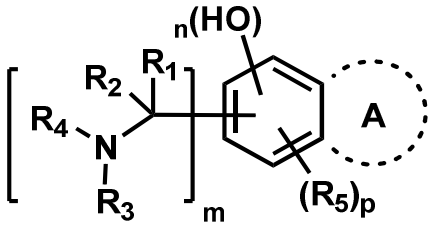
CLAIMS

1. A fuel composition comprising:

a hydrocarbon fuel boiling in the gasoline or diesel range; and

a primary additive having a structure given by



or a salt thereof;

wherein A is a ring moiety;

wherein R_1 and R_2 are independently H, C_1-C_{20} hydrocarbyl group, carboxyl group, ether, or hydroxyl group;

wherein R_3 and R_4 are independently H, C_1-C_{20} hydrocarbyl group, carboxyl group, ether, amino, or hydroxyl group or wherein R_3 and R_4 are part of a cyclic group; R_5 is C_1-C_{100} hydrocarbyl group, carboxyl group, ether, or hydroxyl group; and

wherein p is 0 to 2, n is 1 to 3, m is 1 to 3, and p+n+m is less than 5.

2. The composition of claim 1, wherein the carboxyl group is carboxylic acid, ester, amide or ketone.

3. The composition of claim 1, wherein A is an aromatic ring or a heterocyclic ring.

4. The composition of claim 1, wherein the cyclic group includes one or more nitrogens or one or more oxygens.

5. The composition of claim 1, further comprising:

a secondary additive or a salt thereof, optionally wherein:

(i) the secondary additive is an acid, phenol, 1, 3 dicarbonyl, hydroxyamide, antioxidant, salicylate, amidine or guanidine, or

(ii) wherein the secondary additive is 2-ethylhexanoic acid, or 1,8-diazabicyclo[5.4.0]-undeca-7-ene.

6. The composition of claim 1, wherein:

(i) R_1 and R_2 are both hydrogen, or

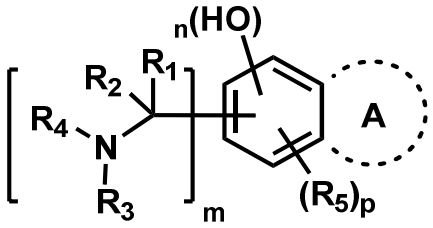
(ii) wherein at least one of R_3 and R_4 is an ethyl or butyl group.

7. A method for preventing or reducing low speed pre-ignition events in a spark-ignited internal combustion engine, the method comprising:

supplying to the engine a fuel composition comprising:

a hydrocarbon fuel boiling in the gasoline or diesel range; and

a primary additive having a structure given by



or a salt thereof;

wherein A is a ring moiety;

wherein R_1 and R_2 are independently H, C_1-C_{20} hydrocarbyl group, carboxyl group, ether, or hydroxyl group;

wherein R_3 and R_4 are independently H, C_1-C_{20} hydrocarbyl group, carboxyl group, ether, amino, or hydroxyl group or wherein R_3 and R_4 are part of a cyclic group; R_5 is C_1-C_{100} hydrocarbyl group, carboxyl group, ether, or hydroxyl group; and

wherein p is 0 to 2, n is 1 to 3, m is 1 to 3, and p+n+m is less than 5.

8. The method of claim 7, wherein the composition further comprising a second additive or a salt thereof, wherein the second additive is an acid, phenol, 1, 3 dicarbonyl, hydroxyamide, antioxidant, salicylate, amidine or guanidine, optionally wherein the secondary additive is 2-ethylhexanoic acid, or 1,8-diazabicyclo[5.4.0]-undeca-7-ene .

9. The method of claim 7, wherein the carboxyl group is carboxylic acid ester, amide, or ketone.

10. The method of claim 7, wherein A is an aromatic ring or a heterocyclic ring.

11. The method of claim 7, wherein the cyclic group includes one or more nitrogens or one or more oxygens.

12. The method of claim 7, wherein:

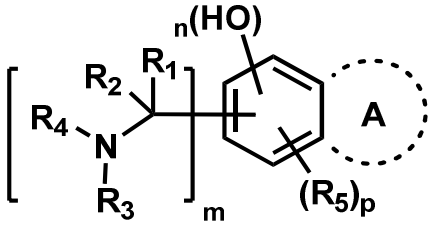
(i) R_1 and R_2 are both hydrogen, or

(ii) at least one of R_3 and R_4 is an ethyl or butyl group.

13. A lubricating oil composition comprising:

a base oil of lubricating viscosity; and

a primary additive having a structure given by



or a salt thereof;

wherein A is a ring moiety;

wherein R_1 and R_2 are independently H, C_1-C_{20} hydrocarbyl group, carboxyl group, ether, or hydroxyl group;

wherein R_3 and R_4 are independently H, C_1-C_{20} hydrocarbyl group, carboxyl group, ether, amino, or hydroxyl group or wherein R_3 and R_4 are part of a cyclic group;

R_5 is C_1-C_{100} hydrocarbyl group, carboxyl group, ether, or hydroxyl group; and

wherein p is 0 to 2, n is 1 to 3, m is 1 to 3, and p+n+m is less than 5.

14. The composition of claim 13, further comprising a second additive or a salt thereof, wherein the second additive is an acid, phenol, 1, 3 dicarbonyl, hydroxyamide, antioxidant, salicylate, amidine or guanidine.

15. The composition of claim 13, wherein the carboxyl group is carboxylic acid ester, amide, or ketone.