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3,274,035

METALLIC COMPOSITION FOR PRODUCTION OF
HYGROSCOPIC SMOKE

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Calif., assignors to the United States of America as
represented by the Secretary of the Navy
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4 Claims. (Cl. 149-40)

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

This invention relates to new compositions for pyro-
technic production of hygroscopic smokes.

Many compositions and methods are known to the art
for producing smokes for concealment purposes as well
as cloud seeding. A variety of haloid compositions have
been made which are said to produce hygroscopic smoke.
They consist essentially of an admixture of an oxidant,
a fuel, a halogen donor and a halogen receptor. Other
substances, which dispersed, have cloud nucleating char-
acteristics include the well-known iodides, silver, lead,
and copper, cupro-oxide, copper sulphide, copper selenide,
mercury telluride, vanadium pentoxide, silver sulphide,
silver nitrate, silver oxide and cadmium telluride. The
pyrotechnic generation of zinc, aluminum and magne-
sium chlorides by the reaction of these metals in pow-
dered form with carbon tetrachloride and hexachloro-
ethane with other additives for the production of smokes
for concealment purposes is well-known. These materi-
als have fairly low hygroscopicities. Since dispersion
of many of the above-mentioned cloud nucleating materi-
als is accomplished by use of concentrated solutions in
spray-type devices, the total effectiveness is reduced.
The present invention provides compositions which show
as good capability of forming nuclei for cloud seeding
as any of the compositions used heretofore, and is sim-
ple and easy to obtain.

It is therefore an object of this invention to provide
a composition which produces hygroscopic smoke for
use in influencing the weather.

Another object is to provide a material which can be
used for clearance of fog from large areas such as air-
craft runways.

Yet another object is to produce a hygroscopic smoke
for inducing precipitation from warm clouds.

Other objects, features and many of the attendant ad-
vantages of this invention will become readily appreciated
as the same become better understood by reference to
the following detailed description:

The present invention is for a composition which upon
combustion yields hygroscopic smoke. It comprises a
carbonate selected from the group consisting of lithium,
sodium, potassium, cesium, rubidium, calcium, magne-
sium, strontium and barium carbonates and mixtures
thereof; a light metal selected from the group consist-
ing of aluminum, magnesium, zinc and zirconium and
mixtures thereof; and an inorganic oxidizer selected from
the group consisting of nitrates and perchlorates of so-
dium, lithium, potassium, calcium, barium and strontium;
and a polyhalogen compound selected from the group
consisting of hexachloroethane and octachloropropane.
The percentages used must be such that stoichiometric
reactions occur and complete volatilization of the com-
bustion products is obtained.

The following examples better illustrate this invention
but should not be considered as limiting.

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Example I

Ingredients:	Percent by weight
Lithium carbonate	19.34
Hexachloroethane	20.66
Aluminum	20.50
Potassium perchlorate	39.50

This composition burns completely and leaves no resi-
due, i.e., all the reaction products are volatilized. The
percentages of lithium carbonate and hexachloroethane
may vary from the values stated so long as their mutual
proportions remain the same.

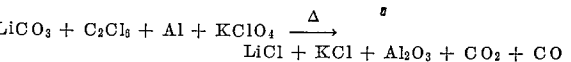
The ingredients are blended and compression molded
into appropriate containers.

Example II

Ingredients:	Percent by weight
Lithium carbonate	16.9
Hexachloroethane	18.1
Aluminum	22.3
Potassium perchlorate	42.7

The above composition was mixed and pressed into
a cylinder one-inch diameter, one-half inch long with a
one-fourth inch hole. This cylinder was ignited using
a loose packed mixture of 2.42% lithium carbonate,
2.58% hexachloroethane, 32.5% aluminum and 62.50%
potassium perchlorate in the hole as an igniter. The
composition burned, leaving no residue and producing
a white smoke cloud. The solid matter in the cloud was
sampled using a cold metal plate and the solid products
were identified as aluminum oxide (Al_2O_3), potassium
chloride (KCl) and lithium chloride (LiCl). The solid
product was quite hygroscopic and absorbed water from
the atmosphere, although the relative humidity at the
time was probably below 5%.

The decomposition of this new composition may be
represented by the following unbalanced equation:



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. The composition which produces hygroscopic smoke
comprising an admixture of the following ingredients:

Ingredients:	Percent by weight
Lithium carbonate	19.34
Hexachloroethane	20.66
Aluminum	20.50
Potassium perchlorate	39.50

2. The composition which produces hygroscopic smoke
comprising an admixture of the following ingredients:

Aluminum
Potassium perchlorate
Lithium carbonate
Hexachloroethane;
the percentage of said ingredients being such that
upon combustion of said composition a stoichi-
ometric reaction occurs.

3. A composition which produces hygroscopic smoke
comprising the following components:

Components	Parts by weight
Pyrotechnic mixture	1.5
Smoke generating mixture	1

said pyrotechnic mixture consisting essentially of aluminum and potassium perchlorate; and said smoke generating mixture consisting essentially of lithium carbonate and hexachloroethane.

4. A composition which produces hygroscopic smoke 5 comprising the following ingredients:

a carbonate selected from the group consisting of sodium, potassium, cesium, rubidium, calcium, magnesium, strontium and barium carbonates and mixtures thereof;

a light metal selected from the group consisting of magnesium, zinc, aluminum and zirconium and mixtures thereof;

an inorganic oxidizer selected from the group consisting of sodium perchlorate, lithium perchlorate, potassium perchlorate, calcium perchlorate, barium perchlorate, strontium perchlorate and the corresponding nitrates, and mixtures thereof;

a polyhalogen compound selected from the group consisting of hexachloroethane and octachloropropane; 20 the percentages of said ingredients being such that upon combustion of the composition a stoichiometric reaction occurs.

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