United States Patent Office 3,520,665 Patented July 14, 1970

3,520,665 HYDROCARBON MIXTURES CONTAINING A STABLE AZIDE

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No Drawing. Continuation-in-part of application Ser. No. 470,915, July 9, 1965. This application Oct. 10, 1968, Ser. No. 766,627

Int. Cl. C10l 1/22

U.S. Cl. 44—51 9 Claims

ABSTRACT OF THE DISCLOSURE

Stable azides, such as alkali metal azides or phenyl azide, are introduced in biocidal amounts into liquid hydrocarbon mixtures to kill microorganisms present therein. The liquid hydrocarbon mixture may be a fuel.

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation-in-part application of application Ser. No. 470,915, filed July 9, 1965, now abandoned.

This invention relates to liquid petroleum products. More specifically, this invention relates to the use of azides as biocidal additives to these products, particularly fuels.

Certain microorganisms thrive in wet petroleum derived organic liquids, particularly those employed in fuels. When these microorganisms become sufficiently numerous in engine fuels, for example, they often cause clogging of fuel filters and lines, pitting of metals and coatings, and disruption of the normal functioning of fuel gauges. It is well known that no known organism can survive for long in an organic phase of pure liquid hydrocarbons since no known organism can survive without water. The miscibility of water in liquid hydrocarbons is so low as not to provide the minimum amount of water necessary for the survival of any known organism in the hydrocarbon phase. It has been discovered that bacteria originally thought to be found in the organic phase are actually found in small droplets of water, which droplets are finely dispersed in the organic phase, and further, that organisms which metabolize hydrocarbons do so at the interface between the aqueous phase and the organic phase.

Petroleum fuels commonly pick up moisture when they are stored for even short periods and thus become culture media for hydrocarbon-metabolizing organisms. These organisms are particularly noxious in jet, turbine, and diesel engines which run on "kerosene-type" fuels. Kerosene-type fuels appear to be more readily metabolized by the microorganisms than more completely refined fuels.

Hydrocarbon-metabolizing organisms are also detrimental ni other areas. Corrosion caused by these organisms is encountered in oil well casings. Often the degradation of cutting oil may be attributed to them. Generally speaking harmful microorganism activity may be found in the mining, refining, processing, storage, formulation and use of petroleum products.

It is known to add biologically active compounds, i.e., biocides, to wet hydrocarbons to control these noxious microorganisms. Presently available biocides are often effective for only a short period because the microorganisms rapidly produce immune strains. Organic biocides usually have extremely low solubility in water. Thus, they do not incroporate readily into the moisture associated with the fuel.

According to the present invention, stable azides are utilized as biocides in wet liquid hydrocarbon mixtures. Examples of the azides within contemplation in the practice of this invention are the alkali metal azides, specifically those of lithium, sodium, potassium, rubidium and cesium, which may be utilized either separately or in combination. Of these, sodium azide and/or potassium azide are preferred. Stable organic azides, such as phenyl azide, may also be used.

The azides may be introduced directly to the wet liquid hydrocarbon mixture, i.e., a hydrocarbon mixture containing significant, e.g., a fraction of a percent or more, water. Apparently the microorganisms infesting these hydrocarbons are incapable of producing strains resistant to the azides. A particularly advantageous property of the azides is their high solubility in water. Solutions containing 250 grams of azide in 750 grams of water are readily prepared. By contrast, the azides are only very slightly soluble in petroleum derived liquids. Most of the azide added to a wet hydrocarbon mixture passes to the aqueous phase. Thus, the moisture which otherwise would sustain the life of the microorganisms in the hydrocarbon mixture is rendered extremely toxic to the microorganisms.

According to one embodiment of the instant invention, a biocidal amount, i.e., an amount which kills substantially all of the organisms infesting the liquid hydrocarbon mixture, of one or more stable azides is added directly to the wet liquid hydrocarbon mixture. The azide is conveniently added in crystalline form which may be either substantially pure or accompanied by a diluent which is compatible with the azide. Thus, the azide may be added as powder, pellets, solution or oil dispersion. One or more stable azides may be mixed with wet crude oil, drilling muds, oil well additives or refined petroleum products. When the azides are added to fuel in crystalline form, it is preferable to separate the aqueous phase from the organic fuel prior to use. In this way, the possibility of forming non-volatile inorganic deposits in an engine from the azides is reduced. Azide may be kept in contact with the fuel after the fuel has been placed in the fuel tank of a vehicle by fastening a packet of the solid material in the tank. In this fashion, an equilibrium concentration of azide is maintained in the organic phase but the solid phase is kept isolated away from fuel lines.

The fuels of this invention include liquid hydrocarbon fuels, typically derived from petroleum. In addition to the liquid hydrocarbons, the fuels may contain substantial quantities of additives conventionally employed to stabilize the fuel or to impart antiknock, anticorrosive, antigumming, or other desirable properties to the fuel. The fuels of primary interest are jet fuels comprising primarily saturated naphthenic and paraffinic hydrocarbons. They are generally middle cut distillates in the kerosene range.

Amounts of azide as low as about 25 parts per million (p.p.m.) by weight, basis the weight of water associated with the fuels, are generally effective. Amounts in excess of about 2,000 p.p.m. on the aforestated basis are rarely employed, being far in excess of the amount normally required. Usually, to insure complete kill of the microorganisms without adding an inordinate excess of azide, amounts between about 25 and about 1,000 p.p.m. are employed. Often amounts between about 250 and about 1,000 p.p.m. are used. Thus, in a storage tank where the water bottom contains about 30 gallons of water, microorganism growth is effectively controlled by adding to the fuel stored therein as little as about ¼ pound of sodium azide and/or potassium azide.

It is not intended to limit the scope of the invention to the specific details of the disclosure except insofar as those details are recited in the claims.

What is claimed is:

1. A composition comprising a liquid hydrocarbon in contact with an aqueous phase and containing a biocidal amount of at least one stable azide selected from the group consisting of alkali metal azide and phenyl azide.

2. The composition of claim 1 wherein said stable azide is selected from the group consisting of alkali metal azide and mixtures thereof.

3. The composition of claim 1 wherein said stable azide is selected from the group consisting of sodium azide, potassium azide and mixtures thereof.

4. The composition of claim 1 wherein said stable azide is phenyl azide.

5. The composition of claim 1 wherein said liquid hydrocarbon mixture is a motor fuel.

6. The composition of claim 5 wherein the liquid hydrocarbons are a middle cut distillate in the kerosene range consisting essentially of naphthenic and paraffinic hydrocarbons.

7. The composition of claim 5 wherein said stable azide is present in about 25 to about 2,000 parts per million by weight basis the weight of the water associated with the liquid hydrocarbons.

8. The composition of claim 1 wherein said stable azide is present in the organic phase in an equilibrium amount.

9. The composition of claim 1 wherein said stable azide is present in about 25 to about 2,000 parts per million by weight basis the weight of the water associated with the liquid hydrocarbons.

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U.S. Cl. X.R.

44—72, 64; 252—8.5