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STABILIZED AVIATION GASOLINE

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This invention relates to inhibitors for aviation gasoline containing tetra-alkyl lead, which inhibitors increase the storage stability of said gasolines.

It is an object of the invention to produce motor fuel compositions of enhanced storage stability, particularly aviation fuels. Another purpose is to provide new and improved inhibitors for leaded aviation gasoline. Other objects will be apparent from the following description.

I have found that the addition of hydrobromic or hydriodic acid to an oxidation inhibitor comprising an amino phenol greatly increases the stability of an initially stable gasoline containing tetra-alkyl lead and the inhibitor. Gasolines which are susceptible to this treatment for retarding their decomposition are relatively stable compositions such as straight run or casing head gasoline, alkylated fractions such as iso-octane, and the like. Although such hydrocarbons have a comparatively long life when stored alone, their age decomposition is tremendously accelerated when the conventional quantity (up to about 6 cc./gal.) of tetra-alkyl lead is added to the fuel to increase its knock rating. In such a gasoline, both the initially stable hydrocarbons and the tetra-alkyl lead disintegrate at a fairly rapid rate upon standing so that the natural life of the gasoline is greatly shortened by the occurrence of both lead precipitate and organic gum formation.

On the other hand, for some undetermined reason, hydrobromic or hydriodic acid does not exhibit this enhancing effect in the presence of amino phenolic inhibitors when the inhibitors are used to stabilize a cracked (i.e., unsaturated) or originally unstable gasoline. My inhibitors thus exhibit their principal stabilizing power in preventing the decomposition of tetra-alkyl lead which is dissolved in gasoline or other motor fuel.

The hydrobromic or hydriodic acid may advantageously be present in any amount up to the stoichiometric quantity necessary to neutralize the basic amino phenolic inhibitor. Less than this equivalent amount will have an effect proportionate to the quantity present, while any amount in excess of the stoichiometrical quantity will have no additional inhibiting effect and on the contrary may possess the disadvantage of being corrosive.

This enhancing effect may be illustrated by the following examples in which straight run gasoline containing 4 cc. tetra-ethyl lead per gallon was tested for oxidation stability in the presence of different inhibitors or their hydrobromides.

Inhibitor A had the following composition:

	Percent
N butyl p-amino phenol.....	42
NN'dibutyl p phenylene diamine.....	6
Alcohol (10% methyl, 90% isopropyl).....	52

Inhibitor B consisted of benzyl p-amino phenol.

The amount of hydrogen bromide used in inhibitor A in trials 2 and 4 was only the amount necessary to neutralize the inhibitor.

	W. per cent added	Induction period in presence 0.05 part per million Cu
		Minutes
Inhibitor A.....	0.0005	400
Inhibitor A hydrobromide.....	0.0005	550
Inhibitor B.....	0.001	730
Inhibitor B hydrobromide.....	0.001	920
Inhibitor C.....	0.005	350
Inhibitor C hydrobromide.....	0.005	485

The improvement in induction periods obtained in these tests on the basis of equal weights of inhibitors was even greater than the simple numerical difference between the figures in the last column above, since the amount of amino phenol itself in the quantity of amino phenol hydrobromide used is obviously considerably less than the equal weight of unneutralized amino phenol taken for comparison.

This enhancing effect is observed only when amino phenols are employed with hydrobromic acid or hydriodic acid. Inhibitors containing only the amino group or only the phenolic group do not exhibit such increased anti-oxidant ability. Indeed, hydrobromic acid exhibits an adverse effect in the presence of non-amino phenolic inhibitors.

The amino group of the phenolic inhibitor may be a primary amine, or one hydrogen may be substituted (to produce a secondary amine) by such groups as methyl, ethyl, n- and iso-propyl, normal-, tertiary- and iso-butyl, amyl, hexyl, cyclohexyl, acetyl, acetonitrile, butylidene, heptylidene, benzylidene (as well as chlor- or nitrobenzylidene), cinnamylidene, furfuryl, and the like, their analogues, homologues and suitable substituted derivatives.

The amino phenolic inhibitor may be mononuclear such as the above or they may be polynuclear, as well as mono- or poly-hydroxy, as in amino naphthol, phenyl or benzyl amino naph-

thol, amino anthranol, amino phenanthrol, amino di- or tri-hydroxy naphthalene, etc.

When more than one $=NH$ or $-NH_2$ group is found in the phenolic compound, sufficient hydrobromic or hydriodic acid may be employed to neutralize all primary or secondary amines present.

In general, concentrations of my amino phenol—hydrobromide or amino phenol—hydriodic inhibitors between about 0.0005% and 0.1% and more preferably between about 0.0005% and .004% are adequate to stabilize a typical aviation or saturate type gasoline.

The hydrobromic or hydriodic acid and the amino phenol may be added to the gasoline separately, together, or they may be first mixed in the desired proportion and incorporated in the gasoline as needed.

I claim as my invention:

1. A stable motor fuel comprising a predominant amount of a normally stable gasoline type motor fuel containing an amount of tetra-alkyl lead sufficient to render the mixture relatively

unstable on storage and a stabilizing amount of a compound selected from the group consisting of primary and secondary amino phenol hydroiodides and hydrobromides.

2. The composition of claim 1, wherein the tetra-alkyl lead is tetra-ethyl lead.

3. The composition of claim 1, wherein there is substantially no unneutralized amino phenol.

4. The composition of claim 1, wherein the stabilizer is derived from a secondary amino phenol.

5. The composition of claim 1, wherein the stabilizer is present in about 0.0005% w. to about 0.1% w.

6. The composition of claim 1, wherein the stabilizer is present in about 0.0005% w. to about 0.004% w.

7. The composition of claim 1, wherein the amino phenol is N butyl para amino phenol.

8. The composition of claim 1, wherein the amino phenol is benzyl para amino phenol.

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