Electronic Supplementary Material (ESI) for Soft Matter.


# Supplementary information

## Optothermal pulling, trapping, and assembly of colloids using nanowire plasmons

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## S1. Velocity of the colloid at different frame differences (df)

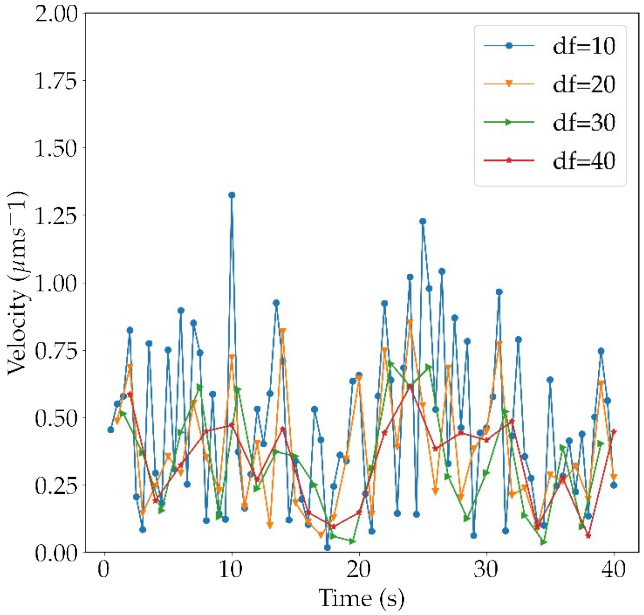


**Figure S1:** Displacements are calculated for frame differences (df) of 10, 20, 30, and 40 frames and corresponding velocities are plotted.

## S2. Brownian motion of particles

2 µm Silica colloids in milli-Q water are dropcasted on a glass substrate and sealed in a 120 µm spacer. The brownian motion of the particles is recorded over a period of 50 s in the absence of the nanowire and laser excitation.

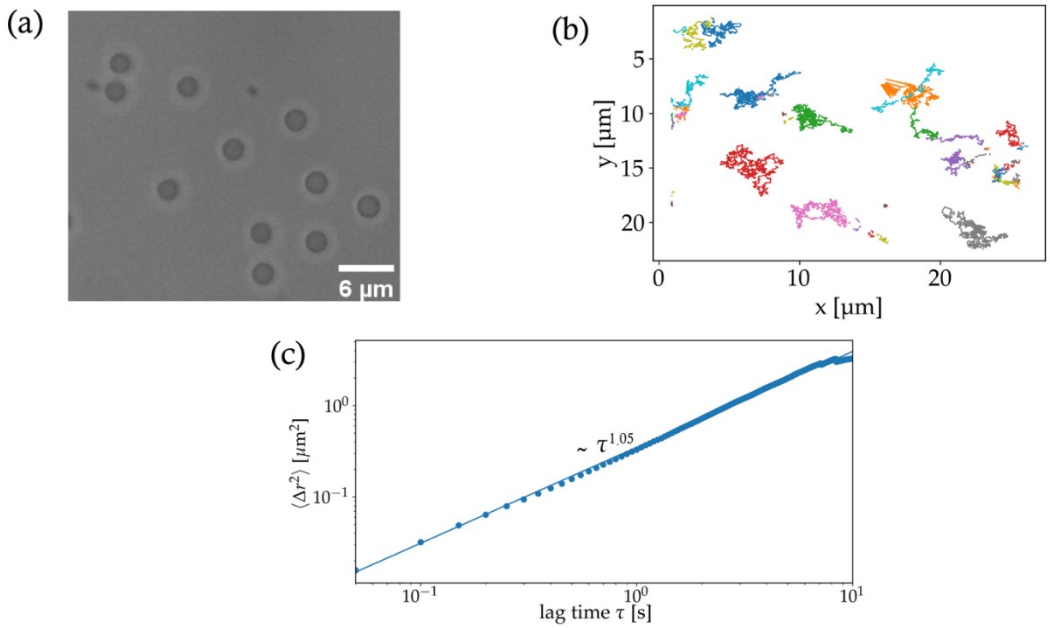

**Figure S2:** (a) Snapshot of particles undergoing Brownian motion. (b) Trajectories of the particles over a period of 50 s. (c) Ensemble MSD of all the particles. The diffusion exponent is 1.05. The Brownian motion of the particles is characterized when the particles are under thermal equilibrium i.e. there is no temperature gradient. The laser is switched off and the motion of the particles is recorded for 50 s. The trajectories of the particles are shown in figure S2 (b). MSD of all the particles is averaged and plotted against lag time on a log-log scale as shown in figure S2 (c). A diffusion coefficient of 1.05 shows that the particles are undergoing Brownian motion.

**S3: Single particle transport along the nanowire**

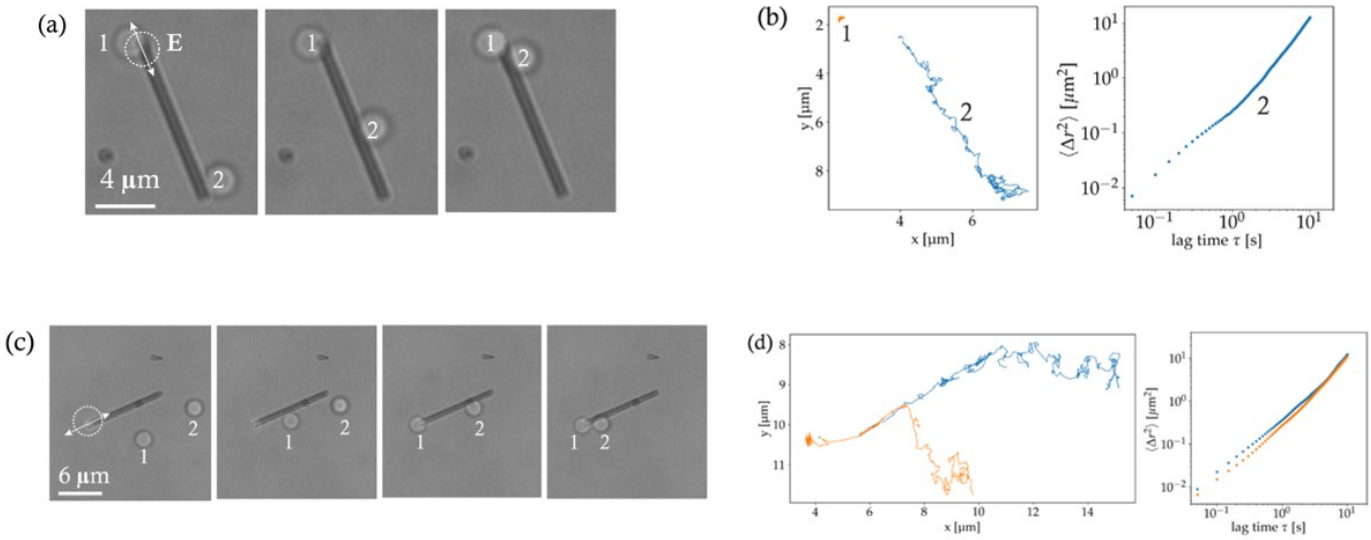


**Figure S3:** (a) Transport of a 2 µm silica colloid along the nanowire. The two particles are marked 1 and 2 for clear distinction between them. Particle 1 is already trapped at the excitation point. The corresponding trajectories of the two particles are plotted in S3 (b). As particle 1 is trapped at the excitation point, its trajectory is localized and is represented by orange color. The trajectory of particle 2 is shown by blue color. The corresponding MSD of the particle 2 is also shown.

Taking another case, two particles reaching the nanowire at different locations is also considered. Figure S3 (c) shows the series of images of two particles. Particle 1 is trapped by the wire near its middle point after which it starts to move towards the excitation point, whereas particle 2 is captured at the distal end. The trajectories of both the particles are shown in (d) marked by orange (particle 1) and blue (particle 2) color. The corresponding MSD of both the particles when they are trapped by the wire is shown in the next panel of figure S3 (d).

**S4: Near-field electric field distribution**

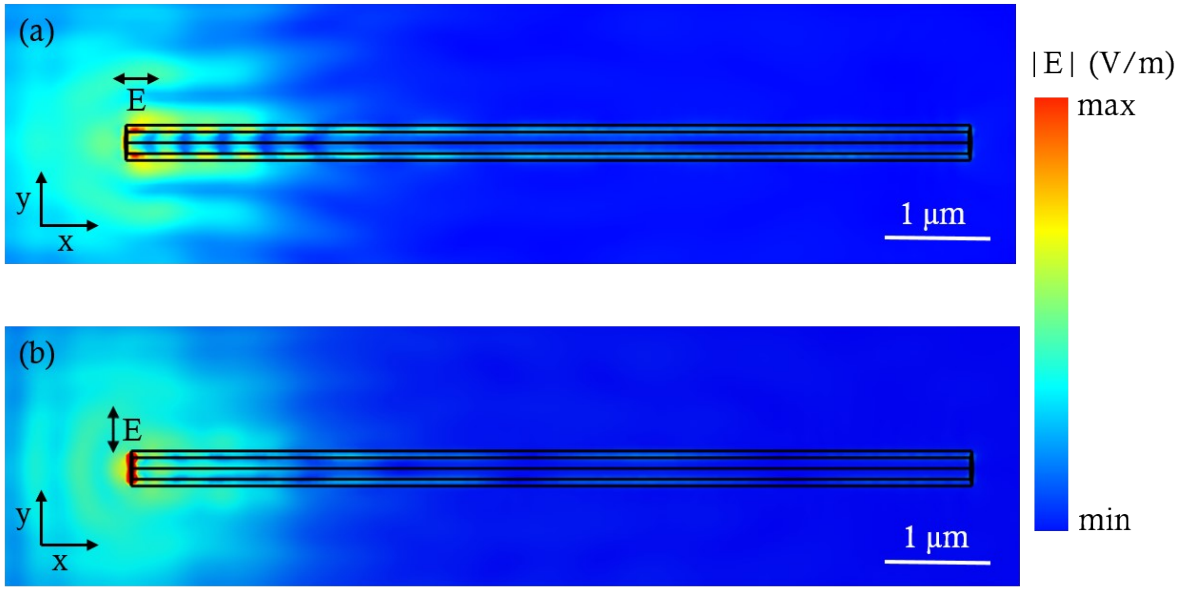


**Figure S4:** Calculated near-field electric field magnitude when one end of the nanowire is excited with polarization along the nanowire and (b) perpendicular to the nanowire.

**S5: Details of supplementary movies**

S1. Transport of a single 2 µm silica colloid from the distal end of the nanowire to the excitation point.
S2. 2 µm silica colloids undergoing Brownian motion.
S3. No trapping of 2.2 µm polystyrene beads is observed.
S4. Assembly process of 2 µm silica colloids.
S5. Assembly of silica beads when the polarization is along the nanowire.
S6. Assembly of silica beads when the polarization is perpendicular to the nanowire.