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OXIDATION INHIBITOR

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The present invention is directed to the stabilization of hydrocarbon fractions against oxidation. More particularly, the invention relates to the employment of anti-oxidants or so-called inhibitors for preventing or retarding deterioration of hydrocarbon fractions as a result of oxidative processes.

It is well known that various hydrocarbon fractions, particularly hydrocarbon fractions derived from petroleum, are susceptible to oxidation. For example, it is common practice to add various materials to gasoline and kerosene fractions to prevent or retard during storage deterioration attributable to oxidative processes. It is also common practice to add various materials to the higher boiling hydrocarbon fractions, such as white oils and lubricating oils, to prevent or retard oxidative deterioration thereof. Of course, the susceptibility to oxidation of each of these fractions is not the same and, accordingly, different oxidation inhibitors are used. Even in fractions boiling in the same range, for example lubricating oil, the kind of oxidation inhibitor incorporated therein has in the past been dependent upon the prior treatment to which the lubricating oil had been subjected. The choice of a particular inhibitor may, for example, depend upon whether the oil had been previously heavily acid treated, lightly acid treated, caustic treated, or solvent extracted. It will be appreciated, of course, that under such circumstances the selection of a particular inhibitor or a combination of inhibitors may become a rather complicated process indicating the desirability of having a single inhibitor suitable for use in each of the different hydrocarbon fractions irrespective of the manner in which the hydrocarbon fraction has been previously treated.

It is the principal object of the present invention to provide a hydrocarbon fraction which is resistant to oxidation. It is a further object to provide an additive which, when added in small amount to a hydrocarbon fraction, prevents or retards the oxidative processes which ordinarily take place in such fractions during use or storage.

Briefly, the present invention may be described as a composition including a hydrocarbon fraction to which is added the reaction product of an aryl amine and a tri-thioketone.

The aforementioned inhibitor is added to the hydrocarbon fraction to be inhibited in an amount in the range of from about 0.5% to about 5.0% by weight of the hydrocarbon fraction. In some instances it may be desirable to use less than 0.5% by weight, and as little as 0.1% by weight may be employed. Under certain circumstances, it may be desirable to use more than 5% of the inhibitor in the composition. If, for example, the inhibitor is employed in a lubricating oil, ordinarily no more than 5% by weight will be employed. However, if the inhibitor is used in an extreme pressure lubricant, it may be desirable to use considerably larger quantities, and it may be desirable to use as much as 30% to 40% by weight of the inhibitor.

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It might be mentioned, however, that highly satisfactory inhibitors have been prepared by reacting trithioacetone with diphenyl amine. It will be apparent, of course, that a different trithion could have been used in this reaction in place of the trithioacetone. It will be further apparent that a different mono-basic or di-basic aryl amine could have been employed in place of the diphenyl amine. In any event, 51 parts by weight of diphenyl amine were reacted with 22 parts by weight of trithioacetone dissolved in benzene at a temperature of 165° F. to 175° F. for a period of four hours. A dark brown mass of crystals was obtained from the benzene solution when cooling, the yield of crystals amounting to 88% based on the total charge of reactants. The aforementioned reaction product was tested in the usual manner for activity in preventing the oxidation of an easily oxidizable white mineral oil.

Oxidation of an oil sample is carried out in a 200 cc. glass three-necked round bottom flask. The central neck of this flask is 5 cm. long and has an inside diameter of 3 cm. The two opposed side necks are 6 cm. long and 1.5 cm. inside diameter, and are situated at a 30° angle with the central neck, perpendicular to the surface of the spherical flask. The stirrer is a glass rod 0.5 cm. in diameter, entering the flask through a glass tube bearing held in place by a rubber stopper in the central neck, with two glass blades 1.0 cm. long by 0.7 cm. wide welded to opposite sides of the bottom end of the glass rod at a 30° angle with the vertical. The stirrer is driven by a 1750 R. P. M. motor connected to the stirrer by a rubber tubing coupling. The blades of the stirrer are situated about 0.5 cm. from the bottom of the flask and spin in such a direction that their propeller-like action circulates the oil to the bottom of the flask, up along the sides of the flask, back to the center of the flask, and down to the stirrer blades again. A considerable amount of air is sucked down with the descending oil and intimately contacted with it by the action of the stirrer. A thermometer well 5 cm. long and 1.0 cm. inside diameter is situated in one side of the flask equidistant from the two side

arms. During the oxidation the flask is about two-thirds immersed in an oil bath maintained at 375° F. The temperature of the oil in the flask is usually 5 to 10° F. below the temperature of the oil bath.

The oxidation test is carried out in the specially constructed flask by stirring 100 cc. of the sample in the presence of air for sixteen hours at 375° F. At the end of that time the flask is removed from the oil bath and tests obtained on the oxidized oil.

The results of these tests are given in the following table:

	Inhibitor		
	None	Trithio-Acetone	Trithio-acetone and Diphenyl Amine Reaction Product
Inhibitor Added, Wt. Percent of Oil	None	2.0	2.0
Tests Before Oxidation and Before Adding Inhibitor:			
Vis. @ 210° F., S. S. U.	53.4	54.0	54.0
Viscosity Index	79	82	82
Tests after Oxidation of Inhibited Oil:			
Vis. @ 210° F., S. S. U.	119	56.4	54.7
Percent Increase in Vis. 210° F.	123	4	1
Viscosity Index	58	83	83
Neutralization Value	14.6	0.70	0.13
Conradson Carbon Residue	1.1	0.08	0.01

It will be noted from the foregoing table that the reaction product of trithioacetone and diphenyl amine effectively inhibited oxidation of the white oil in which it was incorporated, thereby preventing deterioration of the oil as indicated by the viscosity index, the neutralization value and the Conradson carbon residue of the oxidized oil as compared to the unoxidized oil. It further shows that this reaction product is decidedly superior to trithioacetone as an inhibitor.

While the single example given herein is directed to a lubricating oil composition made from a petroleum distillate fraction boiling in the lubricating oil boiling range, it will be apparent that the class of compounds disclosed herein may be used in other hydrocarbon fractions, such as gasoline and kerosene, for inhibiting oxidation reactions which take place therein during storage and while in use.

The nature and objects of the present invention having been fully described and illustrated, what I wish to claim as new and useful and to secure by Letters Patent is:

1. An improved composition resistant to oxidation consisting of a petroleum hydrocarbon fraction susceptible to oxidation containing a minor amount of the reaction product of diphenyl amine and trithioacetone, said reactants being reacted in a weight ratio of 51 parts and 22 parts, respectively, at a temperature in the range of 165° to 175° F. for a period of about 4 hours, said minor amount of the reaction product being in the range of 0.5% by weight to 5.0% by weight of the hydrocarbon fraction.

2. A composition in accordance with claim 1 in which the hydrocarbon fraction is a lubricating oil.

3. A composition in accordance with claim 1 in which the hydrocarbon fraction is a white mineral oil.

4. A composition in accordance with claim 1 in which the composition consists of a lubricating oil containing 2% by weight of said reaction product of diphenylamine and trithioacetone.

No references cited.