Free Fatty-Acid Based Biomaterials (2018-041)

Crosslinked free fatty acids for us in antibacterial medical device implants

Market Overview

FFA-based biomaterials created via this novel crosslinking process have significant opportunity for application in medical device implants. The global market for medical device coatings is expected to reach $7.9 billion in 2021. However, common materials for these coatings, such as stainless steel, titanium, and Teflon, often provoke an aggressive immune response that can cause the implants to degrade and fail. Where FFA based biomaterials have shown promise, the previous methods used to crosslink them yielded materials inherently susceptible to the same pattern of degredation. Clemson researchers have developed a novel process to crosslink these FFAs, rendering them more durable, less inflammatory, and highly antimicrobial, conferring significant advantage over previous iterations.

Technical Summary

Incorporating Free Fatty Acids into composite materials via covalent crosslinking with elemental sulfur substantially improves on oxidative crosslinking methods that resulted in weakly bound molecules. Alone, FFAs and triglycerides do not posses adequate strength to serve in biomaterial applications. The former strategy to increase their strength involved the production of oxygen-crosslinked chains, the resultant produce still being susceptible to degredation and provoking an inflammatory immune response. Using elemental sulfur to crosslink FFAs via a thiol-ene type reaction generates FFA/S8 composites instead, free from the hazards of degradation and immune response activation, as well as being inherently antimicrobial, all of which are excellent qualities for use in a medical implant device.

Application

Bioengineering, Medical Device Implant, Antibacterial, Antimicrobial

Development Stage

Prototype

Advantages

- FFAs crosslinked using elemental sulfur, conferring strong antimicrobial properties beneficial for preventing infection due to implant
- FFAs crosslinked using elemental sulfur, improving strength and durability necessary for use in medical implant devices, offerent an advantage over oxidative crosslinking methods
- Biomaterials based on FFAs, eliminating the aggressive immune response the human body has to other foreign materials

App Type	Country	Serial No.	Patent No.	CURF Ref. No.	Inventors
Utility	United States	16/710,873	NA	2018-041	Dr. Andrew Tennyson, Rhett Smith

About the Inventors

Dr. Andrew Tennyson

Assistant Professor of Inorganic Chemistry at Clemson University

Dr. Tennyson graduated from the University of Chicago in 2003, receiving his B.S. with Honors in chemistry and his M.S. in inorganic chemistry. He earned his Ph.D. in bioinorganic chemistry from the Massachusetts Institute of Technology in 2008. He went on to become a postdoctoral fellow in organic & organometallic chemistry at the University of Texas at Austin from 2008-2010. He then began his research at Clemson University in 2010 in the Department of Chemistry, and in 2012 received a joint appointment in the Department of Materials Science and Engineering. His research addresses unsolved challenges in medicine and environmental remediation using redox chemistry.

For more information on this technology contact:

curf@clemson.edu
Please put technology ID in subject line of email.