

CLAIMS

1. A buoyant reflective composition, comprising:

a plurality of hollow silicon dioxide glass microspheres wherein
microsphere size ranges from about 500 nanometers to about 650 nanometers, wherein
5 each microsphere contains therein an air inclusion bubble about 400 nanometers in
diameter and has a true density of from about 0.1 g/cm³ to about 0.65 g/cm³ with a
nominal true density of about 0.15 g/cm³, and is within a range of between about 1%
by weight to about 98% by weight of the total, with a nominal value of about 23% by
weight;

10 titanium dioxide particles having a specific surface area of about 10
square meters per gram, the particles being of a mean size of about 140 nm with a
distribution spanning from about 30 nm to about 300 nm, wherein a greater proportion
of the particles is anatase phase, wherein the isoelectric point is about 4.1 in water, and
wherein an approximate fraction of nanoparticles in the composition includes between
15 about 0% to about 10% by weight of the total TiO₂ particles;

an aliphatic component mixture having at least one C16 or C18 aliphatic
alcohol with at least one slightly water soluble C16 or C18 aliphatic carboxylic acid,
wherein the binder of density of the aliphatic alcohol is about 0.82 g/cm³ with a
combined melting point of between about 46 degrees C to about 70 degrees C, such
20 that the hot melted fluid mixture achieves a process viscosity of between about 6 mPa
to about 10 mPa prior to cooling and solidification to the local ambient environmental
temperature of use,

wherein the total composition has a density of less than about 1.0 g/cm³
and is buoyant in water.

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2. The composition of Claim 1, wherein the at least one C16 or C18 aliphatic
carboxylic acid is between about 0% by weight to about 10% by weight.

3. The composition of Claim 2, wherein the titanium dioxide content is between about 0% by weight to about 5% by weight.
4. The composition of Claim 3, further comprising:
5 up to about 5 % by weight iron oxide as Fe²⁺, Fe³⁺, or both.
5. A method of cooling an environment, comprising:
providing a substrate; and
applying an effective amount of a preselected buoyant reflective coating
10 to the substrate.
6. The method of Claim 5, wherein the preselected buoyant reflective coating includes a composition of Claim 2, and wherein the substrate includes construction or roofing materials, and wherein the composition of Claim 2 on the
15 materials provides thermally reflective waterproofing and insulation to the materials.
7. The method of Claim 5, wherein the preselected buoyant reflective coating includes a composition of Claim 3, wherein the substrate includes surface water, and wherein the composition of Claim 3 on the surface water reduces the
20 evaporative loss of the treated surface water by up to about 30%.
8. The method of Claim 5, wherein the preselected buoyant reflective coating includes a composition of Claim 3, wherein the substrate includes a rear surface of a solar electricity producing panel, wherein the composition of Claim 3
25 applied to the rear surface of the solar electricity producing panel directs solar reflectivity onto the solar electricity producing panel, and wherein the operating temperature of the solar electricity producing panel is reduced.

10. The method of Claim 5, wherein the preselected buoyant reflective coating includes a composition of Claim 3, wherein the substrate includes a root support substrate used in hydroponic horticulture, and wherein applying the effective amount of the composition of Claim 3 includes applying a continuous or a
5 discontinuous surface coating to the root support substrate.

11. The method of Claim 5, wherein the preselected buoyant reflective coating includes using a composition of Claim 3, wherein the substrate includes a permaculture soil surface and wherein applying the effective amount of the
10 composition of Claim 3 includes applying a continuous or a discontinuous surface coating to generate a reflective permaculture surface.

12. The method of Claim 5, wherein the preselected buoyant reflective coating includes using the composition of Claim 3, wherein the substrate includes a
15 native sandy soil of an arid or a semi-arid desert, and wherein once applied to the native sandy soil the composition of Claim 3 conserves essential subsoil nitrogen and conserves moisture from substantial evaporative or volatile loss.

13. The method of Claim 5, wherein the preselected buoyant reflective
20 coating includes using the composition of Claim 3, wherein the substrate includes a settlement of fungal growth or mosses in a soil, and wherein insulative thermal protection by the composition of Claim 3 is conferred to the settlement allowing further cultivation of light-reflecting foliage, food-producing crops, or both, in the soil.

25 14. The method of Claim 5, wherein the preselected buoyant reflective coating includes using the composition of Claim 3, wherein the substrate includes incident light reflection onto an underside of an agricultural plant leaf, wherein once the composition of Claim 3 is applied the underside of agricultural plant leaf is irradiated for the purpose

of light-mediated sterilization of pathogenic organisms from invading the stomata or breathing orifices of plants, and wherein disease transmission to humans or animals who consume such agricultural plant leaf is avoided.

- 5 15. The method of Claim 5, wherein the preselected buoyant reflective coating includes the composition of Claim 4, wherein the substrate includes any surface water having diatoms or plankton, wherein the composition of Claim 4 applied to the surface water reduces evaporative loss of treated surface water by up to about 30%, and wherein the diatoms or the plankton in or near the treated surface water or
10 both are nourished thereby.