

**Development of Carbon Nanotube Membranes  
for Commercial Applications:  
Status and Lessons Learned  
Olgica Bakajin, Porifera Inc.**

Carbon nanotube (CNT) membranes have unique nanometer size smooth hydrophobic CNT pores that are also electrically conductive. Well-established carbon chemistry allows for relatively simple CNT pore functionalization, enabling engineering of selective membranes.

We have expanded a significant effort in designing process for making carbon nanotube membranes, which can be used for chemical separations, selective electroosmotic pumping, and drug delivery. In of our work we demonstrate reproducible fabrication of CNT membranes on 4" diameter wafer substrates. Gaps between CNTs in aligned array grown on silicon wafer are blocked with polymer (epoxy resin). CNT ends are exposed by using CMP (Chemical Mechanical Polishing) on one side, and by simple wafer release in HF on other side. We show that even the subtle differences in membrane manufacture result with considerable differences in membrane transport properties. I will also discuss the challenges of proper characterization of these membranes.

Our work is ongoing and commercialization of Carbon Nanotube Membranes, still presents numerous challenges. Lessons learned from our commercial development would be applicable to commercial development of other nano-materials.