Trapping aerosols using optical tweezers: from micron to nano scale

Abstract:

A tightly focused laser beam so-called Optical Tweezers (OT) are proven unique micromanipulation tools. Nanometer spatial resolution along with megahertz temporal resolution of OT has turned it to a versatile micromanipulation tool. Aerosol trapping ability of OT has opened new era in its environmental applications. Here we provide some methods for optimization of trapping of aerosols. We have showed that, both by theory and experiment, how changing the mechanical tube length of the microscope objective and the refractive index of the immersion medium not only would improve the trap strength, but also provides considerably larger trappable particle an trappable depth range for aerosols, by decreasing the total spherical aberration. These optimizations along with our new sample chamber have been abled us to trap 1 μm water droplets and gold, polystyrene and silica nanoparticles, down to 80 nm.