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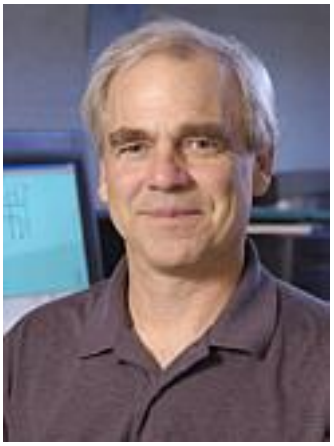
Distinguished Lecture Series



William P. Ball, Ph.D.
Johns Hopkins University

Effects of Surface Oxides and Natural Organic Matter on Environmentally Relevant Properties of Carbon Nanotubes

Monday, February 25, 2013

10:30 to 11:30AM
Seminar Room D3 W122

Abstract

Multi-walled carbon nanotubes (MWCNTs) are fascinating engineered nanomaterials of high commercial value that are being produced at steadily increasing rates. The behavior of MWCNTs in aquatic systems is of interest in regard to their potential use in treatment technologies and also in the context of their environmental transport and toxicity. In order to develop fundamental understanding of how such particles behave in aquatic settings, we have been investigating the role of surface and solution chemistry in moderating the interactions of MWCNTs with potential dissolved water contaminants (e.g., polycyclic aromatic hydrocarbons and divalent metal cations) and on MWCNT aggregation, deposition and transport in simple, well-characterized porous media. By providing precise measurements of CNT surface functionality and limiting our focus to simple and well-characterized systems, we strive for fundamental data that can complement studies in more complex systems and provide insights into situations where CNTs unique size and shape may make their behavior different than other colloids. This seminar will present data obtained on the sorption, aggregation, deposition, and transport properties of various oxidized MWCNTs that have been prepared by refluxing in different HNO3 solutions. Focus will be on recent work to explore the applicability of filtration theory to the transport of well-dispersed tubes in spherical silica porous media. Results suggest that clean-bed filtration theory can apply for properly controlled conditions and that the effects of surface functionalization, pH, and ionic strength on MWCNT deposition are qualitatively consistent with DLVO theory, such these materials behave much like other colloids in these regards. On the other hand, transport experiments also suggest that the extremely high aspect ratio of these materials may make them much more susceptible to interception mechanisms of collision than would be expected on the basis of their hydrodynamic diameter.

About the speaker

Dr. William (Bill) Ball is a Professor of environmental engineering in the Department of Geography and Environmental Engineering at Johns Hopkins University (JHU). He has over 25 years of experience in the investigation of processes controlling water quality and contaminant fate, as relating to both engineered processes of water treatment and transport of contaminants in natural aquatic systems. Bill received his BS in Civil Engineering from the University of Virginia and his MS and PhD in environmental engineering from Stanford University. Between his MS and PhD he worked for 6 years in professional environmental engineering consulting (with the firm that is now MWH). Since 1989, Bill has been teaching and conducting research, first at Duke University and, for the past twenty years at Johns Hopkins University.

Bill is currently serving as the Associate Director of the JHU Global Water Program.

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