MAR05-2004-003988

Abstract for an Invited Paper
for the MAR05 Meeting of
the American Physical Society

Single molecule studies in spatially restricted fluid systems

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We have used simple nanofluidic devices to isolate individual active biomolecules in solution in order to observe there identity and activity. We have employed metallic apertures a few tens of nanometers in diameter to confine a region of optical excitation to a volume on the order of 10^{-20} liters, which allows for the observation of single molecule binding activity at meaningful rates and concentrations. Small fluid channels have also been used to isolate individual optically detected molecules. Temporal observation of either the driven or diffusive motion of molecules through the restricted observation volume provides information about the identity of the molecule and can also be used to detect specific chemical binding events. Single specific molecular binding events can be observed by optically observing the spectral characteristics of labeled molecules. In this talk we will describe several approaches and applications of the single molecule studies in microfabricated fluidic systems.