Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Nonlinear dynamics of ordered particle arrays in parallel-wall channels under creeping-flow conditions[1] JERZY BLAWZDZIEWICZ, Yale University, ELIGIUSZ WAJNRYB, IPPT Warsaw, Poland, NIDHI KHURANA, Yale University — We investigate wave propagation and structural transitions in flow-driven or force-driven particle arrays confined in parallel-wall channels. Our numerical simulations reveal that square and hexagonal particle arrays tend to maintain ordered structure, which is stable with respect to relatively large perturbations. Evolution of such perturbations can be described in terms of a superposition of propagating displacement waves. We show that coupling between longitudinal and transverse waves may lead to lattice instabilities. Under some conditions there occurs a rapid transition from an ordered square lattice to partially ordered hexagonal structure with a large number of defects. This new nonequilibrium fluctuating structure resembles 2D hexatic equilibrium phase.

[1]Supported by NSF CAREER grant CBET-0348175

Jerzy Blawzdziewicz
Yale University

Date submitted: 04 Aug 2008 Electronic form version 1.4