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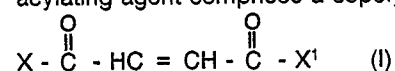
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(54) **Lubricating oil additives.**

(57) A lubricating composition comprises a major amount of an oil of lubricating viscosity and a minor amount of one or more carboxylic derivatives obtainable by reacting at least one substituted succinic acylating agent, which acylating agent comprises a copolymer of an aliphatic olefin and a monomer having the structure:



wherein X and X' are the same or different provided at least one of X and X' is such that the substituted succinic acylating agents can function as carboxylic acylating agents with a reactant selected from (a) an amine having within its structure at least one H-N group, (b) an alcohol, (c) a reactive metal or a reactive metal compound, and (d) a combination of two or more of any of (a) to (c).

The preferred aliphatic olefin is a C₄-C₃₀ aliphatic olefin for example octadecene-1. The preferred monomer is maleic anhydride. Preferred amines comprises C₁₀-C₁₈ primary monoamines.

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LUBRICATING OIL ADDITIVES

The present invention relates generally to additives for use in lubricating oils, compositions comprising and processes for producing said additives. In particular, the present invention relates to additives for use as dispersants and viscosity index improvers.

Operation of internal combustion engines is accompanied by the formation of piston varnish and sludge in the crankcase and in the oil passages of the engine. The sludge and varnish seriously restrict the ability of the crankcase oil to satisfactorily lubricate the engine. Furthermore, the sludge with its entrapped water tends to contribute to rust formation in the engine. To combat the varnish and sludge in internal combustion engines it has long been the practice to incorporate, into the lubricating oil, additives in the form of dispersants. The dispersants function to disperse the components of varnish and sludge throughout the oil and thereby prevent their accumulation.

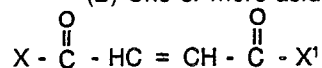
It has long been known to use nitrogen-containing compounds as dispersants and/or detergents. Many of the known nitrogen-containing dispersants and/or detergent compounds are based on the reaction of an alkenylsuccinic acid or anhydride with an amine or polyamine to produce an alkenylsuccinimide or an alkenylsuccinamic acid depending upon the nature of the reactants and the reaction conditions.

More recently, the operating demands placed on internal combustion engines have led to a desirability for the dispersant additive to make a viscosity index improver contribution to the additive package sufficient to permit elimination of all or a significant amount of the viscosity index improver additive conventionally employed in such packages. In this connection GB-A-1565627 claims a lubricating composition comprising a major amount of oil of lubricating viscosity and a minor amount of one or more carboxylic derivatives produced by reacting at least one substituted succinic acylating agent with a reactant selected from (a) an amine having within its structure at least one H-N< group, (b) an alcohol, (c) a reactive metal or reactive metal compound, and (d) a combination of two or more of any of (a) to (c), the components of (d) being reacted with said one or more substituted succinic acylating agents simultaneously or sequentially in any order, wherein said substituted succinic acylating agent(s) consist of substituent groups and succinic groups wherein the substituent groups are derived from polyalkene, said polyalkene having a M_n value of 1300 to 5000 and a M_w/M_n value of 1.5 to 4, said acylating agent(s) having within their structure an average of at least 1.3 succinic groups for each equivalent weight (as hereinbefore defined) of substituent groups.

Also claimed in GB-A-1565627 is a process for producing one or more substituted acylating agents by heating at a temperature of at least 140°C:

(A) Polyalkene having an M_n value of 1300 to 5000 and a M_w/M_n value of 1.5 to 4,

(B) One or more acidic reactants of the formula



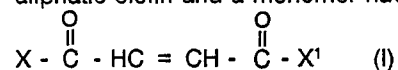
wherein X and X' are the same or different provided at least one of X and X' is such that the substituted acylating agent can function as a carboxylic acylating agent, or X and X' are joined and form an -O-link,

(C) Chlorine.

A disadvantage of the substituted acylating agents of GB-A-1565627 is that they and the carboxylic derivatives derived from them can contain residual chlorine originating from the process for preparing the acylating agents. It is well known that chlorine can be deleterious in internal combustion engines.

We have now found that the use of chlorine in the preparation of carboxylic derivatives can be avoided if there is used, instead of the acylating agent formed in the manner of GB-A-1565627, a pre-formed copolymer of an aliphatic olefin and a reactant corresponding to (B). Moreover, the carboxylic derivatives resulting therefrom, in addition to their dispersancy properties, can have very good viscosity index improver properties.

Accordingly, the present invention provides a lubricating composition comprising a major amount of an oil of lubricating viscosity and a minor amount of one or more carboxylic derivatives obtainable by reacting at least one substituted succinic acylating agent, which acylating agent comprises a copolymer of an aliphatic olefin and a monomer having the structure:



wherein X and X' are the same or different provided at least one of X and X' is such that the substituted succinic acylating agents can function as carboxylic acylating agents with a reactant selected from (a) an amine having within its structure at least one H-N group, (b) an alcohol, (c) a reactive metal or a reactive metal compound, and (d) a combination of two or more of any of (a) to (c).

The succinic acid acylating agent comprises a copolymer of an olefin and a monomer having the

structure (I). The olefin: monomer molar ratio in the copolymer is preferably 1:2 to 2:1, more preferably about 1:1.

As regards the olefin, this may be any polymerisable olefin characterised by the presence of one or more ethylenically unsaturated groups. The olefin may be either a terminal olefin or an internal olefin, preferably a terminal olefin. Although it is preferred to employ olefinic hydrocarbons, the olefin may contain non-hydrocarbon groups, for example alkoxy or hydroxy groups. Examples of suitable olefin monomers include 1-hexene, octadecene-1 and diisobutylene. The olefin is preferably a C₄-C₃₀ olefin.

As regards the monomer having the structure (I), at least one, and preferably both X and X' must be such that the substituted acylating agent can esterify alcohols, form amides or amine salts with ammonia or amines, form metal salts with reactive metals or basically reacting metal compounds, and otherwise function as a conventional carboxylic acid acylating agent. Thus X and/or X' can be -OH, -O- hydrocarbyl, -NH₂, -Cl, Br, or together can be an oxygen atom so as to form the anhydride. Preferably X and/or X' are either -OH or together are an oxygen atom, more preferably X and X' are together an oxygen atom, i.e. the monomer having the structure (I) is maleic anhydride.

A range of olefin/monomer having the structure (I) copolymers suitable as substituted succinic acylating agents are commercially available. The molecular weight of said copolymer is preferably in the range 5,000 - 50,000. A preferred copolymer is a copolymer of octadecene-1 and maleic anhydride.

The amine (a) having within its structure at least one H-N group may be a monoamine or a polyamine compound. Mixtures of two or more amines may be used. Preferably the amine contains at least one primary amine group (i.e. -NH₂). The amine may be either saturated or unsaturated. Suitable amines are further described in the aforesaid GB-A-1565627, which is incorporated by reference herein. Suitably the amine may be a saturated or unsaturated C₁₀-C₁₈ primary amine preferably a C₁₂-C₁₈ primary amine, for example octadecylamine or dodecylamine, or a mixture thereof. It is an advantage of the present invention that succinimides resulting from the use of C₁₂-C₁₈ primary amines have superior colour properties when compared with succinimides produced by certain of the prior art routes.

Alcohols which may be used as (b) include both the monohydric and polyhydric alcohols. For further details of suitable alcohols the reader is referred to the aforesaid GB-A-1565627.

Reactive metals and reactive metal compounds useful as (c) are those which are known to form salts and complexes when reacted with carboxylic acid and carboxylic acid acylating agents. Suitable compounds (c) are discussed in greater detail in GB-A-1565627. The oil of lubricating viscosity may be any natural or synthetic lubricating oil. Suitable lubricating oils are described in GB-A-1565627.

The lubricating oil composition of the present invention may also contain other additives conventionally employed in lubricating oils, for example antioxidants and anti-wear additives. It is an advantage of using dispersants produced in the manner of the present invention that the VI improver additive conventionally employed in lubricating oil compositions can be replaced at least in part by the dispersant.

In a final aspect the present invention provides a concentrate composition for use in lubricating oil compositions as hereinbefore described which composition comprises from 20 to 90% by weight of a normally liquid, substantially inert organic solvent or diluent and from 10 to 80% by weight of at least one carboxylic derivative as hereinbefore described.

The solvent or diluent may suitably be a natural or synthetic oil of lubricating viscosity and may be the same or different to that used in the lubricating oil composition.

The invention will now be further illustrated by reference to the following Examples.

45 Example 1

Octadecylamine and a 1:1 copolymer of 1-hexene and maleic anhydride (MW 21,000) in equimolar amounts were mixed in SN 150 base oil (total 33% b.w. of active components in solution) and heated to 160°C for 15 minutes with stirring. Thereafter, the mixture was stripped at 160°C for 15 minutes under vacuum to give a very pale (yellow) product.

The product was dissolved in SN 150 oil (7.3% level of active components) and its viscometric behaviour examined. The results are reported in the accompanying Table.

55 Example 2

The procedure of Example 1 was repeated except that octadecylamine was replaced by dodecylamine. The viscometric results are reported in the accompanying Table.

Example 3

The procedure of Example 1 was repeated except that instead of octadecylamine there was used tallowamine (partially unsaturated mainly C₁₈ amine) [approx. 2:1 ratio of C₁₈:C₁₆]. The viscometric results are reported in the accompanying Table.

Example 4

The procedure of Example 1 was repeated except that oleylamine (partially unsaturated mainly C₁₈ amine) was used instead of octadecylamine. The viscometric results are reported in the accompanying Table.

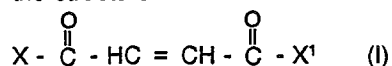
TABLE

Example	Concn. (% w/w)	Viscosity at 100° C (cSt)	Viscosity at 40° C (cSt)	Viscosity at -20° C (P)	Viscosity Index
1	7.3	8.8	54.1	36	141
2	7.3	8.7	57.9	34	124
3	7.3	8.7	54.8	34.5	135
4	7.3	8.8	55.1	33.0	138

"Active components" refers to the reaction product of the amine and copolymer.

Claims

1. A lubricating composition comprising a major amount of an oil of lubricating viscosity and a minor amount of one or more carboxylic derivatives obtainable by reacting at least one substituted succinic acylating agent, which acylating agent comprises a copolymer of an aliphatic olefin and a monomer having the structure:



wherein X and X' are the same or different provided at least one of X and X' is such that the substituted succinic acylating agents can function as carboxylic acylating agents with a reactant selected from (a) an amine having within its structure at least one H-N group, (b) an alcohol, (c) a reactive metal or a reactive metal compound, and (d) a combination of two or more of (a) to (c).

2. A lubricating composition as claimed in claim 1 wherein the aliphatic olefin is a C₄-C₃₀ aliphatic olefin.

3. A lubricating composition as claimed in either claim 1 or claim 2 wherein the aliphatic olefin is octadecene-1.

4. A lubricating composition as claimed in any one of claims 1 to 3 wherein the monomer is maleic anhydride.

5. A lubricating composition as claimed in any one of claims 1 to 4 wherein the amine (a) is a C₁₀-C₁₈ primary monoamine.

6. A lubricating composition as claimed in any one of claims 1 to 5 wherein the minor amount of one or more carboxylic acid derivatives comprises between 1 and 80% by weight of the composition.

7. A lubricating composition as claimed in claim 6 wherein the minor amount of one or more carboxylic acid derivatives comprises between 1 and 10% by weight of the composition.

8. A lubricating composition as claimed in claim 6 wherein the minor amount of one or more carboxylic acid derivatives comprises between 10 and 80% by weight of the composition.