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Zirconia as a Dental Biomaterial

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Abstract

Zirconia is metal ceramic restorations were considered standard as reliable materials. Day by day the demand is increasing for supported the commercialization of new metal free restorations. A vast growing demand is rising for zirconia ceramic the articles published on July 2013 were identified through a Medline that PubMed and Elsevier. Zirconia materials can withstand posterior physiologic loads. It considered as reliable materials; these restorations are not problem free.

Keywords: Biomaterials • Zirconia • Bonding

Introduction

Today's most popular thing that dental ceramic are silica leucite, lithium disilicate, alumina and zirconia based materials. Zirconia it is the combination of compound molecule of zirconium dioxide. It has properties for mainly dental use like superior toughness, strength and fatigue resistance in addition to excellent wear properties and biocompatibility. The other name of zirconia that is "ceramic steel". Zirconium is very strong metal with similar chemical and physical properties to titanium.

Incidentally zirconium and titanium are the two main metals which is implementing dentistry, because mostly they do not bone forming cells, which are essential for osseointegration.

Dental zirconia is modified yttria (Y2O3) it is tetragonal zirconia polycrystal. It is added to stabilize the crystal structure which is transforming during firing at an constant temperature and its improve the physical properties of zirconia. The zirconia start transforming to the tetragonal phase at 1187°C.

Peaks at the temperature of 1197°C and it was finished at the temperature of 1206°C. At cooling transformation from the tetragonal to the monoclinic phase starts at specific Celsius 1052°C, peaks at 1048°C and finished at the temperature 1020°C which was exhibiting a different behavior like hysteresis this.

During at the zirconia phase transmission process the unit of cells monoclinic their configuration occupies about some 4% which volume was the tetragonal of configuration which was very large relatively changes. This could result on the formation of bio ceramic cracks into if it does not stabilize oxides which were used in this.

So, as the monoclinic phase has not formed the under normal cooling conditions, which the cubic and the tetragonal phases were retained and crack formation due to the process of transformation while avoiding. The consequently, these zirconia-based ceramics used for biomedical purposes typically exist as a standard tetragonal partially stabilized of zirconia at room temperature. It turned out of that it highly localized stress which ahead of a propagating crack on sufficient to trigger zirconia grains to transform in the vicinity of the crack tip. In this case of 4% volume increase becomes to beneficial and essentially squeezing the crack to close and increasing toughness, known as transformation toughening. The tetragonal phase which is stabilized at the lower dopant to concentrations than this cubic phase.

This effect has been attributed to a surface energy which the difference of Consequently, zirconia based the bio ceramics used for biomedical purposes typically to exist as a metastable tetragonal partially stabilizing on zirconia (PSZ) at room temperature.

Zirconia structures were used for dental purposes were fabricated by using CAD and CAM computer aided design and computer-aided manufacturing technology.

The first method to mills the fully sintered block of zirconia with no distortion (shrinkage) till the final structure. The main disadvantage of this method was the great wear of the grinding tools which were (burs) and the population of flaws produced during the worked-on machining that may lower the mechanical reliability of the structure.

In other method we can describe that the zirconia structures were milled from a pre-sintered block at reaching its final mechanical properties after sintered which are produces structural shrinkage it can be partly compensated at the designing stage and the fit of the zirconia restoration will be warranted to others.

Most important, the CAD-CAM technique can produce zirconia restorations with the sufficient precision for dental use.

Zirconia was dull white in colour and its opacity can mask the underneath structure. Most dental zirconia systems indicate structural dyeing to enhance the aesthetic.

Currently it was fully contoured of anatomical-shaped monolithic zirconia dental restorations are offered which could abbreviate or extinguish the dental laboratory work on zirconia-based restorations.

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