer. In addition, or alternatively, the zeolite can be applied after the hybrid turf carrier was installed, e.g. by mixing the zeolite into the infill layer.

[0051] Optionally, the sports flooring according to the invention comprises a backing layer which is opposed to the lower face of the carrier structure and further optionally an infill layer on the upper face of the carrier structure. The term "hybrid turf grass" as used in the inventive method refers to a combination of natural grass and artificial grass, whereby the artificial grass accounts for 0.5%-25% of the surface area of the hybrid turf grass. The term "carrier structure" as used in accordance with the inventive method may comprise any reinforcing root-permeable mat prepared in any manner devised by the person skilled in the art depending on the desired characteristics for the final hybrid turf system. For example, the carrier may be woven, non-woven or knitted. It is further feasible that the synthetic fibers may be tufted into a base layer if present. Any material commonly used in the art for making a hybrid turf support may be used to make the carrier used in the hybrid turf support according to the invention. For example, the carrier may be made from materials selected from the group consisting of biodegradable materials and/or non-biodegradable materials, and these materials may be of a biological (natural) or non-biological (synthetic) origin and/or composition. The material may be chosen depending on the desired characteristics for the final hybrid turf system. The yarns may also be treated to provide beneficial properties, for example, impregnated with insect repellent or coated to provide resilience. The term "infill layer" refers to an infill material that is applied to the surface of the carrier structure and which may e.g. comprise sand, or resilient and inelastic polymer granules, or e.g. a mixture of sand and rubber granules. For example, US2005/0003193A1 discloses infill material comprising granules which have a core of recycled tire material; and a coating layer of a plastic material.

[0052] The infill material provides fiber support for the artificial turf grass fibers and has a thickness of about 5-60mm.

[0053] In one aspect, the present invention provides for a method of improving sports flooring comprising natural turf grass, whereby the method comprises the steps of providing a sports flooring which comprises natural turf grass and applying a microporous zeolite mineral to the sports flooring as disclosed herein. Accordingly, in one aspect, the method according to the invention as disclosed as above may e.g. be also be used to improve sports flooring comprising natural turf grass.

[0054] In one embodiment, the inventive sports flooring is positioned on a base layer as support which is opposed with its upper face to the lower face of the carrier structure. According to the inventive method additional layers which are not part of the sports flooring may be added to improve the durability and longevity of the sports flooring of the invention. Additional layers may e.g. include a weed barrier, which may be placed between the soil layer and the base layer, or e.g. between the base layer and carrier structure, or the backing layer if present. Including a weed barrier may e.g. be advantageous in situations in which the sports flooring is installed in areas in which the soil cannot be entirely freed from unwanted weeds thereby preventing the weeds from growing into the sports flooring. Additional layers may e.g. include a reservoir layer, which may be placed between the soil layer and the base layer, or e.g. between the base layer and carrier structure, or the backing layer if present. Including a reservoir layer may e.g. be advantageous for providing the in the reservoir layer stored water to the roots of the natural grass during a dry spell.

[0055] According to the inventive method the microporous zeolite mineral is applied to the sports flooring. The term "applying" as used for the inventive method refers to scattering, or evenly distributing the microporous zeolite mineral onto at least one face of the sports flooring and may e.g. also encompass the mixing of the microporous zeolite mineral with sand or gravel of the base layer. Term "mixing" as used for the inventive method may also encompass a layered distribution of base layer material (e.g. sand) with the microporous zeolite mineral, such that the resulting base layer

comprises e.g. at least a first sand layer, a layer of the microporous zeolite mineral and a second layer of e.g. sand. The base layer which is positioned below the carrier structure, or if present the backing layer of the sports flooring of the invention may comprise e.g. two, three, four of the layers as disclosed above which results in an efficient and uniform absorption and release of water by the microporous zeolite mineral upon contact with natural precipitation. Alternatively, the microporous zeolite mineral may e.g. be evenly distributed in the sand of the base layer, by mixing both, the microporous zeolite mineral and the sand in a cement mixer prior distributing the mixture on the soil layer. According to the inventive method the microporous zeolite mineral may e.g. be applied during the assembly of the sports flooring as the base layer will not be readily accessible once the sports flooring has been installed.

[0056] The term "zeolite mineral" as used in the inventive method refers to a group of more than 60 soft, white aluminosilicate minerals of tectosilicate type which is a three-dimensional framework of interconnected tetrahedra, comprising to a large extend aluminum, silicon and oxygen atoms. Zeolite minerals consist of a crystalline structure built from $[\text{AlO}_4]^{5-}$ and $[\text{SiO}_4]^{4-}$ bonded together in such a way that all four oxygen atoms located at corners of each tetrahedron are shared with adjacent tetrahedral crystals. The general formula of zeolites can e.g. be described as $\text{M}_{e2/n}\text{O} \cdot \text{Al}_2\text{O}_3 \cdot x\text{SiO}_2 \cdot y\text{H}_2\text{O}$, whereby Me is any alkaline or alkaline earth atom, n is the charge on that atom, x is the number of Si tetrahedron varying from 2 to 10 and y is the number of water molecules, typically between 2 and 7. Examples of natural zeolites include e.g. clinoptilolite, mordenite, phillipsite, chabazite, stilbite, or laumontite. Preferred zeolites according to the invention which include clinoptilolite, chabazite, mordenite, phillipsite and stilbite which may be obtained by mining due to their abundance in nature, resulting in lower production costs compared to the same amount synthetic zeolites. Synthetic zeolite minerals may e.g. also be used in the inventive method. The term "microporous zeolite mineral" as used in the inventive method refers to porous zeolite mineral which is characterized by pore diameters of less than about 10nm (e.g. of about 1nm, 2nm, 3nm, 4nm, 6nm, 7nm to about 9nm), or to zeolite minerals, such as e.g. those disclosed above, which are able to absorb and adsorb (also referred as sorption) water which can be reversibly released from the microporous zeolite mineral.

[0057] Accordingly, the installation of the sports flooring according to the inventive method may e.g. comprise the removal of soil in the area in which the sports flooring is to be installed. Subsequently, the base layer may e.g. be applied to the soil layer. Typically, the base layer comprises fine gravel and sand which may be present in a mixture of about 40, 50, 60, 70 parts gravel to: 30, 40, 50, 60 parts sand. Typically, base layers have a thickness of about 7cm - 10cm (e.g. 3 - 4 inches). Subsequently, according to the inventive method the microporous zeolite mineral is applied to the base layer prior to positioning the sports flooring onto the base layer such that the upper face of the base layer is opposed to the lower face of the carrier structure of the hybrid turf grass, or e.g. opposed to the backing layer should the hybrid turf grass comprise a backing layer. The application of the microporous zeolite mineral to the base layer, or any other layer of the sports flooring (e.g. the upper face of the carrier structure) in accordance with the invention will have the effect that the microporous zeolite mineral will absorb the water as it passes through the respective layer into the soil underneath the sports flooring and which will subsequently release the water thereby reducing the dependency on natural precipitation and which in addition will result in a constant growth rate of such natural grass and will overcome variations in the growth rate due to variations in natural precipitation.

[0058] According to one embodiment, it may be preferable to apply the microporous zeolite mineral close to the root system of the natural grass of the hybrid turf grass to enable an efficient uptake of the water released from the microporous zeolite mineral by the root system of the natural grass of the sports flooring in accordance with the inventive method as disclosed above, which in turn will result in a constant growth rate of the natural turf grass comprised in the sports flooring. Accordingly, the microporous zeolite mineral may e.g. be applied to the upper face of the base layer and to the upper face of the carrier structure, or e.g. to the upper face of the base layer and if present to the upper face of the infill layer.

[0059] The amount of microporous zeolite mineral that may be used depends on several factors such as e.g. geographic location, composition of the soil layer, or the amount of natural precipitation expected. For example, if large variations in natural precipitation are expected larger amounts of the zeolite mineral should be used such that the natural precipitation can be efficiently taken up by mineral and subsequently be released when there is no natural precipitation. The amount of microporous zeolite mineral which e.g. is applied to the sports flooring according to the inventive method may be chosen such that the amount of natural precipitation which passes through the base layer does not exceed the water absorption capacity of the microporous zeolite mineral. For example, in one embodiment, the amount of microporous zeolite mineral may be chosen such that from about 5%, 7.5%, 10%, 12.5%, 15%, 17.5%, 20%, 25%, 30% to about 35%, 40%, 45%, 50% or e.g. from about 6%, 7%, 8%, 9% to about 10%, 12.5%, 15%, 17.5%, 20%, 25%, 30%, 35%, 40%, 45%, 50% (v/v) of the natural precipitation is absorbed by the microporous zeolite mineral. The amount may be chosen to provide sufficient amounts of water to the natural grass comprised in the hybrid turf grass of the sports flooring according to the invention. Larger amounts of the microporous zeolite mineral may e.g. be used in the inventive method depending on the amount of natural precipitation to be adsorbed and subsequently being released.

[0060] In one embodiment, the microporous zeolite mineral may e.g. be mixed into the base layer in accordance with the inventive method. For example, if the upper face of the base layer is comprised of sand or fine gravel the microporous zeolite mineral may mixed with the sand or fine gravel. This will allow an even distribution of the microporous zeolite

mineral within the base layer which may for example be advantageous if a more compacted installation of the sports flooring is desired.

[0061] According to one embodiment, the microporous zeolite mineral may in accordance with the inventive method in addition to being mixed into the base layer applied to one further face of the sports flooring. For example, the microporous zeolite mineral may in accordance with the inventive method in addition to being mixed into the base layer applied to upper face of the carrier structure, or e.g. applied to the upper face of the infill layer whereby the amount of microporous zeolite mineral applied in accordance with the inventive method may depend on variations in natural precipitation as disclosed above. Adding the microporous zeolite mineral to more than one layer of the sports flooring of the invention will increase the amount of water that can be retained and subsequently released when no natural precipitation is available. For example, according to the inventive method the microporous zeolite mineral may be mixed into the base layer and additionally applied to the upper face of the base layer.

[0062] According to some embodiments, the microporous zeolite mineral is mixed into the base layer or the backing layer such, that the microporous zeolite mineral is in contact with the reservoir layer.

[0063] The reservoir layer may be located below the carrier structure and above the soil layer.

[0064] The reservoir layer as used herein is a layer that comprises a substance or substance mixture that is adapted to absorb and desorb large volumes of water, e.g. to adsorb water at least 0.5 time its weight, preferably at least 2 times its weight. For example, the substance can be microporous zeolite mineral grains or granules, sphagnum, compacted rock wool, clay ball, calcined diatom or a mixture of these materials. The substance can also be a "super absorber" in the narrow sense, i.e., a superabsorbent polymer (also called slush powder or "hydro gels", when cross-linked) that can absorb and retain extremely large amounts of water relative to their own mass. Many of the above mentioned substances absorb aqueous solutions through hydrogen bonding with water molecules. A super absorber may absorb 300 times its weight.

[0065] For example, the reservoir layer may be composed of materials such as microporous zeolite mineral grains or granules, sphagnum, compacted rock wool, clay ball, calcined diatom or a mixture of these materials. These materials may act as super absorber and be adapted to store large amounts of water. Thus the microporous zeolite mineral, which is in physical contact with the materials of the reservoir layer, may absorb water from the materials of the reservoir layer by capillarity and provide the water to the roots of the natural grass.

[0066] In one embodiment, the microporous zeolite mineral is applied between the upper face of the base layer and the lower face of the backing layer, e.g. the microporous zeolite mineral is applied to the interface between the base layer and the backing layer in accordance with the inventive method. For example, the microporous zeolite mineral may according to the invention also be applied to the upper face of the carrier structure, forming an additional layer between the carrier structure and infill layer. In one embodiment, the microporous zeolite mineral as disclosed above may e.g. according to the invention also be applied to the upper face of the infill layer. Applying the microporous zeolite mineral to the at least one further layer of the sports flooring according to the invention may be advantageous to increase buffering capacity of the sports flooring towards natural precipitation, because water first is partially absorbed by the microporous zeolite mineral applied to the at least one further layer in addition to the natural precipitation that is absorbed by the microporous zeolite mineral that is mixed into the base layer and/or is applied at the interface between the lower face of the backing layer and the upper face of the base layer.

[0067] In one embodiment, the microporous zeolite mineral is mixed with rubber or cork granules and applied between the upper face of the carrier structure and the soil layer to cushion the surface and thus to increase the playing comfort on the surface. Hereby it may be feasible that the microporous zeolite mineral mixed with rubber or cork granules is applied within 10 cm from the surface (approximately till the root level of the natural grass).

[0068] According to one embodiment, the backing layer used in the sports flooring in accordance with the inventive method is degradable. A "degradable" material as used herein is a material capable of being fully or at least partially decomposed chemically, physically and/or biologically in a comparatively short time span, e.g. less than a year or less than 6 months or preferably less than four weeks, e.g. three, two or one week. A degradable backing layer can be, for example, a biodegradable backing layer. A degradable backing layer can also be a backing layer that disintegrates if exposed to some particular physical or chemical conditions, e.g. water. Hence, according to embodiments of the invention, the hybrid turf comprises a degradable backing layer which does not maintain its structural integrity when e.g. in response to contact with water. For example, the degradable backing layer in the inventive method may comprise an inhomogeneous mixture of two types of latex having different swelling capabilities. The backing layer may e.g. comprise about 50% by weight of a first, less water-swellaable latex and comprise about 50% by weight a second, water-swellaable latex. However, other ratios of first to second latex are also possible; e.g., 1.4:1 or 1:1.4. The term "water-swellaable" as used in accordance with the inventive method generally refers to a material, or polymer such as e.g. latex as disclosed herein, which absorbs an amount of water greater than at least from about 10% w/w, 12.5% w/w, 15% w/w, 20% w/w to about 25% w/w, 30% w/w, 35%w/w, 40%w/w, 45%w/w, 50%w/w, 60%w/w, 75%w/w, 80%w/w, or e.g. from about 35%w/w, 40%w/w, 45%w/w, 50%w/w to about 60%w/w, 75%w/w, 80%w/w, 90%w/w, 100%w/w of its own weight upon immersion in an aqueous medium, or e.g. when contacted with water such as natural precipitation. The term "latex" as used in

accordance with the invention refers to a stable dispersion (emulsion) of polymer micro particles in an aqueous medium. For example, the first and/or the second latex may e.g. be a latex form that is found in nature, but it may e.g. in certain embodiments be synthetic latex used as the first less water-swellable and/or second water-swellable latex. Synthetic latex can be made by polymerizing a monomer such as styrene that has been emulsified with surfactants. The synthesis of synthetic latexes is e.g. described in U.S. Pat. No. 3,397,165 which discloses the preparation of butadiene polymer latexes useful as paper impregnates or for coating surfaces. It may be further feasible that the degradable backing layer may be produced from natural products such as diatomaceous earth or semi natural products such as compressed rock wool. The above described latexes are formed by providing a butadiene/styrene copolymer seed and then polymerizing butadiene and styrene monomers together with acrylic or methacrylic acid. Alternatively, synthetic latex can be made by polymerizing two or more different forms of monomers (referred herein as "co-monomers"). This form of latex is also referred to as "hybrid latex." For example, a particular form of hybrid latex can be generated in a copolymerization reaction of acrylate, styrene, and a water-swellable polymer, such as e.g. starch.

[0069] In one embodiment, the first, less water-swellable latex which may be used for manufacturing the backing layer of the sports flooring according to the invention may e.g. be obtained by copolymerization of a first copolymerization mixture which comprises:

- 20% to 40% w/w styrene or substituted styrene;
- 20% to 50% w/w acrylate and/or methacrylate;
- 5% to 20% w/w of one or more ethylenically unsaturated monomers (e.g., acrylate, methacrylate, styrene); and
- 1% to 15% w/w of a not-yet-polymerizable form of the polymerizable polymer.

[0070] In one embodiment, the copolymer of the second, water-swellable latex may e.g. be obtained by copolymerization of a second copolymerization mixture comprising:

- 20% to 40% w/w styrene or the substituted styrene;
- 20% to 50% w/w acrylate and/or methacrylate;
- 5% to 20% w/w of one or more ethylenically unsaturated monomers (e.g., acrylate, methacrylate, styrene); and
- 20% to 50% w/w of a not-yet-polymerizable form of the polymerizable polymer.

[0071] By increasing the fraction of the not-yet-polymerizable form of the polymerizable polymer (e.g., naturally occurring starch), the swelling capabilities of the polymer generated by the copolymerization are increased. By decreasing the fraction of the not-yet-polymerizable form of the polymerizable polymer, the swelling capabilities of the polymer generated by the copolymerization are decreased.

[0072] In one embodiment, the second copolymerization mixture as disclosed above may e.g. comprise at least 10% by weight more of the not-yet polymerizable form of the polymerizable polymer than the first copolymerization mixture. Preferably, the second copolymerization mixture may e.g. comprise at least 20% w/w, 25%w/w, 30% w/w, 35% w/w, 40%w/w, 45%w/w, 50%w/w, 55%w/w, 60%w/w, 75%w/w more of the not-yet polymerizable form of the polymerizable polymer than the first copolymerization mixture as disclosed above. The higher the difference in weight of the not-yet polymerizable polymer between the first and second latex the stronger the mechanical shear forces resulting from water contact and the faster the degradation of any material generated from an inhomogeneous mixture of the two different latex forms. Thus, depending on the desired disintegration properties of the backing layer in the inventive method the relative difference in abundance between the not-yet polymerizable form of the polymerizable polymer of the second and first latex are chosen.

[0073] According to embodiments, the generation of the inhomogeneous liquid mixture of the first and second latex may e.g. comprise stirring the first liquid latex with the second liquid latex under stirring conditions that are known to yield a liquid latex mixture having a desired degree of inhomogeneity. The desired degree of inhomogeneity is a degree of inhomogeneity that causes a solidified film of the first and second latex to disintegrate into fragments of a desired size in response to contact with water. For example, it may be desired to apply a backing layer that disintegrates into pieces which are about 0.2-2 cm in size after one hour of water contact. In order to determine the desired degree of inhomogeneity and the corresponding stirring conditions (duration, stirring speed, etc.), different mixtures (test mixtures) of the first and second latex as disclosed above may e.g. be created. Each of the test mixtures is stirred under different conditions (stirring speed, stirring duration, optionally also stirrer type or temperature, etc.). The test mixtures may e.g.

be applied to an even layer and are allowed to dry to form a solid film. The film may then e.g. be submerged in water. After a predefined time (e.g. one hour), disintegration of the films the size of the fragments is determined. Stirring conditions that yield a desired degree of inhomogeneity and a corresponding desired fragment size may e.g. then be used for generating the liquid mixture of the first and second latex.

[0074] According to embodiments, an inhomogeneous test latex mixture may e.g. be generated which comprises the first and second latex that will be used for producing the backing of the hybrid turf support or the artificial turf. The test mixture is applied on an even surface and allowed to solidify and dry to form a test latex film. When the test latex film has dried, it is put in contact with water for a predefined time; e.g., one hour. The time of exposure is the desired backing layer disintegration time upon exposing the backing layer to water; e.g., to rainfall or irrigation. After the predefined time has elapsed, check whether the film has disintegrated. If the film has disintegrated, the first and second latex types used for generating the test latex mixture are used for manufacturing the backing of the artificial turf or the backing of the support. If the film has not disintegrated (to a sufficient degree), the composition of the first and/or second latex is changed in a way that the water-swelling capabilities of the first and second latex differ more strongly. Then, a new test latex mixture is generated comprising the first and/or second latex with modified composition. And the test is repeated to check whether the swelling capabilities of the different latex form in the new test latex mixture cause the backing to disintegrate in the water exposure test to a sufficient degree.

[0075] The generation of the copolymers as disclosed above may e.g. be performed, for example, as described in patent application US20130276245A1, which is incorporated in its entirety hereby by reference. US20130276245A1 describes a composition for surface coloration of paper. The disclosure of US20130276245A1 is unrelated to the production of sports flooring and the inventive method as disclosed above. Embodiments of the inventive method as disclosed above are based on the surprising observation that the copolymerization described for generating the composition for surface coloration allows us to exactly define the swelling capability of latex by choosing appropriate amounts of co-monomers, whereby at least one of said co-monomers is in fact a water-swellaable polymer.

[0076] As the backing layer comprising a first and second latex as disclosed above disintegrates when for example put in contact with water, openings in the backing layer are created to allow for root growth through the backing layer, drainage of water and exchange of gases. This results in favorable growth conditions for the natural turf grass comprised in the sports flooring of the invention. Favorable growth conditions will enable the natural grass to recover more quickly from wear and render it less susceptible to disease. The overall effect is a more durable and consistent natural turf grass surface in the sports flooring according to the inventive method as disclosed above.

[0077] Typically, the degradable backing layer as disclosed above contacts water when natural grass seeds or sprigs are added onto the support at a sod farm and when the support is irrigated in order to grow natural grass plants on the support. The mechanical shear forces may be so high that the backing disintegrates into small pieces after a few or even after the first irrigation operation. If the difference in the swelling properties of the first and second latex is too low to result in a complete disintegration of the backing, at least microscopic cracks in the backing material are created that allow water to penetrate the backing and ease the penetration of the backing by the growing roots of the turf grass plants. The effect of the water-induced microscopic cracks or the water-induced disintegration of the backing layer is that the newly rooting grass plants can penetrate these openings easily, which also allows for downward water movement and gas exchange as well as improved water uptake by the microporous zeolite mineral. Since the microporous zeolite mineral which may e.g. be applied to the upper face of the carrier prior to application of the infill layer, or e.g. the upper face of the infill layer will result in a constant supply of water to backing layer it thereby further enhances the disintegration of the backing. The effect is a more reliable disintegration of the backing layer according to the inventive method.

[0078] The penetration of the roots through the cracks will cause further disintegration. It has been observed that, in some prior art hybrid turf systems, the roots of the grass plants clog all openings of the carrier material of the support which will then impede drainage, aeration and root development. When this occurs, moisture retention in the soil becomes too high and air porosity in the soil is correspondingly reduced. The soil becomes anaerobic which is detrimental to root growth of the natural turf grass of the hybrid turf grass comprised in the sports flooring. This problem may e.g. also be overcome through the use of the microporous zeolite mineral in accordance with the inventive method.

[0079] In one embodiment, the backing layer of the sports flooring in accordance with the inventive method may be biodegradable. The term "biodegradable" as used for the backing layer in the inventive method refers to a backing layer that fully disintegrates over time when put in contact with water, or sunlight and the constituents of which can be broken down and/or metabolized up by bacteria and fungi in the soil (e.g. within the base layer) and metabolized. Biodegradation of the backing layer as disclosed herein does have two effects: Firstly, it will result in a better exchange of gases within the sports flooring and will allow for the precipitation to freely seep into the base layer where the natural precipitate is taken up at the interface of the backing and base layer by the microporous zeolite mineral. Secondly, the constant release of water by the microporous zeolite mineral will provide an environment which favors constant microbial metabolism and growth. Thus, the use of microporous zeolite mineral in the inventive method as disclosed above will have a synergistic effect as through the constant release of water it accelerates the disintegration of the backing layer at the same time it will render the growth conditions for the soil-borne microbes more favorable which will result in an improved biodegradation

of the backing layer. The break-down products of the biodegradable backing layer in the inventive method may e.g. also have the effect of fertilization on the natural turf grass in the sports flooring according to the inventive method as disclosed herein.

[0080] The above embodiments of the inventive method allow for providing an improved sports flooring comprising natural grass that ensures that the natural grass plants do not die as a result of waterlogging. Biodegradable backing layers that may e.g. be used according to the invention comprises starch or a starch derivative. For example, a biodegradable backing layer in accordance with the inventive method as disclosed above may comprise a first and/or second latex disclosed above which are an emulsion of a copolymer in an aqueous medium, whereby the copolymer is a copolymerization product of a polymerizable polymer and one or more monomers. The one or more monomers may e.g. be selected from a group comprising:

i. styrene or a substituted styrene; and

ii. an acrylate and/or methacrylate, whereby the polymerizable polymer is water-swellaable and polymerizable starch or a polymerizable starch derivative.

[0081] For example, the polymer of the first latex may e.g. be a copolymer of:

i. styrene or a substituted styrene;

ii. an acrylate and/or methacrylate and/or butadiene; and

iii. a polymerizable form of a swellable polymer; e.g., an ethylenically unsaturated starch, and e.g. the first mixture of monomers may consist of:

i. from 20% to 40% by weight of the first copolymerization mixture of styrene or a substituted styrene;

ii. from 20% to 50% by weight of the first copolymerization mixture of an acrylate and/or a methacrylate and/or butadiene;

iii. from 5% to 20% by weight of the first copolymerization mixture of one or more ethylenically unsaturated monomers (e.g., acrylate, methacrylate, styrene); said monomers are given in addition to components i and ii and are added for generating polymerizable (grafted) forms of the not-yet-polymerizable polymer (starch); and

iv. 1% to 15% by weight of the first copolymerization mixture of a not-yet-polymerizable form of the polymerizable polymer.

[0082] For example, the first mixture can comprise 40% styrene, 50% acrylate, 4% methacrylate, and 6% starch. The second mixture of monomers that may e.g. be used for the manufacture of a biodegradable backing layer accordance with the inventive method consists of:

i. from 20% to 40% by weight of the second copolymerization mixture of styrene or a substituted styrene;

ii. from 20% to 50% by weight of the second copolymerization mixture of acrylate and/or methacrylate and/or butadiene;

iii. from 5% to 20% by weight of the second copolymerization mixture of one or more ethylenically unsaturated monomers (e.g., acrylate, methacrylate, styrene); said monomers are given in addition to components i and ii and are added for generating polymerizable (grafted) forms of the not-yet-polymerizable polymer (starch); and

iv. 20% to 50% by weight of the second copolymerization mixture of a not-yet-polymerizable form of the polymerizable polymer.

[0083] For example, the second mixture can comprise 30% styrene, 30% acrylate, 10% methacrylate, and 30% starch. Polymerizable starch and starch derivatives are e.g. disclosed in US patent nos. 2,668,156; US4,079,025 which are hereby incorporated in their entirety by reference. Starch or starch derivatives suitable for incorporating into the final copolymer 206, 208 may e.g. include practically all thinned starches of plant origin including starches from corn, wheat, potatoes, tapioca, rice, sago, and sorghum. Waxy and high-amylose starches may also be suitable. The starches can

be thinned by acid hydrolysis, oxidative hydrolysis, or enzymatic degradation. Further derivatized starches also suitable include those such as starch ethers, starch esters, cross-linked starches, oxidized starches, and chlorinated starches—for example, carboxymethyl cellulose and hydroxyethyl methyl cellulose. Typical examples are the commercially available amylopectin and dextrin. A commercially available example of oxidized starch is Perfectamyl® 4692.

[0084] In to one embodiment, the sports flooring according to the inventive method may e.g. be placed on additional layers such layers comprising a drainage system should the base layer and underlying soil require a draining system to avoid excess accumulation of water. This may e.g. be advantageous if the soil layer is comprised of water impermeable soil, such as clay and the amount of natural precipitation exceeds the maximum water absorbance capacity by the microporous zeolite mineral applied to the sports flooring of the invention.

[0085] In one embodiment, the sports flooring according to the invention comprises hybrid turf grass and natural grass. For example, the sports flooring of the invention may comprise between from about 70%, 72.5%, 75%, 80%, 85% to about 90%, 92.5%, 95%, 98%, 99%, 99.9%, or from about 70% to about 72.5%, 75%, 80%, 85% 90%, 92.5%, 95%, 98%, 99%, 99.9%, or from about 90%, 92.5%, 95% to about 96%, 97%, 98%, 99%, 99.5% natural grass. Natural grass that may e.g. be used in sports flooring in accordance with the inventive method may be one of Kentucky bluegrass (*Poa pratensis*), perennial ryegrass (*Lolium perenne*), tall fescue (*Festuca arundinacea*), or mixtures of different grass types such as e.g. a mixture of *Festuca brevipila* (15%), *Festuca rubra* ssp. (45%) and *Poa pratensis* (40%), or e.g. a mixture of *Festuca arundinacea* (70%), *Lolium perenne* (10%) and *Poa pratensis* (20%), or e.g. a mixture of *Lolium perenne* (30%), *Festuca* ssp (40%) and *Poa pratensis* (30%), or e.g. *Agrostis stolonifera* (100%), or e.g. *Agrostis stolonifera capilaris* (8%), *Agrostis stolonifera* (7%), *Festuca nigrescens* (45%), *Festuca rubra trichophylla* (40%), or e.g. a mixture of *Festuca trichophylla* (20%), *Festuca rubra rubra* (20%), *Lolium perenne* (30%) and *Poa pratensis* (30%) depending on the intended use of the inventive sports flooring. In one embodiment, the inventive sports flooring may e.g. comprise on its surface a grass layer comprising at least partially the grass types disclosed above. Depending on the expected amount of natural precipitation the sports flooring according to the invention may e.g. also comprise a sprinkler or irrigation system which is placed below the sports flooring according to the inventive method, e.g. below the carrier structure, or if present below the backing layer. Irrigation systems may e.g. be needed in arid geographical locations where the annual natural precipitation does not exceed 10 inches (e.g. 250-260mm).

[0086] According to one embodiment, the sports flooring in accordance with the inventive method comprises from about 0.1% to about 25% artificial fibers. For example, the sports flooring may comprise from about 0.1%, 0.25%, 0.5%, 0.75%, 1%, 2.5%, 3%, 4%, 5%, 7.5%, 10% to about 15%, 20%, 25%, or from about 15%, 16%, 17.5%, 18% to about 19%, 20%, 22.5%, 25% artificial fibers. The sports flooring according to the invention may e.g. comprise 0.5%, 1%, 2.5%, 5%, 7.5%, 10% artificial fibers and 99.5%, 99%, 97.5%, 95%, 92.5%, 90% natural turf grass, whereby the natural turf grass may be selected from the grass types and mixtures thereof as disclosed above. Accordingly, the inventive method as disclosed above may e.g. be used to improve sports flooring comprising hybrid turf grass. Different types of hybrid grass are known in the art such as e.g. hybrid grass in which the turf grass roots were allowed to intertwine with a mix of sand and synthetic fibers during growth. Different methods may e.g. be used to insert the synthetic fibers into the sand layer comprising the turf grass, such as injection with a tufting machine, or by mixing the fibers and sand which is then subsequently used to provide the turf grass layer. Another method that is used in the manufacture of hybrid turf grass is to place a mat with woven or tufted fibers on the surface of e.g. a sand layer (e.g. the base layer) followed by brushing in the sand to keep the artificial fibers in an upright position, followed by seeding the turf grass mixture, which may e.g. be selected from the group as disclosed above. The artificial fibers may e.g. be comprised of a polyolefin which has a good colorfast preventing bleaching of the artificial turf grass fibers in the hybrid turf grass structure. For example, WO2016/113342 A1 discloses artificial turf grass fibers which in addition have fire retardant properties. In one embodiment, the artificial turf grass fibers may e.g. be made of a linear, low-density polyethylene (LLDPE)/nano silica (SiO_2) composite as disclosed in Procedia Engineering 72 (2014) 901 - 906 to improve the tensile strength of the artificial turf grass fibers.

[0087] In one embodiment, according to the inventive method of improving sports flooring comprising hybrid turf grass comprising natural turf grass comprises applying from about 25g/m², 50g/m², 75g/m² to about 100g/m², 125g/m², 150g/m², 200g/m², 250g/m², 300g/m², 350g/m², 400g/m², 450g/m², 500g/m², 750g/m², 1000g/m², 1250g/m², 1500g/m², 2000g/m², 2250g/m², 2500g/m², 3000g/m², 3500g/m², 4000g/m², 4500g/m², 5000 g/m², 5500g/m², 6000g/m², 6500g/m², 7000 g/m², 7500g/m², 8000g/m², 8500g/m² of a microporous zeolite mineral as disclosed herein to the sports flooring comprising hybrid turf grass as disclosed above. For example, depending on the environmental conditions, such as natural precipitation (e.g. rain) and heat, as well as mechanical stress that the sports flooring may be exposed to the amount of microporous zeolite mineral may be varied to ensure a stable growth of the natural turf grass. For example, extended periods of drought or prolonged heat exposure may require larger amounts of the microporous zeolite material to be used in the inventive method to ensure a continuous release of water from the microporous zeolite mineral is sufficient to ensure a constant growth rate of the natural turf grass comprised in the hybrid turf grass. For example, sports flooring according to the invention when used in arid areas, such as golf courses in or close to deserts, may require larger amounts of the microporous zeolite mineral as disclosed above, e.g. 350g/m², 400g/m², 450g/m², 500g/m²,

750g/m², 1000g/m², 1250g/m², 1500g/m², 2000g/m², 2250g/m², 2500g/m², 3000g/m², 3500g/m², 4000g/m², 4500g/m², 5000 g/m², 5500g/m², 6000g/m², 6500g/m², 7000 g/m², 7500g/m², 8000g/m², 8500g/m² to ensure a continuous and sufficient release of water throughout the day to ensure a steady growth rate of the natural turf grass. In addition, the use of larger amounts of the microporous zeolite mineral may e.g. provide the advantage of microclimate regulation in arid areas due to the high evaporation enthalpy of the water released.

[0088] According to one embodiment, the microporous zeolite mineral used in the inventive method is characterized by a porosity of about 10% to about 40%, e.g. from about 10%, 12.5%, 15%, 17.5% to about 20%, 22.5%, 25%, 27.5%, 30%, 32.5, 35%, 37.5%, 40% or from about 20%, 22.5%, 25% to about 27.5%, 30%, 32.5%, 35%, 37.5%, 40%. According to a preferred embodiment, the porosity of microporous zeolite mineral used in the inventive method is from about 10%, 12.5%, 15%, 17.5% to about 20%, 22.5% 25%, 27.5%, 30%, 32.5%, 35%, or from about 20%, 22.5%, 25% to about 27.5%, 30%, 32.5%, 35%. The term "porosity" as used according to the invention is a measure of the void fraction in a material. Voids can either be 'closed', and inaccessible or 'open' and connected to other voids and thence to the exterior of the material. The total porosity (ϕ) is defined by the ratio of the volume of void space (V_v) to the total, or bulk volume of the material (V_T) and can be expressed as $\phi = V_v/V_T$. Porosity may e.g. be expressed as percentage of the bulk or total volume of the material, such as the microporous zeolite according to the invention. Several methodologies known in prior art may e.g. be used to determine the porosity of the microporous zeolite mineral of the invention such as optical microscopy, scanning electron microscopy, X-ray computed tomography, nitrogen adsorption and BET analysis (see e.g. "Bio-aggregates Based Building Materials", ISBN 978-94-024-1030-3, pages 39-68 for a more detailed description of the methodologies, which is hereby incorporated by reference). For example, the porosity of the microporous zeolite mineral of the invention may also be determined based on solar reflectivity, which depends on the shape of the reflecting object. Depending on the methodology used for determining porosity the resulting values may differ, but e.g. should not exceed a porosity of about 40% irrespective of the methodology used.

[0089] In one embodiment, the microporous zeolite mineral used in the inventive method is characterized by a specific surface area of below 40m²/g. As used for the inventive method specific surface area refers to the surface of the microporous zeolite which enables the microporous zeolite mineral to release water under ambient temperatures, e.g. a temperature of about 10°C to about 50°C, e.g. 15°C, 20°C, 25°C, 30°C, 35°C, 40°C, 42°C, 45°C, 47°C, or e.g. from about 12°C, 15°C, 20°C, 25°C, 30°C to about 35°C, 40°C, 45°C, 50°C, or e.g. from about 35°C, 40°C, 45°C to about 50°C. The specific surface area of the microporous zeolite mineral of the invention is preferably below 40m²/g to allow water to be efficiently released from the zeolite mineral at ambient temperatures. For example, the specific surface area of the microporous zeolite mineral of the invention may be from about 10 m²/g to less than 40m²/g, e.g. from about 10.5 m²/g, 11m²/g, 12m²/g, 15m²/g, 17.5m²/g, 20m²/g, 25m²/g, 30m²/g to about 32m²/g, 35m²/g, 37.5m²/g, 38m²/g, 39m²/g, 39.5m²/g, or from about 32m²/g, 35m²/g to about 39m²/g, preferably between about 15m²/g to about 20m²/g. In one aspect, the microporous zeolite mineral used in the inventive method as disclosed above may e.g. be characterized by a pore radius from about 1nm, 2nm, 3nm, 4nm, to about 5nm, 6nm, 7nm, 8nm, 9nm, or e.g. from about 1.5nm to about 6nm. For example, the microporous zeolite mineral used in the inventive method may e.g. be characterized by a pore size of about 1.5nm to about 6nm and a porosity of about 15%, 16%, 17% to about 18%, 19%, 20%.

[0090] According to one embodiment, the microporous zeolite mineral used in the inventive method has a selected grain size of smaller than 20mm, preferably smaller than 2.5mm, and a porosity of about 15% to about 20%. For example, the microporous zeolite mineral used in the inventive method may have a grain size from about 100μm, 150μm, 200μm, 250μm, 300μm, 350μm, 400μm to about 500μm, 600μm, 700μm, 800μm, 900μm, 1mm, 1.3mm, 1.5mm, 1.7mm, 2.0mm, or e.g. from about 500μm, 600μm, 700μm, 800μm to about 1mm, 1.3mm, 1.5mm, 1.8mm, 2.0mm, 2.2mm and a porosity of about 15% to about 20%, e.g. of about 16%, 17%, 18%, 19%. One advantage of using microporous zeolite mineral of a specified grain size below 20mm, preferably below 2.5mm, as disclosed above and a porosity between 15% - 20% in the inventive method can e.g. be seen in a controlled adsorption and desorption of water by the microporous zeolite mineral at ambient temperatures in the sports flooring, e.g. in the hybrid turf grass comprised in the inventive sports flooring.

[0091] According to one embodiment, the grain size distribution of the microporous zeolite mineral in the inventive method as disclosed above is as follows: 70-90% of the grains have a size in the range of about 0.4mm to about 20mm, preferably in the range of about 0.4mm to about 10mm, and about 10% to about 30% of the grains have a grain size smaller than about 0.4mm. For example, the microporous zeolite mineral for use in the inventive method as disclosed above may comprise from about 70%, 75%, 80%, 85%, 90% of grains which have grain size of about 0.4mm to about 2.5mm, e.g. 0.45mm, 0.5mm, 0.6mm, 0.6mm, 0.7mm, 0.8mm, 0.9mm, 1mm, 1.3mm, 1.6mm, 1.9mm, 2.5mm, or e.g. from about .45mm, 0.5mm, 0.6mm, 0.6mm, to about 0.8mm, 0.9mm, 1mm, 1.5mm, 1.8mm, 2.0mm, 2.5mm and from about 10% to about 30% (e.g. 15%, 20%, 25%) of the grains have a grain size smaller than 0.4mm, e.g. 0.35mm, 0.3mm, 0.25mm, 0.2mm, 0.15mm, 0.1mm. The grain size should, however, not be smaller than 80μm. For example, if the microporous zeolite material is scattered on the upper face of the carrier structure of the sports flooring as disclosed above it may be advantageous to use a larger grain size to avoid dust formation to reduce the probability of inhalation of such dust particles.

[0092] In one embodiment, the microporous zeolite mineral for use in the inventive method is selected from the group comprising clinoptilolite, mordenite, phillipsite, chabazite, stilbite, or laumontite. The above zeolite minerals are preferred in the inventive method as they can be provided at low cost and can be readily processed to yield microporous zeolite mineral having a grain size distribution as disclosed above. Synthetic zeolites such as e.g. zeolite A and Faujasite may

e.g. also be used in the inventive method; however, they are more expensive than natural zeolite minerals.

[0093] The amount of microporous zeolite material used may e.g. also depend on the distribution of the zeolite mineral within the turf grass structure. For example, scattering of the microporous zeolite mineral as disclosed above on the upper face of the carrier structure may require less of the zeolite mineral to avoid an unnatural feel of the turf grass structure during sports activities. Larger amounts of the microporous zeolite mineral may e.g. be required or desirable if the microporous zeolite mineral is placed between the upper face of the base layer and the lower face of the backing layer, or between the base layer and the carrier structure of the sports flooring of the invention, or if e.g. the microporous zeolite mineral is mixed into the base layer.

[0094] In one embodiment, the sports flooring in the inventive method may e.g. comprise from about 0.1%w/w to about 10%w/w of the microporous zeolite mineral as disclosed above. For example, the sports flooring used in the inventive method may e.g. comprise from about 0.1%w/w, 0.25%w/w, 0.5%w/w, 0.75%w/w, 1%w/w, 1.5%w/w, 2%w/w, 2.5%w/w, to about 3%w/w, 4%w/w, 5%w/w, 6%w/w, 7%w/w, 8%w/w, 9%w/w, 10%w/w or from about 0.2%w/w, 0.6%w/w, 0.8%w/w to about 1%w/w, 1.5%w/w, 2%w/w, 2.5%w/w, 3%w/w, 4%w/w, 5%w/w, 6%w/w, 7%w/w, 8%w/w, 9%w/w, 10%w/w of the microporous zeolite mineral according to the invention. The term "%w/w" as used here by refers to the relative abundance of the microporous zeolite mineral of the invention expressed as weight per weight. According to one aspect, the inventive sports flooring as disclosed above may e.g. comprise from about 0.1%v/v, 0.25%v/v, 0.5%v/v, 1%v/v, 2.5%v/v, 5%v/v to about 10%v/v, 12.5%v/v, 15%v/v, 17.5%v/v, 20%v/v, 22.5%v/v 25%v/v, or e.g. from about 0.2%v/v to about 2%v/v, 3%v/v, 4% v/v. The term "%v/v" as used herein refers to the relative abundance of the microporous zeolite mineral of expressed as volume per volume. For example, the relative abundance of the microporous zeolite mineral in the inventive sports flooring may be determined empirically within the limits of the amounts disclosed herein to determine the amount of microporous zeolite mineral required to result in a constant growth rate of the natural turf grass in the sports flooring, but at the same time does not interfere with sports activities by e.g. rendering the sports flooring to hard or soft for the respective sports activity.

[0095] In one embodiment, the present invention pertains to a sports flooring comprising hybrid turf grass which can be obtained by the inventive method as disclosed above. For example, a sports flooring obtainable by the inventive method may e.g. comprise at least a carrier structure and an infill layer and optionally a backing layer as disclosed above whereby the sports flooring comprises from about 75% to about 99.5% natural grass and from about 25% to about 0.5% artificial fibers and whereby e.g. the sports flooring comprises from about 25g/m², 50g/m², 75g/m² to about 100g/m², 125g/m², 150g/m², 200g/m², 250g/m², 300g/m², 350g/m², 400g/m², 450g/m², 500g/m², 750g/m², 1000g/m², 1250g/m², 1500g/m², 2000g/m², 2250g/m², 2500g/m², or form about 100g/m² 125g/m², 150g/m², 200g/m², 250g/m², 300g/m², 350g/m², 400g/m², 450g/m², 500g/m², 750g/m², 1000g/m² to about 3000g/m², 3500g/m², 4000g/m², 4500g/m², 5000g/m², 5500g/m², 6000g/m², 6500g/m², 7000g/m², 7500g/m², 8000g/m², 8500g/m² of the microporous zeolite mineral as disclosed above, and wherein the microporous zeolite mineral is applied to at least one face of a layer of the sports flooring as disclosed above, e.g. at the interface between the base layer and the carrier structure, or e.g. at the interface between the base layer and the backing layer and a second layer such as to the upper face of the carrier structure.

[0096] According to one embodiment, the sports flooring obtainable by the inventive method as disclosed above comprises microporous zeolite mineral which has a selected grain size smaller than 20mm, preferably smaller than 10mm or smaller than 2.5mm, and a porosity of about 15% to about 20% as disclosed above.

[0097] In one embodiment, the sports flooring obtainable by the inventive method comprises microporous zeolite mineral which is characterized by a grain size distribution of 70-90% of the grains have a size in the range of about 0.4mm to about 20mm, preferably in the range of about 0.4mm to about 10mm, and about 10% to about 30% of the grains have a grain size smaller than about 0.4mm as disclosed above.

[0098] In one embodiment, the sports flooring obtainable by the inventive method comprises microporous zeolite mineral selected from the group comprising clinoptilolite, mordenite, phillipsite, chabazite, stilbite, or laumontite.

[0099] In one embodiment, the present invention pertains to microporous zeolite mineral for use according to the invention for regulating the abundance of water in a sports flooring comprising hybrid turf grass, wherein the porosity of the microporous zeolite mineral is from about 10 % to about 20% and wherein the selected grain size of said microporous zeolite mineral is smaller than 20mm, preferably smaller than 10mm.

[0100] In one embodiment, the microporous zeolite mineral for use according to the invention for regulating the abundance of water in a sports flooring comprising natural grass is e.g. characterized by porosity of about 11%, 12%, 13%, 14%, 15%, 16%, 17%, 18%, 19%, or e.g. by a porosity from about 15% to about 20% and a selected grain size smaller than 20mm, preferably smaller than 2.5mm as disclosed above, e.g. 0.45mm, 0.5mm, 0.6mm, 0.6mm, 0.7mm, 0.8mm, 0.9mm, 1mm, 1.1mm, 1.2mm, 1.3mm, 1.4mm, or e.g. from about .45mm, 0.5mm, 0.6mm, 0.7mm, to about 0.8mm, 1mm, 1.2mm, 1.4mm, 1.5mm, 1.7mm, 2.0mm, 2.2mm. The effect of regulating the abundance of water in the sports

flooring according to the inventive method can be seen in a constant growth of the natural grass in the sports flooring.

[0101] According to one embodiment, the microporous zeolite mineral for use according to the invention as disclosed above may e.g. be selected from the group of natural zeolites, such as clinoptilolite, mordenite, phillipsite, chabazite, stilbite, or laumontite, which may be prepared by e.g. means of wet grinding or dry grinding in a steel ball mill and subsequent selection on one or a series of mesh screens of the desired mesh size.

[0102] In one embodiment, the microporous zeolite mineral for use in regulating the abundance of water in a sports flooring comprising hybrid turf grass according to the invention as disclosed above is characterized by a grain size distribution of 70-90% of the grains having a size in the range of about 0.4mm to about 20mm, preferably about 0.4mm to about 2.5mm, and about 10% to about 30% of the grains having a grain size smaller than about 0.4mm. Accordingly, 70%, 75%, 80%, 85% 90% of the grains of the microporous zeolite mineral for use according to the invention have a size of about 0.4mm to about 2.5mm, e.g. from about 0.5mm, 0.6mm, 0.7mm, 0.8mm, 0.9mm, 1mm to about 1.1mm, 1.2mm, 1.3mm, 1.4mm, or e.g. of about 0.45mm, 0.5mm, 0.6mm, 0.7mm, to about 0.8mm, 1mm, 1.2mm, 1.4mm, 1.5mm, 1.7mm, 2.0mm, 2.2 mm and from about 10% to about 30% (e.g. 15%, 20%, 25%) of the grains have a grain size smaller than 0.4mm, e.g. 0.35mm, 0.3mm, 0.25mm, 0.2mm, 0.15mm, 0.1mm. The grain size should, however, not be smaller than 80µm.

[0103] According to one embodiment, the microporous zeolite mineral for use according to the invention is selected from the group of clinoptilolite, mordenite, phillipsite, chabazite, stilbite, or laumontite.

[0104] In one embodiment, it may e.g. be desirable that the above microporous zeolite minerals for use according to the invention have a low capacity for the uptake of arsenic or other heavy metals to avoid accumulation of this toxic metalloid in the sports flooring over time. It may thus e.g. be desirable that the microporous zeolite minerals for use according to the invention have a high Si:Al ratio, e.g. a ratio of Si:Al of ≥ 2 , preferably a ratio of Si:Al of ≥ 3 . Said microporous zeolite minerals have a low capacity for binding arsenic or other heavy metals.

[0105] In one embodiment, microporous zeolite mineral for use according to the invention as disclosed above is used to regulate both the absence of water and the abundance of water in a sports flooring comprising natural grass, wherein the sports flooring is one of a sports field, or golf course. For example, the microporous zeolite mineral for use according to the invention may be used on sports floorings such as football fields, soccer fields, hockey fields, rugby fields tennis courts, recreation and playing areas, or for athletics tracks. In case of a golf course it may be desirable that the microporous zeolite material for use according to the invention is e.g. only applied to the tee box or putting green, areas which are subjected to higher mechanical stress than e.g. the fairway and for which a constant growth rate of the natural grass in the sports flooring is important to provide a uniform surface. The effect of such uniform surface is an e.g. improved rolling characteristic of golf balls, which are of particular importance on putting greens.

[0106] In one embodiment, the present invention provides for a golf course comprising the inventive sports flooring as disclosed above. For example, the golf course according to the invention may comprise a tee box and/or putting green which comprises the inventive sports flooring as disclosed above, e.g. a sports flooring comprising hybrid turf grass obtainable by the inventive method as disclosed above. This may e.g. not only be advantageous on golf courses for which means for irrigation are limited, but also under environmental aspects if the amount of water used for irrigation is efficiently taken up by the root system of the natural turf grass comprised in the hybrid turf grass of the inventive sports flooring as disclosed herein in the inventive sports flooring thereby reducing the amount of water required to achieve a constant growth rate of the natural turf grass.

[0107] In one embodiment, the inventive sports flooring forming part of the golf course according to the invention may e.g. be used to regulate the microclimate in the sports flooring. This may be particularly useful in arid and hot geographical locations, where the continued release and evaporation of water from the microporous zeolite mineral of the invention will result in a cooling of the hybrid turf grass and thereby in a cooling of the sports flooring of the invention due to the water's evaporation enthalpy.

[0108] In one embodiment, the present invention e.g. also provides for sports fields, such as soccer, rugby and American football fields, or tennis courts which comprise the inventive sports flooring as disclosed above.

[0109] In one embodiment, the above method of improving sports flooring comprising hybrid turf grass may e.g. also be used to regulate the biodegradation of organic matter within the sports flooring. For example, in the inventive method the biodegradable backing layer may be comprised of an inhomogeneous mixture of two types of latex, e.g. as disclosed above, having different swelling capabilities as disclosed above and which results in opening in the backing layer when put in contact with water such as natural precipitation. Natural precipitation which seeps through the layers of the sports flooring as disclosed above will be absorbed by the microporous zeolite mineral between the upper face of the base layer or reservoir layer and the lower face of the carrier structure or backing layer and subsequently be released when the moisture of the surrounding layers decreases thereby providing a constant moisture in the respective layer of the sports flooring which is preferably close to the root system of the natural grass of the sports flooring. A constant water supply to the sports flooring will in turn result in better growth conditions for soil-borne bacteria, fungi and other micro-organisms which will correspond with a constant decomposition or biodegradation rate of organic matter in the respective layer of the sports flooring. The term "organic matter" as used in the inventive method refers to detritus, comprising

roots, grass blades and other organic material which accumulates over time in the layers of the sports flooring. A constant degradation rate of organic matter or detritus in proximity to the root system of the natural grass of the sports flooring provides a continued supply of fertilization to the natural turf grass of the sports flooring. This fertilization favors a healthy natural turf grass of the hybrid turf grass of the sports flooring as disclosed herein which is e.g. characterized by a constant growth rate. To reduce possible felting (felt is the waste of dead mowings and roots that form a barrier preventing the passage of water and air), it is within the invention that bacteria or yeast, as e.g. *saccharomyces cerevisiae*, can be added to the microporous zeolite mineral in order to promote the degradation of felt. The inventive method of regulating biodegradation of organic matter in the sports flooring comprises applying from about 25g/m², 50g/m², 75g/m², 100g/m², 125g/m², 150g/m² to about 200g/m², 250g/m², 300g/m², 350g/m², 400g/m², 450g/m², 500g/m², 750g/m², 1000g/m², 1250g/m², 1500g/m², 2000g/m², 2250g/m², 2500g/m², 3000g/m², 4000g/m², 5000g/m², 5500g/m², 6000 g/m², or from about 200g/m², 250g/m², 300g/m², 350g/m², 400g/m², 450g/m², 500g/m², 750g/m², 1000g/m², 1250g/m², 1500g/m², 2000g/m² to about 2250g/m², 2500g/m², 3000g/m², 3500g/m², 4000g/m², 4500g/m², 5000g/m², 5500g/m², 6000g/m², 6500g/m², 7000g/m², 7500g/m², 8000g/m², 8500g/m² of the a microporous zeolite mineral as disclosed herein to the sports flooring comprising hybrid turf grass as disclosed above.

[0110] In one embodiment, the backing layer in the inventive method of regulating the biodegradation of organic matter may e.g. be biodegradable comprising starch or a starch derivative as disclosed above. For example, the use of a biodegradable backing layer in the inventive method may be advantageous as the constant moisture level in the sports flooring will have two effects, e.g. enhancing its degradation through a constant supply of water which will result in swelling-induced breaks in the backing layer, which will be more efficiently degraded by the soil-borne microorganisms. According to the invention it may e.g. be advantageous to use a biodegradable backing layer as disclosed above in combination with base layer comprising the microporous zeolite mineral as disclosed above and in addition to apply the microporous zeolite mineral to at least one further face of the sports flooring, such as e.g. the carrier structure, to increase the amount of natural precipitate available for continued release. This will result in a more efficient and thereby uniform degradation of the detritus in one or more layers of the sports flooring. For example, it may be desirable to apply the microporous zeolite mineral to the face of a layer above and to the face of a layer below the root system of the natural grass of the hybrid turf grass to provide a section within the sports flooring in which is characterized by a constant water supply and constant rate of biodegradation of organic matter. For example, the microporous zeolite mineral may e.g. be applied to the interface of base layer and backing layer and mixed with or worked into the infill layer according to the inventive method. The corresponding effect may be seen in the enrichment of nutrients which can then be taken up by the roots of the natural grass. Further, this degradation of organic matter may also be stored in microporous zeolite grains and used as a fertilizer reservoir.

[0111] In one embodiment, the microporous zeolite mineral used in the inventive method may be as disclosed above, e.g. having a grain size as disclosed above, e.g. a selected grain size smaller than 20 mm and a porosity of about 15% to about 20% and e.g. characterized by a grain size distribution of said microporous zeolite mineral of 70-90% of the grains having a size in the range of about 0.4mm to about 20mm, preferably in the range of about 0.4mm to about 10mm, and about 10% to about 30% of the grains having a grain size smaller than about 0.4mm. According to one embodiment, the microporous zeolite mineral that may be used in the inventive method of regulating the biodegradation of organic matter is selected from the group comprising clinoptilolite, mordenite, phillipsite, chabazite, stilbite, or laumontite. Aspects of the present invention are described in more detail by the example below, which is only used for illustration purposes and not meant to be limiting for the scope of the invention.

Example

Production and selection of microporous zeolite mineral

[0112] The below example provides a method of producing the microporous zeolite mineral according to the invention: The zeolite ore which may e.g. be obtained from a mining pit is fed in through a grizzly with 16"x16" opening, the output ore of the grizzly travels in a subsequently via a first conveyer into a jaw crusher where the output ore of the grizzly is reduced to a 4 inch size resulting in 4inch ore. The 4 inch ore travels in a next step via a second conveyor to a double deck Nordberg screen with a 5/8 inch screen on the top deck. The resulting output of the double deck Nordberg screen is a minus 5/8 inch material and plus 5/8 inch material.

[0113] In a next step the minus 5/8 inch material may travel to a third conveyor toward a grinding unit via a dryer. The plus 5/8 inch material travels back via a fourth conveyor to a cone crusher which can be used to reduce the plus 5/8 inch material to at least ½ inch material. The ½ inch material may then return in a next step to the Nordberg screen via the second conveyor.

[0114] From the third conveyor, the zeolite material output of the Nordberg screen may then travel to a propane fueled rotary kiln dryer where it may be heated at 250°C, reducing moisture to 5%, and subsequently fed into the grinding unit.

[0115] The zeolite material may then be conveyed from the dryer via a fifth conveyor to an impact crusher and five-

decked Midwestern screens. From the screens the zeolite may be sized and conveyed to a sixth conveyor and returned via a seventh conveyor to the impact crusher which is returned to the Midwestern Screens. At the Midwestern screens, the products may be sized according to yield the microporous zeolite mineral of the invention.

[0116] The following table gives example properties of the selected microporous zeolite mineral of the present method:

Parameter	Values
Granulometry	14x40 mesh (0.42 - 1.39 mm)
Particle size distribution	
14 mesh (1.39 mm)	0.9 %
20 mesh (0.84 mm)	39.0 %
30 mesh (0.59 mm)	27.0 %
40 mesh (0.42 mm)	21.0 %
100 mesh (0.15 mm)	10.0 %
< 100 mesh	0.6%
color / Brightness	White / 85
Mohs Hardness	2.5 - 4
Porosity	15 - 20%
Arsenic total	< 4 mg/kg sec
Level of humidity	≤ 6 %

Brief description of the drawings

[0117] In the following embodiments of the invention are explained in greater detail, by way of example only, making reference to the drawings in which:

- Figure 1A depicts a cross-sectional view of a sports flooring of the invention before natural turf grass has started growing on the carrier structure, whereby the microporous zeolite mineral was applied to the upper face of the base layer.
- Figure 1B depicts a cross-sectional view of a sports flooring of the invention after natural turf grass has started growing on the carrier structure, whereby the microporous zeolite mineral was applied to the upper face of the base layer.
- Figure 1C depicts a cross-sectional view of a sports flooring of the invention before natural turf grass growth with microporous zeolite mineral mixed into the base layer.
- Figure 1D depicts a cross-sectional view of a sports flooring of the invention after the natural turf grass has grown into the base layer comprising the microporous zeolite mineral and the backing layer is degraded in the vicinity of the roots of the natural turf grass.
- Figure 2 depicts two different copolymerization mixtures used for generating the polymer of the first and second latexes which can be used in the manufacture of a degradable backing layer.

Detailed description of the drawings

[0118] Like numbered elements in these figures are either equivalent elements or perform the same function. Elements which have been discussed previously will not necessarily be discussed in later figures if the function is equivalent.

Figure 1A depicts a cross-sectional view of a sports flooring 100 of the invention before natural turf grass (seeded but not yet grown; not depicted) exposed to illumination and/or sunlight 105 has started growing on the carrier structure 107. The sports flooring 100, as depicted in Fig. 1, comprises a carrier structure 107 and artificial turf grass 110. As depicted, the sports flooring 100 further comprises a base layer 102 on the lower side LS of the sports flooring 100, to which the microporous zeolite mineral 130 was applied, and a backing layer 120 arranged above the applied microporous zeolite mineral 130. On the upper side US of the sports flooring an infill layer 106 is depicted as a surface layer, which has been arranged above the carrier structure 107.

Figure 1B depicts a cross-sectional view of a sports flooring 100 of the invention after natural turf grass 112 was

exposed to illumination and/or sunlight 105 and started growing on the carrier structure 107. As depicted, the roots 108 of the natural turf grass 112 have grown into the base layer 102, 103, now interspersed with microporous zeolite mineral, as well the soil layer 140, which is situated under the sports flooring 100. As depicted in the vicinity of the roots 108 of the natural turf grass 112, the backing layer is partially degraded to a partially disintegrated backing layer 121.

Figure 1C depicts a cross-sectional view of a sports flooring 100 of the invention before natural turf grass (seeded but not yet grown; not depicted) exposed to illumination and/or sunlight 105 has started growing on the carrier structure 107. As depicted in Fig. 1C, the sports flooring 100 comprises a carrier structure 107 and artificial turf grass 110. The sports flooring 100 further comprises a base layer 102, wherein the base layer is mixed with microporous zeolite mineral 130, and a backing layer 120 arranged above the base layer mixed with microporous zeolite mineral 115. On the upper side US of the sports flooring an infill layer 106 is depicted as a surface layer, which has been arranged above the carrier structure 107.

Figure 1D depicts a cross-sectional view of a sports flooring 100 of the invention after natural turf grass 112 was exposed to illumination and/or sunlight 105 and started growing on the carrier structure 107. As depicted, the roots 108 of the natural turf grass 112 have grown into the base layer mixed with microporous zeolite mineral 115, as well the soil layer 140 situated under the sports flooring 100. As depicted in the vicinity of the roots 108 of the natural turf grass 112, the backing layer is partially degraded to a partially disintegrated backing layer 121.

Figure 2 depicts two different copolymerization mixtures 202, 204 used for generating the polymer of the first and second latexes 206, 208, which can be used in the manufacture of a degradable backing layer. Biodegradable backing layers that may e.g. be used according to the invention comprise starch or a starch derivative. The biodegradable backing layer may comprise first and/or second latex, which are an emulsion of a copolymer in an aqueous medium, whereby the copolymer is a copolymerization product of a polymerizable polymer and one or more monomers. The one or more monomers are selected from a group comprising styrene or a substituted styrene; and acrylate and/or methacrylate, whereby the polymerizable polymer is water-swellable and polymerizable starch or a polymerizable starch derivative. As depicted in Fig. 2 the polymer 206 of the first latex is a copolymer of styrene or a substituted styrene 210; an acrylate and/or methacrylate and/or butadiene 212; and a polymerizable form 216 of a swellable polymer; e.g., an ethylenically unsaturated starch, and the first mixture 202 of monomers consists of from 20% to 40% by weight of the first copolymerization mixture of styrene or a substituted styrene 210; from 20% to 50% by weight of the first copolymerization mixture of an acrylate and/or a methacrylate and/or butadiene 212; from 5% to 20% by weight of the first copolymerization mixture of one or more ethylenically unsaturated monomers (e.g., acrylate, methacrylate, styrene); said monomers are given in addition to components 210 and 212 and are added for generating polymerizable (grafted) forms of the not-yet-polymerizable polymer (starch); and 1% to 15% by weight of the first copolymerization mixture of a not-yet-polymerizable form of the polymerizable polymer. For example, the first mixture can comprise 40% styrene, 50% acrylate, 4% methacrylate, and 6% starch.

[0119] The second mixture 204 of monomers used for the manufacture of a biodegradable backing layer consists of: from 20% to 40% by weight of the second copolymerization mixture of styrene or a substituted styrene 210; from 20% to 50% by weight of the second copolymerization mixture of acrylate and/or methacrylate and/or butadiene 212; from 5% to 20% by weight of the second copolymerization mixture of one or more ethylenically unsaturated monomers (e.g., acrylate, methacrylate, styrene); said monomers are given in addition to components 210 and 212 and are added for generating polymerizable (grafted) forms of the not-yet-polymerizable polymer (starch) 114; and 20% to 50% by weight of the second copolymerization mixture of a not-yet-polymerizable form of the polymerizable polymer. For example, the second mixture can comprise 30% styrene, 30% acrylate, 10% methacrylate, and 30% starch.

List of reference numerals

[0120]

- 100 Sports flooring
- 102 base layer
- 103 base layer with dispersed microporous zeolite mineral
- 105 illumination and/or sunlight
- 106 infill layer
- 107 carrier structure, e.g. a mesh
- 108 grass roots

110	artificial turf fibers
112	natural grass blades
115	base layer mixed with microporous zeolite mineral
120	backing layer
5 121	backing layer, partially disintegrated
130	microporous zeolite mineral
140	soil layer
202	first co-polymerization mixture
204	second co-polymerization mixture
10 206	copolymer comprised in the first latex
208	copolymer comprised in the second latex
210	styrol or styrol derivative used as co-monomer
212	acrylate or methacrylate used as co-monomer
214	swellable, not polymerizable polymer, e.g. starch
15 216	swellable, polymerizable polymer, e.g. starch grafted on acrylate or styrol, used as co-monomer
US	upper side
LS	lower side

Claims

- Method for providing a sports flooring (100) comprising natural grass (112), said method comprising
 - providing a sports flooring comprising hybrid turf grass, wherein the hybrid turf grass comprises a carrier structure (107), artificial turf grass (110) and natural turf grass (112), and
 - applying a microporous zeolite mineral (103, 115, 130) to said sports flooring (100).
- Method according to claim 1, wherein the hybrid turf grass further comprises a backing layer (120) opposed to the lower face of the carrier structure (107).
- Method according to claim 1 or claim 2, wherein the hybrid turf grass further comprises an infill layer (106) opposed to the upper face of the carrier structure (107).
- Method according to any of claims 1-3, wherein the hybrid turf grass further comprises a base layer (102), which is located below the carrier structure (107).
- Method according to claim 4, wherein the microporous zeolite mineral is applied between the lower face of the carrier structure (107) or the lower face of the backing layer (120) and the upper face of the base layer (102) of the hybrid turf grass.
- Method according to any of claims 4-5, wherein the microporous zeolite mineral is mixed into the base layer (115).
- Method according to any of claims 1-6, wherein the hybrid turf grass further comprises a reservoir layer (102), which is located below the carrier structure (107) and above the soil layer (140), wherein the reservoir layer (102) comprises materials selected from the group consisting of microporous zeolite minerals, sphagnum, compacted rock wool, clay ball and calcined diatom or a mixture of these materials.
- Method according to any one of claims 1-7, wherein the microporous zeolite mineral is mixed into the base layer (102, 115) and applied to at least one further face of the hybrid turf grass structure.
- Method according to claim 8, wherein the at least one further face is the upper face of the base layer (102, 115).
- Method according to any one of claims 2-9, wherein the backing layer (120, 121) is degradable and disintegrates in response to water contact.
- Method according to any one of claims 2-9, wherein the backing layer (120, 121) is biodegradable.
- Method according to any one of claims 1-11, wherein the sports flooring comprises from about 0.1% to about 25%

artificial fibers (110).

13. Method according to any one of claims 1-12, wherein the specific surface area of the microporous zeolite mineral is below 40m²/g.

14. Method according to any one of claim 1-13, wherein the microporous zeolite mineral has a selected grain size between 0.5 mm and 20 mm and a porosity of about 15% to about 20%.

15. Sports flooring (100) obtainable by the method according to any one of claims 1-14.

16. A sports flooring (100) comprising hybrid turf grass (100), the hybrid turf grass comprising:

- a carrier structure (107);
- natural grass (112);
- artificial grass (110); and
- a microporous zeolite mineral (103, 115, 130).

17. The sports flooring (100) of claim 16, further comprising:

- a degradable backing layer; and
- a base layer (102);
- wherein the microporous zeolite mineral (103, 115, 130) is located in the sports flooring at least between the lower face of the backing layer and the upper face of the base layer (102).

18. The sports flooring (100) of claim 16 or 17, further comprising:

- a backing layer and/or a base layer;
- a reservoir layer that comprises substances adapted to absorb and desorb water,
- wherein the microporous zeolite mineral is mixed into the base layer or the backing layer such that the microporous zeolite mineral is in contact with the reservoir layer and adapted to soak water from the reservoir layer.

19. The sports flooring (100) of claim 18, the substance of the reservoir layer being selected from a group comprising microporous zeolite mineral grains or granules, sphagnum, compacted rock wool, clay ball, calcined diatom or a mixture of these materials.

20. Microporous zeolite mineral for use in the regulation of the abundance of water in a sports flooring (100) according to any of the claims 16-19, wherein the porosity of the microporous zeolite mineral is from about 10 % to about 20% and wherein the selected grain size of said microporous zeolite mineral is smaller than 20mm.

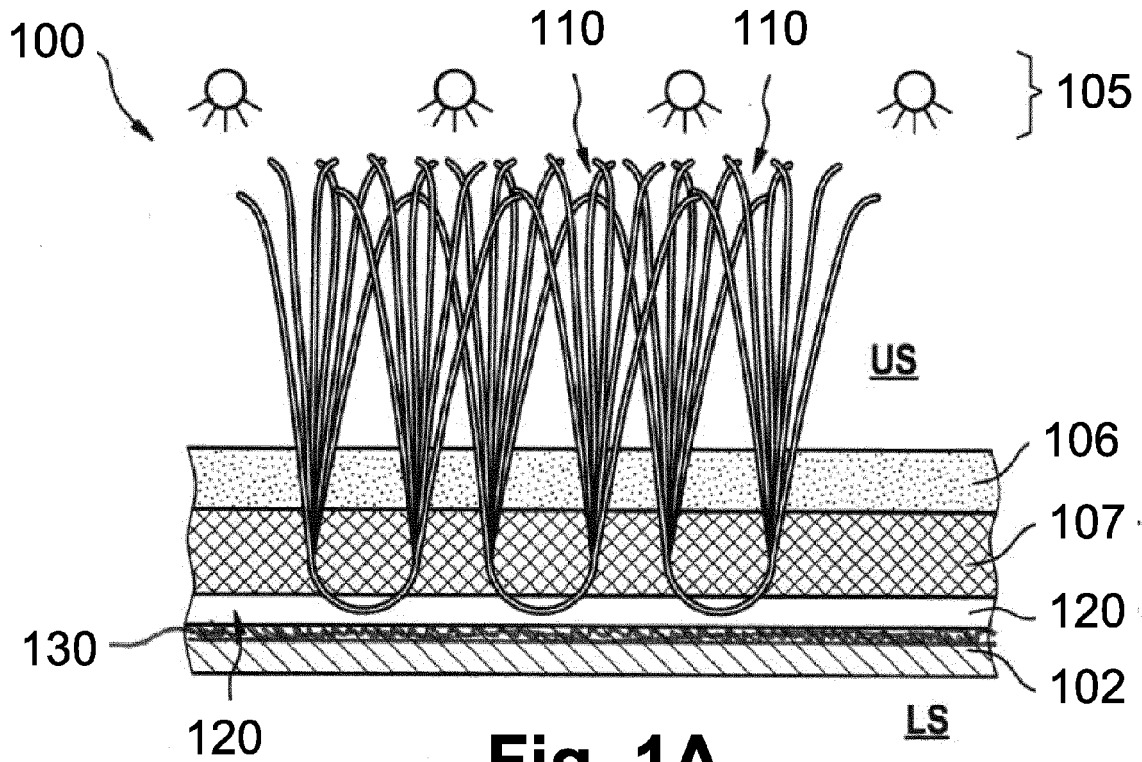


Fig. 1A

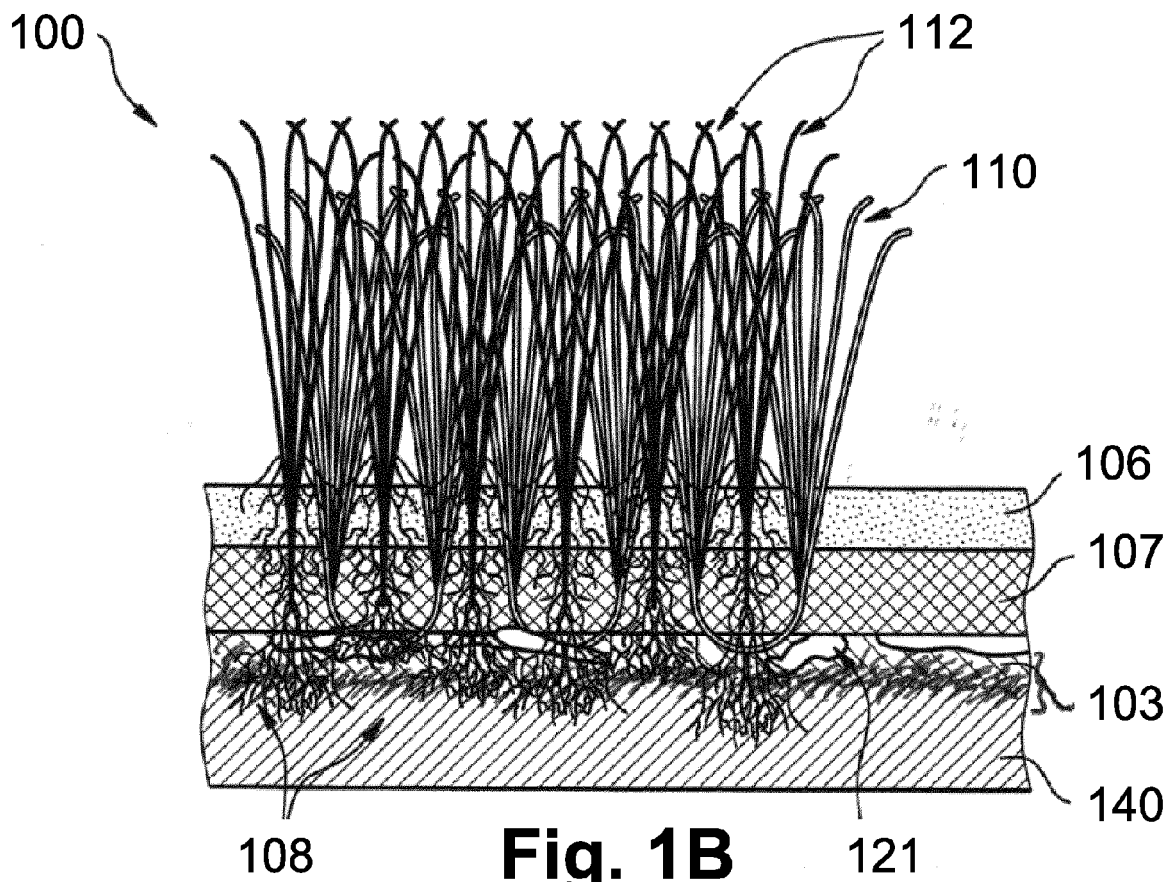


Fig. 1B

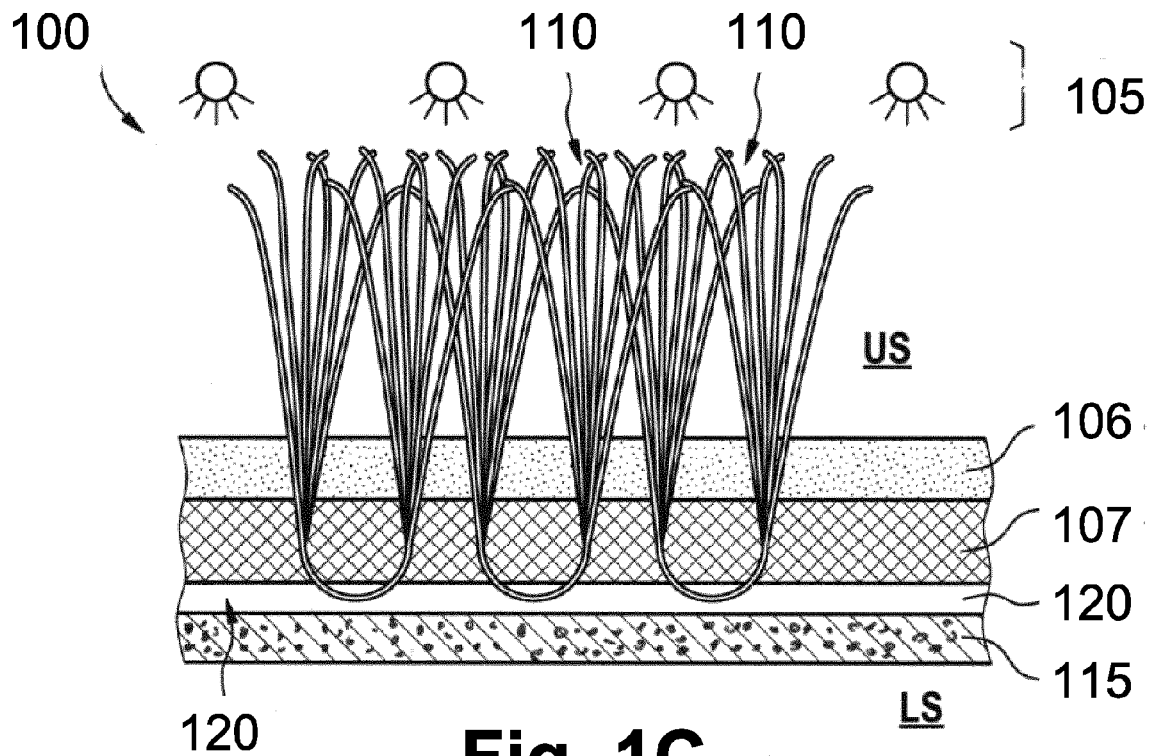


Fig. 1C

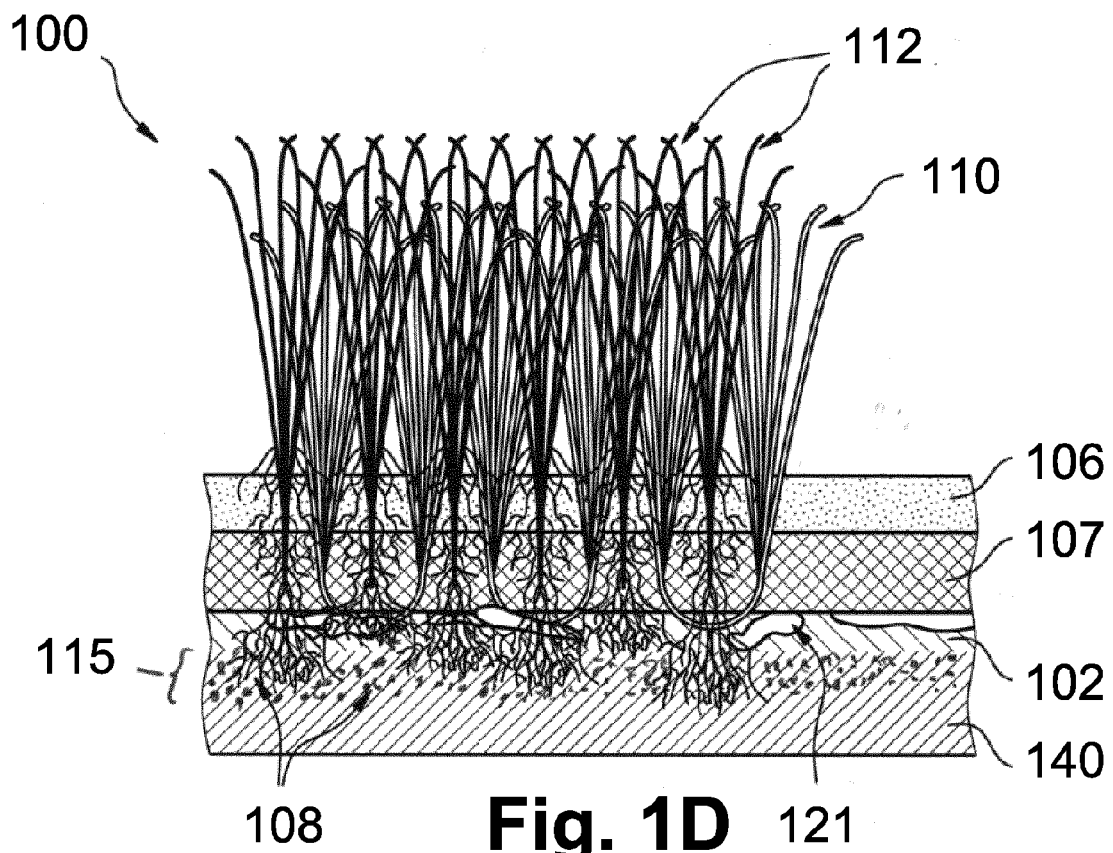


Fig. 1D

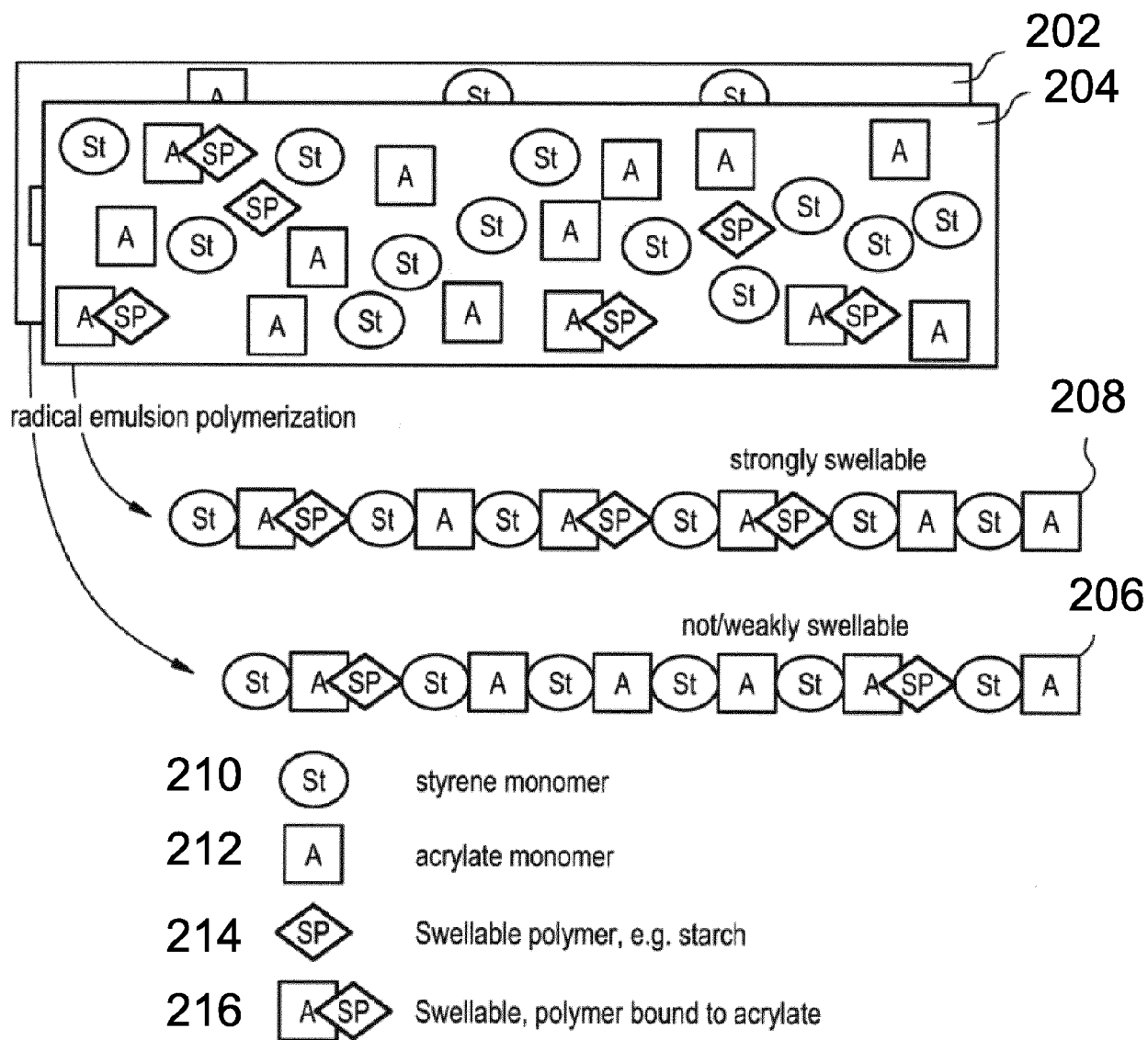


Fig. 2

**PARTIAL EUROPEAN SEARCH REPORT**

Application Number

under Rule 62a and/or 63 of the European Patent Convention.
This report shall be considered, for the purposes of
subsequent proceedings, as the European search report

EP 18 19 9337

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2014/049531 A2 (MAR PROJECT S R L [IT]; VOLTERRANI MARCO [IT]) 3 April 2014 (2014-04-03) * the whole document *	1-6,8,9, 12-14,16	INV. E01C13/08
Y	* the whole document *	7,10,11, 17-19	
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Y	WO 2005/003463 A1 (INVENTRESS B V [NL]; BRANDON ABRAHAM WILHELMUS [NL]) 13 January 2005 (2005-01-13) * the whole document *	7,17-19	
Y	WO 2012/159145 A1 (HG SPORTS TURF PTY LTD [AU]; SUTHERLAND HAMISH ROSS [AU] ET AL.) 29 November 2012 (2012-11-29) * the whole document *	10,11	
A	US 2014/314499 A1 (PINTAT BENOÎT [FR]) 23 October 2014 (2014-10-23) * the whole document *	1,16	TECHNICAL FIELDS SEARCHED (IPC) E01C

INCOMPLETE SEARCH

The Search Division considers that the present application, or one or more of its claims, does/do not comply with the EPC so that only a partial search (R.62a, 63) has been carried out.

Claims searched completely :

Claims searched incompletely :

Claims not searched :

Reason for the limitation of the search:

see sheet C

Place of search

Munich

Date of completion of the search

15 May 2019

Examiner

Beucher, Stefan

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

**INCOMPLETE SEARCH
SHEET C**

Application Number

EP 18 19 9337

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Claim(s) completely searchable:
1-14, 16-19

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Claim(s) not searched:
15, 20

Reason for the limitation of the search:

15

In reply to the invitation pursuant to Rule 62a(1) EPC (dated 15.04.2019) the applicant indicated that the search is to be carried out on the basis of the independent claim 16.

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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