

Claims

What is claimed is:

1. An apparatus for generating a biodegradable material comprising:
a first unit for receiving a first material;
wherein the first unit comprises a fiber catcher for catching a portion of fibers in the first material;
a second unit for engaging the portion of the fibers;
a third unit for engaging a second material with the portion of the fibers, the second material and the portion of the fibers form a third material; and
a water removing unit for reducing water content in the third material.
2. The apparatus of claim 1, further comprising a shaper for shaping the third material after the water removing unit, wherein the shaper applies heat and pressure to the third material.
3. The apparatus of claim 1, wherein the first material comprise a pulp suspension.
4. The apparatus of claim 1, wherein the second material comprises a fibrillated cellulose slush after grinding.
5. The apparatus of claim 1, the third unit comprises a container for holding the second material.
6. The apparatus of claim 5, wherein the third unit comprises a heating element.
7. The apparatus of claim 6, wherein the heating element is configured to maintain a temperature of the second material at least about 40 degrees Celcius.
8. The apparatus of claim 6, wherein the heating element is configured to warm a temperature of the second material at least about 40 degrees Celcius when the surface material engages the first material.
9. The apparatus of claim 1, wherein the third material is generally free from

chemical additives adapted for improving tensile strength, enhanced oil barrier, gas and/or liquid impermeability, a tensile modulus, or a tensile index.

10. The apparatus of claim 1, wherein the third 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.
11. The apparatus of claim 1, wherein the third material 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.
12. The apparatus of claim 1, wherein the third material comprises the fibrillated cellulose with different diameters having a weight ratio of 1: 100 or 1: 50.
13. The apparatus of claim 1, wherein the third material comprises the fibrillated cellulose with a diameter of about 1-10000 nanometer (nm).
14. The apparatus of claim 1, wherein the third material comprises the fibrillated cellulose having about 0.1 – 1000 micrometers, about 10 – 500 micrometers, about 1 – 25 micrometers, or about 0.2 – 100 micrometers.
15. The apparatus of claim 1, wherein the third material comprises a planar sheet.
16. The apparatus of claim 1, wherein the third material comprises a container for edible items.
17. The apparatus of claim 1, wherein the third material comprises a fibrillated mixture.

18. The apparatus of claim 1, wherein the third material comprises a film with a thickness of about 0.01 – 3.0 millimeter (mm).
19. The apparatus of claim 15, wherein the planar sheet comprises a length ranging from 0.01 mm to 10000 mm.
20. An apparatus for generating a biodegradable material comprising:
a second unit for engaging a second material;
a third unit for engaging the second material in a vacuum state to form a third material; and
a water removing unit for reducing water content in the third material.
21. A method for generating a biodegradable material comprising:
engaging a second material;
engaging the second material in a vacuum state to form a third material; and
reducing water content in the third material.
22. A method for generating a biodegradable material comprising:
receiving a first material at a fiber catcher for catching a portion of fibers in the first material;
engaging a second material;
engaging the second material in a vacuum state to form a third material; and
reducing water content in the third material.