

## UNITED STATES PATENT OFFICE

2,496,508

## STABILIZED ORGANIC SULFUR-CONTAINING COMPOUNDS

Roger W. Watson, Chicago, Ill., and Lawson W. Mixon, Hammond, Ind., assignors to Standard Oil Company, Chicago, Ill., a corporation of Indiana

No Drawing. Application June 26, 1946,  
Serial No. 679,556

6 Claims. (Cl. 252—48.2)

1

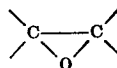
This invention relates to an improved method of inhibiting the evolution of hydrogen sulfide from organic sulfur-containing compounds from which hydrogen sulfide is normally evolved, and to organic sulfur-containing compounds stabilized against hydrogen sulfide evolution.

Many organic sulfur-containing compounds evolve hydrogen sulfide in the course of their normal use or in storage. Because of the obnoxious odor of hydrogen sulfide gas the evolution of hydrogen sulfide from such organic compounds is very objectionable. Examples of such organic compounds are sulfurized terpenes, sulfurized olefins and olefin polymers, sulfurized fatty oils of animal and vegetable origin, sulfurized sperm oil, sulfurized mineral oils and the like. Not only is the use of such organic compounds restricted because of the obnoxious odor of the evolved hydrogen sulfide, but the use of compounds containing various amounts of such organic sulfur compounds is often restricted because of this nuisance. For example, lubricants such as hydrocarbon lubricating oils frequently contain sulfurized materials to impart thereto various desired properties such as extreme pressure properties, anticorrosion properties and the like. However, such lubricants in storage or during service evolve hydrogen sulfide which is considered to be highly objectionable by the users of such lubricants. It is, therefore, an object of the present invention to provide an improved method of inhibiting the evolution of hydrogen sulfide from organic sulfur-containing compounds which normally evolve hydrogen sulfide during service or storage. Another object of the present invention is to provide a method whereby organic sulfur-containing compounds which evolve obnoxious hydrogen sulfide odors are rendered inoffensive. Another object of the invention is to provide organic sulfur-containing compounds stabilized against hydrogen sulfide evolution. Other objects and advantages of the invention will become apparent from the following description thereof.

We have discovered that the evolution of hydrogen sulfide from organic sulfur-containing compounds can be substantially inhibited by adding to such sulfur-containing compounds, organic epoxides in small but sufficient quantities to substantially inhibit the evolution of hydrogen sulfide; suitably in concentrations of from about 0.001% to about 5.0% and preferably from about 0.01% to about 3.0% by weight based upon the sulfur-containing compound. The term "organic epoxide" as used herein and in the appended

2

claims means a compound containing an olefin oxide group such as the structural grouping



The following specific compounds are representative of the classes named above:

|                   |                     |
|-------------------|---------------------|
| Epichlorohydrin   | Chloroprene oxide   |
| Glycide           | Isoprene oxide      |
| Ethylene oxide    | Decene oxide        |
| Propylene oxide   | Styrene oxide       |
| 2,3-epoxybutane   | Cyclohexylene oxide |
| 1,2-epoxybutane   | Cyclopentene oxide  |
| Isobutylene oxide | Pinene oxide        |
| Butadiene oxide   |                     |

and epoxide compounds formed by the oxidation of hydrocarbons, especially olefinic hydrocarbons.

While the foregoing compounds are all effective in inhibiting the evolution of hydrogen sulfide from organic sulfur-containing compounds, it is not to be implied that all are equivalents, since the specific activity of the various epoxides varies to some extent.

The effectiveness of organic epoxides of the type described herein in inhibiting the evolution of hydrogen sulfide from organic sulfur-containing compounds is illustrated by the data in the following table. These data were obtained by placing the control or the control and the various inhibitors in a container and maintaining the same at the desired temperature, namely 250° F. or 200° F., while passing nitrogen therethrough at a rate of one liter per hour. After one-half hour to remove preformed hydrogen sulfide, the exit tube from the container was connected to a flask of lead acetate solution. The rate of hydrogen sulfide evolved was determined by the amount of lead sulfide formed. The control was a mineral lubricating oil additive composition containing a sulfurized mineral oil, a sulfurized terpene, and a KOH neutralized reaction product of P<sub>2</sub>S<sub>5</sub> and an isobutylene polymer.

| Sample                          | Temperature, ° F. | Mg. H <sub>2</sub> S/100 g. Sample/hr. |
|---------------------------------|-------------------|----------------------------------------|
| Control.....                    | 250               | 35.0                                   |
| Do.....                         | 200               | 18.0                                   |
| Control+2% epichlorohydrin..... | 200               | 0.1                                    |

The above tabulated data show the effectiveness of organic epoxides in inhibiting hydrogen sulfide evolution from organic sulfur-containing compounds. While these data were obtained with

3

a specific lubricant composition using a particular oil-soluble detergent, namely the KOH neutralized reaction product of  $P_2S_5$  and an isobutylene polymer, and particular organic sulfur-containing compounds, namely a sulfurized mineral oil and a sulfurized terpene, other oil-soluble detergent-type additives and other organic sulfur-containing materials can be used. For example, the oil-soluble detergent may be a neutralized reaction product of a phosphorous sulfide and a hydrocarbon as described in U. S. 2,316,082.

Many lubricant compositions contain from about 0.001% to about 10% by weight of an oil-soluble detergent-type additive and an organic sulfur-containing additive, the former to impart varnish inhibiting or removing properties to the lubricant, and the latter to impart lubricating and/or corrosion inhibiting properties. The oil-soluble detergent-type additive is frequently responsible for an increased rate of hydrogen sulfide evolution from the organic sulfur-containing additive. Under these conditions the addition of the herein-disclosed epoxides effectively inhibits the evolution of hydrogen sulfide from such compositions.

The term "oil-soluble detergent-type additive" as used herein and in the appended claims means an organic compound having the property of substantially inhibiting the formation of varnish in internal combustion engines and/or the property of removing varnish formed in such engines.

While we have described our invention by reference to specific embodiments thereof, these have been by way of illustration and the invention is not to be limited thereby, but includes within its scope such modifications as come within the spirit and scope of the appended claims.

We claim:

1. A sulfurized oleaginous compound which normally evolves hydrogen sulfide on storage

4

containing in combination therewith from about 0.001% to about 5%, by weight, based on the sulfurized compound, of an aliphatic epoxide.

2. A composition as described in claim 1 in which the epoxide is epichlorohydrin.

3. A lubricant composition consisting essentially of a major proportion of a hydrocarbon oil, an organic sulfur-containing compound which evolves hydrogen sulfide, and from about 0.001% to about 5%, by weight, based on the sulfur-containing compound, of an aliphatic epoxide.

4. A lubricant composition as described in claim 3 in which the aliphatic epoxide is epichlorohydrin.

5. A lubricant composition consisting essentially of a major proportion of a hydrocarbon oil, an organic sulfur-containing compound which normally evolves hydrogen sulfide, an oil-soluble phosphorus- and sulfur-containing detergent type additive, and from about 0.001% to about 5%, by weight, based on the sulfur-containing compound, of an aliphatic epoxide.

6. A lubricant composition as described in claim 5, in which the oil-soluble detergent-type additive is a neutralized reaction product of a phosphorous sulfide and a hydrocarbon.

ROGER W. WATSON.  
LAWSON W. MIXON.

#### REFERENCES CITED

The following references are of record in the file of this patent:

#### UNITED STATES PATENTS

| Number    | Name            | Date          |
|-----------|-----------------|---------------|
| 1,840,269 | Borgstrom       | Jan. 5, 1932  |
| 2,166,604 | Meyer           | July 18, 1939 |
| 2,205,021 | Schuette et al. | June 18, 1940 |
| 2,249,340 | Wilson et al.   | July 15, 1941 |