Femtosecond-Pulsed Plasmonic Nanotweezers

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Supplementary Video S1: Fluorescence Enhancement

This video shows a trapped 1.2-μm diameter fluorescent polystyrene sphere in the inverted orientation. The sphere is initially placed off the array and the white-light illumination is switched off to show a dim two-photon fluorescence signal from the trapped sphere. The particle is subsequently moved onto the 425 x 425 array and a dramatic increase in the fluorescence signal is evident along with a reduction in the Brownian motion of the particle.

Supplementary Video S2: 300-nm Polystyrene Sphere Trapping

This video depicts the trapping of a single 300-nm polystyrene sphere using 65 μW of incident laser power. The video depicts particle behavior that is characteristic of trapping: (1) 0-8 seconds – particles are seen to "jump" into the focal volume, which is located just above the central tick on the 5-μm scalebar, and are held there for significant periods of time (2) 8-16 seconds – tweezing, or manipulation, of the particles across the BNAs is performed until the stage motion

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becomes too fast, at which point the particle is ejected from the trap (3) $\sim$ 23 seconds – a new particle enters the trap and undergoes suppressed Brownian motion at the trap site, and (4) 35-45 seconds – the shutter on the microscope is closed, causing the particle to undergo significant Brownian motion, and re-opened, causing the particle to jump back to the trap site and remain fixed, i.e., the particle is trapped.

Supplementary Video S3: 300-nm Polystyrene Sphere Cluster Trapping

This video is a darkfield image of several 300-nm diameter fluorescent polystyrene spheres trapped using an input power of 50 μW. The trapped particles are located near the central hash mark on the 5 μm scale bar. Approximately 2/3 through the video, the group of particles is translated across the BNA surface so as to demonstrate particle tweezing.

Supplementary Video S4: 80-nm Ag Nanoparticle Trapping

This video demonstrates the ability of the femtosecond nanotweezers to trap 80-nm Ag nanoparticles. The particle is initially undergoing significant Brownian motion, owing to its small size, and is suddenly pulled into the trap and held for a significant period of time. Trapping is performed using 50 μW of input power.