WHAT IS CLAIMED IS:

1. A method of making a product, the method comprising:

saccharifying a reduced recalcitrance cellulosic and/or reduced recalcitrance lignocellulosic material using one or more enzymes, in a liquid, to form a saccharified mixture comprising glucose, xylose, and a saccharified cellulosic or lignocellulosic residue material, wherein the recalcitrance of the cellulosic and/or lignocellulosic material is reduced by irradiation with ionizing radiation,

contacting the saccharified mixture with an organism, wherein the organism selectively ferments glucose to provide one or more unfermented sugars including xylose, fermentation solids and a first fermentation product,

isolating the first fermentation product from unfermented sugars and fermentation solids, and

isolating the one or more unfermented sugars including xylose from the fermentation solids.

2. The method of claim 1 further comprising isolating the first fermentation product by a method selected from the group consisting of filtering, centrifuging, evaporation, distillation, crystallization, precipitation, extraction, chromatography, electrodialysis, and combinations thereof.

3. The method of claim 1 further comprising distilling the fermentation product from the one or more unfermented sugars and fermentation solids.

4. The method of any one of the above claims further comprising isolating the one or more unfermented sugars by a method selected from the group consisting of filtering, centrifuging, evaporation, distillation, crystallization, precipitation, extraction, chromatography, electrodialysis, and combinations thereof.

5. The method of any one of the above claims further comprising utilizing the fermentation solids as a nutrient source.

6. The method of claim 1 further comprising utilizing the fermentation solids for a second fermentation.

7. The method of any one of the above claims further comprising utilizing the fermentation solids to assist in a second fermentation, wherein the fermentation solids contain living organisms or remnants of living organisms.

8. The method of any one of the above claims further comprising converting the xylose to another product.

9. The method of claim 1 wherein a product of the fermentation comprises an alcohol.

10. The method of claim 9 wherein a product of the fermentation comprises ethanol.

11. The method of claim 1 wherein the organism comprises a yeast, or a mixture of organisms, such as a yeast and a bacterium.

12. The method of claim 8 where the another product is xylitol.

13. The method of claim 1 wherein the ionizing radiation comprises accelerated electrons from an electron beam.

14. The method of claim 13 wherein a total dose of radiation applied to the cellulose or lignocellulosic material is between about 10 Mrad and about 200 Mrad, such as between about 15 Mrad and about 75 Mrad or between about 20 Mrad and about 50 Mrad.

15. The method of any one of the above claims further comprising isolating lignin-derived compounds, such as soluble lignin-derived compounds, from the saccharified material prior to contacting the saccharified material with the fermenting organism.

16. The method of claim 1 wherein the glucose and xylose comprise at least 50 wt. % of total carbohydrates available in the reduced recalcitrance cellulosic or lignocellulosic material.

17. The method of claim 16 wherein glucose comprises at least 10 wt. % of the monosaccharides present in the saccharified material.

18. The method of claim 1 wherein the xylose is produced at a concentration of at least about 20 g/L.

19. The method of claim 1, further comprising,
fermenting the xylose to produce a second fermentation product.

20. The method of claim 19 further comprising isolating the second fermentation product from unfermented sugars and fermentation solids.

21. The method of claims 19 or 20 further comprising isolating the second fermentation product by a method selected from the group consisting of filtering, centrifuging, evaporation, distillation, crystallization, precipitation, extraction, chromatography, electrodialysis, and combinations thereof.

22. The method of claims 19, 20 or 21 where the first or second product is selected from the group consisting of sugars, sugar alcohols, alcohols, organic acids, unsaturated acids, carboxylic esters, unsaturated esters, anhydrides, aldehydes, ketones, hydrogen, carbon dioxide, fuels, biodiesel and combinations thereof.

23. The method of claim 1 where the liquid is aqueous.

24. The method of claim 5 where the fermentation solids are used as nutrient source for mammals.

25. The method of claim 3 where the fermentation solids are isolated as distillation bottoms.

26. The method of claim 25 where the second fermentation uses distillation bottoms as a nutrient source for the second fermentation.

27. The method of claim 22 where the product of the fermentation is an organic acid.

28. The method of claim 27 where the product is acetic or butyric acid.