

Title: Nanofabrication method for Dental implants

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KEYWORDS: Nanotubes, Dental implant, osteoconductive, osteoinductive, Anodization

DOMAIN: Material Science (Dental Implantology)

SUMMARY:

The nanofabrication of nanotube structures on the surface of a dental implant promotes faster bone formation around the implant. It involves an electrochemical anodization reaction that produces an open-face nanotube structure on the implant's surface. The morphological characteristics of the nanotube facilitate effective tissue adhesion and support osteoblast function for the formation of new bone. Consequently, this leads to an improvement in the osteoconductive and osteoinductive properties of dental implants. The anodization process is optimizable to develop uniform nanotubes all over the surface including complex curvatures of dental implants. The nanotube's length and diameter should be optimized for the dental implant application to achieve a cytocompatible and mechanically stable nanotube structure.

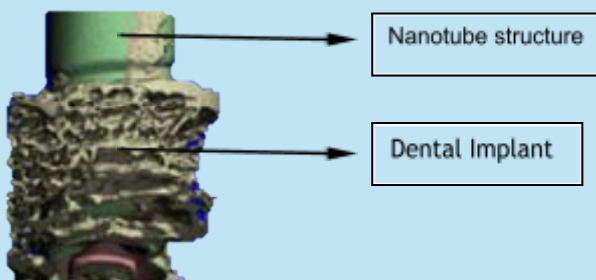
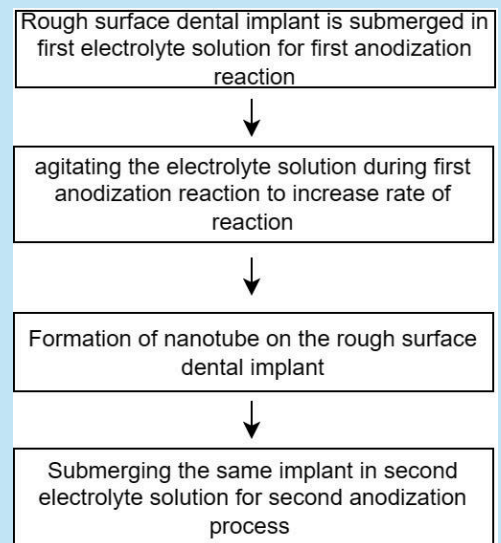


Figure: Nanotube structure on Titanium dental implant



Flowchart of Anodization reaction

ADVANTAGES:

1. Promotes fast recovery.
2. Economical and time-saving method as compared to the traditional methods.
3. The method allows the fabrication of nanotubes on any implant regardless of its geometry.
4. The open-face nanotube structure can incorporate bioactive molecules and drugs, delivered directly at the target site.
5. It is mechanically stable and resists the delamination of nanotubes ensuring longevity of the dental implant.

APPLICATION:

1. Surface modification of dental implants to improve osteointegration.
2. Scalable to fabricate nanotubes on other medical devices.

SCALE OF DEVELOPMENT: Development at lab-scale.

TECHNOLOGY READINESS LEVEL: TRL 3

IP STATUS: Indian Patent Application No. (202111000795)