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Abstract of the seminar

Through control over material size, morphology and chemical structure, nanotechnology offers novel materials that are nearly "all surface" and that can be more reactive per atom than bulk materials. Such engineered nanomaterials (ENMs) can offer superior catalytic, adsorptive, optical, quantum, electrical and/or antimicrobial properties that enable multi-functional technology platforms for next-generation water treatment. This presentation will address emerging opportunities for nanotechnology to improve the selectivity and efficiency to remove priority pollutants, decrease electrical energy requirements, and meet a growing need for safer and more affordable decentralized water treatment and reuse. Examples of applicable nano-enabled technologies include electrosorption with highly conductive and selective electrodes to remove multivalent ions that precipitate or cause scaling; solar-thermal processes enabled by nanophotonics to desalinate with membrane distillation; disinfection and advanced oxidation using nanocatalysts; and electrocatalytic degradation of recalcitrant organic pollutants of emerging concern. We envision using these enabling technologies to develop compact modular water treatment systems that are easy to deploy and can tap unconventional water sources and treat challenging wastewaters to protect human lives and support economic development.

Short Bio

Pedro J.J. Alvarez is the George R. Brown Professor of Civil and Environmental Engineering at Rice University, where he also serves as founding Director of the NSF ERC on Nanotechnology-Enabled Water Treatment (NEWT). His research interests include environmental implications and applications of nanotechnology, bioremediation, fate and transport of toxic chemicals, water footprint of biofuels, water treatment and reuse, and antibiotic resistance control. Pedro received the B. Eng. Degree in Civil Engineering from McGill University and MS and Ph.D. degrees in Environmental Engineering from the University of Michigan. He is the 2012 Clarke Prize laureate and also won the 2014 AAEES Grand Prize for Excellence in Environmental Engineering and Science. Past honors include President of AEESP, the Perry McCarty AEESP Founders' Award for Outstanding Contributions to Environmental Engineering Education & Practice, the AEESP Frontiers in Research Award, the WEF McKee Medal for Groundwater Protection, the SERDP cleanup project of the year award, the Brown and Caldwell lifetime achievement award for site remediation, the ASCE Freese Award, the Outsanding Achievement Award from the Chinese Chemical Society, and various best paper awards with his students. Pedro has served on the advisory committee of the NSF Engineering Directorate and on the scientific advisory board of the EPA, and is currently an Executive Editor of Environmental Science and Technology. He was elected to the National Academy of Engineering for pedagogical and practical contributions to bioremediation and environmental nanotechnology, and is a foreign member of the Chinese Academy of Engineering.