

# BIOENGINEERING SEMINAR

SPRING 2024

## Engineering Material Surfaces for Modulating Cell Adhesion

### Abstract

Surfaces that contain micro- and nanoscale features in a well-controlled and “engineered” manner have been shown to significantly affect cellular adhesion and subcellular function of various biological systems. Our research is focused towards using the tools of micro- and nanotechnology for applications in biomaterials and tissue engineering. The goal of current research is to design implants that induce controlled, guided, and rapid healing in medical devices such as hip and knee implants, stents, and heart valves. Our work proposes the use of well-controlled nanostructured interfaces to modulate cell adhesion and enhance implant integration. We have modified these nanostructured interfaces to be either superhydrophillic or superhydrophobic depending on the application. For example, to improve cell adhesion and subsequent interaction with the surface, superhydrophillic nanostructures surfaces are desirable (e.g., osteointegration of orthopedic implants). To prevent cell adhesion on the surface, superhydrophobic surfaces are desirable (e.g., preventing blood clotting on stents and heart valves, preventing infection on implant surfaces, etc.). We hypothesize that controlled biomimetic nanoscale architectures can promote cell adhesion, differentiation and matrix production and enhance short-term and long-term integration of medical devices. Moreover, the ability to create model nano-dimensional constructs that mimics physiological systems can aid in studying complex tissue interactions in terms of cell adhesion, communication, response to matrix geometry, and effect of external chemical stimuli. By understanding how physical surface parameters influence cells, we can more effectively design material surfaces that can be used in a clinical setting for medical devices.

### Biography

Dr. Popat is a Professor and Chair in the Department of Bioengineering at George Mason University. Prior to coming to George Mason University, he was Professor in Department of Mechanical Engineering/School of Biomedical Engineering at Colorado State University for over 16 years. His primary research areas are in the field of Biomaterial, Cell-Material Interaction and advanced surface modification techniques. He has authored over 170 peer-reviewed publications in journals such as Langmuir, Biomaterials, Journal of Orthopedic Research, Journal of Biomedical Materials Research, etc. and has an h-index of 51. He has presented his work at numerous national and international level conferences, has established strong research collaborations with researchers from Brazil, India, South Africa, Italy, etc. He received his Ph.D. in Bioengineering from University of Illinois at Chicago in 2003, M.S. in Chemical Engineering from Illinois Institute of Technology, Chicago in 2000 and B.E. in Chemical Engineering from M. S. University in India in 1998.



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**Thursday, February 29  
12:00-1:00 pm**

Fairfax Campus:  
**Horizon Hall, Rm 1008**

Live streaming to SciTech  
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