

CLAIMS

1. A method of direct liquid hydrocarbon fuel or hydrocarbon chemical production

comprising:

heating a carbon-oxygen-hydrogen (C-O-H) compound to a temperature of at least 800 degrees Celsius such that the C-O-H compound reacts through a non-oxidation reaction to generate at least a hydrocarbon aerosol that is at least a component of a liquid hydrocarbon fuel or a hydrocarbon chemical, wherein the C-O-H compound includes at least a biomass or a waste product; and

passing the hydrocarbon aerosol through a liquid fuel to gather the hydrocarbon aerosol, wherein the liquid fuel includes at least gasoline, diesel, or aviation fuel.

2. The method of claim 1, wherein the liquid hydrocarbon fuel is liquid when at a temperature of 20 degrees Celsius.

3. The method of claim 1, wherein the non-oxidation reaction comprises a pyrolysis reaction.

4. The method of claim 1, wherein the non-oxidation reaction comprises a hydrous pyrolysis reaction.

5. The method of claim 1, further comprising directly distilling the liquid hydrocarbon fuel.

6. The method of claim 1, wherein the gathered hydrocarbon aerosol includes naphthalene.

7. The method of claim 1, wherein passing the hydrocarbon aerosol through the liquid fuel comprises passing the hydrocarbon aerosol through a mesh disposed with the liquid fuel.

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8. The method of claim 1, wherein the temperature is to at least 900 degrees Celsius.
9. The method of claim 1, wherein the C-O-H compound has a residence time between 10 seconds and 300 seconds.
- 5 10. The method of claim 1, wherein the C-O-H compound has a residence time of at least one second.
11. The method of claim 1, wherein the non-oxidation reaction is performed within a tube furnace.
12. The method of claim 11, wherein the tube furnace includes a material composition that includes at least a high-nickel metal alloy.
- 10 13. The method of claim 11, further comprising using an auger to effect continuous motion of material containing the C-O-H compound into and through the tube furnace and wherein the material containing the C-O-H compound is in a solid phase.
14. The method of claim 1, wherein the temperature is at least 1100 degrees Celsius.
- 15 15. The method of claim 1, wherein the liquid hydrocarbon fuel has an energy content of at least 16,000 BTU/lb or 37,000 kJ/kg.
16. The method of claim 1, wherein the C-O-H compound comprises a C-O-H compound mixed with at least water.
17. The method of claim 16, wherein heating the C-O-H compound comprises reacting the mixed water as well as any water in the C-O-H compound with the C-O-H compound to generate at least the liquid hydrocarbon fuel or the hydrocarbon chemical.
- 20 18. The method of claim 1, wherein the C-O-H compound comprises a wet C-O-H compound.
19. The method of claim 18, further comprising heating the wet C-O-H compound through reacting water from the wet C-O-H compound with the C-O-H compound to generate at least the liquid hydrocarbon fuel or the hydrocarbon chemical.
- 25 20. The method of claim 19, further comprising transferring the wet C-O-H compound to a reaction chamber before heating the wet C-O-H compound.

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21. The method of claim 13, wherein the auger comprises a composition that includes at least a high-nickel metal alloy.

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22. The method of claim 13, wherein the auger includes at least a single pitch between a plurality of blades or multiple different pitches between the plurality of blades.
23. The method of claim of 1, further comprising distilling the gathered hydrocarbon aerosol.
- 5 24. The method of claim 23, further comprising mixing the distilled gathered hydrocarbon aerosol with at least another liquid fuel.
25. A system for direct production of liquid hydrocarbon fuel or hydrocarbon chemical comprising:
- 10 a non-oxidation reaction chamber configured to heat a carbon-oxygen-hydrogen (C-O-H) compound to a temperature of at least 800 degrees Celsius such that the C-O-H compound reacts through a non-oxidation reaction to produce at least a hydrocarbon aerosol that is at least a component of the liquid hydrocarbon fuel or the hydrocarbon chemical, wherein the C-O-H compound includes at least a biomass or a waste product;
- 15 an liquid solvent chamber coupled with the non-oxidation reaction chamber such that the hydrocarbon aerosol passes through a material in a liquid phase disposed within the liquid solvent chamber to gather the hydrocarbon aerosol; and
- the material in the liquid phase disposed within the liquid solvent chamber, wherein the material in the liquid phase includes at least gasoline, diesel or aviation fuel.
- 20 26. The system of claim 25, wherein the non-oxidation reaction comprises a pyrolysis reaction.
27. The system of claim 25, wherein the liquid hydrocarbon fuel is a liquid when at a temperature of 20 degrees Celsius.
28. The system of claims 25, wherein the non-oxidation reaction chamber comprises a tube furnace.
- 25 29. The system of claim 28, wherein the tube furnace includes a material composition that includes at least a high-nickel metal alloy.
30. The system of claim 28, further comprising an auger configured to effect continuous motion of material containing the C-O-H compound into and through the tube furnace.
- 30 31. The system of claim 30, wherein the auger comprises a material composition that includes at least a high-nickel metalalloy.
32. The system of claim 30, wherein the auger includes multiple different pitches between a plurality of blades.

33. The system of claim 30, wherein the auger includes a single pitch between a plurality of blades.
34. The system of claim 25, wherein the non-oxidation reaction comprises a hydrous pyrolysis reaction.

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35. The system of claim 25, wherein the temperature is to at least 900 degrees Celsius.
36. The system of claim 25, further comprising a mesh disposed within the liquid solvent chamber such that passing the hydrocarbon aerosol through the material in the liquid phase disposed within the liquid solvent chamber also includes passing the hydrocarbon aerosol through the mesh.
37. The system of claim 25, further comprising a distiller configured to distill the gathered hydrocarbon aerosol.
38. The system of claim 25, further comprising a mixing chamber configured to mix the gathered hydrocarbon aerosol with at least another liquid fuel.
39. The system of claim 25, wherein the C-O-H compound has a residence time of at least one second.
40. The system of claim 39, wherein the residence time is at least 10 seconds.
41. The system of claim 40, wherein the residence time is at least 100 seconds.
42. The system of claim 41, wherein the residence time is less than 300 seconds.
43. The system of claim 41, wherein the residence time is less than 1000 seconds.
44. The system of claim 25, wherein the temperature is at least 1100 degrees Celsius.
45. The system of claim 38, wherein the other liquid fuel comprises at least gasoline, diesel, or aviation fuel.
46. The system of claim 25, wherein the liquid hydrocarbon fuel has an energy content of at least 16,000 BTU/lb or 37,000 kJ/kg.

47. The system of claim 25, wherein the C-O-H compound comprises a C-O-H compound mixed with at least water.

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48. The system of claim 25, wherein the non-oxidation reaction chamber configured to heat the C-O-H compound is configured to react the mixed water as well as any water in the original C-O-H compound with the C-O-H compound to generate hydrocarbon fuel in one or both liquid aerosol and vapor states.
- 5 49. The system of claim 48, further comprising a conveyor configured to transfer the wet C-O-H compound to the non-oxidation reaction chamber before heating the wet C-O-H compound.
50. The system of claim 25, wherein the gathered hydrocarbon aerosol includes naphthalene.
- 10 51. A method of aerosol capture comprising:
passing a hydrocarbon aerosol through a material in a bulk liquid phase to gather at least a portion of one or more components of the hydrocarbon aerosol, wherein the material in the bulk liquid phase includes at least gasoline, diesel, or aviation fuel.
- 15 52. The method of claim 51, wherein the gathered portion of the one or more hydrocarbon aerosol components comprise at least a hydrocarbon compound.
53. The method of claim 51, wherein the gathered portion of the one or more aerosol components comprise at least a component of a liquid hydrocarbon.
54. The method of claim 51, wherein the material in the bulk liquid phase includes water.
- 20 55. The method of claim 51, wherein the material in the bulk liquid phase is temperature-controlled.
56. The method of claim 51, wherein the material in the bulk liquid phase is disposed within a spiral tubing configuration.
57. The method of claim 51, wherein the material in the bulk liquid phase is disposed within an auger.
- 25 58. The method of claim 51, further comprising distilling the one or more gathered hydrocarbon aerosol components.

59. The method of claim 58, further comprising augmenting the material in the bulk liquid phase with all or part of the one or more distilled gathered hydrocarbon aerosol components.

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60. The method of claim 51, wherein passing the hydrocarbon aerosol through the material in the bulk liquid phase further comprises passing the hydrocarbon aerosol through a mesh of solid material disposed within the material in the bulk liquid phase.
- 5 61. The method of claim 51, wherein passing the hydrocarbon aerosol through the material in the bulk liquid phase further comprises passing the hydrocarbon aerosol through the material in the bulk liquid phase with respect to a plurality of baffles disposed within the material in the bulk liquid phase.
- 10 62. The method of claim 61, wherein passing the hydrocarbon aerosol through the material in the bulk liquid phase further comprises passing the hydrocarbon aerosol through the material in the bulk liquid phase through a mesh of solid material disposed around the plurality of baffles disposed within the material in the bulk liquid phase.
- 15 63. The method of claim 51, further comprising removing water with respect to the remainder of the material in the bulk liquid phase.
- 20 64. The method of claim 63, further comprising removing water with respect to the remainder of the material in the bulk liquid phase wherein the water is immiscible with the remainder of the material in the bulk liquid phase.
65. The method of claim 63, further comprising removing water with respect to the remainder of the material in the bulk liquid phase wherein the water is immiscible with and gravimetrically separable from the remainder of the material in the bulk liquid phase.
66. The method of claim 51, further comprising producing the hydrocarbon aerosol.
67. The method of claim 66, wherein the hydrocarbon aerosol comprises at least a hydrocarbon compound or a component of a liquid hydrocarbon.
- 25 68. The method of claim 67, wherein the hydrocarbon aerosol comprising at least the hydrocarbon compound or the component of the liquid hydrocarbon is produced from at least a biomass or a waste product.
69. The method of claim 67, wherein the hydrocarbon compound or the component of the liquid hydrocarbon comprises at least a hydrocarbon fuel.
- 30 70. The method of claim 67, wherein the hydrocarbon compound or the component of a liquid hydrocarbon comprises at least a hydrocarbon chemical.
71. A system for aerosol capture comprising:

an aerosol gathering chamber configured to pass a hydrocarbon aerosol through a material in a bulk liquid phase disposed within the aerosol gathering chamber to gather at least a portion of one or more components of the hydrocarbon aerosol; and the material in the bulk liquid phase disposed within the aerosol gathering chamber, wherein the material in the bulk liquid phase includes a liquid fuel that includes at least gasoline, diesel, or aviation fuel.

72. The system of claim 71, wherein the gathered portion of the one or more hydrocarbon aerosol components comprises at least a hydrocarbon compound.

73. The system of claim 71, wherein the gathered portion of the one or more hydrocarbon aerosol components comprises at least a component of a liquid hydrocarbon.

74. The system of claim 71, wherein the material in the bulk liquid phase includes water.

75. The system of claim 71, wherein the material in the bulk liquid phase is temperature-controlled.

76. The system of claim 71, further comprising one or more lengths of tubing in a spiral configuration containing the material in the bulk liquid phase to increase a path length through the material in the bulk liquid phase.

77. The system of claim 71, further comprising one or more augers disposed within the aerosol gathering chamber to increase a path length through the material in the bulk liquid phase.

78. The system of claim 71, further comprising one or more distilling systems coupled with the aerosol gathering chamber to distill all or part of the gathered portions of the one or more hydrocarbon aerosol components.

79. The system of claim 78, further comprising one or more couplers configured to couple one or more of the one or more distillers to the aerosol gathering chamber to augment the material in the bulk liquid phase with all or part of the distilled gathered portions of the one or more hydrocarbon aerosol components.

80. The system of claim 71, further comprising a mesh of a solid material disposed within the aerosol gathering chamber configured to increase the area of contact

between the hydrocarbon aerosol and the material in the bulk liquid phase and through which the hydrocarbon aerosol and material in the bulk liquid phase are passed.

81. The system of claim 71, further comprising a plurality of baffles disposed within the aerosol gathering chamber configured to increase a path length through the material in the bulk liquid phase.

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- 5 82. The system of claim 81, further comprising a mesh of solid material disposed around the plurality of baffles within the aerosol gathering chamber configured to increase the area of contact between the hydrocarbon aerosol and the material in the bulk liquid phase and through which the hydrocarbon aerosol and material in the liquid phase are passed.
83. The system of claim 71, further comprising one or more ports coupled with the aerosol gathering chamber to allow removal of water from the aerosol gathering chamber.
- 10 84. The system of claim 71, further comprising one or more ports coupled with the aerosol gathering chamber to allow removal of a portion of at least the portion of the one or more gathered hydrocarbon aerosol components from the aerosol gathering chamber.
85. The system of claim 71, further comprising one or more aerosol production chambers coupled with the aerosol gathering chamber.
- 15 86. The system of claim 85, wherein the one or more aerosol production chambers comprises an aerosol production chamber producing at least the hydrocarbon aerosol.
87. The system of claim 86, wherein the aerosol comprising at least the hydrocarbon aerosol is produced from at least a biomass or a waste product.

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