Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Diffusion in Dense Inhomogeneous Colloid Suspensions in Narrow Channels BINHUA LIN, EMILY WONDER, STUART A. RICE, Univ. of Chicago — We report the results of a study of single particle diffusion in dense colloid fluids confined in a ribbon channel geometry that is intermediate between quasi-one-dimensional (q1D) and quasi-two-dimensional (q2D). In all of the systems studied the colloid density distribution transverse to the ribbon channel is stratified with peak amplitudes that depend on the colloid density. Although the virtual walls that confine a stratum are structured with a scale length of the colloid diameter, that structure does not have an apparent influence on the single particle diffusion, which shows the characteristic features of diffusion in a q1D channel with smooth walls. We find that for all channel widths and packing fractions studied the single particle transverse diffusion coefficient in a stratum is smaller than the single particle longitudinal diffusion coefficient in the same stratum, and that the single particle longitudinal diffusion coefficient varies very little from stratum to stratum, being only slightly smaller in the dense strata next to the walls than in central strata. The lack of variation of the longitudinal diffusion coefficient with apparent stratum density is explained by application of the Fischer-Methfessel approximation to the local density in an inhomogeneous liquid. The ratio of the transverse to longitudinal diffusion coefficients varies very slowly with ribbon width, implying a very slow transition from q1D to q2D behavior.

Binhua Lin
Univ. of Chicago

Date submitted: 14 Nov 2011 Electronic form version 1.4