

ZTA-NanoSurface

Surface modification of zirconia toughened alumina ceramics for implant applications

A cheap and straightforward process has been developed to modify the surface of zirconia toughened alumina ceramics (ZTA), resulting in the formation of a nano-porous/nano-rough layer. The ZTA-NanoSurface is expected to provide antibacterial properties and to enhance bone integration, opening the way for a direct implantation of ZTA components into bone. Partners to further develop the system and/or to establish commercial agreements along with technical cooperation are sought.

The Challenge

ZTA ceramics are bioinert and do not bind directly to bone, which limits their applications as implantable materials. For instance, in current hip replacement systems, a metal shell with an osseointegrative surface needs to be placed between the acetabular bone and the ceramic liner, which restricts the maximal head diameter because of the limited anatomical space. On the other hand, post-operative infections are a major cause of failure for bone implants. To address both issues, it would be beneficial to develop surface modification processes that enable the implantation of ZTA monoblock components in direct contact with bone and reduce the risk of infections.

The Technology

Our surface modification technology allows to:

- Increase ZTA nano-roughness, maintaining existing micro-topography. On-going research suggested that such nano-roughness could reduce bacteria adhesion and boost bone response.
- Produce an interconnected nano-porosity (if desired), with a controlled depth. This porosity can be used for the delivery of antibacterial agents and/or bone growth factors.

Innovative advantages

- Osseointegration enhancement: the ZTA-NanoSurface has the potential to boost bone response
- Passive protection against infections: the ZTA-NanoSurface has the potential to limit bacterial adhesion
- Active protection against infections: the ZTA-NanoSurface can be loaded with anti-bacterial agents
- Flexibility: the thickness of the porous layer can be easily controlled
- Excellent mechanical properties: the porous layer is not a coating, which eliminates adhesion and delamination problems.

Current stage of development

The technology has been successfully applied to the surface modification of ZTA ceramics with several micro-topographies. A proof-of-concept experiment confirmed potential reduction of bacterial adhesion and the possibility of loading the surface with antibacterial agents.

Applications and Target Market

Orthopedic and dental ceramic implant manufacturers.

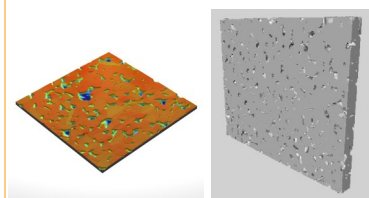
Reference number

MKT16_ZTA_C

Towards direct implantation of ZTA ceramics into bone



**Nano-roughness
+ nano-porosity
=
osseointegration
+ antibacterial properties**



Nano-topography (left) and nano-porosity (right) after the ZTA-NanoSurface treatment

Business Opportunity

Technology available for licensing with technical cooperation

Patent Status

Priority application

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