CLAIMS

1. A lubricating oil composition comprising:

a base oil;

a primary antioxidant comprising alkylated diphenylamines having an alkyl group derived from a propylene tetramer;

a secondary antioxidant comprising a dithiocarbamate, a hindered phenol, or a molybdenum succinimide; and

a sulfonate detergent.

2. The lubricating oil composition of claim 1, wherein at least 50% of the alkyl group of the alkylated diphenylamine have a carbon number between 10 and 15.

3. The lubricating oil composition of claim 1, wherein the sulfonate detergent :

(a) is a petroleum-based detergent or a synthetic detergent, or

(b) is overbased, or

(c) is present in 0.01 wt % to 10 wt % of the lubricating oil composition, or

(d) includes an internal olefin sulfonate, an alkyl ether sulfonate, an alcohol ether sulfonate, a linear alkyl aryl sulfonate, or an alkane sulfonate.

4. The lubricating oil composition of claim 1, wherein the primary antioxidant is present in 0.01 wt % to 20 wt % of the lubricating oil composition.

5. The lubricating oil composition of claim 1, wherein the secondary antioxidant is present in 0.01 wt % to 20 wt % of the lubricating oil composition.

6. The lubricating oil composition 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.

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

supplying to an engine a lubricating oil composition comprising:

a base oil;

a primary antioxidant comprising alkylated diphenylamines having an alkyl group derived from propylene tetramer;

a secondary antioxidant comprising a dithiocarbamate, a hindered phenol, or a molybdenum succinimide; and

a sulfonate detergent.

8. The method of claim 7, wherein at least 50% of the alkylated diphenylamines have a carbon number between 10 and 15.

9. The method of claim 7, wherein the sulfonate detergent:

(a) is a petroleum-based detergent or a synthetic detergent, or

(b)) is overbased, or

(c) is present in 0.01 wt % to 10 wt % of the lubricating oil composition, or

(d) includes an internal olefin sulfonate, an alkyl ether sulfonate, an alcohol ether sulfonate, a linear alkyl aryl sulfonate, or an alkane sulfonate.

10. The method of claim 7, wherein the primary antioxidant is present in 0.01 wt % to 20 wt % of the lubricating oil composition.

11. The method of claim 7, wherein the secondary antioxidant is present in 0.01 wt % to 20 wt % of the lubricating oil composition.

12. The method of claim 7, 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.