Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Fast Mass Transport through Sub-2nm Carbon Nanotubes[1] JASON K. HOLT, LLNL, HYUNG GYU PARK, LLNL & UC Berkeley, YINMIN WANG, MICHAEL STADERMANN, ALEXANDER B. ARTYUKHIN, LLNL, COSTAS P. GRIGOROPOULOS, UC Berkeley, ALEKSANDR NOY, OLGICA BAKAJIN, LLNL — We report gas and water flow measurements through microfabricated membranes with sub-2nm aligned carbon nanotubes as pores. The measured gas flow exceeds predictions of the Knudsen diffusion model by at least an order of magnitude. The measured water flow rate exceeds values calculated from continuum hydrodynamics models by two to three orders of magnitude and agrees with flow rates extrapolated from molecular dynamics simulations. The gas and water permeabilities of these nanotube-based membranes are orders of magnitude higher than those of commercial polycarbonate membranes, despite having an order of magnitude smaller pore sizes. These properties should enable more energy-efficient nanoscale filtration, as well as fundamental studies of mass transport in confined environments.

[1]The authors acknowledge U.S. Department of Energy for the auspieces under Contract No. W-7405-Eng-48 with the funding from the LDRD program in Lawrence Livermore National Laboratory, University of California.

Hyung Gyu Park
LLNL & UC Berkeley

Date submitted: 24 Nov 2005 Electronic form version 1.4