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STABLE MINERAL OIL AND METHOD OF PREPARING THE SAME

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This invention relates to improvements in stable mineral oils and the method of preparing the same.

Mineral oils which are subjected to drastic refining treatments, such as solvent extraction and/or acid treatment, such as sulfuric acid, have been found to be susceptible to sludging through oxidation. Oils which have been so drastically treated as to render them susceptible to sludging and high acidity development are commonly referred to as "overtreated" oils, and as used herein the term "overtreated oils" refers to oils which have been so over-refined by chemical agents and/or solvents that the same are susceptible to sludge formation and the development of high acidity. These oils have unusually high oxygen absorptions.

It is often necessary to drastically treat oils with fuming sulfuric acid in order to reduce the sulfur content to the minimum sulfur requirements. While such treatment enables the oil to meet the sulfur specification, other properties thereof are seriously impaired. Such overtreated oils are susceptible to sludging, high acidity and possible peroxide development. These oxidized oils have poor demulsifying and insulating properties and develop bad odors, which render them unsuitable for their intended use. The present invention makes it possible to overtreat oils in order to meet the sulfur specification without the undesirable consequences which result from such treatment. As examples of oils which tend to develop undesirable properties by reason of their being overtreated are the drastically solvent extracted and/or acid treated motor oils, and oils used for such purposes as lubricating high speed spindles of knitting machinery or bearings of high speed steam turbines and oils used for insulating electric switches and transformers. White or medicinal oils also come within this category.

It is therefore an object of this invention to provide overtreated oils which are not susceptible to sludging, and high acidity development and do not have a high oxygen absorption.

It is another object of this invention to provide lubricants which have increased oxidation stability.

Another object of this invention is to provide lubricants which do not develop a high acidity during service, thereby impairing the demulsibility of the oil, insulating properties, etc.

Still another object of this invention is to prepare a transformer oil which has a low sulfur content and which has a satisfactory oxidation stability.

It is still another object of this invention to provide electrical insulating oils which are substantially nonsludging.

Another object of this invention is to provide a method of preparing overtreated lubricants which have increased oxidation stability.

A further object of the present invention is to provide a method of increasing the sludge stability of highly treated oils.

Other objects and advantages of the invention will become apparent from the following description thereof.

I have found that the oxidation stability of overtreated oils can be attained by adding to such oils a small amount of the extract obtained in mineral oil solvent extraction processes. I am aware that the oxidation stability of highly treated oils such as transformer oils has been purported to be effected by adding to such oils less highly refined oils, such as is disclosed in U. S. Patent 1,966,111. However, this process has the disadvantage in that it requires relatively large amounts of the less highly treated oil to improve the stability of the highly treated oil to which it is added. The addition of relatively large amounts of the less highly refined oil to the more highly refined oil detrimentally modifies the color and other desirable properties of the latter. The present invention, as will be hereinafter established, more effectively improves the stability of overtreated oils by the addition of small amounts of the extract without impairing the other desirable properties of the oil to which it is added.

The extracts, or portions thereof, obtained by the solvent extraction of mineral oils with solvents such as Chlorex (beta, beta-dichloroethyl ether), liquefied sulfur dioxide, nitrobenzene, furfural, phenol, liquefied normally gaseous hydrocarbons such as propane and/or mixtures thereof are suitable for the purposes herein described. Since the various solvent extraction processes are well known to those experienced in the art and since the extraction processes per se are not a part of the present invention the same need not

be herein described in detail. In general the oils are extracted by countercurrent contact with the solvent. One method by which this is accomplished is to mix fresh stock with twice-used solvent and treat the raffinate from this first extraction with once-used solvent, and subsequently treat the raffinate from this second stage extraction with fresh solvent. While the extract from any stage of the process may be used, I prefer to use an intermediate extract, and preferably one which possesses good sludging stability. I have found that the addition of 1 to 10% of this extract greatly increases the oxidation stability of overtreated oils to which it is added.

The effectiveness of small amounts of an extract, obtained from the solvent extraction of mineral oils, in increasing the stability of overtreated oils is demonstrated in the following examples, in which an overtreated transformer oil is used as the control. The control was a transformer oil distillate having the characteristics set forth in Table I, and which was treated with one pound of 104½% sulfuric acid, neutralized, washed with alcohol and water and finally clay filtered to a yield of 1500 gals./ton of clay.

Table I

Gravity, A. P. I.	26.8
Flash, °F	270
Viscosity (Say. sec. at 100° F.)	55
Color (Saybolt)	22

To a portion of this oil was added 3% of the extract obtained from the Chlorex extraction of a 90% H_2SO_4 treated and clay filtered M. C. petroleum distillate having a Saybolt Universal viscosity of about 180 seconds at 100° F. A portion of the overtreated transformer oil distillate without the addition of the Chlorex extract and the portion containing 3% of the extract were submitted to the Snyder life test.

This test which is an index of the oxidation stability of an oil is conducted by maintaining about 500 cc. of the oil to be tested at constant temperature of about 120° C. Once every 24 hours a 10 cc. sample is withdrawn, cooled and centrifuged for the purpose of determining when sludging first appears. The "life" of the oil is the number of days the oil is heated at 120° C. before visible sludge is formed. This test is fully described in the A. S. T. M. Proceedings, vol. 24, part 1, page 638 (1924). The results obtained are tabulated in Table II.

Table II

Oil	Snyder life test
	Days
Overtreated transformer oil	2
Overtreated transformer oil+3% Chlorex extract	6

The above results show an improvement of about 300% in the stability of the overtreated transformer oil containing 3% Chlorex extract.

In another test to the same overtreated transformer oil distillate there were added 2% and 5% of the extract obtained by solvent extracting a Pennsylvania oil having a viscosity of about 120 seconds at 210° F. with nitrobenzene. The effectiveness of 2% of this extract on the oxidation stability of the transformer oil is shown in Table III.

Table III

Oil	Snyder life test
	Days
Overtreated transformer oil	3
Overtreated transformer oil+2% nitrobenzene extract	13
Overtreated transformer oil+5% nitrobenzene extract	17

The above data show an improvement of over 400% in the oxidation stability of the overtreated transformer oil containing 2% nitrobenzene extract oil, and an increased oxidation stability of almost 600% with 5% of the extract.

The above specific embodiments are presented to illustrate my invention, but the scope thereof is not intended to be limited thereto except as set forth in the accompanying claims.

I claim:

1. A sludge resistant mineral oil comprising a highly refined mineral oil normally susceptible to the formation of excessive sludge and the development of high acidity and a small amount of the extract added as such obtained from the solvent extraction of uncracked mineral oils.

2. A sludge resistant mineral oil comprising a highly acid treated mineral oil normally susceptible to the formation of excessive sludge and the development of high acidity and a small amount of the extract added as such obtained from the solvent extraction of uncracked mineral oils.

3. A lubricating oil composition described in claim 2 in which the solvent is Chlorex.

4. A stable electric insulating oil comprising a highly refined mineral oil distillate normally susceptible to the formation of excessive sludge and the development of high acidity and a small amount of the extract added as such obtained from the solvent extraction of uncracked mineral oils.

5. An oxidation resistant transformer oil comprising a highly acid treated transformer oil distillate normally susceptible to the formation of excessive sludge and the development of high acidity and 1 to 10% of the extract added as such obtained from the nitrobenzene extraction of a lubricating oil.

6. The method of increasing the oxidation stability of highly refined mineral oils normally susceptible to the formation of excessive sludge and the development of high acidity which comprises adding to said highly refined mineral oils a small amount of the extract as such obtained from the solvent extraction of mineral oils.

7. A highly refined mineral oil resistant to the formation of sludge and the development of acidity, comprising a mineral oil sufficiently over-refined to the extent that the same normally forms excessive sludge and develops high acidity, and a small amount of extract added as such obtained by the solvent extraction of an uncracked mineral oil, said extract being added in sludge and acidity inhibiting quantities.

8. A highly refined mineral oil described in claim 7 in which the mineral oil is over-refined by treatment with fuming sulfuric acid.

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