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DEOXIDIZER ALLOY FOR MOLTEN METAL BATHS CONSISTING PREDOMINATELY OF COPPER

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This invention relates to copper and to copper base alloys and has for its object the provision of an effective degasifying agent therefor.

Another object is to provide a degasifying agent for molten alloys consisting predominately of copper which degasifying agent consists of an alloy containing one of the strong degasifying elements of the group consisting of barium and strontium.

Still another object is to provide means for effectively introducing barium and strontium in molten copper and copper base alloys.

Other objects will be apparent as the invention is more fully hereinafter disclosed.

In accordance with these objects I have discovered that the strong degasifier elements barium and strontium may be effectively introduced in the desired low amounts for degasifying purposes into molten copper and copper base alloys by alloying the said elements with zinc dissolved in molten copper, forming thereby a master alloy, consisting of Ba or Sr, Zn and Cu small amounts of which when added to molten copper or to molten copper base alloys readily dissolve therein and disperse therethrough for effective reaction of the contained barium or strontium with the oxygen and other gases present in the molten metal bath.

Heretofore in the art, both barium and strontium have been recognized as strong degasifying elements of general utility in the degasification of molten metal baths. The major problem in the use of these elements in most metal baths, due to their relatively low melting and boiling points, is to so introduce them into the bath in economically practical amounts which are effective to accomplish the desired degasification result in the molten metal bath. In the use of these two degasifier metals in molten copper and copper base alloys the problem is further complicated by the low solubility of these two metals in the molten copper which effectively limits the degasifying activity of these degasifying metals in the bath and requires the use of economically impractical amounts of the degasifier metals in excess of that theoretically required for degasifying purposes to accomplish the desired degasifying result in the molten metal bath.

I have discovered that zinc is a strong solubilizing agent for barium and strontium in molten copper and copper base alloys and that a molten copper-zinc alloy containing from 20% to 40% zinc will dissolve and hold in alloy solution, on cooling to atmospheric temperatures, up to about 10% of one of the metals barium and strontium.

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I have further discovered that such a barium or strontium-zinc-copper alloy readily melts and disperses itself in molten copper and copper base alloys wherein the barium or strontium content of the barium or strontium-zinc-copper alloy is effective as a degasifying agent towards gases dissolved in the molten metal bath.

This discovery and the use of this barium or strontium-zinc-copper alloy as a degasifying agent in molten copper and copper base alloys enables me to degasify said molten copper and copper base alloys by the use of approximately the theoretical amount of the barium or strontium required instead of a relatively large excess of barium or strontium as heretofore required in the art.

Normally, for example, in the degasifying of molten copper, the molten metal is protected by a surface cover of carbon which prevents atmospheric oxygen from being absorbed by the molten metal bath. The removal of the last remaining traces of oxygen from the molten metal and of other contained gases is then obtained by the use of degasifier agents. Generally the use of metallic degasifying agents to remove these last traces of oxygen and other gases from the molten copper, is undesirable for the primary reason that the excess of the metallic degasifier remains in the copper as an alloyed constituent to detrimentally effect the electrical conductivity and other properties of the copper. Barium and strontium are alone and outstanding among all available degasifier metals in that these metals have such a low solubility in copper that no substantial excess of these metals can remain in the molten copper. These metals, however, are so expensive that the use of these metals as degasifier elements in copper and copper base alloys is economically impractical except by the practice of the present invention. (See Metals and Alloys, p. 714, vol. 1, No. 15, The Deoxidation of Copper by Schumacher, et al.)

In accordance with the present invention I employ as a degasifier agent for molten copper and copper base alloys, a Ba or Sr-Zn-Cu alloy containing from about 20–40% Zn, up to about 10% Ba or Sr, balance Cu. These alloys, generally, and particularly those containing close to 10% Ba or Sr, are brittle and are readily crushed or otherwise broken up into small sized particles or pieces for addition to the molten metal bath. These alloys, moreover, are highly stable in air, the Ba or Sr content thereof being protected by the Zn from reaction with atmospheric oxygen and moisture.

In the forming of this alloy the zinc is first dissolved in molten copper and the barium or strontium is dissolved in the resultant copper-zinc alloy. Preferably, I use about 30% Zn and 10% Ba or Sr in the forming of this alloy although Zn as low as 20% and as high as 40% may be employed.

In such an alloy the Ba or Sr content is the major degasifying agent and the Zn is the minor degasifying agent, becoming active only after the Ba or Sr is substantially completely exhausted. The addition of this alloy as a degasifying agent to a molten copper bath in an amount theoretically providing sufficient Ba or Sr to substantially completely remove the last traces of oxygen and other gases present in the bath will leave a zinc residue in the bath. In general, zinc in an amount up to 0.4% has been found to have but a slight effect upon the mechanical properties of substantially pure copper. It has also been found that with up to 0.30% zinc, each 0.05% of zinc reduces the electrical conductivity of the copper approximately 0.8%.

Inasmuch as it generally requires less than .50% Ba or Sr to thoroughly degasify the tough pitch grade of copper, it is believed apparent that by the use of a Ba or Sr-Zn-Cu alloy of the present invention which contains about 10% Ba or Sr, 30% Zn, balance Cu, the amount of the Zn so introduced will not materially interfere with the physical and electrical properties of the resultant degasified copper.

As a practical matter, however, in the use and adaptation of this degasifier alloy in molten copper and copper base alloys, I have found it generally effective to employ an amount of the degasifier alloy which contains about ⅔ the theoretical amount of Ba or Sr for complete oxidation,

the Zn content of the degasifier alloy being relied on to remove the balance of oxygen and other gases in the copper or copper base alloy. In this manner the excess zinc content of the degasified alloy is held to a low fractional percentage, preferably not in excess of about 0.30%.

Various modifications and departures from the invention will occur to those skilled in the art and all such are contemplated as may fall within the scope of the following claims.

What I claim is:

1. An alloy for degasifying molten metal baths, said alloy consisting of from small amounts up to 10% one of the metals selected from the group consisting of Ba and Sr, 20% to 40% Zn, balance Cu.

2. An alloy for degasifying molten metal baths, said alloy consisting of 20% to 40% Zn, 10% Ba, balance Cu.

3. An alloy for degasifying molten metal baths, said alloy consisting of 20% to 40% Zn, 10% Sr, balance Cu.

4. An alloy for degasifying molten metal baths, said alloy consisting of 30% Zn, 10% one of the metals of the group consisting of Ba and Sr, balance Cu.

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REFERENCES CITED

The following references are of record in the file of this patent:

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