Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Mode-coupling theory of the enhancement of viscosity by strong confinement G. ANANTHAKRISHNA, Materials Research Centre, Indian Institute of Science, Bangalore, India., MOUMITA DAS, Division of Engineering and Applied Sciences, Harvard University, Cambridge, MA 02138, SRIRAM RAMASWAMY, Department of Physics, Indian Institute of Science, Bangalore, India — Experiments (A. L. Demirel and S. Granick, Phys. Rev. Lett. **77**, 2261 (1996)) have found that confining a fluid to a thin layer on the scale of a few molecular dimensions leads to a large increase in the apparent shear viscosity and stress relaxation time. We study the "mode-coupling" enhancement of viscosity for a simple fluid confined in one direction between parallel walls but free to move in the other two, and show that reducing the confinement thickness slows down the relaxation of density fluctuations in a manner similar to lowering temperature or increasing density. As in bulk fluids, this drives a nonlinear feedback leading to a large increase in the shear viscosity at confining distances $\sim$ a few molecular dimensions.

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Date submitted: 15 Dec 2004 Electronic form version 1.4