Claims

1. A composite material including a plurality of sub-layers, the composite material including:

- a UV-Vis reflective sub-layer, including boron nitride bound by a water dispersible binder; and
- a Vis-Near IR reflective sub-layer, including titanium dioxide bound by a water dispersible binder.

2. The composite material of claim 1 wherein the or each water dispersible binder independently includes a polymer selected from: an acrylic polymer; a polyvinylidene fluoride (PVDF)-acrylic copolymer; styrene-acrylic copolymer; polyvinyl acetate copolymer; vinyl-acrylic copolymer; and a silicone (co)polymer.

3. The composite material according to claim 1 or claim 2 wherein the boron nitride is hexagonal boron nitride.

4. The composite material according to any one of claims 1 to 3 wherein the boron nitride is unfunctionalised hexagonal boron nitride.

5. The composite material according to any one of claims 1 to 4 further including voids and wherein the pigment volume concentration (PVC) of the boron nitride is higher than the critical pigment volume concentration (CPVC) of the boron nitride so as to provide a composite material having voids that form from 1% to 40% by volume of the UV-Vis reflective sub-layer.

6. The composite material according to any one of claims 1 to 5 further including voids and wherein the pigment volume concentration (PVC) of the titanium dioxide is higher than the critical pigment volume concentration (CPVC) of the titanium dioxide so as to provide a composite material having voids that form from 1% to 40% by volume of the Vis-Near IR reflective sub-layer.

7. The composite material according to any one of claims 1 to 6 further including voids and wherein the ratio of volume of boron nitride to volume of binder is from 1:1 to 10:1, and the voids form from 1% to 40% by volume of the UV-Vis reflective sub-layer.

8. The composite material according to any one of claims 1 to 7 further including voids and wherein the ratio of volume of titanium dioxide to volume of binder is from 1:1 to 10:1, and the voids form from 1% to 40% by volume of the Vis-Near IR reflective sub-layer.

9. A multi-layered system including an optional primer layer; a layer of a composite material according to any one of claims 1 to 8; and a surface coating layer, wherein the order of the layers and sub-layers in the system is: primer layer where present; Vis-Near IR reflective sub-layer; UV-Vis reflective sub-layer; surface coating layer.

10. A method of providing a composite material on a substrate, the method including the steps of:

i) providing a substrate and spreading onto the substrate a first dispersion including:

- an aqueous carrier;
- a water dispersible binder;
- titanium dioxide;

ii) allowing the first dispersion applied to the substrate to at least partially harden, so as to provide a Vis-Near IR reflective sub-layer, including titanium dioxide;

iii) spreading onto the Vis-Near IR reflective sub-layer a second dispersion including:

- an aqueous carrier;
- a water dispersible binder;
- boron nitride;

iv) allowing the second dispersion applied to the Vis-Near IR reflective sub-layer to at least partially harden, so as to provide a UV-Vis reflective sub-layer, including boron nitride.

11. The method according to claim 10 wherein the water dispersible binder of the first dispersion and the water dispersible binder of the second dispersion each independently include a polymer

selected from: an acrylic polymer; a polyvinylidene fluoride (PVDF)-acrylic copolymer; styrene-acrylic copolymer; polyvinyl acetate copolymer; vinyl-acrylic copolymer; and a silicone (co)polymer.

12. A method for increasing atmospheric condensation on a surface coating, the method including the steps of:

i) applying the multi-layered system according to claim 9 to a substrate;

ii) exposing the multi-layered system on the substrate to solar radiation so that water condenses on the surface coating.

13. A coating system for coating at least part of a substrate, including:

- a composite material according to any one of claims 1 to 8 applied to a substrate; and
- a surface coating applied to the composite material.

14. A method for increasing atmospheric condensation on a surface coating, the method including the steps of:

i) applying the coating system of claim 13 to a substrate so as to provide a substrate coated in the composite material and the surface coating;

ii) exposing the composite material on the substrate to solar radiation so that water condenses on the surface coating.

15. A method for reducing temperature gain on a surface of a substrate due to solar radiation, the method including the step of interposing the composite material according to any one of claims 1 to 8 or the system according to claim 9 or 13 between the surface of the substrate and the solar radiation.