CLAIMS

1. A method comprising:

irradiating a lignocellulosic material in air with from about 10 Mrad to about 150 Mrad of radiation, using an electron beam, to generate carboxylic acid groups by reaction of the irradiated feedstock with the air and thereby provide an irradiated lignocellulosic material having a larger number of carboxylic acid groups than the lignocellulosic material from which the irradiated material was obtained; and

converting the irradiated lignocellulosic material to a product selected from the group consisting of alcohols, organic acids, sugars, hydrocarbons, and mixtures thereof, utilizing an enzyme and/or a microorganism.

2. The method of claim 1 wherein the treated material further comprises functional groups selected from the group consisting of hydroxyl groups, aldehyde groups, ketone groups and ester groups.

3. The method of claim 1 further comprising removing lignin from the lignocellulosic material.

4. The method of claim 1 wherein the lignocellulosic material comprises a fibrous material.

5. The method of claim 1, wherein the ~~biomass feedstock~~ has a bulk density of less than about 0.5 g/cm^3.

6. The method of claim 1 further comprising physically treating the lignocellulosic material by shearing, stone grinding, mechanical ripping or tearing, pin grinding, or air attrition milling.

7. The method of claim 1 wherein the lignocellulosic material has a BET surface area of greater than 0.25 m^2/g.

8. The method of claim 1 wherein converting the irradiated lignocellulosic material comprises fermenting.

9. The method of claim 1, wherein the lignocellulosic material comprises a material selected from the group consisting of wood, particle board, sawdust, agricultural waste, sewage, silage, grasses, rice hulls, bagasse, ~~cotton~~, jute, hemp, flax, bamboo, sisal, abaca, straw, corn cobs, corn stover, switchgrass, alfalfa, hay, coconut hair, seaweed, algae, and mixtures thereof.

10. The method of claim 1 wherein the lignocellulosic material has a porosity greater than 70 percent.

11. The method of claim 1 wherein converting the irradiated lignocellulosic material comprises subjecting the material to enzymatic hydrolysis.

12. The method of claim 1 wherein irradiating is performed at a dose rate of 1 Mrad/s to 10 Mrad/s.

13. The method of claim 1 wherein irradiating comprises applying radiation to the lignocellulosic material with more than one electron beam device.

14. The method of claim 1 wherein the electron beam delivers electrons having an energy of 0.3 MeV to 2.0 MeV.

15. The method of claim 1 wherein the electron beam delivers electrons having an energy of 0.7 MeV to 1.25 MeV.

16. The method of claim 11 wherein converting comprises contacting the irradiated material with a cellulase in an aqueous medium.

CLAIMS

1. A method comprising:

irradiating a lignocellulosic material in air with from about 10 Mrad to about 150 Mrad of radiation, using an electron beam, to generate carboxylic acid groups by reaction of the irradiated feedstock with the air and thereby provide an irradiated lignocellulosic material having a larger number of carboxylic acid groups than the lignocellulosic material from which the irradiated material was obtained; and

converting the irradiated lignocellulosic material to a product selected from the group consisting of alcohols, organic acids, sugars, hydrocarbons, and mixtures thereof, utilizing an enzyme and/or a microorganism.

2. The method of claim 1 wherein the treated material further comprises functional groups selected from the group consisting of hydroxyl groups, aldehyde groups, ketone groups and ester groups.

3. The method of claim 1 further comprising removing lignin from the lignocellulosic material.

4. The method of claim 1 wherein the lignocellulosic material comprises a fibrous material.

5. The method of claim 1, wherein the lignocellulosic material has a bulk density of less than about 0.5 g/cm^3.

6. The method of claim 1 further comprising physically treating the lignocellulosic material by shearing, stone grinding, mechanical ripping or tearing, pin grinding, or air attrition milling.

7. The method of claim 1 wherein the lignocellulosic material has a BET surface area of greater than 0.25 m^2/g.

8. The method of claim 1 wherein converting the irradiated lignocellulosic material comprises fermenting.

oo