

Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

Predicting Frictionless Flows THOMAS B. SISAN, SETH LICHTER,
Northwestern University — Nearly drag-free flow through carbon nanotubes (CNTs)
was recently demonstrated.¹ Flow rates orders of magnitude above that predicted
by applying the no-slip boundary condition were measured. We formulate an an-
alytical model which reproduces the high-speed flow observed. As inferred from
the experiments, we find extremely large slip lengths. Unlike the no-slip condition
which applies equally to all materials, the amount of slip is dependent on material
parameters. CNTs can be made with different diameters and lattice structure. We
show how CNT properties affect the amount of slip. The properties of the liquid also
affect the amount of slip, and we show how the orientation of water molecules af-
fects the amount of slip. We also show how to design CNT flows with the maximum
amount of slip.

¹M. Majumder et al. *Nature* **438**: 44 (2005), J. K. Holt et al. *Science* **312**: 1034
(2006)

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Date submitted: 05 Aug 2006

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