Claims

1. A method for the production of an agent for enhancing soil growth, comprising:

grinding a biomass feedstock to produce ground biomass particles;

subjecting the ground biomass particles to sequential or concurrent ramps of temperature and pressure shocks;

selectively collecting at least one volatile component as it is released from the ground biomass particles;

collecting a last remaining nonvolatile component comprising BMF char;

rendering a surface of the BMF char hydrophilic;

exposing the BMF char to microorganisms; and

adding the BMF char to soil.

2. The method of claim 1, wherein the biomass particles are ground to a diameter between about 0.001 inch and about 1 inch.

3. The method of claim 1, further comprising dispensing the ground biomass particles into thin sheets whose total thickness is a multiple of the ground biomass particle diameter before subjecting the ground biomass particles to sequential or concurrent ramps of temperature and pressure shocks wherein the multiple is any real number in the range of 1 to 30.

4. The method of claim 1, wherein the biomass feedstock is used to produce different BMF chars based on a composition of the biomass feedstock.

5. The method of claim 1, wherein the pressure shocks vary in magnitude from 0.2 MPa to 10 GPa, wherein an admixture of pressure shocks of differing magnitudes is combined with pressure shocks applied over a range of times.

6. The method of claim 1, wherein the temperature ramp includes a sufficiently high temperature to create a nonvolatile carbonaceous material within the ground biomass particles.

7. The method of claim 1, wherein the pressure shocks increase thermal conductivity of formed nonvolatile carbonaceous material within the ground biomass particles.

8. The method of claim 1, wherein the temperature ramps and pressure shocks are conducted in an atmosphere containing a supercritical fluid.

9. The method of claim 1, wherein the pressure shocks decrease the effective density of the ground biomass particles.

10. The method of claim 1, wherein a pH of the BMF char is controlled via pH adjustment agents.

11. The method of claim 1, wherein the BMF char is activated.

12. The method of claim 1, wherein a pH of the soil is modified to accept the addition of BMF char.

13. The method of claim 1, wherein the surface of the BMF char is rendered hydrophilic by removing adsorbed gas within char pores.

14. The method of claim 13, wherein the surface of the BMF char is rendered hydrophilic by high temperature removal of adsorbed hydrocarbons.

15. The method of claim 13, wherein adsorbed gases are removed by water infiltration, vacuum suction, ultrasonic means, or impact means.

16. The method of claim 13, wherein adsorbed gases are removed by introducing a water solution containing soluble plant nutrients.

17. The method of claim 1, wherein microorganisms include members of at least one of fungi, bacteria or archaea.

18. The method of claim 17, wherein fungi are selected from members of the phyla Glomeromycota.

19. The method of claim 1, wherein the BMF char contains glomalin structures.

20. A method for the production of an agent for enhancing soil growth, comprising:

grinding a biomass feedstock to produce ground biomass particles having a diameter between about 0.001 inch and about 1 inch;

dispensing the ground biomass particles into thin sheets whose total thickness is a multiple of the ground biomass particle diameter;

subjecting the ground biomass particles to sequential or concurrent ramps of temperature and pressure shocks;

selectively collecting at least one volatile component as it is released from the ground biomass particles;

collecting a last remaining nonvolatile component comprising BMF char;

rendering a surface of the BMF char hydrophilic;

adding the BMF char to soil; and

exposing the soil and BMF char to microorganisms.

Claims

1. A method for the production of an agent for enhancing soil, comprising:

subjecting a biomass feedstock to sequential or concurrent ramps of temperature and pressure;

removing at least one volatile component as it is released from the biomass feedstock and collecting a nonvolatile component comprising BMF char;

rendering a surface of the BMF char hydrophilic after collecting the BMF char;

exposing the BMF char to microorganisms after rendering the surface hydrophilic.

2. The method of claim 1, wherein the biomass feedstock is ground to a diameter between about 0.001 inch and about 1 inch.

3. The method of claim 2, further comprising dispensing the ground biomass particles into thin sheets whose total thickness is a multiple of the ground biomass particle diameter before subjecting the ground biomass particles to sequential or concurrent ramps of temperature and pressure shocks wherein the multiple is any real number in the range of 1 to 30.

4. The method of claim 1, wherein the biomass feedstock is used to produce different BMF chars based on a composition of the biomass feedstock.

5. The method of claim 1, wherein the pressure shocks vary in magnitude from 0.2 MPa to 10 GPa, wherein an admixture of pressure shocks of differing magnitudes is combined with pressure shocks applied over a range of times.

6. The method of claim 1, wherein the temperature ramp includes a sufficiently high temperature to create a nonvolatile carbonaceous material within the biomass feedstock.

7. The method of claim 1, wherein the pressure shocks increase thermal conductivity of formed nonvolatile carbonaceous material within the biomass feedstock.

8. The method of claim 1, wherein the temperature ramps and pressure shocks are conducted in an atmosphere containing a supercritical fluid.

9. The method of claim 1, wherein the pressure shocks decrease the effective density of the biomass feedstock.

10. The method of claim 1, wherein a pH of the BMF char is controlled via pH adjustment agents.

11. The method of claim 1, wherein the BMF char is activated.

12. The method of claim 1, wherein the surface of the BMF char is rendered hydrophilic by removing adsorbed gas within char pores.

13. The method of claim 12, wherein removal of adsorbed gas is carried out by immersing BMF biochar in heated water.

14. The method of claim 13, wherein the heated water comprises inorganic nutrients.

15. The method of claim 1 or 12, wherein the surface of the BMF char is rendered hydrophilic by high temperature removal of adsorbed hydrocarbons.

16. The method of claim 1, wherein microorganisms include members of at least one of fungi, bacteria or archaea.

17. The method of claim 16, wherein fungi include one or more members of the phyla Glomeromycota.

18. The method of claim 1, wherein the BMF char contains glomalin structures.

19. The method of claim 1, further comprising introducing inorganic nutrients into the BMR biochar.

20. The method of claim 1, further comprising adding the BMF char to soil after exposing the BMF char to microorganisms.

21. The method of claim 1, wherein a pH of the soil is modified to accept the addition of BMF char.

22. A method of enhancing soil health, comprising:

providing a BMF biochar made according to any one of claims 1-19; and

adding the BMF biochar to soil.

23. The method of claim 22, further comprising adding pH adjuster to the soil to neutralize the BMF biochar.