

51. The method of any one of claims 1 to 46, wherein the alga is a cyanophyta, a prochlorophyta, a rhodophyta, a chlorophyta, a heterokontophyta, a tribophyta, a glaucophyta, a chlorarachniophyte, a euglenophyta, a euglenoid, a haptophyta, a chrysophyta, a cryptophyta, a cryptomonad, a dinophyta, a dinoflagellata, a pyrmnesiophyta, a bacillariophyta, a xanthophyta, a eustigmatophyta, a raphidophyta, a phaeophyta, or a phytoplankton.
52. The method of any one of claims 1 to 46, wherein the photosynthetic bacterium, yeast, alga, or vascular plant has been transformed with a nucleic acid sequence encoding a protein involved in the isoprenoid pathway.
53. The method of claim 52, wherein the protein is a terpene synthase.
54. The method of claim 53, wherein the terpene synthase is a fusicoccadiene synthase, a kaurene synthase, a casbene synthase, a taxadiene synthase, an abietadiene synthase, a homolog of any one of the above, or a chimera or fusion comprising any one of the above.
55. An upgraded oil composition made by the method of any one of claims 1 to 54.
56. A method for upgrading an oil composition comprising: catalytically removing nitrogen from the oil composition to create an upgraded oil composition, wherein the oil composition comprises greater than about 0.5% w/w nitrogen, greater than about 8% w/w oxygen or greater than about 0.1% phosphorus.
57. The method of claim 56, wherein the oil composition comprises greater than about 2.5, greater than about 3, greater than about 3.5, greater than about 4, greater than about 4.5, or greater than about 5 % w/w nitrogen.
58. The method of claim 56, wherein the oil composition comprises greater than about 9 or greater than about 10 % w/w oxygen.
59. The method of claim 56, wherein the oil composition comprises greater than about 0.1, greater than about 0.2, greater than about 0.5, greater than about 1, or greater than about 2 % w/w phosphorous.

60. A method for preparing an upgraded oil composition comprising: catalytically removing i) a metal or metalloid, ii) nitrogen, or iii) oxygen from an oil composition to create the upgraded oil composition.
61. The method of claim 60, further comprising delivering the upgraded oil composition to an oil pipeline.
62. The method of claim 60, wherein the metal or metalloid is removed before nitrogen or oxygen.
63. A method for preparing an upgraded oil composition comprising: removing chlorophyll or chlorophyllide from an oil composition; and catalytically removing metals or metalloids and oxygen from the oil composition to create the upgraded oil composition.
64. The method of claim 63, wherein the oil composition is obtained from an algal biomass.
65. The method of claim 63, wherein the removing step is carried out at a temperature of greater than about 250, greater than about 300, greater than about 350, greater than about 400, greater than about 450, or greater than about 500 °C.
66. The method of claim 63, wherein the removing step is carried out at a pressure of hydrogen of greater than about 500, greater than about 750, or greater than about 1000 psi.
67. The method of any one of claim 63 to 66, further comprising refining the upgraded oil composition.
68. The method of claim 67, wherein the refining comprises catalytic cracking.
69. The method of any one of claim 63 to 66, further comprising combusting the upgraded oil composition.
70. The method of any one of claim 63 to 66, further comprising distilling the upgraded oil composition to remove hydrocarbons that are C₄ hydrocarbons or smaller.

71. The method of claim 70, wherein the hydrocarbons that are removed by the distilling are used to heat the method.

72. A system for preparing a hydrocarbon composition for refining, comprising: a metal-removing reactor comprising a metal-removing catalyst configured to remove metal or metalloid atoms from an oil composition; and a nonmetal-removing reactor comprising a nonmetal-removing catalyst configured to remove at least one of nitrogen or oxygen or sulfur from the oil composition, wherein the nonmetal-removing reactor is in fluidic communication with the metal-removing reactor.

73. The system of claim 72, further comprising a second metal-removing reactor, wherein the second metal-removing reactor is interchangeable with the metal-removing reactor.

74. The system of claim 73, further comprising: a third metal-removing reactor interchangeable with the second metal-removing reactor or the metal-removing reactor, wherein when the metal-removing reactor is in operation, the second metal-removing reactor is on stand-by and comprises an unused metal-removing catalyst, and the third metal-removing reactor is being emptied and/or refilled with a second unused metal-removing catalyst.

75. The system of any one of claims 72 to 74, wherein the metal-removing catalyst comprises: a support of alumina, aluminosilicate, or aluminosilic; and Co/Mo, Ni/Mo, or W/Mo.

76. The system of any one of claims 72 to 75, further comprising a second nonmetal-removing reactor configured to remove at least one of nitrogen or oxygen or sulfur from the oil composition, wherein the second nonmetal-removing reactor is in fluidic communication with the nonmetal-removing reactor.

77. The system of claim 76, wherein the nonmetal-removing catalyst comprises: a support of alumina, aluminosilicate, or aluminosilic; and Co/Mo, Ni/Mo, or W/Mo.

78. The system of any one of claims 72 to 77, wherein the oil composition is obtained from an algal biomass.

79. The system of any one of claims 72 to 77, wherein the system is in fluidic communication with an oil pipeline.

80. The system of any one of claims 72 to 79, further comprising a distilling device in fluidic communication with the system configured to remove hydrocarbons that are C₄ hydrocarbons or smaller from the hydrocarbon composition.

81. An upgraded oil composition obtained from an algal biomass, made by the process of:

i) removing a heteroatom, a metal, or a metalloid from an oil composition to obtain the upgraded oil composition, wherein the upgraded oil composition is used to make a product with a freezing point of -60°C to -70°C.

82. An upgraded oil composition obtained from an algal biomass, made by the process of:

i) removing a heteroatom, a metal, or a metalloid from an oil composition to obtain the upgraded oil composition, wherein the upgraded oil composition is used to make a product with a freezing point of -50°C to -75°C.

83. An upgraded oil composition obtained from an algal biomass, made by the process of:

i) removing a heteroatom, a metal, or a metalloid from an oil composition to obtain the upgraded oil composition, wherein the upgraded oil composition is used to make a product with a freezing point of -67°C.

84. A method for upgrading an oil composition obtained from an algal biomass, comprising:

i) removing a heteroatom, a metal, or a metalloid from the oil composition to obtain the upgraded oil composition, wherein the upgraded oil composition is used to make a product with a freezing point of -60°C to -70°C .

85. A method for upgrading an oil composition obtained from an algal biomass, comprising:

i) removing a heteroatom, a metal, or a metalloid from the oil composition to obtain the upgraded oil composition, wherein the upgraded oil composition is used to make a product with a freezing point of -50°C to -75°C .

86. A method for upgrading an oil composition obtained from an algal biomass, comprising:

i) removing a heteroatom, a metal, or a metalloid from the oil composition to obtain the upgraded oil composition, wherein the upgraded oil composition is used to make a product with a freezing point of -67°C .

87. An upgraded oil composition made by the method of any one of claims 56 to 71 and 8684 to 9286.

51. The method of any one of claims 1 to 46, wherein the alga is a cyanophyta, a prochlorophyta, a rhodophyta, a chlorophyta, a heterokontophyta, a tribophyta, a glaucophyta, a chlorarachniophyte, a euglenophyta, a euglenoid, a haptophyta, a chrysophyta, a cryptophyta, a cryptomonad, a dinophyta, a dinoflagellata, a pyrmnesiophyta, a bacillariophyta, a xanthophyta, a eustigmatophyta, a raphidophyta, a phaeophyta, or a phytoplankton.
52. The method of any one of claims 1 to 46, wherein the photosynthetic bacterium, yeast, alga, or vascular plant has been transformed with a nucleic acid sequence encoding a protein involved in the isoprenoid pathway.
53. The method of claim 52, wherein the protein is a terpene synthase.
54. The method of claim 53, wherein the terpene synthase is a fusicoccadiene synthase, a kaurene synthase, a casbene synthase, a taxadiene synthase, an abietadiene synthase, a homolog of any one of the above, or a chimera or fusion comprising any one of the above.
55. An upgraded oil composition made by the method of any one of claims 1 to 54.
56. A method for preparing an upgraded oil composition comprising: removing chlorophyll or chlorophyllide from an oil composition; and catalytically removing metals or metalloids and oxygen from the oil composition to create the upgraded oil composition.
57. The method of claim 56, wherein the oil composition is obtained from an algal biomass.
58. The method of claim 56, wherein the removing step is carried out at a temperature of greater than about 250, greater than about 300, greater than about 350, greater than about 400, greater than about 450, or greater than about 500 °C.
59. The method of claim 56, wherein the removing step is carried out at a pressure of hydrogen of greater than about 500, greater than about 750, or greater than about 1000 psi.
60. The method of any one of claim 56 to 59, further comprising refining the upgraded oil composition.
61. The method of claim 60, wherein the refining comprises catalytic cracking.

62. The method of any one of claim 56 to 59, further comprising combusting the upgraded oil composition.
63. The method of any one of claim 56 to 59, further comprising distilling the upgraded oil composition to remove hydrocarbons that are C₄ hydrocarbons or smaller.
64. The method of claim 63, wherein the hydrocarbons that are removed by the distilling are used to heat the method.
65. An upgraded oil composition obtained from an algal biomass, made by the process of:
- i) removing a heteroatom, a metal, or a metalloid from an oil composition to obtain the upgraded oil composition, wherein the upgraded oil composition is used to make a product with a freezing point of -60°C to -70°C.
66. An upgraded oil composition obtained from an algal biomass, made by the process of:
- i) removing a heteroatom, a metal, or a metalloid from an oil composition to obtain the upgraded oil composition, wherein the upgraded oil composition is used to make a product with a freezing point of -50°C to -75°C.
67. An upgraded oil composition obtained from an algal biomass, made by the process of:
- i) removing a heteroatom, a metal, or a metalloid from an oil composition to obtain the upgraded oil composition, wherein the upgraded oil composition is used to make a product with a freezing point of -67°C.
68. A method for upgrading an oil composition obtained from an algal biomass, comprising:
- i) removing a heteroatom, a metal, or a metalloid from the oil composition to obtain the upgraded oil composition, wherein the upgraded oil composition is used to make a product with a freezing point of -60°C to -70°C.
69. A method for upgrading an oil composition obtained from an algal biomass, comprising:

i) removing a heteroatom, a metal, or a metalloid from the oil composition to obtain the upgraded oil composition, wherein the upgraded oil composition is used to make a product with a freezing point of -50°C to -75°C .

70. A method for upgrading an oil composition obtained from an algal biomass, comprising:

i) removing a heteroatom, a metal, or a metalloid from the oil composition to obtain the upgraded oil composition, wherein the upgraded oil composition is used to make a product with a freezing point of -67°C .

71. An upgraded oil composition made by the method of any one of claims 56 to 64 and 68 to 70.