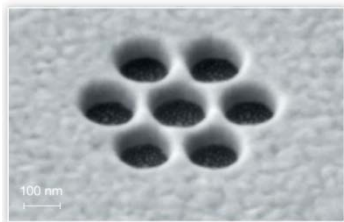
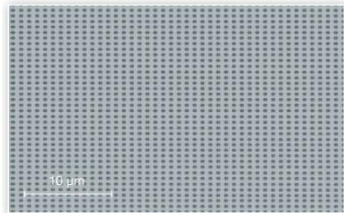


VELION - A Novel FIB-SEM Nanofabrication Instrument Concept and its Applications in Nanoscale Science and Engineering

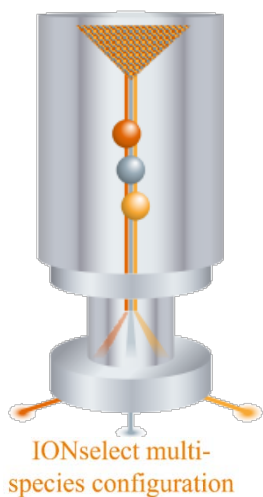
By:

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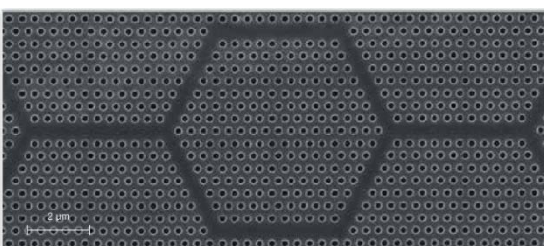
Oligomer structures within a 100-µm-wide array for plasmonics, showing excellent fidelity and reproducibility



IONselect multi-species configuration

Raith has advanced FIB instrumentation over the last fifteen years with the vision that nanofabrication has special requirements that should drive the development of FIB technology. The plasmonics and nanophotonics communities have clearly demonstrated that there are applications whereby FIB-Lithography (FIBL) has its advantages in first delivering the answers to important questions in nanoscale science and engineering. One important motivation for using FIBL is the relative simplification of the overall nanofabrication process, especially for the direct processing at the nanometer scale of novel materials. However, traditional FIB-SEM instruments are lacking patterning resolution, stability, large, corrected fields-of-view, and laser interferometer stages, which are essential components in EBL instrumentation and are mandatory for plasmonics and nanophotonics, which often require high resolution nanolithography with tight dimensional control over areas much larger than a field-of-view. Here, we present a new FIB-SEM nanofabrication instrument containing these essential components of EBL instrumentation, and review its FIBL applications in plasmonics and nanophotonics, including plasmonic arrays and zero mode waveguides for sensing biological molecules, solar absorber arrays, color center creation by maskless ion implantation, large area photonic structures in diamond, and metallic metasurfaces.

With the appreciation that the ion's properties can have dramatic consequences on the physical and chemical nature of the resulting nanostructures, we also discuss the motivations behind applications employing either Gallium or non-Gallium species, such as Silicon, Gold, Germanium, Lithium, Bismuth and clusters. Beyond nanofabrication, VELION is also capable of generating lamellas for transmission electron microscopy (TEM) analyses. The workflows will also be presented.



Write field stitching allows for direct milling of long waveguides with offsets on the 10 nm scale only.