CLAIMS

1. A lubricating oil composition comprising:

a major amount of a base oil; and

a minor amount of an antioxidant composition comprising:

a mixture of alkylated diphenylamines having a weight ratio of mono-alkylated diphenylamine to di-alkylated diphenylamine ranging from 0.6 to 4; and

a molybdenum or sulfur additive that provides synergistic enhancement of oxidation stability in combination with the mixture of alkylated diphenylamines.

2. The lubricating oil composition of claim 1, wherein the mixture of alkylated diphenylamines is present in a concentration ranging from 0.01 wt % to 5 wt % of the lubricating oil composition.

3. The lubricating oil composition of claim 1, wherein the molybdenum or sulfur additive is present in a concentration ranging from 0.01 wt % to 5 wt % of the lubricating oil composition.

4. The lubricating oil composition of claim 1, wherein the mixture of alkylated diphenylamine is primarily a mixture product of diphenylamine alkylated with propylene tetramer.

5. The lubricating oil composition of claim 1, wherein the additive is a molybdenum succinimide, molybdenum amino alcohol, molybdenum dithiocarbamate, sulfurized olefin ester, sulfurized isobutylene, methylene bisdithiocarbamate, molybdenum dialkyldithiocarbamate, molybdenum ester/amide, molybdenum dithiophosphate, molybdenum amine-complex, methylene bis(dibutyldithiocarbamate), sulfurized hydrocarbon, sulfurized ester, sulfurized fatty

acid, sulfurized vegetable oil, sulfurized isobutylene, sulfur-containing phenol, or thioester bis-hydrocinnamic ester.

6. The lubricating oil composition of claim 1, wherein the weight ratio of mono-alkylated diphenylamine to di-alkylated diphenylamine ranges from 0.8 to 3.

7. The lubricating oil composition of claim 1, wherein the weight ratio of mono-alkylated diphenylamine to di-alkylated diphenylamine ranges from 0.9 to 1.1.

8. The lubricating oil of claim 1, further comprising:

an antioxidant, an ashless dispersant, an anti-wear agent, a detergent, a rust inhibitor, a dehazing agent, a demulsifying agent, a friction modifier, a metal deactivating agent, a pour point depressant, a viscosity modifier, an antifoaming agent, a co-solvent, a package compatibilizer, a corrosion-inhibitor, a dye, or an extreme pressure agent.

9. An oxidation stabilizing composition comprising:

a mixture of alkylated diphenylamines having a weight ratio of mono-alkylated diphenylamine to di-alkylated diphenylamine ranging from 0.6 to 4; and

a molybdenum or sulfur additive that provides synergistic enhancement of oxidation stability in combination with the mixture of alkylated diphenylamines.

10. The oxidation stabilizing composition of claim 9, further comprising:

a lubricating oil, a mineral oil, a hydraulic fluid, a metal working fluid, or a gear oil.

11. The oxidation stabilizing composition of claim 9, wherein the additive is a organomolybdenum compound, sulfur-containing organomolybdenum compound, sulfur-free organomolybdenum compound, or a sulfur-containing organic compound.

12. The oxidation stabilizing composition of claim 9, wherein the additive is a molybdenum succinimide, molybdenum amino alcohol, molybdenum dithiocarbamate, molybdenum dialkyldithiocarbamate, molybdenum ester/amide, molybdenum dithiophosphate, molybdenum amine-complex, sulfurized olefin ester, sulfurized isobutylene, methylene bisdithiocarbamate, methylene bis(dibutyldithiocarbamate), sulfurized hydrocarbon, sulfurized ester, sulfurized fatty acid, sulfurized vegetable oil, sulfurized isobutylene, or thioester bis hydrocinnamic ester.

13. The oxidation stabilizing composition of claim 9, wherein the mixture of alkylated diphenylamine is primarily a mixture product of diphenylamine alkylated with propylene tetramer.

14. The oxidation stabilizing composition of claim 9, wherein the weight ratio of mono-alkylated diphenylamine to di-alkylated diphenylamine ranges from 0.8 to 3.

15. The oxidation stabilizing composition of claim 9, wherein the weight ratio of mono-alkylated diphenylamine to di-alkylated diphenylamine ranges from 0.9 to 1.1.

16. The oxidation stabilizing composition of claim 9, further comprising:

an antioxidant, an ashless dispersant, an anti-wear agent, a detergent, a rust inhibitor, a dehazing agent, a demulsifying agent, a friction modifier, a metal deactivating agent, a pour point depressant, a viscosity modifier, an antifoaming agent, a co-solvent, a package compatibilizer, a corrosion-inhibitor, a dye, or an extreme pressure agent.

17. A method of improving oxidation stability of a lubricating oil, the method comprising:

supplying to the engine a lubricating oil composition comprising:

a major amount of a base oil;

a mixture of alkylated diphenylamines having a weight ratio of mono-alkylated diphenylamine to di-alkylated diphenylamine ranging from 0.6 to 4; and

a molybdenum or sulfur additive that provides synergistic enhancement of oxidation stability in combination with the mixture of alkylated diphenylamines.

18. The method of claim 17, wherein the lubricating oil composition further comprises:

an antioxidant, an ashless dispersant, an anti-wear agent, a detergent, a rust inhibitor, a dehazing agent, a demulsifying agent, a friction modifier, a metal deactivating agent, a pour point depressant, a viscosity modifier, an antifoaming agent, a co-solvent, a package compatibilizer, a corrosion-inhibitor, a dye, or an extreme pressure agent.

19. The method of claim 17, wherein the mixture of alkylated diphenylamines is primarily a mixture product of diphenylamine alkylated with propylene tetramer.

20. The method of claim 17, wherein the additive is molybdenum succinimide, molybdenum amino alcohol, molybdenum dithiocarbamate, sulfurized olefin ester, sulfurized isobutylene, methylene bisdithiocarbamate, molybdenum dialkyldithiocarbamate, molybdenum ester/amide, molybdenum dithiophosphate, molybdenum amine-complex, methylene bis(dibutyldithiocarbamate), sulfurized hydrocarbon, sulfurized ester, sulfurized fatty acid, sulfurized vegetable oil, sulfurized isobutylene, or thioester bis hydrocinnamic ester.

21. A lubricating oil composition comprising:

a major amount of a base oil; and

a minor amount of an antioxidant comprising a mixture of alkylated diphenylamines having a weight ratio of mono-alkylated diphenylamine to di-alkylated diphenylamine ranging from 0.9 to 1.1, wherein the alkylated diphenylamines is a product of an alkylation of diphenylamine and propylene tetramer.

22. The lubricating oil composition of claim 21, wherein the mixture of alkylated diphenylamines is present in a concentration ranging from 0.01 wt % to 5 wt % of the lubricating oil composition.

23. The lubricating oil of claim 21, further comprising:

an antioxidant, an ashless dispersant, an anti-wear agent, a detergent, a rust inhibitor, a dehazing agent, a demulsifying agent, a friction modifier, a metal deactivating agent, a pour point depressant, a viscosity modifier, an antifoaming agent, a co-solvent, a package compatibilizer, a corrosion-inhibitor, a dye, or an extreme pressure agent.

24. The lubricating oil of claim 21, wherein the weight ratio of mono-alkylated diphenylamine to di-alkylated diphenylamine ranges from 0.8 to 3.