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PROCESS OF MANUFACTURING POWDER OF LEAD SUBOXIDE INTERMINGLED WITH POWDER OF METALLIC LEAD.

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This application is a continuation in part of application Number 431,473, filed Dec. 17, 1920.

This invention relates to a process of manufacturing a very fine powder of lead suboxide intermingled with powder of metallic lead, consisting in putting pieces of metallic lead in a rotatable vessel, keeping the same at a temperature not less than 60° C., introducing into the vessel, while slowly rotating, air or any gas containing oxygen, or any other oxidizing agent, causing thus the surface of the pieces of metallic lead to oxidize lead-suboxide, and reducing the suboxide thus formed into a very fine powder by abrasion. The object of this invention is to obtain a large quantity of a very fine chemically reactive powder the principal part of which is lead suboxide, by promoting reduction of the metallic lead pieces into powder by abrasion by converting the surface of the pieces to suboxide.

This invention consists in putting in a rotatable vessel pieces of metallic lead, keeping these pieces at a temperature not less than 60° C., and while rotating the vessel sending air, or other gas containing oxygen thereinto, or sending any other oxidizing agent thereinto, thus oxidizing the surface of the pieces of lead and reducing them by abrasion into a very fine powder which is chemically very reactive.

In this invention the surface of the material, that is, metallic lead, is caused to be acted upon by the air or other oxidizing agent, and to be covered with a coating of lead-suboxide, which being brittle and lacking tenacity compared with metallic lead, can be easily and quickly reduced into powder by abrasion. And as soon as a new metallic surface of the pieces appears, it will be instantly oxidized and abraded, thus continuously producing the desired powder. Thus, the efficiency of manufacture is very great, and the product is a very fine oxidized powder of lead, which is chemically very reactive, intermingled only with a little coarse-grained powder.

The product of this invention is so fine that the apparent specific gravity is 1–3. The composition of powder is approximately from 93 to 97% lead suboxide and about 3 to 7% metallic lead. It is a porous mass of amorphous particles and although not very much different in its property from metallic lead, it is so chemically reactive that it is spontaneously converted into litharge by merely exposing it to air. If a drop of water is dropped on a pile of the same, or a lighted match is applied thereto, oxidation is started instantly, and by the reaction heat the oxidation continues until the whole is converted into litharge.

I am aware that there is known a process of manufacturing lead oxide by putting pieces of lead converted into monoxide or litharge in a rotatable drum, and excoriating the same. Another method known is to heat lead in a closed vessel to a point nearly approaching the melting point in presence of oxidizing agent and thus making lead oxide by heating. But these have nothing to do with the manufacture of lead suboxide, and it is evident that the object of these processes is quite different from that of the present invention, as lead suboxide resembles in its chemical and physical properties rather to metallic lead than to lead oxides; and I need not say that lead suboxide is quite different from other oxides of lead in brittleness, ductility &c., which are principal factors in reducing a substance into powder.

I will now give an example of putting my invention into practice.

Mount rotatably in a horizontal position an iron cylinder about 60 inches long with a diameter of about 60 inches pierced all over with holes ⅛ of an inch in diameter at a rate of four holes in one inch square, and put therein balls of metallic lead about one inch in diameter and also balls of steel or any other hard substance of about the same size. Provide the cylinder, or drum, with pipes to blow air thereinto. Now turn the cylinder at a rate of 25 times in one minute, blowing air thereinto all the while, and keeping the temperature within the cylinder at 60 to 200° C. Then the surface of lead balls will gradually be oxidized by the air, and they will be covered with a layer of lead suboxide, which is comparatively brittle and will be abraded into a fine powder. The metallic surface of the lead balls exposed by the rubbing off of the layer of lead suboxide formed thereon, will be acted upon by air and being oxidized a layer of lead suboxide will be again formed which will be abraded off again as before. Thus, by oxi-

dizing lead balls and abrading off the layer of lead suboxide thus formed, a fine powder can be very easily manufactured. The powder thus formed may be discharged from the holes on the wall of the cylinder.

In this invention, as an oxidizing agent, oxygen, hydrogen peroxide, ozone or a gas containing any of them, or anything that oxidizes the surface of metallic lead, may be utilized besides air. Any such oxidizing agent may be blown into the cylinder in a gust, or may cause the cylinder to suck it. If it is blown into, it is convenient to utilize the force of the current thus caused to blow the powder formed out of the cylinder, and then collect it.

Again, in this invention, in heating lead balls, friction heat or reaction heat caused by oxidation of lead, or both may be utilized; or heat may be introduced from an electric heater, gas heater, or any other source. The main point is to maintain the material lead in the atmosphere of air or any other oxidizing gas at a temperature of not less than 60° C. And in the case of utilizing friction or reaction heat that arises while working this invention, it is preferable to provide around the rotating cylinder heat insulating appliance to prevent the radiation thereof. Also it goes without saying that the production of heat in this case may be regulated by adjusting the weight of metallic balls, thus reducing or increasing friction surface and pressure, or by increasing or reducing the number of rotations of the cylinder.

The advantages of this invention may be enumerated as follows:—

(1) It is easy to maintain the harmony of oxidation of the surface of the material lead, and abrasion of oxidized lead; and a large amount of a fine powder of lead suboxide intermingled with powder of metallic lead, which does not practically differ in its properties from a fine powder of metallic lead, is obtained without using much powder.

(2) The rate of mixture of powder of metallic lead and that of lead suboxide, the apparent specific gravity, and condition of particles, of the product may be altered by adjusting temperature, gust of oxidizing agent, &c.

Claims:

1. A process of manufacturing a fine powder of lead suboxide intermingled with powder of metallic lead, comprising in putting pieces of metallic lead in a rotatable vessel in a dry state, introducing into the said vessel currents of an oxidizing gas to oxidize the surface of the lead while rotating the said vessel, and abrading off the oxide formed on the surface.

2. A process of manufacturing a fine powder of lead suboxide intermingled with powder of metallic lead, comprising in putting in a rotatable vessel pieces of metallic lead in a dry state, introducing into the said vessel while rotating blasts of a gas containing oxygen, such as air, causing such blast to blow the powder produced out of the vessel.

3. A process of manufacturing a fine powder of lead suboxide intermingled with powder of metallic lead comprising in putting pieces of metallic lead in a dry state into a rotatable vessel, and delivering an oxidizing gas into the vessel while revolving the same.

4. A process of manufacturing a fine powder of lead suboxide intermingled with powder of metallic lead, comprising in putting in a rotatable vessel pieces of metallic lead in a dry state, and rotating the vessel maintaining the temperature within the vessel at not less than 60° C., at the same time introducing into the vessel an oxidizing gas.

5. A process of manufacturing a fine powder of lead suboxide intermingled with powder of metallic lead, comprising in providing a rotatable vessel with a heat insulating means, putting in the vessel pieces of metallic lead in a dry state, and rotating the vessel maintaining the temperature of the lead at 60–200° C. and introducing into the vessel an oxidizing gas.

6. A process of manufacturing a fine powder of lead suboxide intermingled with powder of metallic lead, comprising in putting in a rotatable vessel pieces of metallic lead, introducing air thereinto and rotating the vessel maintaining the temperature of the material at not less than 60° C. by the heat generated by friction and chemical reaction.

7. A process of manufacturing a fine powder of lead suboxide intermingled with powder of metallic lead, comprising in putting in a rotatable vessel pieces of metallic lead and balls of steel, and rotating the vessel maintaining the temperature of the contents of the vessel at not less than 60° C., at the same time introducing air into the vessel, thus causing oxidation and abrasion to take place.

8. In the production of a finely divided mixture of lead suboxide and metallic lead, the step of tumbling together and agitating, a mass of hard heavy material containing metallic lead, while maintained at a temperature between about 60° C. and about 200° C.

9. A method of forming a finely divided powder containing a large proportion of oxidized lead which comprises impinging a current of air on lead masses in a dry state, abrading the lead masses, and controlling the temperature to obtain a finely divided powder containing a large proportion of oxidized lead.

10. A method of forming a finely divided

powder containing a large proportion of oxidized lead which comprises impinging a current of air on lead masses in a dry state, and controlling the temperature to maintain the temperature above 60 degrees C. to obtain a finely divided powder, containing a large proportion of oxidized lead.

11. A method of forming a finely divided powder containing a large proportion of oxidized lead which comprises impinging a current of air on lead masses in a dry state, abrading the lead masses, and controlling the current of air to obtain a finely divided powder, containing a large proportion of oxidized lead.

12. A method of forming a finely divided powder containing a large proportion of oxidized lead comprising impinging a current of air on lead masses in a dry state, abrading the lead masses, and controlling the temperature and current of air to obtain a finely divided powder containing a large proportion of oxidized lead.

13. A method of forming a finely divided powder containing a large proportion of oxidized lead which comprises impinging a current of air on lead masses in a dry state, and controlling the current of air and the temperature to maintain the temperature above 60 degrees C. to obtain a finely divided powder containing a large proportion of oxidized lead.

14. Comminuted lead-lead suboxide mixture with apparent specific gravity 1 to 3.

15. As a new composition of matter, a highly chemically reactive finely divided powder comprising a major portion of lead suboxide, said powder being capable of spontaneous oxidation.

16. As a new composition of matter, a highly chemically reactive powder, comprising a large portion of lead suboxide, said powder being capable of spontaneous reaction on contact with moisture.

17. As a new composition of matter, a highly chemically reactive powder, comprising a large portion of lead suboxide, said powder being capable of spontaneous reaction on contact with air.

In testimony whereof I have affixed my signature.

GENZO SHIMADZU.