What is claimed is:

1. A composition, comprising:

lignin; and

less than about 2000 mg in total per kg of said lignin of elements;

wherein said elements are Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Na, Ni, P, Pb, S, Sb, Se, Si, Sn, Sr, Ti, Tl, V, and Zn.

2. A composition of claim 1,

wherein said lignin has a heating value as measured by ASTM-D240 and D5865 of at least about 5,000 BTU/lb.

3. A composition of claim 1,

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

4. A composition of claim 1,

wherein said lignin has a bulk density of less than about 0.35 g/cc.

5. A composition of claim 1,

wherein said lignin is processed from lignocellulosic biomass optionally using supercritical, subcritical, or near critical fluid extraction or combinations thereof.

6. A composition of claim 1,

wherein said composition is substantially free of organic solvent.

7. A composition of claim 1,

wherein said lignin is in a powdered form.

8. A composition of claim 1,

wherein said lignin is in a pelletized form.

9. A composition of claim 1,

wherein said lignin is in a liquid form.

10. A composition of claim 1, further comprising:

less than about 700 mg of calcium per kg of said lignin.

11. A composition of claim 1, further comprising:

less than about 525 mg of iron per kg of said lignin.

12. A composition of claim 1, further comprising:

less than about 150 mg of sulfur per kg of said lignin.

13. A composition of claim 1, further comprising:

less than about 20 g of ash per kg of said lignin.

14. A composition of claim 1, further comprising:

less than about 2000 mg of nitrogen per kg of said lignin.

15. A composition of claim 1, further comprising:

a weight ratio of the total mass of hydrogen and nitrogen to carbon of less than about 0.110.

16. A composition of claim 1,

wherein said lignin is present at a level of at least 30% by weight, based on the total weight of the composition, as measured by pyrolysis molecular beam mass spectrometry.

17. A composition of claim 1,

wherein the weight ratio of syringyl monolignol to guaiacyl monolignol is about 2.0 to about 3.0, as measured by pyrolysis molecular beam mass spectrometry.

18. A composition, comprising:

lignin;

less than about 700 mg of calcium per kg of said lignin;

less than about 525 mg of iron per kg of said lignin; and

less than about 150 mg of sulfur per kg of said lignin.

19. A composition of claim 18, further comprising:

less than about 2000 mg in total per kg of said lignin of elements;

wherein said elements are Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Na, Ni, P, Pb, S, Sb, Se, Si, Sn, Sr, Ti, Tl, V, and Zn.

20. A composition, comprising:

lignin; and

less than about 525 mg of iron per kg of said lignin.

21. A composition of claim 20, further comprising:

less than about 700 mg of calcium per kg of said lignin.

22. A composition of claim 20, further comprising:

less than about 2000 mg in total per kg of said lignin of elements;

wherein said elements are Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Na, Ni, P, Pb, S, Sb, Se, Si, Sn, Sr, Ti, Tl, V, and Zn.

23. A composition, comprising:

lignin; and

less than about 150 mg of sulfur per kg of said lignin.

24. A composition of claim 23, further comprising:

less than about 2000 mg in total per kg of said lignin of elements;

wherein said elements are Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Na, Ni, P, Pb, S, Sb, Se, Si, Sn, Sr, Ti, Tl, V, and Zn.

25. A composition of claim 23, further comprising:

less than about 700 mg of calcium per kg of said lignin.

26. A composition of claim 23, further comprising:

less than about 525 mg of iron per kg of said lignin.

What is claimed is:

1. A composition, comprising:

lignin; and

less than about 2000 mg in total per kg of said lignin of elements;

wherein said elements are Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Na, Ni, P, Pb, S, Sb, Se, Si, Sn, Sr, Ti, Tl, V, and Zn;

wherein said composition is produced by a process comprising:

providing a mixture comprising lignocellulosic biomass and water;

heating said mixture to a first temperature of about 130 °C to about 250 °C and maintaining said first temperature for a period of about 0.5 min to about 5 hours, thereby producing a solids fraction and a liquid fraction; and

subjecting said solids fraction to a supercritical or near-critical fluid under a pressure of about 40 bar to about 300 bar;

wherein said supercritical or near-critical fluid comprises water; and

wherein said supercritical or near-critical fluid is at a temperature of about 374 °C to about 600 °C;

wherein said subjecting step elevates said solids fraction to a second temperature of about 250 °C to about 450 °C; and

wherein said solids fraction is maintained at said second temperature for a period of about 0.05 sec to about 10 sec.

2. A composition of claim 1,

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

3. A composition of claim 1,

wherein said lignin has a bulk density of less than about 0.35 g/cc.

4. A composition of claim 1,

wherein said lignin is in a powdered form.

5. A composition of claim 1,

wherein said lignin is in a pelletized form.

6. A composition of claim 1, further comprising:

less than about 700 mg of calcium per kg of said lignin.

7. A composition of claim 1, further comprising:

less than about 525 mg of iron per kg of said lignin.

8. A composition of claim 1, further comprising:

less than about 150 mg of sulfur per kg of said lignin.

9. A composition of claim 1, further comprising:

less than about 20 g of ash per kg of said lignin.

10. A composition of claim 1, further comprising:

less than about 2000 mg of nitrogen per kg of said lignin.

11. A composition of claim 1, further comprising:

a weight ratio of the total mass of hydrogen and nitrogen to carbon of less than about 0.110.

12. A composition of claim 1,

wherein said lignin is present at a level of at least 30% by weight, based on the total weight of the composition, as measured by pyrolysis molecular beam mass spectrometry.

13. A composition of claim 1,

wherein the weight ratio of syringyl monolignol to guaiacyl monolignol is about 2.0 to about 3.0, as measured by pyrolysis molecular beam mass spectrometry.

14. A composition of claim 1,

wherein said heating is performed at a pressure of about 4 bar to about 100 bar.

15. A composition of claim 1,

wherein said heating is performed for a period of about 1 min to about 120 min.

16. A composition of claim 1,

wherein said supercritical or near-critical fluid is under a pressure of about 230 bar to about 300 bar.

17. A composition of claim 1,

wherein said supercritical or near-critical fluid is under a pressure of about 40 bar to about 260 bar.

18. A composition of claim 1,

wherein said composition is substantially free of organic solvent.

19. A composition, comprising:

lignin;

less than about 700 mg of calcium per kg of said lignin;

less than about 525 mg of iron per kg of said lignin; and

less than about 150 mg of sulfur per kg of said lignin;

wherein said composition is produced by a process comprising:

providing a mixture comprising lignocellulosic biomass and water;

heating said mixture to a first temperature of about 130 °C to about 250 °C and maintaining said first temperature for a period of about 0.5 min to about 5 hours, thereby producing a solids fraction and a liquid fraction; and

subjecting said solids fraction to a supercritical or near-critical fluid under a pressure of about 40 bar to about 300 bar;

wherein said supercritical or near-critical fluid comprises water; and

wherein said supercritical or near-critical fluid is at a temperature of about 374 °C to about 600 °C;

wherein said subjecting step elevates said solids fraction to a second temperature of about 250 °C to about 450 °C; and

wherein said solids fraction is maintained at said second temperature for a period of about 0.05 sec to about 10 sec.

20. A composition of claim 19, further comprising:

less than about 2000 mg in total per kg of said lignin of elements;

wherein said elements are Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Na, Ni, P, Pb, S, Sb, Se, Si, Sn, Sr, Ti, Tl, V, and Zn.

21. A composition, comprising:

lignin; and

less than about 525 mg of iron per kg of said lignin;

wherein said composition is produced by a process comprising:

providing a mixture comprising lignocellulosic biomass and water;

heating said mixture to a first temperature of about 130 °C to about 250 °C and maintaining said first temperature for a period of about 0.5 min to about 5 hours, thereby producing a solids fraction and a liquid fraction; and

subjecting said solids fraction to a supercritical or near-critical fluid under a pressure of about 40 bar to about 300 bar;

wherein said supercritical or near-critical fluid comprises water; and

wherein said supercritical or near-critical fluid is at a temperature of about 374 °C to about 600 °C;

wherein said subjecting step elevates said solids fraction to a second temperature of about 250 °C to about 450 °C; and

wherein said solids fraction is maintained at said second temperature for a period of about 0.05 sec to about 10 sec.

22. A composition of claim 21, further comprising:

less than about 700 mg of calcium per kg of said lignin.

23. A composition of claim 21, further comprising:

less than about 2000 mg in total per kg of said lignin of elements;

wherein said elements are Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Na, Ni, P, Pb, S, Sb, Se, Si, Sn, Sr, Ti, Tl, V, and Zn.

24. A composition, comprising:

lignin; and

less than about 150 mg of sulfur per kg of said lignin;

wherein said composition is produced by a process comprising:

providing a mixture comprising lignocellulosic biomass and water;

heating said mixture to a first temperature of about 130 °C to about 250 °C and maintaining said first temperature for a period of about 0.5 min to about 5 hours, thereby producing a solids fraction and a liquid fraction; and

subjecting said solids fraction to a supercritical or near-critical fluid under a pressure of about 40 bar to about 300 bar;

wherein said supercritical or near-critical fluid comprises water; and

wherein said supercritical or near-critical fluid is at a temperature of about 374 °C to about 600 °C;

wherein said subjecting step elevates said solids fraction to a second temperature of about 250 °C to about 450 °C; and

wherein said solids fraction is maintained at said second temperature for a period of about 0.05 sec to about 10 sec.

25. A composition of claim 24, further comprising:

less than about 2000 mg in total per kg of said lignin of elements;

wherein said elements are Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Na, Ni, P, Pb, S, Sb, Se, Si, Sn, Sr, Ti, Tl, V, and Zn.

26. A composition of claim 24, further comprising:

less than about 700 mg of calcium per kg of said lignin.

27. A composition of claim 24, further comprising:

less than about 525 mg of iron per kg of said lignin.