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HIGH DROPPING POINT ALUMINUM GREASE

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U.S. Cl. 252—33.6 5 Claims

ABSTRACT OF THE DISCLOSURE

Aluminum complex greases comprising as the thickener a mixed aluminum salt of a fatty carboxylic acid of from about 16 to 18 carbon atoms and a mono- or dichloroacetic acid.

BACKGROUND OF THE INVENTION

Field of the invention

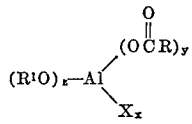
Aluminum complex greases comprising partially neutralized aluminum salts of two different carboxylic anions as thickener are well known in the art. For the most part, aluminum complex greases having high dropping points and low penetrations have depended upon the combination of an aliphatic hydrocarbon carboxylic acid and an aromatic hydrocarbon carboxylic acid.

Description of the prior art

Aluminum carboxylate thickened greases have appeared in numerous patents. See, for example, U.S. Patent Nos. 2,768,138, 2,719,826, 2,654,710, 2,599,553 and 2,276,341. The disclosed aluminum complex greases employ a single fatty acid or a mixture of similar fatty acids or the combination of an aliphatic carboxylic acid and an aromatic carboxylic acid.

SUMMARY OF THE INVENTION

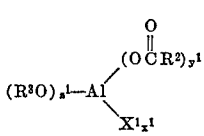
Aluminum complex greases (aluminum di-soaps) are provided comprising the mixed salt of an aliphatic hydrocarbon carboxylic acid of from about 16 to 20 carbon atoms and acetic acid having from 1 to 2 chloro substituents, i.e., mono- and dichloroacetic acid. The aluminum salt thickener will for the most part have the following formula:



in which R is an aliphatic hydrocarbon or monohydroxyhydrocarbon group of from about 15 to 19 carbon atoms, R^1 is hydrogen or a lower aliphatic hydrocarbon radical (1–6 carbon atoms), at least one-half of R^1 being hydrogen, and X is mono- or dichloroacetoxy, and wherein x is at least 0.25, the sum of x and y is from 1.5 to 2.5, z in the range of 0.5 to 1.5 and the sum of x, y and z is 3.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The greases of this invention comprise an oil of lubricating viscosity and a thickener having the following formula:



wherein R^2 is an aliphatic hydrocarbon or monohydroxyhydrocarbon group of from 15 to 19 carbon atoms, more

usually of from 15 to 17 carbon atoms, and most usually a mixture of aliphatic hydrocarbon groups of 15 and 17 carbon atoms, preferably having at least about 50 mole percent of aliphatic hydrocarbon groups of 17 carbon atoms; R^3 is hydrogen or a lower aliphatic hydrocarbon radical, preferably alkyl of from 1 to 3 carbon atoms, wherein at least one-half of R^3 is hydrogen; X^1 is mono- or dichloroacetic acid or a mixture thereof; x^1 is at least 0.25, preferably about 1, y^1 is at least 0.25, preferably about 1, the sum of x^1 and y^1 is from 1.5 to 2.5, z^1 is from 0.5 to 1.5, preferably about 1, and the sum of x^1, y^1 and z^1 is 3.

The aliphatic hydrocarbon or monohydroxyhydrocarbon carboxylic acids of from 16 to 20 carbon atoms (the hydrocarbon group is of from 15 to 19 carbon atoms) are illustrated by stearic acid, linoleic acid, oleic acid, palmitic acid, margaric acid, arachidic acid, gadoleic acid, 12-hydroxystearic acid, etc.

The lower alkyl groups are illustrated by methyl, ethyl, propyl, isopropyl, butyl, hexyl, etc. Particularly preferred are the alkyl groups, methyl, ethyl and isopropyl. That is, the alkyl groups are from 1 to 6 carbon atoms, and preferably of from 1 to 3 carbon atoms.

While any of the methods of preparation disclosed in the various patents indicated above might be used, a preferred method of preparation is disclosed in copending application Serial No. 331,127, now Patent No. 3,345,291, filed December 17, 1963.

The preferred method comprises combining about 1.5 to 2.5 molar parts of the aliphatic hydrocarbon carboxylic acid and the chlorinated acetic acid, in which the mole ratio of the two acids is in the range of from about 0.25:1 to 4:1, approximately 1 molar part of a lower aluminum alcoholate, from 0 to 1.5 molar parts of water and a large weight excess of an oil of lubricating viscosity. (By oil of lubricating viscosity is intended primarily a hydrocarbonaceous oil having a viscosity at 100° F. in the range of 35 to 50,000 Saybolt Universal Seconds (SUS).) The mixture is then heated to a temperature in the range of about 150° to 300° F., until reaction of the alcoholate with the acids is substantially complete. A quantity of water is then added in the range of 0.05 to 10 molar parts and at least sufficient to bring the total water introduced to at least about 0.5 molar parts and the resultant mixture is vigorously agitated at a temperature of from about 200° to 500° F. The grease is then ready to be used.

A preferred procedure is not to add any water initially, but to add about 1 to 5 molar parts of water after the reaction with aluminum alkoxide and acid is substantially complete.

The following examples are offered by way of illustration and not by way of limitation.

Example I

Into a Kitchen Aid mixer was introduced 118.2 g. (0.42 mole) of stearic acid, 39.3 g. (0.42 mole) of monochloroacetic acid and 1,575 g. of a 480 Neutral Oil. The mixture was heated with stirring to 210° F. and 85.0 g. (0.42 mole) of aluminum isopropoxide added. After heating for 45 minutes at 230° F., the mixture was cooled to 200° F. and 10 g. of water added. The temperature was then slowly raised to 330° F., driving off water and isopropyl alcohol and then held at that temperature with stirring for 1 hour. At the end of this time, the mixture was allowed to cool to room temperature and then milled in a 3-roller mill. Properties: worked penetration, P_{60}—300; dropping point—approximately 450° F.; four ball weld point—224 kg. pass/251 kg. weld. (Worked penetration—ASTM penetration after 60 strokes in the ASTM worker at 77° F.; the four ball

weld point is obtained by placing the test grease in a four ball test machine and determining the pressure at which welding takes place.)

Example II

Into a Kitchen Aid mixer was introduced 109.2 g. (0.384 mole) of stearic acid, 49.6 g. (0.384 mole) of dichloroacetic acid and 1,575 g. of 480 Neutral Oil. The mixture was heated with stirring to 210° F. and 78.5 g. (0.384 mole) of aluminum isopropoxide added. After heating for 45 minutes at 230° F., the mixture was cooled to 200° F. and 10 g. of water was added. The temperature was then slowly raised to 330° F., driving off water and isopropyl alcohol and held at the final temperature with stirring for about 1 hour. At the end of this time, the mixture was cooled to room temperature and milled on a 3-roller mill. The materials were used in an amount to obtain about 10 weight percent thickener. Properties: P_{60}—238; dropping point—approximately 450° F.; four ball weld point—greater than 400 kg. (400 kg. is the limit of the machine).

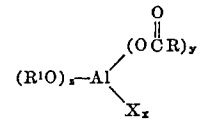
By comparison, a grease prepared in the manner of Examples I and II and having 7.8 weight percent thickener of an aluminum acetate stearate salt thickener, had a worked penetration of greater than 300 and a dropping point of 201° F.

It is evident from the above results that quite surprisingly by using a mono- or dichloro-substituted acetic acid in combination with an aliphatic hydrocarbon carboxylic acid of from about 16 to 20 carbon atoms, aluminum complex greases may be obtained with low penetrations and high dropping points. Moreover, in the four ball weld test, high pressures may be applied without welding of the balls.

As will be evident to those skilled in the art, various modifications on this invention can be made or followed, in the light of the foregoing disclosure and discussion, without departing from the spirit or scope of the disclosure or from the scope of the following claims.

I claim:

1. Aluminum complex grease composition having a major amount of an oil of lubricating viscosity and in an amount sufficient to thicken the oil to a grease consistency, an aluminum salt of the following formula:



wherein R is an aliphatic hydrocarbon or aliphatic monohydroxyhydrocarbon group of from about 15 to 19 carbon atoms, R^1 is hydrogen or a lower aliphatic hydrocarbon radical, at least one-half of R^1 being hydrogen, X is a mono- or dichloroacetoxy and wherein x is at least 0.25, y is at least 0.25, the sum of x and y is in the range of from 1.5 to 2.5, z is in the range of 0.5 to 1.5 and the sum of x, y and z is 3.

2. A grease according to claim 1, wherein R is a mixture of aliphatic hydrocarbon groups of from 15 and 17 carbon atoms, and R^1 is hydrogen or alkyl of from 1 to 3 carbon atoms.

3. A grease according to claim 2, wherein R^1 is hydrogen or isopropyl.

4. A grease according to claim 2, wherein X is monochloroacetoxy.

5. A grease according to claim 2, wherein X is dichloroacetoxy.

References Cited

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