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HIGH TEMPERATURE DENTAL GOLD ALLOY

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U.S. Cl. 75—165 7 Claims

ABSTRACT OF THE DISCLOSURE

The present invention provides high temperature dental gold alloys having melting points above 2000° F. and adapted to have fused thereto low fusing porcelains having fusing temperatures of about 1800° F. The alloys consist of gold, gallium and palladium, and one or more additional elements selected from the group consisting of nickel, silver, platinum and iridium. During casting the gallium forms an oxide on the surface of the alloy which promotes bonding of the fused porcelain thereto without discoloring the porcelain.

The present invention relates to high temperature gold alloys, and especially to high temperature dental gold alloys.

Heretofore it has not been possible to fuse porcelain directly to dental gold for the reason, among others, that currently available dental gold alloys melt at about 1900° F. and low fusing porcelains fuse at a temperature of approximately 1800° F., which is too close to the melting point of currently available dental gold alloys to assure stability at high temperatures and to avoid deformation of shape of the underlying dental alloy structure when the porcelain is applied by direct fusing.

It is an object of the present invention to provide a high temperature dental gold alloy which will melt at a temperature in excess of 2400° F. and which when cast will be stable during the application of low fusing porcelain at about 1800° F.

According to the present invention I have found that I can produce a high temperature dental gold alloy which melts at approximately 2450° F. and which consists of:

	Percent by wt.
Gallium	4
Nickel	6
Palladium	35
Gold	55

I have found that I can produce a similar high temperature dental gold alloy which consists of:

	Percent by wt.
Silver	1
Gallium	4
Palladium	35
Gold	60

I have also found that I can modify this formula by adding 5% gold and 5% palladium, making a composition of 110% by weight for the alloy which will have equally high temperature characteristics.

Generally speaking, the preferred alloy of the present invention will contain from 2% to 6% gallium, 2% to 12% nickel, and the balance palladium-gold in the approximate ratios of 35% palladium and 55% gold. Such an alloy will have stability, when cast, and will not deform at temperatures of 2000° F. or higher and will retain its definite shape when low fusing porcelain at a fusing temperature of 1800° F. is directly applied to such dental gold alloy.

It has been found that such dental gold alloy has an exceptionally high Brinell hardness of as much as 332 under rolled conditions and lends itself particularly for

use in partial castings and partial dentures wherein rigidity in the casting is especially desirable.

It has also been found that the high temperature gold alloys of the present invention have extremely high tensile strength and minimal percent elongation. Both of these characteristics render these alloys especially desirable for partial dental restorations including partials which will accept porcelain application for restoring missing teeth, or for concealing the underlying metal.

The high temperature melting gold alloys of the present invention have a white gold color, are extremely hard to the point that they cannot be stamped, and have a tensile strength far in excess of the strengths which characterize dental gold alloys currently available. And furthermore, as before mentioned, they have sufficient rigidity and stability when cast to withstand the fusing temperatures of low fusing porcelains which can be directly applied to the same.

As a further modification of the present invention, I have found that I can also provide a high temperature gold alloy which will withstand a temperature of 2000° F. without distortion, which will have the desired tensile strength and Brinell hardness, and wherein I introduce as an additional element iridium in approximately equal percentage to gallium. In the preferred formula for the present invention the iridium is substituted in part for nickel.

I have also found that an alloy consisting, by weight, of approximately 88% gold, 8% palladium, 3% platinum, from about 0.25% to 2.00% gallium, and iridium in the same proportion as gallium, possesses the desired characteristics for accomplishing the purpose of the present invention. The iridium in combination with the gold imparts to the alloy the desired physical properties of tensile strength and Brinell hardness, and also raises the melting point of the gold alloy so as to withstand a temperature of 2000° F.

In order to incorporate iridium into the gold alloy it is necessary to have a sufficient percentage of palladium and platinum present to make the alloy homogeneous, for the reason that platinum and palladium are compatible with iridium, whereas gold is not. Accordingly, it is not possible to form an alloy merely by mixing and heating together gold, iridium and gallium. An alloy of said elements will not result for the reason that as soon as that combination is in the liquid state the elements tend to separate. However, if gold is incorporated with palladium or platinum, or a combination of both, the resulting alloy will accept the iridium and gallium to form the desired alloy. To form the alloy the iridium, gallium, platinum and palladium are combined and heated until they are completely in solution. This may require a temperature of 2600° F. to 2800° F. When the elements are completely in solution they may be allowed to solidify, after which the desired ratio of gold is added and the mixture is again brought up to its melting point. The four elements, iridium, gallium, platinum and palladium, will initially float on the surface of the gold. Upon continued heating all of the elements become liquid and go into solution with one another. When the solution becomes clear and no floating particles are visible it is known that the elements are in solution and form the desired alloy, which may then be allowed to solidify.

I have also found as an extremely important additional advantage of the present invention that the high temperature alloys herein disclosed—all of which contain gallium—provide a thin film of oxide on their surface which is ideal for promoting the fusion of porcelain to such alloys without imparting an undesirable color to the porcelain.

While the present invention has been described in its preferred forms, it will be understood that various

changes may be made therein without departing from the spirit of the invention or from the scope of the appended claims.

What I claim is:

1. A high temperature dental gold alloy consisting by weight of approximately 55% gold, 35% palladium, 2% to 6% gallium, and another element selected from the group comprising nickel, silver and iridium.

2. A high temperature dental gold alloy according to claim 1, wherein the other element is from 2% to 12%.

3. A high temperature dental gold alloy according to claim 1, wherein by weight the alloy consists of approximately 4% gallium, 6% nickel, 35% palladium and 55% gold.

4. A high temperature dental gold alloy according to claim 1, wherein by weight the alloy consists of approximately 1% silver, 4% gallium, 35% palladium and 60% gold.

5. A high temperature dental gold alloy according to claim 4, to which has been added approximately 5% more gold and 5% more palladium.

6. A high temperature dental gold alloy according to claim 2, wherein iridium in the approximate amount by weight of gallium is substituted in part for nickel.

7. A high temperature dental gold alloy consisting by weight of approximately 83% to 89% gold, 0.25% to 2.00% gallium, and 16.75% to 9% platinum group metals selected from the group comprising palladium, platinum and iridium.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,574,611 Dated April 13, 1971

Inventor(s) EMIL M. PROSEN

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

SPECIFICATION:

Column 1, line 63, "palladium-gold" should read

--- palladium - gold ---

CLAIMS:

Claim 2, line 10, after "is" insert --- nickel -

Signed and sealed this 3rd day of August 1971.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
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Commissioner of Patents