

Multi-scale high precision machining with ion beams

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Abstract

Most commercial FIB systems are based on the gallium liquid metal ion source (Ga LMIS) technology. LMIS FIBs allow fabrication of structures spanning sizes from tens of nanometers to tens of micrometers with great precision. For illustration some selected applications of Ga FIB from the field of materials research will be presented.

On the other hand, there is an increasing need to generate either even smaller or bigger structures. This has led to the development of alternative ion sources and micro-machining workflows.

Today, neon (Ne) and helium (He) FIBs can be used to mill structures in the sub-10nm range. Ne and He beams are generated from gas field ionization sources (GFIS). ZEISS Orion Nanofab combines a He/Ne GFIS column with a Ga LMIS column for forefront research at the nanoscale. At the other end, machining of larger and much larger features is possible with xenon plasma source FIBs and a combination of a Ga FIB with laser machining, respectively. For the latter approach a laser unit was attached to the airlock of a FIB-SEM instrument. Machining workflows using this setup will be described in this talk too.

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