Non-Confidential Description

Coatings Containing 'Caged' Disinfectant: Imparting Superior Mechanical Properties and Broad Range Anti-Microbial Activity

Technology Case: RFT-242

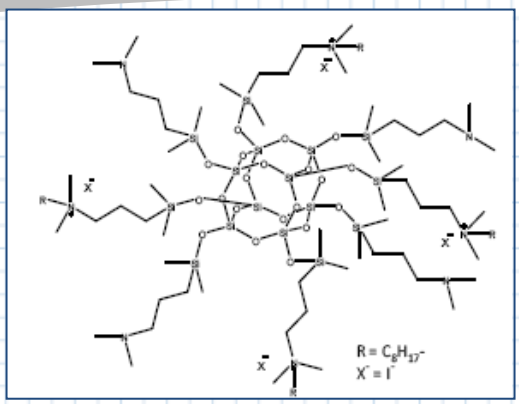

Fig. An idealized structure of the Q-POSS

Invention Summary

Scientists at NDSU have recently invented a novel quaternary ammonium functionalized polymer that exhibits broad spectrum antimicrobial activity and has superior mechanical properties.

The invention involves the effective incorporation of POSS (Polyhedral Oligomeric Silsesquioxane compounds having unique cage like structure) into a polymer matrix that has quaternary ammonium compounds (disinfectants that control microbial growth).

Invention Premise

The coating has been shown to impart antimicrobial activity towards fungal pathogen, and both a gram-negative (*E. coli*) and gram-positive (*S. aureus*) bacterium. It has also been shown to exhibit superior mechanical characteristics, increased glass transition temperature, lower flammability, and enhanced rheological properties.
Since quaternary ammonium compounds are widely used as disinfectants to control microbial growth, it was of interest to the inventors to synthesize quaternary ammonium functional-POSSs (Q-POSSs) and determine their utility as antimicrobial additives for surface coatings. It was hypothesized that incorporation of Q-POSS into a polymer matrix may impart both biocidal activity and enhanced mechanical properties to the material.

Microorganism	Antimicrobial responses observed		
	+,+	+,–	–,–
S. aureus			
E. coli	Not observed		
C.albicans			

Fig. Representative images illustrating antimicrobial responses to the coating

This invention was the result of synthesis of an array of Q-POSS molecules possessing systematic variations in chemical composition. Moisture-cured polysiloxane coatings containing Q-POSS molecules were prepared by dispersing Q-POSS molecules into a solution blend of silanol-terminated polydimethylsiloxane, methyltriacetoxysilane, and a catalyst.

In order to evaluate the utility of the QPOSS molecules as a broad spectrum antimicrobial additive, the antimicrobial activity of the coatings toward the Gram-negative bacterium, *Escherichia coli, the Gram-positive bacterium, Staphylococcus aureus,* and the opportunistic fungal pathogen, *Candida albicans*, was determined using an agar plating method.

Patents

This technology is patent pending with fully preserved U.S. patent rights and is available for licensing/partnering opportunities.

The Lead Inventor

Bret Chisholm, Ph.D.
Senior Research Scientist

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

Jonathan Tolstedt, Licensing Associate/Patent Agent
NDSU Research Foundation, Fargo, ND 58108-6050
Phone: 701-231-8173 Fax: 701-231-6661
Email: jtolstedt@ndsurf.org
Web: www.ndsuresearchfoundation.org