

1

2,985,521

FUEL COMPOSITIONS

Daniel F. Herman, Orange, N.J., and Roger M. Weil, Brooklyn, N.Y., assignors to National Lead Company, New York, N.Y., a corporation of New Jersey

No Drawing. Filed Sept. 29, 1955, Ser. No. 537,548

3 Claims. (Cl. 44-57)

This invention relates to methods for improving the burning qualities of liquid and gaseous fuels, in particular liquid and gaseous hydrocarbon fuels, and to compositions having improved burning properties.

It is a well known fact that one of the greatest impediments to efficient utilization of fuels is their failure to burn completely. Not only does this tendency result in incomplete utilization of the energy contained therein, but it also leads to other undesirable results. Among such other results may be mentioned the production of large quantities of soot, or of solid liquid and gaseous products of incomplete decomposition, such as aldehydes, acids and the like. Failure of such fuels to burn completely, for example in oil-heating units, internal combustion engines and the like, has been blamed in large part for the unpleasant smog conditions prevalent in many industrial areas.

An object of this invention, therefore, is to provide methods for improving the completeness of combustion of fuel materials. Another object is to provide improved fuel compositions having such desirable combustion characteristics. Other objects and advantages will become apparent from the following more complete description and claims.

Broadly, this invention contemplates the method of improving the burning characteristics of a fuel composition which comprises adding to said fuel composition an organotitanium compound characterized by a direct carbon-titanium bond. This invention also contemplates a fuel composition comprising a combustible material and an organotitanium compound characterized by a direct carbon-titanium bond.

Combustible fuel materials to which the present invention is applicable include a wide range of oxidizable substances, but the fuel materials particularly preferred are liquid and gaseous hydrocarbon materials such as petroleum fractions and the like.

Although we do not wish to restrict ourselves to any particular reaction mechanism, the same not having been fully established, it is believed that the carbon-titanium linkage is responsible, by virtue of some type of catalytic action, for the enhanced burning properties imparted to the fuel. Any organotitanium compound possessing this linkage, therefore, is useful in the practice of this invention. Particularly preferred, however, because of their high degree of stability are those materials wherein the titanium atom is directly bonded to a carbon atom which is a member of a 5- to 6-membered ring. Among such compounds may be mentioned aryltitanium trialkylates such as phenyltitanium triisopropylate, and dicyclopentadienyltitanium dihalides, cyclopentadienyltitanium trihalides, dicyclopentadienyltitanium dialkylates and the like.

The amount of titanium compound added to the fuel may be varied within wide limits. In general, amounts as small as 1 part of titanium compound to 10,000 parts

2

of fuel, by weight, exhibit a noticeable beneficial effect. On the other hand, amounts as large as 1 part of titanium compound to 100 parts of fuel, or even more, may be present without adversely effecting the properties of the fuel. Higher amounts of additive, however, increase the cost of the fuel composition without contributing a proportionate improvement in burning properties. In general, it is preferred to employ about 1 part of titanium compound for each 4,000 parts by weight of fuel.

The improvement in burning characteristics obtained when operating according to the present invention may be quickly and easily determined on a semi-quantitative basis by simply igniting the fuel in an open dish or like container, and duplicating the procedure with a control sample to which no organotitanium compound has been added, and observing the corresponding sizes and intensities of the soot deposits produced by the two samples on a suitable collector such as a piece of white tile or paper held the same distance above each of the burning samples.

In order to illustrate more clearly the nature and properties, and the manner of preparation of the compositions of this invention, the following examples are presented:

Example I

A fuel mixture was prepared by dissolving 5.9 grams of dicyclopentadienyltitanium dichloride in 20 liters of kerosene. The smoking tendency of the solution was evaluated by testing a portion of it in a smoke-point lamp of the type described in A.S.T.M. Method 2107 (May 21, 1953), with a white porcelain evaporating dish suspended a few inches above the flame. The flame was adjusted to a height of 19 mm. The flame was allowed to burn for fifteen minutes, after which the evaporating dish was examined and found to be free of any discoloration or deposit of soot.

By contrast, an identical test performed on an additional portion of the same batch of kerosene, but without any addition, produced a heavy black deposit of soot.

Example II

The procedure of Example I was repeated, substituting 11.2 grams of dibutoxy monocyclopentadienyltitanium chloride for the 5.9 grams of dicyclopentadienyltitanium dichloride of Example I. The results, both as to the treated and the untreated kerosene, were substantially identical with those described in Example I.

The compositions of this invention are simple and inexpensive to prepare, and the addition of the agents herein specified to the fuel may be carried out at the refinery or by the consumer. Among the addition agent described, some, such as dibutoxy monocyclopentadienyltitanium monochloride, for example, are liquids miscible with hydrocarbon fuels, and are particularly advantageous in that respect.

Compositions according to this invention, except for the improvement in completeness of combustion, closely resemble the untreated fuels in their burning characteristics, so that the treated fuels of this invention may be substituted for untreated fuels with little or no adjustment of the combustion apparatus.

While this invention has been described by way of certain preferred embodiments and illustrated by specific examples, these are illustrative only, and the invention is not to be considered as limited, except as set forth in the appended claims.

We claim:

1. A fuel composition consisting essentially of kerosene and a cyclopentadienyltitanium halide in amount between one part of said halide per 10,000 parts of said

3

fuel and one part of said halide per 100 parts of said fuel, the titanium in said cyclopentadienyltitanium halide being in the tetravalent state.

2. A fuel composition consisting essentially of kerosene and dibutoxy monocyclopentadienyltitanium chloride, in amount between one part per 10,000 parts of said fuel and one part per 100 parts of said fuel. 5

3. A fuel composition consisting essentially of kerosene and a dicyclopentadienyltitanium dihalide, in amount between one part per 10,000 parts of said fuel and one part per 100 parts of said fuel. 10

4

References Cited in the file of this patent

UNITED STATES PATENTS

2,161,184	McKone et al.	June 6, 1939
2,560,542	Bartleson et al.	July 17, 1951
2,818,416	Brown et al.	Dec. 31, 1957
2,864,843	De Witt et al.	Dec. 16, 1958

FOREIGN PATENTS

1,080,357	France	May 26, 1954
-----------	--------------	--------------