Bio-ceramic coating for metal implants with superior biocompatibility and osseointegration

Summary

Profile type
Technology offer

Company's country
United Kingdom

POD reference
TOGB20250321022

Profile status
PUBLISHED

Type of partnership
Commercial agreement with technical assistance

Targeted countries
• World

Contact Person
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Term of validity
21 Mar 2025
21 Mar 2026

Last update
21 Mar 2025

General Information

Short summary

A UK company has introduced novel bioceramic coating for titanium and magnesium implants to provide superior biocompatibility, osseointegration and controlling of bio-corrosion. Its colour is also bone-like. Orthopaedics and implant developers and manufacturers are sought to take the materials into large animal and human studies and onto the market under license, accompanied by building of plant for manufacturing under commercial agreements with technical assistance.

Full description

A UK innovative company has been developing a novel bioceramic coating for about five years. Their patented electrochemical technology focuses on nanoceramic coating on metal implants and functionalisation of ceramic surfaces. The company has developed technology that can provide a stable and chemically neutral and biocompatible ceramic surface that is expected to reduce the local tissues' immune reaction, by providing corrosion resistance and a coherent scratch resistant bio-active ceramic surface. It occurs through application of an electrochemical oxidation (ECO) process that combines oxidation of substrate titanium alloy with elementary co-deposition of electrolyte materials to yield an oxidised bio-ceramic layer (20 µm thickness) that contains a range of desirable composition variables such as titanium and zirconium oxides, strontium or silicon, and biological anions such as phosphates, fluorides etc. These beneficial bio-ceramic compositions on the surface of titanium alloys have been demonstrated to

enhance osseointegration, and to provide corrosion and scratch/wear resistance.
Novel bioceramic surfacing for Ti has a superior combination of functional properties compared to commercially available treatments. In the core of it is a chemical conversion of the alloy surface to form a stable ceramic oxide material which prevents metal corrosion and release of harmful metal ions into tissue. Highly convoluted surface morphology with optimised roughness and nano-topography provides required wettability and enhances osseointegration.

ECO bioceramic coating has also been evaluated to enhance corrosion resistance and biocompatibility of magnesium implants. The major drawback of magnesium alloys as implants is their exceptionally high corrosion rate in the physiological environment. The application of the ECO bioceramic can be used to impact upon the rate of Mg degradation by controlling the coating thickness and density. In contrast to conventional plasma electrolytic oxidation (PEO) process the ECO process forms a compact bioceramic layer with desirable topography and definable elemental composition. It enables the integration of a wide range of elements into the ceramic layer such as P, Ca, F, Si, Sr, Zr. Highly developed hydrophilic ECO-bioceramic surfaces on magnesium enables efficient retention of drugs or biodegradable polymeric top coatings.
The company has produced proof of concept in vitro and small animal in vivo study for one type Ti alloy. They wish to partner with developers and manufacturers of implants and orthopaedics, to run similar tests on Mg and to take both groups of alloys into large animal and human studies. The type of cooperation for that can be R&D or technical cooperation.
Once the devices have been proven, the UK company will license them out and transfer the know-how as it will make economic sense to shift the manufacturing to the partners. During the construction of new plant, a commercial agreement with technical assistance would also be necessary in addition to the license agreement. The UK company would have to build parts of the plant as they are rather specific.

Advantages and innovations

ECO bioceramic surfacing for Ti has a superior combination of functional properties compared to commercially available treatments:
- a chemically stable oxide ceramic material which prevents metal corrosion and release of harmful metal ions into tissue;
- a highly convoluted surface morphology with optimised roughness;
- bone like colour, which is important in the case of dental implants.
The combination doesn't compromise on strength or formability.

Technical specification or expertise sought

Stage of development

Available for demonstration

Sustainable Development goals

• Goal 3: Good Health and Well-being

IPR Status

IPR applied but not yet granted

IPR Notes

IPR Notes

Partner Sought

Expected role of the partner

Type of partner sought: industry.
Specific area of partner sought: manufacturers of medical implants.
Role of partner sought: to validate the technology jointly under research or technical cooperation in animal and human trials. Then the technology will be licensed and the transferred to the partner. The plant will be built by the UK company under a commercial agreement with technical assistance.

Type of partnership

Commercial agreement with technical assistance

Type and size of the partner

- **SME 50 - 249**
- **Big company**
- **SME 11-49**
- **SME <=10**

Dissemination

Technology keywords

- **02002015 - Surface treatment (painting, galvano, polishing, CVD, ..)**

Market keywords

- **05003003 - Surgical implants**
- **08001009 - Speciality/performance materials: producers and fabricators**
- **08001012 - Speciality metals (including processes for working with metals)**

Targeted countries

- **World**

Sector groups involved

Media

Images

Before and after