

Tantalum for health



TIC

Tantalum (Ta) is a rare grey metal with unique properties. It makes a significant contribution to modern medicine, allowing millions of people to live longer, healthier lives.

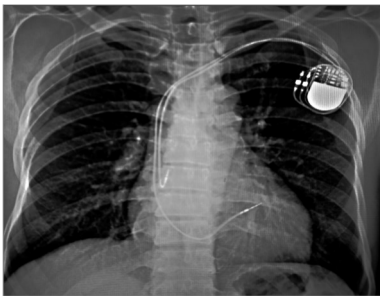
Tantalum in capacitors and chips plays a multitude of roles in advanced hospital equipment, but an equally important aspect is in surgical implants.

Implants using tantalum broadly fall into two categories:

- 1) implantable electronic devices using tantalum capacitors
- 2) implants made from or coated with tantalum metal.

Implantable medical devices

Because tantalum capacitors are exceptionally reliable, highly durable, and can be made to be very small indeed, they allow implantable medical devices to be small, yet powerful. Substitution by large aluminium or ceramic capacitors isn't a comfortable option in the confines of the human body.



X-ray showing an ICD implanted in a man's chest (Shutterstock)

Implantable hearing aids, neurostimulators and insulin pumps are now possible thanks to tantalum capacitors, but the stand-out application is for implantable cardioverter defibrillators (ICDs), which may also be pacemakers.

The traditional alternative to an ICD is an external defibrillator that must be carried everywhere by the patient. An ICD can deliver 750 volts, enough to be effective on even the largest human body.

Tantalum metal implants

The very thin natural coating of tantalum oxide (Ta_2O_5) that covers tantalum metal is totally inert to body fluids, a characteristic that makes it an ideal material for surgical implants.

Tantalum implants have been used in general surgery and neurosurgery for over half a century and no problems have ever been reported concerning biocompatibility.



Tantalum skull plates and screws from the mid-20th century

Surgical applications of tantalum metal include:

- hip and knee replacement fixtures (part or whole)
- monofilament and braided suture wires for skin closure, tendon, and nerve repair
- foils and sheets for nerve anastomoses
- clips for the ligation of vessels
- staples for abdominal surgery
- pliable sheets and plates for cranioplasty (skull) and other reconstructive surgery.

As tantalum is both radiopaque and biologically inert it can also be used for orthopaedic marker balls or beads. These are used to track objects inside a body, such as a stent being inserted during surgery, or to track how well implants have been fixed in a body.

Tantalum can also be used to coat carbon foam scaffolds to create a biocompatible replacement for bone implants, for example in dental implants or for vertebrae of the spinal column. Such a structure is 70 to 80% porous and once it is implanted new biological tissue grows through it, helping to fix it in place.

Looking ahead, additive manufacturing (AM) holds great potential for the use of tantalum in medical applications.

For more information on medical uses of tantalum visit www.TaNb.org.



An implant for a hip replacement (Shutterstock)



A tantalum knee joint made in 2017 by additive manufacturing (China Global Television Network)



Tantalum dental implants were first used in 1940 (Shutterstock)



TANTALUM-NIOBIUM

INTERNATIONAL STUDY CENTER

www.TaNb.org

The T.I.C. is the international trade body that represents the tantalum and niobium industries. We have around 90 members from over 25 countries involved with all aspects of the tantalum and niobium industry supply chain (from mining and refining through to OEMs and recycling).

OBJECTIVES

- Increase awareness and promote the remarkable properties of tantalum and niobium.
- Host the Anders Gustaf Ekeberg Tantalum Prize, an annual award that recognises excellence in tantalum research.
- Organize a general assembly (conference) in October each year for business and technical presentations. Non-members may attend.
- Publish a quarterly Bulletin newsletter for members and stakeholders.
- Collect from the members (via an independent company to ensure confidentiality) statistics on the tantalum and niobium industries.
- Address key issues facing the industry, such as legislation, supply chain due diligence, and transport of radioactive materials (NORM).

Tantalum-Niobium International Study Center (T.I.C.)

Chaussée de Louvain 490, 1380 Lasne, Belgium.

Tel: +32 2 649 51 58; info@tanb.org; www.TaNb.org

The T.I.C. is an AISBL under Belgian law. VAT number BE0414.408.447. This publication is for information only. For our full disclaimer please visit our website or contact our office.