CLAIMS

What is claimed is:

1. A cellulose product comprising the contact product of:

a) at least one cellulosic ether;

b) at least one salt of a polyvalent metal ion; and

c) at least one ligand selected from at least one poly(carboxylic) acid or a salt thereof that comprises secondary nitrogen atoms, primary nitrogen atoms, or no nitrogen atoms.

2. A cellulose product according to claim 1, wherein the poly(carboxylic) acid or the salt thereof is selected from citric acid, malic acid, maleic acid, fumaric acid, oxaloacetic acid, aconitic acid, iso-citric acid, α-ketoglutaric acid, β-ketoglutaric acid, succinic acid, ascorbic acid, 2,2'-azanediyldisuccinic acid, tetrasodium iminodisuccinate, dicarboxymethyl glutamic acid, ethylenediamine-*N,N'*-disuccinic acid, oxalic acid, aspartic acid, glutaric acid, glutamic acid, salts thereof, and combinations thereof.

3. A cellulose product according to claim 1, wherein the cellulosic ether is selected from carboxymethyl cellulose (CMC), hydroxyethyl cellulose (HEC), carboxymethyl hydroxyethyl cellulose (CMHEC), methyl cellulose (MC), hydroxyethyl methyl cellulose (HEMC), ethyl hydroxyl ethyl cellulose (EHEC), hydroxypropyl cellulose (HPC), and combinations thereof.

4. A cellulose product according to claim 1, wherein the cellulose product has less than 10 wt% water.

5. A cellulose product according to claim 1, wherein the salt of a polyvalent metal ion is a water soluble salt of beryllium(II), magnesium(II), calcium(II), strontium(II), barium(II), titanium(II), vanadium(II), vanadium(IV), vanadium(V), chromium(III), chromium(IV), manganese(II), manganese(III), iron(II), iron(III), cobalt(II), cobalt(III), nickel(II), zinc(II), aluminum(III), tin(II), tin (IV), or combinations thereof.

6. A cellulose product according to claim 1, wherein the salt of a polyvalent metal ion is a water soluble salt of calcium(II), aluminum(III), iron(II), iron(III), zinc(II), nickel(II), tin(II), tin (IV), or combinations thereof.

7. A cellulose product according to claim 1, wherein the salt of a polyvalent metal ion is aluminum sulfate or calcium chloride or a combination thereof, and wherein the ligand is citric acid, malic acid, maleic acid, or combinations thereof.

8. A cellulose product according to claim 1, wherein:

the cellulosic ether is carboxymethyl cellulose (CMC);

the polyvalent metal ion is calcium(II), aluminum(III), iron(II), iron(III), zinc(II), nickel(II), tin(II), or tin (IV);

the ligand is a citric acid cycle substrate or product; and

the cellulose product has less than 10 wt% water.

9. A cellulose product according to claim 1, wherein:

the cellulosic ether is carboxymethyl cellulose (CMC);

the polyvalent metal ion is calcium(II) or aluminum(III);

the ligand is citric acid, malic acid, or maleic acid; and

the cellulose product has less than 10 wt% water.

10. A cellulose product according to claim 1, wherein the cellulose product is technical grade, and wherein:

the cellulosic ether is carboxymethyl cellulose (CMC), the polyvalent metal ion is aluminum(III) or calcium(II); and the ligand is citric acid, malic acid, maleic acid, fumaric acid, oxaloacetic acid, aconitic acid, iso-citric acid, α-ketoglutaric acid, β-ketoglutaric acid, succinic acid, ascorbic acid, or combinations thereof;

the cellulose product is characterized by 2 wt % Brookfield viscosity at 25°C of from 3,000 to 8,000 mPa•s;

the cellulose product is characterized by a weight percent recovery of shale chips on a 1.18 mm sieve after hot rolling for 16 hours at 100°C at a 1 ppb test dosage of greater than 92%; and

the cellulose product is characterized by an API Fluid Loss according to ISO 14014-1 at a 1 ppb test dosage of less than 18 mL / 30 minutes.

11. A cellulose product according to claim 1, wherein the cellulose product is purified grade, and wherein:

the cellulosic ether is carboxymethyl cellulose (CMC), the polyvalent metal ion is aluminum(III) or calcium(II); and the ligand is citric acid, malic acid, maleic acid, fumaric acid, oxaloacetic acid, aconitic acid, iso-citric acid, α-ketoglutaric acid, β-ketoglutaric acid, succinic acid, ascorbic acid, or combinations thereof;

the cellulose product is characterized by 1 wt % Brookfield viscosity at 25°C of from 1,200 to 4,000 mPa•s;

the cellulose product is characterized by a weight percent recovery of shale chips on a 1.18 mm sieve after hot rolling for 16 hours at 100°C at a 2 ppb test dosage of greater than 89%; and

the cellulose product is characterized by an API Fluid Loss according to ISO 14014-1 at a 2 ppb test dosage of less than 14 mL / 30 minutes.

12. A cellulose product according to claim 1, wherein the cellulose product is technical grade, and wherein:

the cellulosic ether is carboxymethyl cellulose (CMC), the polyvalent metal ion is aluminum(III) or calcium(II); and the ligand is citric acid, malic acid, maleic acid, fumaric acid, oxaloacetic acid, aconitic acid, iso-citric acid, α-ketoglutaric acid, β-ketoglutaric acid, succinic acid, ascorbic acid, or combinations thereof;

the cellulose product is characterized by 2 wt % Brookfield viscosity at 25°C of from 200 to 1,000 mPa•s;

the cellulose product is characterized by a weight percent recovery of shale chips on a 1.18 mm sieve after hot rolling for 16 hours at 100°C at a 2 ppb test dosage of greater than 91%; and

the cellulose product is characterized by an API Fluid Loss according to ISO 14014-1 at a 2 ppb test dosage of less than 18.5 mL / 30 minutes.

13. A cellulose product according to claim 1, wherein the cellulose product is purified grade, and wherein:

the cellulosic ether is carboxymethyl cellulose (CMC), the polyvalent metal ion is aluminum(III) or calcium(II); and the ligand is citric acid, malic acid, maleic acid, fumaric acid, oxaloacetic acid, aconitic acid, iso-citric acid, α-ketoglutaric acid, β-ketoglutaric acid, succinic acid, ascorbic acid, or combinations thereof;

the cellulose product is characterized by 2 wt % Brookfield viscosity at 25°C of from 500 to 3,500 mPa•s;

the cellulose product is characterized by a weight percent recovery of shale chips on a 1.18 mm sieve after hot rolling for 16 hours at 100°C at a 1 ppb test dosage of greater than 92%; and

the cellulose product is characterized by an API Fluid Loss according to ISO 14014-1 at a 1 ppb test dosage of less than 19 mL / 30 minutes.

14. A cellulose product according to claim 1, wherein the cellulose product is technical grade, and wherein:

the cellulosic ether is carboxymethyl cellulose (CMC), the polyvalent metal ion is aluminum(III) or calcium(II); and the ligand is citric acid, malic acid, maleic acid, fumaric acid, oxaloacetic acid, aconitic acid, iso-citric acid, α-ketoglutaric acid, β-ketoglutaric acid, succinic acid, ascorbic acid, or combinations thereof;

the cellulose product is characterized by 4 wt % Brookfield viscosity at 25°C of from 20 to 200 mPa•s;

the cellulose product is characterized by a weight percent recovery of shale chips on a 1.18 mm sieve after hot rolling for 16 hours at 100°C at a 4 ppb test dosage of greater than 89.5%; and

the cellulose product is characterized by an API Fluid Loss according to ISO 14014-1 at a 4 ppb test dosage of less than 19 mL / 30 minutes.

15. A cellulose product according to claim 1, wherein the cellulose product is purified grade, and wherein:

the cellulosic ether is carboxymethyl cellulose (CMC), the polyvalent metal ion is aluminum(III) or calcium(II); and the ligand is citric acid, malic acid, maleic acid, fumaric acid, oxaloacetic acid, aconitic acid, iso-citric acid, α-ketoglutaric acid, β-ketoglutaric acid, succinic acid, ascorbic acid, or combinations thereof;

the cellulose product is characterized by 4 wt % Brookfield viscosity at 25°C of from 20 to 200 mPa•s;

the cellulose product is characterized by a weight percent recovery of shale chips on a 1.18 mm sieve after hot rolling for 16 hours at 100°C at a 2 ppb test dosage of greater than 90%; and

the cellulose product is characterized by an API Fluid Loss according to ISO 14014-1 at a 2 ppb test dosage of less than 18 mL / 30 minutes.

16. A method of using a cellulose product comprising:

a) providing a cellulose product according to claim 1;

b) combining the cellulose product with an aqueous carrier to form a water-based modified cellulose composition; and

c) using the water-based modified cellulose composition as a drilling fluid, a completion fluid, a work-over fluid, or a stimulation/fracking fluid.

17. A method of using a cellulose product according to claim 16, further comprising combining the water-based modified cellulose composition with a cross-linking agent, an inhibition agent, a viscosifying agent, a filtrate reducing agent, a thermal stabilizing agent, a shear strength stabilizing agent, a bentonite clay, an illite clay, a smectite clay, a montmorillonite clay, a kaolite clay, barium sulfate, calcium carbonate, hematite, a starch, a deflocculant, an anionic polyelectrolyte, an acrylate, a polyphosphate, a lignosulfonate, tannic acid, a derivatized tannic acid, an unmodified cellulosic material, a lubricant, a weighting agent, a fluid loss additive, a brine, a formate salt, or combinations thereof.

18. A cellulose product comprising the contact product of:

a) at least one cellulosic ether;

b) at least one salt of a polyvalent metal ion; and

c) at least one ligand selected from citric acid, malic acid, maleic acid, fumaric acid, oxaloacetic acid, aconitic acid, iso-citric acid, α-ketoglutaric acid, β-ketoglutaric acid, succinic acid, ascorbic acid, 2,2'-azanediyldisuccinic acid, tetrasodium iminodisuccinate, dicarboxymethyl glutamic acid, ethylenediamine-*N,N'*-disuccinic acid, oxalic acid, aspartic acid, glutaric acid, glutamic acid, L-glutamic acid *N,N*-diacetic acid, methylglycinediacetic acid, 2-hydroxyethyliminodiacetic acid, salts thereof, and combinations thereof.

19. A method of using a cellulose product comprising:

a) providing a cellulose product according to claim 18;

b) combining the cellulose product with an aqueous carrier to form a water-based modified cellulose composition; and

c) using the water-based modified cellulose composition as a drilling fluid, a completion fluid, a work-over fluid, or a stimulation/fracking fluid.

20. A method of using a cellulose product according to claim 19, further comprising combining the water-based modified cellulose composition with a cross-linking agent, an inhibition agent, a viscosifying agent, a filtrate reducing agent, a thermal stabilizing agent, a shear strength stabilizing agent, a bentonite clay, an illite clay, a smectite clay, a montmorillonite clay, a kaolite clay, barium sulfate, calcium carbonate, hematite, a starch, a deflocculant, an anionic polyelectrolyte, an acrylate, a polyphosphate, a lignosulfonate, tannic acid, a derivatized tannic acid, an unmodified cellulosic material, a lubricant, a weighting agent, a fluid loss additive, a brine, a formate salt, or combinations thereof.

Claims:

1. An invention not claimed in any divisional application.