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TRIMETHYLLEAD METHYL THIOGLYCOLATE

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This invention relates to a novel organolead compound. More particularly, the invention is concerned with trimethyllead methyl thioglycolate useful as an antiknock compound for hydrocarbon fuels of the gasoline boiling range.

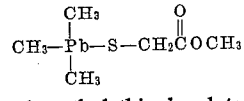
Gasoline compositions of high octane number are commonly required for modern spark ignition internal combustion engines. Improved methods of refining and blending gasoline base stocks have been employed to meet the demands for higher octane number gasoline compositions. New antiknock additives for gasoline base stocks have also been sought for the improvement of octane numbers.

In accordance with the present invention a new organolead compound has been found, namely, trimethyllead methyl thioglycolate which is useful as an antiknock additive in hydrocarbon base fuels boiling in the gasoline boiling range.

The hydrocarbon base fuel of the gasoline composition of this invention is prepared by conventional refining and blending processes. It normally contains straight-chain paraffins, branched-chain paraffins, olefins, aromatics and naphthenes. Since straight-chain paraffins have a tendency to adversely affect octane number, the content of such hydrocarbons is ordinarily low.

As already mentioned, the base fuel is a hydrocarbon fuel boiling in the gasoline boiling range. Generally described, such fuels have an ASTM (D–86) distillation with an initial boiling point of about 100° F. and a final boiling point of about 425° F. Preferably, the unleaded base fuel has a Research octane number of at least 85 as determined by the accepted CFR engine test method. Also, the base fuel preferably contains at least 20 percent by volume of aromatic hydrocarbons. Less than 30 percent by volume of olefinic hydrocarbons are present in the fuel. The total paraffin and naphthene hydrocarbon content of the preferred fuel may be as much as 80 percent by volume. For best over-all engine performance, fuels containing in the range of 20 to 60 percent by volume of paraffinic and naphthenic hydrocarbons are preferred for volatility and other desirable gasoline characteristics. The more preferred hydrocarbon base fuels are also those which contain from 20 to 60 percent by volume aromatic hydrocarbons and from 0 to 30 percent by volume of paraffine and naphthene hydrocarbons, about 30 to 40 percent aromatic hydrocarbons and about 5 to 15 percent olefinic hydrocarbons.

The trimethyllead methyl thioglycolate is illustrated by the formula



The trimethyllead methyl thioglycolate is employed in the hydrocarbon base fuel in amounts sufficient to improve the octane number. Preferably there is at least 0.5 ml. of the compound per gallon of base fuel. If desired, other octane improving additives may be employed in addition to the trimethyllead methyl thioglycolate. These include other lead compounds such as lead tetraethyl, carbonyl derivatives of iron and cyclopentadienyl derivatives of metals such as manganese or iron. Other gasoline additives, such as scavengers like ethylene chloride or bromide, oxidation inhibitors, corrosion inhibitors,

surface ignition suppressants like phosphorus compounds, detergents, and the like may be present. For practical purposes not more than about 4 ml. of lead compounds per gallon is ordinarily used in the compositions.

The following examples illustrate the compositions of the trimethyllead methyl thioglycolate in accordance with this invention. Unless otherwise specified the proportions are on a weight basis.

EXAMPLE I

This example shows the preparation of trimethyllead methyl thioglycolate.

Methyl thioglycolate is prepared as an intermediate by refluxing 150 g. of thioglycolic acid (95+% pure), 200 ml. methanol, 300 ml. chloroform and 20 ml. concentrated sulfuric acid for twenty hours under a Soxhlet thimble containing anhydrous magnesium sulfate to absorb the liberated water. The magnesium sulfate in the thimble is replaced with fresh material twice. On cooling, the mixture separates into two layers. Each layer is washed twice with water to remove sulfuric acid, dried, and the combined layers are fractionated. The yield of methyl thioglycolate is 96 g. Its boiling point is 52.5° C. at a pressure of 17 mm. of mercury.

A solution of trimethyllead chloride and methyl thioglycolate in equimolar proportion in aqueous alcohol is prepared. To this solution is added an aqueous solution of sodium carbonate which causes the evolution of carbon dioxide. Addition of the aqueous sodium carbonate solution is continued until carbon dioxide evolution ceases. The trimethyllead methyl thioglycolate is separated as a colorless viscous liquid. It is readily miscible with aromatic solvents. It decomposes upon heating at about 100° C. at 1 mm. mercury pressure. The infrared spectrum of the compound checks with the known spectro of methyl thioglycolate and alkyllead compounds.

In the examples which follow the trimethyllead methyl thioglycolate is employed as an antiknock compound in gasoline compositions. The examples are summarized in tabular form along with pertinent test data. In the examples the hydrocarbon base fuel contains 51% by volume of paraffins and naphthenes, 25% olefins and 24% aromatic hydrocarbons. The fuel has a sulfur content of about 0.06% by weight. The table shows the effect on octane numbers by the addition of trimethyllead methyl thioglycolate. The octane numbers are based on the Research Method D–908 and the Motor Method D–357 of the "ASTM Manual of Engine Test Methods for Rating Fuels." The latter method, which is more stringent than the Research Method illustrates more accurately the desirable qualities of the improved gasoline composition of the invention.

In the octane number determinations the trimethyllead methyl thioglycolate is used in amounts to provide 3.17 g. of lead per gallon. This is equivalent to the 3 ml. of tetraethyllead per gallon conventionally employed in gasoline.

Table

Example No.	Lead Compound	Research Octane	Motor Octane
II	None—base fuel	94.8	82.3
III	Trimethyllead Methyl Thioglycolate.	95.8	85.9

The examples summarized in the above table show that the improved gasoline composition of the invention containing the novel trimethyllead methyl thioglycolate possess improved octane number ratings compared to the hydrocarbon base fuel alone.

The organolead compounds of this invention are also useful wherever oil-soluble lead compounds are desired.

For example, fine particle dispersions of lead may be obtained by thermal decomposition of the trialkyl lead thioglycolate dissolved in liquid hydrocarbon, such as isooctane. Such fine metal dispersions of lead are useful as catalysts for certain reactions. The fine lead particles may be converted to lead oxides which are useful as lubricating agents. The lead compound of the invention may also be used as a free radical initiator in polymerization reactions.

I claim:

Trimethyllead methyl thioglycolate.

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