CLAIMS

What is claimed is:

1. A composition comprising:

a) at least about 22% by weight of at least one phenolic antioxidant;

b) at least about 0.5% by weight of at least one metal chelating compound; and

c) at least one solvent comprising at least one compound selected from glycols, glycol ethers, glycol ether ester compounds, $C_1 - C_{25}$ monofunctional alcohols, $C_1 - C_{25}$ esters, C_3-C_{14} ketones, $C_2 - C_{10}$ amides, $C_2 - C_{10}$ ethers, and nitro compounds,

wherein at least one phenolic antioxidant and at least one metal chelating compound are dissolved in the solvent, and the composition is readily miscible in biodiesel.

2. A composition comprising:

a) at least about 15% by weight of a phenolic antioxidant;

b) at least about 0.5% by weight of a metal chelating compound; and

c) at least one solvent comprising at least one compound selected from glycols, glycol ethers, glycol ether ester compounds, $C_1 - C_{25}$ monofunctional alcohols, $C_1 - C_{25}$ esters, C_3-C_{14} ketones, $C_2 - C_{10}$ amides, $C_2 - C_{10}$ ethers, and nitro compounds,

wherein the phenolic antioxidant and metal chelating compound are dissolved in the solvent, the composition comprises 0% to 10% by weight of total surface active agents, and the composition is readily miscible in biodiesel.

3. The composition of claim 1 or 2, wherein the composition comprises at least about 25% by weight of at least one phenolic antioxidant.

4. The composition of claim 1 or 2, wherein the composition comprises from about 22% to about 40% by weight of a phenolic antioxidant and about 0.5% to about 10% by weight of a metal chelating compound.

5. The composition of any of the preceding claims, wherein the solvent is a single compound selected from monofunctional $C_1 - C_{25}$ alcohols, $C_2 - C_{10}$ amides, $C_2 - C_{10}$ ethers and glycol ethers.

6. The composition of any of the preceding claims, wherein the solvent is a single compound selected from $C_1 - C_{12}$ glycol ethers.

7. The composition of any of claims 1-5, wherein the solvent is a single compound selected from ethylene glycol monopropyl ether, diethylene glycol mono butyl ether, ethylene glycol mono 2-ethylhexyl ether, DMF, THF, propanol, and ethanol.

8. The composition of any of claim 1-5, wherein the solvent is a single compound selected from ethylene glycol monopropyl ether, diethylene glycol mono butyl ether and ethylene glycol mono 2-ethylhexyl ether.

9. The composition of any of claims 1-4, wherein the solvent comprises at least two compounds selected from glycols, glycol ethers, glycol ether ester compounds, $C_1 - C_{25}$ monofunctional alcohols, $C_1 - C_{25}$ esters, C_3-C_{14} ketones, $C_2 - C_{10}$ amides, $C_2 - C_{10}$ ethers, and nitro compounds.

10. The composition of any of the preceding claims, wherein the at least one phenolic antioxidant is selected from diphenols, bisphenols and triphenols.

11. The composition of any of the preceding claims, wherein the at least one phenolic antioxidant is selected from diphenols and triphenols.

12. The composition of any of claims 1-9, wherein the at least one phenolic antioxidant is TBHQ or t-butyl catechol.

13. The composition of any of claims 1-9, wherein the at least one phenolic antioxidant is pyrogallol.

14. The composition of any of claims 1-4, wherein the at least one phenolic antioxidant is TBHQ, the at least one metal chelating compound is citric acid and the solvent comprises at least one C_1-C_{25} glycol ether, at least one $C_1 - C_{25}$ ester, and at least one glycol.

15. The composition of claim 1, wherein the composition contains less than 10% by weight of total surface active agents.

16. The composition of claim 1 or 2, wherein the composition comprises:

a) between about 22% and about 50% by weight of at least one phenolic antioxidant,

b) between about 50% and about 77.5% % by weight of a glycol ether selected from ethylene glycol monopropyl ether and diethylene glycol monobutyl ether, and

c) between about 1.0% and about 3.0% by weight of at least one metal chelating compound.

17. The composition of any of claims 1-16, wherein the composition comprises 0% to 5% by weight of total surface active agents.

18. A method comprising:

dissolving at least one metal chelating compound in a first solvent to form a first solution, and

combining at least one phenolic antioxidant with the first solution to form a composition.

19. The method of claim 18, wherein the method further comprises selecting amounts of the metal chelating compound, the phenolic antioxidant, the solvent, and optionally other materials combined therewith, such that the composition comprises at least about 22% by weight of the at least one phenolic antioxidant, and at least about 0.5% by weight of at least one metal chelating compound.

20. The method of claim 18, wherein the method further comprises selecting amounts of the metal chelating compound, the phenolic antioxidant, the solvent, and optionally other materials combined therewith, such that the composition:

comprises at least about 15% by weight of the at least one phenolic antioxidant, and at least about 0.5% by weight of at least one metal chelating compound, and

comprises 0% to 10% by weight of total surface active agents.

21. The method of any of claims 18-20, wherein combining at least one phenolic antioxidant with the first solution comprises combining the first solution with a second solution comprising at least one phenolic antioxidant and a second solvent.

22. The method of any of claims 18-20, wherein the method further comprises combining the first solution with a second solvent prior to combining at least one phenolic antioxidant with the first solution.

23. The method of any of claims 18-20, wherein combining at least one phenolic antioxidant with the first solution comprises combining the first solution with a second solution comprising at least one phenolic antioxidant and a third solvent.

24. The method of any of claims 18-20, wherein the first solvent comprises at least two solvent compounds.

25. The method of any of claims 18-20, wherein combining at least one phenolic antioxidant with the first solution comprises combining the first solution with a second solution comprising at least one phenolic antioxidant and a third solvent.

26. The method of any of claims 18-20, wherein combining at least one phenolic antioxidant with the first solution comprises adding at least one phenolic antioxidant to the first solution.

27. A composition comprising:

a) from about 0.001 to about 5 weight % of an antioxidant composition, wherein the antioxidant composition is the composition is any of claims 1-17, and

b) at least one fatty acid or ester of fatty acid.

28. The composition of claim 27, wherein at least one fatty acid or ester of fatty acids is biodiesel.

29. The composition of claim 28, wherein the composition comprises at least about 90% by weight of esters of fatty acids.

30. The composition of claim 27, wherein the composition comprises from 0.001 to 0.4 weight % of the antioxidant composition.

31. A composition comprising:

a) at least one burnable fuel source, and

b) a biodiesel composition, wherein the biodiesel composition is the composition of any of claims 27-30.

32. The composition of Claim 31, wherein the burnable fuel source comprises at least one petroleum distillate.

33. The composition of Claim 31, wherein the burnable fuel source comprises petroleum diesel.

34. The composition of claim 31, wherein the composition comprises at least about 2% by weight of the biodiesel composition.

35. A method for increasing the oxidative stability of at least one fatty acid or ester of fatty acid, comprising combining the at least one fatty acid or ester of fatty acid with the composition of any of claims 1-18.

36. The method of claim 35, wherein at least one fatty acid or ester of fatty acids is biodiesel.

CLAIMS

What is claimed is:

1. A composition comprising:

a) at least about 22% by weight of at least one phenolic antioxidant;

b) at least about 0.5% by weight of at least one metal chelating compound; and

c) at least one solvent comprising at least one compound selected from glycols, glycol ethers, glycol ether ester compounds, $C_1 - C_{25}$ monofunctional alcohols, $C_1 - C_{25}$ esters, C_3-C_{14} ketones, $C_2 - C_{10}$ amides, $C_2 - C_{10}$ ethers, and nitro compounds,

wherein at least one phenolic antioxidant and at least one metal chelating compound are dissolved in the solvent, and the composition is readily miscible in biodiesel.

2. A composition comprising:

a) at least about 15% by weight of a phenolic antioxidant;

b) at least about 0.5% by weight of a metal chelating compound; and

c) at least one solvent comprising at least one compound selected from glycols, glycol ethers, glycol ether ester compounds, $C_1 - C_{25}$ monofunctional alcohols, $C_1 - C_{25}$ esters, C_3-C_{14} ketones, $C_2 - C_{10}$ amides, $C_2 - C_{10}$ ethers, and nitro compounds,

wherein the phenolic antioxidant and metal chelating compound are dissolved in the solvent, the composition comprises 0% to 10% by weight of total surface active agents, and the composition is readily miscible in biodiesel.

3. The composition of claim 1 or 2, wherein the composition comprises at least about 25% by weight of at least one phenolic antioxidant.

4. The composition of claim 1 or 2, wherein the composition comprises from about 22% to about 40% by weight of a phenolic antioxidant and about 0.5% to about 10% by weight of a metal chelating compound.

5. The composition of any of the preceding claims, wherein the solvent is a single compound selected from monofunctional $C_1 - C_{25}$ alcohols, $C_2 - C_{10}$ amides, $C_2 - C_{10}$ ethers and glycol ethers.

6. The composition of any of the preceding claims, wherein the solvent is a single compound selected from $C_1 - C_{12}$ glycol ethers.

7. The composition of any of claims 1-5, wherein the solvent is a single compound selected from ethylene glycol monopropyl ether, diethylene glycol mono butyl ether, ethylene glycol mono 2-ethylhexyl ether, DMF, THF, propanol, and ethanol.

8. The composition of any of claim 1-5, wherein the solvent is a single compound selected from ethylene glycol monopropyl ether, diethylene glycol mono butyl ether and ethylene glycol mono 2-ethylhexyl ether.

9. The composition of any of claims 1-4, wherein the solvent comprises at least two compounds selected from glycols, glycol ethers, glycol ether ester compounds, $C_1 - C_{25}$ monofunctional alcohols, $C_1 - C_{25}$ esters, C_3-C_{14} ketones, $C_2 - C_{10}$ amides, $C_2 - C_{10}$ ethers, and nitro compounds.

10. The composition of any of the preceding claims, wherein the at least one phenolic antioxidant is selected from diphenols, bisphenols and triphenols.

11. The composition of any of the preceding claims, wherein the at least one phenolic antioxidant is selected from diphenols and triphenols.

12. The composition of any of claims 1-9, wherein the at least one phenolic antioxidant is TBHQ or t-butyl catechol.

13. The composition of any of claims 1-9, wherein the at least one phenolic antioxidant is pyrogallol.

14. The composition of any of claims 1-4, wherein the at least one phenolic antioxidant is TBHQ, the at least one metal chelating compound is citric acid and the solvent comprises at least one C_1-C_{25} glycol ether, at least one $C_1 - C_{25}$ ester, and at least one glycol.

15. The composition of claim 1, wherein the composition contains less than 10% by weight of total surface active agents.

16. The composition of claim 1 or 2, wherein the composition comprises:

a) between about 22% and about 50% by weight of at least one phenolic antioxidant,

b) between about 50% and about 77.5% % by weight of a glycol ether selected from ethylene glycol monopropyl ether and diethylene glycol monobutyl ether, and

c) between about 1.0% and about 3.0% by weight of at least one metal chelating compound.

17. The composition of any of claims 1-16, wherein the composition comprises 0% to 5% by weight of total surface active agents.

18. A method comprising:

dissolving at least one metal chelating compound in a first solvent to form a first solution, and

combining at least one phenolic antioxidant with the first solution to form a composition.

19. The method of claim 18, wherein the method further comprises selecting amounts of the metal chelating compound, the phenolic antioxidant, the solvent, and optionally other materials combined therewith, such that the composition comprises at least about 22% by weight of the at least one phenolic antioxidant, and at least about 0.5% by weight of at least one metal chelating compound.

20. The method. of claim 18, wherein the method further comprises selecting amounts of the metal chelating compound, the phenolic antioxidant, the solvent, and optionally other materials combined therewith, such that the composition:

comprises at least about 15% by weight of the at least one phenolic antioxidant, and at least about 0.5% by weight of at least one metal chelating compound, and

comprises 0% to 10% by weight of total surface active agents.

21. The method of any of claims 18-20, wherein combining at least one phenolic antioxidant with the first solution comprises combining the first solution with a second solution comprising at least one phenolic antioxidant and a second solvent.

22. The method of any of claims 18-20, wherein the method further comprises combining the first solution with a second solvent prior to combining at least one phenolic antioxidant with the first solution.

23. The method of any of claims 18-20, wherein combining at least one phenolic antioxidant with the first solution comprises combining the first solution with a second solution comprising at least one phenolic antioxidant and a third solvent.

24. The method of any of claims 18-20, wherein the first solvent comprises at least two solvent compounds.

25. The method of any of claims 18-20, wherein combining at least one phenolic antioxidant with the first solution comprises combining the first solution with a second solution comprising at least one phenolic antioxidant and a third solvent.

26. The method of any of claims 18-20, wherein combining at least one phenolic antioxidant with the first solution comprises adding at least one phenolic antioxidant to the first solution.

27. A composition comprising:

a) from about 0.001 to about 5 weight % of an antioxidant composition, wherein the antioxidant composition is the composition is any of claims 1-17, and

b) at least one fatty acid or ester of fatty acid.

28. The composition of claim 27, wherein at least one fatty acid or ester of fatty acids is biodiesel.

29. The composition of claim 28, wherein the composition comprises at least about 90% by weight of esters of fatty acids.

30. The composition of claim 27, wherein the composition comprises from 0.001 to 0.4 weight % of the antioxidant composition.

31. A composition comprising:

a) at least one burnable fuel source, and

b) a biodiesel composition, wherein the biodiesel composition is the composition of any of claims 27-30.

32. The composition of Claim 31, wherein the burnable fuel source comprises at least one petroleum distillate.

33. The composition of Claim 31, wherein the burnable fuel source comprises petroleum diesel.

34. The composition of claim 31, wherein the composition comprises at least about 2% by weight of the biodiesel composition.

35. A method for increasing the oxidative stability of at least one fatty acid or ester of fatty acid, comprising combining the at least one fatty acid or ester of fatty acid with the composition of any of claims 1-18.

36. The method of claim 35, wherein at least one fatty acid or ester of fatty acids is biodiesel.

37. A composition comprising:
a) between about 25% and about 35% by weight of tert-butyl hydroquinone,
b) between about 1.0% and about 3.0% by weight of citric acid,
c) between about 35% and about 45% by weight of diethylene glycol monobutyl ether,
d) between about 5% and about 10% by weight of propylene glycol, and
e) between about 20% and about 30% by weight of n-butyl acetate.

38. A composition comprising:
a) from about 0.001 to about 5 weight % of an antioxidant composition, wherein the antioxidant composition is the composition of claim37, and
b) at least one fatty acid or ester of fatty acid.

39. A composition comprising:
a) at least one burnable fuel source, and
b) a biodiesel composition, wherein the biodiesel composition is the composition of claim 38.

40. A composition comprising:
a) between about 15% and about 35% by weight of tert-butyl hydroquinone,
b) between about 1.0% and about 3.0% by weight of citric acid,
c) between about 35% and about 45% by weight of diethylene glycol monobutyl ether,
d) between about 5% and about 10% by weight of propylene glycol, and
e) between about 20% and about 30% by weight of n-butyl acetate,
wherein the composition comprises 0% to 10% by weight of total surface active agents.

41. A composition comprising:
a) from about 0.001 to about 5 weight % of an antioxidant composition, wherein the antioxidant composition is the composition of claim 40, and,
b) at least one fatty acid or ester of fatty acid.

42. A composition comprising:
a) at least one burnable fuel source, and
b) a biodiesel composition, wherein the biodiesel composition is the composition of claim 41.