CLAIMS

1. In a process for C5 and C6 sugar recovery from lignocellulosic biomass for fermentation to ethanol, including the steps of pretreatment of the biomass with steam at elevated temperature and pressure, collection of C5 sugars from hemicellulose breakdown, cellulose hydrolysis and collection of C6 sugars from cellulose breakdown, the improvement comprising

conditioning of the biomass prior to the pretreatment step by:
heating the biomass with steam for a time period between 5 minutes to 60 minutes to achieve a steam treated biomass having a temperature of about 80 to 100$^{o}$C;

squeezing the steam heated biomass for removing a liquid stream containing resins, oils, fatty acids or other inhibitors of downstream hydrolysis or fermentation; and

after the step of squeezing the steam heated biomass, adding water, or water and a user selected catalyst desired for the pretreatment process, for adjusting a moisture content of the steam treated biomass to about 45% to 80%.

2. The process of claim 1, wherein the moisture content is adjusted to about 55% to 80%.

3. The process of claim 1, wherein the moisture content is adjusted to about 65% to 80%.

4. The process of claim 1, wherein the moisture content is adjusted to about 70% to 75%.

5. The process of claim 1, wherein the heating step is carried out at atmospheric pressure.

6. The process of claim 5, wherein the time period is about 10 to 60 minutes.

7. The process of claim 5, wherein the time period is about 10 to 30 minutes.

8. The process of claim 5, wherein the time period is about 15 to 30 minutes.

9. The process of claim 5, wherein the time period is approximately 20 minutes.

10. The process of claim 5, wherein the temperature of the steam heated biomass is between 95°C and 99°C.

11. In a process for C5 and C6 sugar recovery from lignocellulosic biomass for fermentation to ethanol, including the steps of pretreatment of the biomass with steam at elevated temperature and pressure, collection of C5 sugars from hemicellulose breakdown, cellulose hydrolysis and collection of C6 sugars from cellulose breakdown, the improvement comprising

conditioning of the biomass prior to the pretreatment step by:

heating the biomass with steam for a time period between 5 minutes to 60 minutes to achieve a steam treated biomass having a temperature of about 80 to 100°C;

squeezing the steam heated biomass at a 2-1 to 6-1 compression ratio for removing a liquid stream containing resins, oils, fatty acids or other inhibitors of downstream hydrolysis or fermentation; and

after the step of squeezing the steam heated biomass, adding water, or water and a user selected catalyst desired for the pretreatment process, for adjusting a moisture content of the steam treated biomass to about 45% to 80%.

12. The process of claim 11, wherein the steam heated biomass is squeezed at a 3-1 to 4-1 compression ratio.

13. The process of claim 12, wherein the steam heated biomass is squeezed at a 4-1 compression ratio.

14. The process of claim 1 or 11, wherein the water and the chemical catalyst are added to achieve a catalyst content and a 65% to 75% moisture content of the steam treated biomass.

15. The process of claim 14, wherein the chemical catalyst is sulfuric acid in a sulfuric acid concentration from 0.2% to 2% of biomass by weight.

16. The process of claim 15, where the sulfuric acid concentration is from 0.5% to 2% of the biomass by weight.

17. The process of claim 16, where the sulfuric acid concentration is from 0.8% to 1.0% of the biomass by weight.

18. The process of claim 1 or 11, wherein the biomass has a moisture content of 30-55% prior to the steam heating step of the conditioning.

19. The process of claim 1 or 11, wherein the heating with steam is conducted for 55 to 60 minutes for achieving a biomass temperature of about 80°C.

20. The process of claim 1 or 11, wherein the heating with steam is conducted for 40 to 60 minutes for achieving a biomass temperature of about 85°C.

21. The process of claim 1 or 11, wherein the heating with steam is conducted at a biomass temperature of 90°C for 27 to 55 minutes.

22. The process of claim 1 or 11, wherein the heating with steam is conducted for 20 to 40 minutes for achieving a biomass temperature of about 95°C.

23. The process of claim 1 or 11, wherein the heating with steam is conducted for 15 to 30 minutes for achieving a biomass temperature of about 99°C.

24. The process of claim 1 or 11, wherein the heating with steam is conducted for 14 to 28 minutes for achieving a biomass temperature of about 100°C.

25. The process of claim 1 or 11, wherein the conditioned biomass contains 68-72% moisture by weight prior to the pretreatment process.

26. The process of claim 25, wherein the biomass is corn cobs.

27. The process of claim 2, wherein the conditioned biomass contains 68-72% moisture content and 0.7% to 0.09% sulfuric acid content by weight prior to the pretreatment process.

28. The process of claim 1 or 11, wherein the conditioned biomass is corn cobs and contains 68-72% moisture content and 0.7% to 0.09% sulfuric acid content by weight prior to the pretreatment process.

29. The process of claim 1 or 11, wherein volatile gasses are released during the conditioning process.

**CLAIMS:**

1. In a process for C5 and C6 sugar recovery from lignocellulosic biomass for fermentation to ethanol, including the steps of pretreatment of the biomass with steam at elevated temperature and pressure, collection of C5 sugars from hemicellulose breakdown, cellulose hydrolysis and collection of C6 sugars from cellulose breakdown, the improvement comprising

conditioning of the biomass prior to the pretreatment step by:

heating the biomass with steam for a time period between 5 minutes to 60 minutes to achieve a steam treated biomass having a temperature of about 80 to 100$^{o}$C; and

adjusting a moisture content of the steam treated biomass to about 45% to 80% by weight.

2. The process of claim 1, further including the step of adding to the conditioned biomass a user selected catalyst desired for the pretreatment process.

3. The process of claim 1, wherein, after the step of heating the biomass, the process comprises the additional step of squeezing the steam heated biomass for removing a liquid stream containing resins, oils, fatty acids or other inhibitors of downstream hydrolysis or fermentation.

4. The process of claim 3, further comprising the step of adding water, or water and a catalyst after the step of squeezing the steam heated biomass.

5. The process of claim 1, wherein the moisture content is adjusted to about 55% to 80% by weight.

6. The process of claim 1, wherein the moisture content is adjusted to about 65% to 80% by weight.

7. The process of claim 1, wherein the moisture content is adjusted to about 70% to 75% by weight.

8. The process of claim 1, wherein the heating step is carried out at atmospheric pressure.

9. The process of claim 8, wherein the time period is about 10 to 60 minutes.

10. The process of claim 8, wherein the time period is about 10 to 30 minutes.

11. The process of claim 8, wherein the time period is about 15 to 30 minutes.

12. The process of claim 8, wherein the time period is approximately 20 minutes.

13. The process of claim 8, wherein the temperature of the steam heated biomass is between 95ºC and 99ºC.

14. The process of claim 3, wherein the steam heated biomass is squeezed at a 2-1 to 6-1 compression ratio.

15. The process of claim 14, wherein the steam heated biomass is squeezed at a 3-1 to 4-1 compression ratio.

16. The process of claim 15, wherein the steam heated biomass is squeezed at a 4-1 compression ratio.

17. The process of claim 1, further comprising the step of mixing the steam heated biomass with water, or water and a chemical catalyst prior to the pretreatment step to achieve a catalyst content of 0.07% to 0.09% of biomass by weight and 65% to 75% by weight moisture content.

18. The process of claim 17, wherein the chemical catalyst is sulfuric acid in a sulfuric acid concentration from 0.2% to 2% by volume.

19. The process of claim 18, where the sulfuric acid concentration is from 0.5% to 2% by volume.

20. The process of claim 19, where the sulfuric acid concentration is from 0.8% to 1.0% by volume.

21. The process of claim 1, wherein the biomass has a moisture content of 30-55% prior to the steam heating step of the conditioning.

22. The process of claim 1, wherein the heating with steam is conducted for 55 to 60 minutes for achieving a biomass temperature of about 80$^{o}$C.

23. The process of claim 1, wherein the heating with steam is conducted for 40 to 60 minutes for achieving a biomass temperature of about 85$^{o}$C.

24. The process of claim 1, wherein the heating with steam is conducted at a biomass temperature of 90$^{o}$C for 27 to 55 minutes.

25. The process of claim 1, wherein the heating with steam is conducted for 20 to 40 minutes for achieving a biomass temperature of about 95$^{o}$C.

26. The process of claim 1, wherein the heating with steam is conducted for 15 to 30 minutes for achieving a biomass temperature of about 99$^{o}$C.

27. The process of claim 1, wherein the heating with steam is conducted for 14 to 28 minutes for achieving a biomass temperature of about 100$^{o}$C.

28. The process of claim 1, wherein the conditioned biomass contains 68-72% moisture content by weight prior to the pretreatment process.

29. The process of claim 28, wherein the biomass is corn cobs.

30. The process of claim 2, wherein the conditioned biomass contains 68-72% moisture content and 0.7% to 0.09% sulfuric acid content by weight prior to the pretreatment process.

31. The process of claim 2, wherein the conditioned biomass is corn cobs and contains 68-72% moisture content and 0.7% to 0.09% sulfuric acid content biomass by weight prior to the pretreatment process.

32. The process of claim 1, wherein volatile gasses are released during the conditioning process.