

Claims

What is claimed is:

1. A biodegradable food material comprising:
a composite material with fibrillated cellulose having independently derived plant fibers, said composite material being generally free from toxic chemical additives, said chemical additives adapted for improving dry tensile strength, enhanced oil barrier, gas and/or liquid impermeability, a dry tensile modulus, or a dry tensile index;
wherein the composite material comprises properties of:
an oxygen transmission rate of about $8000 \text{ cm}^3 \text{ m}^{-2} 24 \text{ h}^{-1}$ or less,
a water vapor transmission rate of $3000 \text{ g m}^{-2} 24 \text{ h}^{-1}$ or less,
a dry tensile strength of about 30 MPa or higher,
a dry tensile modulus of about 4 GPa or higher, and
a dry tensile index of about 45 Nm g^{-1} or higher.
2. The biodegradable food material of claim 1, wherein the composite material comprises the fibrillated cellulose with different diameters having a weight ratio of 1: 100 or 1: 50.
3. The biodegradable food material of claim 1, wherein the composite material comprises the fibrillated cellulose with a diameter of about 1-10000 nanometer (nm).
4. The biodegradable food material of claim 1, wherein the composite material comprises the fibrillated cellulose having a length about 0.1 – 1000 micrometers, about 10 – 500 micrometers, about 1 – 25 micrometers, or about 0.2 – 100 micrometers.
5. The biodegradable food material of claim 1, wherein the composite material further comprises additional properties of:
a wet tensile strength of about 5 MPa or higher,
a wet tensile modulus of about 0.4 MPa or higher, and
a wet tensile index of about 5 Nm g^{-1} or higher.
6. The biodegradable food material of claim 1, wherein the composite material is a planar

sheet.

7. The biodegradable food material of claim 1, wherein the composite material comprises a container for edible items.

8. The biodegradable food material of claim 1, wherein the composite material comprises a fibrillated cellulose mixture.

9. The biodegradable food material of claim 1, wherein the composite material comprises a film with a thickness of about 0.01 – 3.0 millimeter (mm).

10. The biodegradable food material of claim 6, wherein the planar sheet comprises a length ranging from 0.01 mm to 10000 mm.

11. A biodegradable material comprising:

a composite material with fibrillated cellulose having independently derived plant fibers, said composite material being generally free from toxic chemical additives, said chemical additives adapted for improving dry tensile strength, enhanced oil barrier, gas and/or liquid impermeability, a dry tensile modulus, or a dry tensile index;

wherein the composite material comprises properties of:

an oxygen transmission rate of about 8000 cm³ m⁻² 24 h⁻¹ or less,

a water vapor transmission rate of 3000 g m⁻² 24 h⁻¹ or less,

a wet tensile strength of about 5 MPa or higher,

a wet tensile modulus of about 0.4 MPa or higher, and

a wet tensile index of about 5 Nm g⁻¹ or higher.

12. The biodegradable material of claim 11, wherein the composite material further comprises additional properties of:

a dry tensile strength of about 30 MPa or higher,

a dry tensile modulus of 4 GPa or higher, and

a dry tensile index of about 45 Nm g⁻¹ or higher.

13. The biodegradable material of claim 11, wherein the composite material comprises the fibrillated cellulose with different diameters having a weight ratio of 1: 100 or 1: 50.
14. The biodegradable material of claim 11, wherein the composite material comprises the fibrillated cellulose with a diameter of about 1-10000 nanometer (nm).
15. The biodegradable material of claim 11, wherein the composite material comprises the fibrillated cellulose having a length about 0.1 – 1000 micrometers, about 10 – 500 micrometers, about 1 – 25 micrometers, or about 0.2 – 100 micrometers.
16. The biodegradable material of claim 11, wherein the composite material comprises a planar sheet.
17. The biodegradable material of claim 16, wherein the planar sheet comprises a length ranging from 0.01 mm to 10000 mm.
18. The biodegradable material of claim 11, wherein the composite material comprises a fibrillated cellulose mixture.
19. The biodegradable material of claim 11, wherein the composite material comprises a film with a thickness of about 0.01 – 3.0 millimeter (mm).
20. The biodegradable material of claim 11, wherein the composite material comprises a container for edible items.