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NON-SPHERICAL CUPREOUS POWDER

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1 Claim. (Cl. 75—.5)

This invention relates to metallic copper powder and, more particularly, to a non-spherical copper powder which is particularly suitable for powder metallurgical usage and to the method of making this non-spherical powder.

When metallic copper is atomized by presently known procedures, the resulting particles of copper powder are characteristically spherical in shape. Although a spherical powder can be packed more densely than a non-spherical powder, a spherical powder cannot be effectively formed into a compact.

We have now found that the characteristic shape of atomized copper particles can be altered by incorporating between 2.5% and 49% by weight of cobalt in the copper prior to its atomization. The resulting cupreous metal, when atomized with air, has a particle shape which is distinctly non-spherical. Thus, the method of the present invention comprises forming a molten copper-base alloy composed essentially of copper and from 2.5 to 49% cobalt, and thereafter atomizing the resulting molten copper-cobalt alloy with air. The resulting product is a powder of non-spherical cupreous particles consisting essentially of a copper-base alloy containing from 2.5 to 49% by weight of cobalt and the balance copper.

The amount of cobalt which is useful in practicing the invention is prescribed by the fact that amounts less than 2.5% by weight of the copper are not effective in changing the characteristic spherical shape of the copper particles, whereas the upper limit of 49% cobalt corresponds to an amount which raises the melting (and hence the sintering) temperature of the alloy to the maximum value compatible with practical operating procedure. Within this range, amounts of cobalt between 2.5% and about 4.5% by weight of the copper produce the desired irregularly shaped particles of the cupreous alloy having a desirably low sintering temperature.

The method of preparing the alloy and of producing the non-spherical particles of this alloy is illustrated by the following procedure which was used to produce powders of copper-cobalt alloys within and without the effective range set forth hereinbefore. In each instance, metallic copper was melted in a clay-graphite crucible and was heated to a temperature well above its melting point while maintaining a protective powdered charcoal cover over the molten metal. The cobalt was added to the molten copper and the melt was stirred wtih a green stick in the manner of the poling process of the copper refining industry. After the resulting melt had been held in the crusible for about 10 minutes to insure homogeneity, it

was atomized in conventional apparatus at a metal flow rate of 3 to 5 pounds per minute and with the use of compressed air at 100 to 120 p.s.i. pressure For each composition, tests were made to determine the particle shape of the powder, its apparent density and the weight loss of a compact made under a compacting pressure of 30 t.s.i. and tested according to the Metal Powder Industries Federation MPI Standard 15 for Determination of Green Strength of Compacted Metal Powder Specimens (a procedure in which the green compact is tumbled in a screen cage). The resulting test data are summarized in the following table:

	Composition, percent			
	Cu+1.6 Co	Cu+2.5 Co	Cu+4.6 Co	Cu+7.0 Co
Atomization Temp., ° C.	1,200	1,200	1,200	1,270.
Particle Shape	Spherical	Irregular	Irregular	Irregular.
Apparent Density, g./cc.	5.40	3.58	3.32	3.21.
Weight Loss, percent.	(Could not be compacted).	0.68	0.70	1.41.

It will be readily seen from the foregoing data that air atomization of copper containing less than about 2.5% cobalt produces spherical particles that, because of this shape, cannot be compacted and that copper containing at least 2.5% cobalt produces, by air atomization, particles which are so irregular in shape that they form strong green compacts.

We claim:

A copper-cobalt alloy powder having a composition consisting essentially of from about 2.5 to about 4.5 percent by weight of cobalt and the remainder essentially copper, the powder having been produced by forming a molten copper-cobalt alloy of said composition and thereafter atomizing the molten copper-cobalt alloy with air.

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