

# The Vanguard System

Porcelain fused to metal (PFM) restorations are the most commonly used dental prosthetics. Other technologies, such as all-ceramic and CAD/CAM ceramics, are now finding increasing acceptance. However, their market share is still substantially less than PFM restorations. The technology for creating PFM restorations can be traced back to the pioneering work done by Widman in the 1830's and subsequent major technological advances in the alloy and in the porcelain compositions beginning in the late 1960's, have led to today's modern restorations. The continued popularity of PFM restorations partially results from their ease of fabrication, their diversity of applications, their pleasing aesthetics, their renowned durability and their ease of installation by dentists using traditional cements, all without the need for expensive equipment or sophisticated technologies. Additionally, PFM restorations can easily be modified chairside by the dentist to assure a perfect fit without major concern of breaking or shattering.

A common characteristic of conventional PFM alloys is the inclusion of oxide forming elemental metals such as copper, zinc, tin, gallium, indium and even iron. The theory for the addition of these oxide formers is that porcelain, which is mostly composed of silicon oxides, will bond to a metal surface with an adherent oxide. Empirical studies have shown that when oxide forming metals are added to ceramic alloy compositions, good adhesion of the porcelain results whereas alloys lacking oxide formers tend to have weaker porcelain adhesion resulting in debonding, cracking or chipping. Unfortunately, most of the metal oxides tend to be dark. The processing of oxide containing ceramic alloys typically require two coats of porcelain opaque to cover the dark color of these oxides and to form suitable bonding to the surface. During the porcelain build-up and processing, the metals continue to oxidize under the porcelain. This oxidation gradually continues even after installation in the patient's mouth.

Figure 1. 3-unit bridge with Vanguard (left) and Figure 2. Vanguard with Bonder.

Over time, the continual oxidation of the metal leads to the formation of dark lines at the margins of the restoration. Over time these dark lines distract from the aesthetics of the restoration and in rare cases, can cause irritation at the gums.

The Vanguard System from Aurident, Inc. represents a new concept in the generation of porcelain fused to metal restorations. This noble metal, castable ceramic alloy contains only precious metals. There are no oxide forming metals in its formulation. The lack of oxide formers is unique among ceramic alloys. Because this alloy does not form any oxides, two critical features become immediately evident. First, the hue and chroma of the overlying porcelain are comparable to the best all-ceramic systems because of the lack of interference from a metal oxide. Secondly, the formation of black lines at the margins of the restoration is eliminated because the oxides that cause these lines are not present. The Vanguard alloy is also highly cost effective. With its low density, technicians can cast up to 35 units from each troy ounce of alloy so that the final cost of the restoration approaches that of lower cost, non-noble alloys.

Vanguard's lack of oxide forming metals requires that a bonder be used to enhance the porcelain-metal bonding. The Vanguard bonder provides two benefits to the finished restoration. First, the porcelain adhesion to the bonder is exceptionally strong so that the potential for chipping or debonding is substantially reduced. Secondly, the bonder



has a gold color that enhances the aesthetics of the porcelain overlay as shown in Figure 2. The bonder, which comes in two gram jars, is mixed with a special liquid and will provide sufficient material to process approximately 100 copings or approximately 2.5 oz of the Vanguard alloy. The final component of the Vanguard System is the optional colorant which is used to create a 24k golden interior color.

The Vanguard alloy is processed in a manner similar to other ceramic alloys by casting either using a gas-oxygen torch or induction casting furnace. The low density of the alloy requires one or more extra windings on the casting machine to develop sufficient centrifugal force to completely fill the mold. Standard processes are used to remove castings from the investment and to remove sprues. Following the cleaning of the casting in alcohol, a light wash of the bonder is applied to the casting surfaces and fired (Figure 2). Only one application of the porcelain opaque is required. This is followed by a traditional porcelain build-up to the final restoration. Because Vanguard has no oxides and because the bonder has a golden color, the aesthetics of the final restoration will satisfy the most demanding cosmetic requirements.

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