CLAIMS:

1. A method for preparing at least one ester polyol ester, the method comprising

esterifying an ester polyol reaction mixture to produce ester polyol, the reaction mixture comprising an ozone acid mixture and at least one primary polyol, wherein the ozone acid mixture comprises at least one dicarboxylic acid and at least one monocarboxylic acid; and

capping the ester polyol with at least one capping carboxylic acid to produce ester polyol ester.

2. The method according to claim 1, wherein:

(i) the ozone acid mixture has a Difunctional/Monofunctional Ratio (DMR) corresponding to a ratio of moles of dicarboxylic acid to moles of monocarboxylic acid; and the ester polyol ester has a viscosity proportional to the DMR of the ozone acid mixture; and/or

(ii) the ester polyol reaction mixture has a hydroxyl to carboxyl ratio (HCR) corresponding to a ratio of moles of –OH groups to moles of –COOH groups and the ester polyol ester has a viscosity inversely proportional to the HCR of the ester polyol reaction mixture.

3. The method according to any one of claims 1 or 2, wherein the ozone acid mixture is prepared by reacting at least one fatty acid with ozone followed by oxidation.

4. The method according to claim 3, wherein the ozone acid mixture comprises at least one dicarboxylic acid and at least one first monocarboxylic acid; and wherein the method comprises adding at least one additional second monocarboxylic acid to the ozone acid mixture, wherein the first and second monocarboxylic acids are different.

5. The method according to claim 4, wherein the one or more additional second monocarboxylic acid reduces the Difunctional/Monofunctional Ratio (DMR) of the ozone acid mixture.

6. The method according to any one of claims 4 or 5, wherein the Difunctional/Monofunctional ratio (DMR) of the ozone acid mixture is reduced from about 0.76 to about 0.05.

7. The method according to any one of the preceding claims, wherein the ester polyol reaction mixture comprises the at least one primary polyol in stoichiometric excess.

8. The method according to any one of the preceding claims, wherein the ester polyol reaction mixture has a hydroxyl to carboxyl ratio (HCR) corresponding to a ratio of moles of –OH groups to moles of –COOH groups and is from about 1.01 to about 2.0.

9. The method according to any one of the preceding claims, wherein the ester polyol ester has a viscosity proportional to the Difunctional/Monofunctional Ratio (DMR) of the ozone acid mixture, and wherein the viscosity at 40°C of the ester polyol ester is from about 39.1 (cS) to about 236 (cS).

10. The method according to any one of the preceding claims, wherein the at least one capping carboxylic acid is one or more monocarboxylic acids.

11. The method according to claim 10, wherein the at least one capping carboxylic acid is selected from the group consisting of: acetic, propanoic, butyric, pentanoic, hexanoic, nonanoic, 2-ethyl hexanoic, heptanoic, octanoic acid, decanoic, lauric, myristic, palmitic and stearic acids, and mixtures thereof.

12. The method according to claim 11, wherein the at least one capping carboxylic acid is nonanoic acid.

13. The method according to any one of the preceding claims, wherein the ester polyol ester has a pour point from about -11.0 °C to about -57.0 °C.

14. The method according to any one of claims 3 to 13, wherein

the at least one fatty acid is derived from fractionated palm fatty acid distillate (PFAD);

the hydroxyl carboxyl ratio (HCR) of the ester polyol reaction mixture is about 1.25;

the Difunctional/Monofunctional Ratio (DMR) of the ozone acid mixture is from about 0.11 to about 0.21;

the viscosity at 40 °C of the ester polyol ester is from about 37.7 (cS) to about 61.6 (cS); and/or

the ester polyol ester has a pour point from about -57.0 °C to about -42.0 °C.

15. The method according to any one of claims 3 to 13, wherein:

the at least one fatty acid is derived from palm kernel fatty acid distillate (PFKAD);

the Difunctional/Monofunctional ratio (DMR) of the ozone acid mixture is about 0.12;

the hydroxyl carboxyl ratio (HCR) of the ester polyol reaction mixture is about 1.25; and/or

the viscosity at 40 °C of the ester polyol ester is about 53.7 (cS).

16. The method according to any one of claims 3 to 13, wherein:

the at least one fatty acid is derived from a mixture of fractionated palm fatty acid distillate (PFAD) and palm kernel fatty acid distillate (PFKAD);

the Difunctional/Monofunctional ratio (DMR) of the ozone acid mixture is from about 0.05 to about 0.32;

the hydroxyl carboxyl ratio (HCR) of the ester polyol reaction mixture is about 1.25; and/or

the viscosity of the ester polyol ester is about 28 (cS) to about 120 (cS).

17. The method according to any one of claims 3 to 13, wherein:

the at least one fatty acid is derived from fractionated vegetable oleic acid;

the Difunctional/Monofunctional ratio (DMR) of the ozone acid mixture is from about 0.13 to about 0.3;

the hydroxyl carboxyl ratio (HCR) of the ester polyol reaction mixture is about 1.25; and/or

the viscosity of the ester polyol ester is about 37.92 (cS) to about 96.13 (cS).

18. The method according to any one of the preceding claims, wherein the primary polyol is selected from glycerin, diglycerin, ethylene glycol, diethylene glycol, 1,2-propanediol, bis(1,2-propanediol), 2-methyl-1,3-propanediol (2-MePG), trimethylolpropane (TMP), di-trimethylolpropane (Di-TMP), neopentyl glycol (NPG), pentaerythritol (PE), dipentaerythritol (diPE) and sorbitol.

19. The method according to any of the preceding claims, wherein the primary polyol is a branched polyhydric primary polyol.

20. The method according to any one of claims 18 or 19, wherein the primary polyol is trimethylolpropane (TMP).

21. The method according to any one of the preceding claims, wherein the ester polyol ester viscosity is proportional to the Difunctional/Monofunctional Ratio (DMR) of the ozone acid mixture.

22. The method according to any of the preceding claims, wherein a lubricant base stock is formed from the ester polyol ester; the lubricant base stock having a volatility inversely proportional to the Difunctional/Monofunctional Ratio (DMR) of the ozone acid mixture.

23. The method according to claim 22, the method further comprising increasing the Difunctional/Monofunctional ratio (DMR) of the ozone acid mixture, thereby decreasing the volatility of the lubricant base stock.

24. The method according to any one of claims 22 or 23, further comprising increasing the Difunctional/Monofunctional ratio (DMR) of the ozone acid mixture, thereby increasing the viscosity of the lubricant base stock.

25. The method according to any one of the preceding claims, wherein the ester polyol ester has a molecular weight (GPC) proportional to the Difunctional/Monofunctional Ratio (DMR) of the ozone acid mixture.

26. The method according to any one of the preceding claims, further comprising increasing the hydroxyl/carboxyl ratio (HCR) of the ester polyol reaction mixture, thereby decreasing the viscosity of the lubricant base stock.

27. The method according to any one of claims 4 to 26, wherein the one or more additional second monocarboxylic acids is selected from the group consisting of: acetic, propanoic, butyric, pentanoic, hexanoic, nonanoic, 2-ethyl hexanoic, heptanoic, octanoic, decanoic, lauric, myristic, palmitic and stearic acids, and mixtures thereof.

28. The method according to claim 27, wherein the one or more additional second monocarboxylic acids is selected from the group consisting of: hexanoic, nonanoic, 2-ethyl hexanoic, heptanoic, and octanoic acids.

29. The method according to any one of claims 3 to 28, wherein the at least one fatty acid is produced by hydrolyzing at least one triglyceride.

30. The method according to claim 29, wherein the at least one triglyceride comprises at least one vegetable oil and/or at least one animal fat.

31. The method according to claim 30, wherein the at least one vegetable oil is selected from the group consisting of: soybean, safflower, linseed, corn, sunflower, olive, canola, sesame, cottonseed, mustard, camelina, jatropha, peanut, coconut, rapeseed, Chinese tallow, tung, castor, algae, wheat germ, soya, hemp, palm and palm kernel oils, palm olein, and a mixture thereof.

32. The method according to claim 30, wherein the at least one animal fat is selected from the group consisting of: fish oil, tallow, duck fat, and a mixture thereof.

33. The method according to claim 30, wherein the at least one vegetable oil comprises palm oil.

34. The method according to claim 30, wherein the at least one vegetable oil comprises palm olein.

35. The method according to claim 30, wherein the at least one vegetable oil comprises palm kernel oil.

36. The method according to any one of claims 3 to 14 and 18 to 28, wherein the at least one fatty acid is derived from fractionated palm fatty acid distillate (PFAD).

37. The method according to any one of claims 3 to 13 and 17 to 28, wherein the at least one fatty acid is derived from fractionated palm olein.

38. The method according to any one of claims 3 to 13, 15 and 18 to 28, wherein the at least one fatty acid is derived from palm kernel fatty acid distillate (PFKAD).

39. The method according to any one of claims 3 to 38, wherein a range of fatty acids and primary polyols are used while maintaining a desired viscosity of the ester polyol ester, by increasing both the Difunctional/Monofunctional ratio (DMR) of the ozone acid mixture and the hydroxyl/carboxyl ratio (HCR) of the ester polyol reaction mixture.

40. The method according to any one of the preceding claims, wherein the capping step comprises using less than a stoichiometric amount of the at least one capping carboxylic acid.

41. The method according to claim 40, wherein the amount of the at least one capping carboxylic acid used is sufficient to achieve between about 62% to about 100% capping of the ester polyol.

42. The method according to claim 41, wherein the amount of the at least one capping carboxylic acid used is sufficient to achieve between about 62% to about 76% capping of the ester polyol.

43. The method according to any one of claims 41 or 42, wherein the ester polyol is partially capped to produce a partially capped ester polyol ester which is between about 62% to about 99% capped.

44. The method according to claim 43, wherein the ester polyol is partially capped to produce a partially capped ester polyol ester which is between about 62% to about 76% capped.

45. The method according to any one of claims 43 or 44, wherein the partially capped ester polyol ester has greater hydrolytic stability compared to an equivalent fully capped ester polyol ester.

46. The method according to any one of claims 43 to 45, wherein the partially capped ester polyol ester has greater viscosity compared to an equivalent fully capped ester polyol ester, while maintaining a similar pour point.

47. A method for preparing an ester polyol ester, the method comprising esterifying an ozone acid mixture comprising at least one monocarboxylic acid and at least one dicarboxylic acid, in the presence of at least one primary polyol.

48. The method according to claim 47, wherein the ozone acid mixture comprises at least one dicarboxylic acid and at least one first monocarboxylic acid; and wherein the method comprises adding at least one additional second monocarboxylic acid to the ozone acid mixture, wherein the first and second monocarboxylic acids are different.

49. The method according to claim 48, wherein the total amount of monocarboxylic acid is sufficient to achieve a substantially capped ester polyol ester.

50. The method according to any one of claims 47 to 49, wherein the at least one monocarboxylic acid and the at least one additional second monocarboxylic acid are substantially completely esterified.

51. The method according to any one of claims 47 to 50, wherein the total amount of the at least one primary polyol is in stoichiometric excess.

52. The method according to any one of claims 47 to 51, wherein the total amount of hydroxyl functionality in the at least one primary polyol is in stoichiometric excess of between 1% to 38%.

53. The method according to any one of claims 47 to 52, wherein the at least one primary polyol is selected from the group consisting of: glycerin, diglycerin, ethylene glycol, diethylene glycol, 1,2-propanediol, bis(1,2-propanediol), 2-methyl-1,3-propanediol (2-MePG), trimethylolpropane (TMP), di-trimethylolpropane (Di-TMP), neopentyl glycol (NPG), pentaerythritol (PE), dipentaerythritol (diPE) and sorbitol.

54. The method according to any one of claims 47 to 53, wherein the ester polyol ester has a pour point of from about -36 °C to about -51 °C.

55. An ester polyol ester obtainable or obtained by a method according to any one of claims 1 to 54.

56. An ester polyol ester lubricant base oil comprising the ester polyol ester according to claim 55.

57. An ester polyol ester lubricant base oil comprising the reaction product of:

at least one carboxylic acid; and

at least one ester polyol,

wherein the ester polyol has at least one ester group, a first hydroxyl group, and at least a second hydroxyl group.

58. The ester polyol ester lubricant base oil according to any one of claims 56 or 57 having a molecular weight (GPC) of about 700-1900 g/mol.

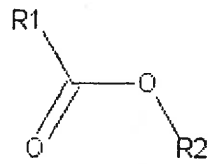
59. The ester polyol ester lubricant base oil according to any one of claims 56 to 58, wherein the at least one carboxylic acid is selected from the group consisting of: acetic, propanoic, butyric, pentanoic, hexanoic, nonanoic, 2-ethyl hexanoic, heptanoic, octanoic, decanoic, lauric, myristic, palmitic and stearic acids, and mixtures thereof.

60. The ester polyol ester lubricant base oil according to claim 59, wherein the at least one carboxylic acid is nonanoic acid.

61. The ester polyol ester lubricant base oil according to any one of claims 56 to 60, having a pour point of below about -11.0 °C.

62. The ester polyol ester lubricant base oil according to any one of claims 56 to 61, having a pour point of between about -57.0 °C to about -11.0 °C.

63. An ester polyol ester composition comprising a compound of Formula I:



Formula I

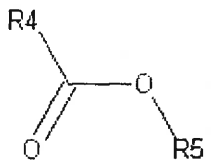
wherein R1 is a linear or branched alkyl chain having from 1 to 17 carbon atoms, optionally substituted with one or more hydroxyl groups, or

R1 is a linear alkyl chain with from 2 to 18 carbon atoms and a terminal carboxylic acid group which isoptionally esterified with a polyol compound of formula R2-OH;

R2, when attached to a hydroxyl group, is a linear or branched primary polyol having from 2 to 12 carbon atoms, wherein each alcohol functional group is optionally esterified with a monocarboxylic acid or dicarboxylic acid of formula R1-COOH, or a monocarboxylic acid of formula R3-COOH; and

R3 is a linear or branched alkyl chain having from 1 to 17 carbon atoms, optionally substituted with one or more hydroxyl groups.

64. An ester polyol ester composition comprising a compound of Formula II:



Formula II

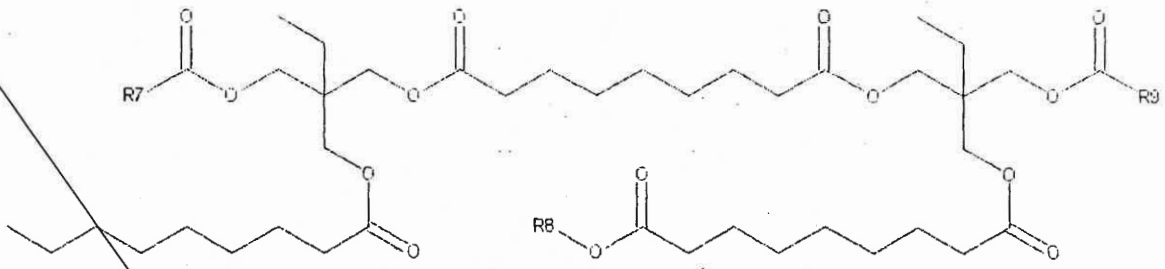
wherein R4 is the alkyl chain of a monocarboxylic acid selected from the group consisting of: acetic, propanoic, butyric, pentanoic, hexanoic, nonanoic, 2-ethyl hexanoic, heptanoic, octanoic acid, decanoic, lauric, myristic, palmitic and stearic acids, or

R4 is a C2-C18 linear alkyl chain with a terminal carboxylic acid group which is optionally esterified with a polyol compound of formula R5-OH;

R5, when attached to a hydroxyl group, is the alkyl chain of a primary polyol selected from the group consisting of: glycerin, diglycerin, ethylene glycol, diethylene glycol, 1,2-propanediol, bis(1,2-propanediol), 2-methyl-1,3-propanediol (2-MePG), trimethylolpropane (TMP), di-trimethylolpropane (Di-TMP), neopentyl glycol (NPG), pentaerythritol (PE), dipentaerythritol (diPE) and sorbitol, wherein each alcohol functional group is optionally esterified with a monocarboxylic acid or dicarboxylic acid of formula R4-COOH, or a monocarboxylic acid of formula R6-COOH; and

R6 is the alkyl chain of a monocarboxylic acid selected from the group consisting of: acetic, propanoic, butyric, pentanoic, hexanoic, nonanoic, 2-ethyl hexanoic, heptanoic, octanoic acid, decanoic, lauric, myristic, palmitic and stearic acids.

65. An ester polyol ester composition comprising a compound of Formula III:



Formula III

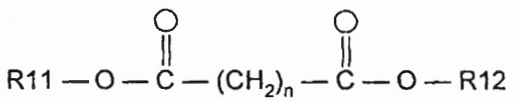
wherein R7, R8 and R9 are independently:

a linear or branched alkyl chain of between 1 to 17 carbon atoms, optionally substituted with one or more hydroxyl groups;

a C2-C18 linear alkyl chain with a terminal carboxylic acid group which is optionally esterified with a polyol compound of formula R10-OH; or

R10, wherein R10, when attached to a hydroxyl group, is a linear or branched primary polyol having from 2 to 12 carbon atoms and each alcohol functional group in R10 is optionally esterified with a linear or branched monocarboxylic acid having from 2 to 18 carbon atoms, or a dicarboxylic acid having from 2 to 18 carbon atoms.

66. An ester polyol ester composition comprising a compound of Formula IV:



Formula IV

wherein n is from 0 to 16;

R11 and R12, when each attached to a hydroxyl group, are independently a linear or branched primary polyol having from 2 to 12 carbon atoms, wherein each alcohol functional group is optionally esterified with a monocarboxylic acid of formula R13-COOH or dicarboxylic acid of formula R14-COOH;

R13 is a linear or branched alkyl chain having from 1 to 17 carbon atoms, optionally substituted with one or more hydroxyl groups; and

R14 is a C2-C18 linear alkyl chain with a terminal carboxylic acid group which is optionally esterified with a primary polyol compound of formula R11-OH or R12-OH.

67. An ester polyol ester composition comprising an azelaic acid ester polyol ester

wherein azelaic acid is esterified with at least one polyol of formula R15-OH;

wherein each polyol R15-OH is a linear or branched primary polyol having from 2 to 12 carbon atoms and contains at least two alcohol functional groups which are independently optionally esterified with a carboxylic acid of formula R16-COOH; and

R16 is chosen from the group consisting of:

a linear or branched alkyl chain having from 1 to 17 carbon atoms, optionally substituted with one or more hydroxyl groups; and

a C2-C18 linear alkyl chain with a terminal carboxylic acid group which is optionally esterified with a polyol compound of formula R15-OH.

68. The ester polyol ester composition according to claim 67 wherein each R15-OH is independently selected from the group consisting of: glycerin, diglycerin, ethylene glycol, diethylene glycol, 1,2-propanediol, bis(1,2-propanediol), 2-methyl-1,3-propanediol (2-MePG), trimethylolpropane (TMP), di-trimethylolpropane (Di-TMP), neopentyl glycol (NPG), pentaerythritol (PE), dipentaerythritol (diPE) and sorbitol, with each alcohol functional group in R15 optionally esterified with a carboxylic acid of formula R16-COOH.

69. The ester polyol ester composition according to any one of claims 67 or 68 wherein each R16-COOH is independently selected from the group consisting of: acetic, propanoic, butyric, pentanoic, hexanoic, nonanoic, 2-ethyl hexanoic, heptanoic, octanoic, decanoic, lauric, myristic, palmitic and stearic acids, and azelaic, oxalic, malonic and 1,18-octadecanoic diacids, each optionally esterified with a polyol compound of formula R15-OH.

CLAIMS:

1. A method for preparing at least one ester polyol ester, the method comprising

esterifying an ester polyol reaction mixture to produce ester polyol, the reaction mixture comprising an ozone acid mixture and at least one primary polyol, wherein the ozone acid mixture comprises at least one dicarboxylic acid and at least one monocarboxylic acid; and

capping the ester polyol with at least one capping carboxylic acid to produce ester polyol ester.

2. The method according to claim 1, wherein:

(i) the ozone acid mixture has a Difunctional/Monofunctional Ratio (DMR) corresponding to a ratio of moles of dicarboxylic acid to moles of monocarboxylic acid; and the ester polyol ester has a viscosity proportional to the DMR of the ozone acid mixture; and/or

(ii) the ester polyol reaction mixture has a hydroxyl to carboxyl ratio (HCR) corresponding to a ratio of moles of –OH groups to moles of –COOH groups and the ester polyol ester has a viscosity inversely proportional to the HCR of the ester polyol reaction mixture.

3. The method according to any one of claims 1 or 2, wherein the ozone acid mixture is prepared by reacting at least one fatty acid with ozone followed by oxidation.

4. The method according to claim 3, wherein the ozone acid mixture comprises at least one dicarboxylic acid and at least one first monocarboxylic acid; and wherein the method comprises adding at least one additional second monocarboxylic acid to the ozone acid mixture, wherein the first and second monocarboxylic acids are different.

5. The method according to claim 4, wherein the one or more additional second monocarboxylic acid reduces the Difunctional/Monofunctional Ratio (DMR) of the ozone acid mixture.

6. The method according to any one of claims 4 or 5, wherein the Difunctional/Monofunctional ratio (DMR) of the ozone acid mixture is reduced from about 0.76 to about 0.05.

7. The method according to any one of the preceding claims, wherein the ester polyol reaction mixture comprises the at least one primary polyol in stoichiometric excess.

8. The method according to any one of the preceding claims, wherein the ester polyol reaction mixture has a hydroxyl to carboxyl ratio (HCR) corresponding to a ratio of moles of –OH groups to moles of –COOH groups and is from about 1.01 to about 2.0.

9. The method according to any one of the preceding claims, wherein the ester polyol ester has a viscosity proportional to the Difunctional/Monofunctional Ratio (DMR) of the ozone acid mixture, and wherein the viscosity at 40°C of the ester polyol ester is from about 39.1 (cS) to about 236 (cS).

10. The method according to any one of the preceding claims, wherein the at least one capping carboxylic acid is one or more monocarboxylic acids.

11. The method according to claim 10, wherein the at least one capping carboxylic acid is selected from the group consisting of: acetic, propanoic, butyric, pentanoic, hexanoic, nonanoic, 2-ethyl hexanoic, heptanoic, octanoic acid, decanoic, lauric, myristic, palmitic and stearic acids, and mixtures thereof.

12. The method according to claim 11, wherein the at least one capping carboxylic acid is nonanoic acid.

13. The method according to any one of the preceding claims, wherein the ester polyol ester has a pour point from about -11.0 °C to about -57.0 °C.

14. The method according to any one of claims 3 to 13, wherein

the at least one fatty acid is derived from fractionated palm fatty acid distillate (PFAD);

the hydroxyl carboxyl ratio (HCR) of the ester polyol reaction mixture is about 1.25;

the Difunctional/Monofunctional Ratio (DMR) of the ozone acid mixture is from about 0.11 to about 0.21;

the viscosity at 40 °C of the ester polyol ester is from about 37.7 (cS) to about 61.6 (cS); and/or

the ester polyol ester has a pour point from about -57.0 °C to about -42.0 °C.

15. The method according to any one of claims 3 to 13, wherein:

the at least one fatty acid is derived from palm kernel fatty acid distillate (PFKAD);

the Difunctional/Monofunctional ratio (DMR) of the ozone acid mixture is about 0.12;

the hydroxyl carboxyl ratio (HCR) of the ester polyol reaction mixture is about 1.25; and/or

the viscosity at 40 °C of the ester polyol ester is about 53.7 (cS).

16. The method according to any one of claims 3 to 13, wherein:

the at least one fatty acid is derived from a mixture of fractionated palm fatty acid distillate (PFAD) and palm kernel fatty acid distillate (PFKAD);

the Difunctional/Monofunctional ratio (DMR) of the ozone acid mixture is from about 0.05 to about 0.32;

the hydroxyl carboxyl ratio (HCR) of the ester polyol reaction mixture is about 1.25; and/or

the viscosity of the ester polyol ester is about 28 (cS) to about 120 (cS).

17. The method according to any one of claims 3 to 13, wherein:

the at least one fatty acid is derived from fractionated vegetable oleic acid;

the Difunctional/Monofunctional ratio (DMR) of the ozone acid mixture is from about 0.13 to about 0.3;

the hydroxyl carboxyl ratio (HCR) of the ester polyol reaction mixture is about 1.25; and/or

the viscosity of the ester polyol ester is about 37.92 (cS) to about 96.13 (cS).

18. The method according to any one of the preceding claims, wherein the primary polyol is selected from glycerin, diglycerin, ethylene glycol, diethylene glycol, 1,2-propanediol, bis(1,2-propanediol), 2-methyl-1,3-propanediol (2-MePG), trimethylolpropane (TMP), di-trimethylolpropane (Di-TMP), neopentyl glycol (NPG), pentaerythritol (PE), dipentaerythritol (diPE) and sorbitol.

19. The method according to any of the preceding claims, wherein the primary polyol is a branched polyhydric primary polyol.

20. The method according to any one of claims 18 or 19, wherein the primary polyol is trimethylolpropane (TMP).

21. The method according to any one of the preceding claims, wherein the ester polyol ester viscosity is proportional to the Difunctional/Monofunctional Ratio (DMR) of the ozone acid mixture.

22. The method according to any of the preceding claims, wherein a lubricant base stock is formed from the ester polyol ester; the lubricant base stock having a volatility inversely proportional to the Difunctional/Monofunctional Ratio (DMR) of the ozone acid mixture.

23. The method according to claim 22, the method further comprising increasing the Difunctional/Monofunctional ratio (DMR) of the ozone acid mixture, thereby decreasing the volatility of the lubricant base stock.

24. The method according to any one of claims 22 or 23, further comprising increasing the Difunctional/Monofunctional ratio (DMR) of the ozone acid mixture, thereby increasing the viscosity of the lubricant base stock.

25. The method according to any one of the preceding claims, wherein the ester polyol ester has a molecular weight (GPC) proportional to the Difunctional/Monofunctional Ratio (DMR) of the ozone acid mixture.

26. The method according to any one of the preceding claims, further comprising increasing the hydroxyl/carboxyl ratio (HCR) of the ester polyol reaction mixture, thereby decreasing the viscosity of the lubricant base stock.

27. The method according to any one of claims 4 to 26, wherein the one or more additional second monocarboxylic acids is selected from the group consisting of: acetic, propanoic, butyric, pentanoic, hexanoic, nonanoic, 2-ethyl hexanoic, heptanoic, octanoic, decanoic, lauric, myristic, palmitic and stearic acids, and mixtures thereof.

28. The method according to claim 27, wherein the one or more additional second monocarboxylic acids is selected from the group consisting of: hexanoic, nonanoic, 2-ethyl hexanoic, heptanoic, and octanoic acids.

29. The method according to any one of claims 3 to 28, wherein the at least one fatty acid is produced by hydrolyzing at least one triglyceride.

30. The method according to claim 29, wherein the at least one triglyceride comprises at least one vegetable oil and/or at least one animal fat.

31. The method according to claim 30, wherein the at least one vegetable oil is selected from the group consisting of: soybean, safflower, linseed, corn, sunflower, olive, canola, sesame, cottonseed, mustard, camelina, jatropha, peanut, coconut, rapeseed, Chinese tallow, tung, castor, algae, wheat germ, soya, hemp, palm and palm kernel oils, palm olein, and a mixture thereof.

32. The method according to claim 30, wherein the at least one animal fat is selected from the group consisting of: fish oil, tallow, duck fat, and a mixture thereof.

33. The method according to claim 30, wherein the at least one vegetable oil comprises palm oil.

34. The method according to claim 30, wherein the at least one vegetable oil comprises palm olein.

35. The method according to claim 30, wherein the at least one vegetable oil comprises palm kernel oil.

36. The method according to any one of claims 3 to 14 and 18 to 28, wherein the at least one fatty acid is derived from fractionated palm fatty acid distillate (PFAD).

37. The method according to any one of claims 3 to 13 and 17 to 28, wherein the at least one fatty acid is derived from fractionated palm olein.

38. The method according to any one of claims 3 to 13, 15 and 18 to 28, wherein the at least one fatty acid is derived from palm kernel fatty acid distillate (PFKAD).

39. The method according to any one of claims 3 to 38, wherein a range of fatty acids and primary polyols are used while maintaining a desired viscosity of the ester polyol ester, by increasing both the Difunctional/Monofunctional ratio (DMR) of the ozone acid mixture and the hydroxyl/carboxyl ratio (HCR) of the ester polyol reaction mixture.

40. The method according to any one of the preceding claims, wherein the capping step comprises using less than a stoichiometric amount of the at least one capping carboxylic acid.

41. The method according to claim 40, wherein the amount of the at least one capping carboxylic acid used is sufficient to achieve between about 62% to about 100% capping of the ester polyol.

42. The method according to claim 41, wherein the amount of the at least one capping carboxylic acid used is sufficient to achieve between about 62% to about 76% capping of the ester polyol.

43. The method according to any one of claims 41 or 42, wherein the ester polyol is partially capped to produce a partially capped ester polyol ester which is between about 62% to about 99% capped.

44. The method according to claim 43, wherein the ester polyol is partially capped to produce a partially capped ester polyol ester which is between about 62% to about 76% capped.

45. The method according to any one of claims 43 or 44, wherein the partially capped ester polyol ester has greater hydrolytic stability compared to an equivalent fully capped ester polyol ester.

46. The method according to any one of claims 43 to 45, wherein the partially capped ester polyol ester has greater viscosity compared to an equivalent fully capped ester polyol ester, while maintaining a similar pour point.

47. A method for preparing an ester polyol ester, the method comprising esterifying an ozone acid mixture comprising at least one monocarboxylic acid and at least one dicarboxylic acid, in the presence of at least one primary polyol, wherein the method comprises adding at least one additional second monocarboxylic acid to the ozone acid mixture, wherein the first and second monocarboxylic acids are different.

48. The method according to claim 47, wherein the total amount of monocarboxylic acid is sufficient to achieve a substantially capped ester polyol ester.

49. The method according to any one of claims 47 to 48, wherein the at least one monocarboxylic acid and the at least one additional second monocarboxylic acid are substantially completely esterified.

50. The method according to any one of claims 47 to 49, wherein the total amount of the at least one primary polyol is in stoichiometric excess.

51. The method according to any one of claims 47 to 50, wherein the total amount of hydroxyl functionality in the at least one primary polyol is in stoichiometric excess of between 1% to 38%.

52. The method according to any one of claims 47 to 51, wherein the at least one primary polyol is selected from the group consisting of: glycerin, diglycerin, ethylene glycol, diethylene glycol, 1,2-propanediol, bis(1,2-propanediol), 2-methyl-1,3-propanediol (2-MePG), trimethylolpropane (TMP), di-trimethylolpropane (Di-TMP), neopentyl glycol (NPG), pentaerythritol (PE), dipentaerythritol (diPE) and sorbitol.

53. The method according to any one of claims 47 to 52, wherein the ester polyol ester has a pour point of from about -36 °C to about -51 °C.