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PRIMING MIXTURES

Wilbur A. Lazier, Wilmington, Del., assignor to E. I. du Pont de Nemours & Company, Wilmington, Del., a corporation of Delaware

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This invention relates to deflagrating compositions of the type used as ammunition priming mixtures and detonators, and contemplates the improvement of such mixtures by the use of a certain class of catalysts commonly identified as chromites.

An ammunition priming mixture is a composition designed to be ignited by percussion and, upon being so ignited, to burn with explosive rapidity and in burning to supply a flame of such duration, heat and intensity as to promptly and thorougly ignite propellent powder. These mixtures ordinarily include a percussion sensitive ingredient but, since the decomposition of percussion sensitive materials does not of itself furnish a flame of the characteristics necessary for the ignition of propellent powder, the mixture likewise includes an oxygen-deficient substance (fuel) and an oxygen-yielding substance (oxidizer) which react under the conditions established by the explosive decomposition of the percussion sensitive ingredient. In some mixtures an abrasive is added for the purpose of facilitating the necessary reactions, particularly the explosion of the percussion sensitive material.

Certain oxidizers, of which barium nitrate is typical, tend to yield oxygen rather slowly and at temperatures which are reached only with substantial difficulty. Likewise, certain otherwise desirable fuels react only under conditions which in ammunition primers are difficult to secure.

It has been found that in many priming mixtures, and other deflagrating compositions, the reactions necessary for the prompt production of an adequate flame are greatly facilitated by the use of catalysts. Such catalysts may contain either an excess or a deficiency of oxygen but they are used in quantities of such proportions that their effect either as a fuel or an oxidizer is negligible; while their effect in catalyzing the reactions of other ingredients is very substantial.

The present invention comprises the discovery of a new class of materials which are extraordinarily effective as catalysts for such deflagrating compositions as ammunition priming mixtures. These substances are known as chromite catalysts. They are not necessarily definite compounds, but are characterized as loosely bound compositions comprising the oxides of heavy metals intimately associated with and at least partially combined with chromium sesquioxide. This group of metals includes iron, nickel, cobalt, copper, zinc, cadmium, silver, manganese, bimuth, lead and tin. Chromites of these metals may be prepared in several different ways, such as, by suitably combining the hydroxides or carbonates of chromium with the heavy metal, or by the ignition at red heat of a chromate of the metal. A mixed or multiple chromite may be made by precipitation from mixed solutions of salts of the metals and a chemically equivalent amount of ammonium chromate followed by ignition, for example, one desirable catalyst is precipitated from a solution of zinc sulphate, copper sulphate, cadmium nitrate, and ammonium chromate. The activity of the chromites as catalysts may be increased by leaching out inactive materials by a weak acid such as acetic acid or in some cases with ammonia.

For the purpose of catalyzing ammunition priming mixtures the chromites may be used alone or with promoters; the promoter being another suitable chromite, an oxide or a metal. Where the promoter is a chromite it may be prepared by co-precipitation and/or calcination along with the principal catalyst. Thus, a copper promoted nickel chromite may be prepared by co-precipitation of the solutions of appropriate copper and nickel salts with ammonium chromate and ammonium hydroxide, with the subsequent washing and calcination of the precipitate. Such a composition may be regarded either as a mixed chromite catalyst or a catalyst of one metal (nickel) with a promoter of a chromite of the second metal (copper).

Chromite catalysts may be used with beneficial results in deflagrating compositions containing a variety of percussion sensitive or explosive ingredients, oxidizers and fuels. Among the explosive substances are: guanylnitrosaminoguanyltetrazene (tetrazene), normal and basic lead styphnate, mercury fulminate, diazodinitrophenol, the basic lead picrates, the normal and basic lead azides, the salts of tetrazole and its derivatives, lead dinitrophenylazide, and the double salts of nitric and hypophosphorous acids of which lead-nitrato-hypophosphite is typical.

Suitable fuels include lead sulphocyanate, antimony sulphide and calcium silicide, such explosive fuels as the monobasic and di-basic lead salts of 2-4 and 3-5 dinitro-benzoic acid, the mono-basic and di-basic lead salts of 3-5 dinitro-orthocresol, the mono-basic and di-basic lead salts of 3-nitro-phthalic acid, and the normal and basic lead salts of dinitro-salicylic acid, as well as the powders of metals such as zirconium.

Suitable oxidizers include both normal and

basic lead and other nitrates, such as barium nitrate, as well as chromates, permanganates, oxides and peroxides.

A specific example of a priming mixture including a chromite catalyst, which is cited as an example merely and is not to be considered as limiting the scope of the invention, is as follows:

	Per cent
Tetrazene	2
Lead styphnate	40
Lead sulphocyanate	8
Barium nitrate	30
Ground glass	20
Chromite catalyst	0.6

The "chromite catalyst" in the above table may be a chromite of any of the metals heretofore indicated, with or without a promoter of another chromite, oxide or metal. As indicated in the table, the preferred quantity of chromite is of the order of 0.6% of the entire mixture, but quantities up to 2% of the entire mixture may be used in some cases. Among such chromites may be mentioned copper chromite, silver chromite, ferric chromite, manganese chromite; and such mixed compositions as: nickel and copper chromites, copper and manganese chromites, copper and silver chromites, zinc and cadmium chromites, zinc and copper chromites, zinc and lead chromites, zinc and bismuth chromites. It will be understood, however, that the named examples of chromites and chromite mixtures are merely illustrative, the use of chromite catalysts in priming mixtures being broadly new, and the appended claims being therefore entitled to a broad construction.

What is claimed is:

1. A deflagrating composition comprising an oxidizing ingredient, a fuel ingredient, and a catalyst which is a chromite of a heavy metal.

2. An ammunition priming mixture comprising a percussion sensitive ingredient, an oxidizing ingredient, a fuel ingredient, a catalyst which is a chromite of a heavy metal, and a promoter for said catalyst which is a chromite of a heavy metal, an oxide, or a metal.

3. An ammunition priming mixture comprising a percussion sensitive ingredient, an oxidizing ingredient, a fuel ingredient, and a catalyst which is a mixed heavy metal chromite.

4. An ammunition priming mixture comprising a percussion sensitive ingredient, an oxidizing ingredient, a fuel ingredient, and a catalyst which is a chromite of a heavy metal.

5. An ammunition priming mixture containing a chromite of a heavy metal.

6. An ammunition priming mixture containing a chromite of a heavy metal in a quantity not exceeding 2%.

7. An ammunition priming mixture containing an oxidizing ingredient, a fuel ingredient, and not more than 2% of a catalyst adapted to accelerate the reaction between said oxidizing ingredient and said fuel ingredient, said catalyst being a chromite of a heavy metal.

8. An ammunition priming mixture comprising an oxidizing ingredient which contains barium nitrate, a fuel ingredient, and a catalyst adapted to accelerate the reaction between said oxidizing ingredient and said fuel ingredient, said catalyst being a chromite of a heavy metal.

9. An ammunition priming mixture containing copper chromite.

10. An ammunition priming mixture containing silver chromite.

11. An ammunition priming mixture containing a catalyst consisting of copper chromite and a promoter of silver chromite.

WILBUR A. LAZIER.