

# Titanium dental implant surface treatment

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Materials used for biomedical applications cover a wide spectrum and must exhibit specific properties. The most important property of materials used for fabricating implants is biocompatibility, followed by corrosion resistance. Commercially pure titanium and titanium alloys are now the most attractive metallic materials for biomedical applications. Titanium alloys are used in medicine for implant devices replacing failed hard tissue. Commercially pure titanium (cp Ti) is used preferentially for dental implant applications. The clinical results show that adequate treatment of surfaces is crucial for reducing healing time, treating at-risk patients and improve the dental implant osseointegration. Osseointegration can occur only if the cells adhere to the biomaterial surface. At this phase, reorganization of the cytoskeleton and information exchange between cells and the extracellular matrix at the cell–biomaterial interface occur, generating gene activation and specific tissue remodeling. The effects of implant surface topography, chemical composition and surface roughness on the process of bone formation are the most studied factors. Studies have shown that titanium implants with adequate roughness may enhance bone-to-implant contact and may increase removal torque force [1]. Several techniques to modify the implant surface have been proposed to improve the success rate of oral rehabilitation with osseointegrated implants [2,3]. Nowadays, the dental implant surface modifications can be imparted by different methods including ion beam, laser etching, acid etching, anodization and biomimetic coatings. For study purposes, the surface modifications can be divided into seven groups: machined, plasma spray and laser, acid etching, grit blasting follow acid etching, laser etching, anodising and biomimetic coatings. Figure 1 shows three dental implant surfaces available in the Brazilian market. Clinical results showed that the anodized surface reduces the healing time for 4 weeks and presents the best results among other surface treatment.

**Keywords:** Dental implant, surface, titanium, pure titanium

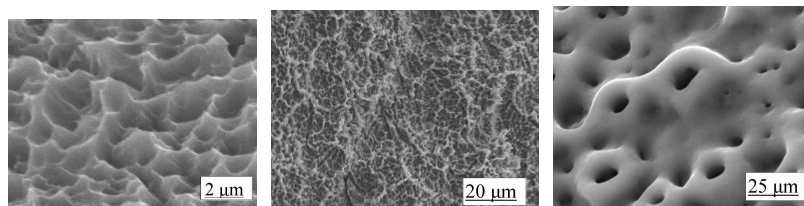


Figure 1: Dental implant surfaces. (A) Acid etched. (B) Sandblasted. (C) Anodized.

- [1] A. Wennerberg. PhD thesis). University of Göteborg, Göteborg, Sweden. (1996).
- [2] CN Elias, Y Oshida, JH Lima, CA Muller. *J. Mech. Behav. Biomed. Mater.* **1**, 234 (2008).
- [3] G. Mendonca, D.B. Mendonca, L.G. Simoes. *Biomaterials* **30**(25), 4053 (2009).

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