

Development of Biomimetic Nanostructured Antibacterial Titanium Surfaces

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Abstract

Titanium is the material of choice for the manufacture of medical implants because of excellent corrosion resistance and proven biocompatibility. The occurrence of premature implant failure is due to implant-associated infections caused by the presence of pathogenic, often antibiotic resistant bacteria, however, remains a prominent concern for clinicians.

Here we consider few examples of biomimetic antibacterial titanium surfaces. Naturally occurring building strategies generate a remarkable compilation of technical equilibrium that is shared amongst many biological materials. These principles of surface growth are rarely found on the surfaces of conventional metals but have the potential to provide desirable properties when used as templates for the natural materials. Antibacterial superhydrophobic quasi periodic self-organized structures on titanium surfaces that possesses a surface topography mimicking that of the surface of the lotus leaf, *Nelumbo nucifera* can be fabricated using femtosecond laser ablation in a single processing step. A great deal of inspiration has resulted from studying the self-cleaning insect wing surfaces. Hydrothermal etching of titanium surfaces, to produce random nanosheet topologies that mimicked the surface architecture of dragonfly wings, has shown remarkable ability to inactivate pathogenic bacteria *via* a physical mechanism. The results reported here provide evidence that titanium surface nano-features can be engineered with a view to controlling bacterial attachment.

Biography

Professor Elena P. Ivanova's professional interests are concentrated on development and research coordination in fundamental and applied aspects of Nano/Biotechnology including planar micro-devices, biomaterials, immobilization of biomolecules and microorganisms in micro/nano/environments, antimicrobial and bactericidal surfaces, bacterial interactions with micro/nano-structured surfaces. She received her Doctor of Philosophy from the Institute of Microbiology and Virology, Ukraine, Doctor of Science from the Pacific Institute of Bio-organic Chemistry, Russian Federation, Juris Doctorate from the University of Melbourne and Graduate Diploma from the Law Institute, Victoria.

Together with colleagues, Elena has published two books, edited 3 books, 26 book chapters, 4 patents, in excess of 300 research papers. Professor Ivanova has been the recipient of AIST and JSPS Fellowships (Japan), a UNESCO Biotechnology Fellowship, a Research Excellence Award from the Governor of Primorye (Russia), the Prominent Young Doctor of Science Award from the Russian Federation, the Morrison Rogosa Award from the American Society for Microbiology (USA), the Australian Museum Eureka Prize for Scientific Research.

