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PORCELAIN BONDING DENTAL GOLD ALLOY

Leo Hirschhorn, 4 Hartley Road,
Great Neck, N.Y. 11023

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ABSTRACT OF THE DISCLOSURE

A dental gold alloy used for bonding to dental porcelains for capping teeth and similar purposes consisting essentially of approximately by weight of 67.7% gold, 11.6% platinum, 16.7% palladium, 1.3% ruthenium, 2% silver, .6% tin and .1% copper. The alloy is characterized in having a melting point of approximately 2400 degrees F. and having a coefficient of expansion closely approximating most commercially available dental porcelains, which may be adjusted for perfect compatibility. In addition, the alloy is relatively free of any tendency to gas, oxidize or discolor during baking, and is capable of greater elongation than prior art alloys.

This invention relates generally to the field of metallic alloys, and more particularly to a gold based dental alloy of a type used in conjunction with dental restorations.

In order to obtain a proper cosmetic appearance, it is common practice to cap natural teeth by cementing or bonding a gold tooth to a prepared stump of the natural tooth lying therebeneath. To give the cap a natural appearance, a porcelain jacket is bonded to the cap, the porcelain being capable of color tinting prior to baking to duplicate the color of the natural teeth of the user. During fabrication, the metallic part of the cap is cast in an investment by the so-called "lost wax" process, and after casting the outer surfaces of the cap are coated with ceramic frits which are subsequently baked upon the cap. The usual practice is to apply a first coat to obtain completely opacity which is baked at a temperature below glazing temperature, and one or more subsequent coats are applied to obtain the desired tint and contour.

Many problems have accompanied the practice of the above technique. Most alloys in present use are either platinum based or gold based, and owing to different coefficients of expansion, it has been a common practice for manufacturers to supply porcelains which are specially prepared to have a mating coefficient of expansion, so that with baking, no cracking in the porcelain occurs, and a uniform bond with the metal is obtained over the entire mating area.

The platinum based alloys melt at approximately 2800 degrees F. or higher. These alloys normally contain large amounts of palladium which is the cheapest of the noble metals. Unfortunately, it is also a very unstable metal when porcelain is baked thereupon. It tends to gas under the porcelain, causing poor bonding. Because of the presence of ferric metal hardeners, the alloy also oxidizes, causing not only defective bonding, but discoloration of the porcelain.

Gold based alloys are somewhat superior in this respect, but, again, owing to the presence of ferric hardeners oxidation and accompanying discoloration still occur. In an attempt to overcome these difficulties, some manufacturers recommend the use of a metallic bonding agent to be applied to the casting before application of the porcelain. This procedure adds to the cost of manufacture, and is not always successful. Another procedure widely followed is a so-called "de-gassing" baking before the application of the porcelain, in which the casting is heated in the absence of the porcelain to avoid checking

or cracking of the porcelain when it is subsequently baked to its maturity.

The problems are complicated by other factors, most of which are traceable to the fact that the metal must be reheated after initial casting. The firings of successive coats of porcelain tends to "cause distortion" in the casting therebeneath, so that the caps no longer conform to the original invested wax pattern from the standpoint of fit when they are installed in the mouth of the user. This is particularly true in those alloys where the amount of base metal additions has been reduced in order to avoid oxidation and discoloration. The softening of the metal has a deleterious effect on the strength of the alloy. Current gold based alloys lack the ductility (due to lack of suitable hardening agents) to permit the fine marginal seals required without chipping or flaking.

It is therefore among the principal objects of the present invention to provide an improved gold based dental alloy in which the above mentioned disadvantages have been substantially eliminated.

Another object of the invention lies in the provision of an improved gold based dental alloy which offers a coefficient of expansion with heat compatible to that of a large number of commercially available dental porcelains.

Yet another object of the invention lies in the provision of an improved dental alloy of the class described which may be relatively free of any tendency to gas, oxidize or discolor with baking.

A further object of the invention lies in the provision of an improved gold based dental alloy, in which the hardening constituents are of a non-ferrous type, thereby eliminating the deleterious effect of ferrous hardeners.

These objects, as well as other incidental ends and advantages, will more fully appear in the progress of the following disclosure, and be pointed out in the appended claim.

In accordance with the invention, a dental alloy is prepared in accordance with the following formulation, the percentages of ingredients being by weight, and are approximate.

EXAMPLE 1

	Percent
Gold	67.7
Platinum	11.6
Palladium	16.7
Ruthenium	1.3
Silver	2.0
Tin	0.6
Copper	0.1

As will be readily observed, gold comprises the major constituent in the alloy, with platinum present in a proportion of slightly less than 1 to 7. This will result in a melting temperature of the alloy of approximately 2400 degrees F. It can be adjusted upwardly by slightly increasing the percentage of platinum as compared to gold, and correspondingly can be lowered by decreasing the amount of platinum in relation to gold. Palladium comprises slightly under 17%, and is employed principally as a filler, to slightly decrease the total cost of the alloy. Palladium also aids in hardening the gold (due to solid solution hardening) and provides together with the platinum a medium for the ruthenium to aid in hardening. This element does not cause oxidation in the alloy during casting, or subsequent baking, and thus, gassing, oxidation and discoloration are avoided. The relative trace amounts of copper and tin enhance the toughness of the alloy, permitting it to be thinned out to a greater degree before porcelain is baked on the casting. This allows for more room for the porcelain, without weakening the metal framework.

Since the alloy is essentially a gold type, it may be cast using investments normally used for casting that metal, thus the expansion of the metal and the investment being much more closely matched, the resultant fit of the cast part is more accurate than that normally found when using platinum type castings.

As has been mentioned, it is possible to modify existing commercial porcelains so that the same will have substantially the same coeffecient of expansion with heating as the alloy. This is accomplished by mixing small portions of the patching type glaze supplied with the regular porcelain in varying amounts, the precise amounts dependent upon the particular porcelain being used. Most commercial porcelains mature at temperatures ranging from 1750 degrees F. to 2000 degrees F., the highest maturity value being 400 degrees below that of the melting point of the alloy.

Because the alloy is essentially gold, soldering of joints is made with gold without difficulty, or gold alloys.

I wish it to be understood that I do not consider the invention limited to the precise composition disclosed in this specification, for obvious modifications will occur to those skilled in the art to which the invention pertains.

I claim:

1. A dental gold alloy consisting essentially of approximately by weight of: 67.7% gold, 11.6% platinum, 16.7% palladium, 1.3% ruthenium, 2% silver, 0.6% tin and 0.1% copper.

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L. DEWAYNE RUTLEDGE, Primary Examiner

E. L. WEISE, Assistant Examiner

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