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[54] **COATED CEMENTED CARBIDES FOR BRAZING**

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[58] **Field of Search** ..... 29/195 A, 182.1, 182.7, 29/182.8, 191.2

[56] **References Cited**

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[57] **ABSTRACT**

A coated cemented carbide and method for making same are disclosed, wherein the binder metal and coating metal are the same and is one of iron, cobalt or nickel, and wherein the coated cemented carbide shows improved wettability to facilitate brazing. Coating by vapor deposition and sulfamate bath electroplating are disclosed as being preferred methods. Cemented carbide discs treated according to this method are suitable for brazing for use in automotive valve lifter assemblies.

12 Claims, No Drawings

COATED CEMENTED CARBIDES FOR BRAZING

This invention relates to coating the surface of a cemented carbide to improve wettability so as to facilitate brazing.

Refractory carbide hard metals or cemented carbides are sintered products consisting primarily of carbides of tungsten, titanium and/or other refractory carbides cemented together by liquid phase sintering using a matrix metal, such as cobalt, nickel or iron as the binder. These cemented carbides exhibit desirable properties as they are both hard metals further strengthened by the presence of the binder metal.

It is desirous to join cemented carbide parts to other metal parts such as ferrous metals, by brazing. It is well known that difficulties may be experienced by brazing, because owing to the composition of the cemented carbide the surfaces are not easily wetted in the brazing process.

Heretofore it was known to provide a wettable layer of a metal, metal alloy or metal salt on a cemented carbide to facilitate brazing. Various metals, alloys and salts have been employed with varying degrees of improved wettability. One conventional method is the salt bath treatment for coating carbide part to facilitate brazing. Attempts to nickel plate a cemented carbide having a cobalt binding did not achieve the desired level of wettability.

It is therefore an object of this invention to provide a coated cemented carbide with improved wettability to facilitate brazing.

It is further an object of this invention to provide a method of coating a cemented carbide to improve wettability so as to facilitate brazing.

It is further an object of this invention to provide a method as aforesaid wherein the need for cleaning the cemented carbide prior to coating is minimized.

It is still a further object of this invention to provide a high purity metal coating on a cemented carbide wherein the binder metal is the same as the coating metal.

It is a further object of this invention to provide a method for treating thin cemented carbides discs to facilitate brazing to a metal part.

It is still a further object of this invention to provide a coated cemented carbide as aforesaid which is inexpensively produced and is yet practical in use for brazing to other materials.

Now, therefore there is disclosed herein a coated cemented carbide for improved wetting to facilitate brazing wherein it is recognized that the binder metal of the cemented carbide be the same metal as the layer of metal deposited on the surface. It has also been found that whereas the prior art wettable layers were alloys or salts of certain metals, the present invention finds that a high purity metal coat provides good wettability. It has been further found that specific coating methods, particularly, vapor deposition by the electron beam technique and most preferrably, electrodeposition from a metal sulfamate bath, provide the desired high purity coated cemented carbides exhibiting improved wettability properties.

It has also been found that whereas certain prior art brazing techniques required extensive cleaning of the cemented carbide parts, by particularly abrasive methods, such as sand blasting, tumbling or the like, the presently described coating methods, particularly that

of sulfamate bath electrodeposition eliminates the need for abrasive cleaning to achieve successful brazing. Furthermore the abrasive cleaning often precluded such treatment for thin cemented carbide discs.

The cemented tungsten carbide discs employed in the tests were approximately 1½ inches in diameter and 1/16 inch in thickness.

The composition in percent by weight of the constituents of the test discs is as follows:

tungsten carbide	91.0
cobalt binder	9.0

EXAMPLE I

Fifty (50) cemented carbide test discs were coated with cobalt by painting the disc with a mixture of fine cobalt power, powdered Lucite and flux in a toluene solvent. The aforesaid painted pieces were heat treated in a hydrogen atmosphere furnace at 1150° C. The first test set is designated as A.

The second set of fifty (50) cemented carbide test discs were treated by the salt bath treatment. The salt bath treatment employed is generally that as disclosed in U.S. Pat. No. 2,979,811 granted Apr. 18, 1961. The second set is designated at B.

A third set of fifty (50) cemented carbide discs were electroplated in a cobalt sulfamate bath to deposit a coating of cobalt on the discs, as will be described more fully hereinafter. This third set is designated as C.

A fourth set of fifty (50) cemented carbide test discs were coated with a layer of cobalt metal by vapor deposition employing an electron beam coating technique. This fourth set is designated as D.

After heat treatment a small piece of copper was placed on top of the pieces, for each of the sets, and the pieces were then put through a hydrogen furnace at 1150°C; the melting point of the copper being 1083°C.

The results of the wettability for each of the lots is as follows:

Test set	Co Coating	Wetting Characteristics
A	solvent deposited	good
B	none deposited	poor
C	electrodeposited	excellent
D	vapor deposited	very good

EXAMPLE II

A set of titanium carbide discs having a nickel binder metal was coated with a layer of nickel metal employing the sulfamate bath electrodeposition technique. The coated cemented carbides wetted successfully.

In the sulfamate electroplating method, it has been found that similar operating conditions may be employed for nickel and cobalt because of the similarity in electrochemical characteristics of these metals.

Prior to electroplating, the discs are first cleaned to remove soil or oily film so as to ensure adequate adhesion of the cobalt metal. Electrocleaning employing an alkaline cleaner is the preferred method. Abrasive cleaning is unecessary. After cleaning, the discs are then rinsed in an air agitated rinse tank using deionized water. After rinsing, a dilute acid dip is em-

ployed to neutralize any alkaline residue on the surface of the discs.

The discs are then placed in a cobalt sulfamate or nickel sulfamate bath, depending of course on the binder metal, having a concentration of 225 grams metal per liter; a pH of about 4.0; at 25°C. A suitable current density is about 40 amps/sq. ft. The cobalt sulfamate bath is air agitated.

At 40 amps/sq. ft., a metal coat of about 0.00025 inch will deposit out in about 8 minutes. Discs are plated to layers of about 0.0002 inch to about 0.0004 inch. Other parts, such as cutting tips have been similarly plated to thickness of from about 0.1 mil to about 0.6 mil.

After plating all coated parts, they are finally rinsed using de-ionized water.

In cemented tungsten carbides it has been found that binder metal may be present in a range of from about 1 to about 30 per cent by weight, and for cemented titanium carbides the range of binder metal is from about 5 to about 40 percent by weight.

It is within the contemplation of this invention that the binder metal and coating metal be one selected from Group VIII of the Periodic Table, and includes by way of example the metals Fe, Co, Ni, Pt, Ru, Rh, Pd and the like. The preferred Group VIII metals is the group of Fe, Co and Ni.

It is also within the contemplation of this invention that in cases wherein the binder comprises mixed metals, such as Ni-Cu; Co-Mo-Cu; Fe-Ni-Cu, and the like, the coating is to consist essentially of the Group VIII metal in the binder, and wherein there are two or more Group VIII metals in the binder the coating is that Group VIII metal that is present in the predominant weight percent.

It is to be understood that various changes may be made in that which has been described, without departing from the spirit of the invention or the scope of the appended claims.

What is claimed is:

1. A coated cemented carbide comprising, a cemented carbide comprising a binder metal selected from Group VIII metals, and a deposited wettable layer coating on said cemented carbide, said coating consisting of the same metal as the binder metal, whereby said coated cemented carbide facilitates brazing.

2. The coated cemented carbide of claim **1,** wherein the binder metal is one selected from the group consisting of iron, cobalt and nickel.

3. The coated cemented carbide of claim **2,** wherein the cemented carbide comprises a tungsten carbide and wherein the binder and coating are cobalt.

4. The coated cemented carbide of claim **2,** wherein the cemented carbide comprises titanium carbide and wherein the binder and coating are cobalt.

5. The coated cemented carbide of claim **2,** wherein the cemented carbide comprises titanium carbide and wherein the binder and coating are nickel.

6. The coated cemented carbide of claim **2,** wherein the cemented carbide comprises tungsten carbide and wherein the binder and coating are nickel.

7. A coated cemented carbide comprising a cemented carbide comprising a binder of more than one metal and wherein at least one of the metals is selected from Group VIII metals, and a deposited wettable layer coating on said cemented carbide, said coating consisting of the same Group VIII metal that is present in the predominant weight percent of the Group VIII metals in the binder, whereby said coated cemented carbide facilitates brazing.

8. The coated cemented carbide of claim **7,** wherein at least one binder metal is one selected from the group consisting of iron, cobalt and nickel.

9. The coated cemented carbide of claim **1,** wherein the wettable layer coating is from about 0.0002 inch to about 0.0004 inch in thickness.

10. The coated cemented carbide of claim **7,** wherein the wettable layer coating is from about 0.0002 inch to about 0.0004 inch in thickness.

11. The coated cemented carbide of claim **1,** wherein said coated carbide is a cutting tip and wherein the thickness of the wettable layer coating is from about 0.1 mil to about 0.6 mil.

12. The coated cemented carbide of claim **7,** wherein said coated carbide is a cutting tip and wherein the thickness of the wettable layer coating is from about 0.1 mil to about 0.6 mil.

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