CLAIMS

1. A film comprising a thermoplastic composition, wherein the composition contains a continuous phase that includes a polyolefin matrix polymer and a nanoinclusion additive dispersed within the continuous phase in the form of discrete domains, wherein a porous network is defined in the composition that includes a plurality of nanopores having an average cross-sectional dimension of about 800 nanometers or less.

2. The film of claim 1, wherein the nanopores have an average cross-sectional dimension of from about 5 to about 700 nanometers and/or, wherein the nanopores have an average axial dimension of from about 100 to about 5000 nanometers.

3. The film of any one of the foregoing claims, wherein the polyolefin matrix polymer has a melt flow rate of from about 0.5 to about 80 grams per 10 minutes, determined at a load of 2160 grams and at 230°C in accordance with ASTM D1238.

4. The film of any one of the foregoing claims, wherein the polyolefin matrix polymer is a propylene homopolymer, propylene/α-olefin copolymer, or a combination thereof.

5. The film of any one of the foregoing claims wherein the polyolefin matrix polymer is a substantially isotactic polypropylene homopolymer or a copolymer containing at least about 90% by weight propylene.

6. The film of any one of the foregoing claims, wherein the continuous phase constitutes from about 60 wt.% to about 99 wt.% of the thermoplastic composition and/or wherein the nanoinclusion additive constitutes from about 0.05 wt.% to about 20 wt.% of the composition, based on the weight of the continuous phase.

7. The film of any one of the foregoing claims, wherein the nanoinclusion additive is a liquid or semi-solid at room temperature.

8. The film of any one of the foregoing claims, wherein the nanoinclusion additive is a polymer having a nonpolar component.

9. The film of claim 8, wherein the polymer further contains a polar component.

10. The film of claim 9, wherein the polymer is a functionalized polyolefin.

11. The film of claim 10, wherein the functionalized polyolefin is a polyepoxide.

12. The film of any one of the foregoing claims, wherein the nanoinclusion additive has melt flow rate of from about 0.1 to about 100 grams per 10 minutes, determined at a load of 2160 grams and at a temperature at least about 40°C above the melting temperature in accordance with ASTM D1238, and/or wherein the ratio of the melt flow rate of the polyolefin matrix polymer to the melt flow rate of the nanoinclusion additive is from about 0.2 to about 8.

13. The film of claim any one of the foregoing claims, wherein the nanoinclusion additive is in the form of nano-scale domains, wherein the nano-scale domains have an average cross-sectional dimension of from about 1 nanometer to about 1000 nanometers.

14. The film of any one of the foregoing claims, wherein the composition further comprises a microinclusion additive dispersed within the continuous phase in the form of discrete domains.

15. The film of claim 14, wherein the microinclusion additive is a polymer.

16. The film of claim 15, wherein the polymer of the microinclusion additive is a styrenic copolymer, fluoropolymer, polyvinyl alcohol, polyvinyl acetate, or polyester.

17. The film of claim 15, wherein the polymer of the microinclusion additive is polylactic acid.

18. The film of claim 15, wherein the microinclusion additive has a glass transition temperature of about 0°C or more and/or wherein the microinclusion additive has a melt flow rate of from about 5 to about 200 grams per 10 minutes, determined at a load of 2160 grams and at a temperature of 210°C.

19. The film of claim 15, wherein the ratio of the melt flow rate of the microinclusion additive to the melt flow rate of the polyolefin matrix polymer is from about 0.5 to about 10 and/or wherein the ratio of the Young's modulus elasticity of the polyolefin matrix polymer to the Young's modulus of elasticity of the microinclusion additive is from about 1 to about 250.

20. The film of claim 14, wherein the microinclusion additive is in the form of micro-scale domains having an average axial dimension of from about 1 micrometer to about 400 mircometers.

21. The film of claim 14, wherein the microinclusion additive constitutes from about 1 wt.% to about 30 wt.% of the composition, based on the weight of the continuous phase.

22. The film of any one of the foregoing claims, wherein the thermoplastic composition further comprises an interphase modifier.

23. The film of any one of the foregoing claims, wherein the porous network further includes micropores.

24. The film of any one of the foregoing claims, wherein the porous network is distributed in a substantially homogeneous fashion throughout the composition.

25. The film of any one of the foregoing claims, wherein the nanopores are distributed in generally parallel columns.

26. The film of any one of the foregoing claims, wherein the total pore volume of the composition is from about 15% to about 80% per cubic centimeter and/or wherein the nanopores constitute about 20 vol.% or more of the total pore volume of the composition.

27. The film of any one of the foregoing claims, wherein the thermoplastic composition has a density of about 0.90 g/cm^3 or less and/ or wherein the film has a water vapor transmission rate of about 300 g/m^2/24 hours or more.

28. The film of any one of the foregoing claims, wherein the film is a multi-layered film that contains a core layer and at least one outer layer, wherein the core layer, the outer layer, or both contain the thermoplastic composition.

29. The film of any one of the foregoing claims, wherein the film is a blown film or wherein the film is a cast film.