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METHOD OF FIBERIZING MAGNESIUM

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The invention relates to fiberized magnesium and magnesium-base alloys. It more particularly concerns a method of fiberizing magnesium and its alloys.

Insofar as we are aware, no method is commercially available by which magnesium and the magnesium-base alloys may be fiberized. Accordingly, the principal object of the invention is to provide a fiberized form of magnesium and its alloys. Another object is to provide a method of making a fiberized form of these metals.

The invention is based upon the discovery that by mixing together pellets of the metal to be fiberized with one of the blue colored solid substances, indigo blue, indanthrene blue (a vat dye having the formula $C_{28}H_{14}N_2O_4$), and die-expressing the mixture from a container through a die opening having a cross-sectional area which is about 1 to 10 per cent of that of the container, the metal exudes from the die as a bundle of thin metal strands encased in a thin sheath of metal. The strands are easily separable from each other and the sheath as individual metal fibers generally about 0.001 to 0.003 inch thick which exhibit a high tensile strength making them useful as fibrous fillers, as for example for rubber reinforcement and the like. In addition, the small diameter of the individual fibers gives them a large ratio of surface area to weight. This feature renders the fiberized metal especially useful in flashlight work, for example, where the ability of this material to oxidize rapidly may be advantageously utilized.

In carrying out the invention, magnesium or any of the magnesium-base alloys may be used in which the magnesium content exceeds about 75 per cent that are capable of being die-expressed as in extrusion. The metal is comminuted or pelleted in any convenient manner as by melting the metal and dropping the molten metal through a shot tower, by atomizing, or by machining. Particle size does not appear to be sharply critical. A convenient size is about 28 mesh. It is preferable to use a mixture of the metal particles of various sizes rather than a single mesh size.

The blue colored solid, with which the metal particles are mixed prior to die-expressing the mixture, is preferably comminuted to about the same mesh or sieve analysis as that of the metal particles. The amount to use is between about 1 to 20 per cent by weight of the mixture, 5 per cent being generally preferred.

The die-expression operation of the mixture is carried out at the elevated temperatures at which magnesium and its alloys are capable of plastic

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deformation such as from about 525° to 850° F., the lower temperatures of the die-expressing temperature range are in general preferable as these avoid the danger, present at the higher temperatures of the range, of the fibers becoming welded together during the extrusion and thus losing their individuality. In addition, hot shortness may occur. Many of the magnesium-base alloys are satisfactorily extruded at about 500° to 625° F. The temperature to use in the die-expressing step is limited on the lower end of the temperature range by the ability to supply the pressure required for die-expressing the metal, and on the upper end of the temperature range by the tendency for the fibrous nature of the extrusion product to be lost by the welding effect of the higher die-expressing temperatures. Thus the upper limit of temperature is generally somewhat lower (e. g. 25 to 100 Fahrenheit degrees) than that which would be satisfactory for a conventional extrusion of the same alloy alone. These temperatures are usually between about 525° and 850° F., although temperatures between about 500° and 600° F. are preferable.

Example 1

Commercial electrolytic magnesium in the form of atomized powder of approximately 28 mesh was mixed with 5 per cent by weight of indigo blue and the mixture charged into a one-half inch diameter cylindrical container of an extrusion press having a die opening 0.07 inch in diameter. The container was heated to 700° F. and the die to 600° F. Upon applying a ram pressure of 90,000 pounds per square inch to the charge in the container extrusion commenced and was continued until the charge was extruded. The extrusion obtained was a bundle of fibers of magnesium, 0.001 to 0.003 inch in diameter about 2 to 3 inches long on the average, encased in a thin cylindrical sheath about 0.01 inch thick. The individual fibers were easily separated by hand.

Example 2

In a similar test to that of Example 1 except that the charge contained 5 per cent by weight of indanthrene blue ($C_{24}H_{14}N_2O_4$) instead of indigo blue, the extrusion product was substantially similar in all respects to that of Example 4.

We claim:

1. The method of producing a bundle of easily separable fibers of magnesium and alloys thereof which comprises mixing together in comminuted form the metal and an organic blue solid selected from the group consisting of indanthrene blue,

and indigo blue, and die expressing the mixture at a temperature between about 500° and 800° F.

2. The method of producing a bundle of easily separable fibers of magnesium and alloys thereof according to claim 1 in which the die expressing is carried out at a temperature between 600° and 700° F.

3. The method of producing a bundle of easily separable fibers of magnesium and alloys thereof which comprises mixing together in comminuted form the metal and indanthrene blue and die expressing the mixture at a temperature between 600° and 700° F.

4. The method of producing a bundle of easily separable fibers of magnesium and alloys thereof which comprises mixing together in comminuted form the metal and indigo blue and die expressing the mixture at a temperature between 600° and 700° F.

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