

Helium and Neon ion based microscopy and nanofabrication

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Gas field ion source (GFIS) based focused ion beam techniques historically also known as Helium Ion Microscopy (HIM) is recognized for its high resolution imaging and nanofabrication capabilities [1]. Over the last decade the tool has been utilized in many different ways. Applications include classical semiconductor materials, magnetic materials, 2D materials, nuclear materials but also biological materials.

I will introduce the technique and discuss the different instrumentation additions we utilize and develop in our lab. This includes ionoluminescence [2], in-situ electrical probing [3], and in-situ irradiation at elevated temperatures. Finally, I want to present how we achieve a world record lateral resolution for backscatter spectrometry using time-of-flight [4]. On the materials science part I will present examples from our own lab covering the various application fields, including patterning of magnetic [5] and 2D materials [3] but also structural characterization of epitaxial metal layers [6]. The capability to investigate insulating or biological samples without compromising the performance of the machine will be presented in the second part [7]. This unique feature of the helium ion microscope is possible thanks to the use of an electron flood gun for charge compensation.

References

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