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(54) **Oil based lubricant compostions.**

(57) This invention relates to oil-based lubricant compositions containing mixed esters of trimellitic acid. The ester mixture may be produced either by mixing individual esters of linear alcohols with those of branched chain alcohols, or by forming a mixed ester by reacting trimellitic acid with a mixture of linear and branched chain alcohols. The product ester mixture reduces the viscosity ratio and imparts acceptable low temperature hydrocarbon compatibility to the lubricants.

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OIL-BASED LUBRICANT COMPOSITIONS

The present invention relates to oil-based lubricant compositions comprising esters of aromatic polycarboxylic acids.

Oil-based lubricants conventionally contain a mineral oil, a hydrocarbon polymer e.g. a polybutene and an organic ester as the main components. The esters are added to the lubricants to improve their performance in specific applications. The choice of ester used is limited by several factors such as viscosity index, compatibility with hydrocarbon base oil components (e.g. polybutenes), volatility and oxidative stability. One type of ester which meets most of these criteria is that derived from trimellitic acid and linear primary alcohols. A specific example is an ester derived from trimellitic acid and a mixture of linear C_8 and C_{10} primary alcohols.

However, trimellitates of linear primary alcohols suffer from some disadvantages under low temperature conditions. For instance, such trimellitates have unacceptable low temperature compatibility with the hydrocarbon base oil components in the lubricant. More importantly, lubricants containing trimellitates of linear primary alcohols solidify on standing at low temperatures, e.g. around -10°C. These disadvantages are significant if the lubricants are to be used in cold environments especially if used as crank case lubricants in automotive engines.

On the other hand if the linear esters are totally replaced by trimellitates of branched chain alcohols, such compositions have unacceptably high viscosity ratio and low oxidation stability.

It has now been found surprisingly that the above problems can be mitigated by replacing part of the trimellitates of linear primary alcohols with the corresponding esters derived from branched chain primary alcohols.

Accordingly, the present invention is a lubricant composition comprising a mineral oil, a hydrocarbon base oil component and a trimellitate ester component characterised in that the ester component is either a mixture of a trimellitate ester of a branched chain alcohol and a trimellitate ester of a linear alcohol, or a trimellitate ester derived from a mixture of linear and branched chain alcohols.

The hydrocarbon base oil component referred to herein is preferably a hydrocarbon polymer, most preferably a polybutene. The weight average molecular weight of the polybutene used is suitably from 200 to 6000, preferably from 1000 to 3000.

The trimellitate esters are suitably those of linear and branched chain primary alcohols and are preferably derived by reacting trimellitic acid or the anhydride thereof with one or more of the appropriate primary alcohols having 8 to 10 carbon atoms.

The trimellitate ester component is more preferably derived by the reaction of trimellitic anhydride with a mixture of the relevant linear and branched primary alcohols. Trimellitate esters which are derived from mixtures of isodecanol and C_8-C_{10} linear alcohols are particularly preferred.

The relative amounts of the trimellitate esters derived from linear and branched chain primary alcohols will depend upon the intended use of the lubricant composition. However, for lubricants usable in low temperature environments, the relative proportions of linear trimellitate esters to branched chain trimellitate esters is suitably from 4:1 to 1:4, preferably from 2:1 to 1:2 by weight. The lubricant composition may contain other conventional additives such as antioxidants, detergents, stabilizers and the like.

The present invention is further illustrated with reference to the following examples.

Examples

1. Ester Preparation

Three trimellitate esters were prepared from trimellitic anhydride and the respective alcohol using a round-bottom two litre flask fitted with anchor stirrer, thermometer pocket, nitrogen sparge and Dean and Stark head/condenser. All products were prepared using conventional stannous oxalate catalysts, at a maximum reaction temperature of 210°C using conventional techniques.

The alkyl group composition of esters prepared is detailed in Table 1.

2. Ester Evaluation

Low temperature hydrocarbon compatability of the esters prepared was simply assessed by mixing 80g of each trimellitate ester with 20g of Hyvis 200 (Registered Trade Mark, polybutene), in a test tube and placing the blend in a refrigerator at -5°C. Each mixture was periodically observed; the results are given in Table 2.

Ester viscosity was measured at 20° intervals between 0° and 100°C using appropriate 'U' tube viscometers maintained at constant temperature in a water bath. The results are given in Table 3.

Table 1

Alkyl Group Composition of Trimellitate Ester Batches

Batch Number	Alcohol Mixture Charged to Reactor				Product Reference
	Component A	Component B	% w/w A	% w/w B	
1	Isodecanol	Tridecanol	67	33	IDTDT
2	Isodecanol	-	100	-	TIDT
3	Isodecanol	Linear Alcohols 8-10	67	33	IDLT

Table 2

Trimellitate Ester Compatability with Hyvis 200 on Storage at -5°

Storage Time (days)	Number of Visible Phases			
	IDTDT	TIDT	IDLT	T810T*
1	1	1	1	2
7	1	1	1	2
14	1	1	1	2

*T810T = Bisoflex (Registered Trade Mark), T810T is the trimellitate of linear C_8/C_{10} primary alcohols.

Table 3

Variation of Viscosity with Temperature for Various Trimellitate Esters

Temperature (°C)	Viscosity (cSt)			
	IDTDT	TIDT	IDLT	T810T*
0	6200	5720	2150	425
20	970	710	400	127
40	230	-	112	51
60	72	-	42	25
80	32	27	20	14
100	17	-	11.5	8.7
Viscosity Ratio ((80°C)/ (0°C)	194	212	107	30

*T810T = Bisoflex (Registered Trade Mark), T810T is the trimellitate of linear C_8/C_{10} primary alcohols.

It can be seen from the above tables that:

(a) The viscosity ratio of tri(isodecyl) trimellitate was found to be similar to mixed tri(isodecyl/tridecyl) trimellitate, (see Table 3), both materials having a branched alkyl group structure. As expected, the replacement of a proportion of isodecanol with a linear C_8/C_{10} alcohol gave a reduction in viscosity ratio. In fact, the V.R. of this mixed linear/branched product (IDLT) was approximately half that of the product (IDTDT) when calculated across the entire 0° to 80°C temperature range examined (see Table 3).

(b) Furthermore, the mixed linear/branched structure showed an acceptable low temperature compatibility in Hyvis 200 (Registered Trade Mark, polybutene) at -5°C for 14 days. Consequently, IDLT appeared to offer an improved viscosity ratio compared to IDTDT, whilst retaining an acceptable low temperature hydrocarbon compatability.

3. Conclusions

The mixed trimellitate of linear C_8/C_{10} alcohol and isodecanol was found to offer both a much reduced viscosity ratio compared to a mixed tri(isodecyl/tridecyl) trimellitate and an acceptable low temperature hydrocarbon compatability.

Claims:

1. A lubricant composition comprising a mineral oil, a hydrocarbon base oil component and a trimellitate ester component characterised in that the ester component is either a mixture of a trimellitate ester of a branched chain alcohol and a trimellitate ester of a linear alcohol, or a trimellitate ester derived from a mixture of linear and branched chain alcohols.

2. A composition according to claim 1 wherein the hydrocarbon base oil component is a hydrocarbon polymer.

3. A composition according to claim 2 wherein the hydrocarbon polymer is a polybutene.

4. A composition according to claim 3 wherein the weight average molecular weight of the polybutene is from 200-6000.

5. A composition according to any one of the preceding claims wherein the trimellitate esters of linear and branched alcohols are derived by reacting trimellitic acid or the anhydride thereof with one or more of the appropriate primary alcohols having 8 to 10 carbon atoms.

6. A composition according to any one of the preceding claims wherein the trimellitate ester is derived from a mixture of isodecanol and a C_8-C_{10} linear alcohol.

7. A composition according to any one of the preceding claims wherein the relative proportions of linear trimellitate esters to branched chain trimellitate esters in the ester component is from 4:1 to 1:4.

8. A composition according to any one of the preceding claims wherein said composition contains one or more additives selected from antioxidants, stabilizers and detergents.