Engineering Challenges in Bioencapsulation

Friday, February 24, 2012  |  2:00 pm  |  DeWALT Seminar Room, 2164 Martin Hall

ABSTRACT: Encapsulation of macromolecules and cells in biocompatible matrices with retention of activity, viability and functionality has extensive applications in biotechnology (e.g. biosensing, biocatalysis, and bioremediation) and in medicine (e.g. tissue engineering, recombinant protein production, and drug delivery). Successful encapsulation depends on developing a biocompatible biointerface (cell-gel interface) while producing a biomaterial of sufficient mechanical robustness and permeability to gases, nutrients, electrolytes, and metabolites. In this presentation we focus on the engineering challenges in bioencapsulation in silica matrices: Firstly, we explore the altered thermodynamics of solvents and biomolecules in silica gels to understand the molecular aspects of nanoconfinement that enable increased chemical reaction rates and higher resistance to pH and thermal insults. Then we move on to presenting the applications of this technology in two distinct fields; bioremediation of herbicides from drinking water and developing an in vitro solitary cancer cell dormancy model for drug screening.

BIO: Dr. Alptekin Aksan received his B.S. and M.S. degrees in Mechanical Engineering from the Middle East Technical University in Ankara, Turkey. He completed his Ph.D. studies on thermomechanics of collagenous tissues in Michigan State University, Mechanical Engineering Department. He worked for three years as a post-doctoral researcher in Center for Engineering in Medicine in Massachusetts General Hospital, Harvard Medical School before joining the faculty of Mechanical Engineering in University of Minnesota in 2005. His research interests are Bioencapsulation, Cellular Biophysics, Biothermodynamics, Biostabilization, and Bioheat/Mass Transfer.

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Host: Professor Amir Riaz
ariaz@umd.edu or (301) 405-0707