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STABLE SULPHURIZED OILS AND THE METHOD OF PREPARING SAME

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The present invention relates to improvements in sulphurized oils and the method of preparing the same, and more particularly relates to improved sulphurized petroleum oils and the method of preparing the same.

It is well known in the art to employ as cutting oils sulphurized animal and/or mineral oil products. Usually these sulphurized oils are prepared by mixing elemental sulphur with the animal and/or mineral oil and heating the mixture at an elevated temperature above about 300° F. for a period of time sufficient to obtain a product having the desired sulphur content. Such sulphurized oils are objectionable in that they are unstable and are susceptible to sedimentation, frequently amounting to 1% to 4%. This is an undesirable quality in sulphurized cutting oils, since they are often used in large plants where circulating systems and tanks are employed in their distribution and the formation of sediment in such unstable oils often blocks the circulating lines and in other ways interferes with normal performance. Although substantially all of the initial sediment may be removed by mechanical means, such as by filtration, additional sediment forms upon aging of the sulphurized oil.

It is an object of the present invention to provide a stable non-emulsifiable sulphurized oil which is resistant to the formation of sediment. Another object of the invention is to provide a sulphurized mineral oil which is substantially free of sediment. Another object of the invention is to provide an improved method of preparing stable sulphurized oils. Another object of the invention is to provide a method of inhibiting the formation of sediment in sulphurized oils.

We have discovered that the foregoing objects can be attained by our improved method of preparing sulphurized oils. In accordance with the present invention, the oil to be sulphurized, for example, a mineral oil of the desired viscosity, is mixed with about 2% to about 8%, and preferably with about 4% to about 6% of pulverized elemental sulphur, and the mixture heated at a temperature within the range of about 300° F. to about 360° F., and preferably within the range of about 335° F. to about 345° F. for a period of time sufficient to obtain a sulphurized oil having the desired sulphur content, usually from about 10 hours to about 15 hours, preferably from about 12 hours to about 13 hours. At the end of the heating period the sulphurized oil is preferably cooled to a temperature of from about 175° F. to about 225° F., and preferably to a temperature within the range of about 190° F. to about 210° F., and a small amount of a preferentially oil-soluble alkali metal sulphonate or an alkaline earth sulphonate such as a sodium sulphonate, potassium sulphonate, calcium sulphonate, etc., or an amine sulphonate, preferably an alkylolamine sulphonate such as triethanolamine sulphonate, is added to the sulphurized oil. Suitable sulphonates are the preferentially oil-soluble sulphonates, well known in the art as mahogany soaps obtained by the treatment of mineral oils with concentrated sulphuric acid, such as fuming sulphuric acid. The amount of preferentially oil-soluble sulphonate employed is within the range of about .001% to about 2%, and preferably within the range of about .005% to about 1%. While we prefer to add the mahogany soap to the sulphurized oil after it has been cooled, as above indicated, we can add the mahogany soap to the sulphurized oil before any substantial cooling.

If desired, the odor of the sulphurized oil may be improved by blowing the sulphurized oil after it has been cooled to about 200° F. with an oxygen-containing gas, such as air, for a period of about 30 minutes to about 90 minutes, and preferably for a period of about 45 to 60 minutes. In case the sulphurized oil is air-blown, the oil-soluble sulphonate is suitably added during the blowing period. Still further odor improvement may be obtained by adding a small amount, namely, about 0.1% of triethanolamine to the sulphurized oil when the temperature has dropped below about 150° F.

The amount of sediment which is present and which may possibly form on aging is reduced by at least 50% and in most cases by at least about 75% when the sulphurized oils are prepared in the manner described. In practically all cases the total sediment amounts to less than 1%.

The following example is purely illustrative of the present invention and is not intended to be limitative thereof.

To 100 gallons of a mineral oil having a Saybolt Universal viscosity at 100° F. of about 100 seconds were added 32 pounds of flowers of sulphur and the mixture heated in a still at a temperature of 340–350° F. for 12 hours. At the end of the sulphurization period the contents of the still were cooled to about 200° F. and blown with air for about 45 minutes, during which time about 2 pounds of sodium mahogany soap were added to the sulphurized oil. At the end of the blowing period after the temperature dropped to about 150° F., about 0.1% triethanolamine was added to inhibit odor development.

The effectiveness of the herein described method

of preparing stabilized sulphurized oils is demonstrated by the data in the following table. The data show the amount of sediment found in sulphurized oil prepared by the conventional methods and in accordance with the present invention with 2.0% sodium mahogany soap and with 0.25% sodium mahogany soap, immediately after sulphurization and after 30 to 35 days storage. Oil A was a 110 second viscosity (S. U. at 100° F.) oil, oil B was a 150 second viscosity (S. U. at 100° F.) oil, and oil C was a 200 second viscosity (S. U. at 100° F.) oil.

Method of sulphurization	Oil A, sedimentation [1]		Oil B, sedimentation [1]		Oil C, sedimentation [1]	
	Fresh	34 days	Fresh	30 days	Fresh	35 days
Conventional	0.9	2.1	1.3	1.4	3.5	4.5
With 2% soda mahogany soap	0.4	0.4	------	0.5	1.3	2.2
With 0.25% soda mahogany soap	------	0.5	------	0.5	------	1.9

[1] Volume per cent.

The above data show the effectiveness of mahogany soap in inhibiting sedimentation in sulphurized oils.

The stabilized sulphurized oil prepared in accordance with the present invention is the type which is not readily or permanently emulsifiable with water, that is, it is not a so-called soluble oil type. We are aware that so-called soluble cutting oils containing a sulphurized base have been made, as shown, for example, in U. S. Patent 2,062,652. Our stabilized sulphurized oil is not to be confused with this type of oil, since the amount of mahogany soap employed in the present invention is inadequate to form a stable permanent emulsion. The term "non-emulsifiable sulphurized oil" as used herein and in the appended claims means a sulphurized oil which is not readily or permanently emulsified with water.

While specific ranges and proportions have been given for the purpose of illustration the invention is not limited thereto, but is of the scope of the following claims.

We claim:

1. The method of preparing a stable non-emulsifiable sulphurized mineral oil comprising sulphurizing the oil with elemental sulphur at a temperature from about 300° F. to about 360° F. and adding to the sulphurized oil an oil-soluble sulphonate selected from the class consisting of alkali metal sulphonates, alkaline earth sulphonates and amine sulphonates in a small but sufficient amount to inhibit the formation of sediment in the sulphurized oil.

2. The method of preparing a stable non-emulsifiable sulphurized mineral oil comprising sulphurizing the oil with elemental sulphur at a temperature from about 300° F. to about 360° F., cooling the sulphurized oil to a temperature of about 200° F. and adding to the sulphurized oil an oil-soluble sulphonate selected from the class consisting of alkali metal sulphonates and alkaline earth sulphonates, in small but sufficient amount to inhibit the formation of sediment in the sulphurized oil.

3. The method described in claim 2 in which the oil-soluble sulphonate is an oil-soluble sodium sulphonate.

4. The method described in claim 2 in which the oil-soluble sulphonate is an oil-soluble potassium sulphonate.

5. The method described in claim 2 in which the oil-soluble sulphonate is an oil-soluble calcium sulphonate.

6. The method of preparing a stable non-emulsifiable sulphurized mineral oil comprising sulphurizing the oil with elemental sulphur at a temperature from about 300° F. to about 360° F., blowing the sulphurized oil with an oxygen containing gas and adding a small amount of an oil-soluble alkali metal sulphonate to the sulphurized oil.

7. The method of preparing a stable non-emulsifiable sulphurized mineral oil comprising sulphurizing the mineral oil with elemental sulphur at a temperature above about 300° F., blowing the sulphurized oil with an oxygen containing gas and adding a small amount of an oil-soluble sodium sulphonate to the sulphurized oil during the gas blowing period.

8. The method of preparing a stable non-emulsifiable sulphurized mineral oil comprising sulphurizing a mineral oil with elemental sulphur at a temperature within the range of about 330° F. to about 360° F. with elemental sulphur, cooling the sulphurized mineral oil to a temperature of from about 175° F. to about 225° F. and adding from about 0.001% to 2% of an oil-soluble alkali metal sulphonate.

9. The method of preparing a stable non-emulsifiable sulphurized mineral oil inhibited against sedimentation comprising sulphurizing a mineral oil with elemental sulphur at a temperature within the range of from about 300° F. to about 360° F. with sulphur, cooling the sulphurized oil to a temperature of from about 175° F. to about 225° F., blowing the cooled sulphurized oil with an oxygen containing gas, and adding from about 0.001% to about 2% of preferentially oil-soluble alkali metal mahogany soap to the sulphurized oil during the gas blowing period.

10. A stable, non-emulsifiable sulphurized mineral oil comprising a sulphurized mineral oil prepared by reacting an oil with elemental sulphur at a temperature from about 300° F. to about 360° F., and an oil soluble sulphonate selected from the class consisting of alkali metal sulphonates, alkaline earth sulphonates and amine sulphonates, said sulphonate being employed in a small but sufficient amount to inhibit the formation of sediment in said sulphurized oil.

11. A stable, non-emulsifiable sulphurized mineral oil composition comprising a sulphurized mineral oil obtained by reacting a mineral oil with elemental sulphur at a temperature within the range of from about 330° F. to about 360° F. and from about 0.001% to about 2% of an oil soluble sulphonate selected from the class consisting of alkali metal sulphonates, alkaline earth sulphonates and amine sulphonates.

12. A stable, non-emulsifiable sulphurized mineral oil composition as described in claim 11 in which the oil soluble sulphonate is an oil soluble sodium sulphonate.

13. A stable, non-emulsifiable sulphurized mineral oil composition as described in claim 11 in which the oil soluble sulphonate is an oil soluble potassium sulphonate.

14. A stable, non-emulsifiable sulphurized mineral oil composition as described in claim 11 in which the oil soluble sulphonate is an oil soluble calcium sulphonate.

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