CLAIMS

1. A composite comprising:

a substrate having first and second, generally opposed major surfaces;

a first functional layer having first and second, generally opposed major surfaces, wherein the first major surface of the first functional layer is disposed on the first major surface of the substrate, and wherein the first functional layer is at least one of a transparent conductive layer or a gas barrier layer; and

a first nano-structured layer disposed on the second major surface of the first functional layer, the first nano-structured layer comprising a first matrix and a first nano-scale dispersed phase, and having a first random nano-structured anisotropic surface.

2. The composite of claim 1, wherein the first functional layer is a gas barrier layer.

3. The composite of either claim 1 or 2, wherein the first functional layer is a first transparent conductive layer.

4. The composite of any preceding claim, wherein the first transparent conductive layer comprises first transparent conductive oxide.

5. The composite of any preceding claim, wherein the first transparent conductive layer comprises first transparent conductive metal.

6. The composite of any preceding claim, wherein the first transparent conductive layer comprises first transparent conductive polymer.

7. The composite of any preceding claim, wherein the first transparent conductive layer is a gas barrier layer.

8. The composite of any preceding claim, wherein the first nano-structured layer comprises in a range from 0.5 to 41 percent by volume of the first nano-scale dispersed phase, based on the total volume of the first nano-structured layer.

9. The composite of any preceding claim, wherein the first nano-structured layer has a difference in refractive index in all direction of less than 0.05.

10. The composite of any preceding claim, wherein between the first nano-structured layer and the first functional layer there is a difference in refractive index of less than 0.5.

11. The composite of any preceding claim, wherein the first nano-structured anisotropic surface has a percent reflection of less than 2.

12. The composite of any preceding claim, wherein reflectance through the first anisotropic major surface is less than 4.

13. The composite of any preceding claim, wherein substrate is a reflective polarizer or an absorptive polarizer.

14. The composite of any of claims 1 to 13, further comprising:

a second functional layer having first and second, generally opposed major surfaces, wherein the first major surface of the second functional layer is disposed on the second major surface of the substrate, wherein the second functional layer is one of a transparent conductive layer or a gas barrier layer; and

a second nano-structured layer disposed on the second major surface of the second functional layer, the second nano-structured layer comprising a second matrix and a second nano-scale dispersed phase, and having a second random nano-structured anisotropic surface.

15. The composite of any of claims 1 to 14, further comprising:

a second nano-structured layer having first and second, generally opposed major surfaces, wherein the first major surface of the second nano-structured layer is disposed on the second major surface of the substrate, the second nano-structured layer comprising a second matrix and a second nano-scale dispersed phase, and having a second random nano-structured anisotropic surface at the second major surface of the second nano-structured layer; and

a second functional layer having first and second, generally opposed major surfaces, wherein the first major surface of the second functional layer is disposed on the second major

surface of the second nano-structured layer, and wherein the second functional layer is at least one of a transparent conductive layer or a gas barrier layer.

16. A composite comprising:

a substrate having first and second, generally opposed major surfaces;

a first nano-structured layer having first and second, generally opposed major surfaces, wherein the first major surface of the first nano-structured layer is disposed on the first major surface of the substrate, the first nano-structured layer comprising a first matrix and a first nano-scale dispersed phase, and having a first random nano-structured anisotropic surface at the second major surface of the first nano-structured layer; and

a first functional layer having first and second, generally opposed major surfaces, wherein the first major surface of the first functional layer is disposed on the second major surface of the first nano-structured layer, and wherein the first functional layer is at least one of a transparent conductive layer or a gas barrier layer.

17. The composite of claim 16, wherein the first functional layer is a gas barrier layer.

18. The composite of either claim 16 or 17, wherein the first functional layer is a first transparent conductive layer.

19. The composite of any of claims 16 to 18, wherein the first transparent conductive layer comprises first transparent conductive oxide.

20. The composite of any of claims 16 to 19, wherein the first transparent conductive layer comprises first transparent conductive metal.

21. The composite of any of claims 16 to 20, wherein the first transparent conductive layer comprises first transparent conductive polymer.

22. The composite of any of claims 16 to 21, wherein the first transparent conductive layer is a gas barrier layer.

23. The composite of any of claims 16 to 22, wherein the first nano-structured article comprises in a range from 0.5 to 41 percent by volume of the first nano-scale dispersed phase, based on the total volume of the first nano-structured layer.

24. The composite of any of claims 16 to 23, wherein the first nano-structured layer has a difference in refractive index in all direction of less than 0.05.

25. The composite of any of claims 16 to 24, wherein between the first nano-structured layer and first functional layer there is a difference in refractive index of less than 0.5.

26. The composite of any of claims 16 to 25, wherein the first nano-structured anisotropic surface has a percent reflection of less than 2%.

27. The composite of any of claims 16 to 26, wherein reflectance through the first anisotropic major surface is less than 4%.

28. The composite any of claims 16 to 27, wherein substrate is a reflective polarizer or an absorptive polarizer.

29. The composite of any of claims 16 to 28, further comprising:

a second nano-structured layer having first and second, generally opposed major surfaces, wherein the first major surface of the second nano-structured layer is disposed on the second major surface of the substrate, the second nano-structured layer comprising a second matrix and a second nano-scale dispersed phase, and having a second random nano-structured anisotropic surface at the second major surface of the second nano-structured layer; and

a second functional layer having first and second, generally opposed major surfaces, wherein the first major surface of the second functional layer is disposed on the second major surface of the second nano-structured layer, and wherein the second functional layer is at least one of a transparent conductive layer or a gas barrier layer.

What is claimed is:

1. A composite comprising:

a substrate having first and second, generally opposed major surfaces;

a first functional layer having first and second, generally opposed major surfaces, wherein the first major surface of the first functional layer is disposed on the first major surface of the substrate, and wherein the first functional layer is at least one of a transparent conductive layer or a gas barrier layer; and

a first nano-structured layer disposed on the second major surface of the first functional layer, the first nano-structured layer comprising a first matrix and a first nano-scale dispersed phase, and having a first random nano-structured anisotropic surface, wherein the nano-structured anisotropic surface comprises nanofeatures having a height to width ratio of at least 5:1.

2. The composite of claim 1, wherein the first functional layer is a gas barrier layer.

3. The composite of either claim 1 or 2, wherein the first functional layer is a first transparent conductive layer.

4. The composite of any preceding claim, wherein the first transparent conductive layer comprises first transparent conductive oxide.

5. The composite of any preceding claim, wherein the first transparent conductive layer comprises first transparent conductive metal.

6. The composite of any preceding claim, wherein the first transparent conductive layer comprises first transparent conductive polymer.

7. The composite of any preceding claim, wherein the first transparent conductive layer is a gas barrier layer.

8. The composite of any preceding claim, wherein the first nano-structured layer comprises in a range from 0.5 to 41 percent by volume of the first nano-scale dispersed phase, based on the total volume of the first nano-structured layer.

9. The composite of any preceding claim, wherein the first nano-structured layer has a difference in refractive index in all direction of less than 0.05.

10. The composite of any preceding claim, wherein between the first nano-structured layer and the first functional layer there is a difference in refractive index of less than 0.5.

11. The composite of any preceding claim, wherein the first nano-structured anisotropic surface has a percent reflection of less than 2.

12. The composite of any preceding claim, wherein reflectance through the first anisotropic major surface is less than 4.

13. The composite of any preceding claim, wherein substrate is a reflective polarizer or an absorptive polarizer.

14. The composite of any of claims 1 to 13, further comprising:

a second functional layer having first and second, generally opposed major surfaces, wherein the first major surface of the second functional layer is disposed on the second major surface of the substrate, wherein the second functional layer is one of a transparent conductive layer or a gas barrier layer; and

a second nano-structured layer disposed on the second major surface of the second functional layer, the second nano-structured layer comprising a second matrix and a second nano-scale dispersed phase, and having a second random nano-structured anisotropic surface.

15. The composite of any of claims 1 to 14, further comprising:

a second nano-structured layer having first and second, generally opposed major surfaces, wherein the first major surface of the second nano-structured layer is disposed on the second major surface of the substrate, the second nano-structured layer comprising a second matrix and a second nano-scale dispersed phase, and having a second random nano-structured anisotropic surface at the second major surface of the second nano-structured layer; and

a second functional layer having first and second, generally opposed major surfaces, wherein the first major surface of the second functional layer is disposed on the second major surface of the second nano-structured layer, and wherein the second functional layer is at least one of a transparent conductive layer or a gas barrier layer.

16. A composite comprising:

a substrate having first and second, generally opposed major surfaces;

a first nano-structured layer having first and second, generally opposed major surfaces, wherein the first major surface of the first nano-structured layer is disposed on the first major surface of the substrate, the first nano-structured layer comprising a first matrix and a first nano-scale

dispersed phase, and having a first random nano-structured anisotropic surface at the second major surface of the first nano-structured layer, wherein the nano-structured anisotropic surface comprises nanofeatures having a height to width ratio of at least 5:1; and

a first functional layer having first and second, generally opposed major surfaces, wherein the first major surface of the first functional layer is disposed on the second major surface of the first nano-structured layer, and wherein the first functional layer is at least one of a transparent conductive layer or a gas barrier layer.

17. The composite of claim 16, wherein the first functional layer is a gas barrier layer.

18. The composite of either claim 16 or 17, wherein the first functional layer is a first transparent conductive layer.

19. The composite of any of claims 16 to 18, wherein the first transparent conductive layer comprises first transparent conductive oxide.

20. The composite of any of claims 16 to 19, wherein the first transparent conductive layer comprises first transparent conductive metal.

21. The composite of any of claims 16 to 20, wherein the first transparent conductive layer comprises first transparent conductive polymer.

22. The composite of any of claims 16 to 21, wherein the first transparent conductive layer is a gas barrier layer.

23. The composite of any of claims 16 to 22, wherein the first nano-structured article comprises in a range from 0.5 to 41 percent by volume of the first nano-scale dispersed phase, based on the total volume of the first nano-structured layer.

24. The composite of any of claims 16 to 23, wherein the first nano-structured layer has a difference in refractive index in all direction of less than 0.05.

25. The composite of any of claims 16 to 24, wherein between the first nano-structured layer and first functional layer there is a difference in refractive index of less than 0.5.

26. The composite of any of claims 16 to 25, wherein the first nano-structured anisotropic surface has a percent reflection of less than 2%.

27. The composite of any of claims 16 to 26, wherein reflectance through the first anisotropic major surface is less than 4%.

28. The composite any of claims 16 to 27, wherein substrate is a reflective polarizer or an absorptive polarizer.

29. The composite of any of claims 16 to 28, further comprising:

a second nano-structured layer having first and second, generally opposed major surfaces, wherein the first major surface of the second nano-structured layer is disposed on the second major surface of the substrate, the second nano-structured layer comprising a second matrix and a second nano-scale dispersed phase, and having a second random nano-structured anisotropic surface at the second major surface of the second nano-structured layer; and

a second functional layer having first and second, generally opposed major surfaces, wherein the first major surface of the second functional layer is disposed on the second major surface of the second nano-structured layer, and wherein the second functional layer is at least one of a transparent conductive layer or a gas barrier layer.