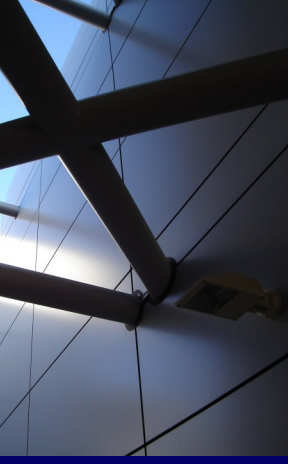

COLLOQUIUM
MECHANICAL ENGINEERING

The Department of Mechanical Engineering presents:

Dr. PRASHANTHI VANDRANGI, Post-doctoral Researcher, ME, BIEN, MSE
& SHANNON GOTT, PhD Student, ME

Friday, January 24, 2014, 11:10AM-12:00PM
Winston Chung Hall 205/206

Prashanthi Vandrangi

ENHANCED ENDOTHELIAL CELL PROLIFERATION AND MORPHOLOGICAL RESPONSE ON SUB –MICROMETER PATTERNED TITANIUM

Abstract:

Titanium (Ti) is of particular interest as a biomaterial due to its potential use in pro-healing vascular stents. To remain effective over an extended period, vascular stents must promote surface re-endothelialization. The native vascular endothelium is anchored onto a nanofibrous basement membrane scaffold, with the scaffold topography believed to strongly regulate cell behavior. Thus, to enhance the potential for stent re-endothelialization, we sought to mimic the topographical features of native endothelial basement membrane by fabricating micro- and nano- patterned topography on Ti biomaterial. Using our novel Ti deep reactive ion etching (Ti DRIE) technique, we here report successful fabrication of surface gratings with groove widths down to 500 nm. This is the smallest feature size achieved to date on a bare metal. Next, we evaluated the behavior of cultured human endothelial cells (HEC) cultured on these Ti substrates. We observe that HEC proliferation on these substrates increases considerably with decreasing feature sizes (p-value=0.001 for HECs cultured on 500 nm when compared to those cultured on unpatterned substrates). Notably, response on all patterns is typically greater than the unpatterned control. Importantly, this preferential cell proliferation on sub-micron grooves correlates with more favorable cellular morphology and cytoskeletal structure, as evidenced by significant elongation and alignment along the grating axis. These preliminary findings of endothelial cell response on patterned Ti surface are consistent with previous reports of cell behavior on patterned polymeric substrates, thus underscoring the usefulness and fidelity of our unique Ti DRIE fabrication technique. Work is underway to obtain a deeper understanding of the effects of sub-micron patterned Ti substrates on endothelial cells as it has important implications for the development effective vascular stents and cardiovascular implants.

Biography: Prashanthi Vandrangi obtained her BTech in Electrical and Communication Engineering from Bombay University (India) and her MS in Biomedical Engineering from Louisiana Tech University and her PhD in Biomedical Engineering under the direction of Professor and Chair of Bioengineering Dr. Victor G. J. Rodgers and Professor of Biomedical Sciences John J. Y. Shyy in 2012. Her Dissertation centers on studying the vascular biotransport considerations in signaling cascades during the onset and progression of atherosclerosis. Additionally, she worked on many collaborative projects in conjunction with Dr. David Lo (Biomedical Sciences), Dr. Joseph Carruso, and Dr. Allen Herford (Loma Linda University). Dr. Vandrangi has 45 conference posters/presentations and 4 published papers. Before joining UCR, she worked as a Business Analyst with Goldman Sachs. She has led numerous outreach activities including WIRED; spearheaded and directed the implementation of GradSuccess (formerly GradPREP); was the founding board member of the SACNAS at UCR Chapter; and planned, executed and hosted the Inland Empire's Regional Science Olympiad Competition at UCR for three consecutive years.