4,957,651; and 4,683,069. For example, U.S. Pat. Nos. 5,114,603 and 4,683,069 describe lubricating oil compositions comprising mixtures of glycerol monooleate and glycerol dioleate in combination with other additives which were added for their conventional purpose.

U.S. Pat. No. 5,286,394 discloses a friction-reducing lubricating oil composition and a method for reducing the fuel consumption of an internal combustion engine. The lubricating oil composition disclosed therein comprises a major amount of an oil having lubricating viscosity and a minor amount of a friction-modifying, polar and surface active organic compound selected from a long list of compounds including mono- and higher esters of polyols and aliphatic amides. Glycerol monooleate and oleamide (i.e. oleylamide) are mentioned as examples of such compounds.

SUMMARY

The present invention is directed in part to a lubricating oil composition having a particular mixture of compounds which in combination provide an improved frictional benefit than either of the compounds alone. This frictional synergy benefit is surprising. Accordingly, disclosed is a lubricating oil composition comprising a major amount of an oil of lubricating viscosity and from 0.25 to 5 weight percent based upon the total mass of the lubricating oil composition of a friction modifier composition containing:

a) an amino alcohol reaction product prepared by isomerizing a C_{12}-C_{30} normal alpha olefin using at least one of a solid or liquid catalyst to form an internal olefin; epoxidizing said olefin; and reacting with an mono- or di-hydroxyl hydrocarbyl amine;

b) an ester of glycerol and a C_{12}-C_{22} carboxylic acid containing 0 to 3 double bonds.

The normal alpha olefins may be predominantly a single carbon number fraction selected from the group of 1-dodecene, 1-tetradecene, 1-hexadecene, 1-octadecene, 1-eicosene, 1-docosene and 1-tetracosene, where the normal alpha olefin contains greater than 85 weight percent, i.e. greater than 90 weight percent up to and including pure olefin series or they may be mixtures. In one aspect, the normal alpha olefin is a C_{12}-C_{18} normal alpha olefin in another; longer chains are employed such as wherein the normal alpha olefin is a C_{20}-C_{30} normal alpha olefin.

In one aspect, the mono- or di-hydroxyl hydrocarbyl amine is selected from the formula $HN(R^1OH)_{2-x}H_x$ wherein R^1 is a C_{1-10} linear or branched alkylene group and x is 0 or 1. Particularly preferred groups are wherein R^1 is a C_{2-5} linear or branched alkylene group. In this respect, the mono- or di-hydroxyl hydrocarbyl amine is preferably selected from the group consisting of ethanolamine, propanolamine, isopropanolamine, butanolamine, sec-butanolamine, diethanolamine, dipropanolamine, di-isopropanolamine, dibutanolamine, and di-sec-butanolamine.

In a preferred aspect, the ester of glycerol and a C_{12}-C_{22} carboxylic acid contains no more than one double bond; and even more preferably the compound b) is a glycerol monooleate. The glycerol monooleate may contain a minor amount of dioleate and a small amount of trioleate but preferably within the mixture the monooleate is in a major amount. The relative amounts of component a) to component b) may vary over the range for the friction modifier, such as 0.25 to 1.5 weight percent (singularly or in combination); and in one aspect the ratio of component a) to component b) is from 0.9:1 to 5:1; more commonly the ratio is 0.9:1 to 1.5:1. In another aspect at least one of component a) or component b) is a borated component. In one aspect only component b) is borated.

In yet another aspect, is directed to a method of lubricating an internal combustion engine, comprising supplying to said engine an oil of lubricating viscosity and from 0.25 to 5 weight percent based upon the total mass of the lubricating oil composition of a friction modifier composition containing:

a) an amino alcohol reaction product prepared by isomerizing a C_{12}-C_{30} normal alpha olefin using at least one of a solid or liquid catalyst to form an internal olefin; ~~e~~poxidizing said olefin; and reacting with an mono- or di-hydroxyl hydrocarbyl amine;

b) an ester of glycerol and a C_{12}-C_{22} carboxylic acid containing 0 to 3 double bonds.

DETAILED DESCRIPTION

Typically, glycerol esters of fatty acids, such as oleic acid, are prepared by reacting glycerol and a fatty acid. The product of this reaction is often referred to as, e.g., glyceryl monooleate. However, in a typical commercial product, only about 50-60 mole percent of the esters produced are monoesters. The remainder are primarily diesters, with a small amount of

WHAT IS CLAIMED IS:

1. A lubricating oil composition comprising a major amount of an oil of lubricating viscosity and from 0.25 to 5 weight percent based upon the total mass of the lubricating oil composition of a friction modifier composition containing:

a) an amino alcohol reaction product prepared by isomerizing a C_{12}-C_{30} normal alpha olefin using at least one of a solid or liquid catalyst to form an internal olefin; epoxidizing said olefin; and reacting with an mono- or di-hydroxyl hydrocarbyl amine;

b) an ester of glycerol and a C_{12}-C_{22} carboxylic acid containing 0 to 3 double bonds.

2. The lubricating oil composition according to Claim 1, wherein the normal alpha olefin is a C_{12}-C_{18} normal alpha olefin.

3. The lubricating oil composition according to Claim 1, wherein the normal alpha olefin is a C_{20}-C_{30} normal alpha olefin.

4. The lubricating oil composition according to Claim 1, wherein the friction modifier composition is present from 0.25 to 1.5 weight percent based upon the total mass of the lubricating oil composition.

5. The lubricating oil composition according to Claim 1, wherein the normal alpha olefin contains greater than 85 weight percent of a single carbon number fraction selected from the group of 1-dodecene, 1-tetradecene, 1-hexadecene, 1-octadecene, 1-eicosene, 1-docosene and 1-tetracosene.

6. The lubricating oil composition according to Claim 1, wherein the mono- or di-hydroxyl hydrocarbyl amine is of the formula $HN(R^1OH)_{2-x}H_x$ wherein R^1 is a C_{1-10} linear or branched alkylene group and x is 0 or 1.

7. The lubricating oil composition according to Claim 6, wherein R^1 is a C_{2-5} linear or branched alkylene group.

8. The lubricating oil composition according to Claim 1, wherein the mono- or di-hydroxyl hydrocarbyl amine is selected from the group consisting of ethanolamine, propanolamine, isopropanolamine, butanolamine, sec-butanolamine, diethanolamine, dipropanolamine, di-isopropanolamine, dibutanolamine, and di-sec-butanolamine.

9. The lubricating oil composition according to Claim 1 wherein b) is a glycerol monooleate.

10. The lubricating oil composition according to Claim 1 wherein the ratio of component a) to component b) is from 0.9:1 to 5:1.

11. The lubricating oil composition according to Claim 1 wherein at least one of component a) or component b) is a borated component.

12. A method of lubricating an internal combustion engine, comprising supplying to said engine an oil of lubricating viscosity and from 0.25 to 5 weight percent based upon the total mass of the lubricating oil composition of a friction modifier composition containing:

a) an amino alcohol reaction product prepared by isomerizing a C_{12}-C_{30} normal alpha olefin using at least one of a solid or liquid catalyst to form an internal olefin; ~~e~~epoxidizing said olefin; and reacting with an mono- or di-hydroxyl hydrocarbyl amine;

b) an ester of glycerol and a C_{12}-C_{22} carboxylic acid containing 0 to 3 double bonds.

13. The method of Claim 12, wherein the normal alpha olefin is a C_{12}-C_{18} normal alpha olefin.

14. The method according to Claim 12 wherein b) is a glycerol monooleate.

15. The method according to Claim 14 wherein b) is a glycerol monooleate is borated.