Non-Confidential Description

'Dual Action' Anti-Microbial Coatings for Implantable Medical Devices

Technology Case: RFT-260

Invention Summary

Scientists at North Dakota State University have invented a unique 'dual action' anti-microbial polysiloxane coating that has the capability of exhibiting long-term antimicrobial activity on implantable medical devices.

The coatings have a leachable silver-based antimicrobial domain in conjunction with a surface-bound contact active microbial agent - Quaternary Ammonium salt (QAS) that exhibits the two levels of antimicrobial protection.

While the covalently bound QAS groups inhibits bio-film formation by microorganisms that come into contact with the coating prior to insertion of the devices into the body, the leachable antimicrobial agent inhibits bio-film formation by microorganisms in the vicinity of the device.

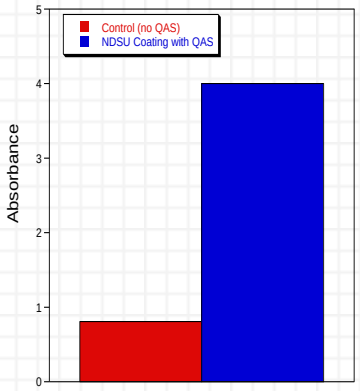

Fig. Turbidity measurements of siloxane-based coating solutions.Red Bar: Control (no QAS), blue Bar: NDSU Coating with QAS

Benefits

- Coating exhibits two levels of antimicrobial protection.
- Specific interaction between the QAS groups and the leachable antimicrobial agent and water molecules provide enhanced release characteristics of the leachable antimicrobial.
- Modification of the polysiloxane with QAS groups maintains the desirable mechanical properties and biocompatibility of a conventional polysiloxane.

Invention Premise

While Quaternary Ammonium salts have been known and widely used for more than half a century as disinfectants, silver is a widely used antimicrobial agent that is active through a leaching mechanism.

Previous work at NDSU has shown that the addition of silver salts and nanoparticles to silicone coating solutions result in poor dispersion of the silver probably due to the non-polar nature of silicones. It was thought that the highly polar, ionic QAS groups present in the siloxane coatings may enable a much better dispersion of silver.

This hypothesis was tested and verified using turbidity studies. The higher turbidity of the QAS-functional siloxane shows that the QAS functionality enables a much better dispersion of the silver and suggests that novel, antimicrobial coatings possessing both long-term contact active antimicrobial activity as well as longer range, releasable antimicrobial activity can be produced using the NDSU approach. Subsequent microbial studies supported the results.

Patents

This technology is patent pending with fully preserved world-wide patent rights available for licensing/partnering opportunities.

The Lead Inventor

Bret Chisholm, Ph.D.

Senior Research Scientist

bret.chisholm@ndsu.edu

Dr. Bret Chisholm received his B.S. degree in Chemistry from North Dakota State University in 1989 and his Ph.D. in Polymer Science in 1993 from the University of Southern Mississippi. After graduation, Chisholm was employed by General Electric (GE) for 11 years and worked in the areas of organic coatings, combinatorial/high-throughput methods, hybrid organic-inorganic coatings, polymer blends, crystalline polymers, and ionomers. In October of 2004, Chisholm joined the Center for Nanoscale Science and Engineering as a Senior Research Scientist and Director of the Combinatorial Materials Research Laboratory. He is also an Adjunct Professor for the Department of Coatings and Polymeric Materials and serves as a thesis advisor for several graduate students. Chisholm holds 20 U.S. patents and has authored more than 100 publications.

Inquiries

Jaideep Goswami, Licensing Associate, MBA
NDSU Research Foundation, Fargo, ND 58108-6050
Phone: 701-231-7886 Fax: 701-231-6661
Email: jaideepGoswami@ndsurf.org
Web: www.ndsuresearchfoundation.org