Kris Looney

Kris Looney is the President of Venture Acceleration Services at Emergent Technologies, Inc. (ETI). ETI is a venture firm that funds, manages, and develops early stage breakthrough platform technologies from research institutions. Kris also serves as President of Selenium, Ltd. which is a start-up anti-microbial and anti-biofouling solutions company. A business generalist with an entrepreneurial background, Mr Looney previously served as CFO of Transformation Enzyme Corporation, where he was pivotal in the financial management and business development that enabled the company to become an industry leader in the nutritional supplement market. He also previously served as COO and interim CEO of the American Red Cross of Central Texas in a competitive philanthropic environment. Mr Looney holds a Bachelor of Arts in Marketing and Master of Business Administration from the University of Texas at Austin.

Selenium Ltd: SELDOX™ enabled membrane technology

The technology in a nutshell:
Using a selenium-based membrane coating to create an environment that is hostile to bacterial growth.

Introduction

The build-up of bacterial films on reverse osmosis (RO) membranes causes a decrease in the flux through the membrane over time. Selenium Ltd. has proposed a way to hinder the growth of bacterial biofilms, by creating an anti-microbial environment on the surface of the membrane. By permanently attaching selenium-based compounds to the membrane, water flux is maintained, energy and cleaning costs are reduced, and the need to pretreat the water is decreased.

This technology was presented by Kris Looney, President of Selenium Ltd. The company was founded in 2004, based on discoveries made by Professor Ted Reid and Professor Julian Spallholz at Texas Tech University. Funding is provided by Emerging Technologies Inc., a venture capital firm based in Austin, Texas.

Technology overview

The SELDOX™ materials are carbon-selenium compounds. The selenium compounds are not anti-microbial; instead, the SELDOX™ compounds catalytically create an environment that is hostile to bacteria around the membrane through the formation of reactive oxygen species (ROS). The selenium-based compounds may be attached to a variety of surfaces as a coating or through direct integration at the point of membrane manufacture via copolymerisation. Both methods utilise covalent attachment chemistries, which means that they do not need to leach out of the membrane to be effective, and do not need to be replaced over the lifetime of the material.

The technology works as follows:

- The SELDOX™ materials catalyse a reaction between oxygen and thiols (such as glutathione), which can be found in bacterial cell walls.
- The oxygen molecules acquire an electron from the selenium compounds, to produce a more reactive oxygen molecule.
- This process destroys the bacteria that come within 35 nm of the membrane.

Selenium Ltd. conducted a proof of concept study to illustrate the efficiency of the technology. An RO membrane system (including membranes and spacers) coated with selenium compounds was exposed to synthetic wastewater contaminated with ***Staphlyococcus aureus (S. aureus)*** bacteria. After 24 hours, the loss in flux for the Seldox enabled system was 8%, while the untreated (control system) lost 52% in flux. The biomass of the bacteria on the coated membrane was 10,000 times less than the biomass found on a similar, uncoated membrane. The number of colony forming units (CFU) of ***S. aureus*** bacteria in a membrane spacer material that was copolymerised with selenium compounds was 0.0001% of the units found in a control spacer.

Intellectual property

This is a unique technology with a strong IP position. The company has been issued 13 patents, 7 of which are in the United States. These patents cover the composition of the selenium-based compounds, and the methods with which they are used to create an anti-microbial effect. The company also has several patents that have yet to be approved. Much of the IP that covers these compounds is held by the company as trade secrets pending further development with an industry partner. The development of specific applications for this technology will provide more opportunities to improve the company's IP portfolio.

Applications

This technology was originally intended to be used as an anti-bacterial coating for medical devices. Selenium Ltd. has obtained FDA 510(k) and CE approval to use SELDOX™ materials in dental sealants and orthodontic adhesives, and these compounds have been used in a full orthodontic treatment system for children.

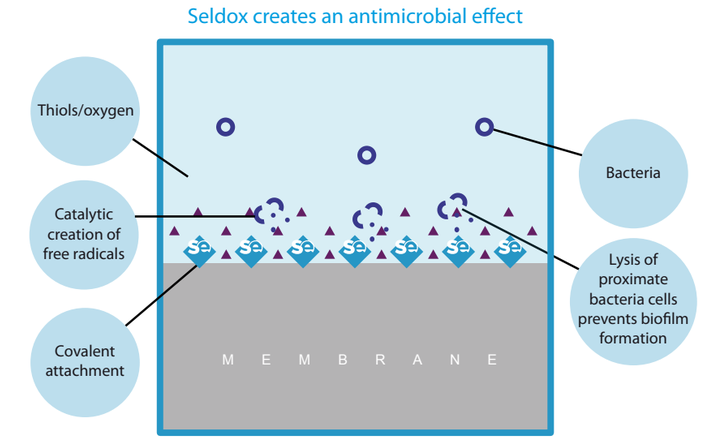
This technology could be applied to membranes, spacers, tubing, equipment and accessories in the desalination industry. Selenium Ltd. has received a National Institutes of Health (NIH) grant to apply this technology to dental waterlines, and a National Science Foundation (NSF) grant to develop the technology for RO spacers.

Costs and challenges

It will cost around $20 to copolymerise the SELDOX™ material to a typical $480 RO element. Looney estimates that the material will make savings of $200/element in the first of year of operation.

Selenium Ltd. has completed initial research and development, and provided a proof of concept study for water management applications. The company still needs to

Destruction of bacteria by catalysed redox reaction



Source: Selenium Ltd