Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Intensity Fluctuations of Optical Microscopy as a Means to Measure Axial Diffusion MALVIKA BIHARI, PSE, UMASS Amherst, THOMAS RUSSELL, PSE,UMASS Amherst, DAVID HOAGLAND, PSE UMASS Amherst — Via optical microscopy, geometrically hindered motions of a single large solute (particle or polymer) can be imaged in real time. Here, intensity fluctuations of confocal fluorescence microscopy admit another way to probe such motions, one convenient when motions are perpendicular to a planar substrate. The focal plane is positioned within the substrate (lying on the microscope stage) and intensity fluctuations arise from motions in-and out- of the focal volume. Two experiments illustrate the new approach, diffusion within pores of a planar membrane or in solution near a solid wall. In the first, diffusion coefficients of spherical particles were measured inside pores of a track-etched polycarbonate membrane as functions of particle and pore size. In the second, anisotropic diffusion (perpendicular/parallel) of the same particles was measured within a few particle diameters of a solid boundary. Theory for hydrodynamically hindered diffusion in both cases is well developed, and data are compared to predictions. Two ways to assess particle/polymer motion, tracking single particles and correlating intensity fluctuations, will be discussed.

Malvika Bihari
Department of Polymer Science and Engineering,
University of Massachusetts Amherst

Date submitted: 01 Dec 2008 Electronic form version 1.4