AUSTRALIA

Patents Act

APPLICATION FOR A STANDARD PATENT

Z/We Phillips Petroleum Company

of Bartlesville,
State of Oklahoma,
UNITED STATES OF AMERICA.

hereby apply for the grant of a standard patent for an invention entitled:

RAPIDLY DISPERSIBLE COMPOSITIONS OF ANTIMONY PENTOXIDE

which is described in the accompanying complete specification.

Details of basic application
Number of basic application: 026,234
Convention country in which basic application was filed: UNITED STATES OF AMERICA
Date of basic application: 16 March 1987

Address for Service:

PHILLIPS ORMONDE & FITZPATRICK
Patent and Trademark Attorneys
367 Collins Street
Melbourne 3000 AUSTRALIA

Dated: 26 February 1988

PHILLIPS ORMONDE & FITZPATRICK
Attorneys for:
Phillips Petroleum Company

By:

Our Ref: 85860
POF Code: 1422/5:47

6012q/1
DECLARATION IN SUPPORT OF A CONVENTION APPLICATION
FOR A PATENT OR A PATENT OF ADDITION

In support of the Convention application made by

PHILLIPS PETROLEUM COMPANY, a corporation,
organized under the laws of the State of
Delaware, United States of America, of
Bartlesville, State of Oklahoma, United
States of America.

for a patent / patent of addition / for an invention entitled:

RAPIDLY DISPERSEABLE COMPOSITIONS OF ANTIMONY PEROXIDE

1. Jack Ewart Phillips
of Bartlesville, State of Oklahoma, United States of America
do solemnly and sincerely declare as follows:

2. I am the applicant for the patent / patent of addition
(or, in the case of an application by a body corporate)
1. I am authorized by PHILLIPS PETROLEUM COMPANY

the applicant for the patent / patent of addition / to make this
declaration on its behalf.

2. The basic application as defined by Section 141 of the
Act was made in the United States of America
on the 16th day of March 1987, by Richard Edward Lowery,
Denton Claude Fentress,
and Don Wayne Godbehere

3. I am also an inventor of the invention referred to in the basic application.
(or, where a person other than inventor is applicant)

3. Richard Edward Lowery, Denton Claude Fentress, and Don
Wayne Godbehere, all citizens of the United States of
America, respectively of 14413 E 33rd, Tulsa, 74134,
5438 Clearview Drive, Bartlesville, 74003, and 304
Pawnee, Ochelata, 74051, all in the State of Oklahoma,
United States of America

I am the actual inventors of the invention and the facts upon which
provide / the said Company is entitled to make the application are as follows:
The Applicant Company is the assignee of the said invention from the actual
inventor

4. The basic application referred to in paragraph 2 of this Declaration
was the first application made in a convention country in respect of
the invention the subject of the application.

Declared at BARTLESVILLE, OKLAHOMA this day of 19

TO:
THE COMMISSIONER OF PATENTS
COMMONWEALTH OF AUSTRALIA.

(FLS signature of Declarant-no initials)
A powdered antimony pentoxide composition comprising:
   a) from 8 to 13 weight percent of water; and
   b) from 86 to 92 weight percent of antimony pentoxide.

A process for producing a powdered antimony pentoxide composition by spray drying a sol containing 25 to 40 weight percent of antimony pentoxide, the improvement which comprises spray drying the antimony sol at an inlet temperature range of from 180°F to 210°F.
Name(s) of Applicant(s):

Phillips Petroleum Company

Address(es) of Applicant(s):

Bartlesville,
State of Oklahoma,
UNITED STATES OF AMERICA.

Address for Service is:

PHILLIPS ORMONE & FITZPATRICK
Patent and Trade Mark Attorneys
367 Collins Street
Melbourne 3000 AUSTRALIA

Complete Specification for the invention titled:

RAPIDLY DISPERSIBLE COMPOSITIONS OF ANTIMONY PENTOXIDE

Our Ref : 85860
POF Code: 1422/50647

The following statement is a full description of this invention, including the best method of performing it known to applicant(s):
RAPIDLY DISPERSIBLE COMPOSITIONS OF ANTIMONY PENTOXIDE

The present invention pertains to powdered antimony pentoxide compositions which rapidly disperse when contacted with an aqueous medium. Another aspect of the invention pertains to a process for producing a rapidly dispersible powdered antimony pentoxide composition.

As shown by U.S. Patent 4,026,819, it is well known in the art that antimony trioxide and antimony pentoxide are useful flame retardants. Although antimony pentoxide is the oxide of choice, commercially available antimony pentoxide powders suffer the disadvantage of a slow dispersion rate in water. This is a significant shortcoming because in a number of commercial applications, an aqueous antimony pentoxide sol is required.

Thus, a process that would produce a powdered antimony pentoxide that would rapidly disperse when contacted with an aqueous medium would represent a significant contribution to the art.
In accordance with the present invention, it has been discovered that when an antimony pentoxide sol is spray dried at an inlet temperature range of from 180°F to 210°F, there is produced a powdered antimony pentoxide composition that disperses within 90 seconds of when it is contacted with an aqueous medium.

The production of antimony pentoxide sols is well known to those skilled in the art. U.S. 4,026,819, issued to Langre et al, teaches a number of methods for producing these sols.

A preferred manner for producing the antimony pentoxide sols of the present invention is to admix antimony trioxide with water and hydrogen peroxide in the presence of heat. However, the present invention is suitable for use with any antimony pentoxide sol, regardless of the manner in which it is produced.

Optionally, the antimony pentoxide sols of the present invention can contain a stabilizer in the range of from 1 to 10 weight percent. Suitable stabilizers can be selected from the group consisting of alkanol amines, alpha-hydroxycarboxylic acids, polyhydroxy alcohols, or salts of alkanol amines. These stabilizers are well known to those skilled in the art and are available from numerous commercial suppliers. The presently preferred stabilizer is triethanolamine phosphate.

The preferred antimony pentoxide sols of the present invention will contain from 25 to 40 weight percent of antimony pentoxide, from 60 to 75 weight percent of water, and optionally, from 1-10 weight percent of a stabilizer based on the total weight of the antimony pentoxide sol.

The key to the practice of the present invention is to spray dry the antimony pentoxide sol at an inlet temperature range of from 180°F to 210°F, which produces a powdered antimony pentoxide composition containing from 8 to 13 weight percent water and from 86 to 92 weight percent of antimony pentoxide. If a stabilizer is used in preparing the sol, then it will be present in the powdered composition in the range of from 0.01 to 1 percent. These compositions will readily disperse when contacted with an aqueous medium.

The process of the present invention is suitable for use with any of the spray dryers that are commercially available. It is immaterial whether the drying chamber of the spray dryer is equipped with
a rotary atomizer, a pressure nozzle atomizer, or a two fluid nozzle atomizer. It is immaterial to the practice of the present invention whether the antimony sol is fed into the atomizer in a continuous or intermittent fashion. The flow rate and the pressure under which the sol is fed into the atomizer is immaterial to the practice of the present invention, provided that it is suitable for that particular spray dryer. The flow rate and the pressure under which the sol enters the drying chamber from the atomizer is also immaterial to the practice of the present invention provided that it is appropriate for that particular spray dryer.

The flow rate and the pressure under which the hot gases enter the drying chamber is also immaterial to the practice of the present invention, provided that that rate is appropriate for the chosen spray dryer. The manner in which these hot gases are generated is also not critical. They can be produced by electrical means, the combustion of fossil fuels, or any other manner conventionally used in the industry.

The following specific example is intended to illustrate the advantages of this invention, but is not intended to unduly limit this invention.

**Example I**

The purpose of this example is to demonstrate that the powdered antimony pentoxide compositions of the present invention will rapidly disperse when they are contacted with an aqueous medium.

An antimony pentoxide sol was produced having the following composition:

<table>
<thead>
<tr>
<th>Material</th>
<th>Amount (in lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antimony Trioxide</td>
<td>20.0</td>
</tr>
<tr>
<td>Hydrogen Peroxide</td>
<td>12.5</td>
</tr>
<tr>
<td>Phosphoric Acid (85 wt%)</td>
<td>1.2</td>
</tr>
<tr>
<td>Triethanol amine</td>
<td>4.5</td>
</tr>
<tr>
<td>Distilled Water</td>
<td>40.0</td>
</tr>
</tbody>
</table>

This mixture was then heated to 150°F to 180°F for 36 minutes. The triethanol amine and phosphoric acid react to form the stabilizer, triethanolamine phosphate, in situ within the reaction vessel. The
resulting sol was then spray dried at temperatures ranging from 140°F to 700°F.

The spray drier utilized had a pressure nozzle atomizer and is commercially available from Niro Atomizer Inc. of Columbia, Maryland.

The water content of the antimony compositions produced at these various temperatures was determined by the loss on ignition test.

In the loss on ignition test, 100 grams of the powdered antimony pentoxide composition was placed in a 1000°F oven for 3 hours. The material was then reweighed and the difference represents the water that was present in the composition.

The ability of the powdered antimony composition to disperse in water was determined in the following manner. Two gram samples were placed in 100 ml of tap water that had been heated to 50°C and were mechanically stirred. The time necessary for the powdered composition to dissolve and form a clear solution was determined visually. The following data was generated.

<table>
<thead>
<tr>
<th>Batch</th>
<th>Inlet Temp(°F)</th>
<th>Water Content (wt%)</th>
<th>Dispersion Time (in seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Control)</td>
<td>140°F</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>2 (Invention)</td>
<td>208</td>
<td>9.0</td>
<td>90</td>
</tr>
<tr>
<td>3 (Invention)</td>
<td>200</td>
<td>10.2 - 11.2</td>
<td>40</td>
</tr>
<tr>
<td>4 (Invention)</td>
<td>200</td>
<td>10 - 11</td>
<td>62</td>
</tr>
<tr>
<td>5 (Invention)</td>
<td>200</td>
<td>10 - 11</td>
<td>40</td>
</tr>
<tr>
<td>6 (Control)</td>
<td>480</td>
<td>2.2</td>
<td>190</td>
</tr>
<tr>
<td>7 (Control)</td>
<td>700</td>
<td>1.0</td>
<td>&gt;540</td>
</tr>
</tbody>
</table>

1 Batch #1, which was spray dried at 140°F, did not form a powdered composition. Its dispersion time was not tested.

Batches #6 and 7 were spray dried at an inlet temperature of 480 and 700°F, respectively. They took from 190 to >540 seconds to disperse. Batch #1 which was spray dried at an inlet temperature of 140°F, did not form a powdered composition. It was still a liquid when it left the nozzle of the spray dryer.
Batches #2-5 which were spray dried at an inlet temperature range of from \(180^\circ\text{F}\) to \(210^\circ\text{F}\), dispersed with a time period of from 40-90 seconds. Thus, this data demonstrates that when antimony pentoxide sols are spray dried at an inlet temperature ranging from \(180^\circ\text{F}\) to \(210^\circ\text{F}\), there is a dramatic improvement in the rate at which the resulting antimony powders redispense in water.

Reasonable variations can be made in view of the foregoing disclosure without departing from the spirit or scope of the invention.
CLAIMS
The claims defining the invention are as follows:

1. A powdered antimony pentoxide composition comprising:
   a) from 8 to 13 weight percent of water; and
   b) from 86 to 92 weight percent of antimony pentoxide.

2. A composition according to claim 1, wherein there is additionally present therein from 0.01 to 1 weight percent of a stabilizer which is an alkanol amine, salt of an alkanol amine, polyhydroxy alcohol or alpha-hydroxycarboxylic acid.

3. A composition according to claim 2, wherein said stabilizer is triethanolamine phosphate.

4. A process for producing a powdered antimony pentoxide composition by spray drying a sol containing 25 to 40 weight percent of antimony pentoxide, the improvement which comprises spray drying the antimony sol at an inlet temperature range of from 180°F to 210°F.

5. A process according to claim 4, wherein said antimony sol additionally contains from 1 to 10 weight percent of a stabilizer which is an alkanol amine, alpha-hydroxy carboxylic acid, polyhydroxy alcohol or salt of an alkanol amine.

6. A process according to claim 4 or 5, wherein said antimony sol contains about 35 weight percent of antimony pentoxide, about 8 weight percent of triethanolamine phosphate and about 57 weight percent of water.

7. A powdered antimony pentoxide composition substantially as herein described with reference to any one of the Examples.

8. A process for producing a powdered antimony pentoxide composition substantially as herein described with reference to any one of the Examples.

9. A powdered antimony pentoxide composition when prepared by a process according to any one of claims 4-6 and 8.

DATED: 29 February, 1988
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