

TECHNOLOGY OFFER

Novel antibacterial material with activated gold nanoparticles

The Jožef Stefan Institute has developed a novel approach for reaching highly effective antibacterial action in a human- and environmental- friendly way using active gold. The technology can be used for formation of implants in orthopaedics, dentistry, plastic surgery, for antibacterial protection in first-aid material, in cosmetics for hygiene (tooth pastes, mouthwash liquid, soaps, shower gels, etc.), etc. The institute is looking for partners interested in licensing agreement.

Technology field: nanomaterials, antibacterial properties, ceramics

Silver is a metal with natural ability to have antibacterial action. It belongs to the group of the most effective antibacterial agents today. This metal has strong action not only against various types of bacteria it is also active against many other pathogens including viruses and fungi. Moreover, because of its non-selective action against pathogens this metal is able to overcome resistivity issue regard all commercially available antibiotics today. Because of the listed properties, majority of the commercially available products with an antibacterial component contain silver for this function. However, the safety of already widely used silver nanoparticles has been questioned by European Union [1.].

The solution:

New antibacterial human- and environmental- friendly material composed of hydroxyapatite, gold nanoparticles and amino acids in the form of composite.

Advantages

In comparison with silver the novel material is:

- **Less toxic for human beings and their environment**
- **Has improved antibacterial properties**

It is prepared using "green" technology.

New concept was developed for formation of human- and environmental-friendly material able to provide antibacterial activity. This material is composed of bioceramic (hydroxyapatite), metallic (gold) and organic part containing amino and thiol groups (amino acids) in the form of composite. Bioceramic part of this material is templating agent applied as a controller of growth and stability of metallic nanoparticles particle. These metallic nanoparticles have functionalized surface and they are centres of antibacterial activity of composites. Efficacy of antibacterial activity of these materials depends on selection of surface functionalization providing activity against both Gram-

positive and Gram-negative bacteria. For developed materials this activity is much stronger compare to HAp/Ag composite which shows ability for their use as more favourable replacement of toxic silver. Materials were synthesized using sonochemical method, which has been developed as a novel, "green" approach for their formation.

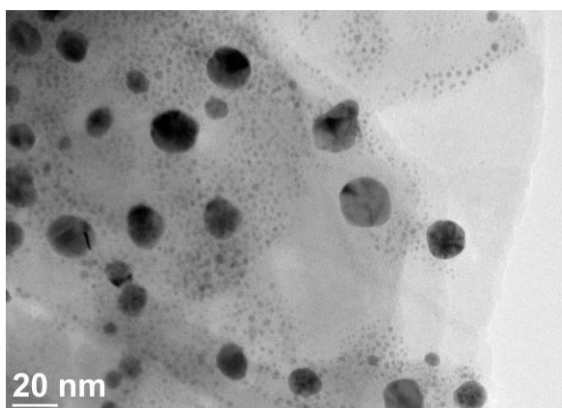


Figure 1: SEM image of activated composite with gold nanoparticles.

It has been shown that the newly developed material has antibacterial properties but is not harmful for human cells. At the minimal inhibitory concentration (MIC) of novel material against *E. coli*, 90% of human osteoblast cells are viable, while less than 20% of these cells are viable at MIC of nanosilver. Similar effect was shown for *S. aureus*.

The technology has been developed at the Jožef Stefan Institute, Slovenia. The Jožef Stefan Institute is leading

Slovenian research institute with more than 960 employees. The research group of [The Advanced Materials Department](#) are experts in the field of material science with emphasis of expertise in anorganic and nanomaterials that are industrially applicable.

[1.] https://ec.europa.eu/health/scientific_committees/consultations/public_consultations/scenihr_consultation_17_en

STAGE OF DEVELOPMENT

TRL 4, technology is ready to be licensed out.

TARGET SECTORS

Producers of implants in orthopaedics, dentistry, plastic surgery, first-aid material, cosmetics for hygiene, filters, chewing gums, paints and other products that have to have antibacterial properties.

INTELLECTUAL PROPERTY

Technology is patented: EP2863751 (B1), SI24094.

CONTACT DETAILS

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