



# **THE METALLURGY OF DENTAL TITANIUM- A SYSTEMATIC REVIEW**

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**Abstract:**-Metallurgy is the branch of science that deals with the science and technology concerned with the properties of metals and regarding the processing, production, refining and redating the metal in concern. Metallurgy can also be termed as “material science”, composition of inter metallic compounds and mixtures of metals, which can be termed as alloys. Metallurgy can be divided into ferrous metallurgy and colored metallurgy. Any metallurgy concerning non iron basis are colored metallurgies. A chalcolithic term from ancient practice of manipulation of, metals into the right composition to use to its fullest in a shape compatible for the purpose. In this review, we will understand the metallurgy of dental implants and the manipulation of titanium for dental usage corresponding to dental implantology . The periodic symbol of titanium is “Ti” and atomic number is 22 .It is an low density high strength metal and is resistant to bodily fluids.

**Keywords:** Titanium, conductivity, density , composition.

Element category:

itanium metal Melting point : 1668°C

Boiling point : 3287 °c

Density : 4,506g/cm<sup>3</sup>

Crsytal structure : hexagonal close packed

Titanium was discovered by William Gregorin in the year 1791 , and can be alloyed with iron, aluminium, molybdenum . It is corrosion resistant metal

## **1. THE DENTAL IMPLANT:**

The dental implant is also called as endo osseous implant . Meaning; implant placed inside the bone .It is a crown-bridge interface. It consists of a “screw “type body which is placed inside the jaw bone on which the “crown “or the tooth viable replacement is staged. It replaces the missing crown of the teeth. The screw is made up of titanium alloy; which concerns the review Why to use titanium for dental implants: Biocompatible: Titanium is the most Biocompatible hard element of the metallic variant in its category due to its non-corrosive and minimal leaching property . The non-reactive nature of the Titanium to bone and human tissue makes it first on line for dental and medical implantology. It is also used in association with “Nickel” to provide higher resistance to deformation

## **2. COMMERCIAL PREPARTION OF TITANIUM**

Titanium can be oared also is commercially prepared by reduction of tetra chloride (TiCl<sub>4</sub>) with magnesium at 800°C in argon atmosphere .This sensitive procedure is termed globally as “ scroll process “ Titanium is the fourth most abundant metal in the world . It is mainly formed in minerals like ilmenite , leucosene and rutile It has low thermal conductivity and high electrical conductivity .Titanium is strong as steel and is 45 % lighter than steel thus making it the apt metal/element to replace Bone . Titanium being placed inside the jaw reacts to form mineral level of oxides

## **3. USAGE IN DENTISTRY**

Per-InguarBrinemarkwas the first person who developed cylinder which was made with titanium, which showed Osseo-integration in rabbit tibia. Then it was directed to be used in human bone for prosthesis for correction of deformities. Later a Swedish study revealed the safety of application of titanium on human subjects. In 1982, Brinemark introduced titanium implants into the field of medicine.

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#### 4. COMPOSITION FOR DENTAL USE:

“[Ti-6AL-4v]” is the composition, where titanium-aluminum-vanadium alloy is interfaced with steel and Nickel – Type V Titanium is utilized for dental implants as there is an requirement for strength and rigidity to dissipate the masticatory load “ The force exerted on the jaw by the jaws movement “ So hardest and stable form of titanium is required for the designing of the implants Titanium in process : Has the tendency to form layer of oxide during its alpha phase of heat modelling and it may compromise the strength and overall ductility of the material .Thus a vacuum chamber is employed and injection modelling proves is used in fabrication. The casting process of the implant involves centrifugation. Under a chamber of Neon /any other inert gas, an electrical plasma arch is used to melt and remodel

#### 5. METALLURGY BEHIND THE IMPLANTS :

The metallurgy of dental implants can be sectioned or differentiated into various generations as per the journal works of the Indian Prosthodontic Society, they are : Generation 1 : Prefabricated titanium cylinders and a component of bar being put together by means of laser welding

Generation 2 : Different anonymous components of titanium merged with cylinders

Generation 3 : Individualized molding of each component and combined by laser weld

#### 6. CONCLUSION:

Even added the half decade of usage, updating and continuous research on the alloying, composition and metallurgy, defects do follow welded samples through pores, clefts, fissures, leaching, and hypersensitivity issues. There is nil procedure which can be stated flawless to fabricate and manipulate titanium for dental implantology also giving in to the biological aspects involving the failure of a dental implant stability and financial expenses. The research on the metallurgy of titanium is a popular state of matter and a well invited field for the merging of engineering and dental science.

#### 7. REFERENCE

- [1] W. Laing and D. Taylor, NHS Report from the Office of Health Economics (1982) (DHSS, London, 1982).Google Scholar
- [2] R. T. Bothe, K. E. Beaton and H. A. Davenport, Surg. Gynecol. Obstet. 71 (1940) 598. Google Scholar
- [3] G. S. Leventhal, J. Bone Joint Surg. 33A (1951) 473. Google Scholar
- [4] O. E. Bederand G. Eade, Surgery 39 (1956) 470. PubMed Google Scholar
- [5] G. R. Parr, L. K. Gardner and R. W. Toth, J. Prosthet. Dent. 54 (1985) 410. PubMed Google Scholar
- [6] J. Barksdale, in “Titanium. Its Occurrence, Chemistry and Technology” (Ronald Press Co., New York, 1966) p. 3. Google Scholar