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ARTIFICIAL TURF WITH SHIELDED WATER ABSORBER LAYER

Abstract

The invention relates to an artificial turf (**100, 200**) that provides an infill layer including a water absorber layer (**106**) and a performance layer (**104**), where the performance layer is on top of the water absorber layer and shields the water absorber layer from sunlight, and where the water absorber layer is adapted to serve as water reservoir layer and includes a porous, water-absorbent material.

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Background/Summary

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. patent application Ser. No. 18/067,087, filed Dec. 16, 2022, the content of which is hereby incorporated by reference in its entirety.

FIELD OF THE INVENTION

[0002] The invention relates generally to an artificial turf and, more particularly, to an artificial turf comprising infill.

Background and Related Art

[0003] Use of artificial turf is increasing because it is easier to maintain than natural turf and its surface characteristics are in many respects better than those of natural turf. Artificial turf is used in many applications including household floor matting, playing surface for sports such as soccer, football, rugby, tennis, golf, exercise fields, landscaping applications and other applications.

[0004] To reduce the surface temperature in strong sunlight, artificial turf may comprise zeolite to reduce the surface temperature by evaporating water.

[0005] For example, U.S. Pat. No. 11,453,982 discloses the use of artificial turf infill material comprising a zeolite for cooling the surface of the artificial turf.

SUMMARY

[0006] It is an objective of the present invention to provide for an improved artificial turf, method of installing an artificial turf, use of an artificial turf, and a system including an artificial turf, as specified in the independent claims. Embodiments of the invention are given in the dependent claims. Embodiments of the present invention can be freely combined with each other if they are not mutually exclusive.

[0007] In one aspect, the invention relates to an artificial turf having an infill layer, where the infill layer includes a water absorber layer and a performance layer. The water absorber layer is adapted to serve as water reservoir layer and includes a porous, water-absorbent material, and the performance layer is configured on top of the water absorber layer, thereby shielding the water absorber layer from sunlight.

[0008] Providing the performance layer on top of the water absorber layer can have the advantage of largely or completely shielding the water absorber layer from direct sunlight. This in turn may have the advantage that the infill of the absorber layer heats up more slowly and the water stored in this layer also evaporates more slowly. This in turn can mean that the cooling effect provided by the evaporation lasts longer. In case the artificial turf is irrigated, the artificial turf needs to be watered much less frequently.

[0009] The performance layer above the absorber layer can also have the advantage of protecting the absorber layer not only from the sun's rays, but also from wind. This reduces air exchange and allows a stable humidity gradient to form across the voids of the absorber layer and the performance layer, which also reduces the rate of evaporation. A further advantage may be that dust generation during a game or in the event of strong winds is reduced. According to some embodiments, the water absorbent material may comprise a fraction of particles of small size which can be stirred up and blown away by the mechanical forces during play or by wind. The performance layer may prevent this and thus prevent or reduce the discharge of infill material.

[0010] Providing the performance layer above the absorber layer can also have a further advantage of insulating the absorber layer from large ambient temperature changes occurring above a top surface of the performance layer (i.e., above a top surface of the artificial turf). For example, water in the absorber layer may be insulted from freezing and from very high temperatures, due to the insulating effects of the performance layer, thereby reducing the risk that the structural integrity of the artificial turf is compromised, either permanently or temporarily, and thus mitigating deterioration of the artificial turf (i.e., increasing lifetime of the artificial turf), as well as ensuring proper function of the artificial turf (e.g., cooling effect, shock-absorption via compressibility, distribution of humidity, etc.).
[0011] Conventional height of an artificial turf, in total, is typically 6-7 cm. For example, an artificial turf having a total height of about 60 mm typically has a total infill height of about 30 mm-50 mm, e.g., about 35 mm-45 mm. An artificial turf having a total height of about 40 mm typically has a total infill height of about 10 mm-30 mm, e.g., about 15 mm-25 mm. Hence, the available volume for storing water is limited and any water contained therein may evaporate quickly.
[0012] Embodiments of the present invention advantageously slow down evaporation sufficiently such that an increase of temperature can be reduced for a longer time.
[0013] For example, the absorbent material of the absorber layer may be soaked with water as a result of irrigating the artificial turf, as a result of a rainfall, or as a result of the absorbent material drawing moisture from the air. In particular, in the morning, when the air warms up while the ground is still cold, condensation can form on the inner and outer surfaces of the porous absorber material, which is absorbed by the absorber. By soaking up water from the environment and slowly releasing it over the course of one or more days, the heating up of the artificial turf can be prevented or reduced.
[0014] In case the artificial turf is an occasionally or regularly irrigated artificial turf, the number of irrigation actions can be strongly reduced, as compared with irrigated artificial turf fields using conventional artificial turf infill. For example, Hockey fields are often irrigated before a game starts and during game breaks. Thus, by using the above-described infill and infill layer structure irrigation during game breaks may not be necessary any more. For example, irrigation in the morning, evening or night may be sufficient to charge and keep charged the water content of the artificial turf, which additionally has the further advantageous effect of conserving water, which is becoming more of a finite and/or scarce resource. Since the ambient temperature is typically lower in the morning, evening and night, more water reaches the absorber layer with less loss.
[0015] Furthermore, skin of players is advantageously protected from skin burns (i.e., zeolite minerals and other porous material may be abrasive). That is, the performance layer, which may come in contact with human skin, can include material less abrasive to human skin than zeolite or other porous minerals used as absorbent in the water absorber layer.
[0016] In addition, infill in the water absorber layer, or in other words, the water absorber layer itself, is advantageously protected by the performance layer from wear and tear (i.e., protected from deterioration), as well as protected from being washed out/blown away. That is, light-weight, highly porous particles that compose the water absorber layer are particularly of high risk of being washed or blown away.
[0017] According to some embodiments, at least 80 weight percent (i.e., wt. %) of the water absorber layer consists of first particles having a first particle size, and at least 80 wt. % of the performance layer consists of second particles having a second particle size. The second particle size is similar to or greater than the particle size of the first particles.
[0018] A second particle size being “similar” to the first particle size as used herein is, for example, a particle size between the first particle size plus 20% of the first particle size and the first particle size minus 20% of the first particle size. In another embodiment, the second particle size being similar to the first particle size is a particle size between the first particle size plus 10% of the first

particle size and the first particle size minus 10% of the first particle size.

[0019] Advantageously, using a performance layer whose particle size is similar to or greater than the particle size of the absorber layer may prevent a trickle-down of small (e.g., smaller) particles from the performance layer into the water absorber layer and hence prevent an unmixing of the performance layer, as well as preventing an remixing of the absorber layer, thereby enabling the artificial turf to maintain its non-conventional functionality, such as the performance layer interacting synergistically with the absorber layer to provide improved cooling, less abrasion to human skin, reduced turf irrigation, less degradation of the artificial turf, etc.

[0020] According to some embodiments, the water absorber layer has a height of 0.5 mm to 50 mm, e.g., 0.5 mm to 20 mm, e.g., 0.5 mm to 30 mm, e.g., 1 mm to 10 mm, e.g., 1 mm to 5 mm.

[0021] According to some embodiments, the water absorber layer has a height that is substantially identical or similar to the height of the performance layer. For example, a similar size may mean a size not larger than a particular size plus 20% that size and not smaller than the particular size minus 20% that size. According to another example, a similar size may mean a size not larger than a particular size plus 10% that size and not smaller than the particular size minus 10% that size.

[0022] For example, for a 50 mm pile height artificial turf carpet installed at a windy, arid and hot area, a zeolite-based absorber layer having a height of 15 mm and an SBR rubber granulate performance layer having a height of about 13 mm to 17 mm may be used. The thickness of the absorber layer may ensure that when the absorbent, e.g. a zeolite granulate, is soaked with water, the weight of the absorber layer will help protecting the turf and the infill from being blown away by strong winds. The large volume of the absorber layer may ensure that a cooling effect is observable for many ours or even days even in very dry and hot areas.

[0023] According to other embodiments, the performance layer has a height that is at least twice as high, e.g. at least three times as high, e.g. at least four times or even at least five times as high as the height of the absorber layer.

[0024] For example, a 40 mm pile height artificial turf can be provided, whereby the absorber layer consists of a zeolite applied in an amount of 4 kg per sqm, having a zeolite particle size of 0.5-1.5 mm and having a bulk density of 950 g/l. This absorber layer is covered by a performance layer consisting of SBR rubber granulate applied in an amount of 8 kg per sqm, having a SBR rubber granulate size of 0.5-1.5 mm and having a performance layer height of 16 mm.

[0025] The above-mentioned example may be particularly advantageous in a use case scenario where a highly elastic sports floor is needed, where a thin absorber layer is sufficient to cool the artificial turf (e.g., because the artificial turf is installed in a cool or cold region) and/or where the installation site is wind-protected, so no extra weight in form of a thick, water-loaded absorber layer is needed.

[0026] According to embodiments, the water absorber layer has a weight per m.sup.2 that is identical or similar to the weight per m.sup.2 of the performance layer. According to some embodiments, a “similar weight” means that the water absorber layer has a weight per m.sup.2 that is between a weight per m.sup.2 of the performance layer plus 20% the weight of the performance layer per m.sup.2 and the weight of the performance layer per m.sup.2 minus 20% the weight of the performance layer per m.sup.2.

[0027] According to embodiments, the water absorber layer includes or consists of particles selected from a group including: [0028] zeolite particles, [0029] bentonite particles, [0030] Lightweight expanded clay aggregate (LECA) particles, [0031] expanded clay (ECA) particles, [0032] calcium hydro silicate particles, [0033] calcium silicate particles, [0034] aluminum silicate particles, [0035] calcium carbonate particles, [0036] sodium aluminum silicate particles, [0037] aluminum magnesium silicate particles, [0038] calcium aluminum silicate particles, [0039] aerated concrete particles, and [0040] mixtures of two or more of the aforementioned particles.

[0041] The above-mentioned particles may have the benefit of being form stable also in case the water absorbed to the particles freezes and thaws multiple times.

[0042] According to preferred embodiments, the particles are zeolite particles.
[0043] Zeolites are microporous, crystalline aluminosilicate materials commonly used as commercial adsorbents and catalysts. Zeolites may be mined (natural zeolites) or may be manufactured (synthetic zeolites). According to other embodiments, zeolite particles include synthetic zeolite particles, naturally occurring zeolite particles or mixtures thereof.
[0044] According to embodiments, the particles are zeolite particles comprising or consisting of clinoptilolite.
[0045] Clinoptilolite is a naturally occurring zeolite composed of a microporous arrangement of silica and alumina tetrahedra. It has a Mohs hardness of between 3.5 to 4.0 on the Mohs scale, and a relative density, also referred to as "specific gravity", of 0.95 to 0.99 when dry. When Clinoptilolite is soaked with water, it has a relative density of around 1.3 to 1.5. The relative density is a measure of the density of a substance in comparison to the density of water measured at temperatures of 4 Celsius at atmospheric pressure. Clinoptilolite is a molecular sieve and is a form-stable zeolite which does not disintegrate even after many freeze-thaw cycles in a moist environment.
[0046] According to one embodiment, the water absorbent material used for providing the absorber layer has a hardness between 3 and 4 on the Mohs scale.
[0047] This may have the advantage of form stability: even if the zeolite is fully soaked with water and if the water repeatedly freezes and thaws when the temperature fluctuates around 0° C., the zeolite or other absorber having a hardness in this range will not disintegrate. It will also not swell as the material is capable of resisting to the forces exerted by the water comprised in the porous material when it expands upon freezing.
[0048] Hence, the use of zeolites in the water absorber layer may provide a form-stable absorber layer which will not disintegrate or significantly change its form or layer structure even after a multitude of freeze-thaw cycles of the water absorbed by the absorber.
[0049] As the zeolite in the absorber layer is covered by the performance layer which may comprise elastic particles, a soft and resilient playing surface may be provided. This may also reduce the risk of injuries (e.g. skin abrasion). Another advantage may be that the present infill material reduces the wear on synthetic turf fibers caused by the friction between the conventional infill and the fibers. A further advantage may be that costs are reduced, as elastic infill material is often more expensive than zeolite.
[0050] Industrially important zeolites may be produced synthetically. Typical procedures entail heating aqueous solutions of alumina and silica with sodium hydroxide. Equivalent reagents include sodium aluminate and sodium silicate. Some synthetic zeolites may hold some key advantages over their natural analogs. The synthetic materials may be manufactured in a uniform, phase-pure state. It is also possible to produce zeolite structures that do not appear in nature. Since the principal raw materials used to manufacture zeolites are silica and alumina, which are among the most abundant mineral components on earth, the costs for creating a zeolite-based absorber layer are comparatively low.
[0051] One of the most important properties of zeolites is its reversible and large water absorption capacity, which is present in zeolites structures such as Clinoptilolite, among others. For example, 1.0 g of some zeolites such as Clinoptilolite in a dry state may be able to bind 0.5 g water, i.e., about 50% of its own mass, which corresponds to a relative density of Clinoptilolite of about 1.5.
[0052] Advantageously, natural zeolites are neither dangerous, nor toxic, and are also environmentally friendly.
[0053] According to some embodiments, the zeolites used as infill of the absorber layer may be obtained by crushing zeolite ore for obtaining groups of zeolite materials. The specific surface area of each group of the groups may be determined or measured. Based on the measured specific surface area groups that fulfill the selection criterion may be selected to form the microporous zeolite mineral. The specific surface area may for example be measured by adsorption using the

Brunauer, Emmett, and Teller (BET) technique. This may have the advantage of measuring the surface of fine structures and deep texture on the particles.
[0054] According to one embodiment, the porosity of the zeolite (and/or the zeolite ore from which it is derived) is between 15% to 30%, in particularly between 23% and 27%, in particularly about 25%. The maximum specific surface area is between 20 m.sup.2/g and 35 m.sup.2/g. In some embodiments, the maximum specific surface area is between 15 m.sup.2/g and 25 m.sup.2/g. In some further embodiments, the maximum specific surface area is between 19 m.sup.2/g and 21 m.sup.2/g. For example, the selected specific surface area may be 20 m.sup.2/g and the microporous zeolite has a porosity of 20%. According to one embodiment, the microporous zeolite has a grain size between 0.5 mm and 3 mm, in particular between 0.9 and 2.0 mm, or in particular between 1.3 mm and 1.7 mm. In some examples, the zeolite grain size (or "particle size") has an average grain size between 0.9 mm and 1.2 mm.
[0055] According to one embodiment, the microporous zeolite mineral has a grain size distribution as follows: 70% to 90% of the grains have a size in the range [0.4 mm, 1.5 mm] and 10% to 30% of the grains have a size smaller than 0.4 mm. In another example, the microporous zeolite mineral has a grain size distribution as follows: 70% to 90% (e.g. 88%) of the grains of the microporous zeolite mineral have a size in the range [0.42 mm, 1.41 mm] (14-40 mesh) and 10% to 30% (e.g. 12%) of the grains of microporous zeolite mineral have a size smaller than 0.42 mm. The selected sizes may enable to obtain the selected specific surface area.
[0056] According to embodiments, the water absorber layer further includes sand.
[0057] Advantageously, sand increases the weight of the artificial turf, as well as the weight of the water absorber layer, thereby in some cases eliminating any need for an additional stabilizing layer. Furthermore, sand advantageously increases capillary activity of the water absorber layer by, for example, increasing the pressure around the porous zeolite particles to increase the capillary activity of at least some of the porous passages of the zeolite particles and/or acting in itself as a capillary active material, due to its range of small particle sizes and/or composition of sand particles (i.e., silica).
[0058] According to embodiments, the artificial turf includes a further (optional) infill layer referred to as stabilizing layer. The stabilizing layer is on top of the backing and below the water absorber layer (i.e., positioned between the backing and the water absorber layer).
[0059] Advantageously, the additional stabilizing layer may stabilize the artificial turf by pressing the backing down and holding the artificial turf installation in place. Preferably, the infill material of the stabilizing layer has a higher density than the infill in the water absorber layer and/or is a capillary active material.
[0060] According to embodiments, the stabilizing layer includes or consists of sand. In other embodiments, clay, small stone granules or mixtures thereof may be used for providing the stabilizing layer. Advantageously, sand combines the benefits of high density and capillary activity.
[0061] Furthermore, the stabilizing layer not only further stabilizes the artificial turf, but may in addition synergistically contribute and enhance the capability of the water absorber layer to cool the artificial turf. For example, if it rains heavily or if the surface of the artificial turf is heavily irrigated, the water absorber layer may soon become saturated with water. The stabilizing layer may then act as a further water reservoir: when the stabilizing layer becomes saturated with water, the water may be stored and bound in the cavities between the particles of the stabilizing layers by capillary forces. This may prevent the formation of puddles and may prevent root rot (if the artificial turf is a hybrid turf) which may occur if the artificial turf is installed on a sealed ground and rain water cannot quickly be drained. The additional water reservoir in the form of the stabilizing layer may also allow preventing the overloading of a drainage system of the play field where the artificial turf is installed.
[0062] According to embodiments, the performance layer has a height of 0.5 mm to 50 mm, preferentially 5 mm to 35 mm, and more preferentially 15 mm to 25 mm.

[0063] According to embodiments, the performance layer includes or consists of a water-absorbing material which is different from the water-absorbing material in the absorber layer. For example, the absorber layer may comprise a form stable water absorbing material which does not substantially change its form or swell when absorbing water. The performance layer may comprise water-absorbing material which is elastic and/or is not form-stable when absorbing or releasing water.

[0064] According to embodiments, the water-absorbent material in the absorber layer is rigid (e.g. having a hardness of at least 3.0 in Mohs scale) while at least 50%, e.g. at least 60%, e.g. at least 70% by volume of the performance layer consists of an elastic material such as rubber, plant-based fibers or plant-based particles.

[0065] According to embodiments, the water-absorbent material used in the performance layer includes water-absorbent particles coated with one or more porous layers of a water-impermeable material. In one embodiment, the water-impermeable material includes polyurethane.

[0066] Advantageously, the water-absorbent particles of the performance layer increase water storage capacity of the infill. In addition, the coating advantageously slows down water evaporation. For example, each coating layer is not perfectly uniform and thus comprises openings (i.e., it is porous due to its non-uniformity), so the one or more porous layers of the water-impermeable material coating the water-absorbent particles enable water to be absorbed while at the same time controlling evaporation of water from the water-absorbent particles (e.g., by controlling evaporation speed).

[0067] According to embodiments, each of the water absorbent particles in the performance layer is covered by a first coating (or “film”) of a water impermeable material, where the first coating only partially covers the particle. In another embodiment, each particle is coated with a second coating of the water impermeable material, where the second coating only partially covers the first coating. In other embodiments, each particle is coated with two or more coating (or only a single coating) of the water impermeable material. By controlling the number of coatings that coat the particles, the porosity of the combined coatings which surround a particle can be controlled (i.e., the average number of gaps in the one or more coatings and/or the average number of gaps that reach the surface of a water-absorbent particle can be controlled, and thus the porosity of the combined coatings of the water-absorbent particle can be controlled).

[0068] As a hypothetical example, during the formation of the first coating or any subsequent coating the coverage is each (on the average) only 90% of the surface of the water-absorbent particle. That is, after the initial (i.e., first) coating (i.e., film) has been deposited, roughly 10% of each particle would be uncoated. There would be small surface defects. Deposition of the subsequent coatings (i.e., subsequent films) would then also cover 90% of the surface. As the interaction between the particles is essentially a random process, one can expect that 90% of the defects that were exposed after the deposition of the initial coating are coated in this case. The result of doing two coatings is then a performance layer infill including water-absorbent particles that are 99% coated with only minor amounts of defects (i.e., locations where a particle is not coated with either the initial coating or the subsequent coating).

[0069] According to one embodiment, each of the one or more coatings (i.e., films) includes at least one type of polyurethane polymer. In other embodiments, each of the one or more layers additionally includes one or more pigments for rendering a specific color to the performance infill.

[0070] According to further embodiments, at least one type of water-impermeable material, such as a polymer (e.g., polyurethane), and optionally one or more pigments, are mixed with a water-absorbent material (e.g., water-absorbent particles), preferably elastic water-absorbent particles, e.g. plant-based particles. Next, water and a catalyst are added to the mixture during the mixing process to cure the water-impermeable material (and optionally the pigment) onto the surface of the water-absorbent material. As a large number of the particles of the water-absorbent material are mixed they interact with each other and bump into each other occasionally during the process. For this reason, there may be holes or defects (also referred to as gaps) in the initial coating (i.e., first film). These are regions where particles are insufficiently coated by the first film. The above process may then be repeated n number of times for coating the particles with n number of films, where n is an integer greater or equal to 1.

[0071] In conjunction with the present disclosure of water-absorbent particles coated with one or more porous layers of a water-impermeable material, the present application hereby incorporates by reference the complete disclosure of European Patent Application Publication No. EP 3216821 A1, published on Sep. 13, 2017, and filed as European Patent Application No. EP 16159975.8 on Mar. 11, 2016.

[0072] According to embodiments, the water-absorbent material used for the performance layer is selected from a group comprising: [0073] plant-based-fibers, preferentially jute fibers and/or hemp fibers, [0074] bark, preferentially bark-based particles; [0075] wood, [0076] seeds, and [0077] mixtures of two or more of the aforementioned group.

[0078] According to embodiments, the performance layer is a capillary-active layer adapted to transport water from the water-absorber layer to an upper surface of the performance layer.

[0079] A capillary-active performance layer can increase water storing capacity and/or can facilitate transport of water via capillary forces from the absorber layer into the performance layer. The performance layer may comprise or consist of organic material facilitating a capillary effect like wood chips, hemp fibers, jute fibers, coconut fibers and sisal fibers. The performance layer may also comprise microporous mineral materials as e.g. lava pebbles, pumice granulate, granulate made from expanded clay and or aluminum silicates as e.g. zeolites like clinoptilolite and mixtures hereof to increase water storage capacity, but preferably the performance layer comprises less than 50%, in particular less than 40%, in particular less than 30% by volume microporous mineral materials. According to some embodiments, the performance layer is an elastic layer. By limiting the amount of rigid, inelastic mineral materials, the performance layer remains elastic and improves the structural properties of the overall artificial turf structure.

[0080] In some embodiments the clinoptilolite granulate has a size of 0.5-3.0 mm and is spread at a level of 0.5 to 2.0 kg/sqm in the performance layer.

[0081] In some embodiments the clinoptilolite granulate has a size of 0.5-3.0 mm and is spread at a level of 0.5 to 2.0 kg/sqm in the absorber layer.

[0082] According to embodiments, the performance layer includes or consists of elastic particles. For example, the particles can be selected from a group including: [0083] cork particles; [0084] styrene butadiene rubber (SBR) particles; [0085] natural rubber particles, preferentially natural rubber particles derived from gutta percha; [0086] synthetic thermoplastic elastomer particles, preferentially one or more selected from [0087] styrene-butadiene-styrene (SBS) particles; [0088] styrene-ethylene-butadiene-styrene (SEBS) particles; [0089] ethylene propylene diene monomer (EPDM) particles; [0090] particles made of a blend of rubber and EPDM; and [0091] mixtures of two or more of the aforementioned particles.

[0092] According to embodiments, the performance layer includes at least 50%, e.g., at least 60%, e.g. at least 70%, e.g. at least 80% by volume the elastic particles.

[0093] According to embodiments, the elastic particles are non-water-absorbent elastic particles.

[0094] According to embodiments, the performance layer includes or consists of non-elastic particles, in particular particles selected from a group including: [0095] fruit stone particles or olive pit particles; [0096] wood particles; [0097] seeds; [0098] mixtures of two or more of the aforementioned particles.

[0099] In another aspect, the invention relates to a method for installing an artificial turf. The method includes: placing an artificial turf backing on a ground, where the backing carries artificial turf fibers; applying a water absorber layer on top of the backing, where the water absorber layer includes or consists of a water-absorbent material; and applying a performance infill layer on top of the water absorber layer such that performance infill layer shields the water absorber layer from

sunlight.
[0100] According to embodiments, the method further includes, before applying the water absorber layer, applying a stabilizing infill layer on top of the backing, wherein the stabilizing infill layer is between the water absorber layer and the backing, and wherein the stabilizing infill layer contacts the water absorber layer. That the stabilizing infill layer contacts the water absorber layer means that these two layers have a common interface.
[0101] In a further aspect, the invention relates to the use of the artificial turf according to any one of the embodiments and examples described herein, whereby the use includes irrigating the artificial turf selectively at times when the sun intensity is below a daily maximum.
[0102] For example, the irrigation may be performed selectively one or more times a day at a time when the sun intensity is below 90%, or below 80%, or below 70%, or below 60% or below 50% of the daily maximum, or during nighttime or at dawn, according to embodiments. According to further embodiments, the daily maximum can be an actual daily maximum (i.e., real-time maximum measured or recorded by, e.g., weather services or a temperature measuring device on or near the artificial turf of the present invention), or a maximum forecast by a weather service for the local area in which the artificial turf is provided. In other embodiments, the number of times that irrigation is provided on a daily basis, as well selecting (by for example, an operator or maintenance worker attending to the artificial turf, or in other embodiments, by an automatic irrigation control system coupled to an irrigation system for irrigating the artificial turf) the particular percentage below the daily maximum (e.g., 90%, 80%, 70%, 60%, 50%) which triggers irrigation of the turf, may be based on ambient (or forecast) environmental conditions, such as relative humidity, wind conditions and/or extent of cloud cover, for example.
[0103] In a further aspect, the invention relates a system including the artificial turf according to any one of the embodiments and examples described herein, and a controller configured to send irrigation control commands, where the control commands are configured to trigger an irrigation of the artificial turf selectively at times when the sun intensity is below a daily maximum, as described herein.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
[0104] In the following figures, these embodiments of the invention are explained in greater detail, by way of example only:
[0105] FIG. **1** illustrates an artificial turf comprising two infill layers in the form of a water absorber layer and a performance layer;
[0106] FIG. **2** illustrates an artificial turf comprising three infill layers in the form of a stabilizing layer, a water absorber layer and a performance layer;
[0107] FIG. **3** illustrates a water-absorbent particle of the performance layer coated with two porous layers of a water-impermeable material;
[0108] FIG. **4** illustrates a system for irrigating the artificial turf of FIGS. **1** and **2**; and
[0109] FIG. **5** illustrates a flow chart of a method of installing the artificial turf of FIGS. **1** and **2**.
DETAILED DESCRIPTION
[0110] In the following description of aspects and embodiments of the present invention, the following terms shall have the following meanings.
[0111] “Artificial turf” also encompasses “hybrid turf,” where a hybrid turf has combined features of a natural turf and a synthetic turf.
[0112] “Water absorbent” material is any material that has a capacity to absorb water and is capable of releasing this water again in the course of multiple hours or days. The water-absorbent material used in the water absorber layer may in particular be a material capable of absorbing water in an

amount of at least 10%, or at least 20%, or at least 30%, or at least 40% or at least 50% of its own weight.

[0113] According to embodiments, the water-absorbent material is a non-swelling (form-stable) microporous water absorbent material like aluminosilicate particles (e.g. zeolite particles).

[0114] In a preferred embodiment, the water absorbent material is clinoptilolite granulate, which has a mass water absorbance of 30-60 wt. %, forms a load-stable (i.e., compression and mechanical stable) non-swelling layer, and is resistant to freeze-thaw cycles.

[0115] For example, freeze-thaw tests have been made on clinoptilolite granulate, in which clinoptilolite granulate is frozen in water at −28° C., then subsequently thawed. Upon inspection, no damage to the microstructure of the granulate was visible. Furthermore, tests reveal that the clinoptilolite resists high temperature changes, even after absorption of water. In addition, water absorbance by clinoptilolite does not lead to an expansion of the granulate even after freezing. Other zeolites with material characteristics in respect to water absorbance capacity and form stability are also preferred.

[0116] According to other examples, the water absorbent material can be a super absorber made e.g., from starch, nanocellulose and carboxymethyl cellulose or polyacrylic acids, which are swelling with water absorption. For example, a super absorber can be a sodium polyacrylate, e.g. poly(sodium prop-2-enoate).

[0117] As a super absorber typically swells and is not form stable, it is preferably used as a component of the performance layer and is not used in the absorber layer or is comprised in the absorber layer only in small amounts. For example, less than 5 wt. % of the absorber layer may consist of the super absorber (considering the weight of the absorbent materials in the absorber layer in dry state, respectively).

[0118] According to embodiments, the absorber layer comprises a mixture of water-absorbent materials, e.g., a mixture of zeolite particles and a super-absorber and/or wood. This may allow adapting the form stability and water-absorbance capacity of the absorber layer to the mechanical properties needed in the sports activity the artificial turf is used for and/or to the temperature condition at the use site. For example, at least 70% of the absorber layer may consist of non-elastic, porous mineral particles such as zeolite, at least 70% of the performance layer may consist of elastic particles such as rubber particles, and at least 5% of the absorber layer and/or of the performance layer may consist of a further water absorbent material such as a super-absorber or a plat-based absorbent material such as wood chips.

[0119] The mass water absorbance of a water-absorbent material used according to embodiments of the invention can be as high as 1000 wt. % (relative to the weight of the water-absorbent material in dry state) in the case of super absorber, at up to 100% for wood chips (as e.g. BrockFill®) and of 10-60 wt. % in the case of zeolite granulate.

[0120] FIG. **1** illustrates an artificial turf **100** including two infill layers in the form of a water absorber layer **106** and a performance layer **104**. The artificial turf **100** also includes a backing **108** (also referred to as a backing layer) and synthetic fibers **102**. As illustrated, the artificial turf **100** is installed on a base **110**. Typically, the base is ground (i.e., soil or earthen material), but the base may also be a synthetically manufactured material, such as concrete, or a similarly stable material.

[0121] In one embodiment, the backing **108** is a primary backing (also referred to as a carrier). The fibers are secured to the primary backing via conventional means known to those of skill in the art. The primary backing layer may be based on either a woven or non-woven material. The primary purpose of this backing layer is to hold the synthetic fibers in place utilizing conventional methods, such as tufting or weaving. According to some embodiments, the backing is composed of two or more layers of the backing material, to add more durability and toughness to the backing. According to embodiments, the backing layer is primarily constructed with either polyester or polypropylene materials, providing both high strength and durability.

[0122] In other embodiments, the backing includes the primary backing and an optional secondary backing. The secondary backing (i.e., secondary layer) is a layer applied to a bottom (i.e., bottom side) of the primary backing. Conventionally, the secondary backing is a liquid polyurethane or latex coating that is applied after the synthetic fibers have been secured to the primary backing, and then allowed to cure. Once cured, the secondary backing provides greater overall bonding strength and stability between the synthetic fibers and the backing **108**.

[0123] The synthetic fibers **102** may be any type of conventional synthetic fibers, all of which are well known to those of skill in the art. The present application hereby incorporates by reference the complete disclosure of International Publication No. WO 2015/144223 published on Oct. 1, 2015, which is the publication of International Application No. PCT/EP2014/056149 filed on Mar. 27, 2014, describing an artificial turf fiber made by co-extruding a multi-phase PE-PA mixture (polyethylene-polyamide mixture), European Publication No. EP3235930A1 published on Oct. 25, 2017, which is the publication of European Application No. EP16165769.7 filed on Apr. 18, 2016, describing an artificial turf fiber with LLDPE and LDPE, and International Publication No. WO 2015/165739 published on Nov. 5, 2015, which is the publication of International Application No. PCT/EP2015/058237 filed on Apr. 16, 2015, describing a PE-based fiber with a nucleating agent.

[0124] According to embodiments, the water absorber layer **106** includes a porous, water-absorbent material. The performance layer **104** is positioned on top of the water absorber layer, thereby shielding the water absorber layer from sunlight.

[0125] According to some embodiments, at least 80 weight percent (i.e., wt. %) of the water absorber layer **106** consists of first particles **112** having a first particle size, and at least 80 wt. % of the performance layer **104** consists of second particles **114** having a second particle size. The second particle size is between the first particle size plus 20% of the first particle size and the first particle size minus 20% of the first particle size. In other embodiments, the second particle size is between the first particle size plus 10% of the first particle size and the first particle size minus 10% of the first particle size.

[0126] According to some embodiments, the water absorber layer **106** has a height of 0.5 mm to 30 mm, preferentially 1 mm to 10 mm, and more preferentially 1 mm to 5 mm.

[0127] According to embodiments, the water absorber layer **106** has a height that is substantially identical to the height of the performance layer **104**. According to other embodiments, the water absorber layer has a height that is between a height of the performance layer plus 20% the height of the performance layer and the height of the performance layer minus 20% the height of the performance layer.

[0128] According to embodiments, the water absorber layer **106** has a weight per m.sup.2 that is identical or substantially identical to the weight per m.sup.2 of the performance layer **104**+/−20%. According to other embodiments, the water absorber layer has a weight per m.sup.2 that is between a weight per m.sup.2 of the performance layer plus 20% the weight of the performance layer per m.sup.2 and the weight of the performance layer per m.sup.2 minus 20% the weight of the performance layer per m.sup.2.

[0129] According to embodiments, the water absorber layer **106** includes or consists of particles **112** selected from a group including zeolite particles, bentonite particles, lightweight expanded clay aggregate (LECA) particles, expanded clay (ECA) particles, calcium hydro silicate particles, calcium silicate particles, aluminum silicate particles, calcium carbonate particles, sodium aluminum silicate particles, aluminum magnesium silicate particles, calcium aluminum silicate particles, aerated concrete particles, and mixtures of two or more of the aforementioned particles.

[0130] According to embodiments, the particles **112** of the water absorber layer **106** include zeolite particles and the zeolite particles include clinoptilolite. Clinoptilolite is a naturally occurring zeolite composed of a microporous arrangement of silica and alumina tetrahedra. It has a Mohs hardness of 3.5 to 4 and a specific gravity of 2.1 to 2.2.

[0131] According to embodiments, the water absorber layer **106** optionally includes sand **116**. Sand increases the weight of the artificial turf, as well as the weight of the water absorber layer, thereby in some cases eliminating any need for stabilizing layers. Furthermore, sand increases capillary activity of the water absorber layer.

[0132] According to embodiments, the performance layer **104** has a height of 0.5 mm to 50 mm, preferentially 5 mm to 35 mm, and more preferentially 15 mm to 25 mm. According to embodiments, the performance layer includes or consists of a water-absorbent material.

[0133] According to embodiments, the water-absorbent material of the performance layer **104** is selected from a group including plant-based-fibers, preferentially jute fibers and/or hemp fibers, bark, preferentially bark-based particles, wood, seeds, and mixtures of two or more of the aforementioned group.

[0134] According to embodiments, the performance layer **104** is a capillary-active layer adapted to transport water from the water-absorber layer **106** to an upper surface of the performance layer.

[0135] According to other embodiments, the performance layer includes elastic particles **114**. For example, the particles can be selected from a group including cork particles, styrene butadiene rubber (SBR) particles, natural rubber particles, preferentially natural rubber particles derived from gutta percha, synthetic thermoplastic elastomer particles, preferentially one or more selected from styrene-butadiene-styrene (SBS) particles, styrene-ethylene-butadiene-styrene (SEBS) particles, ethylene propylene diene monomer (EPDM) particles, and particles made of a blend of rubber and EPDM, and mixtures of two or more of the aforementioned particles.

[0136] According to embodiments, the elastic particles **114** of the performance layer **104** are non-water-absorbent elastic particles.

[0137] According to other embodiments, the performance layer **104** includes non-elastic particles **114**, in particular particles selected from a group including fruit stone particles or olive pit particles, wood particles, seeds, and mixtures of two or more of the aforementioned particles.

[0138] FIG. **2** illustrates an artificial turf **200** including three infill layers in the form of a water absorber layer **106**, a performance layer **104**, and a stabilizing layer **202**. The reference numbers of FIG. **2** that are the same as the reference numbers of FIG. **1** refer to identical features.

[0139] According to embodiments, the stabilizing layer **202** is on top of the backing **108** and below the water absorber layer **106** (i.e., positioned between the backing **108** and the water absorber layer **106**). Advantageously, the additional stabilizing layer **202** may stabilize the artificial turf by pressing the backing down and holding the artificial turf installation in place. Preferably, the infill material of the stabilizing layer has a higher density than the infill in the water absorber layer and/or is a capillary active material.

[0140] According to embodiments, the stabilizing layer **202** includes or consists of sand **204**. In other embodiments, clay, small stone granules or mixtures thereof may be used. Sand **204** combines the benefits of providing a high-density infill layer having capillary activity.

[0141] FIG. **3** illustrates a water-absorbent particle **114** of the performance layer **104** coated with two porous layers **302**, **304** of a water-impermeable material. According to an embodiment, the water-impermeable material includes polyurethane. Although FIG. **3** depicts only two porous layers **302**, **304** of a water-impermeable material coating the water-absorbent particle **114**, for ease of illustration and explanation, the scope of the present invention includes water-absorbent particle **114** of the performance layer **104** coated with one or more porous layers of a water-impermeable material.

[0142] According to embodiments, the water absorbent particle **114** includes a first layer **302** of a water impermeable material, where the first layer only partially covers the particle. In the embodiment as illustrated, the particle is coated with a second layer **304** of the water impermeable material, where the second layer only partially covers the first layer **302**. In other embodiments, each particle is coated with one layer of the water impermeable material, or three or more layers of the water impermeable material.

[0143] By controlling the number of layers that coat the particles, the porosity of the combined layers can be controlled (i.e., the average number of gaps in the one or more layers and/or the average number of gaps that reach the surface of a water-absorbent particle can be controlled, and thus the porosity of the combined layers coating the water-absorbent particle can be controlled). In order to simplify the drawing, only a single gap **306** is illustrated in the layers **302**, **304**. However, the scope of the invention includes any number of gaps in the two layers **302**, **304**, where the number of gaps are dependent at least upon the number of coating layers. Generally speaking, the greater the number of coating layers, the smaller the number of gaps.

[0144] As a hypothetical example only, during the formation of the first coating or any subsequent coating the coverage is each (on the average) only 90% of the surface of the water-absorbent particle. That is, after the initial (i.e., first) coating (i.e., layer) has been deposited, roughly 10% of each particle would be uncoated. There would be small surface defects. Deposition of the subsequent coatings (i.e., subsequent layers) would then also cover 90% of the surface. As the interaction between the particles is essentially a random process, one can expect that 90% of the defects that were exposed after the deposition of the initial coating are coated in this case. The result of doing two coatings is then a performance layer infill including water-absorbent particles that are 99% coated with only minor amounts of defects (i.e., locations (i.e., gaps) where a particle is not coated with either the initial coating or the subsequent coating).

[0145] According to one embodiment, each of the one or more coatings (i.e., layers) includes at least one type of polyurethane polymer. In other embodiments, each of the one or more layers additionally includes one or more pigments for rendering a specific color to the performance infill.

[0146] According to further embodiments, at least one type of water-impermeable material, such as a polymer (e.g., polyurethane), and optionally one or more pigments, are mixed with a water-absorbent material (e.g., water-absorbing particles). Next, water and a catalyst are added to the mixture during the mixing process to cure the water-impermeable material (and optionally the pigment) onto the surface of the water-absorbent material. As a large number of the particles of the water-absorbent material are mixed they interact with each other and bump into each other occasionally during the process. For this reason, there may be holes or defects (also referred to as gaps) in the initial coating (i.e., first layer). These are regions where particles are insufficiently coated by the first layer. The above process may then be repeated n number of times for coating the particles with n number of layers, where n is an integer greater or equal to 1.

[0147] In conjunction with the present disclosure of water-absorbing particles coated with one or more porous layers of a water-impermeable material, the present application hereby incorporates by reference the complete disclosure of European Patent Application Publication No. EP 3216821 A1, published on Sep. 13, 2017, and filed as European Patent Application No. EP 16159975.8 on Mar. 11, 2016.

[0148] FIG. **4** illustrates a system **400**, including the artificial turf **100** or **200** according to FIGS. **1** and **2**, respectively, and a controller **402**. The controller **402** is configured to send irrigation control commands for triggering, for example, an irrigation module **404** to irrigate the artificial turf **100**, **200** selectively at times when the sun intensity is below a daily maximum. Irrigation devices, such as irrigation module **404**, which receive water from a water source, such as source **406**, include portable devices, self-propelled (i.e., mobile) devices, and fixed-in-ground devices. Irrigation devices and water sources are well known to those of skill in the art, and will not be described in further detail.

[0149] According to embodiments, irrigation may be performed selectively one or more times a day at a time when the sun intensity is below 90%, or below 80%, or below 70%, or below 60% or below 50% of the daily maximum, or during nighttime or at dawn, according to embodiments. According to further embodiments, the daily maximum can be an actual daily maximum (i.e., real-time maximum measured or recorded by, e.g., weather services or a temperature measuring device on or near the artificial turf of the present invention), or a maximum forecast by a weather service for the local area in which the artificial turf is provided.

[0150] In other embodiments, the controller **402** is configured to determine a number of times that irrigation is provided on a daily basis and/or determine (or select) a particular percentage below the daily maximum (e.g., determining on of 90%, 80%, 70%, 60%, 50%) which triggers irrigation of the turf, based on ambient (or forecast) environmental conditions, such as relative humidity, wind conditions and/or extent of cloud cover, for example. In other embodiments, an operator or maintenance worker attending to the artificial turf determines or selects the number of times that irrigation is provided on a daily basis and/or determines or selects a particular percentage below the daily maximum (e.g., determining on of 90%, 80%, 70%, 60%, 50%) which triggers irrigation of the turf, and programs the controller **402** accordingly.

[0151] FIG. **5** illustrates a method **500** for installing an artificial turf. The method includes placing, in step **502**, an artificial turf backing **108** on the ground **110**, where the backing carries artificial turf fibers **102**; applying, in step **506**, a water absorber layer **106** on top of the backing, where the water absorber layer includes or consists of water-absorbent material; and applying, in step **508**, a performance infill layer **104** on top of the water absorber layer such that performance infill layer shields the water absorber layer from sunlight.

[0152] According to embodiments, the method further includes, before applying the water absorber layer in step **506**, applying in optional step **504** a stabilizing infill layer **202** on top of the backing, where the stabilizing infill layer is between the water absorber layer and the backing, and where the stabilizing infill layer contacts the water absorber layer.

[0153] Embodiments of the present invention also relate to the use of the artificial turf according to any one of the embodiments and examples described above, whereby the use includes irrigating the artificial turf selectively at times when the sun intensity is below a daily maximum.

[0154] Although the invention has been described in reference to specific embodiments, it should be understood that the invention is not limited to these examples only and that many variations of these embodiments may be readily envisioned by the skilled person after having read the present disclosure. The invention may thus further be described without limitation and by way of example only by the following embodiments. The following embodiments may contain preferred embodiments. Accordingly, the term “clause” as used therein may refer to such a “preferred embodiment”.

Clause 1

[0155] An artificial turf (**100**, **200**) comprising: [0156] an infill layer, the infill layer including: [0157] a water absorber layer (**106**) adapted to serve as water reservoir layer, the water absorber layer comprising porous, water-absorbent material; and [0158] a performance layer (**104**), the performance layer on top of the water absorber layer and shielding the water absorber layer from sunlight. [0159] 2. The artificial turf of clause 1, [0160] wherein at least 80 weight % of the water absorber layer consists of first particles having a first particle size; [0161] wherein at least 80 weight % of the performance layer consists of second particles having a second particle size; and [0162] wherein the second particle size is between the first particle size plus 20% of the first particle size and the first particle size minus 20% of the first particle size. [0163] 3. The artificial turf of clause 2, wherein the second particle size is between the first particle size plus 10% of the first particle size and the first particle size minus 10% of the first particle size. [0164] 4. The artificial turf of any one of the previous clauses, the water absorber layer having a height of 0.5 mm to 30 mm. [0165] 5. The artificial turf of any one of the previous clauses, the water absorber layer having a height of 1 mm to 10 mm. [0166] 6. The artificial turf of any one of the previous clauses, the water absorber layer having a height of 1 mm to 5 mm. [0167] 7. The artificial turf of any one of the previous clauses, the water absorber layer having a height that is between a height of the performance layer plus 20% the height of the performance layer and the height of the performance layer minus 20% the height of the performance layer. [0168] 8. The artificial turf of any one of the previous clauses, the water absorber layer having a weight per m.sup.2 that is between a weight per m.sup.2 of the performance layer plus 20% the weight of the performance layer per m.sup.2 and the weight of the performance layer per m.sup.2 minus 20% the weight of the performance layer per m.sup.2. [0169] 9. The artificial turf of any one of the previous clauses, the water absorber layer comprising or consisting of particles selected from a group including: [0170] zeolite particles, [0171] bentonite particles, [0172] lightweight expanded clay aggregate (LECA) particles, [0173] expanded clay (ECA) particles, [0174] calcium hydro silicate particles, [0175] calcium silicate particles, [0176] alumina silicate particles, [0177] calcium carbonate particles, [0178] sodium alumina silicate particles, [0179] alumina magnesium silicate particles, [0180] calcium alumina silicate particles, [0181] aerated concrete particles, and [0182] mixtures of two or more of the aforementioned particles. [0183] 10. The artificial turf of clause 9, wherein the particles are the zeolite particles, and the zeolite particles comprise clinoptilolite. [0184] 11. The artificial turf of any one of the previous clauses, wherein the water absorber layer further comprises sand. [0185] 12. The artificial turf of any one of the previous clauses, wherein the infill layer further comprises a stabilizing layer (**202**), the stabilizing layer positioned between a backing (**108**) and the water absorber layer. [0186] 13. The artificial turf of clause 12, the stabilizing layer comprising or consisting of sand (**204**). [0187] 14. The artificial turf of any one of the previous clauses, the performance layer having a height of 0.5 mm to 50 mm. [0188] 15. The artificial turf of any one of the previous clauses, the performance layer having a height of 5 mm to 35 mm. [0189] 16. The artificial turf of any one of the previous clauses, the performance layer having a height of 15 mm to 25 mm. [0190] 17. The artificial turf of any one of the previous clauses, the performance layer comprising or consisting of water-absorbent material. [0191] 18. The artificial turf of clause 17, wherein the water-absorbent material of the performance layer comprises water-absorbing particles coated with one or more porous layers of a water-impermeable material. [0192] 19. The artificial turf of clause 18, wherein the water-impermeable material comprises polyurethane. [0193] 20. The artificial turf of clause 17, 18 or 19, wherein the water-absorbent material of the performance layer is selected from a group comprising: [0194] plant-based fibers, [0195] bark, [0196] wood, [0197] seeds, and [0198] mixtures of two or more of the aforementioned materials. [0199] 21. The artificial turf of clause 20, wherein the plant-based fibers comprise jute fibers and/or hemp fibers, and the bark comprises bark-based particles. [0200] 22. The artificial turf of clause 1, the performance layer being a capillary-active layer adapted to transport water from the water-absorber layer to an upper surface of the performance layer. [0201] 23. The artificial turf of clause 1, the performance layer comprising or consisting of elastic particles selected from a group including: [0202] cork particles; [0203] styrene butadiene rubber (SBR) particles; [0204] natural rubber particles; [0205] synthetic thermoplastic elastomer particles; and [0206] mixtures of two or more of the above-mentioned particles. [0207] 24. The artificial turf of clause 23, wherein the natural rubber particles are derived from gutta percha, and wherein the synthetic thermoplastic elastomer particles comprise one or more particles from a group including: [0208] styrene-butadiene-styrene (SBS) particles, [0209] styrene-ethylene-butadiene-styrene (SEBS) particles, [0210] ethylene propylene diene monomer (EPDM) particles, and [0211] particles made of a blend of rubber and EPDM. [0212] 25. The artificial turf of clause 23, wherein the elastic particles are non-water-absorbent elastic particles. [0213] 26. The artificial turf of any one of the previous clauses, the performance layer comprising or consisting of non-elastic particles selected from a group including: [0214] fruit stone particles or olive pit particles, or [0215] wood particles, or [0216] seeds, or [0217] mixtures of two or more of the aforementioned particles. [0218] 27. A method for installing an artificial turf (**100**, **200**), the method comprising: [0219] placing (**402**) an artificial turf backing (**108**) on a ground (**110**), the backing carrying artificial turf fibers; [0220] applying (**406**) a water absorber layer (**106**) on top of the backing, the water absorber layer being adapted to serve as water reservoir layer and comprising or consisting of water-absorbent material; and [0221] applying (**408**) a performance infill layer (**104**) on top of the water absorber layer such that performance infill layer shields the water absorber layer from sunlight. [0222] 28. The method of clause 27, further comprising: [0223] before applying the water absorber layer, applying (**404**) a stabilizing infill layer on top of the backing, wherein the stabilizing infill layer is between the water absorber layer and the backing, and wherein the stabilizing infill layer contacts the water absorber layer. [0224] 29. Use of the artificial turf according to any one of the previous clauses, comprising irrigating the artificial turf selectively at times when a sun intensity is below a daily maximum. [0225] 30. A system comprising: [0226] the artificial turf (**100**, **200**) according to clause 1; and [0227] a controller (**402**) configured to send irrigation control commands, the control commands configured to trigger an irrigation of the artificial turf selectively at times when a sun intensity is below a daily maximum.

[0228] Although the invention has been described with specific embodiments it should be understood that many other variations of the invention may be envisaged by the skilled person after having read the present disclosure which do not depart from the scope of the invention as defined in the following claims.

LIST OF REFERENCE NUMERALS

[0229] **100** artificial turf [0230] **102** synthetic fibers [0231] **104** performance layer [0232] **106** water absorber layer [0233] **108** backing (primary backing=carrier, optional secondary backing=coating with PU or latex) [0234] **110** ground [0235] **112** first particles of absorber layer [0236] **114** second particles of performance layer [0237] **116** sand [0238] **200** artificial turf [0239] **202** stabilizing layer [0240] **204** sand, clay and/or small stone aggregates [0241] **302** first coating layer [0242] **304** second coating layer [0243] **306** gap in the coating layers **302**, **304** [0244] **400** system [0245] **402** controller [0246] **404** irrigation device/system [0247] **406** water source [0248] **502-508** method steps

Claims

1. An artificial turf comprising: an infill layer, the infill layer including: a water absorber layer adapted to serve as water reservoir layer, the water absorber layer comprising porous, water-absorbent material; and a performance layer, the performance layer on top of the water absorber layer and shielding the water absorber layer from sunlight.

2. The artificial turf of claim 1, wherein at least 80 weight % of the water absorber layer consists of first particles having a first particle size; wherein at least 80 weight % of the performance layer consists of second particles having a second particle size; and wherein the second particle size is between the first particle size plus 20% of the first particle size and the first particle size minus 20% of the first particle size.

3. The artificial turf of claim 2, wherein the second particle size is between the first particle size plus 10% of the first particle size and the first particle size minus 10% of the first particle size.

4. The artificial turf of claim 1, the water absorber layer having a height of 0.5 mm to 30 mm, in particular a height of 1 mm to 10 mm, in particular a height of 1 mm to 5 mm.

5. The artificial turf of claim 1, the water absorber layer having a height that is between a height of the performance layer plus 20% the height of the performance layer and the height of the performance layer minus 20% the height of the performance layer.

6. The artificial turf of claim 1, the water absorber layer having a weight per m.sup.2 that is between a weight per m.sup.2 of the performance layer plus 20% the weight of the performance layer per m.sup.2 and the weight of the performance layer per m.sup.2 minus 20% the weight of the performance layer per m.sup.2.

7. The artificial turf of claim 1, the water absorber layer comprising or consisting of particles selected from a group including: zeolite particles, bentonite particles, lightweight expanded clay aggregate particles, expanded clay particles, calcium hydro silicate particles, calcium silicate particles, alumina silicate particles, calcium carbonate particles, sodium alumina silicate particles, alumina magnesium silicate particles, calcium alumina silicate particles, aerated concrete particles, and mixtures of two or more of the aforementioned particles.

8. The artificial turf of claim 7, wherein the particles are the zeolite particles, and the zeolite

particles comprise clinoptilolite.
9. The artificial turf of claim 1, wherein the water absorber layer further comprises sand.
10. The artificial turf of claim 1, wherein the infill layer further comprises a stabilizing layer, the stabilizing layer positioned between a backing and the water absorber layer.
11. The artificial turf of clause 10, the stabilizing layer comprising or consisting of sand.
12. The artificial turf of claim 1, the performance layer having a height of 0.5 mm to 50 mm, in particular a height of 5 mm to 35 mm, in particular a height of 15 mm to 25 mm.
13. The artificial turf of claim 1, the performance layer comprising or consisting of water-absorbent material.
14. The artificial turf of claim 13, wherein the water-absorbent material of the performance layer comprises water-absorbing particles coated with one or more porous layers of a water-impermeable material.
15. The artificial turf of claim 13, wherein the water-absorbent material of the performance layer is different from the porous, water-absorbent material of the absorber layer.
16. The artificial turf of claim 1, the performance layer being a capillary-active layer adapted to transport water from the water-absorber layer to an upper surface of the performance layer.
17. The artificial turf of claim 16, wherein the performance layer comprises at least one of organic material, microporous mineral material and elastic material for transporting water from the water-absorber layer to the upper surface of the performance layer.
18. The artificial turf of claim 1, the performance layer comprising or consisting of elastic particles selected from a group including: cork particles; styrene butadiene rubber particles; natural rubber particles; synthetic thermoplastic elastomer particles; and mixtures of two or more of the above-mentioned particles; wherein in particular: the natural rubber particles are derived from gutta percha, and wherein the synthetic thermoplastic elastomer particles comprise one or more particles from a group including: styrene-butadiene-styrene particles, styrene-ethylene-butadiene-styrene particles, ethylene propylene diene monomer particles, and particles made of a blend of rubber and EPDM.
19. The artificial turf of claim 1, wherein the porous, water-absorbent material of the water absorber layer is rigid.
20. A method for installing an artificial turf, the method comprising: placing an artificial turf backing on a ground, the backing carrying artificial turf fibers; applying a water absorber layer on top of the backing, the water absorber layer being adapted to serve as water reservoir layer and comprising or consisting of a first water-absorbent material; and applying a performance infill layer on top of the water absorber layer such that performance infill layer shields the water absorber layer from sunlight.
21. The method of claim 20, further comprising: before applying the water absorber layer, applying a stabilizing infill layer on top of the backing, wherein the stabilizing infill layer is between the water absorber layer and the backing, and wherein the stabilizing infill layer contacts the water absorber layer.
22. The method of claim 20, wherein the performance layer comprises or consists of a second water-absorbent material.
23. The method of claim 22, wherein the first water-absorbent material is different from the second water absorbent-material.
24. The method of claim 22, wherein the second water-absorbent material comprises water-absorbing particles coated with one or more porous layers of a water-impermeable material.
25. Use of the artificial turf according to claim 1, comprising irrigating the artificial turf selectively at times when a sun intensity is below a daily maximum.
26. The use of the artificial turf according to claim 25, wherein irrigating the artificial turf further comprises irrigating the artificial turf selectively at times only when the sun intensity is below a predefined percentage of the daily maximum.

27. A system comprising: the artificial turf according to claim 1; and a controller configured to send irrigation control commands, the control commands configured to trigger an irrigation of the artificial turf selectively at times when a sun intensity is below a daily maximum.