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BIOENGINEERING

UNIVERSITY of WASHINGTON

A Department of the College of Engineering & School of Medicine

BIOEN 509 – DEPARTMENTAL SEMINAR SERIES

Thursday, April 7 2011, 12:30-1:20 PM

Foege Bioengineering Building N130A

Molecular Understanding, Design and Development of Ultra Low Fouling Zwitterionic-based Functional Materials

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An important challenge in many applications, ranging from biomedical devices to drug delivery carriers, is the prevention of nonspecific biomolecular and microorganism attachment on surfaces. To address this challenge, our goals are twofold. First, we strive to provide a fundamental understanding of nonfouling mechanisms at the molecular level using an integrated experimental and simulation approach. Second, we aim to develop biocompatible and environmentally benign ultra low fouling materials based on the molecular principles we have learned. Over the last few years, we have demonstrated that zwitterionic and mixed charge materials and surfaces are highly resistant to nonspecific protein adsorption, even from complex media such as undiluted blood plasma and serum. Both simulation and experimental results show that the strong hydration of zwitterionic materials is responsible for their excellent nonfouling properties. In addition to their excellent nonfouling properties, zwitterionic carboxybetaine-based materials have functional groups for direct protein immobilization while the cationic precursors of zwitterionic materials have self-sterilizing capabilities. At present, zwitterionic materials have been applied to a number of applications, including implantable medical devices, early cancer diagnostics, drug/gene delivery, antimicrobial coatings, and marine coatings.

Dr. Professor Jiang received his Ph.D. degree in chemical engineering from Cornell University in 1993. He was a postdoctoral fellow at UC Berkeley between 1993 and 1994 and a research fellow at Caltech between 1994 and 1996 both in chemistry. He is currently Boeing-Roundhill Professor of Chemical Engineering and Adjunct Professor of Bioengineering at the University of Washington, Seattle. He was a visiting professor in the Department of Chemical Engineering at MIT with Prof. Robert Langer in 2007. He received an NSF CAREER award in 2001 and was selected to Fellow, American Institute of Biomedical and Biological Engineering in 2010. He is currently a senior editor for Langmuir. His research focuses on biomolecular interfaces, biomaterials, and biosensors, particularly molecular understanding, design and development of zwitterionic-based materials for biomedical and engineering applications.



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