

UNITED STATES PATENT OFFICE

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COMPOSITION OF MATTER

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sec. 266)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to them of any royalty thereon.

This invention relates in general to new composition of matter particularly adapted for rendering harmless bis (beta-chloroethyl) sulphide commonly known as mustard gas.

It is well known that bis (beta-chloroethyl) sulphide is a vesicant compound which is extremely persistent, that is, the bis (beta-chloroethyl) sulphide remains vesicant after long exposures to air, sunlight, and moisture. Furthermore, this compound penetrates many substances and adheres tenaciously to other substances, the result being that objects contaminated with mustard gas are dangerous to persons touching them for long periods of time, sometimes several months. Since the first use of this compound in the World War, much study has been devoted to the discovery of an agent which would effectively and rapidly destroy or render harmless mustard gas. Such agent should be relatively cheap, the ingredients should be readily procurable, and the compound should effectively and rapidly cleanse contaminated equipment.

One object of this invention is to provide a new compound which quickly destroys bis(beta-chloroethyl) sulphide.

Another object of this invention is to provide an effective demustardizing agent which is cheap to manufacture, is readily used without danger to personnel, and which rapidly reacts with bis(beta-chloroethyl) sulphide to render the same harmless.

Another object of this invention is to provide a new compound to rapidly render harmless bis (beta-chloroethyl) sulphide without the production of other harmful compounds.

It is known that water will react with bis (beta-chloroethyl) sulphide to form hydrochloric acid and thiodiglycol, but under ordinary conditions this reaction is so slow as to make it valueless as a method of renovating objects contaminated with bis (beta-chloroethyl) sulphide. Therefore another object of this invention is to provide a demustardizing agent comprising a water-in-oil emulsion in which a large percentage of water is dispersed in such form as to rapidly react with bis(beta-chloroethyl) sulphide.

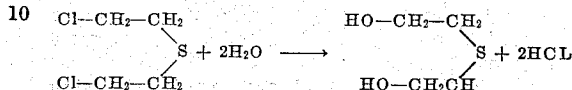
With these and other objects in view which will be apparent from the following description and claims, the invention consists in the ingredients hereinafter described and claimed, with the understanding that the several necessary substances and compounds and the steps involved in the procedure may be widely varied without departing from the spirit of the invention nor exceeding the scope of the appended claims.

The present invention relates to a new com-

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ound which will rapidly and effectively render bis (beta-chloroethyl) sulphide harmless and which can be readily procured for use at or near the front line of operations in case of war, for renovating objects contaminated with this compound.

It is known that bis (beta-chloroethyl) sulphide is decomposed into hydrochloric acid and thiodiglycol by the action of water, as follows:



Under ordinary conditions this reaction is so slow, however, as to make it valueless as a method of renovating objects contaminated with bis (beta-chloroethyl) sulphide. By the use of the composition of matter herein described, a water-in-oil emulsion is formed in which the water is so dispersed that a rapid reaction occurs between bis (beta-chloroethyl) sulphide and water.

The ingredients of this novel composition of matter consists of kerosene, sodium bicarbonate, and an emulsifying agent mixed with a large percentage of water.

The emulsifying agent must be one in which bis (beta-chloroethyl) sulphide is readily soluble and which will form a stable water-in-oil type of emulsion when mixed with water and an oil. It has been found that certain oils and fats when combined with a magnesium compound form a suitable emulsifying agent.

The preferred emulsifying agent may be prepared as follows: About 100 parts by weight of horse oil is placed in a suitable vessel equipped with heating and stirring devices. About 12 parts by weight of magnesium carbonate, or 8.3 parts by weight of magnesium hydroxide or 6 parts by weight of magnesium oxide is then added, and the mixture stirred and heated to 250° C. for 3 hours, or until the evolution of gas is complete.

By the above treatment either a liquid, pasty, or solid product is obtained on cooling, depending upon the completeness of the reaction. The pasty or solid product produces a suitable emulsifying agent, but the solid requires considerable time to dissolve in preparing the emulsion. This disadvantage may be overcome by the addition of kerosene or other suitable solvent to the emulsifier while hot. The emulsifier thus prepared may be used at once or stored and used as desired.

Although horse oil and magnesium compound are preferred as the emulsifying agent, excellent results may be obtained by other compounds. Coconut oil, codfish oil, lard oil, and palm oil may be used with substantially the same proportions of magnesium carbonate, magnesium oxide, or magnesium hydroxide as above outlined and

prepared in the same manner. These emulsifying agents when used with a high percentage of water are substantially as effective as the horse oil-magnesium compound agent.

It will be apparent that the emulsifying agent may be varied as to fat or oil content and the magnesium compound. One important feature is the direct action of a suitable magnesium compound on the fat or oil, the amount of magnesium compound used being insufficient for complete saponification of the fat or oil.

The demustardizing agent for washing and renovating objects contaminated with bis (beta-chloroethyl) sulphide, is prepared by mixing water, kerosene, an alkaline material such as sodium bicarbonate, and one of the above emulsifiers. As an example of the proportions used, 100 gallons of the wash may be prepared as follows. Place in a suitable vessel about 8 pounds of the emulsifying agent prepared as above described, and add about 10 gallons of kerosene. Stir for a few minutes, preferably with a high speed mechanical stirrer, and then add while continuing to stir, 90 gallons of water containing about 42 pounds of sodium bicarbonate in solution. It is preferable, though not essential, to use water at a temperature of about 50° C. or to heat the mixture in the vessel while stirring.

A satisfactory compound may be obtained using 90 to 95% water, 10 to 5% kerosene by volume, and 5 to 10 grams of sodium bicarbonate and 1 to 2 grams of one of the emulsifying agents described herein, per 100 cc. of emulsion.

In the destruction of bis (beta-chloroethyl) sulphide the emulsion is assumed to act as follows. The bis (beta-chloroethyl) sulphide is first dissolved in the continuous phase (kerosene) and is quickly distributed throughout the bulk of the emulsion. In order for the reaction to occur, it is necessary for the bis (beta-chloroethyl) sulphide to reach the water which is dispersed in the form of minute globules. According to theory, each globule of water is surrounded by a film of emulsifying agent through which the bis (beta-chloroethyl) sulphide must pass to reach the water. It is thus apparent that the rate of penetration of the bis (beta-chloroethyl) sulphide depends upon its solubility in the emulsifying agent, and thus on the nature of the emulsifying agent.

The ratio of water to oil is also an important factor in the destruction of bis (beta-chloroethyl) sulphide, because the higher the ratio of water, the greater the volume of dispersed water, the greater the number of water globules, the greater the surface of water exposed, and the greater the rate of reaction. When bis (beta-chloroethyl) sulphide is dissolved in the outer phase of an emulsion it comes into contact with the disperse phase at a rate dependent upon its solubility in the emulsifying agent and upon the surface area of the disperse phase.

On reaching the disperse phase reaction occurs with the formation of thiodiglycol and hydrochloric acid, as previously indicated. The presence of sodium bicarbonate in the water phase assists the reaction by neutralization of the hydrochloric acid. The presence of an electrolyte in an emulsion generally causes it to become unstable but in the present case the electrolyte (sodium bicarbonate) either does not affect the stability of the emulsion, or improves it. It will be understood that alkalis other than sodium bicarbonate may be used to neutralize the hydrochloric acid.

For the destruction of bis(beta-chloroethyl)

sulphide, the compound described herein has many advantages. (a) It has a high dispersed water content—90 to 95% by volume. (b) It has a correspondingly low continuous phase or oil content—10 to 5% by volume. (c) The emulsifying agent is superior to other known emulsifying agents from the standpoint of rapid decomposition of bis (beta-chloroethyl) sulphide. Although this emulsifying agent is somewhat similar to a bivalent soap, it accomplishes a result which no bivalent soap has been found capable of accomplishing. (d) The small quantity of emulsifying agent required to prepare the emulsion. Whereas in most emulsions the amount of emulsifier is from 5 to 10% by weight, the amount of emulsifying agent required in this invention is only about 1%. (e) The emulsion is stable, in spite of the presence of the electrolyte. (f) This emulsion has an exceptionally high rate of reaction with bis (beta-chloroethyl) sulphide. Thus five drops of bis (beta-chloroethyl) sulphide is practically destroyed in five hours at room temperatures by 25 cc. of this emulsion without agitation, whereas no appreciable decrease of bis (beta-chloroethyl) sulphide occurs after weeks of contact with water alone. (g) This emulsion is non-corrosive of itself and does not react with bis (beta-chloroethyl) sulphide to form strongly corrosive and vesicant compounds.

While we have described the preferred embodiments of this invention, we wish it to be clearly understood that we do not confine ourselves to the precise steps or ingredients set forth herein by way of illustration, as it is apparent that many changes and variations may be made therein by those skilled in the art without departing from the spirit of the invention or exceeding the scope of the appended claims.

We claim:

1. A water-in-oil emulsion for the destruction of bis (beta-chloroethyl) sulphide comprising water, kerosene, and an emulsifying agent consisting of the reaction product of horse oil and one of the group of compounds consisting of magnesium carbonate, magnesium oxide, and magnesium hydroxide.

2. A water-in-oil emulsion for the destruction of bis(beta-chloroethyl) sulphide comprising water, kerosene, and an emulsifying agent consisting of the reaction product of horse oil and magnesium carbonate.

3. A water-in-oil emulsion for the destruction of bis (beta-chloroethyl) sulphide comprising water, kerosene, and an emulsifying agent consisting of the reaction product of horse oil and magnesium oxide.

4. A water-in-oil emulsion for the destruction of bis (beta-chloroethyl) sulphide comprising water, kerosene, and an emulsifying agent consisting of the reaction product of horse oil and magnesium hydroxide.

5. A water-in-oil emulsion for the destruction of bis (beta-chloroethyl) sulphide comprising water, kerosene, an alkali which will neutralize hydrochloric acid, and an emulsifying agent consisting of the reaction product of horse oil and one of the group of compounds consisting of magnesium carbonate, magnesium oxide, and magnesium hydroxide.

6. A compound for decomposing bis (beta-chloroethyl) sulphide comprising approximately 90 to 95% water containing an alkali which will neutralize hydrochloric acid, approximately 9-4% of kerosene, and approximately 1% of an emulsifying agent consisting of the reaction prod-

uct of horse oil and one of the group of compounds consisting of magnesium carbonate, magnesium oxide and magnesium hydroxide.

7. A composition of matter for decomposing bis (beta-chloroethyl) sulphide comprising approximately 90-95% water containing an alkali which will neutralize hydrochloric acid, approximately 9-4% of kerosene, and approximately 1% of an emulsifying agent consisting of the reaction product of horse oil and magnesium carbonate.

8. A composition of matter for decomposing bis(beta-chloroethyl) sulphide comprising approximately 90-95% water containing an alkali which will neutralize hydrochloric acid, approximately 9-4% of kerosene, and approximately 1% of an emulsifying agent consisting of the reaction product of horse oil and magnesium oxide.

9. A composition of matter for decomposing bis (beta-chloroethyl) sulphide comprising approximately 90-95% water containing an alkali which will neutralize hydrochloric acid, approximately 9-4% of kerosene, and approximately 1% of an emulsifying agent consisting of the reaction product of horse oil and magnesium hydroxide.

10. A composition of matter for decomposing bis (beta-chloroethyl) sulphide comprising water containing sodium bicarbonate, kerosene, and an emulsifying agent consisting of the reaction product of horse oil and one of the group of compounds consisting of magnesium carbonate, magnesium oxide, and magnesium hydroxide.

11. A composition of matter for decomposing bis (beta-chloroethyl) sulphide comprising water containing sodium bicarbonate, kerosene, and an emulsifying agent consisting of the reaction product of horse oil and magnesium carbonate.

12. A composition of matter for decomposing bis (beta-chloroethyl) sulphide comprising water containing sodium bicarbonate, kerosene, and an emulsifying agent consisting of the reaction product of horse oil and magnesium oxide.

13. A composition of matter for decomposing bis (beta-chloroethyl) sulphide comprising water containing sodium bicarbonate, kerosene, and an emulsifying agent consisting of the reaction product of horse oil and magnesium hydroxide.

14. A composition of matter for decomposing bis (beta-chloroethyl) sulphide comprising water, kerosene, and an emulsifying agent consisting of the reaction product of approximately one hundred parts by weight of horse oil and twelve parts by weight of magnesium carbonate.

15. A composition of matter for decomposing bis (beta-chloroethyl) sulphide comprising water, kerosene, and an emulsifying agent consisting of the reaction product of approximately one hundred parts by weight of horse oil and eight parts by weight of magnesium hydroxide.

16. A composition of matter for decomposing bis (beta-chloroethyl) sulphide comprising water, kerosene, and an emulsifying agent consisting of the reaction product of approximately one hundred parts by weight of horse oil and six parts by weight of magnesium oxide.

17. A composition of matter for decomposing bis(beta-chloroethyl) sulphide comprising approximately 88% water, 10% kerosene, 1% sodium bicarbonate, and 1% emulsifying agent consisting of the reaction product of approximately 89% horse oil and 11% magnesium carbonate.

18. A composition of matter for decomposing bis(beta-chloroethyl) sulphide comprising approximately 88% water, 10% kerosene, 1% sodium

bicarbonate, and 1% emulsifying agent consisting of the reaction product of approximately 92.6% horse oil and 7.4% magnesium hydroxide.

19. A composition of matter for decomposing bis(beta-chloroethyl) sulphide comprising approximately 88% water, 10% kerosene, 1% sodium bicarbonate, and 1% emulsifying agent consisting of the reaction product of approximately 94.3% horse oil and 5.7% magnesium oxide.

20. An emulsifying agent consisting of the reaction product of horse oil and one of the compounds of the group consisting of magnesium carbonate, magnesium oxide, and magnesium hydroxide.

21. An emulsifying agent consisting of the reaction product of horse oil and magnesium carbonate.

22. An emulsifying agent consisting of the reaction product of horse oil and magnesium oxide.

23. An emulsifying agent consisting of the reaction product of horse oil and magnesium hydroxide.

24. An emulsifying agent consisting of the reaction product of a magnesium compound and one of the group of compounds consisting of horse oil, coconut oil, codfish oil, lard oil, and palm oil.

25. An emulsifying agent comprising one of the group of compounds consisting of magnesium carbonate, magnesium oxide, and magnesium hydroxide, chemically combined with one of the compounds consisting of horse oil, coconut oil, codfish oil, lard oil, and palm oil.

26. An emulsifying agent for forming a water-in-oil emulsion comprising the reaction product of substantially 5-11% of a magnesium compound, and 95-89% of one of the compounds consisting of horse oil, coconut oil, codfish oil, lard oil, and palm oil.

27. A composition of matter for changing bis (beta-chloroethyl) sulphide to thiodiglycol and hydrochloric acid comprising 90-95% water, kerosene, an alkali to neutralize the hydrochloric acid formed, and an emulsifying agent consisting of the reaction product of fat and a magnesium compound.

28. A water-in-oil emulsion for the destruction of bis (beta-chloroethyl) sulphide comprising water, kerosene, and an emulsifying agent consisting of the reaction product of a magnesium compound and one of the group of compounds consisting of horse oil, coconut oil, codfish oil, lard oil, and palm oil.

29. A water-in-oil emulsion for the destruction of bis (beta-chloroethyl) sulphide comprising 90-95% water, 9-4% kerosene, and 1% emulsifying agent consisting of the reaction product of a magnesium compound and fat, the emulsifying agent being a solvent for bis (beta-chloroethyl) sulphide.

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