

Abstract Submitted
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Single-Particle Placement on a large scale¹ PRADEEP BHADRACHALAM, HONG-WEN HUANG, VISHVA RAY, SEONG JIN KOH, University of Texas at Arlington — The capability of positioning single nanoparticles onto exact substrate locations holds prime technological and scientific importance. We present a novel technique to precisely place exactly one single nanoparticle onto a targeted substrate location on a large scale. This was done by defining an electrostatic guiding structure using CMOS compatible fabrication technology, which guides exactly one single 20nm gold nanoparticle onto a desired substrate location with a success rate over 90%. The measured precision of this single-particle placement (SPP) was 12.1nm. This technique has an inherent capability of limiting one single nanoparticle for each target location. Theoretical calculations has revealed that this self-limiting capability originates from an increase of free energy barrier after a nanoparticle is placed on the target location, effectively blocking the approach of other nanoparticles. We also demonstrate size-selective placement of single nanoparticles, where individual nanoparticles of different sizes are guided to different target locations on the same substrate.

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