Duke University
Office of Licensing & Ventures
Technology Opportunity

ACTIVE BIOFOULING CONTROL SYSTEM (MEDICAL)

File #3720-2

Application

Duke University is seeking a company interested in commercializing a novel and versatile method of controlling biofouling contamination. A frequent complication that plagues the efficacy of medical therapies that rely on the implantation of synthetic materials into the human body is the tendency for their surfaces to be colonized by pathogenic bacteria. These bacteria once colonized on surfaces tend to rapidly form complex biofilms (elaborate cellular communities that are encapsulated along the surface of the implant by cross-linked extracellular polymeric exudates), which provide the pathogenic organism with several mechanisms by which they can develop both short term and long term resistance to antibiotics and other treatments. Ironically, the short term resistance of these complex surface communities has contributed, in part, to adaptation in response to the over prescription of antibiotics and to the evolution of pathogenic bacteria into true antibiotic-resistant strains. A related problem and contributing factor to the problem of infectious biofilms is the need to control colonization of surfaces by bacteria (biofouling) in clinical and hospital environments. So-called nosocomial infections, which are increasingly due to highly virulent agents because of the adaptations mentioned above, are often devastating because of the reduced immuno-resistance of hospitalized patients. Related problems include the need to control the formation of infectious biofilms on surfaces of devices used in biotechnology (e.g., fermenters, tissue culture bioreactors).

The fundamental problem of the tendency for biofouling of implants and medical instruments has long been evident, and significant effort over the past few decades has been expended on developing surface coatings and treatments (e.g., fouling resistant surfaces, biocidal surfaces) that reduce the formation of biofilms. These methods invariably have only limited short-term success, typically due to the complexity (cellular and macromolecular composition, reactivity) of the milieu that the surface of interest encounters. There thus remains a dire need for new methods for controlling the adhesion of infectious bacteria and the formation of infectious biofilms on surfaces of medical and biotechnological interest.

Technology

Researchers at Duke University have developed dynamic topological surface technologies to control biofouling. The Duke approach enables general solutions which are implementable over a large range of conditions, applications and devices / equipment.

Intellectual Property

Patent pending

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Inventors

Xuanhe Zhao, Ph.D., is an Assistant Professor of Mechanical Engineering and Material Sciences at Duke University. Dr. Zhao's current research centers on soft active materials (SAMs), which include dielectric elastomers, hydrogels, magnetic polymers, and muscles. By integrating experiment and theory, Zhao is studying the behaviors of SAMs driven by multiple thermodynamic forces (e.g., stress, electric field, magnetic field, chemical potential), and exploring SAMs' applications in various areas such as drug delivery, tissue engineering, energy harvesting, robotics, microfluidics, and water treatment.

Gabriel P. Lopez, Ph.D., is a Professor of Biomedical Engineering and Professor of Mechanical Engineering and Materials Science at Duke University. He also serves as Founding Director of the National Science Foundation's Research Triangle Materials Research Science and Engineering Center (Triangle MRSEC). Dr. Lopez's primary professional interests lie in research and education in biomaterials science and engineering, bioanalytical chemistry and biointerfacial phenomena.

Vrad Levering is a catheter engineer and student in the Biomedical Engineering Department at Duke University.

Phanindhar Shivapooja is a student in the Biomedical Engineering Department at Duke University.

Qiming Wang is a student in the Department of Mechanical Engineering & Material Science at Duke University.

Contact

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