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METHYLAMINE NITROFORM OXIDIZER IN NITROCELLULOSE, ALUMINUM AND METRIOL TRINITRATE PROPELLANTS

Anthony J. Matuszko and Marguerite S. Chang, both of Washington, D.C., assignors to the United States of America as represented by the Secretary of the Navy

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3 Claims. (Cl. 149—92)

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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 relates to a novel, nitrogen-containing nitroform derivative and the method of its preparation. Specifically, the invention is directed to the preparation of methylamine nitroform, a novel composition of matter.

Organic nitro and polynitro compounds have been known for many years as substances which release large amounts of energy upon decomposition initiated by thermal energy or shock energy. Examples of such substances are TNT (trinitrotoluene) and tetranitromethane. More recently, certain polynitro compounds have been incorporated into composite rocket propellant formulations in order to increase the specific impulse of the formulations.

In contrast to many polynitro compounds, nitroform, although known for some time and although apparently an explosive substance, has not been used as an explosive because of a number of serious, inherent disadvantages. Among these are:

(1) Pure nitroform (M.P. 56° C.) will not detonate and is very difficult to initiate;

(2) Because it is easily soluble in water, nitroform is hygroscopic—a property not desirable in an explosive;

(3) Nitroform is very unstable, decomposing at temperatures only slightly higher than room temperature (e.g. 30° C.).

Although nitroform, itself, is not suitable as an explosive, it has now been found that it is possible to prepare a derivative thereof which possesses properties making it useful as an oxidizer and thereby desirable as an ingredient in high energy propellants.

Accordingly, it has been discovered that methylamine may be reacted with nitroform to form an adduct, methylamine nitroform. The reaction involves bubbling a stream of gaseous methylamine into a solution of nitroform in carbon tetrachloride.

Methylamine nitroform may be mixed into suitable explosive and propellant formulations. For example, incorporation of methylamine nitroform in a propellant system including, as other major ingredients, nitrocellulose, aluminum and metriol trinitrate, increases the specific impulse of the system. Sensitivity and stability data obtained on pure methylamine nitroform show that the compound is reasonably stable and insensitive as compared to other high energy oxidizers.

A specific embodiment of the invention is described in the following example. It is to be understood, however, that the example is merely for purposes of illustration and that it is not intended that the scope of the invention be limited thereby.

Example

A solution of 3 g. (0.02 mole) of nitroform in 15 ml. of carbon tetrachloride was cooled in an ice bath while a stream of gaseous methylamine was bubbled into the solution for 10 to 15 minutes. A yellow precipitate was formed immediately upon contact of the gas with the nitroform solution. After the reaction was completed, the yellow solid was separated by filtration and 3.0 g. (79% of theoretical) of methylamine nitroform was obtained. Upon recrystallization from methanol/carbon tetrachloride, yellow needles were obtained which melted, with decomposition, at 126–128° C.

Analysis.—Calculated ($C_2H_6N_4O_6$): C, 13.18; H, 3.29; N, 30.76. Found: C, 13.29; H, 3.36; N, 30.41.

Ignition temperature ---------- 112° C.

Vacuum stability @ 60° C. (0.5 g.):

2 hr.	cc. gas	0.82
24 hr.	do	0.95
43 hr.	do	1.02
48 hr.	do	1.02

The reaction proceeds quite simply and no particular precautions are necessary. The reaction conditions are not critical and may be varied according to the particular situation. Thus, the reaction proceeds at room temperature or at temperatures higher or lower than room temperature. Similarly, the rate of feed of the gaseous methylamine stream is not critical, it merely being necessary that sufficient methylamine be fed into the reaction mixture to sustain the reaction.

As indicated above, methylamine nitroform may be incorporated as an oxidizer in a propellant formulation. A typical propellant formulation, containing methylamine nitroform is as follows:

	Percent
Nitrocellulose (12.0% nitrogen)	14.4
Aluminum	21.0
Adiponitrile	1.0
2-nitro diphenylamine	1.0
Metriol trinitrate	28.0
Methylamine nitroform	34.6

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.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent of the United States is:

1. A process for preparing methylamine nitroform which comprises, reacting methylamine with a solution of nitroform in carbon tetrachloride.

2. The process of claim 1 wherein the reaction is conducted at room temperature.

3. In a propellant composition comprising nitrocellulose, aluminum and metriol trinitrate the improvement comprising methylamine nitroform as an oxidizer in said composition.

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CARL D. QUARFORTH, *Primary Examiner.*

REUBEN EPSTEIN, *Examiner.*