

Claims

1. A fuel composition comprising as an additive the reaction product of a polycarboxylic acid having no more than 5 carbon atoms per carboxylic acid group, or an anhydride thereof
5 and an alcohol having at least 5 carbon atoms.
2. A method of improving the performance of an engine, the method comprising combusting in the engine a fuel composition comprising as an additive the reaction product of a polycarboxylic acid having no more than 5 carbon atoms per carboxylic acid group, or an
10 anhydride thereof and an alcohol having at least 5 carbon atoms.
3. The use of the reaction product of a polycarboxylic acid having no more than 5 carbon atoms per carboxylic acid group, or an anhydride thereof and an alcohol having at least 5 carbon atoms as an additive for a fuel composition to improve the performance of an
15 engine combusting said fuel composition.
4. A composition, method or use according to any preceding claim wherein the polycarboxylic acid or anhydride thereof is selected from citric acid, itaconic acid, citraconic acid, 2-methylene glutaric acid, 2-methylene adipic acid, isocitric acid, 2-
20 hydroxycitric acid, malic acid, tartaric acid, 2-hydroxyadipic acid, 2-hydroxyglutaric acid, aconitic acid, and anhydrides and/or isomers thereof.
5. A composition, method or use according to any preceding claim wherein the polycarboxylic acid or anhydride thereof is selected from citric acid, itaconic acid and
25 itaconic anhydride.
6. A composition, method or use according to any preceding claim wherein the alcohol is a compound of formula $H-(OR)_n-OR^1$, wherein R is an optionally substituted alkylene group; R^1 is an optionally substituted hydrocarbyl group; and n is 0 or a positive integer.
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7. A composition, method or use according to claim 6 wherein the alcohol is selected from:
 - alkanols of formula $CH_3(CH_2)_xOH$ wherein x is from 4 to 23, preferably from 9 to 19;
 - branched or cyclic alkyl alcohols in which n is 0;
 - alkenyl alcohols in which n is 0;
 - 35 - glycol ethers in which n is not 0.
8. A composition, method or use according to claim 6 or claim 7 wherein the alcohol is selected from an

- an alcohol of formula R^1OH wherein R^1 is a (preferably branched) alkyl group having 8 to 30 carbon atoms;
 - an alcohol of formula R^1OH wherein R^1 is an alkenyl group having 8 to 30 carbon atoms; and
 - 5 - an alcohol of formula $H-(OR)_n-OR^1$ wherein n is from 1 to 24, R is ethylene, propylene or isopropylene, and R^1 is an unsubstituted alkyl group having 8 to 30, preferably 12 to 24, carbon atoms.
9. A composition, method or use according to any preceding claim wherein the alcohol is
- 10 selected from hexanol, octanol, nonanol, decanol, dodecanol, tetradecanol, cetyl alcohol, stearyl alcohol, 2-ethyl-1-butanol, 2-ethyl-1-hexanol, 2-ethyl-1-heptanol, 2-propylheptanol, 2-ethyl-1-decanol, 2-hexyl-1-decanol, 2-octyl-1-decanol, 2-hexyl-1-dodecanol, 2-octyl-1-dodecanol, 2-decyl-1-tetradecanol, isotridecanol, cyclohexanol, cyclooctanol, benzyl alcohol, citronellol, oleyl alcohol, 9-decen-1-ol, cis-3-hexen-1-ol, trans-2-hexen-1-ol, 5-
- 15 hexen-1-ol, 6-methyl-5-hepten-2-ol, 1-octen-3-ol, trans-2-octen-1-ol, 10-undecen-1-ol and compounds of formula $CH_3(CH_2)_xO(CH_2CH(CH_3)O)_yH$ or an isomer thereof wherein x is from 10 to 15, and y is from 10 to 20.
10. A composition, method or use according to any preceding claim wherein the
- 20 polycarboxylic acid or anhydride thereof and the alcohol are reacted in a molar ratio of from 2:1 to 1:2.
11. A composition, method or use according to any preceding claim wherein the additive has
- 25 an acid value of from 0.6 to 9.7 mmol H^+/g , preferably from 1.3 to 7.1 mmol H^+/g , more preferably from 1.6 to 6.2 mmol H^+/g .
12. A composition, method or use according to any preceding claim wherein the fuel
- 30 composition is a diesel fuel composition, which optionally comprises one or more further additives selected from:
- (i) a quaternary ammonium salt additive;
 - (ii) the product of a Mannich reaction between an aldehyde, an amine and an optionally substituted phenol;
 - 35 (iii) the reaction product of a carboxylic acid-derived acylating agent and an amine;
 - (iv) the reaction product of a carboxylic acid-derived acylating agent and hydrazine;

- (v) a salt formed by the reaction of a carboxylic acid with di-n-butylamine or tri-n-butylamine;
- 5 (vi) the reaction product of a hydrocarbyl-substituted dicarboxylic acid or anhydride and an amine compound or salt which product comprises at least one amino triazole group;
- (vii) a substituted polyaromatic detergent additive;
- 10 (viii) partial esters of substituted succinic acids.
13. A composition, method or use according to claim 12 wherein the diesel fuel composition further comprises a quaternary ammonium salt additive; preferably wherein the quaternary ammonium salt additive is the reaction product of a nitrogen-containing species having at least one tertiary amine group and a quaternising agent wherein the nitrogen containing species is the reaction product of a hydrocarbyl-substituted acylating agent and a compound comprising at least one tertiary amine group and a primary amine, secondary amine or alcohol group; preferably wherein the quaternising agent is an ester quaternising agent.
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14. A composition, method or use according to any preceding claim wherein the fuel composition is a gasoline fuel composition, which optionally comprises one or more further additives selected from:
- 25 (p) hydrocarbyl – substituted polyoxyalkylene amines or polyetheramines;
- (q) acylated nitrogen compounds which are the reaction product of a carboxylic acid-derived acylating agent and an amine;
- (r) hydrocarbyl-substituted amines wherein the hydrocarbyl substituent is substantially aliphatic and contains at least 8 carbon atoms;
- 30 (s) Mannich base additives comprising nitrogen-containing condensates of a phenol, aldehyde and primary or secondary amine;
- (t) aromatic esters of a polyalkylphenoxyalkanol;
- (u) an additional quaternary ammonium salt additive; and
- (v) tertiary hydrocarbyl amines having a maximum of 30 carbon atoms.
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15. A method or use according to any of claims 2 to 14 which combats deposits in the engine.
16. A method or use according to any of claims 2 to 15 wherein the engine is a diesel engine, preferably a modern diesel engine having a high pressure fuel system.

17. A method or use according to claim 16 wherein the improvement in performance is selected from one or more of:
- 5 - a reduction in power loss of the engine;
 - a reduction in external diesel injector deposits;
 - a reduction in internal diesel injector deposits;
 - an improvement in fuel economy;
 - a reduction in fuel filter deposits;
- 10 - a reduction in emissions; and
 - an increase in maintenance intervals.
18. A method or use according to any of claims 2 to 17 which combats internal diesel injector deposits.
- 15 19. A method or use according to any of claims 2 to 18 which achieves a maximum exhaust temperature deviation of less than 30°C in the DW10C test.
- 20 20. A method or use according to any of claims 2 to 15 wherein the engine is a gasoline engine, preferably a direct injection spark ignition engine.
21. A method or use according to claim 20 wherein the improvement in performance is selected from one or more of:
- 25 • improved fuel economy
 • reduced maintenance
 • less frequent overhaul or replacement of injectors
 • improved driveability
 • improved power
- 30 • improved acceleration
22. A method or use according to any of claims 2 to 21 which achieves "keep clean" performance.
- 35 23. A method or use according to any of claims 2 to 22 which achieves "clean up" performance.