

Introduction to Center for Scalable and Integrated NAno-Manufacturing (SINAM)

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Presentation

Abstract: The Center for Scalable and Integrated NAno-Manufacturing (SINAM) was established through the National Science Foundation's (NSF) Nano-scale Science and Engineering Centers (NSEC) program. Under the vision of a new nanotechnology manufacturing paradigm combining fundamental scientific research with industrial outlook, SINAM is developing high-throughput, large scale nano-manufacturing tools through the collective effort of its exceptional interdisciplinary team. One of the major challenges in capitalization on nanotechnology is the development of a high-throughput nano-fabrication technology that allows frequent and easy design changes for a wide material selection. Maskless nanolithography, such as electron-beam and scanning-probe-lithography, offers the desired flexibility but suffers from low throughput. SINAM has proposed and developed a new low-cost high-throughput approach of mask-less nanolithography that uses an array of plasmonic lenses which can "fly" at high speed above the surface to be patterned, concentrating short wavelength surface plasmons into sub-100 nm spots for photolithography. A self-spacing air-bearing was designed, which can fly the array just 20 nm above a disk substrate that is spinning at speeds of 4-12 meter/second to utilize the near field focusing effect. A linewidth as small as 80 nm and a patterning resolution of 145 nm are experimentally demonstrated. This low-cost nano-fabrication scheme has the potential to achieve throughputs that are two to five orders of magnitude higher than other maskless techniques. SINAM is also exploring other disruptive nanomanufacturing methods for niche applications in healthcare and energy that will impact the whole society.