Patented Sept. 8, 1942

2,295,192

UNITED STATES PATENT OFFICE

2,295,192

LUBRICATING COMPOSITION AND MODIFIED ADDITION AGENTS FOR THE SAME

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No Drawing. Application October 26, 1940, Serial No. 363,018

16 Claims. (Cl. 252—53)

The present invention relates to lubricating oils containing addition agents for use in automotive engines and to methods for modifying certain addition agents so that their undesirable qualities may be removed, thereby gaining the full benefit of the desirable qualities.

An object of the present invention is to improve the properties of the oils by modifying the addition agents 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 comprises a mixture of the two along with residual fatty oil and free fatty acids. The commercial products frequently contain about 65% phosphatides based on phosphorus content and about 35% of fatty oil plus fatty acid. Whenever the term "phosphatides" appears 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 been found, however, that while certain qualities of the lubricant are improved by these addition agents, certain other undesirable properties appear. In the case of the phosphatides it has been found that early sludge is often formed and that certain metal alloy bearing surfaces are corroded, particularly lead-containing bearings. These adverse effects are believed to be caused not only by the acidic properties of the phosphatides or the fatty oils occurring in the commercial mixtures of the phosphatides, but also by the unsaturation of the phosphatides and the commercial mixtures thereof.

In order to overcome the above-mentioned undesirable effects of the phosphatides they may be hydrogenated and then neutralized. After having treated the phosphatides in this manner they are better suited for use as addition agents to lubricating oils.

The exact nature of the reactions involved in both the hydrogenation and neutralization steps is not clear. The fact that the unmodified phosphatides cause corrosion of various metal alloy bearing surfaces and tend to form early sludge is probably due to the fact that the phosphatides exhibit acidic properties. These acidic properties are not only caused by the nature and position of the elements and groups of elements in the compound, but are also caused by the presence of double bonds which occur in the phosphatides as well as the commercial mixtures of the same. The presence of double bonds in a compound rapidly leads to the development of acidic properties in the compound on oxidation. It is evident, therefore, that the hydrogenation of phosphatides and the subsequent neutralization thereof produces a product which is particularly suitable for use as an addition agent in lubricating oils. The neutralization may be carried out by various neutralizing agents such as ammonia or by the use of amines including both the alkyl and alkylolamines and aromatic amines such as pyridine, quinoline and their derivatives. It is believed that the ammonium, or amine salts of the commercial phosphatides are formed. The amount of organic base used in the neutralization may be varied from 50% to 100%, or even an excess of organic base, ranging up to 200% of the acidity of the phosphatide may be used.

The hydrogenation of the phosphatides may be carried out by any well-known processes provided the conditions are not so severe as to affect adversely the phosphatides by decomposing them. It is preferred, however, to carry out the hydrogenation by the relatively low temperature, fat hydrogenation technique using, for example, nickel formate as catalyst. Several methods for hydrogenating commercial phosphatides are described in Chemie und Technologie de Fette und Fett Produkte. Hefter-Schonfeld, 2nd edition, vol. 1, page 508. An additional method is also described in Jour. Agr. Chem. Soc., Japan, vol. 9, pp. 728 to 732. (Reviewed in Chemical Abstracts, vol. 27, p. 5563.) Obviously, the hydrogenation step will not only saturate the phosphatides per se but also the free fats and fatty acids which accompany the phosphatides in the commercial mixtures.

In order to facilitate handling of the phosphatide during the hydrogenation and the neutralization step it is sometimes desirable to dilute the phosphatidic material with mineral oil, preferably in the proportion of 1 part material to 1 part or more of mineral oil.

The phosphatides are neutralized simply by mixing them with one of the aforementioned neutralizing agents for several hours either at room temperature or at temperatures from 80° F. to about 300° F. If desired, the phosphatide or neutralizing agent may be added to the oil first and then the other added so the reaction will take place in situ.

While ammonia or ammonium hydroxide derivatives may be used, it is preferred to use an organic base such as pyridine, pyridine derivatives, the tetra alkyl ammonium hydroxides, hydroxylamines, primary, secondary and tertiary amines or the amines prepared from various oils such as cocoanut oil. The amines may have the following general formulae R_4NOH, R_3N, R_2NH, RNH_2, $(OHR)_3N$, R'NHR, or $R'NR_2$ wherein R and R' represents an alkyl, alkylene, aryl or aralkyl radical.

Specifically $(C_5H_{11})_4NOH$, $(CH_3)_3N$, $(C_4H_9)_3N$, $(C_5H_9)_3N$, $(C_2H_5)_2NH$, $(C_3H_7)_2NH$, $(C_5H_9)NH_2$, $C_{18}H_{37}NH_2$, $C_6H_5NH_2$, $(OHC_2H_4)_3N$, and $C_6H_5N(CH_3)_2$ have been found to be satisfactory.

After the phosphatidic material has been hydrogenated and subsequently neutralized, a small quantity, preferably from about 0.01% to about 5% is added to the oil, with the result that the oxidation stability and the detergent properties of the oil are improved, at least to the same extent as when unmodified phosphatide is added to the oil, but with the additional advantage that no corrosion of the metal alloy bearing surfaces occurs, and early sludge formation is minimized. Furthermore, the antioxidant effect is improved.

Although the foregoing description has referred primarily to lubricating oils, other lubricants, such as grease, derive the same benefits from the modified phosphatides and are therefore contemplated in the present invention.

Furthermore, it is possible and sometimes advantageous to add other well-known addition agents, for example, sulfur-type inhibitors such as sulfurized olefin polymers, organic phosphites, etc., to the oil.

I claim:

1. An addition agent for lubricants comprising the reaction product of a hydrogenated phosphatidic material and an organic amine at temperatures below about 300° F.

2. An addition agent for lubricants comprising the reaction product of a hydrogenated phosphatidic material and an alkyl amine at temperatures below about 300° F.

3. An addition agent for lubricants comprising the reaction product of a hydrogenated phosphatidic material and an aromatic amine at temperatures below about 300° F.

4. An addition agent for lubricants comprising the reaction product of a hydrogenated phosphatidic material and an alkylolamine at temperatures below about 300° F.

5. An addition agent for lubricants as claimed in claim 1 wherein the hydrogenated phosphatidic material comprises hydrogenated lecithin and hydrogenated cephalin.

6. An addition agent for lubricants as claimed in claim 1 wherein the hydrogenated phosphatidic material comprises hydrogenated lecithin.

7. An addition agent for lubricants as claimed in claim 1 wherein the hydrogenated phosphatidic material comprises hydrogenated cephalin.

8. A lubricant comprising a lubricating oil and the reaction product of a hydrogenated phosphatidic material and an organic amine at temperatures below about 300° F.

9. A lubricant comprising a lubricating oil and the reaction product of a hydrogenated phosphatidic material and an alkyl amine at temperatures below about 300° F.

10. A lubricant comprising a lubricating oil and the reaction product of a hydrogenated phosphatidic material and an aromatic amine at temperatures below about 300° F.

11. A lubricant comprising a lubricating oil and the reaction product of a hydrogenated phosphatidic material and an alkylolamine at temperatures below about 300° F.

12. A lubricant comprising a lubricating oil and from about 0.01% to about 5% of the reaction product of a hydrogenated phosphatidic material and an organic amine at temperatures below about 300° F.

13. An addition agent for lubricants comprising the reaction product of a hydrogenated phosphatidic material and an organic amine at temperatures within the approximate range of 80° F. to 300° F.

14. An addition agent for lubricants comprising the reaction product of a hydrogenated phosphatidic material and an alkyl amine at temperatures within the approximate range of 80° F. to 300° F.

15. An addition agent for lubricants comprising the reaction product of a hydrogenated phosphatidic material and an aromatic amine at temperatures within the approximate range of 80° F. to 300° F.

16. An addition agent for lubricants comprising the reaction product of a hydrogenated phosphatidic material and an alkylolamine at temperatures within the approximate range of 80° F. to 300° F.

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