

Sources for focused ion beams and their potential use for single ion implantation

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Focused ion beams are best known for their unique nanopatterning capabilities and their enabling role for other high resolution microscopy methods such as transmission electron microscopy or atom probe tomography [1]. However, in particular in the field of quantum technology alternative sources are enabler for the spatially resolved fabrication of the building blocks for future quantum technology applications. This includes single photon emitters but also spin qbits.

Here, I will present our efforts to contribute to the development of new liquid metal alloy ion sources (LMAIS) and new gas field ion sources (GFIS). I will give a brief overview of our LMAIS fabrication and present first results obtained with a xenon-based GFIS. The different ion sources enable different projects related to many material systems like wide band gap semiconductors, 2D materials, single photon emitters and other quantum technology challenges, materials in fusion and fission reactors, biology and many more. As an example for applications related to quantum technology I will present our results on the spatially resolved fabrication of individual and waferscale single photon emitters [2–4]. Finally, I will present our efforts in the development of a dedicated single ion implanter. The single ion implantation detection scheme and the new ion beam columns used on this tool will be presented.

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