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PERCHLORATE SALTS OF ALKANOL AMINES

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The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

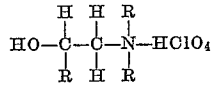
This invention is a continuation in part of our copending application Serial No. 134,592, filed December 22, 1949, now abandoned, for Perchlorate Salts of Alkanol Amines.

This invention relates to the perchlorate salts of alkanol amines.

It is an object of this invention to produce oxygen-rich compounds for use in liquid propellent fuels.

This invention consists of the preparation of the perchlorate salts of aliphatic compounds which contain both hydroxide and amine groups, i.e., the perchlorate salts of alkanol amines.

Of these salts, compounds meeting the following formula have been found particularly effective:



where R is of the class:

H
Alkyl
Hydroxyl substituted alkyl
Amino substituted alkyl

Prime examples of such compounds are the perchlorate salts of the ethanolamines, e.g., ethanolamine, dimethylethanolamine, and methyldiethanolamine. Other examples of the instant invention are to be found in the perchlorate salts of monoisopropanolamine and of diisopropanolamine.

The compound is prepared in accordance with the instant invention by dissolving the alkanol amine chosen in a polar solvent such as water or acetic acid, adding an equivalent amount of perchloric acid, and evaporating the resultant solution to dryness.

Examples of the instant invention are as follows:

Example I.—Dimethylethanolamine (0.25 gram) and 70% perchloric acid (0.39 gram) were dissolved in water. The resulting solution was evaporated to dryness and the residue further dried in an evacuated desiccator over anhydrous calcium sulfate. The product was a white hygroscopic solid which melted at 40° C., and burned almost explosively when ignited.

Example II.—Monoisopropanolamine (0.25 gram) and 70% perchloric acid (0.48 gram) were dissolved in water,

and the water was removed as in Example I. A glassy colorless product was obtained which melted around 30° C. When ignited it burned rapidly with the formation of a small amount of soot.

Example III.—Aminoethylethanolamine was dissolved in glacial acetic acid. A solution of 70% perchloric acid (0.82 gram) in glacial acetic acid was added. A white precipitate formed, which was removed by suction filtration, washed several times with ether, and dried. The melting point was about 145° C.

Most of the compounds falling within the instant invention are low melting and soluble in polar organic solvents such as alcohol. As a result they may be readily added to liquid propellant fuels to increase the oxygen content thereof and decrease the amount of oxidizer which would otherwise have to be used.

The compounds claimed in this application are particularly useful as additives to liquid fuels used for rocket propellants. When rockets operate on liquids, two fluids are usually allowed to react in the motor. One is the fuel, the other is the oxidant. Examples of fuels are hydrazine, aniline, and alcohol. Examples of oxidants are nitric acid and liquid oxygen. The compounds disclosed herein (the perchlorate salts of alkanol amines) contain large quantities of oxygen which are available for burning the fuel and their addition to the fuel greatly decreases the amount of oxidant such as nitric acid or liquid oxygen which must be carried by the rocket. Since the latter oxidants are usually much more hazardous than the fuel-perchlorate mixture, the advantage of the addition of the perchlorate is obvious. The amount of perchlorate which can be added is limited only by the solubility of the perchlorate in the fuel. The solubility varies considerably with the nature of the fuel but in some cases, for example ethyl alcohol, may exceed 50% of the weight of the fuel. The extent to which the perchlorate replaces the usual oxidant (nitric acid or liquid oxygen) can be calculated from the percentage added to the fuel and the usual chemical stoichiometric considerations. Such fuel-perchlorate mixtures are relatively non-explosive and may be stored without change for considerable periods of time. The perchlorate salts of alkanol amines themselves are explosive and because they melt at low temperatures can readily be cast in various forms or mixed with other ingredients of combined explosives. This ease of handling gives them advantages for some purposes, such as in certain types of fireworks, over less easily handled materials.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. Monoisopropanolamine perchlorate.

2. The perchlorate salt of an alkanol amine taken from the group consisting of dimethylethanolamine, monoisopropanolamine, and aminoethylethanolamine.

3. Aminoethylethanolamine perchlorate.

References Cited in the file of this patent

UNITED STATES PATENTS

2,406,572 Vogl ---------- Aug. 27, 1946