Titanium Technology in Medical Applications

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Titanium Technology in Medical Applications

- A brief history of Titanium in medical applications
- Medical Grade Titanium
- Benefits of Medical Grade Titanium
- Uses of Medical Grade Titanium
A brief history of Titanium in medical applications

- 1940’s beginnings in dentistry
- 1950’s and 60’s development of specialized Titanium Alloys
  - Including Ti 6Al-4V and Ti 6Al-4V ELI
- 1960’s pioneering work in hip and knee replacements
- Last 20 years, the Six Million Dollar Man becomes a reality
A brief history of Titanium in medical applications

- Today, Titanium is used from head to toe in biomedical implants
- Titanium is the metal of choice for:
  - Prosthetics
  - Internal and External Fixation
  - Inner Body Devices
  - Instrumentation
  - Dental
- 2017 Estimated usage 1,500 metric tonnes (3.3 million lbs.) in medical devices
Medical Grade Titanium

Most Common grades for medical applications:

- ASTM F67    ISO 5832-2    Unalloyed Ti. (ASTM B348 Grades 1 – 4)
- ASTM F136    ISO 5832-3    Ti 6Al-4V ELI (ASTM B348 Grade 23)
- ASTM F1472    ISO 5832-3    Ti 6Al-4V (ASTM B348 Grade 5)
- ASTM F1295    ISO 5832-11    Ti 6Al-7Nb
Benefits of Medical Grade Titanium

- Strong
- Lightweight
- Corrosion Resistant
- Cost-Effective
- Non-Toxic
- Biocompatible (non-toxic AND not rejected by the body)
- Long-Lasting
- Non-Ferromagnetic
- Supports Osseointegration (the joining of bone with the artificial implant)
- Flexibility and Elasticity comparable with that of human bone
Benefits of Medical Grade Titanium

- High corrosive resistance
- Low specific gravity
- Bio Compatible Material
- Non Magnetic Property
- High specific strength

Photo Credit: TitaniumTools.com
Uses of Medical Grade Titanium

- Hip and Knee Replacements
Uses of Medical Grade Titanium

- **Extremities Replacement:**
  - Shoulder/Elbow/Wrist/Finger
  - Ankle/Toes

- **External and Internal Fixation:**
  - Bone Plates
  - Screws
  - Pins
  - Intramedullary Nails
Uses of Medical Grade Titanium

- Spinal Fusion Cage
- Expandable Rib Cage
- Maxillofacial and Craniofacial Repair
Uses of Medical Grade Titanium

- **Surgical Instruments**
  - Surgical Forceps
  - Retractors
  - Surgical Tweezers
  - Needle and Micro Needle Holders
  - Dental Drills
  - Lasik Eye Surgery Equipment

- **Benefits**
  - Lighter weight than steel
  - Bacteria resistant
  - Withstand repeated sterilization
  - Non-magnetic
Uses of Medical Grade Titanium

- Cardiovascular Devices
  - Pacemaker Cases
  - Defibrillators
  - Intra-vascular Stents**

** Usually made from Nitinol
A Nickel-Titanium Shape Memory Alloy
Uses of Medical Grade Titanium

- Dental Applications
  - Implants

- Orthodontic Braces
  - Stronger, more secure and lighter than their steel counterparts
The Future for Medical Grade Titanium

- The future for medical grade Titanium looks bright.
- The aging baby-boomer demographic wants to continue to stay active.
- The health industry is pushing all ages to lead more active lives.
- Growth for medical grade raw materials is projected to be 3-5% per annum over next 5 years.
- Medical industry will continue researching new and innovative uses for Titanium.

* Distributors play a key role in the medical grade Titanium supply chain
The list of benefits from using Titanium for medical applications is lengthy. Due to its corrosion resistance, biocompatibility, and its innate ability to join with human bone, medical grade Titanium has become the pre-eminent metal used in the medical field.

Titanium: Truly the Medical Metal of Choice.
Thank You

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