SAN DIEGO STATE UNIVERSITY

Mechanical Engineering
Fall Seminar

Materials Solutions for Energy and Environmental Problems

Tuesday, Nov. 5, 11:00 am-12:00 pm; Dean's Conf. Rm E-203E

Abstract: Global concerns about the environment, resource and energy pressures have induced the new technologies development including materials innovation and applications. The materials research has made significant contributions to energy problems and environmental recovery. In this talk, two research topics will be discussed. I will first present 'flexible thermoelectric materials'. A thermoelectric generator is a solid-state device to convert a thermal gradient into electricity. Flexible thermoelectric devices are recently attracting increasing interest. While p-type conductive polymers have been developed to have decent thermoelectric properties, the progress in n-type counterparts has fallen behind due to difficulties in n-type doping of organic semiconductors. Given this background, we have investigated n-type composites of Bi_2Te_3 nanowires - carbon nanotubes (CNTs). We demonstrated improvement of thermoelectric performance through a combination of post-annealing process and *in-situ* synthesis approach. In the second portion of this talk, I will discuss 'nano-scale zero valent iron particles on carbon-based materials' aiming to remove toxic pollutants in water. Despite the great potential of nano-scale zero valent iron (nZVI) for groundwater remediation, their high tendency for agglomeration reduces surface area and consequently, deteriorates the performance. To address this drawback, the zero valent iron nanoparticles were immobilized in porous medium (e.g., activated carbons and biochar). The hexavalent chromium, Cr(VI) is a toxic form of Cr element that is well known to cause cancer. It was demonstrated that nZVI particles on activated carbons enabled to remove Cr(VI) effectively. In addition, incorporation of nZVI particles and biochar will be discussed focusing on the facile surface modification of biochar and the improved remediation performance of toxic organic compounds. The developed materials were characterized in terms of physical-chemical properties and reaction kinetics. This talk will suggest the value of considering advanced materials as a great solution to energy and environmental problems we have, now and in future.

Dr. Jaeyun Moon

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BIO: Dr. Jaeyun Moon is an Assistant Professor in Mechanical Engineering at the University of Nevada, Las Vegas (UNLV). She obtained her Ph.D. degree from University of California, San Diego, and joined UNLV in 2014. Before starting her Ph.D. study, she had worked for Samsung Electronics as a senior engineer/ manager working on DRAM process development and data analysis. At UNLV, she is a principal investigator of '*Energy and Environmental Materials Laboratory*,' focusing on study of thermoelectric materials and metal oxides for energy applications and advanced adsorbents/catalysts for environmental applications. Her research group has conducted several research projects supported by Department of Energy (DOE), National Aeronautics and Space Administration (NASA), and industries (Tesla and Hyundai motors).

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