Optical trapping for manipulating single molecules and nanoparticles

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Optical trapping, typically in the form of optical tweezers, is a versatile tool for manipulating micron-sized objects in water. More recently, researchers have been looking at applications of optical trapping for manipulation of single molecules and nanoparticles. I will describe experiments on the optical trapping of femtoliter volume water droplets for studying single molecules, and the resonant trapping of metallic nanoparticles. Sequestering of molecules in submicron-sized water droplets that can be manipulated using optical trapping offers significant advantages over other single molecule techniques. These advantages include small volume mixing to rapidly change the local environment, as well as the ability for transit complexes to repeatedly collide within the detection region. Resonant trapping of particles offers the possibility of enhancing or decreasing the trapping force on an object, thereby enabling greater selectivity.