CLAIMS

What is claimed is:

1. A method of preparing lignin from lignocellulosic biomass, comprising:

providing lignocellulosic biomass at a first pressure and at a first temperature, lignocellulosic biomass comprising:

a first solid fraction comprising:

insoluble lignin; and

a first liquid fraction comprising:

soluble C_6 saccharides; and

optionally, soluble lignin;

reducing said first temperature of said lignocellulosic biomass to a second temperature at least about 1°C above the glass transition temperature of lignin under said first pressure; and

reducing said first pressure of said lignocellulosic biomass at said second temperature to a second pressure in a time less than about 1 second to precipitate said soluble lignin in said first liquid fraction and form a mixture comprising:

a second solid fraction comprising:

insoluble lignin; and

precipitated lignin; and

a second liquid fraction comprising:

soluble C_6 saccharides.

2. A method of claim 1,

wherein said method is continuous.

3. A method of claim 1, further comprising:

reducing the temperature of said mixture.

4. A method of claim 1, further comprising:

permitting said insoluble lignin and said precipitated lignin to separate out by gravity.

5. A method of claim 1, further comprising:

separating said second solid fraction and said second liquid fraction.

6. A method of claim 1,

wherein said second pressure is greater than atmospheric pressure.

7. A method of claim 6, further comprising:

reducing the second pressure to atmospheric pressure.

8. A method of claim 1,

wherein said second pressure is atmospheric pressure.

9. A method of claim 1, further comprising:

recovering heat using at least one heat exchanger.

10. A method of claim 1,

wherein said lignocellulosic biomass is fractionated to remove at least a portion of C_5 saccharides prior to said providing step.

11. A method of claim 1,

wherein the average particle size of said insoluble lignin and precipitated lignin is less than about 500 microns.

12. A lignin product produced by the method of claim 1.

13. A lignin product of claim 12,

wherein said lignin product is used as a fuel, tackifier, phenol formaldehyde resin extender in the manufacture of particle board and plywood, in the manufacture of molding compounds, urethane and epoxy resins, antioxidants, controlled-release agents, flow control agents, cement/concrete mixing, plasterboard production, oil drilling, general dispersion, tanning leather, road covering, vanillin production, dimethyl sulfide and dimethyl sulfoxide production, phenol substitute in phenolic resins incorporation into polyolefin blends, aromatic (phenol) monomers, additional miscellaneous monomers, carbon fibers, metal sequestration in solutions, basis of gel formation, polyurethane copolymer, and combinations thereof.

14. A composition, comprising:

lignin;

wherein said lignin is processed from lignocellulosic biomass using supercritical or near critical fluid extraction.

15. A composition of claim 14,

wherein said lignin has an average particle size less than about 500 microns.

16. A composition of claim 14,

wherein said lignin has a heating value as measured by ASTM-D240 of at least about 5,000 BTU/lb at 30% moisture content.

17. A composition of claim 14,

wherein said lignin has a heating value as measured by ASTM-D240 of at least about 7,500 BTU/lb at 15% moisture content.

18. A composition of claim 14,

wherein said lignin has a heating value as measured by ASTM-D240 of at least about 8,000 BTU/lb at 5% moisture content.

19. A composition of claim 14,

wherein said composition is substantially free of organic solvent.

CLAIMS

What is claimed is:

1. A composition comprising,

lignin;

wherein said composition has an ash content of less than about 0.5 wt.%;

wherein said ash comprises at least about 18 wt.% Ca as CaO; and

wherein said ash comprises at least about 22 wt.% Fe as Fe2O3.

2. The composition of claim 1,

wherein said composition has a heating value of at least about 7,500 BTU/lb at 15% moisture content.

3. The composition of claim 1,

wherein said composition has a moisture content of about 5% to about 30%.

4. The composition of claim 1,

wherein said composition comprises less than about 0.15% N, as measured in an ultimate analysis.

5. The composition of claim 1,

wherein said composition comprises less than about 0.02% S, as measured in an ultimate analysis.

6. The composition of claim 1,

wherein said ash comprises about 29 wt.% Si as SiO_2.

7. The composition of claim 1,

wherein said ash comprises about 13 wt.% S as SO_3.

8. The composition of claim 1,

wherein said ash comprises about 1 wt.% P as P_2O_5.

9. The composition of claim 1,

wherein said composition has a softening temperature of at least about 1172 °C, as measured in an oxidizing atmosphere.

10. The composition of claim 1,

wherein said lignin has a particle size less than about 500 microns.

11. The composition of claim 1,

wherein said lignin has a particle size less than about 50 microns.

12. The composition of claim 1,

wherein said lignin has a particle size of about 10 microns to about 30 microns.

13. The composition of claim 1,

wherein said composition is substantially free of organic solvent.

14. The composition of claim 1,

wherein said composition is used as a fuel.

15. The composition of claim 14,

wherein, when said composition is used as a fuel in a combustion chamber, said composition has a softening temperature of about 35 °C to about 65 °C above a flue gas temperature peak at an exit of the combustion chamber.

16. The composition of claim 1,

wherein, in a proximate analysis, said composition has greater than 55 wt.% volatile matter.

17. The composition of claim 1,

wherein said lignin is processed from lignocellulosic biomass using supercritical or near critical fluid extraction.

18. The composition of claim 17,

wherein said supercritical or near critical fluid comprises water.