MECHANICAL & INDUSTRIAL ENGINEERING COLLOQUIUM: ME 794 001

Measuring and Imaging the Cellular Impacts of Engineered Nanoparticles at the Bio-nano Interface

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Abstract: With the rapid development and widespread use of new engineered nanomaterials, there is a pressing need to investigate the potential impacts from engineered nanoparticles (ENPs) on the environment, ecological and biological systems. Many previous studies indicated that the interfacial phenomena such as aggregation, sorption, ion release, and generation of reactive oxygen species (ROS) of ENPs and the interactions between ENPs and microbial cells can significantly influence the biological consequences. In this seminar, I will demonstrate the cellular impacts of such interfacial interactions of ENPs from the physical and chemical perspectives. Physical damage was evaluated by measuring the local scale changes to the cellular surface characteristics (e.g., adhesiveness, hardness and electrical properties) of *E. coli* cells before and after direct exposure to hematite (α-Fe_2O_3) NPs using atomic force microscope (AFM). Chemical damage was explored by correlating the photogeneration of reactive oxygen species (ROS) with antimicrobial ability of various metal oxide NPs, which integrated the knowledge of material science and aquatic chemistry to ravel mechanisms of ROS production on semiconductor nanomaterial surfaces. Overall, the research findings are aimed at furthering our understanding of fundamental implications of nanoparticle-cell interactions.

Bio: Wen Zhang is currently the faculty of NJIT's Newark College o Engineering in the Department of Civil and Environmental Engineering as an assistant professor. Prior to joining NJIT, Wen worked as a research engineer at Georgia Institute of Technology, where he received his PhD in Environmental Engineering in 2011. His research mainly focuses on environmental applications and implications of engineered nanomaterials. Specifically, he is interested in the size effects of nanoparticles on the interfacial interactions with microbial and human cells. He quantifies the cellular impacts of such interfacial interactions by measuring the local scale changes to the multiple physical and biomechanical properties such as adhesive and electrical properties of cells. Wen has published more than 20 scientific papers, which built his credentials in nano research. Wen was a research Fellow funded by the Semiconductor Research Corporation (SRC). In 2011, he received the Simon Karecki Award from the Global Research Collaboration and SEMATECH Engineering Research Center for Environmentally Benign Semiconductor Manufacturing. Most recently, he received the 2012 CH2M Hill/AEESP Outstanding Doctoral Dissertation Award from the Association of Environmental Engineering and Science Professors (AEESP).

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