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ADDITION AGENT FOR LUBRICANTS

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The present invention relates to lubricating oils containing addition agents for use in automotive engines, and to a method for modifying certain addition agents in order to improve their effect on the properties of the lubricating oil.

It is an object of the present invention to improve the properties of lubricants by modifying the addition agents therefor either before addition to the lubricant or in situ.

More particularly, the present invention relates to such addition agents as phosphatides and commercial mixtures of the same. The former include, for example, lecithin and cephalin, while the latter usually comprise a mixture of the two together with fatty oil and free fatty acids. The commercial mixtures frequently contain about 65% phosphatides, based on phosphorus content, and about 35% of fatty oil and fatty acid. Whenever the terms "phosphatides" or "phosphatidic material" appear herein it is to be understood that not only the pure compounds such as lecithin and cephalin, but also the commercial mixtures of lecithin, cephalin, oil, etc. are intended.

It is known that the addition of phosphatides to oils improves the quality thereof by preventing ring sticking and by acting as detergents and antioxidants. It has now been found that the effect of phosphatides, when used as addition agents, may be greatly improved by sulfurization, the resulting sulfurized phosphatides imparting extreme pressure properties to the lubricant. In addition to this advantage, sulfurized phospatides also improve the resistance of oils to oxidation. It is to be particularly noted, furthermore, that sulfurization of the phosphatides does not affect the detergent properties which characterize untreated phosphatides. The sulfurization of phosphatides may be carried out separately and the product added to the lubricant or if desired the reaction may be carried out in the lubricating oil itself or in another inert diluent. The sulfurization of phosphatides may also be carried out in the presence of other oils for instance olefin polymers such as the trimer, tetramer, etc. of isobutylene or fatty oils such as sperm oil, etc. Under these circumstances both the phosphatides and the oil are sulfurized at the same time and are both added to the lubricating oil.

Sulfurized phosphatides may be added to the lubricating oil alone or together with untreated phosphatides or with additional sulfurized inhibitors such as sulfurized fatty oil, sulfurized olefin polymers or sulfurized mineral oil. When it is desired to add the last-mentioned inhibitors to an oil the sulfurization thereof and the sulfurization of the phosphatides is preferably carried out in one operation as stated above.

As stated hereinbefore, the sulfurization of the phosphatides does not minimize the detergent properties of the untreated phosphatide but rather improves the addition agent so that extreme pressure properties are imparted to the lubricating oil. Three samples of an S. A. E. 20 lubricating oil containing 1%, 2½% and 5%, respectively, of sulfurized phosphatides were subjected to the Almen test to determine the extreme pressure characteristics. The results of the tests were as follows:

Almen test

Percent sulfurized phosphatides	Passed	Failed
	Pounds	*Pounds*
5	24	26
2½	22	24
1	24	26
0	4	6

It is clear from the above tests that the addition of sulfurized phosphatides gives good extreme pressure properties to the oil.

The sulfurized phosphatides are prepared by adding a sulfurizing agent such as elemental sulfur to the phosphatidic material in the presence or absence of an oil or other inert diluent and heating the mixture while stirring the same. If desired sodium polysulfide may be used as the sulfurizing agent or as a carrier together with elemental sulfur. After the sulfur has combined with the phosphatides, any free sulfur remaining is separated from the sulfurized phosphatides. As a specific example, four parts of commercial phosphatide were heated to about 280° F. and one part of sulfur was then added. The mass was stirred for about one hour at temperatures of from 280° F. to 290° F. After cooling, three volumes of hexane were added to the reaction mass and the solution allowed to stand for several hours at 0° F. in order to permit any remaining free sulfur to settle out. It is obvious that other inert extraction agents may be used instead of hexane such as light petroleum naphthas, petroleum ether and the like. The clear solution was then filtered cold and the hexane evaporated under vacuum at a temperature less than 135° F. The resulting product was dark red rubbery material which was soluble in a lubricating oil at about 200° F. It is to be particularly noted, however, that if temperatures in excess of 300° F. are used during the reaction between the phosphatides and the sulfur, and if the time of reaction exceeds three

hours, the product is a tough, rubbery material which is substantially insoluble in an S. A. E. 20 lubricating oil even when the oil has been heated to more than 300° F. Care must, therefore, be taken to limit the time of heating of the phosphatides and sulfur to not more than three hours and also to limit the temperature to not more than 300° F. If these limitations are observed the reaction product which is obtained can be dissolved readily in lubricating oil at temperatures of between 200° F. and 300° F. However, if reaction temperatures of the order of 100° F. to 250° F. are used, a suitable product is obtained even when the time of heating exceeds three hours. In particular, when temperatures of about 100° F. are used, the time of heating may be from 10 to 15 hours or even longer. The modified addition agent has a sulfur content of from about 2% to about 15% but usually the product contains from about 6% to about 7% sulfur. It is possible to combine, chemically, sulfur with the phosphatidic material by treating the material with a sulfur-phosphorus compound, such as P_2S_5. Under these circumstances, some of the phosphorus may also be combined with the phosphatide. This product will have certain beneficial properties in addition to those obtained by merely sulfurizing the phosphatidic material.

Although the foregoing description has referred particularly to lubricating oils, however, other lubricants such as grease derive the same benefits from the sulfurized phosphatides and are therefore contemplated in the present invention. The foregoing description is not to be construed as a limitation of the invention since various modifications will be readily apparent to one skilled in the art without departing from the spirit of the invention. The present invention is to be limited solely by the appended claims.

We claim:

1. A lubricating oil additive consisting of a sulfurized "phosphatidic material."

2. A lubricating oil additive consisting of a "phosphatidic material" containing chemically bound sulfur.

3. A lubricating oil additive as claimed in claim 1 wherein the sulfur content is from about 2% to about 15%.

4. A lubricating oil additive as claimed in claim 1 wherein the "phosphatidic material" comprises a mixture of lecithin and cephalin.

5. A lubricating oil additive as claimed in claim 1 wherein the "phosphatidic material" comprises lecithin.

6. A lubricating oil additive as claimed in claim 1 wherein the "phosphatidic material" comprises cephalin.

7. A process for preparing a sulfurized phosphatidic material comprising heating a "phosphatidic material" in the presence of elemental sulfur to a temperature below about 300° F. for a period of time insufficient to form a tough, rubbery, substantially oil insoluble material.

8. A process for preparing a sulfurized "phosphatidic material" comprising mixing a "phosphatidic material" with elemental sulfur, heating the mixture to a temperature of from about 200° F. to about 300° F. while agitating, for a period of time insufficient to form a tough, rubbery, substantially oil insoluble material, and separating excess free sulfur from the reaction product.

9. A process for preparing a sulfurized "phosphatidic material" comprising heating a mixture of a "phosphatidic material" and elemental sulfur to a temperature of from about 200° F. to about 300° F. for a period of from 1 to 2 hours while agitating, cooling the reaction mass, adding an extraction agent, filtering to remove excess free sulfur and finally evaporating the filtrate under vacuum at a temperature below about 135° F. to remove the extraction agent.

10. A process for preparing a sulfurized "phosphatidic material" comprising heating a "phosphatidic material" to about 280° F., adding one part elemental sulfur to about four parts of the heated "phosphatidic material," agitating the mass for about one hour while maintaining a temperature of from about 280° F. to about 290° F., cooling the reaction mass, adding about three volumes of hexane, settling out the free sulfur at about 0° F., filtering the solution while cold to remove excess free sulfur, and evaporating the filtrate under vacuum at a temperature below about 135° F. to remove the hexane.

11. A composition of matter comprising a minor amount of sulfurized "phosphatidic material" and a major amount of a lubricating oil, the amount of sulfurized "phosphatidic material" being sufficient to impart extreme pressure characteristics to the lubricating oil.

12. A composition of matter comprising an effective amount to about five per cent sulfurized "phosphatidic material" and a lubricating oil, the amount of sulfurized "phosphatidic material" being sufficient to impart extreme pressure characteristics to the lubricating oil.

13. A composition of matter as claimed in claim 12 wherein the sulfurized "phosphatidic material" contains from about two per cent to about fifteen per cent sulfur.

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