Accuracy and Mechanistic Details of Optical Printing of Single Au and Ag Nanoparticles

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Resumen

Optical printing is a powerful all-optical method that allows the incorporation of colloidal nanoparticles (NPs) onto substrates with nanometric precision. Here, we present a systematic study of the accuracy of optical printing of Au and Ag NPs, using different laser powers and wavelengths. When using light of wavelength tuned to the localized surface plasmon resonance (LSPR) of the NPs, the accuracy improves as the laser power is reduced, whereas for wavelengths off the LSPR, the accuracy is independent of the laser power. Complementary studies of the printing times of the NPs reveal the roles of Brownian and deterministic motion. Calculated trajectories of the NPs, taking into account the interplay between optical forces, electrostatic forces, and Brownian motion, allowed us to rationalize the experimental results and gain a detailed insight into the mechanism of the printing process. A clear framework is laid out for future optimizations of optical printing and optical manipulation of NPs near substrates.

Palabras Claves: UTN; FRD; UTN; FRD; nanofabrication, optical forces, optical tweezers, colloidal patterning