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SULPHUR-CONTAINING PHOSPHATIDE, LUBRICANT, AND METHOD OF MAKING

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This invention relates generally to the art of phosphatides and more particularly to new and improved phosphatide compositions of special value as an additive to lubricating oils and greases, and to a new and improved method of making such compositions and to a new and improved lubricant.

Mineral lubricating oils and greases are not capable of withstanding certain severe operating conditions to which they are often subjected in use, for example, in internal combustion engines, electric motors, high pressure bearings and the like. These oils and greases tend to deteriorate or decompose under some of those conditions. In use, these oils and greases may deteriorate by being oxidized with the resultant formation of corrosive acids which corrode certain metals and alloys, particularly bearing metal containing cadmium-silver or copper-lead alloys. Such corrosion may be of critical importance where high strength alloys are required to carry heavy loads. These oils and greases may also deteriorate or decompose by being cracked, or oxidized, and then polymerized with resultant increase of viscosity or formation of resinous compounds, or both. Excessive wear of engine parts, loss of engine power and the sticking or freezing of metal parts, such as rings in piston ring grooves, and increased costs of engine operation and maintenance may result from these increases in viscosity or formations of resinous compounds.

Various efforts have been made heretofore to increase the resistance of lubricating oils and greases to deterioration or decomposition when subjected to severe operating conditions. These efforts have included the use of additives, that is, compounds which were added to the oils and greases and which consisted of phenols, halogenated materials, phosphorous, metallic compounds and commercial soybean lecithin. However, so far as I know, none of these additives has been entirely satisfactory.

The present invention is predicated on the discovery that phosphatides in their commercial form or purified forms, and their lecithin and cephalin fractions, possess new and unexpected inhibiting properties when combined with sulfur.

While various methods may be employed to produce the compounds embodying this invention, one convenient method which is satisfactory is as follows: Commercial soybean phosphatide was dehydrated by dissolving it in benzene and distilling off the water. The phosphatides were reacted at room temperature with thiocyanogen in solution, for example, a .2N solution in benzene,

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with the formation of a sulfur-containing phosphatidic compound. The solvent was removed after completion of the reaction and the compound remaining was ready for use as an inhibiting additive for a mineral lubricating oil or grease.

The amount of sulfur combined with the phosphatide may be varied by varying the ratio of phosphatide to thiocyanogen or by varying the strength of the thiocyanogen solution but the latter method is not preferred because of the decrease in stability of the thiocyanogen as its concentration increases. When about 68.8 gms. of dehydrated phosphatide was treated with about 400 cc. of .2N thiocyanogen solution the resulting compound contained about 3.73% of sulfur. A smaller amount of the phosphatide when treated with the same amount of solution gave a compound containing 5.43% of sulfur. By varying the reactants, as described, sulfur contents in the resulting compounds may range up to about 10% or more.

Phosphatides containing below about 4% of sulfur are soluble in mineral lubricating oils but as the sulfur content increases beyond about 4% the solubility of the compounds decreases. However, the compounds which are insufficiently soluble in the oil may be used satisfactorily with greases.

One method of preparing the above mentioned thiocyanogen solution is as follows:

Chemically pure potassium thiocyanate and chemically pure lead nitrate were reacted in benzene and the resulting lead thiocyanate was carefully dried. A thiocyanate solution was prepared by dissolving 10 gms. of bromine in 300 cc. of benzene and adding thereto 30 gms. of the dried lead thiocyanate. The excess lead thiocyanate and the resulting lead bromide were filtered off. The filtrate consisted of a benzene solution of fairly stable thiocyanogen having a thiocyanogen normality of .215N, as determined by titration against a standard sodium thiosulfate solution.

The inhibiting properties of compounds embodying the present invention are illustrated by the following test results: An SAE–30 Mid-Continent, solvent refined, lubricating oil having dissolved therein about .5% of phosphatide compound containing about 3.73% of sulfur was subjected to the "Sohio" test for 65 hours. The resulting naphtha insolubles (mgs./10 gms. oil) amounted to about 22 mgs. as compared with about 40 mgs. for the same oil containing the same amount of untreated phosphatide as an additive. Moreover, this sulfur containing phos-

phatide appeared to exert a greater anti-corrosive action than phosphatide materials free from sulfur. A similar phosphatide containing about 5.43% of sulfur also possessed good inhibiting properties under similar test conditions.

Various amounts of sulfur-containing phosphatides may be used with mineral oil lubricants. When used with oils they should be largely or wholly soluble therein, but when used with greases they may be largely or wholly insoluble. The phosphatides containing up to about 6% of sulfur are soluble in such oils and may amount to as much as 5% of the oils while phosphatides containing above about 6% of sulfur are largely insoluble in such oils, may be used effectively in greases and may amount to as much as 15% thereof.

The Sohio test, above referred to, was carried out as follows: Air was blown at a constant rate thru the lubricating oil while it was maintained at an elevated temperature and contained catalizers in the form of two low carbon steel tubes and a copper strip immersed in the oil. The standard conditions of the test were as follows:

Temperature	° F.	325
Volume of oil	cc.	255
Air rate	liters per hour	30
Area of steel	sq. cm.	300
Area of copper	cm.	20

Time, variable.

Having thus described the invention so that others skilled in the art may be able to understand and practice the same, I state that what I desire to secure by Letters Patent is defined in what is claimed.

What is claimed is:

1. The process for treating phosphatides for use as additives to a lubricant containing a mineral oil to inhibit the formation of naphtha insolubles therein which comprises the steps of treating a vegetable phosphatide with an approximately .2N solution of thiocyanogen in benzene at room temperature, and removing the benzene after formation of the resulting sulfur-containing phosphatide compound.

2. The process for treating phosphatides for use as additives to a lubricant containing a mineral oil to inhibit the formation of naphtha insolubles therein which comprises the step of bringing a vegetable phosphatide into contact with thiocyanogen dissolved in an organic solvent.

3. The process for treating phosphatides for use as additives to a lubricant containing a mineral oil to inhibit the formation of naphtha insolubles therein which includes the step of contacting a vegetable phosphatide with dissolved thiocyanogen.

4. A mineral lubricating composition comprising a mineral oil and between about .1% and about 15% of a product prepared by reacting a crude vegetable phosphatide with thiocyanogen at room temperature.

5. A mineral lubricating composition comprising a mineral oil and between about .1% and about 5% of a product prepared by reacting a vegetable phosphatide with thiocyanogen in suitable diluent at room temperature.

6. A mineral lubricating composition comprising a mineral oil and about 5% of a product prepared by reacting a vegetable phosphatide with thiocyanogen in a suitable diluent at room temperature.

7. A mineral lubricating composition comprising a mineral oil and between about .1% and about 5% of a product prepared by reacting a crude vegetable phosphatide with a 0.2 normal benzene solution of thiocyanogen at room temperature.

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