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PEROXIDE-GLYCEROL EXPLOSIVE

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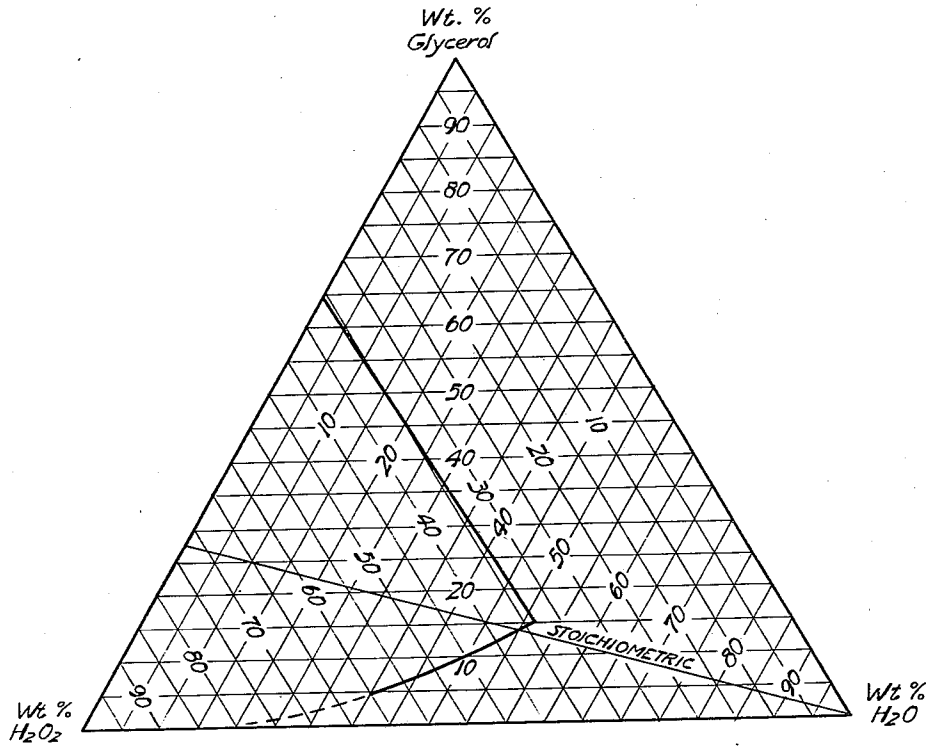

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PEROXIDE-GLYCEROL EXPLOSIVE

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2 Claims. (Cl. 52—1)

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The present invention relates to an explosive and more particularly to a composition containing hydrogen peroxide, water and glycerine, the complete composition being explodable only with a standard blasting cap, as contrasted with mechanical shock, provided the quantity of water in the system is below a certain relatively critical figure. This is a continuation-in-part of Serial No. 643,752, filed January 26, 1946.

Most of the liquid explosives presently in use are so sensitive to shock that they may not be transported over the usual transportation means. Furthermore, their nature is such that complicated methods of manufacture practically prohibit the production of the explosive at the point of use. By reason of the inherent characteristics of nitroglycerine, that material is preferred as an explosive in many types of operations where disruptive forces are employed as, for instance, oil well drilling and prospecting in certain types of mining and the like, to cite but a few examples.

In all of these operations, nitroglycerine seems to be the preferred explosive and its use has been continued even though it is well recognized that the use of this product is attended by an unusual hazard due to its sensitivity to detonation by mechanical shock. The complicated nature of the manufacturing process required to produce nitroglycerine eliminates the possibility of manufacturing it at the point of use so that it must be transported by means other than the usual common carrier.

It is an object of the present invention to provide an explosive composition of especially high power and sensitivity which may be readily manufactured.

It is a further object of the invention to provide an explosive composition which may be made at the point of use with consequent elimination of the transportation hazard.

It is a further object to provide an explosive mixture that is resistant to mechanical impact but which can be detonated only with a blasting cap.

In accordance with the present invention, hydrogen peroxide, water and glycerine may be mixed to produce a single phase liquid system in which, at room temperatures, the ingredients are relatively non-reactive. The end product, provided the water content is maintained below about 52% and provided the amount of hydrogen peroxide is sufficient to consume the glycerine, is a violent explosive resistant to detonation by mechanical shock but which will detonate when explosion is initiated by the employment of a standard blasting cap.

Where the amount of water in the composition rises above about 52% by weight, the composition is not explodable with a blasting cap. In general, the explosive power of the composition is relatively more disruptive, the less the quantity of water present. The amount of hydrogen peroxide and glycerine employed are preferably the stoichiometric quantities necessary to provide complete combustion to carbon dioxide and water. Explosion may, however, be obtained when these proportions are departed from.

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In order to determine the range of explosive composition, a series of solutions was made up from very pure hydrogen peroxide, glycerine and water. Portions of each contained in 4 oz. glass bottles were subjected to 22 cal. rifle fire in order to test the effect of mechanical impact. Further portions were subjected to the action of a #6 blasting cap immersed therein. For these tests the samples were placed in test tubes confined in heavy metal pipes. These tests are summarized in Table I below.

Table I

Hydrogen Peroxide	Composition, Wt. Per Cent		Effect of Blasting Cap	Effect of Rifle Bullet
	Glycerine	Water		
90	0	10	0	0
81	6	13	Explosion	0
65	5	30	do	0
50	13	37	do	0
34	15	51	do	0
34	13	53	0	0
32	20	48	0	0
30	25	45	0	0
38	32	30	Explosion	0
37	40	23	do	0
33	54	13	0	0
41	56	3	Explosion	0
31	66	3	0	0
19	79	2	0	0

It is to be noted that all compositions tested were immune to rifle fire.

The explosive limits are shown in the attached triangular plot; Fig. 1.

All detonable compositions fall within a roughly triangular area whose corners have the following coordinates:

	Corner A	Corner B	Corner C
	Per cent		
Per cent H_2O_2	85+	33	35
Per cent H_2O	10—	52	0
Per cent Glycerol	5	15	65

No compositions containing more than about 52% water can be detonated. Compositions containing somewhat less than 52% water can be detonated provided the glycerol and hydrogen peroxide are present in correct proportions for complete combustion of the glycerol to CO_2 and H_2O. Compositions containing much less water are detonable over a wide range of hydrogen peroxide-glycerol ratios.

Further to show the stability of glycerol-hy-

drogen peroxide explosive, a mixture containing 5.2 ml. of 90% hydrogen peroxide and 2.01 ml. of C. P. glycerol was stored at 50° C. for 3 hours. There was no detectable loss in active oxygen content as determined by iodimetric analysis.

A similar mixture was stored for 3 days at room temperature (approximately 25° C.). Iodiometric analysis showed that 95% of the original available oxygen was still present after this time.

A mixture of 18 ml. glycerol and 27 ml. of 90% hydrogen peroxide was heated in a glass beaker over an open flame. After a time, a sputtering noise was heard and the liquid had the appearance of boiling. Later, a jet of flame appeared above the liquid. Vigorous burning followed until the liquid was completely consumed. There was no detonation.

Thermal calculations indicate that the peroxide explosives herein described fall in the energy range of the high explosives. In general, at the optimum concentration ratio, about 1500 cal. is released per gram of mixture consumed. This figure is to be compared with 800 cal./g. for TNT and 1500 cal./g. for nitroglycerine. The performance of an explosive is, of course, affected by other factors such as rate of detonation. Measurements indicate that the peroxide mixtures actually fall in the performance range of the high explosives.

The action of glycerol is in contrast to the general explosive characteristic of organic materials miscible with highly concentrated hydrogen peroxide which are explosive on mechanical shock as exemplified by a rifle bullet. As an example, solutions of 90% hydrogen peroxide in amounts to produce carbon dioxide and water with the following all exploded violently on mechanical impact of a rifle bullet: methanol, ethanol, isopropanol, ethylene glycol, mannitol, ethyl acetate, cane sugar, diethylene glycol, monoethyl ether, acetone, dioxane, aniline and many others. The behavior of the glycerol-hydrogen peroxide mixture is in contrast with the general behavior of other organic substances.

The ready synthesis of the peroxide explosives at the point of use is of great value in those cases where performance demands have heretofore compelled the use of nitroglycerine and similar materials which must be manufactured at a chemical plant and then transported and stored at great hazard.

What is claimed is:

1. An explosive, insensitive to mechanical impact but explodable with a blasting cap, which comprises glycerin, water and hydrogen peroxide, the water constituting not more than 52% of the mixture, the glycerine and hydrogen peroxide being present in approximately the stoichiometric amounts required for complete combustion of the glycerine to carbon dioxide and water.

2. An explosive insensitive to mechanical impact but explodable with a blasting cap which comprises glycerine, hydrogen peroxide and water, the ratio of the three substances as determined on a standard triangular three component graph to fall within the triangular area defined by the following corners:

Glycerine 5%; hydrogen peroxide 85%; water 10%

Glycerine 15%; hydrogen peroxide 33%; water 52%

Glycerine 65%; hydrogen peroxide 35%; water 0%.

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REFERENCES CITED

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

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