



Aggregation Behavior and Cytotoxicity of Carbon-Based Nanomaterials in Aquatic Environments

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With the emergence of nanotechnology, engineered nanomaterials, such as fullerene and carbon nanotubes, will inevitably find their way into natural waters. Understanding the aggregation behavior of these nanomaterials is important for predicting their transport, reactivity, and bioavailability in aquatic environments. This presentation will focus on the aggregation kinetics of fullerene (C₆₀) nanoparticles and carbon nanotubes. The early-stage aggregation kinetics of these nanomaterials are investigated via time-resolved dynamic light scattering under various solution chemistries (monovalent and divalent cations, and presence of humic acid and macromolecules). The mechanisms of aggregation will be related to solution chemistry and the physicochemical properties of the nanomaterials. In addition to the aggregation kinetics, recent work on the interaction of carbon nanotubes with bacterial cells will be described and the environmental implications of carbon nanotube cytotoxicity will be discussed.

Professor Menachem Elimelech is the Roberto Goizueta Professor of Chemical and Environmental Engineering at Yale University, and is the founder and current Director of the Environmental Engineering Program. Professor Elimelech received his B.S. and M.S. degrees from the Hebrew University in Jerusalem and his Ph.D. from Johns Hopkins University in 1989 in Environmental Engineering. He has been a Visiting Associate at Cal Tech (Environmental Engineering Science) and a Guest Professor at the Swiss Federal Institute of Technology (ETH). In the Summer of 2002, he was the Exxon-Mobil Chair Professor at the National University of Singapore. His research interests center on problems involving physicochemical and biophysical processes in aquatic systems. In 2006, Professor Elimelech was elected to the National Academy of Engineering "for contributions to the theory and practice of advanced filtration technologies for the treatment and reuse of potable water". Professor Elimelech was a recipient of the W.M. Keck Foundation, Engineering Teaching Excellence Award in 1994; the American Society of Civil Engineers, Walter L. Huber Civil Engineering Research Prize in 1996; the 2002 Best Paper Award from the Association of Environmental Engineering and Science Professors (AEESP); an Excellence in Review Award from Environmental Science & Technology in 2004; a Yale University Graduate Mentor Award in 2004; the 2005 Athalie Richardson Irvine Clarke Prize; and the AEESP Frontier Award in Research in 2006. Professor Elimelech serves on the Editorial Advisory Boards of Colloids and Surfaces A, Desalination, Environmental Science & Technology, Environmental Engineering Science, and Separation Science and Technology.