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ANTI-FOULING AND CELL-ADHESION RESISTANT SURFACE COATING FOR MEDICAL IMPLANTS

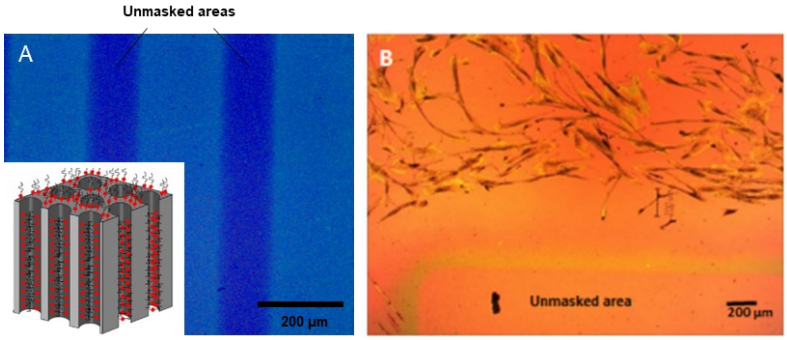
Keywords: anti-fouling, reduced osseointegration, implant removal, dental implants, nanotechnology, surface coating, scratch resistant

INVENTION NOVELTY

The present technology provides an innovative surface coating for medical implants using anti-fouling polymers on the pore walls of supported porous oxide structures to prevent implant-related infections while reducing osseointegration.

VALUE PROPOSITION

While surface modification of medical implants has emerged as an effective method to enhance osseointegration, the reverse activity might be of extraordinary interest when it comes to the removal of temporary implants in trauma surgery or for guided bone regeneration in dentistry. By preventing implant-related infections and a high degree of osteogenic integration, the retention of the medical implant is not only safer but also their removal is far less detrimental to the bone microenvironment.



Fluorescence micrograph obtained on a structured surface and subsequently treated with FITC labelled BSA. The areas that were covered with the mask are devoid of POEGMA and show the characteristic fluorescence of labelled BSA. No BSA fluorescence is seen in the gaps of 100 µm containing POEGMA, (B) Fibroblast cell (elongated structures) adhesion on a structured surface. Areas that are devoid of POEGMA (masked stripes) show adherent cells. Inset: Schematic visualization of the TiO_2-POEGMA nanocomposite (Modified from Wassel et al. (2019))

TECHNOLOGY DESCRIPTION

The organic-inorganic nanomaterial composed of titanium dioxide nanotubes functionalized with biocompatible antifouling polymer brushes was realized on titanium sheets, demonstrating its feasibility as a surface coating for medical implants. The fabrication process is based on anodization of the titanium implant to create a porous titanium oxide layer, followed by the grafting of the antifouling polymer on the pore walls. The process can be applied to larger area substrates, such as plates and screws. The anti-fouling properties and cell-adhesion resistance, have been demonstrated *in-vitro,* indicating the use of the nanocomposites for the prevention of implant-related infections and reduced osteointegration. In addition, scratch resistance could also be demonstrated, achieving a desirable mechanical stability.

COMMERCIAL OPPORTUNITY

We are looking for a licensing or/and cooperation partner.

DEVELOPMENT STATUS

The anti-fouling and non-adherent properties have been demonstrated *in vitro*.

PATENT SITUATION

Patent is granted in Europe EP3577177B1, validated in DE, GB, and FR, with priority of February 2017.

FURTHER READING

Wassel et al. (2019), Materials & Design 163, 107542. (Scratch resistant non-fouling surfaces via grafting non-fouling polymers on the pore walls of supported porous oxide structures)

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