CLAIMS

1. An oil soluble polyester composition comprising a reaction product of:

(a) a hydrocarbyl-substituted succinic acylating agent;

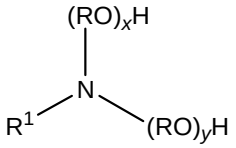
(b) a hydroxyalkyl-substituted amine compound selected from a *N,N*-di-hydroxyalkyl-substituted tertiary monoamine, a *N,N'*-di-hydroxyalkyl-substituted tertiary diamine, or combinations thereof; and

(c) a poly(oxyalkylene) polyol having from 2 to 15 C_{2-4} alkylene oxide units per molecule.

2. The oil soluble polyester composition of claim 1, wherein the hydrocarbyl-substituted succinic acylating agent comprises a polyisobutenyl succinic anhydride in which the polyisobutenyl group has a number average molecular weight (M_n) of from 500 to 5000.

3. The oil soluble polyester composition of claim 2, wherein the hydrocarbyl-substituted succinic acylating agent further comprises a C_{12-20} hydrocarbyl-substituted succinic acylating agent.

4. The oil soluble polyester composition of claim 1, wherein the *N,N*-di-hydroxyalkyl-substituted tertiary monoamine has the following structure:



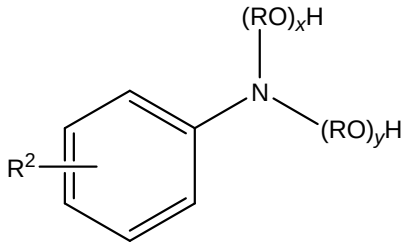
wherein:

(a) R^1 is selected from C_{1-20} alkyl, C_{5-20} cycloalkyl, C_{6-20} aryl, 5- to 20-membered heteroaryl, and 5- to 20-membered heterocyclyl, and wherein the alkyl, cycloalkyl, aryl, heteroaryl, and heterocyclyl groups are optionally substituted;

(b) R in each of the *x* (RO) and the *y* (RO) groups is independently C_{2-4} alkylene; and

(c) *x* and *y* are independently an integer of 1 to 5.

5. The composition of claim 1, wherein the *N,N*-di-hydroxyalkyl-substituted tertiary monoamine has the following structure:



wherein:

(a) R^2 is hydrogen, C_{1-4} alkyl, —NH—(C_{6-10} aryl), —NH—(C_{7-16} aralkyl), —O—(C_{1-4} alkyl), —O—(C_{6-10} aryl), or —O—(C_{7-16} aralkyl)

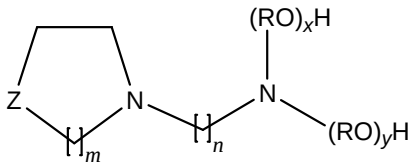
(b) R in each of the *x* (RO) and the *y* (RO) groups is independently C_{2-4} alkylene; and

(c) *x* and *y* are independently an integer of 1 to 5.

6. The oil soluble polyester composition of claim 5, wherein the *N,N*-di-hydroxyalkyl tertiary monoamine is selected from the group consisting of *N,N*-bis(2-hydroxyethyl)aniline, *N,N*-bis(2-hydroxypropyl)aniline, *N,N*-bis(2-hydroxyethyl)-*N*'-phenyl-1,4-phenylenediamine, 4-phenoxy-*N,N*-bis(2-hydroxyethyl)aniline, and 4-benzyloxy-*N,N*-bis(2-hydroxypropyl)aniline, and combinations thereof.

7. The oil soluble polyester composition of claim 6, wherein the *N,N*-di-hydroxyalkyl tertiary monoamine is *N,N*-bis(2-hydroxyethyl)aniline.

8. The oil soluble polyester composition of claim 1, wherein the *N,N*-di-hydroxyalkyl-substituted tertiary monoamine has the following structure:



wherein:

(a) R in each of the *x* (RO) and the *y* (RO) groups is independently C_{2-4} alkylene;

(b) *x* and *y* are independently an integer of 1 to 5;

(c) Z is CH_2, O, S, N—(C_{1-4} alkyl), or N—(C_{6-10} aryl);

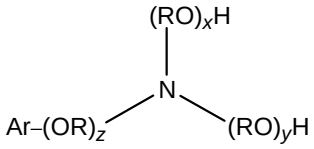
(d) *m* is an integer of 1 to 3; and

(e) *n* is an integer of 1 to 6.

9. The oil soluble polyester composition of claim 8, wherein the *N,N*-di-hydroxyalkyl-substituted tertiary monoamine is selected from the group consisting of 2-pyrrolidino-*N,N*-bis(2-hydroxyethyl)ethylamine, 2-pyrrolidino-*N,N*-bis(2-hydroxypropyl)ethylamine, 2-piperidino-*N,N*-bis(2-hydroxyethyl)ethylamine, 2-piperidino-*N,N*-bis(2-hydroxypropyl)ethylamine, 3-piperidino-*N,N*-bis(2-hydroxyethyl)propylamine, 3-piperidino-*N,N*-bis(2-hydroxypropyl)propylamine, 2-morpholino-*N,N*-bis(2-hydroxyethyl)ethylamine, 2-morpholino-*N,N*-bis(2-hydroxypropyl)ethylamine, 3-morpholino-*N,N*-bis(2-hydroxyethyl)propylamine, and 3-morpholino-*N,N*-bis(2-hydroxypropyl)propylamine, and combinations thereof.

10. The oil soluble polyester composition of claim 9, wherein the *N,N*-di-hydroxyalkyl-substituted tertiary monoamine is 3-morpholino-*N,N*-bis(2-hydroxyethyl)propylamine.

11. The oil soluble polyester composition of claim 1, wherein the *N,N*-di-hydroxyalkyl-substituted tertiary monoamine has the following structure:



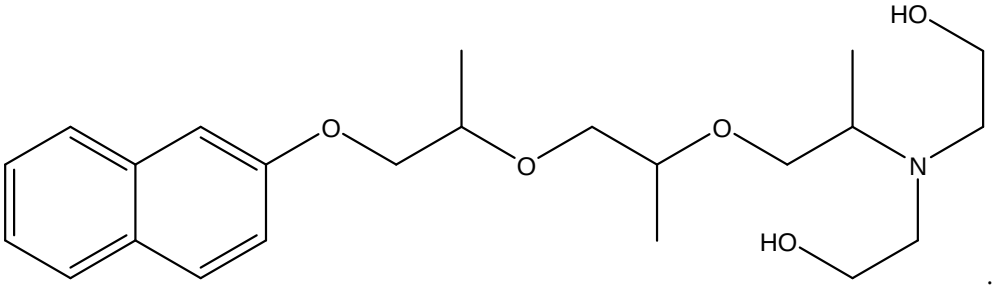
wherein:

(a) R in each of the *x* (RO), *y* (RO) and *z* (RO) groups is independently C_{2-4} alkylene;

(b) *x*, *y* and *z* are independently an integer of 1 to 5; and

(c) Ar is optionally substituted C_{6-20} aryl.

12. The oil soluble polyester composition of claim 11, wherein the *N,N*-di-hydroxyalkyl-substituted tertiary monoamine has the following structure:



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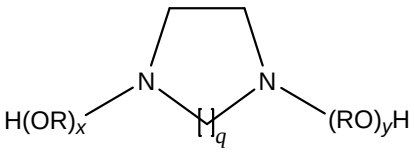
13. The oil soluble polyester composition of claim 1, wherein the *N,N'*-di-hydroxyalkyl-substituted tertiary diamine has the following structure:



wherein:

(a) R in each of the *x* (RO) and the *y* (RO) groups is independently C_{2-4} alkylene; and

(b) *q* is an integer of 1, 2, or 3.

14. The oil soluble polyester composition of claim 13, wherein the *N,N'*-di-hydroxyalkyl-substituted tertiary diamine is selected from the group consisting of *N,N'*-bis(2-hydroxyethyl)piperazine, *N,N'*-bis(2-hydroxypropyl)piperazine, *N*-(2-hydroxyethyl)-*N'*-(2-hydroxypropyl)piperazine, *N*-(2-hydroxyethyl)-*N'*-(2-hydroxybutyl)piperazine, *N,N'*-bis(2-hydroxyethyl)homopiperazine, *N,N'*-bis(2-hydroxypropyl)homopiperazine, and combinations thereof.

15. The oil soluble polyester composition of claim 14, wherein the *N,N'*-di-hydroxyalkyl-substituted tertiary diamine is *N,N'*-bis(2-hydroxyethyl)piperazine.

16. The oil soluble polyester composition of any one of claims 4, 5, 8 11, or 13, wherein R in each of the *x* (RO) and the *y* (RO) groups is independently selected from ethylene and propylene.

17. The oil soluble polyester composition of any one of claims 4, 5, 8 11, or 13, wherein *x* is an integer of 1 and *y* is an integer of 1.

18. The oil soluble polyester composition of claim 1, wherein the reaction product further comprises a poly(oxyalkyene) polyol having from 5 to 15 C_{2-4} alkylene oxide units per molecule.

19. The oil soluble polyester composition of claim 1, wherein the reaction product further comprises an aliphatic dicarboxylic acid having 6 to 20 carbon atoms, an aromatic dicarboxylic acid having 8 to 20 carbon atoms, or a combination thereof.

20. A lubricating oil composition comprising (a) a major amount of an oil of lubricating viscosity and (b) from 0.05 to 15 wt. %, based on the total weight of the lubricating oil composition, of the oil soluble polyester composition of claim 1.

21. The lubricating oil composition of claim 20, further comprising at least one additive selected from the group consisting of demulsifiers, detergents, dispersants, extreme pressure agents, foam inhibitors, friction modifiers, multifunctional additives, oxidation inhibitors, pour point depressants, rust inhibitors, and wear inhibitors.

22. A lubricating oil additive concentrate comprising from 80 to 20 wt. % of an organic liquid diluent and from 20 to 80 wt. % of the oil soluble polyester composition of claim 1.

23. A method for controlling soot-induced viscosity increase experienced in diesel engine lubricating oils during use in diesel engines, the method comprising employing as the diesel engine lubricating oil the lubricating oil composition of claim 20.

24. A method of improving soot dispersancy in an internal combustion engine which comprises operating the engine with a lubricating oil composition comprising a major amount of oil of lubricating viscosity and an effective amount of the oil soluble polyester composition of claim 1.

25. A process for preparing an oil soluble polyester composition which comprises reacting a mixture comprising:

(i) a hydrocarbyl-substituted succinic acylating agent;

(ii) a hydroxyalkyl-substituted amine compound selected from a *N,N*-di-hydroxyalkyl-substituted tertiary monoamine, a *N,N'*-di-hydroxyalkyl-substituted tertiary diamine, or combinations thereof; and

(iii) a poly(oxyalkylene) polyol having from 2 to 15 C_{2-4} alkylene oxide units per molecule; and

wherein a charge mole ratio of the hydroxalkyl-substituted amine compound to the hydrocarbyl succinic acylating agent in the mixture is maintained at 0.67 to 1.5:1.

26. The process of claim 25, wherein the mixture is maintained at a temperature of 150°C to 260°C.

27. The process of claim 25, wherein the hydrocarbyl-substituted succinic acylating agent comprises a polyisobutenyl succinic anhydride in which the polyisobutenyl group has a number average molecular weight (M_n) of from 500 to 5000.

28. A process for preparing an oil soluble polyester composition which comprises the steps of:

(a) reacting a mixture comprising:

(i) a first hydrocarbyl-substituted succinic acylating agent (HC-SAA^1); and

(ii) a hydroxyalkyl-substituted amine compound to form an intermediate material, wherein the hydroxyalkyl-substituted amine compound is selected from the group consisting of a *N,N*-di-hydroxyalkyl-substituted tertiary monoamine, a *N,N'*-di-hydroxyalkyl-substituted tertiary diamine, and combinations thereof; and

(iii) a poly(oxyalkylene) polyol having from 2 to 15 C_{2-4} alkylene oxide units per molecule; and

(b) reacting the intermediate material of step (a) with a second hydrocarbyl-substituted acylating agent (HC-SAA^2);

wherein a charge mole ratio of the hydroxalkyl-substituted amine compound to [(HC-SAA^1)+(HC-SAA^2)] is maintained at 0.67 to 1.5:1.

29. The process of claim 28, wherein steps (a) and (b) are maintained at a temperature of 150°C to 260°C.

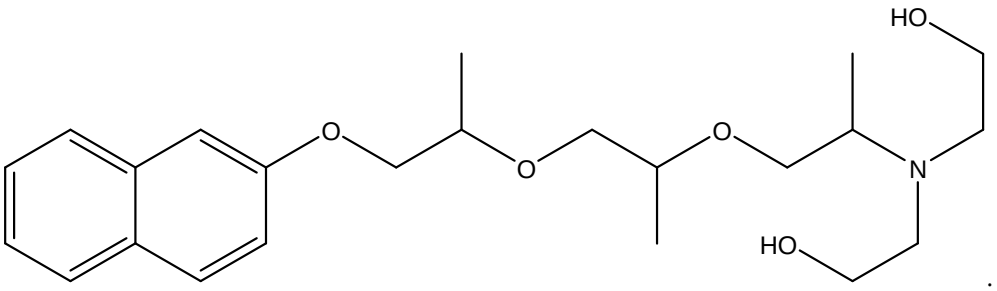
30. The process of claim 28, wherein the first hydrocarbyl-substituted succinic acylating agent comprises a C_{12-20}-hydrocarbyl-substituted acylating agent.

31. The process of claim 30, wherein the C_{12-20}-hydrocarbyl-substituted acylating agent is selected from one or more of dodecenyl succinic anhydride, hexadecenyl succinic anhydride, and octadecenyl succinic anhydride.

32. The process of claim 28, wherein the second hydrocarbyl-substituted succinic acylating agent comprises a polyisobutenyl succinic anhydride in which the polyisobutenyl group has a number average molecular weight (M_n) of from 500 to 5000.

33. The process of claim 25 or 28, wherein the *N,N*-di-hydroxyalkyl tertiary monoamine is selected from the group consisting of *N,N*-bis(2-hydroxyethyl)aniline, *N,N*-bis(2-hydroxypropyl)aniline, *N,N*-bis(2-hydroxyethyl)-*N*'-phenyl-1,4-phenylenediamine, 4-phenoxy-*N,N*-bis(2-hydroxyethyl)aniline, and 4-benzyloxy-*N,N*-bis(2-hydroxypropyl)aniline, and combinations thereof.

34. The process of claim 25 or 28, wherein the *N,N*-di-hydroxyalkyl-substituted tertiary monoamine has the following structure:



35. The process of claim 25 or 28, wherein the *N,N*′-di-hydroxyalkyl-substituted tertiary diamine is selected from the group consisting of *N,N*′-bis(2-hydroxyethyl)piperazine, *N,N*′-bis(2-hydroxypropyl)piperazine, *N*-(2-hydroxyethyl)-*N*′-(2-hydroxypropyl)piperazine, *N*-(2-hydroxyethyl)-*N*′-(2-hydroxybutyl)piperazine, *N,N*′-bis(2-hydroxyethyl)homopiperazine, *N,N*′-bis(2-hydroxypropyl)homopiperazine, and combinations thereof.

36. The process of claim 28, wherein the poly(oxyalkylene)polyol is selected from one or more of polyethylene glycol 200, polyethylene glycol 300, polyethylene glycol 400, polyethylene glycol 600, polypropylene glycol 400, and polypropylene glycol 725.