DANCO
Medical

COLOR CONSIDERATIONS FOR

Titanium Color Anodizing

Interference Colors

The colors produced by these metals are known as interference colors. There are no pigments or dyes involved. They are generated by a transparent oxide film grown on the metal surface. The colors develop when part of the light striking the surface reflects and part passes through the film to reflect off the metal below. When the delayed light reappears and combines with the surface light waves they may either reinforce or cancel. This generates a specific color. The thickness of the oxide film dictates the color. In nature these colors can be found in the eddies of an oily wet street and in the iridescent colors of some insects.

Coloring

Coloring can be achieved in two ways; thermal oxidation and electrolytic oxidation (anodizing). Both processes do essentially the same thing. Through electron excitation, the metals react with oxygen to form a thin transparent film. Thermal oxidation (heat coloring) is simple, but difficult to control. Anodizing is infinitely more predictable and is the only effective way to color some of the reactive metals such as niobium.

The colors produced appear in up to five repeating orders. Most of the current jewelry is produced with the first two orders. All the colors of the light spectrum are not produced. True red and forest green are not generated.

When the oxide is of a thickness to generate interference colors, its depth is measured in angstroms (=1/100,000,000 centimeter). This layer can vary in thickness from 500 to 1,000 + depending on the color. It is not the oxide itself that is perceived by the viewer but its effect on light.

Although harder than the parent metal, the extreme thinness of this oxide dictates that it is not a strong wearing surface. Bracelets, belt buckles, rings and items that normally receive heavy abrasion should not be considered unless the metals are protected by other design elements.

Anodizing

Anodizing most closely resembles standard electroplating. When a reactive metal is suspended in a electrolytic bath as an anode(+) and current is passed through the bath, oxygen is produced at the anode surface. This oxygen reacts with the metal to form a thin oxide film that generates colors. The transparent oxide increases in thickness in relation to the amount of voltage applied. At any given voltage the oxide will grow to a specific thickness (i.e. color) and stop, having reached a stage where current will no longer pass. This phenomenon of voltage controlled growth means that the color is also voltage controlled.

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There are other factors which may affect the application of anodized coatings or the base product after anodizing. Please consult with our technical support staff.