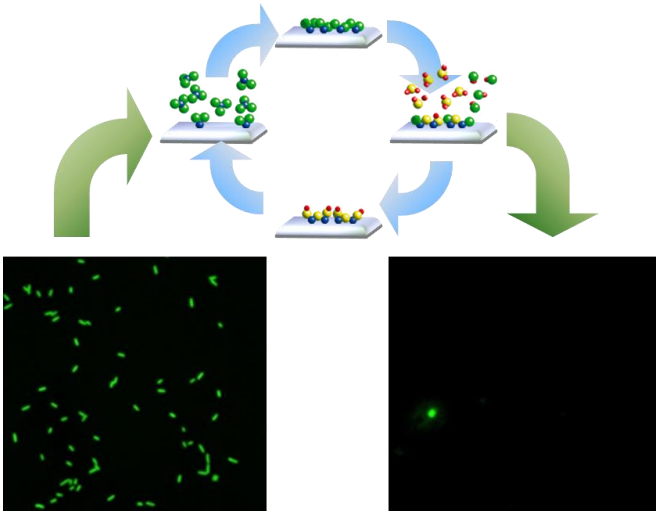
ACTive Implant for Optoacoustic Natural sound enhancement

SEVENTH FRAMEWORK PROGRAMME

Antifouling Coatings

Once biomedical devices come in contact with the biological environment, they are prone to surface biofouling due to the adhesion of both microbes and thrombotic agents, which are a result of the organism's response to the presence of a foreign body. It is therefore imperative to prevent the adhesion of noxious substrates. This is generally achieved by manipulating the chemical composition of the device's surface or through the incorporation of regulatory biomolecules.

Some of the most successful approaches to biofouling resistance involve the preparation of highly hydrophilic and charged surface coatings.



Surface Coating Design

Anti-biofouling coatings can be prepared using both non-toxic (bacteria and protein repellent) and toxic (bactericide) substances. When implantable objects are to reside within the body for extended periods of time, as is the case in ACTION, the materials used must be non-toxic and ensure long-term biocompatibility and performance. The anti-fouling layers must also be tailored for the coated item, ensuring good adhesion and avoiding adverse effects on the properties of the optical components, such as IR transmittance and refractive index.

In order to meet these requirements, VTT has designed nano-sized coatings based on (i) Atomic Layer Deposition, and (ii) modification of the device surface with highly hydrophilic molecules and polymers through silane chemistry and self-assembly.

Antifouling Performance

A whole series of novel thin films for biomaterials and implants were developed in VTT using the atomic layer deposition (ALD) technique. Characterization of the films showed that extremely thin (4 nm) silver layers deposited on oxide surfaces afforded the best combination of stability, IR transparency and prevention of bacterial adhesion. Ongoing investigations indicate that protein adsorption can be further reduced by capping with a single layer of self-assembling molecules. Additionally, antimicrobial and protein-resistant coatings prepared by silane chemistry have also been developed and are under evaluation as potential back-up options for the ALD coatings.

For additional information, please contact info@action-project.eu or visit our website at: www.action-project.eu

Project Partners

MED-EL, CSEM SA, Medizinische Hochschule Hannover, Teknologian tutkimuskeskus VTT Oy, SUSS MicroOptics SA, VERTILAS GmbH, STMicroelectronics

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