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SYNTHETIC LUBRICANT

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This invention relates to improvements in synthetic lubricating oils and particularly to synthetic lubricating oils for use in internal combustion engines.

With recent advances in petroleum research, there have been developed a number of synthetic lubricating oils prepared by polymerization, hydrogenation and the like. Thus synthetic lubricating oils have been prepared by the condensation of diphenyl in the presence of aluminum chloride as described in U. S. Patent 2,030,832; by the polymerization of isobutylene in the presence of boron fluoride as described in the co-pending application of E. R. Barnard, Serial No. 237,145; by the polymerization of cracked paraffin wax in the presence of aluminum chloride as taught by U. S. Patents 1,955,260, 2,091,398 and others.

While synthetic lubricating oils have many highly desirable properties such as for example low pour points, low Conradson carbon, oxidation stability, high viscosity indices, etc. they do not in general possess good lubricating properties. Where synthetic oils have been employed in internal combustion engines, difficulty has been encountered with scored and scuffed pistons and cylinder walls and feathering of piston rings. This deficiency in lubricating quality has greatly hindered the extensive use of synthetic lubricating oils and although the lubricity of these oils may be improved by the addition of certain addition agents, this increases the cost of the already relatively expensive lubricating oils. Therefore, this remedy is an undesirable one from an economic viewpoint.

It is, therefore, the primary object of the present invention to provide a synthetic lubricating oil which possesses good lubricating qualities. It is a further object of the present invention to provide a synthetic lubricating oil adapted for use in internal combustion engines which will not score and scuff pistons and cylinder walls and which can be employed without the necessity of incorporating therein an addition agent to impart good lubricating qualities thereto.

I have discovered that the lubricity of synthetic lubricating oils can be materially enhanced by submitting such oils to an extremely mild sulfurization. By an extremely mild sulfurization I mean sulfurization of the synthetic lubricating oils to obtain a final product containing only from about 0.0005% sulfur to about 0.5% sulfur and preferably about 0.005% to about 0.05%. I have discovered that synthetic lubricating oils sulfurized to this extremely small extent evidence much improved lubricity and can be successfully employed in the lubrication of internal combustion engines.

The present invention is not to be confused with the prior practice of sulfurizing lubricating oils, or of adding a sulfurized material to lubricants to impart thereto extreme pressure properties. I am aware of this prior practice and make no claim to the sulfurization of lubricating oils or to the addition of sulfurized materials to synthetic lubricating oils to impart extreme pressure properties to such lubricants. Although my synthetic lubricant possesses substantially no extreme pressure properties, it is nevertheless very effective in providing adequate lubrication for internal combustion engines. By the term "possessing substantially no extreme pressure properties" as applied to my lubricant I mean a lubricant which will not pass any of the accepted methods of testing extreme pressure lubricants, such as the Almen test, described by Wolf and Moughy in their paper on "Extreme Pressure Lubricants" given at the 13th Annual Meeting of the A. P. I. at Houston, Texas, November 17, 1932.

My invention can be more clearly understood from the following description thereof in which a synthetic lubricating oil obtained by the polymerization of isobutylene is employed by the way of example to describe the same. The synthetic lubricating oil used in this example is made by subjecting liquid isobutylene or a hydrocarbon mixture containing it to the action of boron fluoride at ordinary temperatures, for example, temperatures of about 0° F. to about 100° F. The resultant polymerization product is carefully distilled to remove from it the excessively light and heavy polymerization products which are unsatisfactory. More specifically, in the preparation of this synthetic lubricating oil, liquid isobutylene, or a hydrocarbon mixture containing the same, is maintained under pressure and cooled to a temperature of about 32° F. and about 0.1% to about 2% of boron fluoride is added with vigorous agitation. Excessive rise in temperature due to the heat of reaction is avoided by suitable efficient cooling means. In order to facilitate agitation in handling and to assist in controlling the reaction, I prefer to employ a diluent such as hexane, liquid butane, propane, naphtha, or the like. As an example of a hydrocarbon mixture containing isobutylene, I may employ the butane-butylene fraction recovered from petroleum gases, especially those gases produced in the cracking of petroleum oils for the production of

gasoline. This light fraction contains from about 10% to about 25% of isobutylene.

After the isobutylene has been subjected to the action of the boron fluoride catalyst for about 30 minutes, the catalyst is neutralized and the light unreacted hydrocarbons removed by evaporation. The resultant reaction product is a viscous oil having the following characteristics:

Saybolt Universal viscosity at 100° F.	1538
Saybolt Universal viscosity at 210° F.	117
Viscosity index of about	101
Flash about	250° F.
Pour point about	−35° F.

This product may be further improved by subjecting the same to vacuum distillation to obtain a material free of undesirable low boiling constituents and undesirable high molecular weight constituents. I have discovered that a fraction having the following characteristics is most desirable for the intended purpose.

Saybolt Universal viscosity at 210° F.	55 to 95 secs.
Viscosity index	80 to 95
Pour point	−35° F.

The synthetic lubricating oil so obtained is subsequently heated at a temperature of about 375° F. to about 400° F. for about 60 to 120 minutes with sufficient sulfur to give a resultant product containing not more than about 0.05% sulfur. In place of using elemental sulfur, I may treat the synthetic lubricating oil with sulfur chloride. However, when effecting the sulfurization with the latter, the reaction is carried out at a temperature of about 100 to 110° F. for about 30 minutes and finally at a temperature of about 300° F. for about 1 hour.

Synthetic lubricating oils sulfurized to the extent above stated can be employed as such without the necessity of incorporating an addition agent. Engines lubricated by synthetic lubricating oils treated as herein described can be operated for long periods without showing evidence of scoring and scuffing of the pistons and cylinder walls, and piston rings are free of feathering.

Having thus described my invention, what I claim is:

1. A lubricating oil possessing substantially no extreme pressure properties adapted for use in internal combustion engines comprising substantially a synthetic lubricating oil obtained by the condensation of an olefin and containing from about 0.0005% to about 0.05% stably bound sulfur.

2. A lubricating oil possessing substantially no extreme pressure properties adapted for use in internal combustion engines comprising substantially a synthetic lubricating oil obtained by the condensation of an isoolefin at a temperature of about 0° F. to about 100° F. in the presence of boron fluoride and containing from about 0.0005% to about 0.05% stably bound sulfur.

3. As a new composition of matter a synthetic lubricating oil possessing substantially no extreme pressure properties obtained by the condensation of an isoolefin with boron fluoride at a temperature of about 0° F. to about 100° F. and sulfurized to the extent of from about 0.0005% to about 0.05% sulfur.

4. A synthetic lubricating oil possessing substantially no extreme pressure properties adapted for the lubrication of internal combustion engines without causing scoring and scuffing of the pistons and cylinder walls of said engine comprising substantially a sulfurized synthetic lubricating oil obtained by the condensation of isobutylene with boron fluoride at a temperature of from about 0° F. to about 100° F., said sulfurized synthetic lubricating oil containing a substantial amount but not more than about 0.05% sulfur.

5. A method of preparing a synthetic lubricating oil possessing substantially no extreme pressure properties for use in internal combustion engines and free of any tendency to cause scoring and scuffing of the pistons and cylinder walls of said engine comprising reacting an isoolefin with boron fluoride at a temperature of about 32° F., neutralizing the unreacted boron fluoride, separating the resultant condensation product and subsequently heating said condensation product at a temperature between about 375° F. and about 400° F. for about 1 to 2 hours in the presence of elemental sulfur to obtain a final product containing not more than about 0.05% sulfur.

6. The method of preparing a synthetic lubricating oil as described in claim 5 in which the isoolefin is isobutylene.

7. The method of preparing a synthetic lubricating oil as described in claim 5 in which the condensation product is vacuum distilled prior to sulfurization to give a product having a Saybolt Universal viscosity at 210° F. of from about 55 seconds to about 95 seconds, a viscosity index of from about 80 to about 95 and a pour point of about 25° F.

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