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## PROCESS FOR GRANULATING METALS

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The chief object of this invention is to provide a practical process to granulate metals, and in particular the easily oxidizable metals such as sodium, potassium, lithium, etc. and their alloys, without excessive oxidization. A secondary object is to produce the metallic granules in such a way that they tend to assume the spherical form.

I will now describe a method to granulate metallic sodium.

I melt the sodium metal in an iron kettle under a suitable hydrocarbon oil such as pure paraffine base, S. A. E. 50, lubricating oil and then raise the temperature to and maintain at about 125 degrees C. In a second kettle I have pure paraffine base, S. A. E. 50, lubricating oil maintained at a temperature of about 125 degrees C. I have a third kettle preheated to about 125 degrees C. into which I pour about ten pounds of molten sodium from the first kettle and about 5 pounds of oil from the second kettle and then stir, beat or mix the mixture of oil and molten sodium until the molten sodium assumes the form of globules of the desired fineness. The longer and more vigorous the beating or mixing, the finer the sodium globules become. When globules of the desired fineness is obtained, the hot mixture of molten globular sodium and oil is run into a barrel containing cold dry kerosene or other suitable hydrocarbon or liquid. The quantity and temperature of the kerosene should be such that after the hot sodium oil mixture is added to it, the combined temperature of the sodium-oil-kerosene mixture should not rise to over 60 degrees C. I have used ten gallons of kerosene at a temperature of 25 degrees C. to cool 10 pounds of sodium globules. If the kerosene bath is allowed to get too hot there is a tendency for the sodium globules to weld together to form an oolitic mass.

The function of the oil or grease is to cover the molten sodium globules and hence to keep the globules from coalescing. The quantity of oil or grease to use per pound of sodium will vary with the fineness of sodium globules desired. For example, suppose we desire 1/8 to 1/4 inch diameter shot, then 2 pounds of oil to 10 pounds of sodium is sufficient. Should we desire sodium globules of 1/100 inch in diameter, then we should use 7 to 10 pounds of oil to 10 pounds of sodium.

I have discovered that the molten sodium sometimes has a tendency to form irregular shaped granules and resists becoming globular. When this happens the difficulty can be overcome by melting the sodium under oil and pouring into cold kerosene or other suitable hydrocarbon and then remelting it under oil and beating or mixing it with oil as described above. In this manner I have made up to 1/4 inch diameter shot and down to 1/100 inch diameter globules. With a suitable power beater or mixer there is no reason wny 1/1000 inch diameter globules cannot be produced.

I have described how to produce sodium globules or shot. It is apparent that other metals such as potassium, lithium, tin, bismuth, lead, zinc, cadmium, aluminum, various alloys, etc. can be granulated by this process. To granulate any of these metals or alloys, the metal is melted and then heated about 25 deg. C. above its melting point and then beaten or mixed with a suitable oil, grease or other substance liquid at the melting point of the metal used, and then pouring the mixture into a suitable cooling liquid.

Any type of stirrer, beater or mixer can be used. I find the coiled wire type of household beater suitable for small scale operation. To make fine uniform globules in quantity it is desirable to use a suitably designed mixer or beater.

Having described my invention, I now claim:

1. The process for granulating the alkali metals which consists of melting the metal under a suitably non-reactive liquid having a boiling point above the melting point of said metal and then mixing or beating the mixture until the molten metal is granulated to the desired fineness and then pouring the beaten mixture into a suitably non-reactive cooling liquid maintained at a temperature below the melting point of the metal to solidify the metallic granules.

2. The process for granulating an alloy of alkali metals which consists of melting the alloy under a suitably non-reactive liquid having a boiling point above the melting point of said alloy and then mixing or beating the mixture until the molten alloy is granulated to the required fineness and then pouring the beaten mixture into a suitably non-reactive cooling liquid maintained at a temperature below the melting point of the alloy to solidify the metallic granules.

3. The process for granulating an alkali metal alloy having a melting point below 360 degrees C. which consists of melting the alloy under a suitably non-reactive liquid having a boiling point above the melting point of said alloy and then mixing or beating the mixture until the molten alloy is granulated to the desired fineness and then pouring the beaten mixture into a suitably non-reactive cooling liquid maintained at

a temperature below the melting point of said alloy to solidify the metallic granules.

4. The process for granulating metallic sodium which consists of melting the metal under a suitably non-reactive liquid having a boiling point above the melting point of sodium and then mixing or beating the mixture until the molten sodium is granulated to the desired fineness and then pouring the beaten mixture into a suitably non-reactive cooling liquid maintained at a temperature below the melting point of sodium to solidify the metallic granules.

5. The process for granulating metallic sodium which consists of melting the sodium under a hydrocarbon oil having a boiling point above the melting point of sodium and then mixing or beating the mixture until the molten sodium is granulated to the desired fineness and then pouring the beaten mixture into a suitable hydrocarbon cooling liquid maintained at a temperature below the melting point of sodium to solidify the metallic granules.

6. The process for granulating an alloy of sodium and potassium which consists of melting the alloy under a hydrocarbon having a boiling point above the melting point of the alloy and then mixing or beating the mixture until the alloy is granulated to the required fineness and then pouring the beaten mixture into a cooling hydrocarbon maintained at a temperature below the melting point of the alloy to solidify the metallic granules.

7. The process for granulating an alloy containing 1 to 10% potassium and 90 to 99% sodium which consists of melting the alloy under a hydrocarbon liquid having a boiling point above the melting point of the alloy and then mixing or beating the mixture until the alloy is granulated to the desired fineness and then pouring the beaten mixture into a hydrocarbon cooling liquid maintained at a temperature below the melting point of the alloy to solidify the metallic granules.

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