



**MATERIALS DEPARTMENT / MRL
JOINT COLLOQUIUM**

Friday, October 9, 2009, 4:00 PM, ESB 1001



“Carbon Nanotube Nanofluidics”

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Abstract

Carbon nanotubes are an excellent platform for the fundamental studies of transport through channels commensurate with molecular size. Water transport through carbon nanotubes is also believed to have some similarities with the transport in biological channels such as aquaporins. I will discuss the transport of gas, water and ions through microfabricated membranes with sub-2 nanometer aligned carbon nanotubes as ideal atomically-smooth pores. The measured gas flow through carbon nanotubes exceeded predictions of the Knudsen diffusion model by more than an order of magnitude. The measured water flow exceeded values calculated from continuum hydrodynamics models by more than three orders of magnitude and is comparable to flow rates extrapolated from molecular dynamics simulations and measured for aquaporins. More recent reverse osmosis experiments reveal ion rejection by these membranes. Based on our experimental findings, I will discuss our current understanding of the fundamentals of water and gas transport and of ion rejection. I will also explore the potential application space that exploits these unique nanofluidic phenomena. The extremely high permeabilities of these membranes, combined with their small pore size will enable energy efficient filtration and eventually decrease the cost of water desalination and of separations of industrial gases and biomolecules.

Olgica Bakajin is currently a Chief Technology Officer at Porifera, Inc., a startup company that is working on commercialization of carbon nanotube membranes. She also holds a part time research appointment at UC Davis. Until July 2009 she was a staff physicist at Lawrence Livermore National Laboratory, Livermore, CA where led a research group. She received her bachelor's degree in physics with satisfied requirements for a bachelor's degree in chemistry from the University of Chicago in 1996. In 2000 she received a PhD degree in Physics from Princeton University. She then joined Lawrence Livermore National Laboratory as a Lawrence Fellow. After spending the first 9 months of her fellowship visiting the National Institutes of Health, Dr. Bakajin came to Livermore. She has been conducting independent research there, until 2003 as a Fellow, and since then until July of 2009 as a member of the permanent scientific staff. Dr. Bakajin has authored over 30 peer reviewed publications, 4 issued US Patents and several patents pending. Her work has been cited over 2000 times.

Host: Professor Omar Saleh

LIGHT REFRESHMENTS WILL BE SERVED PRIOR TO THE SEMINAR AT 3:45PM